ACCREDITED
TESTING LABORATORY
CERTIFICATE # 4821.01

Bay Area Compliance Labs Corp.

FCC PART 27

TEST REPORT

For

Comba Telecom Ltd.

611 East Wing, No. 8 Science Park West Avenue, HongKong, China

FCC ID: PX8MBDA-EAWS

Report Type:	**Product Type:**
Original Report	mBDA Band Selective Repeater

Report Number:	RSZ171226016 -00
Report Date:	2018-05-07
Reviewed By:	Rocky Kang RF Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Comba Telecom Ltd.'s* product, model number: *mBDA-EAWS (FCC ID: PX8MBDA-EAWS) in* this report is a *mBDA Band Selective Repeater,* which was measured approximately: 48.2 cm (L)*26.5 cm (W)*47.3 cm (H), used for mobile station, rated with input voltage: AC 120 V.

Operating Frequency Range :

Technical Parameters	Frequency Range (MHz)	Max. gain (dB)	Max. Conducted Output Power (dBm)
Uplink	1710-1755	80	17
Downlink	2110-2180	80	33

** All measurement and test data in this report was gathered from production sample serial number: 1702875. (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2017-12-26.*

Objective

This test report is prepared on behalf of *Comba Telecom Ltd.* in accordance with Subpart 27 of the Federal Communication Commissions rules.

Related Submittal(s)/Grant(s)

No Related Submittal(s)/Grant(s).

Test Methodology

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

Part 27 – Miscellaneous wireless communications services

Applicable Standards: KDB 935210 D05 v01r02.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter	uncertainty
Occupied Channel Bandwidth	±5%
Input/output power and amplifier gain	±1.5dB
Unwanted Emission, conducted	±1.5dB
Radiated Emissions Below 1GHz	±4.70dB
Radiated Emissions Above 1GHz	±4.80dB
Internodulation	±1.5dB
Noise Figure Measurements	±1.5dB
Temperature	±1℃
Supply voltages	±0.4%

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, 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. : 342867, the FCC Designation No. : CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The EUT was configured for testing according to KDB 935210 D05 v01r02..

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

EUT Exercise Software

No exercise software was used.

Special Accessories

No special accessory was used.

Equipment Modifications

No modification was made to the EUT tested.

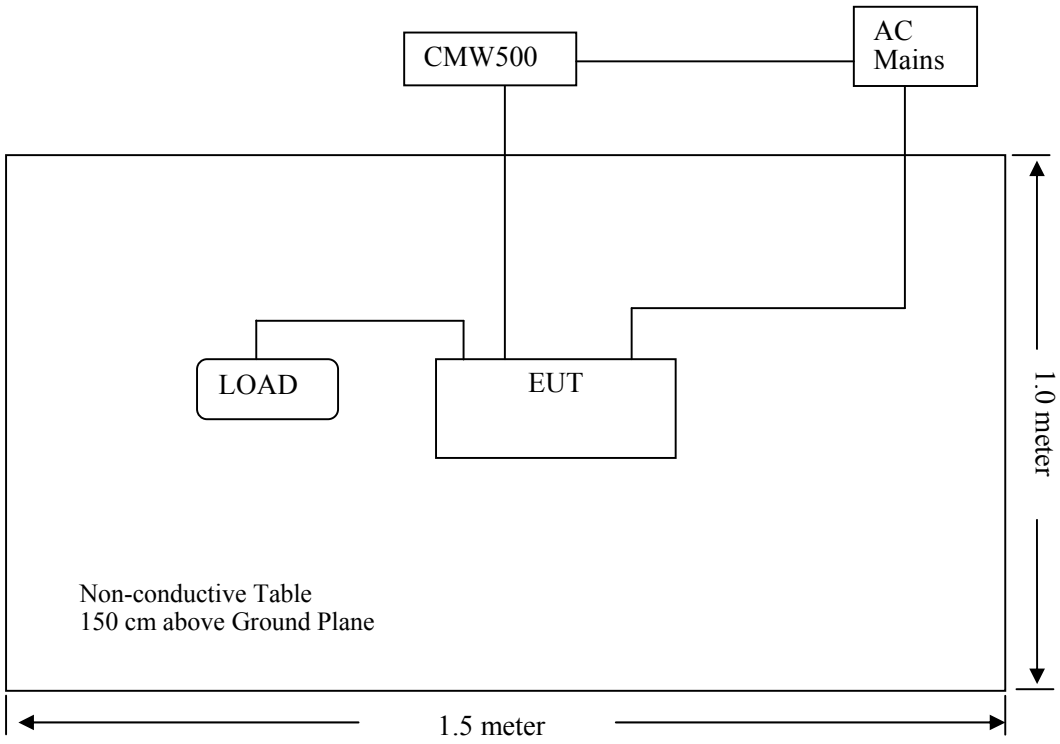
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	1201.002K50-146520-wh
N/A	Load	N/A	N/A
Comba	Power and Monitor unit	mBDA-PMU-A92W300	AA1780001549

External I/O Cable

Cable Description	Length (m)	From Port	To
Unshielded Un-Detachable AC Cable	4.0	AC Mains	EUT
Shielding Detachable RF Cable	1.2	EUT	CMW500
Shielded Detachable RF Cable	1.2	EUT	load

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§1.1307 (b)(1), §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§27.50(d)	Input/output power and amplifier gain	Compliance
§2.1049, §27.53	Bandwidth	Compliance
§27.53(h)	Intermodulation& Band Edge	Compliance
§27.53(h)	Spurious emissions at antenna terminals	Compliance
§27.53(h)	Radiated spurious emission	Compliance
§20.21	Out-of-band rejection	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017-12-29	2020-12-28
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2017-04-24	2018-04-24
Sunol Sciences	Bi-log Antenna	JB1	A040904-2	2017-12-17	2020-12-16
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2017-02-14	2018-02-14
HP	Amplifier	HP8447E	1937A01046	2017-11-19	2018-05-21
Anritsu	Signal Generator	68369B	004114	2017-12-24	2018-12-24
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2017-12-07	2018-12-07
COM POWER	Dipole Antenna	AD-100	041000	NCR	NCR
A.H. System	Horn Antenna	SAS-200/571	135	2015-08-18	2018-08-17
Ducommun technologies	RF Cable	UFA210A-1-4724-30050U	MFR64369 223410-001	2017-11-19	2018-05-21
Ducommun technologies	RF Cable	104PEA	218124002	2017-11-19	2018-05-21
Ducommun technologies	RF Cable	RG-214	1	2017-11-19	2018-05-21
Ducommun technologies	RF Cable	RG-214	2	2017-11-19	2018-05-21
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-04	2017-12-29	2020-12-29
Ducommun technologies	Horn Antenna	ARH-4223-02	1007726-03	2017-12-29	2020-12-29
Ducommun technologies	Pre-amplifier	ALN-22093530-01	991373-01	2017-08-03	2018-08-03
RF Conducted Test					
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200120	2017-12-05	2018-12-05
Long Wei	DC Power Supply	TPR-6420D	398363	NCR	NCR
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	1201.002K50-146520-wh	2017-04-24	2018-04-24
Rohde & Schwarz	Wideband Radio Communication tester	CMW500	1201.002K50-146520-wh	2018-04-24	2019-04-24
Ducommun technologies	RF Cable	RG-214	3	2017-11-22	2018-05-22
Ducommun technologies	RF Cable	104PEA	218124002	2017-11-19	2018-05-21
WEINSCHEL	10dB Attenuator	5324	AU0709	2017-06-15	2018-06-15

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) 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)(1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	$*900/f^2$	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	$*180/f^2$	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units, e.g., mW).
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

For General Population/Uncontrolled Exposure:

Frequency (MHz)	Antenna Gain		Max Tune-up Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
	(dBi)	(numeric)	(dBm)	(mW)			
1710-1755	10	10	17	50.12	40	0.02	1.0
2110-2180	10	10	33	1995.26	40	0.99	1.0

Radiation Exposure Statement:

To comply with FCC RF exposure requirements, a minimum separation distance of 40cm is required between the antenna and persons, and the available max antenna gain must not exceed 10 dBi.

FCC §27.50(d) - INPUT/OUTPUT POWER AND AMPLIFIER GAIN

Applicable Standard

According to §27.50(d)The following power and antenna height requirements apply to stations transmitting in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz and 2180-2200 MHz bands:

(1) The power of each fixed or base station transmitting in the 1995-2000 MHz, 2110-2155 MHz, 2155-2180 MHz or 2180-2200 MHz band and located in any county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, is limited to:

(i) An equivalent isotropically radiated power (EIRP) of 3280 watts when transmitting with an emission bandwidth of 1 MHz or less;

(ii) An EIRP of 3280 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.

(2) The power of each fixed or base station transmitting in the 1995-2000 MHz, the 2110-2155 MHz 2155-2180 MHz band, or 2180-2200 MHz band and situated in any geographic location other than that described in paragraph (d)(1) of this section is limited to:

(i) An equivalent isotropically radiated power (EIRP) of 1640 watts when transmitting with an emission bandwidth of 1 MHz or less;

(ii) An EIRP of 1640 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.

(3) A licensee operating a base or fixed station in the 2110-2155 MHz band utilizing a power greater than 1640 watts EIRP and greater than 1640 watts/MHz EIRP must coordinate such operations in advance with all Government and non-Government satellite entities in the 2025-2110 MHz band. A licensee operating a base or fixed station in the 2110-2180 MHz band utilizing power greater than 1640 watts EIRP and greater than 1640 watts/MHz EIRP must be coordinated in advance with the following licensees authorized to operate within 120 kilometers (75 miles) of the base or fixed station operating in this band: All Broadband Radio Service (BRS) licensees authorized under this part in the 2155-2160 MHz band and all advanced wireless services (AWS) licensees authorized to operate on adjacent frequency blocks in the 2110-2180 MHz band.

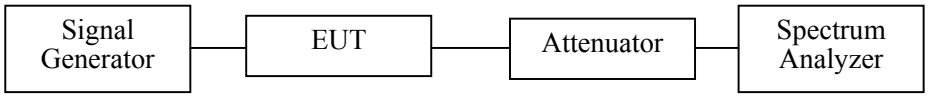
(4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP. Fixed stations operating in the 1710-1755 MHz band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.

Test Procedure

Conducted RF Output Power:

According to KDB 935210 D05 v01r02 section 3.5.2:

a) Connect a signal generator to the input of the EUT.
b) Configure to generate the AWGN (broadband) test signal.
c) The frequency of the signal generator shall be set to the frequency f0 as determined from 3.3.
d) Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation as necessary.
e) Set the signal generator output power to a level that produces an EUT output level that is just below the AGC threshold (see 3.2), but not more than 0.5 dB below.
f) Measure and record the output power of the EUT; use 3.5.3 or 3.5.4 for power measurement.
g) Remove the EUT from the measurement setup. Using the same signal generator settings, repeat the power measurement at the signal generator port, which was used as the input signal to the EUT, and record as the input power. EUT gain may be calculated as described in 3.5.5.
h) Repeat steps f) and g) with input signal amplitude set to 3 dB above the AGC threshold level.
i) Repeat steps e) to h) with the narrowband test signal.
j) Repeat steps e) to i) for all frequency bands authorized for use by the EUT.



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

The testing was performed by Dylan Li on 2018-05-04.

Test Mode: Transmitting

Test Result: Compliance. Please refer to following table.

Modes	Frequency (MHz)	Signal Type	Signal Level	Input power (dBm)	Output Power (dBm)	Gain (dB)	EIRP (dBm)
Uplink	1732.500	AWGN	Pre-AGC	-64.2	16.34	80.54	26.34
			3dB above AGC	-61.2	16.57	77.77	26.57
		GSM	Pre-AGC	-63.9	16.25	80.15	26.25
			3dB above AGC	-60.9	16.42	77.32	26.42
Downlink	2140.288	AWGN	Pre-AGC	-48.3	32.42	80.72	42.42
			3dB above AGC	-45.3	32.59	77.89	42.59
		GSM	Pre-AGC	-48.9	31.97	80.87	41.97
			3dB above AGC	-45.9	32.04	77.94	42.04

Note: EIRP=Conducted Output Power(dBm) +Antenna Gain (dBi)
The Maximum indoor and outdoor Gain for all Bands shall not exceed 10 dBi

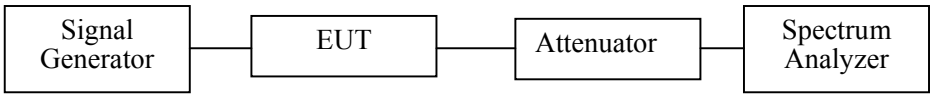
FCC §2.1049 & §27.53– BANDWIDTH

Applicable Standard

FCC §2.1049, FCC §27.53

Test Procedure

Test Method: KDB 935210 D05 Indus Booster Basic Meas v01r02 section 3.4
A 26 dB bandwidth measurement shall be performed on the input signal and the output signal; alternatively, the 99% OBW can be measured and used. See KDB Publication 971168 [R8] for more information on measuring OBW



Test Data

Environmental Conditions

Temperature:	24~25 ℃
Relative Humidity:	50~55 %
ATM Pressure:	101.0~101.5 kPa

The testing was performed by Dylan Li from 2018-01-12 to 2018-05-07.

Test Mode: Transmitting

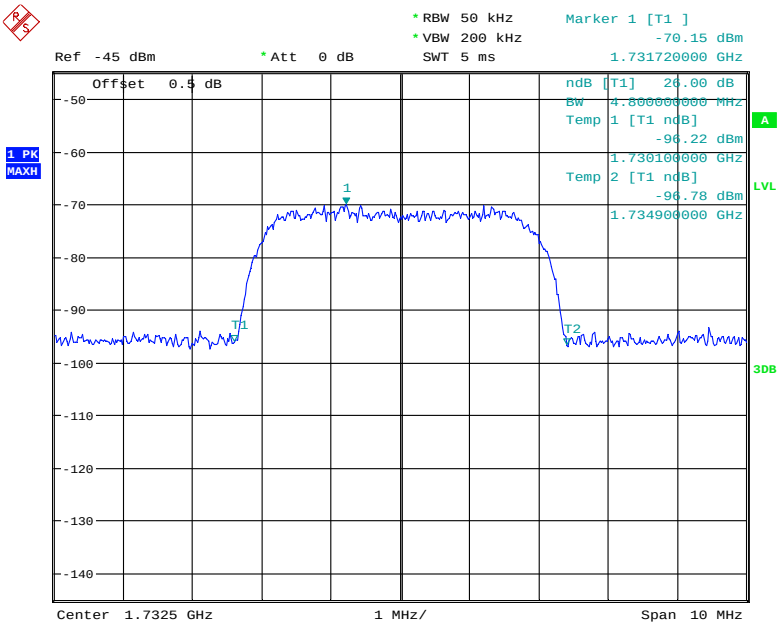
Please refer to the following tables and plots.

Mode	Signal Type	Signal Level	Frequency (MHz)	99% Bandwidth (MHz)		26dB Bandwidth (MHz)	
				Input	Output	Input	Output
Uplink	AWGN	Pre-AGC	1732.5	4.31	4.17	4.80	4.66
		3dB above AGC	1732.5	4.25	4.17	4.70	4.64
	GSM	Pre-AGC	1732.5	0.250	0.244	0.314	0.318
		3dB above AGC	1732.5	0.248	0.244	0.314	0.312
Downlink	AWGN	Pre-AGC	2145	4.18	4.17	4.65	4.63
		3dB above AGC	2145	4.18	4.17	4.65	4.63
	GSM	Pre-AGC	2145	0.245	0.245	0.304	0.319
		3dB above AGC	2145	0.245	0.248	0.314	0.314

Note: Input signal level refer to the result of item: Input/output power and amplifier gain

Uplink:

Frequency: 1732.5 MHz, 26 dB Bandwidth AWGN, AGC Input



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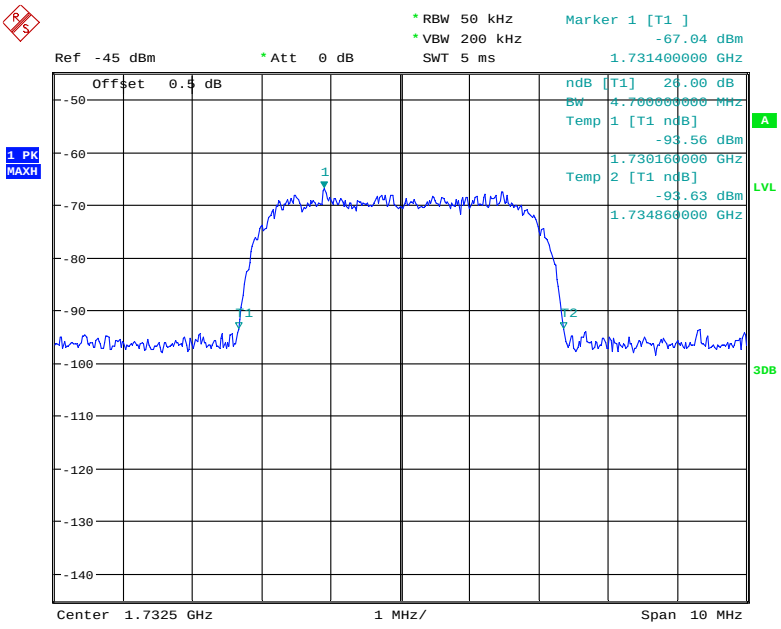

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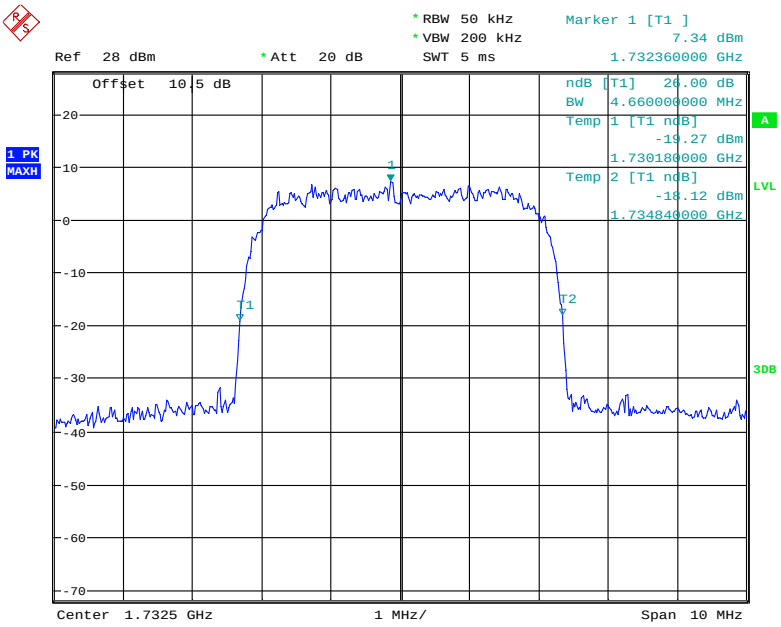

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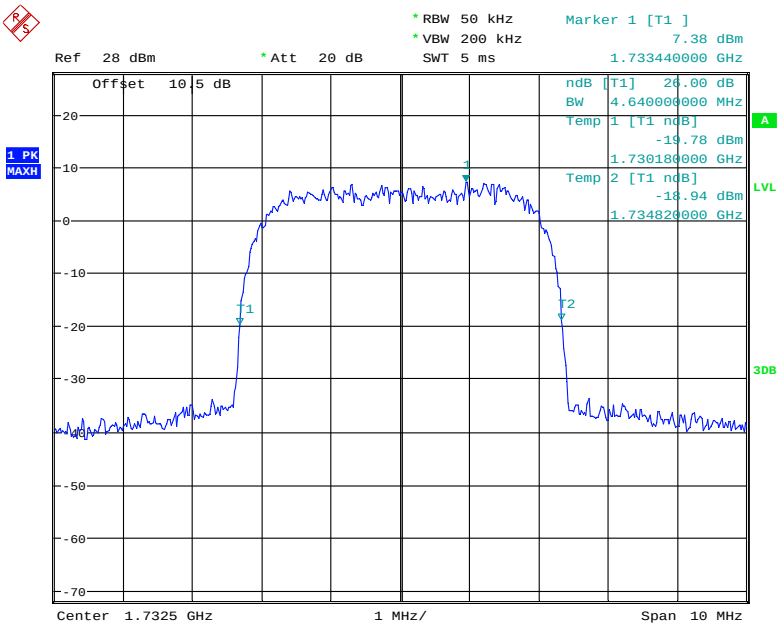
Frequency: 1732.5 MHz, 26 dB Bandwidth AWGN, AGC+3 Output



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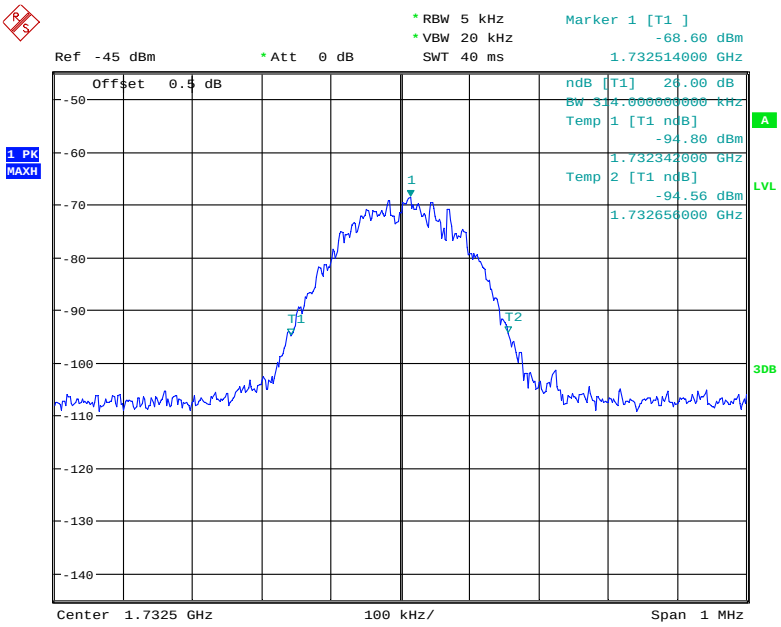

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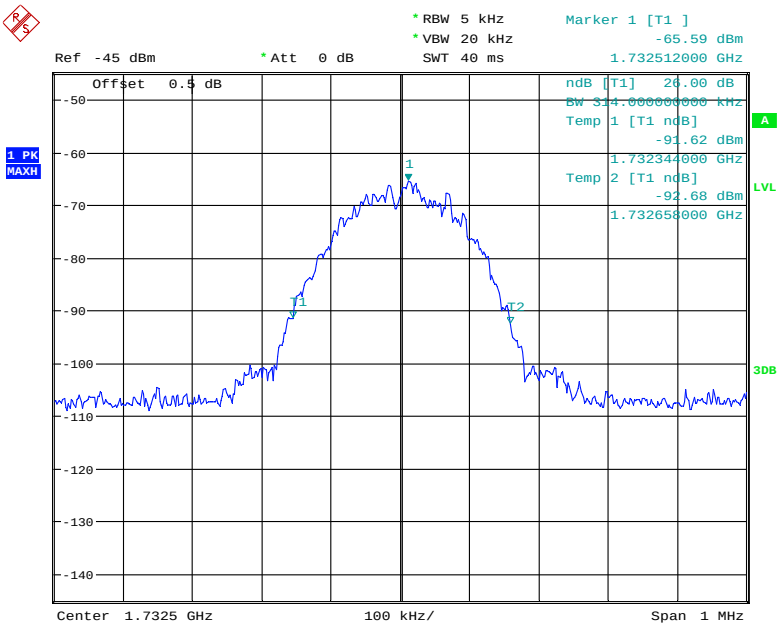

