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HAC Volume Control Test Report

Applicant Name: **SAMSUNG Electronics Co., Ltd.** 129, Samsung-ro, Yeongtong-gu, Suwon-Si, Gyeonggi-do, 16677 Rep. of Korea	**Date of Issue:** Oct. 16, 2023 **Test Report No.:** HCT-TE-2310-FC001 **Test Site: HCT CO., LTD.**

FCC ID	A3LSMS926U
Equipment Type:	**Mobile Phone**
Application Type	**Certification**
FCC Rule Part(s):	**FCC 47 CFR §20.19**
Test Standard:	**ANSI/TIA-5050:2018**
Model Name:	**SM-S926U**
Additional Model Name:	**SM-S926U1**
Date of Test:	**Sep. 20, 2023 ~ Oct. 13, 2023**

This wireless portable device has been confirmed to meet the hearing-aid compatible volume control specific of TIA-5050 standard with partially-waivered by DA-23-914 and had been tested in accordance with the specified measurement procedures. And this volume control test result is based on the assumption that all production units will be designed electrically identical to the device tested in this report.
I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Hui-Cheol, Eun
Test Engineer
Telecommunication Group

A-Ram, Han
Technical Manager
Telecommunication Group

REVISION HISTORY

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

Revision No.	Date of Issue	Description
0	Oct. 16, 2023	Initial Release

This test results were applied only to the test methods required by the standard.

The above Test Report is not related to the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA.

Table of Contents

1. Test Regulations

The tests were performed according to the following regulations:

Test Standard	FCC 47 CFR §20.19
Test Method	ANSI/TIA-5050:2018 KDB 285076 D01 HAC Guidance v06r04 KDB 285076 D03 HAC FAQ v01r06 KDB 285076 D04 Volume Control v02 KDB 285076 D05 HAC Waiver DA 23-914 v01

Under the revised KDB 285076 D04 Volume Control v02 on September 29, 2023, we demonstrate compliance to a Volume Control requirement using amended test method by the waiver DA23-914.

Further details on application of the waiver DA23-914 are described in section 4.2.3 of this report.

2. Test Location

Test Laboratory	
Company Name	HCT Co., LTD
Address	74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of Korea
Telephone	+82 31 645 6300
Fax.	+82 31 645 6401

Test Facilities	
Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.	
National Radio Research Agency	Designation No. KR0032 (Including MRA: CANADA, Vietnam, USA)
KOLAS	Accreditations No. KT197
A2LA	Certificate Number: 4114.01

3. Device Under Test Description

3.1 DUT General Specification

Device Description	
Applicant Name	SAMSUNG Electronics Co., Ltd.
Model Name	SM-S926U
Additional Model Name	SM-S926U1
EUT Type	Mobile Phone
Test DUT Serial Number	WIF1275M
H/W Version	REV1.0
S/W Version	S926U.001-

3.2 DUT Wireless Specification

Air Interface	Bands (MHz)	Type	Volume Control Tested	Voice Service	Audio Codec Evaluated
GSM	850	VO	Yes	-	HR V1, FR V1, FR V2
	1900				
	GPRS/EDGE	VD	No	Google Meet	OPUS
WCDMA (UMTS)	850 (B5)	VO	Yes	-	AMR-NB, AMR-WB
	1700 (B4)				
	1900 (B2)				
	HSPA	VD	No	Google Meet	OPUS
LTE-FDD	680 (B71)	VD	Yes	VoLTE / Google Meet	AMR-NB, AMR- WB, EVS-NB, EVS-WB, EVS-SWB, EVS-FB / OPUS
	700 (B12/13/14)				
	850 (B5/26)				
	1700 (B4/66)				
	1900 (B2/25)				
	2300 (B30)				
	2500 (B7)				
LTE-TDD	2600 (B41(B38))	VD	Yes		
	3600 (B48)				
NR-FDD	680(n71)	VD	Yes	VoNR / Google Meet	AMR-NB, AMR- WB, EVS-NB, EVS-WB, EVS-SWB, EVS-FB / OPUS
	700(n12)				
	850(n5/n26)				
	1700(n66)				
	1900(n2/25)				
	2300(n30)				
NR-TDD	2600(n41)	VD	Yes		
	3800(n77/78)				
Wi-Fi	2450	VD	Yes	Wi-Fi Calling / Google Meet	AMR-NB, AMR- WB, EVS-NB, EVS-WB, EVS-SWB, EVS-FB / OPUS
	5200 (U-NII-1)				
	5300 (U-NII-2A)				
	5500 (U-NII-2C)				
	5800 (U-NII-3)				
BT	2450	DT	No	-	-

Type:
VO: Legacy Cellular Voice Service
DT: Digital Transport only (no voice)
VD: IP Voice service over Digital Transport

* In accordance with KDB 285076 D05 HAC Waiver DA 23-914 v01, Volume Control test was performed only on CMRS narrowband and CMRS wideband voice codecs operating over licensed-frequency bands and Wi-Fi Calling. Additionally, in accordance with same waiver, super-wideband codec and OTT codecs had not been confirmed to comply with TIA-5050 standard.

4. Test Descriptions

4.1 Test Information

4.1.1 General Test Condition

Volume Control Test Information	
Tone Control	None
Acoustic Interface	Type 3.3 Ear Simulator (HATS)
Test Signal	IEEE 269-2010 Male mono 48 kHz
Test Signal Level	-20 dBm0 to RETP*
Volume Setting	-1 volume from maximum level
Back ground Noise (Chamber ambient noise)	21.4 dBA

*The RETP (Receive Electrical Test Point) is the point in the device test arrangement where signals are applied to the DUT in the receive direction.

4.1.2 Mounting Force

Mounting Force is the force against the artificial ear pinna simulator when handset is placed standard test position. And the 2 N force is used for testing requirements related to use by persons with hearing devices and 8 N force is used for testing requirements related to use by persons without hearing device, test is performed on each side.

4.1.3 Frequency band for transmission modes

Test Item	Narrowband Band (Hz)	Wideband Band (Hz)
Receiving volume control	100 ~ 4 000	100 ~ 7 720
Receiving distortion and noise	400 ~ 3 150	250 ~ 5 000
Receiving frequency response	100 ~ 4 000	100 ~ 8 000

4.1.4 Conversational Gain Calculation

Conversational gain for volume control measurement is calculated by formula below.

Monoaural Conversational Gain = (Measured dBSPL Level - 70 dBSPL) dB

4.1.5 Stimulus signal for distortion test

1) Random pink noise for stimulus signal has 250 ms 'on' and 150 ms 'off' cycle.

2) PN-SDNR (Pulsed Noise Signal to Distortion and Noise Ratio) is calculated by formula below.

$$\text{PN-SDNR (dB)} = 20 * \text{Log} \left[\frac{\text{measured stimulus amplitude}}{\text{measured distortion amplitude}} \right]$$

3) Lower and upper edge for stimulus measurements are shown in table below.

Stimulus Measurement Lower Band Edge	Stimulus Lower Band Edge	Nominal Center Frequency	Stimulus Upper Band Edge	Stimulus Measurement Upper Band Edge	Handset Operating Mode
190	225	250	280	315	Wideband only
245	280	315	355	390	
320	355	400	445	480	Narrowband & Wideband
410	445	500	560	595	
525	560	630	710	745	
675	710	800	890	925	
855	890	1 000	1 120	1 155	
1 085	1 120	1 250	1 415	1 450	
1 375	1 410	1 600	1 780	1 815	
1 745	1 780	2 000	2 240	2 275	
2 205	2 240	2 500	2 820	2 855	
2 785	2 820	3 150	3 550	3 585	
3 515	3 550	4 000	4 465	4 500	Wideband only
4 430	4 465	5 000	5 625	5 660	

4.1.6 Definition of Frequency Response

The receive frequency response is the ratio of the output of sound pressure at the listener reference point to the voltage input to the reference codec, or digital bit stream equivalent, as shown in follow formula for each frequency or frequency band.

$$S_{JE} = 20 \log_{10}(P_E / V_R) \text{ dB re 1 Pa/V}$$

Where

$S_{JE} = \text{Receive Sensitivity, Juntion to Ear, at } f_i$

$P_E = \text{LRP sound pressure measured by ear simlator at DRP and translated to the FF or DF, at } f_i$

$V_R = \text{RMS input voltage to the reference codec, or digital bit stream equivalent, at } f_i$

4.1.7 DRP to FF and DF Transformation Value at 1/12 Octave Center Frequencies

Function	Freq. (Hz)	DRP to FF (dB)	Freq. (Hz)	DRP to FF (dB)	Freq. (Hz)	DRP to FF (dB)	Freq. (Hz)	DRP to FF (dB)
DRP to FF	91.7	0.00	290	-0.70	917	-4.94	2 900	-17.48
	97.2	0.00	307	-0.83	972	-5.07	3 070	-17.43
	103	0.00	325	-0.98	1 030	-5.07	3 250	-17.13
	109	0.00	345	-1.16	1 090	-5.03	3 450	-16.59
	115	0.00	365	-1.36	1 150	-4.96	3 650	-15.94
	122	0.00	387	-1.58	1 220	-4.94	3 870	-15.11
	130	-0.01	410	-1.77	1 300	-5.09	4 100	-14.20
	137	-0.01	434	-1.94	1 370	-5.30	4 340	-13.25
	145	-0.01	460	-2.10	1 450	-5.65	4 600	-12.35
	154	-0.02	487	-2.27	1 540	-6.19	4 870	-11.60
	163	-0.03	516	-2.45	1 630	-6.95	5 160	-11.04
	173	-0.05	546	-2.59	1 730	-8.04	5 460	-10.31
	183	-0.08	579	-2.69	1 830	-9.33	5 790	-9.55
	194	-0.11	613	-2.80	1 940	-10.67	6 130	-8.70
	205	-0.16	649	-2.94	2 050	-11.86	6 490	-7.80
	218	-0.22	688	-3.19	2 180	-13.39	6 880	-6.67
	230	-0.29	729	-3.52	2 300	-14.76	7 290	-5.08
	244	-0.39	772	-3.92	2 440	-15.89	7 720	-3.61
	259	-0.48	818	-4.35	2 590	-16.79	8 180	-2.97
	274	-0.59	866	-4.69	2 740	-17.34	8 660	-3.42
DRP to DF	91.7	0.00	290	-0.63	917	-3.99	2 900	-13.98
	97.2	0.00	307	-0.72	972	-4.21	3 070	-13.88
	103	0.00	325	-0.81	1 030	-4.45	3 250	-13.77
	109	0.00	345	-0.93	1 090	-4.66	3 450	-13.48
	115	-0.01	365	-1.05	1 150	-4.86	3 650	-13.01
	122	-0.03	387	-1.19	1 220	-5.10	3 870	-12.29
	130	-0.05	410	-1.32	1 300	-5.43	4 100	-11.54
	137	-0.06	434	-1.44	1 370	-5.80	4 340	-10.95
	145	-0.07	460	-1.58	1 450	-6.29	4 600	-10.32
	154	-0.07	487	-1.78	1 540	-6.95	4 870	-9.64
	163	-0.07	516	-2.04	1 630	-7.73	5 160	-9.03
	173	-0.09	546	-2.32	1 730	-8.60	5 460	-8.40
	183	-0.11	579	-2.63	1 830	-9.39	5 790	-7.85
	194	-0.15	613	-2.87	1 940	-10.24	6 130	-7.36
	205	-0.19	649	-3.07	2 050	-11.07	6 490	-6.91
	218	-0.24	688	-3.21	2 180	-11.95	6 880	-6.39
	230	-0.30	729	-3.32	2 300	-12.76	7 290	-6.00
	244	-0.36	772	-3.45	2 440	-13.49	7 720	-6.23
	259	-0.46	818	-3.59	2 590	-13.84	8 180	-7.17
	274	-0.55	866	-3.78	2 740	-13.99	8 660	-7.74

4.2 Test Configuration

4.2.1 Test Diagram

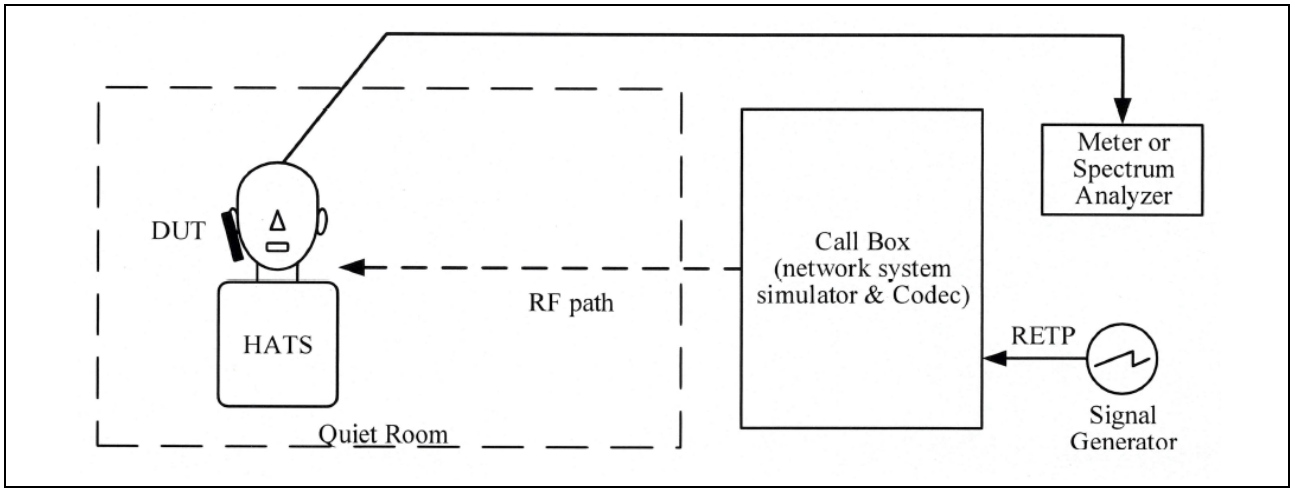


Figure 1. Volume Control Test Set-up

1) In order to satisfy the quiet room condition below 40 dBA background noise according to TIA-5050 standard, HATS and DUT were placed in Anechoic Chamber and the noise level was checked using Sound Level Meter Type 2250.

2) labCORE equipment is used for signal generator and meter. This equipment directly provided operating voltage for HATS's microphone and -20 dBm0 sound source to Call Box RETP Point.

3) CMW500 Call box was used for GSM, WCDMA, LTE and WIFI call tests, where the audio input level was set to 1.572 V so that the signal source level supplied from labCORE to RETP matched -20 dBm0.

4) When testing NR calls using UXM Call box, we used USB audio JIG U8903B-UAM because equipment does not provide direct audio input. In addition, since JIG output is connected to MIC input of SIP virtual terminal software called IMS Client, equipment microphone level was set to equivalent to the level of CMW 500, which already RETP condition was known. Finally, we conducted NR call test after confirming CMW500 LTE Call and UMX NSA mode have same level of measurement results.

4.2.2 Handset Positioning

In all tests, handset was placed at the STP (Standard Test Position) of IEEE std 269 and ITU-T P.64 annex E by adjusting the handset positioner Type 4606 of HATS Type 4821C.

4.2.3 Waiver DA23-914 for Volume Control Test

This test report demonstrate compliance with Volume Control requirements of TIA-5050 standard relaxed by applying Waiver DA23-914. And for detailed information on test application, refer to Technical testing guidance of KDB 285076 D05 HAC Waiver DA 23-914 v01:

2.a. Under the waiver, only CMRS narrowband and CMRS wideband voice codecs are required to comply with the volume control requirements of the TIA 5050-2018 Volume Control Standard as amended as follows

→ According to this content, test codec is limited to AMR and EVS codecs.

2.a.1. For the 2N mounting force test, one narrowband and one wideband voice codec embedded with the handset must pass with at least one volume control setting with a conversational gain of ≥ 6 dB for all voice services, bands of operation and air interfaces over which it operates using one codec bit rate of the applicant's choosing.

→ According to this content, only EVS-NB 24.4 kbps and EVS-WB 128 kbps codecs were tested for all air interface and bands of DUT.

2.a.2. For the 8N mounting force test, one narrowband and one wideband voice codec embedded with the handset must pass with at least one volume control setting with a conversational gain of ≥ 6 dB for all voice services, bands of operation and air interfaces over which they operate but is not required to meet or exceed the full 18 dB of conversational gain specified in section 5.1.1 of the TIA 5050 Volume Control Standard using one codec bit rate of the applicant's choosing.

→ According to this content, we reported conversational gain result even if it less than 18 dB for 8 N mounting force test.

2.b. For all other narrowband and wideband codecs not evaluated in 2.a. above, TIA 5050-2018 Receive Distortion and Noise Performance and Receive Acoustic Frequency Response Performance evaluations are not required; however, these codecs shall be assessed for conversational gain and documented in the test report at the 2N and 8N levels with a gain of ≥ 6 dB for all voice services, bands of operation and air interfaces over which they operate. The handset volume setting used to comply with 2.a. shall be used for these other CMRS codec evaluations.

→ According to this, Conversational Gain tests were performed for different bit rates of EVS-NB and WB. And other codecs such as FR V2 for GSM and AMR-NB, WB were also tested.

2.c. Any other codec for voice services embedded in the handset, not identified in 2.a. and 2.b. above, is not required to comply or demonstrate in the test reports for conversational gain.

→ According to this content, we did not test 'Google Meet' supported by DUT.

4.3 Measurement Uncertainty

Test Item	Uncertainty
Receiving volume control	1.3 dB
Receiving distortion and noise	1.4 dB
Receiving frequency response	1.3 dB
NOTE : All uncertainty values are expanded standard uncertainty to give a confidence level of 95 %, based on coverage factor k=2	

4.4 Test Environment

Temperature	(23.4 ± 1.5) ℃
Relative humidity	(56.8 ± 15.0) %
Atmospheric pressure	(100.1 ± 1.0) kPa

5. 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 (M.D.Y)
Head and Torso Simulator	B&K	Type 4128C	2515986	N/A
Anechoic Chamber	B&K	N/A	N/A	N/A
Sound Level Meter	B&K	Type 2250	2506747	12.14.2023
Sound Calibrator	B&K	Type 4231	2513225	12.14.2023
ACQUA compact	Head Acoustic	labCORE	77000427	06.01.2024
Radio Communication Tester	R & S	CMW 500	139103	12.15.2023
Radio Communication Tester	R & S	CMW 500	167916	09.21.2024
USB Audio Module	KEYSIGHT	U8903B-UAM	101006	N/A
UXM 5G Wireless Test Set	KEYSIGHT	E7515B	MY60102101	05.02.2024

6. Test Result Summary

6.1 Summary of TIA-5050 full test results for codecs of applicant's choosing

According to sections 2.a. of KDB 285076 D05 HAC Waiver DA 23-014 v01, only the highest bit rate of EVS-NB and EVS-WB codecs selected by the applicant were tested.

1) Narrow Band Codec: EVS-NB 24.4 kbps

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Mounting Force (N)	Conv. Gain (dB) *Refer Section 7.1*	Min PN-SDNR (dB) *Refer Section 7.2*	Frequency Response *Refer Section 7.3*	F.R. Plot page
EVS-NB (NB)	Max-1 Vol.	24.4	LTE	B7	2	11.51	26.36	PASS	50
					8	13.56	31.57	PASS	
				B12	2	11.93	30.00	PASS	51
					8	13.57	33.32	PASS	
				B13	2	12.08	29.58	PASS	52
					8	13.60	25.34	PASS	
				B14	2	12.22	33.79	PASS	53
					8	13.78	33.46	PASS	
				B25	2	11.59	26.25	PASS	54
					8	13.85	32.93	PASS	
				B26	2	11.87	33.38	PASS	55
					8	13.87	28.06	PASS	
				B30	2	12.21	29.94	PASS	56
					8	13.83	27.52	PASS	
				B41	2	12.19	28.96	PASS	57
					8	13.80	26.89	PASS	
				B48	2	11.64	33.29	PASS	58
					8	13.24	29.93	PASS	
				B66	2	11.83	32.84	PASS	59
					8	13.31	31.28	PASS	
				B71	2	11.73	26.31	PASS	60
					8	13.60	30.38	PASS	
			NR	n7	2	11.25	31.34	PASS	61
					8	12.71	32.07	PASS	
				n12	2	11.85	30.74	PASS	62
					8	12.44	24.59	PASS	
				n25	2	12.32	27.09	PASS	63
					8	13.93	29.01	PASS	
				n26	2	11.56	30.21	PASS	64
					8	12.72	29.30	PASS	
				n30	2	11.66	32.35	PASS	65
					8	13.53	31.71	PASS	
				n38	2	11.73	28.75	PASS	66
					8	13.77	31.73	PASS	
				n41	2	11.62	32.05	PASS	67
					8	12.70	29.12	PASS	
				n48	2	11.37	30.96	PASS	68
					8	13.56	30.55	PASS	
				n66	2	11.81	30.97	PASS	69
					8	13.59	26.77	PASS	

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Mounting Force (N)	Conv. Gain (dB) *Refer Section 7.1*	Min PN-SDNR (dB) *Refer Section 7.2*	Frequency Response *Refer Section 7.3*	F.R. Plot page
EVS-NB (NB)	Max-1 Vol.	24.4	NR	n70	2	11.54	29.33	PASS	70
					8	13.70	29.02	PASS	
				n71	2	11.84	32.03	PASS	71
					8	13.79	30.56	PASS	
				n77	2	11.60	25.70	PASS	72
					8	13.66	31.72	PASS	
				n78	2	11.76	29.76	PASS	73
					8	13.54	29.63	PASS	
			WIFI	802.11b 2.4 GHz	2	12.07	24.84	PASS	74
					8	13.86	26.26	PASS	
				802.11g 2.4 GHz	2	12.09	27.54	PASS	75
					8	14.34	30.19	PASS	
				802.11n 2.4 GHz	2	12.37	32.46	PASS	76
					8	13.45	28.68	PASS	
				802.11ac 2.4 GHz	2	11.66	23.92	PASS	77
					8	14.65	24.56	PASS	
				802.11ax 2.4 GHz	2	11.94	25.75	PASS	78
					8	13.29	33.08	PASS	
				802.11a 5 GHz	2	11.76	26.63	PASS	79
					8	13.06	33.28	PASS	
				802.11n 5 GHz	2	11.70	30.92	PASS	80
					8	13.13	25.65	PASS	
				802.11ac 5 GHz	2	11.48	33.15	PASS	81
					8	13.32	25.42	PASS	
				802.11ax 5 GHz	2	11.78	30.86	PASS	82
					8	13.45	31.08	PASS	

2) Wide Band Codec: EVS-WB 128 kbps

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Mounting Force (N)	Conv. Gain (dB) *Refer Section 7.1*	Min PN-SDNR (dB) *Refer Section 7.2*	Frequency Response *Refer Section 7.3*	F.R. Plot page
EVS-WB (WB)	Max-1 Vol.	128	LTE	B7	2	10.20	35.97	PASS	83
					8	12.23	35.98	PASS	
				B12	2	10.73	35.93	PASS	84
					8	12.42	35.98	PASS	
				B13	2	10.83	36.00	PASS	85
					8	12.38	35.98	PASS	
				B14	2	11.00	35.90	PASS	86
					8	12.69	35.93	PASS	
				B25	2	10.51	35.95	PASS	87
					8	12.99	36.02	PASS	
				B26	2	10.72	35.93	PASS	88
					8	12.66	35.91	PASS	
				B30	2	11.04	35.87	PASS	89
					8	12.66	35.93	PASS	
				B41	2	11.08	35.92	PASS	90
					8	12.71	35.92	PASS	
				B48	2	10.22	35.93	PASS	91
					8	12.06	36.02	PASS	
				B66	2	10.49	36.01	PASS	92
					8	12.19	36.03	PASS	
				B71	2	10.61	35.84	PASS	93
					8	12.29	35.82	PASS	
			NR	n7	2	10.18	31.41	PASS	94
					8	11.87	28.38	PASS	
				n12	2	10.82	31.99	PASS	95
					8	11.38	31.03	PASS	
				n25	2	11.68	24.20	PASS	96
					8	12.64	27.54	PASS	
				n26	2	10.17	28.30	PASS	97
					8	11.72	29.63	PASS	
				n30	2	10.79	28.25	PASS	98
					8	12.59	28.57	PASS	
				n38	2	10.67	25.62	PASS	99
					8	12.71	29.77	PASS	
				n41	2	10.62	26.58	PASS	100
					8	11.79	26.19	PASS	
				n48	2	10.42	28.04	PASS	101
					8	12.86	32.18	PASS	
				n66	2	11.06	25.57	PASS	102
					8	12.69	25.74	PASS	
				n70	2	10.83	25.73	PASS	103
					8	12.40	25.70	PASS	
				n71	2	11.02	26.42	PASS	104
					8	12.71	29.98	PASS	
				n77	2	10.31	30.67	PASS	105
					8	12.45	26.45	PASS	
				n78	2	11.16	27.64	PASS	106
					8	12.87	31.67	PASS	
			WIFI	802.11b 2.4 GHz	2	10.94	35.68	PASS	107
					8	12.72	32.87	PASS	

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Mounting Force (N)	Conv. Gain (dB) *Refer Section 7.1*	Min PN-SDNR (dB) *Refer Section 7.2*	Frequency Response *Refer Section 7.3*	F.R. Plot page
EVS-WB (WB)	Max-1 Vol.	128	WIFI	802.11g 2.4 GHz	2	11.08	35.60	PASS	108
					8	13.23	35.73	PASS	
				802.11n 2.4 GHz	2	11.15	35.89	PASS	109
					8	12.28	32.75	PASS	
				802.11ac 2.4 GHz	2	10.73	31.83	PASS	110
					8	13.20	23.30	PASS	
				802.11ax 2.4 GHz	2	10.91	25.34	PASS	111
					8	12.49	24.68	PASS	
				802.11a 5 GHz	2	10.90	35.73	PASS	112
					8	11.93	35.70	PASS	
				802.11n 5 GHz	2	10.74	35.78	PASS	113
					8	11.97	35.80	PASS	
				802.11ac 5 GHz	2	10.23	35.70	PASS	114
					8	12.09	35.89	PASS	
				802.11ax 5 GHz	2	10.80	36.00	PASS	115
					8	12.28	35.97	PASS	

6.2 Conversational Gain for other codecs

According to section 2.b. of KDB 285076 D05 HAC Waiver DA 23-914 v01, only conversational gain was tested for codecs not evaluated in section 6.1 and its worst-case data is:

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Mounting Force (N)	Conv. Gain (dB) *Refer Section 7.1*
HR V1	Max-1 Vol.	N/A	GSM	850	**2**	11.38
				850	**8**	13.71
FR V1				1900	**2**	12.24
				850	**8**	13.41
FR V2				1900	**2**	12.55
				850	**8**	13.74
AMR-NB		4.75	NR	n7	**2**	10.51
			NR	n41	**8**	11.85
AMR-WB		6.6	WCDMA	B4	**2**	**9.10**
			NR	n12	**8**	**10.57**
EVS-NB		5.9	NR	n7	**2**	10.86
			NR	n12	**8**	12.11
EVS-WB		5.9	WIFI	802.11ac 5GHz	**2**	9.13
			NR	n26	**8**	10.72

The worst conversational gain for mounting force 2N and 8 N were found in AMR-WB Codec. Refer to section 7.1.3 for full test results on conversational gains.

7. Test Details

7.1 Receive Volume Control Performance

7.1.1 Test Limit

1) With a mounting force of 8N, the DUT shall have at least one volume control setting that will produce a conversational gain of ≥ 18 dB with the output distortion and frequency response meeting the requirements.
2) With a mounting force of 2N, the DUT shall have at least one volume control setting that will produce a conversational gain of ≥ 6 dB with the output distortion and frequency response meeting the requirements.

* Because the 18 dB limit for 8 N mounting force test is waived by waiver DA23-914, this test report only confirmed the 6 dB limit for the entire codecs.

7.1.2 Test Procedure

1) Configure the DUT with a mounting force of 8N and test equipment as shown in Figure 1 in an active call state with the applicable codec for the transmission mode under test.
2) Set the DUT volume control to the maximum setting.
3) If the DUT has an adjustable tone control feature, a tone control setting that meets the frequency response requirements.
4) Apply the real speech test signal at a level of -20 dBm0 at the RETP and measure the acoustic output at the Drum Reference Point (DRP) over one complete sequence of the test signal.
5) Translate the measurement made at the DRP to the Free Field (FF) using the translation data.
6) Over the applicable frequency band, determine the ASL in dBSPL for the resulting sound pressure level in accordance with Method B of ITU-T Recommendation P. 56:

a. Narrowband 100 Hz through 4 000 Hz.
b. Wideband 100 Hz through 7 720 Hz.

7) Calculate the Conversational Gain by subtracting 70 dB from the measured dBSPL.
8) Measure the output distortion. If a distortion failure occurs at the maximum volume control setting, reduce the volume control setting and repeat the measurement to determine if a setting can be found for which the conversational gain requirement is met without a distortion failure.
9) Repeat steps 2) to 8) with a mounting force of 2N.

7.1.3 Test Result

1) Codec Bitrate Investigation

: For codecs with bit rate, check the bit rate with the worst conversational gain.

Air interface	Band of operation	Volume Control Level	Codec	Bitrate (kbps)	Conv. Gain (dB)	
					Mounting Force 2 N	Mounting Force 8 N
WCDMA	B4	Max-1 Vol.	AMR-NB (Narrow band)	4.75	10.56	13.09
				5.15	10.64	13.21
				5.90	10.74	13.30
				6.70	11.01	13.48
				7.40	11.10	13.55
				7.95	11.14	13.70
				10.20	11.27	13.68
				12.20	11.45	13.83
			AMR-WB (Wide band)	6.60	9.10	11.62
				8.85	9.33	11.80
				12.65	9.44	11.90
				14.25	9.49	11.97
				15.85	9.45	11.96
				18.25	9.48	12.00
				19.85	9.63	11.99
				23.05	9.67	12.08
				23.85	9.66	12.16
LTE	B25	Max-1 Vol.	AMR-NB (Narrow band)	4.75	11.08	13.22
				5.15	11.10	13.47
				5.90	11.29	13.60
				6.70	11.47	13.77
				7.40	11.49	13.76
				7.95	11.63	13.83
				10.20	11.67	13.87
				12.20	11.78	14.12
			AMR-WB (Wide band)	6.60	9.67	11.39
				8.85	9.83	11.58
				12.65	9.92	11.73
				14.25	10.07	11.70
				15.85	10.04	11.69
				18.25	10.02	11.67
				19.85	10.00	11.75
				23.05	10.04	11.58
				23.85	10.09	11.65
			EVS-NB (Narrow band)	5.9	10.91	13.24
				7.2	11.06	13.38
				8.0	11.08	13.54
				9.6	11.20	13.55
				13.2	11.34	13.67
				16.4	11.63	13.82
				24.4	11.59	13.85
			EVS-WB (Wide band)	5.9	9.40	11.03
				7.2	9.42	11.07
				8.0	9.50	11.19

Air interface	Band of operation	Volume Control Level	Codec	Bitrate (kbps)	Conv. Gain (dB)	
					Mounting Force 2 N	Mounting Force 8 N
LTE	B25	Max-1 Vol.	EVS-WB (Wide band)	9.6	9.60	11.23
				13.2	9.72	11.20
				16.4	9.84	12.34
				24.4	9.73	12.41
				32.0	10.62	12.95
				48.0	10.36	12.93
				64.0	10.05	12.67
				96.0	10.50	12.91
				128.0	10.51	12.99
NR	n25	Max-1 Vol.	AMR-NB (Narrow band)	4.75	11.58	13.34
				5.15	11.85	13.62
				5.90	12.28	13.31
				6.70	12.31	13.56
				7.40	12.21	13.46
				7.95	12.22	13.82
				10.20	12.57	13.86
				12.20	12.34	13.88
			AMR-WB (Wide band)	6.6	10.41	12.07
				8.85	10.71	12.39
				12.65	11.13	12.61
				14.25	10.86	12.68
				15.85	10.87	12.42
				18.25	11.33	12.42
				19.85	11.22	12.73
				23.05	11.14	12.60
				23.85	11.09	12.75
			EVS-NB (Narrow band)	5.9	11.95	13.27
				7.2	11.97	13.66
				8.0	12.12	13.57
				9.6	12.06	13.66
				13.2	12.05	13.70
				16.4	12.41	13.70
				24.4	12.32	13.93
			EVS-WB (Wide band)	5.9	10.28	12.12
				7.2	10.66	12.35
				8.0	10.45	12.14
				9.6	10.64	12.19
				13.2	11.02	12.41
				16.4	11.05	12.38
				24.4	11.14	12.27
				32.0	10.76	12.28
				48.0	11.21	12.49
				64.0	11.12	12.57
				96.0	11.30	12.72
				128.0	11.68	12.64
WIFI	802.11b 2.4 GHz	Max-1 Vol.	AMR-NB (Narrow band)	4.75	10.75	13.15
				5.15	10.85	13.18
				5.90	11.17	13.40
				6.70	11.25	13.64
				7.40	11.20	13.73
				7.95	11.35	13.71

Air interface	Band of operation	Volume Control Level	Codec	Bitrate (kbps)	Conv. Gain (dB)	
					Mounting Force 2 N	Mounting Force 8 N
WIFI	802.11b 2.4 GHz	Max-1 Vol.	AMR-NB (Narrow band)	10.20	11.35	14.05
				12.20	11.60	13.96
			AMR-WB (Wide band)	6.6	9.66	11.72
				8.85	9.72	11.81
				12.65	9.61	12.21
				14.25	9.83	12.29
				15.85	9.79	12.45
				18.25	10.00	12.94
				19.85	10.00	13.20
				23.05	9.95	13.33
				23.85	10.00	13.21
			EVS-NB (Narrow band)	5.9	10.99	13.15
				7.2	11.01	13.37
				8.0	11.07	13.29
				9.6	11.13	13.60
				13.2	11.27	13.45
				16.4	11.92	13.84
				24.4	12.07	13.86
			EVS-WB (Wide band)	5.9	9.16	11.66
				7.2	9.28	11.79
				8.0	9.24	11.54
				9.6	9.35	11.41
				13.2	9.57	11.93
				16.4	9.71	11.87
				24.4	9.71	12.17
				32.0	10.74	12.80
				48.0	10.62	12.66
				64.0	10.49	12.59
				96.0	10.87	12.54
				128.0	10.94	12.72

: According to above results, it is confirmed that the lower codec bit rate has the lower conversational gain value.

2) Conversational Gain for all of operating bands

: For codecs with bit rate, tested only bit rate with worst conversational gain.

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Conv. Gain Limit (dB)	Conv. Gain (dB)	
						Mounting Force 2 N	Mounting Force 8 N
HR V1 (NB)	Max-1 Vol.	N/A	GSM	850	6	11.38	13.71
				1900		12.35	13.73
FR V1 (NB)	Max-1 Vol.	N/A		850		12.25	13.41
				1900		12.24	13.49
FR V2 (NB)	Max-1 Vol.	N/A		850		12.58	13.74
				1900		12.55	13.75
AMR-NB (NB)	Max-1 Vol.	4.75	WCDMA	B2	6	11.08	12.76
				B4		10.56	13.09
				B5		10.77	12.71
			LTE	B7	6	11.21	13.02
				B12		11.67	13.08
				B13		11.49	13.00
				B14		11.58	13.37
				B25		11.08	13.22
				B26		11.28	13.26
				B30		11.74	13.36
				B41		11.73	13.46
				B48		11.12	12.77
				B66		11.24	13.00
				B71		11.35	13.03
			NR	n7	6	10.51	12.40
				n12		11.15	12.34
				n25		11.58	13.34
				n26		10.84	11.89
				n30		10.96	13.00
				n38		10.78	13.20
				n41		11.01	11.85
				n48		10.66	13.11
				n66		11.53	13.14
				n70		11.14	13.08
				n71		11.35	13.14
				n77		11.24	13.19
				n78		11.25	13.18
			WIFI	802.11b 2.4 GHz	6	10.75	13.15
				802.11g 2.4 GHz		11.39	13.88
				802.11n 2.4 GHz		11.94	12.91
				802.11.ac 2.4 GHz		11.44	13.64
				802.11ax 2.4 GHz		11.35	12.31
				802.11a 5 GHz		11.37	12.59
				802.11n 5 GHz		11.08	12.68
				802.11.ac 5 GHz		11.00	12.92
				802.11ax 5 GHz		11.27	12.83
AMR-WB (WB)	Max-1 Vol.	6.6	WCDMA	B2	6	9.51	11.16
				B4		**9.10**	11.62
				B5		9.42	11.39
			LTE	B7	6	9.46	11.53
				B12		10.07	11.54

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Conv. Gain Limit (dB)	Conv. Gain (dB)	
						Mounting Force 2 N	Mounting Force 8 N
AMR-WB (WB)	Max-1 Vol.	6.6	LTE	B13	6	9.86	11.57
				B14		10.05	11.68
				B25		9.67	11.39
				B26		9.82	11.81
				B30		10.22	11.95
				B41		10.06	11.87
				B48		9.59	11.42
				B66		9.83	11.51
				B71		9.57	11.53
			NR	n7	6	9.73	11.14
				n12		10.04	**10.57**
				n25		10.41	12.07
				n26		9.66	10.67
				n30		9.58	11.61
				n38		9.75	11.89
				n41		9.55	10.85
				n48		9.67	11.94
				n66		10.22	11.91
				n70		9.54	11.74
				n71		9.95	11.95
				n77		9.40	11.61
				n78		9.98	11.69
			WIFI	802.11b 2.4 GHz	6	9.66	11.72
				802.11g 2.4 GHz		10.19	12.40
				802.11n 2.4 GHz		10.25	11.52
				802.11.ac 2.4 GHz		9.72	12.48
				802.11ax 2.4 GHz		9.80	11.41
				802.11a 5 GHz		9.89	11.03
				802.11n 5 GHz		9.82	11.07
				802.11.ac 5 GHz		9.43	11.39
				802.11ax 5 GHz		9.95	11.29
EVS-NB (NB)	Max-1 Vol.	5.9	LTE	B7	6	11.17	13.08
				B12		11.67	13.18
				B13		11.51	13.18
				B14		11.79	13.37
				B25		10.91	13.24
				B26		11.50	13.23
				B30		11.79	13.37
				B41		11.74	13.37
				B48		11.14	12.84
				B66		11.27	13.15
				B71		11.36	13.08
			NR	n7	6	10.86	12.46
				n12		11.39	12.11
				n25		11.95	13.27
				n26		10.94	12.13
				n30		11.21	13.16
				n38		11.15	13.23
				n41		11.35	12.34
				n48		11.06	13.19
				n66		11.56	13.32
				n70		11.19	13.20

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Conv. Gain Limit (dB)	Conv. Gain (dB)	
						Mounting Force 2 N	Mounting Force 8 N
EVS-NB (NB)	Max-1 Vol.	5.9	NR	n71	6	11.53	13.21
				n77		11.14	13.12
				n78		11.62	13.18
			WIFI	802.11b 2.4 GHz	6	10.99	13.15
				802.11g 2.4 GHz		11.62	14.06
				802.11n 2.4 GHz		11.90	12.99
				802.11.ac 2.4 GHz		11.54	14.02
				802.11ax 2.4 GHz		11.45	13.14
				802.11a 5 GHz		11.35	12.61
				802.11n 5 GHz		11.11	12.73
				802.11.ac 5 GHz		10.95	12.92
				802.11ax 5 GHz		11.40	12.83
EVS-WB (WB)	Max-1 Vol.	5.9	LTE	B7	6	9.31	11.39
				B12		9.76	11.37
				B13		9.93	11.52
				B14		10.06	11.67
				B25		9.40	11.03
				B26		9.62	11.91
				B30		10.04	11.96
				B41		9.92	11.58
				B48		9.22	11.08
				B66		9.46	11.61
				B71		9.57	11.59
			NR	n7	6	9.51	11.07
				n12		9.99	10.84
				n25		10.28	12.12
				n26		9.76	10.72
				n30		9.65	11.55
				n38		9.80	11.51
				n41		9.83	10.89
				n48		9.54	11.94
				n66		10.17	11.75
				n70		9.65	11.74
				n71		10.07	11.79
				n77		9.74	12.00
				n78		10.13	11.67
			WIFI	802.11b 2.4 GHz	6	9.16	11.66
				802.11g 2.4 GHz		9.98	12.34
				802.11n 2.4 GHz		10.02	11.22
				802.11.ac 2.4 GHz		9.88	12.08
				802.11ax 2.4 GHz		9.92	11.60
				802.11a 5 GHz		9.72	11.07
				802.11n 5 GHz		9.47	11.03
				802.11.ac 5 GHz		9.13	11.29
				802.11ax 5 GHz		9.67	11.25

: Above results show that all codecs meet the TIA-5050 Conversational Gain requirement relaxed by waiver DA 23-914.

