FCC PART 22H, PART 24E

FCC PART 27

MEASUREMENT AND TEST REPORT

For

Shenzhen Phonemax Technology Co., Ltd.

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FCC ID: 2AOMSROCKY2168

Report Type:	**Product Type:**
Original Report	Rugged Smartphone

Report Number:	RDG171207003-00D
Report Date:	2018-01-25
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Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.(Dongguan).

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:		Rugged Smartphone
EUT Model:		Rocky 2
Multiple Model		R2, AC50SAX, PY-002
FCC ID:		2AOMSROCKY2168
Rated Input Voltage:		DC3.8V from Battery or DC 5V from adapter
Adapter Information	**Model:**	TPA-46050200UU
	Input:	100-240V~ 50/60Hz 0.3A
	Output:	5.0V , 2000mA
External Dimension:		Length (146.6 mm)*Width (76 mm)*High (12.7 mm)
Serial Number:		171207003
EUT Received Date:		2017.12.07

Note: The series product, models R2, AC50SAX, PY-002are electrically identical with the model Rocky 2, the differences between them is the model name, we selected Rocky 2 for fully testing .The difference between them was explained in the attached declaration letter.

Objective

This report is prepared on behalf of *Shenzhen Phonemax Technology Co., Ltd.* in accordance with: Part 2-Subpart J, Part 22-Subpart H, and Part 24-Subpart E of the Federal Communications Commission's rules. Part 2, Part 27 of the Federal Communication Commissions rules.

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

Related Submittal(s)/Grant(s)

FCC Part 15C DTS submissions with FCC ID: 2AOMSROCKY2168.
FCC Part 15C DSS submissions with FCC ID: 2AOMSROCKY2168.
FCC Part 15B JBP submissions with FCC ID: 2AOMSROCKY2168.

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
Part 27 – Miscellaneous wireless communications services

Applicable Standards: TIA/EIA 603-D-2010.

All radiated and conducted emissions measurements were performed at Bay Area Compliance Laboratories Corp.(Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Unwanted Emissions, radiated	30MHz ~ 1GHz:5.85 dB 1G~26.5GHz: 5.23 dB
Unwanted Emissions, conducted	±1.5 dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, 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. : 897218,the FCC Designation No. : CN1220.

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

SYSTEM TEST CONFIGURATION

Justification

The EUT was configured for testing according to TIA/EIA-603-D 2010.

The test items were performed with the EUT operating at testing mode.

Technical Parameters:

Equipment Type	Portable
Operation Mode	GSM/GPRS/EDGE WCDMA(Voice+Data),HSUPA, HSDPA, DC-HSDPA, HSPA+ FDD-LTE
Frequency Range	GSM 850: 824-849 MHz(TX); 869-894 MHz(RX) PCS 1900: 1850-1910 MHz(TX); 1930-1990 MHz(RX) WCDMA Band 2: 1850-1910 MHz(TX); 1930-1990 MHz(RX) WCDMA Band 5: 824-849 MHz(TX); 869-894 MHz(RX) LTE Band 2: 1850-1910 MHz(TX) ; 1930-1990 MHz(RX) LTE Band 4: 1710-1755 MHz(TX) ; 2110-2155 MHz(RX) LTE Band 5: 824-849 MHz(TX) ; 869-894 MHz(RX) LTE Band 7: 2500-2570 MHz(TX) ; 2620-2690 MHz(RX) LTE Band 17: 704-716 MHz(TX) ; 734-746 MHz(RX)

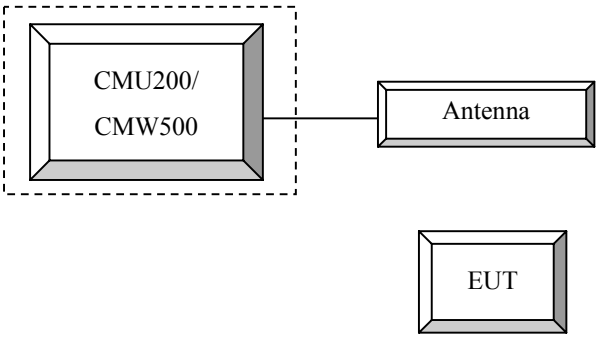
Equipment Modifications

No modification was made to the EUT.

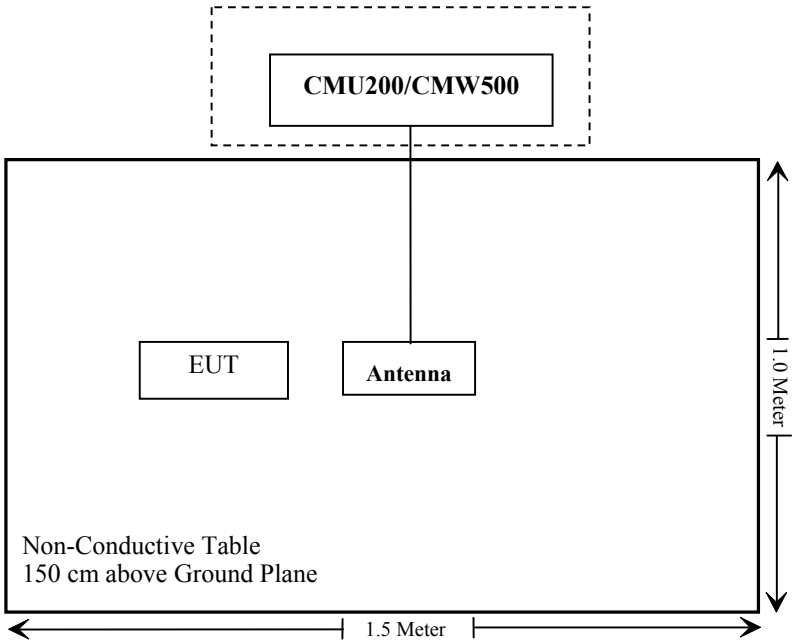
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
R&S	Universial Radio Communication Tester	CMU200	109038
R&S	Wideband Radio Communication Tester	CMW500	147473
N/A	ANTENNA	N/A	N/A

Configuration of Test Setup



Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1310, §2.1093	RF Exposure	Compliance
§2.1046; § 22.913 (a); § 24.232 (c); §27.50	RF Output Power	Compliance
§ 2.1047	Modulation Characteristics	Not Applicable
§ 2.1049; § 22.905 § 22.917; § 24.238; §27.53	Occupied Bandwidth	Compliance
§ 2.1051, § 22.917 (a); § 24.238 (a); §27.53	Spurious Emissions at Antenna Terminal	Compliance
§ 2.1053 § 22.917 (a); § 24.238 (a); §27.53	Field Strength of Spurious Radiation	Compliance
§ 22.917 (a); § 24.238 (a); §27.53	Out of band emission, Band Edge	Compliance
§ 2.1055 § 22.355; § 24.235; §27.54	Frequency stability vs. temperature Frequency stability vs. voltage	Compliance

FCC §1.1310 & §2.1093- RF EXPOSURE

Applicable Standard

FCC§1.1310 and §2.1093.

Test Result

Compliant, please refer to the SAR report: RDG171207003-20.

FCC §2.1047 - MODULATION CHARACTERISTIC

According to FCC § 2.1047(d), Part 22H & 24E, Part 27 there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

FCC § 2.1046, § 22.913 (a) & § 24.232 (c) & § 27.50 - 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.

According to §24.232 (d) Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

According to §27.50

(b)(10) Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

(c) (10) Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

(d), (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.

(h),(2) Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

Test Procedure

GSM/GPRS/EGPRS

Function: Menu select > GSM Mobile Station > GSM 850/1900
Press Connection control to choose the different menus
Press RESET > choose all the reset all settings
Connection Press Signal Off to turn off the signal and change settings
Network Support > GSM + GPRS or GSM + EGSM
Main Service > Packet Data
Service selection > Test Mode A – Auto Slot Config. off
MS Signal Press Slot Config Bottom on the right twice to select and change the number of time slots and power setting
> Slot configuration > Uplink/Gamma
> 33 dBm for GPRS 850
> 30 dBm for GPRS 1900
> 27 dBm for EGPRS 850
> 26 dBm for EGPRS 1900
BS Signal Enter the same channel number for TCH channel (test channel) and BCCH channel
Frequency Offset > + 0 Hz
Mode > BCCH and TCH
BCCH Level > -85 dBm (May need to adjust if link is not stable)
BCCH Channel > choose desire test channel [Enter the same channel number for TCH channel (test channel) and BCCH channel]

Channel Type > Off
P0 > 4 dB
Slot Config > Unchanged (if already set under MS signal)
TCH > choose desired test channel
Hopping > Off
Main Timeslot > 3
Network Coding Scheme > CS4 (GPRS) and MCS5 (EGPRS)

Bit Stream > 2E9-1 PSR Bit Stream
AF/RF Enter appropriate offsets for Ext. Att. Output and Ext. Att. Input
Connection Press Signal on to turn on the signal and change settings

WCDMA-Release 99

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification. The EUT has a nominal maximum output power of 24dBm (+1.7/-3.7).

WCDMA General Settings	Loopback Mode	Test Mode 1
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	βc / βd	8/15

WCDMA HSDPA

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification.

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subset	1	2	3	4
WCDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	Power Control Algorithm	Algorithm2			
	βc	2/15	12/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	βd (SF)	64			
	βc/ βd	2/15	12/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	MPR(dB)	0	0	0.5	0.5
HSDPA Specific Settings	DACK	8			
	DNAK	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
	Ahs=βhs/ βc	30/15			

WCDMA HSUPA

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification.

	Mode	**HSUPA**	**HSUPA**	**HSUPA**	**HSUPA**	**HSUPA**
	Subset	**1**	**2**	**3**	**4**	**5**
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set1				
	HSUPA Test	HSUPA Loopback				
	Power Control Algorithm	Algorithm2				
	βc	11/15	6/15	15/15	2/15	15/15
	βd	15/15	15/15	9/15	15/15	0
	βec	209/225	12/15	30/15	2/15	5/15
	βc/ βd	11/15	6/15	15/9	2/15	-
	βhs	22/15	12/15	30/15	4/15	5/15
	CM(dB)	1.0	3.0	2.0	3.0	1.0
	MPR(dB)	0	2	1	2	0
HSDPA Specific Settings	DACK	8				
	DNAK	8				
	DCQI	8				
	Ack-Nack repetition factor	3				
	CQI Feedback	4ms				
	CQI Repetition Factor	2				
	Ahs=βhs/ βc	30/15				
HSUPA Specific Settings	DE-DPCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI	75	67	92	71	81
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E_FCls	E-TFCI 11 E E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO23 E-TFCI 75 E-TFCI PO26 E-TFCI 81 E-TFCI PO 27		E-TFCI 11 E-TFCI PO4 E-TFCI 92 E-TFCI PO 18	E-TFCI 11 E E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO23 E-TFCI 75 E-TFCI PO26 E-TFCI 81 E-TFCI PO 27	

HSPA+

The following tests were conducted according to the test requirements in Table C.11.1.4 of 3GPP TS 34.121-1

Sub-test	β_c (Note3)	β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (2xSF2) (Note 4)	β_{ed} (2xSF4) (Note 4)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 4)	E-TFCI (Note 5)	E-TFCI (boost)
1	1	0	30/15	30/15	$\beta_{ed}1$: 30/15 $\beta_{ed}2$: 30/15	$\beta_{ed}3$: 24/15 $\beta_{ed}4$: 24/15	3.5	2.5	14	105	105

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c .
Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).
Note 3: DPDCH is not configured, therefore the β_c is set to 1 and β_d = 0 by default.
Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value.
Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signalled to use the extrapolation algorithm.

DC-HSDPA

The following tests were conducted according to the test requirements in Table C.8.1.12 of 3GPP TS 34.121-1

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK

Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table.
Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.

LTE (FDD):

The following tests were conducted according to the test requirements in 3GPP TS36.101

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signaling Value of "NS_01".

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4,10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10,15,20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3 6.6.3.3.2	13	10	Table 6.2.4-2	Table 6.2.4-2
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23[1]	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-

Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.

Radiated method:

ANSI/TIA-603-D section 2.2.17

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Signal Generator	E8247C	MY43321350	2017-09-23	2018-09-23
R&S	EMI Test Receiver	ESCI	100224	2017-09-01	2018-09-01
EMCO	Adjustable Dipole Antenna	3121C	9109-753	N/A	N/A
N/A	Coaxial Cable	C-NJNJ-50	C-0400-01	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-NJNJ-50	C-0075-01	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-NJNJ-50	C-1000-01	2017-09-05	2018-09-05
TDK RF	Horn Antenna	HRN-0118	130 084	2016-01-05	2019-01-05
Agilent	Spectrum Analyzer	E4440A	SG43360054	2017-12-08	2018-12-08
N/A	Coaxial Cable	C-SJSJ-50	C-0800-01	2017-09-05	2018-09-05
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
N/A	Coaxial Cable	C-SJ00-0010	C0010/01	Each Time	/
R&S	Universal Radio Communication Tester	CMU200	109 038	2017-07-18	2018-07-18
R&S	Wideband Radio Communication Tester	CMW500	110479	2017-03-08	2018-03-08

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	21.6~25.4°C
Relative Humidity:	29~41 %
ATM Pressure:	101.5~102 kPa

** The testing was performed by Sunny Cen&Steven Zuo&Mark Pan from 2017-12-15 to 2017-12-20.*

Conducted Output Power

Cellular Band & PCS Band

Band	Channel No.	Conducted Peak Output Power (dBm)								
		GSM	GPRS 1 TX Slot	GPRS 2 TX Slot	GPRS 3 TX Slot	GPRS 4 TX Slot	EDGE 1 TX Slot	EDGE 2 TX Slot	EDGE 3 TX Slot	EDGE 4 TX Slot
Cellular	128	31.65	31.64	31.00	29.51	28.53	26.75	26.46	24.56	23.83
	190	31.71	31.72	31.06	29.58	28.64	26.71	26.31	24.92	23.91
	251	31.73	31.71	31.07	29.62	28.67	26.60	26.14	24.99	23.82
PCS	512	28.53	28.53	27.83	26.27	25.26	25.75	24.96	22.58	21.33
	661	28.50	28.53	27.82	26.24	25.27	25.56	24.82	21.91	20.63
	810	28.66	28.67	27.97	26.41	25.45	25.11	24.34	21.24	19.86

WCDMA Band Ⅱ

Mode	3GPP Sub Test	Low Channel		Middle Channel		High Channel	
		Ave. Power (dBm)	PAR (dB)	Ave. Power (dBm)	PAR (dB)	Ave. Power (dBm)	PAR (dB)
Rel 99	1	20.92	2.37	21.17	2.72	21.16	2.50
HSDPA	1	20.55	5.26	20.52	5.16	20.45	5.16
	2	20.48	5.23	20.43	5.28	20.36	5.1
	3	20.46	5.03	20.57	5.12	20.36	5.48
	4	20.54	5.35	20.51	5.3	20.39	5.17
HSUPA	1	19.52	5.16	19.66	5.29	19.75	5.16
	2	19.54	5.04	19.66	5.08	19.7	5.36
	3	19.51	5.16	19.55	5.26	19.65	5.12
	4	19.59	5.37	19.68	4.95	19.77	4.92
	5	19.53	5.28	19.58	5.12	19.76	5.23
DC-HSDPA	1	20.58	5.08	20.43	5.32	20.42	5.21
	2	20.54	5.17	20.49	5.02	20.45	5
	3	20.63	5.38	20.59	5.18	20.36	5.34
	4	20.56	5.09	20.6	5.16	20.44	5.29
HSPA+	1	19.6	5.27	19.57	5.15	19.75	5.38

WCDMA Band V

Mode	3GPP Sub Test	Low Channel		Middle Channel		High Channel	
		Ave. Power (dBm)	PAR (dB)	Ave. Power (dBm)	PAR (dB)	Ave. Power (dBm)	PAR (dB)
Rel 99	1	21.97	2.47	21.93	2.60	21.92	2.69
HSDPA	1	21.10	5.10	20.93	5.22	20.94	5.26
	2	20.60	5.04	21.62	4.99	21.64	5.03
	3	20.49	4.95	21.54	5.45	21.53	5.17
	4	20.52	4.96	21.69	5.47	21.66	5.35
HSUPA	1	21.08	4.94	20.98	5.13	20.91	4.97
	2	21.03	5.19	20.89	5.04	20.85	4.98
	3	20.93	4.69	20.78	5.12	20.87	4.97
	4	21.01	4.71	20.91	4.98	20.92	5.21
	5	21.06	5.14	20.96	4.96	21.03	5.08
DC-HSDPA	1	20.91	4.83	21.04	5.04	20.59	5.04
	2	21.47	4.86	21.12	5.29	20.63	4.89
	3	20.71	5.13	20.88	5.35	20.47	4.77
	4	21.00	4.78	21.15	4.92	21.55	4.77
HSPA+	1	21.74	5.13	21.21	5.33	21.48	5.02

LTE Band 2 (PART 24)

Channel Bandwidth	Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
1.4MHz	QPSK	1#0	23.94	23.87	23.91
		1#3	23.56	23.54	23.84
		1#5	23.84	23.64	23.54
		3#0	23.65	23.52	23.65
		3#3	23.62	23.52	23.53
		6#0	22.92	22.90	22.88
	16QAM	1#0	22.91	23.24	22.59
		1#3	22.84	23.02	22.61
		1#5	22.71	22.98	22.51
		3#0	22.49	22.86	22.61
		3#3	22.76	22.97	22.58
		6#0	21.85	21.95	21.86
3MHz	QPSK	1#0	23.93	23.89	23.94
		1#8	23.88	23.81	23.81
		1#14	23.76	23.82	23.75
		10#0	23.25	23.32	23.42
		10#5	23.32	23.21	23.35
		15#0	22.99	23.04	23.01
	16QAM	1#0	22.95	23.13	22.62
		1#8	22.82	23.10	22.67
		1#14	22.76	23.06	22.81
		10#0	22.28	22.55	22.45
		10#5	22.64	23.19	22.83
		15#0	22.01	22.05	22.05
5MHz	QPSK	1#0	23.88	23.87	23.86
		1#13	23.78	23.67	23.81
		1#24	23.64	23.54	23.67
		10#0	23.21	23.12	23.30
		10#15	23.15	23.41	23.36
		25#0	22.93	22.99	22.89
	16QAM	1#0	23.02	23.05	23.16
		1#13	23.01	22.98	23.10
		1#24	22.99	22.92	22.94
		10#0	22.59	22.47	22.57
		10#15	23.07	22.66	22.89
		25#0	21.90	22.02	21.91

10MHz	QPSK	1#0	24.08	24.03	24.10
		1#25	24.02	24.01	24.02
		1#49	24.01	23.99	24.01
		25#0	23.89	23.81	23.89
		25#25	23.88	23.86	23.81
		50#0	22.96	23.03	22.97
	16QAM	1#0	22.74	23.03	23.02
		1#25	22.62	23.01	22.89
		1#49	22.52	22.89	22.81
		25#0	22.38	22.73	22.65
		25#25	22.57	22.79	22.87
		50#0	21.96	22.01	21.99
15MHz	QPSK	1#0	24.23	24.14	24.13
		1#38	24.00	24.12	24.15
		1#74	24.10	24.05	24.06
		36#0	23.04	23.12	23.19
		36#39	23.09	23.16	23.20
		75#0	23.08	23.15	23.09
	16QAM	1#0	23.11	23.05	23.06
		1#38	23.05	23.03	23.01
		1#74	23.01	22.92	22.98
		36#0	21.98	22.01	22.08
		36#39	22.99	22.88	23.00
		75#0	22.09	22.10	22.00
20MHz	QPSK	1#0	24.22	24.26	24.27
		1#50	24.21	24.24	24.29
		1#99	24.02	24.13	24.19
		50#0	23.25	23.32	23.33
		50#50	23.32	23.34	23.25
		100#0	22.99	23.18	22.92
	16QAM	1#0	23.20	23.12	23.30
		1#50	23.19	23.10	23.21
		1#99	23.12	23.09	23.19
		50#0	22.33	22.25	22.33
		50#50	23.07	23.09	23.31
		100#0	22.05	22.19	21.99

LTE Band 4 (PART 27)

Channel Bandwidth	Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
1.4MHz	QPSK	1#0	24.87	24.95	24.95
		1#3	24.90	24.88	24.98
		1#5	24.88	24.93	24.96
		3#0	24.95	24.94	25.40
		3#3	24.93	24.95	25.05
		6#0	23.89	23.85	23.93
	16QAM	1#0	23.85	24.53	23.93
		1#3	23.90	24.48	24.00
		1#5	23.87	24.17	23.96
		3#0	23.90	24.21	24.44
		3#3	23.86	24.15	24.33
		6#0	22.88	22.89	22.82
3MHz	QPSK	1#0	24.85	24.82	24.89
		1#8	24.86	24.84	24.80
		1#14	24.84	24.75	24.85
		10#0	23.91	23.98	23.95
		10#5	23.89	23.79	23.98
		15#0	23.91	23.87	23.87
	16QAM	1#0	24.36	24.39	24.43
		1#8	24.39	24.36	24.39
		1#14	24.34	24.39	24.30
		10#0	23.43	23.58	23.45
		10#5	24.37	24.62	24.23
		15#0	22.93	23.00	22.86
5MHz	QPSK	1#0	24.93	24.97	24.96
		1#13	24.91	24.95	24.89
		1#24	24.92	24.93	25.02
		10#0	23.93	23.90	23.91
		10#15	23.90	23.96	23.85
		25#0	23.87	23.87	23.89
	16QAM	1#0	23.82	23.90	23.81
		1#13	23.83	23.78	23.81
		1#24	23.77	23.82	23.86
		10#0	22.75	22.78	22.77
		10#15	23.76	23.72	23.89
		25#0	22.92	22.82	22.88

10MHz	QPSK	1#0	24.92	24.94	24.91
		1#25	24.90	24.89	24.93
		1#49	24.88	24.87	24.78
		25#0	23.94	24.01	23.86
		25#25	23.92	23.98	23.95
		50#0	23.94	23.87	23.88
	16QAM	1#0	24.47	24.48	24.41
		1#25	24.43	24.44	24.51
		1#49	24.48	24.42	24.49
		25#0	23.54	23.57	23.54
		25#25	24.45	24.43	24.44
		50#0	22.92	22.93	22.94
15MHz	QPSK	1#0	24.89	24.83	24.98
		1#38	24.66	24.56	24.70
		1#74	24.85	24.91	24.95
		36#0	24.01	24.08	23.95
		36#39	24.00	23.94	23.90
		75#0	24.01	24.03	24.00
	16QAM	1#0	24.45	24.39	24.37
		1#38	24.46	24.52	24.51
		1#74	24.55	24.55	24.65
		36#0	23.76	23.76	23.61
		36#39	24.59	24.69	24.70
		75#0	22.97	22.96	22.99
20MHz	QPSK	1#0	24.97	24.96	24.94
		1#50	24.91	24.83	24.83
		1#99	24.92	24.88	24.95
		50#0	23.94	23.95	23.99
		50#50	23.96	23.94	23.97
		100#0	23.91	23.89	23.92
	16QAM	1#0	24.32	24.38	24.28
		1#50	24.26	24.31	24.25
		1#99	24.30	24.34	24.39
		50#0	23.21	23.21	23.46
		50#50	24.31	24.40	24.42
		100#0	22.98	23.03	22.96

LTE Band 5 (PART 22)

Channel Bandwidth	Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
1.4MHz	QPSK	1#0	24.92	24.89	24.82
		1#3	24.97	24.88	24.98
		1#5	24.94	24.89	24.97
		3#0	24.89	24.85	24.89
		3#3	24.87	24.77	24.88
		6#0	23.93	23.91	23.92
	16QAM	1#0	23.96	23.87	24.06
		1#3	23.99	23.89	23.92
		1#5	23.95	24.00	24.02
		3#0	23.91	23.80	23.99
		3#3	23.93	24.12	23.99
		6#0	22.86	22.82	22.92
3MHz	QPSK	1#0	24.87	24.86	24.88
		1#8	24.92	24.88	24.97
		1#14	24.88	24.80	24.92
		10#0	23.88	23.79	23.94
		10#5	23.84	23.90	23.84
		15#0	23.87	23.86	23.94
	16QAM	1#0	24.27	24.18	24.36
		1#8	24.25	24.16	24.29
		1#14	24.20	24.12	24.21
		10#0	23.19	23.08	23.20
		10#5	24.22	24.06	24.27
		15#0	22.89	22.96	22.85
5MHz	QPSK	1#0	24.93	24.84	24.93
		1#13	24.94	24.95	24.85
		1#24	24.91	24.96	24.86
		10#0	23.91	23.83	23.89
		10#15	23.92	23.82	23.86
		25#0	23.85	23.81	23.95
	16QAM	1#0	23.74	23.69	23.75
		1#13	23.74	23.82	23.72
		1#24	23.75	23.68	23.78
		10#0	22.70	22.58	22.84
		10#15	23.75	23.65	23.80
		25#0	22.87	22.95	22.87
10MHz	QPSK	1#0	24.93	24.90	24.97
		1#25	24.92	24.96	24.98
		1#49	24.96	24.87	24.90
		25#0	23.89	23.86	23.84
		25#25	23.93	23.84	23.93
		50#0	23.91	23.83	23.92
	16QAM	1#0	24.36	24.40	24.39
		1#25	24.39	24.43	24.41
		1#49	24.43	24.45	24.44
		25#0	23.36	23.44	23.35
		25#25	24.42	24.47	24.31
		50#0	22.91	22.91	22.96

LTE Band 7 (PART 27)

Channel Bandwidth	Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5MHz	QPSK	1#0	22.65	22.73	22.55
		1#13	22.38	22.29	22.30
		1#24	22.95	22.99	22.85
		10#0	21.53	21.59	21.51
		10#15	21.83	21.88	21.81
		25#0	21.64	21.64	21.62
	16QAM	1#0	22.29	22.24	22.23
		1#13	21.85	21.89	21.77
		1#24	22.38	22.31	22.28
		10#0	21.01	20.95	20.96
		10#15	22.06	22.03	21.99
		25#0	22.08	22.13	22.06
10MHz	QPSK	1#0	22.09	22.00	22.01
		1#25	22.53	22.57	22.54
		1#49	23.03	23.07	23.10
		25#0	21.40	21.45	21.31
		25#25	22.17	22.27	22.19
		50#0	21.78	21.88	21.88
	16QAM	1#0	21.93	21.95	21.87
		1#25	22.40	22.50	22.50
		1#49	22.93	22.99	22.90
		25#0	21.25	21.34	21.14
		25#25	22.11	22.19	22.03
		50#0	21.27	21.24	21.20
15MHz	QPSK	1#0	21.48	21.44	21.46
		1#38	22.42	22.34	22.40
		1#74	23.64	23.55	23.57
		36#0	21.14	21.15	21.21
		36#39	22.25	22.26	22.28
		75#0	21.66	21.59	21.75
	16QAM	1#0	21.33	21.27	21.38
		1#38	22.19	22.11	22.20
		1#74	23.39	23.36	23.37
		36#0	20.89	20.97	21.05
		36#39	22.25	22.26	22.31
		75#0	20.85	20.85	20.89
20MHz	QPSK	1#0	21.57	21.60	21.48
		1#50	22.83	22.89	22.85
		1#99	23.95	24.05	23.96
		50#0	21.31	21.34	21.23
		50#50	22.77	22.75	22.80
		100#0	22.15	22.20	22.23
	16QAM	1#0	21.05	20.99	20.98
		1#50	22.27	22.28	22.27
		1#99	23.35	23.42	23.40
		50#0	20.67	20.69	20.66
		50#50	21.86	21.96	21.85
		100#0	21.30	21.35	21.27

LTE Band 17 (PART 27)

Channel Bandwidth	Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5MHz	QPSK	1#0	24.28	24.20	24.25
		1#13	24.26	24.29	24.34
		1#24	24.28	24.38	24.29
		10#0	23.30	23.33	23.37
		10#15	23.30	23.30	23.35
		25#0	23.27	23.24	23.19
	16QAM	1#0	23.17	23.08	23.21
		1#13	23.17	23.22	23.25
		1#24	23.21	23.22	23.28
		10#0	22.25	22.16	22.41
		10#15	23.19	23.22	23.27
		25#0	22.34	22.26	22.34
10MHz	QPSK	1#0	24.20	24.18	24.29
		1#25	24.31	24.26	24.37
		1#49	24.35	24.36	24.28
		25#0	24.22	24.31	24.21
		25#25	24.34	24.38	24.31
		50#0	23.31	23.35	23.37
	16QAM	1#0	23.37	23.44	23.29
		1#25	23.44	23.39	23.37
		1#49	23.51	23.51	23.54
		25#0	23.38	23.48	23.43
		25#25	23.34	23.41	23.42
		50#0	22.32	22.27	22.37

PAR, Band 2

Test Modulation		Channel Bandwidth	Low Channel PAR (dB)	Middle Channel PAR (dB)	High Channel PAR (dB)	Limit (dB)
QPSK	1 RB	20 MHz	2.66	3.75	1.73	13
	100 RB		6.38	6.47	6.47	13
16QAM	1 RB	20 MHz	3.53	4.71	2.88	13
	100 RB		6.92	7.15	6.89	13

PAR, Band 4

Test Modulation		Channel Bandwidth	Low Channel PAR (dB)	Middle Channel PAR (dB)	High Channel PAR (dB)	Limit (dB)
QPSK	1 RB	20 MHz	4.84	4.84	3.75	13
	100 RB		6.28	6.38	6.63	13
16QAM	1 RB	20 MHz	5.22	5.74	4.65	13
	100 RB		7.02	7.18	7.15	13

PAR, Band 5

Test Modulation		Channel Bandwidth	Low Channel PAR (dB)	Middle Channel PAR (dB)	High Channel PAR (dB)	Limit (dB)
QPSK	1 RB	10 MHz	4.07	3.85	2.85	13
	50 RB		5.19	5.10	5.03	13
16QAM	1 RB	10 MHz	4.78	4.55	3.81	13
	50 RB		6.03	5.87	5.80	13

PAR, Band 7

Test Modulation		Channel Bandwidth	Low Channel PAR (dB)	Middle Channel PAR (dB)	High Channel PAR (dB)	Limit (dB)
QPSK	1 RB	20 MHz	4.29	5.03	4.90	13
	100 RB		6.51	6.44	6.41	13
16QAM	1 RB	20 MHz	4.78	5.90	5.74	13
	100 RB		7.24	7.15	7.18	13

PAR, Band 17

Test Modulation		Channel Bandwidth	Low Channel PAR (dB)	Middle Channel PAR (dB)	High Channel PAR (dB)	Limit (dB)
QPSK	1 RB	10 MHz	4.71	4.55	4.33	13
	50 RB		5.48	5.42	5.35	13
16QAM	1 RB	10 MHz	5.54	5.58	5.32	13
	50 RB		6.51	6.28	6.38	13

Note: peak-to-average ratio (PAR) <13 dB.

ERP & EIRP

Part 22H

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
GSM 850 Middle Channel								
836.600	H	94.67	19.7	0.0	1	18.7	38.5	19.8
836.600	V	98.04	26.2	0.0	1	25.2	38.5	13.3
EDGE 850 Middle Channel								
836.600	H	93.20	18.3	0.0	1	17.3	38.5	21.2
836.600	V	96.45	24.7	0.0	1	23.7	38.5	14.8
WCDMA Band V Middle Channel								
836.600	H	86.17	11.2	0.0	1	10.2	38.5	28.3
836.600	V	93.42	21.6	0.0	1	20.6	38.5	17.9

Part 24E

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
PCS 1900 Middle Channel								
1880.000	H	92.79	20.2	11.7	2.7	29.2	33.0	3.8
1880.000	V	90.66	18.2	11.7	2.7	27.2	33.0	5.8
EGPRS 1900 Middle Channel								
1880.000	H	91.11	18.5	11.7	2.7	27.5	33.0	5.5
1880.000	V	90.03	17.6	11.7	2.7	26.6	33.0	6.4
WCDMA Band II Middle Channel								
1880.000	H	85.53	12.9	11.7	2.7	21.9	33.0	11.1
1880.000	V	83.07	10.6	11.7	2.7	19.6	33.0	13.4

Note:
1) The unit of Antenna Gain is dBd for frequency below 1GHz, and the unit of Antenna Gain is dBi for frequency above 1GHz.
2) Absolute Level = Substituted Level - Cable loss + Antenna Gain
3) Margin = Limit-Absolute Level

LTE Band 2

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK 1.4M BW Middle Channel 1880.000 MHZ								
1880.000	H	87.85	15.2	11.7	2.7	24.2	33.00	8.8
1880.000	V	88.19	15.7	11.7	2.7	24.7	33.00	8.3
16QAM 1.4M BW Middle Channel 1880.000 MHZ								
1880.000	H	87.57	15	11.7	2.7	24.0	33.00	9.0
1880.000	V	88.98	16.5	11.7	2.7	25.5	33.00	7.5
QPSK 3M BW Middle Channel 1880.000 MHZ								
1880.000	H	87.23	14.6	11.7	2.7	23.6	33.00	9.4
1880.000	V	88.68	16.2	11.7	2.7	25.2	33.00	7.8
16QAM 3M BW Middle Channel 1880.000 MHZ								
1880.000	H	87.02	14.4	11.7	2.7	23.4	33.00	9.6
1880.000	V	88.34	15.9	11.7	2.7	24.9	33.00	8.1
QPSK 5M BW Middle Channel 1880.000 MHZ								
1880.000	H	87.16	14.6	11.7	2.7	23.6	33.00	9.4
1880.000	V	88.72	16.3	11.7	2.7	25.3	33.00	7.7
16QAM 5M BW Middle Channel 1880.000 MHZ								
1880.000	H	86.89	14.3	11.7	2.7	23.3	33.00	9.7
1880.000	V	87.26	14.8	11.7	2.7	23.8	33.00	9.2
QPSK 10M BW Middle Channel 1880.000 MHZ								
1880.000	H	85.94	13.3	11.7	2.7	22.3	33.00	10.7
1880.000	V	86.63	14.2	11.7	2.7	23.2	33.00	9.8
16QAM 10M BW Middle Channel 1880.000 MHZ								
1880.000	H	85.74	13.1	11.7	2.7	22.1	33.00	10.9
1880.000	V	86.22	13.8	11.7	2.7	22.8	33.00	10.2
QPSK 15M BW Middle Channel 1880.000 MHZ								
1880.000	H	87.38	14.8	11.7	2.7	23.8	33.00	9.2
1880.000	V	88.45	16	11.7	2.7	25.0	33.00	8.0
16QAM 15M BW Middle Channel 1880.000 MHZ								
1880.000	H	86.84	14.2	11.7	2.7	23.2	33.00	9.8
1880.000	V	87.62	15.2	11.7	2.7	24.2	33.00	8.8
QPSK 20M BW Middle Channel 1880.000 MHZ								
1880.000	H	87.24	14.6	11.7	2.7	23.6	33.00	9.4
1880.000	V	88.36	15.9	11.7	2.7	24.9	33.00	8.1
16QAM 20M BW Middle Channel 1880.000 MHZ								
1880.000	H	87.64	15	11.7	2.7	24.0	33.00	9.0
1880.000	V	88.27	15.8	11.7	2.7	24.8	33.00	8.2

LTE Band 4

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK 1.4M BW Middle Channel 1732.500 MHZ								
1732.500	H	85.36	11.3	10.9	2.5	19.7	30.00	10.3
1732.500	V	87.49	13.1	10.9	2.5	21.5	30.00	8.5
16QAM 1.4M BW Middle Channel 1732.500 MHZ								
1732.500	H	84.78	10.7	10.9	2.5	19.1	30.00	10.9
1732.500	V	87.96	13.6	10.9	2.5	22.0	30.00	8.0
QPSK 3M BW Middle Channel 1732.500 MHZ								
1732.500	H	84.62	10.6	10.9	2.5	19.0	30.00	11.0
1732.500	V	87.49	13.1	10.9	2.5	21.5	30.00	8.5
16QAM 3M BW Middle Channel 1732.500 MHZ								
1732.500	H	84.33	10.3	10.9	2.5	18.7	30.00	11.3
1732.500	V	87.28	12.9	10.9	2.5	21.3	30.00	8.7
QPSK 5M BW Middle Channel 1732.500 MHZ								
1732.500	H	84.45	10.4	10.9	2.5	18.8	30.00	11.2
1732.500	V	87.38	13	10.9	2.5	21.4	30.00	8.6
16QAM 5M BW Middle Channel 1732.500 MHZ								
1732.500	H	84.29	10.2	10.9	2.5	18.6	30.00	11.4
1732.500	V	86.57	12.2	10.9	2.5	20.6	30.00	9.4
QPSK 10M BW Middle Channel 1732.500 MHZ								
1732.500	H	84.35	10.3	10.9	2.5	18.7	30.00	11.3
1732.500	V	86.18	11.8	10.9	2.5	20.2	30.00	9.8
16QAM 10M BW Middle Channel 1732.500 MHZ								
1732.500	H	84.22	10.2	10.9	2.5	18.6	30.00	11.4
1732.500	V	85.79	11.4	10.9	2.5	19.8	30.00	10.2
QPSK 15M BW Middle Channel 1732.500 MHZ								
1732.500	H	86.67	12.6	10.9	2.5	21.0	30.00	9.0
1732.500	V	87.46	13.1	10.9	2.5	21.5	30.00	8.5
16QAM 15M BW Middle Channel 1732.500 MHZ								
1732.500	H	86.12	12.1	10.9	2.5	20.5	30.00	9.5
1732.500	V	87.13	12.8	10.9	2.5	21.2	30.00	8.8
QPSK 20M BW Middle Channel 1732.500 MHZ								
1732.500	H	86.46	12.4	10.9	2.5	20.8	30.00	9.2
1732.500	V	86.79	12.4	10.9	2.5	20.8	30.00	9.2
16QAM 20M BW Middle Channel 1732.500 MHZ								
1732.500	H	86.12	12.1	10.9	2.5	20.5	30.00	9.5
1732.500	V	86.56	12.2	10.9	2.5	20.6	30.00	9.4

LTE Band 5

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK 1.4M BW frequency: 836.500 MHz								
836.500	H	87.17	12.2	0.0	1	11.2	38.5	27.3
836.500	V	91.64	19.8	0.0	1	18.8	38.5	19.7
16-QAM 1.4M BW frequency: 836.500 MHz								
836.500	H	86.82	11.9	0.0	1	10.9	38.5	27.6
836.500	V	91.37	19.6	0.0	1	18.6	38.5	19.9
QPSK 3M BW frequency: 836.500 MHz								
836.500	H	86.48	11.6	0.0	1	10.6	38.5	27.9
836.500	V	91.04	19.2	0.0	1	18.2	38.5	20.3
16-QAM 3M BW frequency: 836.500 MHz								
836.500	H	86.11	11.2	0.0	1	10.2	38.5	28.3
836.500	V	90.75	19	0.0	1	18.0	38.5	20.5
QPSK 5M BW frequency: 836.500 MHz								
836.500	H	85.73	10.8	0.0	1	9.8	38.5	28.7
836.500	V	90.45	18.7	0.0	1	17.7	38.5	20.8
16-QAM 5M BW frequency: 836.500 MHz								
836.500	H	85.21	10.3	0.0	1	9.3	38.5	29.2
836.500	V	90.13	18.3	0.0	1	17.3	38.5	21.2
QPSK 10M BW frequency: 836.500 MHz								
836.500	H	84.83	9.9	0.0	1	8.9	38.5	29.6
836.500	V	89.84	18	0.0	1	17.0	38.5	21.5
16-QAM 10M BW frequency: 836.500 MHz								
836.500	H	84.34	9.4	0.0	1	8.4	38.5	30.1
836.500	V	89.61	17.8	0.0	1	16.8	38.5	21.7

LTE Band 7

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK 5M BW Middle Channel 2535.000 MHZ								
2535.000	H	84.69	12.1	13.1	3.1	22.1	33.00	10.9
2535.000	V	85.14	14	13.1	3.1	24.0	33.00	9.0
16QAM 5M BW Middle Channel 2535.000 MHZ								
2535.000	H	84.46	11.9	13.1	3.1	21.9	33.00	11.1
2535.000	V	85.02	13.9	13.1	3.1	23.9	33.00	9.1
QPSK 10M BW Middle Channel 2535.000 MHZ								
2535.000	H	83.98	11.4	13.1	3.1	21.4	33.00	11.6
2535.000	V	84.54	13.4	13.1	3.1	23.4	33.00	9.6
16QAM 10M BW Middle Channel 2535.000 MHZ								
2535.000	H	83.78	11.2	13.1	3.1	21.2	33.00	11.8
2535.000	V	84.26	13.1	13.1	3.1	23.1	33.00	9.9
QPSK 15M BW Middle Channel 2535.000 MHZ								
2535.000	H	84.12	11.5	13.1	3.1	21.5	33.00	11.5
2535.000	V	84.95	13.8	13.1	3.1	23.8	33.00	9.2
16QAM 15M BW Middle Channel 2535.000 MHZ								
2535.000	H	83.76	11.2	13.1	3.1	21.2	33.00	11.8
2535.000	V	84.43	13.3	13.1	3.1	23.3	33.00	9.7
QPSK 20M BW Middle Channel 2535.000 MHZ								
2535.000	H	83.64	11	13.1	3.1	21.0	33.00	12.0
2535.000	V	84.95	13.8	13.1	3.1	23.8	33.00	9.2
16QAM 20M BW Middle Channel 2535.000 MHZ								
2535.000	H	83.43	10.8	13.1	3.1	20.8	33.00	12.2
2535.000	V	84.51	13.4	13.1	3.1	23.4	33.00	9.6

LTE Band 17

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK 5M BW frequency: 710.000 MHz								
710.000	H	81.47	4.7	0.0	0.9	3.8	34.8	31.0
710.000	V	93.59	19.2	0.0	0.9	18.3	34.8	16.5
16-QAM 5M BW frequency: 710.000 MHz								
710.000	H	81.17	4.4	0.0	0.9	3.5	34.8	31.3
710.000	V	93.34	19	0.0	0.9	18.1	34.8	16.7
QPSK 10M BW frequency: 710.000 MHz								
710.000	H	80.76	3.9	0.0	0.9	3.0	34.8	31.8
710.000	V	92.97	18.6	0.0	0.9	17.7	34.8	17.1
16-QAM 10M BW frequency: 710.000 MHz								
710.000	H	80.42	3.6	0.0	0.9	2.7	34.8	32.1
710.000	V	92.67	18.3	0.0	0.9	17.4	34.8	17.4

Note:
1) The unit of Antenna Gain is dBd for frequency below 1GHz, and the unit of Antenna Gain is dBi for frequency above 1GHz.
2) Absolute Level = Substituted Level - Cable loss + Antenna Gain
3) Margin = Limit-Absolute Level

FCC §2.1049, §22.917, §22.905 & §24.238 & §27.53- OCCUPIED BANDWIDTH

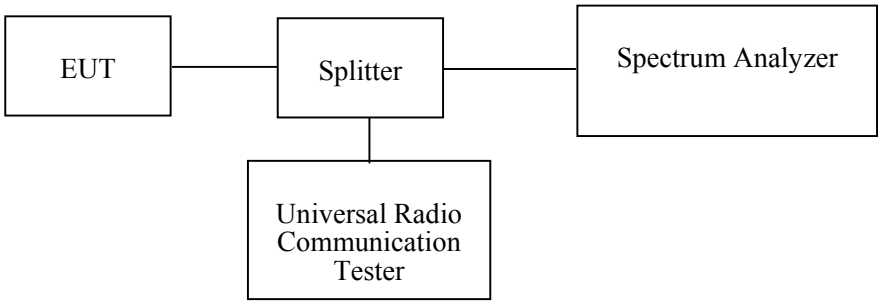
Applicable Standard

FCC §2.1049, §22.917, §22.905, §24.238 and §27.53.

Test Procedure

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

The 26 dB & 99% bandwidth was recorded.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSU 26	200256	2017-12-08	2018-12-08
R&S	Universal Radio Communication Tester	CMU200	109 038	2017-07-18	2018-07-18
R&S	Wideband Radio Communication Tester	CMW500	110479	2017-03-08	2018-03-08
N/A	Coaxial Cable	C-SJ00-0010	C0010/01	Each Time	/
E-Microwave	RF Attenuator	6dB	6dB-1	Each Time	/
Pasternack	RF Coaxial Cable	0.5m	C-5	Each Time	/
E-Microwave	Two-way Spliter	ODP-1-6-2S	OE0120142	Each Time	/

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	23.1~25.4°C
Relative Humidity:	32~41 %
ATM Pressure:	102~102.2 kPa

The testing was performed by Mark Pan from 2017-12-15 to 2017-12-24.

Test Mode: Transmitting

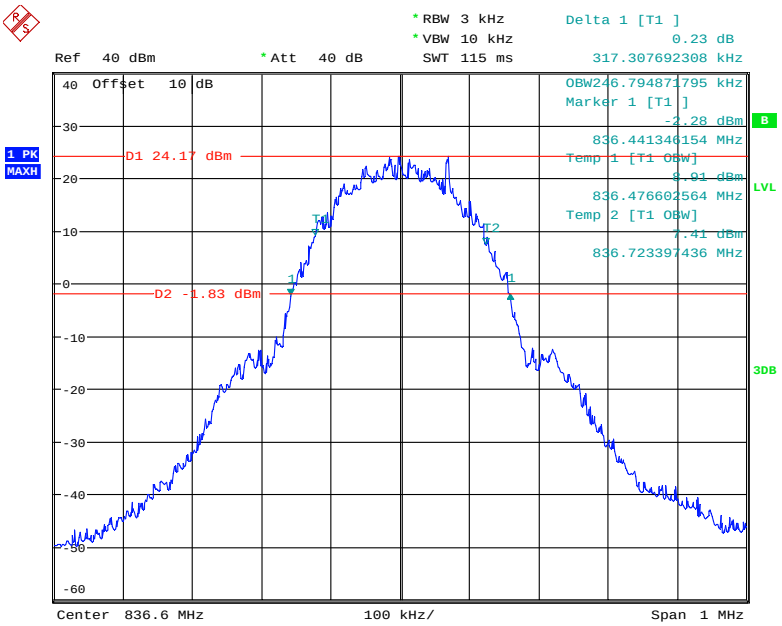
Test Result: Compliant. Please refer to the following table and plots.

Band	Test Channel	Mode	99% Occupied Bandwidth (MHz)	26 dB Occupied Bandwidth (MHz)
Cellular	M	GSM	0.247	0.317
		EDGE	0.255	0.325
PCS		PCS	0.244	0.316
		EDGE	0.252	0.316
WCDMA Band II		Rel 99	4.199	4.888
		HSDPA	4.215	4.904
		HSUPA	4.215	4.888
WCDMA Band V		Rel 99	4.215	4.904
		HSDPA	4.215	4.904
		HSUPA	4.215	4.872

Band	Test Modulation	Test Bandwidth (MHz)	Test Channel	99% Occupied Bandwidth (MHz)	26 dB Occupied Bandwidth (MHz)
LTE Band 2	QPSK	1.4	M	1.104	1.303
		3		2.748	3.077
		5		4.540	5.112
		10		8.960	9.919
		15		13.560	15.096
		20		18.000	19.615
	16QAM	1.4	M	1.110	1.302
		3		2.748	3.090
		5		4.540	5.144
		10		8.960	9.754
		15		13.560	15.060
		20		18.000	19.778

Band	Test Modulation	Test Bandwidth (MHz)	Test Channel	99% Occupied Bandwidth (MHz)	26 dB Occupied Bandwidth (MHz)
LTE Band 4	QPSK	1.4	M	1.092	1.309
		3		2.760	3.070
		5		4.540	5.119
		10		9.000	9.927
		15		13.620	15.180
		20		18.000	19.712
	16QAM	1.4	M	1.110	1.321
		3		2.760	3.055
		5		4.540	5.176
		10		9.000	9.683
		15		13.560	15.096
		20		18.080	19.746
LTE Band 5	QPSK	1.4	M	1.110	1.302
		3		2.748	3.085
		5		4.540	5.129
		10		9.000	10.020
	16QAM	1.4	M	1.110	1.311
		3		2.748	3.077
		5		4.540	5.092
		10		8.960	9.771
LTE Band 7	QPSK	5	M	4.560	5.112
		10		9.000	9.840
		15		13.560	15.130
		20		18.000	19.615
	16QAM	5	M	4.540	5.079
		10		8.960	9.701
		15		13.560	14.967
		20		18.080	19.550
LTE Band 17	QPSK	5	M	4.540	5.066
		10		8.960	9.786
	16QAM	5	M	4.520	5.080
		10		8.960	9.712

GSM 850 Cellular Band



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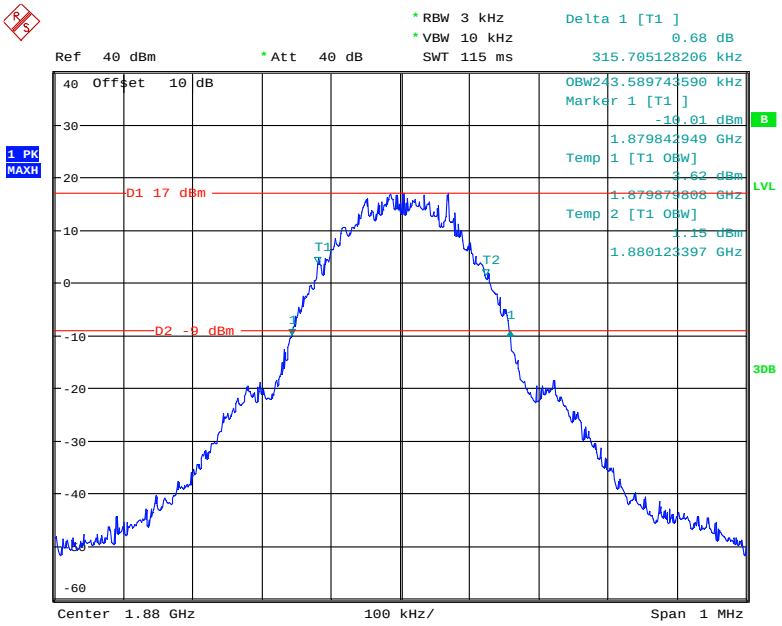
GSM PCS1900 Cellular Band



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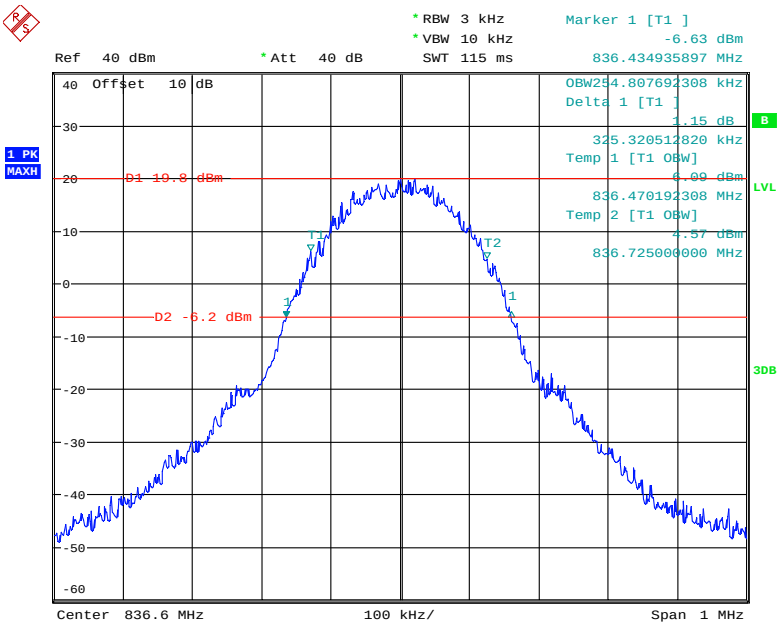
EDGE 850 Cellular Band



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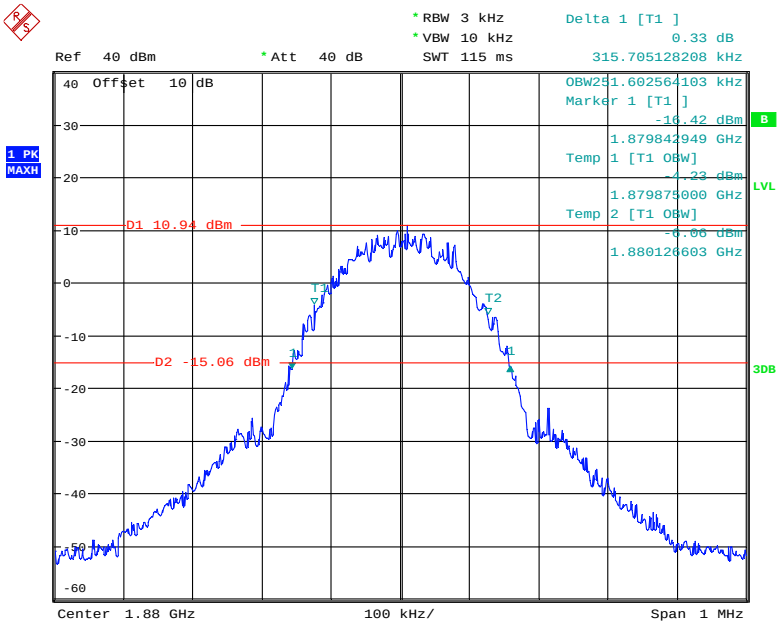
EDGE PCS1900 Cellular Band



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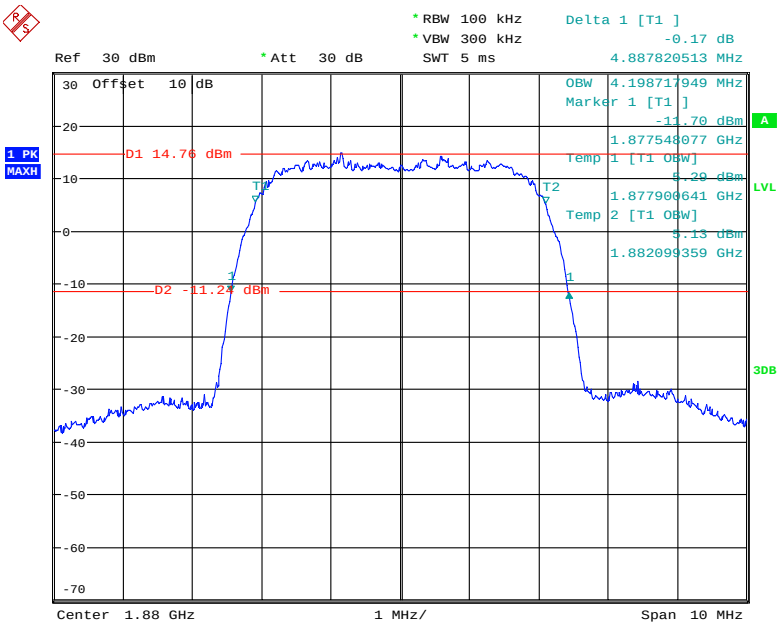
REL99 Band II



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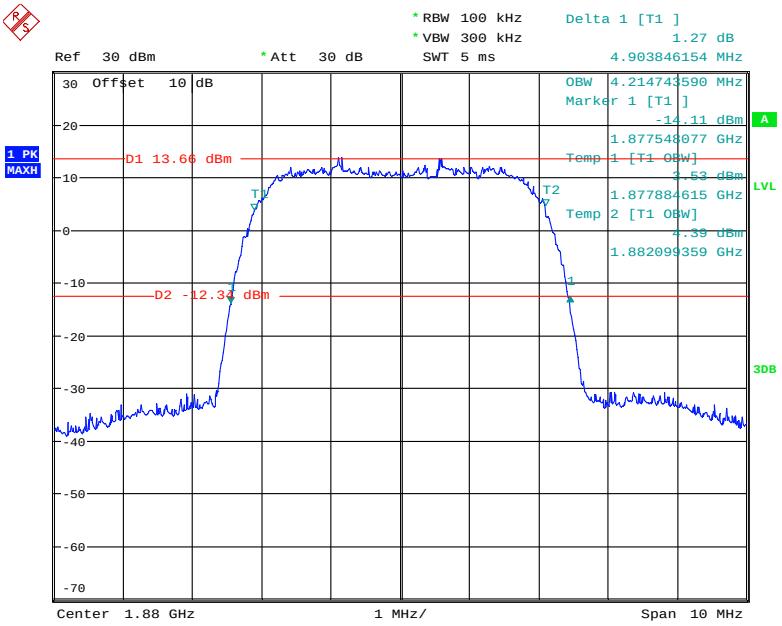
HSDPA Band II



