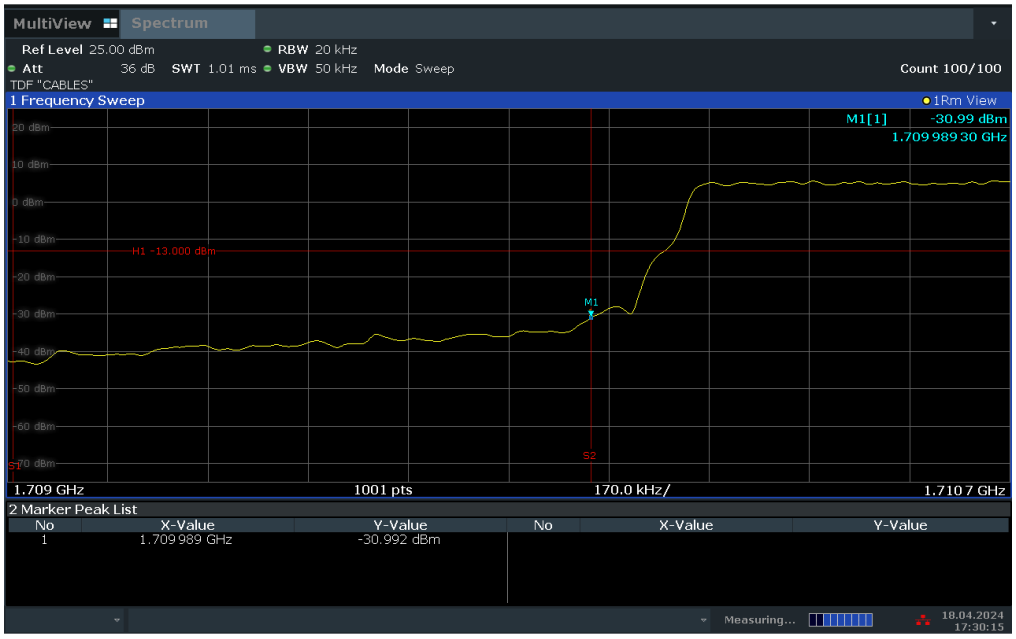
LTE Band 4

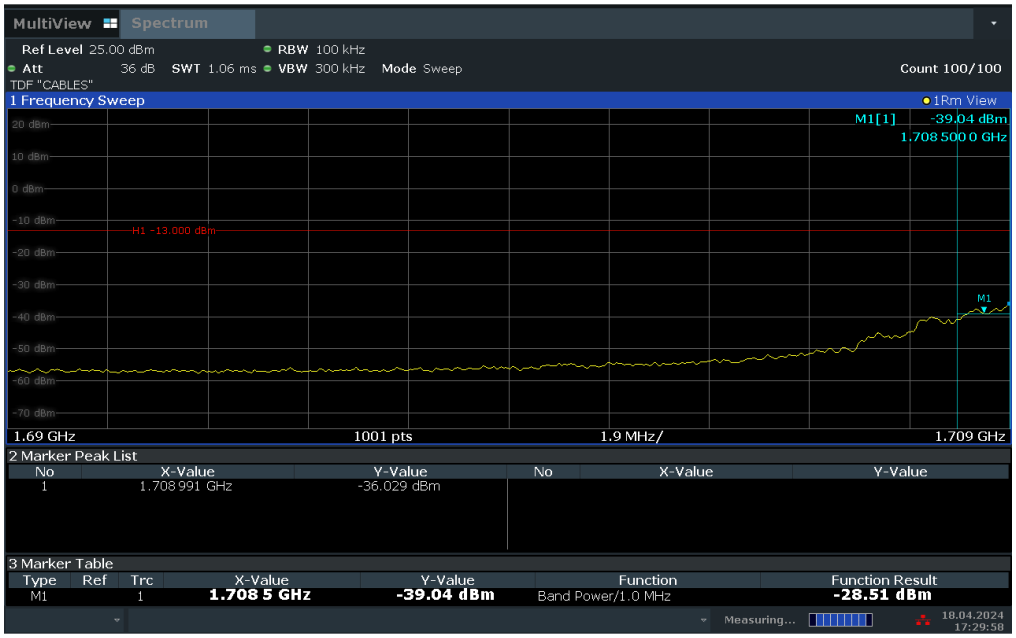
Peak



17:30:16 18.04.2024

Plot 7-91. Lower Band Edge Plot (LTE Band 4 – 1.4MHz QPSK – Full RB)

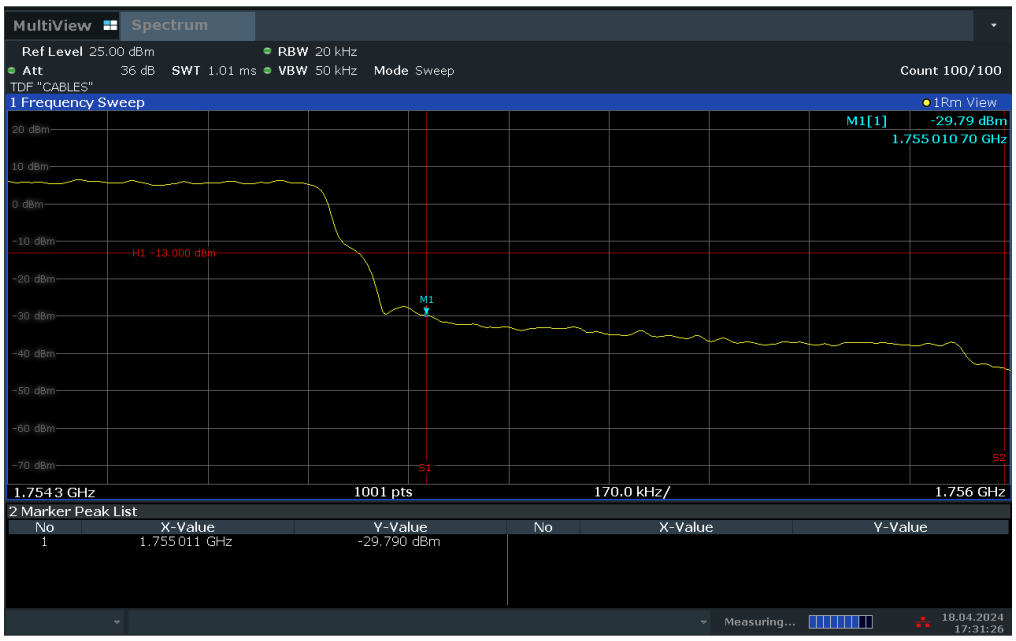
Peak



17:29:59 18.04.2024

Plot 7-92. Lower Extended Band Edge Plot (LTE Band 4 – 1.4MHz QPSK – Full RB)

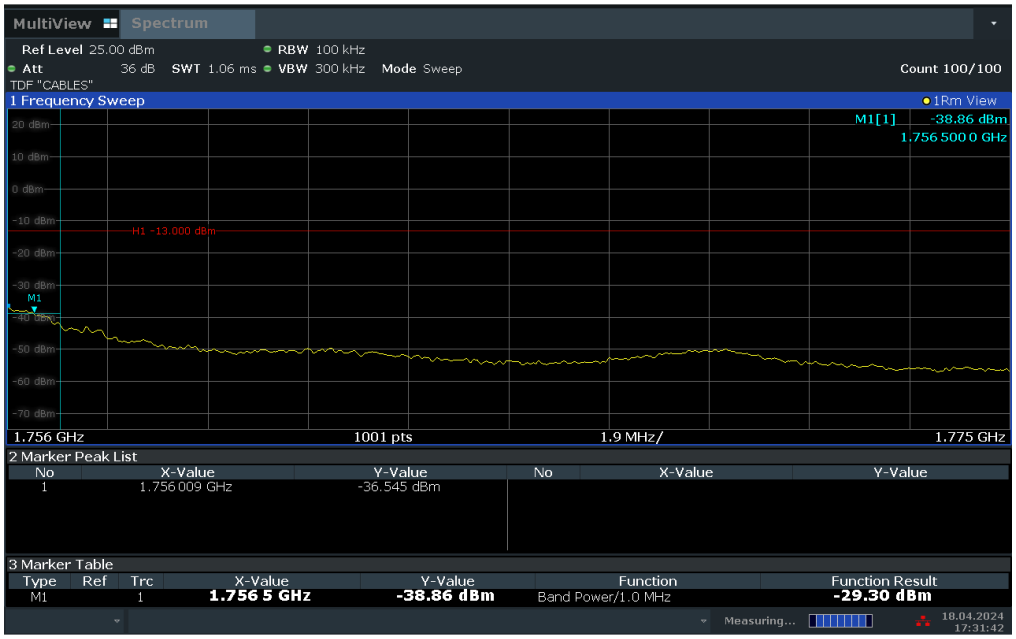
Peak



17:31:27 18.04.2024

Plot 7-93. Upper Band Edge Plot (LTE Band 4 – 1.4MHz QPSK – Full RB)

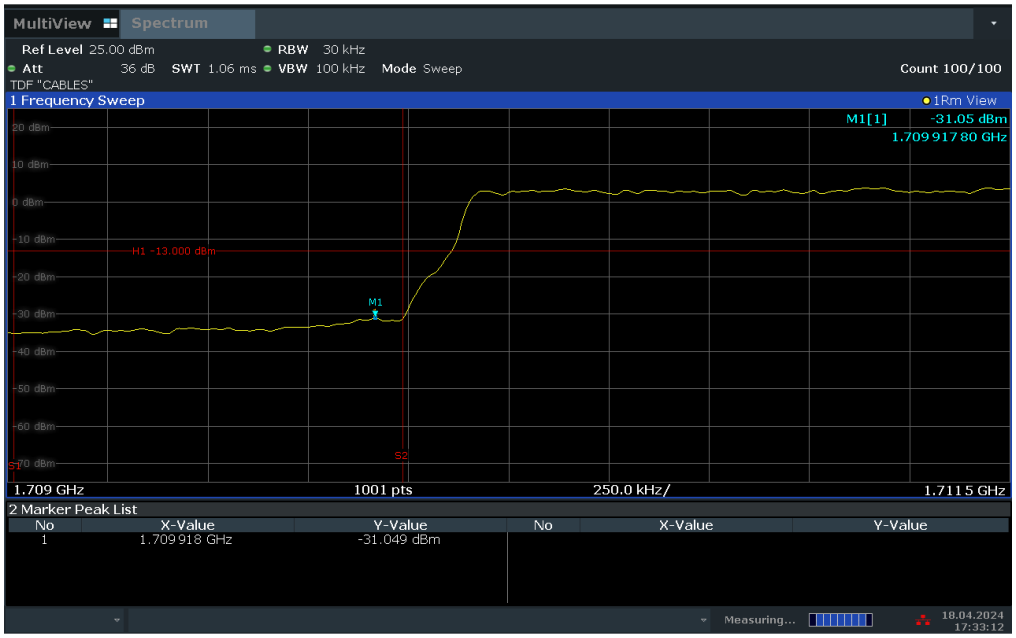
Peak



17:31:43 18.04.2024

Plot 7-94. Upper Extended Band Edge Plot (LTE Band 4 – 1.4MHz QPSK – Full RB)

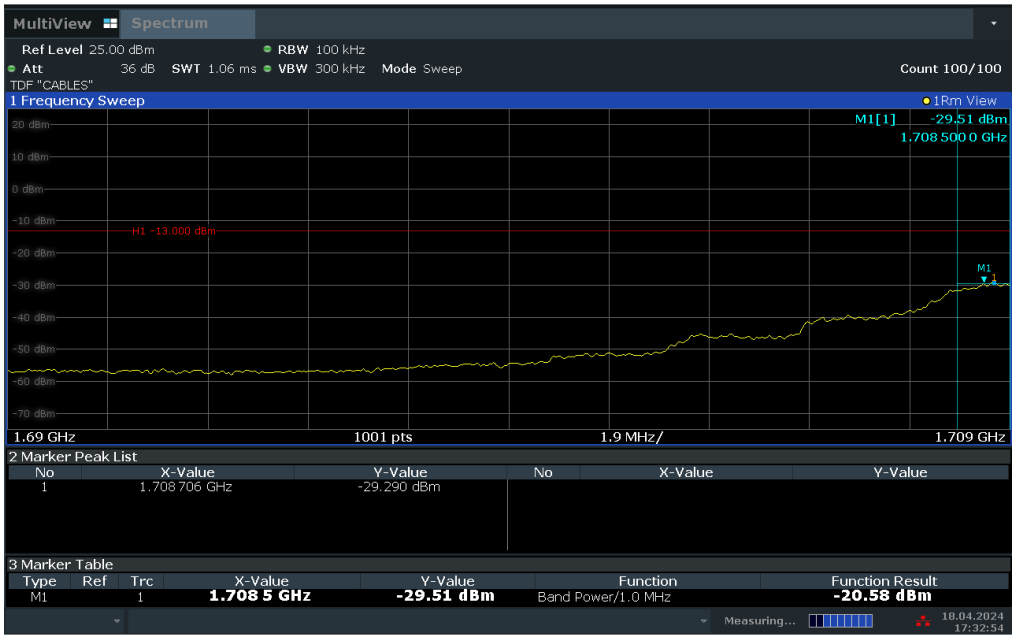
Peak



17:33:12 18.04.2024

Plot 7-95. Lower Band Edge Plot (LTE Band 4 - 3MHz QPSK – Full RB)

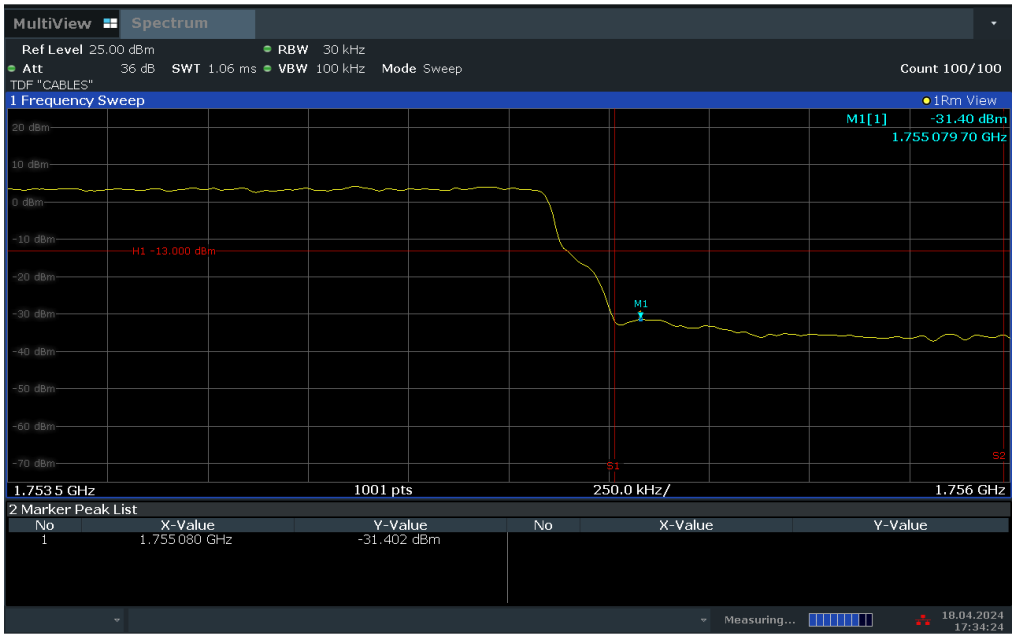
Peak



17:32:56 18.04.2024

Plot 7-96. Lower Extended Band Edge Plot (LTE Band 4 - 3MHz QPSK – Full RB)

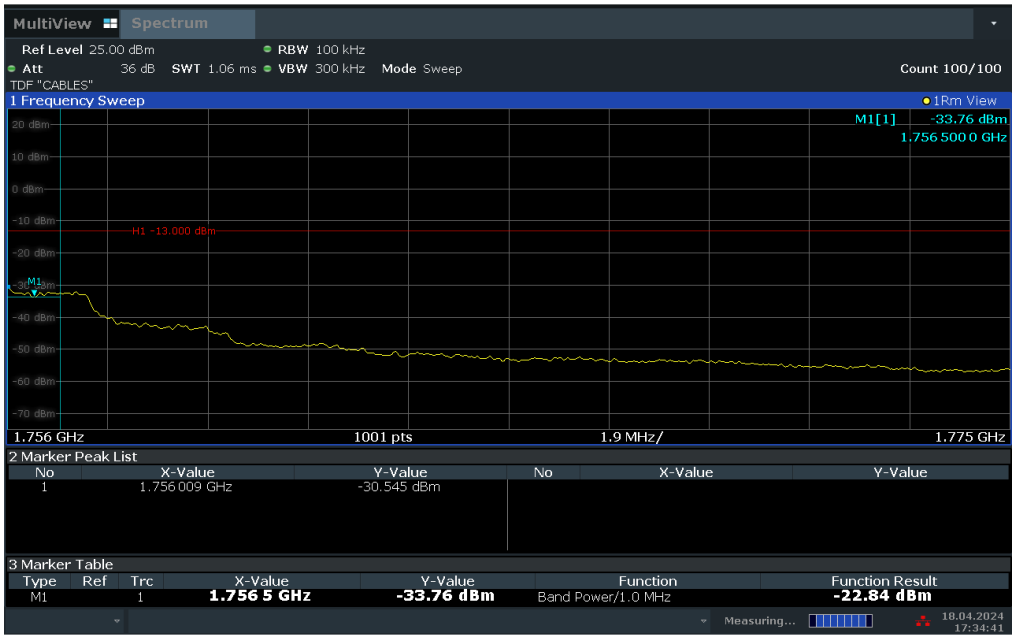
Peak



17:34:24 18.04.2024

Plot 7-97. Upper Band Edge Plot (LTE Band 4 - 3MHz QPSK – Full RB)

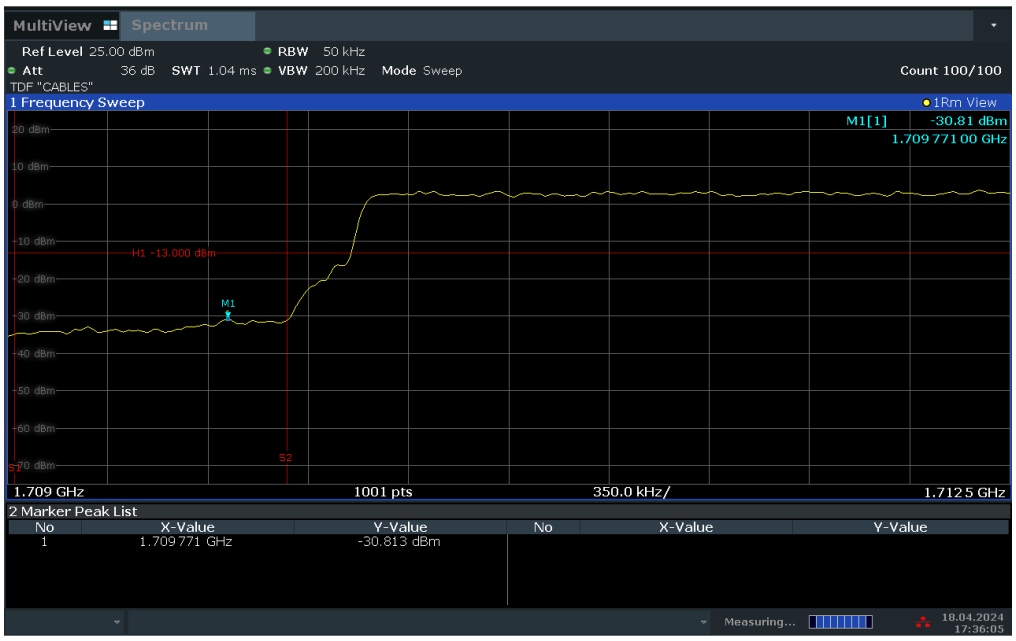
Peak



17:34:41 18.04.2024

Plot 7-98. Upper Extended Band Edge Plot (LTE Band 4 - 3MHz QPSK – Full RB)

