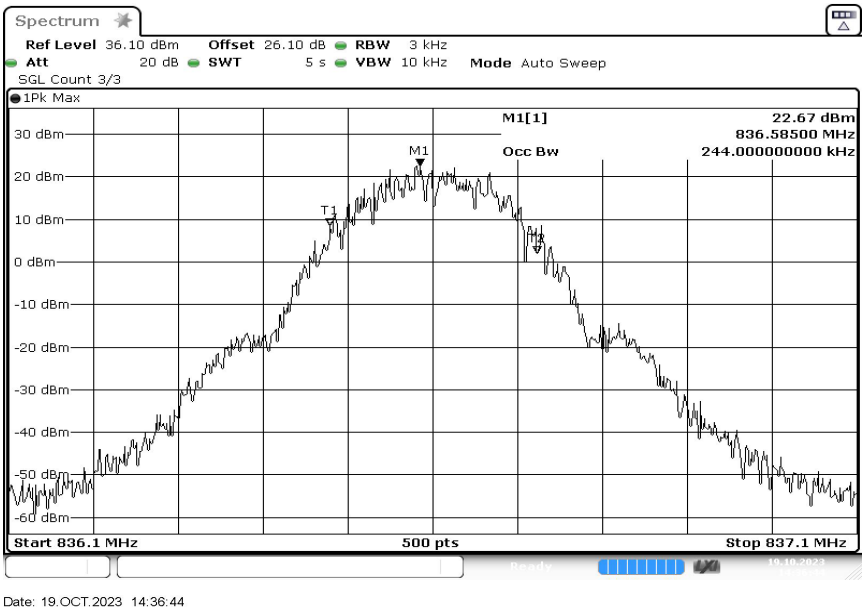
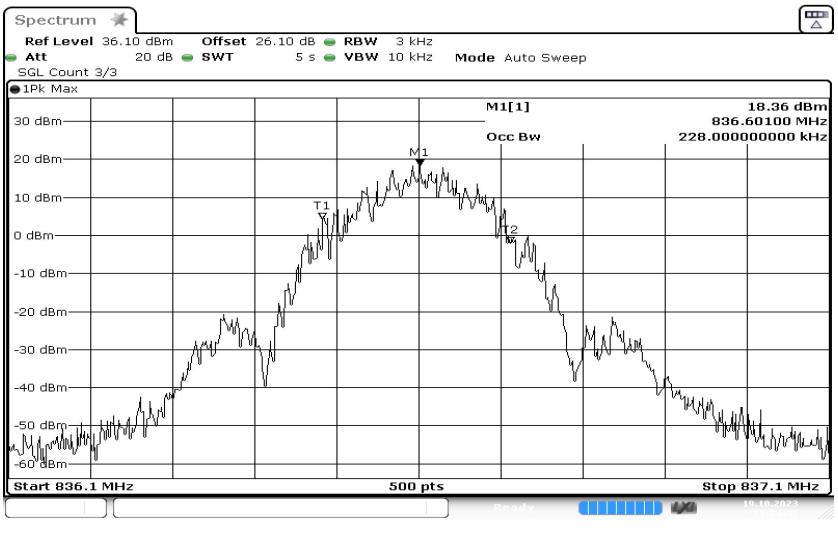
5.5.4 MEASUREMENT PLOT (EXAMPLE PLOT, SHOWING WORST CASE, IF APPLICABLE)

Technology = GSM, Radio Technology = GSM 850, Operating Frequency = mid channel (S01_AE01)



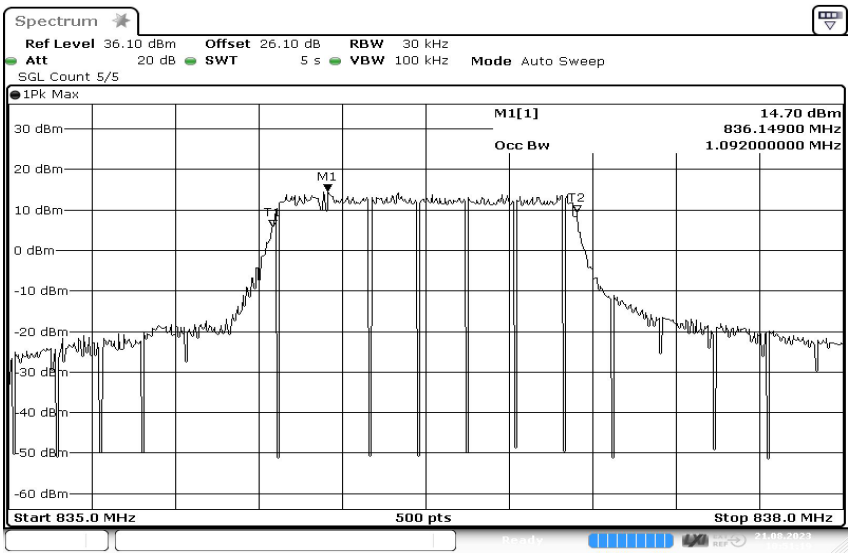
Date: 19.OCT.2023 14:36:44

Technology = GSM, Radio Technology = GSM 850 EDGE, Operating Frequency = mid channel (S01_AE01)



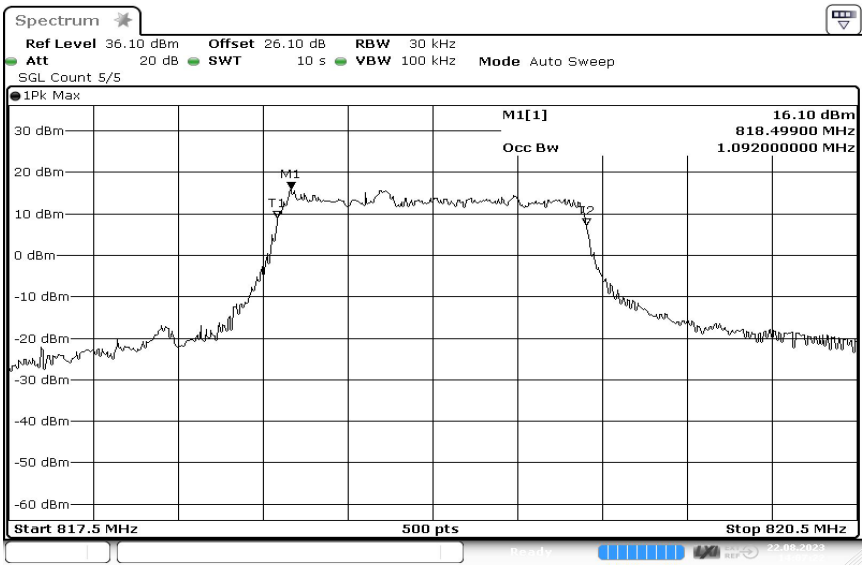
Date: 19.OCT.2023 15:24:42

Technology = CAT-M1, Radio Technology = eFDD 5, Operating Frequency = mid channel (S01_AB01)



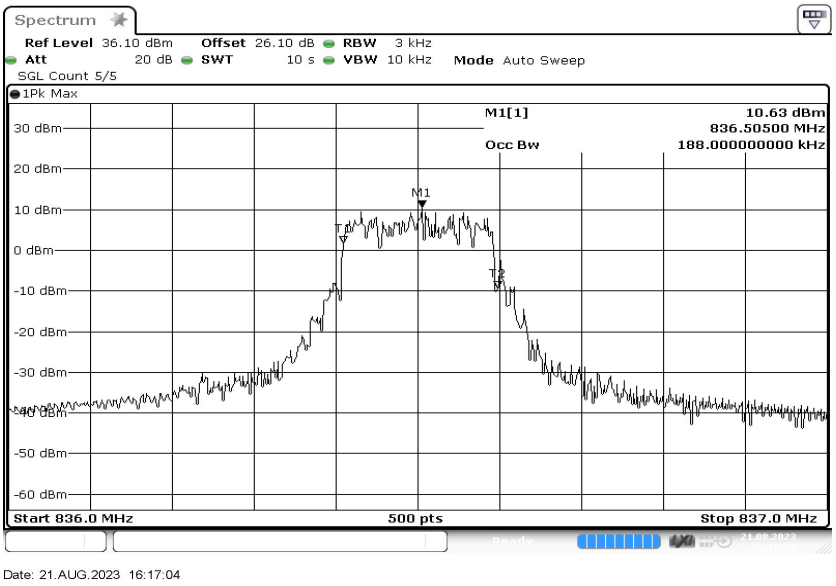
Date: 21.AUG.2023 10:51:20

Technology = CAT-M1, Radio Technology = eFDD 26, Operating Frequency = mid channel (S01_AB01)



Date: 22.AUG.2023 14:07:23

Technology = NB-IoT, Radio Technology = eFDD 5, Operating Frequency = mid channel (S01_AB01)



5.5.5 TEST EQUIPMENT USED

- Radio Lab

5.6 BAND EDGE COMPLIANCE

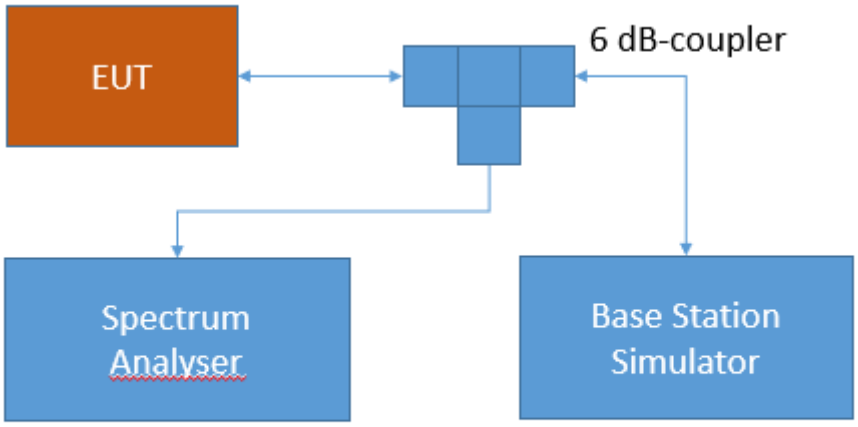
Standard **FCC PART 22 Subpart H**

The test was performed according to:
ANSI C63.26: 2015; 5.7.3

5.6.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to the applicable conducted spurious emission test case per § 2. 1051 and RSS-GEN 6.13. The limit comes from the applicable rule part and ISED RSS-Standard for the operating band of the cellular device.

