

TEST REPORT

HAC T-COIL Test for certification of SM-S731U

APPLICANT

Samsung Electronics. Co., Ltd.

REPORT NO.

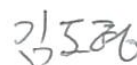
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TEST REPORT

HAC T-COIL Test
for certification

REPORT NO.**HCT-SR-2505-FC007-R1****DATE OF ISSUE****Jul.30, 2025****FCC ID****A3LSMS731U****Applicant**

SAMSUNG Electronics Co., Ltd
129, Samsung-ro, Yeongtong-gu, Suwon-Si, Gyeonggi-do, 16677, Korea

Product Name**Mobile Phone****Model Name****SM-S731U****Additional Model Name****SM-S731U1****Date of Test****May. 13, 2025~ Jul. 03, Jul.25 ~Jul.29, 2025****Location of Test**

☒ **Permanent Testing Lab** ☐ **On Site Testing Lab**
(Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Republic of Korea)

FCC Rule Part(s)**FCC 47 CFR § 20.19 , ANSI C63.19-2019****C63.19-2019HACResult:****PASS**

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	Jul. 14, 2025	Initial Release
1	Jul. 30, 2025	Retest of OTT VoIP

Notice

Content

The results shown in this test report only apply to the sample(s), as received, provided by the applicant, unless otherwise stated.

The test results have only been applied with the test methods required by the standard(s).

The laboratory is not accredited for the test results marked *.

Information provided by the applicant is marked **.

Test results provided by external providers are marked ***.

When confirmation of authenticity of this test report is required, please contact www.hct.co.kr

The test results in this test report are not associated with the ((KS Q) ISO/IEC 17025) accreditation by KOLAS (Korea Laboratory Accreditation Scheme) / A2LA (American Association for Laboratory Accreditation) that are under the ILAC (International Laboratory Accreditation Cooperation) Mutual Recognition Agreement (MRA).

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1. Test Regulations

The tests were performed according to the following regulations:

Test Standard	FCC 47 CFR § 20.19, ANSI C63.19-2019
Test Method	• FCC CFR47 Part 20.19 • ANSI C63.19 2019-version • FCC KDB 285076 D01 HAC Guidance v06r04 • FCC KDB 285076 D02 T Coil testing v04 • FCC KDB 285076 D03 HAC FAQ v01r07 • TCB workshop updates

2. Test Location

2.1 Test Laboratory

Company Name	HCT Co., Ltd.
Address	74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Republic of Korea
Telephone	031-645-6300
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2.2 Test Facilities

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

Korea	National Radio Research Agency (Designation No. KR0032)
	KOLAS (Testing No. KT197)

3. DEVICE UNDER TEST DESCRIPTION

3.1 General Information of the EUT

Model Name	SM-S731U
Additional Model Name	SM-S731U1
Equipment Type	Mobile Phone
FCC ID	A3LSMS731U
Application Type	Certification
Applicant	SAMSUNG Electronics Co., Ltd.

3.2 DUT specification

Device Wireless specification overview		
Band & Mode	Operating Mode	Tx Frequency
GSM850	Voice / Data	824.2 MHz ~ 848.8 MHz
GSM1900	Voice / Data	1 850.2 MHz ~ 1 909.8 MHz
UMTS Band 2	Voice / Data	1 852.4 MHz ~ 1 907.6 MHz
UMTS Band 4	Voice / Data	1 712.4 MHz ~ 1 752.6 MHz
UMTS Band 5	Voice / Data	826.4 MHz ~ 846.6 MHz
LTE FDD Band 2 (PCS)	Voice / Data	1 850.7 MHz ~ 1 909.3 MHz
LTE FDD Band 4 (AWS)	Voice / Data	1 710.7 MHz ~ 1 754.3 MHz
LTE FDD Band 5 (Cell)	Voice / Data	824.7 MHz ~ 848.3 MHz
LTE FDD Band 7	Voice / Data	2 502.5 MHz ~ 2 567.5 MHz
LTE FDD Band 12	Voice / Data	699.7 MHz ~ 715.3 MHz
LTE FDD Band 13	Voice / Data	779.5 MHz ~ 784.5 MHz
LTE FDD Band 14	Voice / Data	790.5 MHz ~ 795.5 MHz
LTE FDD Band 25	Voice / Data	1 850.7 MHz ~ 1 914.3 MHz
LTE FDD Band 26	Voice / Data	814.7 MHz ~ 848.3 MHz
LTE FDD Band 30	Voice / Data	2 307.5 MHz ~ 2 312.5 MHz
LTE TDD Band 38	Voice / Data	2 572.5 MHz ~ 2 617.5 MHz
LTE TDD Band 41	Voice / Data	2 498.5 MHz ~ 2 687.5 MHz
LTE TDD Band 48	Voice / Data	3 552.5 MHz ~ 3 697.5 MHz
LTE FDD Band 66 (AWS)	Voice / Data	1 710.7 MHz ~ 1 779.3 MHz
LTE FDD Band 71	Voice / Data	665.5 MHz ~ 695.5 MHz
NR FDD Band n2 (PCS)	Voice / Data	1 852.5 MHz ~ 1 907.5 MHz
NR FDD Band n5	Voice / Data	826.5 MHz ~ 846.5 MHz
NR FDD Band n7	Voice / Data	2 502.5 MHz ~ 2 567.5 MHz
NR FDD Band n12	Voice / Data	701.5 MHz ~ 713.5 MHz
NR FDD Band n14	Voice / Data	790.5 MHz ~ 795.5 MHz
NR FDD Band n25 (PCS)	Voice / Data	1 852.5 MHz ~ 1 912.5 MHz
NR FDD Band n26	Voice / Data	816.5 MHz ~ 846.5 MHz
NR FDD Band n30	Voice / Data	2 307.5 MHz ~ 2 312.5 MHz
NR TDD Band n38	Voice / Data	2 575 MHz ~ 2 615 MHz
NR TDD Band n41	Voice / Data	2 501.01 MHz ~ 2 685 MHz
NR TDD Band n48	Voice / Data	3 555 MHz ~ 3 695.01 MHz
NR FDD Band n66	Voice / Data	1 712.5 MHz ~ 1 777.5 MHz
NR FDD Band n70	Voice / Data	1 697.5 MHz ~ 1 707.5 MHz
NR FDD Band n71	Voice / Data	665.5 MHz ~ 695.5 MHz
NR TDD Band n77	Voice / Data	3 705 MHz ~ 3 975 MHz
NR TDD Band n77 DoD	Voice / Data	3 445.01 MHz ~ 3 544.98 MHz
NR TDD Band n78	Voice / Data	3 705 MHz ~ 3 795 MHz
NR TDD Band n78 DoD	Voice / Data	3 455.01 MHz ~ 3 544.98 MHz
U-NII-1	Voice / Data	5 180 MHz ~ 5 240 MHz
U-NII-2A	Voice / Data	5 260 MHz ~ 5 320 MHz
U-NII-2C	Voice / Data	5 500 MHz ~ 5 720 MHz
U-NII-3	Voice / Data	5 745 MHz ~ 5 825 MHz
U-NII-4	Voice / Data	5 845 MHz ~ 5 885 MHz
U-NII-5	Voice / Data	5 925 MHz ~ 6 425 MHz
U-NII-6	Voice / Data	6 425 MHz ~ 6 525 MHz
U-NII-7	Voice / Data	6 525 MHz ~ 6 865 MHz
U-NII-8	Voice / Data	6 865 MHz ~ 7 115 MHz
2.4 GHz WLAN	Voice / Data	2 412 MHz ~ 2 462 MHz
Bluetooth / LE	Data	2 402 MHz ~ 2 480 MHz
NFC	Data	13.56 MHz
WPC	Data	110 kHz ~ 148 kHz

4. Measuring Instrument Calibration

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations and is traceable to recognized national standards.

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
ABM Probe	SPEAG	AM1DV3	3049	11/14/2025
ABM Probe	SPEAG	AM1DV3	3050	01/20/2026
Data Acquisition Electronics	SPEAG	DAE4ip	1867	05/21/2026
Data Acquisition Electronics	SPEAG	DAE4	1225	02/18/2026
Data Acquisition Electronics	SPEAG	DAE4	446	03/19/2026
Data Acquisition Electronics	SPEAG	DAE4	652	06/19/2026
DAC	Sound Devices	USBPre 2	HB1319212059	N/A
DAC	Sound Devices	USBPre 2	HB1318341009	N/A
Radio Communication Tester	R & S	CMW 500	167916	09/11/2025
Radio Communication Tester	R & S	CMX 500	100325	10/14/2025
USB Audio Module	KEYSIGHT	U8903B-UAM	101006	N/A
UXM 5G Wireless Test Set	KEYSIGHT	E7515B	MY58460166	07/30/2025
External Media Audio	R & S	CMX-ZG180A	101186	N/A

5. Measurement Uncertainty

Measurement Uncertainty for Audio Band Magnetic Measurement

Error Description	Uncertainty ± %	Probability distribution	Div.	c/ ABMd	c/ ABMu	Std. Unc. ABMd	Std. Unc. ABMu
Probe Sensitivity							
Reference Level	3.0	N	1	1	1	3.0	3.0
AMCC Geometry	0.4	R	1.73	1	1	0.2	0.2
AMCC Current	1.0	R	1.73	1	1	0.6	0.6
Probe Positioning during Calibr.	0.1	R	1.73	1	1	0.1	0.1
Noise Contribution	0.7	R	1.73	0.0143	1	0.0	0.4
Frequency Slope	5.9	R	1.73	0.1	1.0	0.3	3.5
Probe System							
Repeatability / Drift	1.0	R	1.73	1	1	0.6	0.6
Linearity / Dynamic Range	0.6	R	1.73	1	1	0.4	0.4
Acoustic Noise	1.0	R	1.73	0.1	1	0.1	0.6
Probe Angle	1.0	R	1.73	1	1	0.6	0.6
Spectral Processing	0.9	R	1.73	1	1	0.5	0.5
Integration Time	0.6	N	1.00	1	5	0.6	3.0
Field Distribution	0.2	R	1.73	1	1	0.1	0.1
Test Signal							
Ref. Signal Spectral Response	0.6	R	1.73	0	1	0.00	0.4
Positioning							
Probe Positioning	1.9	R	1.73	1	1	1.1	1.1
Phantom Thickness	0.9	R	1.73	1	1	0.5	0.5
DUT Positioning	1.9	R	1.73	1	1	1.1	1.1
External Contributions							
RF Interference	0.0	R	1.73	1	0.3	0.0	0.0
Test Signal Variation	2.0	R	1.73	1	1	1.2	1.2
Combined Uncertainty							
Combined Std. Uncertainty	(k=1)					3.9	6.0
Expanded uncertainty	(Coverage factor for 95%, k=2)					7.8	12.0
Notes for table : N –Normal, R –Rectangular, Div. - Divisor used to obtain standard uncertainty							

6. Test Procedures for all Technologies

6.1 General Procedures C63.19-2019, Section 6

ANSI C63.19-2019, Section 6

This document describes the measurement of the baseband (audio frequency) magnetic T-Coil signal from a WD. The goal is to evaluate the size of the area where a user could position their WD relative to their hearing aid's telecoil and receive an acceptable magnetically coupled signal. Three quantities are measured and evaluated. The first is the field strength of the desired signal at the center of the audio band (desired ABM signal).³¹ The second is the frequency response of the desired signal measured across the audio band.

This subclause describes the procedures used to measure the ABM (T-Coil) performance of the WD. Measurements shall be performed over a measurement area 50 mm square, in the measurement plane, as specified in A.3. The measurement area shall be scanned with a uniform measurement point spacing of $2.0 \text{ mm} \pm 0.5 \text{ mm}$ in each X-Y axis of the plane, yielding 676 measurement points with approximately even spacing throughout the area. In addition to measuring the desired ABM signal levels, the weighted magnitude of the unintended signal shall also be determined. Weighting of the unintended and undesired ABM field shall be by the spectral and temporal weighting described in D.4 through D.6. Measurements shall not include undesired properties from the WD's RF field; therefore, use of a coaxial connection to a base station simulator or non-radiating load may be necessary. However, even then with a coaxial connection to a base station simulator or non-radiating load there may still be RF leakage from the WD, which may interfere with the desired measurement.

Measurements shall be performed with the probe coil oriented in the transverse direction, as illustrated in A.3, that is, aligned in the plane of the measurement area and perpendicular to the long dimension of the WD. A multi-stage sequence consists of first measuring the field strength of the desired T-Coil signal (desired ABM signal) that is useful to a hearing aid T-Coil at each specified measurement point. The undesired magnetic component (undesired ABM field) is then measured in the same transverse orientation at each of the same measurement points. At a single location only, taken at or near the highest desired ABM signal reading, the desired ABM signal frequency response shall be determined in a third measurement stage.

Test flow for T-Coil signal test

The following steps summarize the basic test flow for determining desired ABM signal and undesired ABM field. These steps assume that a sine wave or narrowband 1/3 octave signal can be used for the measurement of desired ABM signal level. An alternative procedure, yielding equivalent results, using a broadband excitation is described in 6.5.

- a) A validation of the test setup and instrumentation shall be performed. This may be done using a TMFS or Helmholtz Coil. Measure the emissions and confirm that they are within tolerance of the expected values.
- b) Confirm that equipment that requires calibration has been calibrated, and that the noise level meets the requirements given in 6.3.2.
- c) Position the WD in the test setup and connect the WD RF connector to a base station simulator or a non-radiating load (if necessary to control RF interference in the measurement equipment) as shown in Figure 6.1 or Figure 6.2.
- d) The drive level to the WD is set such that the reference input level specified in Table 6.1 is input to the base station simulator (or manufacturer's test mode equivalent) in the 1 kHz, 1/3 octave band. This drive level shall be used for the T-Coil signal test (desired ABM signal) at $f = 1 \text{ kHz}$.
Either a sine wave at 1025 Hz, or a voice-like signal, band-limited to the 1 kHz 1/3 octave, as specified in 6.4.3, shall be used for the reference audio signal. If interference is found at 1025 Hz an alternative nearby reference audio signal frequency may be used.³⁵ The same drive

level will be used for the desired ABM signal frequency response measurements at each 1/3 octave band center frequency. The WD volume control may be set at any level up to maximum, provided that a signal at any frequency at maximum modulation would not result in clipping or signal overload.

e) At each measurement location over the measurement area and in the transverse orientation, measure and record the desired 1 kHz T-Coil magnetic signal (desired ABM signal) as described in Step c).

f) At or near a location representing a maximum in the just-measured desired ABM signal, measure and record the desired T-Coil magnetic signals (desired ABM signal at f_i) as described in 6.4.5.2 in each individual ISO 266:1975 R10 standard 1/3 octave band. The desired audio band input frequency (f_i) shall be centered in each 1/3 octave band maintaining the same drive level as determined in Step c), and the reading taken for that band. Equivalent methods of determining the frequency response may also be employed, such as fast Fourier transform (FFT) analysis using noise excitation or input-output comparison using simulated speech. The full-band integrated or half-band integrated probe output, as described in D.9, may be used, as long as the appropriate calibration curve is applied to the measured result, so as to yield an accurate measurement of the field magnitude. (The resulting measurement shall be an accurate measurement in dB(A/m).) Compare the frequency response found to the requirements of 6.6.3.

g) At the same locations measured in Step d), measure and record the undesired broadband audio magnetic signal (undesired ABM field) with no audio signal applied (or digital zero applied, if appropriate) using the specified spectral weighting, the half-band integrator followed by the temporal weighting.

h) Calculate and record the location and number of the measurement points that satisfy both the minimum desired ABM signal level and the maximum undesired ABM field level specified in 6.6.2. Compare this to the requirements in 6.6.4 and record the result.

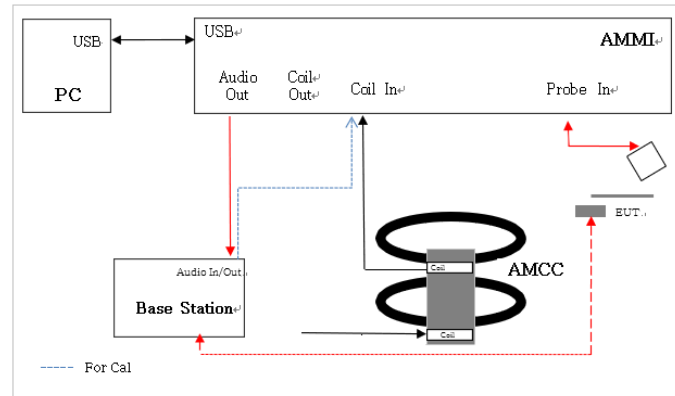
i) Calculate and record the location and number of the measurement points that satisfy the maximum undesired ABM field level and distribution requirements specified in 6.6.4.

All measurements of the desired signal shall be shown to be of the desired signal and not of an undesired signal. This may be shown by turning the desired signal ON and OFF with the probe measuring the scanned locations.

At the measurement location for each orientation, measure and record the undesired broadband audio magnetic signal (ABM2) as specified in 6.4.2 g) with no audio signal applied (or digital zero applied, if appropriate) using A-weighting and the half-band integrator. Calculate the ratio of the desired to undesired signal strength (i.e., signal quality).

Obtain the data from the postprocessor, SEMCAD, and determine the primary group, secondary group that properly the signal quality based on Table 8.

Test Setup Diagram



6.2 VoWiFi

This device supports Wi-Fi calling (aka Voice over Wi-Fi or VoWiFi) which is an extended feature of the carriers CMRS service to offload VoLTE calls onto local area networks over WI-FI via the internet and subject to HAC assessment for phones with a HAC rating.

The set up for VoWiFi uses the Base station as described in section 7.1 with the exception that the reference audio level is set at -16dBm0. The reference level is calibrated using the standard call box calibration procedures with the exception of the -16dBm0 reference level being used.

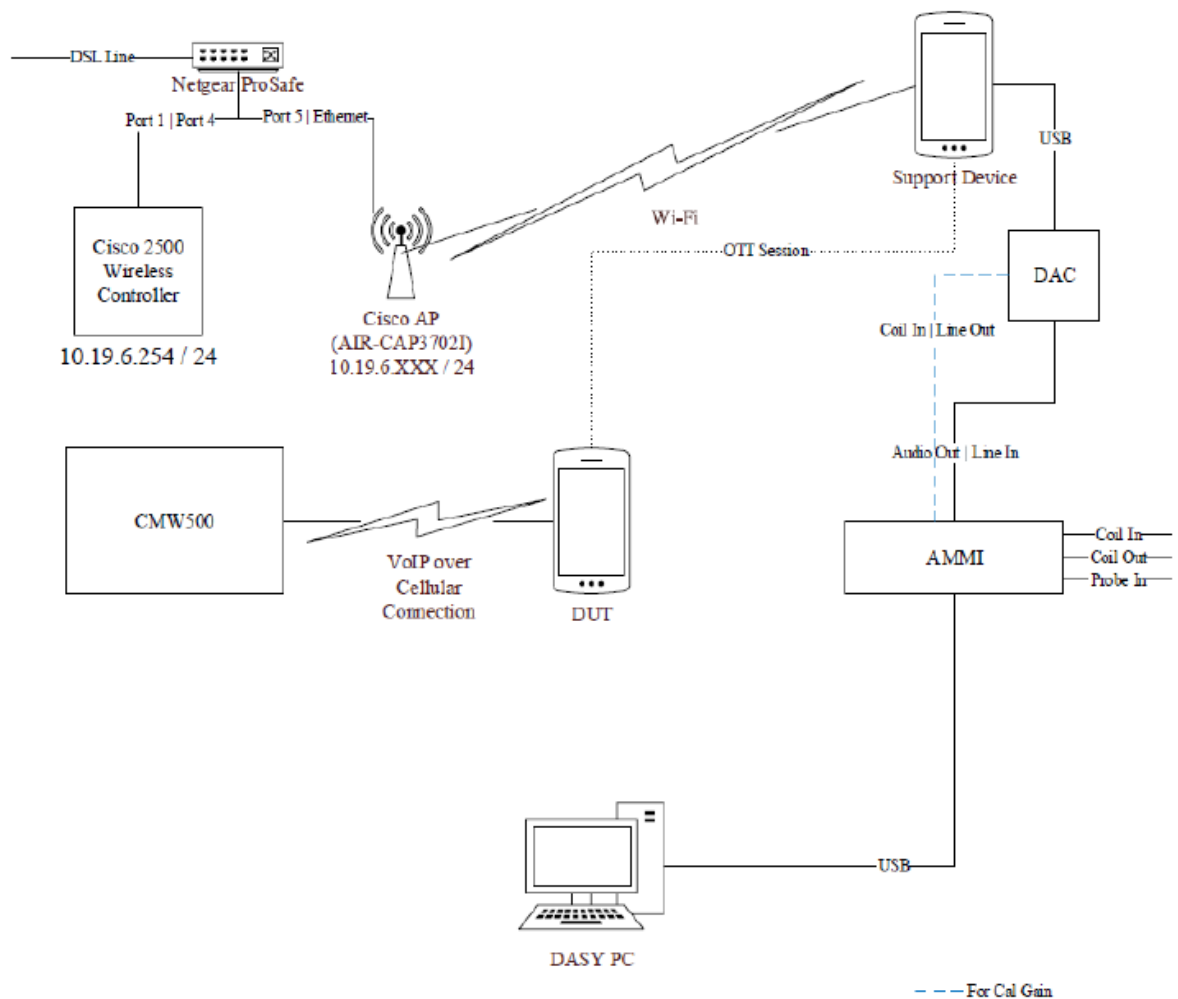
An investigation was performed to determine worst case codec, bit rate and air interface configuration (refer to sections 11.3, 11.4 and 11.5).

6.3 Over the Top(OTT) Voice over IP(VoIP)

This device supports VoIP via a preinstalled application that uses the Google Meet service, using OPUS as its only codec (refer to § 10 for air interface details and § 11.6 for codec bit rates). VoIP capabilities require HAC assessment when voice calls are supported over the cellular data connection via pre-installed VoIP applications.

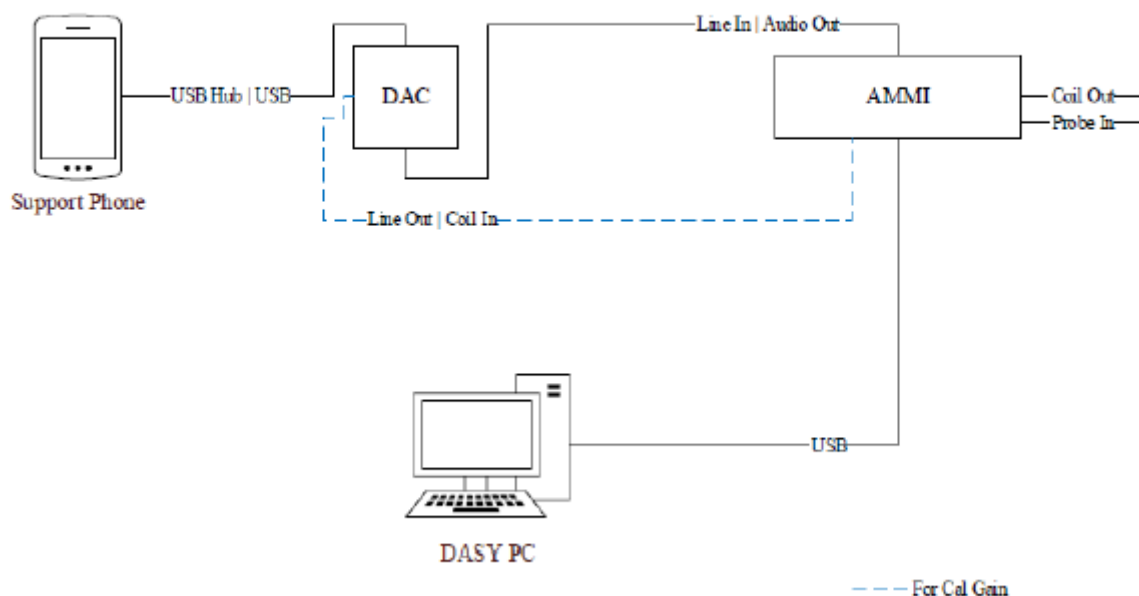
The equipment is set up as shown below with a support device used to originate the call using the IP transport. The support device connects to the cloud-based Google Meet service via Wi-Fi access point and router, or RJ45. The DUT connects to the VoIP service via a cellular/unlicensed air interface to the call box and an Ethernet connection from call box to Internet. The various codec bit rate and air interface configurations are evaluated to determine the worst-case configuration (refer to § 11.6).

Test Setup configuration for OTT calls



For the OTT call, the calibrated audio card within the CMW500 cannot be used so the AMMI is connected to an external Digital-Analog Converter (DAC) and the DAC is connected to the Support Device via USB. The test signal is sent from the DASY PC to the AMMI, from the AMMI to the DAC, from the DAC to the Support Device, and, via the VoIP call, to the DUT.

As this test set up uses an external DAC between the AMMI's audio output and support device, the appropriate gain factor for the OTT call needs be determined. This is done by connecting the DAC between the AMMI Audio output and Coil input as shown below.



Using the metering function on the DAC, the DAC gain is adjusted until the volume reaches 0dBFS (3.14 dBm0 based on TIA/EIA 810-A).

7. Audio Level and Gain Measurements

The following reference input levels (table 6.1—Normal speech input level of ANSI C63.19-2019) that correlate to a normal speech input level shall be used for the standard transmission protocols.

Normal speech input level -16 dBm0 is used for all testing: GSM, WCDMA, VoLTE, VoNR, VoWiFi.

Input level -20dBm0 is used for Over The Top (OTT) Voice over IP(VOIP) Testing (Codec : OPUS).

Table 6.1—Normal speech input levels

Standard	Protocol	Input (dBm0)
TLA-2000	CDMA	-18
TLA/EIA-136	TDMA (50 Hz)	-18
J-STD-007	GSM (217 Hz)	-16
T1/T1P1/3GPP (See Note 1)	UMTS (WCDMA)	-16
iDEN ^a	TDMA (22 Hz and 11 Hz)	-18
VoIP ^a (See Note 2)	Voice over Internet Protocol	-16

NOTE 1—For UMTS (Universal Mobile Telecommunications System), refer to 3GPP TS26.131 and TS26.132 (<http://www.3gpp.org>).

NOTE 2—VoIP is used in this table as a general term specifying a group of voice services that use -16 dBm0 as their normal acoustic level. The group includes a variety of voice services, including Voice-over-LTE (VoLTE), Voice-over-IP-multimedia-subsystem (VoIMS), Voice-over-Wi-Fi (VoWiFi) and similar services. For 3G, LTE, and WLAN terminals used for Commercial Mobile Radio Service (CMRS) based telephony, refer to 3GPP TS26.131 and TS26.132.

^a The manufacturer shall establish that -16 dBm0 is the normal acoustic level in order to place it in this category.

For protocols not listed in Table 6.1, use the normal speech input level per the relevant specifications for that air interface.

7.1 GSM, UMTS, VoLTE, VoNR, VoWifi

Refer to the below table for the gains used to measure.

GSM, UMTS, VoLTE

Signal Type	Audio Level [dBm]	Peak to Full Scale [dB]	Peak to RMS Scale [dB]	BWC [dB]	Scaling [Gain]
Voice 1 kHz	-16	-0.37	15.74	0.07	-12.39 to -12.09
Normal Voice	-16	0	21.57	10.81	-6.57 to -6.26

VoNR

Signal Type	Audio Level [dBm]	Peak to Full Scale [dB]	Peak to RMS Scale [dB]	BWC [dB]	Scaling [Gain]
Voice 1 kHz	-16	-0.37	15.74	0.07	-7.56 to -7.38
Normal Voice	-16	0	21.57	10.81	-1.73 to -1.55

VoWifi 2.4GHz,5GHz

Signal Type	Audio Level [dBm]	Peak to Full Scale [dB]	Peak to RMS Scale [dB]	BWC [dB]	Scaling [Gain]
Voice 1 kHz	-16	-0.37	15.74	0.07	-12.37 to -12.36
Normal Voice	-16	0	21.57	10.81	-6.54 to -6.53

Refer to the below table for the gains used to measure VoLTE.

The following software/firmware was used to simulate the VoLTE server for testing:

Firmware	License Keys	Software Name
V4.0.24 for LTE	KS500	LTE FDD R8 SIG BASIC
	KS550	LTE TDD R8 SIG BASIC
V4.0.56 for Audio	KA100	IP APPL ENABLING IPv4
	KA150	IP APPL ENABLING IPv6
	KAA20	IP APPL IMS BASIC
	KM050	DATA APPL MEAS
	KS104	EVS SPEECH CODEC

Refer to the below table for the gains used to measure VoWifi.

Firmware	License Keys	Software Name
V4.0.23 for WLAN	KS650	WLAN A/B/G SIG BASIC
	KS651	WLAN N SIG BASIC
	KS656	WLAN IEEE 802.11ac
	KS657	WLAN IEEE 802.11ax
V4.0.56for Audio	KA100	IP APPL ENABLING IPv4
	KA150	IP APPL ENABLING IPv4
	KAA20	IP APPL IMS BASIC
	KM050	DATA APPL MEAS
	KS104	EVS SPEECH CODEC

Firmware	License Keys	Software Name
V8.0.0.164 for WLAN	KM350	WLAN IEEE a/b/g/n/ac SIG BASIC
	KM351	WLAN IEEE SIG 802.11ax
	KM351	WLAN IEEE 802.11ax
	KM360	WLAN IEEE 802.11 MIMO
	KS350B	WLANIEEE a/b/g/n/ac APs
	KS355B	WLAN IEEE ax
V8.0.0.164 for Audio	KA110	IP APPL ENABLING IPv4, DATA APPL MEAS
	KA180	Audio Enabler

Refer to the below table for the gains used to measure VoNR of Call Box(E7515B)

The following software/firmware was used to simulate the VoNR server for testing:

Firmware	License Model	Software Name
5G NR	C8700200A	Test Application Framework
Audio	C8700201A	IMS-SIP Emulation
	C87300P1A	LTE IP data
	C87350P1A	5G NR IP data

7.2 Over the Top(OTT) Voice over IP(VoIP)

For EDGE, HSPA, LTE, NR and Wi-Fi the linear gain levels listed below were used. The results below were based on a reference input level of -20 dBm.

To calibrate the DAC (refer § 6.3), three. Way audio files (sine wave, 1 kHz voice, and 300 to 3 kHz voice) are sent from the DASY PC to the AMMI, then to the DAC. The Helmholtz resonator measures the field strength, which represents the AMMI to DAC input sensitivity. After determining the input sensitivity, the adjusted linear gain values can then be calculated.

OTT NR

Signal Type	Audio Level [dBm]	Peak to Full Scale [dB]	Peak to RMS Scale [dB]	BWC [dB]	Scaling [Gain]
Voice 1 kHz	-20	-0.37	15.74	0.07	-12.78
Normal Voice	-20	0	21.57	10.81	-6.95

OTT GSM, UMTS ,Wifi, LTE

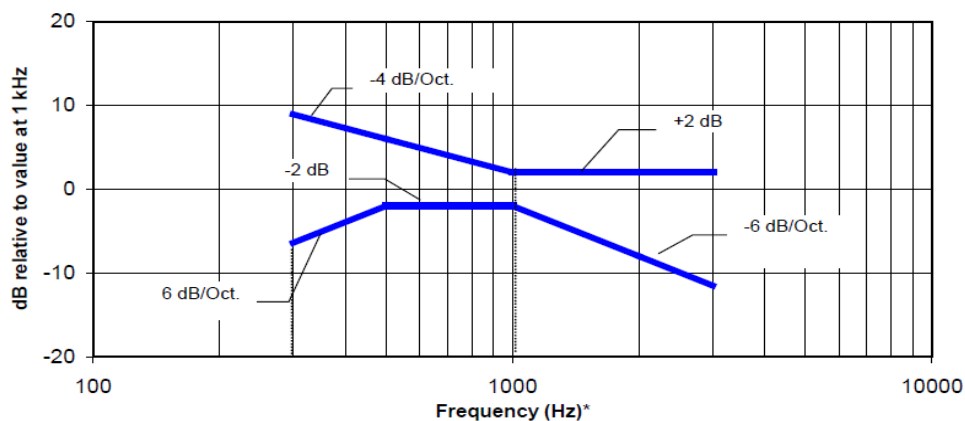
Signal Type	Audio Level [dBm]	Peak to Full Scale [dB]	Peak to RMS Scale [dB]	BWC [dB]	Scaling [Gain]
Voice 1 kHz	-20	-0.37	15.74	0.07	-12.98 to -13.03
Normal Voice	-20	0	21.57	10.81	-7.01 to -7.13

8. T-coil Measurement Criteria

8.1 Frequency Response

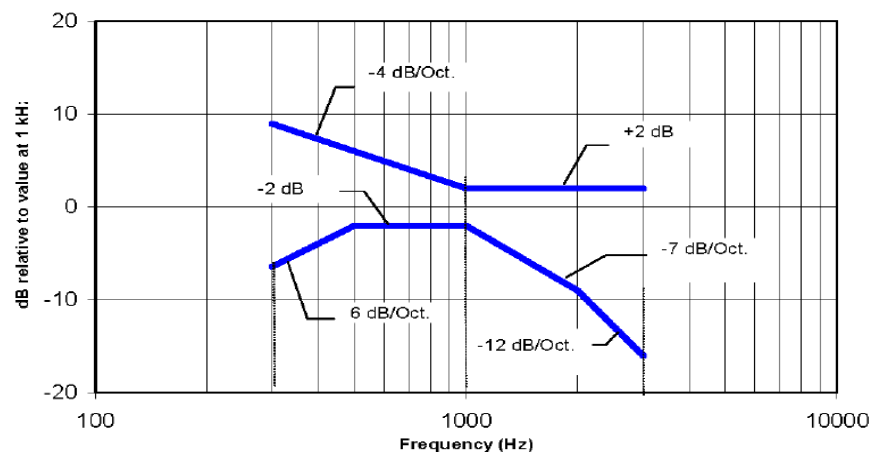
The frequency response of the axial component of the magnetic field, measured in 1/3 octave bands, shall follow the response curve, over the frequency range 300 Hz to 3000 Hz.

Figure 6.4 and Figure 6.5 provide the boundaries for the specified frequency. These response curves are for true field strength measurements of the T-Coil signal. Thus the 6 dB/octave probe response has been corrected from the raw readings.



NOTE—Frequency response is between 300 Hz and 3 kHz.

Figure 6.4—Magnetic field frequency response for WDs with a maximum field ≤ -15 dB(A/m) at 1 kHz



NOTE—Frequency response is between 300 Hz and 3000 Hz.

Figure 6.5—Magnetic field frequency response for WDs with a maximum field that exceeds -15 dB(A/m) at 1 kHz

8.2 Desired ABM Signal, Undesired ABM Field qualification requirements

ANSI C63.19-2019, Section 6.6.4.1

For a WD that is expected to operate primarily in radio access technologies that include 2G GSM for legacy support, the WD shall be qualified for telecoil compatibility one of two ways:

- a) The WD shall be rated for telecoil use for all other voice operating modes, exclusive of 2G GSM, according to the criteria of 6.6.4.2.
- b) If the WD is to be rated for telecoil use in its 2G GSM operating modes, these modes shall be qualified according to the criteria of 6.6.4.3.

ANSI C63.19-2019, 6.6.4.2 Non-2G GSM operating modes

The goal of this requirement is to ensure an adequate area where desired ABM signal is sufficiently strong to be heard clearly and a larger area where undesired ABM field is sufficiently low as to avoid undue annoyance. Qualifying measurement points shall fulfill the requirements of 6.6.2; both the primary and secondary group requirements shall be met:

- The primary group shall include at least 75 measurement points.
- The secondary group shall include at least 300 contiguous measurement points.

Additionally, to avoid an oddly shaped area of low noise, the secondary group shall include at least one longitudinal column of at least 10 contiguous qualifying points and at least one transverse row containing at least 15 contiguous qualifying points.

ANSI C63.19-2019, 6.6.4.3 2G GSM operating modes

If the 2G GSM operating mode(s) are selected for qualification, the qualifying measurement points shall fulfill the requirements of 6.6.2; both the primary and secondary group requirements shall be met:

- The primary group shall include at least 25 measurement points.
- The secondary group shall include at least 125 contiguous measurement points.

9. Device Under Test

Normal operation	Held to head	
Back Cover	The Back Cover is not removable	
Test sample information	S/N	Notes
	YEJ0647M, YEJ0622M	T-coil Test
	YEJ06434M	

Note : T-Coil Measurements in this report were performed by Maximum Power (Pmax) in static power condition.

10. Air Interfaces and Operating Mode

Air Interface	Bands (Mhz)	Type	C63.19 Tested	Simultaneous Transmitter	Name of voice service	Audio Codecs Evaluated
GSM	850	VO	Yes	Wi-Fi, BT	CMRS Voice ¹	EFR
	1900					
	GPRS/EDGE	VD	Yes	Wi-Fi, BT	Google Meet ¹	OPUS
UMTS	850	VO	Yes	Wi-Fi, BT	CMRS Voice ¹	AMR-NB &AMR-WB
	1700					
	1900					
	HSPA	VD	Yes	Wi-Fi, BT	Google Meet ¹	OPUS
LTE - FDD	680 (B71)	VD	Yes	NR, Wi-Fi, BT	VoLTE ¹ Google Meet ¹	VoLTE: AMR-NB, AMR-WB, EVS-NB, EVS-WB Google Meet :OPUS
	700 (B12/13/14)					
	850 (B5/26)					
	1700 (B4/66)					
	1900 (B2/25)					
	2300 (B30)					
	2500 (B7)					
LTE – TDD	2600 (B38/41)	VD	Yes	NR, Wi-Fi, BT	VoLTE ¹ Google Meet ¹	VoLTE:AMR-NB, AMR-WB, EVS-NB, EVS-WB Google Meet :OPUS
	3600 (B48)					
NR -FDD	680(B71)	VD	Yes	LTE, Wi-Fi, BT	VoNR ¹ Google Meet ¹	VoNR:AMR-NB, AMR-WB, EVS-NB, EVS-WB. Google Meet :OPUS
	700(B12/14)					
	850(B5/26)					
	1700(B66,B70)					
	1900(B2/25)					
	2300(B30)					
	2500 (B7)					
NR -TDD	2600(B38,B41)	VD	Yes	LTE, Wi-Fi, BT	VoNR ¹ Google Meet ¹	VoNR:AMR-NB, AMR-WB, EVS-NB, EVS-WB Google Meet :OPUS
	3600 (B48)		Yes			
	3800(B77, B78)		Yes			
Wi-Fi	2450	VD	Yes	WWAN and Wifi 5/6GHz	VoWiFi ¹ Google Meet ¹	VoWiFi:AMR-NB, AMR-WB, EVS-NB, EVS-WB Google Meet :OPUS
	5200 (U-NII-1)		Yes	WWAN and Wifi 2.4GHz, BT		
	5300 (U-NII-2A)					
	5500 (U-NII-2C)					
	5800 (U-NII-3)					
	5900 (U-NII-4)					
	6200(UNII 5)		Yes ²	WWAN and Wifi 2.4GHz, BT		
	6500(UNII 6)		No ³			
	6700(UNII 7)					
7000(UNII 8)						
BT	2450	DT	N/A	WWAN and Wifi 5/6GHz	N/A	N/A
Type: VO: Legacy Cellular Voice Service DT: Digital Transport only(no voice) CMRS: Commercial Mobile Radio Service VD: IP Voice service over Digital Transport				Note: 1. Ref Lev in accordance with the ANSI 63.19-2019 Table 6.1 2. UNII band 5 was evaluated for operations which are entirely below 6 GHz. 3. Wifi 6GHz(UNII 6~8) are currently outside the scope of ANSI C63.19 and FCC HAC regulations.		

