

Appendix A

Volume Control Test Data and Graph for Report No.: SUES251000220971

The DUT shall have at least one volume control setting that will produce a conversational gain of ≥ 6 .

Verdict: Pass.

1.1 For codecs with bit rate, check the bit rate with the worst conversational gain

Codec	Codec Bitrate (kbps)	Conv. Gain(dB)									
		GSM850		WCDMA B2		LTE B41		NR n77		802.11b	
		2N	8N	2N	8N	2N	8N	2N	8N	2N	8N
AMR-NB	4.75	14.51	19.19	14.41	18.63	13.26	17.88	13.60	18.13	14.21	16.97
	5.15	14.71	19.24	14.47	18.65	13.31	18.02	13.65	18.31	14.25	17.11
	5.9	14.73	19.41	14.53	18.78	13.32	18.05	13.67	18.34	14.43	17.26
	6.7	15.23	19.42	14.63	18.87	13.49	18.09	13.72	18.37	14.49	17.75
	7.4	15.25	19.57	14.64	19.17	13.55	18.13	13.86	18.51	14.89	18.51
	7.95	15.28	19.72	14.65	19.19	13.72	18.26	13.94	18.57	14.94	18.60
	10.2	15.34	19.77	14.79	19.27	13.85	18.48	14.03	18.59	14.96	18.77
	12.2	15.42	19.97	14.83	19.43	13.87	18.52	14.28	18.61	14.99	19.68
AMR-WB	6.6	N/A		8.25	12.96	7.71	12.12	8.69	12.85	8.20	12.20
	8.85			8.31	13.01	7.73	12.13	8.70	12.86	8.31	12.22
	12.65			8.36	13.02	7.76	12.15	8.71	12.88	8.35	12.26
	14.25			8.50	13.19	7.78	12.18	8.74	12.91	8.38	12.34
	15.85			8.60	13.23	7.81	12.21	8.77	12.99	8.52	12.38
	18.25			8.84	13.27	7.83	12.25	8.78	13.08	8.54	12.45
	19.85			8.91	13.33	7.84	12.27	8.84	13.09	8.68	12.57
	23.05			8.92	13.36	7.85	12.29	8.86	13.11	8.86	12.62
	23.85			8.98	13.45	7.87	12.41	8.90	13.15	8.87	12.63
EVS-NB	5.9	N/A				14.29	19.20	14.19	18.90	13.99	19.01
	7.2					14.30	19.24	14.26	19.17	14.18	19.09
	8					14.34	19.38	14.41	19.28	14.20	19.20
	9.6					14.43	19.45	14.44	19.35	14.21	19.52
	13.2					14.45	19.63	14.52	19.39	14.40	19.53
	16.4					14.51	19.68	14.61	19.44	14.48	19.54
	24.4					14.79	19.77	14.77	19.45	14.51	19.62
EVS-WB	5.9					8.12	13.29	8.36	12.90	8.26	12.96
	7.2					8.13	13.35	8.41	12.93	8.32	13.01
	8					8.63	13.40	8.42	12.98	8.40	13.08
	9.6					8.67	13.47	8.46	13.00	8.46	13.17
	13.2					8.78	13.57	8.53	13.08	8.65	13.23
	16.4					8.86	13.63	8.55	13.15	8.72	13.34
	24.4					8.99	13.67	8.56	13.16	8.84	13.46
EVS-SWB	9.6					10.94	14.58	10.66	14.34	10.92	14.83
	13.2					11.04	14.68	10.71	14.52	10.99	15.06
	16.4					10.99	14.86	10.68	14.92	11.24	15.08
	24.4					10.97	15.04	10.70	14.95	11.32	15.09

1.2 For codecs with bit rate, tested only bit rate with the worst conversational gain

Air Interface	Band	Limit (dB)	Conv. Gain(dB)							
			FR V1		FR V2		HR V1		AMR NB (4.75kbps)	
			2N	8N	2N	8N	2N	8N	2N	8N
GSM	850	6	14.38	18.85	14.56	19.07	14.56	19.06	14.51	19.19
	1900	6	14.25	18.85	14.60	19.09	14.70	19.03	14.71	19.48

