

FCC TEST REPORT No. 14/986	2014
for 47 CFR Part 15	November, 27

Model name: LCU NEMA PRO
Product description: Street light controller
FCC ID: NTAT210
Applicant: Telematics Wireless Ltd., Israel
Manufacturer: Telematics Wireless Ltd., Israel

*The results in this report apply only to the samples tested.
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1 EQUIPMENT UNDER TEST

1.1 Basic description

Equipment Category	
Model name	LCU NEMA PRO
Destination	a compact RF Transceiver unit for street light control system
Configuration	stand-alone device
ID number	n/a

1.2 Technical characteristics declared by manufacturer

Table 1.2.1 – FHSS Narrow Channel Parameters	
Parameter	Value
Frequency Band	902 – 928 MHz
Modulation	Frequency Shift Keying (2GFSK)
Receiver Sensitivity	-105 dBm@110 kbps (BER < 0.1%)
Channel Separation	400 kHz
Data Rates	110 kbps
Frequency deviation	± 50 kHz
Channel Bandwidth @ 20dBc	<250 kHz
Frequency stability (including initial stability, temperature and aging)	<12 ppm
Peak Output power (without Antenna)	Up to +27dBm
Number of hopping channels	51 channels, from 904.8 MHz to 924.8 MHz at 0.4 MHz steps
Harmonics	< - 54 dBm
Max Occupancy time on any channel	400 ms per 20 seconds

Table 1.2.2 – FHSS Wide Channel Parameters	
Parameter	Value
Frequency Band	902 – 928 MHz
Modulation	Frequency Shift Keying (2GFSK)
Receiver Sensitivity	-105 dBm@110 kbps (BER < 0.1%)
Channel Separation	800 kHz
Data Rates	220 kbps
Frequency deviation	±110 kHz
Channel Bandwidth @ 20dBc	≥250 kHz
Frequency stability (including initial stability, temperature and aging)	<12 ppm
Peak Output power (without Antenna)	Up to +24 dBm
Number of hopping channels	26 channels, from 904.8 MHz to 924.8 MHz at 0.8 MHz steps
Harmonics	< - 54 dBm
Max Occupancy time on any channel	400 ms per 10 seconds

Antenna

Antenna type
Antenna gain

internal
0 дBi

Supply

Power source
Nominal supply voltage

AC
120 VAC

1.3 Photos

Figure 1.3.1 External photo



Figure 1.3.2 Internal photo



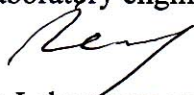
2 GENERAL INFORMATION ABOUT TESTS

2.1 Test program and results of the tests

Number of test	FCC rule	Description of test	Result (Pass, Fail, N/A)
1	15.247(b)3	Peak Output Power	Pass
2	15.207(a)	Conducted Emissions	Pass
3	15.107(a)	Conducted Emissions	Pass
4	15.247(d)	Radiated Spurious Emissions	Pass
5	15.109 Class B	Radiated Emission	Pass

Tested by:

tests No. 1: Laboratory engineer



Boris Trifonov

tests No. 2 - 5: Laboratory engineer



Vladimir Osaulko

Checked by:

Leading engineer



Fjodor Shubin

2.2 Test conditions and test modes

Normal temperature and humidity:

- temperature: from +15 °C to +35 °C;

- relative humidity: from 20 % to 75 %

Normal power source:

- Unom = 120 VAC

The frequencies for the testing

Channel	Frequency, MHz
Low	904.8
Mid	914.4
High	924.8

2.3 Test equipment used

№	Name	Model	Inventory or serial No.
1.	EMI Test receiver/spectrum analyzer	R&S ESU-26	100260
2.	Spectrum analyzer	R&S FSV40	105763
3.	Signal Generator	SMB100A	100217
4.	Antenna (30 – 1000) MHz	Schwarzbeck UBAA 9114	9111-214
5.	Antenna (30 – 1000) MHz	Schwarzbeck VULB9163	9163244
6.	Antenna (1000 - 10000) MHz	HP11966 model 3115	9903-5701
7.	Antenna (750 - 10000) MHz	ETS- Lindgren model 3115	154877
8.	Loop antenna	APA-CP	101142
9.	Digital multimeter	FLUKE 189	89750179
10.	Preamplifier (0.1-18) GHz	Agilent 87405c	MY47010400
11.	Psychrometer	BIT-2	B931
12.	Shielded Semi-Anechoic Chamber	"DON"	1

All listed above test equipment is calibrated and certified in accordance with established procedure. The equipment has certificates currently in force.

Ancillary equipment

№	Name	Model
1.	Test load	TNET 200 DEBUG ADAPTER
2.	Notebook	IBM ThinkPad

2.4 Measurement uncertainty

Parameter	Maximum uncertainty
Radiated emission	± 5.2 dB
Conducted emission	± 2.7 dB
Frequency	± 1 × 10 ⁻⁸
Temperature	± 1 °C
Humidity	± 2 %
Voltage supply DC	± 2 %

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of k = 2.

2.5 Photo of test site

Figure 2.5.1 Radiated measurements



Figure 2.5.2 Radiated measurements



Figure 2.5.3 Conducted measurements



3 REPORT OF MEASUREMENTS AND EXAMINATIONS

3.1 Peak Output power

3.1.1 Test requirements 15.247 (b) 3

b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:

3) For systems using digital modulation in the (902 - 928) MHz, (2400 - 2483.5) MHz, and (5725 - 5850) MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b) (1), (b) (2), and (b) (3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.1.2 Test procedure

1) The transmitter output was connected to the spectrum analyzer through the test load.

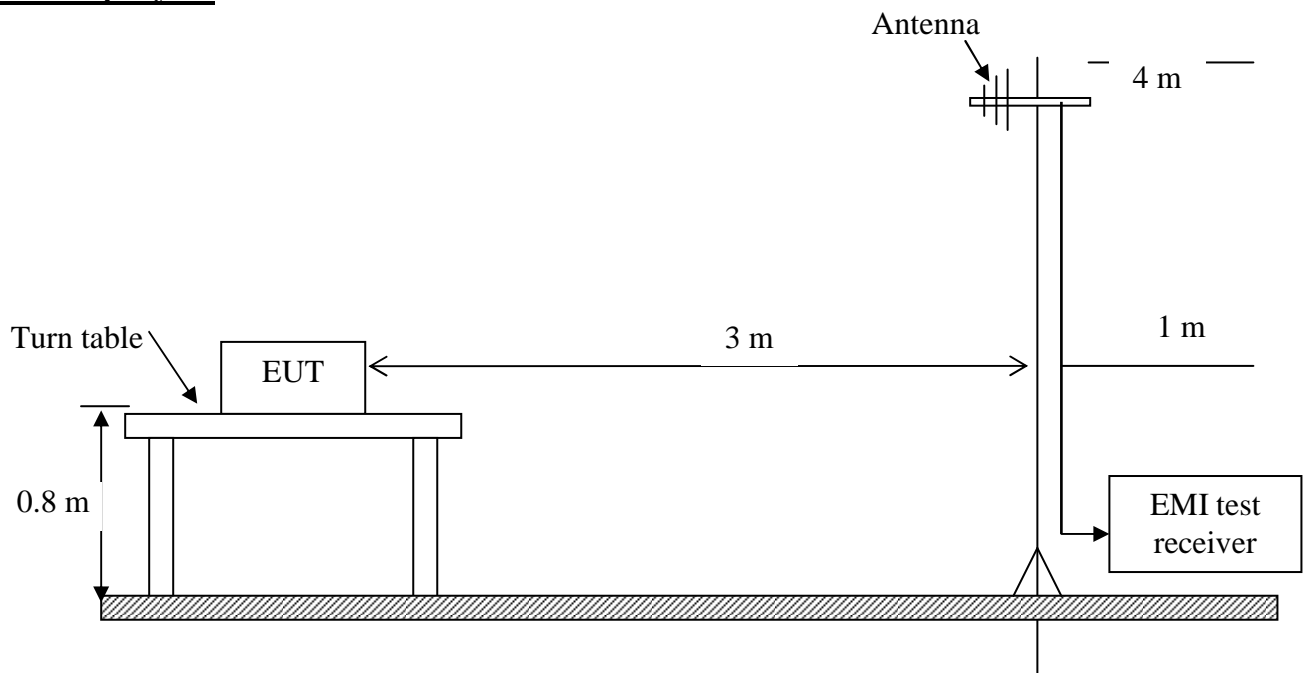
2) The transmitter was set to the normal operational mode with the maximum power rating.

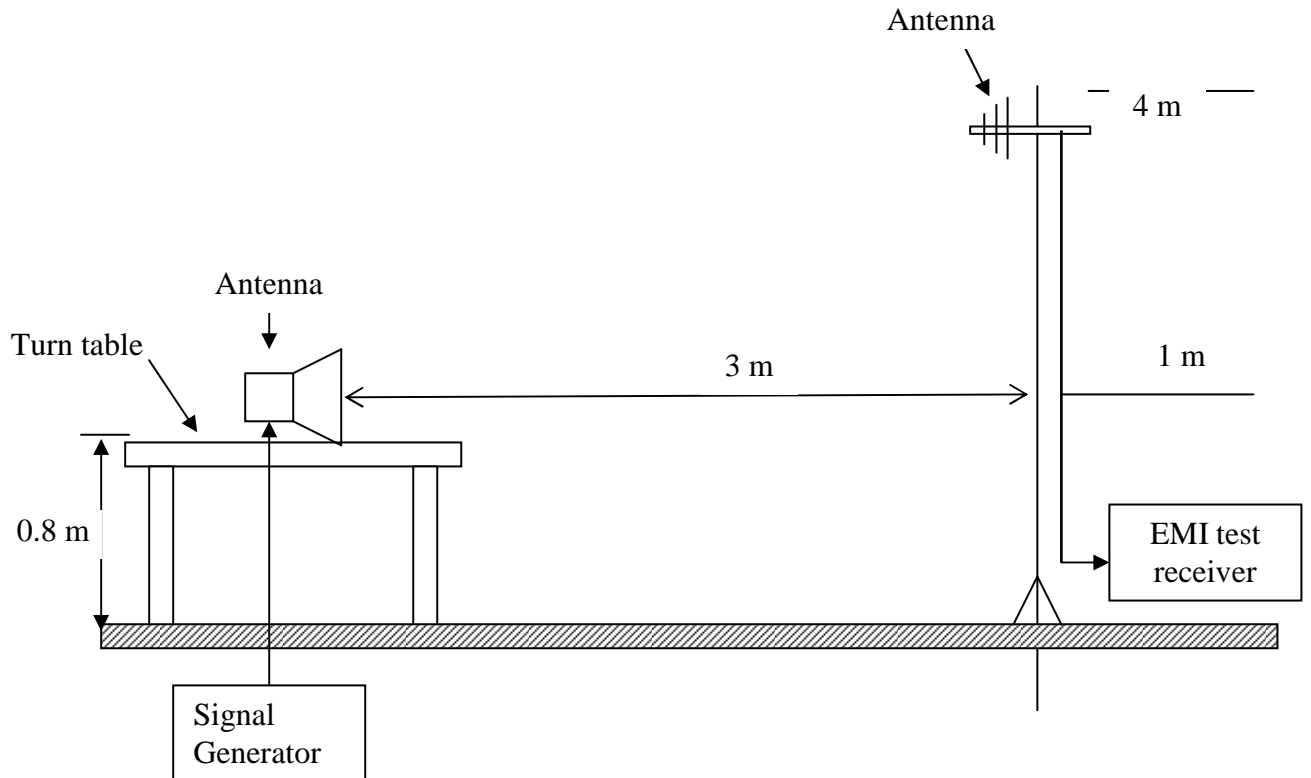
3) Spectrum analyzer was set to the hopping frequency investigated in Time Domain Power Measurement mode with the following settings: RBW = Channel Separation; VBW > RBW; Video Detector = RMS; Trigger = Video; Span = Zero Span; Sweep Time = Adjusted to observe the whole burst.

4) The power was measured as average power during the burst in Time Domain Power Measurement mode.

3.1.3 Test setup layout

Test setup layout





3.1.4 Test result

Temperature: +18 °C

Relative humidity: 40 %

Table 3.1.1 Peak output power test result

Frequency, MHz	Output generator, dBm	Coax Loss, dB	Antenna gain, dBi	Test antenna height, m	Measured E.I.R.P., dBm	E.I.R.P Limit, dBm	Test Result (Pass, Fail, N/A)
FHSS Narrow Channel Mode							
904.8	20.35	- 3.5	6.0	1.05	22.85	30	Pass
914.4	23.90	- 3.8	6.0	1.05	26.10	30	Pass
924.8	23.60	- 4.8	6.0	1.05	24.80	30	Pass
FHSS Wide Channel Mode							
904.8	19.90	- 3.5	6.0	1.05	22.40	30	Pass
914.4	23.55	- 3.8	6.0	1.05	25.75	30	Pass
924.8	23.25	- 4.8	6.0	1.05	24.45	30	Pass

3.2 Conducted Emissions

3.2.1 Test requirements of 15.207

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

3.2.2 Test procedure (ANSI C63.10-2013, Sections 6.3)

The EUT emitted a BEACON (Info + Reading value + Alarm Status) every 11sec.

The EUT was placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

The measurements were performed on the line under test in a 2m x 2m x 2m screened enclosure by means of an Impedance Stabilization Network (ISN) bonded to the ground plane and connected to the spectrum analyzer. The EUT was placed on a non-metallic table, 0.8m above the ground reference plane and was configured, arranged and operated in a manner consistent with typical application and load conditions. Normal performance of the EUT was verified.

Conducted common mode (asymmetric mode) disturbance at the tested port was investigated in the appropriate frequency range using the resolution-bandwidth per CISPR16-1, Table 7, and QP and Average readings were taken.

Worst-case results were recorded.

3.2.3 Test result

Temperature: +20°C

Relative humidity: 63%

EUT OPERATING MODE: Transmit

Table 3.2.1 Conducted emission test result**"Phase" (904.8 MHz, 110 kbps, QP detector)**

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	QP	QP	QP	
0.15000	37.4	66.0	28.6	Pass
0.35186	32.6	58.9	26.3	Pass
0.71508	31.7	56.0	24.3	Pass
1.59908	32.2	56.0	23.8	Pass
4.09461	24.8	56.0	31.2	Pass
5.36871	37.5	60.0	22.5	Pass
8.52278	17.1	60.0	42.9	Pass
26.63405	13.6	60.0	46.4	Pass

"Phase" (904.8 MHz, 110 kbps, AV detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	AV	AV	AV	
0.17732	32.8	54.6	21.8	Pass
0.35467	29.9	48.9	19.0	Pass
0.70941	28.2	46.0	17.8	Pass
1.12618	21.8	46.0	24.2	Pass
4.06211	16.5	46.0	29.5	Pass
5.36871	29.7	50.0	20.3	Pass
7.99644	12.6	50.0	37.4	Pass
29.07388	8.6	50.0	41.4	Pass

"Phase" (904.8 MHz, 220 kbps, QP detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	QP	QP	QP	
0.15860	38.1	65.5	27.4	Pass
0.36325	35.6	58.7	23.1	Pass
0.66031	31.7	56.0	24.3	Pass
1.14427	29.7	56.0	26.3	Pass
3.81125	22.6	56.0	33.4	Pass
5.32610	37.2	60.0	22.8	Pass
7.99644	17.9	60.0	42.1	Pass
19.51985	13.6	60.0	46.4	Pass

"Phase" (904.8 MHz, 220 kbps, AV detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	AV	AV	AV	
0.15000	33.7	56.0	22.3	Pass
0.36325	31.4	48.7	17.3	Pass
0.78683	30.4	46.0	15.6	Pass
1.14427	22.1	46.0	23.9	Pass
4.06211	15.8	46.0	30.2	Pass
5.32610	29.5	50.0	20.5	Pass
7.99644	13.2	50.0	36.8	Pass
26.00492	9.9	50.0	40.1	Pass

"Neutral" (904.8 MHz, 110 kbps, QP detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	QP	QP	QP	
0.15241	37.9	65.8	27.9	Pass
0.36037	35.5	58.7	23.2	Pass
0.78059	33.2	65.0	31.8	Pass
1.62476	33.3	65.0	31.7	Pass
2.88369	21.8	65.0	43.2	Pass
5.36871	37.4	60.0	22.6	Pass
7.99644	20.2	60.0	39.8	Pass
26.00492	14.7	60.0	45.3	Pass

"Neutral" (904.8 MHz, 110 kbps, AV detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	AV	AV	AV	
0.17874	32.8	54.5	21.7	Pass
0.36037	32.2	48.7	16.5	Pass
0.78059	30.6	46.0	15.4	Pass
1.20030	24.9	46.0	21.1	Pass
2.88369	13.8	46.0	32.2	Pass
5.36871	30.1	50.0	19.9	Pass
7.99644	14.9	50.0	35.1	Pass
25.39066	9.4	50.0	40.6	Pass

"Neutral" (904.8 MHz, 220 kbps, QP detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	QP	QP	QP	
0.16770	37.5	65.1	27.6	Pass
0.30728	34.0	60.0	26.0	Pass
0.67092	34.4	56.0	21.6	Pass
1.26915	28.1	56.0	27.9	Pass
4.06211	24.9	56.0	31.1	Pass
5.36871	36.8	60.0	23.2	Pass
8.72896	16.7	60.0	43.3	Pass
26.42266	14.5	60.0	45.5	Pass

"Neutral" (904.8 MHz, 220 kbps, AV detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	AV	AV	AV	
0.18306	34.0	54.3	20.3	Pass
0.42601	33.2	47.4	14.2	Pass
0.85209	31.4	46.0	14.6	Pass
1.15342	25.1	46.0	20.9	Pass
4.09461	17.4	46.0	28.6	Pass
5.41166	29.0	50.0	21.0	Pass
7.99644	12.5	50.0	37.5	Pass
25.18914	9.9	50.0	40.1	Pass

"Phase" (914.4 MHz, 110 kbps, QP detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	QP	QP	QP	
0.15000	38.6	66.0	27.4	Pass
0.36325	36.3	58.7	22.4	Pass
0.72657	33.8	56.0	22.2	Pass
1.09957	26.9	56.0	29.1	Pass
4.02987	23.3	56.0	32.7	Pass
5.24190	36.8	60.0	23.2	Pass
8.06041	17.3	60.0	42.7	Pass
27.27839	15.0	60.0	45.0	Pass

"Phase" (914.4 MHz, 110 kbps, AV detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	AV	AV	AV	
0.15000	33.6	56.0	22.4	Pass
0.36616	32.4	48.6	16.2	Pass
0.73238	31.2	46.0	14.8	Pass
1.09957	22.5	46.0	23.5	Pass
4.06211	15.7	46.0	30.3	Pass
5.28383	29.6	50.0	20.4	Pass
7.99644	12.9	50.0	37.1	Pass
25.18914	10.0	50.0	40.0	Pass

"Phase" (914.4 MHz, 220 kbps, QP detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	QP	QP	QP	
0.15987	38.1	65.5	27.4	Pass
0.36325	36.2	58.7	22.5	Pass
0.67092	33.1	56.0	22.9	Pass
1.20990	27.5	56.0	28.5	Pass
4.02978	23.6	56.0	32.4	Pass
5.15902	36.0	60.0	24.0	Pass
7.99644	17.7	60.0	42.3	Pass
29.99999	14.3	60.0	45.7	Pass

"Phase" (914.4 MHz, 220 kbps, AV detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	AV	AV	AV	
0.15000	33.7	56.0	22.3	Pass
0.36616	32.3	48.6	16.3	Pass
0.73238	31.2	46.0	14.8	Pass
1.15342	22.7	46.0	23.3	Pass
4.06211	15.7	46.0	30.3	Pass
5.28383	29.2	50.0	20.8	Pass
7.99644	12.7	50.0	37.3	Pass
25.39066	9.9	50.0	40.1	Pass

"Neutral" (914.4 MHz, 110 kbps, QP detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	QP	QP	QP	
0.15735	38.1	65.6	27.5	Pass
0.30003	33.8	60.2	26.4	Pass
0.72657	34.4	56.0	21.6	Pass
1.27931	29.0	56.0	27.0	Pass
3.93468	24.6	56.0	31.4	Pass
5.36871	35.3	60.0	24.7	Pass
8.12490	16.8	60.0	43.2	Pass
28.16183	14.5	60.0	45.5	Pass

"Neutral" (914.4 MHz, 110 kbps, AV detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	AV	AV	AV	
0.15000	33.6	56.0	22.4	Pass
0.42601	32.6	47.4	14.8	Pass
0.72657	31.2	46.0	14.8	Pass
1.15342	25.7	46.0	20.3	Pass
3.99789	16.7	46.0	29.3	Pass
5.28383	29.0	50.0	21.0	Pass
7.99644	12.5	50.0	37.5	Pass
25.39066	9.8	50.0	40.2	Pass

"Neutral" (914.4 MHz, 220 kbps, QP detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	QP	QP	QP	
0.16244	37.7	65.3	27.6	Pass
0.30243	34.4	60.2	25.8	Pass
0.73238	34.1	56.0	21.9	Pass
1.27931	29.5	56.0	26.5	Pass
3.99789	25.0	56.0	31.0	Pass
5.24190	35.8	60.0	24.2	Pass
8.72896	16.7	60.0	43.3	Pass
27.93832	14.5	60.0	45.5	Pass

"Neutral" (914.4 MHz, 220 kbps, AV detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	AV	AV	AV	
0.18306	33.8	54.3	20.5	Pass
0.42601	32.8	47.4	14.6	Pass
0.85209	31.2	46.0	14.8	Pass
1.15342	25.4	46.0	20.6	Pass
4.06211	17.3	46.0	28.7	Pass
5.28383	28.9	50.0	21.1	Pass
7.99644	12.5	50.0	37.5	Pass
26.21296	9.9	50.0	40.1	Pass

"Phase" (924.8 MHz, 110 kbps, QP detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	QP	QP	QP	
0.15860	38.0	65.5	27.5	Pass
0.30243	34.2	60.2	26.0	Pass
0.72657	34.1	56.0	21.9	Pass
1.14427	28.0	56.0	28.0	Pass
4.02987	24.9	56.0	31.1	Pass
5.24190	35.1	60.0	24.9	Pass
8.79879	16.6	60.0	43.4	Pass
25.79853	14.4	60.0	45.6	Pass

"Phase" (924.8 MHz, 110 kbps, AV detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	AV	AV	AV	
0.18017	33.9	54.5	20.6	Pass
0.42263	32.0	47.4	15.4	Pass
0.72657	31.2	46.0	14.8	Pass
1.20990	23.6	46.0	22.4	Pass
3.93468	16.6	46.0	29.4	Pass
5.32610	28.1	50.0	21.9	Pass
7.99644	12.5	50.0	37.5	Pass
26.04492	9.9	50.0	40.1	Pass

"Phase" (924.8 MHz, 220 kbps, QP detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	QP	QP	QP	
0.15120	38.3	66.0	27.7	Pass
0.36325	36.4	58.7	22.3	Pass
0.72657	34.2	56.0	21.8	Pass
1.09957	24.6	56.0	31.4	Pass
4.09461	23.4	56.0	32.6	Pass
5.32610	35.5	60.0	24.5	Pass
8.59096	16.6	60.0	43.4	Pass
16.64431	13.7	60.0	46.3	Pass

"Phase" (924.8 MHz, 220 kbps, AV detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	AV	AV	AV	
0.15000	33.6	56.0	22.4	Pass
0.36325	32.4	48.7	16.3	Pass
0.72657	31.7	46.0	14.3	Pass
1.15342	22.5	46.0	23.5	Pass
3.99789	15.5	46.0	30.5	Pass
5.32610	28.1	50.0	21.9	Pass
7.99644	12.5	50.0	37.5	Pass
25.18914	9.9	50.0	40.1	Pass

"Neutral" (924.8 MHz, 110 kbps, QP detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	QP	QP	QP	
0.17732	37.5	64.6	27.1	Pass
0.30484	33.8	60.1	26.3	Pass
0.85209	32.4	56.0	23.6	Pass
1.14427	28.2	56.0	27.8	Pass
4.09461	25.7	56.0	30.3	Pass
5.24190	36.2	60.0	23.8	Pass
8.25541	16.7	60.0	43.3	Pass
27.49662	14.5	60.0	45.5	Pass

"Neutral" (924.8 MHz, 110 kbps, AV detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	AV	AV	AV	
0.18017	33.6	54.5	20.9	Pass
0.42263	31.5	47.4	15.9	Pass
0.72657	31.8	46.0	14.2	Pass
1.15342	23.4	46.0	22.6	Pass
3.99789	16.8	46.0	29.2	Pass
5.32610	28.0	50.0	22.0	Pass
7.99644	12.3	50.0	37.7	Pass
26.00492	9.7	50.0	40.3	Pass

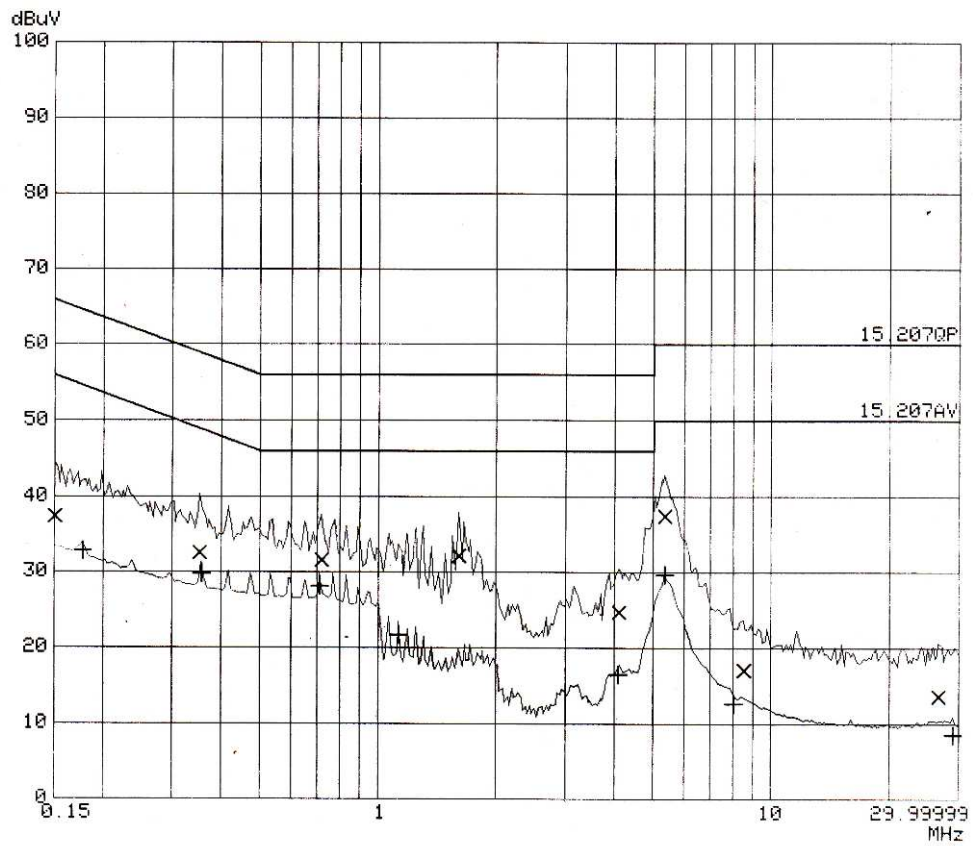
"Neutral" (924.8 MHz, 220 kbps, QP detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	QP	QP	QP	
0.15486	38.2	65.7	27.5	Pass
0.36616	33.7	58.6	24.9	Pass
0.72657	34.4	56.0	21.6	Pass
1.14427	27.4	56.0	28.6	Pass
4.02987	24.8	56.0	31.2	Pass
5.20030	36.1	60.0	23.9	Pass
7.99644	17.0	60.0	43.0	Pass
27.49662	14.5	60.0	45.5	Pass

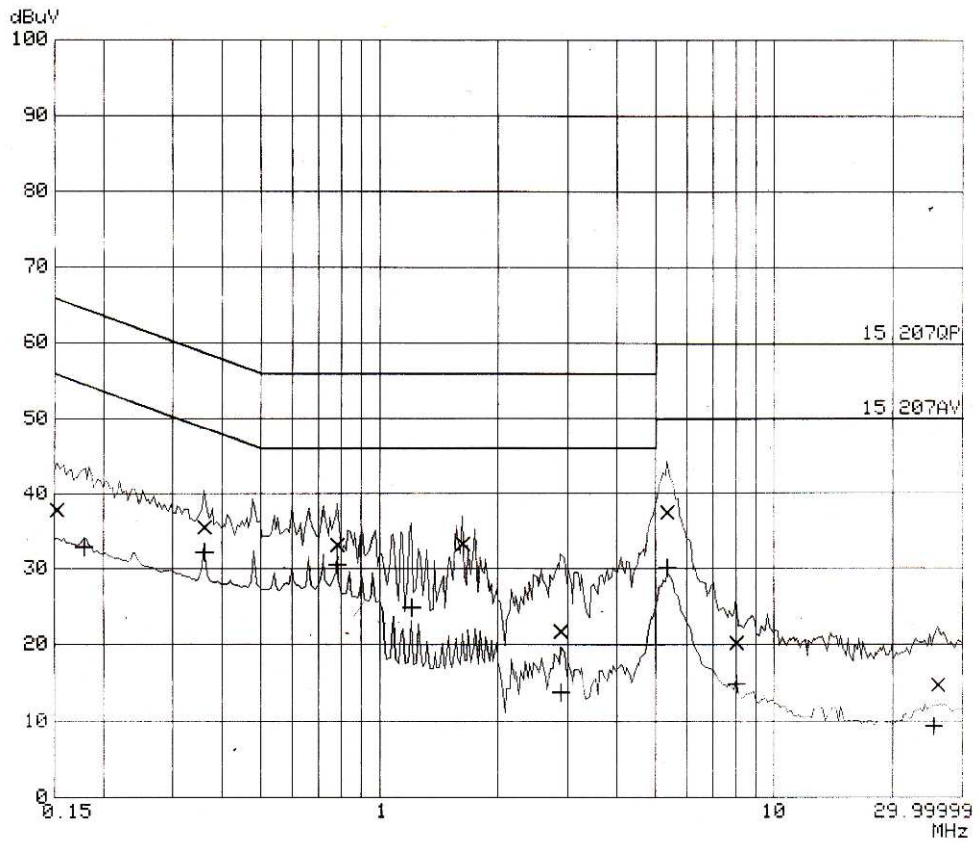
"Neutral" (924.8 MHz, 220 kbps, AV detector)

Frequency, MHz	Measured Result, dBμV	Limit, dBμV	Margin, dB	Result (Pass, Fail, N/A)
	AV	AV	AV	
0.18161	33.8	54.4	20.6	Pass
0.42263	31.7	47.4	15.7	Pass
0.72657	31.7	46.0	14.3	Pass
1.20990	23.7	46.0	22.3	Pass
3.99789	17.0	46.0	29.0	Pass
5.24190	27.7	50.0	22.3	Pass
7.99644	12.2	50.0	37.8	Pass
25.18914	9.9	50.0	40.1	Pass