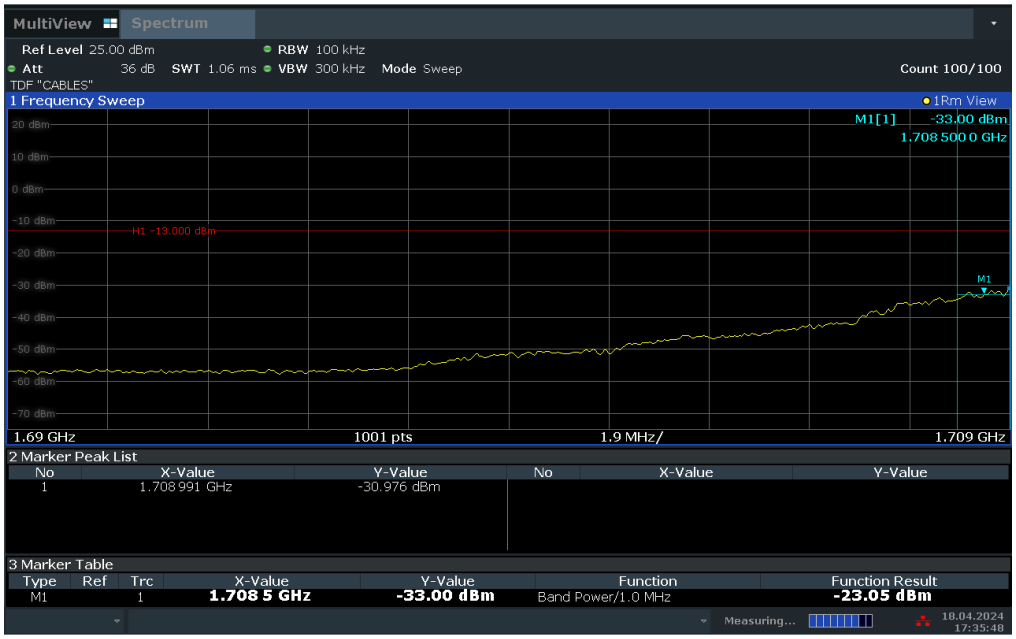
Peak



17:36:06 18.04.2024

Plot 7-99. Lower Band Edge Plot (LTE Band 4 - 5MHz QPSK – Full RB)

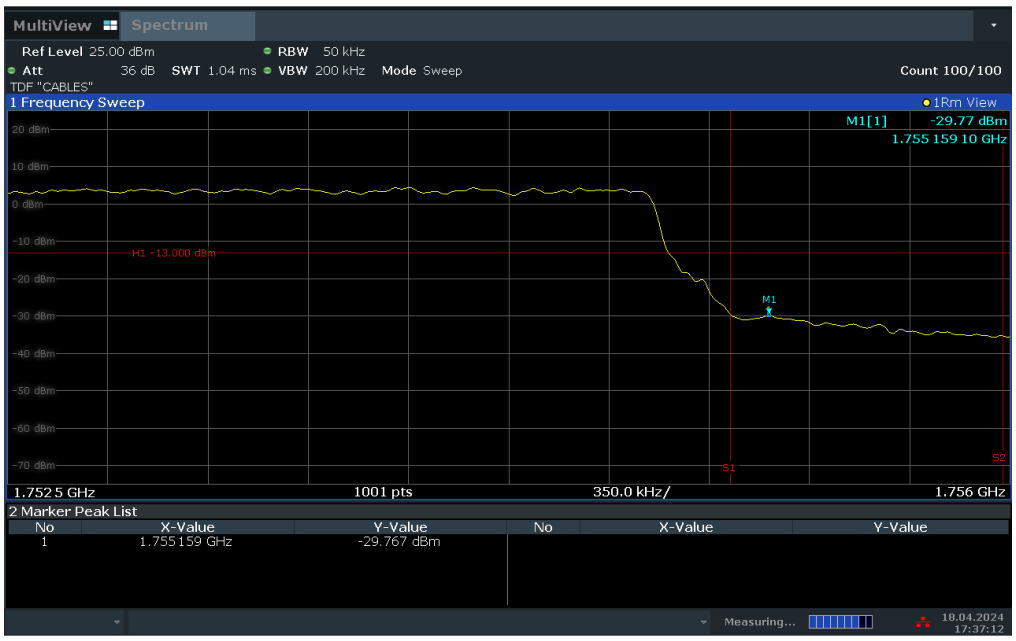
Peak



17:35:49 18.04.2024

Plot 7-100. Lower Extended Band Edge Plot (LTE Band 4 - 5MHz QPSK – Full RB)

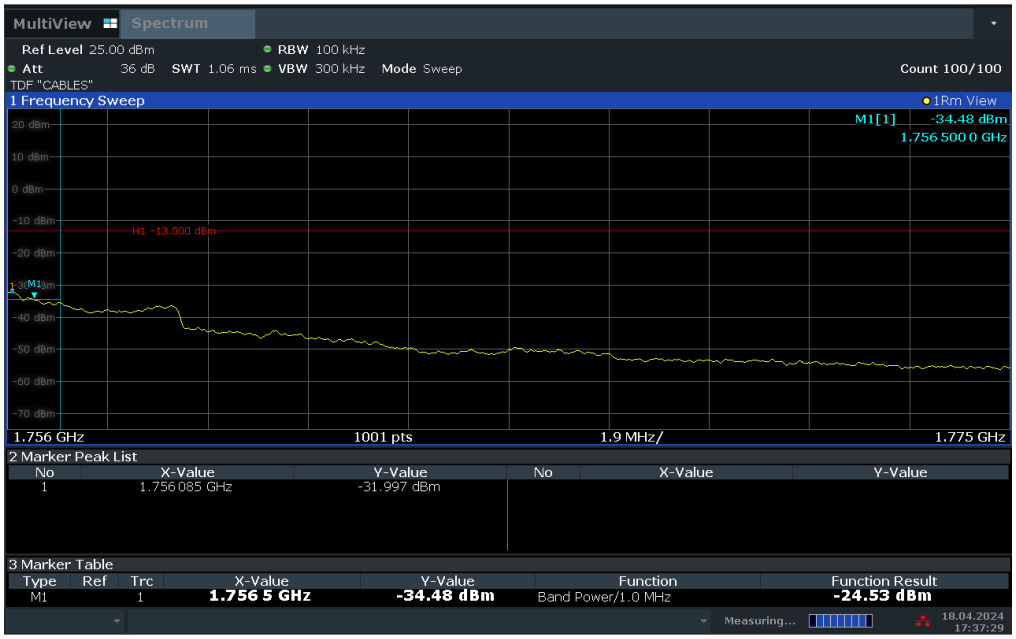
Peak



17:37:13 18.04.2024

Plot 7-101. Upper Band Edge Plot (LTE Band 4 - 5MHz QPSK – Full RB)

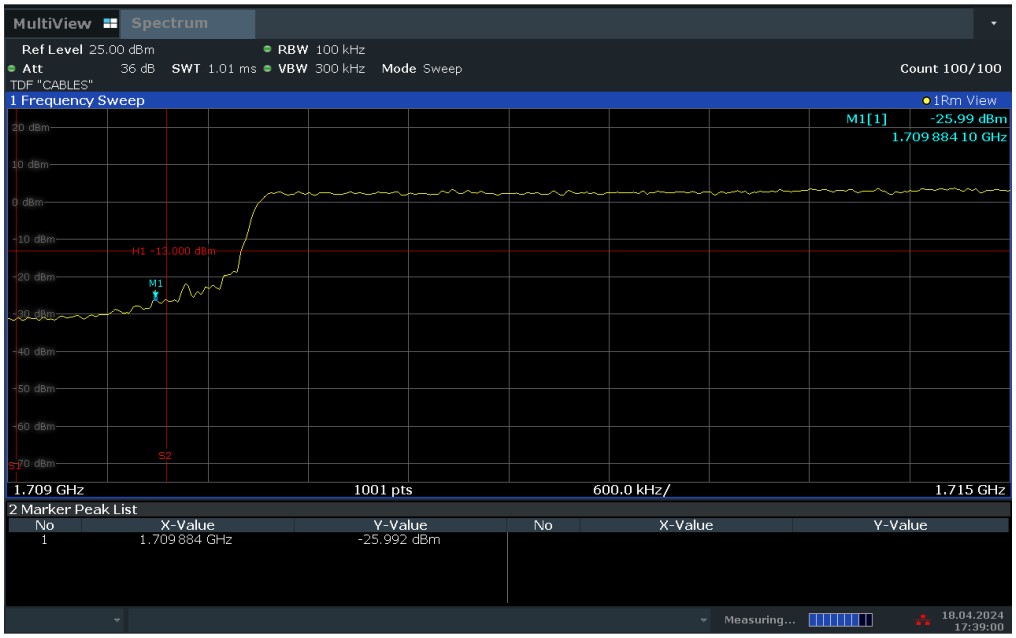
Peak



17:37:30 18.04.2024

Plot 7-102. Upper Extended Band Edge Plot (LTE Band 4 - 5MHz QPSK – Full RB)

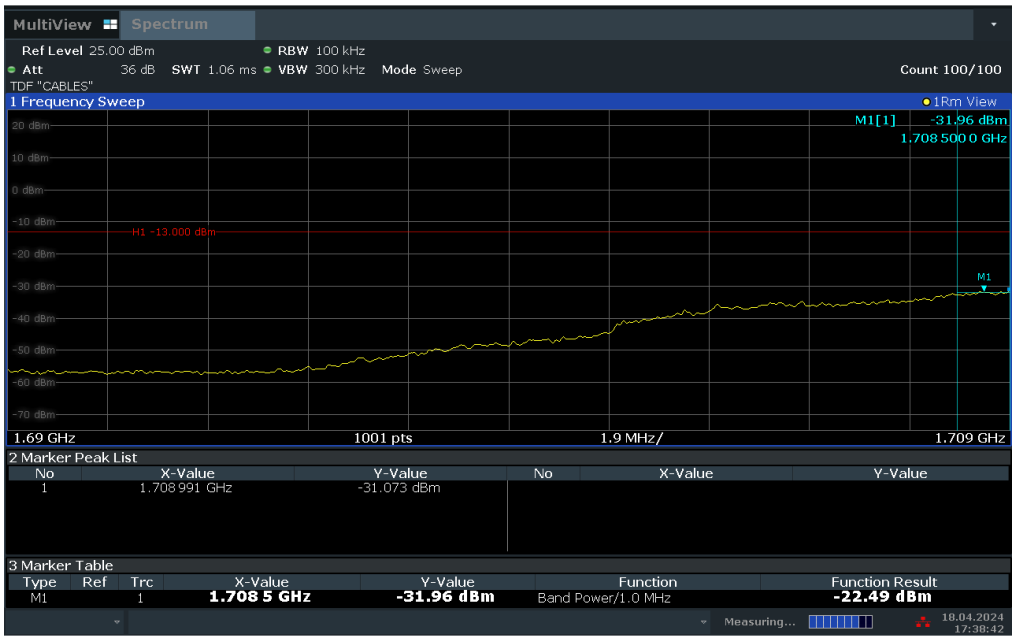
Peak



17:39:00 18.04.2024

Plot 7-103. Lower Band Edge Plot (LTE Band 4 - 10MHz QPSK – Full RB)

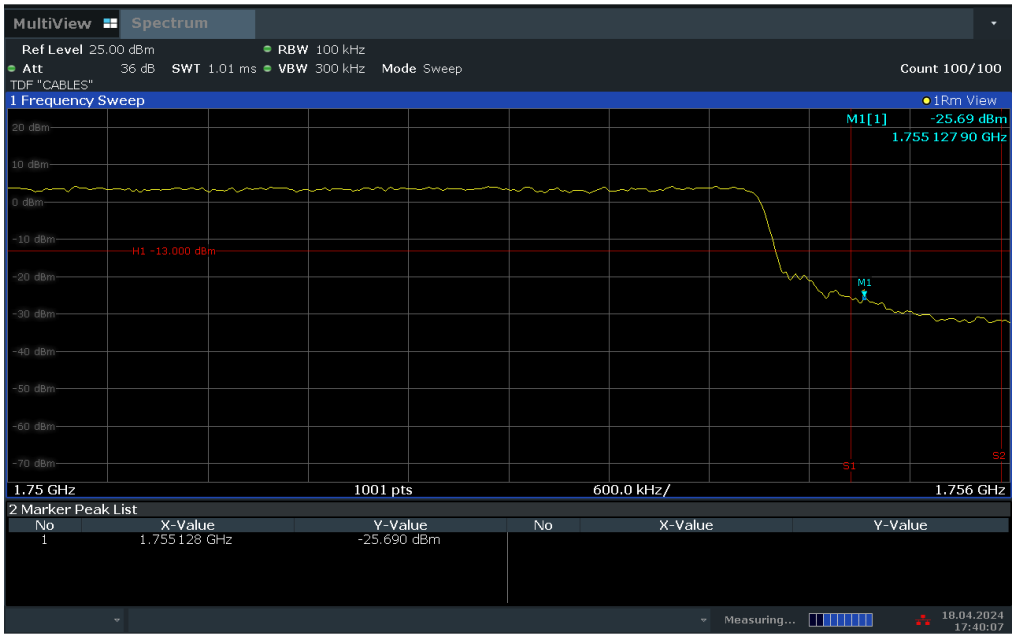
Peak



17:38:43 18.04.2024

Plot 7-104. Lower Extended Band Edge Plot (LTE Band 4 - 10MHz QPSK – Full RB)

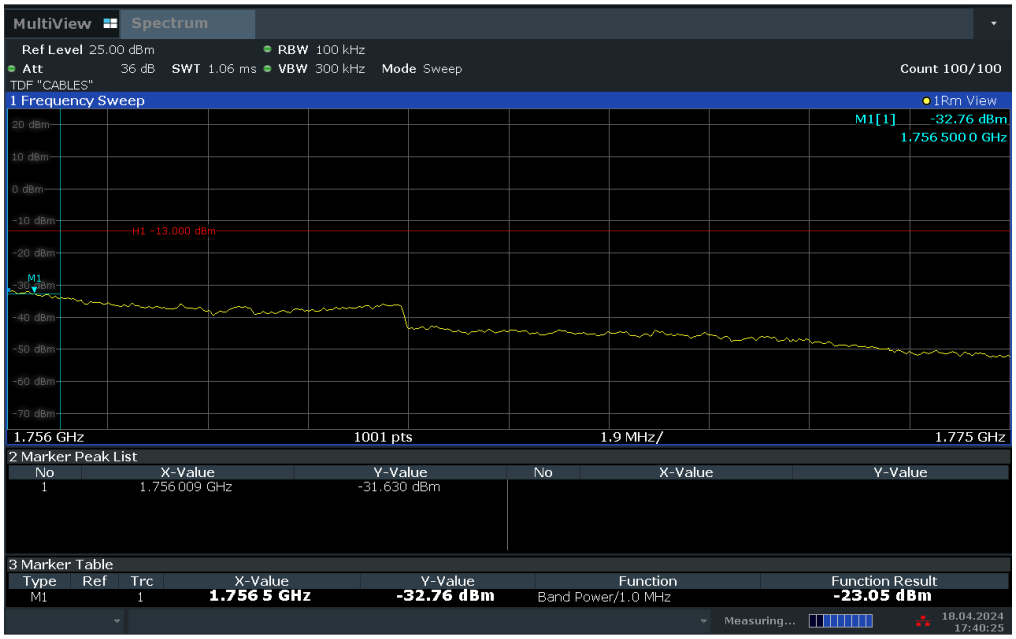
Peak



17:40:08 18.04.2024

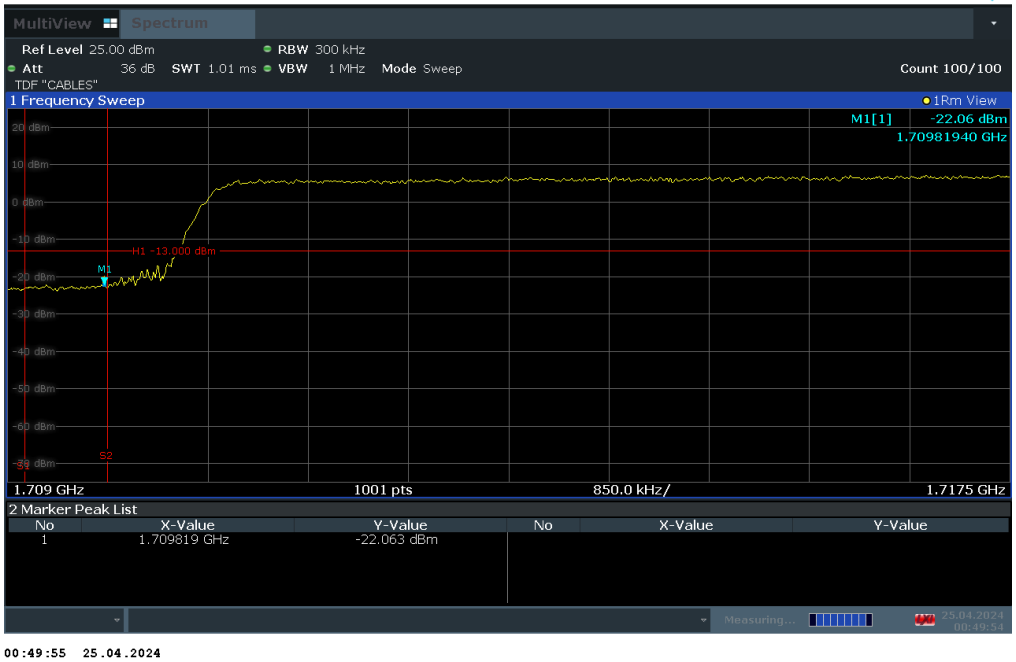
Plot 7-105. Upper Band Edge Plot (LTE Band 4 - 10MHz QPSK – Full RB)