Air Interface	Band	Limit (dB)	Conv. Gain(dB)									
			AMR NB (4.75kbps)		AMR WB (6.6kbps)		EVS NB (5.9kbps)		EVS WB (5.9kbps)		EVS SWB (9.6kbps)	
			2N	8N	2N	8N	2N	8N	2N	8N	2N	8N
WCDMA	B2	6	14.41	18.63	8.25	12.96	N/A					
	B4	6	14.24	18.85	8.30	13.02						
	B5	6	14.07	18.69	8.21	12.94						
LTE	B25(2)	6	14.37	18.88	8.27	13.07	14.36	19.09	8.43	12.91	10.86	14.67
	B26(5)	6	14.17	18.70	8.29	12.87	14.52	19.04	8.37	12.78	10.68	14.61
	B7	6	14.14	18.85	8.29	12.94	14.42	19.02	8.29	12.91	10.56	14.64
	B12(17)	6	14.52	19.12	8.72	13.36	14.37	19.14	8.48	12.84	10.55	14.72
	B13	6	14.63	19.19	8.16	13.15	14.45	19.18	8.40	12.92	10.79	15.01
	B14	6	14.58	19.18	8.22	12.98	14.21	19.01	8.12	12.94	10.92	14.69
	B30	6	14.41	19.14	8.32	13.17	14.15	19.07	8.17	13.09	10.85	14.81
	B71	6	14.62	19.08	8.33	12.79	14.30	18.89	8.35	13.04	10.98	14.80
	B42	6	13.89	18.59	9.04	13.61	13.94	18.48	8.69	13.25	10.85	14.73
	B48	6	14.14	18.85	8.69	13.45	14.19	18.90	8.23	12.68	10.70	14.34
	B41(38)	6	13.26	17.88	7.71	12.12	14.29	19.20	8.12	13.29	10.97	15.04
NR	B66(4)	6	14.44	19.06	8.35	13.19	14.34	18.95	8.25	12.99	10.71	14.62
	n7	6	14.24	18.63	8.61	13.19	14.70	18.46	8.20	12.74	10.65	14.91
	n12	6	14.50	18.62	8.80	12.86	14.63	19.09	9.09	13.14	10.80	14.61
	n14	6	13.88	18.63	8.83	12.90	13.96	18.46	8.69	13.25	11.06	14.45
	n25(2)	6	14.09	18.50	8.29	12.78	13.96	18.85	8.23	12.68	10.77	14.49
	n26(5)	6	14.10	18.79	9.04	13.61	14.55	19.07	9.10	12.74	10.78	14.44
	n30	6	14.19	18.94	8.69	13.45	14.34	18.59	8.82	12.92	10.84	14.52
	n41(38)	6	14.06	18.53	8.50	12.95	14.05	18.69	8.04	12.80	11.18	14.70
	n48	6	14.34	19.07	8.44	13.57	14.43	19.30	8.22	13.06	11.22	14.68
	n66	6	13.89	18.59	8.62	12.76	14.21	18.85	8.12	12.73	10.89	14.96
	n70	6	14.14	18.85	8.22	12.98	14.15	19.07	8.16	12.89	10.85	14.81
	n71	6	14.13	18.90	8.20	12.82	13.94	18.48	7.80	12.58	10.85	14.73
WLAN-2.4G	n77(78)	6	13.60	18.13	8.69	12.85	14.19	18.90	8.36	12.90	10.70	14.34
	802.11b	6	14.21	16.97	8.20	12.20	13.99	19.01	8.26	12.96	10.92	14.83
	802.11g	6	13.59	18.62	8.51	12.85	14.36	19.24	8.35	13.11	11.55	15.04
WLAN-5G	802.11n	6	14.51	18.33	8.11	12.95	14.20	19.15	8.11	13.14	10.95	14.91
	802.11a	6	14.62	19.11	8.53	12.92	14.28	19.06	8.16	12.89	11.53	14.94
	802.11n	6	14.47	19.25	8.36	13.16	14.24	19.45	8.47	13.30	11.25	15.03