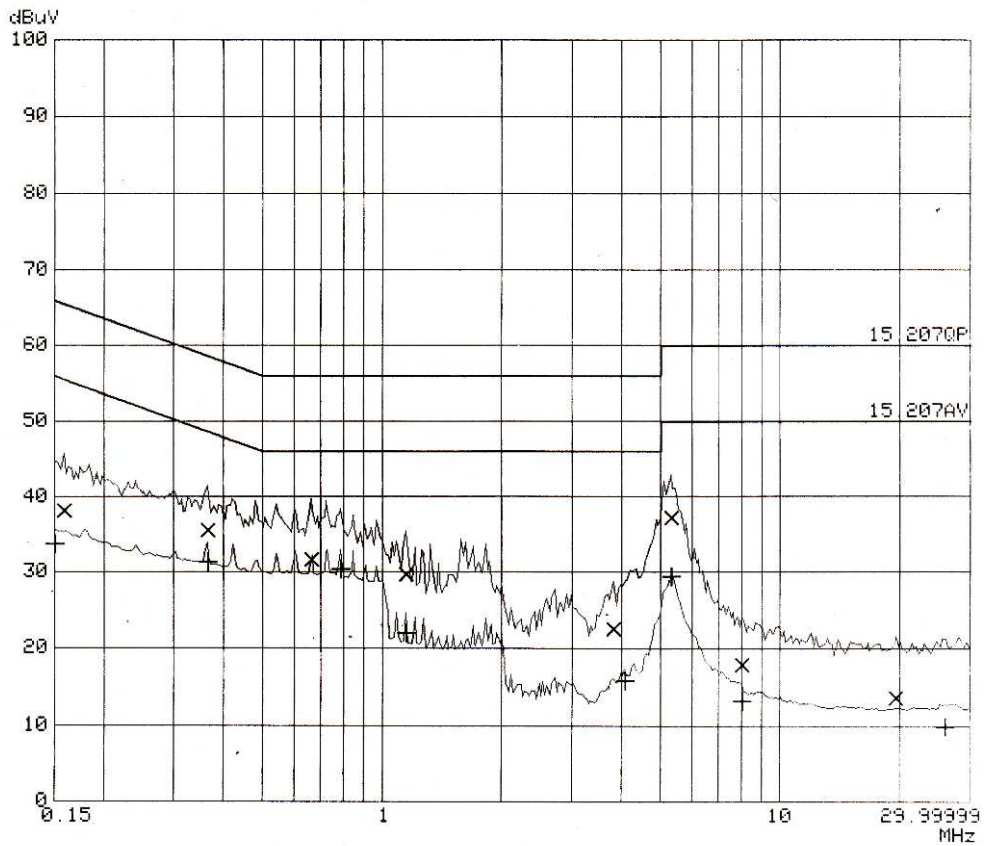
Plot 3.2.1 "Phase" 904.8 MHz, 110 kbps



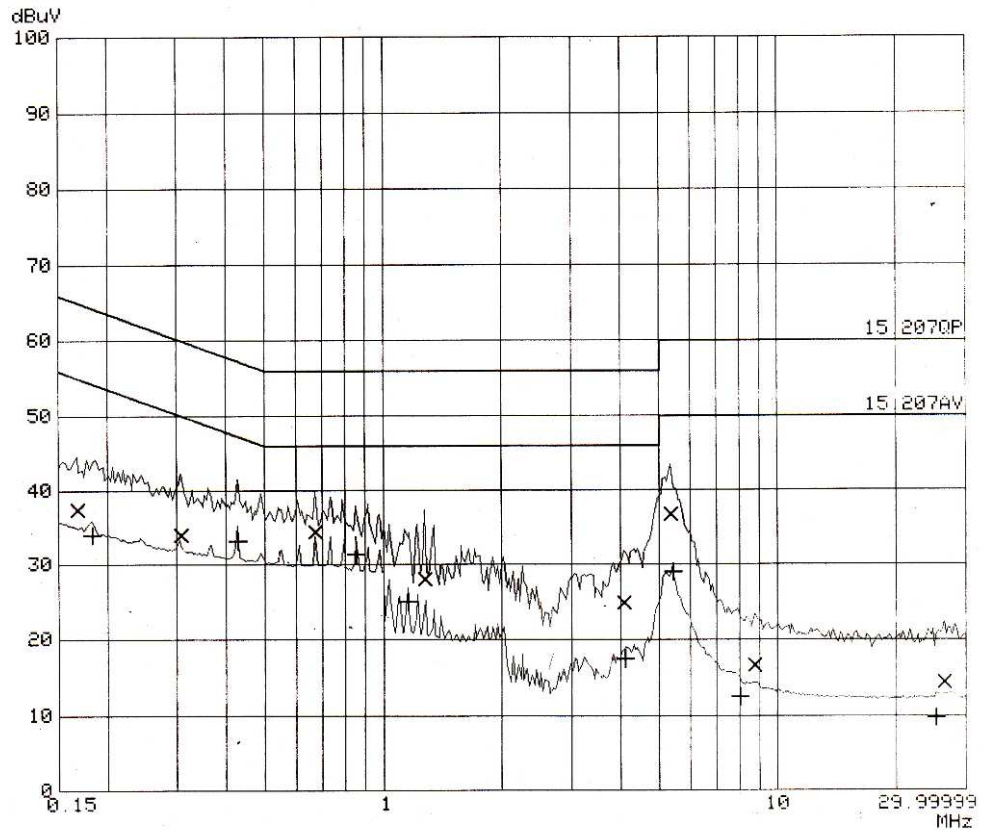
Plot 3.2.2 "Neutral" 904,8 MHz, 110 kbps



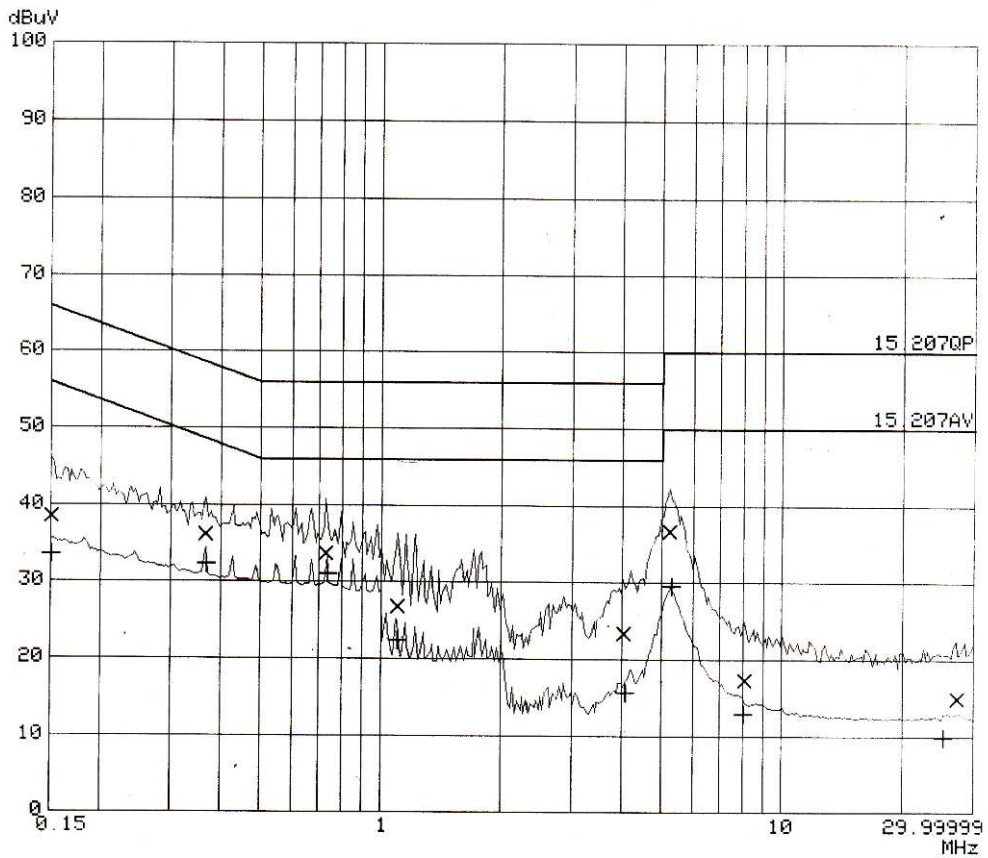
Plot 3.2.3 "Phase" 904,8 MHz, 220 kbps



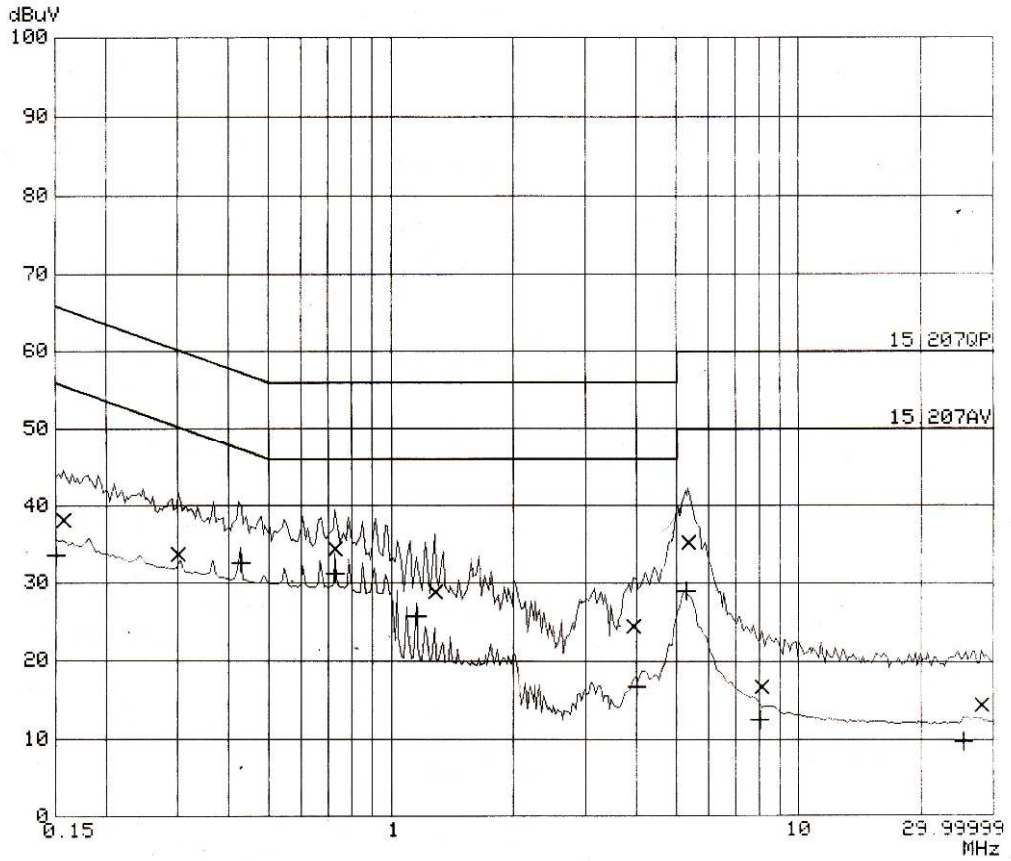
Plot 3.2.4 "Neutral" 904,8 MHz, 220 kbps



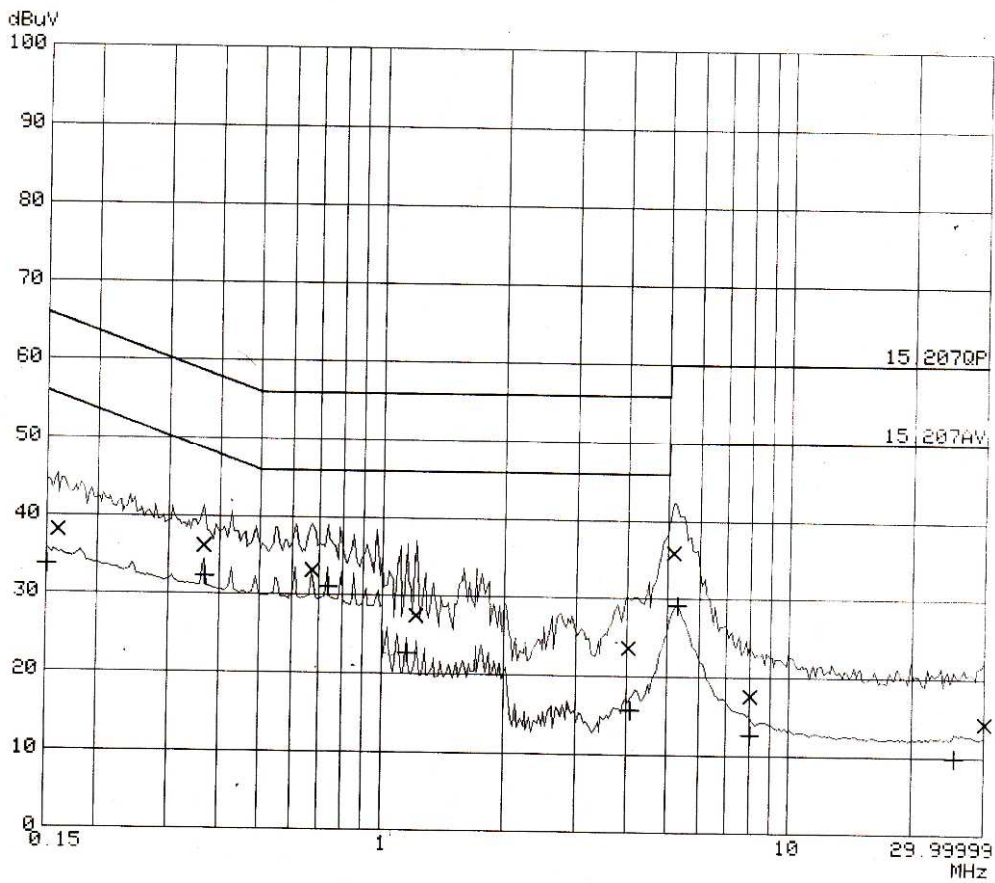
Plot 3.2.5 "Phase" 914,4 MHz, 110 kbps



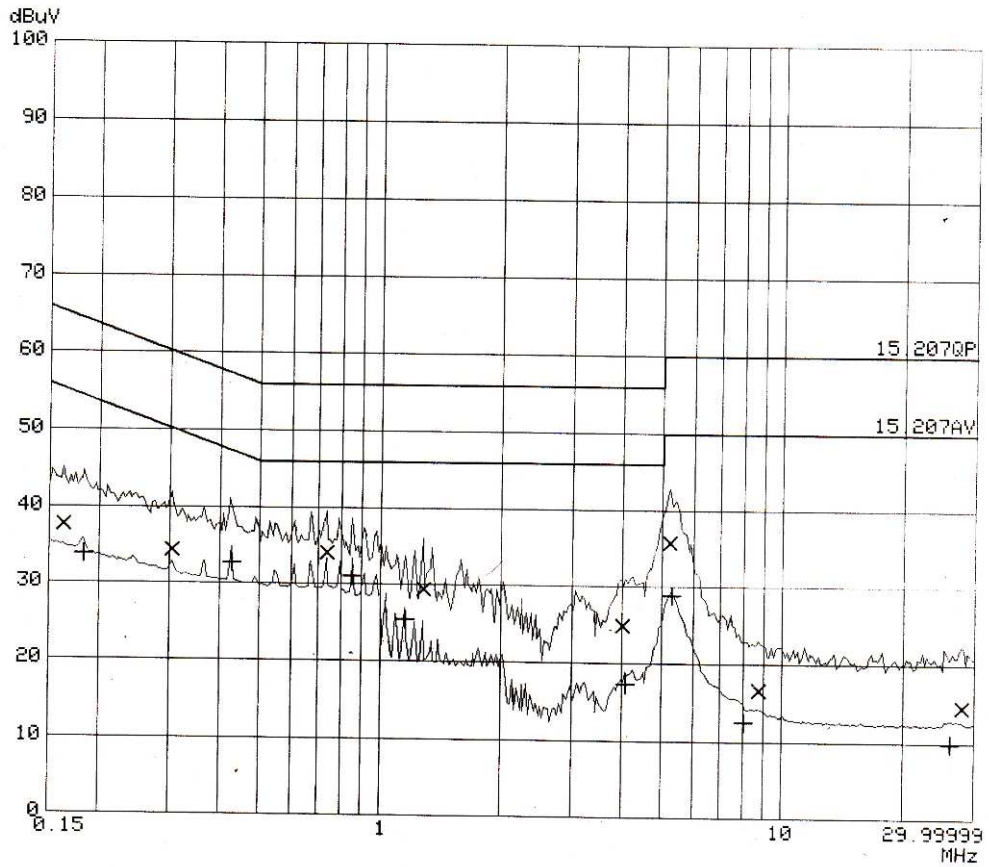
Plot 3.2.6 "Neutral" 914,4 MHz, 110 kbps



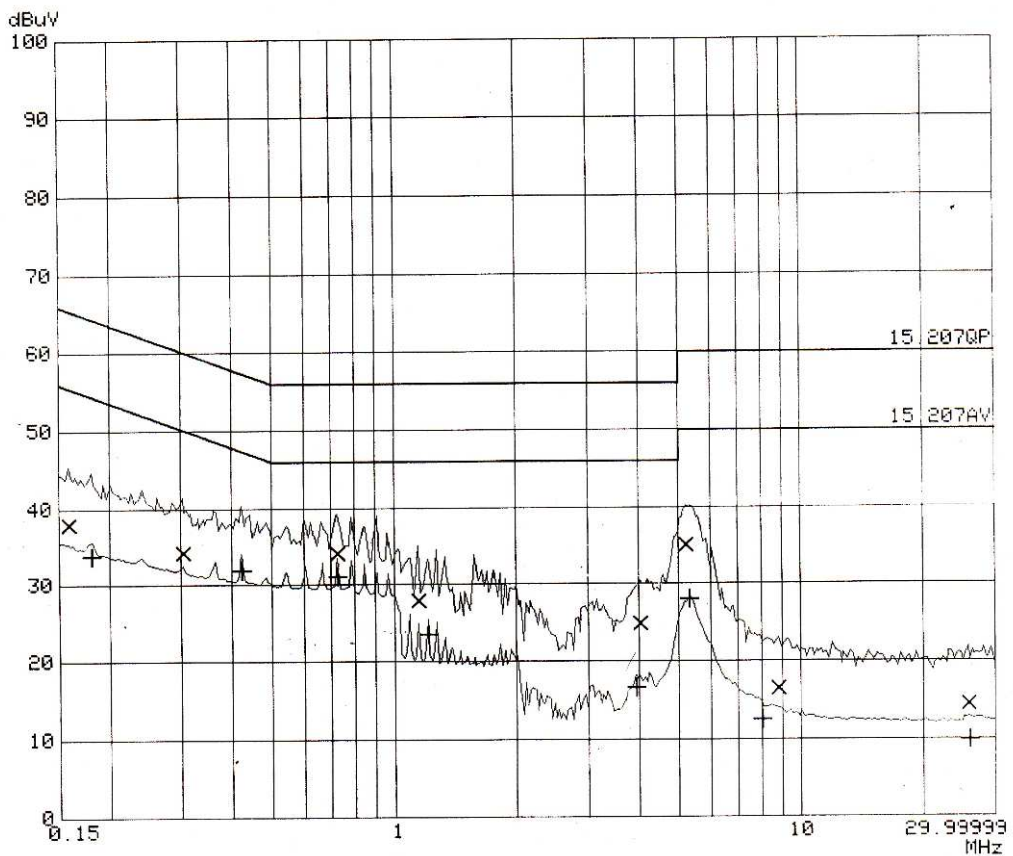
Plot 3.2.7 "Phase" 914,4 MHz, 220 kbps



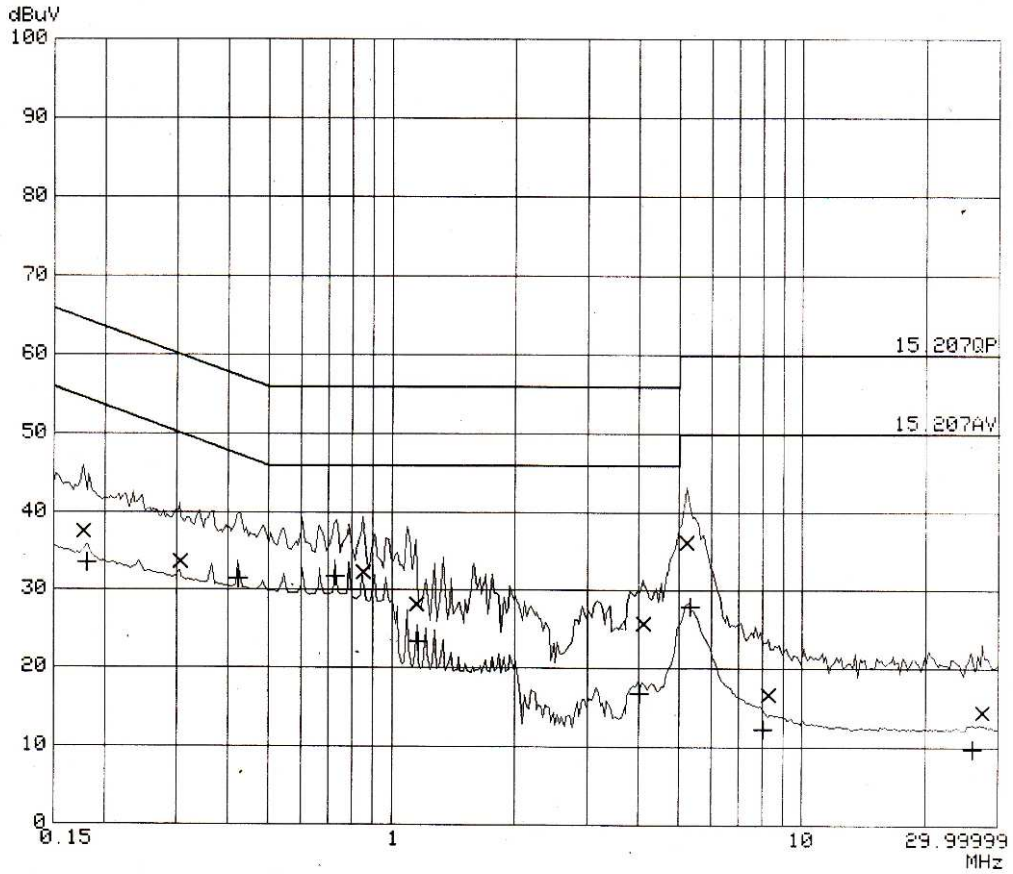
Plot 3.2.8 "Neutral" 914,4 MHz, 220 kbps



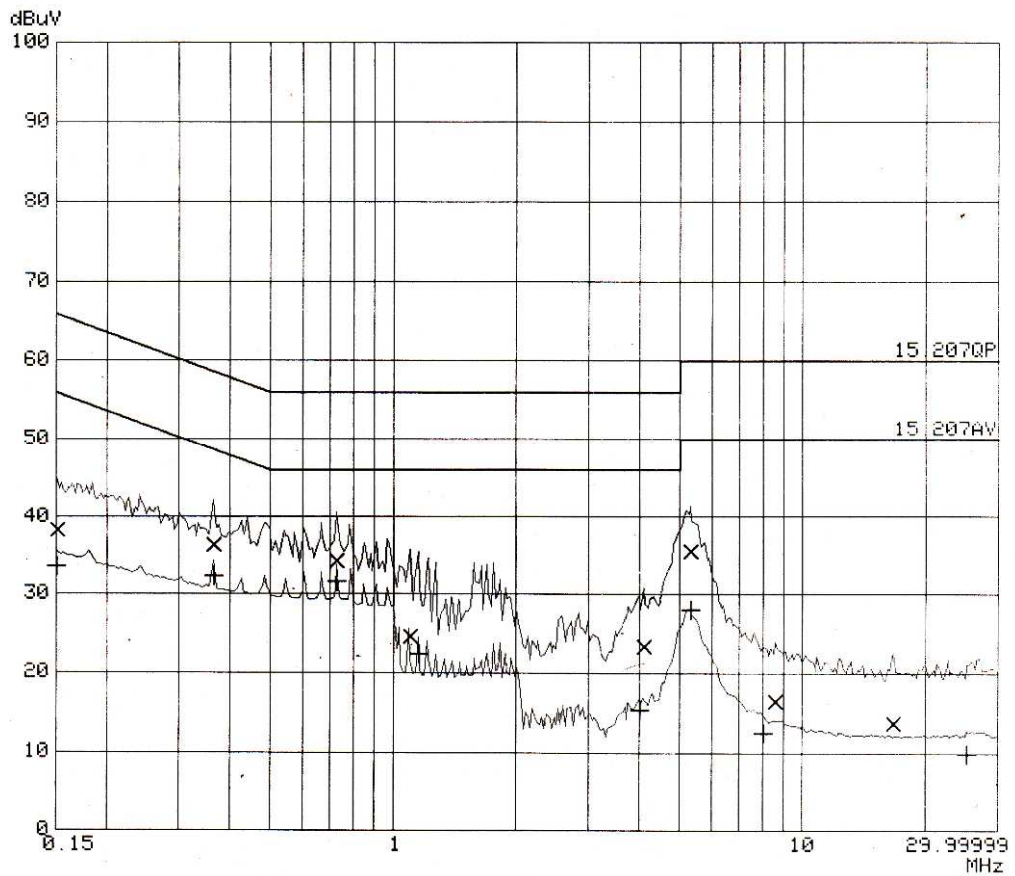
Plot 3.2.9 "Phase" 924,8 MHz, 110 kbps



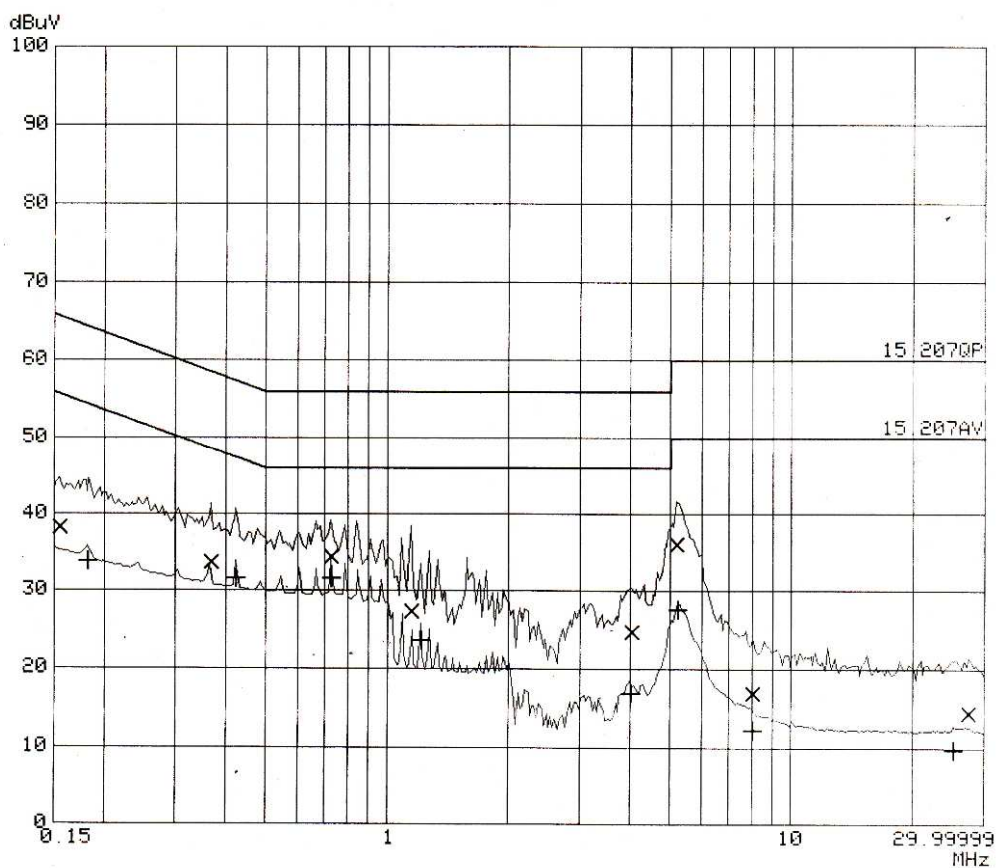
Plot 3.2.10 "Neutral" 924,8 MHz, 110 kbps



Plot 3.2.11 "Phase" 924,8 MHz, 220 kbps



Plot 3.2.12 "Neutral" 924,8 MHz, 220 kbps



3.3 Conducted Emissions

3.3.1 Test requirements of 15.107

(a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

3.3.2 Test procedure (ANSI C63.10-2013, Sections 6.3)

The EUT was placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

The measurements were performed on the line under test in a 2m x 2m x 2m screened enclosure by means of an Impedance Stabilization Network (ISN) bonded to the ground plane and connected to the spectrum analyzer. The EUT was placed on a non-metallic table, 0.8m above the ground reference plane and was configured, arranged and operated in a manner consistent with typical application and load conditions. Normal performance of the EUT was verified.

Conducted common mode (asymmetric mode) disturbance at the tested port was investigated in the appropriate frequency range using the resolution-bandwidth per CISPR16-1, Table 7, and QP and Average readings were taken.

Worst-case results were recorded.