Peak

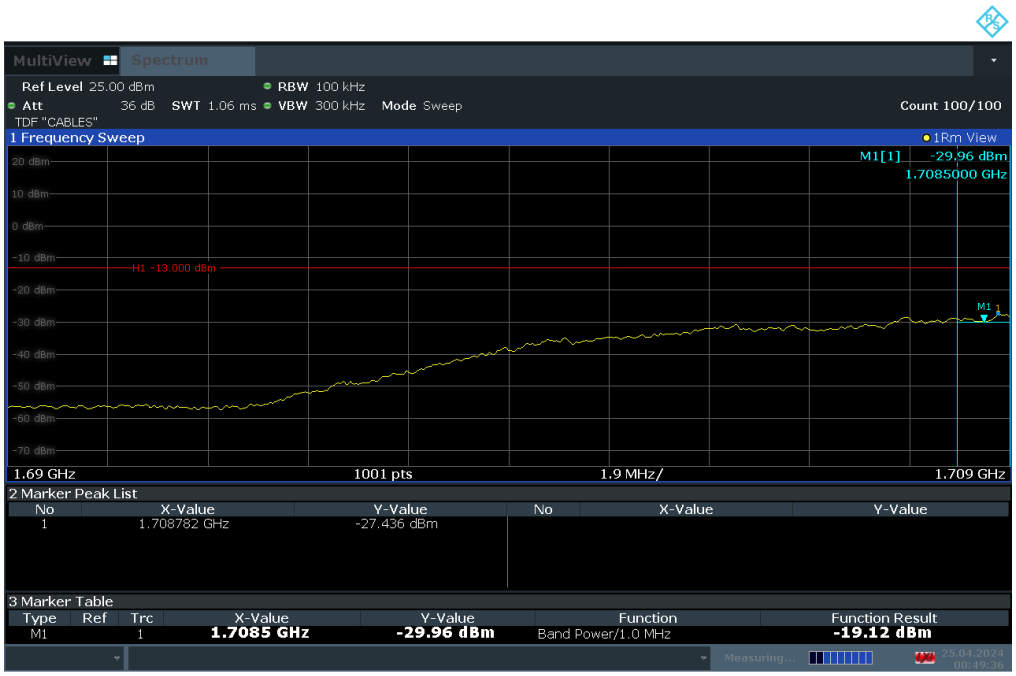


17:40:25 18.04.2024

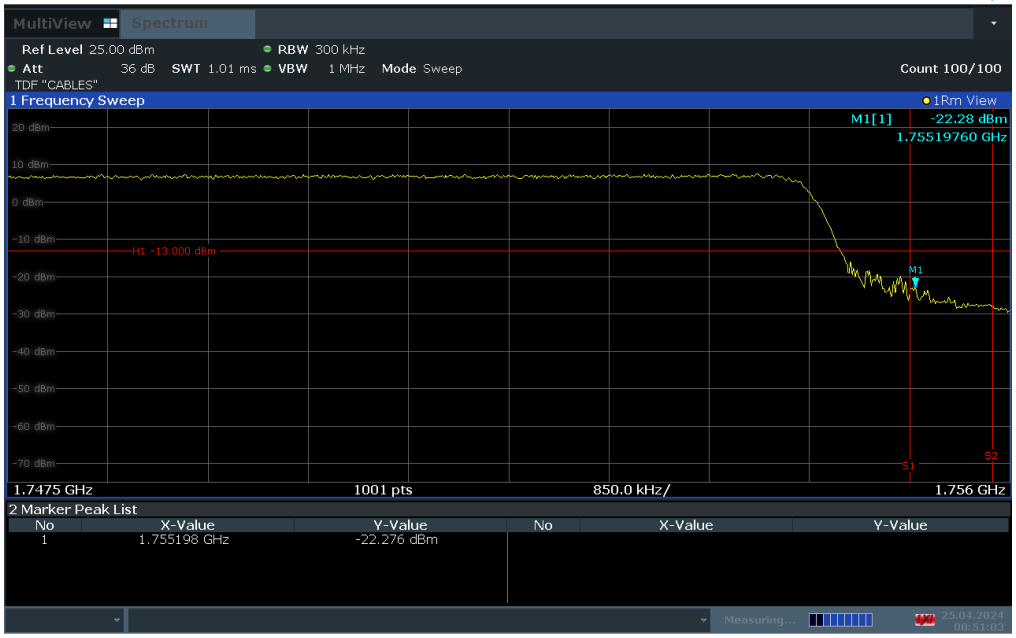
Plot 7-106. Upper Extended Band Edge Plot (LTE Band 4 - 10MHz QPSK – Full RB)



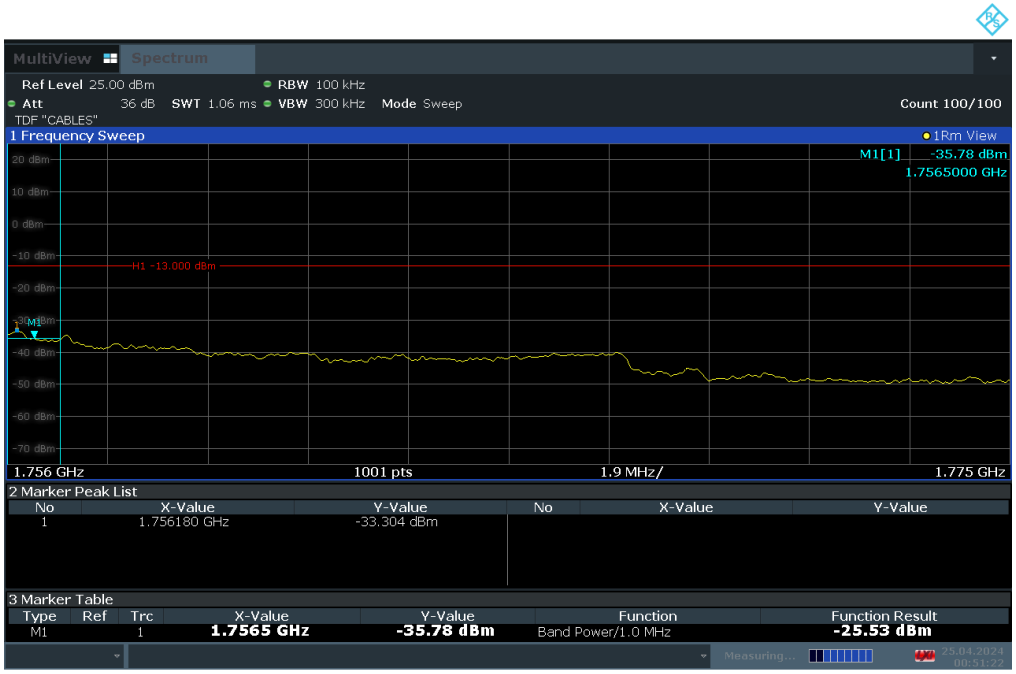
Plot 7-107. Lower Band Edge Plot (LTE Band 4 - 15MHz QPSK – Full RB)



Plot 7-108. Lower Extended Band Edge Plot (LTE Band 4 - 15MHz QPSK – Full RB)

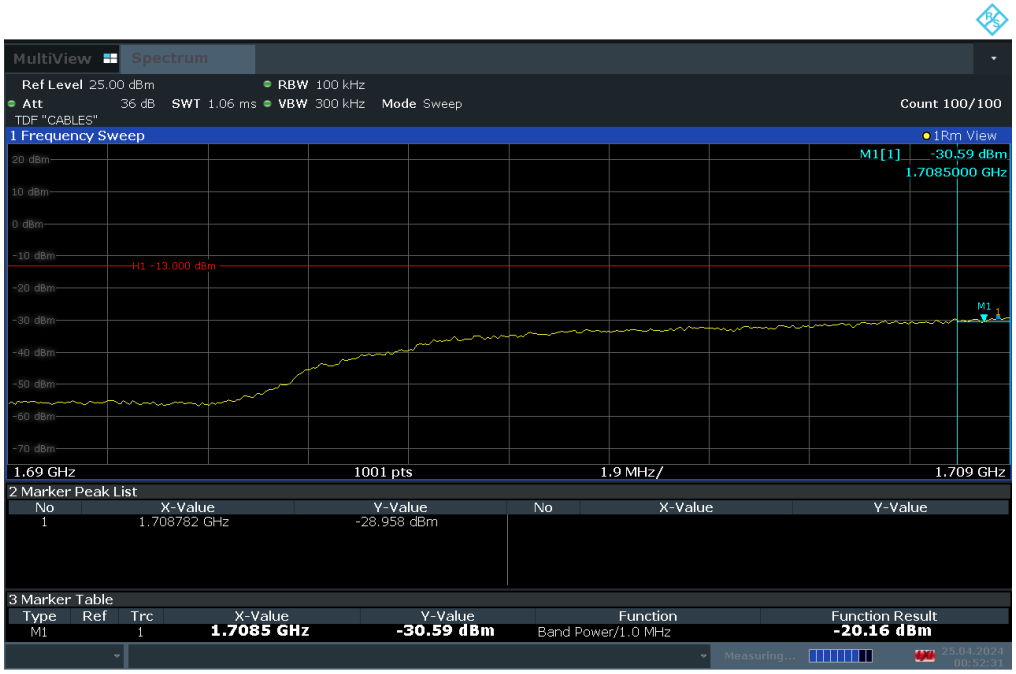


Plot 7-109. Upper Band Edge Plot (LTE Band 4 - 15MHz QPSK – Full RB)

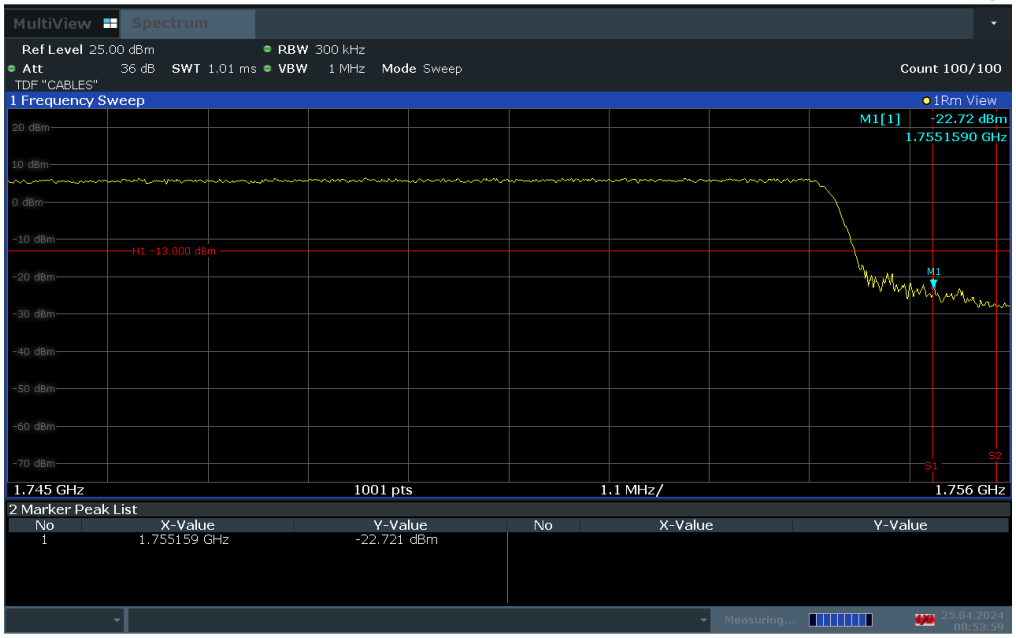


Plot 7-110. Upper Extended Band Edge Plot (LTE Band 4 - 15MHz QPSK – Full RB)

Plot 7-111. Lower Band Edge Plot (LTE Band 4 - 20MHz QPSK – Full RB)

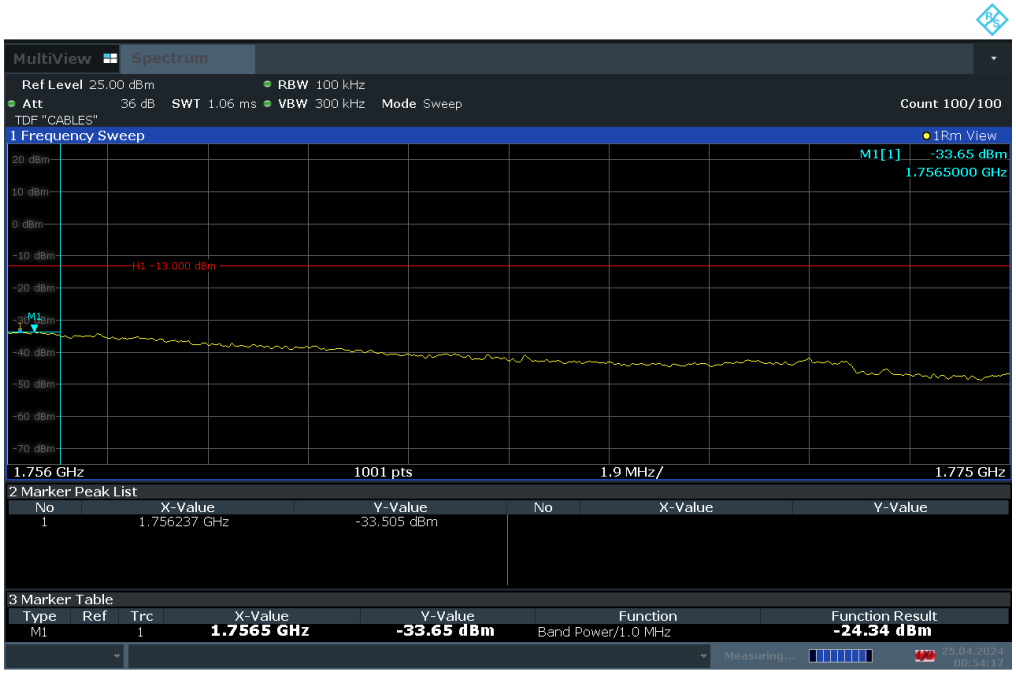


Plot 7-112. Lower Extended Band Edge Plot (LTE Band 4 - 20MHz QPSK – Full RB)



00:54:00 25.04.2024

Plot 7-113. Upper Band Edge Plot (LTE Band 4 - 20MHz QPSK – Full RB)

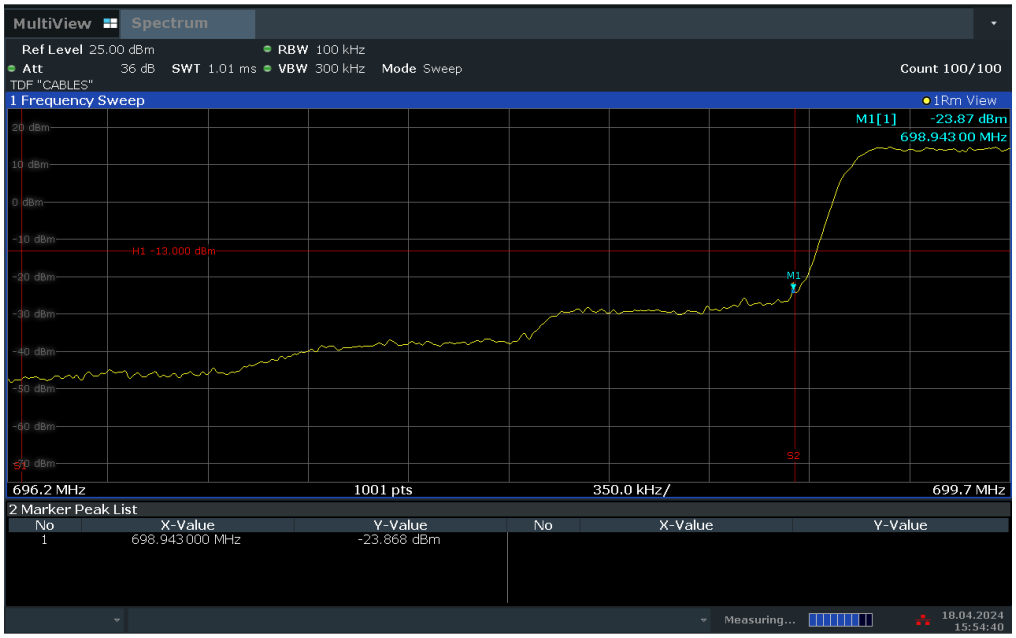


00:54:18 25.04.2024

Plot 7-114. Upper Extended Band Edge Plot (LTE Band 4 - 20MHz QPSK – Full RB)

LTE Band 12

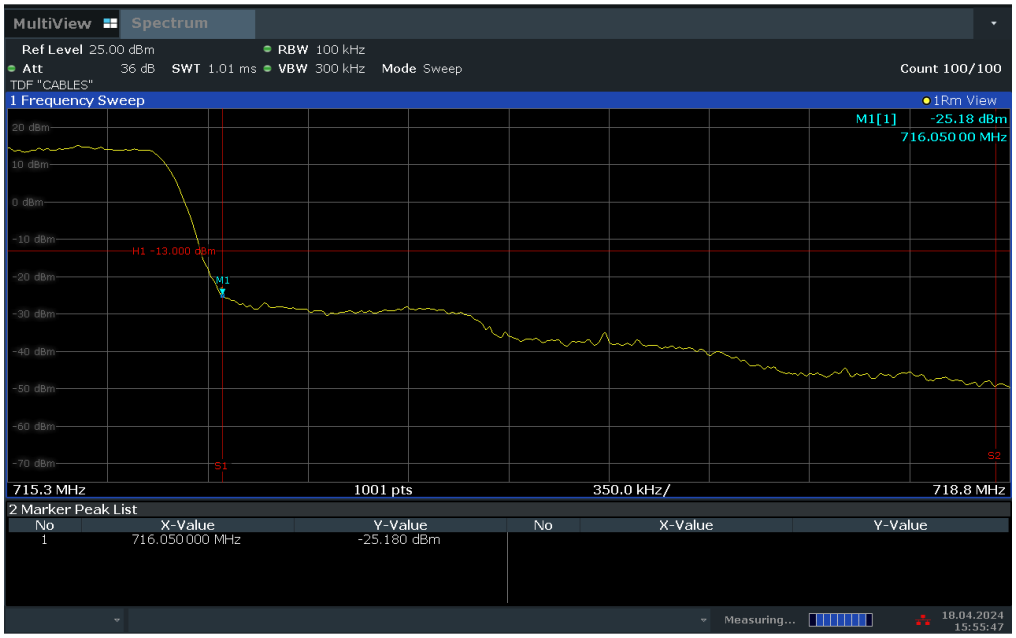
Peak



15:54:40 18.04.2024

Plot 7-115. Lower Band Edge Plot (LTE Band 12 – 1.4MHz QPSK – Full RB)

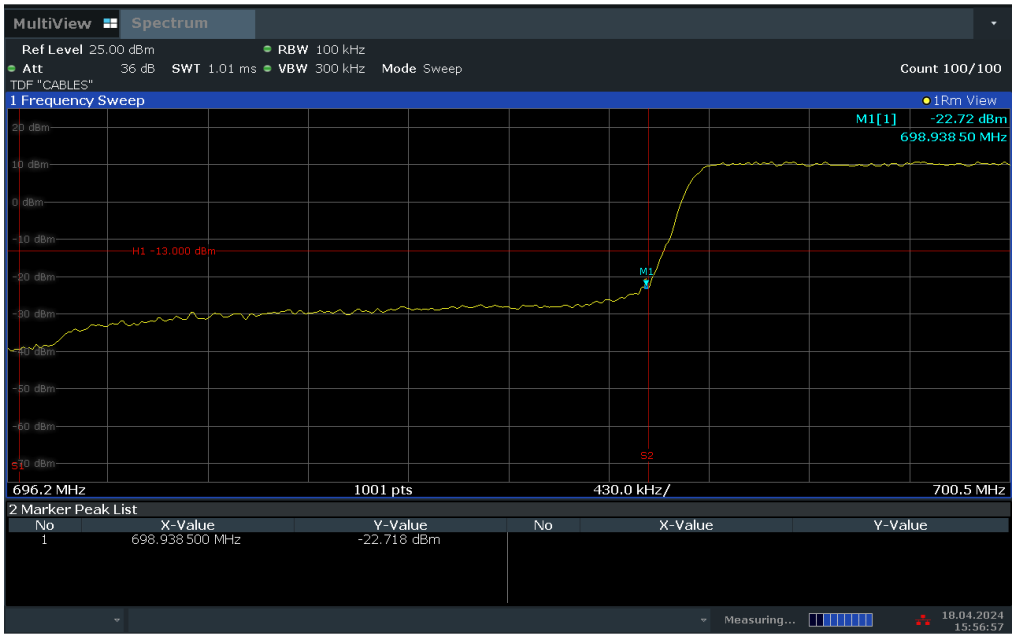
Peak



15:55:47 18.04.2024

Plot 7-116. Upper Band Edge Plot (LTE Band 12 – 1.4MHz QPSK – Full RB)