11. HAC (T-coil) Test Results

11.1 Codec Investigation

An investigation between the various codec configurations (Low/High bit rates for Narrowband, Wideband) and specific parameters are documented (Primary Group, Secondary Group, longitudinal contiguous points, transverse row contiguous points, frequency response) to determine the worst-case bit rates for each voice service type. The table below compares the varying codec configurations. A codec investigation was performed on one band of each GSM, UMTS, LTE FDD/TDD, NR FDD/TDD.

The highlighted results below were determined to be the worst case codec configuration(s) for GSM, UMTS and LTE, NR.

GSM

Codec Investigation				
Codec State	AMR-NB (kbit/s)		Orientation	Band/ Channel
	FR V1	HR V1		
Freq. Response(dB)	1.74	1.97	y (Transversal)	GSM 850 CH.190 ANT A
Primary	80	101		
Secondary	187	214		
Contiguous Longitudinal	11	12		
Contiguous Transverse	26	26		

UMTS

Codec Investigation								
Codec State	AMR-NB (kbit/s)			AMR-WB (kbit/s)			Orientation	Band/ Channel
	4.75	7.4	12.2	6.6	15.85	23.85		
Freq. Response(dB)	2.00	1.90	2.00	2.00	1.93	1.91	y (Transversal)	UMTS Band 2 Rel.99 CH.9400 ANT A
Primary	554	552	558	556	578	579		
Secondary	675	673	676	676	676	676		
Contiguous Longitudinal	26	26	26	26	26	26		
Contiguous Transverse	26	26	26	26	26	26		

LTE FDD

Codec Investigation								
Codec State	AMR-NB (kbit/s)			AMR-WB (kbit/s)			Orientation	Band/ Bandwidth/ Channel
	4.75	7.4	12.2	6.6	15.85	23.85		
Freq. Response(dB)	1.34	1.44	1.16	2.00	1.94	1.99	y (Transversal)	LTE Band25 CH.26365 20 MHz QPSK 1RB 0offset ANT F
Primary	455	457	458	546	547	563		
Secondary	674	673	673	660	652	663		
Contiguous Longitudinal	26	26	26	26	26	26		
Contiguous Transverse	26	26	26	26	26	26		

Codec Investigation											
Codec State	EVS-NB (kbit/s)			EVS-WB (kbit/s)			EVS-SWB (kbit/s)			Orientation	Band/ Bandwidth/ Channel
	5.9	13.2	24.4	5.9	13.2	24.4	9.6	16.4	24.4		
Freq. Response(dB)	1.73	1.21	1.81	2.00	1.75	1.90	2.00	2.00	2.00	y (Transversal)	LTE Band25 CH.26365 20 Mhz QPSK 1RB 0offset ANT F
Primary	459	459	534	490	568	468	514	403	527		
Secondary	662	673	650	666	665	565	649	666	662		
Contiguous Longitudinal	26	26	26	26	26	26	26	26	26		
Contiguous Transverse	26	26	26	26	26	26	26	26	26		

LTE TDD

Codec Investigation								
Codec State	AMR-NB (kbit/s)			AMR-WB (kbit/s)			Orientation	Band/ Bandwidth/ Channel
	4.75	7.4	12.2	6.6	15.85	23.85		
Freq. Response(dB)	1.97	2.00	2.00	2.00	1.99	1.98	y (Transversal)	LTE Band41 CH.40620 20 MHz QPSK 1RB 0offset ANT B
Primary	269	281	283	279	287	283		
Secondary	395	405	404	394	390	387		
Contiguous Longitudinal	19	20	20	19	19	19		
Contiguous Transverse	26	26	26	26	26	26		

Codec Investigation											
Codec State	EVS-NB (kbit/s)			EVS-WB (kbit/s)			EVS-SWB (kbit/s)			Orientation	Band/ Bandwidth/ Channel
	5.9	13.2	24.4	5.9	13.2	24.4	9.6	16.4	24.4		
Freq. Response(dB)	1.77	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	y (Transversal)	LTE Band41 CH.40620 20 MHz QPSK 1RB 0offset ANT B
Primary	223	277	273	239	311	309	272	273	269		
Secondary	398	392	390	409	407	404	405	405	401		
Contiguous Longitudinal	20	20	19	20	20	20	20	20	20		
Contiguous Transverse	26	26	26	26	26	26	26	26	26		

NR FDD

Codec Investigation								
Codec State	AMR-NB (kbit/s)			AMR-WB (kbit/s)			Orientation	Band/ Bandwidth/ Channel
	4.75	7.4	12.2	6.6	15.85	23.85		
Freq. Response(dB)	1.62	1.58	2.00	2.00	1.93	1.78	y (Transversal)	NR Band n25 CH.376500 DFT-s OFDM QPSK 40 Mhz 1RB 1offset ANT F
Primary	443	444	525	542	565	566		
Secondary	662	663	645	657	664	664		
Contiguous Longitudinal	26	26	26	26	26	26		
Contiguous Transverse	26	26	26	26	26	26		

Codec Investigation											
Codec State	EVS-NB (kbit/s)			EVS-WB (kbit/s)			EVS-SWB (kbit/s)			Orientation	Band/ Bandwidth/ Channel
	5.9	13.2	24.4	5.9	13.2	24.4	9.6	16.4	24.4		
Freq. Response(dB)	1.23	1.96	2.00	1.66	2.00	2.00	2.00	2.00	2.00	y (Transversal)	NR Band n25 CH.376500 DFT-s OFDM QPSK 40 MHz 1RB 1offset ANT F
Primary	478	544	546	357	403	493	521	514	527		
Secondary	661	661	663	651	567	662	660	649	661		
Contiguous Longitudinal	26	26	26	26	26	26	26	26	26		
Contiguous Transverse	26	26	26	26	26	26	26	26	26		

NR TDD

Codec Investigation								
Codec State	AMR-NB (kbit/s)			AMR-WB (kbit/s)			Orientation	Band/ Bandwidth/ Channel
	4.75	7.4	12.2	6.6	15.85	23.85		
Freq. Response(dB)	1.42	1.31	1.71	1.86	1.90	1.96	y (Transversal)	NR Band n41 CH.518598 DFT-s OFDM QPSK 100 Mhz 1 RB 1 offset PC2 ANT B
Primary	132	132	133	183	176	175		
Secondary	341	339	338	350	345	345		
Contiguous Longitudinal	17	17	17	18	18	18		
Contiguous Transverse	26	26	26	26	26	26		

Codec Investigation											
Codec State	EVS-NB (kbit/s)			EVS-WB (kbit/s)			EVS-SWB (kbit/s)			Orientation	Band/ Bandwidth/ Channel
	5.9	13.2	24.4	5.9	13.2	24.4	9.6	16.4	24.4		
Freq. Response(dB)	1.52	1.85	2.00	2.00	2.00	2.00	2.00	2.00	2.00	y (Transversal)	NR Band n41 CH.518598 DFT-s OFDM QPSK 100 Mhz 1 RB 1 offset PC2 ANT B
Primary	139	127	134	109	183	185	121	114	110		
Secondary	323	316	316	355	355	352	350	345	342		
Contiguous Longitudinal	17	17	17	18	18	18	18	18	17		
Contiguous Transverse	26	26	26	26	26	26	26	26	26		

11.2 Air Interface Investigation

Use the worst-case codec test and document a limited set of bands/modulations/channels/bandwidth. Observe the effect of changing the band and bandwidth to ensure that there are no unexpected variations.

11.2.1 GSM / UMTS

Mode	Ch. Freq.	Ambient Noise dB (A/m)	Primary	Secondary	Contiguous longitudinal	Contiguous Transverse	Freq. Response(dB)	Hmax dB(A/m)	Plot No.
GSM 850 Codec: FR V1 ANT A	CH.190 836.5 MHz	-54.31	80	187	11	26	1.74	17.28	
GSM 850 Codec: FR V1 ANT E	CH.190 836.5 MHz	-54.31	72	185	11	26	1.72	17.10	1
GSM 1900 Codec: FR V1 ANT A	CH.661 1880.0 MHz	-54.31	134	255	14	26	1.73	17.01	
GSM 850 Codec: FR V1 ANT E	CH.128 824.2 MHz	-54.31	76	181	11	26	1.67	17.41	2
	CH.251 848.8 MHz	-54.31	77	183	11	26	1.67	17.40	3
UMTS Band 2 AMR-NB Codec: 7.4kbit/s ANT A	CH.9400 1880.0 MHz	-54.31	552	673	26	26	1.90	18.03	
UMTS Band 4 AMR-NB Codec: 7.4kbit/s ANT A	CH.1412 1732.4 MHz	-54.31	548	667	26	26	1.84	17.94	
UMTS Band 5 AMR-NB Codec: 7.4kbit/s ANT A	CH.4183 836.6 MHz	-54.31	523	645	26	26	2.00	17.70	4
UMTS Band 5 AMR-NB Codec: 7.4kbit/s ANT E	CH.4183 836.6 MHz	-54.31	548	672	26	26	2.00	17.48	
UMTS Band 5 AMR-NB Codec: 7.4kbit/s ANT A	CH.4132 826.4 MHz	-54.31	547	674	26	26	2.00	17.30	5
	CH.4233 846.6 MHz	-54.31	545	672	26	26	2.00	17.31	6

11.2.2 LTE-FDD

RB/ Modulation configuration

Mode	Ch. Freq.	BW	Mod.	RB Config.	Ambient Noise dB (A/m)	Primary	Secondary	Contiguous longitudinal	Contiguous Transverse	Freq. Response(dB)	Hmax dB (A/m)	Plot No.
LTE Band 25 ANT F Codec: EVS-SWB 16.4kbit/s	CH.26365 1882.5 MHz	20 MHz	QPSK	1/0	-56.8	403	666	26	26	2.00	9.69	
				1/49	-56.8	410	669	26	26	2.00	9.74	
				1/99	-56.8	404	666	26	26	2.00	9.61	
				50/0	-56.8	412	675	26	26	2.00	9.58	
				50/25	-56.8	411	674	26	26	2.00	9.63	
				50/49	-56.8	404	665	26	26	2.00	10.44	
				100/0	-56.8	411	676	26	26	2.00	9.59	
			16QAM	1/0	-56.8	433	574	26	26	2.00	16.67	
			64QAM	1/0	-56.8	452	591	26	26	2.00	16.67	
			256QAM	1/0	-56.8	490	624	26	26	2.00	16.76	
		15 MHz	QPSK	1/0	-56.8	391	657	26	26	2.00	10.00	
		10 MHz		1/0	-56.8	392	652	26	26	2.00	10.00	
		5 MHz		1/0	-56.8	525	666	26	26	2.00	16.88	
		3 MHz		1/0	-56.8	513	655	26	26	2.00	16.88	
		1.4 MHz		1/0	-56.8	528	665	26	26	2.00	16.81	

Mode	Ch. Freq.	BW	Mod.	RB Config.	Ambient Noise dB (A/m)	Primary	Secondary	Contiguous longitudinal	Contiguous Transverse	Freq. Response(dB)	Hmax dB (A/m)	Plot No.
LTE Band 25 ANT A Codec: EVS-SWB 16.4 kbit/s	CH.26365 1882.5 MHz	15 MHz	QPSK	1/0	-56.87	529	674	26	26	2.00	16.75	
LTE Band 7 ANT B Codec: EVS-SWB 16.4 kbit/s	CH.21100 2535 MHz	15 MHz	QPSK	1/0	-56.87	521	662	26	26	2.00	16.75	
LTE Band 7 ANT F Codec: EVS-SWB 16.4 kbit/s	CH.21100 2535 MHz	15 MHz	QPSK	1/0	-56.87	518	664	26	26	2.00	16.69	
LTE Band 12 ANT A Codec: EVS-SWB 16.4 kbit/s	CH.23095 707.5 MHz	10 MHz	QPSK	1/0	-56.87	405	665	26	26	2.00	9.99	
LTE Band 12 ANT E Codec: EVS-SWB 16.4 kbit/s	CH.23095 707.5 MHz	10 MHz	QPSK	1/0	-56.87	527	669	26	26	2.00	16.78	
LTE Band 13 ANT A Codec: EVS-SWB 16.4 kbit/s	CH.23230 782 MHz	10 MHz	QPSK	1/0	-56.87	406	664	26	26	2.00	10.59	
LTE Band 13 ANT E Codec: EVS-SWB 16.4 kbit/s	CH.23230 782 MHz	10 MHz	QPSK	1/0	-56.87	520	662	26	26	2.00	16.72	
LTE Band 14 ANT A Codec: EVS-SWB 16.4 kbit/s	CH.23330 793 MHz	10 MHz	QPSK	1/0	-56.87	423	670	26	26	2.00	10.27	
LTE Band 14 ANT E Codec: EVS-SWB 16.4 kbit/s	CH.23330 793 MHz	10 MHz	QPSK	1/0	-56.87	515	657	26	26	2.00	16.75	
LTE Band 26 ANT A Codec: EVS-SWB 16.4 kbit/s	CH.26865 831.5 MHz	15 MHz	QPSK	1/0	-56.87	358	610	26	26	1.99	10.71	7
LTE Band 26 ANT E Codec: EVS-SWB 16.4 kbit/s	CH.26865 831.5 MHz	15 MHz	QPSK	1/0	-56.87	526	664	26	26	2.00	16.77	
LTE Band 30 ANT A Codec: EVS-SWB 16.4 kbit/s	CH.27710 2310 MHz	10 MHz	QPSK	1/0	-56.87	527	664	26	26	2.00	16.76	
LTE Band 30 ANT F Codec: EVS-SWB 16.4 kbit/s	CH.27710 2310 MHz	10 MHz	QPSK	1/0	-56.87	404	654	26	26	2.00	10.20	
LTE Band 66 ANT A Codec: EVS-SWB 16.4 kbit/s	CH.132322 1745 MHz	15 MHz	QPSK	1/0	-56.87	376	645	26	26	2.00	10.15	
LTE Band 66 ANT F Codec: EVS-SWB 16.4 kbit/s	CH.132322 1745 MHz	15 MHz	QPSK	1/0	-56.87	506	646	26	26	2.00	16.72	
LTE Band 71 ANT A Codec: EVS-SWB 16.4 kbit/s	CH.133297 680.5 MHz	15 MHz	QPSK	1/0	-56.87	372	632	26	26	1.95	10.16	
LTE Band 71 ANT E Codec: EVS-SWB 16.4 kbit/s	CH.133297 680.5 MHz	15 MHz	QPSK	1/0	-56.87	512	650	26	26	2.00	16.76	

11.2.3 LTE-TDD

RB/ Modulation configuration

Mode	Ch. Freq.	BW	Mod.	RB Config.	Ambient Noise dB (A/m)	Primary	Secondary	Contiguous longitudinal	Contiguous Transverse	Freq. Response(dB)	Hmax dB (A/m)	Plot No.
LTE Band 41 ANT B Codec: EVS-NB 5.9kbit/s	CH.40620 2593 MHz	20 MHz	QPSK	1/0	-57.0	223	398	20	26	1.77	15.01	
				1/49	-57.0	226	410	21	26	1.71	15.10	
				1/99	-57.0	223	405	20	26	1.83	14.37	
				50/0	-57.0	226	406	20	26	1.60	14.80	
				50/25	-57.0	226	404	20	26	1.50	14.90	
				50/49	-57.0	228	402	20	26	2.00	14.49	
				100/0	-57.0	213	401	20	26	1.81	14.44	8
			16QAM	100/0	-57.0	233	417	21	26	2.00	15.50	
			64QAM	100/0	-57.0	240	415	21	26	1.42	14.23	
			256QAM	100/0	-57.0	316	490	25	26	1.78	15.92	
		15 MHz	QPSK	100/0	-56.96	229	416	21	26	1.90	15.08	
		10 MHz		100/0	-56.96	231	412	21	26	1.08	15.61	
		5 MHz		100/0	-56.96	228	412	21	26	1.32	15.56	

Mode	Ch. Freq.	BW	Mod.	RB Config.	Ambient Noise dB (A/m)	Primary	Secondary	Contiguous longitudinal	Contiguous Transverse	Freq. Response(dB)	Hmax dB (A/m)	Plot No.
LTE Band 41 ANT F Codec: EVS-NB 5.9kbit/s	CH.40620 2593 MHz	20 MHz	QPSK	100/0	-56.96	225	402	20	26	1.66	14.93	
LTE Band 48 ANT F Codec: EVS-NB 5.9kbit/s	CH.55990 3625 MHz	20 MHz	QPSK	100/0	-56.96	258	440	20	26	1.78	15.73	
LTE Band 41 ANT B Codec: EVS-NB 5.9kbit/s	CH.39750 2506 MHz	20 MHz	QPSK	100/0	-56.96	238	413	21	26	1.29	15.30	9
LTE Band 41 ANT B Codec: EVS-NB 5.9kbit/s	CH.40185.2 549.5 MHz	20 MHz	QPSK	100/0	-56.96	248	418	22	26	1.02	16.10	10
LTE Band 41 ANT B Codec: EVS-NB 5.9kbit/s	CH.41055 2636.5 MHz	20 MHz	QPSK	100/0	-56.96	210	392	20	26	1.90	18.03	11
LTE Band 41 ANT B Codec: EVS-NB 5.9kbit/s	CH.41490 2680 MHz	20 MHz	QPSK	100/0	-56.96	240	420	22	26	1.54	14.97	12

11.2.4 NR-FDD

RB/ Modulation configuration

Mode	Ch. Freq.	BW	Waveform	Mod.	RB Config.	Ambient Noise dB (A/m)	Primary	Secondary	Contiguous longitudinal	Contiguous Transverse	Freq. Response (dB)	Hmax dB (A/m)	Plot No.
NR Band n25 ANT F Codec: EVS-WB 5.9kbit/s	CH.376500 1882.5 MHz	40 MHz	CP-OFDM	QPSK	1/1	-56.85	483	650	26	26	1.96	14.87	
					1/108	-56.85	357	651	26	26	1.66	7.23	
					1/214	-56.85	468	637	26	26	1.84	14.82	
					108/0	-56.85	494	671	26	26	2.00	15.95	
					108/54	-56.85	513	676	26	26	2.00	15.04	
					108/108	-56.85	504	672	26	26	2.00	15.49	
					216/0	-56.85	507	670	26	26	2.00	15.76	
				16QAM	1/108	-56.85	403	562	26	26	1.83	16.40	
				64QAM	1/108	-56.85	468	634	26	26	2.00	15.59	
				256QAM	1/108	-56.85	517	676	26	26	1.99	16.42	
			DFT-s-OFDM	QPSK	1/1	-56.85	357	651	26	26	1.66	7.23	
					1/108	-56.85	468	640	26	26	2.00	15.26	
					1/214	-56.85	475	641	26	26	2.00	14.78	
					108/0	-56.85	496	660	26	26	2.00	15.22	
					108/54	-56.85	500	669	26	26	2.00	15.43	
					108/108	-56.85	505	669	26	26	1.94	15.32	
					216/0	-56.56	496	669	26	26	2.00	15.20	
				BPSK	1/1	-56.56	492	662	26	26	2.00	15.50	
				16QAM	1/1	-56.56	446	602	26	26	2.00	15.69	
				64QAM	1/1	-56.56	443	612	26	26	1.92	15.25	
				256QAM	1/1	-56.56	461	614	26	26	2.00	16.19	

Mode	Ch. Freq.	BW	Waveform	Mod.	RB Config.	Ambient Noise dB (A/m)	Primary	Secondary	Contiguous longitudinal	Contiguous Transverse	Freq. Response (dB)	Hmax dB (A/m)	Plot No.
NR Band n25 ANT F Codec: EVS-WB 5.9kbit/s	CH.376500 1882.5 MHz	35 MHz	DFT-s-OFDM	QPSK	1/1	-56.56	499	663	26	26	2.00	15.41	
		30 MHz			1/1	-56.56	504	665	26	26	1.73	16.17	
		25 MHz			1/1	-56.56	478	640	26	26	1.94	16.07	
		20 MHz			1/1	-56.56	366	651	26	26	2.00	9.54	
		15 MHz			1/1	-56.56	356	650	26	26	1.84	14.63	
		10 MHz			1/1	-56.56	360	664	26	26	2.00	8.56	
		5 MHz			1/1	-56.56	496	658	26	26	1.72	15.93	

Mode	Ch. Freq.	BW	Waveform	Mod.	RB Config.	Ambient Noise dB (A/m)	Primary	Secondary	Contiguous longitudinal	Contiguous Transverse	Freq. Response (dB)	Hmax dB (A/m)	Plot No.
NR Band n25 ANT A Codec: EVS-WB 5.9	CH.376500 1882.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.87	478	661	26	26	1.23	13.32	
NR Band n7 ANT B Codec: EVS-WB 5.9	CH.507000 2535 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.87	309	593	26	26	2.00	9.58	13
NR Band n7 ANT F Codec: EVS-WB 5.9	CH.507000 2535 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.87	495	652	26	26	1.77	16.10	
NR Band n12 ANT A Codec: EVS-WB 5.9	CH.141500 707.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.87	509	672	26	26	2.00	14.77	
NR Band n12 ANT E Codec: EVS-WB 5.9	CH.141500 707.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.87	493	662	26	26	1.67	15.71	
NR Band n14 ANT A Codec: EVS-WB 5.9	CH.158600 793 MHz	10 MHz	DFT-s-OFDM	QPSK	1/1	-56.87	357	661	26	26	1.94	8.65	
NR Band n14 ANT E Codec: EVS-WB 5.9	CH.158600 793 MHz	10 MHz	DFT-s-OFDM	QPSK	1/1	-56.87	354	663	26	26	1.89	9.25	
NR Band n26 ANT A Codec: EVS-WB 5.9	CH.166300 831.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.87	377	668	26	26	1.70	8.24	
NR Band n26 ANT E Codec: EVS-WB 5.9	CH.166300 831.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.87	326	630	26	26	1.81	8.76	
NR Band n30 ANT A Codec: EVS-WB 5.9	CH.462000 2310 MHz	10 MHz	DFT-s-OFDM	QPSK	1/1	-56.87	374	651	26	26	1.58	9.49	
NR Band n30 ANT F Codec: EVS-WB 5.9	CH.462000 2310 MHz	10 MHz	DFT-s-OFDM	QPSK	1/1	-56.87	335	626	26	26	1.98	9.72	
NR Band n66 ANT A Codec: EVS-WB 5.9	CH.349000 1745 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.87	353	646	26	26	1.56	9.83	
NR Band n66 ANT F Codec: EVS-WB 5.9	CH.349000 1745 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.87	330	634	26	26	2.00	10.07	
NR Band n70 ANT A Codec: EVS-WB 5.9	CH.340500 1702.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.87	402	674	26	26	1.34	10.97	
NR Band n70 ANT F Codec: EVS-WB 5.9	CH.340500 1702.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.87	364	653	26	26	1.93	8.85	
NR Band n71 ANT A Codec: EVS-WB 5.9	CH.136100 680.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.87	379	667	26	26	1.44	10.31	
NR Band n71 ANT E Codec: EVS-WB 5.9	CH.136100 680.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.87	388	669	26	26	1.96	11.17	

Mode	Ch. Freq.	BW	Waveform	Mod.	RB Config.	Ambient Noise dB (A/m)	Primary	Secondary	Contiguous longitudinal	Contiguous Transverse	Freq. Response (dB)	Hmax dB (A/m)	Plot No.
NR Band n7 ANT B Codec: EVS-WB 5.9	CH.501500 2507.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.87	423	538	26	26	1.93	17.28	14
NR Band n7 ANT B Codec: EVS-WB 5.9	CH.512500 2562.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.87	424	539	26	26	1.70	17.41	15

11.2.5 NR-TDD

RB/ Modulation configuration

Mode	Ch. Freq.	BW	Waveform	Mod.	RB Config.	Ambient Noise dB (A/m)	Primary	Secondary	Contiguous longitudinal	Contiguous Transverse	Freq. Response (dB)	Hmax dB (A/m)	Plot No.
NR Band n41 PC2 ANT B Codec: EVS-WB 5.9kbit/s	CH.518598 2592.99 MHz	100 MHz	CP-OFDM	QPSK	1/1	-56.87	165	435	22	26	1.61	10.43	
					1/137	-56.87	182	435	22	26	1.92	9.25	
					1/271	-56.87	146	409	21	26	2.00	10.01	
					137/0	-56.87	175	447	22	26	1.94	9.64	
					137/68	-56.87	159	425	21	26	1.87	9.99	
					137/136	-56.87	165	434	22	26	2.00	9.52	
					273/0	-56.87	175	438	22	26	2.00	10.28	
				16QAM	1/271	-56.87	262	438	22	26	2.00	15.75	
				64QAM	1/271	-56.87	277	458	23	26	2.00	15.66	
				256QAM	1/271	-56.87	334	507	24	26	1.70	15.75	
			DFT-s-OFDM	QPSK	1/1	-56.87	109	355	18	26	2.00	10.55	16
					1/137	-56.87	231	393	20	26	1.83	15.14	
					1/271	-56.87	200	370	19	26	2.00	16.38	
					135/0	-56.87	248	416	21	26	2.00	14.89	
					135/67	-56.87	129	384	19	26	1.92	9.01	
					135/138	-56.87	126	395	20	26	1.64	9.12	
					270/0	-56.87	147	406	20	26	1.72	9.98	
				BPSK	1/1	-56.87	123	384	19	26	1.78	9.55	
				16QAM	1/1	-56.87	149	413	21	26	1.70	8.50	
				64QAM	1/1	-56.87	152	430	21	26	2.00	9.91	
				256QAM	1/1	-56.87	201	471	24	26	2.00	9.44	

Mode	Ch. Freq.	BW	Waveform	Mod.	RB Config.	Ambient Noise dB (A/m)	Primary	Secondary	Contiguous longitudinal	Contiguous Transverse	Freq. Response (dB)	Hmax dB (A/m)	Plot No.
NR Band 41PC2 ANT B Codec: EVS-WB 5.9 kbit/s	CH.518598 2592.99 MHz	90 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	179	342	17	26	2.00	15.79	
		80 MHz			1/1	-56.77	178	348	18	26	1.67	11.27	
		70 MHz			1/1	-56.77	185	353	18	26	2.00	15.64	
		60 MHz			1/1	-56.77	173	349	18	26	2.00	15.81	
		50 MHz			1/1	-56.77	187	355	18	26	2.00	16.37	
		40 MHz			1/1	-56.77	188	358	18	26	2.00	16.14	
		30 MHz			1/1	-56.77	192	358	18	26	2.00	16.36	
		25 MHz			1/1	-56.77	193	354	18	26	1.94	16.15	
		20 MHz			1/1	-56.77	180	348	18	26	2.00	16.17	
		15 MHz			1/1	-56.77	176	345	17	26	2.00	15.67	
		10 MHz			1/1	-56.77	171	345	17	26	1.77	16.63	
NR Band n41 PC3 ANT B Codec: EVS WB 5.9kbit/s	CH.518598 2592.99 MHz	100 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	234	402	20	26	1.31	16.13	
NR Band n41 PC2 ANT F Codec: EVS WB 5.9kbit/s	CH.518598 2592.99 MHz	100 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	177	345	19	26	1.85	15.69	
NR Band n41 PC3 ANT F Codec: EVS WB 5.9kbit/s	CH.518598 2592.99 MHz	100 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	225	387	21	26	2.00	15.65	
NR Band n48 ANT F Codec: EVS WB 5.9kbit/s	CH.641666 3624.99 MHz	40 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	259	417	22	26	2.00	16.03	
NR Band n77 PC2 ANT F Codec: EVS WB 5.9kbit/s	CH.650000 3750 MHz	100 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	213	383	20	26	2.00	15.74	
NR Band n77 PC2 DoD ANT F Codec: EVS WB 5.9kbit/s	CH.633334 3500.01 MHz	100 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	162	334	19	26	1.91	15.87	
NR Band n77 PC3 ANT F Codec: EVS WB 5.9kbit/s	CH.650000 3750 MHz	100 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	155	429	22	26	1.64	9.92	
NR Band n77 PC3 DoD ANT F Codec: EVS WB 5.9kbit/s	CH.633334 3500.01 MHz	100 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	122	388	20	26	1.91	10.90	

11.3 VoWi-Fi Codec Investigation

An investigation between the various codec configurations (Low/High bit rates for Narrowband, Wideband) and specific parameters are documented (Primary Group, Secondary Group, longitudinal contiguous points, transverse row contiguous points, frequency response) to determine the worst-case bit rates for each voice service type. The table below compares the varying codec configurations. A codec investigation was performed for each Wi-Fi 2.4 GHz and 5 GHz.

The highlighted results below were determined to be the worst case codec configuration(s) for Wi-Fi 2.4 GHz and 5 GHz.

Wi-Fi 2.4 GHz

Codec Investigation								
Codec State	AMR-NB (kbit/s)			AMR-WB (kbit/s)			Orientation	Band/ Bandwidth/ Channel
	4.75	7.4	12.2	6.6	15.85	23.85		
Freq. Response(dB)	2.00	2.00	1.96	2.00	1.99	1.98	y (Transversal)	802.11b CH.6 2437 MHz DSSS 1Mbps
Primary	358	365	358	342	342	351		
Secondary	481	485	479	478	479	479		
Contiguous Longitudinal	22	22	21	22	21	21		
Contiguous Transverse	26	26	26	26	26	26		

Codec Investigation											
Codec State	EVS-NB (kbit/s)			EVS-WB (kbit/s)			EVS-SWB (kbit/s)			Orientation	Band/ Bandwidth/ Channel
	5.9	13.2	24.4	5.9	13.2	24.4	9.6	16.4	24.4		
Freq. Response(dB)	1.68	1.79	1.93	2.00	2.00	2.00	2.00	2.00	2.00	y (Transversal)	802.11b CH.6 2437 MHz DSSS 1Mbps
Primary	308	321	302	335	340	340	339	343	336		
Secondary	472	476	475	475	481	481	481	484	483		
Contiguous Longitudinal	22	22	22	22	22	22	22	22	22		
Contiguous Transverse	26	26	26	26	26	26	26	26	26		

Wi-Fi 5 GHz

Codec Investigation								
Codec State	AMR-NB (kbit/s)			AMR-WB (kbit/s)			Orientation	Band/ Bandwidth/ Channel
	4.75	7.4	12.2	6.6	15.85	23.85		
Freq. Response(dB)	1.31	1.01	1.21	2.00	2.00	1.92	y (Transversal)	802.11a CH.40 5200 MHz BPSK 6Mbps
Primary	374	379	381	381	379	385		
Secondary	502	504	506	491	491	487		
Contiguous Longitudinal	22	22	22	21	21	21		
Contiguous Transverse	26	26	26	26	26	26		

Codec Investigation											
Codec State	EVS-NB (kbit/s)			EVS-WB (kbit/s)			EVS-SWB (kbit/s)			Orientation	Band/ Bandwidth/ Channel
	5.9	13.2	24.4	5.9	13.2	24.4	9.6	16.4	24.4		
Freq. Response(dB)	1.43	1.54	1.46	1.34	1.86	2.00	2.00	2.00	2.00	y (Transversal)	802.11a CH.40 5200 MHz BPSK 6Mbps
Primary	321	379	374	352	389	388	348	352	352		
Secondary	491	497	492	495	493	492	487	491	491		
Contiguous Longitudinal	22	22	22	22	22	22	21	22	22		
Contiguous Transverse	26	26	26	26	26	26	26	26	26		

11.4 VoWi-Fi Antennas Investigation

EVS-NB 24.4 kbit/s was the worst case bit-rates for 2.4GHz 802.11b, EVS-NB 5.9 kbit/s was the worst case bit-rates for 5GHz 802.11a. The secondary antenna was investigated to determine which antennas yields a worse Primary Group.

The worst case codec and bit-rate from 802.11b 2.4GHz, 802.11a 5GHz Antenna MIMO was used to determine Antenna 1, 2 exclusions.

2.4GHz Antenna Investigation					
Codec State	ANT1	ANT2	MIMO	Orientation	Band/ Bandwidth/ Channel
	EVS-NB (kbit/s)				
	24.4				
Freq. Response(dB)	1.92	2	1.93	y (Transversal)	802.11b CH.6 2437 MHz 1Mbps
Primary	322	317	302		
Secondary	441	441	475		
Contiguous Longitudinal	20	20	22		
Contiguous Transverse	26	26	26		

5GHz Antenna Investigation					
Codec State	ANT1	ANT2	MIMO	Orientation	Band/ BandWidth/ Channel
	EVS-NB (kbit/s)				
	5.9				
Freq. Response(dB)	1.17	2	1.43	y (Transversal)	802.11a CH.40 5200 MHz 6Mbps
Primary	392	395	321		
Secondary	551	557	491		
Contiguous Longitudinal	26	26	22		
Contiguous Transverse	26	26	26		

11.5 VoWi-Fi Air Interface Investigation

Using the data from § 11.4, further testing was performed on the remaining 802.11 modes. The objective of these measurements is to ensure that changing the modulation, bandwidth, and data rate, whilst using the worst case codec configuration measured in § 11.3, § 11.4, yields no unexpected variations.

VoWi-Fi Air Interface Investigation (Continued)

Mode	Ch. Freq.	BW	Mod.	Ambient Noise dB (A/m)	Primary	Secondary	Contiguous longitudinal	Contiguous Transverse	Freq. Response (dB)	Hmax dB (A/m)	Plot No.
802.11b Codec: EVS-NB 24.4kbit/s	CH.6 2437 MHz	20 MHz	1 Mbps	-56.74	302	475	22	26	1.93	14.76	
			5.5 Mbps	-56.74	317	442	20	26	1.94	17.02	
			11 Mbps	-56.74	299	428	21	26	1.98	16.81	
802.11g Codec: EVS-NB 24.4kbit/s	CH.6 2437 MHz	20 MHz	6 Mbps	-56.74	298	427	20	26	1.99	16.71	17
802.11n HT20 Codec: EVS-NB 24.4kbit/s	CH.6 2437 MHz	20 MHz	MCS 0	-56.74	378	409	20	26	1.94	16.76	
802.11ac VHT20 Codec: EVS-NB 24.4kbit/s	CH.6 2437 MHz	20 MHz	MCS 0	-56.74	303	443	20	26	2.00	15.75	
802.11ax HE20 Codec: EVS-NB 24.4kbit/s	CH.6 2437 MHz	20 MHz	MCS 0	-56.74	307	447	20	26	2.00	15.50	
802.11g Codec: EVS-NB 24.4kbit/s	CH.1 2412 MHz	20 MHz	6 Mbps	-56.74	245	383	20	26	2.00	15.81	18
	CH.11 2462 MHz			-56.74	245	382	18	26	2.00	15.85	19

Mode	Ch. Freq.	BW	Mod.	Ambient Noise dB (A/m)	Primary	Secondary	Contiguous longitudinal	Contiguous Transverse	Freq. Response (dB)	Hmax dB (A/m)	Plot No.
802.11a Codec: EVS-NB 5.9kbit/s	CH.40 5200 MHz	20 MHz	6 Mbps	-56.89	321	491	22	26	1.43	16.17	
			18 Mbps	-56.89	337	536	25	26	1.61	15.22	
			54 Mbps	-56.89	382	556	26	26	1.63	15.06	
802.11n HT20 Codec: EVS-NB 5.9 kbit/s	CH.40 5200 MHz	20 MHz	MCS 0	-56.89	338	505	22	26	1.45	15.37	
			MCS 3	-56.89	364	536	24	26	1.55	14.39	
			MCS 7	-56.89	368	542	25	26	2.00	15.29	
802.11n HT40 Codec: EVS-NB 5.9 kbit/s	CH.38 5190 MHz	40 MHz	MCS 0	-56.89	348	521	23	26	1.56	14.47	
			MCS 3	-56.89	374	547	26	26	1.74	14.81	
			MCS 7	-56.89	378	547	26	26	1.03	15.09	
802.11ac VHT20 Codec: EVS-NB 5.9 kbit/s	CH.40 5200 MHz	20 MHz	MCS 0	-56.89	341	500	22	26	1.60	15.11	
			MCS 4	-56.89	380	543	25	26	1.19	15.43	
			MCS 8	-56.89	374	532	26	26	1.60	14.48	
802.11ac VHT40 Codec: EVS-NB 5.9 kbit/s	CH.38 5190 MHz	40 MHz	MCS 0	-56.89	342	500	23	26	2.00	15.76	
			MCS 4	-56.89	369	534	25	26	1.94	15.62	
			MCS 9	-56.89	378	546	26	26	1.61	15.55	
802.11ac VHT80 Codec: EVS-NB 5.9 kbit/s	CH.42 5210 MHz	80 MHz	MCS 0	-56.89	338	511	25	26	1.68	15.13	
			MCS 4	-56.89	372	542	26	26	1.93	15.47	
			MCS 9	-56.89	378	542	26	26	1.86	15.17	
802.11acVHT160 Codec: EVS-NB 5.9 kbit/s	CH.50 5250 MHz	160 MHz	MCS 0	-56.89	395	549	26	26	1.36	14.99	
			MCS 4	-56.89	387	547	26	26	1.64	14.67	
			MCS 9	-56.89	389	543	26	26	1.65	15.01	
802.11axHE20 Codec: EVS-NB 5.9 kbit/s	CH.40 5200 MHz	20 MHz	MCS 0	-54.96	335	501	22	26	1.59	15.48	
			MCS 6	-54.96	361	520	23	26	1.45	15.32	
			MCS 11	-54.96	374	528	25	26	1.53	15.48	
802.11axHE40 Codec: EVS-NB 5.9 kbit/s	CH.38 5190 MHz	40 MHz	MCS 0	-54.96	359	512	22	26	1.65	15.45	
			MCS 6	-54.96	367	532	26	26	2.00	15.50	
			MCS 11	-54.96	371	535	26	26	1.52	15.55	
802.11axHE80 Codec: EVS-NB 5.9 kbit/s	CH.42 5210 MHz	80 MHz	MCS 0	-54.96	350	518	24	26	1.42	15.32	
			MCS 6	-54.96	361	528	26	26	1.81	15.43	
			MCS 11	-54.96	378	534	26	26	1.66	15.12	
802.11axHE160 Codec: EVS-NB 5.9 kbit/s	CH.50 5250 MHz	160 MHz	MCS 0	-54.96	384	541	26	26	1.82	15.70	
			MCS 6	-54.96	372	537	26	26	1.09	15.26	
			MCS 11	-54.96	383	545	26	26	1.14	15.01	

Mode	Ch. Freq.	BW	Mod.	Ambient Noise dB (A/m)	Primary	Secondary	Contiguous longitudinal	Contiguous Transverse	Freq. Response (dB)	Hmax dB (A/m)	Plot No.
802.11a Codec: EVS-NB 5.9kbit/s	CH56 5280 MHz	20 MHz	6Mbps	-54.96	293	551	26	26	1.62	14.92	20
	CH120 5600 MHz		6Mbps	-54.96	391	553	26	26	1.38	15.56	
	CH157 5785 MHz		6Mbps	-54.96	396	558	26	26	1.74	15.15	
802.11a Codec: EVS-NB 5.9kbit/s	CH.173 5865 MHz	20 MHz	6Mbps	-54.96	332	562	26	26	1.76	13.73	
802.11ax HE20 Codec: EVS-NB 5.9 kbit/s	CH.5 5975 MHz	20 MHz	MCS 0	-54.96	323	533	24	26	1.29	12.51	
802.11ax HE40 Codec: EVS-NB 5.9 kbit/s	CH.3 5965 MHz	40 MHz	MCS 0	-54.96	353	515	23	26	1.36	14.97	
802.11a Codec: EVS-NB 5.9kbit/s	CH.52 5260 MHz	20 MHz	6Mbps	-54.96	295	495	22	26	1.81	14.85	21
	CH.64 5320 MHz	20 MHz	6Mbps	-54.96	249	448	22	26	2.00	15.27	22

11.6 OTT Codec Investigation

The DUT's nested OTT application supports range of codec bit rate 6 – 75 kbit/s, thus an investigation between the various codec configurations (6/75 as Low/High bit rates) and specific parameters are documented (Primary Group, Secondary Group, longitudinal contiguous points, transverse row contiguous points, Frequency Response) to determine the worst-case bit rates for each service type.