3.3.3 Test result

Temperature: +20°C

Relative humidity: 63%

EUT OPERATING MODE: Idle

Table 3.3.1 Conducted emission test result**"Phase" (QP detector)**

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	QP	QP	QP	
0.15345	37.1	65.8	28.7	Pass
0.30148	34.0	60.2	26.2	Pass
0.74091	33.4	56.0	22.6	Pass
1.15967	27.2	56.0	28.8	Pass
4.03873	24.1	56.0	31.9	Pass
5.24376	34.4	60.0	25.6	Pass
8.97210	16.7	60.0	43.3	Pass
25.81492	13.9	60.0	46.1	Pass

"Phase" (AV detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	AV	AV	AV	
0.18174	30.2	54.4	24.2	Pass
0.43945	28.7	47.1	18.4	Pass
0.74209	29.3	46.0	16.7	Pass
1.19984	21.6	46.0	24.4	Pass
4.03873	13.7	46.0	32.3	Pass
5.31653	24.5	50.0	25.5	Pass
7.98311	9.3	50.0	40.7	Pass
26.79320	8.4	50.0	41.6	Pass

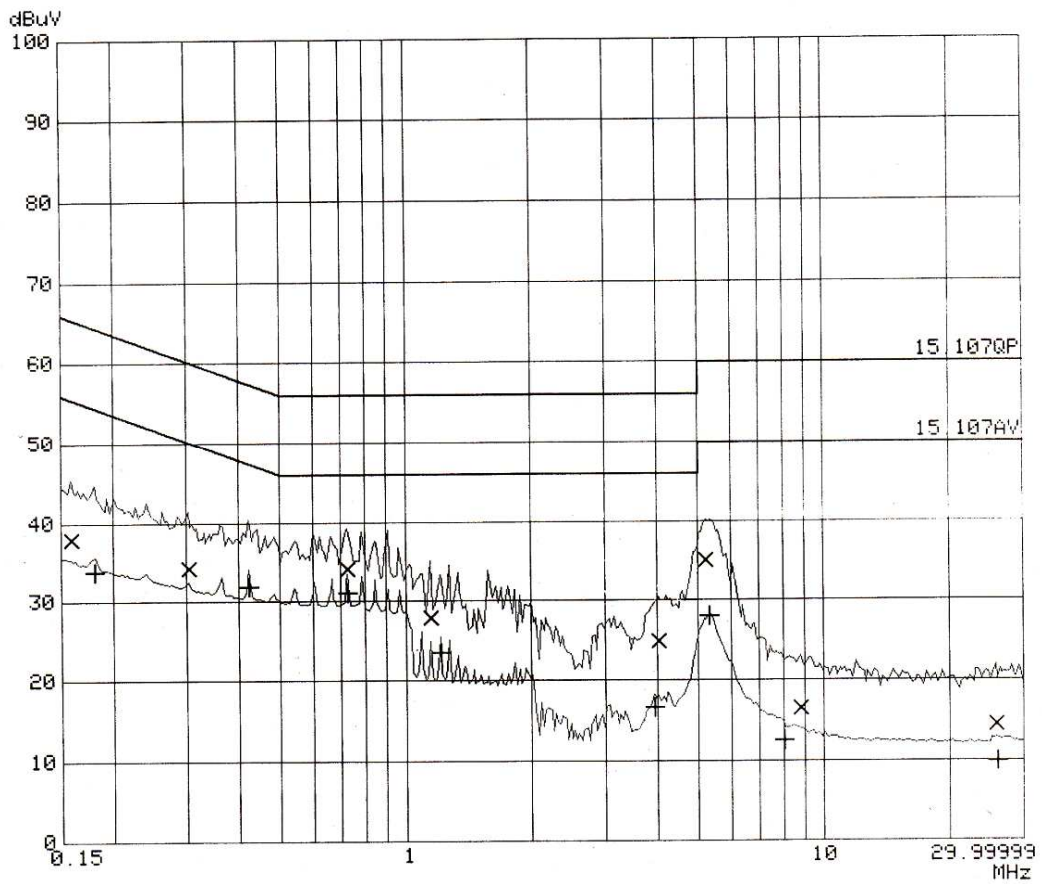
"Neutral" (QP detector)

Frequency, MHz	Measured Result, dB μ V	Limit, dB μ V	Margin, dB	Result (Pass, Fail, N/A)
	QP	QP	QP	
0.15830	37.4	65.6	28.2	Pass
0.30832	33.1	60.0	26.9	Pass
0.72335	34.4	56.0	21.6	Pass
1.27467	28.4	56.0	27.6	Pass
3.92601	24.5	56.0	31.5	Pass
5.36892	35.1	60.0	24.9	Pass
8.12494	16.5	60.0	43.5	Pass
28.26531	14.0	60.0	46.0	Pass

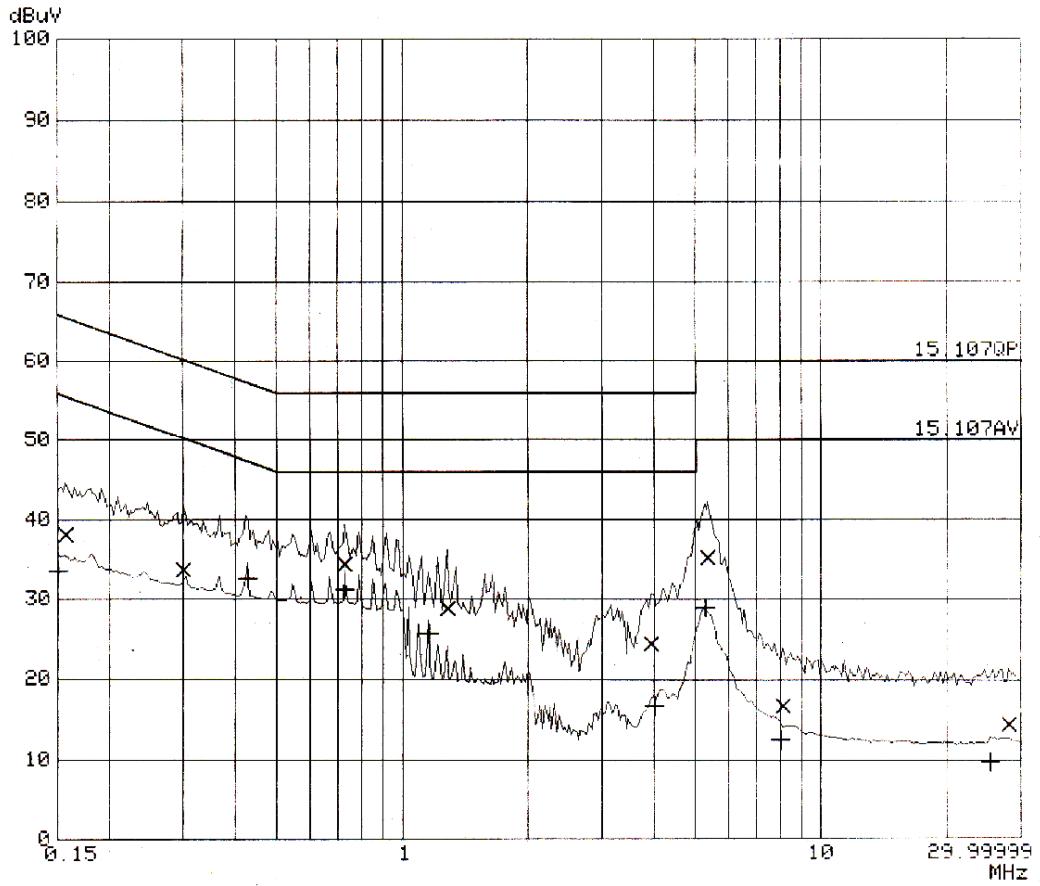
"Neutral" (AV detector)

Frequency, MHz	Measured Result, dBμV	Limit, dBμV	Margin, dB	Result (Pass, Fail, N/A)
	AV	AV	AV	
0.15034	32.5	56.0	23.5	Pass
0.43877	32.4	47.1	14.7	Pass
0.73590	28.0	46.0	18.0	Pass
1.16432	22.9	46.0	23.1	Pass
3.90654	16.4	46.0	29.6	Pass
5.29129	29.0	50.0	21.0	Pass
7.89564	11.0	50.0	39.0	Pass
25.34582	6.0	50.0	44.0	Pass

Plot 3.3.1 "Phase"



Plot 3.3.2 "Neutral"



3.4 Spurious Emissions (radiated)

3.4.1 Test requirements 15.247 (d)

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least **20 dB** below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b) (3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209 (a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205 (a), must also comply with the radiated emission limits specified in § 15.209 (a) (see § 15.205 (c)).

Table 3.4.1 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3 m within restricted bands, dB(μ V/m) ^{***}			Attenuation of field strength of spurious versus carrier outside restricted bands, dBc ^{***}
	Peak	Quasi Peak	Average	
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	20.0
0.090 – 0.110	NA	108.5 – 106.8**	NA	
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**	
0.490 – 1.705	NA	73.8 – 63.0**	NA	
1.705 – 30.0*		69.5		
30 – 88		40.0		
88 – 216		43.5		
216 – 960		46.0		
960 – 1000		54.0		
1000 – 10 th harmonic	74.0	NA	54.0	

* - The limit for 3 m test distance was calculated using inverse square distance extrapolation factor as follows:

$$\text{Lim}_{s_2} = \text{Lim}_{s_1} + 40\log(S_1/S_2),$$

where S_1 and S_2 – standard defined and test distance respectively in meters.

** - The limit decreases linearly with the logarithm of frequency.

*** - The field strength limits applied from lower radio frequency generated in the device, without going below 9 kHz up to the tenth harmonic of the highest fundamental frequency.

Table 3.4.2 Restricted bands

MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.37625 - 8.38675	73 - 74.6	399.9 - 410	2690 - 2900	10.6 - 12.7
0.495 - 0.505	8.41425 - 8.41475	74.8 - 75.2	608 - 614	3260 - 3267	13.25 - 13.4
2.1735 - 2.1905	12.29 - 12.293	108 - 121.94	960 - 1240	3332 - 3339	14.47 - 14.5
4.125 - 4.128	12.51975 - 12.52025	123 - 138	1300 - 1427	3345.8 - 3358	15.35 - 16.2
4.17725 - 4.17775	12.57675 - 12.57725	149.9 - 150.05	1435 - 1626.5	3600 - 4400	17.7 - 21.4
4.20725 - 4.20775	13.36 - 13.41	156.52475 - 156.52525	1645.5 - 1646.5	4500 - 5150	22.01 - 23.12
6.215 - 6.218	16.42 - 16.423	156.7 - 156.9	1660 - 1710	5350 - 5460	23.6 - 24
6.26775 - 6.26825	16.69475 - 16.69525	162.0125 - 167.17	1718.8 - 1722.2	7250 - 7750	31.2 - 31.8
6.31175 - 6.31225	16.80425 - 16.80475	167.72 - 173.2	2200 - 2300	8025 - 8500	36.43 - 36.5
8.291 - 8.294	25.5 - 25.67	240 - 285	2310 - 2390	9000 - 9200	Above 38.6
8.362 - 8.366	37.5 - 38.25	322 - 335.4	2483.5 - 2500	9300 - 9500	

3.4.2 Test procedure (Public Notice DA 00-705; ANSI C63.4)

The transmitter was set to the normal operational mode with the maximum power rating.

Measurements of spurious emissions outside restricted bands.

Measurement were made in the anechoic chamber with metal floor (in the band of 9 kHz - 1000 MHz) and in fully anechoic chamber (1000 MHz - 10000 MHz) at distance of 3 m. The turntable was rotated, test antenna height (in the band 30 MHz-1000 MHz) was altered in the range of 1-4m (in the chamber with metal floor), test antenna polarization was changed from horizontal to vertical to find maximum reading. In the frequency range of 9 kHz to 30 MHz measurements were made with loop antenna placed at the height of 1 m.

1) Reference power was measured on the center frequency of the signal at distance of 3 m using biconical antenna by the test receiver with the following settings: RBW = 100 kHz, VBW = 300 kHz, Video Detector = Positive Peak.

Spurious emissions were measured:

- 2) In the band of 9 kHz - 30 MHz with active loop antenna and with the following test receiver settings: RBW =100 kHz; VBW=300 kHz; Video Detector = Positive Peak.
- 3) In the band of 30 MHz - 1000 MHz with biconical antenna and with the following test receiver settings: RBW = 100 kHz; VBW = 300 kHz; Video Detector = Positive Peak.
- 4) In the band of 1000 MHz - 10000 MHz with horn antenna and with the following test receiver settings: RBW = 100 kHz; VBW = 300 kHz; Video Detector = Positive Peak.
- 5) The worst test results (the lowest margins) were recorded and shown in the associated plots.

Measurements of spurious emissions within restricted bands below 1 GHz.

Measurement were made in the anechoic chamber with metal ground floor at distance of 3 m. The turntable was rotated, test antenna height (above 30 MHz) was altered in the range of 1-4m, test antenna polarization was changed from horizontal to vertical to find maximum reading.

Spurious emissions were measured:

- 1) In the band of 9 kHz - 150 kHz with active loop antenna and with the following settings of test receiver: RBW = 1 kHz; VBW = 3 kHz; Video Detector = Positive Peak - during prequalification measurement, Quasi-Peak - during final measurement.
- 2) In the band of 150 kHz - 30 MHz with active loop antenna and with the following settings of test receiver: RBW = 10 kHz; VBW = 30 kHz, Video Detector = Positive Peak - during prequalification measurement, Quasi-Peak - during final measurement.
- 3) In the band of 30 MHz - 1000 MHz with biconical antenna and with the following settings of test receiver: RBW = 120 kHz, VBW = 300 kHz, Video Detector = Positive Peak - during prequalification measurement, Quasi-Peak - during final measurement.
- 4) The worst test results (the lowest margins) were recorded and shown in the associated plots.

Measurements of spurious emissions within restricted bands above 1 GHz.

Measurements were made in the anechoic chamber at distance of 3 m. The turntable was rotated; test antenna polarization was changed from horizontal to vertical to find maximum reading.

Spurious emissions were measured:

- 1) In the band of 1000 MHz - 10000 MHz with horn antenna and with the following settings of test receiver: RBW = 1 MHz, VBW = 3 MHz, Video Detector = Positive Peak - during prequalification measurement, Average - during final measurement.
- 2) The worst test results (the lowest margins) were recorded and shown in the associated plots.

Figure 3.4.1 Test setup layout (below 30 MHz)

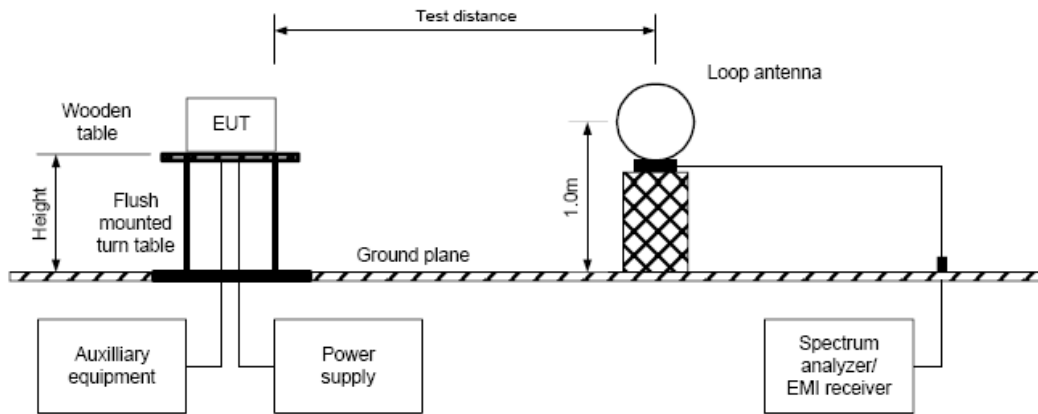
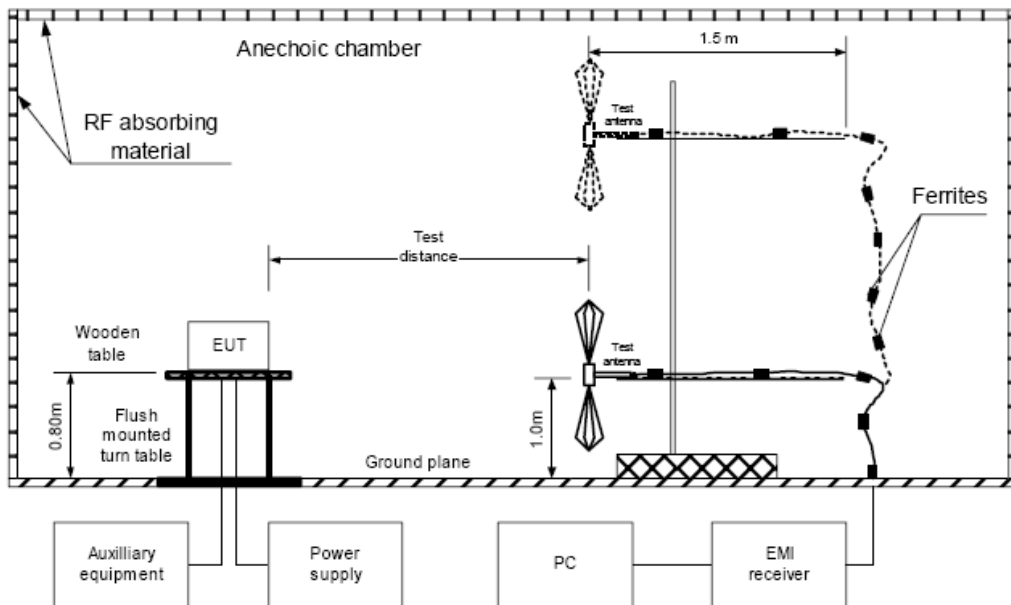


Figure 3.4.2 Test setup layout (above 30 MHz and below 10 GHz)

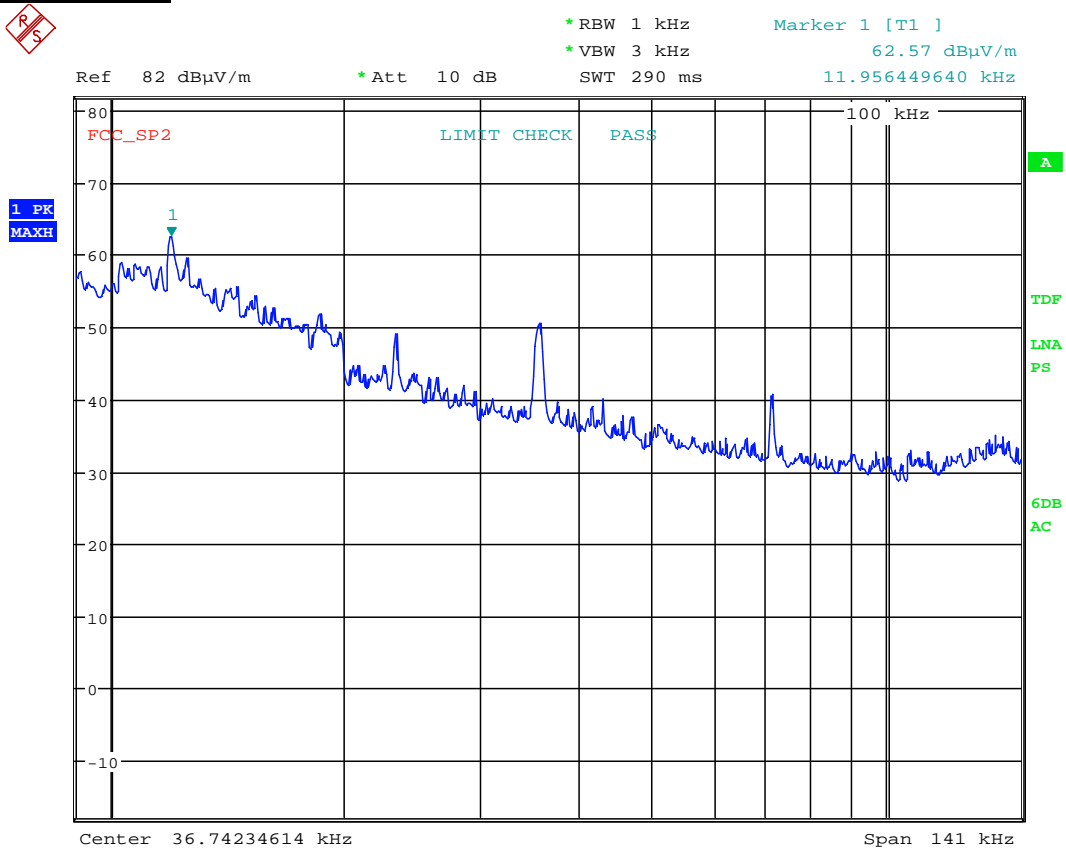


3.4.3 Test result 9 kHz - 10000 kHz

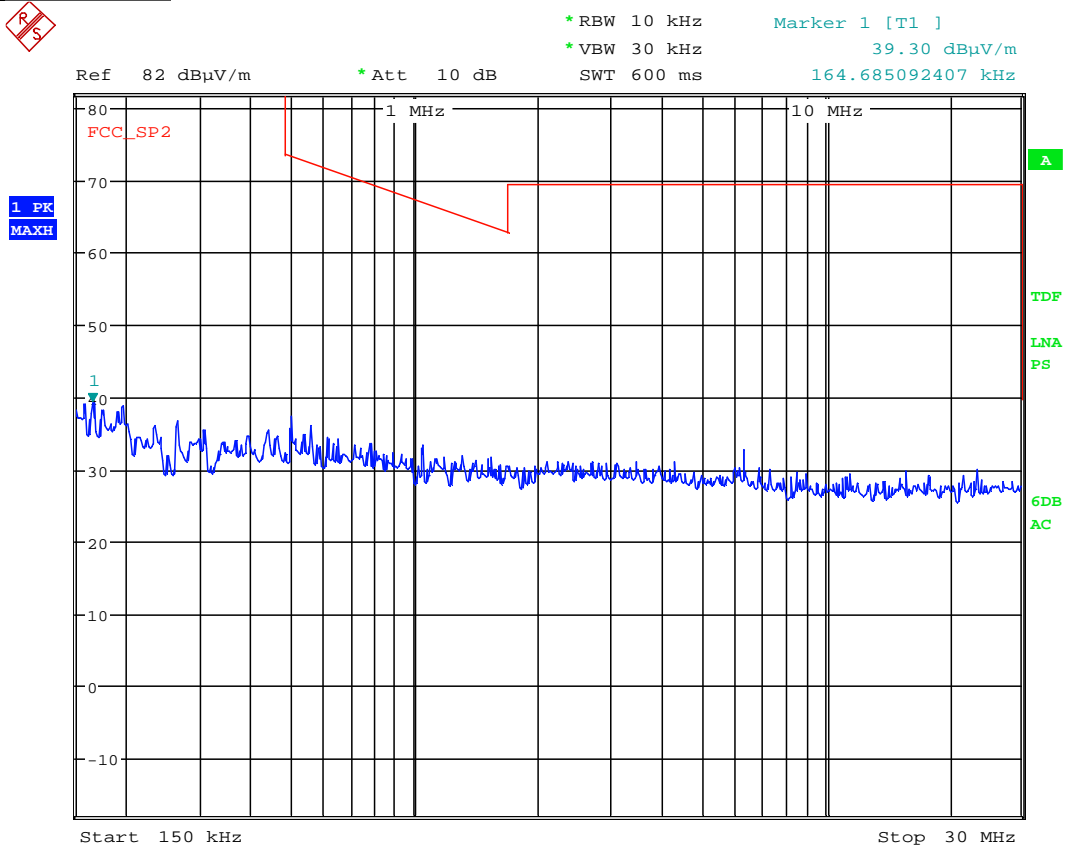
Temperature: +18 °C

Relative humidity: 45 %

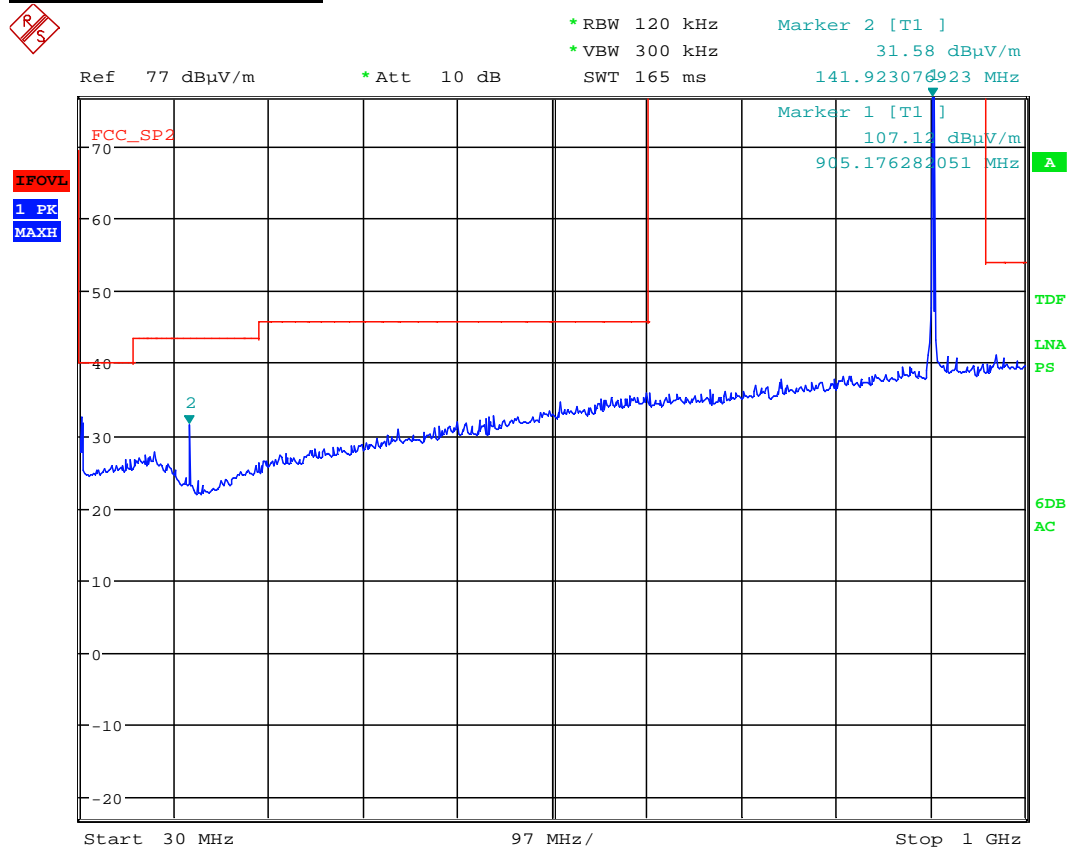
Plot 3.4.1 Radiated emission measurements from 9 kHz to 150 kHz at the 904.8 MHz carrier frequency (step 400 kHz)



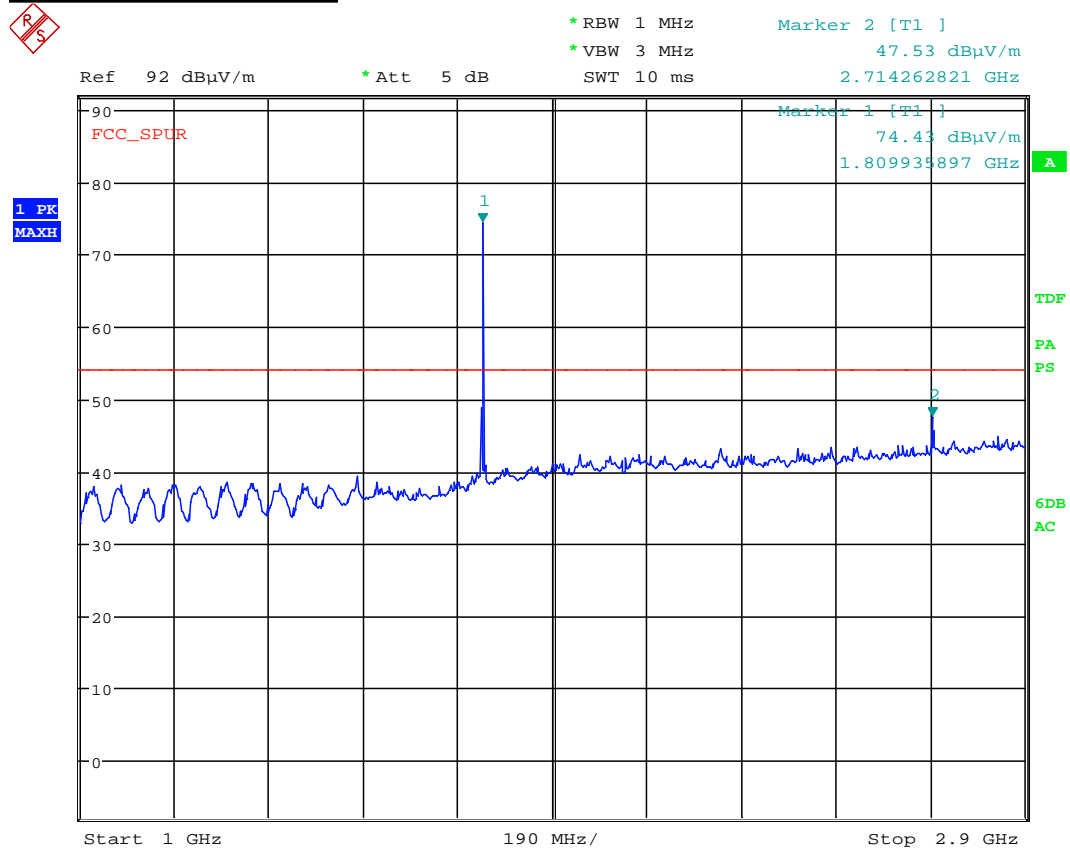
Plot 3.4.2 Radiated emission measurements from 150 kHz to 30 MHz at the 904.8 MHz carrier frequency (step 400 kHz)



Plot 3.4.3 Radiated emission measurements from 30 MHz to 1000 MHz at the 904.8 MHz carrier frequency (step 400 kHz)

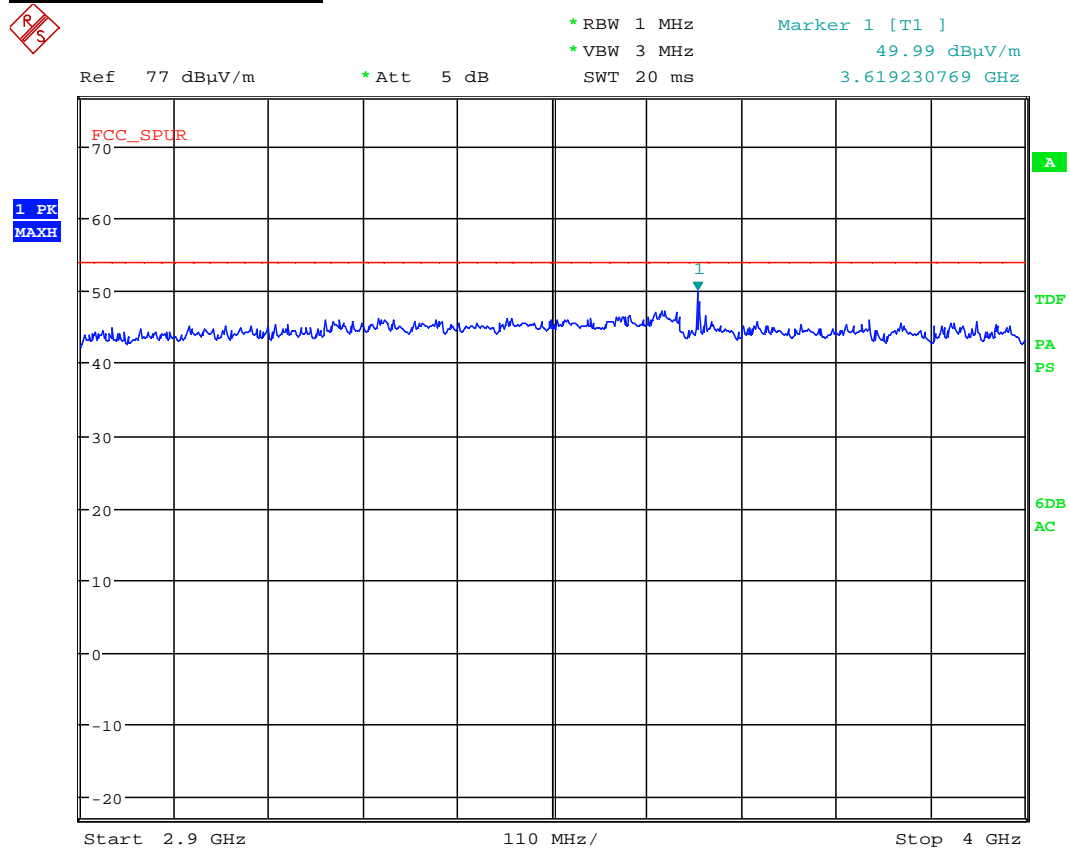


Plot 3.4.4 Radiated emission measurements from 1000 MHz to 2900 MHz at the 904.8 MHz carrier frequency (step 400 kHz)*

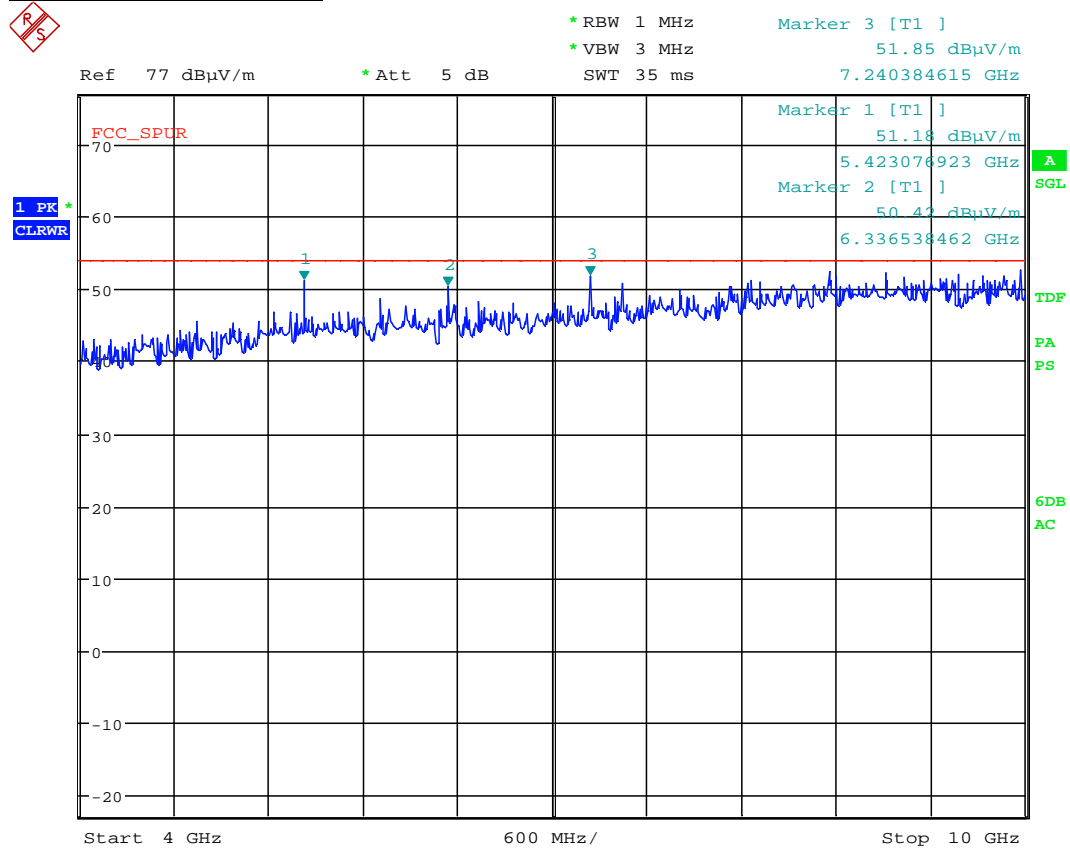


* - limit for restricted bands does not apply to the second harmonic (904.8 MHz)