7.2 Receive Distortion and Noise Performance

7.2.1 Test Limit

With a mounting force of 8N and 2N, the ratio of the stimulus signal power to the 100 Hz to 8000 Hz total A-weighted distortion and noise power shall be ≥ 20 dB when tested over the range of 1/3 octave band center frequencies:

1) Narrowband transmission mode: Each 1/3 octave band center frequency from 400 Hz to 3150 Hz.
2) Wideband transmission mode: Each 1/3 octave band center frequency from 250 Hz to 5000 Hz.

* According to waiver DA23-914, distortion test is only performed for EVS-NB 24.4 kbps and EVS-WB 128 kbps.

7.2.2 Test Procedure

1) Configure the DUT with a mounting force of 8N and test equipment as shown in Figure 1 in an active call state with the applicable codec for the transmission mode under test with the volume control at the setting.
2) Receive distortion and noise is measured using the PN-SDNR procedure.
3) To ensure DUT activation, apply the real speech test signal at a level of -20 dBm0 followed immediately by the initial 1/3 octave center frequency PN test signal based on the narrowband or wideband operating mode. Measure the acoustic output at the DRP over the complete sequence of the PN test signal.
4) Translate the measurement made at the DRP to the FF using the translation data.
5) Calculate the acoustic output unweighted total signal power of the stimulus measurement band.
6) Calculate the notched A-weighting distortion and noise components.
7) Calculate the ratio of the signal power to the total A-weighted distortion and noise power.
8) Repeat for each of the remaining 1/3 octave center frequencies based on the narrowband or wideband operating mode.
9) Repeat steps 2-8 with a mounting force of 2N.

7.2.3 Test Result

1) Distortion Test Result for EVB-NB 24.4 kbps and LTE

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Dst. Center Frequency (Hz)	Dst. Limit (dB)	PN-SDNR (dB)	
							Mounting Force 2N	Mounting Force 8N
EVS-NB (NB)	Max-1 Vol.	24.4	LTE	B7	400	20	40.56	38.99
					500		29.76	36.54
					630		40.05	40.32
					800		39.55	33.28
					1 000		26.36	31.57
					1 250		33.89	33.14
					1 600		41.33	43.29
					2 000		35.00	34.02
					2 500		44.30	37.53
					3 150		36.93	36.16
				B12	400	20	40.23	38.75
					500		31.21	37.88
					630		30.00	40.96
					800		39.87	41.34
					1 000		38.51	38.02
					1 250		33.17	33.32
					1 600		40.36	42.47
					2 000		42.73	43.36
					2 500		44.11	43.54
					3 150		39.23	38.94
				B13	400	20	38.67	34.06
					500		37.57	37.09
					630		39.48	40.82
					800		39.15	39.02
					1 000		29.58	34.28
					1 250		33.97	25.54
					1 600		40.90	30.57
					2 000		43.89	25.34
					2 500		44.98	39.53
					3 150		39.60	33.73
				B14	400	20	39.47	39.05
					500		36.37	36.29
					630		39.16	41.15
					800		40.92	41.22
					1 000		36.38	37.73
					1 250		33.79	33.46
					1 600		41.76	43.00
					2 000		43.34	43.39
					2 500		44.24	44.42
					3 150		38.69	37.73
				B25	400	20	31.73	32.93
					500		27.27	38.75
					630		39.09	38.88
					800		39.62	39.31
					1 000		26.25	38.53
					1 250		26.95	32.98

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Dst. Center Frequency (Hz)	Dst. Limit (dB)	PN-SDNR (dB)	
							Mounting Force 2N	Mounting Force 8N
EVS-NB (NB)	Max-1 Vol.	24.4	LTE	B25	1 600	20	42.53	40.29
					2 000		31.85	37.75
					2 500		38.15	42.43
					3 150		35.88	38.07
				B26	400	20	38.29	38.06
					500		36.37	37.65
					630		39.53	28.06
					800		41.60	42.06
					1 000		37.78	32.03
					1 250		33.56	32.46
					1 600		41.00	42.31
					2 000		42.88	43.42
					2 500		43.59	43.43
					3 150		33.38	38.37
				B30	400	20	40.31	40.71
					500		37.99	29.26
					630		40.28	33.16
					800		40.57	32.08
					1 000		39.29	27.52
					1 250		29.94	33.58
					1 600		41.64	31.46
					2 000		41.88	32.35
					2 500		43.62	43.85
					3 150		38.26	38.67
				B41	400	20	32.45	40.06
					500		37.50	26.89
					630		41.47	34.27
					800		31.64	42.63
					1 000		33.01	29.83
					1 250		28.96	32.52
					1 600		42.55	42.72
					2 000		43.60	45.01
					2 500		43.28	41.82
					3 150		35.47	39.10
				B48	400	20	38.67	36.00
					500		37.46	35.90
					630		39.88	41.99
					800		41.72	42.76
					1 000		38.05	41.54
					1 250		33.81	29.93
					1 600		33.29	41.79
					2 000		43.97	44.46
					2 500		44.90	44.45
					3 150		40.89	38.28
				B66	400	20	39.48	41.18
					500		34.69	36.17
					630		32.84	41.58
					800		37.49	31.28
					1 000		39.05	37.92
					1 250		33.09	33.43
					1 600		42.72	41.29

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Dst. Center Frequency (Hz)	Dst. Limit (dB)	PN-SDNR (dB)	
							Mounting Force 2N	Mounting Force 8N
EVS-NB (NB)	Max-1 Vol.	24.4	LTE	B66	2 000	20	39.68	44.21
					2 500		41.44	41.65
					3 150		39.90	34.13
				B71	400	20	34.57	33.63
					500		37.10	37.17
					630		30.80	38.47
					800		32.74	32.55
					1 000		30.65	38.39
					1 250		26.31	30.38
					1 600		28.57	32.20
					2 000		31.65	43.08
					2 500		37.83	44.03
					3 150		38.62	38.80

2) Distortion Test Result for EVB-NB 24.4 kbps and NR

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Dst. Center Frequency (Hz)	Dst. Limit (dB)	PN-SDNR (dB)	
							Mounting Force 2N	Mounting Force 8N
EVS-NB (NB)	Max-1 Vol.	24.4	NR	n7	400	20	35.28	38.49
					500		31.34	34.98
					630		38.17	39.71
					800		38.49	38.57
					1 000		36.74	38.64
					1 250		32.06	33.75
					1 600		39.22	32.07
					2 000		39.32	37.09
					2 500		40.69	38.71
					3 150		32.88	32.76
				n12	400	20	31.58	35.32
					500		36.64	26.33
					630		39.66	35.35
					800		39.73	27.50
					1 000		37.74	29.97
					1 250		32.48	30.11
					1 600		40.84	28.33
					2 000		33.55	34.27
					2 500		38.52	32.19
					3 150		30.74	24.59
				n25	400	20	32.12	37.20
					500		34.67	35.04
					630		39.20	39.03
					800		38.05	34.46
					1 000		35.84	37.23
					1 250		33.00	33.20
					1 600		38.77	40.55
					2 000		39.38	38.90
					2 500		37.81	36.77
					3 150		27.09	29.01
				n26	400	20	35.17	35.96
					500		35.25	29.30
					630		38.66	39.31
					800		34.47	37.33
					1 000		34.59	36.32
					1 250		30.74	35.05
					1 600		41.00	41.14
					2 000		34.79	32.84
					2 500		40.36	37.86
					3 150		30.21	30.03
				n30	400	20	37.55	33.41
					500		34.05	32.82
					630		39.60	35.87
					800		38.86	39.86
					1 000		36.71	31.71
					1 250		32.35	35.64
					1 600		39.47	41.09
					2 000		35.93	39.83
					2 500		40.80	37.03

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Dst. Center Frequency (Hz)	Dst. Limit (dB)	PN-SDNR (dB)	
							Mounting Force 2N	Mounting Force 8N
EVS-NB (NB)	Max-1 Vol.	24.4	NR	n30	3 150	20	33.28	31.83
				n38	400	20	34.35	38.64
					500		35.33	31.73
					630		40.03	40.06
					800		37.95	37.67
					1 000		36.19	36.86
					1 250		32.87	33.01
					1 600		38.38	39.56
					2 000		33.82	38.92
					2 500		36.99	36.99
					3 150		28.75	32.12
				n41	400	20	32.05	35.38
					500		35.07	31.90
					630		39.41	36.18
					800		38.23	37.42
					1 000		36.76	36.65
					1 250		32.06	32.83
					1 600		40.00	33.84
					2 000		37.70	39.96
					2 500		36.96	35.41
					3 150		34.13	29.12
				n48	400	20	36.17	39.82
					500		36.31	30.55
					630		39.16	38.78
					800		35.96	35.76
					1 000		36.66	36.38
					1 250		34.60	34.70
					1 600		38.94	30.60
					2 000		35.12	41.02
					2 500		38.06	37.57
					3 150		30.96	30.75
				n66	400	20	38.37	33.51
					500		35.02	34.68
					630		38.78	39.21
					800		39.07	37.48
					1 000		31.41	36.37
					1 250		32.39	31.93
					1 600		34.37	40.34
					2 000		39.19	39.16
					2 500		37.98	36.04
					3 150		30.97	26.77
				n70	400	20	35.00	37.55
					500		35.14	34.44
					630		36.05	38.54
					800		34.82	38.57
					1 000		34.87	37.42
					1 250		33.22	33.05
					1 600		40.21	40.09
					2 000		35.94	39.25
					2 500		35.90	36.36
					3 150		29.33	29.02

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Dst. Center Frequency (Hz)	Dst. Limit (dB)	PN-SDNR (dB)	
							Mounting Force 2N	Mounting Force 8N
EVS-NB (NB)	Max-1 Vol.	24.4	NR	n71	400	20	38.35	34.95
					500		35.33	32.05
					630		38.77	38.90
					800		38.69	37.57
					1 000		35.82	37.83
					1 250		33.21	30.56
					1 600		35.98	40.31
					2 000		34.48	34.88
					2 500		33.66	33.44
					3 150		32.03	32.43
				n77	400	20	33.72	39.07
					500		36.19	35.98
					630		39.31	39.06
					800		33.30	36.40
					1 000		37.17	36.86
					1 250		33.95	33.47
					1 600		39.57	33.88
					2 000		38.98	40.11
					2 500		35.92	36.10
					3 150		25.70	31.72
				n78	400	20	38.93	36.79
					500		29.76	34.38
					630		32.11	34.59
					800		40.23	38.93
					1 000		36.07	36.42
					1 250		32.60	32.18
					1 600		40.98	41.27
					2 000		32.44	39.97
					2 500		35.21	39.92
					3 150		32.19	29.63

3) Distortion Test Result for EVB-NB 24.4 kbps and WIFI

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Dst. Center Frequency (Hz)	Dst. Limit (dB)	PN-SDNR (dB)	
							Mounting Force 2N	Mounting Force 8N
EVS-NB (NB)	Max-1 Vol.	24.4	WIFI	802.11b 2.4 GHz	400	20	31.68	29.50
					500		29.90	26.26
					630		31.51	27.19
					800		32.88	30.49
					1 000		26.82	26.40
					1 250		24.84	31.62
					1 600		33.28	27.56
					2 000		32.45	29.54
					2 500		36.11	34.56
					3 150		33.85	33.26
				802.11g 2.4 GHz	400	20	33.54	39.90
					500		36.54	37.53
					630		39.43	41.78
					800		41.38	41.22
					1 000		27.54	40.72
					1 250		28.88	30.19
					1 600		43.15	41.95
					2 000		35.94	43.01
					2 500		36.77	38.88
					3 150		32.47	39.01
				802.11n 2.4 GHz	400	20	38.54	38.54
					500		37.48	36.09
					630		39.49	41.41
					800		40.36	41.19
					1 000		37.75	38.91
					1 250		32.46	28.68
					1 600		36.83	42.19
					2 000		39.01	42.55
					2 500		44.24	38.96
					3 150		34.90	39.48
				802.11ac 2.4 GHz	400	20	31.82	30.55
					500		31.21	24.56
					630		27.84	26.97
					800		32.82	32.98
					1 000		29.83	39.13
					1 250		23.92	32.71
					1 600		32.70	41.74
					2 000		35.04	45.10
					2 500		34.49	40.94
					3 150		30.67	35.80
				802.11ax 2.4 GHz	400	20	38.00	36.11
					500		36.59	38.06
					630		35.72	41.33
					800		40.34	39.95
					1 000		25.75	40.42
					1 250		27.11	33.08
					1 600		42.87	41.76
					2 000		42.73	42.91
					2 500		38.61	42.41

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Dst. Center Frequency (Hz)	Dst. Limit (dB)	PN-SDNR (dB)	
							Mounting Force 2N	Mounting Force 8N
EVS-NB (NB)	Max-1 Vol.	24.4	WIFI	802.11ax 2.4 GHz	3 150	20	30.69	38.67
				802.11a 5 GHz	400	20	39.22	39.65
					500		26.63	38.03
					630		27.66	41.33
					800		41.26	41.43
					1 000		31.44	40.52
					1 250		32.75	33.28
					1 600		42.83	41.85
					2 000		43.15	36.96
					2 500		45.43	40.40
					3 150		39.32	33.95
				802.11n 5 GHz	400	20	31.49	39.91
					500		36.03	25.65
					630		41.84	41.96
					800		40.61	29.80
					1 000		40.93	39.48
					1 250		33.24	32.54
					1 600		42.65	43.03
					2 000		30.92	44.24
					2 500		45.69	45.08
					3 150		39.94	35.55
				802.11ac 5 GHz	400	20	38.03	32.29
					500		37.48	25.42
					630		39.71	27.24
					800		33.15	32.05
					1 000		42.05	31.28
					1 250		33.78	32.73
					1 600		43.90	29.74
					2 000		42.60	44.03
					2 500		38.74	38.75
					3 150		34.42	36.95
				802.11ax 5 GHz	400	20	38.02	39.69
					500		36.37	36.76
					630		40.76	41.11
					800		33.61	41.18
					1 000		39.57	42.71
					1 250		30.86	31.08
					1 600		40.79	41.12
					2 000		32.72	43.40
					2 500		40.35	45.44
					3 150		35.25	38.58

4) Distortion Test Result for EVB-WB 128 kbps and LTE

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Dst. Center Frequency (Hz)	Dst. Limit (dB)	PN-SDNR (dB)	
							Mounting Force 2N	Mounting Force 8N
EVS-WB (WB)	Max-1 Vol.	128	LTE	B7	250	20	40.55	40.55
					315		41.27	41.49
					400		43.32	43.46
					500		44.27	45.56
					630		47.09	47.51
					800		46.27	47.13
					1 000		48.75	49.08
					1 250		35.97	35.98
					1 600		49.58	50.51
					2 000		50.40	50.87
					2 500		54.95	55.11
					3 150		47.11	47.03
					4 000		49.55	49.33
					5 000		53.92	55.41
				B12	250	20	39.60	40.32
					315		40.62	41.42
					400		42.84	43.21
					500		43.84	44.79
					630		45.20	46.34
					800		45.76	46.83
					1 000		47.61	48.52
					1 250		35.93	35.98
					1 600		48.18	49.14
					2 000		48.62	49.75
					2 500		51.04	52.74
					3 150		43.69	44.69
					4 000		44.73	46.02
					5 000		49.40	51.78
				B13	250	20	40.56	40.68
					315		41.38	41.44
					400		43.10	43.38
					500		44.55	45.08
					630		47.34	47.39
					800		46.16	46.94
					1 000		48.76	49.31
					1 250		36.00	35.98
					1 600		49.88	50.30
					2 000		50.40	51.23
					2 500		55.68	56.00
					3 150		46.83	46.92
					4 000		49.47	49.56
					5 000		54.84	55.93
				B14	250	20	37.81	39.50
					315		39.36	40.89
					400		41.75	42.76
					500		42.09	43.99
					630		42.76	44.80
					800		44.25	45.91
					1 000		46.35	48.05

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Dst. Center Frequency (Hz)	Dst. Limit (dB)	PN-SDNR (dB)	
							Mounting Force 2N	Mounting Force 8N
EVS-WB (WB)	Max-1 Vol.	128	LTE	B14	1 250	20	35.90	35.93
					1 600		45.82	48.58
					2 000		47.32	49.06
					2 500		49.96	51.58
					3 150		42.11	43.50
					4 000		42.02	43.40
					5 000		46.39	49.16
				B25	250	20	40.43	40.72
					315		41.16	41.32
					400		43.16	43.14
					500		44.92	44.97
					630		47.16	46.32
					800		46.69	47.01
					1 000		48.47	48.87
					1 250		35.95	36.02
					1 600		49.74	49.87
					2 000		50.70	36.67
					2 500		55.52	54.91
					3 150		47.65	46.56
					4 000		49.43	48.53
					5 000		54.10	54.91
				B26	250	20	38.59	39.47
					315		40.28	41.11
					400		42.55	43.20
					500		43.36	42.20
					630		44.39	45.09
					800		45.30	46.17
					1 000		46.79	47.69
					1 250		35.93	35.91
					1 600		47.16	48.38
					2 000		47.73	48.55
					2 500		50.36	50.88
					3 150		42.94	43.32
					4 000		42.96	42.98
					5 000		47.71	48.79
				B30	250	20	37.93	39.27
					315		39.85	40.83
					400		41.65	42.73
					500		42.90	44.32
					630		43.46	45.48
					800		45.15	46.81
					1 000		46.76	48.13
					1 250		35.87	35.93
					1 600		46.59	48.26
					2 000		47.34	48.81
					2 500		50.41	50.92
					3 150		42.29	42.82
					4 000		42.22	43.72
					5 000		46.91	48.23
				B41	250	20	41.08	41.11
					315		42.13	41.98

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Dst. Center Frequency (Hz)	Dst. Limit (dB)	PN-SDNR (dB)	
							Mounting Force 2N	Mounting Force 8N
EVS-WB (WB)	Max-1 Vol.	128	LTE	B41	400	20	44.11	43.89
					500		45.47	45.35
					630		47.91	47.83
					800		46.89	46.61
					1 000		49.14	49.03
					1 250		35.92	35.92
					1 600		50.12	50.96
					2 000		51.56	51.47
					2 500		55.53	55.37
					3 150		47.27	46.77
					4 000		50.12	49.56
					5 000		55.03	55.89
				B48	250	20	41.18	41.07
					315		41.86	41.87
					400		43.81	43.81
					500		45.48	45.83
					630		48.19	48.22
					800		47.05	47.96
					1 000		48.91	49.32
					1 250		35.93	36.02
					1 600		50.17	51.02
					2 000		51.07	51.15
					2 500		55.97	54.98
					3 150		47.38	45.96
					4 000		49.54	48.16
					5 000		54.03	53.36
				B66	250	20	41.05	41.32
					315		41.61	41.85
					400		43.53	43.90
					500		45.08	45.60
					630		47.65	47.97
					800		46.25	47.07
					1 000		48.64	49.23
					1 250		36.01	36.03
					1 600		50.41	50.84
					2 000		50.70	50.92
					2 500		55.79	55.37
					3 150		46.25	46.96
					4 000		49.16	49.30
					5 000		53.90	55.36
				B71	250	20	38.84	40.37
					315		40.01	41.44
					400		42.23	43.43
					500		43.38	44.97
					630		44.67	46.30
					800		45.42	47.11
					1 000		47.14	48.45
					1 250		35.84	35.82
					1 600		47.57	49.37
					2 000		48.42	50.00
					2 500		51.27	53.13

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Dst. Center Frequency (Hz)	Dst. Limit (dB)	PN-SDNR (dB)	
							Mounting Force 2N	Mounting Force 8N
EVS-WB (WB)	Max-1 Vol.	128	LTE	B71	3 150	20	43.51	44.84
					4 000		44.58	46.38
					5 000		48.99	52.51

5) Distortion Test Result for EVB-WB 128 kbps and NR

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Dst. Center Frequency (Hz)	Dst. Limit (dB)	PN-SDNR (dB)	
							Mounting Force 2N	Mounting Force 8N
EVS-WB (WB)	Max-1 Vol.	128	NR	n7	250	20	32.02	28.38
					315		35.09	34.06
					400		37.24	36.74
					500		37.44	35.65
					630		36.95	36.73
					800		40.11	39.94
					1 000		31.41	41.50
					1 250		41.87	42.22
					1 600		40.63	41.31
					2 000		40.87	44.31
					2 500		44.40	40.31
					3 150		36.44	32.89
					4 000		35.34	34.50
					5 000		40.04	40.32
				n12	250	20	31.99	31.03
					315		34.99	33.88
					400		37.14	36.50
					500		37.87	35.79
					630		34.18	36.97
					800		39.61	39.75
					1 000		43.03	43.35
					1 250		42.16	41.90
					1 600		39.54	40.99
					2 000		43.45	39.95
					2 500		44.23	43.87
					3 150		36.56	35.68
					4 000		35.36	34.15
					5 000		40.24	39.96
				n25	250	20	24.20	27.54
					315		29.61	27.91
					400		32.07	30.67
					500		30.65	31.91
					630		32.68	30.90
					800		34.08	34.13
					1 000		34.50	37.50
					1 250		39.07	30.88
					1 600		30.55	35.16
					2 000		36.81	37.31
					2 500		39.43	36.79
					3 150		30.04	28.99
					4 000		30.92	28.11
					5 000		37.03	34.79
				n26	250	20	28.30	32.90
					315		33.73	35.46
					400		36.02	35.22
					500		34.23	37.71
					630		36.46	37.71
					800		39.37	36.32
					1 000		39.20	42.80

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Dst. Center Frequency (Hz)	Dst. Limit (dB)	PN-SDNR (dB)	
							Mounting Force 2N	Mounting Force 8N
EVS-WB (WB)	Max-1 Vol.	128	NR	n26	1 250	20	37.24	40.88
					1 600		40.94	29.63
					2 000		44.08	43.41
					2 500		43.11	43.07
					3 150		36.29	31.18
					4 000		34.80	34.26
					5 000		39.99	39.59
				n30	250	20	28.25	28.57
					315		33.69	33.92
					400		36.10	30.52
					500		34.98	35.08
					630		36.65	36.65
					800		39.58	32.61
					1 000		35.31	40.26
					1 250		40.40	41.65
					1 600		40.42	41.11
					2 000		34.30	37.54
					2 500		43.45	43.46
					3 150		36.45	35.26
					4 000		34.08	33.84
					5 000		40.25	40.16
				n38	250	20	25.62	29.77
					315		30.53	32.74
					400		33.04	32.55
					500		32.80	34.12
					630		32.99	33.17
					800		36.17	34.14
					1 000		37.90	40.14
					1 250		35.65	34.78
					1 600		36.10	37.71
					2 000		38.90	39.85
					2 500		40.42	37.59
					3 150		32.47	31.29
					4 000		32.14	30.87
					5 000		37.02	36.94
				n41	250	20	26.58	26.19
					315		32.02	30.91
					400		34.38	32.68
					500		33.73	31.40
					630		34.75	33.67
					800		37.93	37.09
					1 000		38.49	34.85
					1 250		40.81	39.66
					1 600		35.10	38.16
					2 000		40.48	36.76
					2 500		42.15	40.53
					3 150		32.51	32.19
					4 000		33.25	31.37
					5 000		38.01	37.39
				n48	250	20	28.04	32.18
					315		33.80	33.55

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Dst. Center Frequency (Hz)	Dst. Limit (dB)	PN-SDNR (dB)	
							Mounting Force 2N	Mounting Force 8N
EVS-WB (WB)	Max-1 Vol.	128	NR	n48	400	20	36.11	36.24
					500		34.72	34.83
					630		36.45	36.23
					800		39.39	39.28
					1 000		39.59	40.12
					1 250		41.94	42.01
					1 600		40.73	40.85
					2 000		41.87	42.39
					2 500		44.29	42.75
					3 150		33.78	33.18
					4 000		35.39	33.70
					5 000		40.07	40.09
				n66	250	20	25.57	25.74
					315		30.63	30.75
					400		33.17	32.64
					500		32.86	33.61
					630		33.54	31.81
					800		36.84	35.33
					1 000		38.65	38.61
					1 250		39.41	39.30
					1 600		35.19	37.74
					2 000		39.81	36.69
					2 500		40.42	39.26
					3 150		31.17	31.71
					4 000		31.92	31.10
					5 000		37.03	36.78
				n70	250	20	25.73	25.70
					315		30.18	30.78
					400		31.81	29.08
					500		33.31	32.61
					630		33.32	33.51
					800		36.41	31.33
					1 000		39.67	37.98
					1 250		33.04	39.59
					1 600		36.75	32.81
					2 000		39.71	39.39
					2 500		40.82	39.82
					3 150		33.22	30.55
					4 000		32.43	31.21
					5 000		37.44	37.26
				n71	250	20	26.42	29.98
					315		30.15	31.12
					400		32.18	33.84
					500		33.63	33.35
					630		33.58	33.99
					800		36.79	37.26
					1 000		39.30	40.98
					1 250		35.96	40.06
					1 600		36.67	38.61
					2 000		39.47	40.42
					2 500		40.71	39.43

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Dst. Center Frequency (Hz)	Dst. Limit (dB)	PN-SDNR (dB)	
							Mounting Force 2N	Mounting Force 8N
EVS-WB (WB)	Max-1 Vol.	128	NR	n71	3 150	20	33.00	32.10
					4 000		32.50	31.33
					5 000		37.66	37.10
				n77	250	20	30.67	26.45
					315		31.15	31.64
					400		34.34	27.31
					500		33.72	33.70
					630		34.27	34.32
					800		37.67	32.58
					1 000		39.55	39.81
					1 250		40.44	40.21
					1 600		38.63	34.89
					2 000		40.56	40.80
					2 500		41.16	33.63
					3 150		33.82	32.13
					4 000		33.33	31.93
					5 000		38.00	38.28
				n78	250	20	27.64	31.67
					315		33.45	32.85
					400		36.01	34.76
					500		35.25	36.46
					630		36.41	36.81
					800		39.38	35.92
					1 000		40.96	42.57
					1 250		41.81	42.09
					1 600		40.61	33.41
					2 000		42.48	43.98
					2 500		43.72	43.12
					3 150		33.24	34.99
					4 000		34.76	33.86
					5 000		40.06	40.55

6) Distortion Test Result for EVB-WB 128 kbps and WIFI

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Dst. Center Frequency (Hz)	Dst. Limit (dB)	PN-SDNR (dB)	
							Mounting Force 2N	Mounting Force 8N
EVS-WB (WB)	Max-1 Vol.	128	WIFI	802.11b 2.4 GHz	250	20	38.69	37.98
					315		39.87	40.50
					400		37.32	42.49
					500		42.78	43.15
					630		40.79	35.72
					800		43.89	39.18
					1 000		36.63	47.33
					1 250		35.68	32.87
					1 600		39.67	34.24
					2 000		38.44	49.23
					2 500		36.51	51.80
					3 150		43.11	36.02
					4 000		35.90	44.19
					5 000		46.75	43.99
				802.11g 2.4 GHz	250	20	38.98	40.52
					315		41.16	41.84
					400		43.01	43.62
					500		44.19	44.95
					630		43.63	45.41
					800		46.02	46.49
					1 000		48.07	48.01
					1 250		35.60	35.89
					1 600		48.59	49.58
					2 000		49.25	49.63
					2 500		53.14	52.26
					3 150		44.06	35.73
					4 000		45.90	45.95
					5 000		50.96	51.73
				802.11n 2.4 GHz	250	20	38.29	40.31
					315		40.21	41.80
					400		42.08	43.57
					500		43.06	44.82
					630		44.65	46.48
					800		45.09	47.10
					1 000		47.40	48.84
					1 250		35.89	35.65
					1 600		47.75	49.28
					2 000		48.84	50.45
					2 500		52.53	52.80
					3 150		43.64	44.31
					4 000		45.84	32.75
					5 000		49.96	52.68
				802.11ac 2.4 GHz	250	20	35.29	36.56
					315		39.02	37.36
					400		35.21	40.17
					500		43.86	39.21
					630		40.24	30.15
					800		40.45	38.62
					1 000		47.69	37.04

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Dst. Center Frequency (Hz)	Dst. Limit (dB)	PN-SDNR (dB)	
							Mounting Force 2N	Mounting Force 8N
EVS-WB (WB)	Max-1 Vol.	128	WIFI	802.11ac 2.4 GHz	1 250	20	35.89	23.30
					1 600		31.83	33.94
					2 000		44.29	30.88
					2 500		35.39	33.22
					3 150		44.63	38.35
					4 000		46.11	31.61
					5 000		48.17	45.65
				802.11ax 2.4 GHz	250	20	31.43	31.99
					315		32.73	32.58
					400		31.89	38.11
					500		36.92	31.72
					630		28.46	32.21
					800		32.42	35.45
					1 000		29.06	30.92
					1 250		25.34	24.68
					1 600		29.53	28.69
					2 000		30.00	35.78
					2 500		36.35	33.69
					3 150		31.50	29.49
					4 000		34.93	37.30
					5 000		42.89	41.89
				802.11a 5 GHz	250	20	40.31	41.33
					315		41.46	42.26
					400		42.48	44.16
					500		45.69	45.62
					630		48.64	47.79
					800		47.99	47.09
					1 000		48.36	49.03
					1 250		35.73	35.70
					1 600		52.45	50.98
					2 000		52.70	51.23
					2 500		57.11	55.41
					3 150		47.87	46.64
					4 000		52.10	49.82
					5 000		56.04	55.19
				802.11n 5 GHz	250	20	40.33	40.71
					315		41.96	41.79
					400		43.69	43.68
					500		45.20	45.28
					630		47.45	47.57
					800		46.52	46.48
					1 000		48.84	48.87
					1 250		35.78	35.80
					1 600		50.75	50.77
					2 000		50.92	51.58
					2 500		56.07	55.28
					3 150		46.93	45.50
					4 000		49.83	49.32
					5 000		54.87	55.44
				802.11ac 5 GHz	250	20	40.22	40.25
					315		41.15	41.54

Codec	Volume Control Level	Codec Bitrate (kbps)	Air Interface	Band of operation	Dst. Center Frequency (Hz)	Dst. Limit (dB)	PN-SDNR (dB)	
							Mounting Force 2N	Mounting Force 8N
EVS-WB (WB)	Max-1 Vol.	128	WIFI	802.11ac 5 GHz	400	20	37.07	41.69
					500		45.38	45.69
					630		48.60	49.03
					800		44.62	48.33
					1 000		48.76	48.86
					1 250		35.70	35.89
					1 600		53.31	53.56
					2 000		53.52	53.85
					2 500		57.34	56.75
					3 150		48.41	48.35
					4 000		52.11	51.97
					5 000		56.24	57.16
				802.11ax 5 GHz	250	20	40.34	40.85
					315		41.39	41.73
					400		43.38	42.63
					500		42.24	46.24
					630		48.66	49.34
					800		47.88	48.41
					1 000		48.71	49.02
					1 250		36.00	35.97
					1 600		52.86	53.08
					2 000		52.63	52.92
					2 500		57.07	55.91
					3 150		46.65	46.42
					4 000		52.14	52.01
					5 000		56.96	57.35

7.3 Receive Acoustic Frequency Response Performance

7.3.1 Test Limit

For the volume control settings determined with a mounting force of 8N and 2N, the receive frequency response shall be measured at the DRP in 1/12 octave bands. After translation to the FF or DF, it shall fall between the applicable upper and lower limits.

The exact limit value at any 1/12 octave band center frequency falling between two consecutive points specified in the table may be caluated using the formula follow:

$$X_f = X_1 + (X_2 - X_1) * \left(\frac{\log_{10} f - \log_{10} f_1}{\log_{10} f_2 - \log_{10} f_1}\right)$$

Where

$X_f = \text{limit value at frequency } f$

$X_1 = \text{limit value at frequency } f_1 \text{ as given in table}$

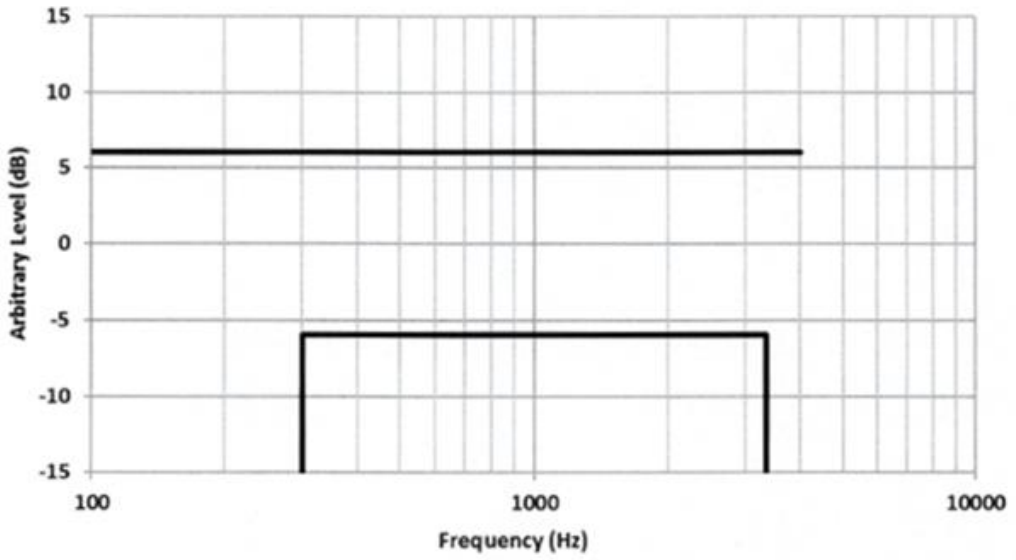
$X_2 = \text{limit value at frequency } f_2 \text{ as given in table}$

The results for each 1/12 octave band measurement are to be evaluated against the upper and lower limit values only at the center frequency point for that band (i.e., not the entire width of the band). For graphical purposes, the individual 1/12 octave band measurement results are plotted as points on a linear dB scale (y-axis) versus the band's center frequency on a logarithmic frequency scale (x-axis). The frequency response limits are floating or ˜best fit" (i.e., the maximum and minimum deviations from the upper and lower limits should be equidistant from those limits).

* According to waiver DA23-914, Frequency Response test is only performed for EVS-NB 24.4 kbps and EVS-WB 128 kbps.

