

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

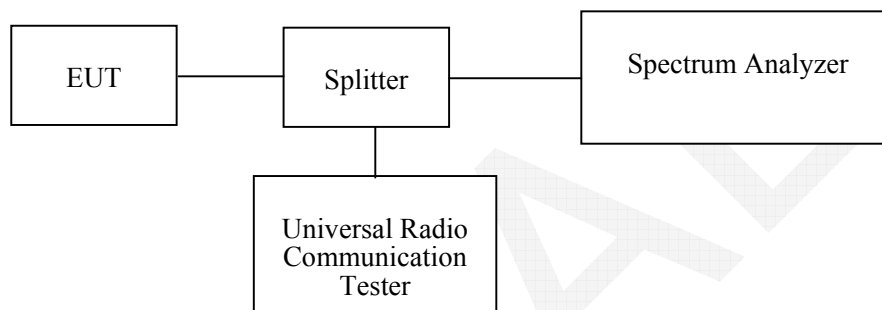
Applicable Standard

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	2015-05-09	2016-05-09

* **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

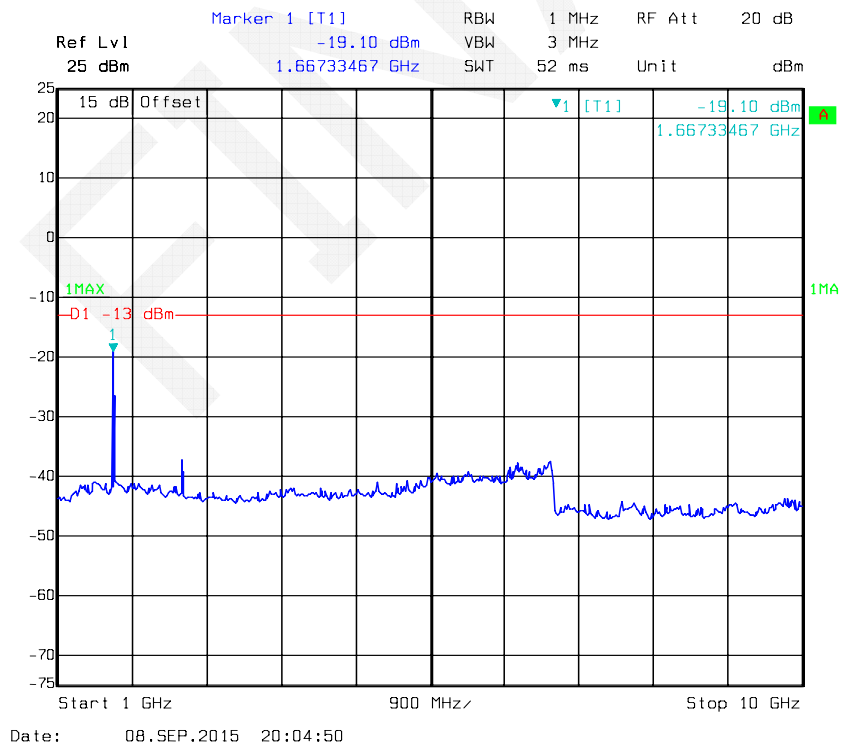
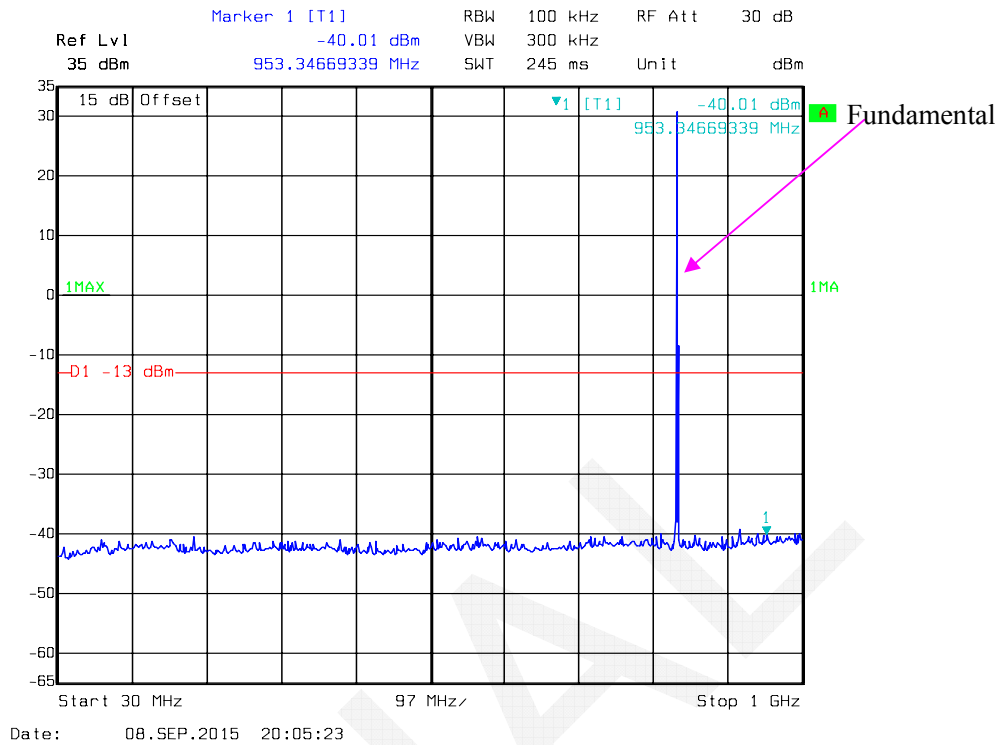
Environmental Conditions

Temperature:	26.9-27.3 °C
Relative Humidity:	58-60 %
ATM Pressure:	98-100.2 kPa

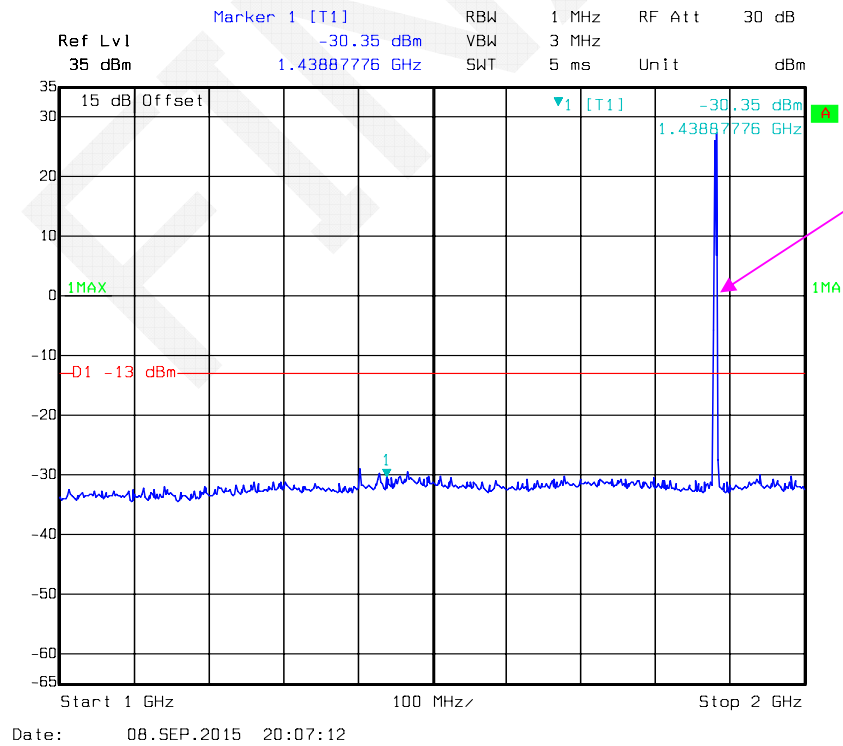
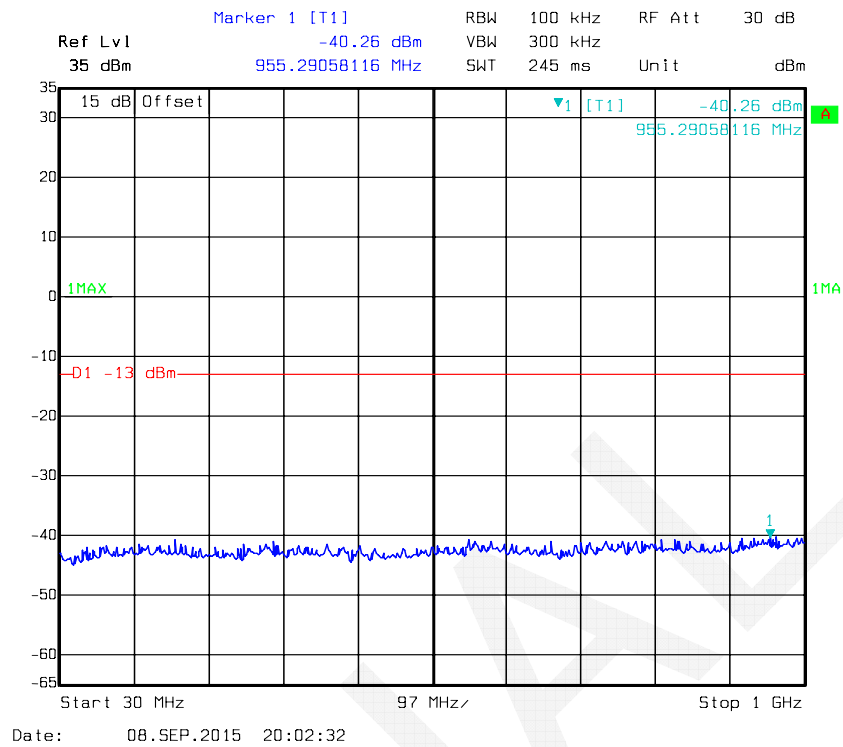
The testing was performed by Lion Xiao on 2015-08-30&2015-09-08&2015-09-11.

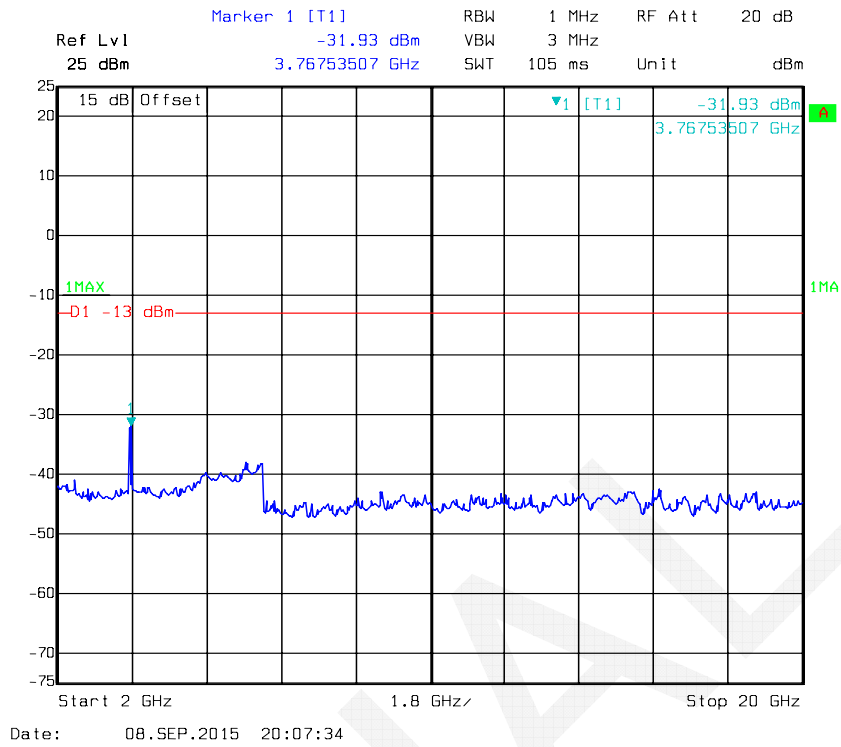
Please refer to the following plots.

GSM850_Middle Channel

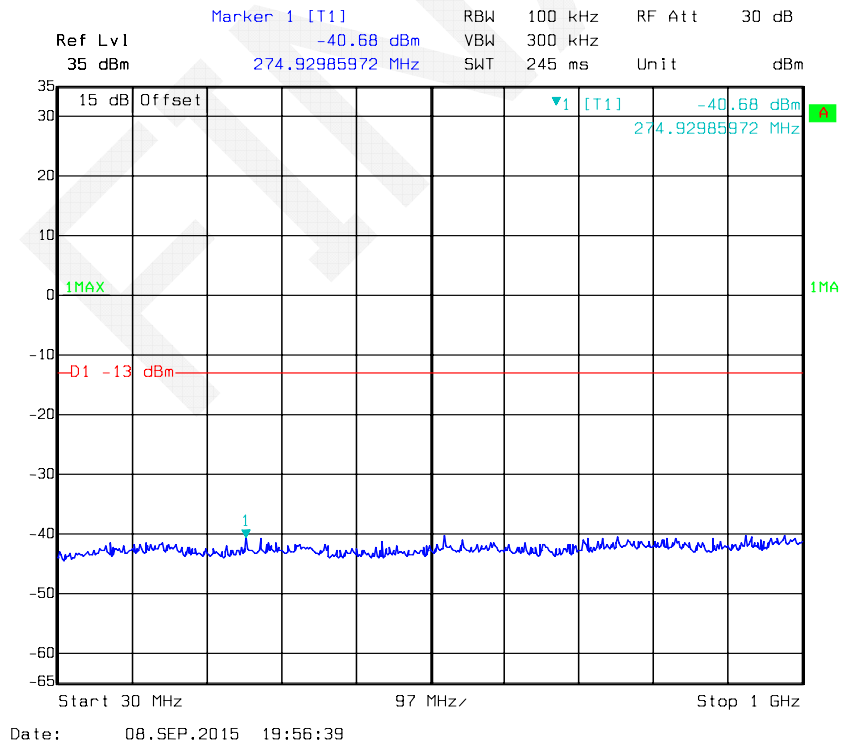


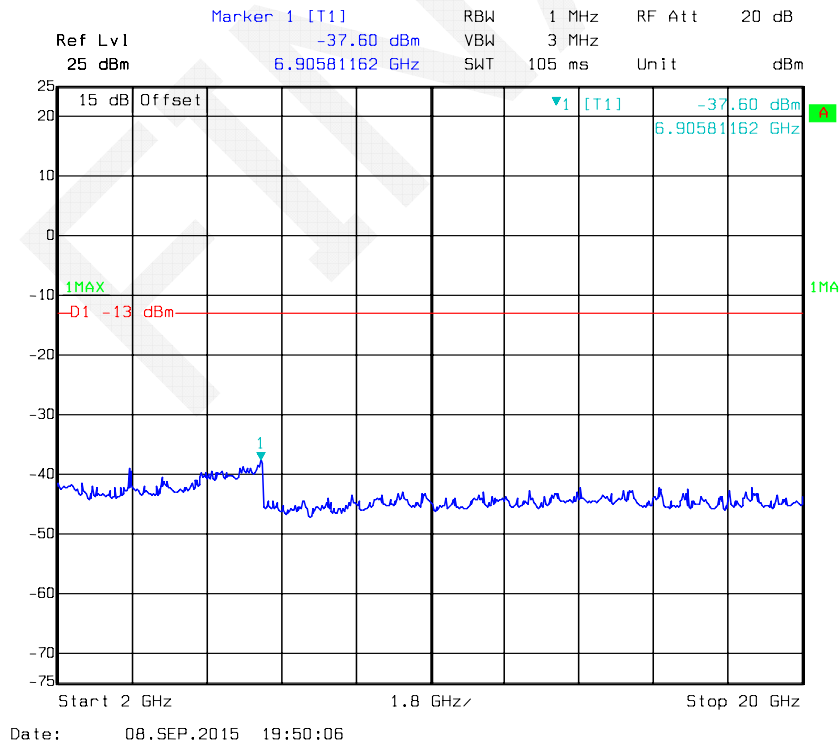
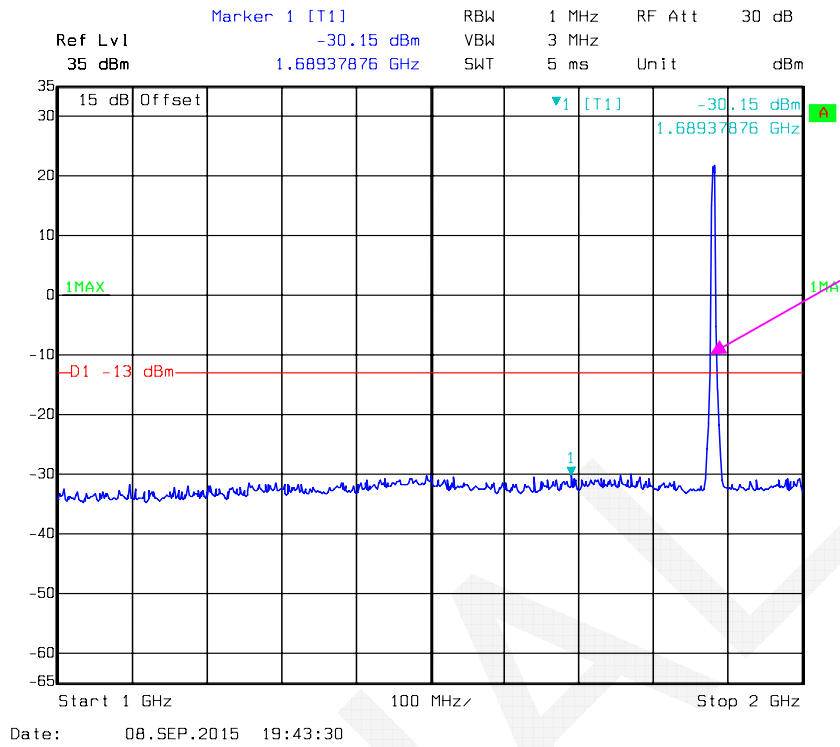
PCS 1900_ Middle Channel



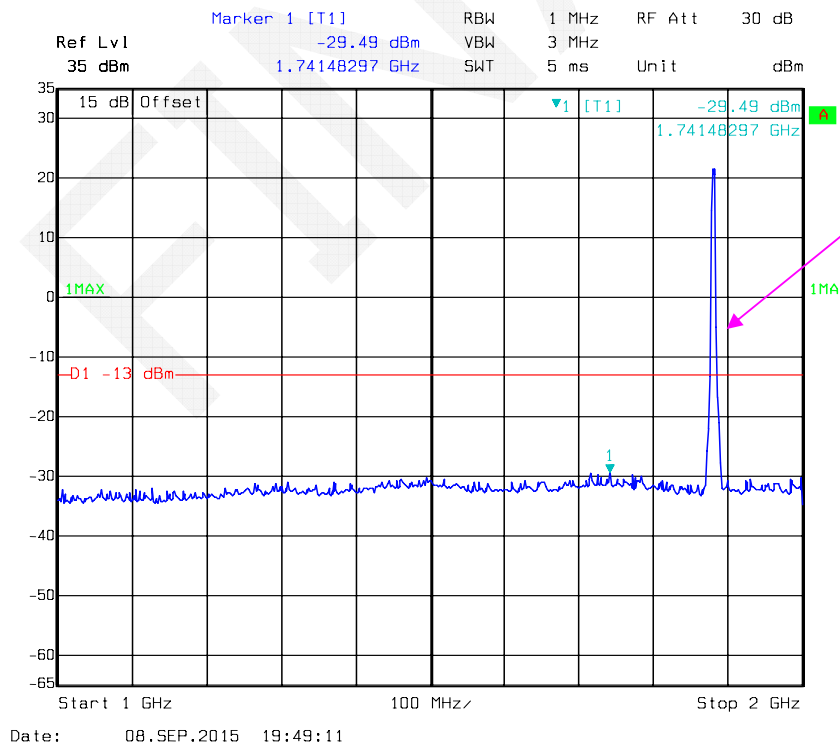
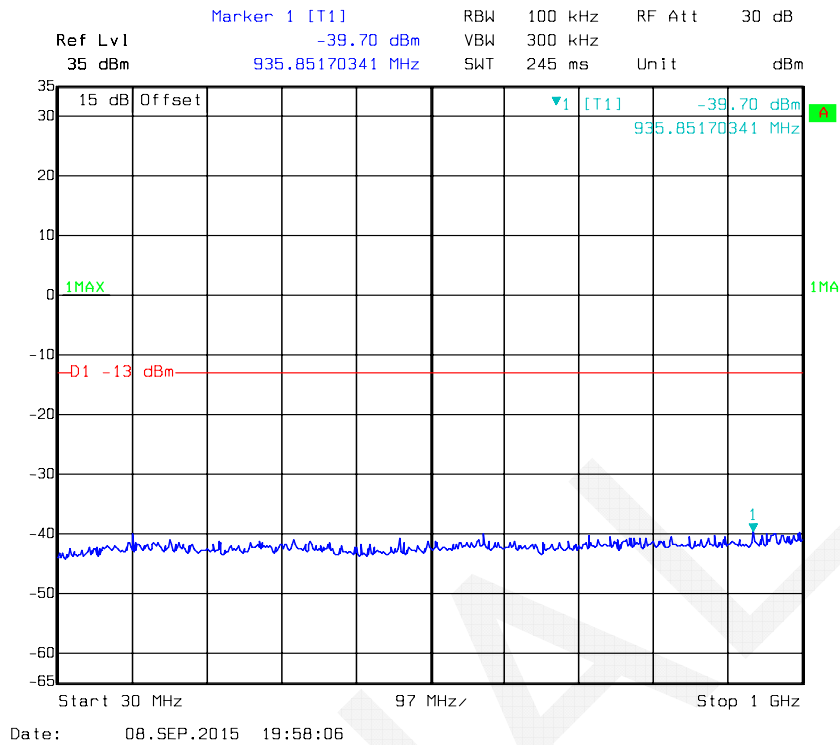


REL99 Band II_Middle Channel

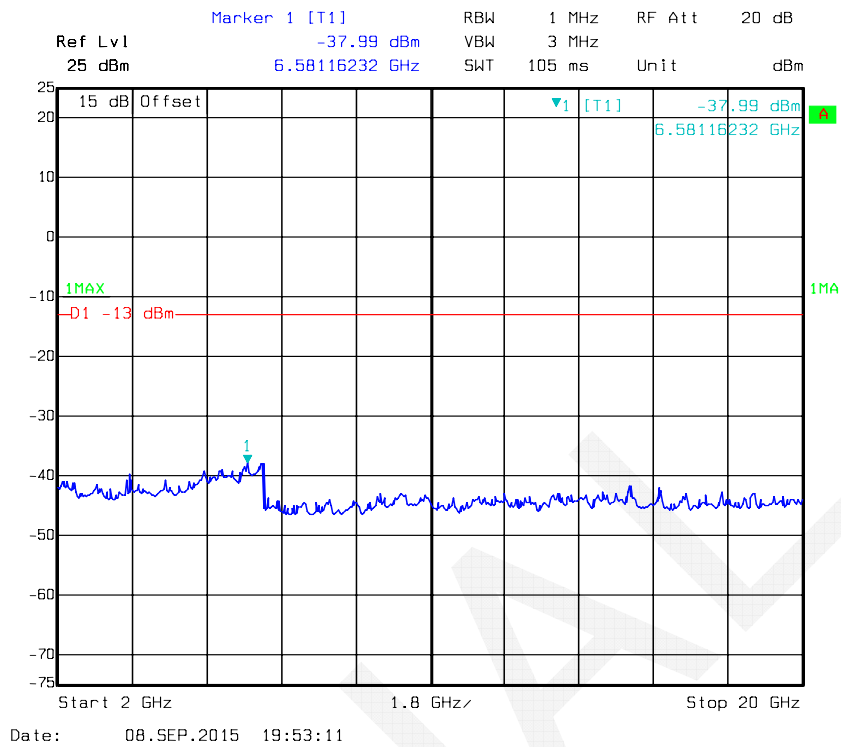




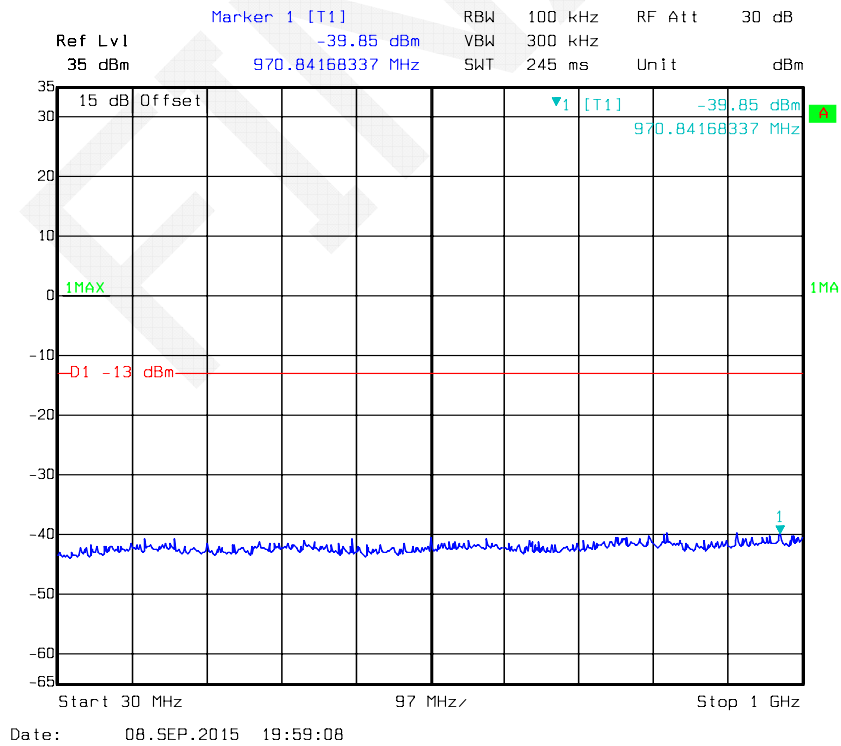
HSDPA Band II _Middle Channel

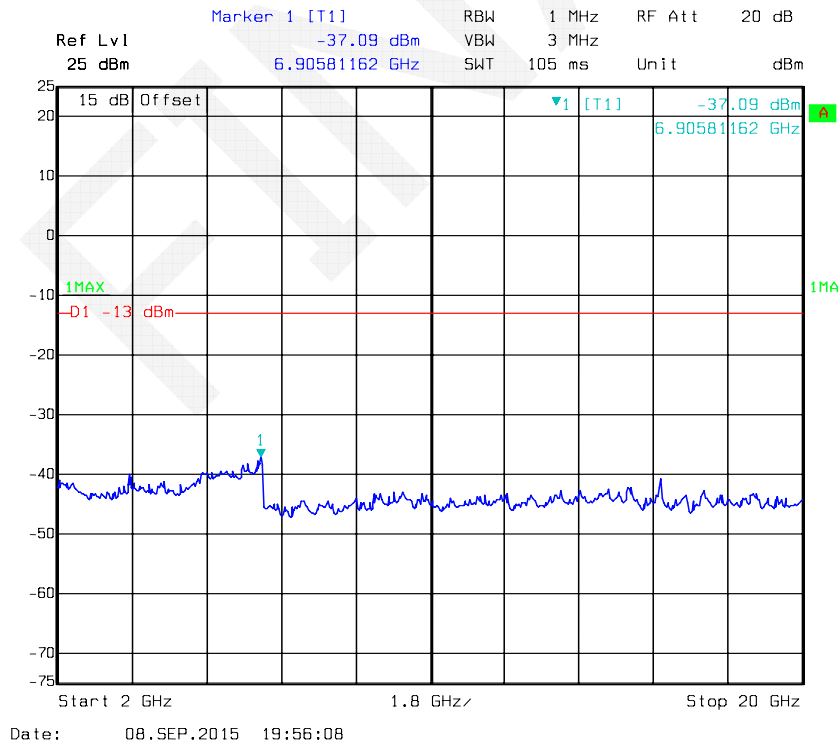
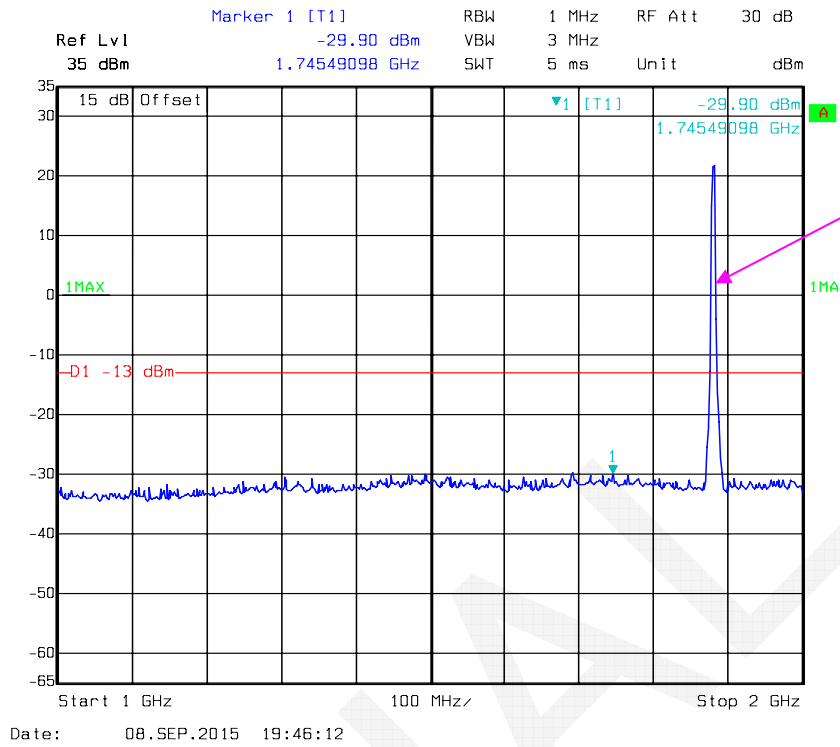