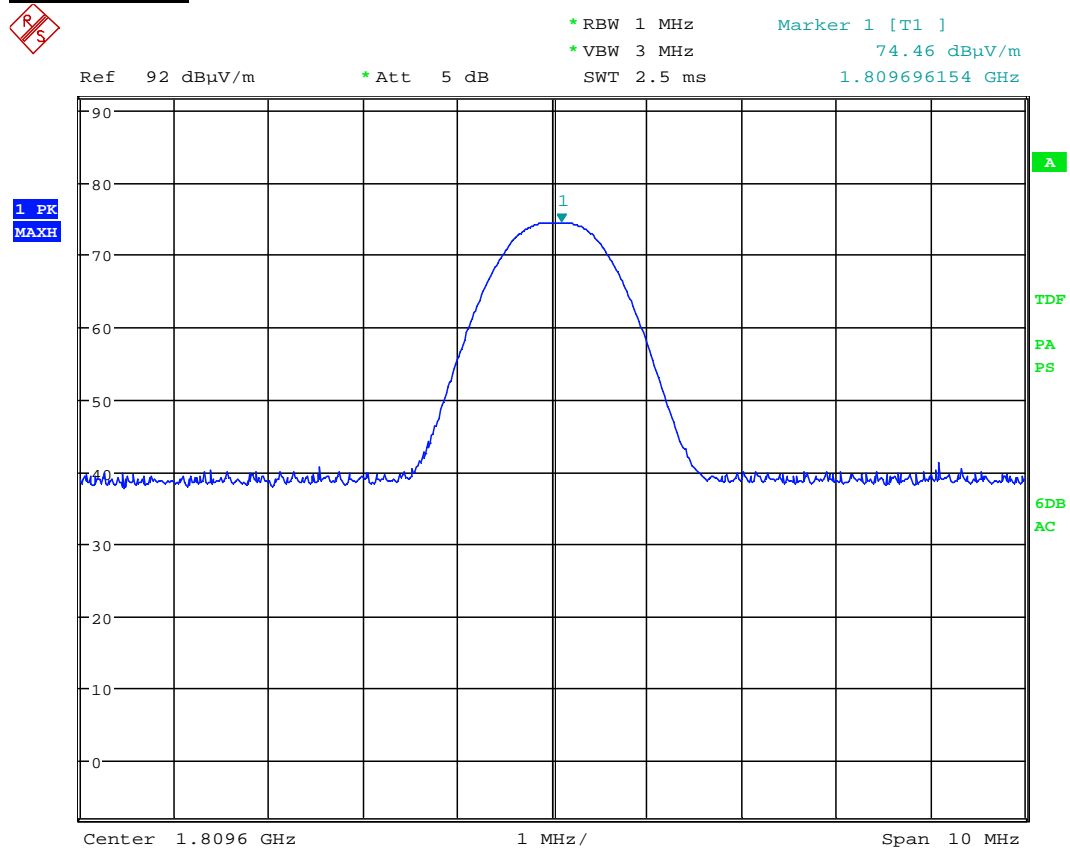
Plot 3.4.5 Radiated emission measurements from 2900 MHz to 4000 MHz at the 904.8 MHz carrier frequency (step 400 kHz)



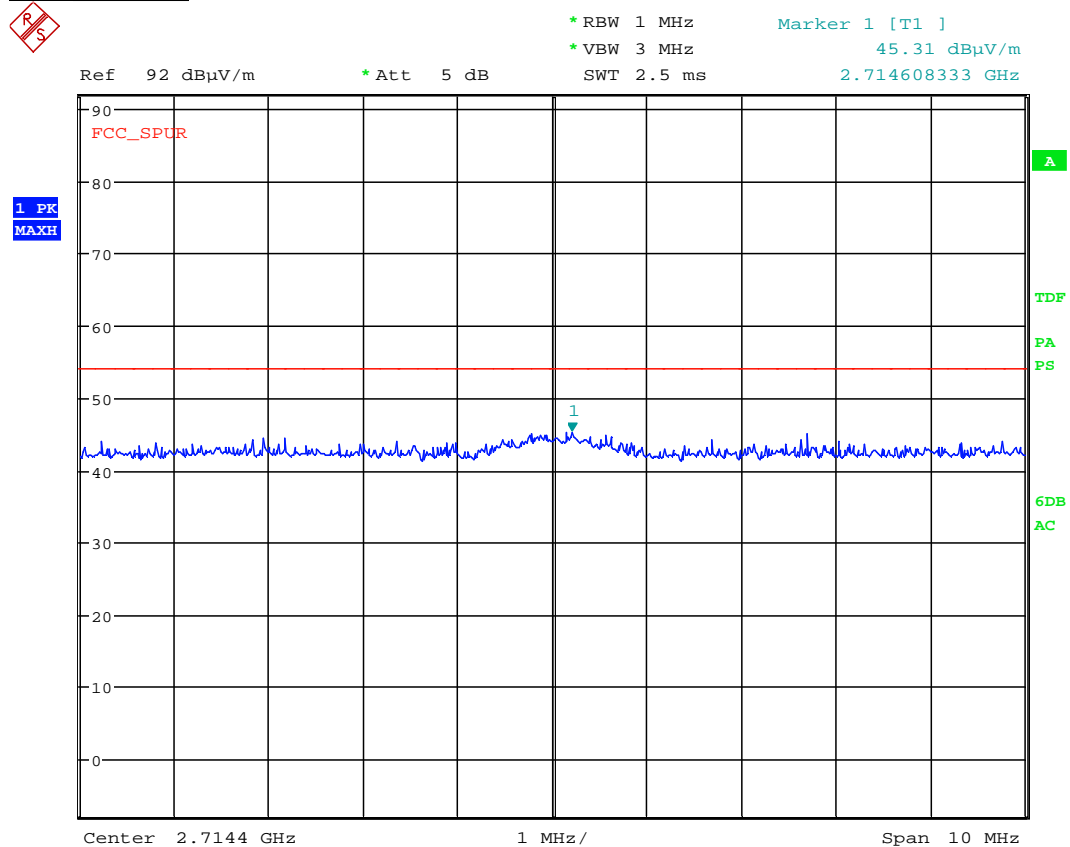
Plot 3.4.6 Radiated emission measurements from 4000 MHz to 10000 MHz at the 904.8 MHz carrier frequency (step 400 kHz)



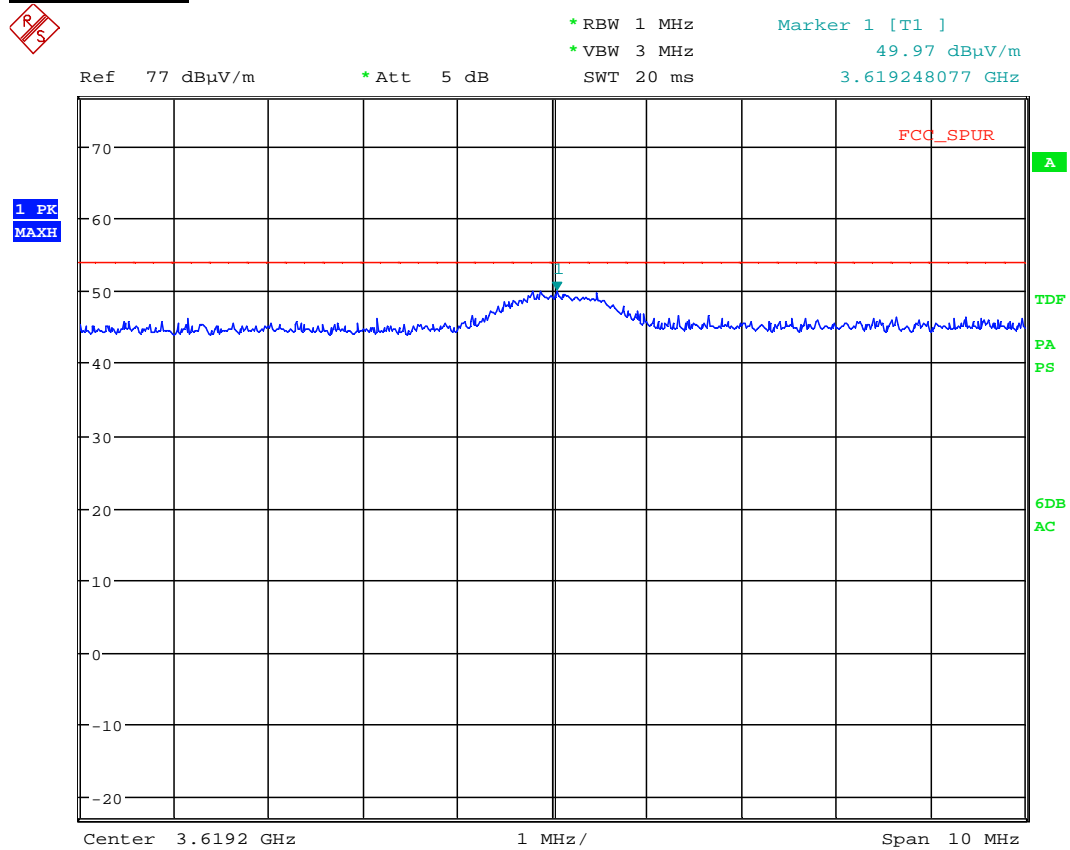
Plot 3.4.7 Radiated emission measurements at the second harmonic of 904.8 MHz carrier frequency (step 400 kHz)



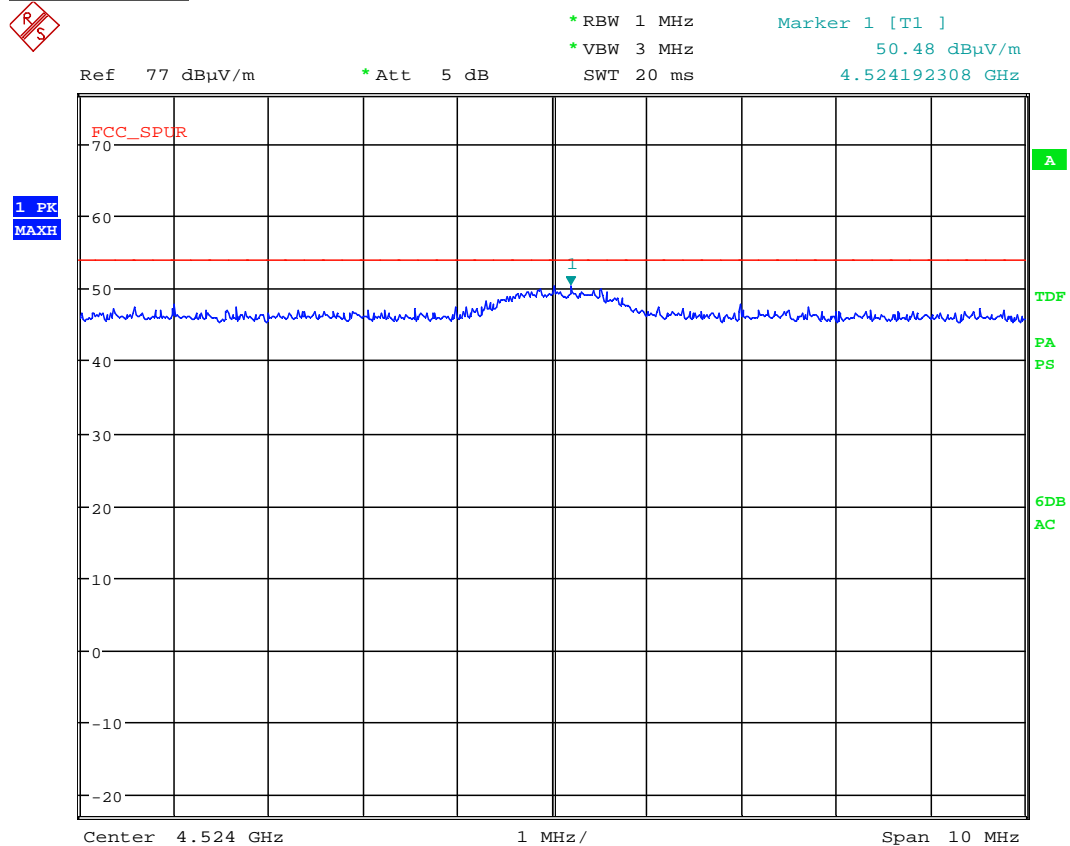
Plot 3.4.8 Radiated emission measurements at the third harmonic of 904.8 MHz carrier frequency (step 400 kHz)



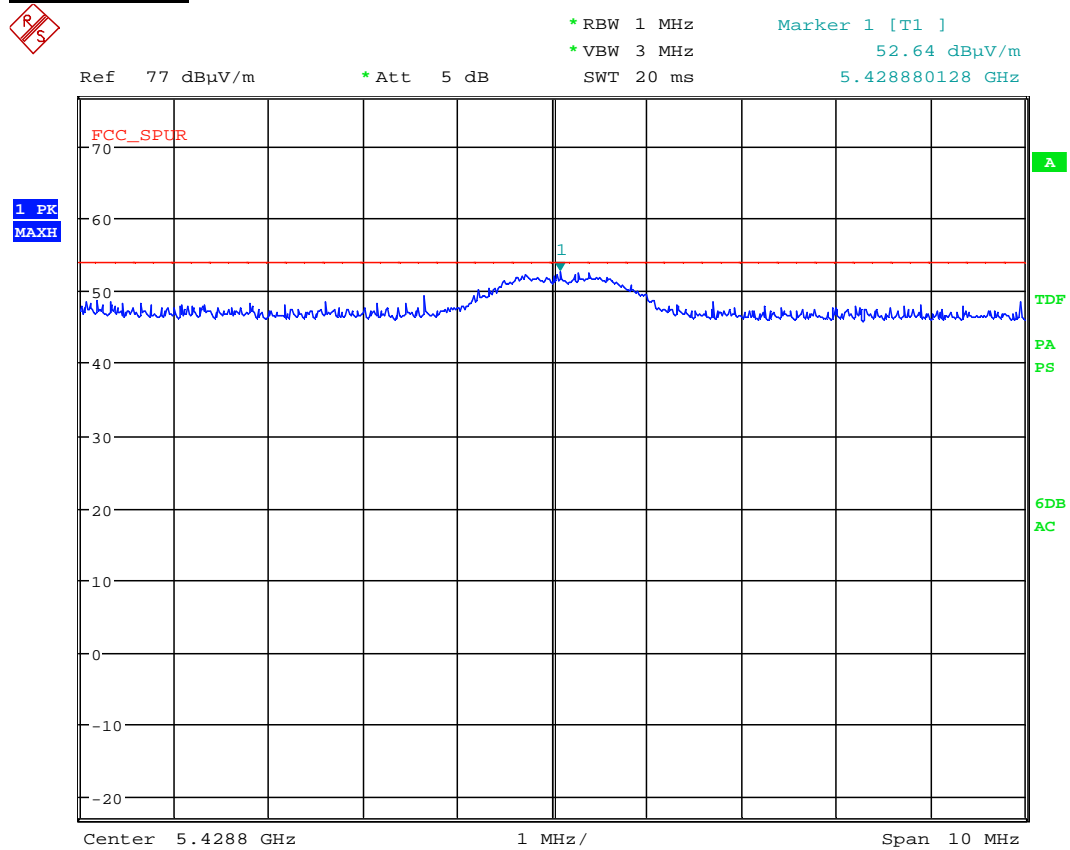
Plot 3.4.9 Radiated emission measurements at the fourth harmonic of 904.8 MHz carrier frequency (step 400 kHz)



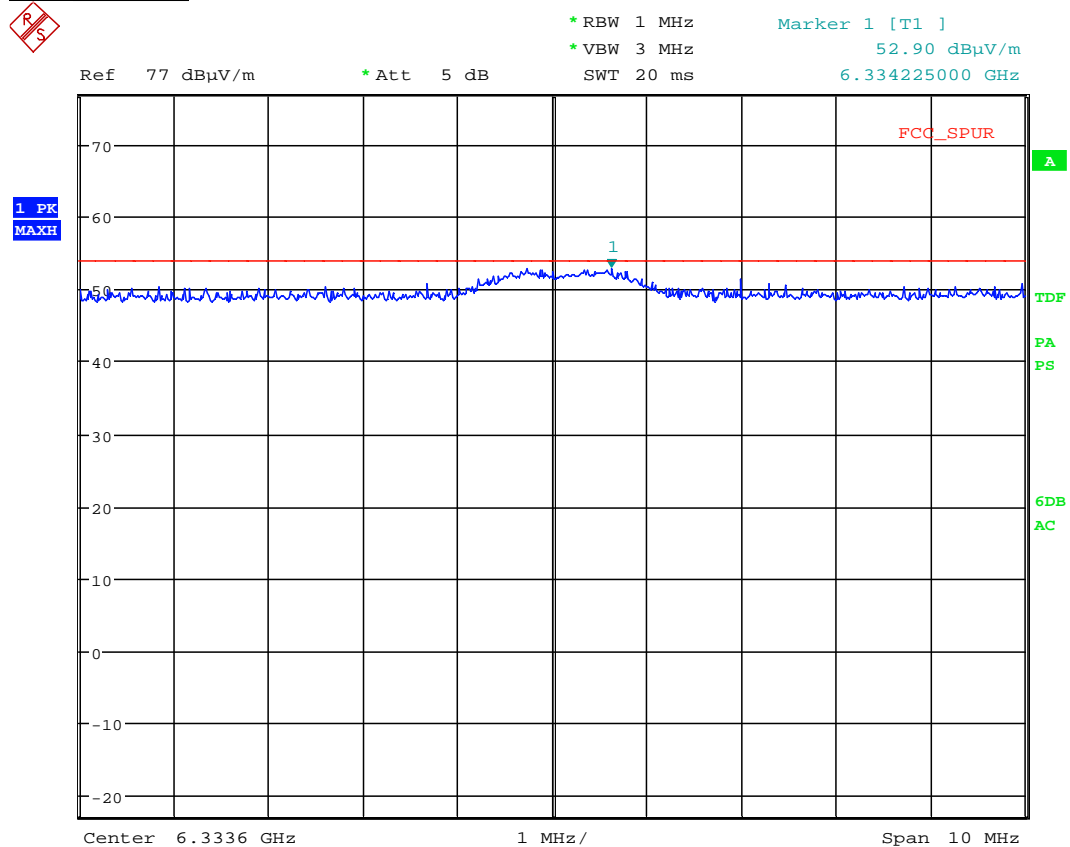
Plot 3.4.10 Radiated emission measurements at the fifth harmonic of 904.8 MHz carrier frequency (step 400 kHz)



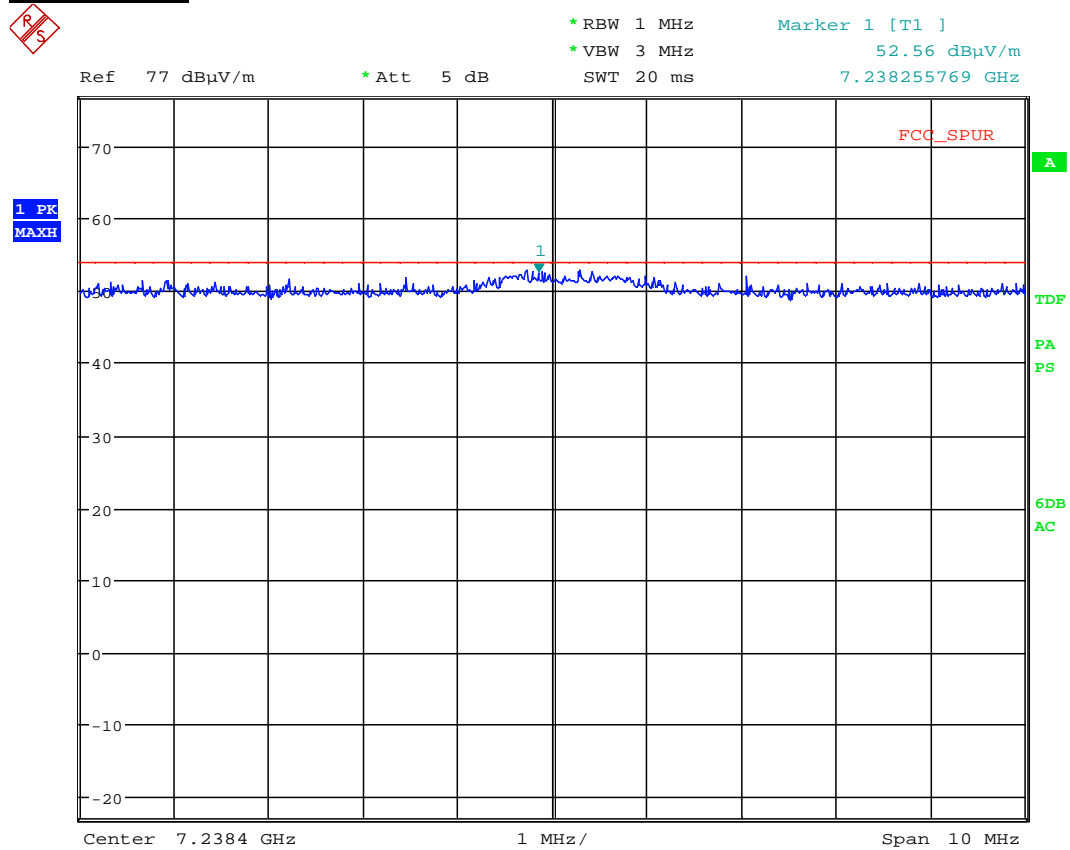
Plot 3.4.11 Radiated emission measurements at the sixth harmonic of 904.8 MHz carrier frequency (step 400 kHz)



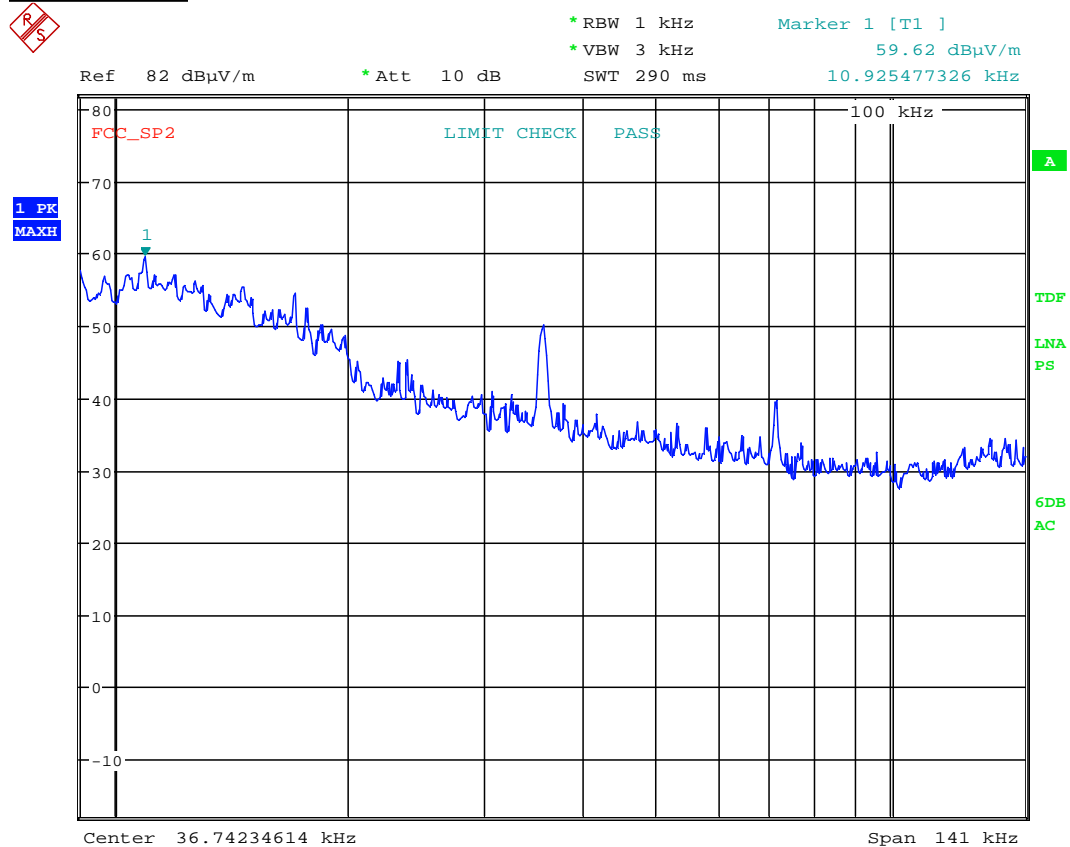
Plot 3.4.12 Radiated emission measurements at the seventh harmonic of 904.8 MHz carrier frequency (step 400 kHz)



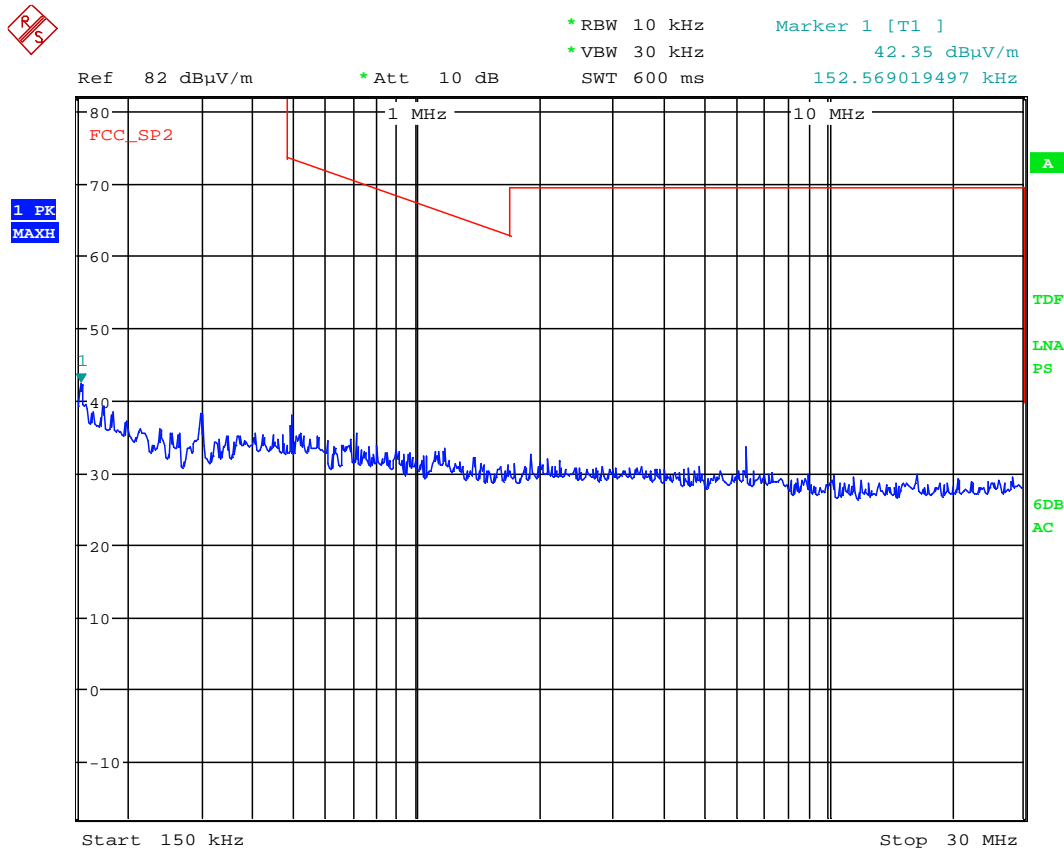
Plot 3.4.13 Radiated emission measurements at the eighth harmonic of 904.8 MHz carrier frequency (step 400 kHz)



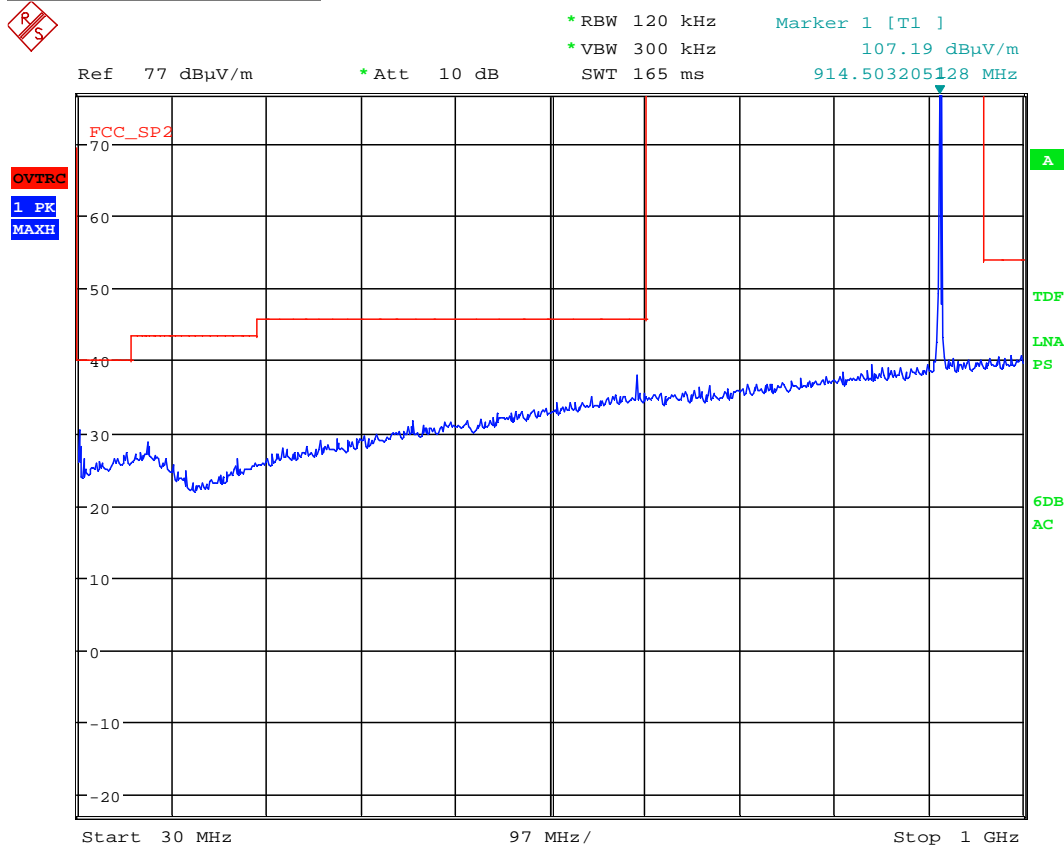
Plot 3.4.14 Radiated emission measurements from 9 kHz to 150 kHz at the 914.4 MHz carrier frequency (step 400 kHz)