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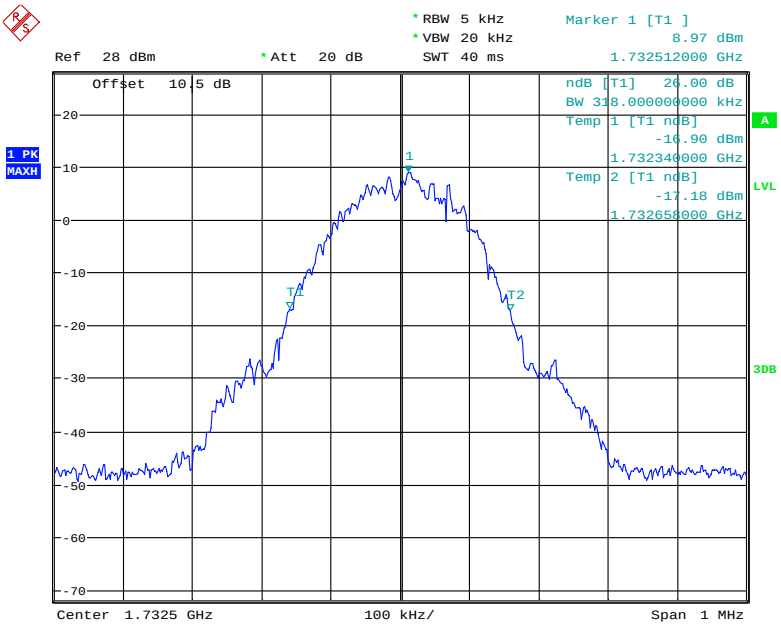

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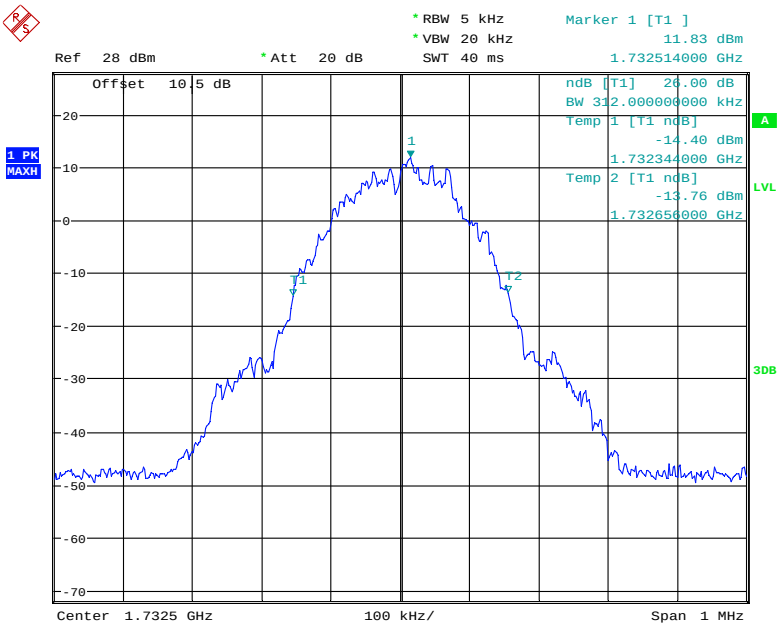

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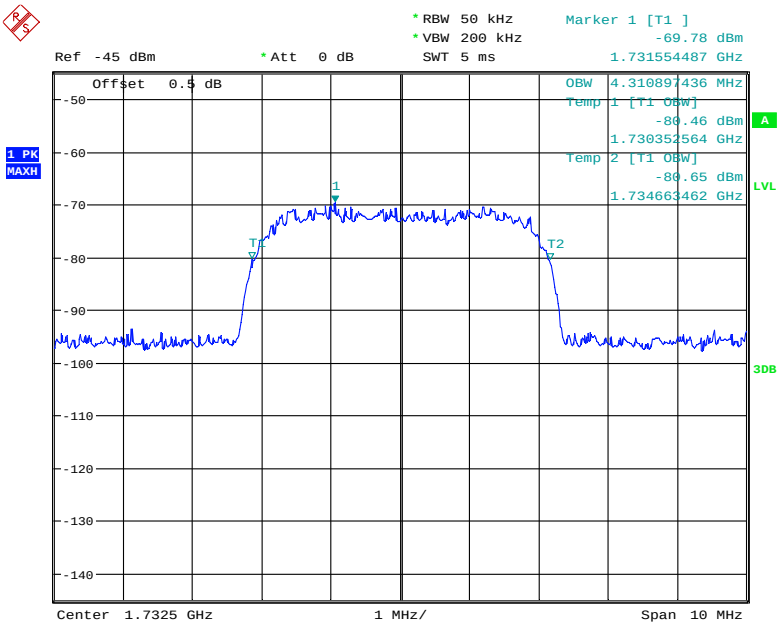

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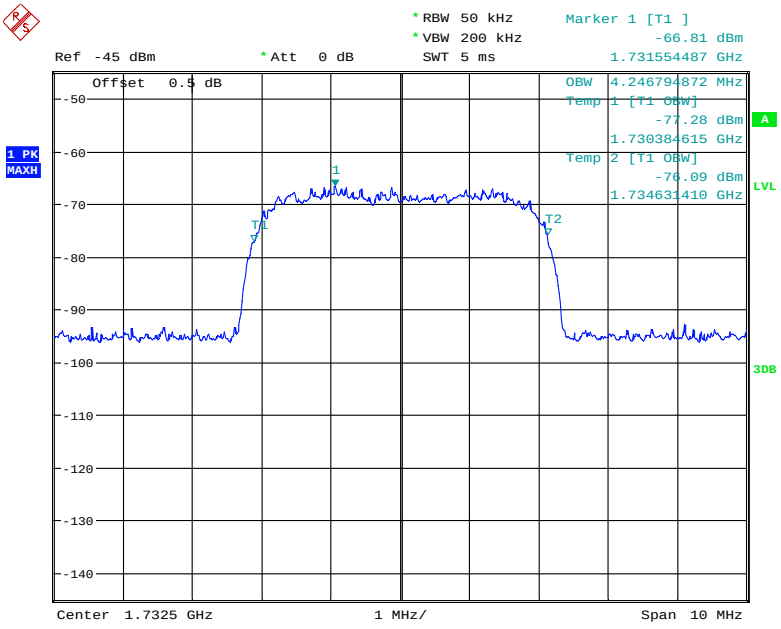
Frequency: 1732.5 MHz, 99% Occupied Bandwidth AWGN, AGC+3 Input



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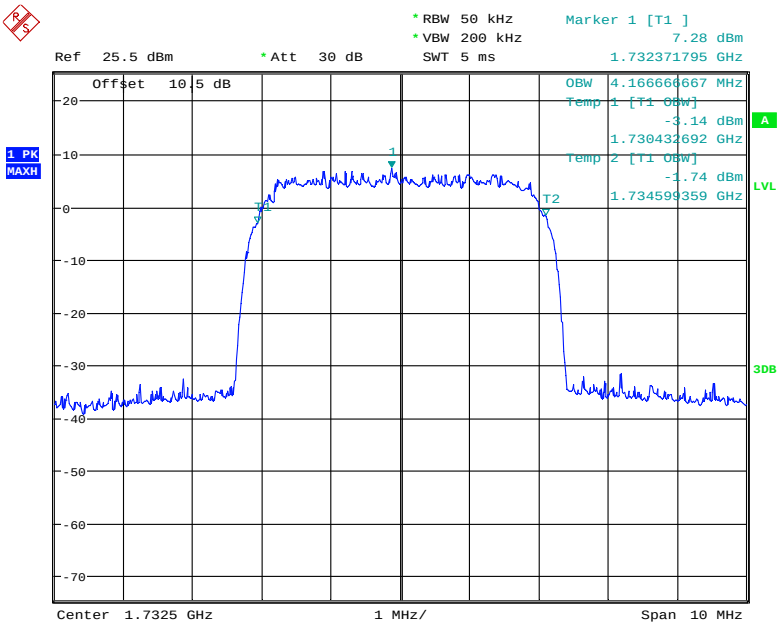
Frequency: 1732.5 MHz, 99% Occupied Bandwidth AWGN, AGC Output



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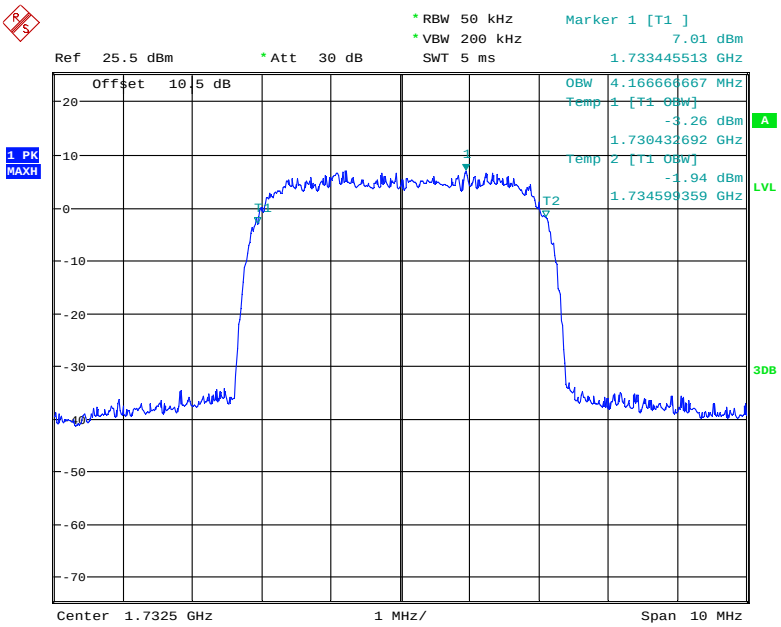
Frequency: 1732.5 MHz, 99% Occupied Bandwidth AWGN, AGC+3 Output



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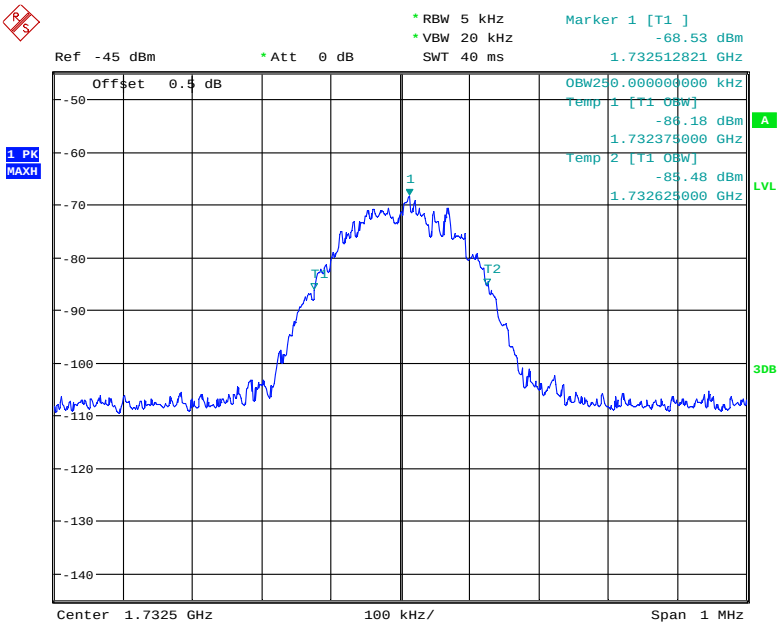

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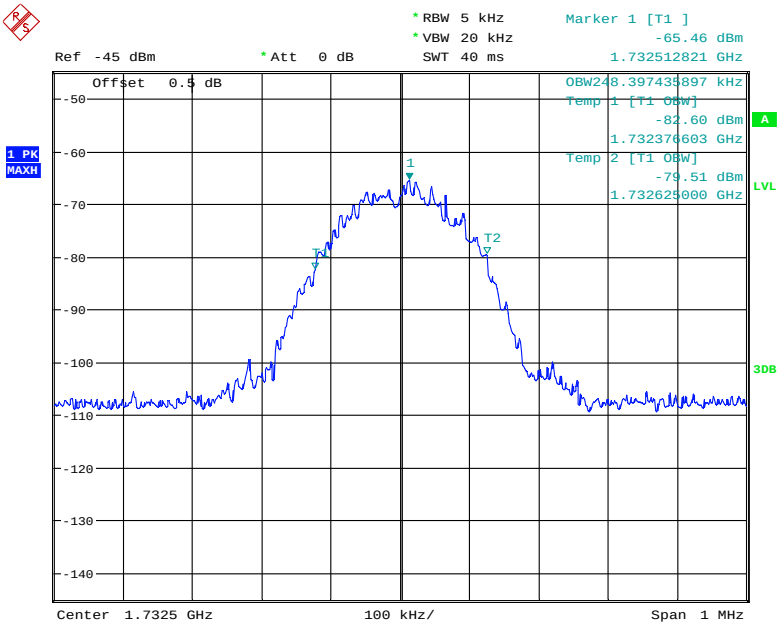

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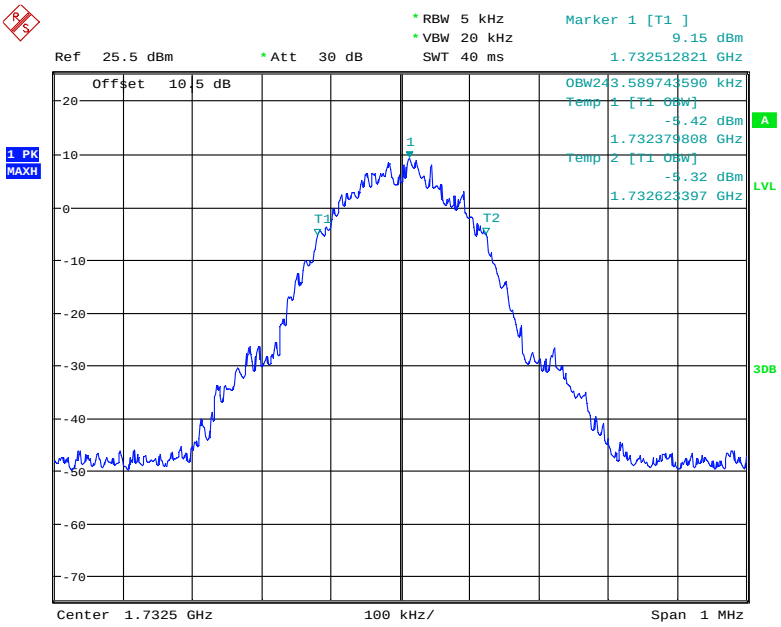

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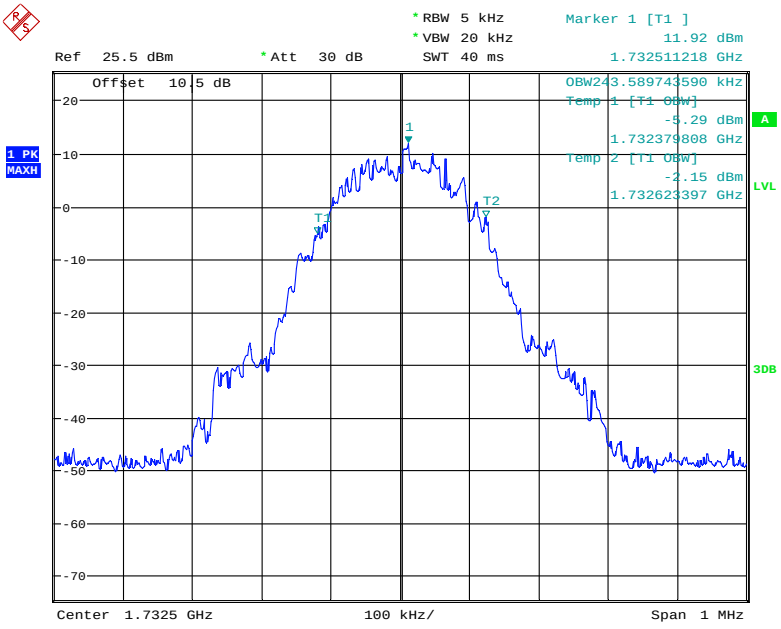

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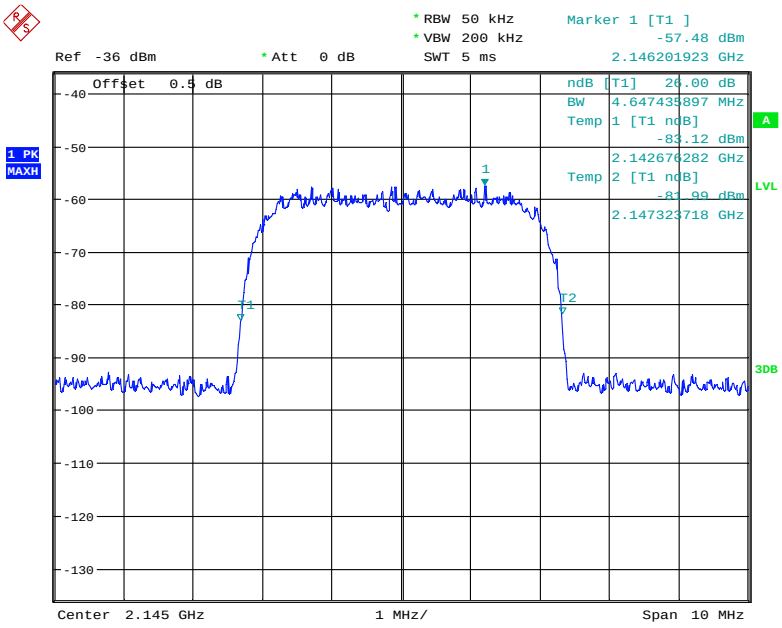
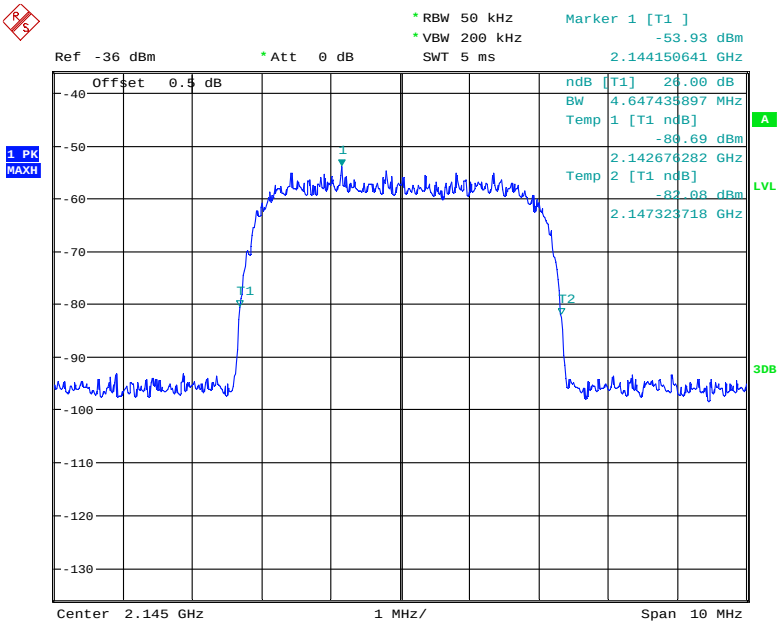
Downlink:

Frequency: 2145 MHz, 26 dB Bandwidth AWGN, AGC Input



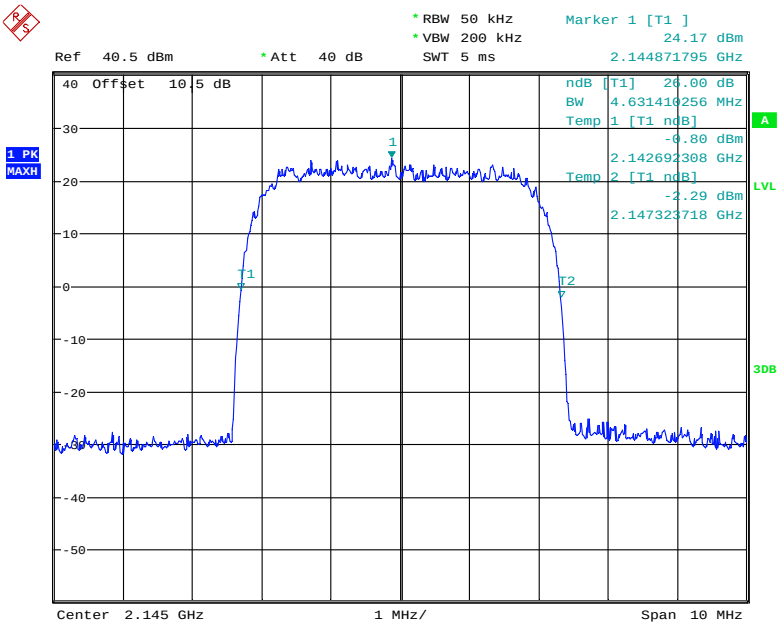
Date: 18.JAN.2018 19:41:27

Frequency: 2145 MHz, 26 dB Bandwidth AWGN, AGC+3 Input



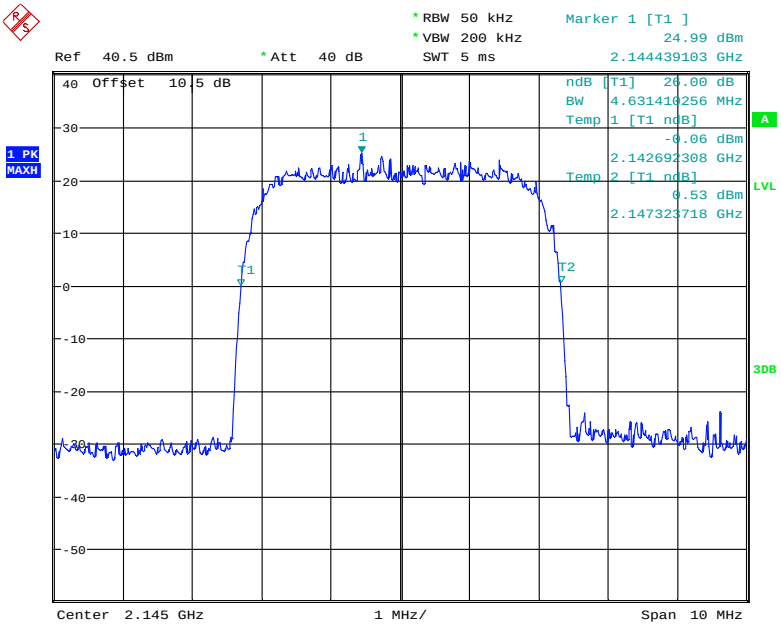
Date: 18.JAN.2018 19:41:46

Frequency: 2145 MHz, 26 dB Bandwidth AWGN, AGC Output



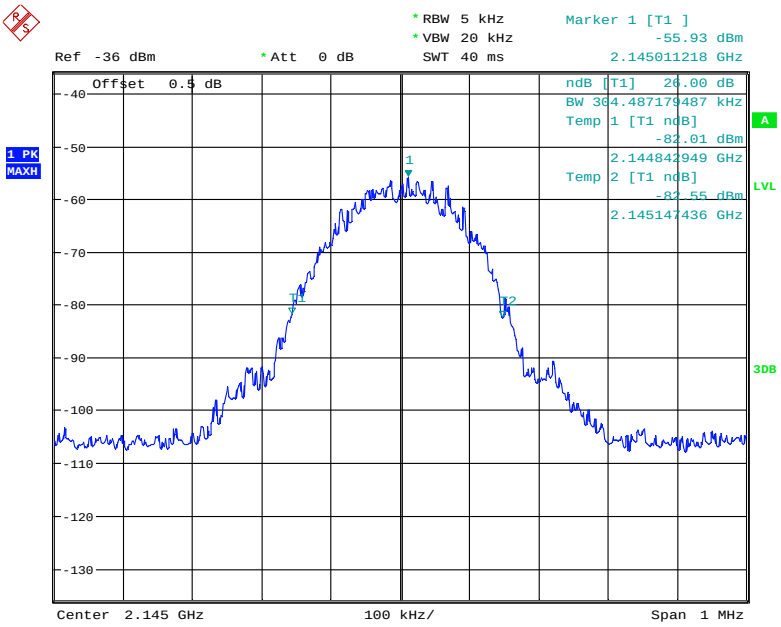
Date: 12.JAN.2018 20:29:43

Frequency: 2145 MHz, 26 dB Bandwidth AWGN, AGC+3 Output



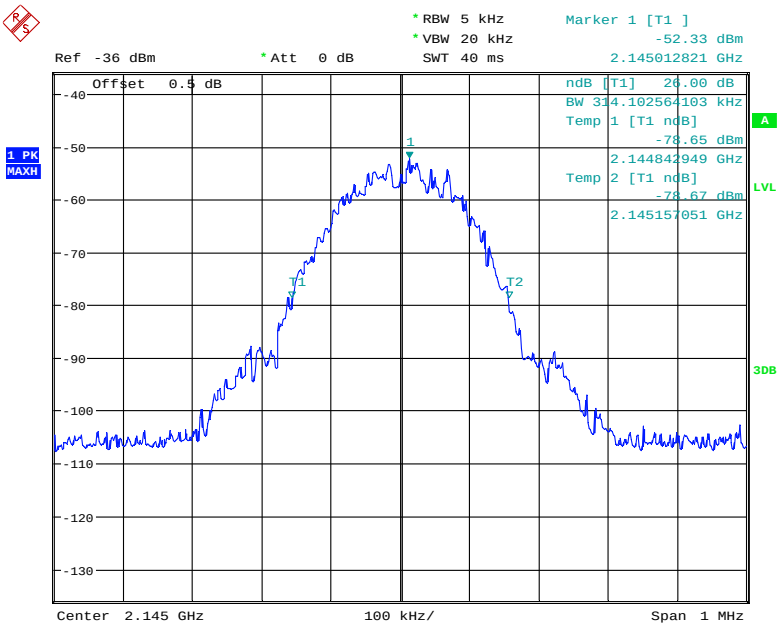
Date: 12.JAN.2018 20:30:14

Frequency: 2145 MHz, 26 dB Bandwidth GSM, AGC Input



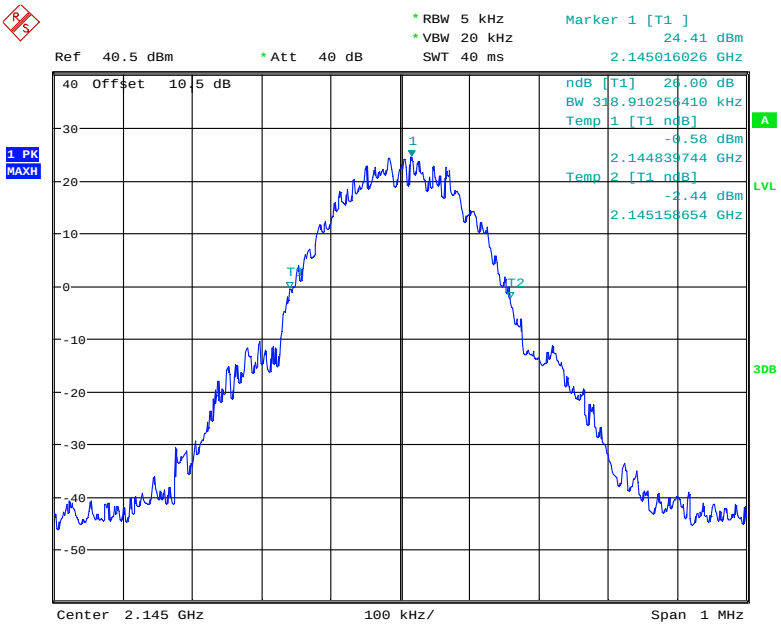
Date: 18.JAN.2018 19:40:56

Frequency: 2145 MHz, 26 dB Bandwidth GSM, AGC+3 Input



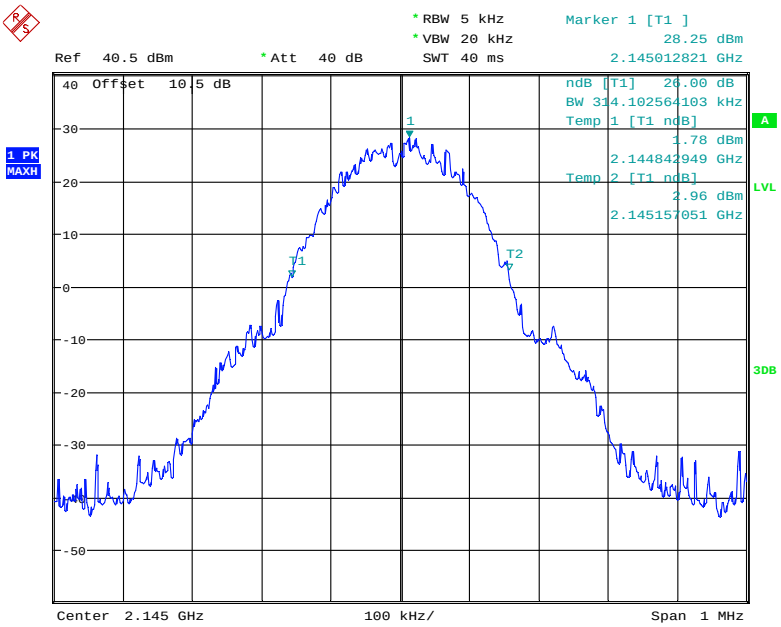
Date: 18.JAN.2018 19:40:13

Frequency: 2145 MHz, 26 dB Bandwidth GSM, AGC Output



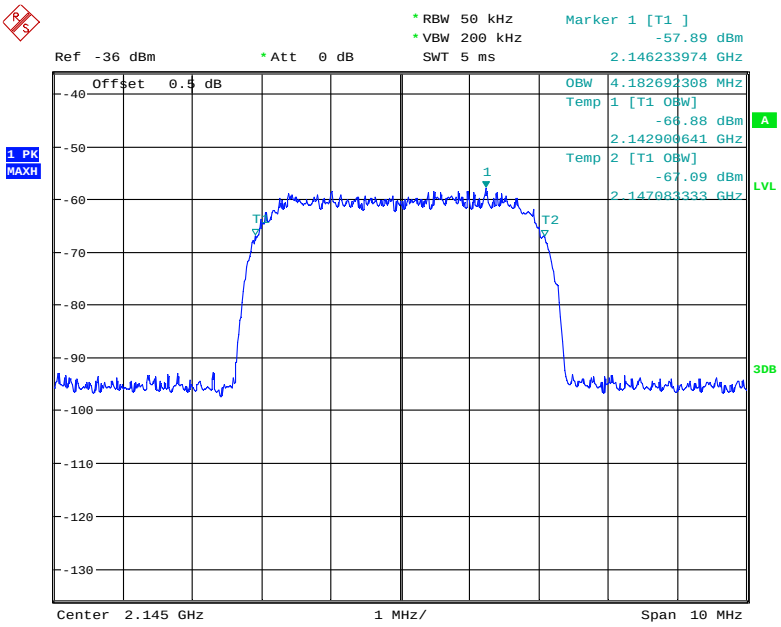
Date: 12.JAN.2018 20:28:59

Frequency: 2145 MHz, 26 dB Bandwidth GSM, AGC+3 Output



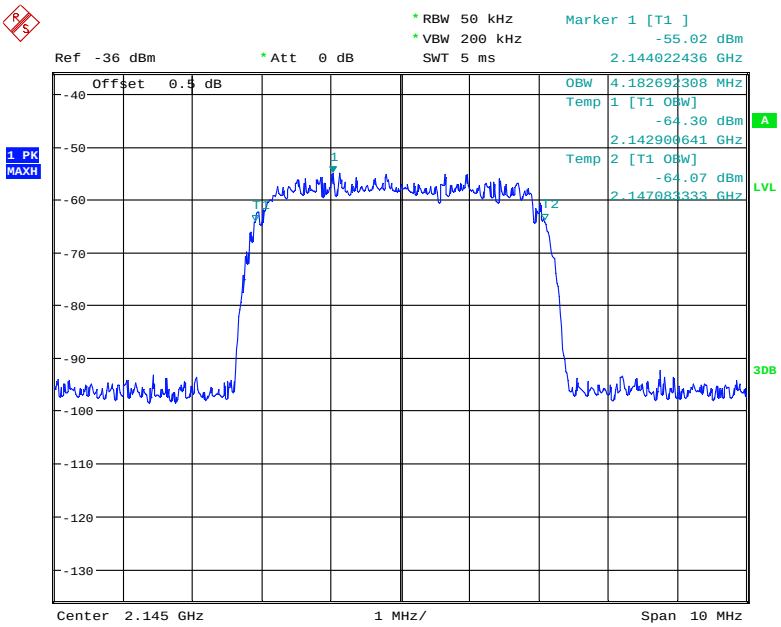
Date: 12.JAN.2018 20:28:18

Frequency: 2145 MHz, 99% Occupied Bandwidth AWGN, AGC Input



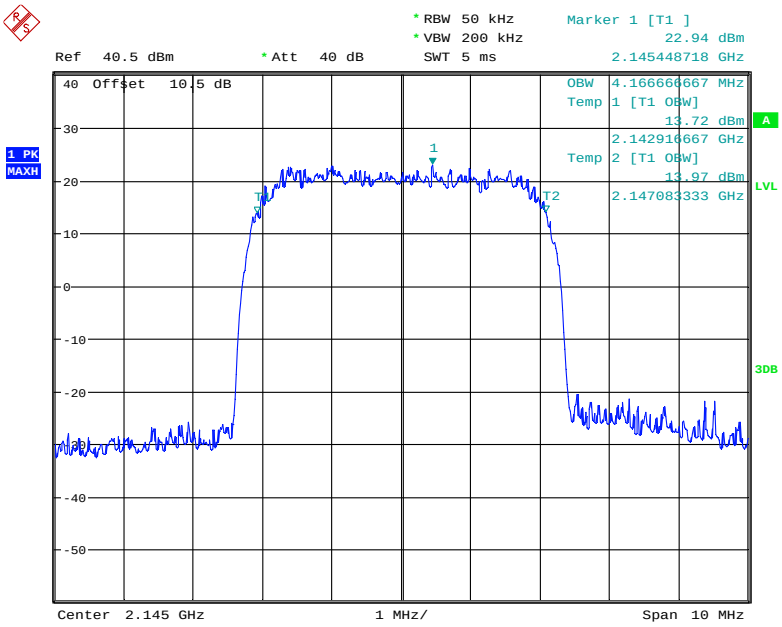
Date: 18.JAN.2018 19:36:36

Frequency: 2145 MHz, 99% Occupied Bandwidth AWGN, AGC+3 Input



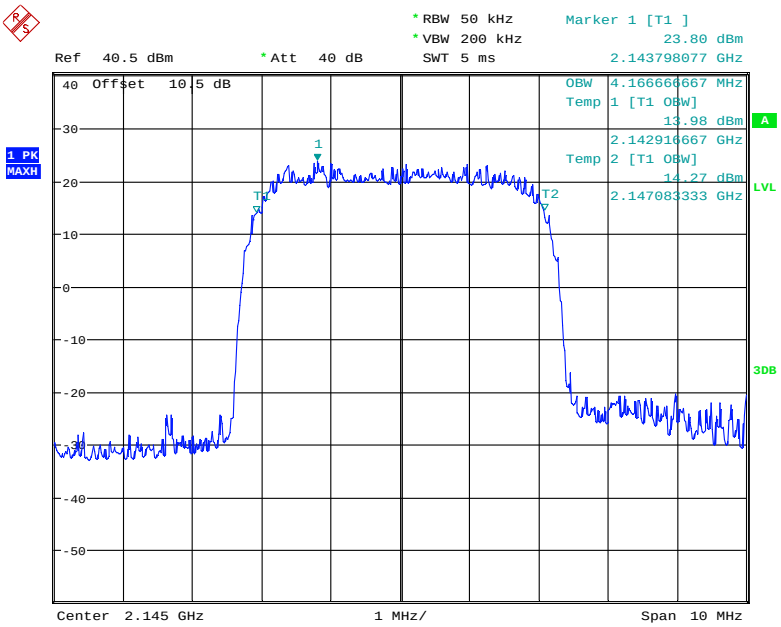
Date: 18.JAN.2018 19:37:53

Frequency: 2145 MHz, 99% Occupied Bandwidth AWGN, AGC Output



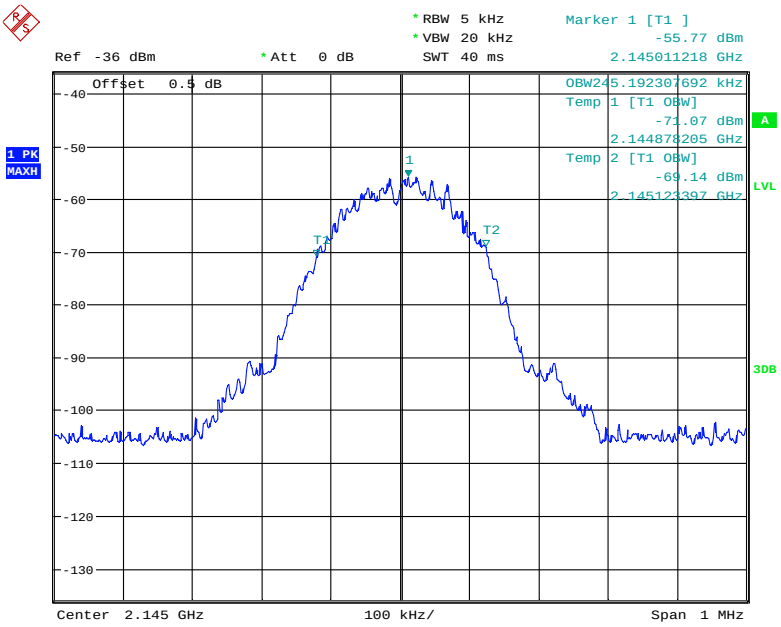
Date: 12.JAN.2018 20:24:31

Frequency: 2145 MHz, 99% Occupied Bandwidth AWGN, AGC+3 Output



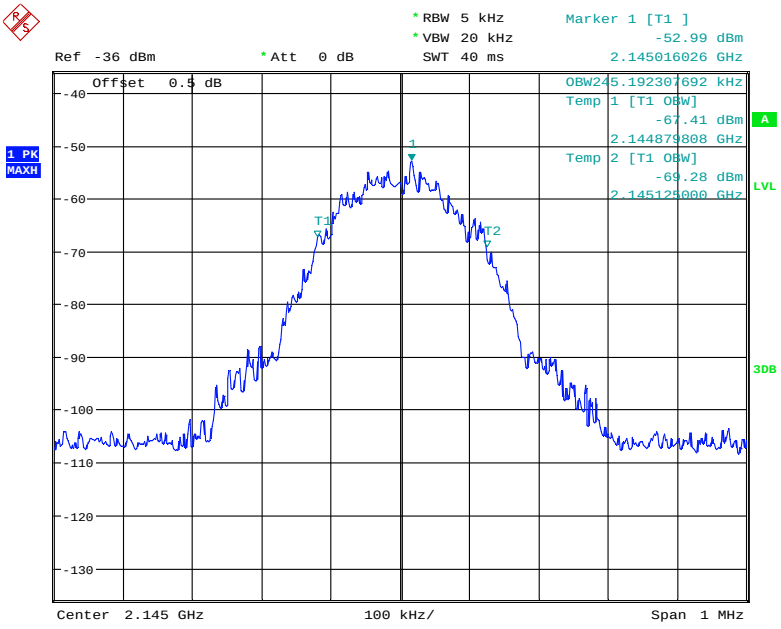
Date: 12.JAN.2018 20:25:41

Frequency: 2145 MHz, 99% Occupied Bandwidth GSM, AGC Input



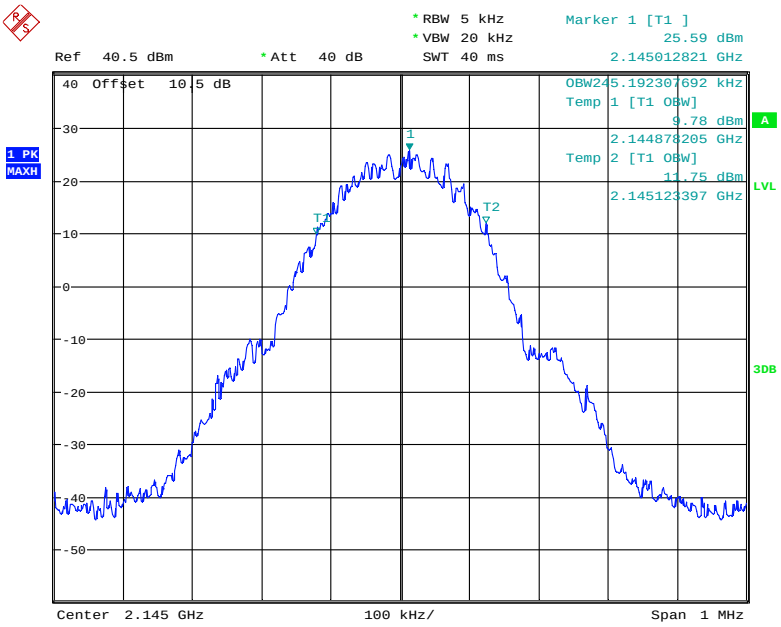
Date: 18.JAN.2018 19:38:58

Frequency: 2145 MHz, 99% Occupied Bandwidth GSM, AGC+3 Input



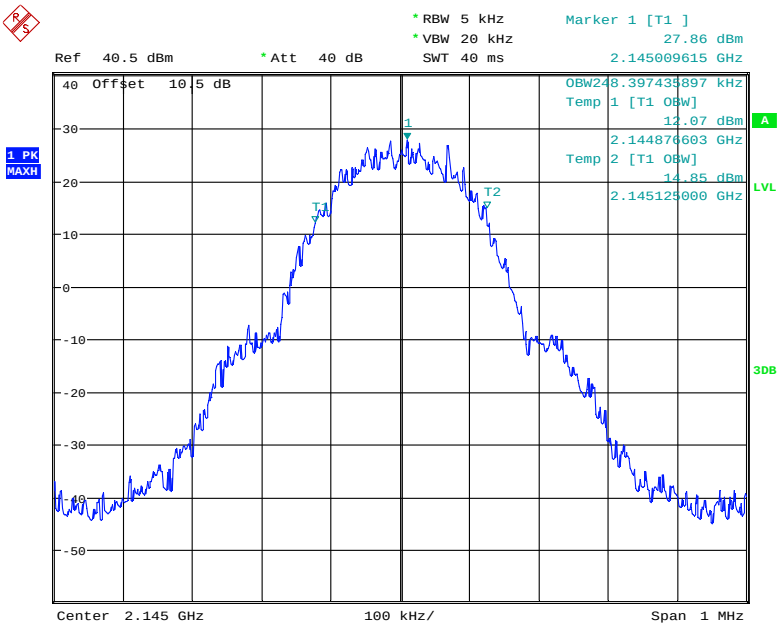
Date: 18.JAN.2018 19:39:38

Frequency: 2145 MHz, 99% Occupied Bandwidth GSM, AGC Output



Date: 12.JAN.2018 20:26:56

Frequency: 2145 MHz, 99% Occupied Bandwidth GSM, AGC+3 Output



Date: 12.JAN.2018 20:27:29

FCC §27.53 (h) - RADIATED SPURIOUS EMISSIONS

Applicable Standard

FCC §27.53 (h)

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 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 1g (TXpwr in Watts/0.001)-the absolute level

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Dylan Li on 2018-01-17.

Test Mode: Transmitting(pre-scan the low, middle and high channel, the worst case was middle channel)

30MHz - 22GHz:

Frequency (MHz)	Receiver Reading (dBμV)	Turn Table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)			
Uplink-1732.5 MHz										
425.03	45.12	321	1.2	V	-49.9	0.44	0.0	-50.34	-13	37.34
425.03	45.01	349	1.3	H	-50.0	0.44	0.0	-50.44	-13	37.44
3465.00	44.26	203	2.3	H	-56.1	1.50	9.70	-47.90	-13	34.90
3465.00	42.63	147	2.2	V	-58.5	1.50	9.70	-50.30	-13	37.30
Downlink-2145 MHz										
425.03	45.21	201	2.4	V	-49.8	0.44	0.0	-50.22	-13	37.22
425.03	44.96	57	2.0	H	-50.0	0.44	0.0	-50.44	-13	37.44
4290.00	45.26	53	2.5	H	-55.9	1.50	10.60	-46.80	-13	33.80
4290.00	43.34	42	1.7	V	-57.1	1.50	10.60	-48.00	-13	35.00
8580.00	52.35	120	1.9	H	-42.3	2.10	11.10	-33.30	-13	20.30
8580.00	50.26	353	2.3	V	-44.5	2.10	11.10	-35.50	-13	22.50

Note:
Absolute Level = Substituted Level - Cable loss + Antenna Gain
Margin = Limit- Absolute Level

FCC §27.53(h) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard

FCC§27.53(h).

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

Test Procedure

Test Method: KDB 935210 D05 Indus Booster Basic Meas v01r02 section 3.6.3

a) Connect a signal generator to the input of the EUT.
b) Set the signal generator to produce the broadband test signal as previously described (i.e., 4.1 MHz OBW AWGN).
c) Set the center frequency of the test signal to the lowest available channel within the frequency band or block.
d) Set the EUT input power to a level that is just below the AGC threshold (see 3.2), but not more than 0.5 dB below.
e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.
f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band of operation (e.g., reference bandwidth is typically 100 kHz or 1 MHz).
g) Set the VBW $\geqslant$ 3 $\times$ RBW.
h) Set the Sweep time = auto-couple.
i) Set the spectrum analyzer start frequency to the lowest RF signal generated in the equipment, without going below 9 kHz, and the stop frequency to the lower band/block edge frequency minus 100 kHz or 1 MHz, as specified in the applicable rule part.
The number of measurement points in each sweep must be $\geqslant$ (2 $\times$ span/RBW), which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer. 4
j) Select the power averaging (rms) detector function.
k) Trace average at least 10 traces in power averaging (rms) mode.
l) Use the peak marker function to identify the highest amplitude level over each measured frequency range. Record the frequency and amplitude and capture a plot for inclusion in the test report.
m) Reset the spectrum analyzer start frequency to the upper band/block edge frequency plus 100 kHz or 1 MHz, as specified in the applicable rule part, and the spectrum analyzer stop frequency to 10 times the highest frequency of the fundamental emission (see Section 2.1057). The number of measurement points in each sweep must be $\geqslant$ (2 $\times$ span/RBW), which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.
n) Trace average at least 10 traces in power averaging (rms) mode.
o) Use the peak marker function to identify the highest amplitude level over each of the measured frequency ranges. Record the frequency and amplitude and capture a plot for inclusion in the test report; also provide tabular data, if required.
p) Repeat steps i) to o) with the input test signals firstly tuned to a middle band/block frequency/channel, and then tuned to a high band/block frequency/channel.
q) Repeat steps b) to p) with the narrowband test signal.
r) Repeat steps b) to q) for all authorized frequency bands/blocks used by the EUT.