The EUT was connected to the test setup according to the following diagram:



Test Setup FCC Part 22/24/27/90 Cellular;
Band edge compliance

The attenuation of the measuring and stimulus path are known for each measured frequency and are considered.

The Spectrum Analyzer settings can be directly found in the measurement diagrams.

5.6.2 TEST REQUIREMENTS / LIMITS

FCC Part 2.1051; Measurement required: Spurious emissions at antenna terminal:

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated

under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

Part 22, Subpart H – Cellular Radiotelephone Service

§22 917 – Emission limitations for cellular equipment

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

RSS-132; 5.5 Transmitter Unwanted Emissions

Mobile and base station equipment shall comply with the limits in (i) and (ii) below.

1. In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 $\log_{10}$p (watts).
2. After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 $\log_{10}$ p (watts). If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

5.6.3 TEST PROTOCOL

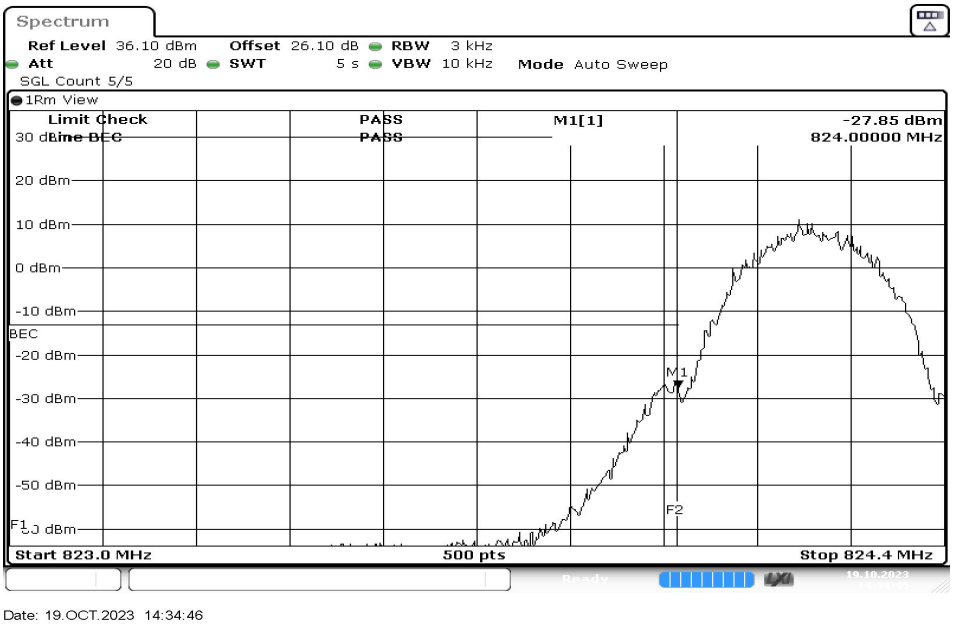
Ambient temperature: 20 - 28 °C
Relative humidity: 30 - 40 %

Radio Technology	Channel	Resource Blocks / Subcarrier	Band-width [MHz]	Peak [dBm]	Average [dBm]	RMS [dBm]	Limit [dBm]	Margin to Limit [dB]
GSM 850	low	-	0.2	-18.3	-37.8	-27.9	-13	14.9
GSM 850	high	-	0.2	-19.3	-37.5	-29.8	-13	16.8
GSM 850 EDGE	low	-	0.2	-30.5	-46.0	-39.5	-13	26.5
GSM 850 EDGE	high	-	0.2	-29.7	-50.1	-40.7	-13	27.7
CAT-M1 eFDD 5 QPSK	low	6	1.4	-20.0	-44.0	-43.8	-13	30.8
CAT-M1 eFDD 5 QPSK	high	6	1.4	-15.9	-45.5	-35.9	-13	22.9
CAT-M1 eFDD 5 16QAM	low	5	1.4	-15.9	-42.5	-33.8	-13	20.8
CAT-M1 eFDD 5 16QAM	high	5	1.4	-16.6	-46.1	-38.0	-13	25.0
CAT-M1 eFDD 26 QPSK	low	6	1.4	-18.3	-43.4	-34.7	-13	21.7
CAT-M1 eFDD 26 QPSK	high	6	1.4	-17.2	-44.9	-35.9	-13	22.9
CAT-M1 eFDD 26 16QAM	low	5	1.4	-14.8	-44.7	-36.1	-13	23.1
CAT-M1 eFDD 26 16QAM	high	5	1.4	-19.6	-49.8	-40.2	-13	27.2
NB-IoT eFDD 5 QPSK	low	12	0.2	-64.0	-70.9	-70.2	-13	57.2
NB-IoT eFDD 5 QPSK	high	12	0.2	-8.1	-28.9	-18.3	-13	5.3
NB-IoT eFDD 5 BPSK	low	1	0.2	-8.9	-15.6	-15.7	-13	2.7
NB-IoT eFDD 5 BPSK	high	1	0.2	-10.5	-16.7	-16.3	-13	3.3

Remark: Please see next sub-clause for the measurement plot.

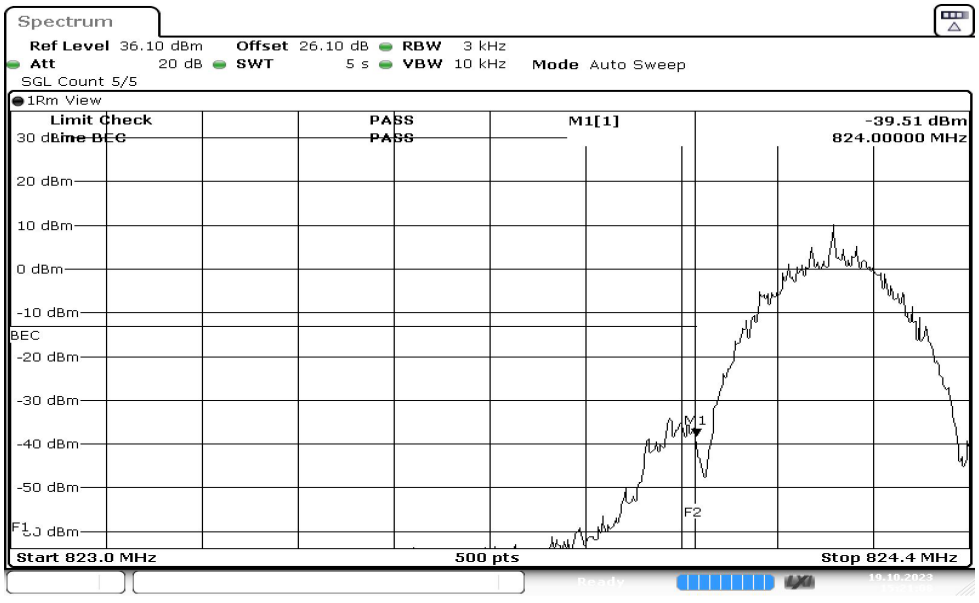
5.6.4 MEASUREMENT PLOT (EXAMPLE PLOT, SHOWING WORST CASE, IF APPLICABLE)

Technology = GSM, Radio Technology = GSM 850, Operating Frequency = low channel (S01_AE01)



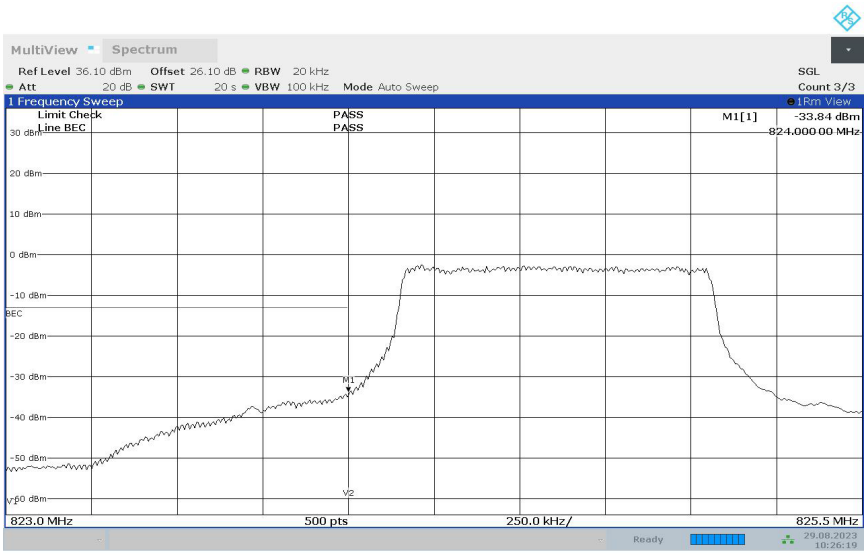
Date: 19.OCT.2023 14:34:46

Technology = GSM, Radio Technology = GSM 850 EDGE, Operating Frequency = low channel (S01_AE01)



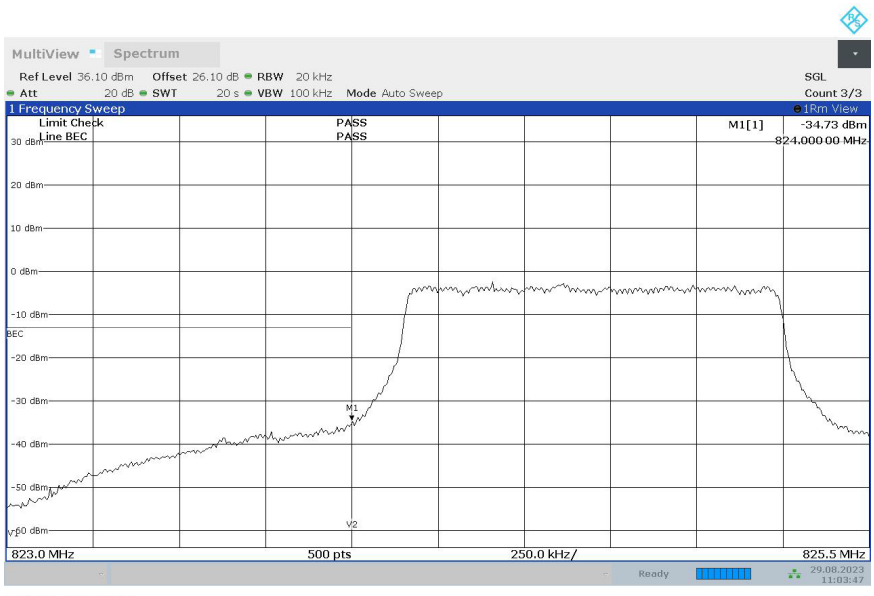
Date: 19.OCT.2023 15:21:08

Technology = CAT-M1, Radio Technology = eFDD 5, Operating Frequency = low channel (S01_AB01)