The table below compares the varying codec configurations.

Codec Investigation					
Codec State	codec bit rate (kbit/s)			Orientation	Band/ BandWidth/ Channel
	6	40	75		
Freq. Response(dB)	1.28	2.00	1.67	y(Transversal)	GSM 850 EDGE 2 slot CH.190 836.5 Mhz ANT E
Primary	124	118	123		
Secondary	285	277	285		
Contiguous Longitudinal	16	15	16		
Contiguous Transverse	26	26	26		
Freq. Response(dB)	2.00	1.82	2.00	y(Transversal)	UMTS Band 5 HSUPA subtest 1 CH.4183 836.6 Mhz ANT A
Primary	372	401	404		
Secondary	564	585	585		
Contiguous Longitudinal	26	26	26		
Contiguous Transverse	26	26	26		
Freq. Response(dB)	1.36	2.00	2.00	y(Transversal)	LTE Band 26 15 Mhz QPSK 1RB 0offset CH.26865 831.5 Mhz ANT A
Primary	408	412	389		
Secondary	574	570	547		
Contiguous Longitudinal	26	26	26		
Contiguous Transverse	26	26	26		
Freq. Response(dB)	1.21	2.00	2.00	y(Transversal)	LTE Band 41 PC3 20 Mhz QPSK 100RB 0offset CH.41055 2636.5 Mhz ANT B
Primary	245	250	253		
Secondary	407	407	407		
Contiguous Longitudinal	19	20	19		
Contiguous Transverse	26	26	26		

Codec Investigation					
Codec State	codec bit rate (kbit/s)			Orientation	Band/ Bandwidth/ Channel
	6	40	75		
Freq. Response (dB)	2.00	2.00	2.00	y(Transversal)	2.4 GHz 802.11g 6Mbps CH.11 2462 MHz
Primary	353	308	353		
Secondary	510	457	507		
Contiguous Longitudinal	23	20	21		
Contiguous Transverse	26	26	26		
Freq. Response (dB)	1.17	2.00	2.00	y(Transversal)	5 GHz 802.11a 6Mbps CH.64 5320 MHz
Primary	317	328	329		
Secondary	480	482	483		
Contiguous Longitudinal	20	20	21		
Contiguous Transverse	26	26	26		
Freq. Response(dB)	1.86	1.99	2.00	y(Transversal)	NR Band n7 15 MHz DFT-S OFDM QPSK 1RB 1offset CH.507000 2535 MHz ANT B
Primary	339	327	327		
Secondary	505	503	506		
Contiguous Longitudinal	26	26	26		
Contiguous Transverse	26	26	26		
Freq. Response(dB)	1.82	1.95	2.00	y(Transversal)	NR Band n41 PC2 100 MHz DFT-s-OFDM QPSK 1RB 1offset CH.518598 2592.99 MHz ANT B
Primary	198	207	211		
Secondary	363	366	372		
Contiguous Longitudinal	17	17	17		
Contiguous Transverse	26	26	26		

11.7 OTT Air Interface Investigation

Mode	Ch. Freq.	BW	Mod.	RB Config.	Ambient Noise dB (A/m)	Primary	Secondary	Contiguous longitudinal	Contiguous Transverse	Freq. Response (dB)	Hmax dB (A/m)	Plot No.
GSM850 EDGE 2 slots GoogleMeet Codec: 40kbit/s ANT A	CH.190 836.6 MHz				-52.77	118	277	15	26	2.00	13.14	
GSM850 EDGE 2 slots GoogleMeet Codec: 40kbit/s ANT E	CH.190 836.6 MHz				-52.77	38	199	12	26	1.13	10.29	23
GSM1900 EDGE 2 slots GoogleMeet Codec: 40kbit/s ANT A	CH.661 1880 MHz				-52.77	66	242	13	26	1.94	12.56	
GSM850 EDGE 2 slots GoogleMeet Codec: 40kbit/s ANT E	CH.128 824.2 MHz				-52.77	36	200	12	26	1.45	9.90	24
GSM850 EDGE 2 slots GoogleMeet Codec: 40kbit/s ANT E	CH.251 848.8 MHz				-52.77	48	185	12	26	1.10	13.50	25
UMTS Band 2 HSUPA subtest1 GoogleMeet Codec: 6kbit/s ANT A	CH.9400 1880 MHz				-52.77	427	587	26	26	2.00	13.61	
UMTS Band 4 HSUPA subtest1 GoogleMeet Codec: 6kbit/s ANT A	CH.1412 1732.4 MHz				-52.77	424	583	26	26	1.43	12.42	
UMTS Band 5 HSUPA subtest1 GoogleMeet Codec: 6kbit/s ANT A	CH.4183 836.6 MHz				-52.77	372	564	26	26	2.00	12.14	26
UMTS Band 5 HSUPA subtest1 GoogleMeet Codec: 6kbit/s ANT E	CH.4183 836.6 MHz				-52.77	377	570	26	26	2.00	11.44	
LTE Band 7 Google Meet Codec: 75kbit/s ANT B	CH.21100 2535 MHz	15 MHz	QPSK	1/0	-52.31	412	570	26	26	2.00	14.15	
LTE Band 7 Google Meet Codec: 75kbit/s ANT F	CH.21100 2535 MHz	15 MHz	QPSK	1/0	-52.31	480	636	26	26	2.00	13.96	
LTE Band 12 Google Meet Codec: 75kbit/s ANT A	CH.23095 707.5 MHz	10 MHz	QPSK	1/0	-52.31	427	576	26	26	2.00	14.39	
LTE Band 12 Google Meet Codec: 75kbit/s ANT E	CH.23095 707.5 MHz	10 MHz	QPSK	1/0	-52.31	343	493	23	26	2.00	14.02	
LTE Band 13 Google Meet Codec: 75kbit/s ANT A	CH.23230 782 MHz	10 MHz	QPSK	1/0	-52.31	432	581	26	26	2.00	14.30	
LTE Band 13 Google Meet Codec: 75kbit/s ANT E	CH.23230 782 MHz	10 MHz	QPSK	1/0	-52.31	332	484	22	26	2.00	13.92	27
LTE Band 14 Google Meet Codec: 75kbit/s ANT A	CH.23330 793 MHz	10 MHz	QPSK	1/0	-52.31	359	511	26	26	2.00	14.26	
LTE Band 14 Google Meet Codec: 75kbit/s ANT E	CH.23330 793 MHz	10 MHz	QPSK	1/0	-52.31	339	493	23	26	2.00	13.95	
LTE Band 25 Google Meet Codec: 75kbit/s ANT A	CH.26365 1882.5 MHz	15 MHz	QPSK	1/0	-52.31	420	571	26	26	2.00	14.29	
LTE Band 25 Google Meet Codec: 75kbit/s ANT F	CH.26365 1882.5 MHz	15 MHz	QPSK	1/0	-52.31	339	492	22	26	2.00	13.80	
LTE Band 26 Google Meet Codec: 75kbit/s ANT A	CH.26865 831.5 MHz	15 MHz	QPSK	1/0	-52.31	389	547	26	26	2.00	14.20	
LTE Band 26 Google Meet Codec: 75kbit/s ANT E	CH.26865 831.5 MHz	15 MHz	QPSK	1/0	-52.31	342	494	23	26	2.00	13.91	

Mode	Ch. Freq.	BW	Mod.	RB Config.	Ambient Noise dB (A/m)	Primary	Secondary	Contiguous longitudinal	Contiguous Transverse	Freq. Response (dB)	Hmax dB (A/m)	Plot No.
LTE Band 30 Google Meet Codec: 75kbit/s ANT A	CH.27710 2310 MHz	10 MHz	QPSK	1/0	-52.31	332	485	21	26	2.00	13.92	
LTE Band 30 Google Meet Codec: 75kbit/s ANT F	CH.27710 2310 MHz	10 MHz	QPSK	1/0	-52.31	425	576	26	26	2.00	14.38	
LTE Band 66 Google Meet Codec: 75kbit/s ANT A	CH.132322 1745 MHz	15 MHz	QPSK	1/0	-52.31	423	573	26	26	2.00	14.31	
LTE Band 66 Google Meet Codec: 75kbit/s ANT F	CH.132322 1745 MHz	15 MHz	QPSK	1/0	-52.31	339	492	23	26	2.00	13.85	
LTE Band 71 Google Meet Codec: 75kbit/s ANT A	CH.133297 680.5 MHz	15 MHz	QPSK	1/0	-52.31	419	572	26	26	2.00	14.24	
LTE Band 71 Google Meet Codec: 75kbit/s ANT E	CH.133297 680.5 MHz	15 MHz	QPSK	1/0	-52.31	336	490	22	26	2.00	13.86	
LTE Band 41 PC3 Google Meet Codec: 6kbit/s ANT B	CH.41055 2549.5 MHz	20 MHz	QPSK	100/0	-52.31	245	407	19	26	1.21	14.0	
LTE Band 41 PC3 Google Meet Codec: 6kbit/s ANT F	CH.40620 2593.0 MHz	20 MHz	QPSK	100/0	-52.31	237	383	19	26	2.00	14.32	28
LTE Band 48 PC3 Google Meet Codec: 6kbit/s ANT F	CH.55990 3625 MHz	20 MHz	QPSK	100/0	-52.31	266	413	19	26	2.00	14.37	
Wi-Fi 2.4 GHz 802.11g Google Meet Codec: 6 kbit/s	CH.11 2462 MHz	20 MHz	6 Mbps		-52.77	308	457	20	26	2.00	15.45	29
U-NII 5.2 GHz 802.11a Google Meet Codec: 6kbit/s	CH.40 5200 MHz	20 MHz	6 Mbps		-52.77	284	438	21	26	1.46	14.52	30
U-NII 5.3 GHz 802.11a Google Meet Codec: 6kbit/s	CH.64 5300 MHz	20 MHz	6 Mbps		-52.77	317	480	20	26	1.17	14.51	
U-NII 5.6 GHz 802.11a Google Meet Codec: 6kbit/s	CH.120 5600 MHz	20 MHz	6 Mbps		-52.77	284	438	21	26	2.00	14.49	
U-NII 5.8 GHz 802.11a Google Meet Codec: 6kbit/s	CH.157 5785 MHz	20 MHz	6 Mbps		-52.77	321	470	20	26	2.00	14.39	
U-NII 5.9 GHz 802.11a Google Meet Codec: 6kbit/s	CH.173 5865 MHz	20 MHz	6 Mbps		-52.77	390	548	26	26	1.46	14.35	
U-NII 5.9 GHz 802.11ax20 Google Meet Codec: 6kbit/s	CH.5 5975 MHz	20 MHz	MCS 0		-52.77	345	499	23	26	1.51	14.66	

Mode	Ch. Freq.	BW	Wave form	Mod.	RB Config.	Ambient Noise dB (A/m)	Primary	Secondary	Contiguous longitudinal	Contiguous Transverse	Freq. Response (dB)	Hmax dB (A/m)	Plot No.
NR Band n25 Google Meet Codec: 40kbit/s ANT A	CH.376500 1882.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	422	617	26	26	2.00	12.77	
NR Band n25 Google Meet Codec: 40kbit/s ANT F	CH.376500 1882.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	334	513	26	26	2.00	13.09	
NR Band n7 Google Meet Codec: 40kbit/s ANT B	CH.507000 2535 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	401	596	26	26	2.00	12.60	
NR Band n7 Google Meet Codec: 40kbit/s ANT F	CH.507000 2535 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	397	597	26	26	2.00	12.65	
NR Band n12 Google Meet Codec: 40kbit/s ANT A	CH.141500 707.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	410	603	26	26	2.00	12.59	
NR Band n12 Google Meet Codec: 40kbit/s ANT E	CH.141500 707.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	331	504	26	26	2.00	12.35	
NR Band n14 Google Meet Codec: 40kbit/s ANT A	CH.158600 793 MHz	10 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	422	619	26	26	1.99	13.16	
NR Band n14 Google Meet Codec: 40kbit/s ANT E	CH.158600 793 MHz	10 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	342	509	26	26	2.00	13.13	
NR Band n26 Google Meet Codec: 40kbit/s ANT A	CH.166300 831.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	366	609	26	26	2.00	10.86	
NR Band n26 Google Meet Codec: 40kbit/s ANT E	CH.166300 831.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	333	500	26	26	1.99	13.46	
NR Band n30 Google Meet Codec: 40kbit/s ANT A	CH.462000 2310 MHz	10 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	344	507	26	26	2.00	13.39	
NR Band n30 Google Meet Codec: 40kbit/s ANT F	CH.462000 2310 MHz	10 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	317	512	26	26	2.00	12.32	
NR Band n66 Google Meet Codec: 40kbit/s ANT A	CH.349000 1745 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	291	506	26	26	2.00	13.38	31
NR Band n66 Google Meet Codec: 40kbit/s ANT F	CH.349000 1745 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	332	502	25	26	2.00	13.60	
NR Band n70 Google Meet ANT A Codec: 40kbit/s	CH.340500 1702.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	300	506	26	26	2.00	13.12	
NR Band n70 Google Meet ANT F Codec: 40kbit/s	CH.340500 1702.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	374	552	26	26	2.00	11.63	
NR Band n71 Google Meet ANT A Codec: 40kbit/s	CH.136100 680.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	309	506	26	26	2.00	12.58	
NR Band n71 Google Meet ANT E Codec: 40kbit/s	CH.136100 680.5 MHz	15 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	387	559	26	26	2.00	12.83	
NR Band n41 PC2 Google Meet Codec: 6kbit/s ANT B	CH.518598 2592.99 MHz	100 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	159	323	16	26	2.00	13.16	
NR Band n41 PC3 Google Meet Codec: 6kbit/s ANT B	CH.518598 2592.99 MHz	100 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	219	376	17	26	2.00	13.56	
NR Band n41 PC2 Google Meet Codec: 6kbit/s ANT F	CH.518598 2592.99 MHz	100 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	167	334	16	26	2.00	12.59	
NR Band n41 PC3 Google Meet Codec: 6kbit/s ANT F	CH.518598 2592.99 MHz	100 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	132	318	16	26	2.00	12.77	32
NR Band n48 Google Meet Codec: 6kbit/s ANT F	CH.641666 3624.99 MHz	40 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	186	391	17	26	2.00	12.01	

Mode	Ch. Freq.	BW	Wave form	Mod.	RB Config.	Ambient Noise dB (A/m)	Primary	Secondary	Contiguous longitudinal	Contiguous Transverse	Freq. Response (dB)	Hmax dB (A/m)	Plot No.
NR Band n77 PC2 Google Meet Codec: 75kbit/s ANT F	CH.650000 3930 MHz	100 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	207	379	17	26	2.00	13.02	
NR Band n77 PC2 DoD Google Meet Codec: 75kbit/s ANT F	CH.633334 3500.01 MHz	100 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	175	337	17	26	2.00	13.22	
NR Band n77 PC3 Google Meet Codec: 75kbit/s ANT F	CH.650000 3930 MHz	100 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	221	388	18	26	2.00	12.68	
NR Band n77 PC3 DoD Google Meet Codec: 75kbit/s ANT F	CH.633334 3500.01 MHz	100 MHz	DFT-s-OFDM	QPSK	1/1	-56.77	178	349	18	26	1.93	13.23	

Appendix 1. TEST SETUP PHOTO

Please refer to test Setup Photo file no. as follows;

Rev. No.	File No.
0	HCT-SR-2507-FC007-P

Appendix 2. HAC T-COIL Test Plots

Plot 1 GSM 850 CH.190 Voice Codec Speech Codec: FR V1 ANT E

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

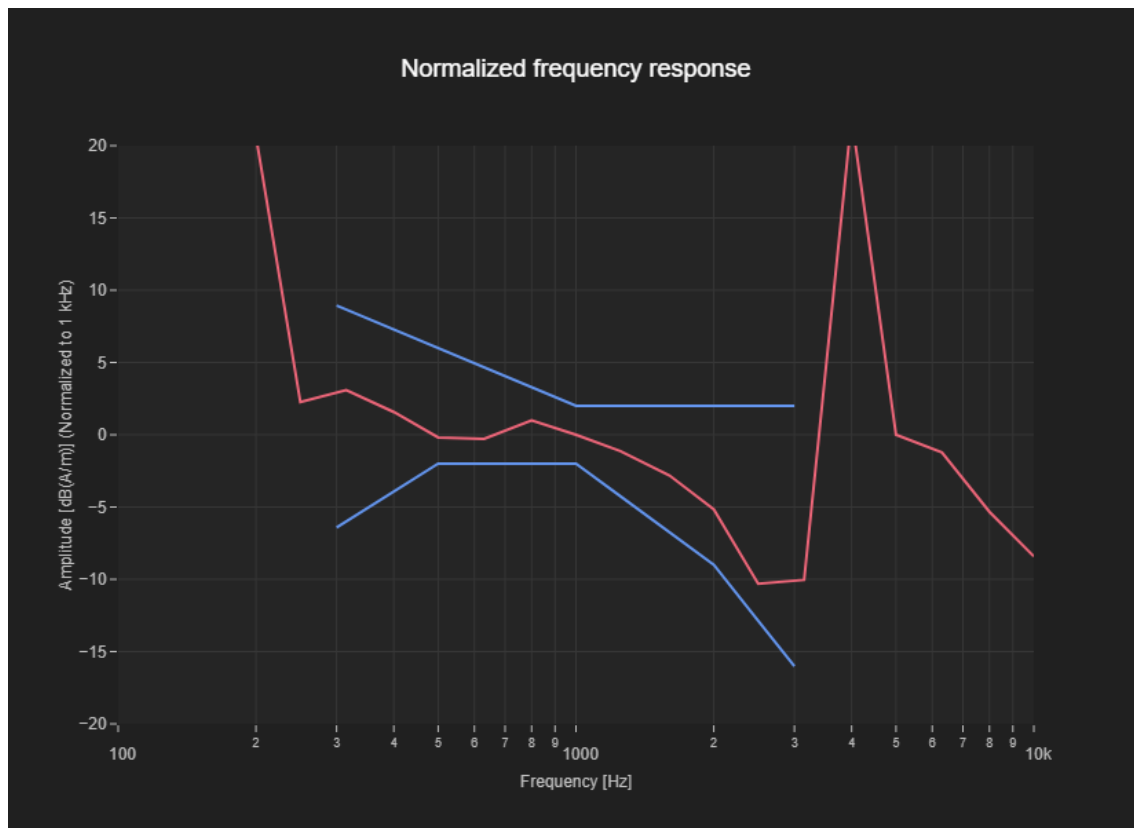
Band Name	Communication Systems Name	Channel	Frequency [MHz]
GSM 850	GSM-FDD (TDMA, GMSK)	190	836.6

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

Results

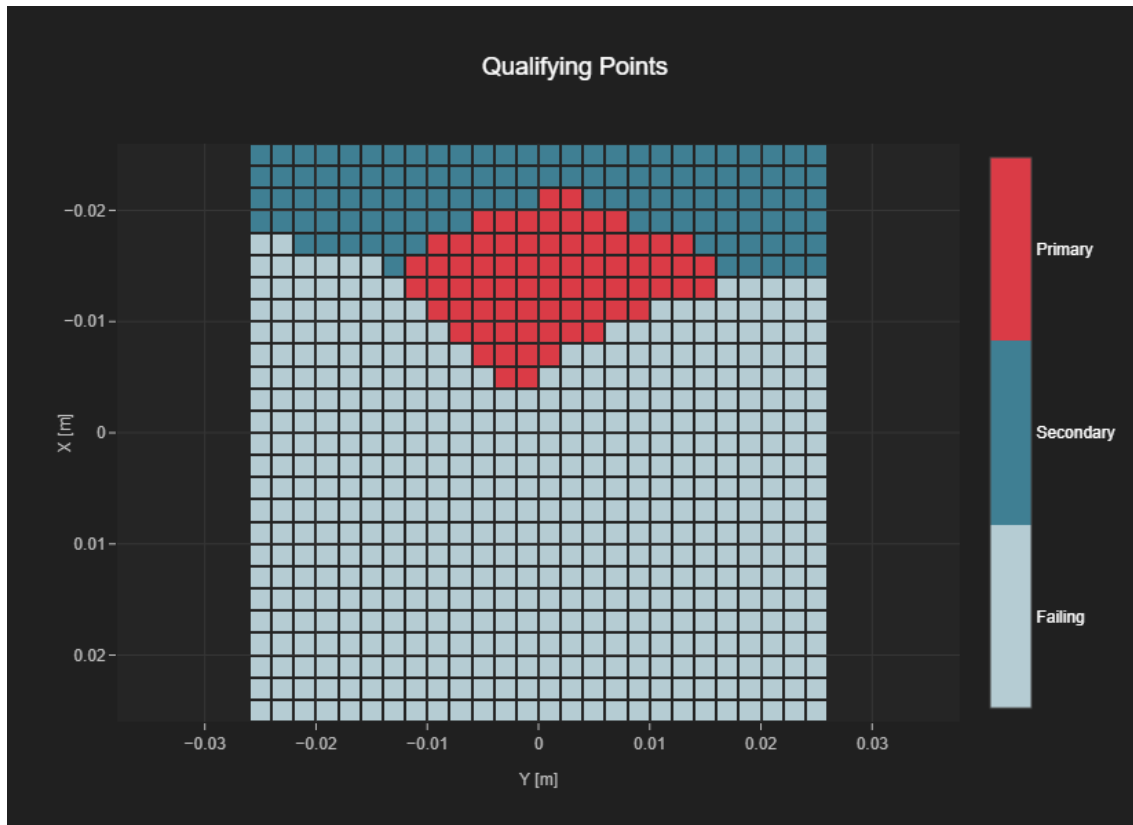
Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
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T-Coil Coupling Mode Test Report

Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
72	185	11	26



Plot 2 GSM 850 CH.128 Voice Codec Speech Codec: FR V1 ANT E

T-Coil Signal Test Report

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

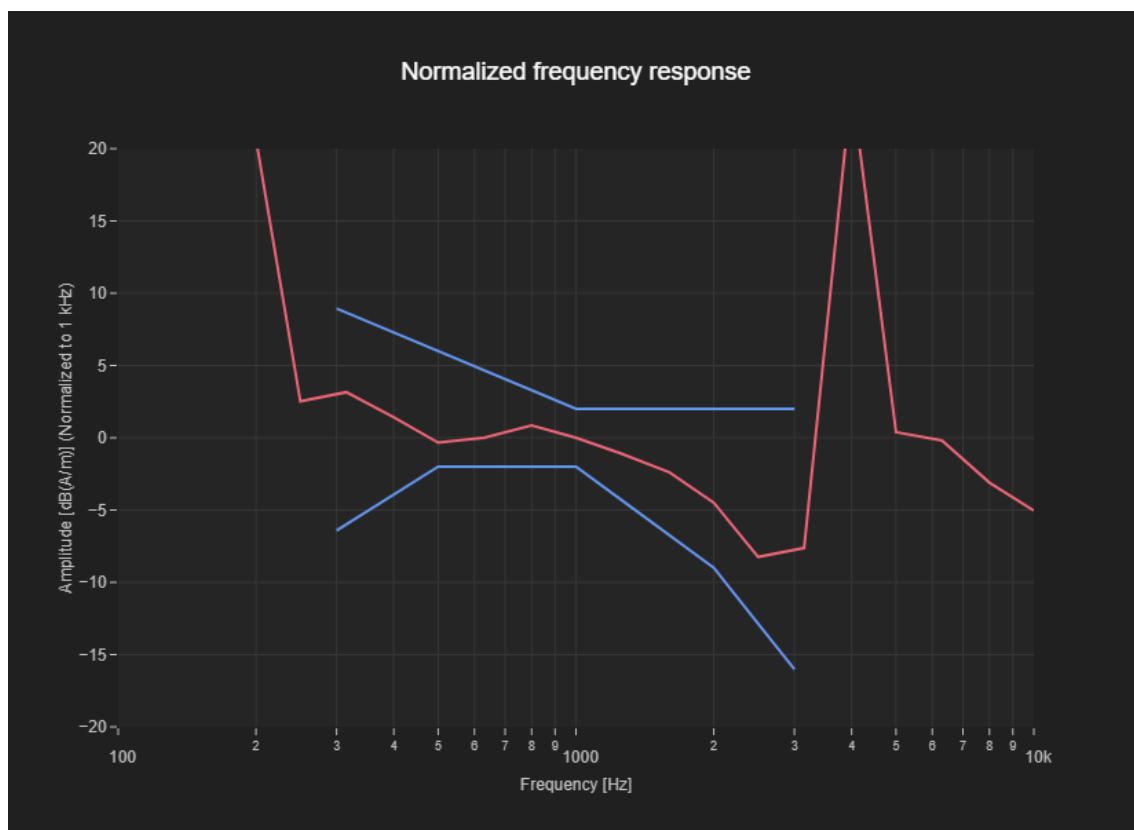
Band Name	Communication Systems Name	Channel	Frequency [MHz]
GSM 850	GSM-FDD (TDMA, GMSK)	128	824.2

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

Results

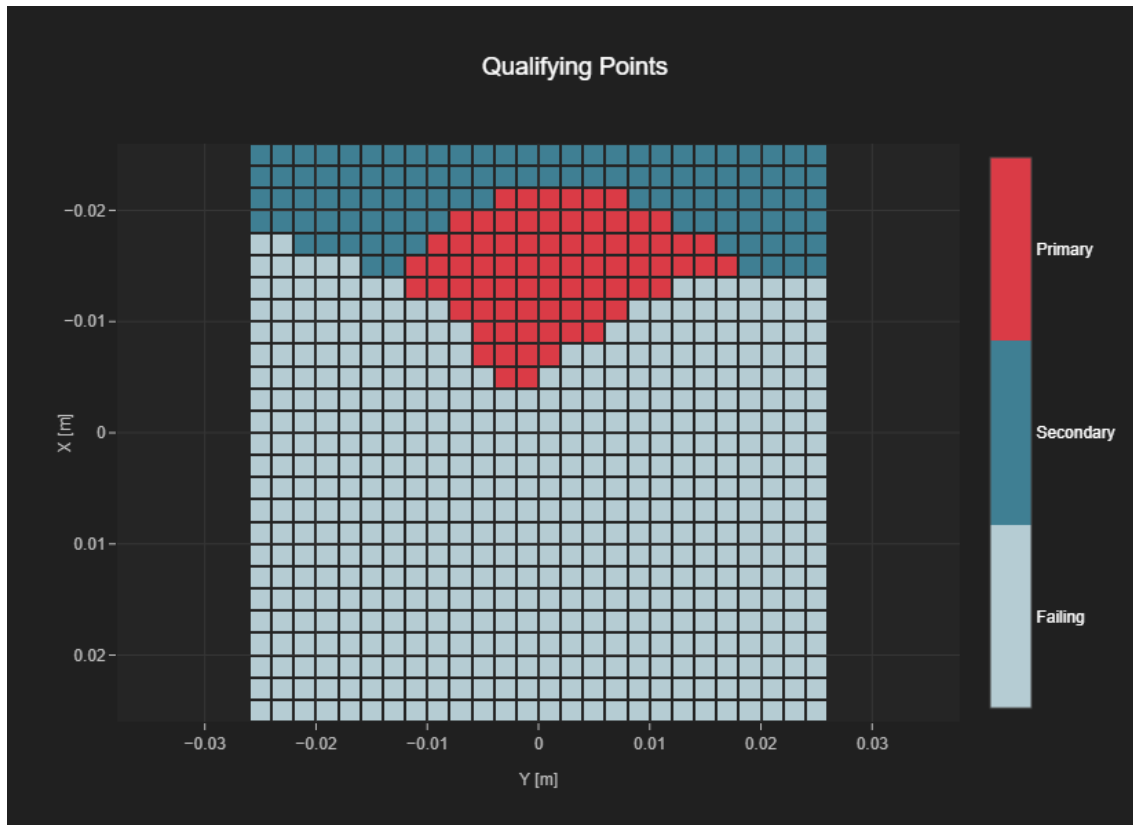
Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	1.67



T-Coil Coupling Mode Test Report

Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
76	181	11	26



Plot 3 GSM 850 CH.251 Voice Codec Speech Codec: FR V1 ANT E T-Coil Signal Test Report

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

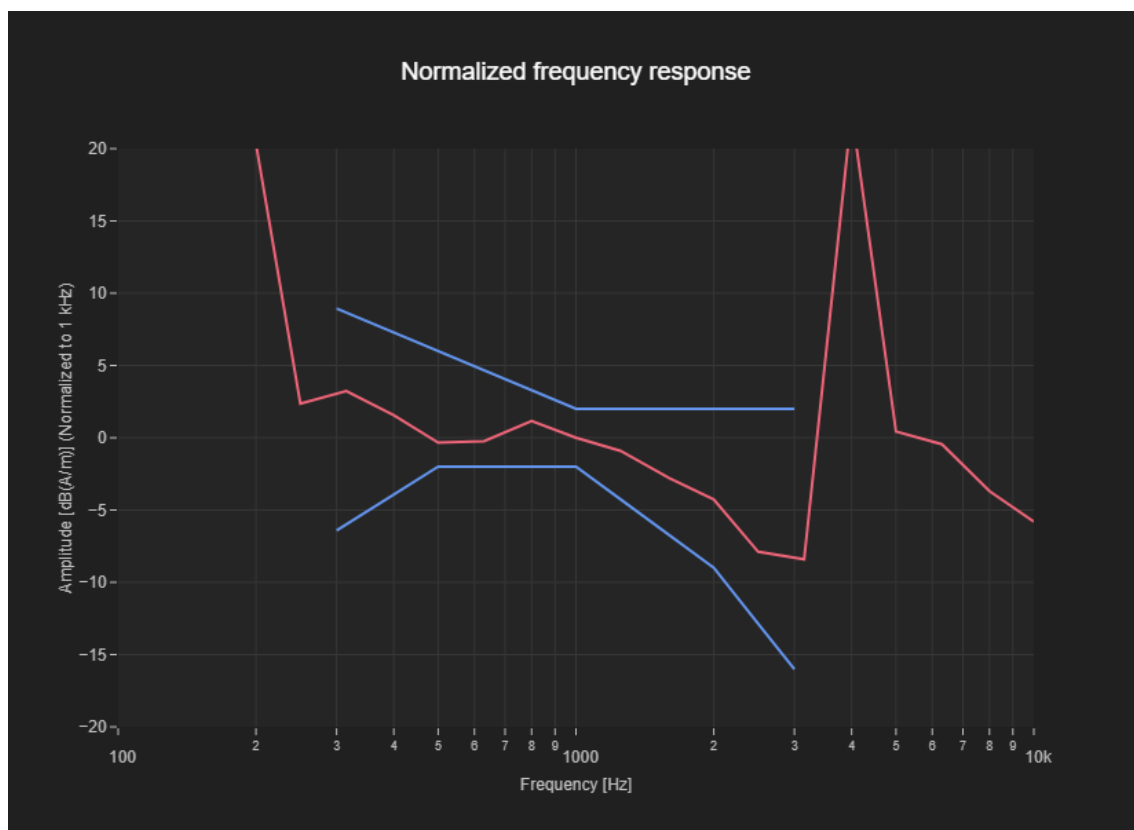
Band Name	Communication Systems Name	Channel	Frequency [MHz]
GSM 850	GSM-FDD (TDMA, GMSK)	251	848.8

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

Results

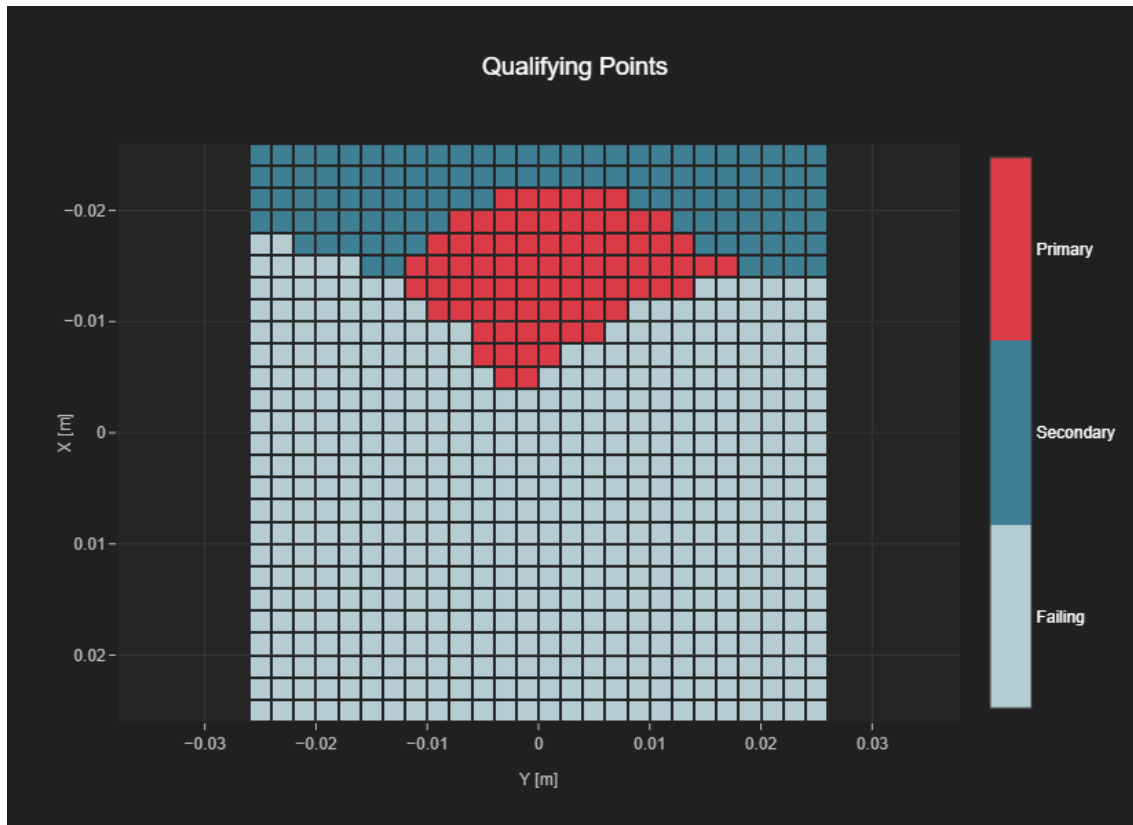
Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	1.67



T-Coil Coupling Mode Test Report

Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
77	183	11	26



Plot 4 UMTS Band 5 CH.4183 Voice AMR-NB Codec: 7.4kbit/s ANT A T-Coil Signal Test Report

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

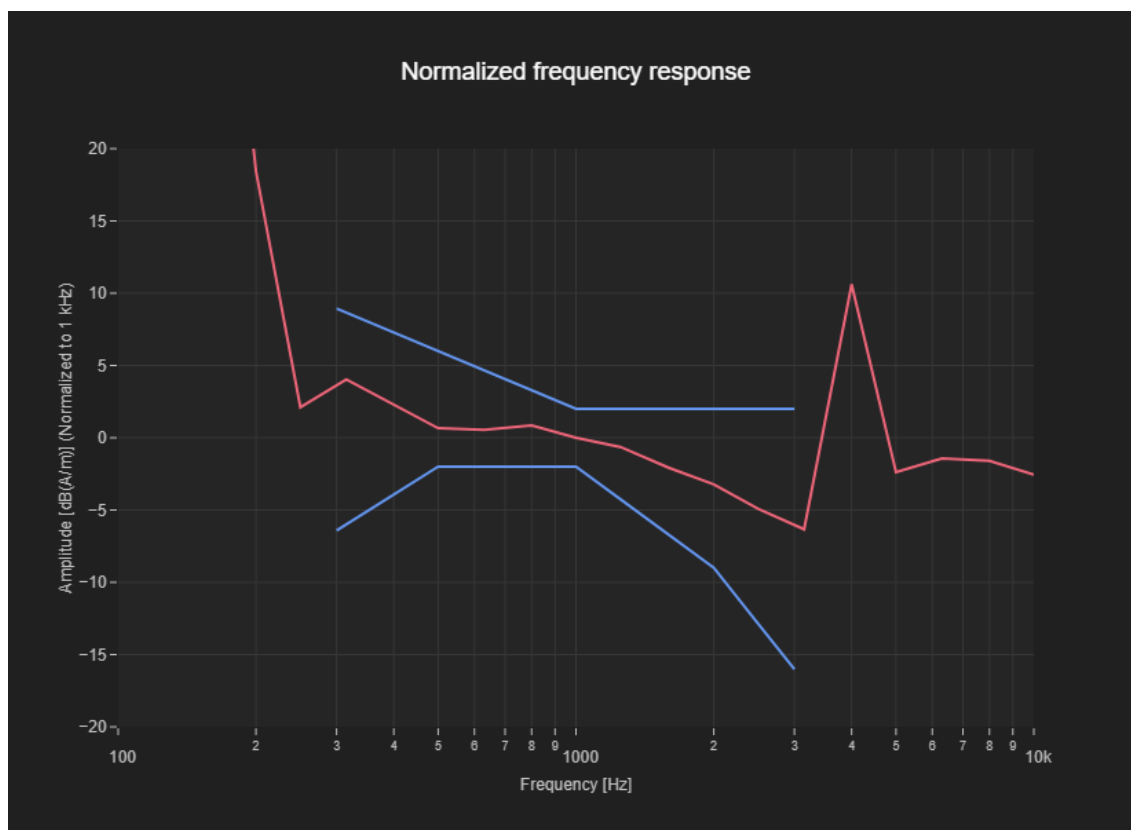
Band Name	Communication Systems Name	Channel	Frequency [MHz]
Band 5	UMTS-FDD (WCDMA, AMR)	4183	836.6