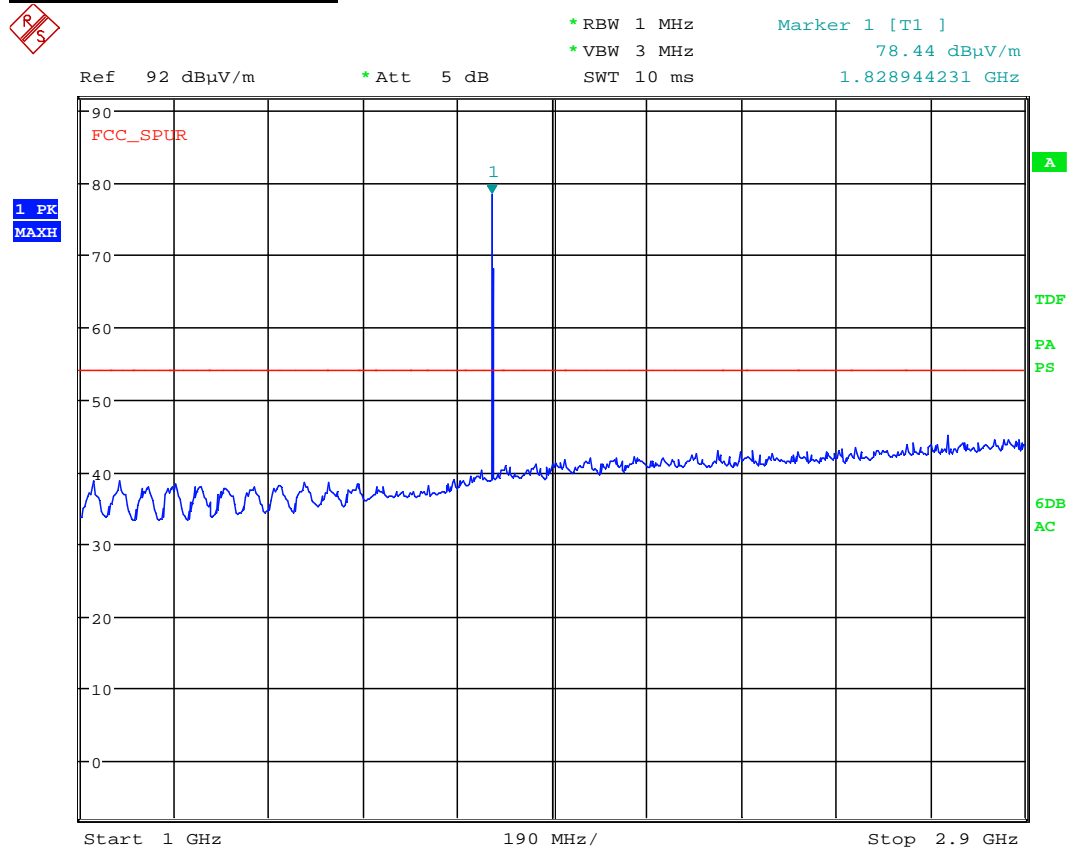
Plot 3.4.15 Radiated emission measurements from 150 kHz to 30 MHz at the 914.4 MHz carrier frequency (step 400 kHz)



Plot 3.4.16 Radiated emission measurements from 30 MHz to 1000 MHz at the 914.4 MHz carrier frequency (step 400 kHz)

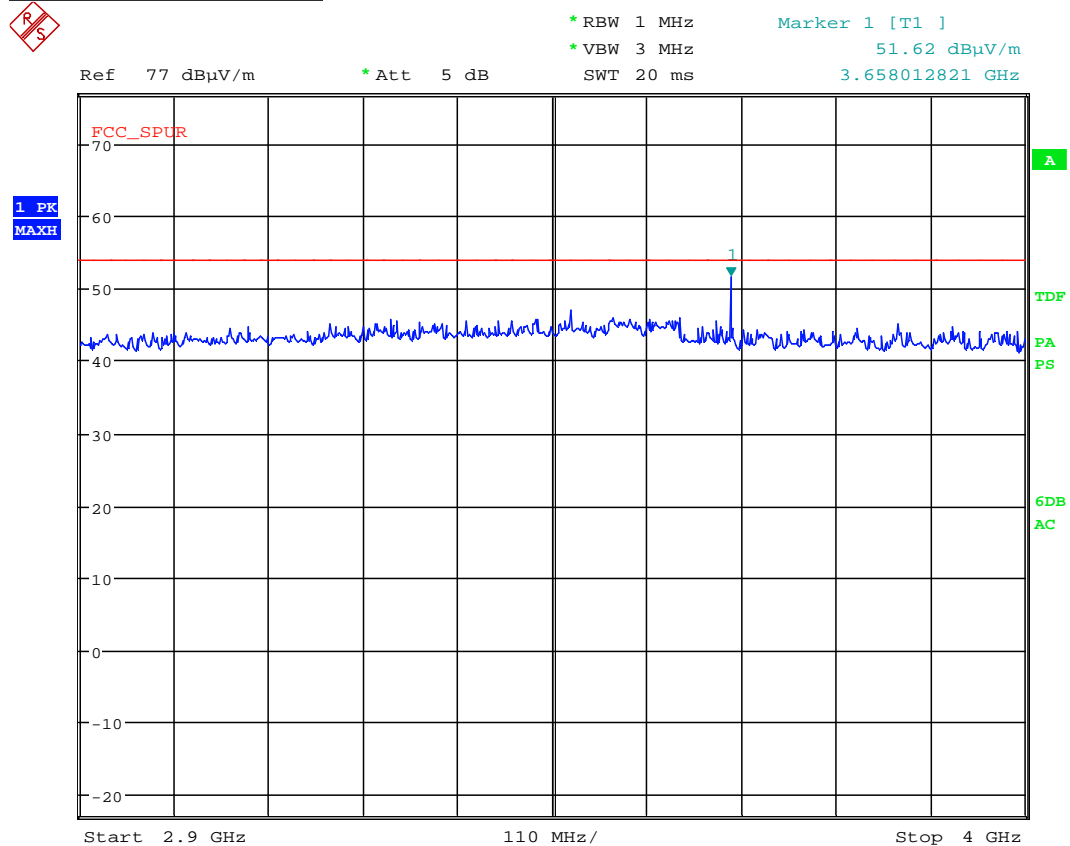


Plot 3.4.17 Radiated emission measurements from 1000 MHz to 2900 MHz at the 914.4 MHz carrier frequency (step 400 kHz)*

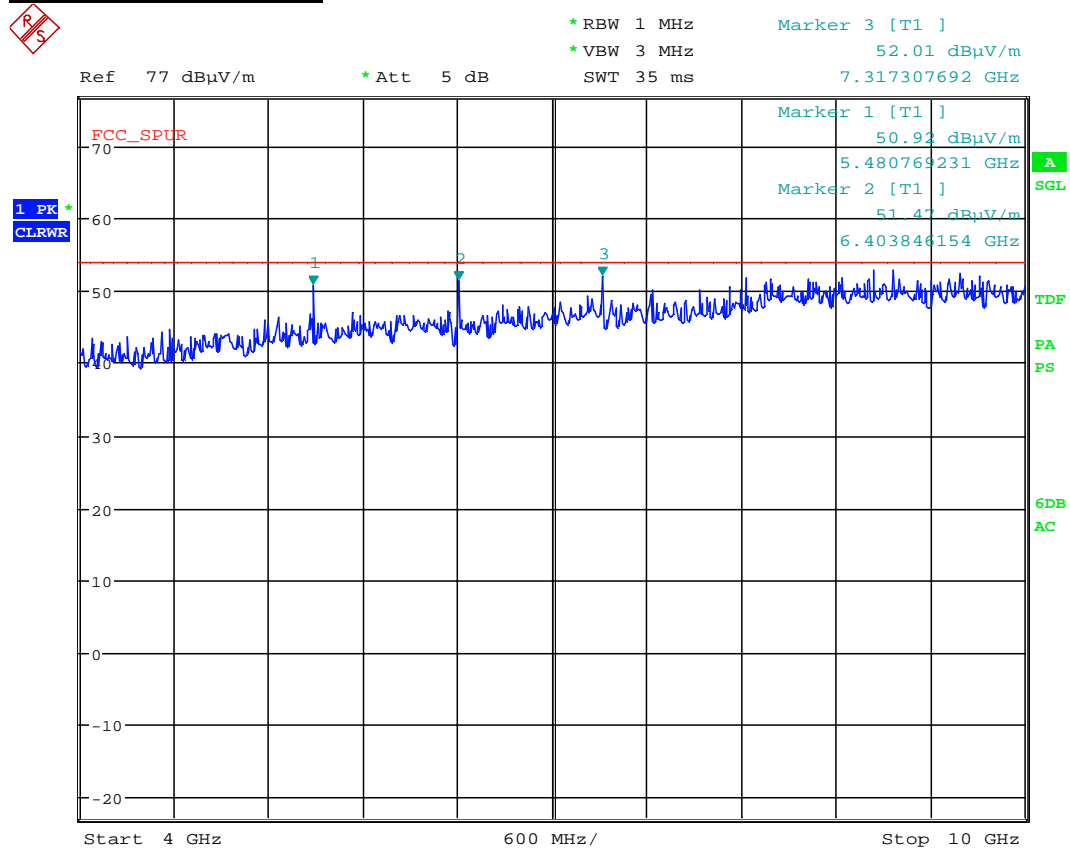


* - limit for restricted bands does not apply to the second harmonic (914.4 MHz)

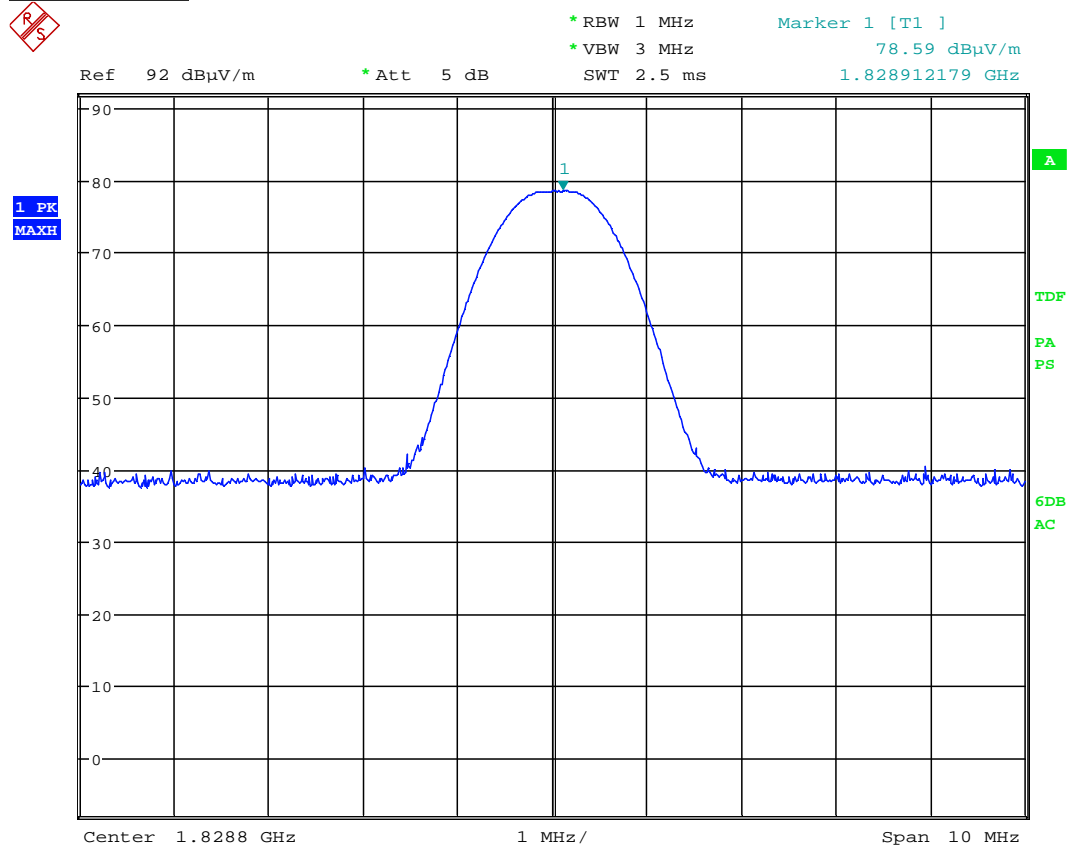
Plot 3.4.18 Radiated emission measurements from 2900 MHz to 4000 MHz at the 914.4 MHz carrier frequency (step 400 kHz)



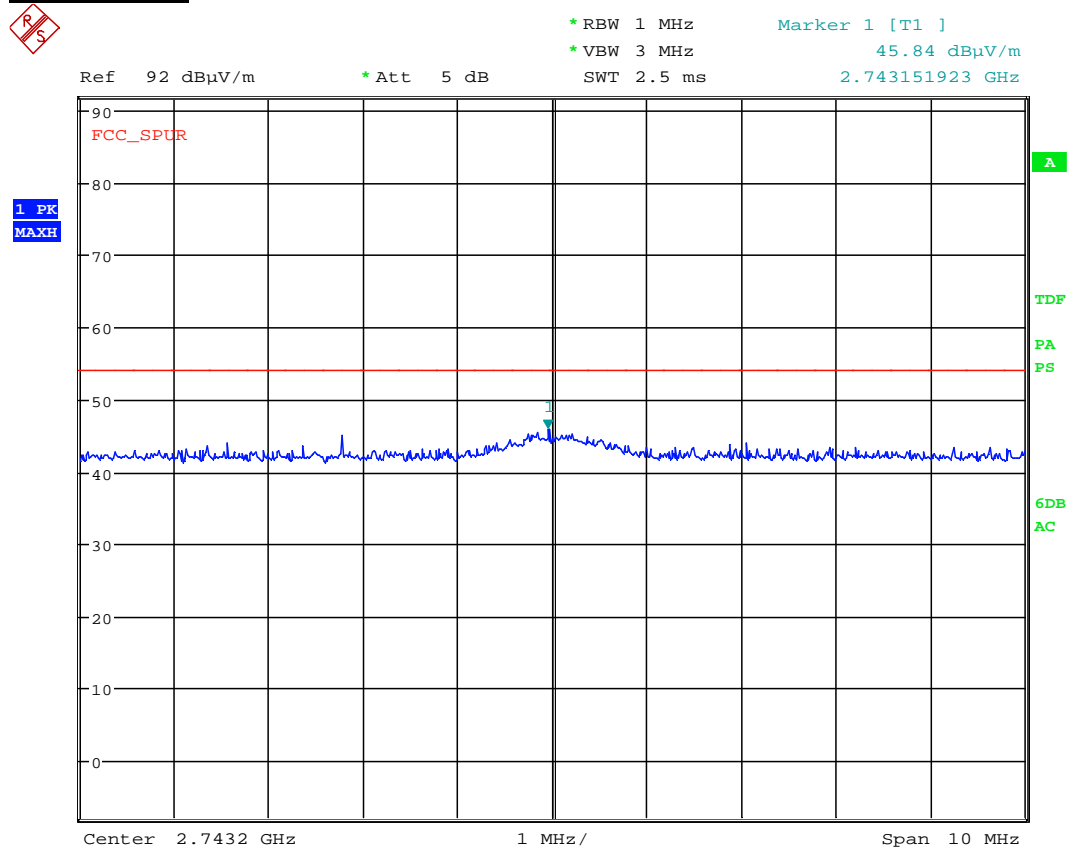
Plot 3.4.19 Radiated emission measurements from 4000 MHz to 10000 MHz at the 914.4 MHz carrier frequency (step 400 kHz)



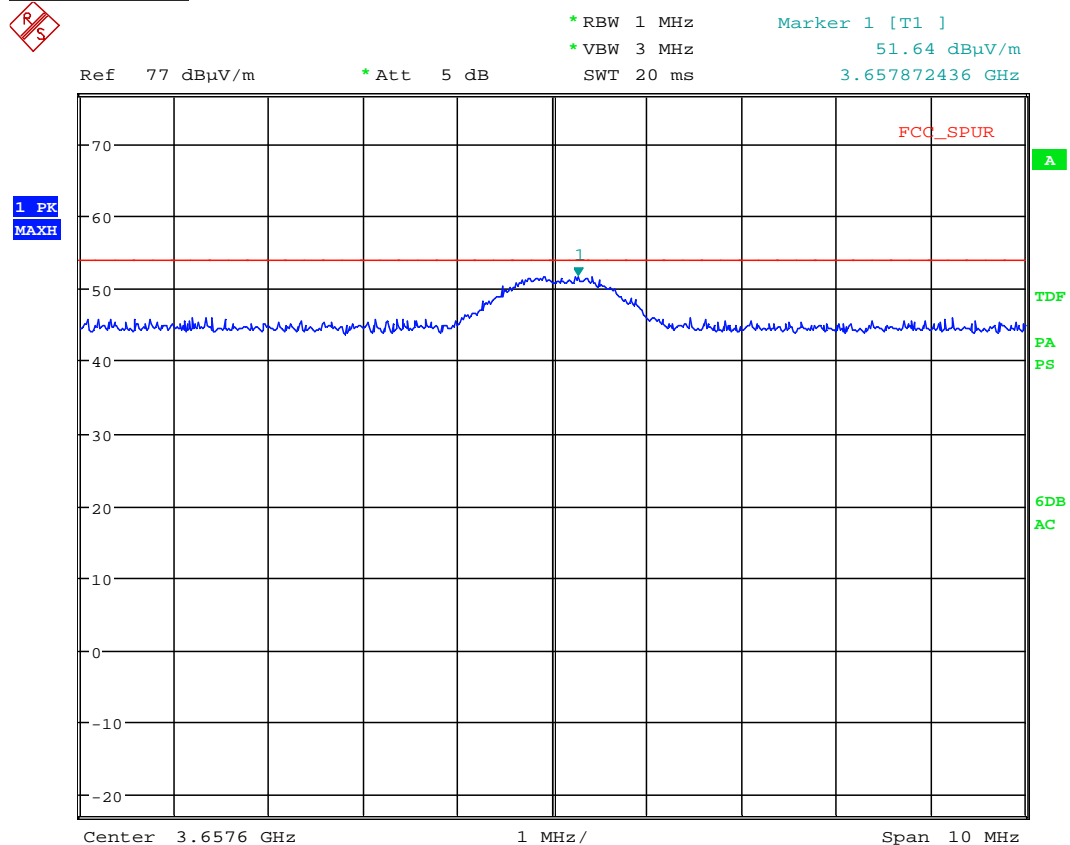
Plot 3.4.20 Radiated emission measurements at the second harmonic of 914.4 MHz carrier frequency (step 400 kHz)



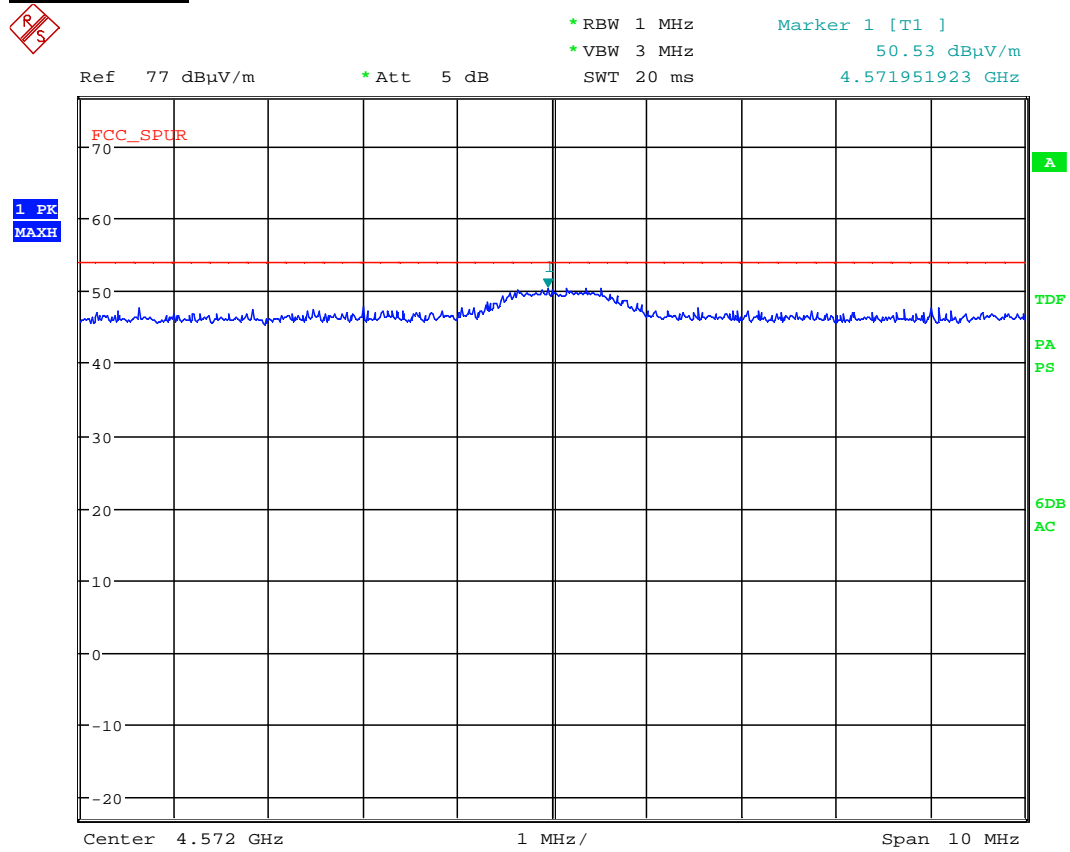
Plot 3.4.21 Radiated emission measurements at the third harmonic of 914.4 MHz carrier frequency (step 400 kHz)



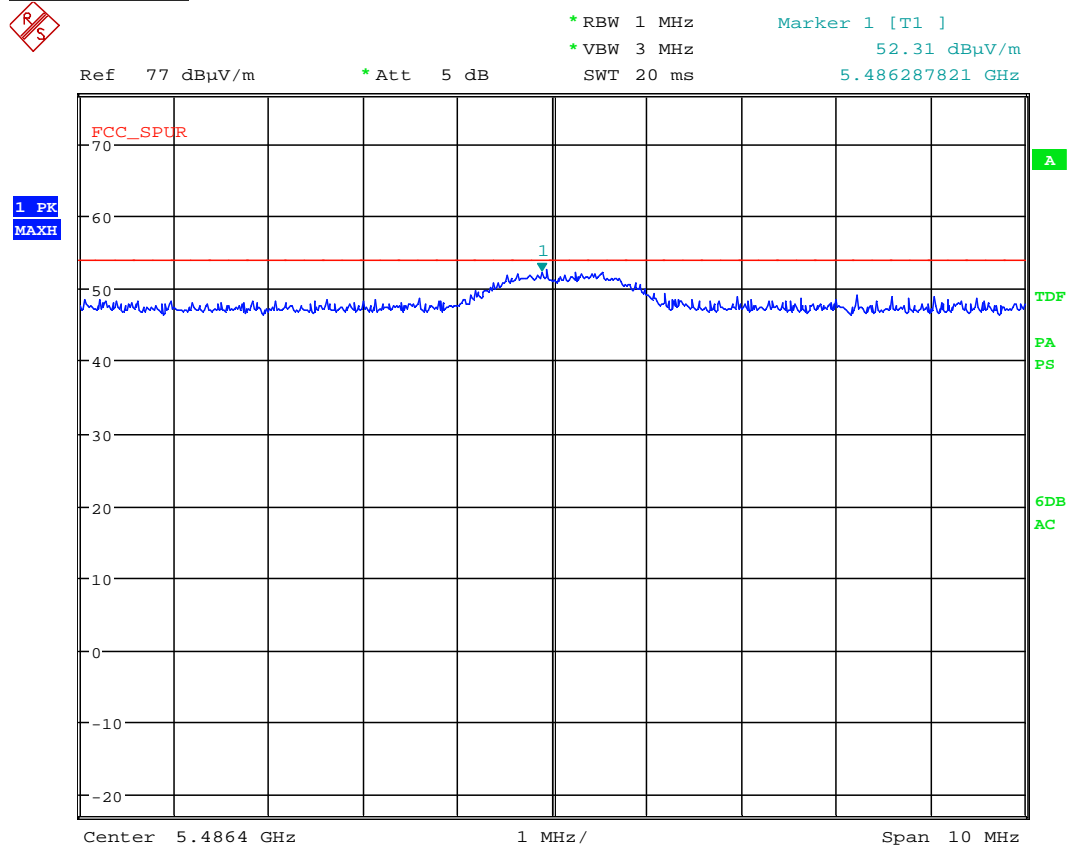
Plot 3.4.22 Radiated emission measurements at the fourth harmonic of 914.4 MHz carrier frequency (step 400 kHz)



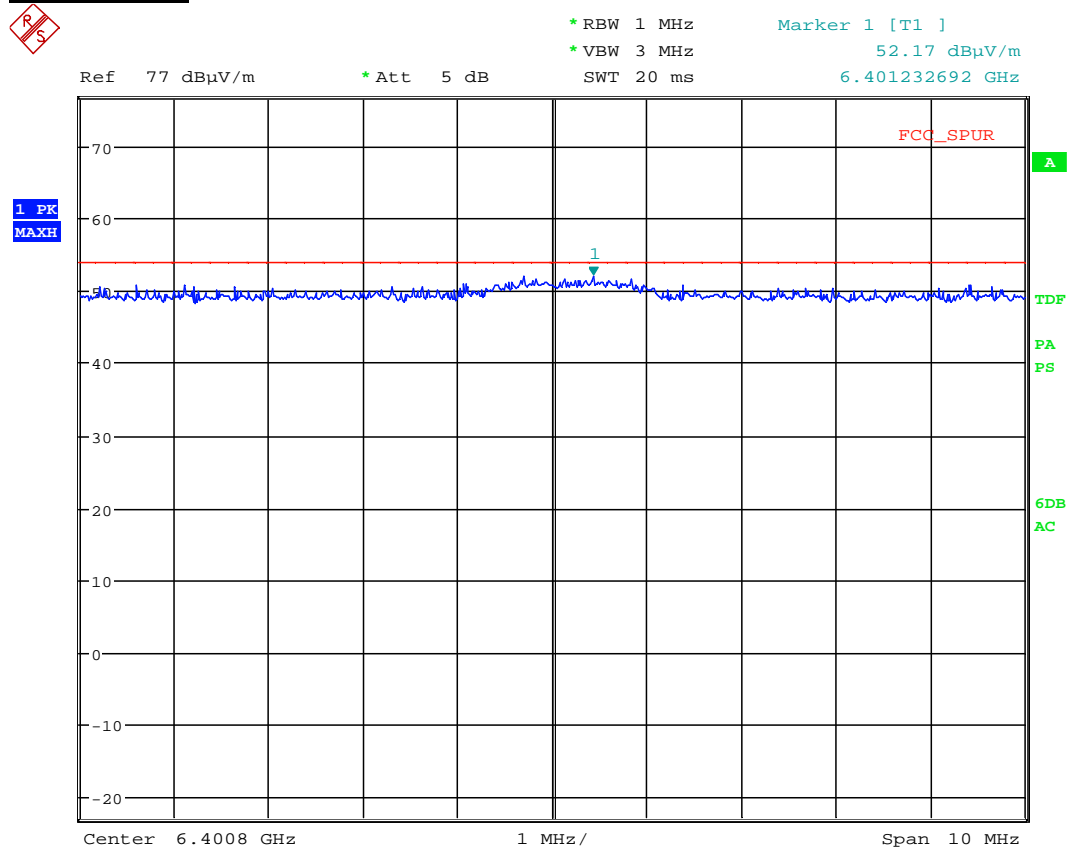
Plot 3.4.23 Radiated emission measurements at the fifth harmonic of 914.4 MHz carrier frequency (step 400 kHz)



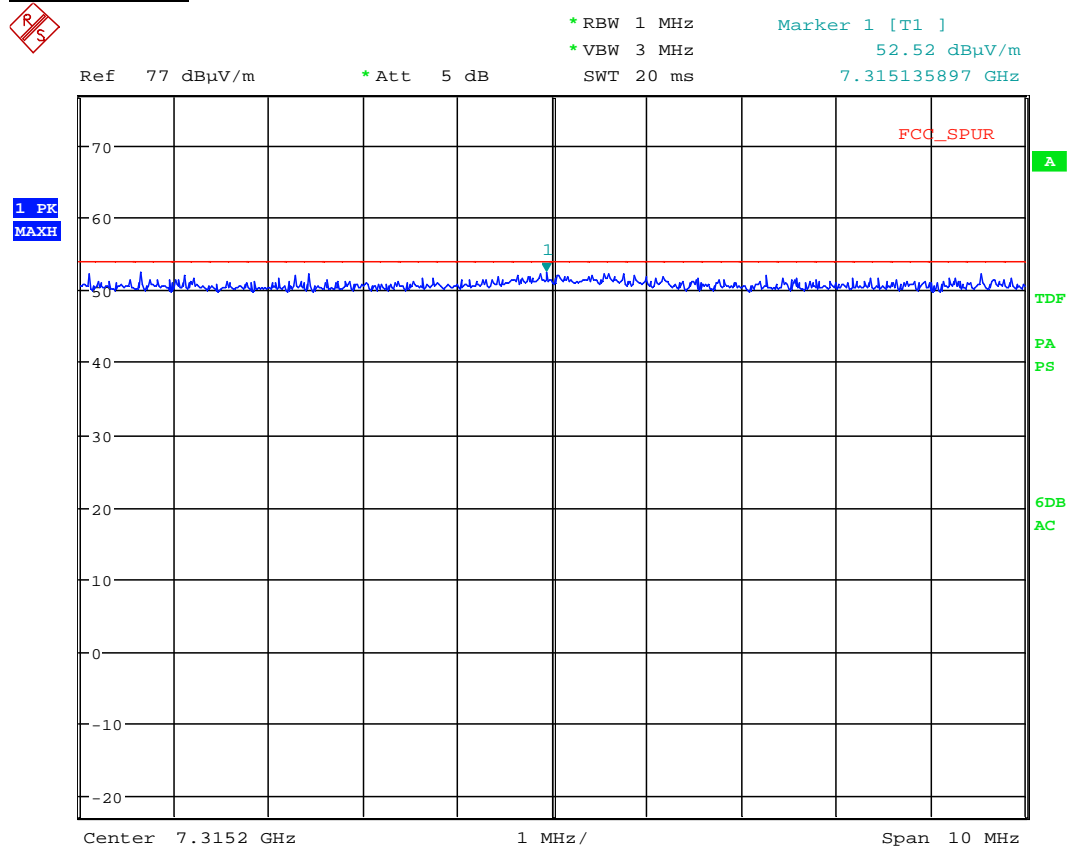
Plot 3.4.24 Radiated emission measurements at the sixth harmonic of 914.4 MHz carrier frequency (step 400 kHz)



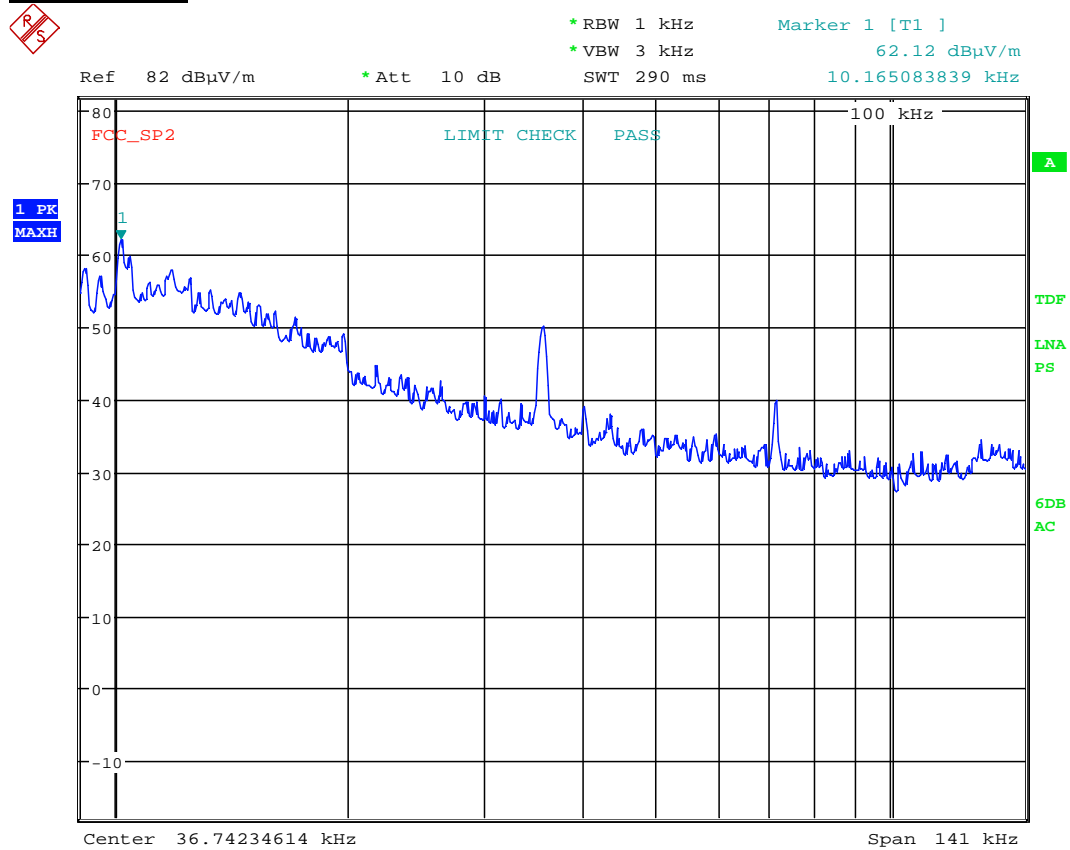
Plot 3.4.25 Radiated emission measurements at the seventh harmonic of 914.4 MHz carrier frequency (step 400 kHz)