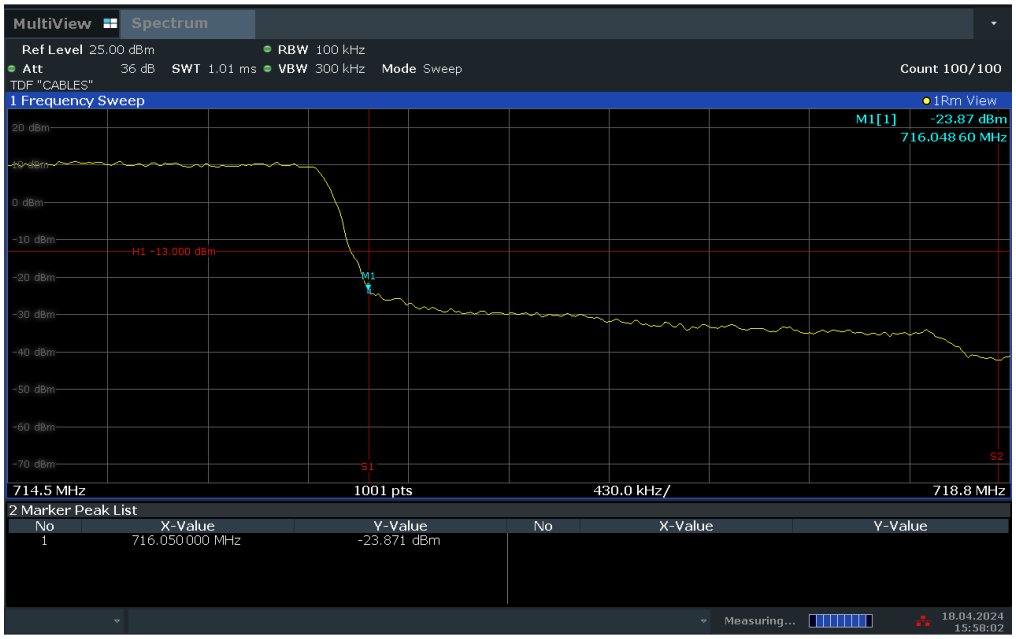
Peak



15:56:57 18.04.2024

Plot 7-117. Lower Band Edge Plot (LTE Band 12 - 3MHz QPSK – Full RB)

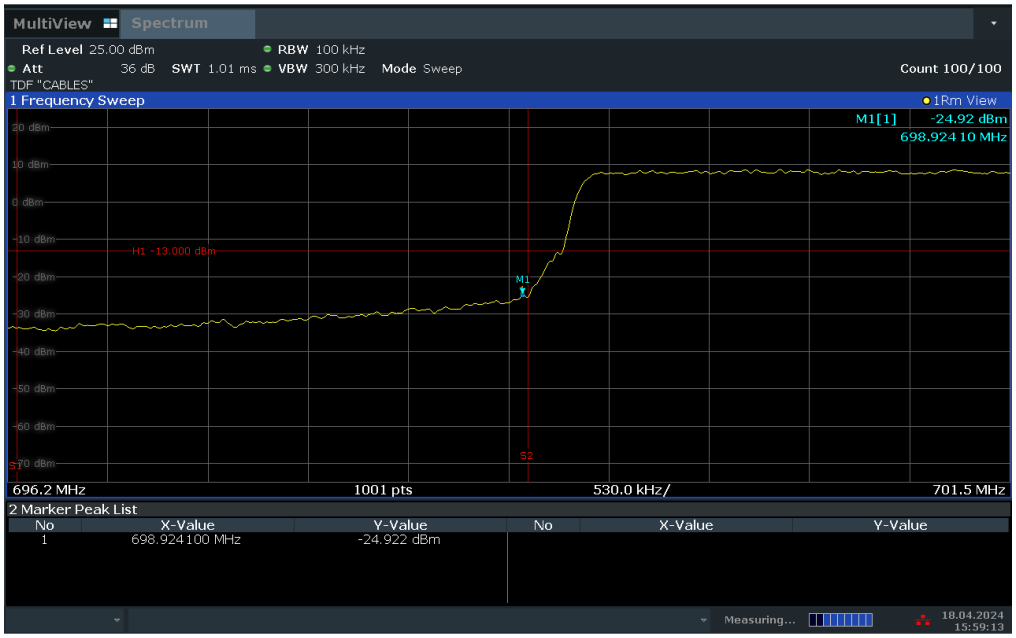
Peak



15:58:03 18.04.2024

Plot 7-118. Upper Band Edge Plot (LTE Band 12 - 3MHz QPSK – Full RB)

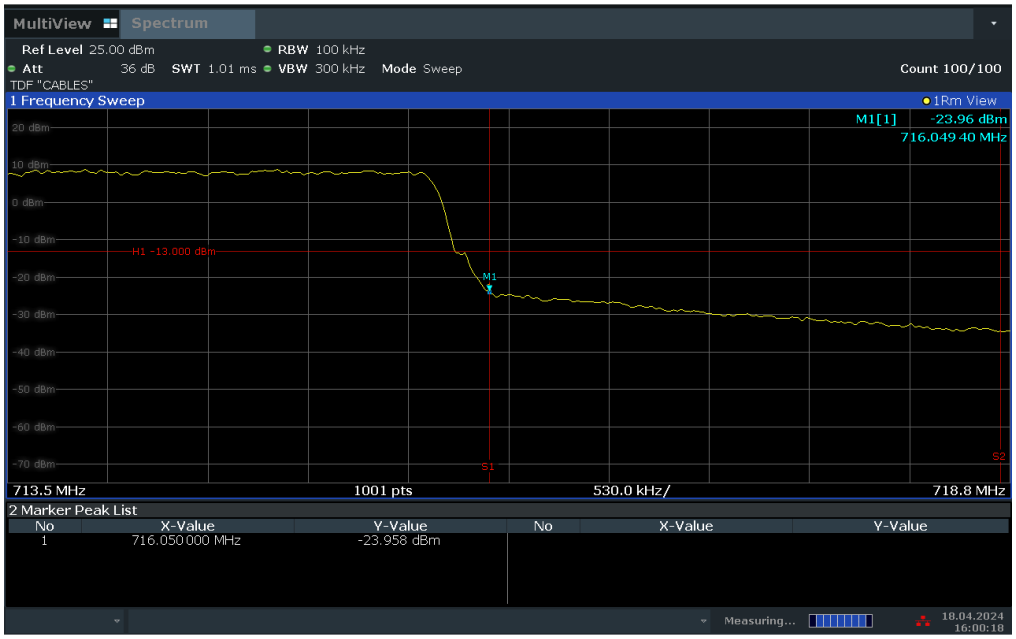
Peak



15:59:13 18.04.2024

Plot 7-119. Lower Band Edge Plot (LTE Band 12 - 5MHz QPSK – Full RB)

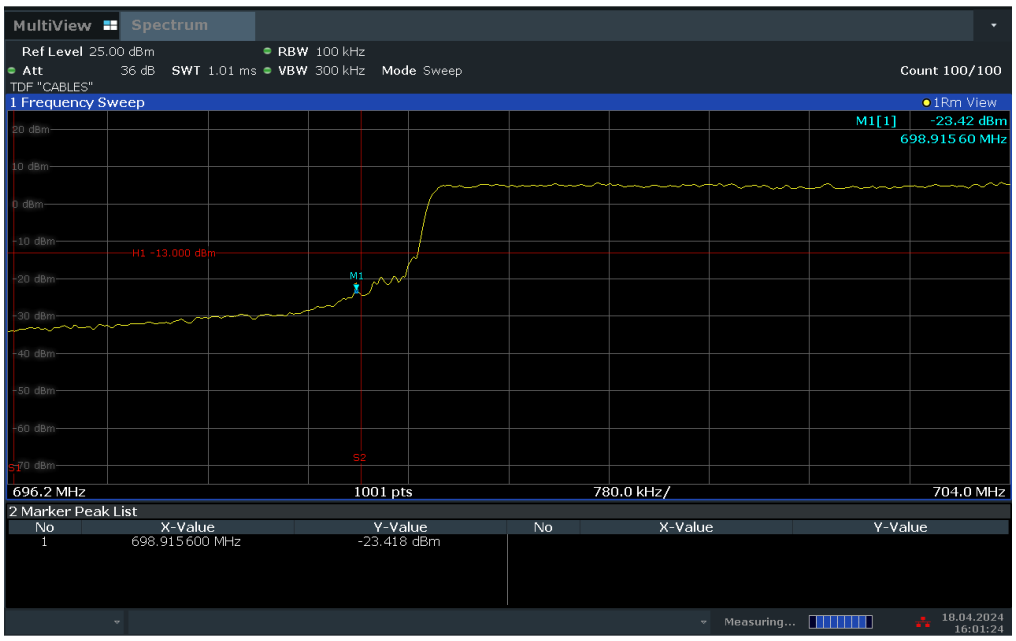
Peak



16:00:18 18.04.2024

Plot 7-120. Upper Band Edge Plot (LTE Band 12 - 5MHz QPSK – Full RB)

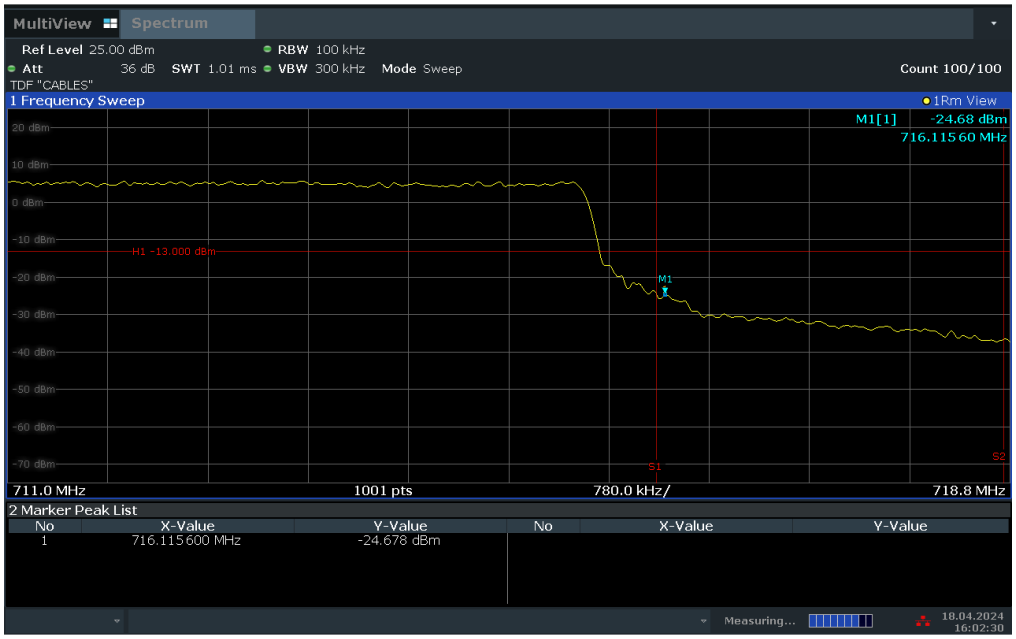
Peak



16:01:24 18.04.2024

Plot 7-121. Lower Band Edge Plot (LTE Band 12 - 10MHz QPSK – Full RB)

Peak

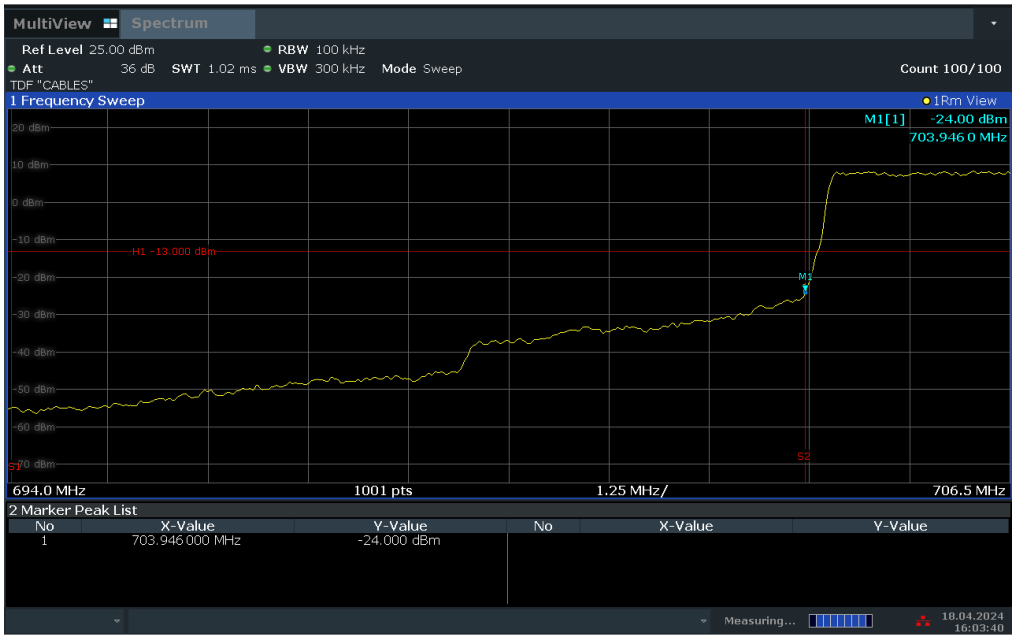


16:02:30 18.04.2024

Plot 7-122. Upper Band Edge Plot (LTE Band 12 - 10MHz QPSK – Full RB)

LTE Band 17

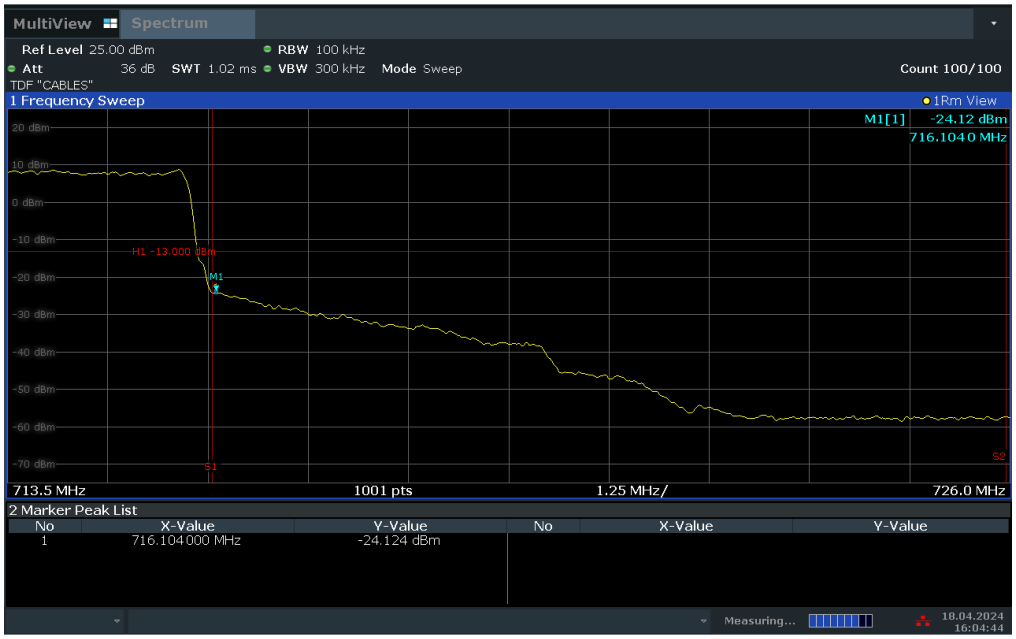
Peak



16:03:40 18.04.2024

Plot 7-123. Lower Band Edge Plot (LTE Band 17 - 5MHz QPSK – Full RB)

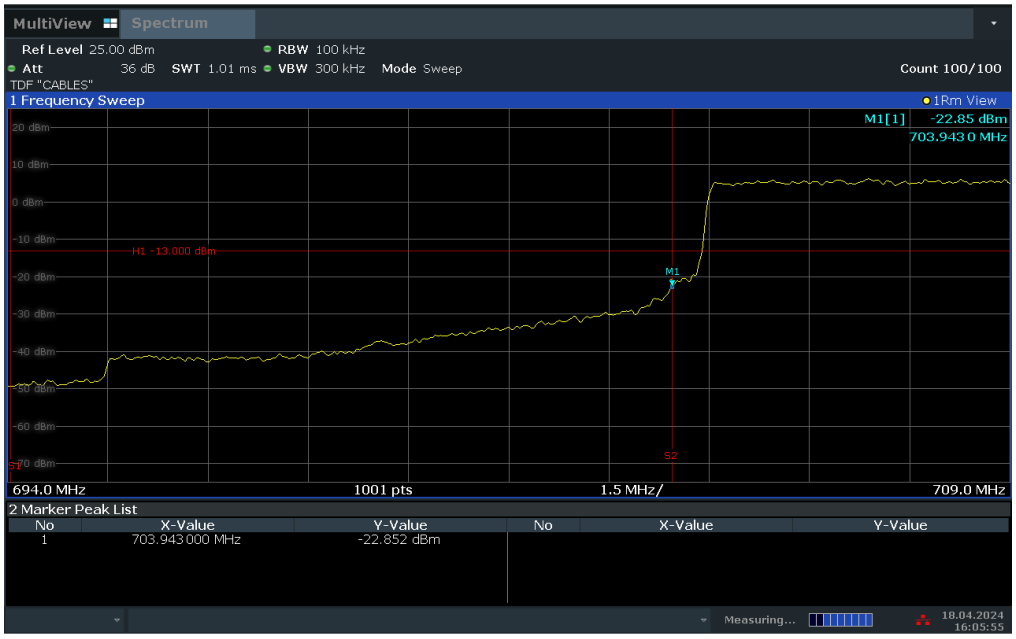
Peak



16:04:45 18.04.2024

Plot 7-124. Upper Band Edge Plot (LTE Band 17 - 5MHz QPSK – Full RB)

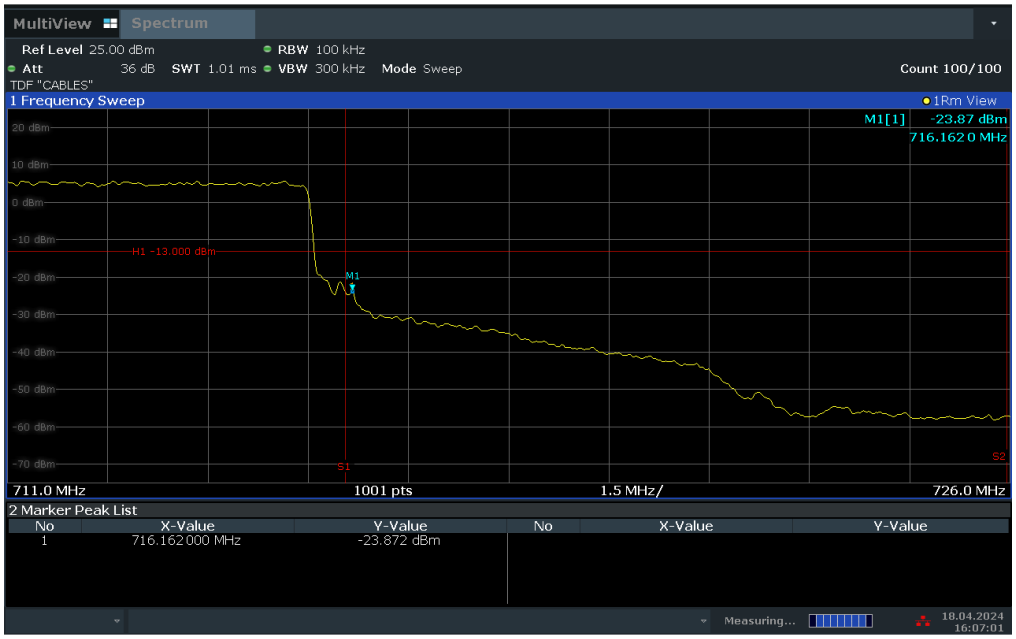
Peak



16:05:56 18.04.2024

Plot 7-125. Lower Band Edge Plot (LTE Band 17 - 10MHz QPSK – Full RB)