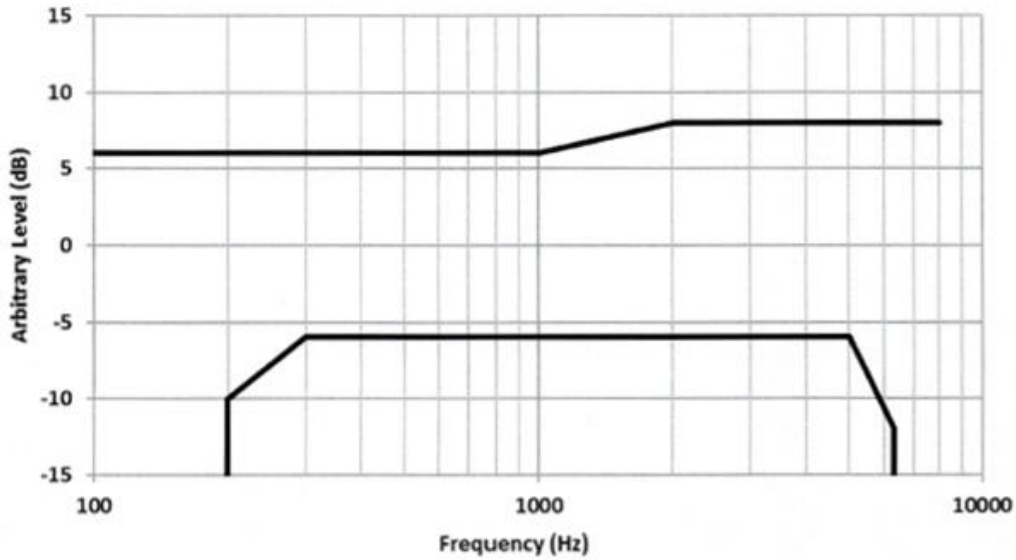
1) Narrowband Receive Frequency Response Limits

Lower Limit Frequency (Hz)	Lower Limit (dB)	Upper Limit Frequency (Hz)	Upper Limit (dB)
300	-6	100	+6
3 400	-6	4 000	+6



2) Wideband Receive Frequency Response Limits

Lower Limit Frequency (Hz)	Lower Limit (dB)	Upper Limit Frequency (Hz)	Upper Limit (dB)
200	-10	100	+6
300	-6	1 000	+6
5 000	-6	2 000	+8
6 300	-12	8 000	+8

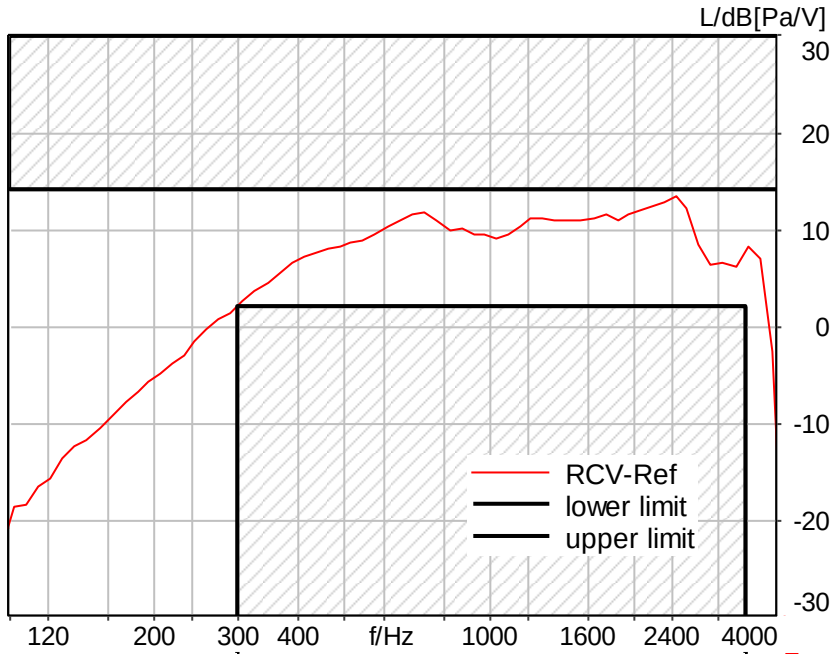
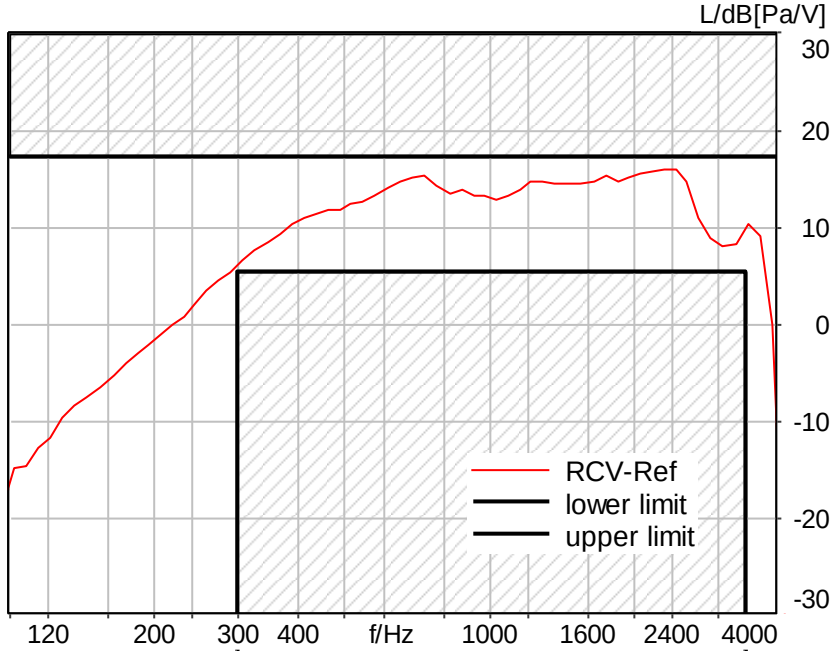


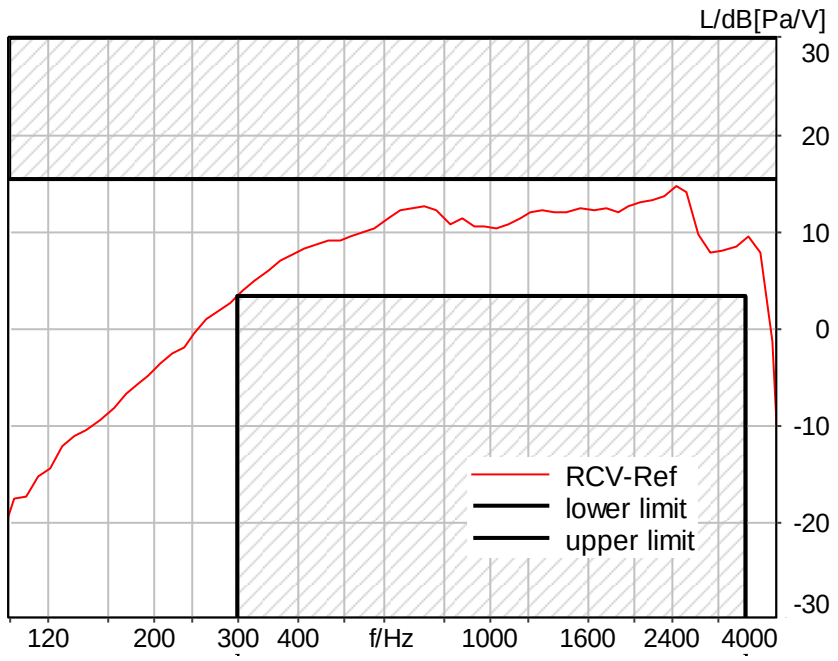
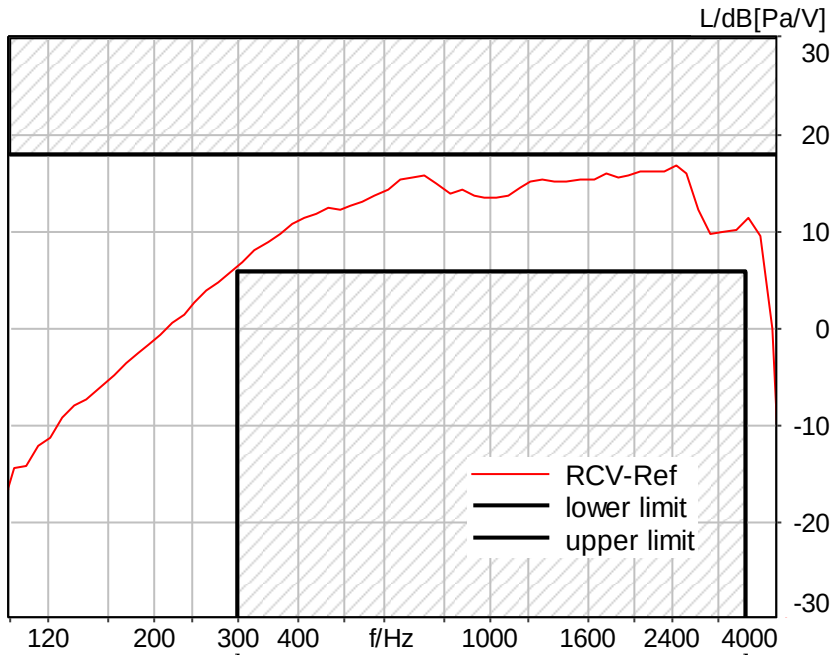
7.3.2 Test Procedure

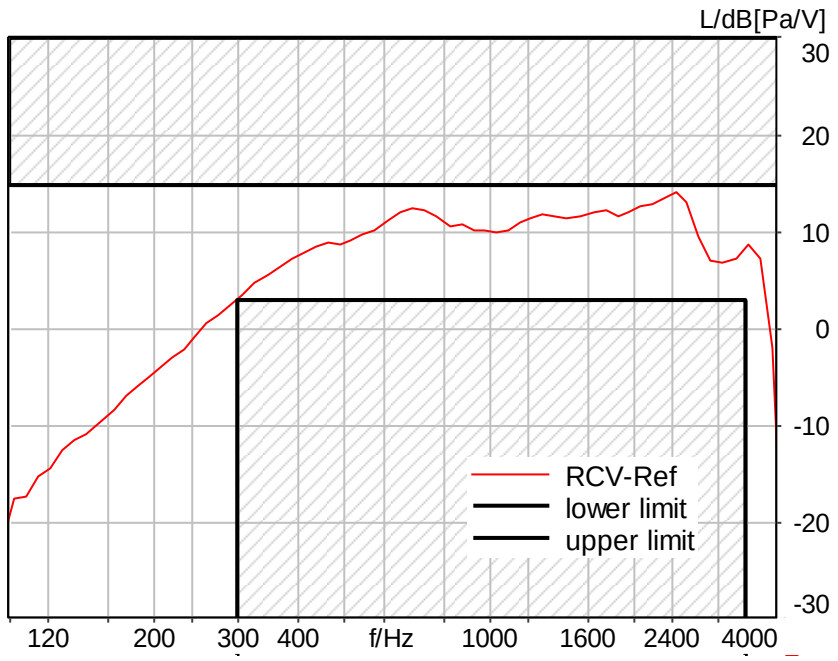
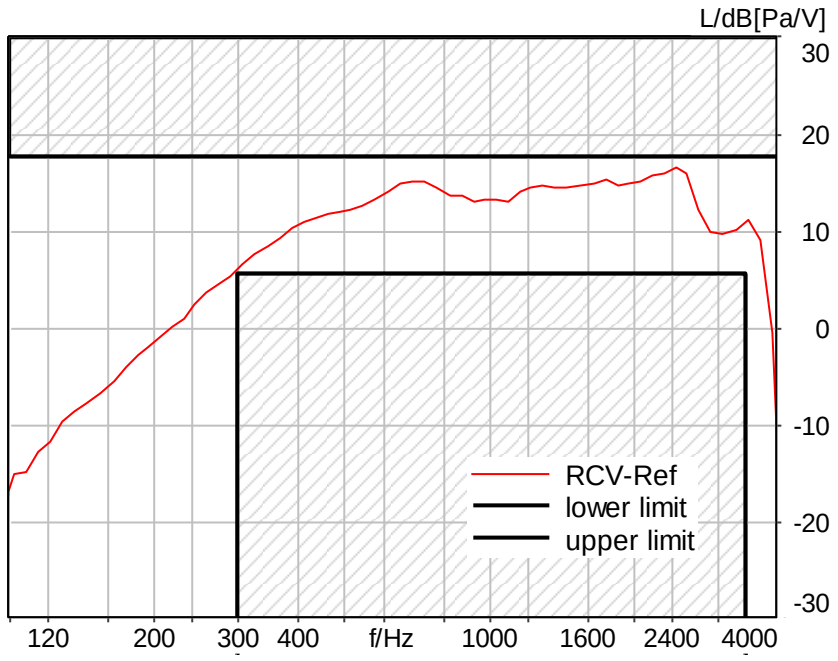
1) Configure the DUT with mounting force of 8N and test equipment as shown in Figure 1 in an active call state with the applicable codec for the transmission mode under test with the volume control setting.
2) If the DUT has an adjustable tone control feature the initial measurement is to be performed with the default tone control setting.
3) Apply the real speech test signal with a level of -20 dBm0 at the RETP.
4) Capture the frequency spectrum at the DRP of the HATS using real-time analysis with 1/12 octave bands over the frequency range from 100 Hz to 4000 Hz for narrowband measurements, or over the frequency range from 100 Hz to 8000 Hz for wideband measurements, averaged over the entire duration of the test signal.
5) Transform the DRP frequency spectrum measurement to the FF or DF.
6) Divide the 1/12 octave measurement data by the 1/12 octave frequency spectrum of the test signal at the RETP and present the measurement in terms of dB (Pa/V).
7) Apply the applicable frequency response limits to determine compliance.
8) If the default tone control setting does not meet the requirement, repeat the above steps for other tone control settings to determine a tone control setting that meets the requirements.
9) Repeat with a Mounting force of 2N.

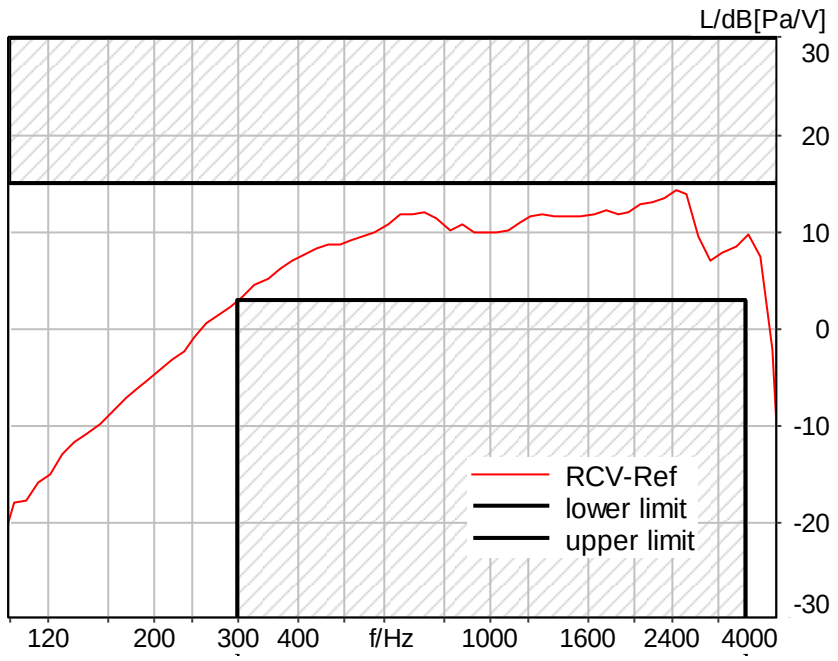
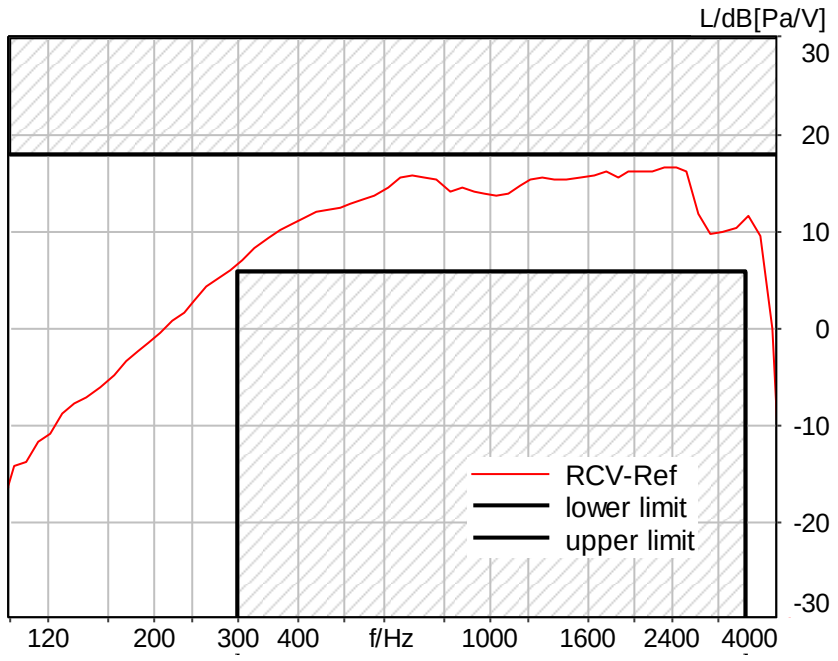
7.3.3 Test Result

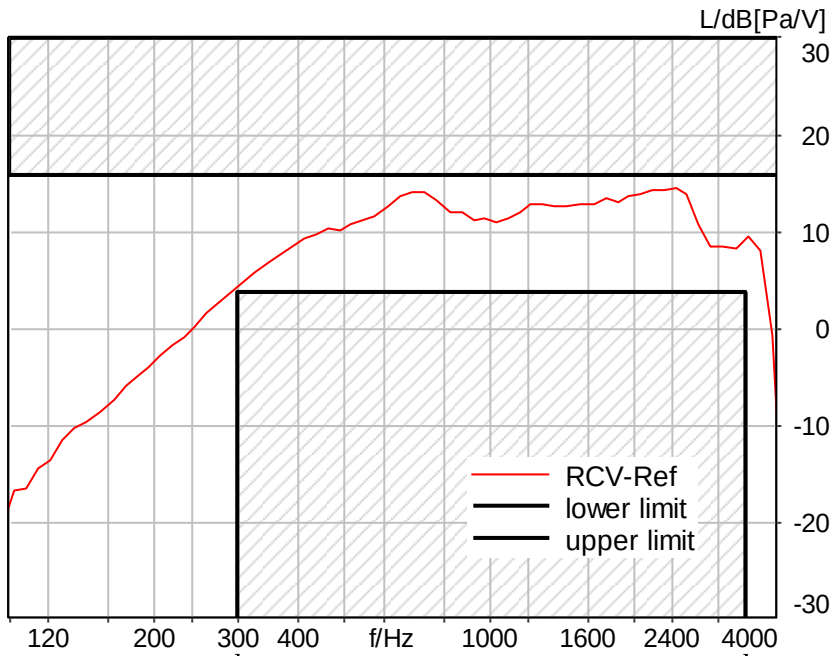
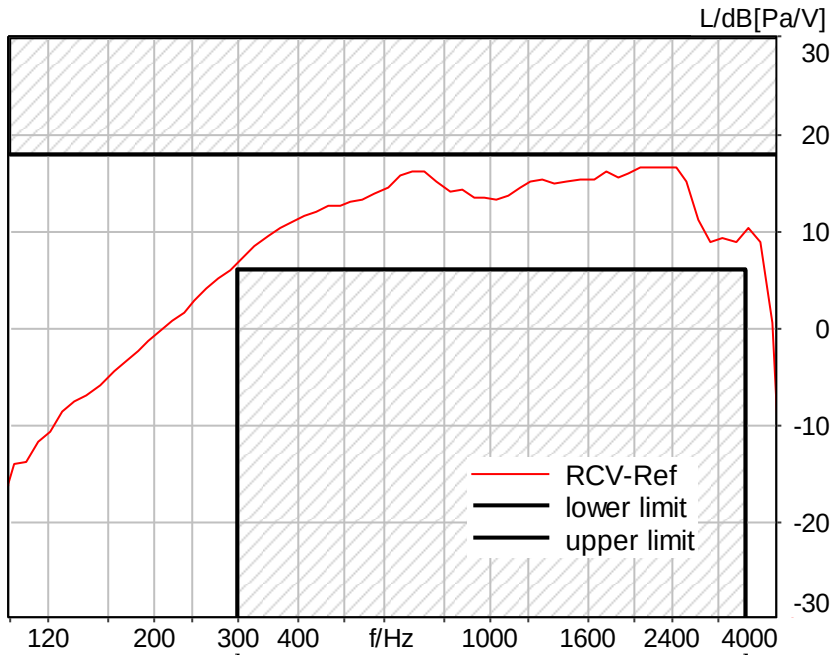
1) Frequency Response Graph for EVS-NB 24.4 kbps and LTE (Volume Control: Max-1 Vol.)

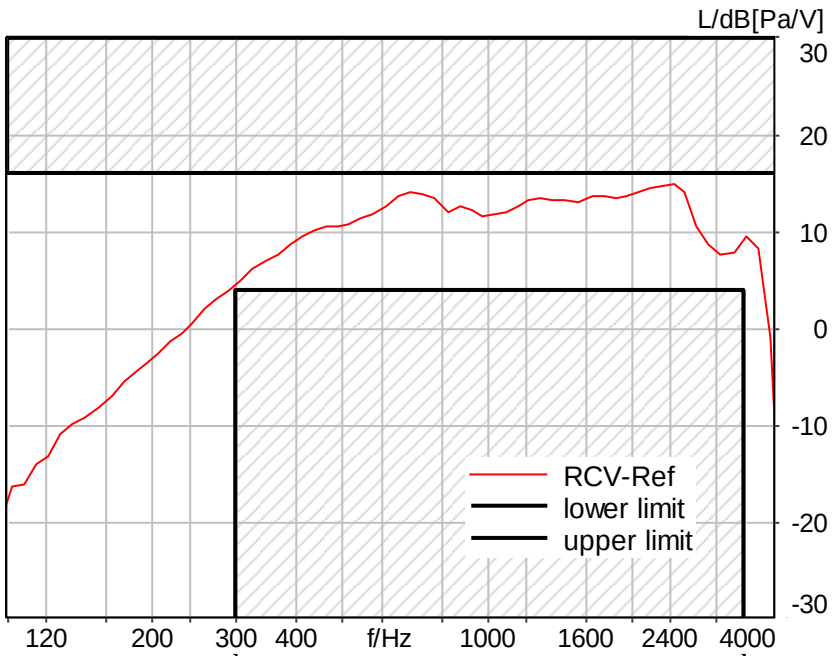
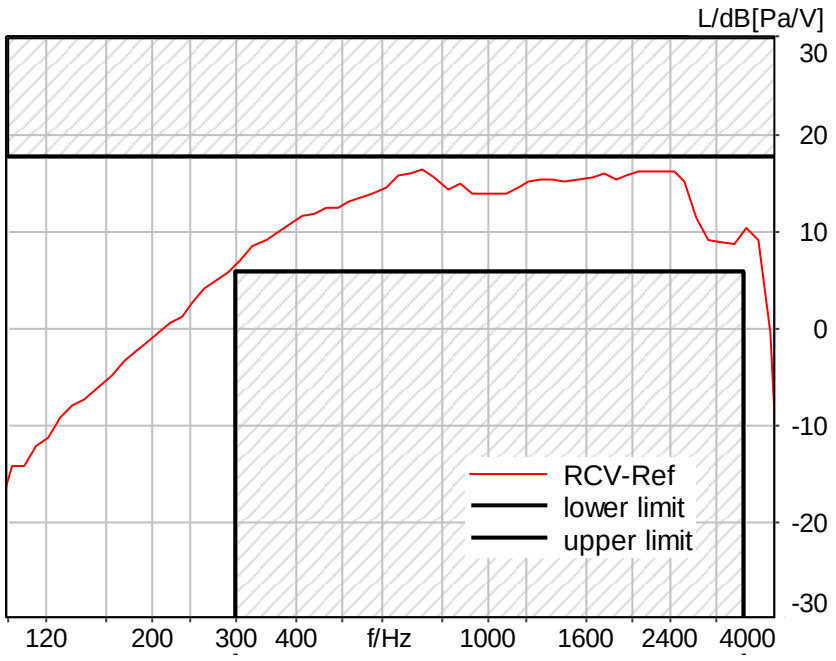
Band	Mount. Force (N)	LRP	Frequency Response
B7	2	FF	 Absolute minimal distance 0.58 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 1.33 dB at 2432.3 Hz Ok

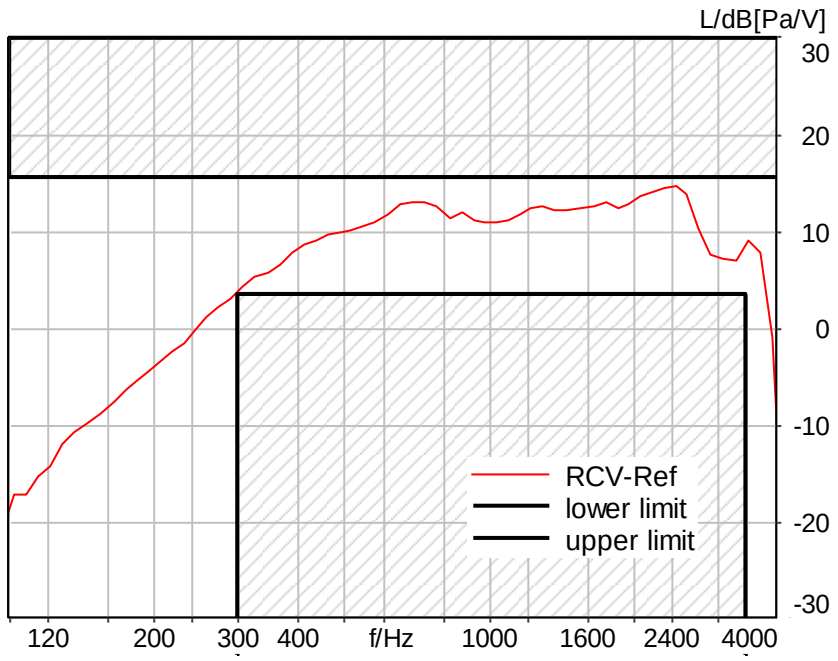
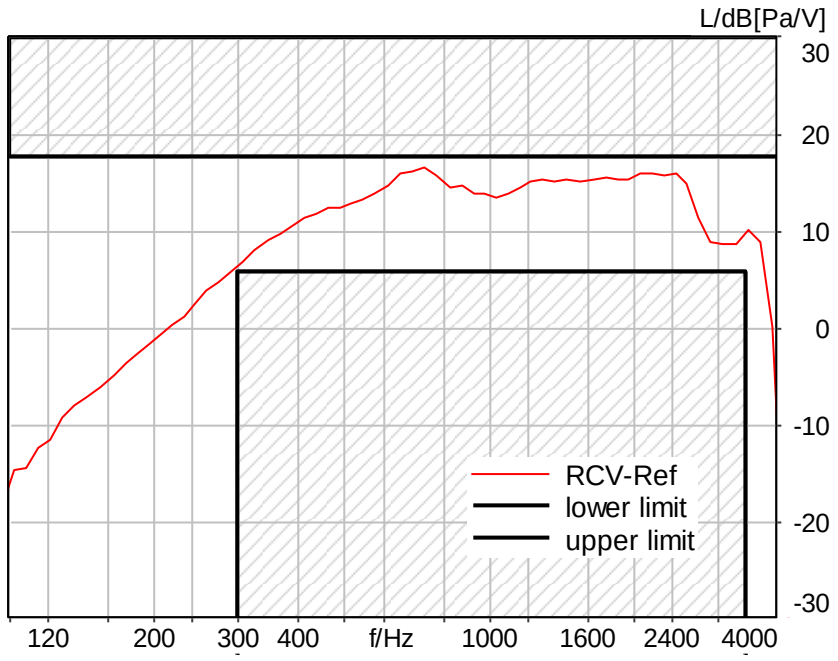
Band	Mount. Force (N)	LRP	Frequency Response
B12	2	FF	 Absolute minimal distance 0.53 dB at 305.9 Hz Ok
	8	FF	 Absolute minimal distance 1.03 dB at 2432.3 Hz Ok

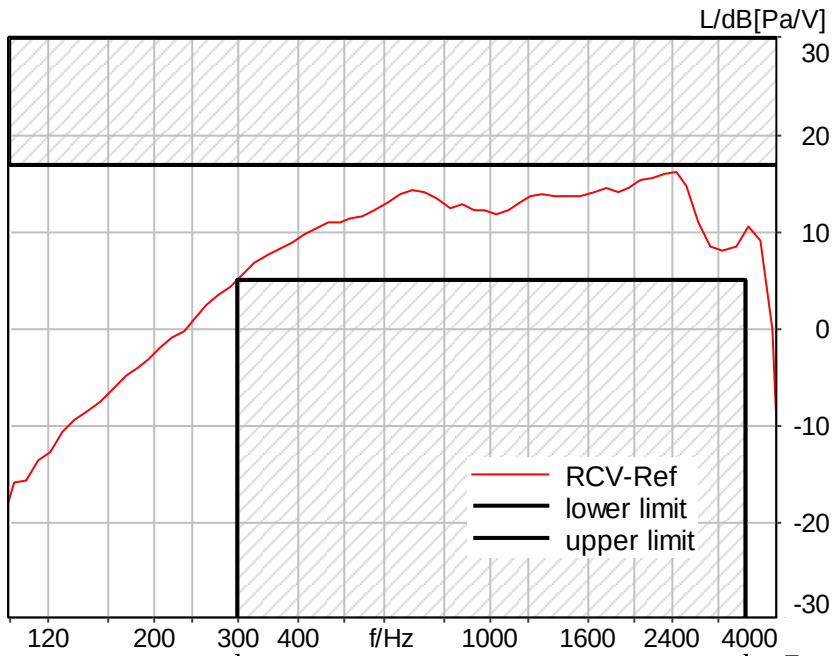
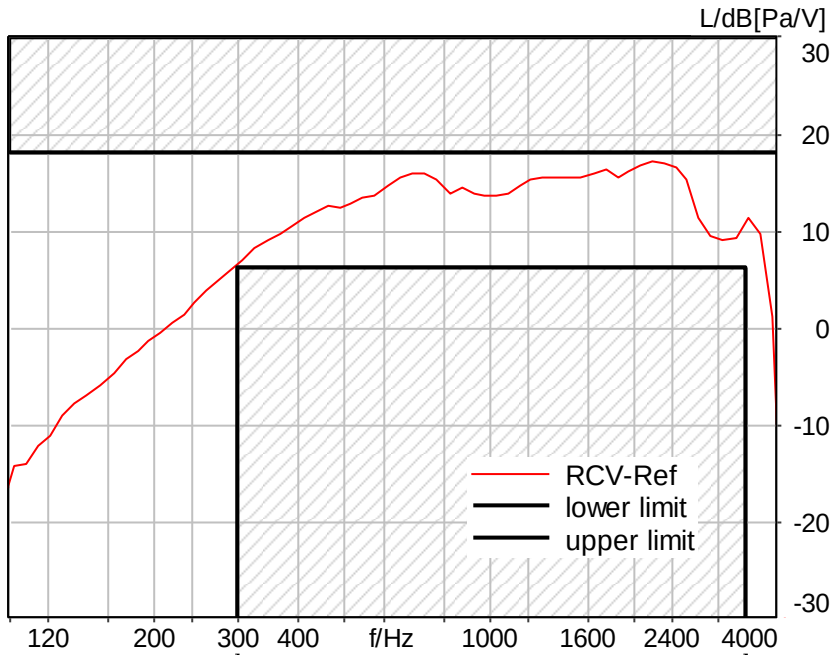
Band	Mount. Force (N)	LRP	Frequency Response
B13	2	FF	 Absolute minimal distance 0.73 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 1.03 dB at 2432.3 Hz Ok

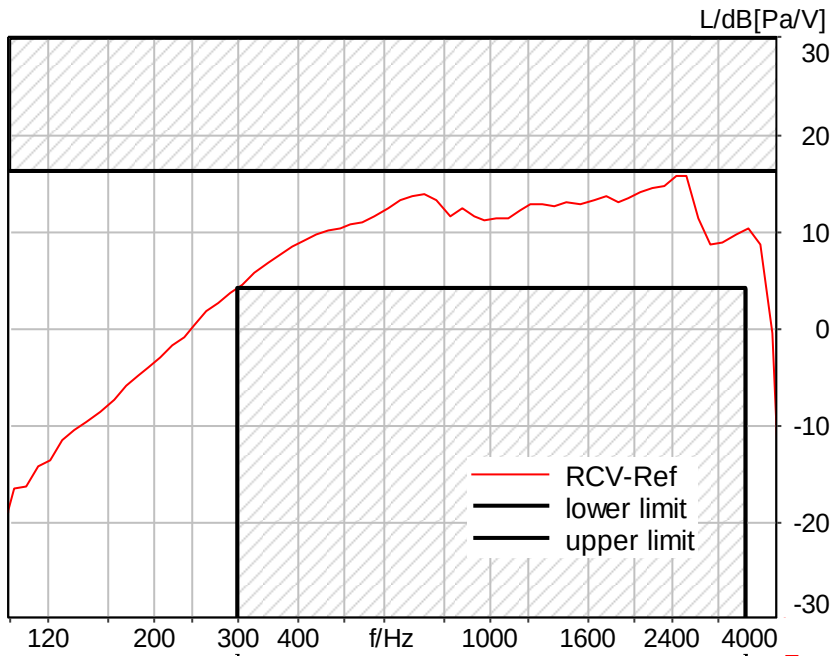
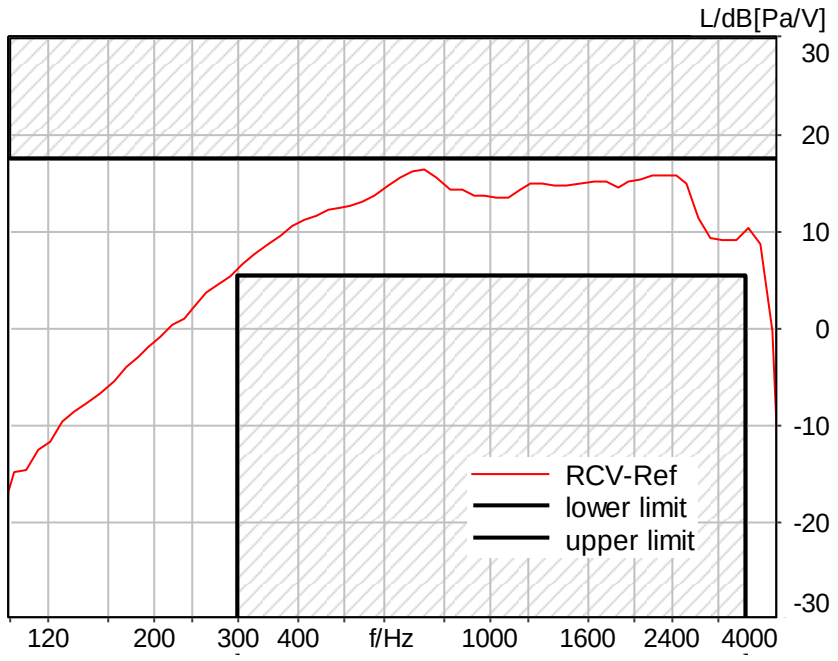
Band	Mount. Force (N)	LRP	Frequency Response
B14	2	FF	 Absolute minimal distance 0.50 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 1.20 dB at 2432.3 Hz Ok

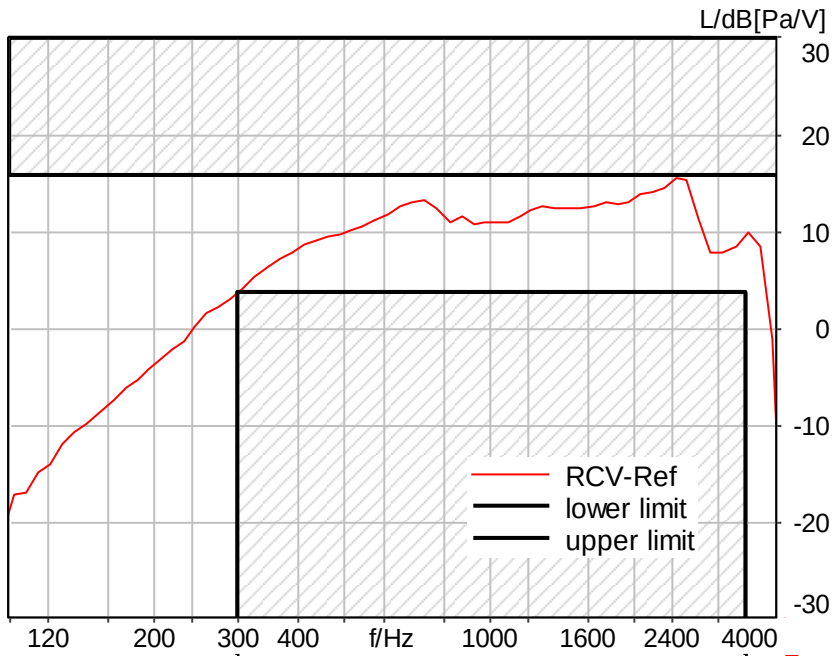
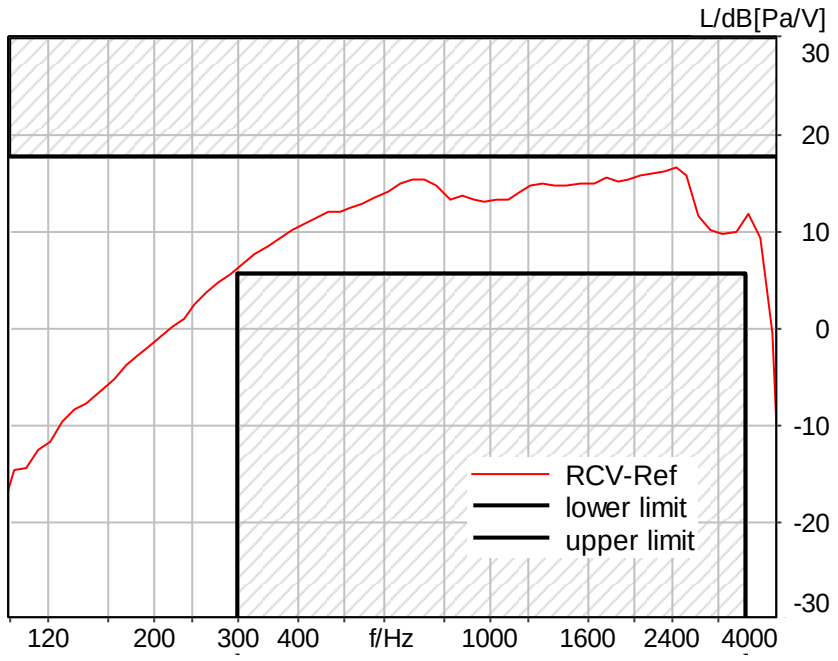
Band	Mount. Force (N)	LRP	Frequency Response
B25	2	FF	 Absolute minimal distance 1.04 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 1.27 dB at 2432.3 Hz Ok

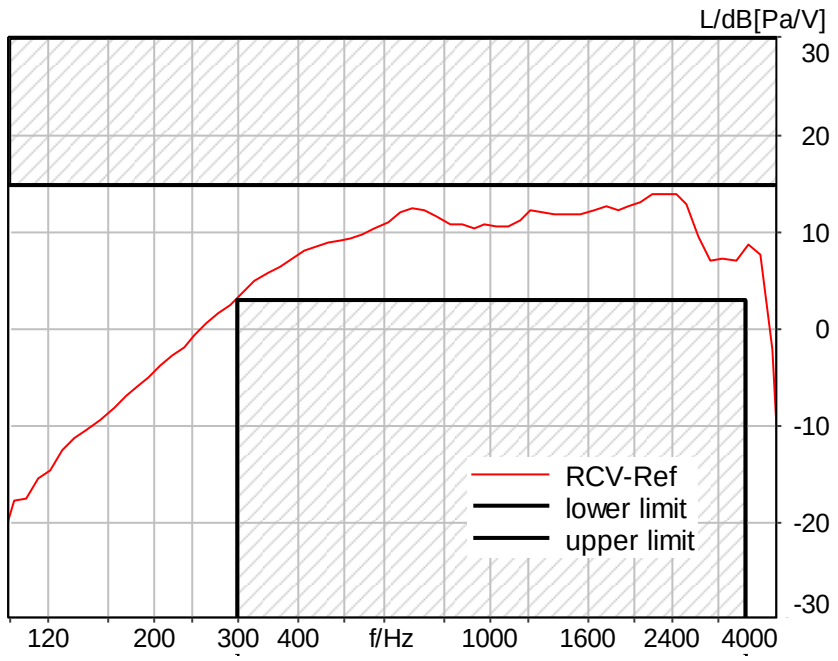
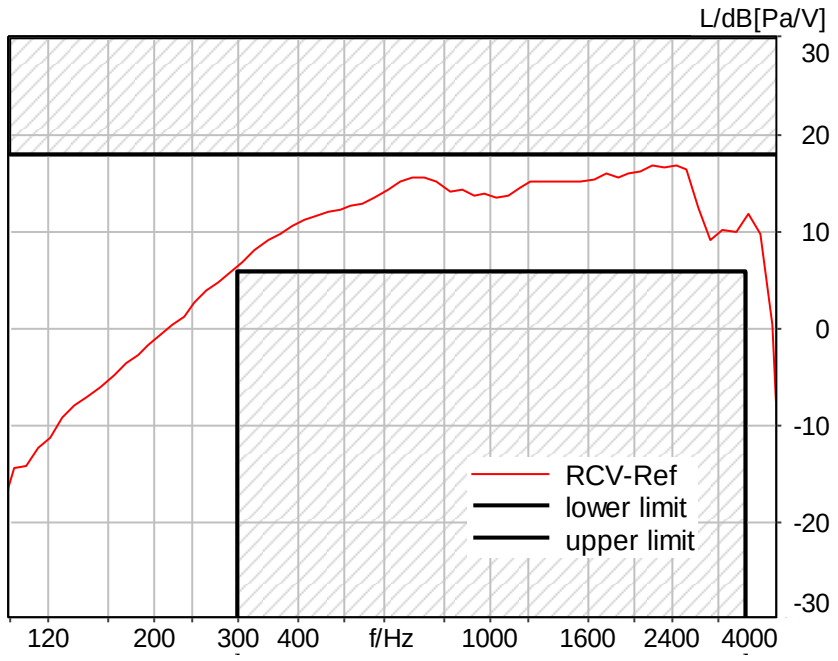
Band	Mount. Force (N)	LRP	Frequency Response
B26	2	FF	 Absolute minimal distance 1.05 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 1.42 dB at 731.5 Hz Ok

Band	Mount. Force (N)	LRP	Frequency Response
B30	2	FF	 Absolute minimal distance 0.73 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 1.21 dB at 305.9 Hz Ok

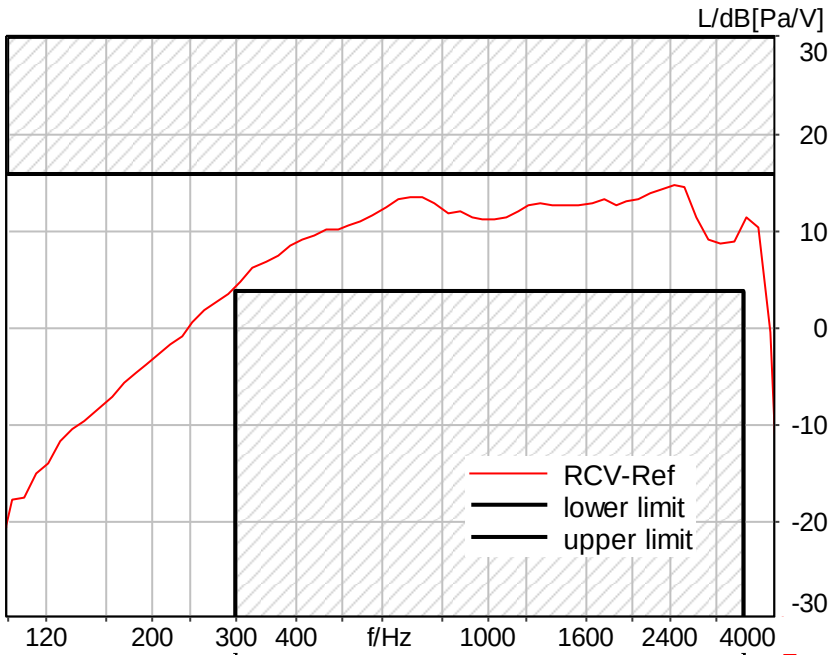
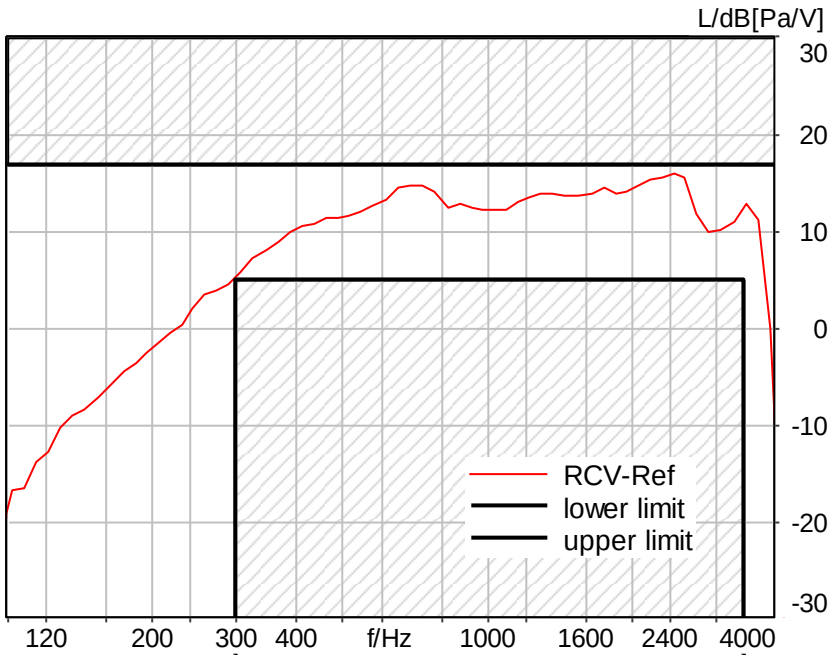
Band	Mount. Force (N)	LRP	Frequency Response
B41	2	FF	 Absolute minimal distance 0.69 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.96 dB at 2177.4 Hz Ok

