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Final Report on Vessel URN Measurements

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Table of Contents

List of figures

List of tables

Executive summary

This report is a public deliverable for the SATURN project (EU-funded, Grant Agreement No. 101006443). It gathers the efforts of different project activities of the "Full-scale URN measurements" task (T2.1), and it is structured into two main parts, corresponding with the field tests performed in November 2022 and March 2023 by TSI and DNV, respectively.

The first test campaign took place in Las Palmas (Spain) and was focused on measuring vessel underwater radiated noise (URN) following a comprehensive variety of testing procedures. Used methods included international standards and class societies' procedures, designed to characterise vessel sound in deep and shallow water. It was also possible to test the first international standard to measure vessel URN in shallow water, the draft international standard (DIS) of ISO 17208-3[1] (currently under development). Details of the whole test campaign, including its execution and the results processing, are gathered in this report. Also, a thorough comparison of reported vessel signatures from the different methods is provided, proving the need for unifying methodologies as most of them returned lower levels than those obtained under ISO 17208-1 procedure, with differences ranging from -1.5 dB to -12 dB for the same vessel.

ISO/DIS 17208-3 was identified as a consistent procedure to characterise vessel sound in shallow water, showing low deviations in the reported levels against the consolidated international standard for measuring URN in deep water, the ISO 17208-1. Its analytical formulation of propagation loss (PL), used to estimate vessel URN in such a complex environment, presented a good trade-off between ease of use and precision. Details of the testing procedure and post-processing methods are collected in this document, compiling lessons learned and suggestions shared with the ISO working group (ISO TC 43/SC 3/WG 1) developing this standard.

A second test campaign took place in Malta to collect onboard data (vibrations, sound, and pressure of the main vessel noise sources) and URN simultaneously. The gathered data will be used for a later correlation study to be performed in this project (T2.2.4) that seeks to estimate vessel URN based on onboard measurements, aiming to find a cost-effective alternative to characterise vessel URN.

Different materials used in this report will be made available to the community. Some of them, as computed vessel signatures or spectra from the onboard measurements, are already compiled within this document (in table format as annexes). Others will be publicly available or accessible from the project website (www.saturnh2020.eu). Drone footage showing how URN measurements of the Las Palmas test campaign were performed is also available and can be found in the following link.

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[1] https://www.iso.org/obp/ui/en/#iso:std:81321:en

Acronyms

ANSI	American National Standards Institute
ANSI-ASA	American National Standard Institute - Acoustical Society of America
BN	background noise
BP	between perpendiculars
BV	Bureau Veritas Marine & Offshore
CD	committee draft
CPA	closest point of approach
CW	cooling water
DE	driving end
DG	diesel generator
DIS	draft international standard
DNV	Det Norske Veritas
DWT	dead weight tonnage
FPP	fixed pitch propeller
GT	gross tonnage
ID	identifier
ISO	International Organization for Standardization
LOA	length overall
MCR	maximum continuous rate
ME	main engine
MLD	moulded
NDE	non-driving end
OA	overall
PL	propagation loss
PS	port side
rms	root mean square
RNL	radiated noise level
SB	starboard
SL	source level
SNR	signal-to-noise ratio
SPL	sound pressure level
STW	speed though water
TC	test campaign
URN	underwater radiated noise

1. Introduction

This report gathers the details of the work executed to meet the project subtasks T2.2.2 and T2.2.3 scope and shares the outcomes produced throughout their execution. Both activities belong to project task T2.2 (“Full-scale URN measurements”), and their core purview is the execution of field measurements to measure vessel underwater radiated noise (URN) and onboard behaviour.

Subtask T2.2.2 "Full-scale URN measurements of vessels in deep and shallow waters" seeks the characterisation of vessel URN obtained under different measuring procedures in deep and shallow waters. These procedures included class societies' methods and international standards, allowing to study if they would yield the same results or, on the other hand, would justify the need to unify the measuring procedures to allow the proper comparison of vessel signatures (spectral decidecade representation of the underwater sound produced by a vessel under specific operational conditions and measured following a particular standard or procedure). Moreover, plenty of coastal areas present water depths shallower than those defined in the current standards (e.g., from 150 m in ISO 17208-1). The ISO identified this need years ago and has been developing the ISO 17208-3 standard since 2021. The available committee draft (CD) was also tested, providing feedback about its use and other aspects to the corresponding ISO working group (ISO TC 43/SC 3/WG 1). Information shared is gathered in this report.

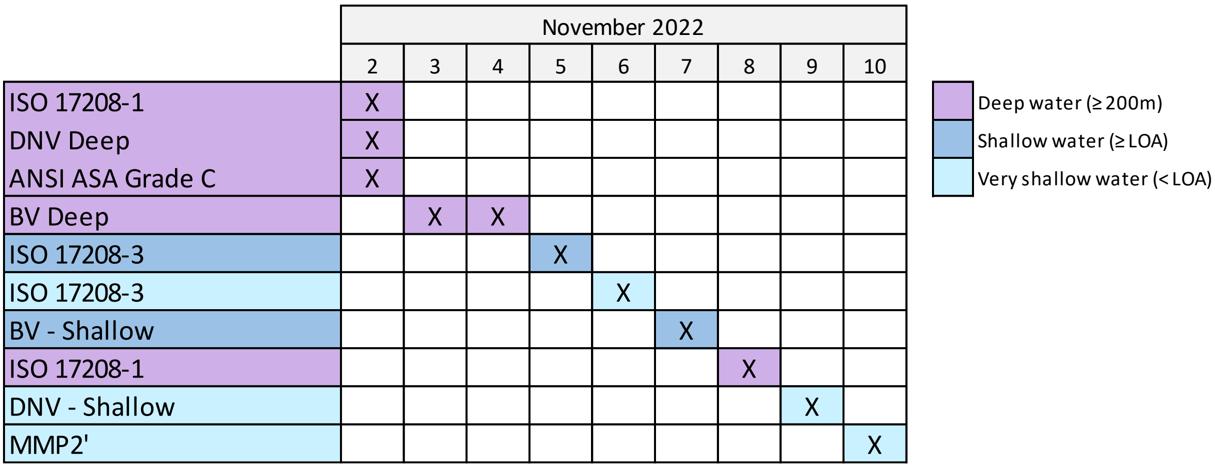
Subtask T2.2.3 “Onboard vessel noise and vibration measurements” is focused on the characterisation of the main onboard sources contributing to the vessel URN, to perform a study later to correlate vessel URN and onboard vibrations and propose a cost-effective solution to estimate vessel URN only using onboard measurements. This task focuses on test execution and data sharing. The correlation study and the cost-effective proposal belong to task T2.2.4 (“Assessing the feasibility of a cost-effective solution for vessel URN measurement based on onboard measurements”), which is not included in this report.

Initially, it was intended to perform all measurements in one test campaign, which was finally not possible. Then, two test campaigns were performed. The first was executed by TSI for nine consecutive days of measurements, focusing on the characterisation of vessel URN under different procedures. The second test campaign was conducted by DNV for one day of measurements, focusing on the acquisition of onboard and URN data needed to be used in the correlation study. This report is organised into two main parts, one per test campaign, gathering their corresponding descriptions and outcomes.

Underwater acoustical terminology follows ISO 18405:2017. Vessel acoustical and bioacoustical terminology follow the SATURN terminology standard (draft, August 2022).

2. Field measurements: Las Palmas

In November 2022, TSI executed a test campaign to measure the URN signature for a specific research vessel in deep and shallow water, following different procedures described in international standards or classification societies' notations. These tests, performed within the subtask T2.2.2 of the SATURN project, aimed to compare the test execution, data processing and obtained vessel signature under different procedures. Collected data will also be used to perform later analysis, such as studying the uncertainties related to URN measurements (T2.2.5) or providing feedback to the ISO working group 1 (TC 43/SC 3/WG 1), which develops the first standard to measure vessel URN in shallow waters (ISO 17208-3), linked to the SATURN project through subtask T2.1.3. The test campaign was performed for eleven consecutive days, while nine were used to perform the measurements. Figure 1 gathers the different tested procedures, their approximate water depths, and how their execution was distributed in time.



	November 2022								
	2	3	4	5	6	7	8	9	10
ISO 17208-1	X								
DNV Deep	X								
ANSI ASA Grade C	X								
BV Deep		X	X						
ISO 17208-3				X					
ISO 17208-3					X				
BV - Shallow						X			
ISO 17208-1							X		
DNV - Shallow								X	
MMP2'									X

Deep water (≥ 200m)
Shallow water (≥ LOA)
Very shallow water (< LOA)

Figure 1: Executed planning for the Las Palmas test campaign.

2.1. Tests execution

2.1.1. Measurements summary

This test campaign is the first of two executed within this project. Its objective was to measure the URN for a certain vessel. It occurred in November 2022 (from 1 to 11 Nov), performing the measurements in the PLOCAN test site (Las Palmas, Spain), a sea area reserved for oceanic research with depths ranging from shore to 600 m.

These trials covered eight instrumentation setups (hydrophone depths), with four different deployments (drifting buoy, surface buoy moored, and two seabed configurations), performing the measurements at fixed speeds over the ground (7 kn, 8 kn, 9 kn, 10 kn, 11 kn) [2] and fixed power (66 % of Maximum Continuous Rate; approximately 11 kn). The complete setup was deployed and recovered daily (9 times in total), spending more than 45 hours in water. Almost 190 vessel passes were recorded, with another 80 background

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[2] 1 kn ≈ 0.514 m/s

noise measurements. Table 1 summarises the primary information of every tested standard or notation, providing their hydrophone depths, target CPA and measured vessel conditions.

Standard/Notation	Test date	Site depth (m)	Top Hyd. depth (m)	Mid Hyd. depth (m)	Low Hyd. depth (m)	Target CPA (m)	Measured conditions
ISO 17208-1 & DNV Deep	2/Nov/2022	206	27	58	100	100	8 kn, 11 kn
ANSI ASA - Grade C	2/Nov/2022	206	27	-	-	100	8 kn, 11 kn
BV Deep	3/Nov/2022 4/Nov/2022	206	40	70	100	100, 150, 200	8 kn, 11 kn
ISO 17208-3 Shallow	5/Nov/2022	80	13	29	50	50	7 kn, 8 kn, 9 kn, 10 kn,
ISO 17208-3 Very shallow	6/Nov/2022	50	20	27.5	35	50	8 kn, 11 kn
BV Shallow	7/Nov/2022	80	35	55	75	100, 150, 200	8 kn, 11 kn
ISO 17208-1	8/Nov/2022	200	27	58	100	100	11 kn, 66% MCR
DNV Shallow	9/Nov/2022	39	-	-	38.8	100	8 kn, 11 kn
MMP2'	10/Nov/2022	39	-	-	37	100	8 kn, 11 kn, 66% MCR

Table 1: Summary of executed URN procedures during the Las Palmas test campaign between 2 Nov and 10 Nov 2022, providing their main details and tested conditions.

2.1.2. Main vessel particulars

The vessel characterised during the Las Palmas test campaign was a research vessel belonging to the Spanish National Institute of Oceanography (generally referred to as IEO for its Spanish name, *Instituto Español de Oceanografía*); the Ángeles Alvariño, which has the following main vessel particulars:

- Vessel length (LOA): 46,7 m
- Ship beam: 10,5 m
- Ship draught: 5,6 m
- Vmax: 13 kn
- RPM max: 166 rpm
- Nominal power: 900 kW
- Fixed pitch propeller
- Number of blades: 5

Figure 2: Picture of the tested vessel taken by a drone during the test campaign.

2.1.3. Equipment

The instrumentation needed to perform the tests were: i) one communication surface buoy, ii) three hydrophones, iii) two GPS receivers (one to track the vessel position and the other to monitor the communication buoy location), iv) one CTD (conductivity, temperature and depth transducer), and v) one pistonphone to perform the daily in-situ verification of the autonomous hydrophones. During the tests, internal software was used to continuously compute the vessel-buoy distance, providing the required course that would allow the vessel's captain to meet the target CPA for each pass, notably reducing the number of invalid passes and therefore reducing the testing time, with the consequent fuel consumption reduction. The specific equipment models used are listed below:

- **Hydrophones**: model icListen HF RB9 from Ocean Sonics. An autonomous hydrophone that stores the raw data internally and allows GPS time synchronisation when connected to the Ocean Sonics surface buoy.
- **Surface buoy:** model BOSS W drifting buoy from Ocean Sonics. This surface buoy has an internal GPS that provides the buoy location and allows the real-time synchronisation of connected hydrophones. The position accuracy does not meet the ISO 17208-1 requirements (an accuracy below 10 m), so it was necessary to encapsulate another GPS inside to meet the ISO standard requirements.
- **CTD**: model Concerto 3 from RBR. Equipment used to measure the sound speed profile and depth in the water. Daily sound speed profiles are shown as subplots in Annex A, while the depth progress plots, measured close to the lowest hydrophone, are available in section 2.4.4. It was always employed, except for the bottom-mounted deployments.

- **Pistonphone**: model 42AC from GRAS. It produces a known output of a pure tone at 250 Hz, producing a constant sound pressure level in air (re 20 µPa) of 134 dB. It was used twice daily to verify the proper functioning of the hydrophones at the beginning and end of measurements (before the deployment and after the recovery). The measured outputs from those in-situ daily verifications are reported in Annex B.
- **Vessel GPS**: model VS1000 from Hemisphere. This equipment uses two antennas installed on the vessel under test, providing high-accuracy position, course and heading. Its accuracy is around 10 cm, which can be improved under a license subscription.
- **Buoy GPS**: model A631 from Hemisphere. This GPS has an IP68 reception antenna, and its power supply was encapsulated within the surface buoy. Its accuracy is around 10 cm with the free subscription, providing sufficient position accuracy to meet the ISO 17208-1 requirements.

Figure 3: Drifting buoy and hydrophones (Ocean Sonics BOSS W, Ocean Sonics icListen HF RB9).

Figure 4: Buoy and vessel GPSs (Hemisphere A631, Hemisphere VR1000).

Figure 5: Pistonphone and CTD (GRAS 42AC, RBR Concerto 3).

The vessel under test had also installed a set of transducers that gathered information during the trials. These parameters are intended to be used for oceanographic purposes of the vessel and were up and running during the Las Palmas test campaign. They were recorded using the highest available sampling rates. Those parameters are:

- Air temperature (ºC) and water temperature (ºC)
- Wind speed (m/s) and wind angle (º)
- Relative wind speed (m/s) and relative wind angle (º)
- Vessel speed over ground (kn)
- Alongships water speed (kn) and athwartships water speed (kn)
- Latitude and longitude (º, ‘, ‘’)
- Sound speed (m/s)
- Water depth (m)
- Heading (º)

These parameters were measured continuously every testing day and are available for use in later tasks as, for example, the uncertainties study to be performed in task T2.2.5 (led by BV). For that purpose, parameters such as “alongships water speed” (presumably equivalent to the speed through water) or the “wind angle” and “wind speed” (to obtain the wind resistance) could be of interest. These two parameters were recently identified as features having a considerable correlation with the URN levels of ships (MacGillivray, Ainsworth, & Zhao, 2022). Additionally, these parameters could be helpful also for modelling purposes; for example, the wind speed accompanied by the height where it was measured (at 8 m above sea surface in this case) can be of interest.

2.1.4. Tested procedures and deployments

This test campaign aimed to quantify the underwater acoustic signature of a vessel under different measuring procedures, performing these tests in deep and shallow water. The intention was to test the higher number of measuring standards and classification societies' methods within the available testing period (nine days). Additionally, it was intended to repeat the ISO 17208-1 procedure on two days to analyse the scatter in the results caused by environmental differences and test some of the options considered in the available ISO 17208-3 draft. Although it was an ambitious test plan, performing all the expected procedures was possible. The rationale of choice for the selected methods is described next:

Procedures for deep water:

- **ISO 17208-1:** this is considered the baseline procedure within this study as it is the international standard to measure underwater vessel noise in deep water. This method was performed twice, the first to be used as the baseline and the second to gather extra data for the uncertainty study to be conducted later in the project (task T2.2.5).
- **ANSI ASA S12.64 - Grade C:** this is the American standard, available from 2009. The Grade C uses one hydrophone at a slant angle of 20º. The 5º permitted dispersion of the standard allowed using the top hydrophone of the ISO 17208-1 deployment for the measurements, being possible to test both procedures simultaneously.
- **DNV:** the deep water method follows the ISO 17208-1 testing procedure, making it suitable to test them in one go. The differences are present in the post-processing of the results, which made it possible to demonstrate the influence of this step in the final reporting of a vessel signature.
- **BV:** this classification society method proposes a different approach to the testing procedure. It uses longer data window times (measuring times) and a set of three CPAs, with significant differences in the post-processing steps, making it an interesting procedure to be performed and compared.

Procedures for shallow water:

ISO 17208-3: this will be the first international standard to measure vessel noise in shallow waters. Even though this standard is still underway, the participation of some project members in its development core group (TNO, JASCO and TSI) made it possible to test and evaluate the method described in the available draft international standard (DIS). Compared with other standards, its definition is more flexible in aspects such as water depths, CPA, and hydrophone deployments.

- **DNV shallow:** this procedure, unlike the others, requires one hydrophone placed on the seabed, offering the possibility of exploring another instrumentation approach.
- **BV shallow:** this procedure allows the use of a vertical array in shallow water, allowing to test a similar deployment as for the ISO 17208-3.

- **MMP2:** this procedure partially emulates a deployment of another ongoing project of this name, currently performed in Canada by JASCO. As a member of the working package, JASCO proposed to reproduce this deployment, where the hydrophone was moored at 2 m from the seabed. It was agreed to use the same target CPA as for DNV shallow procedure (100 m).

Table 2 comprehensively summarises the test campaign, gathering the depth type (deep/shallow/very shallow), deployment strategy (vertical array/bottom mounted/bottom anchored), test site and hydrophone depths, target CPA, vessel speed, and sound speed measured by the CTD. It sums up all the measured conditions, allowing to identify, for example, similar measurements.

	Depth type			Deploy. type			Site depth				CPA distance				Vessel speed						Hydrophone depth															Sound speed[1]				
	Deep	Shallow	Very shallow	Vertical array	Bott. mounted	Bott. anchored	40m	50m	80m	200m	50 m	100 m	150 m	200 m	7 kn	8 kn	9 kn	10 kn	11 kn	66% MCR	13 m	20 m	27 m	27.5 m	29 m	35 m	38 m	38.5 m	40 m	50 m	55 m	58 m	70 m	75 m	100 m	CTD Data	1527 m/s	1530 m/s	1532 m/s	1534 m/s
ISO 17208-1 (day 1)	X			X						X		X				X			X				X									X			X	X	X			
ISO 17208-1 (day 2)	X			X						X		X							X	X			X									X			X	X				
ANSI ASA Grade C	X			X						X		X				X			X				X													X				
DNV DEEP	X			X						X		X				X			X				X									X			X	X				
BV DEEP	X			X						X		X	X	X		X			X										X				X		X	X	X			
ISO 17208-3 (day 1)		X		X					X		X				X	X	X	X	X		X				X					X						X			X	
BV SHALLOW		X		X					X			X	X	X		X			X							X					X			X		X		X		
ISO 17208-3 (day 2)			X	X				X			X					X			X			X		X		X										X				X
DNV SHALLOW			X		X		X					X				X			X									X												
OTHER: MMP2			X			X	X					X				X			X	X							X													

[1]: average value at the deepest hydrophone depth

Table 2: Detailed matrix for the Las Palmas test campaign. The ISO 17208-1 tests took place on 2 Nov (referred to as “day 1”) and 8 Nov (“day 2”). The ISO 17208-3 tests took place on 5 Nov (“day 1”) and 6 Nov (“day 2”).

As already mentioned, testing a varied set of procedures ended up with multiple deployments, some of them having the hydrophones placed on the seabed (bottom mounted or bottom anchored) and others using a surface buoy to hold an array of three hydrophones immersed. A brief description of the employed deployments is provided next, while their drawings are represented in Figure 6 and Figure 7.

- **Drifting buoy**: this is the most popular deployment in dedicated vessel URN tests. A set of hydrophones is suspended from a surface buoy, making a vertical array adrift that moves with the water current. The median current was around 0.6 kn (0.3 m/s or 1 km/h), which would have produced a 4 km displacement of the buoy and hydrophones in 4 hours of tests. This configuration was tested one day for a few hours, as it was not considered feasible to continuously chase the buoy during the tests. Its drawing is represented as (a) in Figure 6.
- **Bottom mounted**: in this deployment, the hydrophone is placed 20 cm from the seabed, using a moored structure that supports the hydrophone fixed to it. In this test campaign, the distance between the hydrophone and seabed was configured to meet DNV shallow waters procedure deployment. This deployment presented better performance regarding flow noise (below 100 Hz), although its high-frequency noise (from 5 kHz) was above the other deployments (see section 2.4.2). The drawing of this deployment is shown in Figure 6, subplot (b).
- **Bottom anchored:** a seabed deployment that keeps the hydrophone 2 metres above it. The hydrophone was attached to a bottom-mounted structure (with a square base and a ~0.5 m vertical bar) through a rope, keeping it floating by an immersed auxiliary buoy. The background noise performance was better than for the vertical array deployment. However, it showed an unexpected behaviour below 70 Hz, which could be improved in a future bespoke design of the mooring structure (removing the vertical bar to attach the rope directly to the base of the mooring structure). Figure 6, subplot (c) shows the drawing of this deployment, while the background noise spectra comparison is in section 2.4.2.
- **Surface buoy moored:** this is a modification of the drifting buoy deployment, decided to be explored within this test campaign. The main expected advantage was to reduce the testing time, to avoid chasing the buoy during the measurements (due to the current drag). The hydrophones disposal is the same as the drifting buoy (vertical array), while the main difference is that the surface buoy is moored. This strategy eased the test execution significantly, allowing a lower dispersion of the measuring conditions (i.e., CPA, site depth, seabed slope and type, etc), yielding a great improvement in the test execution. Figure 8 and Figure 9 demonstrate the improved behaviour of the buoy during vessel passes when using the moored strategy. Its drawing is shown in Figure 7.

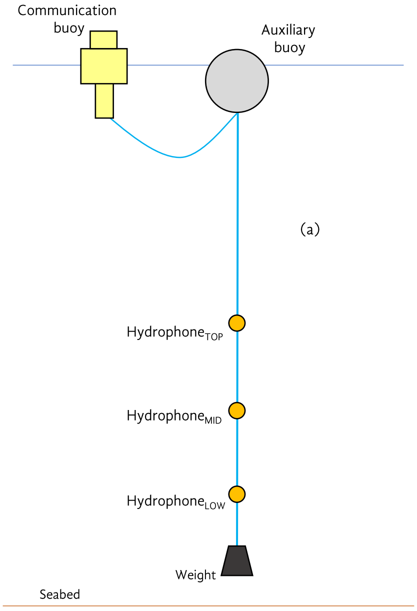

Figure 6: Deployment (a): drifting buoy. Deployment (b): bottom mounted hydrophone using a fixed structure. Deployment (c): bottom anchored hydrophone.

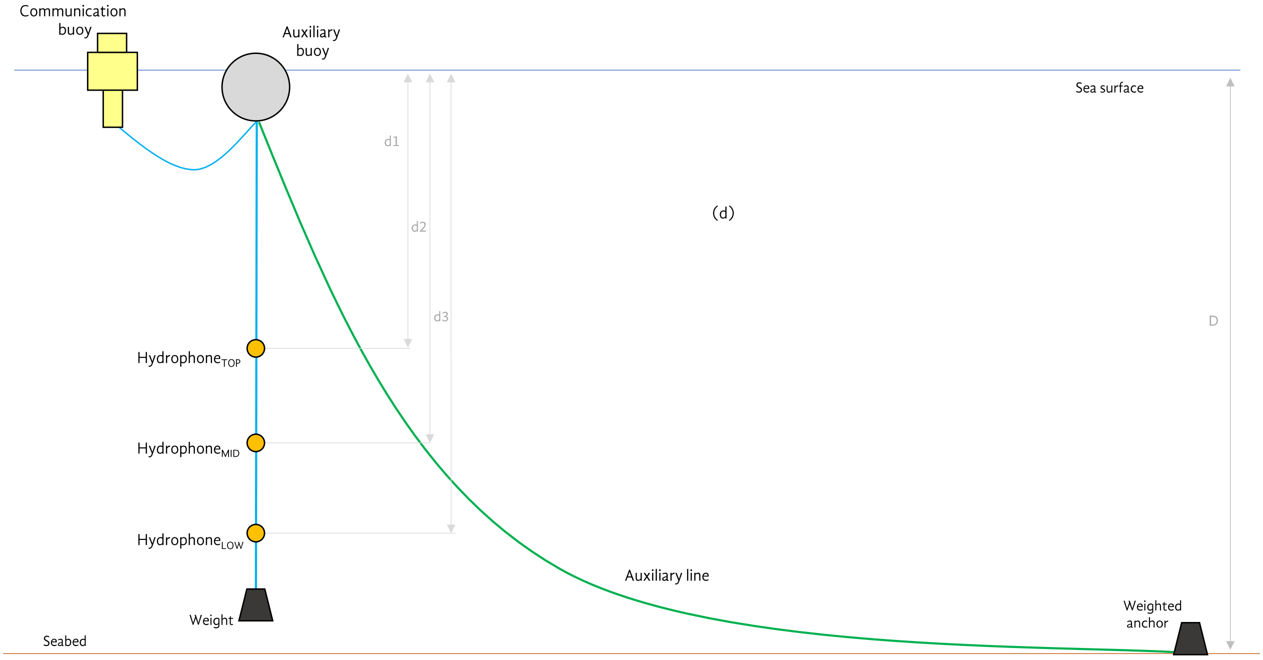

Figure 7: Deployment (d): surface buoy moored.

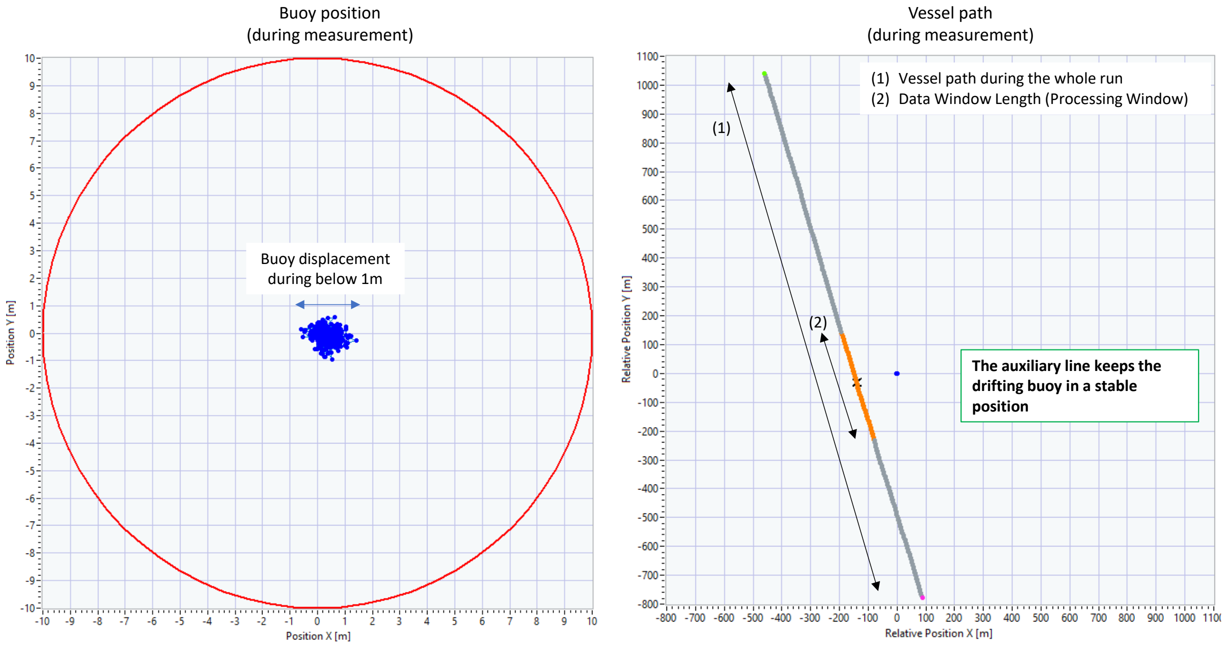

Figure 8: Buoy position and vessel path using the surface buoy moored deployment.

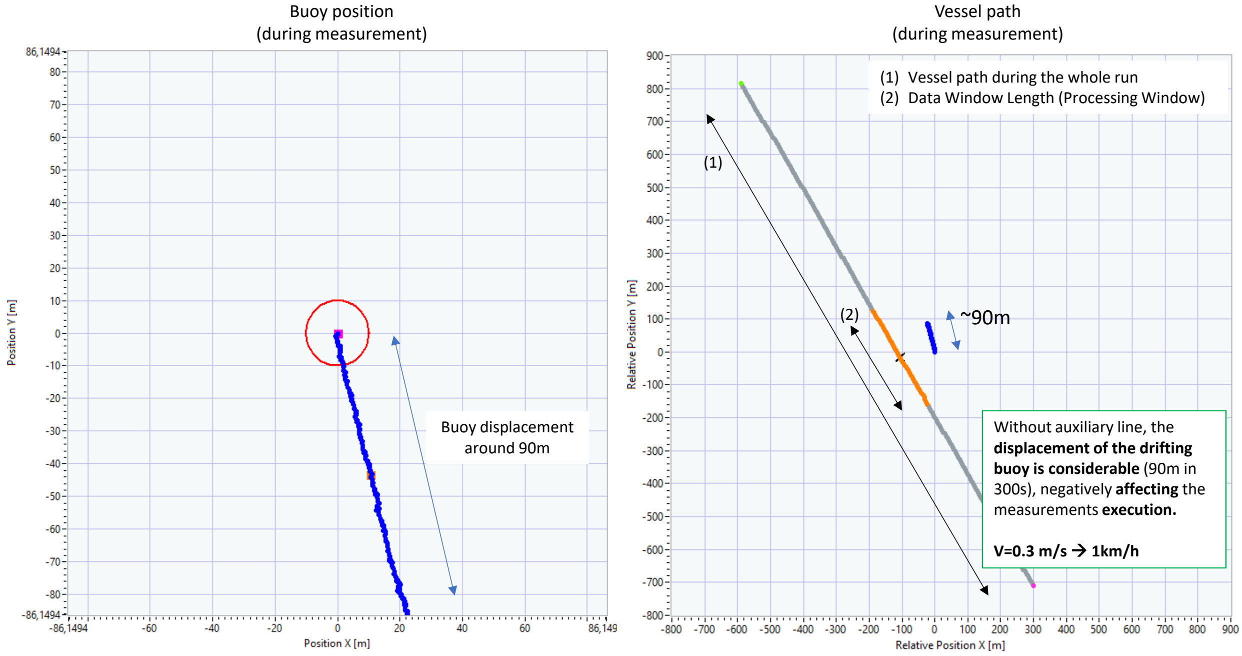

Figure 9: Buoy position and vessel path using the drifting buoy deployment.

A thorough comparison of the deployments, gathering positive and negative points identified during the execution of the Las Palmas test campaign is available in section 2.4.5.

2.1.5. Weather and currents

The weather conditions were very favourable during the whole test campaign. Sea states were below the procedures' requirements, and there was no rain. The vessel instrumentation allowed to record wind speed, current speed, and the vessel heading, objectively supporting the experienced favourable environmental conditions.

2.2. Data processing

Processing activities are focused on quantifying URN produced by the vessel according to a certain test setup and its corresponding post-processing procedure. The following subsections gather the quality verifications performed during the trials and before processing the data and then describe the steps followed to obtain the reported vessel signatures.

2.2.1. Data quality verification

Data quality verification is a crucial step in reporting a vessel's underwater signature. Measuring procedures remark on the importance of verifying the measuring chain before and during the trials and performing daily verifications of the equipment during the measurements. They also define constraints regarding the distance accuracy measurement, vessel speed and others. The objective regarding data quality verification was to perform the required verifications described in the tested methods and to go a step further to ensure the greatest reachable data quality for the project.

For on-site verifications, the primary check was to confirm the proper functioning of the hydrophones twice per day, using a pistonphone before the deployment of the equipment and after the recovery, which produces a pure tone in air at 250 Hz of a known sound pressure level (re 20 μPa) of 134 dB. Figure 10 shows these verifications for a couple of test days, while the rest of the verification plots are gathered and available in Annex B.

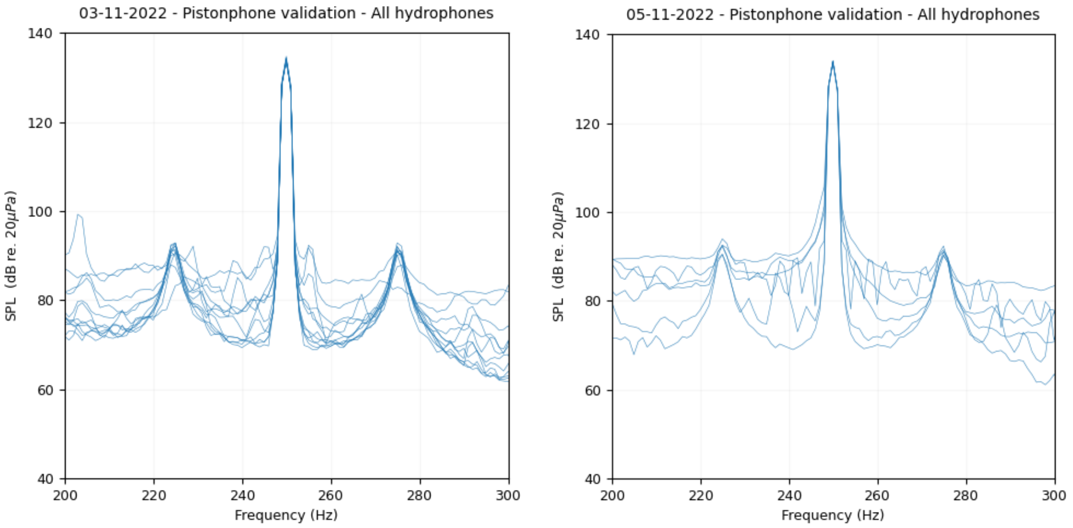

Figure 10: On-site verifications using a pistonphone to produce a pure tone of 134 dB (re. 20μPa) at 250 Hz. Examples of verifications performed two different days during the Las Palmas test campaign.

A box plot using all available pistonphone checks is provided to evaluate the hydrophones calibration scattering. Figure 11 represents measured amplitudes at 250 Hz during the daily verifications, grouped by hydrophone. Precise values for each box represented are gathered in Table 3, while the standard deviation is also included. This table shows that the median measured levels by the hydrophones were within ±0.15 dB from the expected value (134 dB), with a maximum standard deviation of 0.34 dB.

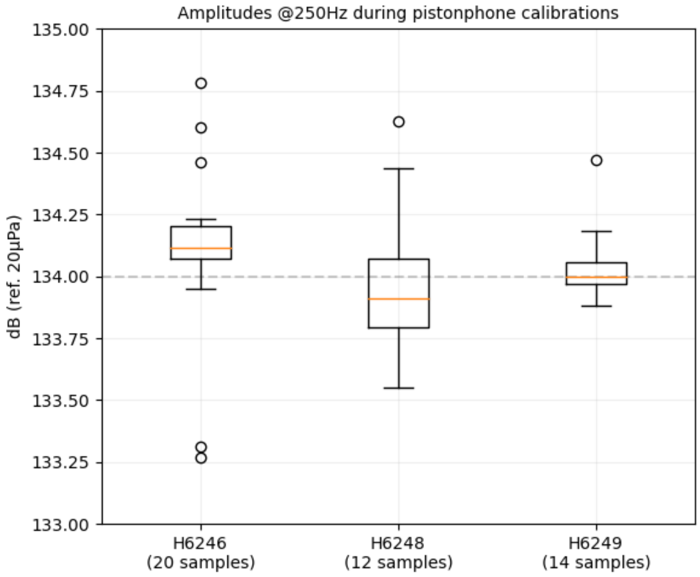

Figure 11: Boxplot of measured amplitudes @250 Hz during the daily checks per hydrophone, which includes all the test campaign pistonphone measurements. The horizontal dashed line indicates the sound level produced by the pistonphone during the verifications (134 dB re. 20 µPa).

HYDROPHONE	Q1	MEDIAN	Q3	WHISKER LOW	WHISKER UP	STD
H6246	134.07	**134.12**	134.2	133.95	134.23	**0.34**
H6248	133.79	**133.91**	134.07	133.55	134.44	**0.3**
H6249	133.97	**134**	134.06	133.88	134.18	**0.14**

Table 3: Statistical values of the pistonphone measurements performed during the Las Palmas test campaign per hydrophone (extracted from Figure 11). Table values are represented in dB (re. 20 µPa).

Additional verifications were also performed to check: i) buoy drift, ii) vessel course, iii) CPA distance, and iv) vessel speed over the ground. These analyses were useful to rate the quality of the measurements to support the choice of the runs used in the computation of the vessel signature. In most cases, the strategy was to select those valid runs performed with the most similar conditions, giving particular importance to the executed CPA and the mean vessel speed over the ground within the processing window. Figure 12 through Figure 15 show an example of the mentioned verifications performed for a certain vessel pass.

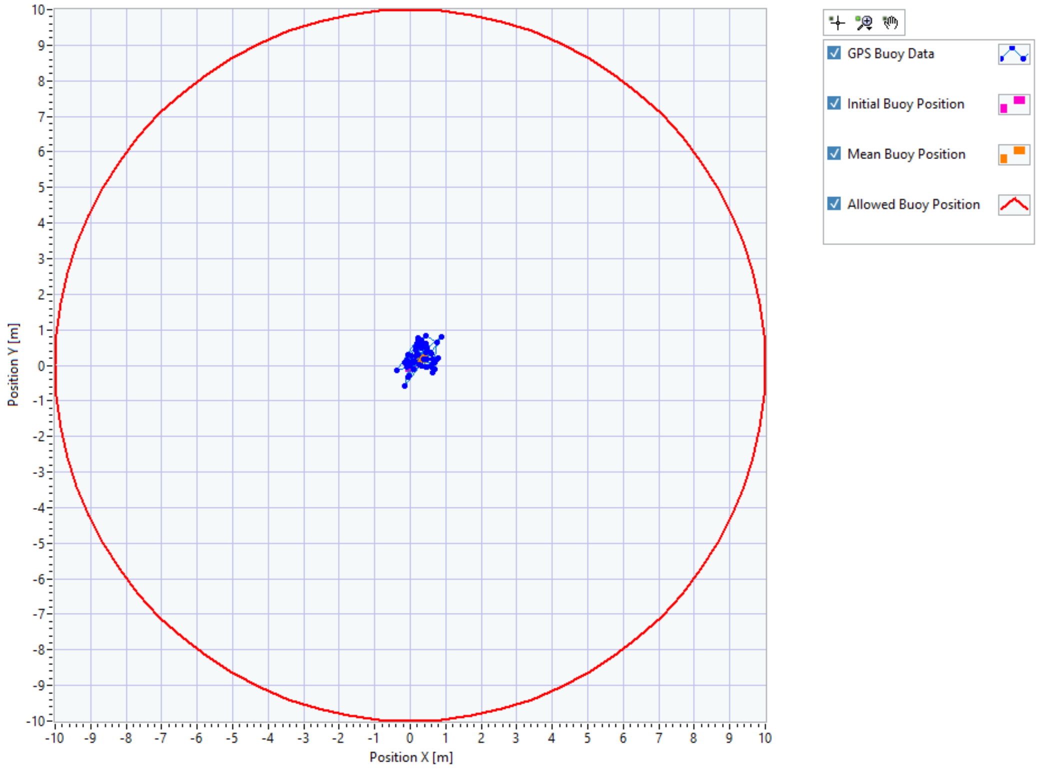

Figure 12: Buoy drift during a run with its allowed dispersion (red circle indicates a 10 m radius).

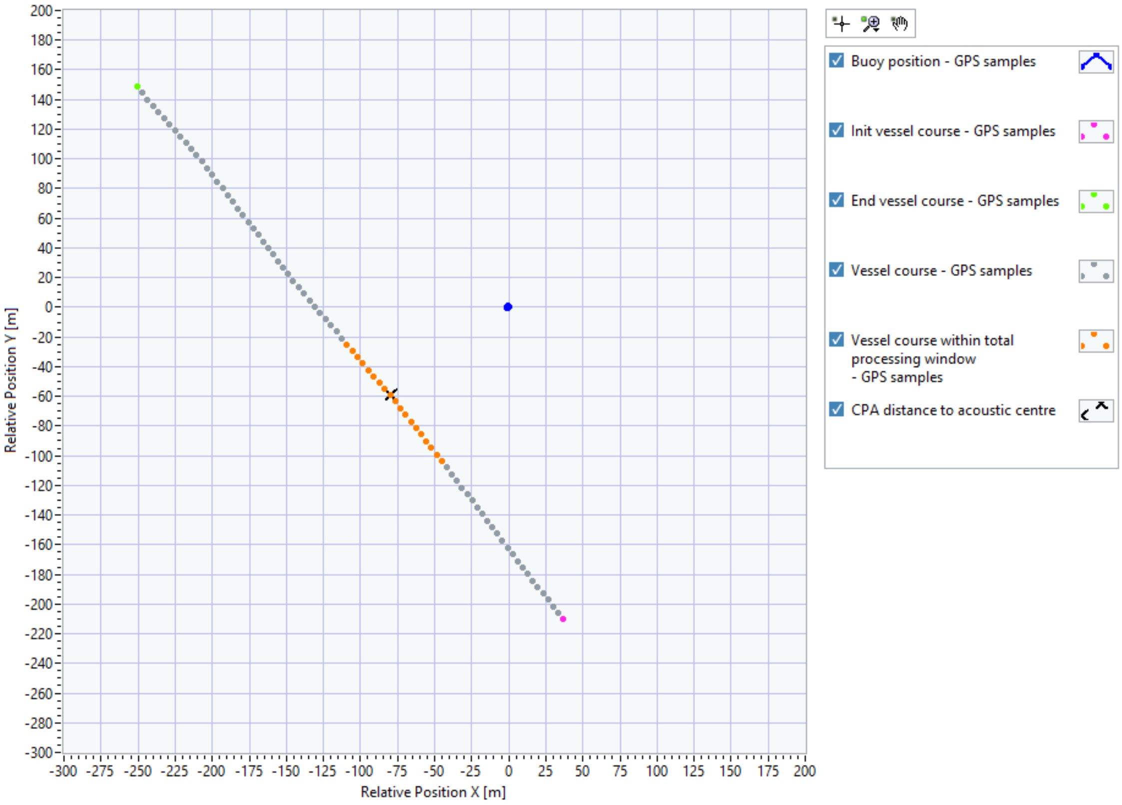

Figure 13: Vessel course during a run. Grey dots indicate the vessel track, orange dots indicate the processing window, and blue dots indicate the buoy position.

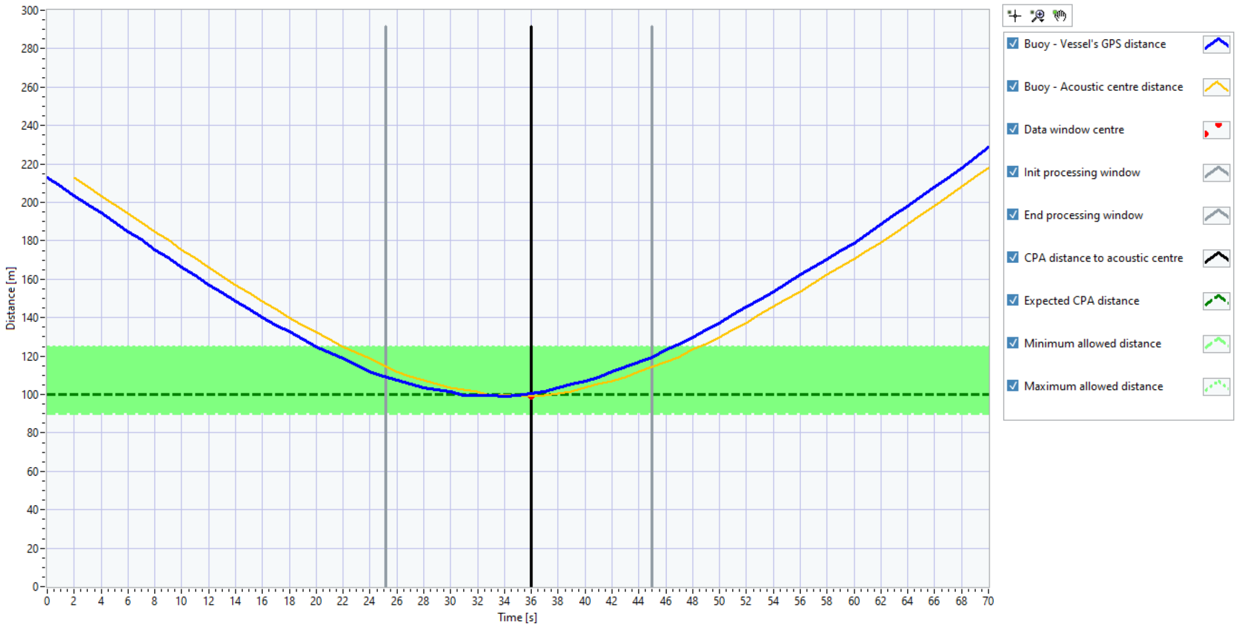

Figure 14: Buoy-vessel distance during a run. The vertical black line indicates the CPA time instant (x axis), the green dashed line indicates the target CPA, and the allowed CPA range is the green area (y axis). The red dot indicates the data window centre (x axis) and measured CPA (y axis), while the vertical grey lines demarcate the total processing window.

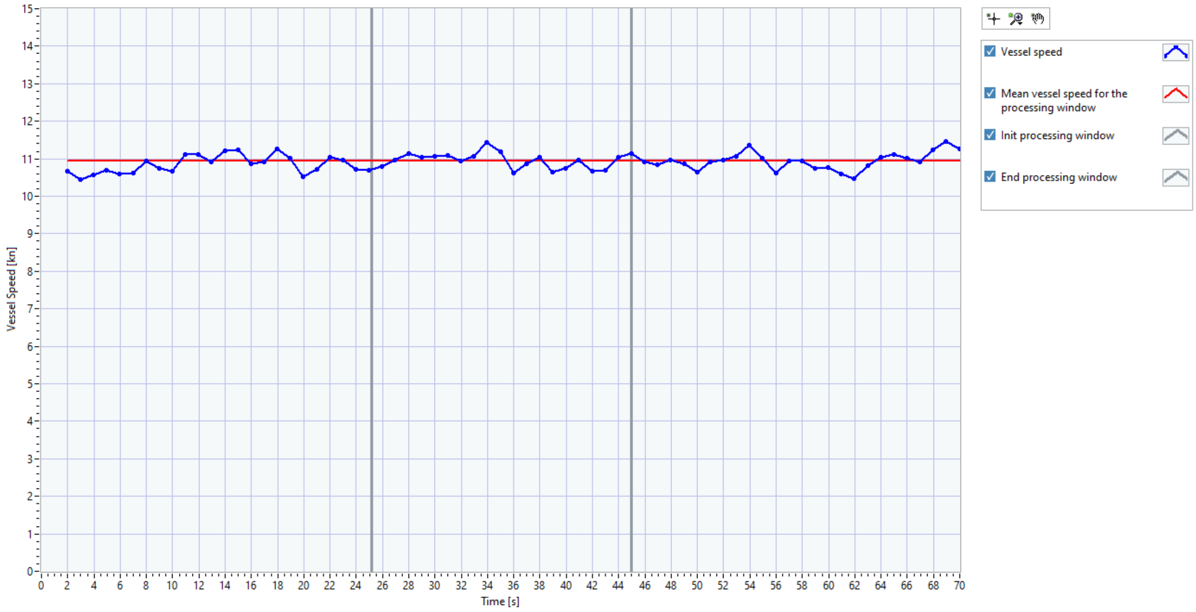

Figure 15: Vessel speed progress during a run (in blue). The horizontal red solid line indicates the mean speed over the ground within the total processing window, marked by the vertical grey stripes.

Part of this information is used to summarise the tested conditions per day, using the measured CPA (from Figure 14) and the average vessel speed of the processing window (from Figure 15), compiling them in a 2D scatterplot as shown below (Figure 16). The next figures show a few days of measurements, where only valid runs are represented (those kept after data quality verification), plotting the mean vessel speed on the vertical axis, and the measured CPA on the horizontal one. These plots are also available for the rest of the test days in Annex A, which is further explained later.

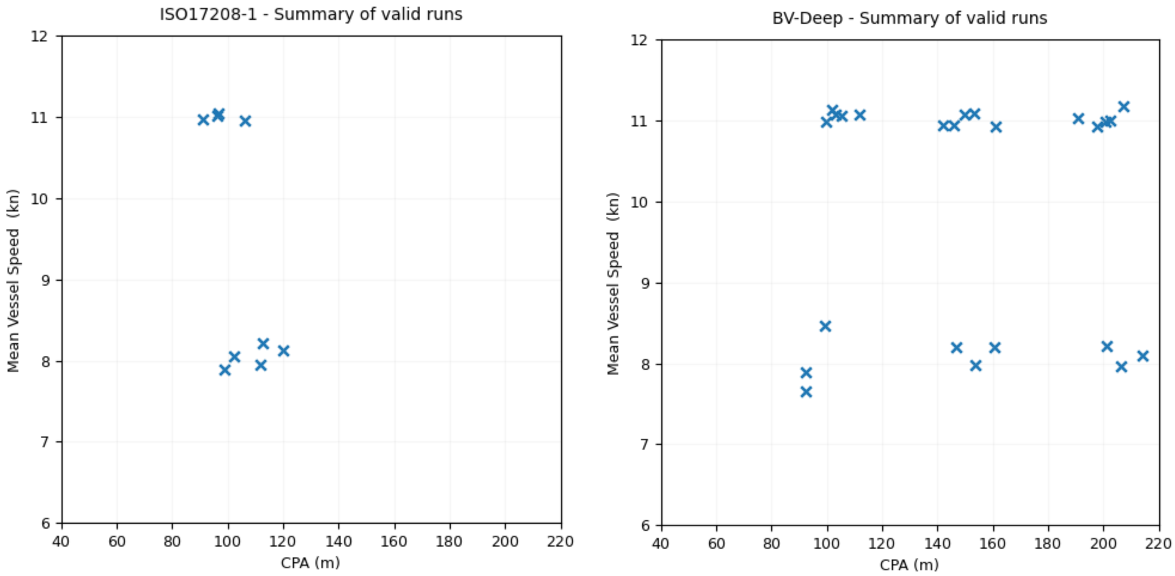

Figure 16: Daily summary for ISO 17208-1 (2 Nov 2022) and BV deep (3 Nov 2022) procedures.

2.2.2. Post-processing

Results reported within this document have been, at least, processed following the post-processing setups described by the procedure used to perform the measurements. Every notation defines specific aspects such as the processing bandwidth, the required background noise corrections, the distance adjustment, or the reporting units (always expressed as decibels but with different reference units). These aspects condition the reported vessel signatures and are often the origin of discrepancies in the results.

Once raw data are considered valid, the first step is to process them to obtain their spectral representation within the processing window. Then, measured sound levels are corrected (measurement chain, spectral hydrophone sensitivity —for to the complete measuring bandwidth—, background noise, and distance correction) to be finally averaged. This averaging comprises the information gathered by the different runs, hydrophones, processing windows, and vessel sides to obtain the final URN signature of the vessel. Table 4 gathers the post-processing details for the measured procedures in the Las Palmas test campaign, making it feasible to quickly identify their differences in important points as, for example, in reporting metric, reference value, bandwidth, distance adjustment or global uncertainty.

The data corresponding to ISO 17208-3 was extracted from the available DIS (Draft International Standard) in June 2023, which may suffer future changes in later versions or reviews.

		ANSI ASA S12.64 (Grade C)	ISO 17208-1	ISO 17208-3	DNV	BV
Reporting metric	Deep water	RNL	RNL	-	$\mathrm{URN}_{\mathrm{DNV}}$	SL / $\mathrm{URN}_{\mathrm{BV}}$
	Shallow water	-	-	SL		
Reporting unit		dB	dB	dB	dB	dB
Reference value[3]		1 μPa · m	1 μPa · m	1 μPa · m	1 μPa · $\mathrm{m}^{0.9}$	1 μPa · m / $\mathrm{Hz}^{-0.5}$ 1 μPa · $\mathrm{m}^{0.95}$ / $\mathrm{Hz}^{-0.5}$
Processing bandwidth		50 Hz - 10 kHz	10 Hz - 20 kHz or 50 kHz	10 Hz - 20 kHz	Deep water: as ISO 17208-1 Shallow water: 10 Hz - 100 kHz	10 Hz - 50 kHz
Frequency representation		"One-Third Octave Band"	Decidecade	Decidecade	"One-Third Octave Band"	"One-Third Octave Band"
Acceptance criteria		No	No	No	Yes (5 curves; one per operation type)	Yes (2 curves)
Data window number		1	1	1	1	19
Background noise correction		If $\mathrm{SPL}_{\mathrm{S+N}}$ - $\mathrm{SPL}_{\mathrm{N}}$: > 10 dB: None [3, 10] dB: Yes < 3 dB: Non-valid	If $\mathrm{SPL}_{\mathrm{S+N}}$ - $\mathrm{SPL}_{\mathrm{N}}$: > 10 dB: None [3, 10] dB: Yes < 3 dB: Non-valid	If $\mathrm{SPL}_{\mathrm{S+N}}$ - $\mathrm{SPL}_{\mathrm{N}}$: ≥ 3 dB: Yes < 3 dB: Non-valid	Deep water: as ISO 17208-1 Shallow water: If $\mathrm{SPL}_{\mathrm{S+N}}$ - $\mathrm{SPL}_{\mathrm{N}}$: > 10 dB: None ≤10 dB: See notation	as ISO 17208-1
Seabed reflection correction		No correction	No correction	Implicit in the PL term	Shallow water: -5 dB reduction	No correction for $\mathrm{URN}_{\mathrm{BV}}$ SL: considered in propagation model
Distance adjustment	Deep water	20log10(R)	20log10(R)	-	18log10(R)	If H ≥ 100m: 20log10(R) If H < 100m: 19log10(R) or propagation model
	Shallow water	-	-	Analytical formula provided. Other procedures allowed.		
Global uncertainty		Provided values for guidance but exact values not specified.	10 - 100 Hz: 5dB 125 Hz – 16 kHz: 3 dB ≥ 20 kHz: 4dB	To be defined	Deep water: as ISO 17208-1 Shallow water: not specified	SL: Deep: ±3,5 dB Shallow: ±4,0 dB $\mathrm{URN}_{\mathrm{BV}}$: Deep: ±4,0 dB Shallow: ±4,5 dB

R = r / (1 m); r: distance between hydrophone and vessel.

Table 4: Post-processing details for the procedures measured in the Las Palmas test campaign.

In some cases, acquired data have also been post-processed following different procedures than those used to execute the measurements. This is the case of ISO 17208-1 measurements, which were also post-processed according to ANSI S12.64 Grade-C, DNV deep and ISO 17208-2 procedures, as they share the test execution requirements. Additionally, as ISO 17208-3 test execution provides a wide variety of possible deployments, depths, and CPAs, it was feasible to post-process measurements executed under other measuring procedures which also meet its description, comparing their results in section 2.3.3.

Figure 17 gathers the post-processing methods applied per tested procedure, highlighting in green those also processed according to another method.

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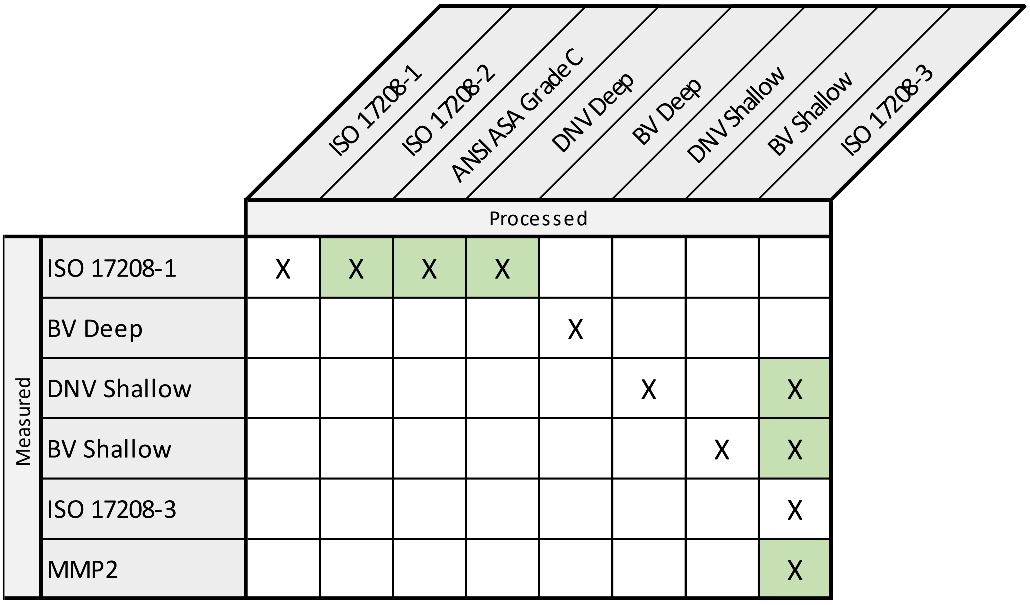
[3] Reference values gathered in the table are the results of the calculations used to report vessel URN in decibels. For further details to obtain such values see (Ainslie, et al., 2022).



		Processed							
		ISO 17208-1	ISO 17208-2	ANSI ASA Grade C	DNV Deep	BV Deep	DNV Shallow	BV Shallow	ISO 17208-3
Measured	ISO 17208-1	X	X	X	X				
	BV Deep					X			
	DNV Shallow						X		X
	BV Shallow							X	X
	ISO 17208-3								X
	MMP2								X

Figure 17: Matrix of tested procedures and post-processing methods applied for them. Green cells indicate procedures that were also post-processed following another method than the one used for the trials.

2.3. Results

The following section gathers the obtained vessel signatures according to the measured procedures, computed using the selected runs during the data quality verification. However, reporting only the vessel signatures has been considered insufficient and therefore, a summary of the interim results used to get them is provided first (section 2.3.1). Then, the resulting signatures per procedure and their comparison are presented in section 2.3.2 and 2.3.3.

2.3.1. Interim results

This section provides a summary of the interim results employed for obtaining the final vessel signatures. The supplementary information provided in this section sums up the tested conditions and the spectral representation of the valid runs, gathering it in five interim plots per procedure, which are:

1. **Summary of valid runs:** scatter plot gathering the mean vessel speed within the processing window (y axis) versus the executed CPA (x axis) for the valid measurements (example shown in Figure 18).
2. **Sound speed profile:** the sound speed was measured continuously during testing. This plot shows the sound speed in the water column in the deployment and recovery of the CTD, attached close to the deepest hydrophone in vertical array deployments (example in Figure 18).
3. **SPL for all measurements:** this plot shows the SPL for valid background noise measurements and vessel passes. The averaging time for the background noise

measurements was compliant with each procedure's requirements (e.g., 30 seconds for ISO 17208-1 measurements, 2 minutes for BV procedures, etc). In the case of vessel passes, reported curves are computed within the processing window (example in Figure 19).

4. **Background noise measurements:** this plot gathers just the valid background noise measurements SPL curves, computing the median value per deployed hydrophone (example in Figure 20).
5. **Median curves per tested condition:** this plot represents the median SPL for every valid tested condition and for all the background noise measurements. This plot, unlike the previous one, considers all the hydrophones together. When different operational conditions were tested, their median curves per tested conditions were reported (example in Figure 21).

Narrowband spectra from the SPL interim plots (3, 4, and 5) were obtained following the next processing configuration: 1 second slices (resulting in 1 Hz frequency resolution), 50% overlapping, Hann window and energy average. Thus, the graphs show SPL in 1 Hz bands, for a temporal observation window of 1 s.

The mentioned summary plots for all the Las Palmas test campaign tested procedures are available in Annex A. Figure 18 through Figure 21 represent one day of measurements as an example, using the data gathered during day 1 of the ISO 17208-1 tests, on 2 November 2022.

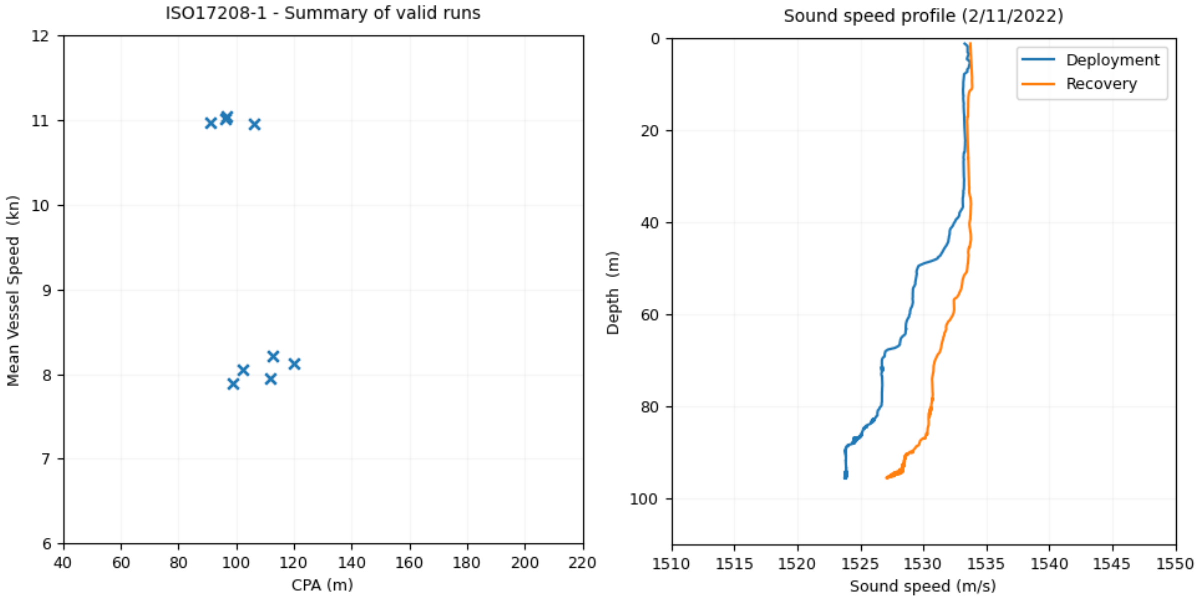


Figure 18: Summary of valid runs (left) and sound speed profiles (right) – 2 November.