Fundamental

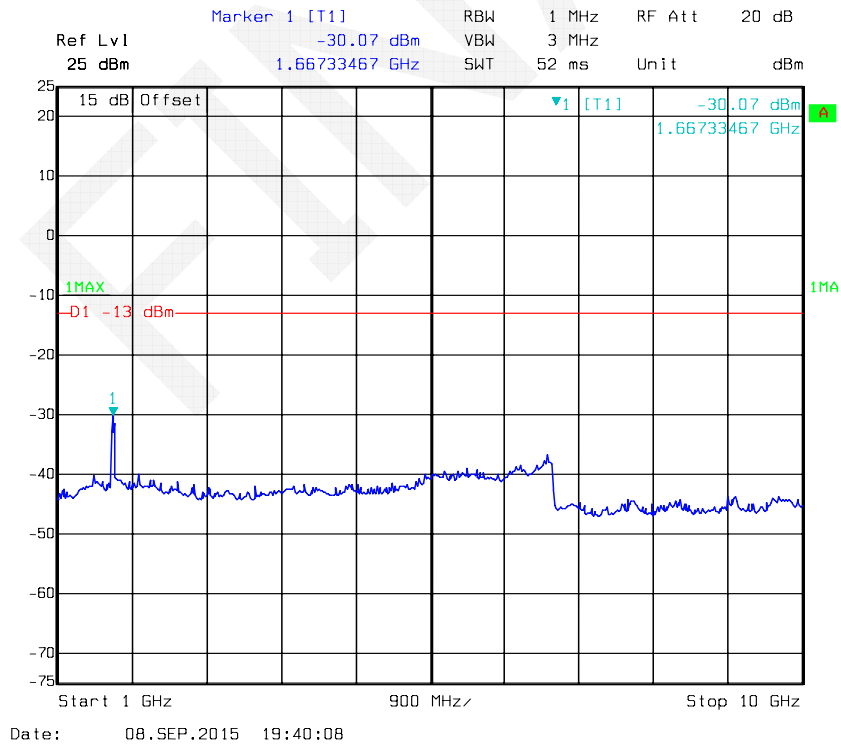
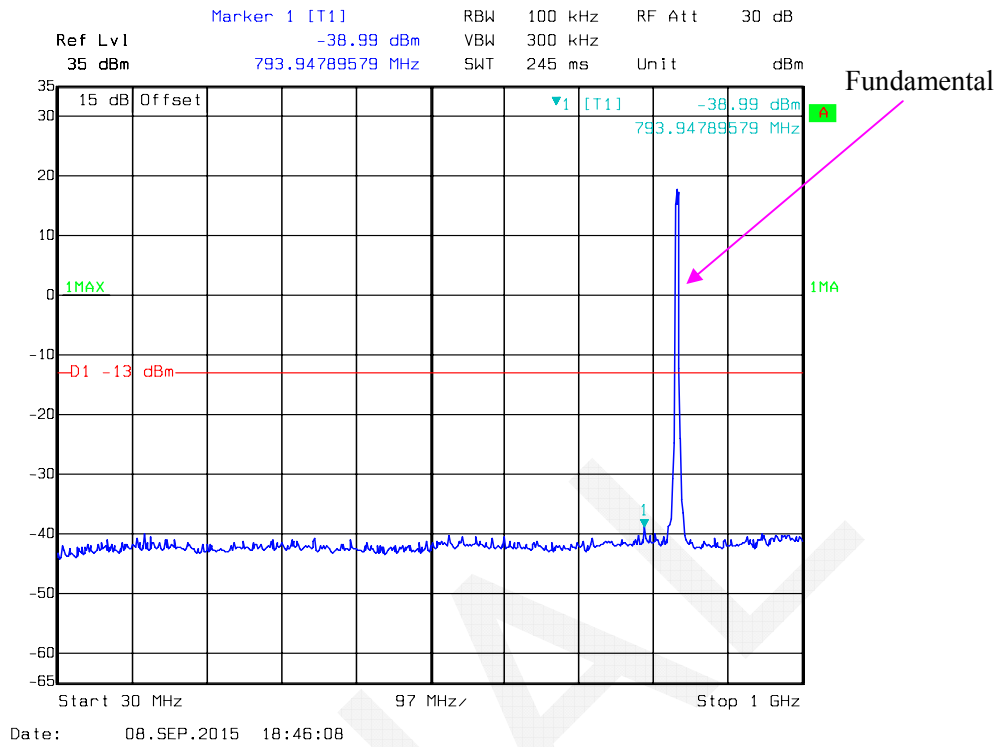


HSUPA Band II_Middle Channel

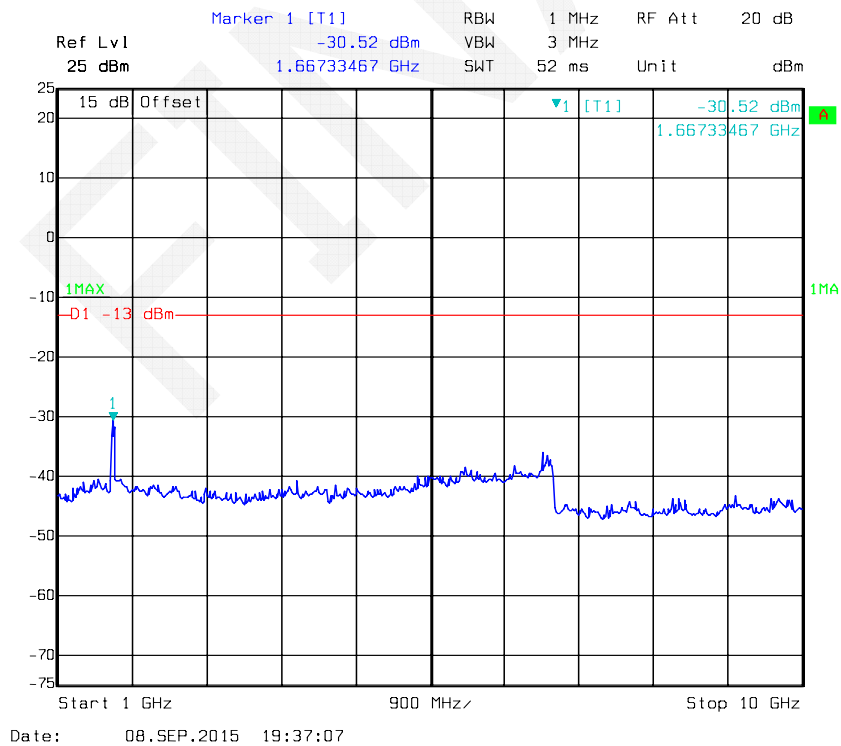
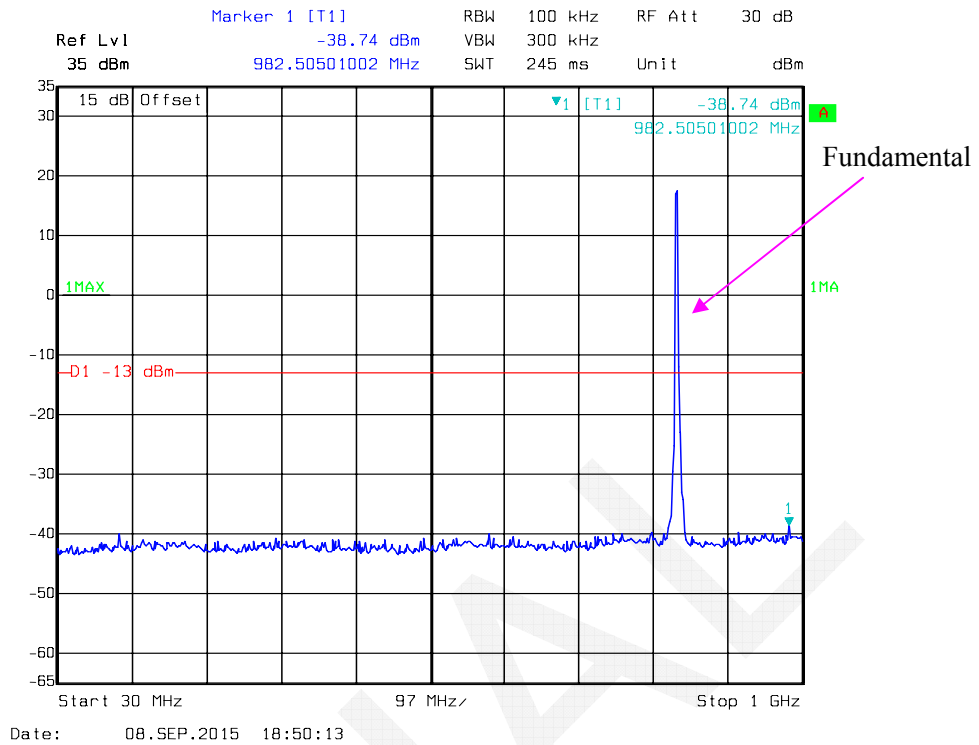




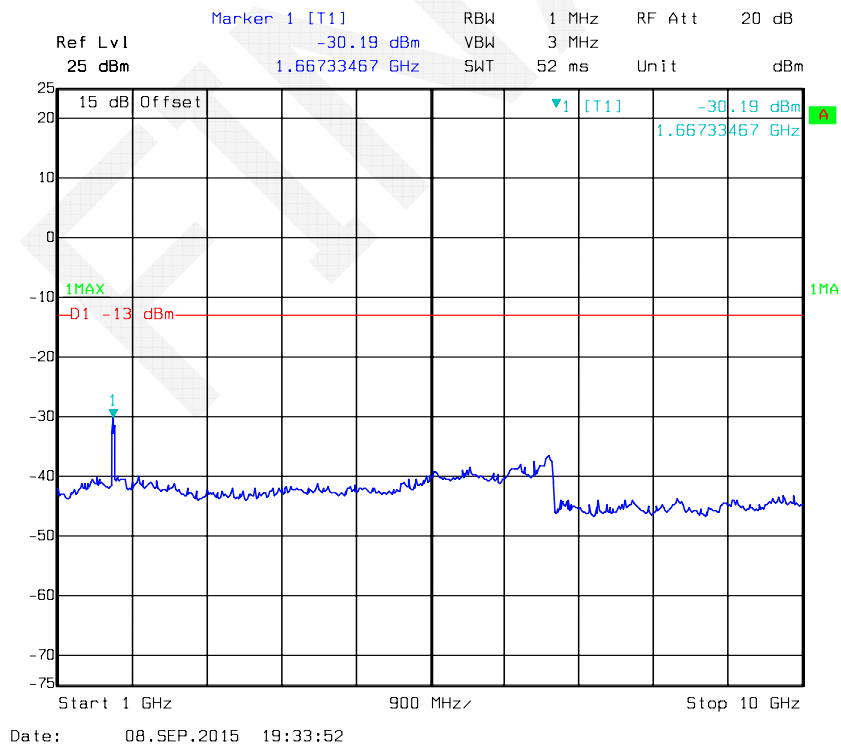
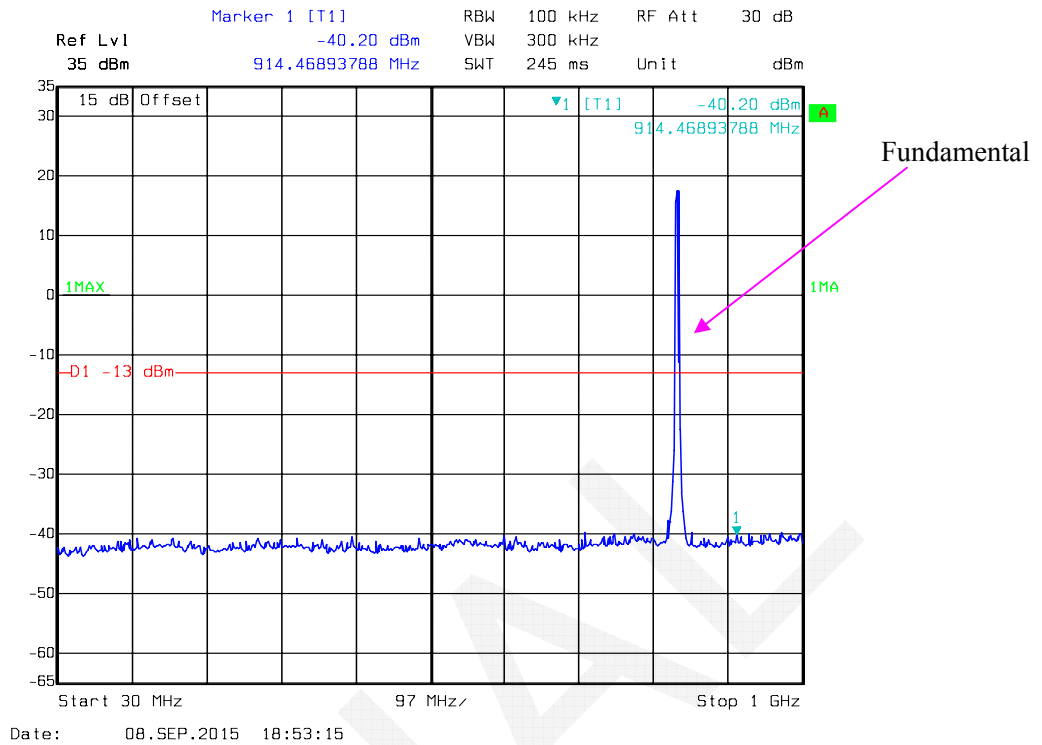
REL99 Band V_ Middle Channel



HSDPA Band V_ Middle Channel

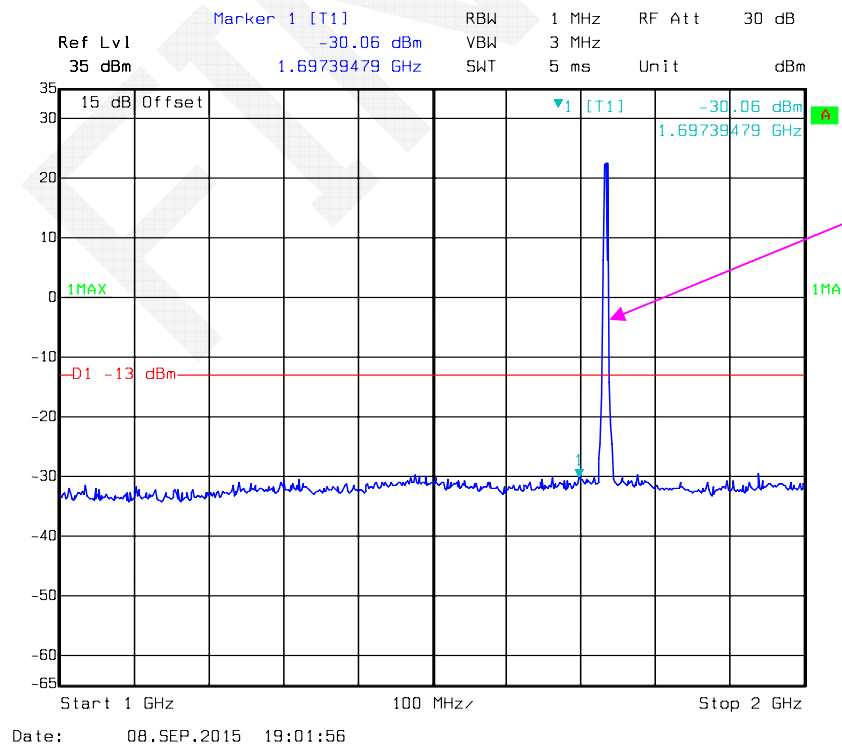
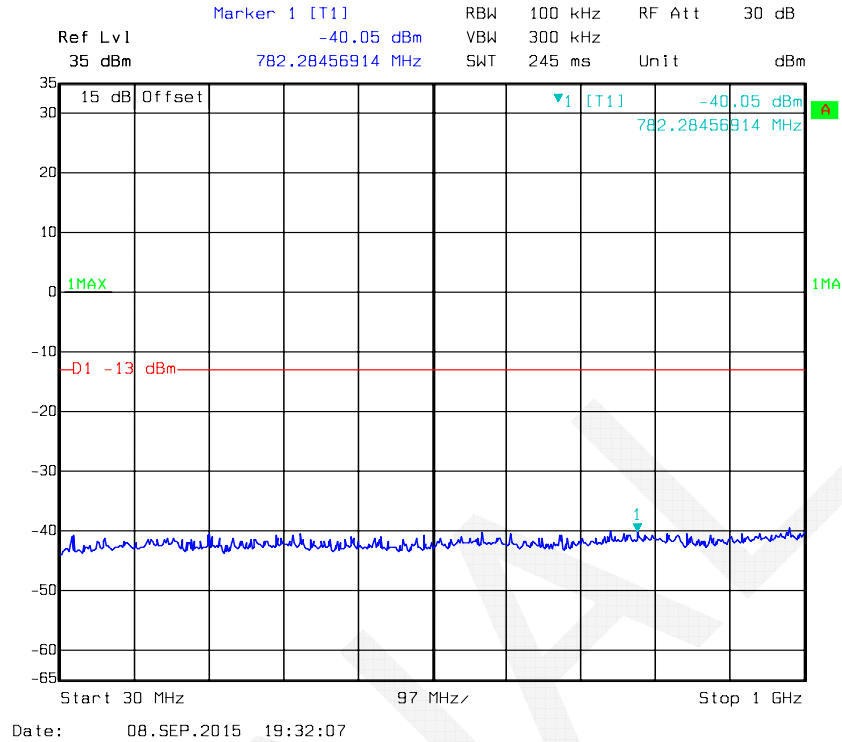


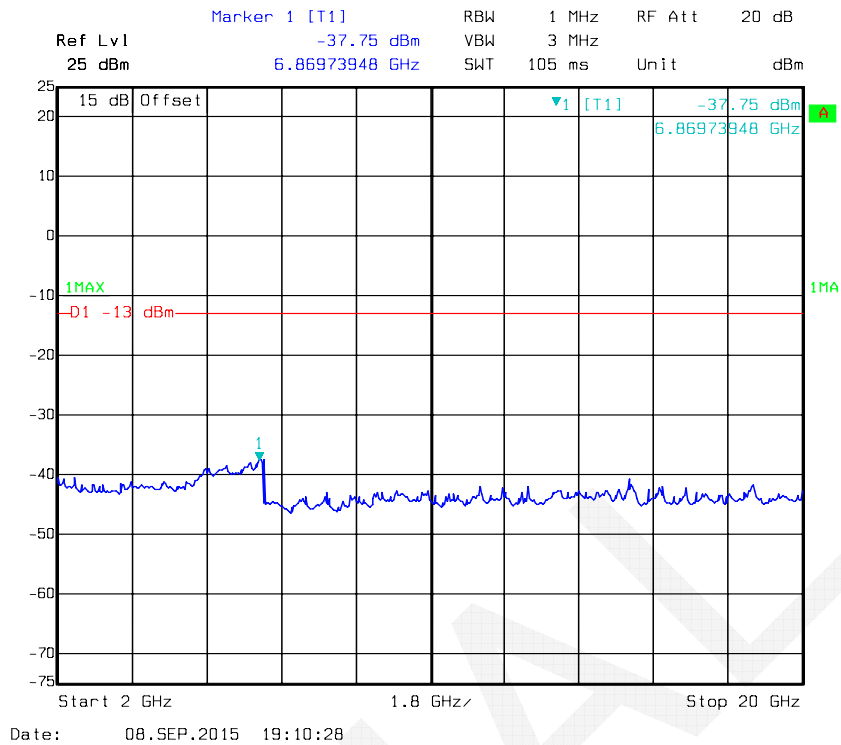
HSUPA Band V_ Middle Channel



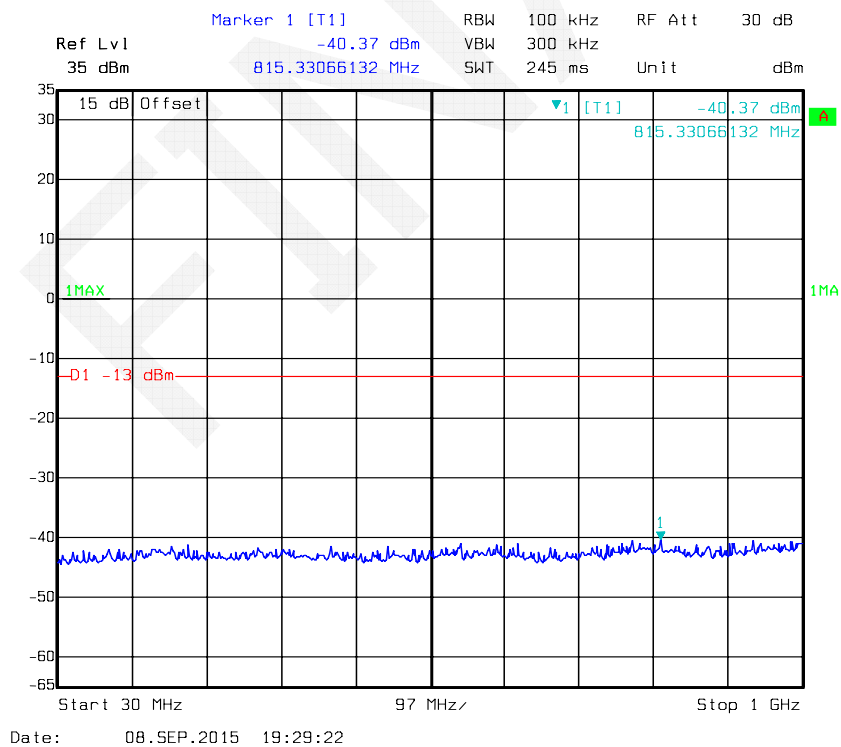
WCDMA Band IV

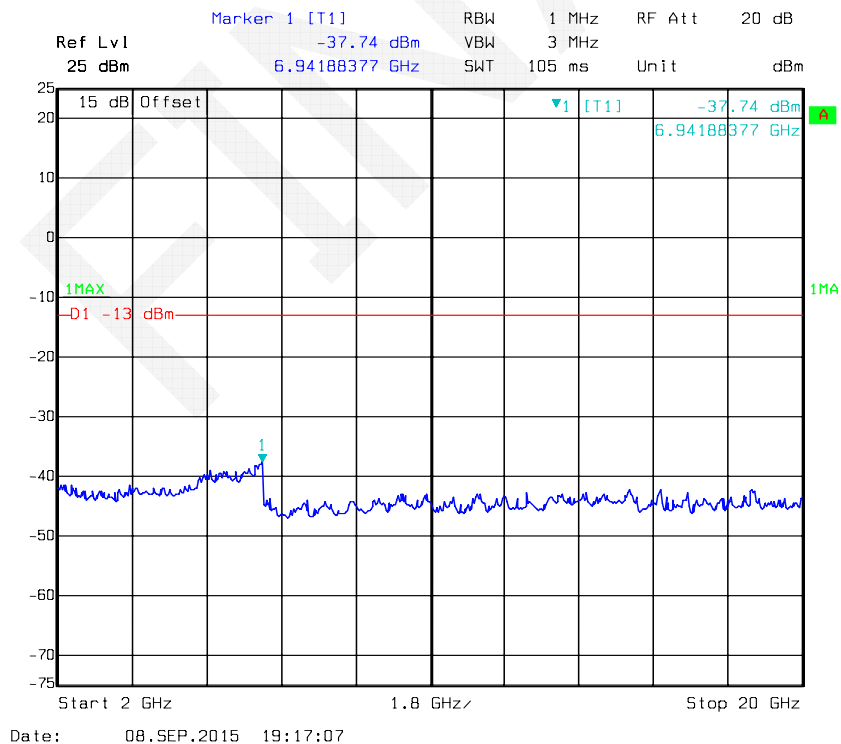
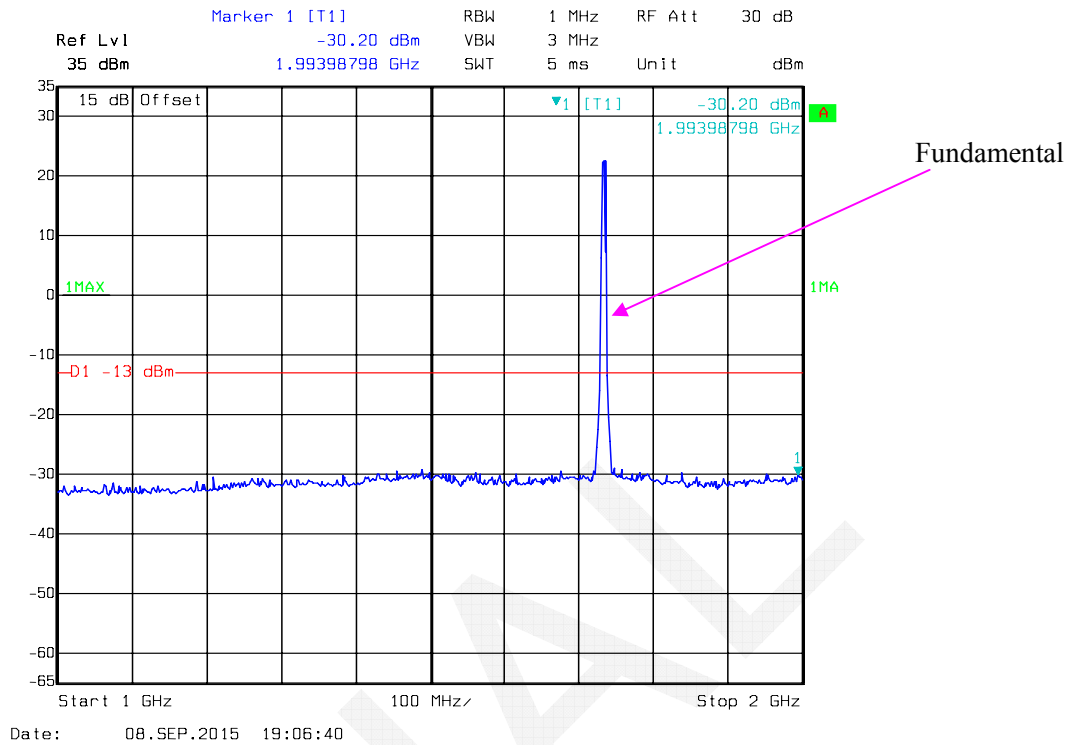
REL99 Band IV_ Middle Channel