	802.11ac	6	14.18	18.95	8.52	13.25	14.36	19.26	8.17	13.01	11.65	15.01
	802.11ax	6	14.42	19.18	8.62	12.76	14.23	19.01	8.26	12.85	10.97	14.88
WLAN-6G	802.11ax	6	14.30	19.14	8.54	12.98	14.21	19.19	8.17	12.85	11.12	14.72

The noise power shall ≥ 20 when tested over the range of 1/3 octave band center frequencies. The receive frequency response shall be measured at the DRP in 1/12 octave bands. After translation to the FF, it shall fall between the applicable upper and lower limits.
Volume Control: Max-2, LRP: FF

Verdict: Pass

2.1 Distortion Test Result and Frequency Response for EVS-NB 24.4 kbps and LTE

Air Interface	Band	Limit (dB)	Mounting Force	Minimum PN-SDNR (dB)	Receive Acoustic Frequency Response Performance
LTE	B25(2)	20	2N	28.24	1.92
	B25(2)	20	8N	30.59	1.08
	B26(5)	20	2N	30.39	2.02
	B26(5)	20	8N	30.10	0.68
	B7	20	2N	28.03	1.88
	B7	20	8N	30.57	1.12
	B12(17)	20	2N	30.64	1.61
	B12(17)	20	8N	30.92	0.76
	B13	20	2N	31.28	1.60
	B13	20	8N	29.82	0.96
	B14	20	2N	30.67	1.77
	B14	20	8N	30.67	0.93
	B30	20	2N	28.79	1.68
	B30	20	8N	30.11	1.01
	B71	20	2N	30.43	1.80
	B71	20	8N	31.49	0.91
	B42	20	2N	29.17	1.76
	B42	20	8N	30.29	0.91
	B48	20	2N	30.85	1.78
	B48	20	8N	31.89	1.18
	B41(38)	20	2N	30.85	1.72
	B41(38)	20	8N	29.85	0.91
	B66(4)	20	2N	28.06	2.27
	B66(4)	20	8N	31.09	1.60

2.2 Distortion Test Result and Frequency Response for EVS-NB 24.4 kbps and FR1

Air Interface	Band	Limit (dB)	Mounting Force	Minimum PN-SDNR (dB)	Receive Acoustic Frequency Response Performance
FR1	n7	20	2N	29.17	1.76

	n7	20	8N	30.99	0.88
	n12	20	2N	28.07	1.75
	n12	20	8N	27.35	0.99
	n14	20	2N	27.46	1.81
	n14	20	8N	25.67	1.00
	n25(2)	20	2N	26.89	1.84
	n25(2)	20	8N	31.20	1.03
	n26(5)	20	2N	28.29	2.04
	n26(5)	20	8N	31.89	1.18
	n30	20	2N	29.08	1.87
	n30	20	8N	27.65	0.98
	n41(38)	20	2N	31.67	1.88
	n41(38)	20	8N	30.29	0.91
	n48	20	2N	31.80	1.74
	n48	20	8N	27.29	1.22
	n66	20	2N	26.65	1.85
	n66	20	8N	29.31	0.99
	n70	20	2N	28.03	1.88
	n70	20	8N	29.85	0.91
	n71	20	2N	25.80	1.91
	n71	20	8N	30.11	1.09
	n77(78)	20	2N	30.85	1.78
	n77(78)	20	8N	26.36	0.91

2.3 Distortion Test Result and Frequency Response for EVB-NB 24.4 kbps and WLAN

Air Interface	Band	Limit (dB)	Mounting Force	Minimum PN-SDNR (dB)	Receive Acoustic Frequency Response Performance
WLAN	2.4G - 802.11b	20	2N	22.73	0.55
	2.4G - 802.11b	20	8N	21.72	1.00
	2.4G - 802.11g	20	2N	21.98	1.65
	2.4G - 802.11g	20	8N	24.26	0.92
	2.4G - 802.11n	20	2N	21.06	1.20
	2.4G - 802.11n	20	8N	24.87	1.21
	5G - 802.11a	20	2N	22.10	1.18
	5G - 802.11a	20	8N	21.49	0.97
	5G - 802.11n	20	2N	23.65	1.00
	5G - 802.11n	20	8N	22.17	0.88
	5G - 802.11ac	20	2N	21.28	1.22
	5G - 802.11ac	20	8N	21.89	1.08
	5G - 802.11ax	20	2N	21.58	0.97
	5G - 802.11ax	20	8N	22.11	1.02
	6G - 802.11ax	20	2N	21.78	1.18

