

TEST REPORT

Applicant Name : TECNO MOBILE LIMITED
 Address : FLAT 39 8/F BLOCK D WAH LOK INDUSTRIAL CENTRE 31-35
 SHAN MEI STREET FOTAN NT Hong Kong
 Report Number : SZNS220222-05448-RF-00C
 FCC ID: 2ADYY-BD1

Test Standard (s)

FCC PART 22H, PART 24E

Sample Description

Product Type: Mobile Phone
 Model No.: BD1
 Multiple Model(s) No.: N/A
 Trade Mark: TECNO
 Date Received: 2022/02/22
 Date of Test: 2022/03/03~2022/03/12
 Report Date: 2022/03/17

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:

Black Ding

Black Ding
 EMC Engineer

Approved By:

Robert Li

Robert Li
 EMC Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Frequency Range	GSM850: 824-849 MHz (TX), 869-894 MHz (RX) PCS1900: 1850-1910 MHz (TX), 1930-1990 MHz (RX) WCDMA B5: 824-849 MHz (TX), 869-894 MHz (RX) WCDMA B2: 1850-1910 MHz (TX), 1930-1990 MHz (RX)
Maximum Conducted Average Output Power	GSM850: 31.00dBm, PCS1900: 25.70dBm WCDMA B5: 21.75dBm, WCDMA B2: 15.67dBm
Modulation Technique	2G: GMSK, 8PSK 3G: BPSK, QPSK, 16QAM
Antenna Specification*	GSM850/WCDMA B5: -6.0dBi PCS1900/WCDMA B2: -1.0dBi (It is provided by the applicant)
Voltage Range	DC 3.85V from battery.
Sample serial number	SZNS220222-05448E-RF-S1 for Conducted and Radiated Emissions SZNS220222-05448E-RF-S2 for RF Conducted Test (Assigned by ATC)
Sample/EUT Status	Good condition
Adapter information	Model: U050TSA Input: AC 100-240V, 50/60Hz, Max 0.2A Output: DC 5.0V, 1.0A
Extreme condition*	L.V.: Low Voltage 3.6V N.V.: Normal Voltage 3.85V H.V.: High Voltage 4.4V (provided by the applicant)

Objective

This test report is in accordance with Part 2, Part 22-Subpart H, Part 24-Subpart E of the Federal Communication Commission's rules.

The objective is to determine the compliance of EUT with FCC rules for output power, modulation characteristic, occupied bandwidth, and spurious emission at antenna terminal, spurious radiated emission, frequency stability, and band edge.

Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-Part J as well as the following parts:

Part 22 Subpart H - Public Mobile Services
Part 24 Subpart E - Personal Communication Services
ANSI C63.26-2015: American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		5%
RF Frequency		0.082×10^{-7}
RF output power, conducted		0.73dB
Unwanted Emission, conducted		1.6dB
AC Power Lines Conducted Emissions		2.72dB
Emissions, Radiated	9kHz - 30MHz	2.66dB
	30MHz - 1GHz	4.28dB
	1GHz - 18GHz	4.98dB
	18GHz - 26.5GHz	5.06dB
	26.5GHz - 40GHz	4.72dB
Temperature		1°C
Humidity		6%
Supply voltages		0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

Listed by Innovation, Science and Economic Development Canada (ISED), the Registration Number is 5077A.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The final qualification test was performed with the EUT operating at normal mode.

Equipment Modifications

No modification was made to the EUT.

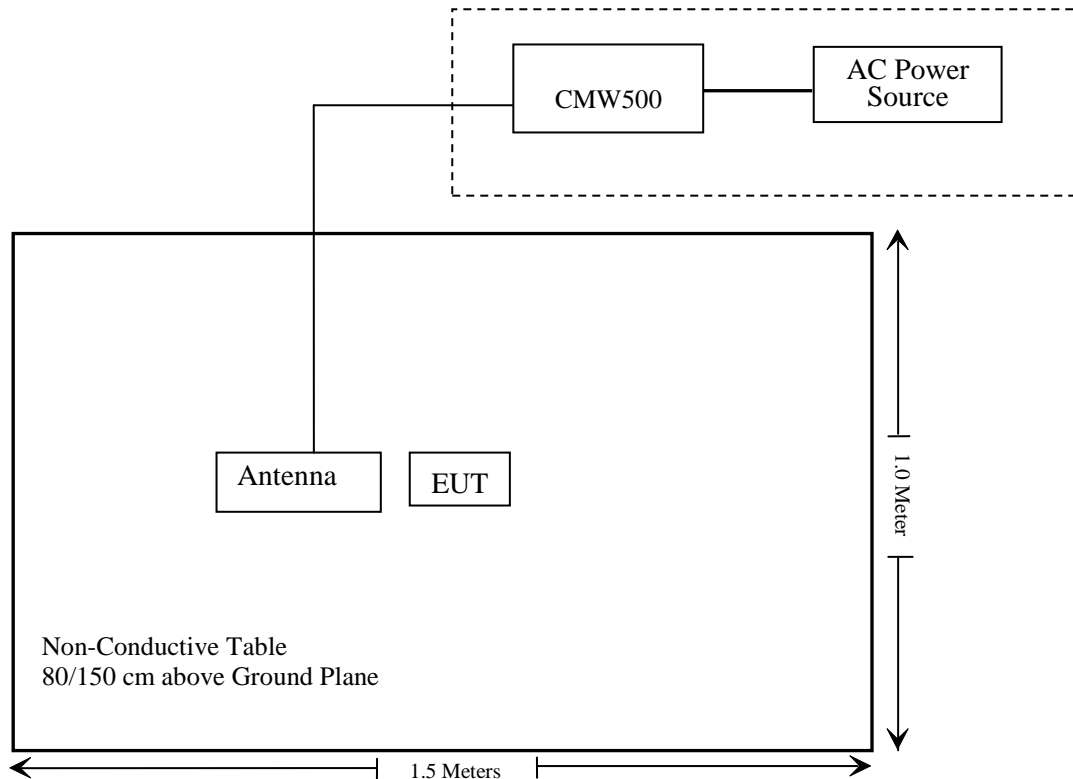
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Rohde & Schwarz	Wideband Radio Communication tester	CMW500	146520

Support Cable Description:

Cable Description	Length (m)	From / Port	To
Unshielded Un-detachable AC cable	1.2	AC Power	CMW500

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307, §2.1093	RF Exposure (SAR)	Compliant*
§2.1046; § 22.913 (a); § 24.232 (c)	RF Output Power	Compliant
§ 2.1047	Modulation Characteristics	Not Applicable
§ 2.1049; § 22.905; § 22.917; § 24.238	Occupied Bandwidth	Compliant
§ 2.1051; § 22.917 (a); § 24.238 (a)	Spurious Emissions at Antenna Terminal	Compliant
§ 2.1053; § 22.917 (a); § 24.238 (a)	Field Strength of Spurious Radiation	Compliant
§ 22.917 (a); § 24.238 (a)	Band Edge	Compliant
§ 2.1055; § 22.355; § 24.235	Frequency stability	Compliant

Compliant*: Please refer to SAR report: SZNS220222-05448E-SA.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
Rohde& Schwarz	Test Receiver	ESR	102725	2021/12/13	2022/12/12
Rohde&Schwarz	Spectrum Analyzer	FSV40	101949	2021/12/13	2022/12/12
SONOMA INSTRUMENT	Amplifier	310 N	186131	2021/11/09	2022/11/08
A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2021/11/09	2022/11/08
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2021/11/11	2022/11/10
Schwarzbeck	Bilog Antenna	VULB9163	9163-194	2020/01/05	2023/01/04
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-655	2020/01/05	2023/01/04
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
PASTERNAK	Horn Antenn	PE9852/2F-20	1120	2020/01/05	2023/01/04
PASTERNAK	Horn Antenn	PE9852/2F-20	1120	2020/01/05	2023/01/04
Unknown	RF Coaxial Cable	No.10	N050	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.11	N1000	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.12	N040	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.13	N300	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.14	N800	2021/12/14	2022/12/13
Wainwright	High Pass Filter	WHKX3.6/18G-10SS	5	2021/12/14	2022/12/13
CD	High Pass Filter	HPM-1.2/18G-60	110	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.16	N200	2021/12/14	2022/12/13
Agilent	Signal Generator	N5183A	MY51040755	2021/12/13	2022/12/12

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2021/12/13	2022/12/12
Rohde & Schwarz	Spectrum Analyzer	FSU26	200982	2021/07/06	2022/07/05
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	154606	2021/12/13	2022/12/12
Mini-Circuits	Power Splitter	DC-18000MHz	SF10944151S	2021/12/14	2022/12/13
Gongwen	Temp. & Humid. Chamber	HSD-500	109	2021/10/14	2022/10/13
HP	6dB Attenuator	8493B	2708A 04769	2021/12/14	2022/12/13
Fluke	Multi Meter	45	7664009	2021/12/14	2022/12/13
Manson	DC Power Source	KPS-6604	ATCS-205	NCR	NCR
Unknown	RF Coaxial Cable	No.31	RF-01	Each time	/
Unknown	RF Cable	Unknown	Unknown	Each time	/

* Statement of Traceability: Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §1.1307(b) & §2.1093 - RF EXPOSURE INFORMATION

Applicable Standard

FCC§1.1310 and §2.1093.

Test Result

Compliant, please refer to the SAR report: SZNS220222-05448E-SA.

FCC §2.1047 - MODULATION CHARACTERISTIC

According to FCC §2.1047(d), Part 22H, 24E there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

FCC § 2.1046, § 22.913 (a) & § 24.232 (c) - RF OUTPUT POWER

Applicable Standard

According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

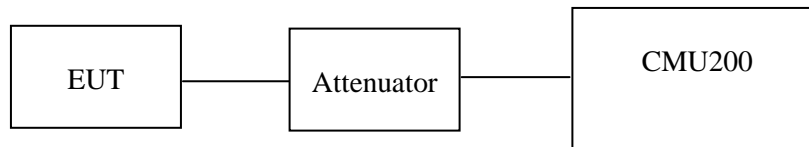
According to FCC §2.1046 and §24.232 (C), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB.

Test Procedure

Conducted method:

The RF output of the transmitter was connected to the CMU200 through sufficient attenuation.



ANSI C63.26-2015 section 5.5.3.

Test Data

Environmental Conditions

Temperature:	27.2 °C
Relative Humidity:	56.2 %
ATM Pressure:	101.0 kPa

The testing was performed by Black Ding from 2022-03-05 to 2022-03-12.

Conducted Power**Cellular Band (Part 22H)**

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)	ERP(dBm)	Limit (dBm)
GSM	128	824.2	30.90	22.75	38.45
	190	836.6	31.00	22.85	38.45
	251	848.8	30.70	22.55	38.45

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				ERP(dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	1 slot	2 slots	3 slots	4 slots	
GPRS	128	824.2	30.75	29.51	27.66	25.62	22.60	21.36	19.51	17.47	38.45
	190	836.6	30.86	29.48	27.70	25.66	22.71	21.33	19.55	17.51	38.45
	251	848.8	30.60	29.30	27.44	25.50	22.45	21.15	19.29	17.35	38.45

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				ERP(dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	1 slot	2 slots	3 slots	4 slots	
EGPRS	128	824.2	24.14	23.31	21.93	19.48	15.99	15.16	13.78	11.33	38.45
	190	836.6	24.07	23.16	21.85	19.41	15.92	15.01	13.70	11.26	38.45
	251	848.8	23.76	22.78	21.52	19.40	15.61	14.63	13.37	11.25	38.45

Mode	Test Mode	3GPP Sub Test	Average Output Power (dBm)			ERP(dBm)		
			Low	Mid	High	Low	Mid	High
WCDMA (Band 5)	RMC12.2k		21.75	21.52	21.28	13.60	13.37	13.13
	HSDPA	1	19.37	19.43	19.37	11.22	11.28	11.22
		2	19.36	19.47	19.26	11.21	11.32	11.11
		3	19.42	19.53	19.44	11.27	11.38	11.29
		4	19.54	19.41	19.52	11.39	11.26	11.37
	HSUPA	1	20.17	19.87	19.83	12.02	11.72	11.68
		2	20.15	19.99	19.88	12.00	11.84	11.73
		3	20.33	19.82	19.92	12.18	11.67	11.77
		4	20.17	19.86	19.95	12.02	11.71	11.80
		5	20.16	19.79	19.69	12.01	11.64	11.54
HSPA+	1	20.24	19.86	19.88	12.09	11.71	11.73	

Note: ERP(dBm) = Conducted Power(dBm) + Antenna Gain(dBd)
 For GSM850 / WCDMA Band5: Antenna Gain = -6dBi = -8.15dBd (0dBd=2.15dBd)
 Limit: ERP ≤ 38.45dBm

PCS Band (Part 24E)

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)	EIRP(dBm)	Limit (dBm)
GSM	512	1850.2	25.70	24.70	33
	661	1880.0	25.50	24.50	33
	810	1909.8	25.42	24.42	33

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				EIRP(dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	1 slot	2 slots	3 slots	4 slots	
GPRS	512	1850.2	25.56	23.67	22.16	20.23	24.56	22.67	21.16	19.23	33
	661	1880.0	25.38	23.49	22.00	20.06	24.38	22.49	21.00	19.06	33
	810	1909.8	25.34	23.50	22.04	20.11	24.34	22.50	21.04	19.11	33

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				EIRP(dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	1 slot	2 slots	3 slots	4 slots	
EGPRS	512	1850.2	22.84	22.05	20.38	18.02	21.84	21.05	19.38	17.02	33
	661	1880.0	21.59	20.93	19.27	16.93	20.59	19.93	18.27	15.93	33
	810	1909.8	21.12	20.38	18.79	16.59	20.12	19.38	17.79	15.59	33

Mode	Test Mode	3GPP Sub Test	Average Output Power (dBm)			EIRP(dBm)		
			Low	Mid	High	Low	Mid	High
WCDMA (Band 2)	RMC12.2k		15.30	15.67	14.39	14.30	14.67	13.39
	HSDPA	1	14.30	14.54	13.74	13.30	13.54	12.74
		2	14.40	14.89	13.86	13.40	13.89	12.86
		3	14.33	14.93	13.85	13.33	13.93	12.85
		4	14.32	14.94	13.79	13.32	13.94	12.79
	HSUPA	1	14.65	14.89	13.65	13.65	13.89	12.65
		2	14.72	14.82	13.88	13.72	13.82	12.88
		3	14.88	14.87	13.85	13.88	13.87	12.85
		4	14.71	14.69	13.67	13.71	13.69	12.67
		5	14.56	14.59	13.75	13.56	13.59	12.75
HSPA+	1	14.69	14.67	13.79	13.69	13.67	12.79	

Note: EIRP(dBm) = Conducted Power(dBm) + Antenna Gain(dBi)

For PCS1900 / WCDMA Band2: Antenna Gain = -1dBi

Limit: EIRP ≤ 33dBm

Peak-to-average ratio (PAR)**Cellular Band**

Mode	Channel	PAR (dB)	Limit (dB)
GSM	Low	3.62	13
	Middle	3.54	13
	High	3.41	13

Mode	Channel	PAR (dB)	Limit (dB)
EGPRS	Low	3.57	13
	Middle	3.42	13
	High	3.46	13

Mode	Channel	PAR (dB)	Limit (dB)
RMC	Low	3.53	13
	Middle	3.42	13
	High	3.44	13
HSDPA	Low	3.57	13
	Middle	3.62	13
	High	3.61	13
HSUPA	Low	3.43	13
	Middle	3.47	13
	High	3.55	13
HSPA+	Low	3.52	13
	Middle	3.54	13
	High	3.56	13

PCS Band

Mode	Channel	PAR (dB)	Limit (dB)
GSM	Low	3.53	13
	Middle	3.56	13
	High	3.54	13

Mode	Channel	PAR (dB)	Limit (dB)
EGPRS	Low	3.56	13
	Middle	3.53	13
	High	3.47	13

Mode	Channel	PAR (dB)	Limit (dB)
RMC	Low	3.47	13
	Middle	3.54	13
	High	3.46	13
HSDPA	Low	3.56	13
	Middle	3.52	13
	High	3.45	13
HSUPA	Low	3.44	13
	Middle	3.46	13
	High	3.47	13
HSPA+	Low	3.46	13
	Middle	3.54	13
	High	3.52	13

FCC §2.1049, §22.917, §22.905 & §24.238 - OCCUPIED BANDWIDTH

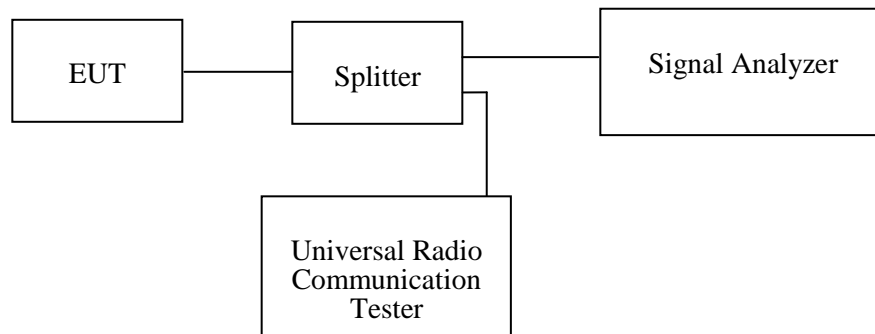
Applicable Standard

FCC 47 §2.1049, §22.917, §22.905 and §24.238.

Test Procedure

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at 5 kHz (GSM) and the 26 dB & 99% bandwidth was recorded.



Test Data

Environmental Conditions

Temperature:	27.2 °C
Relative Humidity:	56.2 %
ATM Pressure:	101.0 kPa

The testing was performed by Black Ding from 2022-03-05 to 2022-03-12.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the following tables and plots.

Cellular Band (Part 22H)

Mode	Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GSM (GMSK)	128	824.2	246.00	318.91
	190	836.6	244.00	316.15
	251	848.8	246.00	314.15
EGPRS(8PSK)	128	824.2	246.00	304.91
	190	836.6	244.00	309.69
	251	848.8	244.00	309.29

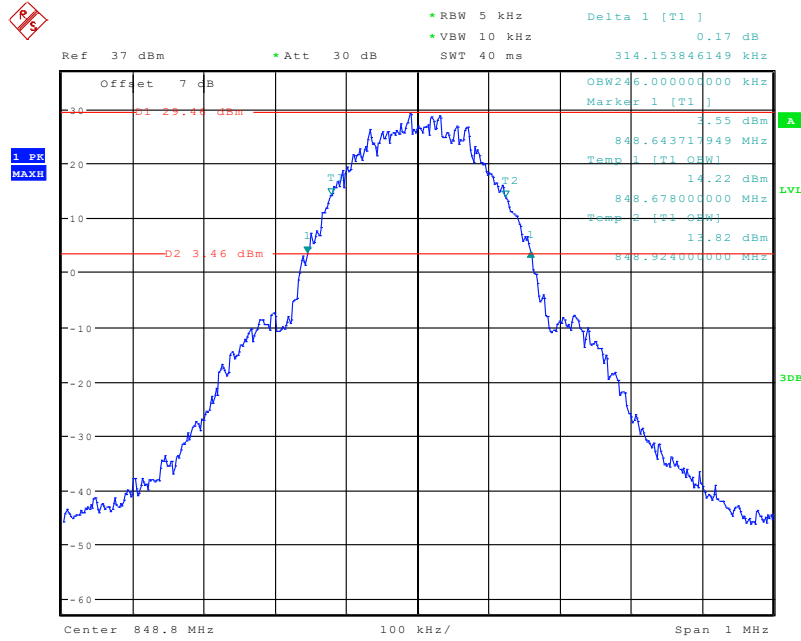
	Frequency (MHz)	Occupied Bandwidth (MHz)	26dB Bandwidth (MHz)
RMC	826.4	4.13	4.67
	836.6	4.15	4.69
	846.6	4.15	4.67
HSDPA	826.4	4.13	4.67
	836.6	4.13	4.67
	846.6	4.11	4.67
HSUPA	826.4	4.13	4.67
	836.6	4.15	4.67
	846.6	4.11	4.67

PCS Band (Part 24E)

Mode	Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GSM (GMSK)	512	1850.2	248.00	316.59
	661	1880.0	246.02	315.50
	810	1909.8	250.00	317.73
EGPRS(8PSK)	512	1850.2	240.00	306.92
	661	1880.0	242.00	304.92
	810	1909.8	242.00	304.49

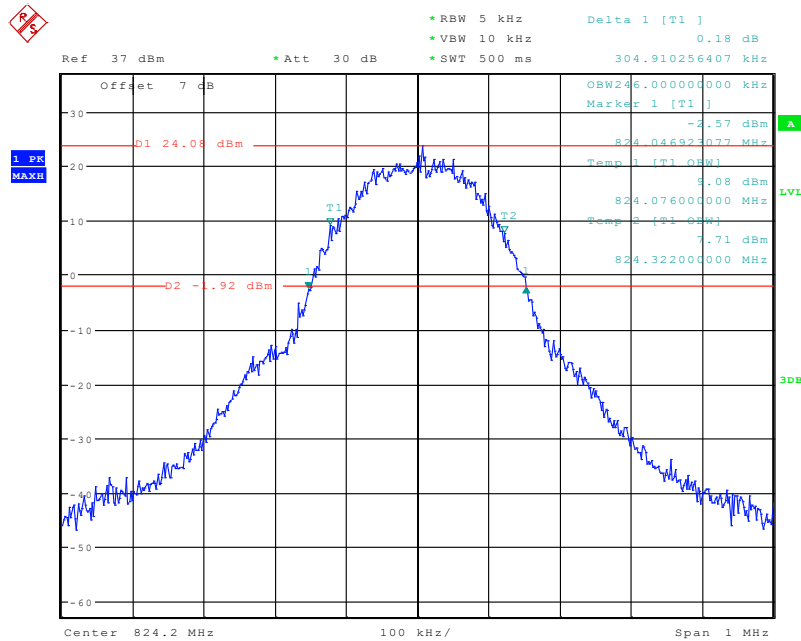
	Frequency (MHz)	Occupied Bandwidth (MHz)	26dB Bandwidth (MHz)
RMC	1852.4	4.13	4.65
	1880.0	4.13	4.67
	1907.6	4.15	4.67
HSDPA	1852.4	4.13	4.67
	1880.0	4.13	4.69
	1907.6	4.15	4.67
HSUPA	1852.4	4.13	4.69
	1880.0	4.13	4.67
	1907.6	4.15	4.67

26 dB Emissions & 99% Occupied Bandwidth for GSM (GMSK) Mode, High channel



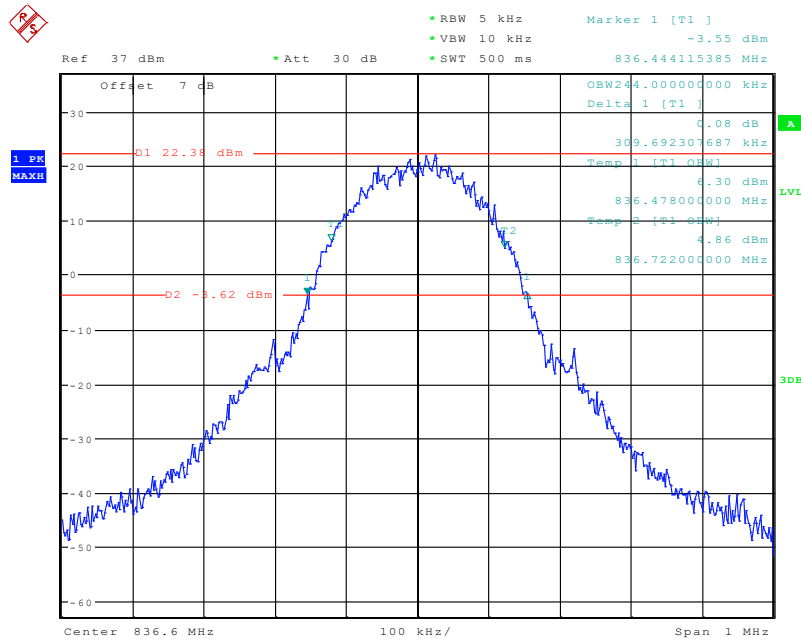
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26 dB Emissions & 99% Occupied Bandwidth for EGPRS (8PSK) Mode, Low channel