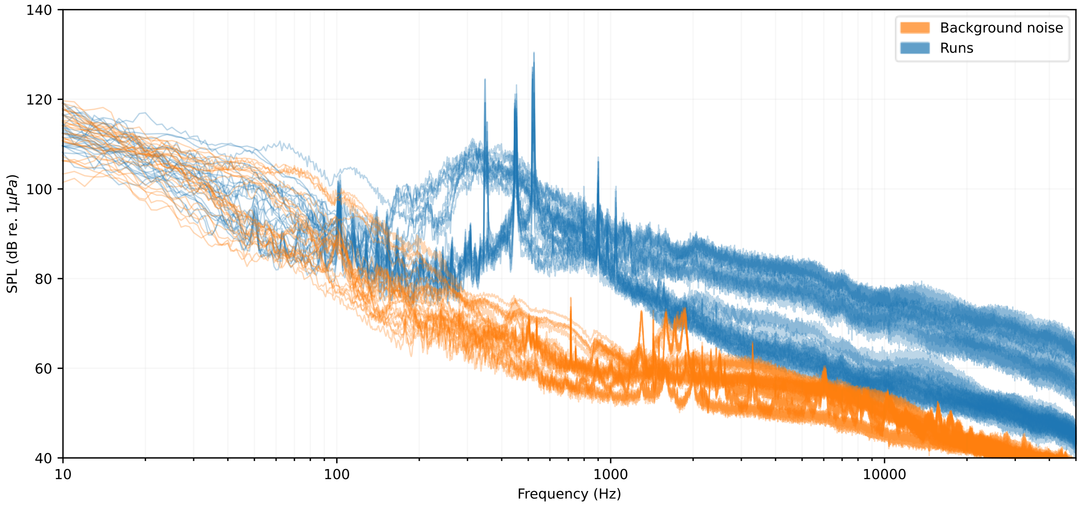


Figure 19: SPL in 1 Hz bands from valid runs and background noise measurements.

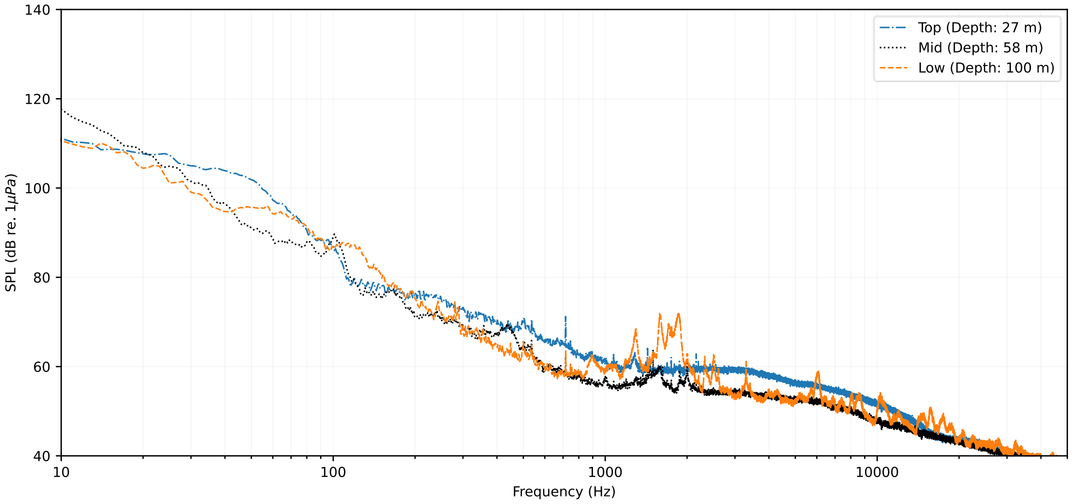


Figure 20: SPL in 1 Hz bands for background noise measurements (grey) and median values per hydrophone.

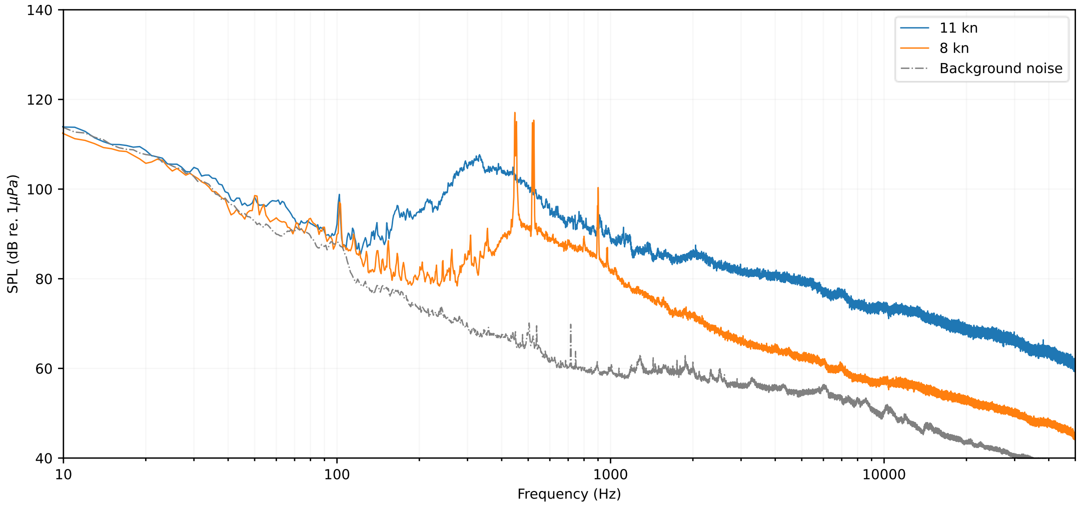


Figure 21: Median SPL spectra in 1 Hz bands for different vessel speeds and background noise measurements.

Using these interim plots was crucial to identify an unexpected vessel performance present during the trials. The vessel was noisier at 8 kn than at 11 kn at specific frequencies (Figure 21), having a tonal contribution from 400 Hz to 600 Hz with a non-stable amplitude. This significant tonal influence also happened at some other tested speeds (from 7 kn to 10 kn, as shown in Figure 22). The only speed not affected was 11 kn, making it feasible to use it as the operating condition employed for the comparison of methods results due to its stable behaviour.

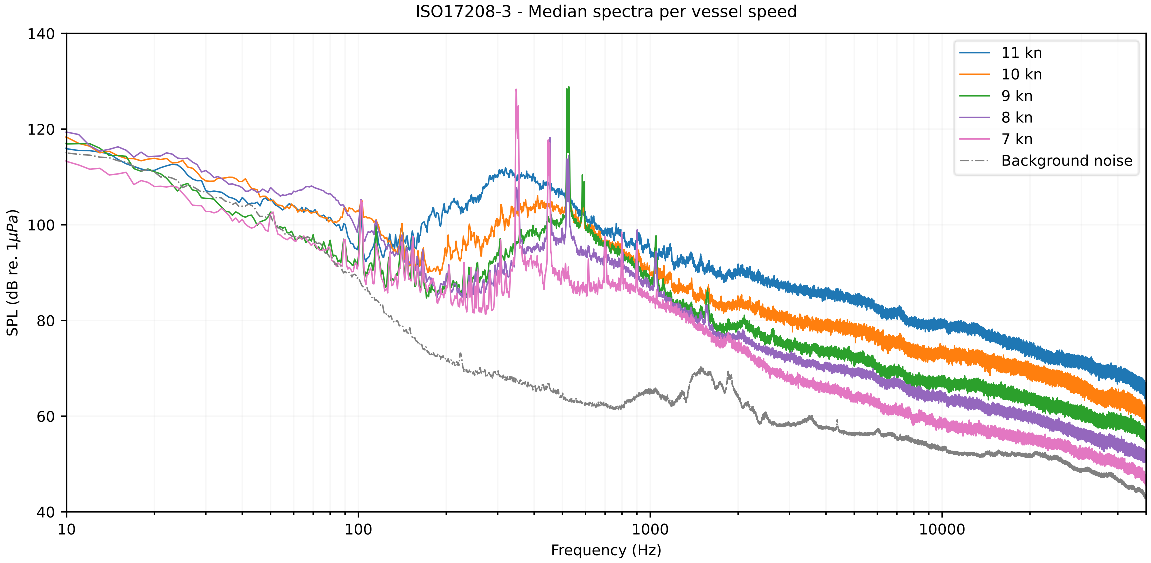


Figure 22: Median SPL in 1 Hz bands per tested speed following ISO 17208-3 procedure measured on 5 November.

2.3.2. Vessel signatures

This section reports the vessel signatures obtained following the different tested standards or classification societies' procedures. Table 5 summarises the results reported within this section and include those measurement executed at 11 kn and 66 % of MCR (which produced vessel speeds around 11 kn).

	Site depth				Depth type			Depl. type		Target CPA distance				Vessel speed	
	200m	80m	50m	40m	Deep	Shallow	Very shallow	Vertical array	Bottom	50 m	100 m	150 m	200 m	11 kn	66% MCR
ISO 17208-1 (day 1)	X				X			X			X			X	
ISO 17208-1 (day 2)	X				X			X			X			X	X
ANSI ASA Grade C	X				X			X			X			X	
DNV DEEP	X				X			X			X			X	
BV DEEP	X				X			X			X	X	X	X	
ISO 17208-3 (day 1)		X				X		X		X				X	
BV SHALLOW		X				X		X			X	X	X	X	
ISO 17208-3 (day 2)			X				X	X		X				X	
DNV SHALLOW				X		X			X		X			X	

Table 5: Reduced matrix of conditions reported with vessel signature.

The site conditions were characterised by strong currents, which produced flow noise, affecting the signal-to-noise ratio (SNR) up to approximately 100 Hz, although some of the tested deployments showed good performance from 40 Hz. Hence, the reporting bandwidth of the following plots starts at 30 Hz, instead of starting at 10 Hz as generally required by the tested procedures.

The number of runs selected to compute the reported vessel signatures met the procedures requirements, which are: two runs in DNV shallow method (one per vessel side), four runs (two per vessel side) in ANSI Grade C, ISO 17208-1, ISO 17208-3, and DNV deep, and six runs in BV procedures (three per vessel side).

The experienced environmental site conditions of this test campaign demonstrated that a test site with strong currents (which probably would produce flow noise in the measuring equipment) can be unsuitable for the URN characterisation of silent ships, as the background noise levels must be low enough to meet the minimum required signal-to-noise ratio (generally above 3 dB).

2.3.2.1. ISO 17208-1

ISO 17208-1 procedure was tested on two different days at the same test site and using equal hydrophones deployment. Several conditions were measured, performing vessel passes at fixed speeds (8 kn and 11 kn) and fixed power (66 % MCR; approximately 11 kn). Different paths were also tested during the second day (shown in Figure 23), performing vessel passes parallel to the shore (paths A and B) and normal to it (paths C and D).

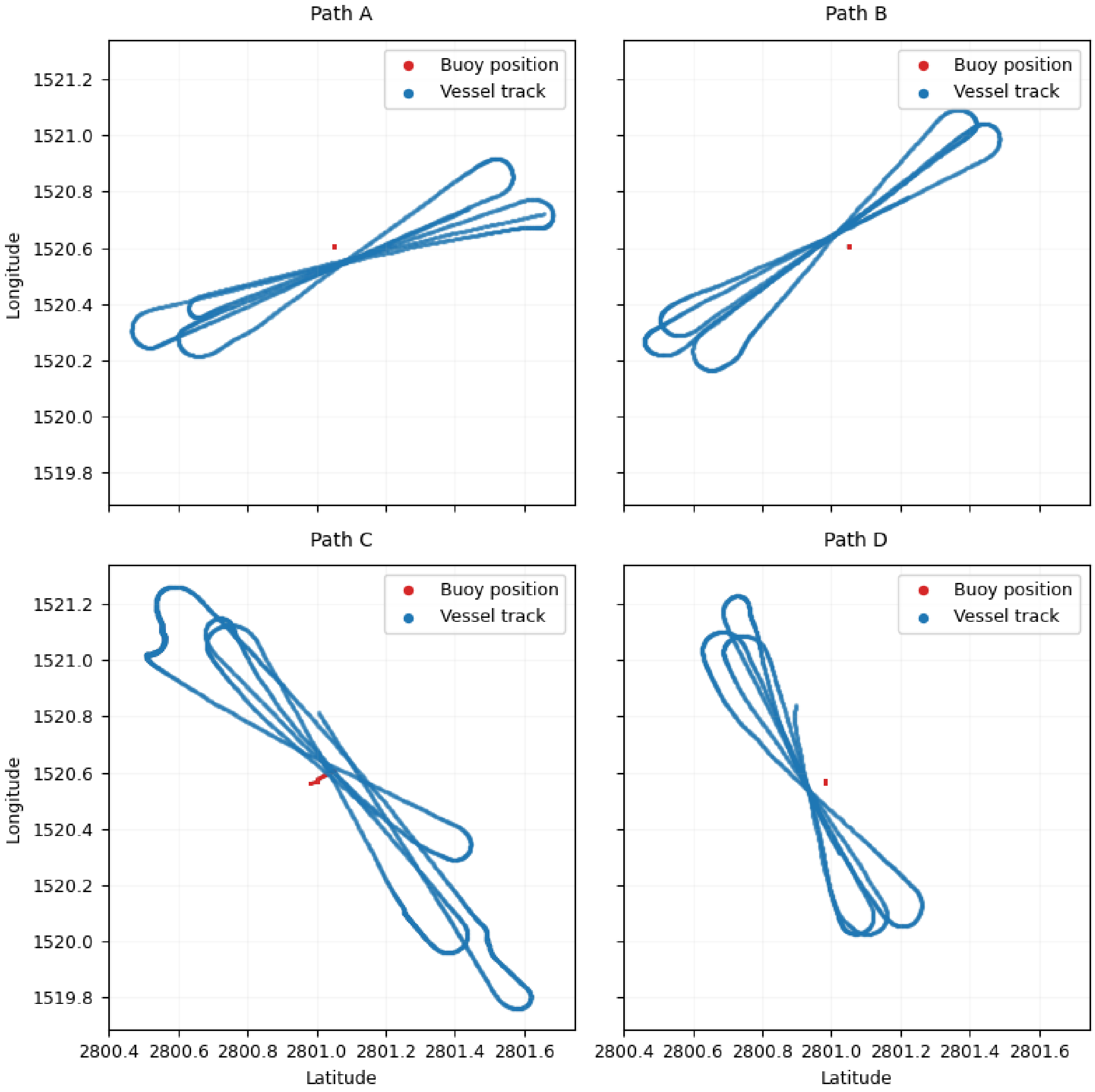


Figure 23: Different tested vessel paths during the second day of ISO 17208-1 measurements (performed on 8 November 2022).

When comparing the obtained vessel signatures for these two days at 11 kn and 66% MCR operating conditions, it was confirmed that the repeatability of the vessel signature was consistent, demonstrating an average deviation from their median below ±1 dB (shown in

Figure 24). It was also proved that fixing the vessel power instead the vessel speed reduced the scattering between port and starboard characterisation.

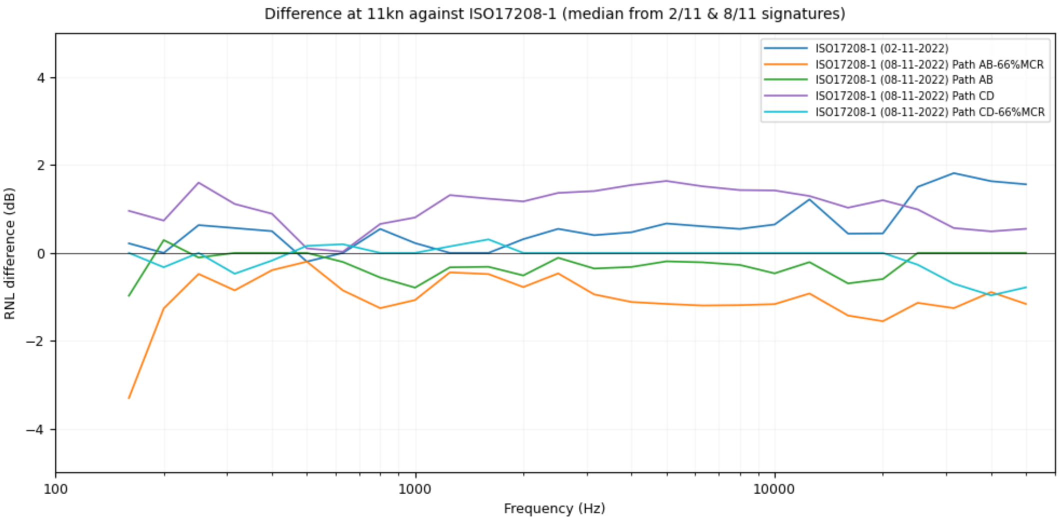


Figure 24: Difference between each vessel signature obtained according to ISO 17208-1 compared with the median of all ISO 17208-1 signatures. Used signatures are gathered in Figure 26.

Outputs from this procedure are used as the reference for later results comparison (section 2.3.3), employing obtained vessel signatures straightaway when comparing RNL results for deep water or converting them through ISO 17208-2, to be used as reference curves for SL comparison.

2.3.2.2. ISO 17208-2

ISO 17208-2 is not a testing procedure but a post-processing method designed to be applied over measurements performed in deep water following, preferably, ISO 17208-1 deployment. It provides analytical formulations to derive the SL from RNL, and within this report, it is considered the reference result when comparing SL curves between procedures. The conversion from RNL to SL performed replaces the distance adjustment of 20Log(R) by PL, using a more complete approach considering the surface influence and the source depth. Details for the conversion process are available in Annex C, while results obtained when applying this computation over ISO 17208-1 results are shown later in Figure 27.

2.3.2.3. ISO 17208-3

ISO 17208-3 will be the first international standard describing how to measure vessel URN in shallow water. It is still in development and is expected to be finished and published by the end of 2024. Several participants of the WP2 of the SATURN project are involved in developing this standard, which allowed access to the committee draft (CD) and a later update of it, the draft international standard (DIS). The CD was used for the preparation activities prior to the measurements, while the DIS was used for the test campaign execution and data post-processing. Any time ISO 17208-3 is mentioned while reporting results within this document, it refers to ISO/DIS 17208-3[4].

During the Las Palmas test campaign, this procedure was executed on two days performing measurements at two water depths (80 m and 47 m) and hydrophone deployments. The relation between site depth and CPA has been used to refer to the water depths as shallow and very shallow. In both cases, CPA (50 m) and vessel speed were equal (8 kn and 11 kn) and so were the engine power set-up. Results obtained from the two mentioned deployments are shown in Figure 28, which shows that reported vessels for the very shallow deployment provided lower SLs than for the shallow deployment in the whole reporting bandwidth (around -1.5 dB average difference), which may come from uncertainties in the test site seabed.

ISO 17208-3 aims to widen the deployment and execution possibilities, accepting different hydrophones deployments, site depths and CPA distances, to make the procedure fulfilment more flexible. These less stringent requirements allowed processing and reporting results as ISO 17208-3 using data gathered following different measuring procedures. Thereby, acquired data from BV shallow procedure, DNV shallow procedure and MMP2 Project procedure were also post-processed and reported as SL meeting ISO 17208-3 description. This exercise permitted reporting eight different signatures according to this standard, making it possible to study their differences (available later in section 2.3.3). Additionally, these results will be used in project task T2.2.5, which aims to quantify and assess the uncertainty linked to this procedure's results.

The PL computation described in ISO 17208-3 is based on an analytical formulation, seeking to find a trade-off between simplicity and precision. This approach differs from using numerical propagation modelling, which can provide more accurate results —especially when actual site parameters are considered—. However, propagation modelling approaches present greater complexity, distancing the possibility of such computation from non-expert users.

The mentioned analytical PL formulation requires only a few parameters for the computation (sound speed in water, sound speed in seabed and source depth) and others generally required in URN tests (CPA, test site depth, and hydrophones depth), providing a PL curve per hydrophone. For the computed results gathered in this report, source depth and sound speed in the seabed were kept fixed (3.9 m and 1750 m/s, respectively), some parameters varied daily (sound speed in water, site depth and hydrophones depth), and CPA varied per run. Figure 25 shows PL curves for ISO 17208-3 measurements performed at shallow and very shallow water depths (80 m and 50 m respectively) for two specific vessel passes.

Further details of the formulation described in the standard and applied in this report results are provided in Annex C. The standard also allows using other PL approaches, describing some alternative methods as auxiliary information.

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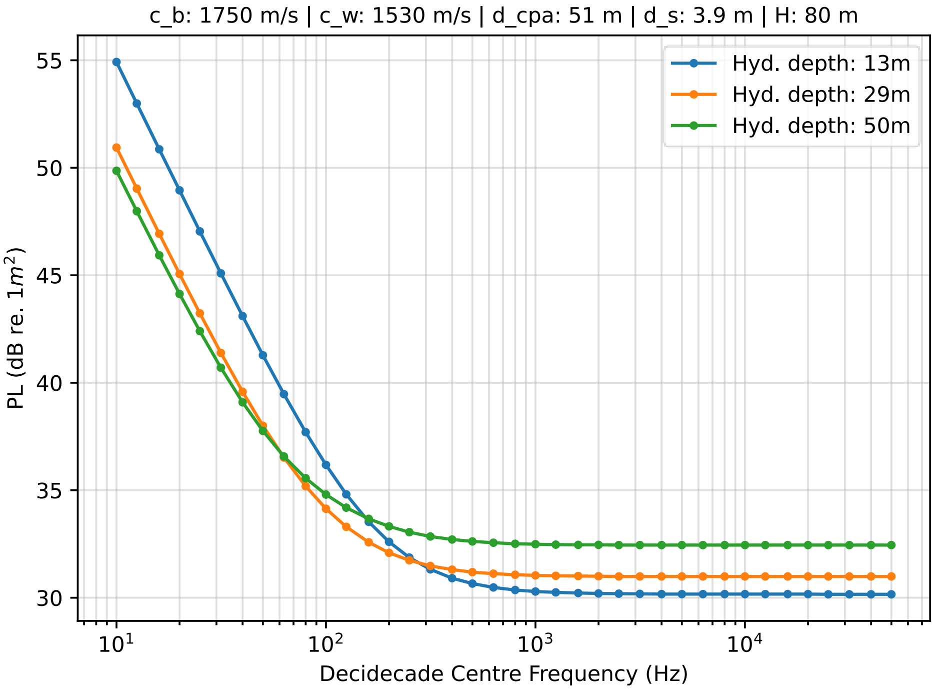
[4] https://www.iso.org/obp/ui/en/#iso:std:81321:en



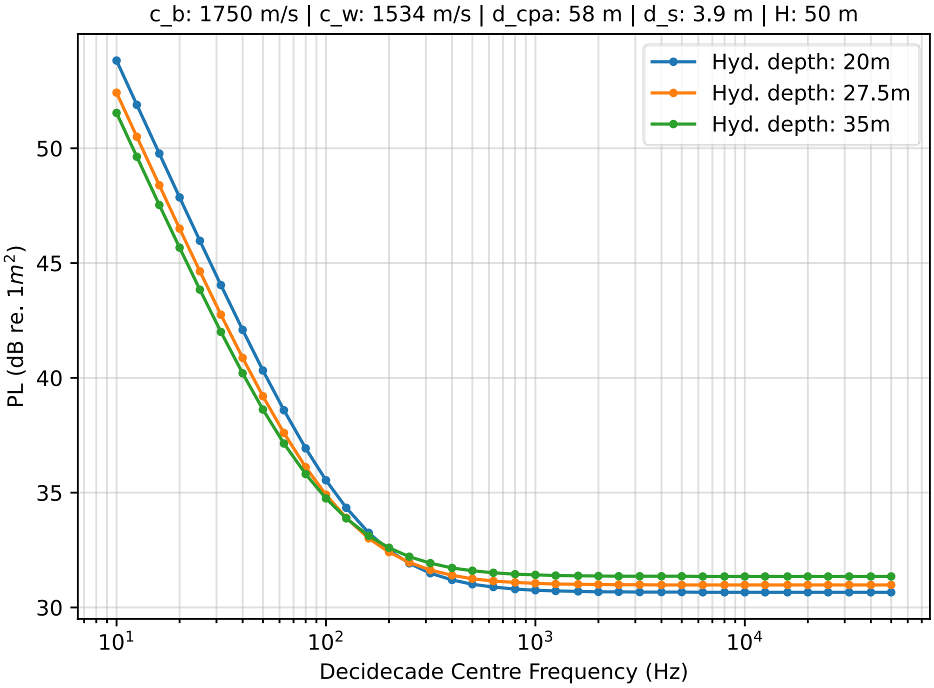


*Figure 25: PL used to get SL for a certain run following ISO 17208-3 method for shallow (top) and very shallow (bottom) deployments measured on 5 and 6 November respectively. Parameters used for the computation are shown in subplot title and legend under the following naming: c_b (sound speed in seabed), c_w (sound speed in water), d_cpa (run CPA), d_s (source depth, computed as 0.7*ship draught), H (site depth), Hyd. Depth (depth of hydrophone).*

2.3.2.4. ANSI ASA S12.64 - Grade C

ANSI ASA S12.64 procedure defines three different grades (A, B and C), which condition the number of hydrophones deployed and some other aspects in the test execution and post-processing. Grade C requires only one hydrophone, which has a depth compatible with the shallowest hydrophone of the ISO 17208-1 deployment, allowing to use the ISO 17208-1 test data to get results processed according to the Grade C method.

Using the data gathered during ISO 17208-1 measurements, it was possible to obtain a set of vessel signatures according to ANSI S12.64 Grade C (two different days at the same test site), represented in Figure 29. However, the reduced employed number of hydrophones implies higher uncertainty values in ANSI S12.64 Grade C results, being less accurate than those reported by ISO 17208-1.

2.3.2.5. DNV

DNV provides two methods to characterise the underwater vessel signature for deep and shallow water. For deep water, the DNV procedure mimics ISO 17208-1 deployment and test execution, while the post-processing differs due to their specified distance adjustment (18Log(R) instead of 20Log(R)), which has an impact on the reference value, making them depart from ISO 17208-1 (Table 6). Hence, DNV's resulting metric is referred to from now on as URN_{DNV} and was computed employing ISO 17208-1 measurements data. The results are represented in Figure 30.

For shallow water, DNV has their method, which uses a hydrophone placed on the seabed, requiring one pass per vessel side (other procedures require two or more). It also uses the 18Log(R) term for the distance adjustment and requires applying a -5 dB reduction over the final vessel signature when the hydrophone is placed at less than 0.2 m from the seabed. These results, having the -5 dB reduction applied as requested in the notation, are also shown in Figure 30.

Measured vessel signatures from the shallow water procedure reported lower levels than those from deep water in the whole bandwidth (from -3 dB to -8 dB difference). On the other hand, the shallow water deployment showed a better performance in low frequency, reducing the deployment inherent noise and making it possible to characterise the vessel signature from 30 Hz, which was not feasible with other deployments.

2.3.2.6. BV

BV also provides two methods to characterise underwater vessel noise for deep and shallow water, which were tested during the Las Palmas test campaign. Due to SNR constraints, it was necessary to reduce the procedure CPAs to obtain sufficient data quality (agreed with BV personnel). Therefore, tested CPAs were 100 m, 150 m and 200 m (instead of 200 m, 300 m and 400 m). On the other hand, during the shallow water measurements, the auxiliary line used to keep the buoy in a steady position got released, making it possible to also characterise the vessel signature with the buoy adrift.

Unlike the other methods, BV results are reported as spectral density, obtained by subtracting the bandwidth from every frequency band to the computed vessel signature. This process affects the shape of the vessel signature (in comparison with the usual spectrum), producing a decreasing slope in the results that becomes more obvious as the frequency raises. However, the conversion to standard spectral representation is a simple reversible subtraction (see equation (1)), which was applied when comparing results with other procedures (later in section 2.3.3).

In this case, the reported vessel signatures for deep and shallow water (Figure 31 and Figure 32) are not directly compared in the same plot as they use different reference units (distance adjusments employed are 20log(R) for deep water and 19log(R) for shallow water). These results are also referred to as URN_{BV} as they depart from the standard procedure (ISO 17208-1).

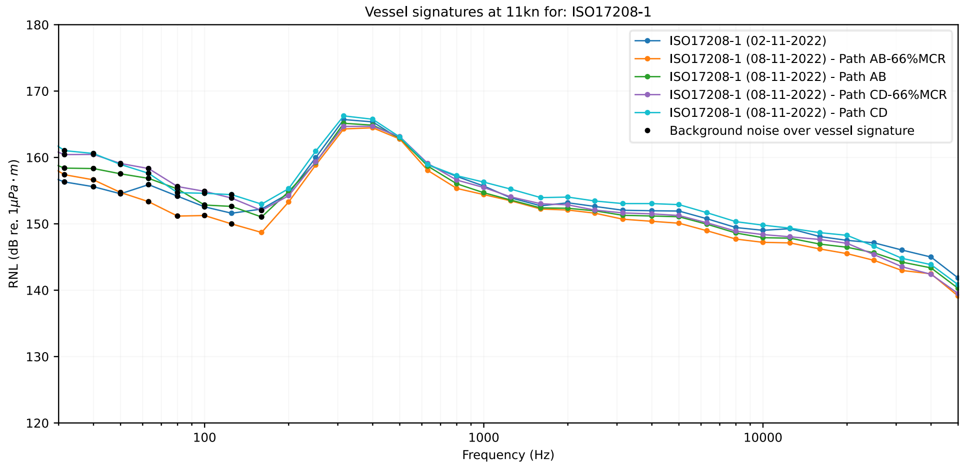


Figure 26: Vessel signatures according to ISO 17208-1 at 11 kn.

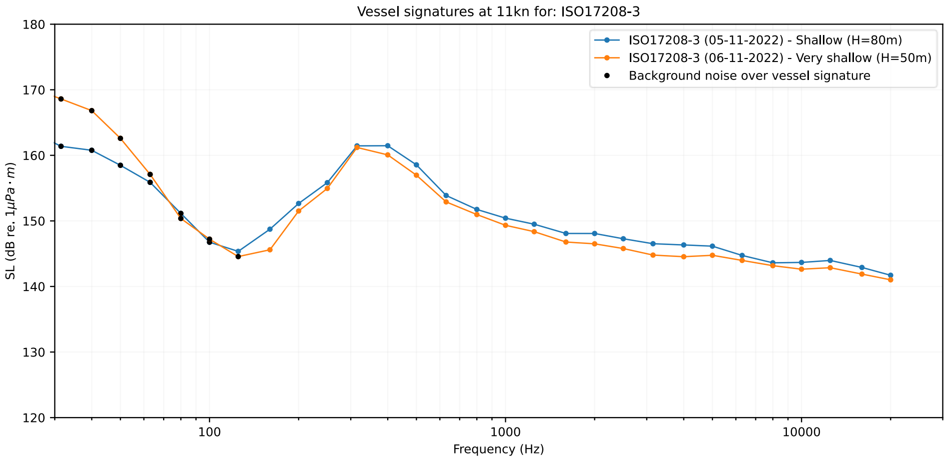


Figure 28: Vessel signatures according to ISO/DIS 17208-3 for shallow water at 11 kn.

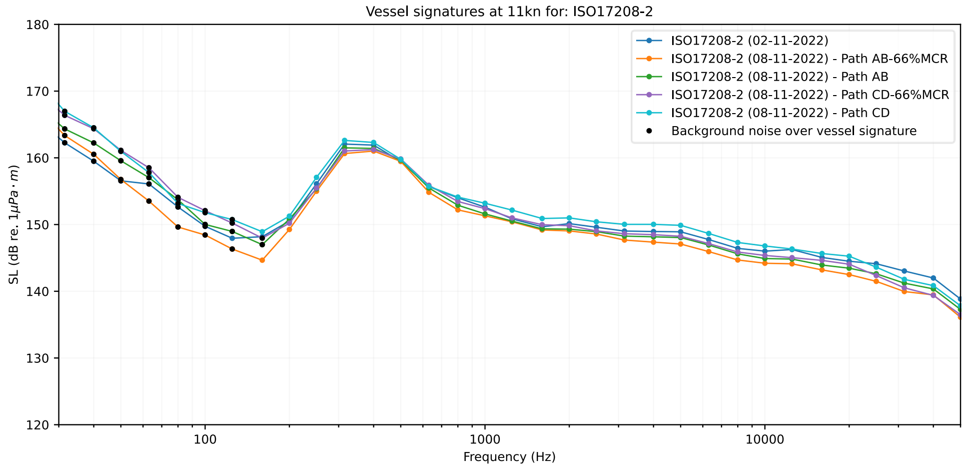


Figure 27: Vessel signatures according to ISO 17208-2 at 11 kn.

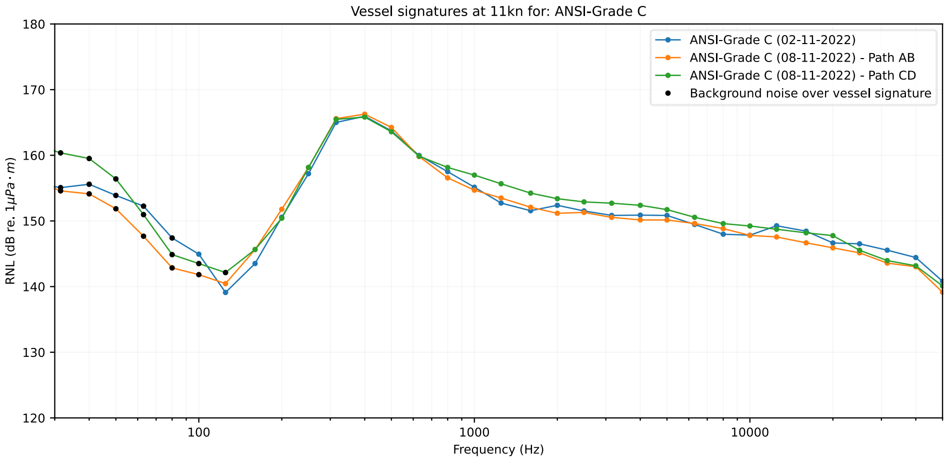


Figure 29: Vessel signatures according to ANSI S21.64 Grade-C standard at 11 kn.

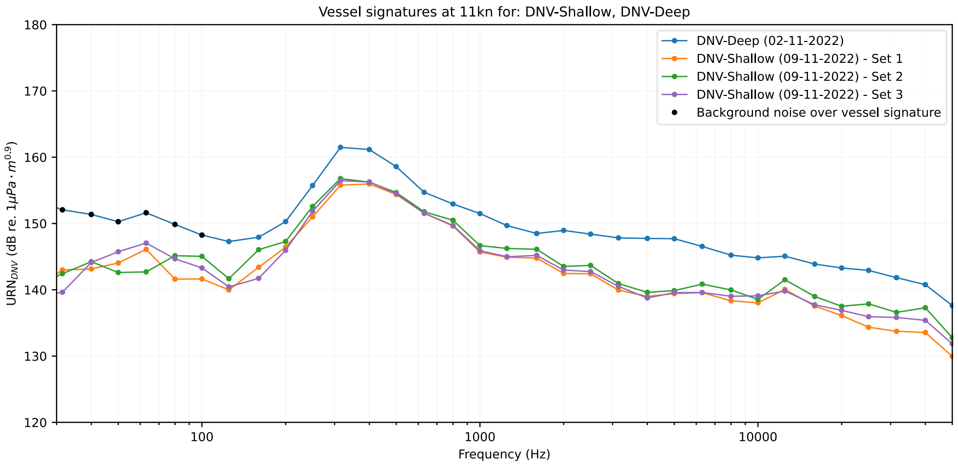


Figure 30: Vessel signatures according to DNV procedures for deep and shallow water at 11 kn.

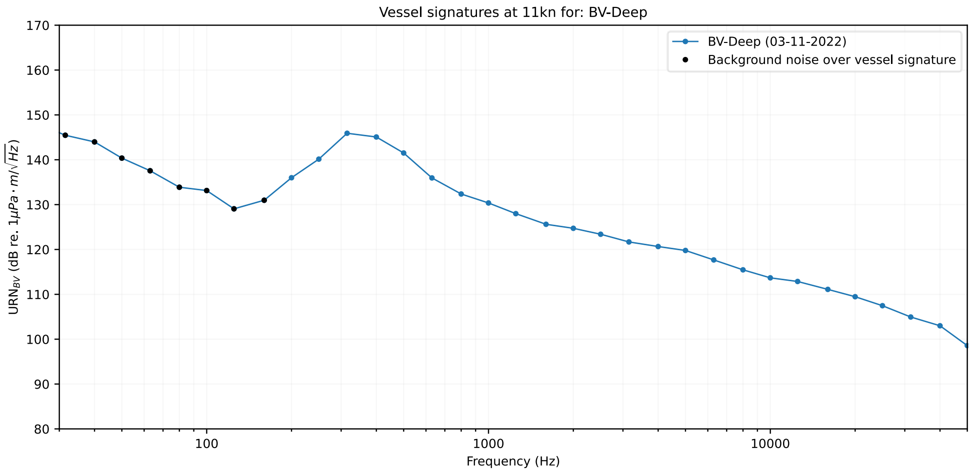


Figure 31: Vessel signatures according to BV procedure for deep water at 11 kn.

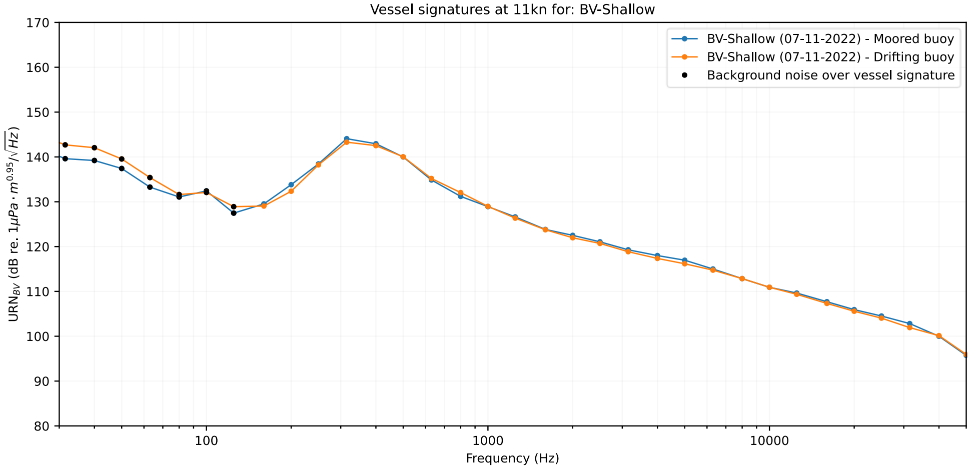


Figure 32: Vessel signatures according to BV procedure for shallow water at 11 kn.

2.3.3. Results comparison

During the Las Palmas test campaign, different procedures were used to measure and report the acoustic signature of the vessel under test. These procedures differ in aspects related to test execution and results post-processing, while this section focuses on the latter.

As already introduced, aspects such as the distance adjustment or the final spectral representation are features which vary between procedures, impacting the resulting reference values. In this report, procedures with considerable differences are referred to using different reporting metric names. Table 6 gathers reporting metrics and reference values per method.

Reporting Metric	Notation	Depth	Distance adjustment	Unit	Reference Value	Spectral Format
RNL	ISO 17208-1	> 150m	20·log(R)	dB	1 µPa · m	Band level
	ANSI ASA S12.64	> 75m				
URN$_{DNV}$	DNV	> 30m	18·log(R)	dB	1 µPa · m$^{0.9}$	Band level
URN$_{BV}$	BV[1]	> 100m	20·log(R)		1 µPa · m / Hz$^{0.5}$	Spectral Density
		< 100m	19·log(R)		1 µPa · m$^{0.95}$ / Hz$^{0.5}$	
SL		any	Numerical modelling (PL)		1 µPa · m / Hz$^{0.5}$	
SL	ISO 17208-2	> 150m	Analytical formula (PL)	dB	1 µPa · m	Band level
	ISO 17208-3	any[2]				

R = r / (1 m); r: distance between hydrophone and vessel.
[1]: BV recommends employing numerical modelling but accepts simpler propagation laws (X·log(R)) for the distance correction. When using numerical modelling, the reporting metric is referred to as SL in this report. Otherwise, it is referred to as URN$_{BV}$.
[2]: the minimum depth is conditioned by vessel size and speed. There is no maximum depth limit.

Table 6: Reporting metric and reference units per URN procedure.

The following subsections compare results from two different approaches. First, resulting vessel signatures obtained strictly following standards and class societies procedures are compared, calling this URN comparison, as there are some reporting metrics together. On the other hand, a second comparison is performed. In this case, all the reported curves use the reporting metric SL (source level) and are referred to as a metric comparison.

2.3.3.1. URN comparison

The comparison of the resulting vessel signatures obtained strictly following each procedure description is provided next. It was necessary to convert BV results from their default spectral density representation to decidecade band levels to allow representing all the curves in the same spectral format. The conversion procedure is described below in equation (1). Results from ISO 17208-3 are dropped from this comparison as they are thoroughly compared in the next section.

$$L_{\mathrm{URN(BV),ddec}} = L_{\mathrm{URN(BV)}} + 10 \log_{10}\left(\frac{\Delta f_i}{1\ \mathrm{Hz}}\right)\ \mathrm{dB} \qquad (1)$$

$L_{\mathrm{URN(BV),ddec}}$: URN levels reported following BV class notation, represented as decidecade band level
Δf_i: decidecade bandwidth for the frequency band identified with its nominal centre frequency f_i (bandwidth values provided in Table 18)

Figure 33 shows the available vessel signatures per procedure, indicating their reference value in the legend. This figure exhibits significant differences in the reported levels, while the general behaviour is the reporting of lower values than those from the ISO 17208-1. Figure 34 evaluates their differences numerically against the ISO 17208-1 median result (median value based on all the available results; previously shown in Figure 26). The difference plot demonstrates noticeable mean differences: i) around -1.5 dB for BV deep, ii) around -5 dB for BV shallow and DNV deep, and iii) up to -12 dB for DNV shallow. Just ANSI S12.64 Grade-C returns similar results as for ISO 17208-1.

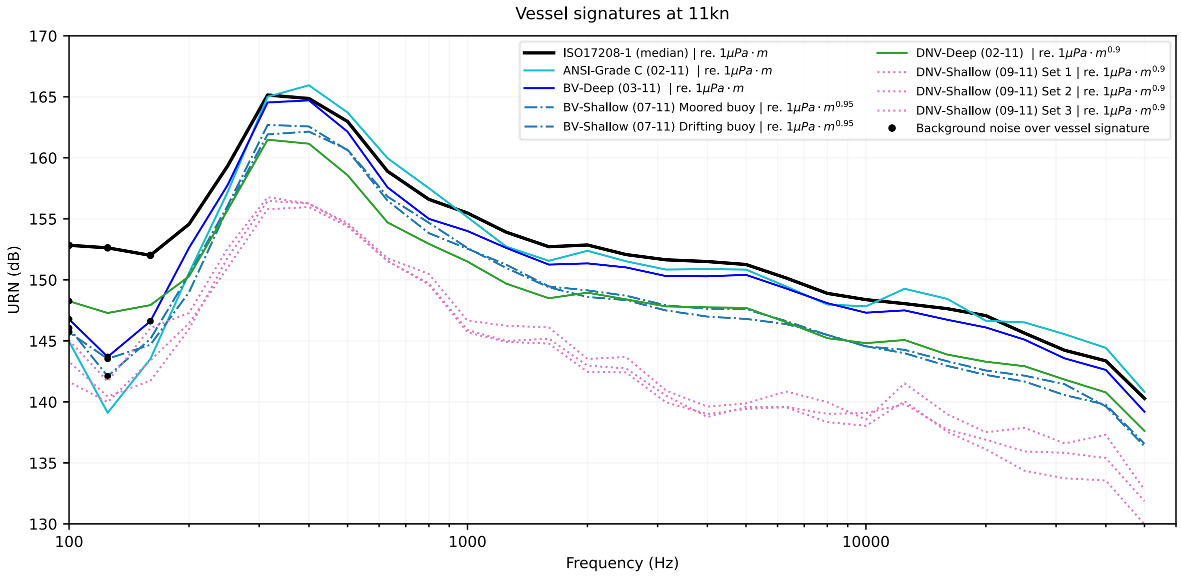


Figure 33: Comparison of vessel signatures at 11 kn reported as described in each procedure. Black dots indicate frequency bands where SNR was insufficient to separate the sound produced by the vessel and the background noise of the test site and, therefore, might not be considered in the comparison.

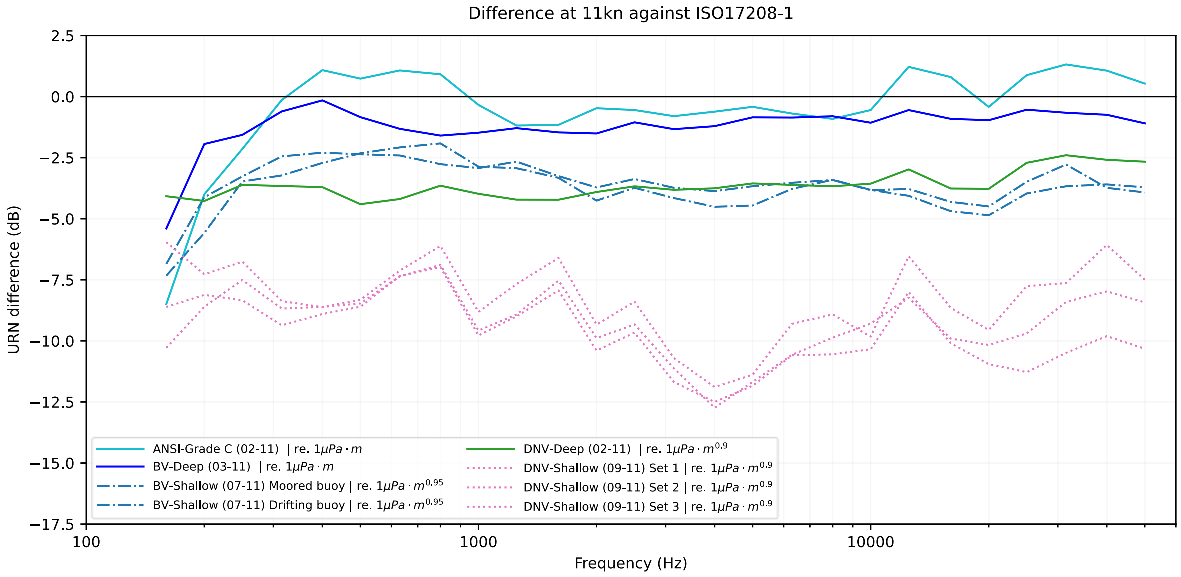


Figure 34: Difference of reported URN levels between ISO 17208-1 and the other procedures.

2.3.3.2. SL comparison

The mentioned flexibility in the ISO 17208-3 requirements in instrumentation deployment and test execution allowed to use measurements from other shallow water methods. DNV Shallow, BV Shallow and MMP2 deployments are largely in line with the ISO 17208-3 requirement, so that the results could be processed according to ISO 17208-3 to be also reported as SL. These results are compared with those obtained following ISO 17208-3 deployment and processing. As the reference curve, results derived from ISO 17208-1 through ISO 17208-2 procedure are employed (obtained as the median of the reported results from Figure 27).

The computation methods to obtain SL from deep and shallow water (ISO 17208-2 and ISO 17208-3) are different, mainly due to the seabed influence, which needs to be considered in the shallow water procedure (ISO 17208-3). The details of the formulation employed to compute the SL under these two different standards are provided in Annex C.

As for the previous section, computed vessel signatures and their difference against the reference curve (ISO 17208-2 median in this case) are shown next (Figure 35 and Figure 36). These figures show similar levels for vertical array deployments (ISO 17208-3 and ISO 17208-3#BV-shallow) up to 400 Hz and a nearly constant deviation of around -2.5 dB for higher frequencies. For the bottom-mounted and bottom-anchored single hydrophone deployments (ISO 17208-3#DNV-shallow and ISO 17208-3#MMP2), the differences are greater, with an approximate average deviation of -4 dB, with some up to -7 dB.

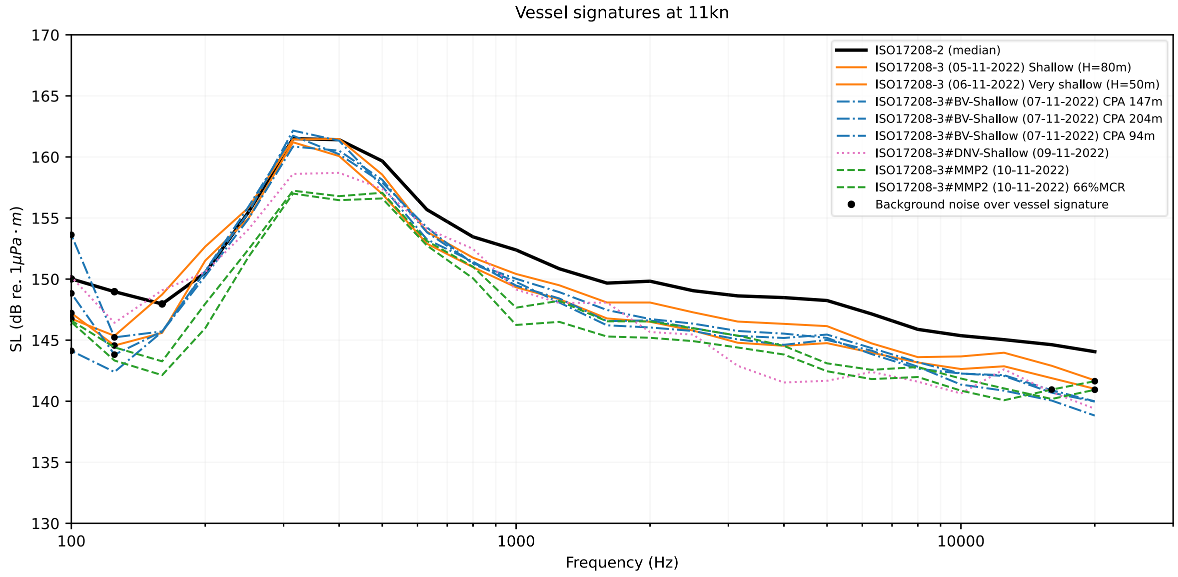


Figure 35: Comparison of all available vessel source levels measured at 11 kn and processed as ISO 17208-3. Legend labels including '#' indicate that the instrumentation deployment was as described in the procedure mentioned after the symbol. Black dots indicate frequency bands where SNR was insufficient to separate the sound produced by the vessel and the background noise of the test site and, therefore, might not be considered in the comparison.

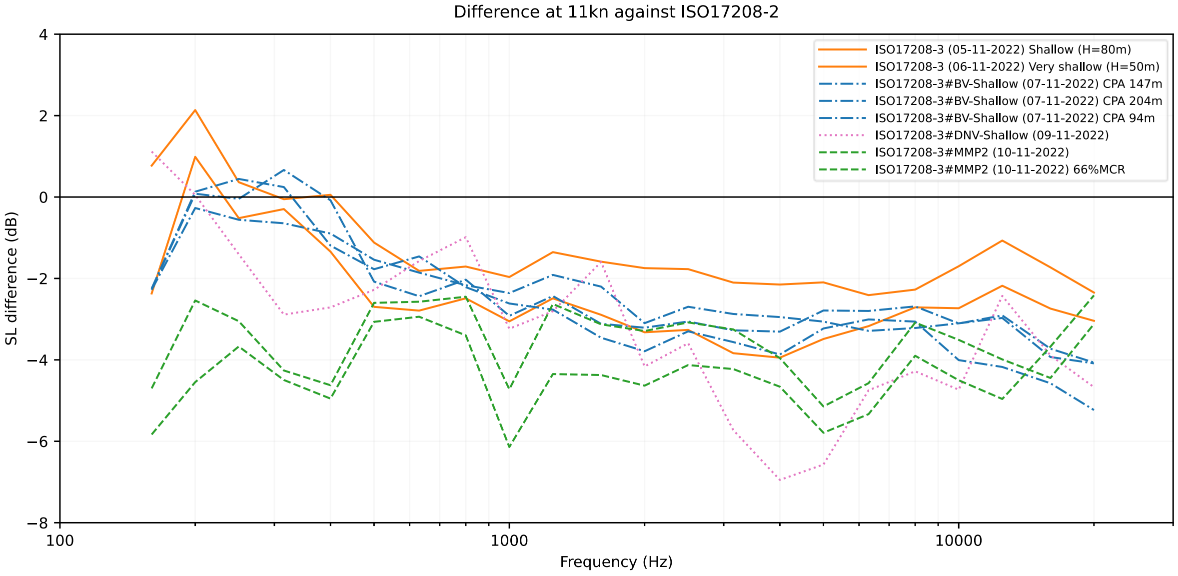


Figure 36: Difference in the computed source levels measured at shallow water against the ISO 17208-2 reference curve (median from the available vessel signatures from ISO 17208-1 procedure).

A separate comparison of SL between ISO 17208-2 and ISO 17208-3 specific procedures (first three curves of Figure 35) is performed later in section 2.4.1.

2.4. Discussion

The discussion section gathers different topics identified during the tests campaign execution or in the later processing tasks. The ensuing subsections collect conclusions or topics considered worthwhile to be shared. Some were already presented in the ISO 17208-3 core group, allowing evaluation if discussed topics might be included somehow in the standard.

2.4.1. Results comparison for ISO 17208: Part 1 vs Part 3

ISO 17208 is split into three parts, covering vessel URN measurements in deep and shallow water (ISO 17208-1 and ISO 17208-3). Part 1 reports results as RNL, which can be converted to SL through part 2 (ISO 17208-2). On the other hand, results from part 3 are reported as SL and can be converted to RNL. These two conversions are performed using the same correction formula, shown in Annex C, equations (9) and (15).

The ultimate purpose of ISO 17208 procedures is to get a unique vessel signature, no matter which method is used. This section seeks to rate the deviation between the results of the project produced under the different methods, comparing them as RNL and SL. For these comparisons, results from parts 1 and 2 are considered the baseline, as they are obtained in deep water, a less complex environment for underwater acoustics propagation.

2.4.1.1. RNL

The following two figures report results expressed as deep water RNL (Figure 37) and their difference (Figure 38). ISO 17208-3 results were converted to RNL according to the conversion method described in the standard (see Annex C) and are compared with ISO 17208-1 median curve (derived using the available results, represented in Figure 26).

ISO 17208-3 results present an underestimation of the deep water RNL levels from 300 Hz, which is more noticeable in the case of the very shallow deployment. The average deviation for the shallow deployment is of around -2 dB above 300 Hz, while for the very shallow deployment it is roughly -3 dB.

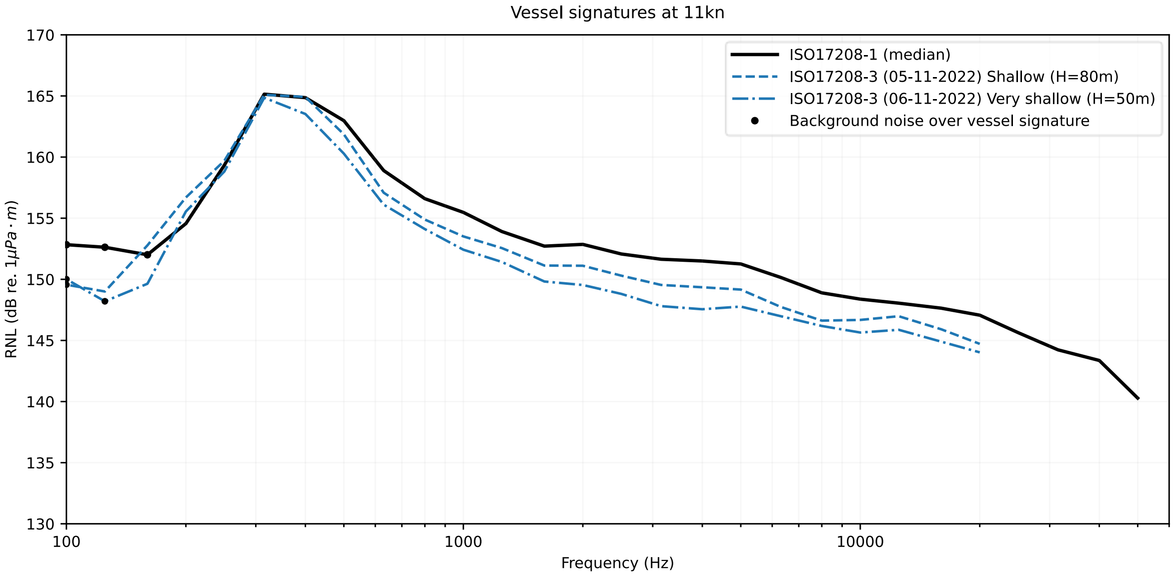


Figure 37: Comparison of vessel signatures from ISO/DIS 17208-3 reported as deep water RNL with ISO 17208-1 at 11 kn. Black dots indicate frequency bands where SNR was insufficient to separate the sound produced by the vessel and the background noise of the test site and, therefore, might not be considered in the comparison.

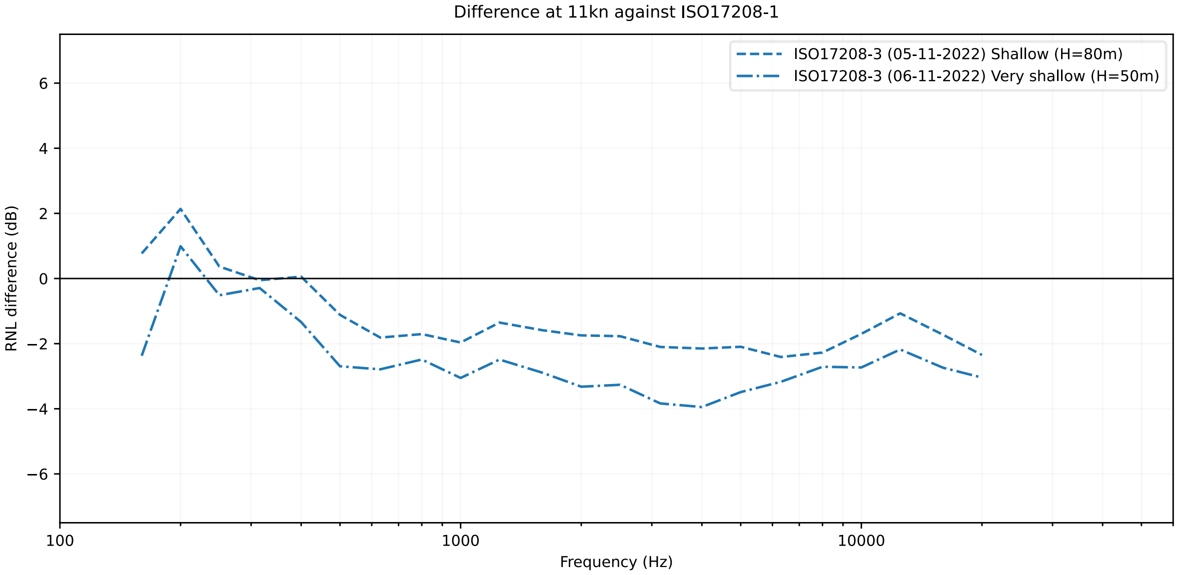


Figure 38: RNL difference between ISO/DIS 17208-3 and the median curve of ISO 17208-1 at 11 kn.

2.4.1.2. SL

Figure 39 and Figure 40 report results expressed as SL, comparing ISO 17208-3 outcomes against ISO 17208-2 median curve (derived using the available results, represented in Figure 27). ISO 17208-3 results present an underestimation of the SL levels from 300 Hz, which is more noticeable in the case of the very shallow deployment. The average deviation for the shallow deployment is of around -2 dB above 300 Hz, while for the very shallow deployment it is roughly -3 dB.

As expected, the level differences between ISO 17208-1 and ISO 17208-3 (Figure 38 and Figure 40) remain the same, no matter whether compared as SL or RNL because the same correction term (ΔL) is used for the transformation of RNL to SL in deep water and SL to RNL in shallow water .