	6G - 802.11ax	20	8N	22.28	0.97
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2.4 Distortion Test Result and Frequency Response for EVB-WB 24.4 kbps and LTE

Air Interface	Band	Limit (dB)	Mounting Force	Minimum PN-SDNR (dB)	Receive Acoustic Frequency Response Performance
LTE	B25(2)	20	2N	24.31	2.31
	B25(2)	20	8N	25.87	2.77
	B26(5)	20	2N	24.66	1.98
	B26(5)	20	8N	26.22	3.01
	B7	20	2N	25.13	2.12
	B7	20	8N	26.67	2.89
	B12(17)	20	2N	24.98	2.19
	B12(17)	20	8N	25.91	2.77
	B13	20	2N	25.45	2.14
	B13	20	8N	26.14	2.69
	B14	20	2N	24.85	2.32
	B14	20	8N	26.57	2.61
	B30	20	2N	25.03	2.48
	B30	20	8N	26.17	2.46
	B71	20	2N	25.67	2.76
	B71	20	8N	25.89	2.58
	B42	20	2N	24.72	2.27
	B42	20	8N	30.09	3.08
	B48	20	2N	28.18	2.45
	B48	20	8N	26.29	3.38
	B41(38)	20	2N	24.01	2.23
	B41(38)	20	8N	27.13	2.90
	B66(4)	20	2N	26.84	3.50
	B66(4)	20	8N	25.47	2.73

2.5 Distortion Test Result and Frequency Response for EVB-WB 24.4 kbps and NR

Air Interface	Band	Limit (dB)	Mounting Force	Minimum PN-SDNR (dB)	Receive Acoustic Frequency Response Performance
FR1	n7	20	2N	23.32	2.12
	n7	20	8N	28.18	2.93
	n12	20	2N	23.80	2.15
	n12	20	8N	25.92	3.11
	n14	20	2N	24.72	2.27
	n14	20	8N	25.92	3.07
	n25(2)	20	2N	26.77	2.41
	n25(2)	20	8N	26.47	3.37
	n26(5)	20	2N	27.45	2.34
	n26(5)	20	8N	30.08	3.24

	n30	20	2N	23.28	2.54
	n30	20	8N	20.50	3.37
	n41(38)	20	2N	24.03	2.11
	n41(38)	20	8N	30.09	3.08
	n48	20	2N	26.83	2.41
	n48	20	8N	24.42	3.08
	n66	20	2N	28.18	2.45
	n66	20	8N	23.47	2.96
	n70	20	2N	26.84	3.50
	n70	20	8N	21.32	2.34
	n71	20	2N	24.58	2.18
	n71	20	8N	23.76	2.96
	n77(78)	20	2N	28.69	2.35
	n77(78)	20	8N	26.29	3.38

2.6 Distortion Test Result and Frequency Response for EVB-WB 24.4 kbps and WLAN

Air Interface	Band	Limit (dB)	Mounting Force	Minimum PN-SDNR (dB)	Receive Acoustic Frequency Response Performance
WLAN	2.4G - 802.11b	20	2N	20.62	1.52
	2.4G - 802.11b	20	8N	21.32	2.34
	2.4G - 802.11g	20	2N	21.16	1.55
	2.4G - 802.11g	20	8N	22.04	2.39
	2.4G - 802.11n	20	2N	20.14	1.68
	2.4G - 802.11n	20	8N	23.25	2.03
	5G - 802.11a	20	2N	24.53	2.22
	5G - 802.11a	20	8N	22.11	1.38
	5G - 802.11n	20	2N	22.39	1.23
	5G - 802.11n	20	8N	21.86	2.43
	5G - 802.11ac	20	2N	21.31	1.35
	5G - 802.11ac	20	8N	20.86	2.16
	5G - 802.11ax	20	2N	20.78	1.47
	5G - 802.11ax	20	8N	21.65	1.97
	6G - 802.11ax	20	2N	21.22	1.52
	6G - 802.11ax	20	8N	21.47	1.89