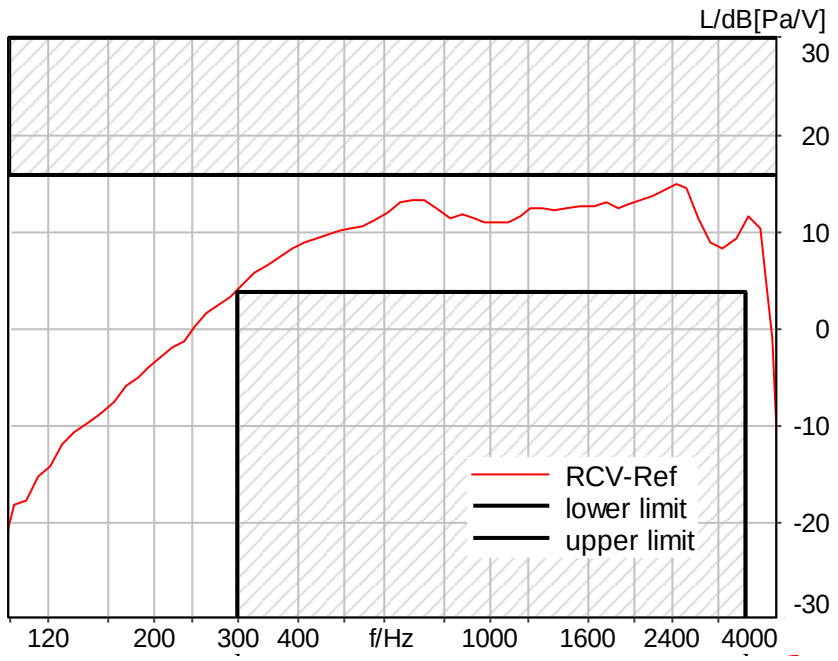
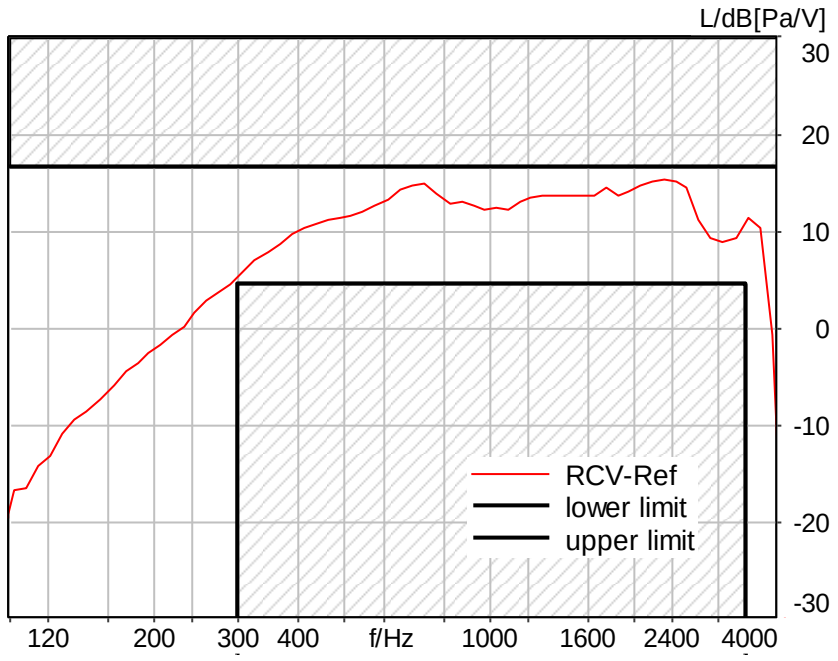
Band	Mount. Force (N)	LRP	Frequency Response
B48	2	FF	 Absolute minimal distance 0.40 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 1.06 dB at 731.5 Hz Ok

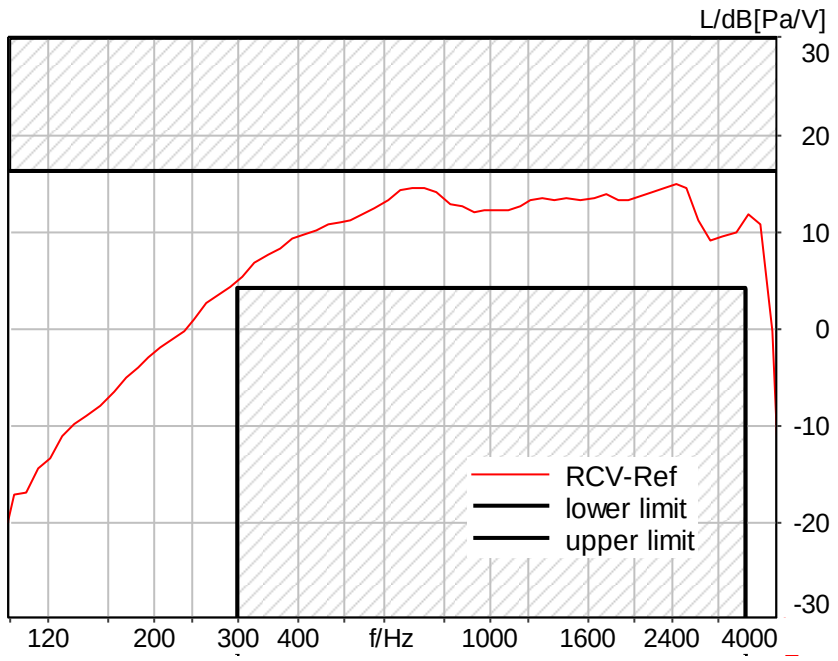
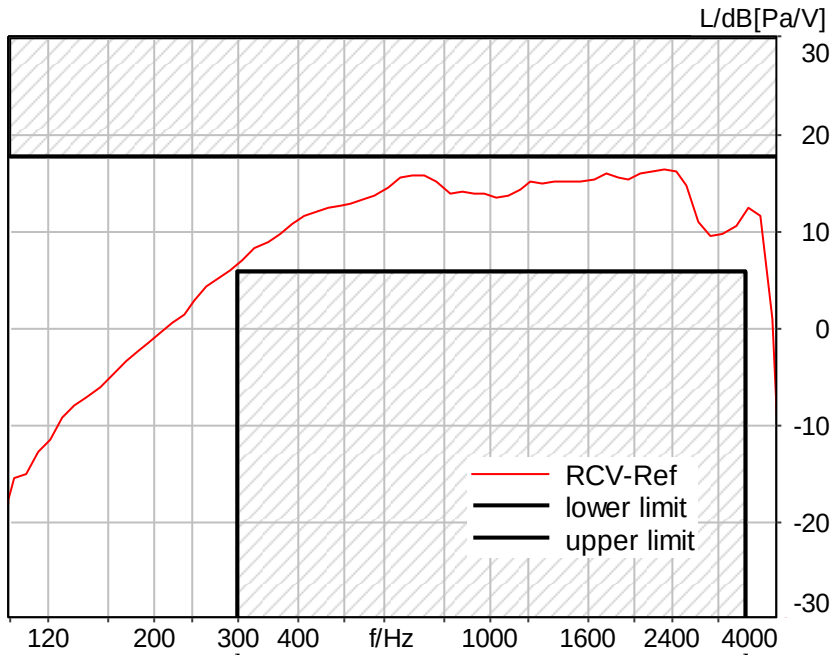
Band	Mount. Force (N)	LRP	Frequency Response
B66	2	FF	 Absolute minimal distance 0.34 dB at 305.9 Hz Ok
	8	FF	 Absolute minimal distance 1.06 dB at 2432.3 Hz Ok

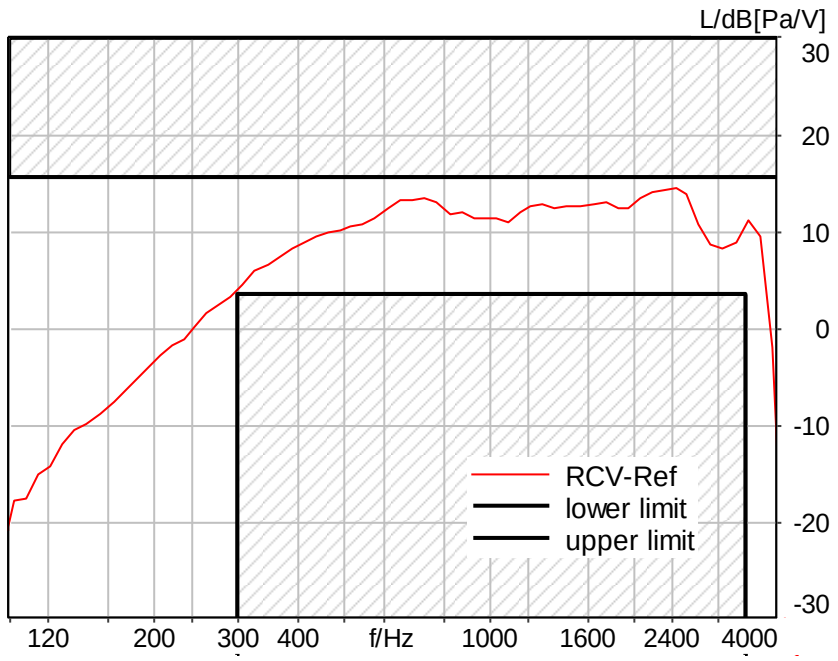
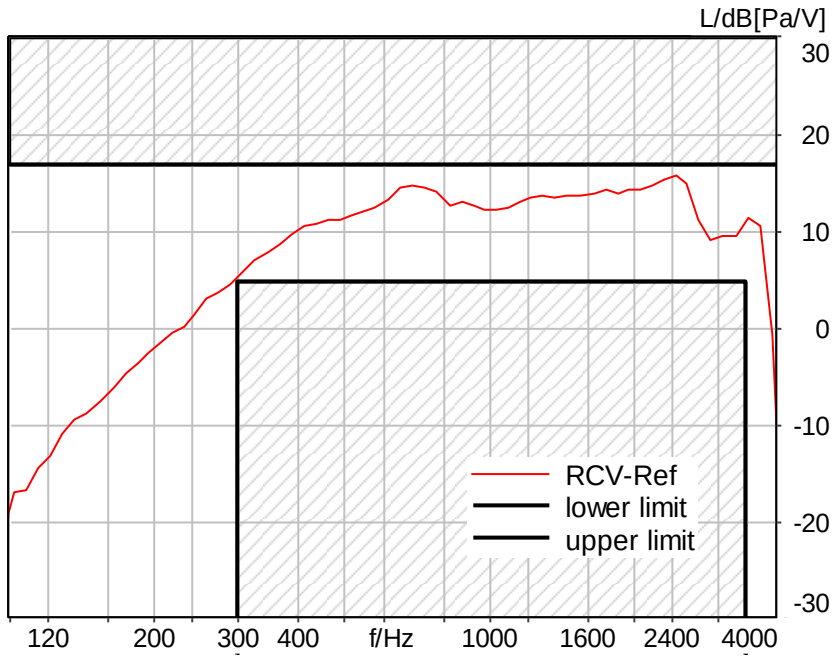
Band	Mount. Force (N)	LRP	Frequency Response
B71	2	FF	 Absolute minimal distance 0.90 dB at 305.9 Hz Ok
	8	FF	 Absolute minimal distance 1.05 dB at 2432.3 Hz Ok

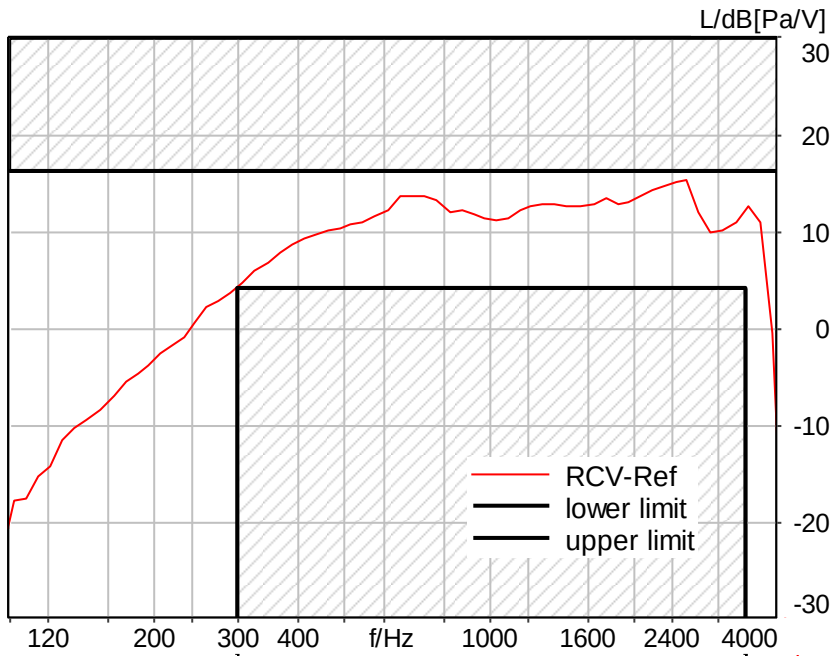
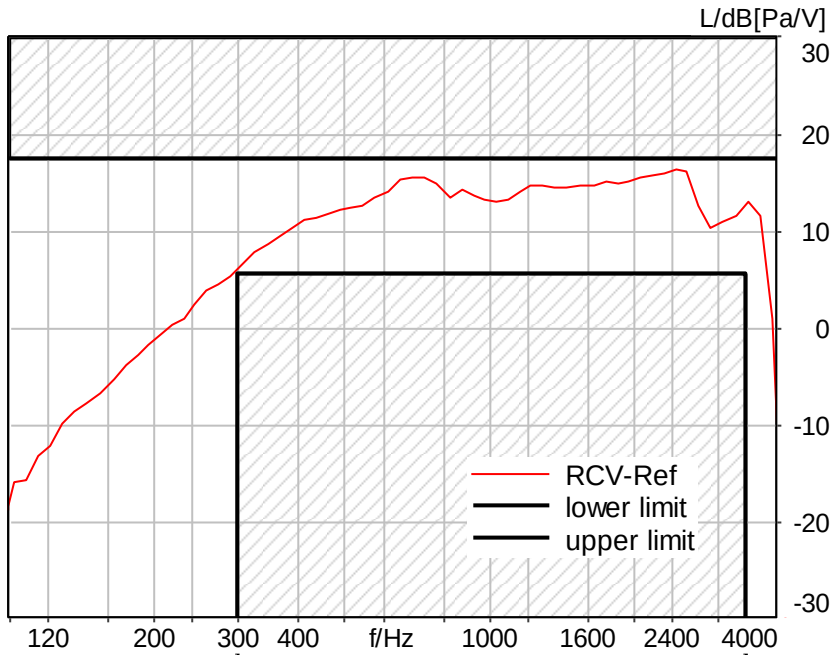
2) Frequency Response Graph for EVS-NB 24.4 kbps and NR (Volume Control: Max-1 Vol.)

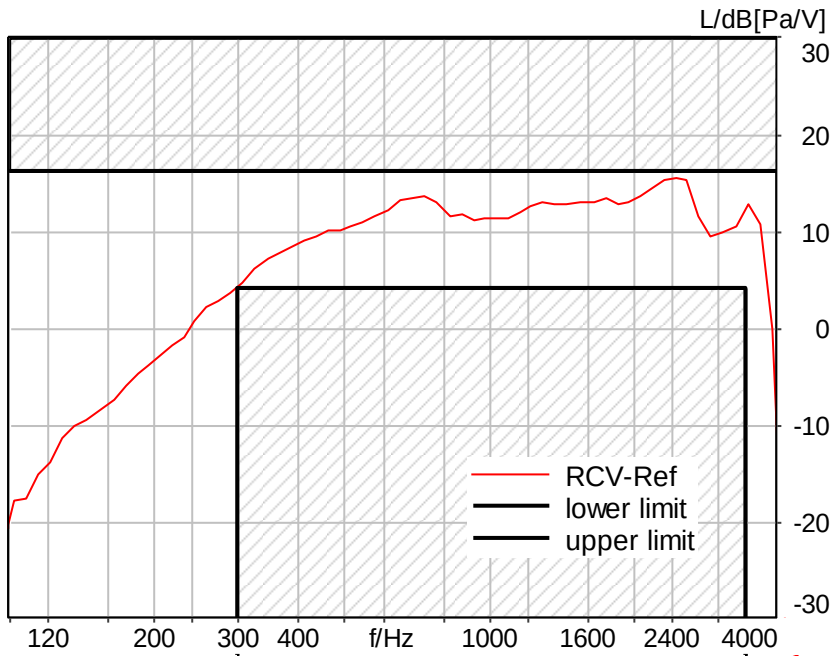
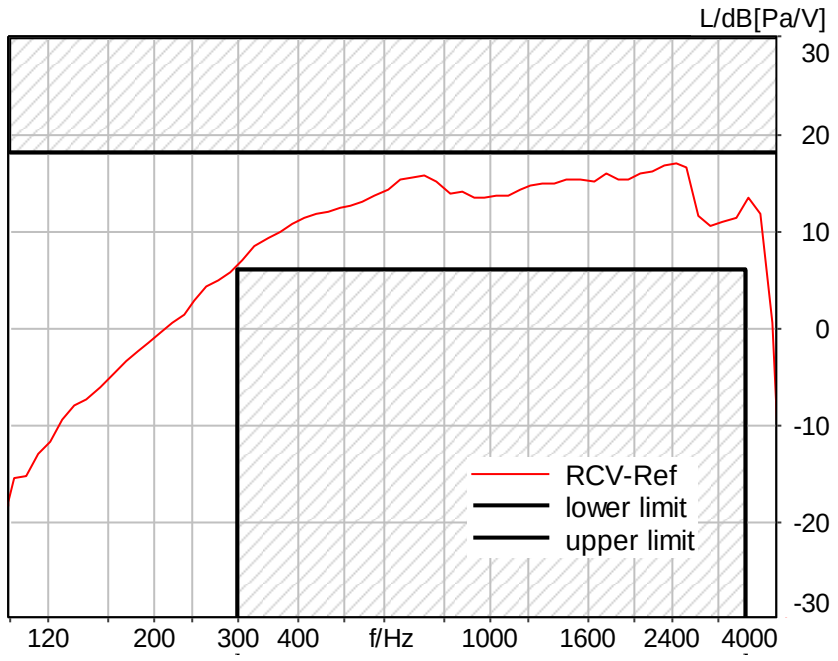
Band	Mount. Force (N)	LRP	Frequency Response
n7	2	FF	 Absolute minimal distance 0.97 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.96 dB at 2432.3 Hz Ok

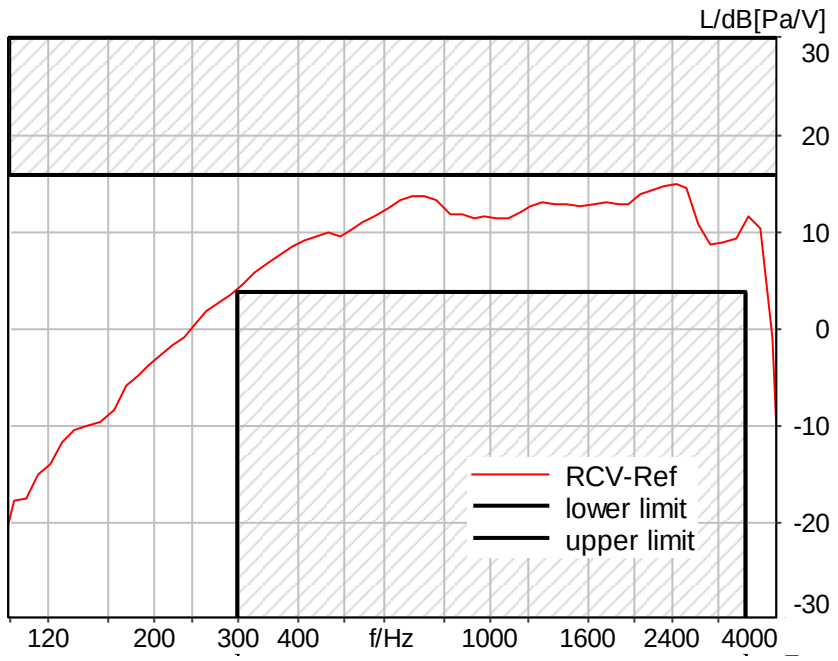
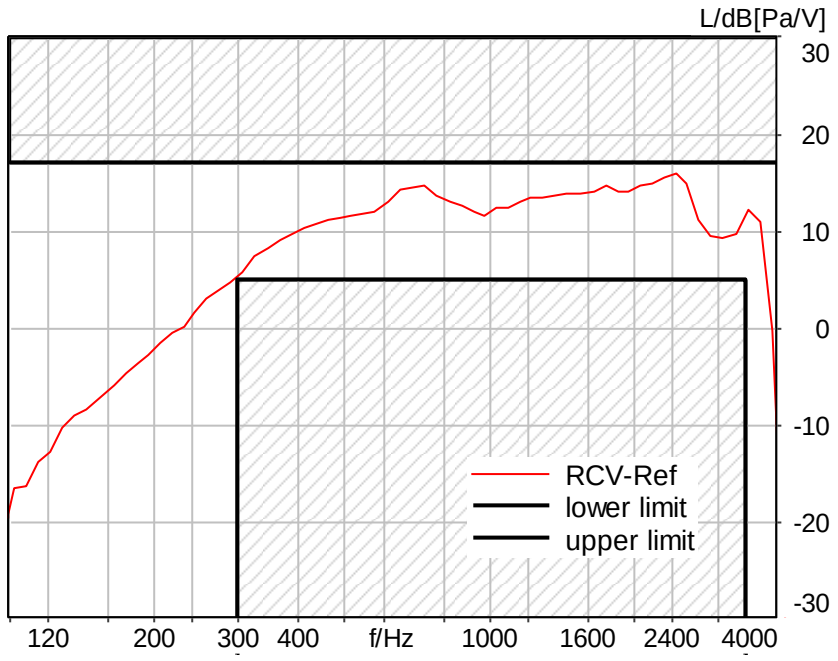
Band	Mount. Force (N)	LRP	Frequency Response
n12	2	FF	 Absolute minimal distance 0.80 dB at 305.9 Hz Ok
	8	FF	 Absolute minimal distance 1.25 dB at 305.9 Hz Ok

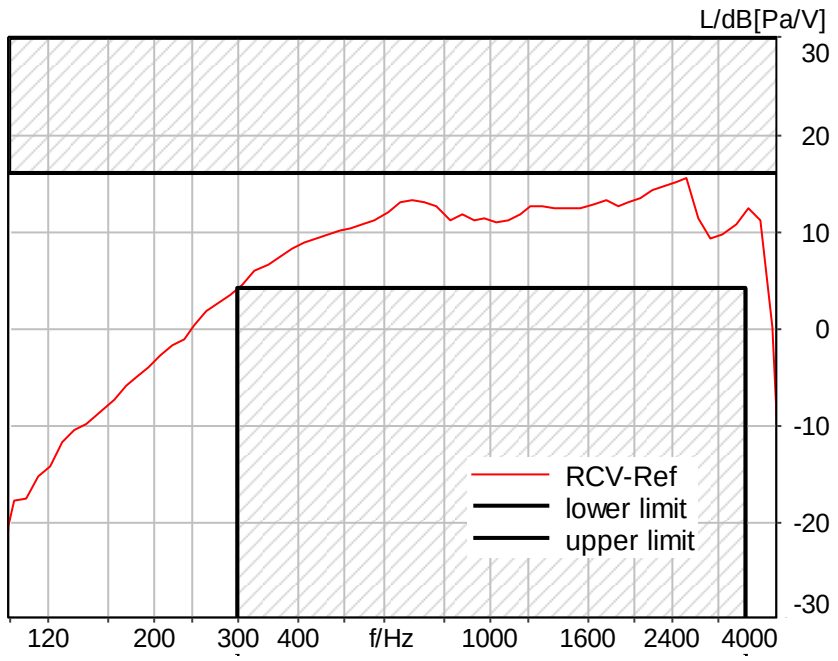
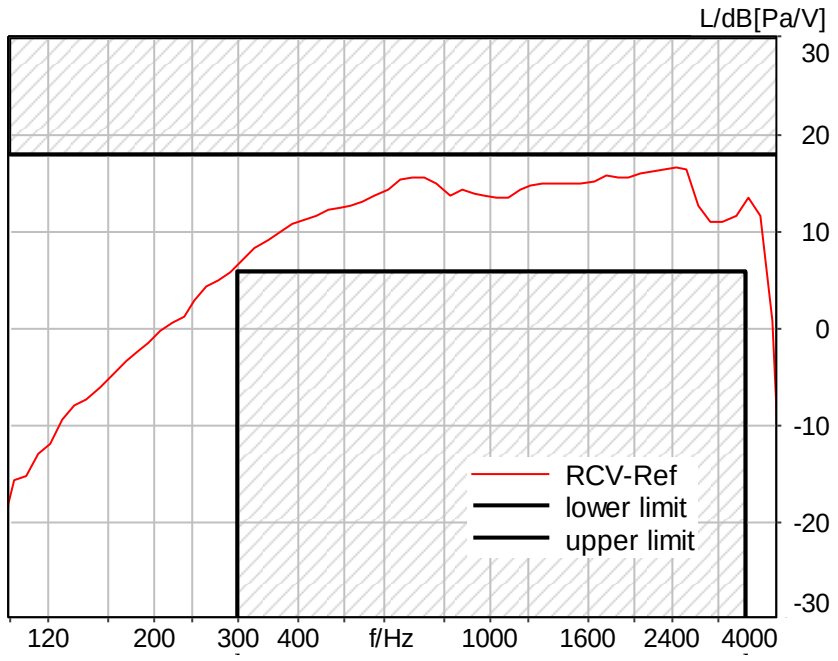
Band	Mount. Force (N)	LRP	Frequency Response
n25	2	FF	 Absolute minimal distance 1.28 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 1.38 dB at 2302.3 Hz Ok

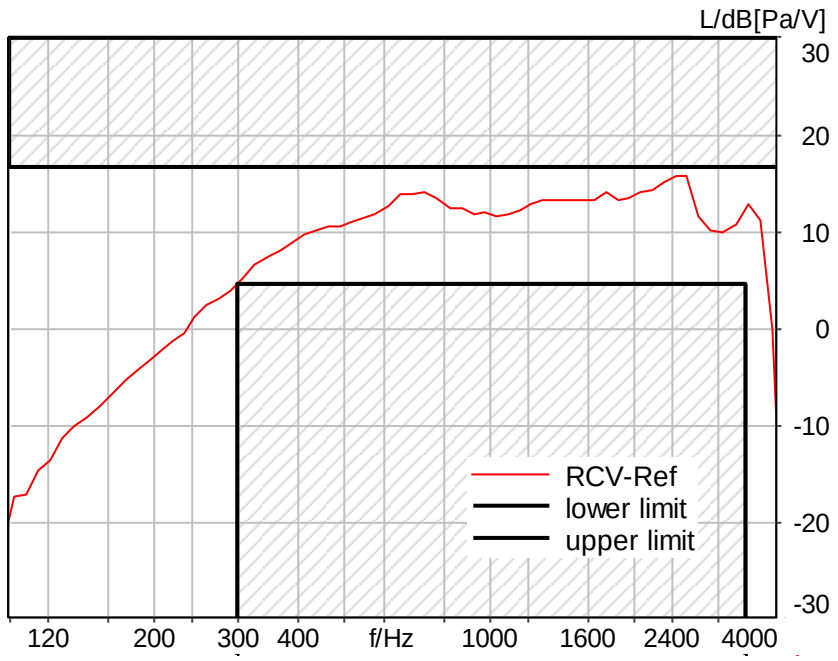
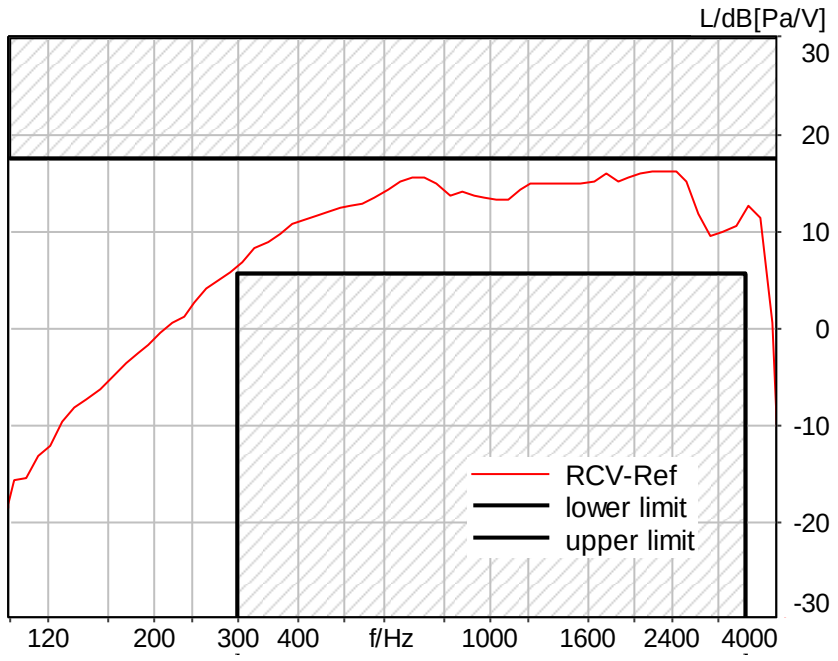
Band	Mount. Force (N)	LRP	Frequency Response
n26	2	FF	 Absolute minimal distance 0.99 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.96 dB at 2432.3 Hz Ok

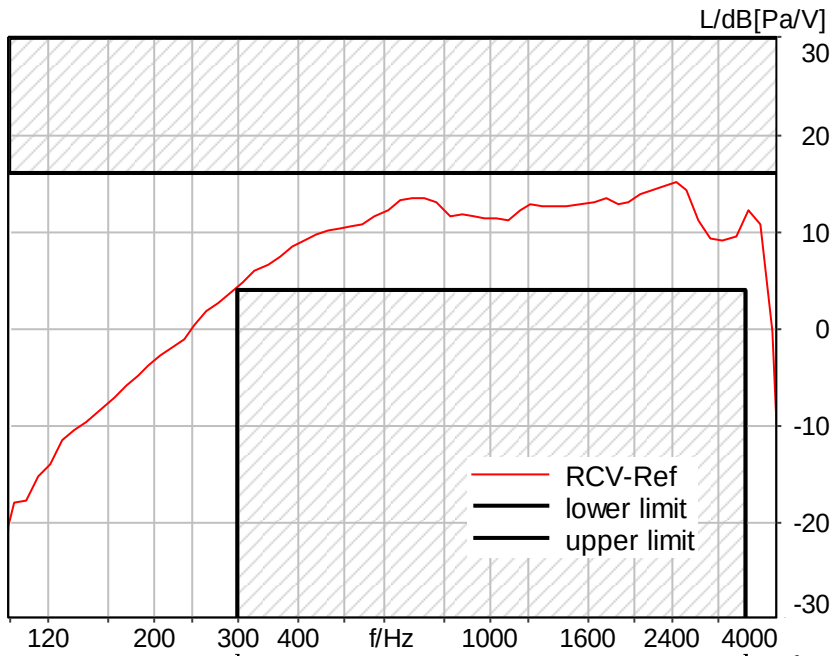
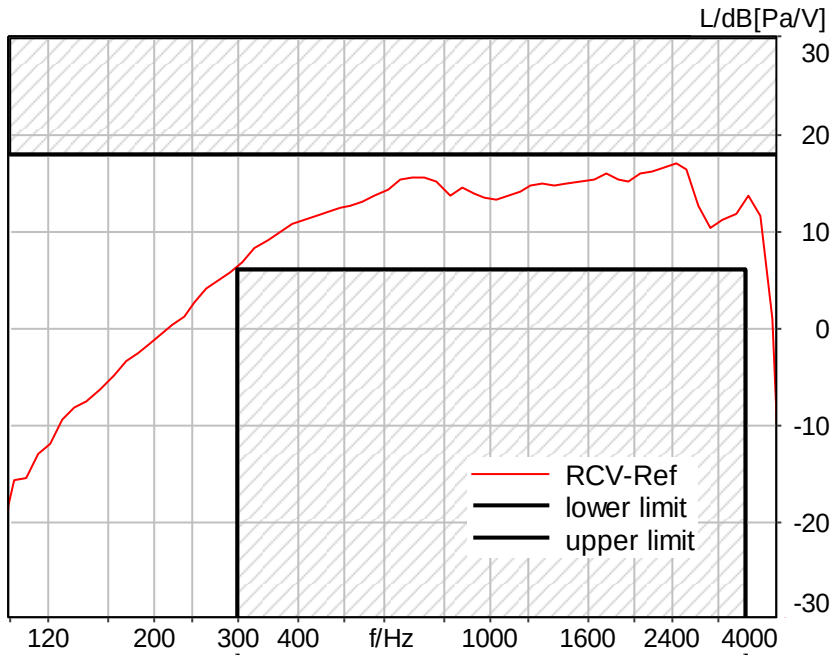
Band	Mount. Force (N)	LRP	Frequency Response
n30	2	FF	 Absolute minimal distance 0.75 dB at 2571.8 Hz Ok
	8	FF	 Absolute minimal distance 1.18 dB at 2432.3 Hz Ok

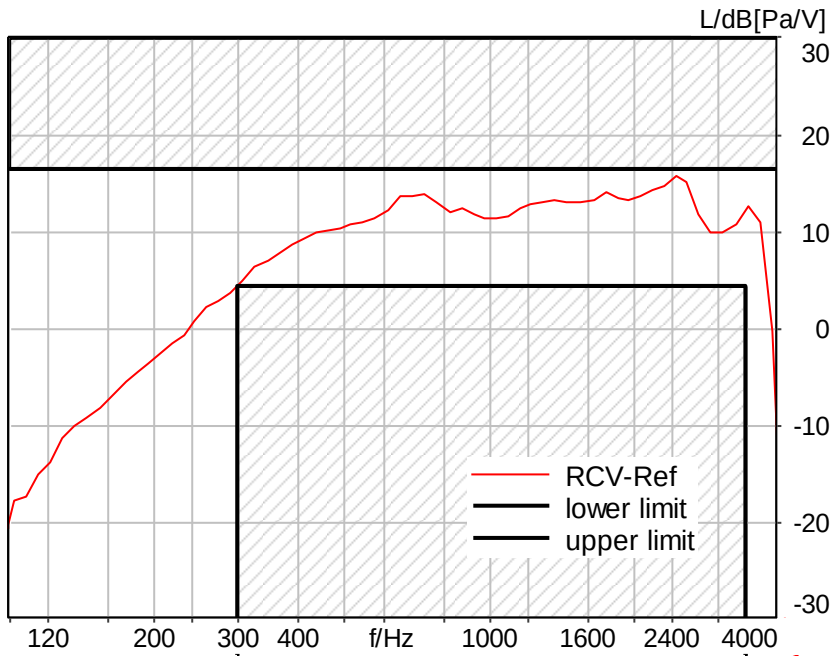
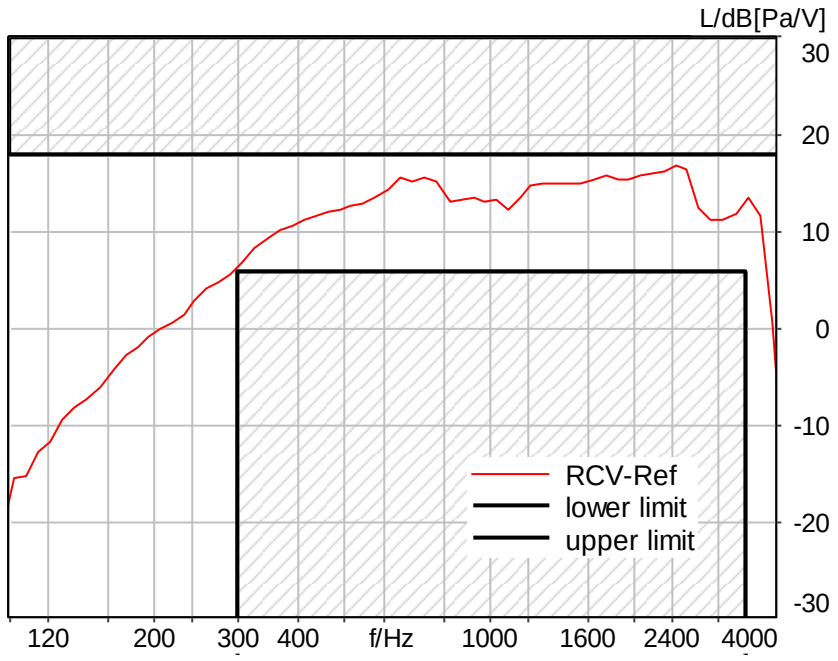
Band	Mount. Force (N)	LRP	Frequency Response
n38	2	FF	 Absolute minimal distance 0.67 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 1.09 dB at 2432.3 Hz Ok

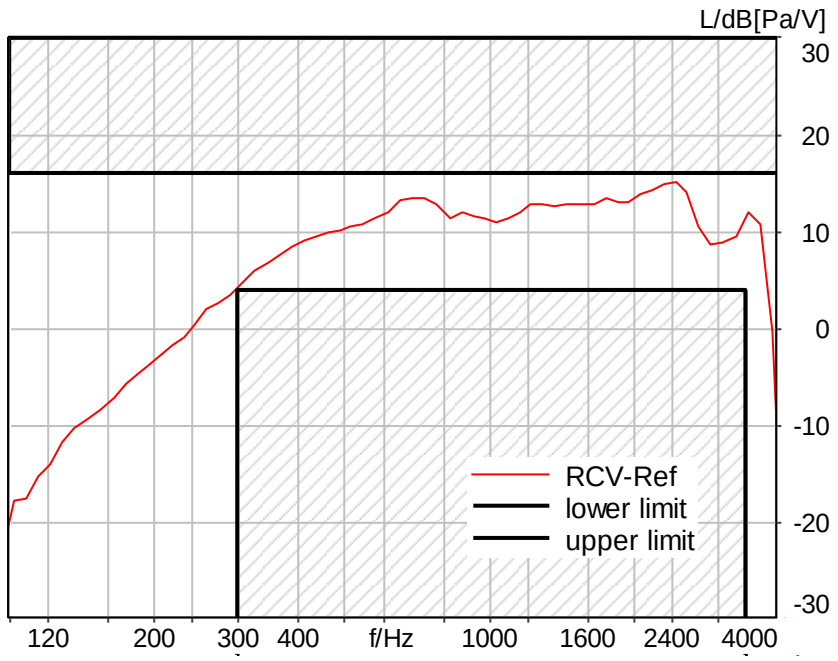
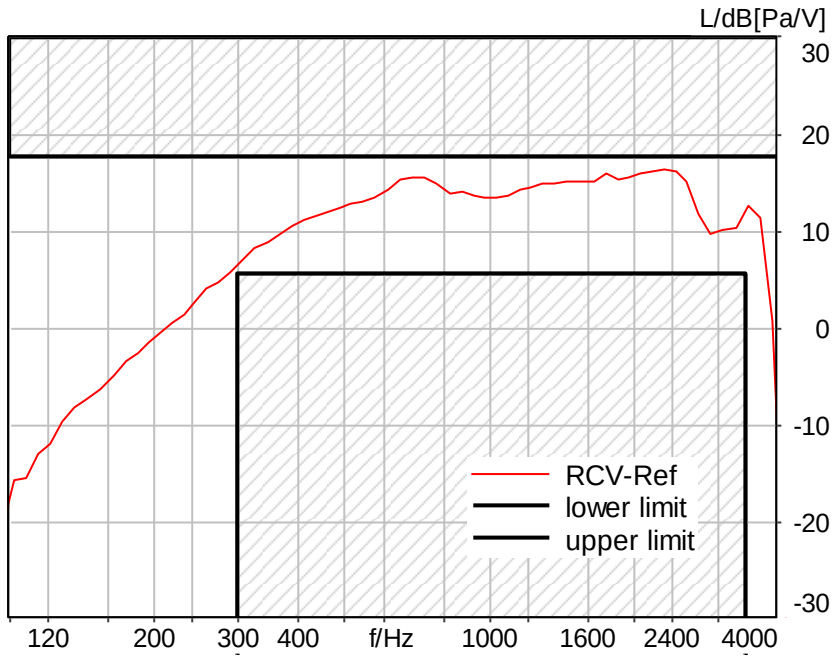
Band	Mount. Force (N)	LRP	Frequency Response
n41	2	FF	 Absolute minimal distance 0.82 dB at 305.9 Hz Ok
	8	FF	 Absolute minimal distance 0.95 dB at 2432.3 Hz Ok