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

Results

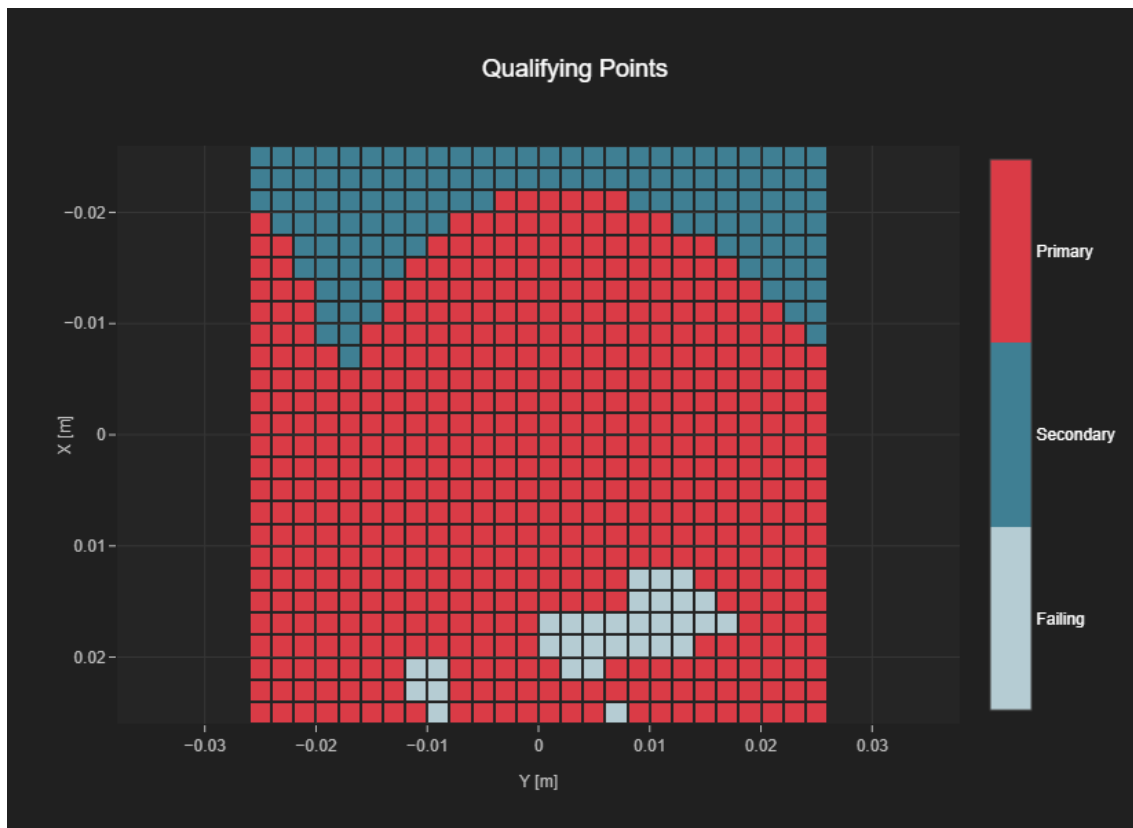
Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	2.0



T-Coil Coupling Mode Test Report

Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
523	645	26	26



Plot 5 UMTS Band 5 CH.4132 Voice AMR-NB Codec: 7.4kbit/s
T-Coil Signal Test Report
Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

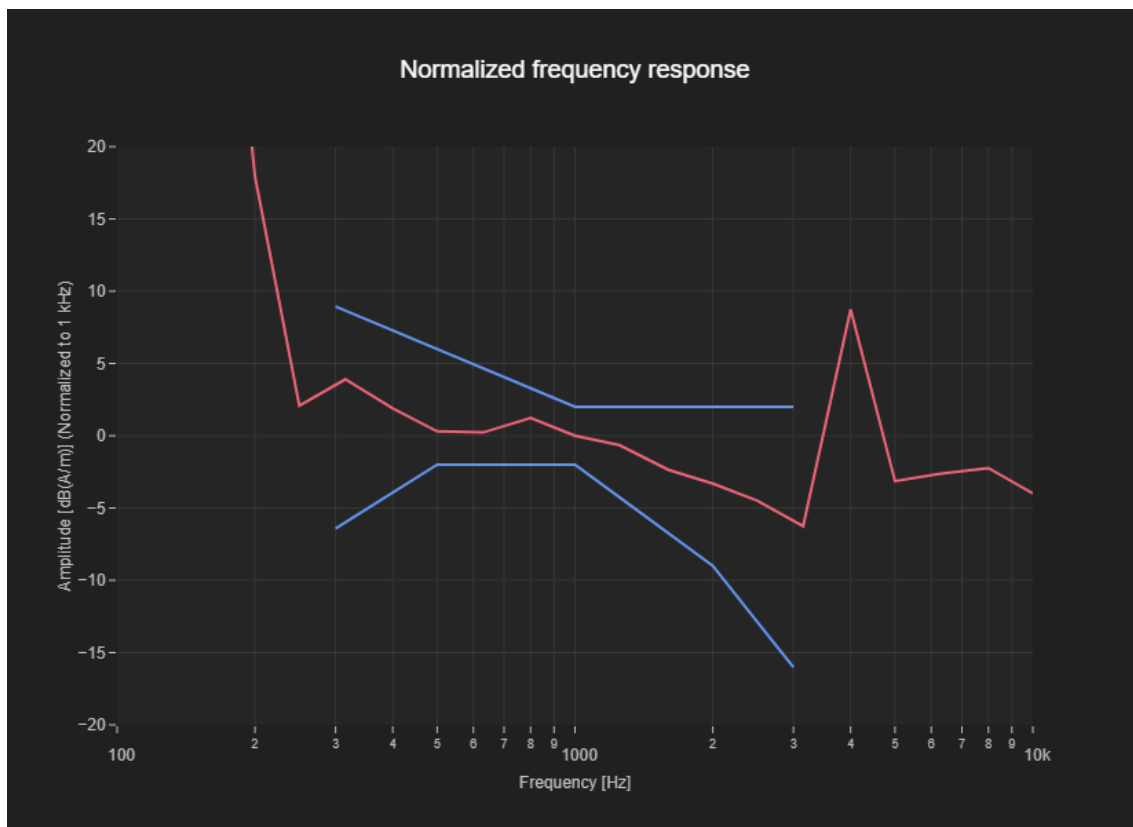
Band Name	Communication Systems Name	Channel	Frequency [MHz]
Band 5	UMTS-FDD (WCDMA, AMR)	4132	826.4

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

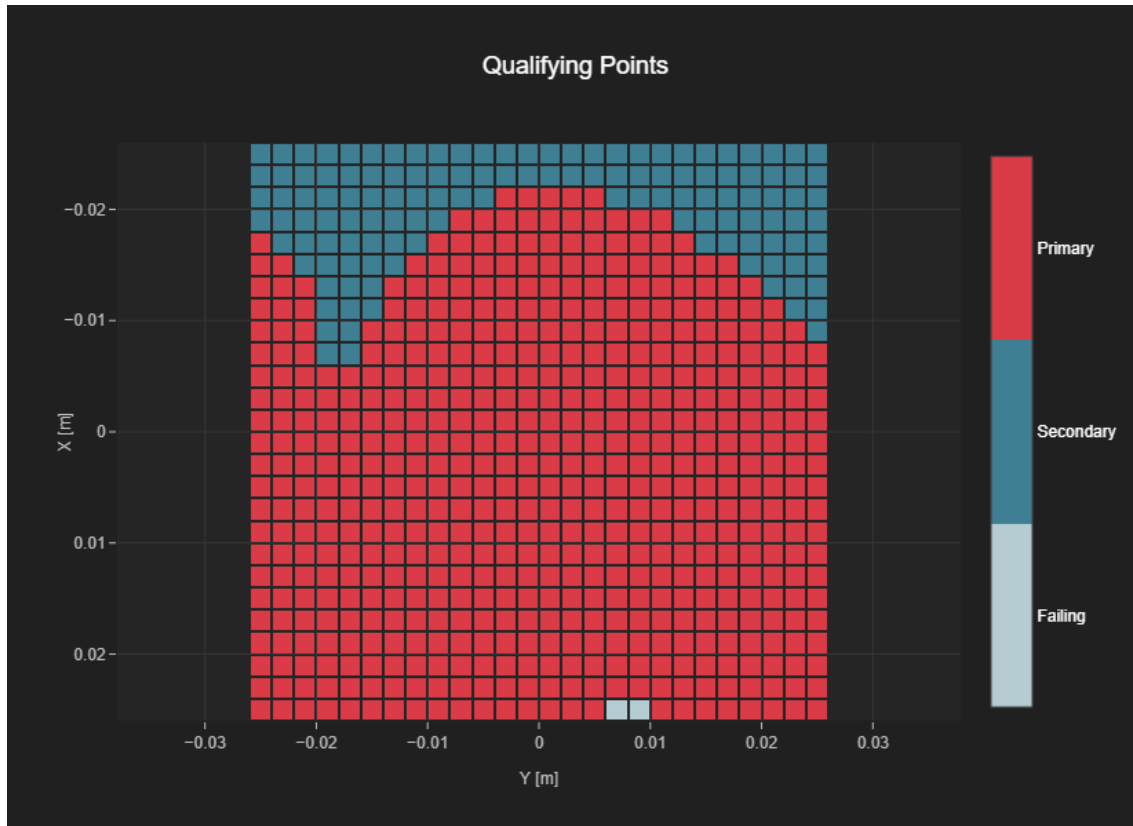
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	2.0



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
547	674	26	26



Plot 6 UMTS Band 5 CH.4233 Voice AMR-NB Codec: 7.4kbit/s

T-Coil Signal Test Report

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

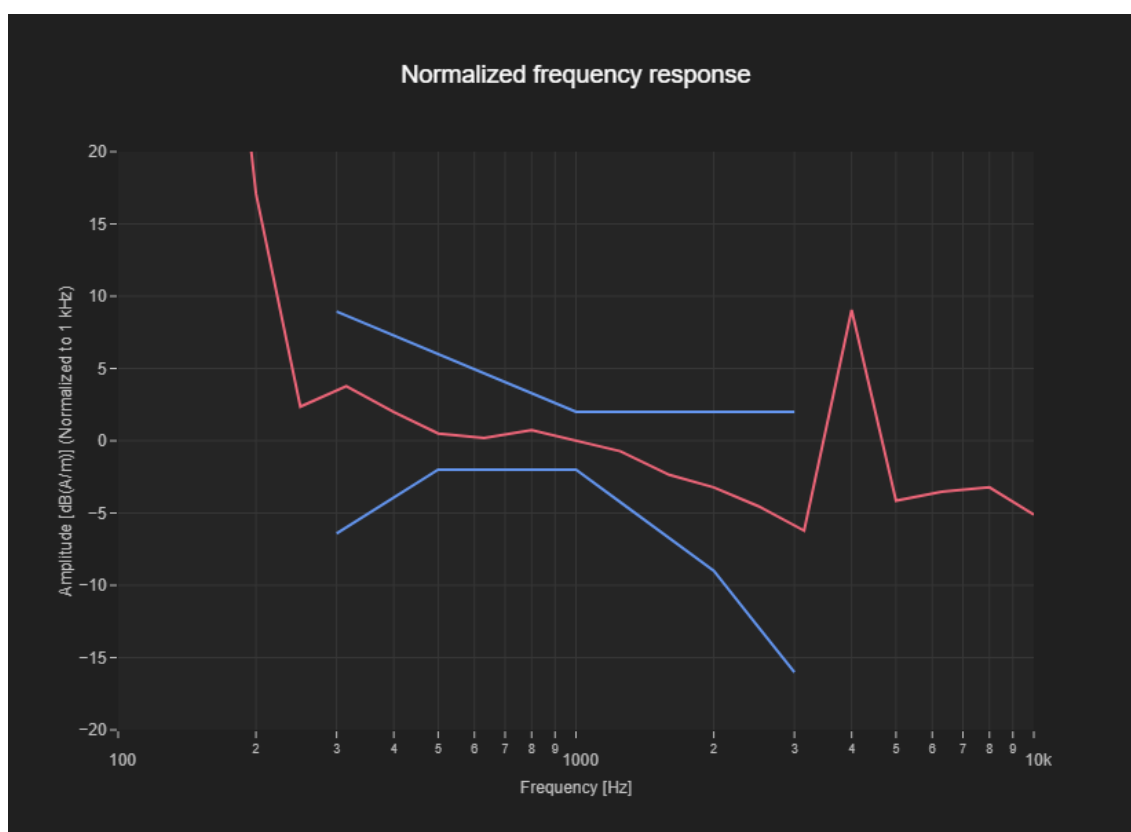
Band Name	Communication Systems Name	Channel	Frequency [MHz]
Band 5	UMTS-FDD (WCDMA, AMR)	4233	846.6

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

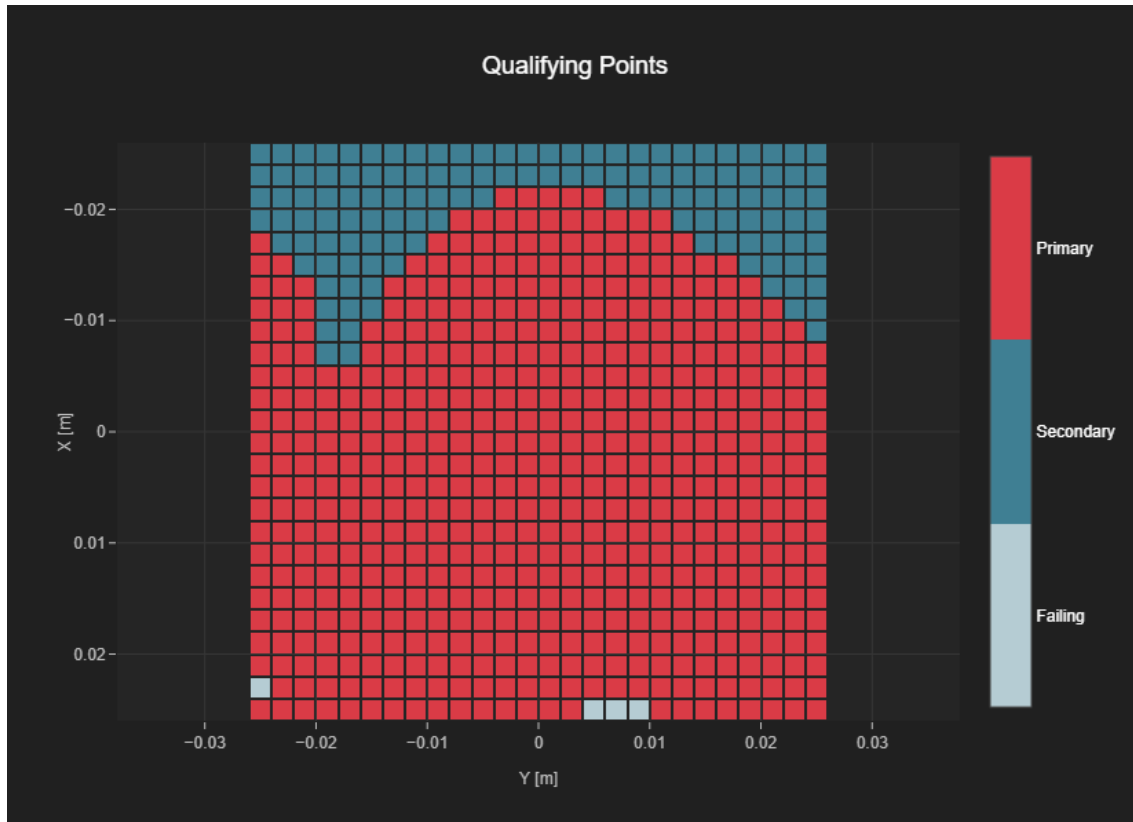
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	2.0



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
545	672	26	26



Plot 7 LTE Band 26 15MHz QPSK 1RB 0offset CH.26865 Voice EVS-SWB Codec 16.4kbit/s
ANT A
T-Coil Signal Test Report
Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

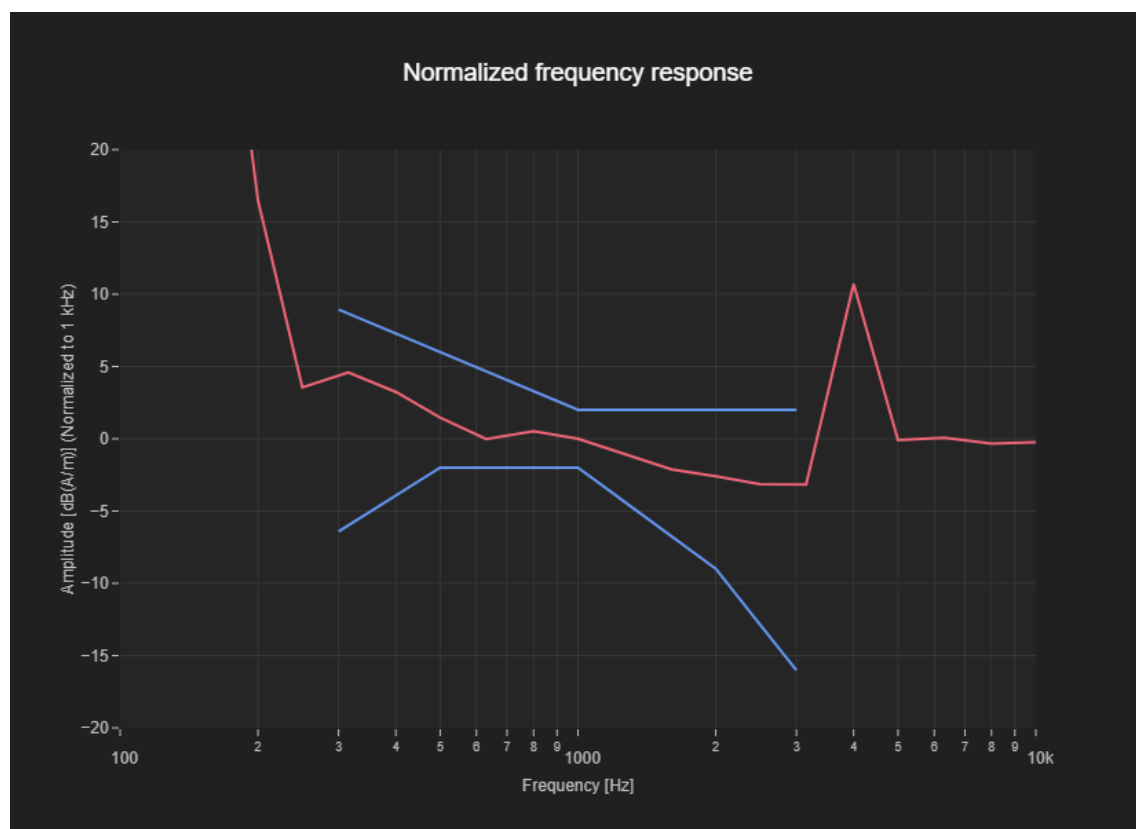
Band Name	Communication Systems Name	Channel	Frequency [MHz]
Band 26	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	26865	831.5

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

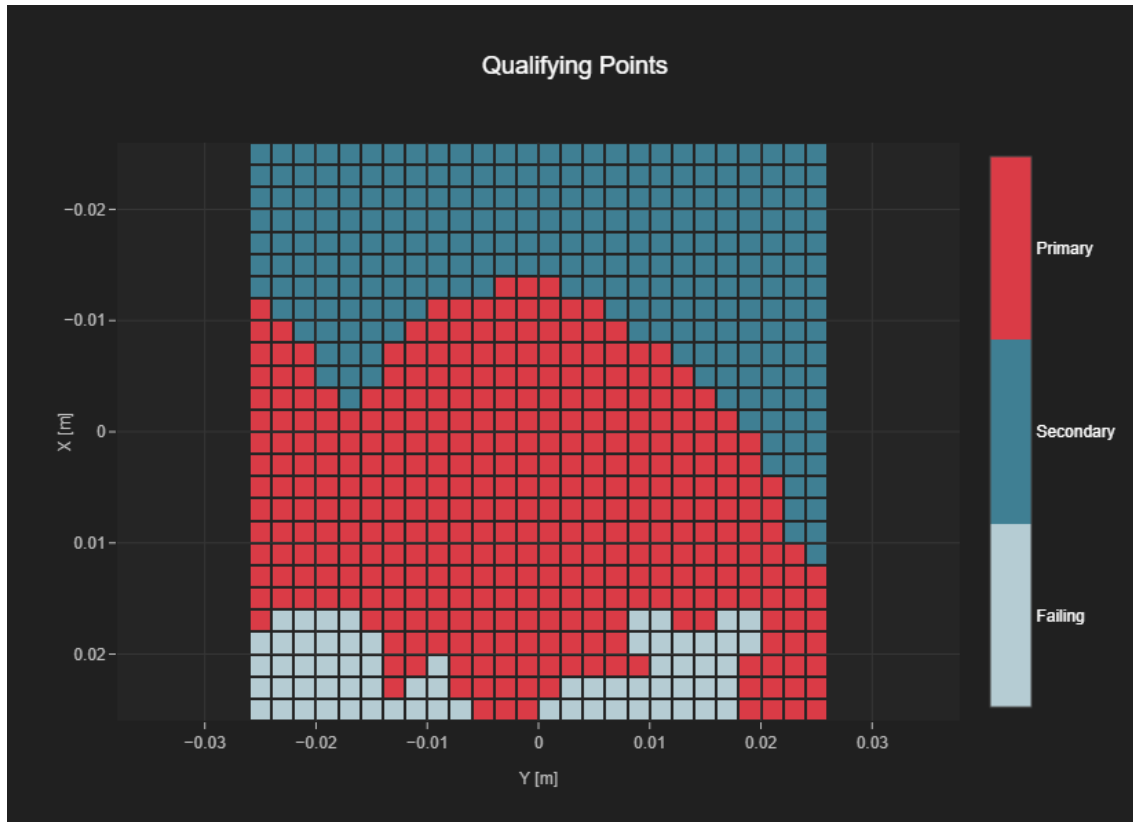
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	1.99



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
358	610	26	26



Plot 8 LTE Band 41 20MHz QPSK 100RB 0offset CH.40620 Voice EVS-NB Codec: 5.9kbit/s
ANT B
T-Coil Signal Test Report
Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

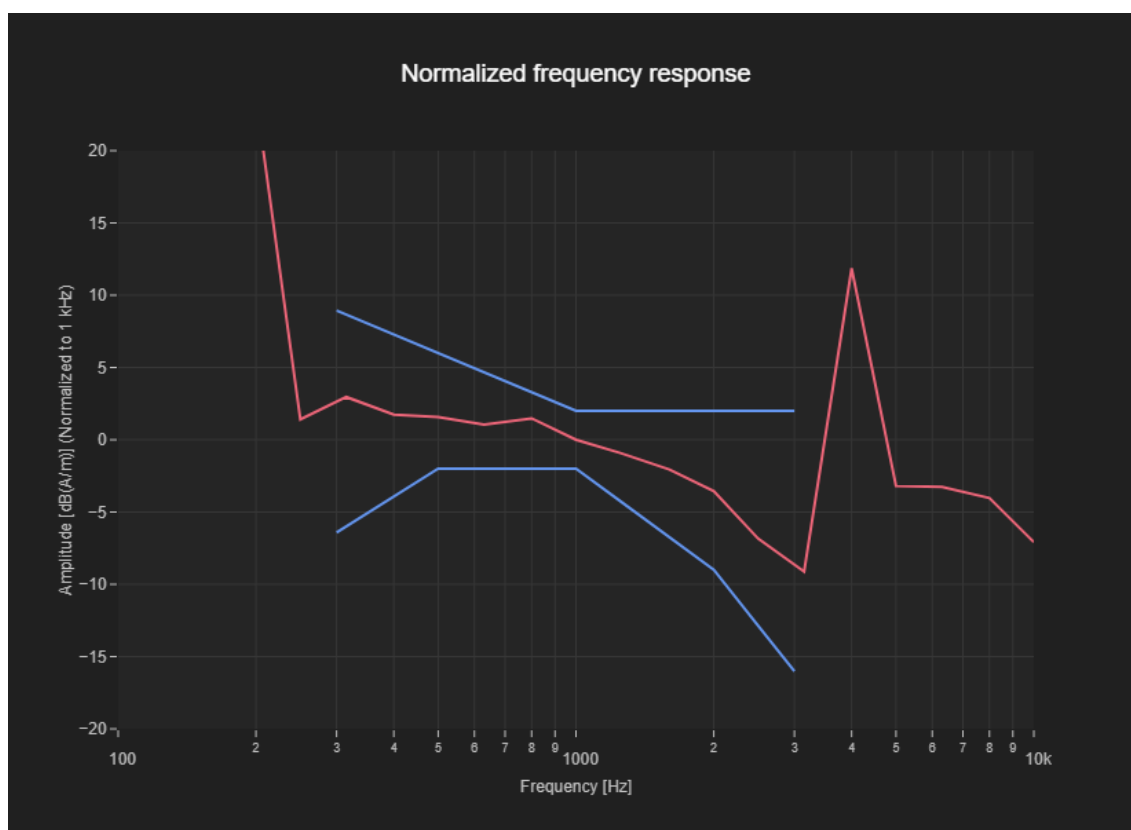
Band Name	Communication Systems Name	Channel	Frequency [MHz]
Band 41	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	40620	2593.0

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
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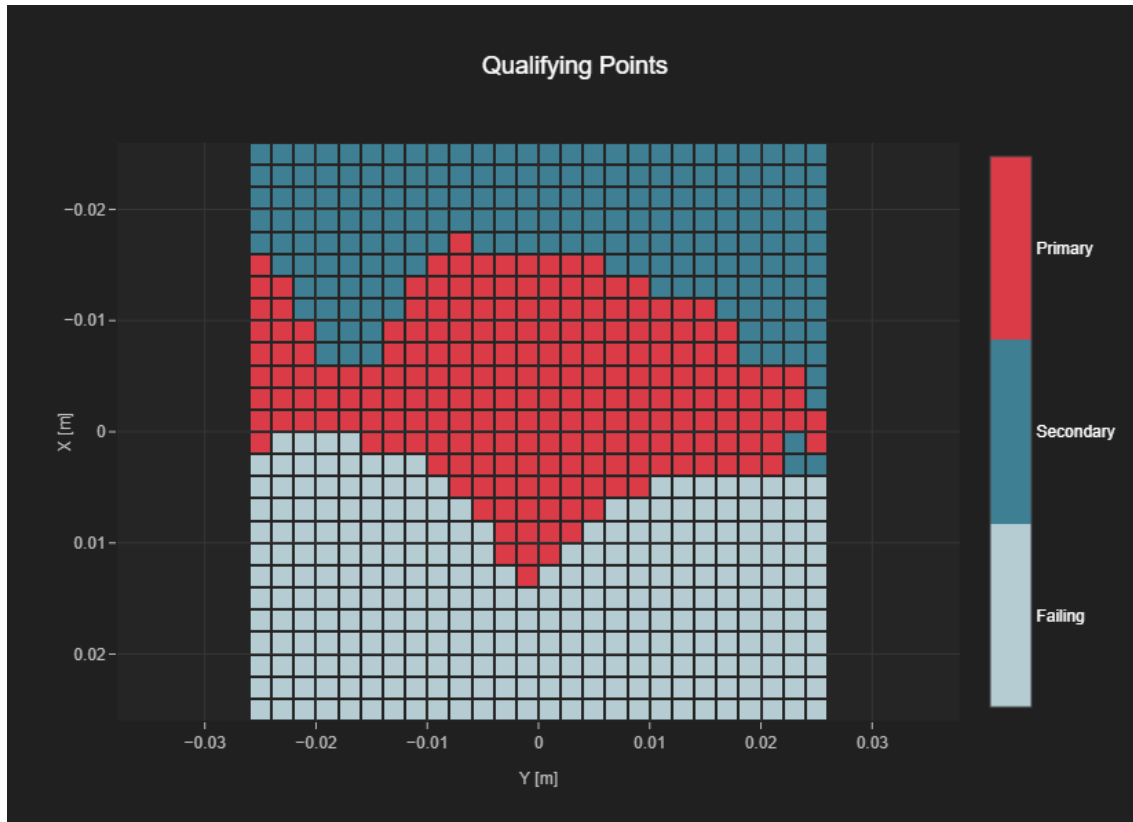
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	1.81	2.0



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
213	401	20	26



Plot 9 LTE Band 41 20MHz QPSK 100RB 0offset CH.39750 Voice EVS-NB Codec: 5.9kbit/s
ANT B
T-Coil Signal Test Report
Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

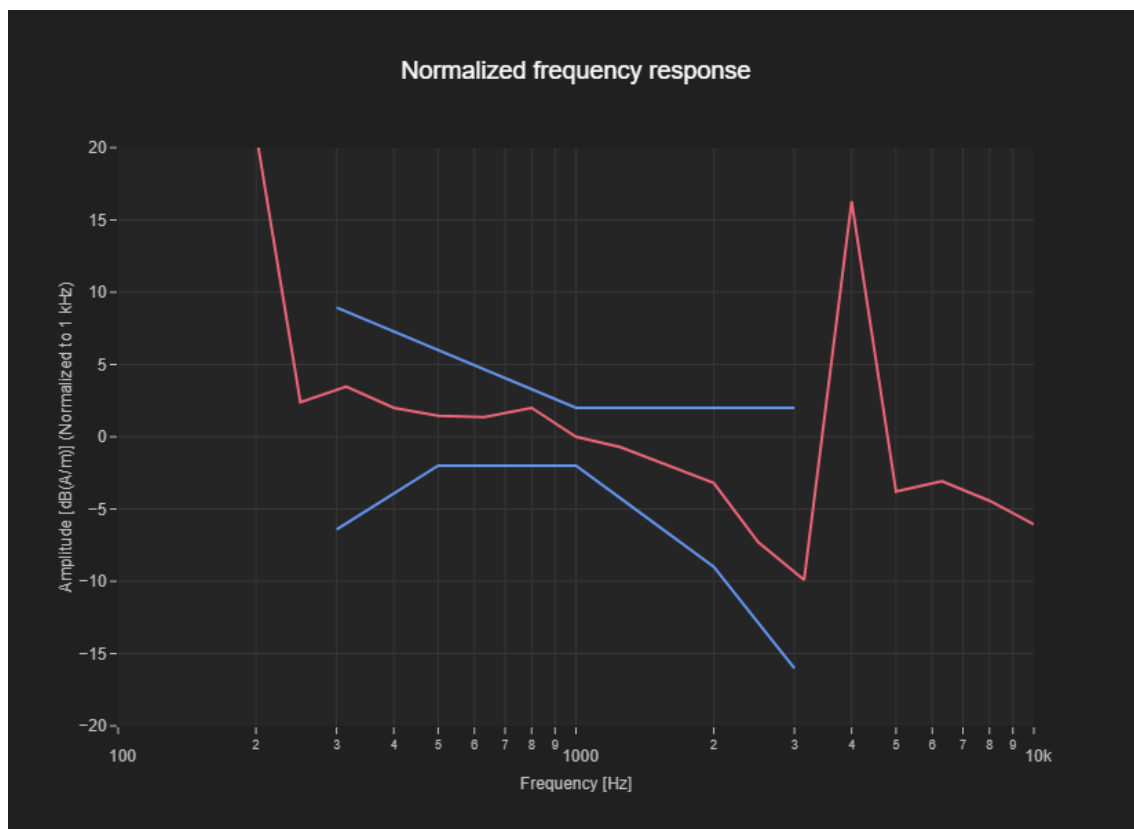
Band Name	Communication Systems Name	Channel	Frequency [MHz]
Band 41	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	39750	2506.0

Grid Settings

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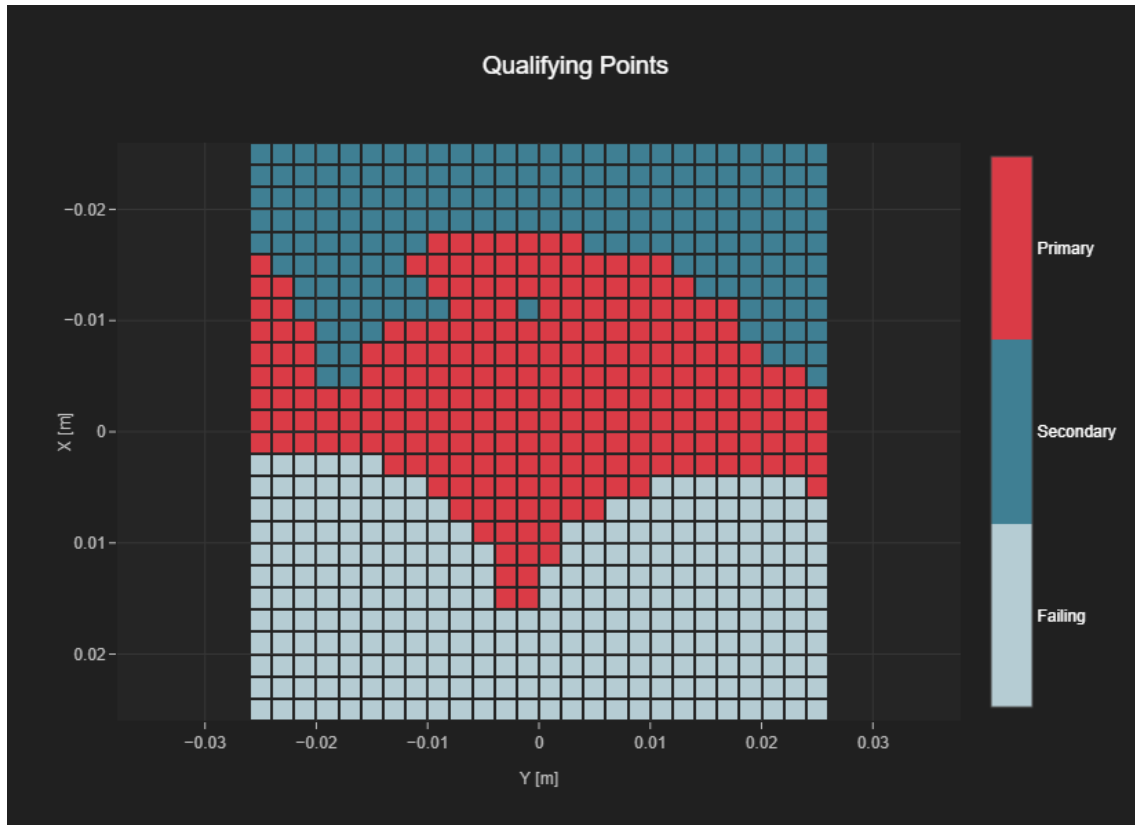
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	1.29	2.0



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
238	413	21	26



Plot 10 LTE Band 41 20MHz QPSK 100RB 0offset CH.40185 Voice EVS-NB Codec:**5.9kbit/s ANT B****T-Coil Signal Test Report****Hardware Setup**

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

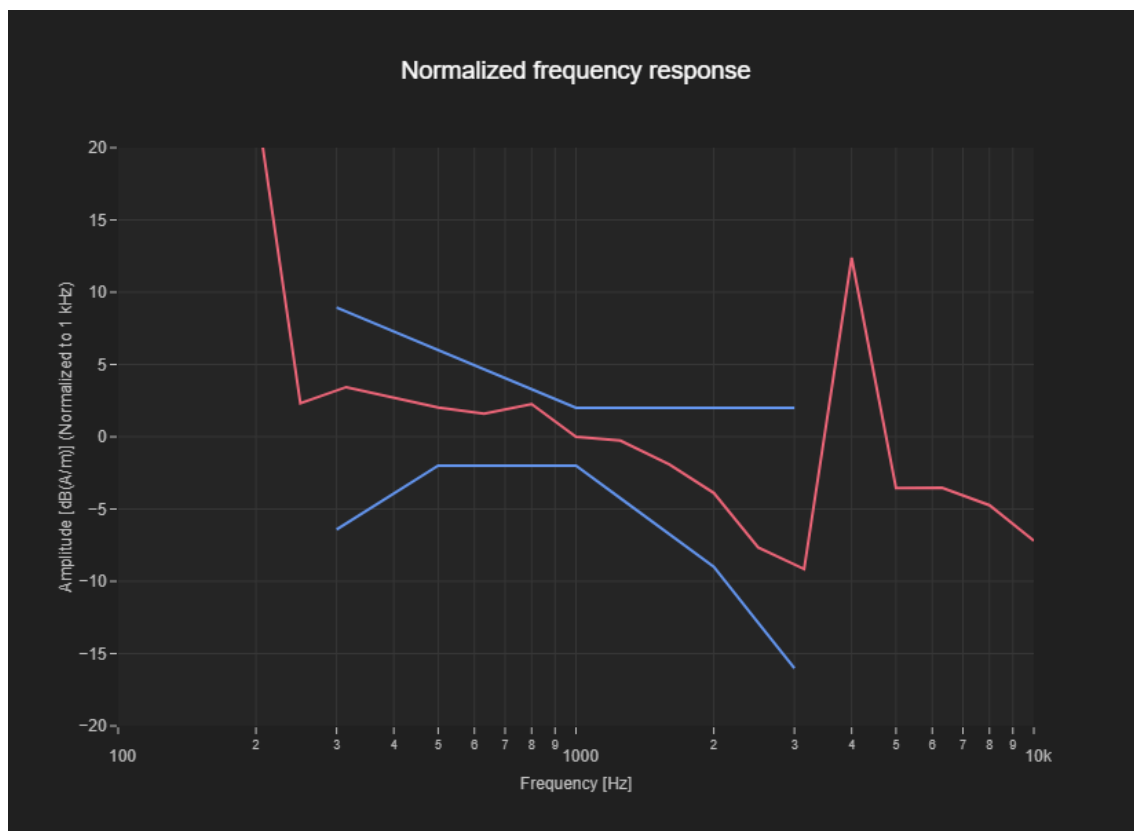
Band Name	Communication Systems Name	Channel	Frequency [MHz]
Band 41	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	40185	2549.5

