

Appendix A

Volume Control Test Data and Graph for Report No.: SUES251200264071

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)									
		GSM 850		WCDMA B4		LTE 41		NR n77		802.11b	
		2N	8N	2N	8N	2N	8N	2N	8N	2N	8N
AMR-NB	4.75	10.52	15.32	10.52	15.45	9.83	15.09	9.32	14.57	10.21	15.26
	5.15	10.56	15.58	10.59	15.49	10.07	15.30	10.04	14.62	10.29	15.37
	5.9	10.78	15.72	10.64	15.79	10.26	15.56	10.22	15.03	10.34	15.36
	6.7	10.87	15.74	10.74	15.93	10.57	15.79	10.29	15.16	10.58	15.46
	7.4	10.98	15.77	10.91	15.80	10.50	15.79	10.31	14.93	10.64	15.74
	7.95	11.09	15.85	11.05	15.96	10.88	15.86	10.06	15.11	10.71	15.82
	10.2	11.11	15.90	11.12	16.08	10.81	15.85	10.17	15.03	10.94	15.87
	12.2	11.26	16.17	11.33	16.18	10.91	16.17	11.03	15.50	11.11	15.94
AMR-WB	6.6	9.25	13.97	9.52	14.02	8.79	13.97	8.83	13.52	8.77	13.63
	8.85	9.32	14.59	9.55	14.16	9.19	14.27	9.03	13.58	8.87	13.99
	12.65	9.37	14.62	9.82	14.27	9.25	14.19	8.97	13.72	9.38	14.02
	14.25	N/A		9.84	14.44	9.49	14.33	9.02	13.78	9.42	14.37
	15.85			9.86	14.45	9.09	14.35	9.01	13.90	9.36	14.42
	18.25			9.89	14.49	9.29	14.12	9.15	13.88	9.55	14.48
	19.85			9.90	14.51	9.39	14.38	9.04	13.78	9.58	14.53
	23.05			9.97	14.56	9.35	14.16	8.92	13.89	9.51	14.51
	23.85			10.00	14.64	9.43	14.25	9.10	13.90	9.65	14.56
EVS-NB	5.9	N/A				10.12	15.05	9.99	14.91	9.93	14.92
	7.2					10.16	15.15	10.10	14.95	10.27	15.28
	8					10.17	15.60	10.27	15.02	10.31	15.47
	9.6					10.42	15.61	10.08	14.99	10.53	15.37
	13.2					10.68	15.83	10.12	14.94	10.76	15.68
	16.4					10.80	15.79	10.65	15.30	10.66	15.76
	24.4					10.55	15.64	10.39	15.57	14.61	19.56
EVS-WB	5.9					8.41	13.39	8.17	13.02	8.17	13.70
	7.2					8.66	13.51	8.24	13.12	8.68	13.75
	8					8.65	13.67	8.21	13.08	8.72	13.78
	9.6					8.58	13.89	8.34	13.30	8.74	13.83
	13.2					8.57	14.05	8.54	13.13	9.03	14.14
	16.4					8.85	14.01	8.68	13.58	9.36	14.19
	24.4					9.08	13.91	8.85	13.86	12.90	18.08

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)		AMR WB (6.6Kbps)	
			2N	8N	2N	8N	2N	8N	2N	8N	2N	8N
GSM	850	6	11.37	16.04	11.48	16.53	11.75	16.29	10.52	15.32	9.25	13.97
	1900	6	11.31	16.05	11.71	16.42	11.68	16.51	10.49	15.28	9.44	14.25

Air Interface	Band	Limit (dB)	Conv. Gain(dB)							
			AMR NB (4.75Kbps)		AMR WB (6.6Kbps)		EVS NB (5.9Kbps)		EVS WB (5.9Kbps)	
			2N	8N	2N	8N	2N	8N	2N	8N
WCDMA	B2	6	10.81	15.62	9.44	14.21	N/A			
	B4	6	10.52	15.45	9.52	14.02				
	B5	6	10.28	15.19	8.86	13.90				
LTE	B25(2)	6	10.43	15.20	8.98	13.76	10.75	15.63	8.88	13.82
	B26(5)	6	10.26	15.08	8.87	13.82	10.91	15.65	8.79	13.89
	B7	6	10.60	15.18	8.95	13.91	10.38	15.81	9.14	13.71
	B12	6	10.63	15.43	8.49	13.72	10.94	15.35	9.05	13.74
	B13	6	10.53	15.51	8.77	13.61	10.66	15.60	8.86	13.82
	B17	6	10.24	15.00	8.81	13.84	10.95	15.49	8.98	13.65
	B30	6	10.81	15.05	8.71	13.79	10.75	15.71	9.02	13.94
	B41(38)	6	9.83	15.09	8.79	13.97	10.12	15.05	8.41	13.39
	B42	6	10.54	15.08	8.76	13.91	11.06	15.62	9.22	13.55
	B66(4)	6	10.62	15.21	8.90	13.70	10.80	15.46	9.11	13.76
	B71	6	10.27	15.27	8.70	13.86	10.90	15.69	9.19	14.08
NR	n25(2)	6	10.20	15.03	8.45	13.45	10.09	15.58	8.11	13.30
	n5	6	9.84	14.85	8.85	13.81	10.04	15.16	8.20	13.48
	n7	6	9.61	15.14	8.52	13.74	9.99	15.18	8.40	13.41
	n41(38)	6	10.19	15.04	8.72	13.80	10.29	15.35	8.36	13.30
	n66	6	9.92	14.87	8.56	13.47	10.14	15.14	8.54	13.45
	n71	6	10.17	15.03	8.71	13.77	10.20	15.06	8.30	13.22
	n77(78)	6	9.32	14.57	8.83	13.52	9.99	14.91	8.17	13.02
WLAN-2.4G	802.11b	6	10.21	15.26	8.77	13.63	9.93	14.92	8.17	13.70
	802.11g	6	10.31	15.35	9.40	14.55	10.16	15.46	8.64	13.73
	802.11n	6	9.93	15.27	9.47	14.47	10.04	15.06	8.71	13.90
WLAN-5G	802.11a	6	10.33	15.39	8.82	13.78	10.21	15.57	8.87	13.76
	802.11n	6	10.13	15.09	8.93	13.46	10.40	14.95	8.49	13.52
	802.11ac	6	10.02	14.90	9.08	13.60	10.01	15.04	8.54	13.82