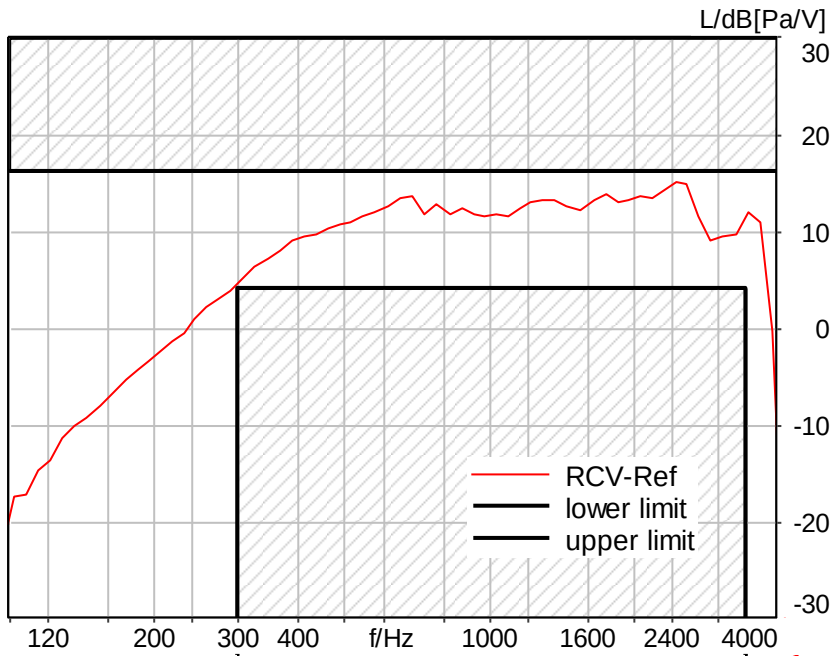
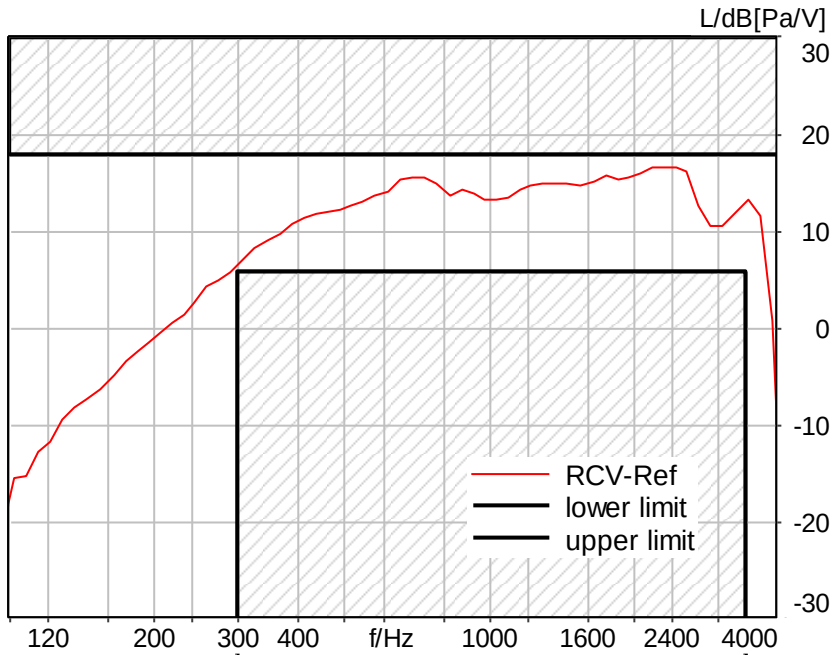
Band	Mount. Force (N)	LRP	Frequency Response
n48	2	FF	 Absolute minimal distance 0.55 dB at 2571.8 Hz Ok
	8	FF	 Absolute minimal distance 1.17 dB at 2432.3 Hz Ok

Band	Mount. Force (N)	LRP	Frequency Response
n66	2	FF	 Absolute minimal distance 0.68 dB at 2571.8 Hz Ok
	8	FF	 Absolute minimal distance 1.35 dB at 2177.4 Hz Ok

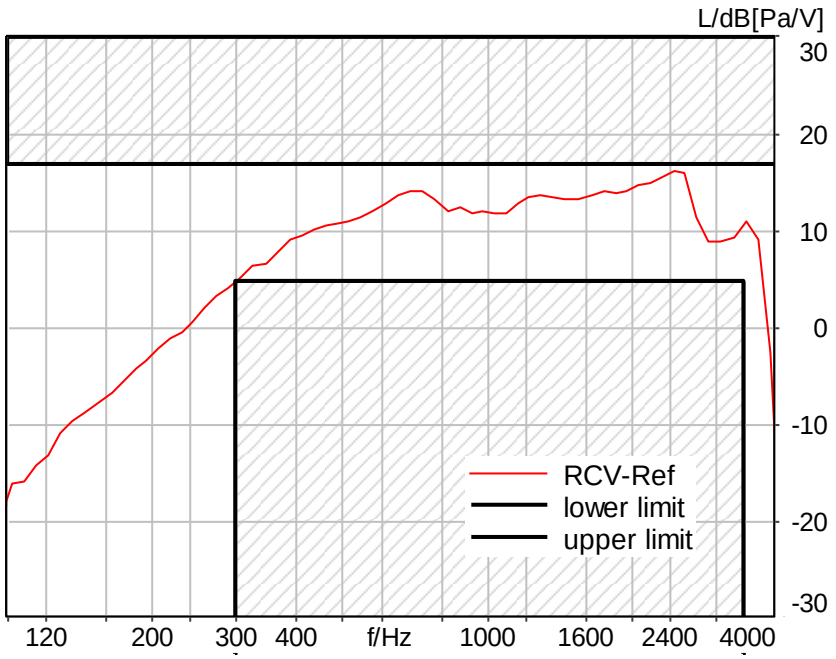
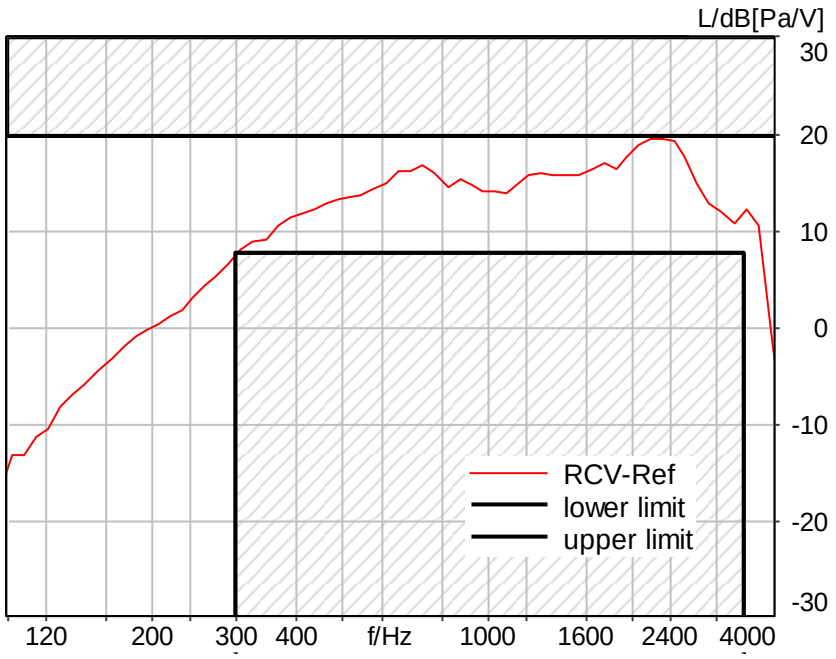
Band	Mount. Force (N)	LRP	Frequency Response
n70	2	FF	 Absolute minimal distance 0.82 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.96 dB at 305.9 Hz Ok

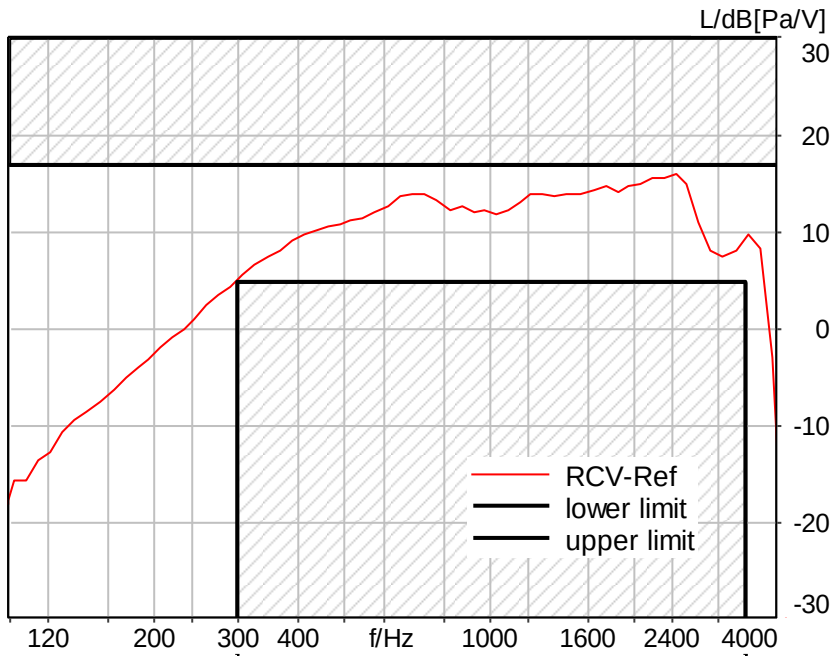
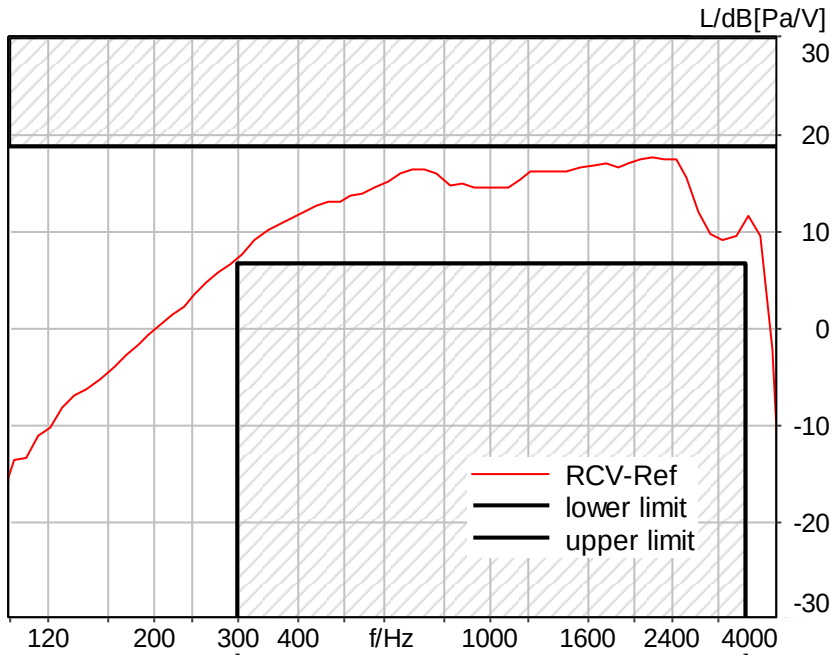
Band	Mount. Force (N)	LRP	Frequency Response
n71	2	FF	 Absolute minimal distance 0.65 dB at 305.9 Hz Ok
	8	FF	 Absolute minimal distance 1.03 dB at 305.9 Hz Ok

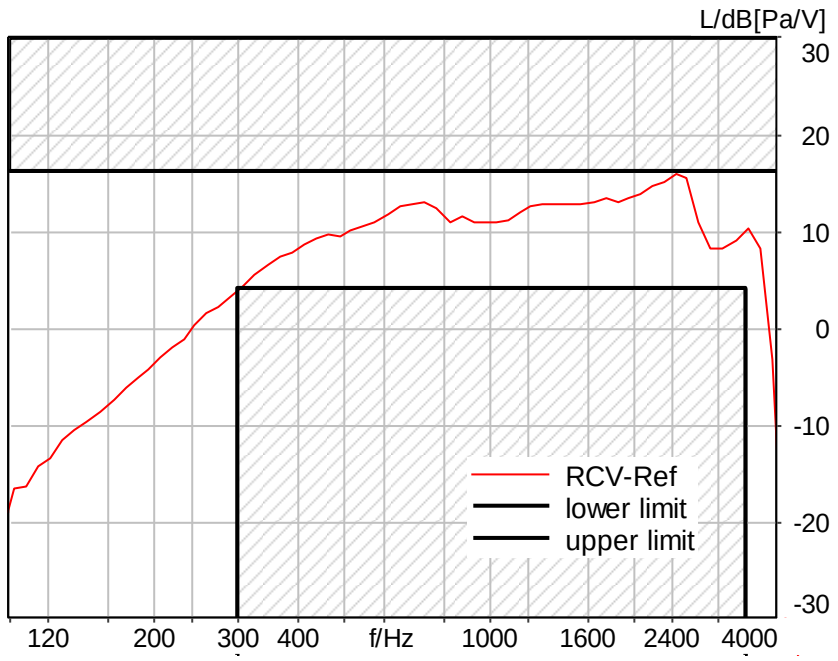
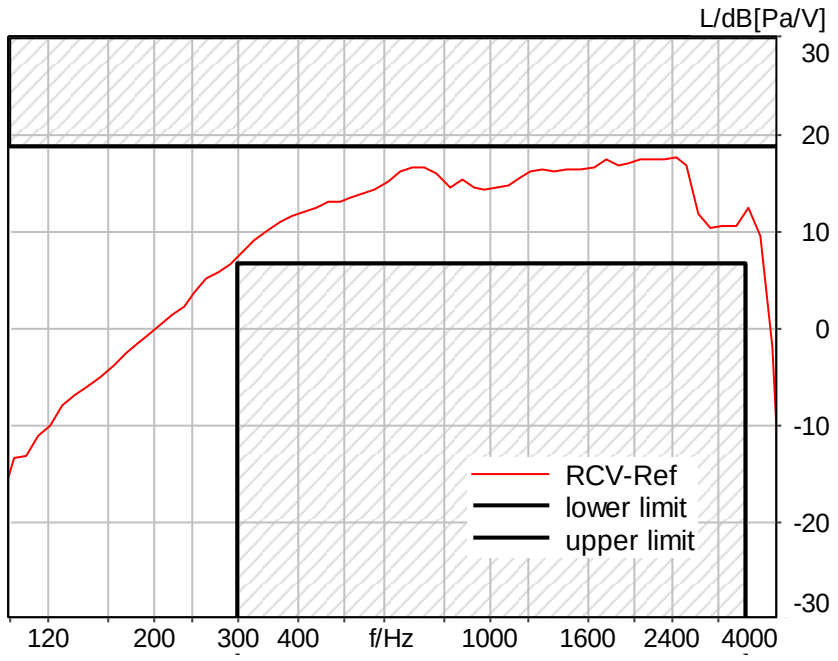
Band	Mount. Force (N)	LRP	Frequency Response
n77	2	FF	 Absolute minimal distance 0.78 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 1.31 dB at 305.9 Hz Ok

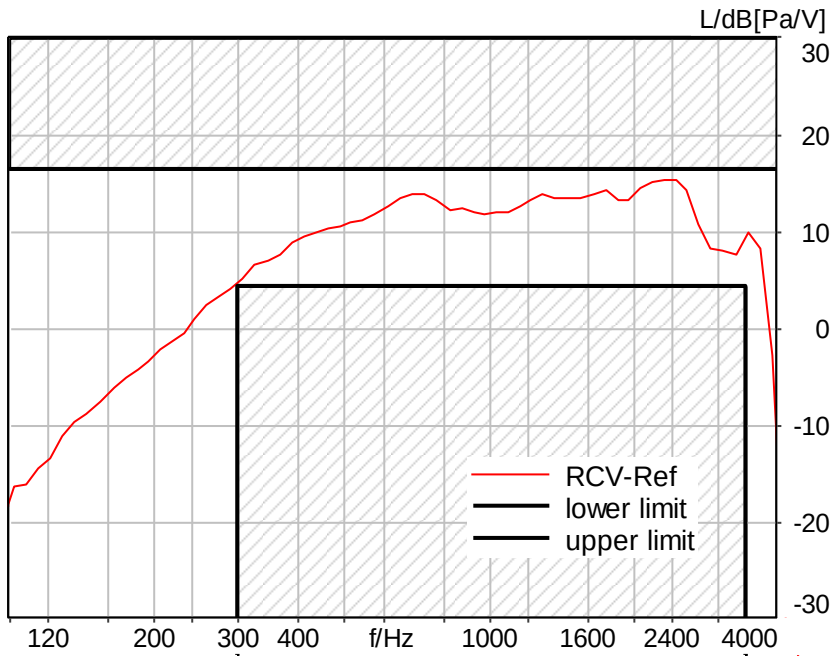
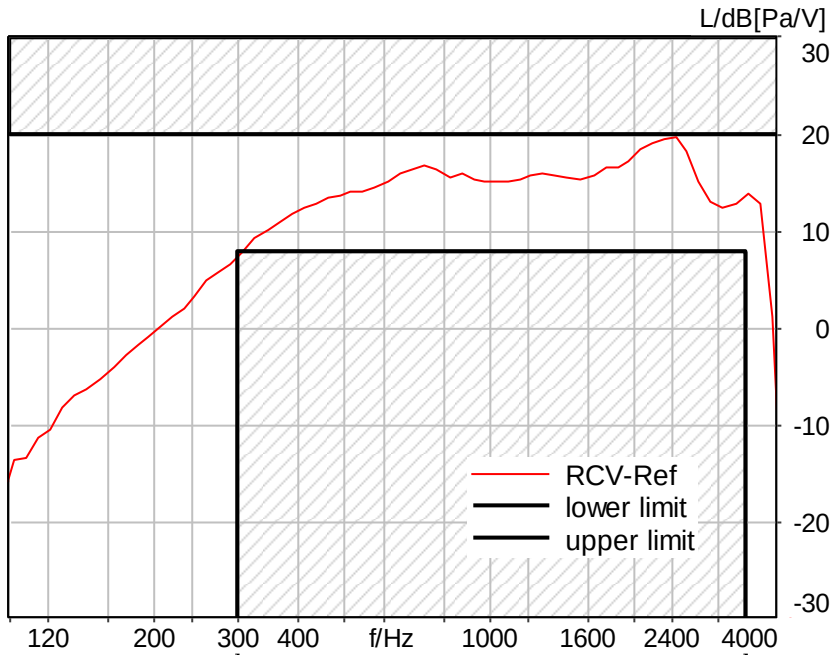
Band	Mount. Force (N)	LRP	Frequency Response
n78	2	FF	 Absolute minimal distance 0.97 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 1.16 dB at 2432.3 Hz Ok

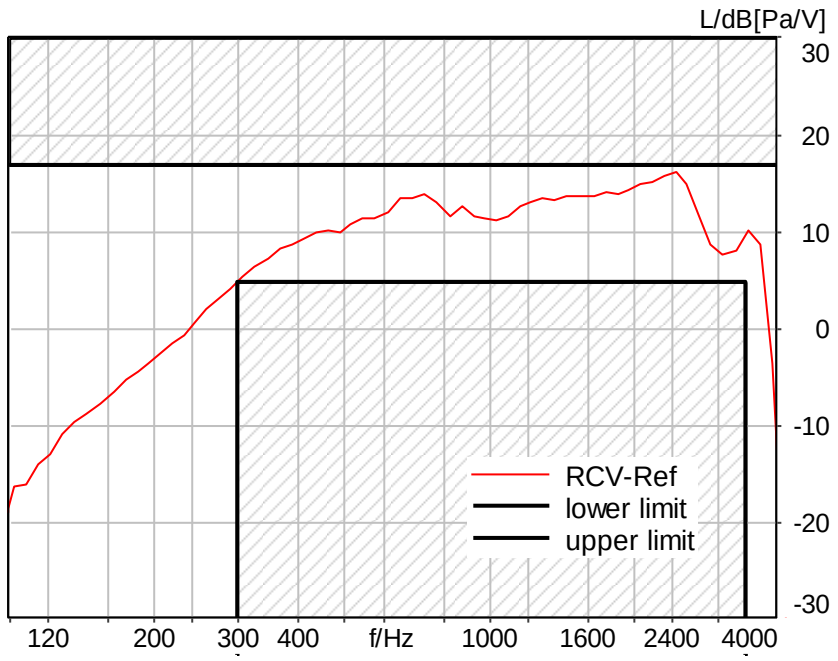
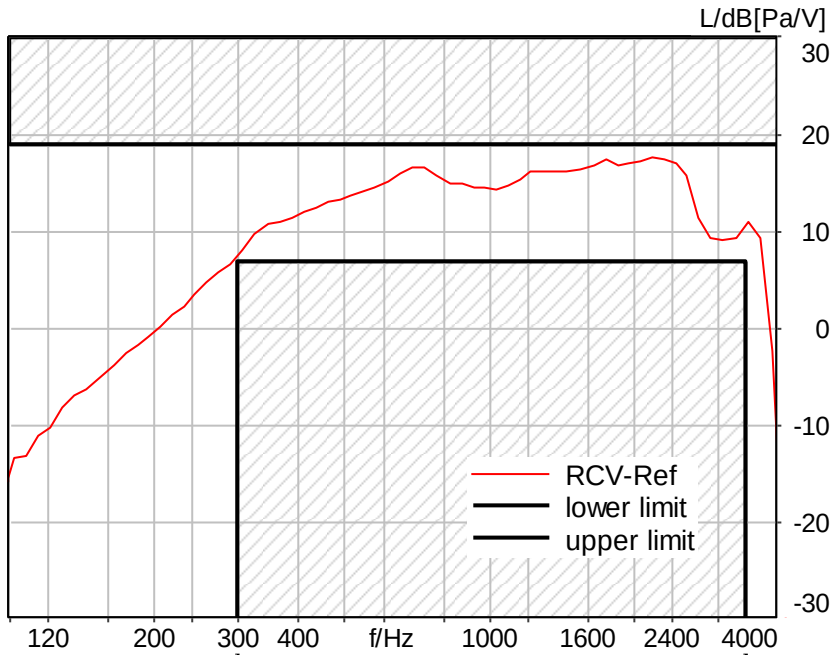
3) Frequency Response Graph for EVS-NB 24.4 kbps and WIFI (Volume Control: Max-1 Vol.)

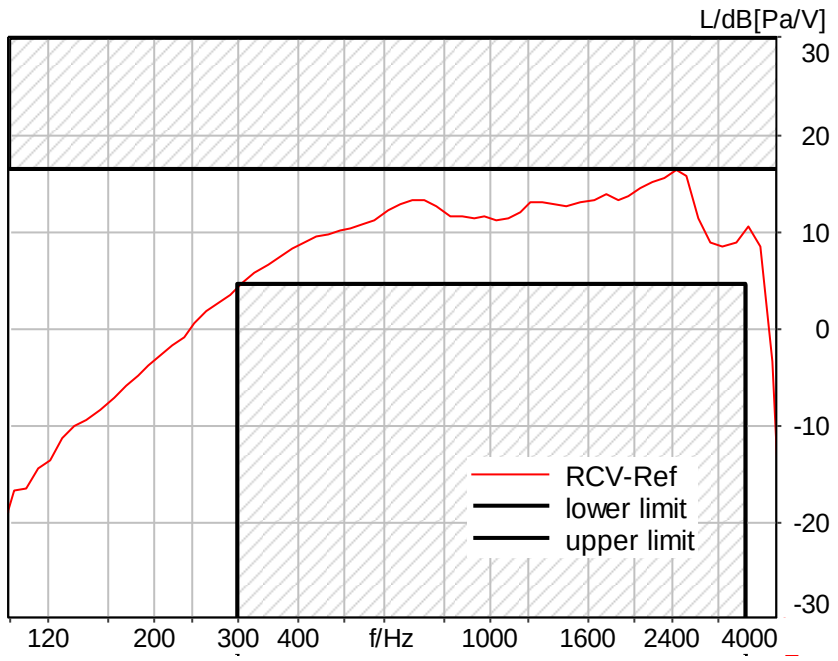
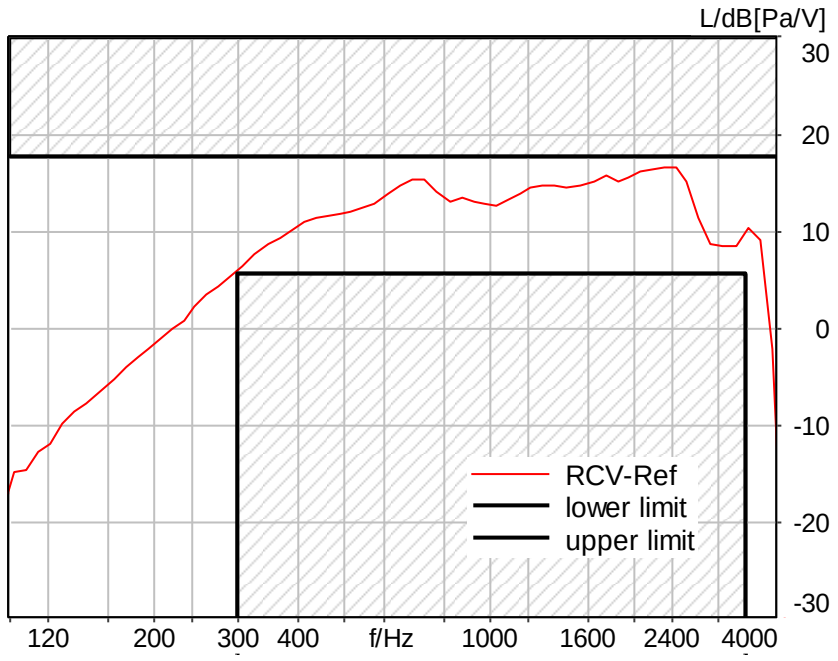
Band	Mount. Force (N)	LRP	Frequency Response
802.11b 2.4 GHz	2	FF	 Absolute minimal distance 0.49 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.29 dB at 2302.3 Hz Ok

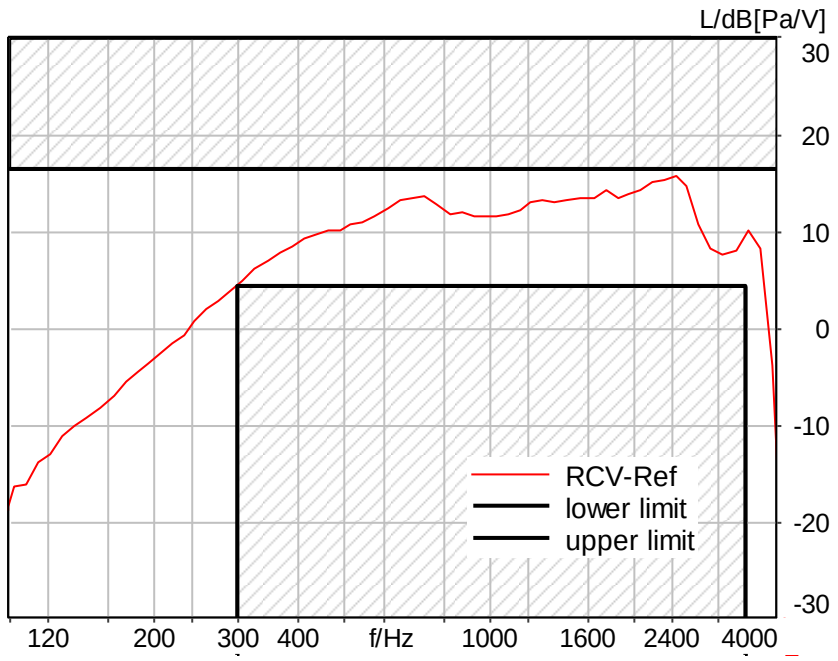
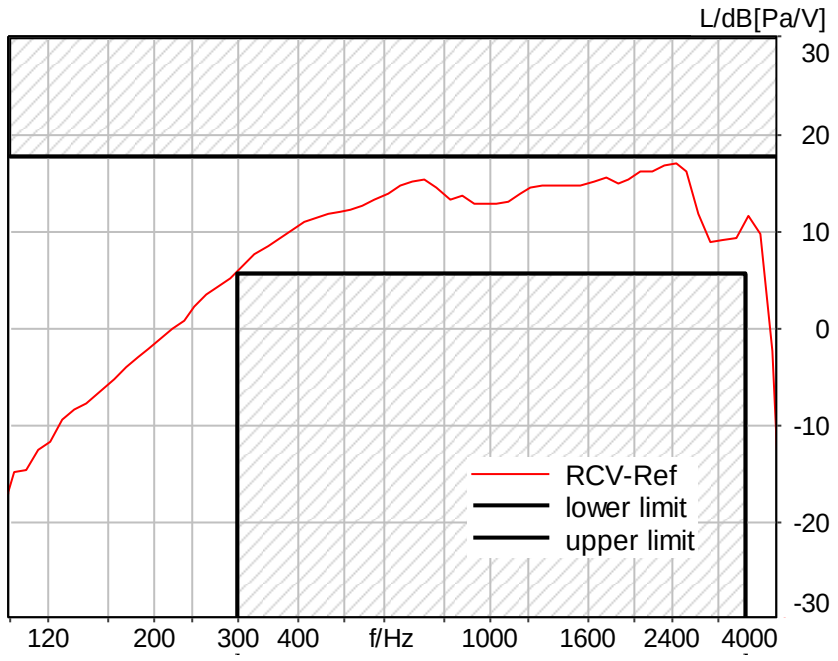
Band	Mount. Force (N)	LRP	Frequency Response
802.11g 2.4 GHz	2	FF	 Absolute minimal distance 0.78 dB at 305.9 Hz Ok
	8	FF	 Absolute minimal distance 1.07 dB at 2177.4 Hz Ok

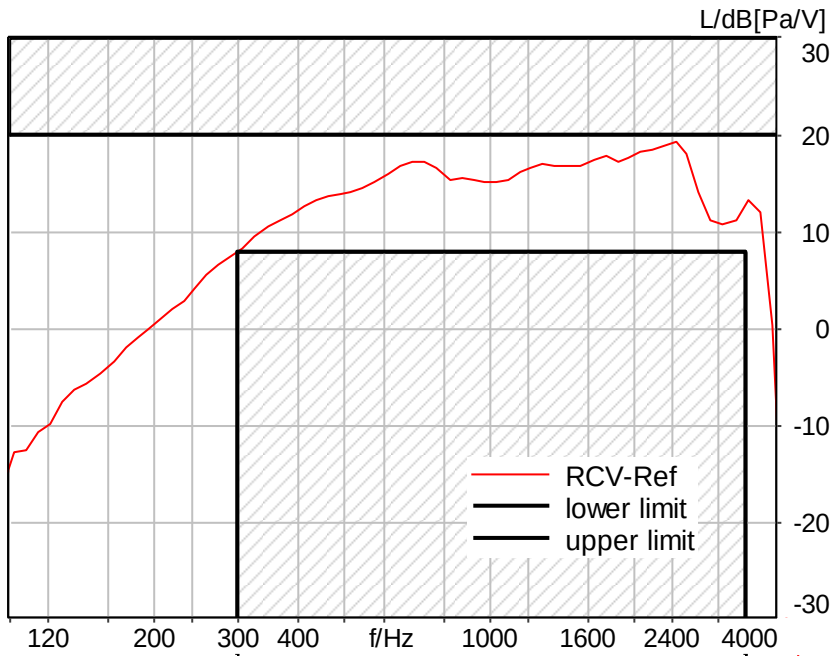
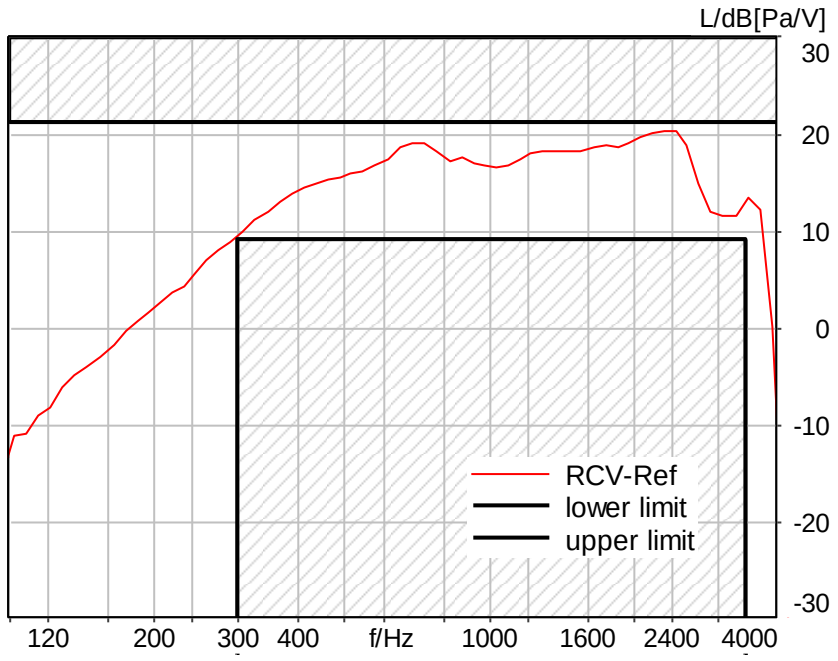
Band	Mount. Force (N)	LRP	Frequency Response
802.11n 2.4 GHz	2	FF	 Absolute minimal distance 0.19 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 1.09 dB at 2432.3 Hz Ok

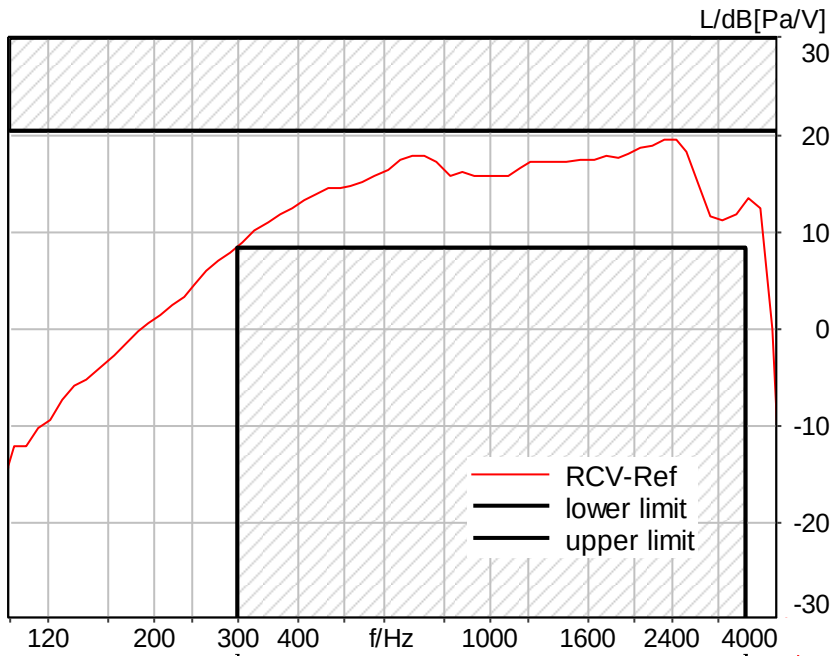
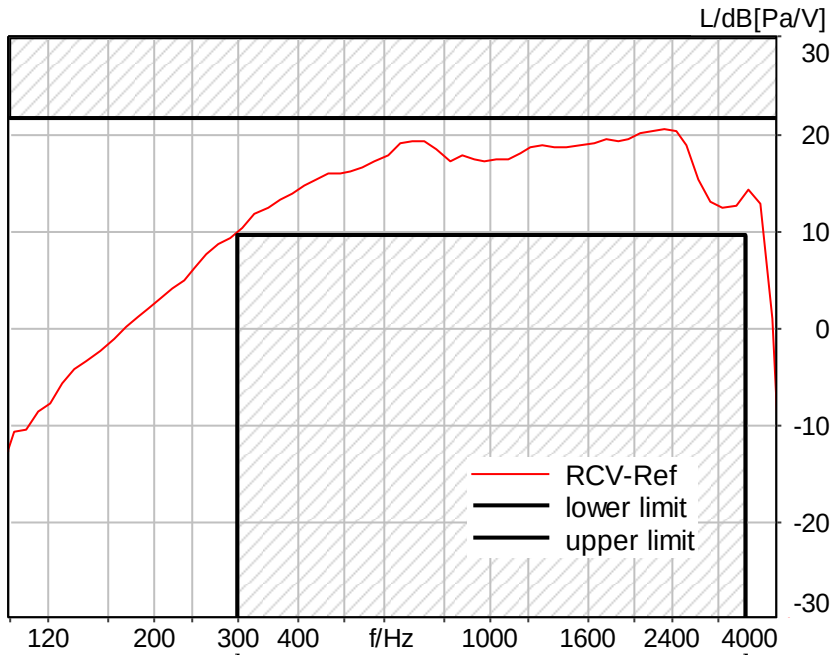
Band	Mount. Force (N)	LRP	Frequency Response
802.11ac 2.4 GHz	2	FF	 Absolute minimal distance 0.89 dB at 2432.3 Hz Ok
	8	DF	 Absolute minimal distance 0.07 dB at 2432.3 Hz Ok

Band	Mount. Force (N)	LRP	Frequency Response
802.11ax 2.4 GHz	2	FF	 Absolute minimal distance 0.64 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 1.25 dB at 2177.4 Hz Ok

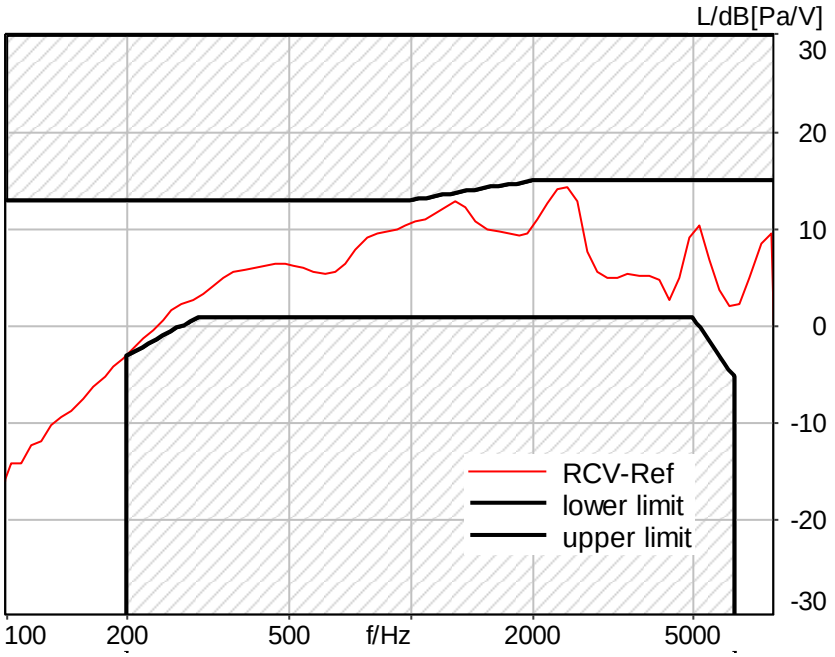
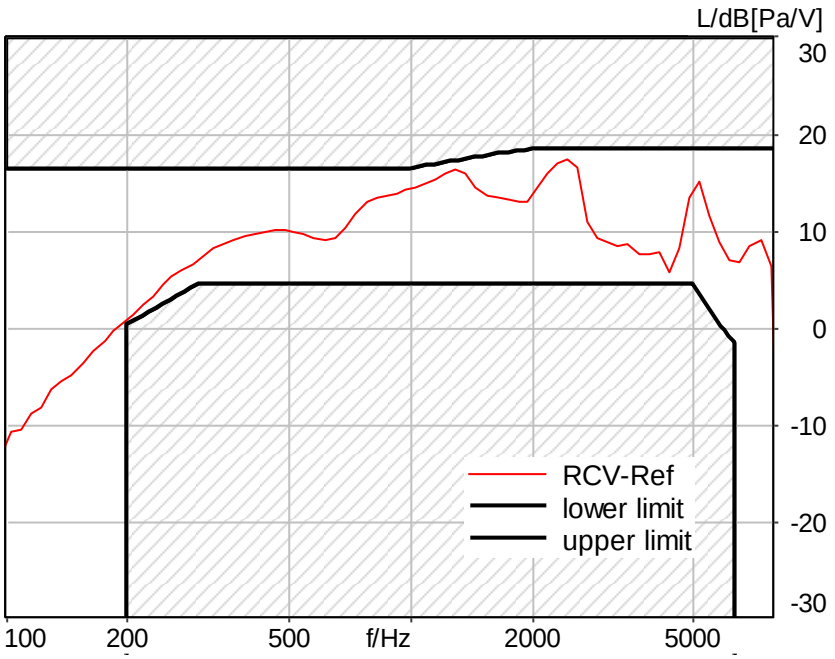
Band	Mount. Force (N)	LRP	Frequency Response
802.11a 5 GHz	2	FF	 Absolute minimal distance 0.19 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.91 dB at 2432.3 Hz Ok

