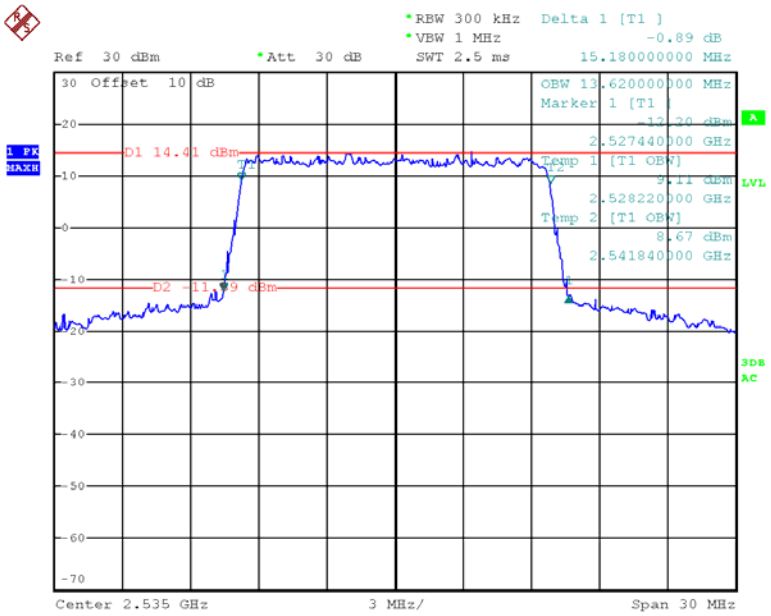
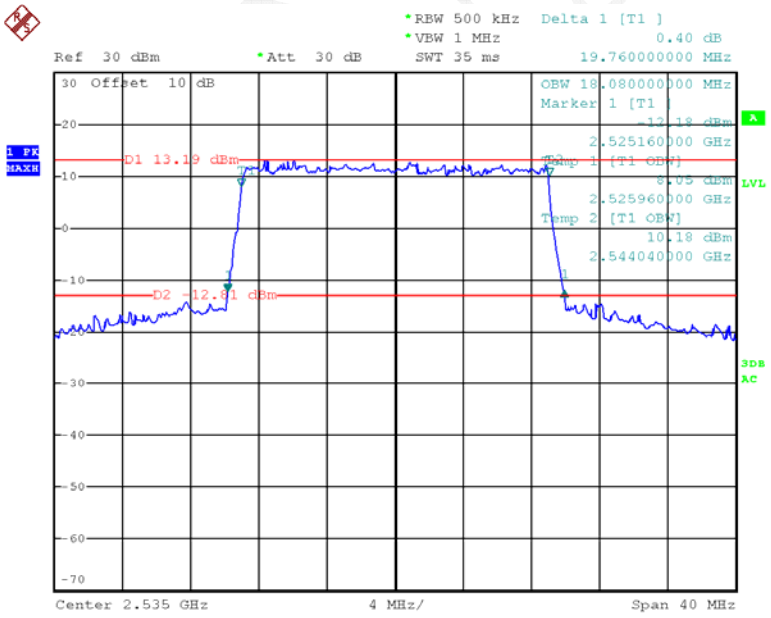
16QAM_15 MHz



Date: 14.JUN.2016 00:16:14

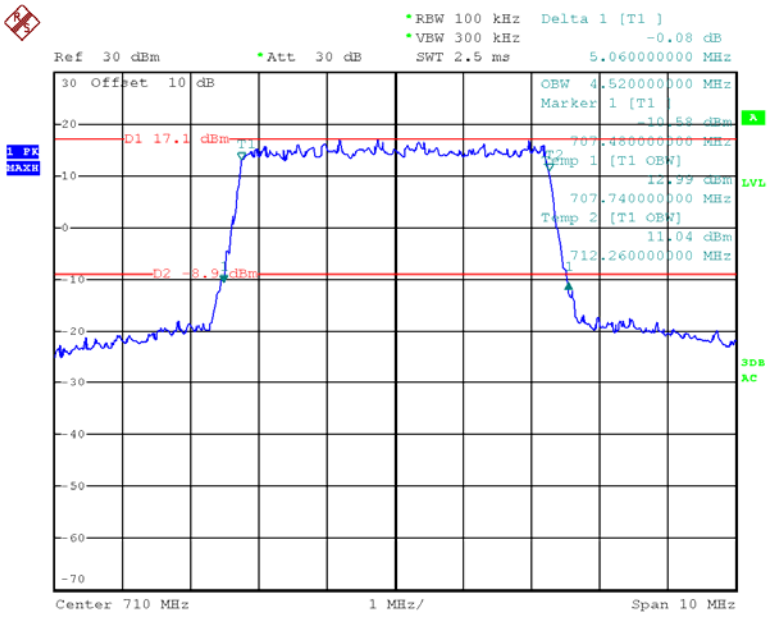
16QAM_20 MHz



Date: 14.JUN.2016 00:17:27

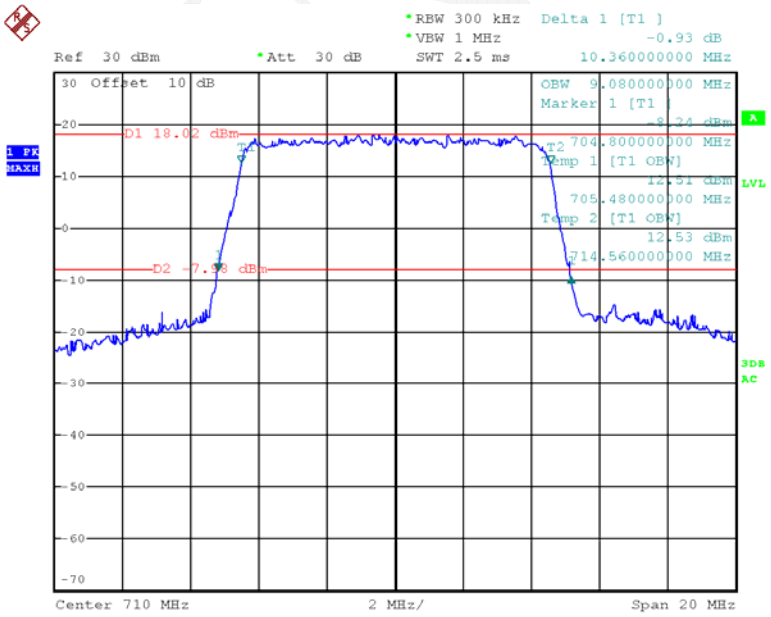
LTE Band 17

QPSK_5 MHz



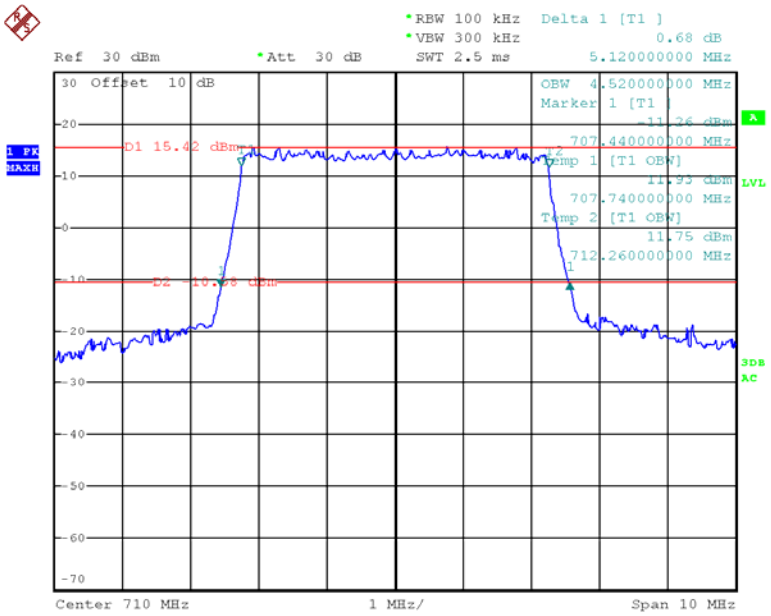
Date: 14.JUN.2016 00:22:16

QPSK_10 MHz



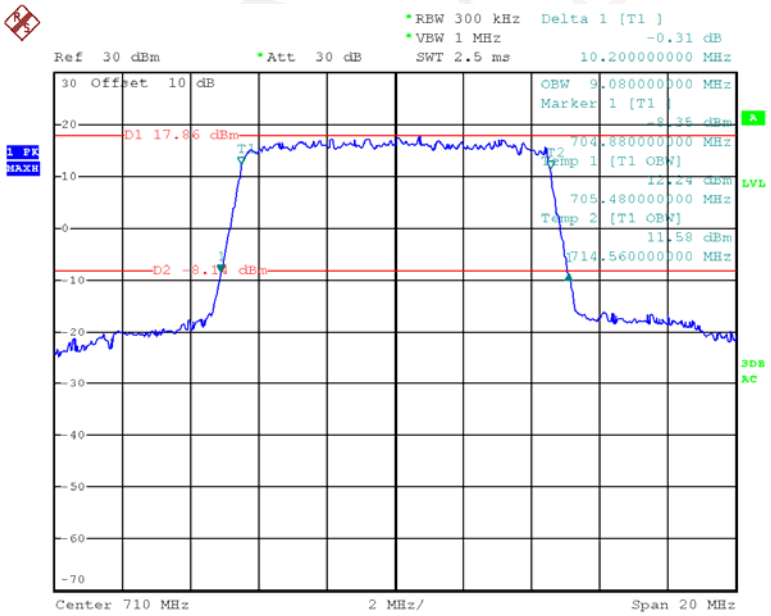
Date: 14.JUN.2016 00:23:02

16QAM_5 MHz



Date: 14.JUN.2016 00:21:35

16QAM_10 MHz



Date: 14.JUN.2016 00:23:39

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

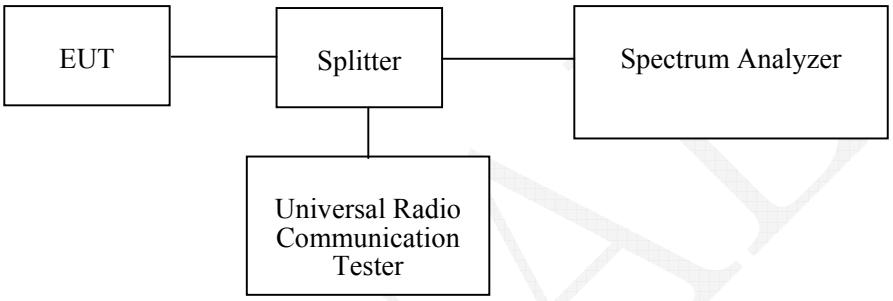
Applicable Standard

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	Spectrum Analyzer	FSP 38	100478	2015-11-23	2016-11-22
R&S	Spectrum Analyzer	FSEM	831259/019	2015-07-28	2016-07-27
R&S	Universal Radio Communication Tester	CMU200	109 038	2015-07-28	2016-07-27
R&S	Wideband Radio Communication Tester	CMW500	106891	2015-11-23	2016-11-23
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06
E-Microwave	Attenuator	EMCA10-5RN	OE01203239	2016-05-08	2017-05-08
Pasternack	RF Coaxial Cable	RF-01	N/A	2016-05-06	2017-05-06
Pasternack	RF Coaxial Cable	RF-02	N/A	2016-05-06	2017-05-06
N/A	Two-way Spliter	ODP-1-6-2S	OE0120142	2016-05-06	2017-05-06

*** 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

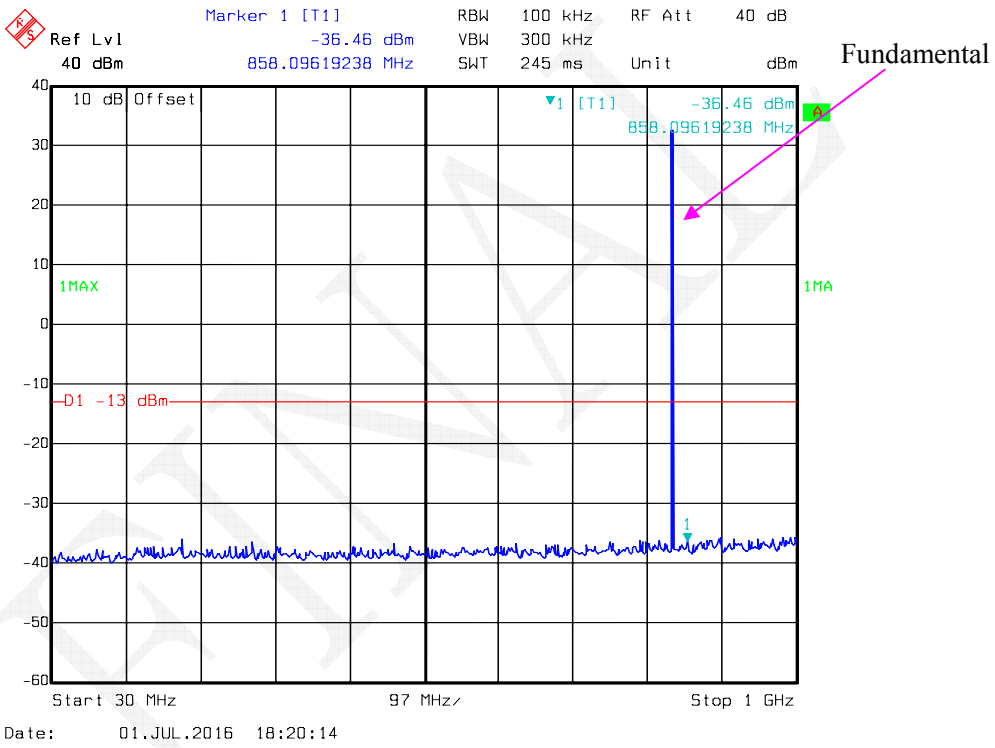
Environmental Conditions

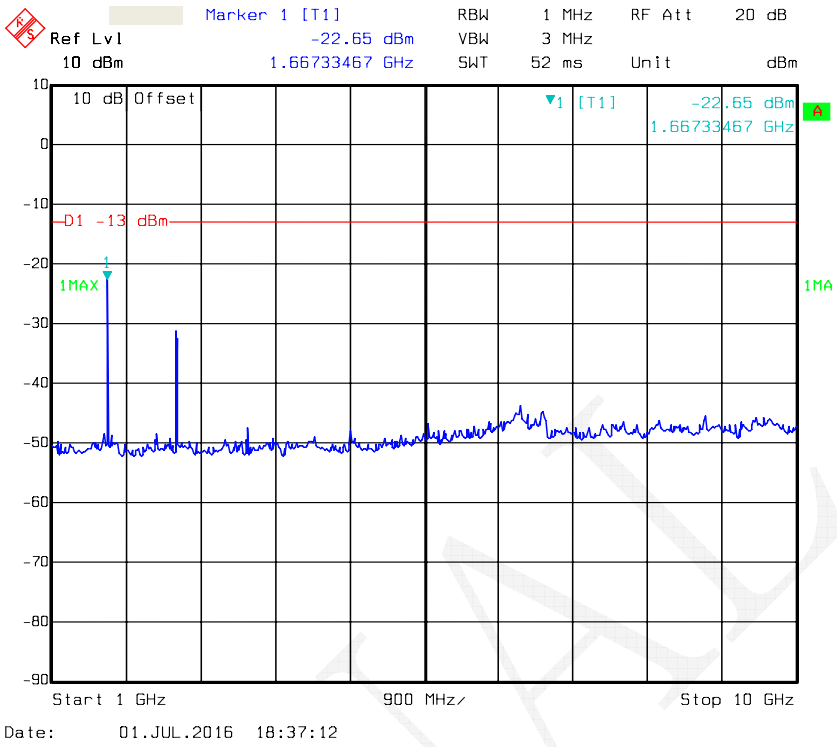
Temperature:	28.5 °C
Relative Humidity:	39 %
ATM Pressure:	100.1 ~ 100.4 kPa

The testing was performed by Lion Xiao from 2016-06-30 to 2016-07-01.

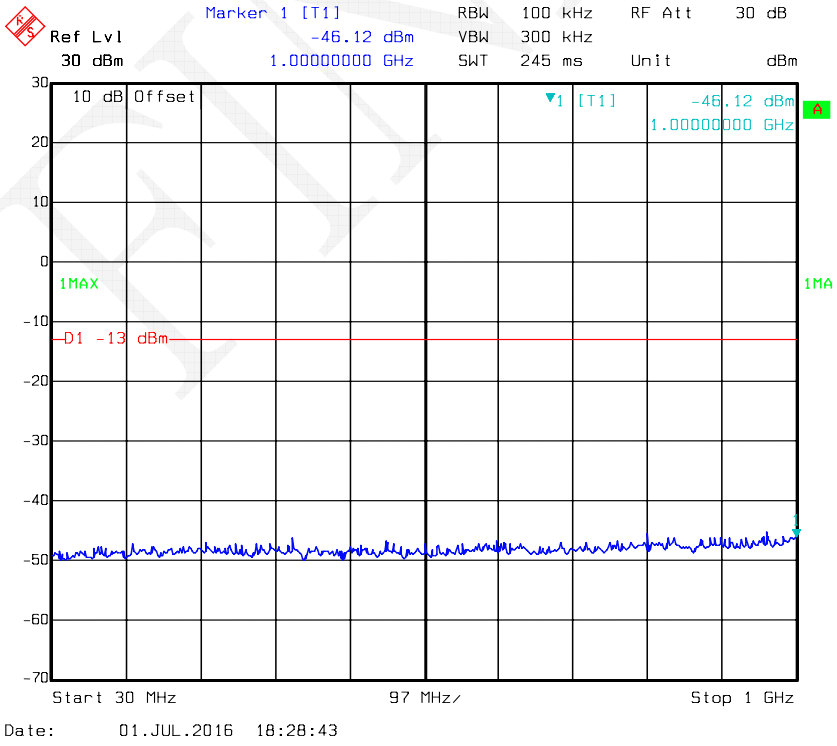
Please refer to the following plots.

GSM850_Middle Channel

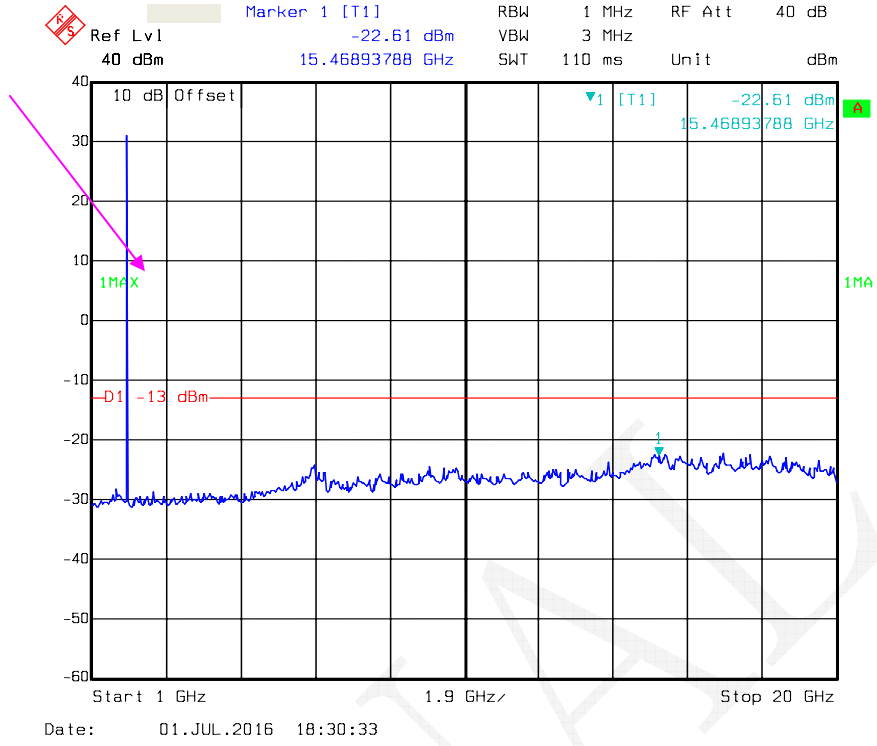




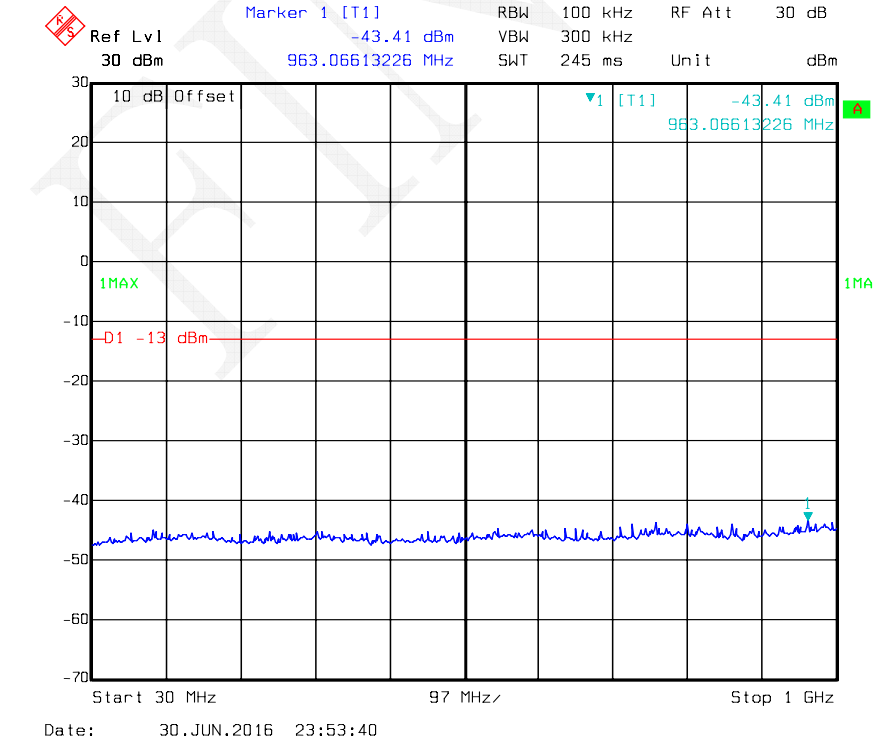
PCS 1900_ Middle Channel



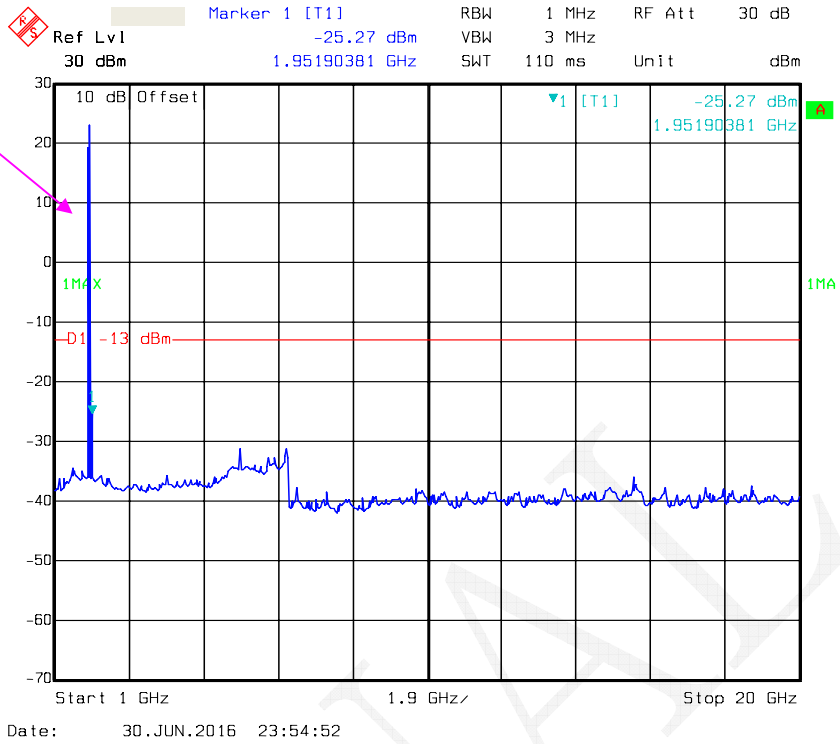
Fundamental



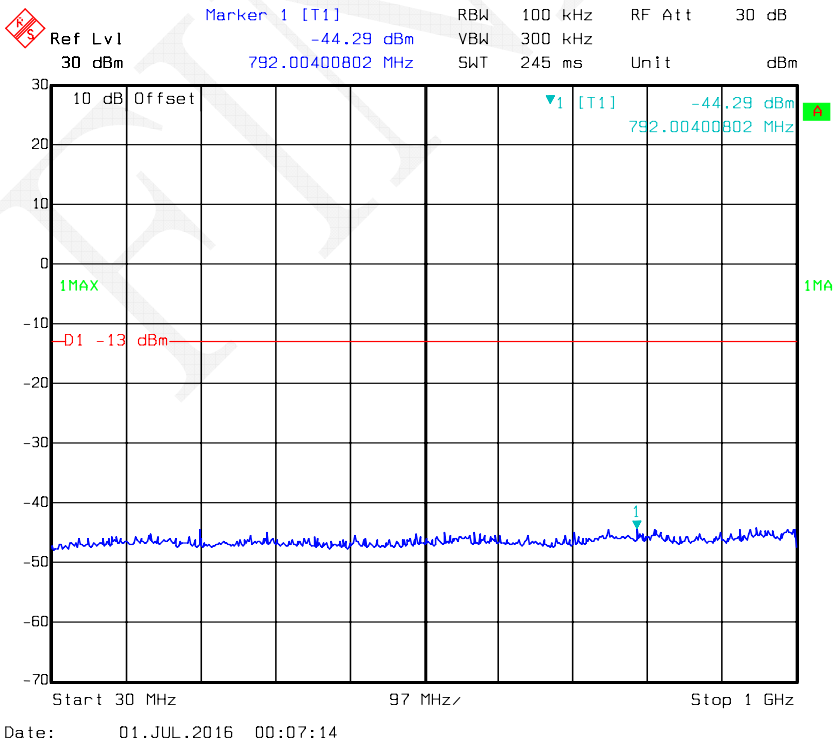
REL99 Band II_ Middle Channel

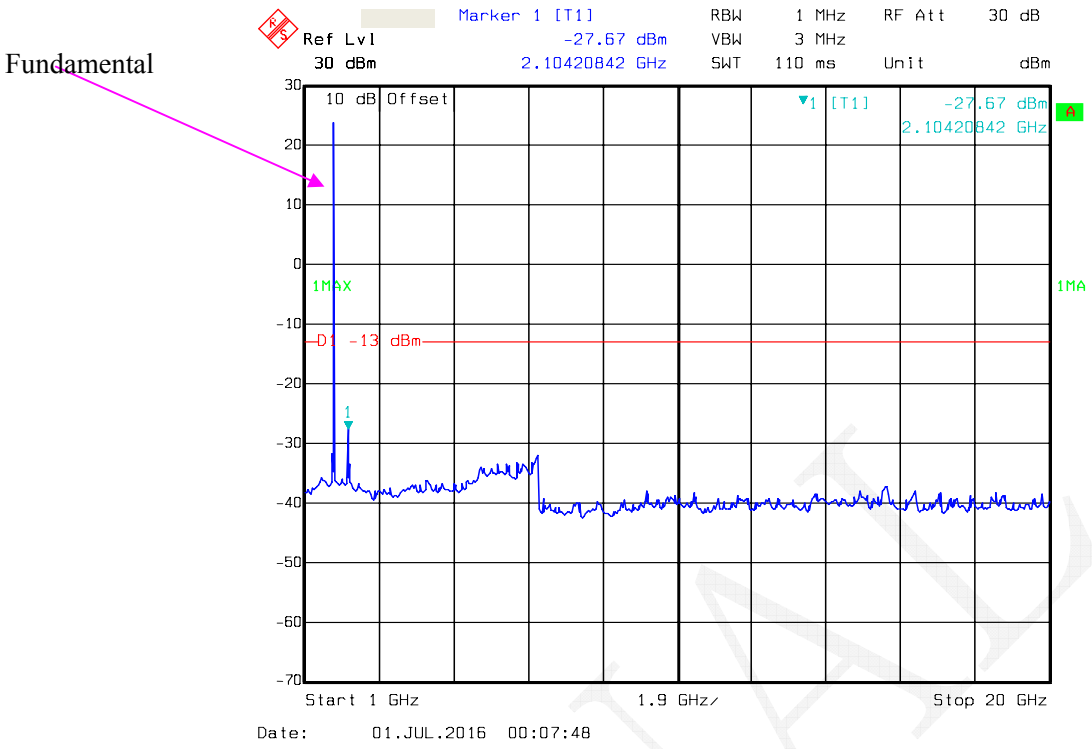


Fundamental

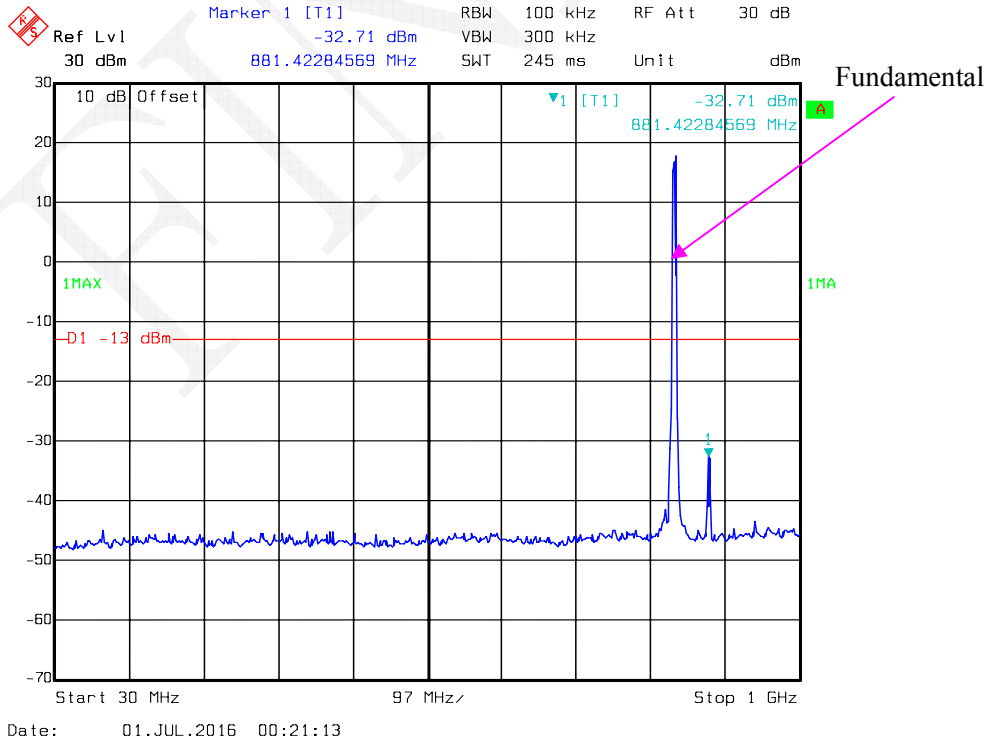


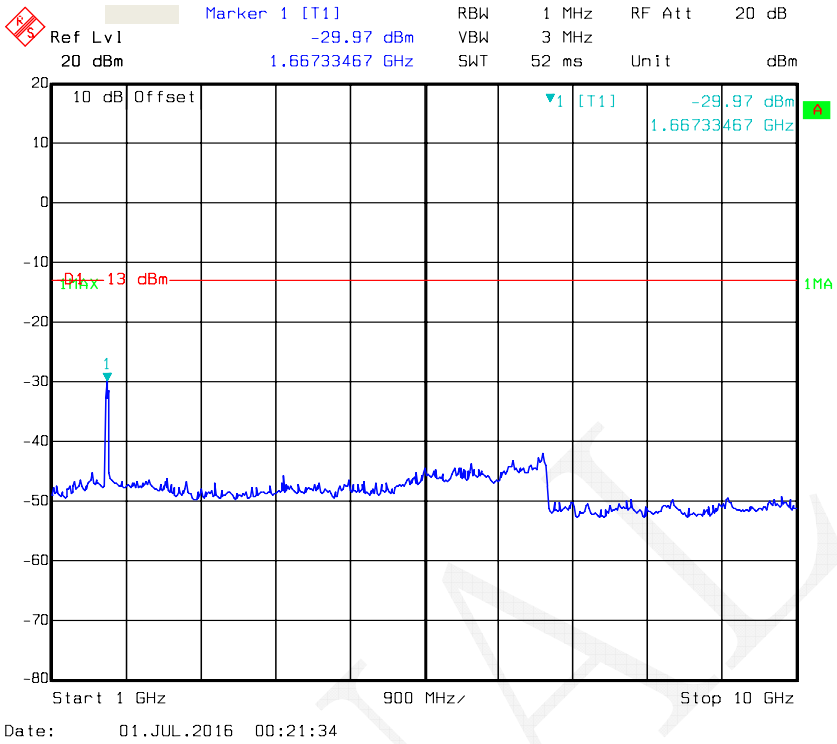
REL99 Band IV_ Middle Channel





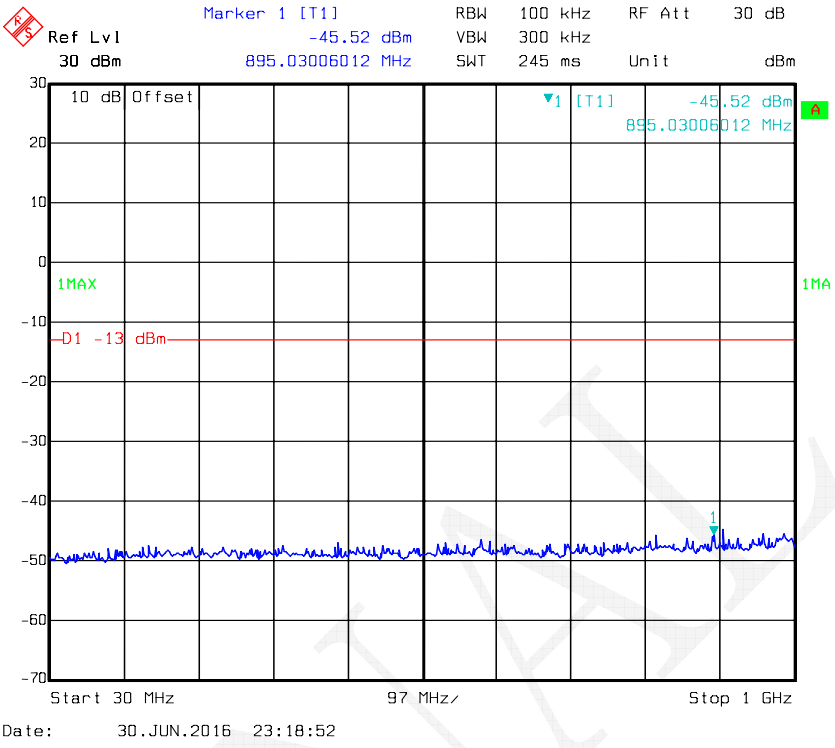
REL99 Band V_ Middle Channel

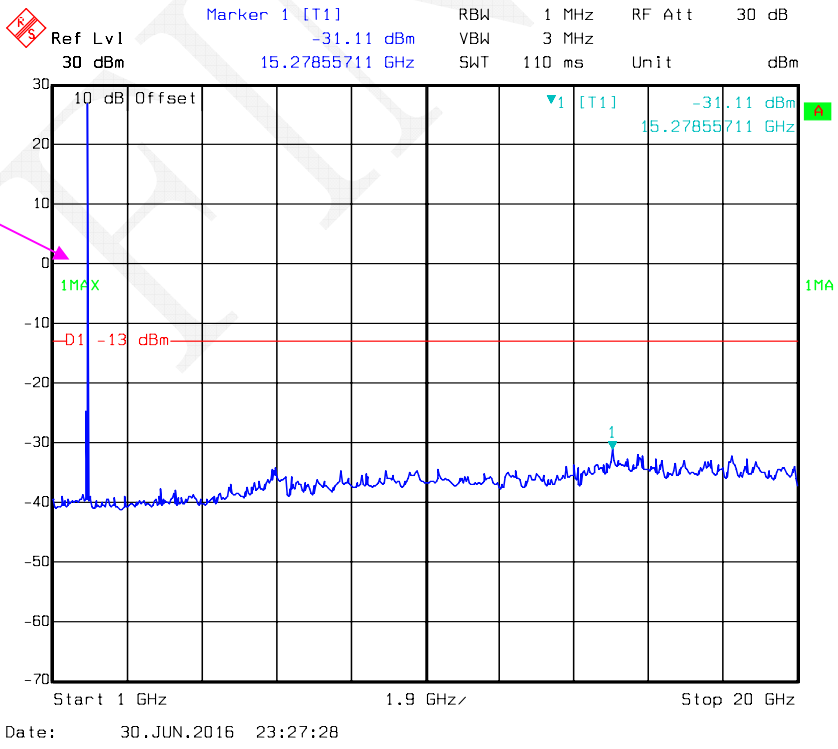



Marker 1 [T1]
RBW 1 MHz
RF Att 20 dB
Ref Lvl
-29.97 dBm
VBW 3 MHz
20 dBm
1.66733467 GHz
SWT 52 ms
Unit dBm
10 dB Offset
1 [T1]
-29.97 dBm
1.66733467 GHz
D1 -13 dBm
1MA
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 01.JUL.2016 00:21:34

LTE Band II (Middle Channel)