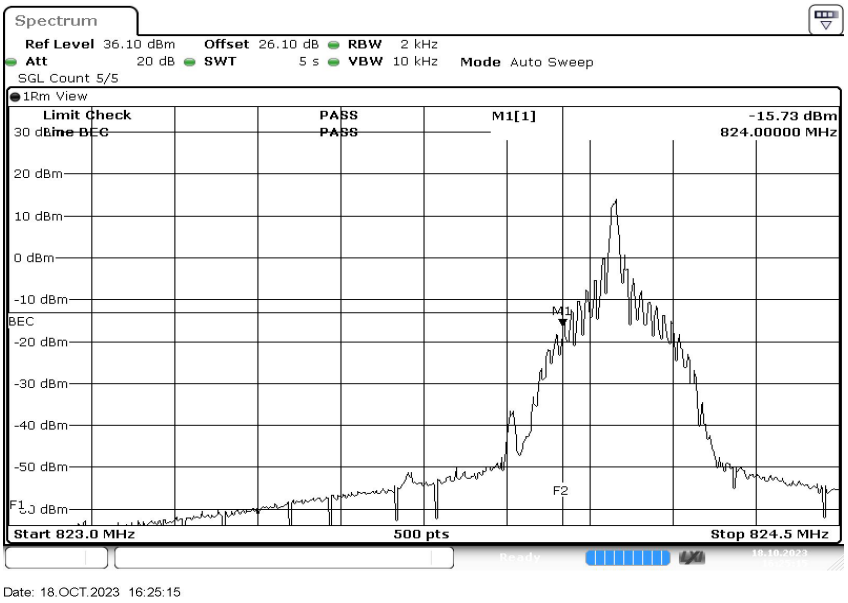
10:26:20 29.08.2023

Technology = CAT-M1, Radio Technology = eFDD 26, Operating Frequency = low channel (S01_AB01)



11:03:47 29.08.2023

Technology = NB-IoT, Radio Technology = eFDD 5 BPSK, Operating Frequency = low channel (S01_AE01)



5.6.5 TEST EQUIPMENT USED

- Radio Lab

5.7 PEAK TO AVERAGE RATIO

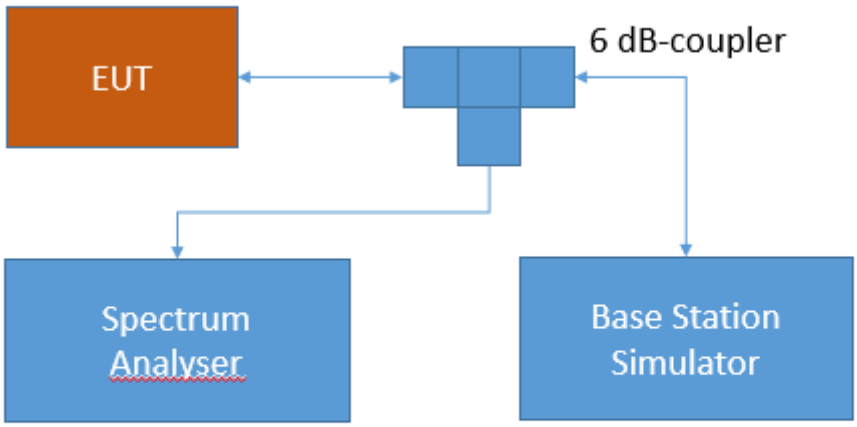
Standard **FCC PART 22 Subpart H**

The test was performed according to:
ANSI C63.26: 2015; 5.2.3.4 (broadband noise-like signal using CCDF [LTE, CAT-M1, NB-IoT])
5.2.6 (alternative procedure for PAPR [GSM, EDGE, WCDMA, HSDPA, HSUPA])

5.7.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance of the EUT to the peak-to-average limits and requirements of the applicable rule part and ISED RSS-Standard for the operating band of the cellular device.

The EUT was connected to the test setup according to the following diagram:



Test Setup FCC Part 22/24/27/90 Cellular;
Peak-average ratio

The attenuation of the measuring and stimulus path are known for each measured frequency and are considered.

The Spectrum Analyzer settings can be directly found in the measurement diagrams. The internal CCDF (complementary cumulative distribution function) of the spectrum analyser is used for this measurement

5.7.2 TEST REQUIREMENTS / LIMITS

FCC Part 22, § 22.913

There exists no applicable limit

RSS-132; 5.4 Transmitter Output Power and Equivalent Isotropically Radiated Power

In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

5.7.3 TEST PROTOCOL

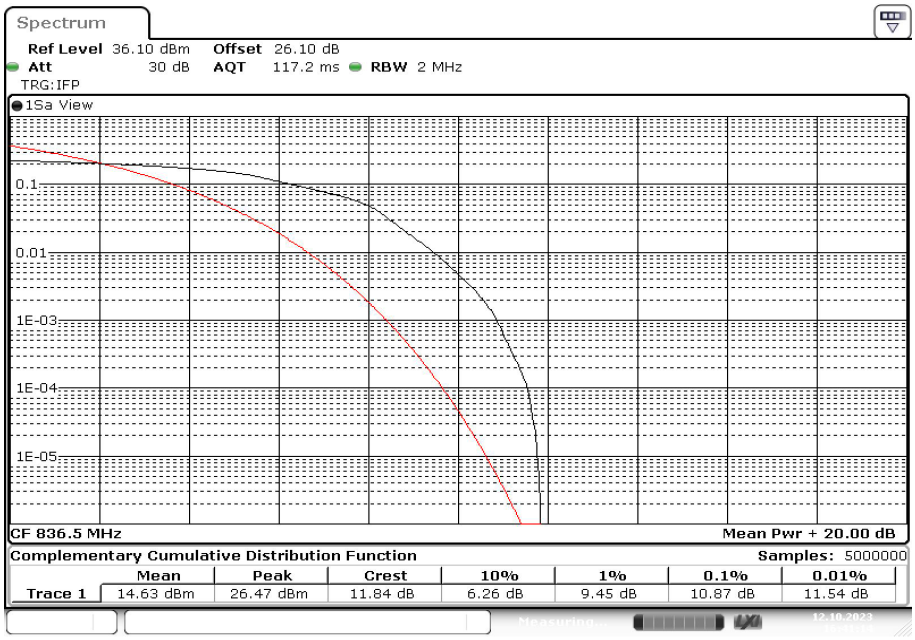
Ambient temperature: 20 - 28 °C
Relative humidity: 30 - 40 %

Radio Technology	Channel	Ressource Blocks / Subcarrier	Bandwidth [MHz]	Peak to Average Ratio [dB]	Limit (IC) [dB]
GSM 850	low	-	0.2	0.7	13
GSM 850	mid	-	0.2	0.6	13
GSM 850	high	-	0.2	0.6	13
GSM 850 EDGE	low	-	0.2	2.9	13
GSM 850 EDGE	mid	-	0.2	3.1	13
GSM 850 EDGE	high	-	0.2	3.0	13
CAT-M1 eFDD 5 QPSK	low	6	1.4	10.1	13
CAT-M1 eFDD 5 QPSK	mid	6	1.4	10.1	13
CAT-M1 eFDD 5 QPSK	high	6	1.4	10.1	13
CAT-M1 eFDD 5 16QAM	low	5	1.4	10.8	13
CAT-M1 eFDD 5 16QAM	mid	5	1.4	10.9	13
CAT-M1 eFDD 5 16QAM	high	5	1.4	10.9	13
CAT-M1 eFDD 26 QPSK	low	6	1.4	10.1	13
CAT-M1 eFDD 26 QPSK	mid	6	1.4	10.1	13
CAT-M1 eFDD 26 QPSK	high	6	1.4	10.0	13
CAT-M1 eFDD 26 16QAM	low	5	1.4	10.9	13
CAT-M1 eFDD 26 16QAM	mid	5	1.4	10.9	13
CAT-M1 eFDD 26 16QAM	high	5	1.4	10.9	13
NB-IoT eFDD 5 QPSK	low	12	0.2	7.8	13
NB-IoT eFDD 5 QPSK	mid	12	0.2	7.9	13
NB-IoT eFDD 5 QPSK	high	12	0.2	8.2	13
NB-IoT eFDD 5 BPSK	low	1	0.2	8.4	13
NB-IoT eFDD 5 BPSK	mid	1	0.2	8.0	13
NB-IoT eFDD 5 BPSK	high	1	0.2	8.0	13

Remark: Please see next sub-clause for the measurement plot.