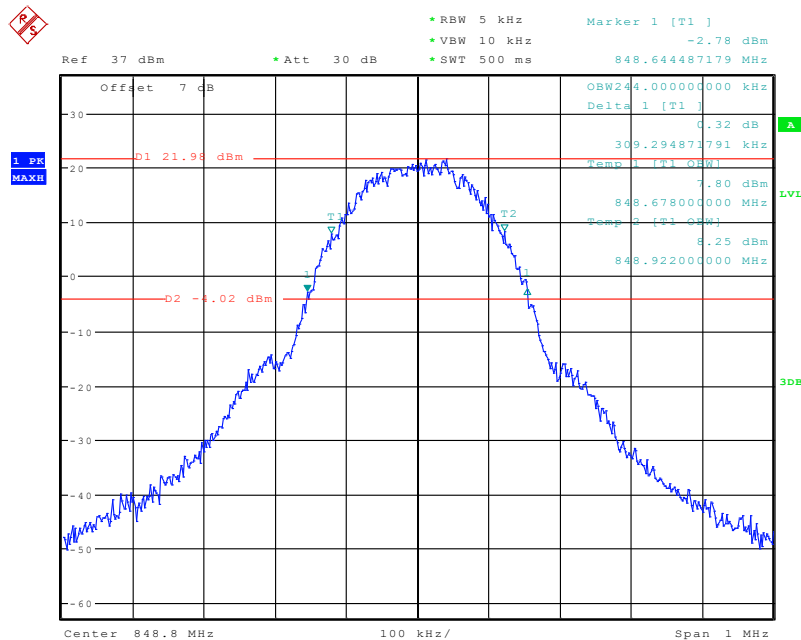
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26 dB Emissions & 99% Occupied Bandwidth for EGPRS (8PSK) Mode, Middle channel



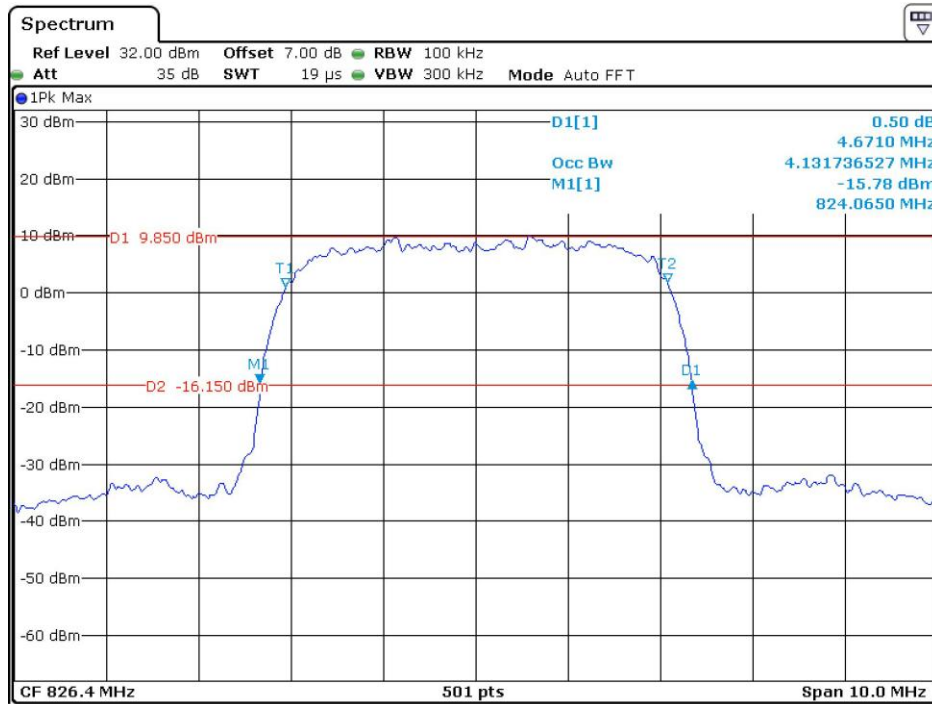
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26 dB Emissions & 99% Occupied Bandwidth for EGPRS (8PSK) Mode, High channel



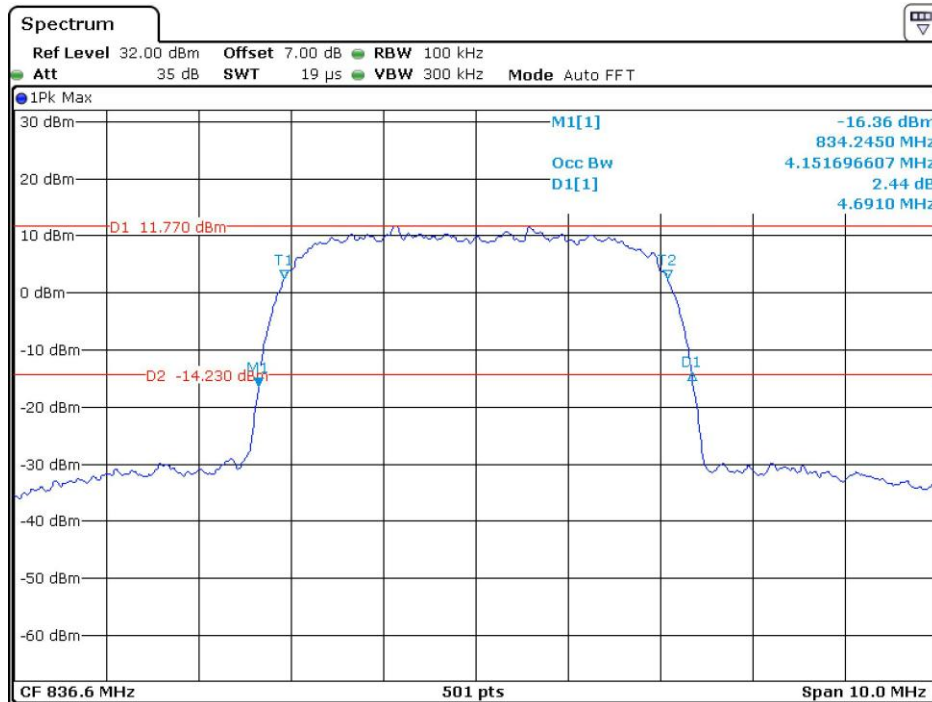
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26 dB Emissions & 99% Occupied Bandwidth for RMC (BPSK) Mode, Low channel



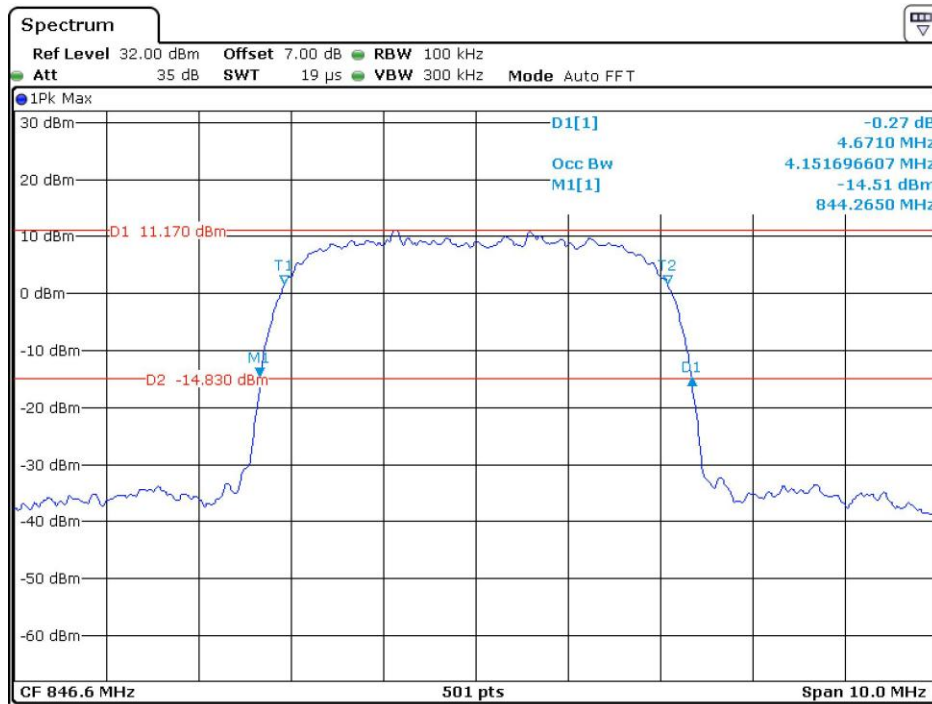
Date: 12.MAR.2022 17:58:56

26 dB Emissions & 99% Occupied Bandwidth for RMC (BPSK) Mode, Middle channel



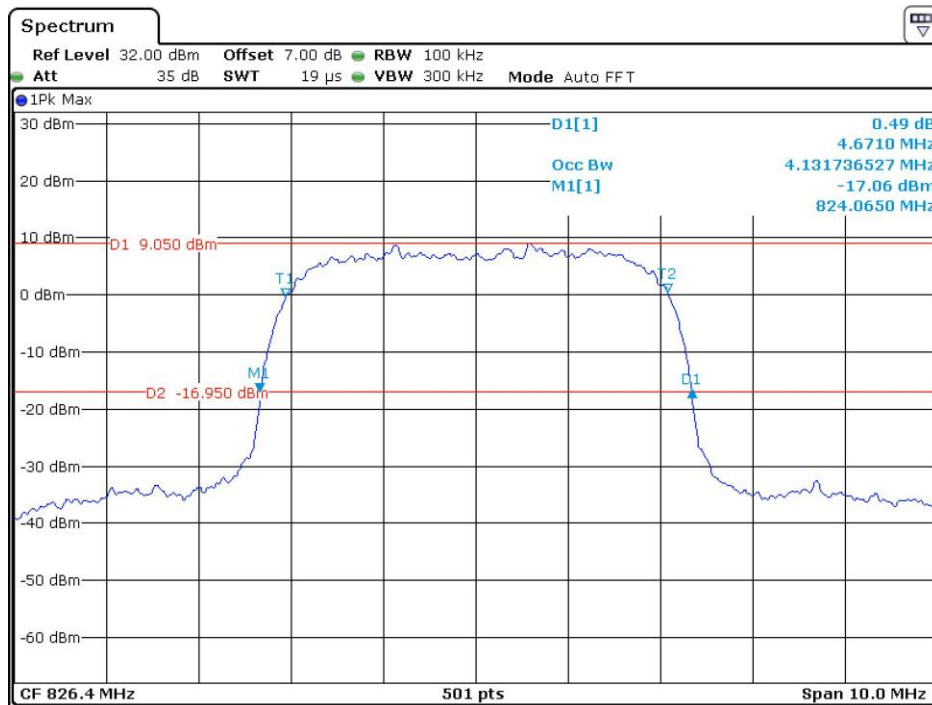
Date: 12.MAR.2022 17:59:57

26 dB Emissions & 99% Occupied Bandwidth for RMC (BPSK) Mode, High channel



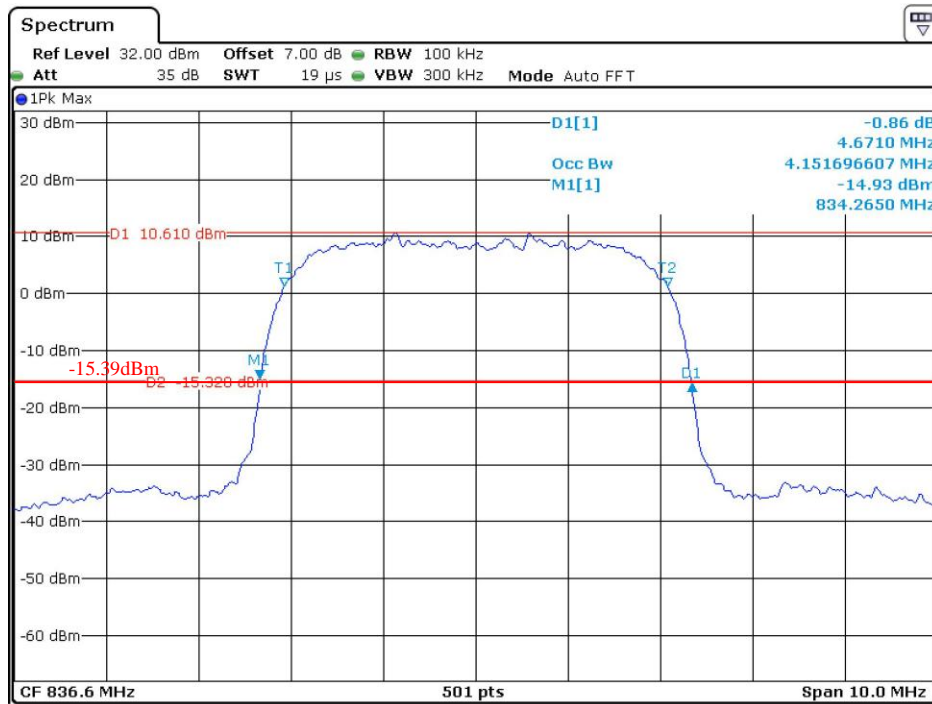
Date: 12.MAR.2022 18:00:33

26 dB Emissions & 99% Occupied Bandwidth for HSUPA (QPSK) Mode, Low channel



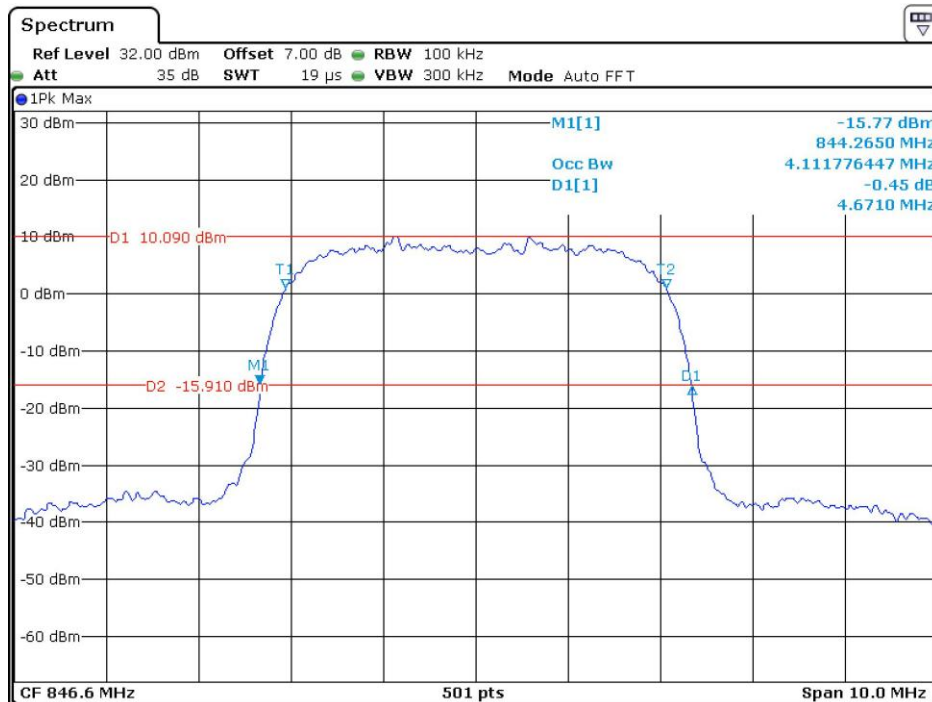
Date: 12.MAR.2022 18:18:14

26 dB Emissions & 99% Occupied Bandwidth for HSUPA (QPSK) Mode, Middle channel



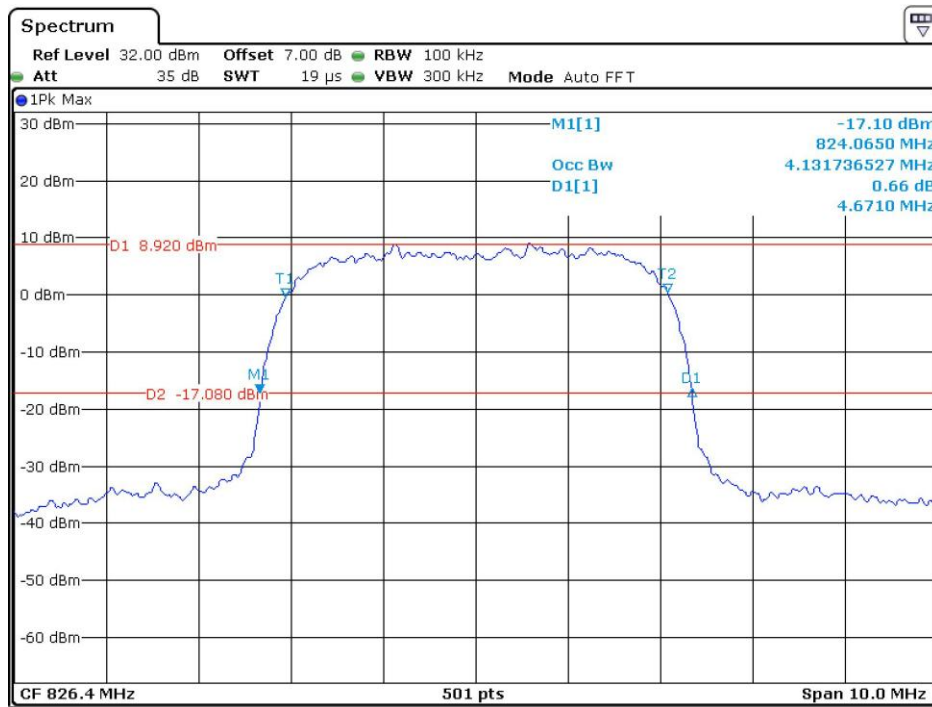
Date: 12.MAR.2022 18:19:06

26 dB Emissions & 99% Occupied Bandwidth for HSUPA (QPSK) Mode, High channel



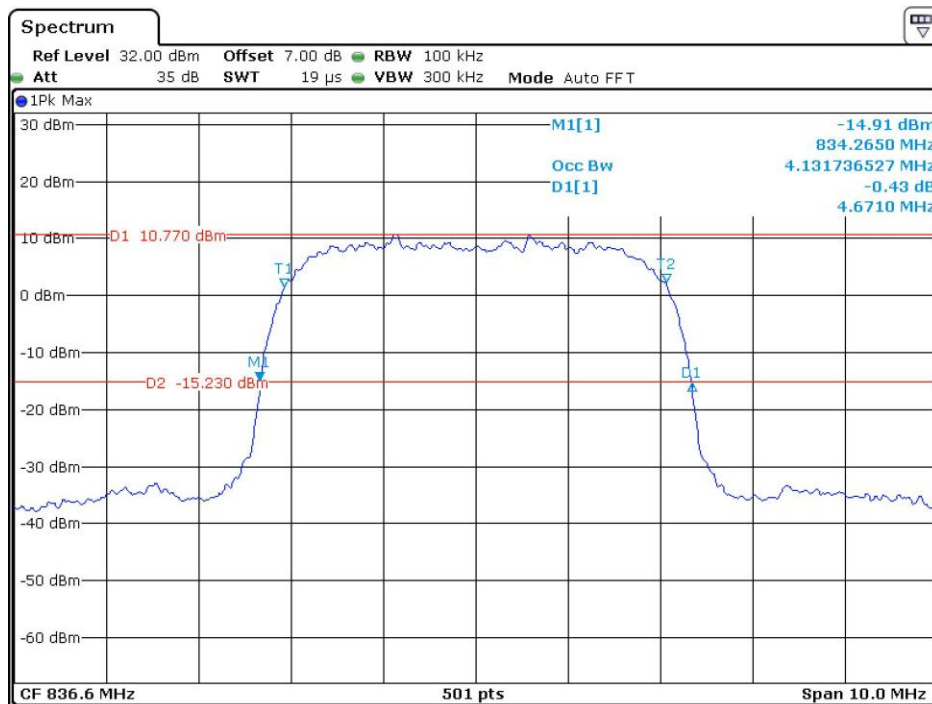
Date: 12.MAR.2022 18:19:57

26 dB Emissions & 99% Occupied Bandwidth for HSDPA (16QAM) Mode, Low channel



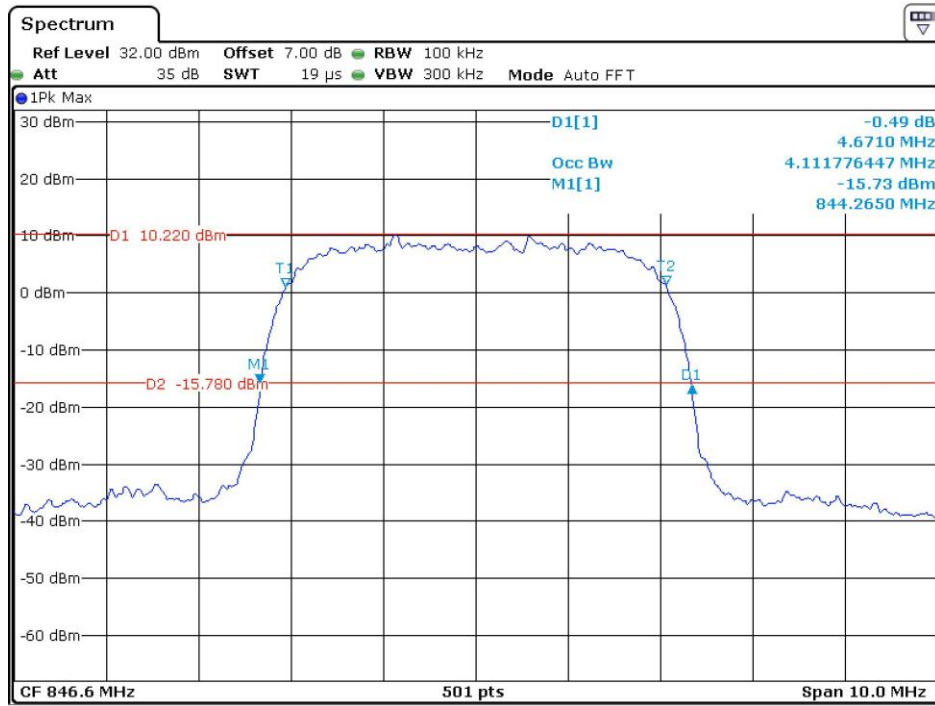
Date: 12.MAR.2022 18:10:22

26 dB Emissions & 99% Occupied Bandwidth for HSDPA (16QAM) Mode, Middle channel



Date: 12.MAR.2022 18:09:20

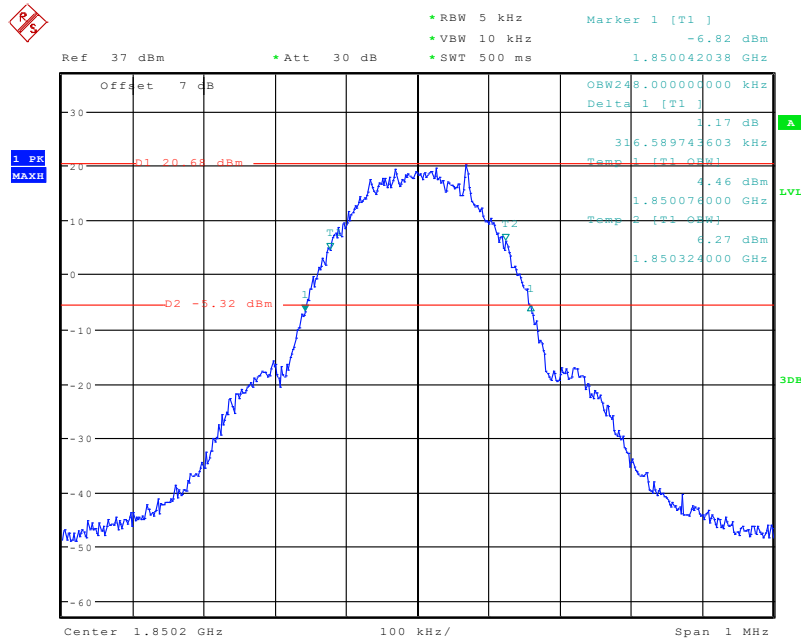
26 dB Emissions & 99% Occupied Bandwidth for HSDPA (16QAM) Mode, High channel