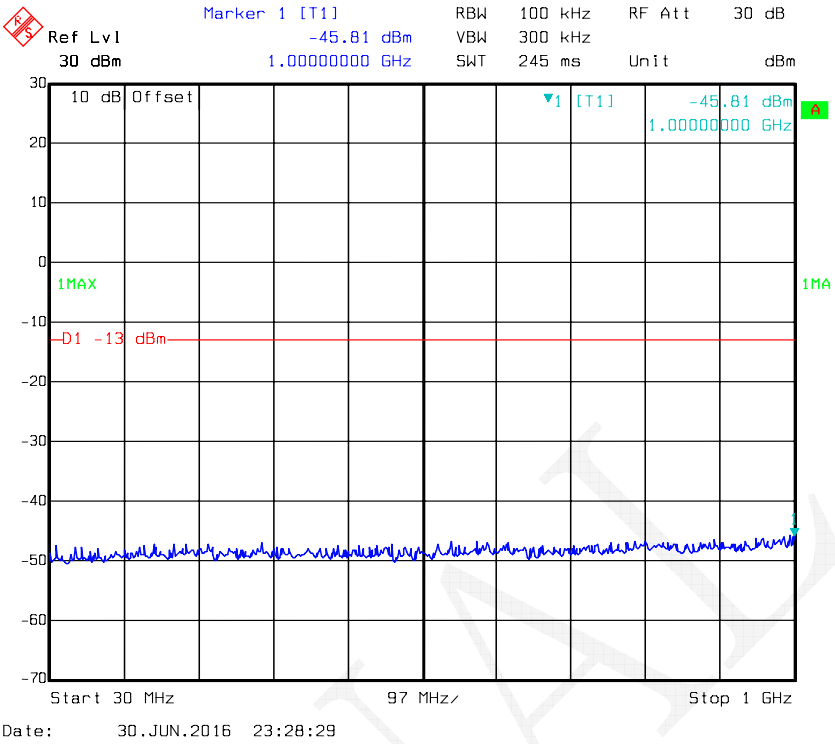
QPSK-1.4 MHz

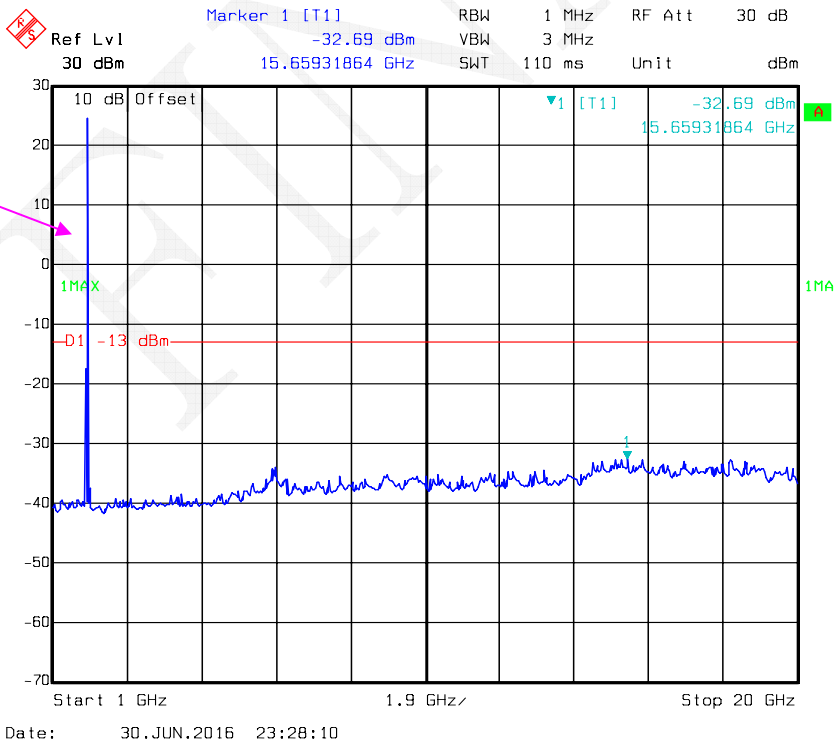




Fundamental

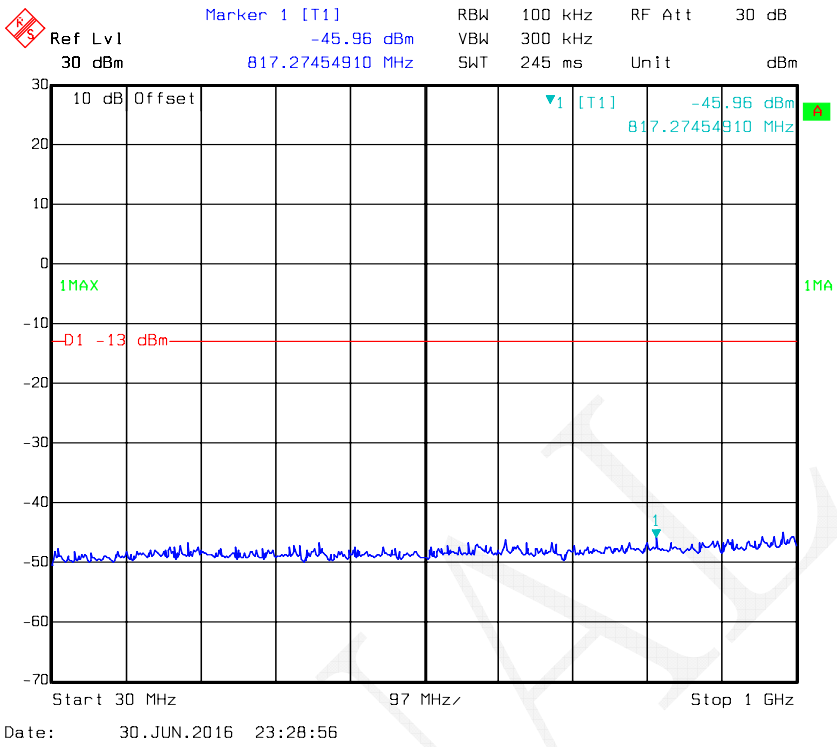
QPSK_3MHz

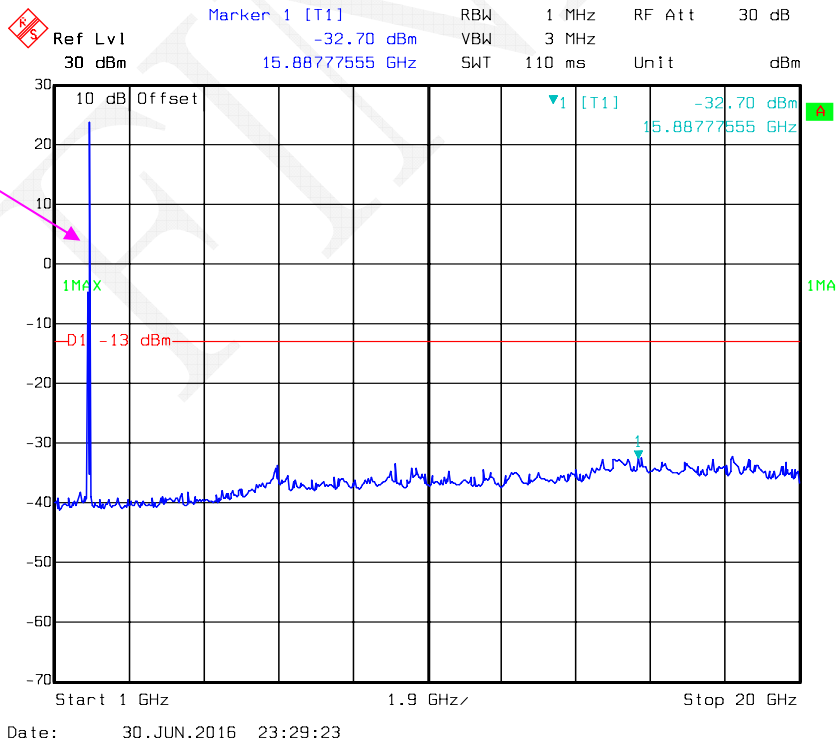




Fundamental

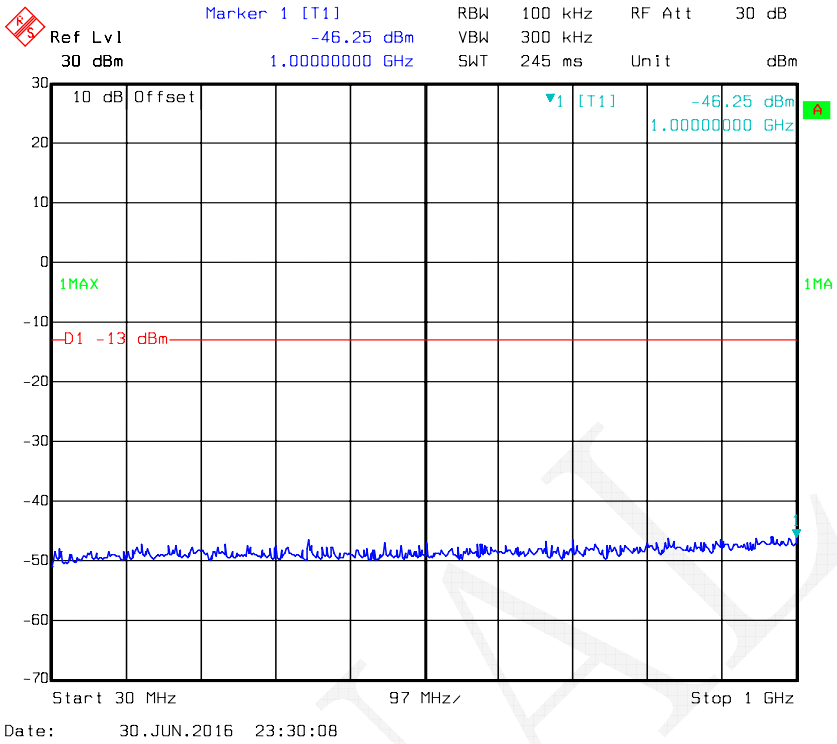
QPSK_5MHz



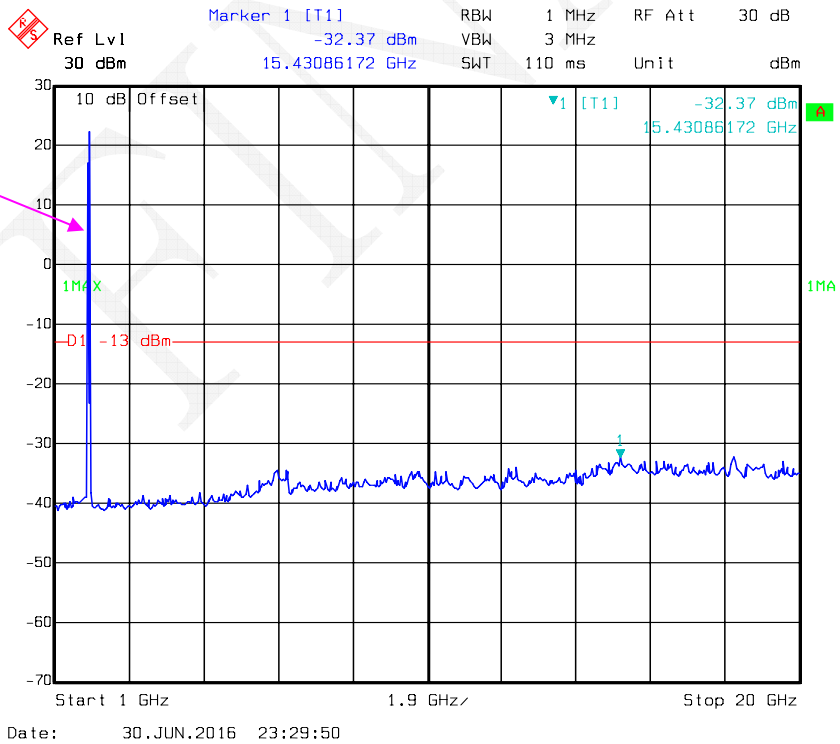


Fundamental

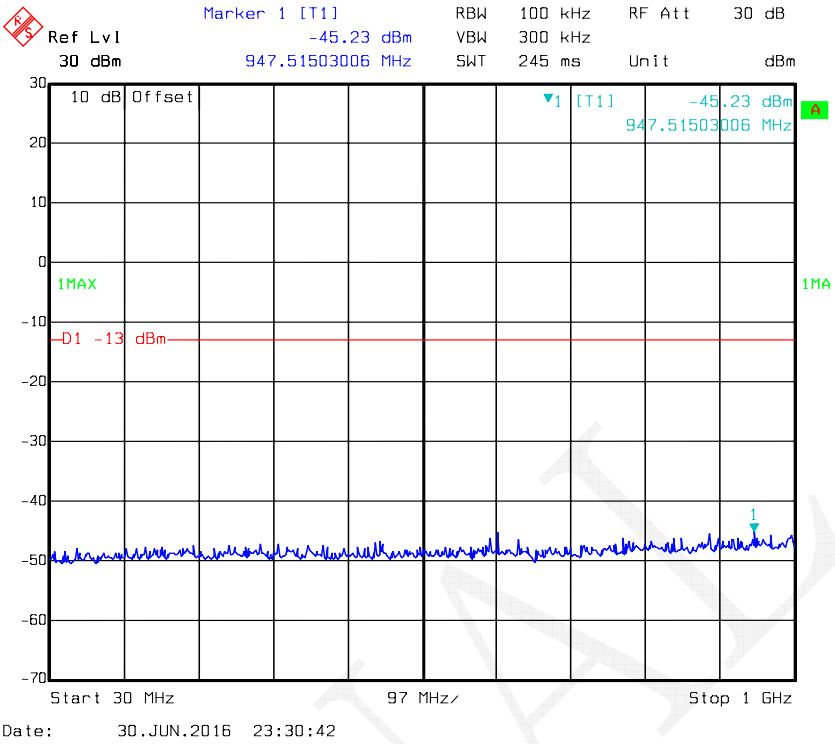
QPSK_10MHz

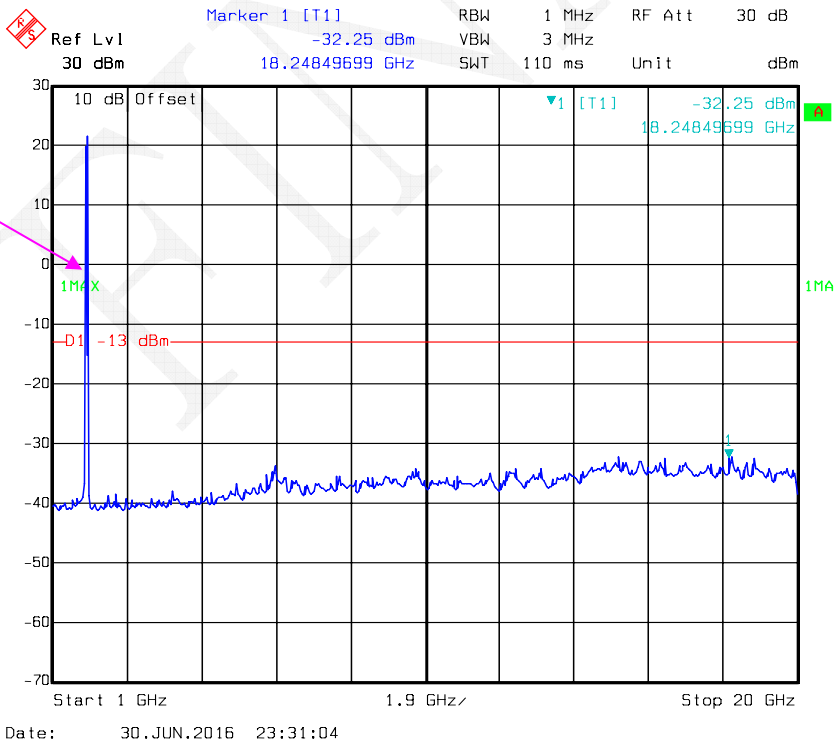


Fundamental



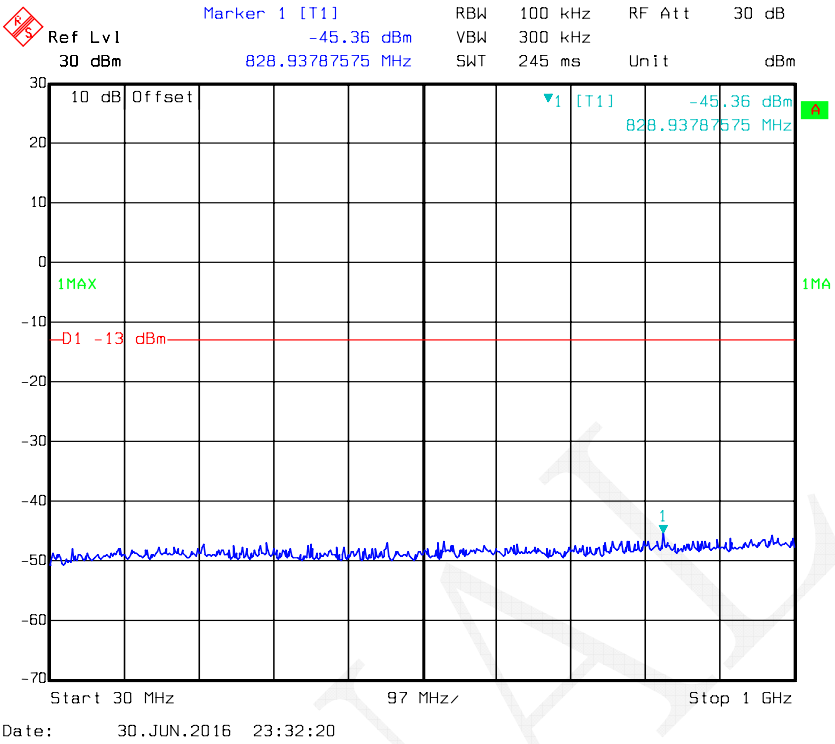
QPSK_15MHz



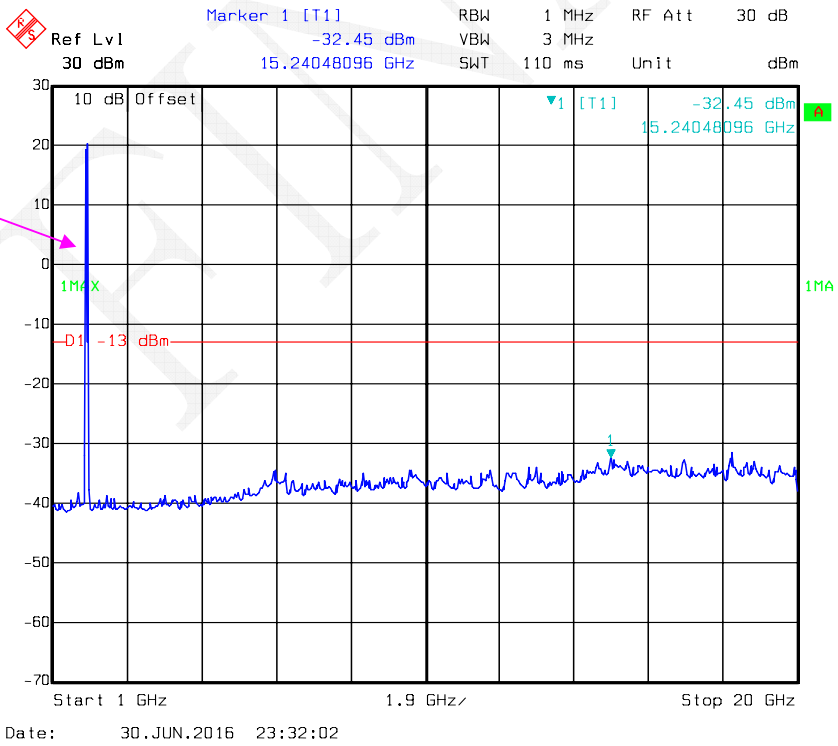


Fundamental

QPSK_20MHz

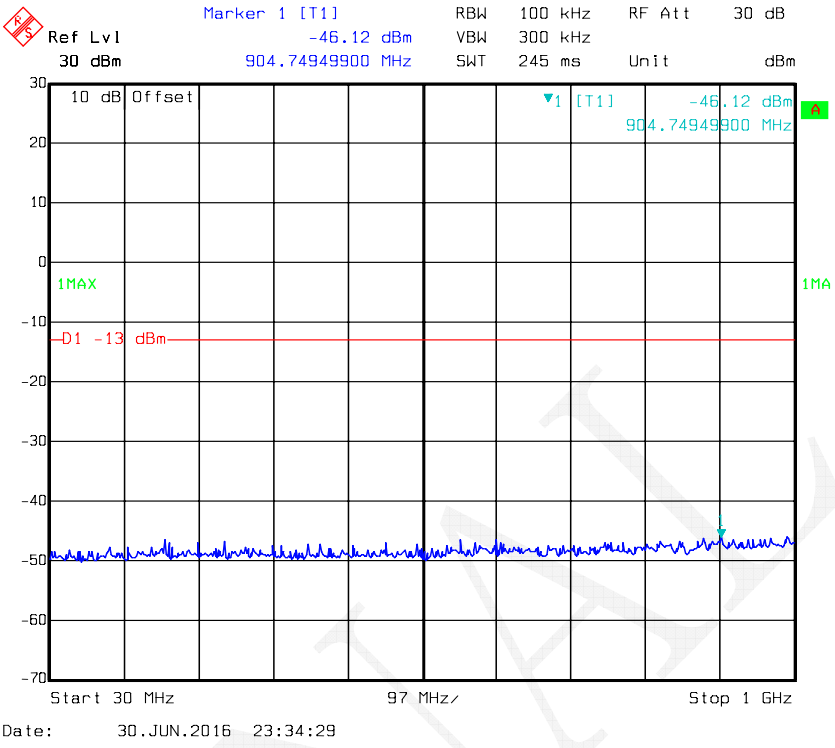


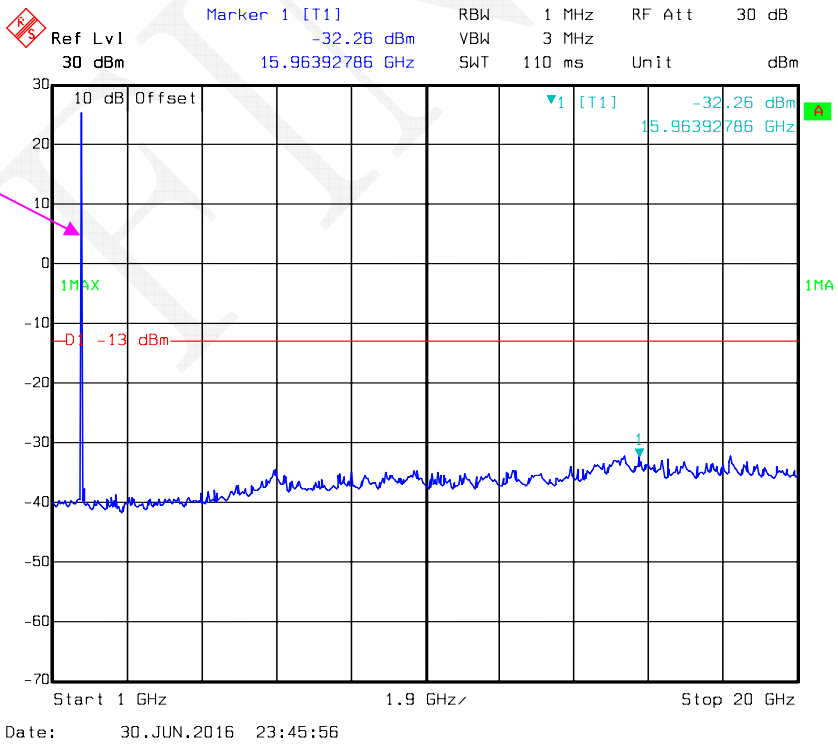
Fundamental



LTE Band IV (Middle Channel)

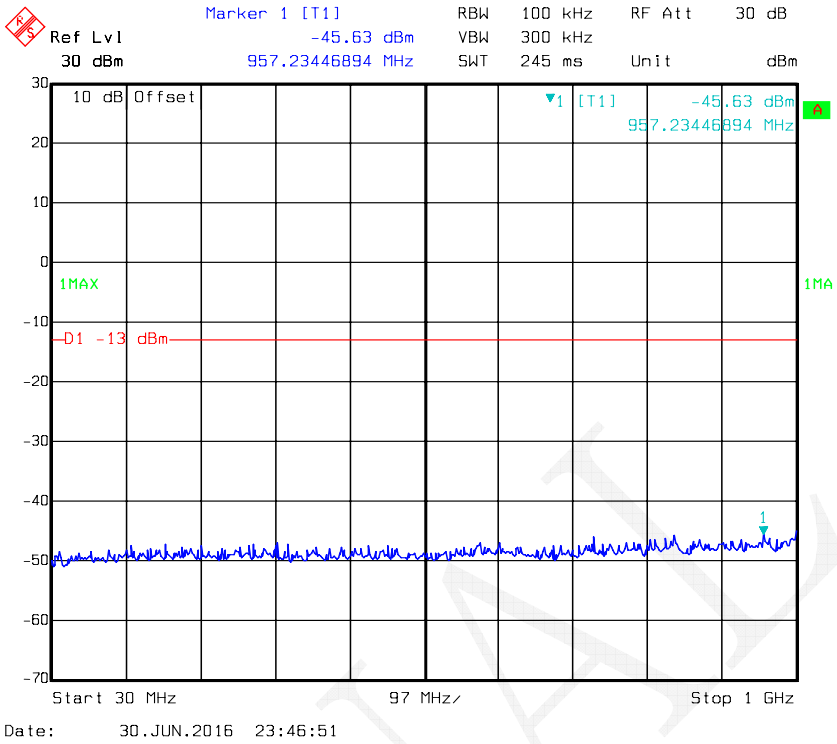
QPSK-1.4 MHz

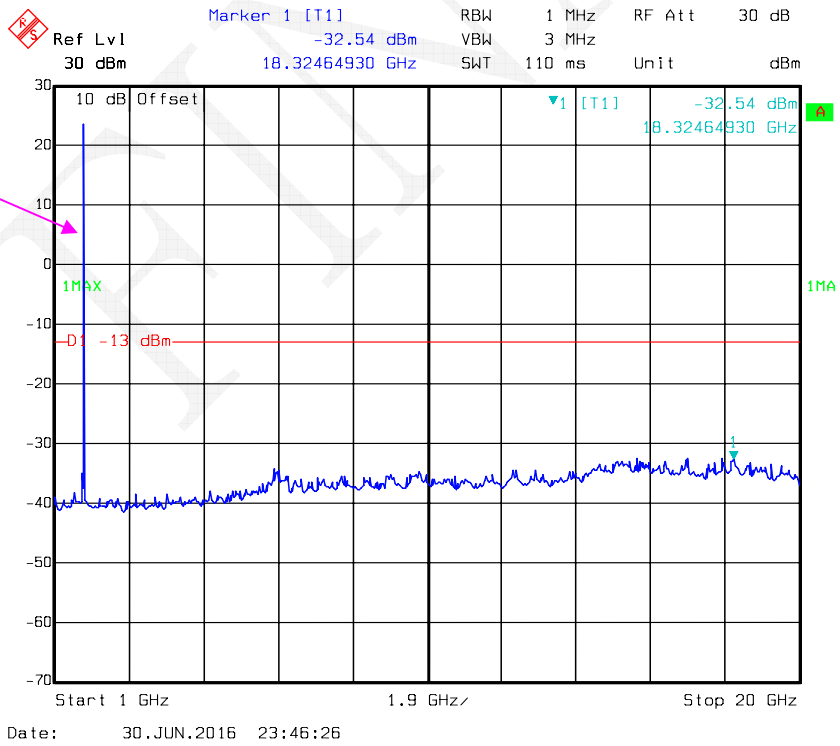




Fundamental

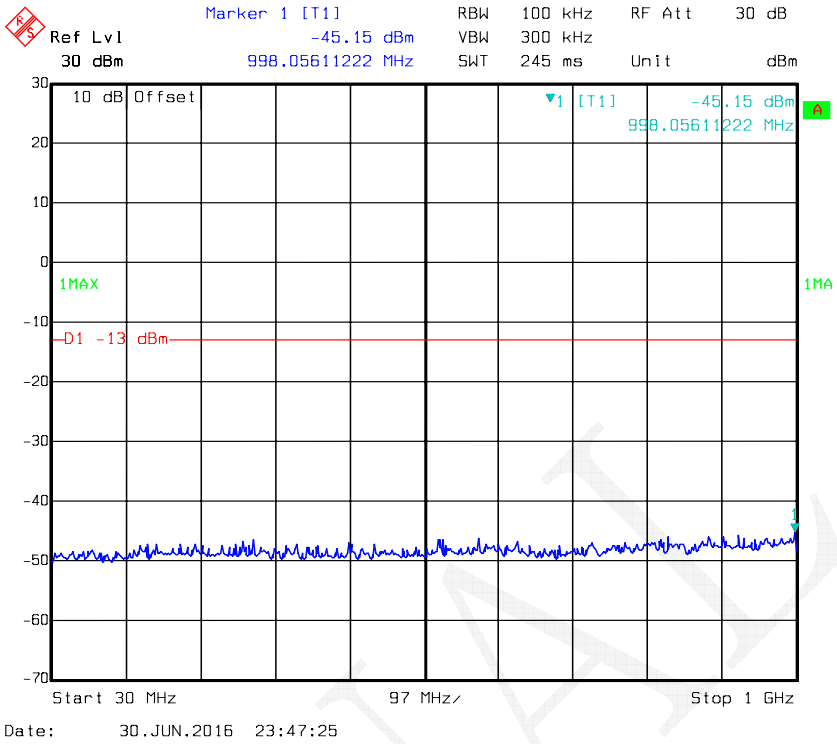
QPSK_3MHz

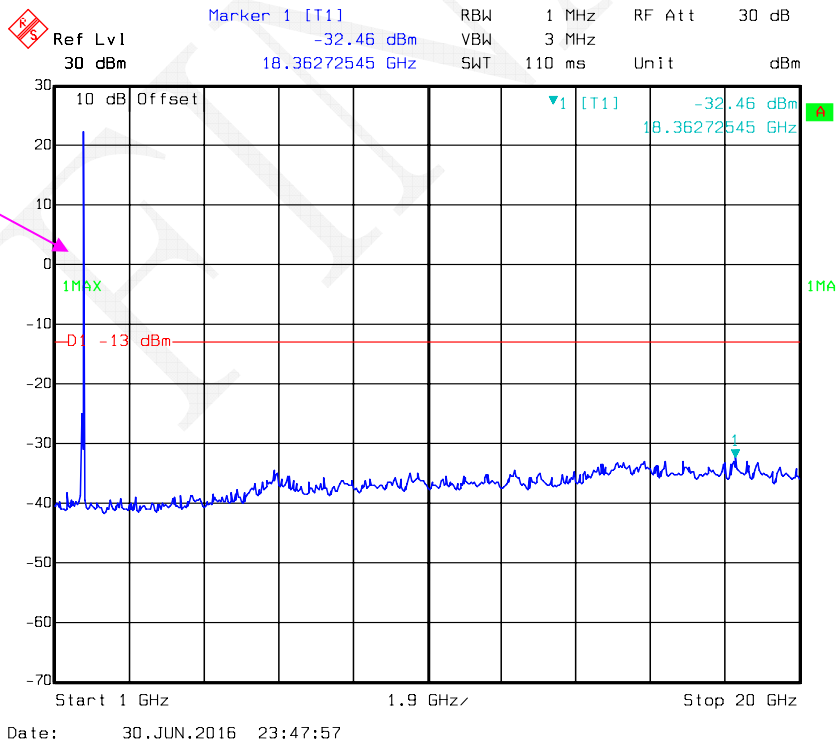




Fundamental

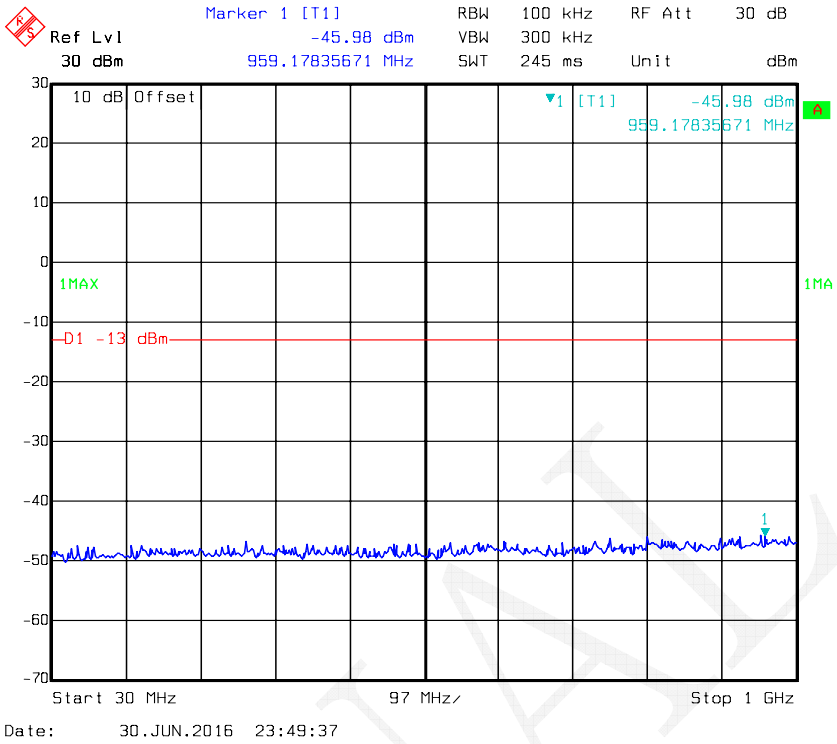
QPSK_5MHz

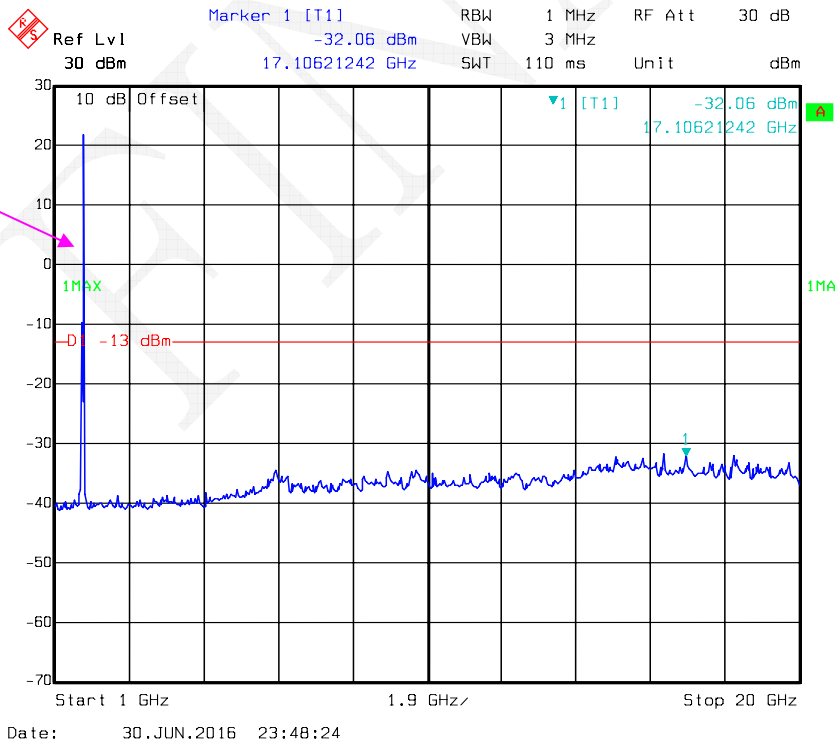




Fundamental

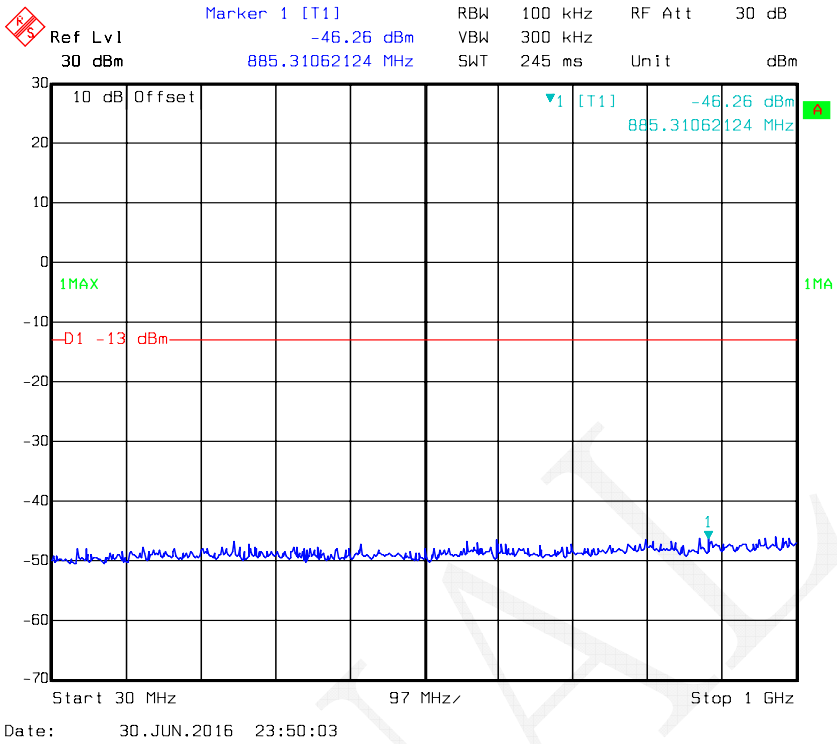
QPSK_10MHz

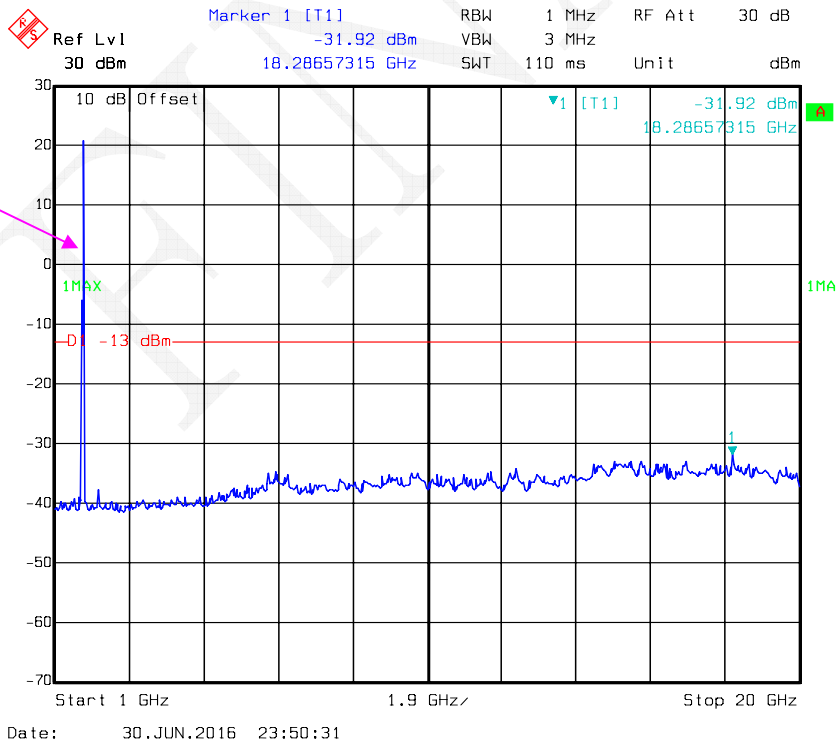




Fundamental

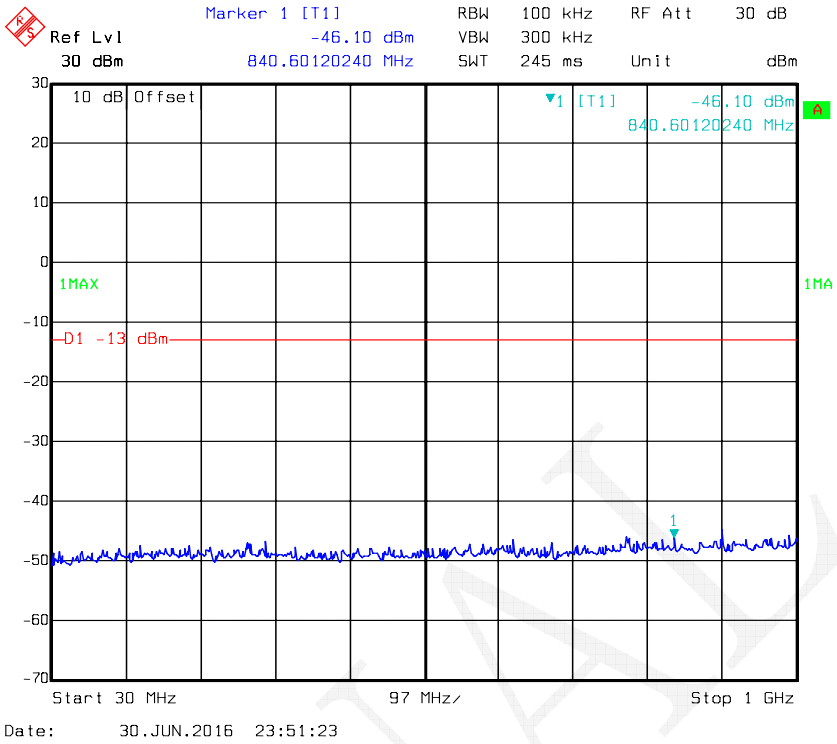
QPSK_15MHz

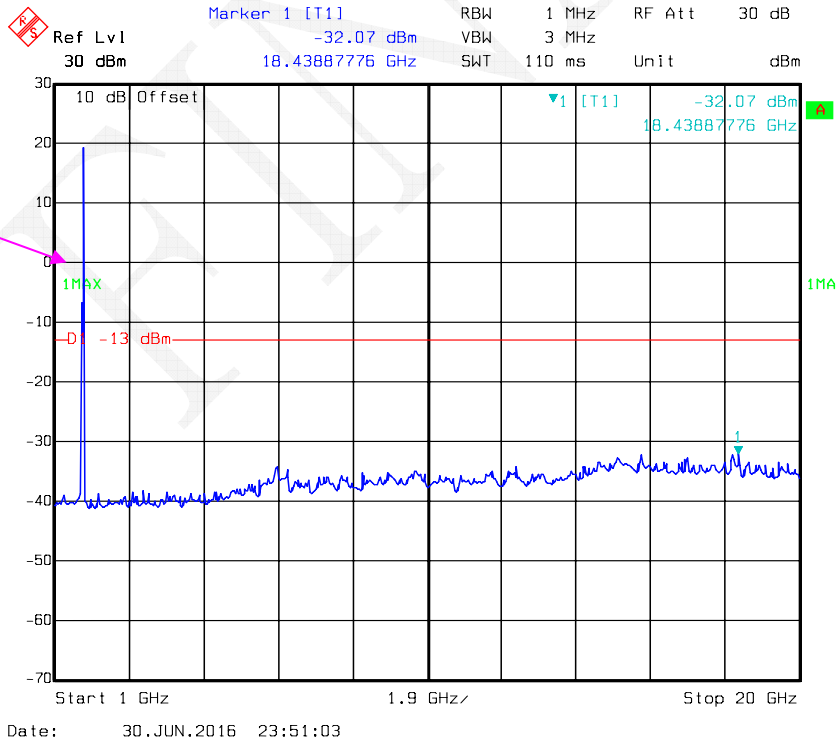




Fundamental

QPSK_20MHz

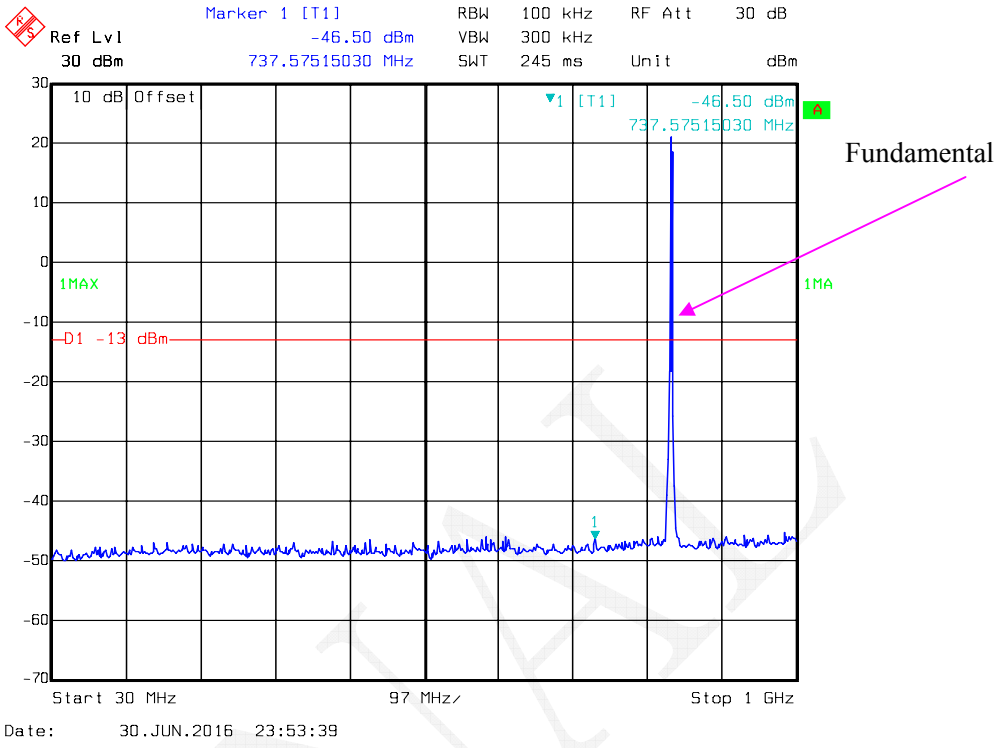


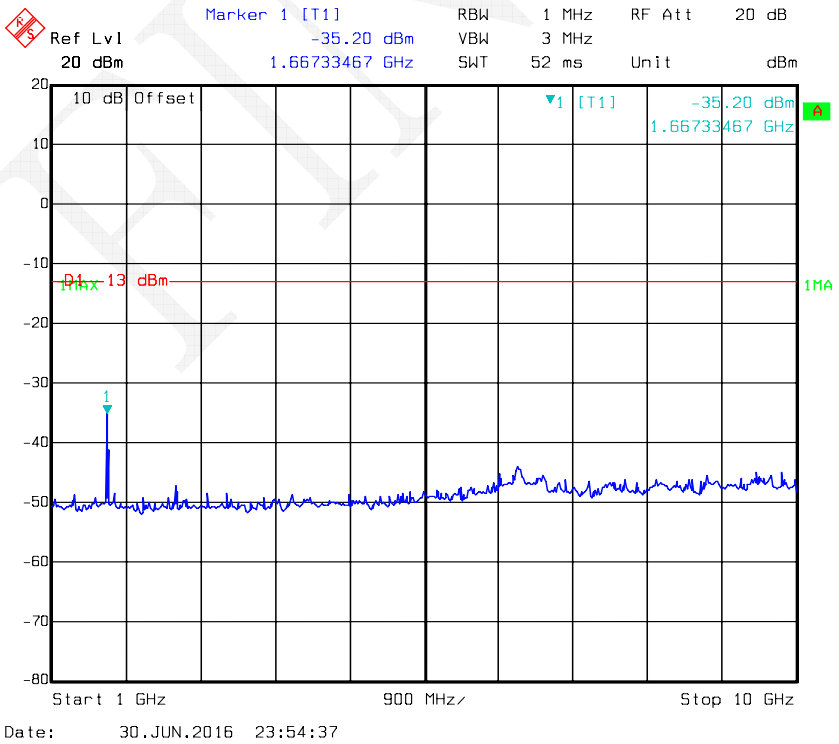


Fundamental

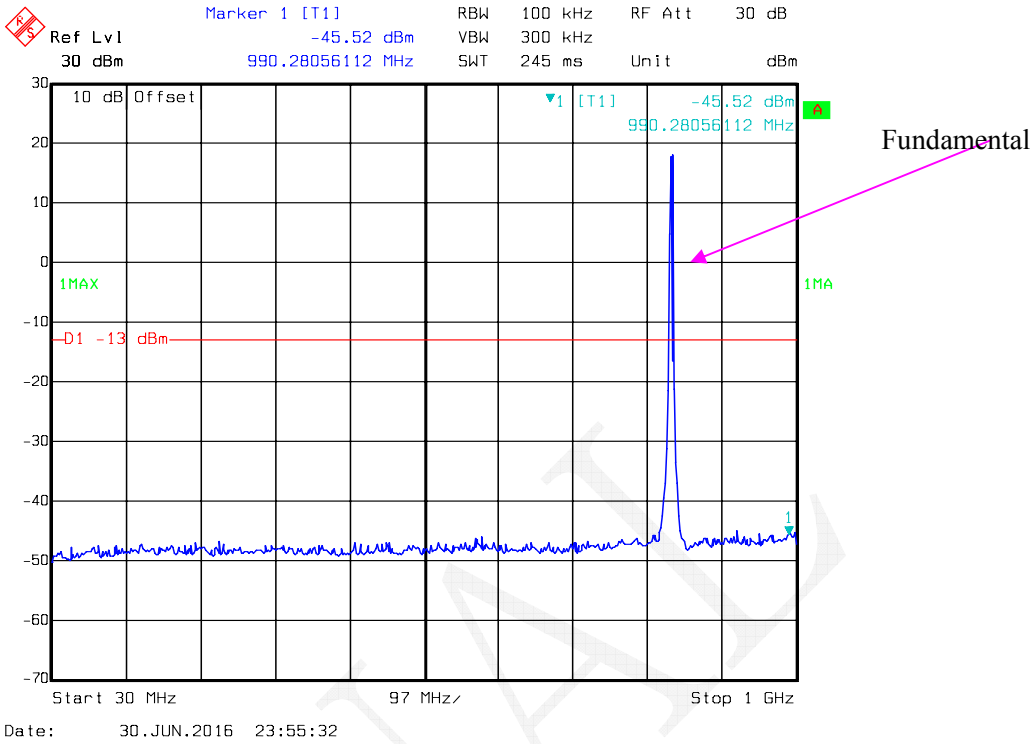
LTE Band V (Middle Channel)

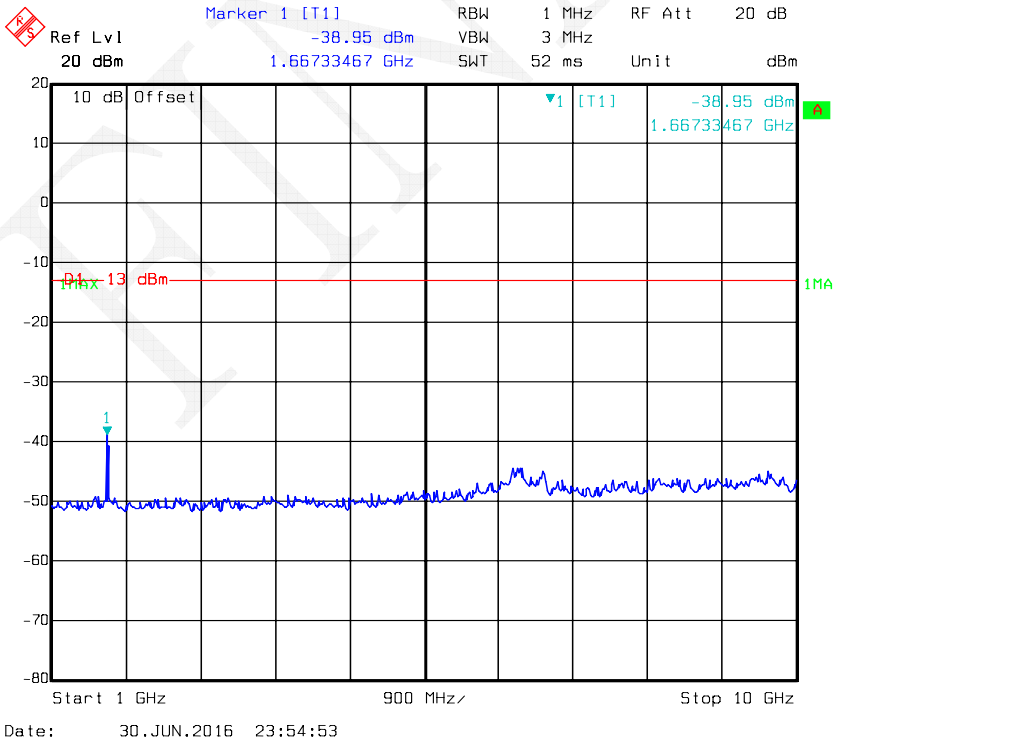
QPSK-1.4 MHz



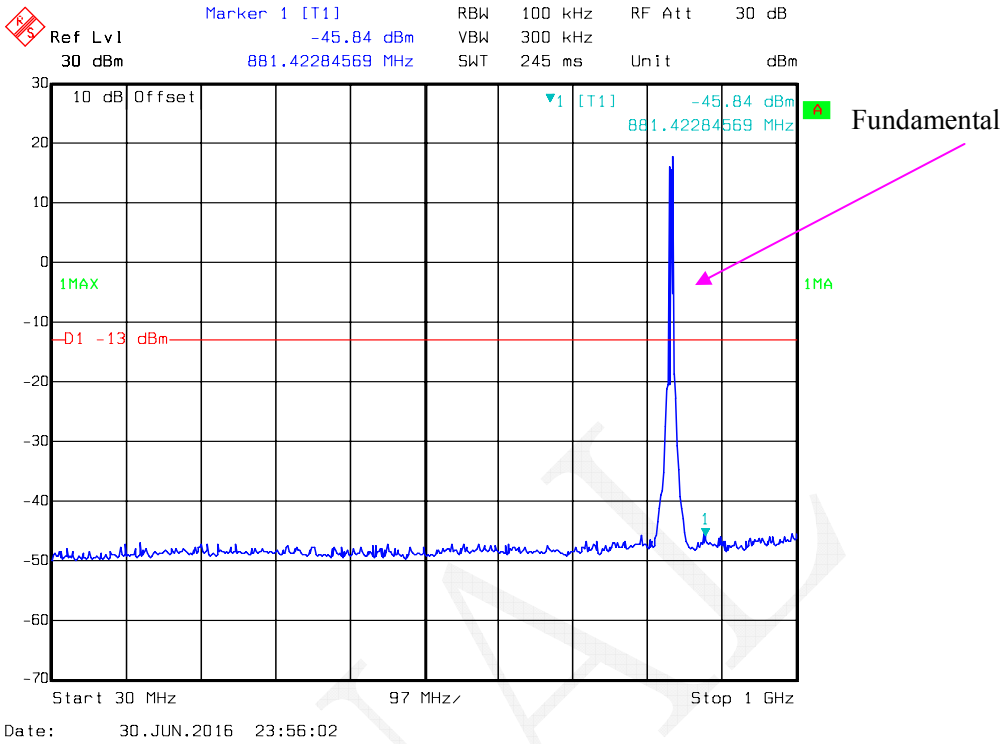


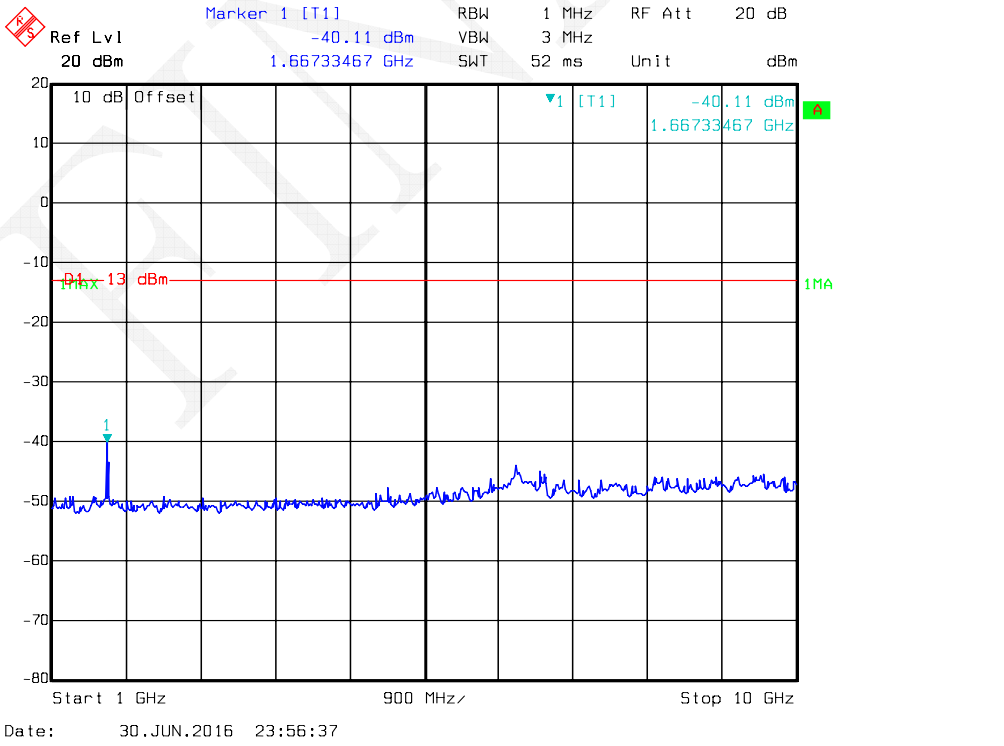
QPSK_3MHz


Marker 1 [T1]
Ref Lvl
30 dBm
-45.52 dBm
990.28056112 MHz
RBW 100 kHz
VBW 300 kHz
SWT 245 ms
RF Att 30 dB
Unit dBm
10 dB Offset
[T1]
-45.52 dBm
990.28056112 MHz
1MAX
1MA
D1 -13 dBm
Start 30 MHz
97 MHz/
Stop 1 GHz
Fundamental
Date: 30.JUN.2016 23:55:32