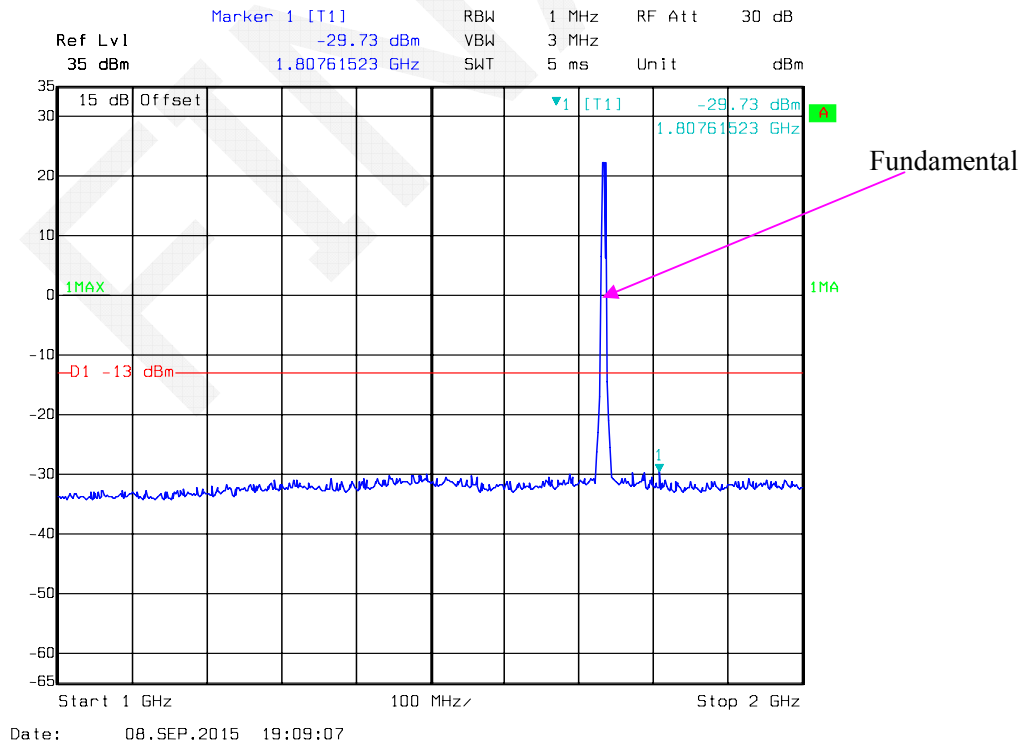
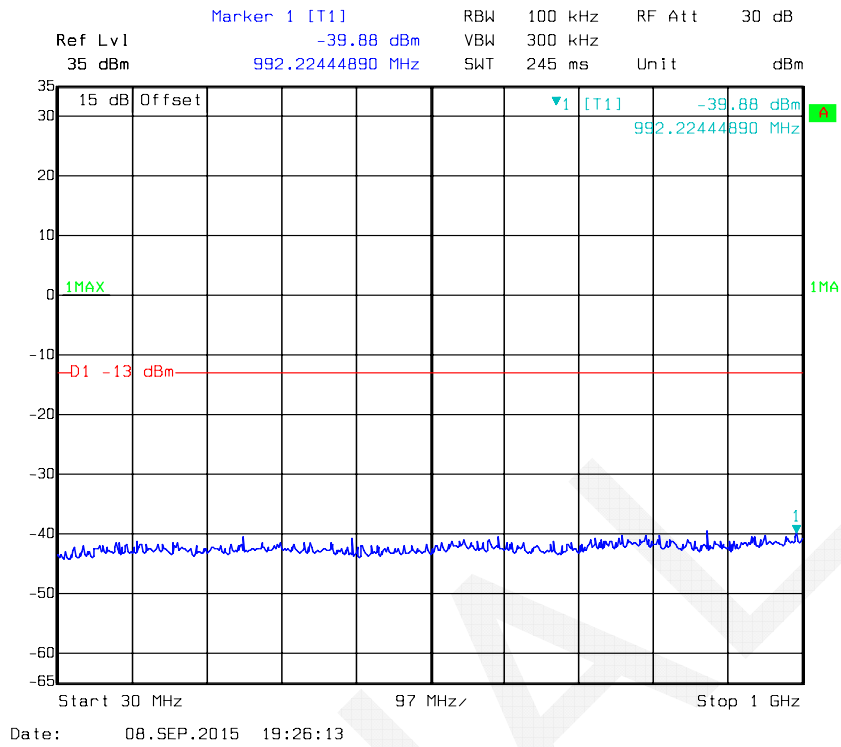


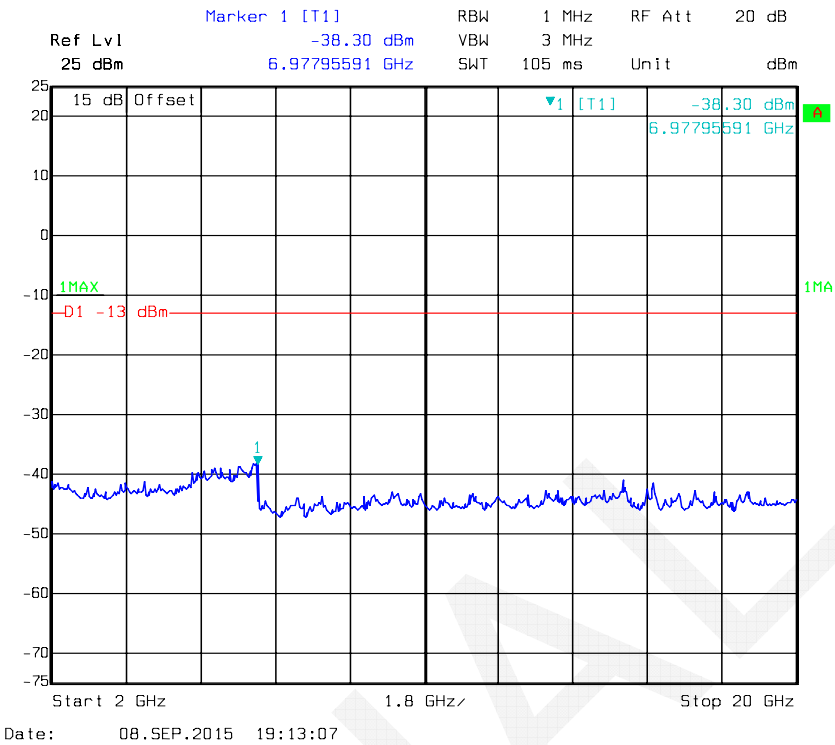
HSDPA Band IV_Middle Channel





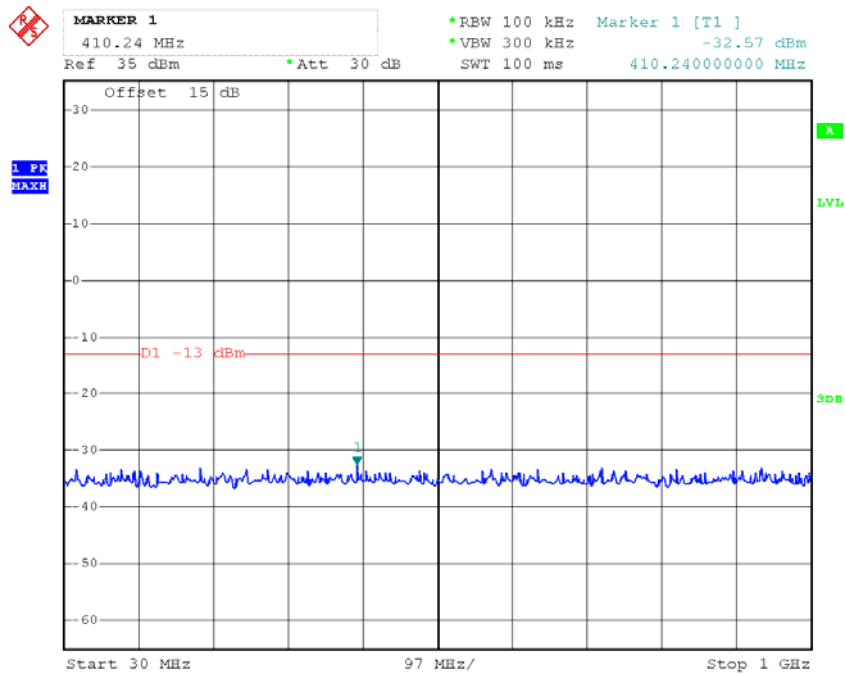
HSUPA Band IV Middle Channel



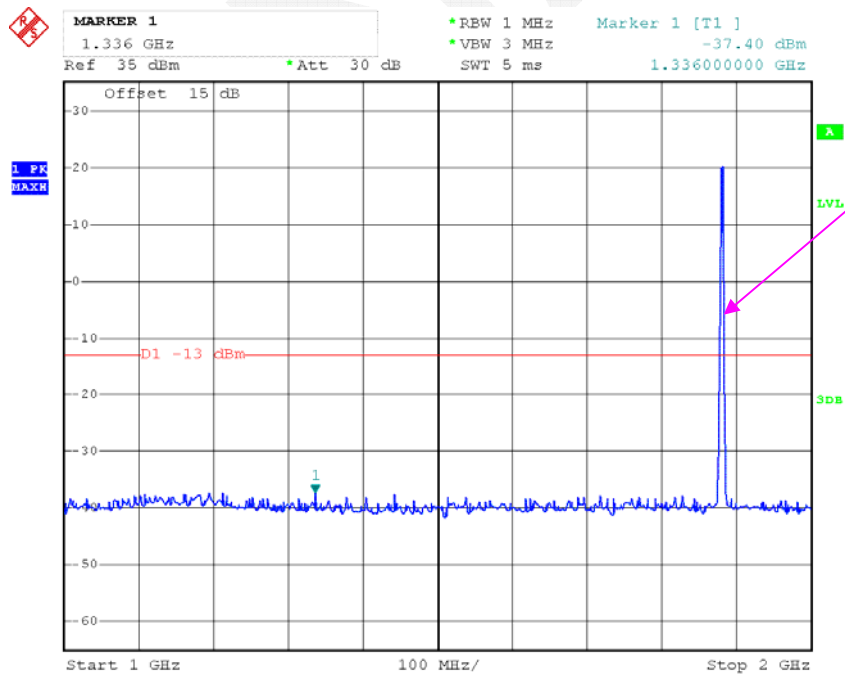


LTE:

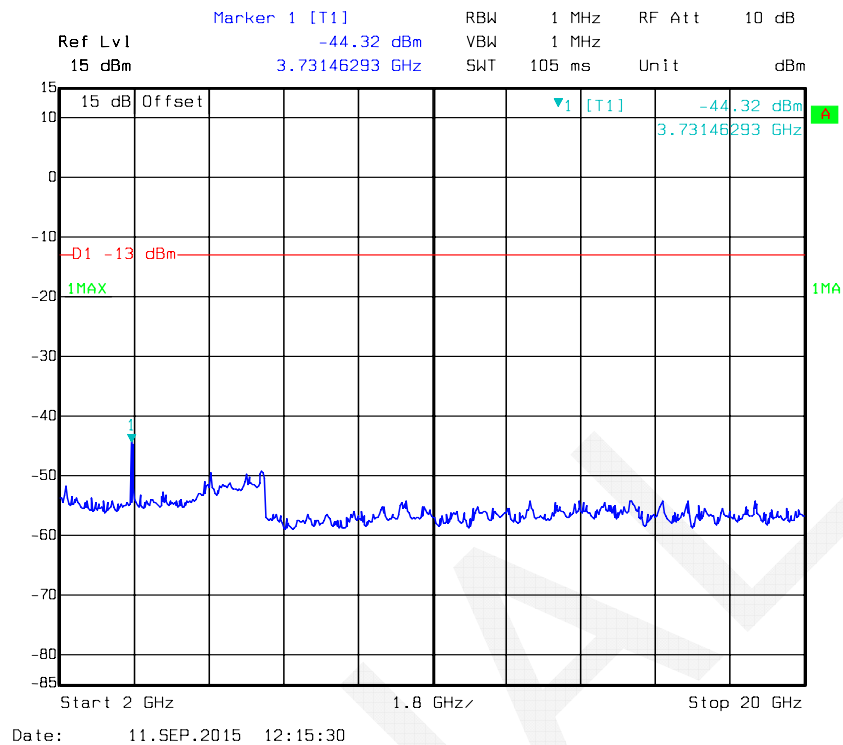
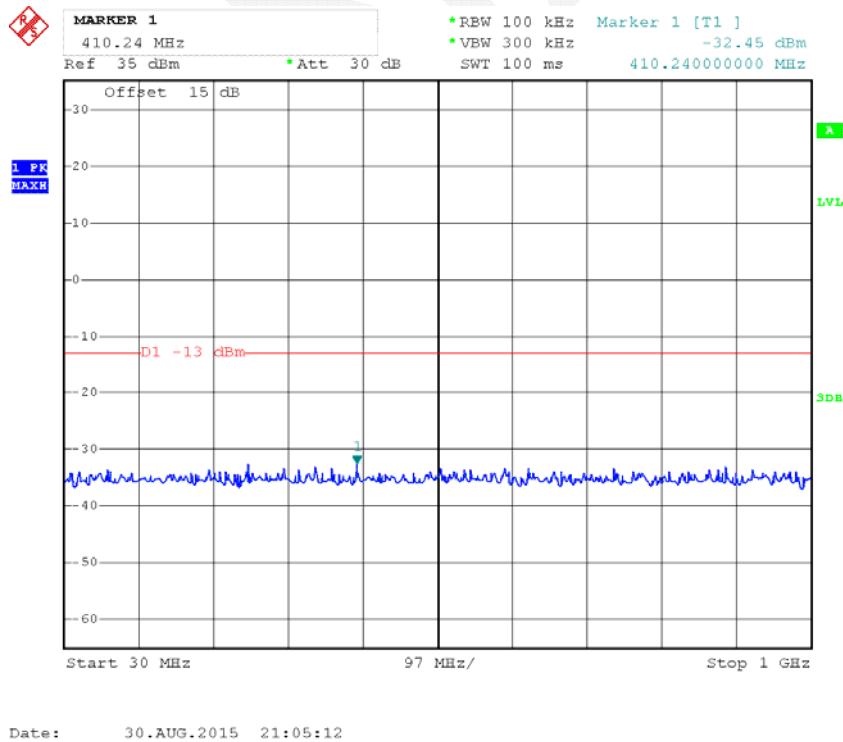
1.4 MHz_QPSK Band II

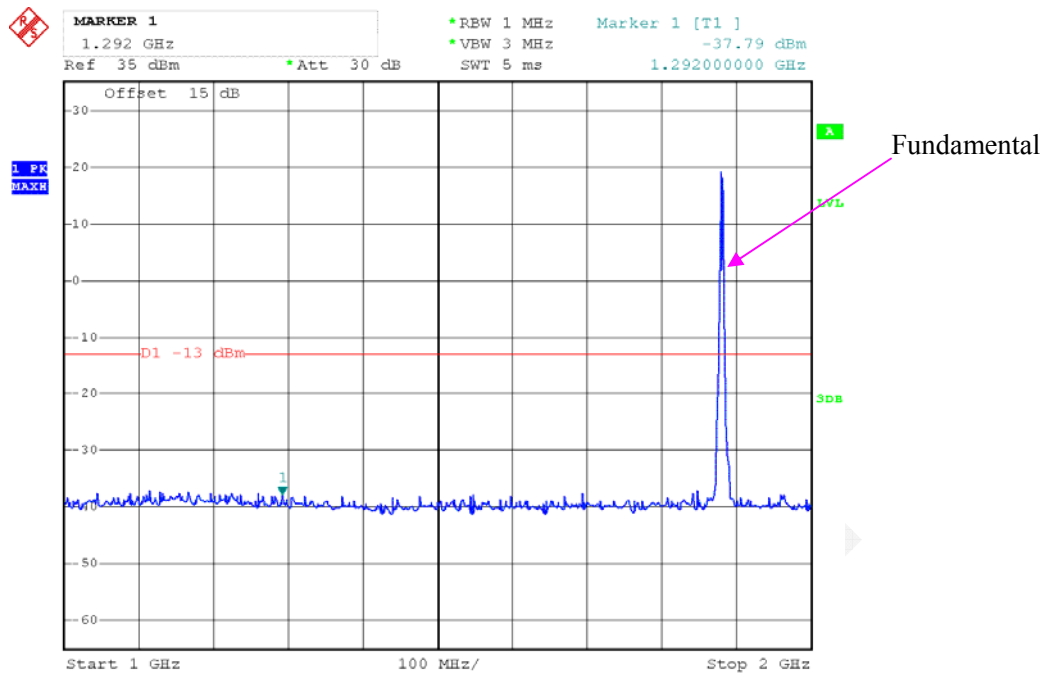


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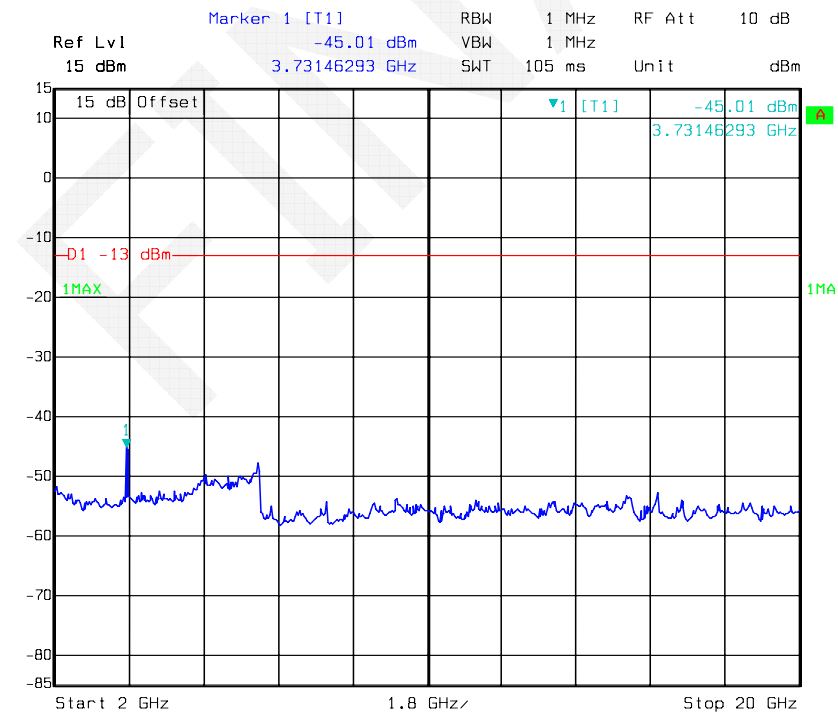


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**3 MHz_QPSK Band II**

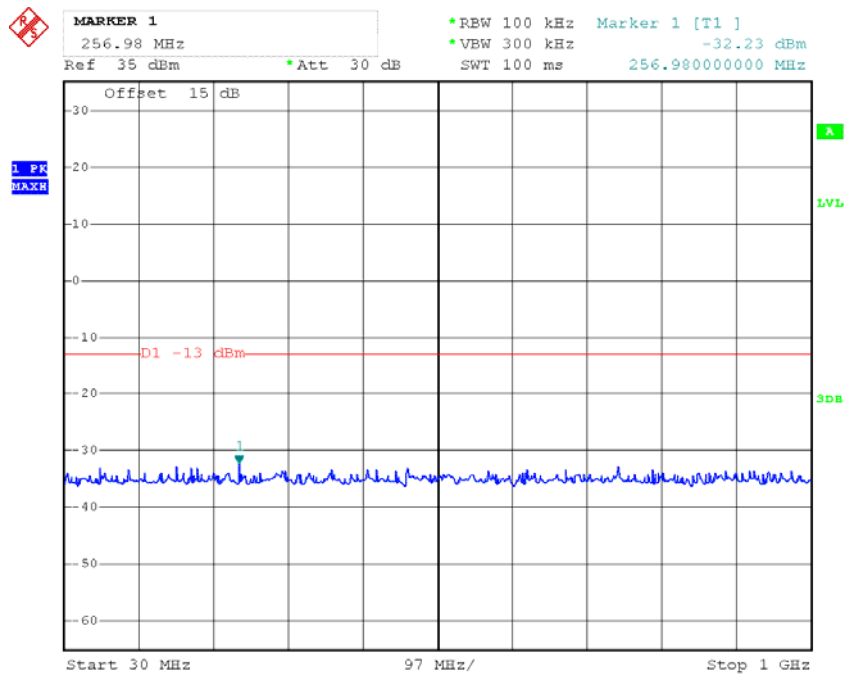


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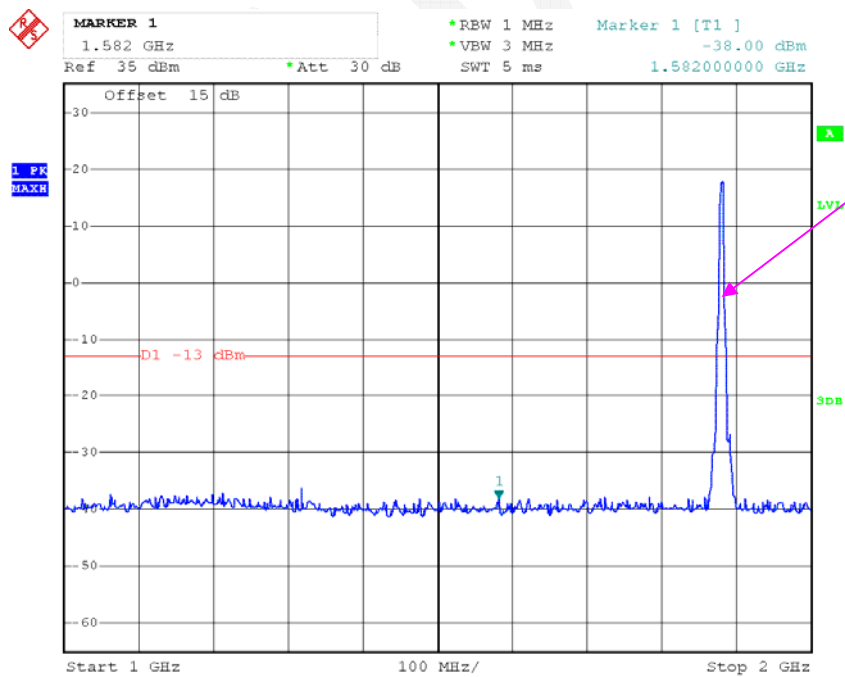


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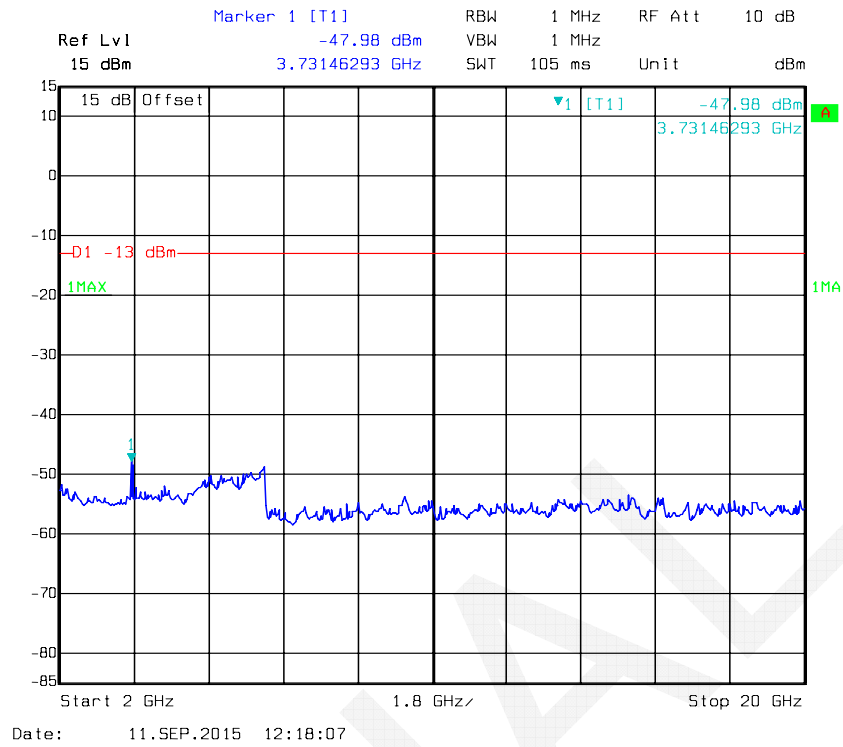
5 MHz_QPSK Band II