Date: 12.MAR.2022 18:08:42

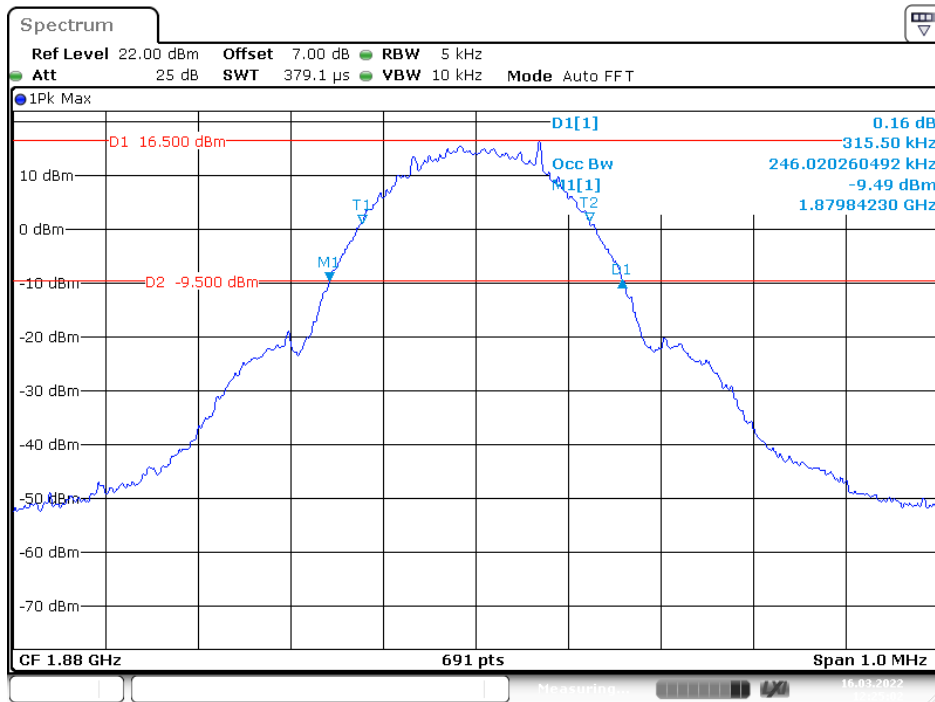
PCS Band (Part 24E)