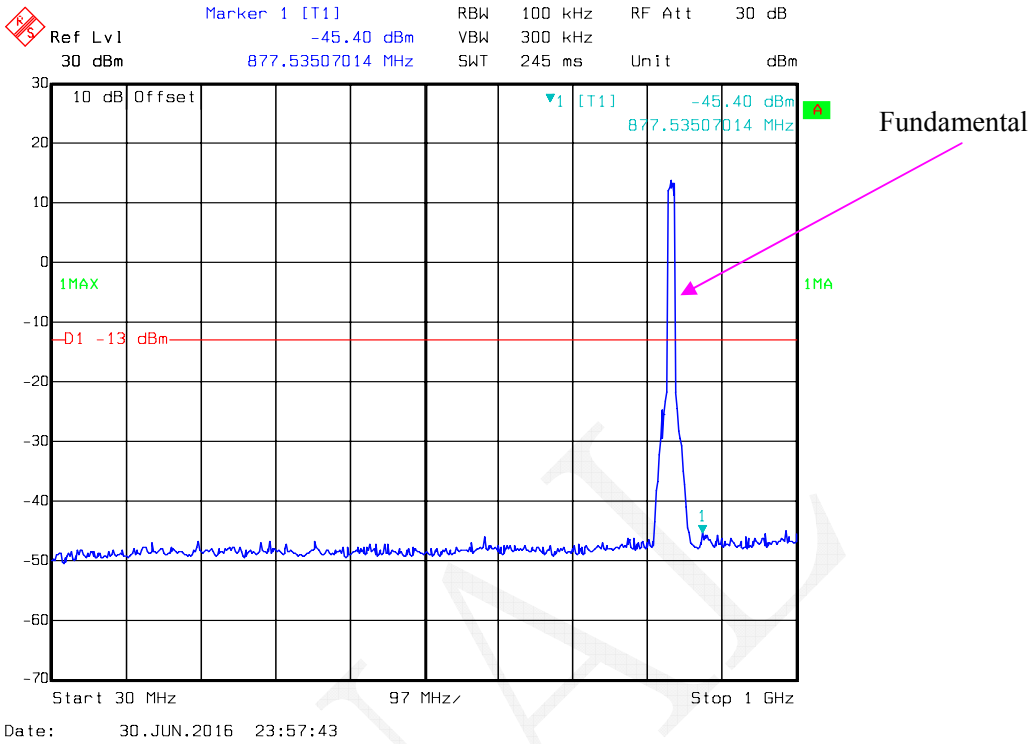

Marker 1 [T1]
Ref Lvl
20 dBm
-38.95 dBm
1.66733467 GHz
RBW 1 MHz
VBW 3 MHz
SWT 52 ms
RF Att 20 dB
Unit dBm
10 dB Offset
[T1]
-38.95 dBm
1.66733467 GHz
1MAX
1MA
D1 -13 dBm
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 30.JUN.2016 23:54:53

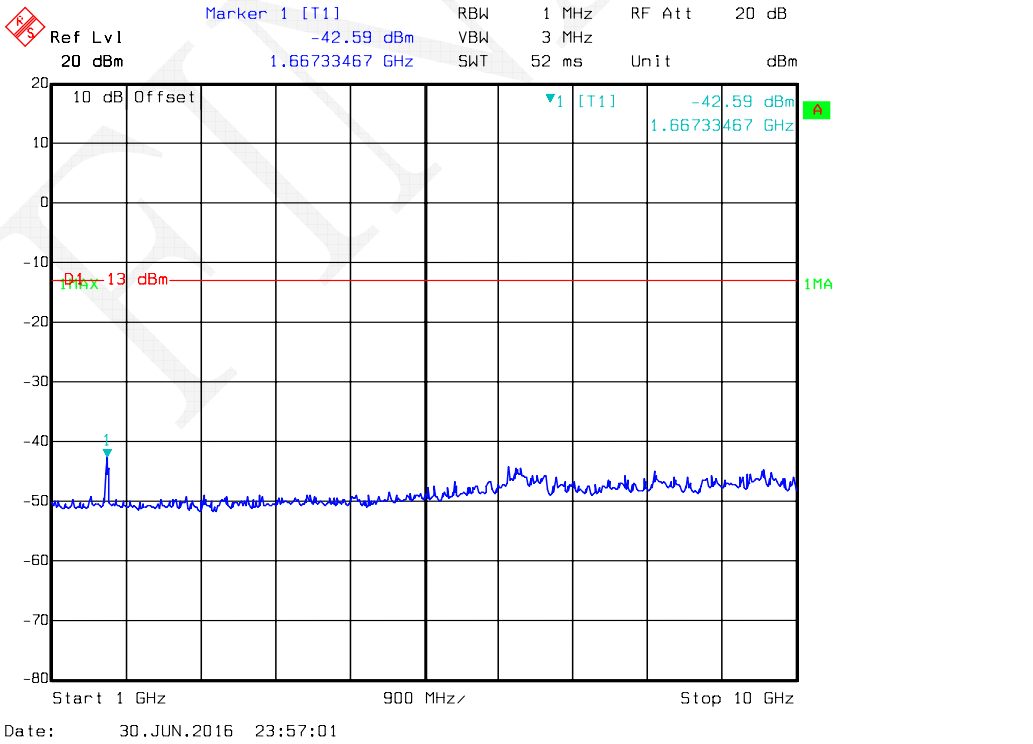
QPSK_5MHz


Marker 1 [T1]
Ref Lvl
30 dBm
-45.84 dBm
881.42284569 MHz
RBW 100 kHz
VBW 300 kHz
SWT 245 ms
RF Att 30 dB
Unit dBm
10 dB Offset
1MAX
D1 -13 dBm
1MA
Fundamental
Start 30 MHz
97 MHz/
Stop 1 GHz
Date: 30.JUN.2016 23:56:02


Marker 1 [T1]
Ref Lvl
20 dBm
-40.11 dBm
1.66733467 GHz
RBW 1 MHz
VBW 3 MHz
SWT 52 ms
RF Att 20 dB
Unit dBm
10 dB Offset
1MAX
D1 -13 dBm
1MA
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 30.JUN.2016 23:56:37

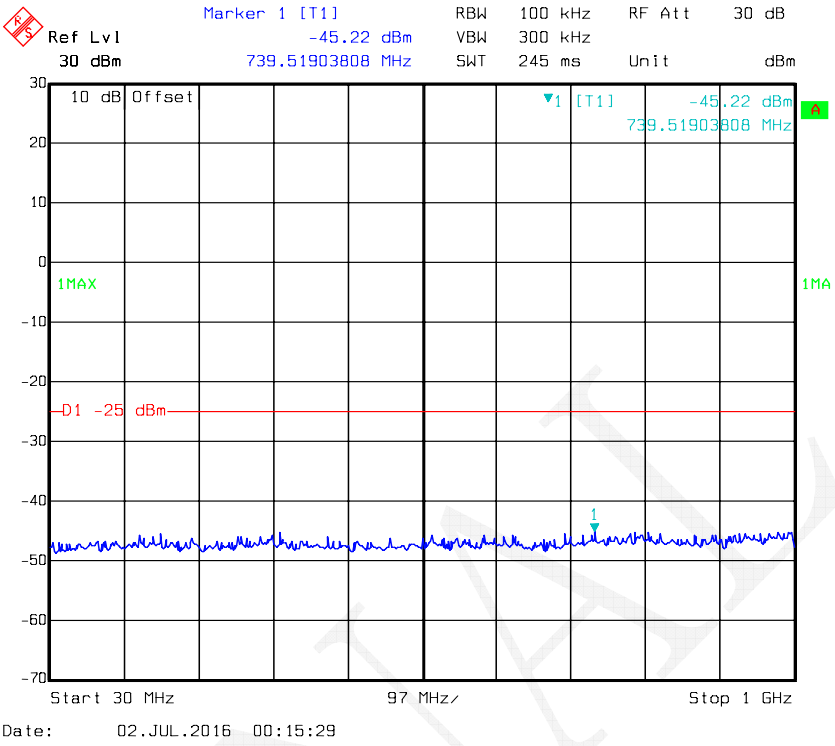
QPSK_10MHz


Marker 1 [T1]
Ref Lvl
30 dBm
-45.40 dBm
877.53507014 MHz
RBW 100 kHz
VBW 300 kHz
SWT 245 ms
RF Att 30 dB
Unit dBm
10 dB Offset
1 [T1] -45.40 dBm
877.53507014 MHz
1MAX
1MA
D1 -13 dBm
Start 30 MHz
97 MHz/
Stop 1 GHz
Date: 30.JUN.2016 23:57:43
Fundamental

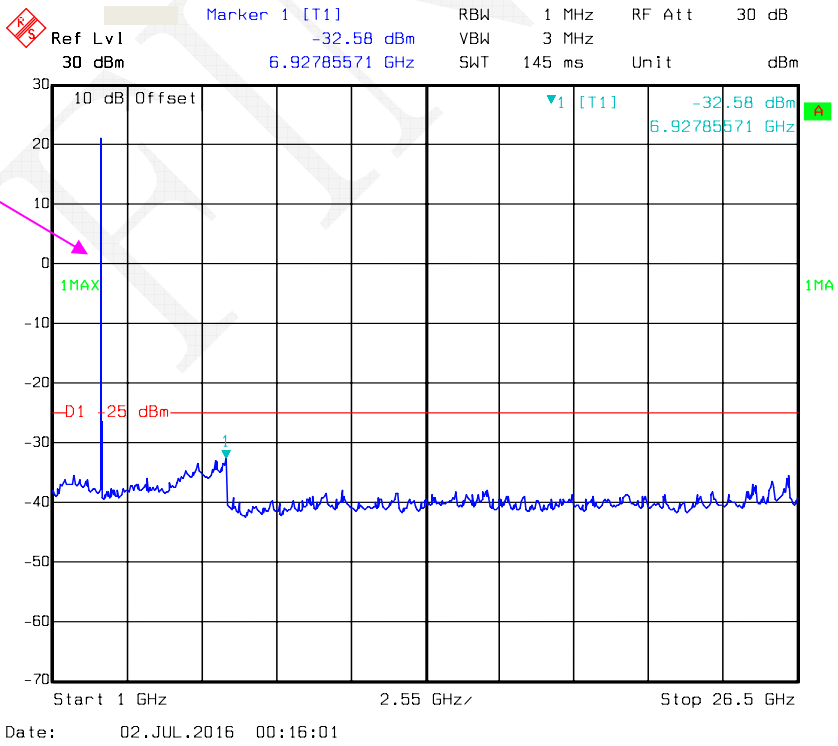

Marker 1 [T1]
Ref Lvl
20 dBm
-42.59 dBm
1.66733467 GHz
RBW 1 MHz
VBW 3 MHz
SWT 52 ms
RF Att 20 dB
Unit dBm
10 dB Offset
1 [T1] -42.59 dBm
1.66733467 GHz
1MAX
1MA
D1 -13 dBm
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 30.JUN.2016 23:57:01

LTE Band VII (Middle Channel)

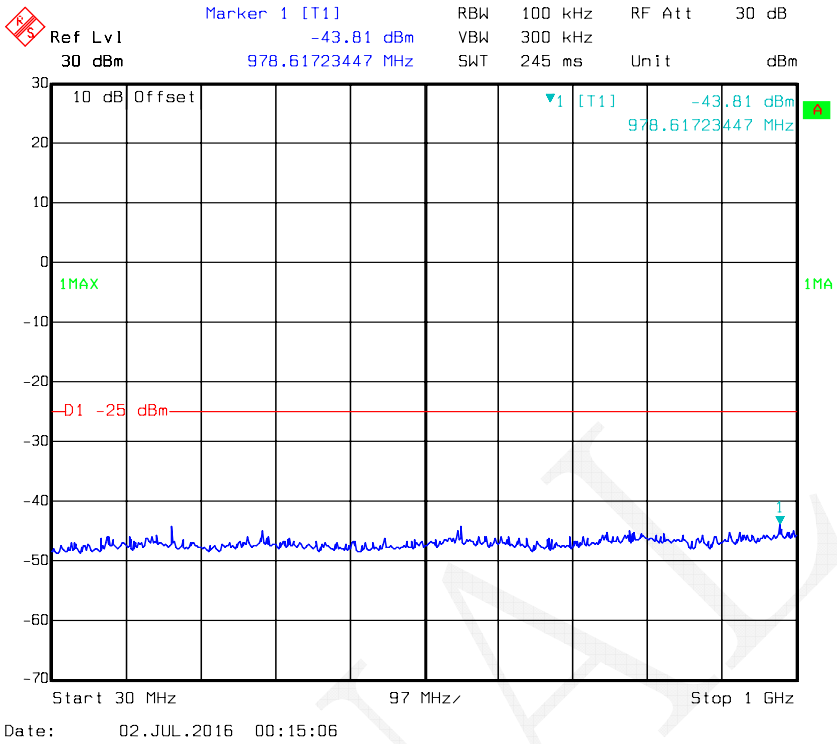
QPSK_5MHz



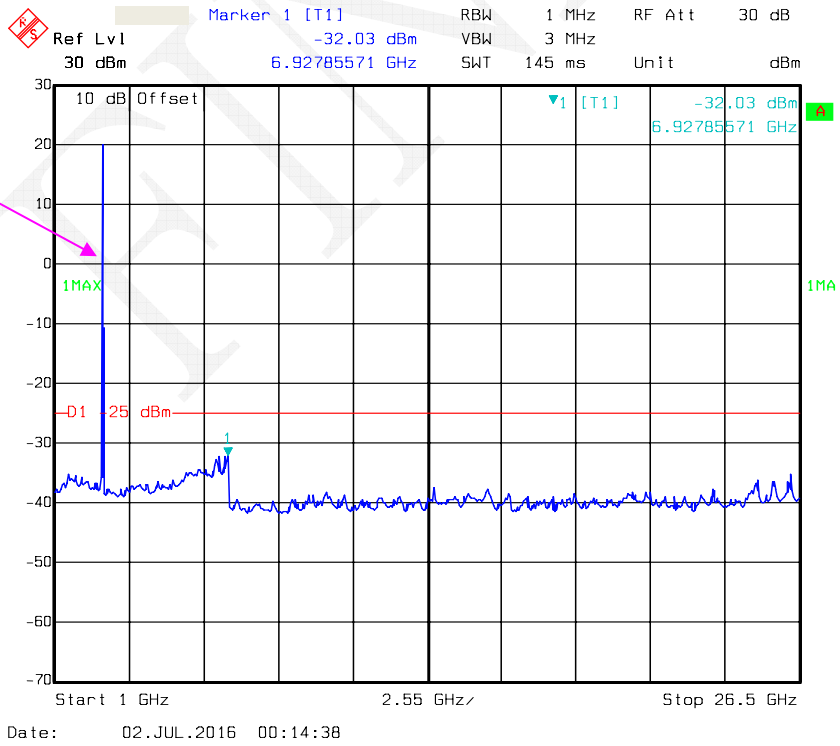
Fundamental



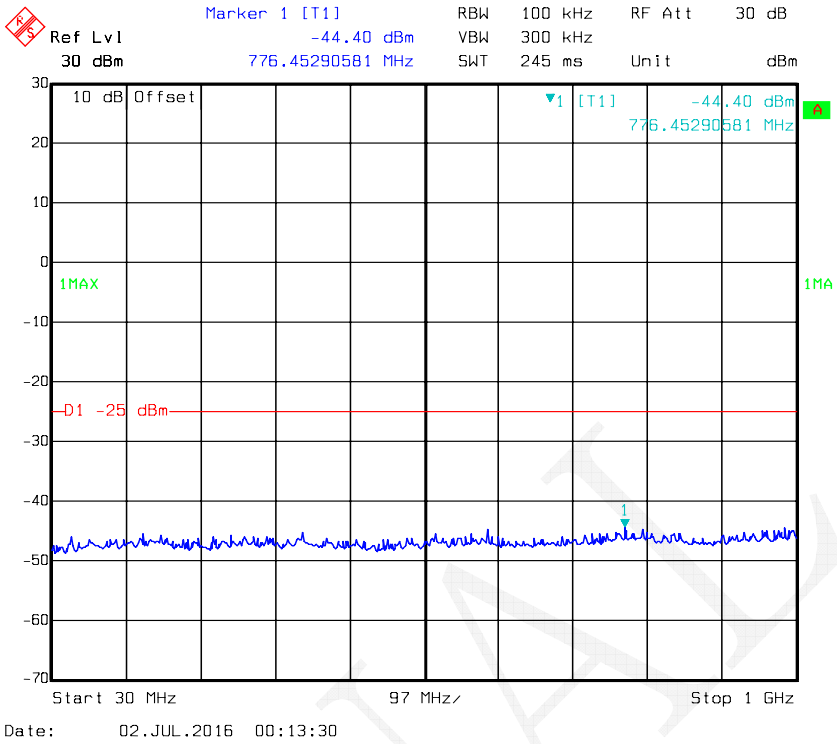
QPSK_10MHz



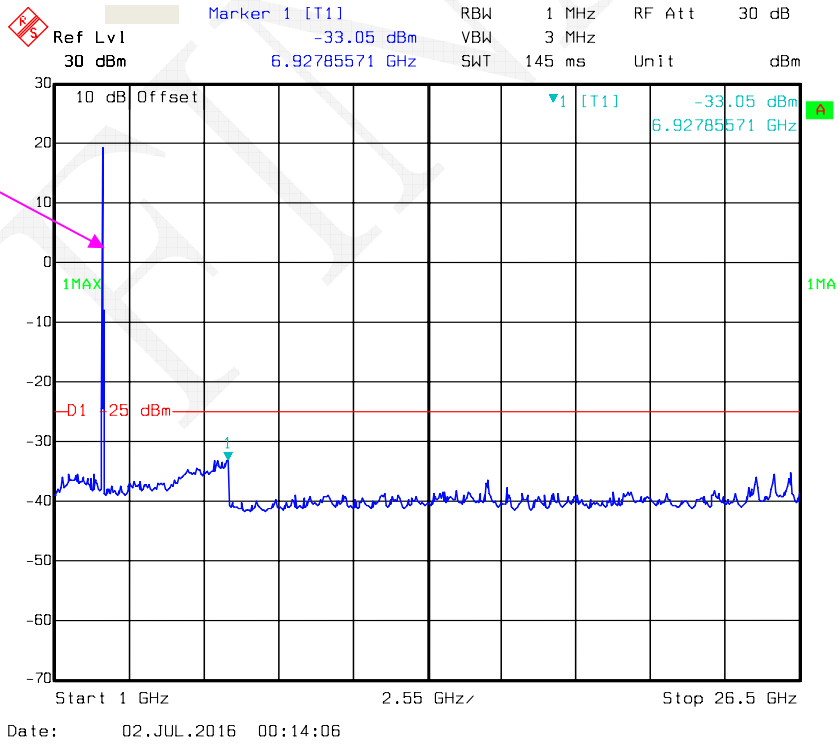
Fundamental



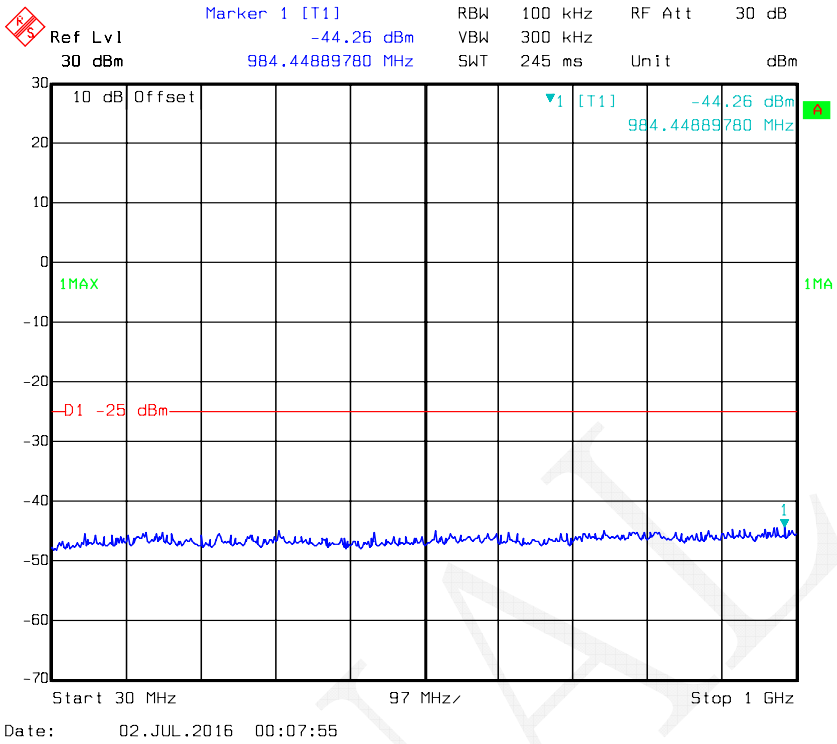
QPSK_15MHz

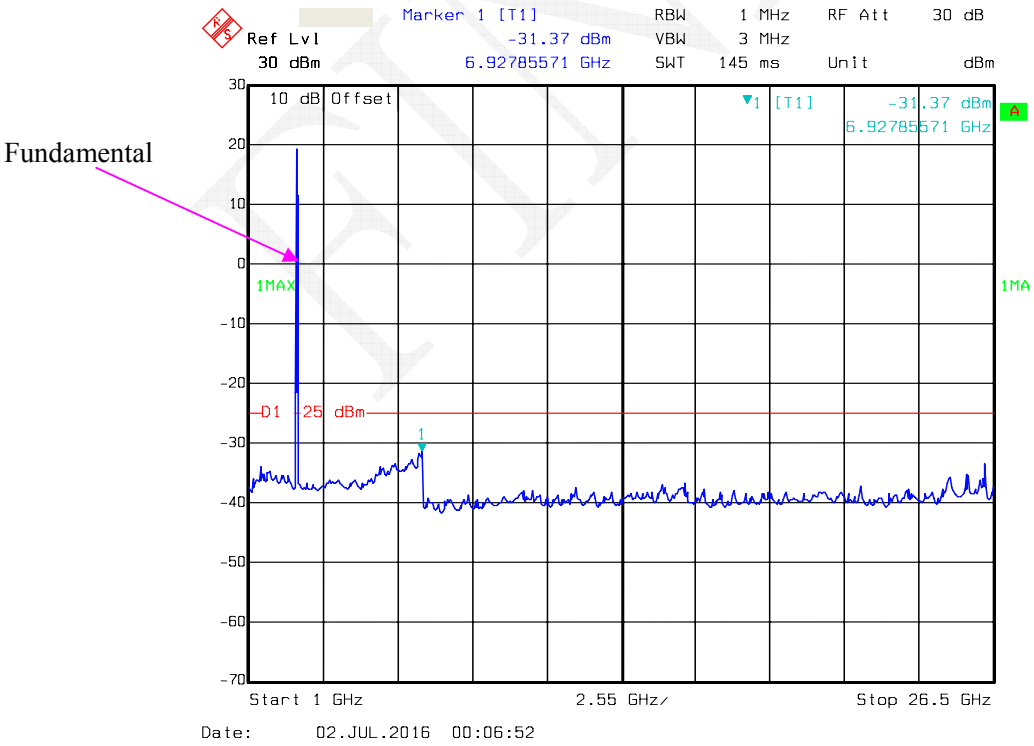


Fundamental



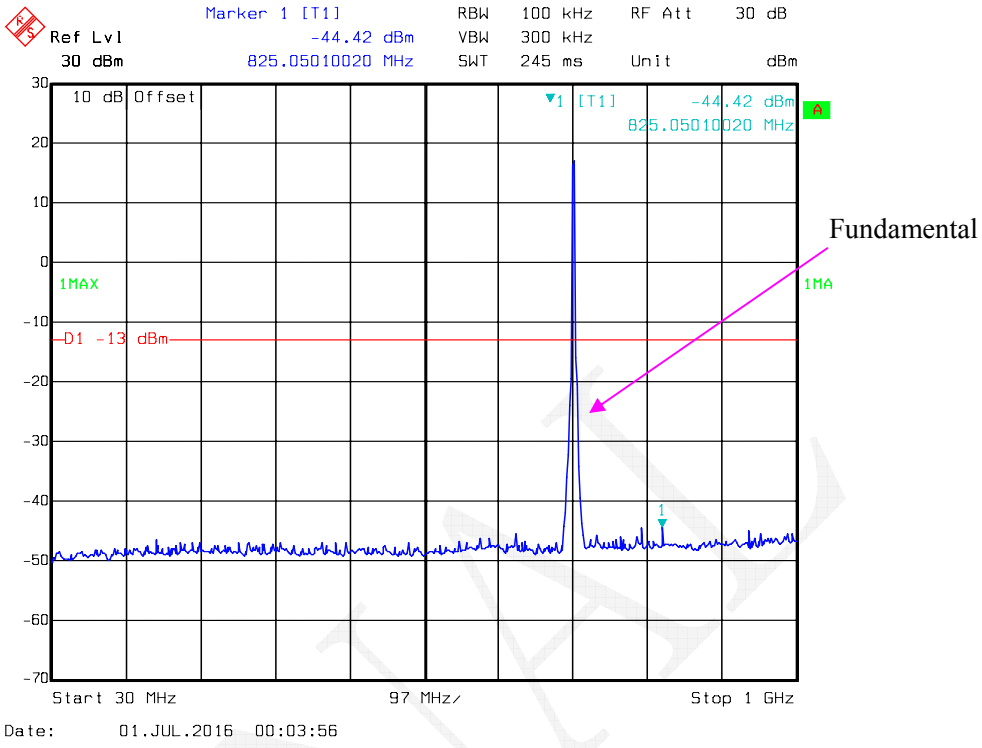
QPSK_20MHz

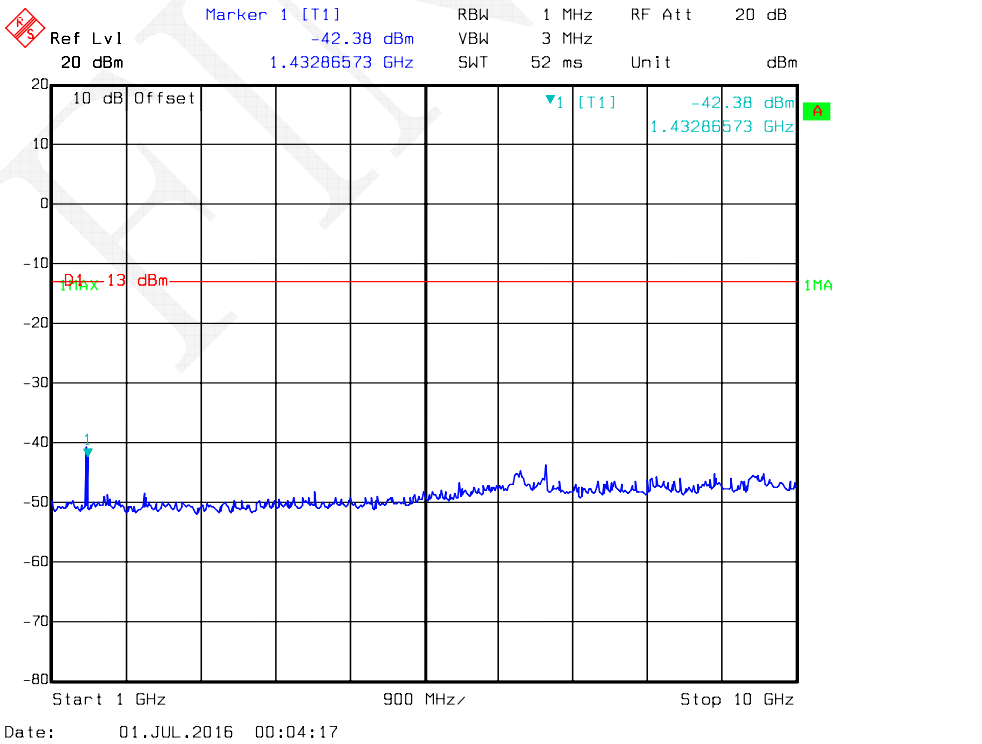

Marker 1 [T1]
Ref Lvl
30 dBm
-44.26 dBm
984.44889780 MHz
RBW 100 kHz
VBW 300 kHz
SWT 245 ms
RF Att 30 dB
Unit dBm
10 dB Offset
1MAX
1MA
D1 -25 dBm
Start 30 MHz
97 MHz/
Stop 1 GHz
Date: 02.JUL.2016 00:07:55


Fundamental
Marker 1 [T1]
Ref Lvl
30 dBm
-31.37 dBm
6.92785571 GHz
RBW 1 MHz
VBW 3 MHz
SWT 145 ms
RF Att 30 dB
Unit dBm
10 dB Offset
1MAX
1MA
D1 -25 dBm
Start 1 GHz
2.55 GHz/
Stop 26.5 GHz
Date: 02.JUL.2016 00:06:52

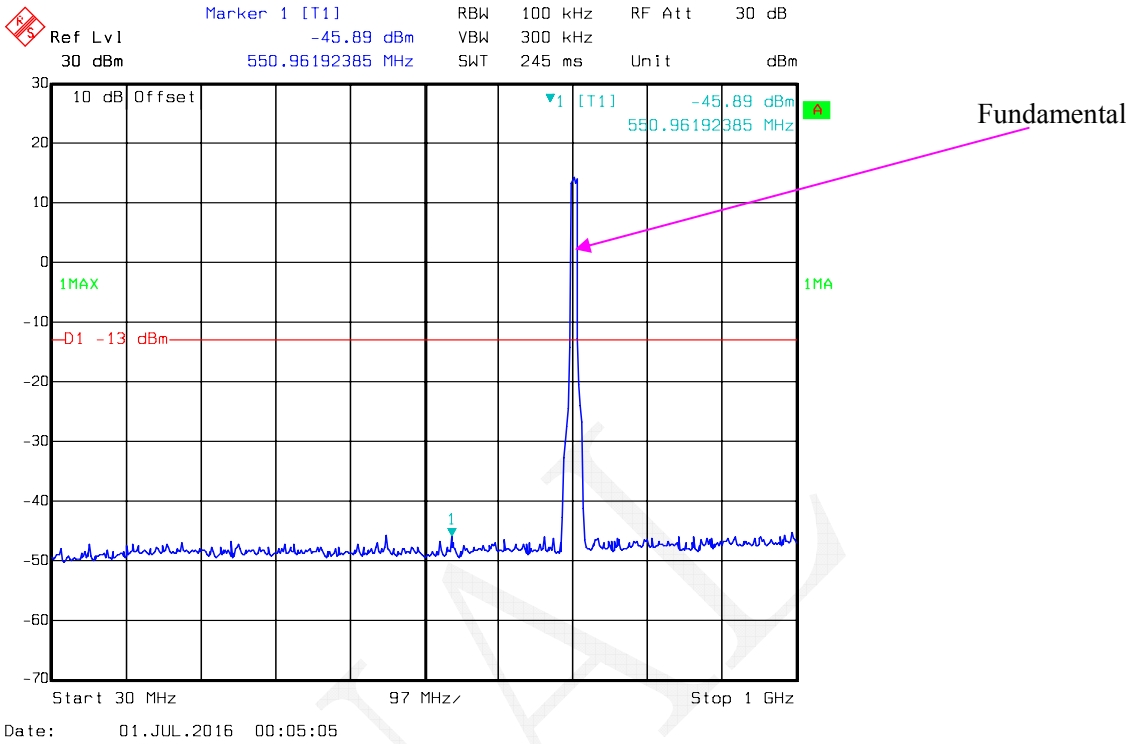
LTE Band 17 (Middle Channel)

QPSK_5MHz

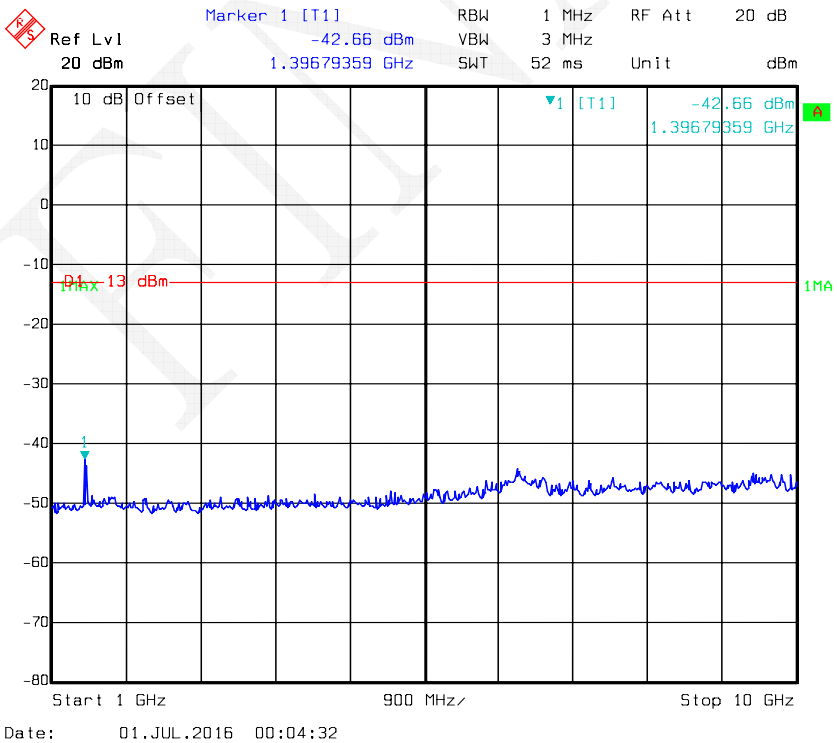




QPSK_10MHz



Date: 01.JUL.2016 00:05:05



Date: 01.JUL.2016 00:04:32

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	2015-08-03	2016-08-02
Sunol Sciences	Antenna	JB3	A060611-3	2014-07-28	2017-07-27
HP	Amplifier	8447E	2434A02181	2015-09-01	2016-09-01
R&S	Spectrum Analyzer	FSEM	DE23437	2015-11-23	2016-11-22
ETS LINDGREN	Horn Antenna	3115	000 527 35	2015-09-06	2018-09-06
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2016-02-19	2017-02-19
Agilent	MXG Vector Signal Generator	N5182B	MY51350142	2016-03-30	2017-03-29
EMCO	Adjustable Dipole Antenna	3121C	9109-753	N/A	N/A
TDK RF	Horn Antenna	HRN-0118	130 084	2015-09-06	2018-09-06
N/A	Coaxial Cable	14m	N/A	2016-05-06	2017-05-06
N/A	Coaxial Cable	8m	N/A	2016-05-06	2017-05-06
N/A	Coaxial Cable	2m	N/A	2016-05-06	2017-05-06
Mini Circuit	High Pass Filter	VHF-3100+	31251	2016-05-06	2017-05-06
Mini Circuit	High Pass Filte	VHF-1200+	N/A	2016-05-06	2017-05-06

*** 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:	28.5 °C
Relative Humidity:	39 %
ATM Pressure:	100.1 kPa

The testing was performed by Lion Xiao on 2016-06-27.

EUT Operation Mode: Transmitting

Cellular Band

30MHz-10 GHz

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
GSM850, Frequency:836.600 MHz								
1673.200	H	33.67	-67.4	10.6	1.5	-58.3	-13.0	45.3
1673.200	V	38.35	-63	10.6	1.5	-53.9	-13.0	40.9
2509.800	H	31.03	-67	13.1	2.8	-56.7	-13.0	43.7
2509.800	V	36.47	-60.6	13.1	2.8	-50.3	-13.0	37.3
289.300	H	35.72	-71.9	0.0	0.5	-72.4	-13.0	59.4
252.800	V	36.89	-68.8	0.0	0.5	-69.3	-13.0	56.3
WCDMA Band V R99,Frequency:836.600 MHz								
1673.200	H	32.45	-68.6	10.6	1.5	-59.5	-13.0	46.5
1673.200	V	36.08	-65.3	10.6	1.5	-56.2	-13.0	43.2
2509.800	H	31.63	-66.4	13.1	2.8	-56.1	-13.0	43.1
2509.800	V	34.39	-62.7	13.1	2.8	-52.4	-13.0	39.4
289.300	H	35.01	-72.6	0.0	0.5	-73.1	-13.0	60.1
252.800	V	36.75	-69	0.0	0.5	-69.5	-13.0	56.5

30MHz-20GHz:

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
GSM1900, Frequency:1880.000 MHz								
3760.000	H	34.85	-59.4	13.8	2.9	-48.5	-13.0	35.5
3760.000	V	36.60	-56.5	13.8	2.9	-45.6	-13.0	32.6
5800.000	H	37.97	-53.8	14.1	2.3	-42.0	-13.0	29.0
5800.000	V	39.10	-52.6	14.1	2.3	-40.8	-13.0	27.8
231.700	H	35.69	-72.3	0.0	0.5	-72.8	-13.0	59.8
299.400	V	36.11	-68.9	0.0	0.5	-69.4	-13.0	56.4
WCDMA Band II, R99, Frequency:1880.000 MHz								
3760.000	H	32.81	-61.5	13.8	2.9	-50.6	-13.0	37.6
3760.000	V	33.04	-60	13.8	2.9	-49.1	-13.0	36.1
5640.000	V	39.93	-51.7	14.0	2.1	-39.8	-13.0	26.8
5640.000	H	41.43	-50.3	14.0	2.1	-38.4	-13.0	25.4
231.700	H	35.49	-72.5	0.0	0.5	-73.0	-13.0	60.0
299.400	V	36.34	-68.6	0.0	0.5	-69.1	-13.0	56.1
WCDMA Band IV, R99, Frequency:1880.000 MHz								
3465.000	H	37.13	-59.8	13.9	1.9	-47.8	-13.0	34.8
3465.000	V	38.34	-57.8	13.9	1.9	-45.8	-13.0	32.8
5197.500	H	46.24	-44.8	14.0	2.3	-33.1	-13.0	20.1
5197.500	V	47.08	-45.5	14.0	2.3	-33.8	-13.0	20.8
266.400	H	35.93	-72	0.0	0.5	-72.5	-13.0	59.5
302.700	V	36.40	-68.2	0.0	0.5	-68.7	-13.0	55.7

LTE Bands(Worst case as below):

30MHz-20GHz:

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
LTE band II, QPSK, Test Frequency:1880.00 MHz								
3760.000	H	38.20	-56.1	13.8	2.9	-45.2	-13.0	32.2
3760.000	V	35.41	-57.7	13.8	2.9	-46.8	-13.0	33.8
5640.000	H	45.39	-46.3	14.0	2.1	-34.4	-13.0	21.4
5640.000	V	45.86	-45.8	14.0	2.1	-33.9	-13.0	20.9
231.700	H	35.41	-72.6	0.0	0.5	-73.1	-13.0	60.1
299.400	V	36.38	-68.6	0.0	0.5	-69.1	-13.0	56.1
LTE Band IV, QPSK, Test Frequency:1732.50 MHz								
3465.000	H	36.21	-60.7	13.9	1.9	-48.7	-13.0	35.7
3465.000	V	38.03	-58.1	13.9	1.9	-46.1	-13.0	33.1
5197.500	H	50.65	-40.4	14.0	2.3	-28.7	-13.0	15.7
5197.500	V	50.84	-41.7	14.0	2.3	-30.0	-13.0	17.0
266.400	H	35.19	-72.7	0.0	0.5	-73.2	-13.0	60.2
302.700	V	36.32	-68.3	0.0	0.5	-68.8	-13.0	55.8

LTE Band V(30MHz-10GHz):

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK, Frequency: 836.5MHz								
1673.000	H	40.57	-60.5	10.6	1.5	-51.4	-13.0	38.4
1673.000	V	42.82	-58.6	10.6	1.5	-49.5	-13.0	36.5
2509.500	H	39.45	-58.6	13.1	2.8	-48.3	-13.0	35.3
2509.500	V	40.13	-57	13.1	2.8	-46.7	-13.0	33.7
289.300	H	35.98	-71.6	0.0	0.5	-72.1	-13.0	59.1
252.800	V	36.51	-69.2	0.0	0.5	-69.7	-13.0	56.7

LTE Band VII(30MHz-26GHz):

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK,Frequency:2535.00 MHz								
5070.000	H	48.51	-42.8	13.9	2.4	-31.3	-25.0	6.3
5070.000	V	50.17	-42	13.9	2.4	-30.5	-25.0	5.5
7605.000	H	45.81	-41.7	13.2	3.1	-31.6	-25.0	6.6
7605.000	V	47.22	-40.3	13.2	3.1	-30.2	-25.0	5.2
250.900	H	35.98	-72.2	0.0	0.5	-72.7	-25.0	47.7
291.700	V	36.05	-69	0.0	0.5	-69.5	-25.0	44.5

LTE Band 17(30MHz-10GHz)

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK,Frequency:710.00 MHz								
1420.000	H	46.97	-53.9	9.1	1.3	-46.1	-13.0	33.1
1420.000	V	51.23	-49.4	9.1	1.3	-41.6	-13.0	28.6
2130.000	H	44.66	-51.3	11.2	1.4	-41.5	-13.0	28.5
2130.000	V	48.41	-46.4	11.2	1.4	-36.6	-13.0	23.6
305.100	H	35.84	-71	0.0	0.5	-71.5	-13.0	58.5
273.900	V	36.57	-68.8	0.0	0.5	-69.3	-13.0	56.3

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 = SG Level - Cable loss + Antenna Gain
3) Margin = Limit-Absolute Level

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

Applicable Standard

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

According to §24.238(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

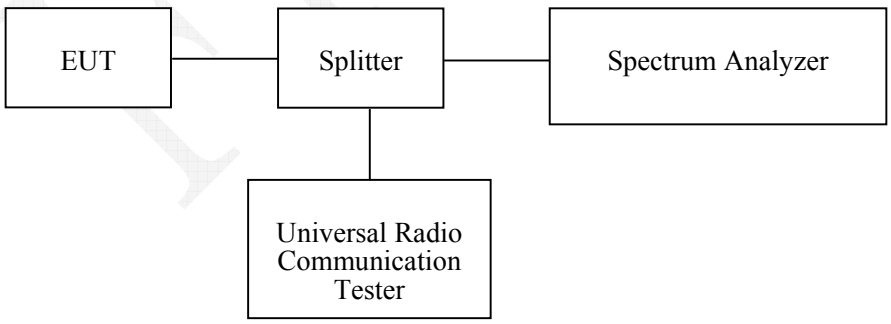
According to §27.53 (h), AWS emission limits—(1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.

According to §27.53 (m), (4) For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

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	Spectrum Analyzer	FSP 38	100478	2015-11-23	2016-11-22
R&S	Spectrum Analyzer	FSEM	831259/019	2015-07-28	2016-07-27
R&S	Universal Radio Communication Tester	CMU200	109 038	2015-07-28	2016-07-27
R&S	Wideband Radio Communication Tester	CMW500	106891	2015-11-23	2016-11-23
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06
E-Microwave	Attenuator	EMCA10-5RN	OE01203239	2016-05-08	2017-05-08
Pasternack	RF Coaxial Cable	RF-01	N/A	2016-05-06	2017-05-06
Pasternack	RF Coaxial Cable	RF-02	N/A	2016-05-06	2017-05-06
N/A	Two-way Spliter	ODP-1-6-2S	OE0120142	2016-05-06	2017-05-06

*** 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

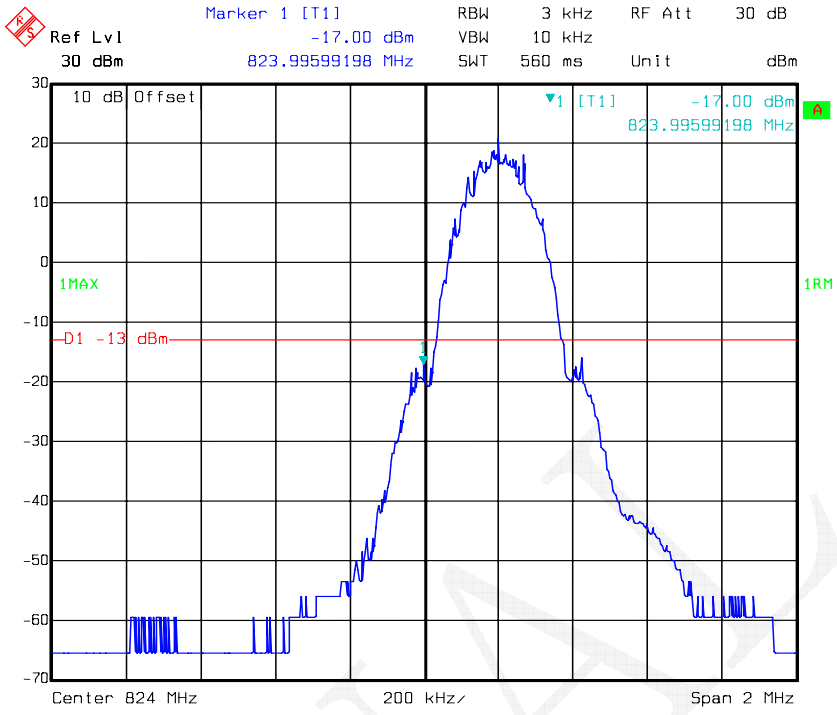
Temperature:	26.2 ~ 28.6 °C
Relative Humidity:	39 ~ 58%
ATM Pressure:	99.7~100.4 kPa

The testing was performed by Lion Xiao from 2016-06-15 to 2016-07-01.