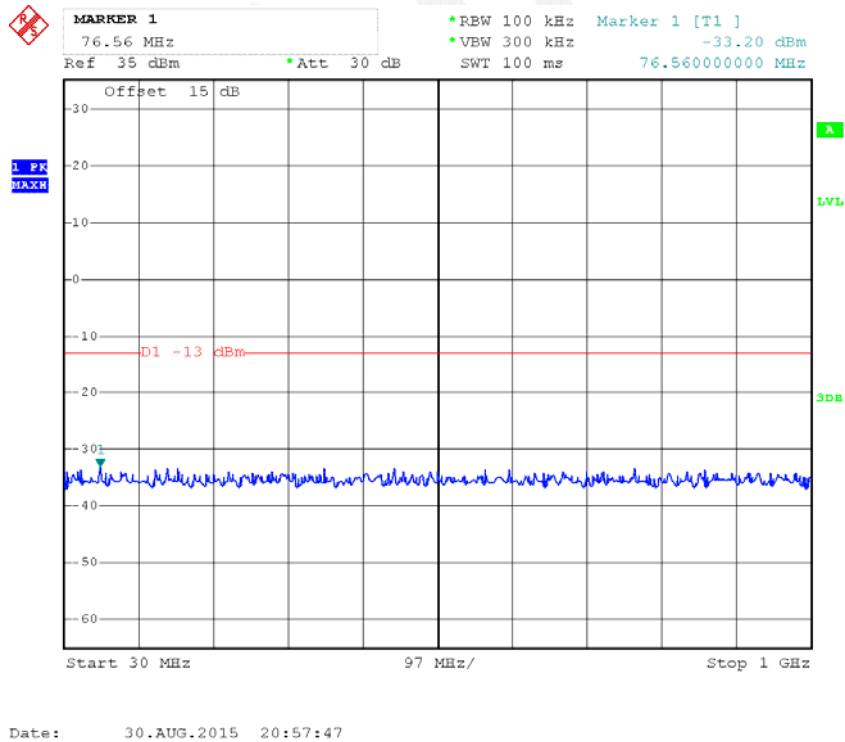
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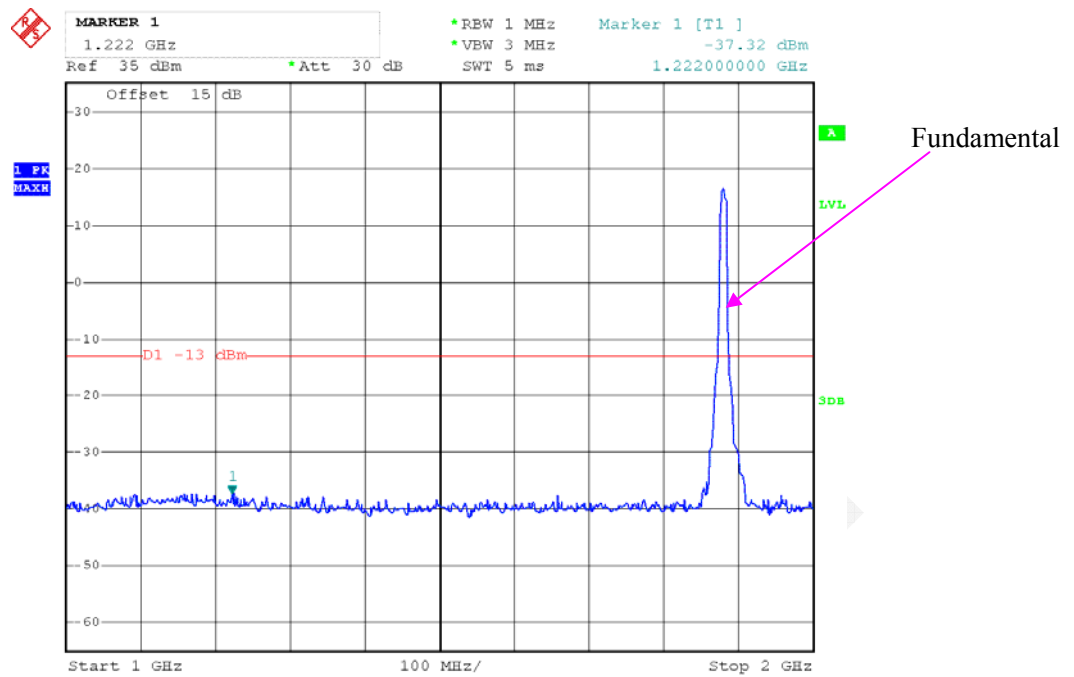


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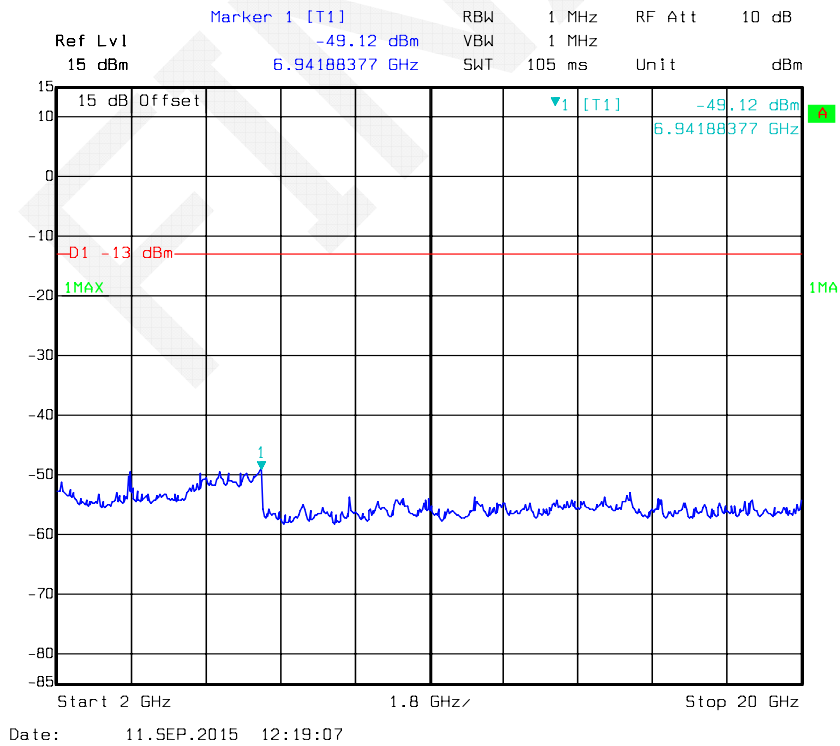


10 MHz_QPSK Band II



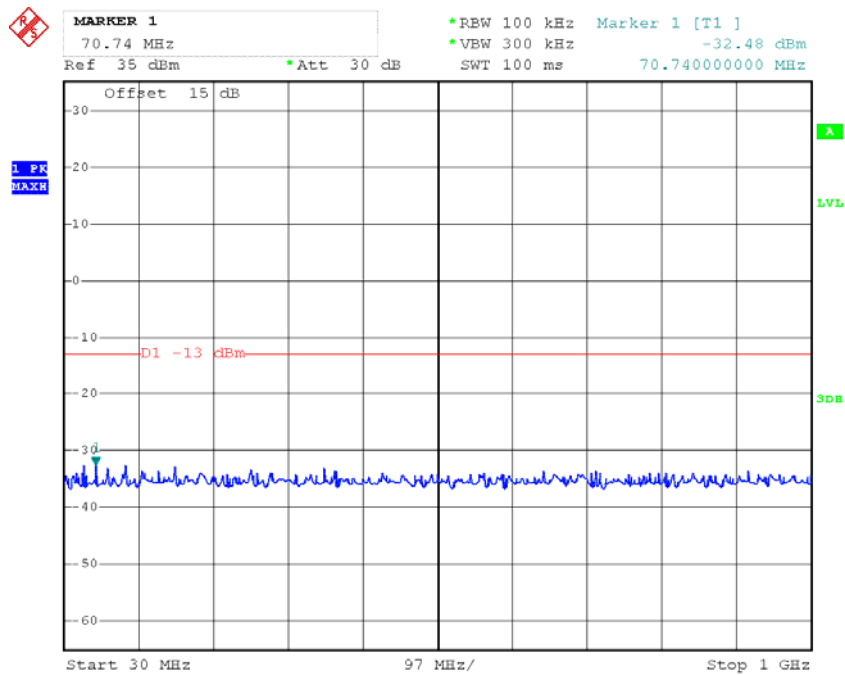


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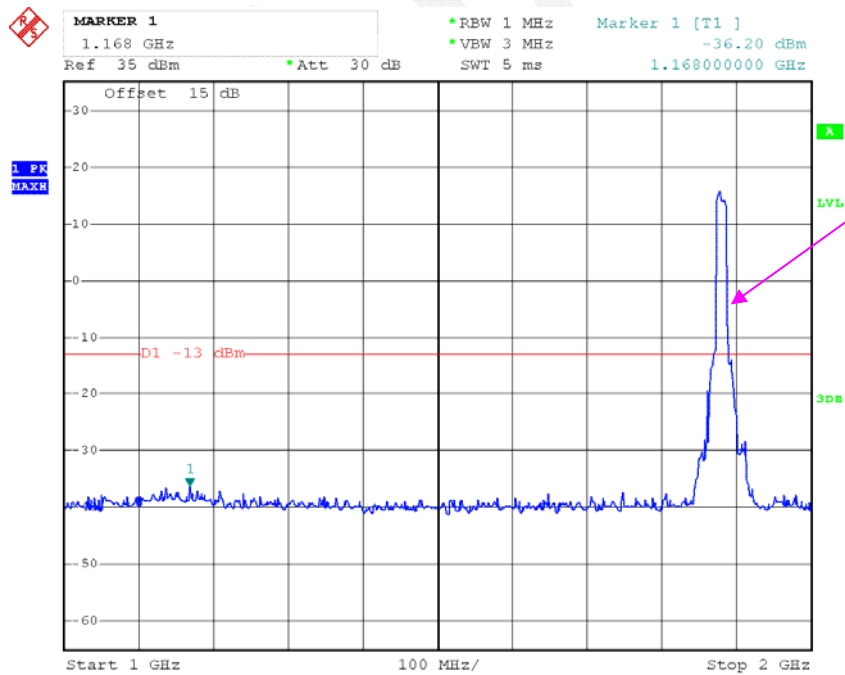


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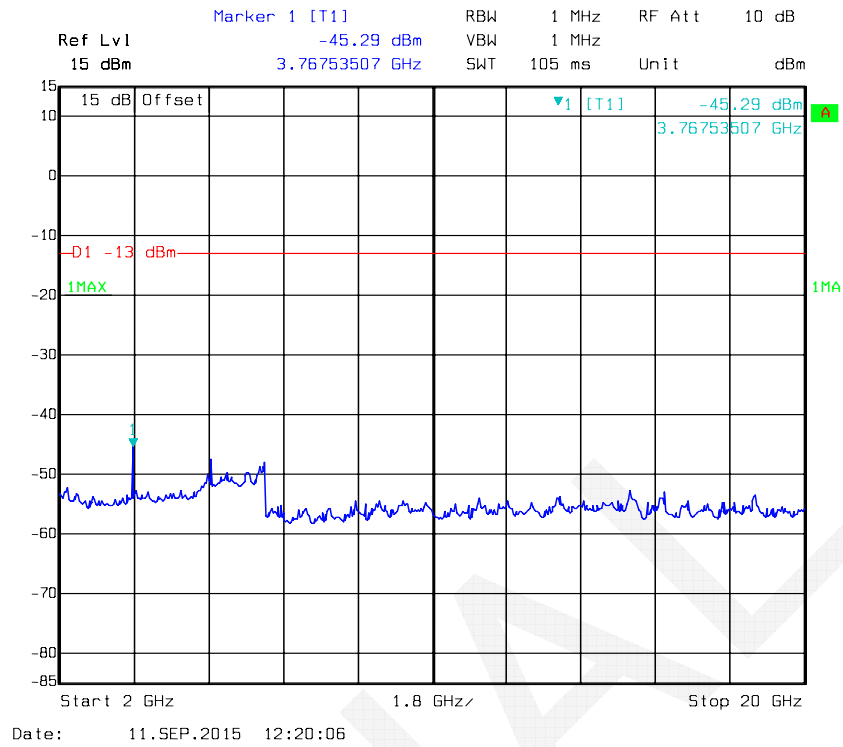
15 MHz_QPSK Band II



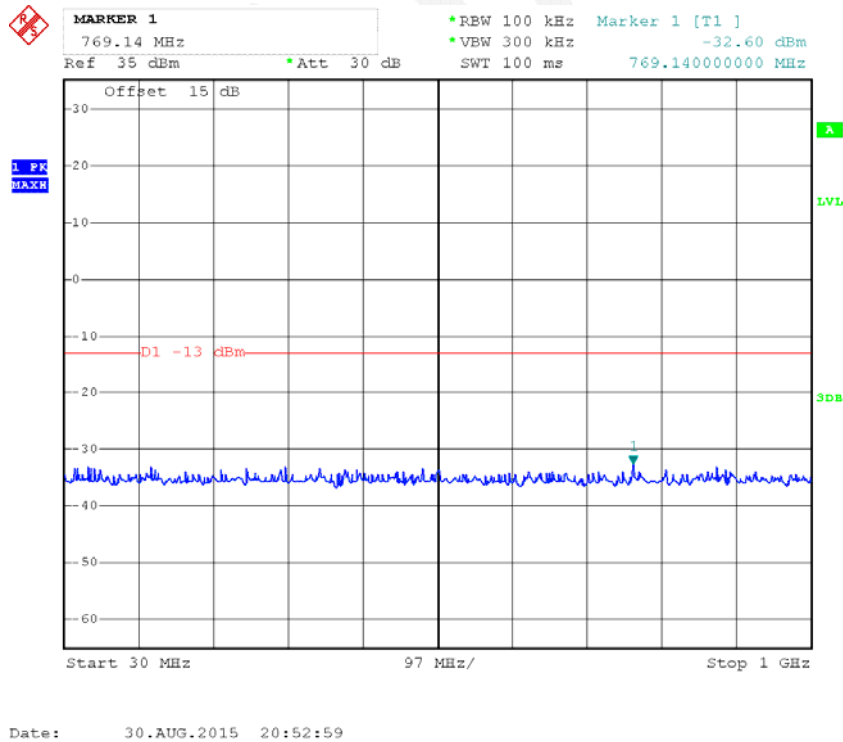
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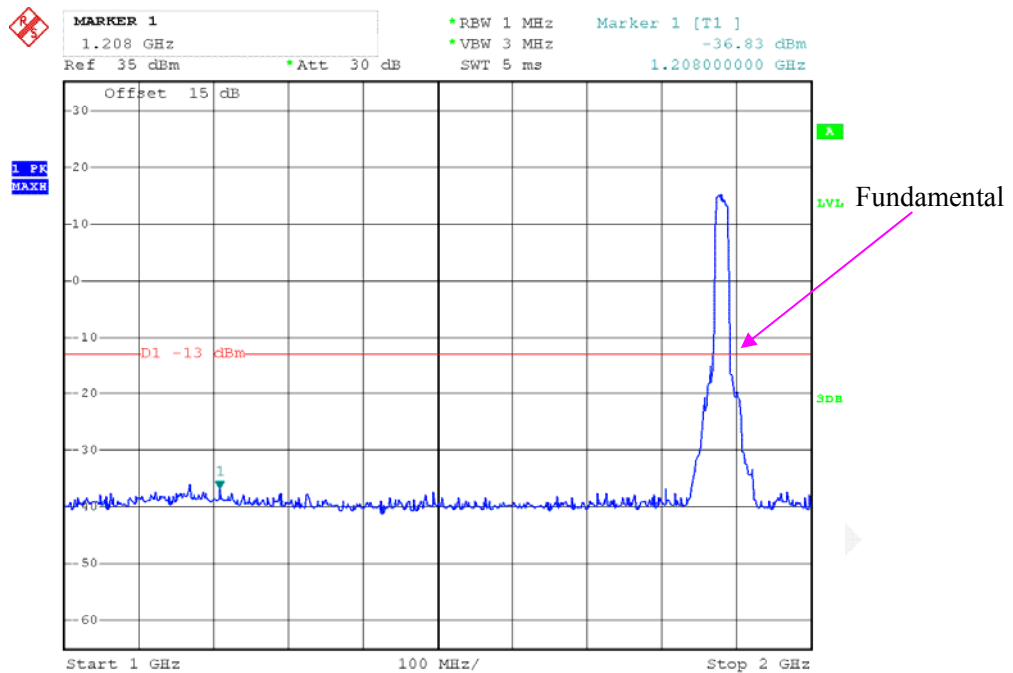


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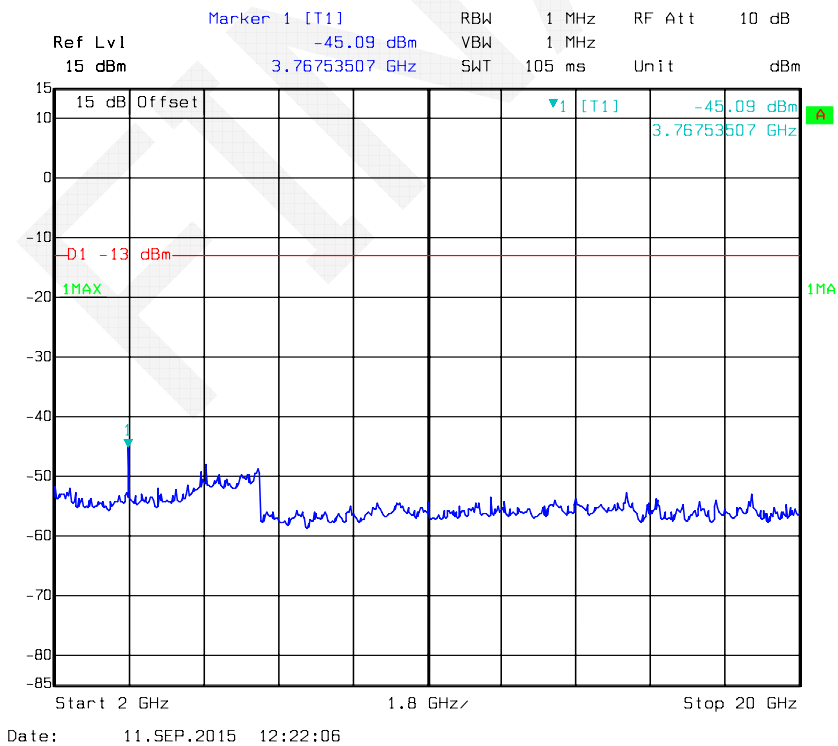


20 MHz_QPSK Band II



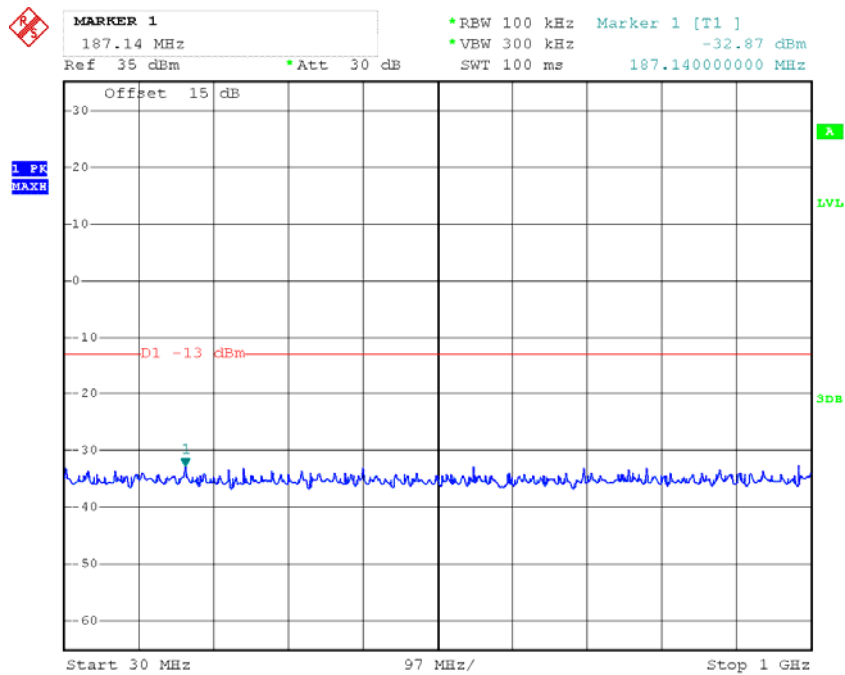


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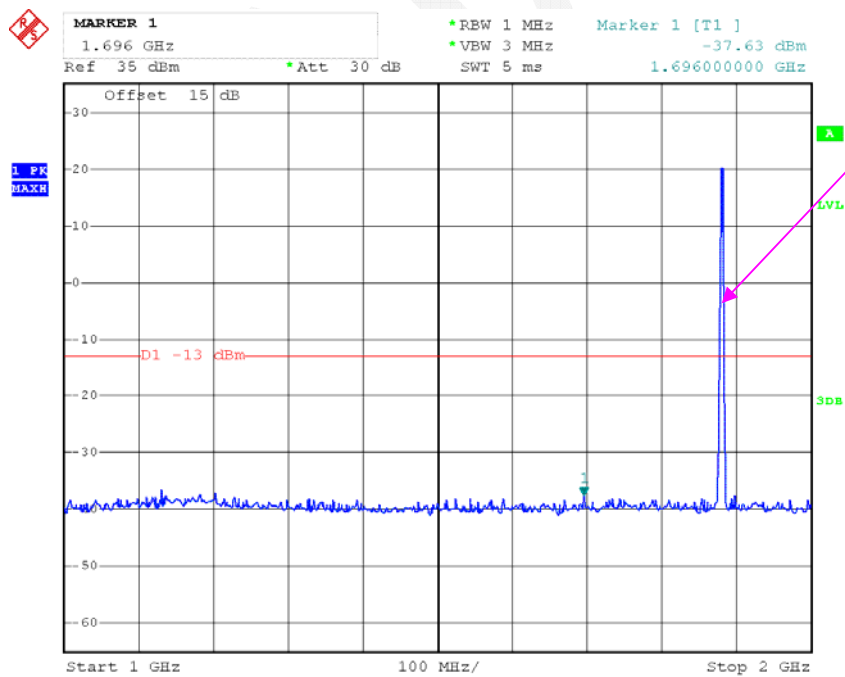


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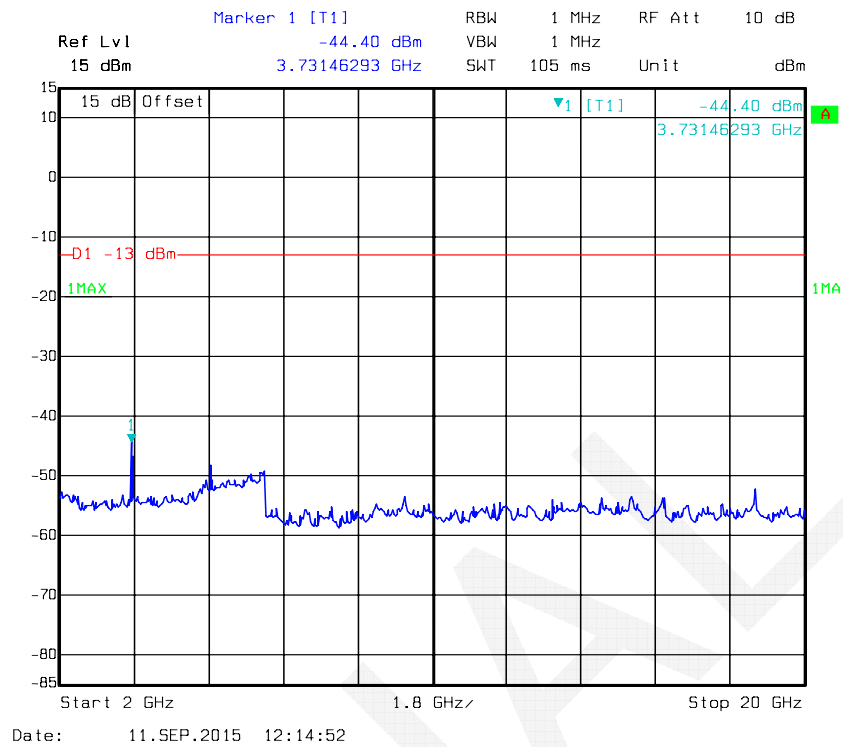
1.4 MHz_16QAM Band II



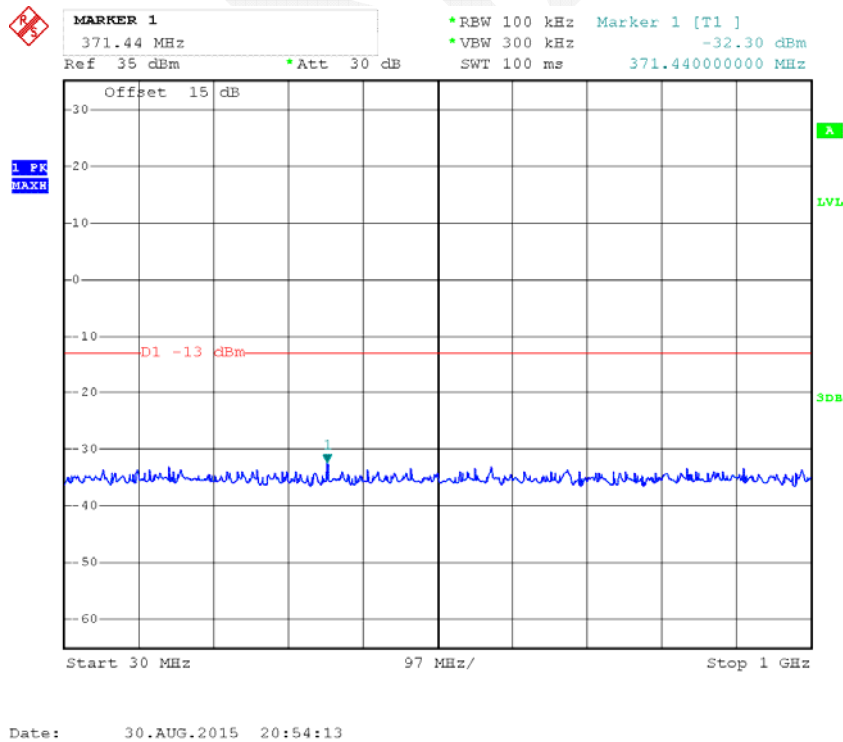
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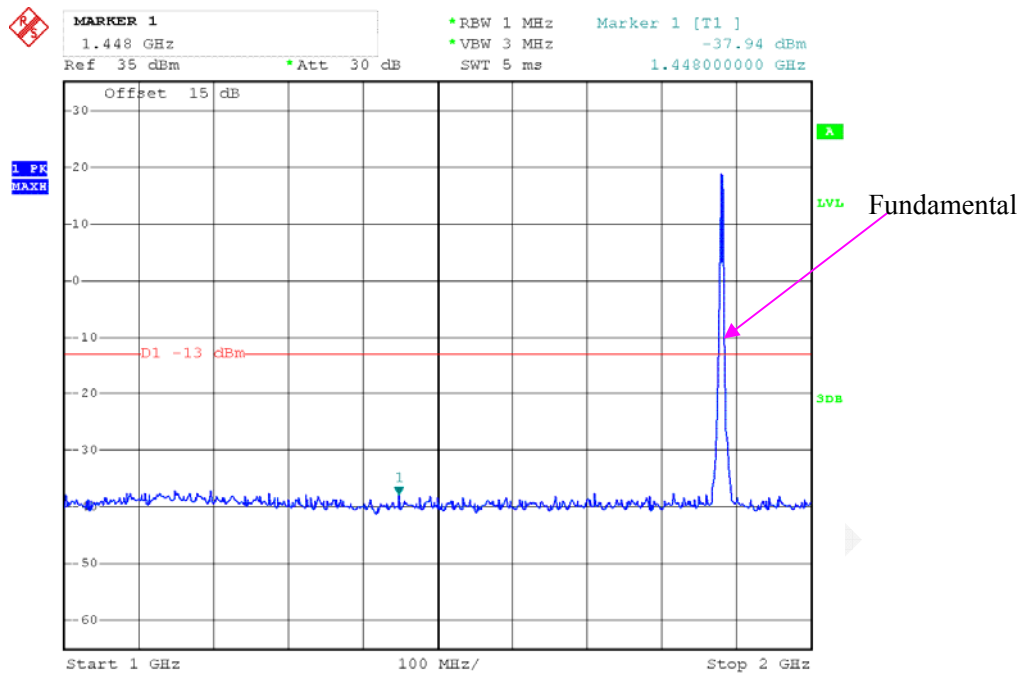