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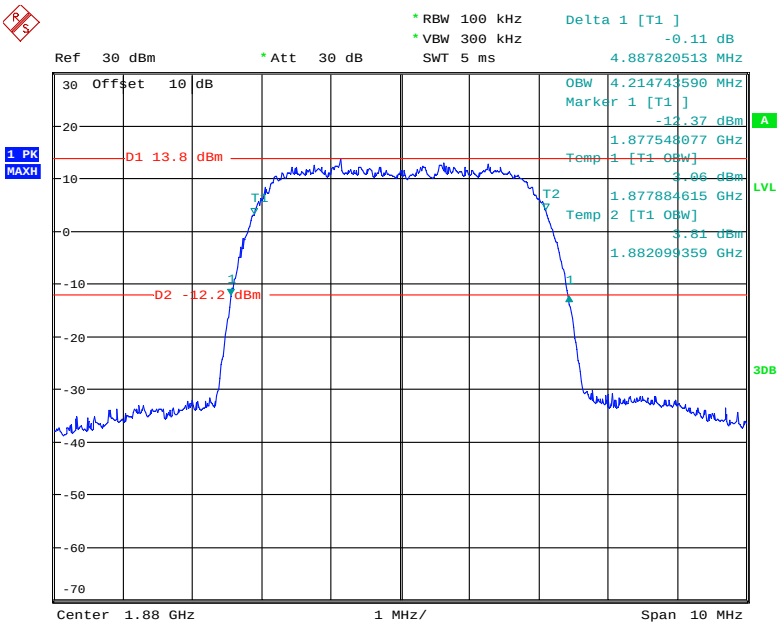
HSUPA Band II



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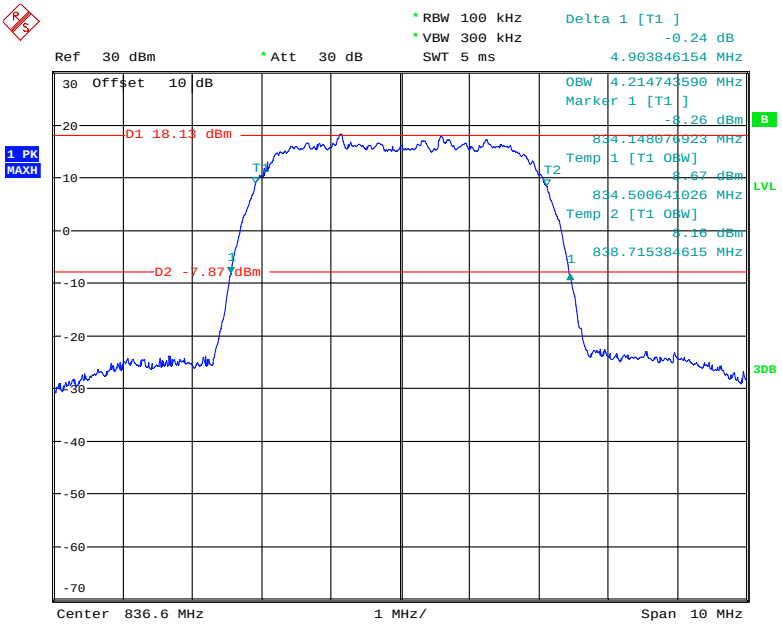
REL99 Band V



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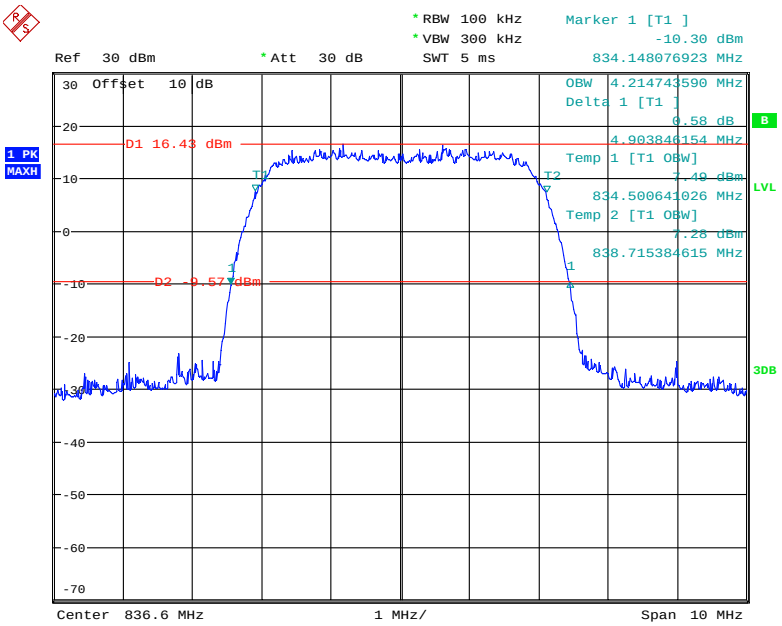

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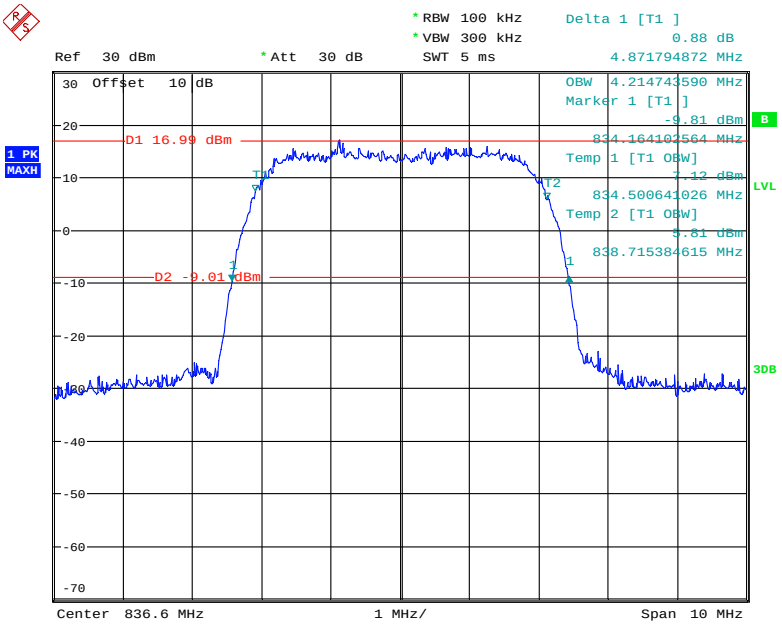

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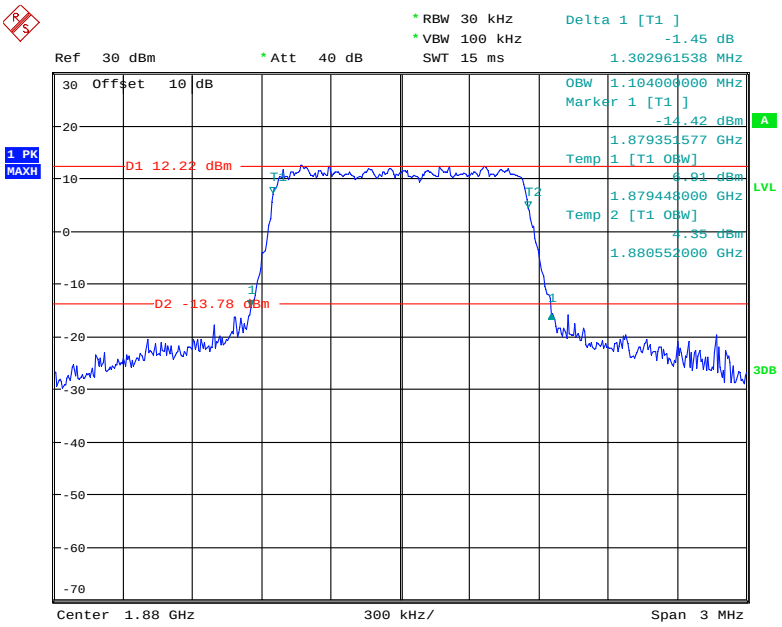
LTE Band 2

QPSK_1.4 MHz



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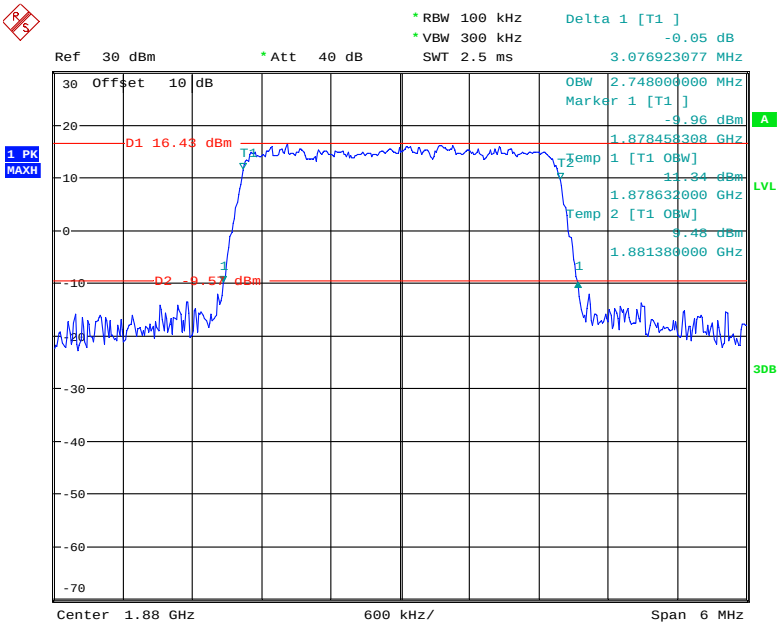
QPSK_3 MHz



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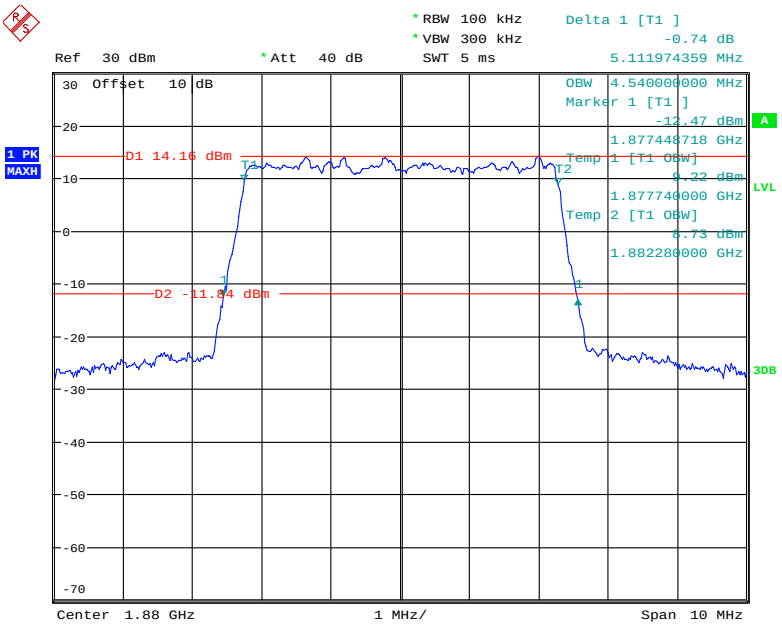
QPSK_5 MHz



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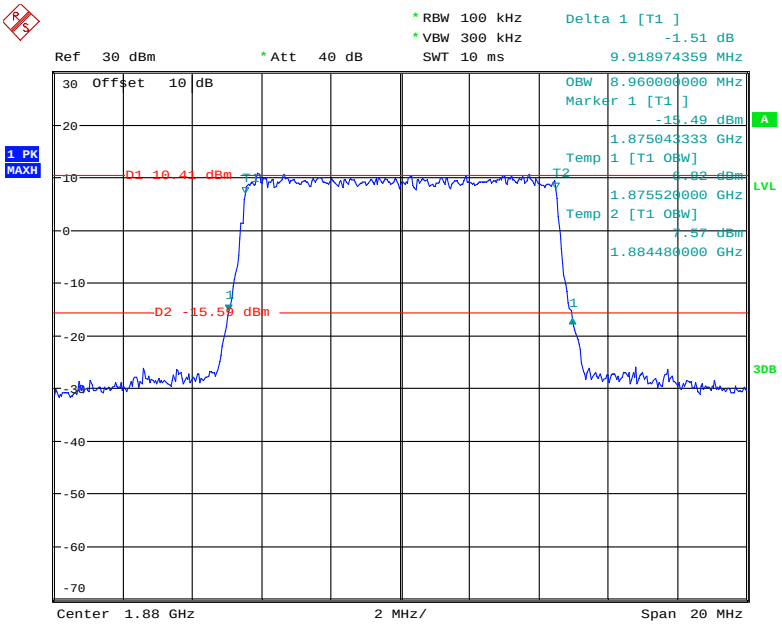
QPSK_10 MHz



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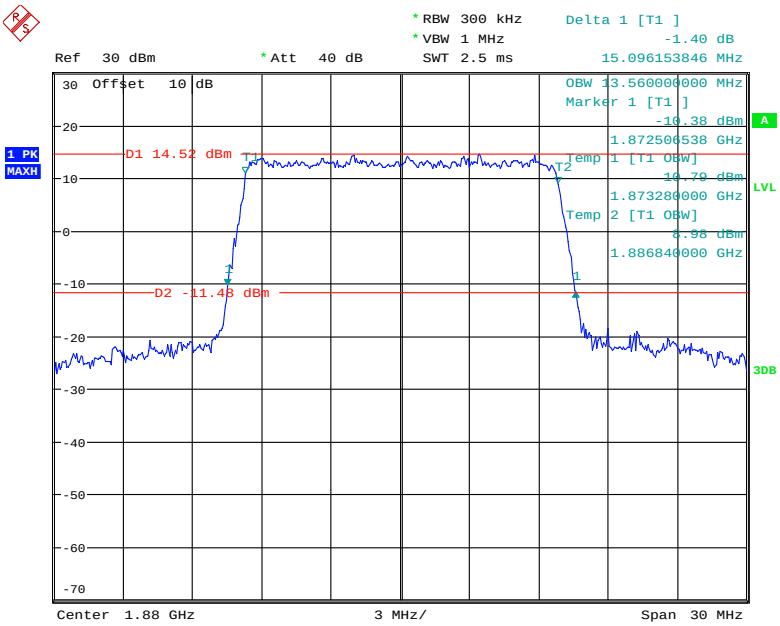
QPSK_15 MHz



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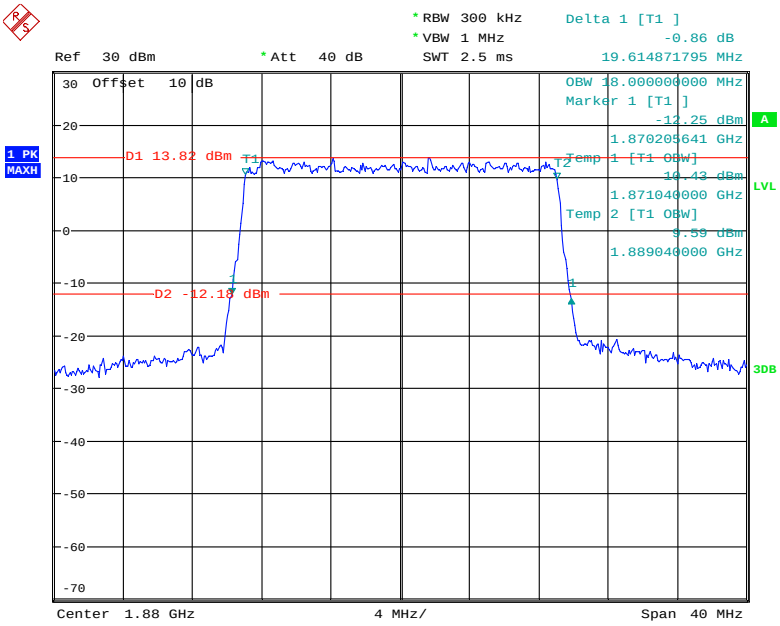
QPSK_20 MHz



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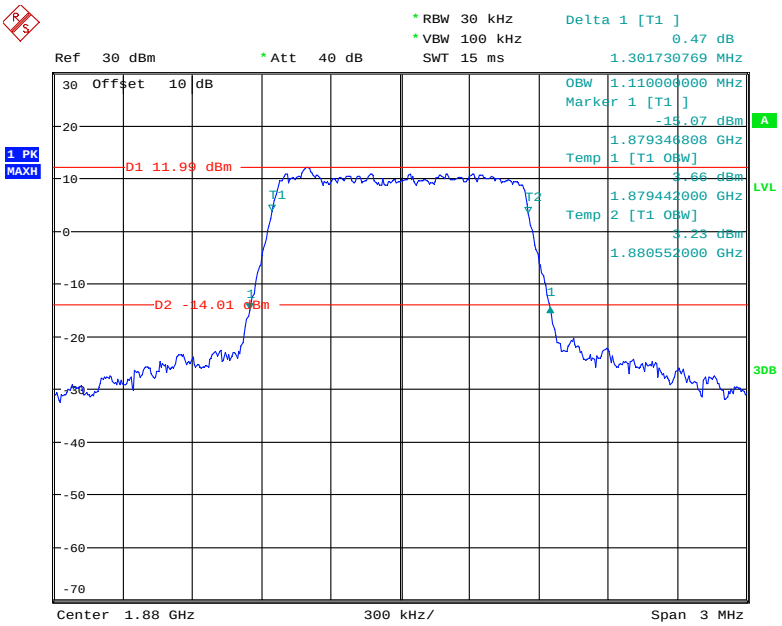
16QAM_1.4 MHz



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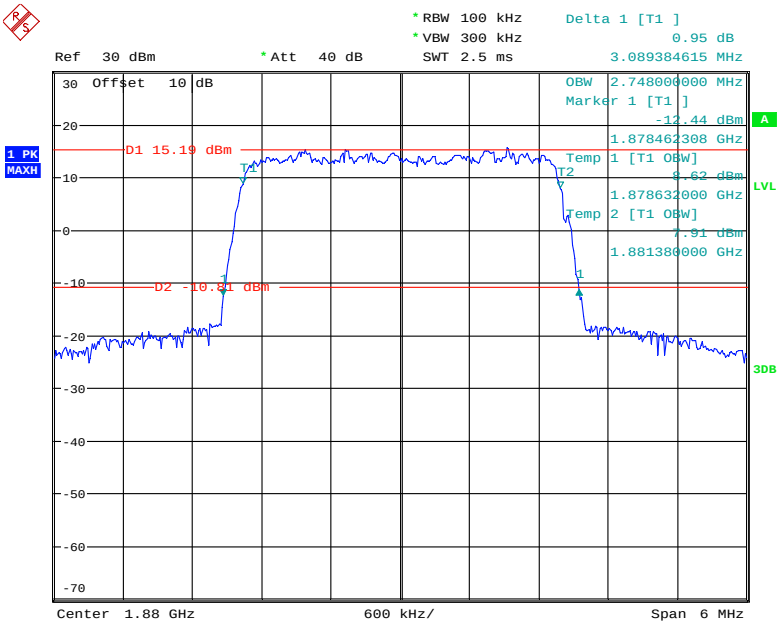
16QAM_3 MHz



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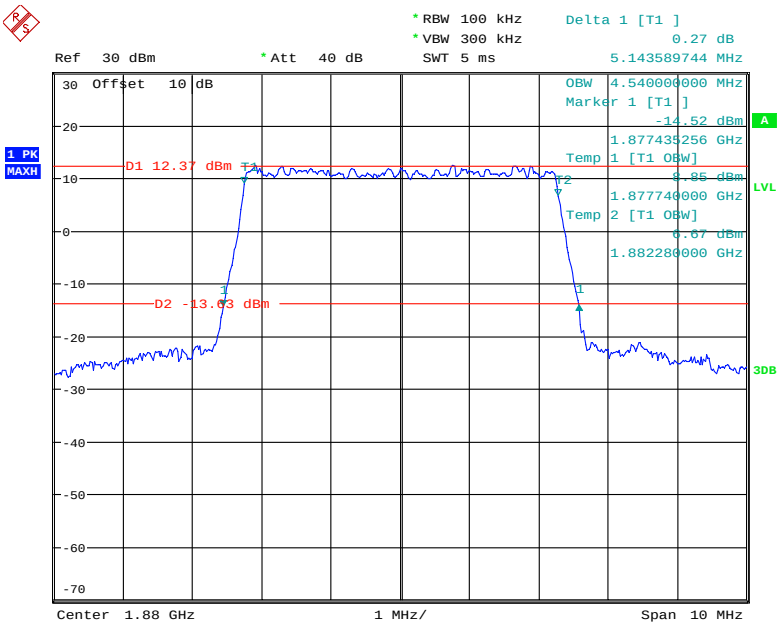
16QAM_5 MHz



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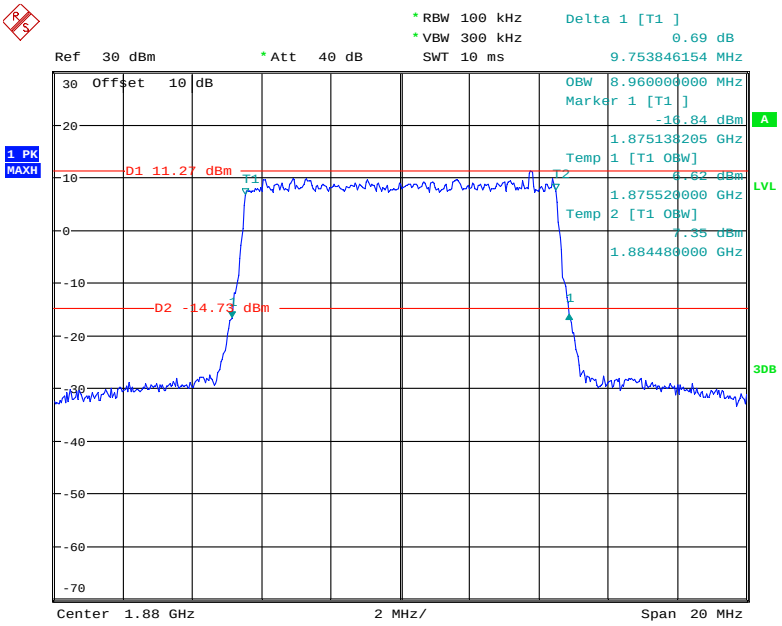
16QAM_10 MHz



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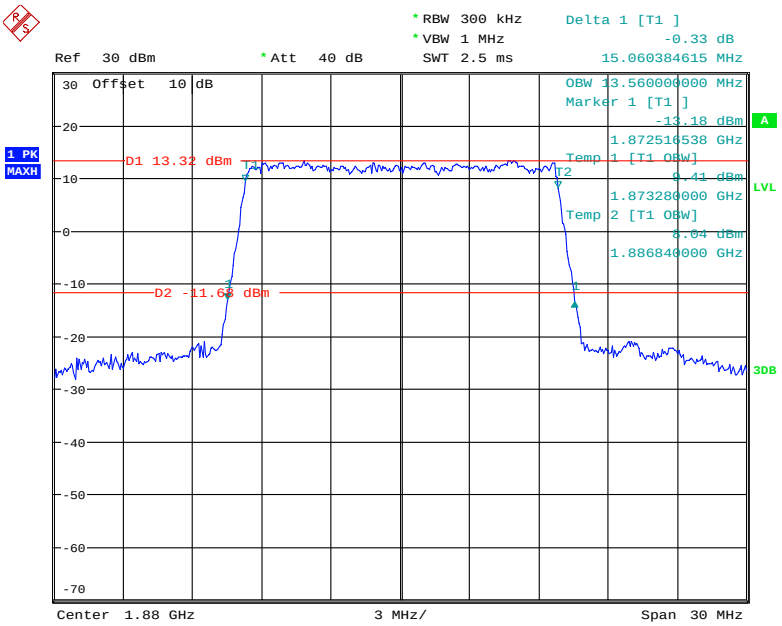
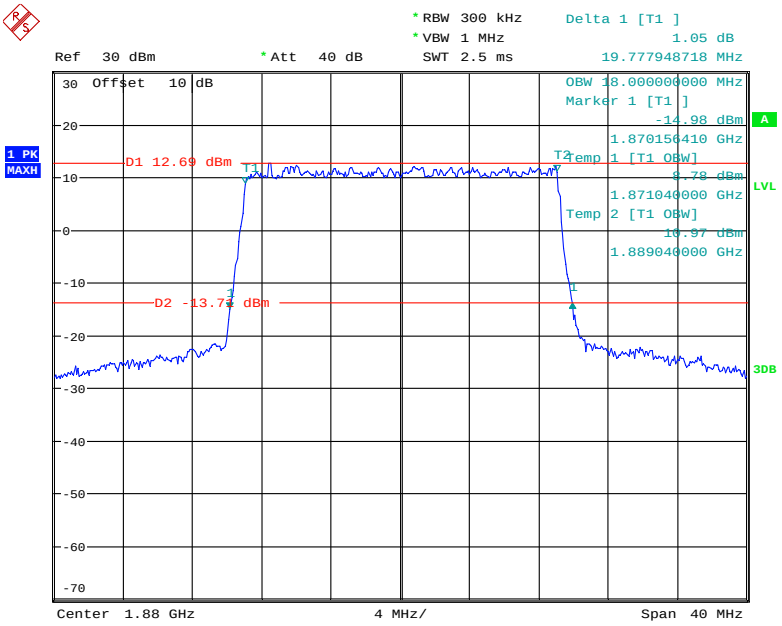
16QAM_15 MHz



Date: 21.DEC.2017 19:56:46

16QAM_20 MHz



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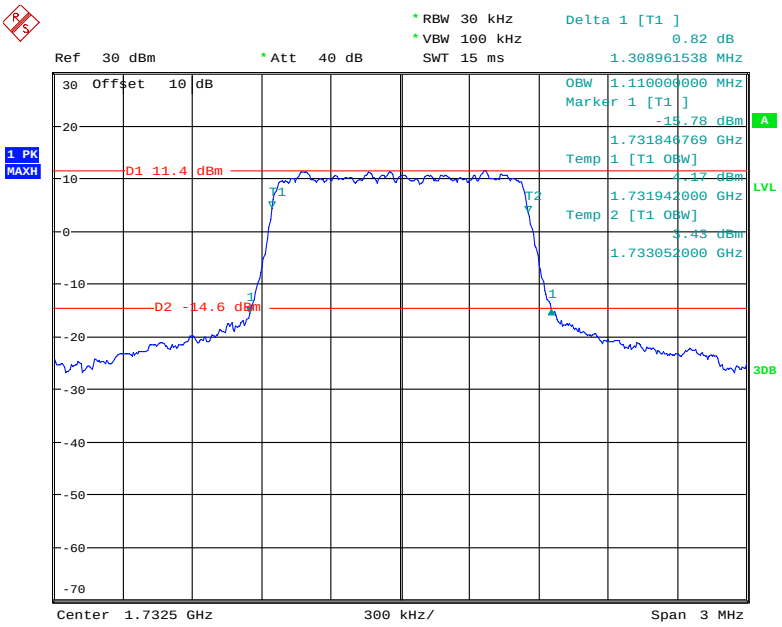
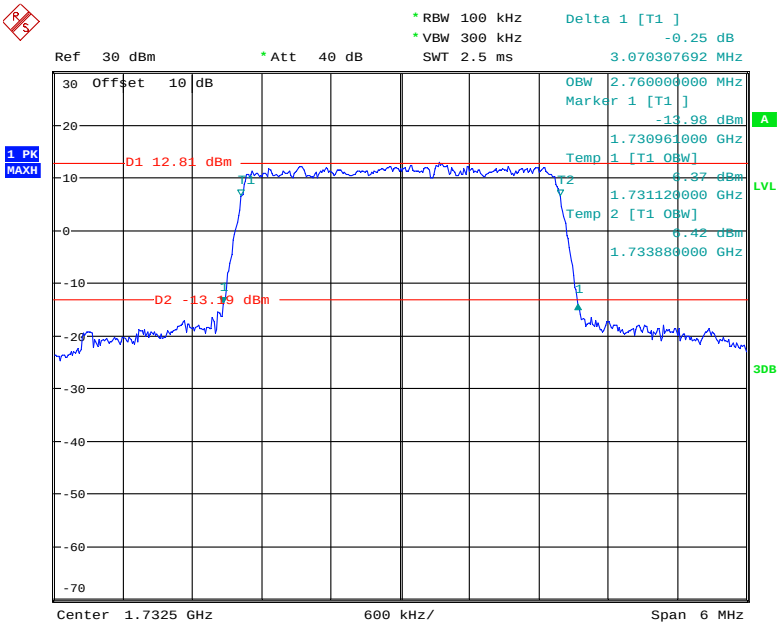
LTE Band 4:

QPSK_1.4 MHz



Date: 21.DEC.2017 20:13:07

QPSK_3 MHz



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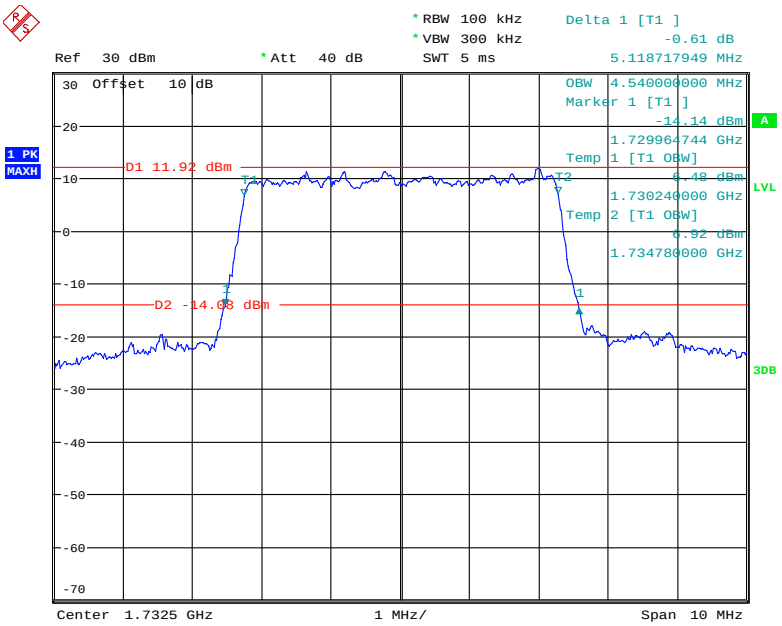
QPSK_5 MHz



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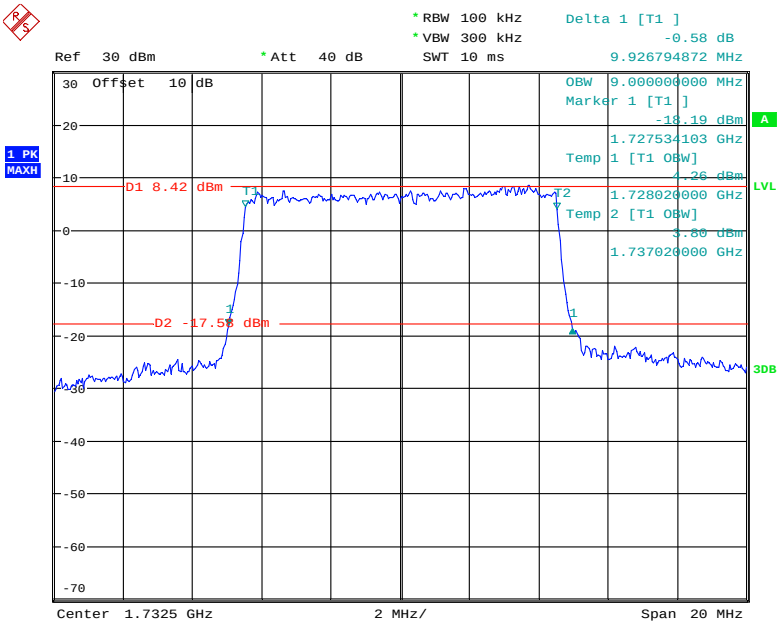
QPSK_10 MHz



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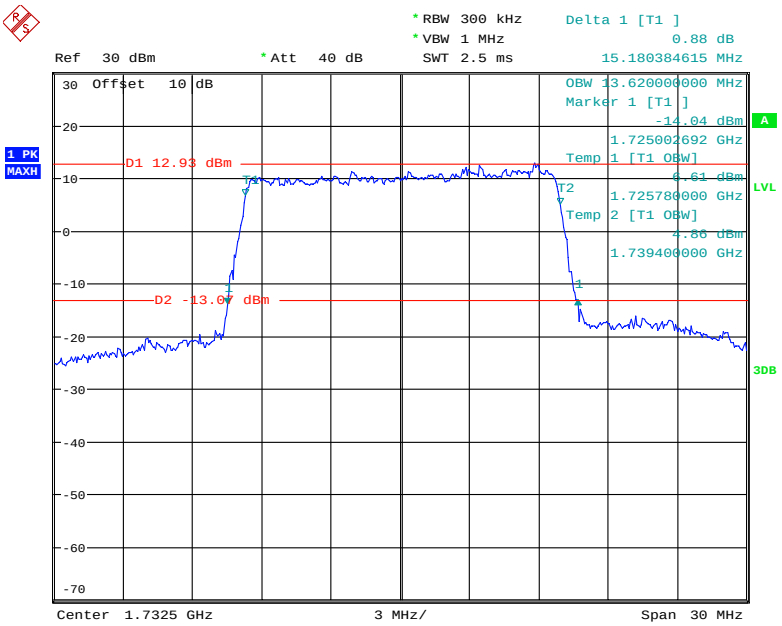
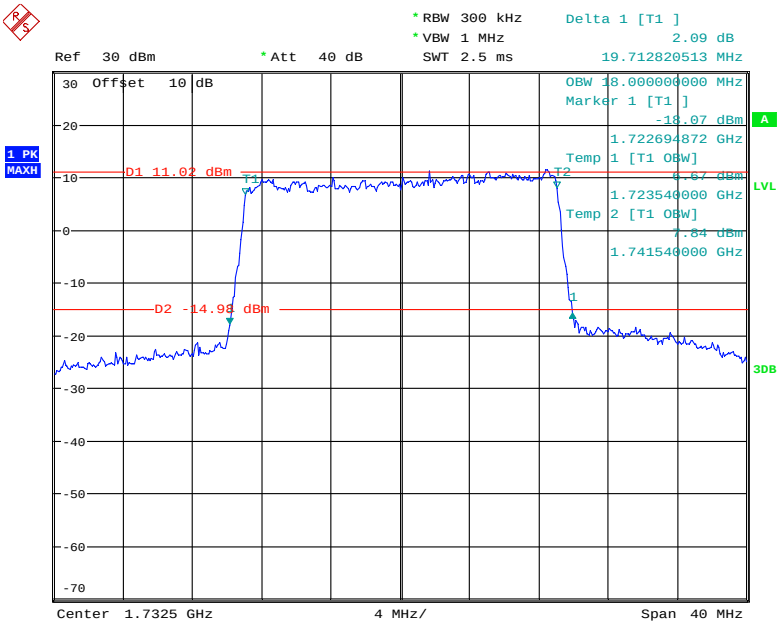
QPSK_15 MHz



Date: 21.DEC.2017 20:42:57

QPSK_20 MHz



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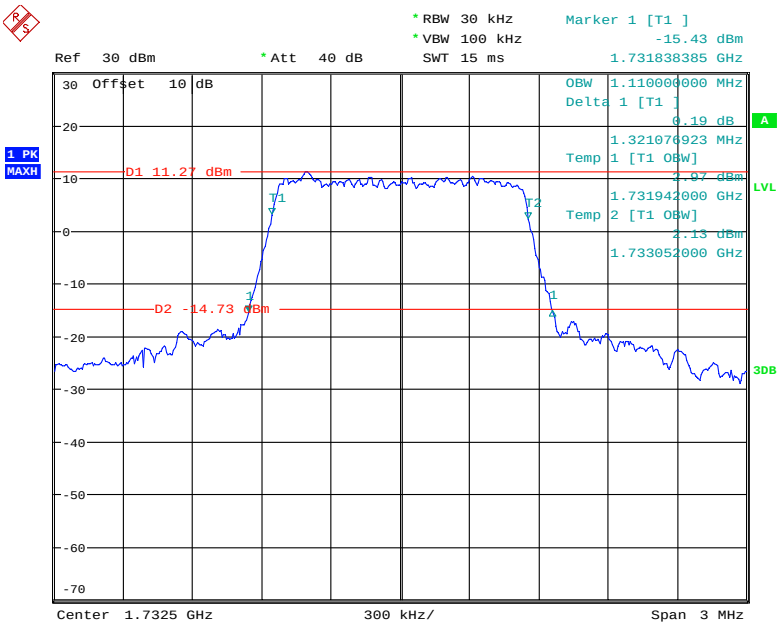
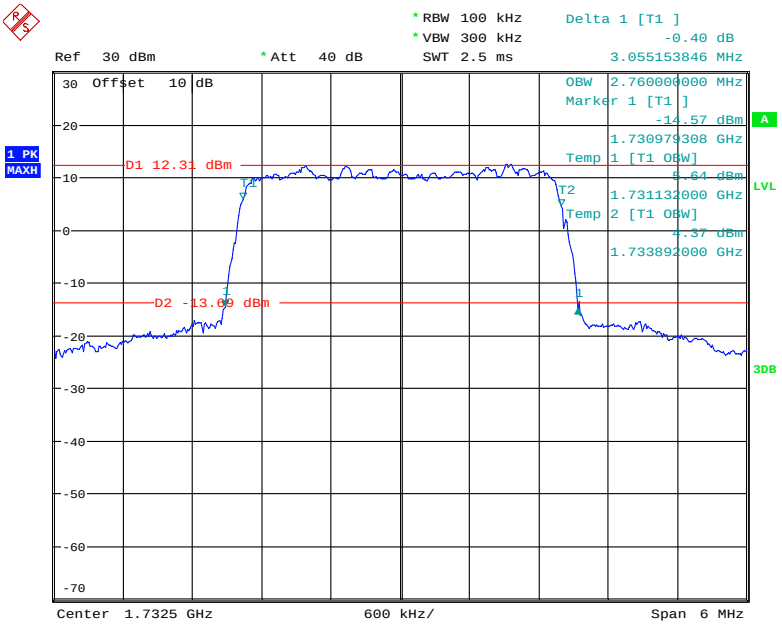
16QAM_1.4 MHz



Date: 21.DEC.2017 20:17:52

16QAM_3 MHz



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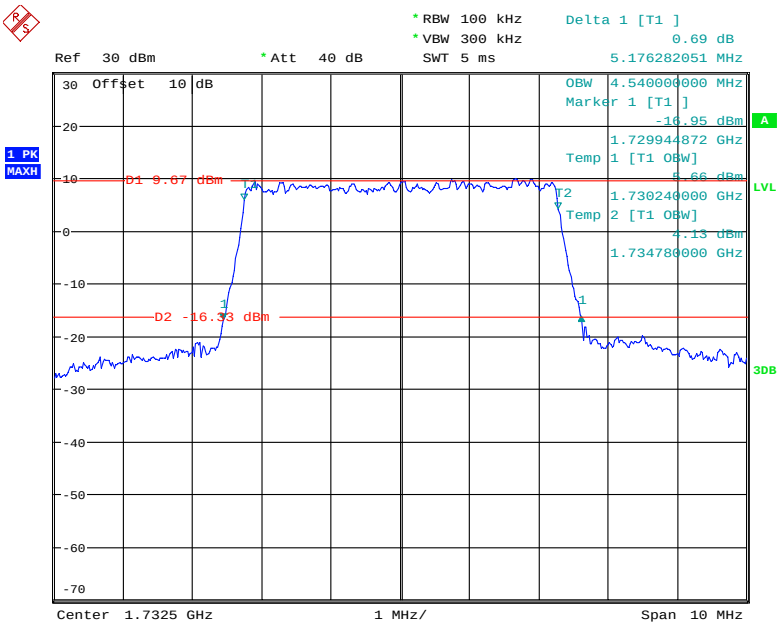
16QAM_5 MHz



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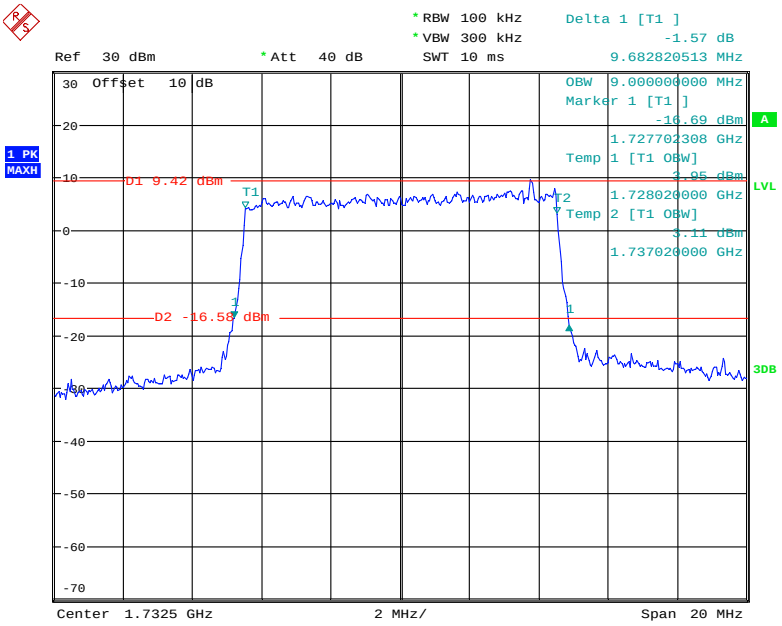
16QAM_10 MHz



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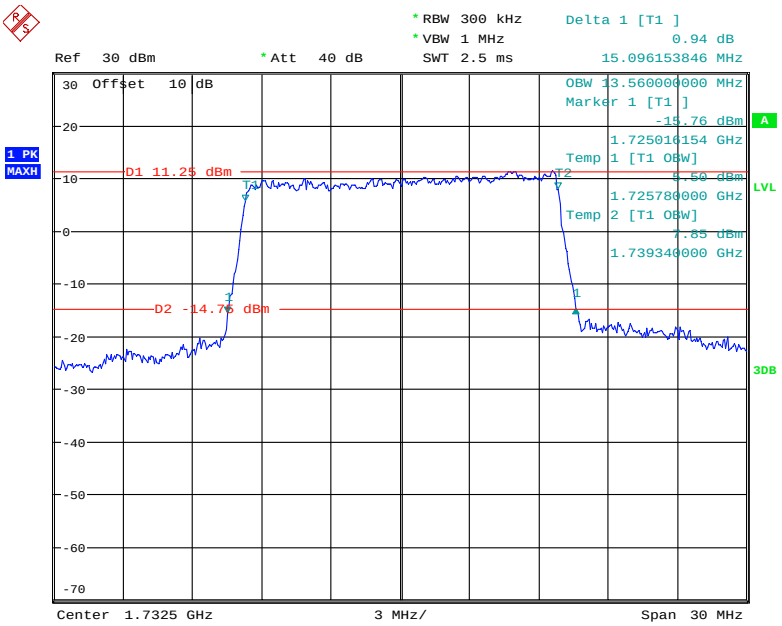
16QAM_15 MHz



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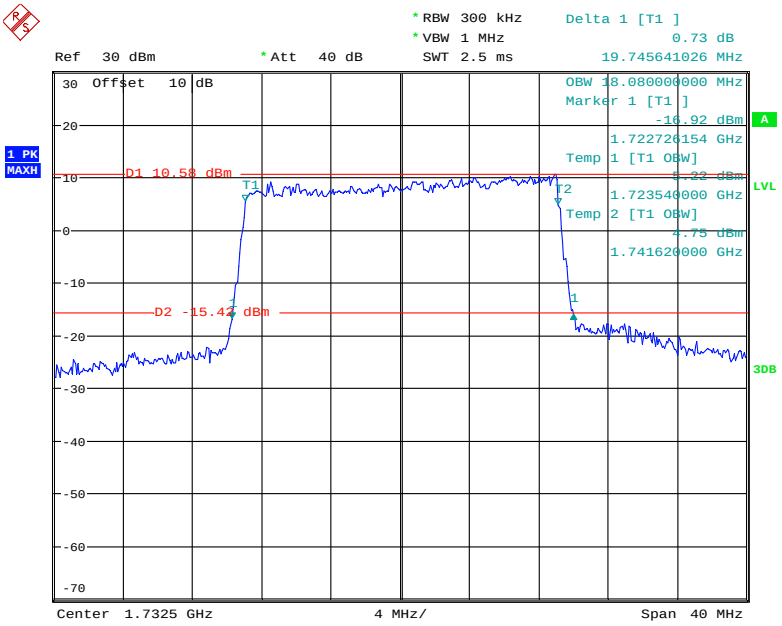
16QAM_20 MHz



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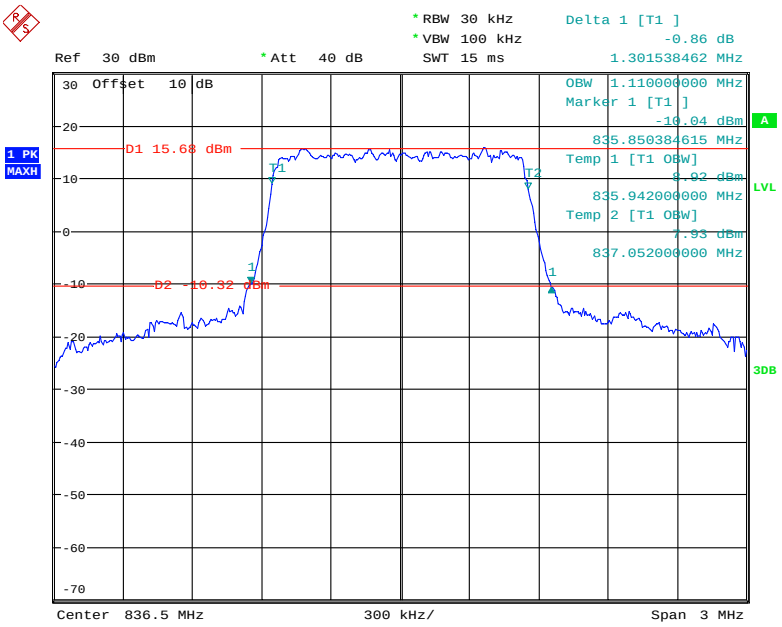
LTE Band 5:

QPSK_1.4 MHz



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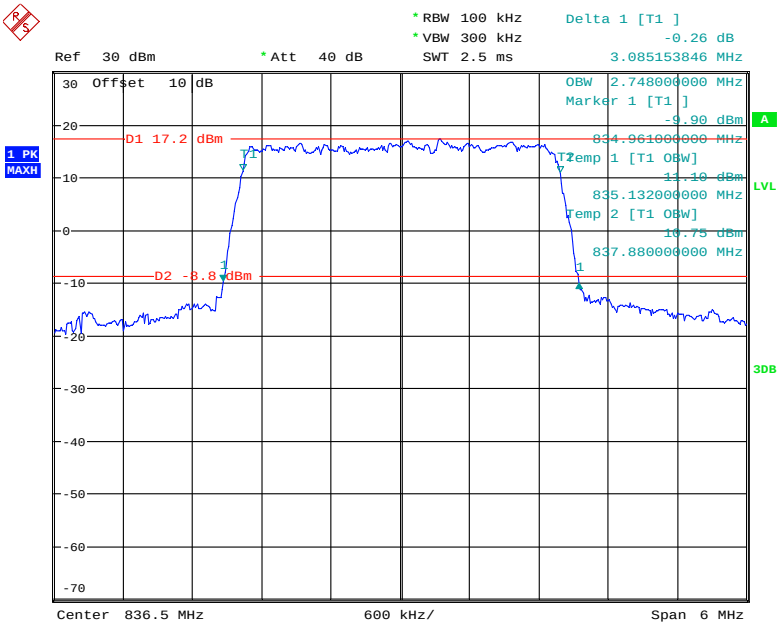
QPSK_3 MHz



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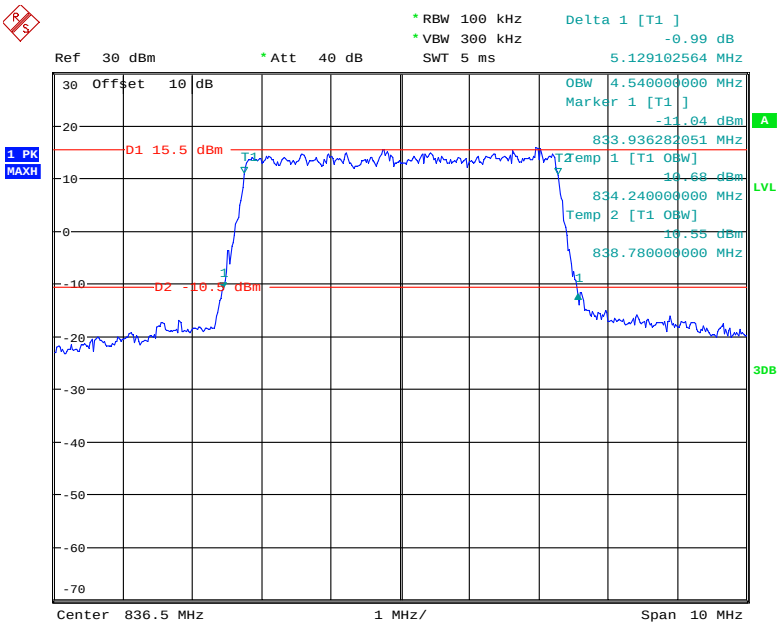
QPSK_5 MHz



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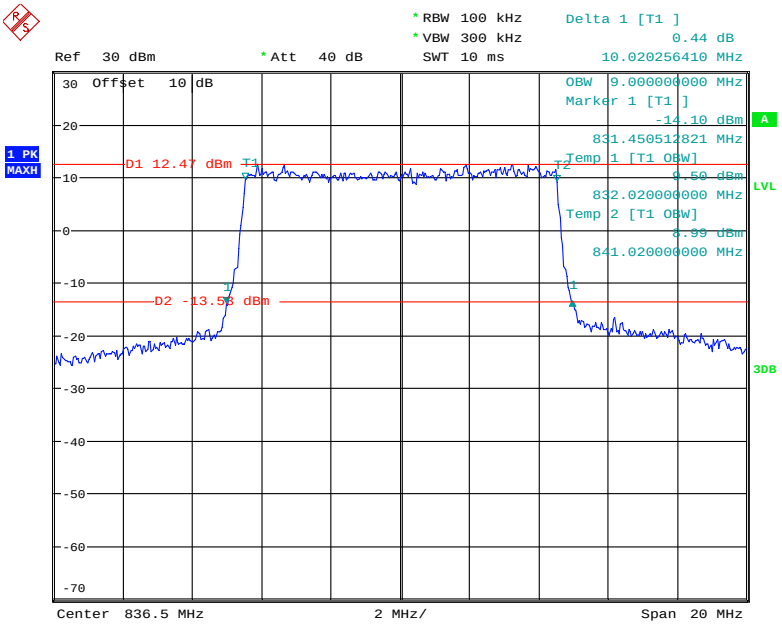
QPSK_10 MHz



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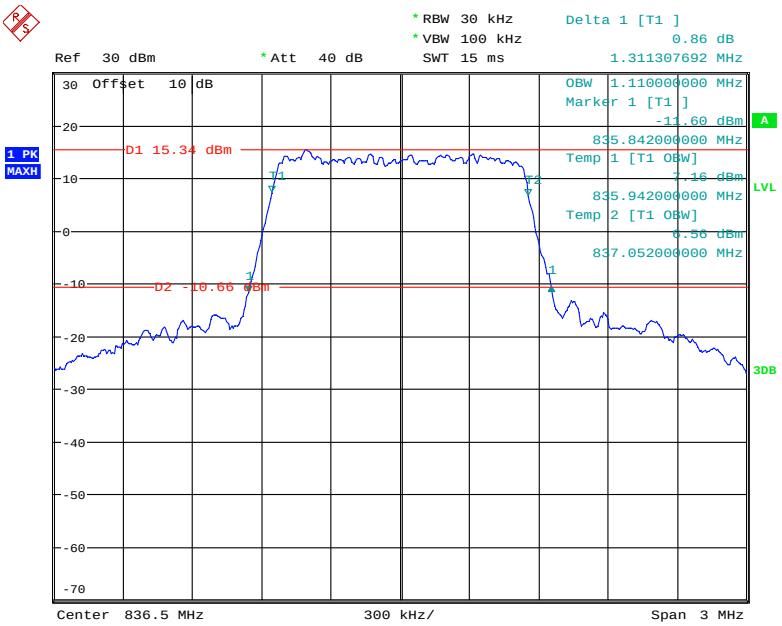
16QAM_1.4 MHz



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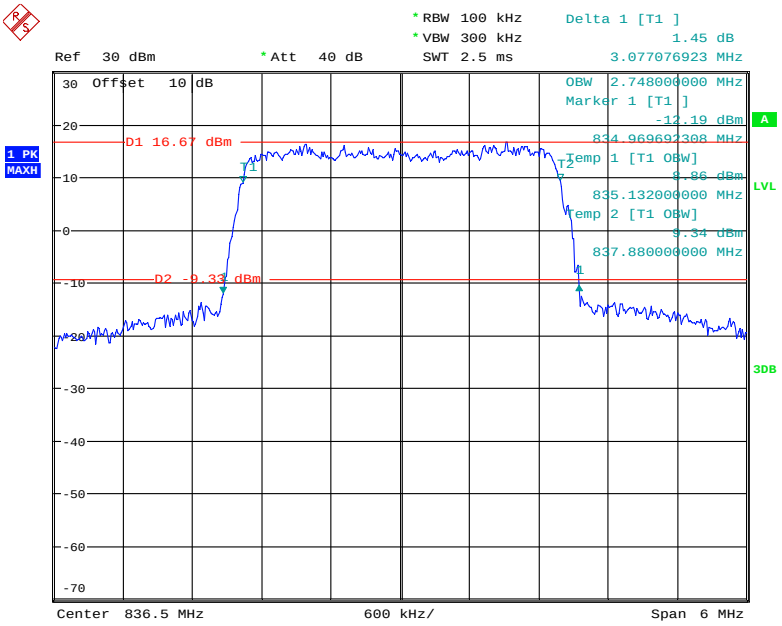
16QAM_3 MHz



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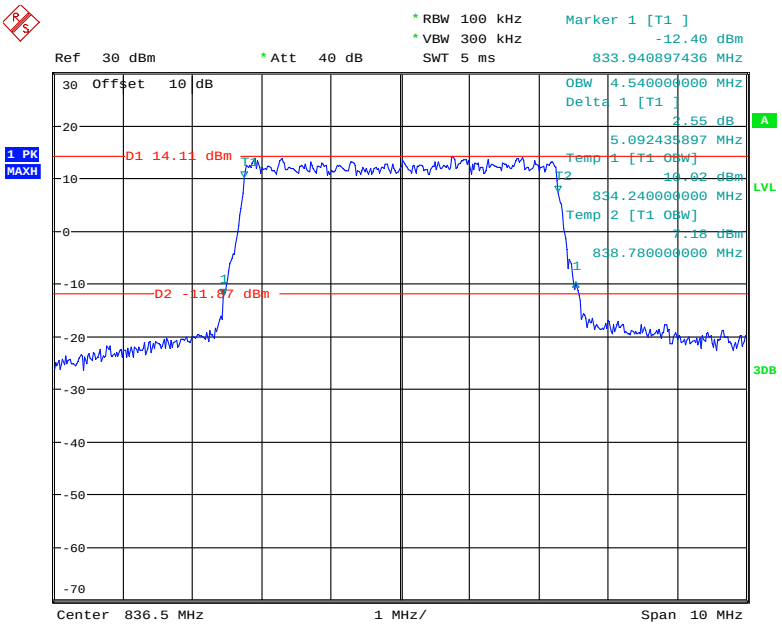
16QAM_5 MHz