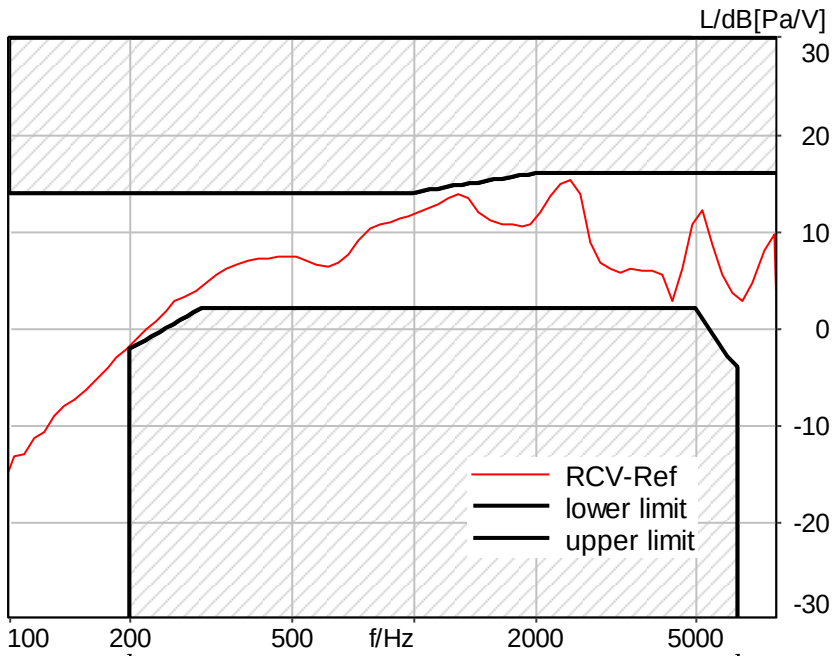
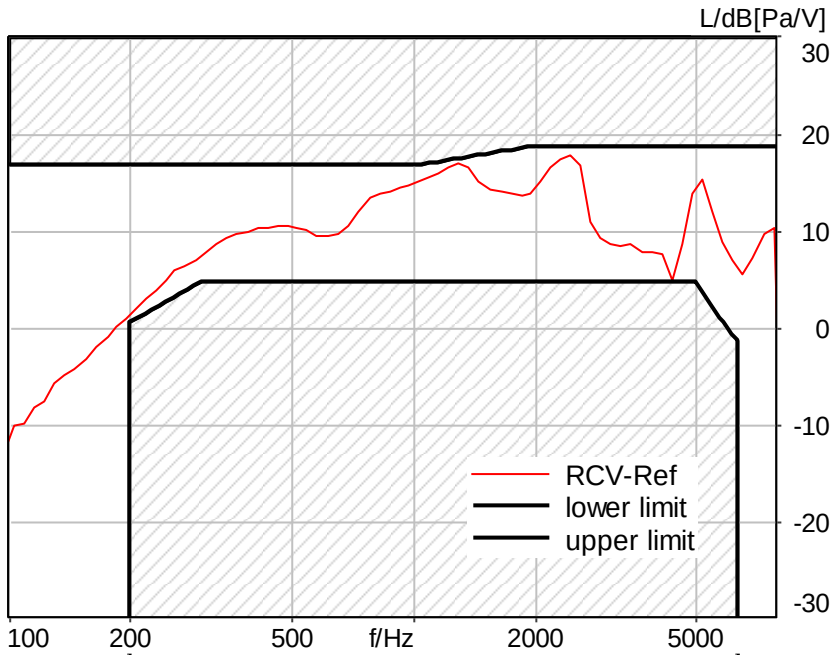
Band	Mount. Force (N)	LRP	Frequency Response
802.11n 5 GHz	2	FF	 Absolute minimal distance 0.63 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.70 dB at 2432.3 Hz Ok

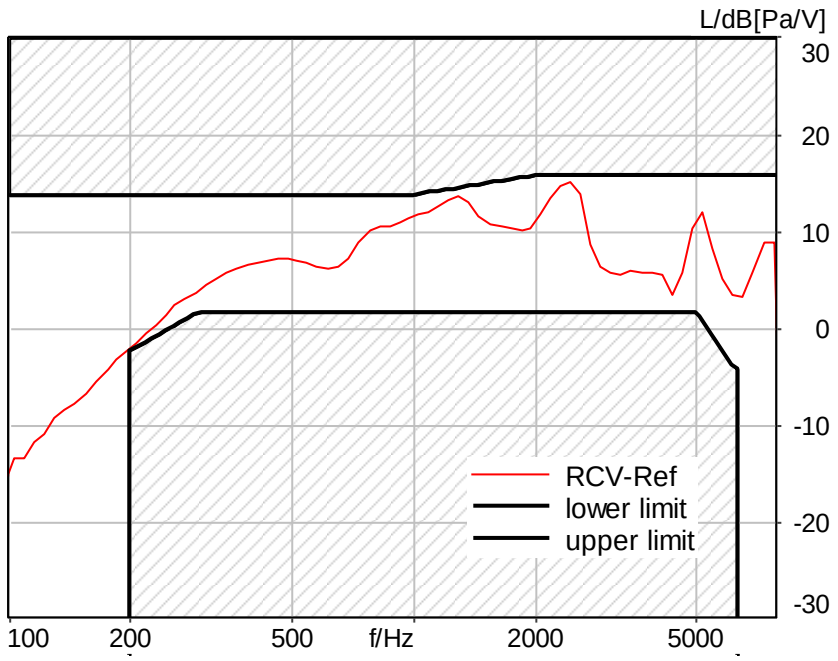
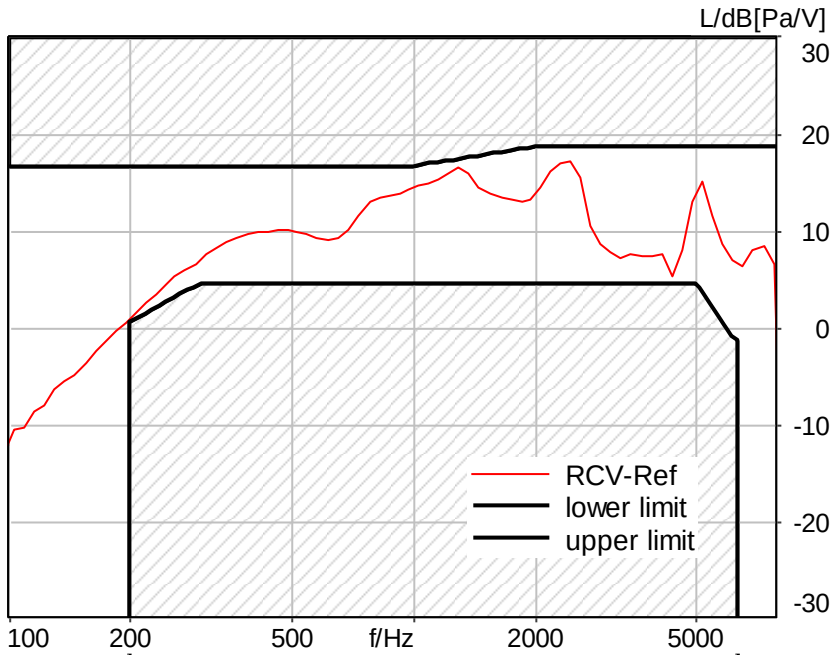
Band	Mount. Force (N)	LRP	Frequency Response
802.11ac 5 GHz	2	FF	 Absolute minimal distance 0.50 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.81 dB at 2302.3 Hz Ok

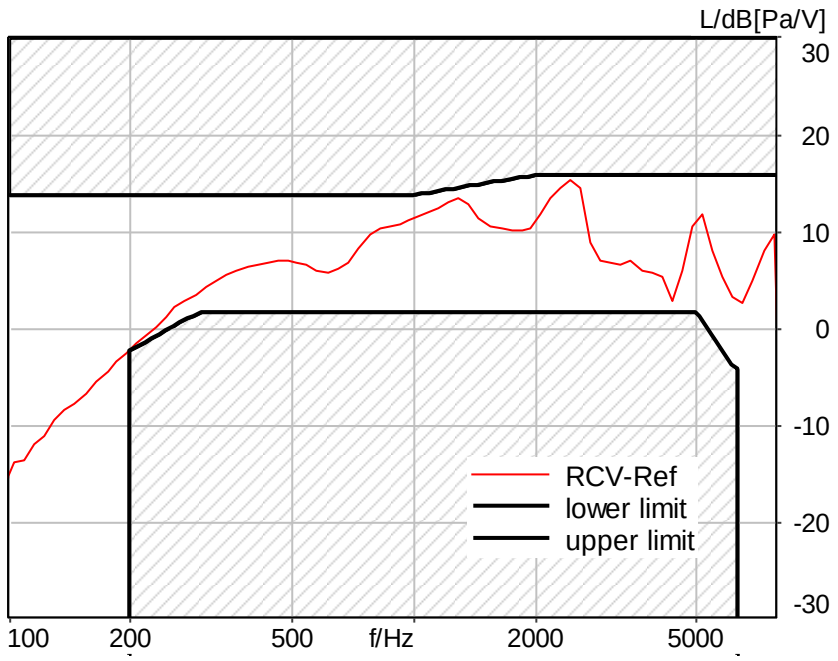
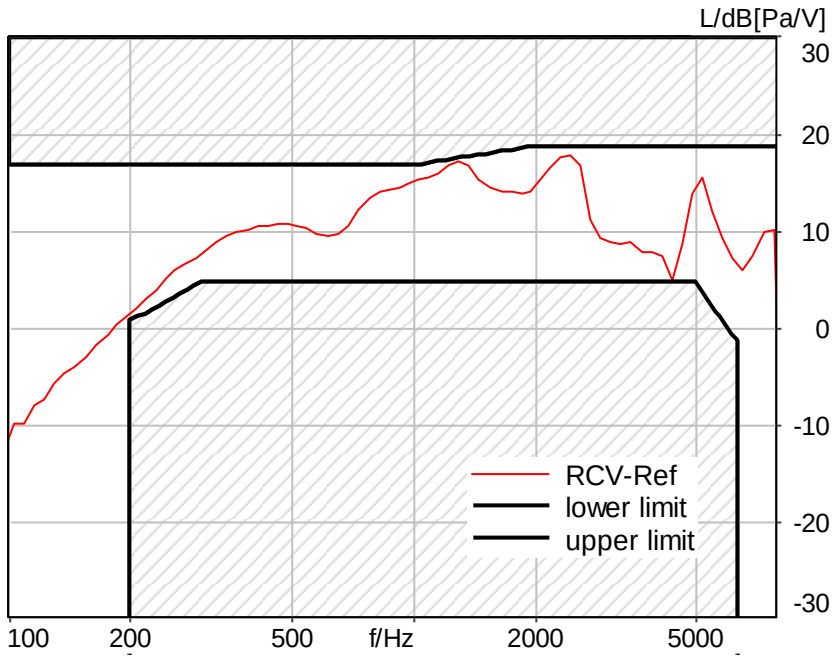
Band	Mount. Force (N)	LRP	Frequency Response
802.11ax 5 GHz	2	FF	 Absolute minimal distance 0.69 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.95 dB at 2302.3 Hz Ok

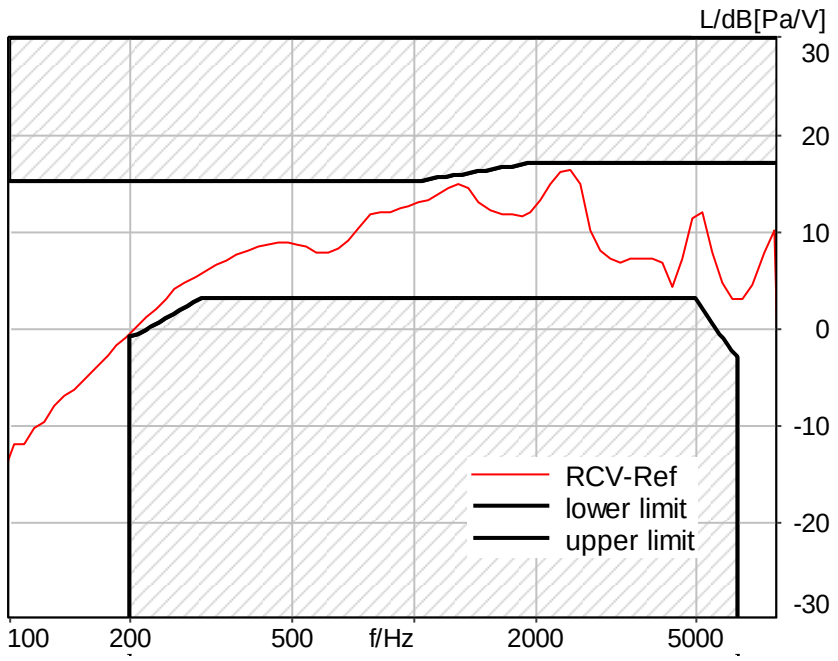
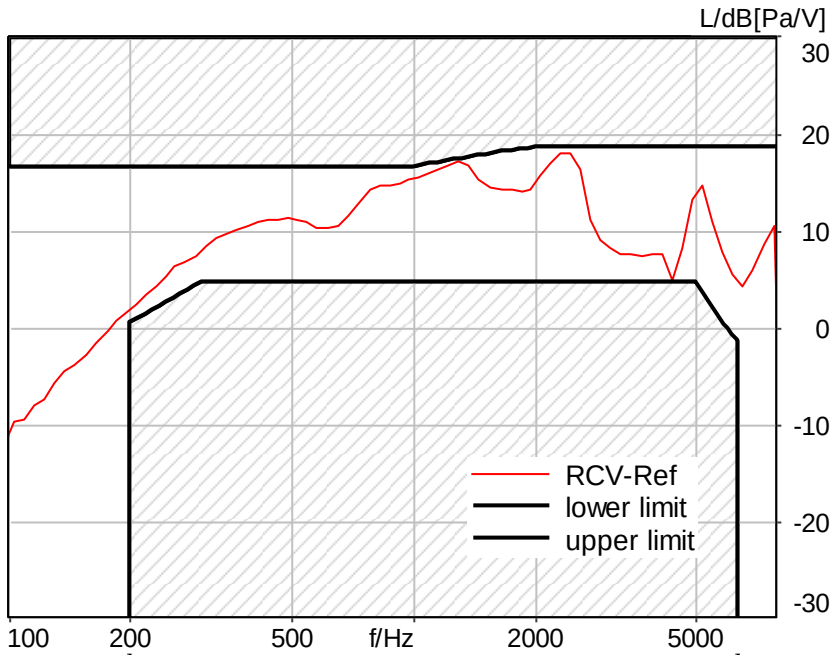
4) Frequency Response Graph for EVS-WB 128 kbps and LTE (Volume Control: Max-1 Vol.)

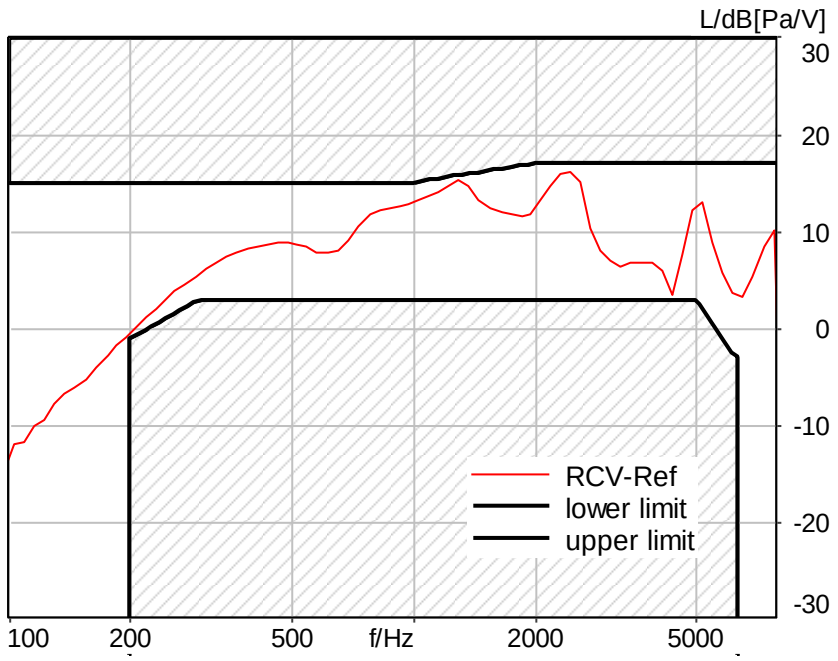
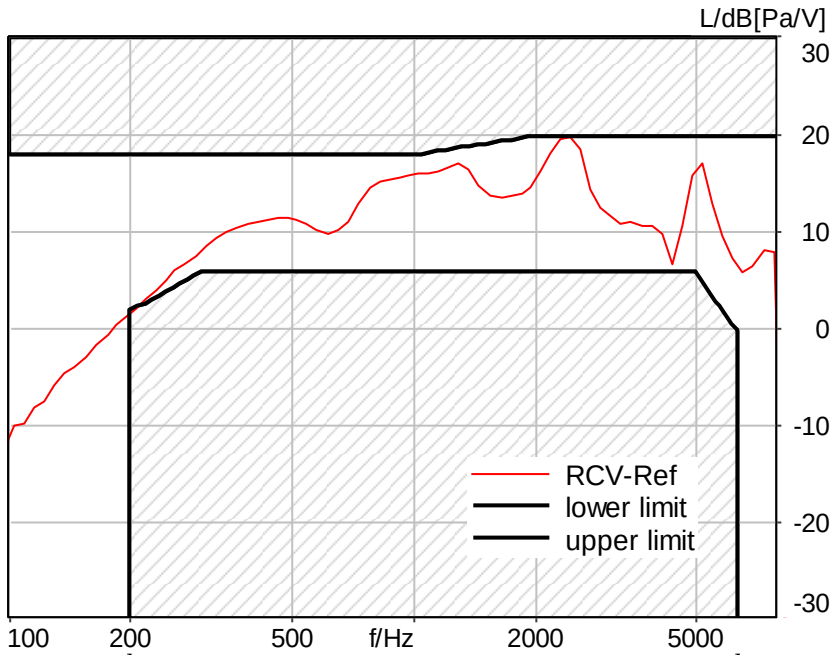
Band	Mount. Force (N)	LRP	Frequency Response
B7	2	FF	 Absolute minimal distance 0.53 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.75 dB at 1285.9 Hz Ok

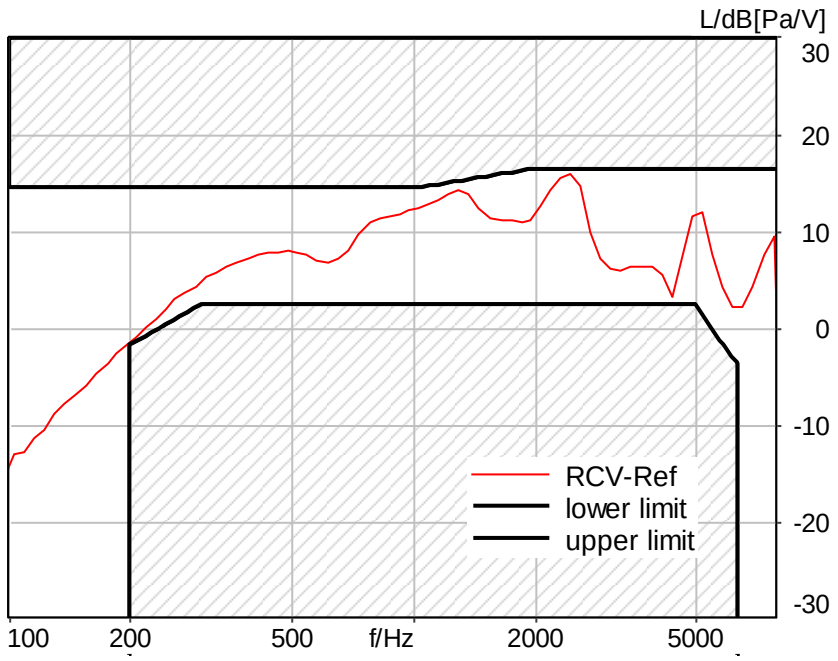
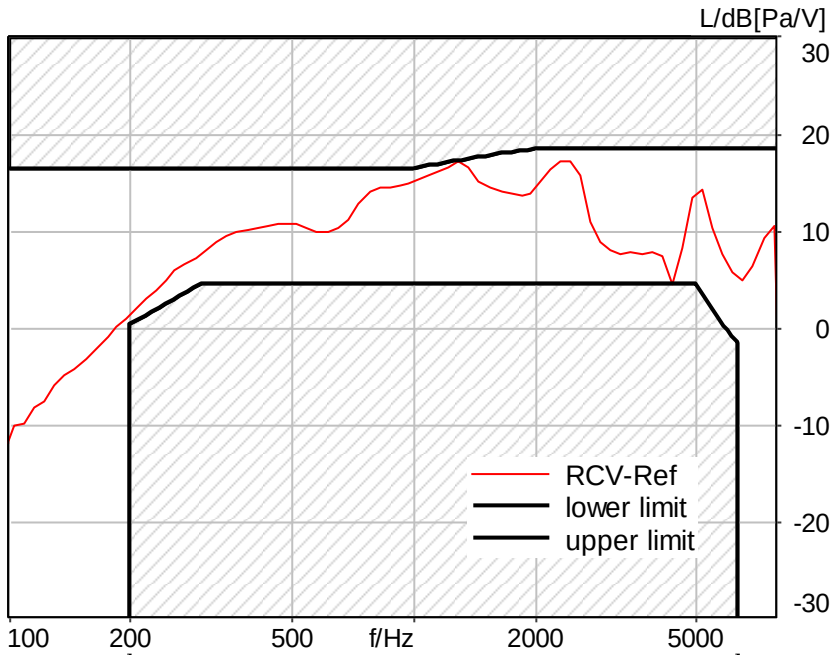
Band	Mount. Force (N)	LRP	Frequency Response
B12	2	FF	 Absolute minimal distance 0.69 dB at 1285.9 Hz Ok
	8	FF	 Absolute minimal distance 0.34 dB at 1285.9 Hz Ok

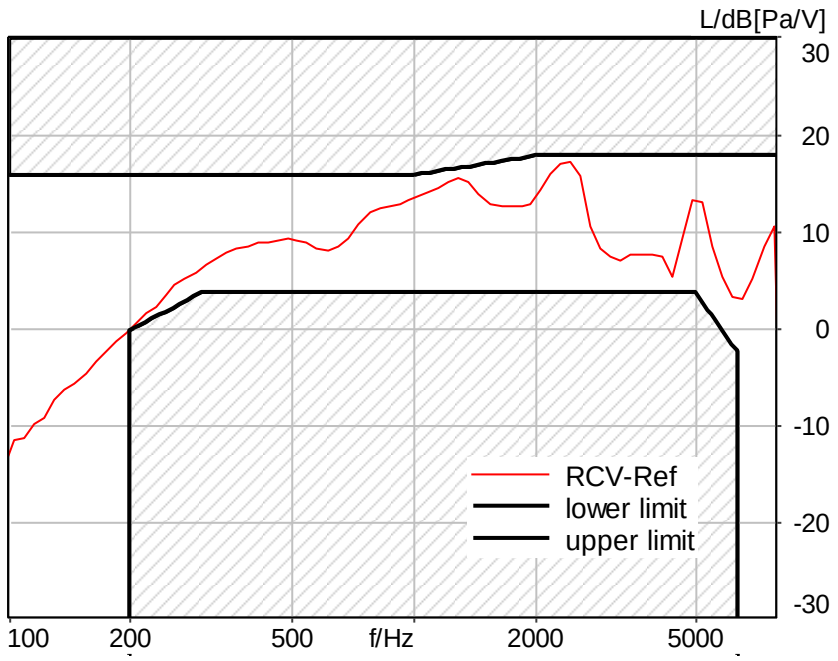
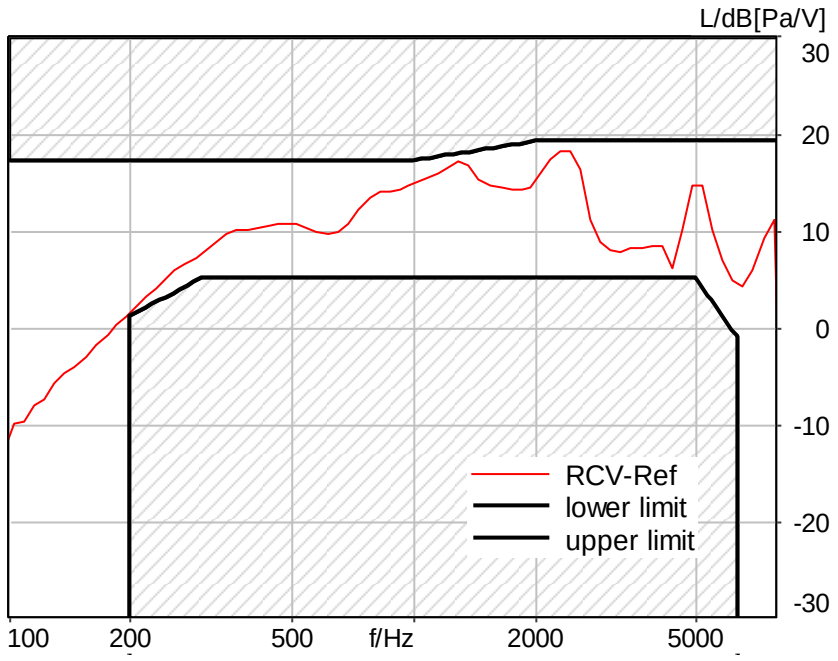
Band	Mount. Force (N)	LRP	Frequency Response
B13	2	FF	 Absolute minimal distance 0.56 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.74 dB at 1285.9 Hz Ok

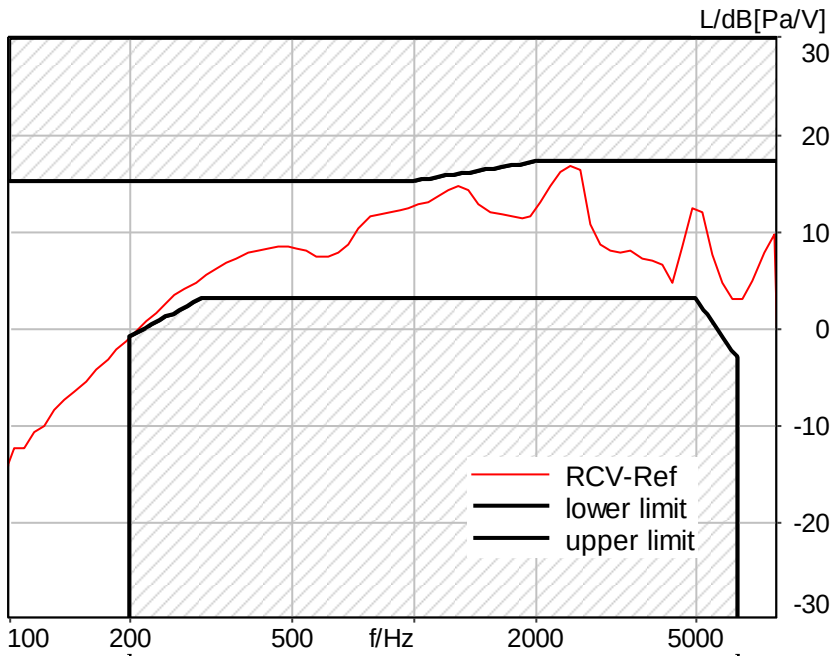
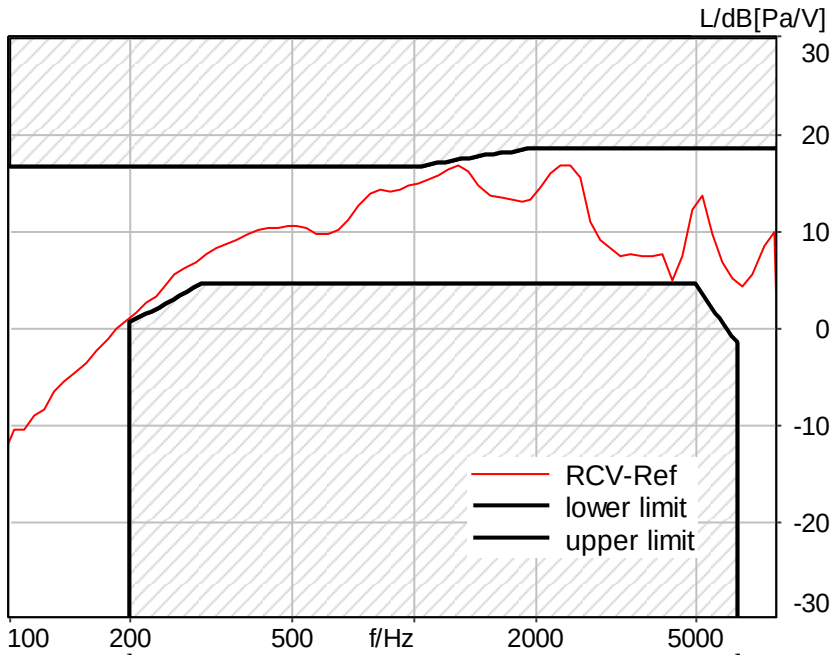
Band	Mount. Force (N)	LRP	Frequency Response
B14	2	FF	 Absolute minimal distance 0.43 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.17 dB at 1285.9 Hz Ok

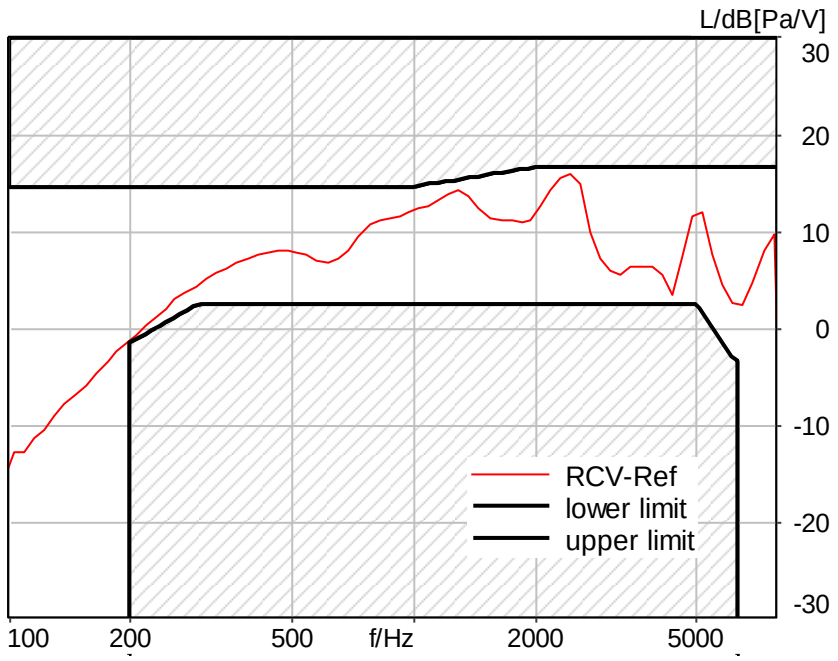
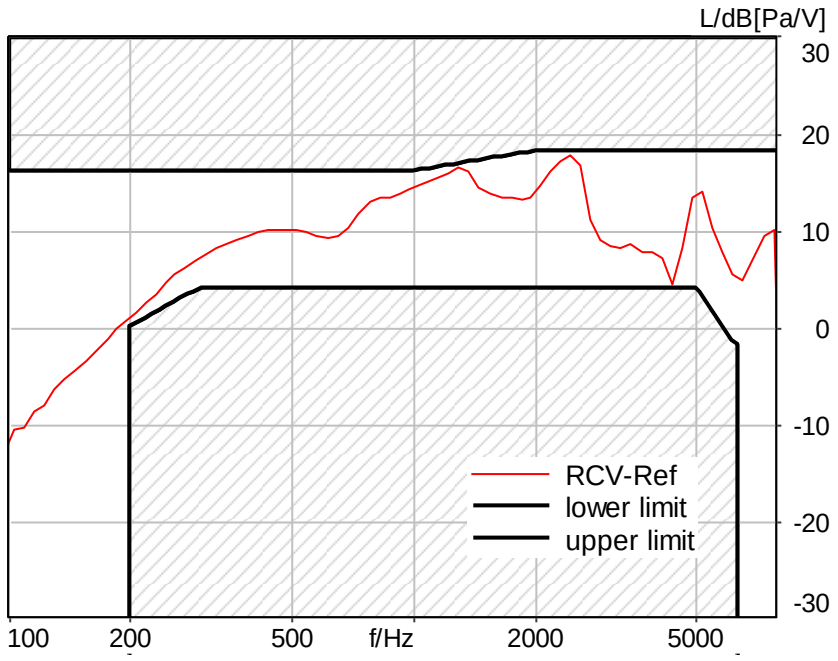
Band	Mount. Force (N)	LRP	Frequency Response
B25	2	FF	 Absolute minimal distance 0.76 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.17 dB at 1285.9 Hz Ok

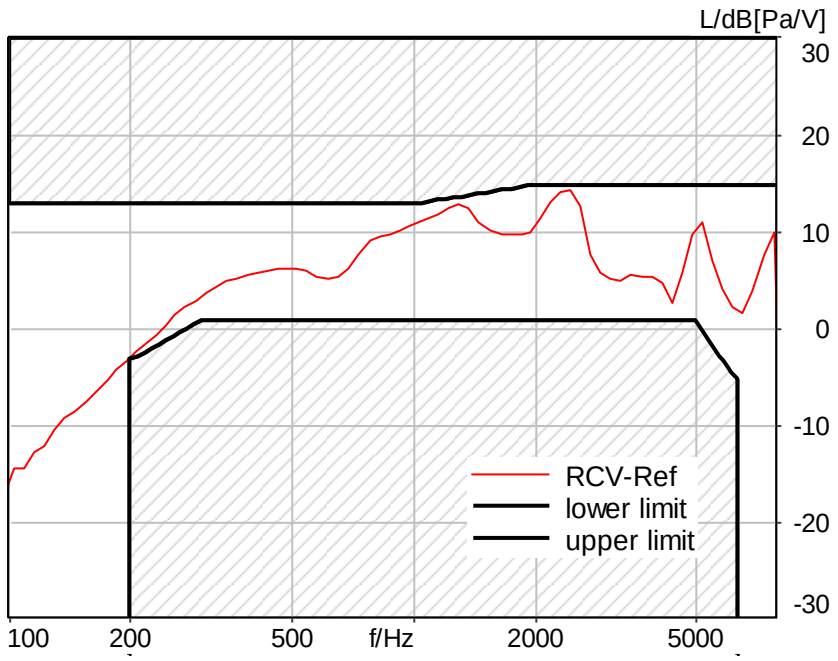
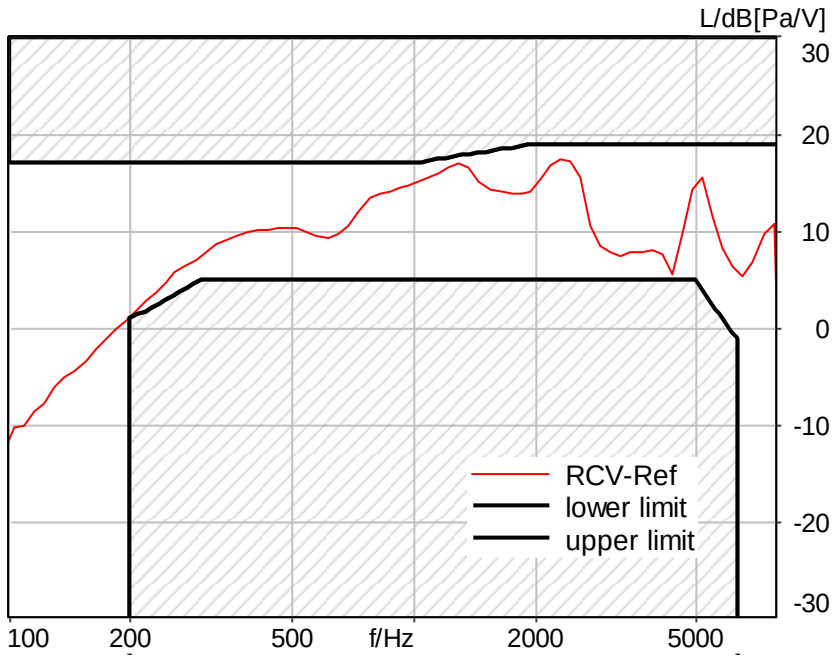
Band	Mount. Force (N)	LRP	Frequency Response
B26	2	FF	 Absolute minimal distance 0.47 dB at 1285.9 Hz Ok
	8	FF	 Absolute minimal distance 0.06 dB at 2432.3 Hz Ok

Band	Mount. Force (N)	LRP	Frequency Response
B30	2	FF	 Absolute minimal distance 0.54 dB at 205.7 Hz Ok
	8	FF	 Absolute minimal distance 0.09 dB at 1285.9 Hz Ok