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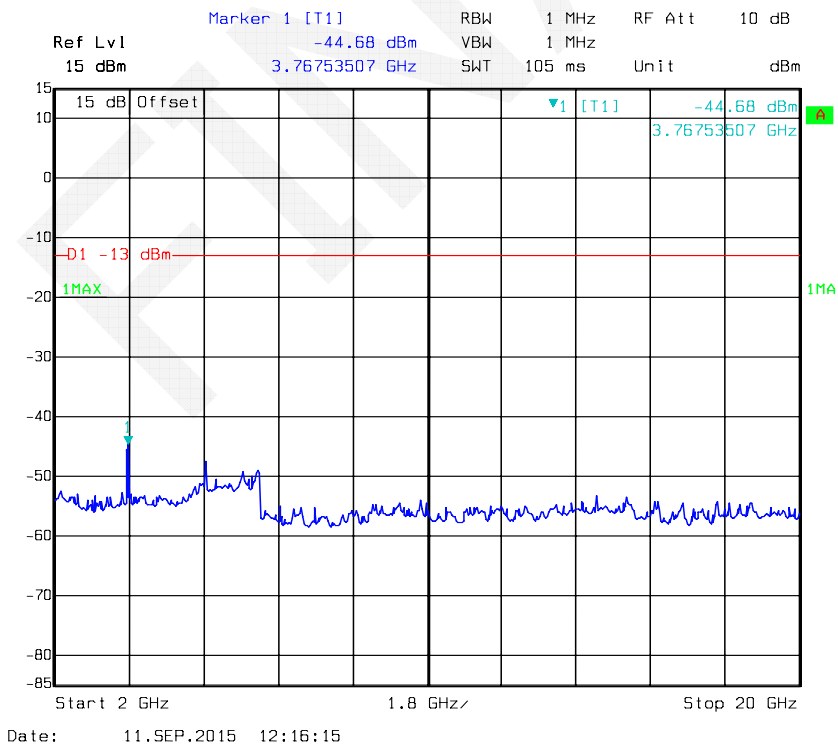


3 MHz_16QAM Band II



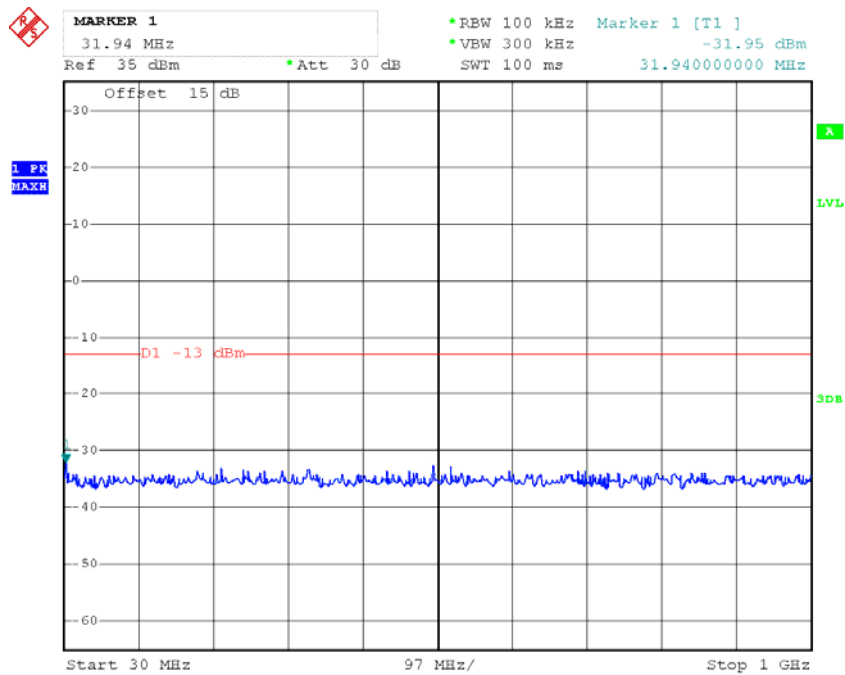


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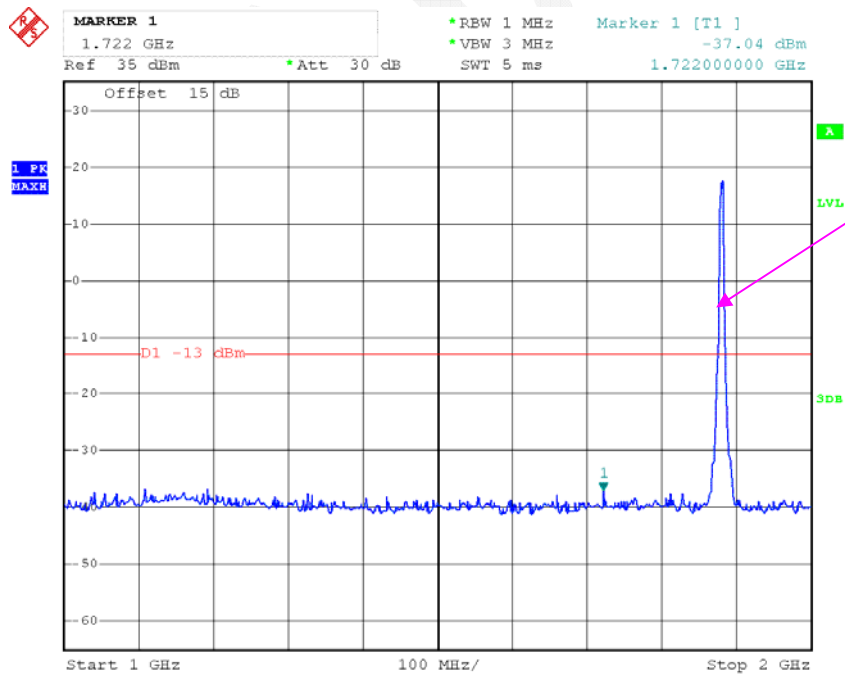


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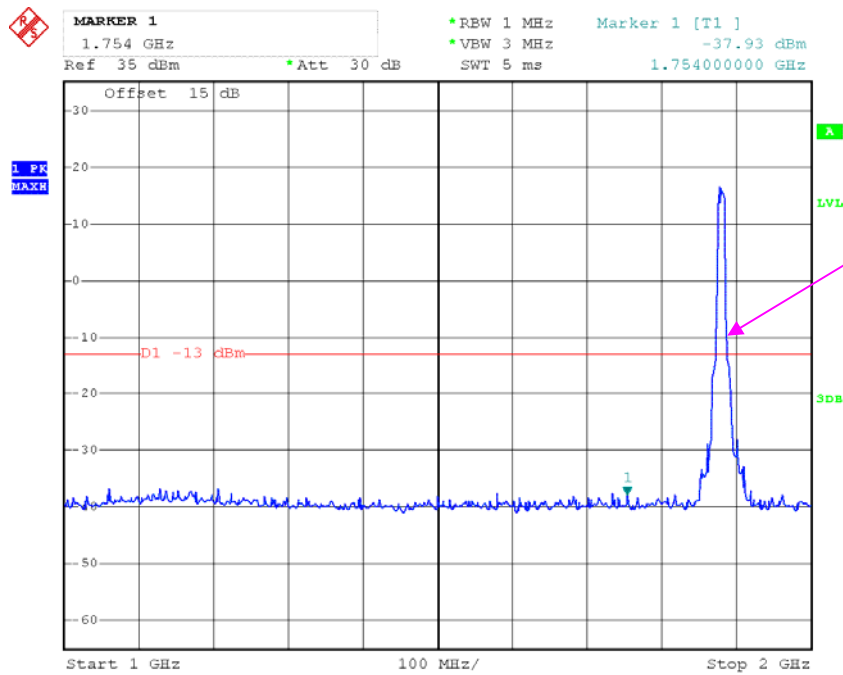
5 MHz_16QAM Band II



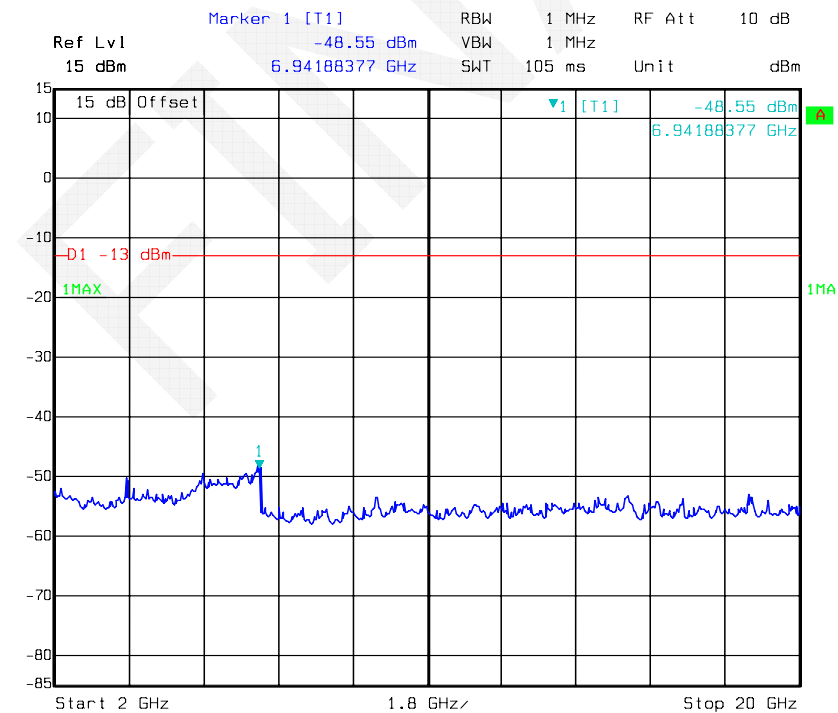
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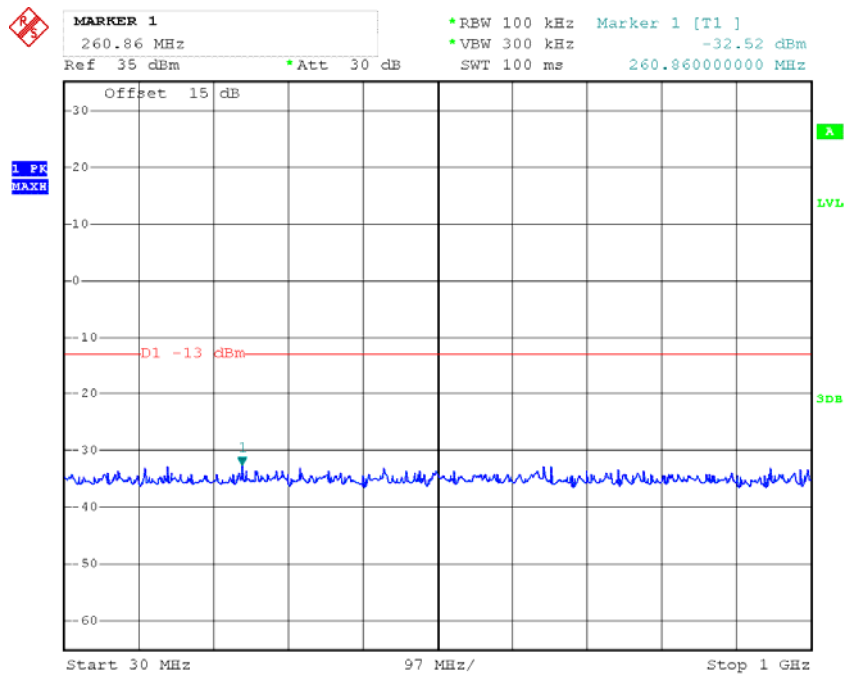


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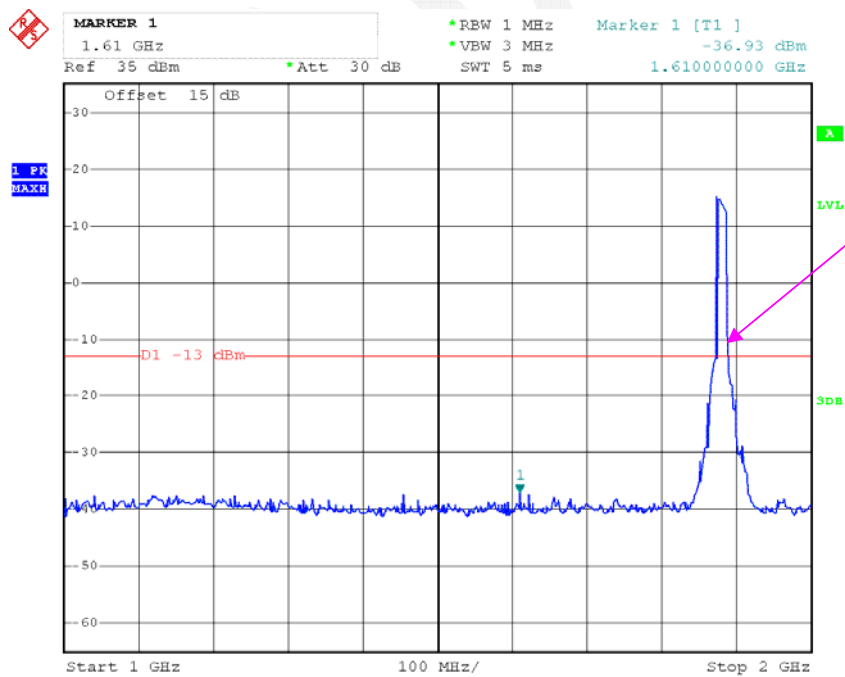


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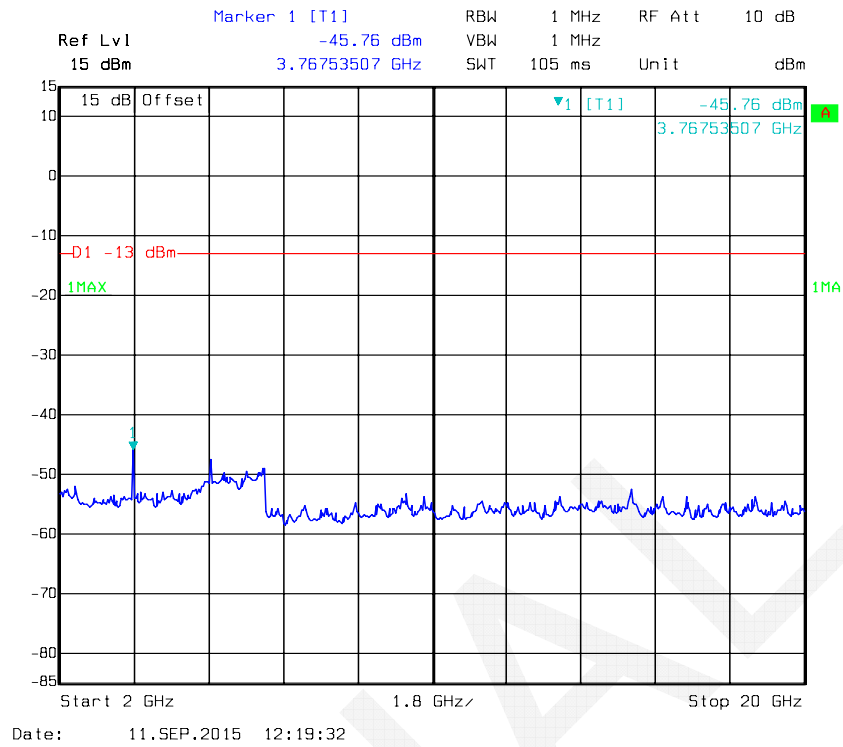
15 MHz _16QAM Band II



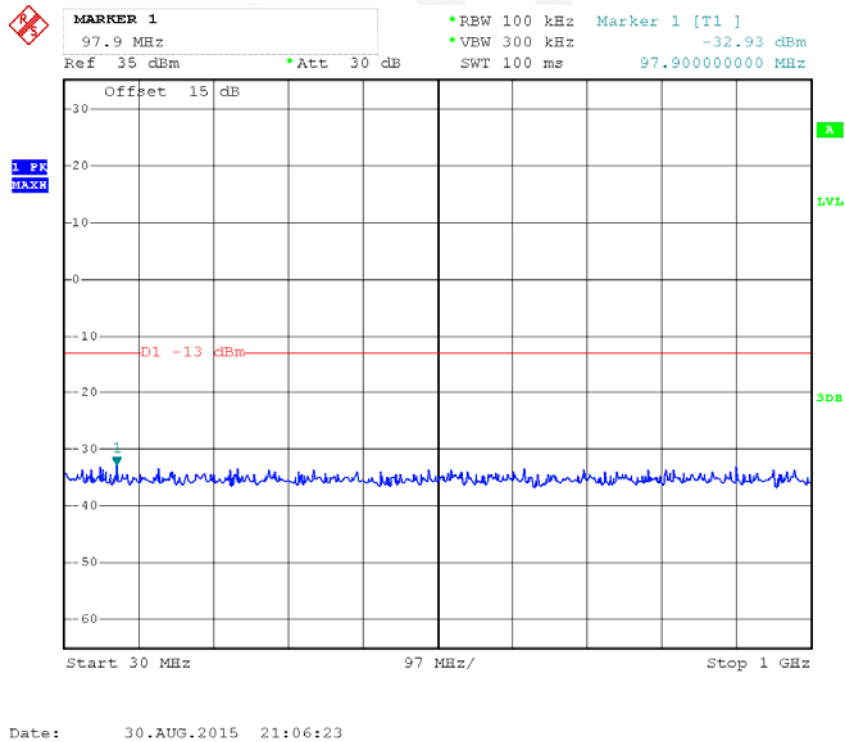
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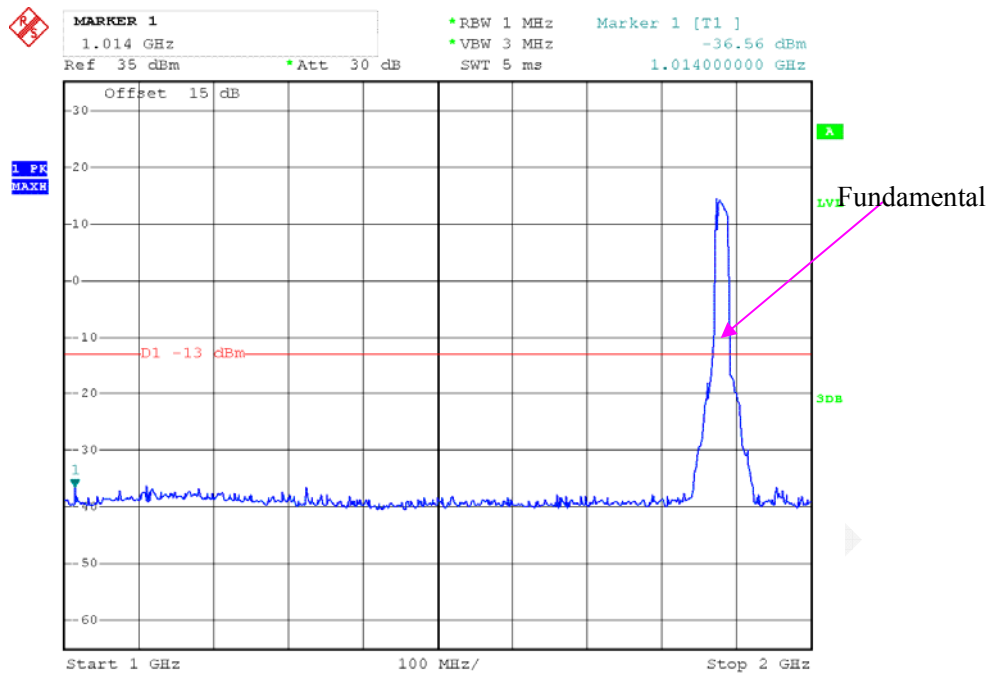


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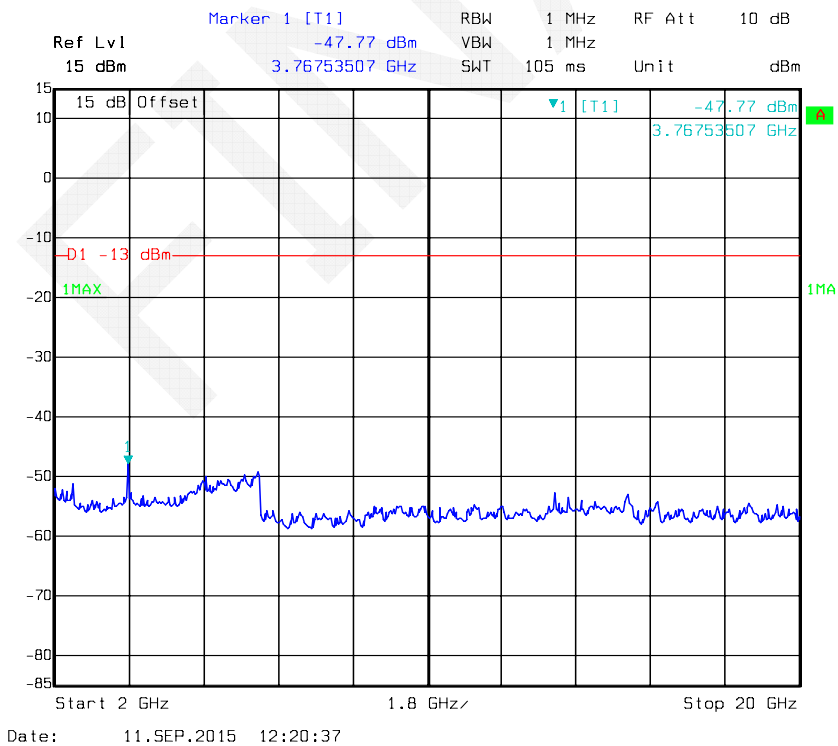


20 MHz_16QAM Band II



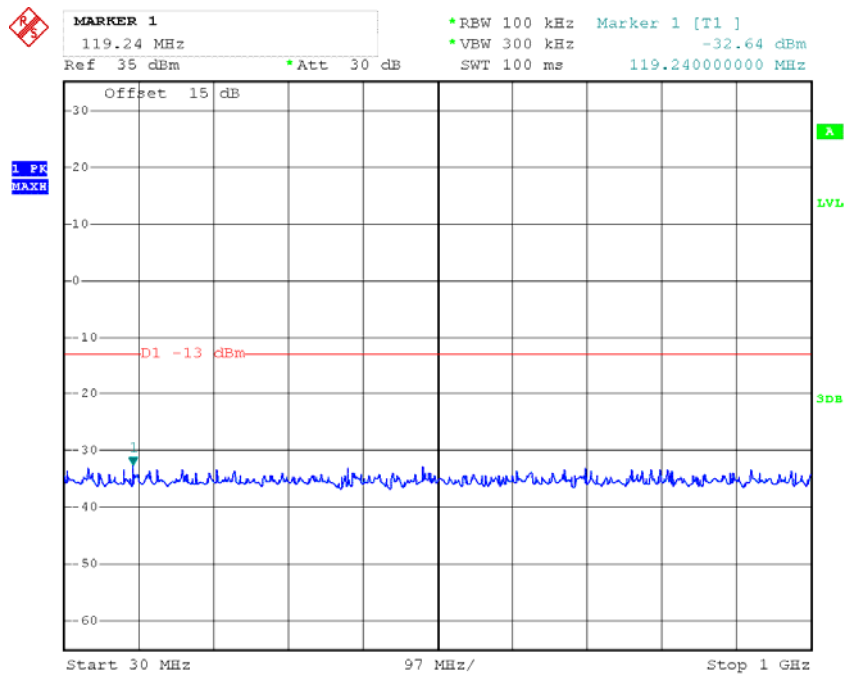


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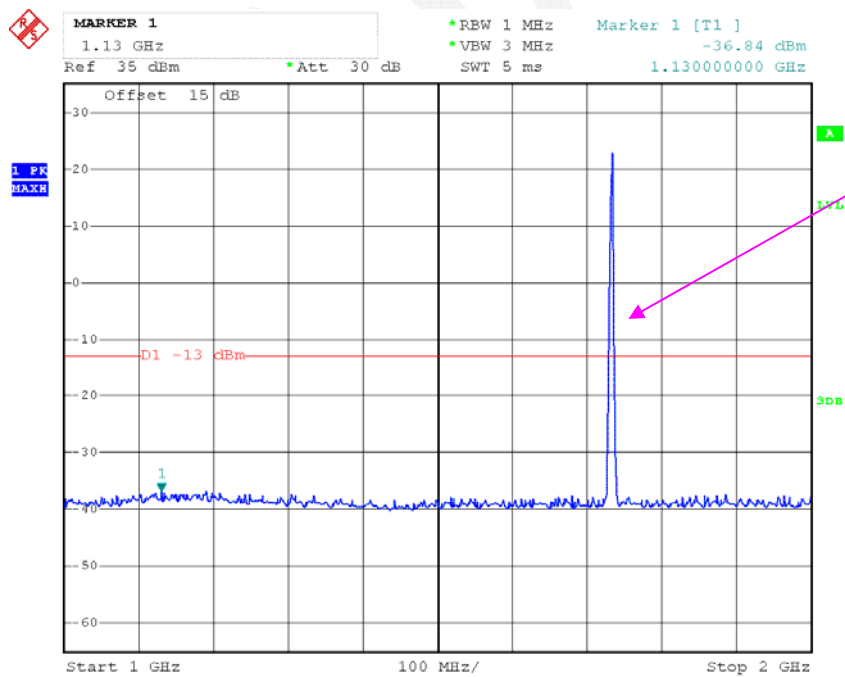


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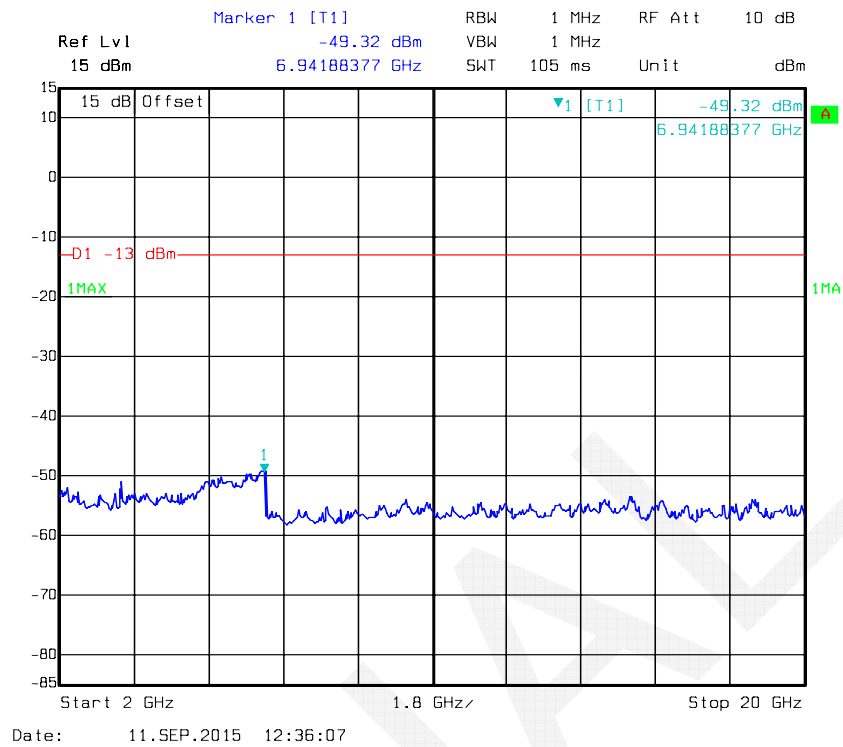
1.4 MHz_QPSK Band IV