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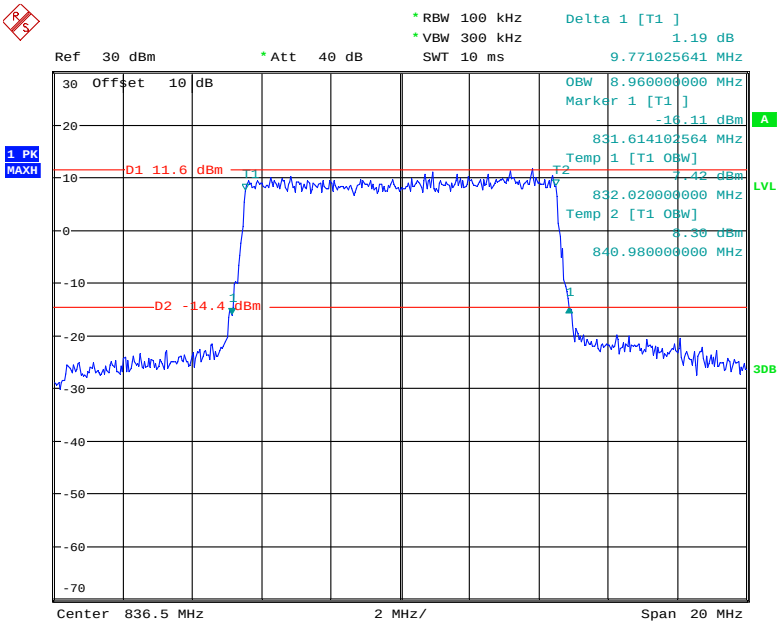
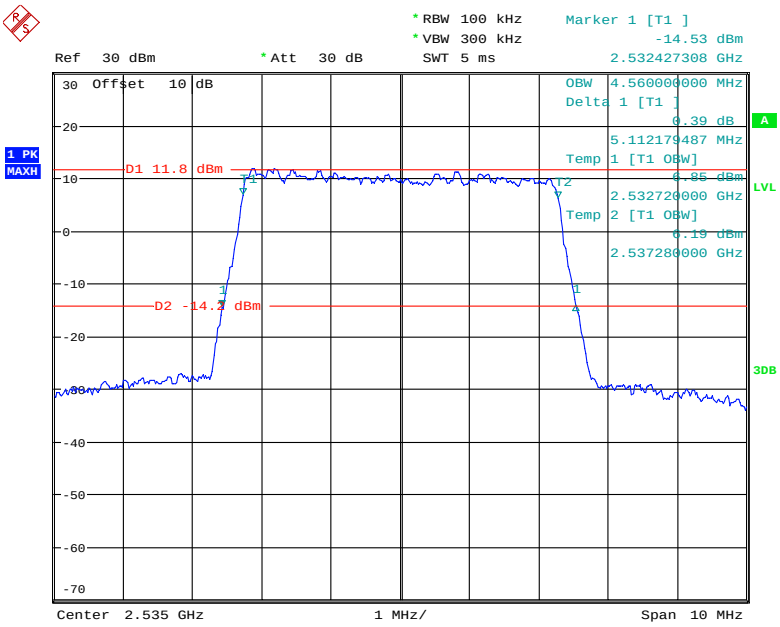
16QAM_10 MHz



Date: 21.DEC.2017 21:19:01

LTE Band 7:

QPSK_5 MHz



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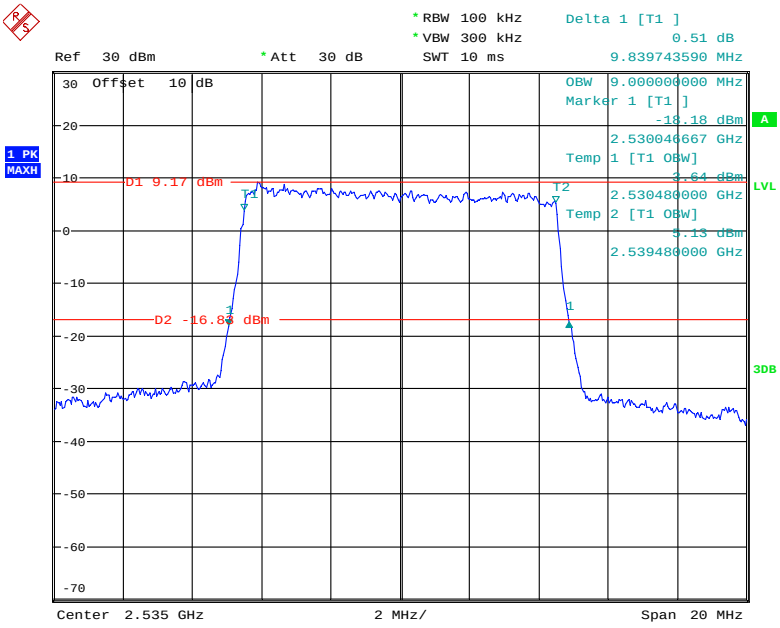
QPSK_10 MHz



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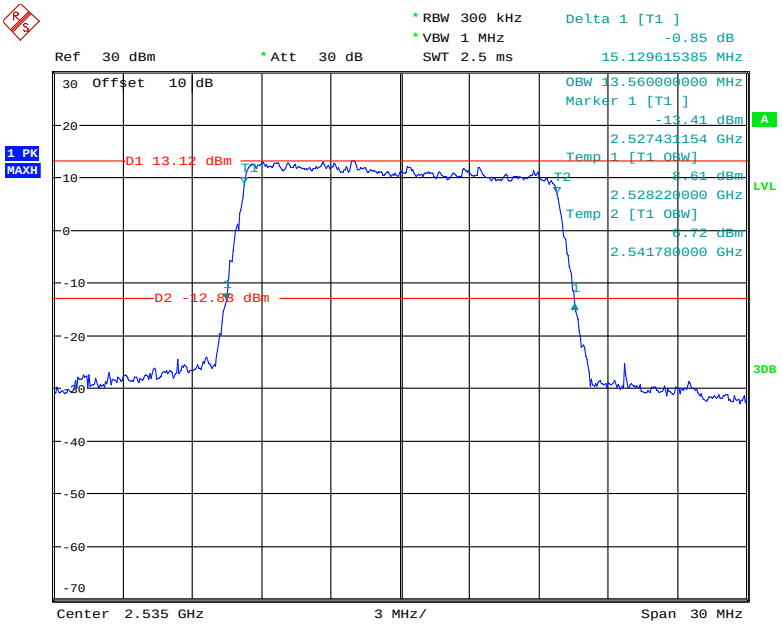
QPSK_15 MHz



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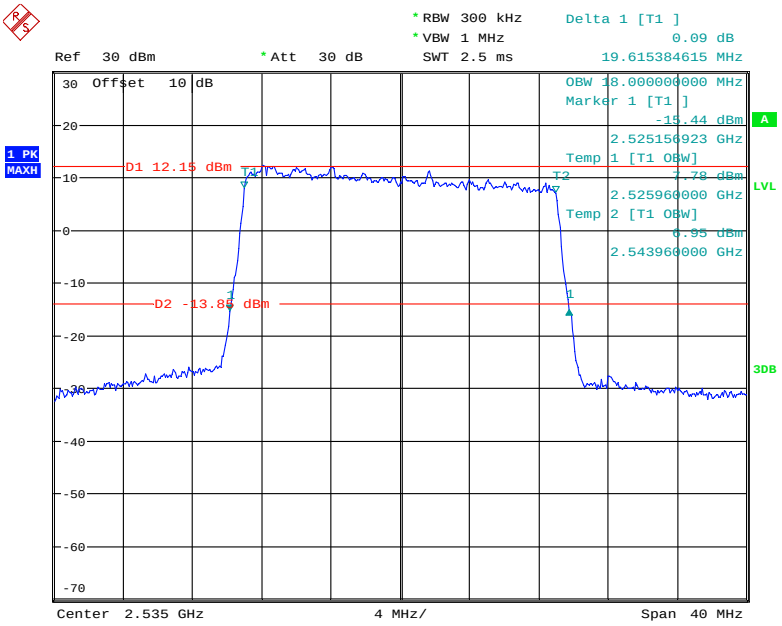
QPSK_20 MHz



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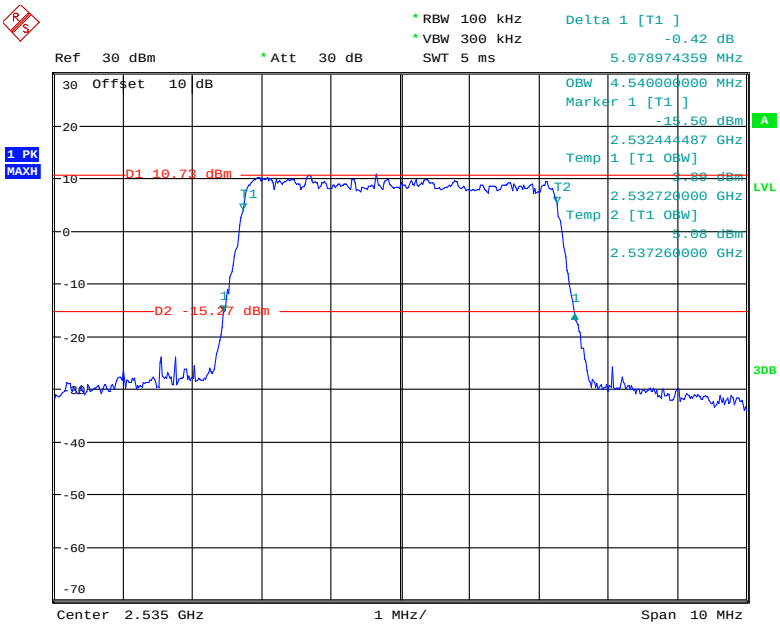
16QAM_5 MHz



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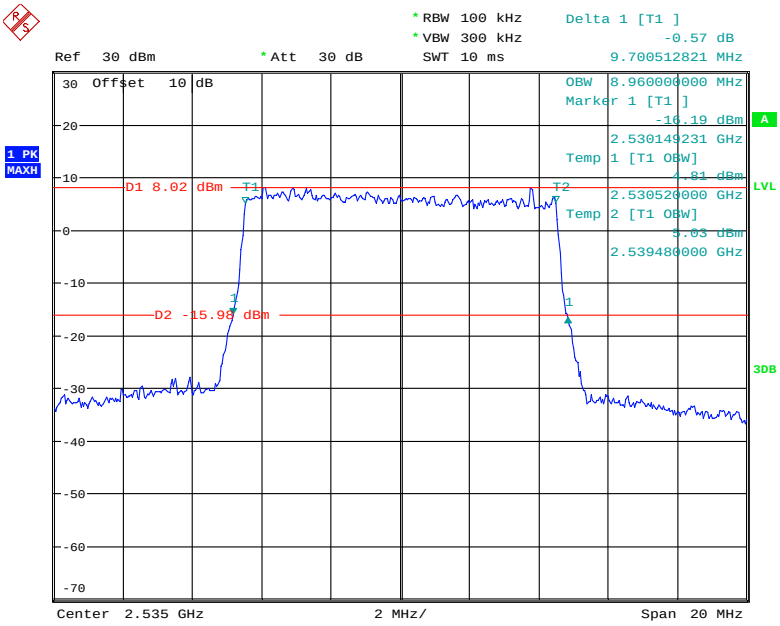
16QAM_10 MHz



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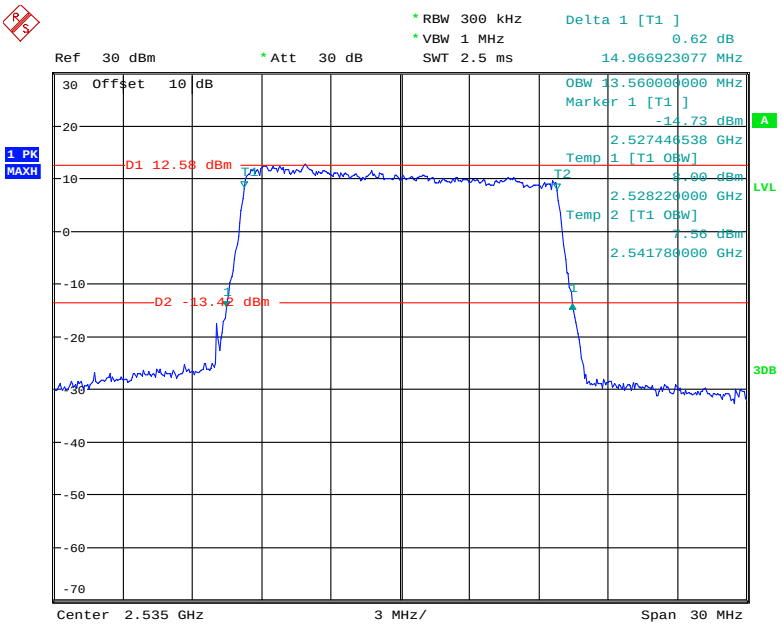
16QAM_15 MHz



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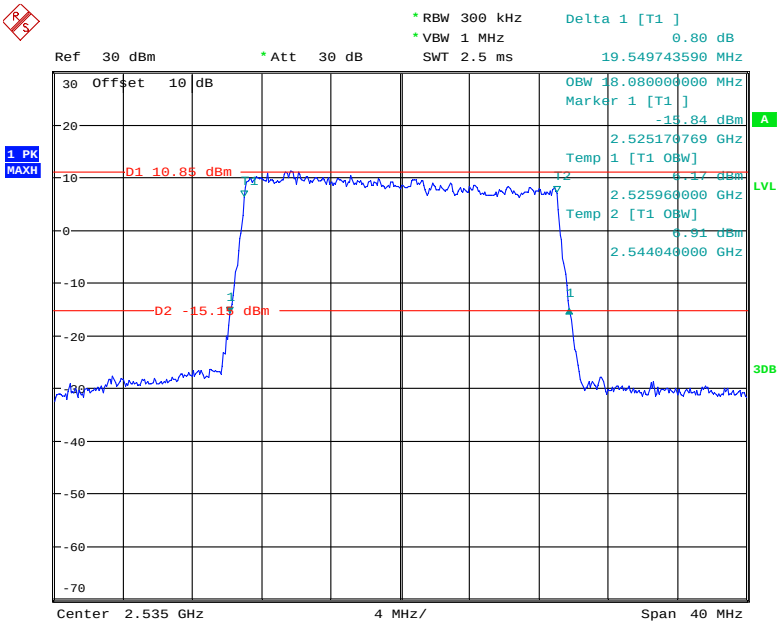
16QAM_20 MHz



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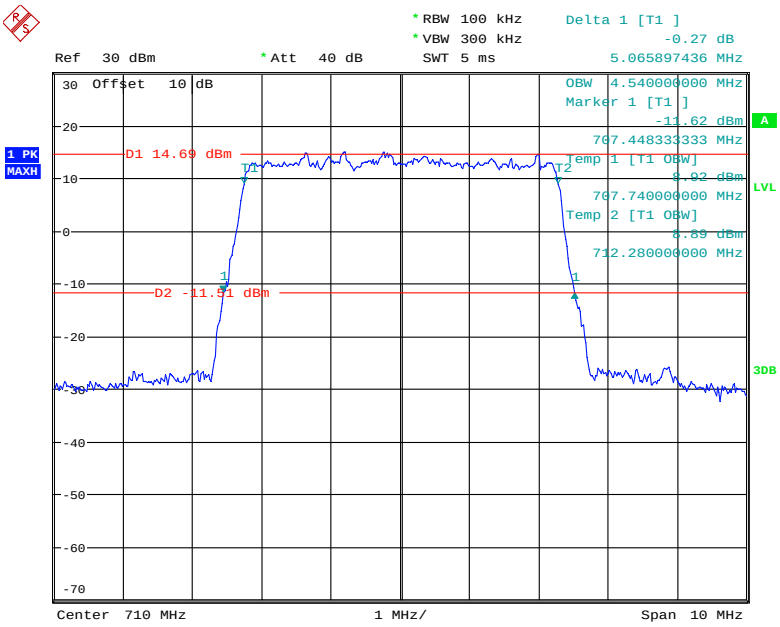
LTE Band 17:

QPSK_5 MHz



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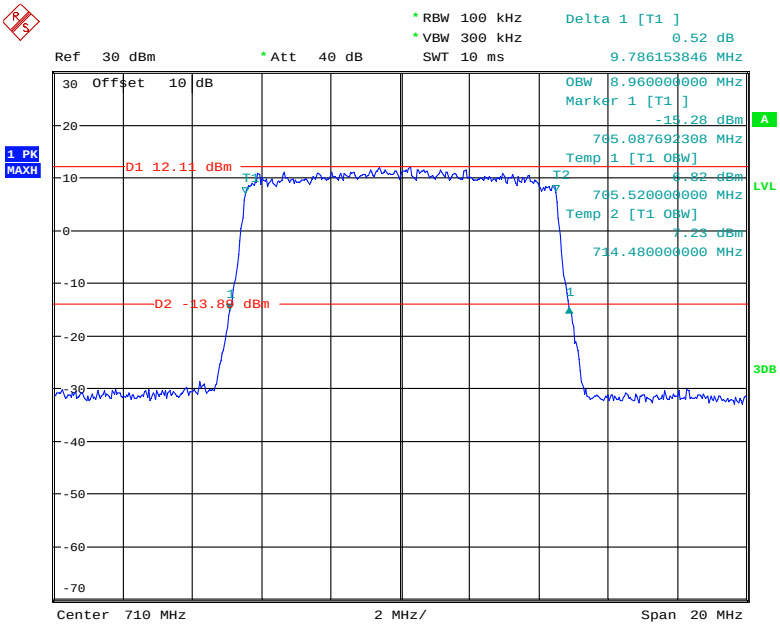
QPSK_10 MHz



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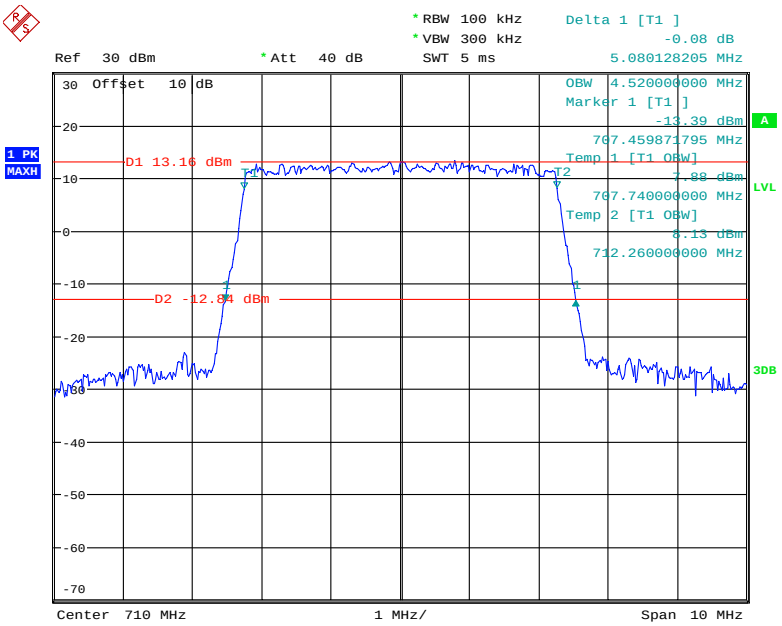
16QAM_5 MHz



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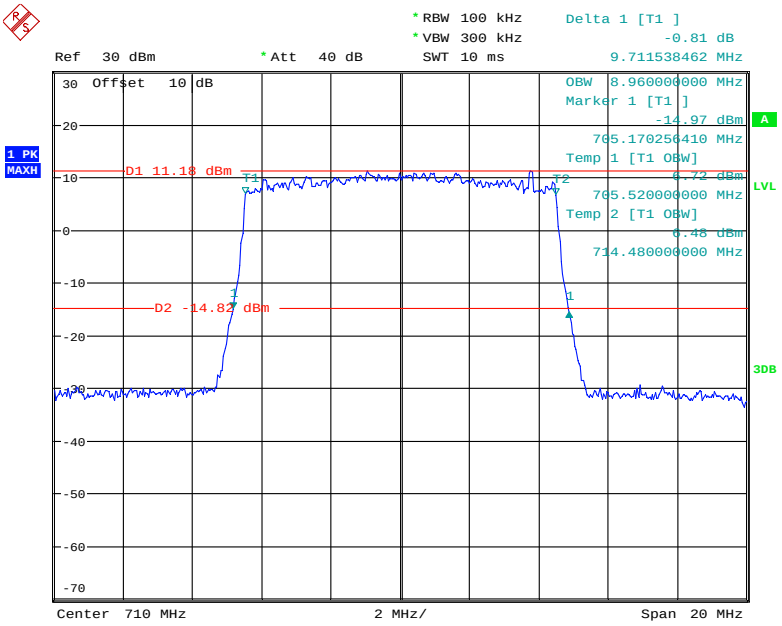
16QAM_10 MHz



Date: 21.DEC.2017 21:28:09

FCC §2.1051, §22.917(a) & §24.238(a) & §27.53 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

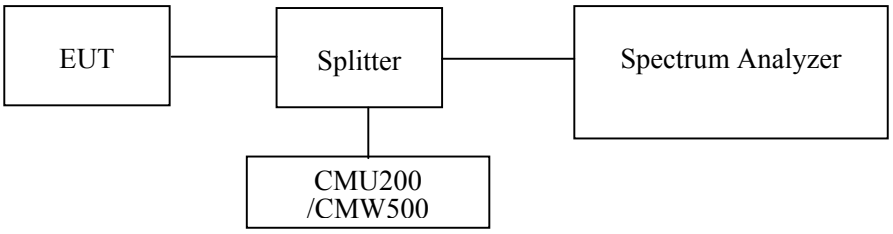
Applicable Standard

FCC §2.1051, §22.917(a) , §24.238(a) and §27.53.

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. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Universal Radio Communication Tester	CMU200	109 038	2017-07-18	2018-07-18
R&S	Wideband Radio Communication Tester	CMW500	110479	2017-03-08	2018-03-08
N/A	Coaxial Cable	C-SJ00-0010	C0010/01	Each Time	/
Pasternack	RF Coaxial Cable	0.5m	C-5	Each Time	/
E-Microwave	RF Attenuator	6dB	6dB-1	Each Time	/
E-Microwave	Two-way Spliter	ODP-1-6-2S	OE0120142	Each Time	/
R&S	Spectrum Analyzer	FSU 26	200256	2017-12-08	2018-12-08

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

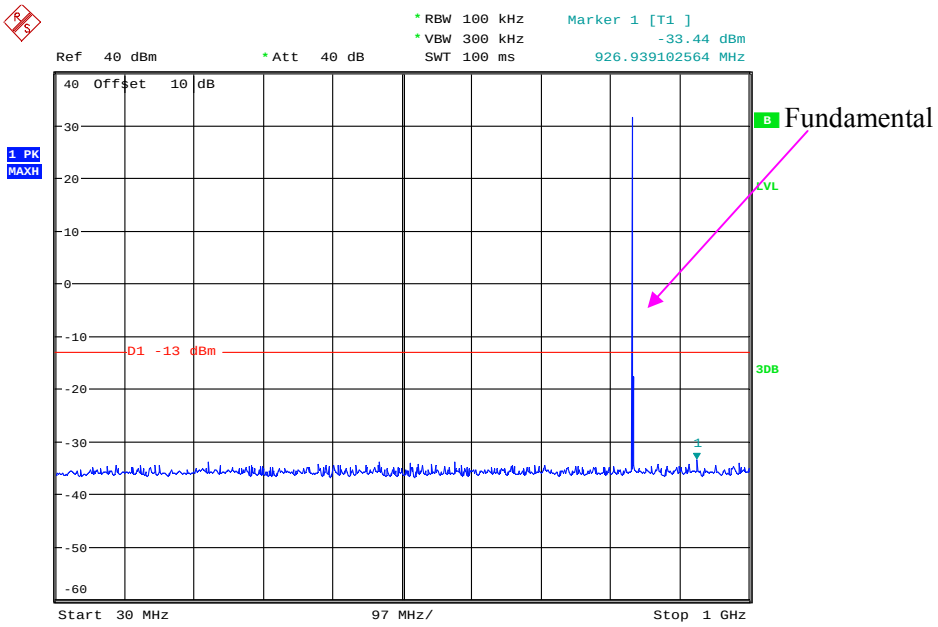
Environmental Conditions

Temperature:	23.1~25.4°C
Relative Humidity:	32~41 %
ATM Pressure:	102~102.2 kPa

The testing was performed by Mark Pan from 2017-12-15 to 2017-12-24.

Please refer to the following plots.

GSM850_Middle Channel



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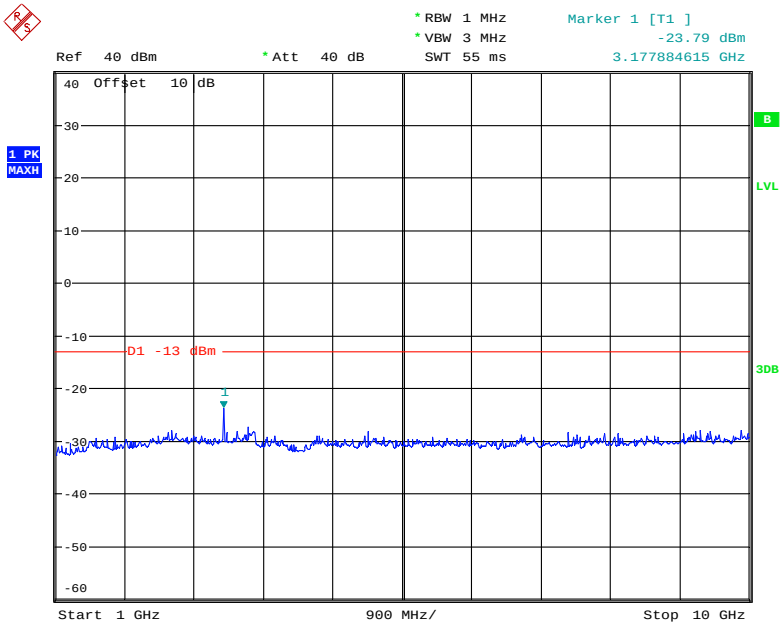
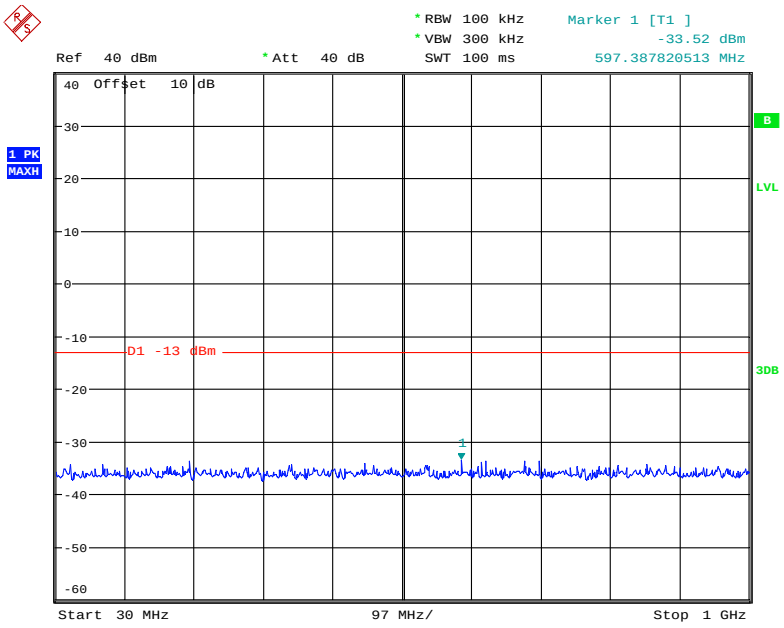
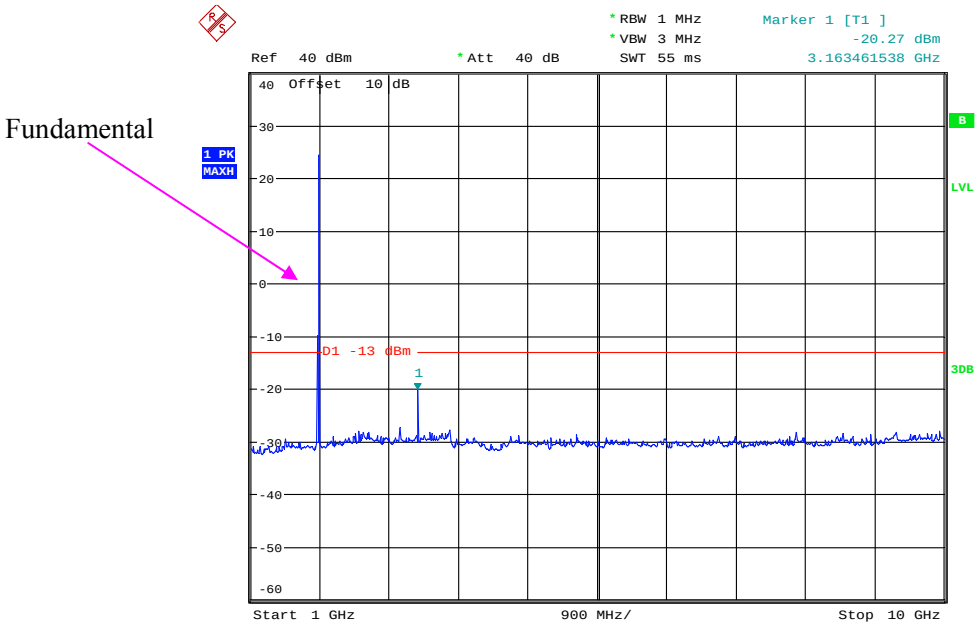


Date: 15.DEC.2017 20:42:01

PCS 1900_ Middle Channel



Date: 15.DEC.2017 20:50:26



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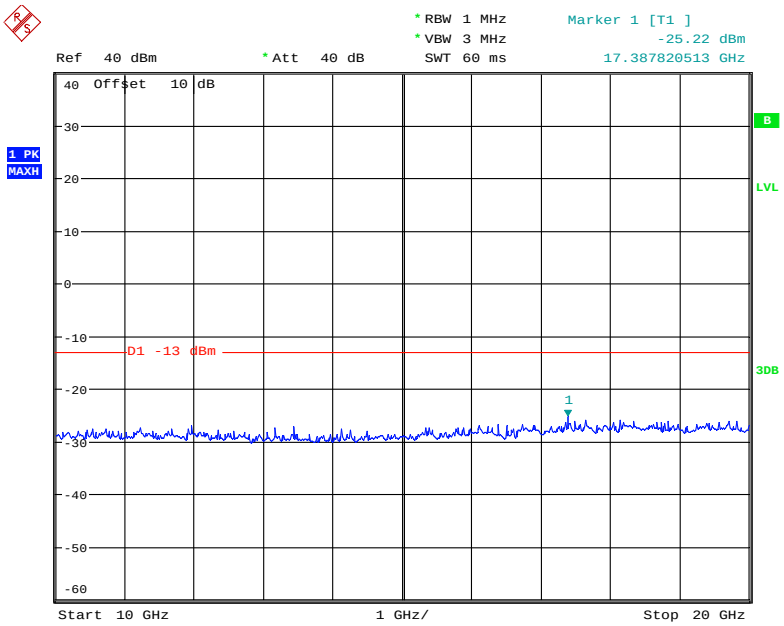

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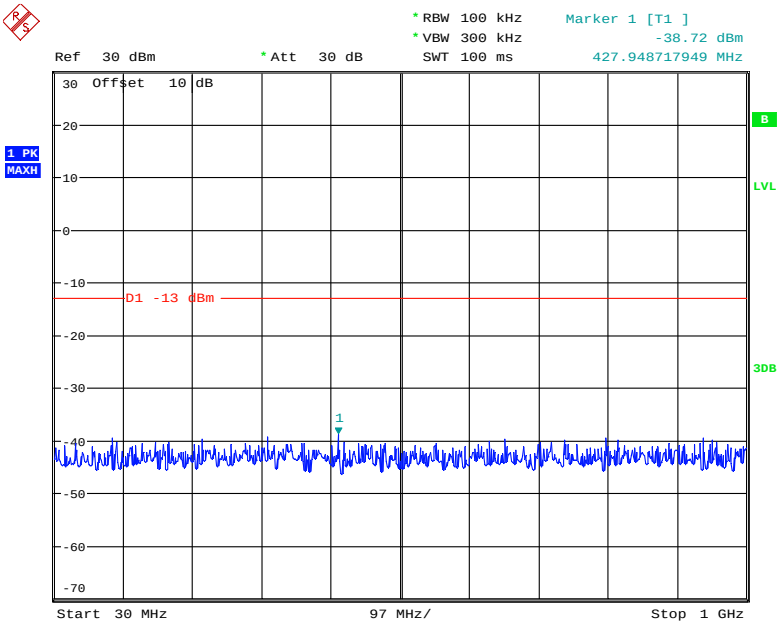
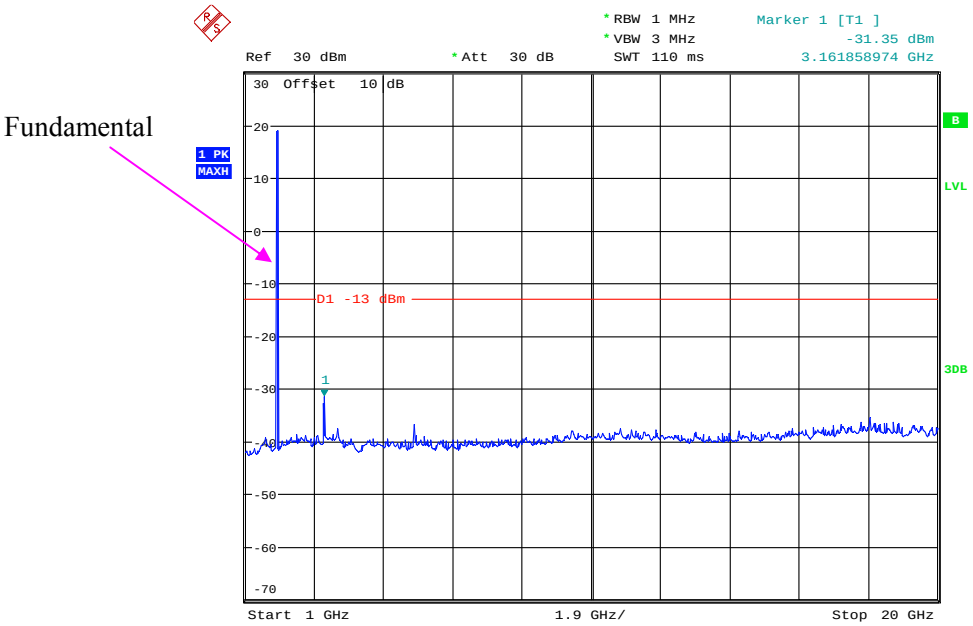
REL99 Band II_ Middle Channel



Date: 24.DEC.2017 13:36:46



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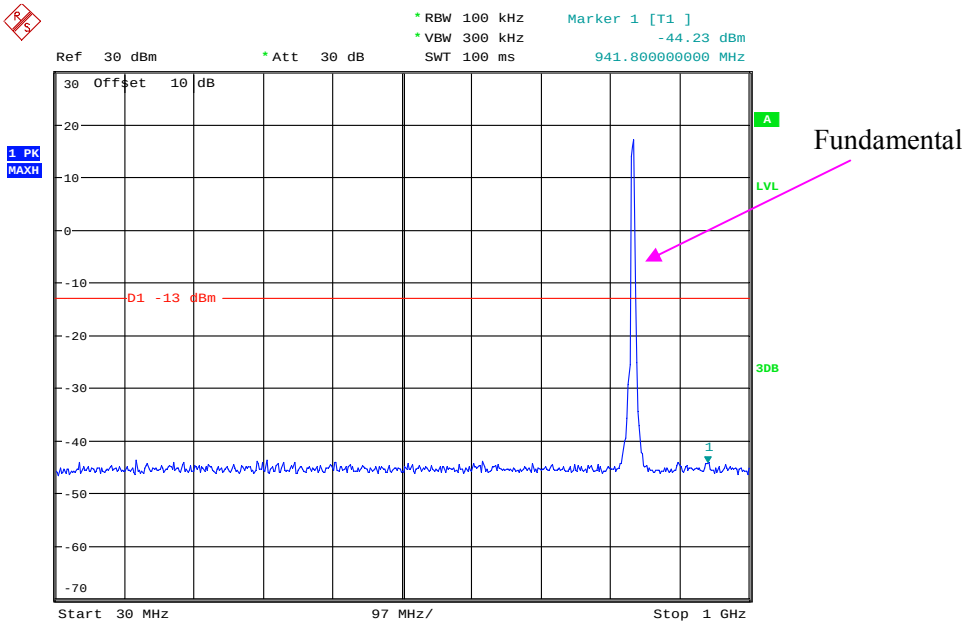
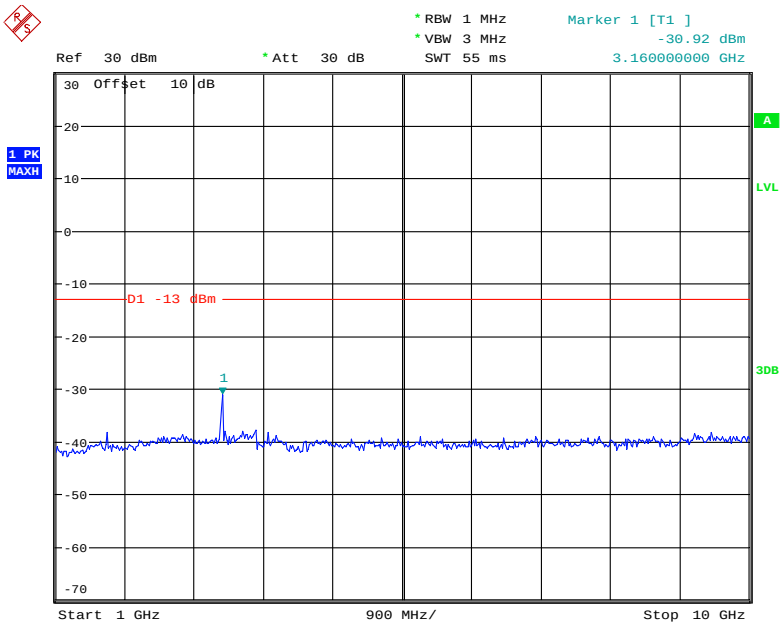
Rel 99 Band Ⅴ_ Middle Channel



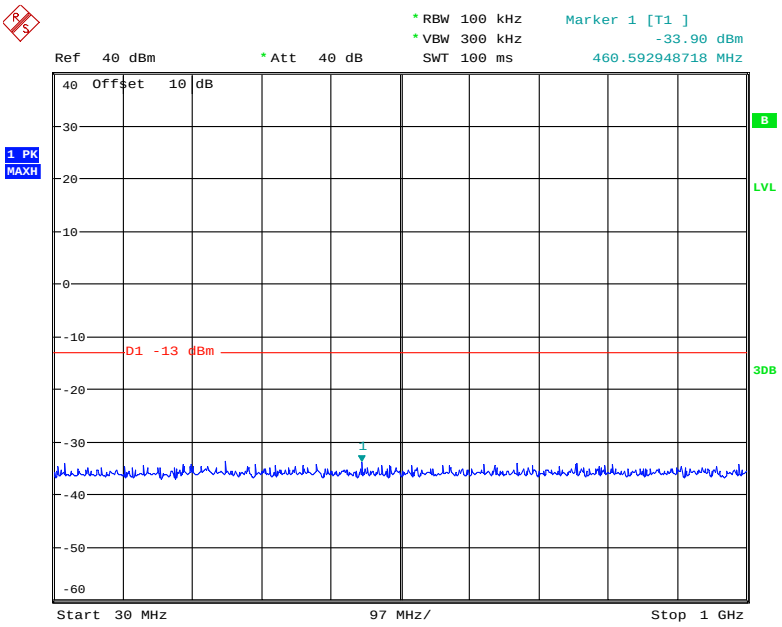
Date: 15.DEC.2017 23:07:12



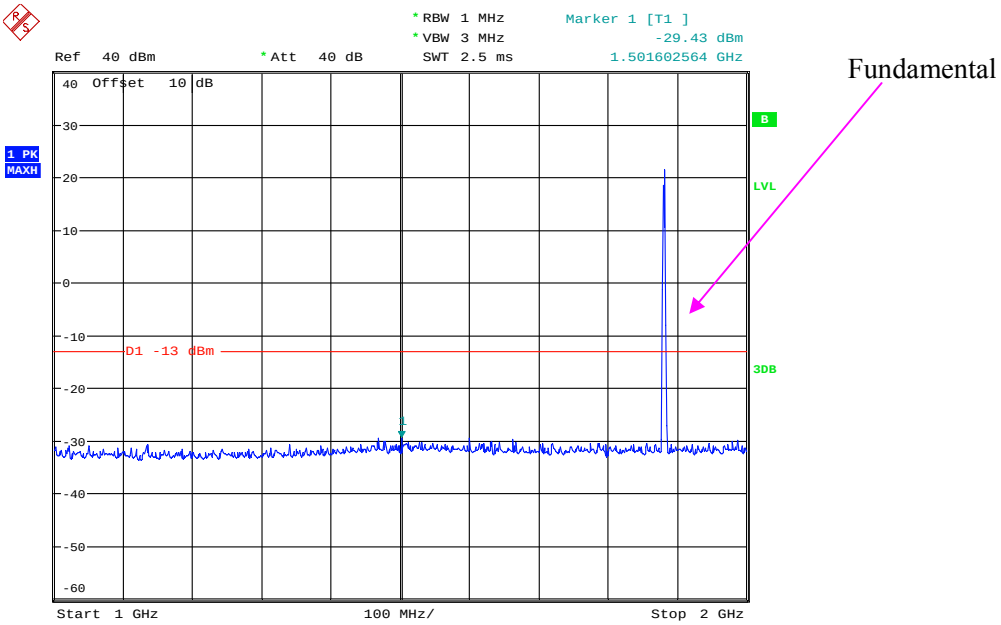
Date: 15.DEC.2017 23:07:47

LTE Band 2 (Middle Channel)

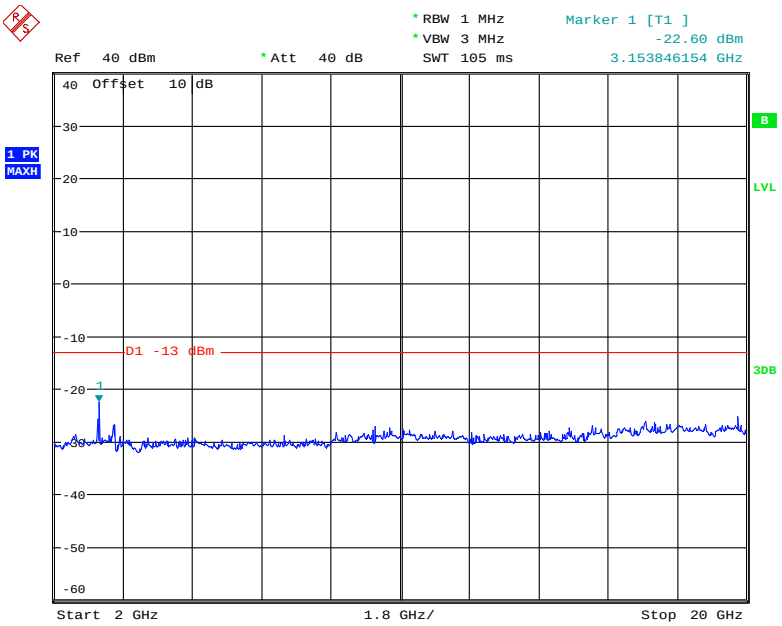
QPSK_1.4 MHz



Date: 21.DEC.2017 19:31:24

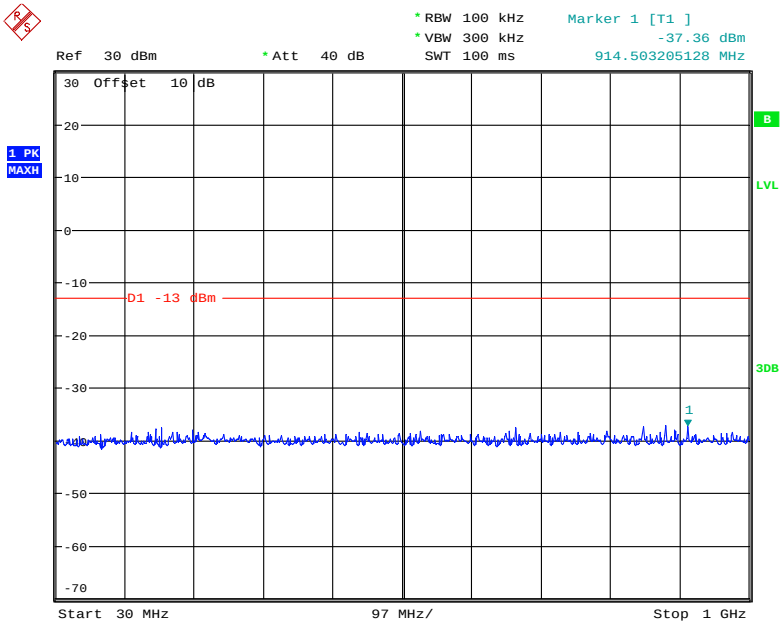


Date: 21.DEC.2017 19:32:04



Date: 21.DEC.2017 19:32:36

QPSK_3 MHz



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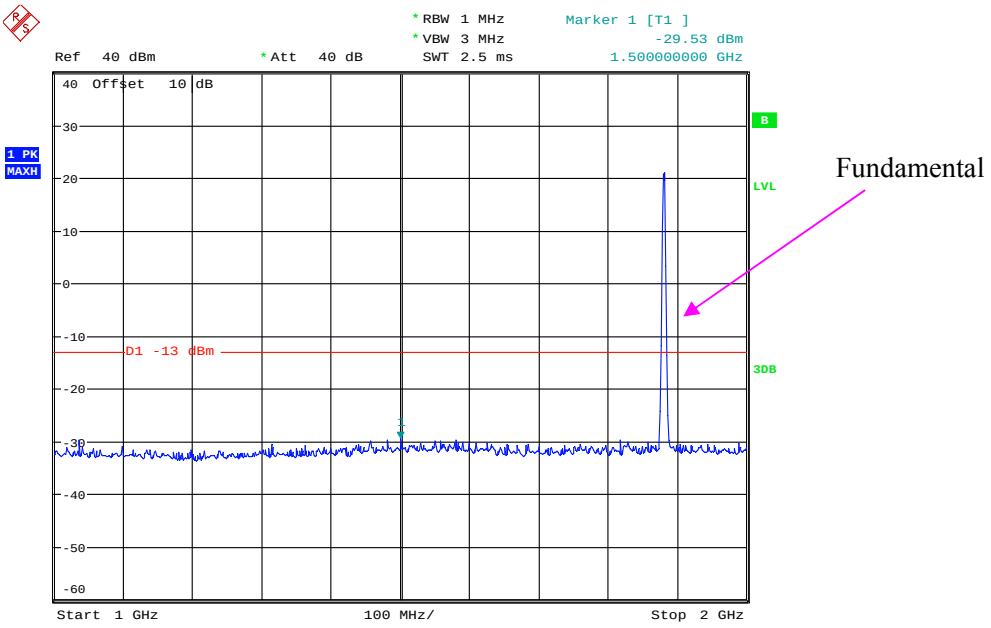

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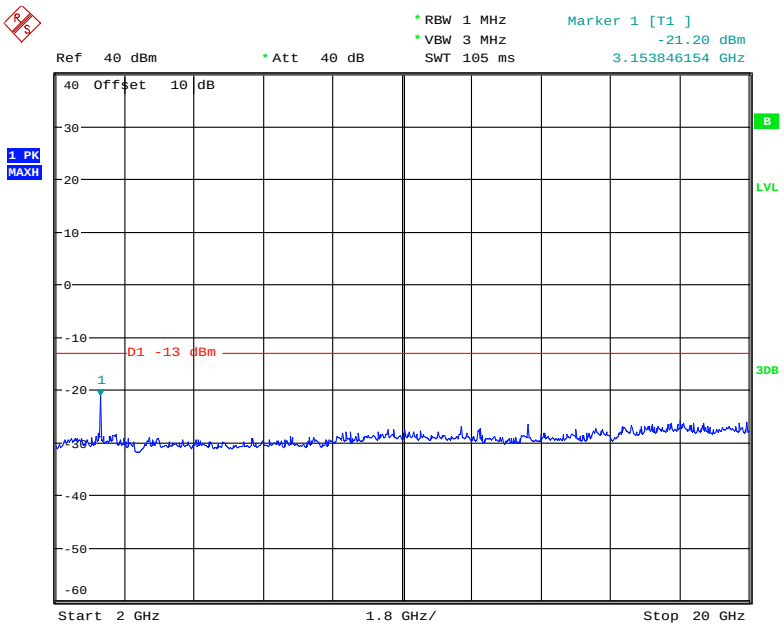

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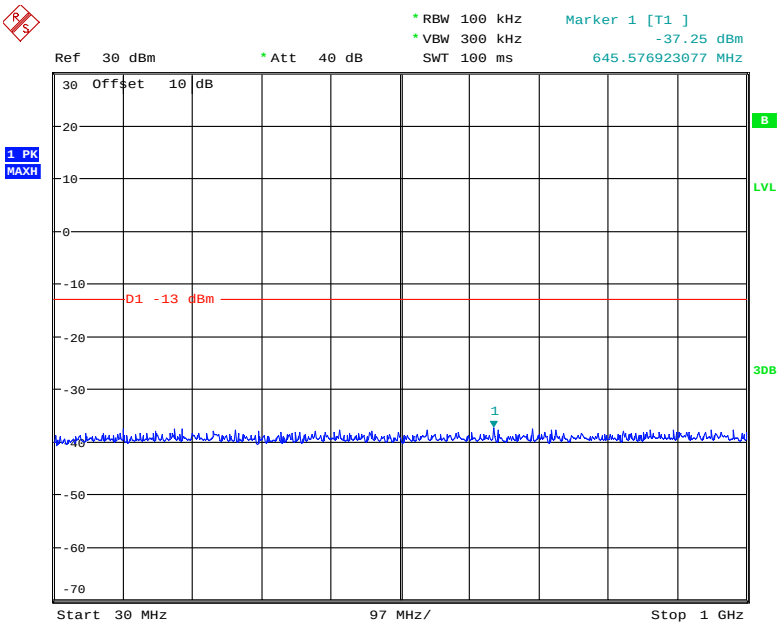
QPSK_5 MHz



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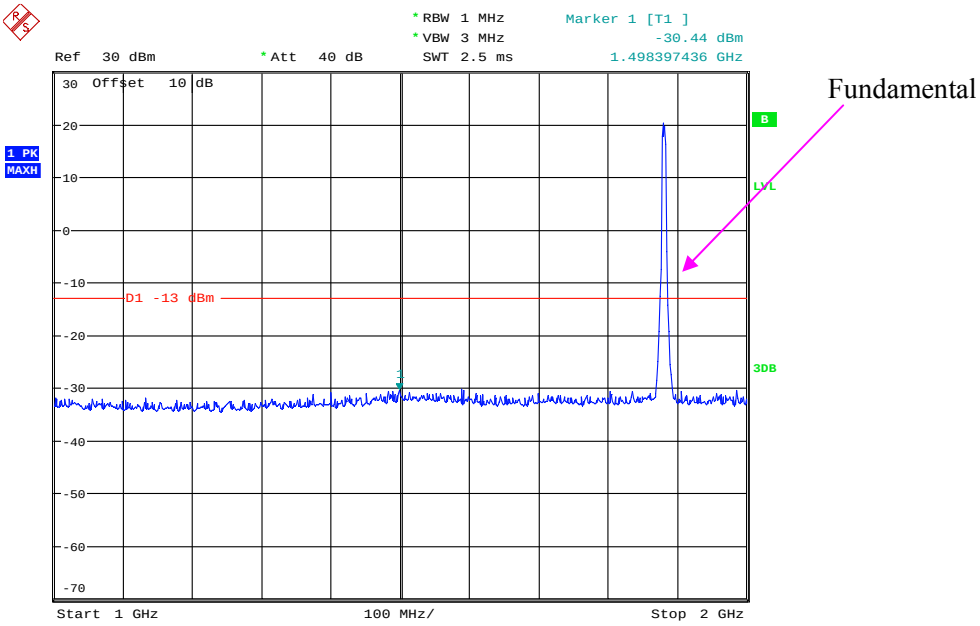

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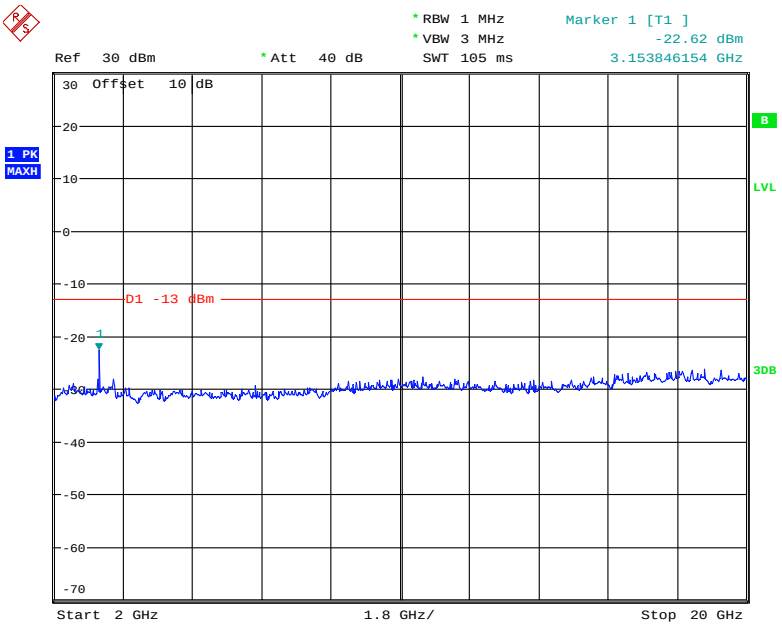

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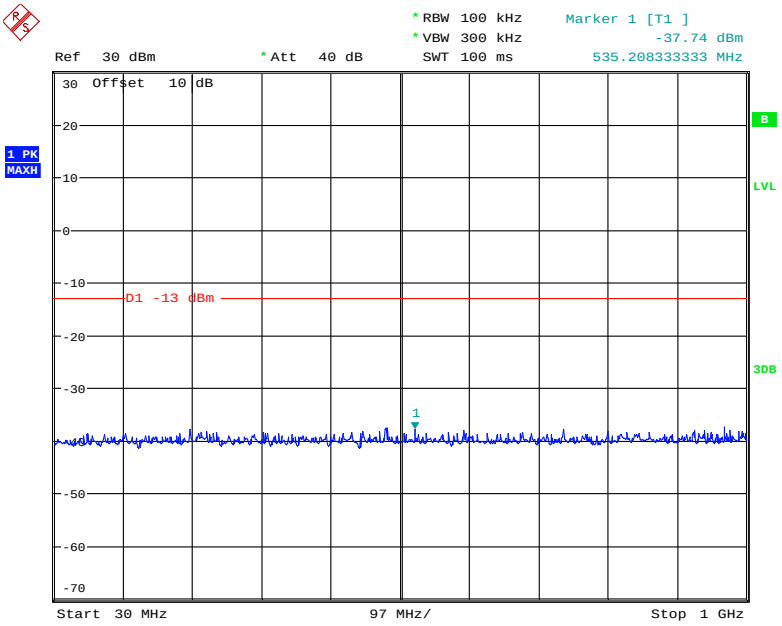
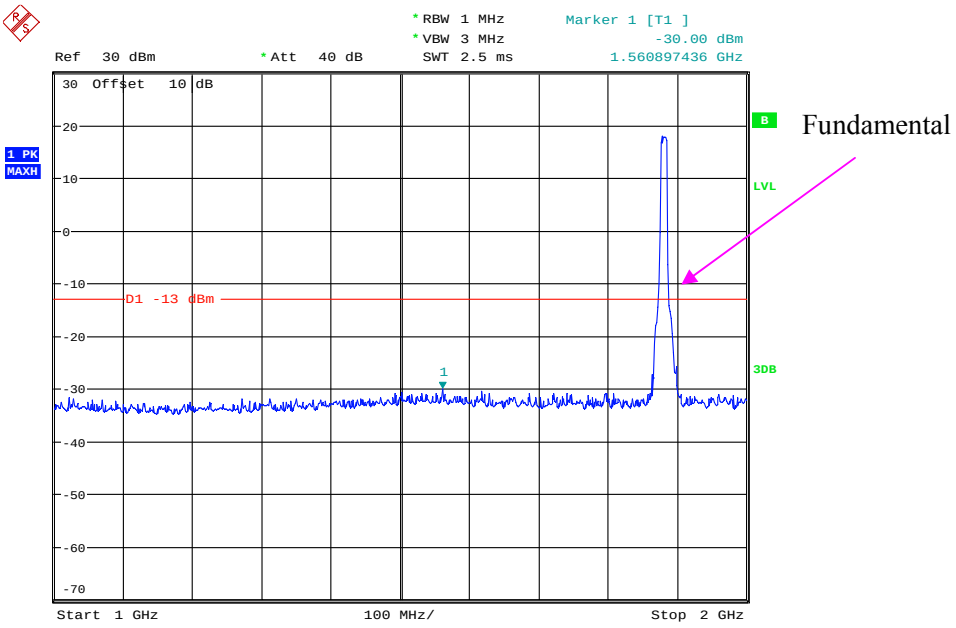
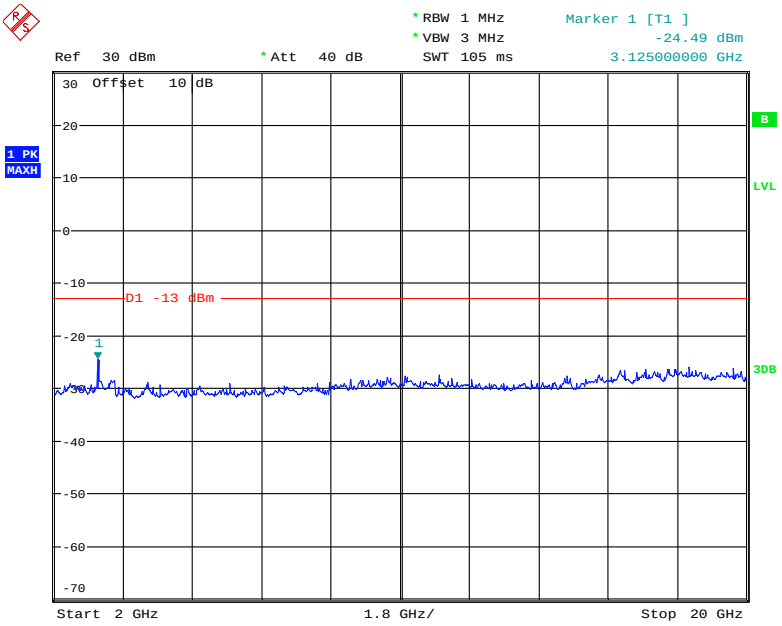
QPSK_10 MHz