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

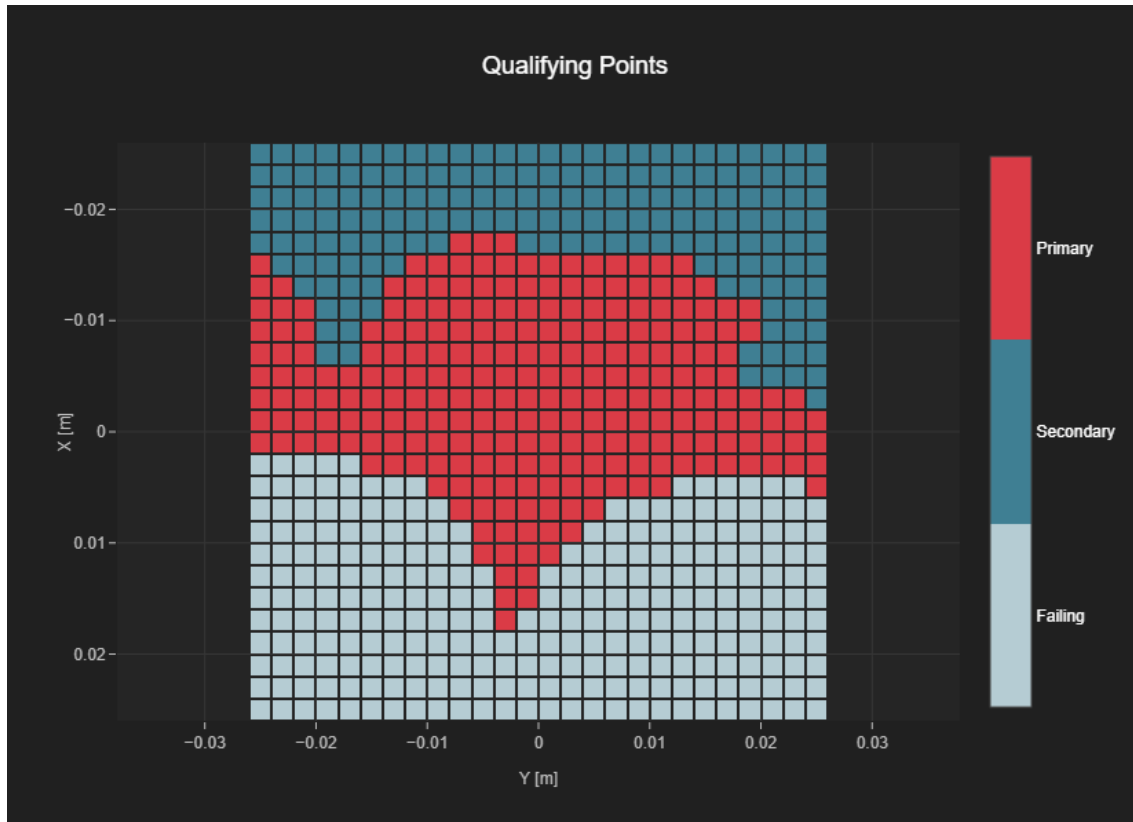
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	1.02	2.0



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
248	418	22	26



Plot 11 LTE Band 41 20MHz QPSK 100RB 0offset CH.41055 Voice EVS-NB Codec:
5.9kbit/s ANT B
T-Coil Signal Test Report
Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

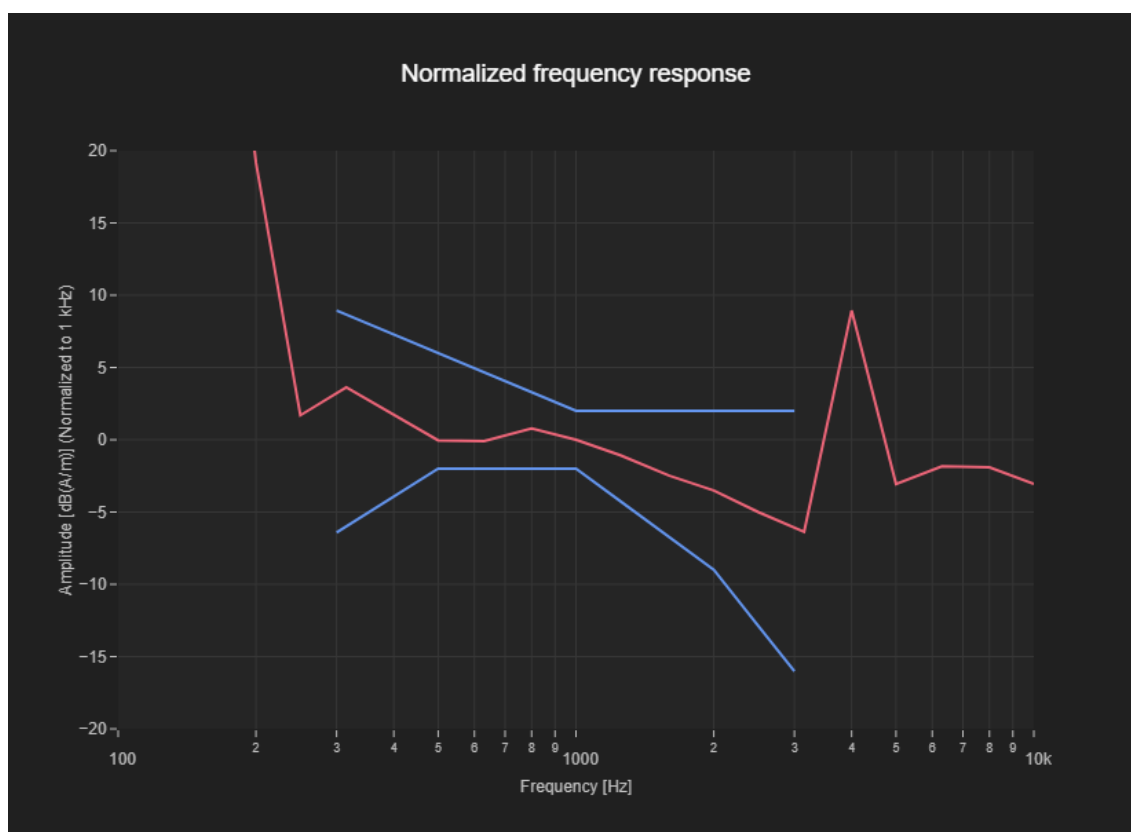
Band Name	Communication Systems Name	Channel	Frequency [MHz]
Band 41	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	41055	2636.5

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

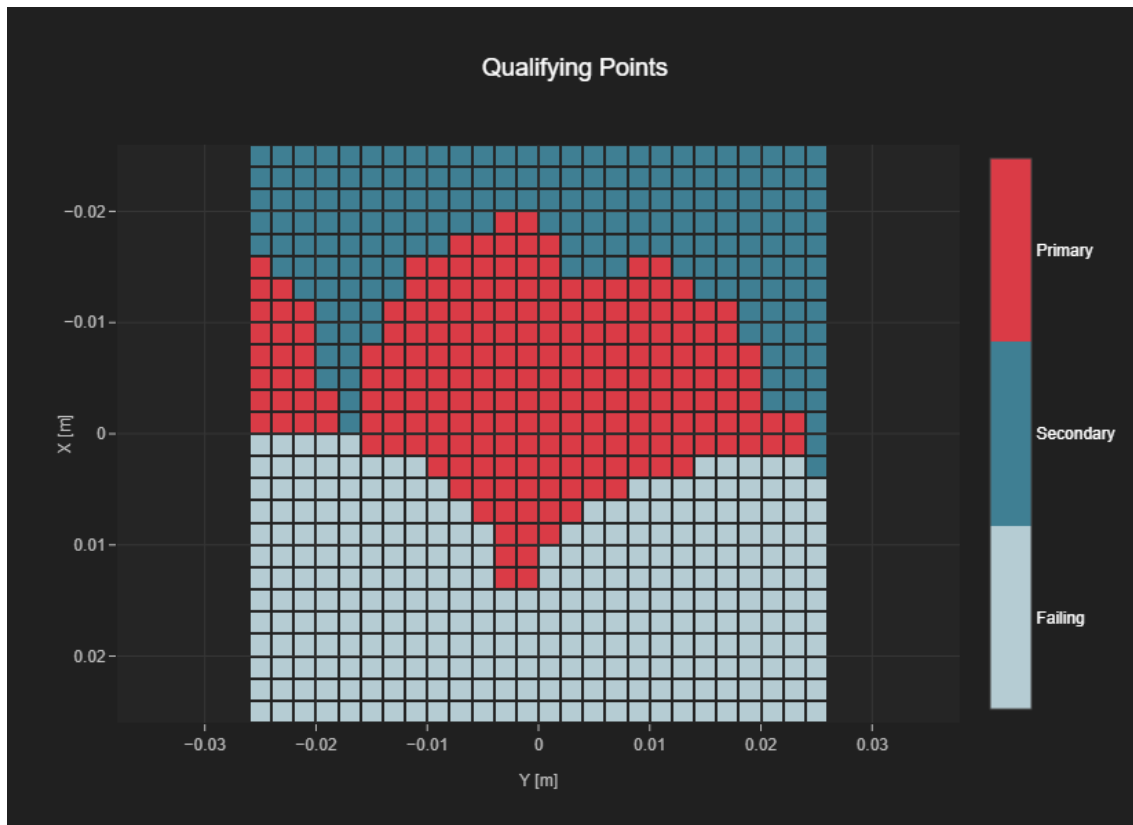
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	1.9



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
210	392	20	26



Plot 12 LTE Band 41 20MHz QPSK 100RB 0offset CH.41490 Voice EVS-NB Codec:
5.9kbit/s ANT B
T-Coil Signal Test Report
Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

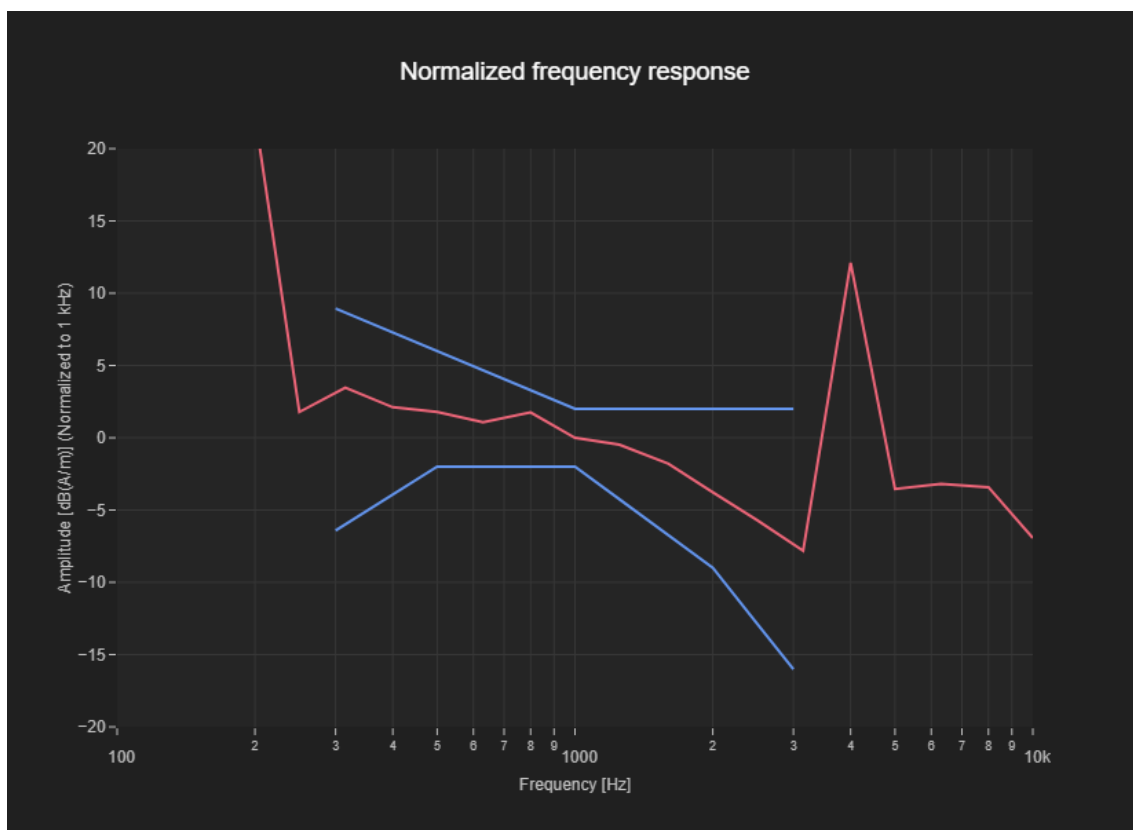
Band Name	Communication Systems Name	Channel	Frequency [MHz]
Band 41	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	41490	2680.0

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

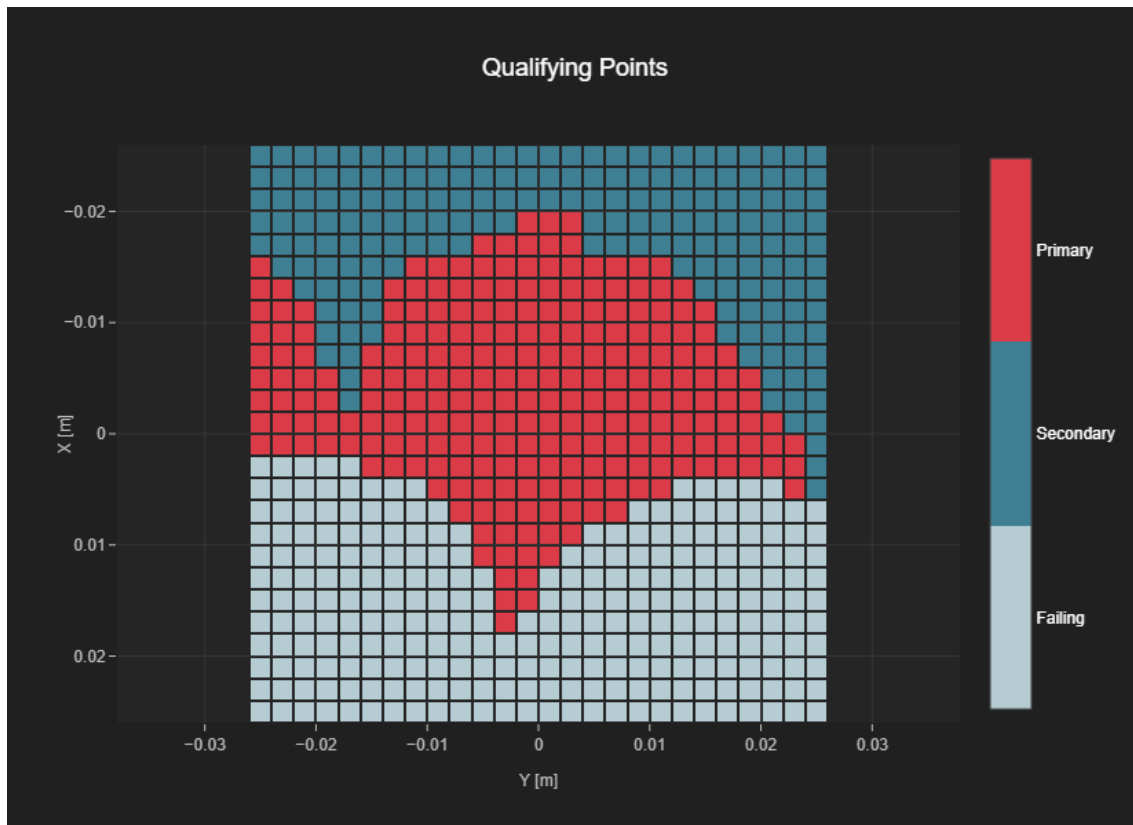
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	1.54	2.0



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
240	420	22	26



Plot 13 NR Band n7 15MHz DFT-S OFDM 1RB 1offset CH.507000 Voice EVS-WB Codec:
5.9kbit/s ANT B
T-Coil Signal Test Report
Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

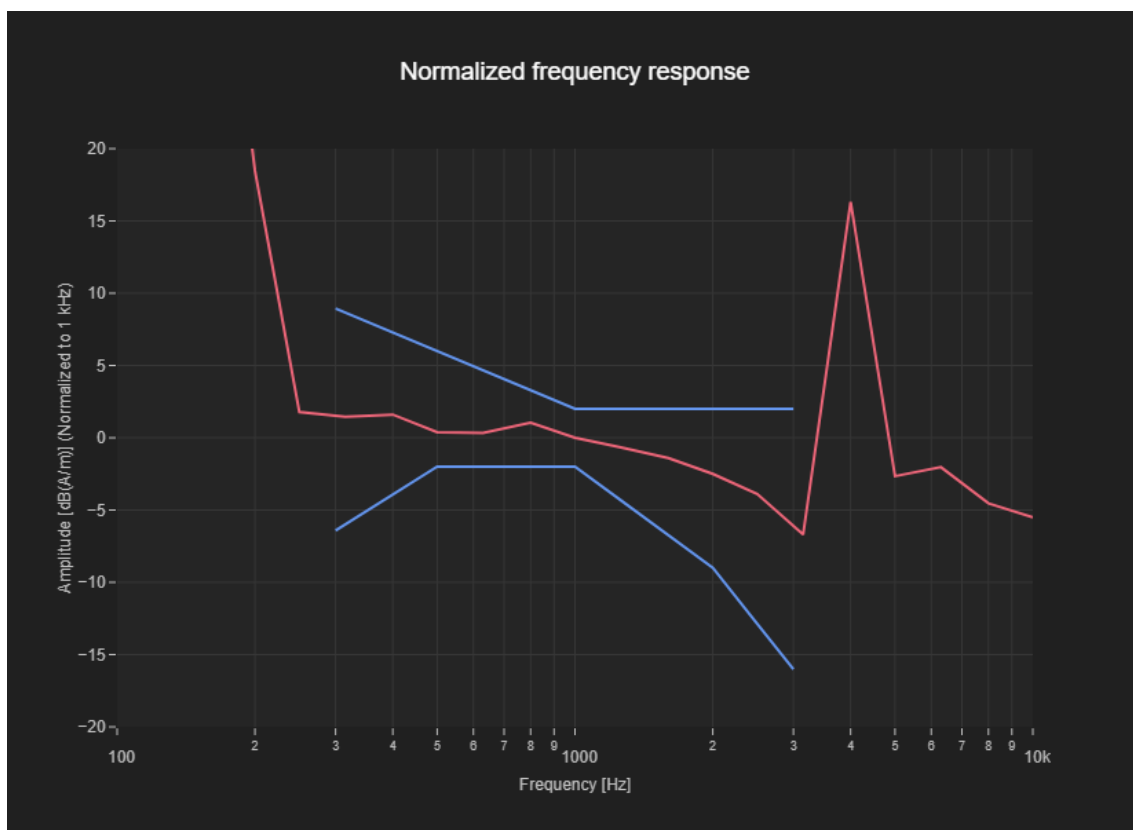
Band Name	Communication Systems Name	Channel	Frequency [MHz]
Band n7	5G NR (DFT-s-OFDM, 1 RB, 15 MHz, QPSK, 15 kHz)	507000	2535.0

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

Results

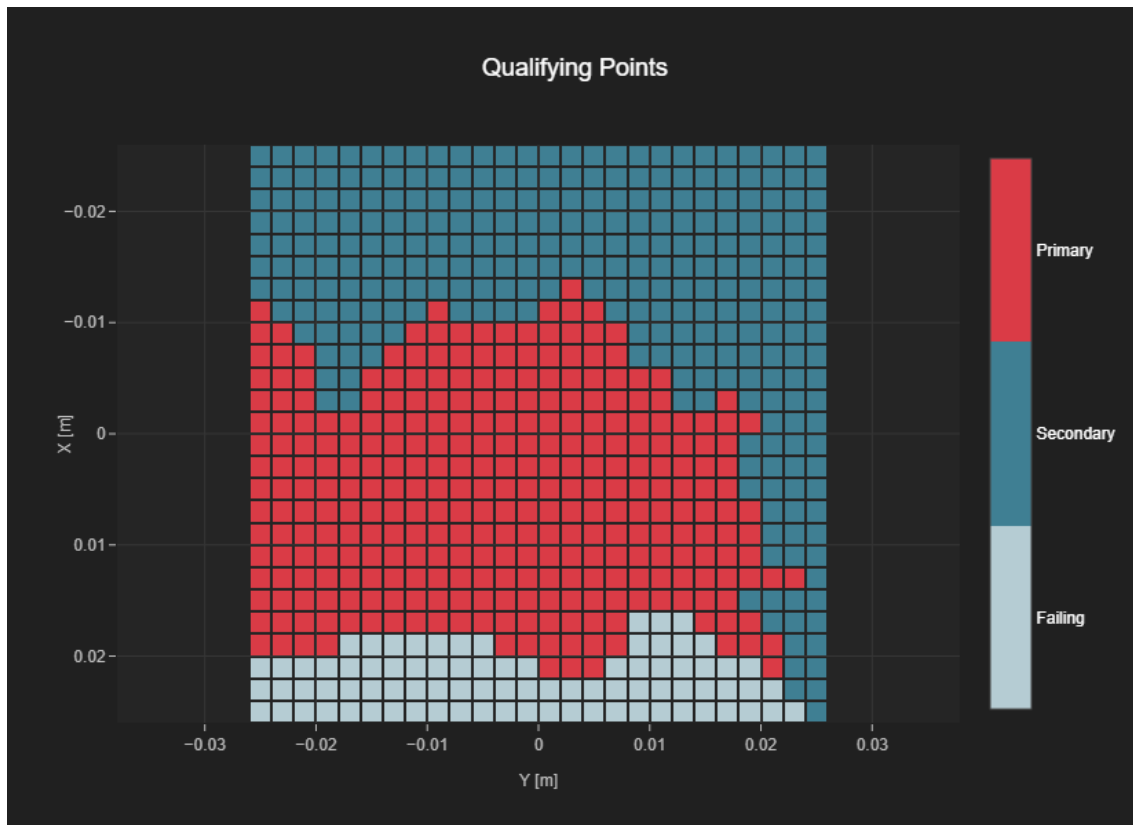
Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	2.0



T-Coil Coupling Mode Test Report

Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
309	593	26	26



Plot 14 NR Band n7 15MHz DFT-S OFDM 1RB 1offset CH.501500 Voice EVS-WB Codec:
5.9kbit/s ANT B
T-Coil Signal Test Report
Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

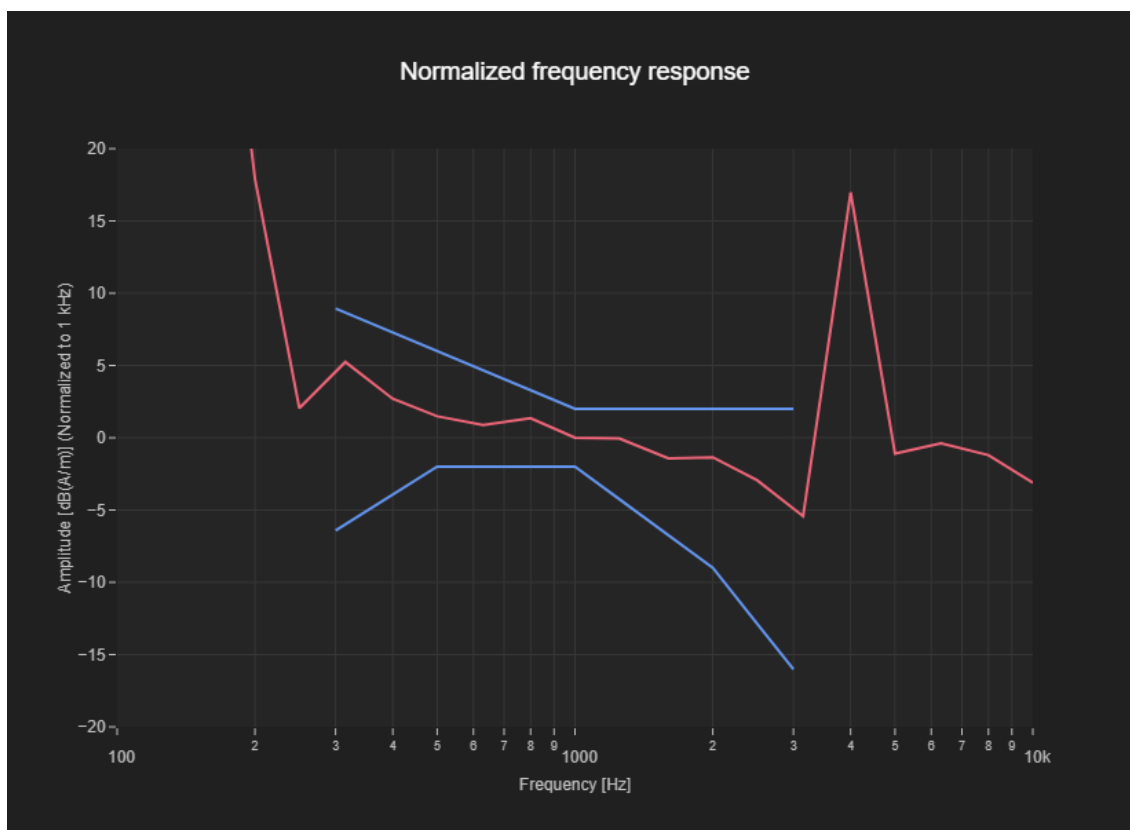
Band Name	Communication Systems Name	Channel	Frequency [MHz]
Band n7	5G NR (DFT-s-OFDM, 1 RB, 15 MHz, QPSK, 15 kHz)	501500	2507.5

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

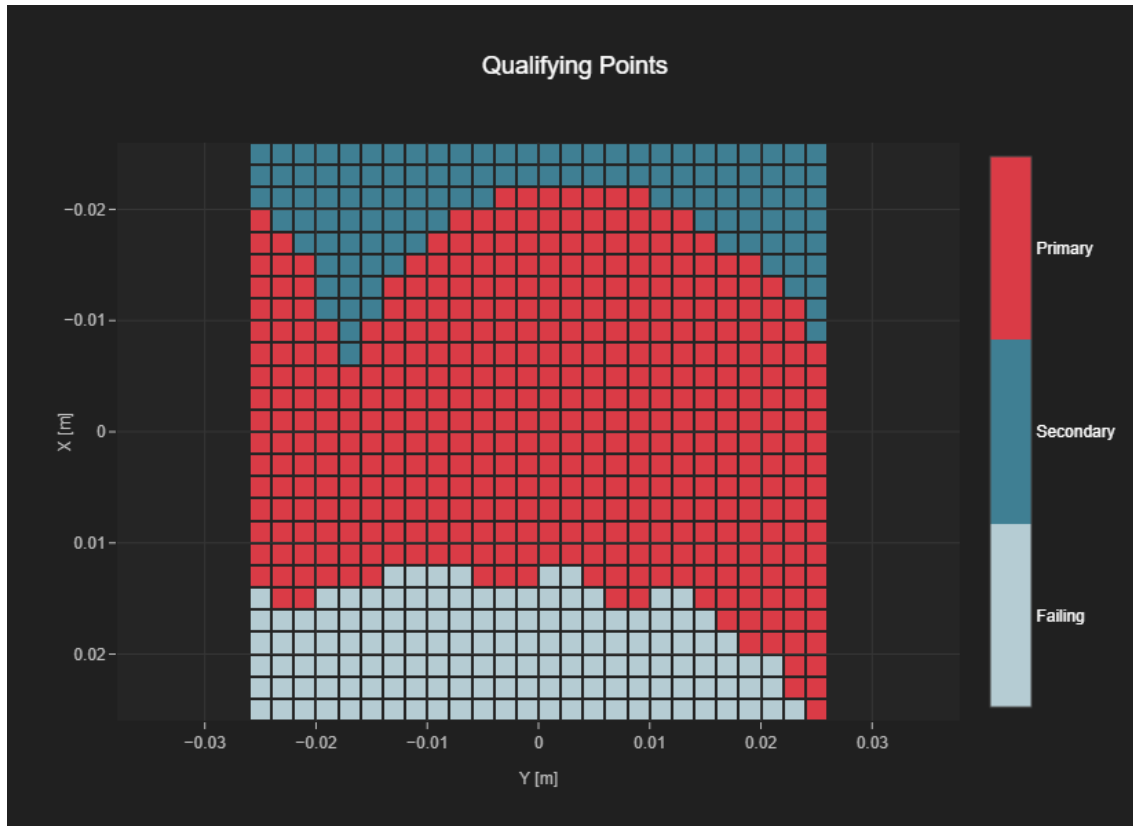
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	1.93	2.0



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
423	538	26	26



Plot 15 NR Band n7 15MHz DFT-S OFDM 1RB 1offset CH.512500 Voice EVS-WB Codec:
5.9kbit/s ANT B
T-Coil Signal Test Report
Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

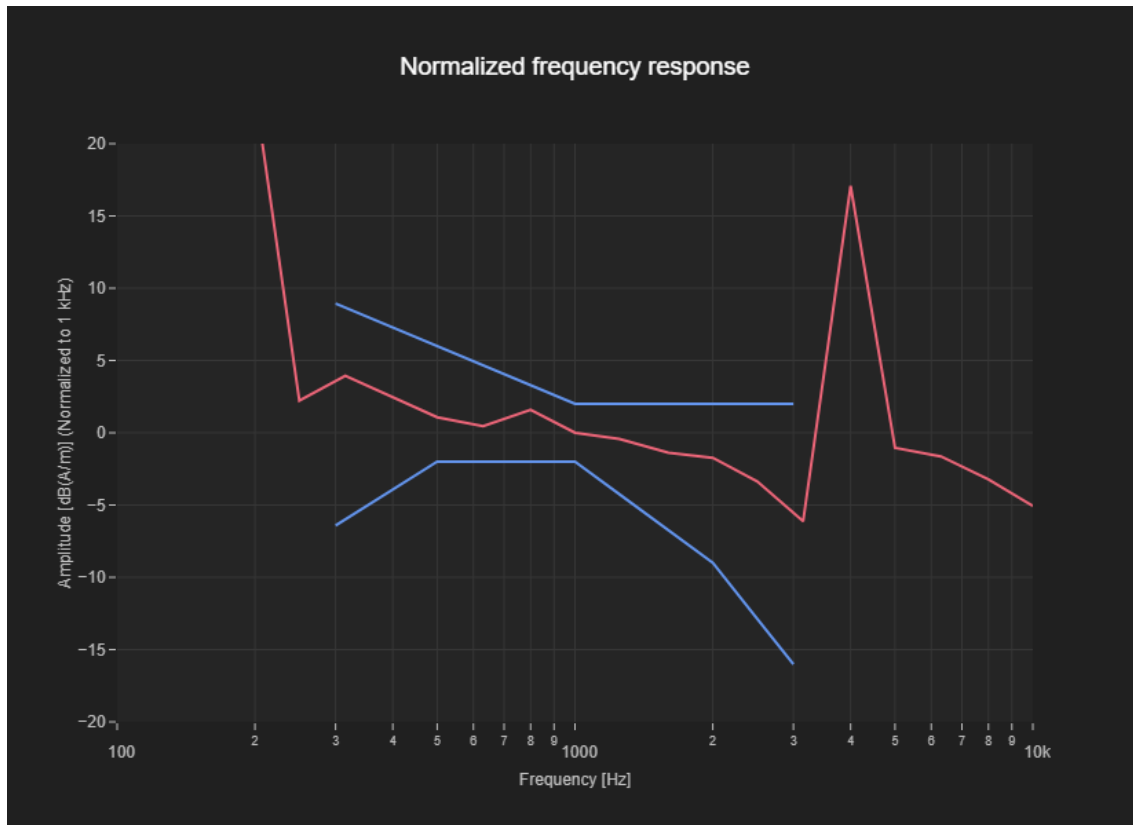
Band Name	Communication Systems Name	Channel	Frequency [MHz]
Band n7	5G NR (DFT-s-OFDM, 1 RB, 15 MHz, QPSK, 15 kHz)	512500	2562.5

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

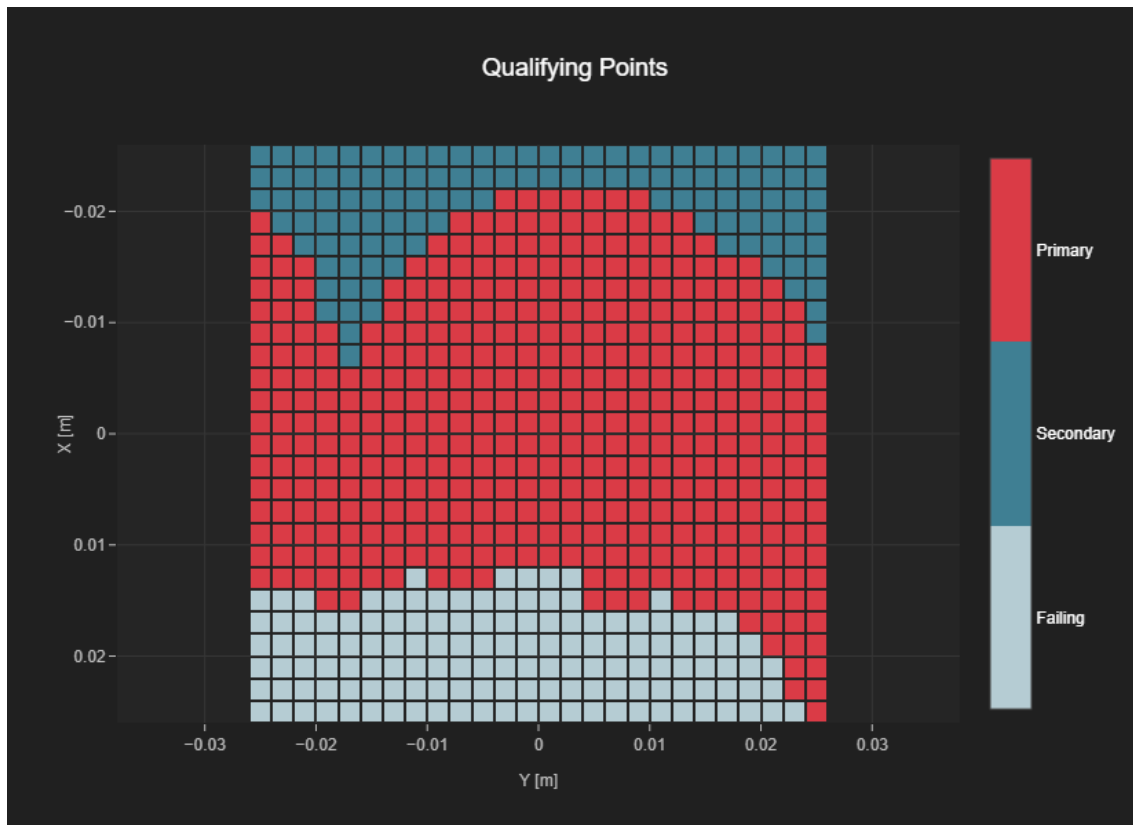
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	1.7	2.0



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
424	539	26	26



Plot 16 NR Band n41 100MHz DFTs OFDM QPSK 1RB 1offset CH.518598
EVS-WB Codec: 5.9kbit/s ANT B
T-Coil Signal Test Report
Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

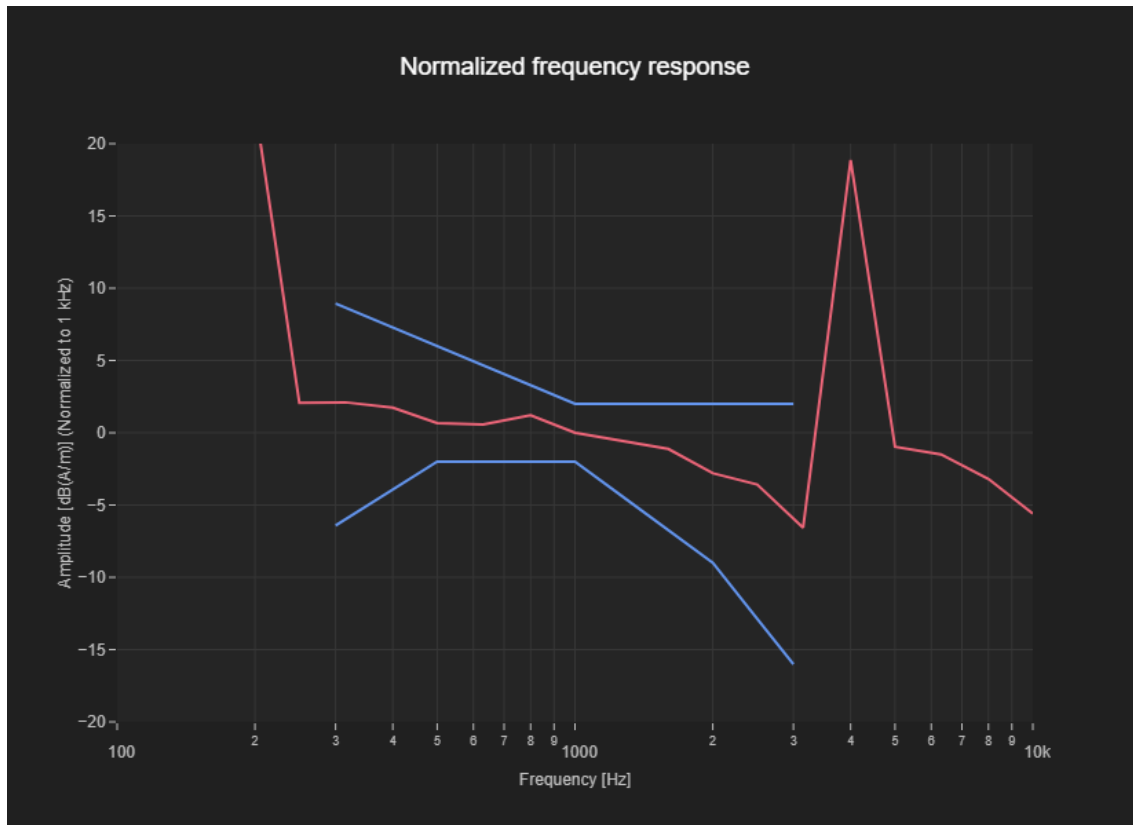
Band Name	Communication Systems Name	Channel	Frequency [MHz]
Band n41	5G NR (DFT-s-OFDM, 1 RB, 100 MHz, QPSK, 30 kHz)	518598	2592.99