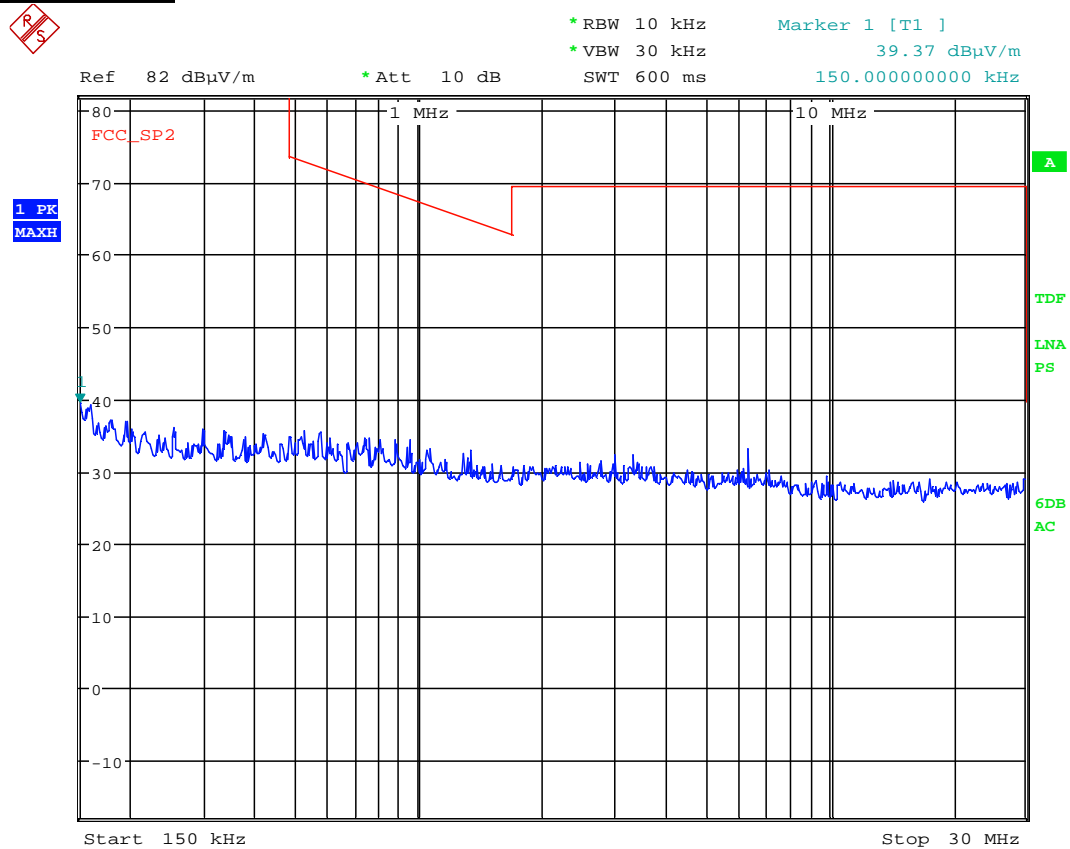
Plot 3.4.26 Radiated emission measurements at the eighth harmonic of 914.4 MHz carrier frequency (step 400 kHz)



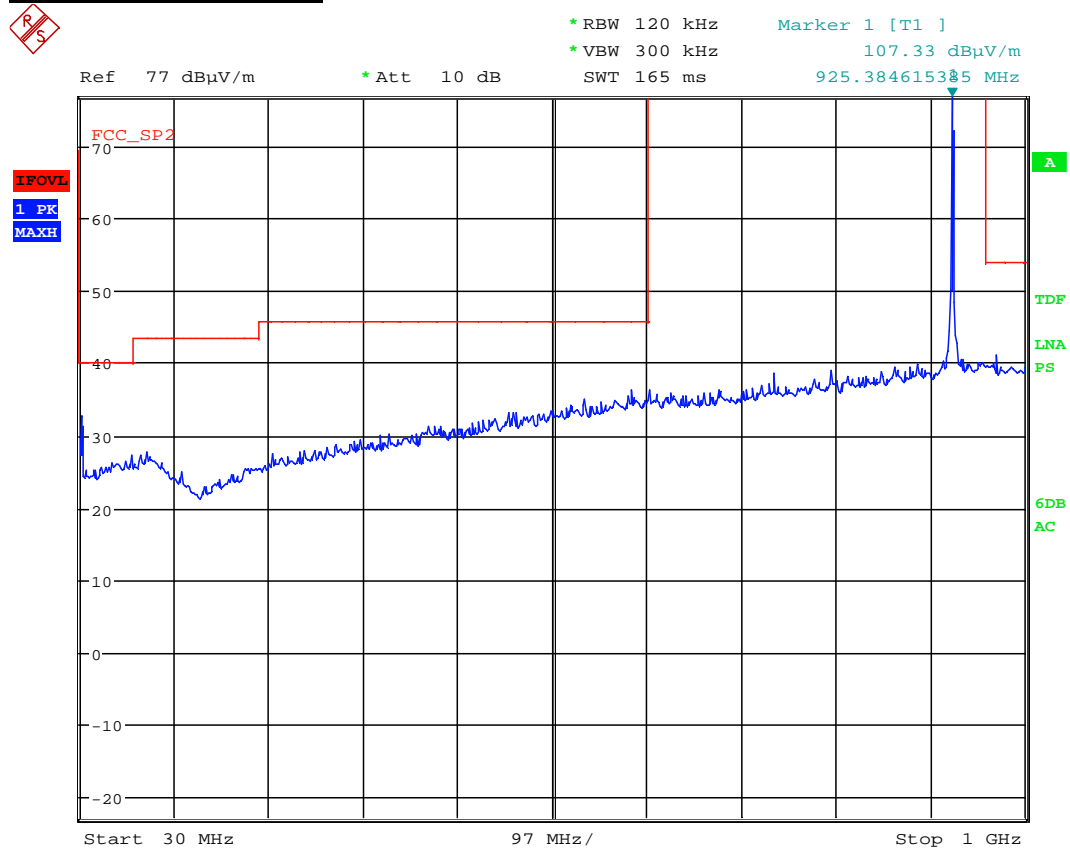
Plot 3.4.27 Radiated emission measurements from 9 kHz to 150 kHz at the 924.8 MHz carrier frequency (step 400 kHz)



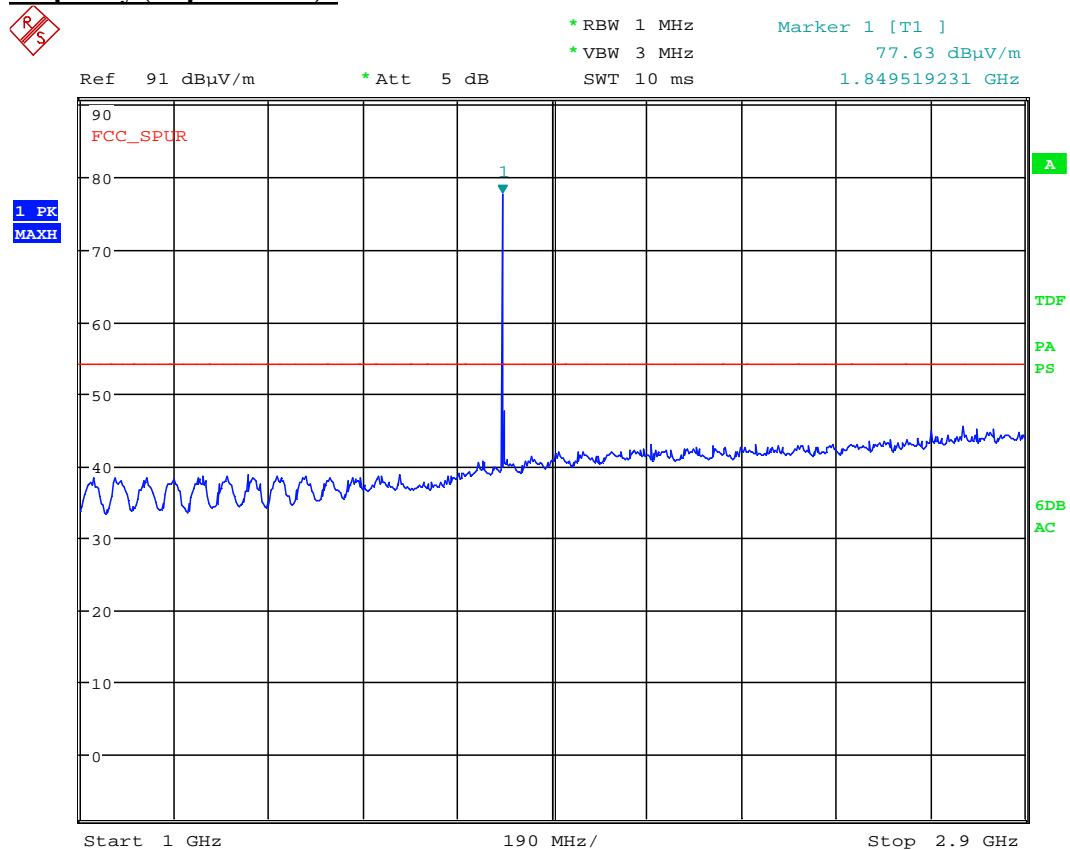
Plot 3.4.28 Radiated emission measurements from 150 kHz to 30 MHz at the 924.8 MHz carrier frequency (step 400 kHz)



Plot 3.4.29 Radiated emission measurements from 30 MHz to 1000 MHz at the 924.8 MHz carrier frequency (step 400 kHz)

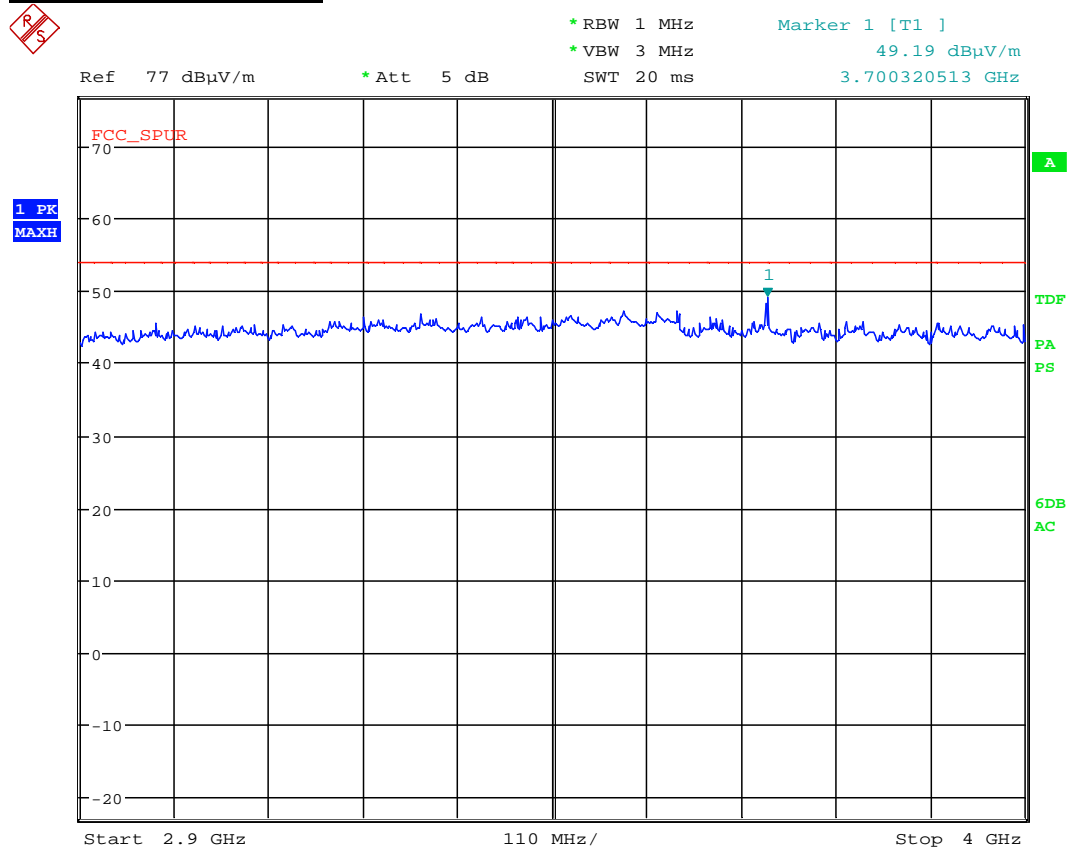


Plot 3.4.30 Radiated emission measurements from 1000 MHz to 2900 MHz at the 924.8 MHz carrier frequency (step 400 kHz)*

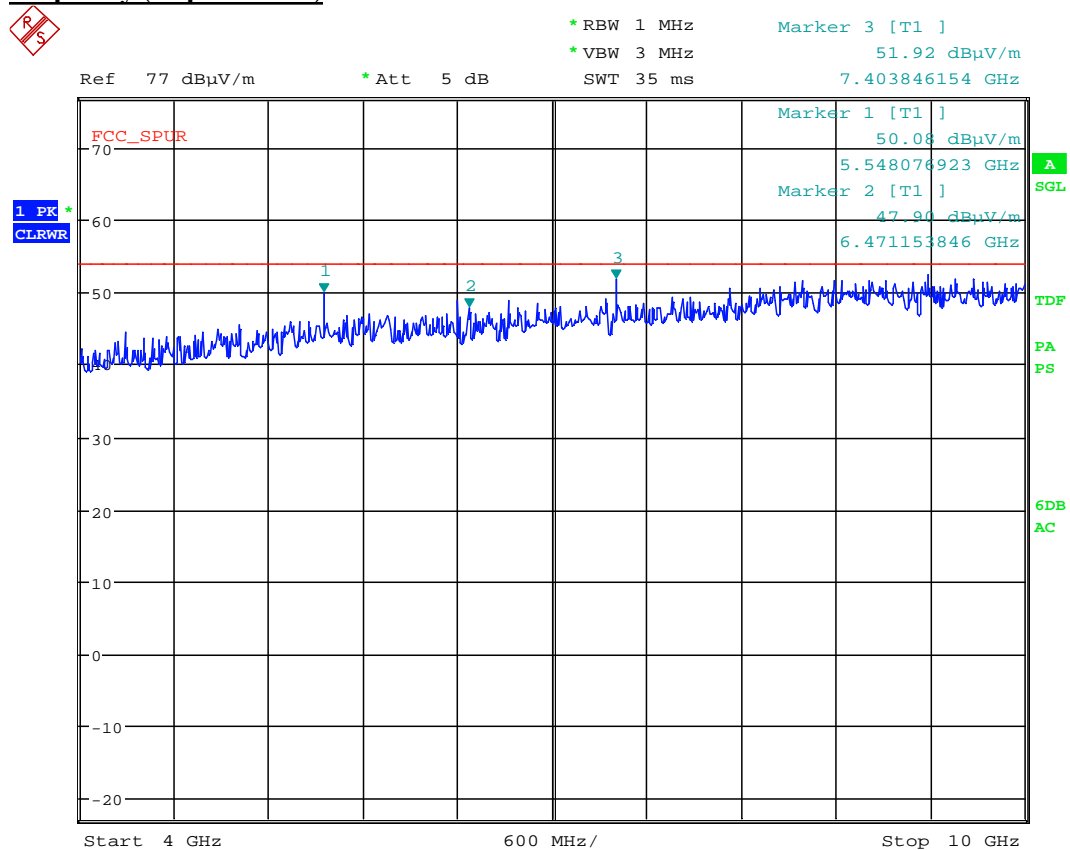


* - limit for restricted bands does not apply to the second harmonic (924.8 MHz)

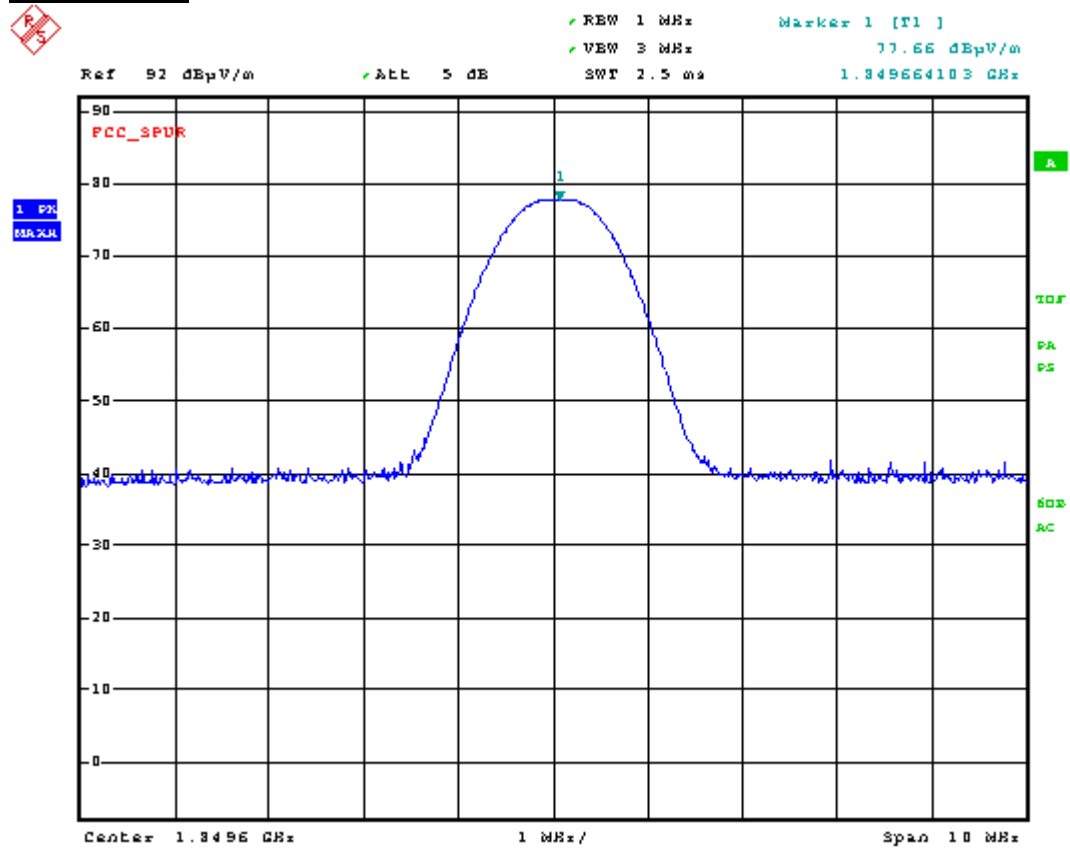
Plot 3.4.31 Radiated emission measurements from 2900 MHz to 4000 MHz at the 924.8 MHz carrier frequency (step 400 kHz)



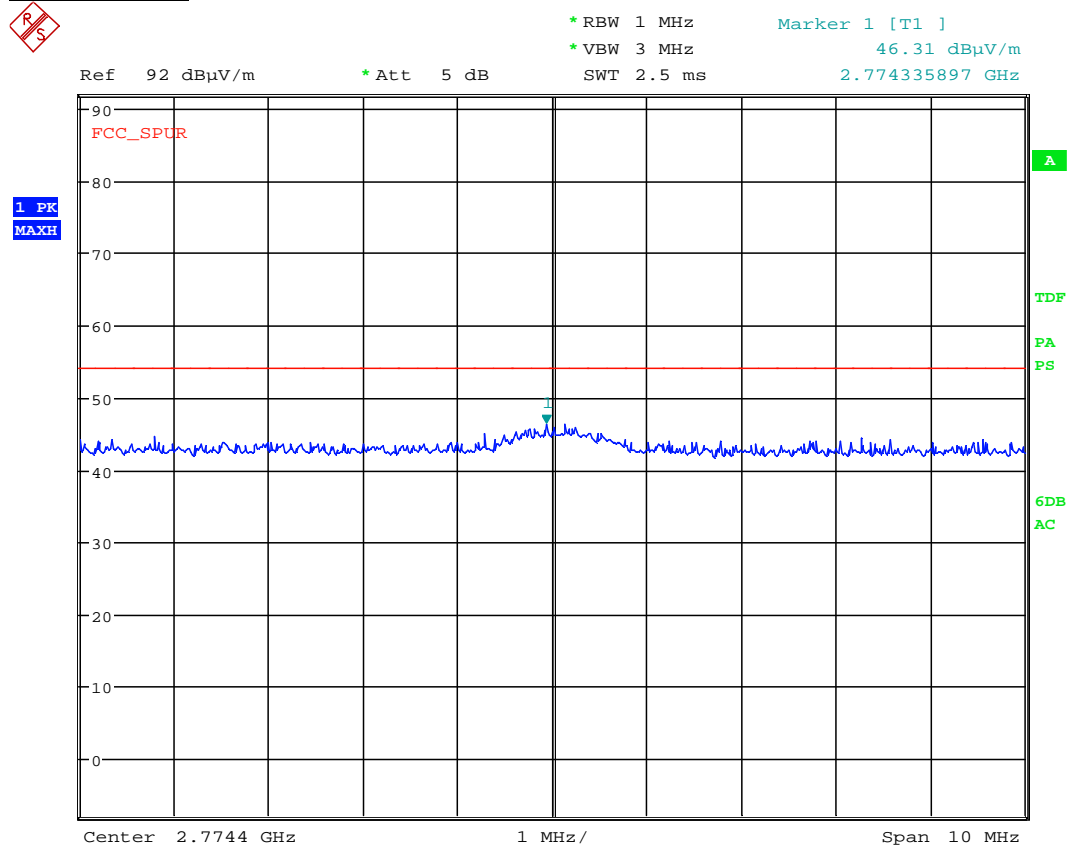
Plot 3.4.32 Radiated emission measurements from 4000 MHz to 10000 MHz at the 924.8 MHz carrier frequency (step 400 kHz)



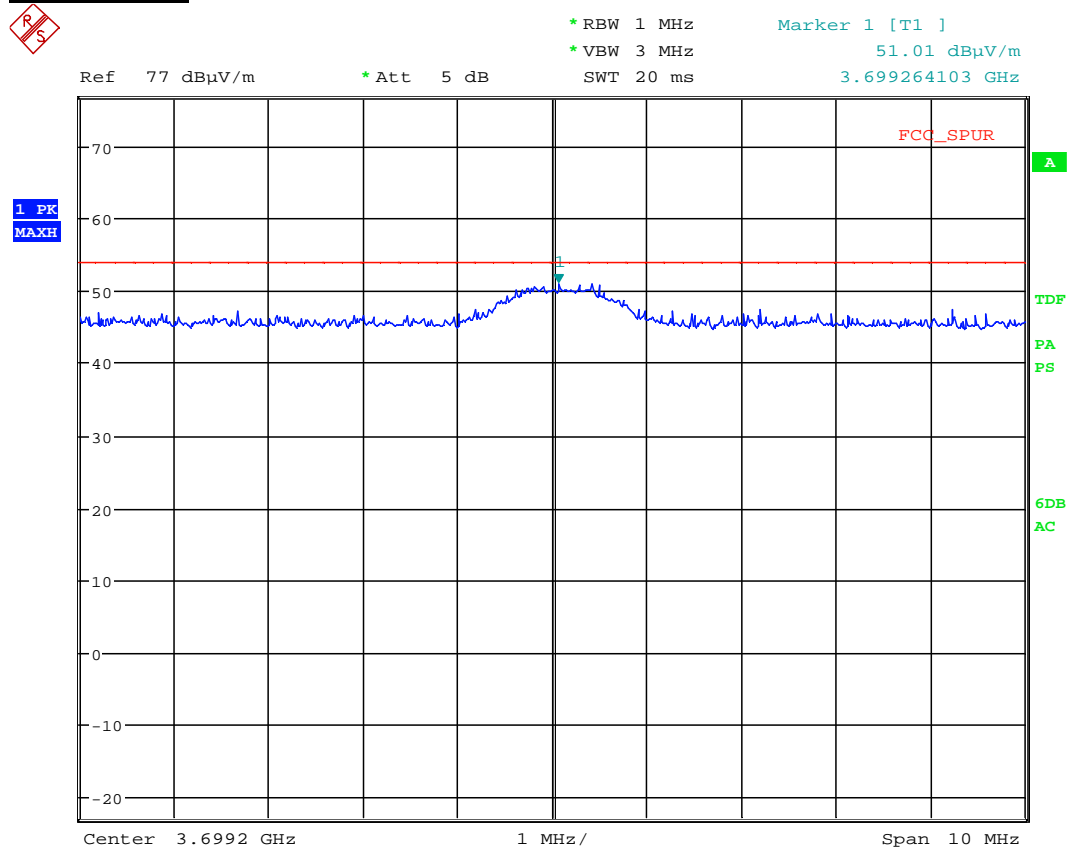
Plot 3.4.33 Radiated emission measurements at the second harmonic of 924.8 MHz carrier frequency (step 400 kHz)



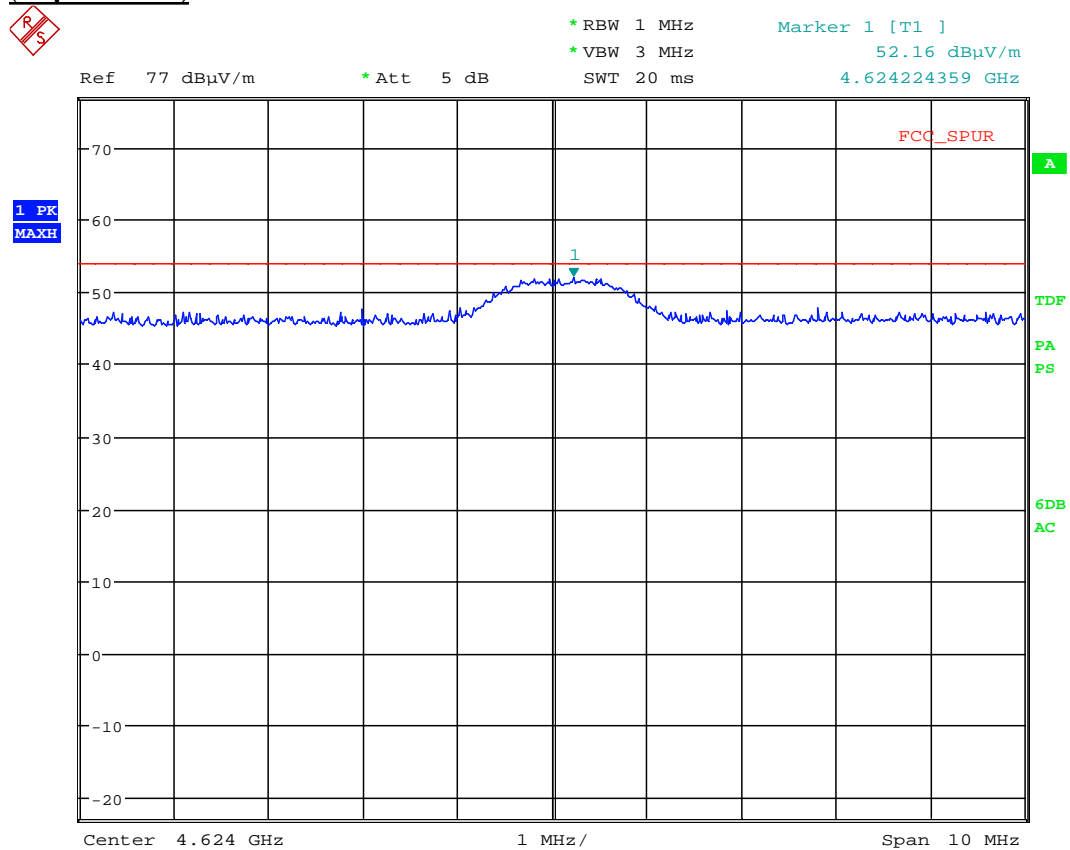
Plot 3.4.34 Radiated emission measurements at the third harmonic of 924.8 MHz carrier frequency (step 400 kHz)



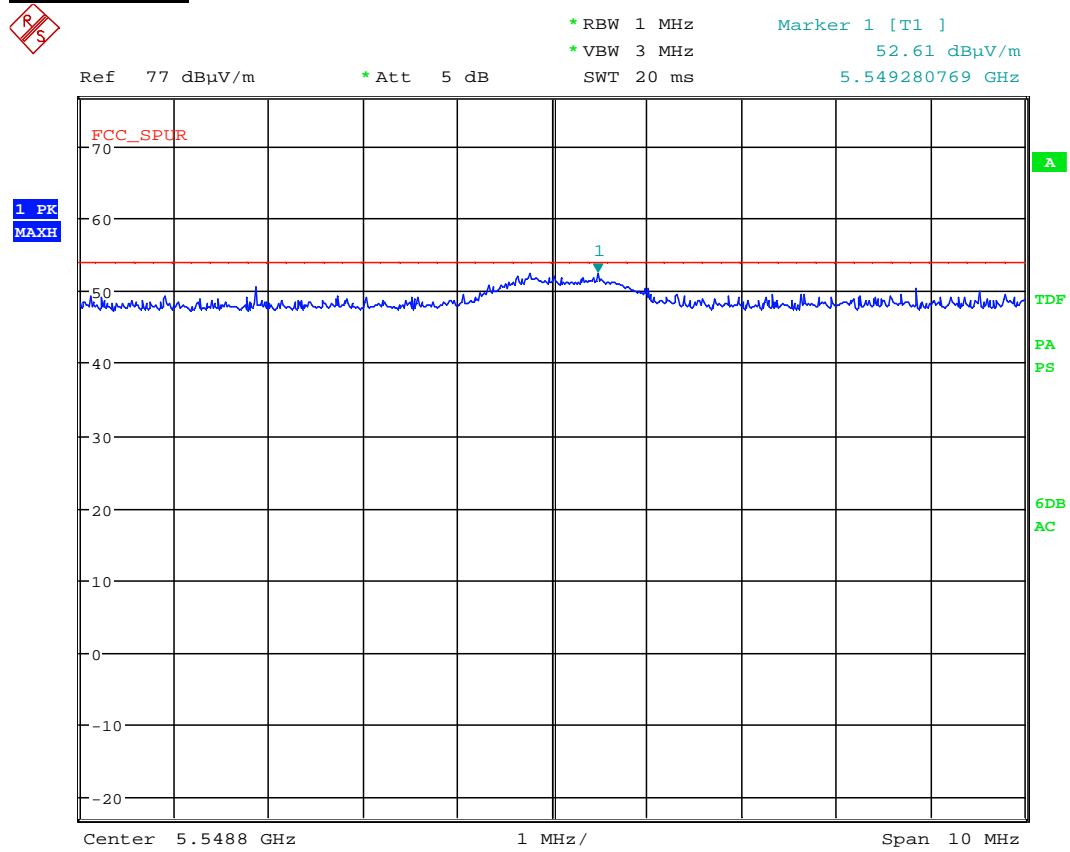
Plot 3.4.35 Radiated emission measurements at the fourth harmonic of 924.8 MHz carrier frequency (step 400 kHz)