Test Data

Environmental Conditions

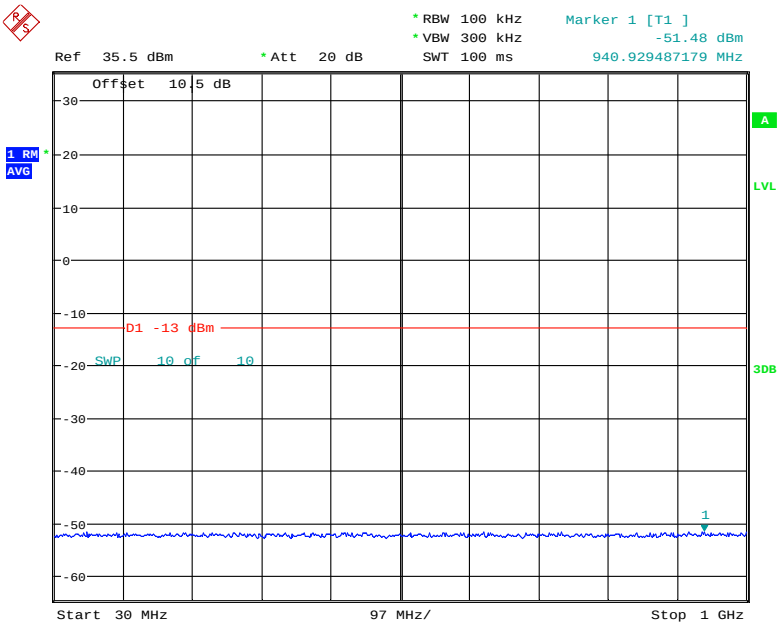
Temperature:	24~25 ℃
Relative Humidity:	50~55 %
ATM Pressure:	101.0~101.5 kPa

The testing was performed by Dylan Li from 2018-01-13 to 2018-05-07.

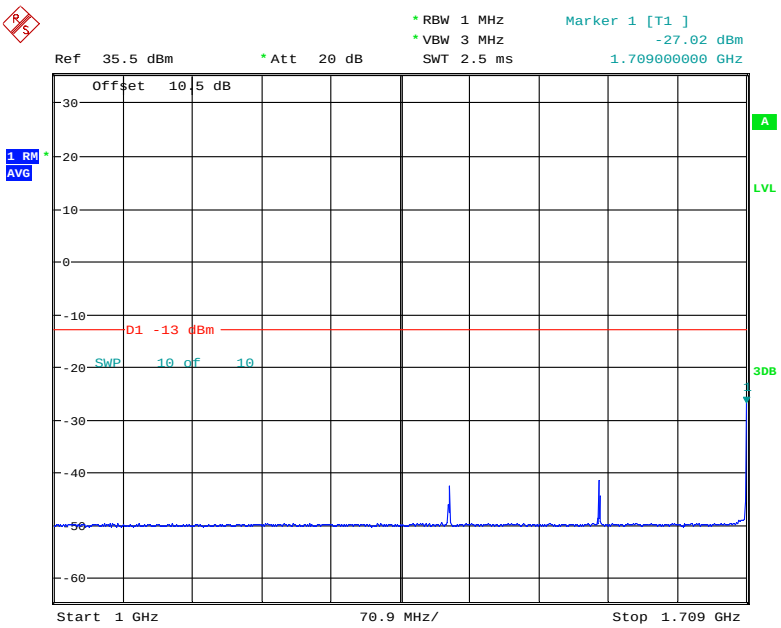
Test Mode: Transmitting, please refer to the following plots.

Uplink:

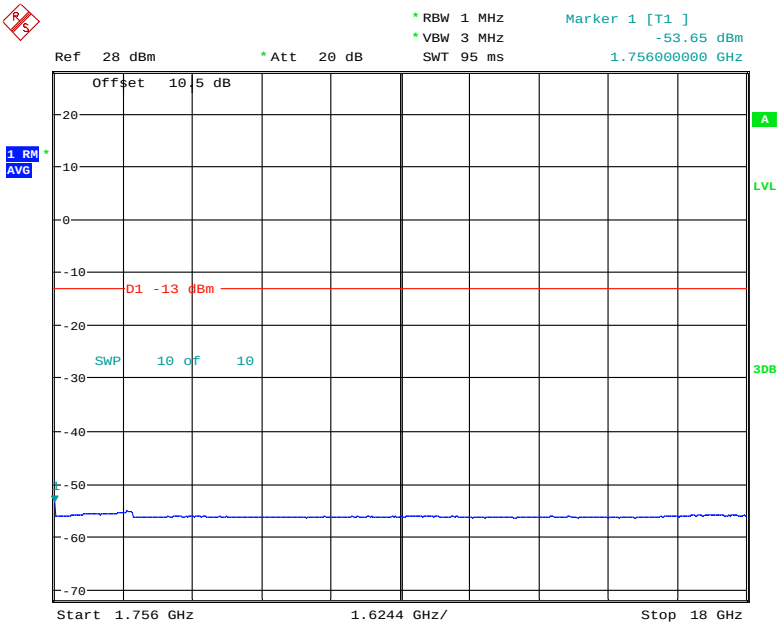
AWGN Low Channel



Date: 13.JAN.2018 19:30:12

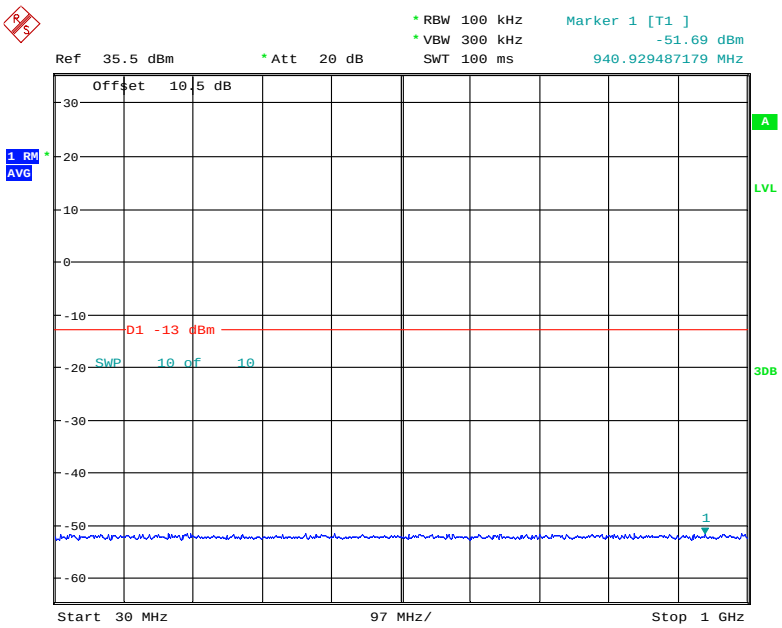


Date: 13.JAN.2018 19:31:36

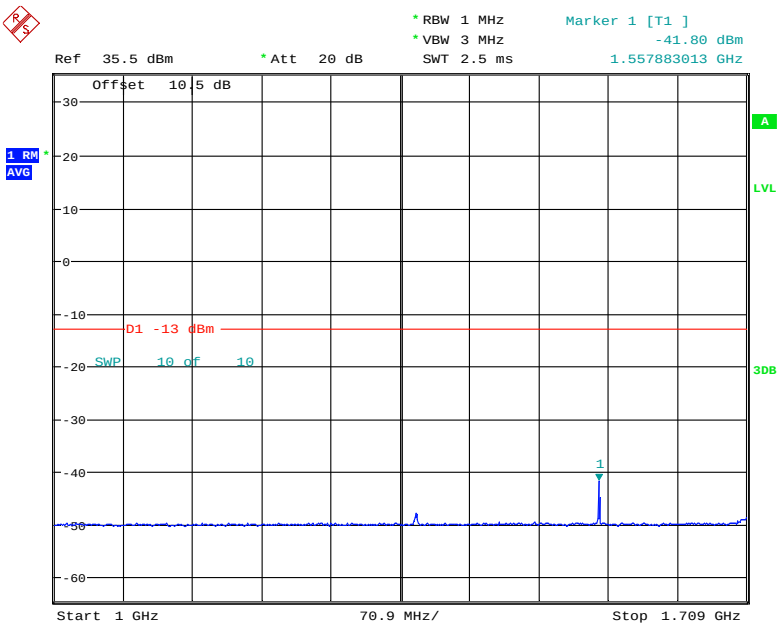


Date: 7.MAY.2018 13:19:41

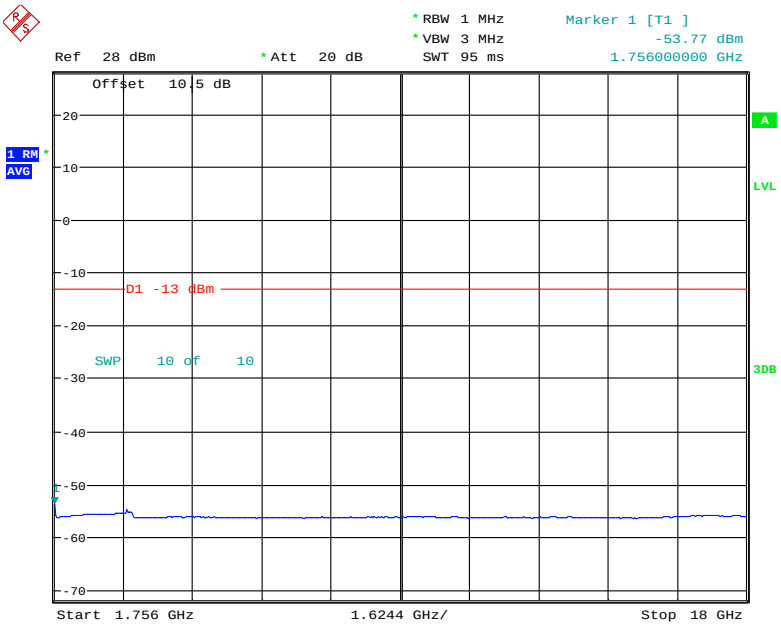
AWGN Middle Channel



Date: 13.JAN.2018 19:42:43

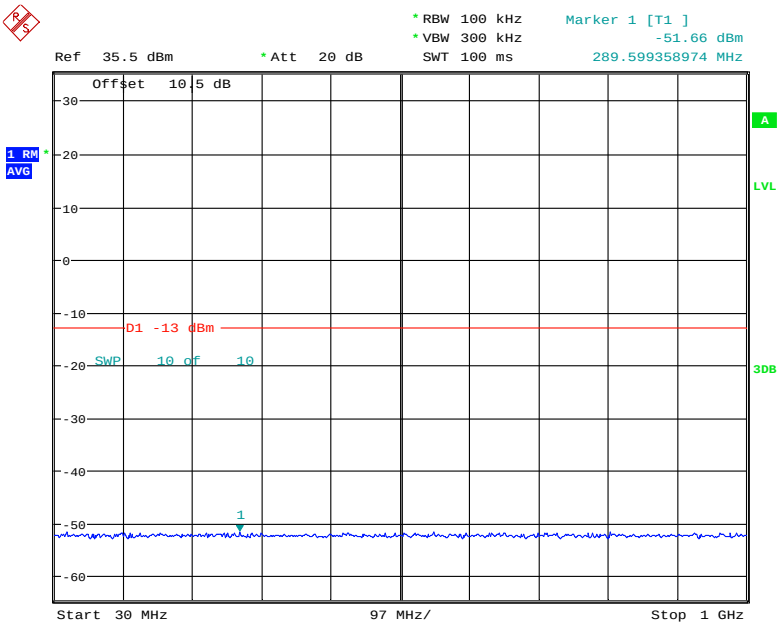


Date: 13.JAN.2018 19:41:51

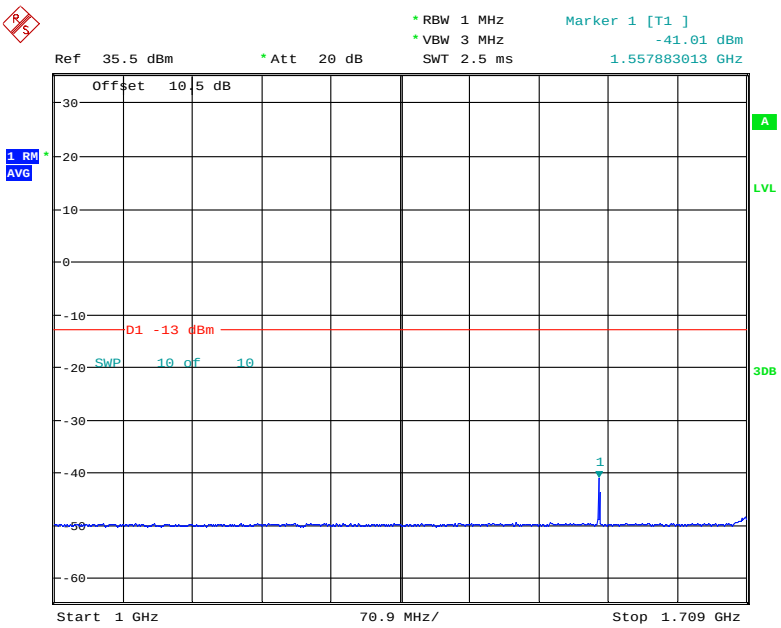


Date: 7.MAY.2018 13:22:13

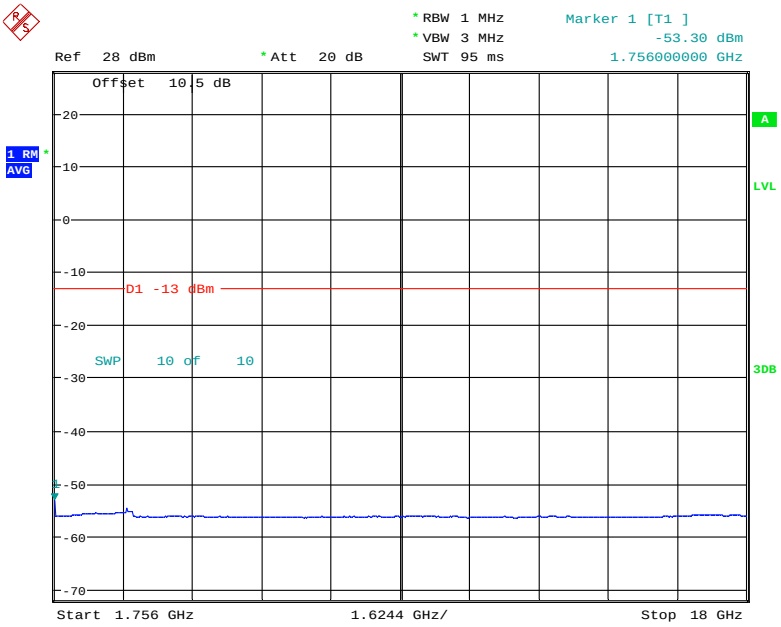
AWGN High Channel



Date: 13.JAN.2018 19:43:59

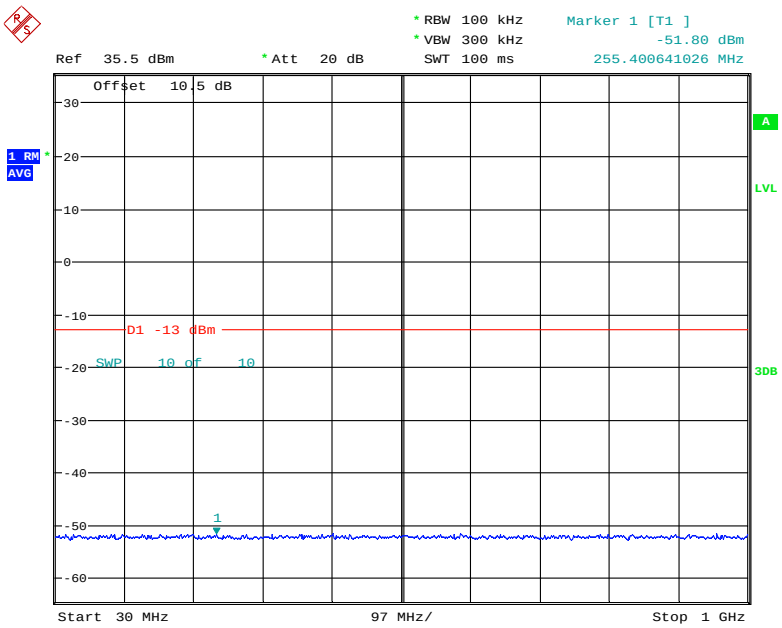


Date: 13.JAN.2018 19:44:34

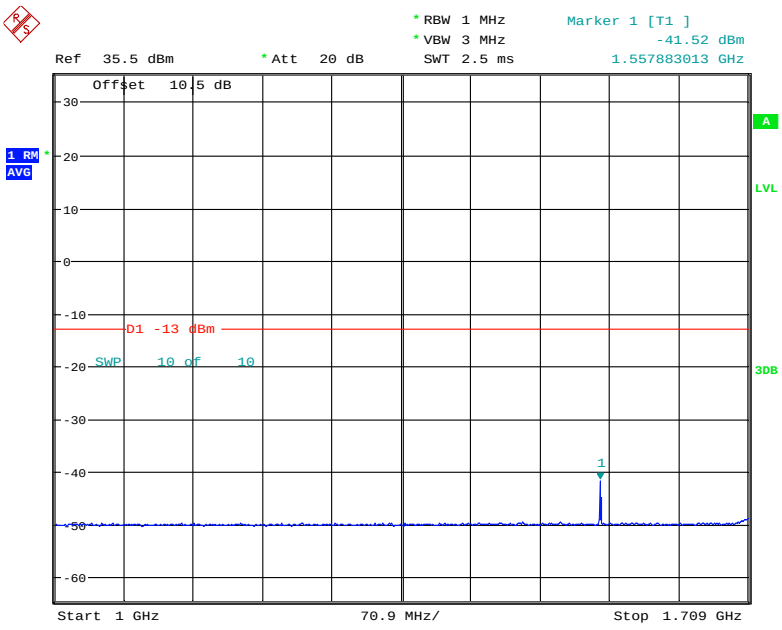


Date: 7.MAY.2018 13:25:07

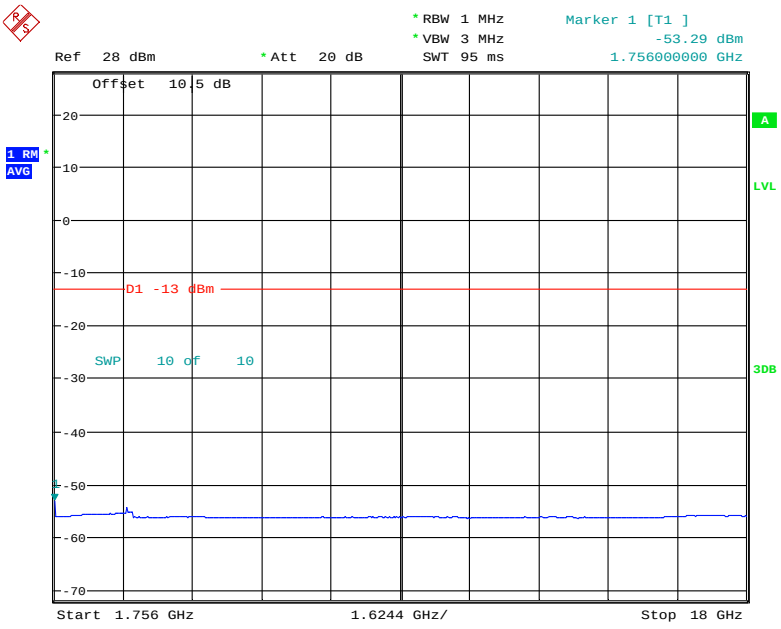
GSM Low Channel



Date: 13.JAN.2018 19:34:28

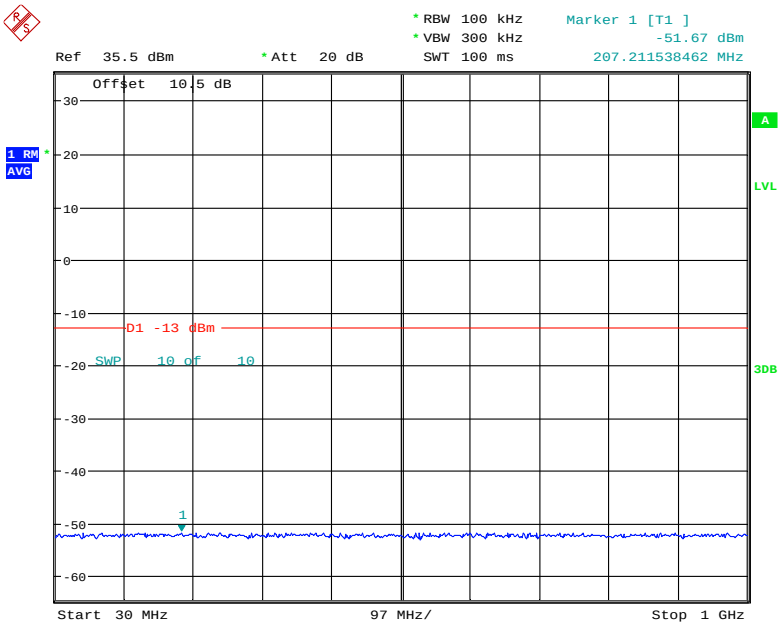


Date: 13.JAN.2018 19:38:32

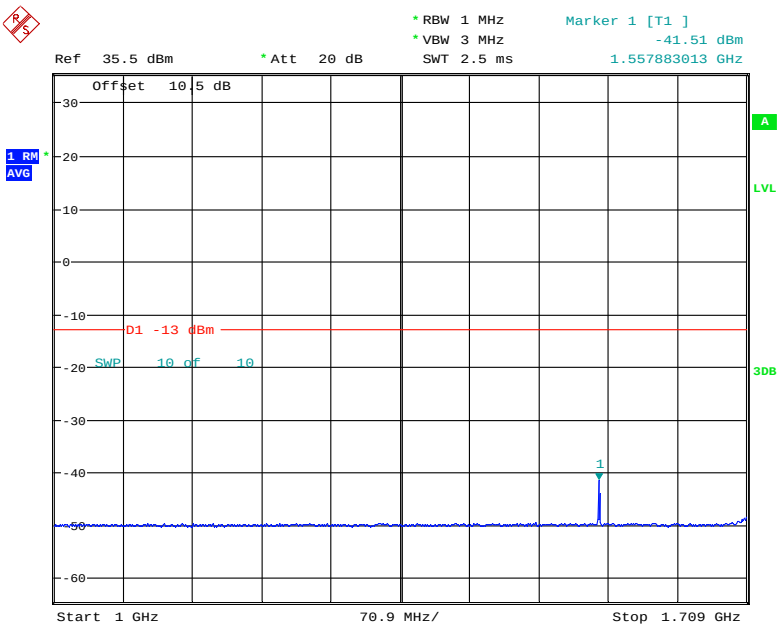


Date: 7.MAY.2018 13:27:07

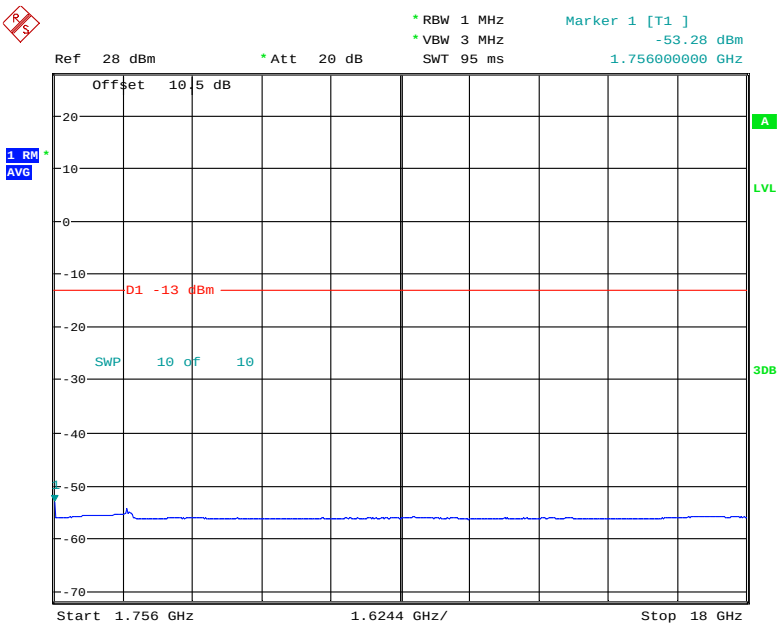
GSM Middle Channel



Date: 13.JAN.2018 19:39:47

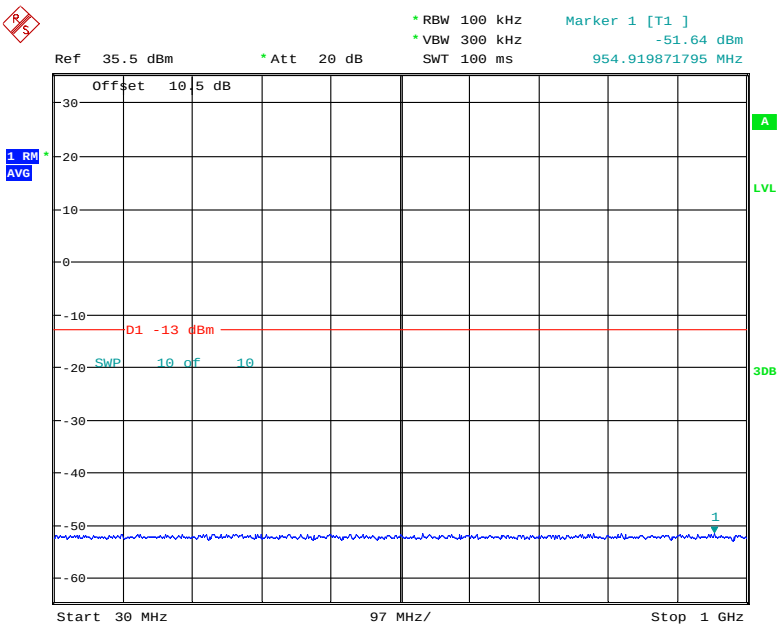


Date: 13.JAN.2018 19:40:43

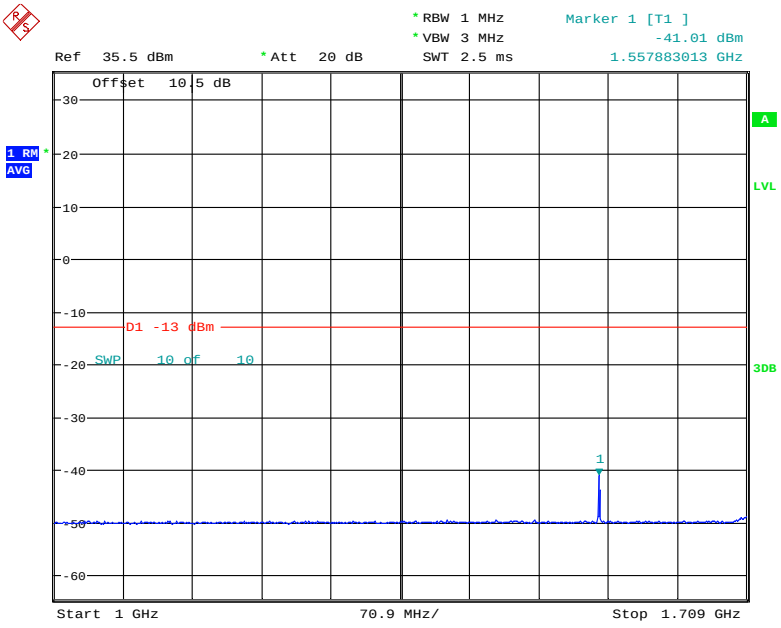


Date: 7.MAY.2018 13:30:16

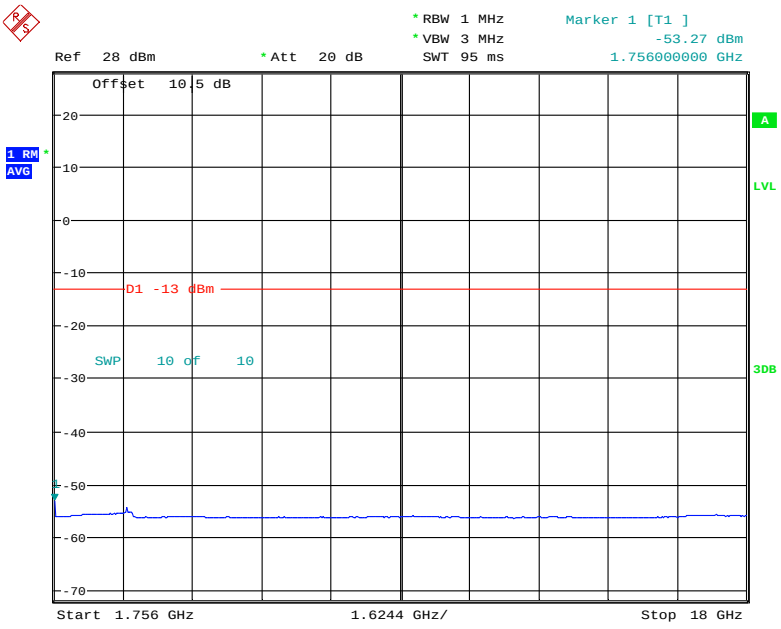
GSM High Channel



Date: 13.JAN.2018 19:50:52



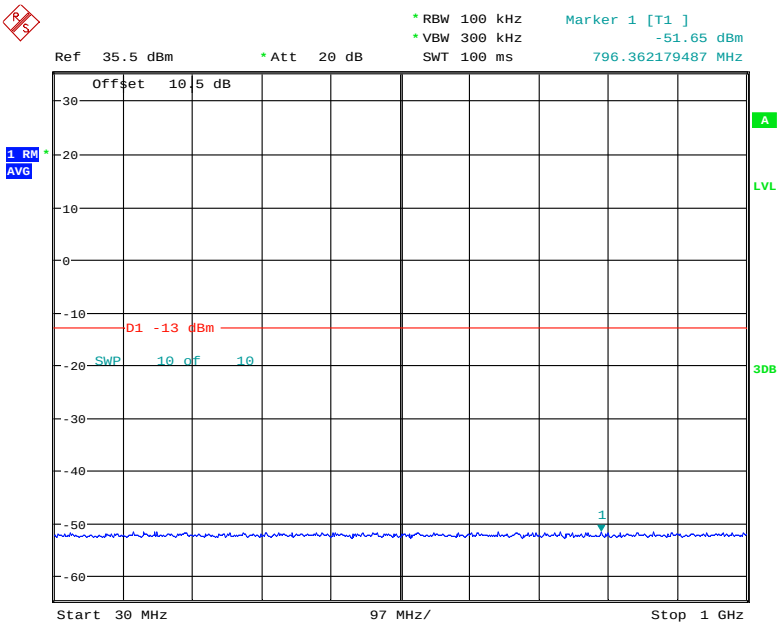
Date: 13.JAN.2018 19:50:34



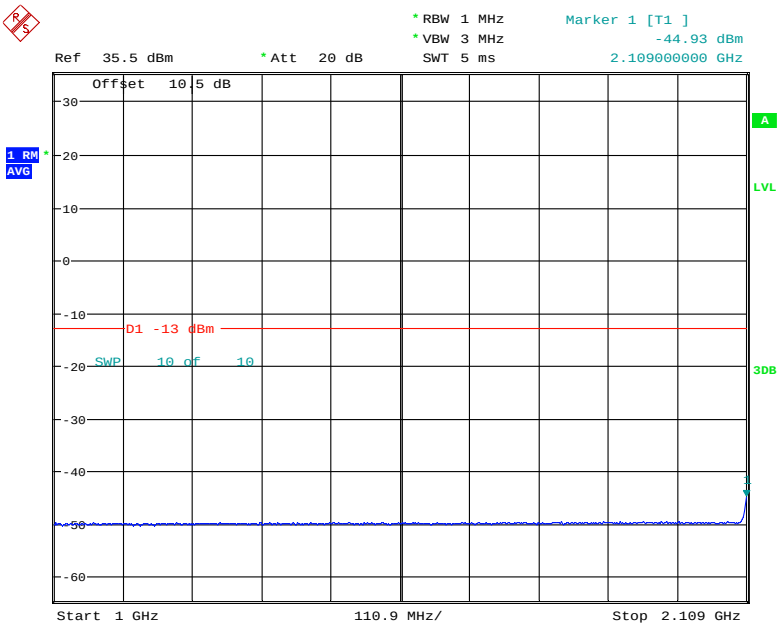
Date: 7.MAY.2018 13:35:14

Downlink:

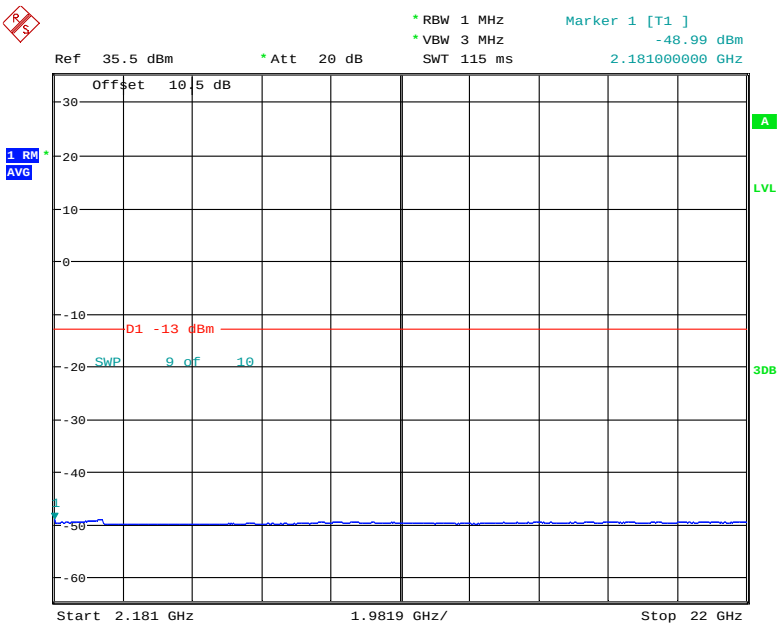
AWGN Low Channel



Date: 13.JAN.2018 19:56:35

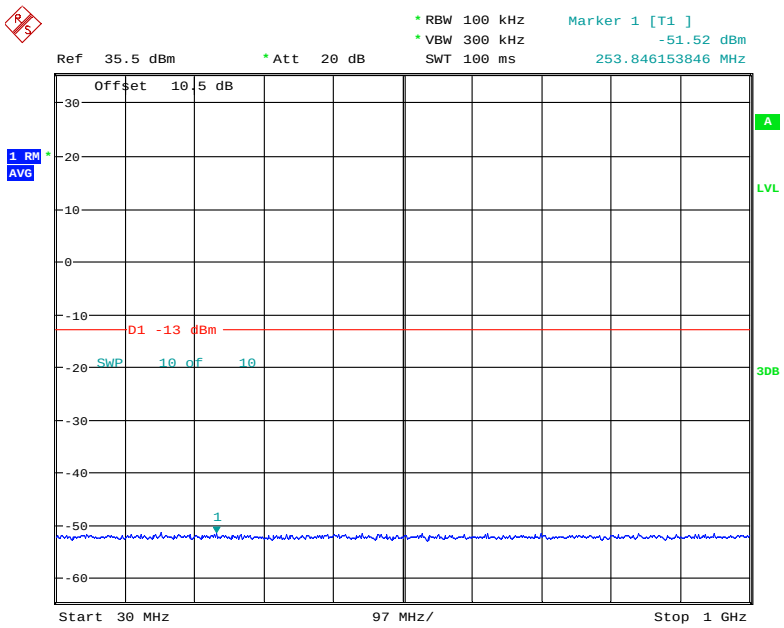


Date: 13.JAN.2018 19:56:17

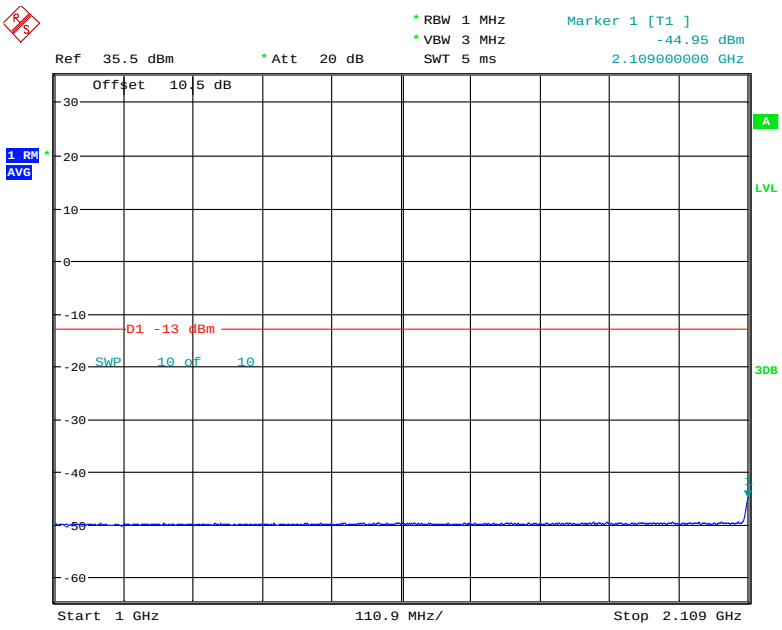


Date: 13.JAN.2018 19:56:01

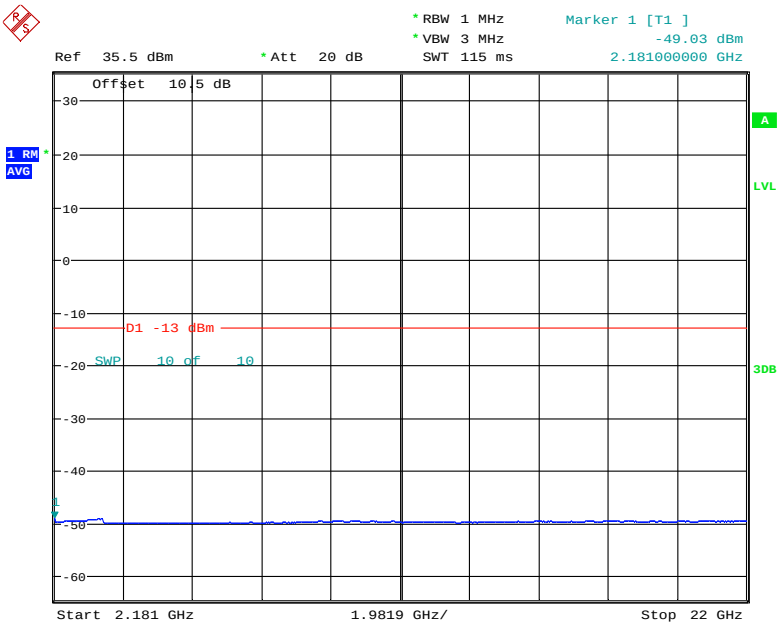
AWGN Middle Channel



Date: 13.JAN.2018 19:56:55

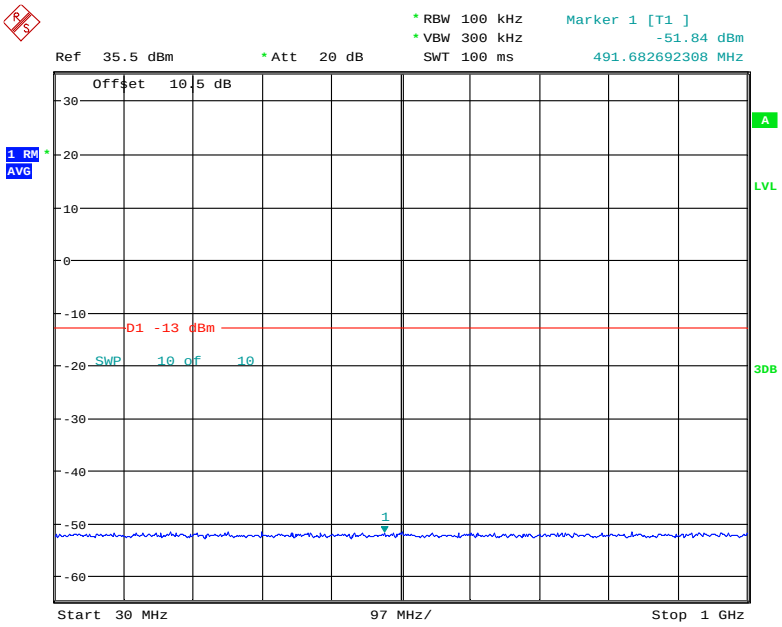


Date: 13.JAN.2018 19:57:39

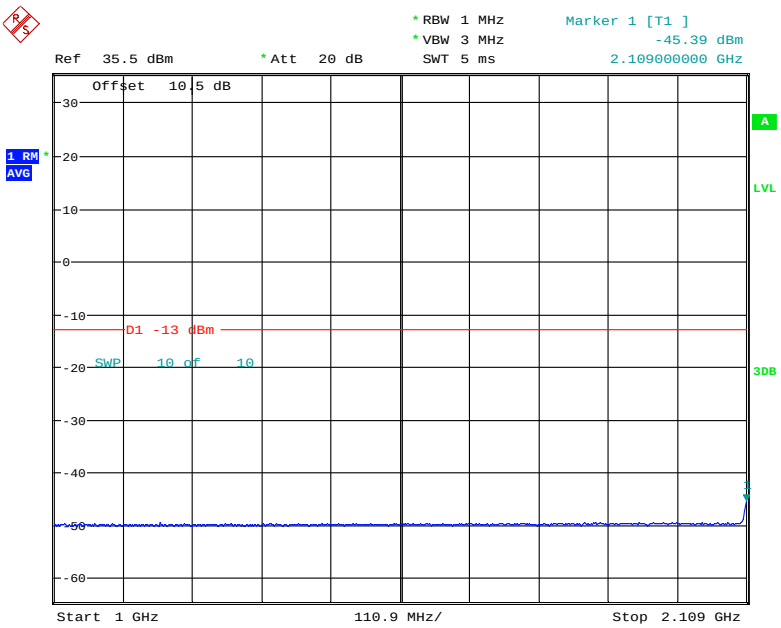


Date: 13.JAN.2018 19:58:20

AWGN High Channel



Date: 13.JAN.2018 20:01:30



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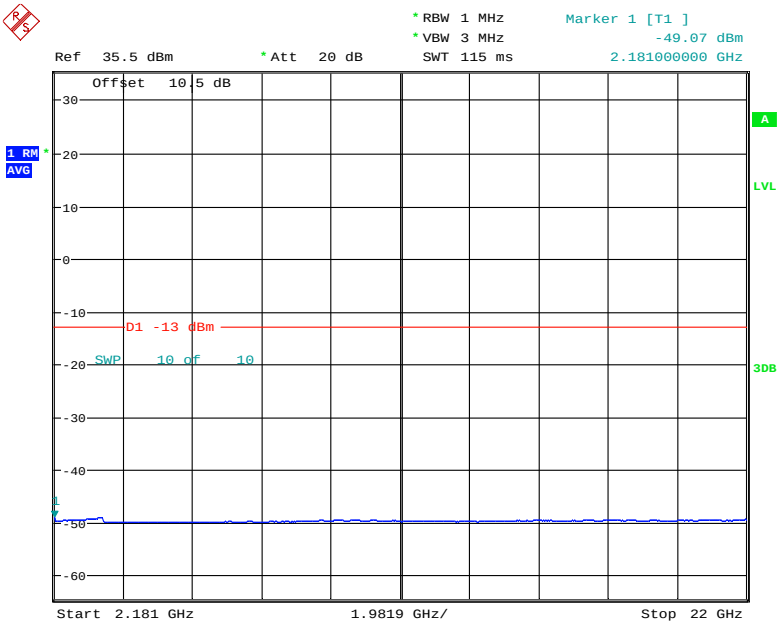
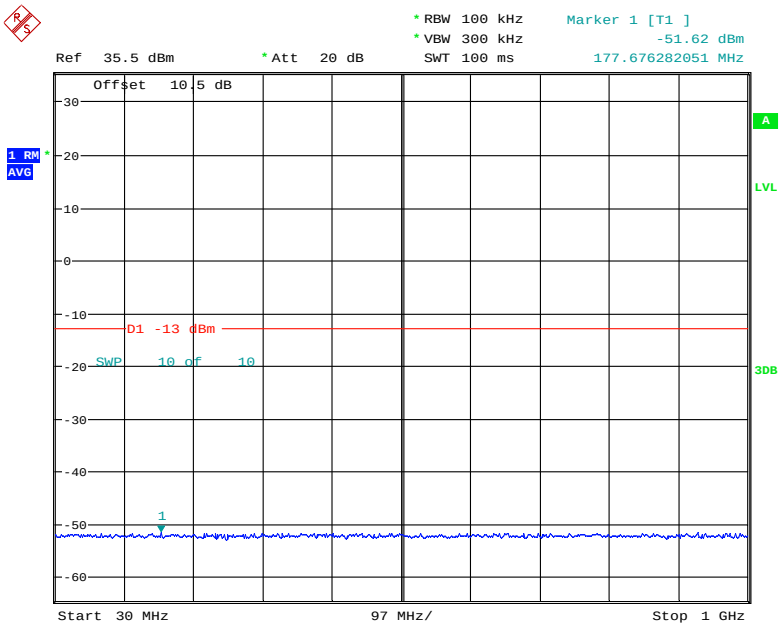
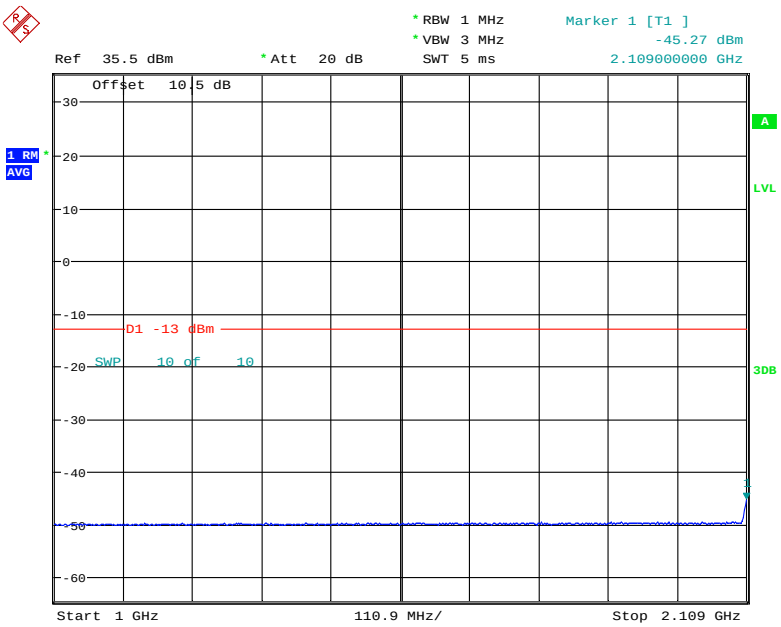