26 dB Emissions & 99% Occupied Bandwidth for GSM (GMSK) Mode, Low channel



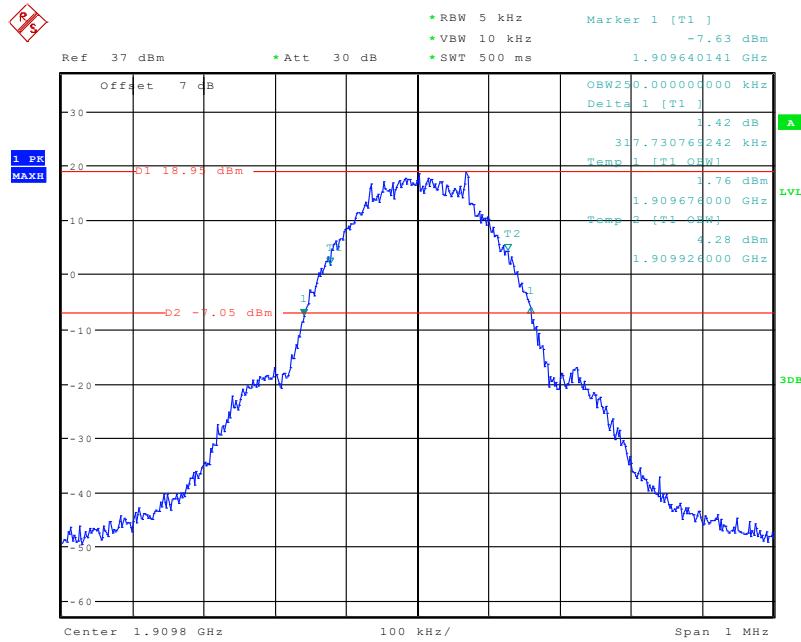
Date: 5.MAR.2022 18:29:21

26 dB Emissions & 99% Occupied Bandwidth for GSM (GMSK) Mode, Middle channel



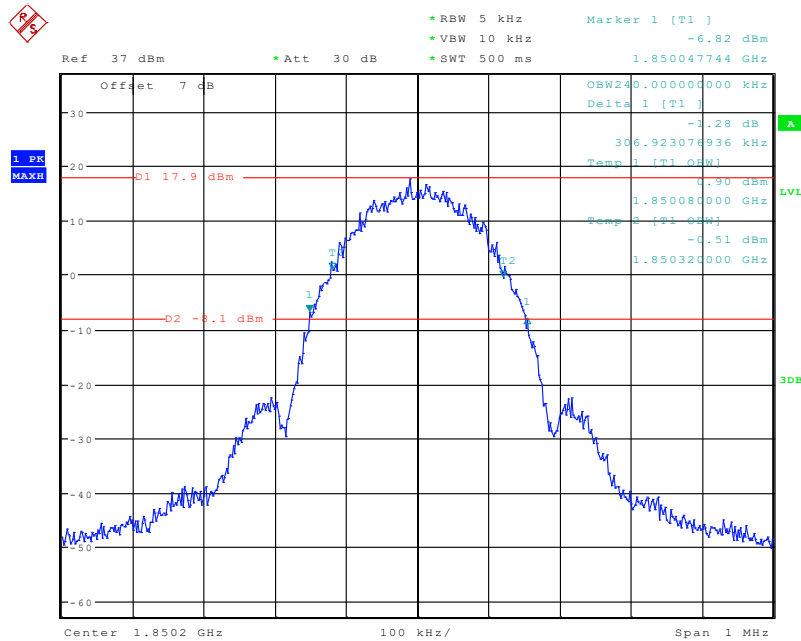
Date: 16.MAR.2022 12:25:03

26 dB Emissions & 99% Occupied Bandwidth for GSM (GMSK) Mode, High channel



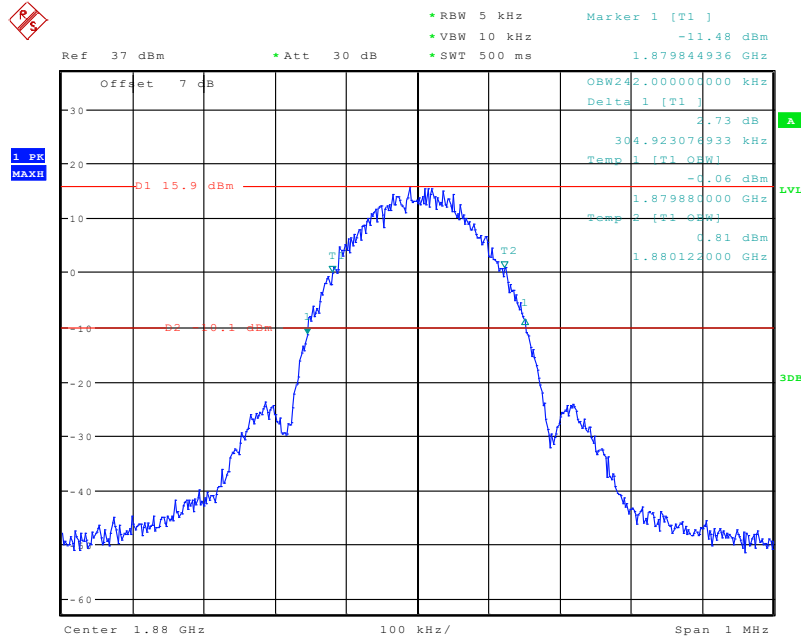
Date: 5.MAR.2022 18:32:35

26 dB Emissions & 99% Occupied Bandwidth for EGPRS (8PSK) Mode, Low channel



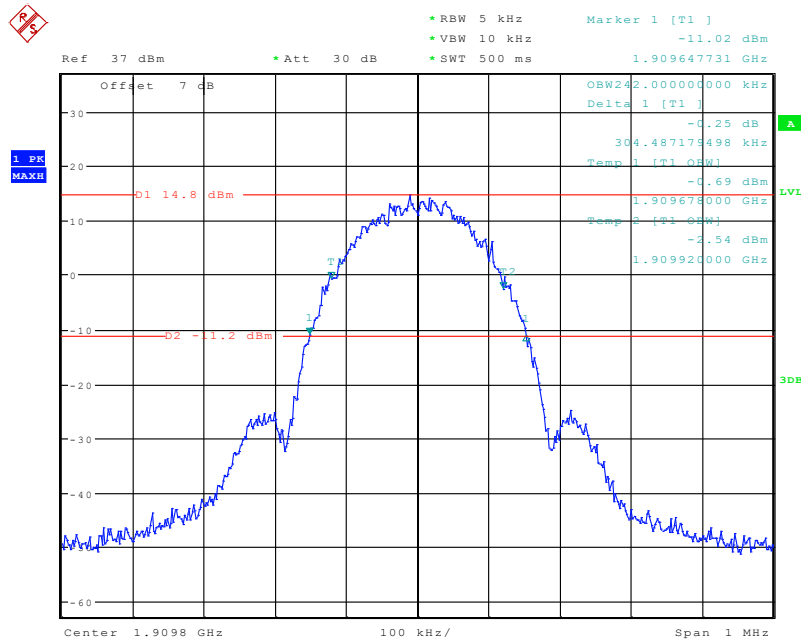
Date: 5.MAR.2022 18:41:49

26 dB Emissions & 99% Occupied Bandwidth for EGPRS (8PSK) Mode, Middle channel



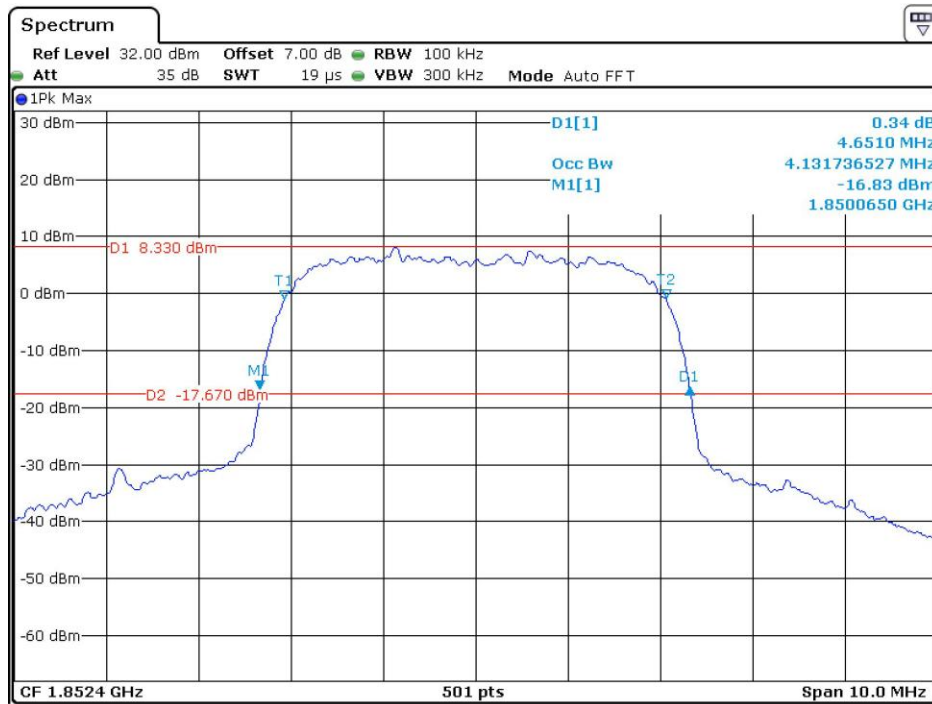
Date: 5.MAR.2022 18:40:30

26 dB Emissions & 99% Occupied Bandwidth for EGPRS (8PSK) Mode, High channel



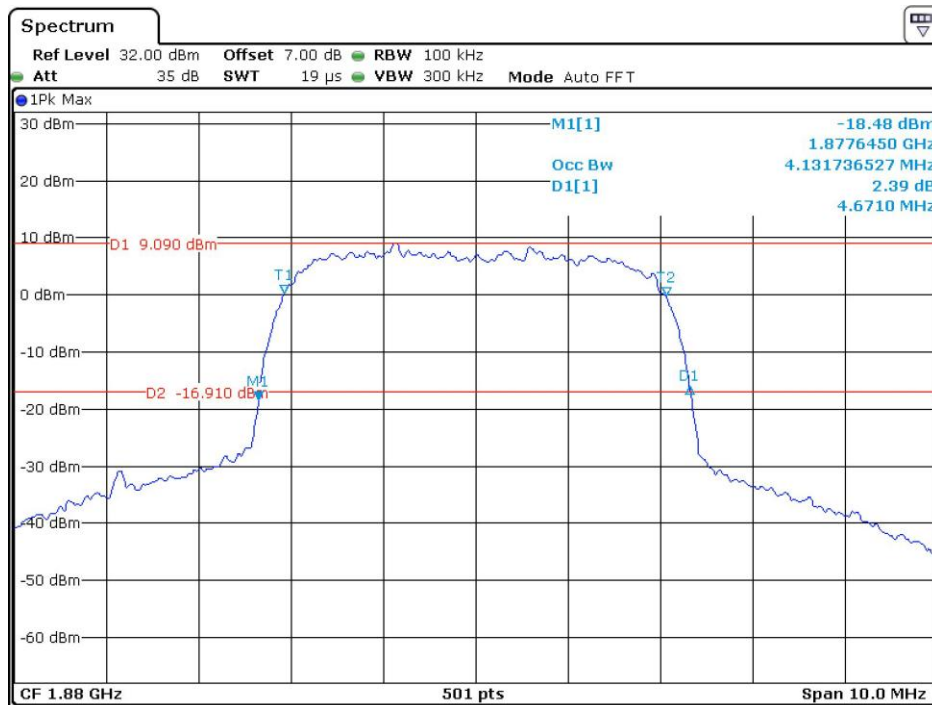
Date: 5.MAR.2022 18:39:29

26 dB Emissions & 99% Occupied Bandwidth for RMC (BPSK) Mode, Low channel



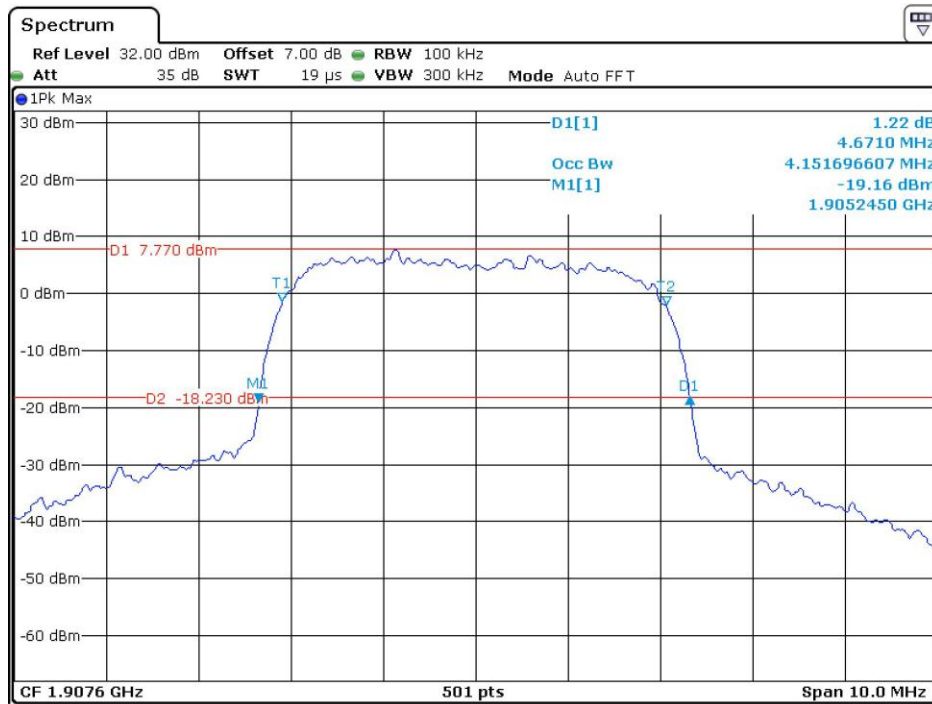
Date: 12.MAR.2022 17:55:52

26 dB Emissions & 99% Occupied Bandwidth for RMC (BPSK) Mode, Middle channel



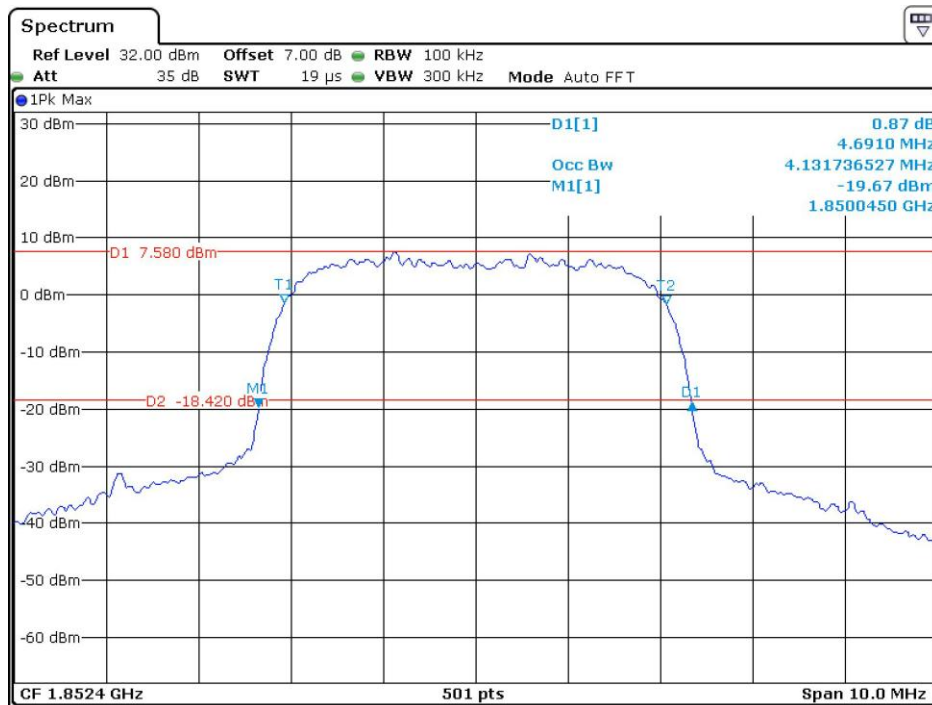
Date: 12.MAR.2022 17:57:14

26 dB Emissions & 99% Occupied Bandwidth for RMC (BPSK) Mode, High channel



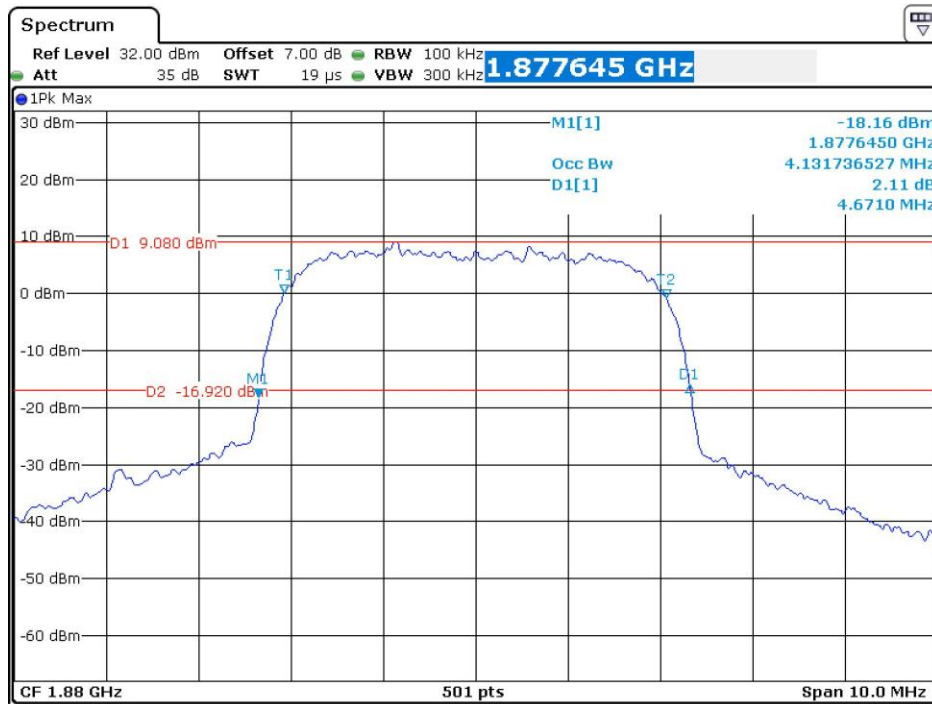
Date: 12.MAR.2022 17:58:05

26 dB Emissions & 99% Occupied Bandwidth for HSUPA (QPSK) Mode, Low channel



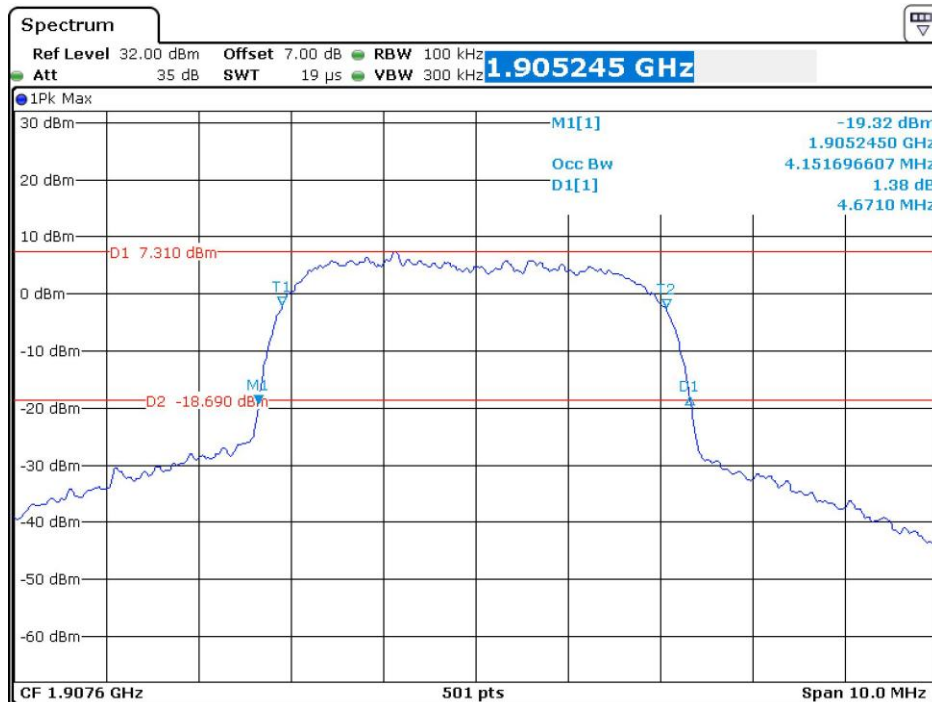
Date: 12.MAR.2022 18:17:23

26 dB Emissions & 99% Occupied Bandwidth for HSUPA (QPSK) Mode, Middle channel



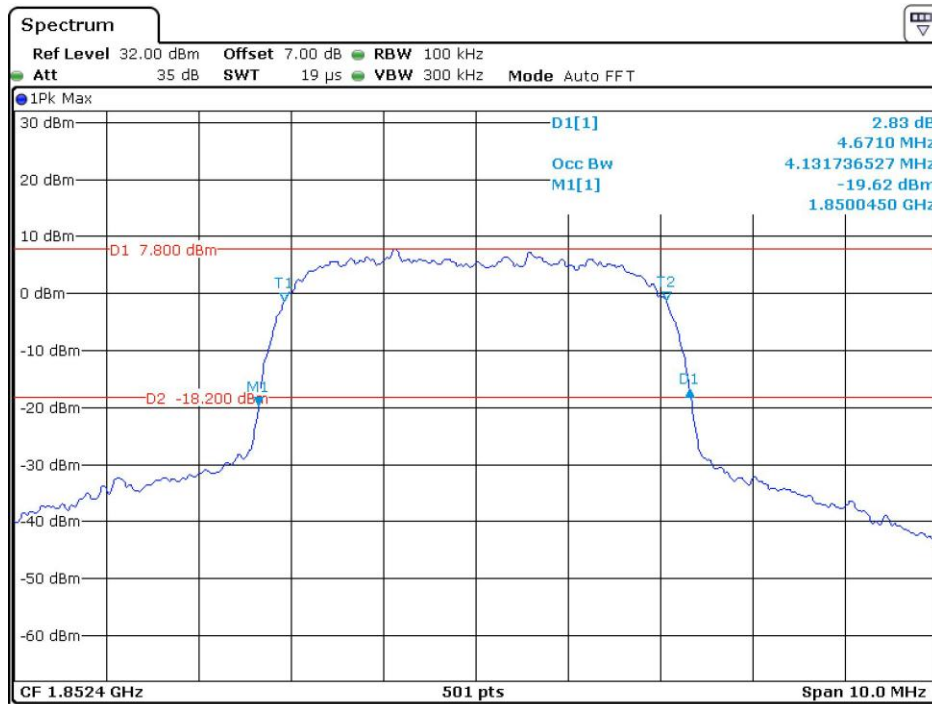
Date: 12.MAR.2022 18:16:42

26 dB Emissions & 99% Occupied Bandwidth for HSUPA (QPSK) Mode, High channel



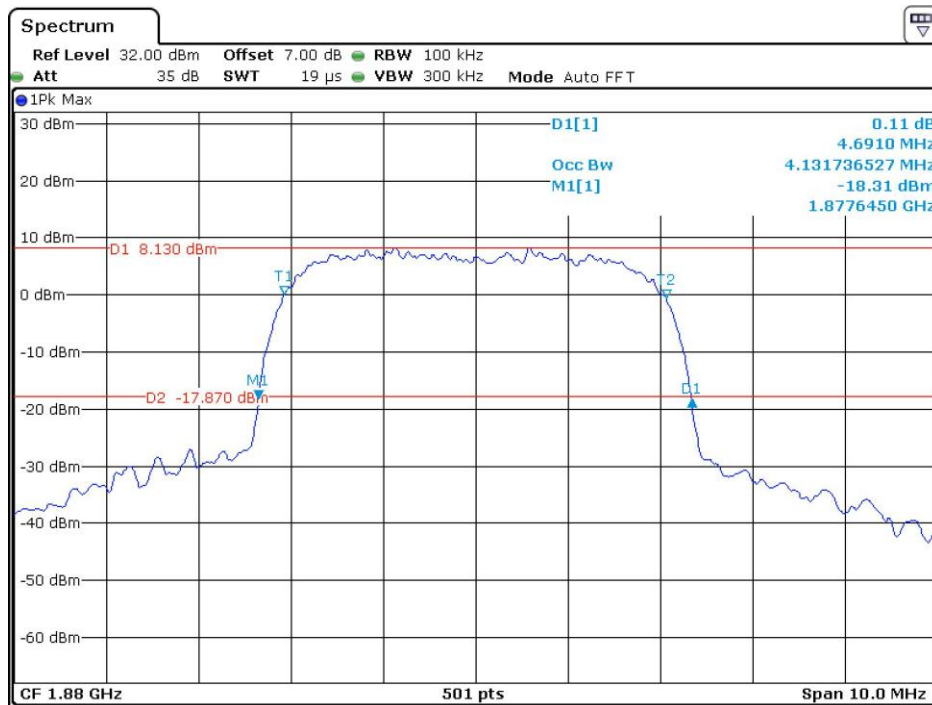
Date: 12.MAR.2022 18:15:45

26 dB Emissions & 99% Occupied Bandwidth for HSDPA (16QAM) Mode, Low channel



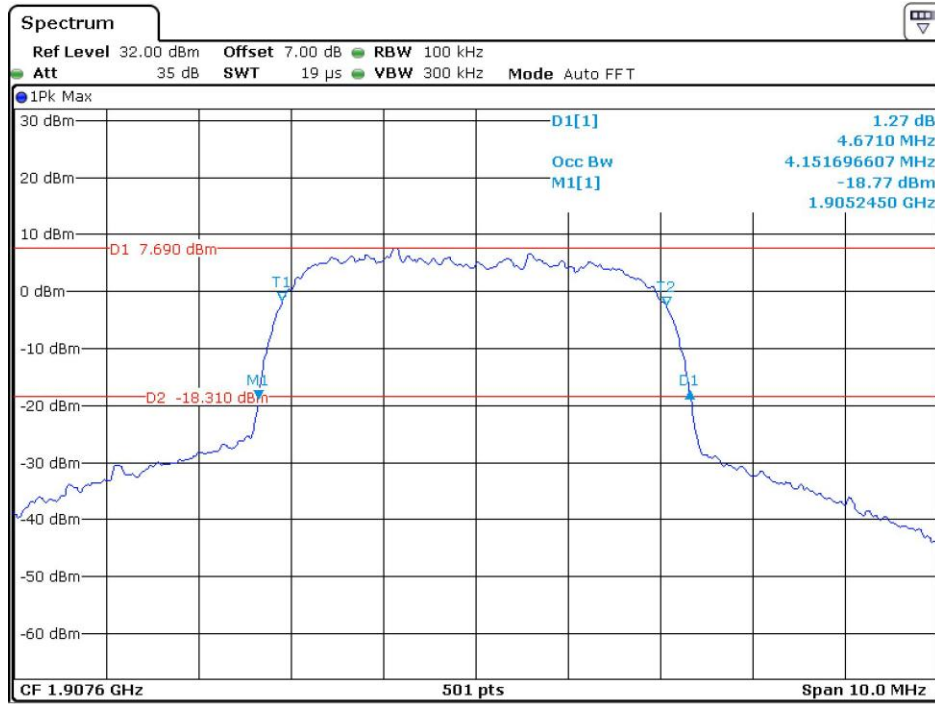
Date: 12.MAR.2022 18:11:24

26 dB Emissions & 99% Occupied Bandwidth for HSDPA (16QAM) Mode, Middle channel



Date: 12.MAR.2022 18:12:00

26 dB Emissions & 99% Occupied Bandwidth for HSDPA (16QAM) Mode, High channel



Date: 12.MAR.2022 18:13:00

FCC §2.1051, §22.917(a) & §24.238(a) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

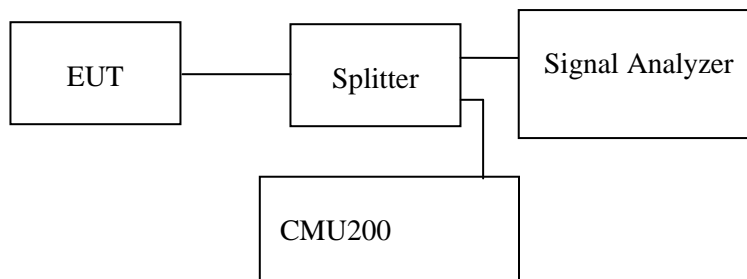
Applicable Standard

FCC §2.1051, §22.917(a) and §24.238(a).

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in §2.1051.

Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100kHz for below 1GHz and 1MHz for above 1GHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.



Test Data

Environmental Conditions

Temperature:	27.2 °C
Relative Humidity:	56.2 %
ATM Pressure:	101.0 kPa

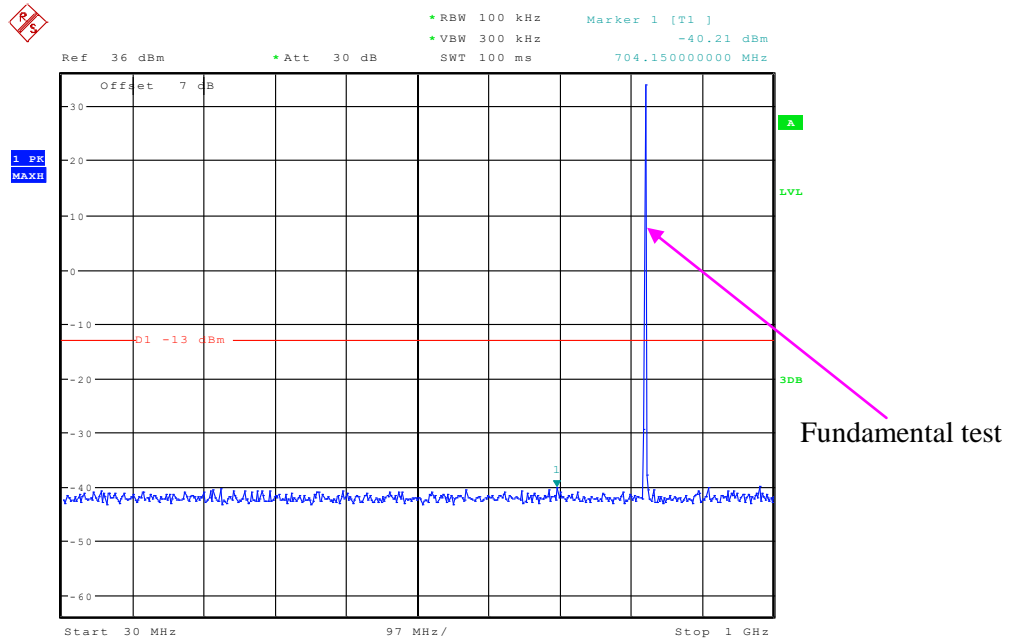
The testing was performed by Black Ding from 2022-03-05 to 2022-03-12.

EUT operation mode: Transmitting

Test result: Compliant, please refer to the following plots.

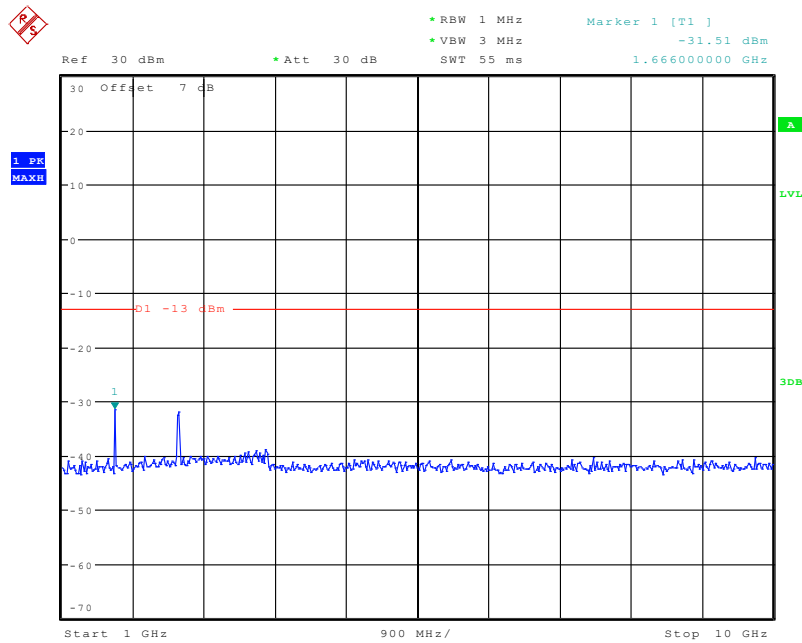
Cellular Band (Part 22H) Low Channel

30 MHz – 1 GHz (GSM Mode)



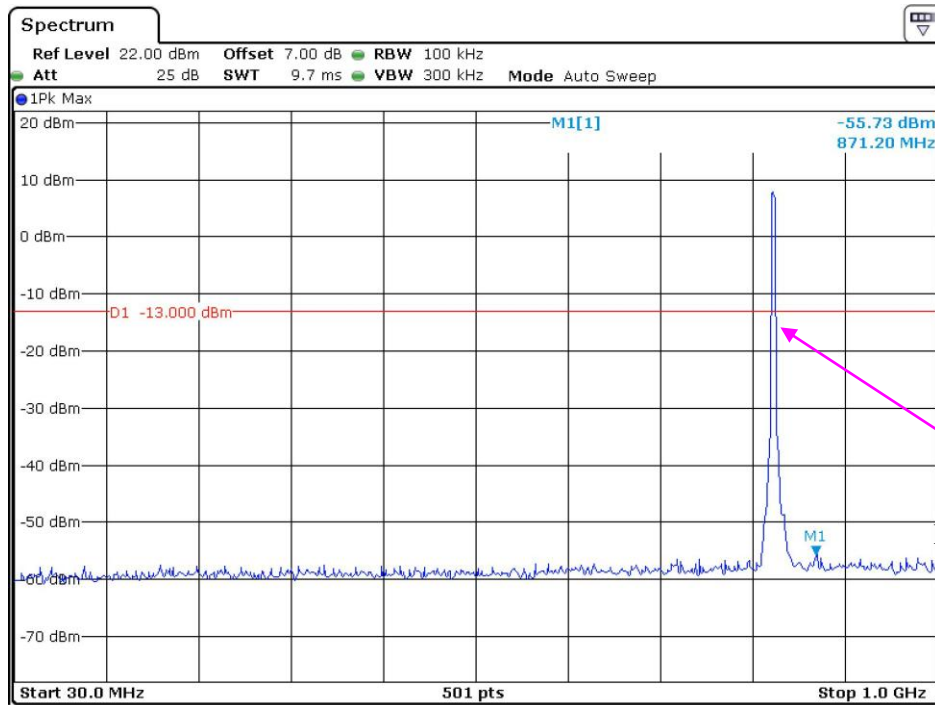
Date: 5.MAR.2022 18:55:19

1 GHz – 10 GHz (GSM Mode)



Date: 5.MAR.2022 18:54:41

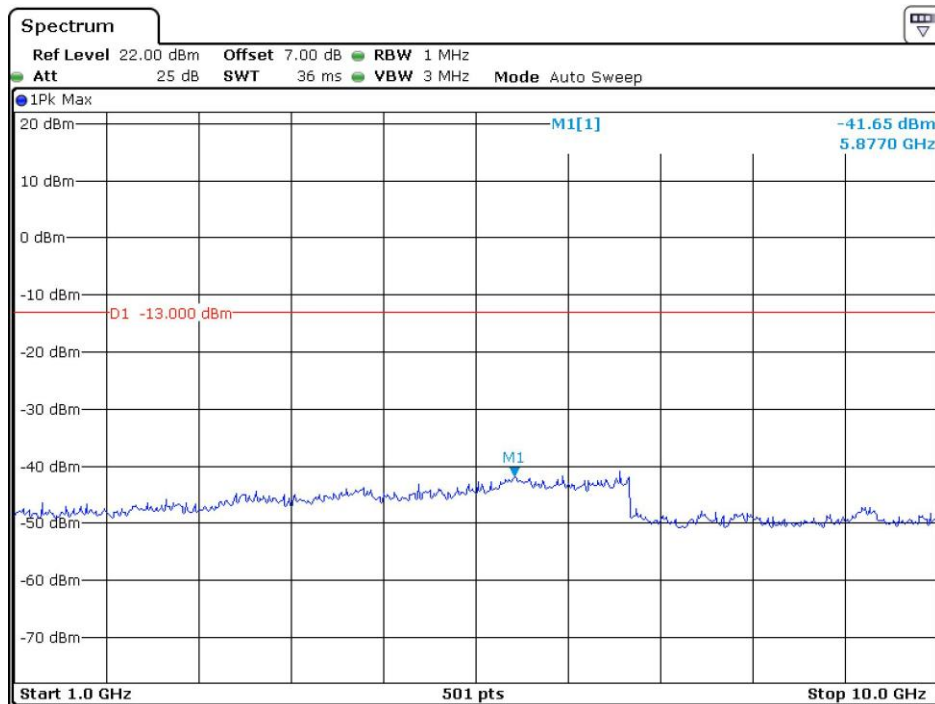
30 MHz – 1 GHz (WCDMA Mode)



Date: 12.MAR.2022 18:31:35

Fundamental test

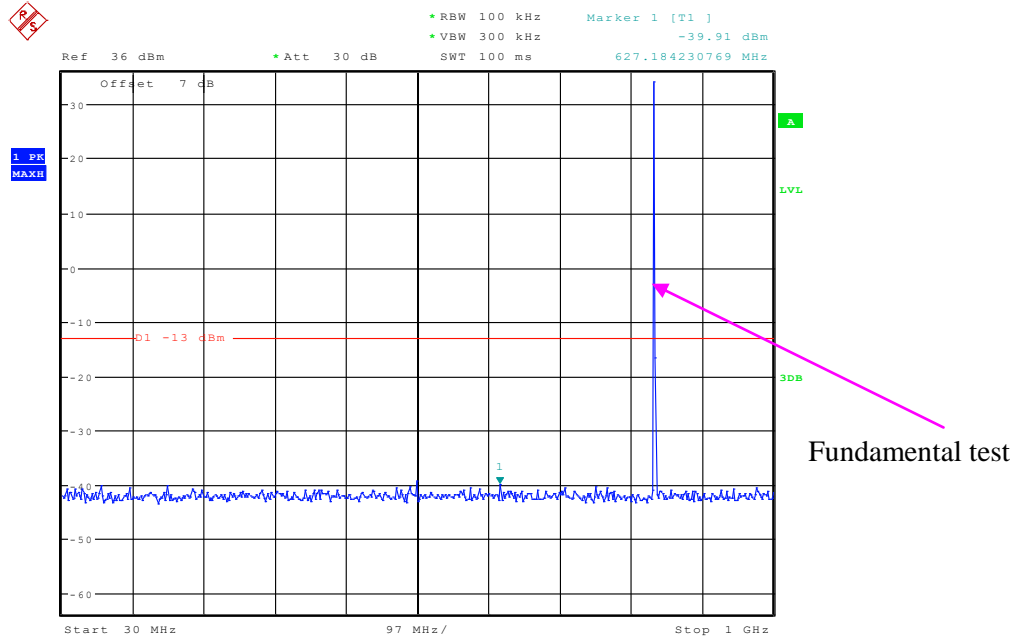
1 GHz – 10 GHz (WCDMA Mode)