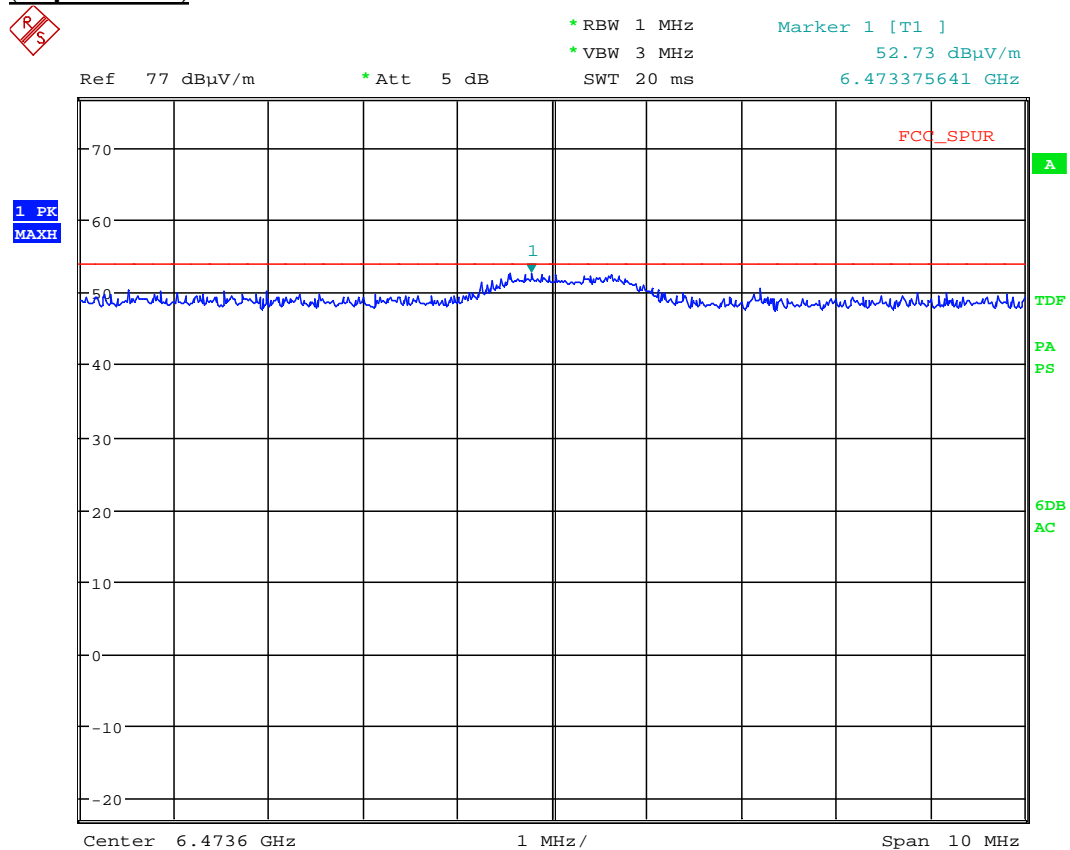
Plot 3.4.36 Radiated emission measurements at the fifth harmonic of 924.8 MHz carrier frequency (step 400 kHz)



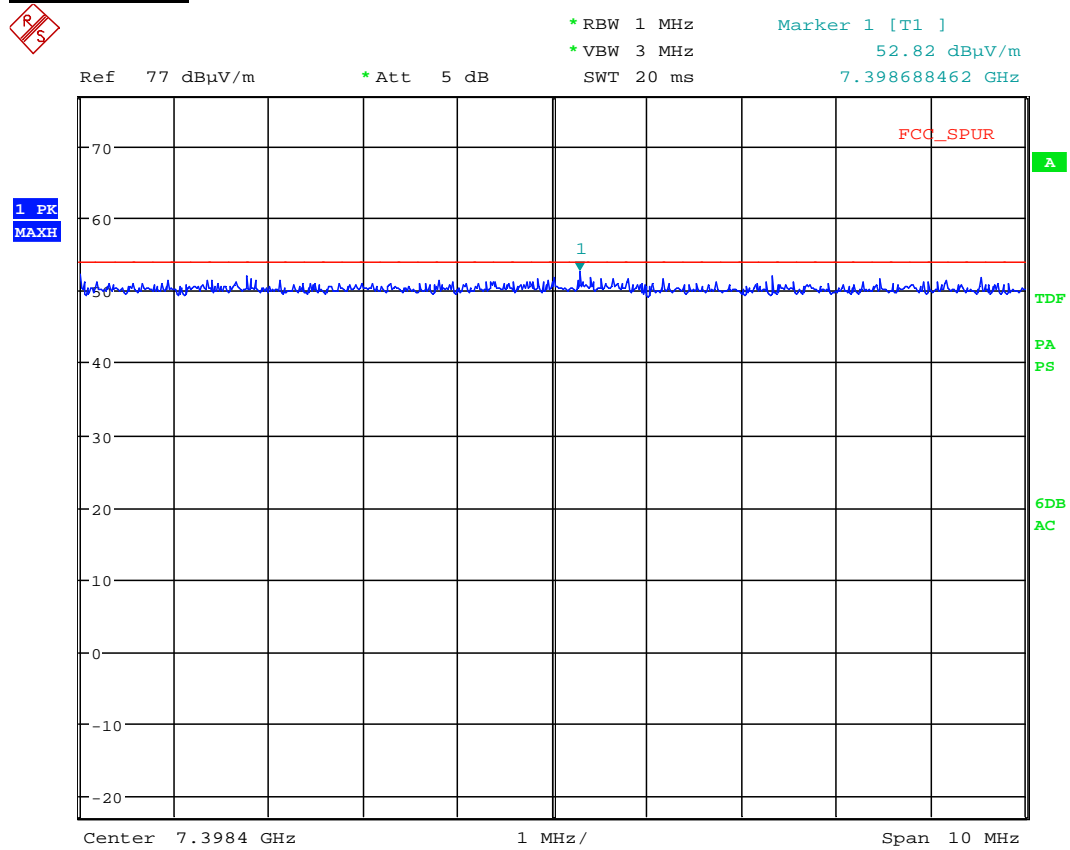
Plot 3.4.37 Radiated emission measurements at the sixth harmonic of 924.8 MHz carrier frequency (step 400 kHz)



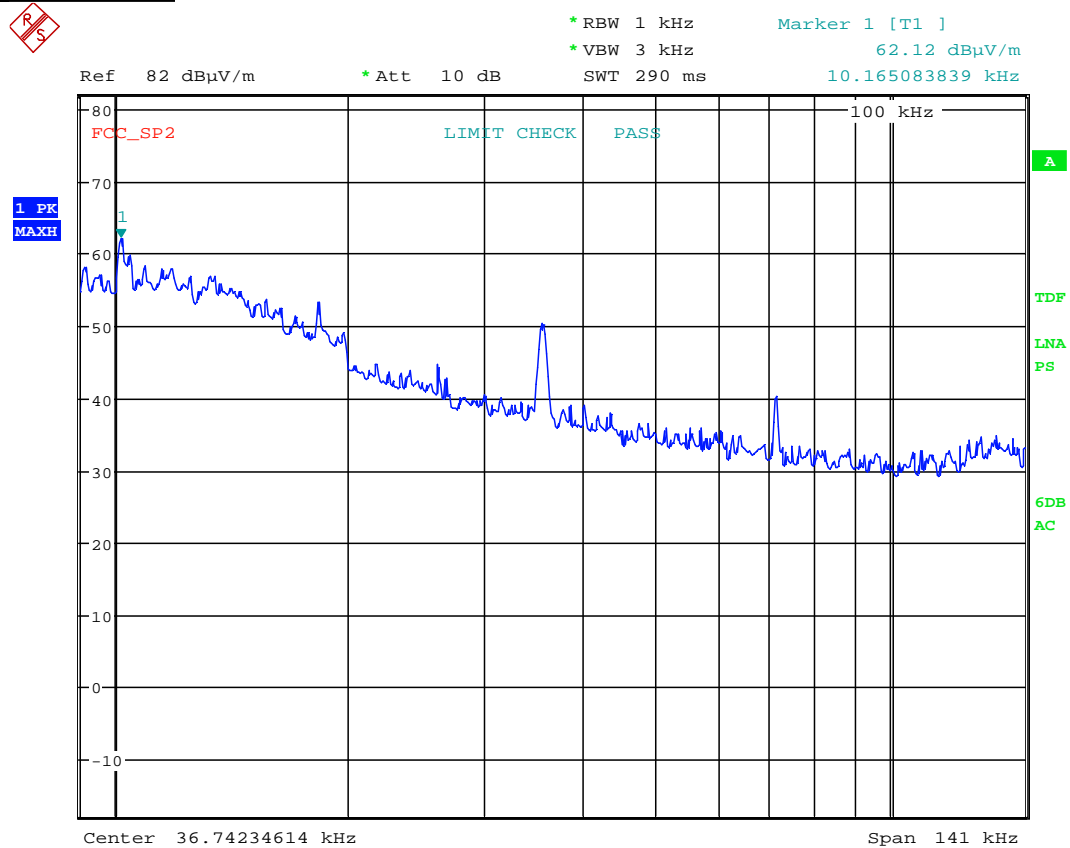
Plot 3.4.38 Radiated emission measurements at the seventh harmonic of 924.8 MHz carrier frequency (step 400 kHz)



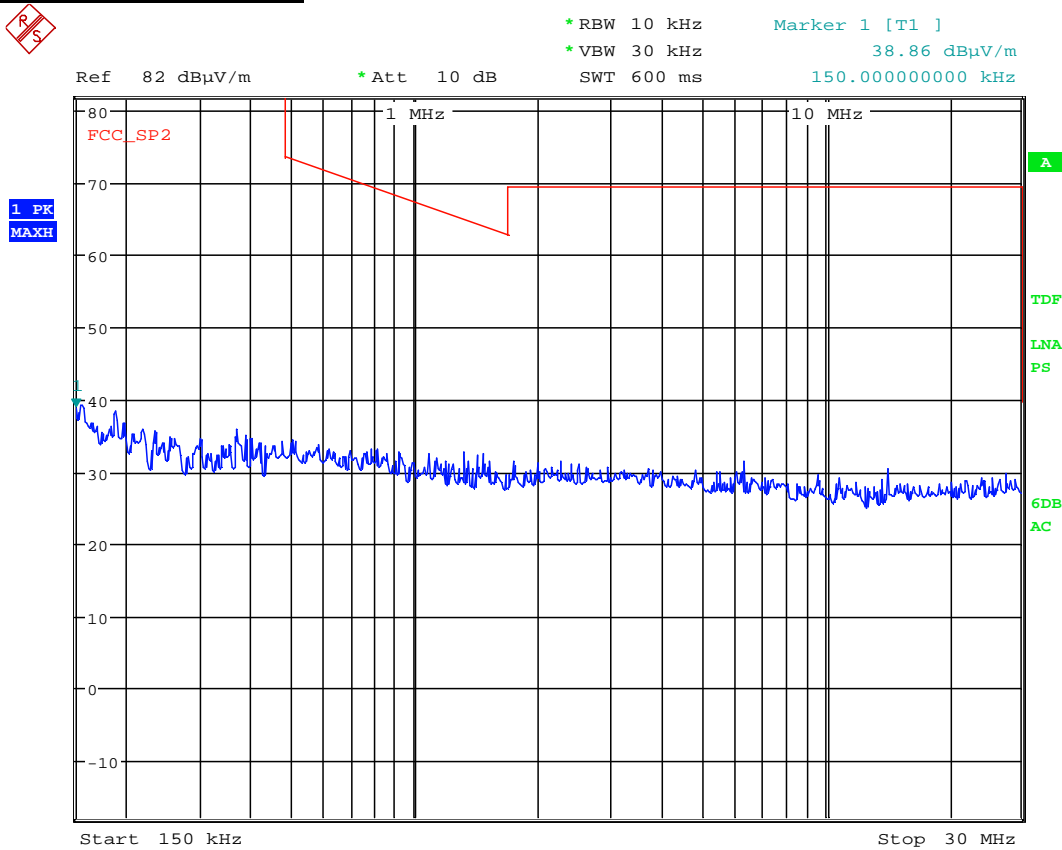
Plot 3.4.39 Radiated emission measurements at the eighth harmonic of 924.8 MHz carrier frequency (step 400 kHz)



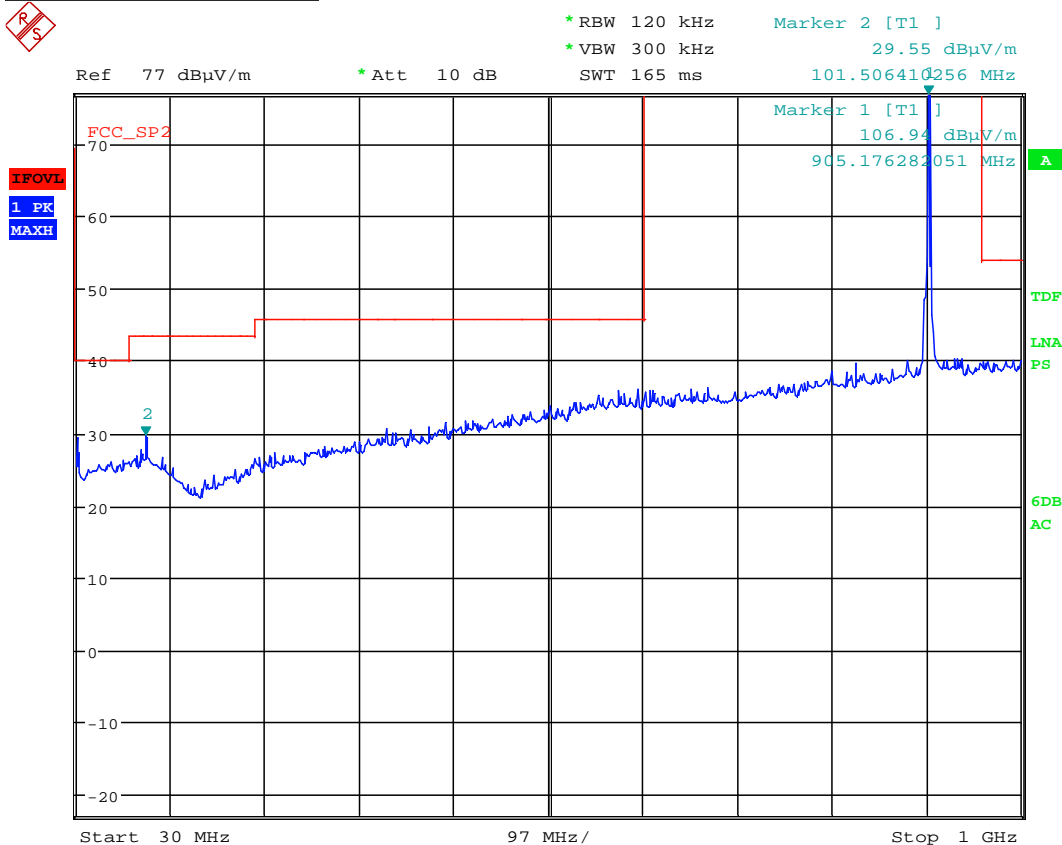
Plot 3.4.40 Radiated emission measurements from 9 kHz to 150 kHz at the 904.8 MHz carrier frequency (step 800 kHz)



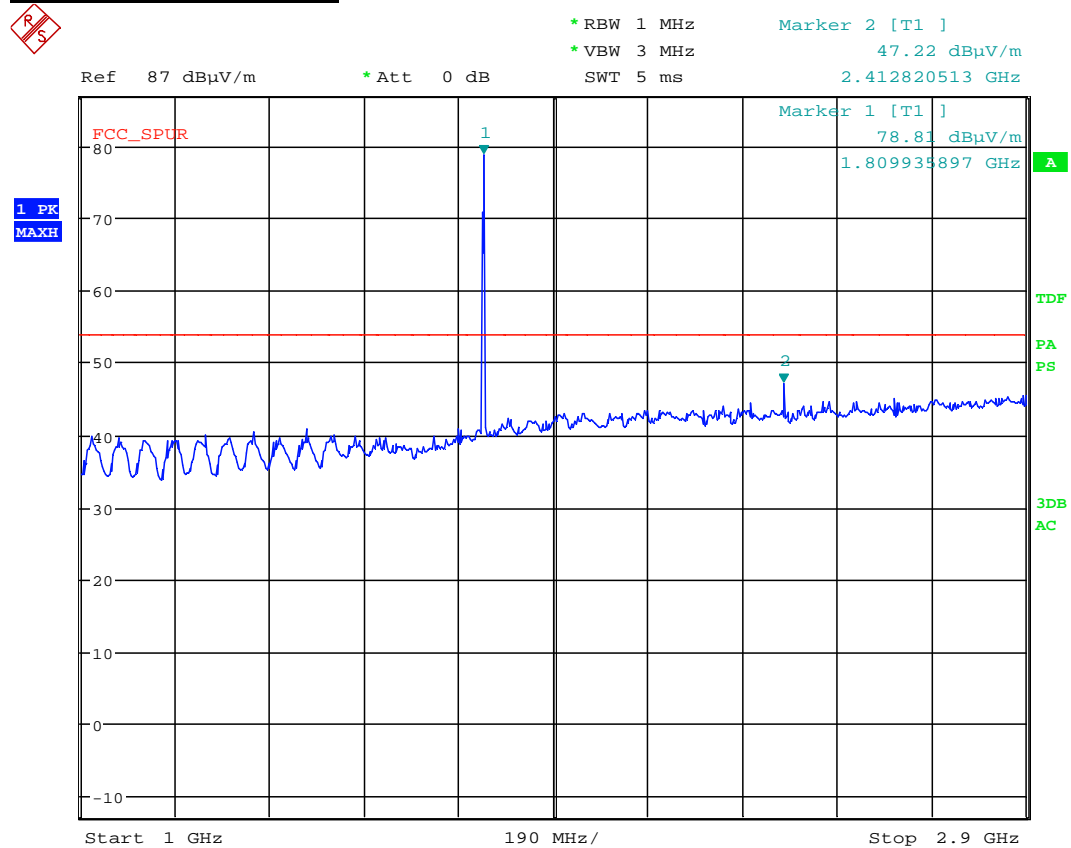
Plot 3.4.41 Radiated emission measurements from 150 kHz to 30 MHz at the 904.8 MHz carrier frequency (step 800 kHz)



Plot 3.4.42 Radiated emission measurements from 30 MHz to 1000 MHz at the 904.8 MHz carrier frequency (step 800 kHz)

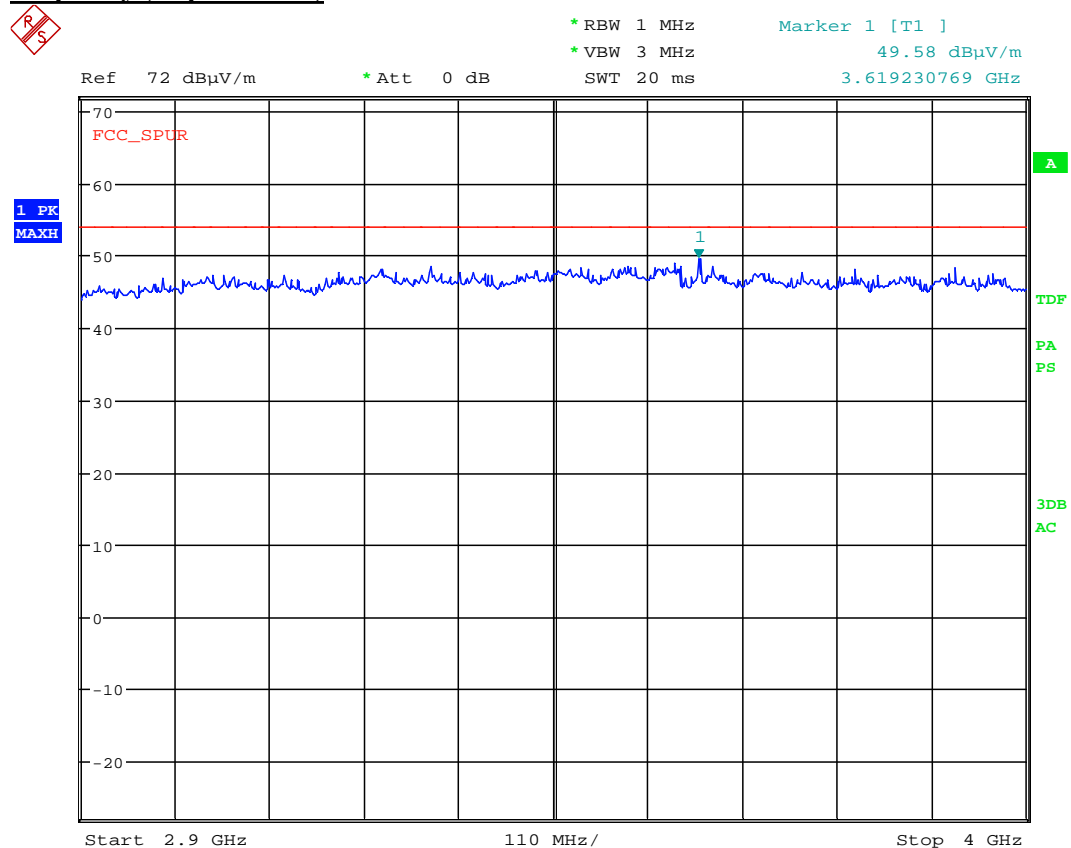


Plot 3.4.43 Radiated emission measurements from 1000 MHz to 2900 MHz at the 904.8 MHz carrier frequency (step 800 kHz)*

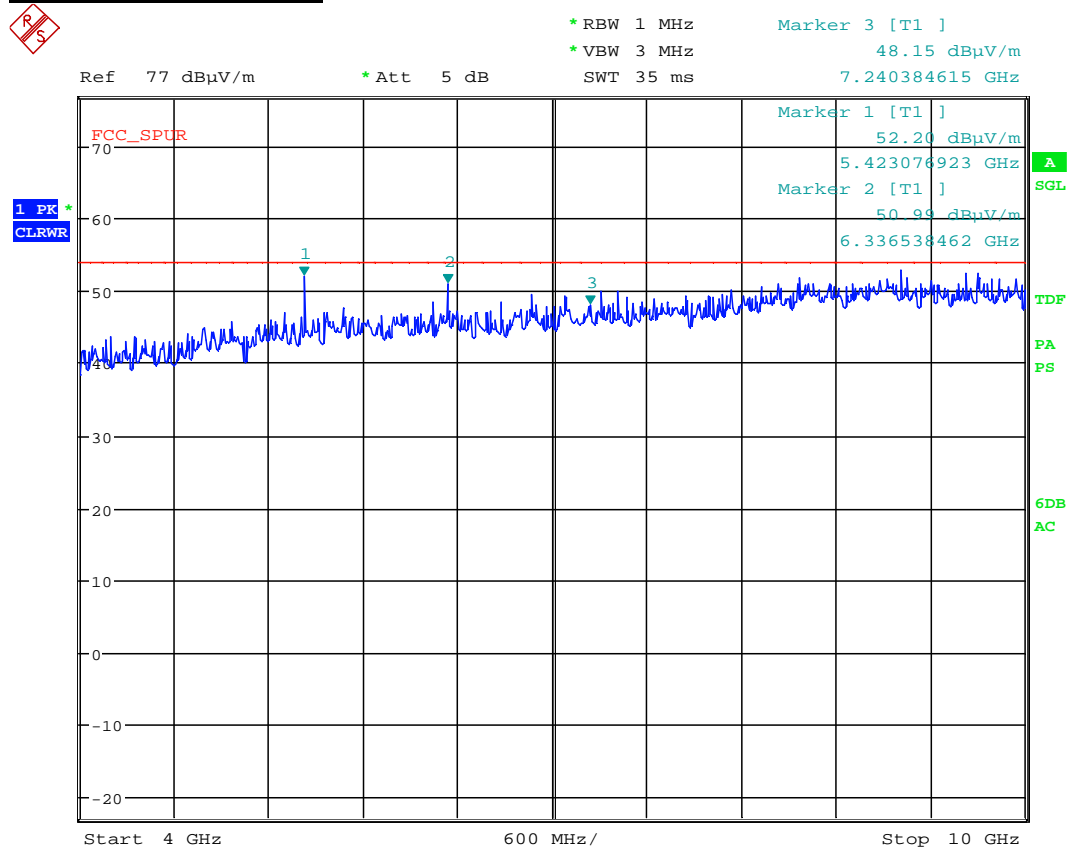


* - limit for restricted bands does not apply to the second harmonic (904.8 MHz)

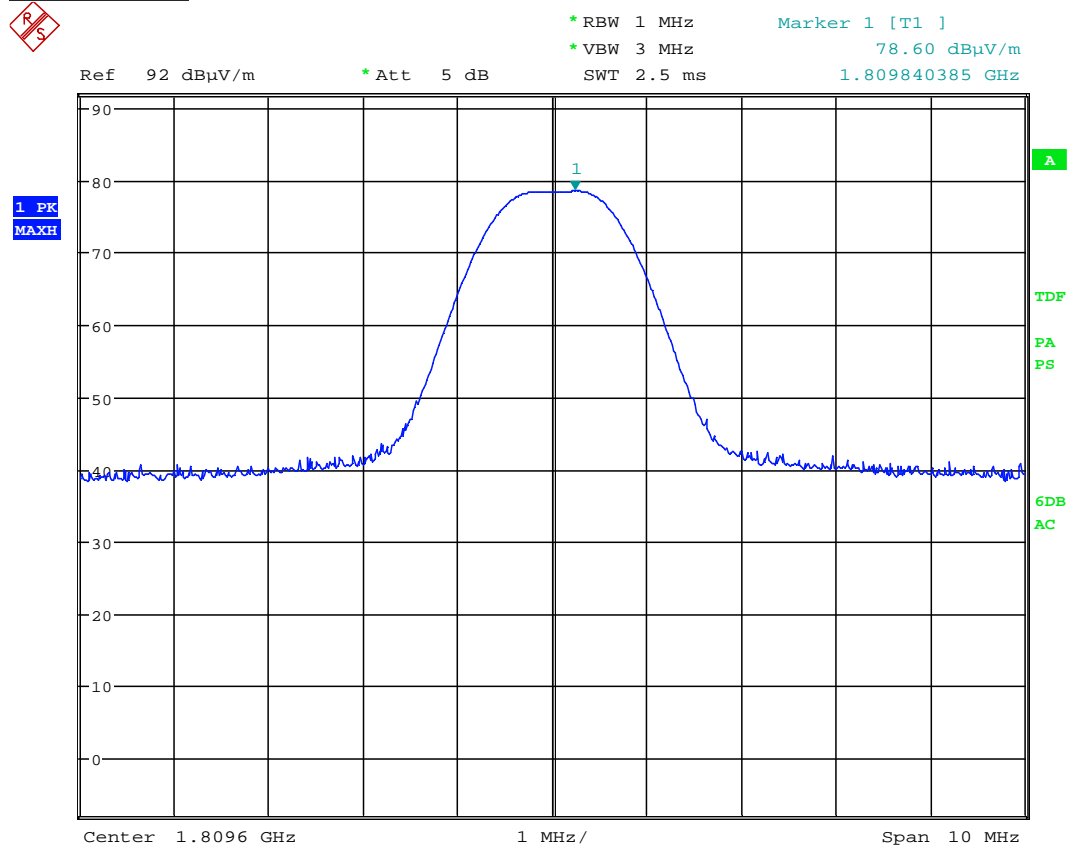
Plot 3.4.44 Radiated emission measurements from 2900 MHz to 4000 MHz at the 904.8 MHz carrier frequency (step 800 kHz)



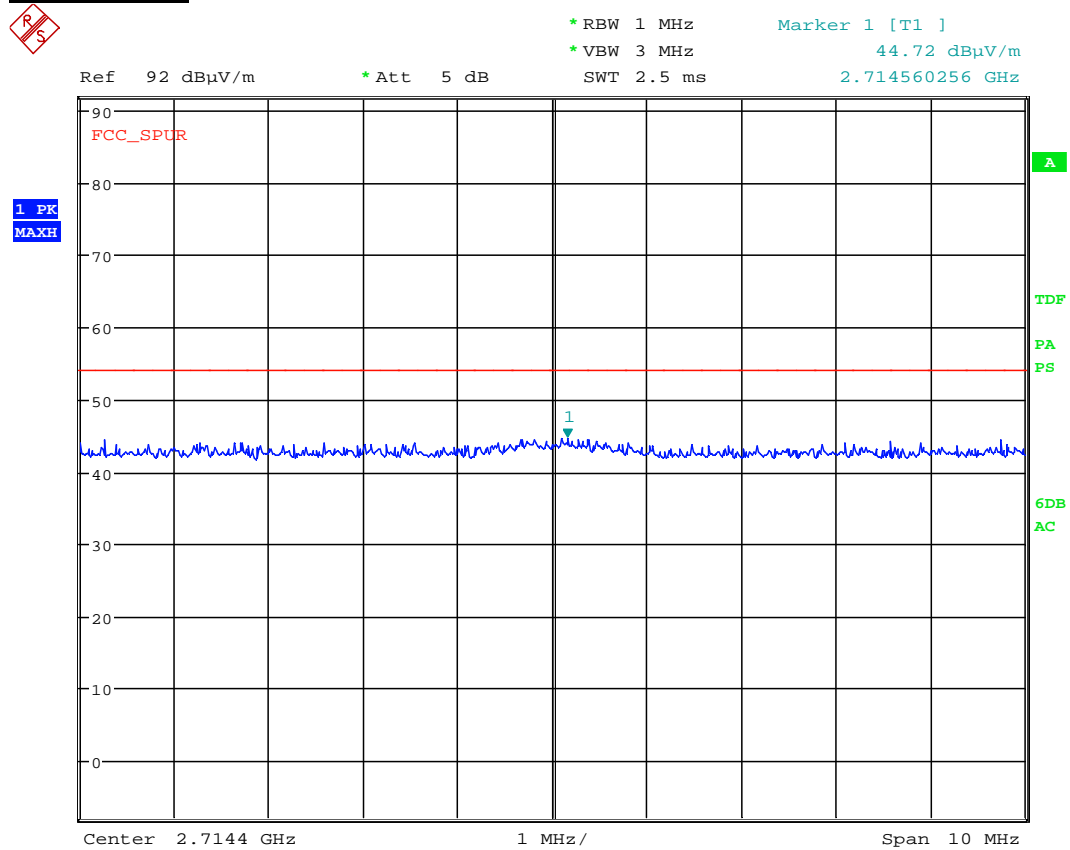
Plot 3.4.45 Radiated emission measurements from 4000 MHz to 10000 MHz at the 904.8 MHz carrier frequency (step 800 kHz)



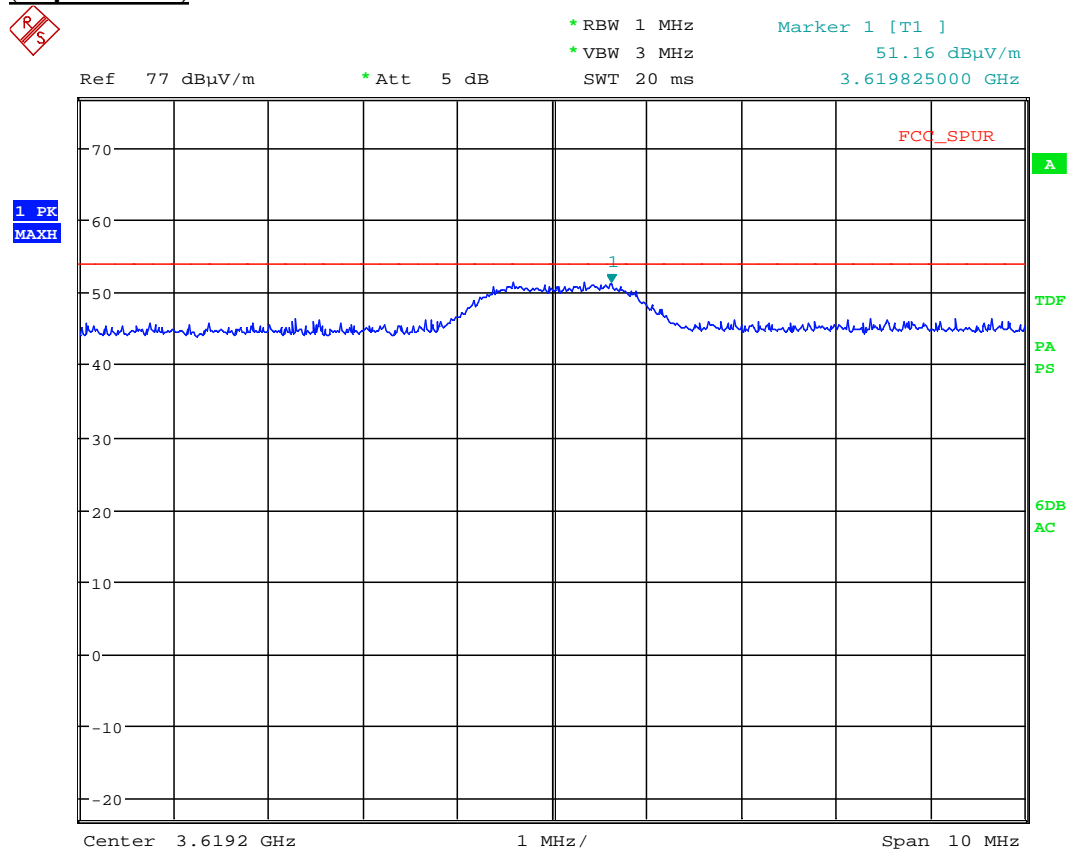
Plot 3.4.46 Radiated emission measurements at the second harmonic of 904.8 MHz carrier frequency (step 800 kHz)