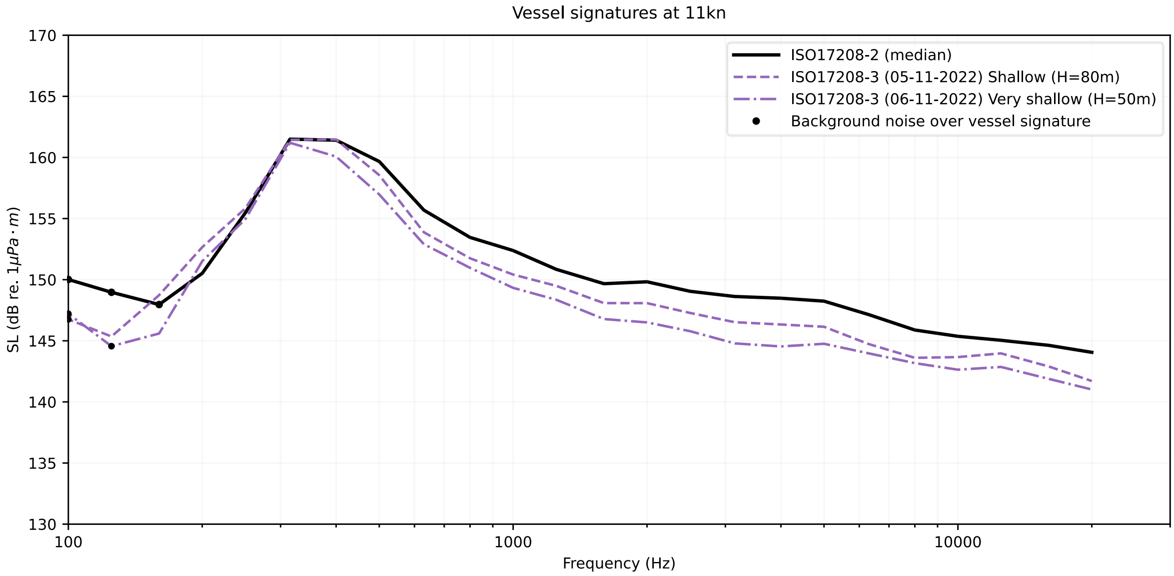


Figure 39: Comparison of vessel signatures reported as SL at 11 kn. Black dots indicate frequency bands where SNR was insufficient to separate the sound produced by the vessel and the background noise of the test site and, therefore, might not be considered in the comparison.

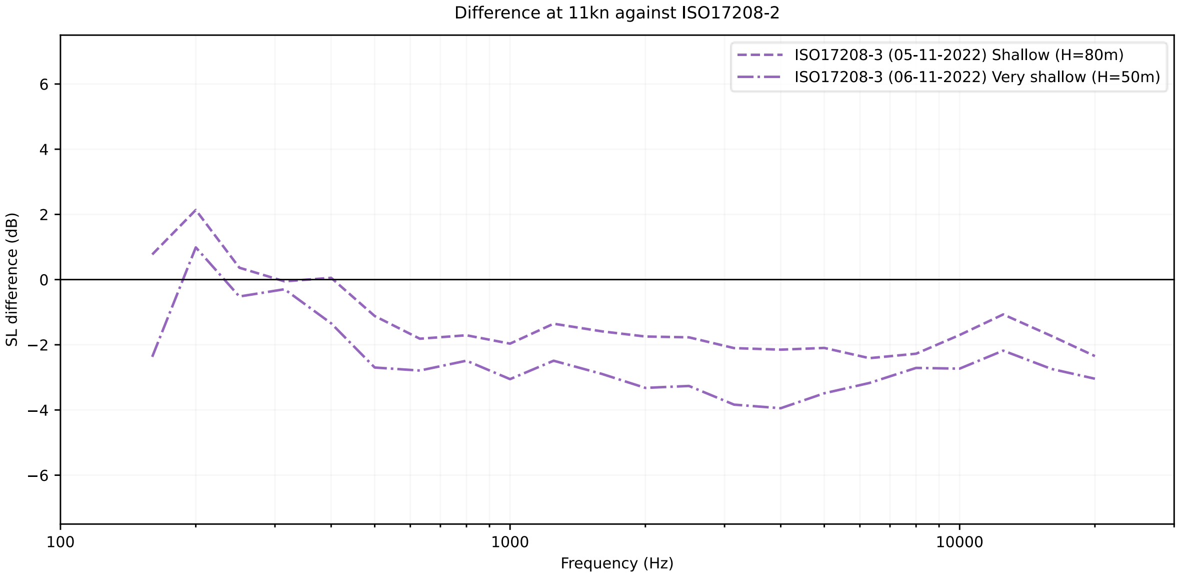


Figure 40: Difference of source levels between ISO/DIS 17208-3 and the median curve of ISO 17208-2 at 11 kn.

2.4.2. Deployment noise during the trials

Low frequency noise was present in this test campaign, making it unfeasible to properly characterise the vessel sound below 100 Hz on most testing days. This inherent noise is assumed to be caused by the test site current, producing the so-called flow noise. Its magnitude varied with the deployment used. This section evaluates how inherent noise was influenced by the instrumentation deployment providing two sets of subplots, showing in their first row results from surface buoy deployments and in the bottom row those from the seabed ones (bottom-mounted and bottom-anchored):

- Figure 41 subplots gather SPL curves measured on different days, which include all background noise (BN) and vessel measurements. This set illustrates the overlapping between background noise and vessel runs at low frequencies, showing that the overlap is more noticeable for the surface buoy deployments, which present levels between 120 dB and 100 dB up to 100 Hz, while bottom deployments are generally below 100 dB at the same frequency range, being around 10 dB lower. On the other hand, these bottom deployments present worse BN performance at high frequency, showing an increase in the levels from 5 kHz.
- Figure 42 subplots collect vessel signatures obtained using measurements from the previous subplots at 11 kn, highlighting with black crosses those decidecade bands with background noise issues. These subplots also show the improved BN performance from bottom deployments and its influence on the vessel signature reporting. Bottom-anchored deployment allows reporting two extra low frequency bands (which could have been more numerous with a bespoke design), and the bottom-mounted deployment only presents BN issues below 20 Hz.

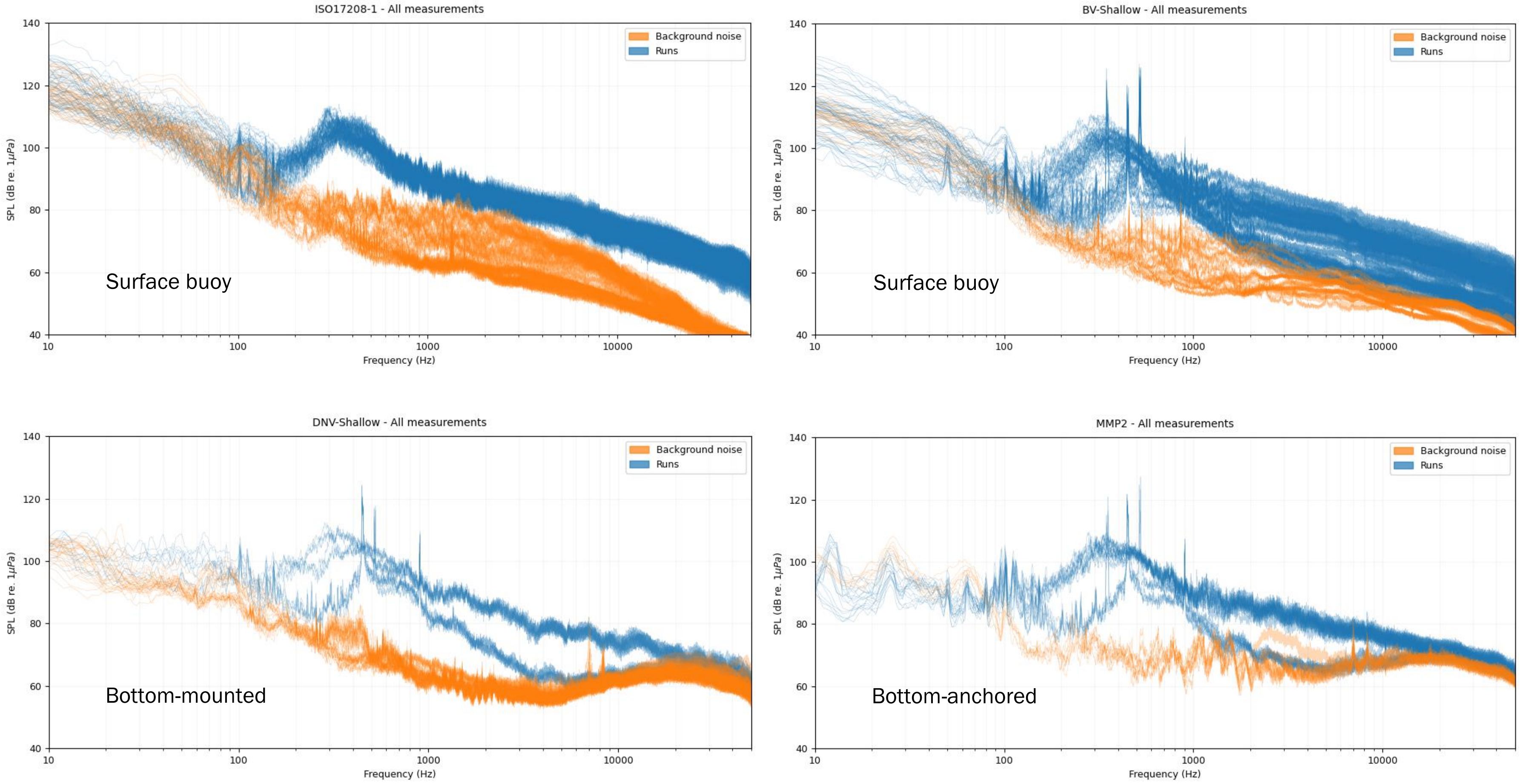


Figure 41: SPL in 1 Hz bands for background noise and vessel passes measurements. Top row shows vertical array deployments examples: ISO 17208-1 and BV Shallow (8 November and 7 November, respectively). Bottom row shows seabed deployments examples: DNV shallow and MMP2 (9 November and 10 November, respectively).

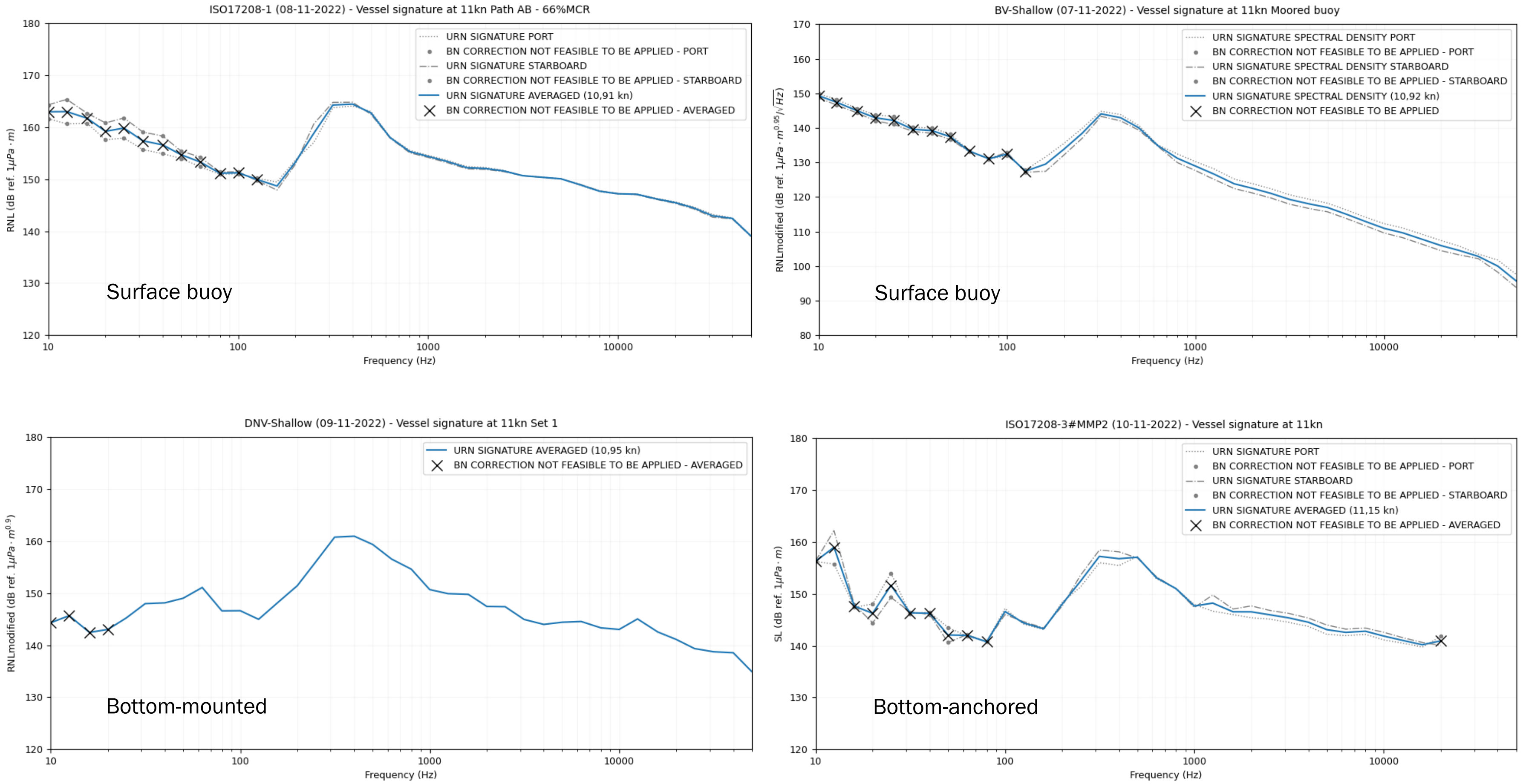


Figure 42: Obtained vessel signatures per deployment and test condition. Top row shows vertical array deployments examples: ISO 17208-1 and BV Shallow. Bottom row shows seabed deployments examples: DNV shallow and MMP2 (processed as ISO 17208-3)).

2.4.3. Background noise dispersion

Background noise measurements can have a major impact on vessel noise characterisation during URN tests. Measuring procedures require recording background noise before and after performing the vessel passes to choose later one -or two in the case of BV- measurements to apply the corresponding correction.

The mentioned start and end measuring strategy was met during the Las Palmas test campaign. However, the main difference came from the processing of the background noise measurements; instead of characterising site noise with only one sample at the start and end day, it was decided to perform longer measurements and process them in consecutive slices. This approach increased the number of available background noise samples, making it possible to study how noise progresses in successive time slots and after some hours of testing.

The main takeaway from this activity is that background noise levels can fluctuate a lot, having identified differences greater than 10 dB in consecutive measurements and in the median curves per period. Consequently, it was identified that selecting one (or two) background noise samples to characterise the underwater environment of the test site could be a poor strategy. This concern was shared with the ISO TC 43/ SC 3/ WG1, which included the following text in the ISO/DIS 17208-3: *"If there is a lot of variation —in the background noise measurements—, the user should consider taking the level exceeded by 10 % of the recorded background noise spectra (10 % exceedance level) as a safe proxy for the background noise level."*

Figure 43 represents background noise levels measured during the Las Palmas test campaign, reported as decidecade SPL, representing start (blue) and end (orange) day processed slices. The median per period (Q50, or 50 % exceedance level) is also provided, summarising the periods statistically. Curves are reported from 100 Hz, dropping frequencies below due to the already mentioned flow noise influence, focusing the comparison on frequencies not influenced by deployment noise. This figure shows results for ISO 17208 procedures (parts 1 and 3), using 30 s as temporal observation window. Similar scattering behaviour was observed for the other tested procedures.

Additionally, Figure 44 represents the Q90 (10 % exceedance level) per period for the same data as Figure 43. This statistical representation of the background noise has been considered as a possible alternative in the ISO/DIS 17208-3 standard, which may apply in those tests with significant fluctuations in background noise measurements.

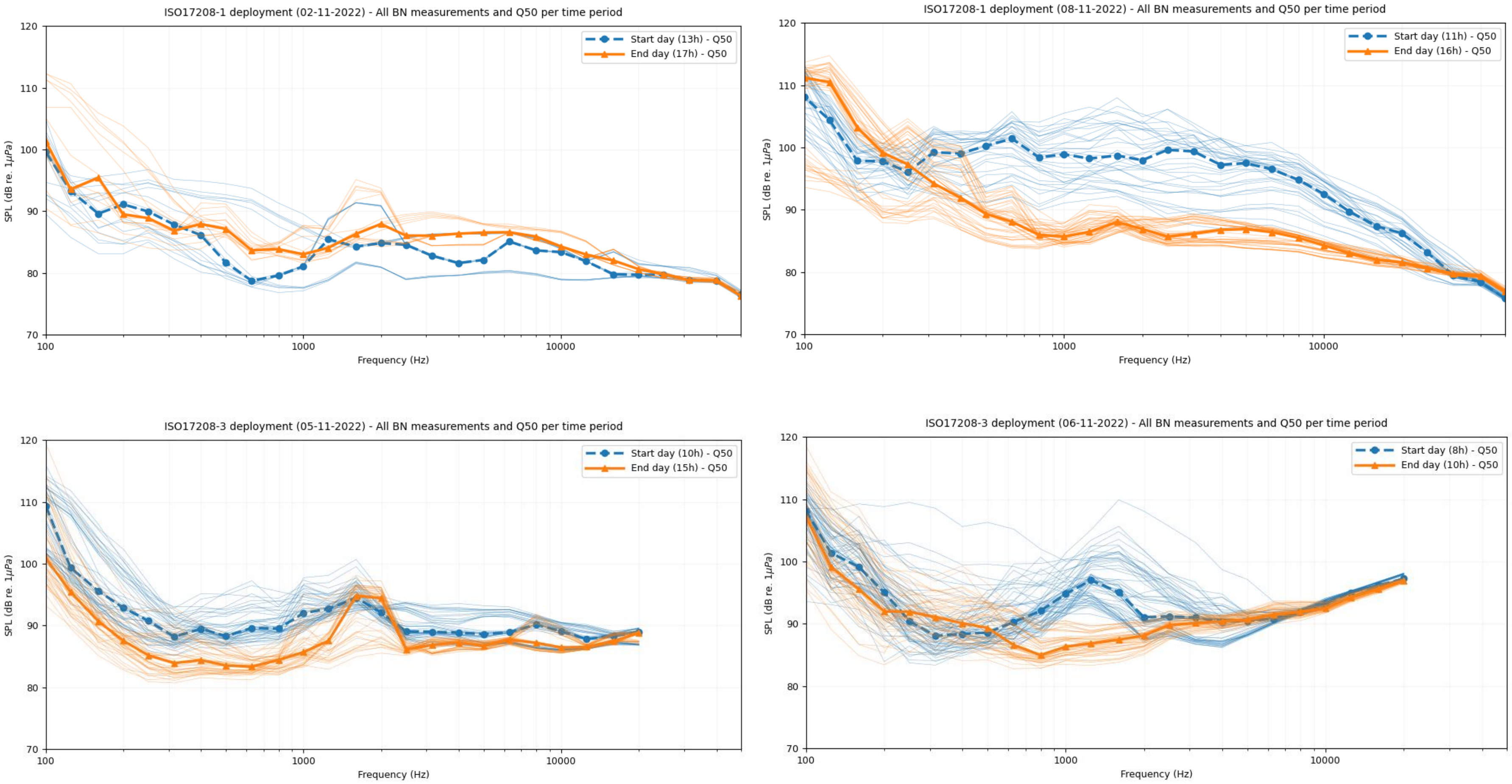


Figure 43: Start and end day background noise measurements for ISO 17208-1 (first row) and ISO 17208-3 (second row) tests with their corresponding median per period.

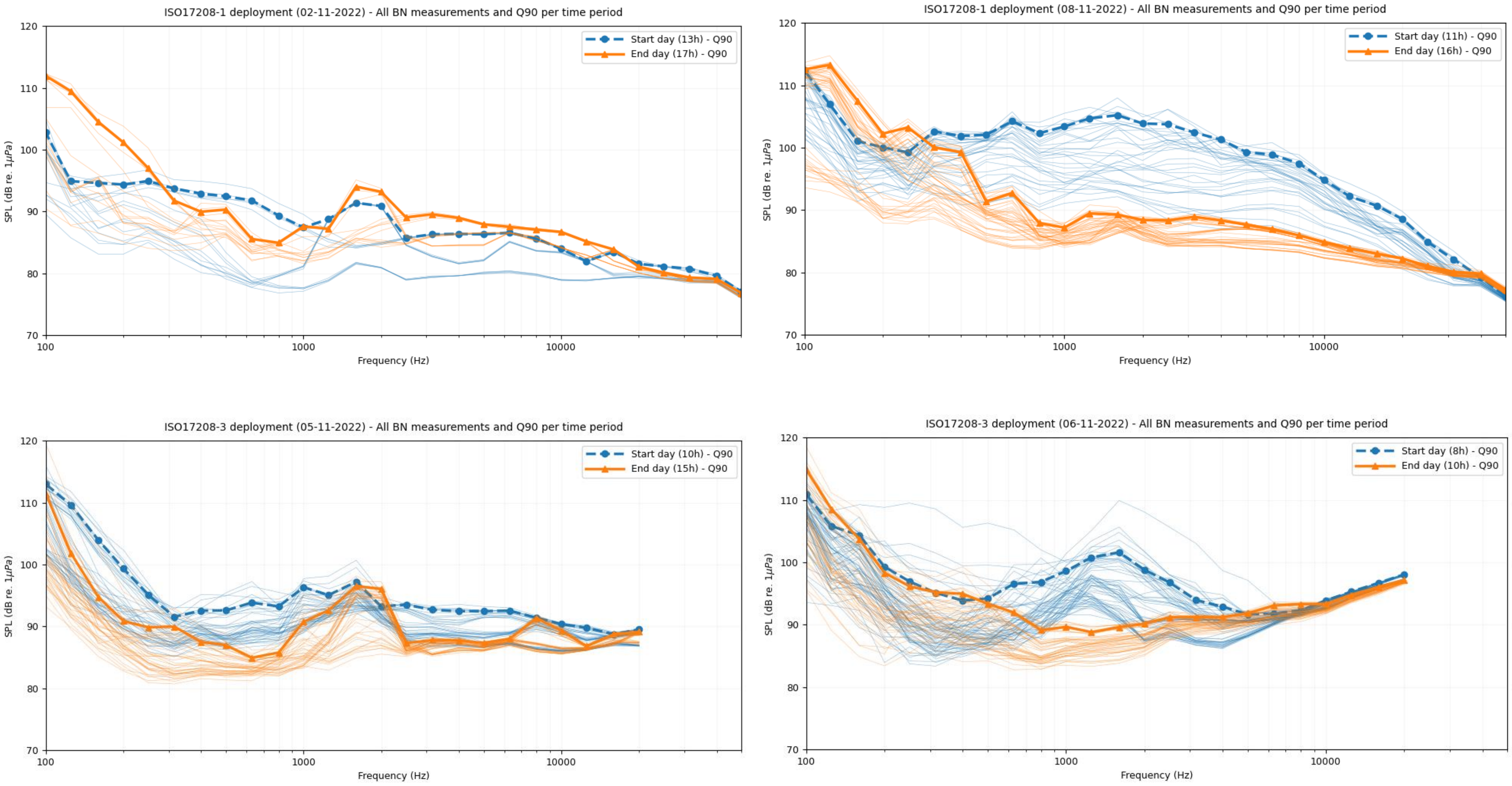


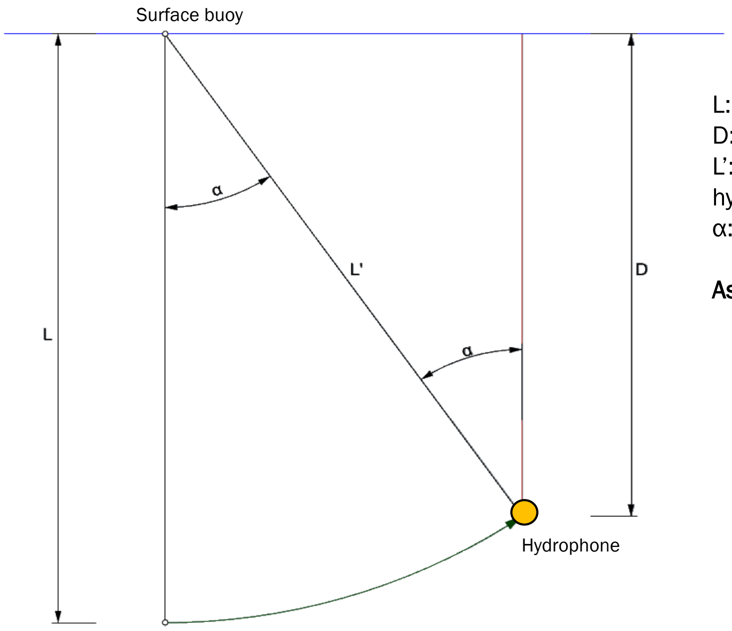
Figure 44: Start and end day background noise measurements for ISO 17208-1 (first row) and ISO 17208-3 (second row) tests with their corresponding Q90 per period.

2.4.4. Depth progress and slant angles

Deployments measured using a vertical array with a surface buoy were instrumented with a CTD. This equipment was close to the deepest hydrophone, generally placed below it. The main objective was to use its recorded data to obtain the sound speed in the water column, although it also provided depth progress during the testing hours. The latter information helped rate the slant angle of the line arrays deployed using a surface buoy.

ISO 17208-1 allows a slant angle of up to 5° and requires corrections over the distance between the vessel and hydrophones if this number is exceeded. This deviation angle was computed as described in equation (2), showing that none of the days this requirement was fulfilled (Table 7, α° column). The required correction was not applied due to practical reasons.

$$\alpha = \cos^{-1}(\mathrm{D}/\mathrm{L}') \tag{2}$$



L: length of vertical array
D: measured hydrophone depth
L': distance between surface buoy and hydrophone (assumed to be equal to L)
α: approximated drift angle

Assumption: L'~L

Figure 45: Drawing for slant angle computation.

	L' (m)	D (m)	α (°)	Depth deviation (m)	Depth deviation (%)
ISO 17208-1 (Day 1)	100	80	36.9	20	20.0
ISO 17208-3 (Shallow)	57	54	18.7	3	5.3
ISO 17208-3 (Very shallow)	38	37	13.2	1	2.6
ISO 17208-1 (Day 2)	105	75	44.4	30	28.6

Table 7: Slant angles at certain depths per deployment.

Figure 46 shows the depth progress measured for the ISO 17208 deployments (parts 1 and 3).

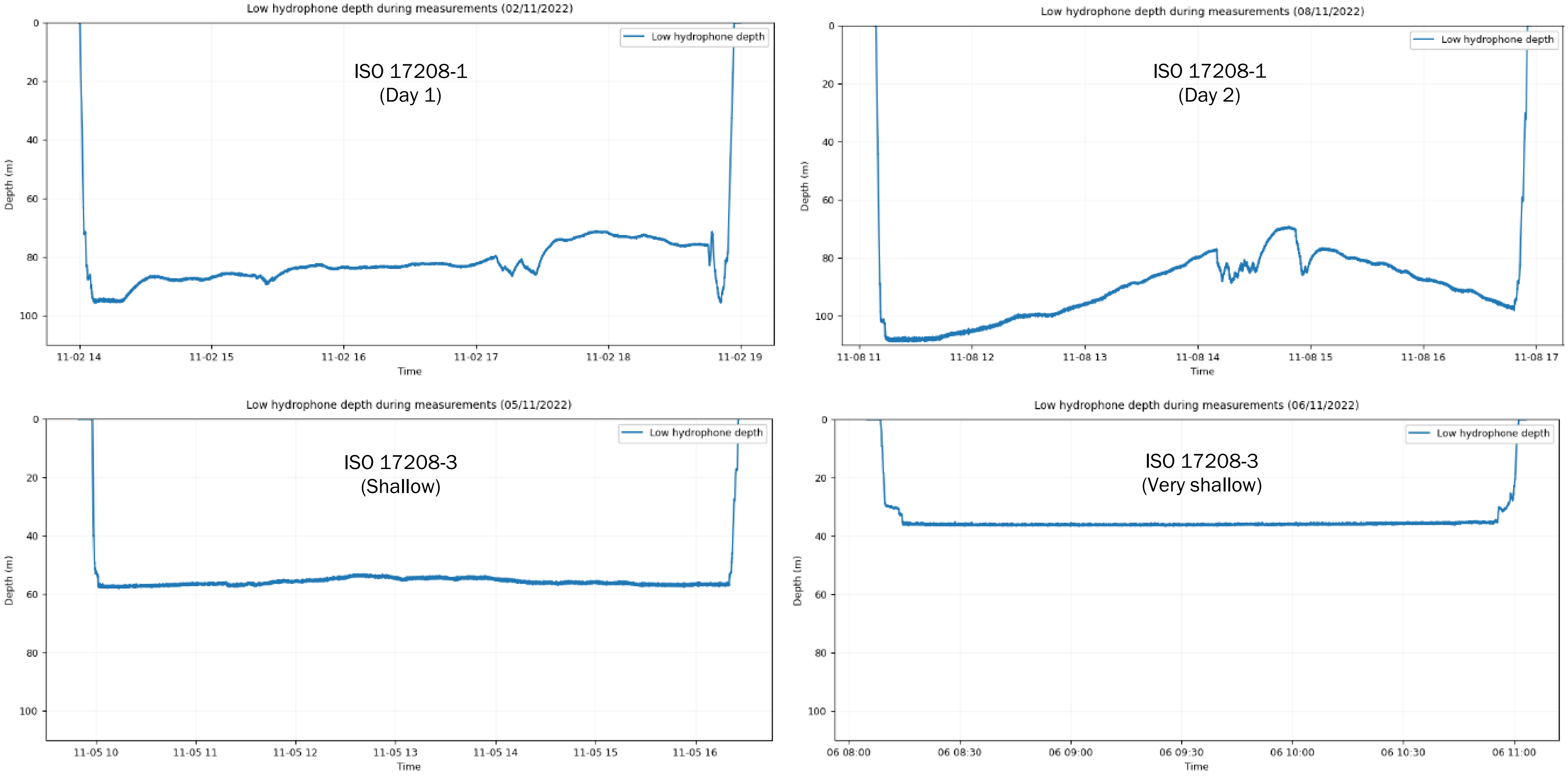


Figure 46: Depth progress of the deepest hydrophone for the ISO 17208-1 (first row) and ISO 17208-3 (second row) vertical array deployments.

2.4.5. Deployments comparison

During the Las Palmas test campaign, a set of four different deployment strategies were used. Their descriptions and rationale of choice were already provided in section 2.1.4, showing their inherent deployment noise previously in section 2.4.2.

This section gathers the pros and cons recognised during the process, including those identified throughout the deployment, execution, and results analysis.

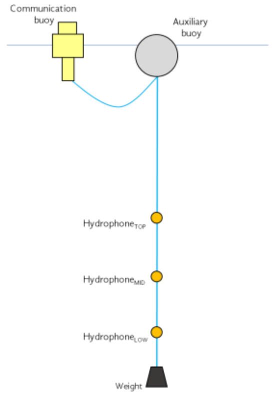
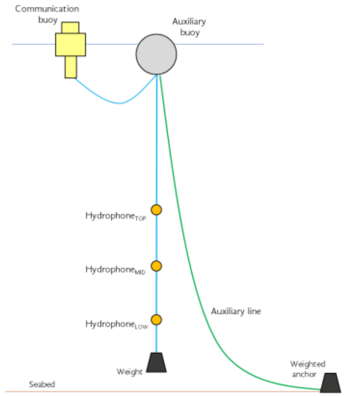
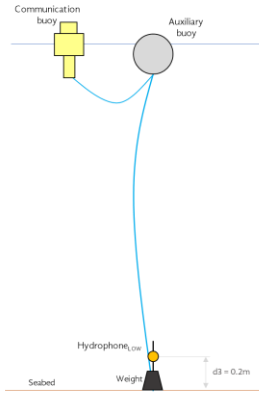
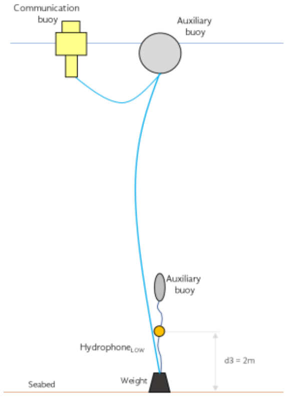
	Surface buoy adrift	Surface buoy moored	Bottom-mounted	Bottom-anchored
Drawing				
Identified advantages	• Less deployment noise than surface buoy moored from mid frequencies (above 300 Hz).	• Robust test execution (same site depth and seabed, easier to hit target CPA, etc). • Reduced testing time compared with surface buoy adrift.	• The most robust regarding flow noise. • Easier deployment than the surface buoy. • Robust test execution.	• More robust regarding flow noise than surface buoy. • Easier deployment than the surface buoy. • Robust test execution.
Identified drawbacks	• Test execution more imprecise: executed CPA, site depth and seabed, vessel path, etc. • Higher dispersion in measured SPL between port and starboard passes. • No clear improvement in flow noise (below 100 Hz). • Can be unsafe for the instrumentation (lost or damage).	• Mooring is not permitted everywhere. • Deployment complexity increases. • Considerable drifting angle for deep water (unless increasing enough the weight).	• Higher deployment noise at high frequencies (from 5 kHz). • The method description states: “The cage structure shall be open”. If this requirement is not met, it could add uncertainties in the results[5].	• Higher deployment noise at high frequencies (from 5 kHz). • Seems to present own resonances (this might be improved with a bespoke mooring design).

Table 8: Comparison of tested deployments in the Las Palmas test campaign.

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[5] For the Las Palmas TC, the deployment to measure the DNV shallow method used a 30 cm round solid base, which deviated from their recommendation.

3. Field measurements: Malta

DNV carried out a measurement campaign on 24 March 2023 to measure the URN signature for a 95000 DWT / 55000 GT bulk carrier, following the DNV shallow water measurement methodology. This is the second measurement campaign of the two executed within this project. The chosen measurement site was close to Gozo Island, Malta. Additionally, measurements of propeller pressure pulses, airborne sound inside the vessel and structureborne noise were carried out. The measurements, performed within the subtask T2.2.2 and T2.2.3 of the SATURN project, aimed to measure the vessel's URN signature and characterise the onboard noise sources simultaneously. The campaign shall also provide a comprehensive data set for the assessment of the feasibility of a cost-effective measurement methodology to estimate vessel URN using onboard measurements (T2.2.4).

Due to the vessel charter itinerary, the vessel was available for testing for a limited time only, which limited the number of passes.

3.1. URN measurements

3.1.1. Test execution

Measurements were carried out at different operating conditions with different vessel speeds (6 kn, 8 kn, 10 kn, 11 kn, 12 kn). Table 9 summarises the primary information of the Malta test campaign, gathering site depth, hydrophone deployment type, hydrophone depth, target CPA and measured vessel speeds.

	Date	Site depth (m)	Depth type	Deploy. type	Hyd. depth (m)	Target CPA (m)	Vessel speed				
Malta test campaign DNV shallow method	24 Mar 2023	72 m	Shallow	Bottom	72 m	200 m	6 kn	8 kn	10 kn	12 kn	Machinery[1]

[1]: Main engine stopped during low-speed navigation (from 3.9 kn to 3.3 kn). It was not feasible to perform such manoeuvre at 0 kn for safety reasons.

Table 9: Summary of Malta test campaign on 24 Mar 2023 and their main tested conditions.

3.1.2. Main vessel particulars

The main characteristics of the vessel under test for the Malta test campaign are gathered below in Table 10.

General	
Ship type	Bulk Carrier
GT	Ca 55 000
Class	Confidential
Hull	
Length, OA	Approx. 230 m
Length, BP	Approx. 230 m
Breadth, MLD	Approx. 40 m
Draught, scantling	15 m
Draught, design	12.2 m
Main engine	
Number of sets	1
Power	Approx. 14 000 kW
Speed	Confidential
Mounting	Rigid
Main generator engine	
Number of sets	3
Power	Approx. 1200 kW
Speed	900 rpm
Mounting	Resilient
Propellers	
Speed	Below 100 rpm
Diameter	Approx. 8 m
Number of blades	4
Control	FPP

Table 10: Main vessel particulars for the Malta test campaign.

3.1.3. Measurement equipment

The measurements were performed with the deployment of two bottom-mounted hydrophones, using the DNV shallow water methodology. The hydrophones deployed were of type icListen HF RB9, and Ocean Sonics make, the information on the hydrophones is summarized in Table 11. The hydrophones are the same type as were used for the measurements carried out in the Las Palmas test campaign (previously described in section 2).

Hydrophone model	Serial number	Designated number
icListen HF RB9	6139	1
icListen HF RB9	6467	2

Table 11: Description of hydrophones used in the Malta test campaign.

3.1.4. Operating conditions

Measurements were carried out with the vessel operating at speeds between 5.5 – 12 knots. The speed through water of 5.5 knots was the minimum speed the vessel managed to sail without loss of steering control over the vessel. The speed through water was attained through monitoring of the vessel's onboard doppler log during the measurements. All analysed operating conditions are summarized in Table 12. The bullet points below summarize additional information describing the general operation of the vessel during the measurements.

- All auxiliary systems necessary to sail the vessel up to and including 12 knots in operation.
- All auxiliary systems in normal operation.
- HVAC at normal summer load.
- Draft aft: 9.3 m.

All other machinery was running at normal operating conditions during the tests.

Run ID	Target condition	Speed [kn]		CPA [m]		Heading [°]	Main engine		DG Power [kW]		
				Hydrophone			RPM	Power [kW]			
		OG[1]	TW[2]	1	2				1	2	3
1	6 kn	5.6	5.5	258	271	302.2	32.8	495	280	-	280
2	6 kn	5.8	6.1	358	218	134.4	32.9	433	278	-	278
3	8 kn	7.7	7.7	309	263	315.4	44.0	1160	260	-	260
4	8 kn	8.0	8.2	399	162	129.5	44.0	1040	270	-	270
5	10 kn	9.9	10.1	316	254	313.5	57.0	2480	270	-	270
6	10 kn	10.3	10.6	368	208	135.2	57.0	2150	550	-	-
7	11 kn	10.7	10.8	342	227	332.6	62.0	3000	550	-	-
8	12 kn	12.5	12.9	301	254	158.6	69.3	4017	630	-	-
9	12 kn	12.1	12.1	247	326	314.6	69.3	4370	570	-	-
10	12 kn	12.4	12.9	304	274	143.2	69.3	3830	570	-	-
-	Machinery condition	3.9	3.3	253	327	312.3	0	0	260	-	260

[1] (Speed) over ground

[2] (Speed) through water

Table 12: Operating conditions of the vessel during the Malta test campaign.

3.1.5. Data processing

TSI performed the data processing of the Malta test campaign. To do so, DNV provided the measured raw data (from GPS and hydrophones) and the related metadata (tested conditions gathered in a logbook, main vessel particulars, etc.), which had to be adapted, allowing to process this test campaign data as done for the Las Palmas test campaign.

The following figures summarise the vessel passes, showing the vessel track and the location of the deployed hydrophones in Figure 47. Mean vessel speed within the processing window and CPA per vessel pass are provided in Figure 48. These plots give an overview of the measured conditions during this test campaign, showing that the vessel speed was characterised at different target speeds (6 kn, 8 kn, 10 kn, 11 kn and 12 kn) with CPAs rating from 150 m to 400 m, gathering a total of 19 vessel passes.

DNV deployed two hydrophones placed on the seabed (separated 580 m) to execute the vessel passes between them. This was decided to speed up the test execution due to the considerable vessel size (230 m of LOA) and its consequent manoeuvrability limits. However, this approach presents a drawback when vessel passes are not executed through the middle division; executed CPAs suffer noticeable dispersion, as shown in Figure 48.

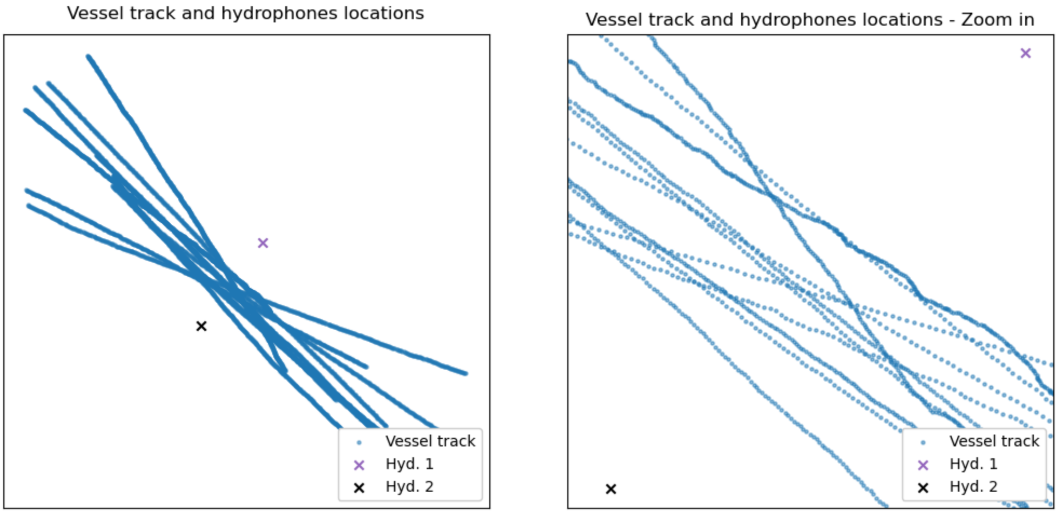

Figure 47: Vessel track and hydrophones locations during the Malta test campaign.

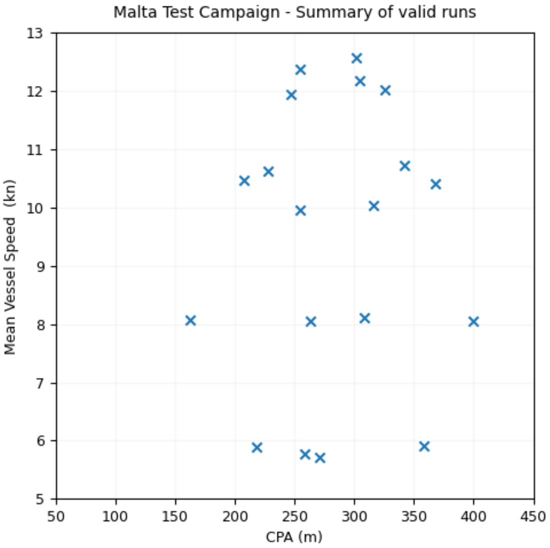

Figure 48: Mean vessel speed and associated CPA per run during the Malta test campaign.

The entire measurement system was checked by check calibrator before start and at end of the measurement survey. All the other quality verifications explained in section 2.2.1 and applied over the Las Palmas test campaign were also performed (vessel track, vessel speed, CPA, SPL review, etc.). However, discarding runs for not meeting the CPA requirements of the DNV class procedure was not possible, as not enough runs would have met this restriction (CPA within the 100 m to 200 m range).

After the data preparation and quality verification, the ensuing steps in the post-processing were the same as those for the Las Palmas test campaign, following the DNV shallow water procedure to get the vessel signature (further details already provided in section 2.2.2). Interim results obtained in the workflow and the final vessel signatures are provided in the next section.

3.1.6. Results

This section provides not only the final vessel signatures per vessel speed but also the spectral representation (SPL) of the measurements used to get them, being referred to as interim results.

3.1.6.1. Interim results

Measured SPL per vessel pass and background noise measurements are shown (Figure 49 and Figure 50). Unlike in the previous test campaign, the inherent deployment noise presented a better performance, without a clear influence of flow noise, probably caused by differences in the environmental conditions of the test site (softer currents). Only measurements performed at low speeds (6 kn and 8 kn) suffered background noise issues, namely at an isolated decidecade frequency band below 100 Hz and from 10 kHz (shown in the vessel signatures reporting; Figure 51).

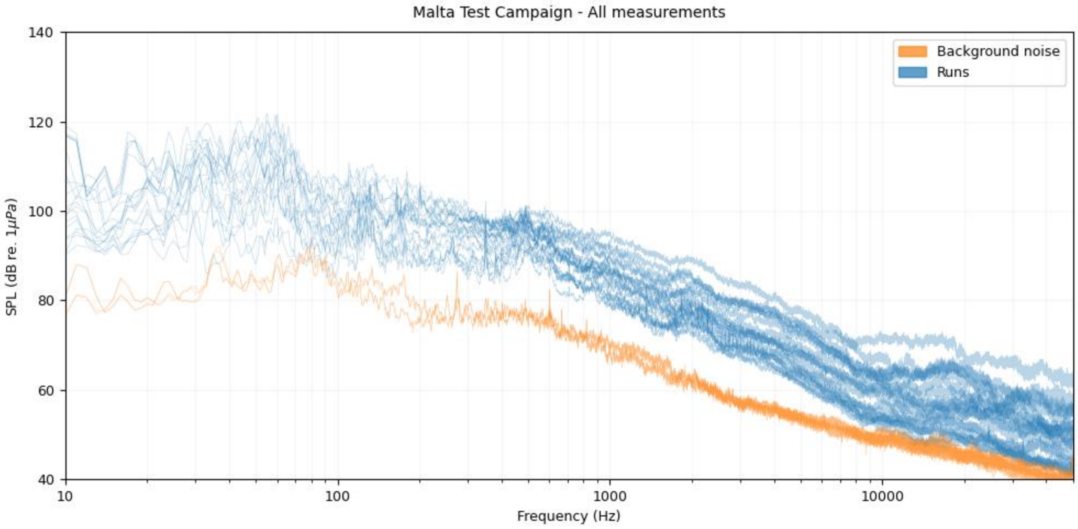

Figure 49: SPL in 1 Hz bands from measured runs and background noise measurements – Malta test campaign.

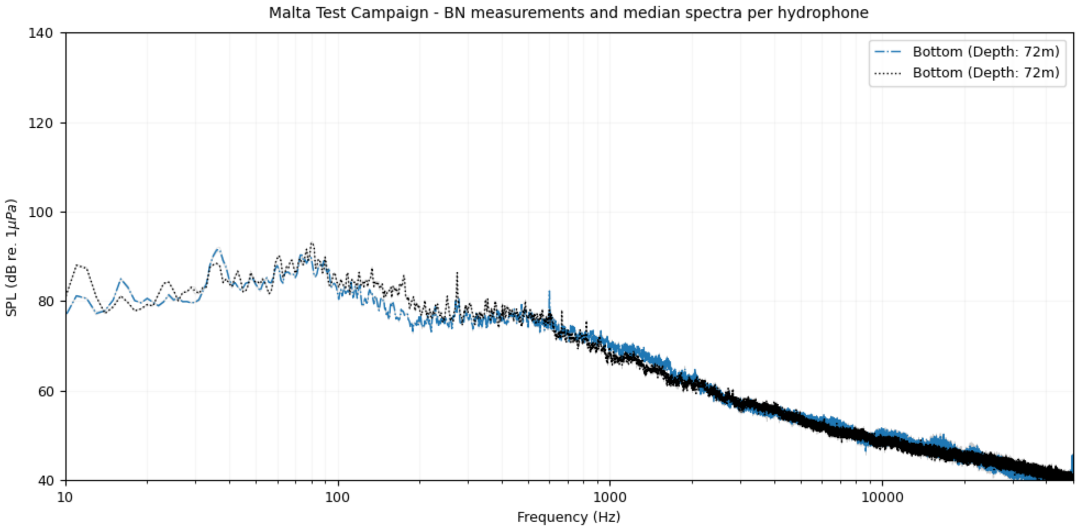

Figure 50: Median SPL in 1 Hz bands for background noise measurements per hydrophone – Malta test campaign.

3.1.6.2. Vessel signatures

This section reports the vessel signatures measured in the Malta test campaign following different post-processing approaches.

DNV

The vessel signatures obtained following the DNV shallow water procedure using the measurements of the Malta test campaign are compiled in Figure 51. As for the Las Palmas test campaign, the reporting metric is referred to as URN_{DNV}, and includes a -5 dB correction requested by the method due to the placement of the hydrophones on the seabed.

This procedure requires two runs to report a vessel signature (one per vessel side), so a couple of vessel signatures per speed are reported in most cases. The repeatability between vessel signatures for the same speeds is consistent, where only the lowest speeds presented background noise issues, mainly at high frequencies (above 10 kHz).

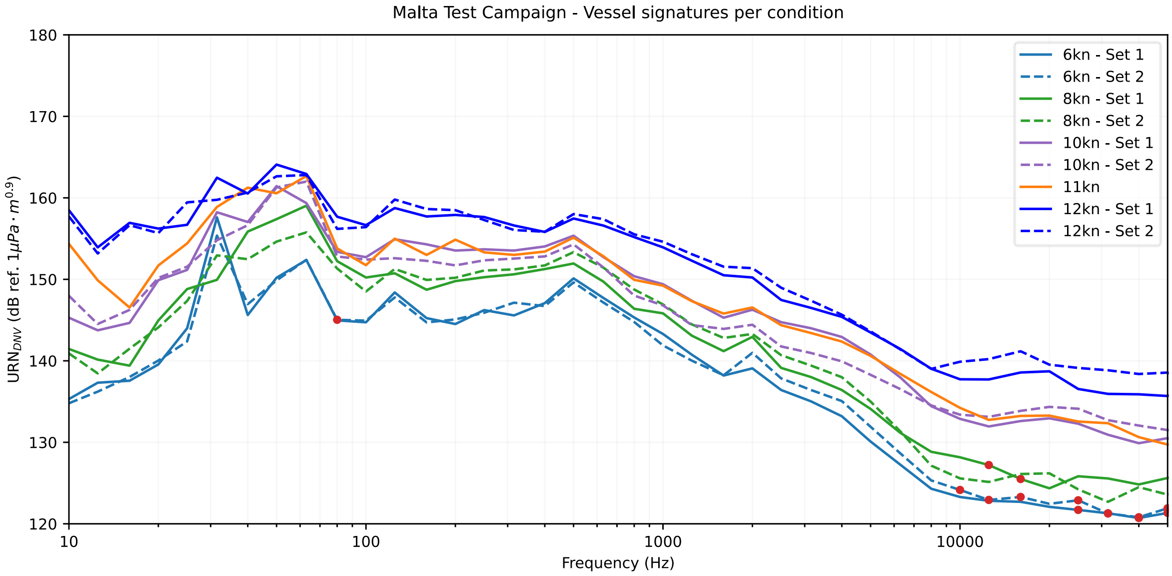

Figure 51: Vessel signatures in decidecade bands according to DNV procedure for a set of speeds. Red dots indicate frequencies where high background noise levels prevent the proper characterisation of the vessel noise.

ISO 17208-3

URN data measured in the Malta test campaign were also processed following ISO 17208-3 procedure, allowing to report results as SL and RNL, which are shown next. The whole post-processing method was met, only departing in the data window used, which was one vessel length before and one after CPA, instead of the ±30º from CPA as stated in the ISO/DIS 17208-3.

SL

The main difference in this post-processing method comes from the distance correction, although there are others. In this case, the distance correction is applied employing the already mentioned analytical formula of PL (Annex C), instead of the 18log(R) DNV's strategy. For the computation of the results gathered in this section, most of the parameters were kept fixed, using the following values: source depth (6.5 m), sound speed in water (1515 m/s; assumed from available site data[6]), sound speed in seabed (1588 m/s; assumed from available site data[7]), hydrophone depth (71.8 m) and site depth (72 m). Only CPA varied between runs, ranging from approximately 150 m to 400 m (as already shown in Figure 48).

This processing method requires four runs to get a vessel signature SL (two per vessel side), making it unfeasible to produce a result for the 11 kn speed (with only one measurement per vessel side). Obtained signatures are gathered in Figure 52 and will be used in a later project task to correlate URN with onboard measurements (T2.2.4).

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[6], [5] https://emodnet.ec.europa.eu/

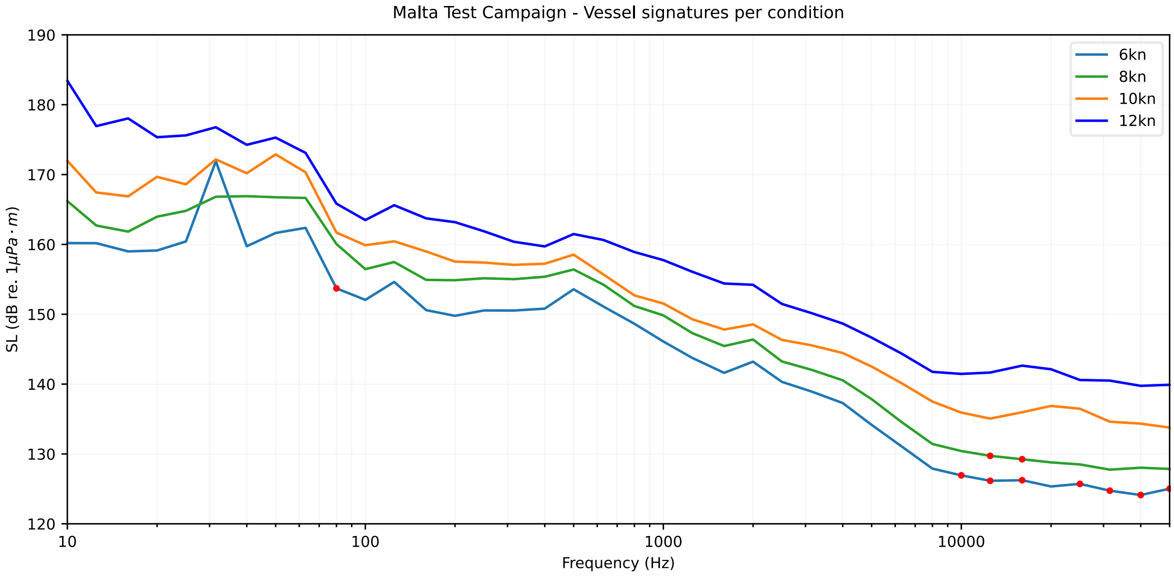

Figure 52: Vessel signatures reported as SL in decidecade bands according to ISO 17208-3, computed using DNV measurements data for a set of speeds. Red dots indicate frequencies where high background noise levels prevent the proper characterisation of the vessel sound.

RNL

Part 3 of the ISO 17208 standard also provides a conversion formula to derive deep water RNL from SL, allowing to obtain similar results to what would have been measured in deep water. The conversion process is detailed in Annex C, equation (15), while the obtained results are gathered in Figure 53. Values used to perform this conversion were 1515 m/s for the sound speed in water and 6.5 m for the source depth.

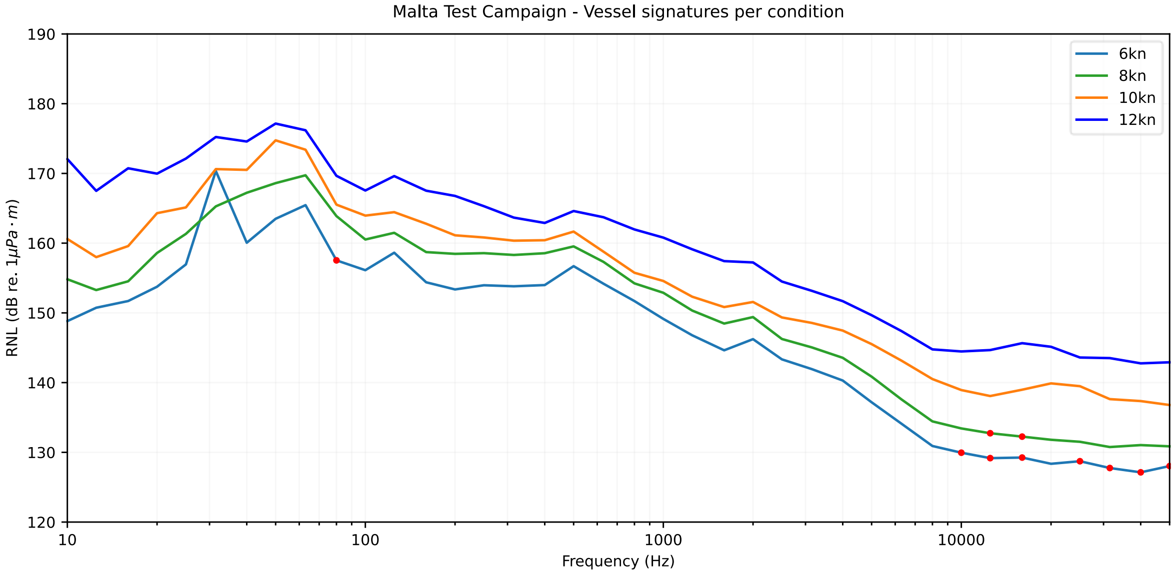

Figure 53: Vessel signatures reported as deep water RNL in decidecade bands according to ISO 17208-3, computed using DNV measurements data for a set of speeds. Red dots indicate frequencies where high background noise levels prevent the proper characterisation of the vessel sound.

3.1.6.3. Results comparison

Below, the comparison between results from the Malta test campaign processed as DNV shallow and ISO 17208-3 methods is shown. Reported results from ISO 17208-3 are expressed as RNL, derived from SL as described in ISO/DIS 17208-3 (further details and specific equations are available in Annex C). Figure 54 plots vessel URN results from the mentioned methods, while Figure 55 represents their level differences. These figures show that DNV results are approximately -13 dB lower at low frequencies (below 100 Hz), and -6 dB lower from 500 Hz, with a transition slope between 100 Hz and 500 Hz. These differences remain consistent in all the other tested speeds (see Figure 56 and Figure 57).

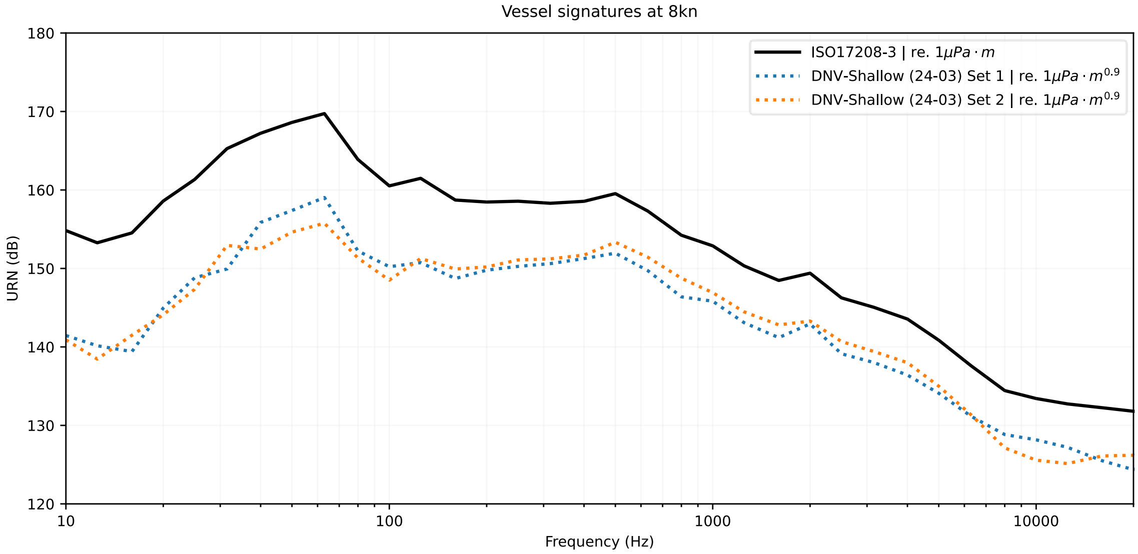

Figure 54: Comparison of vessel signatures in decidecade bands measured in the Malta test campaign at 8 kn and post-processed following DNV-Shallow and ISO 17208-3 methods. The metric used to report ISO 17208-3 results is RNL.

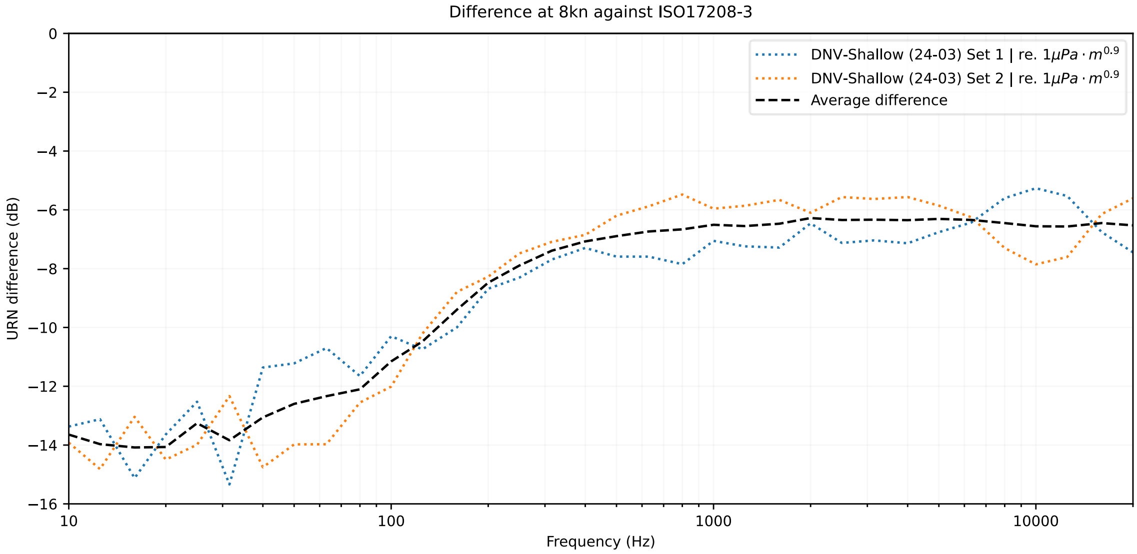

Figure 55: Difference of reported URN levels in decidecade bands between ISO 17208-3 and DNV-Shallow procedures already reported in Figure 54.