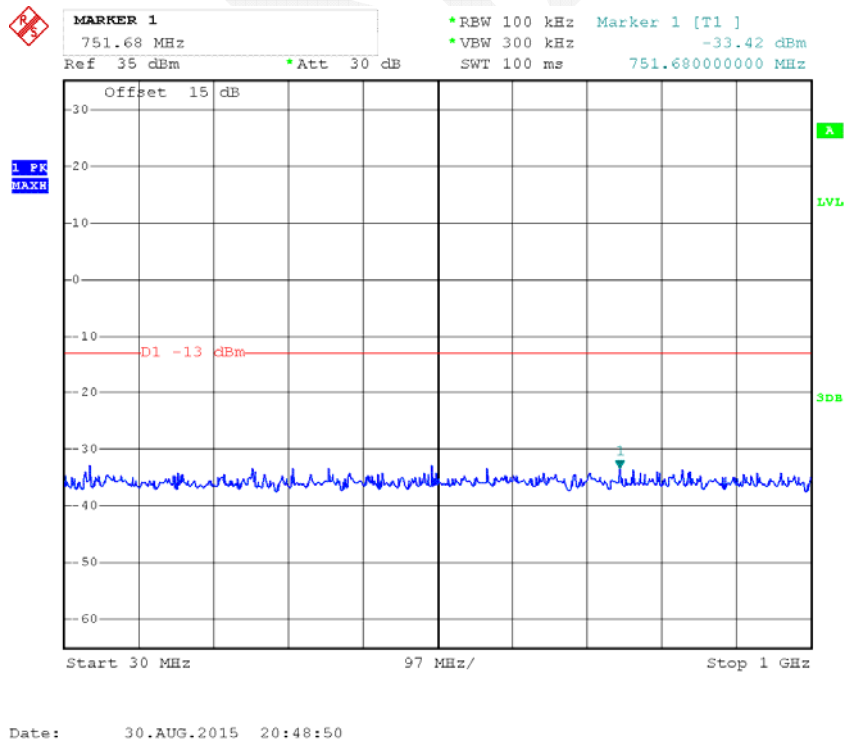
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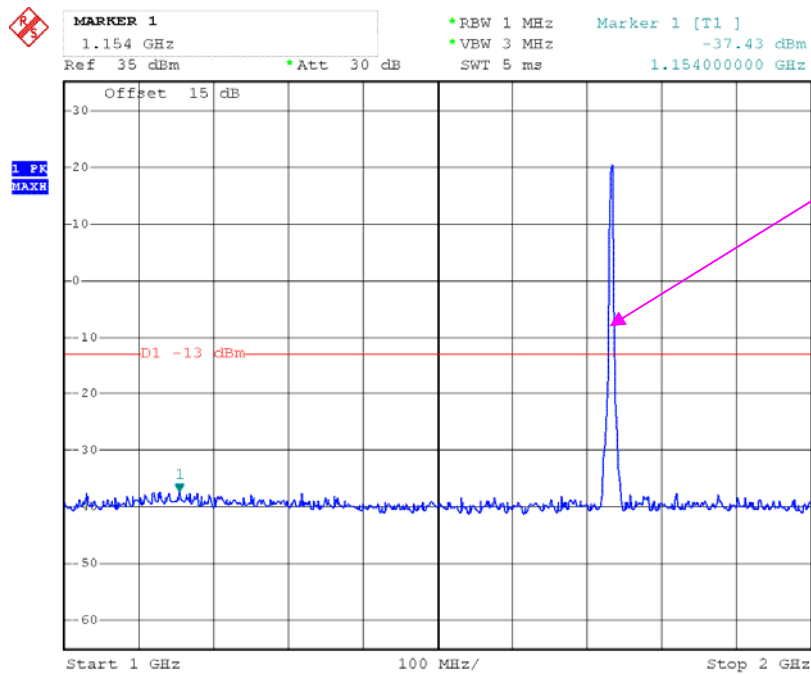


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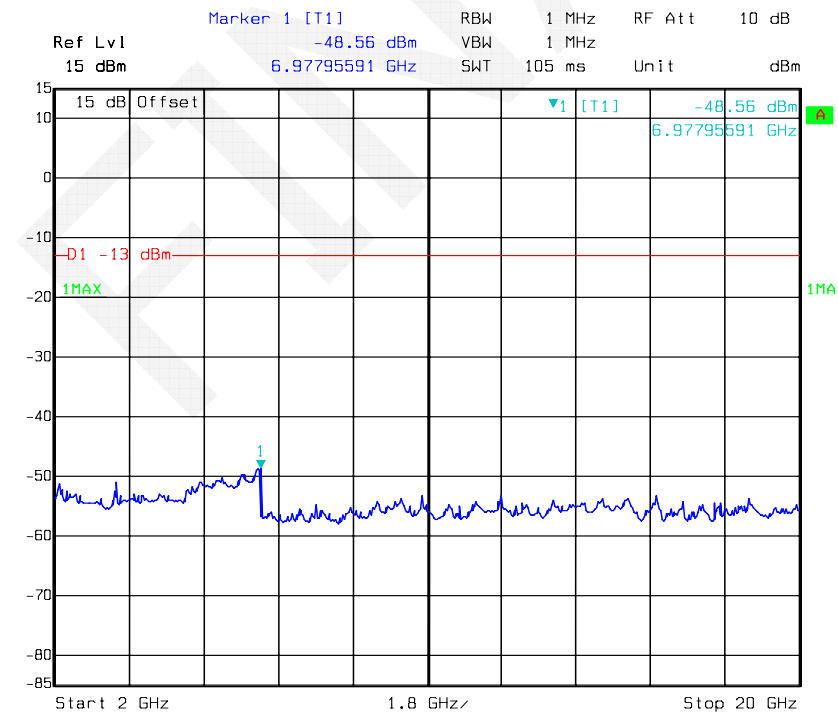


3 MHz_QPSK Band IV



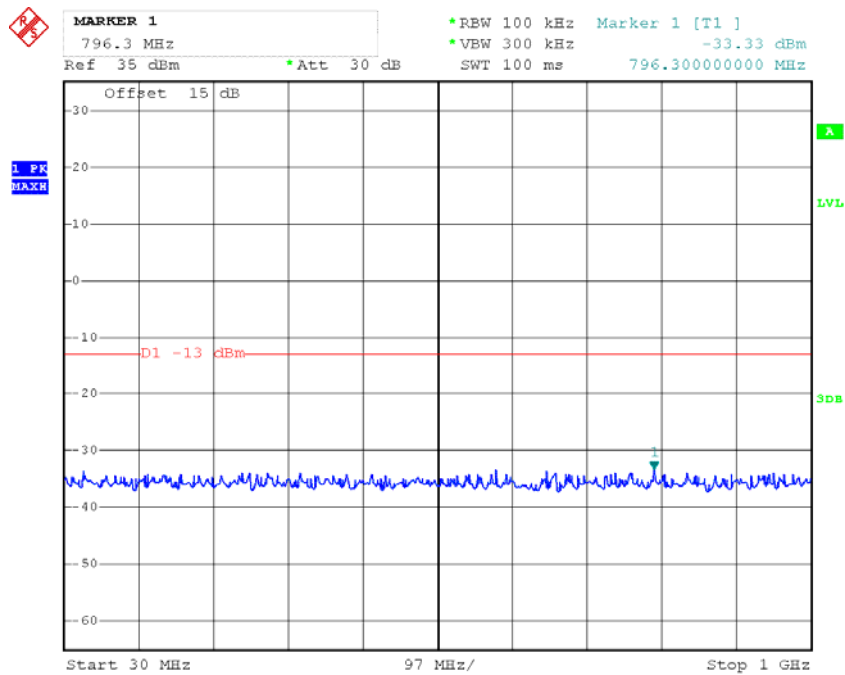


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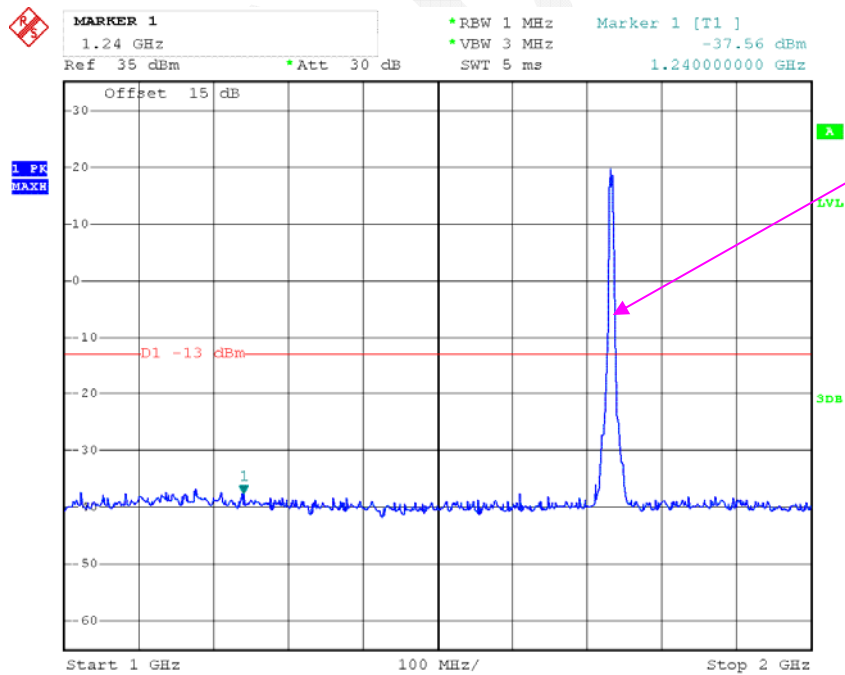


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5 MHz_QPSK Band IV

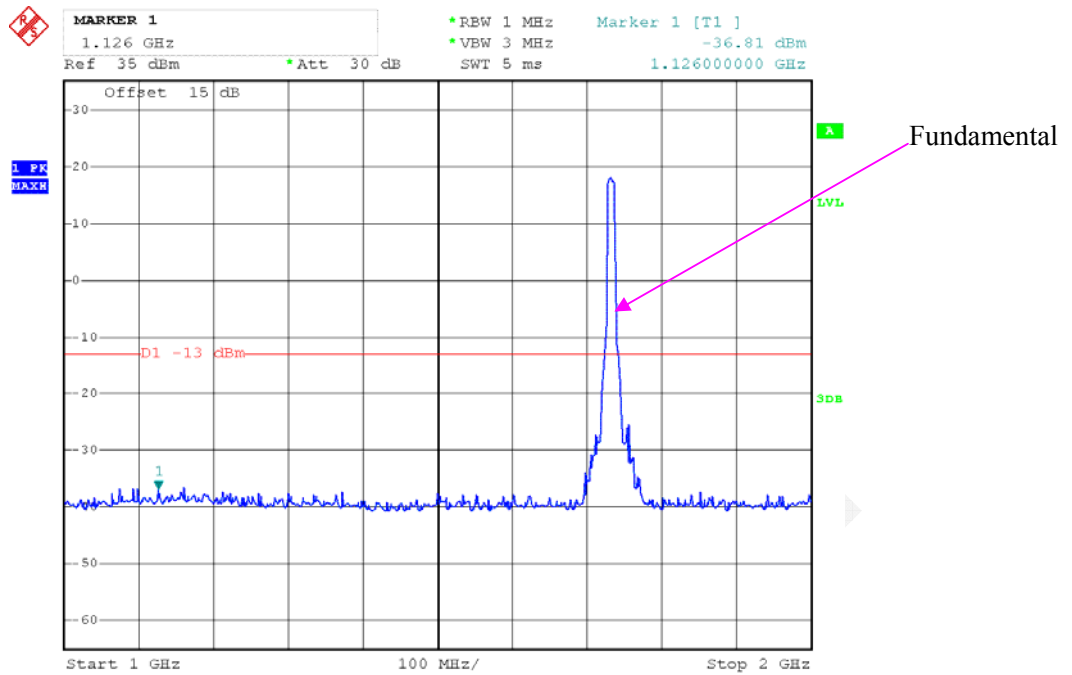


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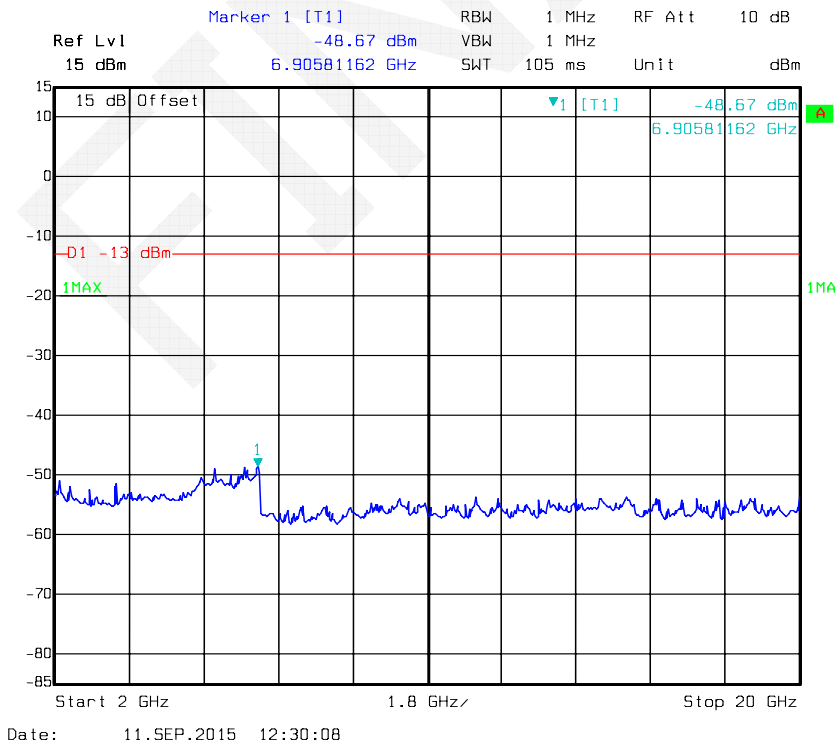


Fundamental

Date: 30.AUG.2015 21:23:20

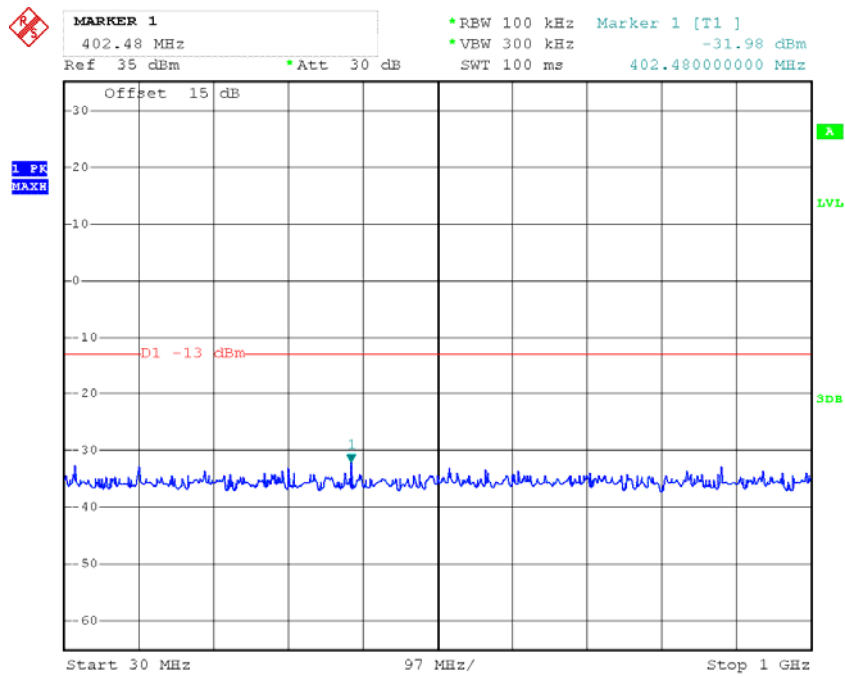


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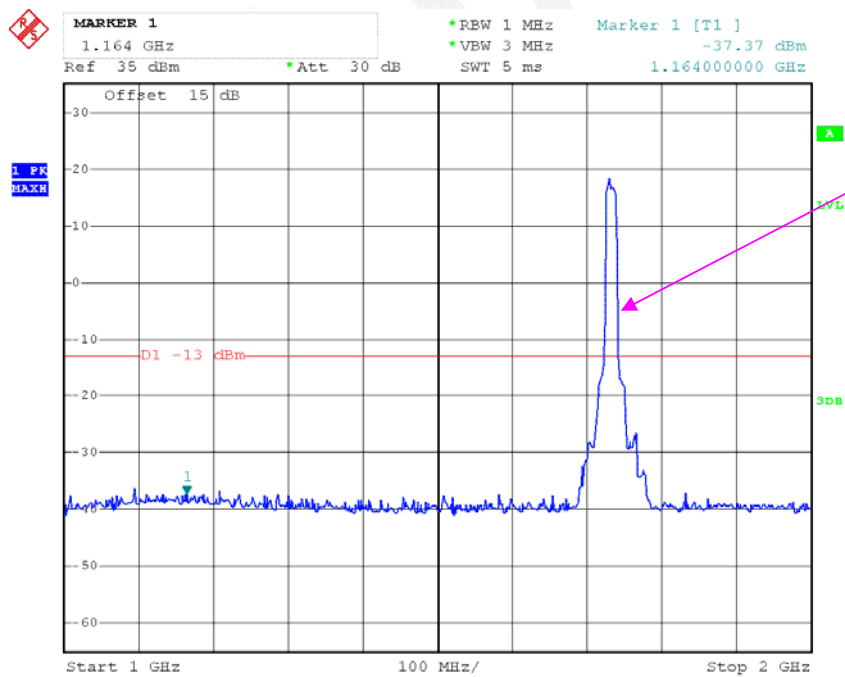


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15 MHz _QPSK Band IV

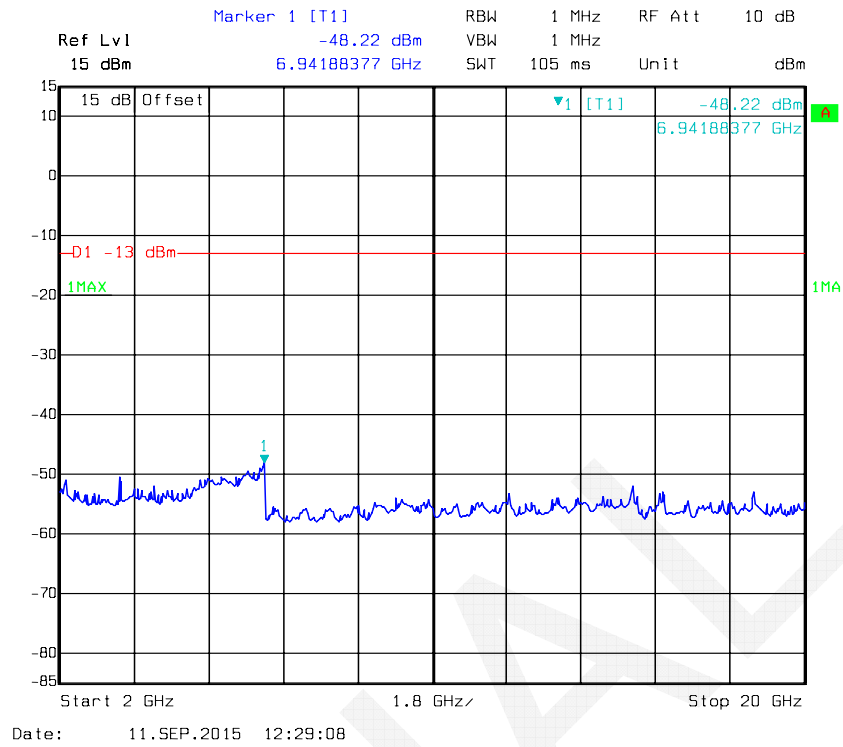


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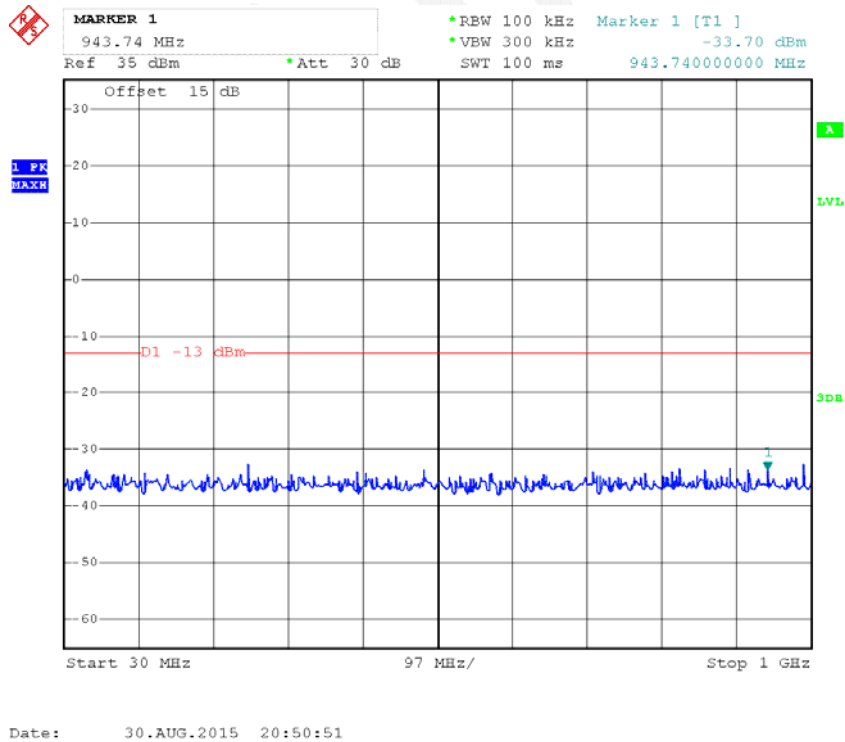


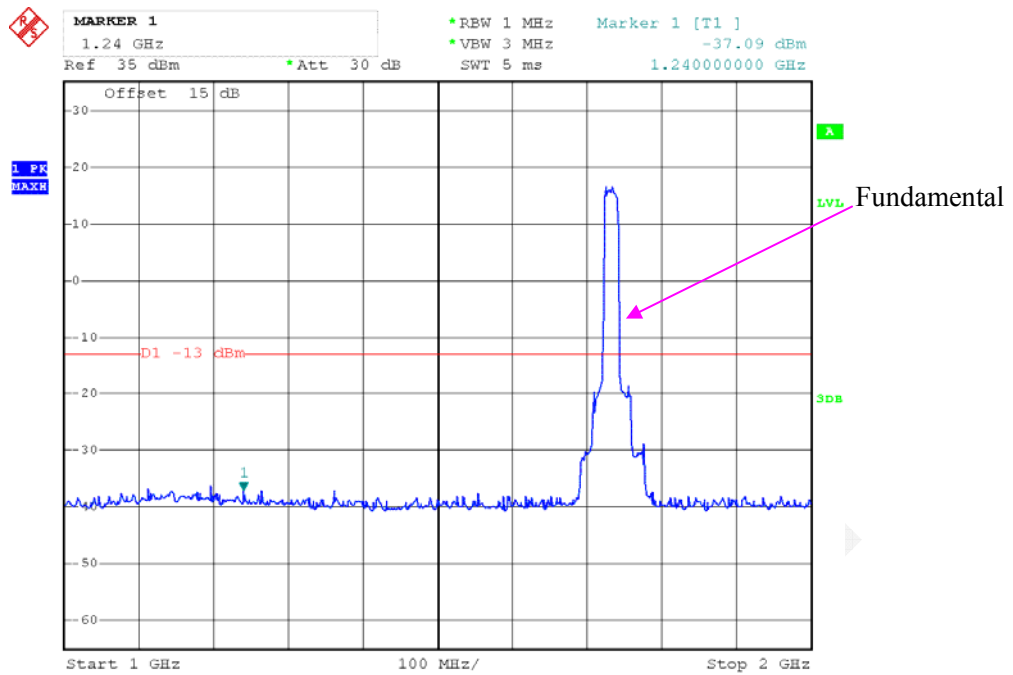
Fundamental

Date: 30.AUG.2015 21:24:36

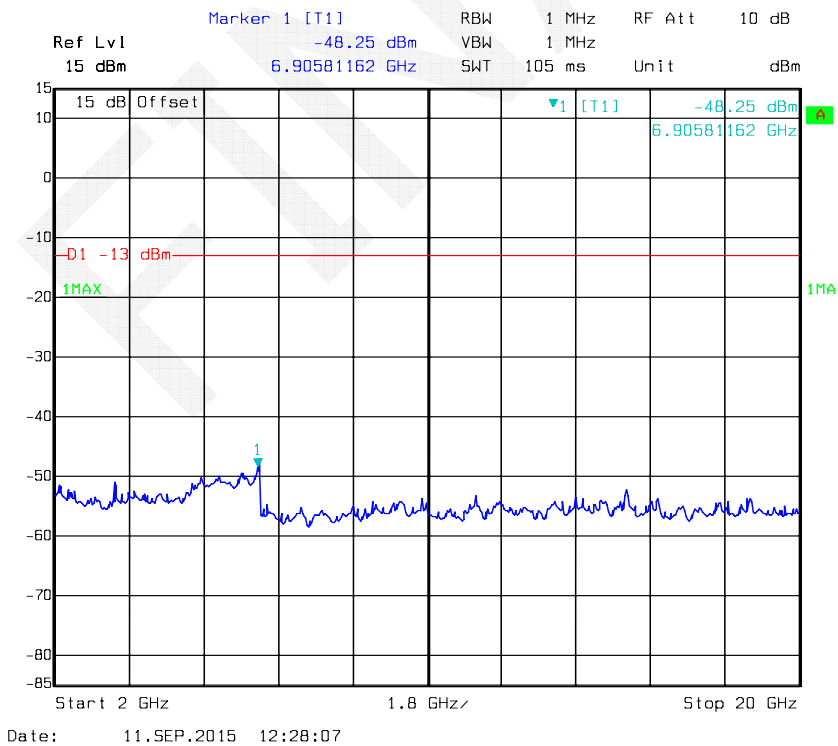


20 MHz_QPSK Band IV



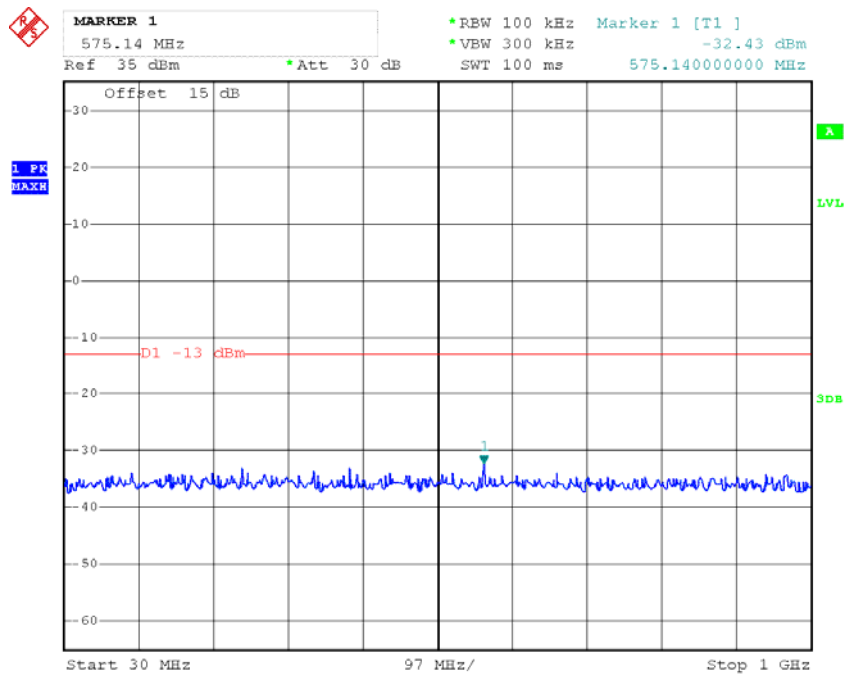


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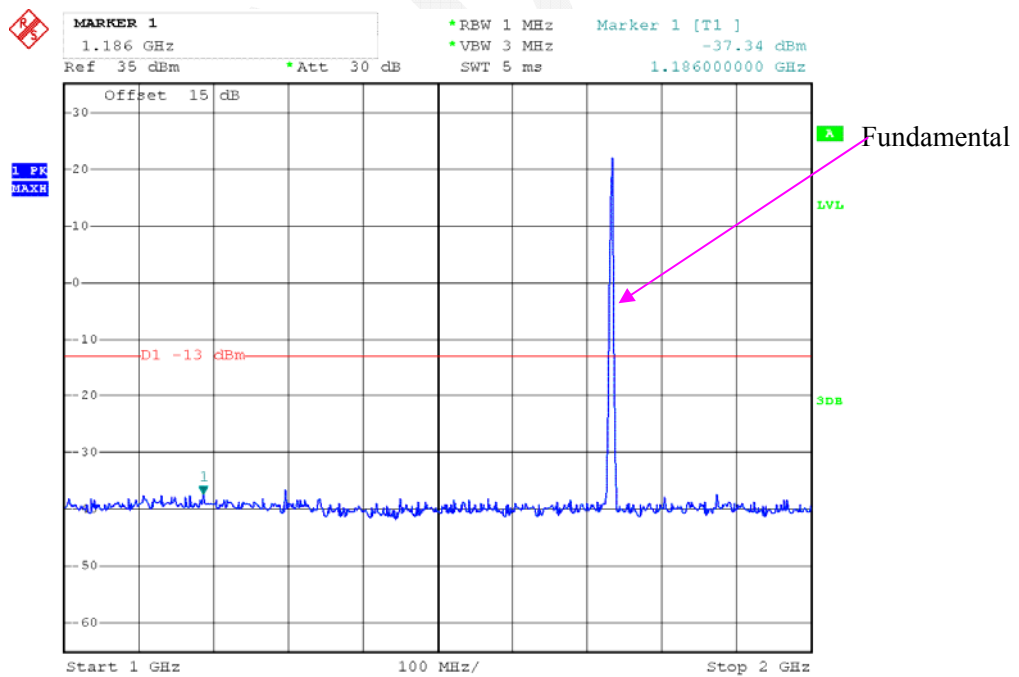