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-1, 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	23.50	2.76
	B25(2)	20	8N	27.48	2.07
	B26(5)	20	2N	25.91	3.08
	B26(5)	20	8N	24.01	1.91
	B7	20	2N	30.71	3.05
	B7	20	8N	28.08	1.99
	B12	20	2N	30.61	2.83
	B12	20	8N	30.11	2.07
	B13	20	2N	30.05	3.12
	B13	20	8N	27.41	2.31
	B17	20	2N	29.21	3.09
	B17	20	8N	29.62	2.00
	B30	20	2N	30.28	3.00
	B30	20	8N	30.06	1.65
	B41(38)	20	2N	30.65	2.38
	B41(38)	20	8N	29.57	2.21
	B42	20	2N	28.40	2.85
	B42	20	8N	26.33	2.11
	B66(4)	20	2N	29.01	2.39
	B66(4)	20	8N	28.81	3.01
	B71	20	2N	27.25	2.93
	B71	20	8N	28.05	1.90

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

Air Interface	Band	Limit (dB)	Mounting Force	Minimum PN-SDNR (dB)	Receive Acoustic Frequency Response Performance
FR1	n25(2)	20	2N	28.51	2.76
	n25(2)	20	8N	28.38	1.86
	n5	20	2N	30.74	3.02
	n5	20	8N	29.20	1.71
	n7	20	2N	29.07	2.82
	n7	20	8N	25.88	1.83
	n41(38)	20	2N	27.39	3.19
	n41(38)	20	8N	30.52	1.77

	n66	20	2N	26.43	2.74
	n66	20	8N	31.72	1.98
	n71	20	2N	26.93	2.70
	n71	20	8N	25.78	1.60
	n77(78)	20	2N	31.58	2.79
	n77(78)	20	8N	26.78	1.62

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	22.13	2.16
	2.4G - 802.11b	20	8N	31.85	1.71
	2.4G - 802.11g	20	2N	25.51	2.15
	2.4G - 802.11g	20	8N	22.44	1.56
	2.4G - 802.11n	20	2N	21.65	2.30
	2.4G - 802.11n	20	8N	20.36	1.82
	5G - 802.11a	20	2N	29.27	2.11
	5G - 802.11a	20	8N	31.83	1.79
	5G - 802.11n	20	2N	31.59	2.11
	5G - 802.11n	20	8N	30.54	1.71
	5G - 802.11ac	20	2N	20.53	2.22
	5G - 802.11ac	20	8N	31.94	1.90

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	25.25	1.02
	B25(2)	20	8N	23.90	1.58
	B26(5)	20	2N	24.26	1.32
	B26(5)	20	8N	23.80	2.31
	B7	20	2N	27.37	1.02
	B7	20	8N	24.55	2.19
	B12	20	2N	23.71	1.14
	B12	20	8N	28.11	2.00
	B13	20	2N	24.40	1.16
	B13	20	8N	28.65	1.91
	B17	20	2N	21.55	1.43
	B17	20	8N	21.67	1.83
	B30	20	2N	25.10	1.59
	B30	20	8N	25.32	1.49
	B41(38)	20	2N	27.11	0.91
	B41(38)	20	8N	26.89	1.21
	B42	20	2N	24.30	0.98
	B42	20	8N	30.25	1.68
	B66(4)	20	2N	20.64	1.24
	B66(4)	20	8N	24.58	1.67
	B71	20	2N	28.46	0.57
	B71	20	8N	24.78	0.98

2.5 Distortion Test Result and Frequency Response for EVB-WB 24.4 kbps and FR1

Air Interface	Band	Limit (dB)	Mounting Force	Minimum PN-SDNR (dB)	Receive Acoustic Frequency Response Performance
FR1	n25(2)	20	2N	25.97	1.04
	n25(2)	20	8N	24.34	1.52
	n5	20	2N	23.92	0.83
	n5	20	8N	22.61	1.42
	n7	20	2N	22.37	0.77
	n7	20	8N	25.25	1.47
	n41(38)	20	2N	23.20	0.95
	n41(38)	20	8N	23.47	1.48
	n66	20	2N	28.98	0.81
	n66	20	8N	23.99	1.51
	n71	20	2N	25.56	0.90
	n71	20	8N	25.20	1.60
	n77(78)	20	2N	28.85	1.18
	n77(78)	20	8N	27.75	1.64

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	27.31	0.32
	2.4G - 802.11b	20	8N	30.10	0.94
	2.4G - 802.11g	20	2N	24.66	0.74
	2.4G - 802.11g	20	8N	26.27	1.00
	2.4G - 802.11n	20	2N	27.60	0.31
	2.4G - 802.11n	20	8N	23.68	1.04
	5G - 802.11a	20	2N	28.95	0.34
	5G - 802.11a	20	8N	31.12	0.78
	5G - 802.11n	20	2N	27.29	0.31
	5G - 802.11n	20	8N	30.78	0.88
	5G - 802.11ac	20	2N	26.09	0.60
	5G - 802.11ac	20	8N	28.06	0.94