Peak

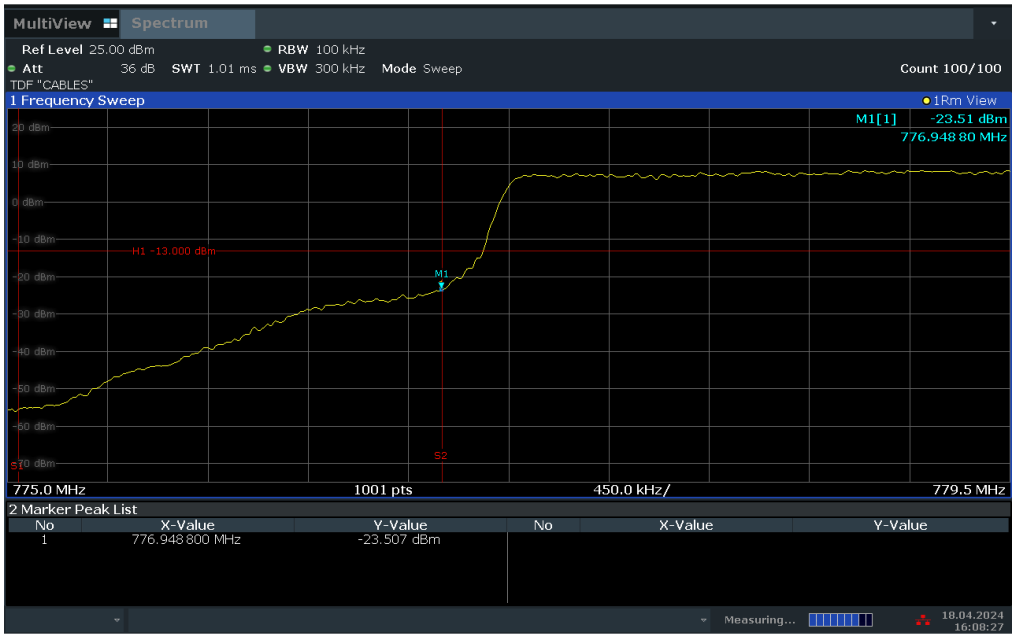


16:07:02 18.04.2024

Plot 7-126. Upper Band Edge Plot (LTE Band 17 - 10MHz QPSK – Full RB)

LTE Band 13

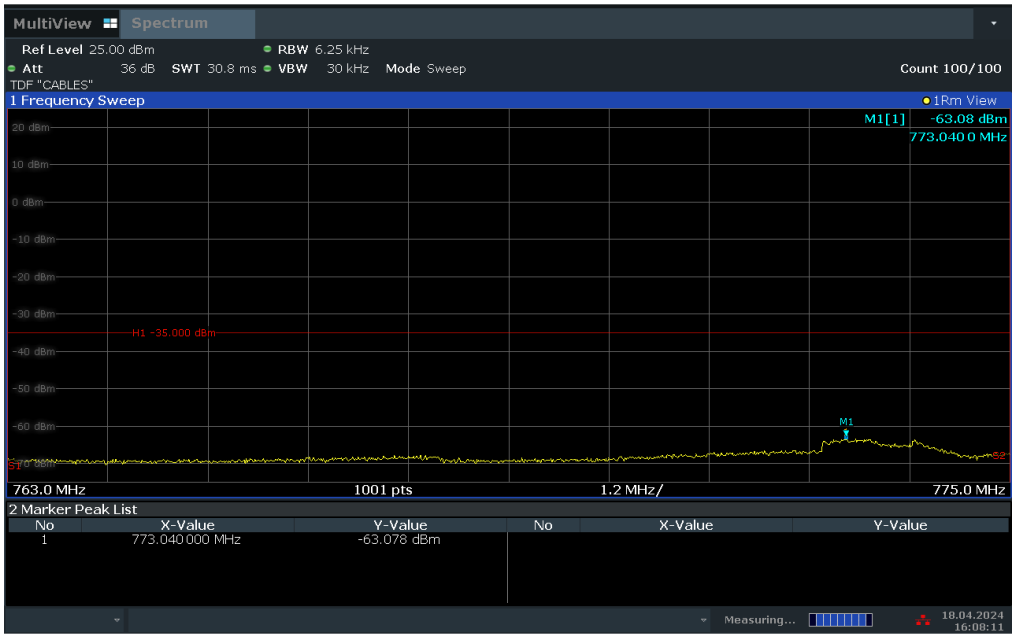
Peak



16:08:28 18.04.2024

Plot 7-127. Lower Band Edge Plot (LTE Band 13 - 5MHz QPSK – Full RB)

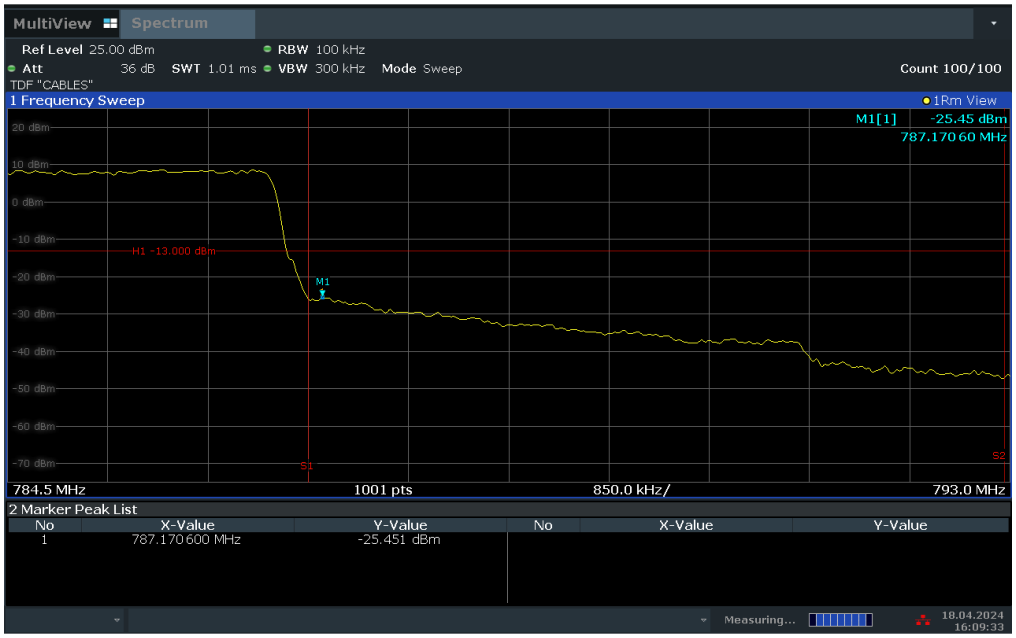
Peak



16:08:11 18.04.2024

Plot 7-128. Lower Emission Mask Plot (LTE Band 13 - 5MHz QPSK – Full RB)

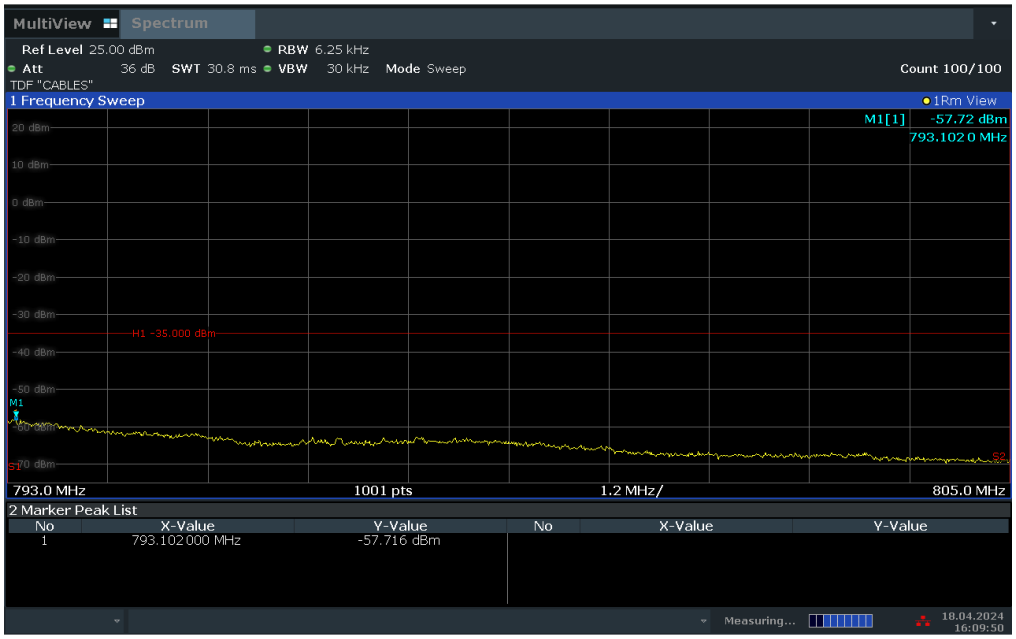
Peak



16:09:34 18.04.2024

Plot 7-129. Upper Band Edge Plot (LTE Band 13 - 5MHz QPSK – Full RB)

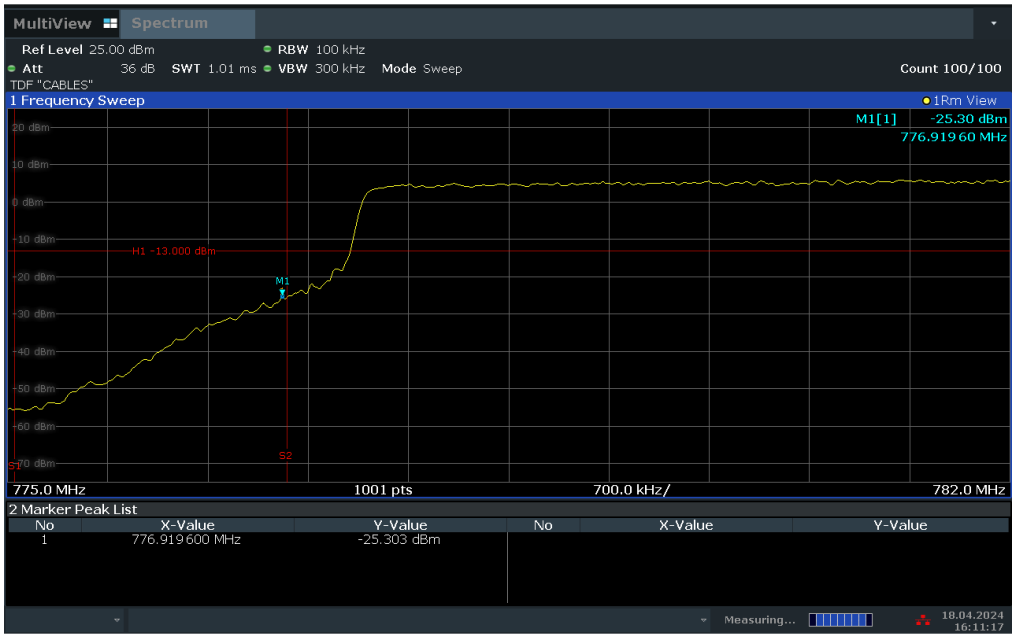
Peak



16:09:51 18.04.2024

Plot 7-130. Upper Emission Mask Plot (LTE Band 13 - 5MHz QPSK – Full RB)

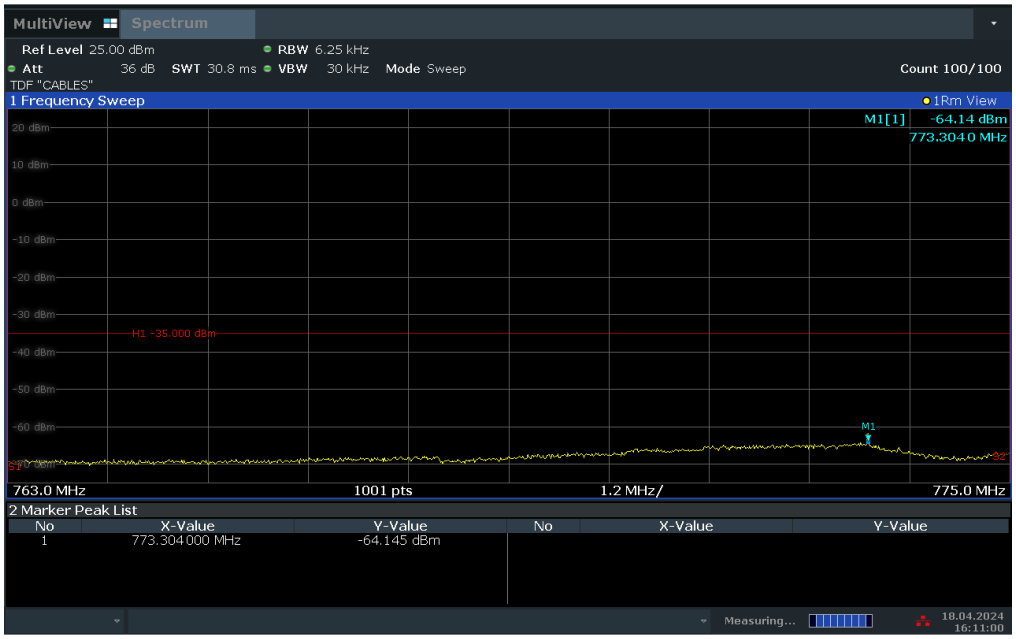
Peak



16:11:18 18.04.2024

Plot 7-131. Lower Band Edge Plot (LTE Band 13 - 10MHz QPSK – Full RB)

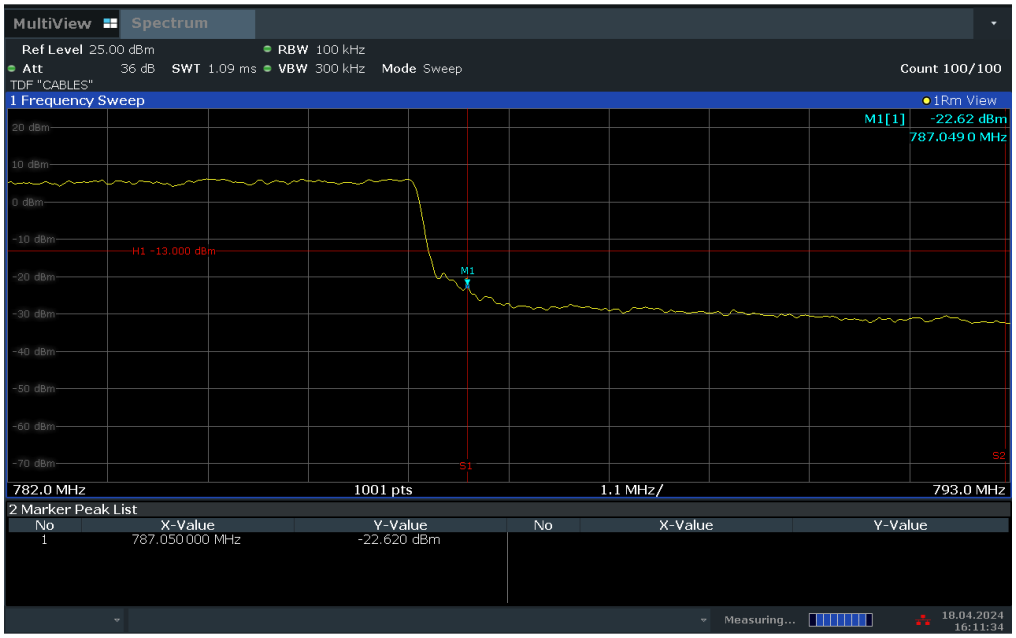
Peak



16:11:00 18.04.2024

Plot 7-132. Lower Emission Mask Plot (LTE Band 13 - 10MHz QPSK – Full RB)

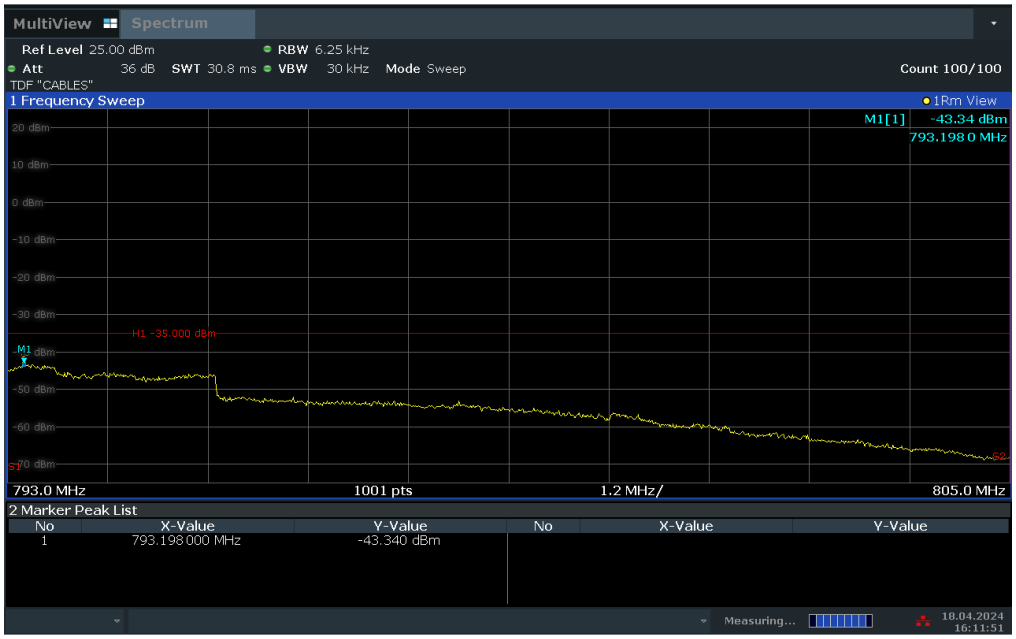
Peak



16:11:35 18.04.2024

Plot 7-133. Upper Band Edge Plot (LTE Band 13 - 10MHz QPSK – Full RB)