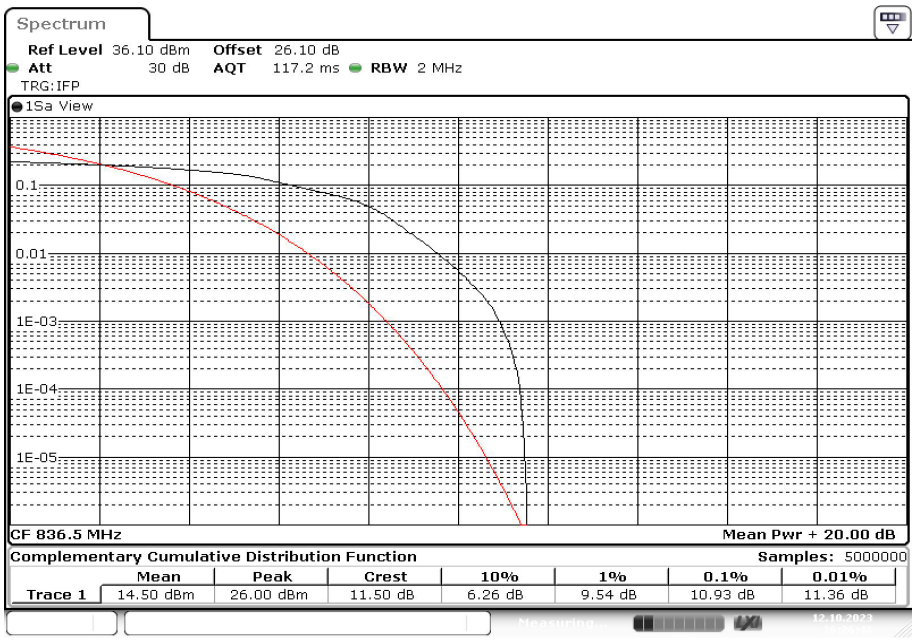
5.7.4 MEASUREMENT PLOT (EXAMPLE PLOT, SHOWING WORST CASE, IF APPLICABLE)

Technology = CAT-M1, Radio Technology = eFDD 26, Operating Frequency = low channel (S01_AE01)



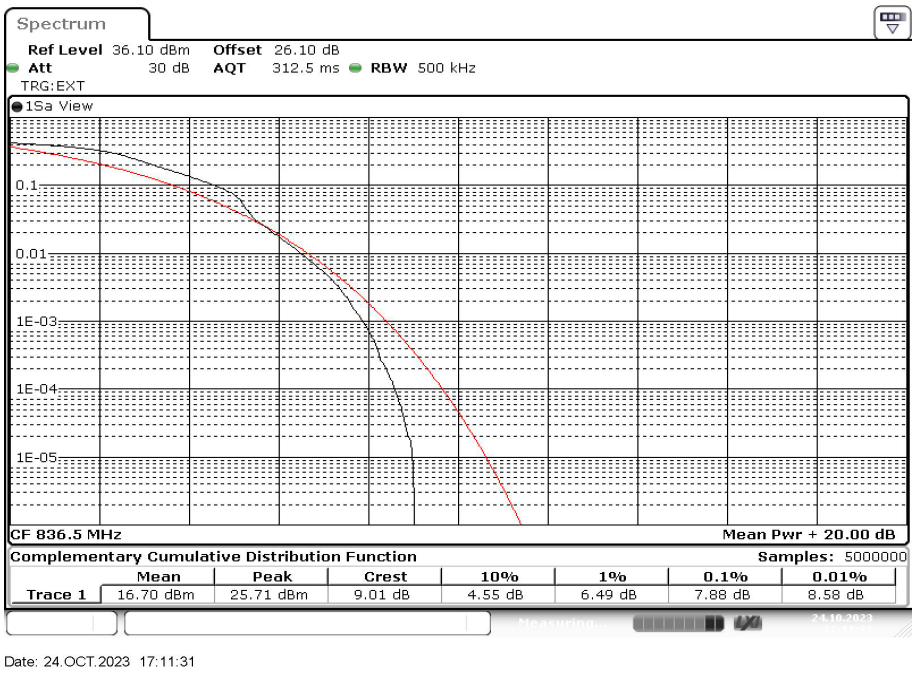
Date: 12.OCT.2023 16:41:14

Technology = CAT-M1, Radio Technology = eFDD 5, Operating Frequency = mid channel (S01_AE01)



Date: 12.OCT.2023 16:26:49

echnology = NB-IoT, Radio Technology = eFDD 5, Operating Frequency = low channel (S01_AE01)



5.7.5 TEST EQUIPMENT USED

- Radio Lab

5.8 RF OUTPUT POWER

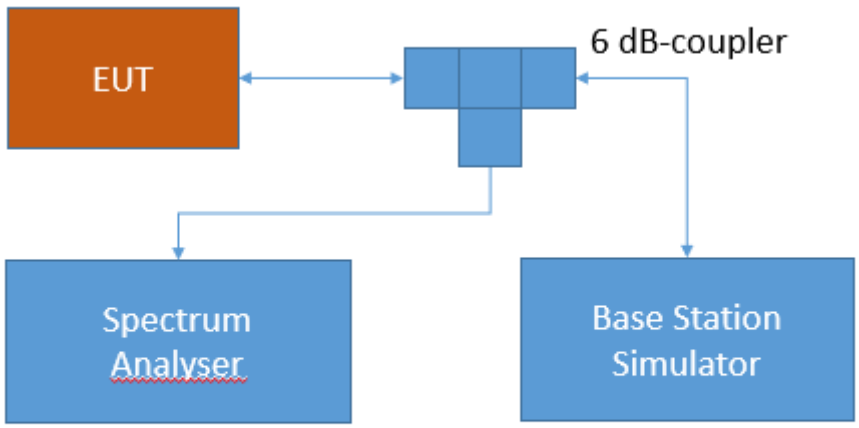
Standard **FCC PART 24 Subpart E**

The test was performed according to:
ANSI C63.26: 2015; 5.2.4.1 Narrowband Signal: 5.2.4.3.3

5.8.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to the applicable RF Output power test case per § 2.1046 and RSS-GEN 6.12. The limit and the requirements come from the applicable rule part and ISED RSS-Standard for the operating band of the cellular device.

The EUT was connected to the test setup according to the following diagram:



Test Setup FCC Part 22/24/27/90 Cellular;
RF Output power

The attenuation of the measuring and stimulus path are known for each measured frequency and are considered.

The Spectrum Analyzer settings can be directly found in the measurement diagrams.

5.8.2 TEST REQUIREMENTS / LIMITS

FCC Part 24, § 24.232

(c) Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

RSS-133; 6.4 Transmitter Output Power and Equivalent Isotropically Radiated Power

The equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510.

SRSP-510; 5.1.2 Radiated Power and Antenna Height Limits – Mobile Stations

Mobile stations and hand-held portables are limited to 2 watts maximum e.i.r.p. The equipment shall employ means to limit the power to the minimum necessary for successful communication.

5.8.3 TEST PROTOCOL

Ambient temperature: 20 - 28 °C
Relative humidity: 30 - 40 %

Radio Technology	Channel	Resource Blocks / Subcarrier	Band-width [MHz]	Peak Cond. Power [dBm]	Average Cond. Power [dBm]	RMS Cond. Power [dBm]	FCC EIRP Limit [W]	IC EIRP Limit [W]	Maximum Antenna Gain FCC [dBi]	Maximum Antenna Gain IC [dBi]
GSM 1900	low	-	0.2	28.59	27.73	27.84	2	2	4.41	4.41
GSM 1900	mid	-	0.2	28.52	27.78	27.82	2	2	4.48	4.48
GSM 1900	high	-	0.2	28.51	27.77	27.88	2	2	4.49	4.49
GSM 1900 EDGE	low	-	0.2	28.03	25.19	25.60	2	2	4.97	4.97
GSM 1900 EDGE	mid	-	0.2	28.09	25.18	25.54	2	2	4.91	4.91
GSM 1900 EDGE	high	-	0.2	28.07	25.10	25.66	2	2	4.93	4.93
CAT-M1 eFDD 2 QPSK	low	1	1.4	-	-	22.20	2	2	10.80	10.80
CAT-M1 eFDD 2 QPSK	low	3	1.4	-	-	21.29	2	2	11.71	11.71
CAT-M1 eFDD 2 QPSK	low	6	1.4	-	-	20.31	2	2	12.69	12.69
CAT-M1 eFDD 2 QPSK	mid	1	1.4	-	-	22.16	2	2	10.84	10.84
CAT-M1 eFDD 2 QPSK	mid	3	1.4	-	-	21.29	2	2	11.71	11.71
CAT-M1 eFDD 2 QPSK	mid	6	1.4	-	-	20.28	2	2	12.72	12.72
CAT-M1 eFDD 2 QPSK	high	1	1.4	-	-	22.23	2	2	10.77	10.77
CAT-M1 eFDD 2 QPSK	high	3	1.4	-	-	21.36	2	2	11.64	11.64
CAT-M1 eFDD 2 QPSK	high	6	1.4	-	-	20.33	2	2	12.67	12.67
CAT-M1 eFDD 2 16QAM	low	1	1.4	-	-	21.05	2	2	11.95	11.95
CAT-M1 eFDD 2 16QAM	low	5	1.4	-	-	20.40	2	2	12.60	12.60
CAT-M1 eFDD 2 16QAM	mid	1	1.4	-	-	21.01	2	2	11.99	11.99
CAT-M1 eFDD 2 16QAM	mid	5	1.4	-	-	20.16	2	2	12.84	12.84
CAT-M1 eFDD 2 16QAM	high	1	1.4	-	-	21.41	2	2	11.59	11.59
CAT-M1 eFDD 2 16QAM	high	5	1.4	-	-	20.29	2	2	12.71	12.71
CAT-M1 eFDD 2 QPSK	low	1	3	-	-	22.22	2	2	10.78	10.78
CAT-M1 eFDD 2 QPSK	low	3	3	-	-	21.28	2	2	11.72	11.72
CAT-M1 eFDD 2 QPSK	low	6	3	-	-	20.30	2	2	12.70	12.70
CAT-M1 eFDD 2 QPSK	mid	1	3	-	-	22.18	2	2	10.82	10.82
CAT-M1 eFDD 2 QPSK	mid	3	3	-	-	21.18	2	2	11.82	11.82
CAT-M1 eFDD 2 QPSK	mid	6	3	-	-	20.25	2	2	12.75	12.75
CAT-M1 eFDD 2 QPSK	high	1	3	-	-	22.24	2	2	10.76	10.76
CAT-M1 eFDD 2 QPSK	high	3	3	-	-	21.24	2	2	11.76	11.76
CAT-M1 eFDD 2 QPSK	high	6	3	-	-	20.24	2	2	12.76	12.76
CAT-M1 eFDD 2 16QAM	low	1	3	-	-	21.33	2	2	11.67	11.67
CAT-M1 eFDD 2 16QAM	low	5	3	-	-	20.18	2	2	12.82	12.82
CAT-M1 eFDD 2 16QAM	mid	1	3	-	-	21.16	2	2	11.84	11.84
CAT-M1 eFDD 2 16QAM	mid	5	3	-	-	20.20	2	2	12.80	12.80
CAT-M1 eFDD 2 16QAM	high	1	3	-	-	21.23	2	2	11.77	11.77
CAT-M1 eFDD 2 16QAM	high	5	3	-	-	20.21	2	2	12.79	12.79
CAT-M1 eFDD 2 QPSK	low	1	5	-	-	22.30	2	2	10.70	10.70
CAT-M1 eFDD 2 QPSK	low	3	5	-	-	21.24	2	2	11.76	11.76
CAT-M1 eFDD 2 QPSK	low	6	5	-	-	21.28	2	2	11.72	11.72
CAT-M1 eFDD 2 QPSK	mid	1	5	-	-	22.16	2	2	10.84	10.84
CAT-M1 eFDD 2 QPSK	mid	3	5	-	-	21.13	2	2	11.87	11.87
eFDD 2 QPSK	mid	6	5	-	-	21.20	2	2	11.80	11.80
eFDD 2 QPSK	high	1	5	-	-	22.21	2	2	10.79	10.79
eFDD 2 QPSK	high	3	5	-	-	21.22	2	2	11.78	11.78
eFDD 2 QPSK	high	6	5	-	-	21.17	2	2	11.83	11.83
eFDD 2 16QAM	low	1	5	-	-	22.30	2	2	10.70	10.70
eFDD 2 16QAM	low	5	5	-	-	20.24	2	2	12.76	12.76
eFDD 2 16QAM	mid	1	5	-	-	22.06	2	2	10.94	10.94
eFDD 2 16QAM	mid	5	5	-	-	20.13	2	2	12.87	12.87
eFDD 2 16QAM	high	1	5	-	-	22.28	2	2	10.72	10.72
eFDD 2 16QAM	high	5	5	-	-	20.20	2	2	12.80	12.80
eFDD 2 QPSK	low	1	10	-	-	22.32	2	2	10.68	10.68
eFDD 2 QPSK	low	3	10	-	-	22.19	2	2	10.81	10.81
eFDD 2 QPSK	low	6	10	-	-	21.25	2	2	11.75	11.75
eFDD 2 QPSK	mid	1	10	-	-	22.22	2	2	10.78	10.78
eFDD 2 QPSK	mid	3	10	-	-	22.12	2	2	10.88	10.88
eFDD 2 QPSK	mid	6	10	-	-	21.19	2	2	11.81	11.81
eFDD 2 QPSK	high	1	10	-	-	21.97	2	2	11.03	11.03
eFDD 2 QPSK	high	3	10	-	-	22.11	2	2	10.89	10.89
eFDD 2 QPSK	high	6	10	-	-	21.15	2	2	11.85	11.85
eFDD 2 16QAM	low	1	10	-	-	22.29	2	2	10.71	10.71
eFDD 2 16QAM	low	5	10	-	-	21.15	2	2	11.85	11.85
eFDD 2 16QAM	mid	1	10	-	-	22.07	2	2	10.93	10.93
eFDD 2 16QAM	mid	5	10	-	-	21.08	2	2	11.92	11.92
eFDD 2 16QAM	high	1	10	-	-	22.02	2	2	10.98	10.98
eFDD 2 16QAM	high	5	10	-	-	21.10	2	2	11.90	11.90
eFDD 25 QPSK	low	1	1.4	-	-	22.58	2	2	10.42	10.42
eFDD 25 QPSK	low	3	1.4	-	-	21.45	2	2	11.55	11.55
eFDD 25 QPSK	low	6	1.4	-	-	20.44	2	2	12.56	12.56
eFDD 25 QPSK	mid	1	1.4	-	-	22.63	2	2	10.37	10.37

