

Appendix A

Volume Control Test Data and Graph for Report No.: SUCR2503000237WM

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)							
		WCDMA B4		LTE B66		NR n77		802.11 b	
		2N	8N	2N	8N	2N	8N	2N	8N
AMR-NB	4.75	7.46	11.27	6.35	11.18	6.31	11.05	6.24	11.03
	5.15	7.62	11.30	6.37	11.23	6.50	11.07	6.26	11.11
	5.90	7.74	11.41	6.59	11.26	6.45	11.15	6.55	11.05
	6.70	7.86	11.70	7.22	11.87	7.22	11.78	7.01	11.66
	7.40	7.96	11.80	7.30	11.88	7.20	11.76	7.00	11.74
	7.95	8.10	11.82	7.26	12.24	7.24	11.86	7.05	11.82
	10.20	8.11	11.93	7.52	12.13	7.36	12.10	7.34	12.07
	12.20	8.34	12.12	7.60	12.19	7.44	12.08	7.28	11.96
AMR-WB	6.60	7.54	12.41	7.24	11.65	6.95	11.68	6.96	11.48
	8.85	7.57	12.45	7.29	11.78	7.08	11.74	6.99	11.61
	12.65	7.63	12.51	7.32	11.81	7.15	11.75	7.02	11.66
	14.25	7.78	12.55	7.72	12.26	7.72	12.20	7.46	12.12
	15.85	7.73	12.58	7.71	12.24	7.66	12.15	7.40	12.10
	18.25	7.82	12.65	7.64	12.31	7.68	12.20	7.47	12.17
	19.85	7.89	12.73	7.75	12.34	7.67	12.14	7.41	12.16
	23.05	7.75	11.65	7.78	12.37	7.67	12.22	7.52	12.13
EVS-NB	5.90	N/A		6.84	11.32	6.57	11.36	6.58	11.27
	7.20			6.89	11.39	6.83	11.39	6.61	11.55
	8.0			7.05	11.59	6.90	11.44	6.90	11.66
	9.6			7.67	12.09	7.29	12.00	6.97	12.10
	13.20			7.44	11.94	7.23	11.87	7.49	12.25
	16.40			7.30	11.96	7.31	11.89	7.28	12.17
	24.4			7.44	12.32	7.44	12.08	7.32	12.24
	EVS-WB			5.90	N/A		6.95	11.53	6.80
7.20		6.99	11.61	6.86			11.57	6.72	11.39
8.0		7.18	11.65	7.04			11.56	6.85	11.46
9.6		7.23	12.26	7.27			12.21	7.33	11.50
13.20		7.02	12.11	7.47			12.02	7.47	11.91
16.40		7.12	12.15	7.53			12.09	7.28	12.14
24.4		7.57	12.32	7.53			12.00	7.44	11.69
EVS-SWB		9.6	N/A				8.36	12.87	8.13
	13.20	8.53			12.88	8.34	12.97	8.23	13.05
	16.40	8.50			13.06	8.71	13.19	8.47	13.20
	24.4	8.50			13.25	8.77	13.22	8.62	13.07

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

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	7.60	11.32	7.75	12.66	N/A			
	B4	6	7.46	11.27	7.54	12.41				
	B5	6	7.41	11.45	7.58	12.51				
LTE	B7	6	6.69	11.16	7.49	11.92	7.02	11.62	7.33	11.58
	B12(17)	6	6.91	11.29	7.66	12.16	7.06	11.78	7.25	11.71
	B14	6	6.77	11.42	7.41	11.82	7.06	11.88	7.25	11.79
	B25(2)	6	6.96	11.23	7.51	11.96	7.18	11.85	7.31	11.85
	B26(5)	6	6.92	11.17	7.52	12.11	7.31	11.82	7.28	11.44
	B30	6	6.92	11.03	7.75	12.19	7.06	11.84	7.43	11.75
	B41(38)	6	6.87	11.48	7.64	12.09	7.31	11.91	7.49	11.66
	B48	6	6.93	11.31	7.79	12.20	7.29	11.73	7.61	11.88
	B66(4)	6	6.35	11.18	7.24	11.65	6.84	11.32	6.95	11.53
	B71	6	6.93	11.33	7.69	12.28	7.23	11.71	7.65	11.82
FR1	N5	6	6.64	11.27	7.42	11.88	7.00	11.54	6.95	11.65
	N7	6	6.81	11.24	7.50	11.80	6.90	11.63	6.74	11.80
	N12	6	6.81	11.16	7.44	11.50	7.34	11.63	7.47	11.77
	N25(2)	6	6.57	11.33	7.36	11.98	7.21	11.77	7.28	11.78
	N30	6	6.64	11.38	7.33	12.08	7.47	11.91	7.29	11.85
	N41(38)	6	6.82	11.37	7.44	11.82	7.37	11.73	7.27	11.96
	N48	6	6.92	11.48	7.44	11.78	7.35	12.10	7.02	11.95
	N66	6	6.88	11.31	7.55	12.18	7.46	11.84	7.17	11.94
	N71	6	6.95	11.38	7.56	12.18	7.42	11.94	7.17	11.91
	N77(78)	6	6.31	11.05	6.95	11.68	6.57	11.36	6.80	11.55
WLAN-2.4G	802.11b	6	6.24	11.03	6.96	11.48	6.58	11.27	6.51	11.23
	802.11g	6	6.47	11.29	7.16	11.91	6.79	11.55	7.17	11.86
	802.11n	6	6.38	11.16	7.00	11.82	6.74	11.56	7.13	11.78
	802.11ac	6	6.35	11.14	7.15	11.82	6.77	11.60	7.04	11.66
	802.11ax	6	6.39	11.23	7.04	11.97	6.87	11.48	7.18	11.68
WLAN-5G	802.11a	6	6.44	11.26	7.01	11.90	6.67	11.82	7.20	11.93
	802.11n	6	6.41	11.32	6.97	11.84	6.64	11.42	7.21	11.3
	802.11ac	6	6.38	11.21	6.88	12.00	7.01	11.67	7.32	11.61
	802.11ax	6	6.44	10.88	6.94	11.89	6.62	11.63	6.96	11.75
WLAN-6E	802.11ax	6	6.28	11.21	6.81	12.00	6.96	11.69	7.01	11.51