Date: 12.MAR.2022 18:29:52

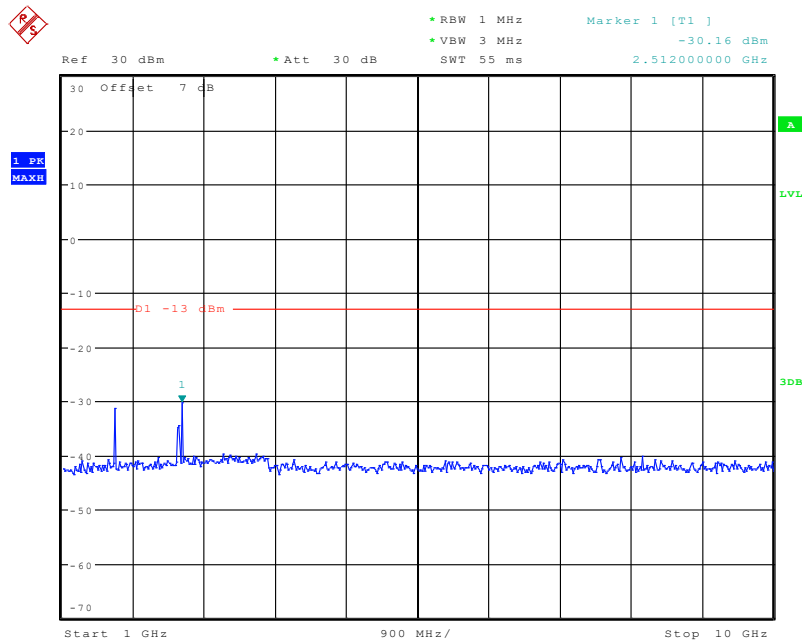
Middle Channel

30 MHz – 1 GHz (GSM Mode)



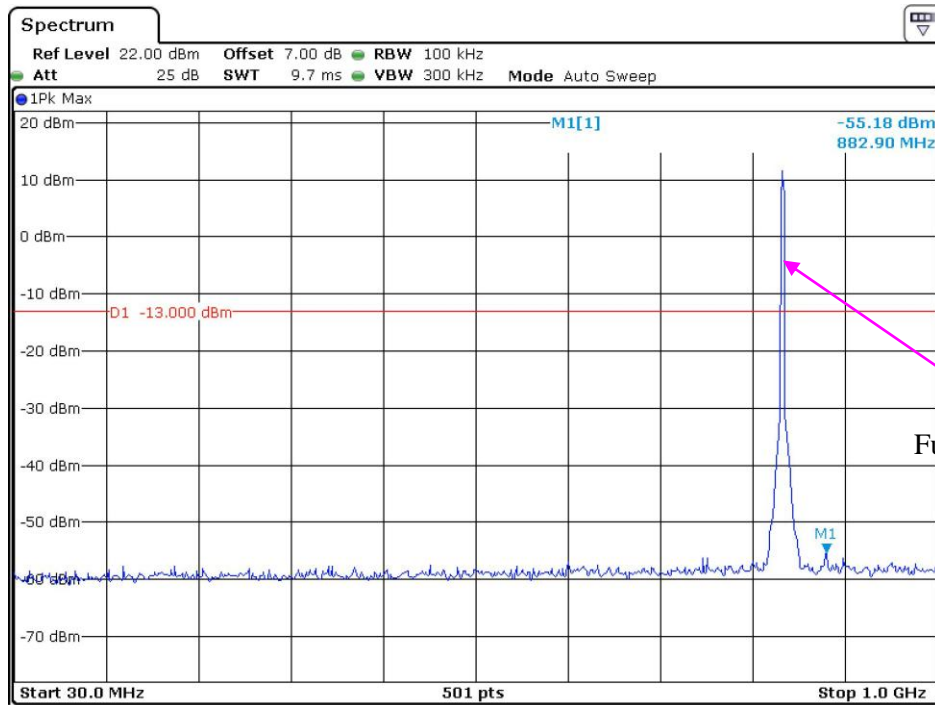
Date: 5.MAR.2022 18:55:46

1 GHz – 10 GHz (GSM Mode)



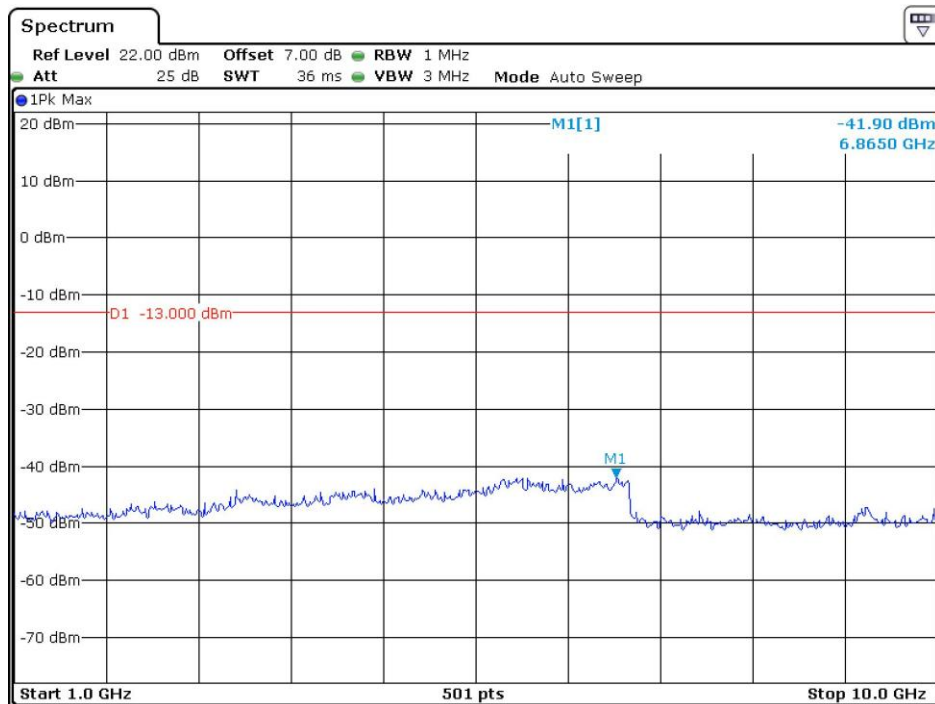
Date: 5.MAR.2022 18:53:44

30 MHz – 1 GHz (WCDMA Mode)



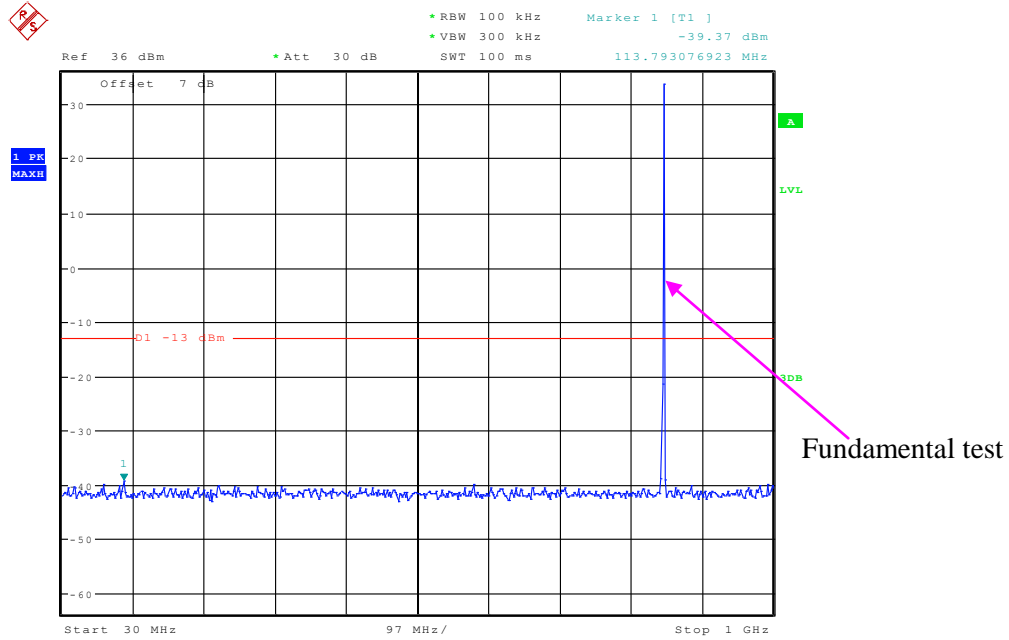
Fundamental test

1 GHz – 10 GHz (WCDMA Mode)



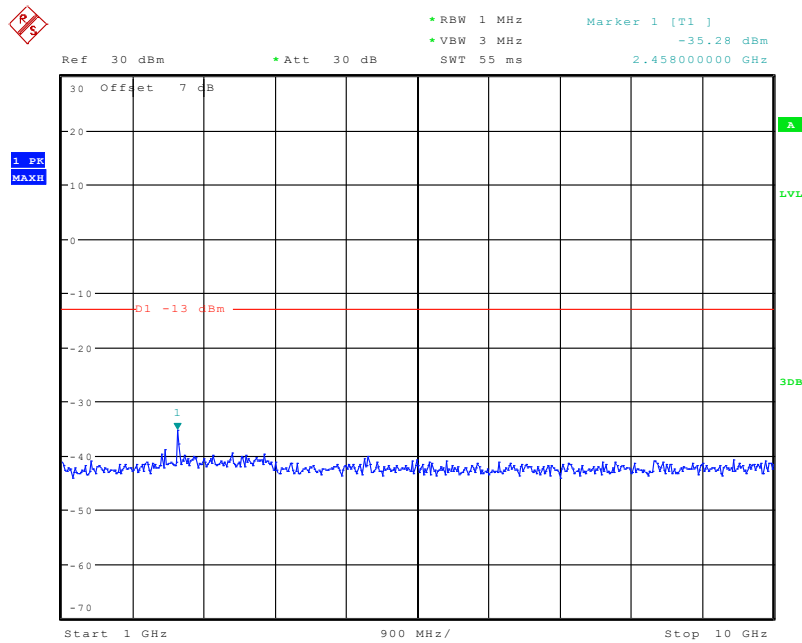
High Channel

30 MHz – 1 GHz (GSM Mode)



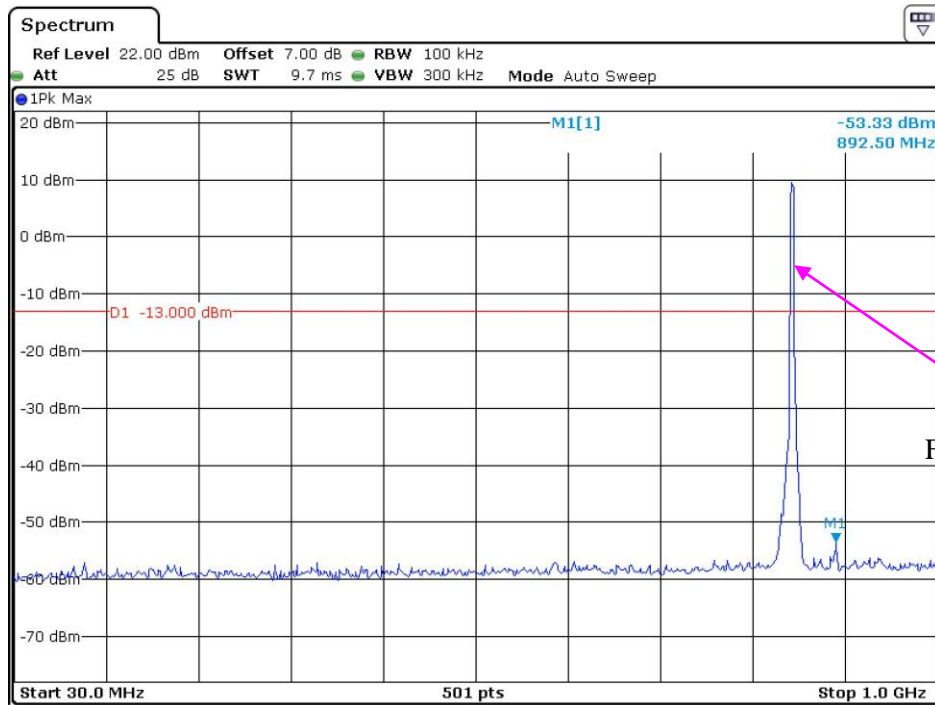
Date: 5.MAR.2022 18:56:17

1 GHz – 10 GHz (GSM Mode)



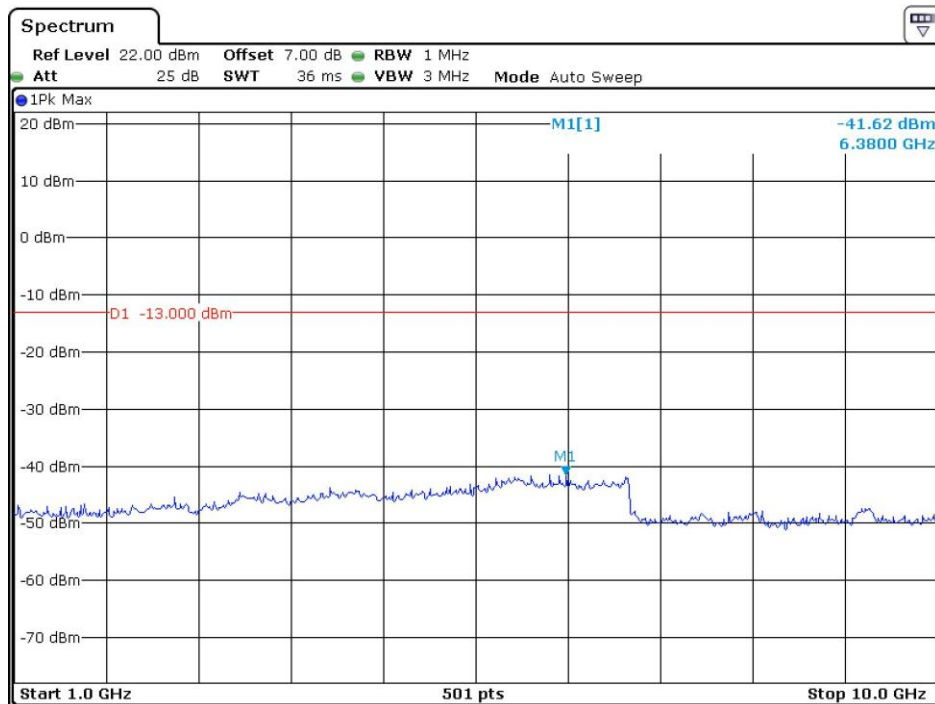
Date: 5.MAR.2022 18:53:58

30 MHz – 1 GHz (WCDMA Mode)



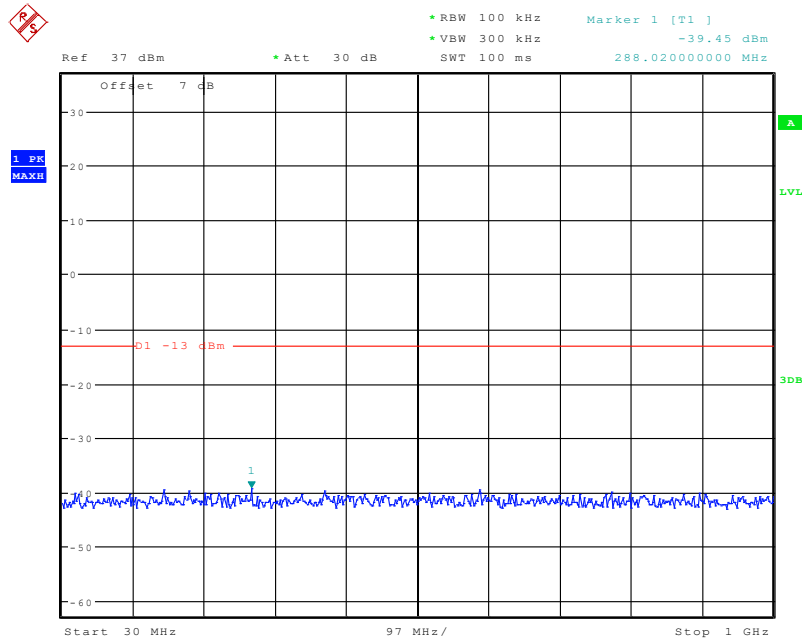
Fundamental test

1 GHz – 10 GHz (WCDMA Mode)



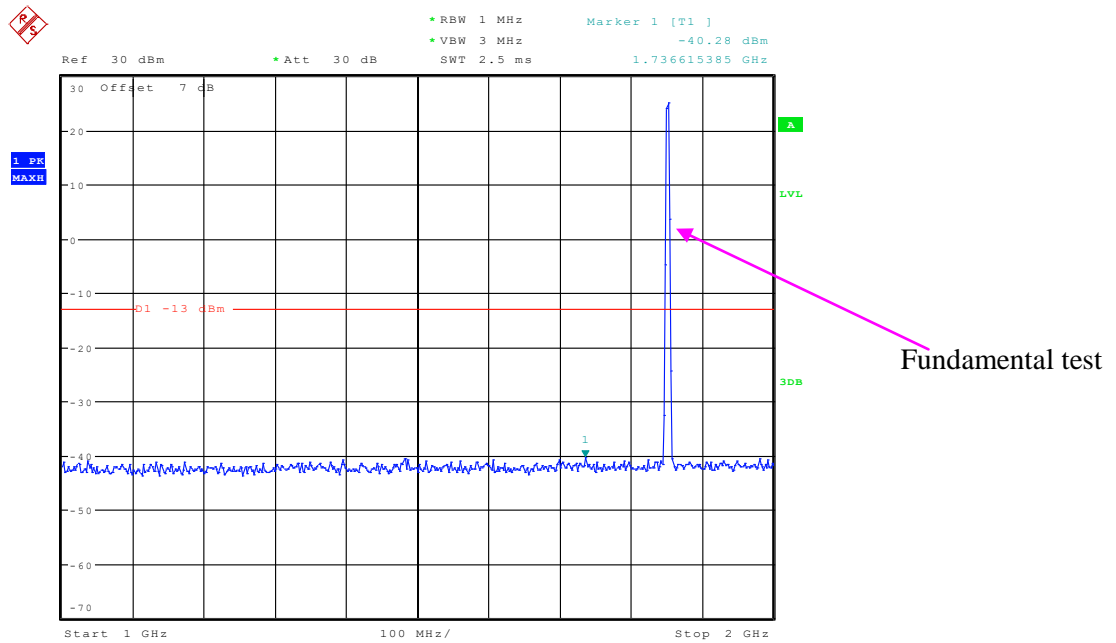
PCS Band (Part 24E) Low Channel

30 MHz – 1 GHz (GSM Mode)



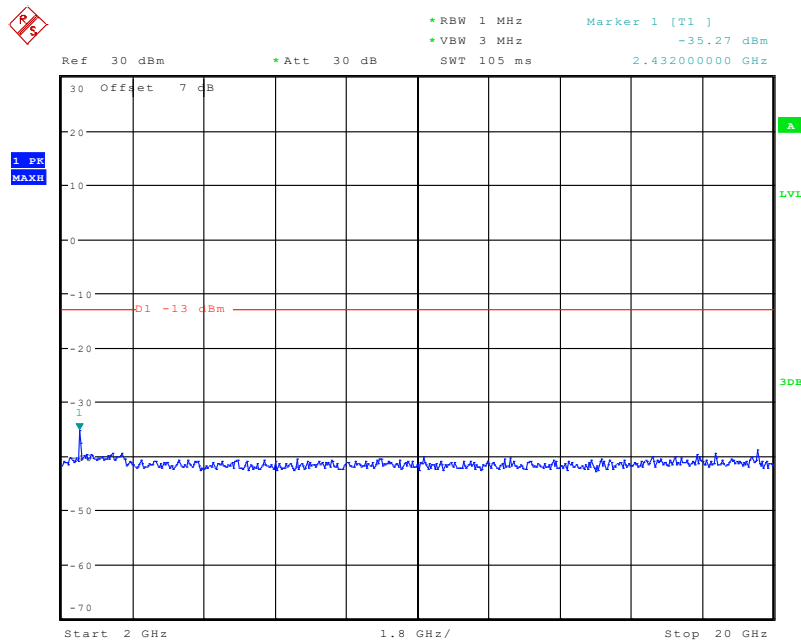
Date: 5.MAR.2022 18:44:09

1 GHz – 2 GHz (GSM Mode)



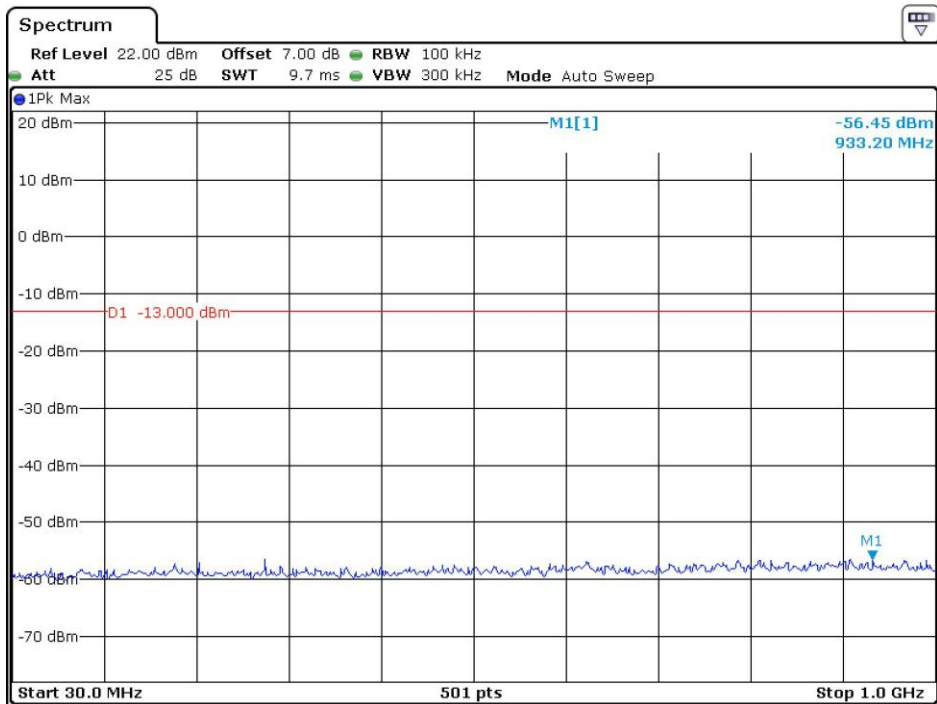
Date: 5.MAR.2022 18:50:48

2 GHz – 20 GHz (GSM Mode)



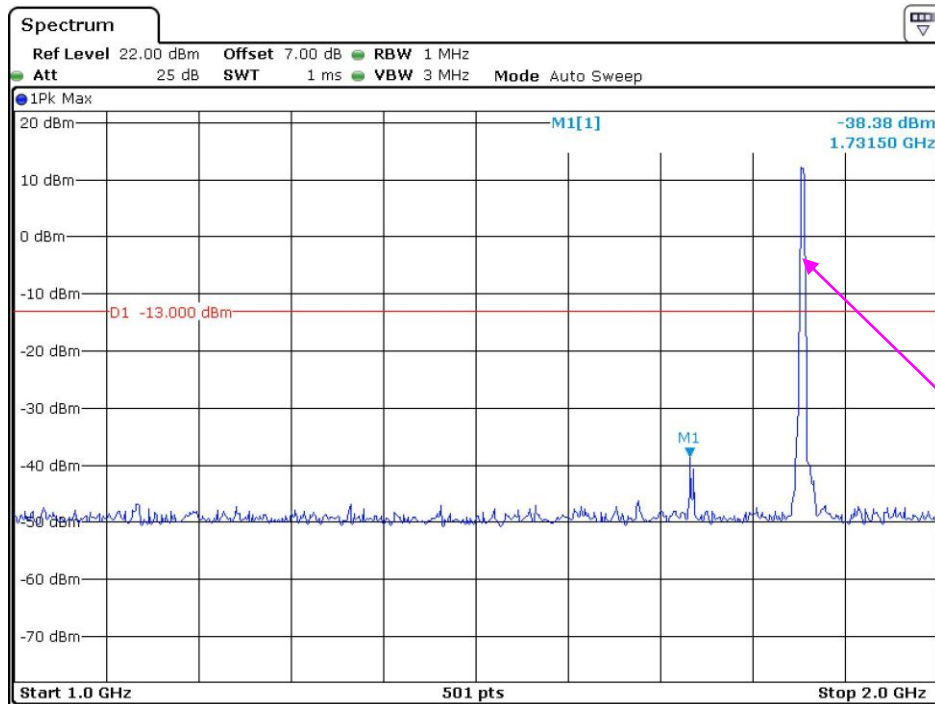
Date: 5.MAR.2022 18:48:36

30 MHz – 1 GHz (WCDMA Mode)



Date: 12.MAR.2022 18:32:18

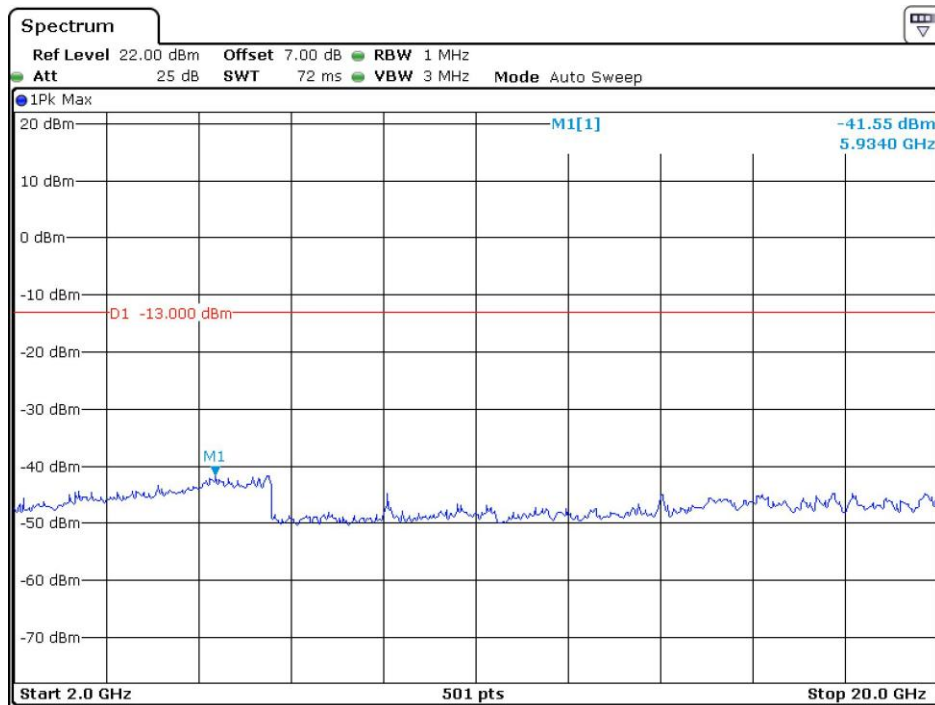
1 GHz – 2 GHz (WCDMA Mode)



Fundamental test

Date: 12.MAR.2022 18:34:01

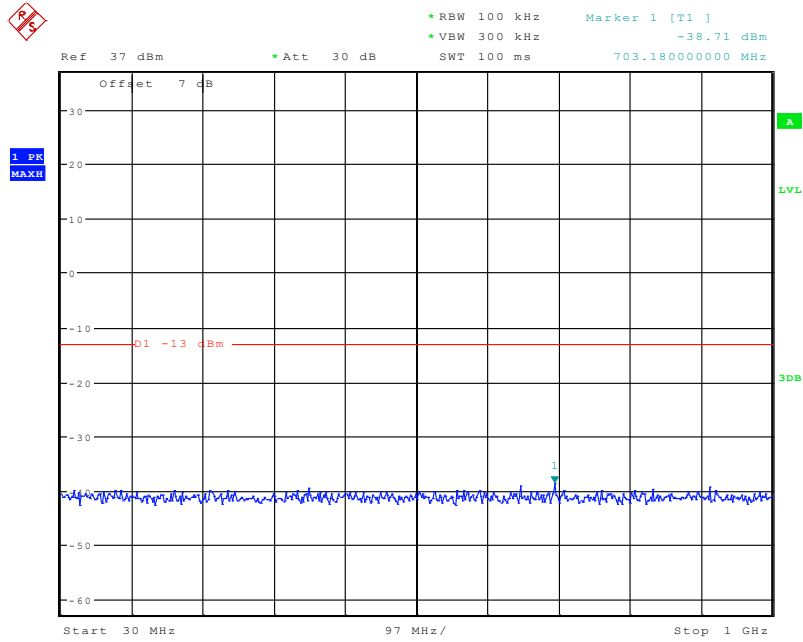
2 GHz – 20 GHz (WCDMA Mode)