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
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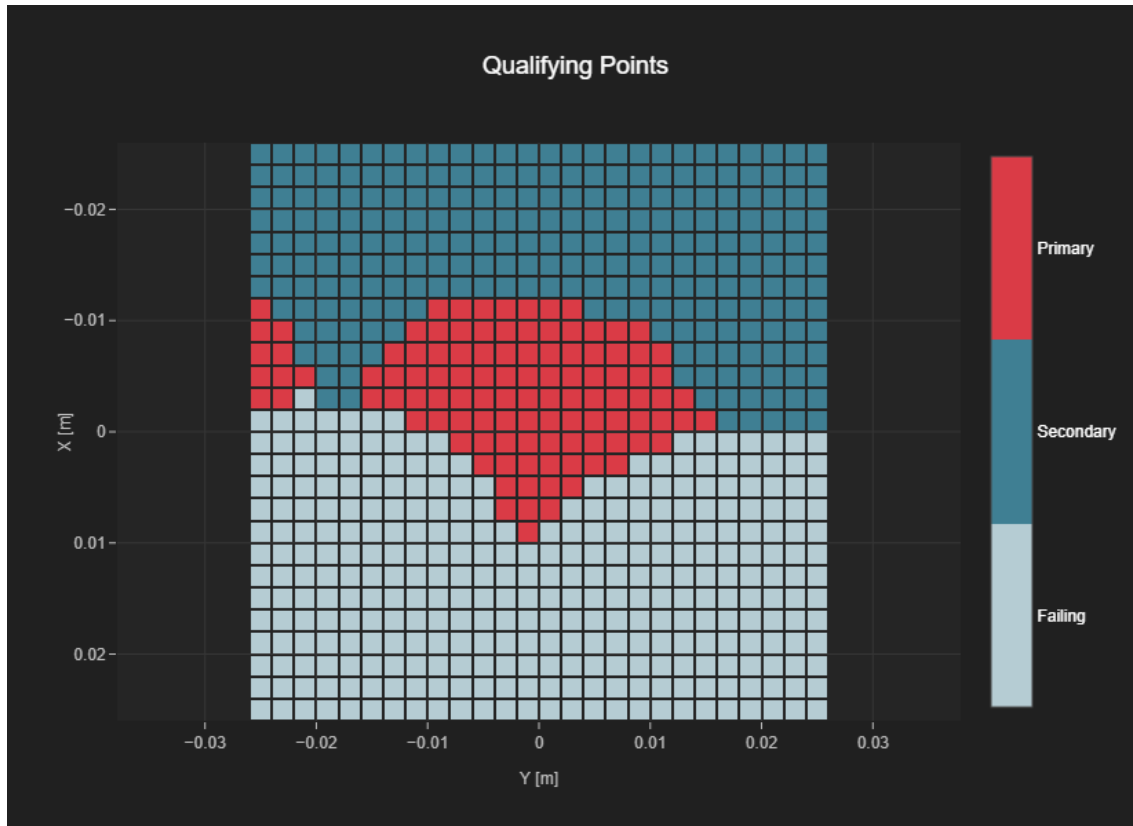
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	2.0



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
109	355	18	26



Plot 17 802.11g CH.6 6Mbps Voice EVS-NB Codec: 24.4 kbit/s

T-Coil Signal Test Report

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

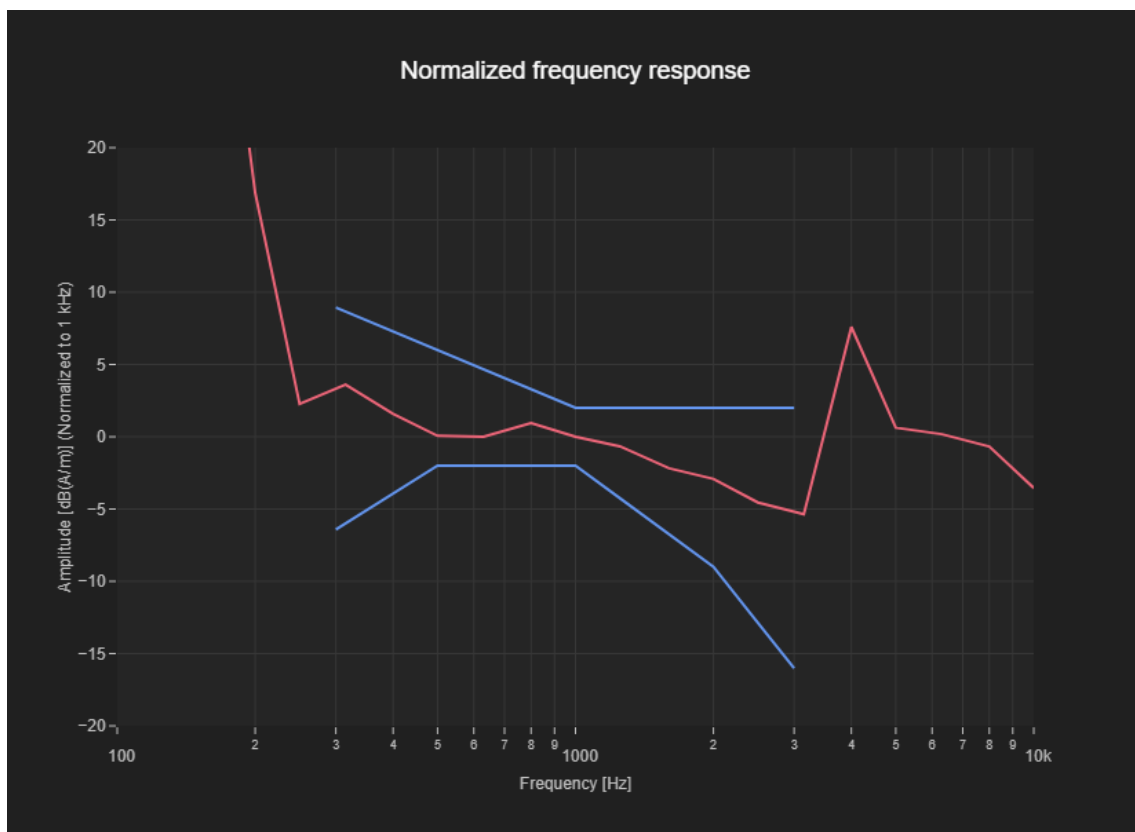
Band Name	Communication Systems Name	Channel	Frequency [MHz]
WLAN 2.4GHz	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)	6	2437.0

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

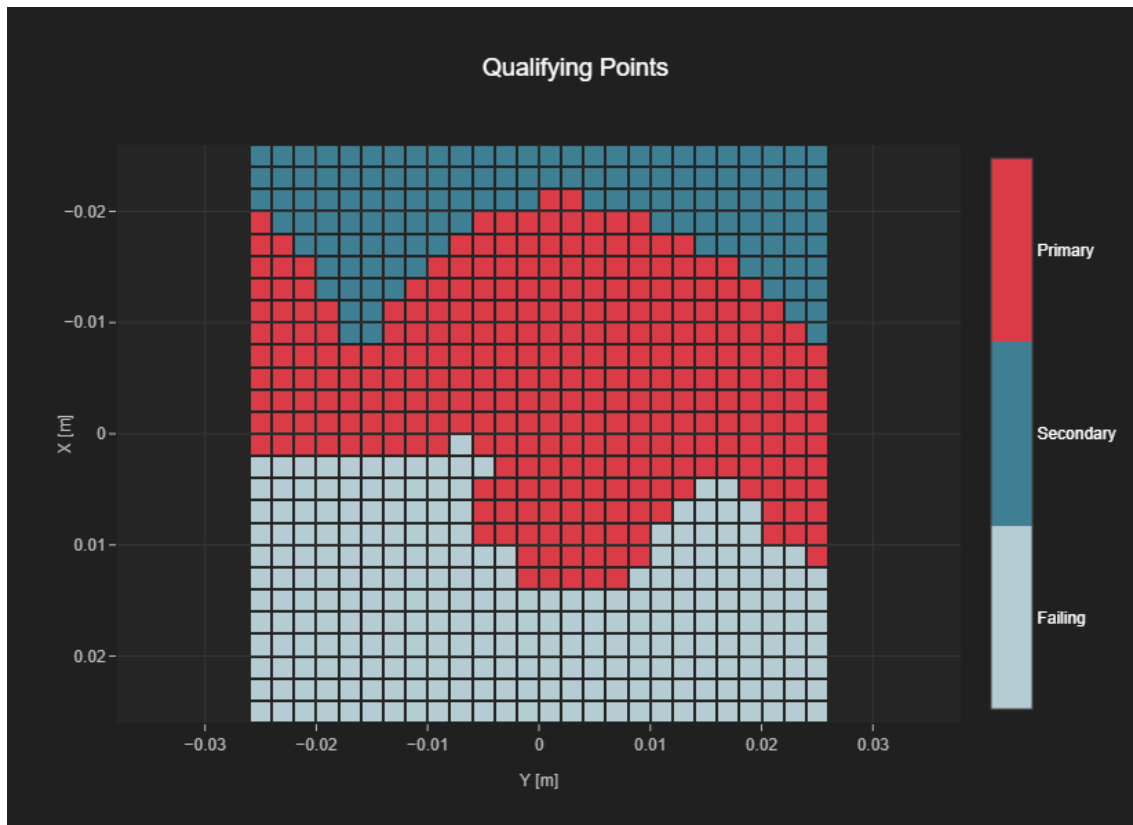
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	1.99



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
298	427	20	26



Plot 18 802.11g CH.1 6Mbps Voice EVS-NB Codec: 24.4 kbit/s

EVS-WB Codec: 5.9kbit/s

T-Coil Signal Test Report

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

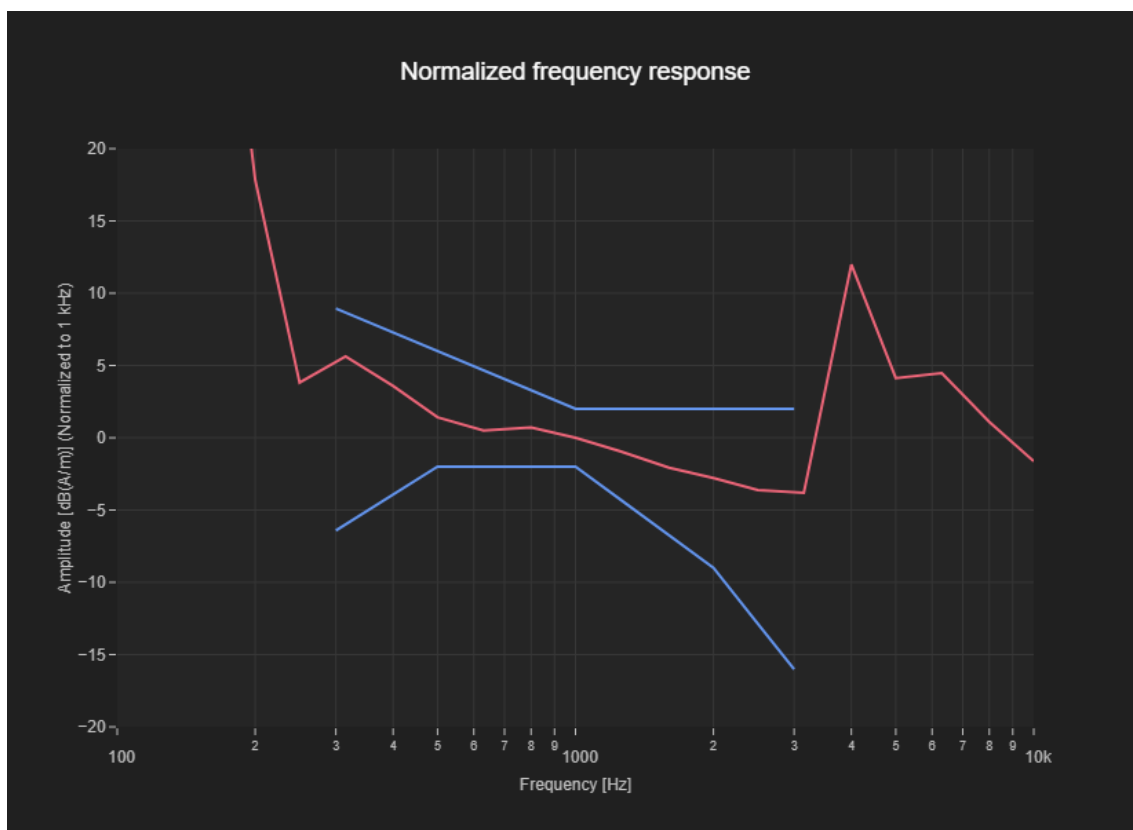
Band Name	Communication Systems Name	Channel	Frequency [MHz]
WLAN 2.4GHz	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)	1	2412.0

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
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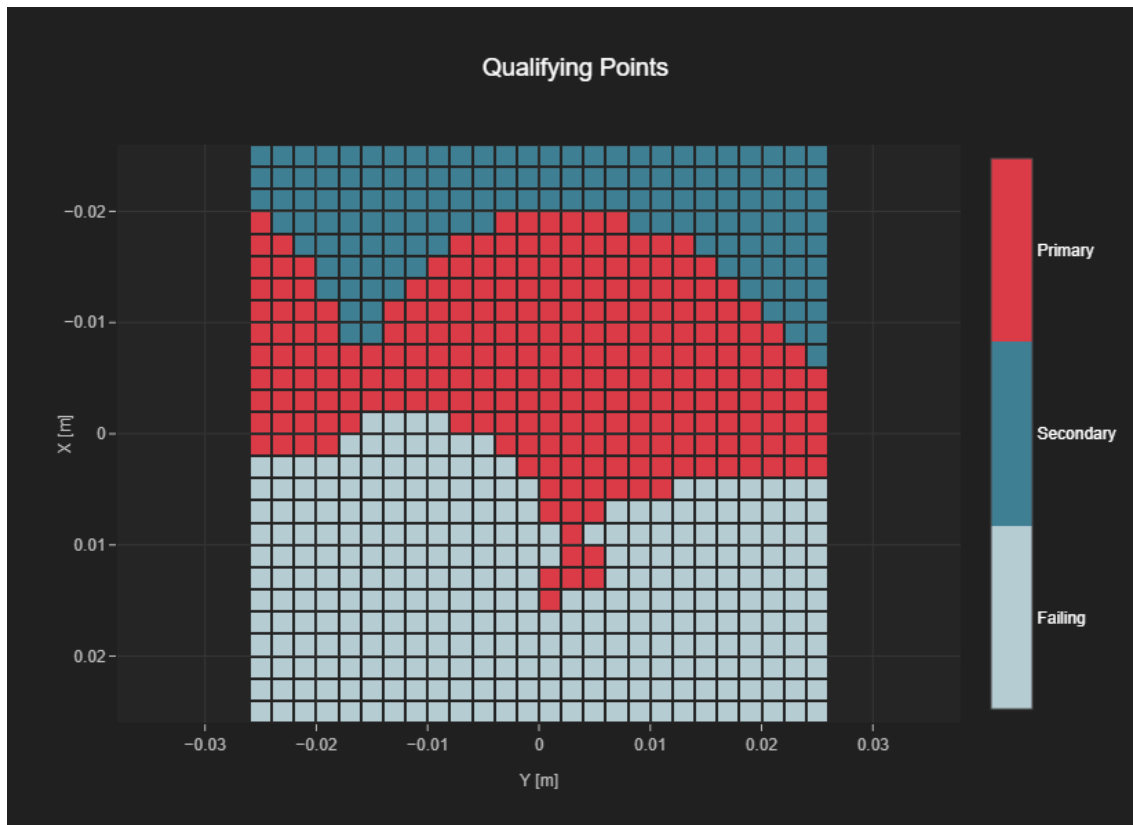
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	2.0



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
245	383	20	26



Plot 19 802.11g CH.11 6Mbps Voice EVS-NB Codec: 24.4 kbit/s

EVS-WB Codec: 5.9kbit/s

T-Coil Signal Test Report

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

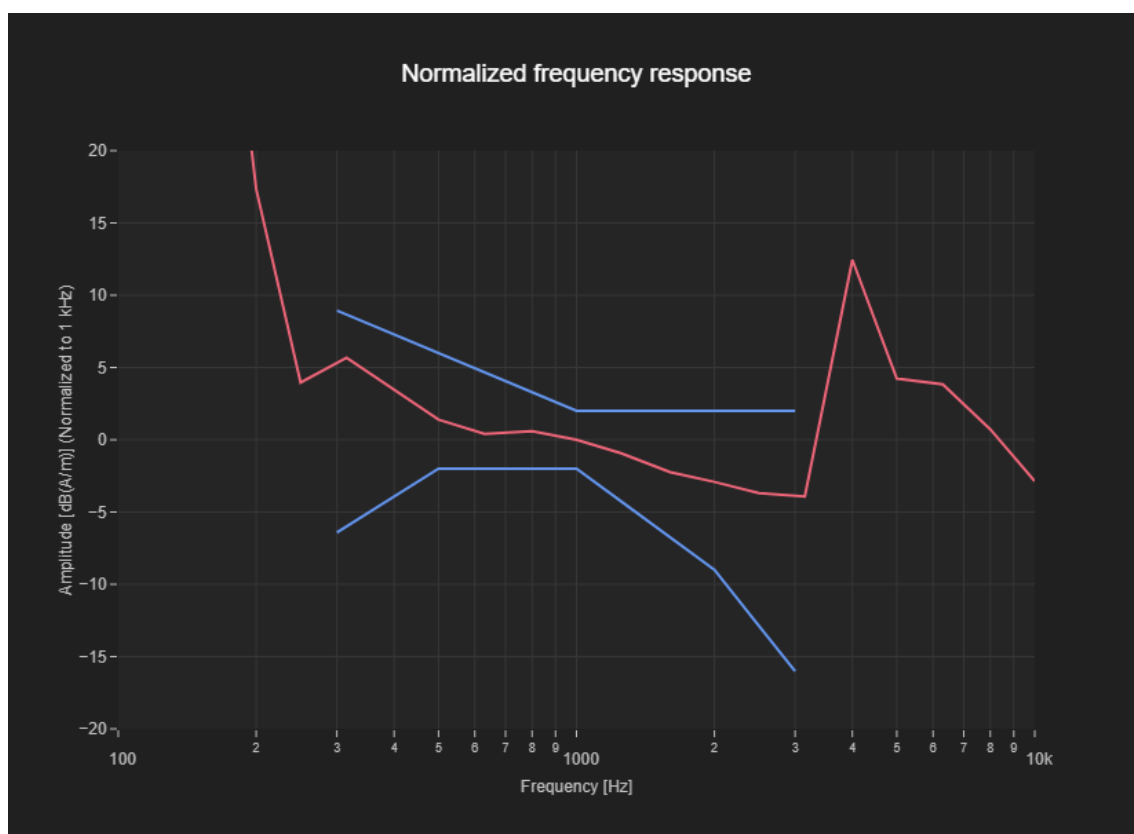
Band Name	Communication Systems Name	Channel	Frequency [MHz]
WLAN 2.4GHz	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)	11	2462.0

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

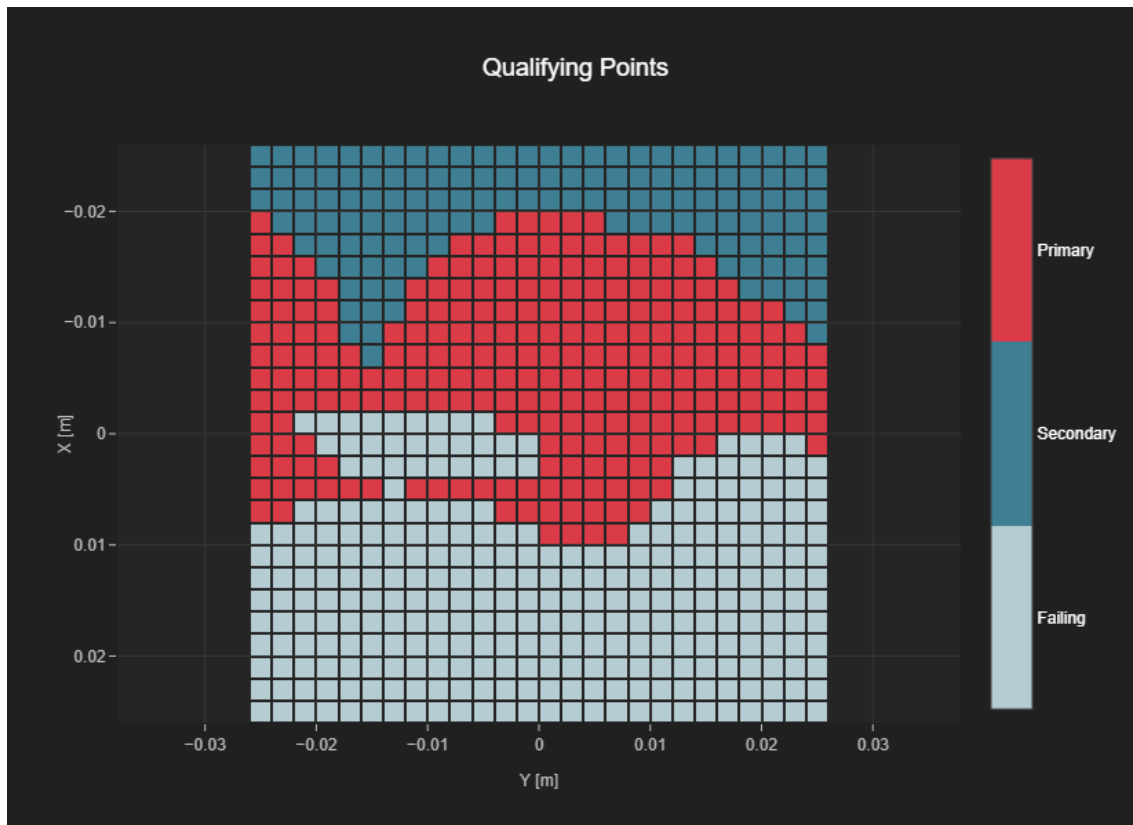
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	2.0



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
245	382	18	26



Plot 20 802.11a CH.56 6Mbps Voice EVS-NB Codec: 5.9 kbit/s

T-Coil Signal Test Report

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

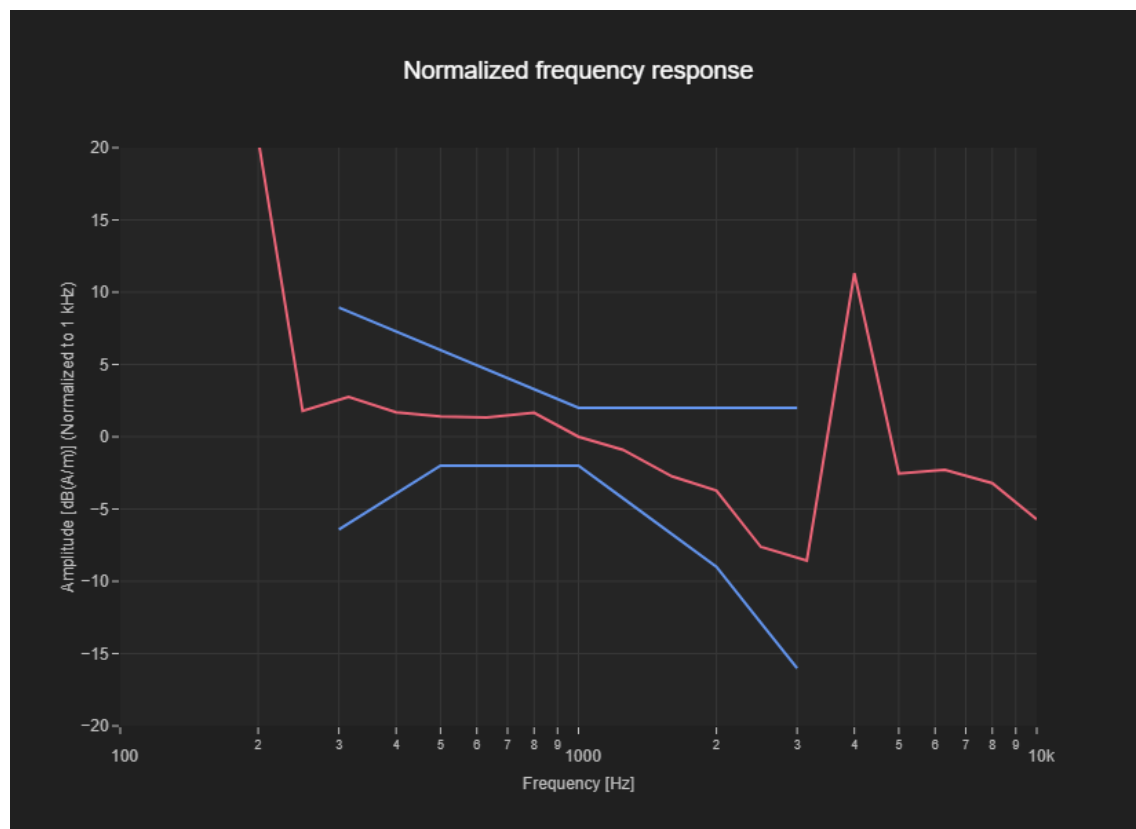
Band Name	Communication Systems Name	Channel	Frequency [MHz]
U-NII-1, U-NII-2A	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)	56	5280.0

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

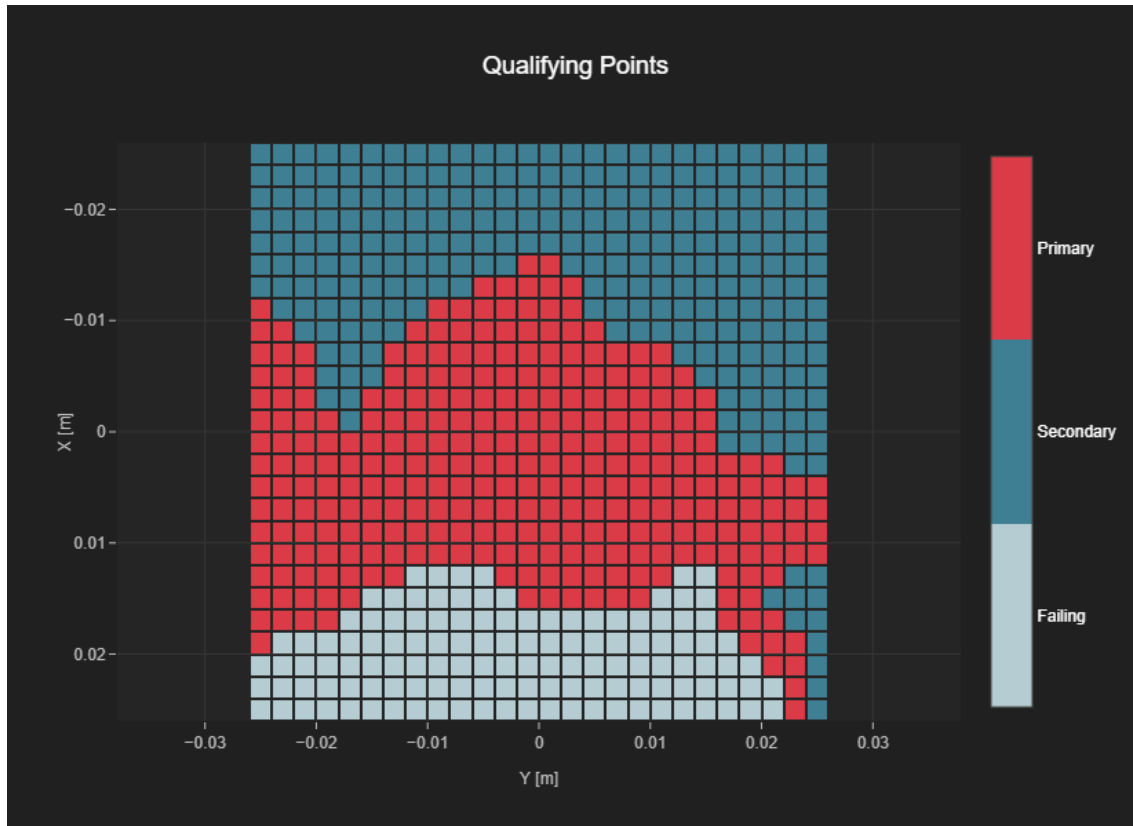
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	1.62	2.0



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
293	551	26	26



Plot 21 802.11a CH.52 6Mbps Voice EVS-NB Codec: 5.9 kbit/s

T-Coil Signal Test Report

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

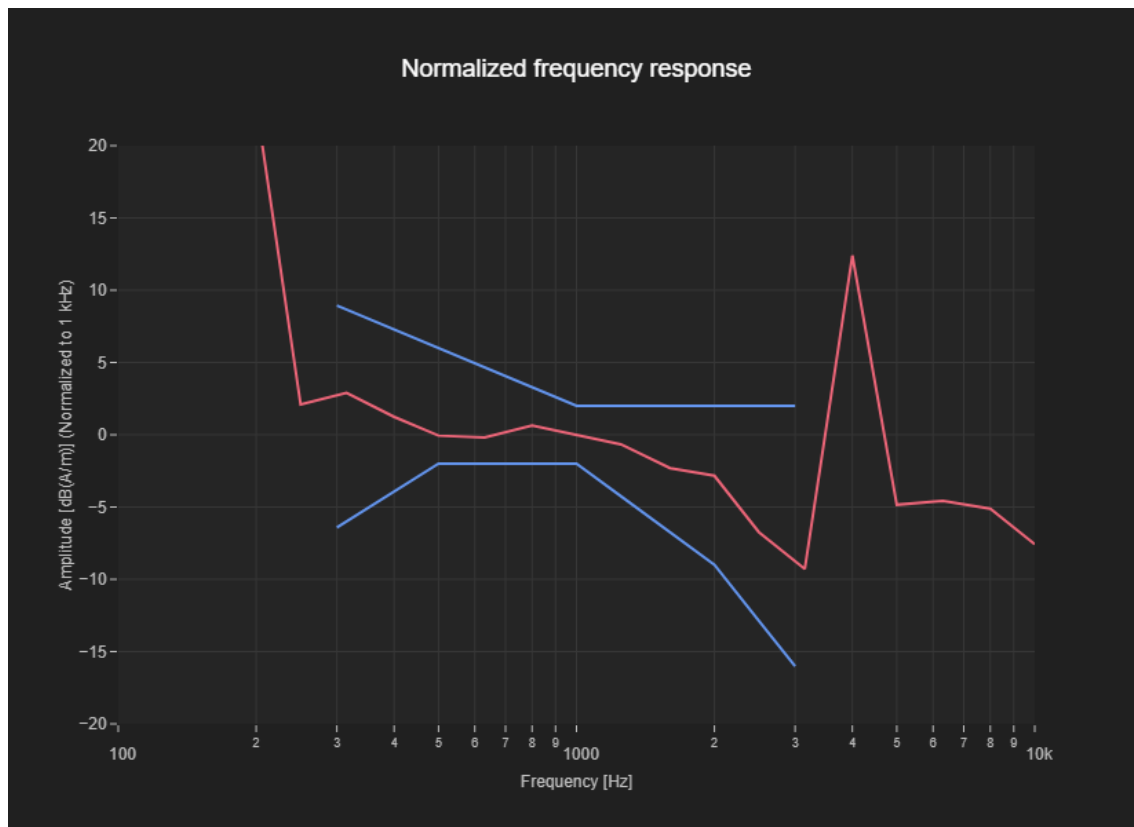
Band Name	Communication Systems Name	Channel	Frequency [MHz]
U-NII-1, U-NII-2A	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)	52	5260.0

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

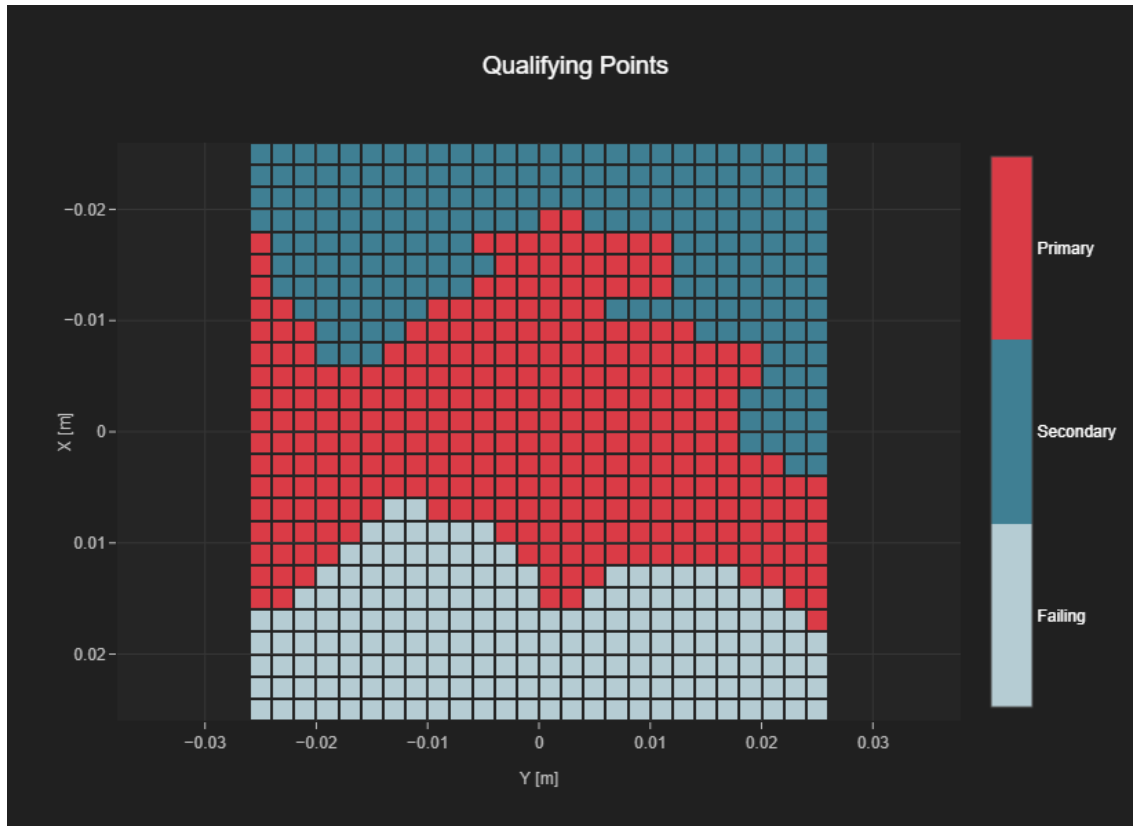
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	1.81



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
295	495	22	26



Plot 22 802.11a CH.64 6Mbps Voice EVS-NB Codec: 5.9 kbit/s

T-Coil Signal Test Report

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn1225	February 18, 2025

Communication Systems

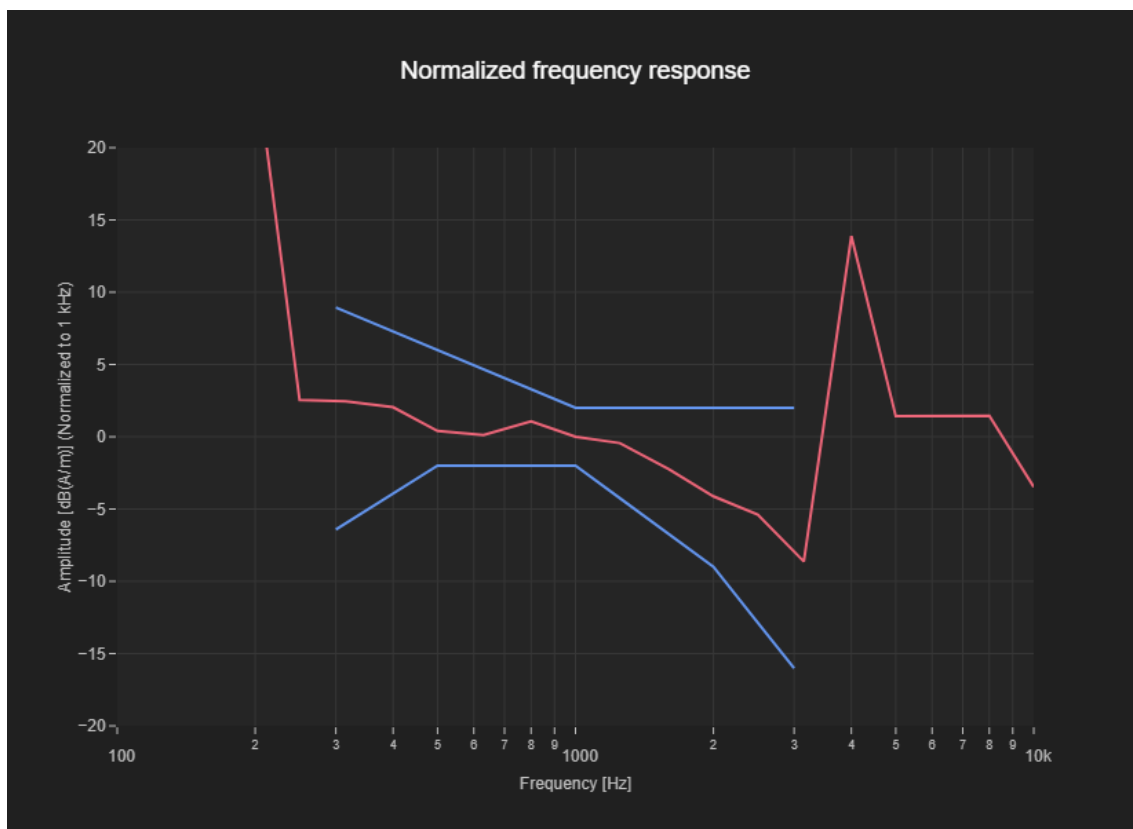
Band Name	Communication Systems Name	Channel	Frequency [MHz]
U-NII-1, U-NII-2A	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)	64	5320.0

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

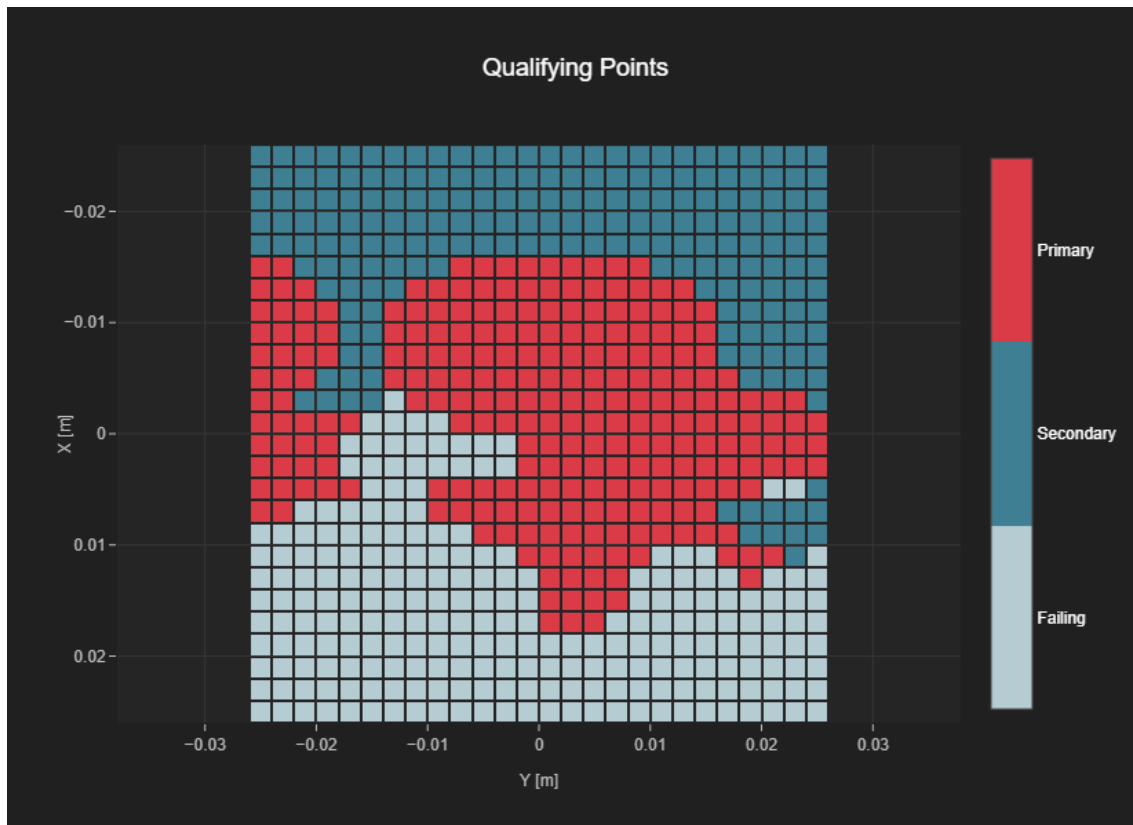
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	2.0