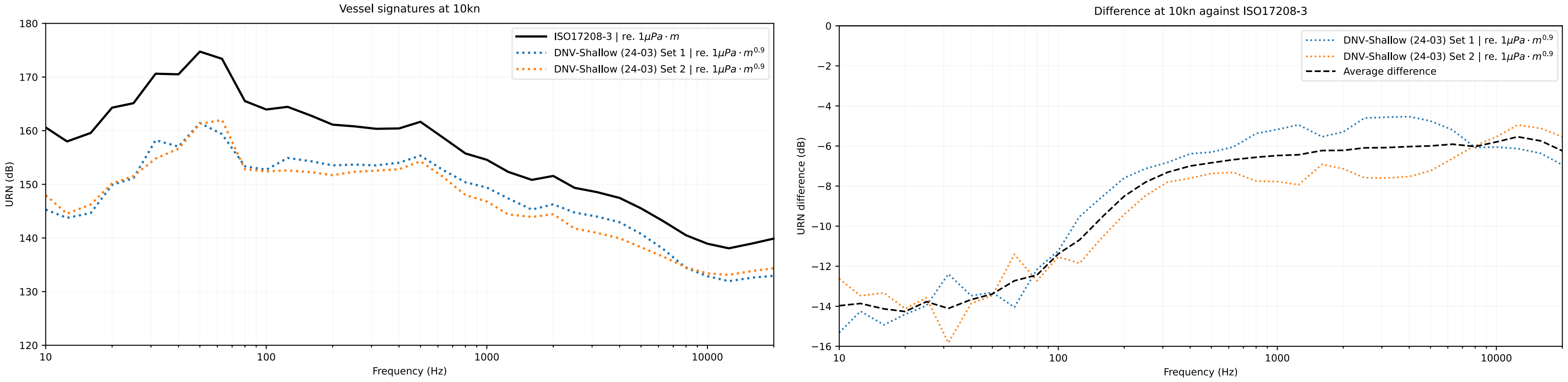

Figure 56: Comparison of vessel signatures in decidecade bands measured in the Malta test campaign at 10 kn and post-processed following DNV-Shallow and ISO 17208-3 methods (left) and their level differences (right).

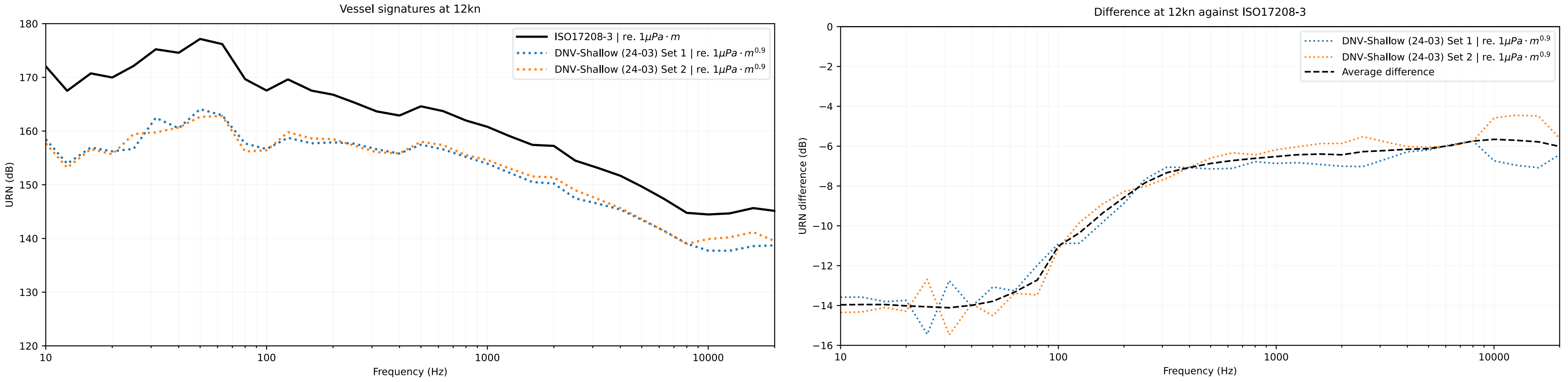

Figure 57: Comparison of vessel signatures in decidecade bands measured in the Malta test campaign at 12 kn and post-processed following DNV-Shallow and ISO 17208-3 methods (left) and their level differences (right).

3.2. Onboard measurements

The aim of the onboard measurements is to characterize the main onboard noise sources during the Malta test campaign according to best practice and ISO 1683:2015 standard for the preferred reference values for acoustical and vibratory levels. The measurements from this sea trial will serve as foundation for subtask 2.2.4 of the SATURN project which will assess the feasibility of a cost-effective solution for vessel URN measurements based on onboard systems. Vessel particulars described in section 3.1.2 also apply to these measurements.

3.2.1. Measurement equipment

Table 13 presents the instrumentation that was employed during the Malta test campaign to characterise the onboard sources. Further information regarding sensor positions and settings are provided in the following sections.

Equipment	Maker	Type
Microphone	PCB	130E20
Accelerometer	Brüel & Kjær	4513
Accelerometer	Brüel & Kjær	4396
Accelerometer	Norsonic	Nor 1270
Pressure sensor	Kistler	601CA
Handheld shaker	PCB	394C06
Acquisition system (master unit)	IMC	Cronosflex
Acquisition system	IMC	C-Series

Table 13: Measurement equipment for the Malta test campaign.

In total three data acquisition units were used, one of these was used as a master unit, to which the other two were synchronized.

3.2.2. Measurement positions

Figure 58 presents an overview of the majority of measurement positions, and indicates locations of sensors measuring structureborne noise, airborne noise, waterborne noise as well as shaft rotation speed. More details on the different types of sensors are included in the following subsections. The multichannel system setup, including DAQ units, and info on channels and sensors is presented in Table 14 and Table 17.

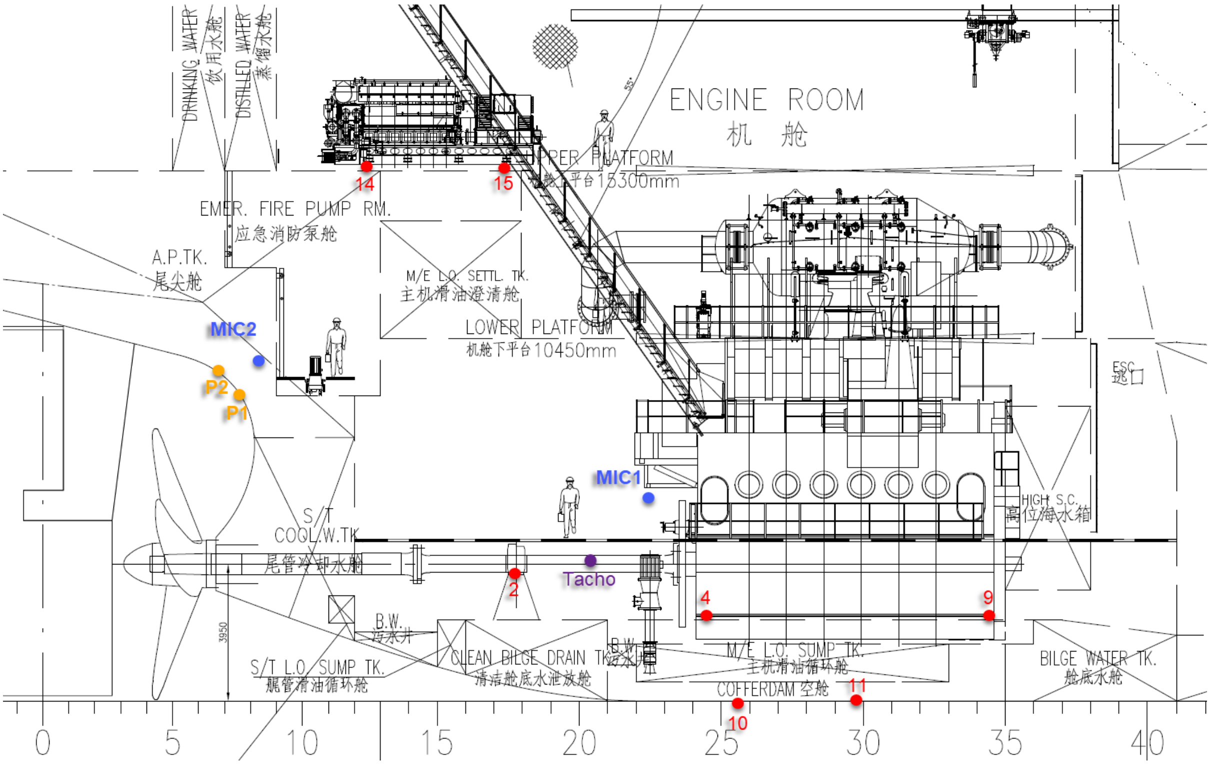

Figure 58: Overview of onboard measurement positions, accelerometers (red colour), microphones (blue colour), pressure sensors (yellow colour) and tachometer (purple colour).

Location	DAQ	MP	Dir.	Foresign	Description	Sensor S/N	Cal. Factor	Cal. Fact. Unit	Sampling Frequency [kHz]
M/E	2447	SBN02	z	+	Shaft Line Bearing	14 / 908	100.480	(m/s^2)/V	50
		SBN04	x	+	M/E DE Foundation SB	15 / 909	100.430	(m/s^2)/V	50
		SBN04	y	-	M/E DE Foundation SB	6 / 899	100.980	(m/s^2)/V	50
		SBN04	z	+	M/E DE Foundation SB	8 / 902	99.920	(m/s^2)/V	50
		SBN09	z	+	M/E ND Foundation SB	12 / 906	101.050	(m/s^2)/V	50
		SBN10	z	+	Shell Plating	16 / 910	100.230	(m/s^2)/V	50
		SBN11	z	+	Shell Plating	10 / 904	100.030	(m/s^2)/V	50
		MIC1			Microphone above Flywheel	32622	20.764	Pa/V	50
		Shaft Speed			Shaft Speed				1
D/G	2493	SBN12	z	+	No.2 CW Pump	1 / 893	100.360	(m/s^2)/V	50
		SBN13	z	-	Fuel Oil Pump	9 / 903	101.290	(m/s^2)/V	50
		SBN14	x	-	D/G 1 NDE Foundation PS	11 / 905	100.110	(m/s^2)/V	50
		SBN14	y	+	D/G 1 NDE Foundation PS	4 / 896	100.620	(m/s^2)/V	50
		SBN14	z	-	D/G 1 NDE Foundation PS	5 / 989	100.900	(m/s^2)/V	50
		SBN15	z	-	D/G 1 NDE Foundation SB	2 / 894	100.610	(m/s^2)/V	50

Table 14: Overview of measurement channels and system setup (1/2).

Location	DAQ	MP	Dir.	Foresign	Description	Sensor S/N	Cal. Factor	Cal. Fact. Unit	Sampling Frequency [kHz]
D/G	CronosFlex	MIC2			Microphone Aft Peak Tank	32515	21.432	Pa/V	50
		p1			Pressure Pulses fwd (Fr#7-8)	9	22983.222	Pa/V	100
		p2			Pressure Pulses aft (Fr#6-7)	6	22202.487	Pa/V	100

Table 15: Overview of measurement channels and system setup (2/2).

Hull pressure

Two pressure sensors were installed to measure the propeller pressure impulses and facilitate characterisation of the propeller as a noise source. The sensors were installed between frame #6-7 and frame #7-8. Both pressure sensors were installed forward of the propeller due to the vessel draft and to aim for full submersion of both sensors during the measurements. The position of the pressure sensors is shown in closer detail in Figure 59. The distances from the pressure sensors to the tip of the propeller were 2.6 m for P1 and 2.33 m for P2.

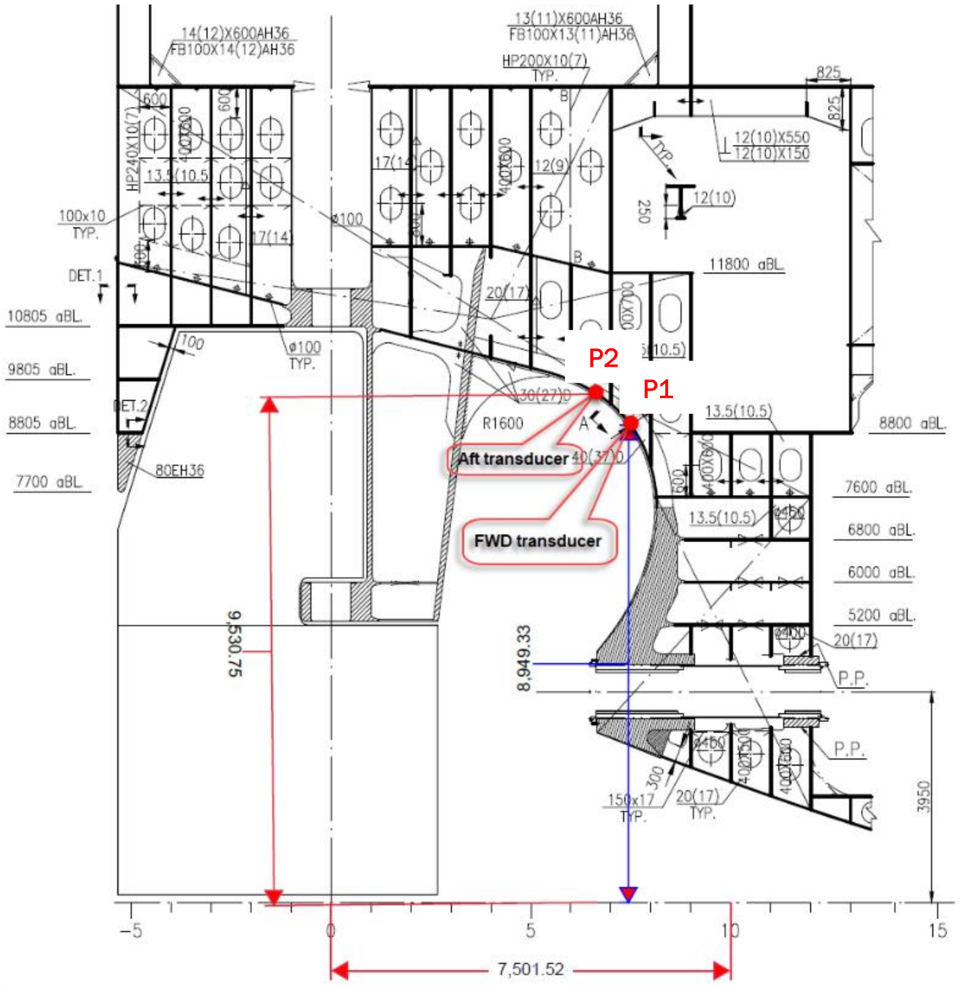

Figure 59: Position of pressure sensors with indications of distances to the propeller tip.

Structureborne noise

The aim of the structureborne noise measurements is to characterise main rotating machinery and also assess the vibratory characteristics of the hull structure.

The main engine, an important noise source onboard, was measured at two locations. Both locations on starboard side of the engine, on the engine foundation in the driving end (SBN04) and the non-driving end (SBN09). Three sensors were installed in X, Y and Z direction[8] on the driving end of the main engine.

The vessel has three diesel generators, one of these were fitted with four sensors at two locations. One was located starboard side non-driving end (SBN15), while three were located on port side non-driving end in three directions (SBN14).

One sensor was also installed on the shaft line bearing at frame #18 (SBN02).

Two sensors were located on the hull structure, at relatively stiff locations in the vicinity of stiffeners and girders. The locations were chosen to be abeam the driving (SBN10) and non-driving end (SBN11) of the main engine.

In addition to the above-mentioned sensors which positions were already indicated in Figure 58, two additional sensors were installed on the No.2 CW (cooling water) pump and the fuel oil pump (SBN12 and SBN13 respectively), these positions are indicated in Figure 60 below.

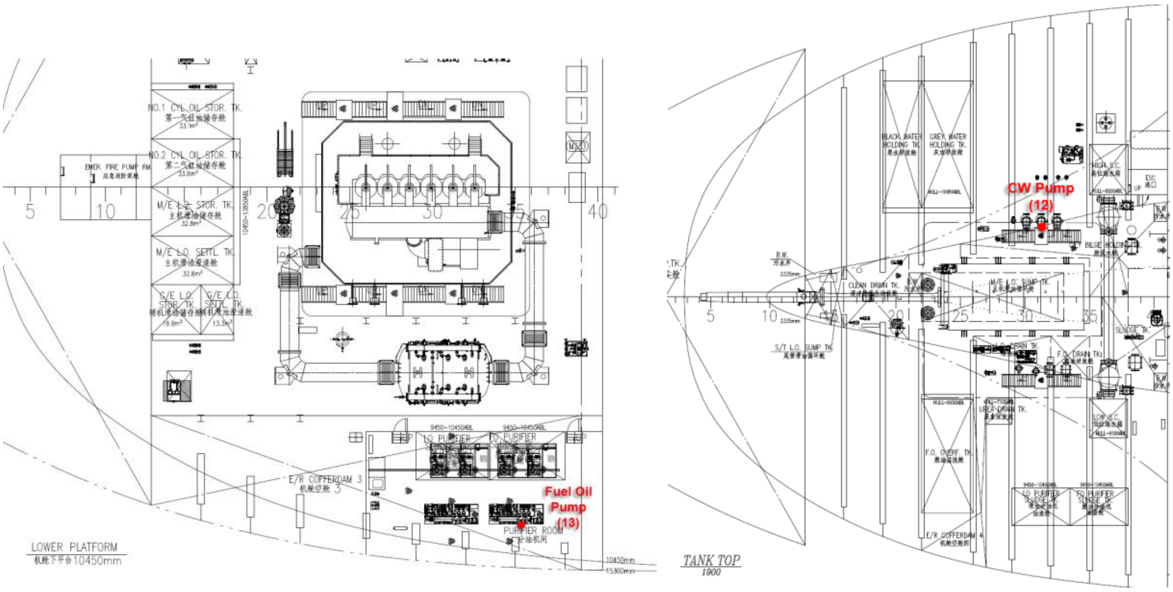

Figure 60: Sensor locations on the fuel oil pump (left) and the cooling water pump (right).

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[8] Coordinate system used:
X: parallel to the ship's longitudinal axis,
Y: transverse to the ship's longitudinal axis,
Z: normal to the ship's floor plane.

Airborne noise

Airborne noise was measured at two locations. A microphone in the engine room, at the driving end of the main engine. A second microphone in the aft-peak tank, at a location about three frames forward of the forwardmost hull pressure sensor. The intention of the airborne noise measurements in the aft-peak tank is to quantify the noise level inside the hull close to the propeller, which may be an alternative way to measure propeller cavitation sound.

Shaft speed

A tachometer was installed on the main engine shaft to accurately assess the shaft speed during the measurements.

3.2.3. Data processing

Table 16 presents the time of the measurements for each run, as well as the start and stop of the time window used for the DNV processing. The length of the time window for the different runs is also presented. The length of the time window varies between the runs. The reason for this is that the time window was chosen to match the time window of the far-field measurements according to DNV shallow method, i.e., when the vessel was closest to the hydrophones. The start of the time window was when the vessel reference point, in this case the propeller, was one ship length away from the 1st hydrophone station, while the end of the time window is when the vessel reference point has passed the 2nd hydrophone station by one ship length. Hence, the data window duration is minimum the time it takes the vessel to sail two ship lengths when the CPA time stamp to the two hydrophone stations are equal. This time window is the averaging time for all result figures.

Run	Measurement timestamp (start) UTC + 1	Time window		
		Start [s]	Stop [s]	Length [s]
1	2023-03-24 10-49-45	374	616	242
2	2023-03-24 11-18-17	472	657	185
3	2023-03-24 11-54-46	184	328	144
4	2023-03-24 12-23-50	267	412	145
5	2023-03-24 12-56-12	244	358	114
6	2023-03-24 13-34-15	229	328	99
7	2023-03-24 14-03-19	177	279	102
8	2023-03-24 14-41-00	167	269	102
9	2023-03-24 15-09-05	204	295	91
10	2023-03-24 15-50-40	217	293	76

Table 16: Time windows for onboard results processed by DNV.

As the onboard measurements employed different sensor types, their corresponding reporting varies. Next, the reporting details per sensor type are provided.

Waterborne noise

RMS sound pressure p is measured in Pa and sound pressure levels are presented in decibels (dB) relative to a reference sound pressure of 1 µPa, that is:

$$L_p = 10 \cdot \log_{10}\left(p_{\mathrm{rms}}^2 / p_{\mathrm{ref}}^2\right) \text{ dB} \tag{3}$$

L_p: sound pressure level
p_{rms}: mean square of sound pressure level
p_{ref}: reference sound pressure (10^{-6} Pa)

Structureborne noise

Structureborne noise is vibration in the audible frequency range, which will generate noise when a vibrating surface excites the surrounding medium. The structureborne noise is usually assessed in velocity levels but may also be defined as acceleration levels.

$$L_v = 10 \log_{10}\left(v_{\mathrm{rms}}^2 / v_{\mathrm{ref}}^2\right) \text{ dB} \tag{4}$$

L_v: velocity level
v_{rms}: root mean square velocity
v_{ref}: reference velocity (10^{-9} m/s)

Additional to the reference velocity given above, results are also presented for a reference velocity of 50 nm/s. Acceleration levels are presented in dB with a reference acceleration of 1 µm/s². The velocity levels can be derived from the acceleration levels through a conversion in the time or frequency domain as described below in equations (5) and (6).

$$v(t) = \int_{t_0}^{t} a(t)\,\mathrm{d}t + v(t_0) \tag{5}$$

$v(t)$: velocity in time domain
$a(t)$: acceleration in time domain
t: end time
t_0: initial time

$$|V(f)| = \frac{|A(f)|}{2\pi f} \tag{6}$$

$V(f)$: velocity spectrum
$A(f)$: acceleration spectrum
f: frequency

Airborne noise

The sound pressure levels are presented in decibel levels relative to a reference sound pressure of 20 µPa:

$$L_p = 10\log_{10}\left(p_{\mathrm{rms}}^2/p_{\mathrm{ref}}^2\right)\ \mathrm{dB} \tag{7}$$

L_p: sound pressure level
p_{rms}: rms sound pressure
p_{ref}: reference sound pressure (20 μPa)

The presented airborne sound levels are not weighted.

3.2.4. Results

The measurement results for all measurements are presented in decidecade bands graphically and in tabular format in Annex G.

The following results are presented:

- Waterborne noise levels [dB re. 1 μPa], measured by the pressure transducers.
- Airborne sound levels [dB re. 20 μPa], measured by the microphones.
- Structureborne noise levels, measured by the accelerometers., represented as:
  - Acceleration [dB re. 1 μm/s^2]
  - Velocity [dB re. 1 nm/s]

The structureborne noise measurements are presented in acceleration and in velocity in figure and table format.

4. Conclusions

This report describes the execution of two test campaigns to gather data to be analysed within this document or later in another project task. Most conclusions gathered below come from the analyses executed over the first test campaign (Las Palmas). In contrast, the core use of the data from the second test campaign (Malta) will be performed later in a correlation study of the SATURN project (task T2.2.4).

Next, the main conclusions of the Las Palmas test campaign are detailed:

- This test campaign allowed the measurement of vessel URN under different standards and class societies' procedures, performing measurements at different water depths (ranging from 50 m to 200 m), using different instrumentation deployment strategies (drifting buoy, surface buoy moored, and two hydrophone seabed configurations) gathering almost 190 vessel passes and 80 background noise measurements. It was also possible to replicate a procedure for deep water on two different days (ISO 17208-1) and test twice ISO 17208-3, which aims to characterise vessel sound in shallow water.
- The execution on two different days of the ISO 17208-1 procedure allowed to evaluate the method's robustness, obtaining five vessel signatures represented as RNL, with an average dispersion below ±1 dB from their median. It was also confirmed that fixing the vessel power instead of the speed reduced the scattering between port and starboard characterisation. ISO 17208-1 results were used as the reference for later vessel signature comparisons, whether in the form of RNL (output metric from ISO 17208-1) or SL (metric derived from RNL using ISO 17208-2 procedure).
- Resulting vessel signatures were obtained following the descriptions of each tested method, meeting their post-processing and reporting requirements. The diversity of these procedures made it unfeasible to compare results using a common reporting metric, so their comparison was performed as URN levels (expressed in dB, most of them referred to different reference units). Such exercise allowed comparing the resulting signatures for the same vessel at equal operating conditions and obtained following different procedures. This study demonstrated significant differences in the results, where URN levels were generally lower than the RNL from ISO 17208-1. BV deep procedure returned URN levels of -1.5 dB, BV[9] shallow and DNV deep around -5 dB, and DNV shallow produced underestimations up to -12 dB below the RNL from ISO 17208-1. Only ANSI S12.64 returned similar results. Differences in the results demonstrated that vessel URN levels depend on the method used, supporting the need for unifying procedures.
- ISO 17208-3 procedure was tested twice at shallow (80 m) and very shallow water depths (50 m; close to vessel length) and compared against deep water results (measured according to ISO 17208-1 and converted to SL through ISO 17208-2). This comparison showed good consistency between deep and shallow water outcomes, with an average underestimation of ISO 17208-3 results above 300 Hz

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[9] BV URN results were computed using X·log(R) as distance adjustment instead of a propagation modelling approach (recommended method), which may produce different deviations. Both approaches (including the employed one) are compliant with the BV class notation procedure.

of around -2.5 dB, obtaining the highest deviations in the case of the very shallow depth deployment. These deviations might be partially explained by uncertainties in the test site seabed. As expected, level differences remain the same when also comparing these results as RNL, as they use the same correction term (ΔL) for the transformation (from RNL to SL in deep water through ISO 17208-2, and from SL to RNL in shallow water through ISO 17208-3).

- ISO 17208-3 widens the deployment and execution possibilities, making the procedure fulfilment more flexible. These less tightened requirements allowed processing and reporting results as ISO 17208-3 using data gathered following different measuring procedures (BV shallow, DNV shallow and MMP2 deployments). This yielded five results for vertical arrays, two for bottom-anchored, and one for bottom-mounted deployments. Compared with ISO 17208-1 results, the vertical arrays (even when using two different water depths and four CPAs) presented a consistent behaviour with an average underestimation of around -2.5 dB from 400 Hz. The differences were greater for the bottom-mounted and bottom-anchored deployments (which used one hydrophone instead of three), with an approximate average deviation of -4 dB, with some isolated frequencies deviating up to -7 dB.
- Different instrumentation deployments were tested: drifting buoy, surface buoy moored, bottom-mounted hydrophone and bottom-anchored hydrophone. None of them is the most suitable choice for any situation, and its choice may also depend on particular aspects of the case. Based on the Las Palmas test campaign, Table 9 collects identified advantages and drawbacks of each tested deployment and considers factors such as deploying difficulty, robustness regarding inherent noise (e.g., flow noise), testing conditions repeatability, equipment safety, etc. This table may be used as a starting point for future testing campaigns. One of the main takeaways is that bottom-mounted/anchored deployments showed higher robustness against flow noise (below 100 Hz) —likely due to lower current speeds—, although their high-frequency performance was worse (from 5 kHz).
- The experienced current speeds for the Las Palmas test campaign (~1.5 m/s on the surface) and the vessel sound characteristics (silent ship) led to limitations in the analyses at low frequencies (below approx. 100 Hz). However, similar currents may not be a restriction for noisier vessels, although it might be considered a risk factor for the measured data quality.
- One of the objectives of testing ISO/CD 17208-3 and ISO/DIS 17208-3 was to inform about the experience of its use and share any comments or lessons learned that might be helpful for the development of the text. Some of the points reported in this regard were:
    - The fluctuations experienced in background noise measurements (easily above 5 dB in consecutive time slots and start and end day measurements comparisons) manifest that choosing only one measurement as a representative sample of the test site might be a poor approach in some cases.
    - The limitation of slant angles below 5° for vertical array deployments using surface buoy seems too strict. This condition was almost never met during

the Las Palmas test campaign. It would have required complicated corrections to update distances between the vessel and the hydrophone in most executed runs, which was impractical. This specific requirement is not included in ISO/DIS 17208-3, although it is considered as a source of uncertainty to be evaluated if the slant range exceeds a 10% deviation from its expected value.

  - The need to provide further guidance to reduce inherent deployment noise or recommendations on what deployment strategy might be adequate (e.g., using bottom-mounted deployments for test sites with expected flow noise caused by strong currents).

The execution of the Malta test campaign was motivated by the need to gather onboard measurements and vessel URN simultaneously, and use gathered data for a later correlation study. That analysis was out of the scope of the current report, but not the processing of such URN measurements. The URN measurements from this test campaign were processed and reported following DNV shallow method and ISO/DIS 17208-3. The results comparison between URN_{DNV} and RNL from ISO 17208-3 showed noticeable lower levels resulting from the DNV procedure, with differences around -13 dB below 100Hz and -6 dB from 500 Hz.

5. References

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Annex A. Interim results from Las Palmas TC

This annexe shows a set of plots that sum up the measurements performed during every day of the Las Palmas test campaign, providing information for the valid runs regarding testing conditions and the spectral representation of the gathered data. Information about the content of each subplot was already explained in section 2.3.1.

Additionally, numerical values used to generate the first subplot of each set of figures, which represents mean vessel speed vs CPA for the valid runs, are gathered in Table 17, available at the end of the section.

Day 1: ISO 17208-1 & DNV Deep

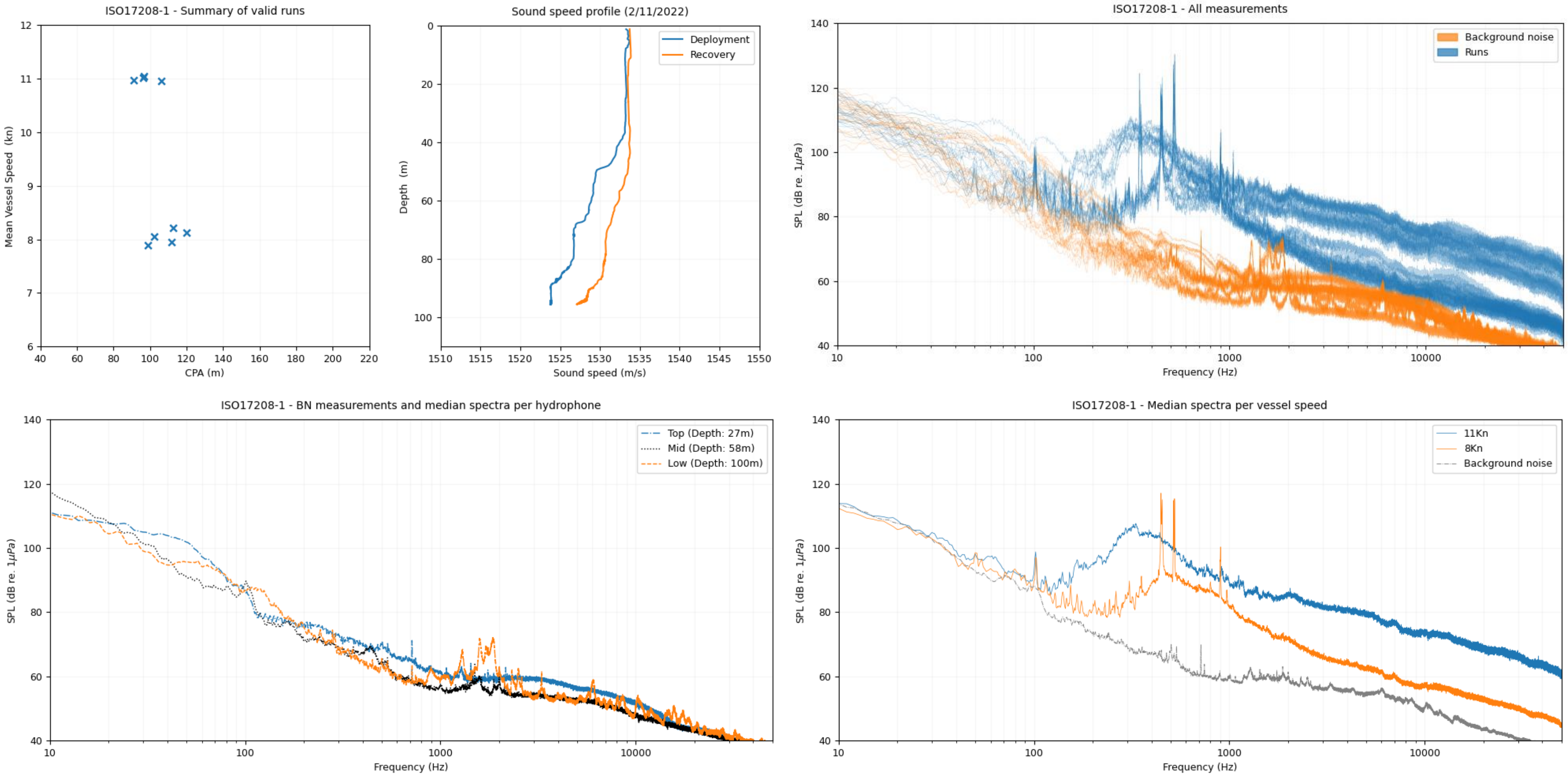


Figure 61: Day 1 (2 Nov 2022) – ISO 17208-1 & DNV Deep.

Day 1: ANSI ASA S12.64 Grade C

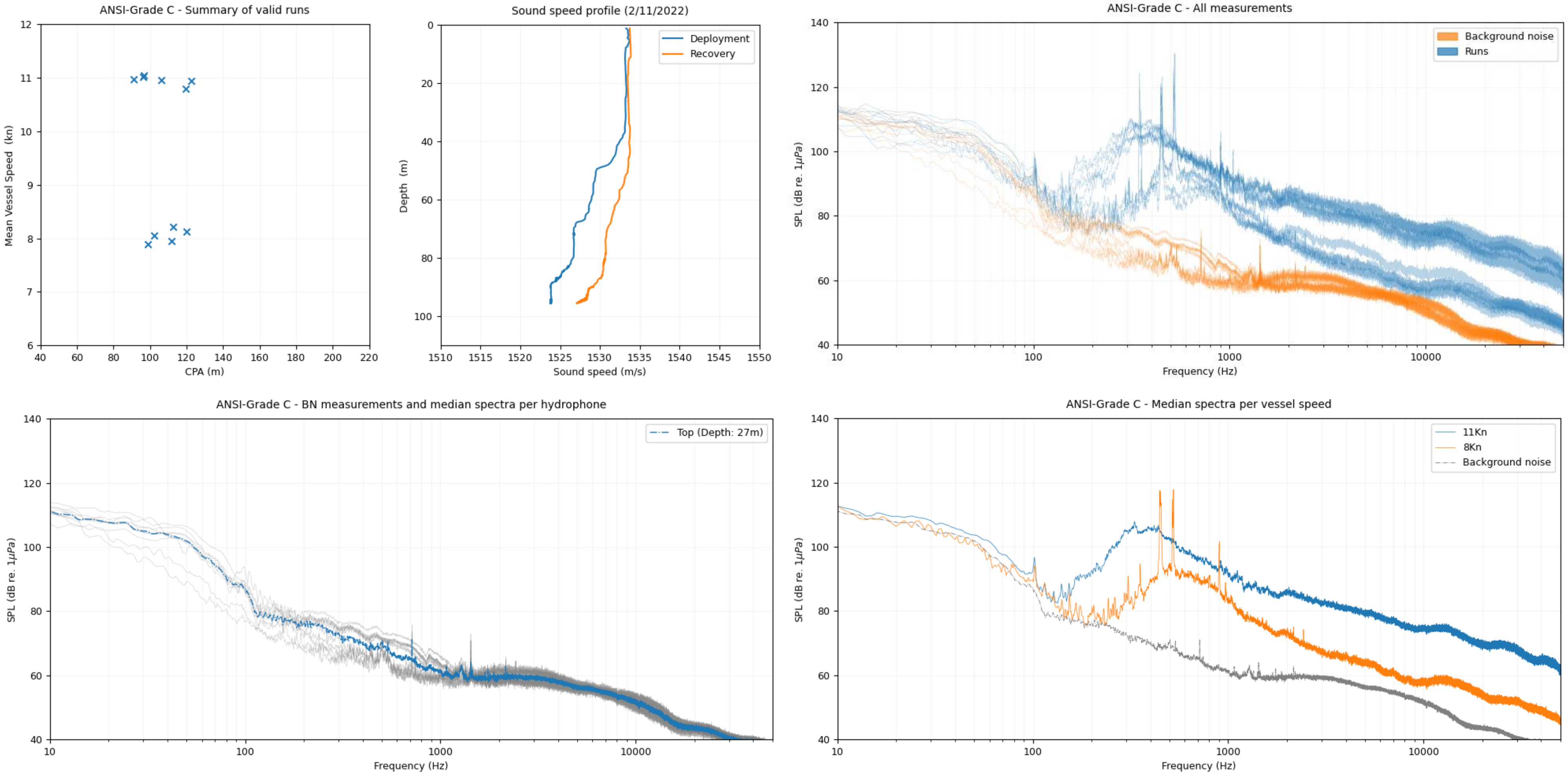


Figure 62: Day 1 (2 Nov 2022) – ANSI S12.64 Grade C.

Day 2 and 3: BV Deep

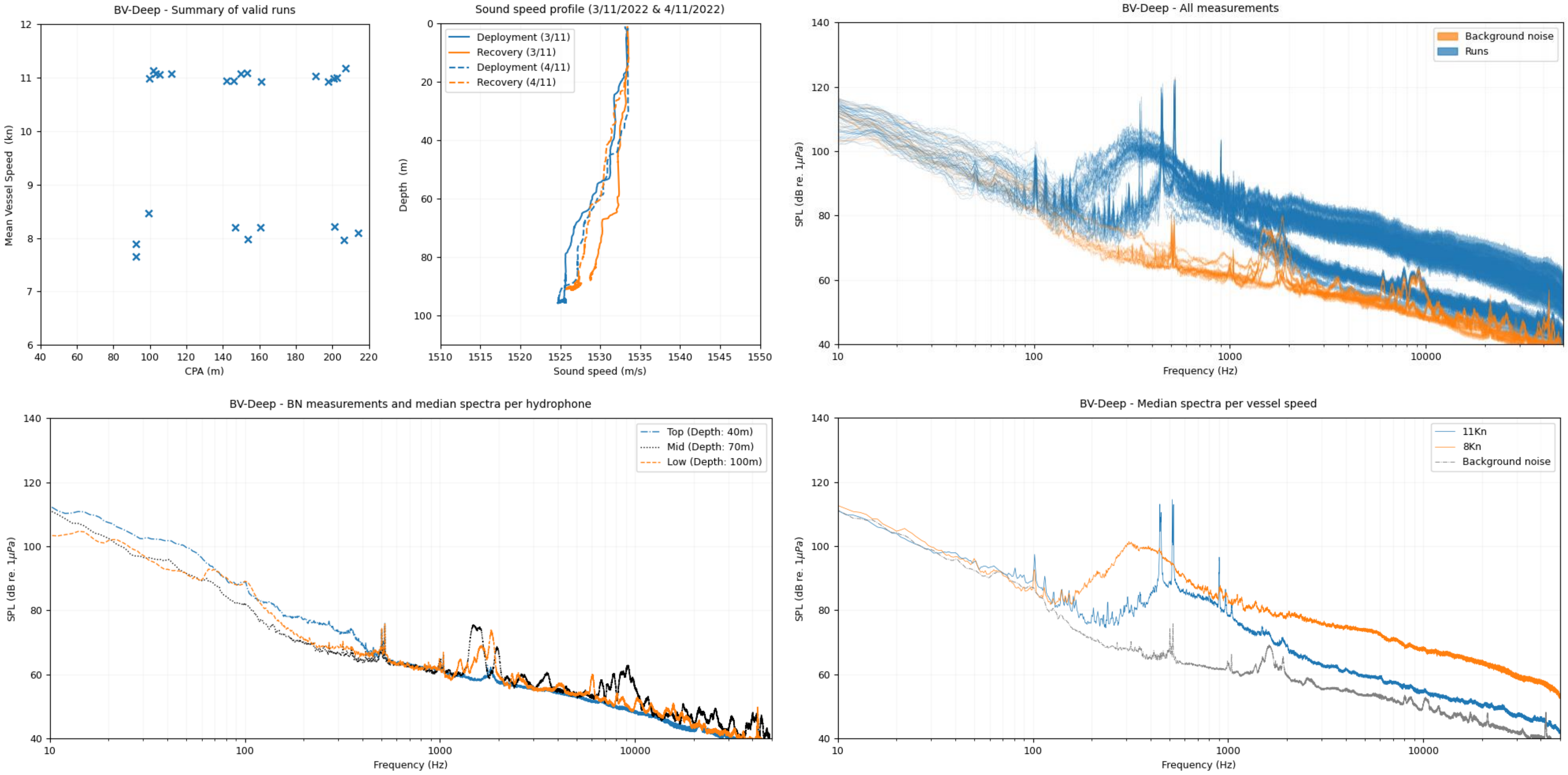


Figure 63: Day 2 and 3 (3 Nov 2022 and 4 Nov 2022) – BV Deep.

Day 4: ISO 17208-3 Shallow

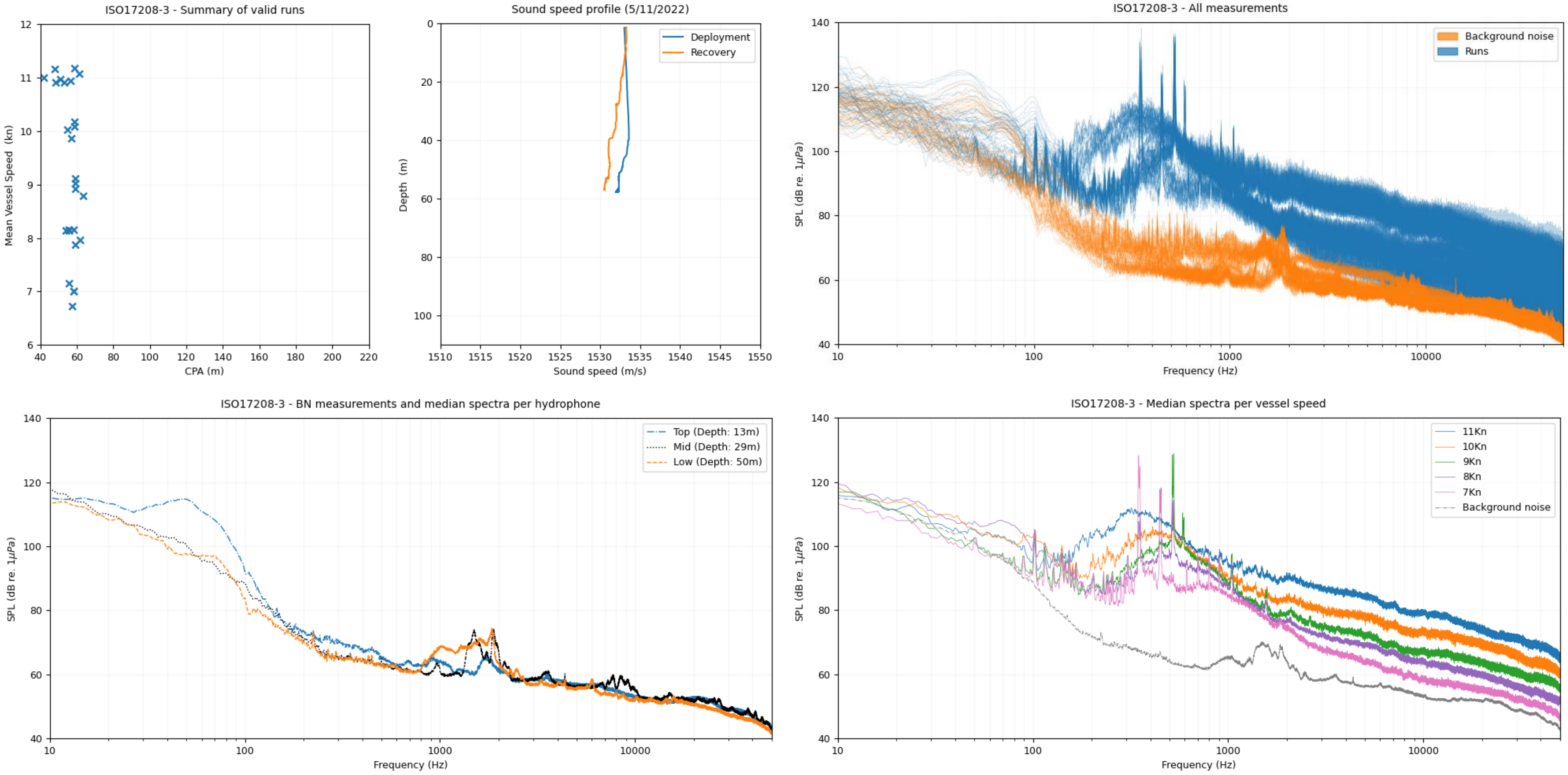


Figure 64: Day 4 (5 Nov 2022) – ISO 17208-3 Shallow.

Day 5: ISO 17208-3 Very Shallow

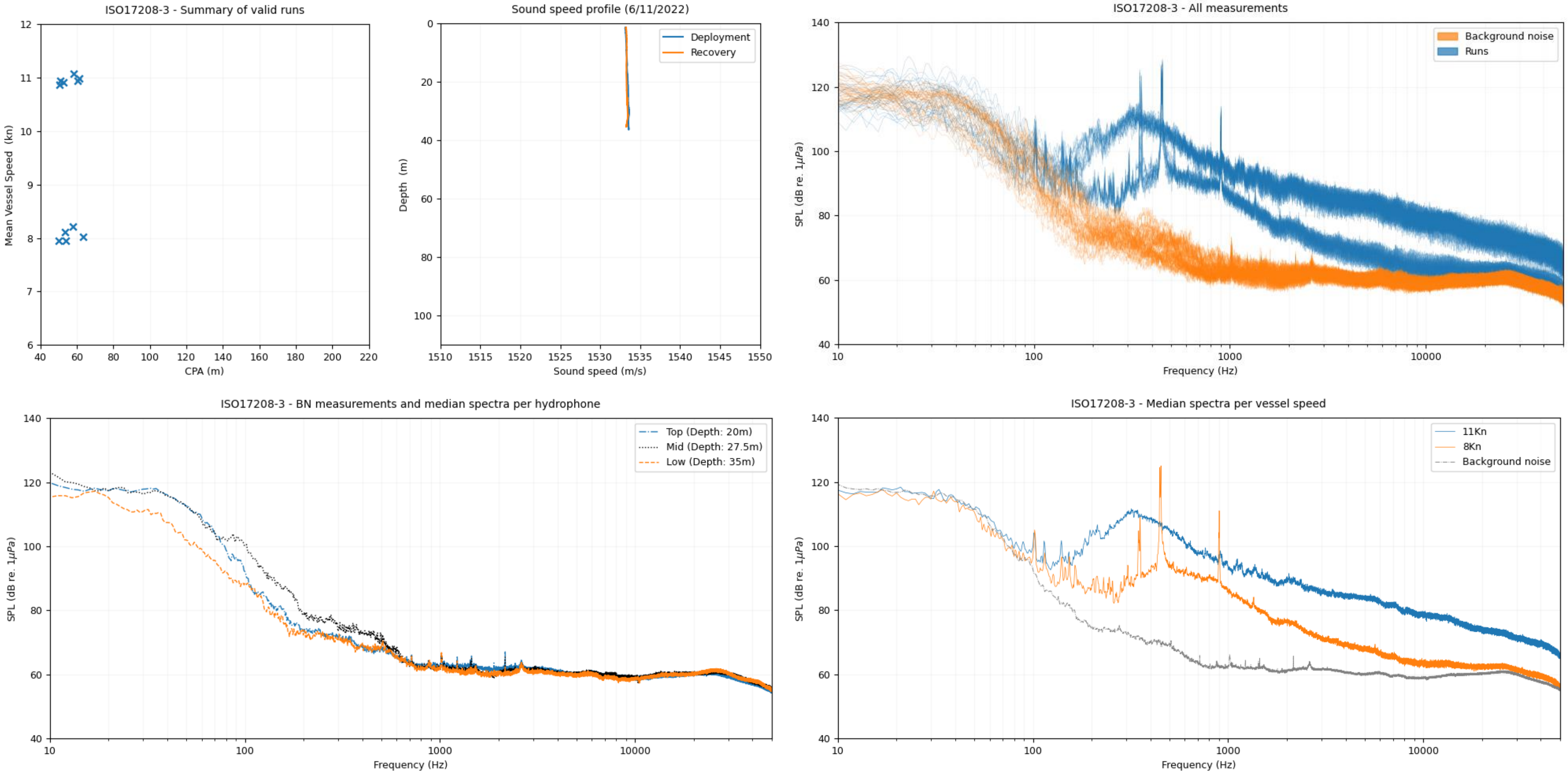


Figure 65: Day 5 (6 Nov 2022) – ISO 17208-3 Very Shallow.

Day 6: BV Shallow

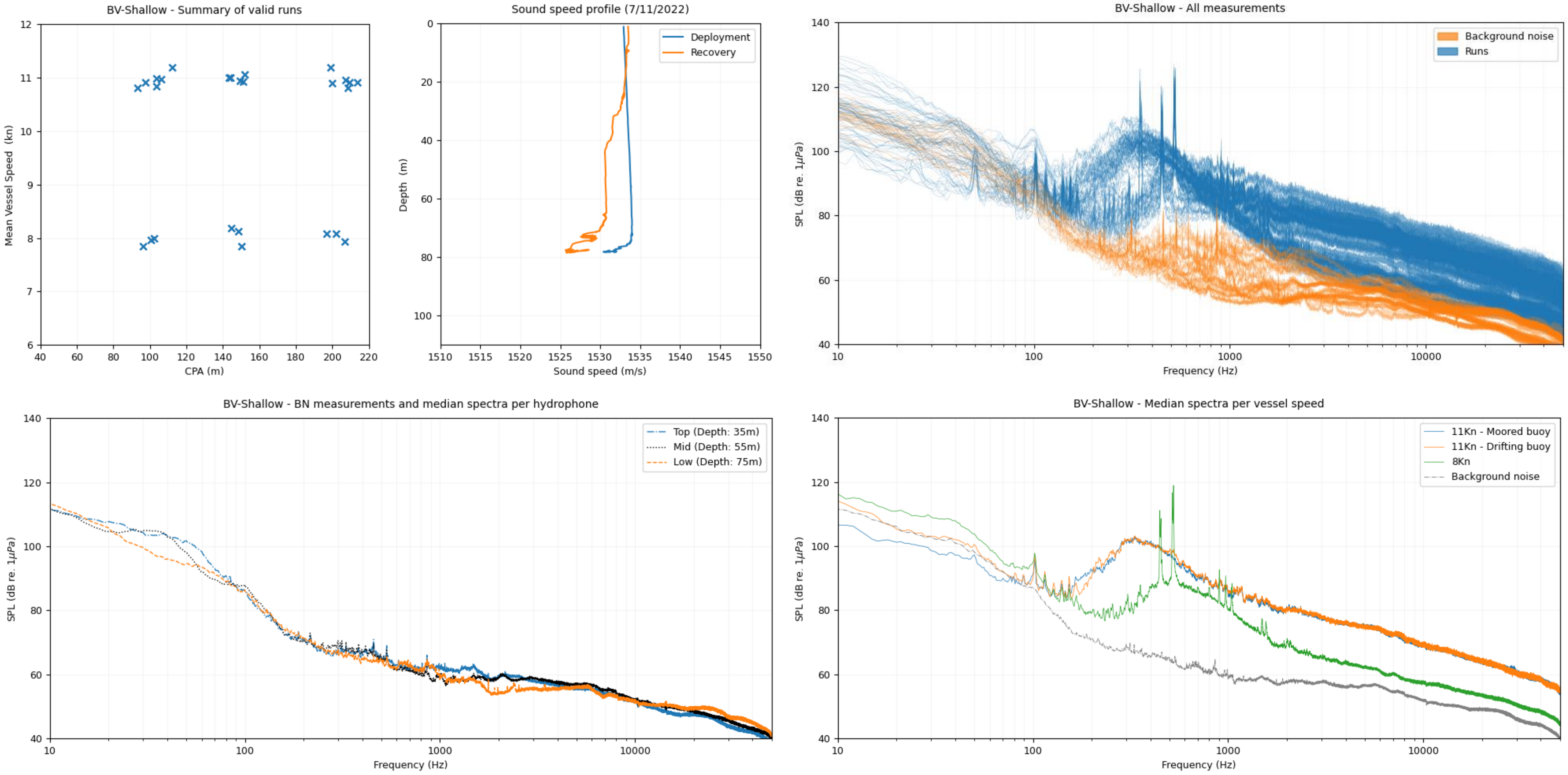
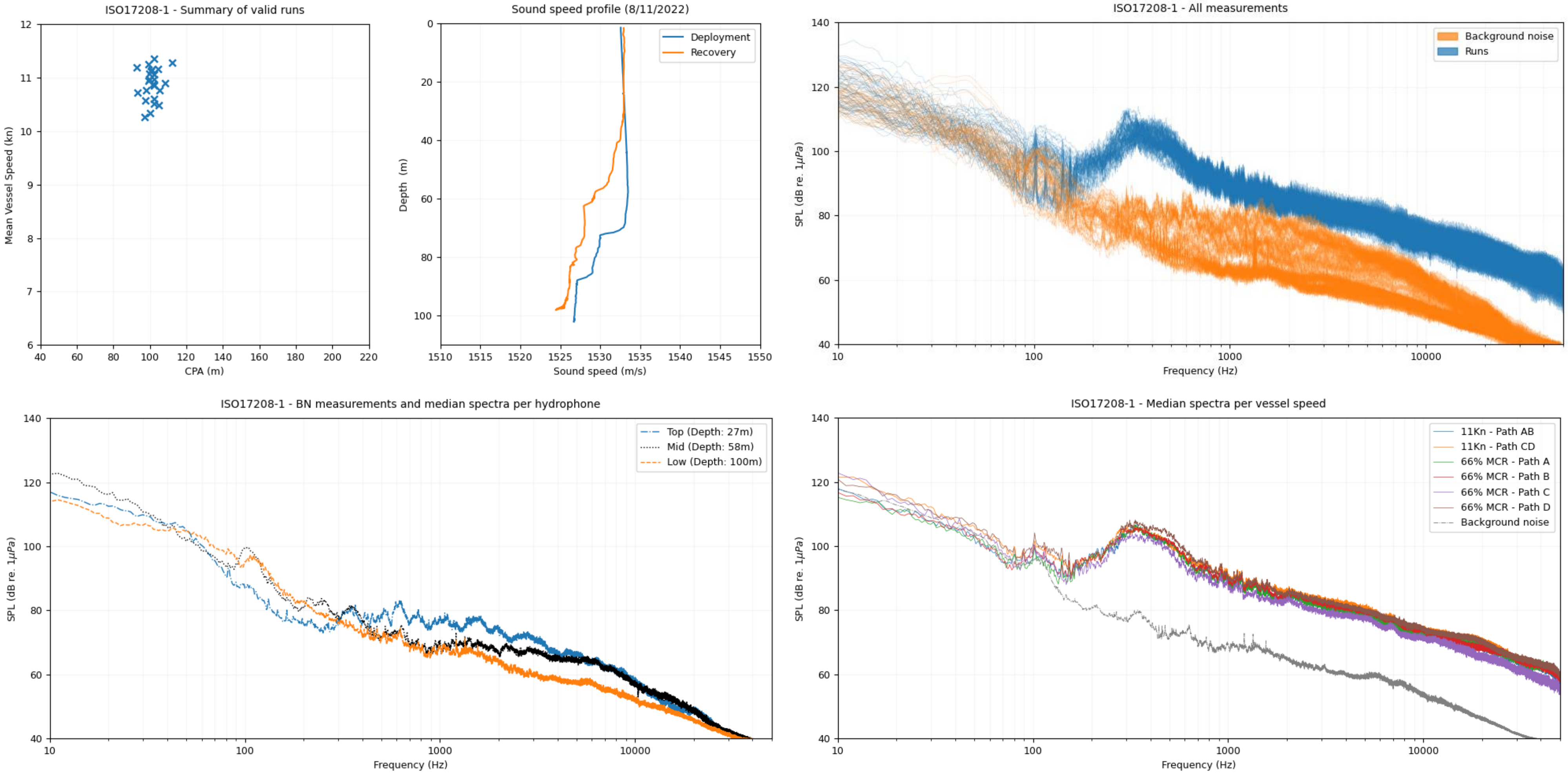


Figure 66: Day 6 (7 Nov 2022) – BV Shallow.

(*) BV processing splits every run in 19 consecutive windows. Results plotted here represent the median of those windows per run.

Day 7: ISO17208-1


ISO17208-1 - Summary of valid runs

Sound speed profile (8/11/2022)

ISO17208-1 - All measurements

ISO17208-1 - BN measurements and median spectra per hydrophone

ISO17208-1 - Median spectra per vessel speed

Figure 67: Day 7 (8 Nov 2022) – ISO17208-1.

Day 8: DNV Shallow

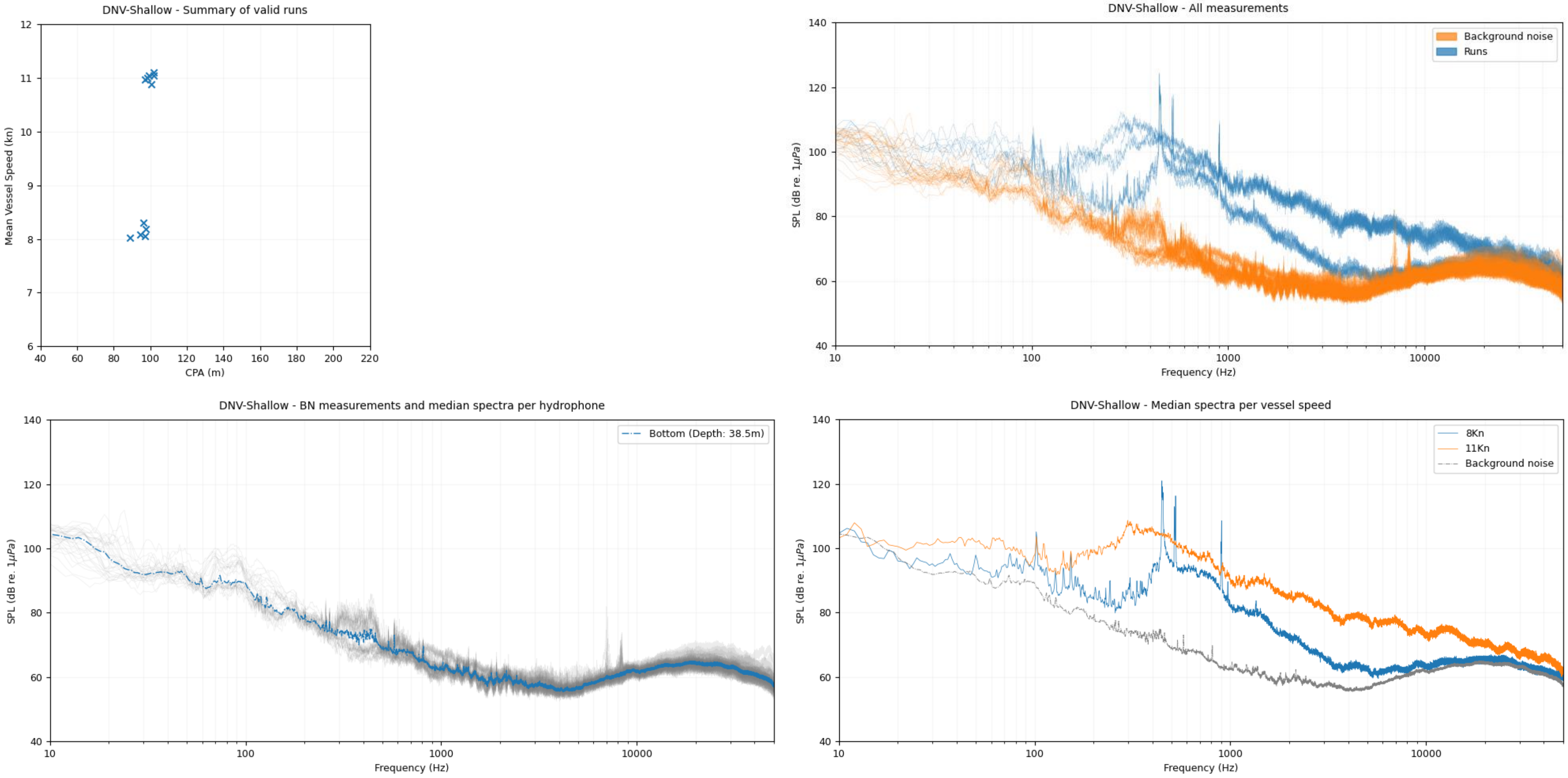


Figure 68: Day 8 (9 Nov 2022) – DNV Shallow.