Date: 21.DEC.2017 19:49:12



Date: 21.DEC.2017 19:48:47



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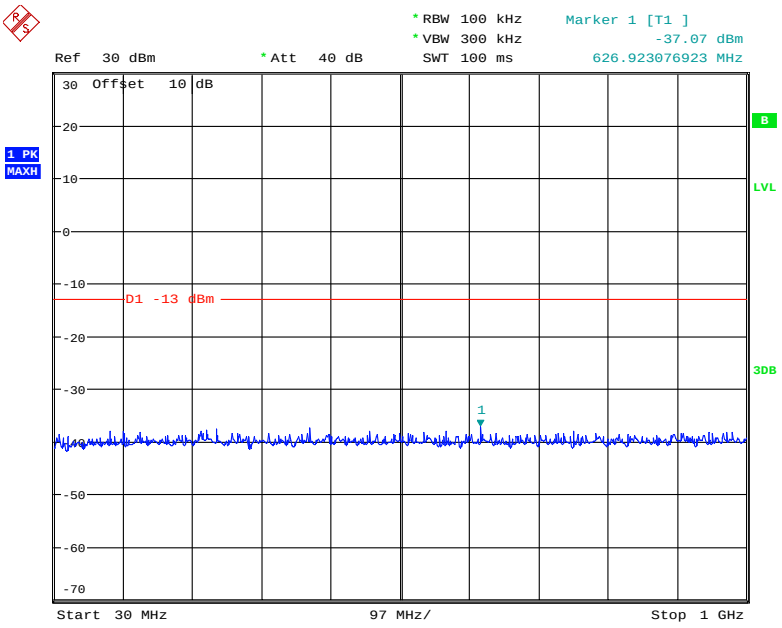

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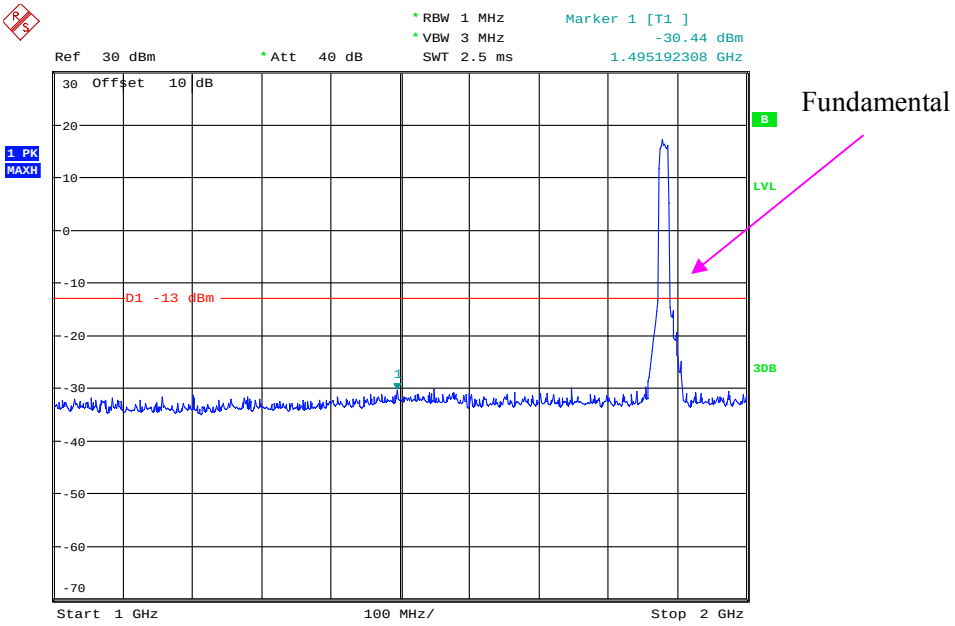

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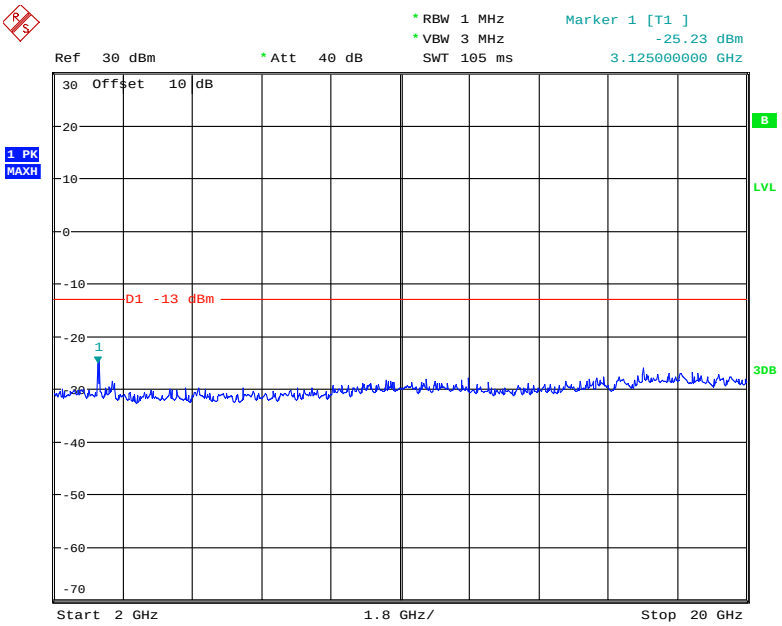

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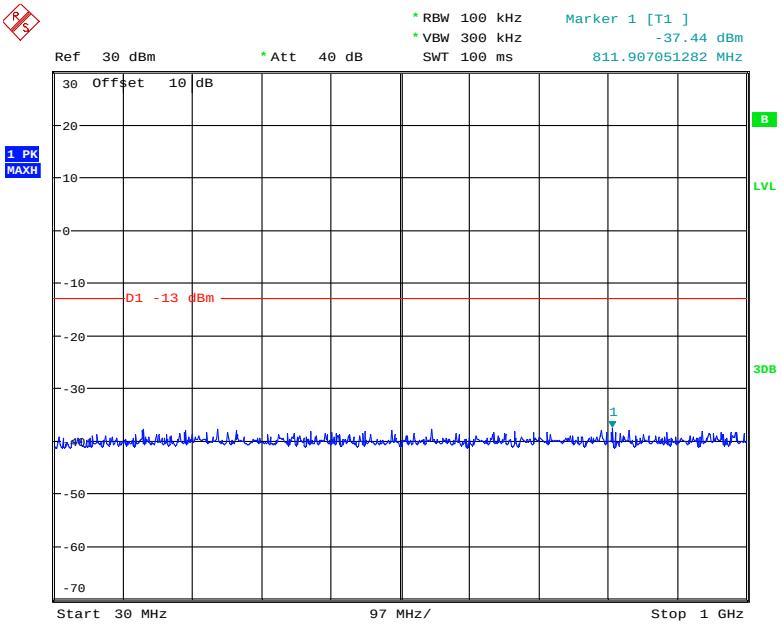

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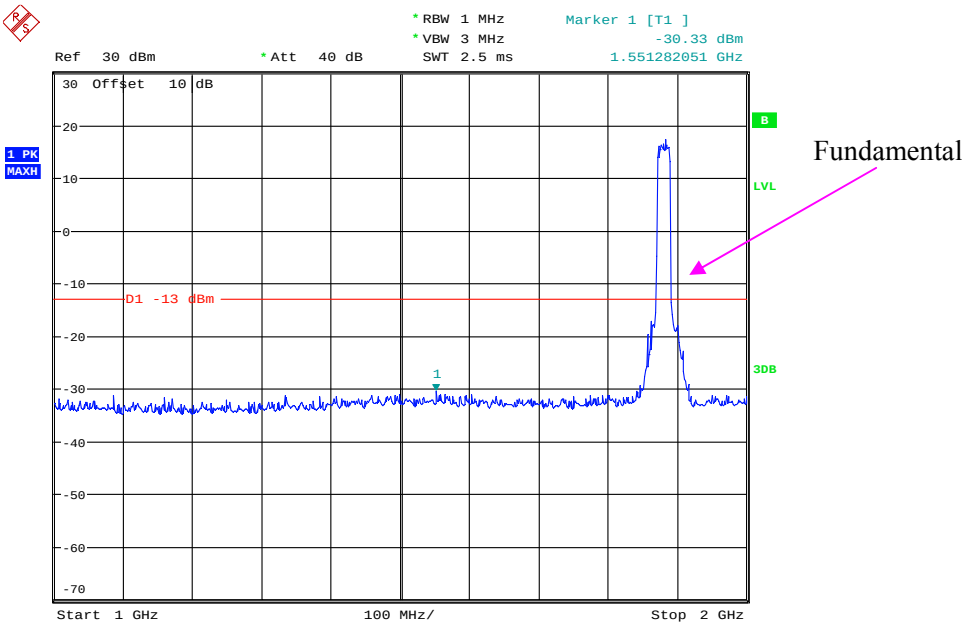

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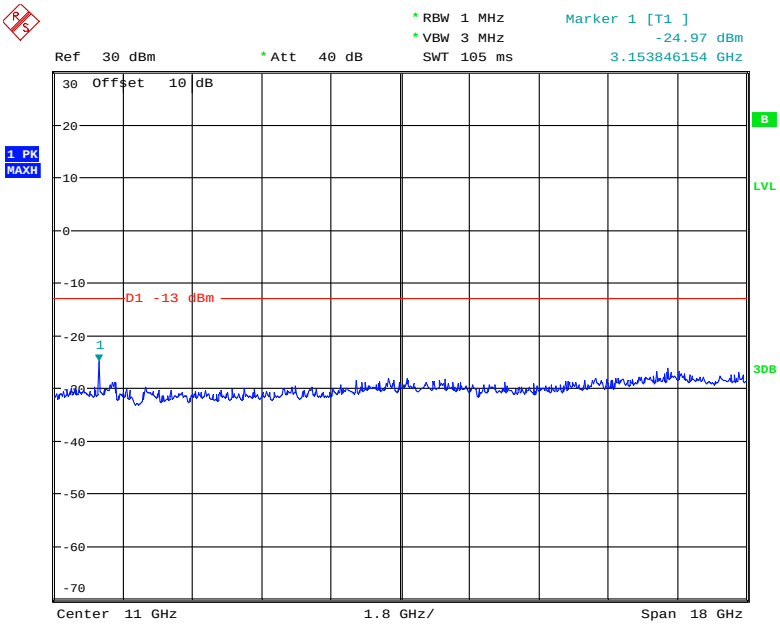

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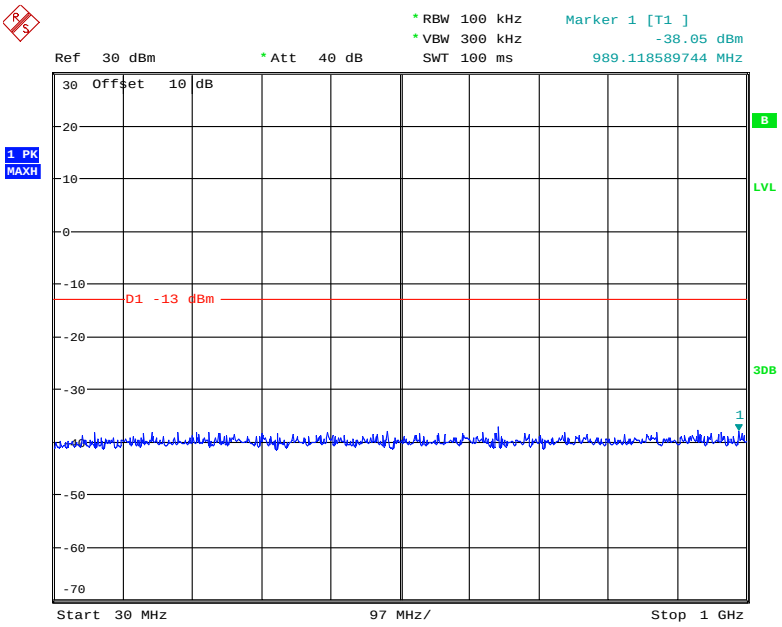
LTE Band 4 (Middle Channel)

QPSK_1.4 MHz



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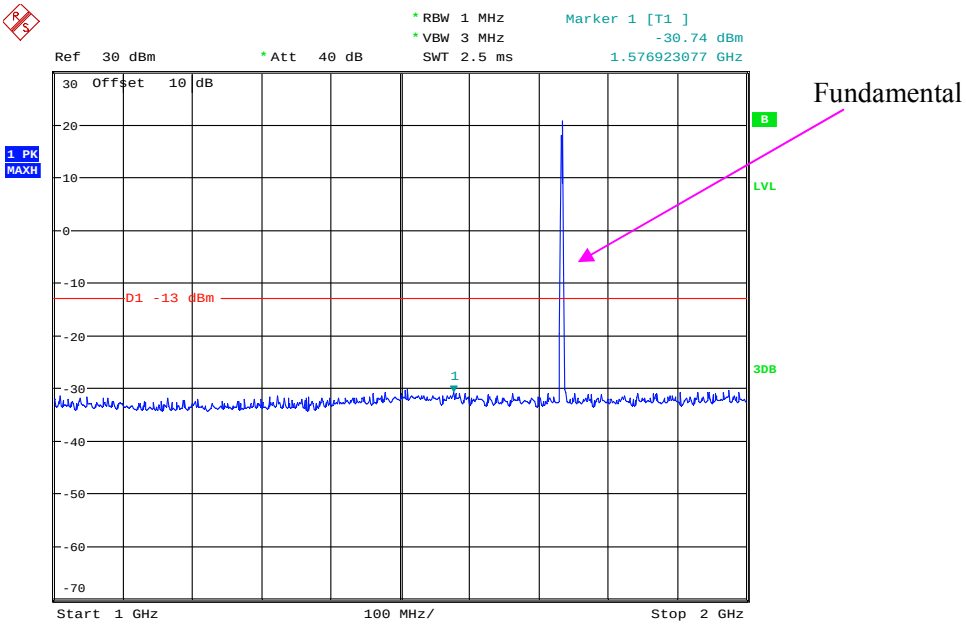

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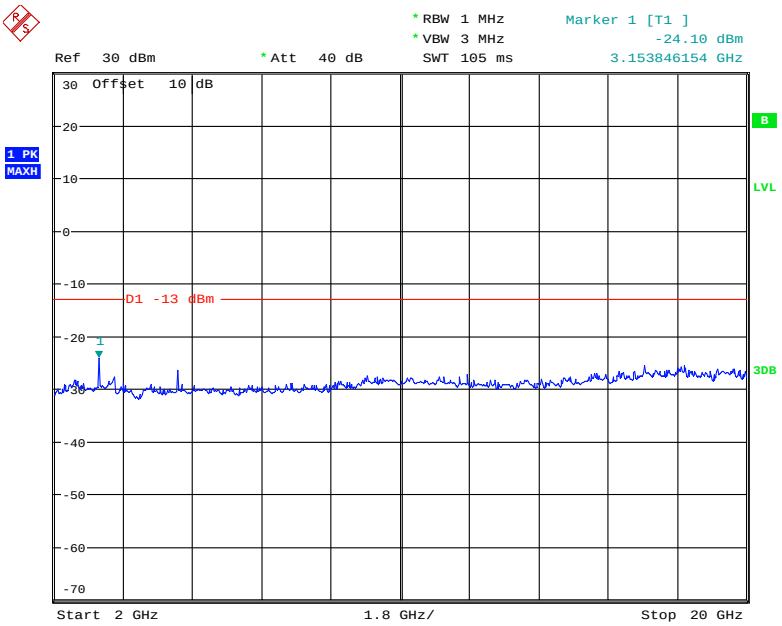

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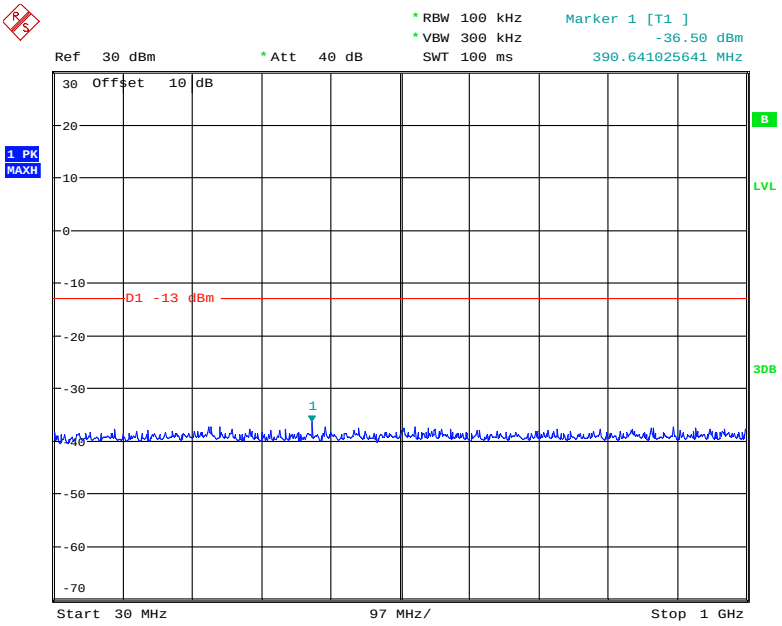
QPSK_3 MHz



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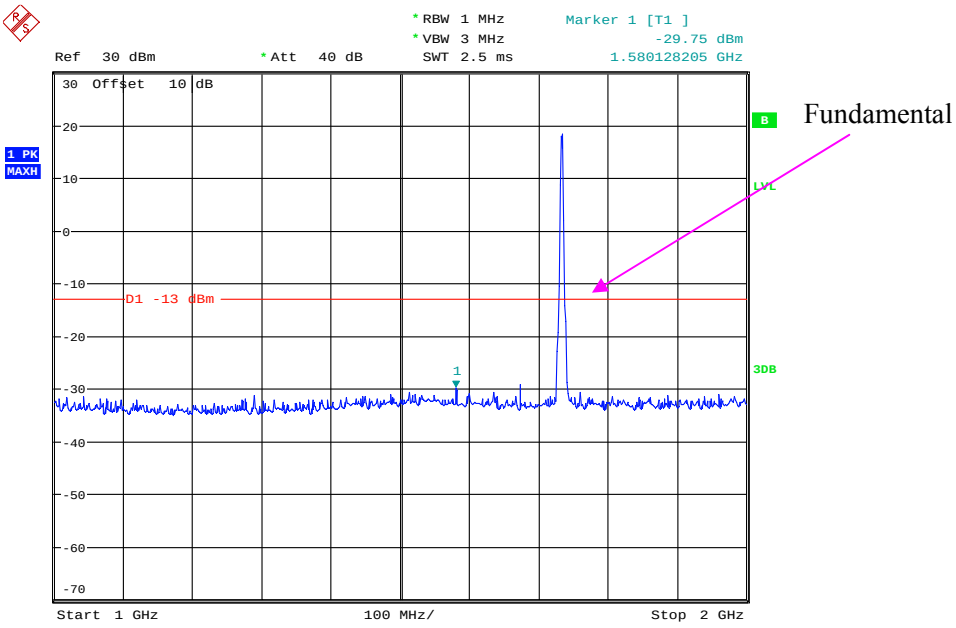

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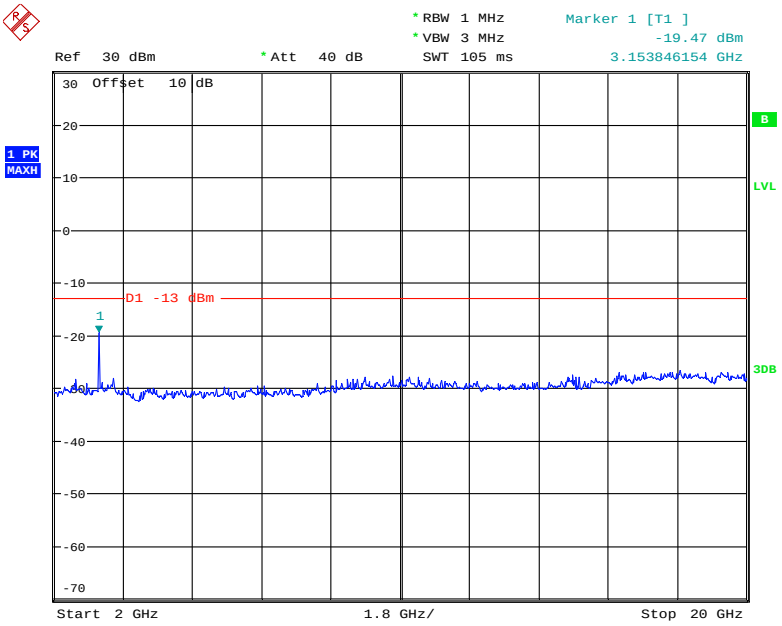

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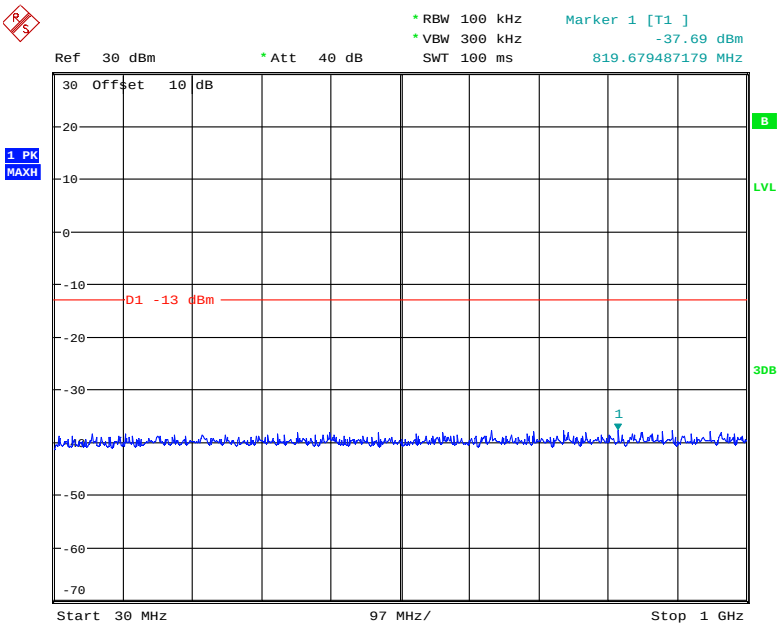
QPSK_5 MHz



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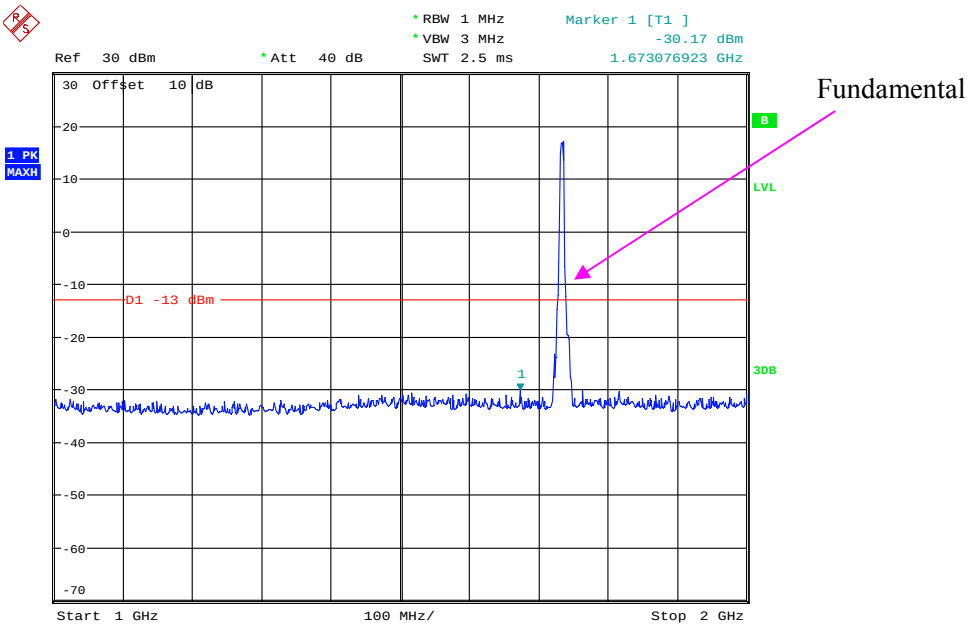

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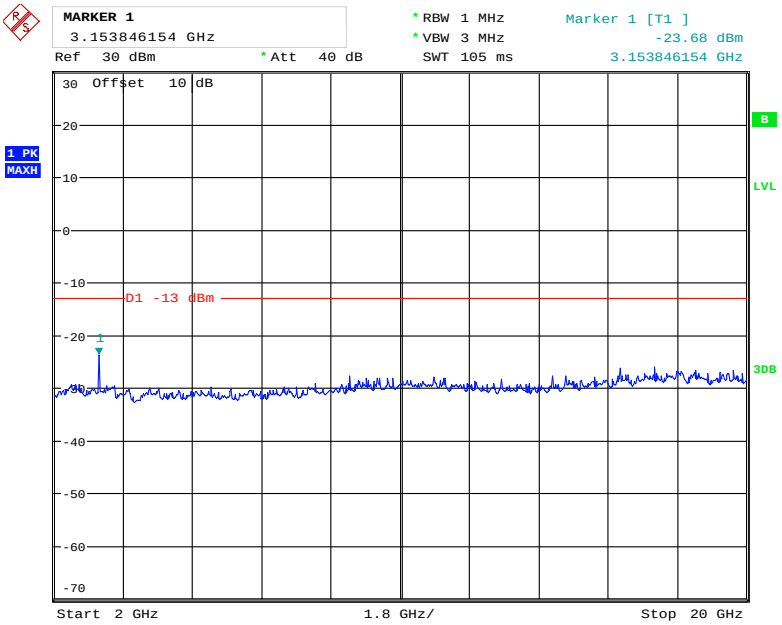

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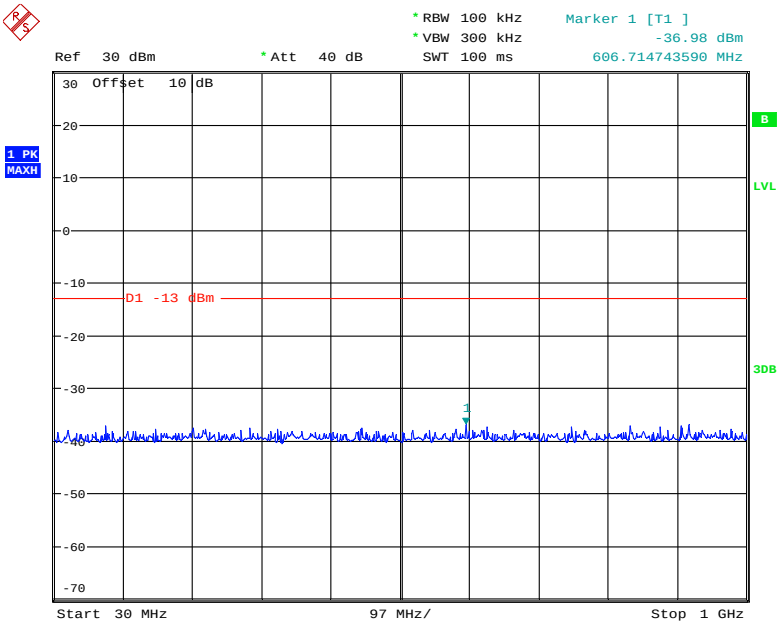
QPSK_10 MHz



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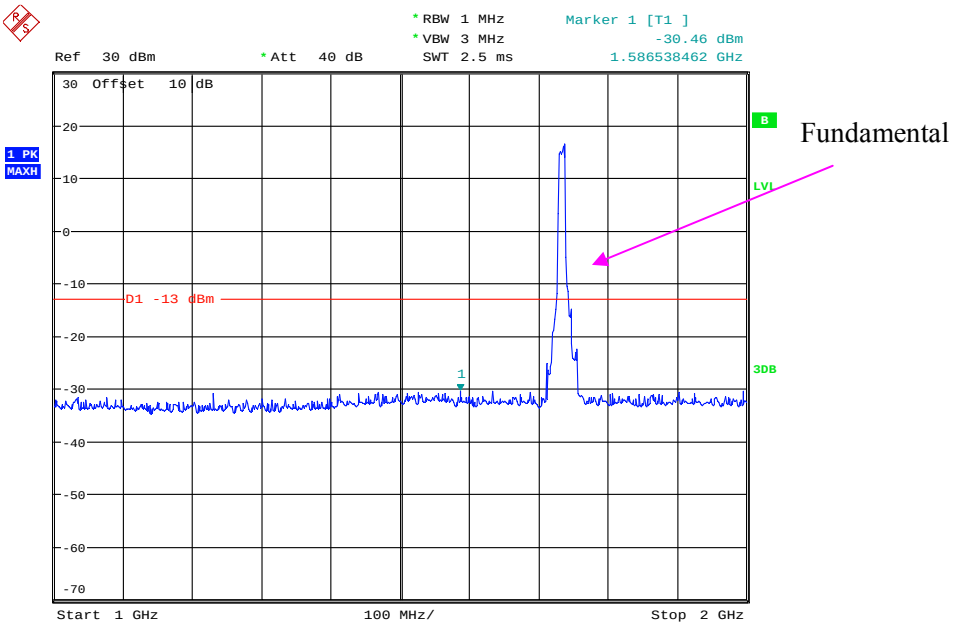

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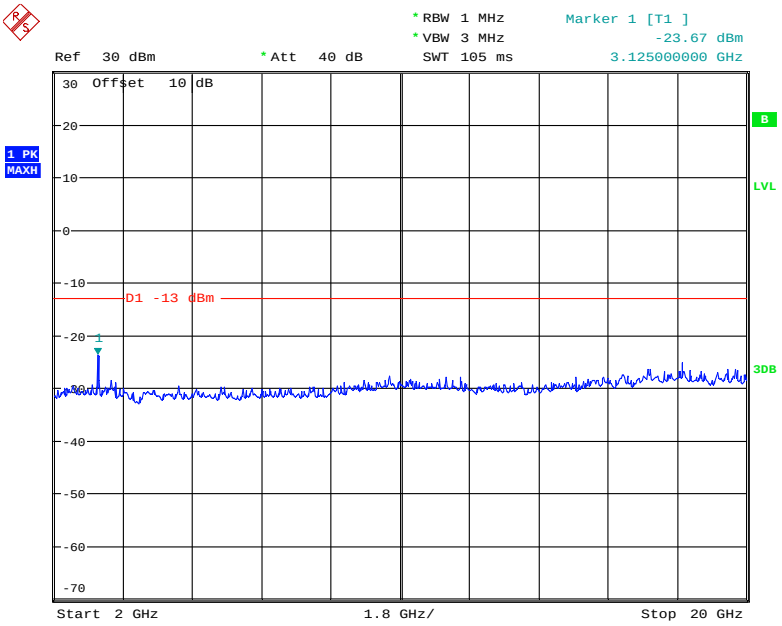

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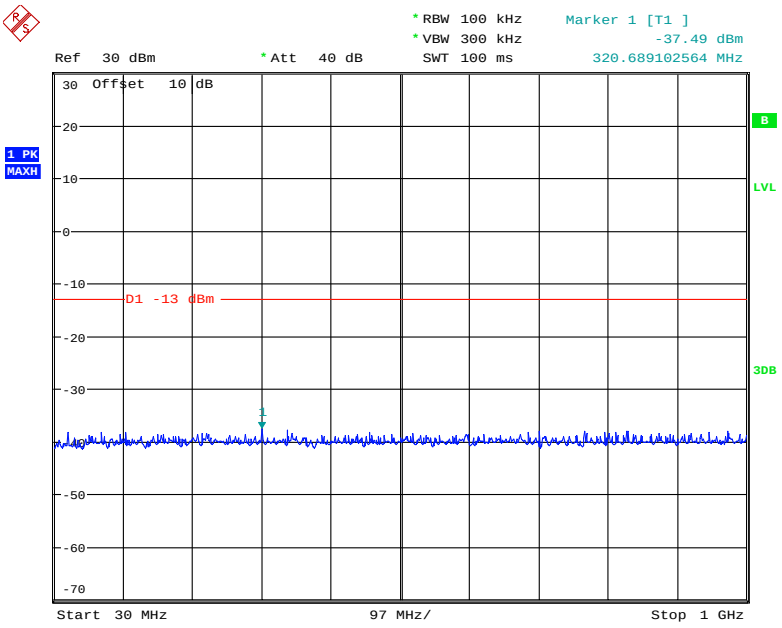

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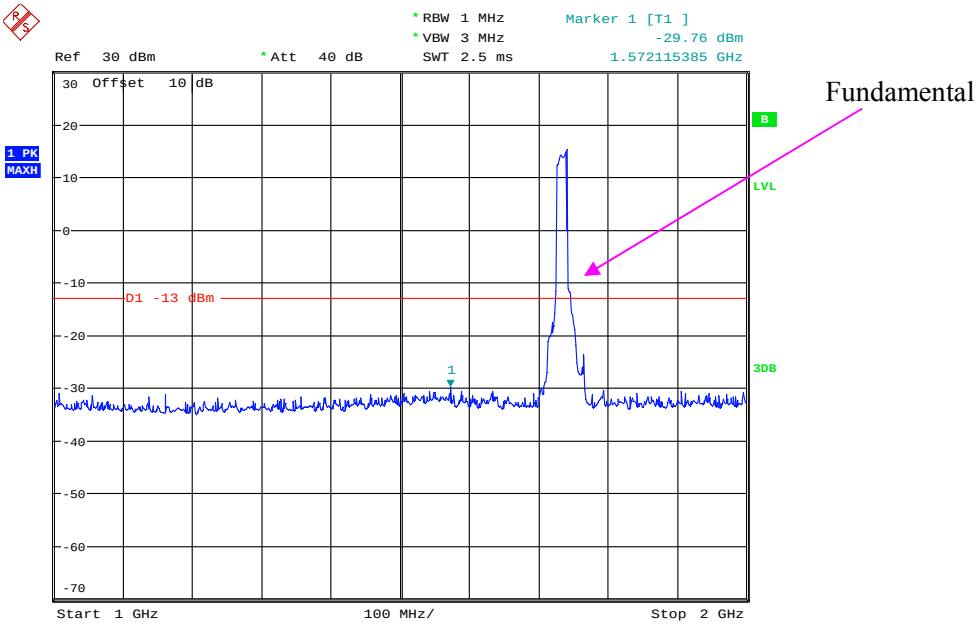

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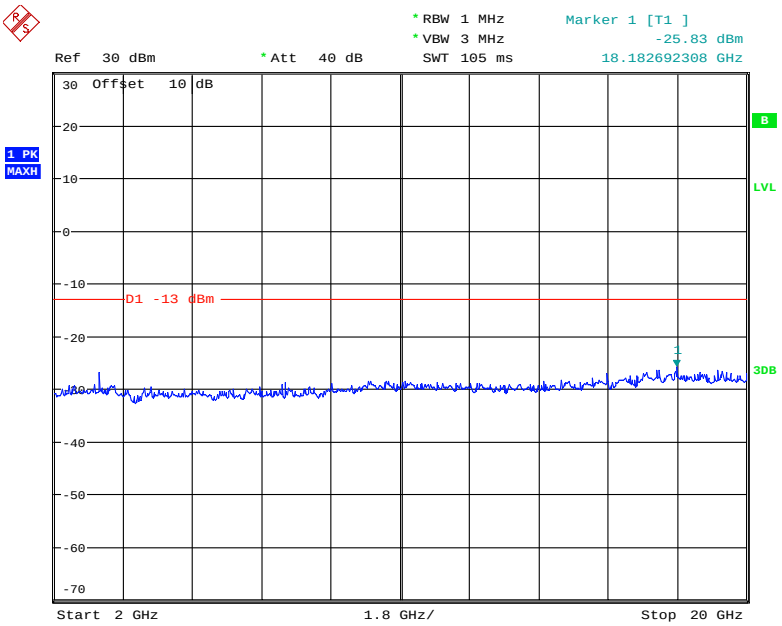

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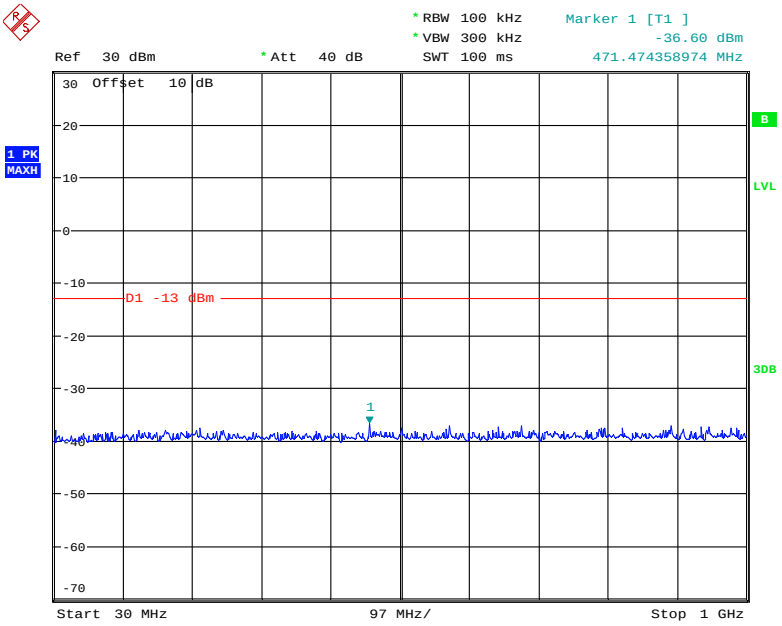
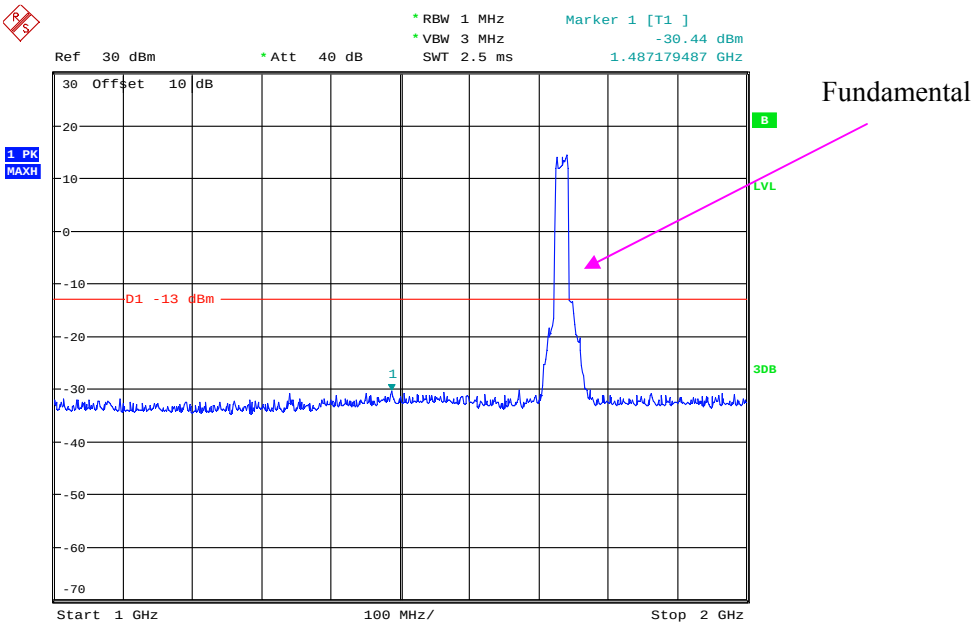
QPSK_20 MHz



Date: 21.DEC.2017 20:48:12



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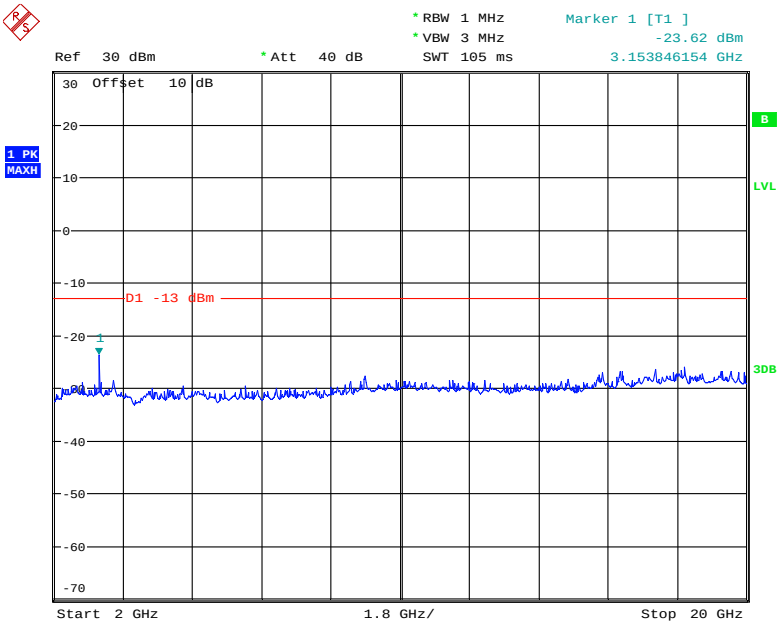
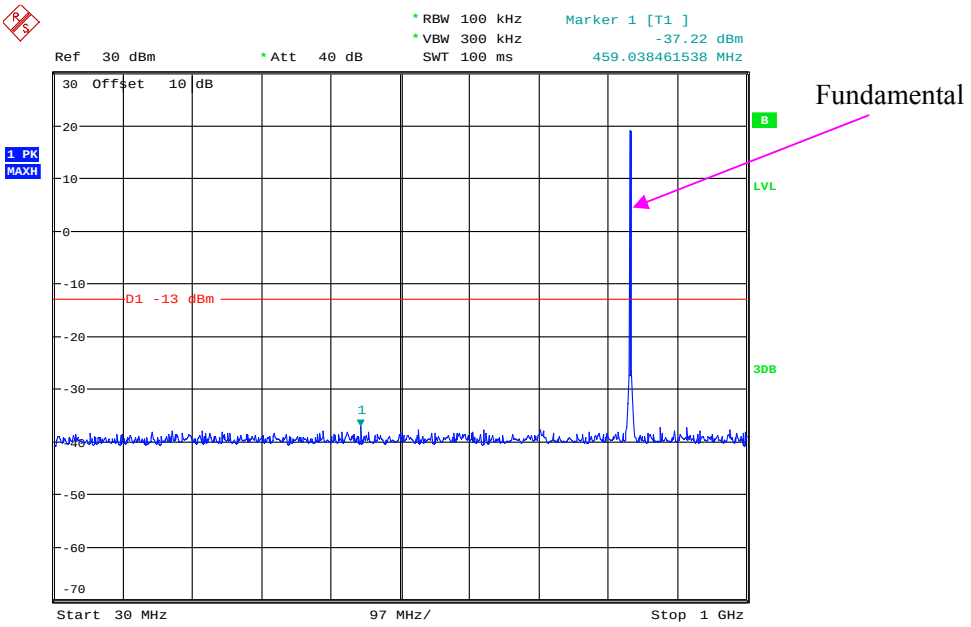


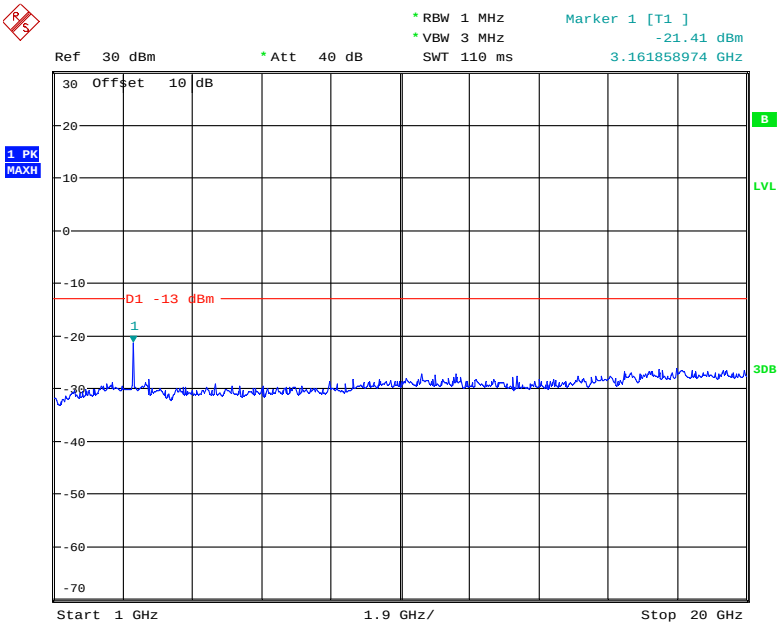
Date: 21.DEC.2017 20:48:58

LTE Band 5 (Middle Channel)

QPSK_1.4 MHz



Date: 21.DEC.2017 20:58:08



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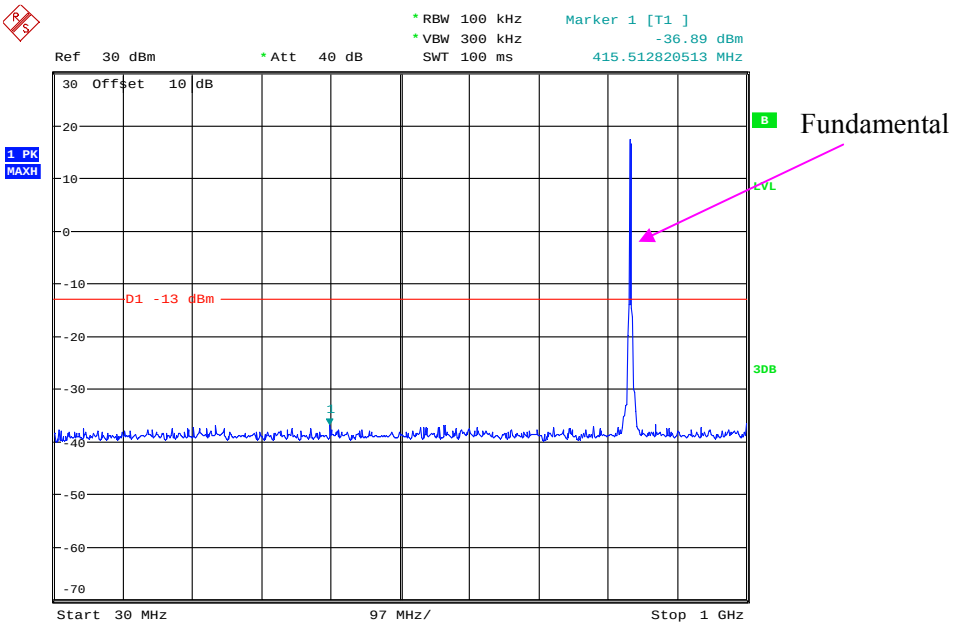

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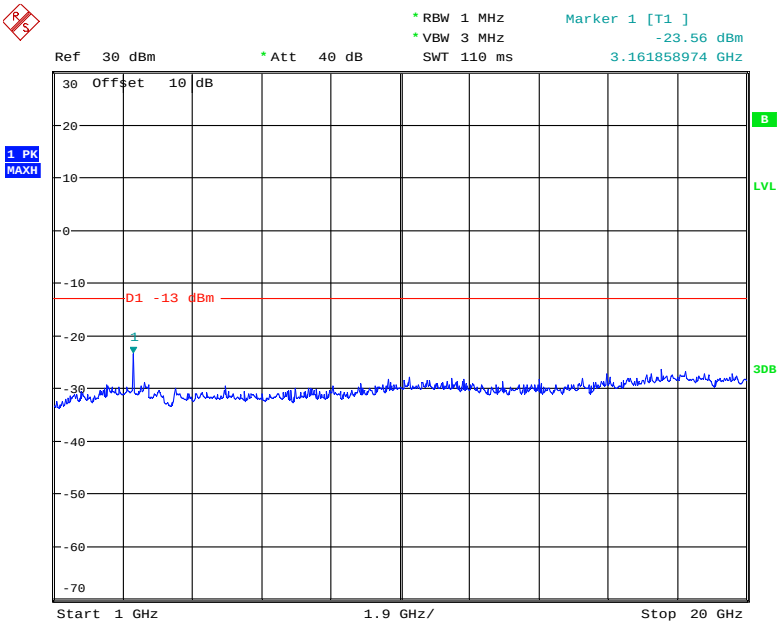

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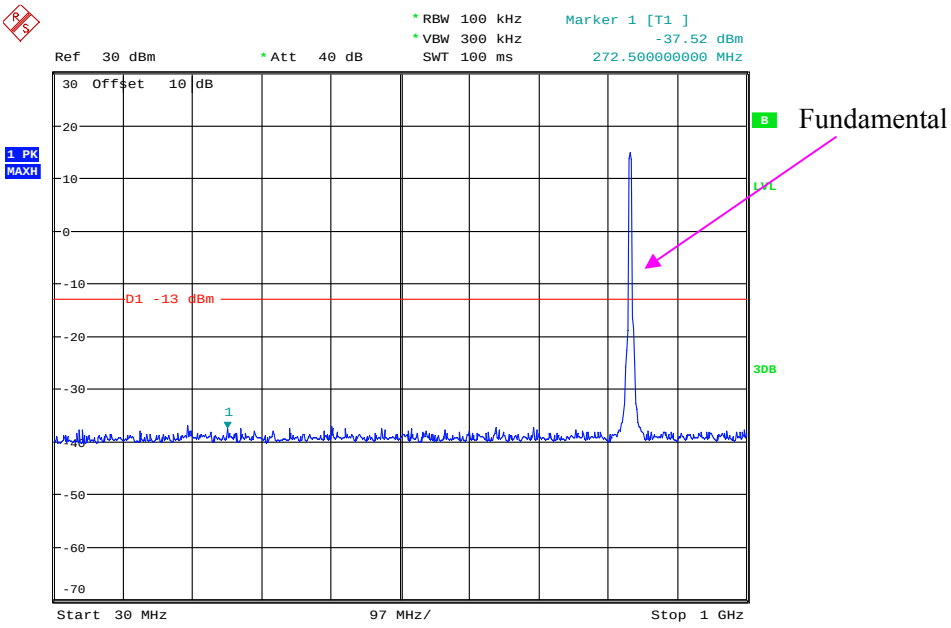
QPSK_5 MHz



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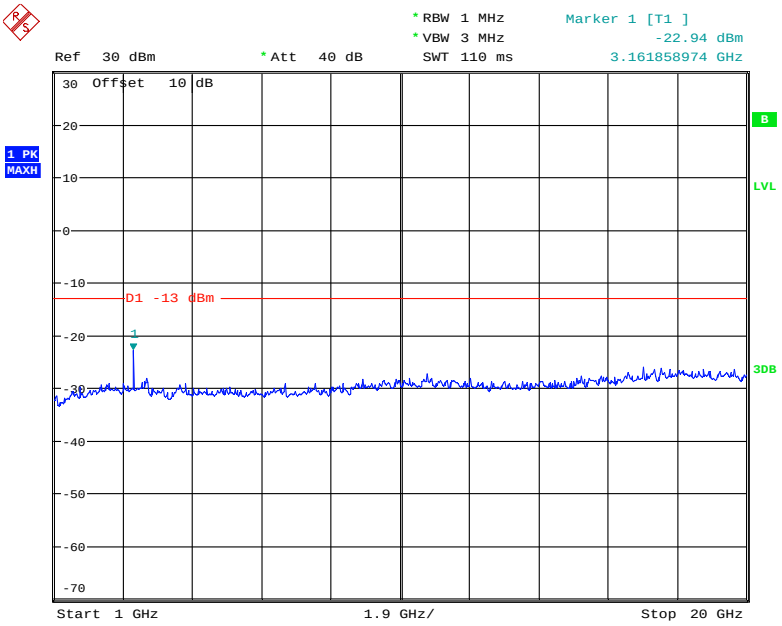

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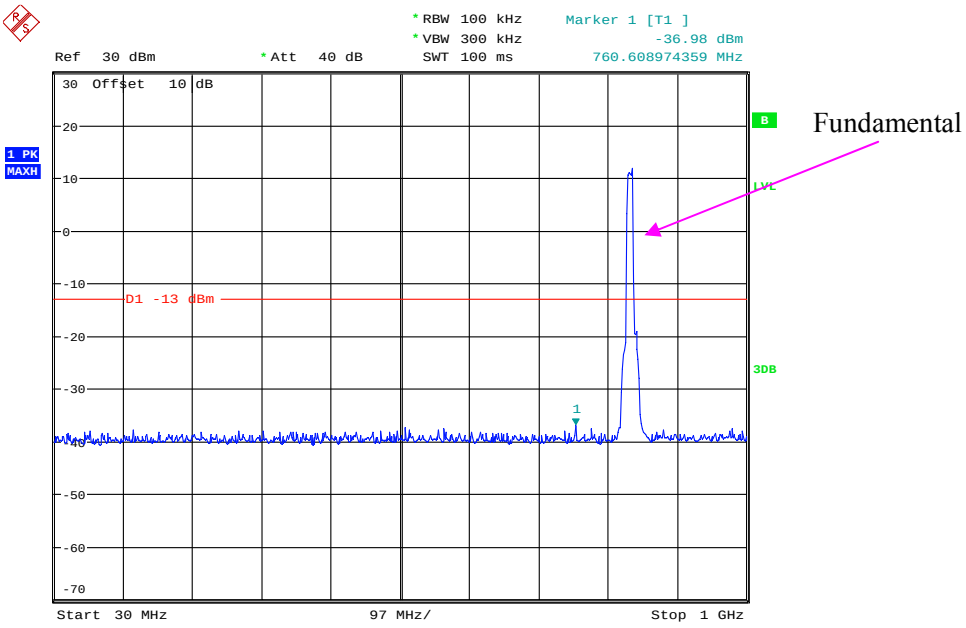
QPSK_10 MHz



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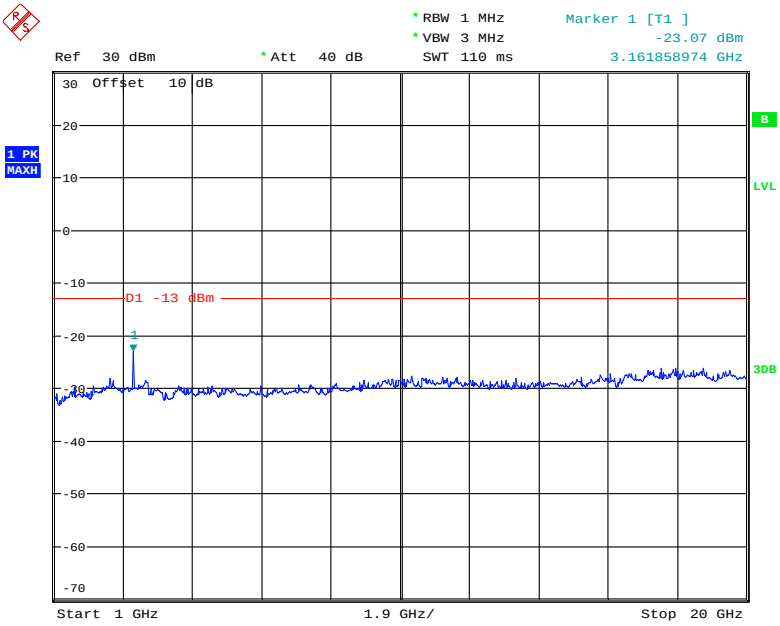