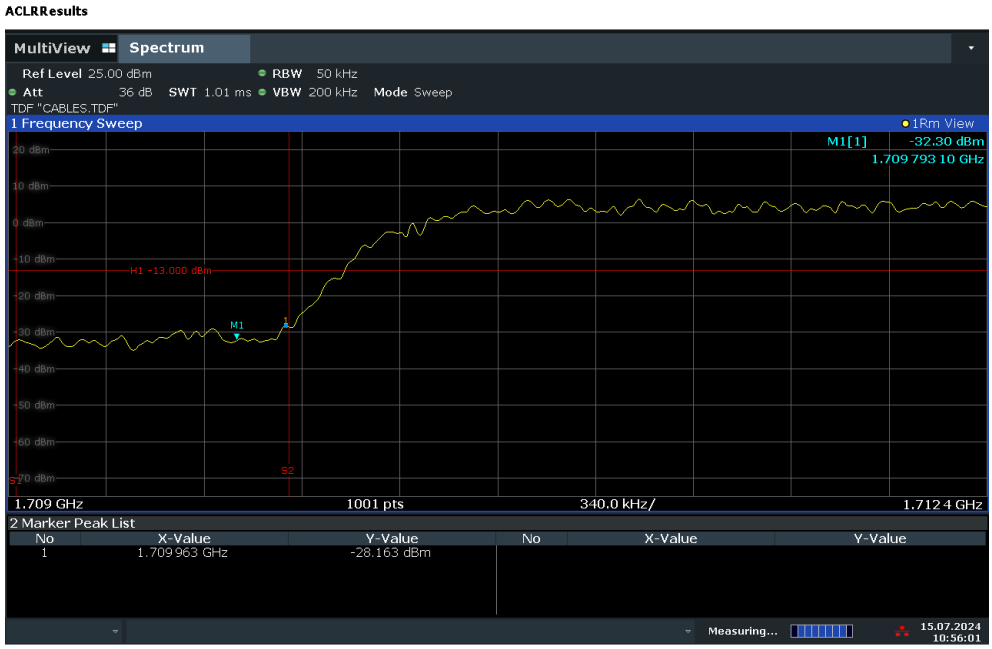
Peak



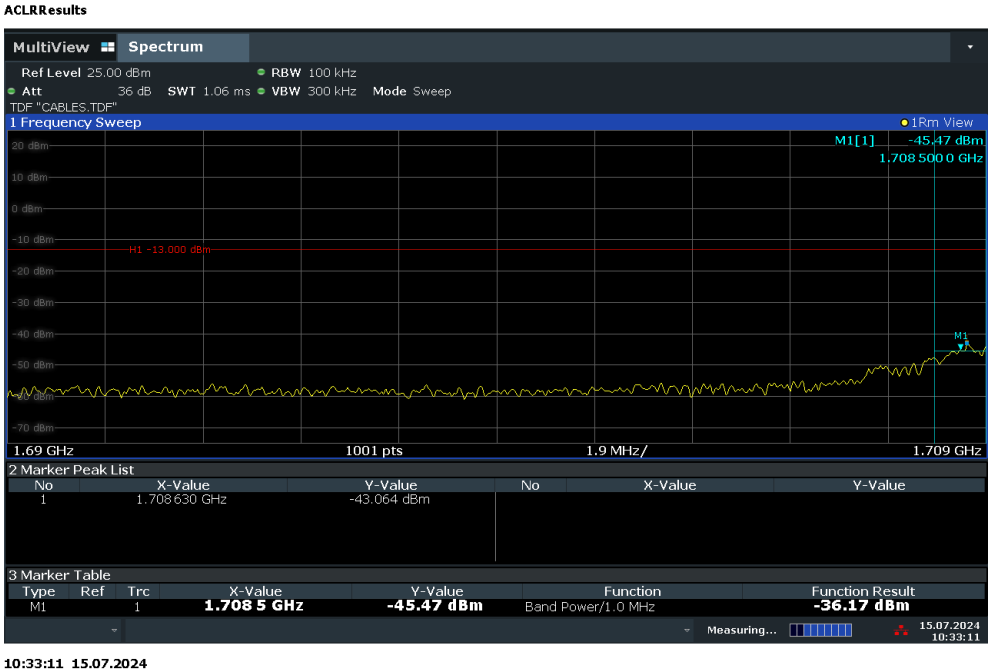
16:11:52 18.04.2024

Plot 7-134. Upper Emission Mask Plot (LTE Band 13 - 10MHz QPSK – Full RB)

WCDMA AWS

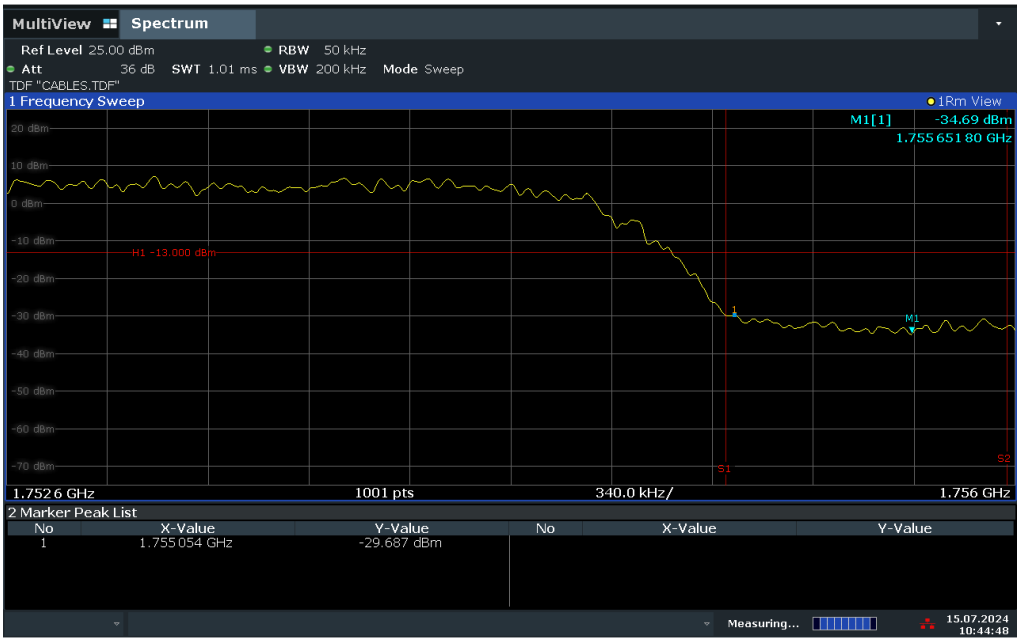


Plot 7-135. Lower Band Edge Plot (WCDMA AWS – Ch. 1312)



Plot 7-136. Lower Extended Band Edge Plot (WCDMA AWS – Ch. 1312)

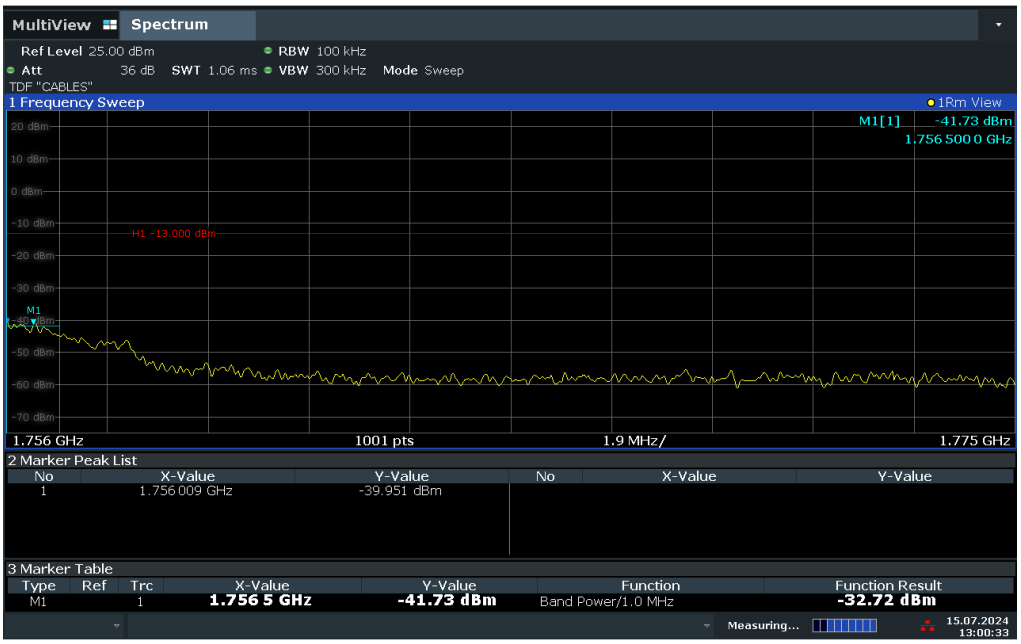
ACLRResults



10:44:49 15.07.2024

Plot 7-137. Upper Band Edge Plot (WCDMA AWS – Ch. 1513)

ACLRResults



13:00:34 15.07.2024

Plot 7-138. Upper Extended Band Edge Plot (WCDMA AWS – Ch. 1513)

7.5 Peak-Average Ratio

§27.50(d)(5)

Test Overview and Limit

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

The peak to average power ratio (PAPR) of the equipment shall not exceed 13 dB for more than 0.1% of the time.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 5.7.1

Test Settings

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW ≥ OBW or specified reference bandwidth
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

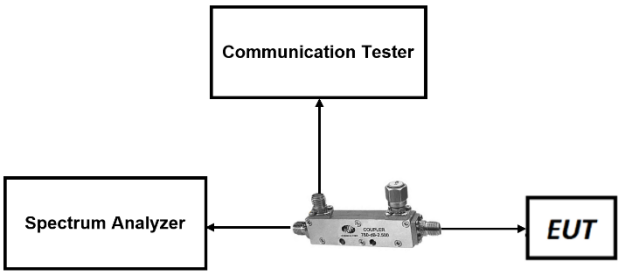


Figure 7-4. Test Instrument & Measurement Setup

Test Notes

None.

LTE Band 66

Plot 7-139. PAR Plot (LTE Band 66 - 1.4MHz QPSK - Full RB)

Plot 7-140. PAR Plot (LTE Band 66 - 1.4MHz 16-QAM - Full RB)

ACLRResults

12:11:02 15.07.2024

Plot 7-141. PAR Plot (LTE Band 66 - 3MHz QPSK - Full RB)

ACLRResults

12:12:23 15.07.2024

Plot 7-142. PAR Plot (LTE Band 66 - 3MHz 16-QAM - Full RB)

ACLRResults

12:13:40 15.07.2024

Plot 7-143. PAR Plot (LTE Band 66 - 5MHz QPSK - Full RB)

ACLRResults

12:15:01 15.07.2024

Plot 7-144. PAR Plot (LTE Band 66 - 5MHz 16-QAM - Full RB)

ACLRResults

12:16:22 15.07.2024

Plot 7-145. PAR Plot (LTE Band 66 - 10MHz QPSK - Full RB)

ACLRResults

12:17:39 15.07.2024

Plot 7-146. PAR Plot (LTE Band 66 - 10MHz 16-QAM - Full RB)

18:31:12 29.04.2024

Plot 7-147. PAR Plot (LTE Band 66 - 15MHz QPSK - Full RB)

18:32:16 29.04.2024

Plot 7-148. PAR Plot (LTE Band 66 - 15MHz 16-QAM - Full RB)

18:33:21 29.04.2024

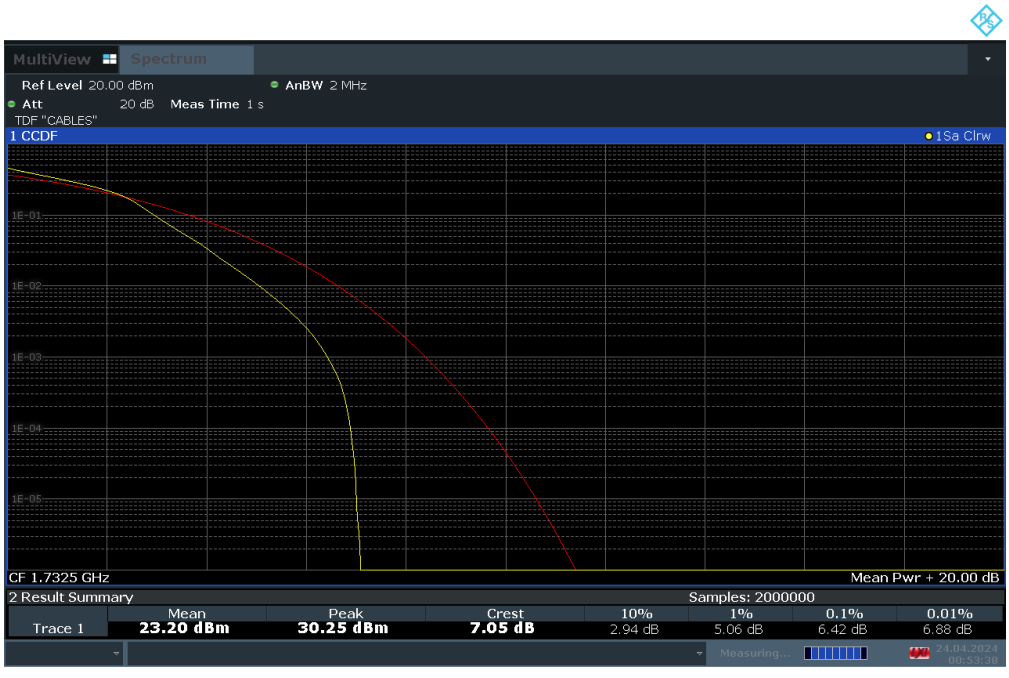
Plot 7-149. PAR Plot (LTE Band 66 - 20MHz QPSK - Full RB)

18:34:30 29.04.2024

Plot 7-150. PAR Plot (LTE Band 66 - 20MHz 16-QAM - Full RB)

LTE Band 4

Plot 7-151. PAR Plot (LTE Band 4 - 1.4MHz QPSK - Full RB)



Plot 7-152. PAR Plot (LTE Band 4 - 1.4MHz 16-QAM - Full RB)

00:54:55 24.04.2024

Plot 7-153. PAR Plot (LTE Band 4 - 3MHz QPSK - Full RB)

00:56:11 24.04.2024

Plot 7-154. PAR Plot (LTE Band 4 - 3MHz 16-QAM - Full RB)

Plot 7-155. PAR Plot (LTE Band 4 - 5MHz QPSK - Full RB)

Plot 7-156. PAR Plot (LTE Band 4 - 5MHz 16-QAM - Full RB)

01:00:05 24.04.2024

Plot 7-157. PAR Plot (LTE Band 4 - 10MHz QPSK - Full RB)

01:01:27 24.04.2024

Plot 7-158. PAR Plot (LTE Band 4 - 10MHz 16-QAM - Full RB)

01:02:44 24.04.2024

Plot 7-159. PAR Plot (LTE Band 4 - 15MHz QPSK - Full RB)

01:04:06 24.04.2024

Plot 7-160. PAR Plot (LTE Band 4 - 15MHz 16-QAM - Full RB)

01:05:28 24.04.2024

Plot 7-161. PAR Plot (LTE Band 4 - 20MHz QPSK - Full RB)

01:06:45 24.04.2024

Plot 7-162. PAR Plot (LTE Band 4 - 20MHz 16-QAM - Full RB)

WCDMA AWS

Plot 7-163. PAR Plot (WCDMA, Ch. 1413)

7.6 Radiated Power (ERP/EIRP)

§27.50(b)(10), §27.50(c)(10), §27.50(d)(4)

Test Overview

Effective Radiated Power (ERP) measurements are calculated by adding highest antenna gain to maximum measured conducted output power. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.2.1
ANSI C63.26-2015 – Section 5.2.5.5

Test Settings

The relevant equation for determining the ERP or EIRP from the conducted RF output power measured is:

ERP/EIRP = PMeas – LC + GT

Where:

ERP/EIRP = Effective or Equivalent Isotropic Radiated Power, respectively (expressed in the same units as PMeas, typically dBW or dBm)

PMeas = measured transmitter output power or PSD, in dBW or dBm

LC = signal attenuation in the connecting cable between the transmitter and antenna in dB

GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

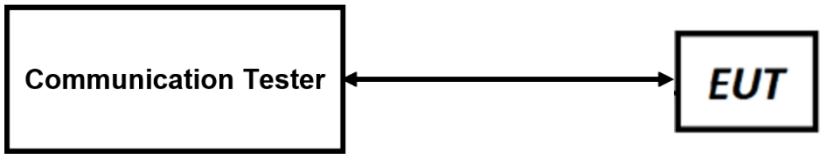


Figure 7-5. ERP/EIRP Measurement Setup

Test Notes

1. The EUT was tested in all possible test configurations. The worst case emissions are reported with the EUT modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.

2. This unit was tested with its standard battery.

3. The Level (dBm) readings in the table were taken with a correction table loaded into the base station simulator. The correction table was used to account for the signal attenuation in the connecting cable between the transmitter and antenna.

4. This device employs UMTS technology with WCDMA (AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to "1."

5. The Ant. Gains (GT) are listed in dBi.

7.6.1 Antenna FCM – EIRP

LTE Band 66

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm]	EIRP [mW]	EIRP Limit [dBm]	Margin [dB]
1.4 MHz	QPSK	1710.7	-12.47	1 / 3	24.14	11.67	14.689	30.00	-18.33
		1745.0	-12.47	1 / 5	24.02	11.55	14.289	30.00	-18.45
		1779.3	-12.47	1 / 0	24.22	**11.75**	14.962	30.00	-18.25
	16-QAM	1745.0	-12.47	1 / 5	23.66	11.19	13.152	30.00	-18.81
3 MHz	QPSK	1711.5	-12.47	1 / 7	24.19	11.72	14.859	30.00	-18.28
		1745.0	-12.47	1 / 7	24.22	11.75	14.962	30.00	-18.25
		1778.5	-12.47	1 / 7	24.31	**11.84**	15.276	30.00	-18.16
	16-QAM	1778.5	-12.47	1 / 7	23.63	11.16	13.062	30.00	-18.84
5 MHz	QPSK	1712.5	-12.47	1 / 0	24.04	11.57	14.355	30.00	-18.43
		1745.0	-12.47	1 / 24	24.18	**11.71**	14.825	30.00	-18.29
		1777.5	-12.47	1 / 24	24.16	11.69	14.757	30.00	-18.31
	16-QAM	1745.0	-12.47	1 / 24	23.61	11.14	13.002	30.00	-18.86
10 MHz	QPSK	1715.0	-12.47	1 / 49	24.04	11.57	14.355	30.00	-18.43
		1745.0	-12.47	1 / 49	24.09	11.62	14.521	30.00	-18.38
		1775.0	-12.47	1 / 49	24.11	**11.64**	14.588	30.00	-18.36
	16-QAM	1745.0	-12.47	1 / 49	23.70	11.23	13.274	30.00	-18.77
15 MHz	QPSK	1717.5	-12.47	1 / 74	24.32	11.85	15.311	30.00	-18.15
		1745.0	-12.47	1 / 37	24.41	**11.94**	15.631	30.00	-18.06
		1772.5	-12.47	1 / 74	24.30	11.83	15.241	30.00	-18.17
	16-QAM	1745.0	-12.47	1 / 74	23.74	11.27	13.397	30.00	-18.73
20 MHz	QPSK	1720.0	-12.47	1 / 99	24.37	**11.90**	15.488	30.00	-18.10
		1745.0	-12.47	1 / 99	24.06	11.59	14.421	30.00	-18.41
		1770.0	-12.47	1 / 0	24.27	11.80	15.136	30.00	-18.20
	16-QAM	1720.0	-12.47	1 / 99	23.79	11.32	13.552	30.00	-18.68

Table 7-2. Antenna FCM EIRP Data (LTE Band 66)