Date: 12.MAR.2022 18:34:29

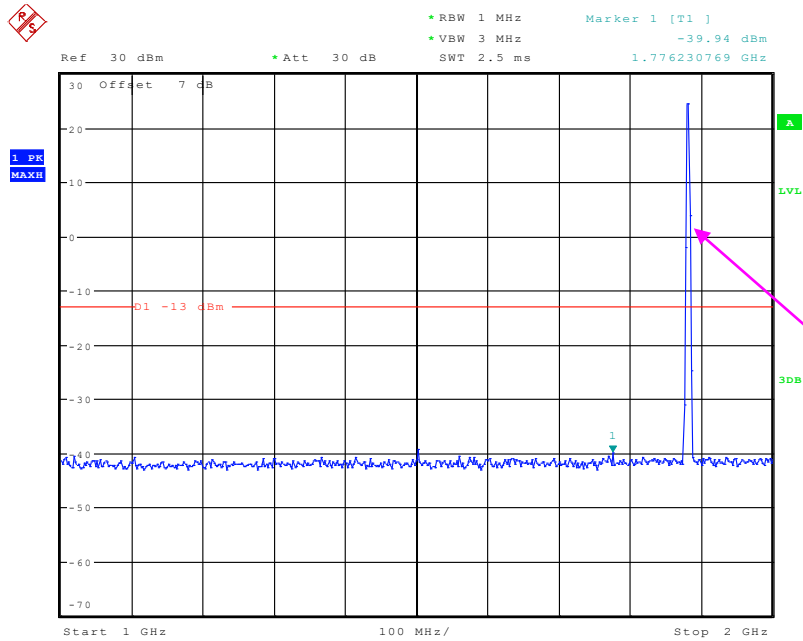
Middle Channel

30 MHz – 1 GHz (GSM Mode)



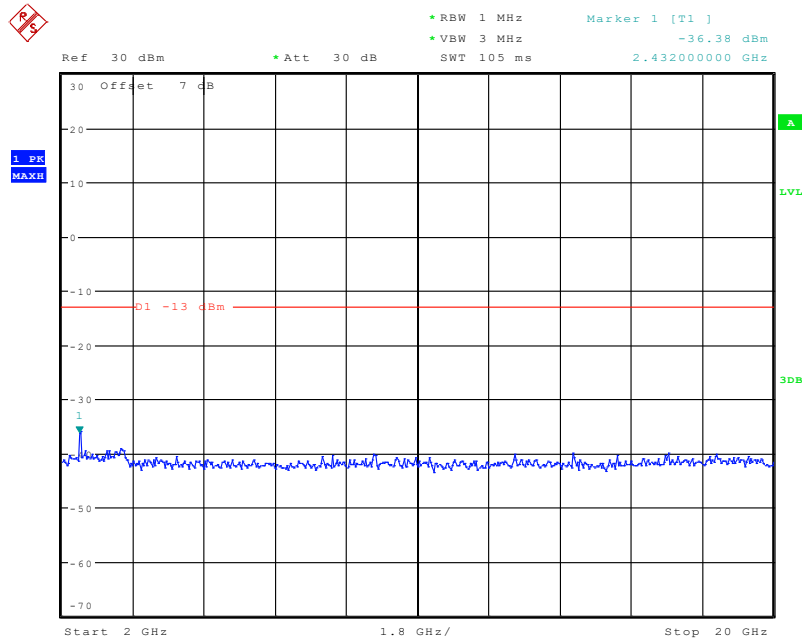
Date: 5.MAR.2022 18:44:37

1 GHz – 2 GHz (GSM Mode)



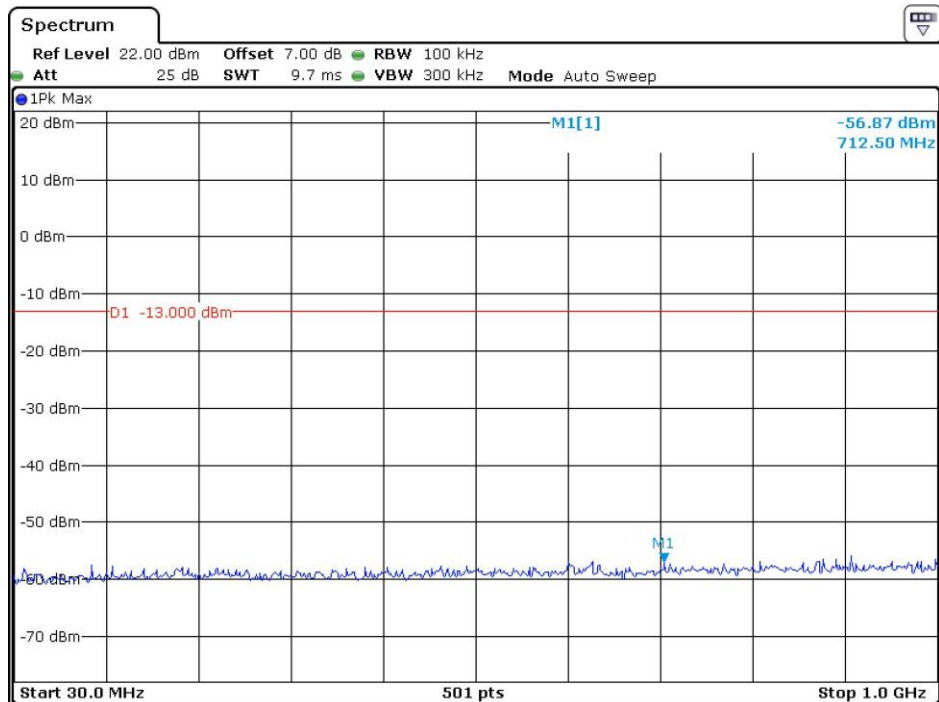
Date: 5.MAR.2022 18:50:24

2 GHz – 20 GHz (GSM Mode)



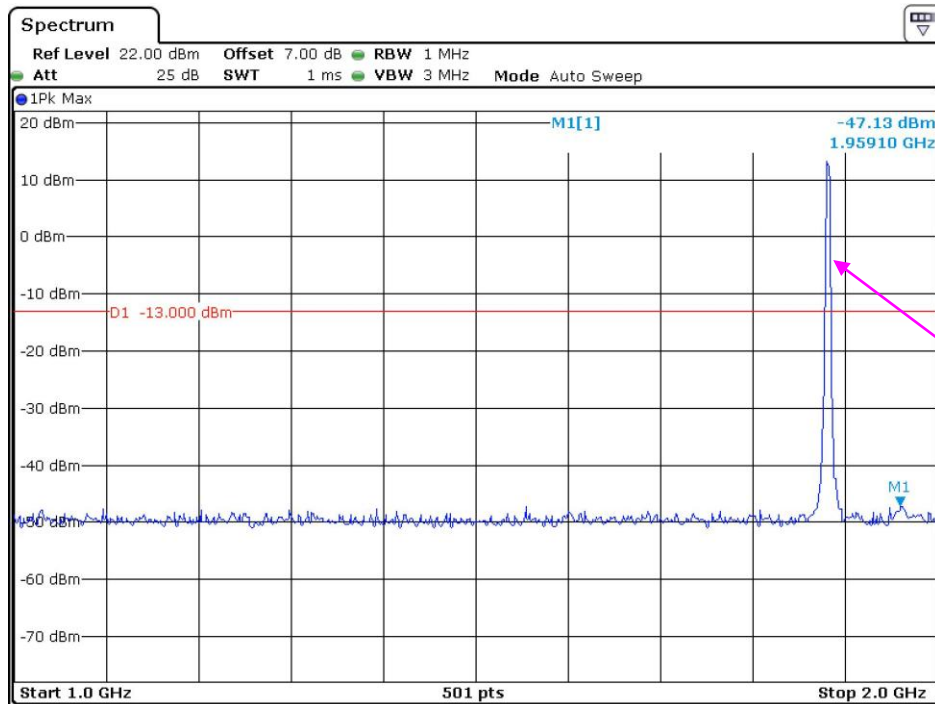
Date: 5.MAR.2022 18:48:49

30 MHz – 1 GHz (WCDMA Mode)



Date: 12.MAR.2022 18:32:33

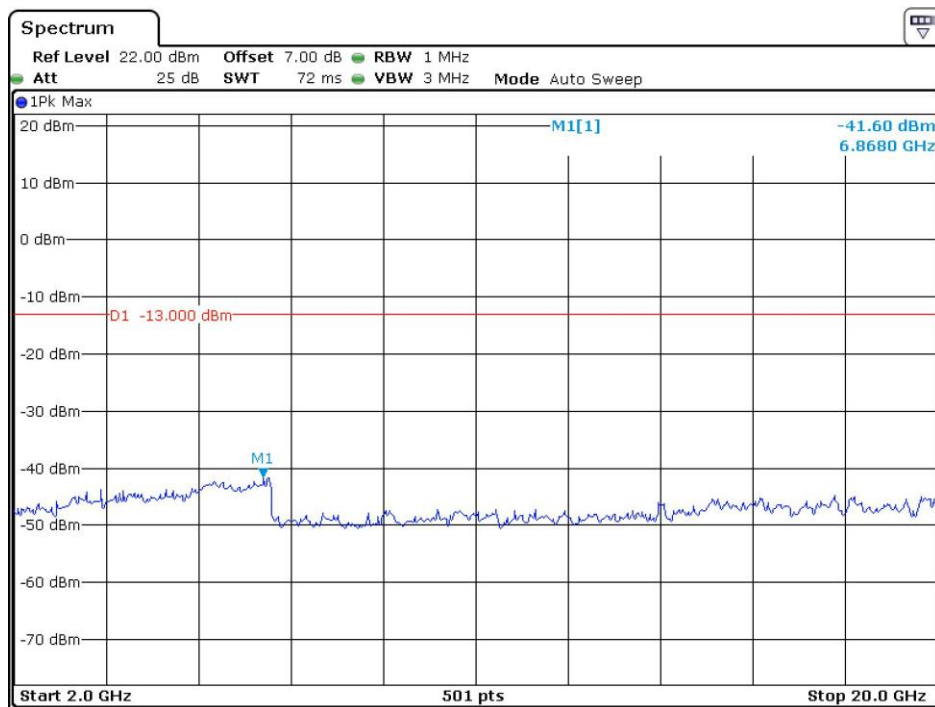
1 GHz – 2GHz (WCDMA Mode)



Fundamental test

Date: 12.MAR.2022 18:33:38

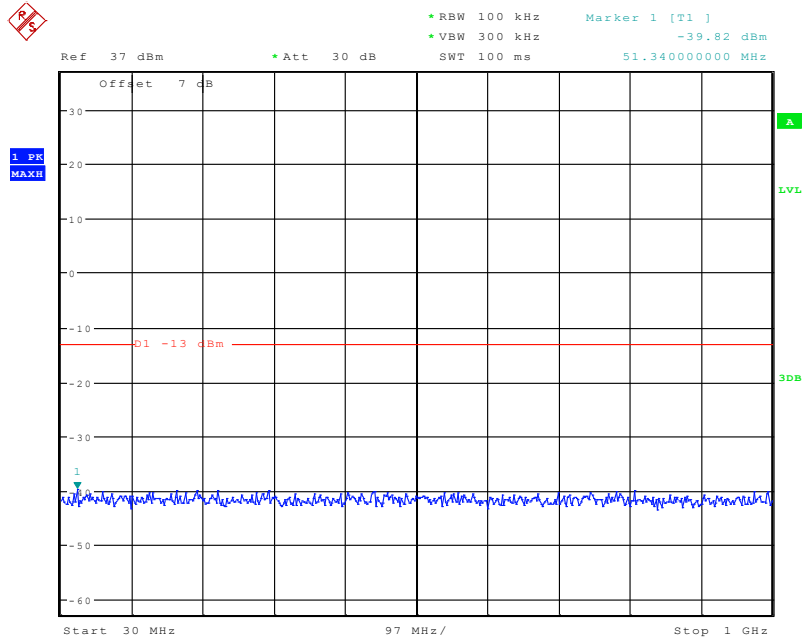
2 GHz – 20GHz (WCDMA Mode)



Date: 12.MAR.2022 18:34:45

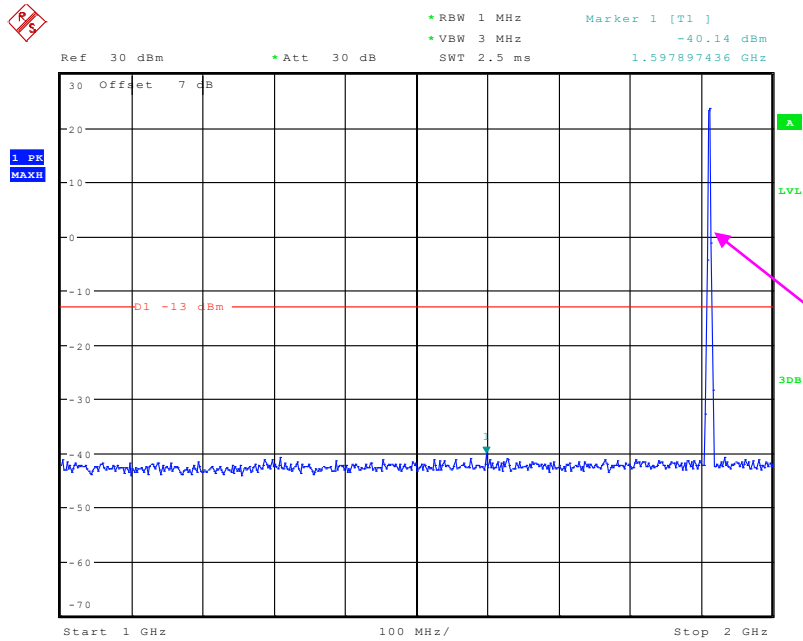
High Channel

30 MHz – 1 GHz (GSM Mode)



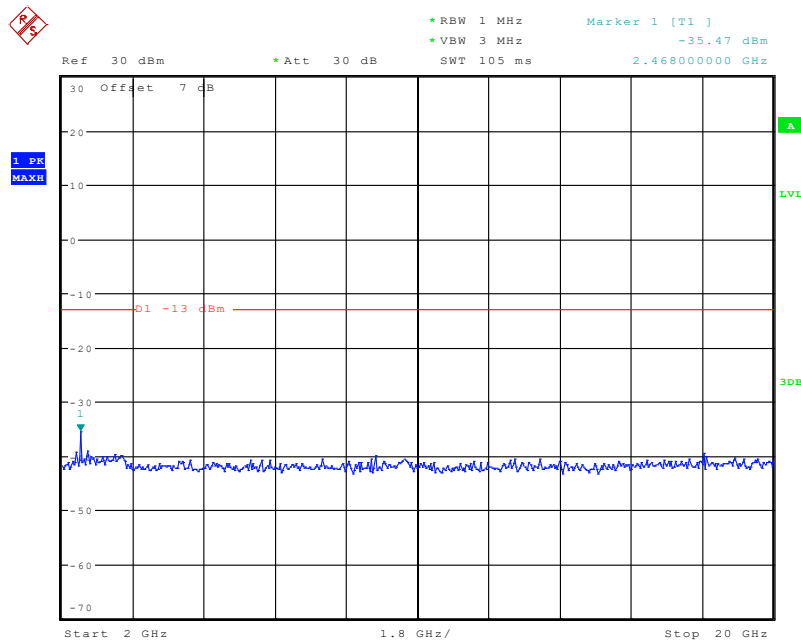
Date: 5.MAR.2022 18:44:51

1 GHz – 2 GHz (GSM Mode)



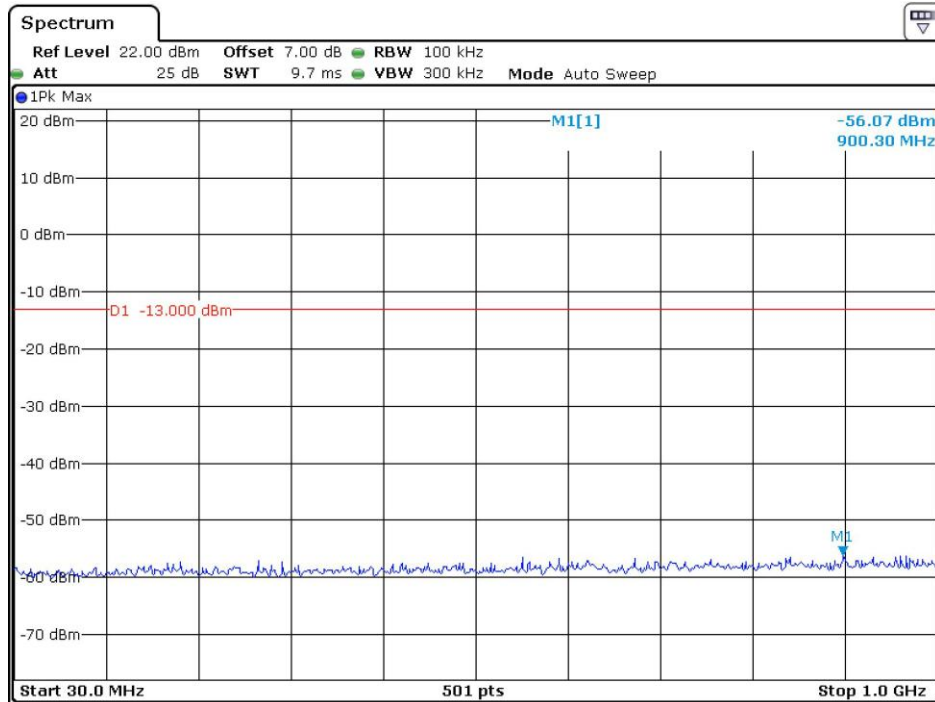
Date: 5.MAR.2022 18:49:18

2 GHz – 20 GHz (GSM Mode)



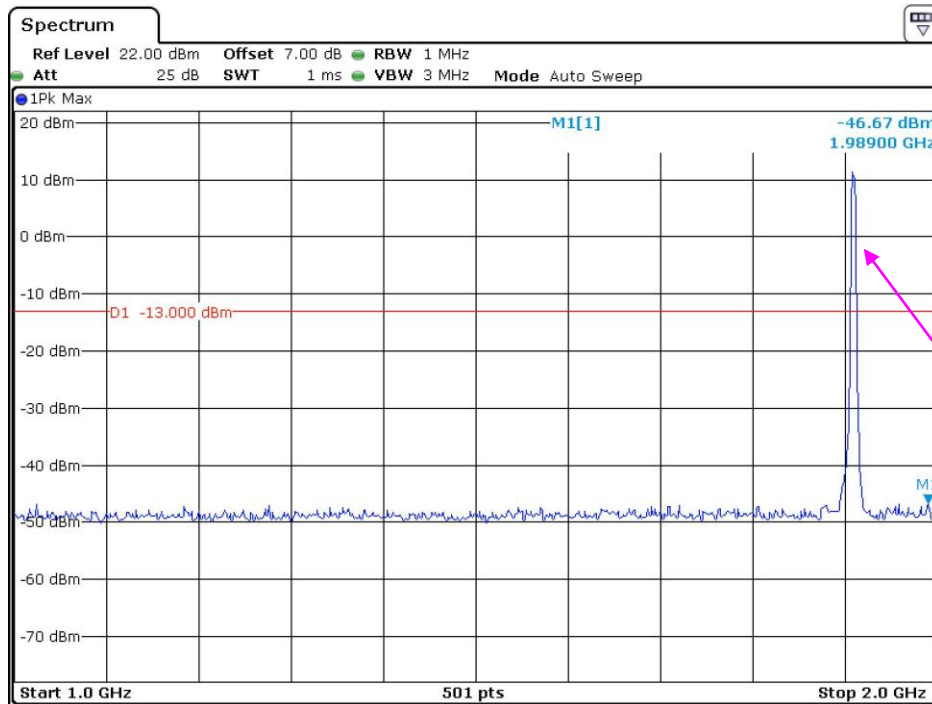
Date: 5.MAR.2022 18:49:00

30 MHz – 1 GHz (WCDMA Mode)



Date: 12.MAR.2022 18:32:52

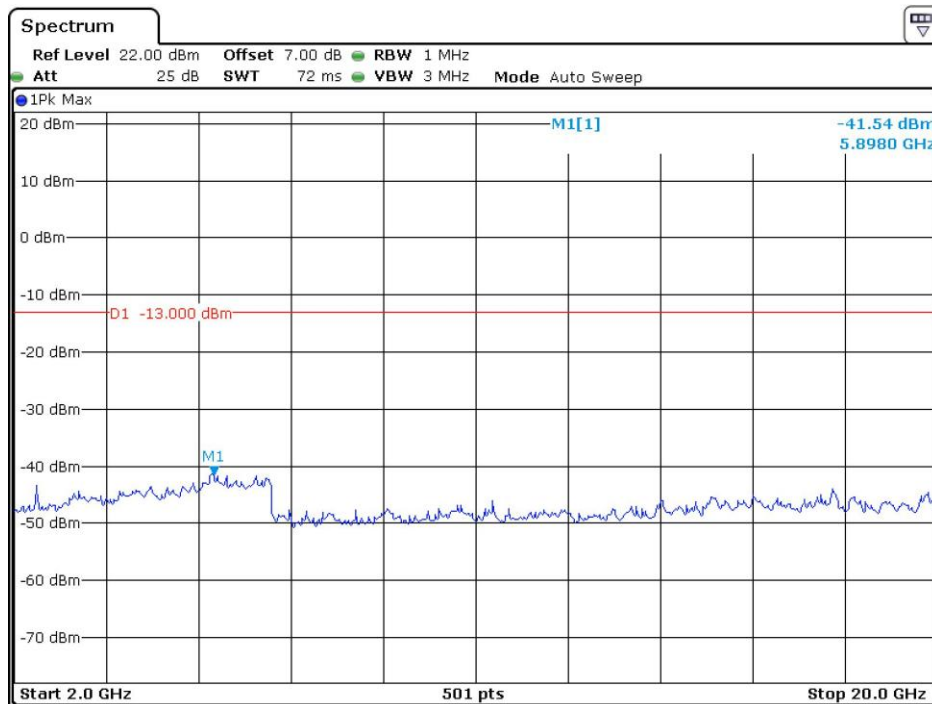
1 GHz – 2 GHz (WCDMA Mode)



Date: 12.MAR.2022 18:33:24

Fundamental test

2GHz – 20 GHz (WCDMA Mode)



Date: 12.MAR.2022 18:35:02

FCC § 2.1053; § 22.917 (a); § 24.238 (a) -SPURIOUS RADIATED EMISSIONS

Applicable Standard

FCC § 2.1053, §22.917(a) and § 24.238(a).

Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the receiving antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 lg (TX pwr in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 Log₁₀ (power out in Watts)

Test Data

Environmental Conditions

Temperature:	20~25.5 °C
Relative Humidity:	50~58 %
ATM Pressure:	101.0~101.1 kPa

The testing was performed by Chao Mo on 2022-03-11 for below 1GHz and on 2022-03-03 for above 1GHz.

EUT operation mode: Transmitting(Pre-scan in the X,Y and Z axes of orientation, the worst case Y-axes of orientation was recorded)

30MHz-10GHz:**Cellular Band (Part 22H)**

Frequency (MHz)	Receiver Reading (dBm)	Turntable Degree	Rx Antenna		Substituted Factor (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)				
GSM850								
Low Channel								
959.45	-61.63	43	1.6	H	10	-51.63	-13	-38.63
959.45	-61.27	103	1.3	V	11.7	-49.57	-13	-36.57
1648.4	-53.80	246	1.7	H	3.5	-50.30	-13	-37.30
1648.4	-52.00	303	2	V	3.1	-48.90	-13	-35.90
2472.6	-46.50	111	1.6	H	6.6	-39.90	-13	-26.90
2472.6	-47.70	336	1.6	V	5.8	-41.90	-13	-28.90
3296.8	-48.50	340	2.2	H	6.4	-42.10	-13	-29.10
3296.8	-49.40	194	1.1	V	5.7	-43.70	-13	-30.70
Middle Channel								
959.51	-61.24	12	2.3	H	10	-51.24	-13	-38.24
959.51	-61.36	17	2.1	V	11.7	-49.66	-13	-36.66
1673.2	-49.30	187	1.1	H	3.8	-45.50	-13	-32.50
1673.2	-46.50	301	2.4	V	3.1	-43.40	-13	-30.40
2509.8	-49.00	335	2.1	H	6.2	-42.80	-13	-29.80
2509.8	-52.20	110	2.4	V	5.6	-46.60	-13	-33.60
3346.4	-50.50	20	1.7	H	6.6	-43.90	-13	-30.90
3346.4	-51.00	152	1	V	5.4	-45.60	-13	-32.60
High Channel								
960.04	-61.42	269	2	H	10	-51.42	-13	-38.42
960.04	-61.47	301	2.3	V	11.7	-49.77	-13	-36.77
1697.6	-50.90	44	2.4	H	4.1	-46.80	-13	-33.80
1697.6	-48.00	159	2.0	V	3.1	-44.90	-13	-31.90
2546.4	-51.00	216	1.9	H	6.1	-44.90	-13	-31.90
2546.4	-51.30	214	1.9	V	5.8	-45.50	-13	-32.50
3395.2	-50.70	316	1.3	H	6.2	-44.50	-13	-31.50
3395.2	-50.80	113	2.0	V	5.4	-45.40	-13	-32.40

Frequency (MHz)	Receiver Reading (dBm)	Turntable Degree	Rx Antenna		Substituted Factor (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)				
WCDMA Band 5								
Low Channel								
959.76	-60.92	259	1.1	H	10	-50.92	-13	-37.92
959.76	-61.3	96	2	V	11.7	-49.6	-13	-36.6
1652.8	-49.50	202	1.1	H	3.5	-46.00	-13	-33.00
1652.8	-50.30	74	2.4	V	3.1	-47.20	-13	-34.20
2479.2	-46.60	311	1.4	H	6.6	-40.00	-13	-27.00
2479.2	-47.00	44	1.7	V	5.8	-41.20	-13	-28.20
3305.6	-49.10	263	2.1	H	6.4	-42.70	-13	-29.70
3305.6	-50.30	258	1.6	V	5.7	-44.60	-13	-31.60
Middle Channel								
959.62	-61.23	262	1.9	H	10	-51.23	-13	-38.23
959.62	-61.48	35	1.1	V	11.7	-49.78	-13	-36.78
1673.2	-47.20	118	1.1	H	3.8	-43.40	-13	-30.40
1673.2	-47.80	90	1.6	V	3.1	-44.70	-13	-31.70
2509.8	-50.20	258	2.5	H	6.2	-44.00	-13	-31.00
2509.8	-50.80	194	2.4	V	5.6	-45.20	-13	-32.20
3346.4	-50.20	36	1.3	H	6.6	-43.60	-13	-30.60
3346.4	-50.40	174	1.7	V	5.4	-45.00	-13	-32.00
High Channel								
960.05	-61.05	208	2.3	H	10	-51.05	-13	-38.05
960.05	-61.49	173	1.8	V	11.7	-49.79	-13	-36.79
1693.2	-53.50	1	2.0	H	4.1	-49.40	-13	-36.40
1693.2	-53.00	58	1.3	V	3.1	-49.90	-13	-36.90
2539.8	-51.00	141	2.0	H	6.1	-44.90	-13	-31.90
2539.8	-54.20	102	2.3	V	5.8	-48.40	-13	-35.40
3386.4	-50.50	274	2.3	H	6.2	-44.30	-13	-31.30
3386.4	-51.00	108	1.2	V	5.4	-45.60	-13	-32.60

30MHz-20GHz:**PCS Band (Part 24E)**

Frequency (MHz)	Receiver Reading (dBm)	Turntable Degree	Rx Antenna		Substituted Factor (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)				
GSM 1900								
Low Channel								
959.52	-61.52	232	1.8	H	10	-51.52	-13	-38.52
959.52	-61.26	277	2.1	V	11.7	-49.56	-13	-36.56
3700.4	-54.60	120	1.9	H	8.1	-46.50	-13	-33.50
3700.4	-54.30	179	1.8	V	7.6	-46.70	-13	-33.70
5550.6	-53.70	53	2.4	H	9.6	-44.10	-13	-31.10
5550.6	-51.90	188	1.8	V	9.1	-42.80	-13	-29.80
Middle Channel								
959.65	-61.15	54	2.4	H	10	-51.15	-13	-38.15
959.65	-61	48	1.3	V	11.7	-49.3	-13	-36.3
3760	-54.80	107	1.4	H	8.8	-46.00	-13	-33.00
3760	-54.40	159	2.2	V	8	-46.40	-13	-33.40
5640	-54.60	5	1.5	H	10.2	-44.40	-13	-31.40
5640	-52.70	55	2.2	V	9.4	-43.30	-13	-30.30
High Channel								
959.37	-61.58	45	1.2	H	10	-51.58	-13	-38.58
959.37	-61.24	135	1.6	V	11.7	-49.54	-13	-36.54
3819.6	-55.60	237	2.4	H	8.7	-46.90	-13	-33.90
3819.6	-55.00	126	2.4	V	7.9	-47.10	-13	-34.10
5729.4	-55.60	205	1.1	H	10.6	-45.00	-13	-32.00
5729.4	-53.80	325	2.4	V	10.2	-43.60	-13	-30.60

Frequency (MHz)	Receiver Reading (dBm)	Turntable Degree	Rx Antenna		Substituted Factor (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)				
WCDMA Band 2								
Low Channel								
42.501	-74.33	353	1.9	H	6.6	-67.73	-13	-54.73
45.012	-68.97	114	1.6	V	1.4	-67.57	-13	-54.57
3704.8	-54.30	93	1.4	H	8.1	-46.20	-13	-33.20
3704.8	-53.50	100	1.3	V	7.6	-45.90	-13	-32.90
5557.2	-54.10	320	2.3	H	9.6	-44.50	-13	-31.50
5557.2	-53.10	172	2.3	V	9.1	-44.00	-13	-31.00
Middle Channel								
42.501	-74.17	21	1.7	H	6.6	-67.57	-13	-54.57
45.012	-69.07	115	1.5	V	1.4	-67.67	-13	-54.67
3760	-55.90	49	2.4	H	8.8	-47.10	-13	-34.10
3760	-55.00	45	2.1	V	8	-47.00	-13	-34.00
5640	-55.50	118	1.3	H	10.2	-45.30	-13	-32.30
5640	-54.20	249	2.1	V	9.4	-44.80	-13	-31.80
High Channel								
42.501	-74.64	72	1.7	H	6.6	-68.04	-13	-55.04
45.012	-69.58	22	1.7	V	1.4	-68.18	-13	-55.18
3815.2	-55.30	52	1.8	H	8.7	-46.60	-13	-33.60
3815.2	-54.70	247	1.1	V	7.9	-46.80	-13	-33.80
5722.8	-56.00	181	1.3	H	10.6	-45.40	-13	-32.40
5722.8	-54.40	195	2.3	V	10.2	-44.20	-13	-31.20

Note:

Absolute Level = Reading Level + Substituted Factor

Substituted Factor contains: SG Level - Cable loss+ Antenna Gain

Margin = Absolute Level - Limit

FCC § 22.917 (a); § 24.238 (a) - BAND EDGES

Applicable Standard

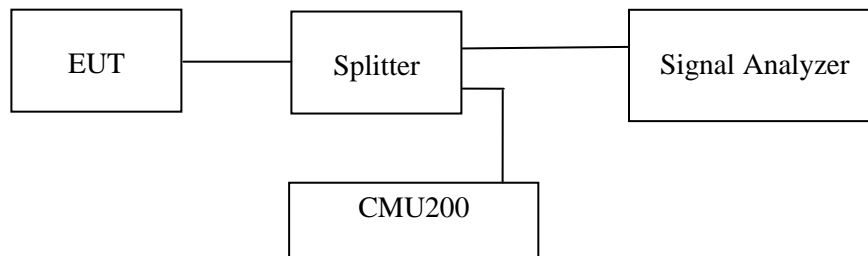
According to § 22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

According to § 24.238(a), the power of any emissions 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.

Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The center of the spectrum analyzer was set to block edge frequency



Test Data

Environmental Conditions

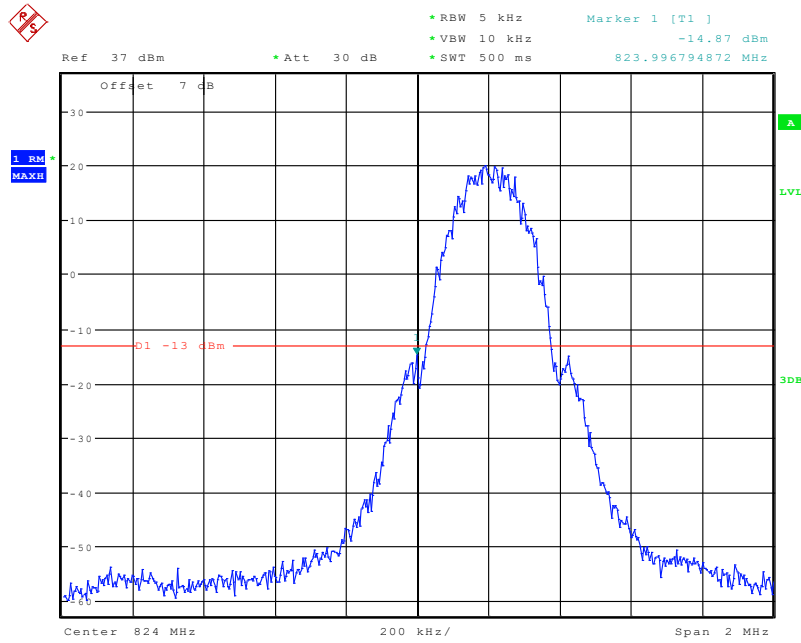
Temperature:	27.2 °C
Relative Humidity:	56.2 %
ATM Pressure:	101.0 kPa

The testing was performed by Black Ding from 2022-03-05 to 2022-03-12.

EUT operation mode: Transmitting

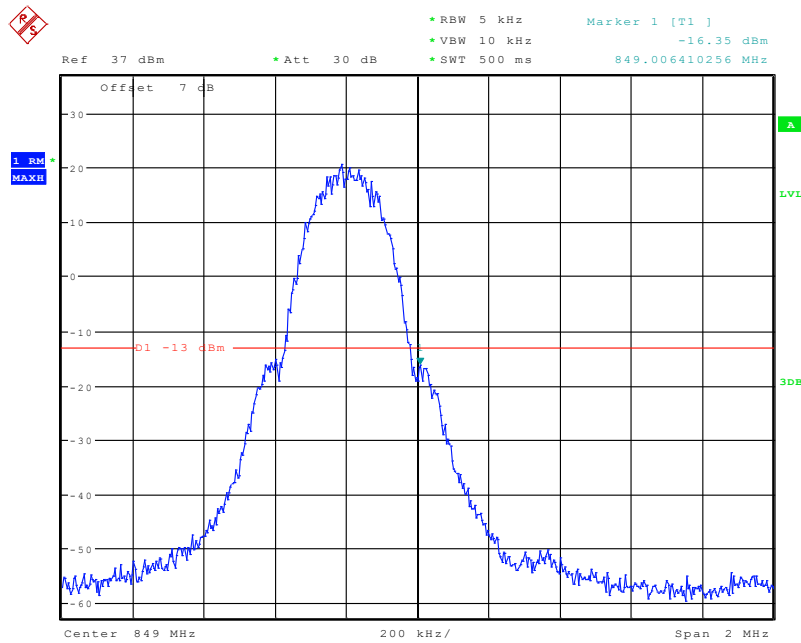
Test Result: Compliant. Please refer to the following plots.