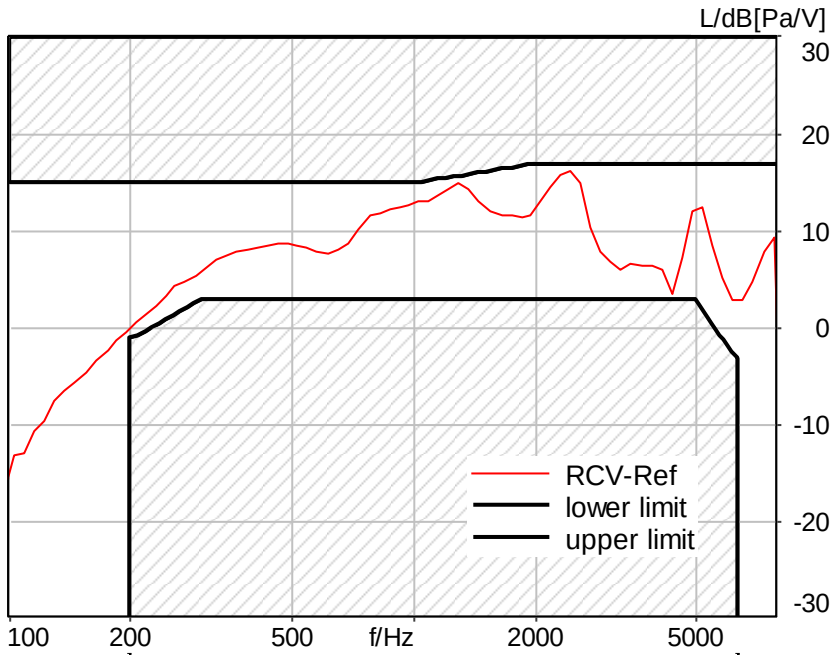
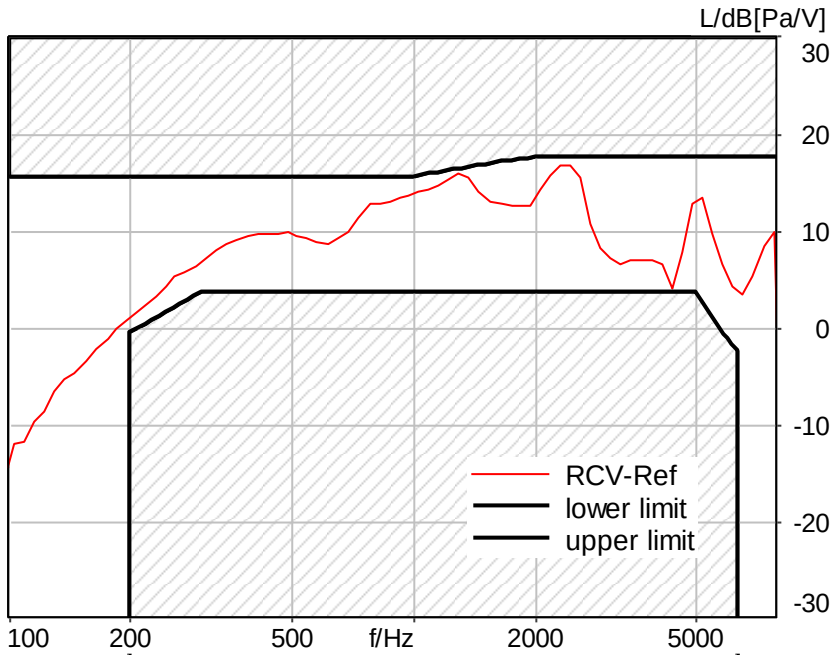
Band	Mount. Force (N)	LRP	Frequency Response
B41	2	FF	 Absolute minimal distance 0.56 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.76 dB at 1285.9 Hz Ok

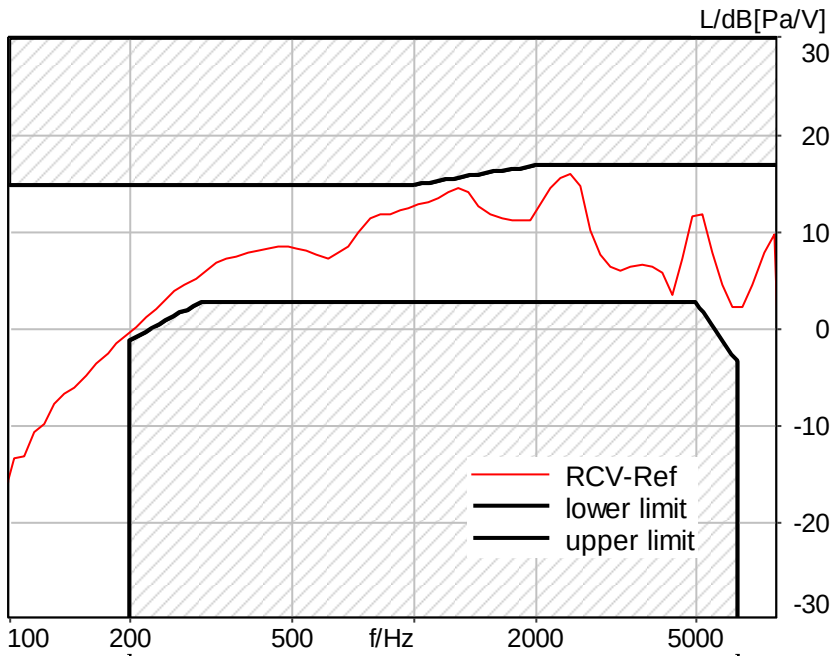
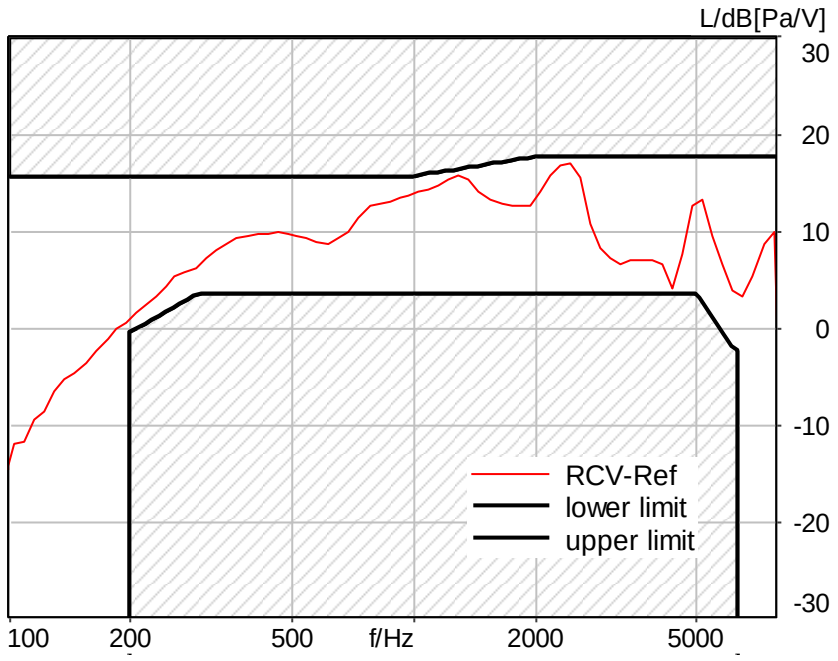
Band	Mount. Force (N)	LRP	Frequency Response
B48	2	FF	 Absolute minimal distance 0.29 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.48 dB at 1285.9 Hz Ok

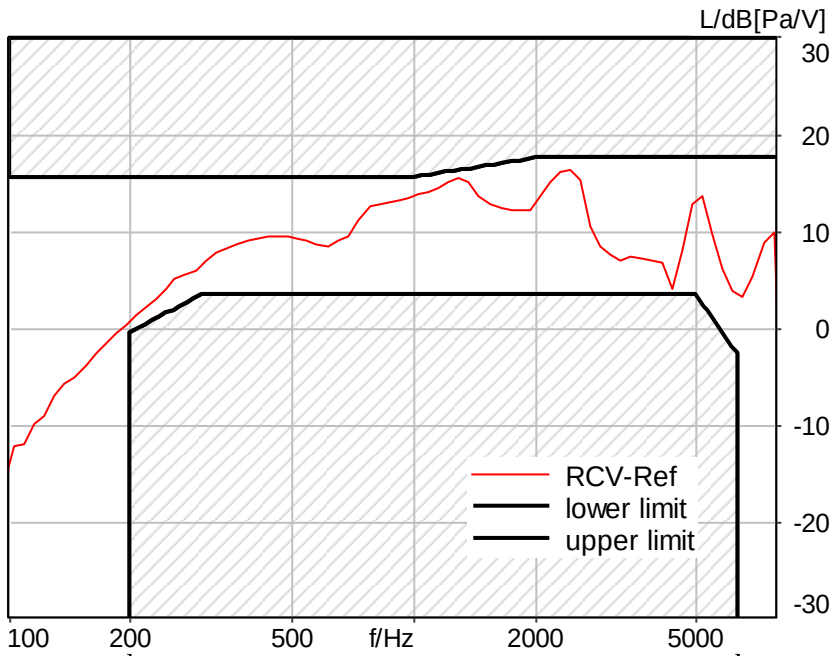
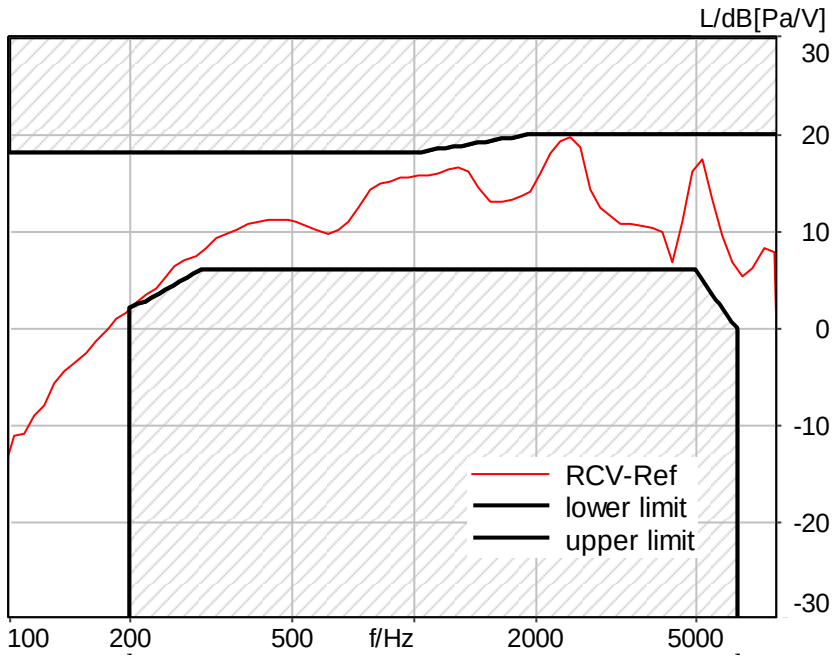
Band	Mount. Force (N)	LRP	Frequency Response
B66	2	FF	 Absolute minimal distance 0.54 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.33 dB at 1285.9 Hz Ok

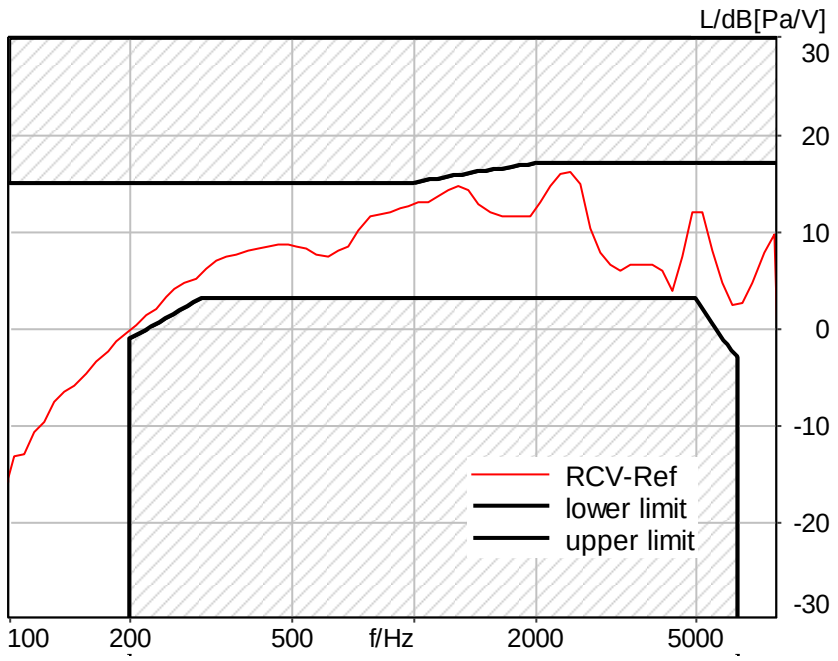
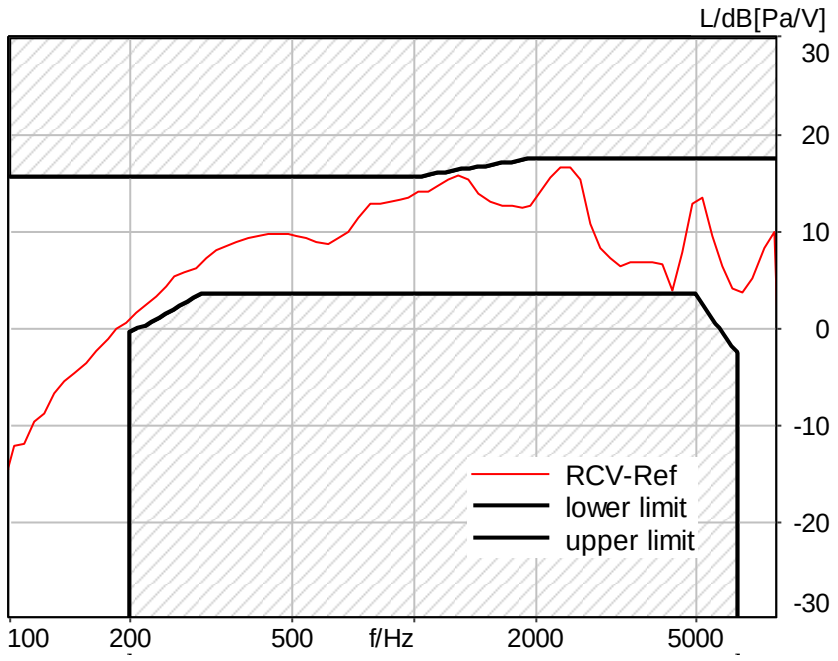
Band	Mount. Force (N)	LRP	Frequency Response
B71	2	FF	 Absolute minimal distance 0.56 dB at 205.7 Hz Ok
	8	FF	 Absolute minimal distance 0.56 dB at 1285.9 Hz Ok

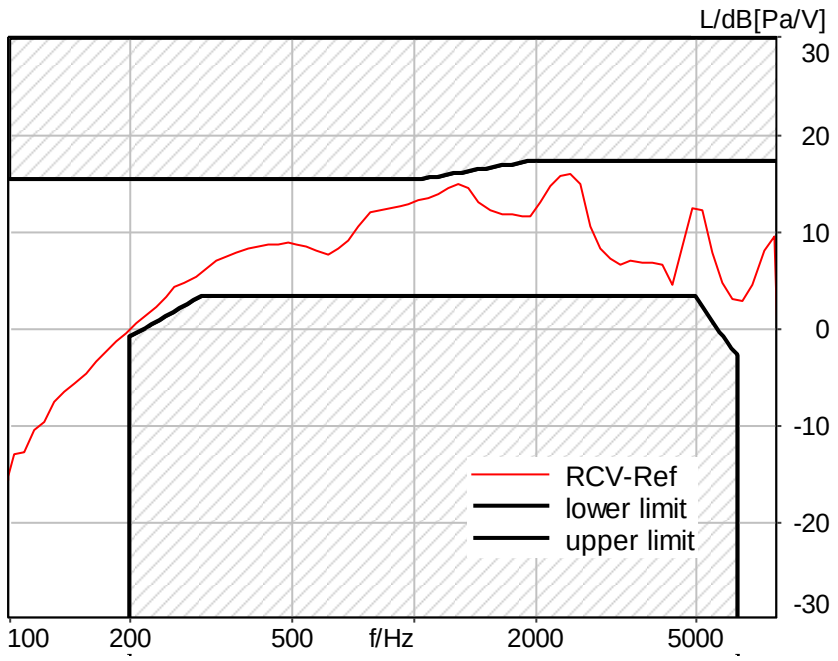
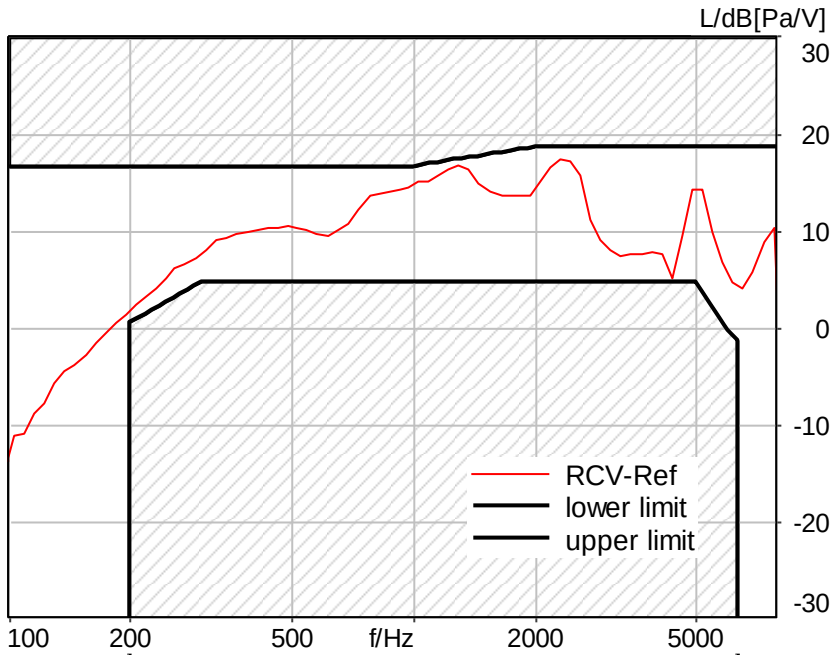
5) Frequency Response Graph for EVS-WB 128 kbps and NR (Volume Control: Max-1 Vol.)

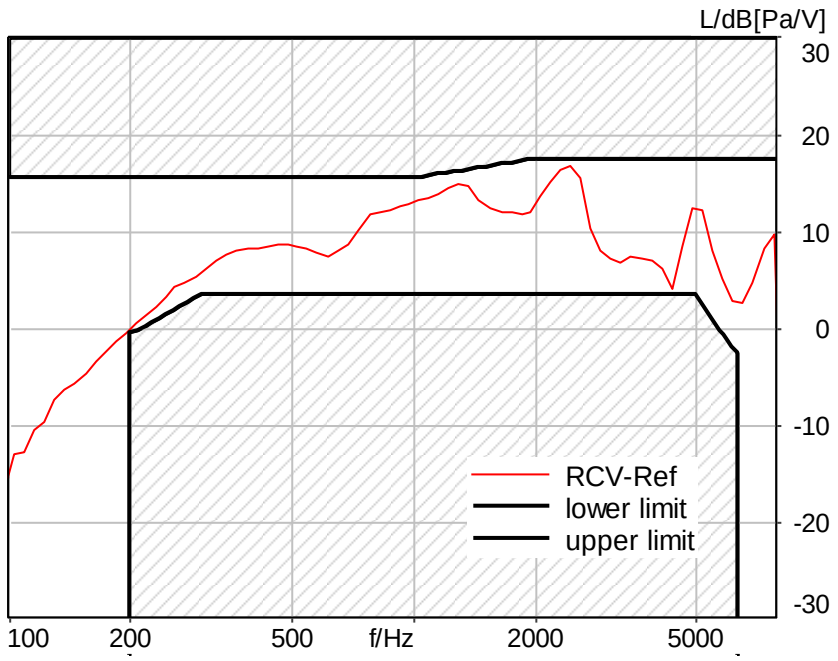
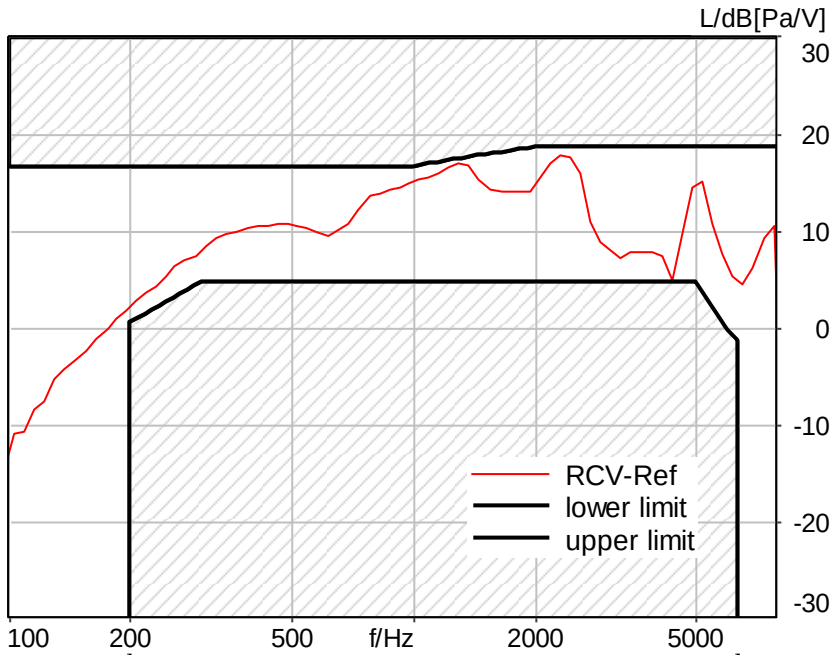
Band	Mount. Force (N)	LRP	Frequency Response
n7	2	FF	 Absolute minimal distance 0.70 dB at 1285.9 Hz Ok
	8	FF	 Absolute minimal distance 0.41 dB at 1285.9 Hz Ok

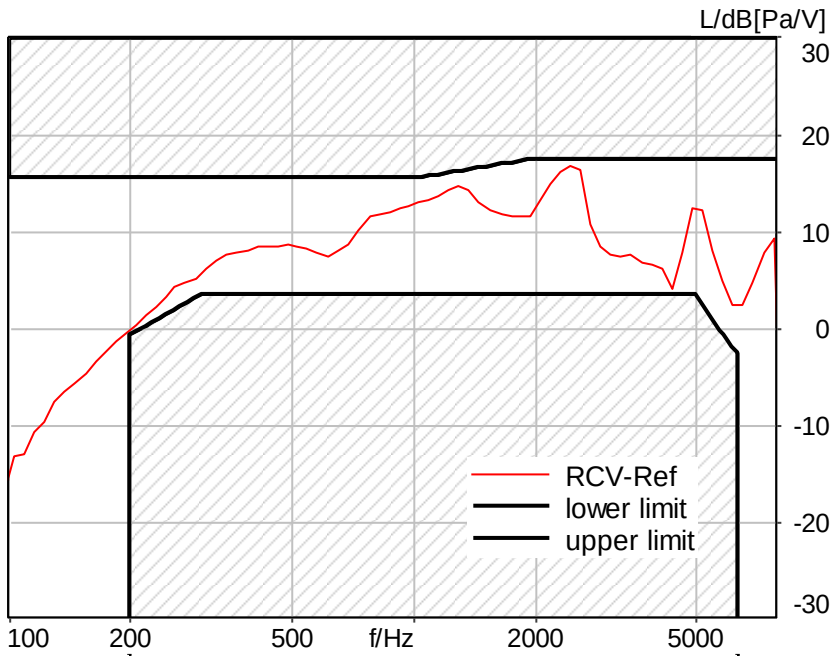
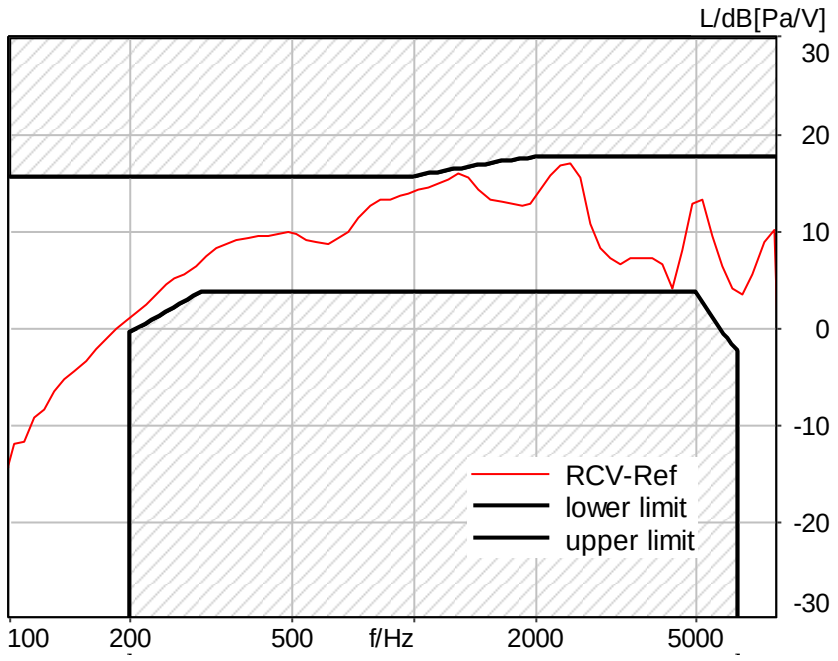
Band	Mount. Force (N)	LRP	Frequency Response
n12	2	FF	 Absolute minimal distance 0.78 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.50 dB at 1285.9 Hz Ok

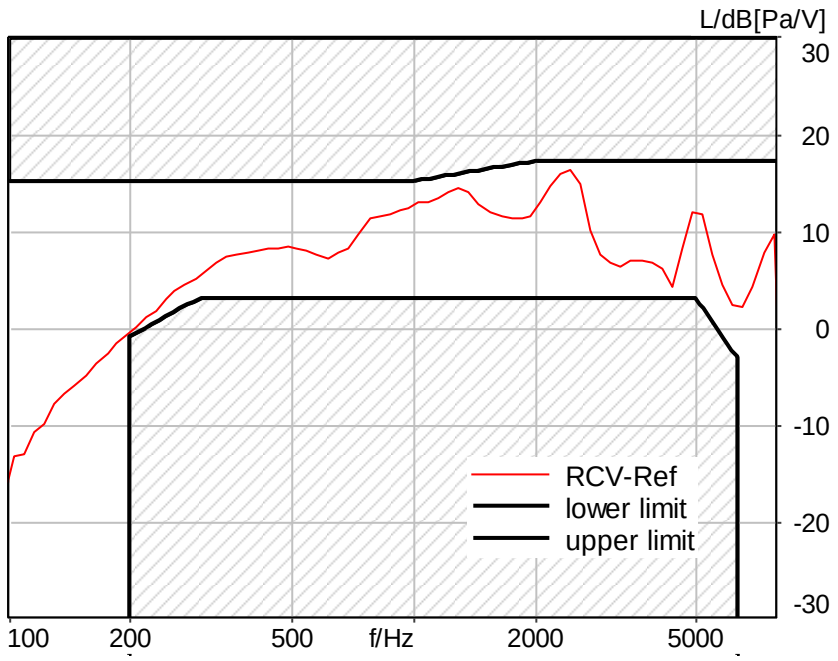
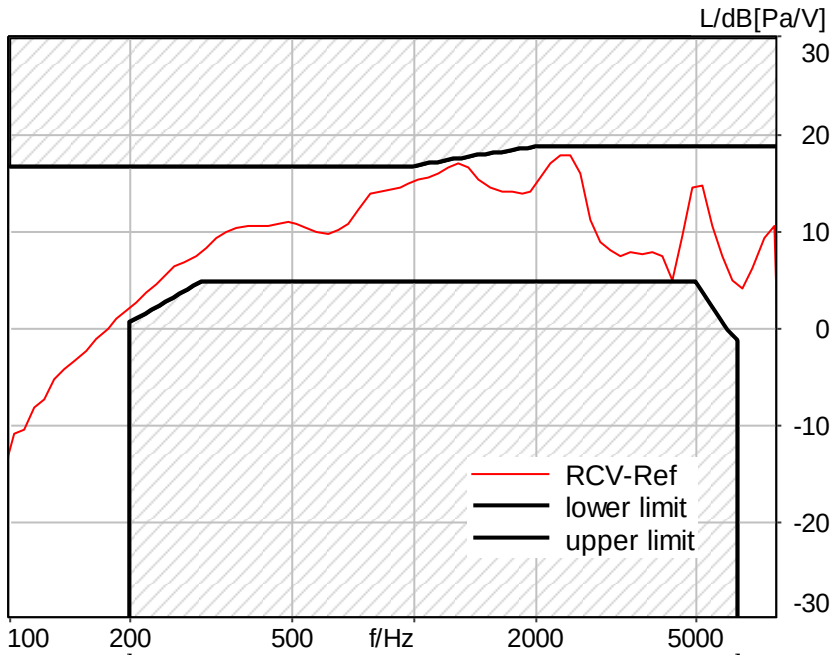
Band	Mount. Force (N)	LRP	Frequency Response
n25	2	FF	 Absolute minimal distance 0.66 dB at 1285.9 Hz Ok
	8	DF	 Absolute minimal distance 0.37 dB at 2432.3 Hz Ok

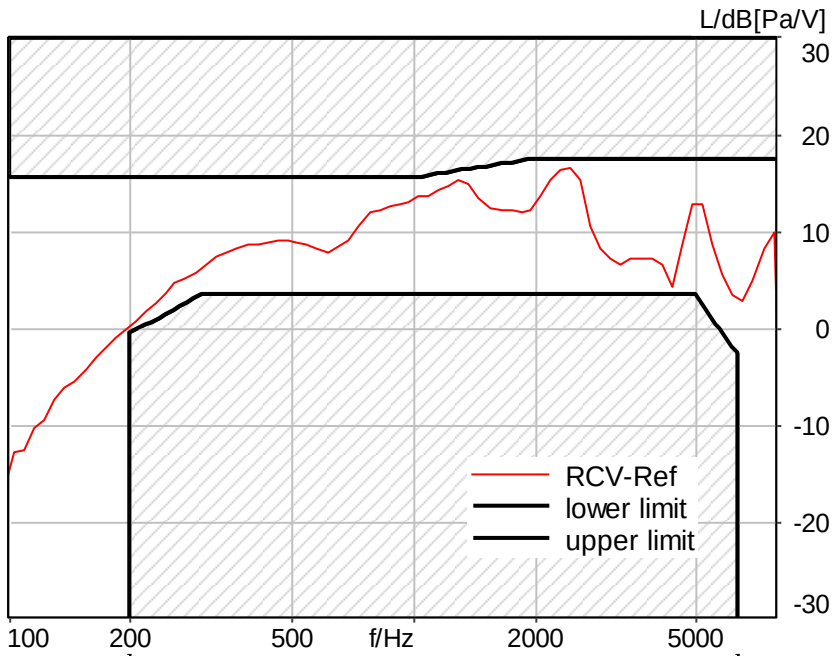
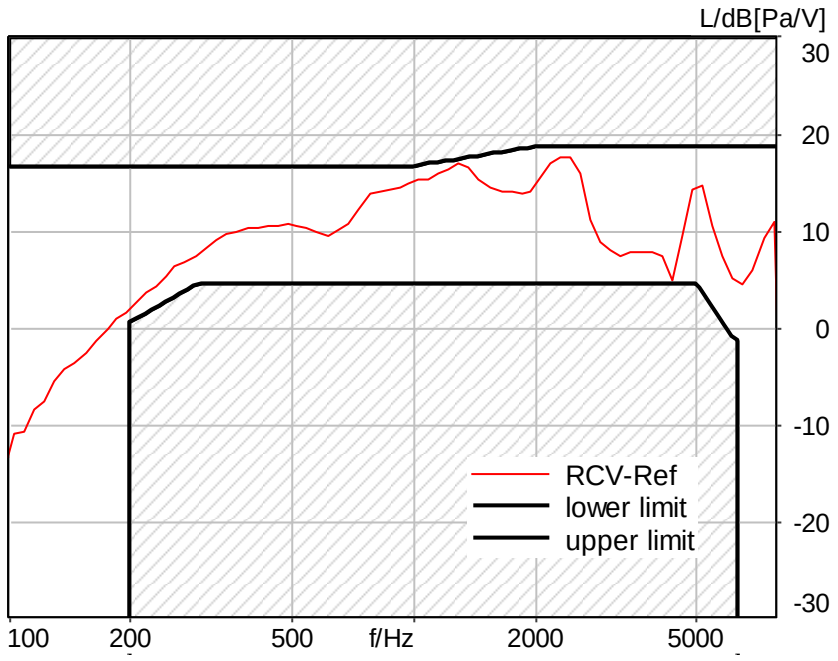
Band	Mount. Force (N)	LRP	Frequency Response
n26	2	FF	 Absolute minimal distance 0.81 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.49 dB at 1285.9 Hz Ok

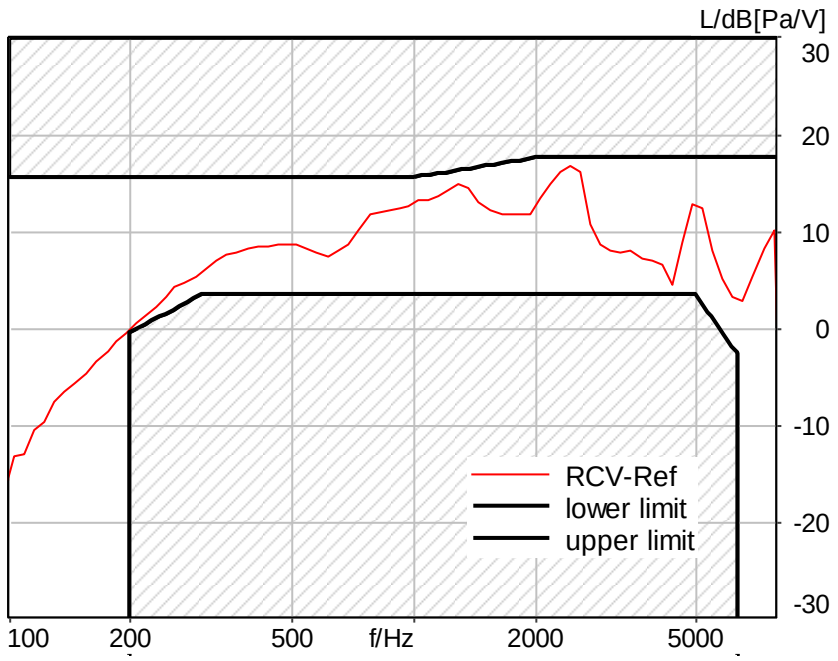
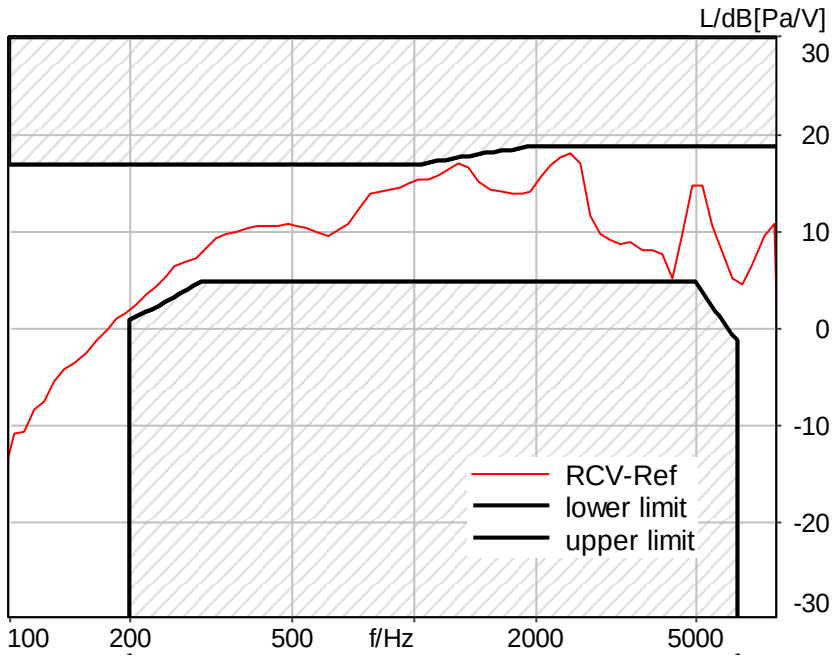
Band	Mount. Force (N)	LRP	Frequency Response
n30	2	FF	 Absolute minimal distance 1.00 dB at 1285.9 Hz Ok
	8	FF	 Absolute minimal distance 0.54 dB at 1285.9 Hz Ok

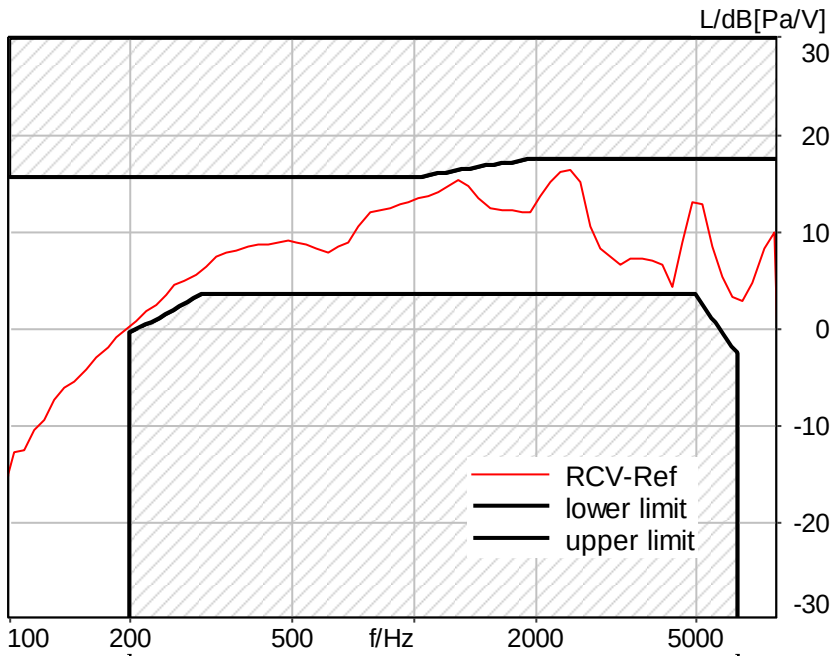
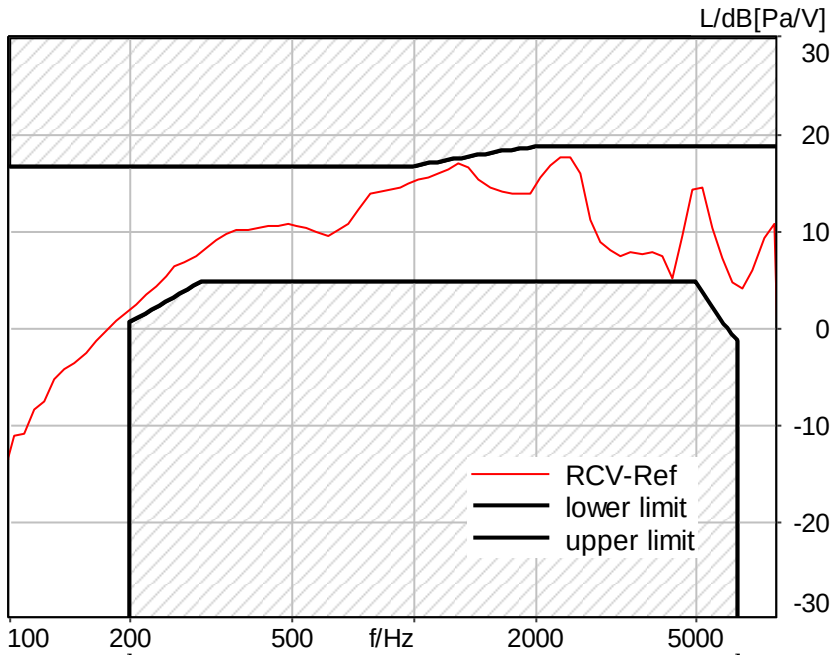
Band	Mount. Force (N)	LRP	Frequency Response
n38	2	FF	 Absolute minimal distance 0.76 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.35 dB at 1285.9 Hz Ok