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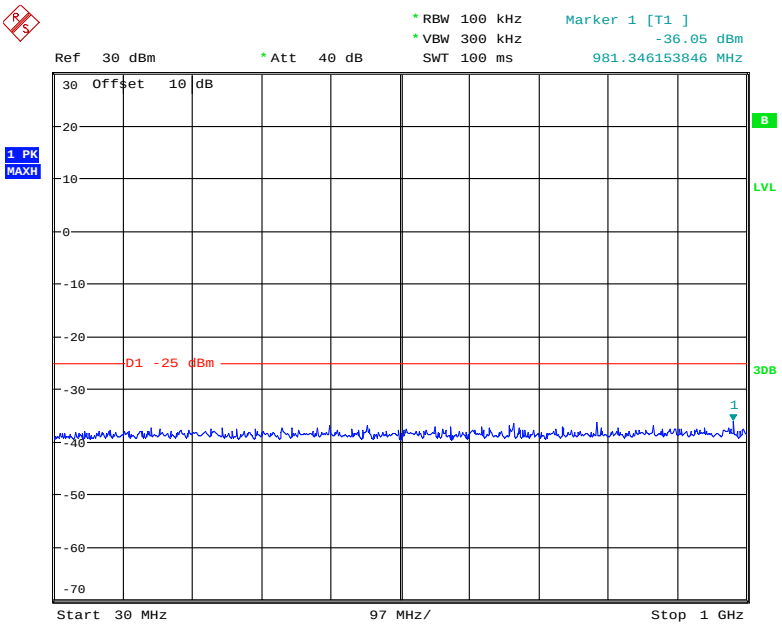
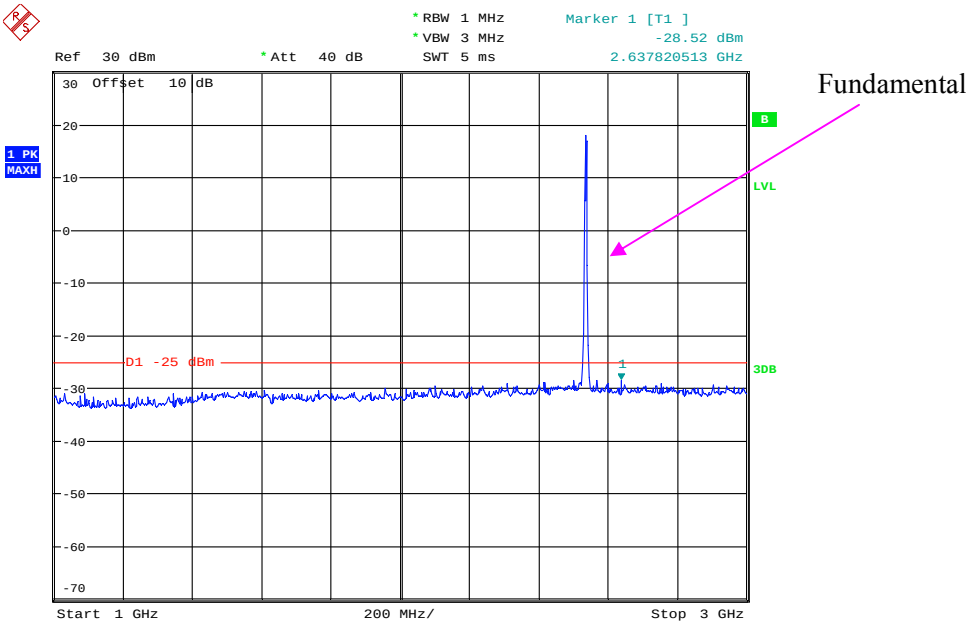
LTE Band 7 (Middle Channel)

QPSK_5 MHz



Date: 17.DEC.2017 11:48:37



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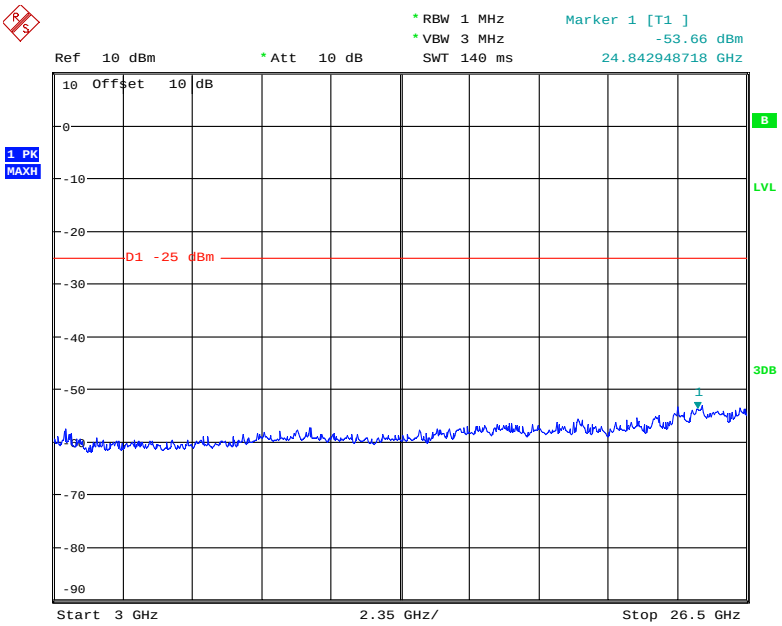

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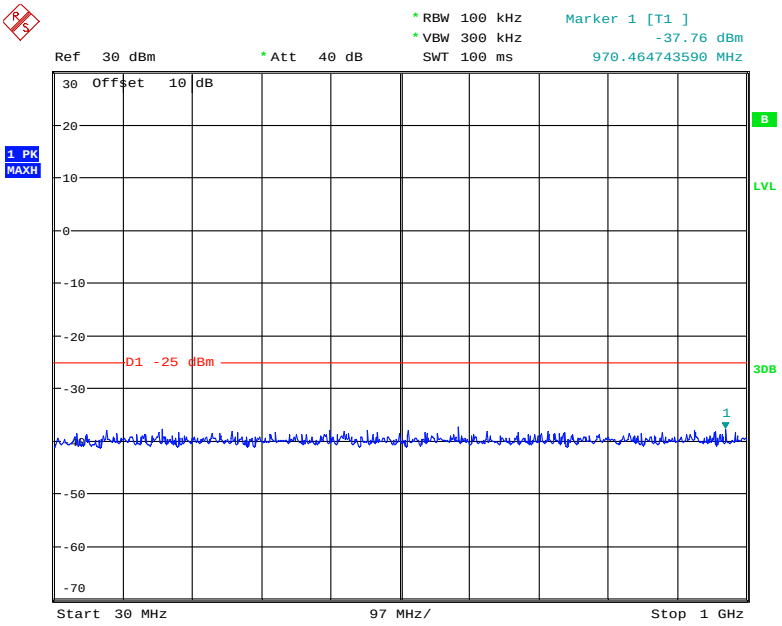
QPSK_10 MHz



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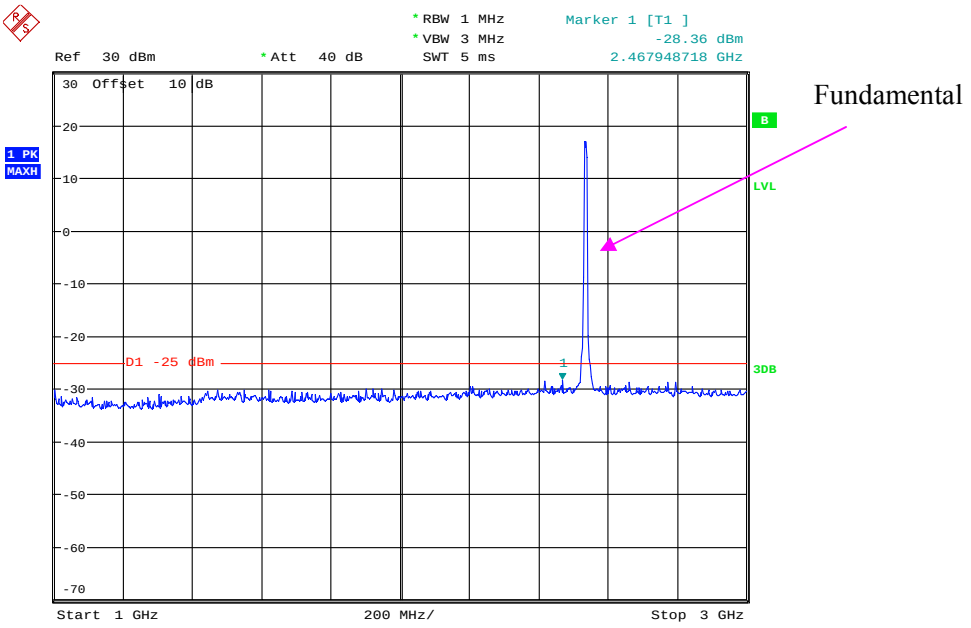

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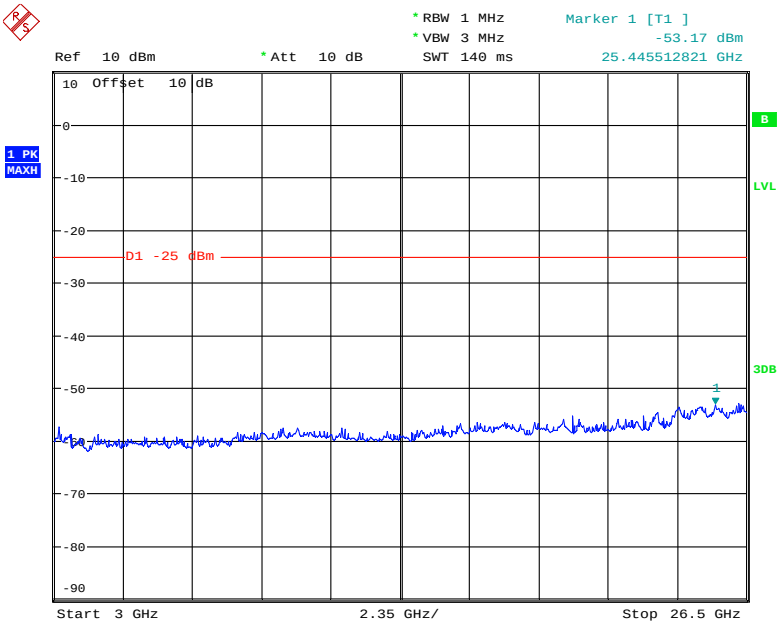
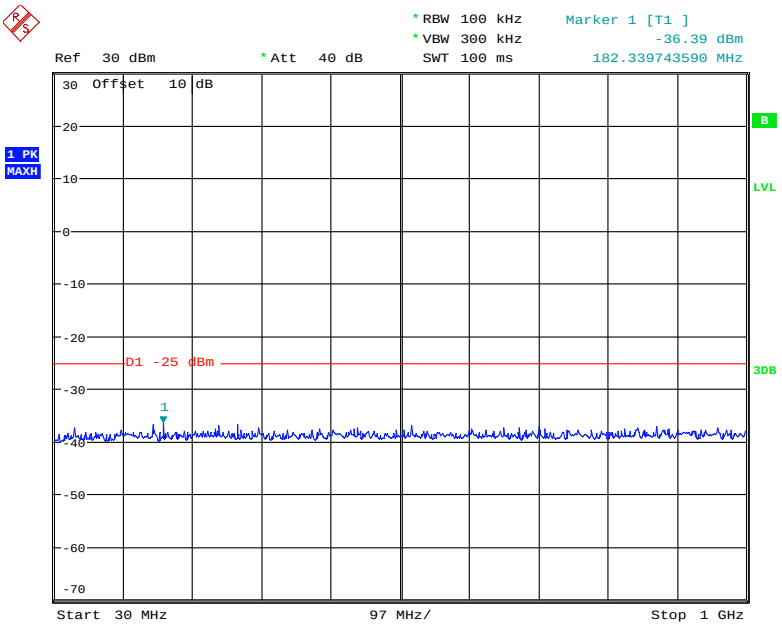


Date: 17.DEC.2017 11:55:54

QPSK_15 MHz



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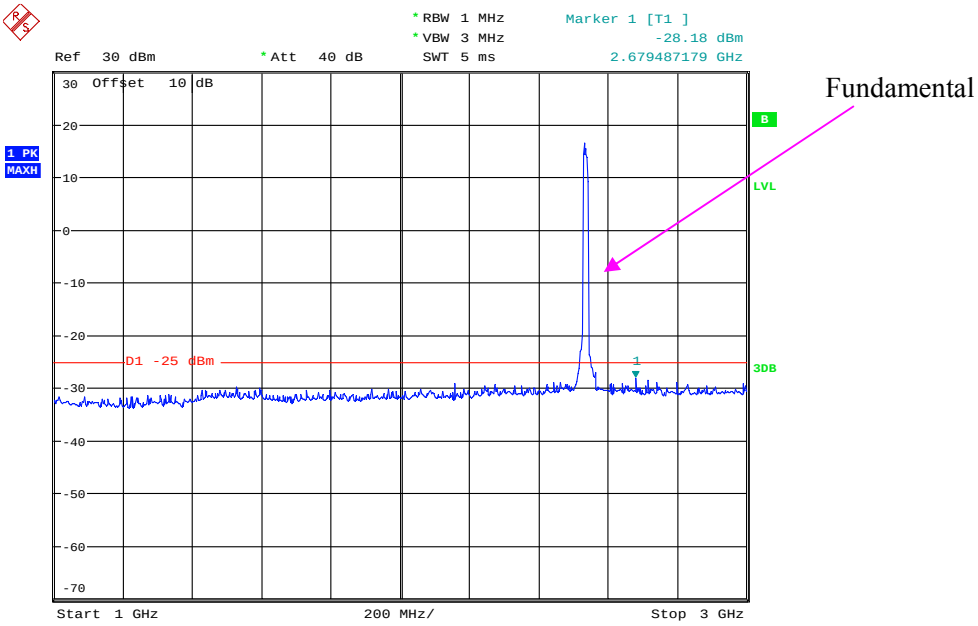

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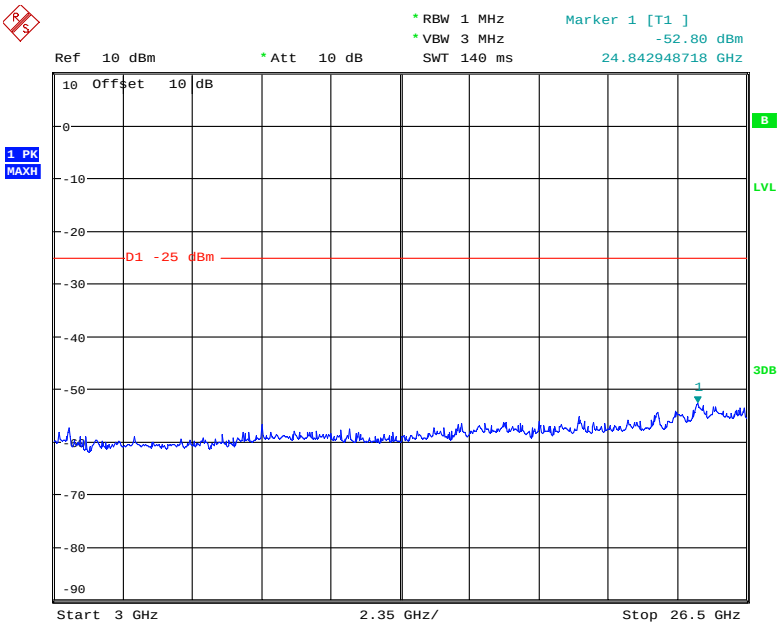
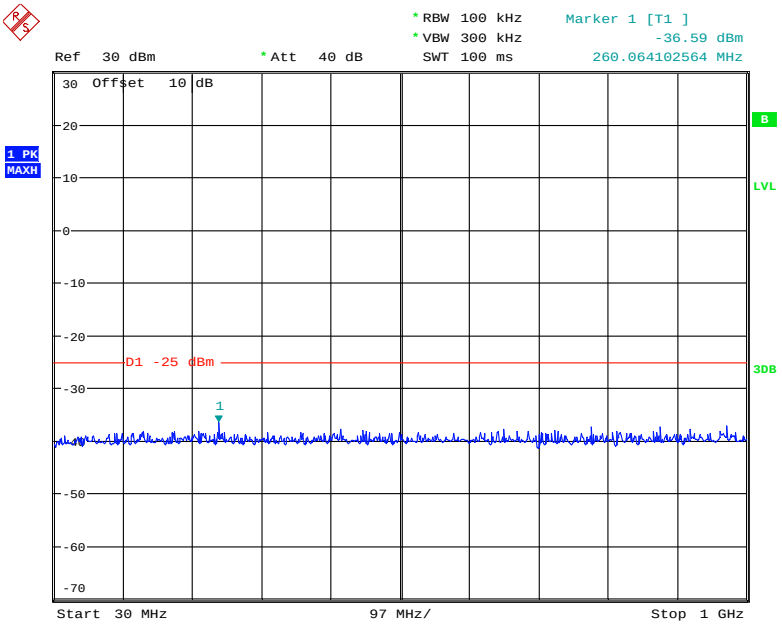


Date: 17.DEC.2017 13:18:00

QPSK_20 MHz



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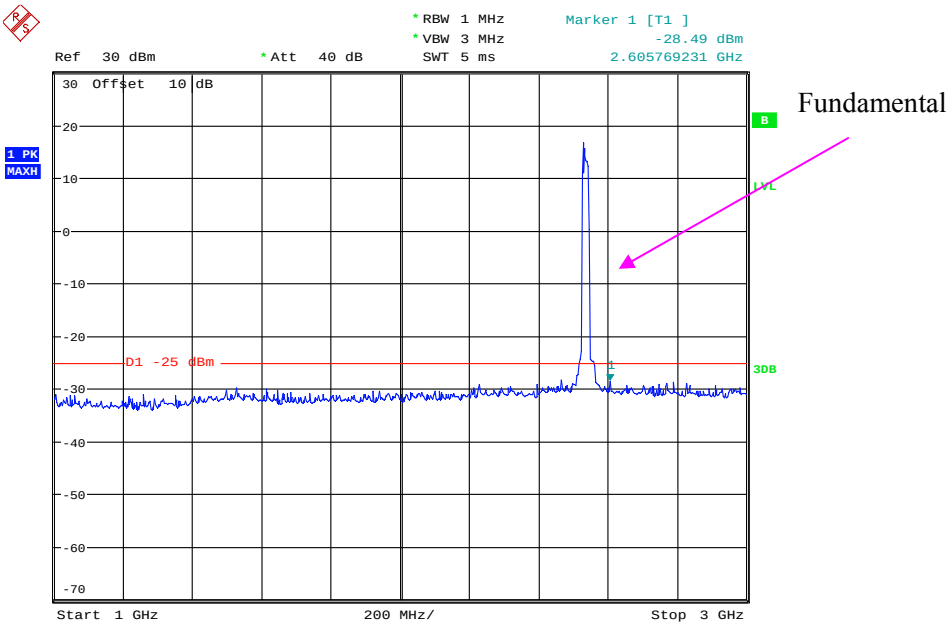

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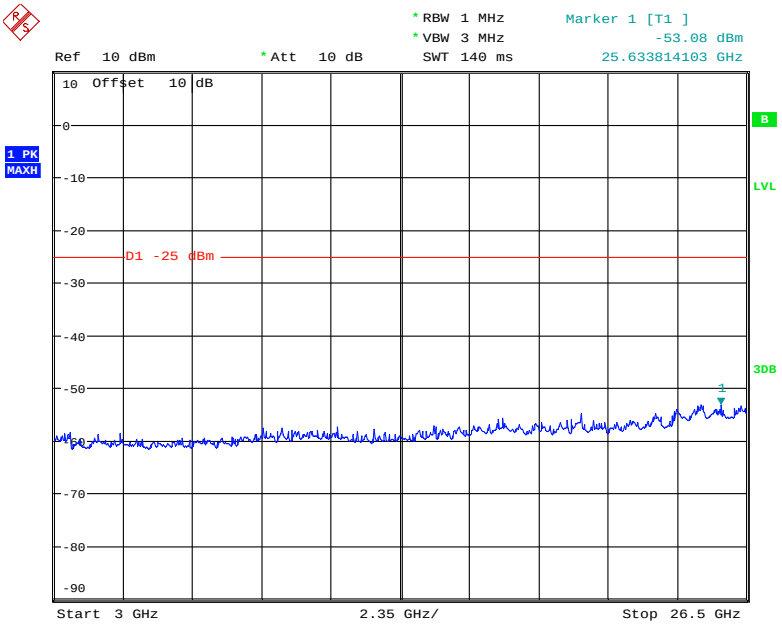
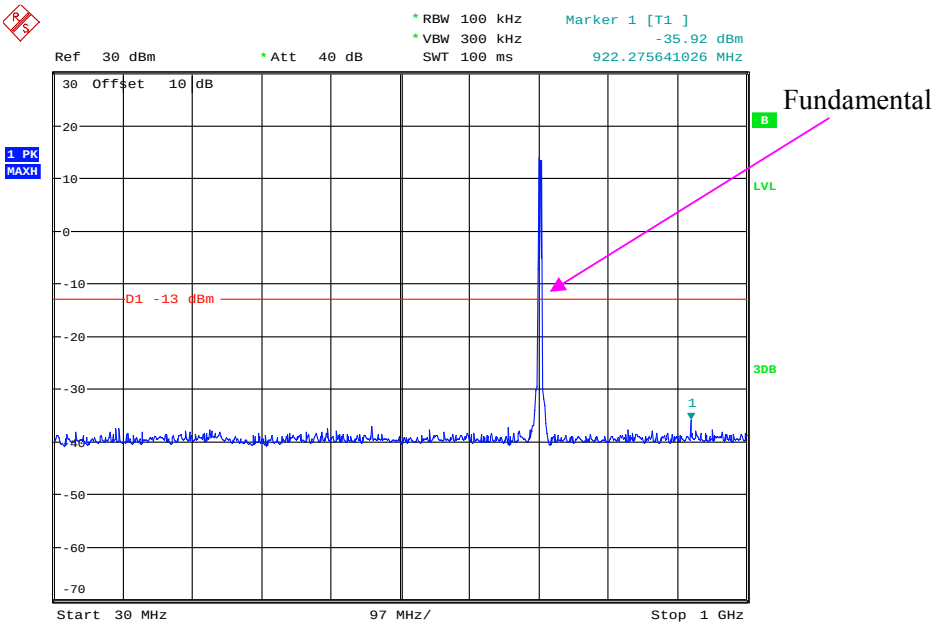


Date: 17.DEC.2017 13:23:16

LTE Band 17 (Middle Channel)

QPSK_5 MHz



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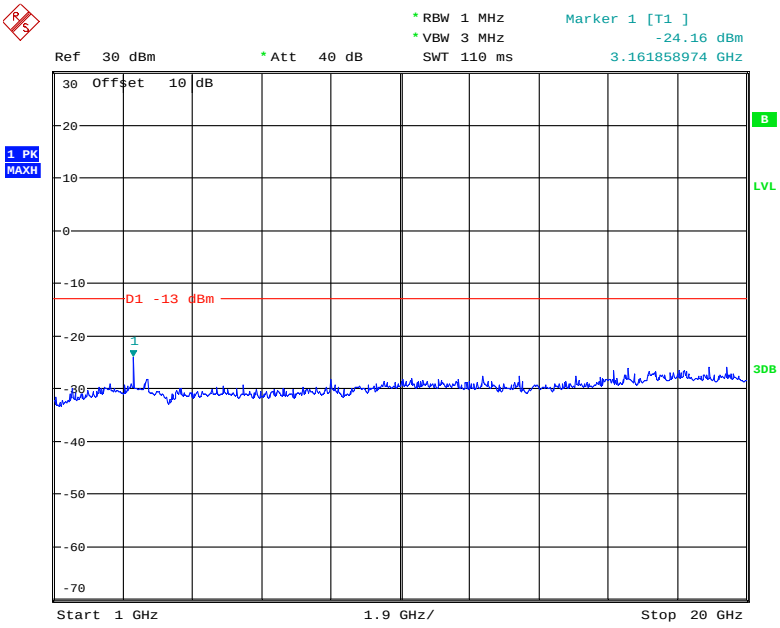
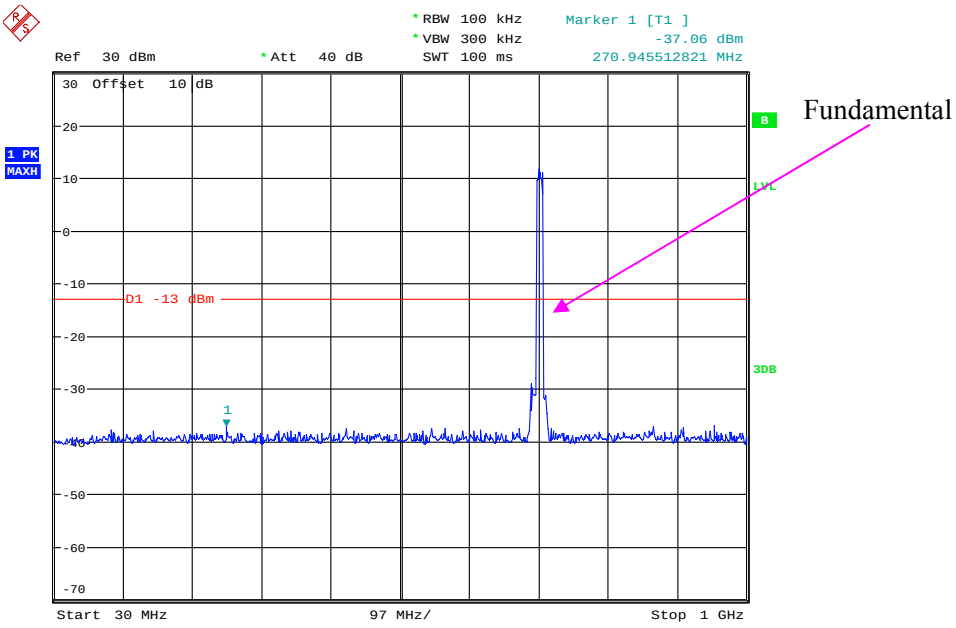


Date: 21.DEC.2017 21:31:41

QPSK_10 MHz



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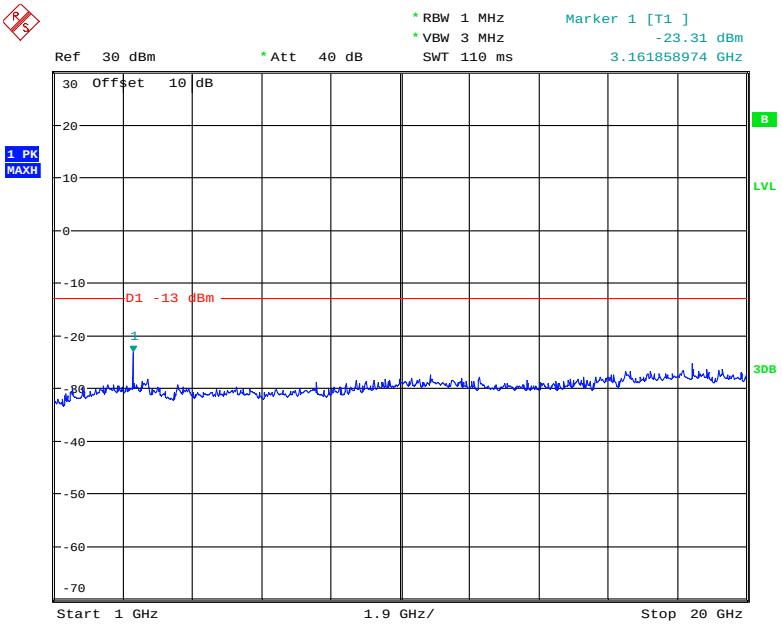


Date: 21.DEC.2017 21:26:19

FCC §2.1053, §22.917 & §24.238 & §27.53 - SPURIOUS RADIATED EMISSIONS

Applicable Standard

FCC § 2.1053, §22.917, § 24.238 and § 27.53.

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 lg (TXpwr in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 Log_{10} (power out in Watts)

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2017-09-01	2018-09-01
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2018-11-10
HP	Amplifier	8447D	2727A05902	2017-09-05	2018-09-05
R&S	Spectrum Analyzer	FSIQ 26	831929/005	2017-08-31	2018-08-31
ETS LINDGREN	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
Mini-Circuit	Amplifier	AFS42-00101800-25-S-42	2001271	2017-09-05	2018-09-05
HP	Signal Generator	1026	320408	2017-12-14	2018-12-14
EMCO	Adjustable Dipole Antenna	3121C	9109-753	N/A	N/A
TDK RF	Horn Antenna	HRN-0118	130 084	2016-01-05	2019-01-04
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-02 1304	2016-11-18	2019-11-18
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-01 1304	2016-11-18	2019-11-18
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2017-09-05	2018-09-05
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2017-09-05	2018-09-05

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	19.4~22°C
Relative Humidity:	31~41 %
ATM Pressure:	101.1~101.6 kPa

** The testing was performed by Sunny Cen&Steven Zuo from 2017-12-16 to 2017-12-20.*

EUT Operation Mode: Transmitting

Cellular Band (PART 22H)

30 MHz-10 GHz:

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
GSM850, Frequency:836.600 MHz								
1673.200	H	58.46	-55.8	10.6	0.7	-45.9	-13.0	32.9
1673.200	V	51.34	-63.5	10.6	0.7	-53.6	-13.0	40.6
2509.800	H	56.37	-56.6	13.1	1.2	-44.7	-13.0	31.7
2509.800	V	50.48	-62.6	13.1	1.2	-50.7	-13.0	37.7
3346.400	H	49.26	-61.4	13.8	1.6	-49.2	-13.0	36.2
3346.400	V	48.34	-62.4	13.8	1.6	-50.2	-13.0	37.2
2100.000	H	47.67	-65.2	11.4	1.1	-54.9	-13.0	41.9
2100.000	V	48.35	-64.6	11.4	1.1	-54.3	-13.0	41.3
198.000	H	43.24	-65.5	0.0	0.5	-66.0	-13.0	53.0
362.000	V	44.37	-64.5	0.0	0.6	-65.1	-13.0	52.1
WCDMA Band V R99,Frequency:836.600 MHz								
1673.200	H	65.37	-48.8	10.6	0.7	-38.9	-13.0	25.9
1673.200	V	64.39	-50.4	10.6	0.7	-40.5	-13.0	27.5
2509.800	H	51.34	-61.7	13.1	1.2	-49.8	-13.0	36.8
2509.800	V	49.25	-63.8	13.1	1.2	-51.9	-13.0	38.9
3346.400	H	48.27	-62.4	13.8	1.6	-50.2	-13.0	37.2
3346.400	V	47.68	-63	13.8	1.6	-50.8	-13.0	37.8
2910.000	H	47.84	-63.8	13.9	1.4	-51.3	-13.0	38.3
2910.000	V	48.53	-63.4	13.9	1.4	-50.9	-13.0	37.9
531.000	H	46.13	-57.4	0.0	0.7	-58.1	-13.0	45.1
197.000	V	47.52	-63.2	0.0	0.5	-63.7	-13.0	50.7

PCS Band (PART 24E)

30 MHz-20 GHz:

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
GSM1900, Frequency:1880.000 MHz								
3760.000	H	54.45	-54.4	13.8	1.6	-42.2	-13.0	29.2
3760.000	V	53.86	-54.8	13.8	1.6	-42.6	-13.0	29.6
5640.000	H	53.84	-52.2	14.0	1.3	-39.5	-13.0	26.5
5640.000	V	52.37	-53.5	14.0	1.3	-40.8	-13.0	27.8
5824.000	H	56.34	-49.5	14.1	1.4	-36.8	-13.0	23.8
5824.000	V	57.39	-48.5	14.1	1.4	-35.8	-13.0	22.8
212.000	H	44.25	-64.5	0.0	0.5	-65.0	-13.0	52.0
378.000	V	45.68	-62.9	0.0	0.6	-63.5	-13.0	50.5
WCDMA Band II, R99, Frequency:1880.000 MHz								
3760.000	H	48.75	-60.1	13.8	1.6	-47.9	-13.0	34.9
3760.000	V	50.86	-57.8	13.8	1.6	-45.6	-13.0	32.6
5640.000	H	51.69	-54.3	14.0	1.3	-41.6	-13.0	28.6
5640.000	V	55.69	-50.2	14.0	1.3	-37.5	-13.0	24.5
5914.000	H	48.26	-56.9	14.0	1.8	-44.7	-13.0	31.7
5914.000	V	54.37	-50.9	14.0	1.8	-38.7	-13.0	25.7
287.000	H	46.52	-62.3	0.0	0.5	-62.8	-13.0	49.8
376.000	V	47.83	-60.8	0.0	0.6	-61.4	-13.0	48.4

LTE Band 2 (30MHz-20GHz):

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK,Frequency:1880.000 MHz								
3760.000	H	48.63	-60.2	13.8	1.6	-48.0	-13.0	35.0
3760.000	V	49.15	-59.5	13.8	1.6	-47.3	-13.0	34.3
5640.000	H	47.75	-58.3	14.0	1.3	-45.6	-13.0	32.6
5640.000	V	47.53	-58.4	14.0	1.3	-45.7	-13.0	32.7
317.000	H	42.50	-65.5	0.0	0.5	-66.0	-13.0	53.0
317.000	V	45.70	-64	0.0	0.5	-64.5	-13.0	51.5

LTE Band 4 (30MHz-20GHz):

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK,Frequency:1732.500 MHz								
3465.000	H	51.36	-58.9	13.9	1.6	-46.6	-13.0	33.6
3465.000	V	52.48	-57.8	13.9	1.6	-45.5	-13.0	32.5
5197.500	H	52.42	-54	14.0	1.5	-41.5	-13.0	28.5
5197.500	V	52.96	-53.5	14.0	1.5	-41.0	-13.0	28.0
275.000	H	42.50	-66.4	0.0	0.5	-66.9	-13.0	53.9
275.000	V	45.70	-65.6	0.0	0.5	-66.1	-13.0	53.1

LTE Band 5 (30MHz-10GHz):

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK,Frequency: 836.500 MHz								
1673.200	H	48.67	-65.5	10.6	0.7	-55.6	-13.0	42.6
1673.200	V	49.41	-65.4	10.6	0.7	-55.5	-13.0	42.5
2509.800	H	48.82	-64.2	13.1	1.2	-52.3	-13.0	39.3
2509.800	V	47.45	-65.6	13.1	1.2	-53.7	-13.0	40.7
3346.400	H	47.16	-63.5	13.8	1.6	-51.3	-13.0	38.3
3346.400	V	47.65	-63.1	13.8	1.6	-50.9	-13.0	37.9
462.000	H	43.80	-60.7	0.0	0.7	-61.4	-13.0	48.4
462.000	V	48.70	-58.9	0.0	0.7	-59.6	-13.0	46.6

LTE Band 7 (30MHz-26GHz)

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK,Frequency:2535.000 MHz								
5070.000	H	51.49	-55.3	13.9	1.3	-42.7	-25.0	17.7
5070.000	V	52.31	-54.3	13.9	1.3	-41.7	-25.0	16.7
7605.000	H	52.62	-47.7	13.2	1.4	-35.9	-25.0	10.9
7605.000	V	53.12	-47.6	13.2	1.4	-35.8	-25.0	10.8
237.000	H	43.50	-65.6	0.0	0.5	-66.1	-13.0	53.1
237.000	V	47.80	-64.3	0.0	0.5	-64.8	-13.0	51.8

LTE Band 17 (30MHz-10GHz)

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK,Frequency:710.000 MHz								
1420.000	H	49.62	-64	9.1	1.2	-56.1	-13.0	43.1
1420.000	V	51.37	-62.7	9.1	1.2	-54.8	-13.0	41.8
2130.000	H	48.65	-64.1	11.2	1.1	-54.0	-13.0	41.0
2130.000	V	48.94	-63.8	11.2	1.1	-53.7	-13.0	40.7
2840.000	H	47.52	-64.5	13.4	1.4	-52.5	-13.0	39.5
2840.000	V	47.87	-64.4	13.4	1.4	-52.4	-13.0	39.4
375.000	H	41.50	-64.3	0.0	0.6	-64.9	-13.0	51.9
375.000	V	45.50	-63.1	0.0	0.6	-63.7	-13.0	50.7

Note:
1) The unit of Antenna Gain is dBd for frequency below 1GHz, and the unit of Antenna Gain is dBi for frequency above 1GHz.
2) Absolute Level = Substituted Level - Cable loss + Antenna Gain
3) Margin = Limit-Absolute Level

FCC §22.917(a) & §24.238(a) & §27.53 - BAND EDGES

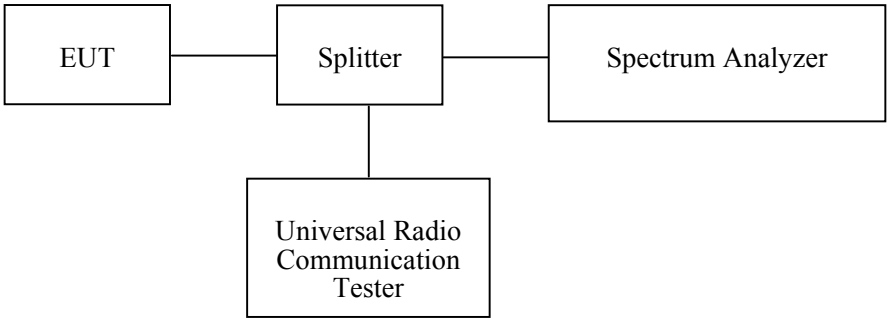
Applicable Standard

FCC § 2.1053, §22.917, § 24.238 and § 27.53.

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Universal Radio Communication Tester	CMU200	109 038	2017-07-18	2018-07-18
R&S	Wideband Radio Communication Tester	CMW500	110479	2017-03-08	2018-03-08
N/A	Coaxial Cable	C-SJ00-0010	C0010/01	Each Time	/
Pasternack	RF Coaxial Cable	0.5m	C-5	Each Time	/
E-Microwave	Two-way Spliter	ODP-1-6-2S	OE0120142	Each Time	/
E-Microwave	RF Attenuator	6dB	6dB-1	Each Time	/
R&S	Spectrum Analyzer	FSU 26	200256	2017-12-08	2018-12-08

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

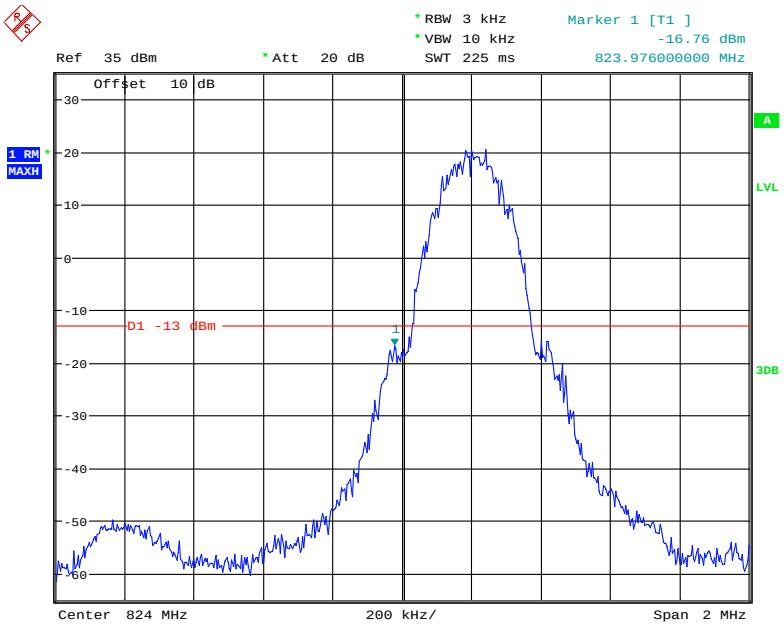
Temperature:	23.9~25.4°C
Relative Humidity:	41~47 %
ATM Pressure:	101.3~102 kPa

The testing was performed by Mark Pan from 2017-12-15 to 2018-01-19.

Test Mode: Transmitting

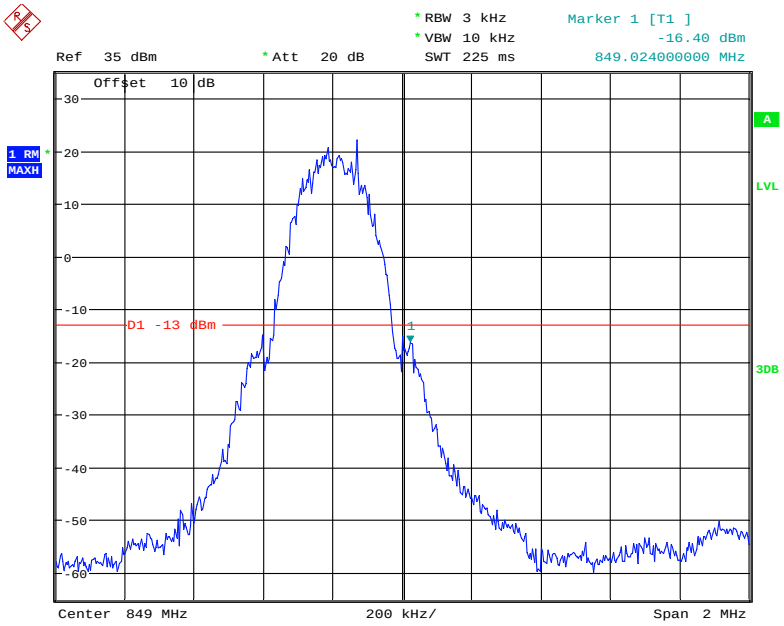
Test Result: Compliant. Please refer to the following plots.

GSM 850, Left Band Edge



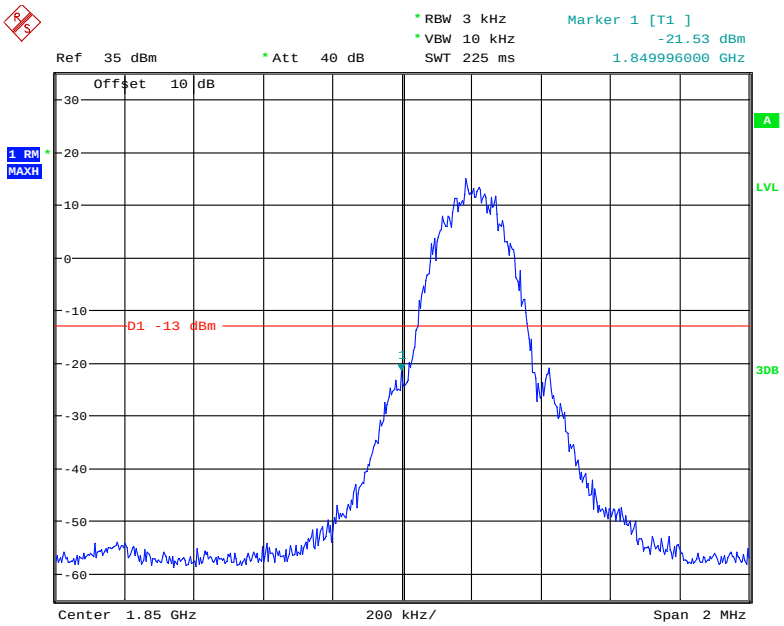
Date: 15.DEC.2017 20:36:15

GSM 850, Right Band Edge



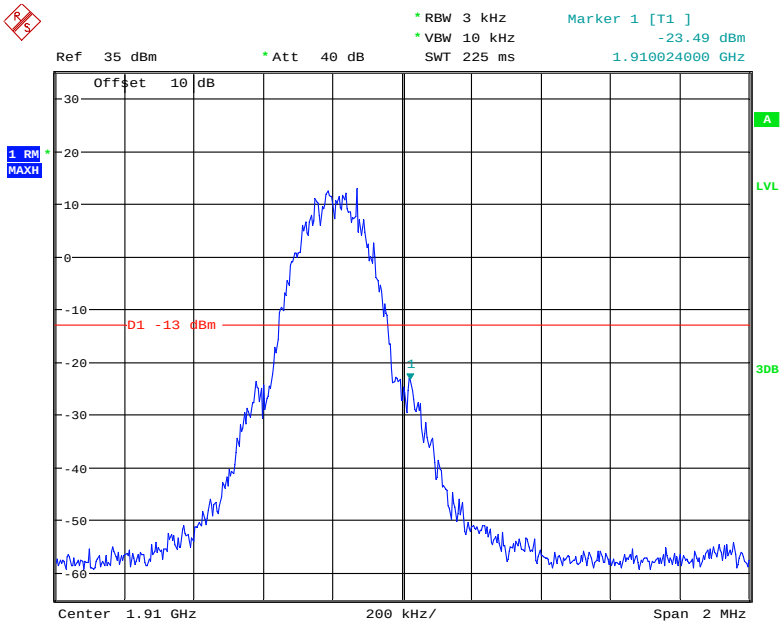
Date: 15.DEC.2017 20:37:43

GSM 1900, Left Band Edge



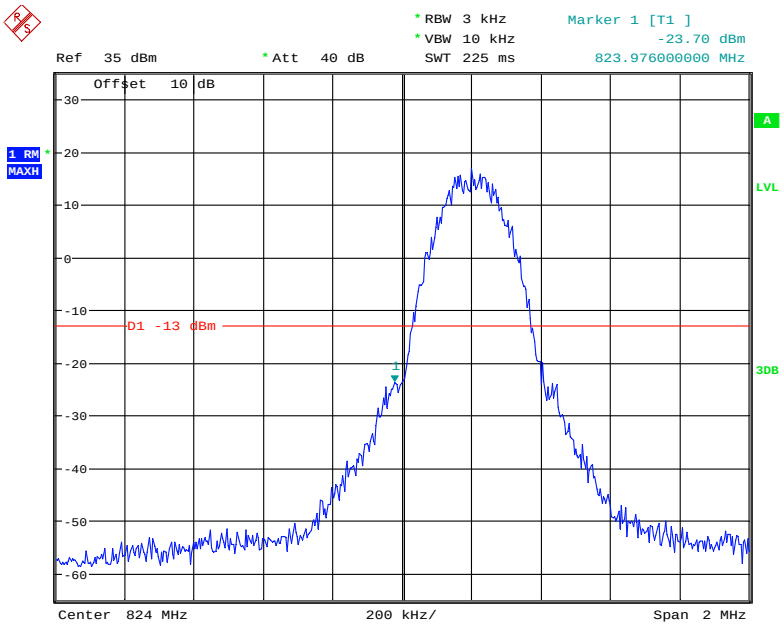
Date: 15.DEC.2017 20:46:29

GSM 1900, Right Band Edge



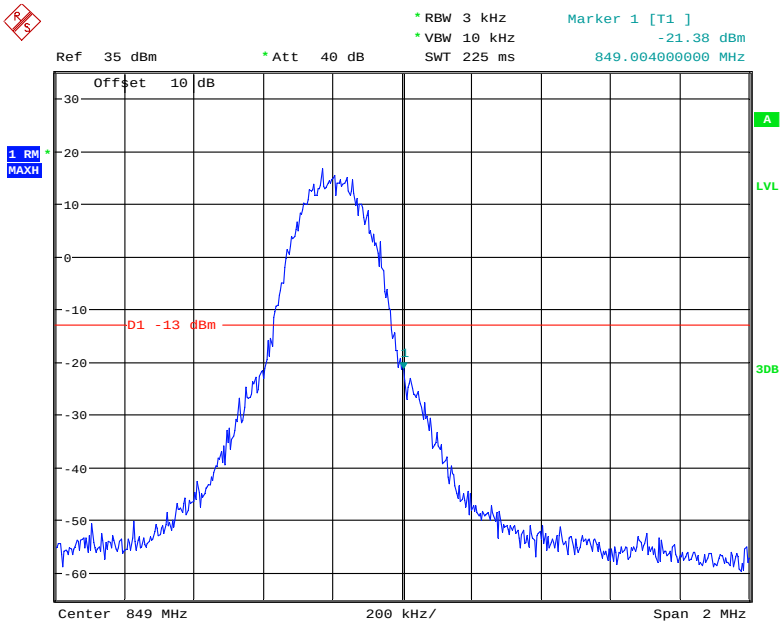
Date: 15.DEC.2017 20:47:32

EDGE 850, Left Band Edge



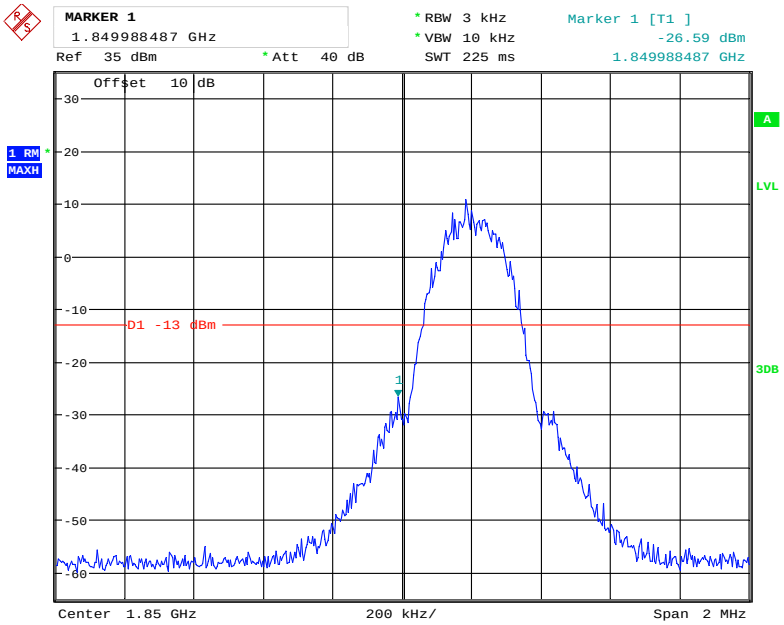
Date: 15.DEC.2017 20:58:33

EDGE 850, Right Band Edge



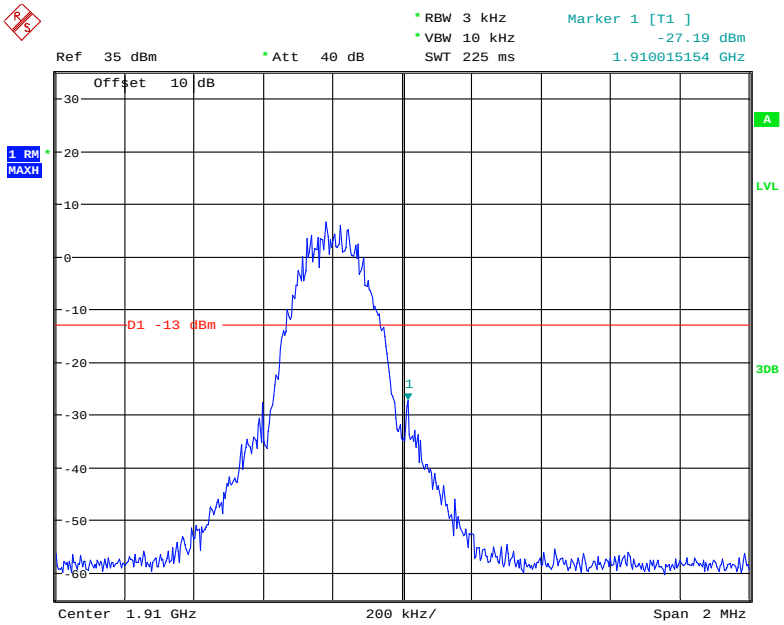
Date: 15.DEC.2017 21:00:11

EDGE 1900, Left Band Edge



Date: 15.DEC.2017 21:08:01

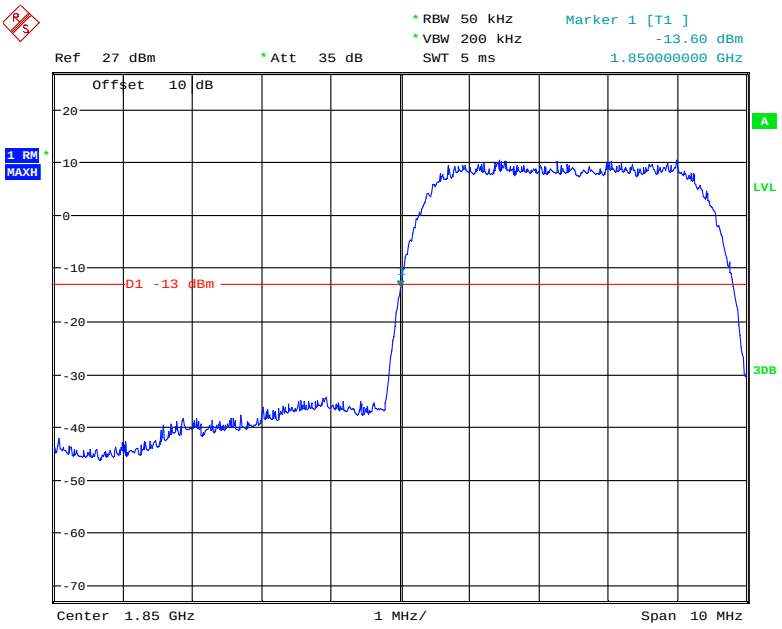
EDGE 1900, Right Band Edge



Date: 15.DEC.2017 21:09:35

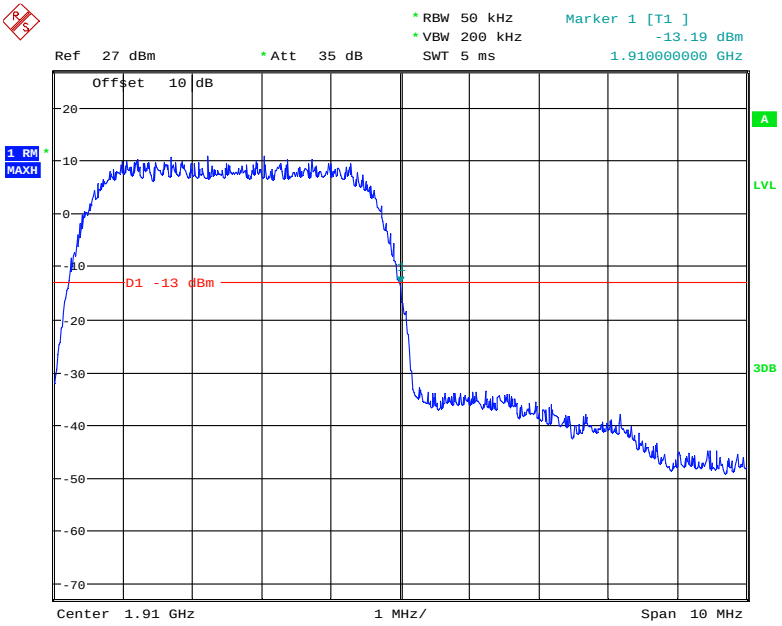
WCDMA Band II:

REL99 Band II, Left Band Edge



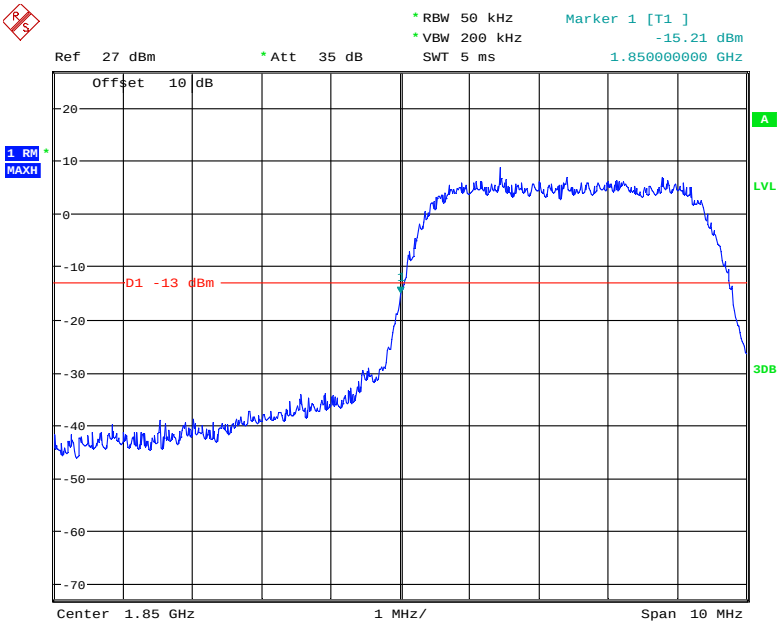
Date: 19.JAN.2018 22:06:42

REL99 Band II, Right Band Edge



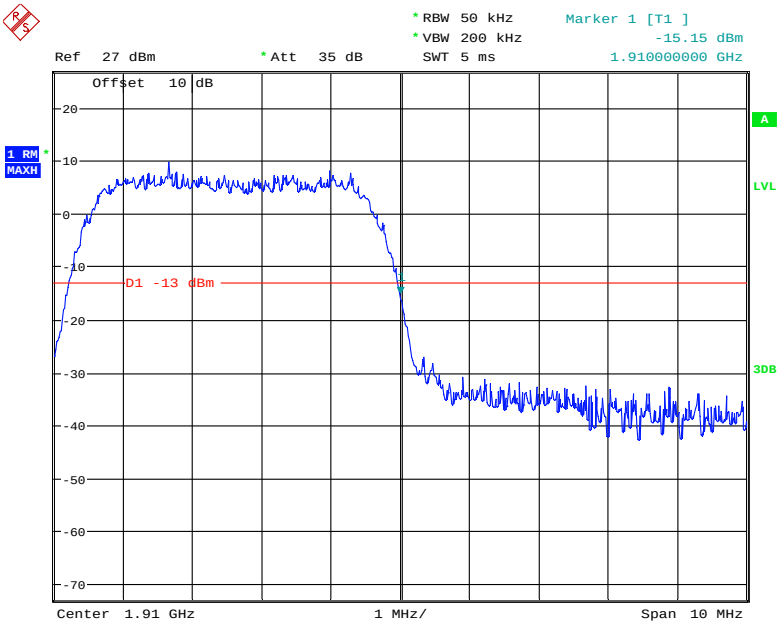
Date: 19.JAN.2018 22:07:45

HSDPA Band II, Left Band Edge



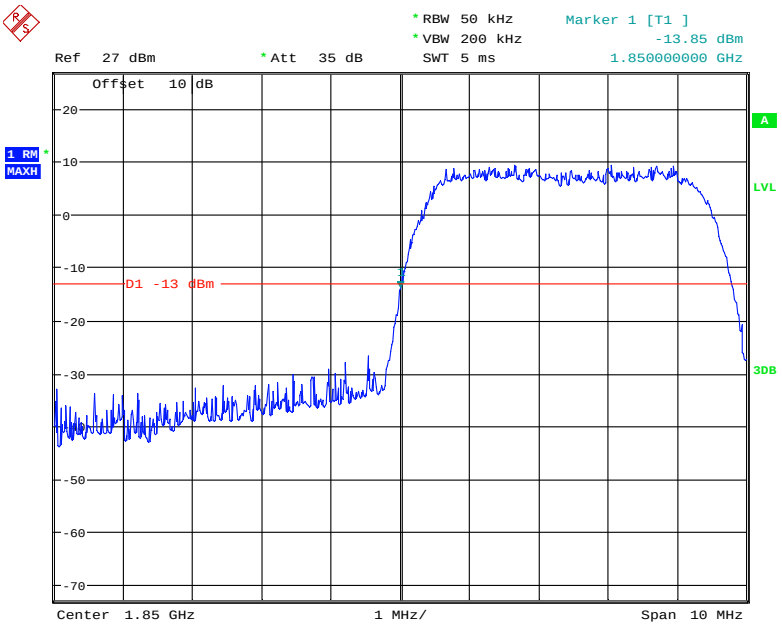
Date: 19.JAN.2018 22:10:36

HSDPA Band II, Right Band Edge



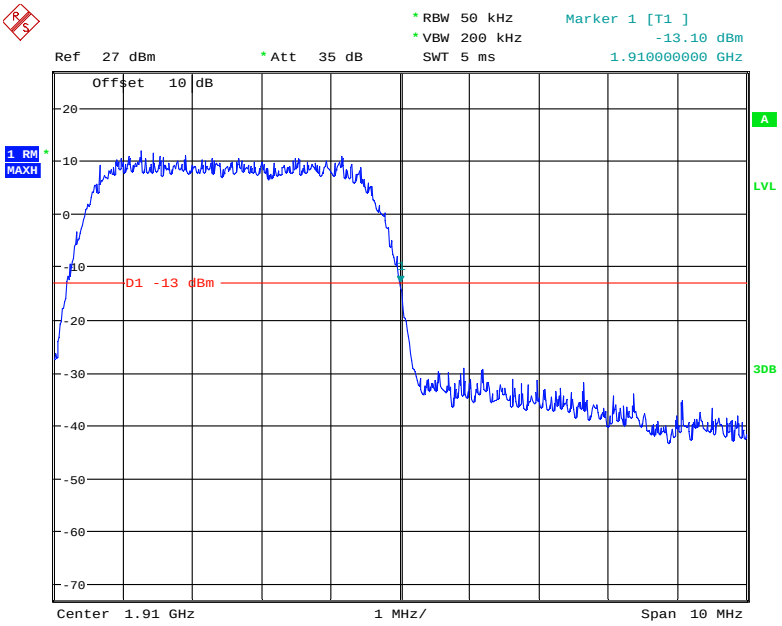
Date: 19.JAN.2018 22:09:24

HSUPA Band II, Left Band Edge



Date: 19.JAN.2018 22:11:47

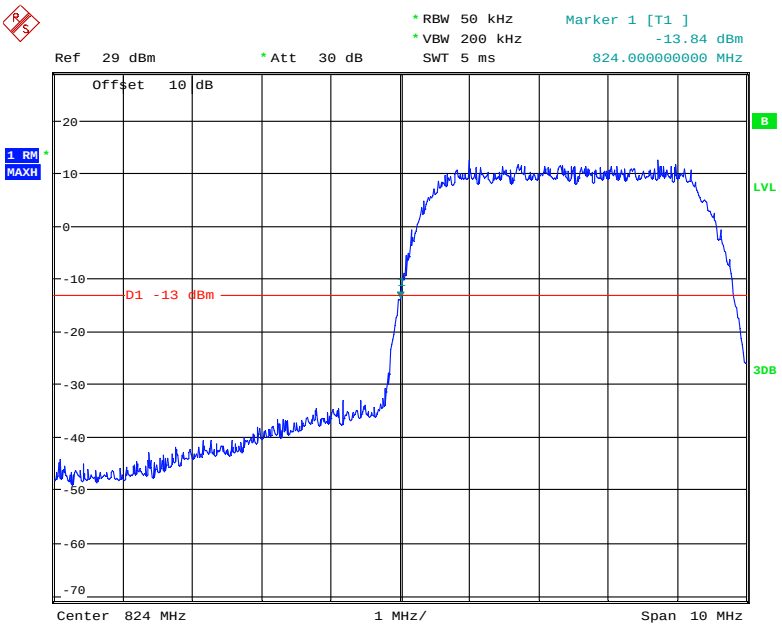
HSUPA Band II, Right Band Edge



Date: 19.JAN.2018 22:17:55

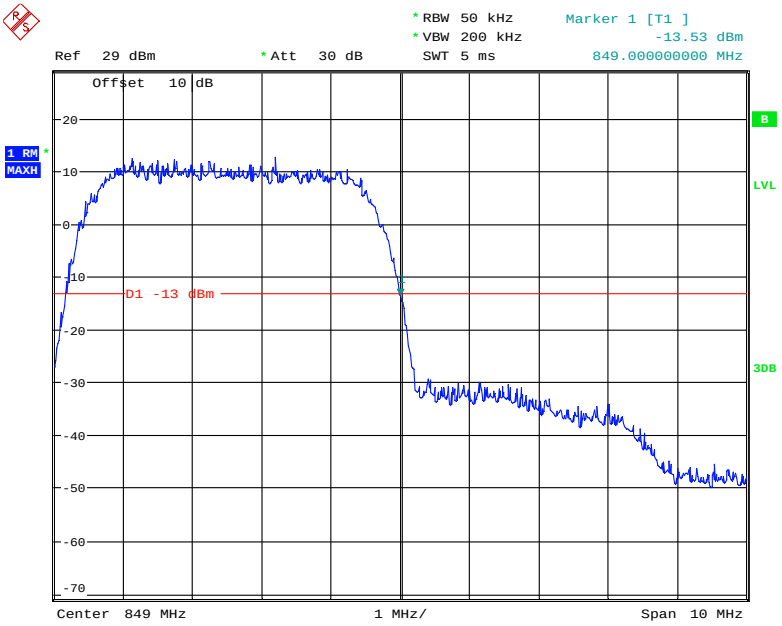
WCDMA Band V

REL99 Band V, Left Band Edge



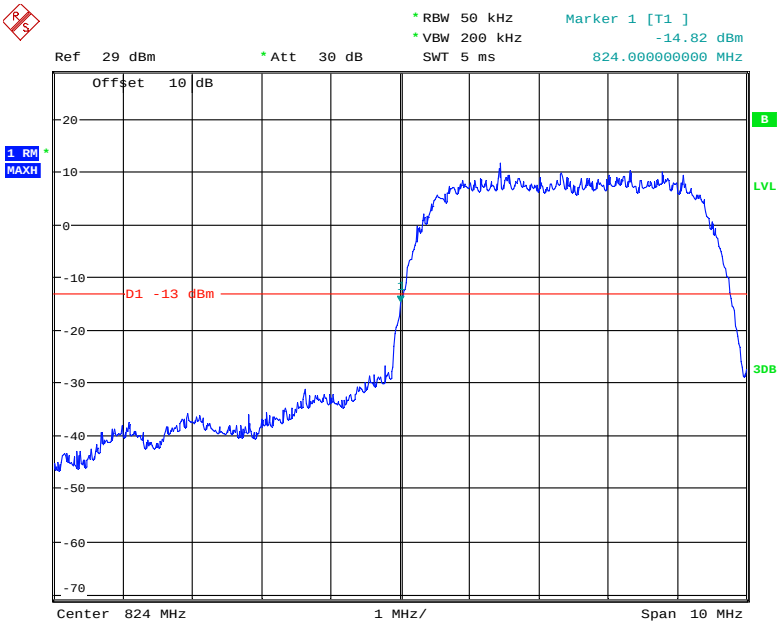
Date: 19.JAN.2018 22:49:26

REL99 Band V Right Band Edge



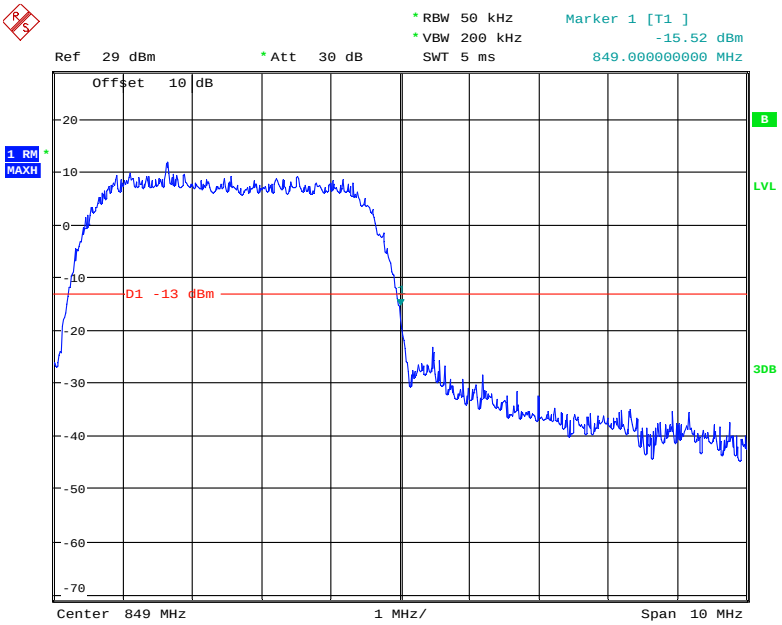
Date: 19.JAN.2018 22:48:43

HSDPA Band V, Left Band Edge



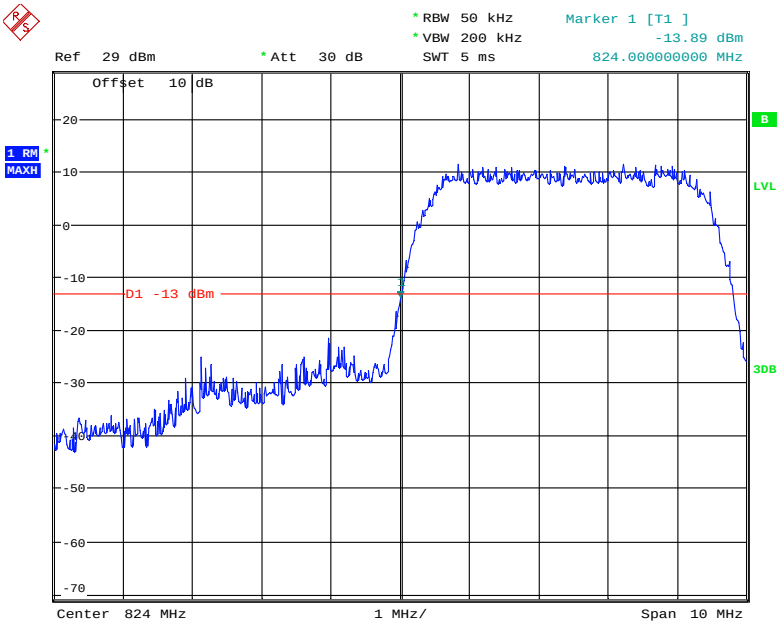
Date: 19.JAN.2018 22:42:35

HSDPA Band V, Right Band Edge



Date: 19.JAN.2018 22:41:24

HSUPA Band V, Left Band Edge



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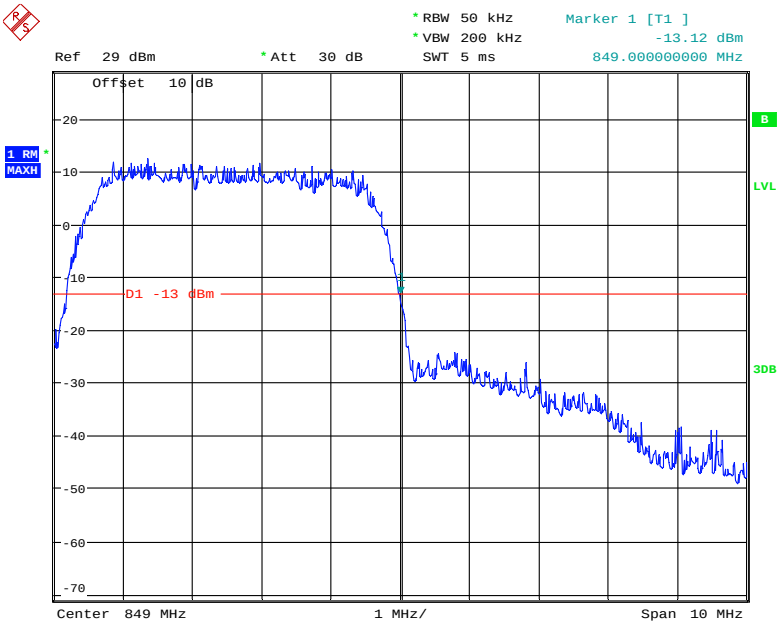
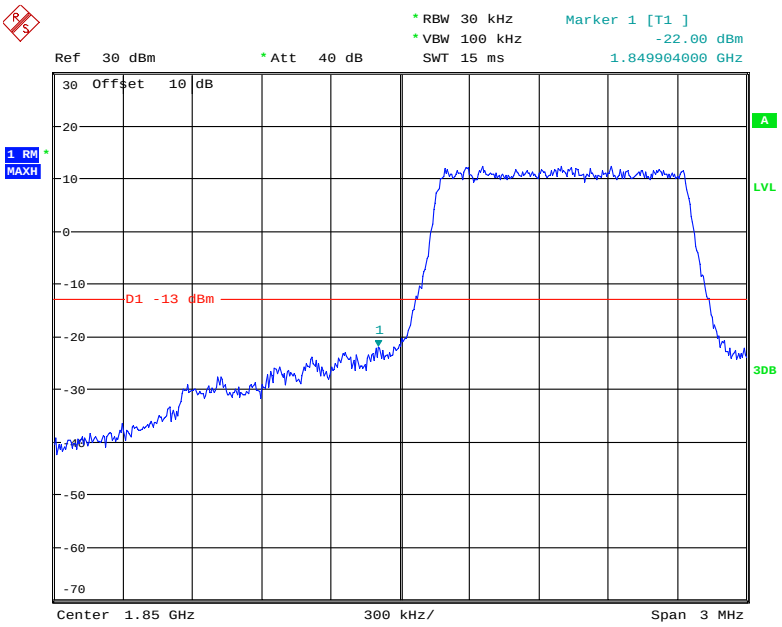
HSUPA Band V, Right Band Edge



Date: 19.JAN.2018 22:47:26

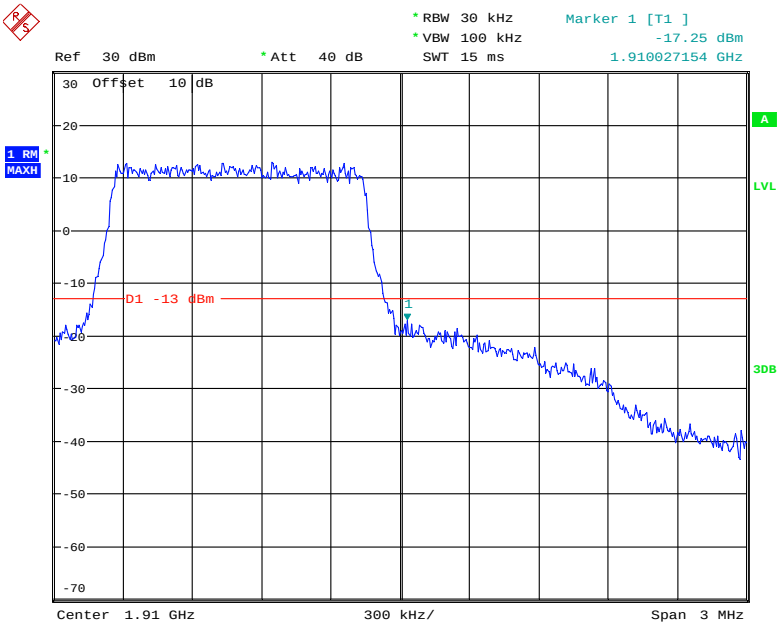
LTE Band II

QPSK_1.4MHz_ 6 RB_ Left



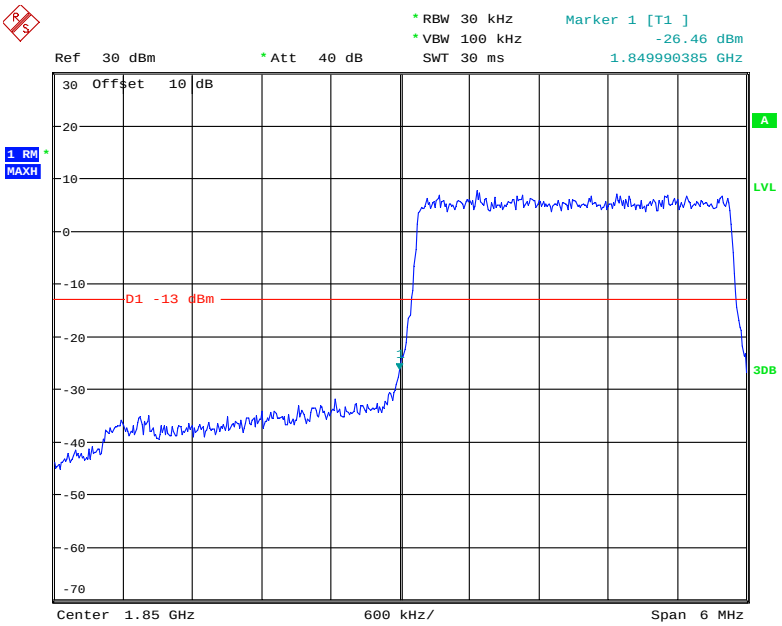
Date: 21.DEC.2017 21:46:27

QPSK_1.4MHz_ 6 RB_ Right



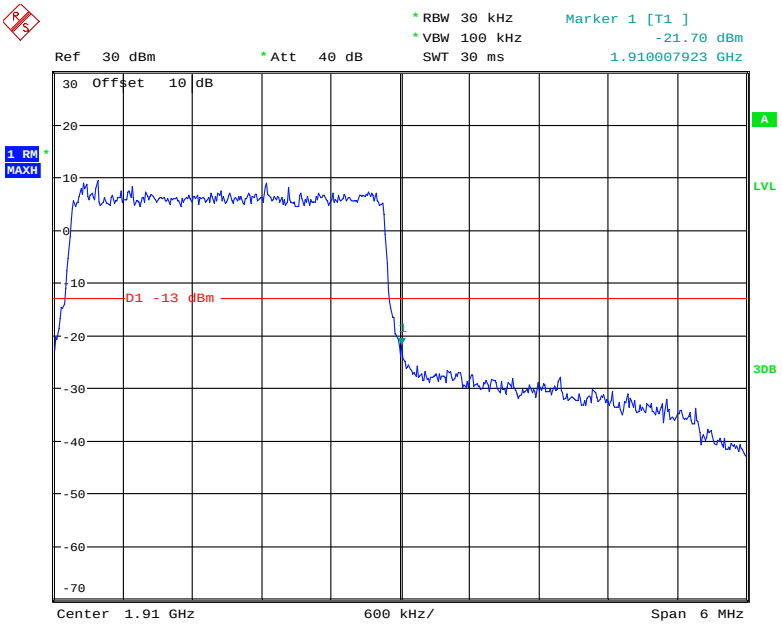
Date: 21.DEC.2017 21:48:18

QPSK_3MHz_ 15 RB_ Left



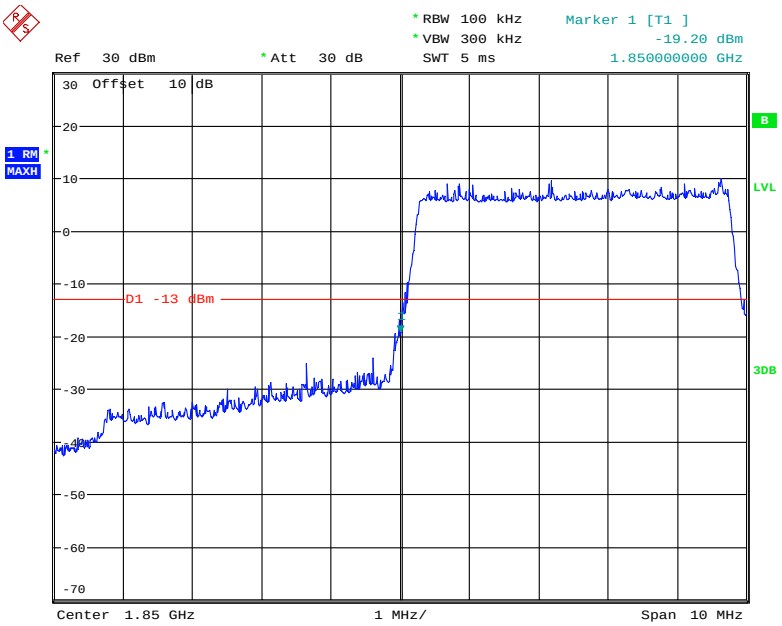
Date: 21.DEC.2017 21:51:25

QPSK_3MHz_ 15 RB_ Right



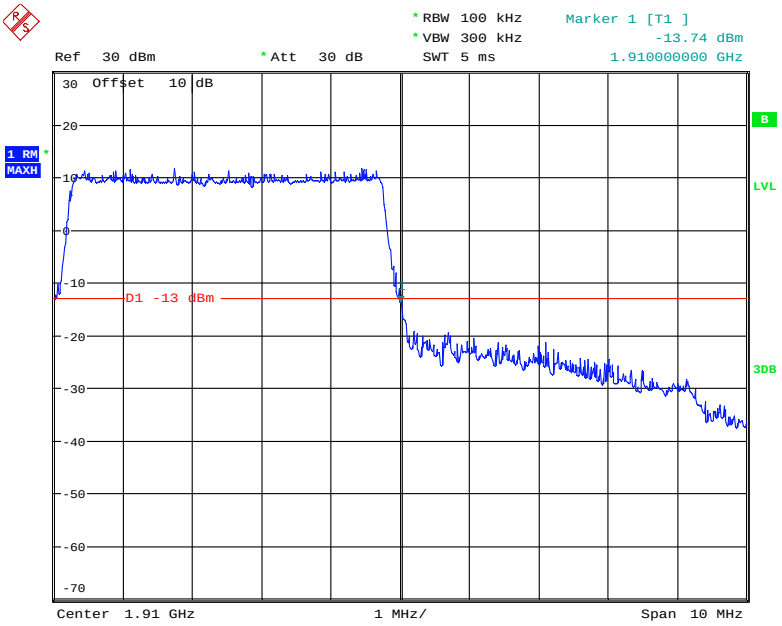
Date: 21.DEC.2017 21:50:35

QPSK_5MHz_ 25 RB_ Left



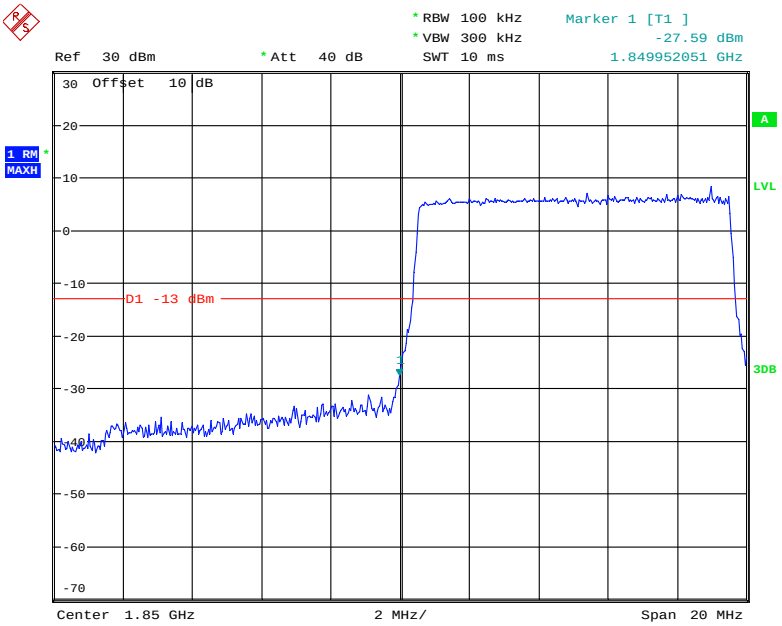
Date: 19.JAN.2018 23:15:43

QPSK_5MHz_ 25 RB_ Right



Date: 19.JAN.2018 23:14:39

QPSK_10MHz_ 50 RB_ Left



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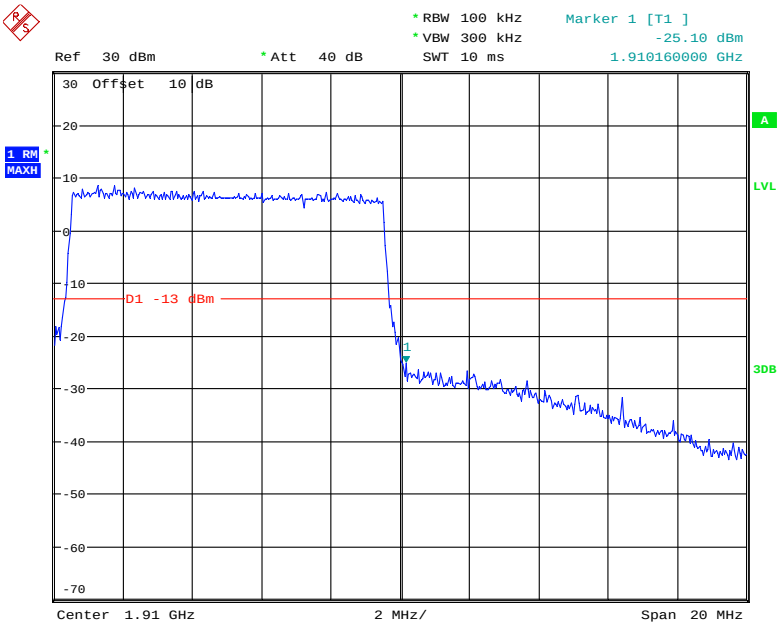
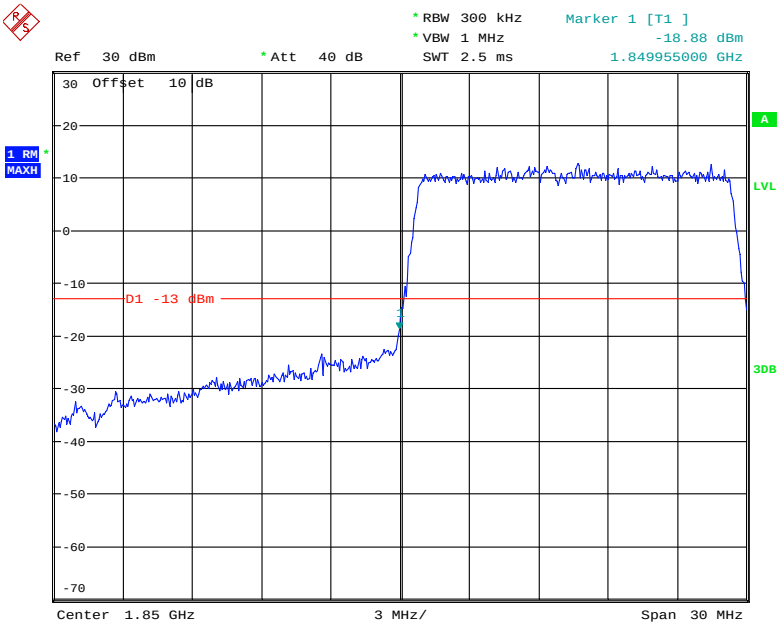
QPSK_10MHz_ 50 RB_ Right



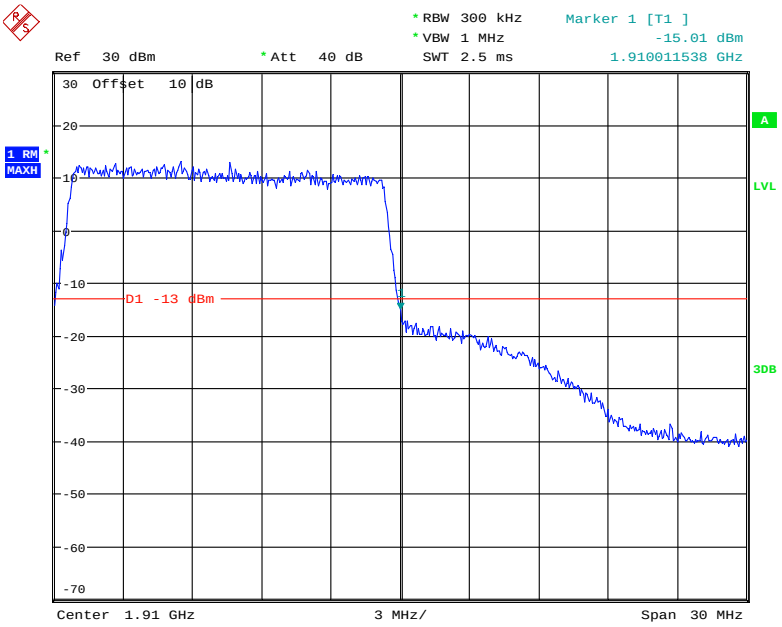
Date: 21.DEC.2017 22:07:16

QPSK_15MHz_ 75 RB_ Left



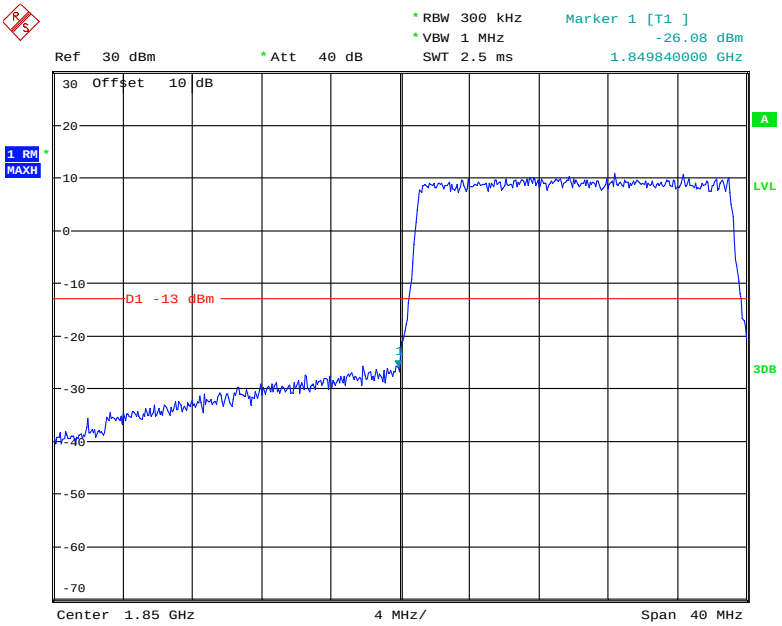
Date: 21.DEC.2017 22:33:51

QPSK_15MHz_ 75 RB_ Right



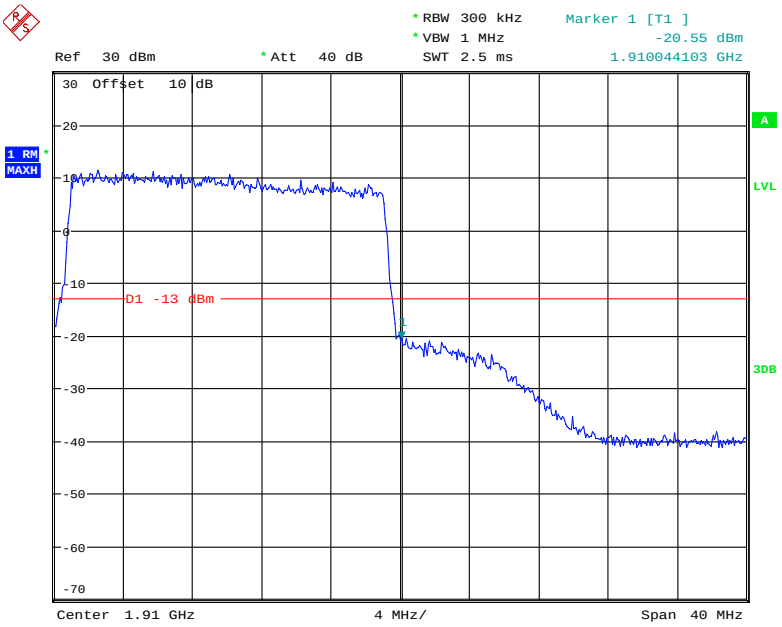
Date: 21.DEC.2017 22:38:24

QPSK_20MHz_ FULL RB_ Left



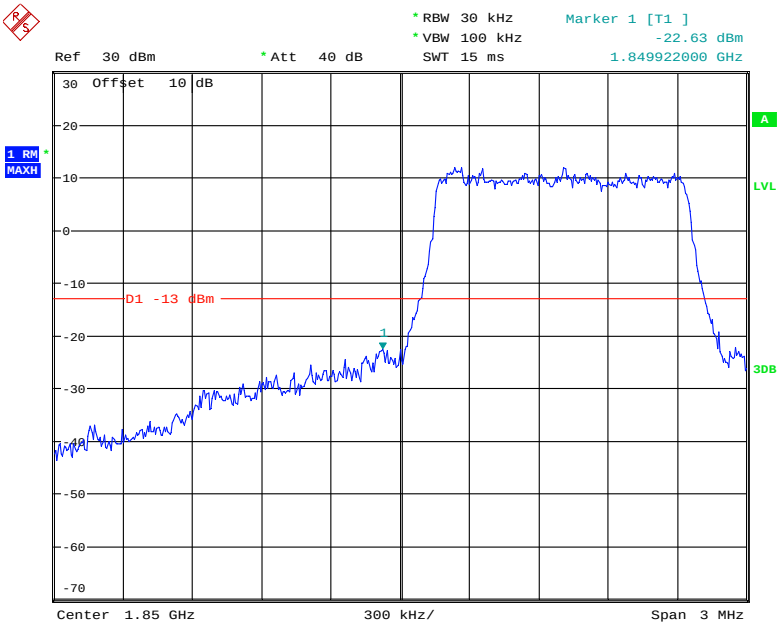
Date: 21.DEC.2017 22:44:11

QPSK_20MHz_ FULL RB_ Right



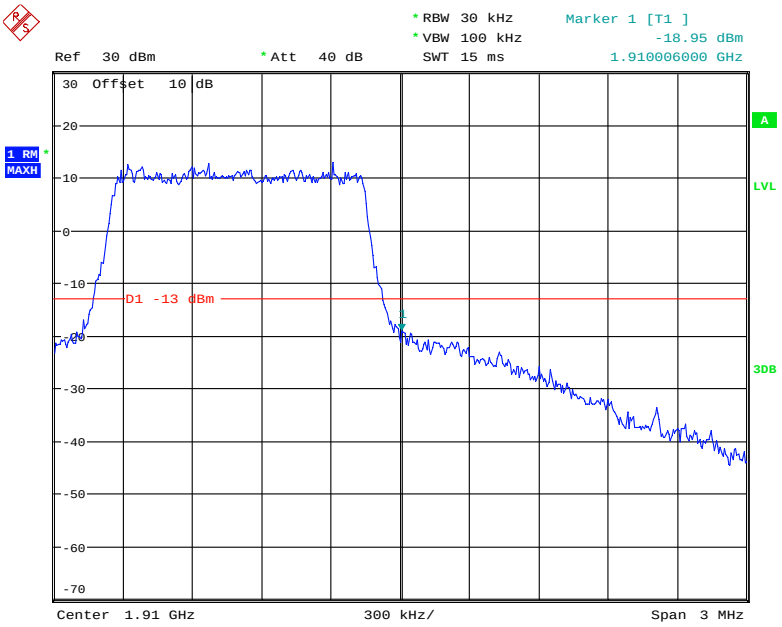
Date: 21.DEC.2017 22:37:07

16QAM_1.4MHz_ 6 RB_ Left



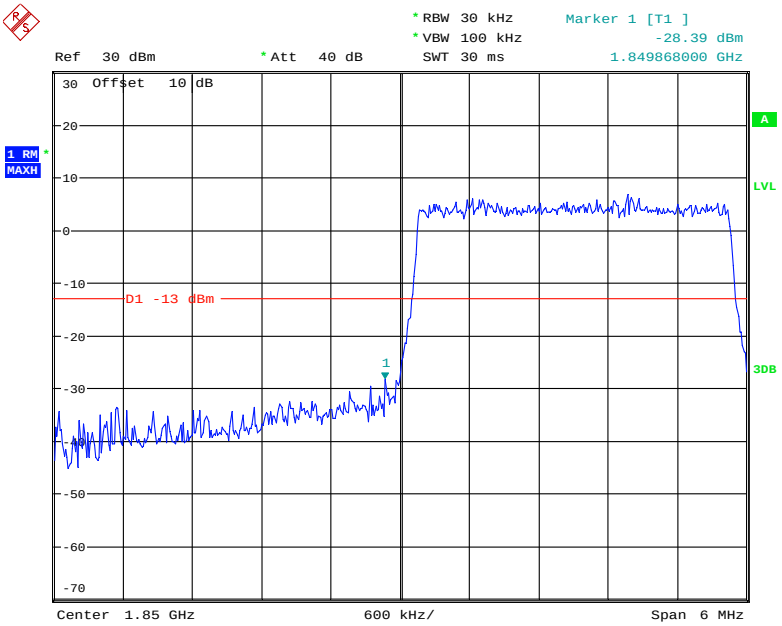
Date: 21.DEC.2017 21:47:00

16QAM_1.4MHz_ 6 RB_ Right



Date: 21.DEC.2017 21:47:45

16QAM_3MHz_ 15 RB_ Left



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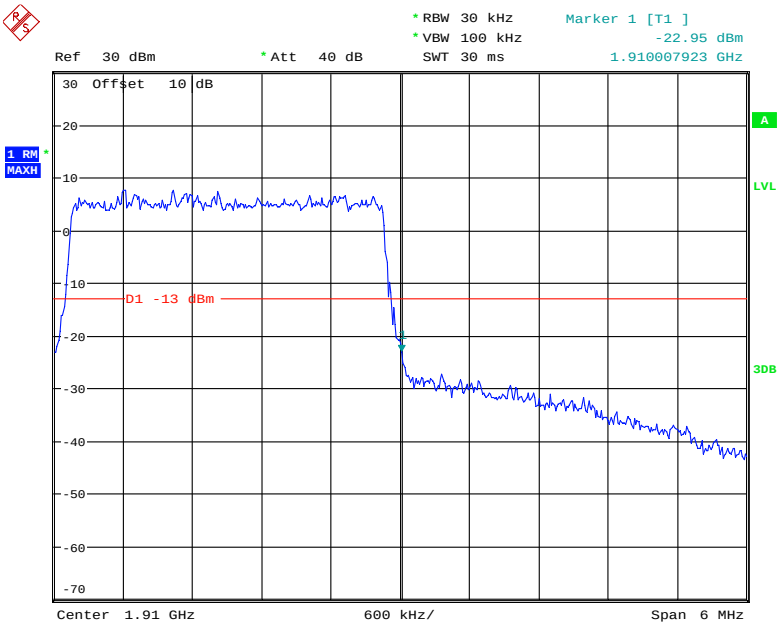
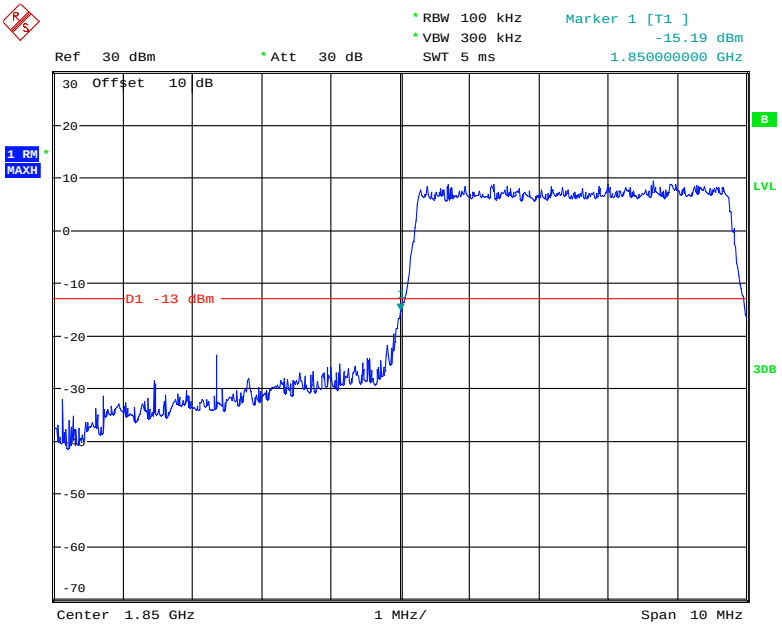
16QAM_3MHz_ 15 RB_ Right



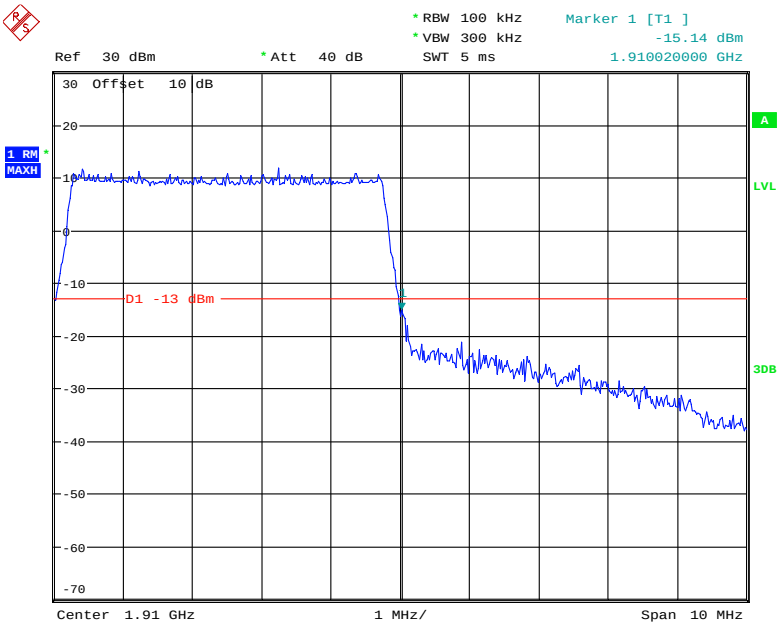
Date: 21.DEC.2017 21:49:59

16QAM_5MHz_ 25 RB_ Left



Date: 19.JAN.2018 23:12:34

16QAM_5MHz_ 25 RB_ Right



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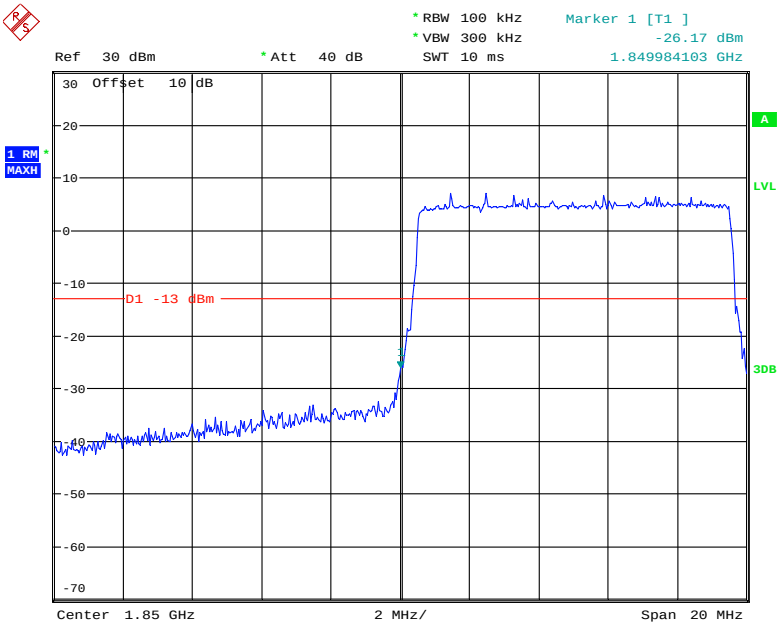
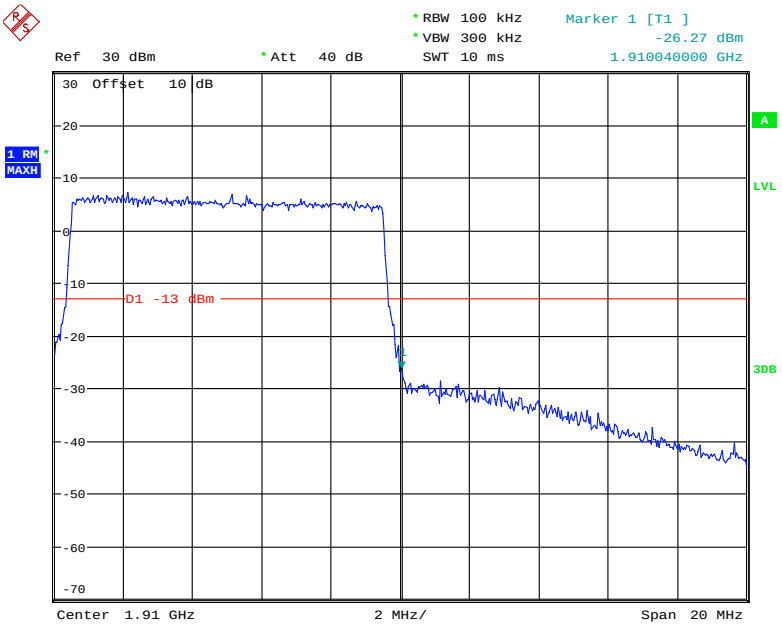
16QAM_10MHz_ 50 RB_ Left



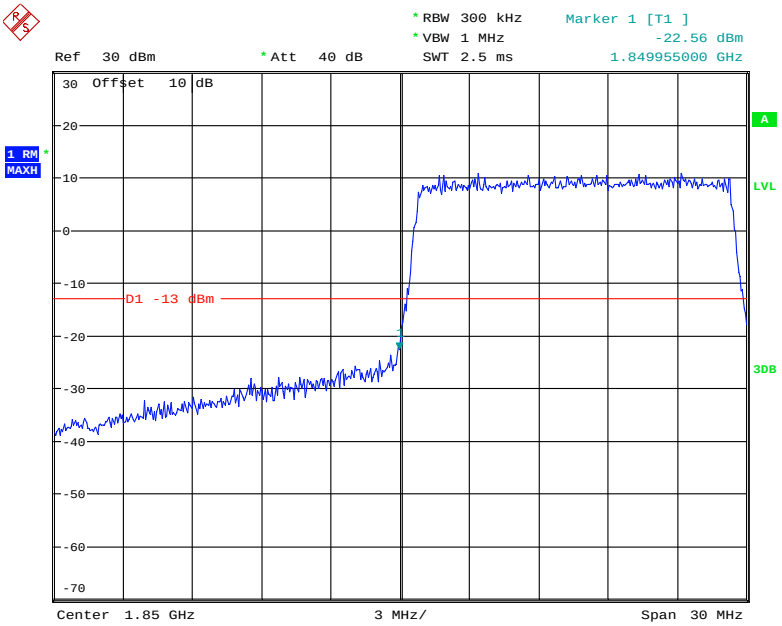
Date: 21.DEC.2017 22:05:37

16QAM_10MHz_ 50 RB_ Right



Date: 21.DEC.2017 22:07:51

16QAM_15MHz_ 75 RB_ Left



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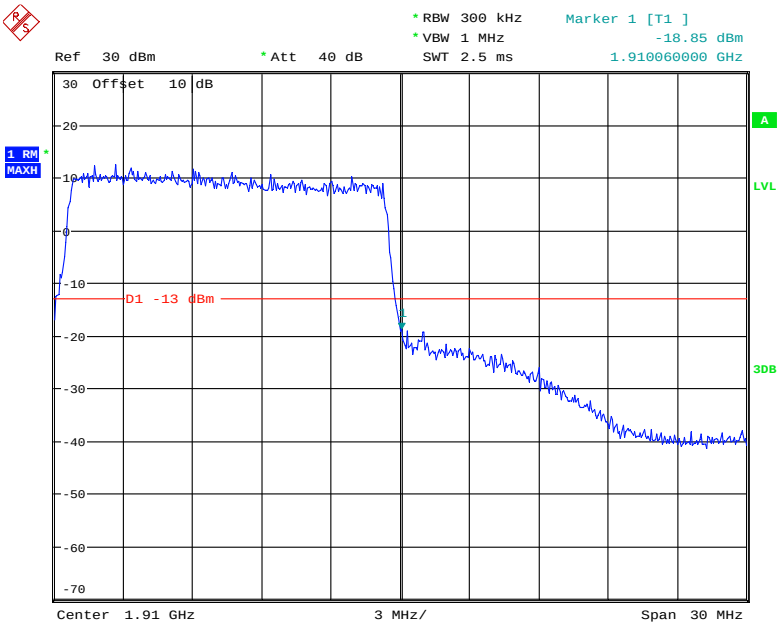
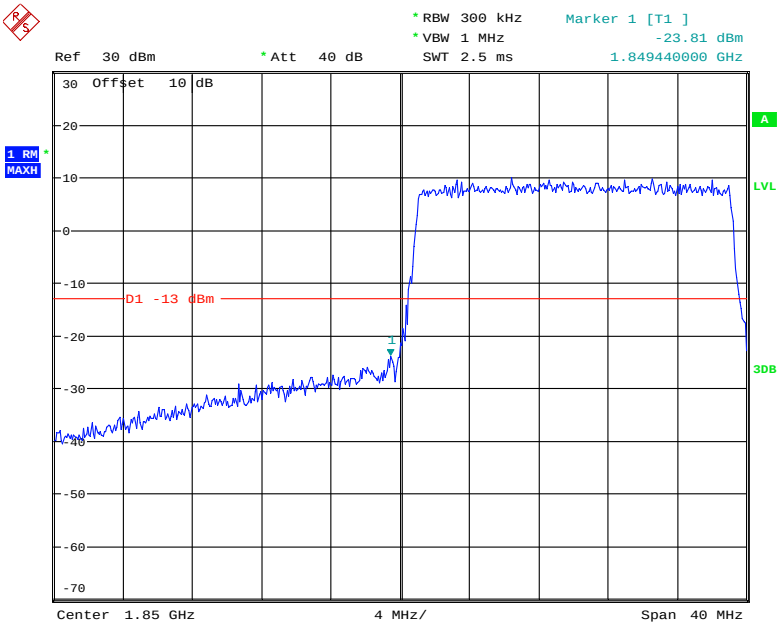
16QAM_15MHz_ 75 RB_ Right