Date: 11.SEP.2015 12:28:07

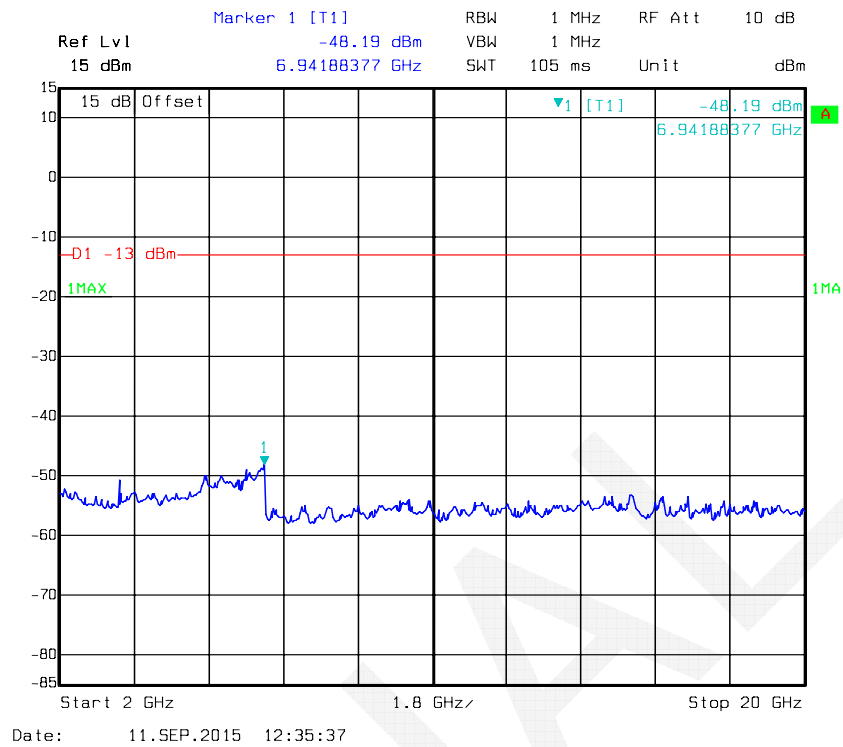
1.4 MHz_16QAM Band IV



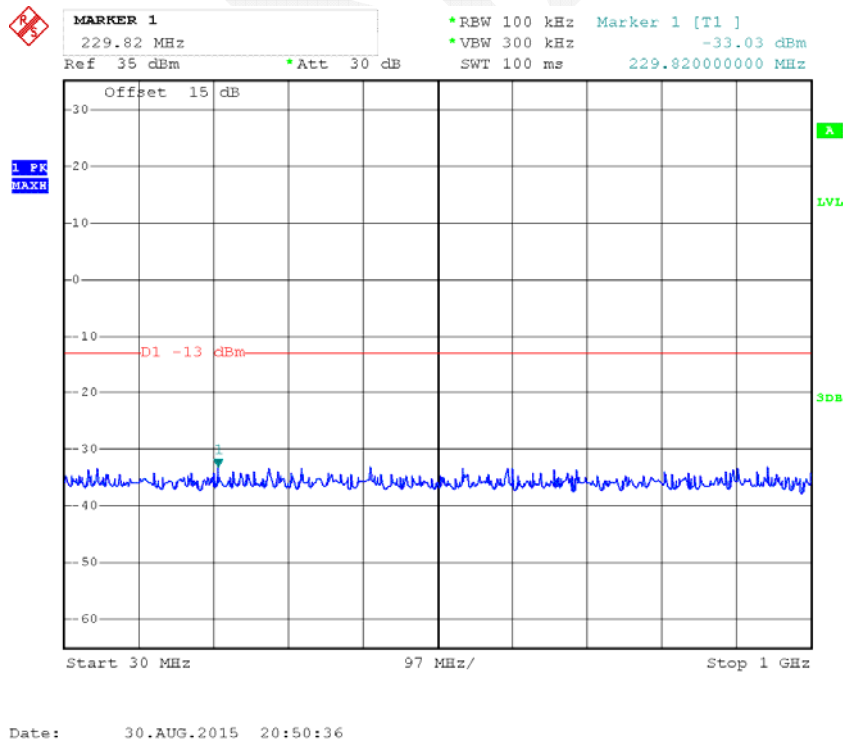
Date: 30.AUG.2015 20:51:06

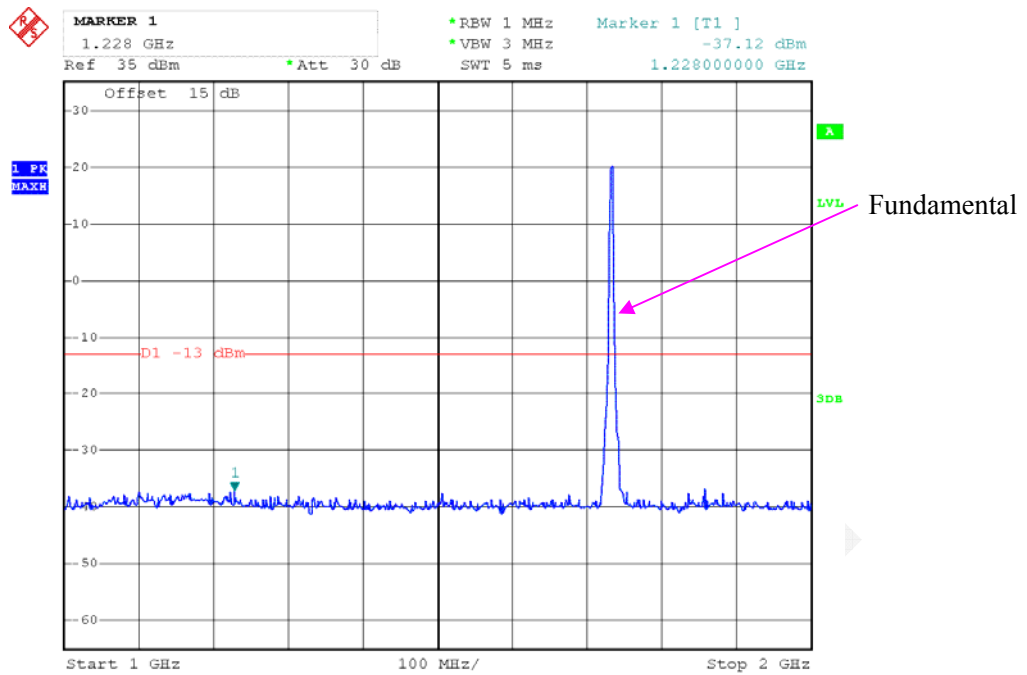


Date: 30.AUG.2015 21:22:28

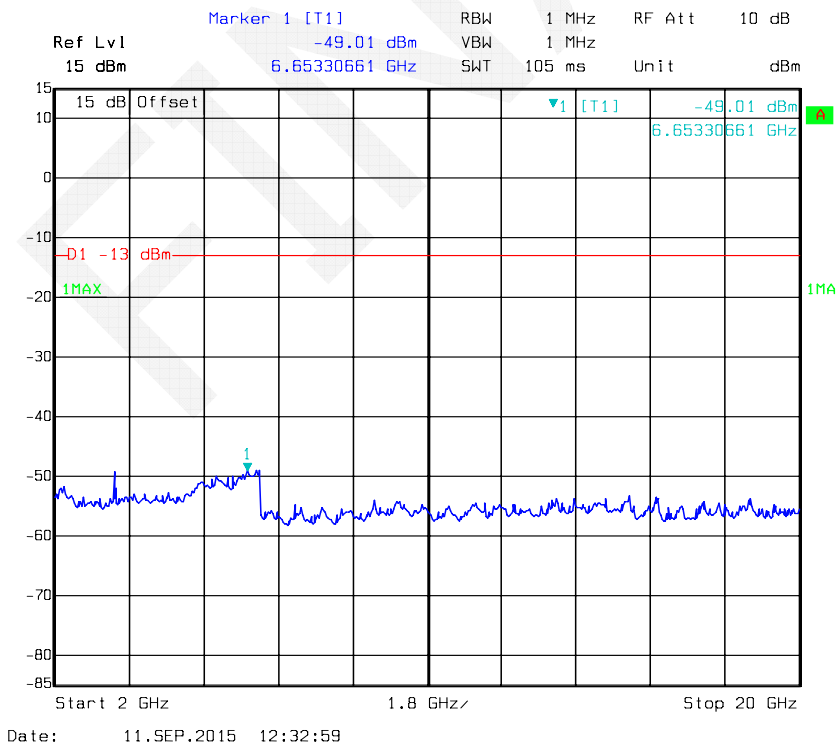


3 MHz_16QAM Band IV



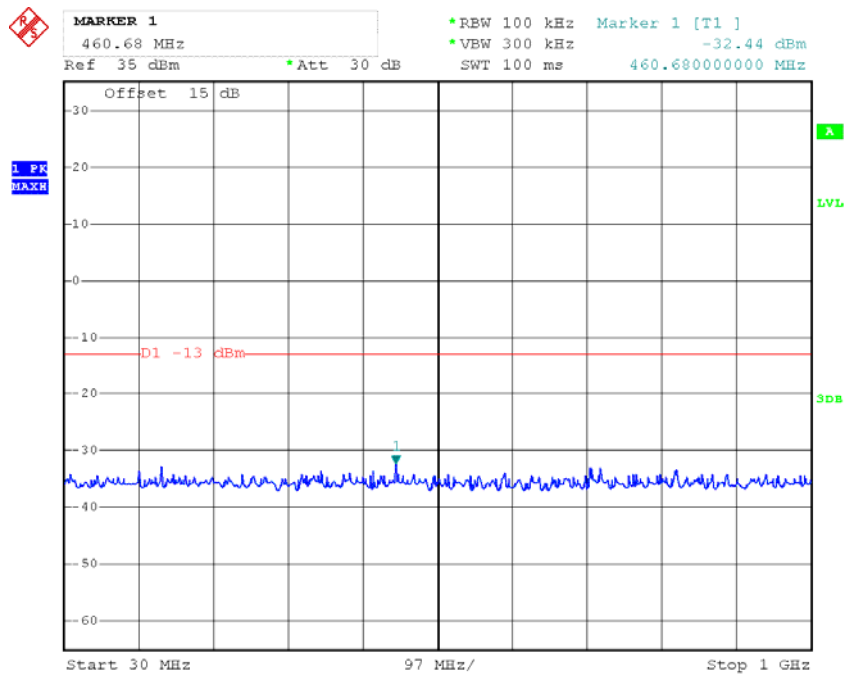


Date: 30.AUG.2015 21:22:58

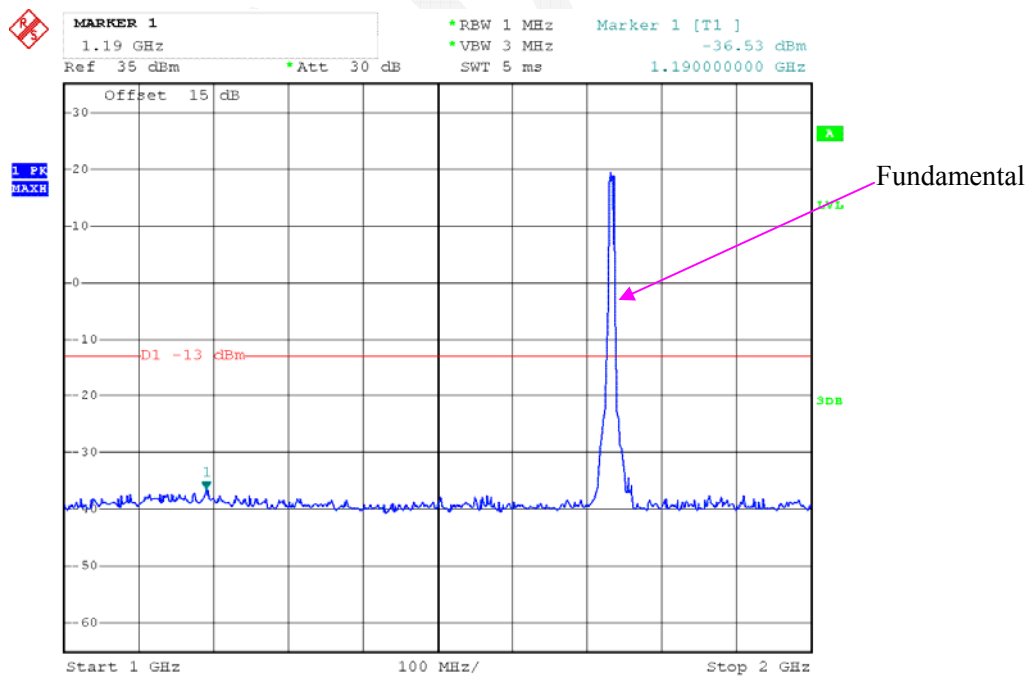


Date: 11.SEP.2015 12:32:59

5 MHz_16QAM Band IV

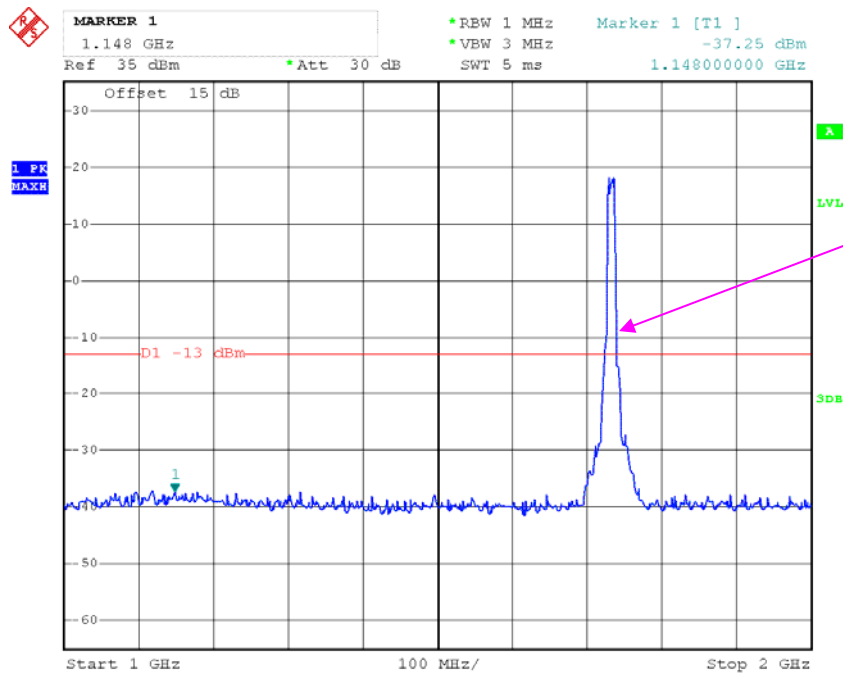


Date: 30.AUG.2015 20:50:07

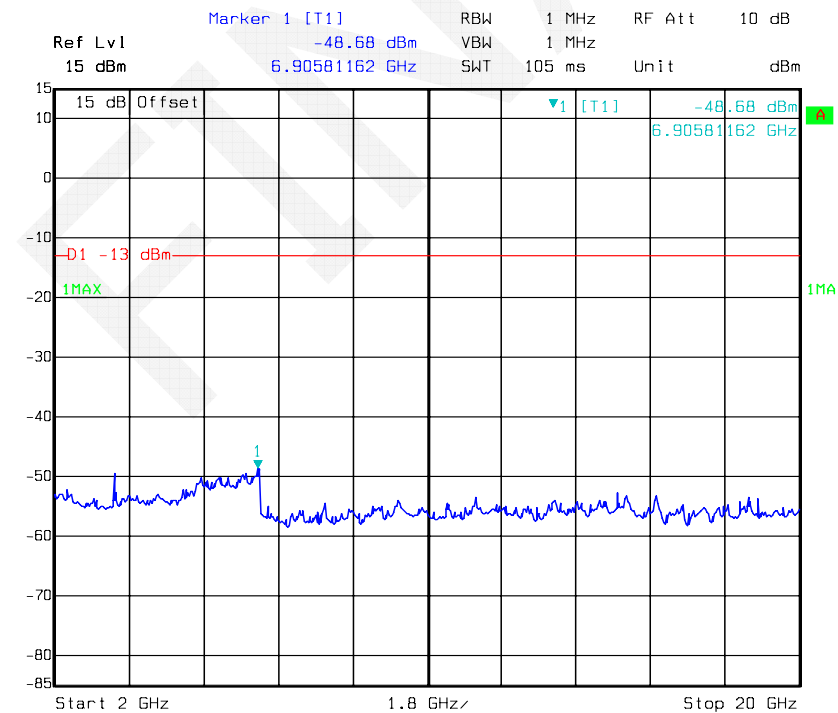


Date: 30.AUG.2015 21:23:41



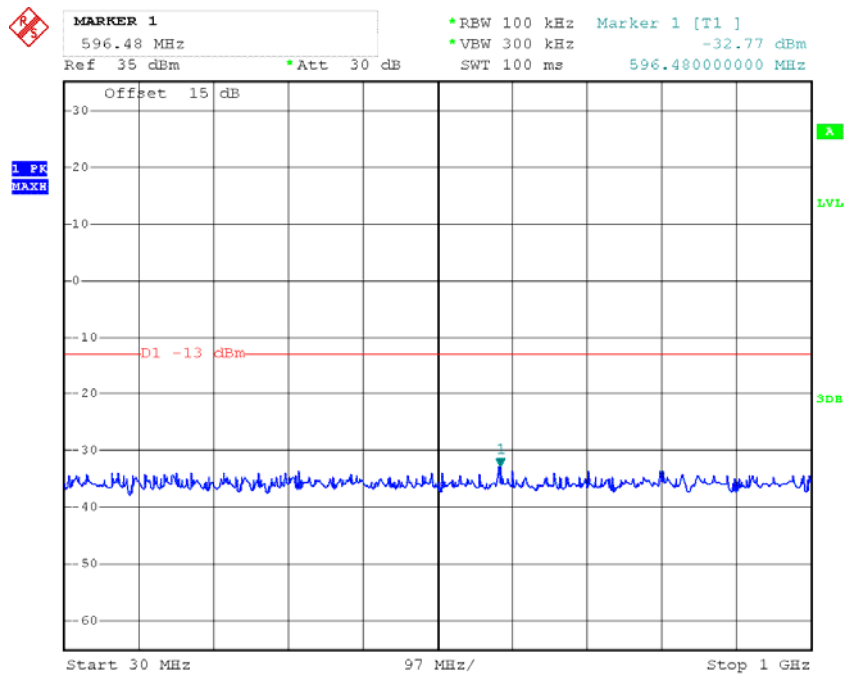


Date: 30.AUG.2015 21:24:18

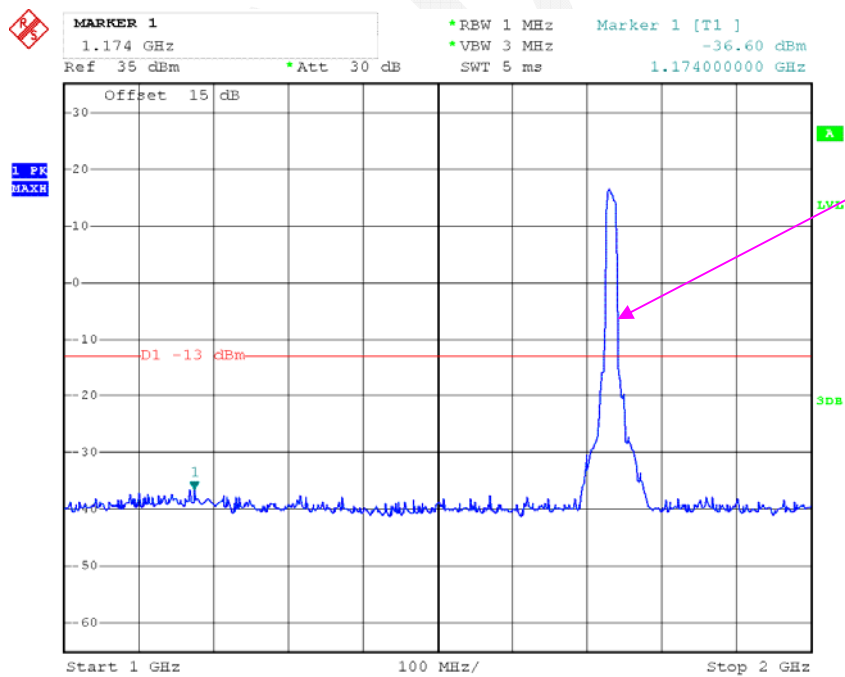


Date: 11.SEP.2015 12:29:39

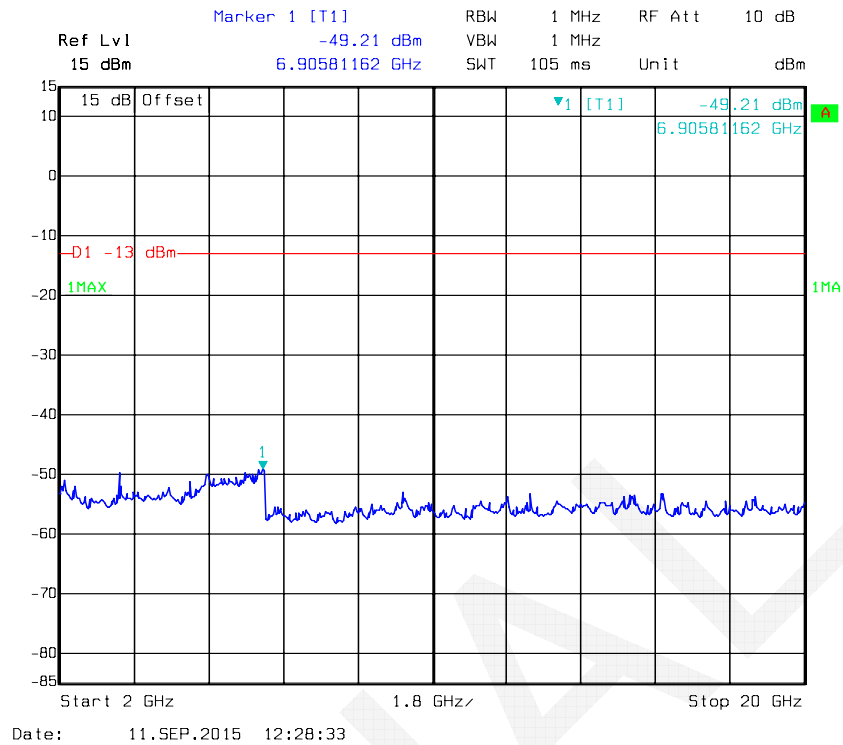
15 MHz_16QAM Band IV



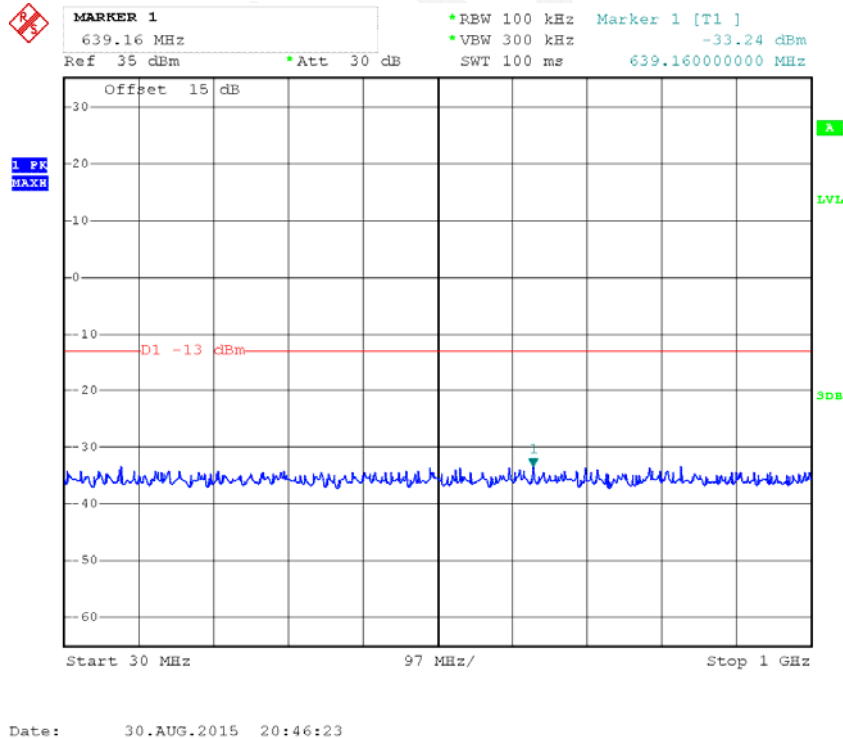
Date: 30.AUG.2015 20:49:01

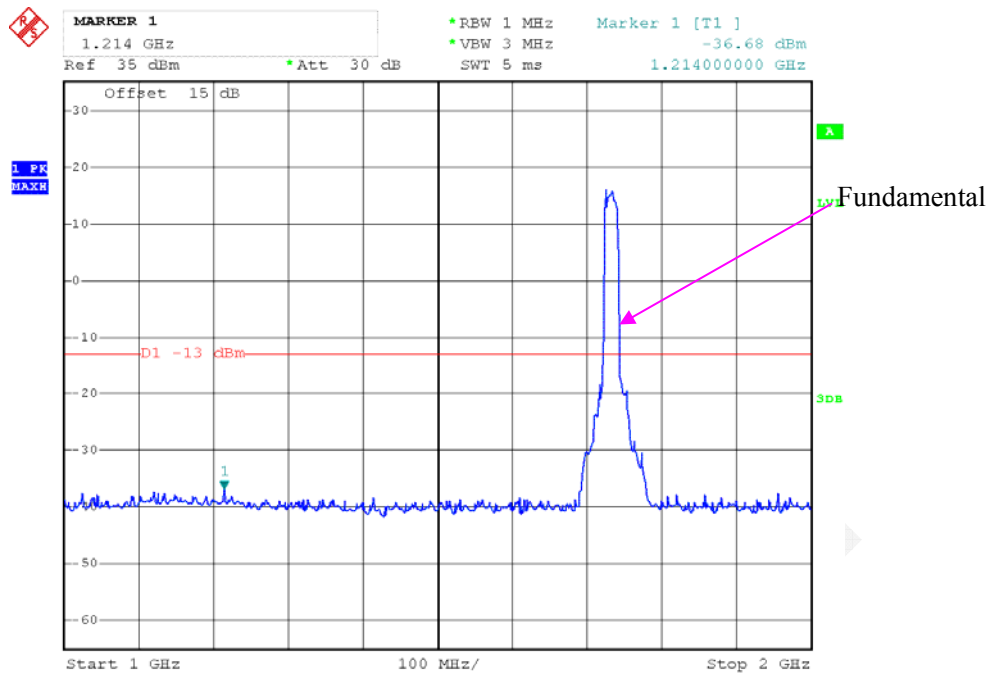


Date: 30.AUG.2015 21:24:48

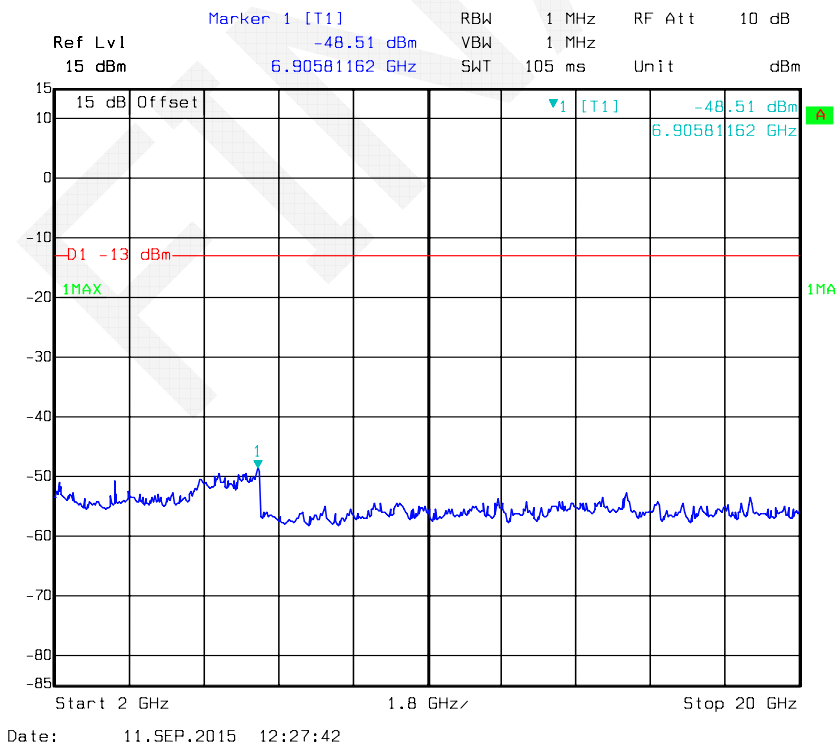


20 MHz _16QAM Band IV



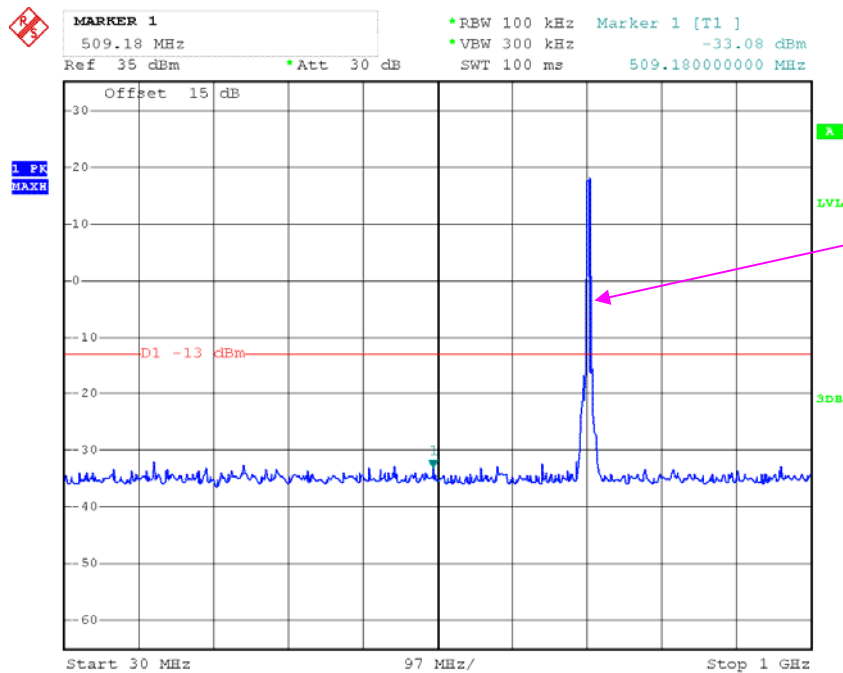


Date: 30.AUG.2015 21:26:56

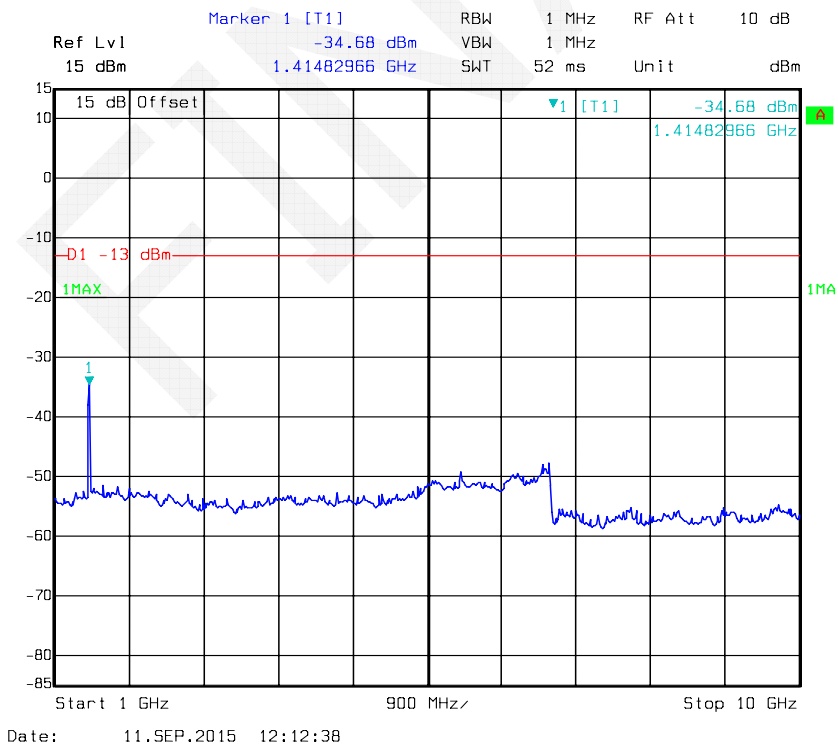


Date: 11.SEP.2015 12:27:42

5 MHz_QPSK Band 17

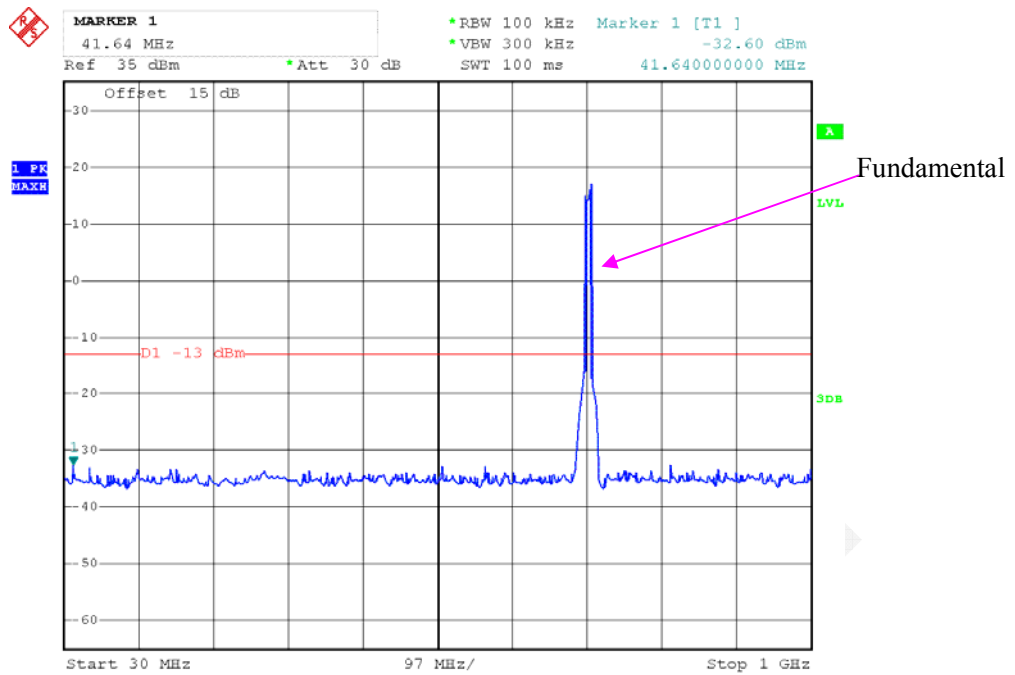


Date: 30.AUG.2015 21:18:14

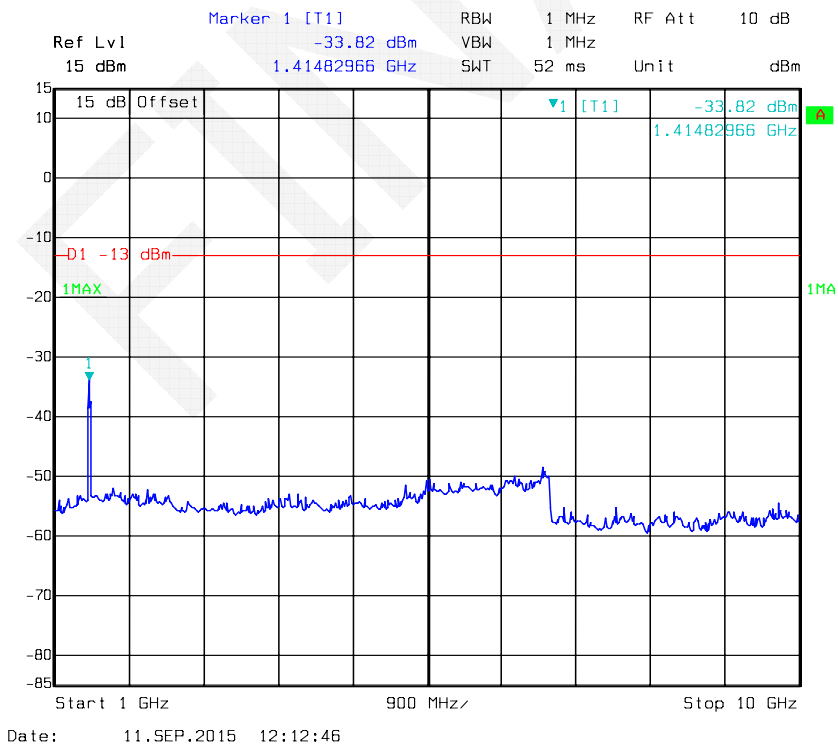


Date: 11.SEP.2015 12:12:38

10 MHz_QPSK Band 17

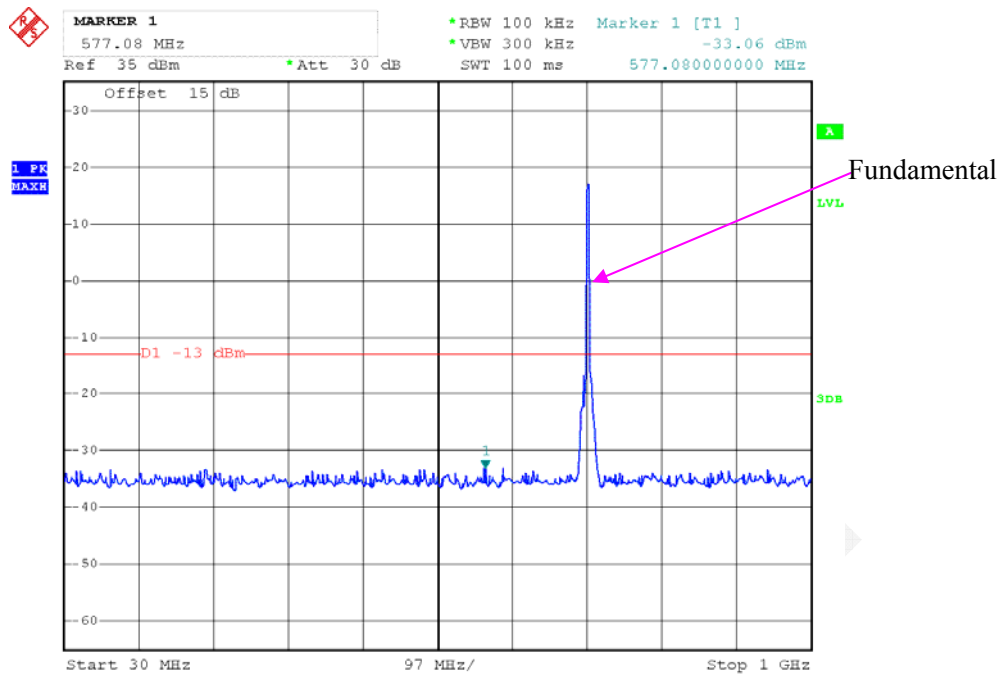


Date: 30.AUG.2015 21:19:24

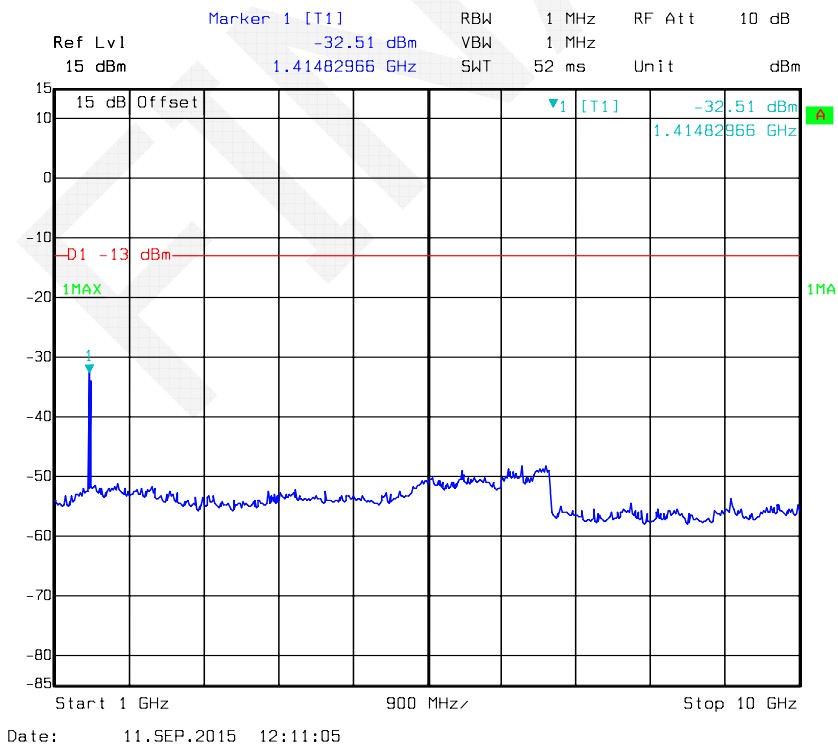


Date: 11.SEP.2015 12:12:46

5 MHz_16QAM Band 17

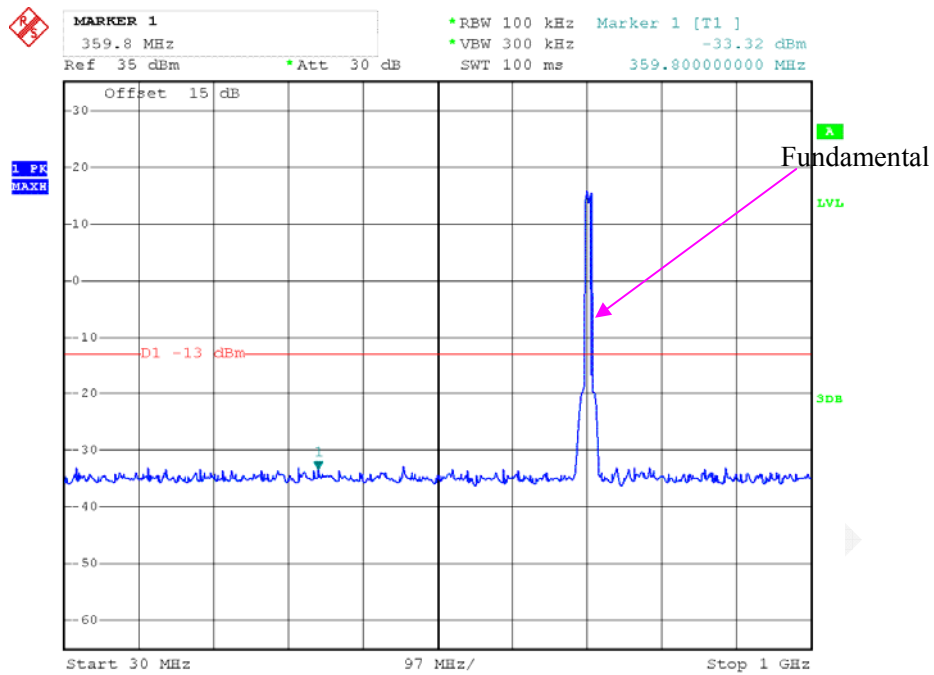


Date: 30.AUG.2015 21:18:29



Date: 11.SEP.2015 12:11:05

10 MHz_16QAM Band 17



Date: 30.AUG.2015 21:19:07



Date: 11.SEP.2015 12:11:46

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 = $10 \lg (\text{TXpwr in Watts}/0.001)$ – the absolute level

Spurious attenuation limit in dB = $43 + 10 \text{ Log}_{10} (\text{power out in Watts})$

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2015-05-09	2016-05-09
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	DE31388	2015-05-09	2016-05-09
ETS LINDGREN	Horn Antenna	3115	000 527 35	2012-09-06	2015-09-06
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2015-02-19	2016-02-19
Giga	Signal Generator	1026	320408	2015-05-09	2016-05-09
EMCO	Adjustable Dipole Antenna	3121C	9109-753	N/A	N/A
TDK RF	Horn Antenna	HRN-0118	130 084	2012-09-06	2015-09-06

* **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:	27.3°C
Relative Humidity:	53%
ATM Pressure:	99.9 kPa

The testing was performed by Lion Xiao on 2015-09-05.

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)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
Frequency:836.6 MHz								
1673.200	H	48.31	-52.8	10.6	1.5	-43.7	-13.0	30.7
1673.200	V	44.77	-56.6	10.6	1.5	-47.5	-13.0	34.5
2509.800	H	43.20	-54.8	13.1	2.8	-44.5	-13.0	31.5
2509.800	V	41.25	-55.8	13.1	2.8	-45.5	-13.0	32.5
143.000	H	36.59	-70.3	0.0	0.4	-70.7	-13.0	57.7
257.100	V	35.13	-70.5	0.0	0.5	-71.0	-13.0	58.0

WCDMA Band V

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)			
Frequency:836.6 MHz								
1673.200	H	34.74	-66.3	10.6	1.5	-57.2	-13.0	44.2
1673.200	V	33.51	-67.9	10.6	1.5	-58.8	-13.0	45.8
2509.800	H	42.08	-55.9	13.1	2.8	-45.6	-13.0	32.6
2509.800	V	39.50	-57.6	13.1	2.8	-47.3	-13.0	34.3