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
249	448	22	26



Plot 23 GSM850 CH.190 EDGE 2 slots Google Meet Codec: 40 kbit/s ANT E T-Coil Signal Test Report

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3050	January 20, 2025	DAE4 Sn652	January 16, 2025

Communication Systems

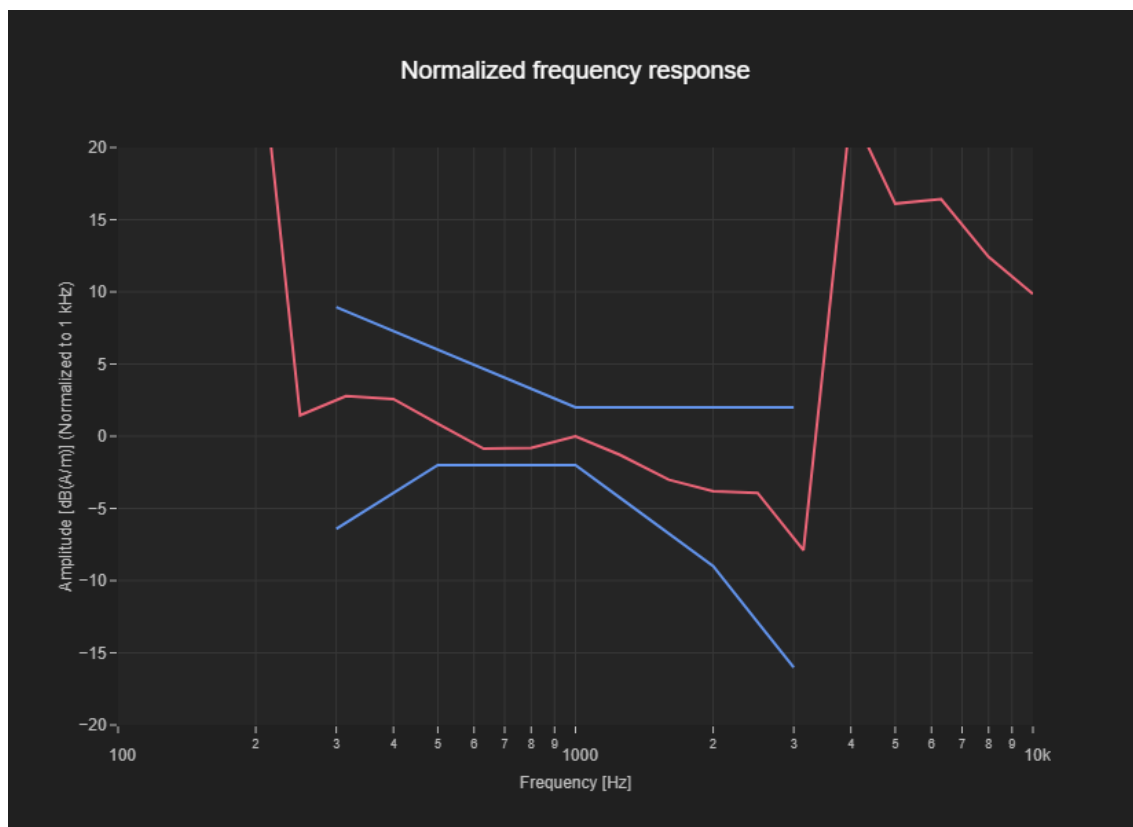
Band Name	Communication Systems Name	Channel	Frequency [MHz]
GSM 850	EDGE-FDD (TDMA, 8PSK, TN 0-1)	190	836.6

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

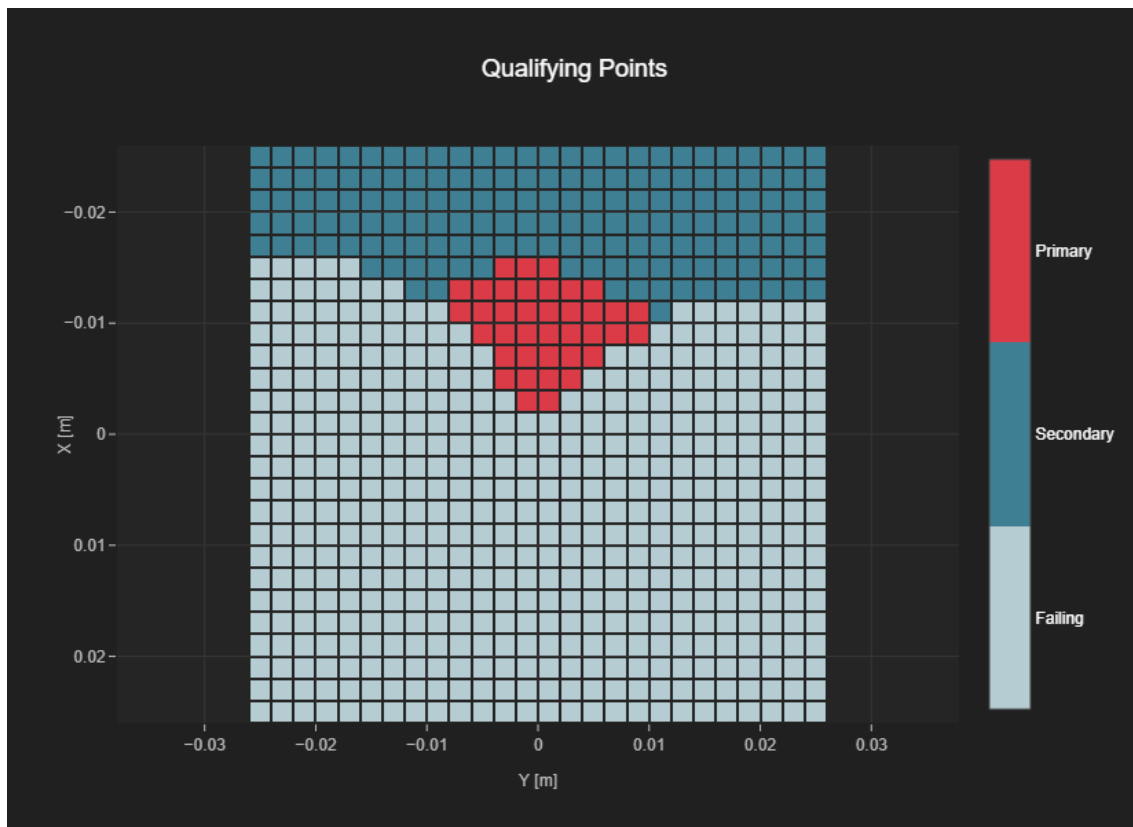
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	1.13



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
38	199	12	26



Plot 24 GSM850 CH.128 EDGE 2 slots Google Meet Codec: 40 kbit/s ANT E T-Coil Signal Test Report

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3050	January 20, 2025	DAE4 Sn652	January 16, 2025

Communication Systems

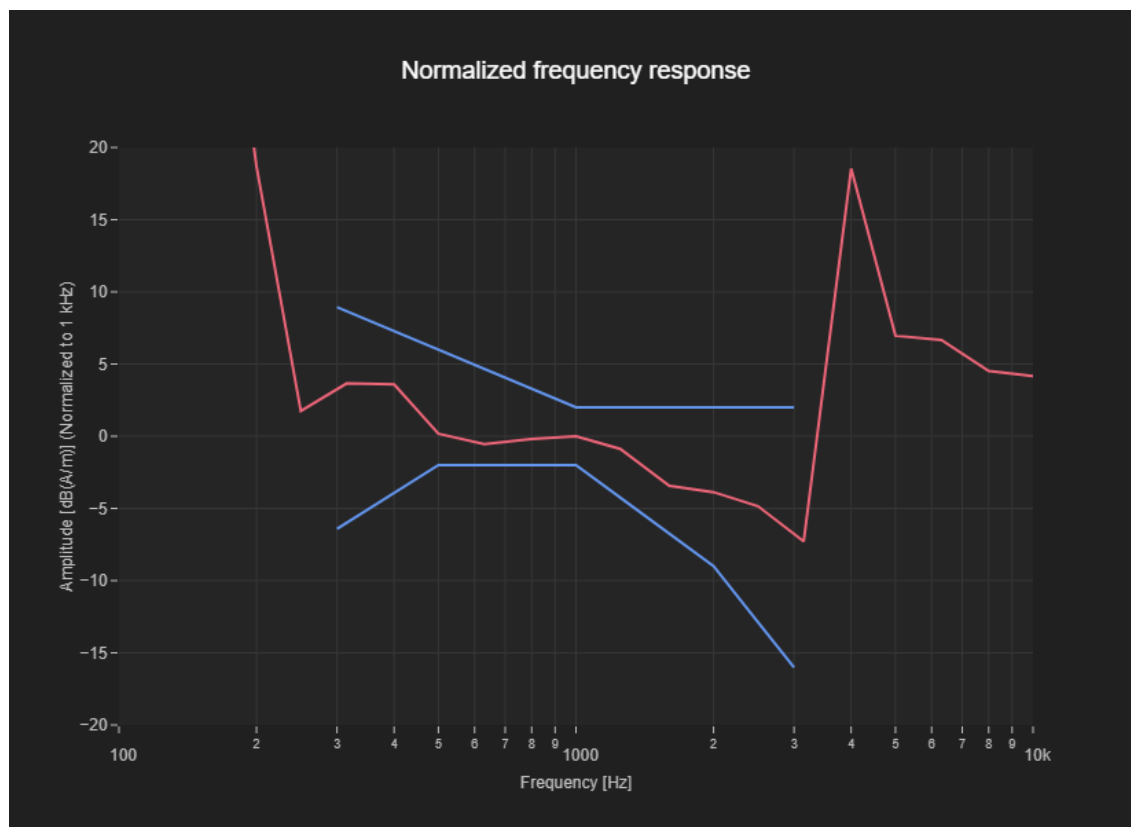
Band Name	Communication Systems Name	Channel	Frequency [MHz]
GSM 850	EDGE-FDD (TDMA, 8PSK, TN 0-1)	128	824.2

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

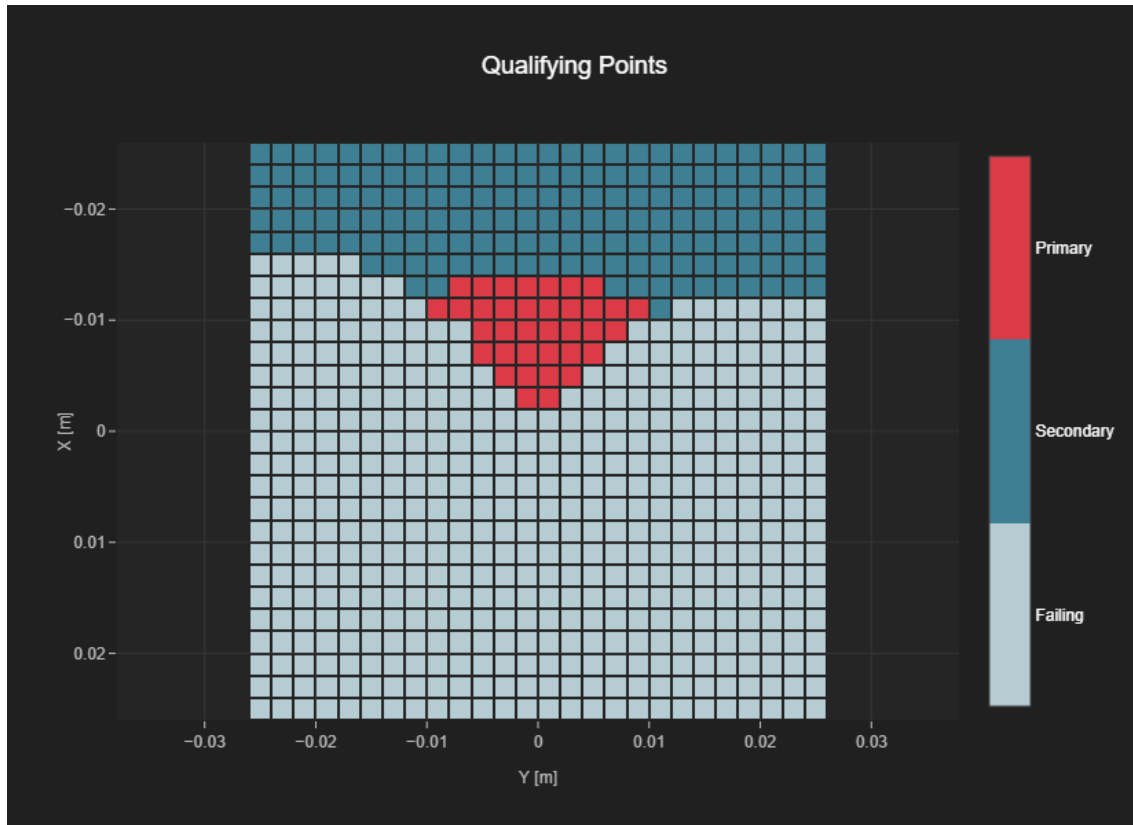
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	1.45



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
36	200	12	26



Plot 25 GSM850 CH.251 EDGE 2 slots Google Meet Codec: 40 kbit/s ANT E

T-Coil Signal Test Report

Hardware Setup

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3050	January 20, 2025	DAE4 Sn652	January 16, 2025

Communication Systems

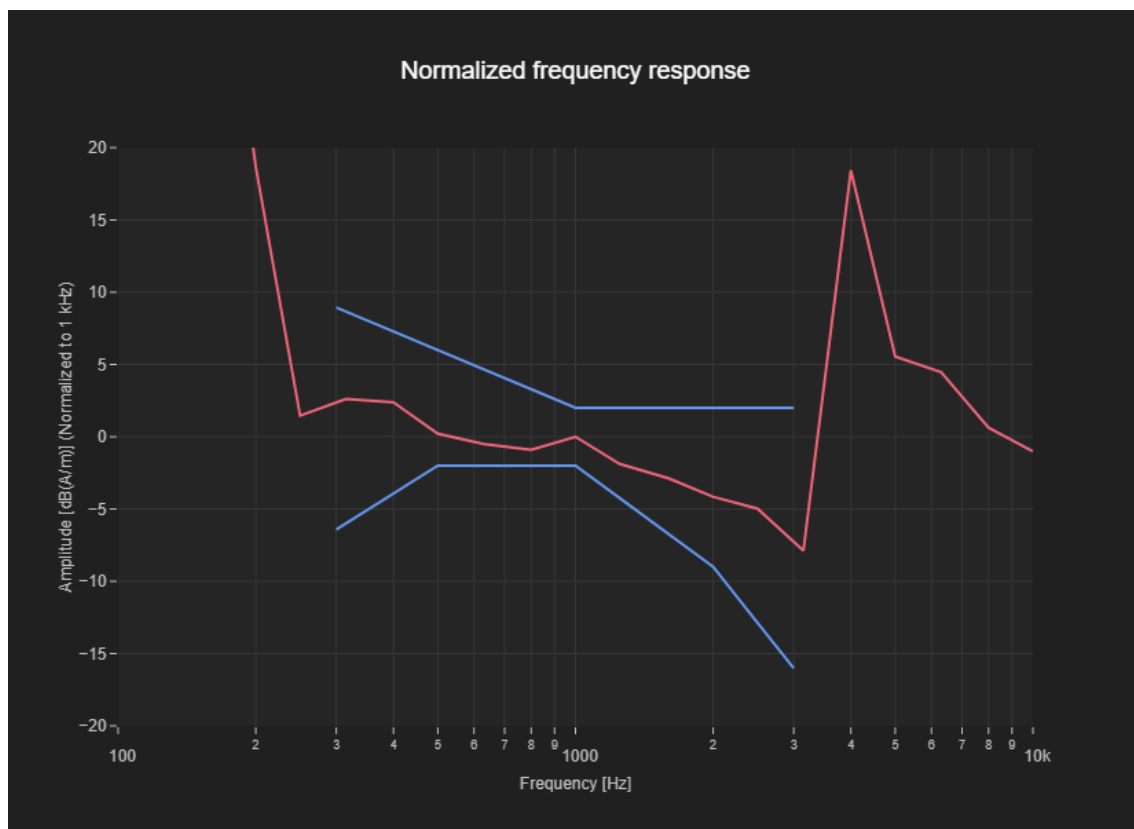
Band Name	Communication Systems Name	Channel	Frequency [MHz]
GSM 850	EDGE-FDD (TDMA, 8PSK, TN 0-1)	251	848.8

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

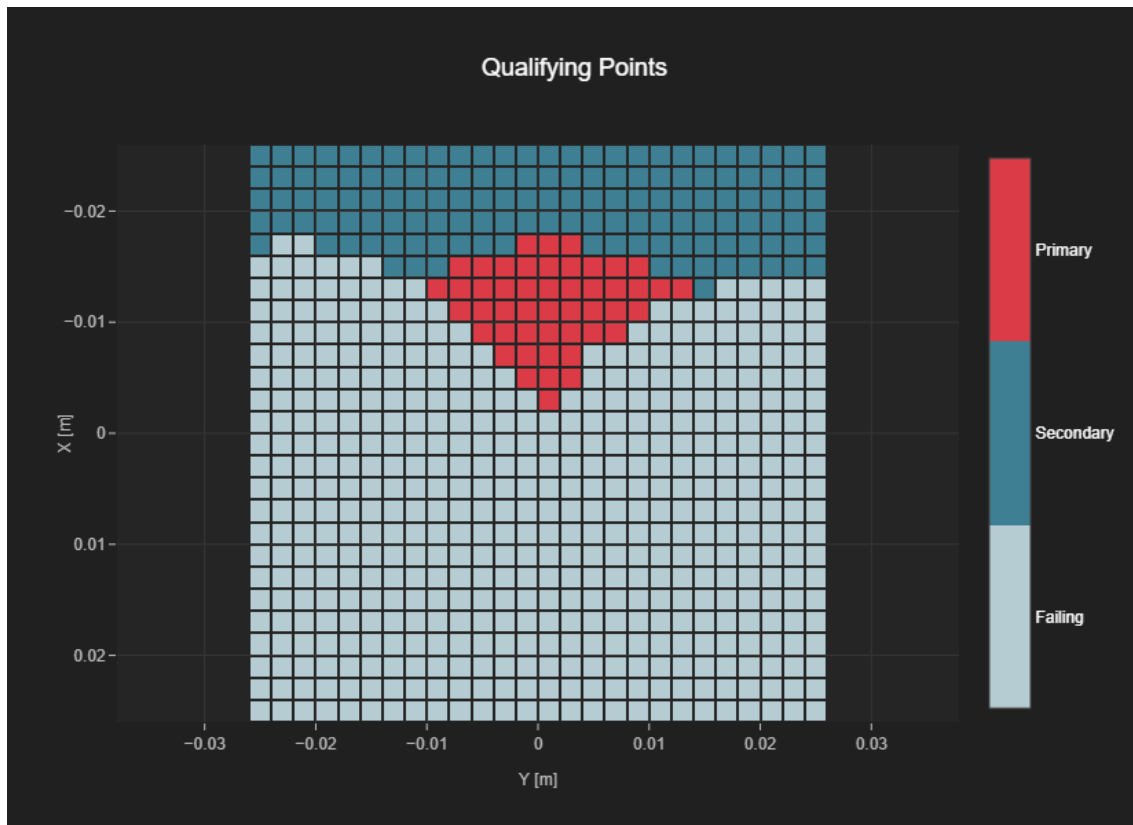
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	4.0	2.0	1.1



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
48	185	12	26



Plot 26 UMTS Band 5 CH.4183 Google Meet Codec: 6 kbit/s ANT A

T-Coil Signal Test Report

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3050	January 20, 2025	DAE4 Sn652	January 16, 2025

Communication Systems

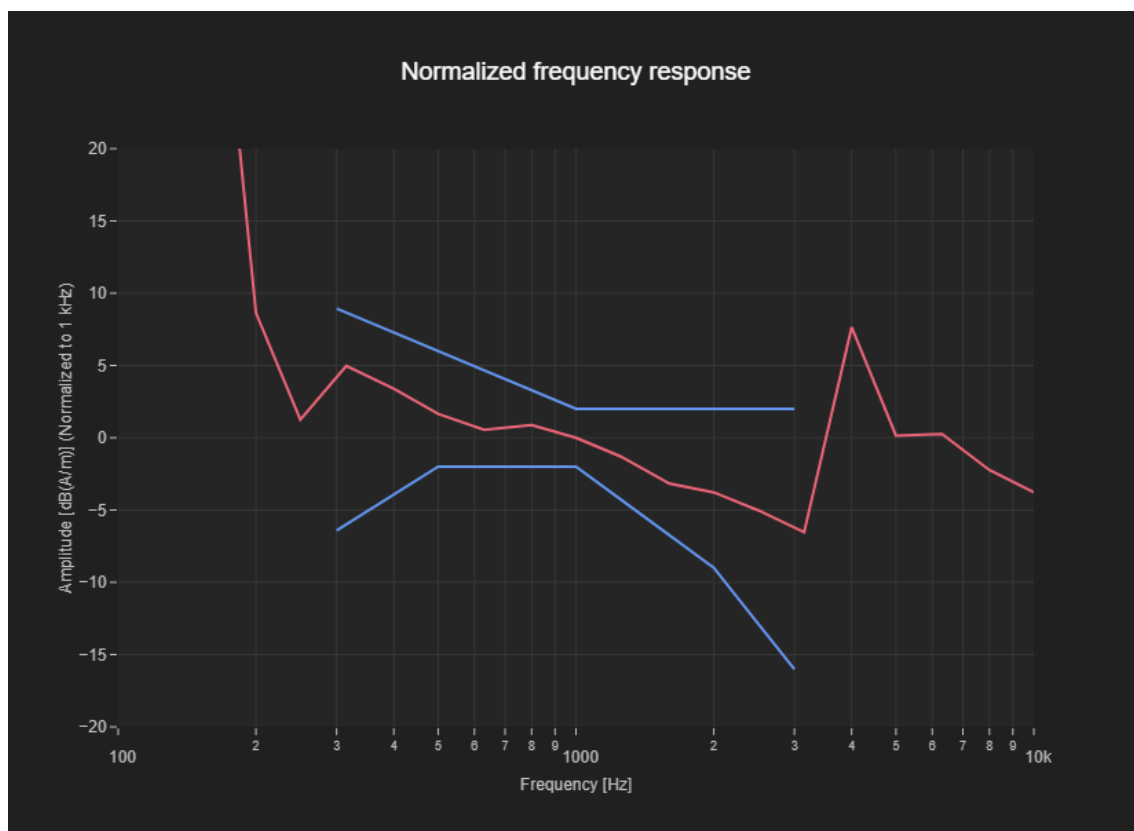
Band Name	Communication Systems Name	Channel	Frequency [MHz]
Band 5	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	4183	836.6

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

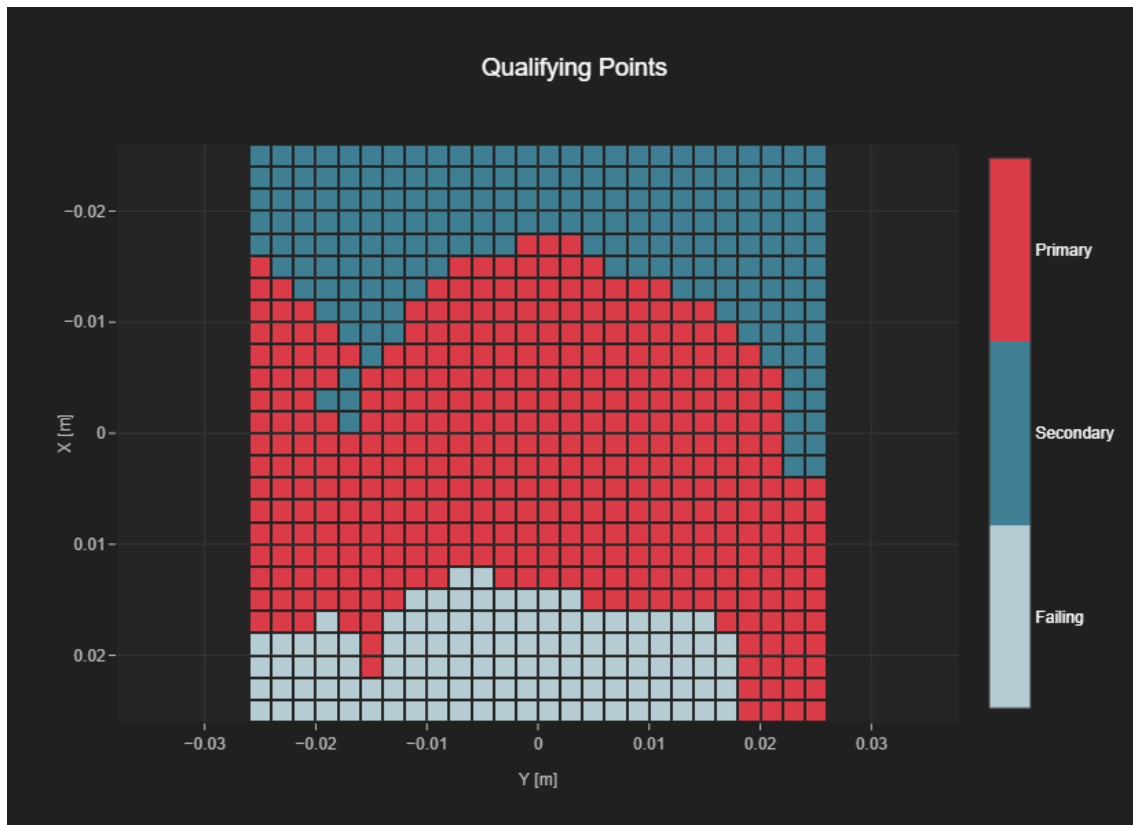
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	2.0



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
372	564	26	26



Plot 27 LTE Band 13 10MHz QPSK 1RB 0offset CH.23230
Google Meet Codec: 75 kbit/s ANT E
T-Coil Signal Test Report

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3050	January 20, 2025	DAE4 Sn652	January 16, 2025

Communication Systems

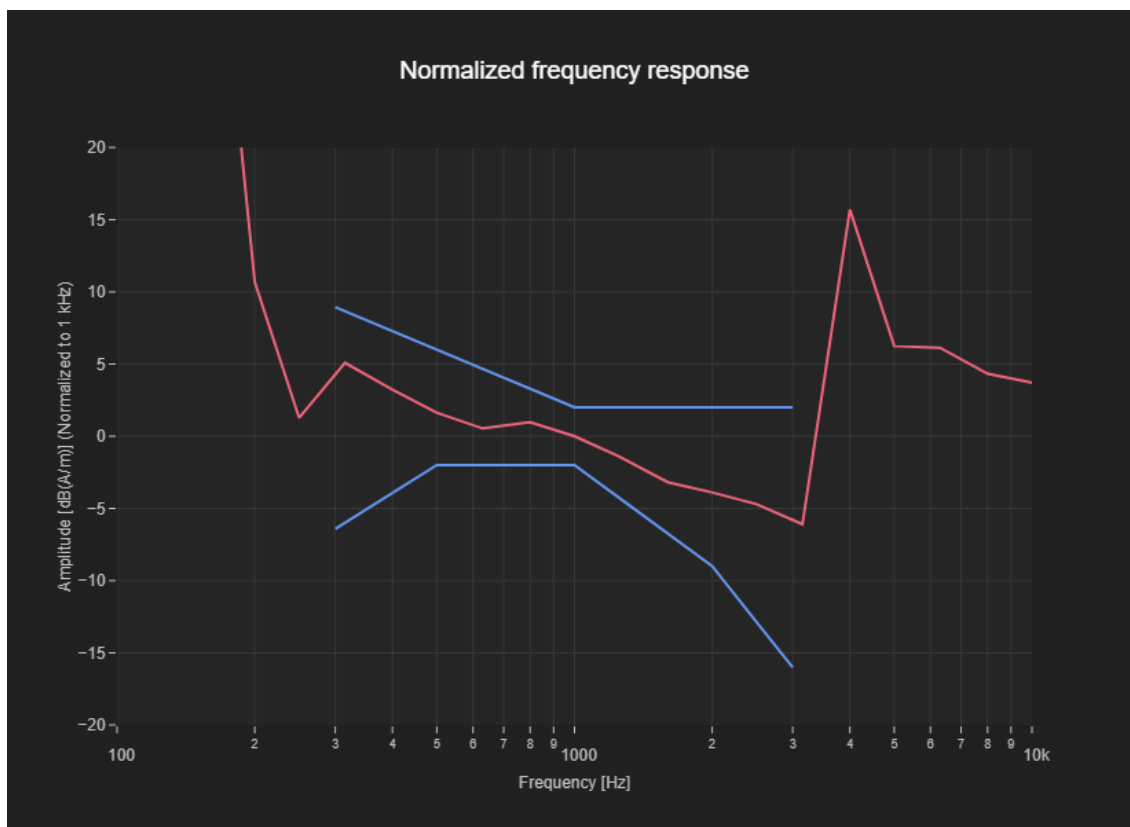
Band Name	Communication Systems Name	Channel	Frequency [MHz]
Band 13	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	23230	782.0

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

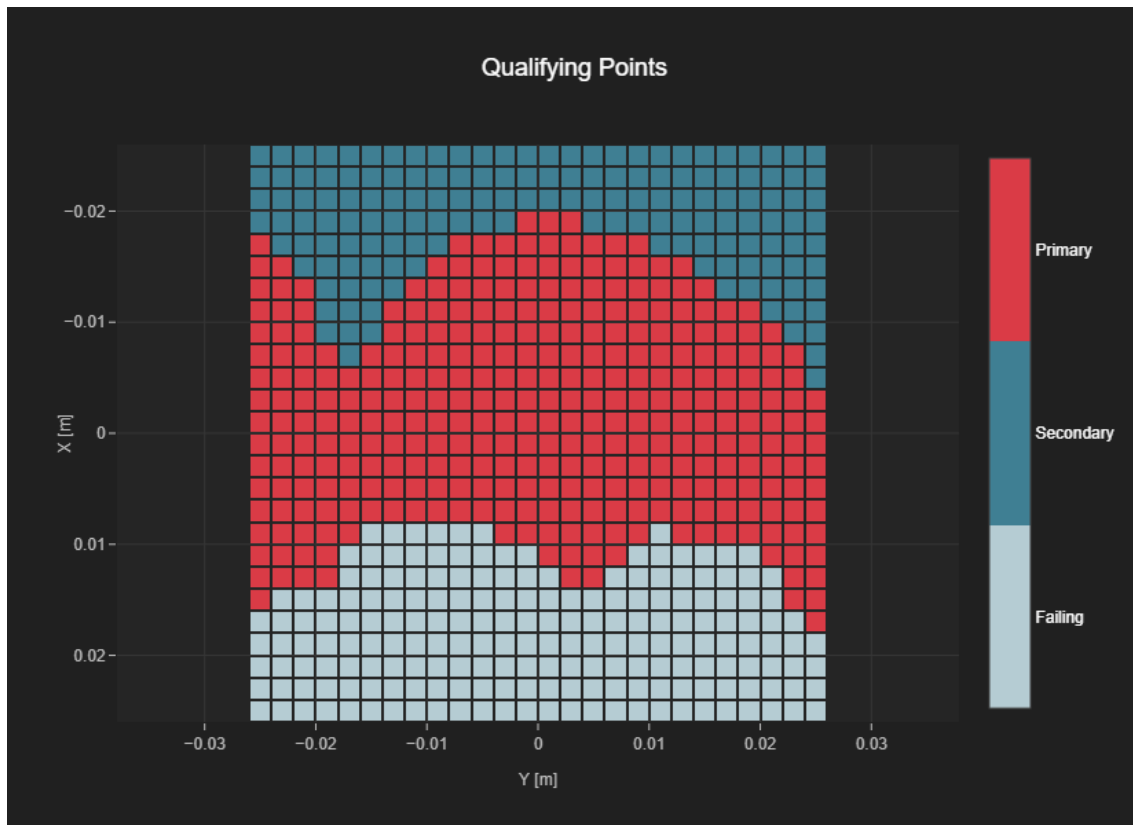
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	2.0



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
332	484	22	26



Plot 28 LTE Band 41 20MHz QPSK 100RB 0offset CH.40620
Google Meet Codec: 6 kbit/s ANT F
T-Coil Signal Test Report

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3050	January 20, 2025	DAE4 Sn652	January 16, 2025

Communication Systems

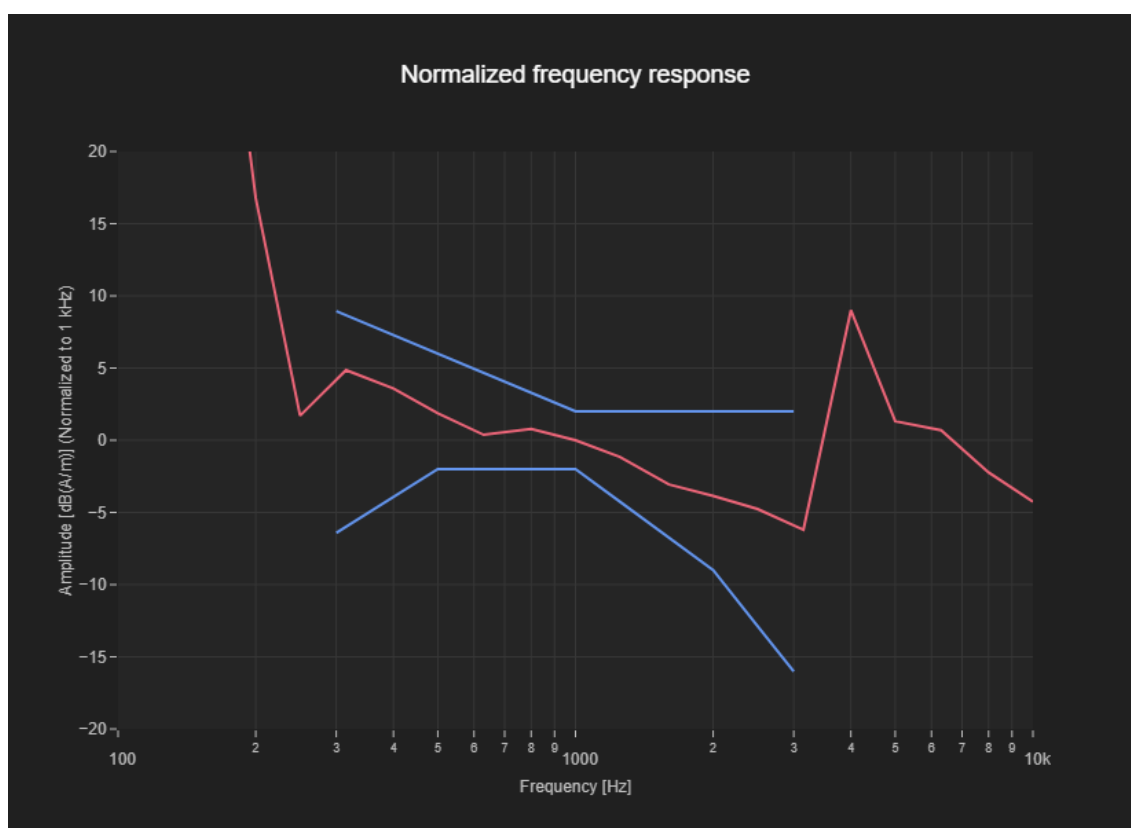
Band Name	Communication Systems Name	Channel	Frequency [MHz]
Band 41	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	40620	2593.0

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

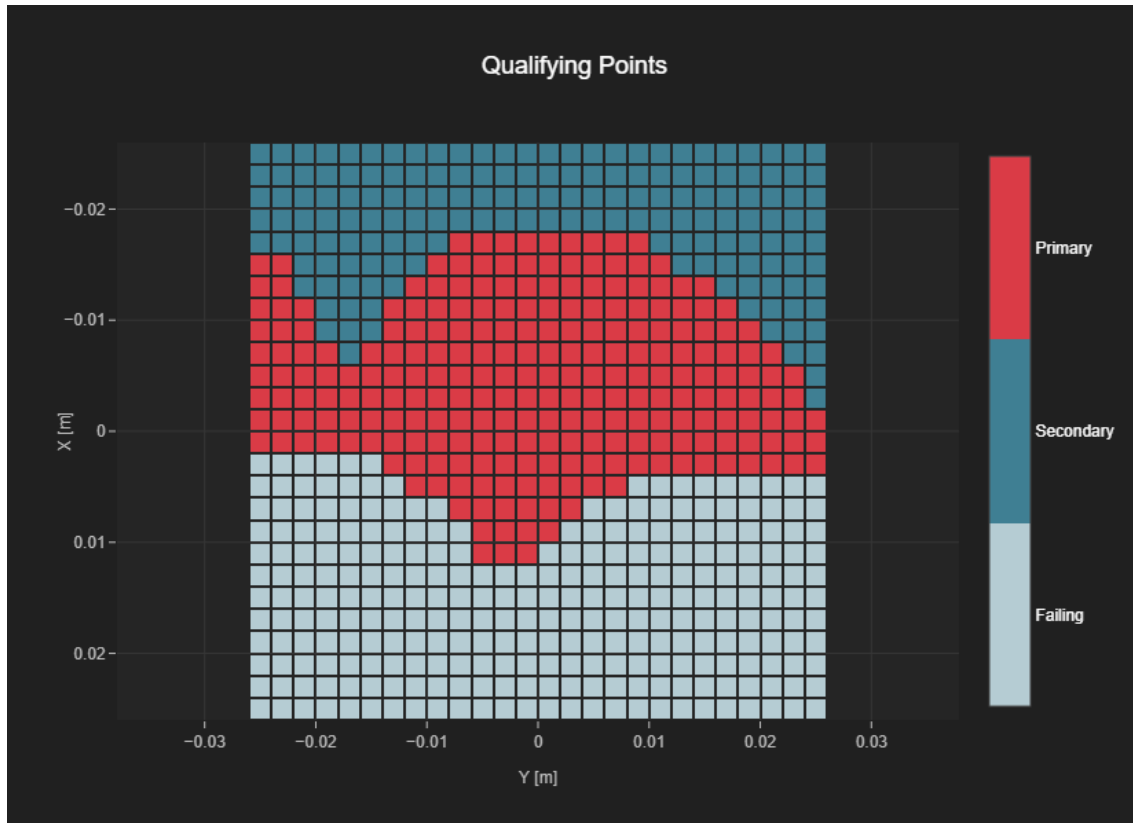
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	2.0