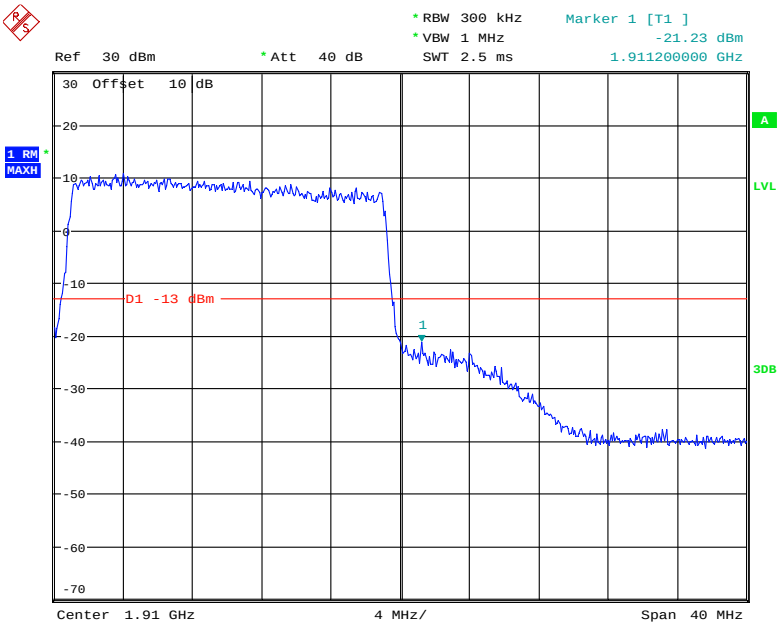
Date: 21.DEC.2017 22:35:15

16QAM_20MHz_ FULL RB_ Left



Date: 21.DEC.2017 22:43:36

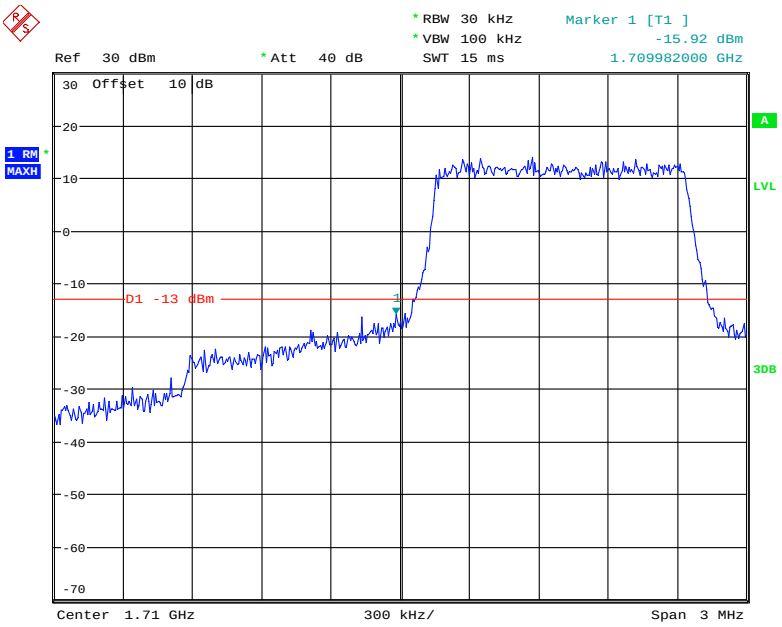
16QAM_20MHz_ FULL RB_ Right



Date: 21.DEC.2017 22:42:47

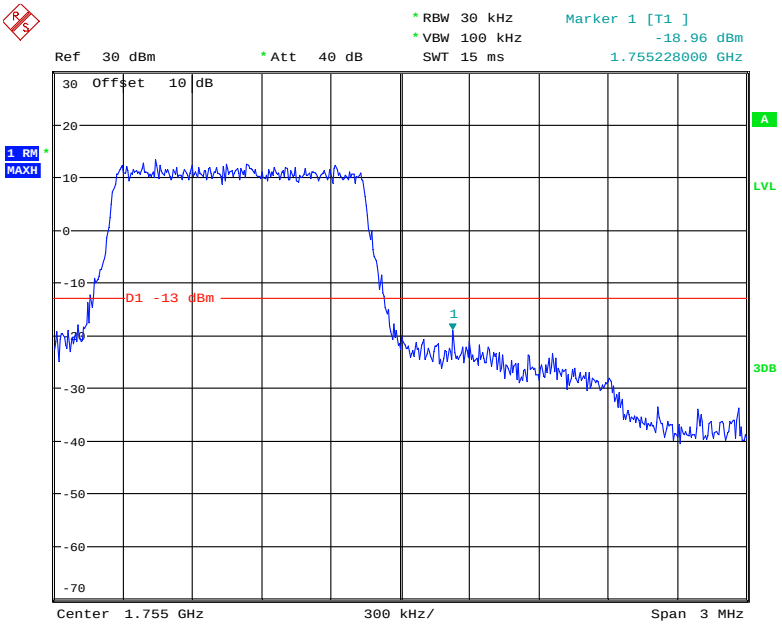
LTE Band IV

QPSK_1.4MHz_ 6 RB_ Left



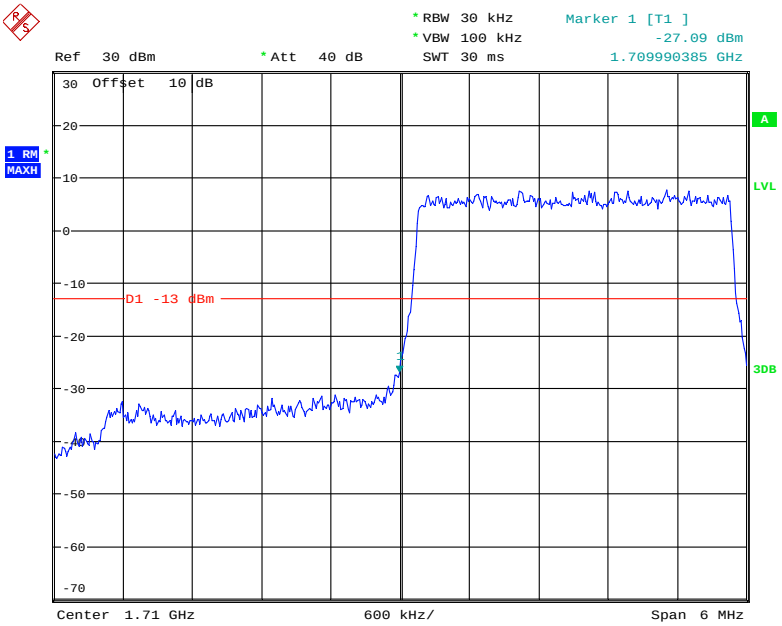
Date: 21.DEC.2017 23:09:41

QPSK_1.4MHz_ 6 RB_ Right



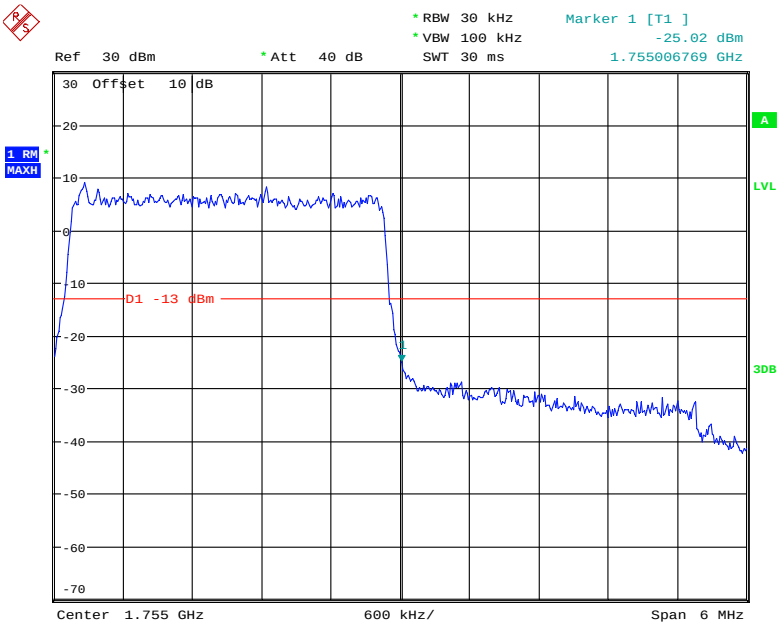
Date: 21.DEC.2017 23:11:59

QPSK_3MHz_ 15 RB_ Left



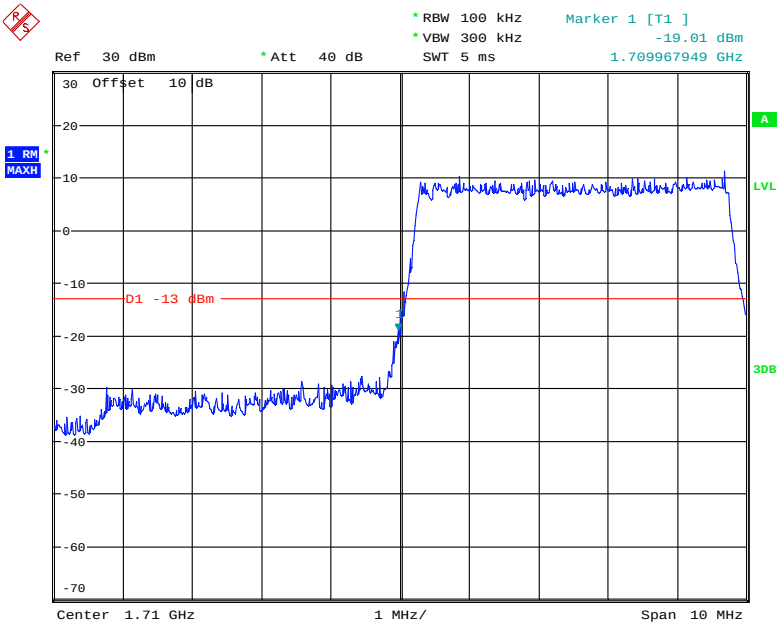
Date: 21.DEC.2017 23:16:01

QPSK_3MHz_ 15 RB_ Right



Date: 21.DEC.2017 23:14:43

QPSK_5MHz_ 25 RB_ Left



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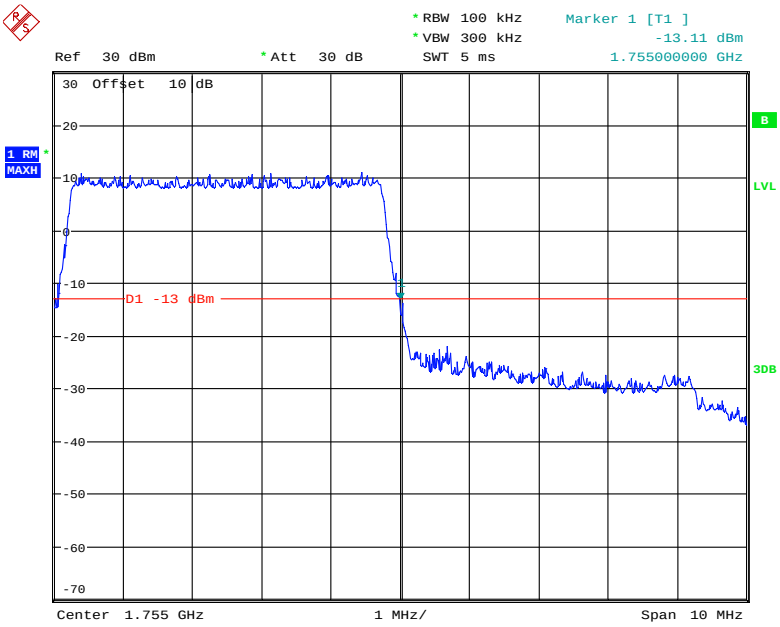
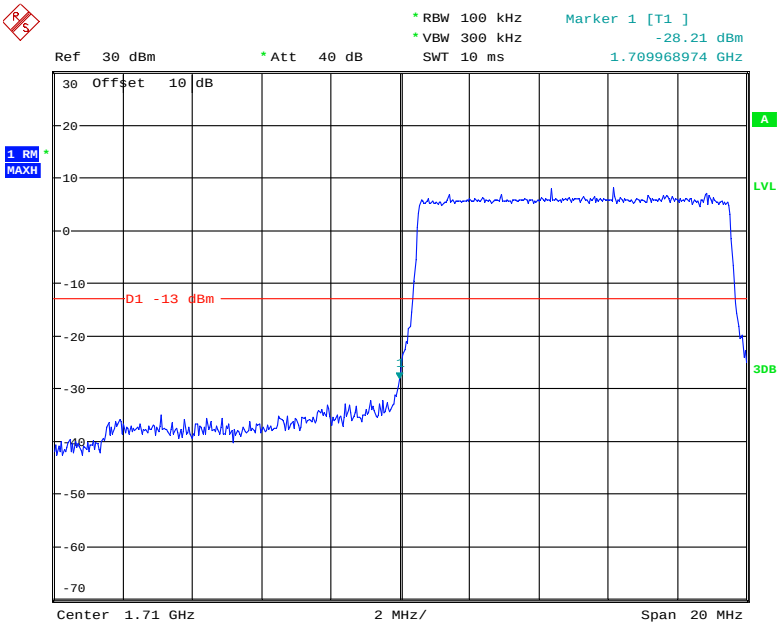
QPSK_5MHz_ 25 RB_ Right



Date: 19.JAN.2018 23:21:01

QPSK_10MHz_ 50 RB_ Left



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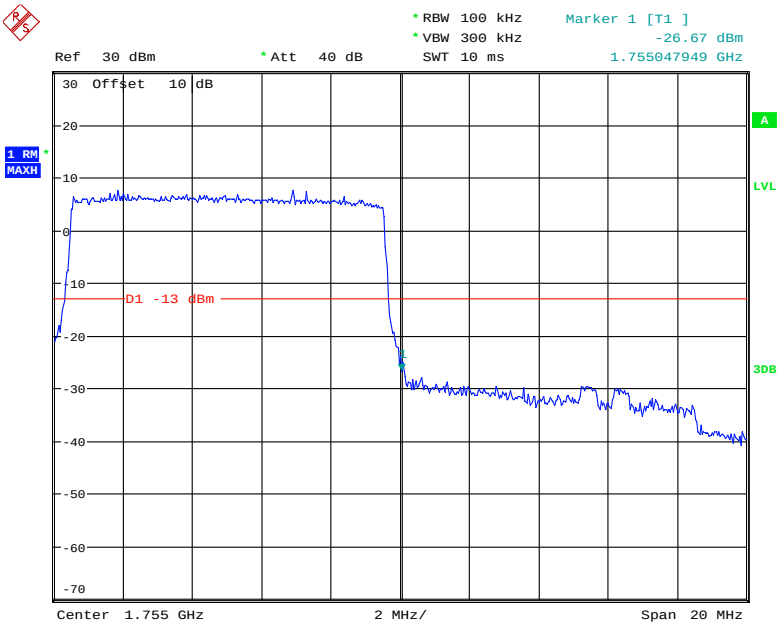
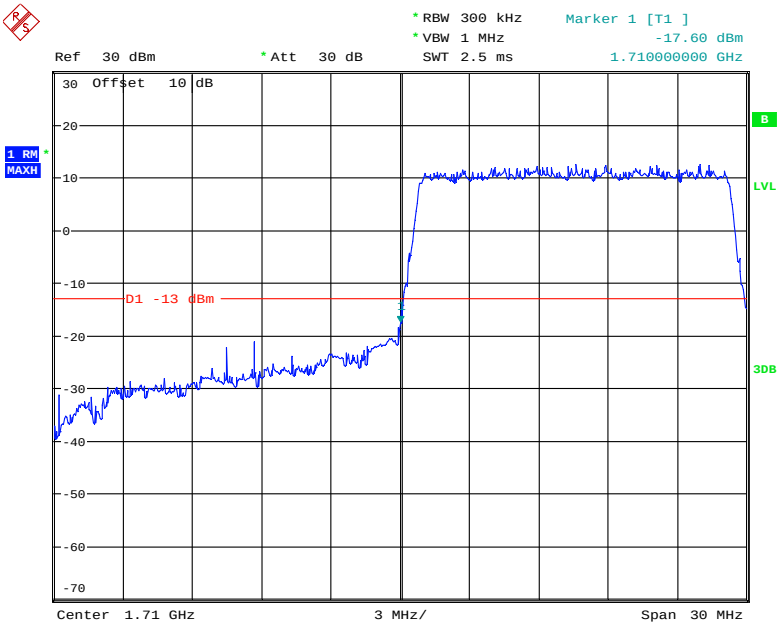
QPSK_10MHz_ 50 RB_ Right



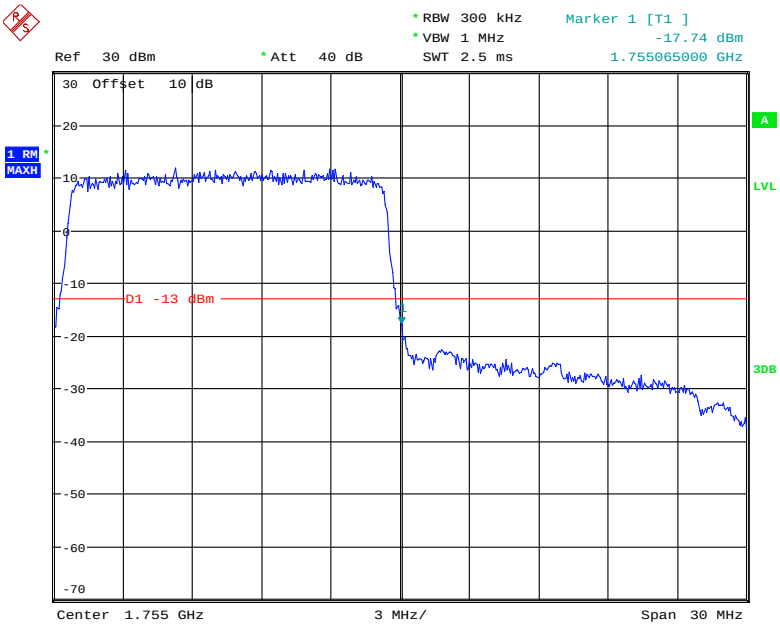
Date: 21.DEC.2017 23:24:05

QPSK_15MHz_ 75 RB_ Left



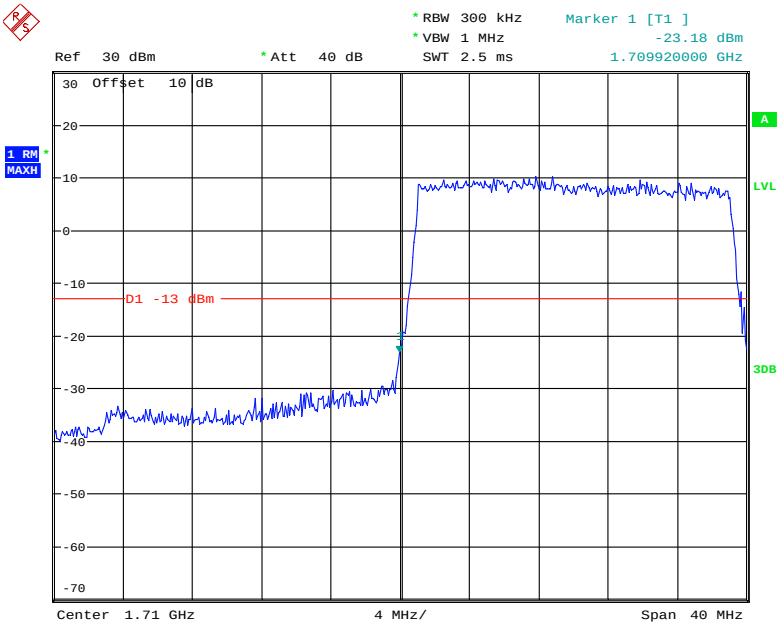
Date: 19.JAN.2018 23:36:34

QPSK_15MHz_ 75 RB_ Right



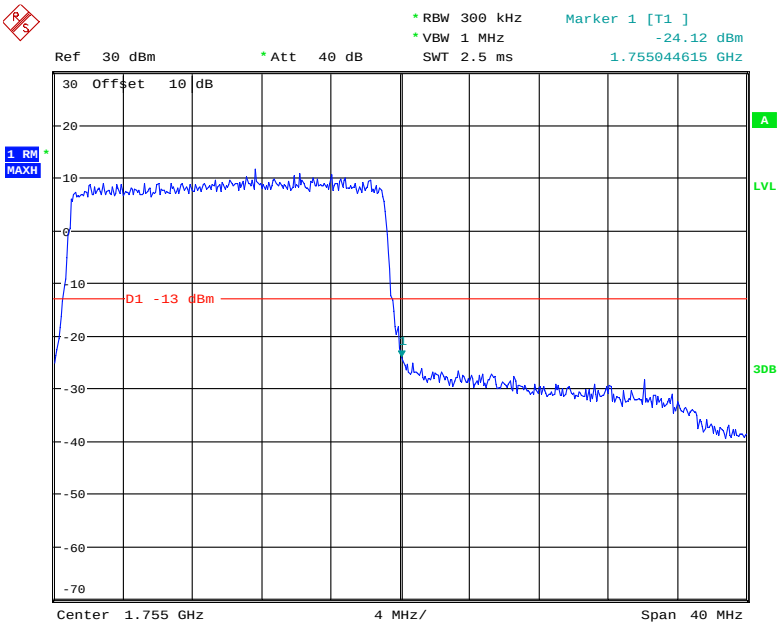
Date: 21.DEC.2017 23:28:50

QPSK_20MHz_ FULL RB_ Left



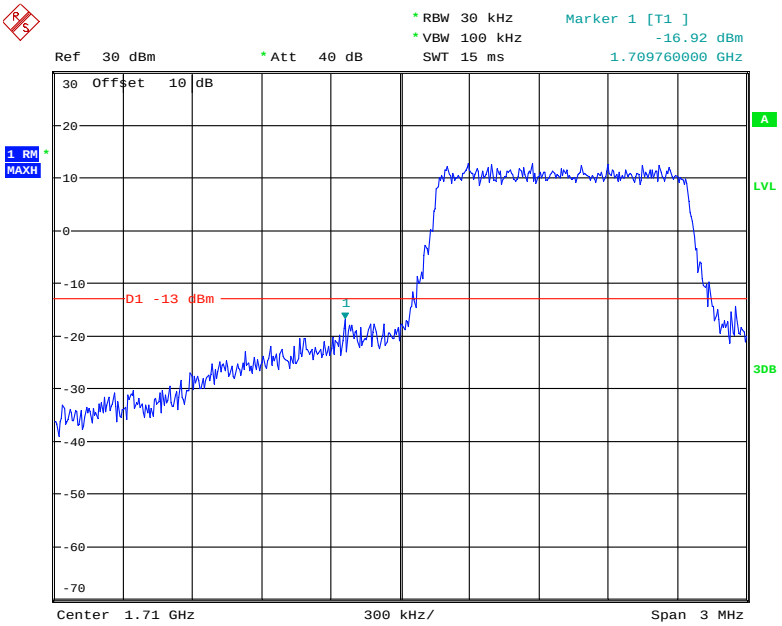
Date: 21.DEC.2017 23:32:17

QPSK_20MHz_ FULL RB_ Right



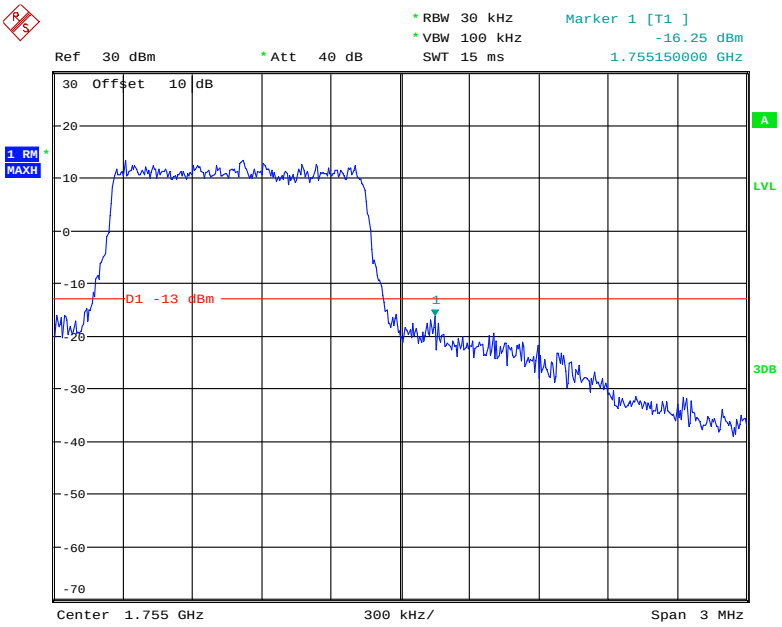
Date: 21.DEC.2017 23:30:31

16QAM_1.4MHz_ 6 RB_ Left



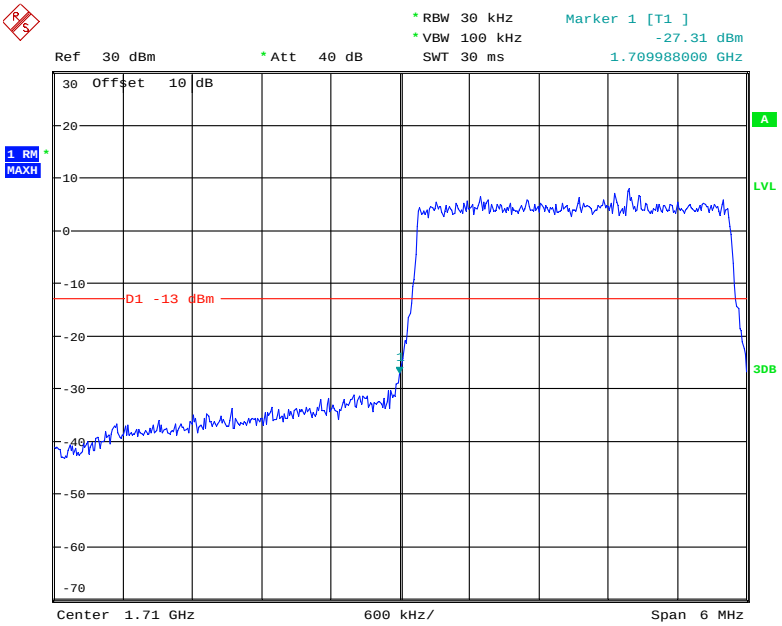
Date: 21.DEC.2017 23:10:24

16QAM_1.4MHz_ 6 RB_ Right



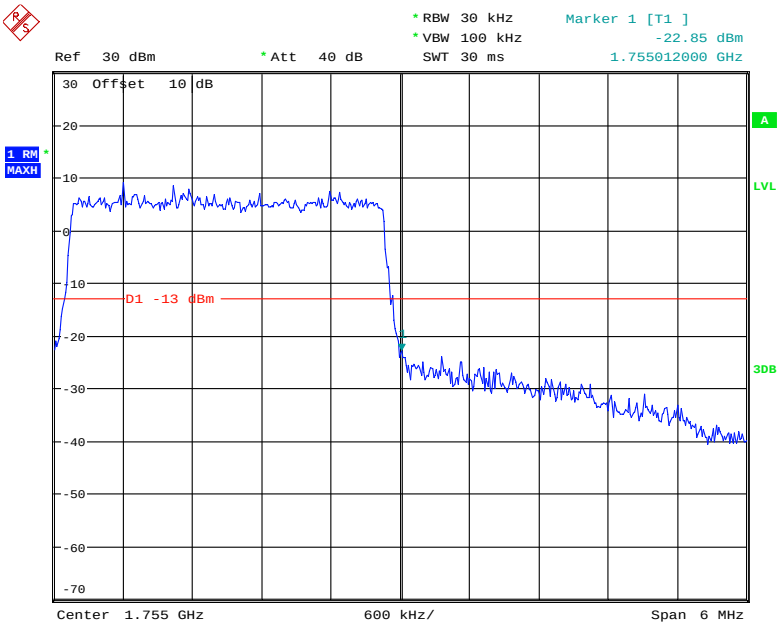
Date: 21.DEC.2017 23:11:28

16QAM_3MHz_ 15 RB_ Left



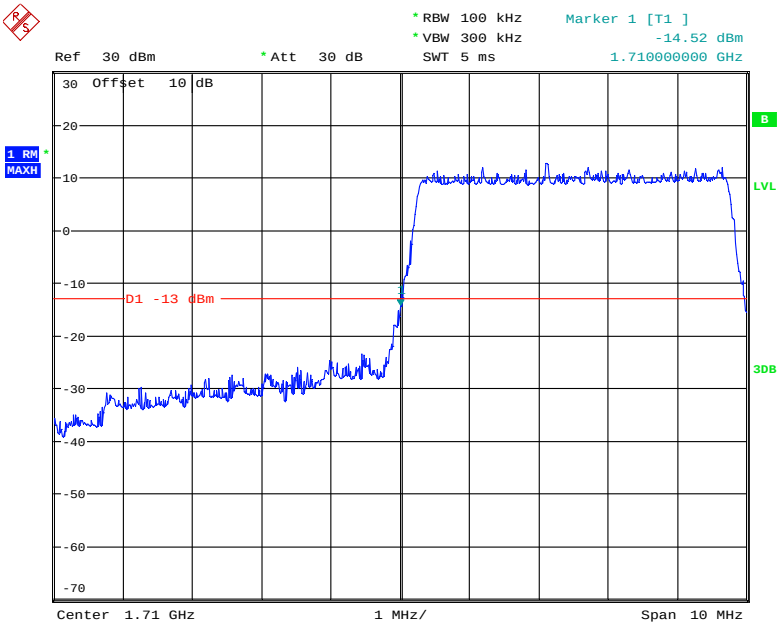
Date: 21.DEC.2017 23:16:41

16QAM_3MHz_ 15 RB_ Right



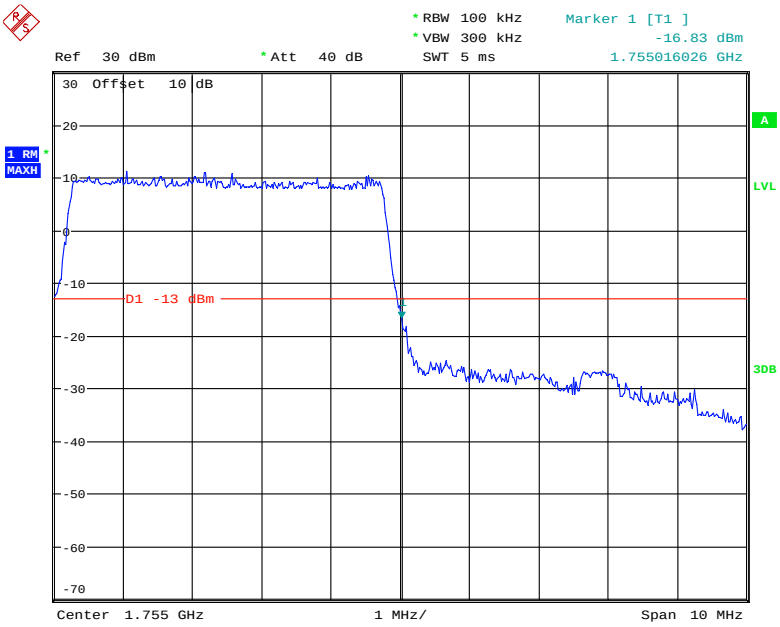
Date: 21.DEC.2017 23:14:07

16QAM_5MHz_ 25 RB_ Left



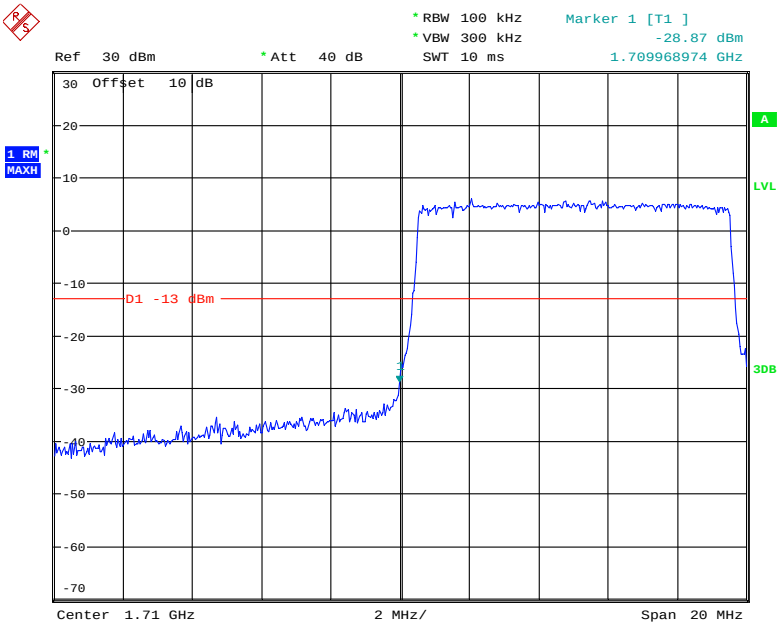
Date: 19.JAN.2018 23:18:43

16QAM_5MHz_ 25 RB_ Right



Date: 21.DEC.2017 23:20:37

16QAM_10MHz_ 50 RB_ Left



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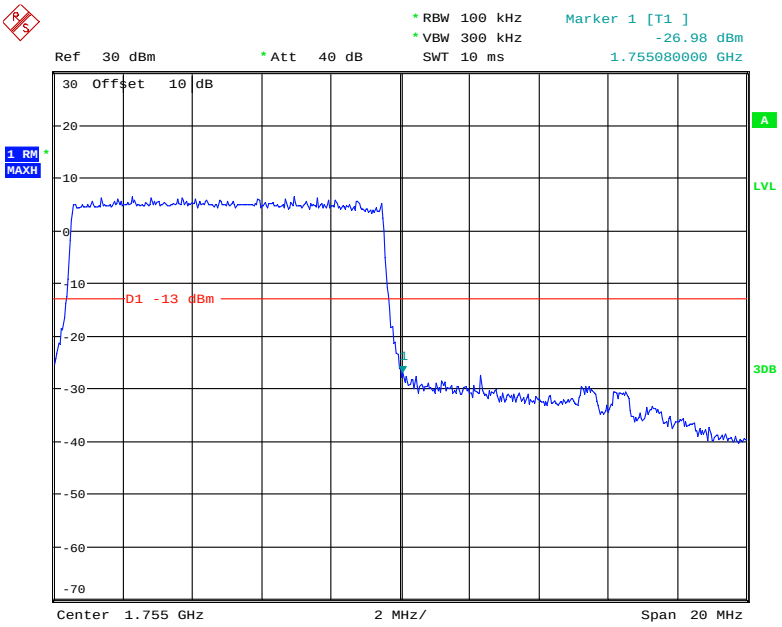
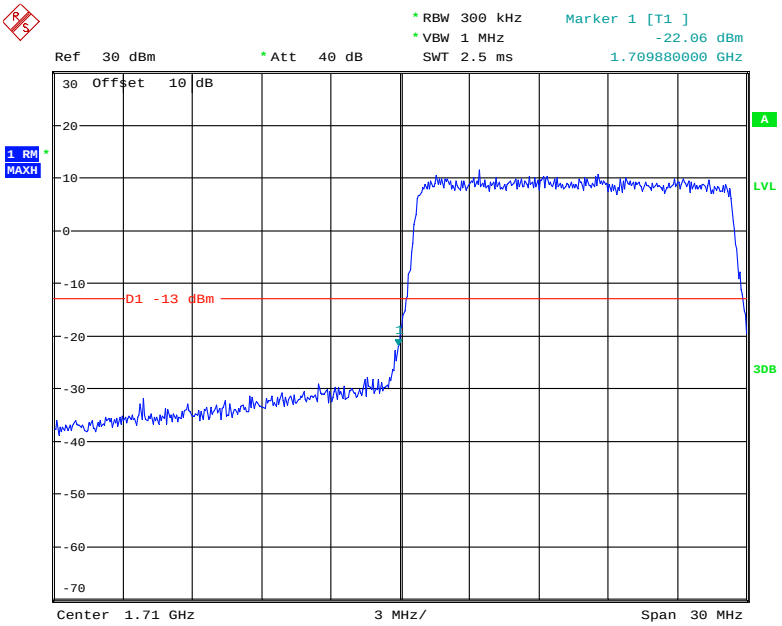
16QAM_10MHz_ 50 RB_ Right



Date: 21.DEC.2017 23:23:33

16QAM_15MHz_ 75 RB_ Left



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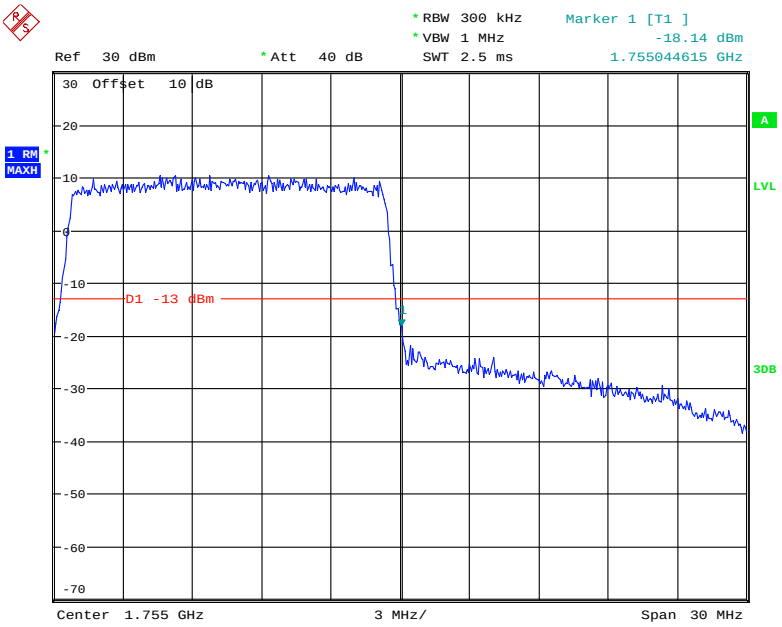
16QAM_15MHz_ 75 RB_ Right



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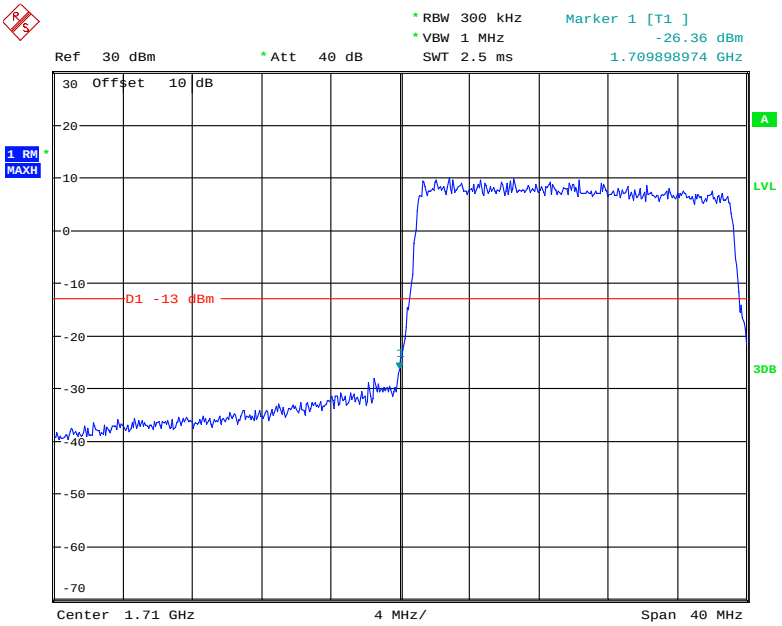
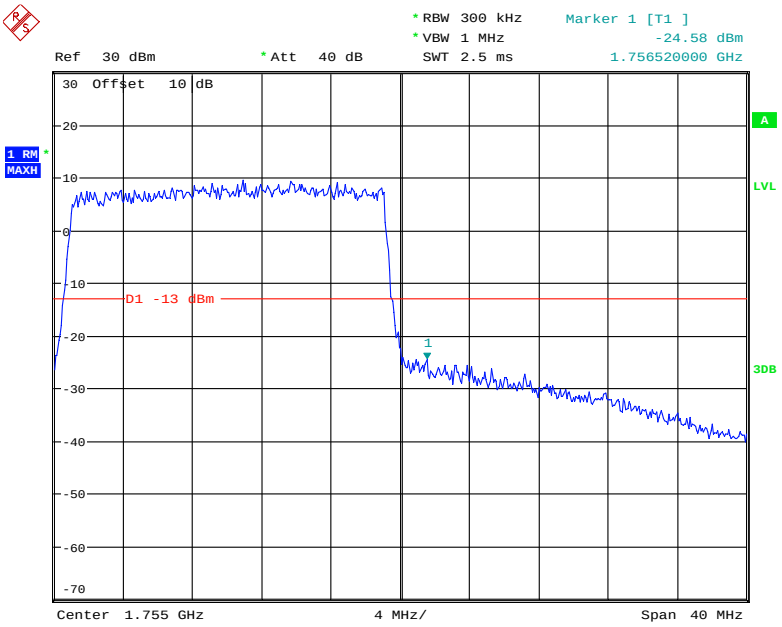
16QAM_20MHz_ FULL RB_ Left



Date: 21.DEC.2017 23:31:49

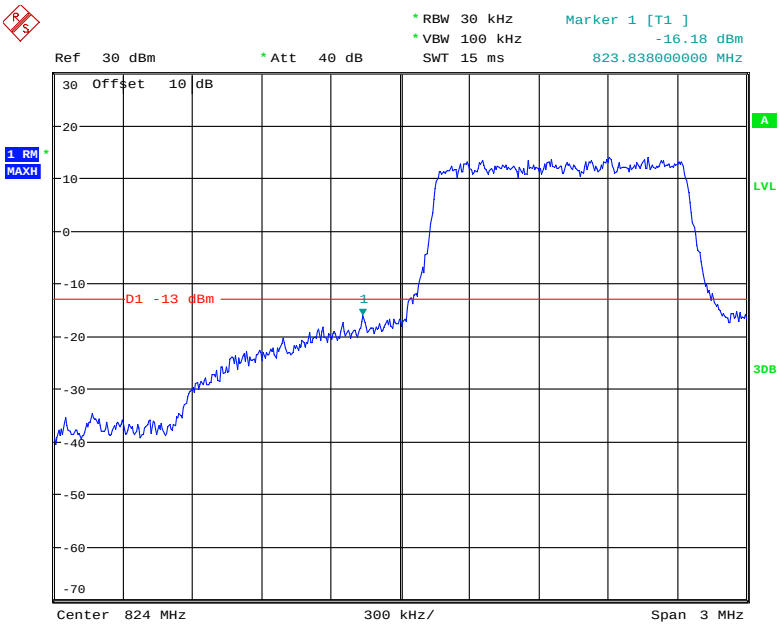
16QAM_20MHz_ FULL RB_ Right



Date: 21.DEC.2017 23:31:02

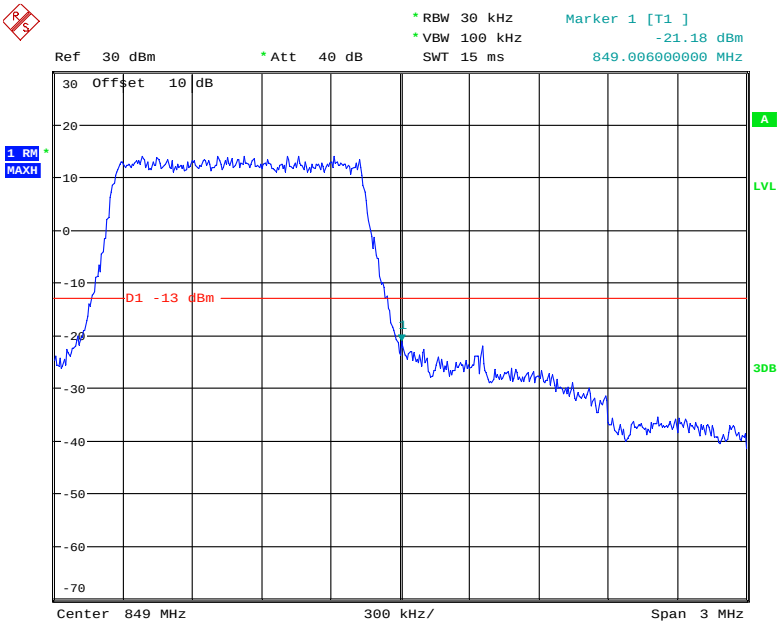
LTE Band V

QPSK_1.4MHz_ 6 RB_ Left



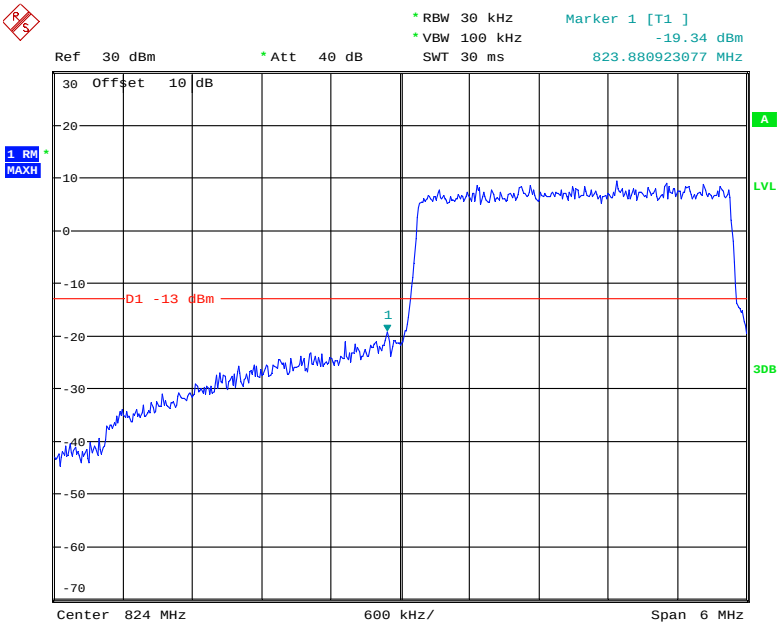
Date: 21.DEC.2017 23:35:00

QPSK_1.4MHz_ 6 RB_ Right



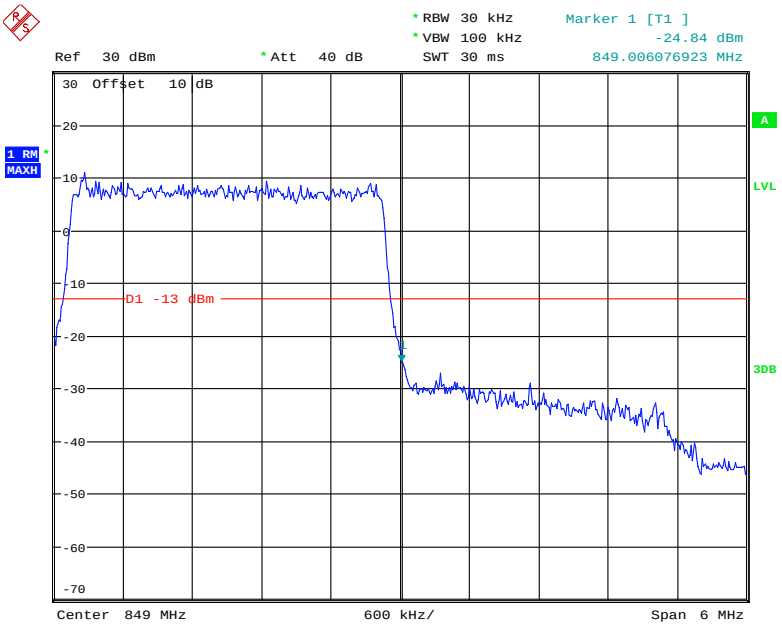
Date: 21.DEC.2017 23:37:24

QPSK_3MHz_ 15 RB_ Left



Date: 21.DEC.2017 23:40:54

QPSK_3MHz_ 15 RB_ Right



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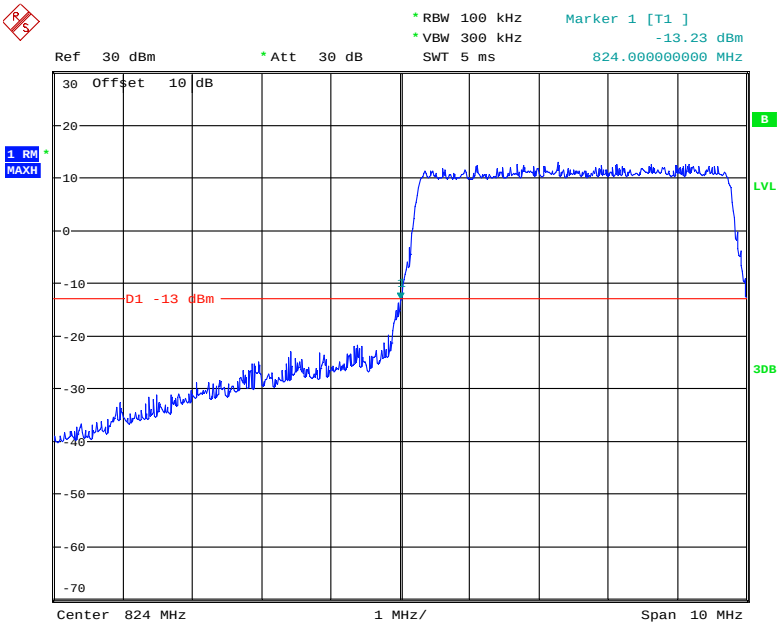
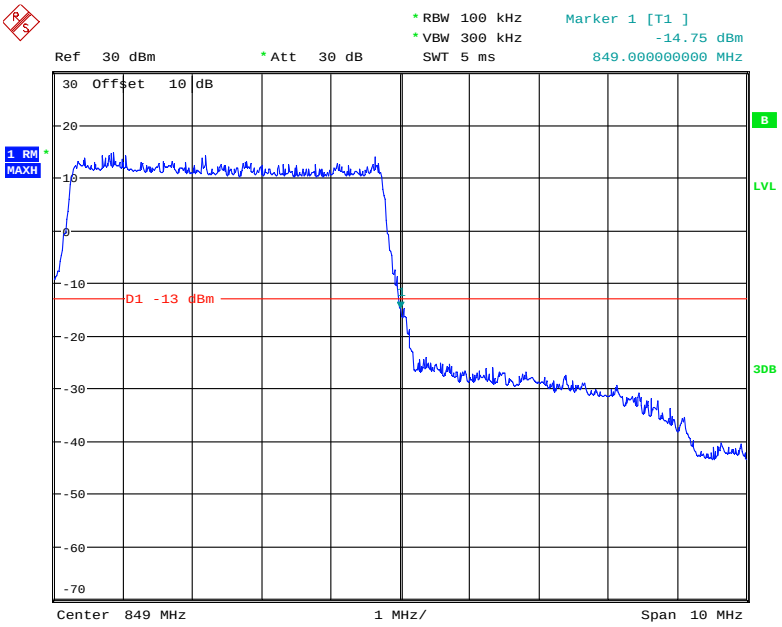
QPSK_5MHz_ 25 RB_ Left



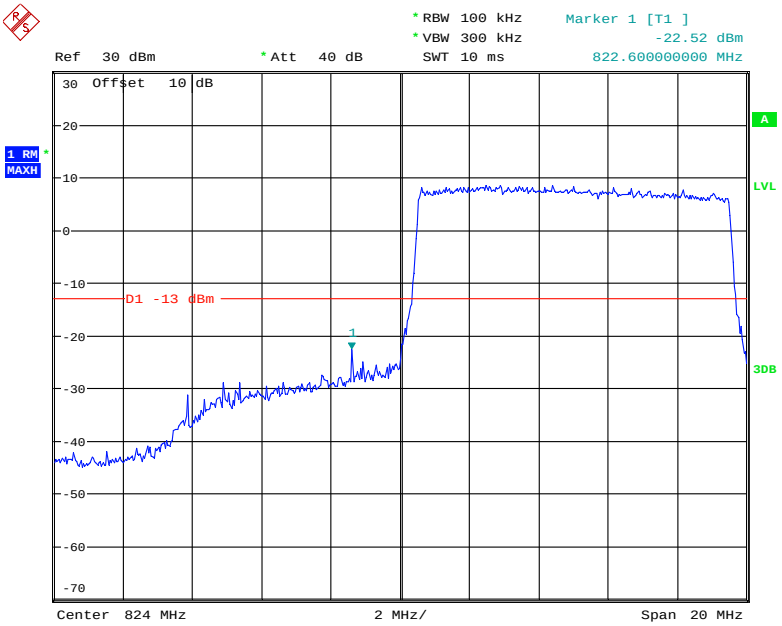
Date: 19.JAN.2018 23:26:48

QPSK_5MHz_ 25 RB_ Right



Date: 19.JAN.2018 23:32:02

QPSK_10MHz_ 50 RB_ Left



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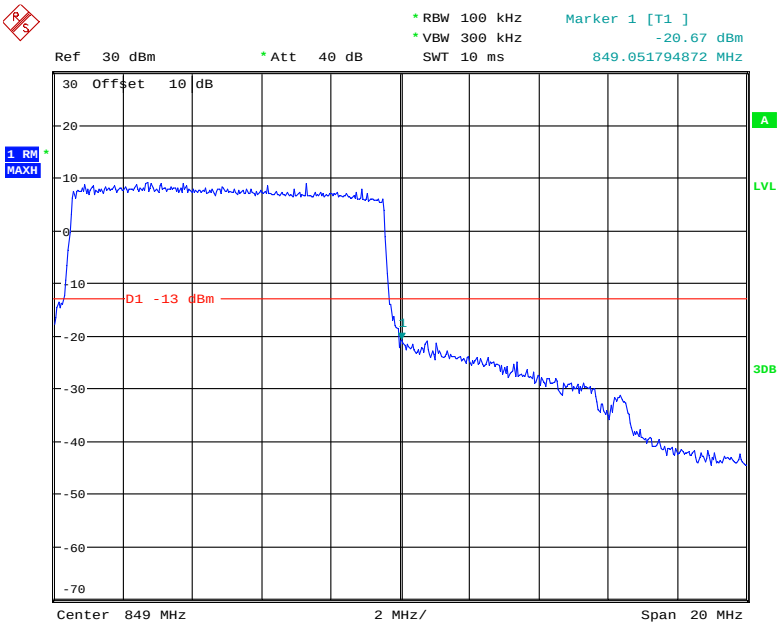
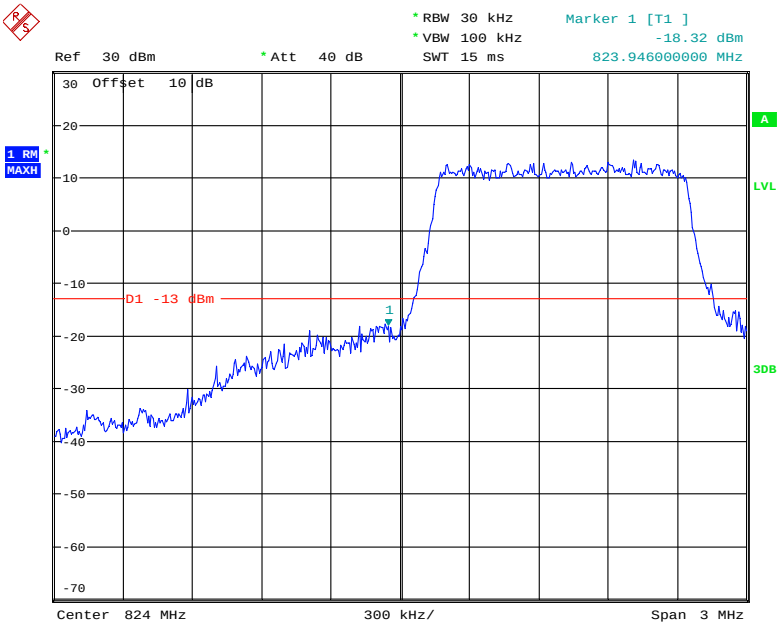
QPSK_10MHz_ 50 RB_ Right



Date: 21.DEC.2017 23:53:53

16QAM_1.4MHz_ 6 RB_ Left



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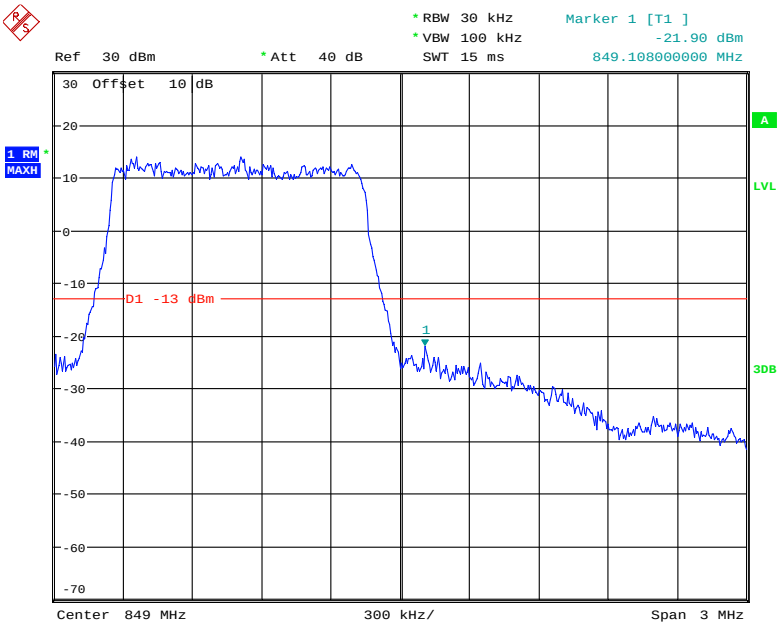
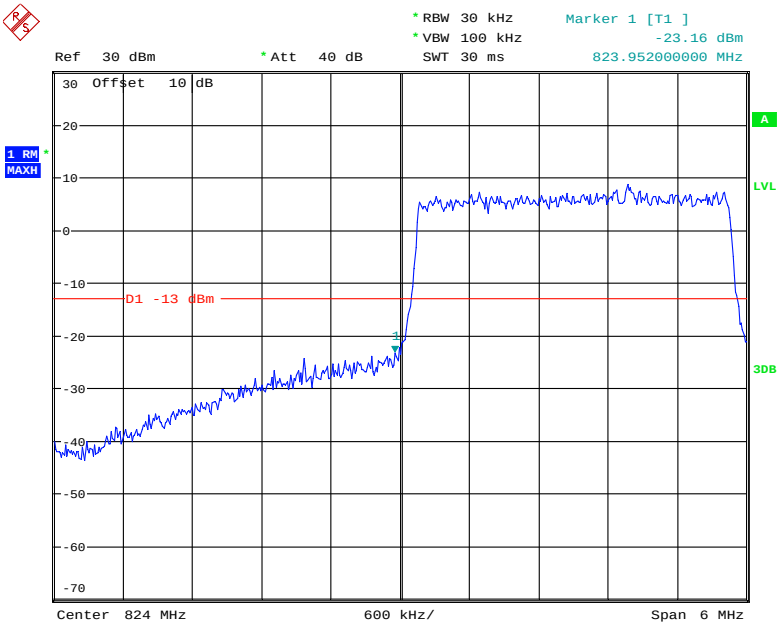
16QAM_1.4MHz_ 6 RB_ Right