LTE Band 4

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm]	EIRP [mW]	EIRP Limit [dBm]	Margin [dB]
1.4 MHz	QPSK	1710.7	-12.47	1 / 0	24.07	11.60	14.454	30.00	-18.40
		1732.5	-12.47	1 / 0	24.30	11.83	15.241	30.00	-18.17
		1754.3	-12.47	1 / 0	24.45	**11.98**	15.776	30.00	-18.02
	16-QAM	1732.5	-12.47	1 / 0	24.04	11.57	14.355	30.00	-18.43
3 MHz	QPSK	1711.5	-12.47	1 / 7	24.06	11.59	14.421	30.00	-18.41
		1732.5	-12.47	1 / 0	24.26	**11.79**	15.101	30.00	-18.21
		1753.5	-12.47	1 / 7	24.24	11.77	15.031	30.00	-18.23
	16-QAM	1732.5	-12.47	1 / 0	23.92	11.45	13.964	30.00	-18.55
5 MHz	QPSK	1712.5	-12.47	1 / 0	24.33	11.86	15.346	30.00	-18.14
		1732.5	-12.47	1 / 0	24.36	**11.89**	15.453	30.00	-18.11
		1752.5	-12.47	1 / 0	24.18	11.71	14.825	30.00	-18.29
	16-QAM	1732.5	-12.47	1 / 0	23.95	11.48	14.060	30.00	-18.52
10 MHz	QPSK	1715.0	-12.47	1 / 49	24.25	11.78	15.066	30.00	-18.22
		1732.5	-12.47	1 / 0	24.27	**11.80**	15.136	30.00	-18.20
		1750.0	-12.47	1 / 0	24.22	11.75	14.962	30.00	-18.25
	16-QAM	1750.0	-12.47	1 / 0	23.99	11.52	14.191	30.00	-18.48
15 MHz	QPSK	1717.5	-12.47	1 / 37	24.37	**11.90**	15.488	30.00	-18.10
		1732.5	-12.47	1 / 0	24.24	11.77	15.031	30.00	-18.23
		1747.5	-12.47	1 / 0	24.14	11.67	14.689	30.00	-18.33
	16-QAM	1747.5	-12.47	1 / 0	23.89	11.42	13.868	30.00	-18.58
20 MHz	QPSK	1720.0	-12.47	1 / 99	24.20	11.73	14.894	30.00	-18.27
		1732.5	-12.47	1 / 0	24.40	**11.93**	15.596	30.00	-18.07
		1745.0	-12.47	1 / 0	24.27	11.80	15.136	30.00	-18.20
	16-QAM	1732.5	-12.47	1 / 0	23.91	11.44	13.932	30.00	-18.56

Table 7-3. Antenna FCM EIRP Data (LTE Band 4)

WCDMA AWS

Mode	Conducted Power [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [mW]	EIRP Limit [dBm]	Margin [dB]
WCDMA1700	23.77	-12.47	**11.30**	13.490	30.00	-18.70
WCDMA1700	23.79	-12.47	**11.32**	**13.552**	30.00	-18.68
WCDMA1700	23.74	-12.47	11.27	13.397	30.00	-18.73

Table 7-4. Antenna FCM EIRP Data (WCDMA AWS)

7.6.2 Antenna BCM – ERP

LTE Band 12

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	ERP [dBm]	ERP [mW]	ERP Limit [dBm]	Margin [dB]
1.4 MHz	QPSK	699.7	-28.00	1 / 0	25.06	**-5.09**	0.310	34.77	-39.86
		707.5	-28.00	1 / 5	25.17	-4.98	0.318	34.77	-39.75
		715.3	-28.00	1 / 5	25.29	**-4.86**	0.327	34.77	-39.63
	16-QAM	707.5	-28.00	1 / 5	24.67	-5.48	0.283	34.77	-40.25
3 MHz	QPSK	700.5	-28.00	1 / 0	25.06	-5.09	0.310	34.77	-39.86
		707.5	-28.00	1 / 7	25.18	**-4.97**	0.318	34.77	-39.74
		714.5	-28.00	1 / 14	25.10	-5.05	0.313	34.77	-39.82
	16-QAM	714.5	-28.00	1 / 7	24.67	-5.48	0.283	34.77	-40.25
5 MHz	QPSK	701.5	-28.00	1 / 24	25.34	-4.81	0.330	34.77	-39.58
		707.5	-28.00	1 / 0	25.38	**-4.77**	0.333	34.77	-39.54
		713.5	-28.00	1 / 24	25.14	-5.01	0.316	34.77	-39.78
	16-QAM	701.5	-28.00	1 / 24	24.77	-5.38	0.290	34.77	-40.15
10 MHz	QPSK	704.0	-28.00	1 / 25	25.23	-4.92	0.322	34.77	-39.69
		707.5	-28.00	1 / 0	25.29	**-4.86**	0.327	34.77	-39.63
		711.0	-28.00	1 / 0	25.12	-5.03	0.314	34.77	-39.80
	16-QAM	707.5	-28.00	1 / 0	24.70	-5.45	0.285	34.77	-40.22

Table 7-5. Antenna BCM ERP Data (LTE Band 12)

LTE Band 17

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	ERP [dBm]	ERP [mW]	ERP Limit [dBm]	Margin [dB]
5 MHz	QPSK	706.5	-28.00	1 / 0	25.33	**-4.82**	0.330	34.77	-39.59
		710.0	-28.00	1 / 0	25.37	**-4.78**	0.333	34.77	-39.55
		713.5	-28.00	1 / 24	25.18	-4.97	0.318	34.77	-39.74
	16-QAM	706.5	-28.00	1 / 0	24.72	-5.43	0.286	34.77	-40.20
10 MHz	QPSK	709.0	-28.00	1 / 0	25.24	-4.91	0.323	34.77	-39.68
		710.0	-28.00	1 / 0	25.30	**-4.85**	0.327	34.77	-39.62
		711.0	-28.00	1 / 49	25.08	-5.07	0.311	34.77	-39.84
	16-QAM	710.0	-28.00	1 / 0	24.71	-5.44	0.286	34.77	-40.21

Table 7-6. Antenna BCM ERP Data (LTE Band 17)

LTE Band 13

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	ERP [dBm]	ERP [mW]	ERP Limit [dBm]	Margin [dB]
5 MHz	QPSK	779.5	-26.20	1 / 0	25.38	**-2.97**	0.505	34.77	-37.74
		782.0	-26.20	1 / 24	25.34	**-3.01**	0.500	34.77	-37.78
		784.5	-26.20	1 / 12	25.09	-3.26	0.472	34.77	-38.03
	16-QAM	782.0	-26.20	1 / 24	24.74	-3.61	0.436	34.77	-38.38
10 MHz	QPSK	782.0	-26.20	1 / 0	25.18	**-3.17**	0.482	34.77	-37.94
	16-QAM	782.0	-26.20	1 / 49	24.64	-3.71	0.426	34.77	-38.48

Table 7-7. Antenna BCM ERP Data (LTE Band 13)

7.7 Radiated Spurious Emissions

§2.1053, §27.53(f)

Test Overview

Radiated spurious emissions measurements are performed using the field strength conversion method described in KDB 971168 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using horizontally and vertically polarized broadband hybrid antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed while the EUT is operating at maximum power and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

ANSI C63.26 2015, TIA-603-E-2016 – Section 2.2.12

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points ≥ 2 x span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

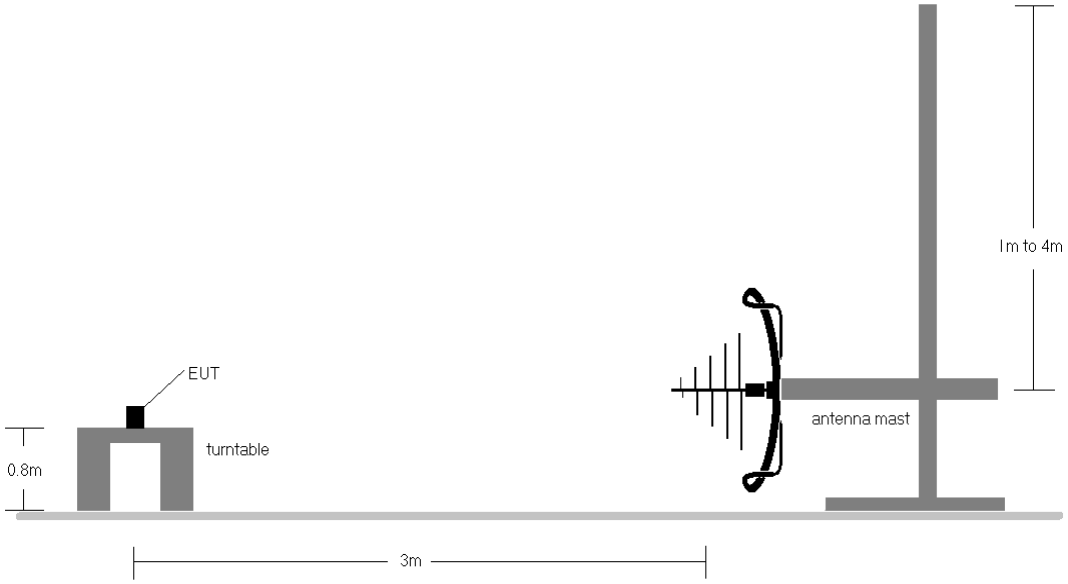


Figure 7-6. Test Instrument & Measurement Setup < 1GHz

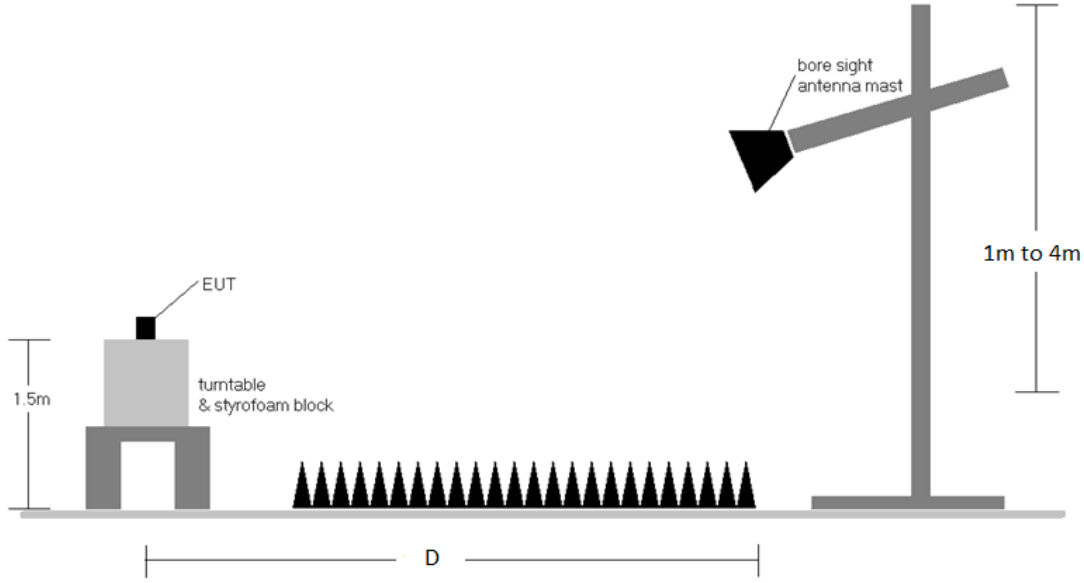


Figure 7-7. Test Instrument & Measurement Setup > 1GHz

Test Notes

1. Field strengths are calculated using the Measurement quantity conversions in KDB 971168 Section 5.8.4.
    a. E(dBµV/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m)
    b. EIRP (dBm) = E(dBµV/m) + 20logD – 104.8; where D is the measurement distance in meters.

2. The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.

3. This unit was tested with its standard battery.

4. The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

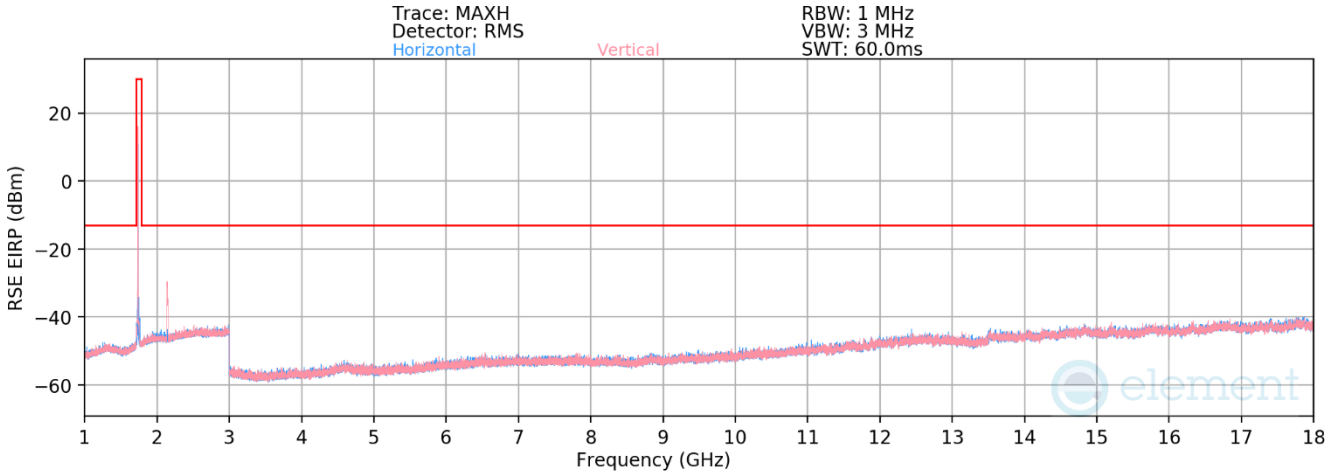
5. D is the measurement test distance and emissions 1-18GHz were measured at a 3 meters test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

6. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

7. This device employs UMTS technology with WCDMA (AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to “1”.

7.7.1 Antenna FCM – Radiated Spurious Emission Measurement

LTE Band 66/4



Plot 7-164. Antenna FCM Radiated Spurious Emission above 1GHz (LTE Band 66/4)

Bandwidth (MHz):	20
Frequency (MHz):	1720.0
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3440.0	V	-	-	-78.09	4.05	32.96	-62.30	-13.00	-49.30
5160.0	V	-	-	-80.20	7.69	34.50	-60.76	-13.00	-47.76
6880.0	V	-	-	-80.26	9.74	36.48	-58.78	-13.00	-45.78

Table 7-8. Antenna FCM Radiated Spurious Data (LTE Band 66/4 – Low Channel)

Bandwidth (MHz):	20
Frequency (MHz):	1745.0
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3490.0	V	-	-	-78.55	4.39	32.84	-62.42	-13.00	-49.42
5235.0	V	-	-	-80.14	7.75	34.62	-60.64	-13.00	-47.64
6980.0	V	-	-	-80.24	9.84	36.60	-58.66	-13.00	-45.66

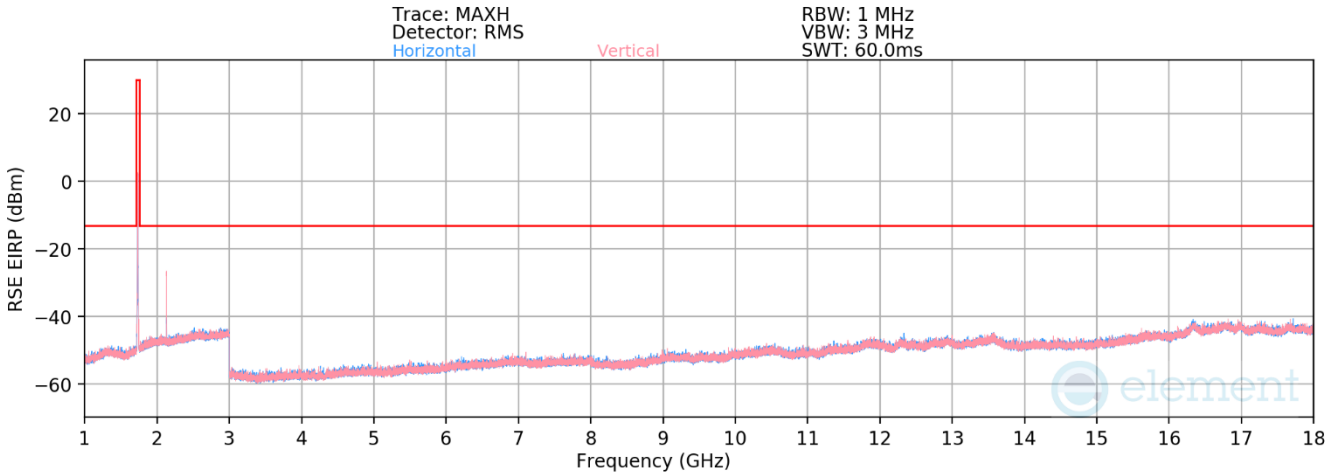
Table 7-9. Antenna FCM Radiated Spurious Data (LTE Band 66/4 – Mid Channel)

Bandwidth (MHz):	20
Frequency (MHz):	1770.0
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3540.0	V	-	-	-78.66	4.39	32.73	-62.53	-13.00	-49.53
5310.0	V	-	-	-80.36	7.83	34.47	-60.79	-13.00	-47.79
7080.0	V	-	-	-80.18	9.95	36.78	-58.48	-13.00	-45.48

Table 7-10. Antenna FCM Radiated Spurious Data (LTE Band 66/4 – High Channel)

WCDMA AWS



Plot 7-165. Antenna FCM Radiated Spurious Emission above 1GHz (WCDMA AWS)

Mode:	WCDMA RMC
Channel:	1312
Frequency (MHz):	1712.4

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3424.8	H	-	-	-79.51	4.60	32.09	-63.17	-13.00	-50.17
5137.2	H	-	-	-80.89	8.72	34.83	-60.43	-13.00	-47.43
6849.6	H	-	-	-81.37	10.93	36.56	-58.69	-13.00	-45.69

7-11. Antenna FCM Radiated Spurious Data (WCDMA AWS – Low Channel)

Mode:	WCDMA RMC
Channel:	1413
Frequency (MHz):	1732.6

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3465.2	H	-	-	-79.68	4.72	32.04	-63.22	-13.00	-50.22
5197.8	H	-	-	-81.30	8.34	34.04	-61.22	-13.00	-48.22
6930.4	H	-	-	-81.83	10.94	36.11	-59.15	-13.00	-46.15

Table 7-12. Antenna FCM Radiated Spurious Data (WCDMA AWS – Mid Channel)

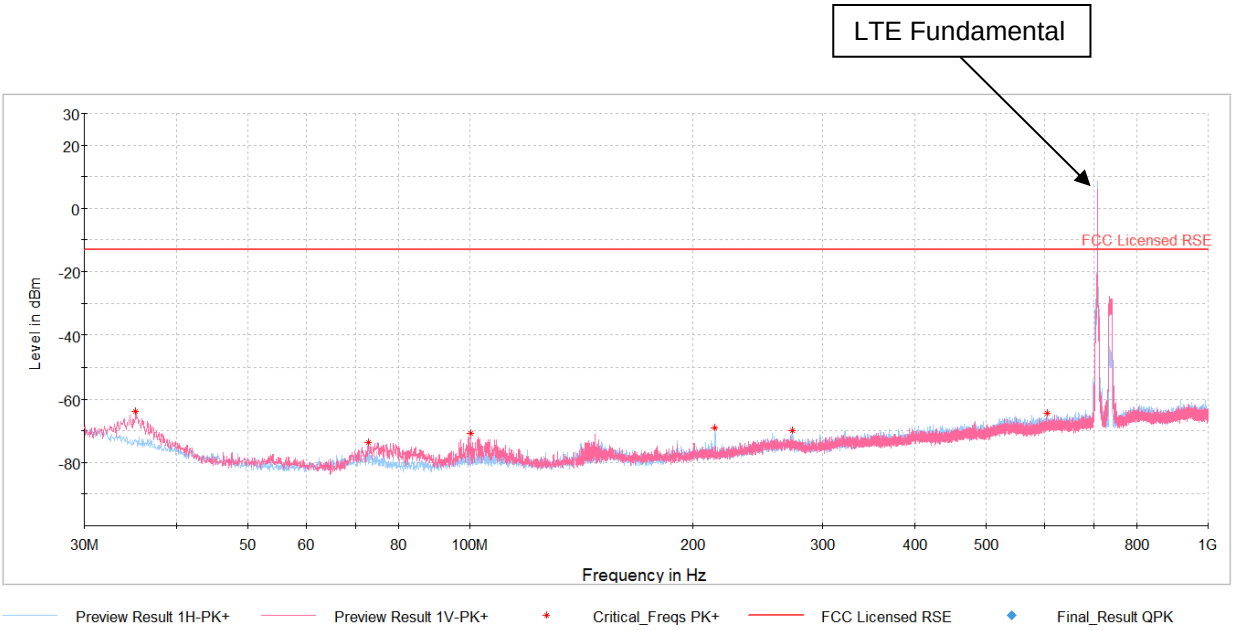
Mode:	WCDMA RMC
Channel:	1513
Frequency (MHz):	1752.6