Day 9: MMP2

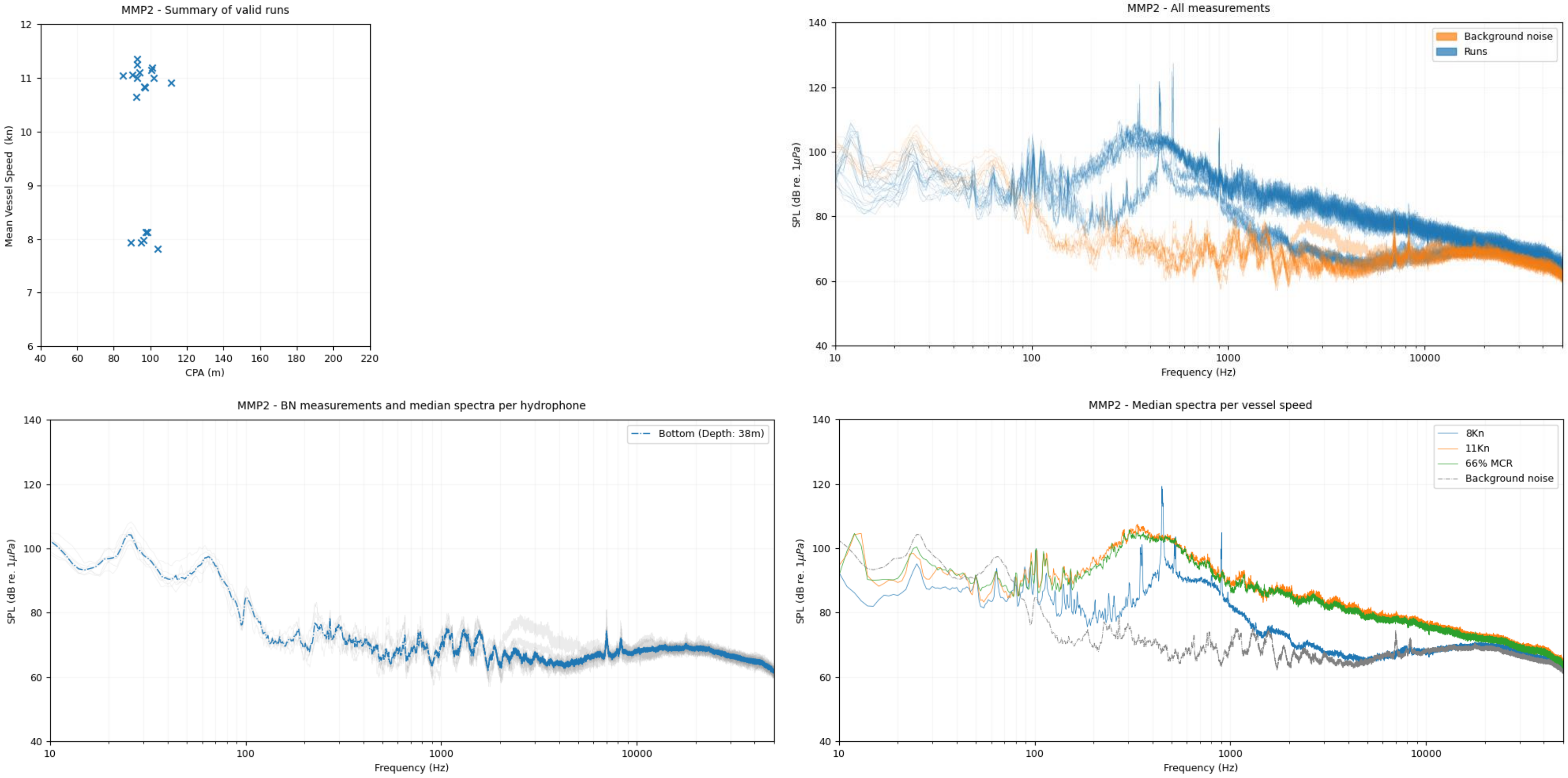


Figure 69: Day 9 (10 Nov 2022) – MMP2.

2 Nov 2023			3 Nov 2023			4 Nov 2023			5 Nov 2023			06 Nov 2023			7 Nov 2023			8 Nov 2023			9 Nov 2023			10 Nov 2023		
ID	CPA [m]	Mean vessel speed [kn]	ID	CPA [m]	Mean vessel speed [kn]	ID	CPA [m]	Mean vessel speed [kn]	ID	CPA [m]	Mean vessel speed [kn]	ID	CPA [m]	Mean vessel speed [kn]	ID	CPA [m]	Mean vessel speed [kn]	ID	CPA [m]	Mean vessel speed [kn]	ID	CPA [m]	Mean vessel speed [kn]	ID	CPA [m]	Mean vessel speed [kn]
R02	102.51	8.05	R01	92.44	7.89	R16	153.78	7.98	R01	50.98	10.98	R01	50.5	10.87	R01	97.62	10.91	R01	92.91	11.2	R01	94.53	8.08	R01	96.41	7.98
R04	98.91	7.89	R03	99.21	8.46	R18	145.88	10.95	R02	47.99	11.16	R02	58.11	11.07	R02	93.24	10.81	R02	97.78	10.76	R02	97.33	8.19	R02	94.95	7.93
R05	112.77	8.21	R06	92.52	7.66	R19	141.94	10.94	R03	41.67	11.01	R03	52.48	10.91	R04	106.08	10.98	R03	99.45	11.25	R03	97.11	8.05	R03	97.68	8.12
R06	119.82	8.13	R07	214.08	8.1	R20	160.83	10.93	R04	58.61	11.18	R04	60.29	10.95	R06	149.46	10.94	R04	102.48	10.52	R04	96.08	8.3	R04	104.16	7.82
R09	111.9	7.95	R08	206.49	7.97	R21	149.62	11.07	R05	52.87	10.91	R05	50.92	10.95	R07	144.04	11	R05	99.17	10.95	R07	88.86	8.02	R05	89.38	7.93
R12	96.39	11.02	R10	201.42	8.21	R22	153.08	11.09	R06	61.41	11.08	R06	61.05	10.99	R08	151.87	11.06	R06	108.31	10.9	R08	101.74	11.11	R06	98.32	8.13
R13	96.57	11.04	R12	160.58	8.2	R24	197.93	10.93	R07	48.14	10.92	R08	57.67	8.22	R09	143.33	11.01	R07	102.11	11.36	R09	96.92	10.98	R07	92.73	11.25
R14	106.27	10.96	R13	146.77	8.2	R25	190.82	11.03	R08	56.64	10.95	R09	63.43	8.02	R10	208.38	10.81	R08	102.09	10.6	R10	100.48	10.89	R08	111.18	10.92
R17	90.9	10.97				R26	202.61	11.01	R10	53.74	8.14	R10	53.66	8.11	R11	207.13	10.96	R09	100.59	11.12	R11	98.57	11.01	R09	84.96	11.05
						R27	207.39	11.18	R11	58.96	7.88	R11	50.16	7.95	R12	199.88	10.9	R10	93.38	10.73	R12	101.79	11.05	R10	93.91	11.1
						R28	111.69	11.07	R12	55.46	8.15	R12	53.89	7.95	R13	199.15	11.19	R11	102.46	11.06	R13	99.38	11.05	R11	90.26	11.06
						R30	101.91	11.14	R13	61.56	7.96				R14	102.11	8	R12	101.71	10.89				R12	100.95	11.2
						R31	103.11	11.08	R14	58.39	8.16				R16	96.15	7.85	R14	105.38	10.76				R13	92.88	11.01
						R32	105.16	11.06	R15	55.49	8.14				R17	100.56	7.97	R15	104.27	11.17				R14	101.9	11.01
						R33	99.49	10.99	R16	58.67	10.09				R18	148.61	8.12	R18	100.04	10.34				R15	92.45	10.65
						R34	200.65	10.99	R17	56.94	9.87				R19	144.74	8.19	R21	112.15	11.28				R16	92.76	11.35
									R18	58.77	10.18				R22	150.14	7.84	R22	102.18	10.85				R17	96.67	10.84
									R19	54.98	10.03				R24	206.82	7.93	R23	97.61	10.58				R18	100.55	11.15
									R20	59.26	8.92				R26	201.9	8.09	R24	97.05	10.26				R19	97.32	10.83
									R21	63.27	8.79				R27	196.69	8.08	R25	99.58	11.08						
									R22	59.05	9.12				R28	103.74	10.84	R26	104.83	10.48						
									R23	59.1	9.03				R29	112.15	11.19	R27	100.86	11.15						
									R24	55.72	7.16				R30	103.45	10.99	R28	102.26	10.98						
									R25	57.55	6.72				R31	151.2	10.93	R29	99.6	10.98						
									R26	58.14	7.01				R32	209.42	10.92									
									R27	58.34	7.01				R33	213.65	10.92									

Table 17: Numerical values of measured CPA and mean vessel speed (within the processing window), per valid run and day.

Annex B. On-site verifications from Las Palmas TC

The following plots show the noise levels measured by all the hydrophones during the start and end day in-situ verifications, performed using a pistonphone that produces a pure tone at 250 Hz of 134 dB SPL (referred to air: 20 µPa).

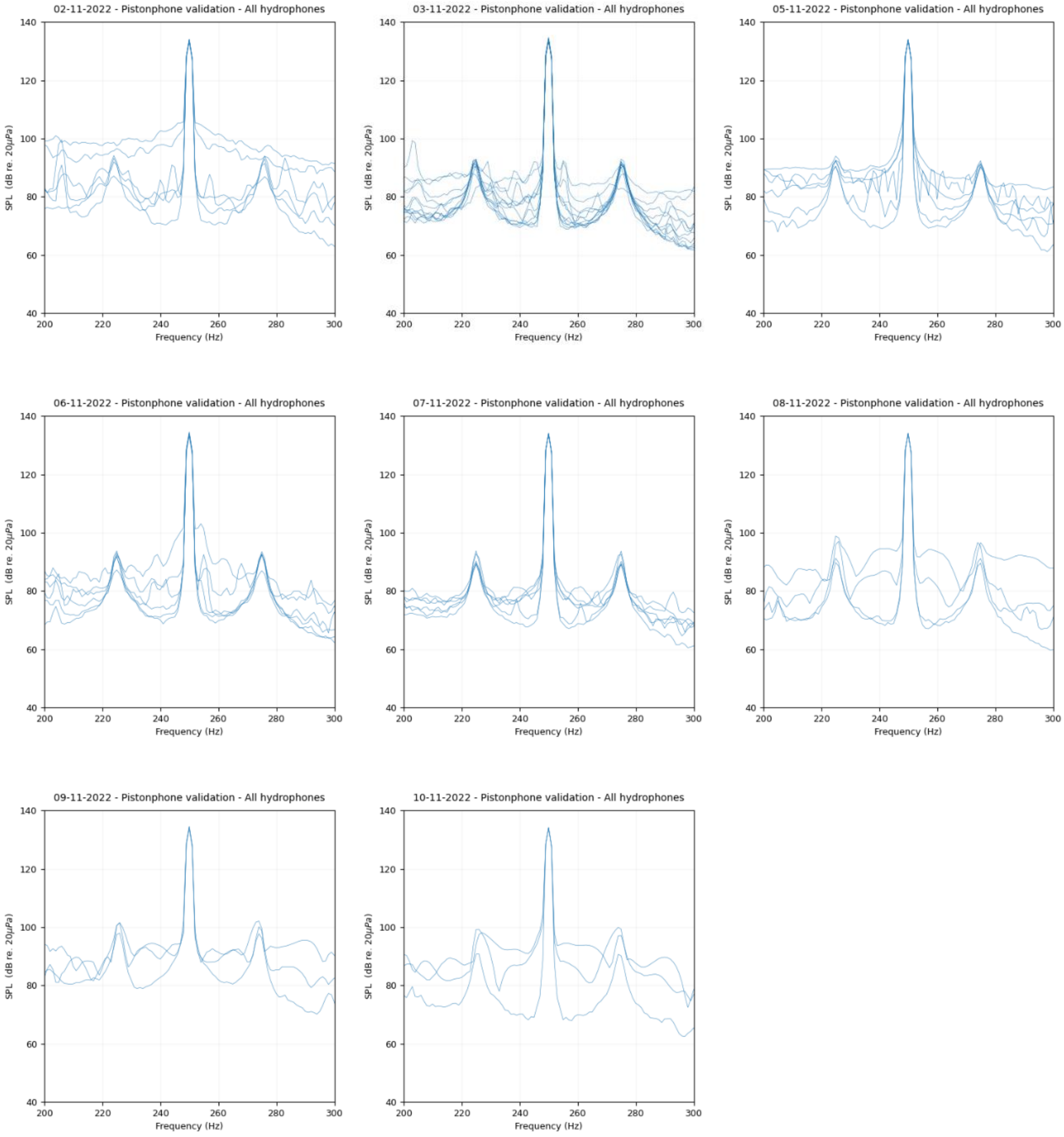


Figure 70: On-site verifications performed daily during the Las Palmas test campaign.

Annex C. Metrics computation for ISO 17208

This annex gathers the computation methods used to report vessel signatures within this report according to ISO 17208-2 (SL) and ISO 17208-3 (SL and RNL).

ISO 17208-2

ISO 17208-2 converts RNL to SL in deep water. For those deployments that meet ISO 17208-1 requirements, a level correction over the final RNL is to be applied, which is described next:

$$L_S = L_{RNL} + \Delta L \tag{8}$$

$$\Delta L = -10\,\lg\left(\frac{14(k_w d_s)^2 + 2(k_w d_s)^4}{14 + 2(k_w d_s)^2 + (k_w d_s)^4}\right)\ \mathrm{dB} \tag{9}$$

where
L_{RN} is the RNL measured and processed as described in ISO 17208-1
$k_w = 2\pi f / c_w$ is the acoustic wavenumber in water, in rad/m
c_w is the sound speed in water, in m/s
f is the central frequency of the decidecade band, in Hz
d_s is the nominal source depth, in m

ISO 17208-3

ISO/DIS 17208-3 allows reporting results as SL or RNL. The SL computation is shown below, copying the exact text from the available DIS used:

"

[...]

The final adjustment of the sensitivity-adjusted measured sound pressure level, L_p is combined with propagation loss correction to produce source level, L_S, for the specified nominal source depth at the ship reference position. For each decidecade band (f_n), each measurement run (m)and each hydrophone depth (d_i), the source level, L_S expressed in decibels (dB) relative to 1 μPa·m, is calculated from the sensitivity-adjusted measured sound pressure level, L_p, by:

$$L_S(f_n, d_i, m) = L_p\,(f_n, d_{CPA}, d_i, m) + N_{PL}(f_n, d_{CPA}, d_i) \tag{10}$$

where N_{PL} is the propagation loss between the ship reference position and the hydrophone at depth h_i when the ship is at CPA, for run m and calculated for the decidecade band centred at f_n.

The preferred calculation method for calculating the propagation loss for measurements according to this standard is the so-called seabed-critical angle (SCA) method [MacGillivray et al, 2023]. It approximates the propagation loss by a combination of contributions from the direct path and the first reflections from sea surface and seabed, depending on the grazing angle θ below the surface to the receiver at CPA and the seabed critical angle ($\psi_c = cos^{-1}(c_w/c_b)$).
Here c_w is the speed of sound in water and c_b the speed of sound in the seabed.

This estimation is derived based on the assumption that the water surface is an ideal pressure release boundary. The effect of wind on the sea surface is not considered in these formulae.

The estimation of propagation loss is then obtained from the SCA formulae [MacGillivray et al, 2023]:

$$N_{PL}(f_n, d_{CPA}, d_i) = -10\, lg\left(\left(\sigma_1 + \frac{\psi_c r_i}{H}\sigma_2\right)\frac{r_0^2}{r_i^2}\right) dB \qquad (11)$$

$$\sigma_1 = \left(\frac{1}{2} + \frac{1}{4(k_w d_s)^2\, sin^2\, \theta_i}\right)^{-1} \qquad (12)$$

$$\sigma_2 = \left(\frac{1}{2} + \frac{3}{4(k_w d_s)^2\, sin^2\, \psi_c}\right)^{-1} \qquad (13)$$

with $k_w = 2\pi f/c_w$ the wavenumber in water, $r_i^2 = d_{CPA}^2 + d_i^2$ is the slant range, $\theta_i = tan^{-1}(d_i/d_{CPA})$ and d_s is the nominal source depth, in m"

For RNL computation, a level correction is applied over reported SL results. The following text, extracted from the available DIS, describes the process:

"
[...]
The resulting source level spectrum can be converted to a radiated noise level similar to what would have been measured in deep water, according to ISO 17208-1. This conversion can be made by subtracting the correction given by the formula proposed in ISO 17208-2.

$$L_{RN} \;=\; L_S - \Delta L \qquad (14)$$

with:

$$\Delta L = -10\, lg \left(\frac{14(k_w d_s)^2 + 2(k_w d_s)^4}{14 + 2(k_w d_s)^2 + (k_w d_s)^4} \right) \, dB \qquad (15)$$

where
$k_w = 2\pi f / c_w$ *is the acoustic wavenumber in water, in rad/m*
c_w *is the sound speed in water, in m/s*
f *is the central frequency of the decidecade band, in Hz*
d_s *is the nominal source depth, in m"*

Annex D. Decidecade frequency bands in table format

Band index(n)	Lower bound (Hz)	Upper bound (Hz)	Nominal centre frequency (Hz)	Bandwidth (Hz)
-20	8.9	11.2	10	2.3
-19	11.2	14.1	12.5	2.9
-18	14.1	17.8	16	3.7
-17	17.8	22.4	20	4.6
-16	22.4	28.2	25	5.8
-15	28.2	35.5	31.5	7.3
-14	35.5	44.7	40	9.2
-13	44.7	56.2	50	11.6
-12	56.2	70.8	63	14.6
-11	70.8	89.1	80	18.3
-10	89.1	112.2	100	23.1
-9	112.2	141.3	125	29.1
-8	141.3	177.8	160	36.6
-7	177.8	223.9	200	46.0
-6	223.9	281.8	250	58.0
-5	281.8	354.8	315	73.0
-4	354.8	446.7	400	91.9
-3	446.7	562.3	500	115.7
-2	562.3	708.0	630	145.6
-1	708.0	891.3	800	183.3
0	891.3	1122.0	1000	230.8
1	1122.0	1412.5	1250	290.5
2	1412.5	1778.3	1600	365.8
3	1778.3	2238.7	2000	460.4
4	2238.7	2818.4	2500	579.7
5	2818.4	3548.1	3150	729.7
6	3548.1	4466.8	4000	918.7
7	4466.8	5623.4	5000	1156.6
8	5623.4	7079.5	6300	1456.1
9	7079.5	8912.5	8000	1833.0
10	8912.5	11220.0	10000	2307.5
11	11220.0	14125.0	12500	2905.0
12	14125.0	17783.0	16000	3658.0
13	17783.0	22387.0	20000	4604.0
14	22387.0	28184.0	25000	5797.0
15	28184.0	35481.0	31500	7297.0
16	35481.0	44668.0	40000	9187.0
17	44668.0	56234.0	50000	11566.0

Table 18: Decidecade frequency bands with their corresponding bandwidth (needed to convert BV results from spectral density to linear spectrum).

Annex E. Vessel signatures from Las Palmas TC

This annexe gathers in table format vessel signatures reported in the results section of the Las Palmas test campaign (section 2.3). These curves are grouped as reported in the comparison plots gathering URN signatures in Table 19 and Table 20 (corresponding to Figure 33), and vessel signatures reported as SL in Table 21 and Table 22 (corresponding to Figure 35).

The mentioned tables collect vessel signatures, accompanied by those frequencies where background noise levels overlapped with measured vessel SPL, making it unfeasible to distinguish the sound produced by the vessel.

Column names are structured to gather important metadata linked to the reported vessel signatures, having a fixed structure that collects the following information:

- Field 1: method used to test and process the data. If '_' is included in this field, the first sub-field indicates the processing method, while the second is the testing procedure.
- Field 2: testing date in dd-mm-yyyy format.
- Field 3: average testing speed of the vessel signature (computed using the mean vessel speed in the processing window from the selected runs used in the final averaging).
- Field 4: mean CPA (computed following the same procedure as for field 3).
- Field 5: resulting metric used to report the vessel signature.
- Field 6: reporting units and reference value used.
- Field 7: optional. It includes additional information.

A few examples of headers included in the following tables are provided next:

- ISO17208-1#02-11-2022#11 kn#110m#RNL#dB (re. 1μPa·m)
- DNV-Shallow#09-11-2022#11 kn#99m#URNdnv#dB(re. μPa·m^0.9)#Set 3
- ISO17208-3_DNV-Shallow#09-11-2022#11 kn#100m#SL#dB (re. 1μPa·m)
- ISO17208-3#06-11-2022#11 kn#56m#SL#dB (re. 1μPa·m)#Very shallow (H=50m)

FREQUENCY(Hz)	ISO17208-1#02-11-2022#11 kn#110m#RNL#dB (re. 1µPa·m)	BN CORRECTION NOT FEASIBLE (DB)	ISO17208-1#08-11-2022#11 kn#103m#RNL#dB (re. 1µPa·m)#Path AB	BN CORRECTION NOT FEASIBLE (DB)	ISO17208-1#08-11-2022#11 kn#104m#RNL#dB (re. 1µPa·m)#Path CD-66%MCR	BN CORRECTION NOT FEASIBLE (DB)	ISO17208-1#08-11-2022#11 kn#104m#RNL#dB (re. 1µPa·m)#Path CD	BN CORRECTION NOT FEASIBLE (DB)	ISO17208-1#08-11-2022#11 kn#100m#RNL#dB (re. 1µPa·m)#Path AB-66%MCR	BN CORRECTION NOT FEASIBLE (DB)	DNV-Shallow#09-11-2022#11 kn#100m#URNdnv#dB (re. 1µPa·m^0.9)#Set 1	BN CORRECTION NOT FEASIBLE (DB)	DNV-Shallow#09-11-2022#11 kn#101m#URNdnv#dB (re. 1µPa·m^0.9)#Set 2
10.0	161.1	161.1	165.6	165.6	169.4	169.4	169.7	169.7	163.0	163.0	139.3	139.3	141.2
12.5	160.7	160.7	164.6	164.6	168.4	168.4	168.3	168.3	163.0	163.0	140.7	140.7	142.4
16.0	159.3	159.3	163.0	163.0	166.1	166.1	167.6	167.6	161.8	161.8	137.5	137.5	140.3
20.0	158.5	158.5	160.6	160.6	163.0	163.0	163.9	163.9	159.2	159.2	138.0	138.0	137.9
25.0	157.8	157.8	160.0	160.0	162.0	162.0	163.8	163.8	159.9	159.9	140.2		140.4
31.5	156.3	156.3	158.4	158.4	160.4	160.4	161.0	161.0	157.4	157.4	143.0		142.4
40.0	155.6	155.6	158.3	158.3	160.5	160.5	160.6	160.6	156.6	156.6	143.1		144.2
50.0	154.5	154.5	157.5	157.5	159.1	159.1	158.9	158.9	154.7	154.7	144.0		142.6
63.0	155.9	155.9	156.8	156.8	158.3	158.3	157.6	157.6	153.3	153.3	146.1		142.7
80.0	154.2	154.2	155.3	155.3	155.6	155.6	154.7	154.7	151.2	151.2	141.6		145.1
100.0	152.6	152.6	152.8	152.8	154.9	154.9	154.6	154.6	151.3	151.3	141.6		145.0
125.0	151.6		152.6	152.6	153.9	153.9	154.4	154.4	150.0	150.0	140.0		141.7
160.0	152.2		151.0	151.0	152.0	152.0	153.0		148.7		143.4		146.0
200.0	154.6		154.9		154.2		155.3		153.3		146.4		147.3
250.0	160.0		159.2		159.3		160.9		158.9		151.0		152.6
315.0	165.7		165.1		164.7		166.3		164.3		155.8		156.8
400.0	165.4		164.9		164.7		165.8		164.5		156.0		156.2
500.0	162.8		163.0		163.1		163.1		162.8		154.4		154.7
630.0	158.9		158.7		159.1		158.9		158.0		151.6		151.8
800.0	157.1		156.0		156.6		157.3		155.3		149.6		150.5
1000.0	155.7		154.7		155.5		156.3		154.4		145.7		146.7
1250.0	153.9		153.6		154.1		155.2		153.5		144.9		146.2
1600.0	152.7		152.4		153.0		153.9		152.2		144.8		146.1
2000.0	153.2		152.3		152.9		154.0		152.1		142.5		143.5
2500.0	152.6		152.0		152.1		153.4		151.6		142.4		143.7
3150.0	152.0		151.3		151.6		153.1		150.7		140.0		140.9
4000.0	152.0		151.2		151.5		153.0		150.4		139.0		139.6
5000.0	151.9		151.1		151.3		152.9		150.1		139.4		139.9
6300.0	150.8		149.9		150.2		151.7		149.0		139.6		140.9
8000.0	149.4		148.6		148.9		150.3		147.7		138.3		140.0
10000.0	149.0		147.9		148.4		149.8		147.2		138.0		138.6
12500.0	149.3		147.8		148.1		149.3		147.1		140.1		141.5
16000.0	148.1		146.9		147.6		148.7		146.2		137.5		139.0
20000.0	147.5		146.5		147.1		148.3		145.5		136.1		137.5
25000.0	147.1		145.6		145.4		146.6		144.5		134.4		137.9
31500.0	146.0		144.2		143.5		144.8		143.0		133.7		136.6
40000.0	145.0		143.4		142.4		143.9		142.5		133.6		137.3
50000.0	141.8		140.3		139.5		140.8		139.1		130.0		132.8

Table 19: Reported URN levels with the corresponding frequency bands with BN issue. Table (1/2).

FREQUENCY(Hz)	BN CORRECTION NOT FEASIBLE (DB)	DNV-Shallow#09-11-2022#11 kn#99m#URNdnv#dB (re. 1µPa·m^0.9)#Set 3	BN CORRECTION NOT FEASIBLE (DB)	DNV-Deep#02-11-2022#11 kn#110m#URNdnv#dB (re. 1µPa·m^0.9)	BN CORRECTION NOT FEASIBLE (DB)	BV-Shallow#07-11-2022#11 kn#149m#URNbv#dB (re. 1µPa·m^0.95 / sqrt(Hz))#Moored buoy	BN CORRECTION NOT FEASIBLE (DB)	BV-Deep#03-11-2022#11 kn#152m#URNbv#dB (re. 1µPa·m / sqrt(Hz))	BN CORRECTION NOT FEASIBLE (DB)	BV-Shallow#07-11-2022#11 kn#157m#URNbv#dB (re. 1µPa·m^0.95 / sqrt(Hz))#Drifting buoy	BN CORRECTION NOT FEASIBLE (DB)	ANSI-Grade C#02-11-2022#11 kn#98m#RNL#dB (re. 1µPa·m)	BN CORRECTION NOT FEASIBLE (DB)
10.0	141.2	136.4	136.4	156.8	156.8	152.9	152.9	161.5	161.5	158.0	158.0	156.0	156.0
12.5		136.9	136.9	156.4	156.4	152.0	152.0	160.1	160.1	156.9	156.9	155.0	155.0
16.0		136.5	136.5	155.0	155.0	150.6	150.6	159.9	159.9	155.1	155.1	154.4	154.4
20.0	137.9	136.9	136.9	154.2	154.2	149.6	149.6	156.9	156.9	153.1	153.1	153.6	153.6
25.0		139.0	139.0	153.6	153.6	149.8	149.8	155.7	155.7	152.7	152.7	155.8	155.8
31.5		139.6		152.1	152.1	148.2	148.2	154.1	154.1	151.3	151.3	155.1	155.1
40.0		144.1		151.4	151.4	148.8	148.8	153.6	153.6	151.7	151.7	155.6	155.6
50.0		145.7		150.3	150.3	148.1	148.1	151.0	151.0	150.2	150.2	153.9	153.9
63.0		147.1		151.6	151.6	144.9	144.9	149.2	149.2	147.0	147.0	152.3	152.3
80.0		144.7		149.9	149.9	143.7	143.7	146.5	146.5	144.2	144.2	147.4	147.4
100.0		143.3		148.3	148.3	146.1	146.1	146.8	146.8	145.7	145.7	144.9	
125.0		140.4		147.3		142.1	142.1	143.7	143.7	143.5	143.5	139.1	
160.0		141.7		147.9		145.2		146.6	146.6	144.7		143.5	
200.0		146.0		150.3		150.4		152.6		149.0		150.6	
250.0		151.8		155.7		156.1		157.8		155.9		157.2	
315.0		156.5		161.5		162.7		164.5		161.9		165.0	
400.0		156.3		161.2		162.6		164.7		162.2		165.9	
500.0		154.5		158.6		160.6		162.1		160.7		163.7	
630.0		151.5		154.7		156.5		157.6		156.8		160.0	
800.0		149.7		152.9		153.8		155.0		154.7		157.5	
1000.0		145.9		151.5		152.6		154.0		152.6		155.1	
1250.0		145.0		149.7		151.2		152.6		151.0		152.7	
1600.0		145.2		148.5		149.5		151.2		149.4		151.6	
2000.0		143.0		149.0		149.1		151.3		148.6		152.4	
2500.0		142.7		148.4		148.7		151.0		148.3		151.5	
3150.0		140.5		147.8		147.9		150.3		147.5		150.8	
4000.0		138.8		147.7		147.6		150.3		147.0		150.9	
5000.0		139.6		147.7		147.6		150.4		146.8		150.8	
6300.0		139.6		146.5		146.6		149.3		146.4		149.5	
8000.0		139.0		145.2		145.5		148.1		145.5		148.0	
10000.0		139.1		144.8		144.6		147.3		144.6		147.8	
12500.0		139.8		145.1		144.3		147.5		144.0		149.3	
16000.0		137.7		143.9		143.3		146.7		142.9		148.4	
20000.0		136.9		143.3		142.6		146.1		142.2		146.6	
25000.0		135.9		142.9		142.2		145.1		141.7		146.5	
31500.0		135.8		141.8		141.4		143.6		140.6		145.5	
40000.0		135.4		140.8		139.6		142.6		139.8		144.4	
50000.0		131.9		137.6		136.4		139.2		136.6		140.8	

Table 20: Reported URN levels with the corresponding frequency bands with BN issue. Table (2/2).

FREQUENCY(Hz)	ISO17208-2#02-11-2022#11 kn#110m#SL#dB (re. 1µPa·m)	BN CORRECTION NOT FEASIBLE (DB)	ISO17208-2#08-11-2022#11 kn#103m#SL#dB (re. 1µPa·m)#Path AB	BN CORRECTION NOT FEASIBLE (DB)	ISO17208-2#08-11-2022#11 kn#104m#SL#dB (re. 1µPa·m)#Path CD-66%MCR	BN CORRECTION NOT FEASIBLE (DB)	ISO17208-2#08-11-2022#11 kn#104m#SL#dB (re. 1µPa·m)#Path CD	BN CORRECTION NOT FEASIBLE (DB)	ISO17208-2#08-11-2022#11 kn#100m#SL#dB (re. 1µPa·m)#Path AB-66%MCR	BN CORRECTION NOT FEASIBLE (DB)	ISO17208-3#05-11-2022#11 kn#52m#SL#dB (re. 1µPa·m)#Shallow (H=80m)	BN CORRECTION NOT FEASIBLE (DB)	ISO17208-3#06-11-2022#11 kn#56m#SL#dB (re. 1µPa·m)#Very shallow (H=50m)
10.0	177.0	177.0	181.5	181.5	185.3	185.3	185.6	185.6	178.9	178.9	171.7	171.7	174.9
12.5	174.6	174.6	178.6	178.6	182.3	182.3	182.3	182.3	177.0	177.0	169.1	169.1	172.7
16.0	171.1	171.1	174.8	174.8	177.9	177.9	179.4	179.4	173.6	173.6	167.3	167.3	171.9
20.0	168.4	168.4	170.5	170.5	172.9	172.9	173.8	173.8	169.1	169.1	164.7	164.7	171.0
25.0	165.8	165.8	168.0	168.0	169.9	169.9	171.8	171.8	167.8	167.8	163.6	163.6	170.3
31.5	162.3	162.3	164.3	164.3	166.4	166.4	167.0	167.0	163.3	163.3	161.4	161.4	168.6
40.0	159.5	159.5	162.2	162.2	164.4	164.4	164.5	164.5	160.5	160.5	160.8	160.8	166.8
50.0	156.6	156.6	159.6	159.6	161.1	161.1	161.0	161.0	156.8	156.8	158.5	158.5	162.6
63.0	156.1	156.1	157.0	157.0	158.5	158.5	157.8	157.8	153.5	153.5	155.9	155.9	157.1
80.0	152.6	152.6	153.7	153.7	154.1	154.1	153.2	153.2	149.6	149.6	151.1	151.1	150.4
100.0	149.7	149.7	150.0	150.0	152.1	152.1	151.8	151.8	148.4	148.4	146.8	146.8	147.2
125.0	147.9		149.0	149.0	150.2	150.2	150.7	150.7	146.3	146.3	145.4		144.6
160.0	148.2		147.0	147.0	148.0	148.0	148.9		144.7		148.7		145.6
200.0	150.5		150.8		150.2		151.3		149.3		152.7		151.5
250.0	156.1		155.4		155.5		157.1		155.0		155.8		155.0
315.0	162.1		161.5		161.0		162.6		160.6		161.4		161.2
400.0	161.9		161.4		161.2		162.3		161.0		161.5		160.1
500.0	159.5		159.7		159.8		159.8		159.5		158.6		157.0
630.0	155.7		155.5		155.9		155.7		154.8		153.9		152.9
800.0	154.0		152.9		153.5		154.1		152.2		151.8		151.0
1000.0	152.6		151.6		152.4		153.2		151.3		150.4		149.3
1250.0	150.8		150.5		151.0		152.2		150.4		149.5		148.4
1600.0	149.7		149.4		150.0		150.9		149.2		148.1		146.8
2000.0	150.1		149.3		149.8		151.0		149.0		148.1		146.5
2500.0	149.6		148.9		149.0		150.4		148.6		147.3		145.8
3150.0	149.0		148.3		148.6		150.0		147.7		146.5		144.8
4000.0	149.0		148.2		148.5		150.0		147.4		146.3		144.5
5000.0	148.9		148.1		148.2		149.9		147.1		146.1		144.8
6300.0	147.8		146.9		147.1		148.7		145.9		144.7		144.0
8000.0	146.4		145.6		145.9		147.3		144.7		143.6		143.2
10000.0	146.0		144.9		145.4		146.8		144.2		143.7		142.6
12500.0	146.3		144.8		145.0		146.3		144.1		144.0		142.9
16000.0	145.1		143.9		144.6		145.7		143.2		142.9		141.9
20000.0	144.5		143.5		144.1		145.3		142.5		141.7		141.0
25000.0	144.1		142.6		142.4		143.6		141.5				
31500.0	143.0		141.2		140.5		141.8		140.0				
40000.0	142.0		140.4		139.4		140.8		139.5				
50000.0	138.8		137.3		136.5		137.8		136.1				

Table 21: Reported SL curves with the corresponding frequency bands with BN issue. Table (1/2).

FREQUENCY(Hz)	BN CORRECTION NOT FEASIBLE (DB)	ISO17208-3_DNV-Shallow#09-11-2022#11 kn#100m#SL#dB (re. 1µPa·m)	BN CORRECTION NOT FEASIBLE (DB)	ISO17208-3_BV-Shallow#07-11-2022#11 kn#147m#SL#dB (re. 1µPa·m)	BN CORRECTION NOT FEASIBLE (DB)	ISO17208-3_BV-Shallow#07-11-2022#11 kn#204m#SL#dB (re. 1µPa·m)	BN CORRECTION NOT FEASIBLE (DB)	ISO17208-3_MMP2#10-11-2022#11 kn#93m#SL#dB (re. 1µPa·m)	BN CORRECTION NOT FEASIBLE (DB)	ISO17208-3_BV-Shallow#07-11-2022#11 kn#94m#SL#dB (re. 1µPa·m)	BN CORRECTION NOT FEASIBLE (DB)	ISO17208-3_MMP2#10-11-2022#11 kn#99m#SL#dB (re. 1µPa·m)#66%MCR	BN CORRECTION NOT FEASIBLE (DB)
10.0	174.9	166.3	166.3	174.1	174.1	186.0		156.3	156.3	164.7	164.7	155.4	155.4
12.5	172.7	164.8	164.8	171.4	171.4	183.4	183.4	159.0	159.0	161.9	161.9	159.7	159.7
16.0	171.9	160.6	160.6	167.6	167.6	180.0	180.0	147.6	147.6	159.3	159.3	147.8	147.8
20.0	171.0	158.1	158.1	165.1	165.1	175.9	175.9	146.2	146.2	157.0	157.0	147.6	147.6
25.0	170.3	157.5		162.8	162.8	173.6	173.6	151.6	151.6	156.0	156.0	155.4	155.4
31.5	168.6	158.0		160.8	160.8	170.6	170.6	146.3	146.3	151.8	151.8	150.1	150.1
40.0	166.8	157.2		159.4	159.4	169.7	169.7	146.3	146.3	148.9	148.9	147.2	147.2
50.0	162.6	155.2		156.7	156.7	164.6	164.6	142.1	142.1	148.0	148.0	144.3	144.3
63.0	157.1	154.0		152.0	152.0	160.5	160.5	142.0	142.0	143.5	143.5	144.8	144.8
80.0	150.4	151.5		148.5	148.5	155.4	155.4	140.8	140.8	141.7	141.7	141.1	141.1
100.0	147.2	150.2		148.8	148.8	153.6	153.6	146.6		144.1	144.1	146.5	
125.0	144.6	146.4		143.8	143.8	145.2	145.2	144.4		142.4		143.3	
160.0		149.1		145.7		145.7		143.3		145.7		142.1	
200.0		150.6		150.6		150.7		148.0		150.3		146.0	
250.0		154.1		155.4		155.9		152.4		154.9		151.8	
315.0		158.6		162.2		161.7		157.2		160.9		157.0	
400.0		158.7		161.3		160.2		156.8		160.5		156.5	
500.0		157.4		157.6		157.9		157.1		158.1		156.6	
630.0		154.1		153.3		154.2		153.1		153.8		152.8	
800.0		152.5		151.4		151.2		151.0		151.3		150.1	
1000.0		149.1		149.5		149.8		147.7		150.0		146.2	
1250.0		148.0		148.4		148.1		148.2		148.9		146.5	
1600.0		148.1		146.6		146.2		146.5		147.5		145.3	
2000.0		145.7		146.6		146.0		146.5		146.7		145.2	
2500.0		145.5		146.0		145.7		146.0		146.4		144.9	
3150.0		142.9		145.3		145.1		145.4		145.8		144.4	
4000.0		141.5		145.2		144.6		144.5		145.5		143.8	
5000.0		141.7		145.5		145.0		143.1		145.2		142.5	
6300.0		142.4		144.3		144.1		142.6		143.9		141.8	
8000.0		141.6		143.2		142.8		142.8		142.7		142.0	
10000.0		140.6		142.3		141.4		141.9		142.3		140.9	
12500.0		142.6		142.1		140.9		141.1		142.1		140.1	
16000.0		140.7		140.9		140.1		140.2		140.7		141.0	141.0
20000.0		139.4		140.0		138.8		140.9	140.9	140.0		141.6	141.6
25000.0													
31500.0													
40000.0													
50000.0													

Table 22: Reported SL curves with the corresponding frequency bands with BN issue. Table (2/2).

Annex F. Vessel signatures from Malta TC

This annex gathers in table format vessel signatures reported in the results section of the Malta test campaign (section 3.1.6). These curves are grouped as reported in the text, and gathers the results from DNV shallow method (Figure 51), and ISO 17208-3 (expressed as SL and RNL; Figure 52 and Figure 53).

Column names are structured to gather important metadata linked to the reported vessel signatures, having a fixed structure that collects the following information:

- Field 1: method used to test and process the data.
- Field 2: testing date in dd-mm-yyyy format.
- Field 3: average testing speed of the vessel signature (computed using the mean vessel speed in the processing window from the selected runs used in the final averaging).
- Field 4: mean CPA (computed following the same procedure as for field 3).
- Field 5: resulting metric used to report the vessel signature.
- Field 6: reporting units and reference value used.
- Field 7: optional. It includes additional information.

A few examples of headers included in the following tables are provided next:

- ISO17208-3#24-03-2023#6kn#276m#SL#dB (re. 1µPa·m)
- ISO17208-3#24-03-2023#6kn#276m#RNL#dB (re. 1µPa·m)
- DNV-Shallow#24-03-2023#6kn#264m#URNdnv#dB (re. 1µPa·m^0.9)#Set 1

FREQUENCY(Hz)	ISO17208-3#24-03-2023#6kn#276m#SL#dB (re. 1µPa·m)	ISO17208-3#24-03-2023#8kn#283m#SL#dB (re. 1µPa·m)	ISO17208-3#24-03-2023#10kn#286m#SL#dB (re. 1µPa·m)	ISO17208-3#24-03-2023#12kn#282m#SL#dB (re. 1µPa·m)	ISO17208-3#24-03-2023#6kn#276m#RNL#dB (re. 1µPa·m)	ISO17208-3#24-03-2023#8kn#283m#RNL#dB (re. 1µPa·m)	ISO17208-3#24-03-2023#10kn#286m#RNL#dB (re. 1µPa·m)	ISO17208-3#24-03-2023#12kn#282m#RNL#dB (re. 1µPa·m)
10.0	156.9	162.7	168.6	180.0	145.4	151.3	157.1	168.5
12.5	156.7	159.0	163.8	173.5	147.2	149.5	154.3	164.0
16.0	155.6	158.2	163.3	174.7	148.2	150.8	155.9	167.3
20.0	155.7	160.3	165.9	172.0	150.3	154.8	160.5	166.5
25.0	157.2	161.6	165.4	172.3	153.7	158.0	161.8	168.7
31.5	168.9	163.8	169.1	173.5	167.3	162.2	167.5	171.9
40.0	156.7	164.2	167.2	171.0	157.0	164.4	167.4	171.3
50.0	158.8	164.2	170.1	172.1	160.6	166.0	171.9	173.9
63.0	159.6	164.2	167.6	170.1	162.7	167.3	170.7	173.1
80.0	151.1	157.7	159.1	163.0	154.9	161.5	162.9	166.8
100.0	149.5	154.1	157.4	160.9	153.6	158.2	161.4	164.9
125.0	152.3	155.2	158.0	163.2	156.3	159.2	162.1	167.2
160.0	148.4	152.8	156.8	161.6	152.2	156.6	160.6	165.4
200.0	147.8	152.9	155.6	161.2	151.4	156.5	159.2	164.8
250.0	148.8	153.4	155.6	160.1	152.2	156.8	159.0	163.5
315.0	148.9	153.4	155.4	158.7	152.2	156.7	158.7	162.0
400.0	149.3	153.9	155.7	158.2	152.5	157.0	158.9	161.4
500.0	152.1	155.0	157.0	160.0	155.2	158.1	160.2	163.1
630.0	149.7	152.8	154.3	159.2	152.8	155.9	157.3	162.3
800.0	147.2	149.7	151.3	157.5	150.3	152.8	154.3	160.6
1000.0	144.7	148.4	150.1	156.4	147.8	151.5	153.2	159.4
1250.0	142.4	145.9	147.9	154.7	145.4	149.0	150.9	157.7
1600.0	140.3	144.1	146.4	153.0	143.3	147.1	149.4	156.1
2000.0	141.8	145.0	147.1	152.9	144.9	148.0	150.2	155.9
2500.0	139.0	141.9	144.9	150.1	142.0	144.9	147.9	153.1
3150.0	137.6	140.6	144.1	148.8	140.6	143.7	147.2	151.8
4000.0	135.9	139.2	143.0	147.3	138.9	142.2	146.1	150.3
5000.0	132.8	136.5	141.1	145.3	135.8	139.5	144.1	148.3
6300.0	129.7	133.2	138.7	143.0	132.8	136.2	141.7	146.0
8000.0	126.6	130.1	136.1	140.4	129.6	133.1	139.1	143.4
10000.0	125.6	129.1	134.5	140.1	128.6	132.1	137.6	143.1
12500.0	124.8	128.4	133.7	140.3	127.8	131.4	136.7	143.3
16000.0	124.9	127.9	134.6	141.3	127.9	130.9	137.6	144.3
20000.0	124.0	127.5	135.5	140.8	127.0	130.5	138.5	143.8
25000.0	124.4	127.2	135.1	139.2	127.4	130.2	138.1	142.2
31500.0	123.4	126.4	133.3	139.2	126.4	129.4	136.3	142.2
40000.0	122.8	126.7	133.0	138.4	125.8	129.7	136.0	141.4
50000.0	123.7	126.5	132.4	138.6	126.7	129.6	135.4	141.6

Table 23: Reported URN levels from ISO 17208-3 procedure in form of SL and RNL from the Malta TC. Table values correspond to curves from Figure 52 and Figure 53.

FREQUENCY(Hz)	DNV-Shallow#24-03-2023#6kn#264m#URNdnv#dB (re. 1µPa·m^0.9)#Set 1	DNV-Shallow#24-03-2023#6kn#288m#URNdnv#dB (re. 1µPa·m^0.9)#Set 2	DNV-Shallow#24-03-2023#8kn#281m#URNdnv#dB (re. 1µPa·m^0.9)#Set 1	DNV-Shallow#24-03-2023#8kn#286m#URNdnv#dB (re. 1µPa·m^0.9)#Set 2	DNV-Shallow#24-03-2023#10kn#285m#URNdnv#dB (re. 1µPa·m^0.9)#Set 1	DNV-Shallow#24-03-2023#10kn#288m#URNdnv#dB (re. 1µPa·m^0.9)#Set 2	DNV-Shallow#24-03-2023#12kn#278m#URNdnv#dB (re. 1µPa·m^0.9)#Set 1	DNV-Shallow#24-03-2023#12kn#287m#URNdnv#dB (re. 1µPa·m^0.9)#Set 2
10.0	135.3	134.8	141.5	140.9	145.3	148.0	158.5	157.7
12.5	137.3	136.2	140.2	138.5	143.7	144.5	153.9	153.2
16.0	137.6	138.0	139.4	141.5	144.7	146.2	156.9	156.6
20.0	139.6	140.0	145.0	144.1	149.9	150.2	156.2	155.7
25.0	144.0	142.4	148.8	147.3	151.2	151.6	156.7	159.4
31.5	157.6	155.4	149.9	152.9	158.2	154.8	162.5	159.8
40.0	145.6	147.0	155.9	152.5	157.0	156.6	160.5	160.7
50.0	150.2	149.9	157.4	154.6	161.4	161.3	164.1	162.6
63.0	152.4	152.4	159.0	155.8	159.4	162.0	162.9	162.8
80.0	145.0	145.0	152.2	151.3	153.4	152.8	157.7	156.2
100.0	144.7	144.9	150.2	148.5	152.7	152.4	156.6	156.4
125.0	148.4	147.8	150.7	151.3	154.9	152.6	158.7	159.8
160.0	145.2	144.7	148.7	149.9	154.3	152.3	157.7	158.6
200.0	144.5	145.1	149.8	150.2	153.5	151.7	157.9	158.5
250.0	146.2	145.9	150.3	151.1	153.7	152.3	157.6	157.3
315.0	145.6	147.1	150.6	151.2	153.5	152.5	156.6	156.1
400.0	147.1	146.7	151.3	151.7	154.0	152.8	155.8	155.8
500.0	150.1	149.6	151.9	153.3	155.4	154.3	157.5	158.0
630.0	147.7	147.2	149.7	151.4	152.7	151.5	156.6	157.4
800.0	145.3	144.8	146.4	148.8	150.4	148.0	155.2	155.5
1000.0	143.3	141.9	145.8	146.9	149.4	146.8	153.9	154.6
1250.0	140.8	140.0	143.1	144.5	147.4	144.4	152.3	153.1
1600.0	138.2	138.2	141.2	142.8	145.3	143.9	150.5	151.6
2000.0	139.1	141.0	142.9	143.3	146.3	144.4	150.2	151.4
2500.0	136.4	137.8	139.1	140.7	144.7	141.8	147.5	149.0
3150.0	135.0	136.4	138.0	139.4	144.0	141.0	146.5	147.4
4000.0	133.2	135.1	136.4	138.0	142.9	139.9	145.4	145.7
5000.0	130.1	131.9	134.1	135.0	140.8	138.3	143.5	143.6
6300.0	127.2	128.6	131.2	131.3	138.0	136.5	141.5	141.4
8000.0	124.3	125.3	128.8	127.1	134.4	134.5	139.0	139.0
10000.0	123.3	124.2	128.2	125.6	132.9	133.4	137.7	139.9
12500.0	122.8	122.9	127.2	125.1	131.9	133.1	137.7	140.2
16000.0	122.7	123.3	125.5	126.1	132.6	133.9	138.6	141.2
20000.0	122.1	122.5	124.4	126.2	132.9	134.3	138.7	139.5
25000.0	121.7	122.9	125.8	124.2	132.3	134.1	136.5	139.1
31500.0	121.3	121.3	125.6	122.7	130.9	132.7	135.9	138.8
40000.0	120.7	120.8	124.8	124.5	129.9	132.1	135.9	138.4
50000.0	121.3	121.9	125.6	123.6	130.5	131.5	135.7	138.6

Table 24: Reported URN levels from DNV shallow procedure from the Malta TC. Table values correspond to curves from Figure 51.

Annex G. Onboard measurements results from Malta TC

Results processed and reported by DNV from the onboard measurements performed in the Malta test campaign are provided in graphical and table format in subsections G.1 and G.2.

G.1. Results in graphical format

Pressure sensors

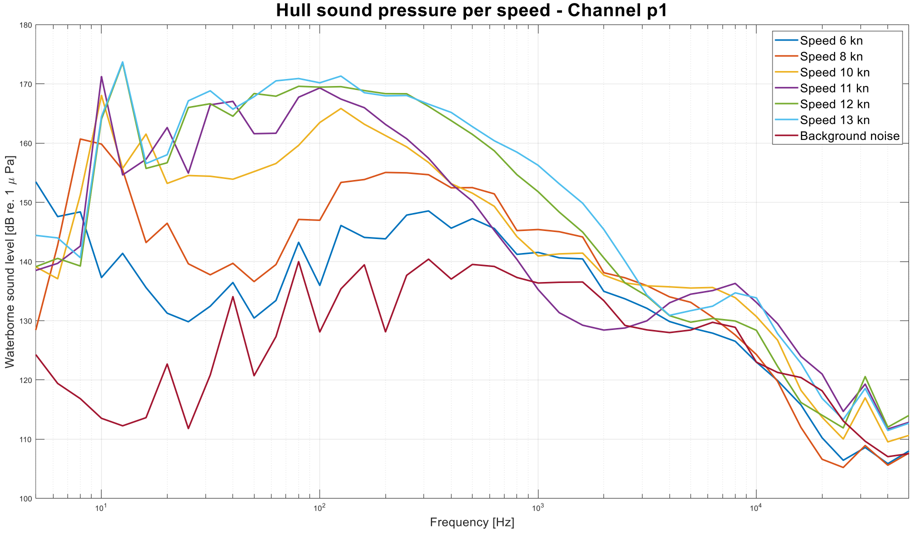


Figure 71: Decidecade spectra from sensor p1 measured during the Malta TC.

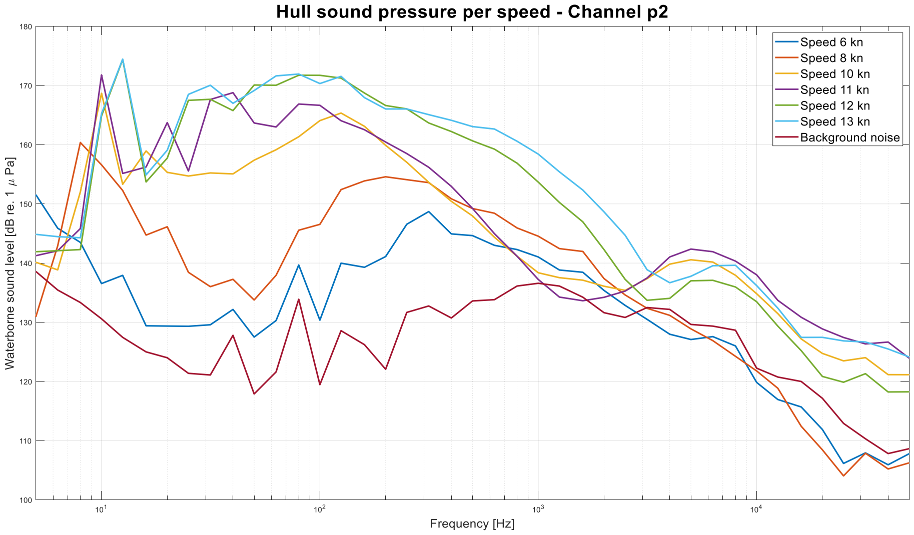


Figure 72: Decidecade spectra from sensor p2 measured during the Malta TC.

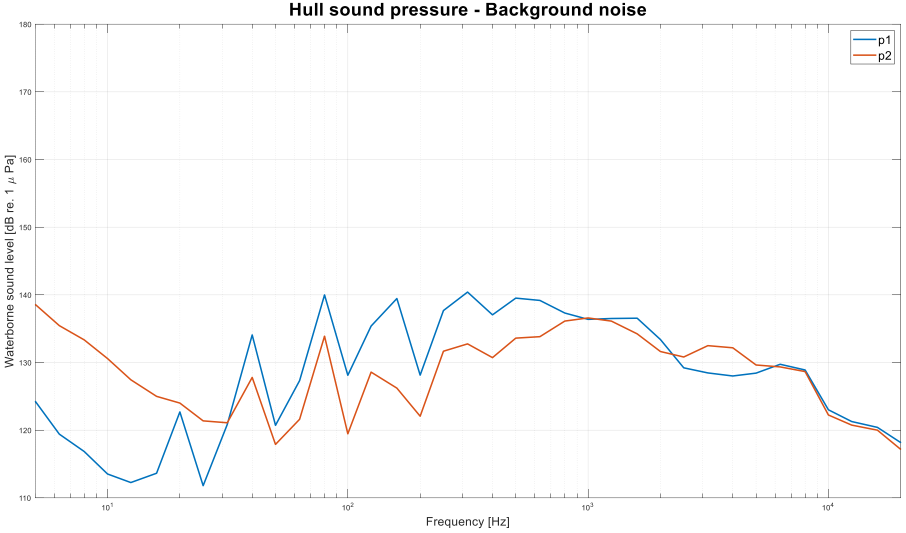


Figure 73: Background noise decidecade spectra from sensors p1 and p2 measured during the Malta TC.

Microphones

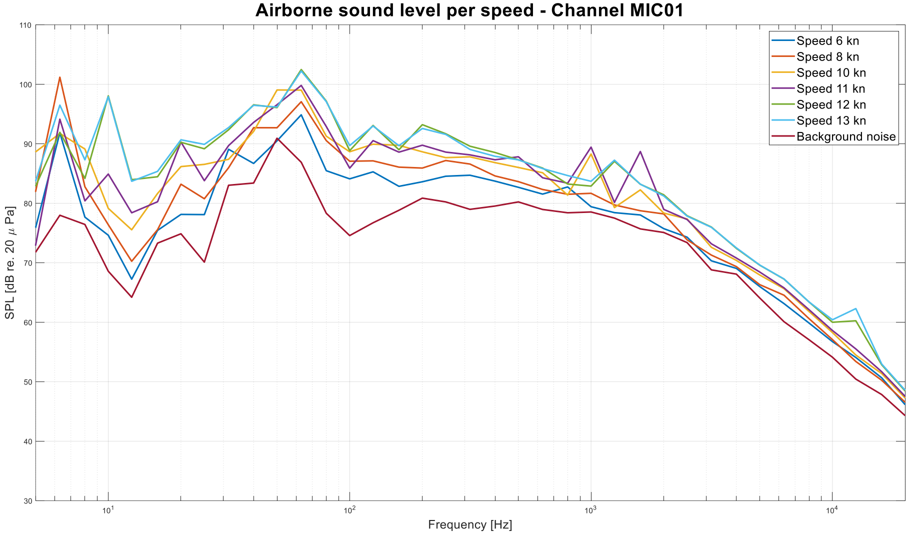


Figure 74: Decidecade spectra from sensor MIC01 measured during the Malta TC.

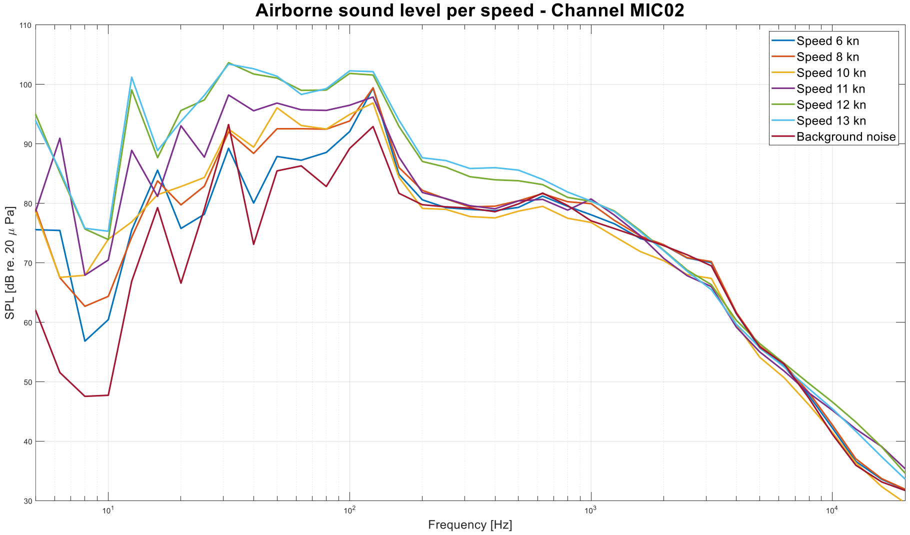


Figure 75: Decidecade spectra from sensor MIC01 measured during the Malta TC.

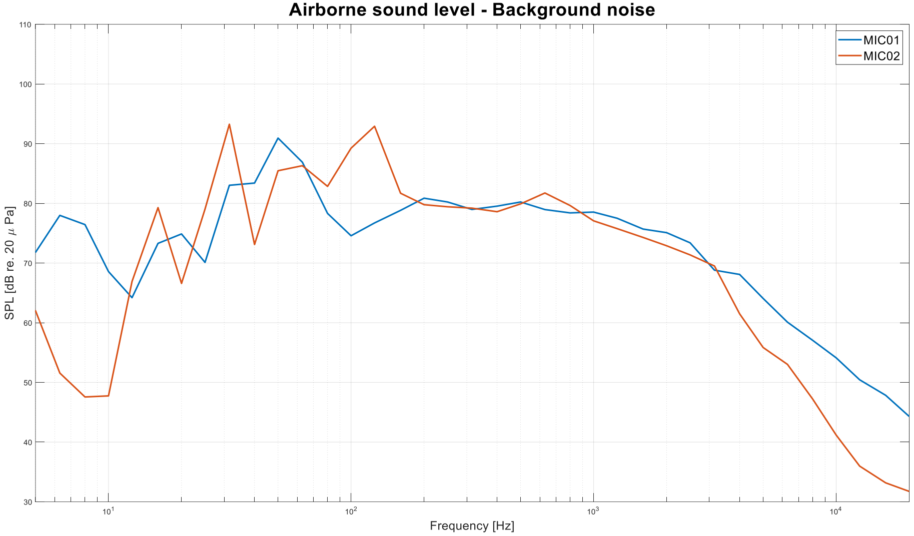


Figure 76: Background noise decidecade spectra from sensors MIC01 and MIC02 measured during the Malta TC.

Accelerometers (acceleration)

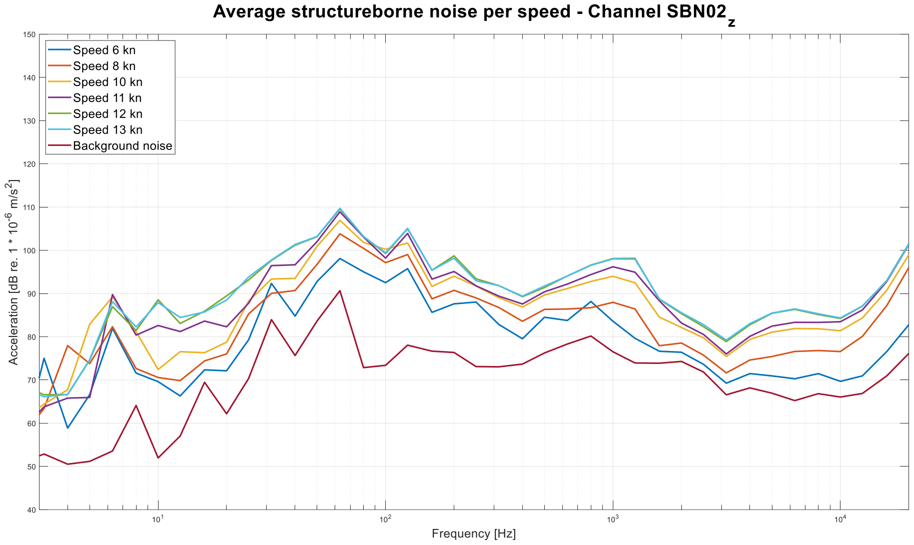


Figure 77: Decidecade spectra from sensor SBN02-Z measured during the Malta TC.

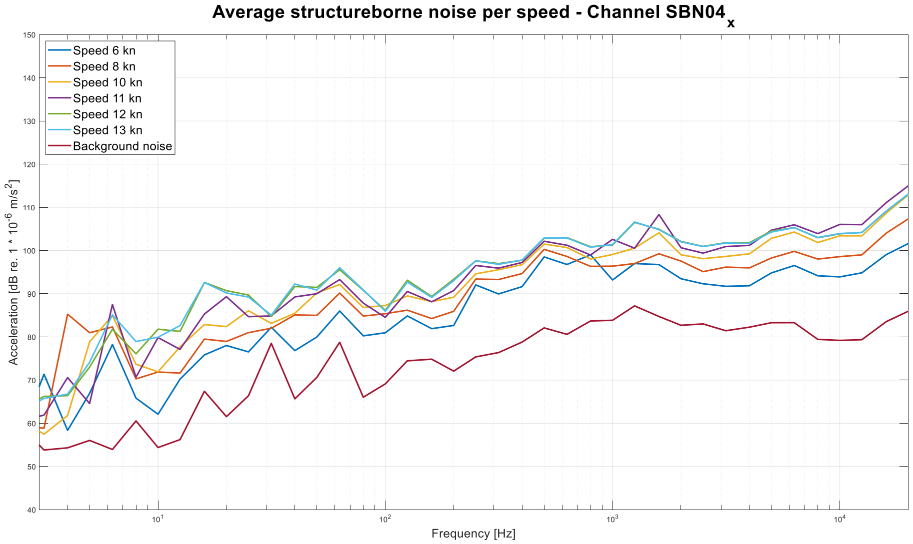


Figure 78: Decidecade spectra from sensor SBN04-X measured during the Malta TC.