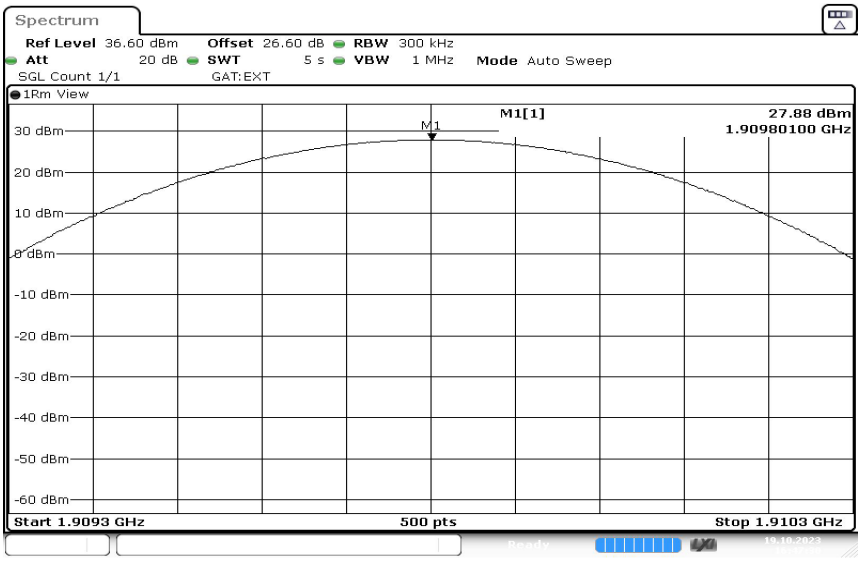
eFDD 25 QPSK	mid	3	1.4	-	-	21.56	2	2	11.44	11.44
eFDD 25 QPSK	mid	6	1.4	-	-	20.49	2	2	12.51	12.51
eFDD 25 QPSK	high	1	1.4	-	-	22.67	2	2	10.33	10.33
eFDD 25 QPSK	high	3	1.4	-	-	21.53	2	2	11.47	11.47
CAT-M1 eFDD 25 QPSK	high	6	1.4	-	-	20.43	2	2	12.57	12.57
CAT-M1 eFDD 25 16QAM	low	1	1.4	-	-	21.51	2	2	11.49	11.49
CAT-M1 eFDD 25 16QAM	low	5	1.4	-	-	20.42	2	2	12.58	12.58
CAT-M1 eFDD 25 16QAM	mid	1	1.4	-	-	21.36	2	2	11.64	11.64
CAT-M1 eFDD 25 16QAM	mid	5	1.4	-	-	20.43	2	2	12.57	12.57
CAT-M1 eFDD 25 16QAM	high	1	1.4	-	-	21.39	2	2	11.61	11.61
CAT-M1 eFDD 25 16QAM	high	5	1.4	-	-	20.46	2	2	12.54	12.54
CAT-M1 eFDD 25 QPSK	low	1	3	-	-	22.68	2	2	10.32	10.32
CAT-M1 eFDD 25 QPSK	low	3	3	-	-	21.51	2	2	11.49	11.49
CAT-M1 eFDD 25 QPSK	low	6	3	-	-	20.44	2	2	12.56	12.56
CAT-M1 eFDD 25 QPSK	mid	1	3	-	-	22.65	2	2	10.35	10.35
CAT-M1 eFDD 25 QPSK	mid	3	3	-	-	21.57	2	2	11.43	11.43
CAT-M1 eFDD 25 QPSK	mid	6	3	-	-	20.44	2	2	12.56	12.56
CAT-M1 eFDD 25 QPSK	high	1	3	-	-	22.61	2	2	10.39	10.39
CAT-M1 eFDD 25 QPSK	high	3	3	-	-	21.55	2	2	11.45	11.45
CAT-M1 eFDD 25 QPSK	high	6	3	-	-	20.44	2	2	12.56	12.56
CAT-M1 eFDD 25 16QAM	low	1	3	-	-	21.63	2	2	11.37	11.37
CAT-M1 eFDD 25 16QAM	low	5	3	-	-	20.50	2	2	12.50	12.50
CAT-M1 eFDD 25 16QAM	mid	1	3	-	-	21.52	2	2	11.48	11.48
CAT-M1 eFDD 25 16QAM	mid	5	3	-	-	20.48	2	2	12.52	12.52
CAT-M1 eFDD 25 16QAM	high	1	3	-	-	21.59	2	2	11.41	11.41
CAT-M1 eFDD 25 16QAM	high	5	3	-	-	20.41	2	2	12.59	12.59
CAT-M1 eFDD 25 QPSK	low	1	5	-	-	22.73	2	2	10.27	10.27
CAT-M1 eFDD 25 QPSK	low	3	5	-	-	21.71	2	2	11.29	11.29
CAT-M1 eFDD 25 QPSK	low	6	5	-	-	21.75	2	2	11.25	11.25
CAT-M1 eFDD 25 QPSK	mid	1	5	-	-	22.65	2	2	10.35	10.35
CAT-M1 eFDD 25 QPSK	mid	3	5	-	-	21.51	2	2	11.49	11.49
CAT-M1 eFDD 25 QPSK	mid	6	5	-	-	21.56	2	2	11.44	11.44
CAT-M1 eFDD 25 QPSK	high	1	5	-	-	22.86	2	2	10.14	10.14
CAT-M1 eFDD 25 QPSK	high	3	5	-	-	21.57	2	2	11.43	11.43
CAT-M1 eFDD 25 QPSK	high	6	5	-	-	21.53	2	2	11.47	11.47
CAT-M1 eFDD 25 16QAM	low	1	5	-	-	22.69	2	2	10.31	10.31
CAT-M1 eFDD 25 16QAM	low	5	5	-	-	21.53	2	2	11.47	11.47
CAT-M1 eFDD 25 16QAM	mid	1	5	-	-	22.48	2	2	10.52	10.52
CAT-M1 eFDD 25 16QAM	mid	5	5	-	-	21.53	2	2	11.47	11.47
CAT-M1 eFDD 25 16QAM	high	1	5	-	-	22.75	2	2	10.25	10.25
CAT-M1 eFDD 25 16QAM	high	5	5	-	-	21.54	2	2	11.46	11.46
CAT-M1 eFDD 25 QPSK	low	1	10	-	-	22.54	2	2	10.46	10.46
CAT-M1 eFDD 25 QPSK	low	3	10	-	-	22.56	2	2	10.44	10.44
CAT-M1 eFDD 25 QPSK	low	6	10	-	-	21.53	2	2	11.47	11.47
CAT-M1 eFDD 25 QPSK	mid	1	10	-	-	22.60	2	2	10.40	10.40
CAT-M1 eFDD 25 QPSK	mid	3	10	-	-	22.53	2	2	10.47	10.47
CAT-M1 eFDD 25 QPSK	mid	6	10	-	-	21.52	2	2	11.48	11.48
CAT-M1 eFDD 25 QPSK	high	1	10	-	-	22.41	2	2	10.59	10.59
CAT-M1 eFDD 25 QPSK	high	3	10	-	-	22.56	2	2	10.44	10.44
CAT-M1 eFDD 25 QPSK	high	6	10	-	-	21.49	2	2	11.51	11.51
CAT-M1 eFDD 25 16QAM	low	1	10	-	-	22.66	2	2	10.34	10.34
CAT-M1 eFDD 25 16QAM	low	5	10	-	-	21.52	2	2	11.48	11.48
CAT-M1 eFDD 25 16QAM	mid	1	10	-	-	22.46	2	2	10.54	10.54
CAT-M1 eFDD 25 16QAM	mid	5	10	-	-	21.50	2	2	11.50	11.50
CAT-M1 eFDD 25 16QAM	high	1	10	-	-	22.48	2	2	10.52	10.52
CAT-M1 eFDD 25 16QAM	high	5	10	-	-	21.50	2	2	11.50	11.50
NB-IoT eFDD 2 QPSK	low	1	0.2	-	-	21.22	2	2	11.78	11.78
NB-IoT eFDD 2 QPSK	low	3	0.2	-	-	21.06	2	2	11.94	11.94
NB-IoT eFDD 2 QPSK	low	6	0.2	-	-	21.05	2	2	11.95	11.95
NB-IoT eFDD 2 QPSK	low	12	0.2	-	-	22.10	2	2	10.90	10.90
NB-IoT eFDD 2 QPSK	mid	1	0.2	-	-	21.16	2	2	11.84	11.84
NB-IoT eFDD 2 QPSK	mid	3	0.2	-	-	21.07	2	2	11.93	11.93
NB-IoT eFDD 2 QPSK	mid	6	0.2	-	-	21.01	2	2	11.99	11.99
NB-IoT eFDD 2 QPSK	mid	12	0.2	-	-	22.15	2	2	10.85	10.85
NB-IoT eFDD 2 QPSK	high	1	0.2	-	-	21.19	2	2	11.81	11.81
NB-IoT eFDD 2 QPSK	high	3	0.2	-	-	21.00	2	2	12.00	12.00
NB-IoT eFDD 2 QPSK	high	6	0.2	-	-	21.02	2	2	11.98	11.98
NB-IoT eFDD 2 QPSK	high	12	0.2	-	-	22.11	2	2	10.89	10.89
NB-IoT eFDD 2 BPSK	low	1	0.2	-	-	22.29	2	2	10.71	10.71
NB-IoT eFDD 2 BPSK	mid	1	0.2	-	-	22.26	2	2	10.74	10.74
NB-IoT eFDD 2 BPSK	high	1	0.2	-	-	22.29	2	2	10.71	10.71