Cellular Band, Left Band Edge for GSM (GMSK) Mode



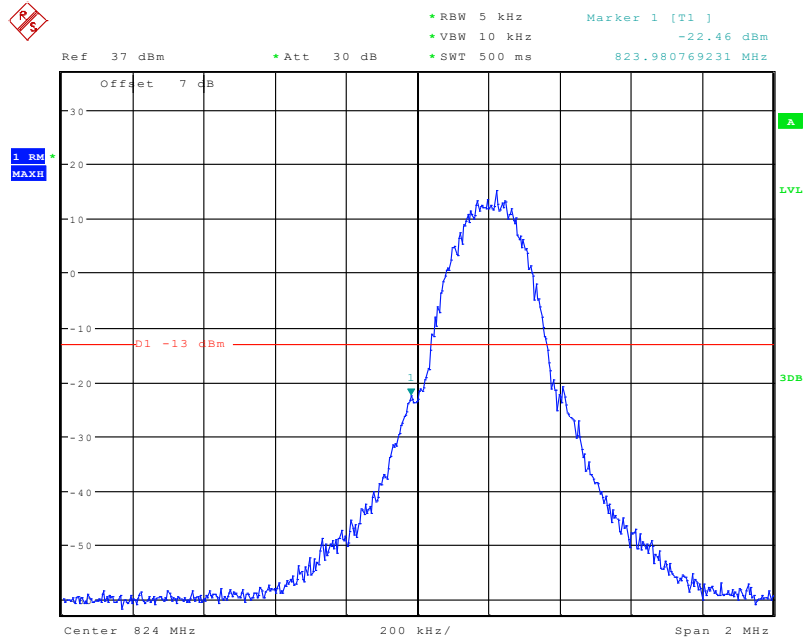
Date: 5.MAR.2022 18:19:11

Cellular Band, Right Band Edge for GSM (GMSK) Mode



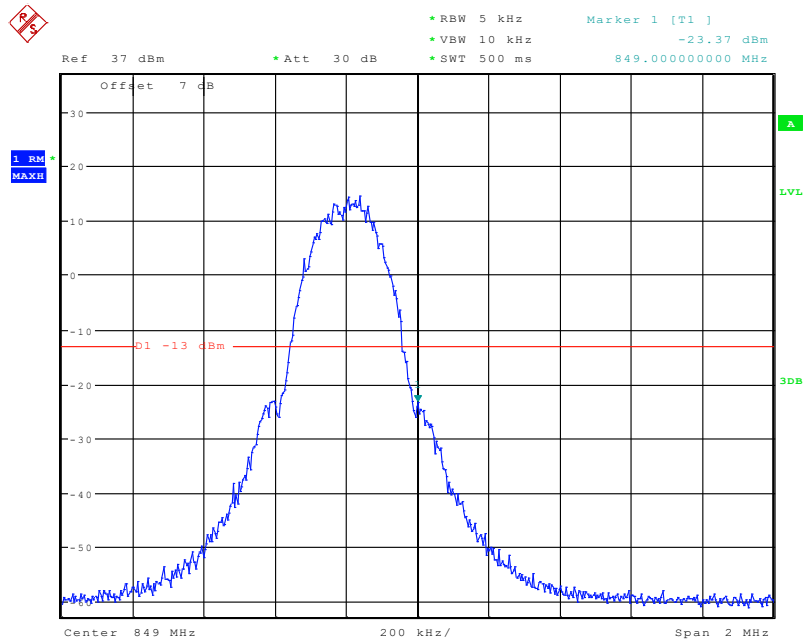
Date: 5.MAR.2022 18:18:36

Cellular Band, Left Band Edge for EGPRS (8PSK) Mode



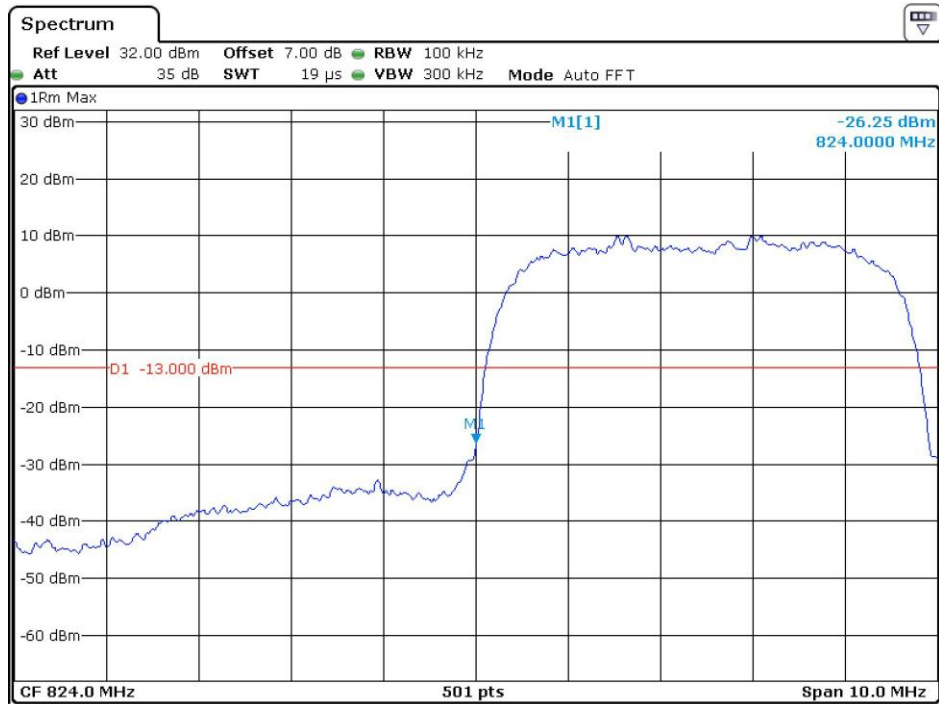
Date: 5.MAR.2022 18:21:16

Cellular Band, Right Band Edge for EGPRS (8PSK) Mode



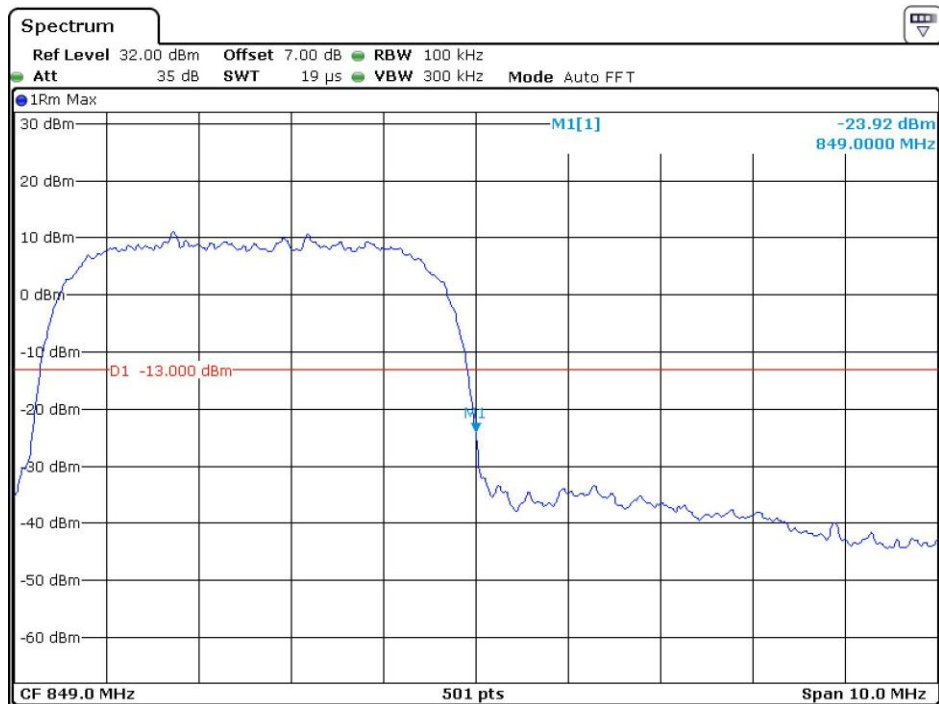
Date: 5.MAR.2022 18:22:20

Cellular Band, Left Band Edge for RMC (BPSK) Mode



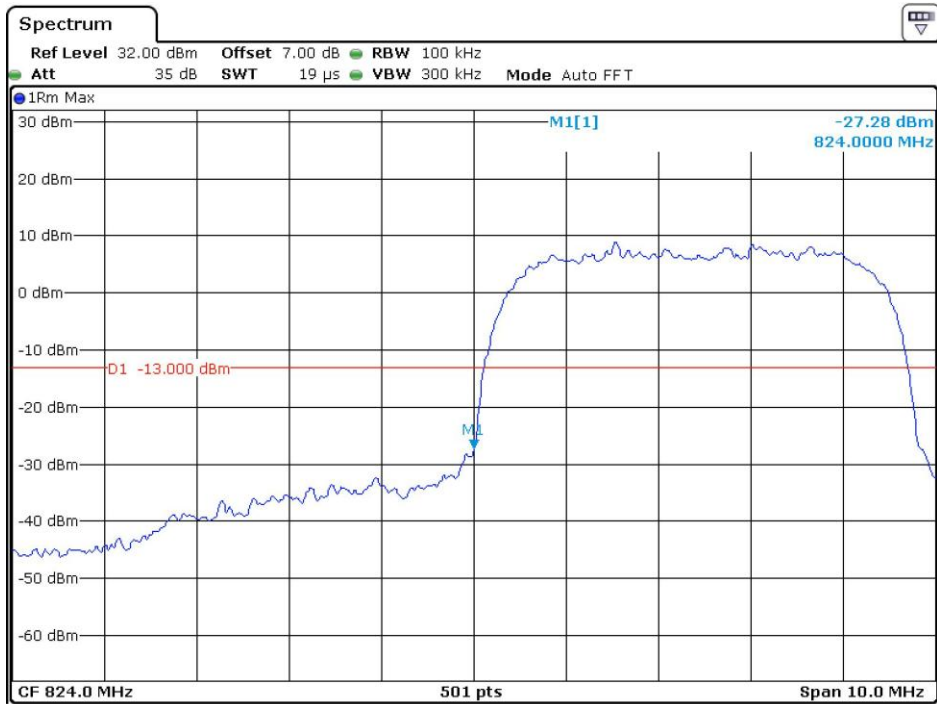
Date: 12.MAR.2022 18:03:36

Cellular Band, Right Band Edge for RMC (BPSK) Mode



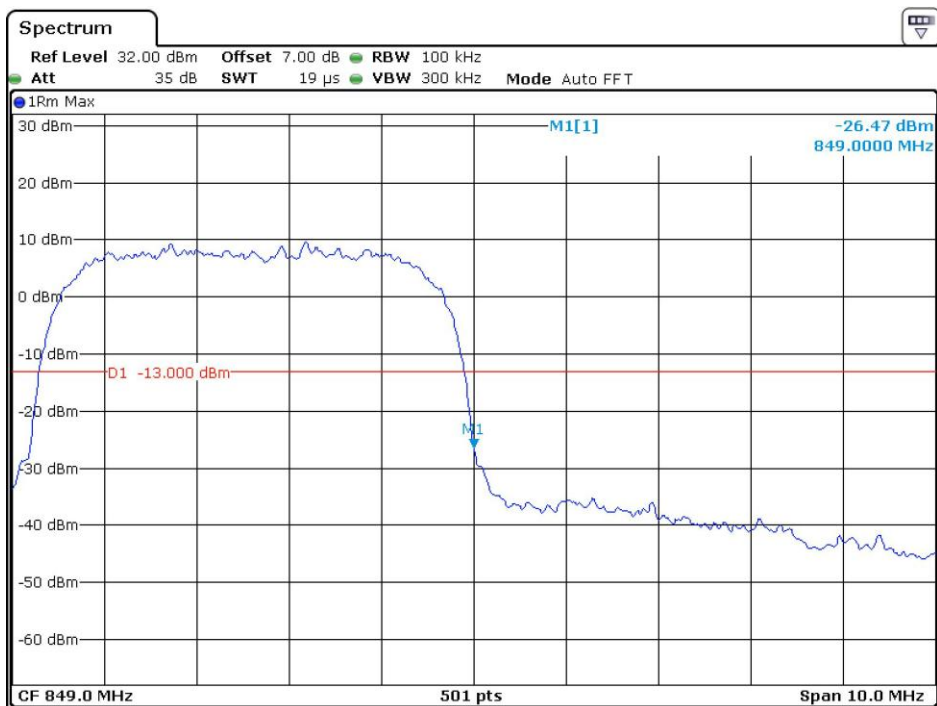
Date: 12.MAR.2022 18:03:05

Cellular Band, Left Band Edge for HSDPA(16QAM) Mode



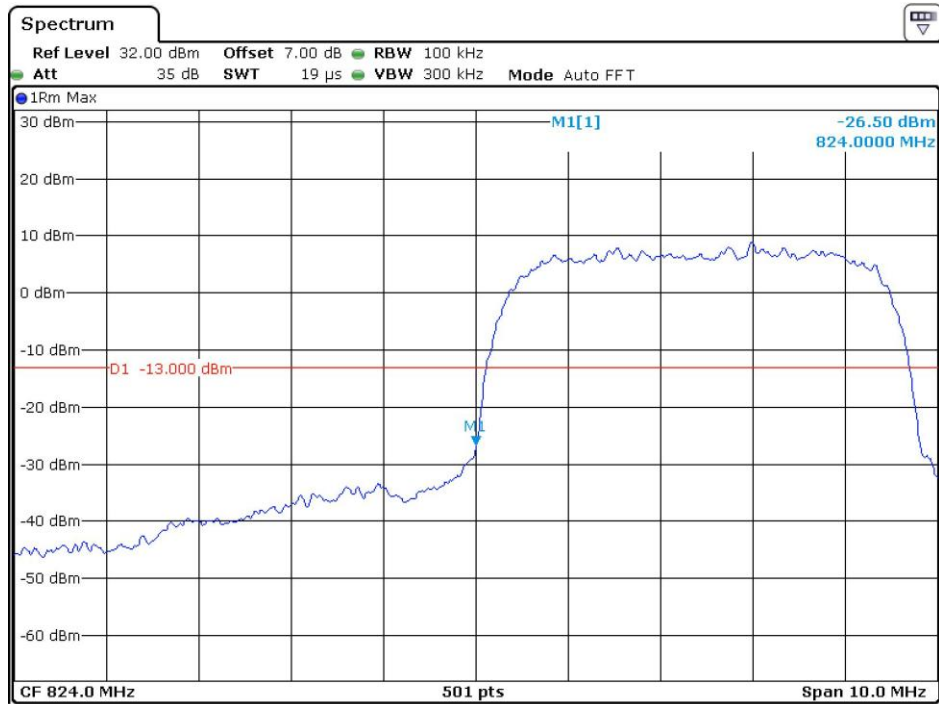
Date: 12.MAR.2022 18:06:50

Cellular Band, Right Band Edge for HSDPA (16QAM) Mode



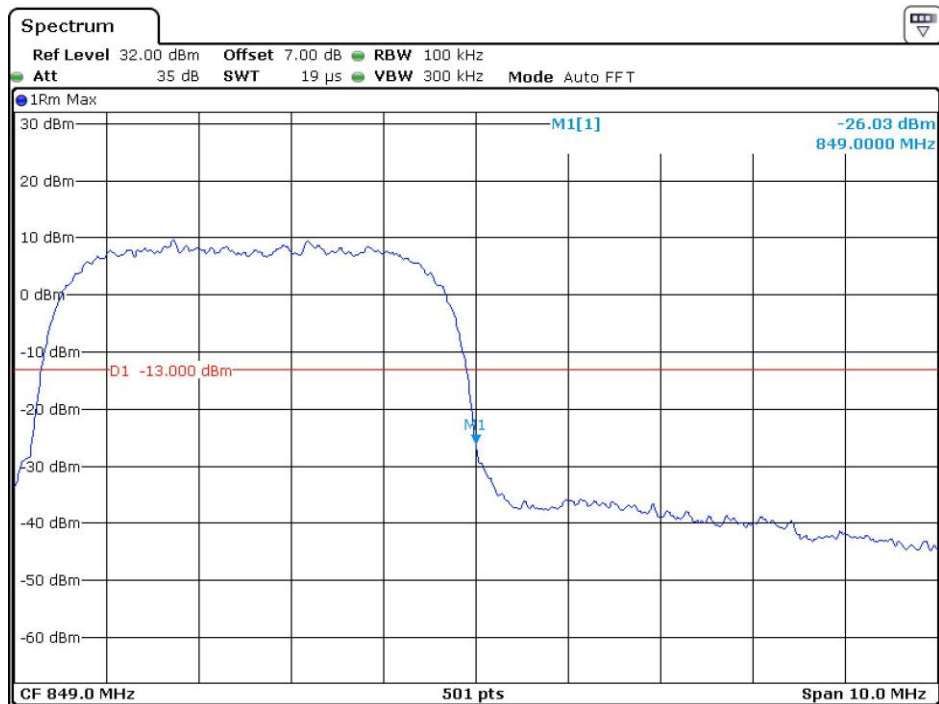
Date: 12.MAR.2022 18:07:10

Cellular Band, Left Band Edge for HSUPA (BPSK) Mode



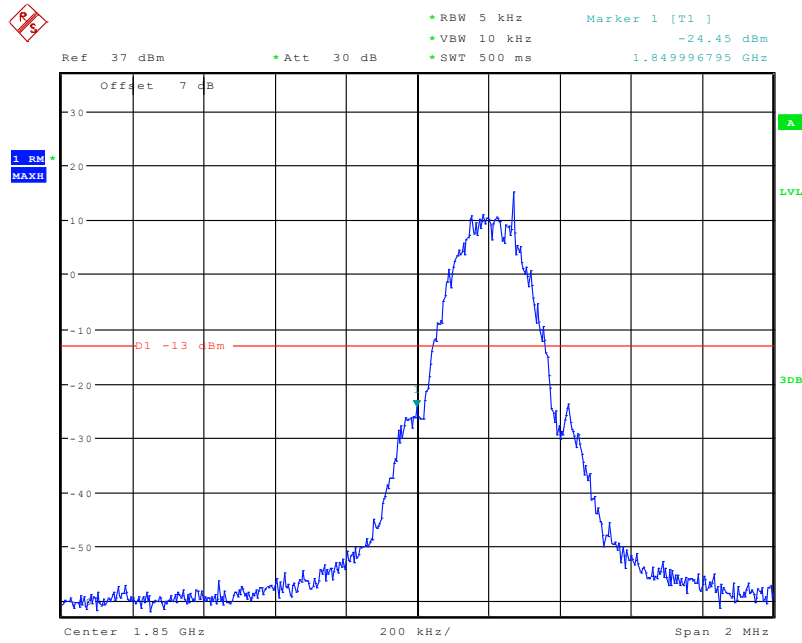
Date: 12.MAR.2022 18:21:20

Cellular Band, Right Band Edge for HSUPA (BPSK) Mode



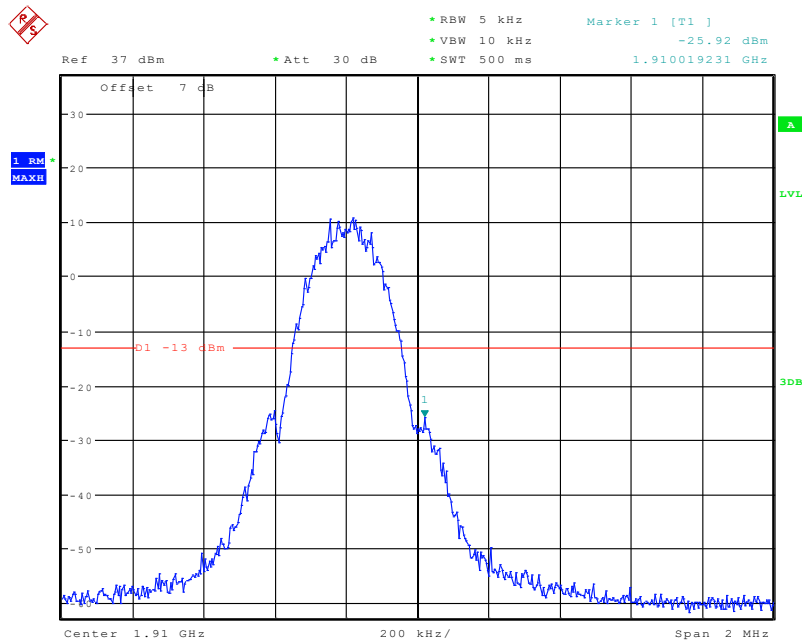
Date: 12.MAR.2022 18:20:59

PCS Band, Left Band Edge for GSM (GMSK) Mode



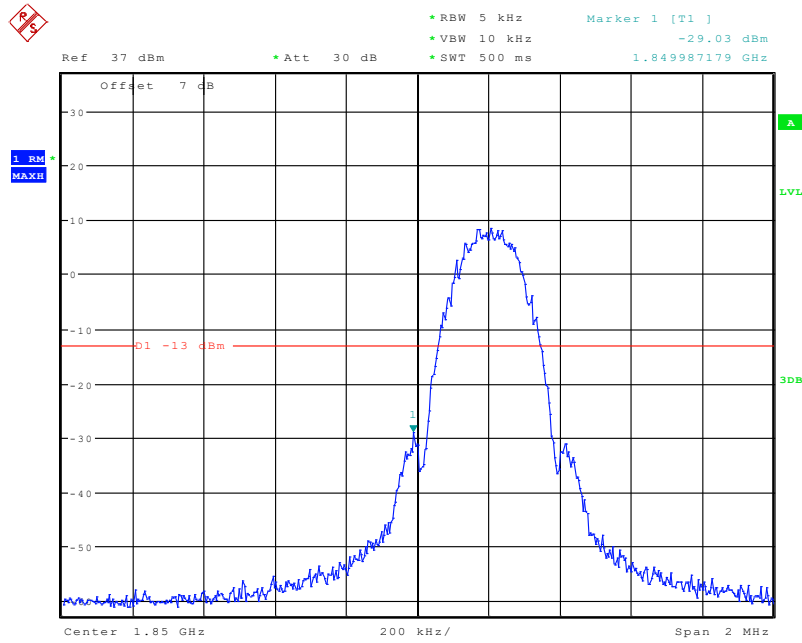
Date: 5.MAR.2022 18:34:00

PCS Band, Right Band Edge for GSM (GMSK) Mode



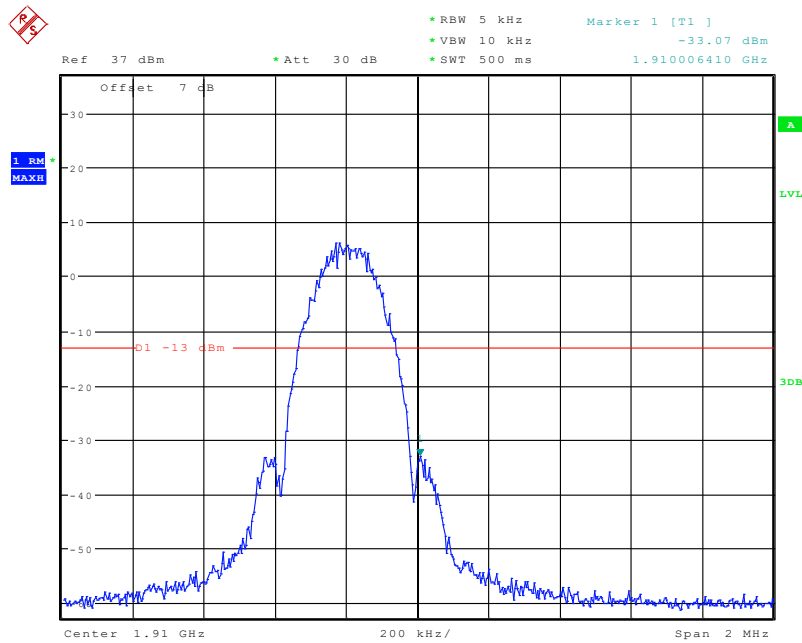
Date: 5.MAR.2022 18:33:19

PCS Band, Left Band Edge for EGPRS (8PSK) Mode



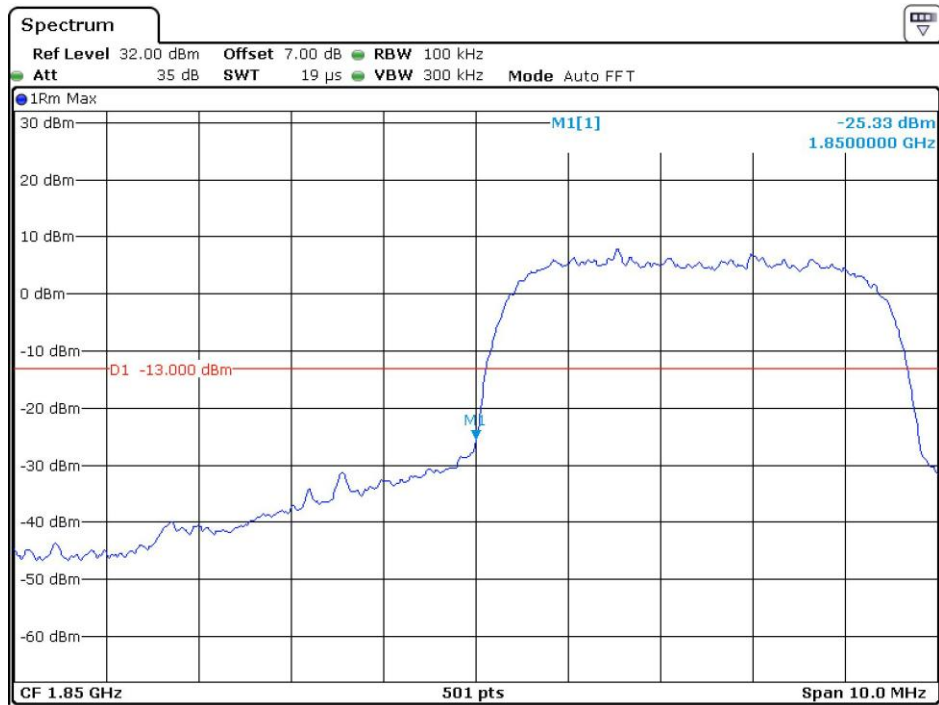
Date: 5.MAR.2022 18:36:57

PCS Band, Right Band Edge for EGPRS (8PSK) Mode



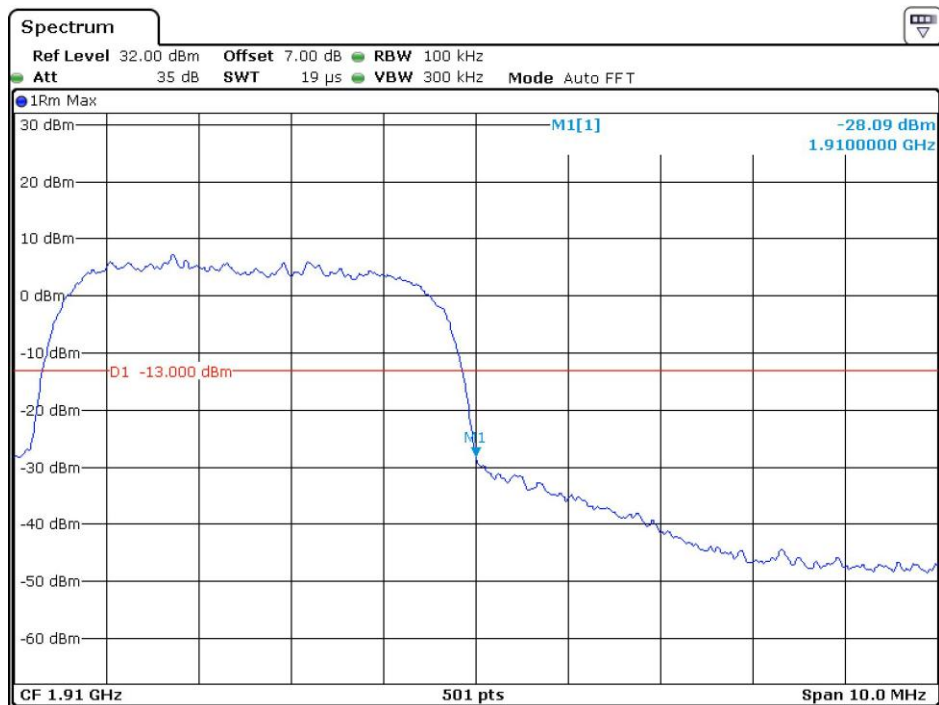
Date: 5.MAR.2022 18:37:55

PCS Band, Left Band Edge for RMC (BPSK) Mode



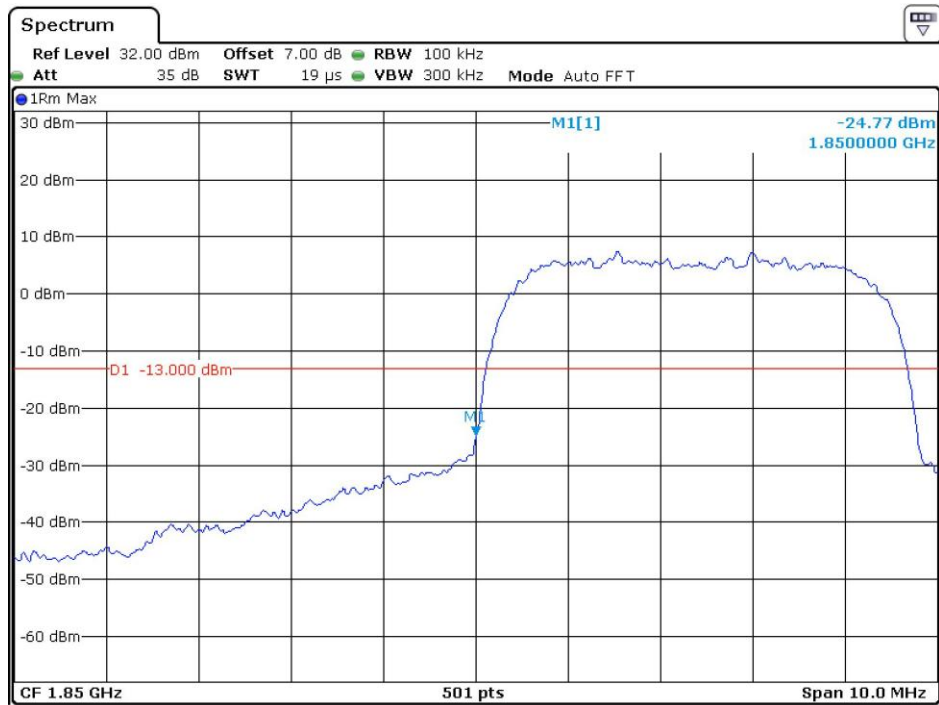
Date: 12.MAR.2022 18:04:06

PCS Band, Right Band Edge for RMC (BPSK) Mode



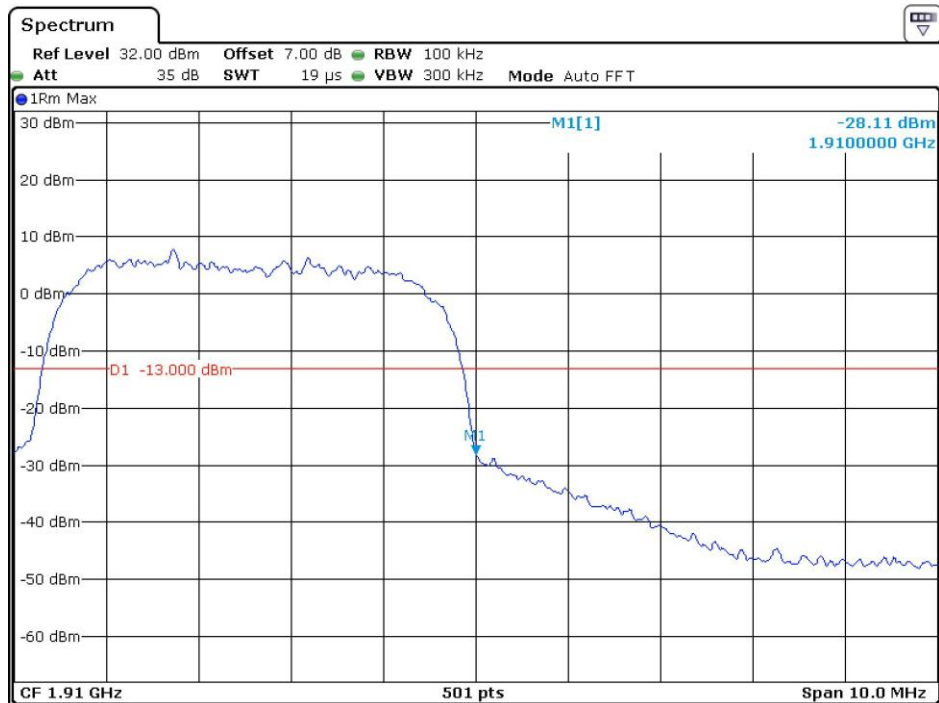
Date: 12.MAR.2022 18:04:26

PCS Band, Left Band Edge for HSDPA(16QAM) Mode



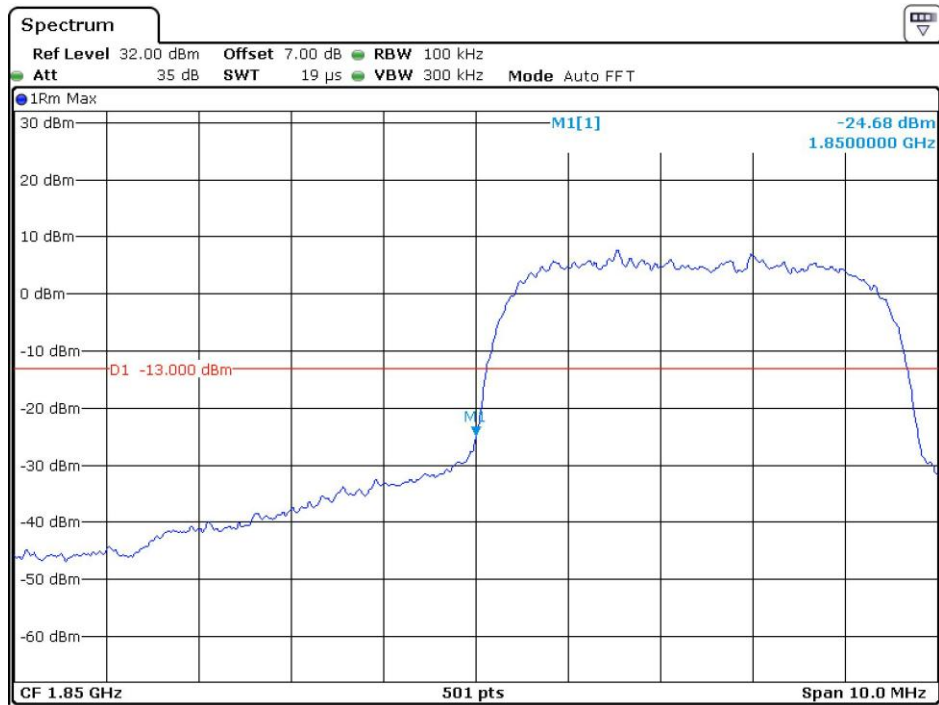
Date: 12.MAR.2022 18:06:29

PCS Band, Right Band Edge for HSDPA (16QAM) Mode



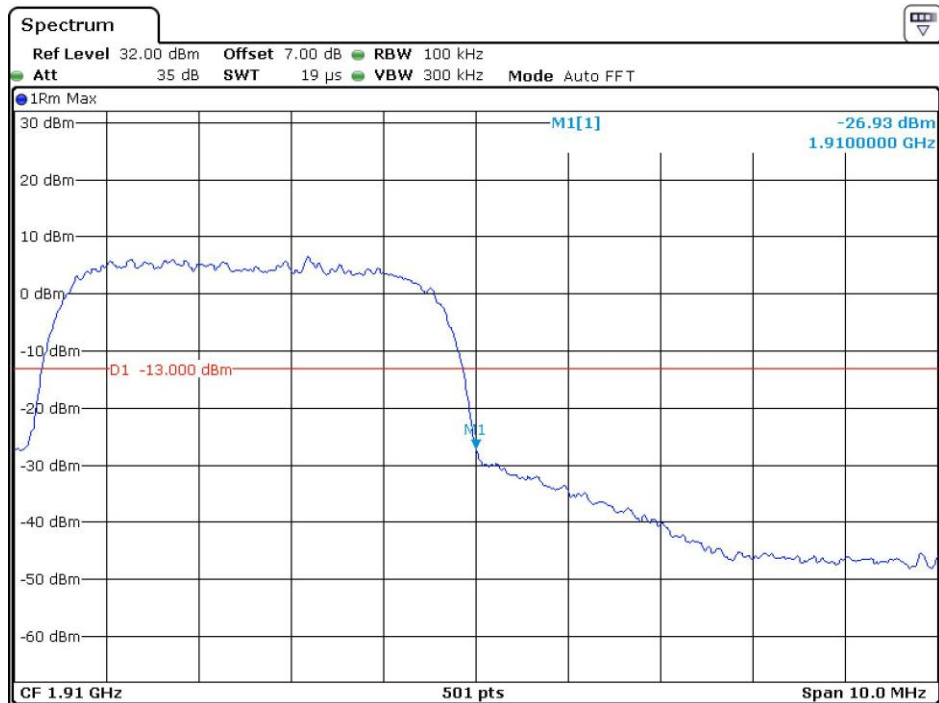
Date: 12.MAR.2022 18:06:08

PCS Band, Left Band Edge for HSUPA (BPSK) Mode



Date: 12.MAR.2022 18:21:43

PCS Band, Right Band Edge for HSUPA (BPSK) Mode



Date: 12.MAR.2022 18:22:05

FCC § 2.1055; § 22.355; § 24.235 - FREQUENCY STABILITY

Applicable Standard

FCC § 2.1055, §22.355 and §24.235.

According to FCC §2.1055, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency Range (MHz)	Base, fixed (ppm)	Mobile ≤ 3 watts (ppm)	Mobile > 3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929.	5.0	N/A	N/A
929 to 960.	1.5	N/A	N/A
2110 to 2220	10.0	N/A	N/A

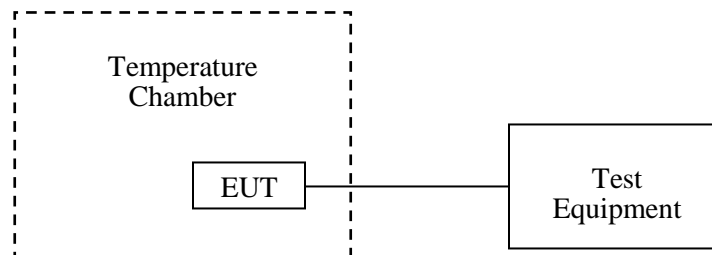
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the communication test set.

Frequency Stability vs. Voltage: For hand carried, battery powered equipment; reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.



Test Data**Environmental Conditions**

Temperature:	27.2 °C
Relative Humidity:	56.2 %
ATM Pressure:	101.0 kPa

The testing was performed by Black Ding from 2022-03-05 to 2022-03-12.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the following tables.

Cellular Band (Part 22H)**GSM Mode**

Middle Channel, $f_0 = 836.6\text{MHz}$				
Temperature (°C)	Voltage Supplied (V_{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	N.V.	-6	-0.0072	2.5
-20		-3	-0.0036	2.5
-10		-5	-0.0060	2.5
0		-8	-0.0096	2.5
10		-2	-0.0024	2.5
20		-3	-0.0036	2.5
30		-6	-0.0072	2.5
40		-4	-0.0048	2.5
50		-4	-0.0048	2.5
20		L.V.	-9	-0.0108
	H.V.	-8	-0.0096	2.5

EDGE Mode

Middle Channel, $f_0 = 836.6\text{MHz}$				
Temperature (°C)	Voltage Supplied (V_{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	N.V.	-6	-0.0072	2.5
-20		-7	-0.0084	2.5
-10		-5	-0.0060	2.5
0		-4	-0.0048	2.5
10		-8	-0.0096	2.5
20		-6	-0.0072	2.5
30		-7	-0.0084	2.5
40		-9	-0.0108	2.5
50		-3	-0.0036	2.5
20		L.V.	-5	-0.0060
	H.V.	-8	-0.0096	2.5

WCDMA Mode

Middle Channel, $f_0 = 836.6\text{MHz}$				
Temperature (°C)	Voltage Supplied (V_{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	N.V.	-8	-0.0096	2.5
-20		-6	-0.0072	2.5
-10		-7	-0.0084	2.5
0		-9	-0.0108	2.5
10		-7	-0.0084	2.5
20		-6	-0.0072	2.5
30		-5	-0.0060	2.5
40		-4	-0.0048	2.5
50		-6	-0.0072	2.5
20		L.V.	-2	-0.0024
	H.V.	-5	-0.0060	2.5

PCS Band (Part 24E)**GSM Mode**

Middle Channel, $f_o = 1880.0$ MHz				
Temperature (°C)	Voltage Supplied (V_{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	N.V.	4	0.0021	pass
-20		5	0.0027	pass
-10		7	0.0037	pass
0		8	0.0043	pass
10		3	0.0016	pass
20		7	0.0037	pass
30		4	0.0021	pass
40		5	0.0027	pass
50		6	0.0032	pass
20		L.V.	7	0.0037
	H.V.	4	0.0021	pass

EDGE Mode

Middle Channel, $f_o = 1880.0$ MHz				
Temperature (°C)	Voltage Supplied (V_{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	N.V.	4	0.0021	pass
-20		6	0.0032	pass
-10		8	0.0043	pass
0		5	0.0027	pass
10		4	0.0021	pass
20		3	0.0016	pass
30		6	0.0032	pass
40		5	0.0027	pass
50		7	0.0037	pass
20		L.V.	3	0.0016
	H.V.	4	0.0021	pass

WCDMA Mode

Middle Channel, $f_o = 1880.0$ MHz				
Temperature (°C)	Voltage Supplied (V_{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	N.V.	9	0.0048	pass
-20		6	0.0032	pass
-10		2	0.0011	pass
0		8	0.0043	pass
10		6	0.0032	pass
20		7	0.0037	pass
30		9	0.0048	pass
40		3	0.0016	pass
50		2	0.0011	pass
20	L.V.	5	0.0027	pass
	H.V.	6	0.0032	pass

******* END OF REPORT *******