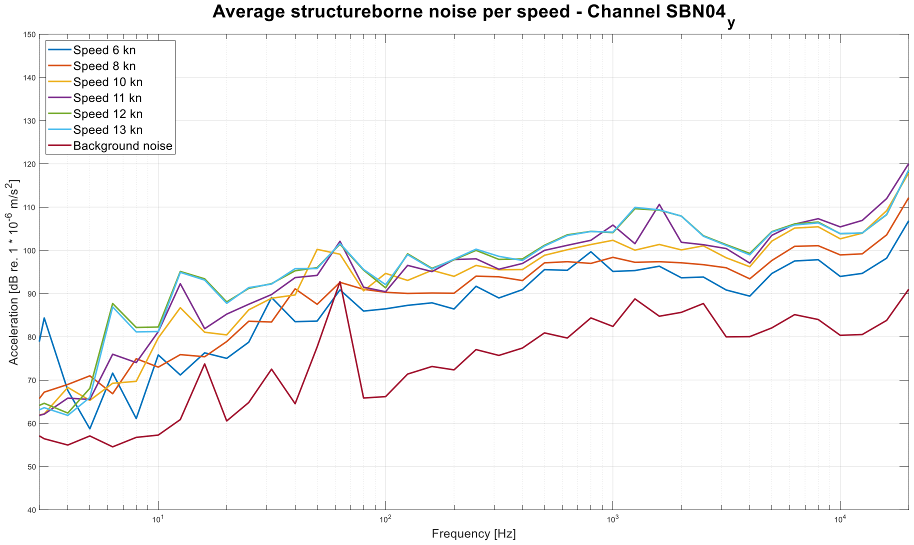


Figure 79: Decidecade spectra from sensor SBN04-Y measured during the Malta TC.

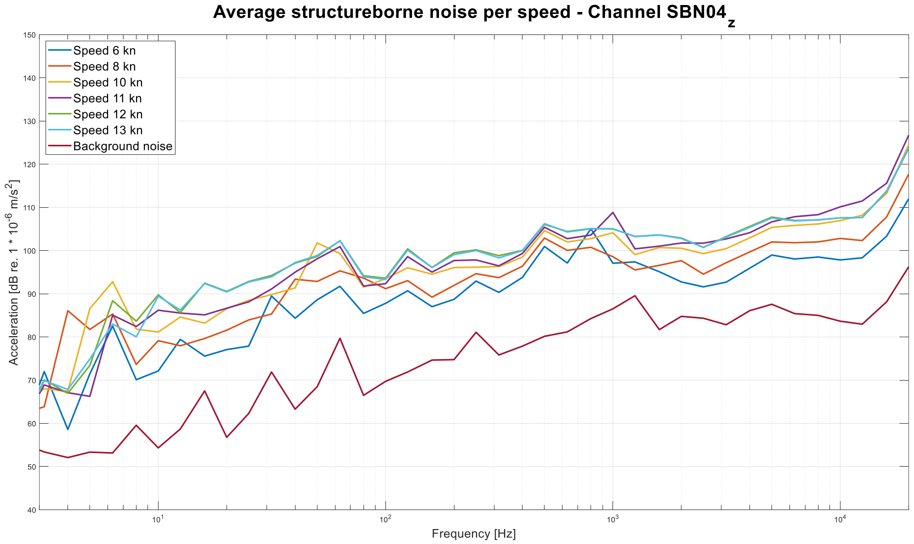


Figure 80: Decidecade spectra from sensor SBN04-Z measured during the Malta TC.

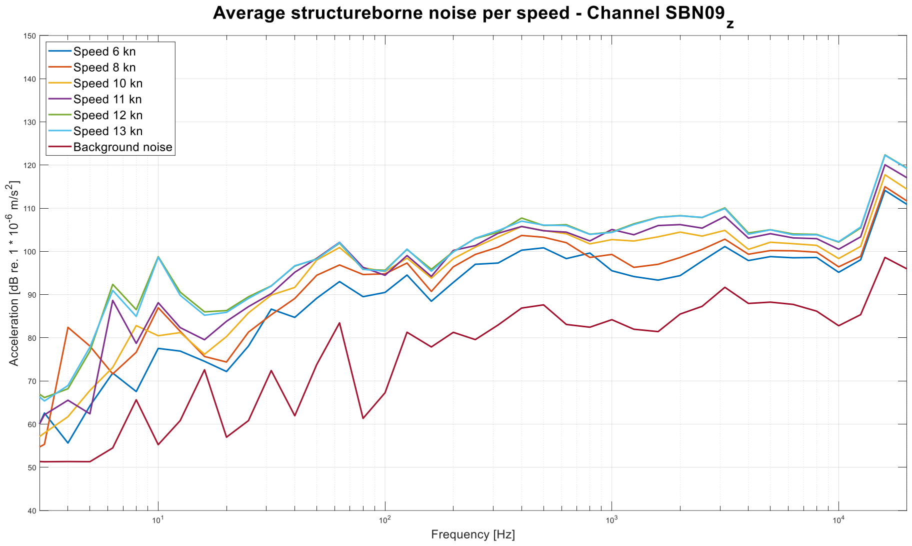


Figure 81: Decidecade spectra from sensor SBN09-Z measured during the Malta TC.

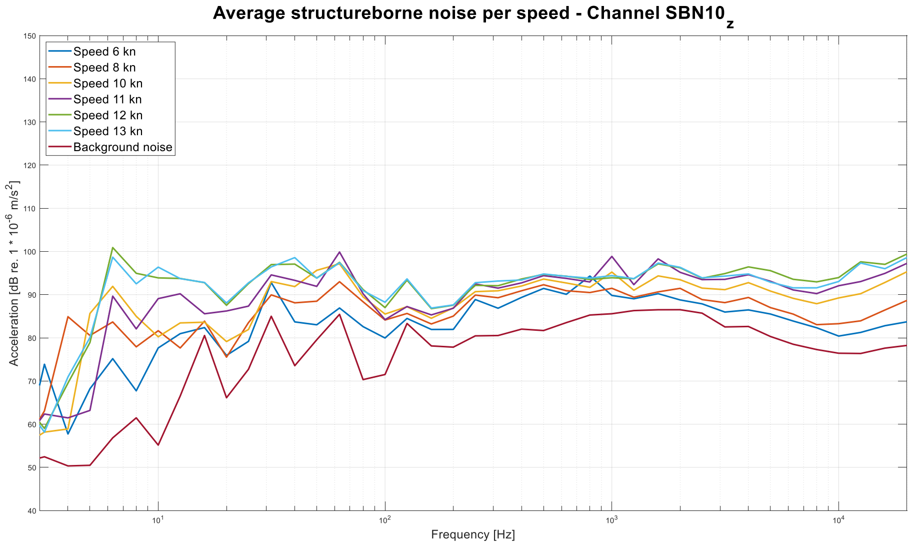


Figure 82: Decidecade spectra from sensor SBN10-Z measured during the Malta TC.

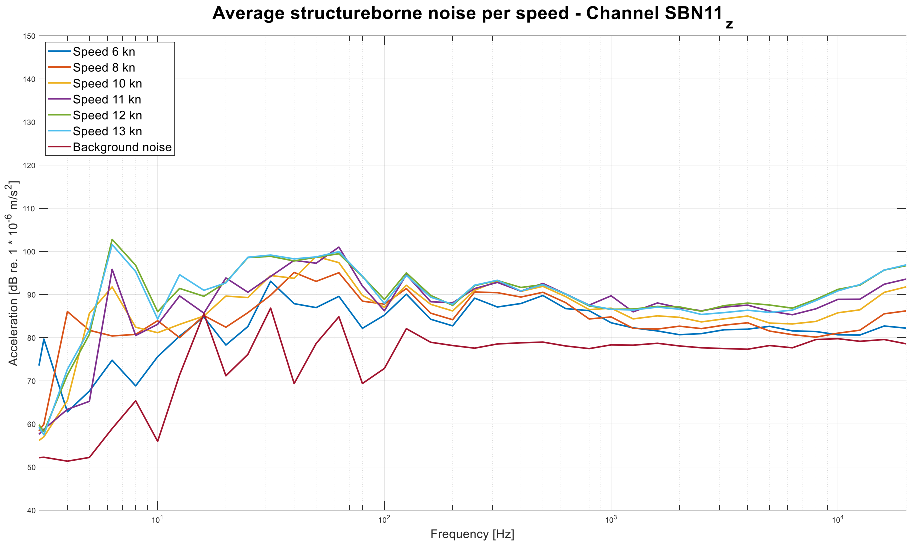


Figure 83: Decidecade spectra from sensor SBN11-Z measured during the Malta TC.

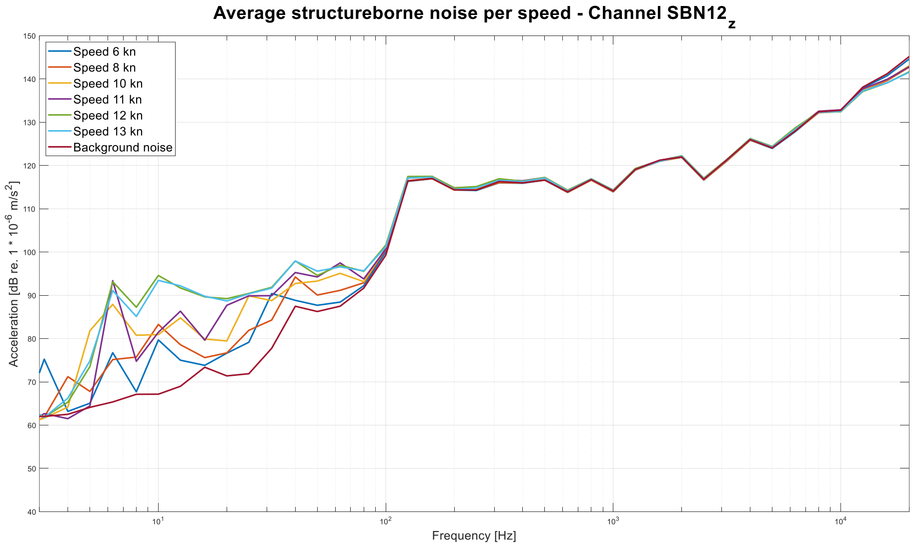


Figure 84: Decidecade spectra from sensor SBN12-Z measured during the Malta TC.

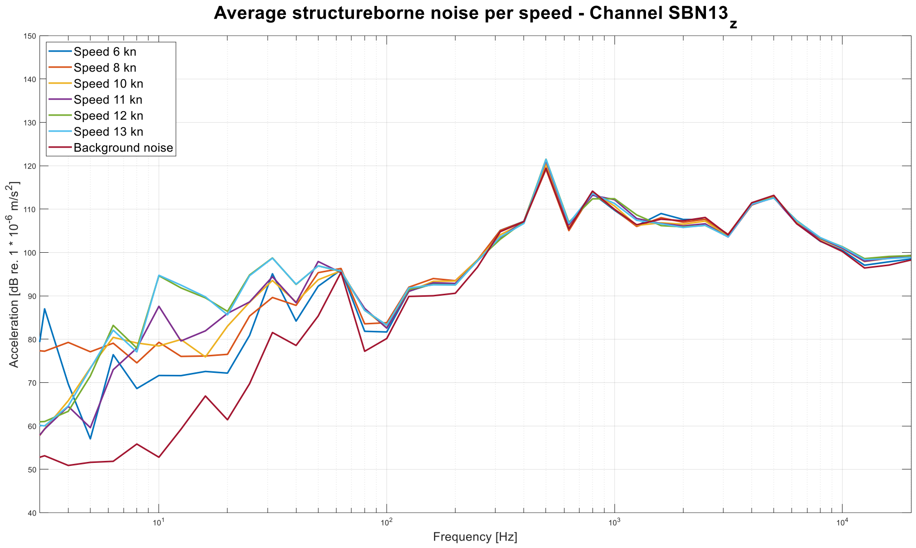


Figure 85: Decidecade spectra from sensor SBN13-Z measured during the Malta TC.

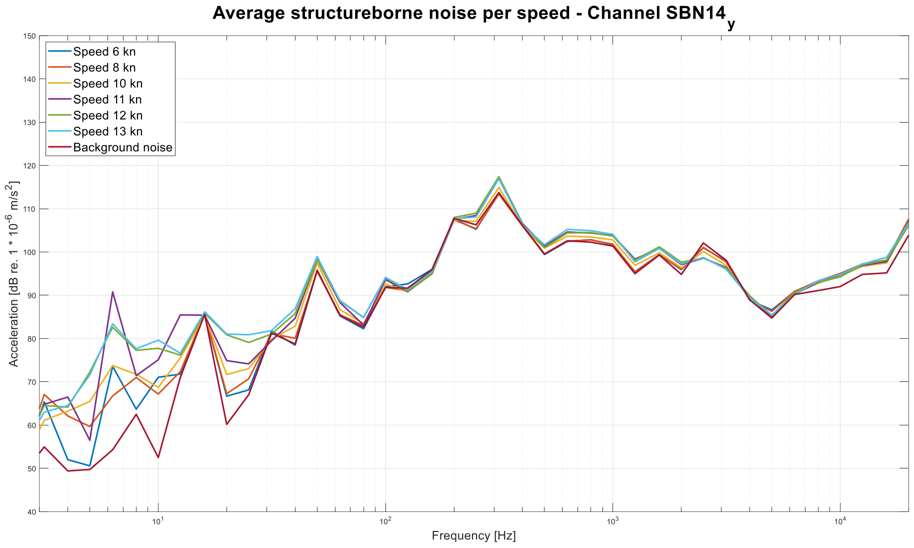


Figure 87: Decidecade spectra from sensor SBN14-Y measured during the Malta TC.

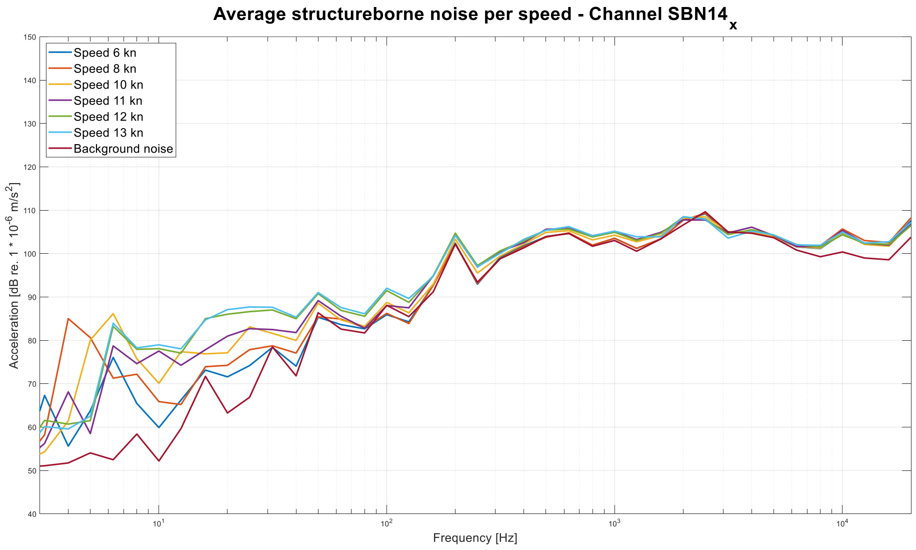


Figure 86: Decidecade spectra from sensor SBN14-X measured during the Malta TC.

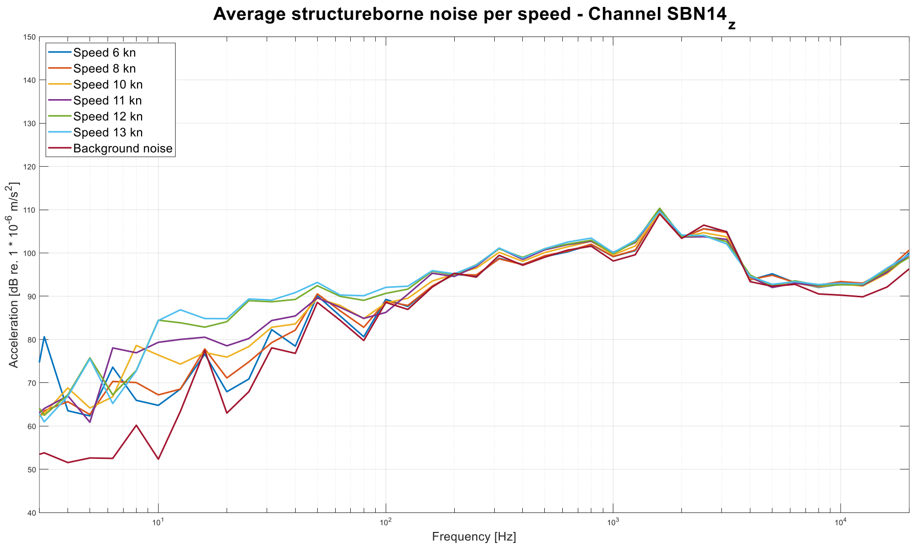


Figure 88: Decidecade spectra from sensor SBN14-Z measured during the Malta TC.

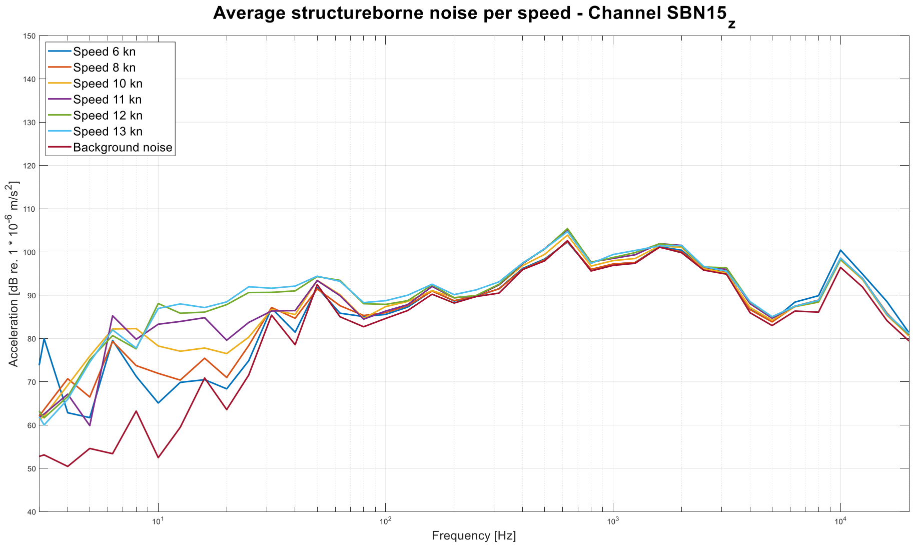


Figure 89: Decidecade spectra from sensor SBN15-Z measured during the Malta TC.

Accelerometers (velocity)

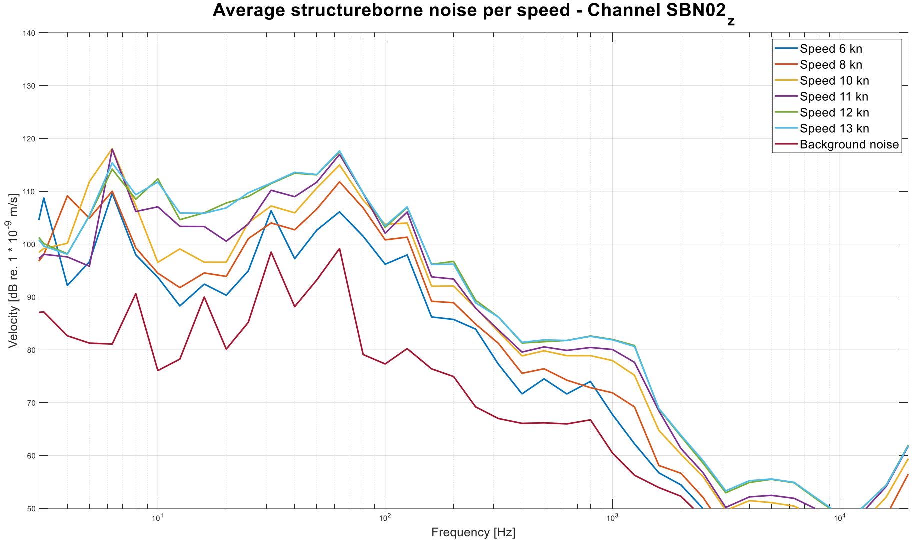


Figure 90: Decidecade spectra from sensor SBN02-Z measured during the Malta TC.

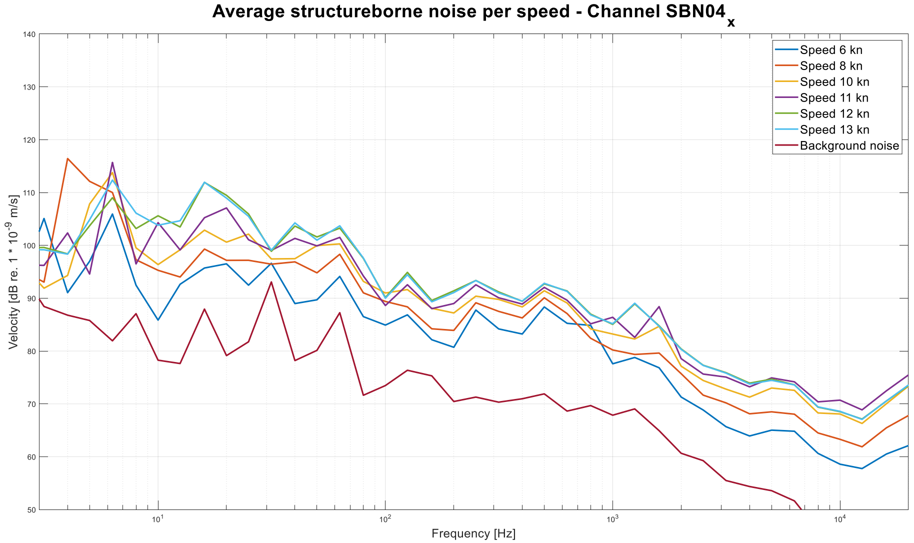


Figure 91: Decidecade spectra from sensor SBN04-X measured during the Malta TC.

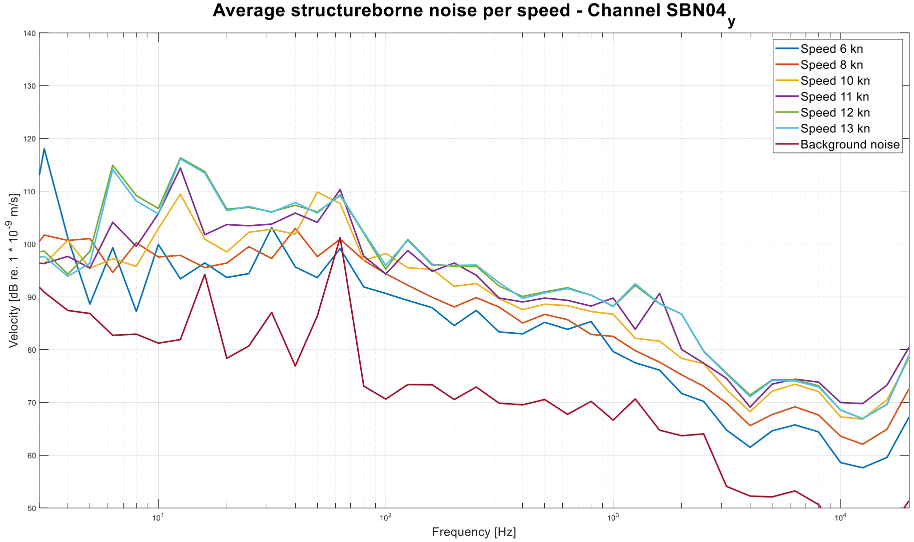


Figure 92: Decidecade spectra from sensor SBN04-Y measured during the Malta TC.

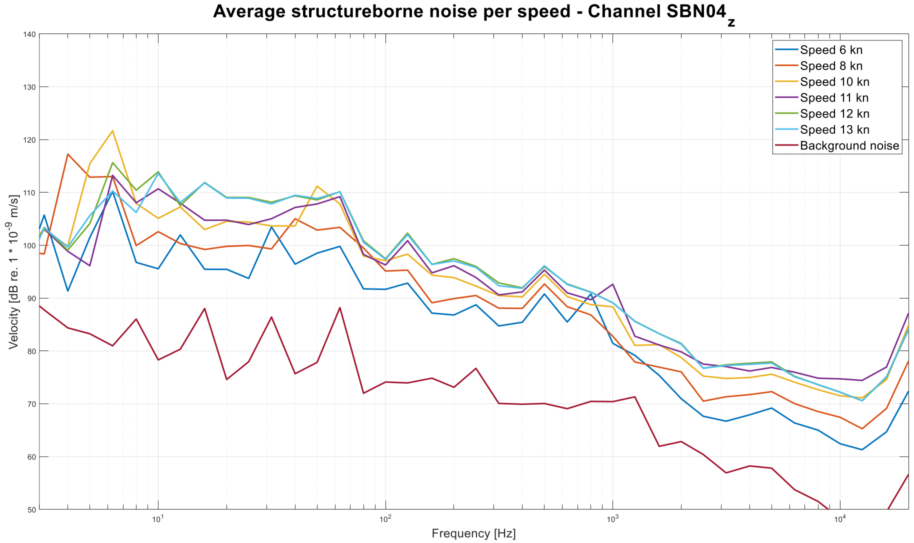


Figure 93: Decidecade spectra from sensor SBN04-Z measured during the Malta TC.

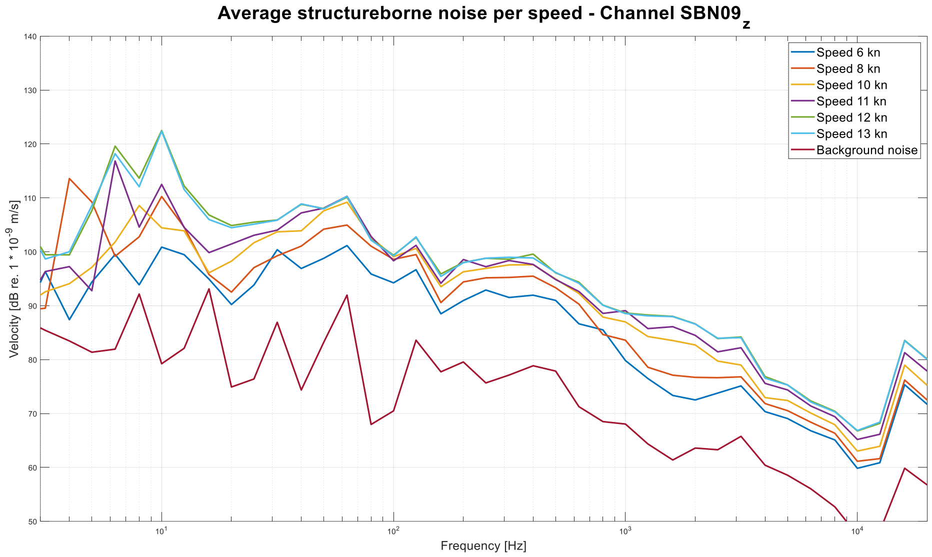


Figure 94: Decidecade spectra from sensor SBN09-Z measured during the Malta TC.

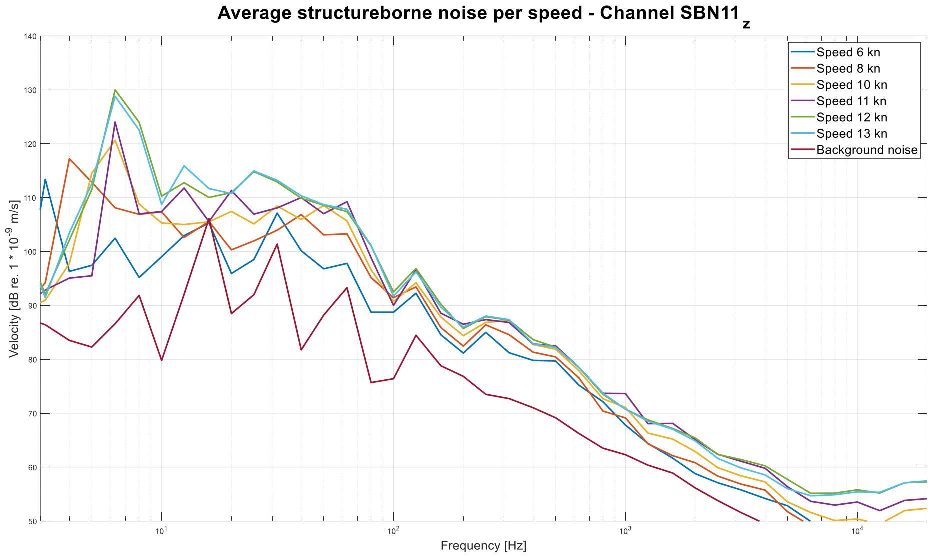


Figure 96: Decidecade spectra from sensor SBN11-Z measured during the Malta TC.

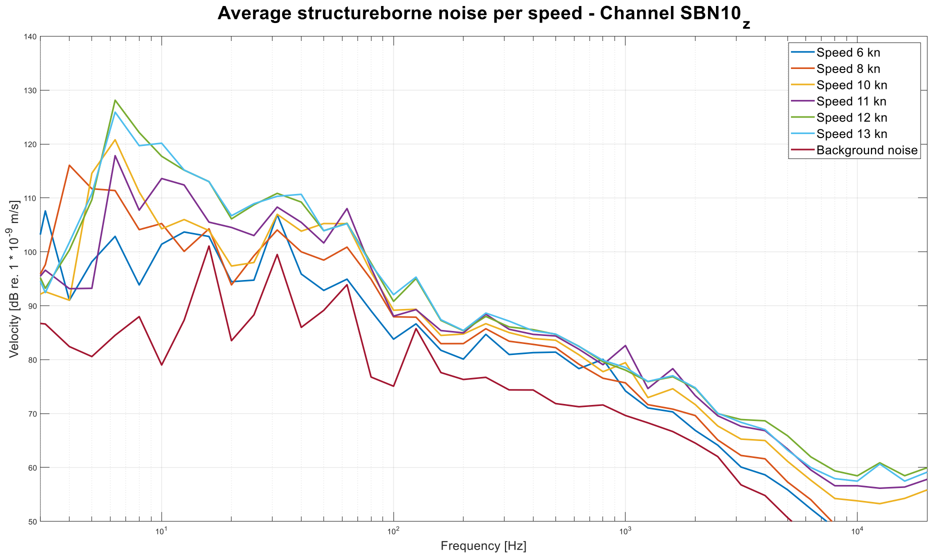


Figure 95: Decidecade spectra from sensor SBN10-Z measured during the Malta TC.

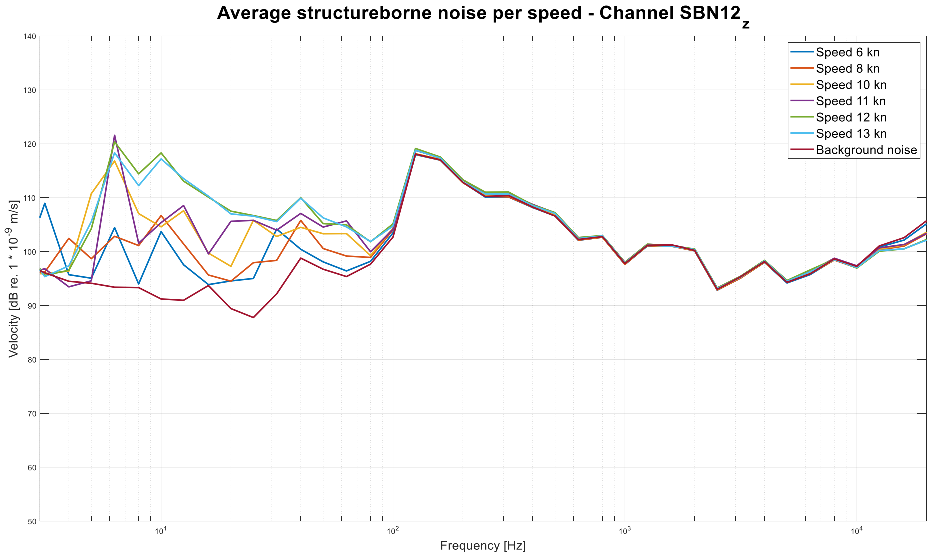


Figure 97: Decidecade spectra from sensor SBN12-Z measured during the Malta TC.

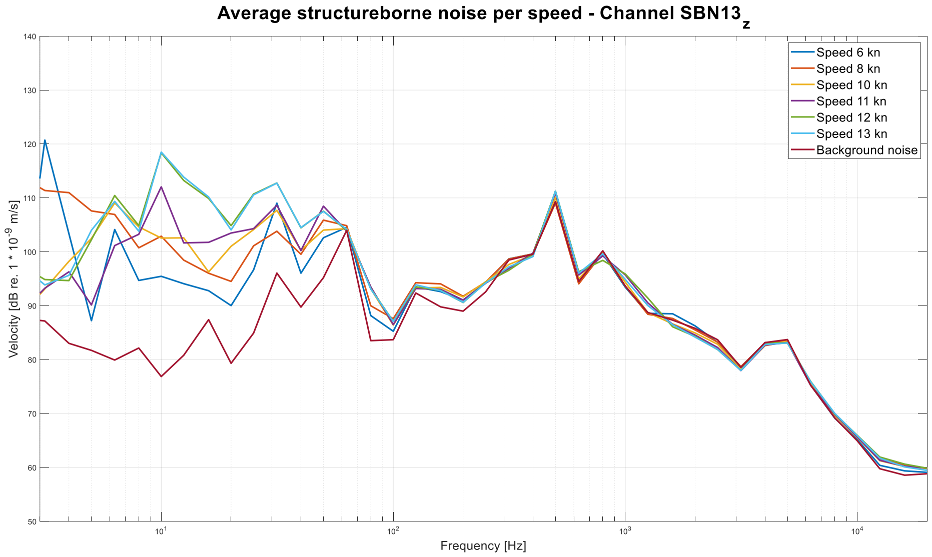


Figure 98: Decidecade spectra from sensor SBN13-Z measured during the Malta TC.

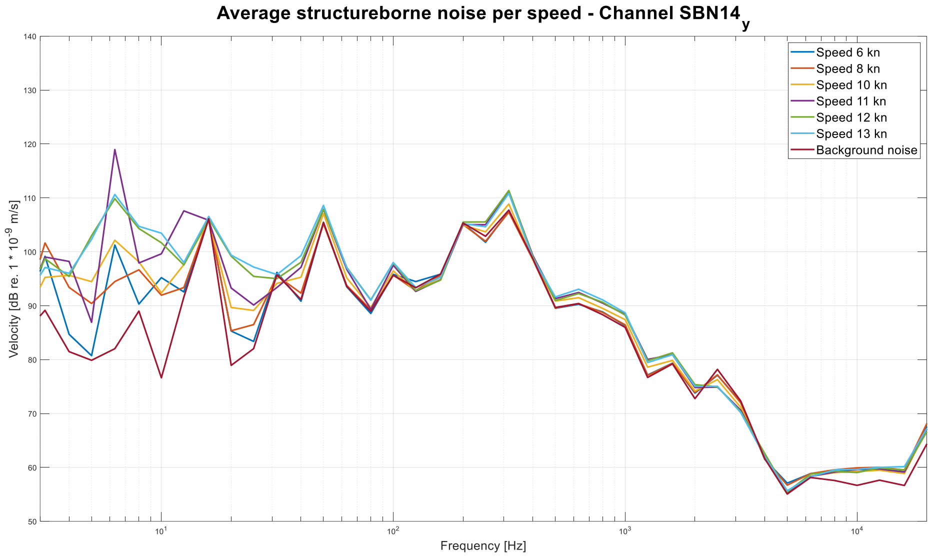


Figure 100: Decidecade spectra from sensor SBN14-Y measured during the Malta TC.

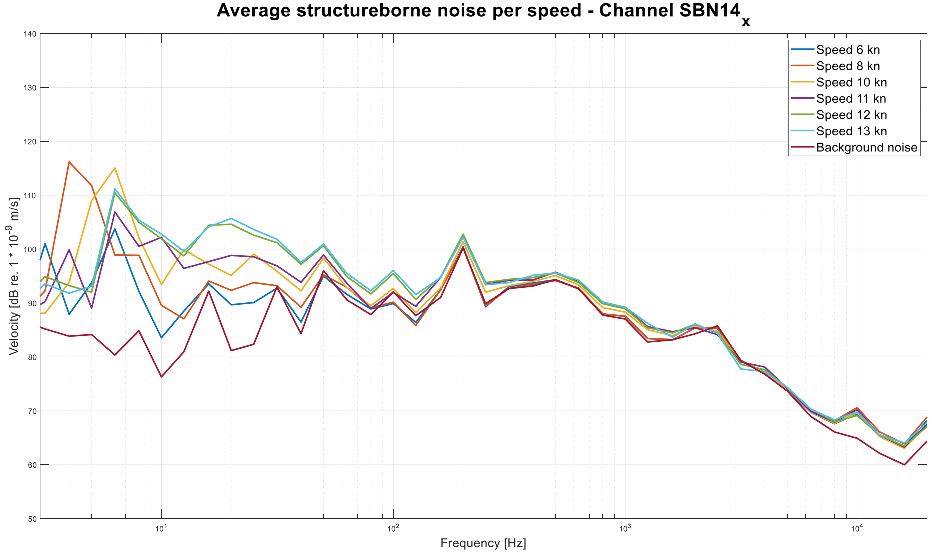


Figure 99: Decidecade spectra from sensor SBN14-X measured during the Malta TC.

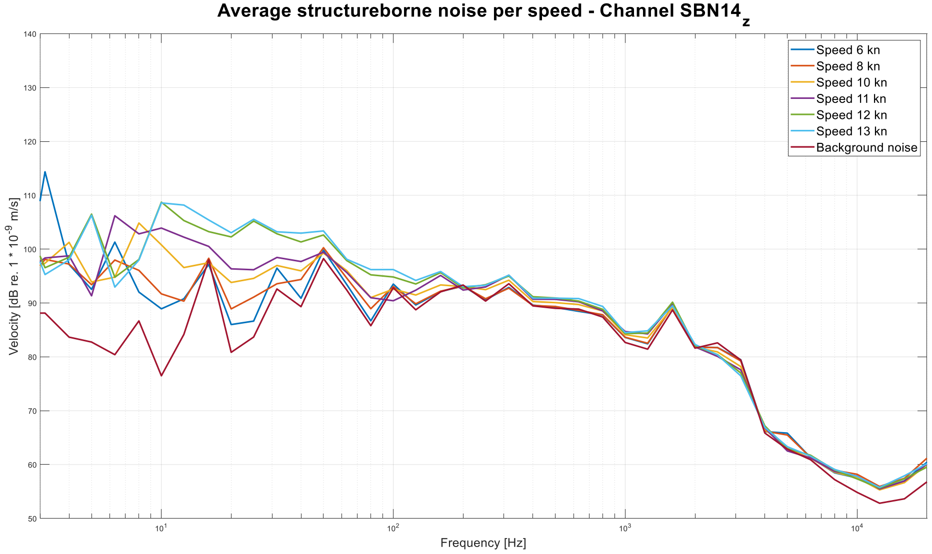


Figure 101: Decidecade spectra from sensor SBN14-Z measured during the Malta TC.

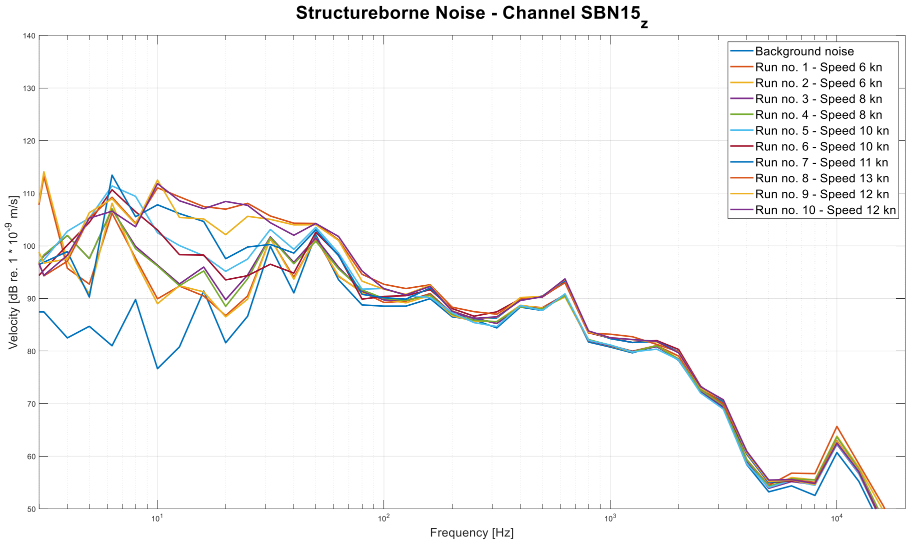


Figure 102: Decidecade spectra from sensor SBN15-Z measured during the Malta TC.

G.2. Results in tabular format

Next, numerical values from results reported in the figures from section G.1 are provided in tabular format.

Pressure sensors

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
5.00	153.4	153.6	127.7	129.1	136.8	140.6	138.5	144.4	140.6	136.9
6.3	147.1	148.0	142.8	142.8	135.9	138.0	139.7	144.0	141.3	139.6
8.0	148.5	148.3	160.6	160.8	151.1	151.5	142.6	140.7	140.8	136.9
10.0	136.9	137.7	159.8	159.9	167.8	168.3	171.2	164.5	164.1	164.0
12.5	141.0	141.7	155.5	155.5	155.7	155.8	154.6	173.7	173.6	173.6
16.0	135.5	135.7	142.9	143.5	161.5	161.6	157.3	156.6	155.9	155.5
20.0	131.7	130.8	146.4	146.6	153.1	153.3	162.6	158.0	156.7	156.7
25.0	129.6	130.0	139.1	140.1	154.2	154.8	154.9	167.2	166.2	165.9
31.5	132.3	132.6	137.7	137.8	154.6	154.2	166.5	168.8	165.5	167.5
40.0	136.2	136.7	139.8	139.7	151.3	155.5	167.1	165.7	163.3	165.5
50.0	130.6	130.3	136.5	136.8	151.5	157.2	161.6	167.8	165.6	170.1
63.0	133.1	133.7	139.6	139.4	155.7	157.3	161.7	170.5	166.8	168.8
80.0	142.9	143.6	147.2	147.1	160.6	158.5	167.8	170.9	168.5	170.5
100.0	136.2	135.8	146.9	147.0	164.0	162.9	169.3	170.2	169.7	169.3
125.0	146.4	145.8	153.0	153.7	165.1	166.5	167.4	171.3	170.0	169.0
160.0	144.5	143.6	153.7	154.0	162.7	163.6	166.0	168.5	168.8	168.9
200.0	144.9	142.4	154.5	155.5	161.3	161.2	163.2	168.0	167.9	168.7
250.0	148.9	146.5	155.4	154.5	159.7	159.0	160.7	168.0	167.7	168.9
315.0	149.4	147.6	155.1	154.2	157.9	155.1	157.4	166.6	165.6	166.7
400.0	146.2	145.1	153.2	151.5	154.2	151.8	153.1	165.2	163.7	163.9
500.0	147.2	147.3	153.2	151.6	153.1	149.1	150.2	162.8	161.6	161.4
630.0	145.7	145.5	152.0	150.8	151.2	146.0	145.3	160.4	158.9	158.4
800.0	140.8	141.6	145.7	144.6	145.9	141.4	140.4	158.5	153.9	155.3
1000.0	141.2	141.9	146.2	144.4	143.1	136.6	135.3	156.3	151.1	152.4
1250.0	140.6	140.7	145.9	143.9	144.0	132.4	131.4	153.1	147.7	149.0
1600.0	140.3	140.5	144.3	144.0	144.3	128.6	129.2	149.9	144.9	145.1
2000.0	135.1	134.8	139.0	137.1	140.5	127.0	128.4	145.4	141.4	139.7
2500.0	133.6	133.8	138.2	136.1	139.2	126.9	128.8	140.1	138.1	133.5
3150.0	131.5	132.6	137.0	134.5	138.6	127.6	130.0	134.3	136.5	128.6
4000.0	129.0	130.6	135.4	131.9	138.2	129.4	133.0	130.9	132.9	126.8
5000.0	128.1	129.4	134.7	130.7	137.6	131.2	134.5	131.7	130.9	128.2
6300.0	127.8	128.0	131.6	129.3	136.6	134.4	135.1	132.5	131.5	128.9
8000.0	126.2	126.9	128.9	125.8	133.3	134.4	136.3	134.7	130.4	129.4
10000.0	122.5	123.5	125.9	121.7	130.2	131.1	133.1	133.9	127.0	129.4
12500.0	119.7	120.1	121.5	116.9	122.3	128.9	129.5	127.8	122.4	122.2
16000.0	115.5	116.0	113.8	108.8	112.6	120.6	124.0	122.8	115.8	116.5
20000.0	110.5	109.9	106.6	106.6	111.7	115.1	121.0	116.9	115.0	112.9
25000.0	106.7	106.2	105.2	105.2	109.1	110.8	114.7	113.3	113.0	110.4
31500.0	109.2	107.9	108.9	108.9	116.0	117.8	119.3	118.6	122.2	118.0
40000.0	105.6	106.1	105.6	105.7	108.6	110.3	111.7	111.5	113.3	110.3
50000.0	107.0	108.8	107.1	108.1	110.7	110.5	112.9	112.7	115.0	112.7

Table 25: p1 - Waterborne noise [dB re. 1 μPa].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
5.00	151.2	151.9	127.7	132.7	139.3	140.9	141.2	144.9	142.1	141.7
6.3	145.2	146.5	142.9	142.9	137.3	140.0	142.1	144.5	143.1	140.8
8.0	143.3	143.7	160.1	160.6	151.9	152.1	145.8	144.3	142.9	141.5
10.0	136.1	137.0	156.4	156.8	168.6	168.8	171.8	165.2	164.9	164.8
12.5	137.3	138.4	152.1	152.4	153.1	153.5	155.1	174.5	174.5	174.3
16.0	129.3	129.5	144.3	145.1	158.7	159.2	156.2	154.9	153.8	153.6
20.0	129.8	128.8	145.9	146.4	156.0	154.6	163.7	159.1	157.8	157.7
25.0	129.0	129.6	137.7	139.1	154.6	154.8	155.6	168.5	167.7	167.2
31.5	129.3	129.8	135.6	136.4	155.7	154.6	167.6	170.0	166.9	168.3
40.0	131.9	132.5	137.3	137.3	153.2	156.4	168.8	167.0	164.8	166.5
50.0	127.5	127.5	133.3	134.2	155.0	158.9	163.7	169.1	168.0	171.5
63.0	130.0	130.6	137.5	138.3	159.1	159.2	163.0	171.6	169.6	170.5
80.0	139.0	140.3	145.3	145.8	163.0	158.7	166.9	171.9	171.8	171.7
100.0	130.5	130.2	145.9	147.1	165.7	161.4	166.7	170.3	172.5	170.8
125.0	140.2	139.8	150.7	153.6	166.6	163.6	164.0	171.5	172.6	169.2
160.0	140.1	138.2	152.7	154.8	164.1	161.8	162.5	168.0	169.7	167.5
200.0	142.8	138.4	153.3	155.5	161.1	158.2	160.4	166.0	166.9	166.3
250.0	148.0	144.4	154.1	154.1	158.1	155.6	158.5	166.0	165.2	166.7
315.0	149.7	147.4	154.1	153.0	154.8	152.0	156.2	165.1	163.5	163.9
400.0	145.6	144.1	151.5	150.1	150.9	150.0	153.0	164.1	162.1	162.3
500.0	144.7	144.6	150.2	147.9	147.8	148.1	149.2	163.1	159.7	161.4
630.0	142.7	143.3	149.3	147.3	144.9	143.8	145.0	162.6	157.9	160.3
800.0	141.5	142.9	147.0	144.5	142.4	139.5	141.2	160.6	154.6	158.4
1000.0	140.2	141.7	145.5	143.3	139.9	135.9	137.2	158.4	151.7	155.0
1250.0	139.1	138.5	143.5	141.0	139.6	133.6	134.3	155.4	149.0	151.2
1600.0	138.1	138.7	143.2	140.3	139.1	133.2	133.6	152.3	146.0	147.7
2000.0	134.6	136.0	138.6	135.7	137.6	133.9	134.2	148.7	142.1	142.4
2500.0	131.6	133.8	135.5	133.4	135.7	135.1	135.3	144.7	137.4	137.0
3150.0	129.5	131.3	133.5	130.9	136.8	137.9	137.5	138.9	134.7	132.5
4000.0	126.9	128.9	131.5	130.8	136.2	141.8	141.0	136.7	132.9	134.9
5000.0	127.0	127.1	129.4	128.3	137.1	142.5	142.4	137.8	135.9	137.9
6300.0	128.4	126.6	127.8	125.7	136.6	142.1	141.9	139.5	135.8	138.1
8000.0	125.9	126.1	124.9	123.5	134.1	140.0	140.3	139.6	135.1	136.7
10000.0	118.7	120.8	122.6	120.7	130.4	137.0	138.0	136.2	133.0	133.9
12500.0	115.7	117.9	120.3	116.8	126.7	133.7	133.7	132.4	129.4	129.3
16000.0	116.4	114.8	113.4	111.2	121.8	129.5	130.8	127.4	126.2	123.9
20000.0	113.5	109.4	105.3	110.2	121.9	126.4	128.9	127.5	121.6	119.9
25000.0	106.9	105.2	103.9	104.2	119.1	125.6	127.4	126.9	120.4	119.3
31500.0	107.8	108.1	108.1	107.6	119.1	126.3	126.3	126.7	122.0	120.5
40000.0	105.6	106.2	105.0	105.4	116.8	123.3	126.7	125.5	118.7	117.7
50000.0	106.5	108.8	106.0	106.5	118.1	122.9	123.9	124.1	118.2	118.3

Table 26: p2 - Waterborne noise [dB re. 1 μPa].

Microphones

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	97.2	97.0	86.1	86.5	101.8	98.8	97.9	94.6	94.9	96.6
1.2	87.9	88.1	86.5	86.2	85.6	85.4	85.3	95.8	92.7	99.9
1.6	82.0	81.6	97.4	97.3	89.1	88.6	84.2	82.9	84.3	82.8
2.0	79.2	79.5	80.5	80.4	100.3	100.4	103.5	96.6	96.4	96.4
2.5	76.5	75.4	76.2	75.6	79.5	77.7	83.3	101.5	101.6	101.6
3.15	78.3	78.7	76.9	76.8	77.4	76.2	77.4	76.1	76.9	81.1
4.0	71.4	71.7	89.9	89.4	81.0	80.2	81.9	79.0	78.4	78.4
5.0	76.7	74.9	82.2	81.8	89.5	87.6	72.9	83.7	83.4	82.3
6.3	91.8	91.9	101.5	100.8	92.5	90.8	94.1	96.5	90.0	93.3
8.0	77.9	77.5	83.1	82.5	88.9	89.3	80.4	87.3	83.2	85.0
10.0	74.5	74.8	76.5	76.3	79.1	79.2	84.9	97.9	97.9	98.2
12.5	67.0	67.4	70.4	70.1	73.9	76.7	78.4	83.7	84.5	83.4
16.0	75.7	75.2	75.7	75.5	81.7	81.6	80.3	85.4	84.1	84.8
20.0	78.5	77.7	83.7	82.7	86.7	85.5	90.3	90.7	88.8	91.3
25.0	78.1	78.0	81.0	80.5	86.9	86.1	83.8	89.9	88.1	90.0
31.5	89.2	88.9	86.5	85.4	88.2	86.4	89.7	92.7	92.6	92.1
40.0	86.5	86.9	92.6	92.8	92.7	91.3	93.6	96.5	97.0	96.1
50.0	90.8	90.2	92.8	92.6	99.5	98.5	96.6	96.2	95.9	96.3
63.0	94.6	95.2	97.3	96.8	99.3	98.8	99.8	102.2	102.5	102.5
80.0	85.7	85.3	90.4	90.7	91.6	91.0	92.9	97.1	96.9	97.4
100.0	84.5	83.6	86.8	87.3	89.0	88.3	85.9	89.7	88.4	89.2
125.0	85.4	85.2	87.1	87.2	90.2	89.6	90.5	93.0	92.6	93.5
160.0	82.8	82.9	86.1	86.1	89.7	89.8	88.6	89.7	88.7	89.3
200.0	83.5	83.7	86.3	85.5	88.9	88.3	89.8	92.6	93.9	92.4
250.0	84.8	84.3	88.2	85.9	87.9	87.5	88.6	91.6	91.9	91.5
315.0	85.2	84.2	86.5	86.7	87.6	88.0	88.1	89.1	90.1	89.0
400.0	83.6	83.8	84.9	84.3	87.0	86.6	87.3	87.9	88.9	88.1
500.0	82.8	82.6	83.7	83.5	86.1	86.0	87.8	87.3	87.5	87.1
630.0	81.6	81.5	82.4	82.2	85.2	85.0	84.3	85.8	86.1	85.7
800.0	83.0	82.5	80.3	82.4	81.4	81.3	83.4	84.7	83.4	83.1
1000.0	79.5	79.3	81.2	82.1	88.1	88.4	89.4	83.7	83.1	82.7
1250.0	78.3	78.5	79.8	79.7	79.3	79.2	80.2	87.2	87.3	86.8
1600.0	78.0	78.0	78.7	78.8	82.2	82.3	88.7	83.2	83.3	83.1
2000.0	75.7	75.7	78.3	78.1	78.4	78.3	79.0	81.2	81.7	81.2
2500.0	74.2	74.4	74.0	73.7	77.5	77.3	77.3	77.8	78.2	77.6
3150.0	70.2	70.4	71.6	70.9	72.6	72.6	73.2	76.0	76.2	75.8
4000.0	69.0	69.1	69.8	68.8	70.4	70.4	70.8	72.5	72.5	72.3
5000.0	65.9	66.1	66.6	66.0	68.0	67.9	68.4	69.6	69.8	69.4
6300.0	63.1	63.1	64.9	64.1	65.5	65.8	65.8	67.3	67.4	67.1
8000.0	59.9	59.9	60.8	60.4	61.9	61.7	62.1	63.4	63.6	63.2
10000.0	56.8	56.7	57.2	57.0	58.3	58.2	58.6	60.4	59.9	60.1
12500.0	54.3	53.8	53.5	53.3	54.5	54.4	55.5	62.3	58.4	61.6
16000.0	50.7	50.6	50.3	50.1	51.4	51.3	51.7	53.0	52.9	52.7
20000.0	46.1	46.2	46.7	46.5	47.3	47.2	47.5	48.6	48.5	48.3

Table 27: MIC01 - Airborne noise [dB re. 20 μPa].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	81.7	83.6	82.9	82.2	91.1	52.6	91.2	90.8	92.3	97.2
1.2	79.0	80.1	80.3	78.8	84.4	48.7	87.8	88.9	89.2	92.8
1.6	84.3	80.8	86.9	82.8	90.6	44.4	89.8	87.6	90.7	88.5
2.0	82.2	83.1	83.3	81.6	85.2	40.6	85.5	83.8	85.2	84.5
2.5	71.6	73.0	72.3	72.0	72.6	36.8	74.0	78.6	79.0	78.0
3.15	78.5	78.0	74.5	74.8	71.0	32.8	72.3	76.1	75.8	76.1
4.0	67.2	67.9	85.1	82.0	75.1	28.8	80.8	88.3	90.0	88.0
5.0	75.7	75.5	79.8	78.3	81.6	25.1	78.6	93.9	95.9	93.8
6.3	76.8	73.5	67.6	67.5	70.6	21.4	91.0	85.6	85.7	84.6
8.0	57.6	55.9	62.9	62.4	70.9	17.7	67.9	75.8	76.2	75.2
10.0	59.6	61.2	64.3	64.4	77.0	14.4	70.5	75.3	71.7	75.4
12.5	74.8	76.1	74.0	74.6	79.9	11.4	88.9	101.2	99.3	98.9
16.0	84.1	86.7	83.7	83.9	84.5	8.5	81.2	88.9	86.6	88.6
20.0	76.4	75.1	80.1	79.3	85.8	6.3	93.0	93.8	93.6	97.0
25.0	78.5	77.9	82.9	82.9	87.4	4.5	87.8	98.2	96.1	98.4
31.5	89.1	89.5	92.6	91.4	95.5	3.1	98.2	103.4	103.7	103.6
40.0	80.0	80.1	88.6	88.2	92.5	2.0	95.6	102.6	101.4	102.1
50.0	87.6	88.2	92.8	92.3	99.1	1.4	96.9	101.4	101.8	100.2
63.0	87.6	86.9	93.0	92.0	96.1	0.9	95.7	98.3	99.0	99.0
80.0	88.5	88.7	92.7	92.3	95.5	0.6	95.6	99.3	98.6	99.5
100.0	92.4	91.7	94.0	93.7	98.0	0.4	96.5	102.3	100.8	102.7
125.0	100.2	98.4	99.0	99.8	99.9	0.2	97.9	102.2	101.4	101.8
160.0	85.0	84.8	86.0	86.0	87.4	0.1	87.8	94.0	93.0	92.9
200.0	80.6	80.6	82.3	82.1	82.2	0.1	81.8	87.7	87.2	86.9
250.0	79.8	78.7	81.0	80.5	82.0	0.1	80.8	87.2	86.4	85.8
315.0	79.3	78.6	79.5	79.3	80.8	0.0	79.6	85.9	84.8	84.1
400.0	78.8	78.8	79.8	79.3	80.6	0.0	79.1	86.0	84.3	83.6
500.0	78.8	79.8	80.6	80.3	81.7	0.0	80.4	85.6	84.3	83.2
630.0	81.0	81.4	81.7	81.6	82.5	0.0	80.7	84.0	83.7	82.5
800.0	79.6	79.4	80.6	80.0	80.5	0.0	78.9	81.9	81.7	80.1
1000.0	77.7	78.4	79.8	80.1	79.8	0.1	80.7	80.4	81.3	79.2
1250.0	76.5	76.7	77.2	77.1	77.5	0.1	78.0	78.6	79.6	77.6
1600.0	74.0	74.1	74.2	74.8	74.9	0.1	74.6	75.2	76.0	74.7
2000.0	72.9	73.1	73.0	73.1	73.4	0.2	70.8	72.0	72.7	71.5
2500.0	70.9	70.8	70.9	70.8	71.0	0.4	67.8	68.6	69.3	68.2
3150.0	70.3	69.8	70.2	70.2	70.4	0.6	66.0	65.5	66.8	65.8
4000.0	61.5	61.3	61.7	61.6	62.6	0.9	59.2	59.7	60.7	59.9
5000.0	55.7	55.7	56.1	55.9	57.1	1.3	55.0	55.8	56.8	56.0
6300.0	52.6	52.6	53.0	53.0	53.7	2.1	51.8	52.5	53.4	52.9
8000.0	47.8	47.6	48.2	48.1	49.1	3.1	48.1	48.8	50.2	49.2
10000.0	42.3	42.2	42.6	42.8	44.5	4.5	45.2	45.5	47.2	45.9
12500.0	36.7	36.6	37.0	37.1	39.4	6.2	42.1	41.7	43.8	42.5
16000.0	33.7	33.5	33.6	33.8	35.4	8.7	39.1	37.4	39.6	38.5
20000.0	32.0	31.9	31.9	32.0	32.6	11.3	35.4	33.6	34.8	34.5

Table 28: MIC02 - Airborne noise [dB re. 20 μPa].