Remark:Please see next sub-clause for the measurement plot.

COMMENT: The max. antenna gain is regarding the output power not SAR / MPE.

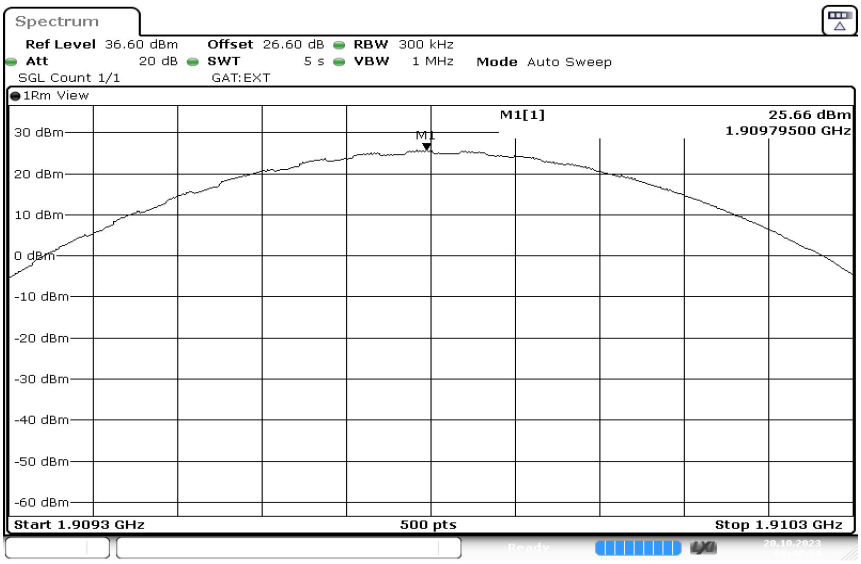
5.8.4 MEASUREMENT PLOT (EXAMPLE PLOT, SHOWING WORST CASE, IF APPLICABLE)

Technology = GSM, Radio Technology = GSM 1900, Operating Frequency = high channel (S01_AE01)



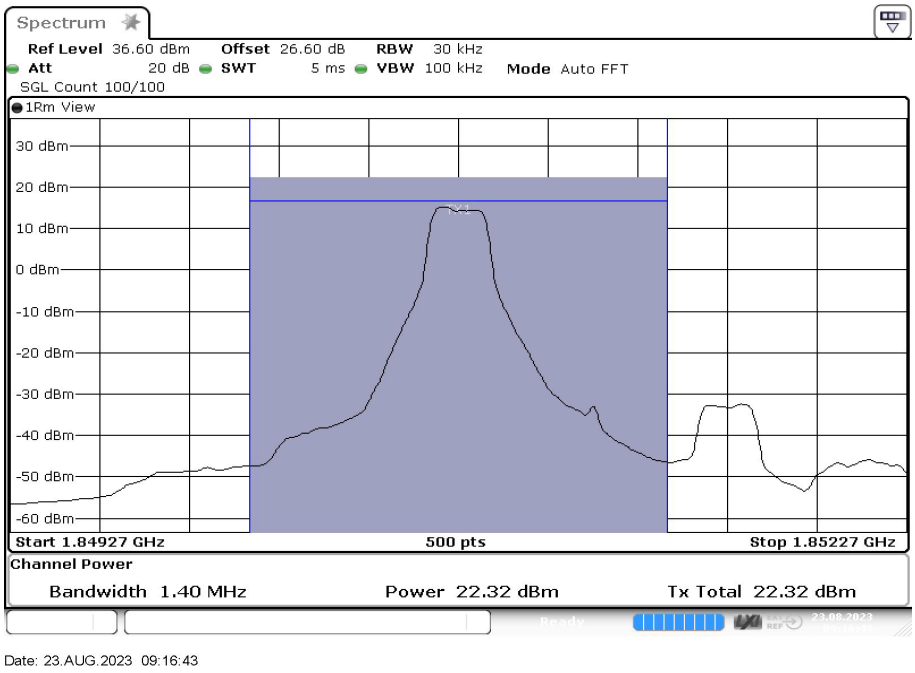
Date: 19.OCT.2023 16:47:30

Technology = GSM, Radio Technology = GSM 1900 EDGE, Operating Frequency = high channel (S01_AE01)



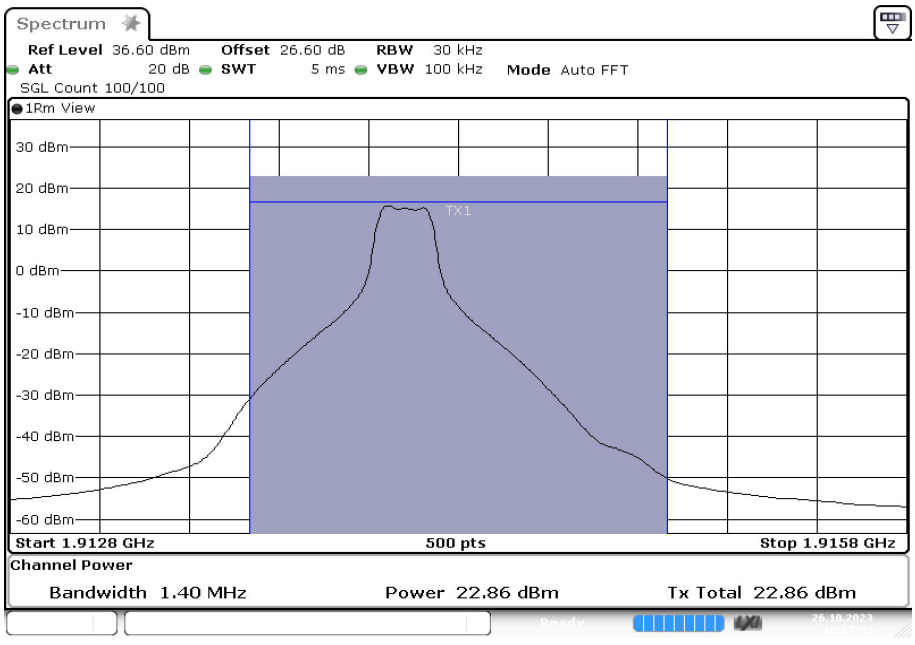
Date: 20.OCT.2023 08:40:35

Technology = CAT-M1, Radio Technology = eFDD 2 QPSK, Operating Frequency = low channel (S01_AB01)