Date: 13.JAN.2018 20:00:51

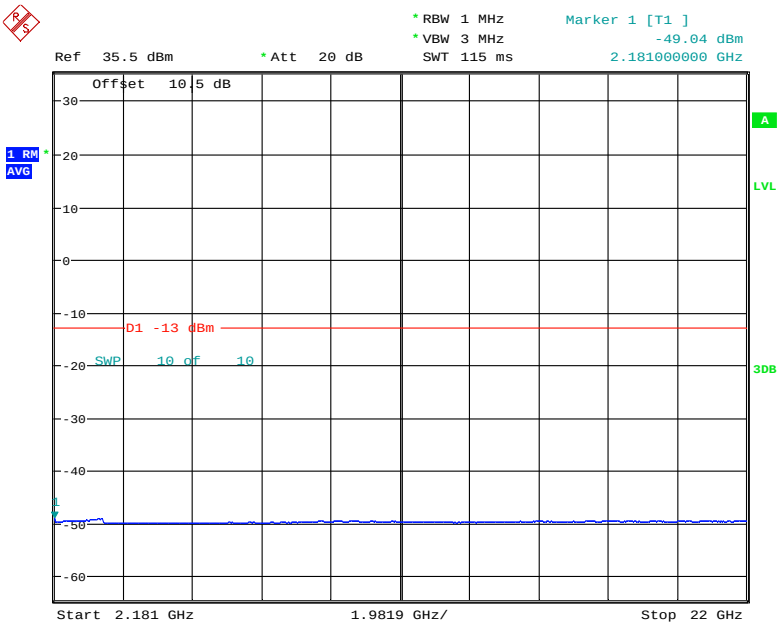
GSM Low Channel



Date: 13.JAN.2018 19:53:46

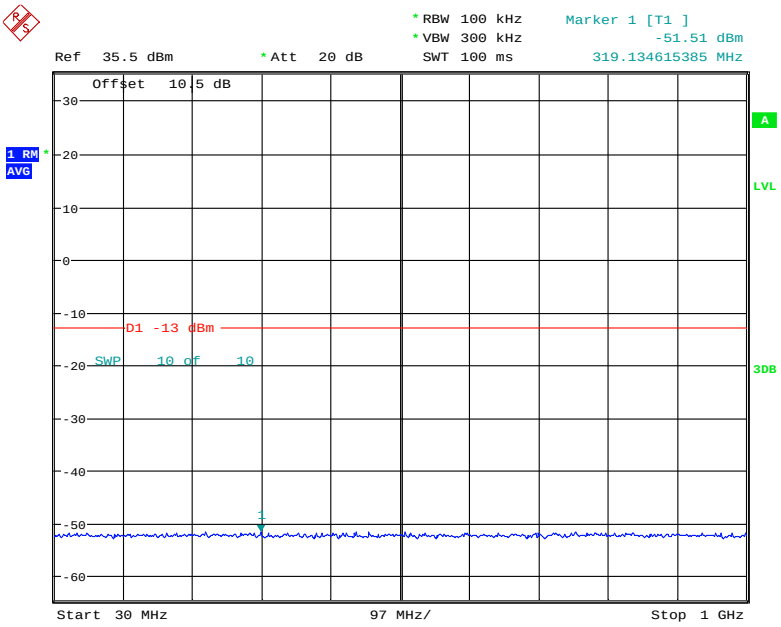


Date: 13.JAN.2018 19:55:06

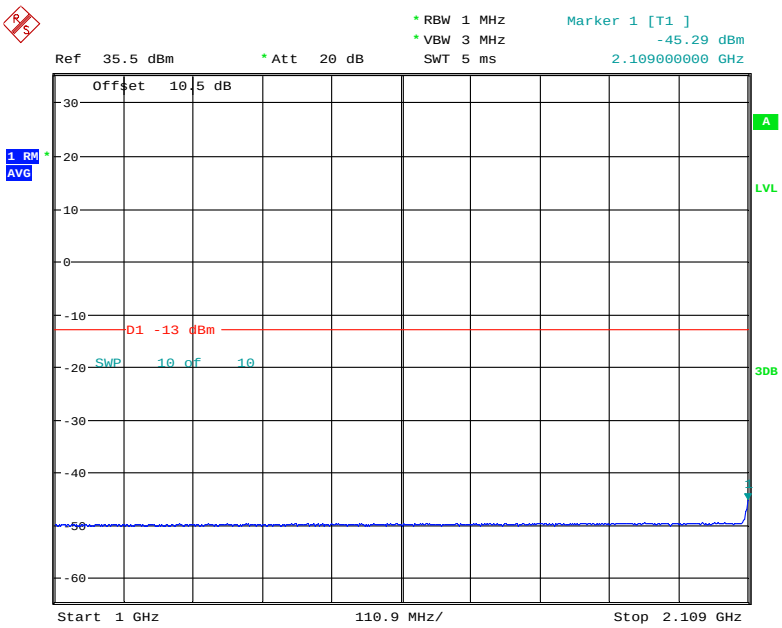


Date: 13.JAN.2018 19:55:29

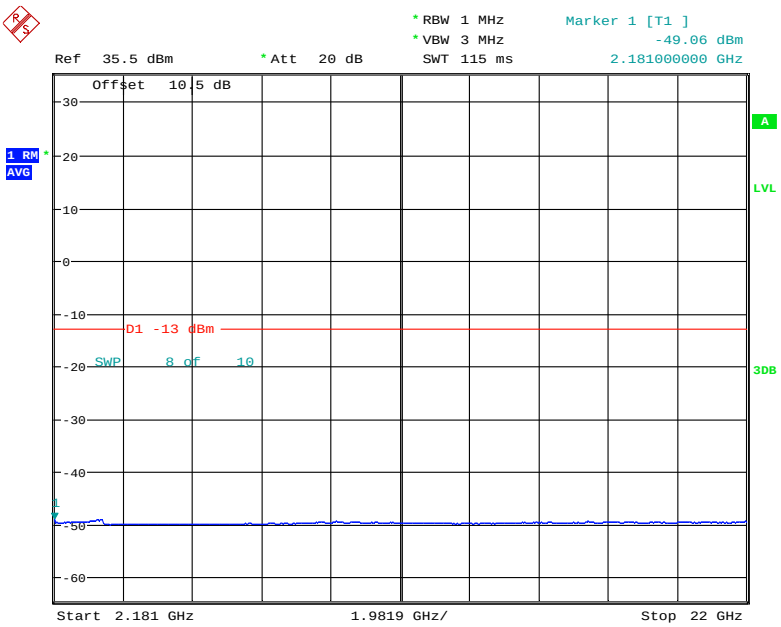
GSM Middle Channel



Date: 13.JAN.2018 19:59:13

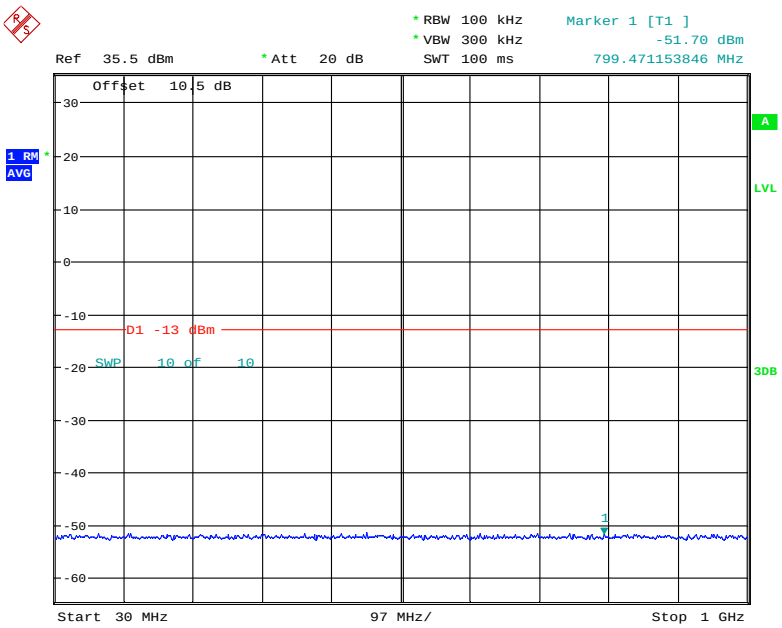


Date: 13.JAN.2018 19:58:57

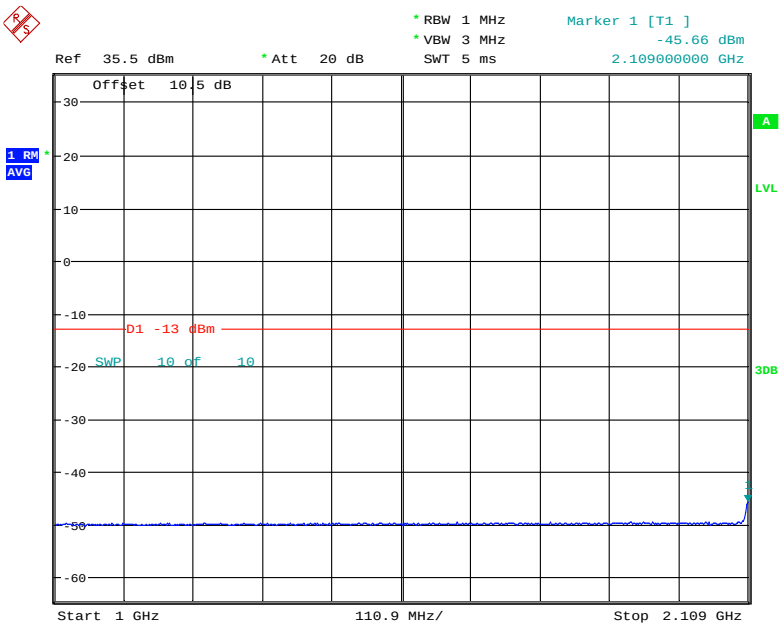


Date: 13.JAN.2018 19:58:44

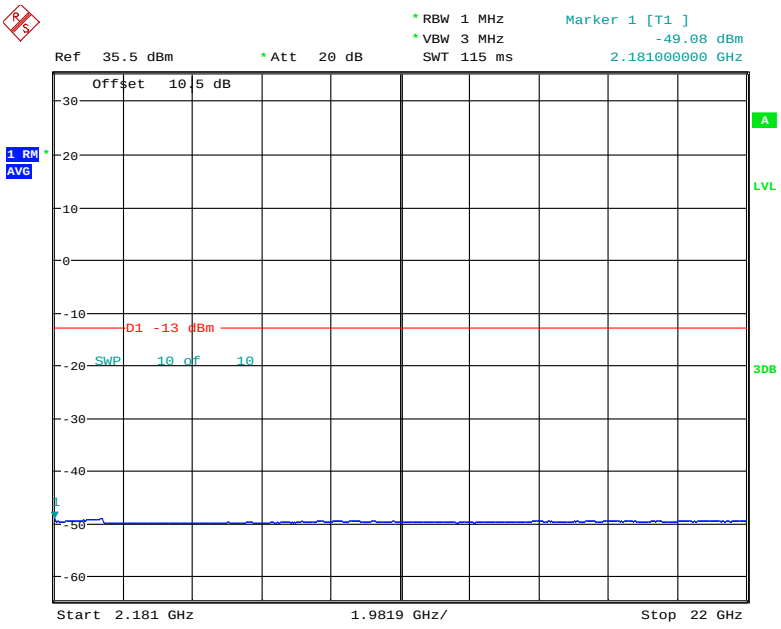
GSM High Channel



Date: 13.JAN.2018 19:59:35



Date: 13.JAN.2018 20:00:06



Date: 13.JAN.2018 20:00:29

FCC §27.53 (h)– INTERMODULATION & BAND EDGES

Applicable Standard

According to FCC §27.53 (h), 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.

Test Procedure

Test Method: KDB 935210 D05 Indus Booster Basic Meas v01r02 section 3.6.2

a) Connect a signal generator to the input of the EUT.
If the signal generator is not capable of generating two modulated carriers simultaneously, then two discrete signal generators can be connected with an appropriate combining network to support this two-signal test.
b) Set the signal generator to produce two AWGN signals as previously described (e.g., 4.1 MHz OBW).
c) Set the center frequencies such that the AWGN signals occupy adjacent channels, as defined by industry standards such as 3GPP or 3GPP2, at the upper edge of the frequency band or block under test.
d) Set the composite power levels such that the input signal is just below the AGC threshold (see 3.2), but not more than 0.5 dB below. The composite power can be measured using the procedures provided in KDB Publication 971168 [R8], but it will be necessary to expand the power integration bandwidth so as to include both of the transmit channels. Alternatively, the composite power can be measured using an average power meter as described in KDB Publication 971168 [R8].
e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.
f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band (typically 1 % of the EBW or 100 kHz or 1 MHz)
g) Set the VBW = 3 × RBW.
h) Set the detector to power averaging (rms) detector.
i) Set the Sweep time = auto-couple.
j) Set the spectrum analyzer start frequency to the upper block edge frequency, and the stop frequency to the upper block edge frequency plus 300 kHz or 3 MHz, for frequencies below and above 1 GHz, respectively.
k) Trace average at least 100 traces in power averaging (rms) mode.
l) Use the marker function to find the maximum power level.
m) Capture the spectrum analyzer trace of the power level for inclusion in the test report.
n) Repeat steps k) to m) with the composite input power level set to 3 dB above the AGC threshold.
o) Reset the frequencies of the input signals to the lower edge of the frequency block or band under test.
p) Reset the spectrum analyzer start frequency to the lower block edge frequency minus 300 kHz or 3 MHz, for frequencies below and above 1 GHz, respectively, and the stop frequency to the lower band or block edge frequency.
q) Repeat steps k) to n).
r) Repeat steps a) to q) with the signal generator configured for a single test signal tuned as close as possible to the block edges.
s) Repeat steps a) to r) with the narrowband test signal.
t) Repeat steps a) to s) for all authorized frequency bands or blocks used by the EUT.

Test Data

Environmental Conditions

Temperature:	24~25 ℃
Relative Humidity:	50~55 %
ATM Pressure:	101.0~101.5 kPa

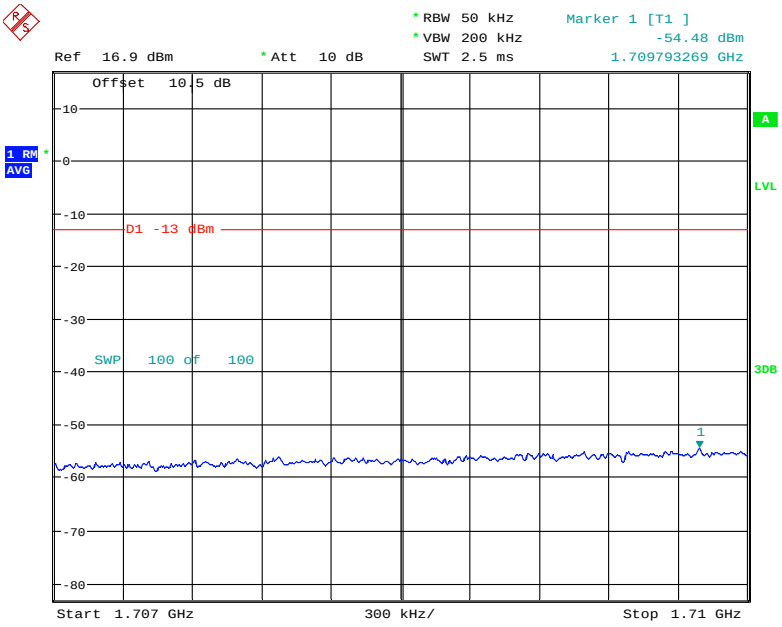
The testing was performed by Dylan Li from 2018-01-16 to 2018-05-07.

Test Mode: Transmitting

Test Result: Compliance. Please refer to following plots.