Air Interface	Band	Limit (dB)	Conv. Gain(dB)	
			EVS SWB (9.6kbps)	
			2N	8N
LTE	B7	6	8.53	13.06
	B12(17)	6	8.55	12.82
	B14	6	8.78	12.94
	B25(2)	6	8.62	13.26
	B26(5)	6	8.69	13.19
	B30	6	8.36	13.01
	B41(38)	6	8.50	12.92
	B48	6	8.48	12.81
	B66(4)	6	8.36	12.87
	B71	6	7.97	12.90
FR1	N5	6	8.45	13.02
	N7	6	8.40	12.93
	N12	6	8.50	12.95
	N25(2)	6	8.66	13.18
	N30	6	8.68	13.05
	N41(38)	6	8.73	13.02
	N48	6	8.54	13.00
	N66	6	8.76	12.70
	N71	6	8.62	12.76
	N77(78)	6	8.13	12.77
WLAN-2.4G	802.11b	6	8.20	13.00
	802.11g	6	8.58	13.15
	802.11n	6	8.52	13.19
	802.11ac	6	8.23	13.27
	802.11ax	6	8.26	13.25
WLAN-5G	802.11a	6	8.68	13.26
	802.11n	6	8.67	13.07
	802.11ac	6	8.53	13.22
	802.11ax	6	8.39	13.16
WLAN-6E	802.11ac	6	8.29	12.98

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-4, 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	B7	20	2N	28.59	1.80
	B7	20	8N	23.19	1.77
	B12(17)	20	2N	28.72	1.86
	B12(17)	20	8N	22.83	1.87
	B14	20	2N	27.13	1.86
	B14	20	8N	20.56	1.91
	B25(2)	20	2N	29.33	1.83
	B25(2)	20	8N	23.18	1.93
	B26(5)	20	2N	29.09	1.76
	B26(5)	20	8N	20.72	1.84
	B30	20	2N	27.50	1.68
	B30	20	8N	21.82	1.80
	B41(38)	20	2N	27.12	1.58
	B41(38)	20	8N	22.60	1.84
	B48	20	2N	26.66	1.79
	B48	20	8N	22.46	1.92
	B66(4)	20	2N	32.80	1.78
	B66(4)	20	8N	21.73	1.82
	B71	20	2N	29.86	1.80
	B71	20	8N	22.93	1.87

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	N5	20	2N	24.51	1.87
	N5	20	8N	24.01	1.90
	n7	20	2N	27.04	1.76
	n7	20	8N	20.73	1.70
	n12	20	2N	26.65	1.74
	n12	20	8N	23.54	1.75
	n25(2)	20	2N	26.65	1.72
	n25(2)	20	8N	22.74	1.76
	n26(5)	20	2N	26.21	1.64
	n26(5)	20	8N	22.07	1.81
	N30	20	2N	27.72	1.64
	N30	20	8N	23.18	1.61
	n41(38)	20	2N	29.35	1.92
	n41(38)	20	8N	23.27	1.87
	n48	20	2N	25.87	1.83
	n48	20	8N	26.23	1.83
	n66	20	2N	26.94	1.77
	n66	20	8N	23.85	1.74
	n71	20	2N	26.39	1.71
	n71	20	8N	24.32	1.78
n77(78)	20	2N	28.71	1.77	
n77(78)	20	8N	21.56	1.80	