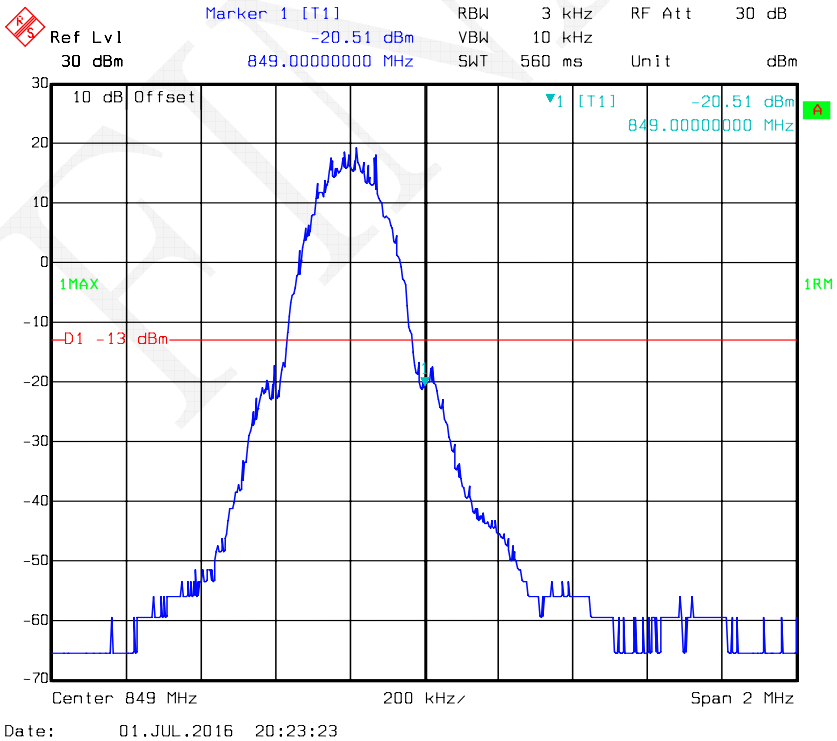
Test Mode: Transmitting

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

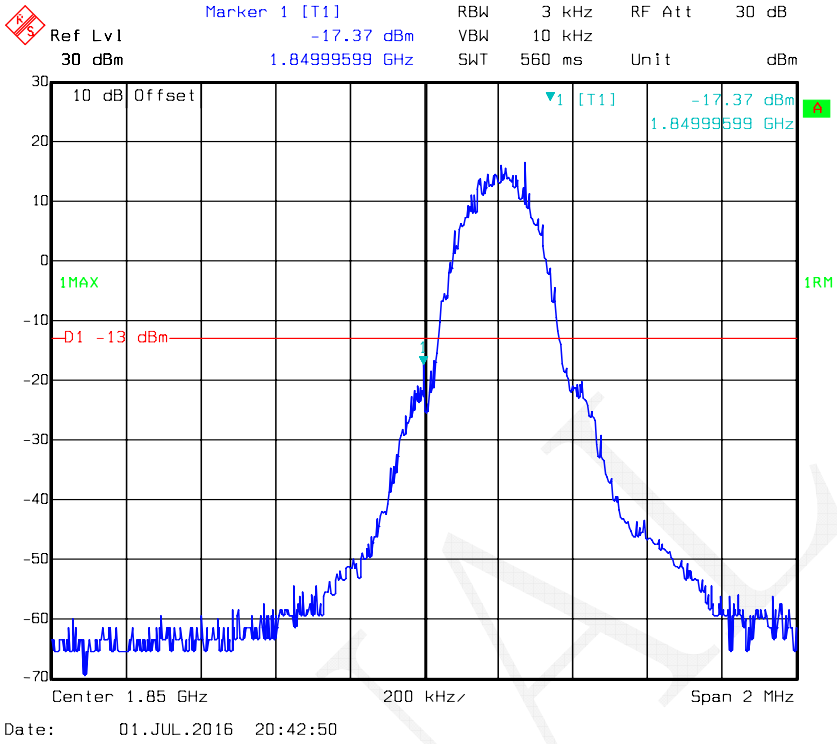
GSM 850, Left Band Edge



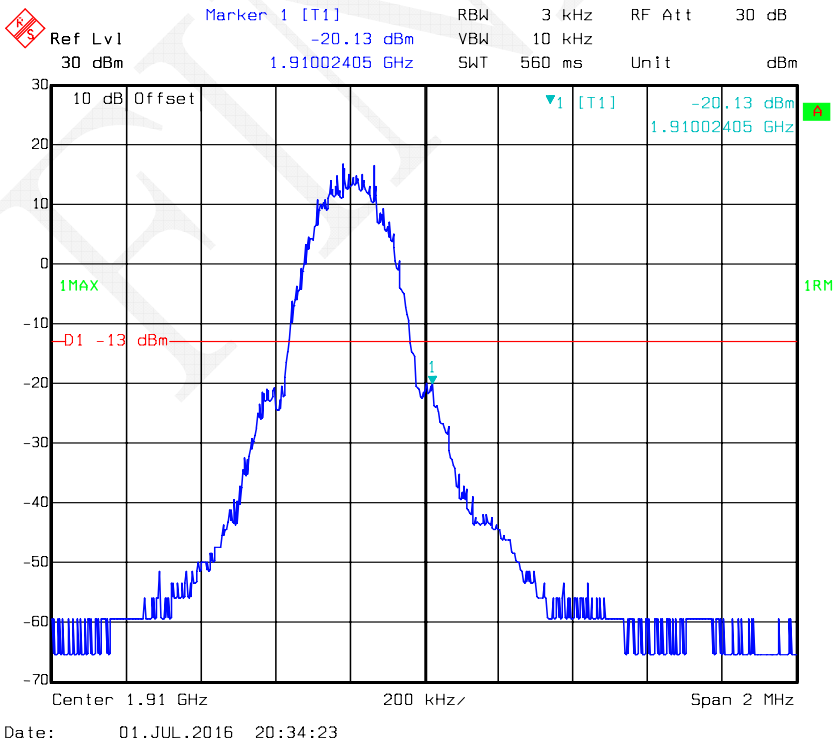
GSM 850, Right Band Edge



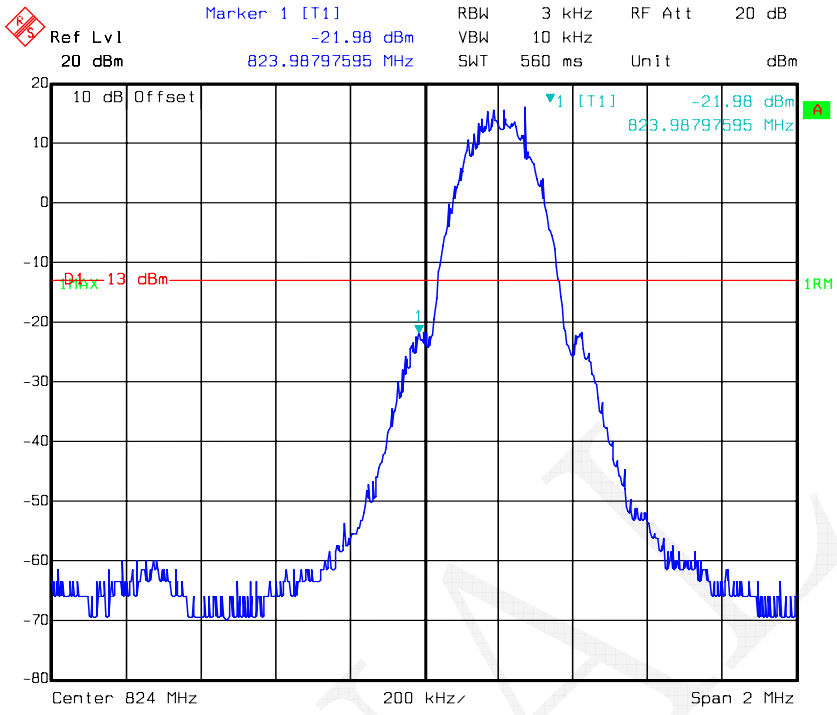
GSM 1900, Left Band Edge



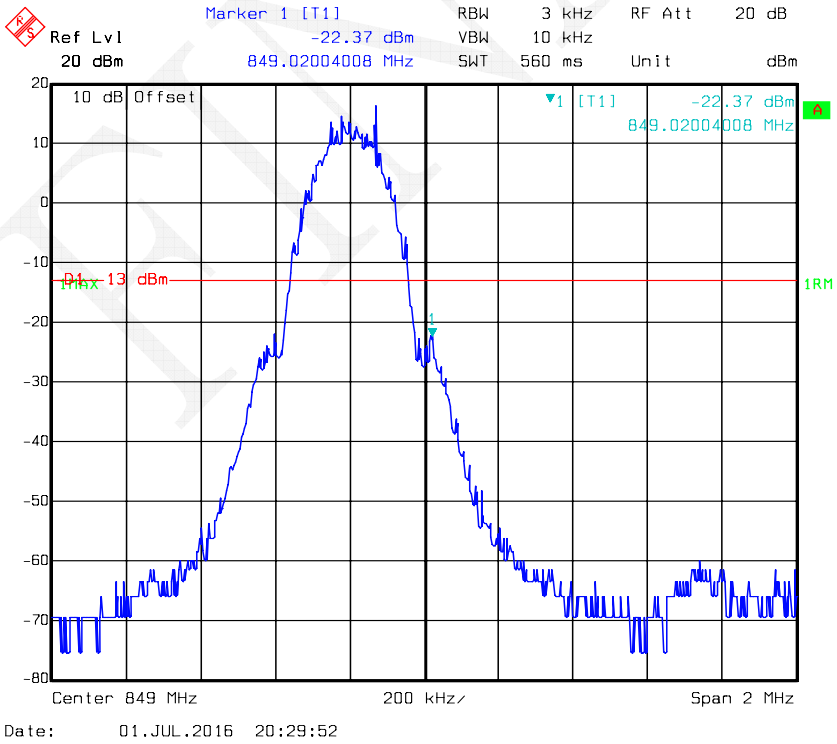
GSM 1900, Right Band Edge



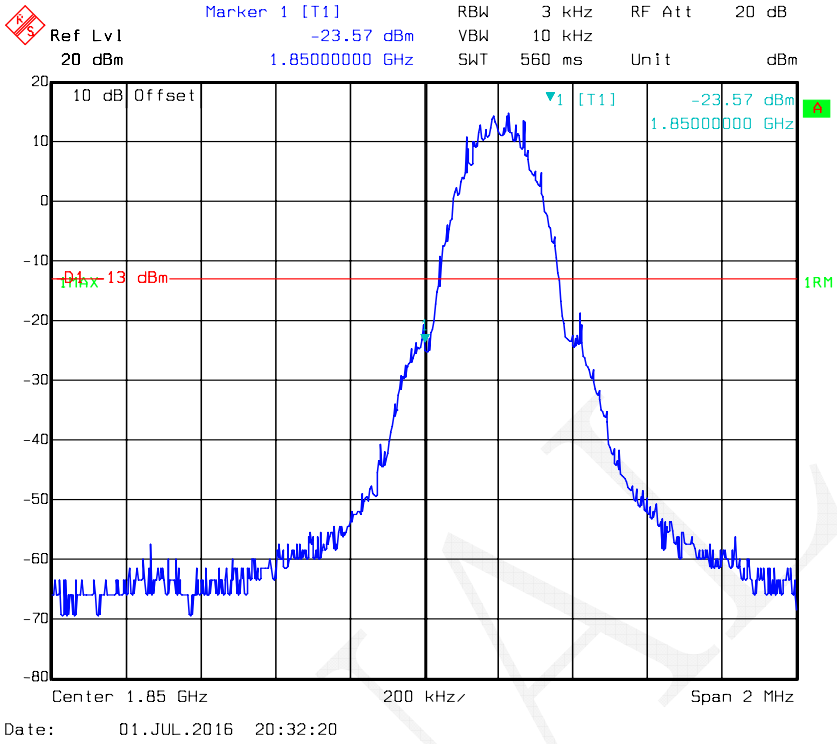
EDGE 850, Left Band Edge



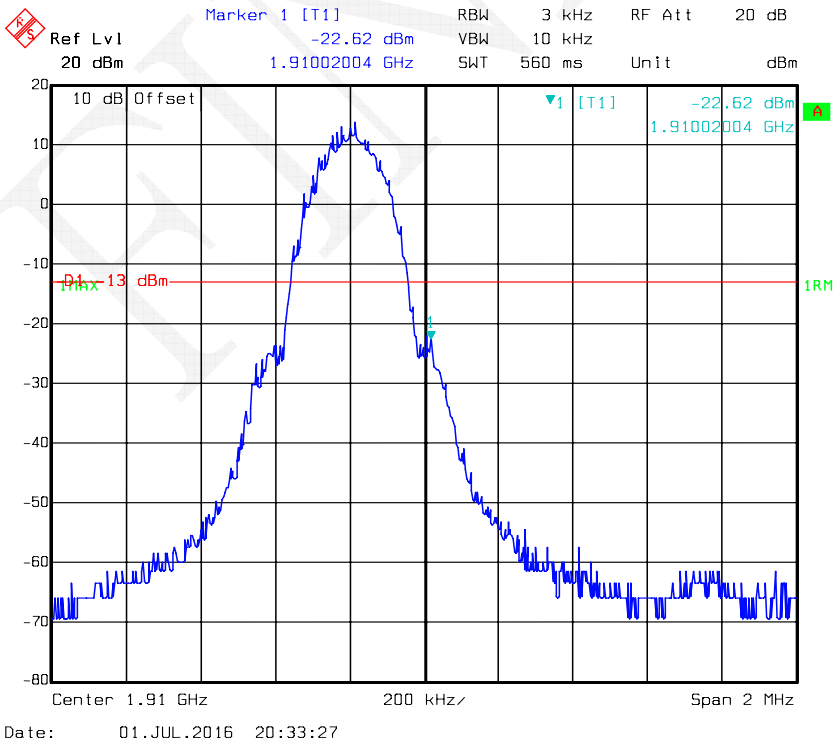
EDGE 850, Right Band Edge



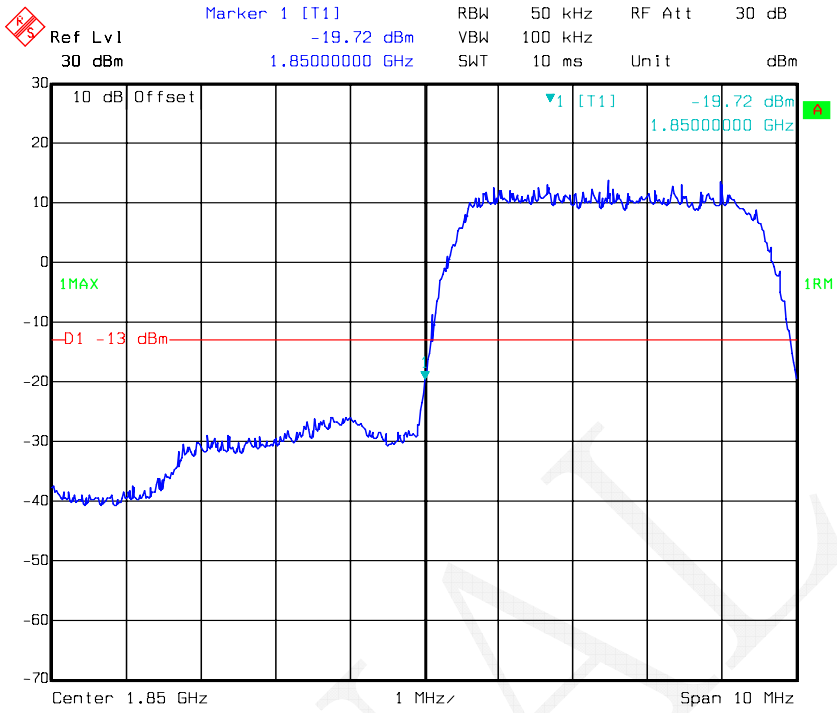
EDGE 1900, Left Band Edge



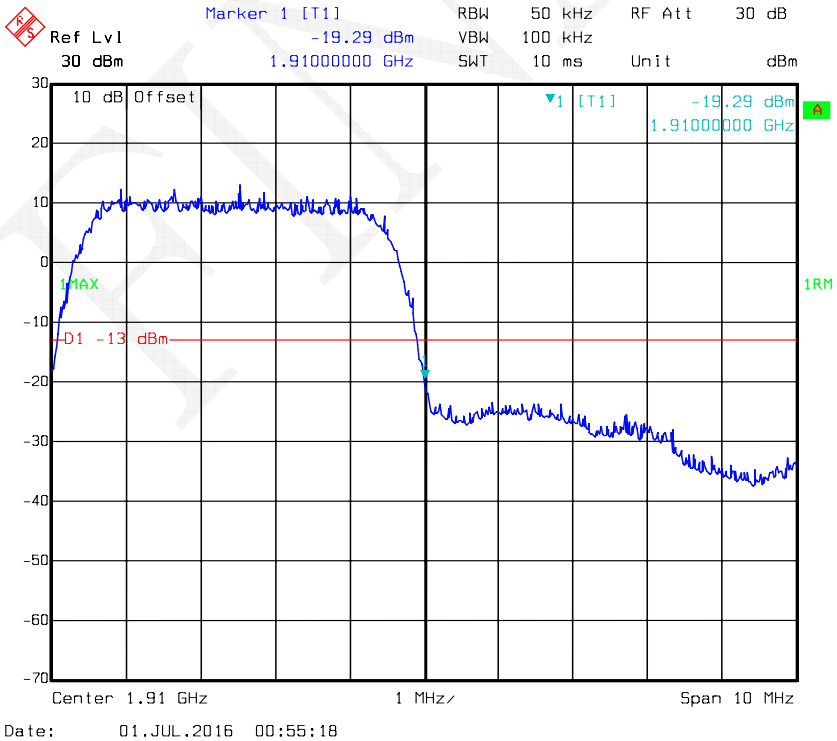
EDGE 1900, Right Band Edge



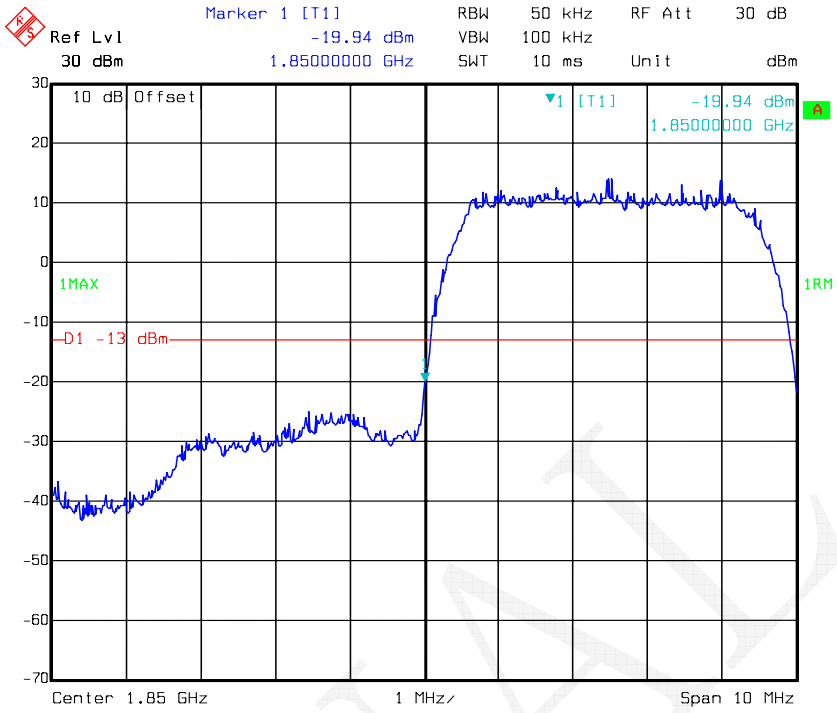
REL99 Band II, Left Band Edge



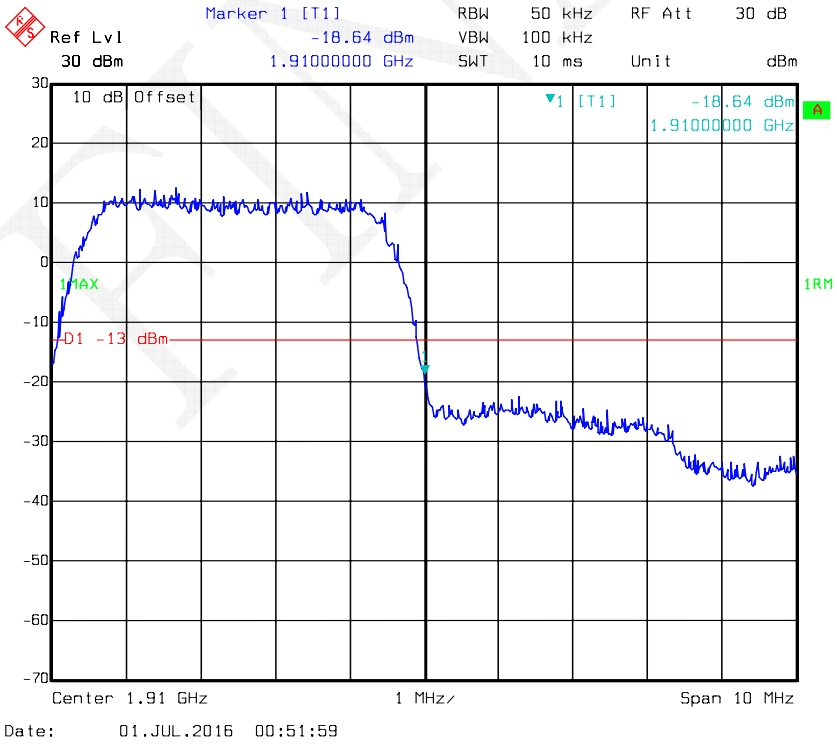
REL99 Band II, Right Band Edge



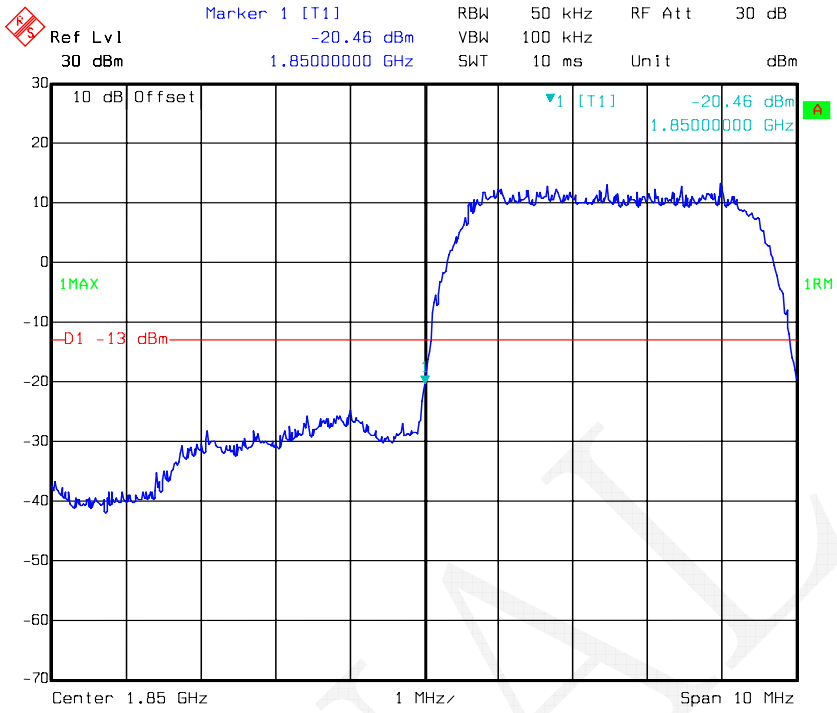
HSDPA Band II, Left Band Edge



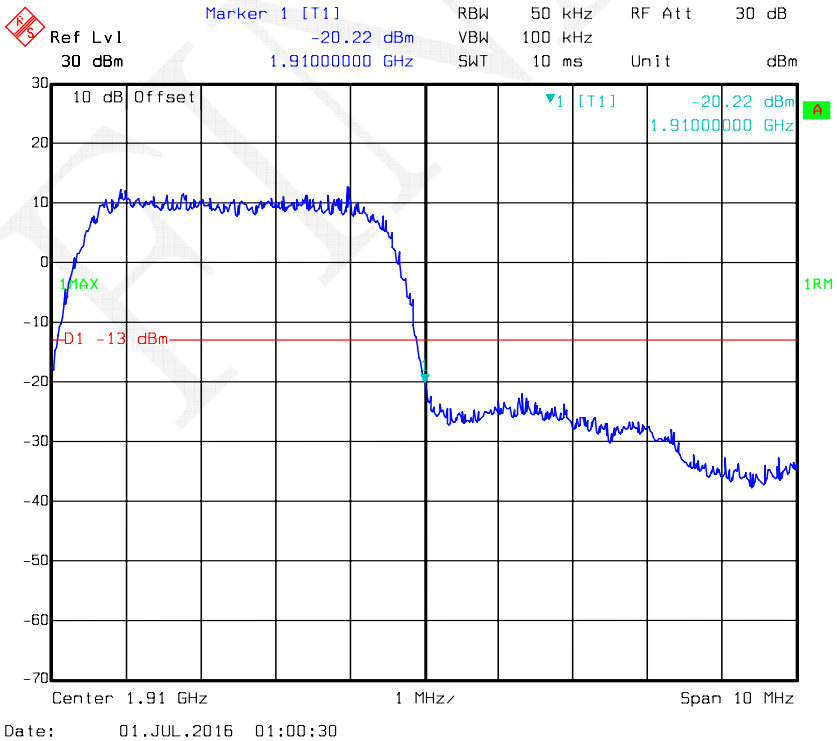
HSDPA Band II, Right Band Edge



HSUPA Band II, Left Band Edge

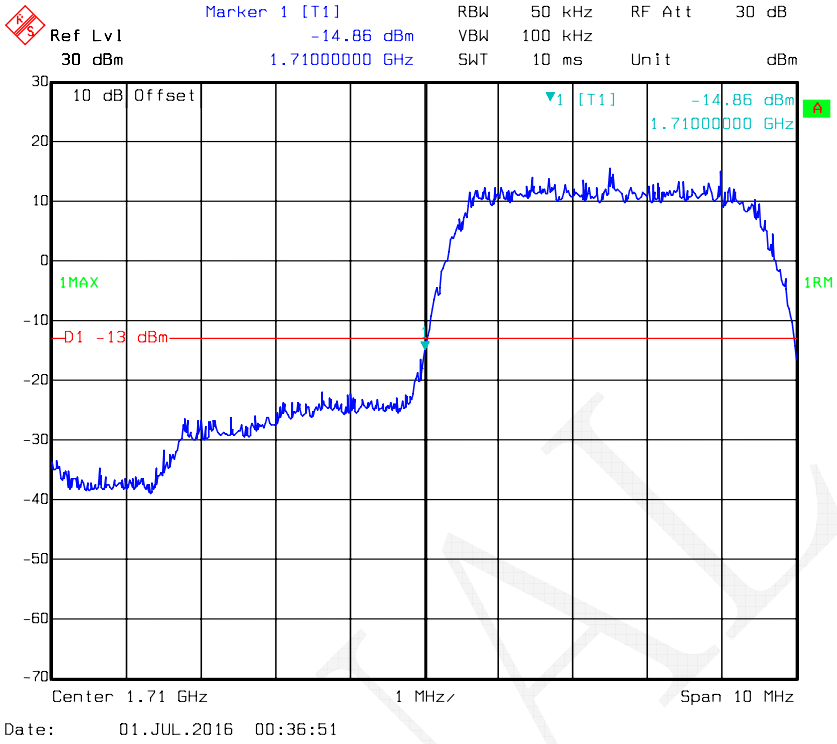


HSUPA Band II, Right Band Edge

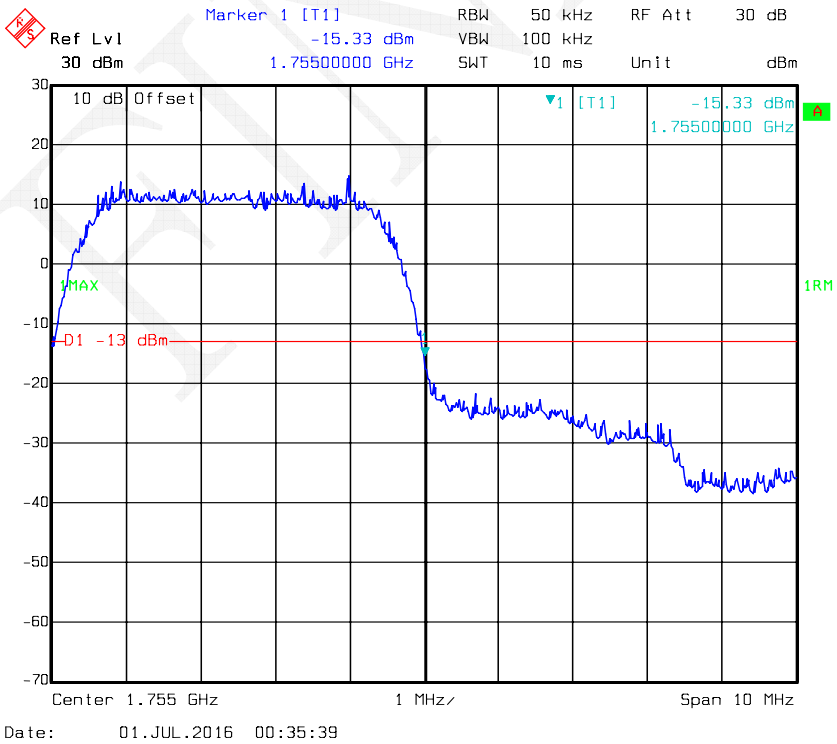


WCDMA Band IV

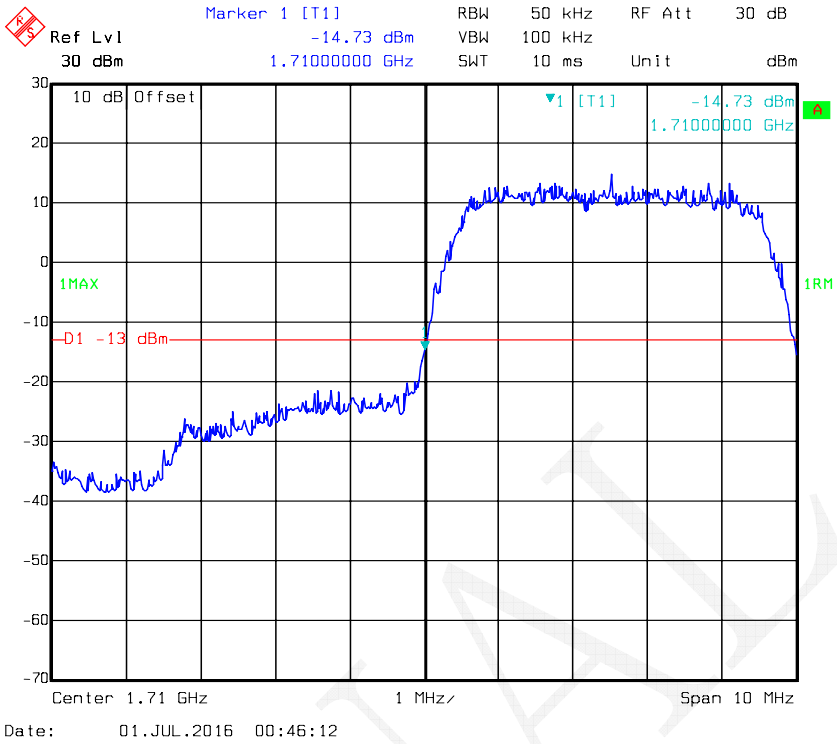
REL99 Band IV, Left Band Edge



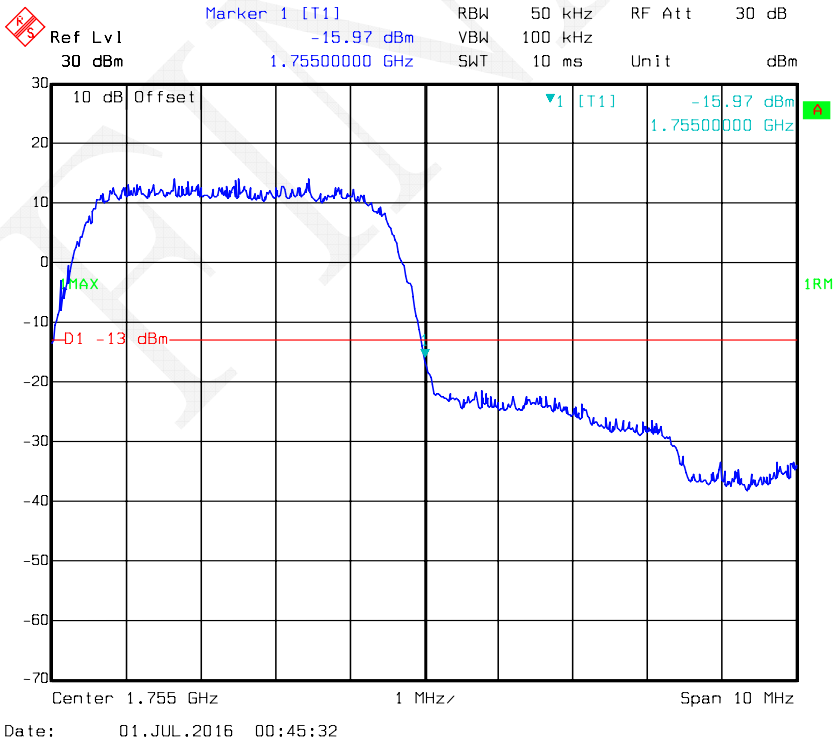
REL99 Band IV Right Band Edge



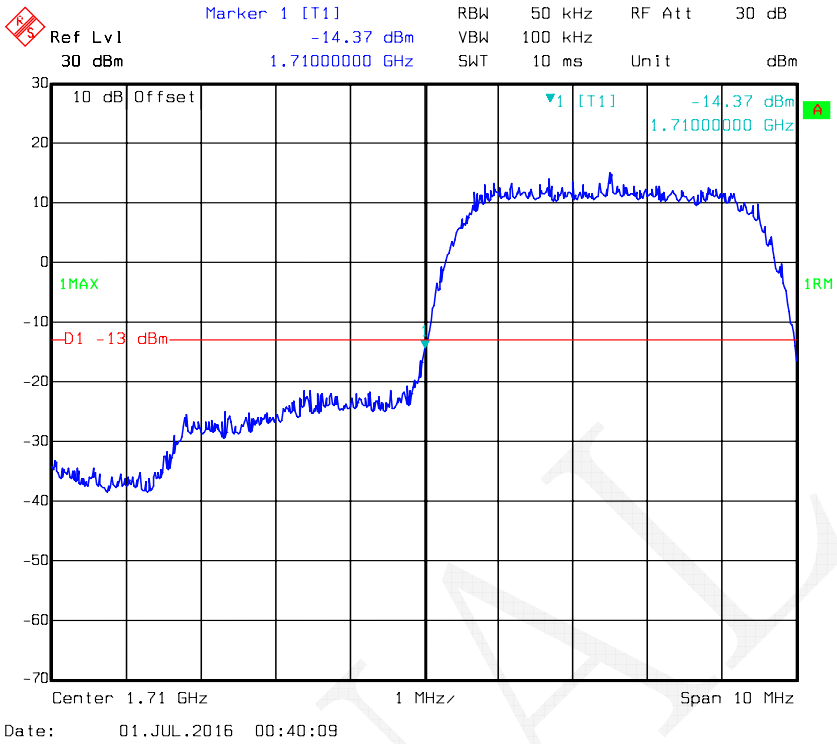
HSDPA Band IV, Left Band Edge



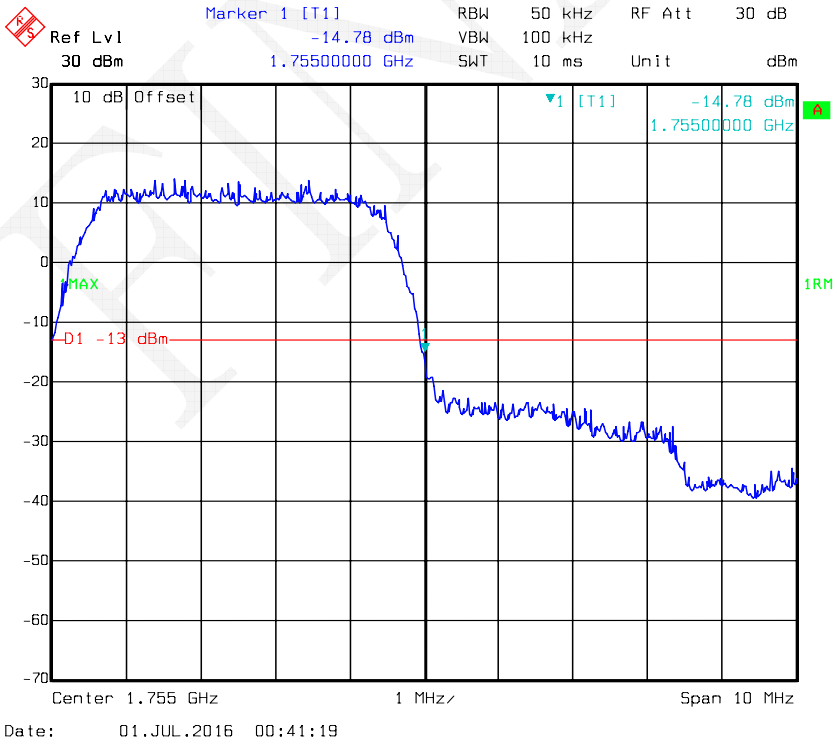
HSDPA Band IV, Right Band Edge



HSUPA Band IV, Left Band Edge

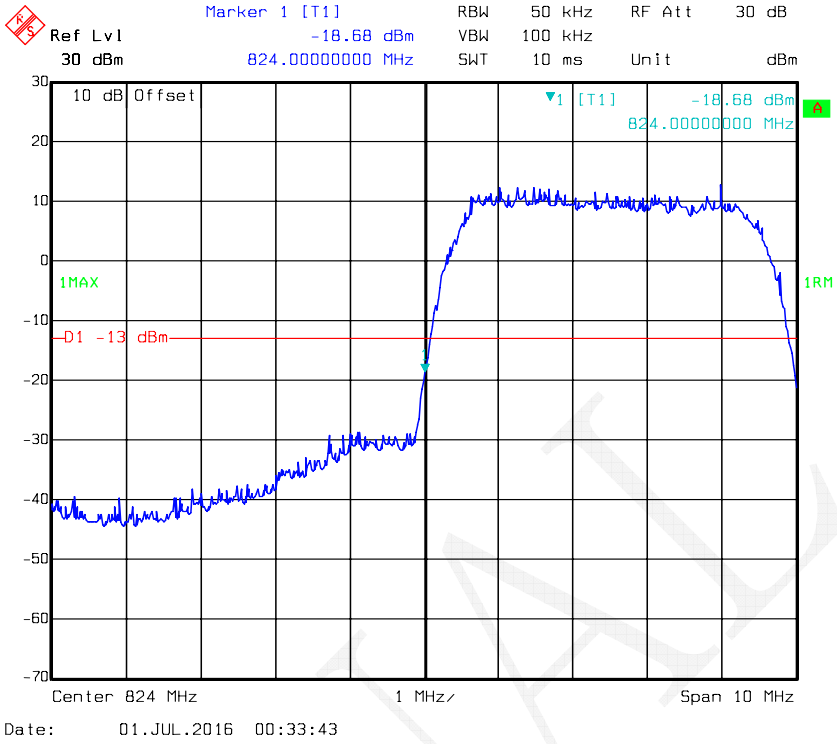


HSUPA Band IV, Right Band Edge

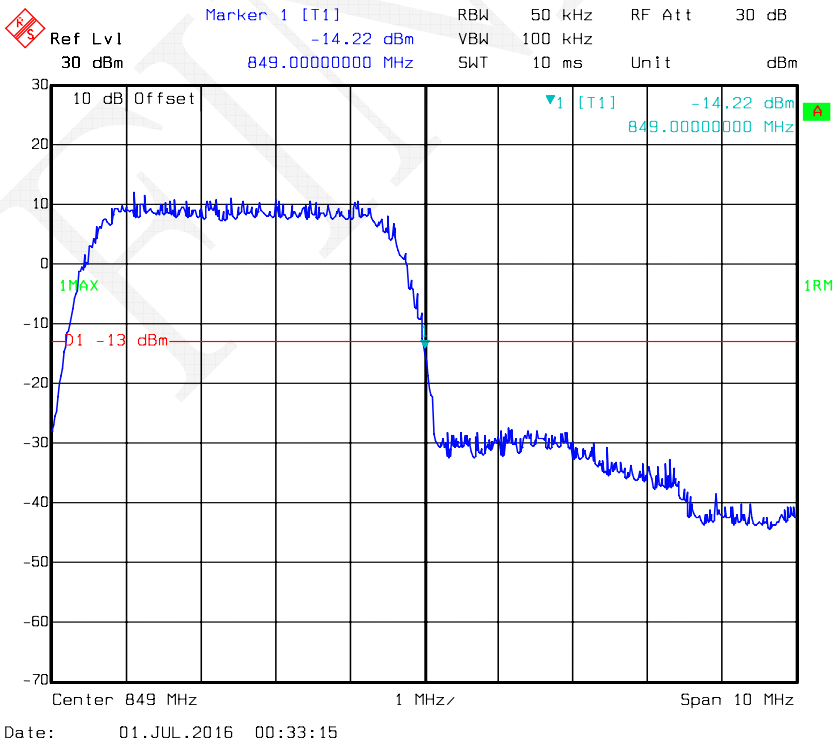


WCDMA Band V

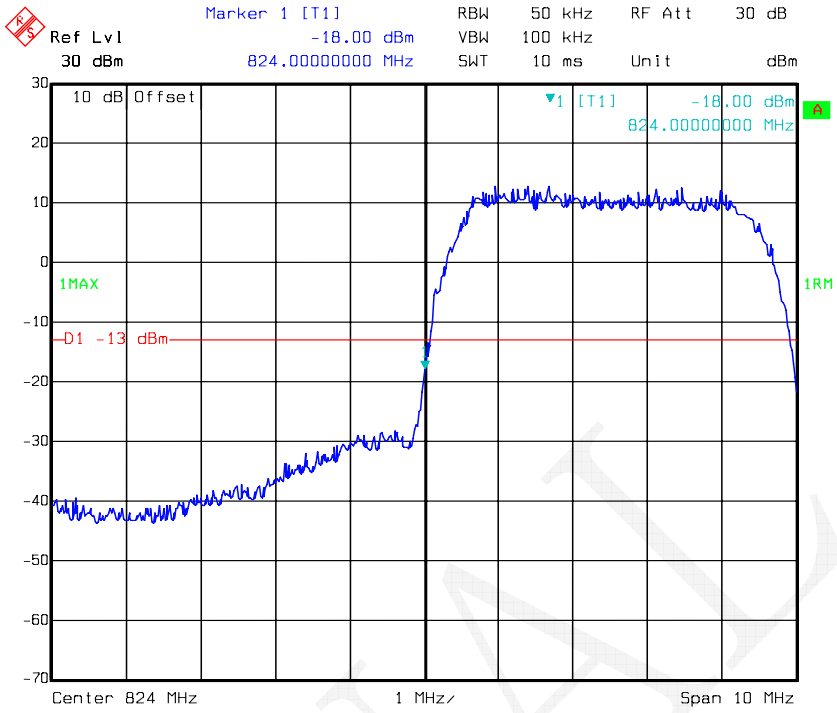
REL99 Band V, Left Band Edge



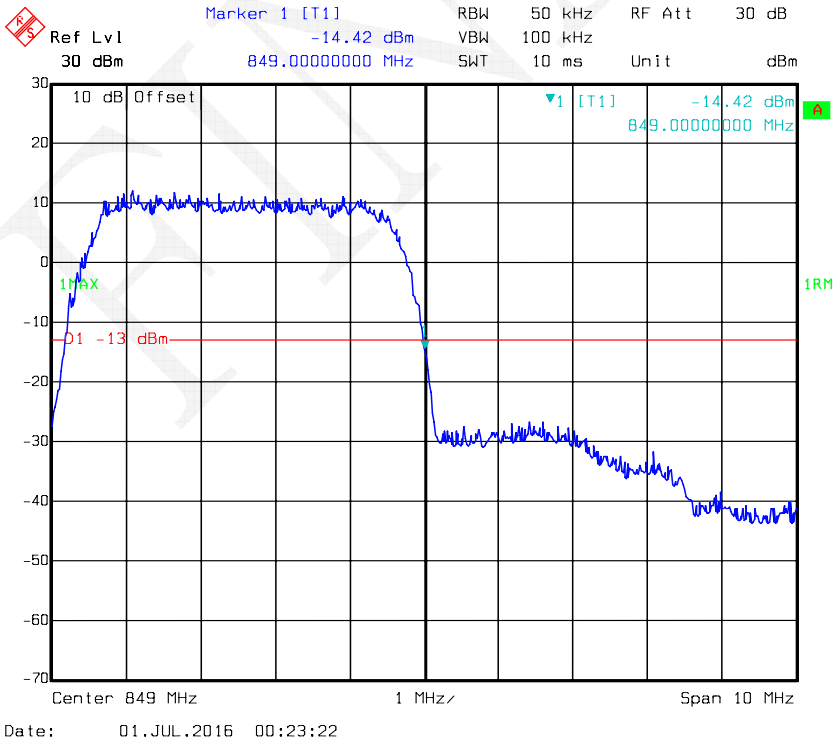
REL99 Band V Right Band Edge



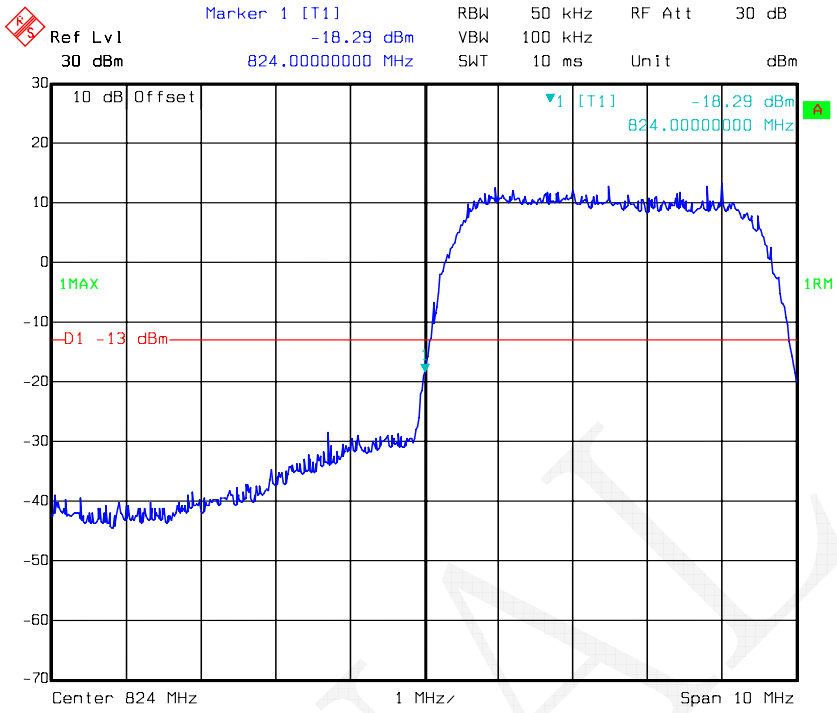
HSDPA Band V, Left Band Edge



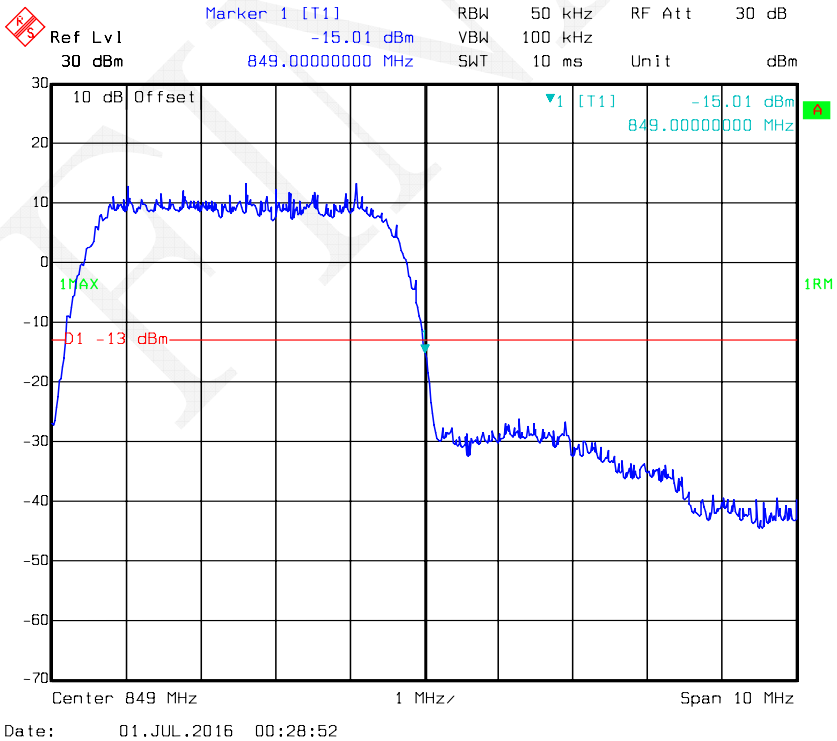
HSDPA Band V, Right Band Edge



HSUPA Band V, Left Band Edge

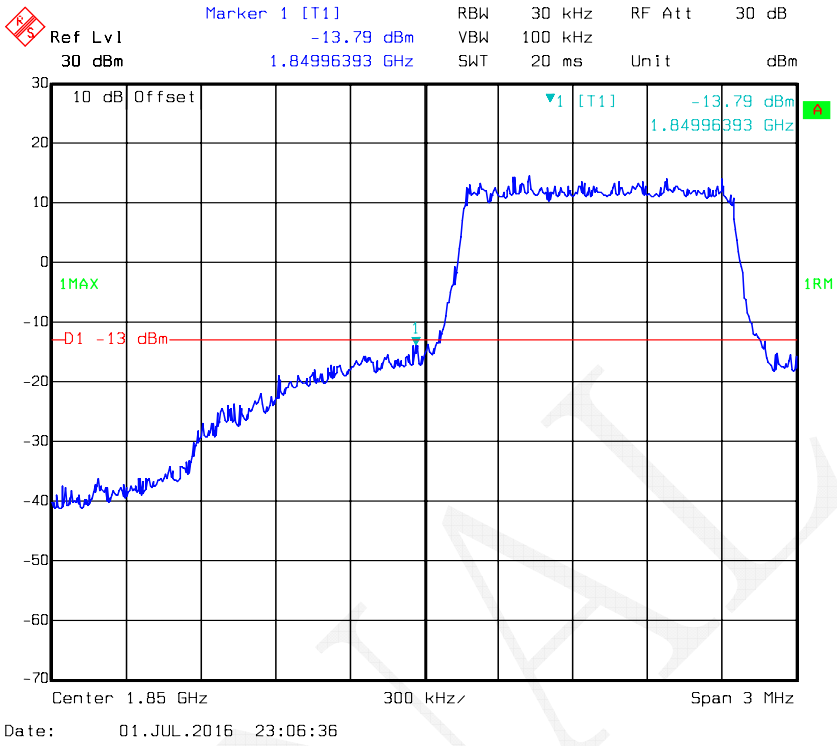


HSUPA Band V, Right Band Edge

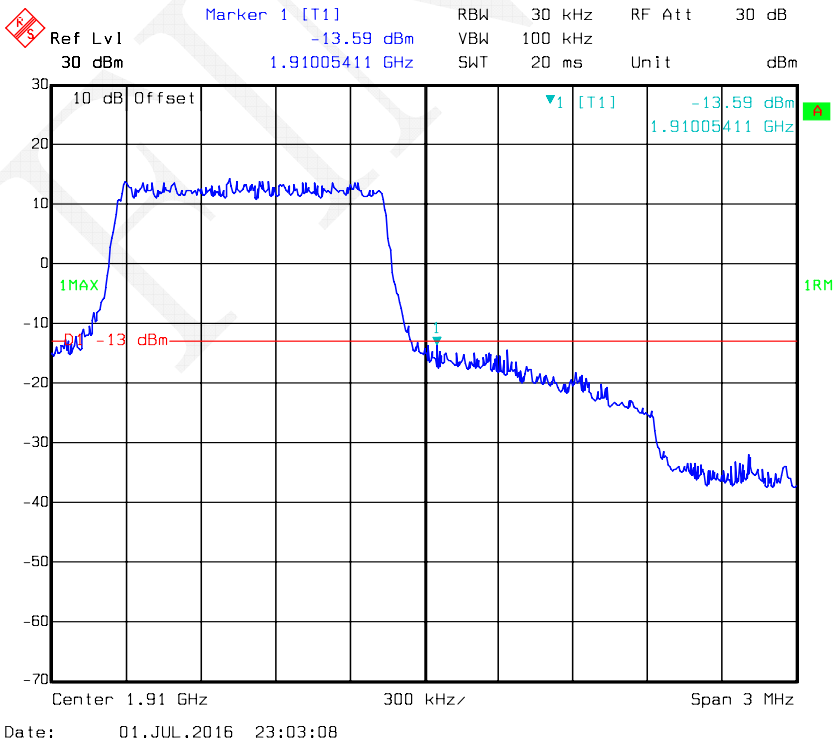


LTE Band II

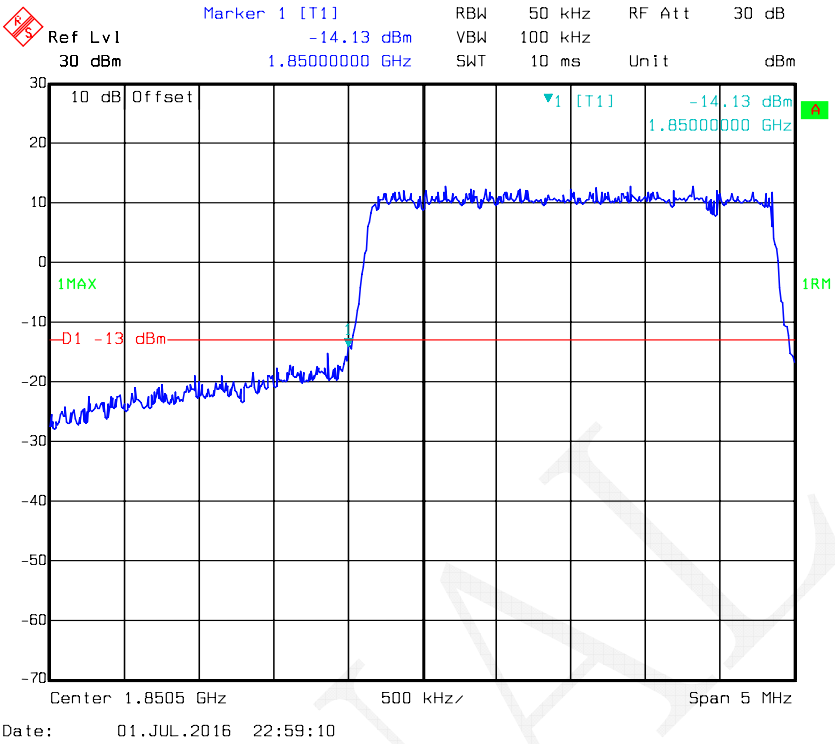
QPSK_1.4MHz_FULL RB_ Left



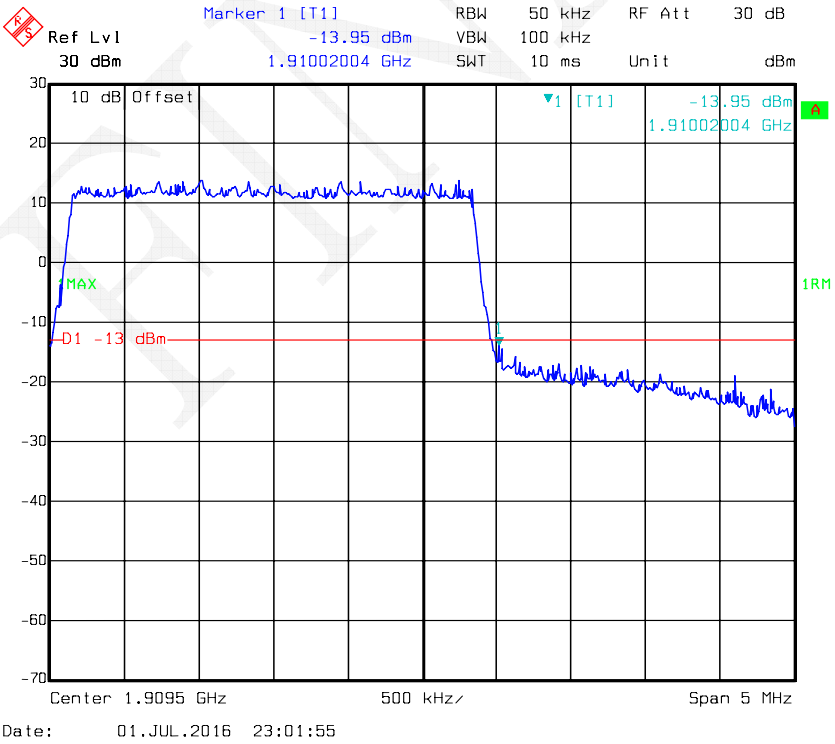
QPSK_1.4MHz_FULL RB_ Right



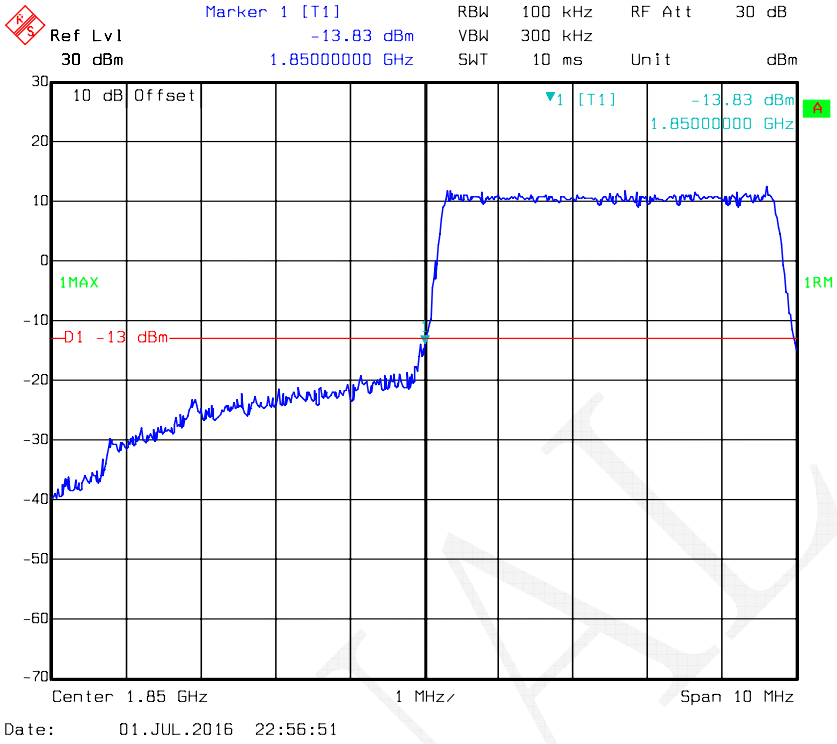
QPSK_3MHz_FULL RB_ Left



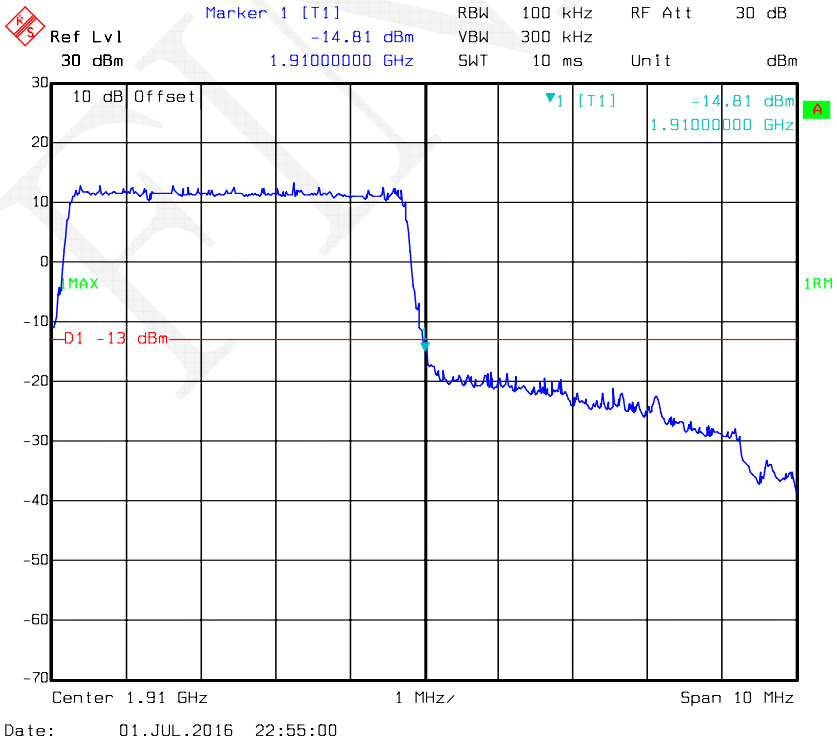
QPSK_3MHz_ FULL RB_ Right



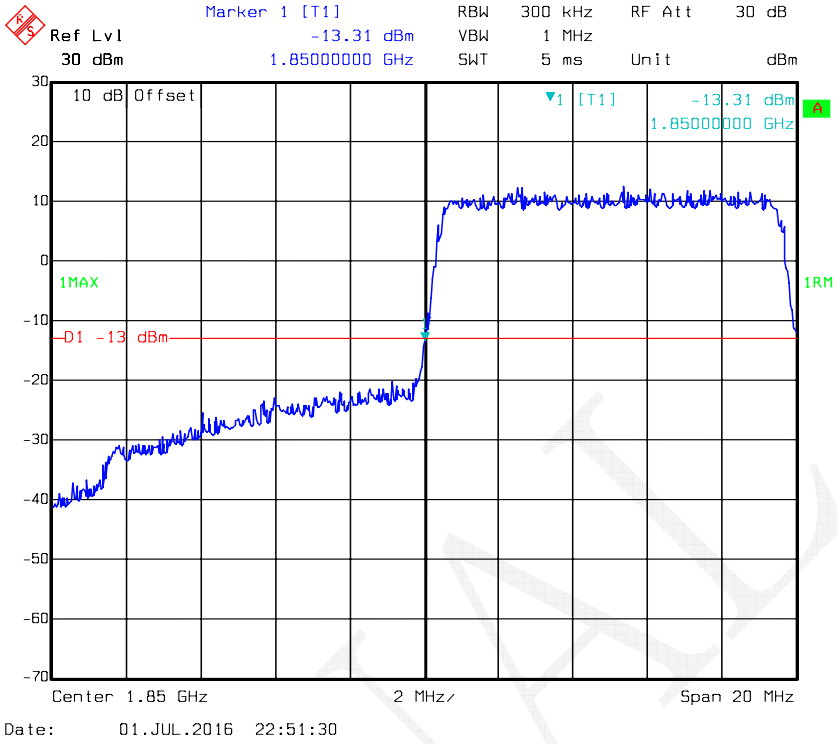
QPSK_5MHz_ FULL RB_ Left



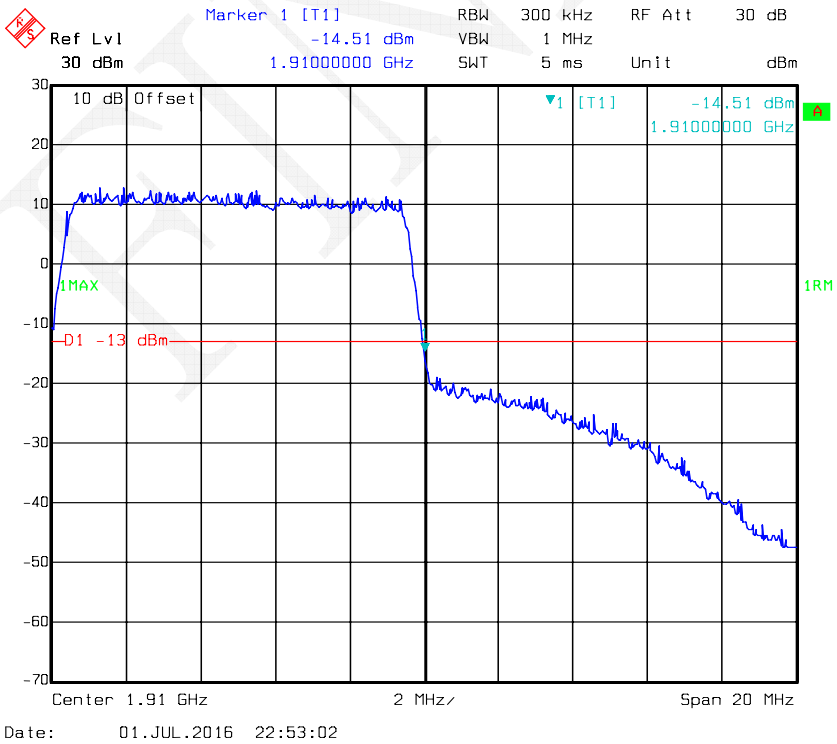
QPSK_5MHz_ FULL RB_ Right



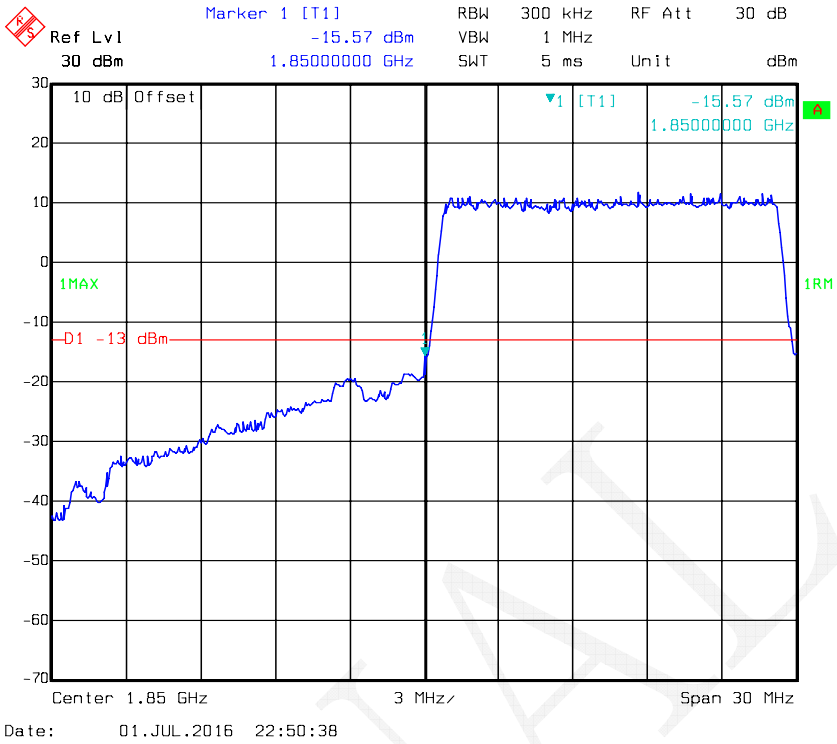
QPSK_10MHz_ FULL RB_ Left



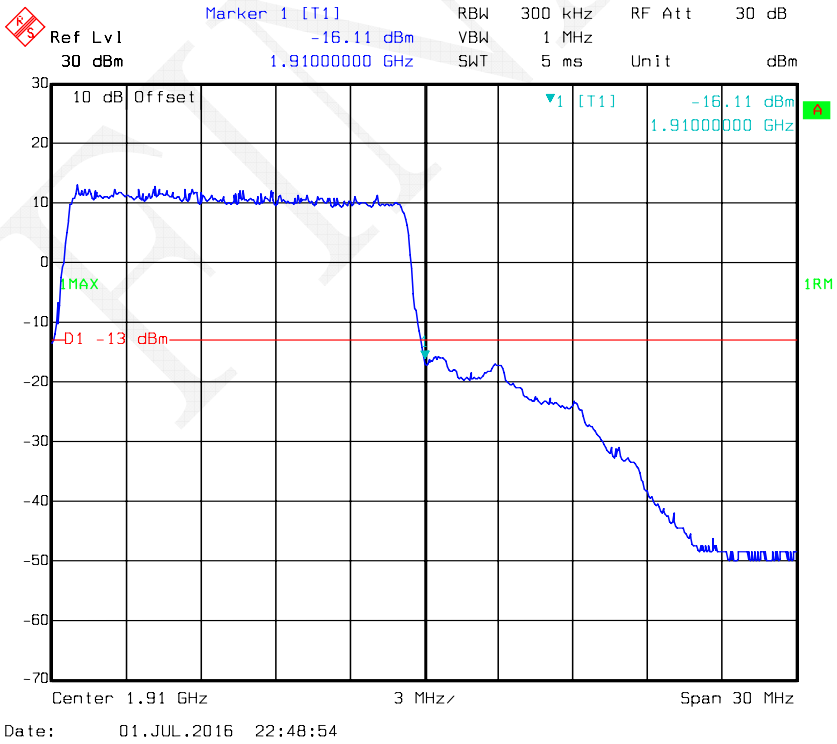
QPSK_10MHz_ FULL RB_ Right



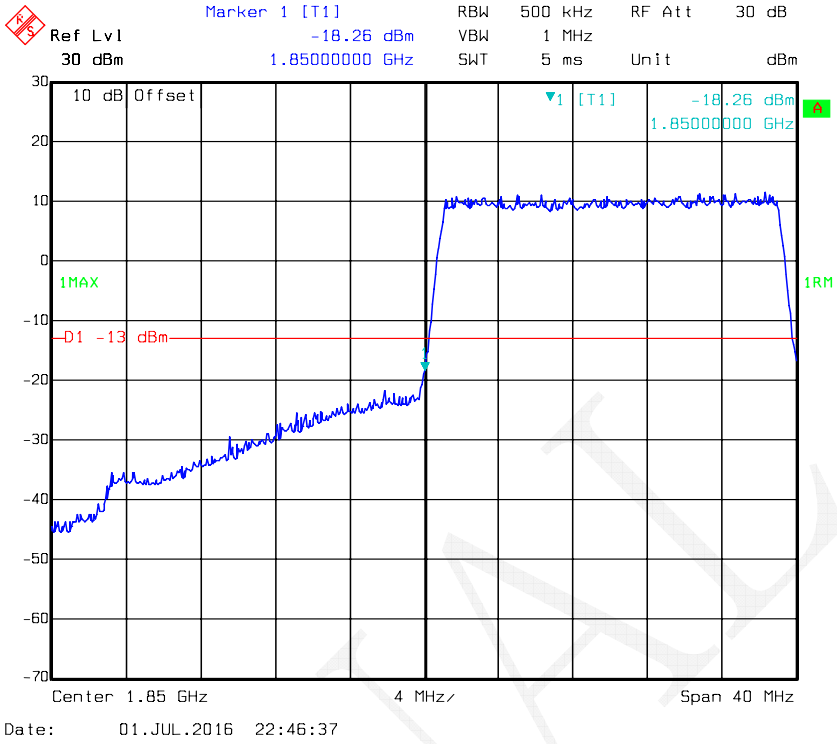
QPSK_15MHz_ FULL RB_ Left



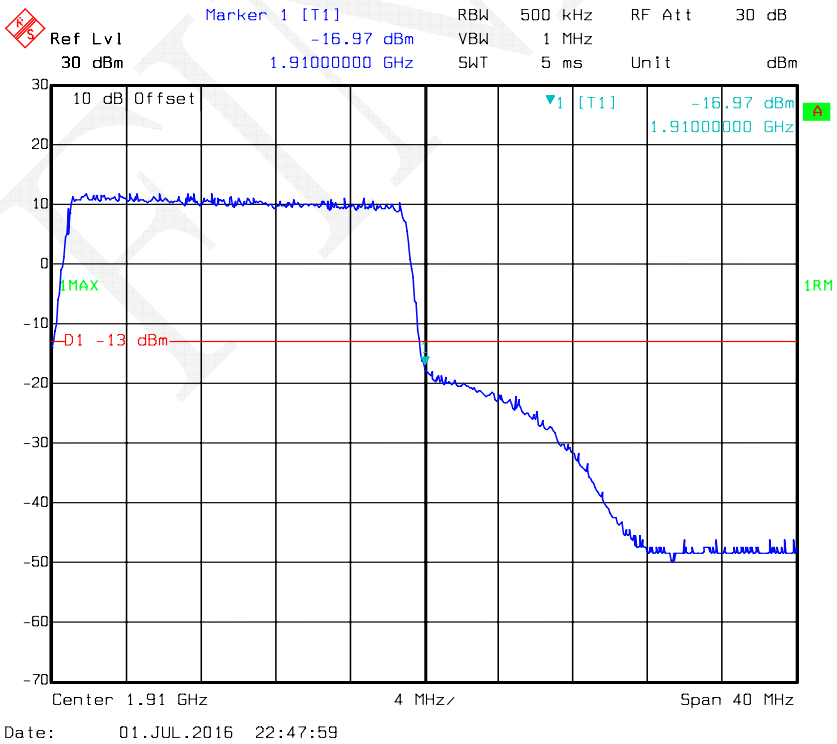
QPSK_15MHz_ FULL RB_ Right



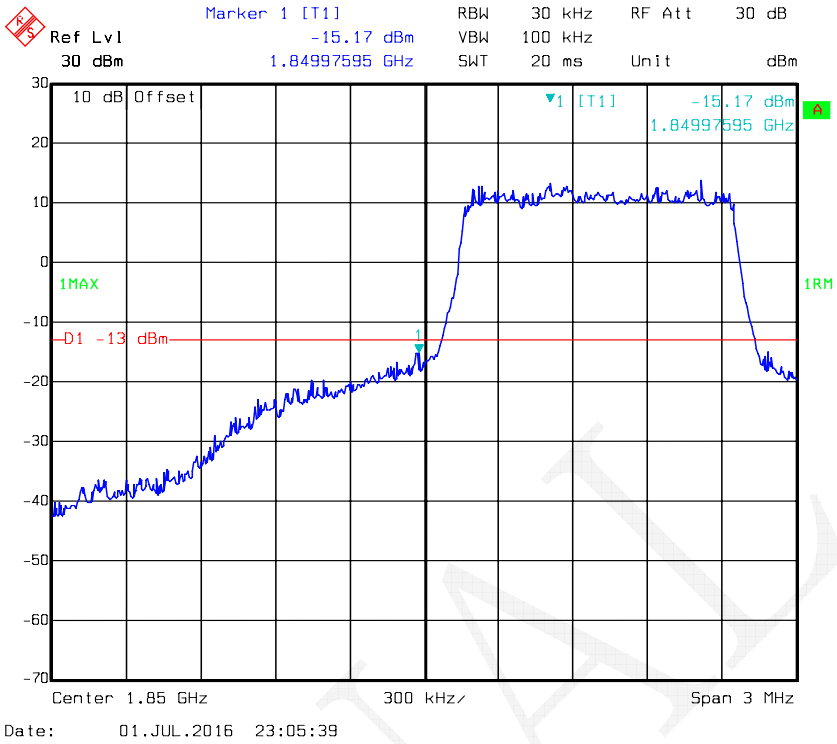
QPSK_20MHz_ FULL RB_ Left



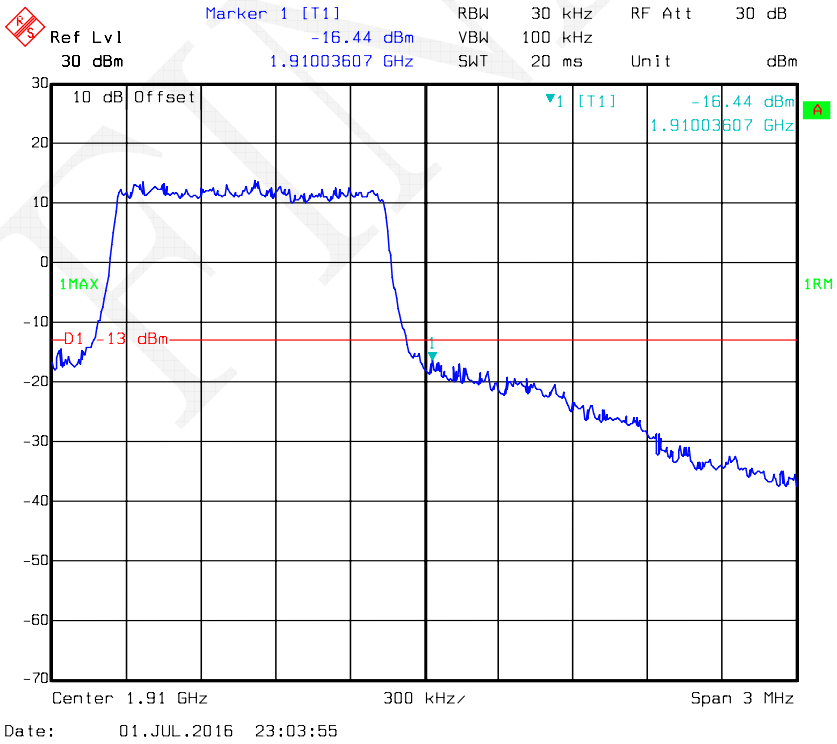
QPSK_20MHz_ FULL RB_ Right



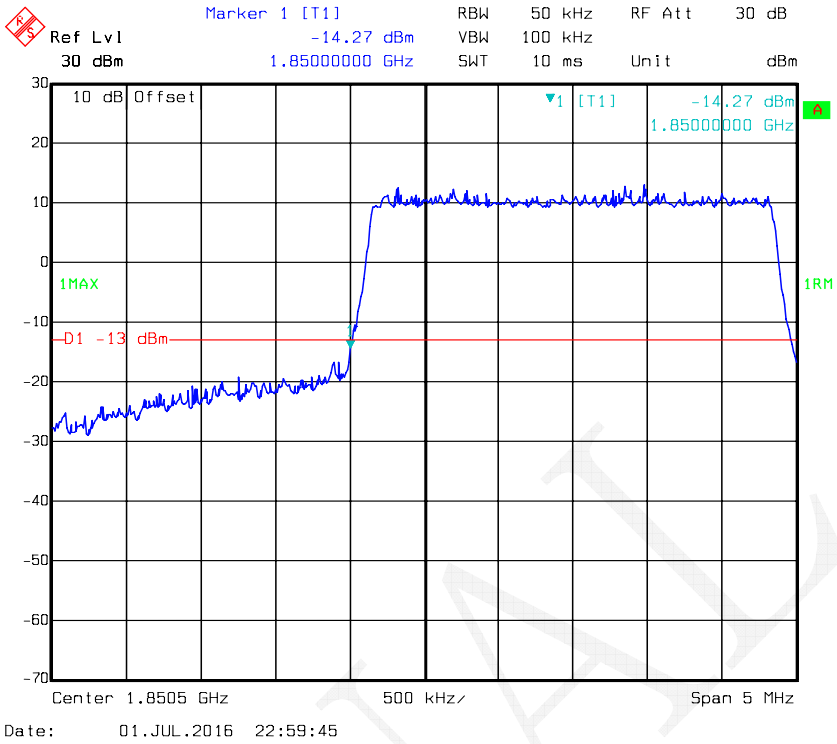
16QAM_1.4MHz_ FULL RB_ Left



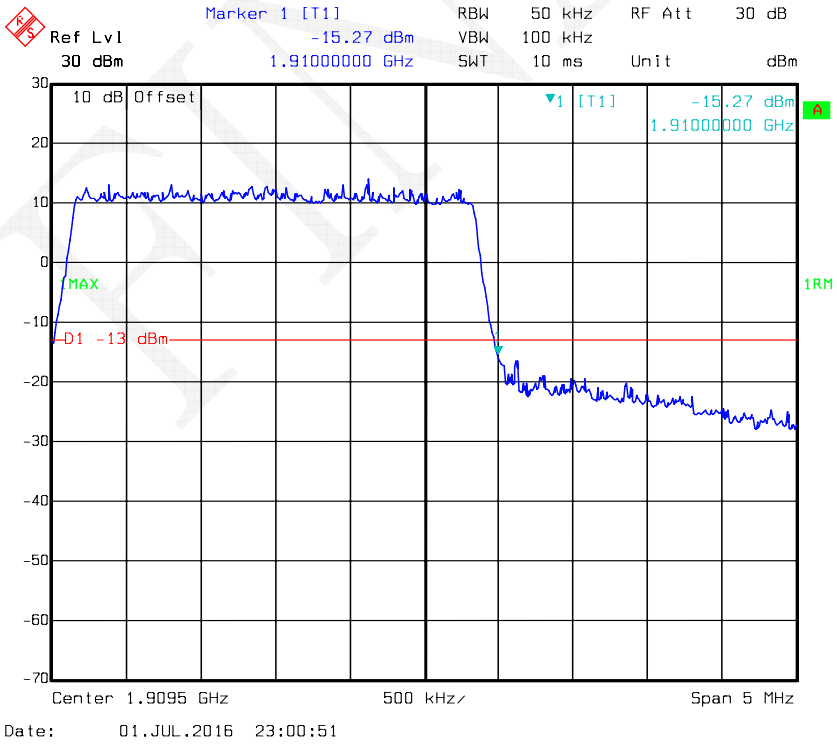
16QAM_1.4MHz_ FULL RB_ Right



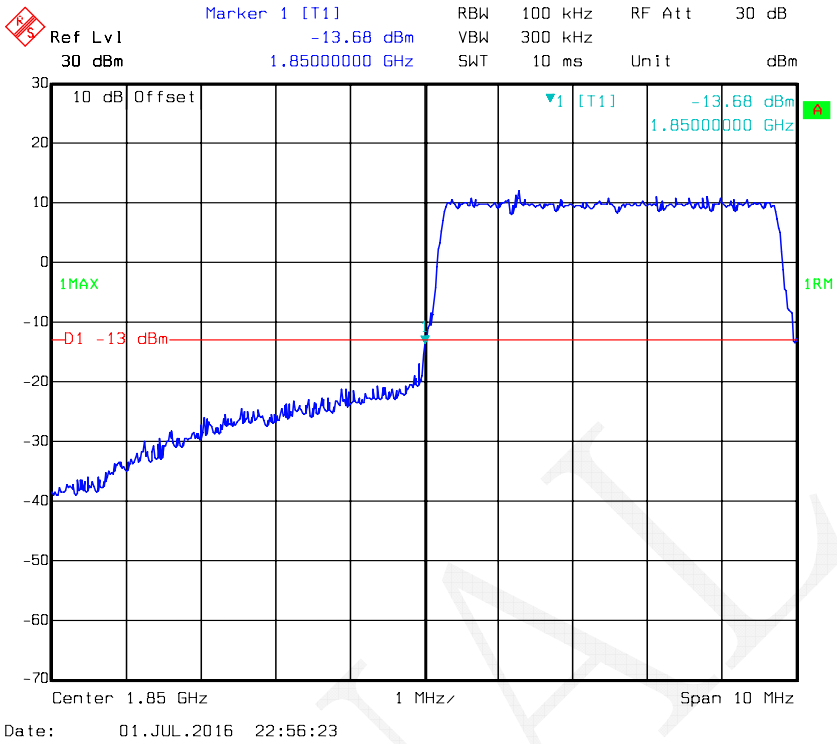
16QAM_3MHz_ FULL RB_ Left



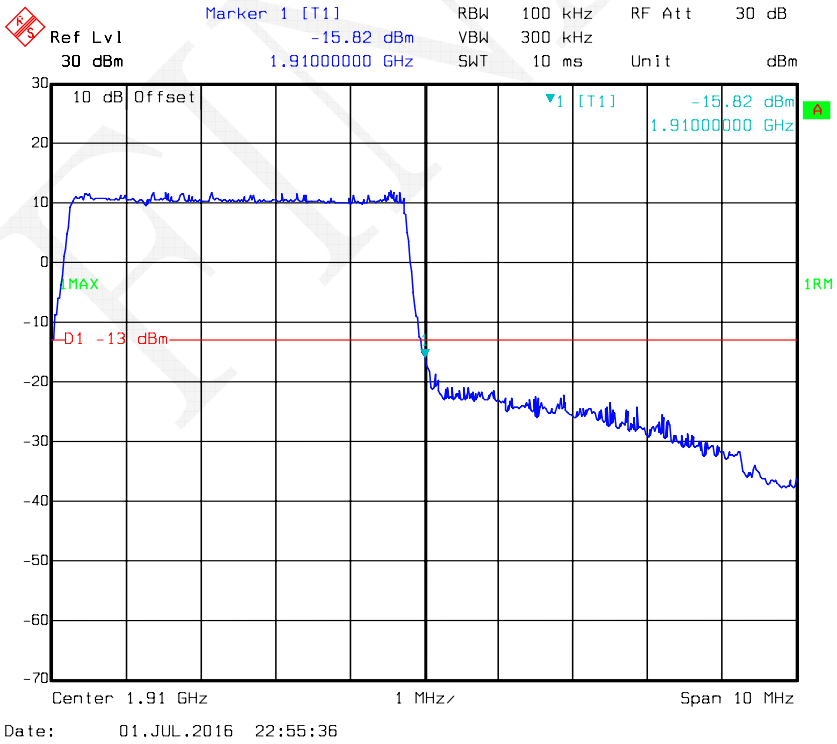
16QAM_3M_ FULL RB_ Right