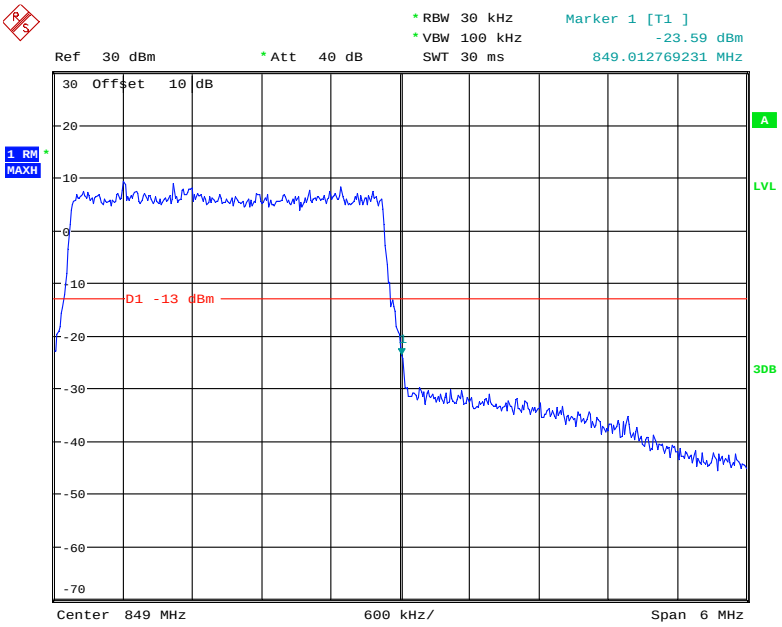
Date: 21.DEC.2017 23:36:50

16QAM_3MHz_ 15 RB_ Left



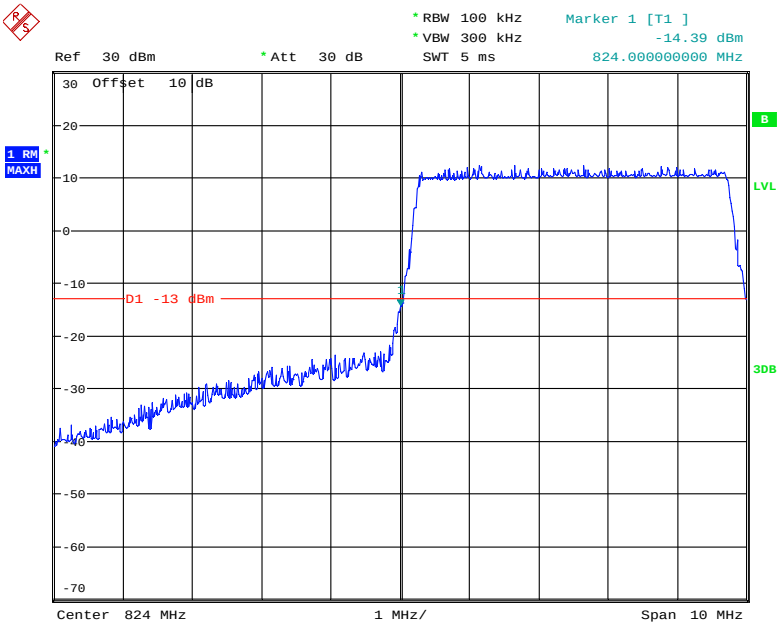
Date: 21.DEC.2017 23:41:25

16QAM_3MHz_ 15 RB_ Right



Date: 21.DEC.2017 23:39:33

16QAM_5MHz_ 25 RB_ Left



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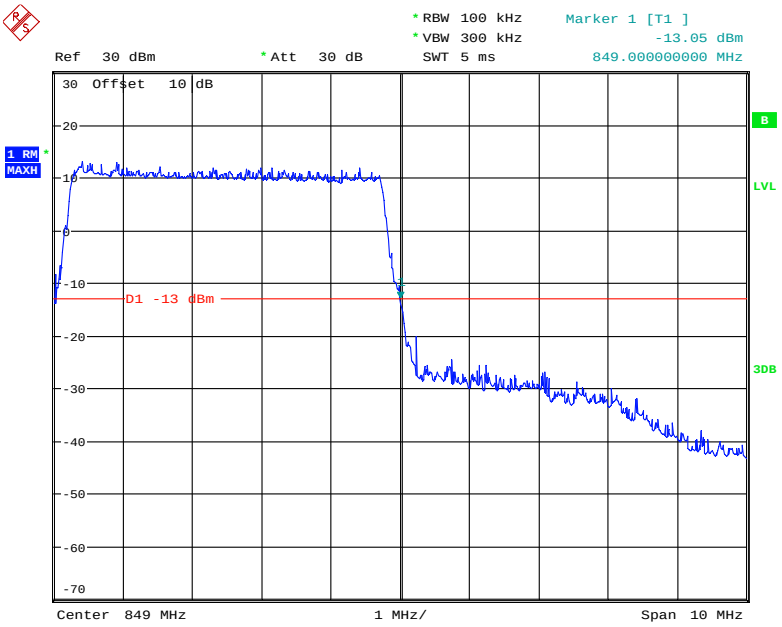
16QAM_5MHz_ 25 RB_ Right



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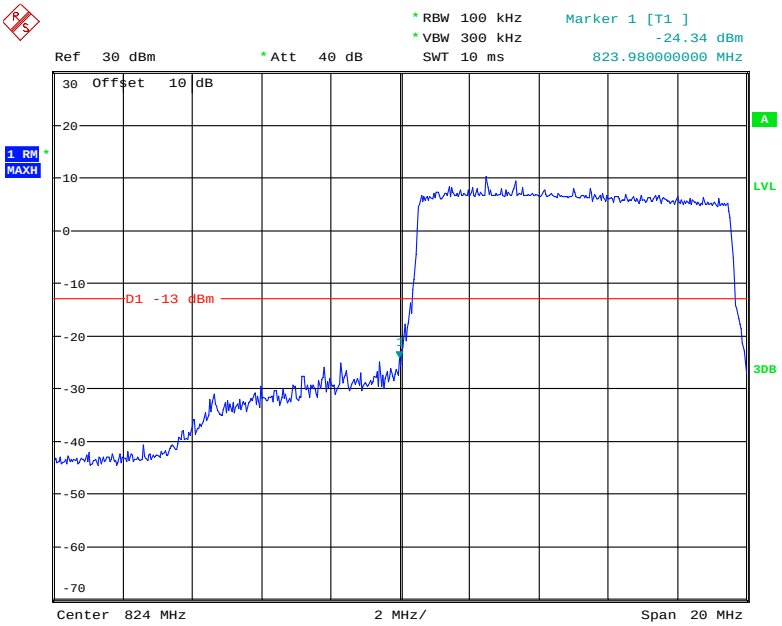
16QAM_10MHz_ 50 RB_ Left



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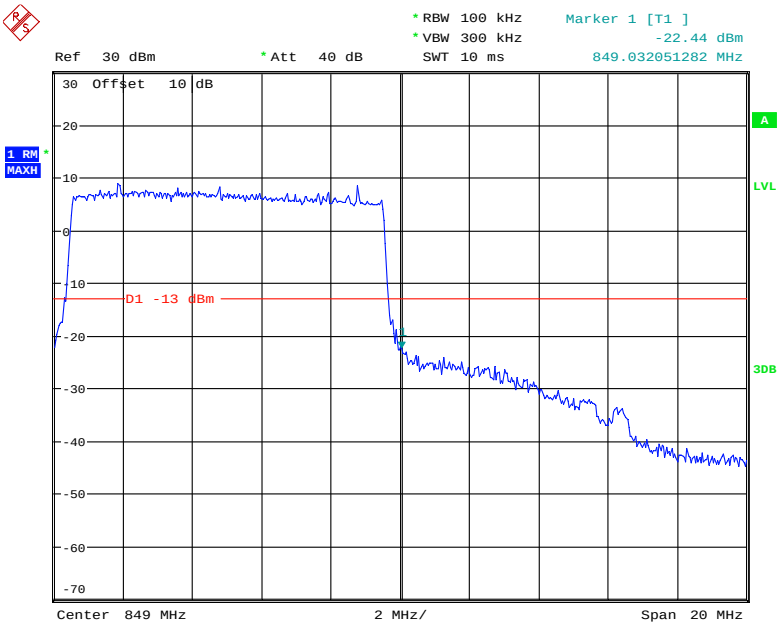
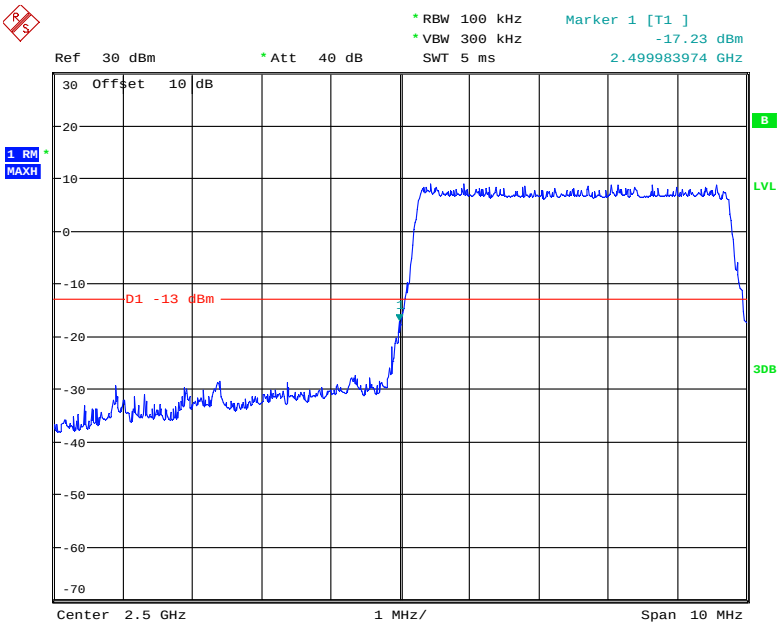
16QAM_10MHz_ 50 RB_ Right



Date: 21.DEC.2017 23:53:03

LTE Band VII

QPSK_5MHz_ 25 RB_ Left



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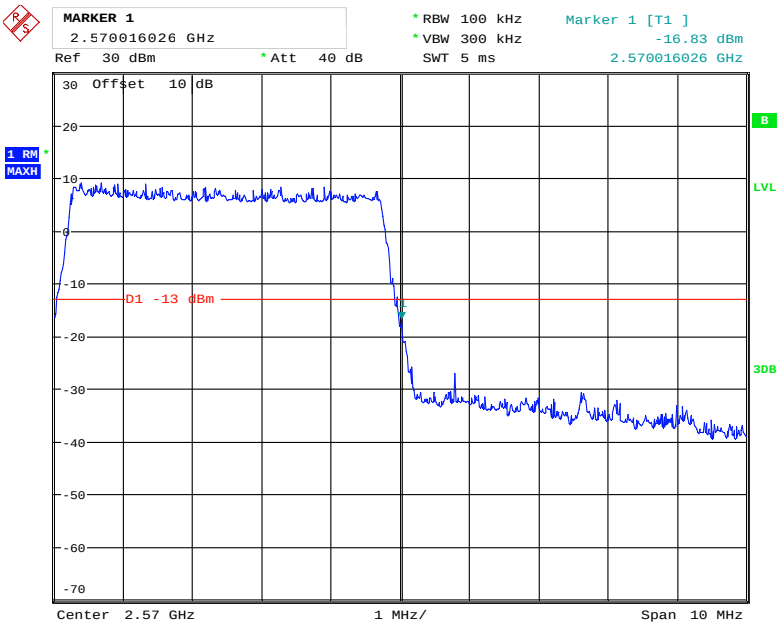
QPSK_5MHz_ 25 RB_ Right



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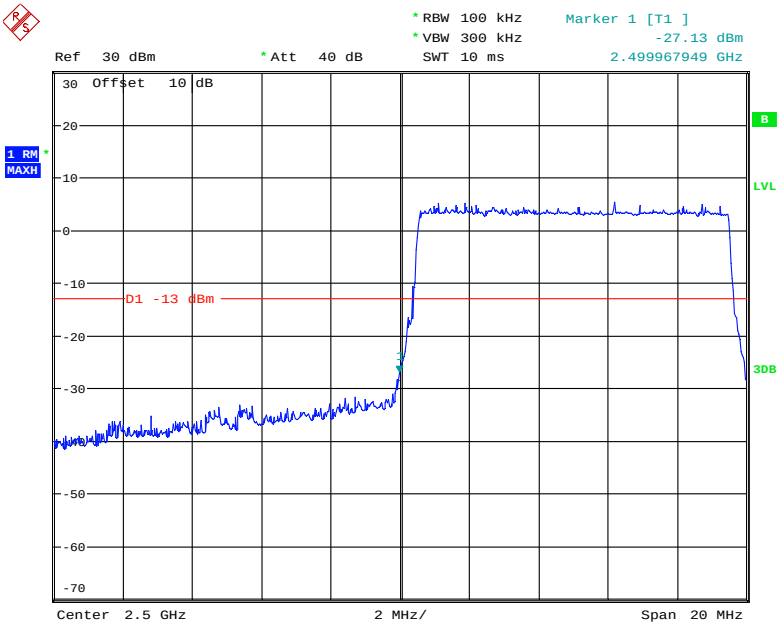
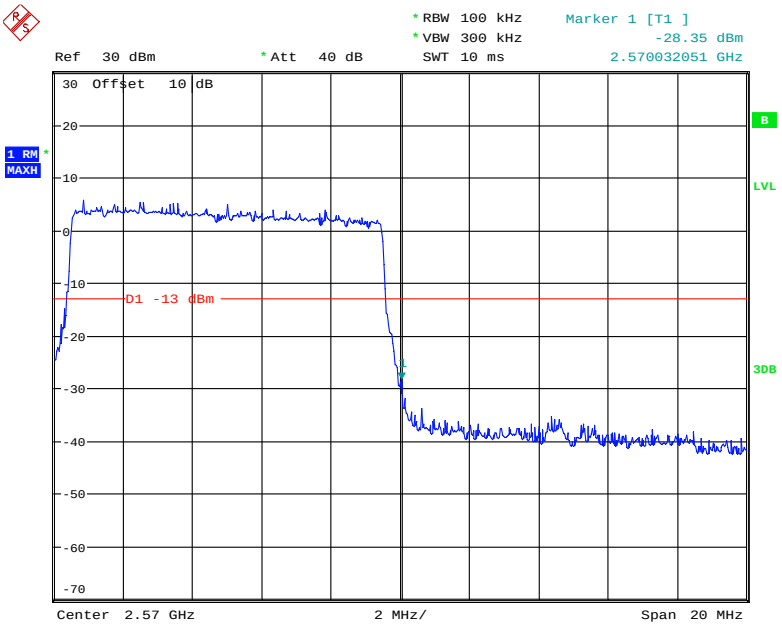
QPSK_10MHz_ 50 RB_ Left



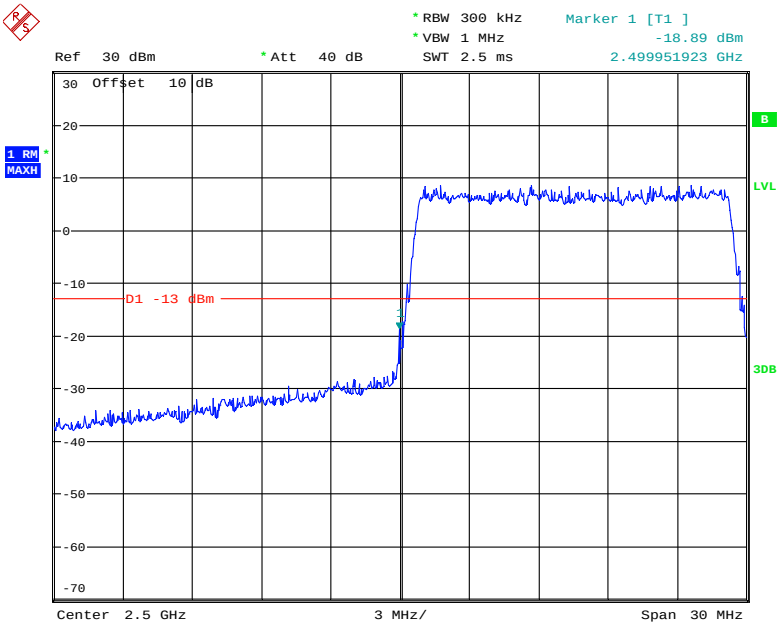
Date: 17.DEC.2017 13:42:44

QPSK_10MHz_ 50 RB_ Right



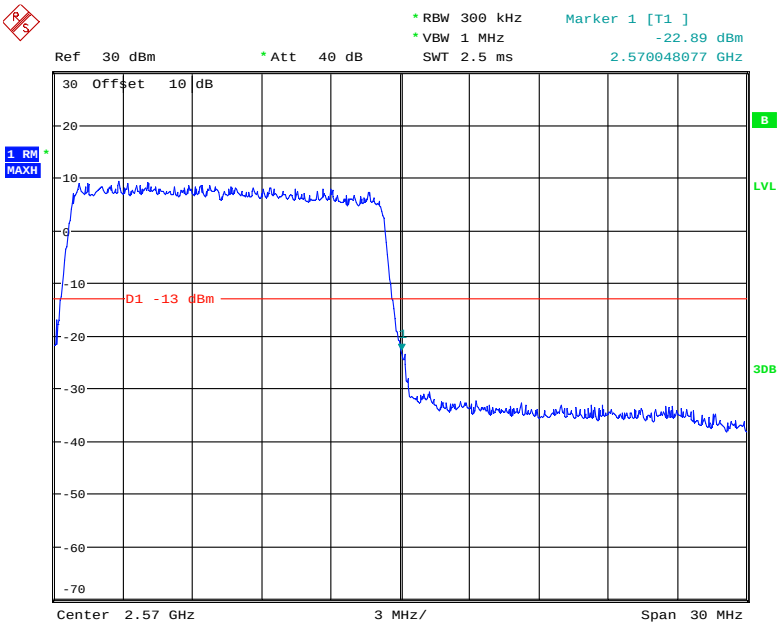
Date: 17.DEC.2017 13:41:49

QPSK_15MHz_ 75 RB_ Left



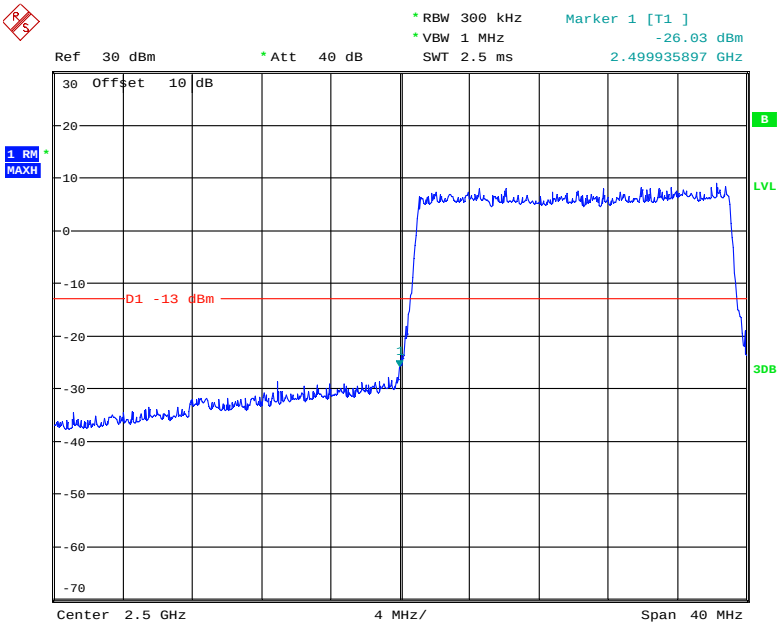
Date: 17.DEC.2017 13:47:41

QPSK_15MHz_ 75 RB_ Right



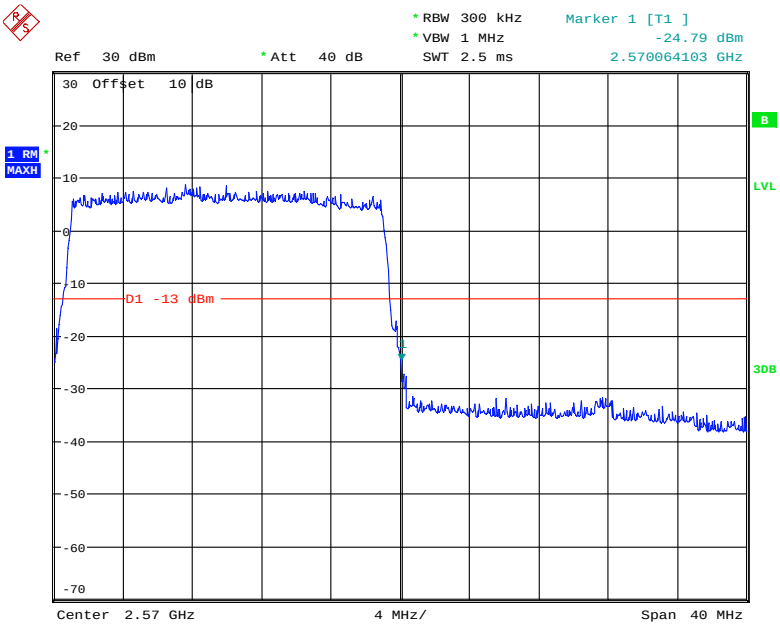
Date: 17.DEC.2017 13:48:38

QPSK_20MHz_ FULL RB_ Left



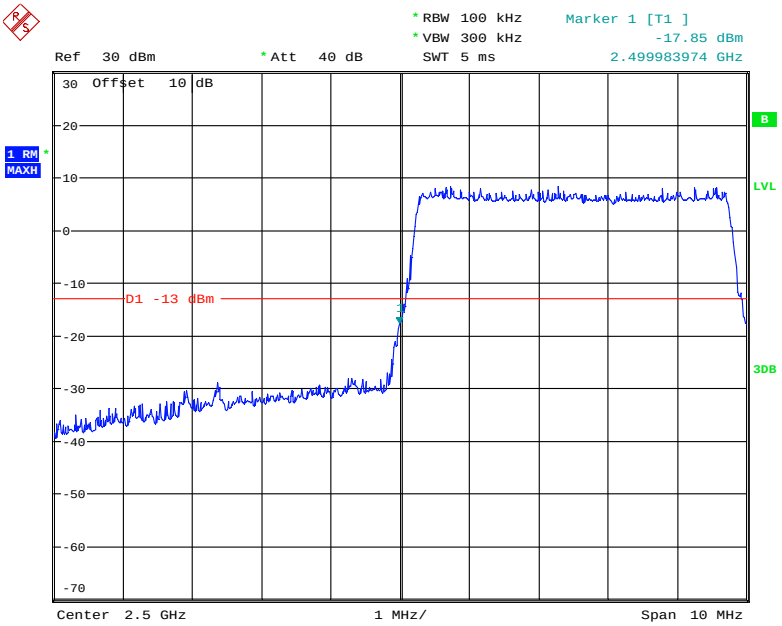
Date: 17.DEC.2017 13:51:36

QPSK_20MHz_ FULL RB_ Right



Date: 17.DEC.2017 13:59:01

16QAM_5MHz_ 25 RB_ Left



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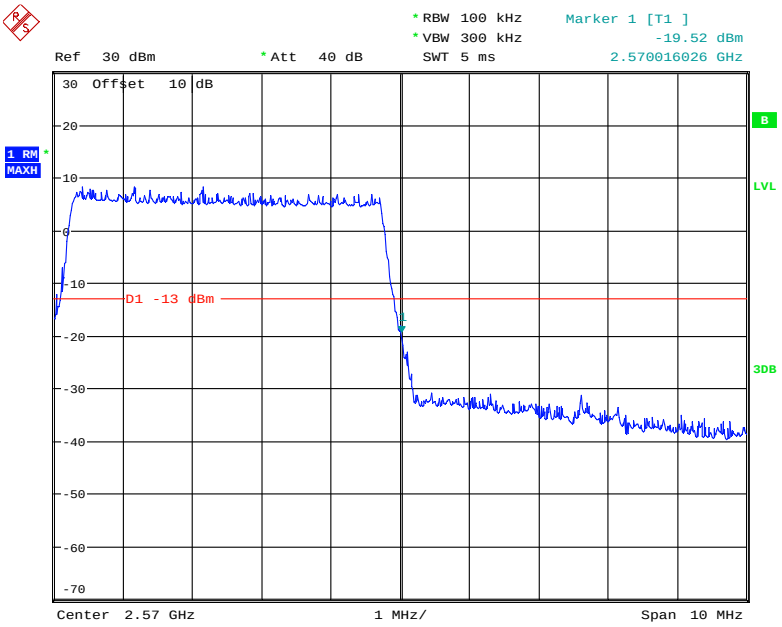
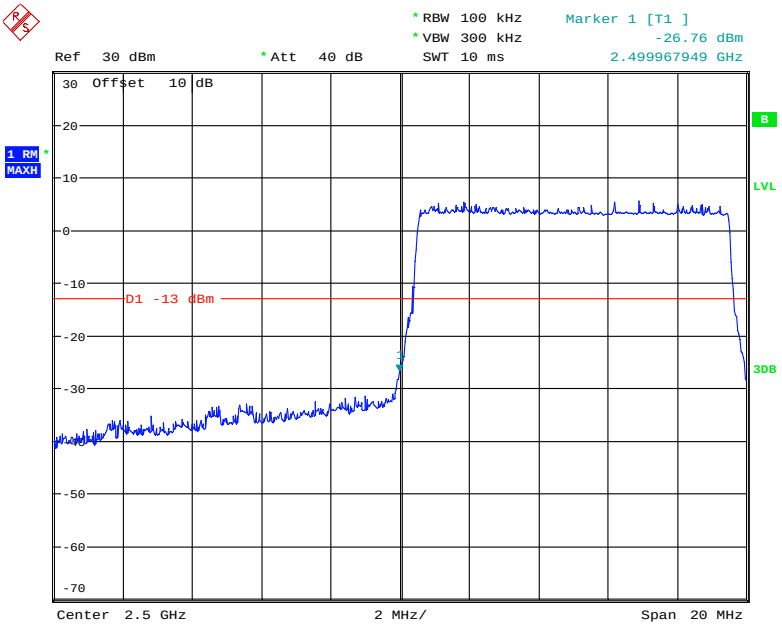
16QAM_5MHz_ 25 RB_ Right



Date: 17.DEC.2017 13:38:24

16QAM_10MHz_ 50 RB_ Left



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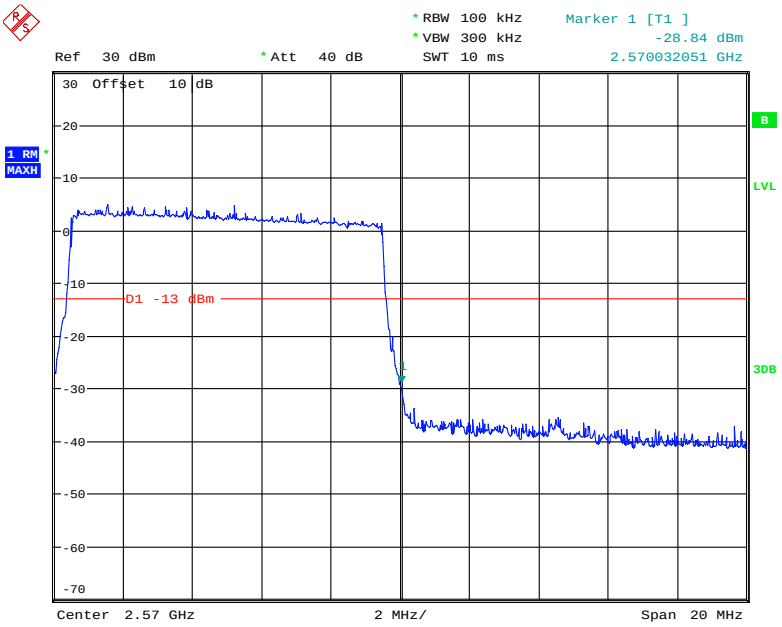
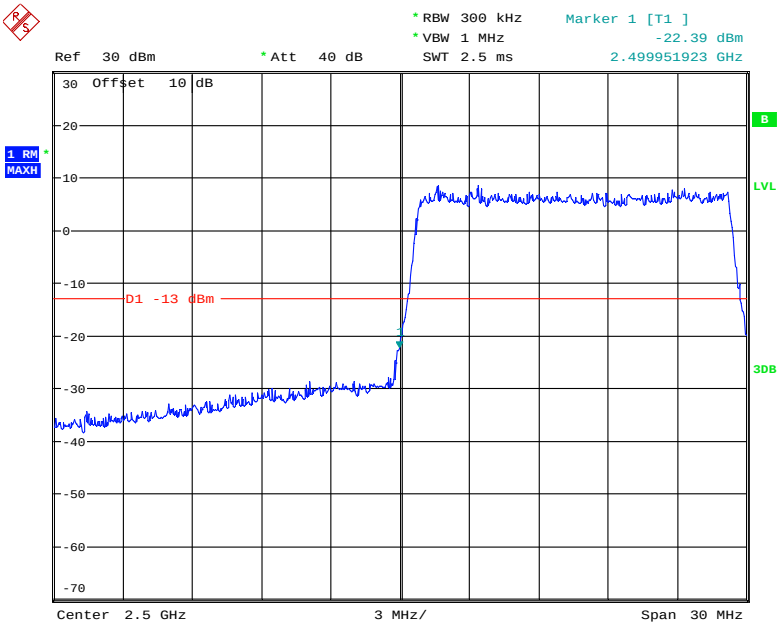
16QAM_10MHz_ 50 RB_ Right



Date: 17.DEC.2017 13:41:13

16QAM_15MHz_ 75 RB_ Left



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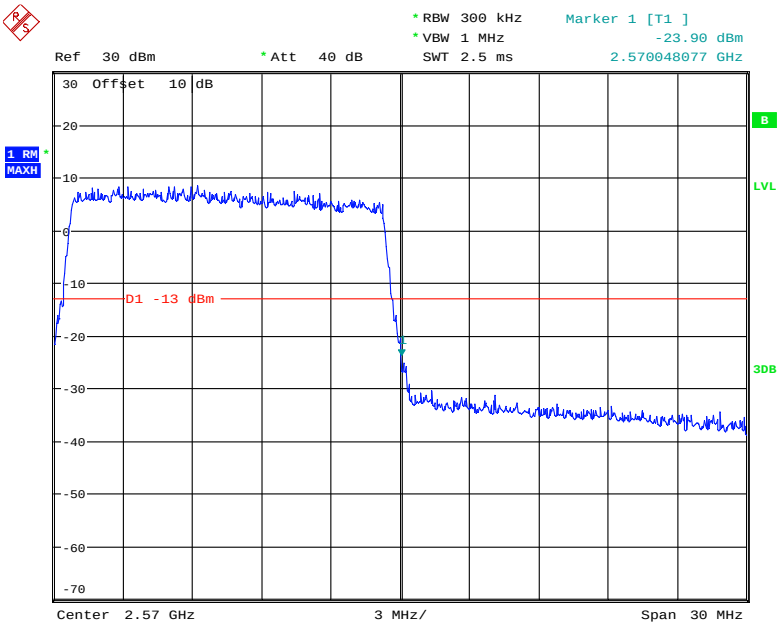
16QAM_15MHz_ 75 RB_ Right



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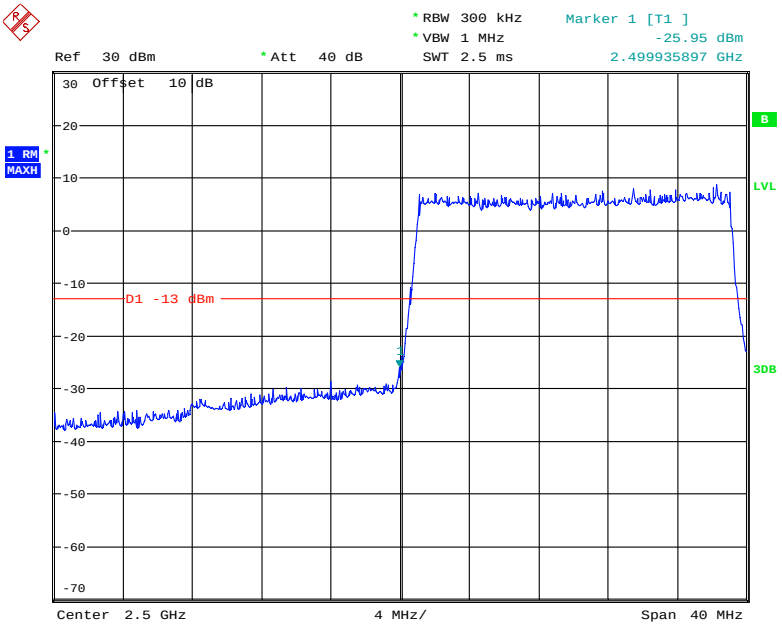
16QAM_20MHz_ FULL RB_ Left



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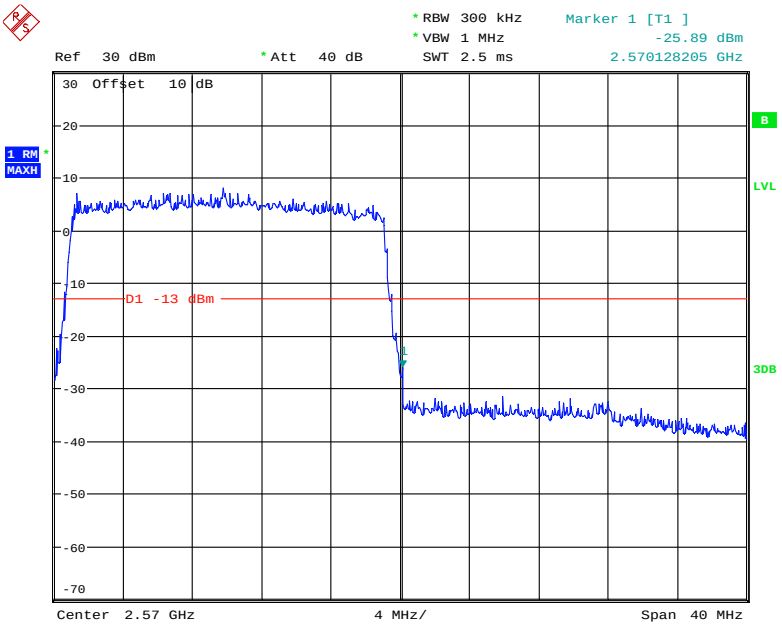
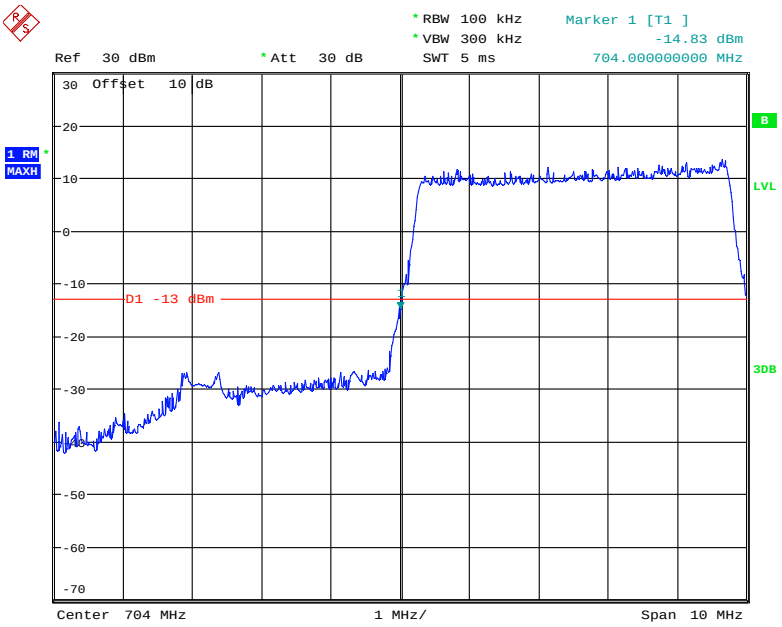
16QAM_20MHz_ FULL RB_ Right



Date: 17.DEC.2017 13:57:35

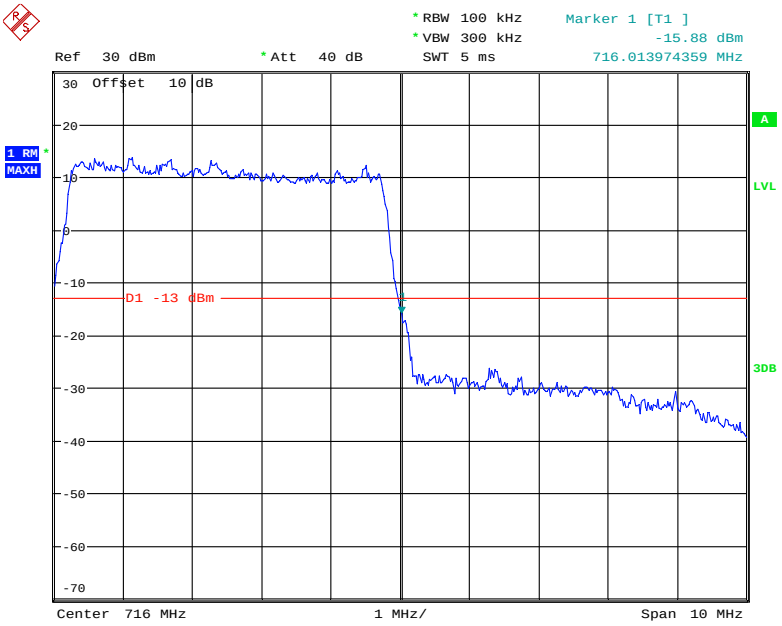
LTE Band XVII

QPSK_5MHz_ 25 RB_ Left



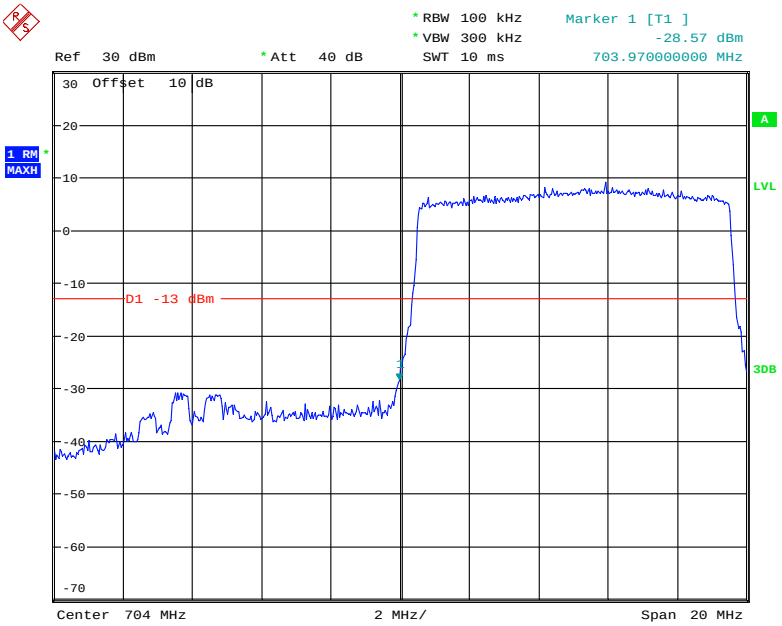
Date: 19.JAN.2018 23:42:28

QPSK_5MHz_ 25 RB_ Right



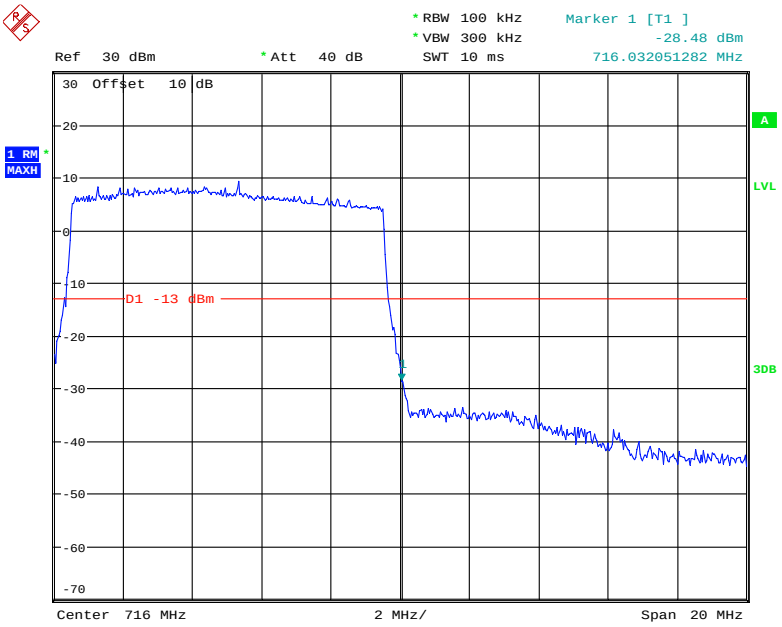
Date: 22.DEC.2017 00:04:02

QPSK_10MHz_ 50 RB_ Left



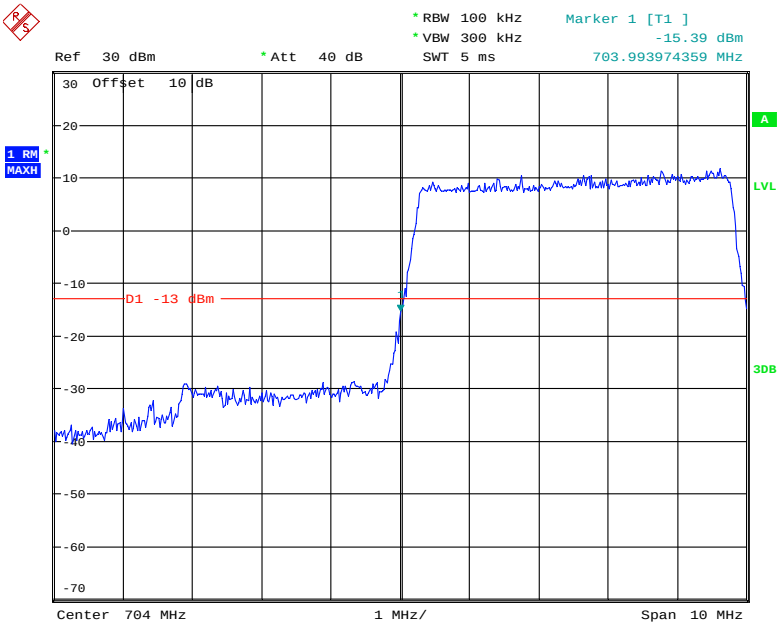
Date: 22.DEC.2017 00:00:29

QPSK_10MHz_ 50 RB_ Right



Date: 22.DEC.2017 00:01:17

16QAM_5MHz_ 25 RB_ Left



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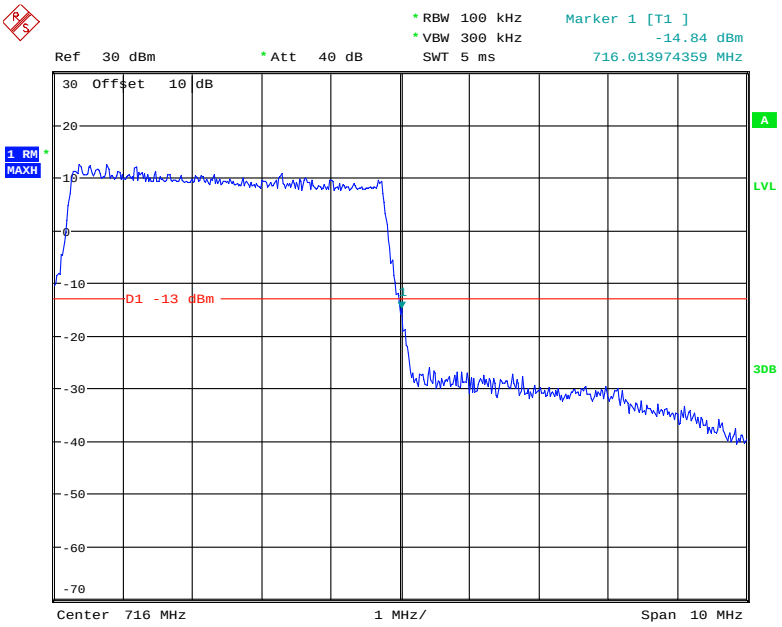
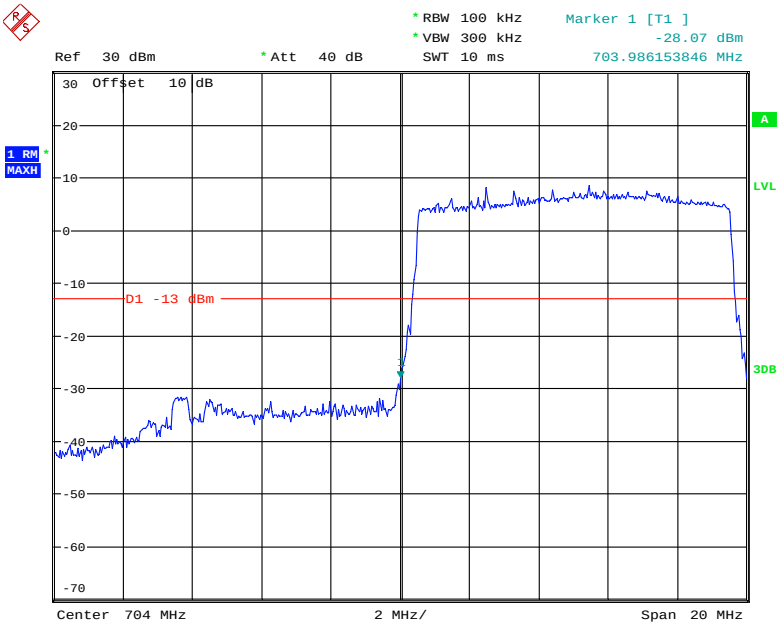
16QAM_5MHz_ 25 RB_ Right



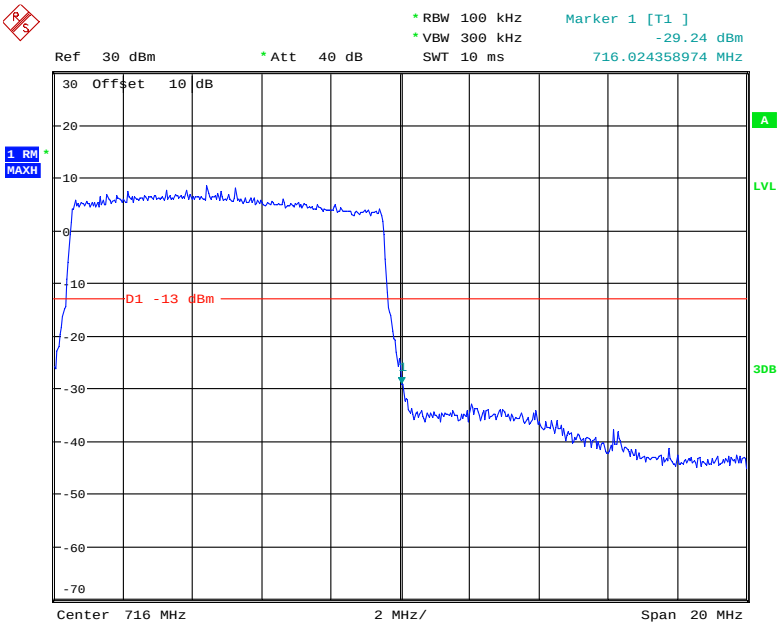
Date: 22.DEC.2017 00:04:37

16QAM_10MHz_ 50 RB_ Left



Date: 21.DEC.2017 23:59:49

16QAM_10MHz_ 50 RB_ Right



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FCC §2.1055, §22.355 & §24.235 & §27.54 - FREQUENCY STABILITY

Applicable Standard

FCC § 2.1055 (a), § 2.1055 (d), §22.355, §24.235， §27.54

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

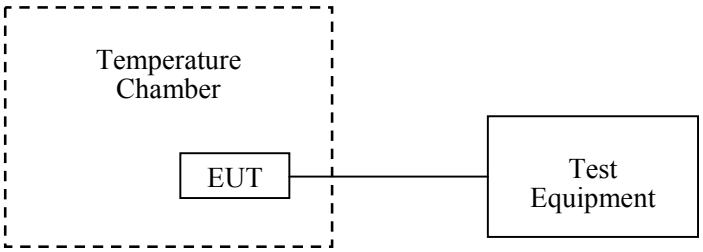
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

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: An external variable DC power supply was connected to the battery terminals of the equipment under test. The voltage was set from 85% to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the battery end point. The output frequency was recorded for each battery voltage.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Dongzhixu	High Temperature Test Chamber	DP1000	201105083-4	2017-09-10	2018-09-09
R&S	Universal Radio Communication Tester	CMU200	109 038	2017-07-18	2018-07-18
R&S	Wideband Radio Communication Tester	CMW500	110479	2017-03-08	2018-03-08
UNI-T	Multimeter	UT39A	M130199938	2017-04-02	2018-04-02
E-Microwave	RF Attenuator	6dB	6dB-1	Each Time	/
N/A	Coaxial Cable	C-SJ00-0010	C0010/01	Each Time	/
Pro instrument	DC Power Supply	pps3300	N/A	N/A	N/A

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	19.2~25.4 °C
Relative Humidity:	34~41 %
ATM Pressure:	102~102.2 kPa

The testing was performed by Mark Pan from 2017-12-15 to 2017-12-18.

Cellular Band (Part 22H)

GMSK, Middle Channel, f_c = 836.6 MHz				
Temperature	**Voltage**	**Frequency Error**	**Frequency Error**	**Limit**
℃	**V_{DC}**	**Hz**	**ppm**	**ppm**
-30	3.8	29	0.035	2.5
-20		12	0.014	
-10		-10	-0.012	
0		3	0.004	
10		4	0.005	
20		10	0.012	
30		11	0.013	
40		8	0.010	
50		20	0.024	
25	3.6	14	0.017	
25	4.35	8	0.010	

8PSK, Middle Channel, f_c = 836.6 MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Limit
℃	V_{DC}	Hz	ppm	ppm
-30	3.8	-5	-0.006	2.5
-20		-10	-0.012	
-10		4	0.005	
0		6	0.007	
10		16	0.019	
20		3	0.004	
30		5	0.006	
40		-13	-0.016	
50		9	0.011	
25	3.6	10	0.012	
25	4.35	15	0.018	

WCDMA Band V: R99, Middle Channel, fc = 836.6 MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Limit
℃	V_{DC}	Hz	ppm	ppm
-30	3.8	12	0.014	2.5
-20		2	0.002	
-10		-6	-0.007	
0		-6	-0.007	
10		12	0.014	
20		12	0.014	
30		-10	-0.012	
40		-4	-0.005	
50		-7	-0.008	
25	3.6	-8	-0.010	
25	4.35	-2	-0.002	

PCS Band (Part 24E)

GMSK, Middle Channel, f_c = 1880.0 MHz				
Temperature	**Voltage**	**Frequency Error**	**Frequency Error**	**Results**
℃	**V_{DC}**	**Hz**	**ppm**	
-30	3.8	10	0.005	Pass
-20		41	0.022	
-10		36	0.019	
0		21	0.011	
10		21	0.011	
20		13	0.007	
30		25	0.013	
40		36	0.019	
50		39	0.021	
25	3.6	28	0.015	
25	4.35	22	0.012	

8PSK, Middle Channel, f_c = 1880.0 MHz				
Temperature	**Voltage**	**Frequency Error**	**Frequency Error**	**Results**
℃	**V_{DC}**	**Hz**	**ppm**	
-30	3.8	3	0.002	Pass
-20		42	0.022	
-10		19	0.010	
0		10	0.005	
10		5	0.003	
20		20	0.011	
30		9	0.005	
40		10	0.005	
50		39	0.021	
25	3.6	32	0.017	
25	4.35	27	0.014	

WCDMA Band II: R99, Middle Channel, f_c = 1880.0 MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Results
℃	V_{DC}	Hz	ppm	
-30	3.8	4	0.002	Pass
-20		-5	-0.003	
-10		0	0.000	
0		6	0.003	
10		6	0.003	
20		8	0.004	
30		12	0.006	
40		7	0.004	
50		12	0.006	
25	3.6	1	0.001	
25	4.35	7	0.004	

LTE Band 2:

QPSK, Channel Bandwidth:10MHz Middle Channel, f_c = 1880 MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Result
℃	V_{DC}	Hz	ppm	
-30	3.8	-4.22	-0.0022	Pass
-20		-4.44	-0.0024	Pass
-10		-5.20	-0.0028	Pass
0		-3.25	-0.0017	Pass
10		-2.30	-0.0012	Pass
20		-5.86	-0.0031	Pass
30		-5.37	-0.0029	Pass
40		-5.67	-0.0030	Pass
50		-5.55	-0.0030	Pass
25	3.6	-4.44	-0.0024	Pass
25	4.35	-4.27	-0.0023	Pass

16QAM, Channel Bandwidth:10MHz Middle Channel, f_c =1880 MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Result
℃	V_{DC}	Hz	ppm	
-30	3.8	-6.35	-0.0034	Pass
-20		-4.46	-0.0024	Pass
-10		-6.62	-0.0035	Pass
0		-5.46	-0.0029	Pass
10		-5.44	-0.0029	Pass
20		-3.90	-0.0021	Pass
30		-3.24	-0.0017	Pass
40		-4.29	-0.0023	Pass
50		-3.35	-0.0018	Pass
25	3.6	-3.62	-0.0019	Pass
25	4.35	-5.22	-0.0028	Pass

LTE Band 4:

QPSK, Channel Bandwidth:10MHz Middle Channel, f_c = 1732.5 MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Result
℃	V_{DC}	Hz	ppm	
-30	3.8	0.69	0.0004	Pass
-20		0.48	0.0003	Pass
-10		0.71	0.0004	Pass
0		1.00	0.0006	Pass
10		0.33	0.0002	Pass
20		0.92	0.0005	Pass
30		0.83	0.0005	Pass
40		0.60	0.0003	Pass
50		0.71	0.0004	Pass
25	3.6	0.21	0.0001	Pass
25	4.35	0.17	0.0001	Pass

16QAM, Channel Bandwidth:10MHz Middle Channel, f_c =1732.5 MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Result
℃	V_{DC}	Hz	ppm	
-30	3.8	-0.07	0.0000	Pass
-20		0.06	0.0000	Pass
-10		-0.44	-0.0003	Pass
0		-0.58	-0.0003	Pass
10		-0.78	-0.0005	Pass
20		0.60	0.0003	Pass
30		-0.24	-0.0001	Pass
40		0.02	0.0000	Pass
50		0.25	0.0001	Pass
25	3.6	-0.45	-0.0003	Pass
25	4.35	-0.26	-0.0002	Pass

LTE Band 5:

QPSK, Channel Bandwidth:10MHz Middle Channel, f_c = 836.5 MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Limit
℃	V_{DC}	Hz	ppm	ppm
-30	3.8	-1.27	-0.0015	2.5
-20		-1.21	-0.0014	2.5
-10		-1.42	-0.0017	2.5
0		0.10	0.0001	2.5
10		0.05	0.0001	2.5
20		-1.13	-0.0014	2.5
30		-0.97	-0.0012	2.5
40		-0.58	-0.0007	2.5
50		-0.81	-0.0010	2.5
25	3.6	-0.99	-0.0012	2.5
25	4.35	-0.34	-0.0004	2.5

16QAM, Channel Bandwidth:10MHz Middle Channel, f_c =836.5 MHz				
Temperature	**Voltage**	**Frequency Error**	**Frequency Error**	**Limit**
℃	**V_{DC}**	**Hz**	**ppm**	**ppm**
-30	3.8	-1.49	-0.0018	2.5
-20		-1.80	-0.0022	2.5
-10		-0.37	-0.0004	2.5
0		-1.55	-0.0019	2.5
10		-1.12	-0.0013	2.5
20		-1.68	-0.0020	2.5
30		0.27	0.0003	2.5
40		-0.26	-0.0003	2.5
50		-0.35	-0.0004	2.5
25	3.6	-0.46	-0.0005	2.5
25	4.35	0.19	0.0002	2.5

LTE Band 7:

QPSK, Channel Bandwidth:10MHz Middle Channel, f_c = 2535 MHz				
Temperature	**Voltage**	**Frequency Error**	**Frequency Error**	**Result**
℃	**V_{DC}**	**Hz**	**ppm**	
-30	3.8	-3.07	-0.0012	Pass
-20		-1.79	-0.0007	Pass
-10		-3.37	-0.0013	Pass
0		-3.81	-0.0015	Pass
10		-3.88	-0.0015	Pass
20		-3.39	-0.0013	Pass
30		-2.81	-0.0011	Pass
40		-2.68	-0.0011	Pass
50		-3.74	-0.0015	Pass
25	3.6	-1.76	-0.0007	Pass
25	4.35	-3.18	-0.0013	Pass

16QAM, Channel Bandwidth:10MHz Middle Channel, f_c =2535 MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Result
℃	V_{DC}	Hz	ppm	
-30	3.8	-2.19	-0.0009	Pass
-20		-2.15	-0.0008	Pass
-10		-3.26	-0.0013	Pass
0		-1.26	-0.0005	Pass
10		-1.08	-0.0004	Pass
20		-2.96	-0.0012	Pass
30		-2.18	-0.0009	Pass
40		-1.33	-0.0005	Pass
50		-2.86	-0.0011	Pass
25	3.6	-3.23	-0.0013	Pass
25	4.35	-2.40	-0.0009	Pass

LTE Band 17:

QPSK, Channel Bandwidth:10MHz Middle Channel, f_c = 710 MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Result
℃	V_{DC}	Hz	ppm	
-30	3.8	-3.24	-0.0046	Pass
-20		-2.12	-0.0030	Pass
-10		-2.25	-0.0032	Pass
0		-2.35	-0.0033	Pass
10		-2.04	-0.0029	Pass
20		-2.12	-0.0030	Pass
30		-2.17	-0.0031	Pass
40		-2.20	-0.0031	Pass
50		-2.09	-0.0029	Pass
25	3.6	-2.38	-0.0034	Pass
25	4.35	-2.24	-0.0032	Pass

16QAM, Channel Bandwidth:10MHz Middle Channel, f_c = 710 MHz				
Temperature	**Voltage**	**Frequency Error**	**Frequency Error**	**Result**
℃	**V_{DC}**	**Hz**	**ppm**	
-30	3.8	-1.57	-0.0022	Pass
-20		-1.79	-0.0025	Pass
-10		-2.46	-0.0035	Pass
0		-1.54	-0.0022	Pass
10		-1.78	-0.0025	Pass
20		-1.30	-0.0018	Pass
30		-1.38	-0.0019	Pass
40		0.03	0.0000	Pass
50		-0.41	-0.0006	Pass
25	3.6	-0.56	-0.0008	Pass
25	4.35	-0.78	-0.0011	Pass

Note: The fundamental emissions stay within the authorized bands of operation based on the frequency deviation measured is small, the extreme voltage was declared by applicant.

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