Accelerometers (acceleration)

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	52.7	50.7	53.2	48.9	55.2	50.6	56.7	50.0	56.8	50.8
1.2	51.7	48.9	52.0	50.8	53.1	50.3	57.6	50.5	56.8	51.1
1.6	64.9	51.5	68.7	61.9	70.8	60.3	69.7	61.2	70.4	62.0
2.0	51.2	51.0	54.6	52.2	58.4	58.2	62.9	59.7	61.0	59.0
2.5	53.8	53.8	57.3	56.4	61.9	58.3	58.4	68.4	69.7	67.7
3.15	74.5	75.5	63.3	63.5	65.2	63.4	63.8	66.1	67.1	66.0
4.0	58.3	59.4	78.2	77.7	69.1	65.6	65.8	66.6	66.2	67.0
5.0	66.8	66.4	74.0	73.6	83.2	82.5	65.9	74.7	74.4	74.8
6.3	80.8	82.9	82.3	82.4	89.5	88.9	89.8	88.1	88.1	85.4
8.0	71.9	71.3	72.9	72.4	82.6	79.0	80.4	82.3	82.5	80.0
10.0	69.4	69.8	71.2	69.8	72.8	72.0	82.6	87.9	88.9	88.2
12.5	66.5	66.1	70.0	69.7	77.6	75.1	81.2	84.5	81.3	84.3
16.0	72.5	72.2	74.6	74.2	76.7	75.9	83.6	85.7	85.0	86.7
20.0	72.4	71.8	76.3	75.7	79.5	77.8	82.3	88.5	87.8	90.7
25.0	79.7	78.9	85.4	85.2	88.6	87.8	87.8	93.8	92.9	93.3
31.5	92.4	92.3	90.1	89.9	94.1	92.5	96.5	97.8	98.4	96.8
40.0	84.9	84.6	90.7	90.7	94.5	92.2	96.6	101.3	102.0	100.2
50.0	93.3	92.3	97.0	96.5	101.4	100.4	102.0	103.2	102.7	103.5
63.0	98.8	97.2	103.9	103.7	107.3	106.5	108.9	109.7	109.1	110.0
80.0	95.6	94.4	100.5	100.3	101.9	101.7	103.1	103.2	102.5	103.8
100.0	92.8	92.2	96.7	97.5	100.4	100.0	98.2	99.4	98.2	100.1
125.0	95.9	95.6	98.8	99.2	101.9	101.4	103.9	105.1	105.1	104.8
160.0	85.4	85.9	89.0	88.5	92.5	90.5	93.3	95.4	95.3	95.5
200.0	87.7	87.5	91.0	90.4	94.5	93.5	95.1	98.2	98.6	98.8
250.0	88.6	87.3	89.0	89.0	91.9	91.6	91.8	92.9	93.5	93.3
315.0	82.8	82.9	87.0	86.5	89.4	88.6	89.4	91.8	91.6	92.0
400.0	79.6	79.5	83.8	83.4	87.2	86.6	87.6	89.4	89.1	89.4
500.0	84.5	84.5	86.5	86.1	89.9	89.5	90.4	91.7	91.2	91.6
630.0	83.9	83.6	86.4	86.4	91.3	91.0	92.2	94.0	94.1	94.0
800.0	88.1	88.2	86.6	86.9	92.9	92.7	94.4	96.5	96.6	96.6
1000.0	83.7	83.5	87.9	88.0	94.0	94.0	96.2	98.0	97.9	98.3
1250.0	79.7	79.6	86.3	86.5	92.4	92.5	94.9	97.9	98.0	98.3
1600.0	76.7	76.6	78.1	77.8	84.7	84.4	88.3	88.8	88.8	88.5
2000.0	76.5	76.3	78.7	78.4	82.3	82.0	83.2	85.6	85.3	85.4
2500.0	73.8	73.5	76.0	75.5	79.9	79.6	80.5	82.8	82.0	82.7
3150.0	69.4	69.1	71.9	71.4	75.8	75.1	76.0	79.2	78.7	79.1
4000.0	71.8	71.2	74.9	74.3	79.6	79.2	80.1	83.0	82.7	82.8
5000.0	71.3	70.5	75.7	75.1	81.1	81.0	82.5	85.5	85.2	85.6
6300.0	70.8	69.7	77.3	75.8	81.8	82.0	83.3	86.4	86.3	86.4
8000.0	72.0	70.8	77.1	76.5	82.2	81.5	83.3	85.3	85.4	84.8
10000.0	70.2	69.1	76.8	76.4	81.3	81.5	83.5	84.4	84.5	84.0
12500.0	71.5	70.3	80.1	80.1	84.0	84.7	86.2	87.1	87.3	86.8
16000.0	77.0	76.1	87.2	87.3	90.0	91.4	92.8	92.9	93.0	93.0
20000.0	83.5	82.0	95.9	96.1	98.2	99.7	101.3	101.4	101.3	101.8

Table 29: SBN02_z - Acceleration [dB re. 1 μm/s²].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	58.3	58.5	60.1	60.2	62.4	64.1	63.5	61.2	62.2	61.8
1.2	60.1	60.8	61.9	61.8	63.4	64.2	63.8	63.7	64.1	64.7
1.6	58.0	57.2	58.8	57.1	59.9	58.3	59.2	58.5	60.5	59.2
2.0	55.3	55.9	58.1	57.5	57.7	58.0	58.2	58.2	58.5	59.8
2.5	57.2	58.2	59.4	59.5	60.7	60.9	60.6	63.0	63.8	63.0
3.15	71.7	71.0	58.7	58.9	57.6	57.3	61.9	65.8	66.3	66.2
4.0	57.9	58.7	85.2	85.3	61.8	61.8	70.6	66.7	64.9	67.5
5.0	66.6	67.2	80.9	81.0	79.1	78.6	64.6	74.1	71.9	73.9
6.3	77.4	79.0	82.4	82.2	85.1	84.7	87.5	85.1	82.0	81.6
8.0	65.9	65.7	70.7	69.9	74.5	72.7	70.7	78.9	76.3	75.9
10.0	62.8	61.2	71.9	71.9	71.9	72.0	79.8	79.9	82.5	80.9
12.5	70.9	69.3	71.8	71.4	77.8	77.6	77.1	82.6	80.5	82.0
16.0	76.4	75.2	79.8	79.2	83.2	82.4	85.3	92.6	92.9	92.3
20.0	78.6	77.4	79.3	78.6	83.0	81.7	89.3	90.2	90.8	90.6
25.0	77.0	76.0	81.3	80.6	86.5	85.5	84.7	89.2	90.5	88.7
31.5	82.1	82.3	82.2	81.7	83.9	82.3	84.9	85.0	85.0	84.4
40.0	77.2	76.4	85.2	85.0	86.6	83.9	89.3	92.2	92.0	91.3
50.0	80.4	79.5	85.0	85.0	90.6	89.8	90.0	90.8	91.2	91.7
63.0	86.2	85.7	90.3	90.0	92.2	92.1	93.3	96.0	95.3	95.8
80.0	80.7	79.8	84.7	84.9	86.9	86.7	87.8	90.9	90.9	90.7
100.0	81.2	80.7	85.5	85.3	87.3	87.2	84.5	85.9	85.8	86.5
125.0	84.7	85.0	86.2	86.2	89.7	89.3	90.5	92.7	93.6	92.6
160.0	81.8	82.0	84.2	84.3	88.2	88.1	88.1	89.1	89.4	89.3
200.0	82.7	82.6	86.0	85.8	89.3	89.0	90.7	93.0	93.3	93.4
250.0	92.4	91.6	93.1	93.7	94.9	94.3	96.5	97.6	97.6	97.6
315.0	90.2	89.7	93.3	93.3	95.7	95.4	95.9	96.8	97.0	97.0
400.0	91.8	91.5	94.3	95.0	96.6	96.8	97.2	97.8	97.8	97.7
500.0	98.6	98.4	100.4	100.2	101.7	101.3	102.1	102.9	102.9	102.8
630.0	96.9	96.6	98.6	98.7	100.7	100.7	101.2	102.9	103.2	102.8
800.0	98.7	99.3	95.7	96.9	98.0	98.1	99.0	100.8	101.1	100.7
1000.0	93.7	92.6	96.2	96.6	99.2	98.9	102.6	101.4	101.3	101.2
1250.0	97.1	96.9	97.1	96.9	100.6	100.5	100.5	106.6	106.4	106.6
1600.0	96.8	96.7	99.3	99.2	104.1	104.1	108.3	104.8	105.2	104.7
2000.0	93.6	93.3	97.7	97.4	99.0	99.0	100.6	102.0	102.3	101.8
2500.0	92.4	92.2	95.5	94.6	97.9	98.3	99.4	100.9	101.1	100.8
3150.0	92.2	91.1	96.9	95.3	98.5	98.7	100.9	101.7	101.9	101.7
4000.0	92.2	91.5	96.6	95.3	99.2	99.3	101.2	101.6	101.9	101.7
5000.0	95.2	94.4	98.9	97.5	102.6	103.0	104.7	104.3	104.7	104.3
6300.0	96.9	96.2	100.4	99.1	104.3	104.3	106.0	105.3	105.5	105.1
8000.0	94.6	93.7	98.6	97.4	101.6	102.1	103.9	103.0	103.2	102.7
10000.0	94.5	93.2	99.2	97.8	102.8	103.9	106.0	103.9	104.1	103.6
12500.0	95.4	94.2	99.5	98.4	102.8	103.9	106.0	104.1	104.3	104.1
16000.0	99.6	98.4	104.6	103.3	107.9	109.3	111.1	109.1	109.2	109.0
20000.0	102.2	100.9	108.1	106.4	111.9	113.7	115.0	113.1	113.2	112.8

Table 30: SBN04_x - Acceleration [dB re. 1 $\mu m/s^2$].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	59.7	58.7	59.8	60.2	60.6	61.6	63.4	61.7	63.0	63.0
1.2	62.5	61.2	65.2	62.8	66.2	63.9	70.5	65.8	72.7	66.9
1.6	65.9	59.4	70.6	68.5	69.4	62.6	75.7	64.8	78.4	66.5
2.0	56.5	57.0	57.9	59.2	58.8	58.4	59.1	59.5	59.3	59.9
2.5	58.7	59.3	60.4	60.2	60.2	61.6	60.8	61.3	61.8	62.8
3.15	84.1	84.6	67.3	67.0	62.3	62.1	62.1	63.6	64.0	65.2
4.0	67.1	68.0	69.9	67.8	69.4	66.7	65.8	61.8	62.6	62.1
5.0	58.6	58.8	71.4	70.5	65.8	64.7	65.5	66.0	67.8	68.4
6.3	72.2	71.0	67.3	66.3	70.1	68.3	76.0	86.9	89.0	85.8
8.0	60.9	61.2	75.4	74.4	70.3	69.0	74.0	81.1	83.4	80.4
10.0	75.3	76.3	73.3	72.6	77.9	81.0	81.2	81.2	82.7	81.8
12.5	71.3	71.0	76.0	75.8	84.9	88.0	92.3	94.9	96.0	94.0
16.0	76.3	76.3	76.1	74.6	81.5	80.6	81.9	93.1	94.1	92.6
20.0	75.3	74.8	79.6	78.1	81.0	79.8	85.2	87.7	88.2	87.9
25.0	79.1	78.4	84.0	83.2	86.7	85.7	87.5	91.4	91.2	91.2
31.5	88.9	89.2	83.6	83.2	89.5	88.3	89.8	92.2	92.6	92.0
40.0	83.7	83.3	91.2	91.0	90.2	89.1	93.7	95.8	95.4	95.1
50.0	84.0	83.2	87.7	87.3	100.5	99.9	94.2	95.8	96.3	95.7
63.0	90.9	90.8	92.9	92.3	99.2	98.9	102.1	101.6	101.5	101.3
80.0	86.0	85.9	90.8	91.1	90.7	90.5	91.5	95.6	95.2	95.6
100.0	86.4	86.5	90.1	90.5	94.6	94.7	90.4	92.1	90.7	91.9
125.0	87.3	87.2	89.8	90.2	93.2	92.9	96.5	99.0	99.1	99.3
160.0	87.7	88.0	90.2	90.1	95.5	95.2	95.1	95.7	95.8	95.9
200.0	86.3	86.5	90.2	90.0	94.1	93.8	97.9	98.0	97.6	98.1
250.0	92.0	91.4	94.1	93.9	96.6	96.4	98.0	100.3	99.8	100.2
315.0	89.2	88.8	94.0	93.8	95.1	95.9	95.6	98.6	97.9	97.9
400.0	90.9	90.9	92.9	93.1	95.6	95.5	97.0	97.7	98.3	97.7
500.0	95.6	95.5	97.2	97.0	99.0	98.7	100.0	101.0	101.2	101.2
630.0	95.6	95.2	97.5	97.2	100.2	100.1	101.2	103.4	103.7	103.5
800.0	99.4	99.9	96.5	97.4	101.5	101.2	102.3	104.4	104.5	104.3
1000.0	95.9	94.1	98.0	98.8	102.1	102.5	105.8	104.2	104.1	104.0
1250.0	95.3	95.3	97.2	97.2	100.2	99.9	101.5	109.9	109.4	109.8
1600.0	96.6	96.0	97.5	97.3	101.4	101.3	110.6	109.4	109.5	109.1
2000.0	93.8	93.5	97.4	96.8	100.1	100.1	101.9	107.9	108.1	107.7
2500.0	93.9	93.7	97.2	96.1	100.9	101.1	101.3	103.3	103.5	103.2
3150.0	91.2	90.5	96.5	95.3	98.1	98.5	100.4	101.1	101.5	101.1
4000.0	89.7	89.1	94.1	92.6	96.2	96.2	97.0	99.0	99.5	99.0
5000.0	95.0	94.3	98.2	97.0	102.2	102.1	103.5	104.2	104.5	104.1
6300.0	97.8	97.3	101.5	100.2	105.2	105.1	106.1	105.9	106.4	105.8
8000.0	98.2	97.4	101.6	100.5	105.3	105.5	107.3	106.3	107.0	106.1
10000.0	94.6	93.2	99.7	98.1	102.3	103.0	105.4	103.9	104.0	103.6
12500.0	95.3	93.9	99.9	98.4	103.1	104.7	106.9	104.0	104.1	103.9
16000.0	98.8	97.4	104.2	102.8	108.2	110.0	112.0	108.3	108.4	108.1
20000.0	107.5	106.1	112.9	111.2	116.9	118.7	120.0	118.6	118.7	118.3

Table 31: SBN04_y - Acceleration [dB re. 1 μm/s^2].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	61.3	60.3	59.6	56.6	67.8	66.3	68.6	62.6	64.1	62.8
1.2	58.5	57.8	58.9	57.6	59.8	58.7	63.1	68.8	70.3	68.1
1.6	68.7	66.0	70.6	66.8	71.3	61.5	70.0	62.0	70.8	63.0
2.0	58.4	58.5	66.1	65.4	63.7	64.4	66.4	54.4	56.3	55.1
2.5	57.1	57.8	62.3	62.1	65.0	63.0	59.3	57.8	60.3	56.9
3.15	71.8	72.2	63.6	64.1	68.6	67.4	68.9	69.9	70.6	69.5
4.0	58.2	59.0	86.2	85.9	68.8	65.4	67.1	67.8	66.6	67.3
5.0	71.2	71.7	81.9	81.6	86.9	86.2	66.2	74.9	72.5	74.1
6.3	80.7	83.8	85.4	85.2	93.1	92.5	85.1	83.0	89.0	87.7
8.0	70.0	70.2	73.8	73.5	82.8	80.6	82.4	80.0	84.2	83.0
10.0	72.6	71.6	79.4	78.8	81.7	80.6	86.2	89.4	89.1	90.3
12.5	79.7	79.2	78.2	77.8	86.1	82.2	85.5	86.3	85.6	85.7
16.0	75.9	75.2	80.0	79.3	83.6	82.7	85.1	92.4	92.9	92.0
20.0	77.4	76.7	81.9	81.2	87.1	85.9	86.7	90.4	90.4	90.7
25.0	78.2	77.5	84.3	83.6	89.0	87.9	88.1	92.7	93.5	92.1
31.5	89.4	89.5	85.6	85.1	90.4	89.1	91.1	93.9	94.7	93.7
40.0	84.6	84.1	93.5	93.3	92.0	90.6	95.0	97.2	97.2	96.9
50.0	89.0	88.1	93.1	92.6	101.9	101.6	98.1	98.9	98.1	99.1
63.0	92.1	91.4	95.3	95.3	99.6	99.0	100.9	102.3	102.5	102.1
80.0	85.6	85.3	93.6	93.7	91.3	91.8	91.8	93.9	94.0	94.3
100.0	87.7	87.9	90.7	91.6	93.3	93.7	92.3	93.3	93.7	93.5
125.0	90.8	90.6	92.8	93.2	96.4	95.6	98.6	100.1	100.8	99.9
160.0	86.8	87.2	89.4	89.1	94.9	94.1	95.0	96.1	95.8	96.4
200.0	88.5	88.9	92.0	91.9	96.4	95.8	97.7	99.1	99.4	99.6
250.0	93.2	92.7	94.5	94.8	96.2	96.1	97.8	100.0	100.2	100.1
315.0	90.4	90.2	93.8	93.6	96.0	96.6	96.5	98.3	98.9	98.7
400.0	93.9	93.7	96.1	96.6	98.5	98.5	99.3	100.0	100.1	100.0
500.0	101.0	100.9	103.0	102.8	104.7	104.5	105.4	106.2	106.0	106.1
630.0	97.2	97.1	100.0	100.1	102.1	101.9	102.8	104.3	104.5	104.4
800.0	105.0	105.1	100.1	101.3	102.7	102.9	103.6	105.0	105.3	104.9
1000.0	97.5	96.7	98.5	98.7	104.2	104.1	108.8	105.1	105.1	104.9
1250.0	97.4	97.4	95.7	95.3	99.1	99.1	100.4	103.2	103.4	103.1
1600.0	94.9	95.3	96.6	96.6	100.8	100.7	101.0	103.6	103.9	103.3
2000.0	92.9	92.6	98.1	97.2	100.5	100.6	101.8	102.8	103.1	102.7
2500.0	91.9	91.3	95.2	93.8	98.9	99.7	101.7	100.8	100.8	100.6
3150.0	93.0	92.3	97.8	96.4	100.2	100.7	102.7	103.1	103.4	103.1
4000.0	96.2	95.6	100.3	99.0	102.9	103.0	104.1	105.4	105.8	105.4
5000.0	99.2	98.7	102.5	101.4	105.5	105.3	106.7	107.5	108.2	107.3
6300.0	98.4	97.7	102.5	101.1	105.5	106.1	107.8	106.9	107.2	106.7
8000.0	98.9	98.1	102.5	101.4	106.1	106.2	108.3	107.1	107.4	106.8
10000.0	98.5	97.0	103.6	101.9	106.4	107.4	110.1	107.6	107.9	107.3
12500.0	98.9	97.6	102.9	101.7	107.4	108.9	111.5	107.7	107.8	107.4
16000.0	103.8	102.8	108.4	107.2	112.4	113.9	115.6	113.8	113.9	113.5
20000.0	112.6	111.3	118.4	116.9	123.2	125.5	126.7	123.8	123.8	123.5

Table 32: SBN04_z - Acceleration [dB re. 1 μm/s^2].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	53.9	51.8	52.9	52.4	52.5	51.1	57.4	51.6	57.3	51.6
1.2	52.1	52.2	52.5	50.2	53.6	51.5	55.2	53.6	59.0	54.5
1.6	61.1	52.9	64.1	56.9	66.1	56.7	64.9	57.7	65.7	57.7
2.0	50.7	49.7	55.2	54.6	62.1	61.4	64.2	61.2	61.5	61.0
2.5	51.3	50.3	53.0	52.1	54.3	53.8	52.4	69.8	69.7	69.8
3.15	62.4	62.8	55.2	55.5	58.2	57.7	62.2	65.4	66.6	65.7
4.0	55.5	55.7	82.5	82.3	62.5	60.8	65.5	68.9	68.0	68.4
5.0	64.4	64.1	78.2	78.0	68.3	67.3	62.4	77.8	76.6	77.2
6.3	72.0	71.7	71.8	71.4	73.8	72.4	88.7	91.0	93.4	91.1
8.0	67.8	67.3	76.8	76.5	83.7	81.7	78.7	85.0	87.5	85.2
10.0	78.1	76.9	87.4	86.5	79.1	81.5	88.1	98.7	97.9	99.5
12.5	77.6	76.1	81.9	81.0	80.9	81.5	82.4	89.8	90.6	90.5
16.0	74.4	74.7	75.7	75.7	76.9	75.4	79.5	85.2	86.0	86.0
20.0	72.5	71.8	74.7	74.0	80.6	79.9	83.8	85.9	85.0	87.3
25.0	78.7	77.4	81.6	81.0	86.2	85.4	87.2	89.1	90.3	88.6
31.5	86.7	86.6	85.5	85.2	90.4	89.3	90.2	92.0	92.3	91.8
40.0	84.9	84.5	89.3	88.9	92.1	91.2	95.2	96.7	96.6	96.6
50.0	89.7	88.6	94.6	94.3	98.4	97.6	98.4	98.2	98.2	98.4
63.0	93.6	92.3	96.9	96.8	101.3	100.5	102.1	102.1	101.2	102.5
80.0	90.1	88.9	94.8	94.5	96.2	96.2	96.3	95.9	95.5	96.2
100.0	90.9	90.1	95.0	94.6	94.9	95.7	94.5	95.4	96.2	95.0
125.0	94.6	94.5	97.5	97.1	98.8	98.0	99.0	100.5	101.2	99.6
160.0	88.1	88.8	90.4	91.0	93.5	94.1	94.2	95.4	95.8	95.9
200.0	92.7	92.9	96.7	96.2	98.3	98.3	100.2	99.9	100.0	99.9
250.0	97.5	96.5	99.2	99.4	100.9	101.1	101.4	103.0	103.0	103.0
315.0	97.6	97.0	101.0	101.0	103.7	103.0	104.2	104.8	104.4	104.5
400.0	100.1	100.4	103.7	103.7	105.4	106.1	105.8	107.0	108.0	107.4
500.0	100.7	100.9	103.3	103.2	104.9	104.8	104.8	106.1	106.1	105.9
630.0	98.3	98.4	102.0	102.1	104.0	104.2	104.5	106.0	106.1	106.2
800.0	99.2	100.1	98.1	99.1	101.7	101.8	102.4	103.9	104.1	103.9
1000.0	96.0	95.0	99.0	99.6	102.6	102.9	105.1	104.4	104.5	104.4
1250.0	94.0	94.4	96.2	96.4	102.4	102.5	103.9	106.2	106.4	106.3
1600.0	93.3	93.4	97.1	96.9	103.4	103.4	106.0	107.9	108.0	107.9
2000.0	94.2	94.6	98.7	98.5	104.4	104.5	106.2	108.3	108.3	108.3
2500.0	97.4	98.1	100.8	100.1	103.3	103.8	105.4	107.9	107.8	107.9
3150.0	101.1	101.2	103.0	102.7	104.9	104.9	108.1	109.9	110.3	109.9
4000.0	98.1	97.7	99.6	99.1	100.3	100.7	103.1	104.0	104.4	104.1
5000.0	98.8	98.9	100.5	99.9	101.8	102.4	104.1	105.0	105.2	104.9
6300.0	98.4	98.6	100.4	99.9	101.4	102.2	103.1	103.8	104.1	103.9
8000.0	98.5	98.7	99.8	99.9	101.2	101.6	103.0	103.8	103.9	104.0
10000.0	95.1	95.3	96.3	96.5	98.2	98.5	100.5	102.3	101.8	102.5
12500.0	98.0	98.1	98.8	98.9	101.0	101.3	103.4	105.6	105.3	105.6
16000.0	114.0	114.3	115.0	115.0	117.7	117.8	120.1	122.3	122.0	122.7
20000.0	110.9	110.9	111.7	111.7	114.3	114.5	117.1	119.2	119.1	119.5

Table 33: SBN09_z - Acceleration [dB re. 1 μm/s²].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	52.5	52.2	53.3	52.3	54.7	51.7	57.7	51.7	57.1	51.4
1.2	54.0	50.8	56.9	52.9	58.1	51.1	65.3	53.8	68.2	54.9
1.6	64.4	52.4	69.2	65.0	69.5	59.2	72.0	61.5	74.6	61.1
2.0	51.8	50.5	53.0	51.2	53.5	51.4	57.2	57.5	58.5	56.6
2.5	51.6	50.4	54.5	53.4	56.2	52.9	55.3	65.5	66.4	64.8
3.15	73.9	73.9	62.9	63.3	59.0	57.2	62.4	58.2	59.8	58.0
4.0	57.5	57.9	85.0	84.8	58.7	59.1	61.5	70.9	69.5	69.6
5.0	67.7	68.6	80.6	80.5	86.0	85.3	63.2	80.1	78.9	79.0
6.3	73.8	76.2	83.9	83.5	92.3	91.6	89.7	98.7	102.2	99.1
8.0	67.6	67.9	78.1	77.7	86.3	83.0	82.1	92.5	96.2	93.1
10.0	78.0	77.3	82.1	81.2	79.4	80.9	89.1	96.4	90.5	95.8
12.5	81.2	80.7	77.7	77.6	82.9	83.9	90.2	93.7	93.9	93.6
16.0	82.4	82.4	83.3	84.3	84.8	82.0	85.6	92.8	93.0	92.6
20.0	76.1	75.7	75.9	75.1	79.7	78.4	86.2	88.1	86.3	88.5
25.0	79.5	78.9	83.8	83.3	82.5	81.3	87.3	92.7	91.9	93.1
31.5	92.8	92.9	90.1	89.8	94.2	91.4	94.6	96.4	97.1	96.8
40.0	84.1	83.3	88.2	88.0	93.3	89.7	93.3	98.6	97.4	96.7
50.0	83.7	82.2	88.8	88.2	95.8	95.4	91.9	93.8	93.9	93.8
63.0	87.5	86.2	93.0	93.0	97.6	96.7	99.9	97.4	97.3	97.6
80.0	82.7	82.5	88.5	88.2	89.5	89.5	90.2	90.9	91.9	90.3
100.0	80.6	79.3	84.5	83.7	85.8	85.2	84.2	88.2	87.1	86.9
125.0	84.3	84.7	85.6	85.7	87.7	86.7	87.2	93.7	92.6	94.0
160.0	82.0	81.8	83.4	83.0	84.8	84.2	85.3	86.9	86.8	86.7
200.0	82.1	81.8	85.2	84.9	86.9	87.0	86.9	87.6	88.2	86.8
250.0	89.2	88.5	89.7	90.1	90.5	90.9	92.5	92.8	93.0	91.2
315.0	87.0	86.7	89.5	89.1	90.9	90.9	91.5	93.2	92.6	91.4
400.0	89.4	89.4	91.0	90.8	92.1	91.9	92.7	93.4	94.6	92.4
500.0	91.6	91.3	92.6	92.0	93.9	93.3	94.4	94.8	95.9	92.9
630.0	90.2	90.0	91.0	90.8	92.8	92.6	93.8	94.2	95.7	92.2
800.0	94.4	94.2	90.3	90.7	91.8	91.6	92.9	93.8	94.8	91.6
1000.0	90.2	89.4	91.5	91.5	95.1	95.4	98.9	94.4	95.5	91.5
1250.0	88.9	89.2	89.7	89.1	91.4	90.7	92.3	93.7	95.3	91.1
1600.0	90.2	90.2	91.1	90.1	94.5	94.2	98.3	97.3	99.2	92.9
2000.0	88.9	88.6	92.0	90.8	93.6	93.3	95.2	96.3	98.3	92.1
2500.0	87.9	87.8	89.6	88.0	92.1	90.9	93.5	93.9	96.0	89.1
3150.0	86.1	85.8	88.9	87.3	91.8	90.4	93.5	94.3	97.4	88.4
4000.0	86.6	86.3	89.9	88.7	93.7	91.6	94.6	94.8	99.0	89.2
5000.0	85.6	85.4	87.9	85.9	91.6	89.9	93.1	92.9	98.2	88.0
6300.0	84.1	83.7	86.1	84.8	89.2	89.1	91.1	91.6	95.5	90.1
8000.0	82.8	81.8	83.2	82.9	88.0	87.8	90.2	91.6	94.5	90.5
10000.0	80.9	79.9	83.4	83.2	89.0	89.5	92.1	93.1	95.0	92.5
12500.0	81.4	81.1	83.8	84.1	90.1	90.3	93.0	97.3	98.3	96.7
16000.0	83.0	82.7	86.2	86.7	92.5	93.2	94.9	96.0	98.3	95.2
20000.0	83.9	83.5	88.1	89.2	94.6	95.9	97.3	98.6	100.2	98.5

Table 34: SBN10_z - Acceleration [dB re. 1 μm/s^2].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	53.7	50.7	54.8	52.1	54.5	52.3	56.8	52.4	57.0	53.0
1.2	54.3	51.7	57.1	53.5	58.4	52.7	65.2	52.9	68.3	55.1
1.6	63.1	53.0	68.1	64.1	68.0	58.6	71.5	61.3	74.4	61.0
2.0	51.9	51.5	52.4	51.1	56.5	54.6	57.3	57.6	58.8	57.4
2.5	51.3	51.1	53.2	52.1	53.7	52.3	53.4	65.6	66.2	65.4
3.15	79.5	79.9	60.0	59.9	57.1	56.9	58.8	57.5	58.4	58.0
4.0	62.4	63.2	86.2	85.9	66.2	64.6	63.4	72.7	71.4	71.3
5.0	67.5	67.8	81.8	81.6	86.0	85.2	65.2	81.9	80.8	80.7
6.3	76.1	72.8	80.7	80.0	92.1	91.4	95.8	101.6	104.1	100.8
8.0	69.2	68.3	81.1	80.4	84.2	79.3	80.5	95.3	98.1	94.8
10.0	75.8	75.4	84.5	83.2	80.6	81.6	83.1	84.3	86.8	85.0
12.5	80.6	80.1	80.3	79.7	83.8	82.2	89.7	94.6	91.6	91.2
16.0	85.3	84.1	85.7	84.4	86.4	82.9	85.7	91.0	90.1	89.0
20.0	78.2	78.3	82.5	82.3	90.0	89.3	93.8	92.7	91.0	94.2
25.0	83.0	82.1	86.3	85.1	89.8	88.8	90.5	98.6	97.1	99.6
31.5	93.0	93.2	90.0	89.7	95.5	92.9	94.2	99.2	97.3	100.0
40.0	88.3	87.4	95.3	94.9	94.6	92.7	97.9	98.3	98.4	97.1
50.0	87.4	86.5	93.2	92.9	99.2	98.4	97.3	98.7	99.1	98.2
63.0	89.8	89.3	95.0	95.1	97.6	97.2	101.0	99.9	99.7	99.2
80.0	82.8	81.4	88.7	88.2	90.3	89.2	92.0	94.2	95.2	92.8
100.0	84.7	85.7	87.5	88.1	87.5	86.5	86.2	87.9	89.3	88.4
125.0	89.9	90.2	91.5	91.3	92.5	91.8	94.6	94.4	95.4	94.6
160.0	84.4	84.2	85.8	85.5	87.9	87.5	88.3	89.4	90.5	88.9
200.0	82.7	82.7	84.3	84.0	86.3	86.1	88.1	87.8	88.6	86.0
250.0	89.6	88.7	90.7	90.5	90.9	91.1	91.4	92.2	92.7	91.2
315.0	87.2	87.0	90.3	90.6	93.0	93.3	92.8	93.3	94.0	92.4
400.0	87.9	88.0	89.7	89.1	90.7	90.8	90.8	90.8	92.4	90.8
500.0	89.8	89.8	90.9	90.1	92.1	91.7	92.6	92.3	93.3	90.9
630.0	86.7	86.7	88.3	87.9	89.6	89.4	90.1	90.1	91.4	88.2
800.0	86.3	86.2	84.3	84.4	86.7	86.2	87.5	87.5	88.9	84.9
1000.0	84.1	82.7	85.0	84.6	87.1	86.5	89.7	86.6	88.2	84.1
1250.0	82.3	82.3	82.6	81.6	84.6	84.1	86.0	86.4	88.5	83.4
1600.0	81.7	81.4	82.6	81.3	85.3	84.8	88.0	87.1	89.2	83.5
2000.0	80.8	80.6	83.2	82.0	85.1	84.3	86.9	86.6	89.2	83.1
2500.0	81.0	80.8	83.0	81.0	84.0	83.3	86.2	85.4	88.2	81.9
3150.0	81.9	81.7	83.9	81.6	84.9	83.7	87.1	85.8	89.7	82.3
4000.0	82.1	81.8	84.3	82.4	85.5	84.5	87.5	86.4	90.2	83.5
5000.0	82.8	82.5	82.5	80.3	83.7	83.0	86.2	85.9	89.4	84.2
6300.0	81.9	81.2	81.3	79.9	83.1	83.3	85.3	86.4	87.9	85.4
8000.0	81.8	80.9	80.1	80.1	83.4	84.1	86.7	88.6	90.1	87.3
10000.0	80.9	80.4	80.9	81.2	85.1	86.4	88.9	90.8	92.2	89.9
12500.0	80.6	80.6	81.3	82.1	85.8	87.0	88.9	92.3	92.5	91.8
16000.0	82.7	82.7	84.9	86.1	89.6	91.2	92.4	95.7	95.4	96.0
20000.0	82.4	82.0	85.3	86.9	90.8	92.6	93.6	96.9	95.6	97.6

Table 35: SBN11_z - Acceleration [dB re. 1 μm/s²].

Frequency [Hz]	BG Noise	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	57.9	56.5	55.4	54.9	55.1	55.9	55.7	57.5	53.2	56.7	54.3
1.2	57.5	58.3	56.8	56.0	55.6	54.4	59.3	58.1	55.7	59.4	54.8
1.6	61.1	63.2	57.2	64.4	60.5	66.4	61.4	67.3	58.9	67.8	59.2
2.0	60.2	60.1	58.8	57.8	58.7	57.2	60.6	59.1	58.4	60.5	57.1
2.5	62.0	61.0	59.8	59.0	59.2	57.9	61.3	59.6	64.8	65.7	63.7
3.15	62.0	74.8	75.7	62.0	61.7	60.3	62.7	62.7	61.8	63.1	60.2
4.0	62.5	63.1	63.3	70.6	71.7	64.0	64.3	61.5	66.2	64.8	65.8
5.0	64.1	66.1	63.7	67.4	68.1	82.1	81.5	64.4	74.8	72.0	74.7
6.3	65.4	76.3	77.2	74.9	75.3	88.2	87.6	93.4	91.1	94.5	91.2
8.0	67.1	68.2	67.1	75.9	75.6	82.8	77.0	74.8	85.1	88.5	85.5
10.0	67.2	79.5	79.9	83.7	82.8	81.5	80.3	81.5	93.5	94.2	94.9
12.5	69.0	75.4	74.6	78.9	78.3	86.5	82.0	86.3	92.2	91.3	92.1
16.0	73.4	74.2	73.4	75.8	75.4	80.3	79.5	79.6	89.8	89.2	90.0
20.0	71.4	76.7	76.5	77.1	76.3	79.7	79.1	87.7	88.7	87.6	90.4
25.0	71.9	79.6	78.6	82.2	81.6	90.1	89.7	89.9	90.4	91.2	89.5
31.5	77.8	90.3	90.6	84.6	84.0	89.4	88.1	89.9	91.7	92.5	91.1
40.0	87.5	89.1	88.6	94.5	94.0	93.1	92.3	95.3	97.9	98.1	97.8
50.0	86.3	87.9	87.5	90.3	89.8	93.3	93.2	94.2	95.6	94.2	94.9
63.0	87.5	88.6	88.2	91.1	91.2	95.2	95.0	97.5	96.6	96.9	97.0
80.0	91.7	92.3	92.1	92.8	93.0	93.1	93.2	93.8	95.7	94.6	96.3
100.0	99.3	100.1	99.9	100.5	100.7	101.2	100.6	100.7	101.2	101.6	101.6
125.0	116.4	116.4	116.2	116.3	116.5	116.5	116.5	117.1	117.1	117.4	117.5
160.0	117.0	117.0	116.9	116.9	117.0	117.0	117.2	117.4	117.3	117.4	117.6
200.0	114.4	114.4	114.3	114.3	114.4	114.3	114.4	114.8	114.5	114.8	114.8
250.0	114.3	114.3	114.1	114.3	114.4	114.5	114.6	115.0	114.8	115.0	115.2
315.0	116.3	116.1	115.9	116.0	116.1	116.3	116.3	116.7	116.6	116.9	117.0
400.0	116.0	116.0	115.8	115.9	116.0	116.0	116.3	116.5	116.3	116.3	116.4
500.0	116.6	116.7	116.5	116.6	116.6	116.8	116.8	117.2	117.1	117.2	117.2
630.0	113.9	113.9	113.7	113.8	113.8	114.0	113.9	114.3	114.1	114.3	114.3
800.0	116.7	116.7	116.6	116.6	116.6	116.7	116.7	116.9	116.9	116.9	117.0
1000.0	114.1	114.0	113.9	113.9	114.0	114.1	114.1	114.3	114.2	114.3	114.3
1250.0	119.1	119.0	118.9	119.0	119.0	119.1	119.1	119.3	119.1	119.3	119.3
1600.0	121.2	121.1	120.9	121.0	121.0	121.0	121.1	121.2	121.0	121.2	120.9
2000.0	122.0	122.0	121.8	121.9	121.9	122.0	122.0	122.2	122.1	122.2	122.3
2500.0	116.8	116.7	116.5	116.6	116.7	116.8	116.8	117.0	116.9	117.1	117.0
3150.0	121.2	121.1	120.9	121.0	121.0	121.1	121.2	121.3	121.1	121.4	121.3
4000.0	126.0	125.9	125.8	125.9	125.9	125.9	126.0	126.2	126.1	126.2	126.2
5000.0	124.1	124.0	123.9	124.0	124.1	124.2	124.1	124.4	124.3	124.4	124.4
6300.0	127.9	127.9	127.7	127.9	128.0	128.1	128.0	128.4	128.3	128.4	128.9
8000.0	132.4	132.3	132.2	132.2	132.2	132.2	132.4	132.5	132.3	132.6	132.1
10000.0	132.8	132.7	132.6	132.5	132.4	132.4	132.8	132.9	132.5	132.9	131.8
12500.0	138.1	138.0	137.8	137.5	137.2	137.1	137.9	137.7	137.2	137.8	136.2
16000.0	141.2	140.9	140.6	139.8	139.4	139.1	140.5	139.9	139.1	140.1	137.8
20000.0	145.2	144.7	144.5	143.0	142.5	141.7	144.1	142.8	141.5	143.1	139.4

Table 36: SBN12_z - Acceleration [dB re. 1 μm/s²].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	51.4	51.2	80.6	51.3	53.5	50.6	54.5	49.8	54.4	51.8
1.2	52.5	50.3	81.0	53.3	56.4	50.6	63.4	52.7	67.7	52.3
1.6	62.8	54.4	81.4	65.5	66.1	57.4	70.9	63.1	74.1	62.8
2.0	52.7	51.9	81.2	53.6	56.6	52.4	58.2	54.4	54.5	54.8
2.5	51.5	51.5	80.7	52.6	52.3	52.2	52.7	60.7	59.7	61.6
3.15	86.7	87.3	80.2	59.4	59.2	59.4	59.3	60.0	60.9	61.1
4.0	69.1	70.2	81.4	75.1	66.4	65.2	64.5	64.6	62.6	64.0
5.0	56.6	57.4	79.5	71.2	73.7	73.1	59.6	73.3	69.3	73.0
6.3	75.0	77.5	80.4	77.2	80.8	80.0	73.0	82.1	83.5	82.9
8.0	69.1	68.1	77.1	67.8	79.0	79.3	78.0	77.1	78.1	77.8
10.0	71.8	71.5	80.7	77.2	77.2	79.4	87.6	94.8	93.9	95.2
12.5	71.8	71.5	77.3	74.3	76.7	81.8	79.6	92.5	92.1	91.5
16.0	73.1	72.0	76.5	75.7	76.3	75.5	81.9	89.8	89.8	89.3
20.0	72.8	71.5	76.9	76.1	83.2	82.8	86.0	85.6	85.9	86.9
25.0	81.0	80.8	85.8	84.9	88.9	88.1	88.6	94.7	94.5	95.1
31.5	95.3	94.9	89.8	89.4	94.6	92.2	94.4	98.7	97.0	100.0
40.0	84.1	84.3	88.1	87.5	89.9	86.7	88.4	92.7	93.7	91.2
50.0	91.5	92.8	94.6	96.0	94.6	92.6	97.9	96.9	97.4	96.5
63.0	95.7	96.2	96.2	96.4	95.9	95.7	95.4	95.7	95.7	95.5
80.0	82.2	81.5	83.8	83.3	86.6	87.0	87.1	86.7	87.0	86.3
100.0	81.6	81.8	84.3	83.3	82.5	82.8	82.6	83.3	83.6	82.9
125.0	91.4	90.8	92.1	91.9	91.0	91.1	91.0	91.8	91.7	91.3
160.0	92.9	92.7	94.1	93.9	93.7	93.0	93.0	92.6	93.1	92.1
200.0	92.7	92.8	93.6	93.4	93.0	93.8	92.9	92.5	92.7	92.3
250.0	98.3	98.0	98.1	98.5	97.6	98.8	98.0	98.1	97.8	98.5
315.0	105.0	105.2	104.9	105.2	104.1	104.1	103.4	103.6	103.1	103.1
400.0	107.1	107.2	107.2	107.1	106.9	106.9	107.2	106.7	107.2	107.0
500.0	119.6	119.2	119.3	119.1	120.4	120.2	121.2	121.5	121.5	121.5
630.0	105.4	105.4	105.0	105.0	105.9	105.7	106.4	106.7	106.9	107.1
800.0	113.5	113.7	114.0	113.6	113.9	114.0	113.2	113.6	112.1	112.7
1000.0	109.9	109.6	110.0	109.8	110.6	110.8	112.2	111.3	112.6	112.2
1250.0	106.3	106.1	105.9	106.1	106.2	106.3	107.8	107.4	108.9	108.5
1600.0	109.0	109.0	107.8	108.3	107.1	106.6	106.7	106.6	106.2	106.2
2000.0	107.8	107.5	107.0	107.0	106.7	106.4	106.2	105.8	106.0	105.8
2500.0	107.7	107.5	107.7	107.6	107.3	107.1	106.6	106.3	106.3	106.2
3150.0	104.1	104.1	104.3	104.1	103.7	103.6	103.6	103.6	103.7	103.7
4000.0	111.3	111.3	111.4	111.4	111.0	110.9	111.0	111.1	111.4	111.5
5000.0	112.9	112.7	113.3	112.8	113.0	112.8	112.7	112.6	112.5	112.6
6300.0	106.8	106.6	107.2	106.8	107.0	106.9	106.7	107.3	107.8	107.0
8000.0	102.6	102.6	103.6	102.7	103.0	103.2	103.2	103.4	103.1	103.6
10000.0	100.6	100.4	101.8	100.4	101.0	100.9	101.0	101.3	101.3	101.4
12500.0	97.2	96.9	99.3	97.1	98.0	97.9	98.0	98.4	98.7	98.5
16000.0	97.9	97.8	99.7	98.0	98.6	98.7	98.7	98.6	99.3	98.8
20000.0	98.6	98.4	99.7	98.7	99.3	99.3	99.3	98.9	99.5	99.1

Table 37: SBN13_z - Acceleration [dB re. 1 μm/s²].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	49.3	50.2	49.2	49.5	49.1	49.0	50.4	48.8	49.3	48.7
1.2	49.0	50.4	50.9	50.4	49.9	50.7	51.5	49.9	52.8	51.4
1.6	52.5	50.1	55.5	52.3	57.0	51.4	57.4	53.1	58.4	51.8
2.0	51.6	50.5	52.0	51.5	51.4	51.2	51.4	51.4	51.5	51.6
2.5	50.7	50.5	51.4	51.6	52.2	51.6	51.7	53.5	54.4	53.2
3.15	67.2	67.4	58.0	58.4	53.9	54.6	56.2	60.1	61.0	62.0
4.0	54.9	56.2	85.1	84.9	60.8	61.9	68.1	59.6	58.4	62.2
5.0	64.8	62.4	80.7	80.5	80.5	79.6	58.5	62.5	61.2	61.8
6.3	76.6	75.5	71.2	71.3	86.6	85.7	78.7	84.0	84.5	81.3
8.0	65.4	65.5	72.5	71.8	75.9	75.6	74.6	78.3	79.1	76.4
10.0	60.0	59.8	66.7	64.9	70.2	70.0	77.5	79.0	74.7	80.0
12.5	66.9	65.5	65.7	64.7	77.8	76.9	74.3	78.0	77.7	76.2
16.0	73.3	73.0	74.3	73.5	76.9	76.8	77.8	84.7	84.7	85.3
20.0	71.8	71.4	74.4	74.1	77.8	76.2	81.0	87.1	84.6	87.1
25.0	74.7	73.6	78.2	77.4	83.8	82.3	82.7	87.7	86.0	87.2
31.5	78.0	78.8	78.9	78.6	82.4	80.7	82.5	87.6	86.9	87.1
40.0	74.1	74.0	77.0	77.1	80.7	79.1	81.8	85.3	84.2	85.6
50.0	85.5	85.2	85.8	85.1	87.6	89.4	89.2	91.0	90.9	90.6
63.0	83.7	83.5	84.9	84.9	85.2	84.1	85.6	87.6	86.4	87.3
80.0	82.8	82.6	82.8	83.0	84.3	81.9	82.8	86.1	84.9	86.1
100.0	86.1	85.7	86.5	86.0	88.5	89.0	88.0	92.0	91.7	91.2
125.0	83.6	84.9	84.0	83.7	85.7	86.9	87.5	89.6	88.9	88.6
160.0	92.7	92.8	92.5	92.8	91.9	93.8	94.9	94.8	94.6	95.2
200.0	102.4	102.4	101.8	102.6	102.4	104.1	104.4	104.2	104.8	104.6
250.0	93.2	92.6	93.3	92.9	93.9	96.7	96.9	96.9	97.3	97.2
315.0	99.2	99.2	98.9	98.8	99.0	99.9	100.5	100.1	100.6	100.6
400.0	102.0	101.7	101.5	101.7	101.5	102.8	102.5	103.3	102.9	102.9
500.0	103.8	103.9	103.8	103.8	103.9	105.7	105.6	105.4	105.4	105.4
630.0	104.7	104.7	104.8	104.7	104.5	105.9	105.8	106.2	105.6	105.7
800.0	101.8	101.9	102.0	102.0	102.0	104.1	104.1	104.1	103.8	103.9
1000.0	103.4	103.6	103.5	103.6	103.1	105.2	105.1	105.2	104.9	105.0
1250.0	101.3	101.1	101.2	101.2	101.1	103.9	103.2	103.9	103.1	102.9
1600.0	103.4	103.3	103.5	103.4	103.8	104.5	104.9	103.9	104.7	104.6
2000.0	107.5	107.9	107.3	108.0	107.3	108.9	107.7	108.5	108.4	108.4
2500.0	109.2	109.2	109.4	109.2	109.2	107.6	107.7	107.9	108.0	108.0
3150.0	105.2	104.6	104.8	105.2	105.3	104.8	104.8	103.6	104.5	104.2
4000.0	105.0	104.8	104.8	105.1	104.7	105.5	106.1	105.2	105.3	105.7
5000.0	103.7	103.8	103.9	103.8	103.7	104.1	104.1	104.3	104.1	104.4
6300.0	101.4	101.7	101.6	101.9	101.4	101.8	101.6	102.0	101.8	102.4
8000.0	101.1	101.3	101.7	101.9	100.9	101.6	101.6	101.9	101.2	101.8
10000.0	104.4	104.8	105.5	105.9	103.9	105.5	105.4	105.0	104.1	104.5
12500.0	102.2	102.4	102.9	103.2	101.7	102.5	102.4	102.4	101.9	102.8
16000.0	102.1	102.0	102.4	102.7	101.7	101.7	102.0	102.7	101.8	102.4
20000.0	107.6	107.6	108.2	108.3	107.1	106.7	106.9	107.2	106.0	106.9

Table 38: SBN14_x - Acceleration [dB re. 1 $\mu m/s^2$].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	51.4	47.8	51.2	47.6	51.7	48.7	56.4	49.5	56.2	47.0
1.2	59.2	49.4	63.0	55.7	64.5	55.5	71.4	57.4	74.9	56.1
1.6	66.4	54.0	72.3	69.1	70.3	60.7	77.8	63.4	81.0	63.8
2.0	52.3	51.6	51.0	51.1	52.8	51.2	56.3	52.0	54.3	52.2
2.5	49.8	49.6	51.3	51.9	50.6	50.8	52.8	53.9	53.5	53.2
3.15	63.7	66.6	67.1	67.1	61.4	60.7	64.8	63.0	63.1	65.6
4.0	51.2	52.7	63.7	59.4	63.0	63.4	66.5	64.5	64.5	63.8
5.0	50.7	50.4	60.6	58.5	65.9	64.9	56.5	71.6	73.0	71.3
6.3	74.6	72.2	67.1	66.3	74.2	73.3	90.8	83.4	83.6	81.4
8.0	63.9	63.4	71.4	70.6	73.1	69.8	71.4	77.6	78.1	76.3
10.0	70.5	71.6	67.4	66.9	66.7	70.1	75.1	79.6	76.6	78.6
12.5	71.6	72.0	72.2	72.5	73.7	76.8	85.5	76.6	76.6	75.7
16.0	85.5	85.8	85.6	85.9	85.4	85.2	85.4	86.2	85.9	85.7
20.0	66.9	66.4	67.8	66.6	72.0	71.3	74.9	81.0	80.2	81.5
25.0	68.1	68.1	71.0	70.4	73.9	72.0	74.1	80.9	77.9	80.0
31.5	81.7	81.8	81.1	81.1	81.5	77.2	79.5	81.8	81.4	80.7
40.0	78.8	78.1	80.3	79.8	80.4	84.4	84.7	86.9	85.7	85.8
50.0	95.8	95.6	95.5	95.5	95.6	98.7	98.3	99.0	98.2	98.4
63.0	85.3	85.2	85.2	85.7	86.0	87.2	88.3	88.7	88.6	89.0
80.0	82.2	82.2	83.0	83.0	83.9	83.0	83.1	84.9	84.5	85.3
100.0	92.0	92.0	91.8	91.8	91.6	93.4	93.6	94.1	94.0	94.2
125.0	92.5	92.8	91.0	91.1	91.1	90.6	90.8	91.3	90.8	91.0
160.0	96.0	96.0	96.1	95.5	96.1	94.8	95.0	95.5	94.5	95.3
200.0	107.9	107.4	107.2	107.6	107.3	107.4	107.5	107.7	108.1	107.9
250.0	105.7	104.7	105.6	105.2	106.2	107.8	108.4	108.1	109.0	108.9
315.0	113.5	113.6	113.3	113.5	113.1	116.2	117.3	116.9	117.3	117.5
400.0	106.2	106.3	105.8	106.1	105.5	106.2	106.6	106.2	106.4	106.3
500.0	99.5	99.3	99.5	99.5	99.5	101.9	101.4	101.7	101.0	101.1
630.0	102.7	102.2	102.6	102.5	102.2	104.7	104.6	105.2	104.4	104.4
800.0	102.8	102.9	102.8	102.8	102.6	104.2	104.4	104.9	104.3	104.7
1000.0	101.7	101.6	101.8	101.8	101.8	103.6	103.8	104.1	103.6	103.7
1250.0	95.5	95.4	95.3	95.4	95.1	98.2	98.4	97.7	98.1	98.1
1600.0	99.4	99.4	99.4	99.3	99.1	100.4	100.8	100.8	101.1	101.2
2000.0	96.1	95.8	96.1	96.0	95.3	97.2	97.1	97.3	97.5	97.7
2500.0	101.0	100.9	101.0	101.1	100.9	99.1	98.6	98.7	98.7	98.5
3150.0	98.1	97.6	97.6	97.8	97.3	96.4	96.4	96.0	96.4	96.1
4000.0	89.1	88.6	88.8	89.0	88.8	89.4	89.6	89.4	89.8	90.0
5000.0	86.4	86.8	85.8	86.7	84.6	85.1	85.0	85.4	85.1	85.5
6300.0	90.8	91.0	90.8	91.0	90.4	90.2	90.3	90.2	90.5	90.9
8000.0	92.7	92.9	93.2	93.4	92.5	93.1	93.0	93.4	92.7	93.4
10000.0	94.3	94.5	94.9	95.2	94.0	94.8	94.8	94.8	94.1	94.4
12500.0	96.9	96.9	97.1	97.4	96.3	97.0	96.9	97.2	96.7	97.4
16000.0	97.9	97.7	98.0	98.3	97.4	97.5	97.8	98.8	97.8	98.4
20000.0	107.1	107.1	107.6	107.7	106.8	106.5	106.7	106.7	105.9	106.3

Table 39: SBN14_y - Acceleration [dB re. 1 μm/s²].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	53.8	51.2	55.6	52.2	56.3	51.5	57.6	52.2	57.4	51.9
1.2	52.7	51.7	53.6	51.1	55.9	51.1	56.5	52.0	60.0	52.0
1.6	65.6	52.6	69.3	60.7	71.8	61.3	71.0	62.5	72.3	63.1
2.0	52.2	52.5	53.4	52.2	55.9	52.5	59.8	60.8	62.0	60.6
2.5	53.5	52.7	57.4	56.9	61.5	56.3	59.4	69.6	70.8	69.1
3.15	80.2	81.1	63.4	63.6	63.8	61.7	64.1	61.0	63.1	61.7
4.0	62.8	64.2	65.6	65.7	69.9	67.3	67.0	66.9	67.1	67.4
5.0	62.8	61.8	62.9	62.5	65.2	62.8	60.9	75.6	76.2	75.2
6.3	74.1	73.0	70.1	70.5	67.6	65.8	78.1	65.2	68.1	66.2
8.0	66.7	65.0	70.1	70.0	80.3	76.0	76.9	72.8	70.7	74.3
10.0	65.3	64.2	67.2	67.2	76.1	76.7	79.4	84.4	83.8	85.0
12.5	68.3	68.8	68.7	68.3	75.4	73.0	80.0	86.9	81.1	85.5
16.0	76.5	76.8	77.8	77.9	78.3	75.2	80.5	84.8	81.6	83.8
20.0	68.1	67.8	71.5	70.7	76.7	75.0	78.5	84.8	82.2	85.4
25.0	71.0	70.8	75.0	74.7	79.5	76.9	80.2	89.4	88.8	89.2
31.5	82.0	82.5	79.4	79.1	83.9	81.5	84.4	89.1	89.4	87.9
40.0	78.7	78.2	82.4	82.0	83.9	83.3	85.4	90.8	89.4	89.1
50.0	90.0	90.2	90.2	90.8	89.0	90.0	89.6	93.2	93.1	91.7
63.0	85.6	85.3	86.8	86.5	88.5	87.1	87.4	90.3	89.5	90.4
80.0	80.9	80.4	83.0	82.6	85.2	84.4	84.9	90.1	88.2	89.8
100.0	89.4	89.1	88.9	88.8	88.6	88.3	86.3	92.1	90.7	90.6
125.0	87.3	87.9	87.9	87.8	89.1	89.9	90.5	92.3	91.7	91.6
160.0	92.2	92.4	92.3	92.4	92.3	94.4	95.3	95.9	95.6	95.9
200.0	95.1	95.0	95.2	94.9	95.5	94.7	94.6	95.2	95.1	94.8
250.0	94.8	94.6	95.0	94.8	95.1	97.5	96.9	97.2	97.3	97.2
315.0	98.7	98.9	98.6	98.7	99.2	101.0	101.1	101.1	100.9	101.0
400.0	97.4	97.3	97.1	97.5	97.2	98.8	98.5	98.8	98.9	99.1
500.0	99.3	99.1	99.5	99.2	99.4	100.7	100.7	101.0	100.8	101.1
630.0	100.4	100.1	100.5	100.3	100.5	102.2	101.9	102.5	101.9	102.2
800.0	102.0	101.8	102.2	101.9	102.1	103.3	102.7	103.4	102.8	103.1
1000.0	99.1	99.2	99.2	99.2	99.0	100.1	100.1	100.1	99.8	99.9
1250.0	100.7	100.4	100.8	100.6	100.4	102.6	102.4	102.9	102.6	102.6
1600.0	109.7	109.9	109.5	109.8	108.7	110.0	110.0	109.7	110.3	110.4
2000.0	103.6	103.5	103.4	103.5	103.1	104.1	103.7	104.2	103.8	103.8
2500.0	105.7	105.5	105.5	105.7	105.3	104.0	103.8	104.0	104.0	104.1
3150.0	105.2	104.8	104.6	104.9	104.2	103.3	103.1	102.1	102.8	102.4
4000.0	93.7	93.8	93.7	94.0	93.6	94.8	94.5	94.6	94.7	95.1
5000.0	94.9	95.4	94.3	95.3	92.3	92.6	92.0	92.8	92.3	92.6
6300.0	93.2	93.1	93.2	93.2	92.9	93.1	93.0	93.4	93.3	93.8
8000.0	92.0	92.1	92.5	92.7	91.8	92.5	92.4	92.7	92.1	92.9
10000.0	92.7	92.8	93.2	93.6	92.2	93.3	93.1	93.0	92.4	92.8
12500.0	92.5	92.6	92.9	93.2	92.1	92.7	92.5	92.8	92.3	93.0
16000.0	95.6	95.5	95.9	96.2	95.2	95.3	95.6	96.5	95.5	96.3
20000.0	100.0	99.9	100.6	100.7	99.7	99.3	99.5	99.6	98.7	99.3

Table 40: SBN14_z - Acceleration [dB re. 1 μm/s^2*].*

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	52.6	49.0	52.7	49.5	54.5	48.2	56.7	51.0	56.2	51.4
1.2	52.3	48.9	52.7	49.9	53.4	50.0	55.7	50.7	57.1	49.6
1.6	64.9	50.9	68.3	59.6	70.9	59.7	70.0	61.8	71.1	62.3
2.0	51.6	50.8	52.1	49.5	54.9	52.9	59.3	60.3	61.0	59.3
2.5	52.1	50.9	56.9	56.0	60.3	55.2	58.7	68.8	69.8	67.9
3.15	79.5	80.4	63.5	63.7	62.8	61.1	62.6	60.0	62.4	60.8
4.0	62.1	63.5	70.7	70.7	70.3	67.7	67.1	66.0	66.5	66.7
5.0	62.5	60.7	66.5	66.5	76.3	75.5	59.9	74.5	75.6	74.5
6.3	78.5	80.4	79.3	79.4	82.6	81.8	85.3	82.0	81.7	79.3
8.0	71.6	70.9	74.0	73.5	83.4	80.9	79.8	77.8	77.5	77.7
10.0	65.6	64.6	72.0	71.9	78.0	78.5	83.3	86.9	88.6	87.5
12.5	69.8	69.9	70.6	70.2	77.7	76.3	83.9	88.0	83.8	87.2
16.0	70.1	70.8	75.8	75.0	77.7	77.9	84.8	87.2	85.1	86.9
20.0	68.5	68.2	71.6	70.3	77.3	75.6	79.6	88.5	83.7	89.9
25.0	75.1	74.6	78.7	78.1	81.6	78.5	83.7	92.0	89.6	91.5
31.5	87.0	87.1	87.2	87.1	88.8	82.4	86.4	91.6	91.0	90.3
40.0	81.7	81.2	84.8	84.5	87.2	82.9	86.5	92.1	91.9	89.9
50.0	91.7	91.9	91.8	91.1	93.9	93.0	93.4	94.4	94.2	94.4
63.0	85.8	85.9	87.7	87.4	90.4	89.9	89.9	93.2	93.0	93.8
80.0	85.1	85.0	85.2	85.4	85.6	83.6	84.5	88.3	87.0	88.9
100.0	85.3	85.8	85.8	86.1	88.1	86.6	86.3	88.7	87.9	87.9
125.0	87.4	87.1	87.6	87.6	88.4	88.7	87.8	90.0	88.8	88.7
160.0	91.2	90.9	91.0	90.9	90.4	91.7	92.0	92.5	92.5	92.3
200.0	88.9	88.5	88.8	88.7	89.0	89.9	89.4	90.1	89.5	89.4
250.0	90.0	89.4	90.1	89.6	89.2	90.3	89.8	91.2	89.9	90.0
315.0	91.3	91.7	91.3	91.6	90.7	93.6	92.4	93.1	92.5	92.6
400.0	96.1	96.2	96.0	96.0	96.2	97.4	97.3	97.4	97.7	97.2
500.0	98.5	98.3	98.2	98.1	97.9	100.6	100.8	100.7	100.7	100.7
630.0	102.5	102.1	102.5	102.3	102.7	104.8	105.1	104.7	105.4	105.4
800.0	95.9	95.9	95.9	96.1	95.9	97.4	97.7	97.4	97.5	97.7
1000.0	97.3	97.1	97.2	97.3	97.3	98.6	98.5	99.4	98.7	98.7
1250.0	97.7	97.5	97.6	97.5	97.5	99.3	99.4	100.3	99.8	99.9
1600.0	101.2	101.2	101.0	101.2	100.5	102.1	101.9	101.4	101.9	102.0
2000.0	100.6	100.2	100.0	100.0	99.9	101.9	101.5	101.5	101.4	101.3
2500.0	96.3	96.1	96.0	96.3	95.7	96.7	96.4	96.7	96.4	96.7
3150.0	95.7	95.3	95.1	95.4	94.6	95.6	96.0	95.6	96.3	96.4
4000.0	86.9	86.7	86.6	86.8	86.2	88.0	88.1	88.5	88.3	88.6
5000.0	84.2	83.9	83.6	84.0	83.8	84.6	84.7	85.0	84.9	85.1
6300.0	88.8	88.0	87.2	87.7	87.4	87.3	87.5	87.5	87.4	87.5
8000.0	90.5	89.2	88.4	89.3	88.2	88.6	88.7	88.8	88.4	88.5
10000.0	101.2	99.5	97.9	99.2	98.0	98.3	98.5	98.6	98.4	98.2
12500.0	95.2	94.6	93.4	94.2	93.5	93.7	93.9	93.8	93.9	93.8
16000.0	89.0	88.0	85.3	86.4	85.5	85.3	85.6	85.6	85.6	85.5
20000.0	81.5	81.1	80.4	80.7	80.5	80.7	80.9	81.2	80.9	81.0

Table 41: SBN15_z - Acceleration [dB re. 1 μm/s²].