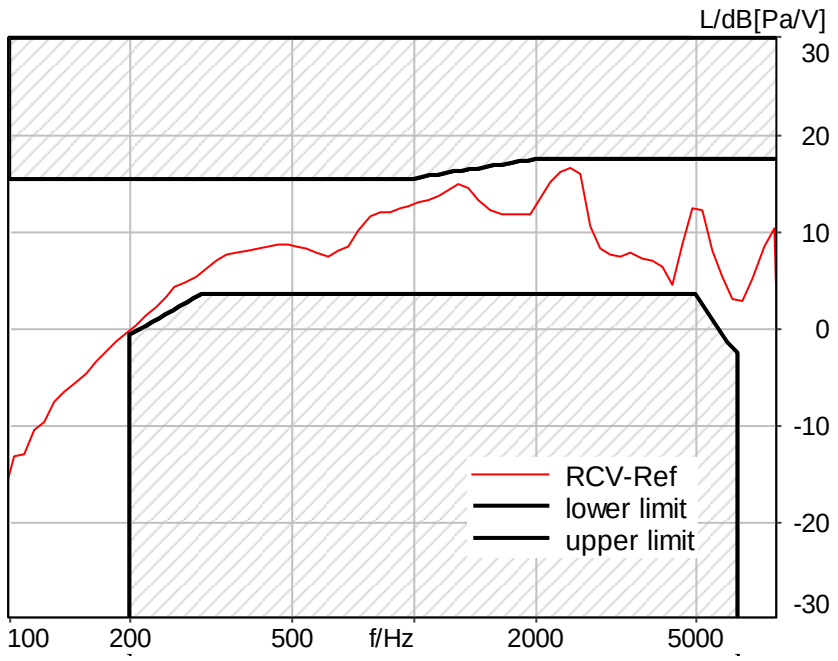
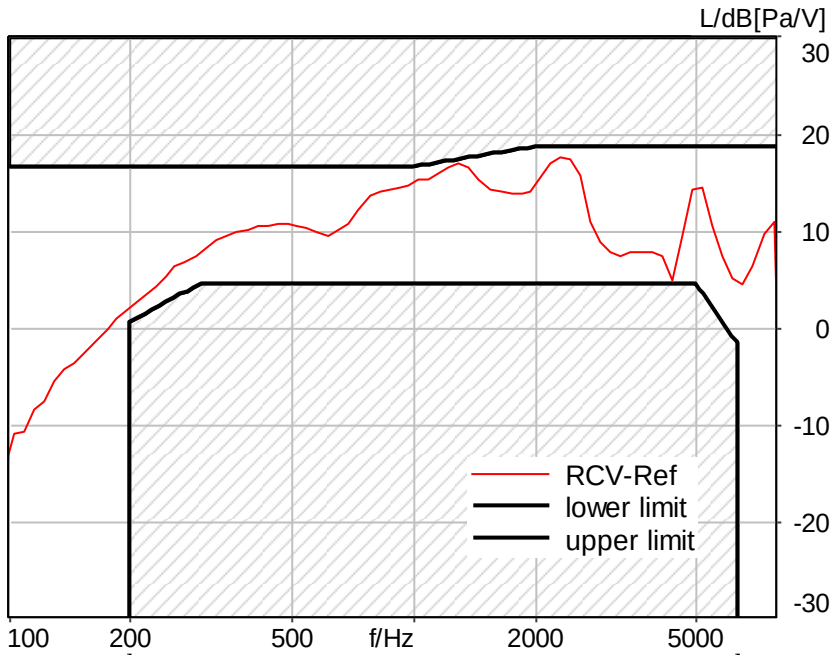
Band	Mount. Force (N)	LRP	Frequency Response
n41	2	FF	 Absolute minimal distance 0.64 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.42 dB at 1285.9 Hz Ok

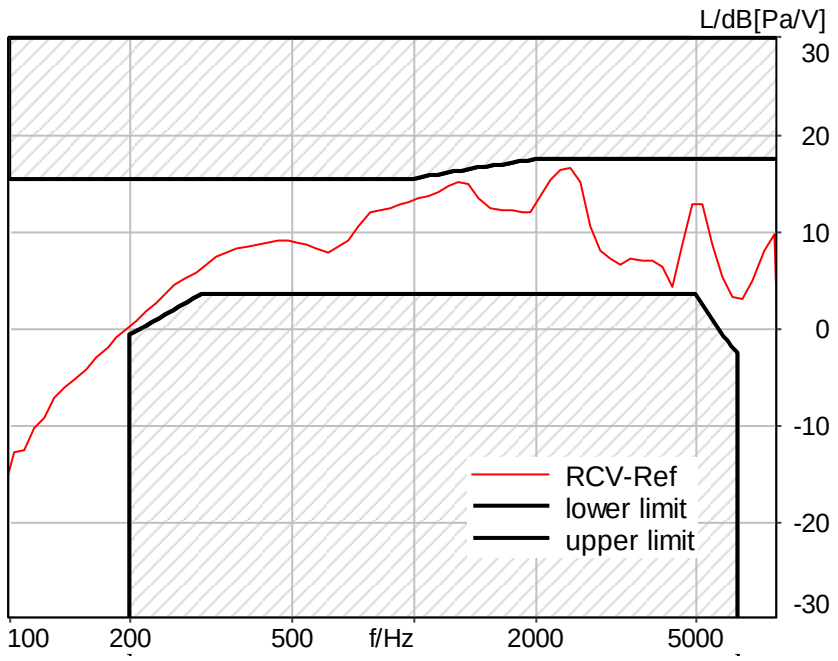
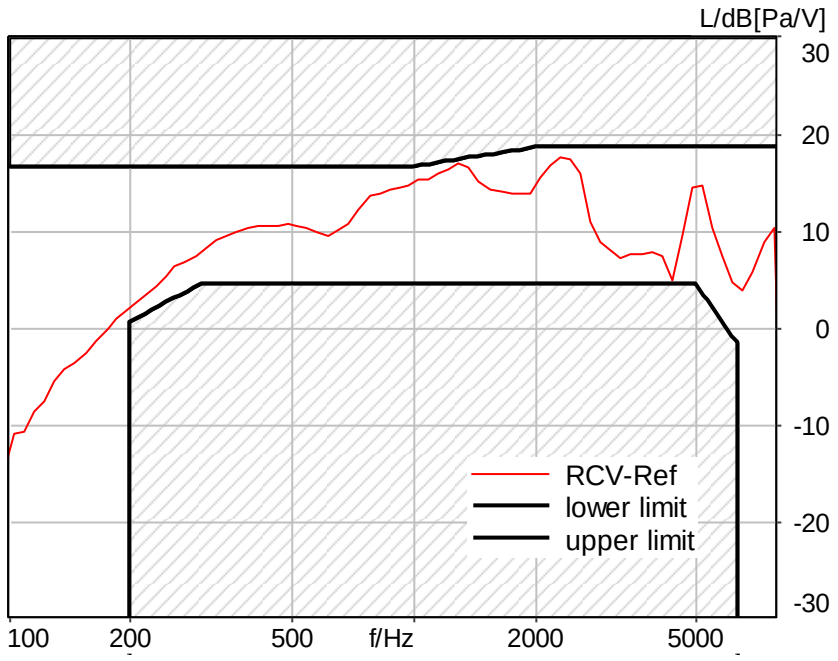
Band	Mount. Force (N)	LRP	Frequency Response
n48	2	FF	 Absolute minimal distance 0.82 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.36 dB at 1285.9 Hz Ok

Band	Mount. Force (N)	LRP	Frequency Response
n66	2	FF	 Absolute minimal distance 0.89 dB at 1285.9 Hz Ok
	8	FF	 Absolute minimal distance 0.40 dB at 1285.9 Hz Ok

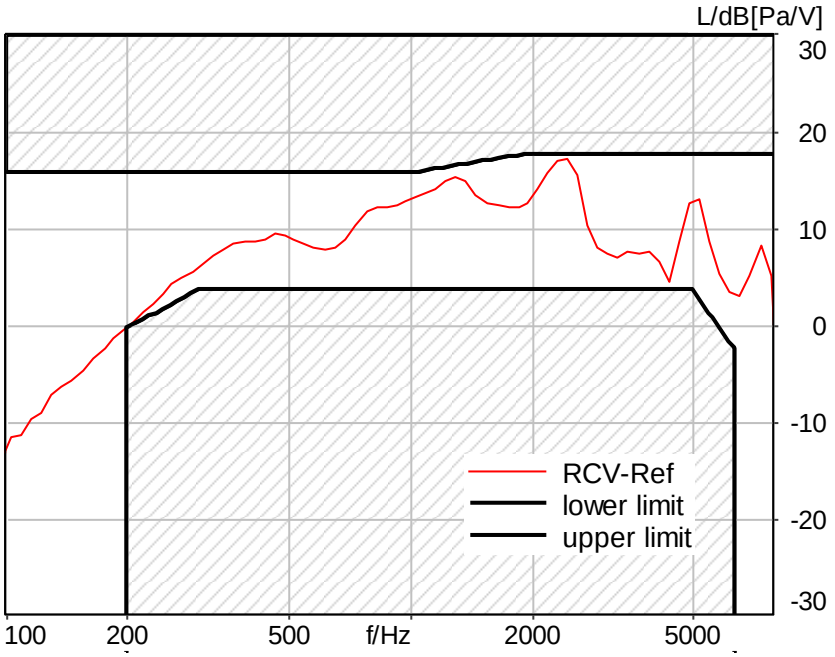
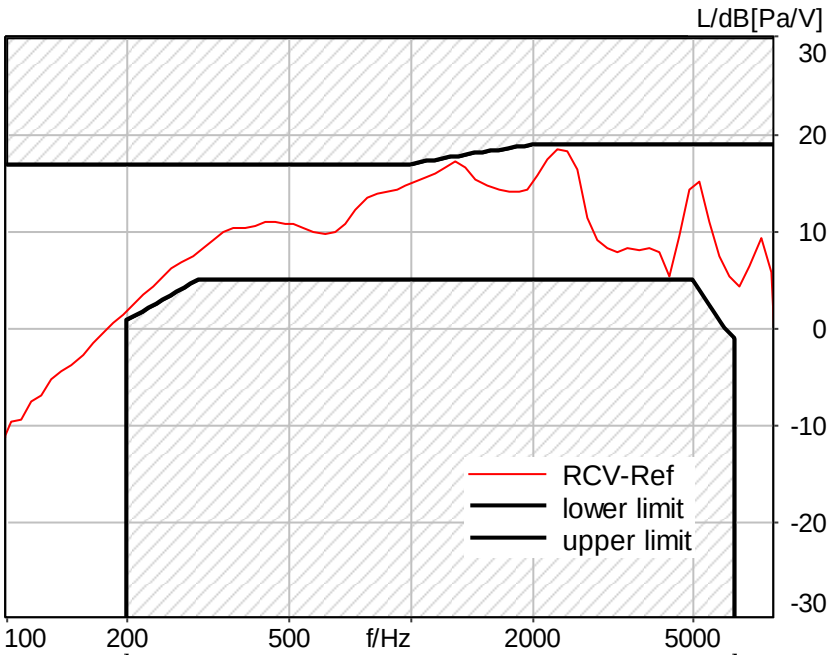
Band	Mount. Force (N)	LRP	Frequency Response
n70	2	FF	 Absolute minimal distance 0.71 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.51 dB at 1285.9 Hz Ok

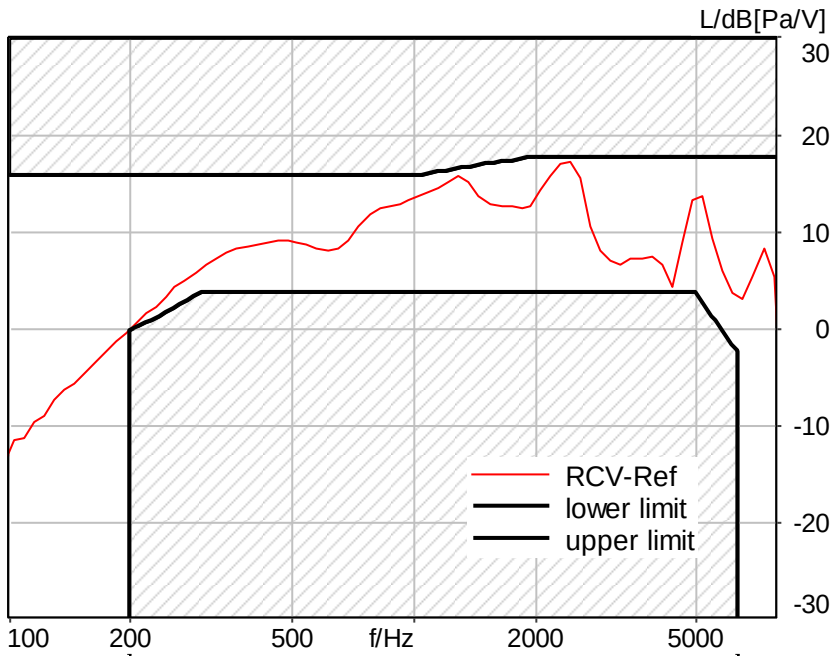
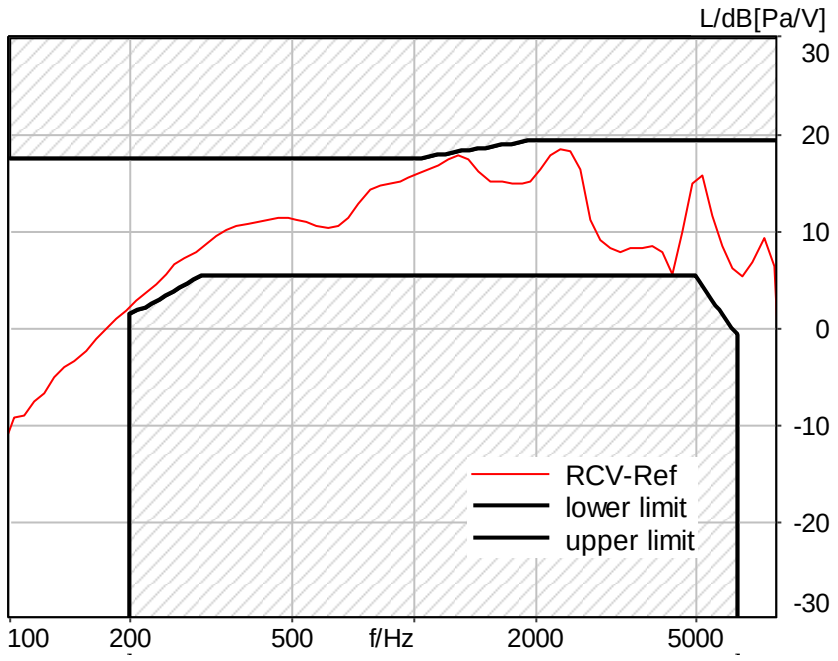
Band	Mount. Force (N)	LRP	Frequency Response
n71	2	FF	 Absolute minimal distance 0.92 dB at 1285.9 Hz Ok
	8	FF	 Absolute minimal distance 0.45 dB at 1285.9 Hz Ok

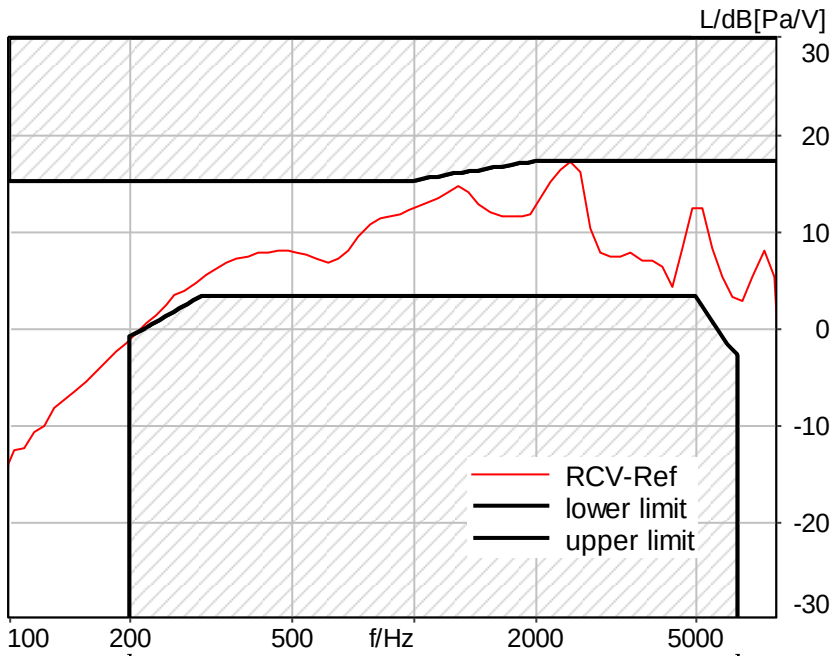
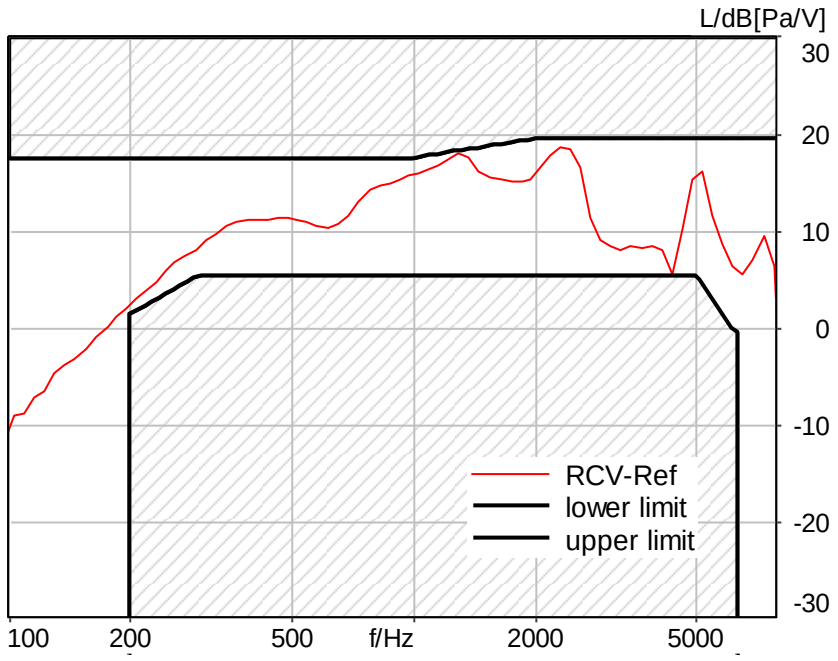
Band	Mount. Force (N)	LRP	Frequency Response
n77	2	FF	 Absolute minimal distance 0.73 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.38 dB at 1285.9 Hz Ok

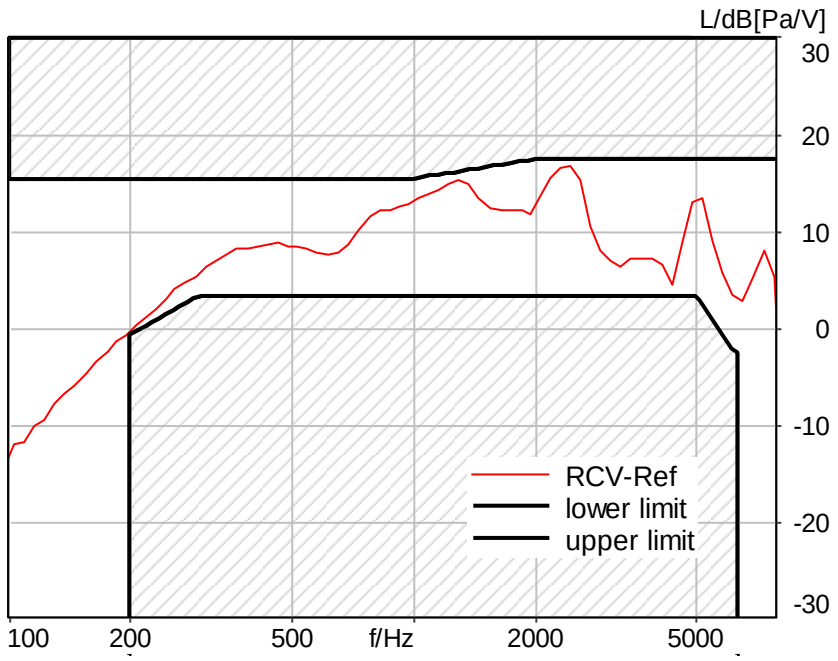
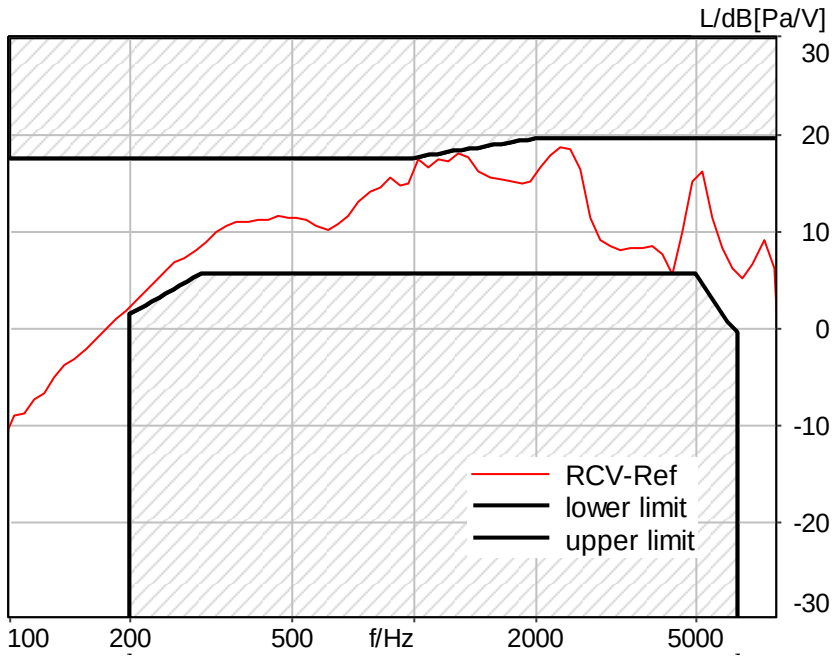
Band	Mount. Force (N)	LRP	Frequency Response
n78	2	FF	 Absolute minimal distance 0.89 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.37 dB at 1285.9 Hz Ok

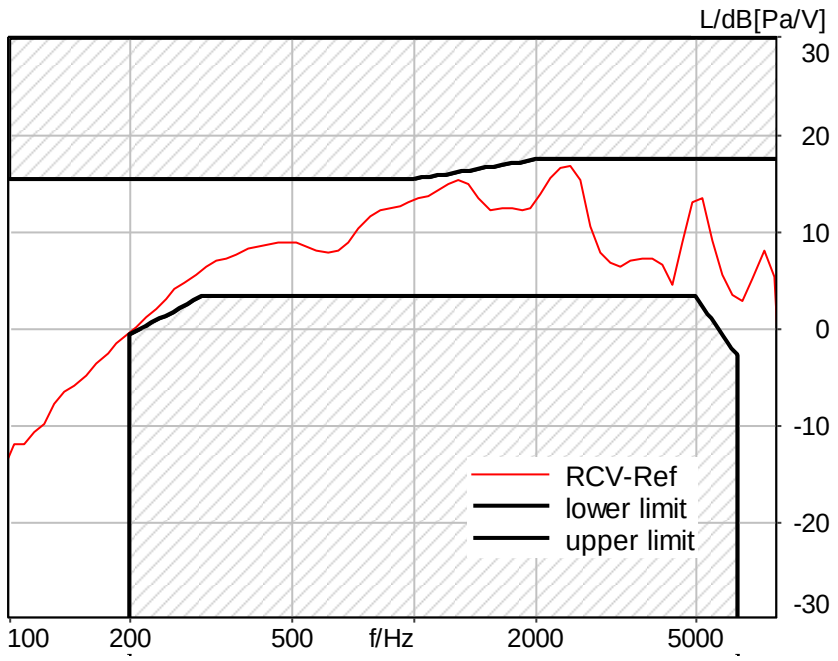
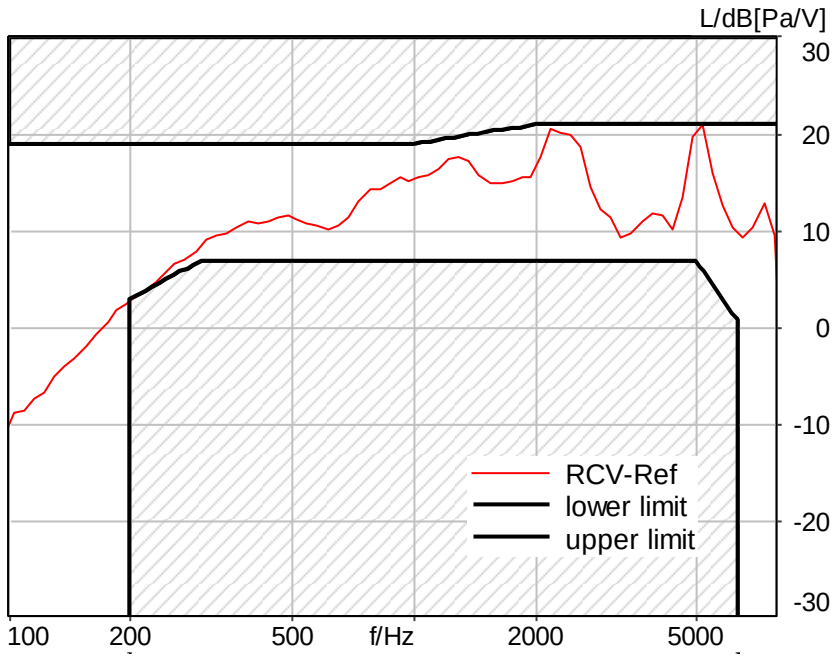
6) Frequency Response Graph for EVS-WB 128 kbps and WIFI (Volume Control: Max-1 Vol.)

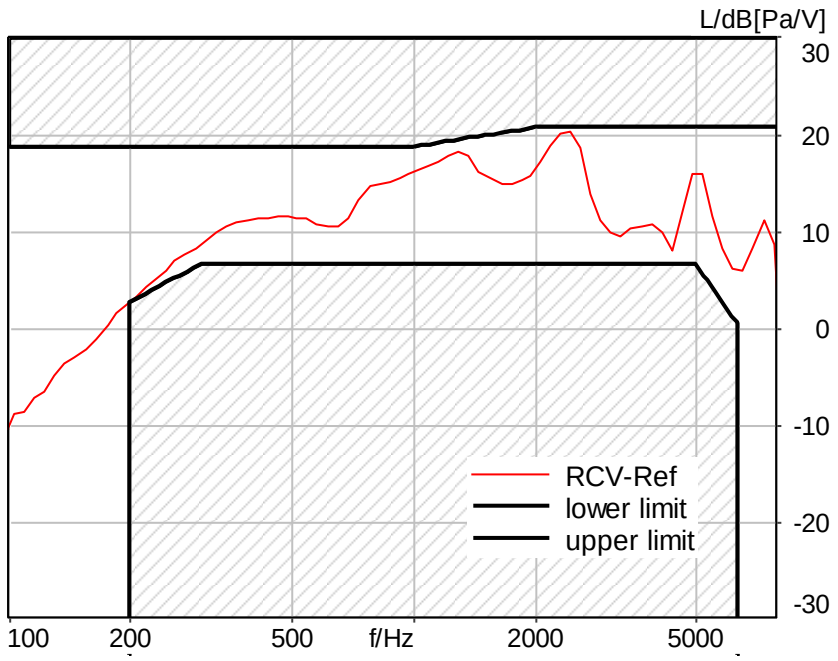
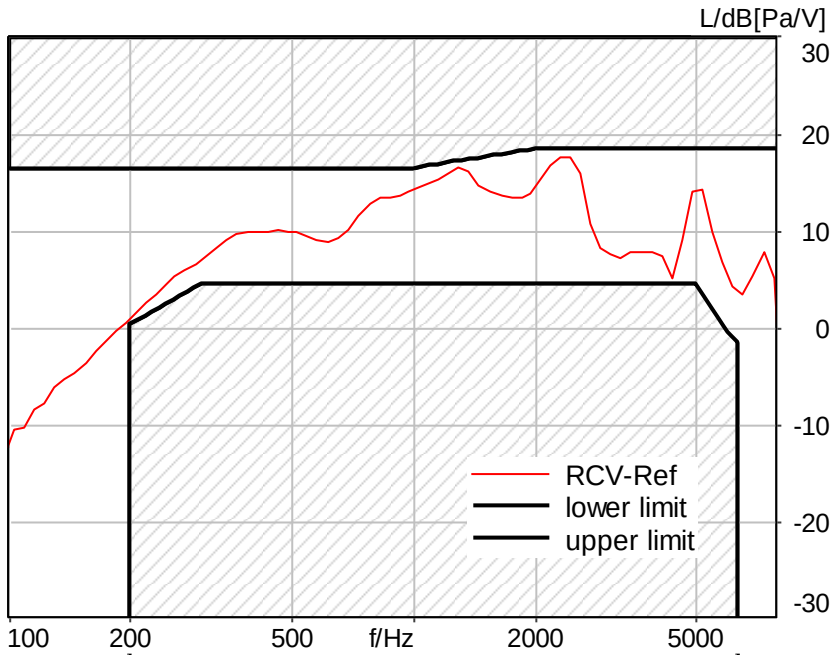
Band	Mount. Force (N)	LRP	Frequency Response
802.11b 2.4 GHz	2	FF	 Absolute minimal distance 0.49 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.41 dB at 1285.9 Hz Ok

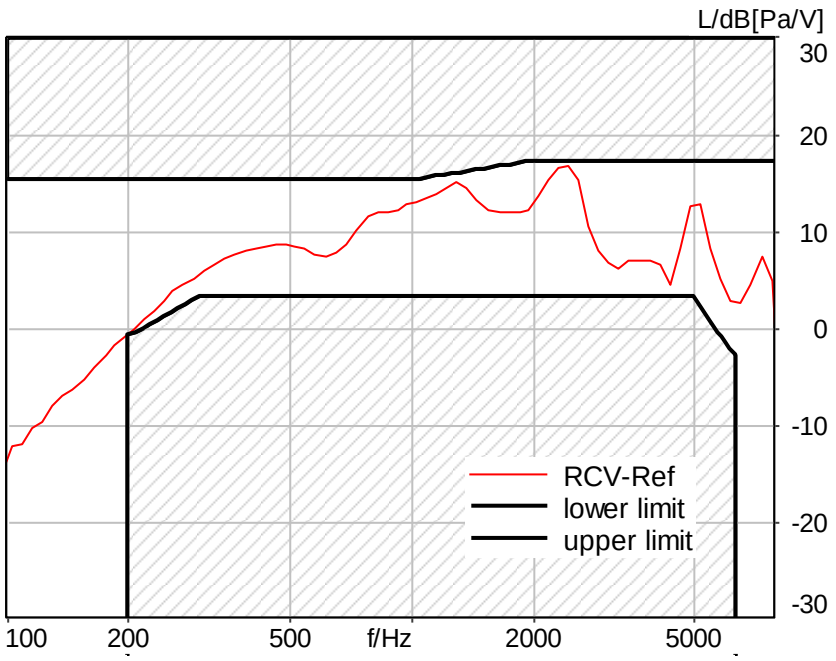
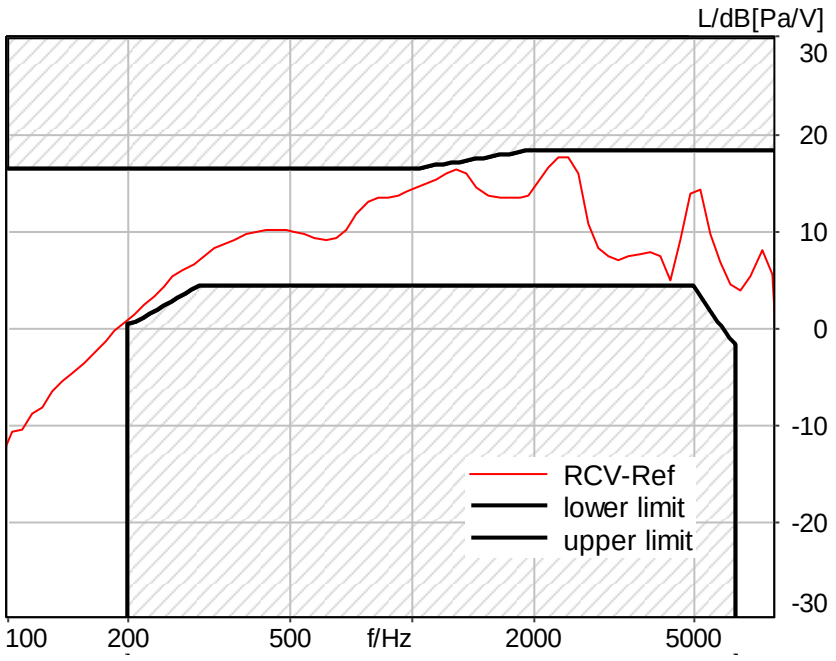
Band	Mount. Force (N)	LRP	Frequency Response
802.11g 2.4 GHz	2	FF	 Absolute minimal distance 0.58 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.15 dB at 1285.9 Hz Ok

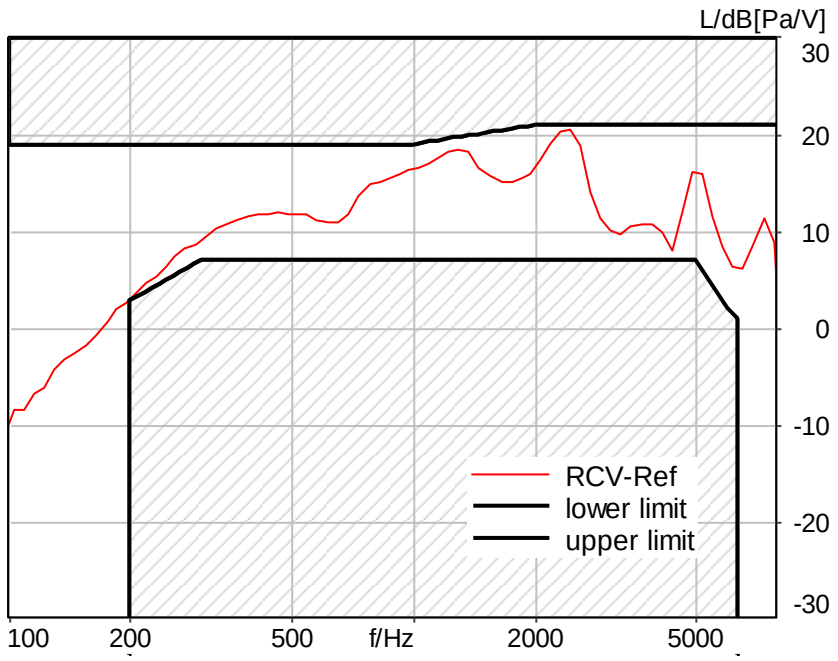
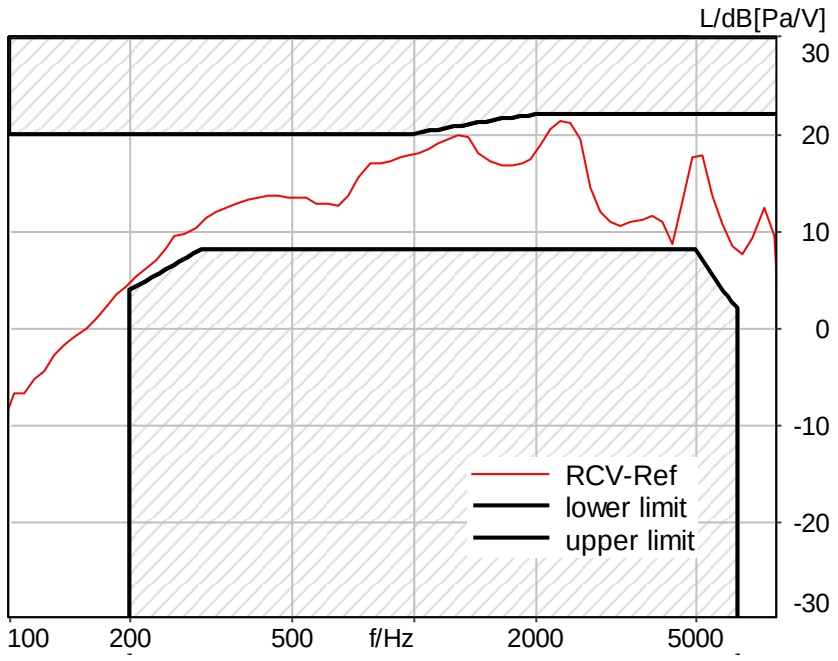
Band	Mount. Force (N)	LRP	Frequency Response
802.11n 2.4 GHz	2	FF	 Absolute minimal distance 0.07 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.08 dB at 1285.9 Hz Ok

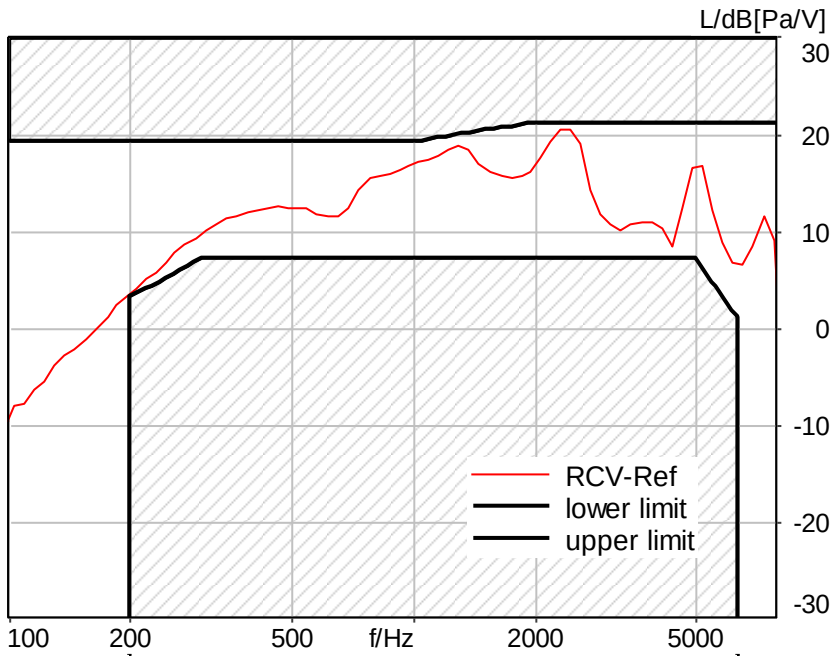
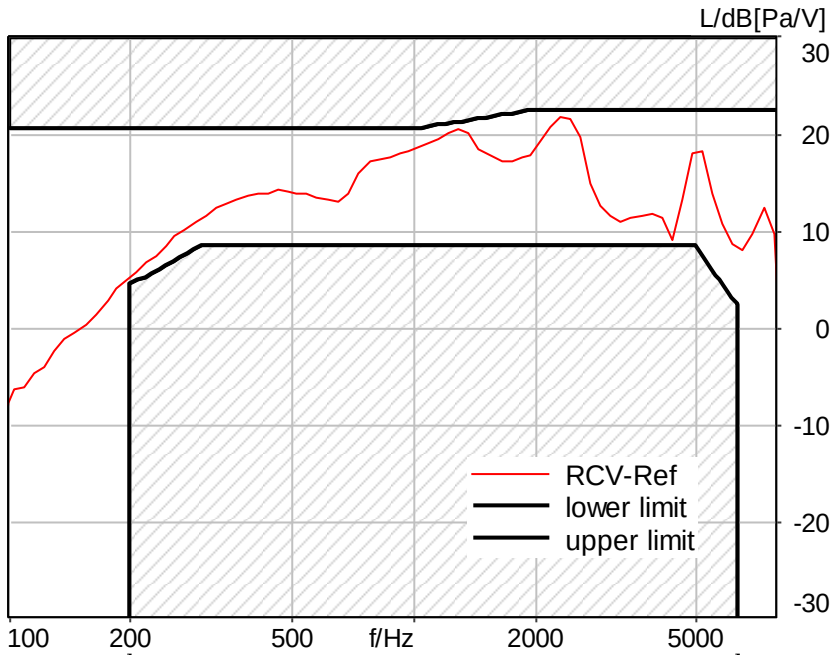
Band	Mount. Force (N)	LRP	Frequency Response
802.11ac 2.4 GHz	2	FF	 Absolute minimal distance 0.69 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.09 dB at 1285.9 Hz Ok

Band	Mount. Force (N)	LRP	Frequency Response
802.11ax 2.4 GHz	2	FF	 Absolute minimal distance 0.61 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.05 dB at 5143.7 Hz Ok

Band	Mount. Force (N)	LRP	Frequency Response
802.11a 5 GHz	2	FF	 Absolute minimal distance 0.43 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.63 dB at 1285.9 Hz Ok

Band	Mount. Force (N)	LRP	Frequency Response
802.11n 5 GHz	2	FF	 Absolute minimal distance 0.48 dB at 205.7 Hz Ok
	8	FF	 Absolute minimal distance 0.63 dB at 1285.9 Hz Ok

Band	Mount. Force (N)	LRP	Frequency Response
802.11ac 5 GHz	2	FF	 Absolute minimal distance 0.44 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.68 dB at 2302.3 Hz Ok

Band	Mount. Force (N)	LRP	Frequency Response
802.11ax 5 GHz	2	FF	 Absolute minimal distance 0.64 dB at 2432.3 Hz Ok
	8	FF	 Absolute minimal distance 0.65 dB at 1285.9 Hz Ok

End of Report