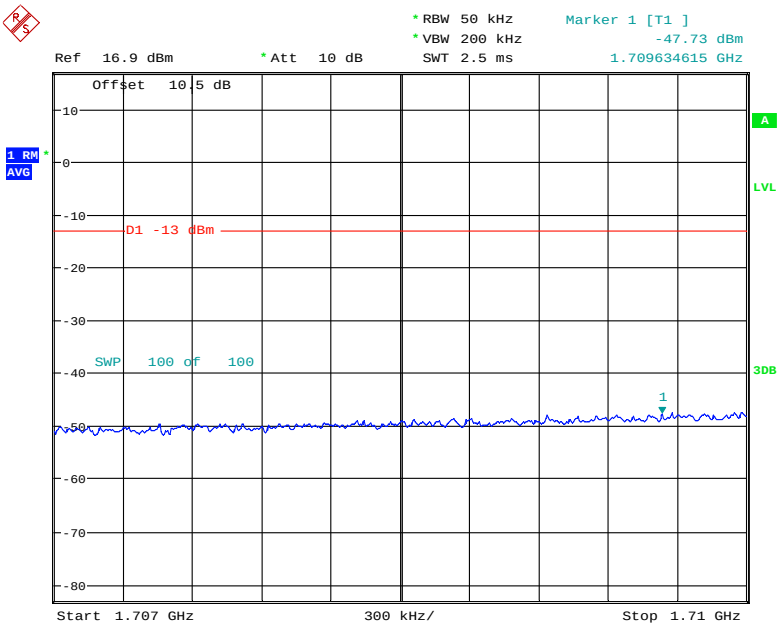
Intermodulation, Uplink

AWGN, Left Band Edge, AGC



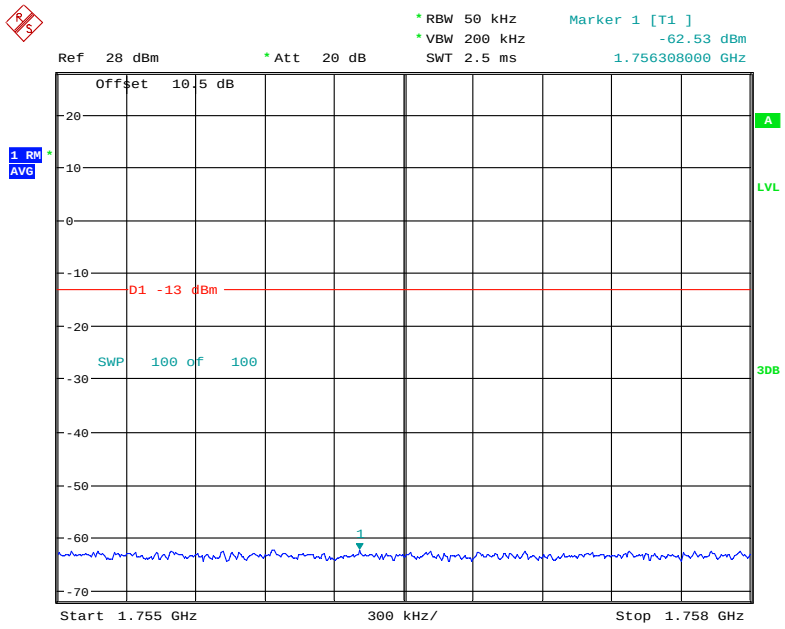
Date: 28.FEB.2018 21:44:18

AWGN, Left Band Edge, AGC+3



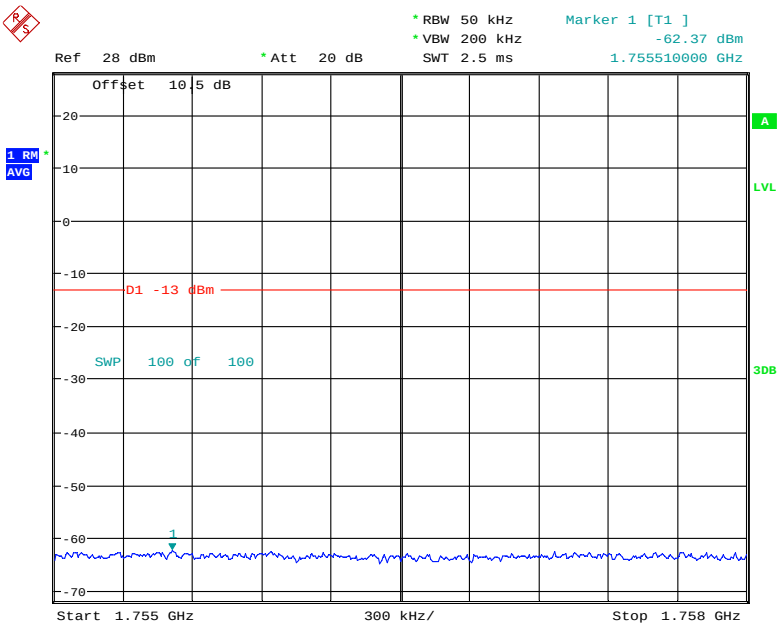
Date: 28.FEB.2018 21:45:39

AWGN, Right Band Edge, AGC



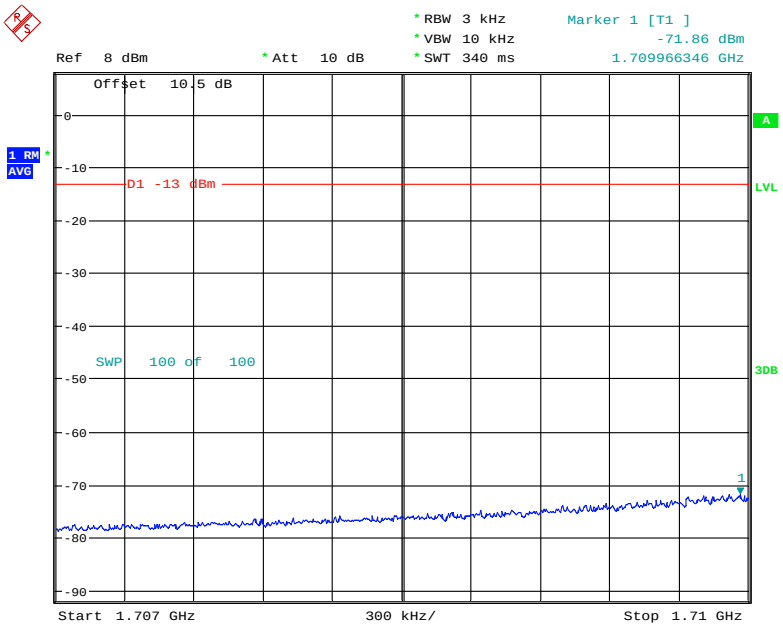
Date: 7.MAY.2018 13:39:26

AWGN, Right Band Edge, AGC+3



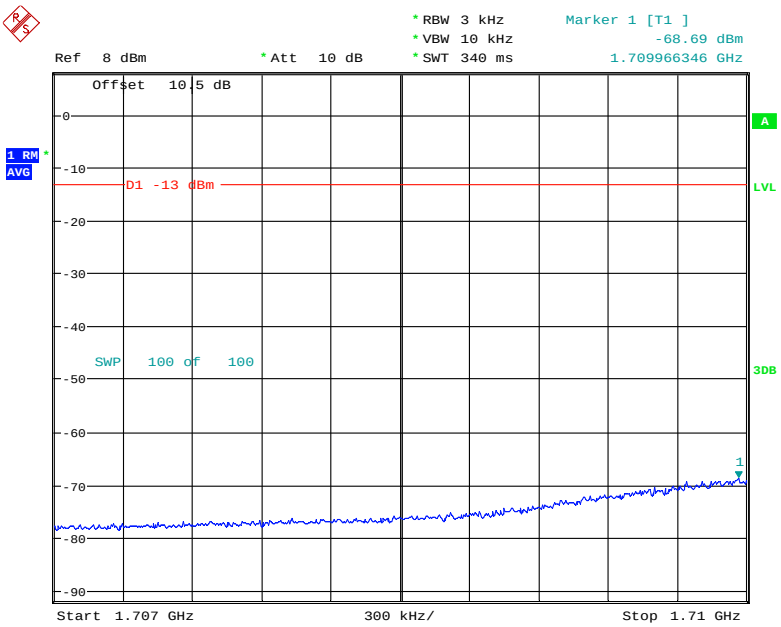
Date: 7.MAY.2018 13:40:59

GSM, Left Band Edge, AGC



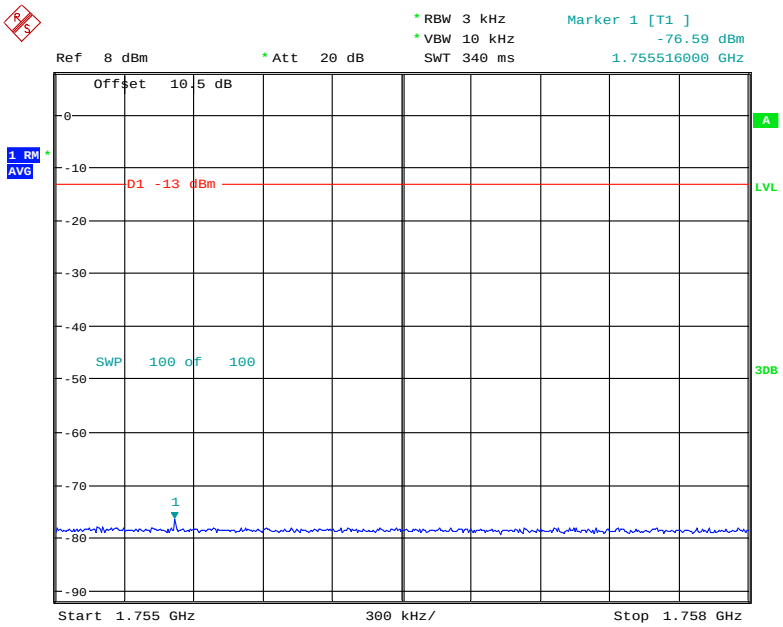
Date: 28.FEB.2018 21:56:26

GSM, Left Band Edge, AGC+3



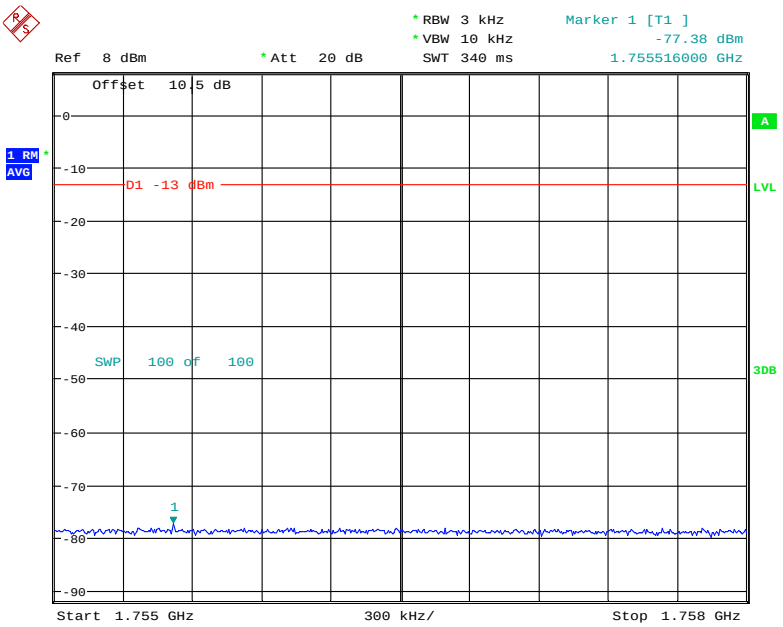
Date: 28.FEB.2018 21:56:57

GSM, Right Band Edge, AGC



Date: 7.MAY.2018 13:43:05

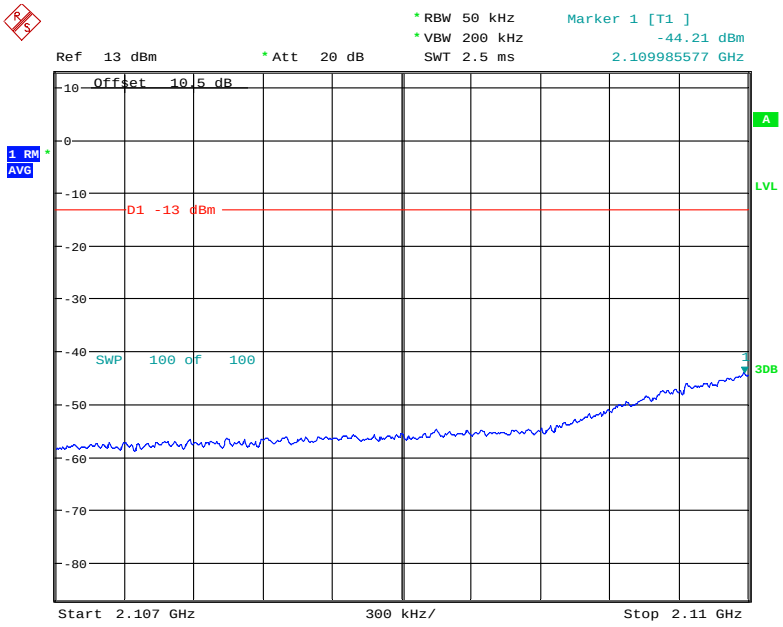
GSM, Right Band Edge, AGC+3



Date: 7.MAY.2018 13:43:56

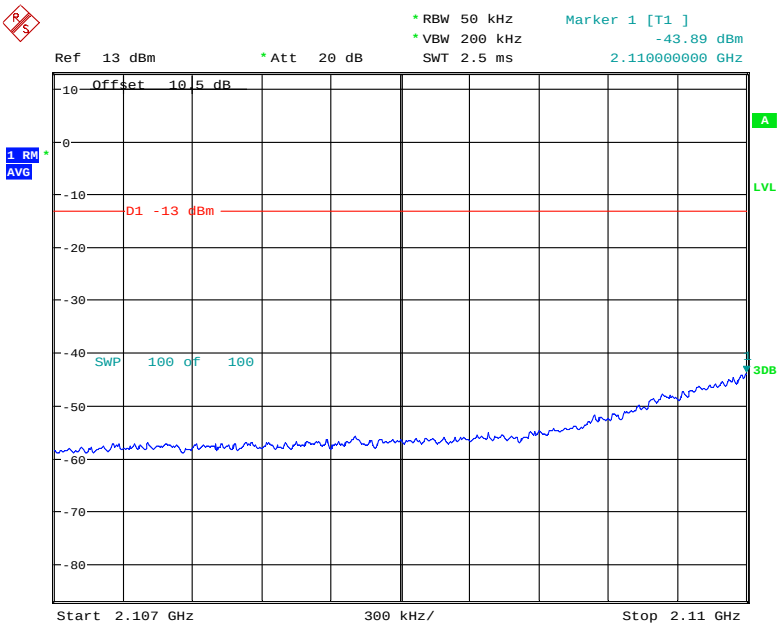
Intermodulation, Downlink

AWGN, Left Band Edge, AGC



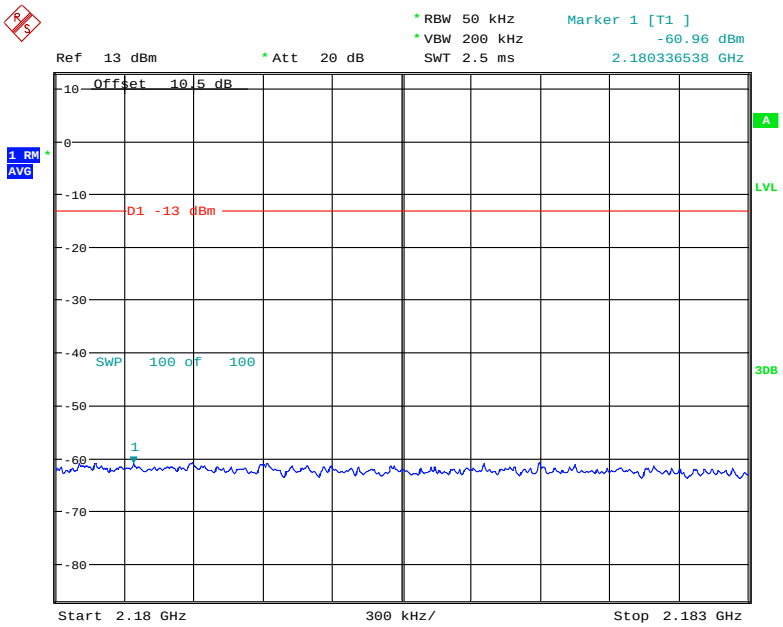
Date: 18.JAN.2018 20:46:13

AWGN, Left Band Edge, AGC+3



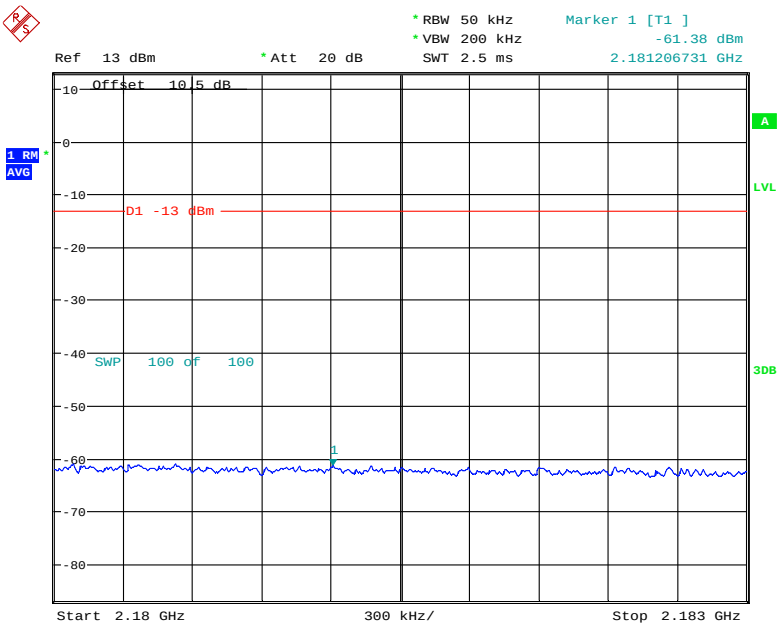
Date: 18.JAN.2018 20:47:45

AWGN, Right Band Edge, AGC



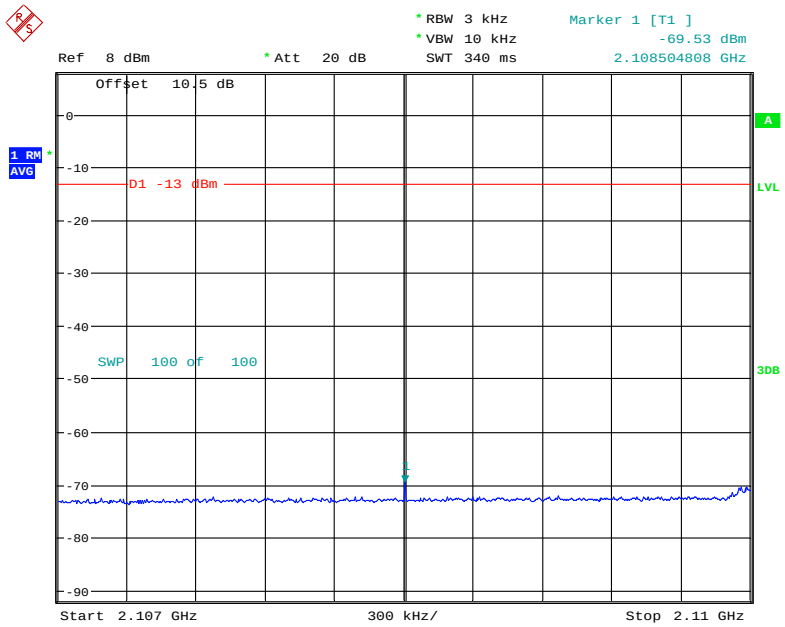
Date: 18.JAN.2018 20:48:25

AWGN, Right Band Edge, AGC+3



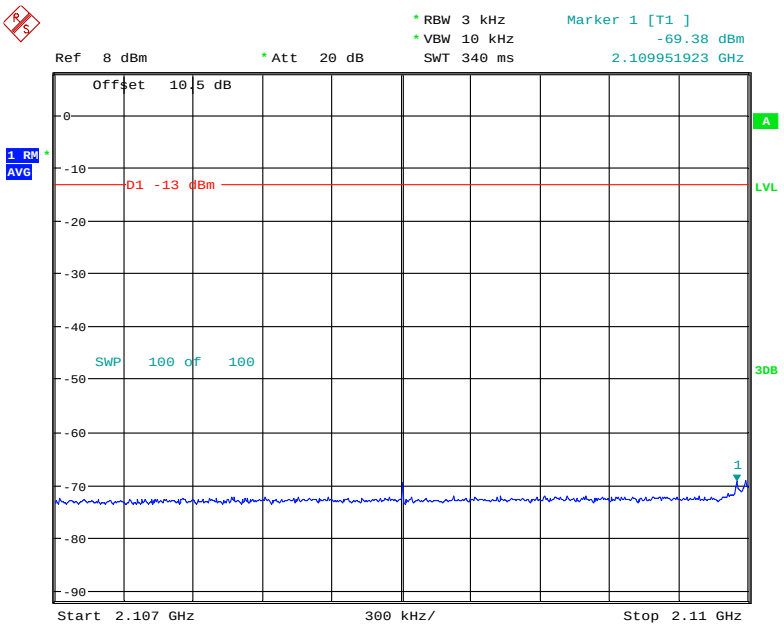
Date: 18.JAN.2018 20:48:10

GSM, Left Band Edge, AGC



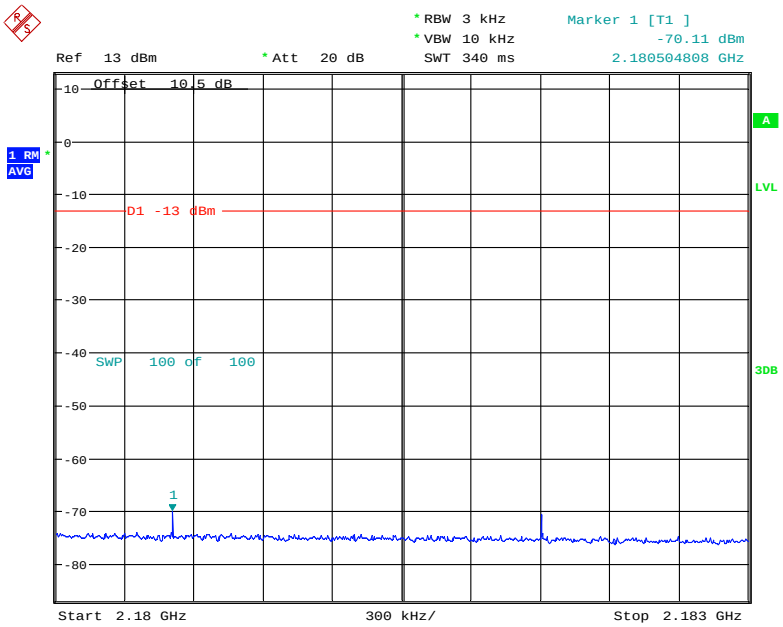
Date: 18.JAN.2018 20:54:34

GSM, Left Band Edge, AGC+3



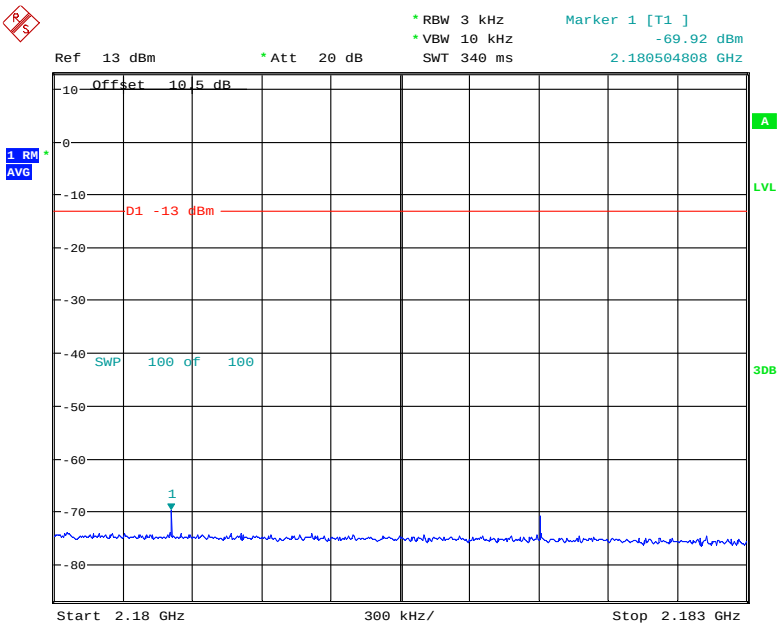
Date: 18.JAN.2018 20:53:58

GSM, Right Band Edge, AGC



Date: 18.JAN.2018 20:49:37

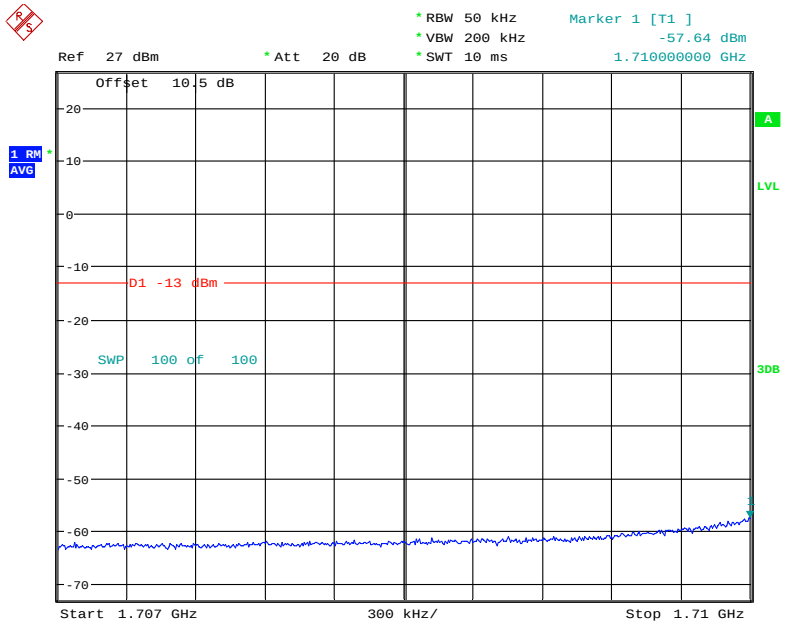
GSM, Right Band Edge, AGC+3



Date: 18.JAN.2018 20:50:44

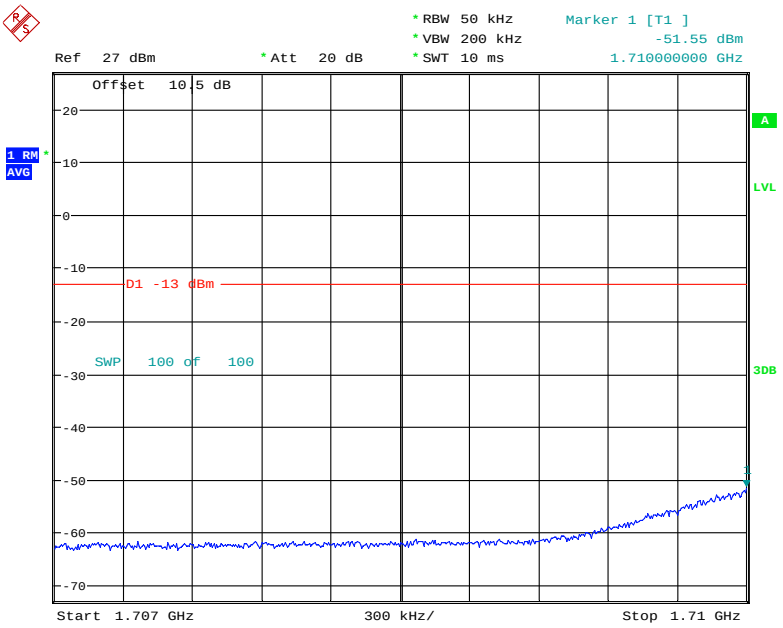
Band edge, Uplink

AWGN, Left Band Edge, AGC



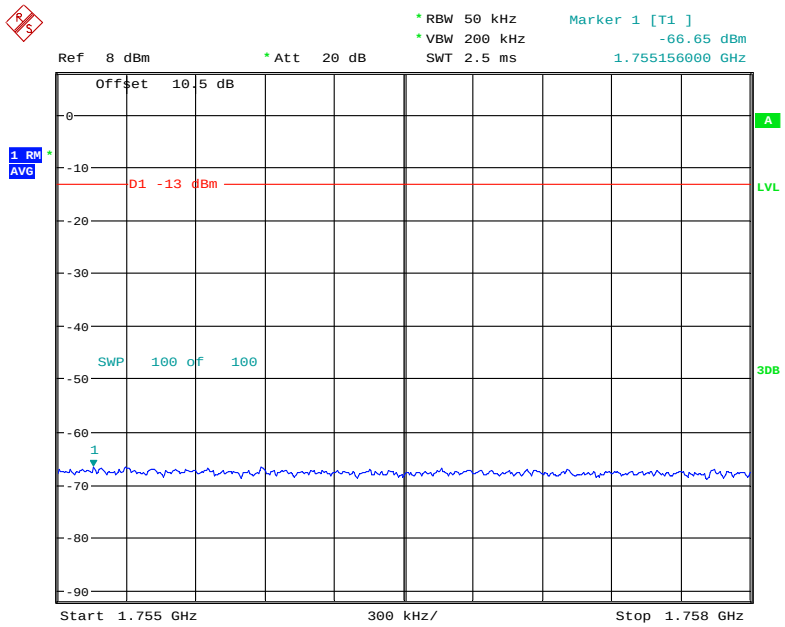
Date: 16.JAN.2018 20:29:38

AWGN, Left Band Edge, AGC+3



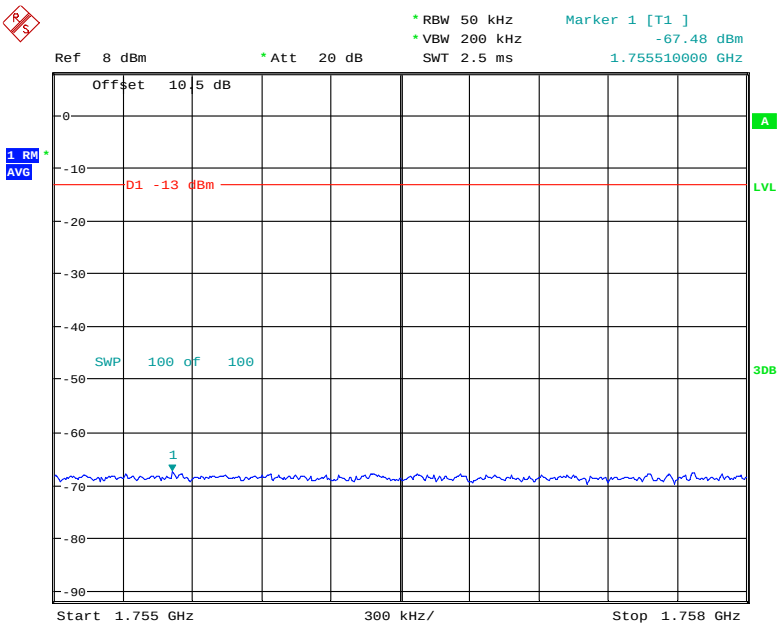
Date: 16.JAN.2018 20:31:30

AWGN, Right Band Edge, AGC



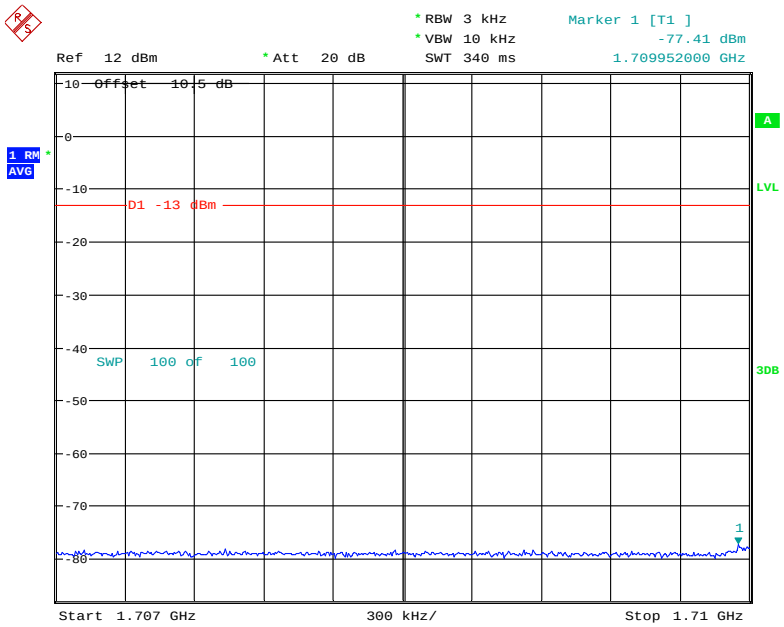
Date: 7.MAY.2018 13:50:25

AWGN, Right Band Edge, AGC+3



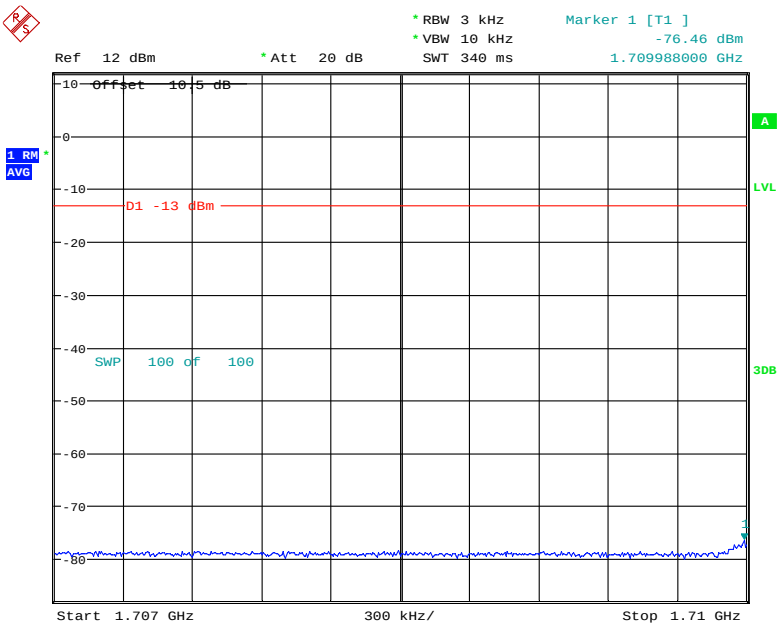
Date: 7.MAY.2018 13:50:50

GSM, Left Band Edge, AGC



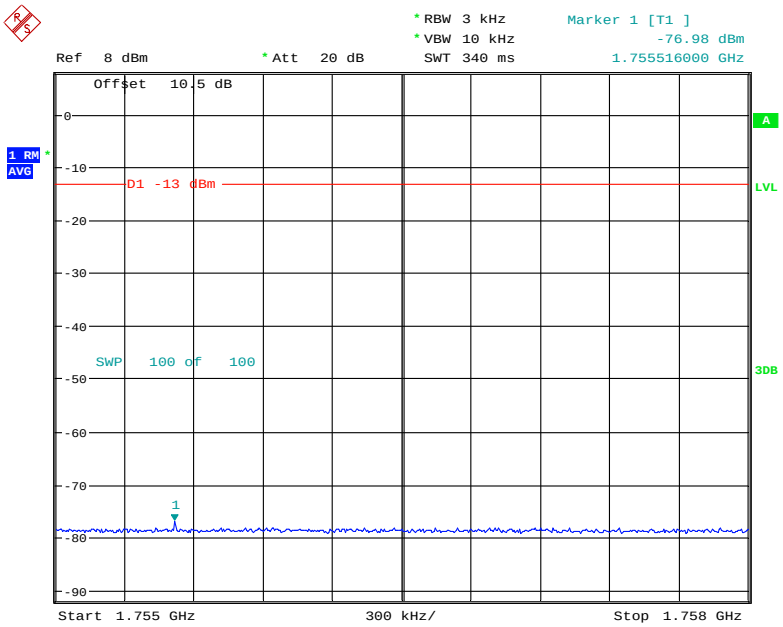
Date: 16.JAN.2018 20:48:24

GSM, Left Band Edge, AGC+3



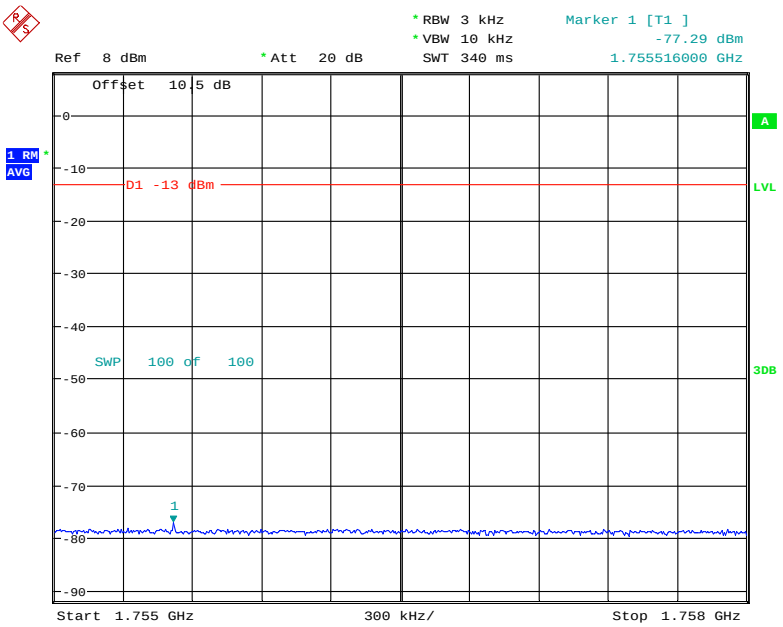
Date: 16.JAN.2018 20:49:24

GSM, Right Band Edge, AGC



Date: 7.MAY.2018 13:49:43

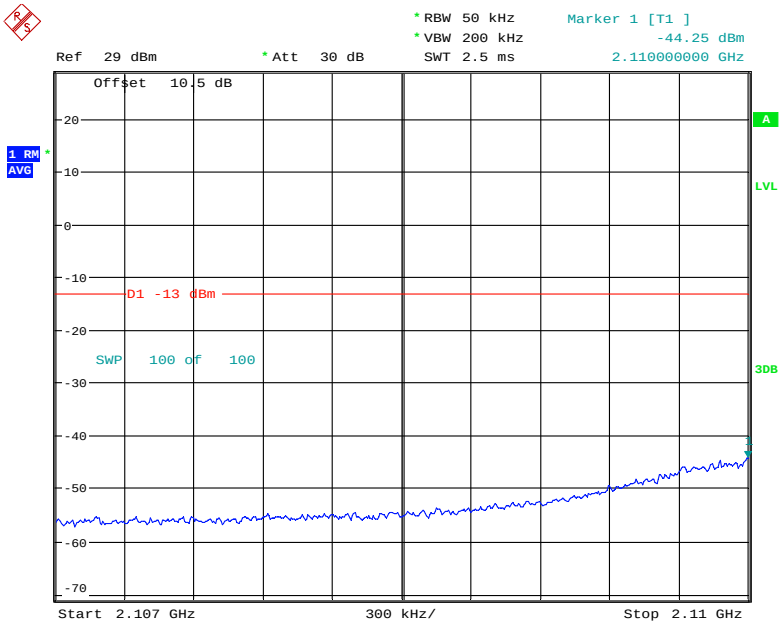
GSM, Right Band Edge, AGC+3



Date: 7.MAY.2018 13:48:46

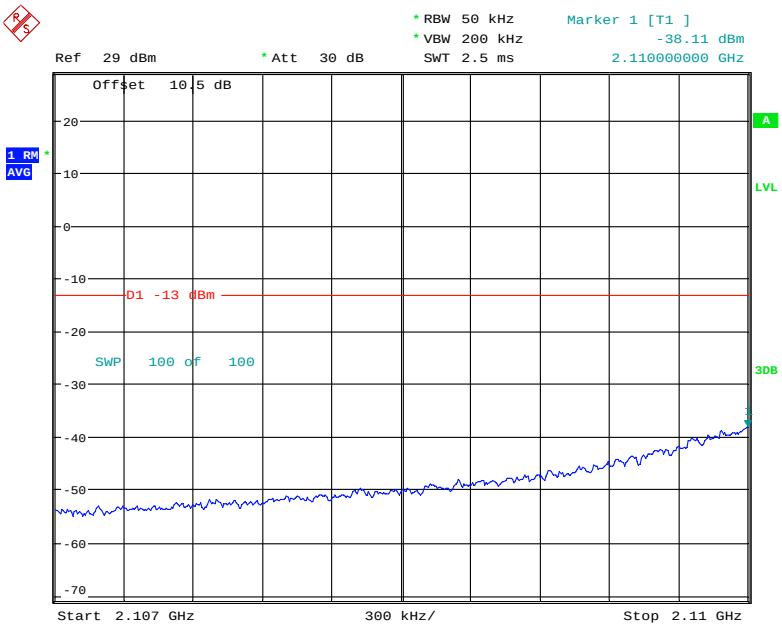
Band edge, Downlink

AWGN, Left Band Edge, AGC



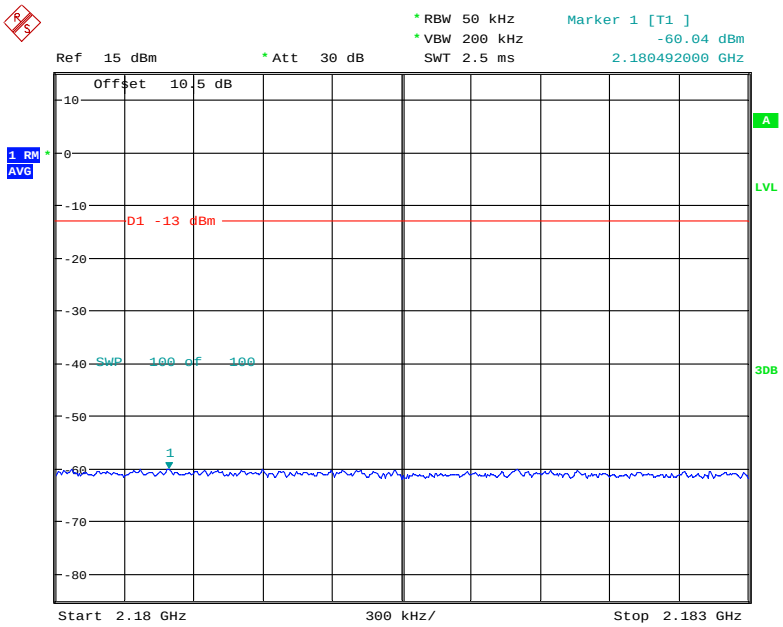