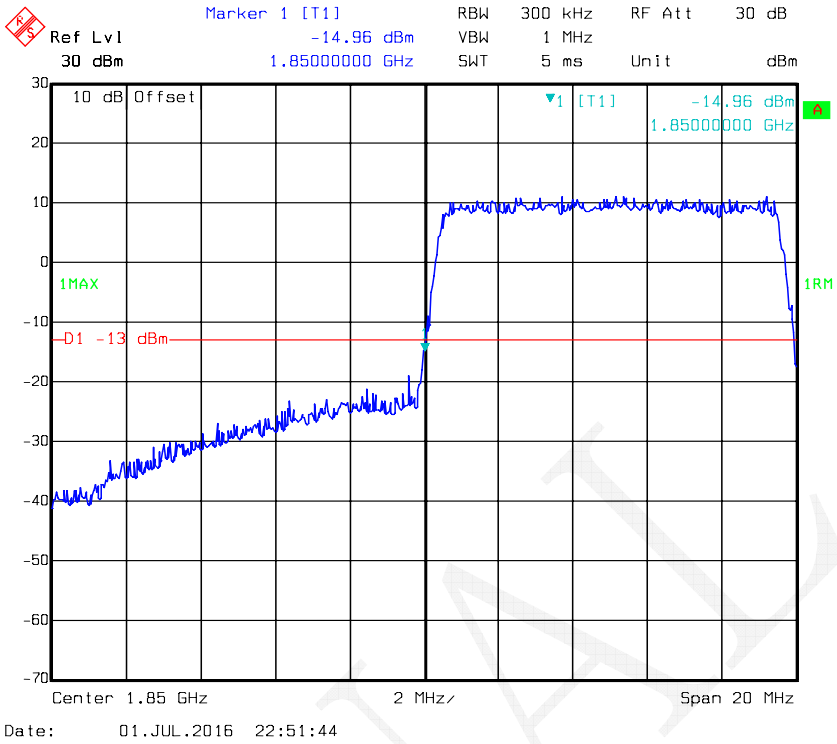
16QAM_5MHz_ FULL RB_ Left



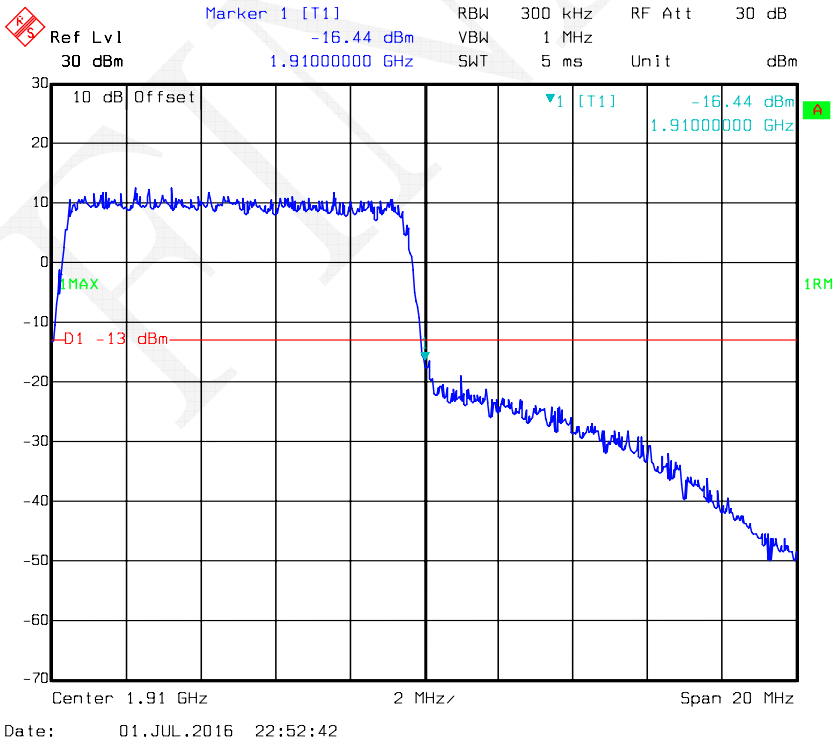
16QAM_5MHz_ FULL RB_ Right



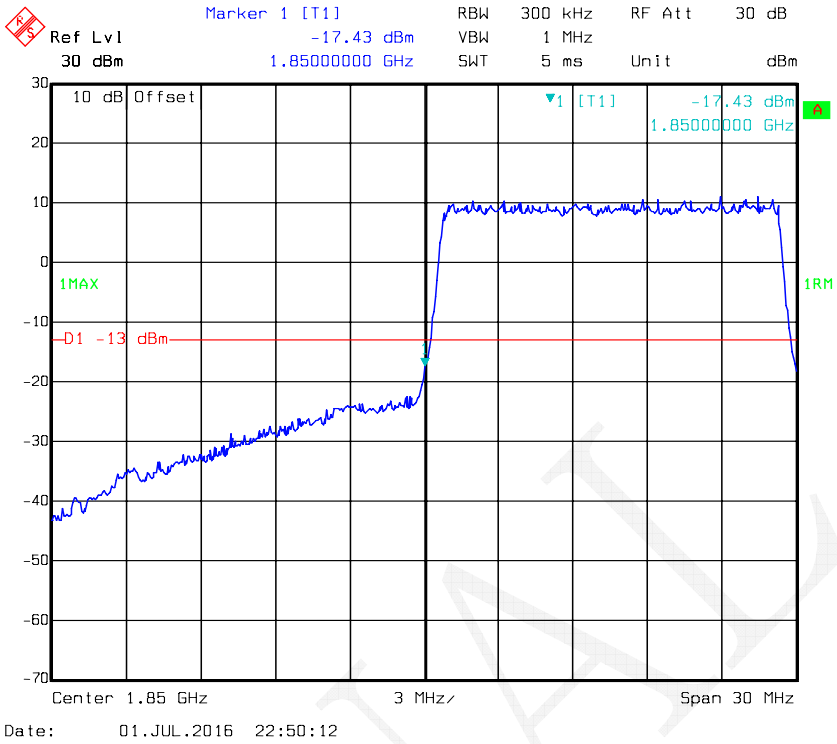
16QAM_10MHz_ FULL RB_ Left



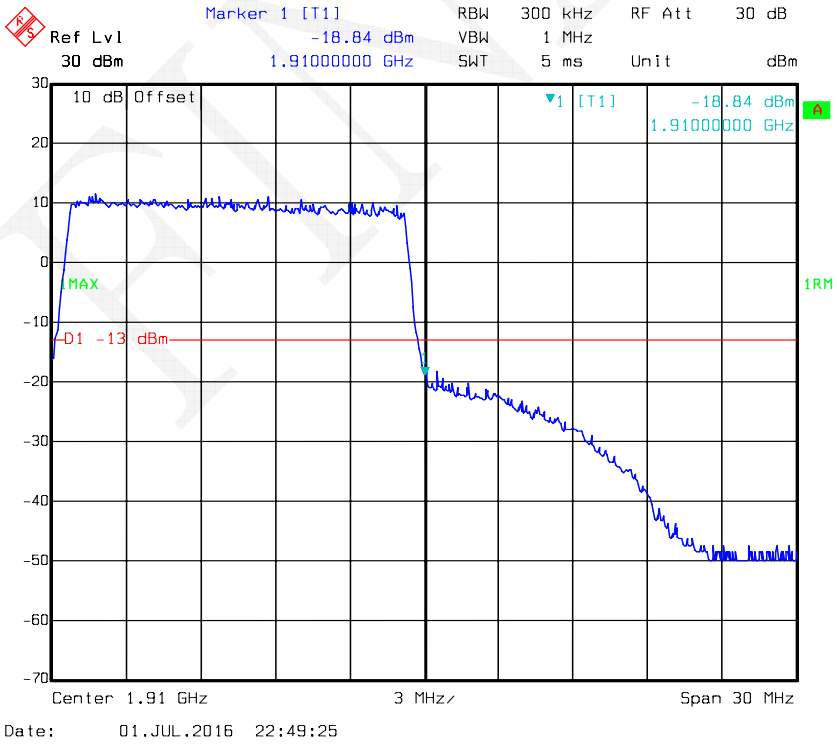
16QAM_10MHz_ FULL RB_ Right



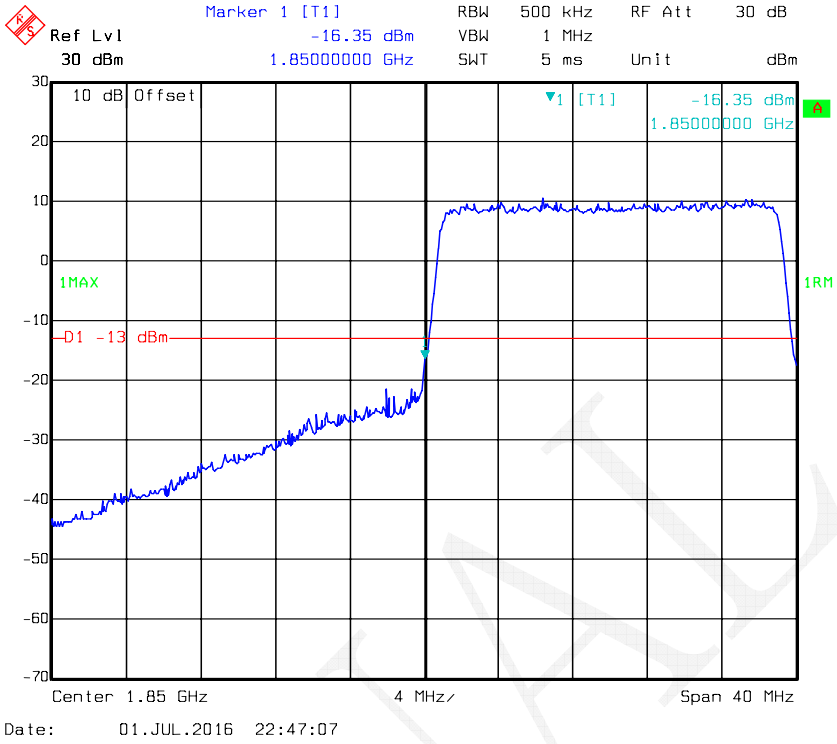
16QAM_15MHz_ FULL RB_ Left



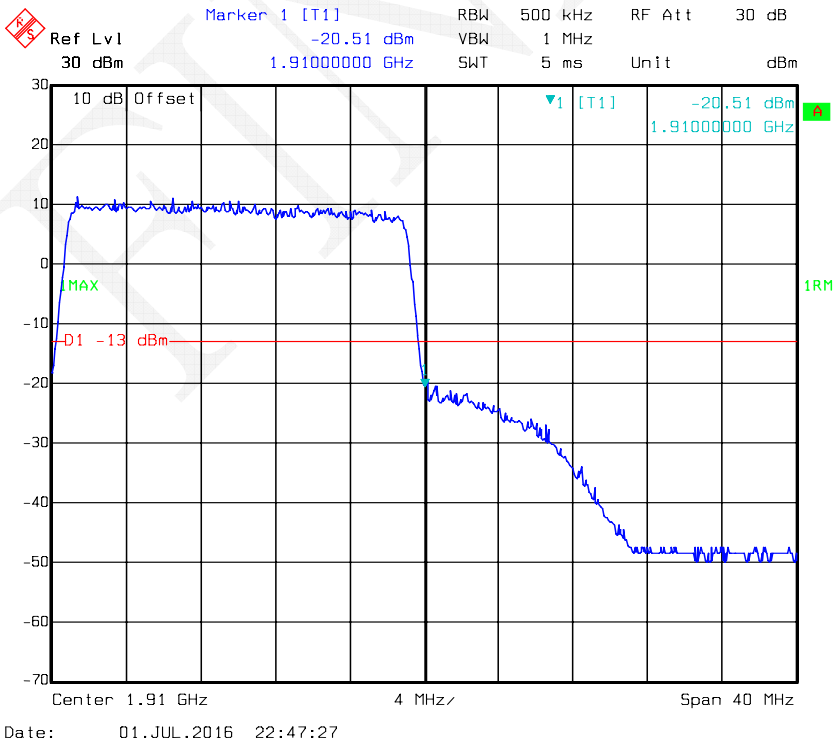
16QAM_15MHz_ FULL RB_ Right



16QAM_20MHz_ FULL RB_ Left

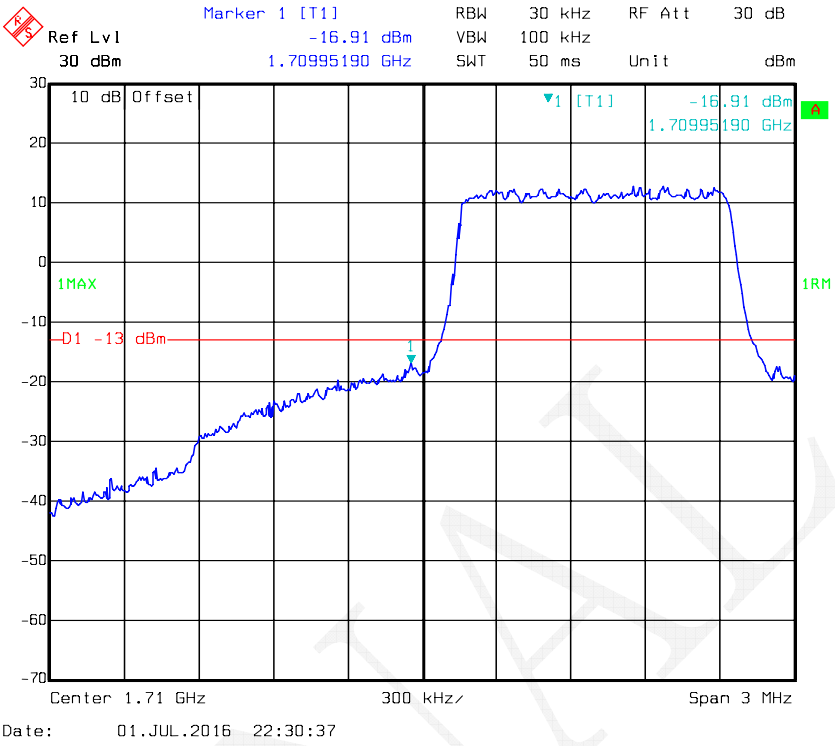


16QAM_20MHz_ FULL RB_ Right

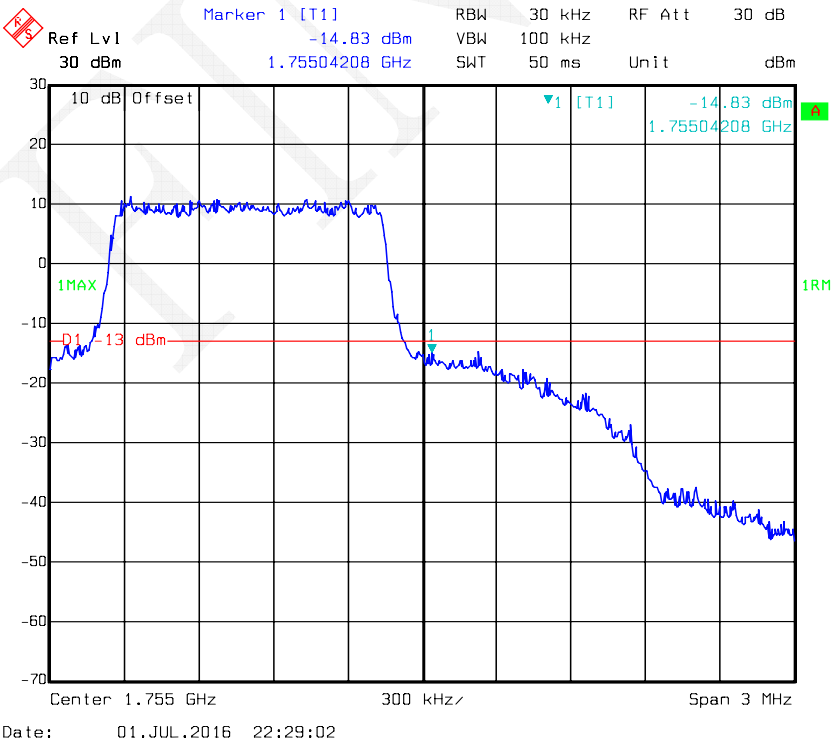


LTE Band IV

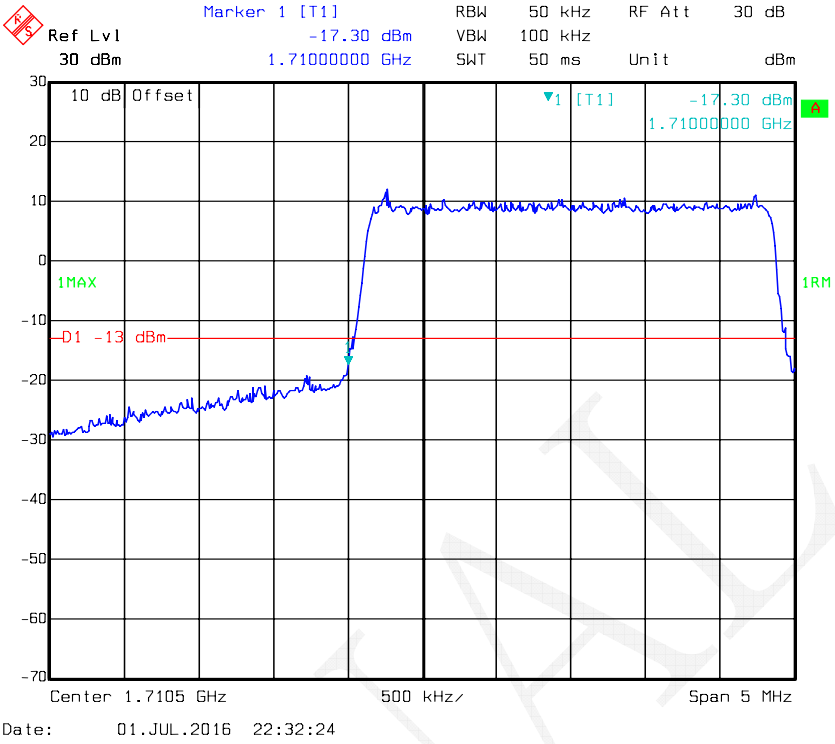
QPSK_1.4MHz_FULL RB_ Left



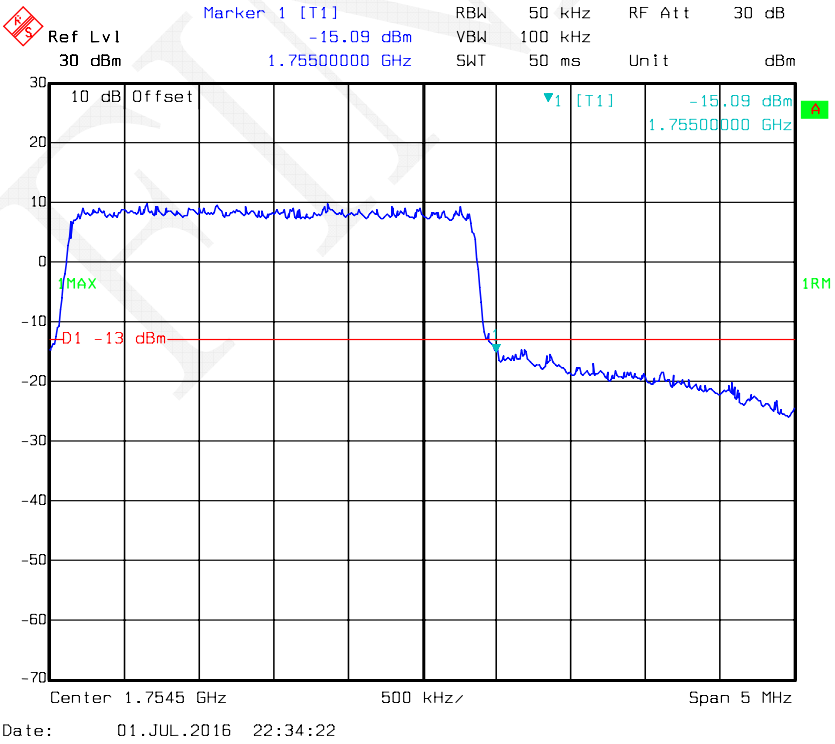
QPSK_1.4MHz_FULL RB_ Right



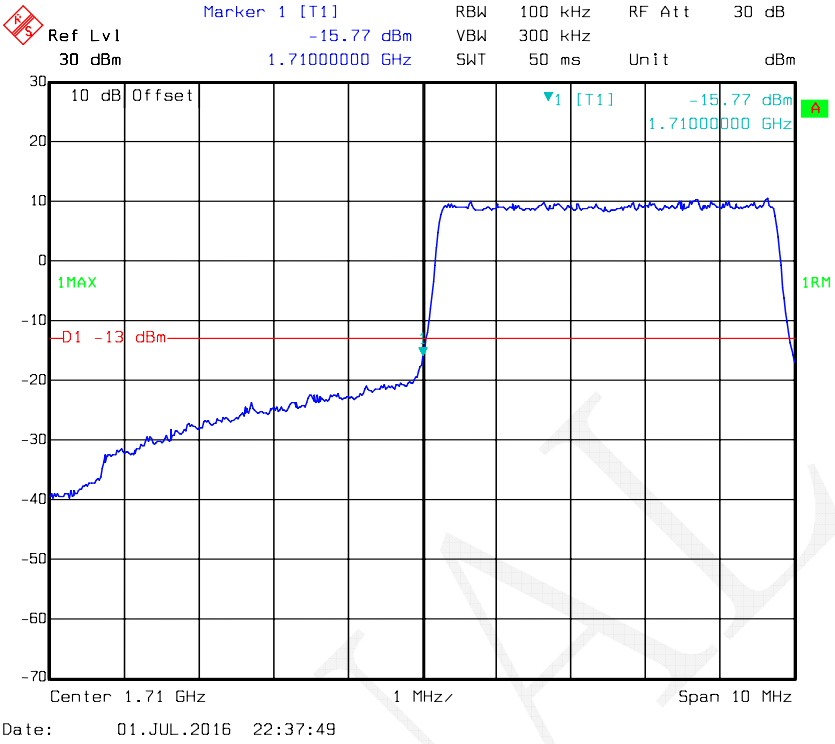
QPSK_3MHz_FULL RB_ Left



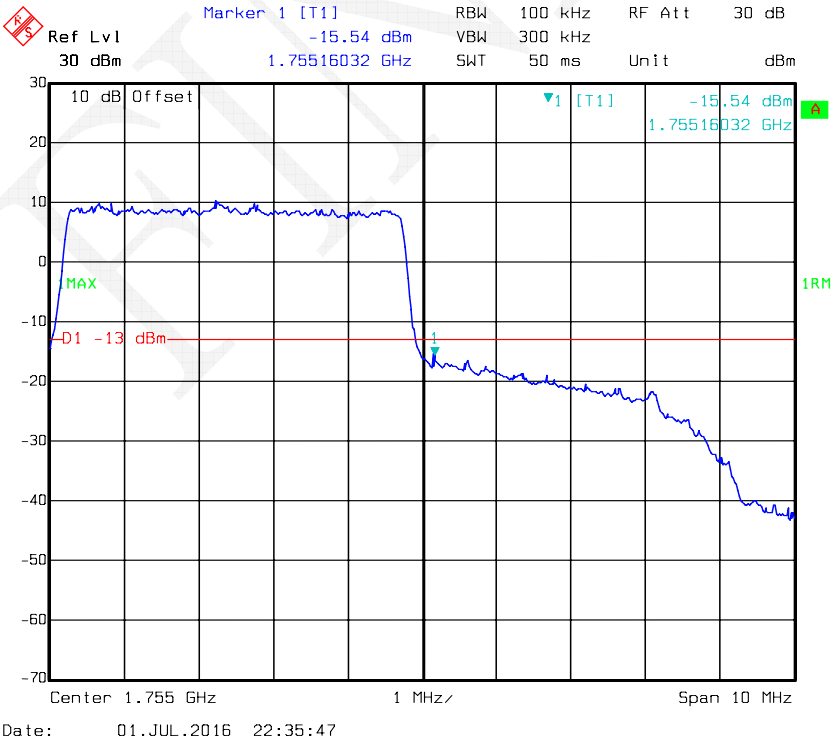
QPSK_3MHz_ FULL RB_ Right



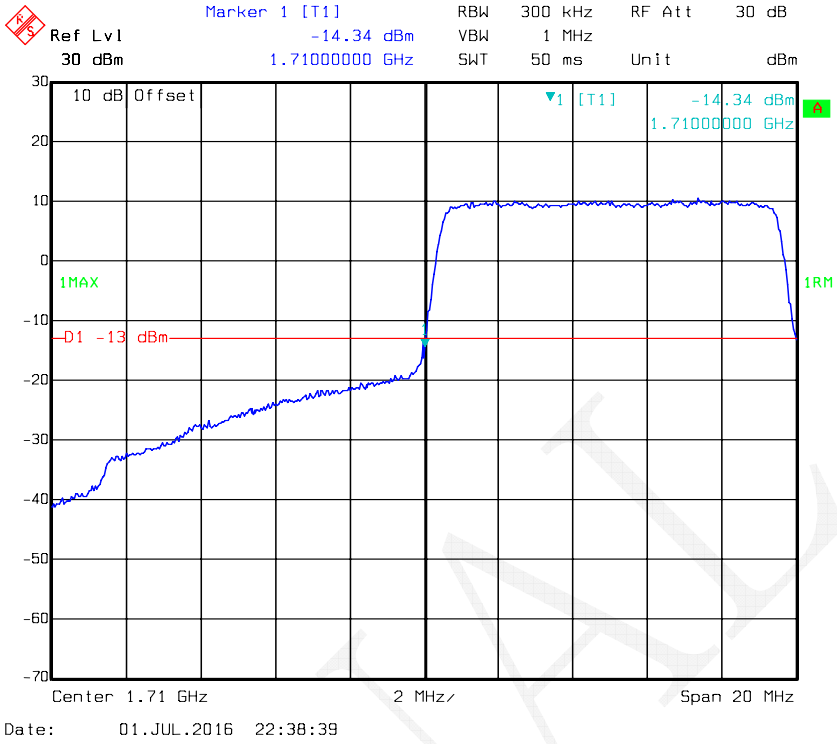
QPSK_5MHz_ FULL RB_ Left



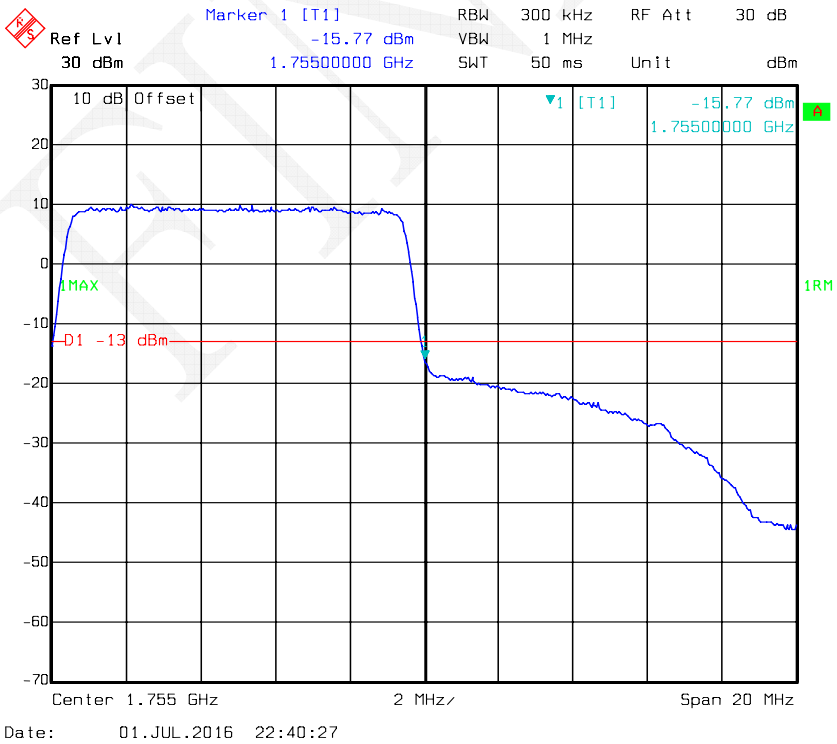
QPSK_5MHz_ FULL RB_ Right



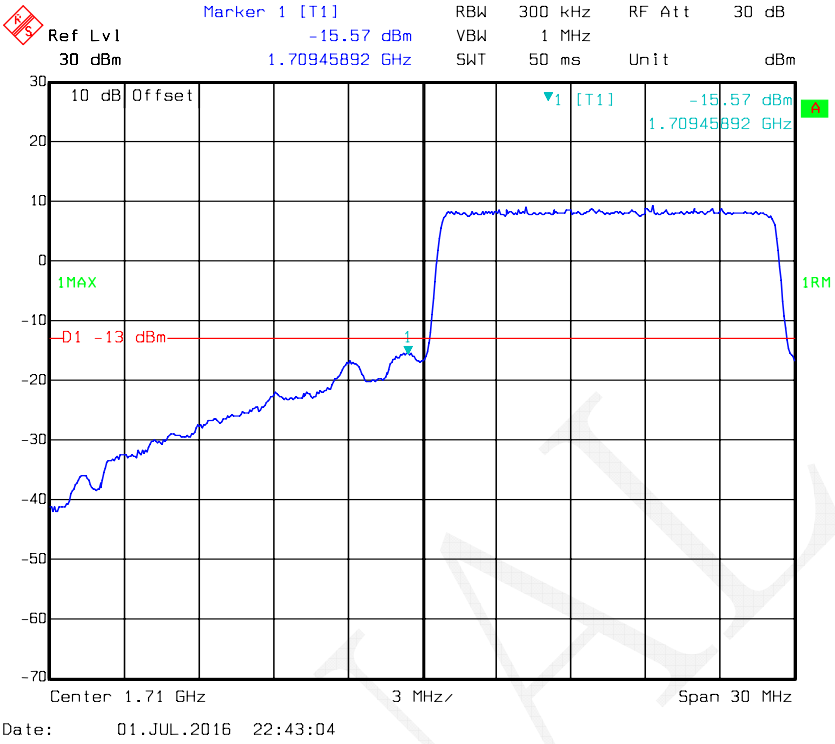
QPSK_10MHz_ FULL RB_ Left



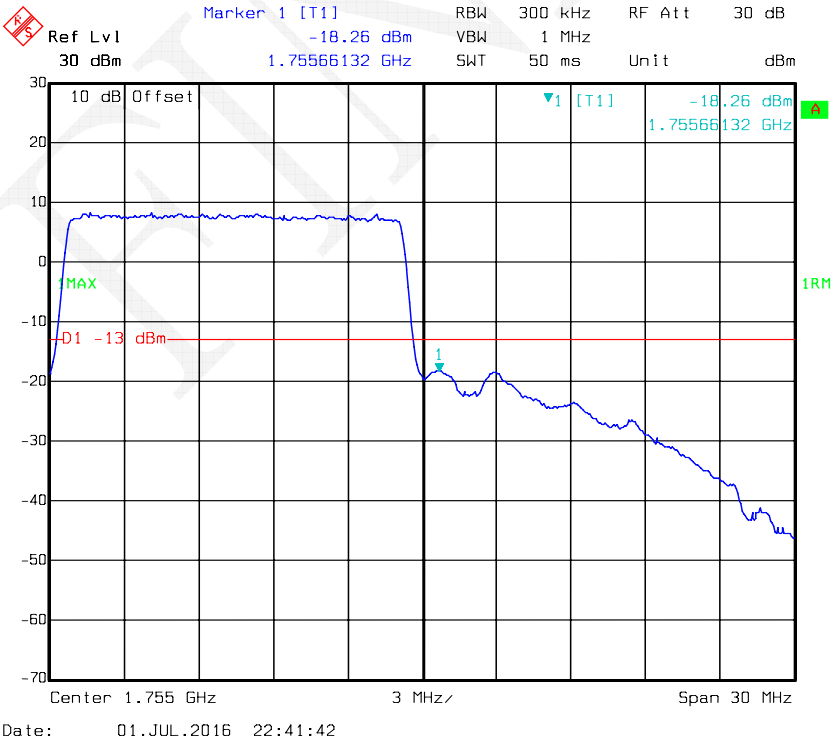
QPSK_10MHz_ FULL RB_ Right



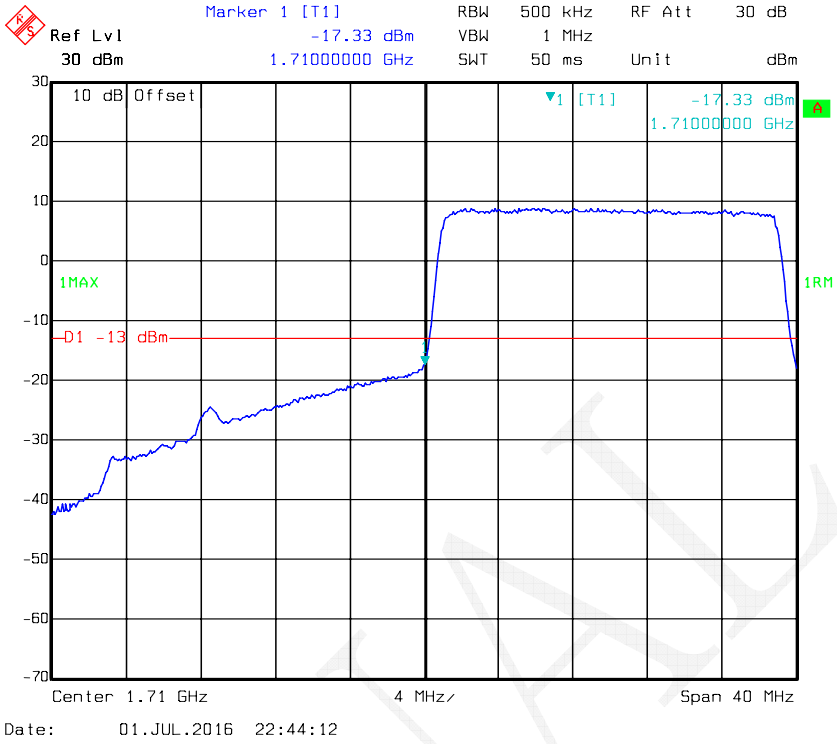
QPSK_15MHz_ FULL RB_ Left



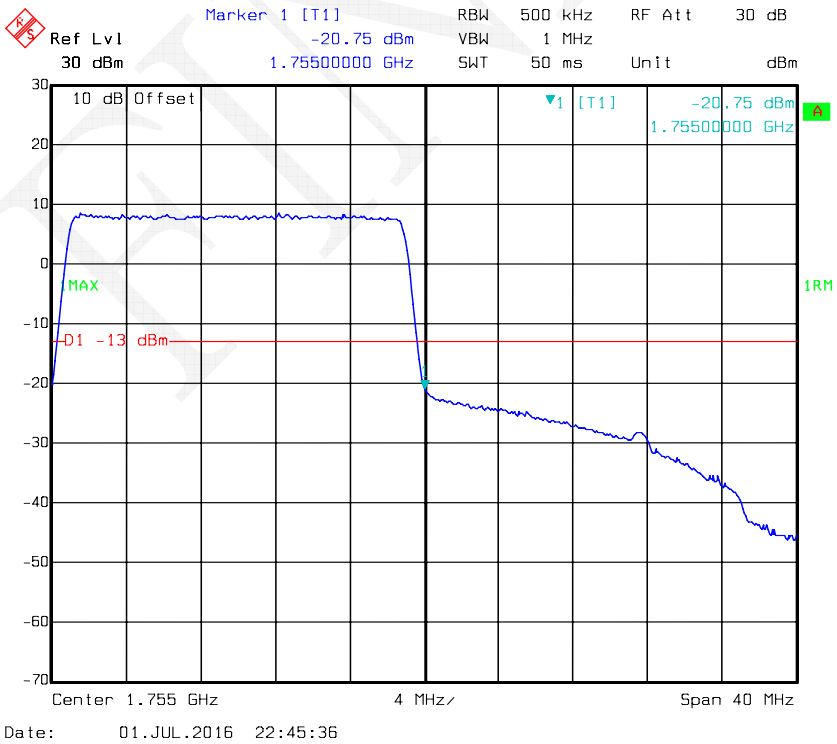
QPSK_15MHz_ FULL RB_ Right



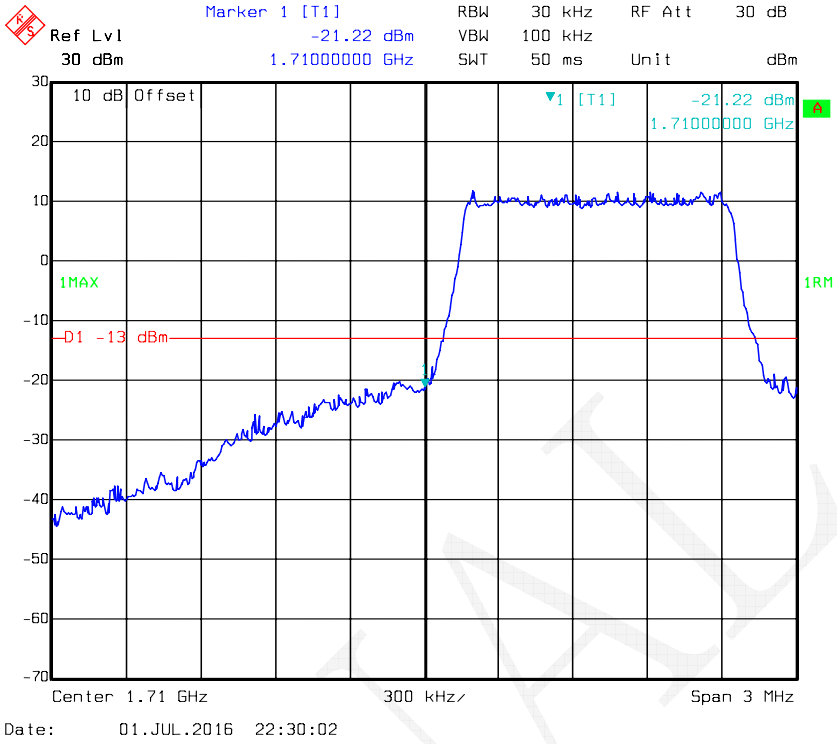
QPSK_20MHz_ FULL RB_ Left



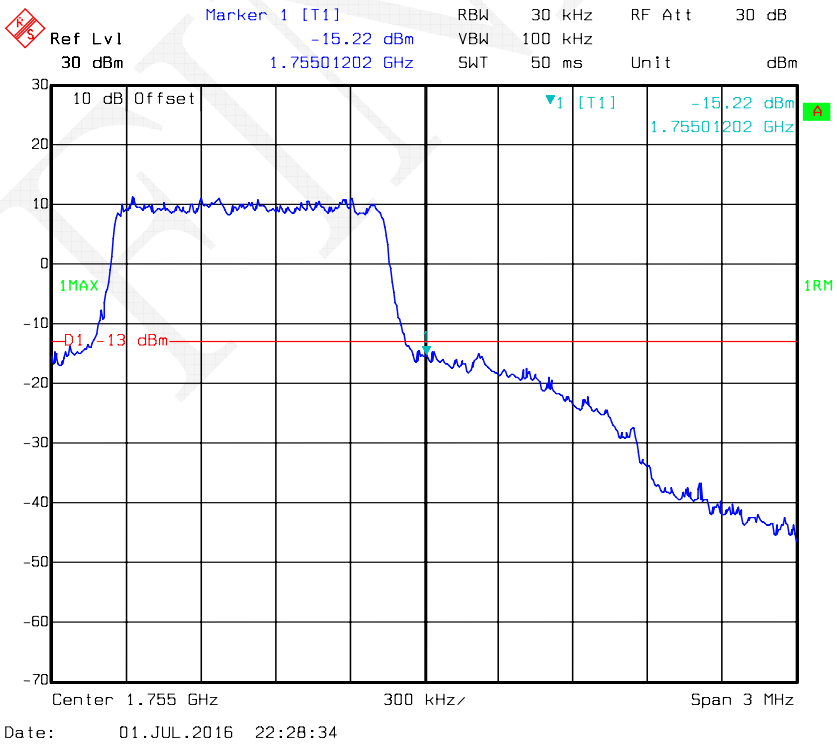
QPSK_20MHz_ FULL RB_ Right



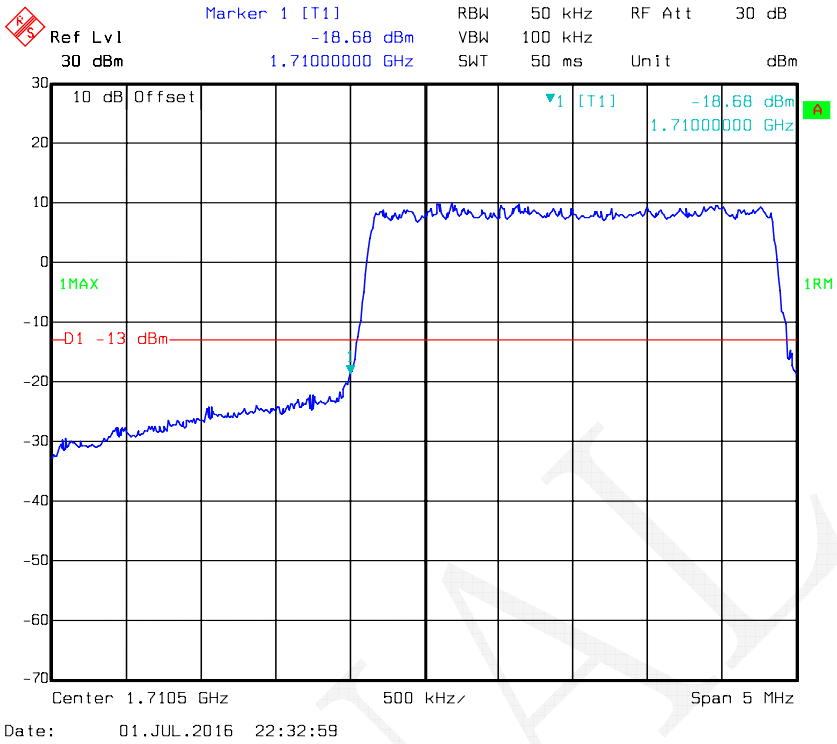
16QAM_1.4MHz_ FULL RB_ Left



16QAM_1.4MHz_ FULL RB_ Right

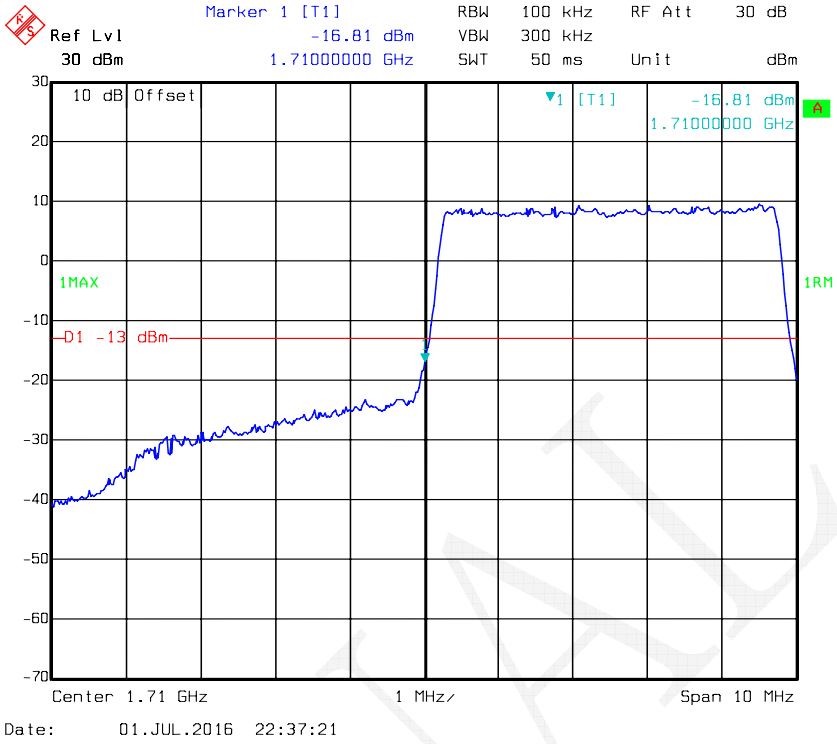


16QAM_3MHz_ FULL RB_ Left

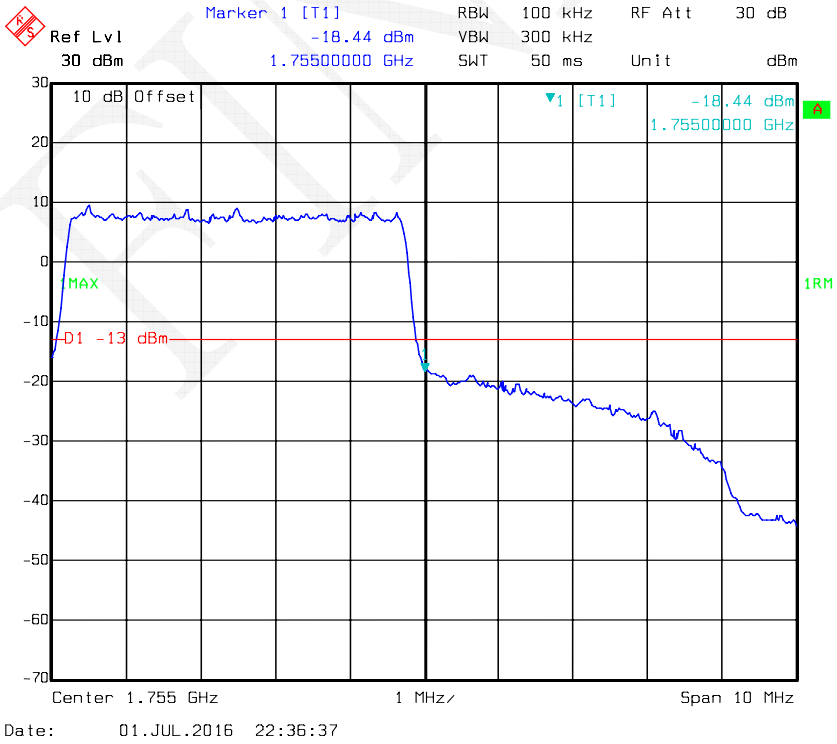


16QAM_3M_ FULL RB_ Right

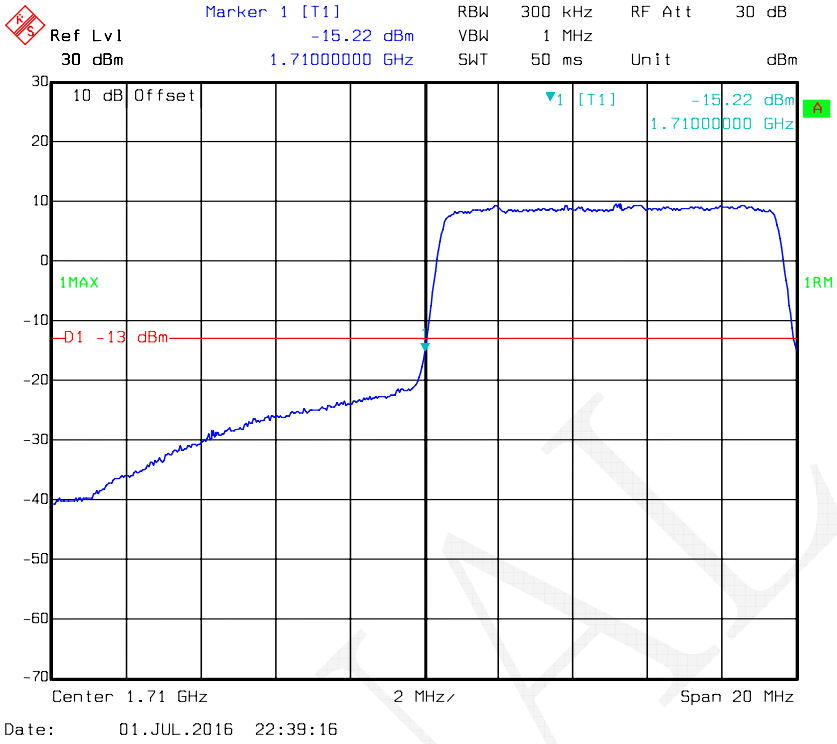
16QAM_5MHz_ FULL RB_ Left



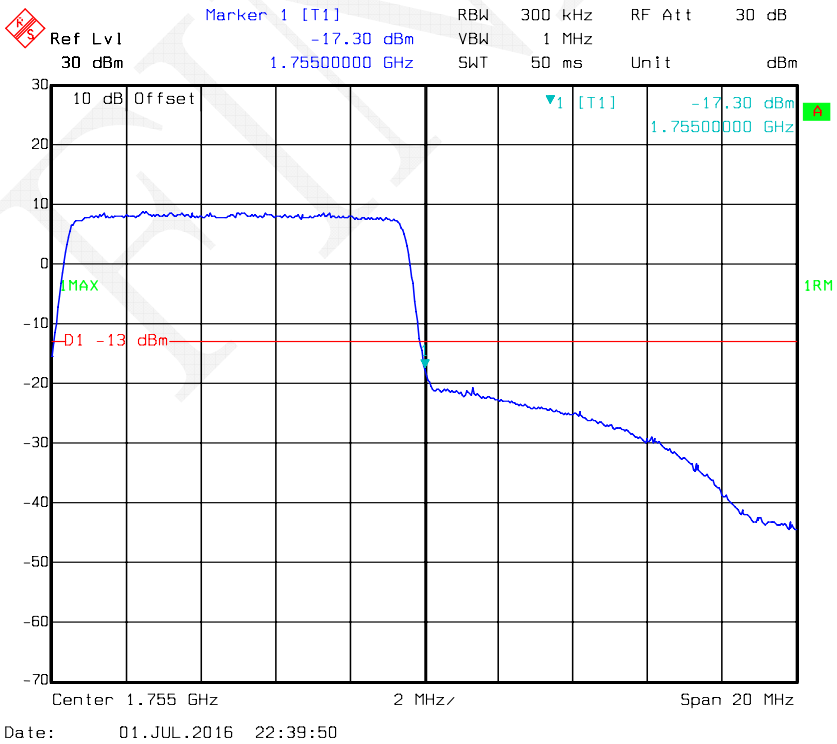
16QAM_5MHz_ FULL RB_ Right



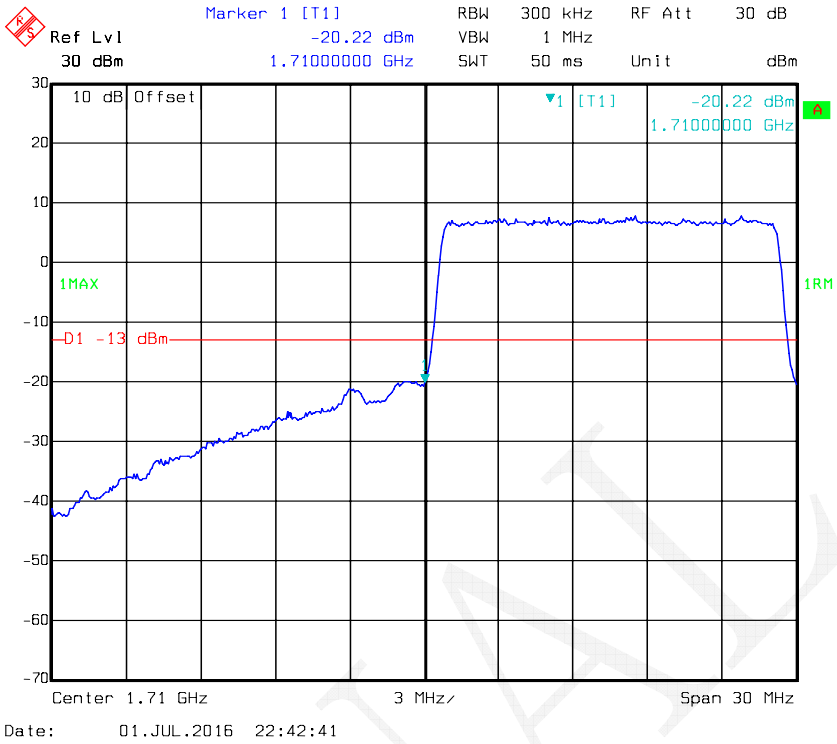
16QAM_10MHz_ FULL RB_ Left



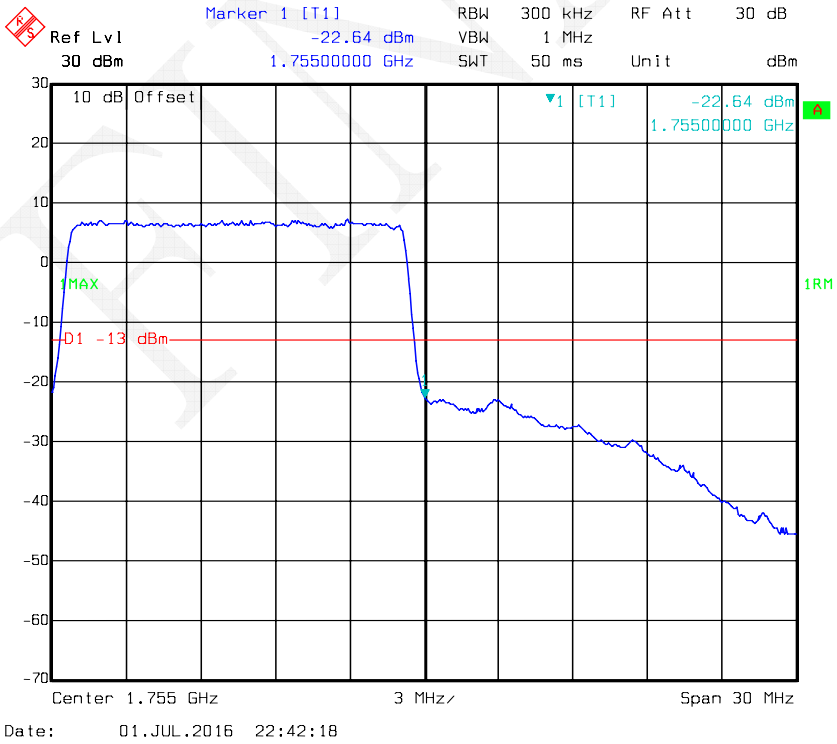
16QAM_10MHz_ FULL RB_ Right



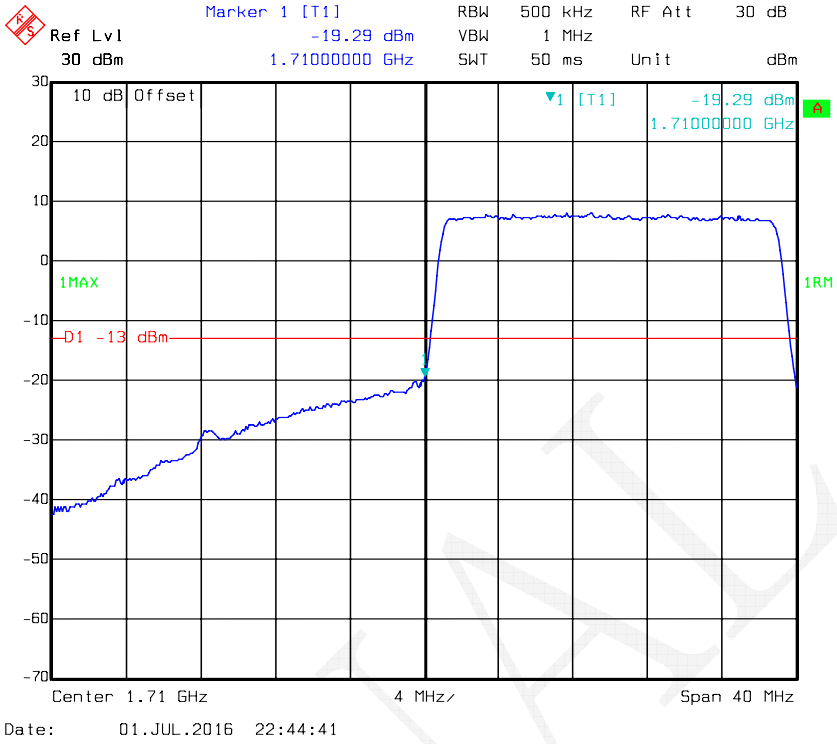
16QAM_15MHz_ FULL RB_ Left



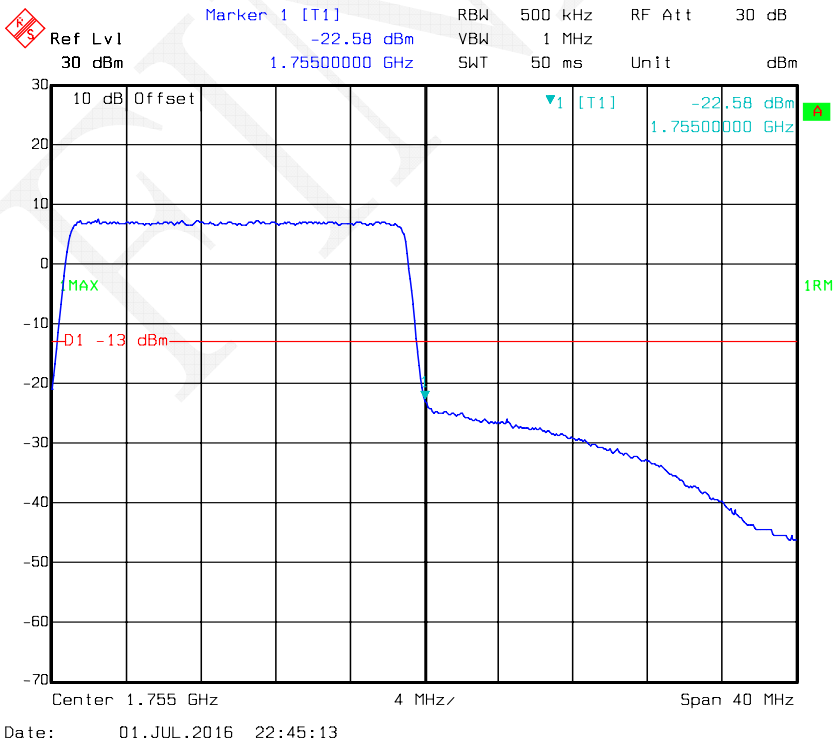
16QAM_15MHz_ FULL RB_ Right



16QAM_20MHz_ FULL RB_ Left

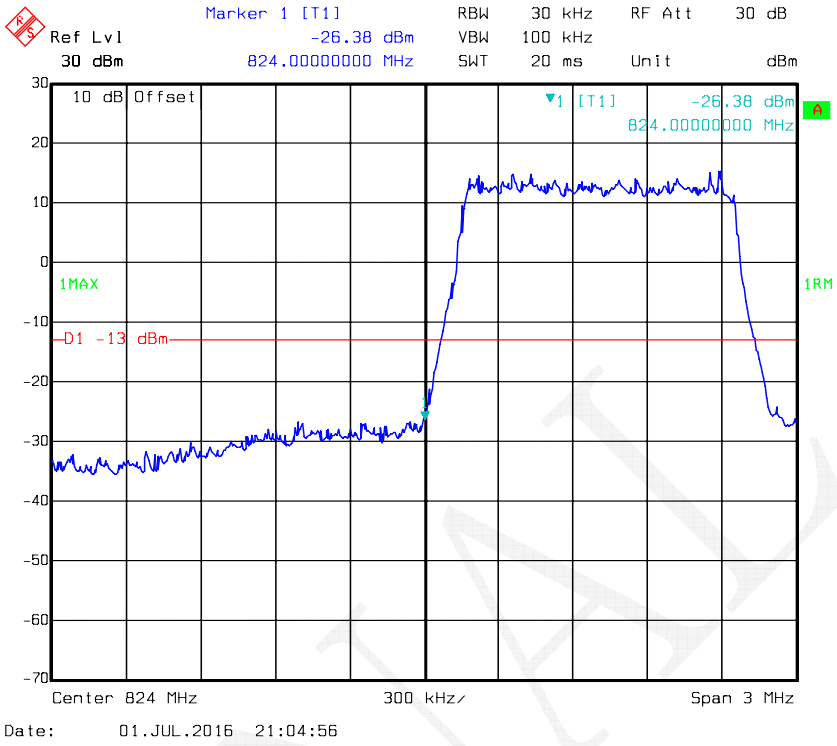


16QAM_20MHz_ FULL RB_ Right

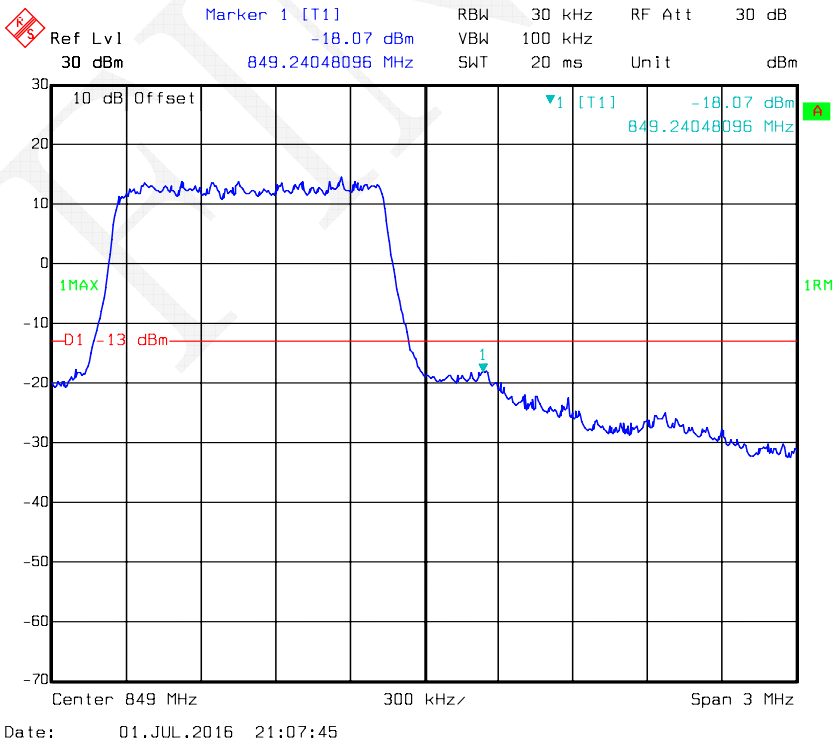


LTE Band V

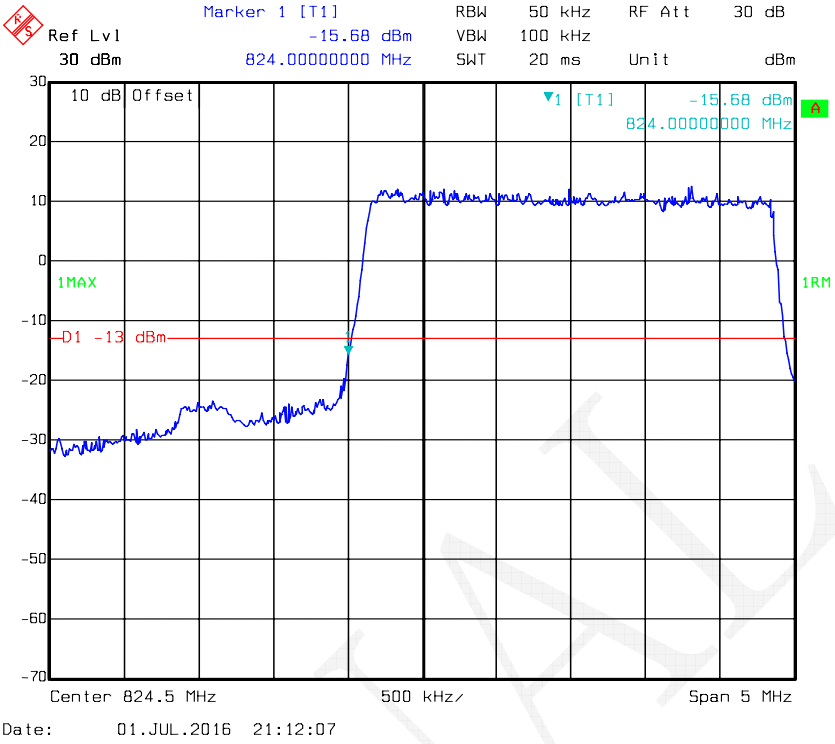
QPSK_1.4MHz_FULL RB_ Left



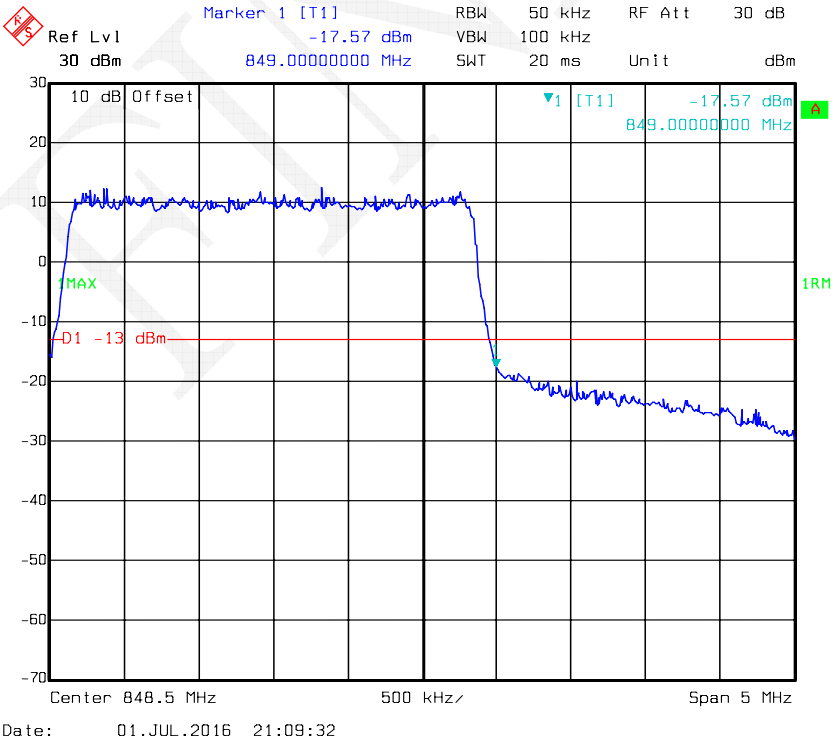
QPSK_1.4MHz_FULL RB_ Right



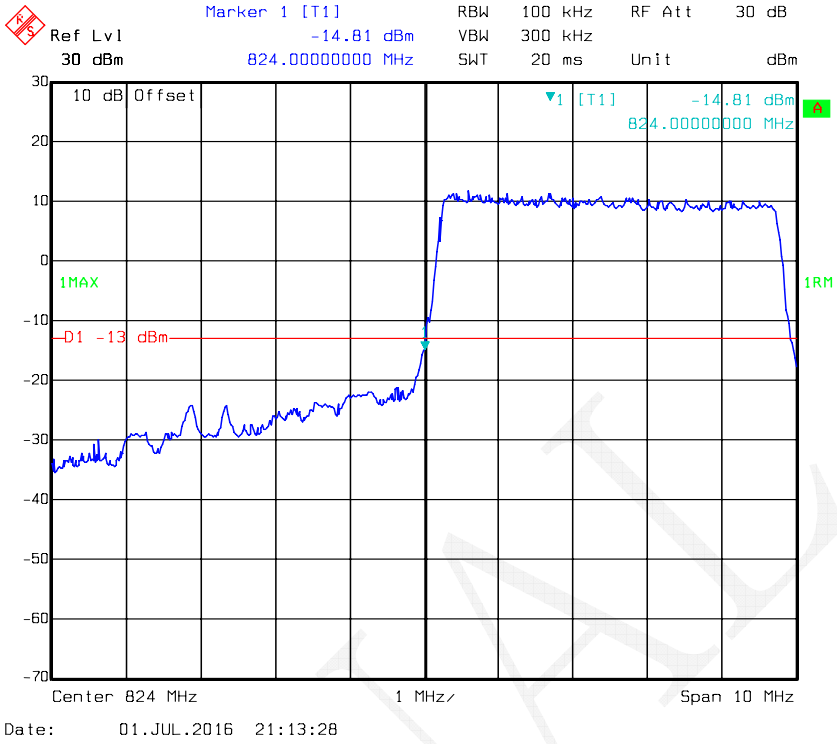
QPSK_3MHz_FULL RB_ Left



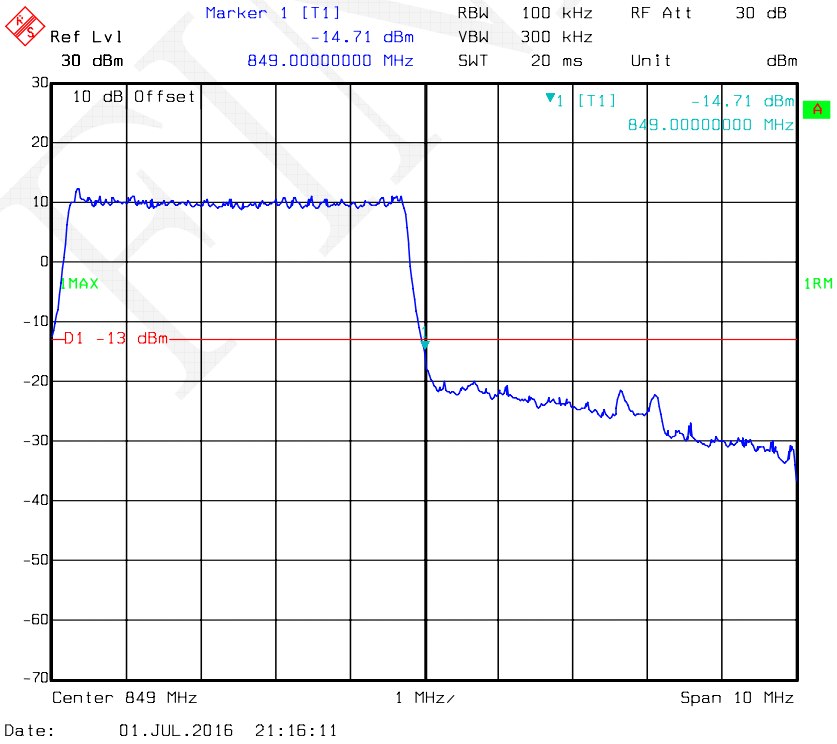
QPSK_3MHz_ FULL RB_ Right



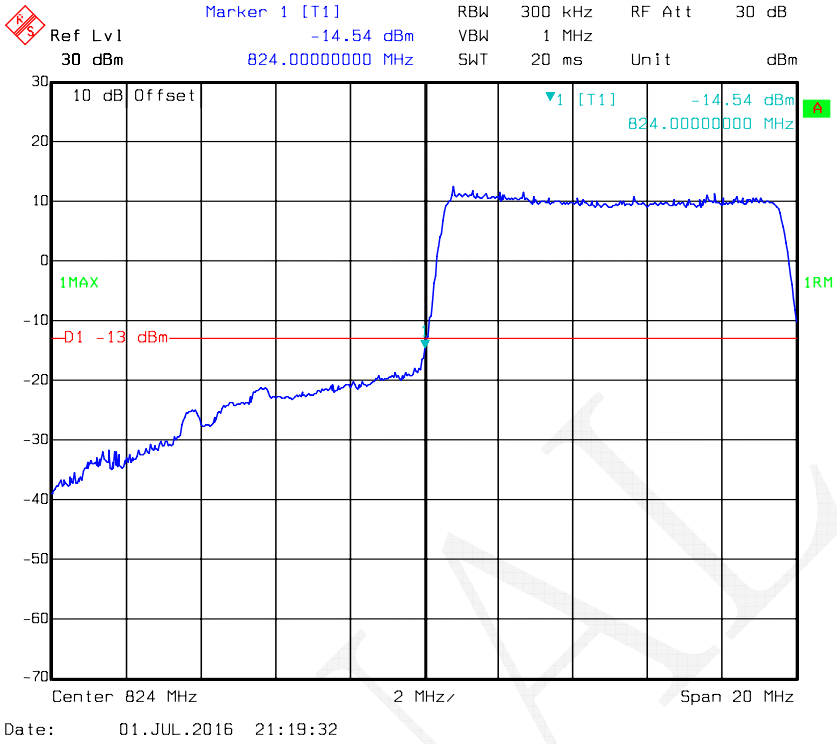
QPSK_5MHz_ FULL RB_ Left



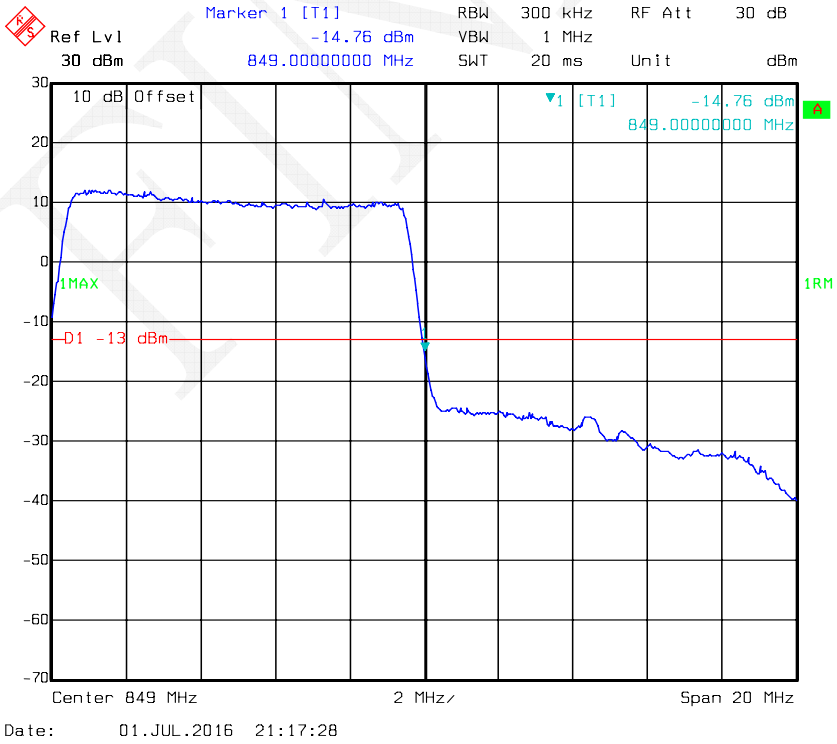
QPSK_5MHz_ FULL RB_ Right



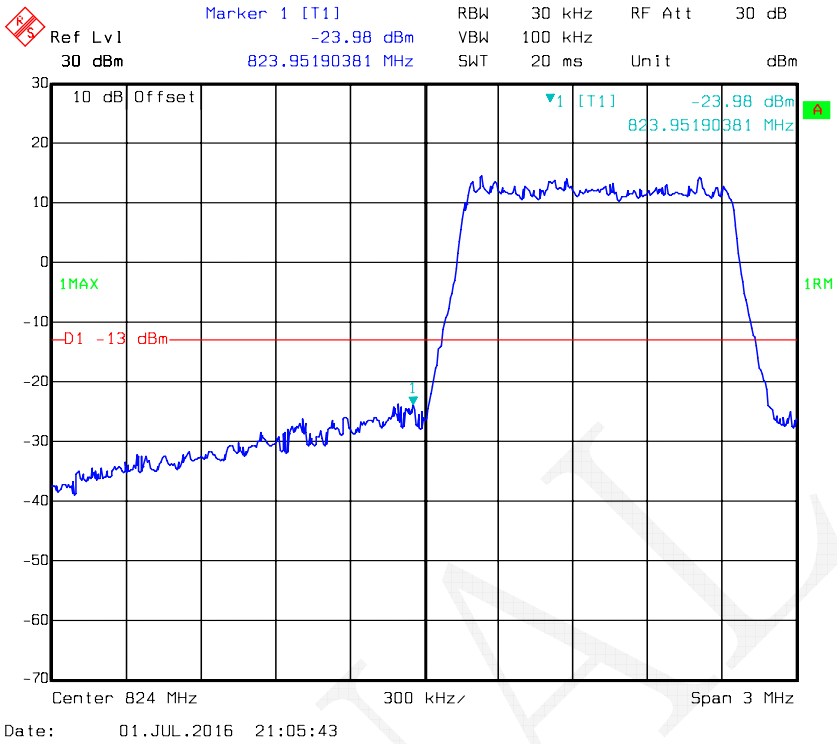
QPSK_10MHz_ FULL RB_ Left



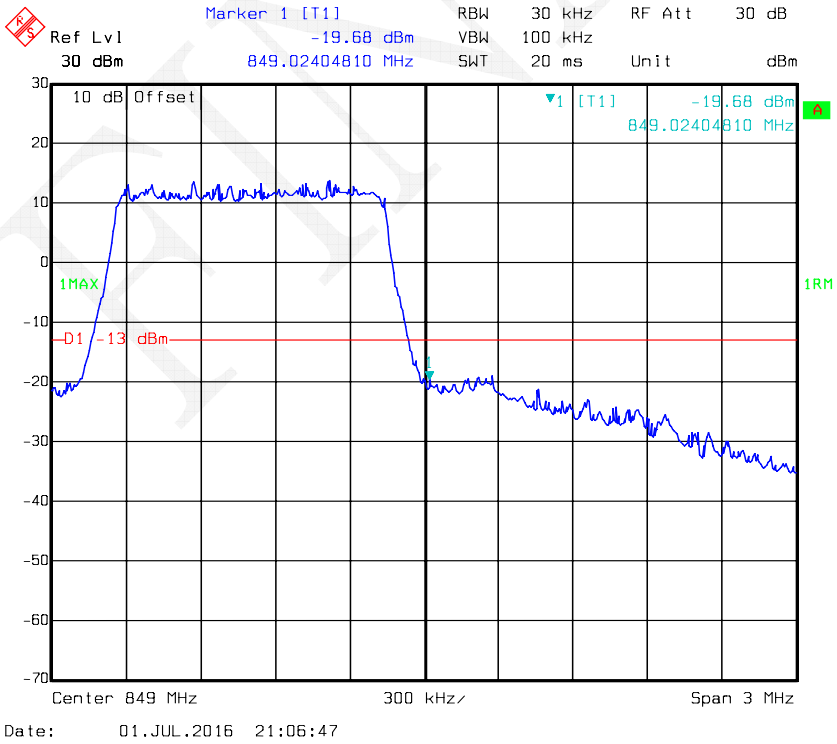
QPSK_10MHz_ FULL RB_ Right



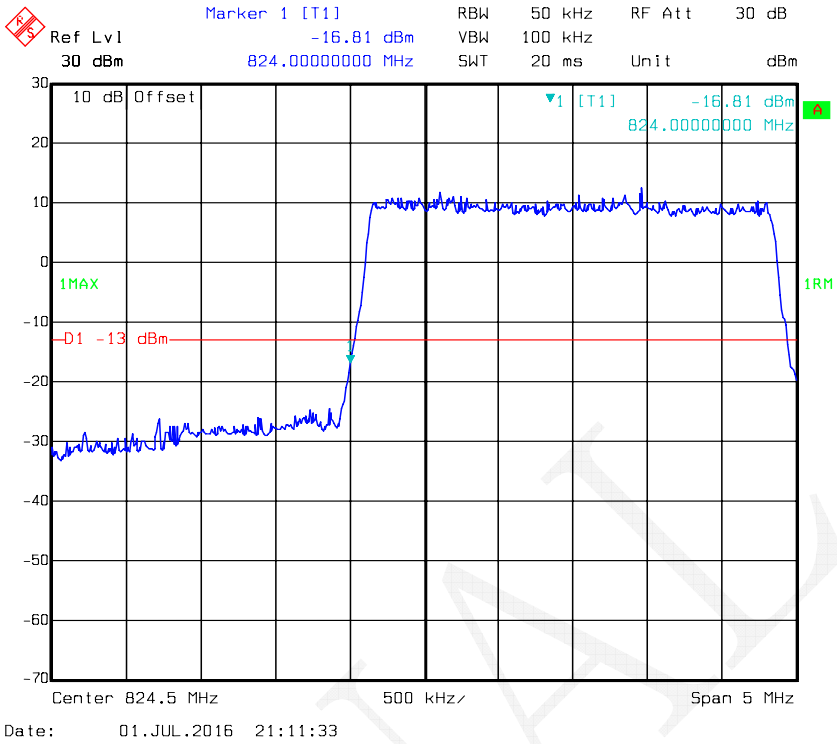
16QAM_1.4MHz_ FULL RB_ Left



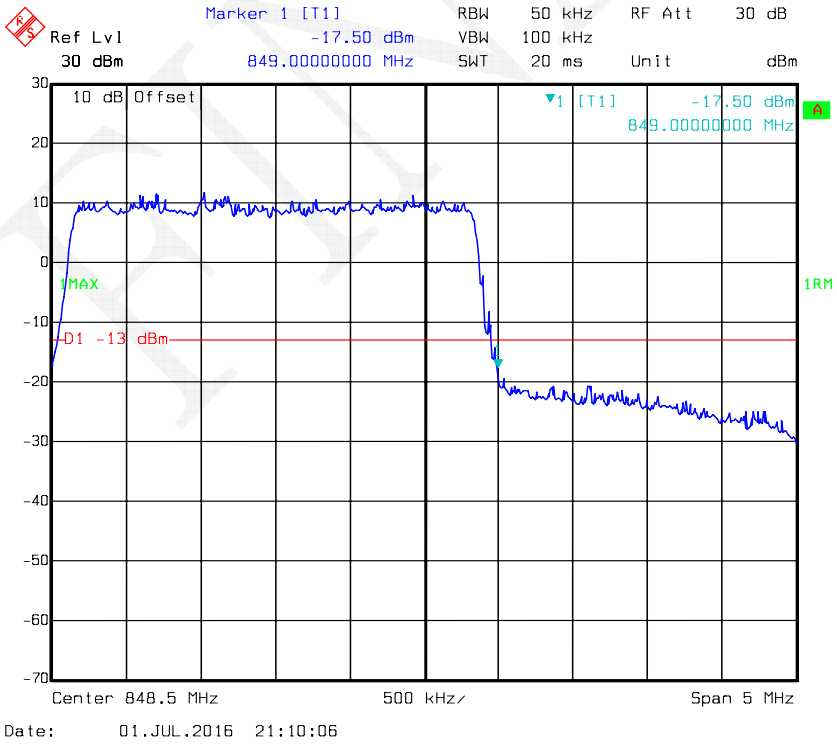
16QAM_1.4MHz_ FULL RB_ Right



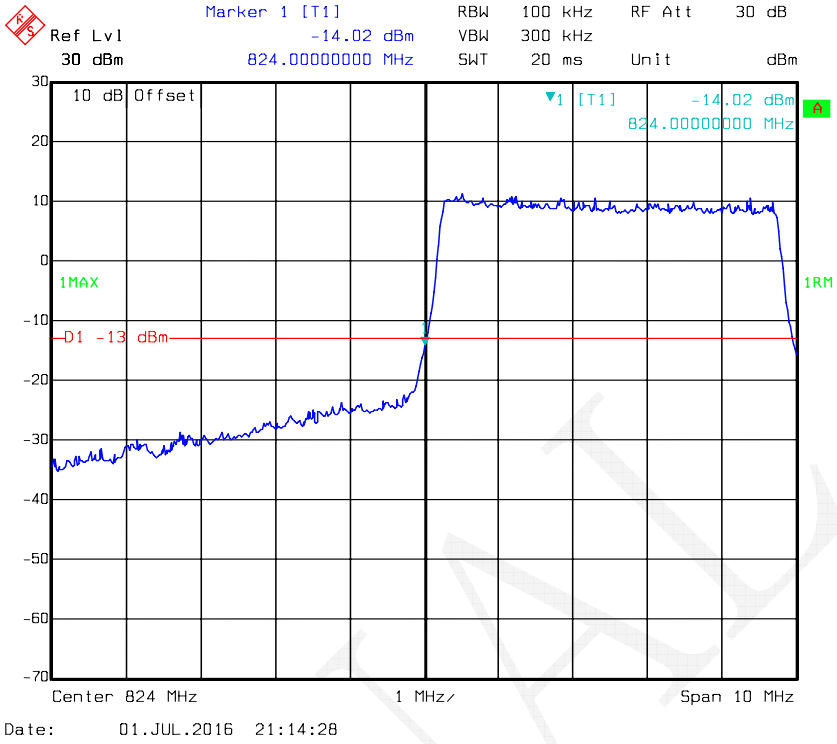
16QAM_3MHz_ FULL RB_ Left



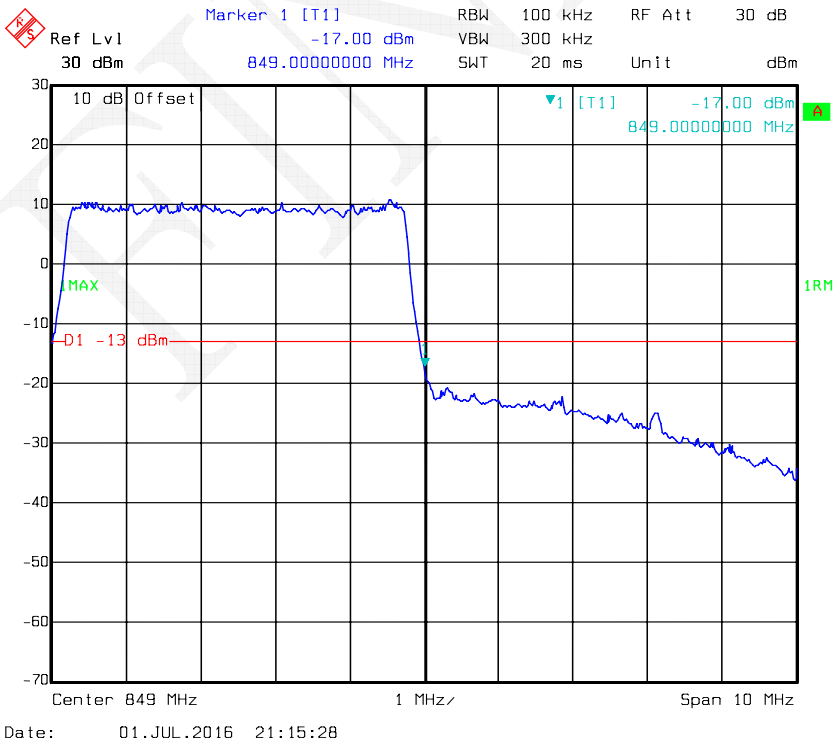
16QAM_3M_ FULL RB_ Right



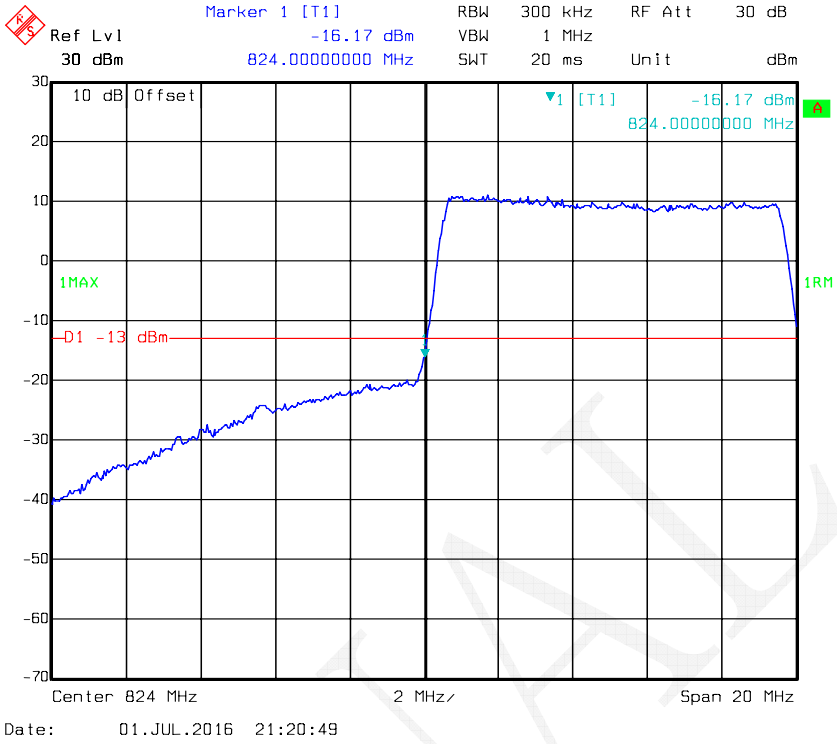
16QAM_5MHz_ FULL RB_ Left



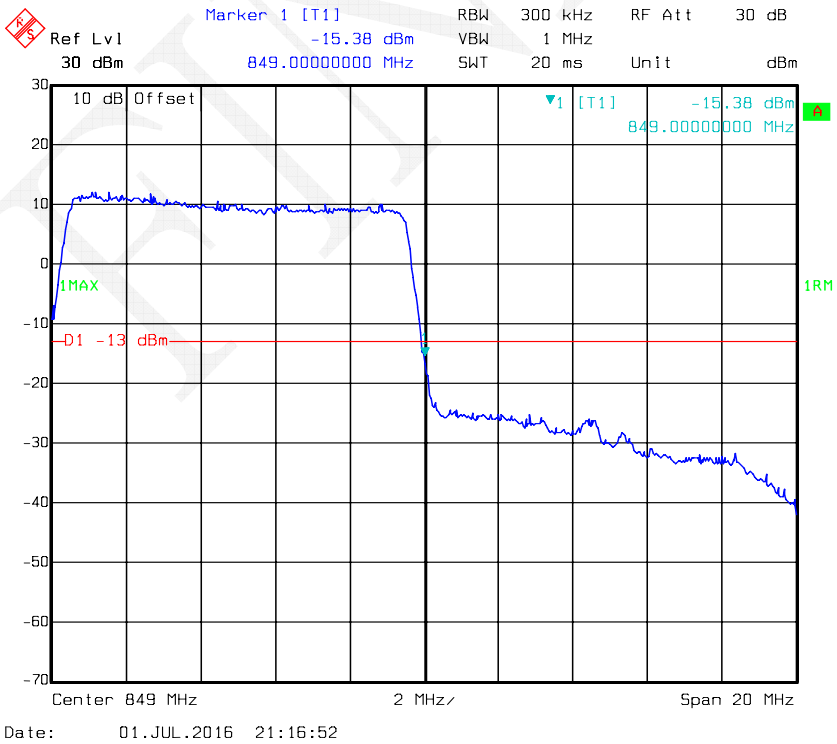