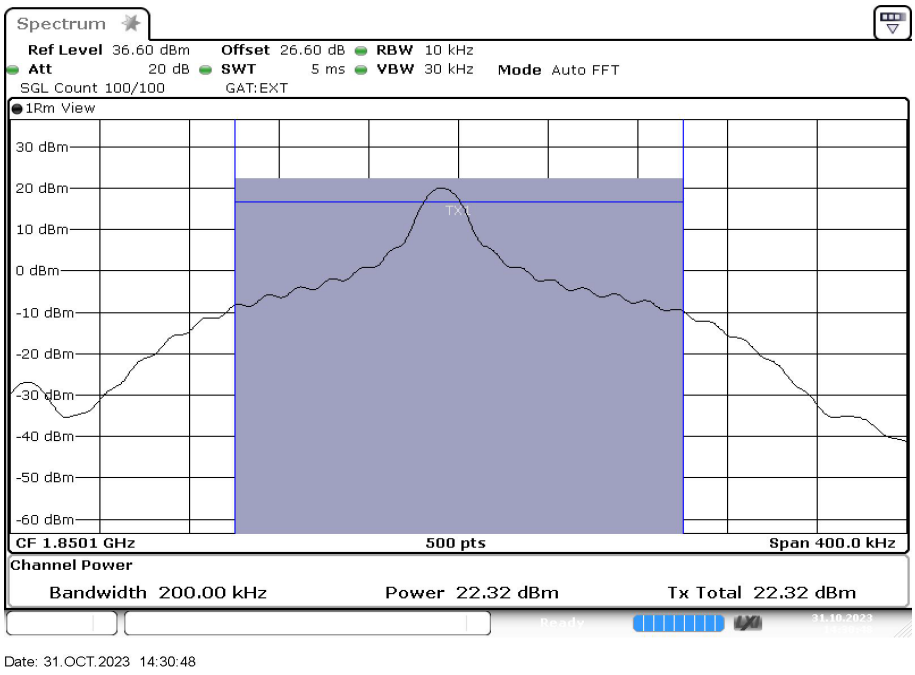
Date: 23.AUG.2023 09:16:43

Technology = CAT-M1, Radio Technology = eFDD 25 QPSK, Operating Frequency = high channel
(S01_AE01)



Date: 26.OCT.2023 16:25:43

Technology = NB-IoT, Radio Technology = eFDD 2, Operating Frequency = low channel (S01_AB01)



5.8.5 TEST EQUIPMENT USED

- Radio Lab

5.9 FREQUENCY STABILITY

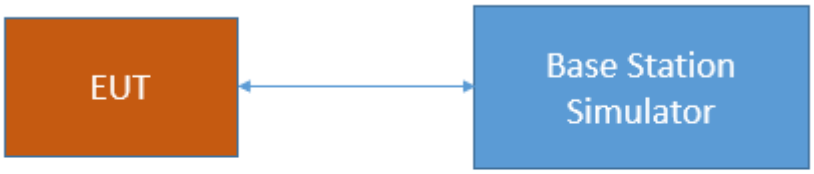
Standard **FCC PART 24 Subpart E**

The test was performed according to:
ANSI C63.26: 2015; 5.6

5.9.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to the applicable frequency stability test case per § 2.1055 and RSS-GEN 6.11. The limit and the requirements come from the applicable rule part and ISED RSS-Standard for the operating band of the cellular device.

The EUT was connected to the test setup according to the following diagram:



Test Setup FCC Part 22/24/27/90 Cellular; Frequency stability

The attenuation of the measuring / stimulus path is known for each measured frequency and are considered.

5.9.2 TEST REQUIREMENTS / LIMITS

FCC Part 24, § 24.235

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

RSS-133; 6.3 Frequency Stability

The carrier frequency shall not depart from the reference frequency, in excess of ±2.5 ppm for mobile stations.

In lieu of meeting the above stability values, the test report may show that the frequency stability is sufficient to ensure that the emission bandwidth stays within the operating frequency block when tested to the temperature and supply voltage variations specified in RSS-Gen.

5.9.3 TEST PROTOCOL

GSM 1900

Temp. °C	Duration min	Voltage	Limit Hz	Freq. error Average (Hz)	Freq. error Max. (Hz)	Verdict
-30	0	normal	2095.5	2	5	passed
-30	5			2	8	passed
-30	10			3	7	passed
-20	0	normal	2095.5	5	5	passed
-20	5			4	6	passed
-20	10			5	8	passed
-10	0	normal	2095.5	3	8	passed
-10	5			1	6	passed
-10	10			2	7	passed
0	0	normal	2095.5	1	8	passed
0	5			5	5	passed
0	10			6	7	passed
10	0	normal	2095.5	4	6	passed
10	5			2	4	passed
10	10			3	5	passed
20	0	low	2095.5	2	8	passed
20	5			4	8	passed
20	10			5	8	passed
20	0	high	2095.5	5	7	passed
20	5			5	8	passed
20	10			3	8	passed
20	0	high	2095.5	5	9	passed
20	5			2	6	passed
20	10			2	7	passed
30	0	normal	2095.5	3	7	passed
30	5			2	8	passed
30	10			2	6	passed
40	0	normal	2095.5	5	6	passed
40	5			2	8	passed
40	10			1	7	passed
50	0	normal	2095.5	4	5	passed
50	5			3	8	passed
50	10			3	6	passed

EDGE 1900

Temp. °C	Duration min	Voltage	Limit Hz	Freq. error Average (Hz)	Freq. error Max. (Hz)	Verdict
-30	0	normal	2095.5	4	9	passed
-30	5			6	11	passed
-30	10			3	8	passed
-20	0	normal	2095.5	5	8	passed
-20	5			5	12	passed
-20	10			6	11	passed
-10	0	normal	2095.5	4	8	passed
-10	5			3	8	passed
-10	10			3	7	passed
0	0	normal	2095.5	2	7	passed
0	5			2	5	passed
0	10			4	6	passed
10	0	normal	2095.5	1	7	passed
10	5			5	6	passed
10	10			6	8	passed
20	0	low	2095.5	3	7	passed
20	5			4	9	passed
20	10			3	8	passed
20	0	high	2095.5	4	8	passed
20	5			3	11	passed
20	10			6	9	passed
20	0	high	2095.5	5	7	passed
20	5			3	7	passed
20	10			2	6	passed
30	0	normal	2095.5	4	7	passed
30	5			6	10	passed
30	10			2	11	passed
40	0	normal	2095.5	5	13	passed
40	5			4	18	passed
40	10			6	10	passed
50	0	normal	2095.5	3	9	passed
50	5			3	8	passed
50	10			5	9	passed

CAT-M1 eFDD2

Temp. °C	Duration min	Voltage	Limit Hz	Freq. error Average (Hz)	Freq. error Max. (Hz)	Verdict
-30	0	normal	4700	8	11	passed
-30	5			11	12	passed
-30	10			-9	13	passed
-20	0	normal	4700	7	11	passed
-20	5			12	15	passed
-20	10			13	16	passed
-10	0	normal	4700	-10	14	passed
-10	5			9	13	passed
-10	10			8	18	passed
0	0	normal	4700	7	16	passed
0	5			6	14	passed
0	10			9	12	passed
10	0	normal	4700	-8	16	passed
10	5			-9	14	passed
10	10			-8	14	passed
20	0	low	4700	8	11	passed
20	5			7	13	passed
20	10			7	13	passed
20	0	high	4700	-7	12	passed
20	5			-8	18	passed
20	10			9	15	passed
20	0	high	4700	4	13	passed
20	5			9	16	passed
20	10			7	15	passed
30	0	normal	4700	-7	13	passed
30	5			9	18	passed
30	10			10	16	passed
40	0	normal	4700	-8	15	passed
40	5			-8	15	passed
40	10			-10	14	passed
50	0	normal	4700	9	16	passed
50	5			8	18	passed
50	10			8	17	passed

CAT-M1 eFDD25

Temp. °C	Duration min	Voltage	Limit Hz	Freq. error Average (Hz)	Freq. error Max. (Hz)	Verdict
-30	0	normal	4706.25	2	8	passed
-30	5			4	6	passed
-30	10			4	8	passed
-20	0	normal	4706.25	3	5	passed
-20	5			4	6	passed
-20	10			3	8	passed
-10	0	normal	4706.25	4	8	passed
-10	5			4	7	passed
-10	10			6	10	passed
0	0	normal	4706.25	4	7	passed
0	5			3	9	passed
0	10			5	9	passed
10	0	normal	4706.25	2	7	passed
10	5			3	10	passed
10	10			3	9	passed
20	0	low	4706.25	2	7	passed
20	5			2	5	passed
20	10			2	6	passed
20	0	high	4706.25	4	8	passed
20	5			6	13	passed
20	10			3	11	passed
20	0	high	4706.25	2	7	passed
20	5			6	9	passed
20	10			3	9	passed
30	0	normal	4706.25	4	8	passed
30	5			4	7	passed
30	10			5	9	passed
40	0	normal	4706.25	3	7	passed
40	5			4	7	passed
40	10			6	10	passed
50	0	normal	4706.25	3	11	passed
50	5			4	9	passed
50	10			4	8	passed

NB-IoT eFDD2

Temp. °C	Duration min	Voltage	Limit Hz	Freq. error Average (Hz)	Freq. error Max. (Hz)	Verdict
-30	0	normal	4700	18	25	passed
-30	5			17	27	passed
-30	10			18	26	passed
-20	0	normal	4700	19	27	passed
-20	5			19	27	passed
-20	10			19	25	passed
-10	0	normal	4700	14	25	passed
-10	5			17	25	passed
-10	10			16	26	passed
0	0	normal	4700	19	25	passed
0	5			18	27	passed
0	10			21	27	passed
10	0	normal	4700	14	19	passed
10	5			10	17	passed
10	10			15	22	passed
20	0	low	4700	9	22	passed
20	5			9	21	passed
20	10			10	22	passed
20	0	high	4700	3	11	passed
20	5			6	10	passed
20	10			11	21	passed
20	0	high	4700	4	14	passed
20	5			8	20	passed
20	10			10	19	passed
30	0	normal	4700	9	32	passed
30	5			14	25	passed
30	10			12	29	passed
40	0	normal	4700	11	25	passed
40	5			13	26	passed
40	10			18	25	passed
50	0	normal	4700	16	24	passed
50	5			18	28	passed
50	10			15	26	passed

Remark: Please see next sub-clause for the measurement plot.