2.3 Distortion Test Result and Frequency Response for EVS-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	22.56	1.95
	2.4G - 802.11b	20	8N	21.32	1.94
	2.4G - 802.11g	20	2N	22.74	1.86
	2.4G - 802.11g	20	8N	20.36	1.79
	2.4G - 802.11n	20	2N	28.78	1.94
	2.4G - 802.11n	20	8N	24.38	1.85
	2.4G - 802.11ac	20	2N	25.31	1.76
	2.4G - 802.11ac	20	8N	20.64	2.05
	2.4G - 802.11ax	20	2N	24.38	1.94
	2.4G - 802.11ax	20	8N	20.65	1.87
	5G - 802.11a	20	2N	27.13	1.84
	5G - 802.11a	20	8N	20.28	1.72
	5G - 802.11n	20	2N	25.96	1.95
	5G - 802.11n	20	8N	21.88	1.77
	5G - 802.11ac	20	2N	24.81	1.90
	5G - 802.11ac	20	8N	20.55	1.77
	5G - 802.11ax	20	2N	26.71	1.91
	5G - 802.11ax	20	8N	20.44	1.79
	6G - 802.11ax	20	2N	25.17	1.82
	6G - 802.11ax	20	8N	20.63	1.77

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	B7	20	2N	22.89	1.39
	B7	20	8N	24.42	0.29
	B12(17)	20	2N	23.76	1.83
	B12(17)	20	8N	24.61	0.59
	B14	20	2N	23.87	1.74
	B14	20	8N	24.13	0.26
	B25(2)	20	2N	29.56	1.59
	B25(2)	20	8N	24.44	0.25
	B26(5)	20	2N	27.20	1.67
	B26(5)	20	8N	23.77	0.70
	B30	20	2N	24.97	1.82
	B30	20	8N	22.21	0.83
	B41(38)	20	2N	24.38	1.58
	B41(38)	20	8N	22.34	0.84
	B48	20	2N	29.93	1.79
	B48	20	8N	22.46	0.93
	B66(4)	20	2N	21.20	1.73
	B66(4)	20	8N	23.50	0.16
	B71	20	2N	24.33	1.76
	B71	20	8N	22.83	0.75

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

Air Interface	Band	Limit (dB)	Mounting Force	Minimum PN-SDNR (dB)	Receive Acoustic Frequency Response Performance
FR1	N5	20	2N	25.49	1.41
	N5	20	8N	23.48	0.97
	n7	20	2N	24.74	1.69
	n7	20	8N	24.64	0.40
	n12	20	2N	24.93	1.39
	n12	20	8N	24.31	0.65
	n25(2)	20	2N	28.29	1.78
	n25(2)	20	8N	25.59	0.48
	n26(5)	20	2N	21.69	1.64
	n26(5)	20	8N	24.01	0.49
	N30	20	2N	24.14	1.52
	N30	20	8N	24.35	0.14
	n41(38)	20	2N	31.02	1.59
	n41(38)	20	8N	22.11	1.19
	n48	20	2N	25.47	1.85
	n48	20	8N	22.12	1.10
	n66	20	2N	27.47	1.34
	n66	20	8N	24.75	1.22
	n71	20	2N	29.70	1.60
	n71	20	8N	23.26	0.17
n77(78)	20	2N	28.77	1.58	
n77(78)	20	8N	21.71	0.40	

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	23.83	1.70
	2.4G - 802.11b	20	8N	21.78	0.75
	2.4G - 802.11g	20	2N	22.54	1.79
	2.4G - 802.11g	20	8N	22.41	1.04
	2.4G - 802.11n	20	2N	21.60	1.84
	2.4G - 802.11n	20	8N	21.82	1.56
	2.4G - 802.11ac	20	2N	21.61	1.87
	2.4G - 802.11ac	20	8N	24.38	0.44
	2.4G - 802.11ax	20	2N	22.02	1.70
	2.4G - 802.11ax	20	8N	22.50	0.91
	5G - 802.11a	20	2N	30.62	1.75
	5G - 802.11a	20	8N	21.60	0.99
	5G - 802.11n	20	2N	23.75	1.75
	5G - 802.11n	20	8N	21.77	0.95
	5G - 802.11ac	20	2N	22.40	1.39
	5G - 802.11ac	20	8N	21.98	1.40
	5G - 802.11ax	20	2N	29.82	1.80
	5G - 802.11ax	20	8N	20.82	1.27
	6G - 802.11ax	20	2N	22.87	1.71
	6G - 802.11ax	20	8N	23.49	0.70