16QAM_5MHz_ FULL RB_ Right



16QAM_10MHz_ FULL RB_ Left

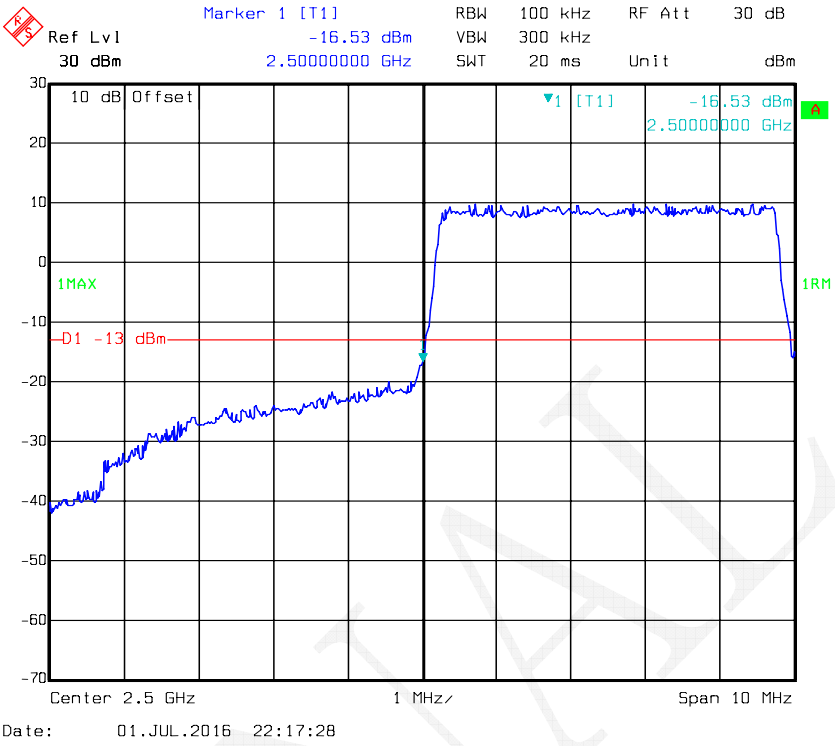


16QAM_10MHz_ FULL RB_ Right

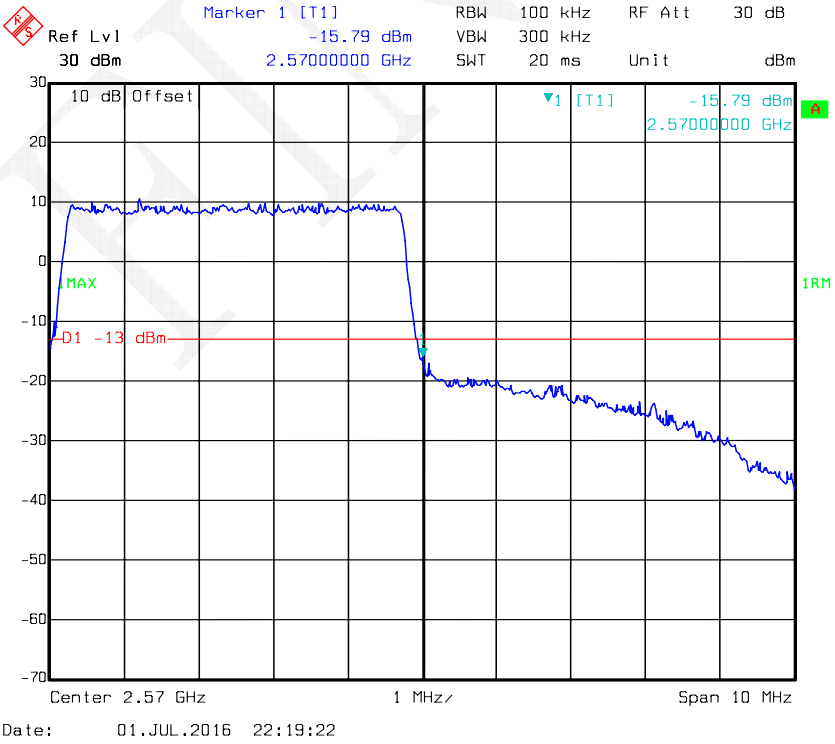


LTE Band VII

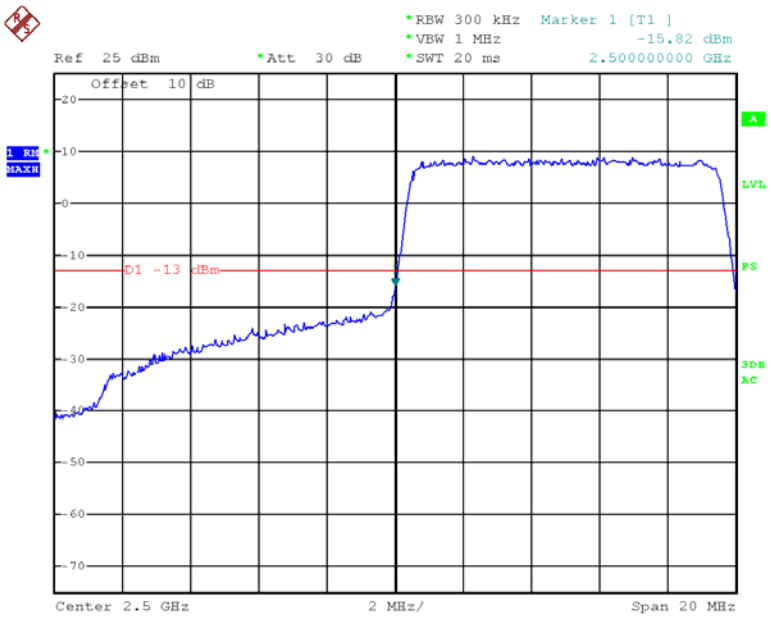
QPSK_5MHz_ FULL RB_ Left



QPSK_5MHz_ FULL RB_ Right

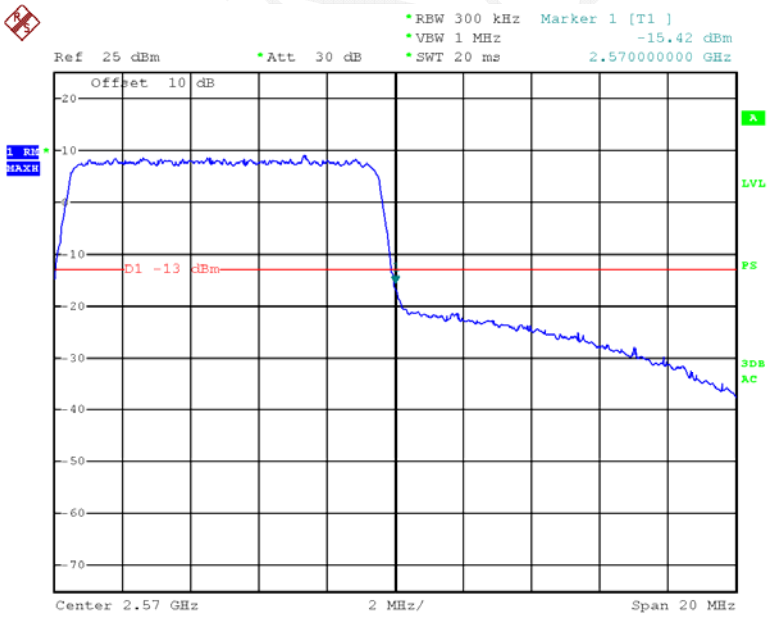


QPSK_10MHz_ FULL RB_ Left



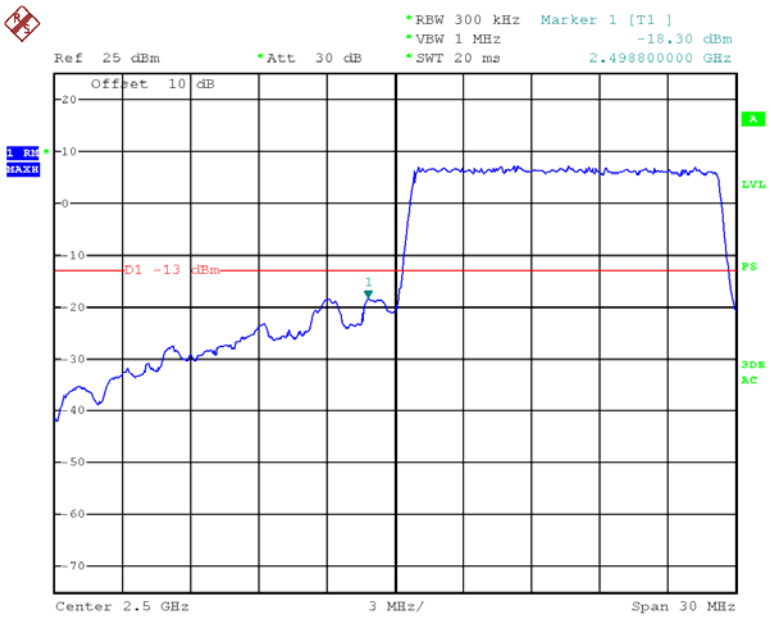
Date: 15.JUN.2016 23:26:11

QPSK_10MHz_ FULL RB_ Right



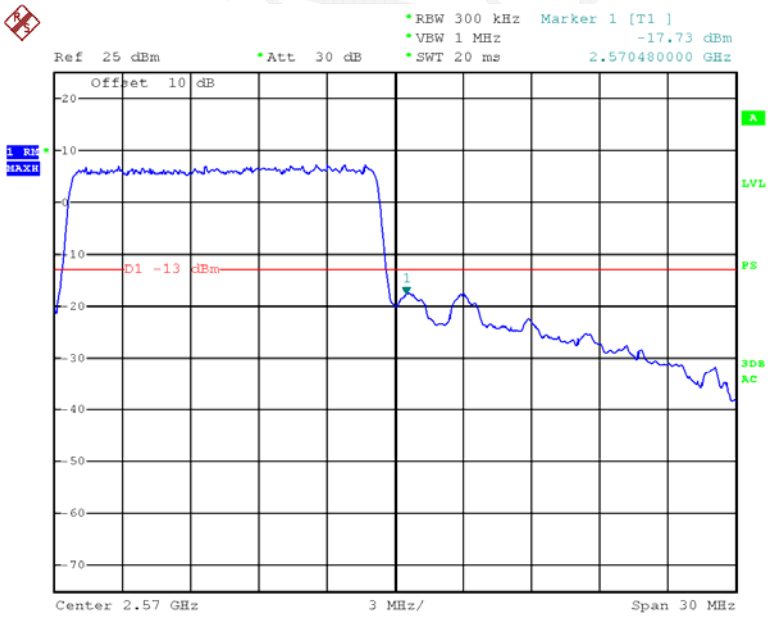
Date: 15.JUN.2016 23:25:34

QPSK_15MHz_ FULL RB_ Left



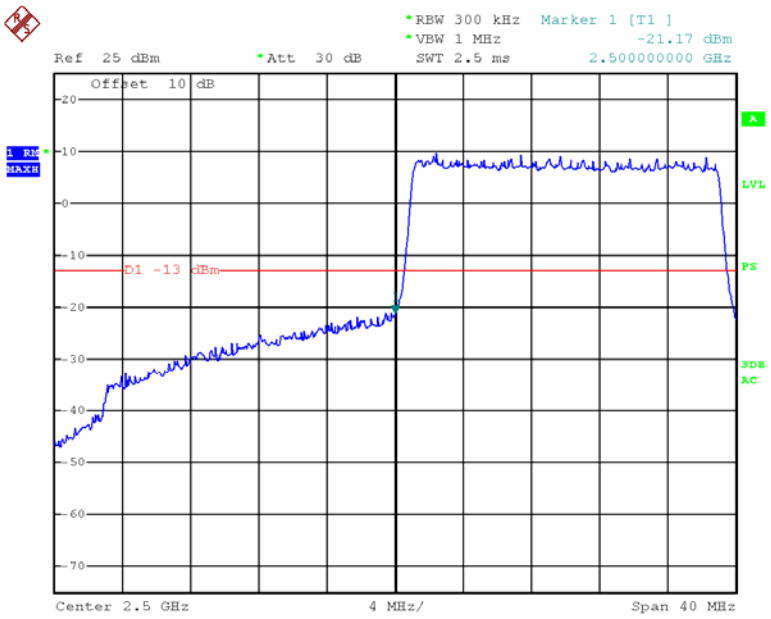
Date: 15.JUN.2016 23:28:05

QPSK_15MHz_ FULL RB_ Right



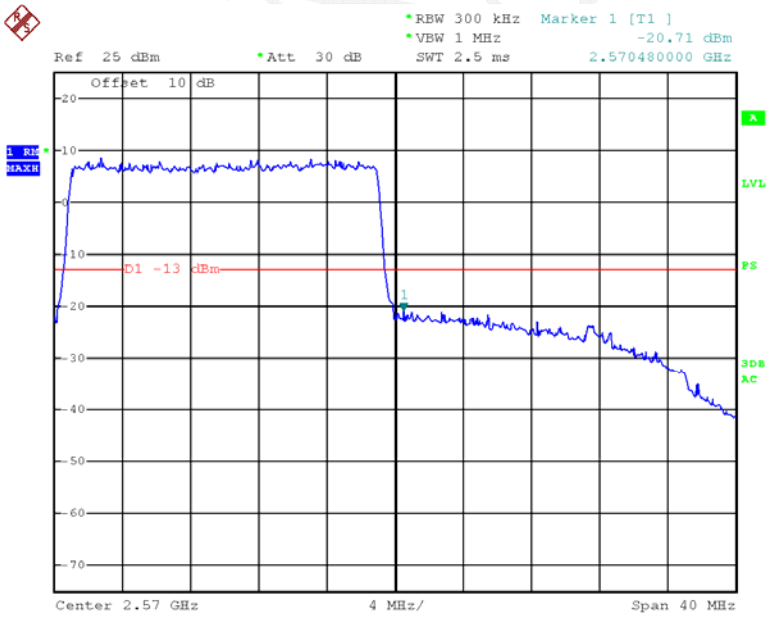
Date: 15.JUN.2016 23:29:52

QPSK_20MHz_ FULL RB_ Left



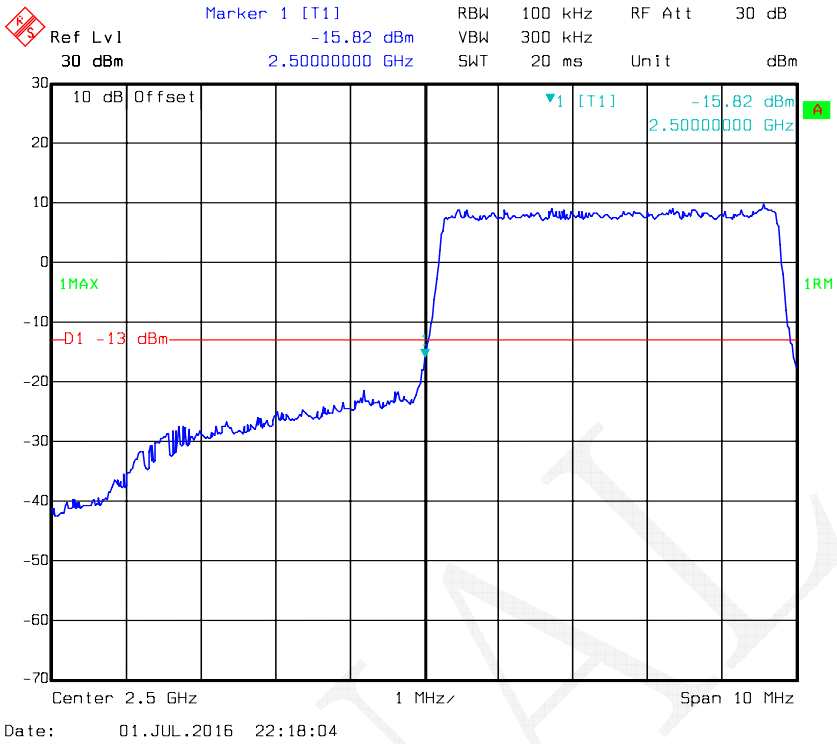
Date: 15.JUN.2016 23:32:19

QPSK_20MHz_ FULL RB_ Right

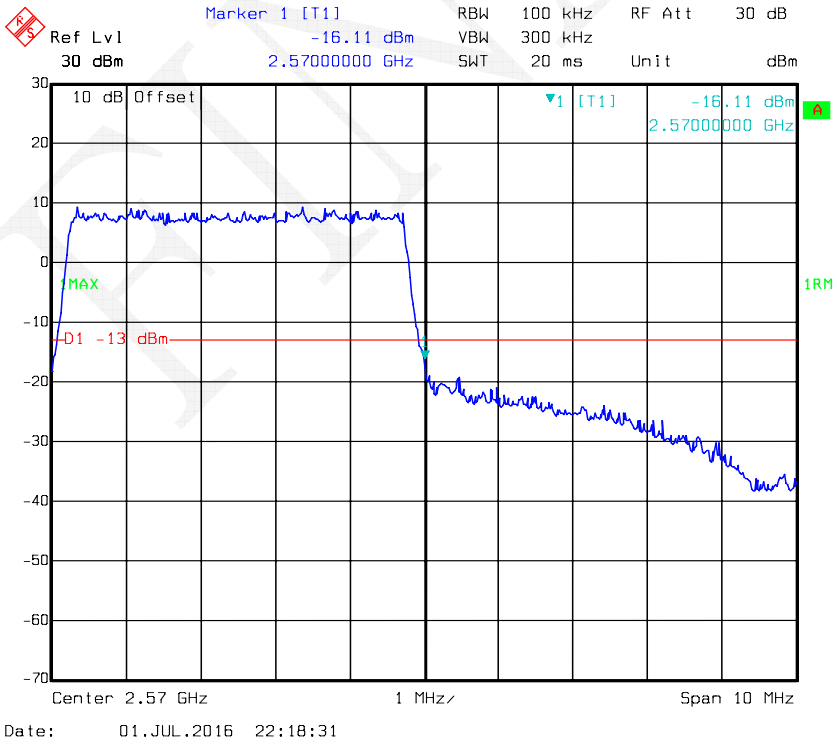


Date: 15.JUN.2016 23:31:15

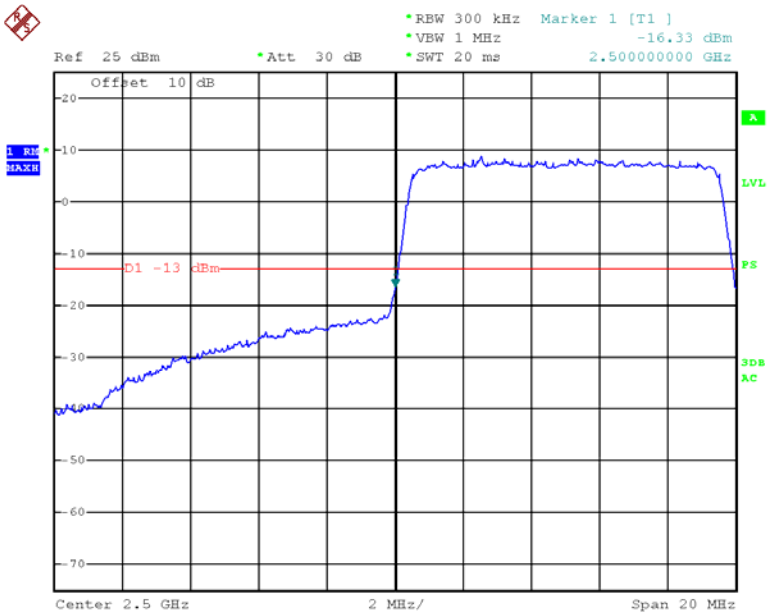
16QAM_5MHz_ FULL RB_ Left



16QAM_5MHz_ FULL RB_ Right

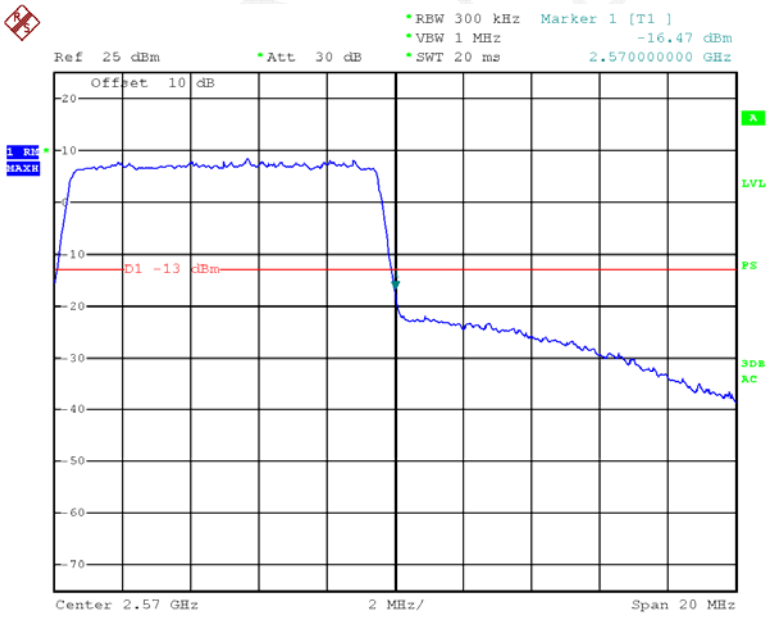


16QAM_10MHz_ FULL RB_ Left



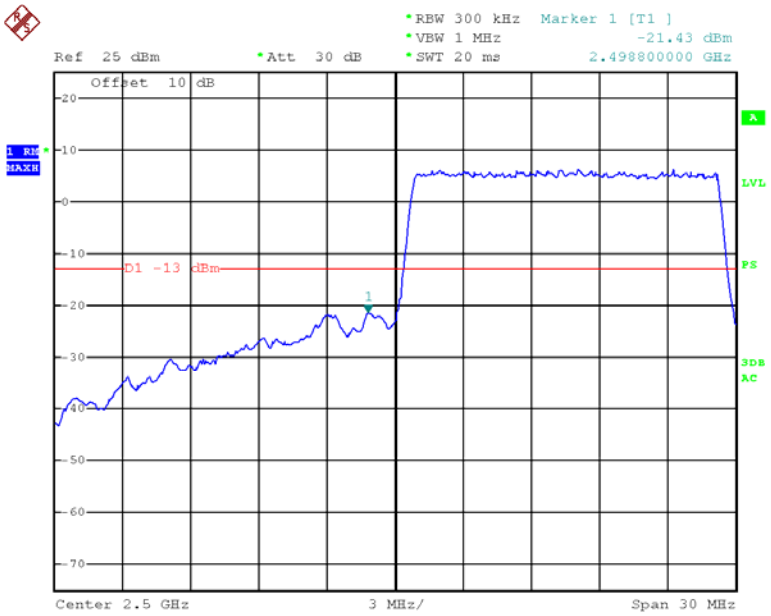
Date: 15.JUN.2016 23:27:05

16QAM_10MHz_ FULL RB_ Right



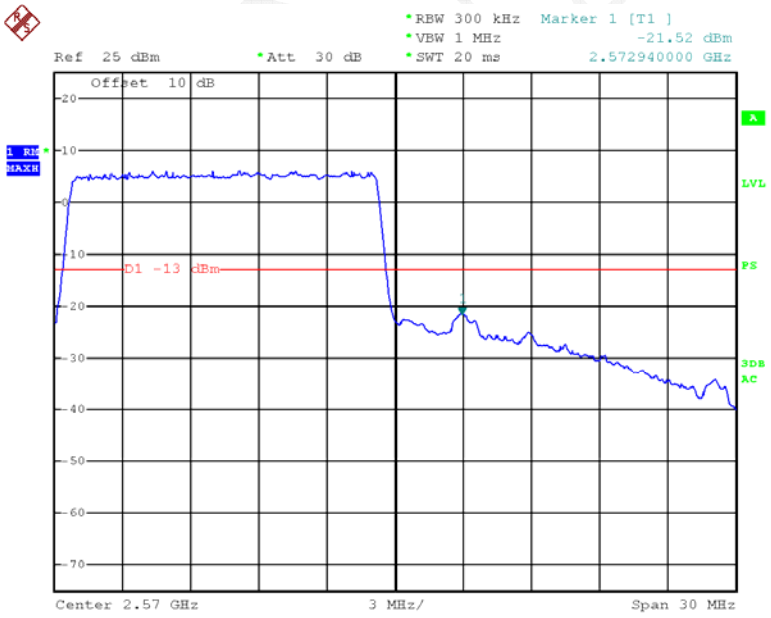
Date: 15.JUN.2016 23:24:47

16QAM_15MHz_ FULL RB_ Left



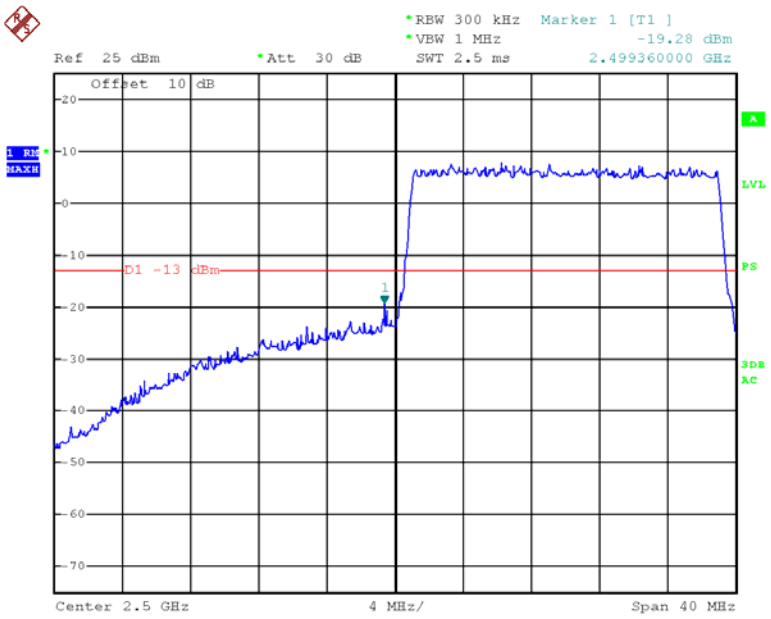
Date: 15.JUN.2016 23:28:30

16QAM_15MHz_ FULL RB_ Right



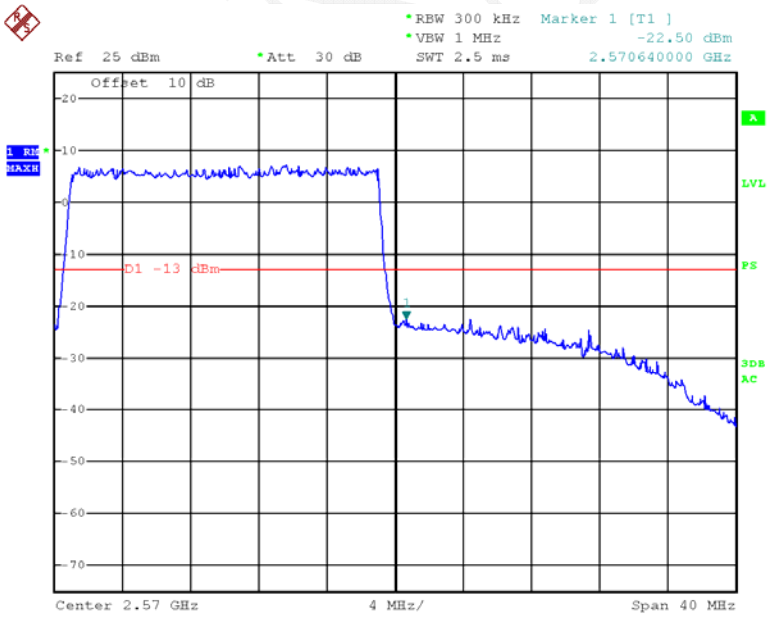
Date: 15.JUN.2016 23:29:33

16QAM_20MHz_ FULL RB_ Left



Date: 15.JUN.2016 23:31:55

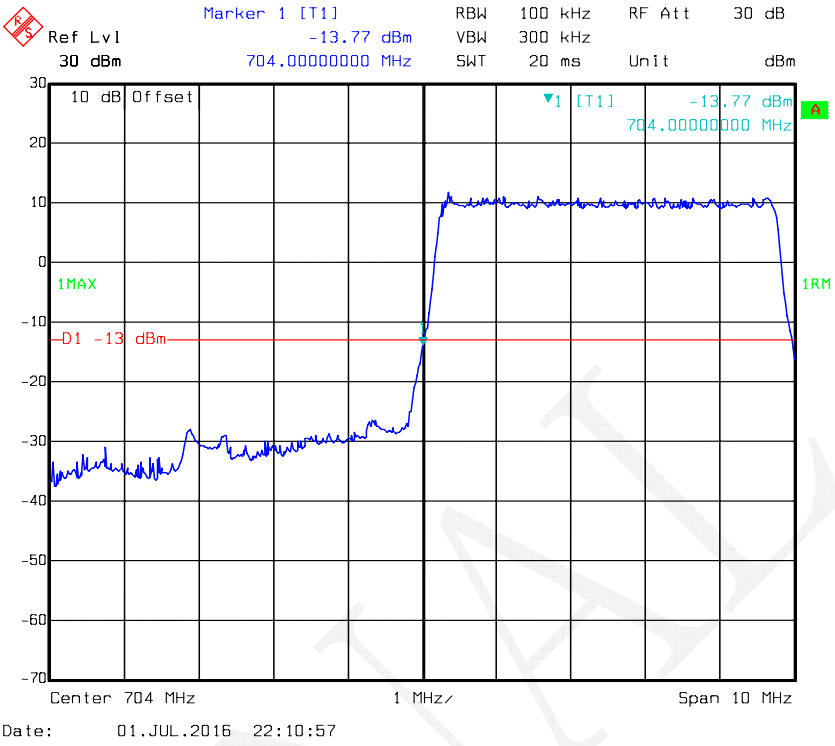
16QAM_20MHz_ FULL RB_ Right



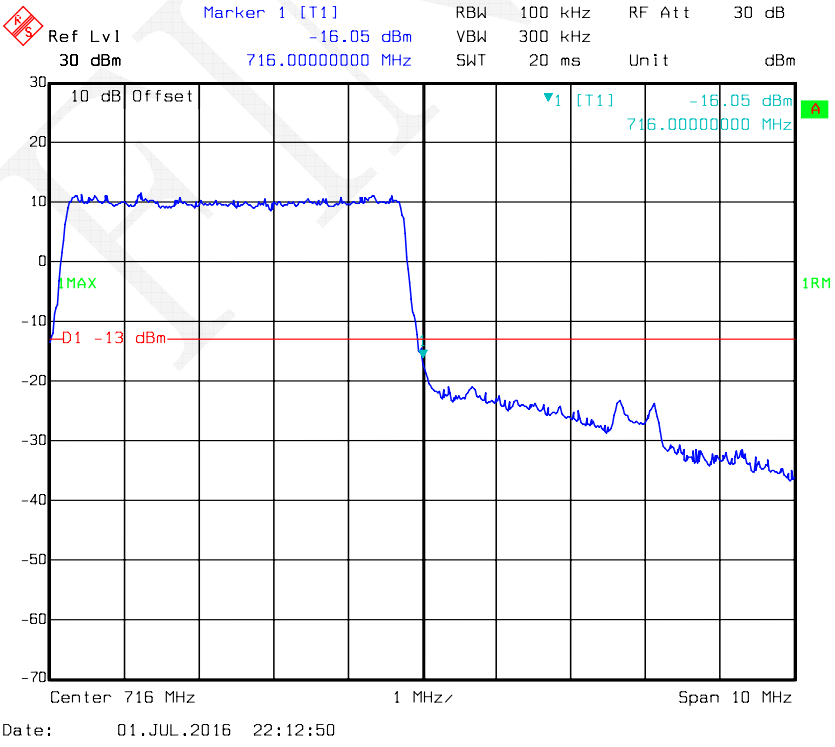
Date: 15.JUN.2016 23:31:35

LTE Band 17

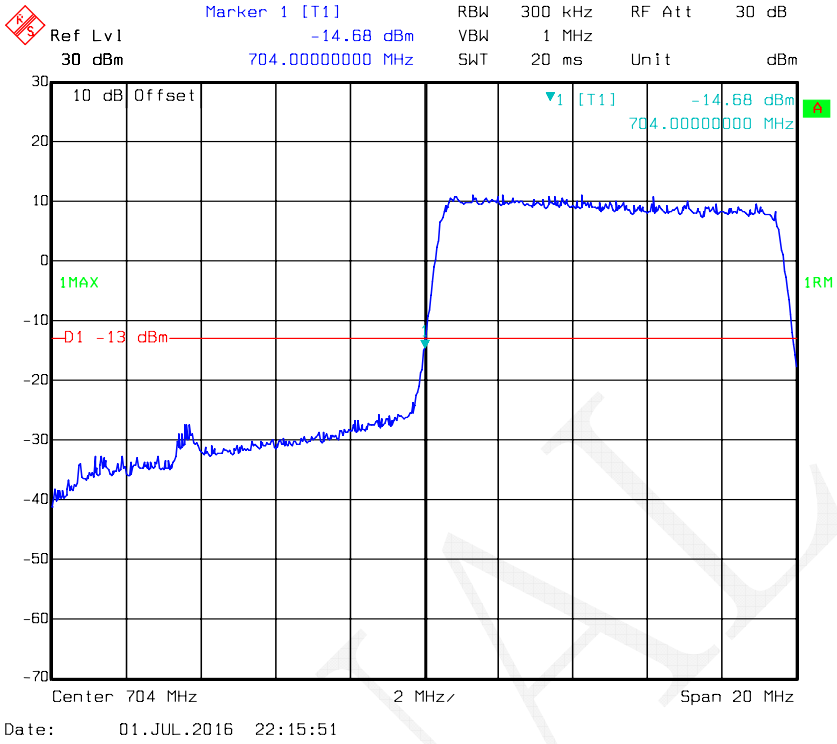
QPSK_5MHz_ FULL RB_ Left



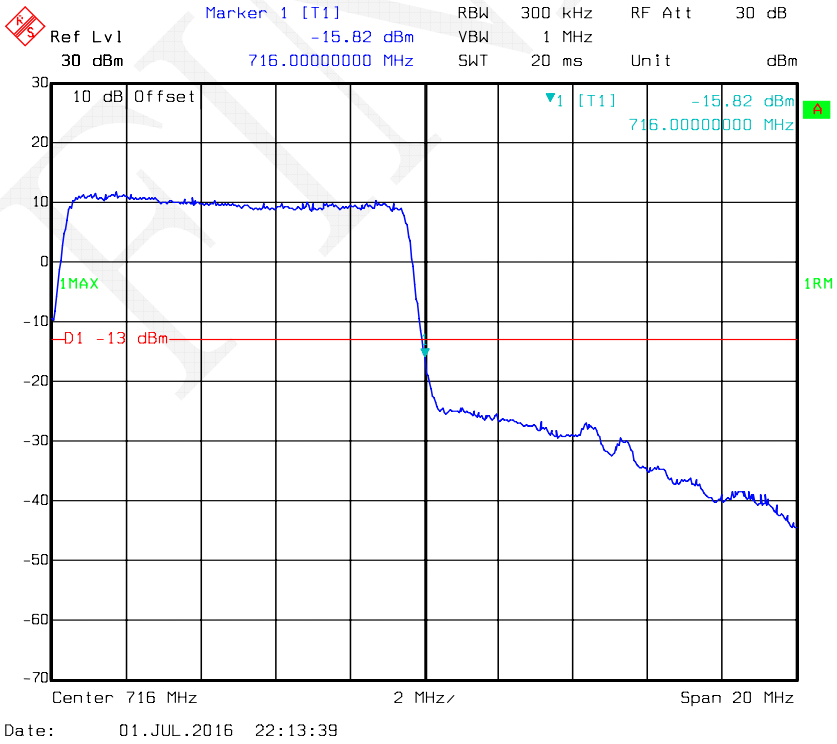
QPSK_5MHz_ FULL RB_ Right



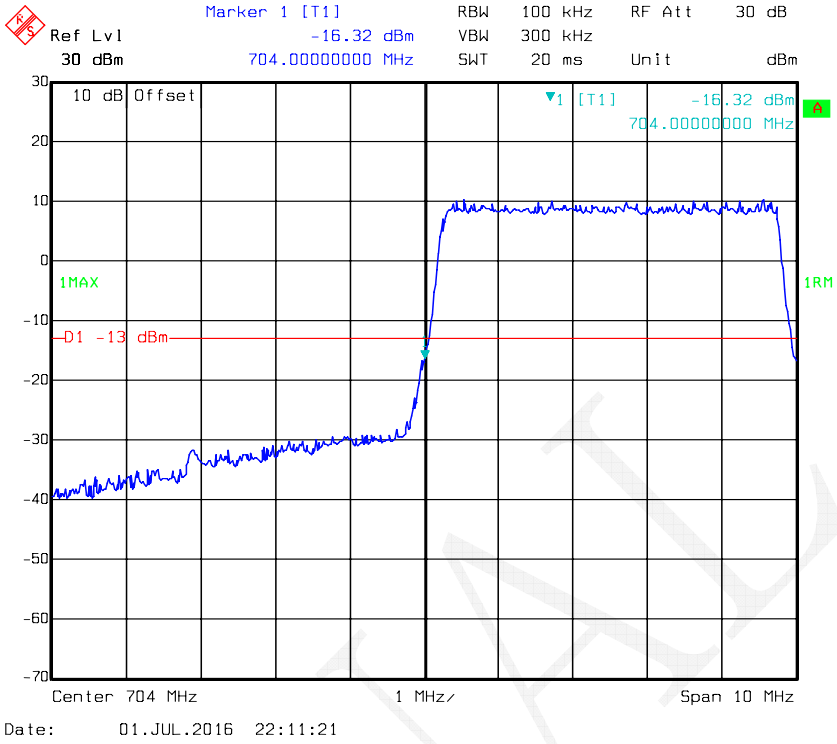
QPSK_10MHz_ FULL RB_ Left



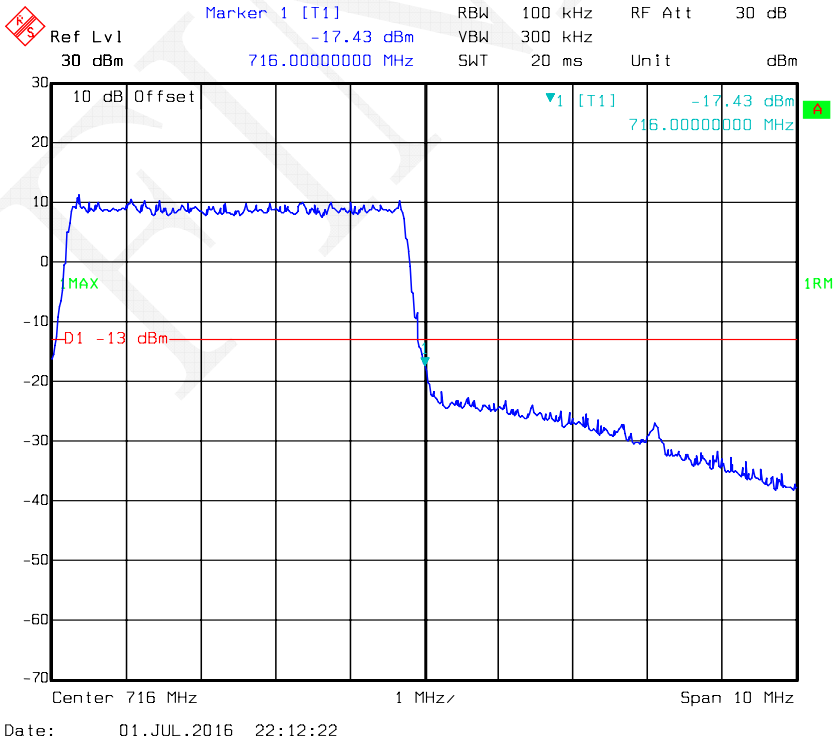
QPSK_10MHz_ FULL RB_ Right



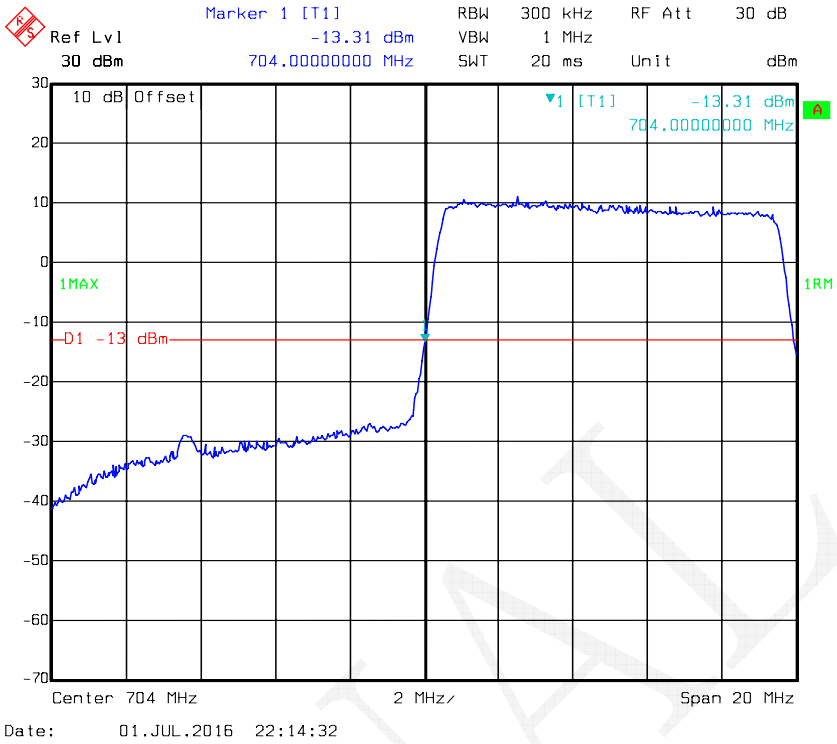
16QAM_5MHz_ FULL RB_ Left



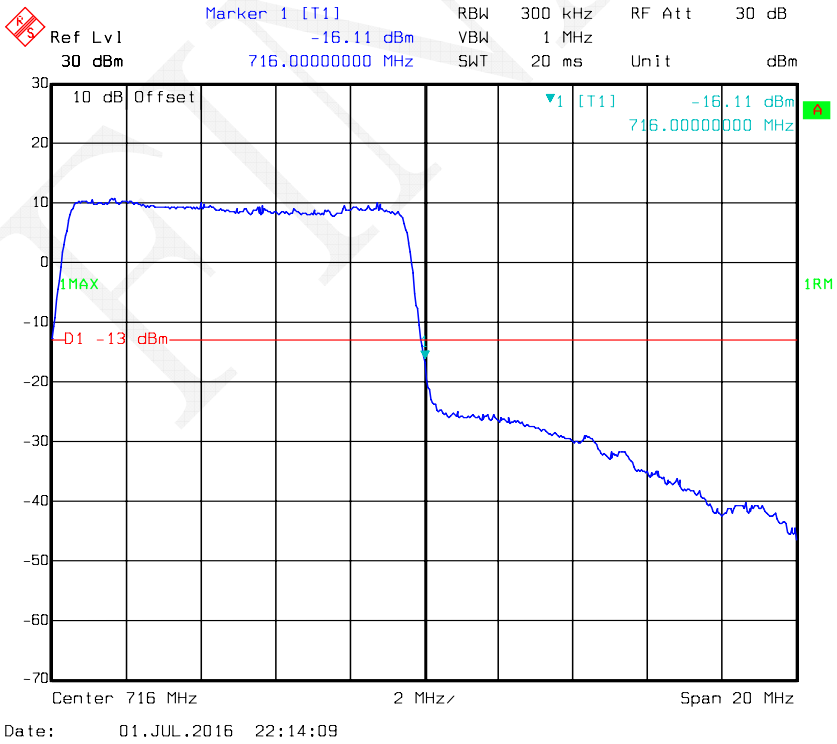
16QAM_5MHz_ FULL RB_ Right



16QAM_10MHz_ FULL RB_ Left



16QAM_10MHz_ FULL RB_ Right



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.

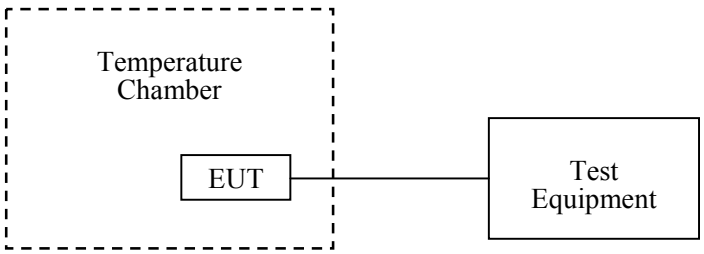
According to §27.54, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

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	201105083-3	2015-09-10	2016-09-09
R&S	Universal Radio Communication Tester	CMU200	109 038	2016-05-09	2017-05-09
R&S	Wideband Radio Communication Tester	CMW500	1201.002K50-146520-wh	2015-12-19	2016-12-19
UNI-T	Multimeter	UT39A	M130199938	2016-04-02	2017-04-02
Pasternack	RF Coaxial Cable	RF-01	/	2016-05-06	2017-05-06

*** 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:	28.5°C
Relative Humidity:	39 %
ATM Pressure:	100.1kPa

The testing was performed by Lion Xiao on 2016-06-27.

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	12	0.014	2.5
-20	3.8	14	0.017	2.5
-10	3.8	10	0.012	2.5
0	3.8	13	0.016	2.5
10	3.8	11	0.013	2.5
20	3.8	19	0.023	2.5
30	3.8	15	0.018	2.5
40	3.8	12	0.014	2.5
50	3.8	21	0.025	2.5
25	3.6	20	0.024	2.5
25	4.35	16	0.019	2.5

Cellular Band (Part 22H)