Date: 16.JAN.2018 20:55:27

AWGN, Left Band Edge, AGC+3



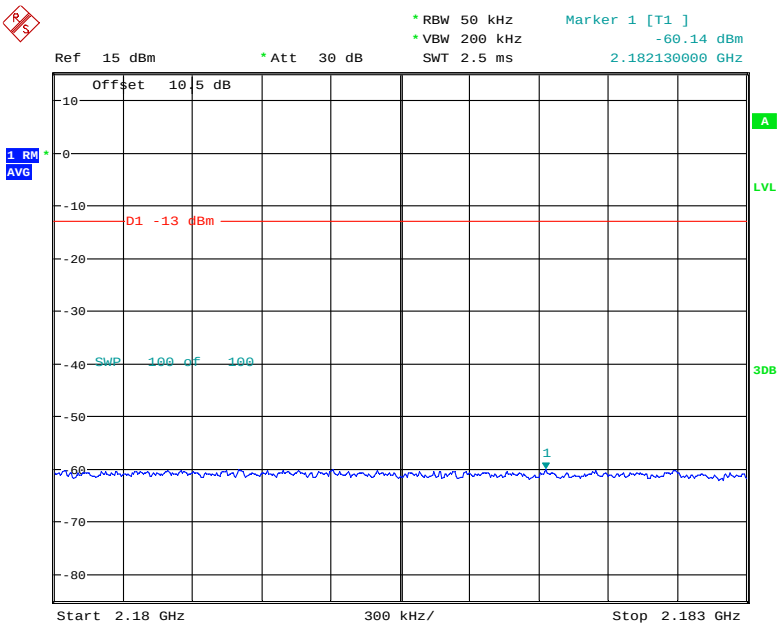
Date: 16.JAN.2018 20:54:56

AWGN, Right Band Edge, AGC



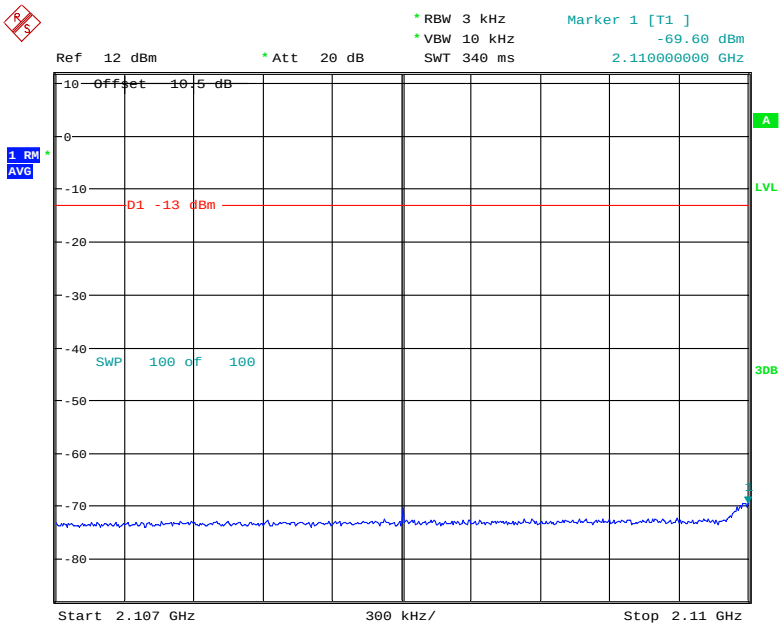
Date: 16.JAN.2018 20:59:45

AWGN, Right Band Edge, AGC+3



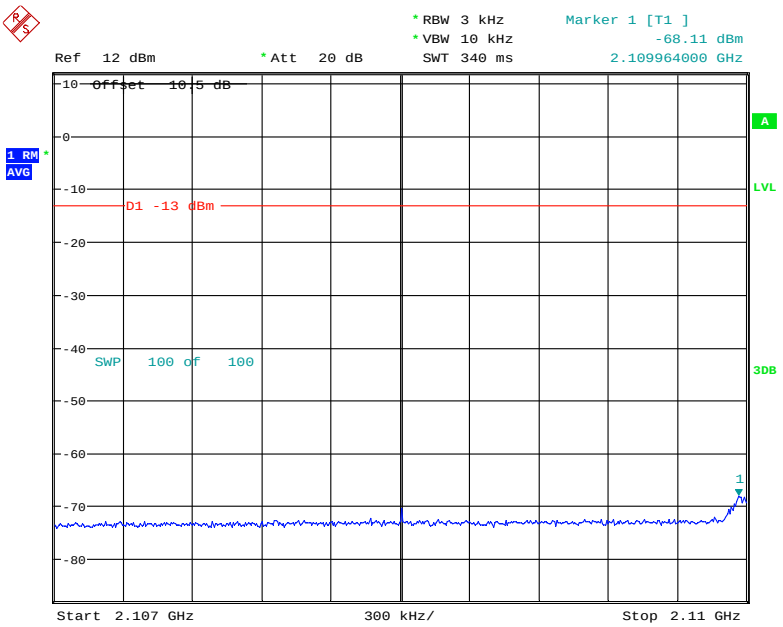
Date: 16.JAN.2018 20:59:13

GSM, Left Band Edge, AGC



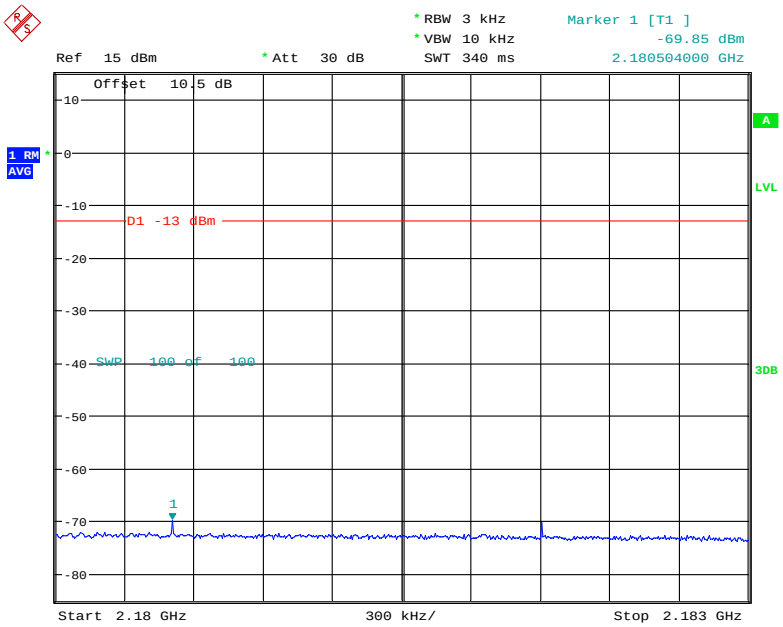
Date: 16.JAN.2018 20:51:15

GSM, Left Band Edge, AGC+3



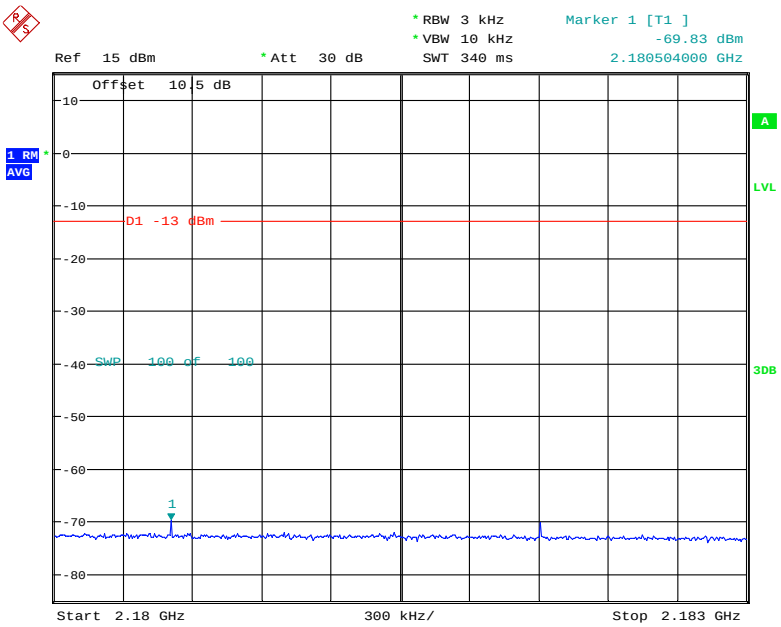
Date: 16.JAN.2018 20:52:16

GSM, Right Band Edge, AGC



Date: 16.JAN.2018 20:57:27

GSM, Right Band Edge, AGC+3



Date: 16.JAN.2018 20:58:36

FCC §20.21 - OUT-OF-BAND REJECTION

Applicable Standard

FCC§20.21.

Test Procedure

Test Method: KDB 935210 D05 Indus Booster Basic Meas v01r02 section 3.3

a) Connect a signal generator to the input of the EUT.
b) Configure a swept CW signal with the following parameters:
1) Frequency range = ± 250 % of the passband, for each applicable CMRS band (see also KDB Publication 935210 D02 [R7] and KDB Publication 634817 [R5] about selection of frequencies for testing and for grant listings).
2) Level = a sufficient level to affirm that the out-of-band rejection is > 20 dB above the noise floor and will not engage the AGC during the entire sweep.
3) Dwell time = approximately 10 ms.
4) Number of points = SPAN/(RBW/2).
c) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
d) Set the span of the spectrum analyzer to the same as the frequency range of the signal generator.
e) Set the resolution bandwidth (RBW) of the spectrum analyzer to be 1 % to 5 % of the EUT passband, and the video bandwidth (VBW) shall be set to ≥ 3 × RBW.
f) Set the detector to Peak Max-Hold and wait for the spectrum analyzer's spectral display to fill.
g) Place a marker to the peak of the frequency response and record this frequency as f 0 .
h) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the −20 dB down amplitude, to determine the 20 dB bandwidth.
i) Capture the frequency response of the EUT.
j) Repeat for all frequency bands applicable for use by the EUT.

Test Data

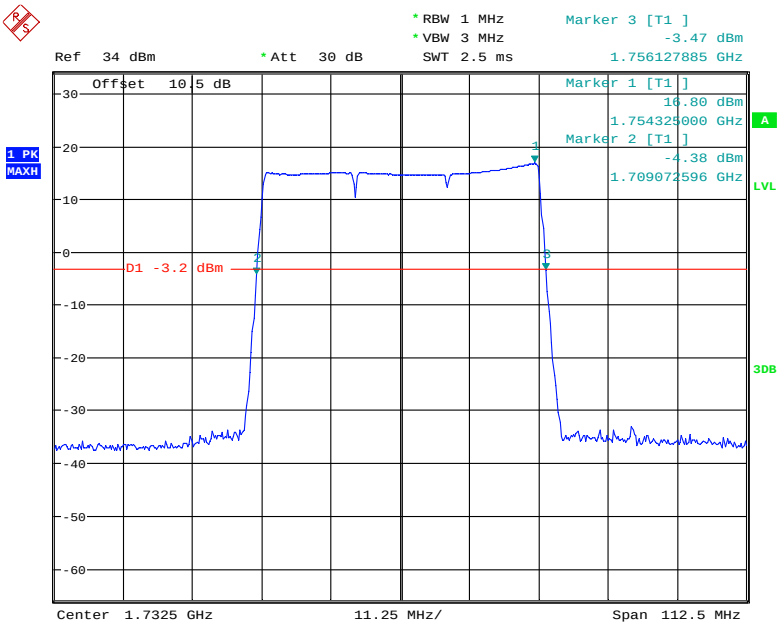
Environmental Conditions

Temperature:	24~25 ℃
Relative Humidity:	50~55 %
ATM Pressure:	101.0~101.5 kPa

The testing was performed by Dylan Li from 2018-01-16 to 2018-05-07.

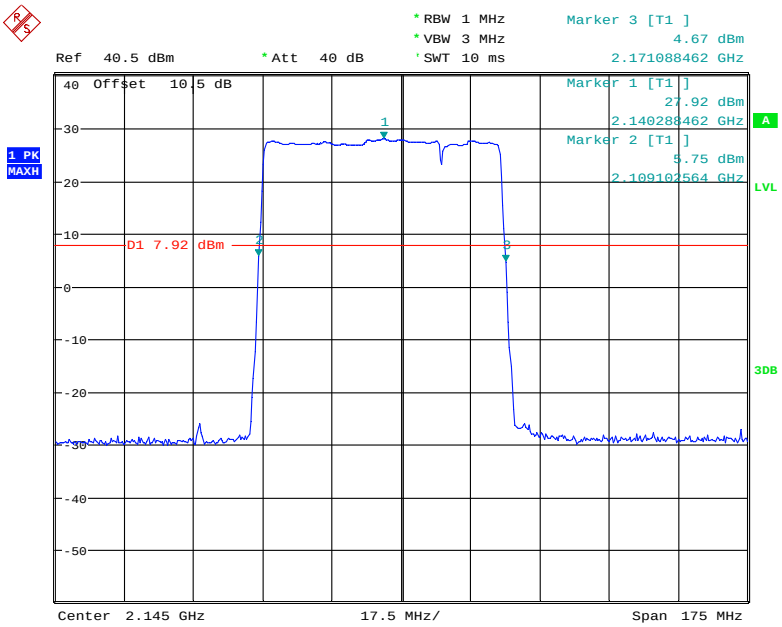
Test Mode: Transmitting, please refer to the following plots.

Uplink



Date: 7.MAY.2018 14:00:32

Downlink



Date: 16.JAN.2018 20:12:20

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