Accelerometers (velocity)

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	97.0	94.7	97.8	93.0	99.7	94.7	101.1	94.4	101.3	95.0
1.2	93.7	90.9	93.8	92.7	95.1	92.5	99.7	92.5	98.6	93.3
1.6	105.0	91.6	108.9	102.3	110.9	100.5	109.9	101.5	110.6	102.2
2.0	89.4	88.9	92.5	90.1	96.8	96.7	100.7	96.7	98.1	96.0
2.5	89.6	89.5	92.9	91.9	97.2	93.5	94.4	105.1	106.3	104.4
3.15	108.2	109.2	97.9	98.1	100.0	98.1	98.1	99.6	100.8	99.3
4.0	91.5	92.7	109.3	108.9	101.6	98.1	97.6	98.1	97.7	98.6
5.0	96.9	96.4	105.1	104.7	112.2	111.5	95.8	105.4	105.1	105.5
6.3	108.5	110.5	110.0	110.0	118.4	117.7	117.9	115.4	115.3	112.7
8.0	98.1	97.8	99.5	99.1	108.8	104.8	106.2	109.3	109.6	107.0
10.0	93.6	93.9	95.2	93.7	96.8	96.3	107.1	111.7	112.7	112.0
12.5	88.5	88.0	91.9	91.6	100.2	97.5	103.4	105.9	103.1	105.7
16.0	92.6	92.3	94.7	94.3	97.0	96.1	103.3	105.8	105.0	106.6
20.0	90.6	90.0	94.2	93.6	97.4	95.6	100.5	106.8	105.7	109.2
25.0	95.3	94.5	101.1	100.9	104.4	103.6	103.8	109.7	108.8	109.2
31.5	106.4	106.2	104.1	103.9	107.9	106.4	110.2	111.6	112.1	110.7
40.0	97.4	97.1	102.7	102.7	106.9	104.6	109.0	113.6	114.2	112.4
50.0	103.1	102.1	106.9	106.4	111.0	110.1	111.7	113.2	112.8	113.4
63.0	106.8	105.2	111.9	111.7	115.3	114.6	117.0	117.6	117.1	117.8
80.0	102.1	100.8	107.0	106.7	108.4	108.2	109.6	109.6	108.9	110.3
100.0	96.5	95.8	100.4	101.2	104.0	103.5	102.1	103.5	102.1	104.1
125.0	98.1	97.8	101.1	101.5	104.2	103.7	106.1	107.0	107.0	106.8
160.0	85.9	86.5	89.5	88.9	92.9	91.0	93.8	96.2	96.1	96.2
200.0	85.8	85.6	89.2	88.6	92.6	91.5	93.4	96.2	96.6	96.9
250.0	84.5	83.2	84.9	84.9	88.1	87.8	87.9	88.9	89.5	89.2
315.0	77.3	77.2	81.5	80.9	83.8	83.0	83.8	86.2	86.0	86.4
400.0	71.7	71.6	75.7	75.4	79.2	78.5	79.6	81.4	81.1	81.4
500.0	74.5	74.5	76.6	76.2	80.0	79.6	80.5	81.9	81.3	81.7
630.0	71.8	71.5	74.3	74.2	79.0	78.7	79.9	81.8	81.8	81.8
800.0	74.0	74.0	72.7	73.0	79.0	78.8	80.4	82.5	82.6	82.6
1000.0	67.9	67.6	71.8	71.9	77.9	78.0	80.1	81.9	81.8	82.1
1250.0	62.2	62.2	69.1	69.3	75.1	75.2	77.6	80.6	80.7	80.9
1600.0	56.7	56.7	58.2	58.0	64.9	64.6	68.4	68.9	68.9	68.7
2000.0	54.5	54.3	56.8	56.4	60.4	60.1	61.3	63.8	63.6	63.7
2500.0	50.1	49.8	52.4	51.8	56.2	55.9	56.8	59.1	58.2	58.9
3150.0	43.5	43.2	46.0	45.5	50.0	49.2	50.2	53.3	52.7	53.1
4000.0	44.0	43.4	47.1	46.4	51.7	51.2	52.2	55.2	54.8	54.9
5000.0	41.5	40.7	45.8	45.2	51.2	51.0	52.5	55.6	55.3	55.7
6300.0	39.3	38.1	45.7	44.2	50.3	50.5	51.9	54.9	54.7	54.9
8000.0	38.4	37.3	43.5	43.0	48.7	47.9	49.7	51.8	51.9	51.2
10000.0	34.8	33.7	41.2	40.9	45.8	45.9	47.9	48.9	49.0	48.4
12500.0	34.4	33.3	43.0	43.0	46.9	47.6	49.1	50.1	50.2	49.8
16000.0	38.4	37.5	48.5	48.6	51.4	52.7	54.1	54.3	54.4	54.4
20000.0	43.9	42.4	56.4	56.6	58.6	60.1	61.8	61.8	61.7	62.2

Table 42: SBN02_z - Velocity [dB re. 1 nm/s].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	102.9	103.3	104.9	105.0	107.3	108.9	108.4	106.1	107.1	106.7
1.2	101.8	102.5	103.6	103.5	105.1	105.9	105.5	105.4	105.9	106.4
1.6	98.5	97.7	99.5	97.9	100.6	99.2	100.0	99.4	101.2	100.0
2.0	93.9	94.5	96.5	96.0	96.5	96.8	96.9	96.8	97.1	98.5
2.5	93.0	94.0	95.1	95.4	96.3	96.6	96.3	99.2	100.0	99.1
3.15	105.4	104.7	93.0	93.1	92.1	91.7	96.2	99.2	99.7	99.5
4.0	90.7	91.4	116.4	116.5	94.3	94.3	102.3	98.3	96.8	99.5
5.0	96.7	97.3	112.1	112.2	108.1	107.6	94.6	104.9	102.6	104.6
6.3	105.1	106.6	110.1	109.9	114.0	113.6	115.7	112.4	109.2	108.8
8.0	92.4	92.5	97.6	96.9	100.3	98.5	96.5	106.1	103.4	103.0
10.0	86.6	85.0	95.3	95.3	96.4	96.4	104.3	103.8	106.3	104.7
12.5	93.4	91.8	94.2	93.9	99.1	99.2	99.1	104.7	102.8	104.1
16.0	96.2	95.2	99.6	99.0	103.3	102.4	105.2	111.9	112.2	111.6
20.0	97.1	95.8	97.5	96.8	101.2	99.9	107.1	108.9	109.6	109.4
25.0	92.9	91.9	97.5	96.8	102.6	101.6	101.1	105.5	106.8	104.9
31.5	96.5	96.7	96.7	96.2	98.1	96.6	99.0	99.1	99.2	98.5
40.0	89.3	88.6	97.0	96.8	98.6	95.9	101.3	104.2	104.0	103.3
50.0	90.1	89.2	94.8	94.8	100.4	99.5	99.9	101.0	101.3	101.8
63.0	94.4	93.9	98.5	98.2	100.3	100.3	101.5	103.7	103.1	103.4
80.0	86.9	86.1	90.9	91.1	93.4	93.0	94.2	97.6	97.6	97.4
100.0	85.2	84.6	89.5	89.3	91.0	90.9	88.6	90.0	89.7	90.6
125.0	86.8	86.9	88.4	88.4	91.8	91.5	92.5	94.4	95.4	94.3
160.0	82.0	82.3	84.2	84.2	88.2	88.0	88.0	89.3	89.5	89.6
200.0	80.7	80.7	84.0	83.8	87.4	87.0	89.0	91.1	91.3	91.5
250.0	88.1	87.4	88.8	89.4	90.6	90.1	92.5	93.3	93.4	93.4
315.0	84.4	84.0	87.5	87.5	89.9	89.6	90.1	91.0	91.2	91.2
400.0	83.4	83.1	85.9	86.6	88.2	88.5	88.9	89.5	89.5	89.4
500.0	88.5	88.2	90.2	90.0	91.6	91.2	92.0	92.8	92.7	92.7
630.0	85.4	85.1	87.1	87.1	89.1	89.1	89.6	91.3	91.6	91.2
800.0	84.5	85.2	81.8	83.0	84.2	84.2	85.1	86.8	87.2	86.8
1000.0	78.1	77.0	79.9	80.5	83.3	83.1	86.4	85.2	85.1	85.0
1250.0	78.8	78.7	79.4	79.3	82.4	82.2	82.6	89.0	88.8	89.0
1600.0	76.9	76.8	79.7	79.6	84.7	84.7	88.4	84.7	85.0	84.5
2000.0	71.4	71.2	75.9	75.5	77.2	77.1	78.6	80.3	80.6	80.2
2500.0	68.9	68.7	72.1	71.2	74.3	74.6	75.6	77.3	77.4	77.2
3150.0	66.2	65.1	70.9	69.4	72.7	72.9	75.1	75.8	76.0	75.8
4000.0	64.3	63.6	68.7	67.4	71.3	71.3	73.2	73.8	74.0	73.8
5000.0	65.4	64.7	69.2	67.7	72.8	73.2	74.9	74.5	74.9	74.4
6300.0	65.1	64.5	68.6	67.4	72.5	72.6	74.2	73.6	73.8	73.4
8000.0	61.0	60.2	65.1	63.9	68.1	68.5	70.4	69.4	69.6	69.1
10000.0	59.2	57.9	63.9	62.5	67.5	68.6	70.7	68.6	68.8	68.3
12500.0	58.3	57.1	62.4	61.3	65.7	66.8	68.9	67.1	67.2	67.0
16000.0	61.1	59.9	66.1	64.8	69.3	70.7	72.5	70.6	70.6	70.4
20000.0	62.7	61.4	68.6	66.8	72.3	74.2	75.5	73.6	73.7	73.2

Table 43: SBN04_x - Velocity [dB re. 1 nm/s].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	104.4	103.6	104.8	105.2	105.3	106.5	107.9	106.6	107.6	108.1
1.2	104.2	102.9	106.8	104.4	107.7	105.7	112.0	107.7	114.0	108.9
1.6	106.6	99.9	111.3	109.1	110.0	103.4	116.5	105.3	119.3	107.1
2.0	95.0	95.6	96.6	97.7	97.5	97.2	97.7	98.3	98.2	98.7
2.5	94.4	95.0	96.2	95.9	95.9	97.3	96.5	97.1	97.6	98.5
3.15	117.8	118.3	101.8	101.6	96.3	96.2	96.3	97.7	98.0	99.3
4.0	100.6	101.6	101.5	99.7	101.9	99.1	97.7	93.9	94.5	94.1
5.0	88.5	88.8	101.5	100.5	96.0	94.8	95.5	96.4	98.2	98.9
6.3	99.9	98.6	95.0	94.1	98.0	96.3	104.1	114.2	116.2	113.1
8.0	87.1	87.3	100.7	99.7	96.4	95.0	99.6	108.1	110.4	107.4
10.0	99.4	100.4	97.9	97.2	101.2	104.2	105.8	105.7	107.2	106.2
12.5	93.6	93.2	98.0	97.7	107.5	110.8	114.4	116.1	117.2	115.3
16.0	96.4	96.5	96.2	94.7	101.3	100.5	101.8	113.5	114.4	113.0
20.0	93.9	93.4	97.1	95.6	99.1	97.8	103.7	106.3	106.8	106.4
25.0	94.7	94.1	99.9	99.1	102.8	101.6	103.5	107.1	106.9	107.0
31.5	103.0	103.3	97.4	97.1	103.3	102.2	103.8	106.0	106.4	105.8
40.0	95.8	95.5	103.1	102.8	102.4	101.2	105.9	107.9	107.5	107.2
50.0	94.0	93.2	97.8	97.5	110.1	109.6	104.1	105.9	106.4	105.8
63.0	99.2	99.1	101.2	100.6	107.9	107.5	110.3	109.4	109.3	109.1
80.0	92.0	91.8	96.8	97.0	97.0	96.7	97.7	102.2	101.9	102.3
100.0	90.6	90.7	94.2	94.6	98.2	98.3	94.3	96.0	94.6	95.7
125.0	89.4	89.3	92.0	92.4	95.6	95.4	98.8	100.7	100.8	101.0
160.0	87.8	88.1	90.0	89.9	95.4	95.0	94.8	96.0	96.0	96.3
200.0	84.5	84.6	88.2	88.0	92.2	91.8	96.4	96.0	95.6	96.0
250.0	87.7	87.1	90.0	89.8	92.6	92.4	94.1	96.0	95.6	96.0
315.0	83.6	83.1	88.2	88.0	89.3	90.1	89.8	92.7	92.1	92.0
400.0	83.0	83.0	85.0	85.1	87.7	87.5	89.0	89.7	90.3	89.8
500.0	85.2	85.1	86.8	86.6	88.7	88.5	89.8	90.8	91.0	90.9
630.0	84.1	83.6	85.9	85.5	88.4	88.3	89.3	91.6	91.8	91.6
800.0	85.0	85.6	82.4	83.3	87.4	87.1	88.3	90.3	90.4	90.3
1000.0	80.5	78.6	82.0	83.0	86.5	86.9	89.8	88.3	88.2	88.1
1250.0	77.5	77.5	79.8	79.8	82.3	82.0	83.9	92.5	91.9	92.4
1600.0	76.4	75.8	77.7	77.5	81.7	81.5	90.7	88.8	88.9	88.5
2000.0	71.8	71.6	75.5	74.9	78.4	78.3	80.0	86.7	86.9	86.5
2500.0	70.3	70.1	73.6	72.5	77.2	77.4	77.5	79.6	79.9	79.6
3150.0	65.1	64.4	70.4	69.2	72.2	72.6	74.6	75.4	75.7	75.4
4000.0	61.8	61.2	66.3	64.8	68.3	68.2	69.1	71.1	71.6	71.2
5000.0	64.9	64.3	68.3	67.0	72.1	72.1	73.5	74.2	74.5	74.1
6300.0	66.0	65.5	69.8	68.5	73.5	73.4	74.4	74.1	74.6	74.0
8000.0	64.8	64.0	68.1	67.1	72.0	72.1	73.9	72.9	73.6	72.7
10000.0	59.3	57.8	64.3	62.7	67.0	67.6	70.0	68.6	68.7	68.3
12500.0	58.3	56.8	62.8	61.3	66.0	67.5	69.8	66.9	67.1	66.8
16000.0	60.2	58.8	65.6	64.2	69.5	71.3	73.3	69.7	69.8	69.5
20000.0	67.9	66.5	73.4	71.7	77.3	79.1	80.5	79.0	79.1	78.7

Table 44: SBN04_y - Velocity [dB re. 1 nm/s].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	105.1	104.1	104.4	101.2	112.3	110.8	112.6	105.9	108.1	106.7
1.2	100.9	100.0	100.6	99.1	101.7	100.6	105.1	111.6	112.9	110.7
1.6	108.6	105.8	111.0	107.4	111.5	101.8	110.2	102.3	111.1	103.4
2.0	96.3	96.3	103.4	102.7	102.2	102.9	104.2	92.8	94.7	93.7
2.5	93.1	93.9	99.1	98.8	100.2	98.2	95.6	93.5	96.2	92.8
3.15	105.5	105.9	98.1	98.6	103.4	102.3	103.1	103.3	103.9	102.8
4.0	90.9	91.7	117.4	117.1	101.2	97.8	98.9	99.7	98.9	99.2
5.0	101.2	101.7	113.1	112.7	115.8	115.1	96.1	105.6	103.2	104.9
6.3	108.4	111.5	113.1	112.9	122.0	121.3	113.2	110.3	116.3	114.9
8.0	96.4	97.1	100.1	99.8	109.0	106.5	108.0	106.2	111.0	109.8
10.0	96.0	95.0	102.9	102.3	105.5	104.7	110.7	113.6	113.3	114.4
12.5	102.2	101.7	100.5	100.1	108.8	104.8	108.0	108.1	107.5	107.6
16.0	95.8	95.1	99.5	98.9	103.4	102.5	104.7	111.8	112.4	111.4
20.0	95.8	95.1	100.1	99.5	105.1	103.8	104.8	108.9	108.9	109.2
25.0	94.1	93.4	100.3	99.6	104.9	103.9	103.9	108.9	109.7	108.3
31.5	103.4	103.5	99.6	99.0	104.3	102.9	105.0	107.8	108.6	107.6
40.0	96.7	96.2	105.1	104.9	104.3	102.9	107.2	109.5	109.5	109.2
50.0	98.9	98.0	103.1	102.6	111.4	111.0	107.8	108.9	108.1	109.0
63.0	100.1	99.5	103.4	103.4	108.1	107.5	109.2	110.1	110.3	109.9
80.0	91.9	91.6	99.4	99.5	97.7	98.2	98.3	100.6	100.7	101.0
100.0	91.6	91.8	94.7	95.5	96.8	97.3	96.3	97.3	97.4	97.5
125.0	93.0	92.7	95.1	95.5	98.7	98.0	100.9	102.0	102.8	101.7
160.0	86.9	87.4	89.3	89.0	94.8	93.9	94.8	96.4	96.1	96.7
200.0	86.6	87.0	90.0	89.8	94.2	93.5	96.1	97.1	97.4	97.5
250.0	89.0	88.5	90.3	90.7	92.4	92.2	93.9	95.8	96.1	95.9
315.0	84.8	84.7	88.2	88.0	90.2	90.8	90.6	92.4	93.0	92.8
400.0	85.6	85.3	87.9	88.3	90.2	90.3	91.2	91.9	92.0	91.9
500.0	90.9	90.7	92.8	92.6	94.6	94.4	95.3	96.1	95.9	96.0
630.0	85.5	85.4	88.4	88.4	90.4	90.2	91.0	92.6	92.7	92.6
800.0	90.7	90.9	86.2	87.4	88.7	88.9	89.7	91.1	91.3	91.0
1000.0	81.9	81.0	82.6	82.9	88.4	88.4	92.6	89.1	89.2	89.0
1250.0	79.2	79.2	78.1	77.7	81.1	81.0	82.8	85.6	85.8	85.5
1600.0	75.2	75.6	76.9	77.0	81.3	81.2	81.1	83.3	83.6	83.0
2000.0	71.1	70.8	76.4	75.6	78.7	78.8	79.8	81.3	81.6	81.2
2500.0	67.9	67.4	71.1	69.8	74.8	75.7	77.5	76.7	76.8	76.6
3150.0	67.1	66.3	72.0	70.6	74.6	75.0	77.0	77.3	77.5	77.3
4000.0	68.2	67.6	72.3	71.0	74.9	75.0	76.2	77.5	77.9	77.5
5000.0	69.4	68.9	72.8	71.7	75.7	75.5	76.9	77.7	78.4	77.5
6300.0	66.7	66.0	70.7	69.3	73.8	74.4	76.0	75.1	75.5	75.0
8000.0	65.4	64.6	69.1	67.9	72.6	72.7	74.8	73.7	73.9	73.3
10000.0	63.1	61.6	68.2	66.5	71.0	72.0	74.7	72.2	72.5	71.9
12500.0	61.9	60.6	65.8	64.6	70.3	71.8	74.4	70.6	70.8	70.4
16000.0	65.2	64.1	69.7	68.5	73.8	75.3	77.0	75.1	75.2	74.9
20000.0	73.0	71.7	78.8	77.3	83.7	85.9	87.1	84.2	84.2	83.9

Table 45: SBN04_z - Velocity [dB re. 1 nm/s].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	98.1	95.8	97.4	96.7	97.1	95.2	101.7	95.7	101.8	95.5
1.2	94.3	94.3	94.5	92.3	95.8	93.6	97.2	96.1	101.2	97.0
1.6	101.2	92.9	104.2	97.1	106.3	96.7	105.1	98.0	106.0	97.9
2.0	88.9	87.8	92.8	92.3	100.5	99.8	102.0	98.2	98.6	97.9
2.5	87.5	86.4	89.5	88.6	89.9	89.4	89.0	106.5	106.5	106.5
3.15	96.1	96.5	89.4	89.7	92.9	92.3	96.3	98.7	99.9	99.0
4.0	87.3	87.6	113.7	113.5	94.8	93.2	97.3	100.0	99.3	99.6
5.0	94.5	94.3	109.3	109.1	97.6	96.7	92.8	108.6	107.3	107.9
6.3	99.7	99.4	99.4	99.0	102.4	101.1	116.8	118.2	120.6	118.3
8.0	94.0	93.7	103.0	102.6	109.6	107.2	104.6	112.1	114.6	112.4
10.0	101.4	100.3	110.7	109.7	103.1	105.5	112.5	122.4	121.6	123.2
12.5	100.2	98.5	105.0	104.1	103.6	104.2	104.5	111.6	112.2	112.3
16.0	94.7	95.1	95.8	95.8	96.8	95.2	99.8	106.0	106.9	106.7
20.0	90.5	89.9	92.9	92.1	98.6	97.9	101.4	104.5	103.6	105.9
25.0	94.4	93.2	97.4	96.7	102.1	101.3	103.1	105.1	106.2	104.6
31.5	100.4	100.4	99.4	99.1	104.2	103.2	104.0	105.9	106.2	105.6
40.0	97.1	96.7	101.2	100.9	104.3	103.4	107.2	108.9	108.8	108.8
50.0	99.3	98.2	104.3	104.1	108.0	107.2	108.1	108.0	107.9	108.1
63.0	101.8	100.4	105.0	104.9	109.6	108.8	110.3	110.3	109.5	110.7
80.0	96.5	95.2	101.2	100.9	102.7	102.7	102.9	102.2	102.0	102.5
100.0	94.6	93.8	98.8	98.4	98.7	99.5	98.3	99.3	99.8	98.9
125.0	96.7	96.6	99.7	99.3	101.0	100.2	101.2	102.8	103.5	101.7
160.0	88.1	88.8	90.3	90.8	93.3	93.8	94.2	95.4	95.9	95.9
200.0	90.9	91.0	94.6	94.2	96.3	96.2	98.6	98.0	98.1	98.0
250.0	93.3	92.4	95.1	95.2	96.9	97.0	97.2	98.8	98.8	98.8
315.0	91.8	91.2	95.3	95.2	97.9	97.2	98.4	99.0	98.5	98.7
400.0	91.8	92.1	95.5	95.4	97.2	97.9	97.6	98.9	99.9	99.2
500.0	90.9	91.1	93.3	93.3	95.0	94.9	94.9	96.2	96.2	96.0
630.0	86.6	86.7	90.2	90.3	92.2	92.3	92.6	94.2	94.3	94.4
800.0	85.0	85.9	84.2	85.0	87.9	87.9	88.6	90.1	90.2	90.0
1000.0	80.3	79.3	83.2	83.9	86.8	87.2	89.1	88.5	88.7	88.6
1250.0	76.3	76.7	78.5	78.7	84.2	84.3	85.8	88.1	88.3	88.2
1600.0	73.3	73.4	77.2	77.0	83.5	83.6	86.1	88.0	88.1	88.0
2000.0	72.3	72.7	76.8	76.6	82.7	82.7	84.5	86.6	86.6	86.7
2500.0	73.4	74.2	77.0	76.3	79.4	80.0	81.4	84.0	83.9	84.0
3150.0	75.1	75.2	76.9	76.7	79.0	79.0	82.2	84.1	84.3	84.1
4000.0	70.5	70.2	72.1	71.5	72.8	73.1	75.6	76.6	77.0	76.7
5000.0	69.0	69.1	70.8	70.2	72.1	72.7	74.4	75.3	75.4	75.2
6300.0	66.7	66.9	68.6	68.1	69.7	70.5	71.4	72.1	72.4	72.2
8000.0	65.0	65.2	66.3	66.4	67.7	68.1	69.4	70.3	70.4	70.5
10000.0	59.7	59.9	61.0	61.2	62.9	63.2	65.2	66.9	66.4	67.1
12500.0	60.8	60.9	61.6	61.7	63.8	64.1	66.2	68.4	68.0	68.3
16000.0	75.2	75.5	76.2	76.2	78.9	79.0	81.3	83.5	83.3	83.9
20000.0	71.7	71.7	72.5	72.5	75.2	75.3	77.9	80.0	79.9	80.3

Table 46: SBN09_z - Velocity [dB re. 1 nm/s].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	96.9	96.3	97.8	96.5	99.2	96.0	102.0	96.0	101.3	95.3
1.2	95.8	93.0	98.4	94.6	99.5	93.2	106.8	95.8	109.3	96.8
1.6	104.7	92.6	109.6	105.6	109.7	99.5	112.5	101.9	115.4	101.5
2.0	89.9	88.6	91.2	89.4	92.0	89.6	95.4	94.7	95.9	93.8
2.5	87.8	86.5	90.1	89.0	91.8	88.6	91.4	102.2	103.1	101.6
3.15	107.6	107.6	97.4	97.8	93.5	91.5	96.6	92.4	94.2	92.1
4.0	90.8	91.2	116.2	116.0	90.8	91.2	93.2	101.8	100.3	100.4
5.0	97.7	98.6	111.8	111.6	114.9	114.2	93.2	110.8	109.6	109.7
6.3	101.5	103.9	111.6	111.2	121.1	120.4	117.8	125.9	129.4	126.3
8.0	93.6	94.1	104.3	103.9	112.6	108.9	107.7	119.7	123.4	120.3
10.0	101.6	101.2	105.7	104.8	103.5	105.0	113.6	120.2	114.6	119.5
12.5	103.9	103.4	100.2	99.9	105.4	106.5	112.4	115.2	115.3	115.1
16.0	102.8	102.9	103.7	104.8	105.2	102.3	105.5	113.0	113.2	112.9
20.0	94.7	94.2	94.3	93.4	98.0	96.6	104.5	106.7	104.9	107.0
25.0	95.1	94.4	99.5	99.0	98.6	97.4	103.0	108.9	107.9	109.4
31.5	106.9	106.9	104.2	103.9	108.1	105.4	108.3	110.3	111.0	110.7
40.0	96.3	95.5	100.2	99.8	105.3	101.6	105.5	110.7	109.5	109.0
50.0	93.6	92.0	98.7	98.2	105.5	105.0	101.6	103.9	104.2	103.7
63.0	95.5	94.2	100.9	100.9	105.6	104.8	108.0	105.2	105.1	105.5
80.0	89.2	88.9	95.0	94.8	96.2	96.2	97.0	97.6	98.6	97.1
100.0	84.4	83.1	88.3	87.6	89.4	88.9	88.1	92.1	90.9	90.8
125.0	86.4	86.9	87.9	87.9	89.8	88.9	89.3	95.3	94.4	95.6
160.0	81.8	81.7	83.1	82.8	84.8	84.1	85.4	87.4	87.2	87.4
200.0	80.2	80.0	83.1	82.8	84.7	84.8	85.0	85.4	86.0	84.6
250.0	85.0	84.4	85.6	85.9	86.5	86.8	88.4	88.7	88.8	87.0
315.0	81.2	80.7	83.6	83.3	85.0	85.0	85.6	87.2	86.6	85.5
400.0	81.3	81.3	83.0	82.7	84.0	83.8	84.7	85.4	86.5	84.4
500.0	81.5	81.3	82.5	81.9	83.9	83.3	84.4	84.8	86.0	82.9
630.0	78.4	78.2	79.3	79.0	81.0	80.9	81.9	82.5	83.9	80.4
800.0	80.2	80.0	76.4	76.7	77.9	77.7	79.1	79.9	80.9	77.7
1000.0	74.7	73.7	75.6	75.8	79.3	79.6	82.6	78.6	79.6	75.7
1250.0	70.9	71.2	72.0	71.3	73.3	72.6	74.6	76.0	77.5	73.4
1600.0	70.3	70.3	71.3	70.3	74.7	74.5	78.3	77.0	78.9	72.6
2000.0	67.0	66.7	70.2	69.0	71.8	71.6	73.3	74.8	76.7	70.5
2500.0	64.2	64.1	65.8	64.3	68.2	67.1	69.6	70.1	72.2	65.4
3150.0	60.3	59.9	63.0	61.3	65.9	64.6	67.6	68.4	71.4	62.5
4000.0	58.8	58.4	62.2	60.9	65.9	63.8	66.8	67.0	71.2	61.4
5000.0	56.0	55.8	58.2	56.2	61.9	60.2	63.4	63.2	68.5	58.2
6300.0	52.5	52.1	54.7	53.3	57.7	57.6	59.5	60.0	63.9	58.4
8000.0	49.2	48.3	49.6	49.3	54.4	54.1	56.6	57.9	61.0	56.8
10000.0	45.5	44.5	47.9	47.8	53.6	54.0	56.6	57.5	59.6	56.9
12500.0	44.5	44.2	46.8	47.1	53.2	53.4	56.2	60.6	61.6	60.1
16000.0	44.5	44.2	47.7	48.1	53.9	54.6	56.4	57.5	59.8	56.6
20000.0	44.5	44.0	48.6	49.7	55.1	56.4	57.8	59.1	60.7	59.0

Table 47: SBN10_z - Velocity [dB re. 1 nm/s].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	98.0	95.0	99.0	96.3	99.0	96.5	101.1	96.6	101.5	97.3
1.2	96.2	93.8	98.7	95.3	99.8	94.6	106.6	94.9	109.5	96.9
1.6	103.5	93.2	108.6	104.7	108.3	98.9	112.2	101.7	115.2	101.5
2.0	90.0	89.6	90.6	89.3	94.9	92.9	95.5	94.8	96.2	94.7
2.5	87.4	87.3	89.2	88.0	89.8	88.2	89.6	102.3	102.9	102.2
3.15	113.2	113.6	94.2	94.3	91.0	90.9	92.9	91.5	92.3	91.9
4.0	95.9	96.7	117.4	117.1	98.5	96.9	95.1	103.5	102.2	102.1
5.0	97.2	97.6	113.0	112.7	114.9	114.2	95.5	112.6	111.6	111.4
6.3	103.9	100.5	108.5	107.7	121.0	120.3	124.0	128.8	131.4	128.0
8.0	95.6	94.7	107.2	106.5	110.6	105.6	107.0	122.5	125.3	122.0
10.0	99.2	98.9	108.0	106.7	104.8	105.8	107.4	108.8	110.9	109.5
12.5	103.2	102.7	103.0	102.2	105.7	104.2	111.8	115.9	112.9	112.6
16.0	105.9	104.6	106.2	104.9	107.0	103.3	105.6	111.7	110.6	109.4
20.0	95.9	96.0	100.4	100.2	107.7	107.1	111.3	110.8	109.0	112.3
25.0	99.0	98.0	102.6	101.3	105.6	104.6	106.9	115.0	113.3	116.0
31.5	107.0	107.3	104.1	103.8	109.5	107.0	108.1	113.2	111.3	114.1
40.0	100.6	99.7	107.0	106.7	106.8	104.9	110.0	110.3	110.5	109.2
50.0	97.2	96.4	103.3	102.9	109.0	108.1	107.0	108.7	109.1	108.1
63.0	98.1	97.5	103.2	103.3	105.8	105.5	109.2	107.8	107.7	107.1
80.0	89.4	88.0	95.4	94.9	97.1	96.1	98.9	101.1	102.1	99.7
100.0	88.3	89.1	91.2	91.7	91.2	90.3	90.0	91.7	92.9	92.1
125.0	92.1	92.5	93.5	93.3	94.5	93.9	96.6	96.3	97.2	96.5
160.0	84.7	84.5	86.0	85.8	88.1	87.6	88.6	89.7	91.0	89.3
200.0	81.2	81.1	82.6	82.3	84.5	84.2	86.5	86.0	86.8	84.3
250.0	85.4	84.6	86.5	86.3	86.8	86.9	87.4	88.0	88.6	87.1
315.0	81.3	81.1	84.4	84.7	87.1	87.3	86.8	87.4	88.0	86.4
400.0	79.8	79.9	81.6	81.0	82.7	82.8	82.9	82.9	84.4	82.7
500.0	79.7	79.7	80.8	80.1	82.1	81.7	82.5	82.2	83.3	80.9
630.0	75.2	75.2	76.8	76.3	78.0	77.8	78.5	78.5	79.8	76.6
800.0	72.2	72.1	70.3	70.5	72.9	72.5	73.7	73.7	75.1	71.1
1000.0	68.6	66.9	69.3	69.0	71.4	70.8	73.7	70.8	72.3	68.3
1250.0	64.4	64.4	64.8	63.8	66.6	66.0	68.1	68.5	70.6	65.5
1600.0	61.8	61.5	62.7	61.5	65.5	64.9	68.1	67.0	69.2	63.5
2000.0	58.9	58.7	61.4	60.2	63.3	62.5	65.1	64.9	67.5	61.3
2500.0	57.2	57.0	59.2	57.3	60.2	59.6	62.4	61.6	64.5	58.1
3150.0	55.9	55.7	57.9	55.6	59.0	57.8	61.1	59.9	63.7	56.4
4000.0	54.4	54.0	56.6	54.7	57.7	56.8	59.8	58.6	62.4	55.6
5000.0	53.0	52.7	52.7	50.5	53.9	53.2	56.4	56.0	59.6	54.4
6300.0	50.3	49.6	49.8	48.4	51.5	51.7	53.7	54.7	56.3	53.6
8000.0	48.3	47.4	46.5	46.5	49.8	50.4	53.0	54.9	56.4	53.6
10000.0	45.6	45.1	45.6	45.8	49.7	51.0	53.5	55.4	56.8	54.4
12500.0	43.7	43.7	44.3	45.2	48.8	50.0	51.9	55.3	55.6	54.7
16000.0	44.2	44.2	46.4	47.5	51.1	52.7	53.8	57.1	56.8	57.4
20000.0	43.0	42.6	45.9	47.5	51.4	53.2	54.2	57.5	56.2	58.2

Table 48: SBN11_z - Velocity [dB re. 1 nm/s].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	100.5	99.5	99.1	99.1	100.1	99.8	101.8	97.3	100.9	98.2
1.2	100.3	98.9	98.2	97.6	96.5	101.3	100.0	98.0	101.0	97.3
1.6	103.3	97.3	104.6	100.7	106.6	101.5	107.6	99.0	108.2	99.3
2.0	98.1	96.7	95.8	96.5	95.6	98.9	97.1	95.9	98.2	94.7
2.5	97.1	95.9	95.1	95.4	93.7	97.3	95.7	101.5	102.3	100.4
3.15	108.5	109.4	96.3	96.1	94.7	96.8	96.8	95.3	96.9	93.8
4.0	95.5	95.9	101.9	103.0	96.3	96.4	93.5	97.4	96.3	96.8
5.0	96.1	93.7	98.3	99.0	111.0	110.5	94.6	105.6	102.6	105.4
6.3	104.0	104.9	102.7	103.0	117.1	116.5	121.6	118.3	121.7	118.5
8.0	94.4	93.5	101.3	101.0	109.1	102.9	101.6	112.2	115.7	112.6
10.0	103.4	104.0	107.1	106.2	105.0	104.2	105.4	117.2	117.9	118.7
12.5	98.0	97.1	101.7	101.1	109.3	104.7	108.5	113.5	112.7	113.5
16.0	94.2	93.5	95.8	95.5	100.1	99.3	99.6	110.3	109.7	110.5
20.0	94.7	94.4	94.9	94.1	97.5	97.0	105.6	107.0	105.6	108.8
25.0	95.5	94.5	98.2	97.7	106.0	105.6	105.8	106.6	107.4	105.8
31.5	104.0	104.3	98.7	98.1	103.4	102.1	104.0	105.6	106.4	105.0
40.0	100.7	100.2	106.0	105.6	104.9	104.1	107.1	109.9	110.2	109.8
50.0	98.2	97.9	100.8	100.3	103.4	103.2	104.6	106.3	104.8	105.6
63.0	96.6	96.2	99.1	99.2	103.4	103.3	105.7	104.6	105.0	105.0
80.0	98.3	98.1	98.8	99.0	99.2	99.3	100.0	101.9	100.9	102.6
100.0	103.6	103.4	104.0	104.1	104.6	104.1	104.2	104.7	105.2	105.1
125.0	118.1	117.9	117.9	118.2	118.1	118.2	118.8	118.8	119.1	119.2
160.0	117.0	116.9	116.9	117.0	117.1	117.2	117.4	117.3	117.4	117.6
200.0	112.9	112.8	112.8	112.9	112.7	112.9	113.3	112.9	113.3	113.3
250.0	110.2	110.0	110.2	110.3	110.4	110.5	110.8	110.7	110.9	111.1
315.0	110.2	110.0	110.1	110.2	110.4	110.4	110.8	110.7	111.0	111.1
400.0	108.3	108.0	108.2	108.3	108.3	108.6	108.8	108.5	108.6	108.7
500.0	106.7	106.5	106.6	106.6	106.8	106.8	107.2	107.1	107.2	107.2
630.0	102.2	102.0	102.1	102.2	102.3	102.3	102.6	102.4	102.6	102.6
800.0	102.7	102.6	102.7	102.7	102.8	102.7	102.9	102.9	102.9	103.1
1000.0	97.7	97.6	97.6	97.7	97.8	97.8	98.0	97.9	98.0	98.0
1250.0	101.1	101.0	101.1	101.1	101.2	101.2	101.4	101.2	101.3	101.4
1600.0	101.1	100.9	101.0	101.0	101.0	101.1	101.2	101.0	101.2	100.9
2000.0	100.2	100.1	100.2	100.2	100.2	100.3	100.4	100.4	100.5	100.5
2500.0	92.9	92.8	92.8	92.9	93.0	93.0	93.2	93.2	93.3	93.3
3150.0	95.2	95.0	95.0	95.1	95.2	95.2	95.4	95.2	95.4	95.3
4000.0	98.1	97.9	98.0	98.0	98.1	98.1	98.3	98.3	98.4	98.4
5000.0	94.3	94.1	94.3	94.3	94.4	94.3	94.6	94.5	94.6	94.7
6300.0	95.8	95.7	95.9	95.9	96.0	95.9	96.3	96.3	96.4	96.9
8000.0	98.6	98.4	98.4	98.4	98.4	98.6	98.8	98.5	98.8	98.4
10000.0	97.2	97.1	97.0	97.0	96.9	97.3	97.4	97.0	97.4	96.4
12500.0	101.0	100.7	100.5	100.2	100.1	100.8	100.7	100.2	100.8	99.2
16000.0	102.3	102.0	101.2	100.8	100.5	101.9	101.3	100.5	101.5	99.2
20000.0	105.3	105.1	103.6	103.1	102.2	104.6	103.4	102.1	103.7	100.1

Table 49: SBN12_z - Velocity [dB re. 1 nm/s].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	95.8	95.5	124.6	95.4	98.0	95.0	98.6	93.7	98.8	96.0
1.2	94.3	92.5	123.1	95.1	97.8	92.3	104.8	94.7	108.8	94.1
1.6	103.1	94.5	121.5	106.0	106.4	97.6	111.6	103.5	115.0	103.2
2.0	90.9	89.9	119.3	91.3	94.9	90.6	96.1	92.0	92.4	92.4
2.5	87.6	87.7	116.9	88.8	88.3	88.4	88.9	97.4	96.3	98.3
3.15	120.5	121.0	114.3	93.6	93.1	93.2	93.2	93.9	94.8	94.9
4.0	102.8	103.8	113.2	106.3	98.8	97.6	96.3	95.6	94.2	95.1
5.0	86.7	87.7	109.9	102.3	102.8	102.1	90.2	104.0	99.9	103.7
6.3	102.7	105.2	108.3	104.9	109.4	108.7	101.2	109.4	110.7	110.2
8.0	95.1	94.2	103.2	94.2	104.5	104.8	103.2	103.8	105.1	104.6
10.0	95.6	95.3	104.4	100.7	101.5	103.4	112.0	118.5	117.7	119.0
12.5	94.2	93.9	99.7	96.7	99.1	104.5	101.7	113.9	113.5	112.9
16.0	93.3	92.2	96.4	95.6	96.7	95.8	101.8	110.2	110.2	109.6
20.0	90.6	89.3	94.9	94.1	101.2	100.8	103.5	104.1	104.3	105.4
25.0	96.8	96.5	101.6	100.6	104.5	103.7	104.3	110.6	110.5	111.0
31.5	109.2	108.8	104.0	103.6	108.8	106.3	108.6	112.7	111.0	114.0
40.0	96.0	96.1	99.8	99.3	101.6	98.4	100.2	104.5	105.4	103.2
50.0	101.9	103.2	105.1	106.5	105.0	102.7	108.5	107.5	108.0	107.0
63.0	104.3	104.8	104.8	104.9	104.3	104.2	103.8	104.2	104.1	103.9
80.0	88.5	87.8	90.2	89.8	93.0	93.3	93.5	93.1	93.5	92.8
100.0	85.1	85.4	88.1	87.0	86.2	86.6	86.5	87.1	87.4	86.7
125.0	93.8	93.2	94.4	94.1	93.2	93.4	93.2	93.9	93.6	93.3
160.0	92.7	92.5	94.2	93.9	93.7	93.0	93.0	92.8	93.4	92.3
200.0	91.0	91.1	91.8	91.7	91.3	92.0	91.1	90.6	90.8	90.3
250.0	94.4	94.1	94.2	94.6	93.7	95.0	94.2	94.2	93.9	94.6
315.0	98.5	98.8	98.5	98.8	97.6	97.7	96.9	97.2	96.6	96.6
400.0	99.6	99.6	99.7	99.5	99.4	99.4	99.8	99.1	99.7	99.5
500.0	109.4	109.1	109.1	109.0	110.2	110.0	110.9	111.2	111.2	111.3
630.0	94.5	94.4	94.1	94.0	95.1	94.9	95.7	96.0	96.2	96.4
800.0	99.5	99.7	100.0	99.6	99.9	100.0	99.2	99.6	98.1	98.7
1000.0	93.6	93.3	93.7	93.5	94.3	94.4	95.7	94.9	96.1	95.7
1250.0	88.7	88.5	88.3	88.5	88.7	88.8	90.5	90.0	91.7	91.2
1600.0	88.5	88.5	87.4	87.9	86.8	86.4	86.5	86.5	86.0	86.2
2000.0	86.4	86.1	85.5	85.5	85.1	84.7	84.6	84.2	84.4	84.2
2500.0	83.3	83.1	83.3	83.2	83.0	82.7	82.2	81.9	82.0	81.8
3150.0	78.6	78.6	78.8	78.6	78.2	78.1	78.0	78.0	78.1	78.0
4000.0	83.0	82.9	83.0	83.1	82.6	82.5	82.7	82.8	83.1	83.2
5000.0	83.4	83.3	83.8	83.3	83.5	83.3	83.2	83.1	83.0	83.1
6300.0	75.3	75.2	75.8	75.3	75.6	75.5	75.2	75.9	76.3	75.5
8000.0	69.1	69.1	70.1	69.2	69.5	69.7	69.8	70.0	69.7	70.1
10000.0	65.2	65.1	66.4	65.1	65.6	65.5	65.7	65.9	65.9	66.0
12500.0	60.5	60.3	62.6	60.4	61.3	61.2	61.3	61.7	62.0	61.9
16000.0	59.4	59.3	61.3	59.5	60.1	60.2	60.2	60.1	60.8	60.4
20000.0	59.2	59.0	60.3	59.2	59.8	59.9	59.9	59.5	60.0	59.7

Table 50: SBN13_z - Velocity [dB re. 1 nm/s].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	93.5	94.4	93.3	93.6	93.2	93.1	94.5	92.9	93.1	92.6
1.2	91.1	92.4	93.1	92.4	91.9	92.7	93.5	91.9	94.6	93.6
1.6	92.6	90.2	95.6	92.6	97.2	91.5	97.7	93.2	98.9	92.0
2.0	89.7	88.6	90.1	89.5	89.3	89.3	89.4	89.5	89.6	89.6
2.5	86.8	86.6	87.5	87.6	88.3	87.6	87.8	89.9	90.9	89.7
3.15	100.9	101.1	92.1	92.5	87.8	88.4	90.2	93.5	94.5	95.3
4.0	87.3	88.4	116.3	116.1	93.2	94.4	99.9	91.8	90.8	94.8
5.0	94.8	92.4	111.9	111.6	109.4	108.5	89.1	93.1	91.7	92.3
6.3	104.3	103.2	98.8	99.0	115.5	114.6	106.9	111.2	111.8	108.6
8.0	92.2	92.2	99.2	98.4	102.2	102.0	100.5	105.4	106.2	103.4
10.0	83.5	83.6	90.3	88.7	93.4	93.5	102.2	102.8	98.7	103.7
12.5	89.2	87.7	87.6	86.5	100.3	99.4	96.4	99.6	99.4	98.1
16.0	93.7	93.4	94.5	93.6	97.3	97.1	97.7	104.1	104.1	104.7
20.0	89.8	89.5	92.5	92.2	95.9	94.2	98.8	105.7	103.1	105.7
25.0	90.6	89.6	94.2	93.4	99.7	98.3	98.6	103.6	101.9	103.2
31.5	92.3	93.1	93.4	93.0	96.7	95.0	96.9	101.8	101.2	101.2
40.0	86.5	86.5	89.1	89.3	93.0	91.4	93.8	97.5	96.3	97.9
50.0	95.2	94.9	95.6	94.8	97.4	99.1	98.9	101.0	100.8	100.5
63.0	91.7	91.5	93.0	92.9	93.4	92.2	93.7	95.5	94.5	95.3
80.0	89.0	88.8	89.0	89.2	90.5	88.2	89.0	92.3	91.0	92.3
100.0	90.1	89.7	90.4	89.9	92.4	93.0	92.0	96.0	95.7	95.2
125.0	85.6	87.1	86.0	85.7	87.7	88.7	89.4	91.6	90.8	90.5
160.0	92.4	92.5	92.3	92.6	91.8	93.6	94.7	94.7	94.5	95.1
200.0	100.4	100.5	99.8	100.6	100.5	102.2	102.5	102.2	102.9	102.7
250.0	89.6	89.0	89.7	89.3	90.3	93.2	93.4	93.4	93.9	93.7
315.0	93.0	93.0	92.8	92.6	92.8	93.6	94.2	93.8	94.4	94.4
400.0	93.8	93.6	93.3	93.6	93.3	94.6	94.3	95.1	94.7	94.7
500.0	94.3	94.4	94.2	94.2	94.3	95.8	95.7	95.6	95.6	95.6
630.0	92.7	92.7	92.8	92.7	92.5	94.0	93.9	94.3	93.7	93.9
800.0	87.9	88.0	88.0	88.0	88.0	90.1	90.1	90.2	89.8	90.0
1000.0	87.4	87.7	87.5	87.6	87.1	89.2	89.2	89.2	88.9	89.0
1250.0	83.5	83.3	83.5	83.4	83.4	86.3	85.6	86.2	85.5	85.3
1600.0	83.2	83.2	83.3	83.2	83.5	84.3	84.7	83.7	84.5	84.4
2000.0	85.2	85.6	85.0	85.7	85.0	86.5	85.4	86.1	86.0	86.1
2500.0	85.3	85.3	85.5	85.3	85.4	84.1	84.2	84.4	84.5	84.5
3150.0	79.6	79.0	79.2	79.5	79.6	79.1	79.1	77.8	78.8	78.5
4000.0	77.1	76.9	76.9	77.2	76.8	77.6	78.1	77.3	77.4	77.8
5000.0	73.8	73.9	74.0	73.9	73.8	74.1	74.2	74.4	74.1	74.4
6300.0	69.6	69.9	69.8	70.1	69.6	70.0	69.9	70.3	70.1	70.6
8000.0	67.5	67.7	68.1	68.3	67.4	68.0	67.9	68.3	67.6	68.3
10000.0	69.3	69.7	70.4	70.8	68.8	70.4	70.3	69.8	69.0	69.3
12500.0	65.2	65.5	65.9	66.2	64.8	65.6	65.5	65.6	65.0	65.9
16000.0	63.5	63.4	63.7	64.0	63.0	63.1	63.3	64.1	63.2	63.8
20000.0	68.2	68.2	68.8	68.9	67.7	67.3	67.5	67.8	66.6	67.5

Table 51: SBN14_x - Velocity [dB re. 1 nm/s].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	95.4	92.0	95.1	91.7	95.8	92.8	100.0	93.6	100.1	91.2
1.2	100.6	91.2	104.2	96.8	105.9	97.0	112.7	98.8	116.0	97.4
1.6	107.2	94.6	113.1	109.8	111.1	101.4	118.6	104.1	121.8	104.5
2.0	90.1	89.3	89.4	89.4	91.2	89.4	94.8	90.1	93.2	90.3
2.5	86.2	85.9	86.9	87.5	86.5	86.8	89.0	90.3	89.9	89.4
3.15	97.6	100.3	101.6	101.6	95.6	94.9	99.0	97.1	97.3	99.8
4.0	83.8	85.5	95.0	90.8	95.4	95.8	98.2	96.0	95.6	95.2
5.0	80.9	80.6	91.5	89.0	94.9	93.9	86.9	102.3	103.8	102.1
6.3	102.3	99.8	94.9	94.0	102.6	101.7	119.0	110.6	110.8	108.6
8.0	90.6	90.0	97.0	96.3	99.5	96.2	97.9	104.7	105.1	103.3
10.0	94.6	95.7	92.3	91.6	90.6	93.6	99.6	103.5	100.8	102.4
12.5	92.4	92.7	93.2	93.5	95.3	99.1	107.6	98.0	98.0	97.1
16.0	106.0	106.3	106.1	106.4	105.9	105.7	105.8	106.6	106.2	106.1
20.0	85.6	85.0	85.9	84.7	90.1	89.2	93.3	99.4	98.4	99.8
25.0	83.4	83.3	86.8	86.2	89.9	88.2	90.1	97.2	94.2	96.4
31.5	96.1	96.2	95.5	95.6	95.9	91.2	93.4	95.8	95.3	94.7
40.0	91.2	90.4	92.6	92.1	92.7	96.9	97.1	99.3	98.0	98.2
50.0	105.5	105.3	105.2	105.2	105.2	108.4	107.9	108.6	107.8	108.0
63.0	93.6	93.5	93.6	94.0	94.4	95.8	96.7	97.0	96.9	97.3
80.0	88.5	88.6	89.3	89.2	90.2	89.1	89.3	91.0	90.7	91.5
100.0	95.8	95.8	95.7	95.7	95.4	97.3	97.5	98.0	97.8	98.0
125.0	94.3	94.7	92.7	92.9	92.9	92.5	92.7	93.4	92.7	93.0
160.0	95.9	95.8	95.9	95.4	96.0	94.6	94.8	95.3	94.3	95.1
200.0	105.5	105.1	104.8	105.2	104.9	104.9	105.0	105.2	105.6	105.5
250.0	102.3	101.2	102.2	101.7	102.9	104.4	105.0	104.7	105.6	105.5
315.0	107.4	107.6	107.3	107.4	107.1	110.1	111.2	110.9	111.3	111.5
400.0	98.7	98.9	98.4	98.7	98.1	98.9	99.3	98.8	99.1	99.1
500.0	89.7	89.4	89.6	89.6	89.6	91.8	91.3	91.6	90.9	91.0
630.0	90.5	90.0	90.4	90.4	90.0	92.6	92.5	93.1	92.2	92.3
800.0	88.8	88.9	88.7	88.7	88.5	90.3	90.5	91.1	90.4	90.8
1000.0	86.4	86.3	86.5	86.4	86.4	88.2	88.4	88.7	88.2	88.3
1250.0	77.2	77.1	77.0	77.1	76.8	79.9	80.0	79.5	79.8	79.8
1600.0	79.4	79.3	79.4	79.2	79.0	80.6	80.9	80.9	81.2	81.3
2000.0	73.9	73.6	74.0	73.9	73.2	75.0	74.8	75.1	75.3	75.5
2500.0	77.2	77.0	77.1	77.2	77.0	75.4	74.9	75.1	75.0	74.9
3150.0	72.4	71.9	71.8	72.1	71.6	70.7	70.6	70.2	70.5	70.2
4000.0	61.7	61.3	61.5	61.7	61.5	62.1	62.2	62.0	62.5	62.7
5000.0	56.9	57.3	56.2	57.2	54.8	55.3	55.2	55.7	55.2	55.7
6300.0	58.7	58.9	58.8	59.0	58.4	58.3	58.3	58.3	58.5	58.9
8000.0	59.0	59.2	59.5	59.7	58.8	59.2	59.1	59.5	58.9	59.7
10000.0	59.2	59.3	59.8	60.1	58.8	59.7	59.6	59.7	58.9	59.2
12500.0	59.7	59.7	59.9	60.2	59.1	59.8	59.7	60.0	59.6	60.2
16000.0	59.3	59.1	59.4	59.7	58.8	58.9	59.1	60.1	59.2	59.8
20000.0	67.6	67.6	68.1	68.2	67.3	67.0	67.2	67.2	66.4	66.8

Table 52: SBN14_y - Velocity [dB re. 1 nm/s].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	98.2	95.3	100.1	96.4	100.8	95.6	102.1	96.3	102.0	95.9
1.2	94.6	93.8	95.6	93.2	97.9	93.2	98.4	94.0	101.6	94.2
1.6	105.8	92.8	109.5	100.9	111.9	101.4	111.2	102.7	112.6	103.3
2.0	90.4	90.4	91.8	90.3	94.3	90.9	97.8	97.8	99.2	97.6
2.5	89.5	88.6	92.9	92.3	96.9	91.7	95.2	106.2	107.4	105.8
3.15	113.9	114.8	98.0	98.2	98.4	96.0	98.4	95.3	97.5	95.3
4.0	96.4	97.8	97.1	97.3	102.4	99.7	98.8	98.0	98.0	98.9
5.0	93.0	92.0	93.5	93.3	94.9	92.6	91.3	106.3	107.0	106.0
6.3	101.8	100.7	97.8	98.2	95.6	93.9	106.2	93.0	95.6	93.8
8.0	92.8	91.2	96.1	96.0	106.6	102.0	102.8	98.0	96.1	99.4
10.0	89.5	88.3	91.7	91.7	100.4	101.1	103.9	108.6	107.8	109.5
12.5	90.5	91.0	90.6	90.1	97.8	94.9	102.2	108.2	102.8	106.9
16.0	97.0	97.3	98.3	98.4	98.7	95.7	100.5	105.4	101.9	104.3
20.0	86.1	85.9	89.3	88.5	94.6	92.8	96.3	103.0	100.3	103.6
25.0	86.8	86.5	91.2	91.0	95.6	93.2	96.2	105.6	105.0	105.4
31.5	96.2	96.7	93.7	93.5	98.0	95.6	98.5	103.2	103.6	102.0
40.0	91.0	90.7	94.6	94.1	96.2	95.7	97.7	103.0	101.5	101.2
50.0	99.7	99.9	100.0	100.5	98.8	99.7	99.4	103.4	103.3	101.8
63.0	93.5	93.3	94.7	94.5	96.5	95.4	95.7	98.1	97.4	98.3
80.0	86.9	86.5	89.1	88.7	91.5	90.5	91.0	96.2	94.3	96.0
100.0	93.7	93.4	93.1	93.1	92.7	92.4	90.4	96.2	94.9	94.8
125.0	89.3	89.9	89.9	89.8	91.1	91.8	92.4	94.2	93.6	93.4
160.0	92.0	92.2	92.1	92.3	92.2	94.3	95.1	95.9	95.5	95.8
200.0	93.2	93.1	93.2	93.0	93.6	92.5	92.4	93.0	92.8	92.7
250.0	90.7	90.5	90.9	90.7	91.0	93.5	93.0	93.3	93.5	93.3
315.0	92.8	93.0	92.7	92.8	93.3	95.0	95.2	95.2	94.9	95.1
400.0	89.6	89.6	89.4	89.7	89.4	91.0	90.7	90.9	91.1	91.2
500.0	89.3	89.1	89.5	89.2	89.4	90.7	90.7	90.9	90.8	91.1
630.0	88.6	88.3	88.8	88.5	88.7	90.5	90.2	90.8	90.2	90.5
800.0	87.9	87.6	88.0	87.7	87.9	89.1	88.5	89.4	88.6	89.0
1000.0	83.6	83.6	83.6	83.6	83.5	84.6	84.7	84.5	84.3	84.4
1250.0	82.6	82.2	82.6	82.4	82.3	84.5	84.3	84.8	84.4	84.4
1600.0	89.4	89.6	89.2	89.6	88.4	89.8	89.8	89.5	90.1	90.2
2000.0	81.9	81.8	81.7	81.8	81.4	82.2	81.8	82.3	82.0	82.0
2500.0	81.8	81.6	81.6	81.8	81.5	80.3	80.1	80.4	80.4	80.4
3150.0	79.7	79.3	79.1	79.4	78.6	77.7	77.6	76.5	77.2	76.8
4000.0	66.1	66.1	66.1	66.3	66.0	67.1	66.8	66.9	67.0	67.4
5000.0	65.6	66.1	64.9	66.0	62.8	63.2	62.5	63.3	62.8	63.1
6300.0	61.4	61.2	61.4	61.3	61.0	61.3	61.2	61.6	61.5	62.0
8000.0	58.5	58.5	58.8	59.0	58.3	58.9	58.7	59.1	58.6	59.4
10000.0	57.4	57.6	58.0	58.4	57.0	58.1	57.9	57.8	57.1	57.5
12500.0	55.4	55.5	55.8	56.1	55.0	55.6	55.5	55.8	55.3	56.0
16000.0	57.0	56.9	57.3	57.6	56.6	56.7	56.9	57.9	56.9	57.7
20000.0	60.5	60.4	61.1	61.2	60.2	59.9	60.1	60.2	59.2	59.8

Table 53: SBN14_z - Velocity [dB re. 1 nm/s].

Frequency [Hz]	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10
1.0	96.9	93.3	97.3	93.7	99.1	92.3	101.3	95.1	100.8	95.4
1.2	94.3	91.0	94.7	91.8	95.5	91.9	97.7	92.5	98.6	91.7
1.6	105.1	91.0	108.4	99.9	111.0	99.9	110.2	102.0	111.3	102.5
2.0	89.7	88.8	90.5	87.7	93.3	91.2	97.2	97.3	98.1	96.3
2.5	88.1	86.8	92.3	91.3	95.8	90.6	94.7	105.5	106.5	104.7
3.15	113.2	114.1	98.1	98.3	97.3	95.4	96.9	94.3	96.7	94.4
4.0	95.7	97.1	102.0	102.0	102.8	100.1	98.9	97.1	97.5	98.2
5.0	92.7	90.9	97.6	97.5	105.3	104.5	90.3	105.3	106.3	105.2
6.3	106.2	108.1	106.9	107.1	111.4	110.7	113.4	109.2	108.9	106.6
8.0	97.6	97.1	99.9	99.5	109.4	106.5	105.5	104.3	104.1	103.6
10.0	89.9	89.0	96.3	96.2	102.5	103.0	107.8	111.0	112.5	111.8
12.5	92.3	92.4	92.8	92.4	100.0	98.3	106.1	109.3	105.4	108.6
16.0	90.5	91.2	96.0	95.2	98.1	98.2	104.6	107.5	105.1	107.1
20.0	86.7	86.5	89.7	88.5	95.1	93.5	97.5	107.0	102.1	108.4
25.0	90.5	89.9	94.4	93.7	97.5	94.3	99.8	108.1	105.6	107.7
31.5	101.4	101.4	101.7	101.6	103.1	96.5	100.3	105.7	105.0	104.4
40.0	94.0	93.7	96.8	96.6	99.3	94.8	98.6	104.3	104.0	102.0
50.0	101.4	101.6	101.5	100.9	103.5	102.6	103.0	104.3	104.0	104.2
63.0	94.2	94.3	95.9	95.6	98.6	98.2	98.1	101.1	101.0	101.8
80.0	91.2	91.1	91.4	91.6	91.8	89.9	90.8	94.6	93.3	95.2
100.0	89.2	89.8	89.7	90.0	91.9	90.4	90.1	92.7	91.7	91.8
125.0	89.5	89.2	89.7	89.6	90.6	90.5	89.9	91.9	90.8	90.7
160.0	90.9	90.6	90.7	90.7	90.2	91.7	92.0	92.6	92.5	92.3
200.0	87.1	86.7	87.1	87.0	87.3	88.1	87.6	88.3	87.6	87.6
250.0	86.2	85.6	86.3	85.8	85.4	86.6	86.1	87.5	86.2	86.2
315.0	85.2	85.6	85.2	85.6	84.7	87.4	86.3	87.0	86.4	86.5
400.0	88.6	88.7	88.5	88.4	88.6	89.9	89.8	89.9	90.2	89.6
500.0	88.2	88.1	88.0	88.0	87.7	90.3	90.4	90.4	90.3	90.3
630.0	90.7	90.3	90.7	90.5	90.9	93.1	93.4	93.0	93.6	93.7
800.0	82.0	82.0	82.0	82.2	82.0	83.5	83.8	83.4	83.6	83.8
1000.0	81.1	80.9	81.0	81.1	81.1	82.4	82.3	83.2	82.5	82.5
1250.0	80.0	79.8	79.9	79.8	79.8	81.6	81.6	82.7	82.2	82.2
1600.0	81.0	81.0	80.8	81.0	80.4	82.0	81.8	81.3	81.7	81.8
2000.0	79.0	78.5	78.4	78.4	78.3	80.3	79.9	79.9	79.7	79.7
2500.0	72.6	72.5	72.4	72.6	72.0	73.3	73.0	73.2	73.0	73.2
3150.0	70.0	69.6	69.4	69.7	69.0	70.0	70.4	69.9	70.7	70.7
4000.0	59.4	59.1	59.0	59.3	58.5	60.4	60.4	60.9	60.7	60.9
5000.0	54.4	54.1	53.9	54.3	54.1	54.9	55.0	55.4	55.2	55.5
6300.0	56.8	55.9	55.2	55.7	55.4	55.3	55.5	55.6	55.5	55.5
8000.0	56.7	55.5	54.6	55.5	54.5	54.8	54.9	55.0	54.6	54.8
10000.0	65.7	63.8	62.3	63.7	62.4	62.7	62.9	62.9	62.8	62.5
12500.0	58.5	57.9	56.7	57.5	56.8	57.0	57.2	57.2	57.2	57.1
16000.0	50.6	49.7	47.0	48.1	47.2	47.0	47.3	47.3	47.3	47.3
20000.0	42.3	41.8	41.1	41.4	41.2	41.3	41.6	41.8	41.6	41.7

Table 54: SBN15_z - Velocity [dB re. 1 nm/s].