EDGE, Middle Channel, f_c = 836.6 MHz				
Temperature	**Voltage**	**Frequency Error**	**Frequency Error**	**Limit**
℃	**V_{DC}**	**Hz**	**ppm**	**ppm**
-30	3.8	-1	-0.001	2.5
-20	3.8	-2	-0.002	2.5
-10	3.8	-6	-0.007	2.5
0	3.8	8	0.010	2.5
10	3.8	2	0.002	2.5
20	3.8	2	0.002	2.5
30	3.8	2	0.002	2.5
40	3.8	8	0.010	2.5
50	3.8	7	0.008	2.5
25	3.6	12	0.014	2.5
25	4.35	13	0.016	2.5

PCS Band (Part 24E)

GMSK, Middle Channel, f_c = 1880.0 MHz				
Temperature	**Voltage**	**Frequency Error**	**Frequency Error**	**Result**
℃	**V_{DC}**	**Hz**	**ppm**	
-30	3.8	17	0.009	Pass
-20	3.8	23	0.012	Pass
-10	3.8	20	0.011	Pass
0	3.8	24	0.013	Pass
10	3.8	21	0.011	Pass
20	3.8	19	0.010	Pass
30	3.8	14	0.007	Pass
40	3.8	18	0.010	Pass
50	3.8	11	0.006	Pass
25	3.6	16	0.009	Pass
25	4.35	13	0.007	Pass

PCS Band (Part 24E)

EDGE, Middle Channel, f_c = 1880.0 MHz				
Temperature	**Voltage**	**Frequency Error**	**Frequency Error**	**Result**
℃	**V_{DC}**	**Hz**	**ppm**	
-30	3.8	-3	-0.002	Pass
-20	3.8	3	0.002	Pass
-10	3.8	-3	-0.002	Pass
0	3.8	2	0.001	Pass
10	3.8	-1	-0.001	Pass
20	3.8	-3	-0.002	Pass
30	3.8	-1	-0.001	Pass
40	3.8	-4	-0.002	Pass
50	3.8	-10	-0.005	Pass
25	3.6	-8	-0.004	Pass
25	4.35	-11	-0.006	Pass

WCDMA Band V: Re199

Middle Channel, f_c = 836.6 MHz				
Temperature	**Voltage**	**Frequency Error**	**Frequency Error**	**Limit**
℃	**V_{DC}**	**Hz**	**ppm**	**ppm**
-30	3.8	-7	-0.008	2.5
-20	3.8	-3	-0.004	2.5
-10	3.8	0	0.000	2.5
0	3.8	2	0.002	2.5
10	3.8	-6	-0.007	2.5
20	3.8	4	0.005	2.5
30	3.8	-4	-0.005	2.5
40	3.8	2	0.002	2.5
50	3.8	0	0.000	2.5
25	3.6	1	0.001	2.5
25	4.35	-1	-0.001	2.5

WCDMA Band IV: Re199

Middle Channel, f_c = 1732.6 MHz				
Temperature	**Voltage**	**Frequency Error**	**Frequency Error**	**Limit**
℃	**V_{DC}**	**Hz**	**ppm**	**ppm**
-30	3.8	-5	-0.003	2.5
-20	3.8	-3	-0.002	2.5
-10	3.8	-1	-0.001	2.5
0	3.8	2	0.001	2.5
10	3.8	-4	-0.002	2.5
20	3.8	-3	-0.002	2.5
30	3.8	1	0.001	2.5
40	3.8	-5	-0.003	2.5
50	3.8	-1	-0.001	2.5
25	3.6	2	0.001	2.5
25	4.35	0	0.000	2.5

WCDMA Band II: Re199

Middle Channel, f_c = 1880.0 MHz				
Temperature	**Voltage**	**Frequency Error**	**Frequency Error**	**Result**
℃	**V_{DC}**	**Hz**	**ppm**	
-30	3.8	-2	-0.001	Pass
-20	3.8	5	0.003	Pass
-10	3.8	4	0.002	Pass
0	3.8	-1	-0.001	Pass
10	3.8	5	0.003	Pass
20	3.8	0	0.000	Pass
30	3.8	1	0.001	Pass
40	3.8	3	0.002	Pass
50	3.8	4	0.002	Pass
25	3.6	0	0.000	Pass
25	4.35	2	0.001	Pass

LTE Band II:

QPSK, Channel Bandwidth:10MHz Middle Channel, f_c = 1880 MHz				
Temperature	**Voltage**	**Frequency Error**	**Frequency Error**	**Result**
℃	**V_{DC}**	**Hz**	**ppm**	
-30	3.8	17.27	0.0092	Pass
-20	3.8	16.64	0.0089	Pass
-10	3.8	16.11	0.0086	Pass
0	3.8	17.12	0.0091	Pass
10	3.8	16.87	0.0090	Pass
20	3.8	16.50	0.0088	Pass
30	3.8	16.19	0.0086	Pass
40	3.8	16.82	0.0089	Pass
50	3.8	16.71	0.0089	Pass
25	3.6	16.87	0.0090	Pass
25	4.35	16.39	0.0087	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	17.71	0.0094	Pass
-20	3.8	17.99	0.0096	Pass
-10	3.8	17.54	0.0093	Pass
0	3.8	16.76	0.0089	Pass
10	3.8	17.14	0.0091	Pass
20	3.8	16.52	0.0088	Pass
30	3.8	18.18	0.0097	Pass
40	3.8	17.66	0.0094	Pass
50	3.8	16.66	0.0089	Pass
25	3.6	18.29	0.0097	Pass
25	4.35	16.98	0.0090	Pass

LTE Band IV:

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	-18.09	-0.0104	Pass