5.9.4 TEST EQUIPMENT USED

- Radio Lab

5.10 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

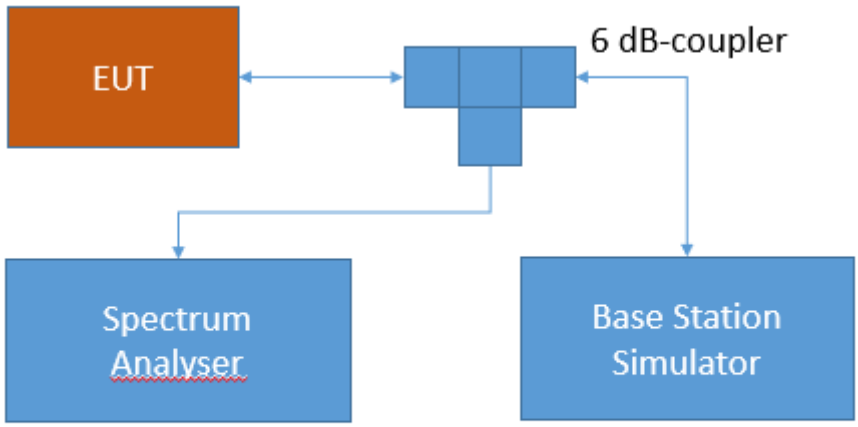
Standard **FCC PART 24 Subpart E**

The test was performed according to:
ANSI C63.26: 2015; 5.7.4

5.10.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to the applicable conducted spurious emission test case per § 2.1051 and RSS-GEN 6.13. The limit comes from the applicable rule part and ISED RSS-Standard for the operating band of the cellular device.

The EUT was connected to the test setup according to the following diagram:



Test Setup FCC Part 22/24/27/90 Cellular;
Spurious Emissions at antenna terminal

The attenuation of the measuring and stimulus path are known for each measured frequency and are considered.

The Spectrum Analyzer settings can be directly found in the measurement diagrams.

5.10.2 TEST REQUIREMENTS / LIMITS

FCC Part 2.1051; Measurement required: Spurious emissions at antenna terminal:

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated

under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

Part 24, Subpart E – Broadband PCS; Band 2

§24.238 – Emission limitations for Broadband PCS equipment

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

RSS-133; 6.5 Transmitter Unwanted Emissions

6.5.1 Out-of-Block Emissions

Equipment shall comply with the limits in (i) and (ii) below.

i. In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10p(watts).
ii. After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10p(watts). If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

5.10.3 TEST PROTOCOL

Ambient temperature: 20 - 28 °C
Relative humidity: 30 - 40 %

Radio Technology	Channel	Detector	Trace	Resolution Bandwidth /kHz	Frequency /MHz	Peak Value /dBm	Limit /dBm	Margin to Limit /dB
GSM 1900	low	rms	maxhold	3	1849.9	-29.39	-13	16.39
GSM 1900	mid	rms	maxhold	-	-	-	-	> 20
GSM 1900	high	rms	maxhold	3	1910.0	-30.01	-13	17.01

Radio Technology	Channel	Detector	Trace	Resolution Bandwidth /kHz	Frequency /MHz	Peak Value /dBm	Limit /dBm	Margin to Limit /dB
EDGE 1900	low	rms	maxhold	3	1850.0	-34.08	-13	21.08
EDGE 1900	mid	rms	maxhold	-	-	-	-	> 20
EDGE 1900	high	rms	maxhold	3	1910.0	-35.26	-13	22.26

Radio Technology	Channel	Detector	Trace	Resolution Bandwidth /kHz	Frequency /MHz	Peak Value /dBm	Limit /dBm	Margin to Limit /dB
CAT-M1 eFDD 2	low	rms	maxhold	5	1849.9	-47.28	-17.5	29.78
CAT-M1 eFDD 2	mid	rms	maxhold	-	-	-	-	> 20
CAT-M1 eFDD 2	high	rms	maxhold	5	1910.2	-47.3	-17.5	29.80
CAT-M1 eFDD 2	high	rms	maxhold	1000	1912.1	-32.82	-13	19.82

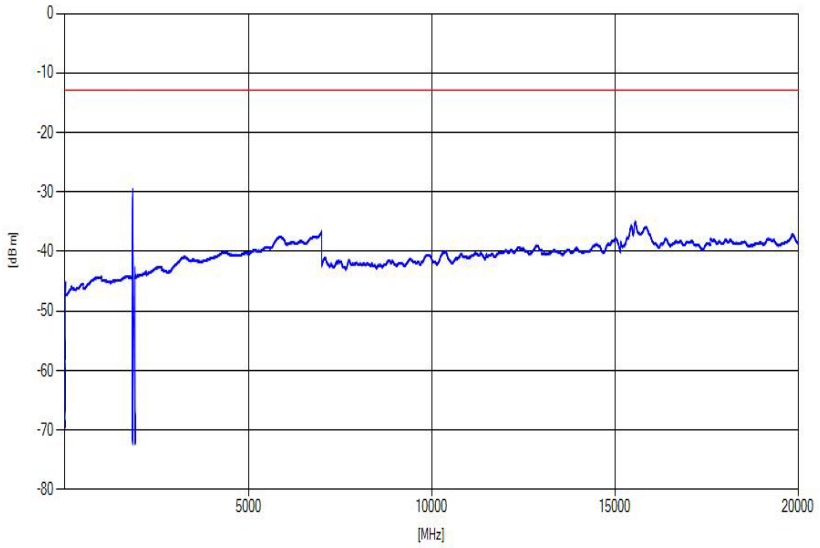
Radio Technology	Channel	Detector	Trace	Resolution Bandwidth /kHz	Frequency /MHz	Peak Value /dBm	Limit /dBm	Margin to Limit /dB
CAT-M1 eFDD 25	low	rms	maxhold	5	1849.9	-44.83	-17.5	27.33
CAT-M1 eFDD 25	mid	rms	maxhold	-	-	-	-	> 20
CAT-M1 eFDD 25	high	rms	maxhold	5	1915.0	-46.96	-17.5	29.46
CAT-M1 eFDD 25	high	rms	maxhold	100	1917.0	-41.73	-23	18.73

Radio Technology	Channel	Detector	Trace	Resolution Bandwidth /kHz	Frequency /MHz	Peak Value /dBm	Limit /dBm	Margin to Limit /dB
NB-IoT eFDD 2	low	rms	maxhold	2	1849.9	-26.12	-13	13.12
NB-IoT eFDD 2	mid	rms	maxhold		-	-	-	> 20
NB-IoT eFDD 2	high	rms	maxhold	2	1910.0	-23.68	-13	10.68

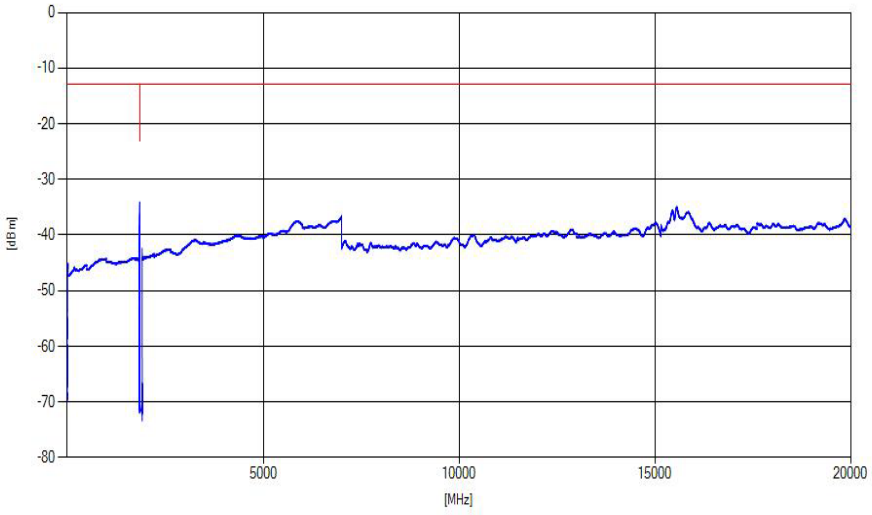
Remark: Please see next sub-clause for the measurement plot.

5.10.4 MEASUREMENT PLOT (EXAMPLE PLOT, SHOWING WORST CASE, IF APPLICABLE)

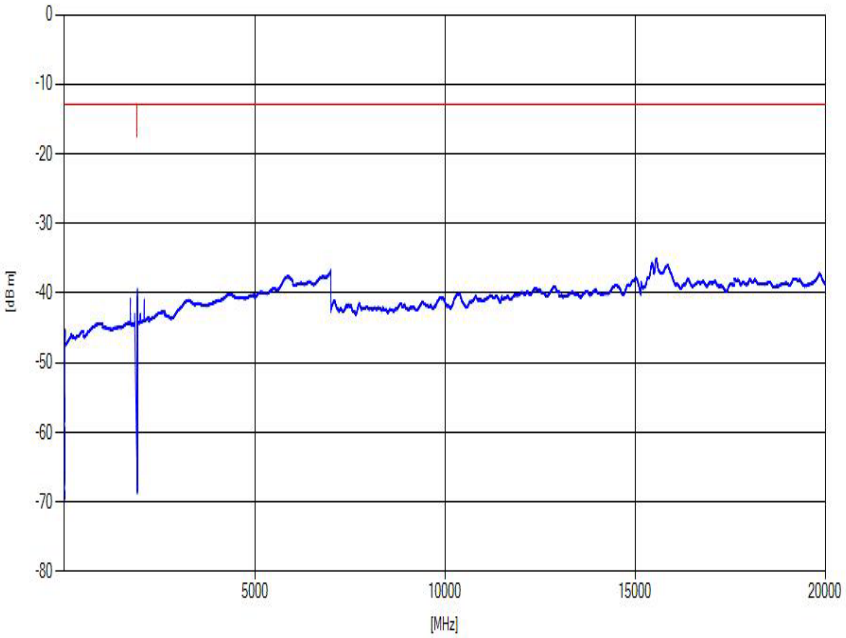
Technology = GSM, Radio Technology = GSM 1900 GPRS, Operating Frequency = low channel (S01_AB01)



Technology = EDGE, Radio Technology = EDGE 1900, Operating Frequency = low channel (S01_AB01)



Technology = CAT-M1, Radio Technology = eFDD 25, Operating Frequency = high channel (S01_AE01)



Technology = CAT-M1, Radio Technology = eFDD 2, Operating Frequency = high channel (S01_AE01)