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
237	383	19	26



Plot 29 Wi-Fi 2.4 GHz 802.11g 6Mbps CH.11 Google Meet Codec: 6 kbit/s

T-Coil Signal Test Report

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3050	January 20, 2025	DAE4 Sn652	January 16, 2025

Communication Systems

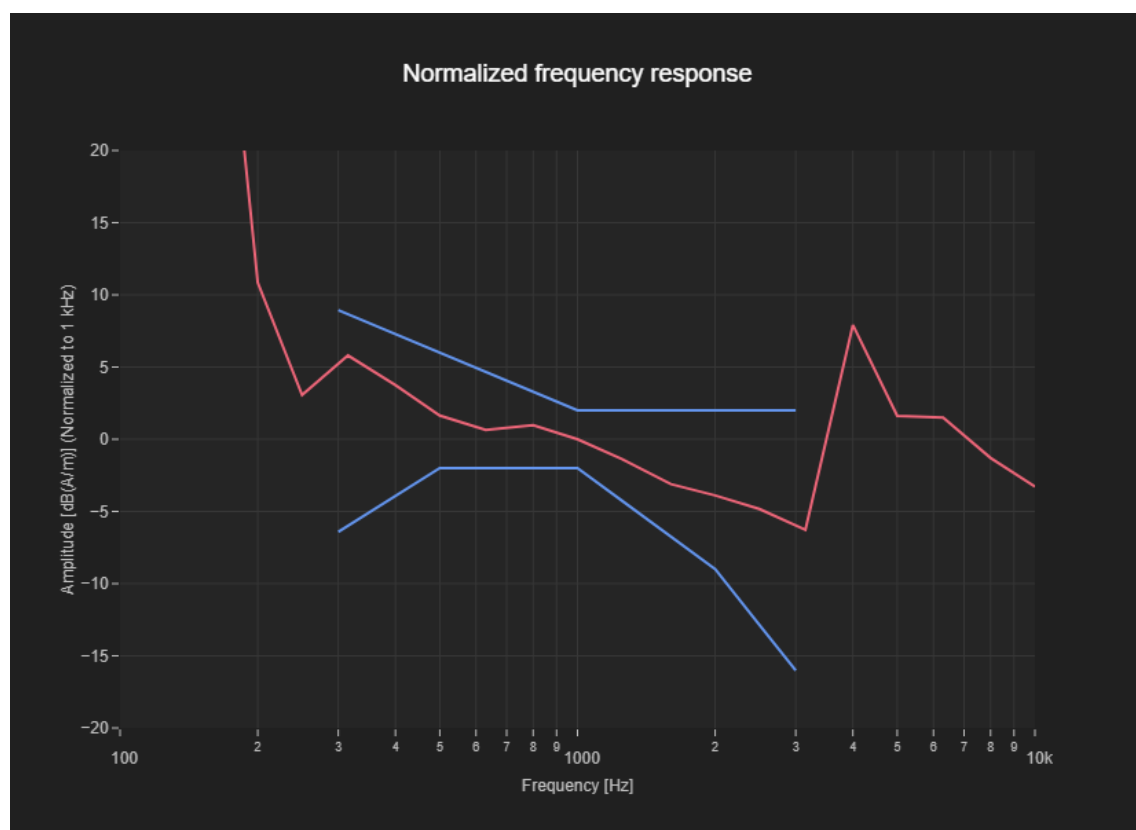
Band Name	Communication Systems Name	Channel	Frequency [MHz]
WLAN 2.4GHz	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)	6	2437.0

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

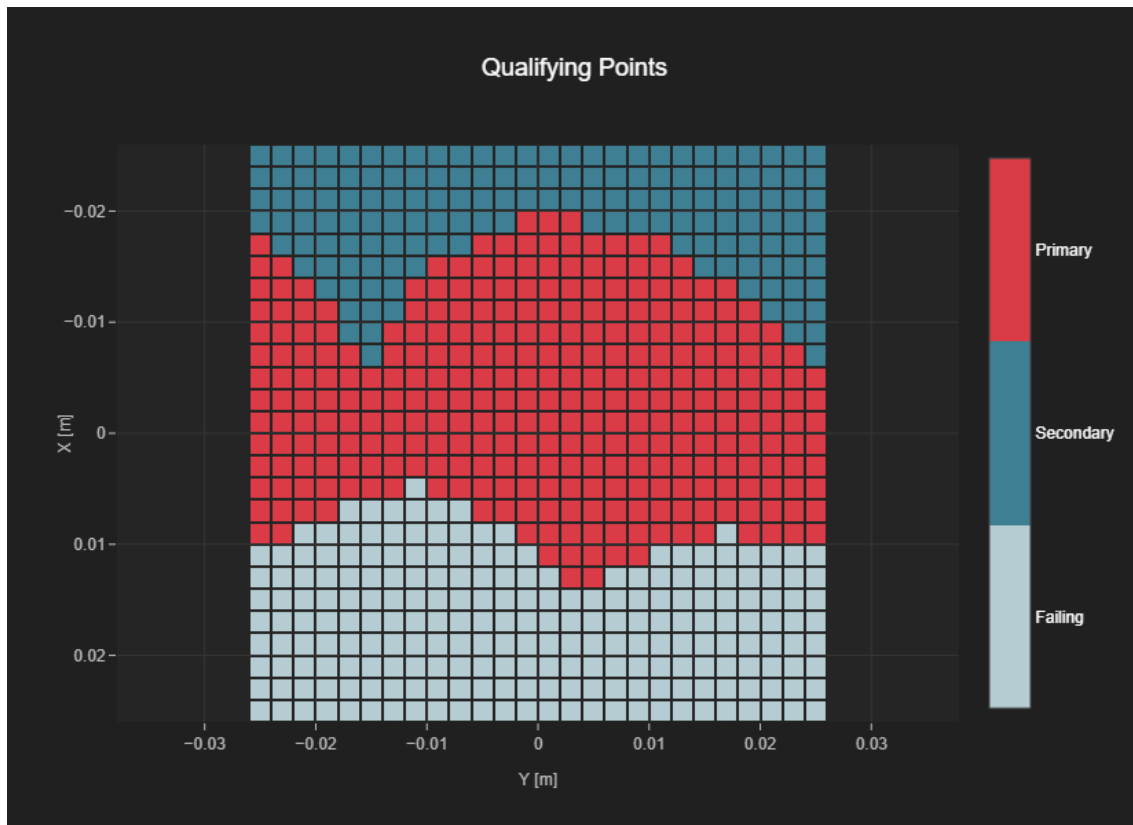
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	4.0	2.0	2.0



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
308	457	20	26



Plot 30 Wi-Fi 5.8 GHz 802.11a 6Mbps CH.40 Google Meet Codec: 6 kbit/s

T-Coil Signal Test Report

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3050	January 20, 2025	DAE4 Sn652	January 16, 2025

Communication Systems

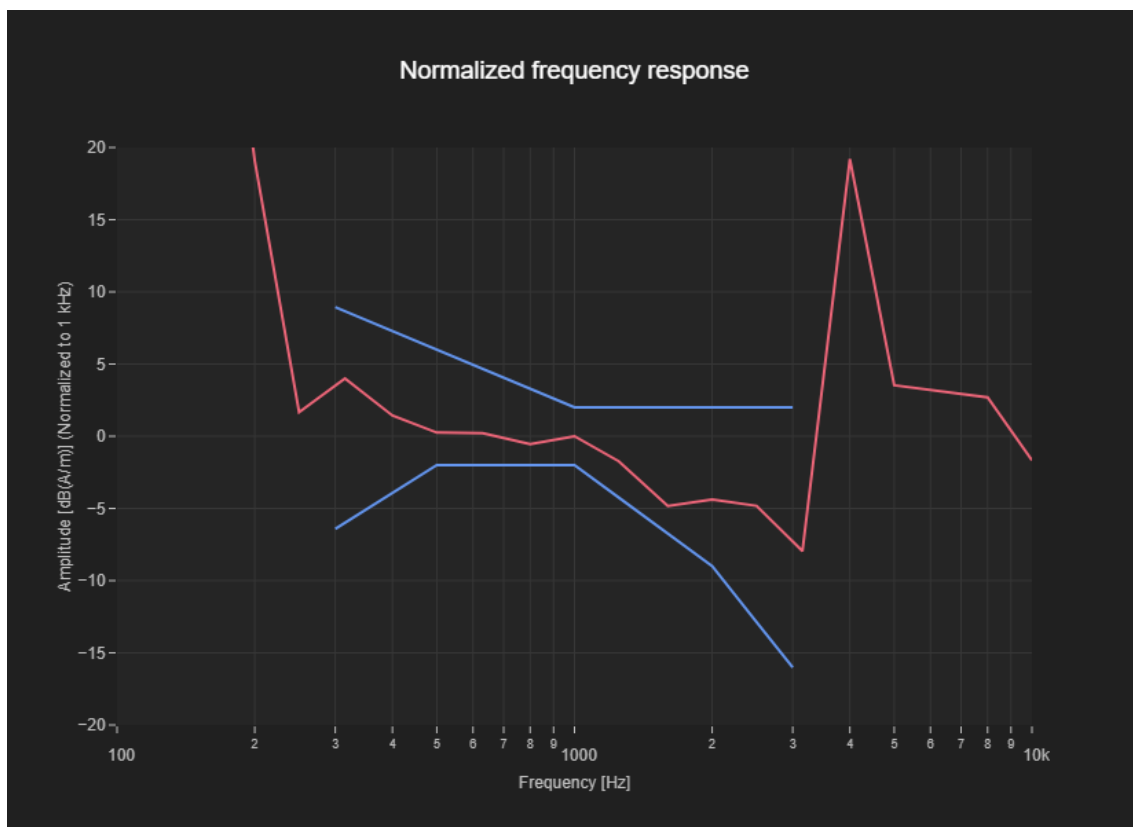
Band Name	Communication Systems Name	Channel	Frequency [MHz]
U-NII-1, U-NII-2A	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)	40	5200.0

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

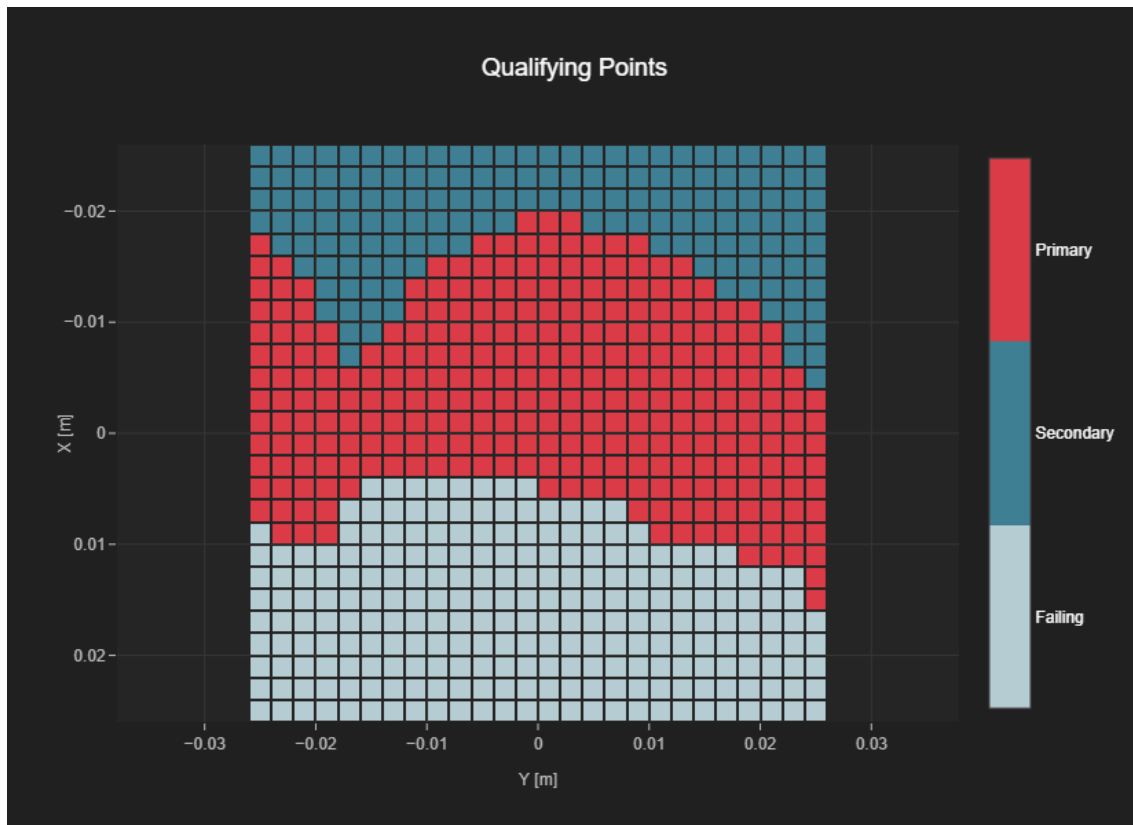
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	1.46



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
284	438	21	26



Plot 31 NR Band n66 DFT-s OFDM 15MHz QPSK 1RB 1offset CH.349000

Google Meet Codec: 40 kbit/s Ant.A

T-Coil Signal Test Report

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn446	November 19, 2024

Communication Systems

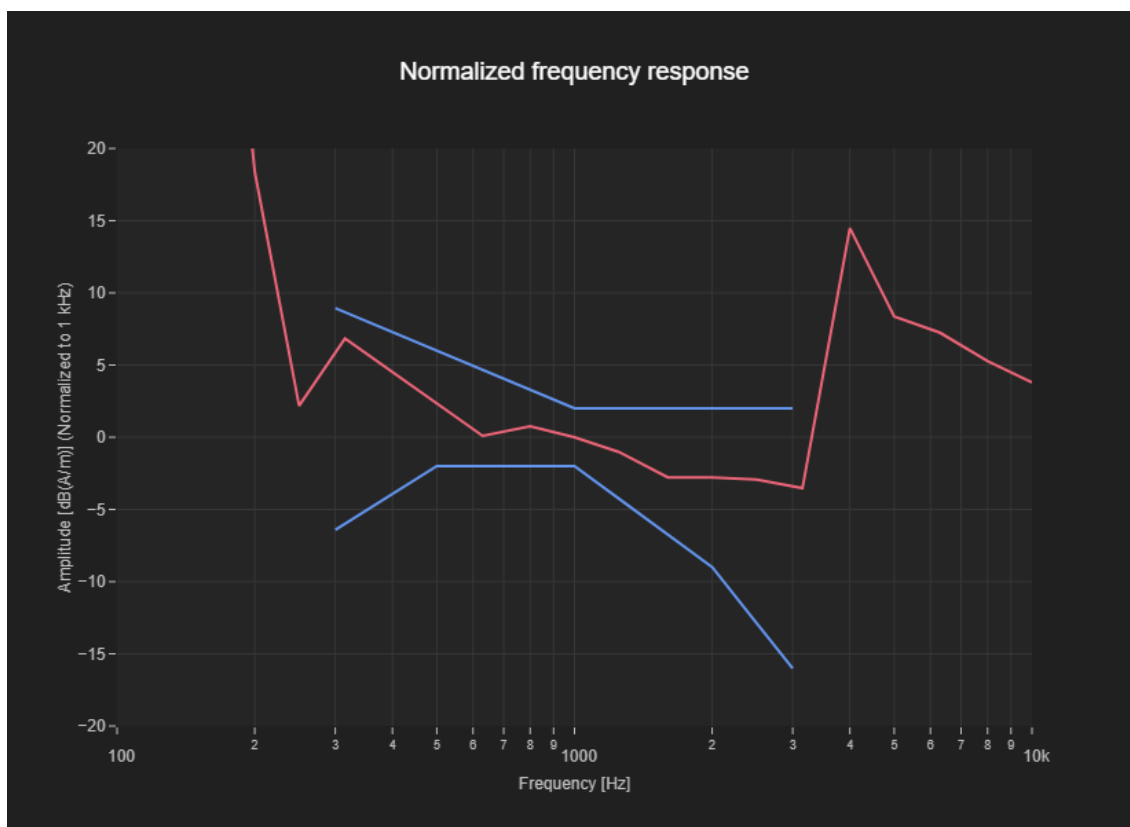
Band Name	Communication Systems Name	Channel	Frequency [MHz]
Band n66	5G NR (DFT-s-OFDM, 1 RB, 15 MHz, QPSK, 15 kHz)	349000	1745.0

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

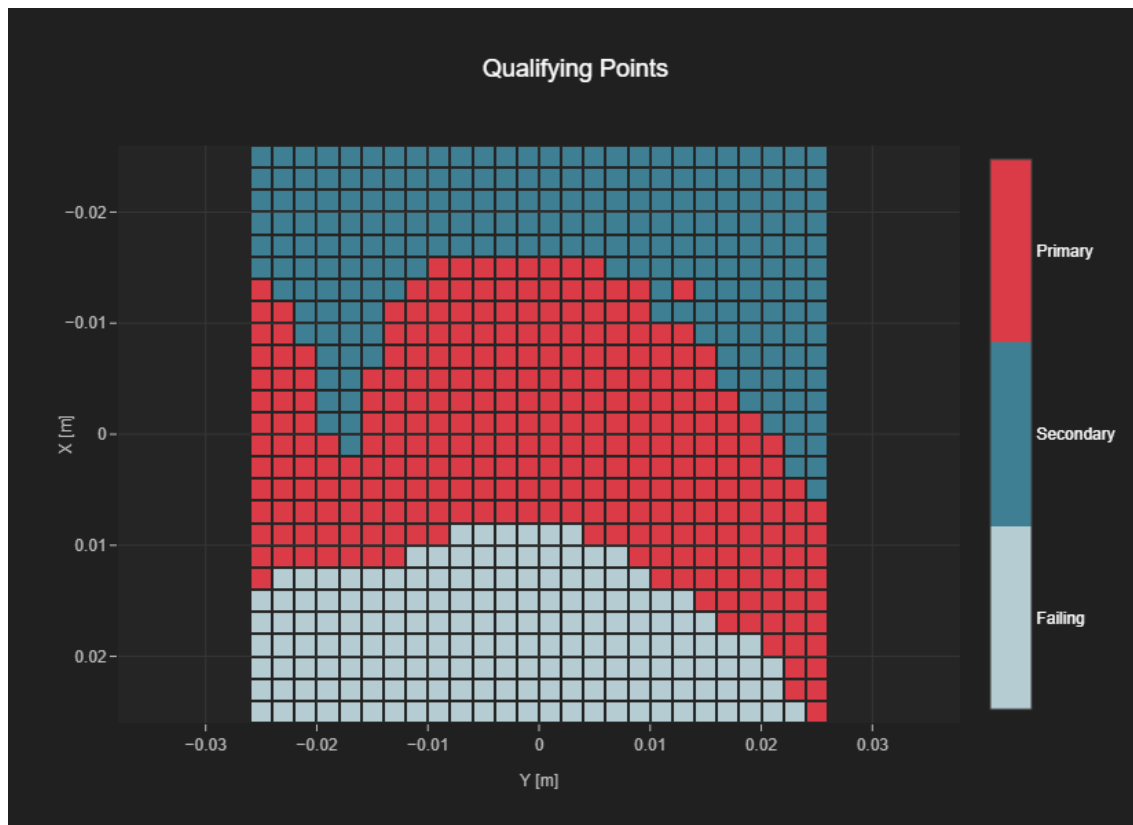
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	2.0



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
291	506	26	26



Plot 32 NR Band n41 PC3 DFT-s OFDM 100MHz QPSK 1RB 1offset CH.518598

Google Meet Codec: 6 kbit/s

T-Coil Signal Test Report

Hardware Setup

Probe Name	Probe Calibration Date	DAE Name	DAE Calibration Date
AM1DV3 - 3049	November 14, 2024	DAE4 Sn446	November 19, 2024

Communication Systems

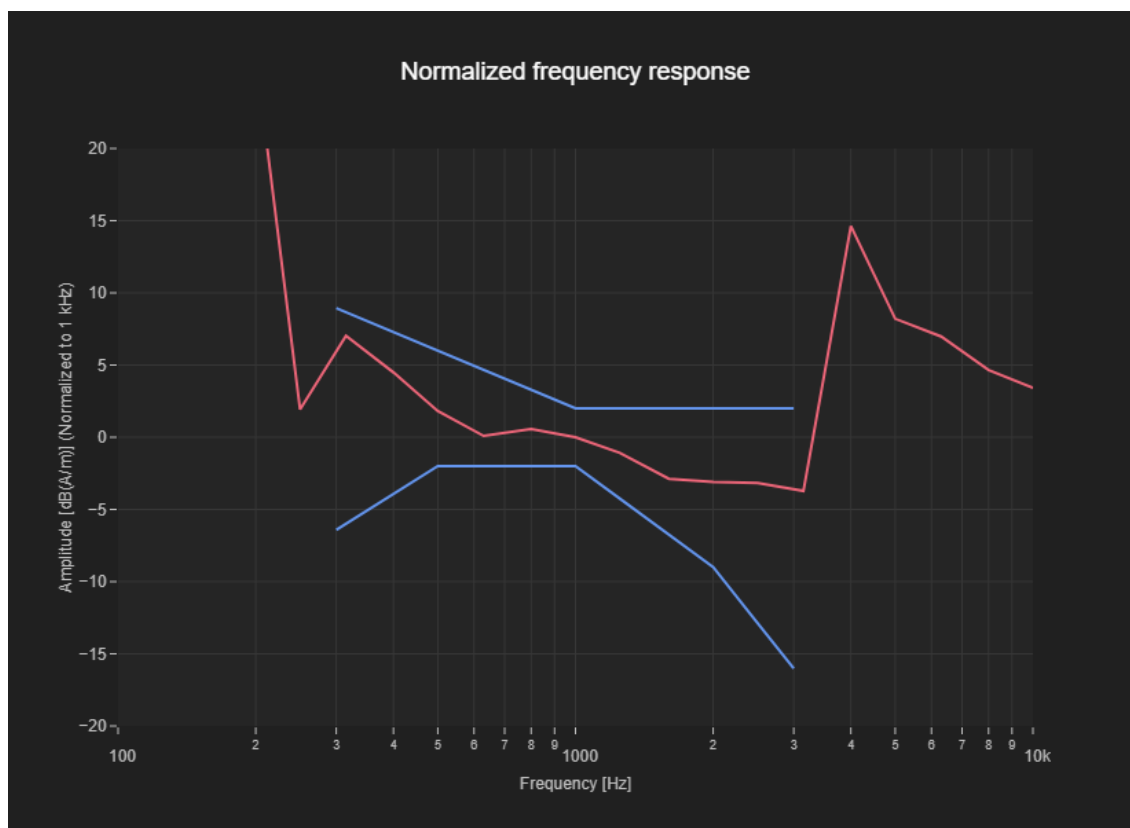
Band Name	Communication Systems Name	Channel	Frequency [MHz]
Band n41	5G NR (DFT-s-OFDM, 1 RB, 100 MHz, QPSK, 30 kHz)	518598	2592.99

Grid Settings

Extent X [mm]	Extent Y [mm]	Step X [mm]	Step Y [mm]	Distance [mm]
52.0	52.0	4.0	4.0	10.0

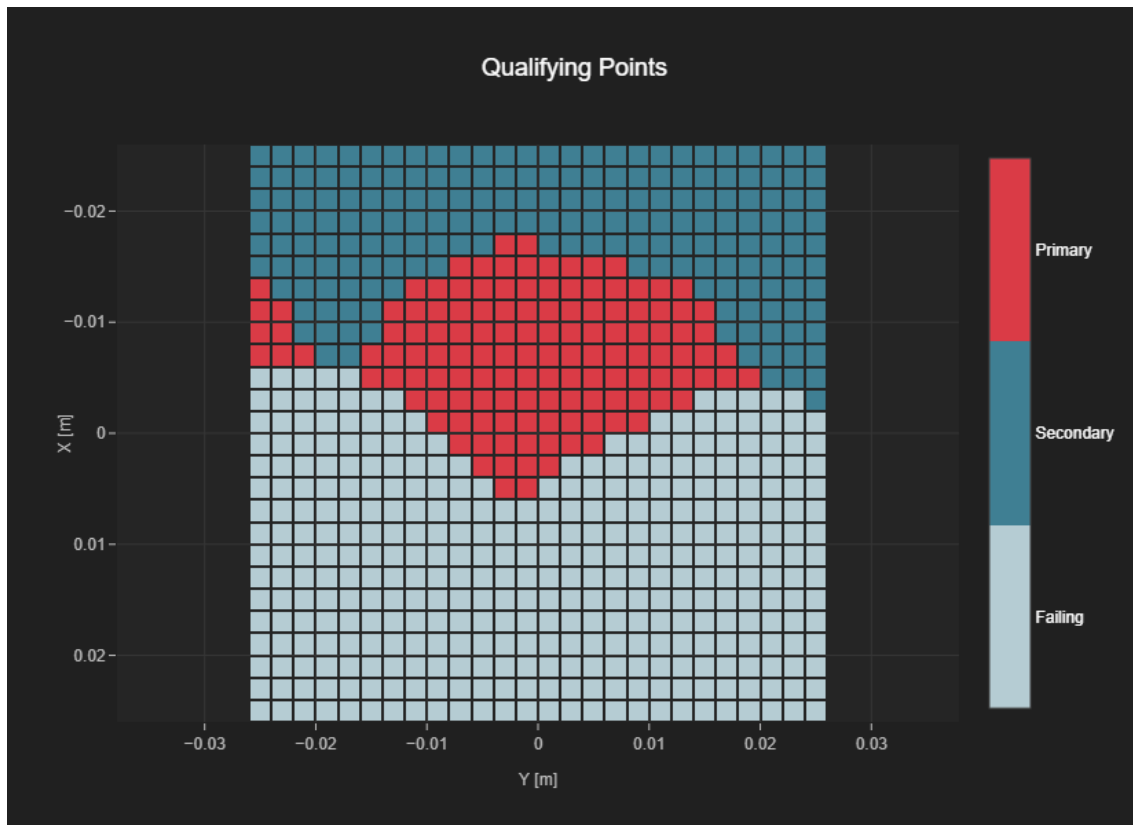
Results

Audio File	Measurement Duration [s]	Margin Upper Bound [dB]	Margin Lower Bound [dB]
48k_voice_300-3000_2s.wav	2.0	2.0	2.0



T-Coil Coupling Mode Test Report Results

Primary Group Contiguous Point Count	Secondary Group Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse
132	318	16	26



Appendix 3. HAC T-Coil Probe Certificates

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland



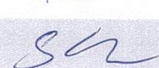
S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **HCT**
Gyeonggi-do, Republic of Korea

Certificate No. **AM1DV3-3049_Nov24**

CALIBRATION CERTIFICATE		검	담당자	화인자																												
Object	AM1DV3 - SN: 3049	제	7/21																													
Calibration procedure(s)	QA CAL-24.v4 Calibration procedure for AM1D magnetic field probes and TMFS in the audio range	작위/인명	50/12.03	1493																												
Calibration date:	November 14, 2024	일자	2024.12.03	2024.12.03																												
This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate. All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%. Calibration Equipment used (M&TE critical for calibration) <table border="1"> <thead> <tr> <th>Primary Standards</th> <th>ID #</th> <th>Cal Date (Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Keithley Multimeter Type 2001</td> <td>SN: 0810278</td> <td>27-Aug-24 (No. 40547)</td> <td>Aug-25</td> </tr> <tr> <td>Reference Probe AM1DV3</td> <td>SN: 3000</td> <td>25-Sep-24 (No. AM1DV3-3000_Sep24)</td> <td>Sep-25</td> </tr> <tr> <td>DAE4</td> <td>SN: 781</td> <td>16-Feb-24 (No. DAE4-781_Feb24)</td> <td>Feb-25</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Secondary Standards</th> <th>ID #</th> <th>Check Date (in house)</th> <th>Scheduled Check</th> </tr> </thead> <tbody> <tr> <td>AMCC</td> <td>SN: 1050</td> <td>01-Oct-13 (in house check Sep-24)</td> <td>Sep-25</td> </tr> <tr> <td>AMMI Audio Measuring Instrument</td> <td>SN: 1062</td> <td>26-Sep-12 (in house check Sep-24)</td> <td>Sep-25</td> </tr> </tbody> </table>					Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration	Keithley Multimeter Type 2001	SN: 0810278	27-Aug-24 (No. 40547)	Aug-25	Reference Probe AM1DV3	SN: 3000	25-Sep-24 (No. AM1DV3-3000_Sep24)	Sep-25	DAE4	SN: 781	16-Feb-24 (No. DAE4-781_Feb24)	Feb-25	Secondary Standards	ID #	Check Date (in house)	Scheduled Check	AMCC	SN: 1050	01-Oct-13 (in house check Sep-24)	Sep-25	AMMI Audio Measuring Instrument	SN: 1062	26-Sep-12 (in house check Sep-24)	Sep-25
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration																													
Keithley Multimeter Type 2001	SN: 0810278	27-Aug-24 (No. 40547)	Aug-25																													
Reference Probe AM1DV3	SN: 3000	25-Sep-24 (No. AM1DV3-3000_Sep24)	Sep-25																													
DAE4	SN: 781	16-Feb-24 (No. DAE4-781_Feb24)	Feb-25																													
Secondary Standards	ID #	Check Date (in house)	Scheduled Check																													
AMCC	SN: 1050	01-Oct-13 (in house check Sep-24)	Sep-25																													
AMMI Audio Measuring Instrument	SN: 1062	26-Sep-12 (in house check Sep-24)	Sep-25																													
Calibrated by:	Name Claudio Leubler	Function Laboratory Technician	Signature 																													
Approved by:	Sven Kühn	Technical Manager																														
This calibration certificate shall not be reproduced except in full without written approval of the laboratory. Issued: November 14, 2024																																

Certificate No: AM1DV3-3049_Nov24

Page 1 of 3

References

- [1] ANSI-C63.19-2007
American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.
- [2] ANSI-C63.19-2019 (ANSI-C63.19-2011)
American National Standard, Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.
- [3] DASY System Handbook

Description of the AM1D probe

The AM1D Audio Magnetic Field Probe is a fully shielded magnetic field probe for the frequency range from 100 Hz to 20 kHz. The pickup coil is compliant with the dimensional requirements of [1+2]. The probe includes a symmetric low noise amplifier for the signal available at the shielded 3 pin connector at the side. Power is supplied via the same connector (phantom power supply) and monitored via the LED near the connector. The 7 pin connector at the end of the probe does not carry any signals, but determines the angle of the sensor when mounted on the DAE. The probe supports mechanical detection of the surface.

The single sensor in the probe is arranged in a tilt angle allowing measurement of 3 orthogonal field components when rotating the probe by 120° around its axis. It is aligned with the perpendicular component of the field, if the probe axis is tilted nominally 35.3° above the measurement plane, using the connector rotation and sensor angle stated below.

The probe is fully RF shielded when operated with the matching signal cable (shielded) and allows measurement of audio magnetic fields in the close vicinity of RF emitting wireless devices according to [1+2] without additional shielding.

Handling of the item

The probe is manufactured from stainless steel. In order to maintain the performance and calibration of the probe, it must not be opened. The probe is designed for operation in air and shall not be exposed to humidity or liquids. For proper operation of the surface detection and emergency stop functions in a DASY system, the probe must be operated with the special probe cup provided (larger diameter).

Methods Applied and Interpretation of Parameters

- *Coordinate System:* The AM1D probe is mounted in the DASY system for operation with a HAC Test Arch phantom with AMCC Helmholtz calibration coil according to [3], with the tip pointing to “southwest” orientation.
- *Functional Test:* The functional test preceding calibration includes test of Noise level
RF immunity (1kHz AM modulated signal). The shield of the probe cable must be well connected.
Frequency response verification from 100 Hz to 10 kHz.
- *Connector Rotation:* The connector at the end of the probe does not carry any signals and is used for fixation to the DAE only. The probe is operated in the center of the AMCC Helmholtz coil using a 1 kHz magnetic field signal. Its angle is determined from the two minima at nominally +120° and –120° rotation, so the sensor in the tip of the probe is aligned to the vertical plane in z-direction, corresponding to the field maximum in the AMCC Helmholtz calibration coil.
- *Sensor Angle:* The sensor tilting in the vertical plane from the ideal vertical direction is determined from the two minima at nominally +120° and –120°. DASY system uses this angle to align the sensor for radial measurements to the x and y axis in the horizontal plane.

Sensitivity: With the probe sensor aligned to the z-field in the AMCC, the output of the probe is compared to the magnetic field in the AMCC at 1 kHz. The field in the AMCC Helmholtz coil is given by the geometry and the current through the coil, which is monitored on the precision shunt resistor of the coil.

AM1D probe identification and configuration data

Item	AM1DV3 Audio Magnetic 1D Field Probe
Type No	SP AM1 001 BA
Serial No	3049

Overall length	296 mm
Tip diameter	6.0 mm (at the tip)
Sensor offset	3.0 mm (centre of sensor from tip)
Internal Amplifier	20 dB

Manufacturer / Origin	Schmid & Partner Engineering AG, Zurich, Switzerland
-----------------------	--

Calibration data

Connector rotation angle	(in DASY system)	281.2°	+/- 3.6 ° (k=2)
Sensor angle	(in DASY system)	-0.30°	+/- 0.5 ° (k=2)
Sensitivity at 1 kHz	(in DASY system)	0.00747 V/(A/m)	+/- 2.2 % (k=2)

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Calibration Laboratory of
Schmid & Partner
Engineering AG
 Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
 The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **HCT**
Gyeonggi-do, Republic of Korea

Certificate No. **AM1DV3-3050_Jan25**

CALIBRATION CERTIFICATE

Object **AM1DV3 - SN: 3050**

Calibration procedure(s) **QA CAL-24.v4**
Calibration procedure for AM1D magnetic field probes and TMFS in the
audio range

Calibration date: **January 20, 2025**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	27-Aug-24 (No. 40547)	Aug-25
Reference Probe AM1DV3	SN: 3000	25-Sep-24 (No. AM1DV3-3000_Sep24)	Sep-25
DAE4	SN: 781	16-Feb-24 (No. DAE4-781_Feb24)	Feb-25

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
AMCC	SN: 1050	01-Oct-13 (in house check Sep-24)	Sep-25
AMMI Audio Measuring Instrument	SN: 1062	26-Sep-12 (in house check Sep-24)	Sep-25

Calibrated by: **Name** **Function** **Signature**
Aidonia Georgiadou **Laboratory Technician** 

Approved by: **Sven Kühn** **Technical Manager** 

Issued: January 20, 2025

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: AM1DV3-3050_Jan25

Page 1 of 3

Handwritten notes and signatures:
 2/21/25
 2025.02.07
 2025.02.07

[References]

- [1] ANSI-C63.19-2007
American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.
- [2] ANSI-C63.19-2019 (ANSI-C63.19-2011)
American National Standard, Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.
- [3] DASY System Handbook

Description of the AM1D probe

The AM1D Audio Magnetic Field Probe is a fully shielded magnetic field probe for the frequency range from 100 Hz to 20 kHz. The pickup coil is compliant with the dimensional requirements of [1+2]. The probe includes a symmetric low noise amplifier for the signal available at the shielded 3 pin connector at the side. Power is supplied via the same connector (phantom power supply) and monitored via the LED near the connector. The 7 pin connector at the end of the probe does not carry any signals, but determines the angle of the sensor when mounted on the DAE. The probe supports mechanical detection of the surface.

The single sensor in the probe is arranged in a tilt angle allowing measurement of 3 orthogonal field components when rotating the probe by 120° around its axis. It is aligned with the perpendicular component of the field, if the probe axis is tilted nominally 35.3° above the measurement plane, using the connector rotation and sensor angle stated below.

The probe is fully RF shielded when operated with the matching signal cable (shielded) and allows measurement of audio magnetic fields in the close vicinity of RF emitting wireless devices according to [1+2] without additional shielding.

Handling of the item

The probe is manufactured from stainless steel. In order to maintain the performance and calibration of the probe, it must not be opened. The probe is designed for operation in air and shall not be exposed to humidity or liquids. For proper operation of the surface detection and emergency stop functions in a DASY system, the probe must be operated with the special probe cup provided (larger diameter).

Methods Applied and Interpretation of Parameters

- *Coordinate System:* The AM1D probe is mounted in the DASY system for operation with a HAC Test Arch phantom with AMCC Helmholtz calibration coil according to [3], with the tip pointing to "southwest" orientation.
- *Functional Test:* The functional test preceding calibration includes test of Noise level
RF immunity (1kHz AM modulated signal). The shield of the probe cable must be well connected. Frequency response verification from 100 Hz to 10 kHz.
- *Connector Rotation:* The connector at the end of the probe does not carry any signals and is used for fixation to the DAE only. The probe is operated in the center of the AMCC Helmholtz coil using a 1 kHz magnetic field signal. Its angle is determined from the two minima at nominally +120° and –120° rotation, so the sensor in the tip of the probe is aligned to the vertical plane in z-direction, corresponding to the field maximum in the AMCC Helmholtz calibration coil.
- *Sensor Angle:* The sensor tilting in the vertical plane from the ideal vertical direction is determined from the two minima at nominally +120° and –120°. DASY system uses this angle to align the sensor for radial measurements to the x and y axis in the horizontal plane.

Sensitivity: With the probe sensor aligned to the z-field in the AMCC, the output of the probe is compared to the magnetic field in the AMCC at 1 kHz. The field in the AMCC Helmholtz coil is given by the geometry and the current through the coil, which is monitored on the precision shunt resistor of the coil.

AM1D probe identification and configuration data

Item	AM1DV3 Audio Magnetic 1D Field Probe
Type No	SP AM1 001 BA
Serial No	3050

Overall length	296 mm
Tip diameter	6.0 mm (at the tip)
Sensor offset	3.0 mm (centre of sensor from tip)
Internal Amplifier	20 dB

Manufacturer / Origin	Schmid & Partner Engineering AG, Zurich, Switzerland
-----------------------	--

Calibration data

Connector rotation angle	(in DASY system)	215.2°	+/- 3.6 ° (k=2)
Sensor angle	(in DASY system)	0.27°	+/- 0.5 ° (k=2)
Sensitivity at 1 kHz	(in DASY system)	0.00753 V/(A/m)	+/- 2.2 % (k=2)

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.