-20	3.8	-16.79	-0.0097	Pass
-10	3.8	-17.32	-0.0100	Pass
0	3.8	-17.98	-0.0104	Pass
10	3.8	-18.16	-0.0105	Pass
20	3.8	-17.62	-0.0102	Pass
30	3.8	-18.30	-0.0106	Pass
40	3.8	-18.39	-0.0106	Pass
50	3.8	-17.25	-0.0100	Pass
25	3.6	-16.77	-0.0097	Pass
25	4.35	-17.60	-0.0102	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	15.87	0.0092	Pass
-20	3.8	16.71	0.0096	Pass
-10	3.8	16.45	0.0095	Pass
0	3.8	16.05	0.0093	Pass
10	3.8	15.86	0.0092	Pass
20	3.8	15.89	0.0092	Pass
30	3.8	16.97	0.0098	Pass
40	3.8	16.80	0.0097	Pass
50	3.8	15.37	0.0089	Pass
25	3.6	17.54	0.0101	Pass
25	4.35	16.55	0.0096	Pass

LTE Band V:

QPSK, Channel Bandwidth:10MHz Middle Channel, f_c = 836.5 MHz				
Temperature	**Voltage**	**Frequency Error**	**Frequency Error**	**Result**
℃	**V_{DC}**	**Hz**	**ppm**	
-30	3.8	20.66	0.0247	Pass
-20	3.8	20.53	0.0245	Pass
-10	3.8	20.29	0.0243	Pass
0	3.8	19.91	0.0238	Pass
10	3.8	20.50	0.0245	Pass
20	3.8	20.69	0.0247	Pass
30	3.8	19.89	0.0238	Pass
40	3.8	20.18	0.0241	Pass
50	3.8	19.45	0.0233	Pass
25	3.6	19.11	0.0228	Pass
25	4.35	20.33	0.0243	Pass

16QAM, Channel Bandwidth:10MHz Middle Channel, f_c = 836.5 MHz				
Temperature	**Voltage**	**Frequency Error**	**Frequency Error**	**Result**
℃	**V_{DC}**	**Hz**	**ppm**	
-30	3.8	17.29	0.0207	Pass
-20	3.8	18.29	0.0219	Pass
-10	3.8	17.96	0.0215	Pass
0	3.8	18.86	0.0225	Pass
10	3.8	17.34	0.0207	Pass
20	3.8	17.63	0.0211	Pass
30	3.8	17.64	0.0211	Pass
40	3.8	17.99	0.0215	Pass
50	3.8	18.15	0.0217	Pass
25	3.6	17.28	0.0207	Pass
25	4.35	17.68	0.0211	Pass

LTE Band VII:

QPSK, Channel Bandwidth:10MHz Middle Channel, f_c = 2535 MHz				
Temperature	**Voltage**	**Frequency Error**	**Frequency Error**	**Result**
℃	**V_{DC}**	**Hz**	**ppm**	
-30	3.8	25.52	0.0101	Pass
-20	3.8	25.45	0.0100	Pass
-10	3.8	26.36	0.0104	Pass
0	3.8	25.49	0.0101	Pass
10	3.8	24.89	0.0098	Pass
20	3.8	26.76	0.0106	Pass
30	3.8	25.01	0.0099	Pass
40	3.8	26.17	0.0103	Pass
50	3.8	24.40	0.0096	Pass
25	3.6	25.92	0.0102	Pass
25	4.35	26.93	0.0106	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	23.15	0.0091	Pass
-20	3.8	23.02	0.0091	Pass
-10	3.8	22.85	0.0090	Pass
0	3.8	22.79	0.0090	Pass
10	3.8	24.20	0.0095	Pass
20	3.8	24.87	0.0098	Pass
30	3.8	24.16	0.0095	Pass
40	3.8	23.80	0.0094	Pass
50	3.8	24.21	0.0096	Pass
25	3.6	22.98	0.0091	Pass
25	4.35	23.40	0.0092	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	-21.10	-0.0297	Pass
-20	3.8	-21.78	-0.0307	Pass
-10	3.8	-22.12	-0.0312	Pass
0	3.8	-21.92	-0.0309	Pass
10	3.8	-21.97	-0.0309	Pass
20	3.8	-21.40	-0.0301	Pass
30	3.8	-22.01	-0.0310	Pass
40	3.8	-21.70	-0.0306	Pass
50	3.8	-21.81	-0.0307	Pass
25	3.6	-21.91	-0.0309	Pass
25	4.35	-22.03	-0.0310	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	-19.98	-0.0281	Pass
-20	3.8	-19.59	-0.0276	Pass
-10	3.8	-18.70	-0.0263	Pass
0	3.8	-19.60	-0.0276	Pass
10	3.8	-19.80	-0.0279	Pass
20	3.8	-19.25	-0.0271	Pass
30	3.8	-19.19	-0.0270	Pass
40	3.8	-19.59	-0.0276	Pass
50	3.8	-19.28	-0.0272	Pass
25	3.6	-19.23	-0.0271	Pass
25	4.35	-19.98	-0.0281	Pass

Note: The fundamental emissions stay within the authorized bands of operation based on the frequency deviation measured is small.

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