279.600	H	36.34	-71.4	0.0	0.5	-71.9	-13.0	58.9
310.300	V	35.09	-68.6	0.0	0.5	-69.1	-13.0	56.1

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)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
Frequency:1880 MHz								
3760.000	H	39.02	-55.3	13.8	2.9	-44.4	-13.0	31.4
3760.000	V	37.18	-55.9	13.8	2.9	-45.0	-13.0	32.0
159.300	H	35.49	-73.3	0.0	0.4	-73.7	-13.0	60.7
187.400	V	34.24	-72.3	0.0	0.5	-72.8	-13.0	59.8

WCDMA Band II

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)			
Frequency:1880 MHz								
3760.000	H	35.52	-58.8	13.8	2.9	-47.9	-13.0	34.9
3760.000	V	34.74	-58.3	13.8	2.9	-47.4	-13.0	34.4
198.600	H	36.76	-71	0.0	0.5	-71.5	-13.0	58.5
235.000	V	35.30	-70.3	0.0	0.5	-70.8	-13.0	57.8

WCDMA Band IV(PART 27)

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)			
Frequency:1732.600 MHz								
3465.200	H	35.07	-61.9	13.9	1.9	-49.9	-13.0	36.9
3465.200	V	35.53	-60.6	13.9	1.9	-48.6	-13.0	35.6
167.900	H	36.02	-72.8	0.0	0.4	-73.2	-13.0	60.2
215.300	V	35.16	-70.3	0.0	0.5	-70.8	-13.0	57.8

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

LTE Band II

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 Middle Channel (1880 MHz)								
3760.000	H	35.32	-59	13.8	2.9	-48.1	-13.0	35.1
3760.000	V	36.93	-56.1	13.8	2.9	-45.2	-13.0	32.2
5640.000	H	42.66	-49	14.0	2.1	-37.1	-13.0	24.1
5640.000	V	44.48	-47.2	14.0	2.1	-35.3	-13.0	22.3
197.400	H	35.97	-71.8	0.0	0.5	-72.3	-13.0	59.3
213.800	V	36.43	-69	0.0	0.5	-69.5	-13.0	56.5
16QAM Middle Channel (1880 MHz)								
3760.000	H	35.80	-58.5	13.8	2.9	-47.6	-13.0	34.6
3760.000	V	37.01	-56.1	13.8	2.9	-45.2	-13.0	32.2
5640.000	H	42.30	-49.4	14.0	2.1	-37.5	-13.0	24.5
5640.000	V	44.27	-47.4	14.0	2.1	-35.5	-13.0	22.5
197.400	H	35.64	-72.2	0.0	0.5	-72.7	-13.0	59.7
213.800	V	36.29	-69.1	0.0	0.5	-69.6	-13.0	56.6

LTE Band IV

LTE Band 4

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 Middle Channel (1732.5 MHz)								
3465.000	H	35.36	-61.6	13.9	1.9	-49.6	-13.0	36.6
3465.000	V	37.82	-58.3	13.9	1.9	-46.3	-13.0	33.3
5197.500	H	35.95	-55.1	14.0	2.3	-43.4	-13.0	30.4
5197.500	V	36.22	-56.3	14.0	2.3	-44.6	-13.0	31.6
233.900	H	35.19	-72.8	0.0	0.5	-73.3	-13.0	60.3
274.100	V	36.30	-69.1	0.0	0.5	-69.6	-13.0	56.6
16QAM Middle Channel (1732.5 MHz)								
3465.000	H	35.75	-61.2	13.9	1.9	-49.2	-13.0	36.2
3465.000	V	38.06	-58.1	13.9	1.9	-46.1	-13.0	33.1
5197.500	H	35.33	-55.7	14.0	2.3	-44.0	-13.0	31.0
5197.500	V	37.70	-54.8	14.0	2.3	-43.1	-13.0	30.1
233.900	H	35.04	-73	0.0	0.5	-73.5	-13.0	60.5
274.100	V	36.71	-68.7	0.0	0.5	-69.2	-13.0	56.2

LTE Band 17

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 Middle Channel (710 MHz)								
1420.000	H	35.49	-65.4	9.1	1.3	-57.6	-13.0	44.6
1420.000	V	36.35	-64.3	9.1	1.3	-56.5	-13.0	43.5
2130.000	H	46.69	-49.2	11.2	1.4	-39.4	-13.0	26.4
2130.000	V	50.77	-44	11.2	1.4	-34.2	-13.0	21.2
166.000	H	35.65	-73.2	0.0	0.4	-73.6	-13.0	60.6
187.400	V	36.29	-70.2	0.0	0.5	-70.7	-13.0	57.7
16QAM Middle Channel (710 MHz)								
1420.000	H	35.92	-65	9.1	1.3	-57.2	-13.0	44.2
1420.000	V	36.65	-64	9.1	1.3	-56.2	-13.0	43.2
2130.000	H	46.12	-49.8	11.2	1.4	-40.0	-13.0	27.0
2130.000	V	50.28	-44.5	11.2	1.4	-34.7	-13.0	21.7
166.000	H	35.09	-73.8	0.0	0.4	-74.2	-13.0	61.2
187.400	V	36.13	-70.4	0.0	0.5	-70.9	-13.0	57.9