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3505.2	H	-	-	-79.48	4.79	32.31	-62.95	-13.00	-49.95
5257.8	H	-	-	-81.58	8.50	33.92	-61.34	-13.00	-48.34
7010.4	H	-	-	-82.20	11.44	36.24	-59.02	-13.00	-46.02

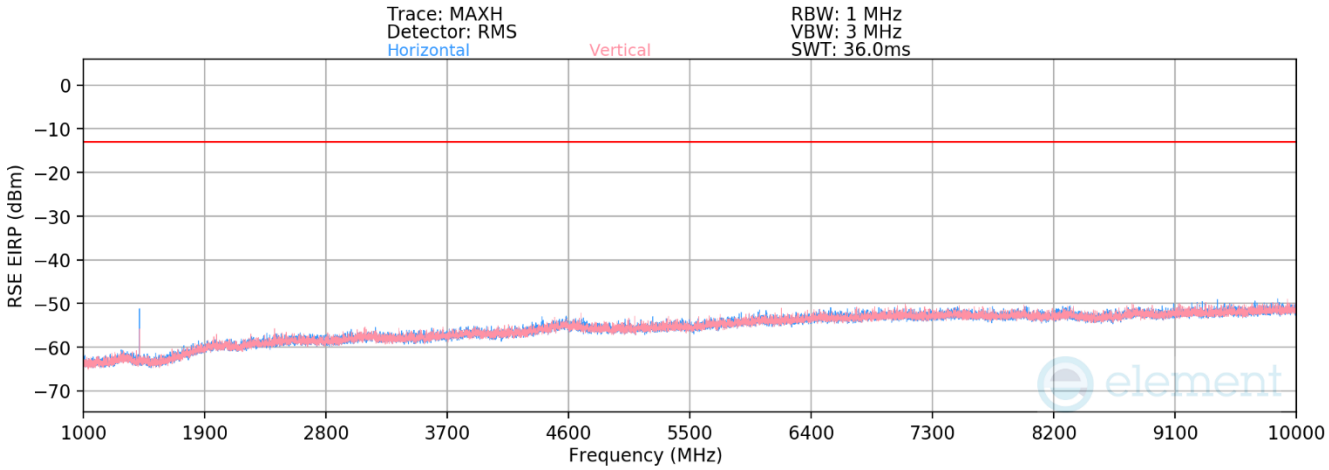
Table 7-13. Antenna FCM Radiated Spurious Data (WCDMA AWS – High Channel)

7.7.2 Antenna BCM – Radiated Spurious Emission Measurement

LTE Band 12/17



Plot 7-166. Antenna BCM Radiated Spurious Emission below 1GHz (LTE Band 12/17)



Plot 7-167. Antenna BCM Radiated Spurious Emission above 1GHz (LTE Band 12/17)

Bandwidth (MHz):	10
Frequency (MHz):	704.0
RB / Offset:	1 / 25

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1408.0	H	255	295	-72.93	-2.94	31.14	-64.12	-13.00	-51.12
2112.0	H	-	-	-77.51	0.86	30.35	-64.90	-13.00	-51.90
2816.0	H	-	-	-77.83	2.42	31.59	-63.67	-13.00	-50.67
3520.0	H	-	-	-78.27	3.96	32.69	-62.57	-13.00	-49.57

Table 7-14. Antenna BCM Radiated Spurious Data (LTE Band 12/17 – Low Channel)

Bandwidth (MHz):	10
Frequency (MHz):	707.5
RB / Offset:	1 / 25

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1415.0	H	253	283	-69.72	-2.90	34.38	-60.88	-13.00	-47.88
2122.5	H	-	-	-77.47	0.70	30.23	-65.02	-13.00	-52.02
2830.0	H	-	-	-77.88	2.42	31.54	-63.72	-13.00	-50.72
3537.5	H	-	-	-78.55	3.96	32.41	-62.85	-13.00	-49.85

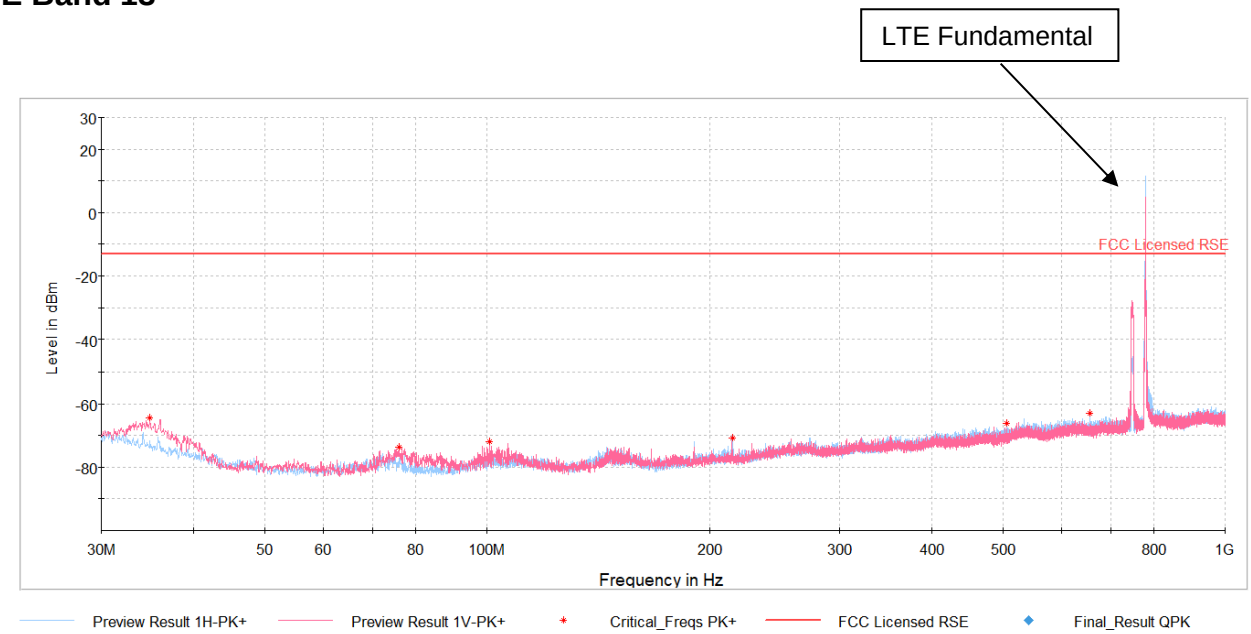
Table 7-15. Antenna BCM Radiated Spurious Data (LTE Band 12/17 – Mid Channel)

Bandwidth (MHz):	10
Frequency (MHz):	711.0
RB / Offset:	1 / 25

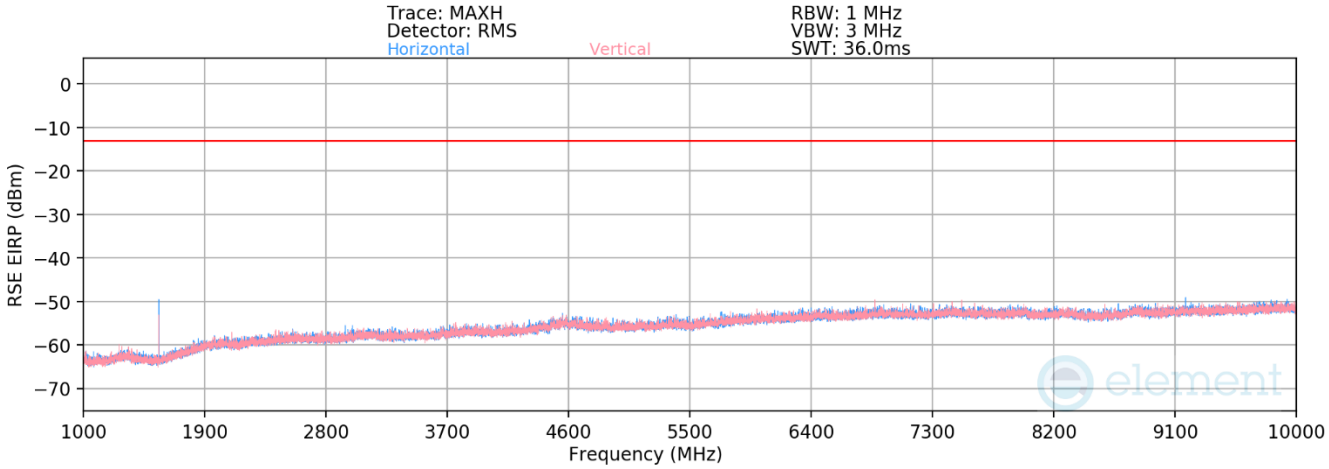
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1422.0	H	252	278	-69.98	-2.90	34.11	-61.14	-13.00	-48.14
2133.0	H	-	-	-77.62	0.86	30.24	-65.01	-13.00	-52.01
2844.0	H	-	-	-77.84	2.32	31.47	-63.78	-13.00	-50.78
3555.0	H	-	-	-78.43	3.72	32.29	-62.97	-13.00	-49.97

Table 7-16. Antenna BCM Radiated Spurious Data (LTE Band 12/17 – High Channel)

LTE Band 13



Plot 7-168. Antenna BCM Radiated Spurious Emission below 1GHz (LTE Band 13)



Plot 7-169. Antenna BCM Radiated Spurious Emission above 1GHz (LTE Band 13)

Bandwidth (MHz):	5
Frequency (MHz):	779.5
RB / Offset:	1 / 12

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1559.0	H	249	290	-70.82	-3.20	32.98	-62.28	-40.00	-22.28
2338.5	H	-	-	-77.47	1.33	30.85	-64.40	-13.00	-51.40
3118.0	H	-	-	-78.13	3.60	32.47	-62.78	-13.00	-49.78
3897.5	H	-	-	-78.55	4.97	33.42	-61.84	-13.00	-48.84

Table 7-17. Antenna BCM Radiated Spurious Data (LTE Band 13 – Low Channel)

Bandwidth (MHz):	5
Frequency (MHz):	782.0
RB / Offset:	1 / 12

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1564.0	H	-	-	-77.14	-3.26	26.60	-68.66	-40.00	-28.66
2346.0	H	-	-	-77.45	1.36	30.91	-64.35	-13.00	-51.35
3128.0	H	-	-	-78.14	3.53	32.39	-62.87	-13.00	-49.87

Table 7-18. Antenna BCM Radiated Spurious Data (LTE Band 13 – Mid Channel)

Bandwidth (MHz):	5
Frequency (MHz):	784.5
RB / Offset:	1 / 12

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1569.0	H	-	-	-76.94	-3.26	26.80	-68.46	-40.00	-28.46
2353.5	H	-	-	-77.33	1.38	31.05	-64.20	-13.00	-51.20
3138.0	H	-	-	-78.54	3.94	32.40	-62.85	-13.00	-49.85

Table 7-19. Antenna BCM Radiated Spurious Data (LTE Band 13 – High Channel)

7.8 Frequency Stability / Temperature Variation

§2.1053, §27.53

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015 and TIA-603-E-2016. The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

For Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI C63.26-2015

TIA-603-E-2016

Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Test Setup

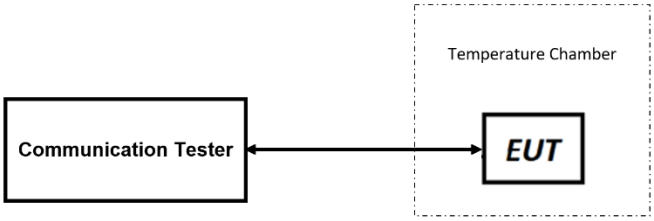


Figure 7-8. Test Instrument & Measurement Setup

Test Notes

None

Frequency Stability / Temperature Variation

LTE Band 66/4

Operating Band Lower Boundary (GHz)	1.710
Ref. Voltage (VDC):	3.80

Voltage (%)	Power (VDC)	Temp (°C)	Measured Freq. (GHz)	Freq. Delta from Operating Range (GHz)
100 %	3.80	- 30	1.7106018	-0.0006018
		- 20	1.7105990	-0.0005990
		- 10	1.7106480	-0.0006480
		0	1.7106440	-0.0006440
		+ 10	1.7106137	-0.0006137
		+ 20 (Ref)	1.7106387	-0.0006387
		+ 30	1.7106439	-0.0006439
		+ 40	1.7106445	-0.0006445
		+ 50	1.7106625	-0.0006625
Battery Endpoint	3.40	+ 20	1.7107756	-0.0007756

Table 7-20. LTE Band 66/4 Lower Boundary Frequency Stability Data

LTE Band 66/4

Operating Band Upper Boundary (GHz)	1.780
Ref. Voltage (VDC):	3.80

Voltage (%)	Power (VDC)	Temp (°C)	Measured Freq. (GHz)	Freq. Delta from Operating Range (GHz)
100 %	3.80	- 30	1.7793683	-0.0006317
		- 20	1.7794245	-0.0005755
		- 10	1.7794017	-0.0005983
		0	1.7794418	-0.0005582
		+ 10	1.7794461	-0.0005539
		+ 20 (Ref)	1.7794265	-0.0005735
		+ 30	1.7794396	-0.0005604
		+ 40	1.7794507	-0.0005493
		+ 50	1.7794439	-0.0005561
Battery Endpoint	3.40	+ 20	1.7794302	-0.0005698

Table 7-21. LTE Band 66/4 Upper Boundary Frequency Stability Data

Frequency Stability / Temperature Variation

LTE Band 12/17	
Operating Band Lower Boundary (GHz)	0.699
Ref. Voltage (VDC):	3.80

Voltage (%)	Power (VDC)	Temp (°C)	Measured Freq. (GHz)	Freq. Delta from Operating Range (GHz)
100 %	3.80	- 30	0.6995142	-0.0005142
		- 20	0.6995094	-0.0005094
		- 10	0.6995169	-0.0005169
		0	0.6995162	-0.0005162
		+ 10	0.6995109	-0.0005109
		+ 20 (Ref)	0.6995081	-0.0005081
		+ 30	0.6995109	-0.0005109
		+ 40	0.6995159	-0.0005159
		+ 50	0.6995418	-0.0005418
Battery Endpoint	3.40	+ 20	0.6995160	-0.0005160

Table 7-22. LTE Band 12/17 Lower Boundary Frequency Stability Data

LTE Band 12/17	
Operating Band Upper Boundary (GHz)	0.716
Ref. Voltage (VDC):	3.80

Voltage (%)	Power (VDC)	Temp (°C)	Measured Freq. (GHz)	Freq. Delta from Operating Range (GHz)
100 %	3.80	- 30	0.7154807	-0.0005193
		- 20	0.7154838	-0.0005162
		- 10	0.7154762	-0.0005238
		0	0.7154783	-0.0005217
		+ 10	0.7154781	-0.0005219
		+ 20 (Ref)	0.7154870	-0.0005130
		+ 30	0.7154800	-0.0005200
		+ 40	0.7154771	-0.0005229
		+ 50	0.7154904	-0.0005096
Battery Endpoint	3.40	+ 20	0.7154734	-0.0005266

Table 7-23. LTE Band 12/17 Upper Boundary Frequency Stability Data

Frequency Stability / Temperature Variation

LTE Band 13				
	Operating Band Lower Boundary (GHz)		0.777	
	Ref. Voltage (VDC):		3.80	
Voltage (%)	**Power (VDC)**	**Temp (°C)**	**Measured Freq. (GHz)**	**Freq. Delta from Operating Range (GHz)**
100 %	3.80	- 30	0.7775232	-0.0005232
		- 20	0.7775298	-0.0005298
		- 10	0.7775300	-0.0005300
		0	0.7775301	-0.0005301
		+ 10	0.7775325	-0.0005325
		+ 20 (Ref)	0.7775349	-0.0005349
		+ 30	0.7775299	-0.0005299
		+ 40	0.7775342	-0.0005342
		+ 50	0.7774938	-0.0004938
Battery Endpoint	3.40	+ 20	0.7775352	-0.0005352

Table 7-24. LTE Band 13 Lower Boundary Frequency Stability Data

LTE Band 13				
	Operating Band Upper Boundary (GHz)		0.787	
	Ref. Voltage (VDC):		3.80	
Voltage (%)	**Power (VDC)**	**Temp (°C)**	**Measured Freq. (GHz)**	**Freq. Delta from Operating Range (GHz)**
100 %	3.80	- 30	0.7864869	-0.0005131
		- 20	0.7864860	-0.0005140
		- 10	0.7864853	-0.0005147
		0	0.7864844	-0.0005156
		+ 10	0.7864839	-0.0005161
		+ 20 (Ref)	0.7864889	-0.0005111
		+ 30	0.7864918	-0.0005082
		+ 40	0.7864961	-0.0005039
		+ 50	0.7866673	-0.0003327
Battery Endpoint	3.40	+ 20	0.7864857	-0.0005143

Table 7-25. LTE Band 13 Upper Boundary Frequency Stability Data

Frequency Stability / Temperature Variation

WCDMA AWS

Operating Band Lower Boundary (GHz)	1.710
Ref. Voltage (VDC):	3.80

Voltage (%)	Power (VDC)	Temp (°C)	Measured Freq. (GHz)	Freq. Delta from Operating Range (GHz)
100 %	3.80	- 30	1.7103501	-0.0003501
		- 20	1.7103510	-0.0003510
		- 10	1.7103591	-0.0003591
		0	1.7103458	-0.0003458
		+ 10	1.7103531	-0.0003531
		+ 20 (Ref)	1.7103393	-0.0003393
		+ 30	1.7103446	-0.0003446
		+ 40	1.7103453	-0.0003453
		+ 50	1.7103494	-0.0003494
Battery Endpoint	3.40	+ 20	1.7103343	-0.0003343

Table 7-26. WCDMA AWS Lower Boundary Frequency Stability Data

WCDMA AWS

Operating Band Upper Boundary (GHz)	1.755
Ref. Voltage (VDC):	3.80

Voltage (%)	Power (VDC)	Temp (°C)	Measured Freq. (GHz)	Freq. Delta from Operating Range (GHz)
100 %	3.80	- 30	1.7546645	-0.0003355
		- 20	1.7546636	-0.0003364
		- 10	1.7546687	-0.0003313
		0	1.7546548	-0.0003452
		+ 10	1.7546555	-0.0003445
		+ 20 (Ref)	1.7546479	-0.0003521
		+ 30	1.7545494	-0.0004506
		+ 40	1.7546624	-0.0003376
		+ 50	1.7546611	-0.0003389
Battery Endpoint	3.40	+ 20	1.7546679	-0.0003321

Table 7-27. WCDMA AWS Upper Boundary Frequency Stability Data

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Apple Watch FCC ID: BCG-A3003** complies with all the requirements of Part 27 of the FCC rules.