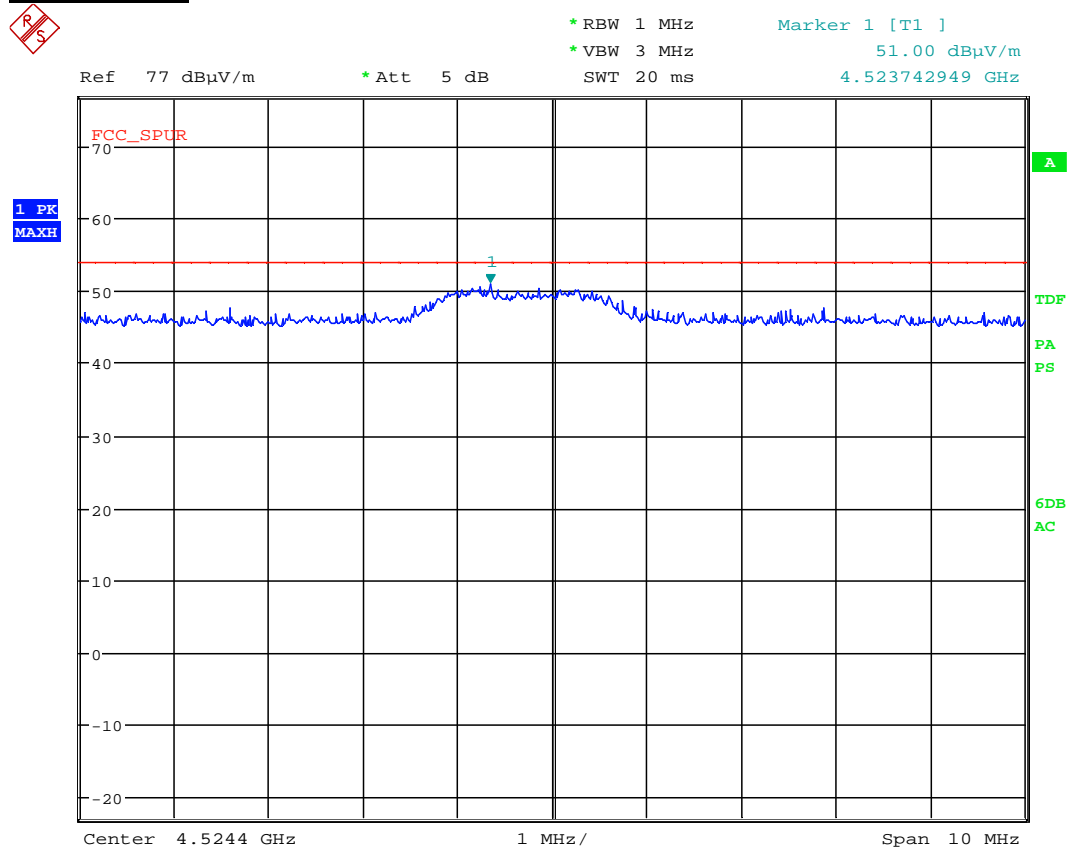
Plot 3.4.47 Radiated emission measurements at the third harmonic of 904.8 MHz carrier frequency (step 800 kHz)



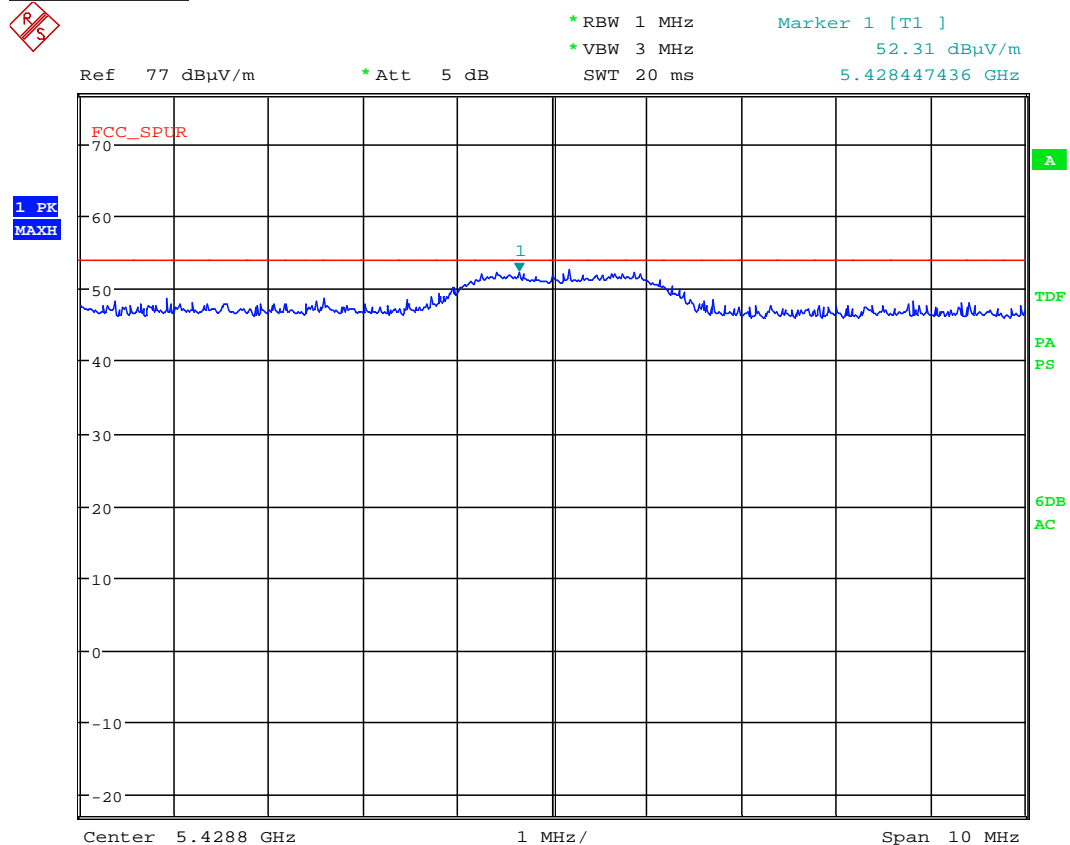
Plot 3.4.48 Radiated emission measurements at the fourth harmonic of 904.8 MHz carrier frequency (step 800 kHz)



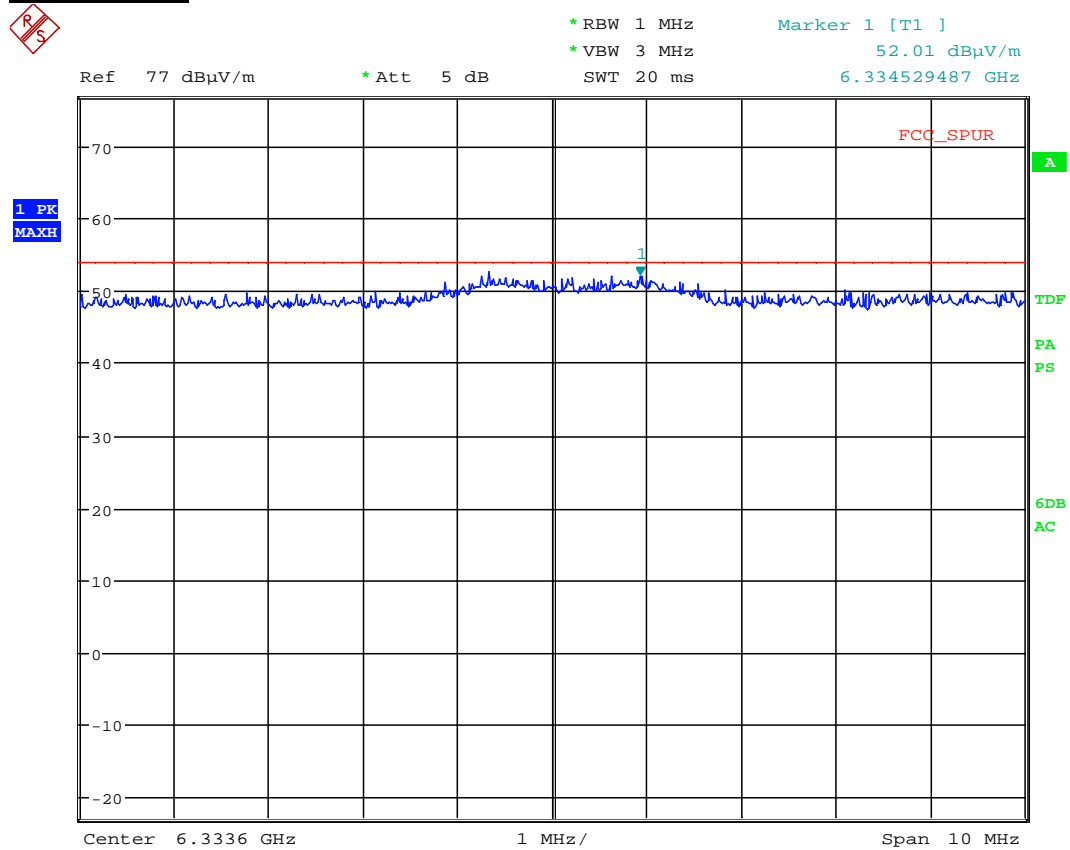
Plot 3.4.49 Radiated emission measurements at the fifth harmonic of 904.8 MHz carrier frequency (step 800 kHz)



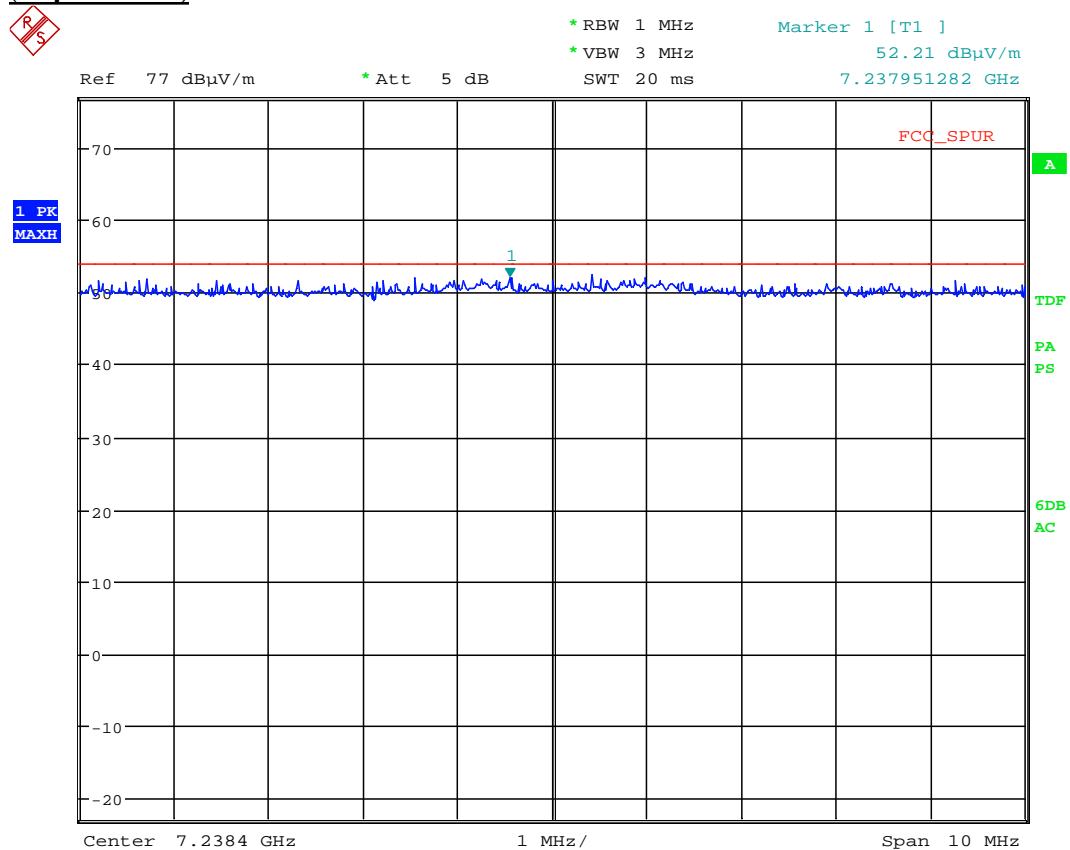
Plot 3.4.50 Radiated emission measurements at the sixth harmonic of 904.8 MHz carrier frequency (step 800 kHz)



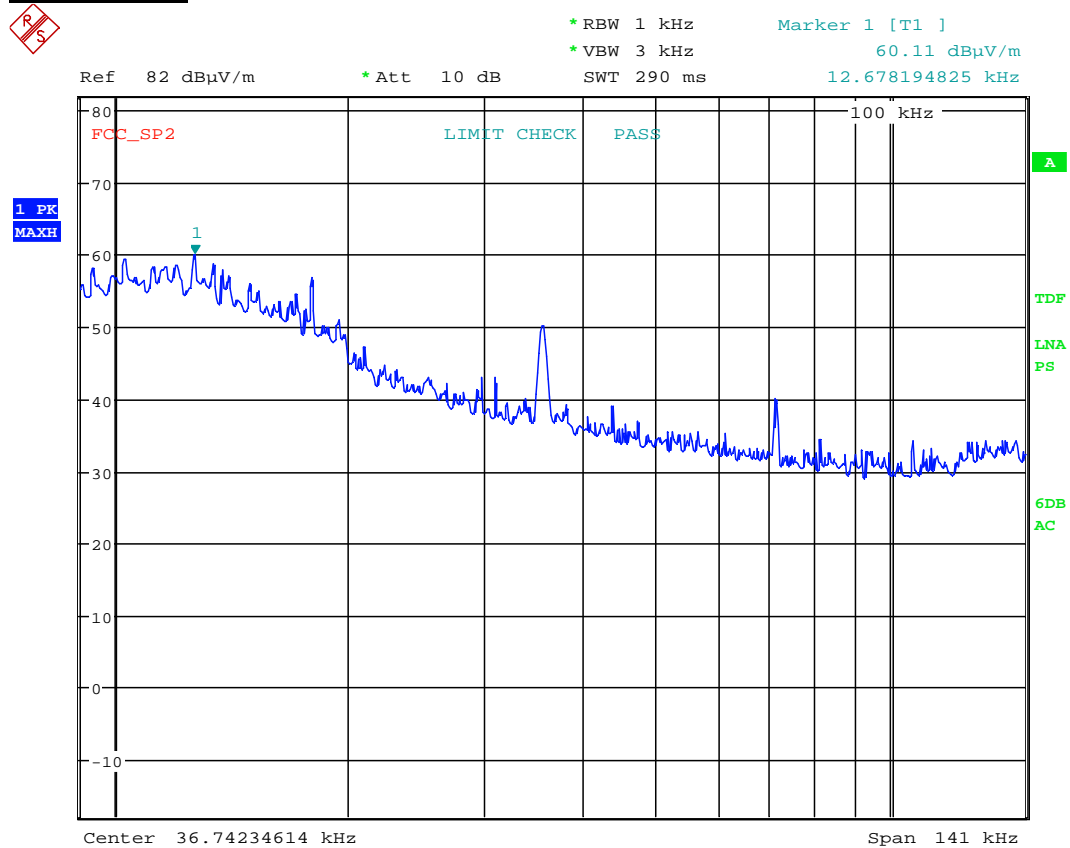
Plot 3.4.51 Radiated emission measurements at the seventh harmonic of 904.8 MHz carrier frequency (step 800 kHz)



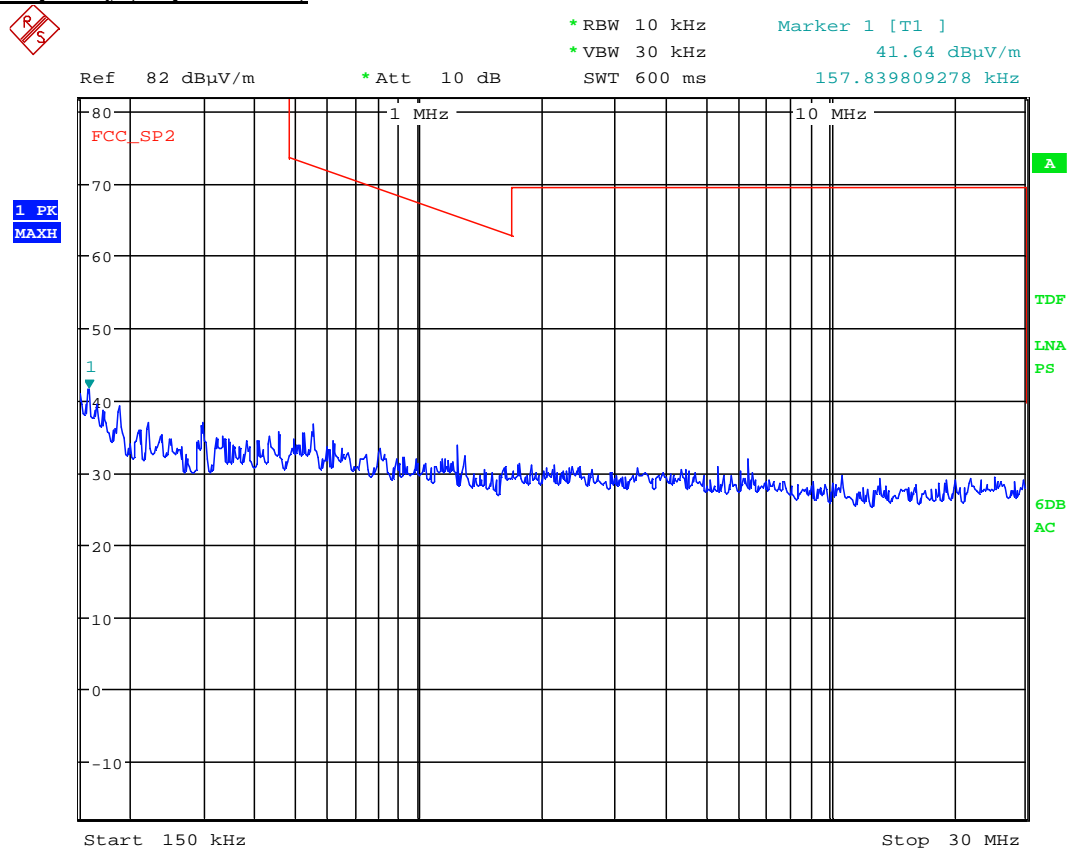
Plot 3.4.52 Radiated emission measurements at the eighth harmonic of 904.8 MHz carrier frequency (step 800 kHz)



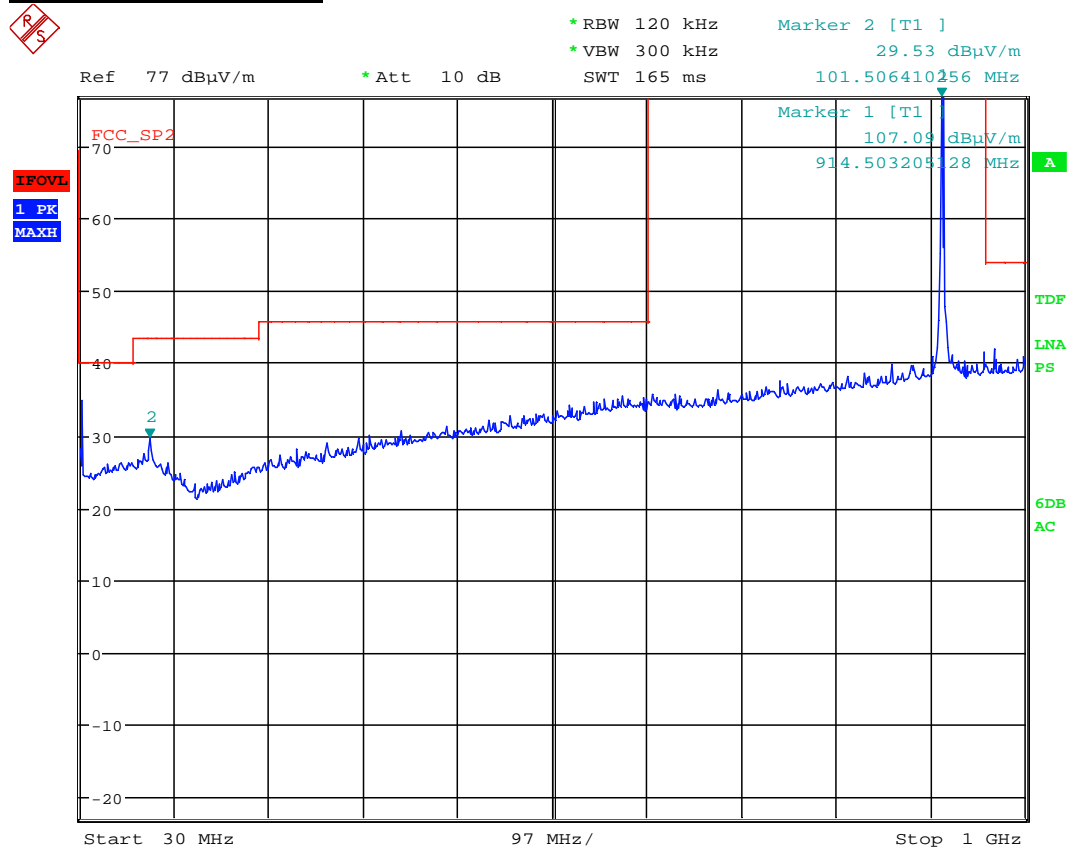
Plot 3.4.53 Radiated emission measurements from 9 kHz to 150 kHz at the 914.4 MHz carrier frequency (step 800 kHz)



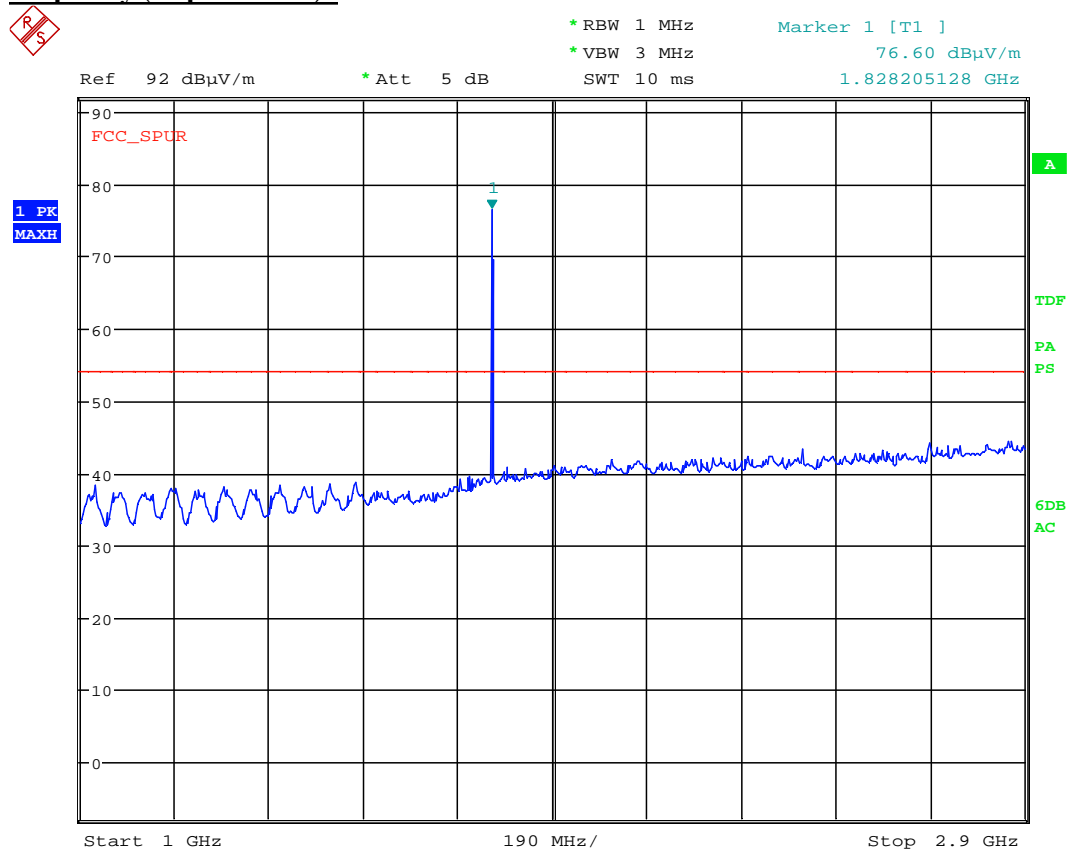
Plot 3.4.54 Radiated emission measurements from 150 kHz to 30 MHz at the 914.4 MHz carrier frequency (step 800 kHz)



Plot 3.4.55 Radiated emission measurements from 30 MHz to 1000 MHz at the 914.4 MHz carrier frequency (step 800 kHz)

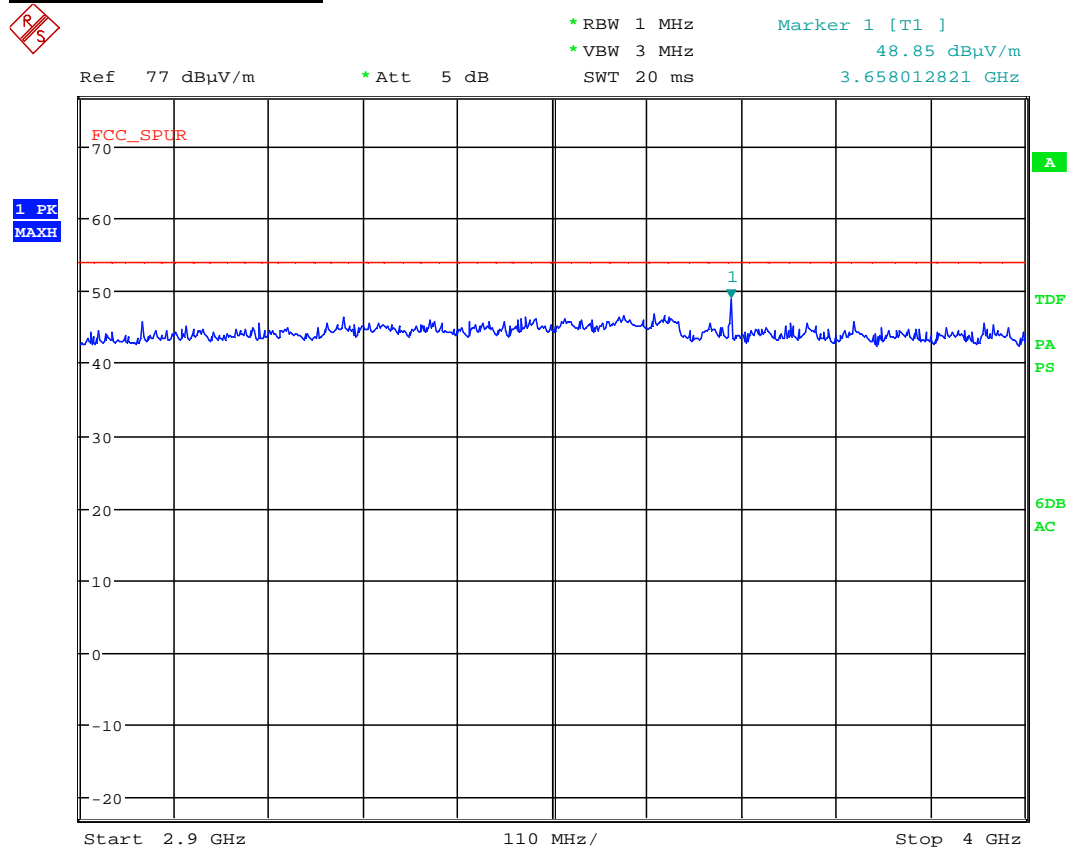


Plot 3.4.56 Radiated emission measurements from 1000 MHz to 2900 MHz at the 914.4 MHz carrier frequency (step 800 kHz)*

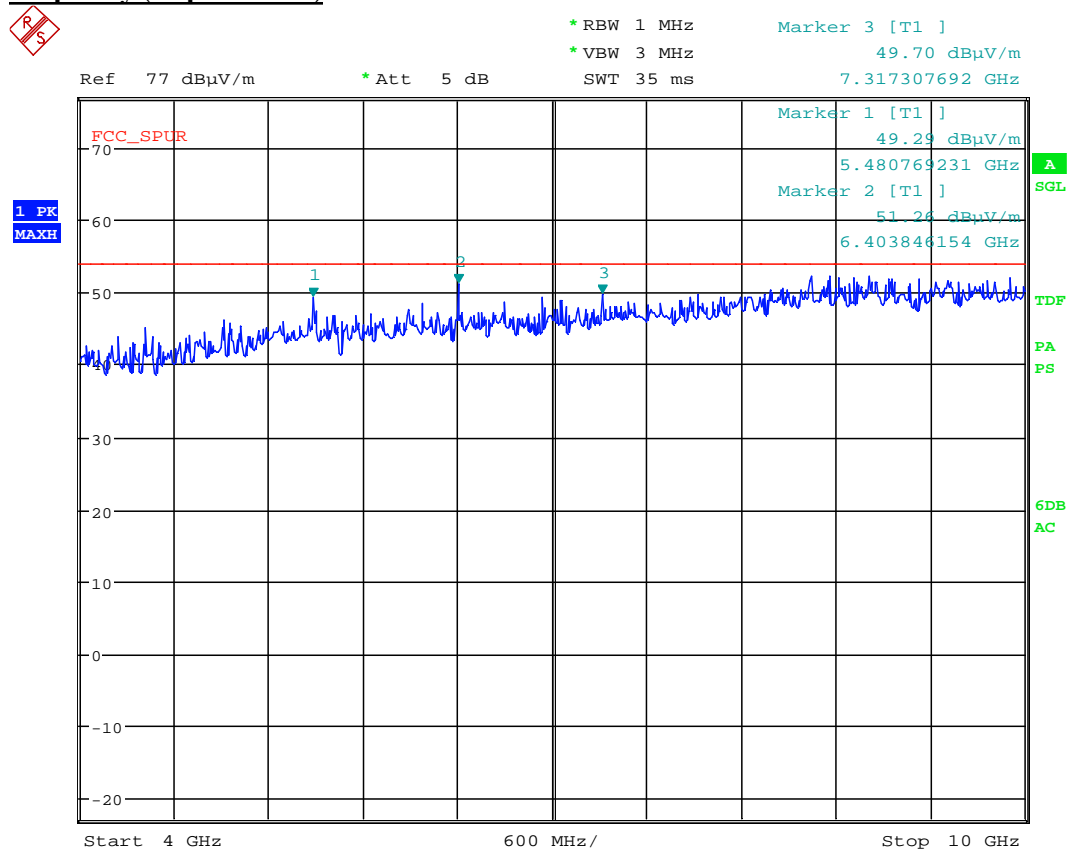


* - limit for restricted bands does not apply to the second harmonic (914.4 MHz)

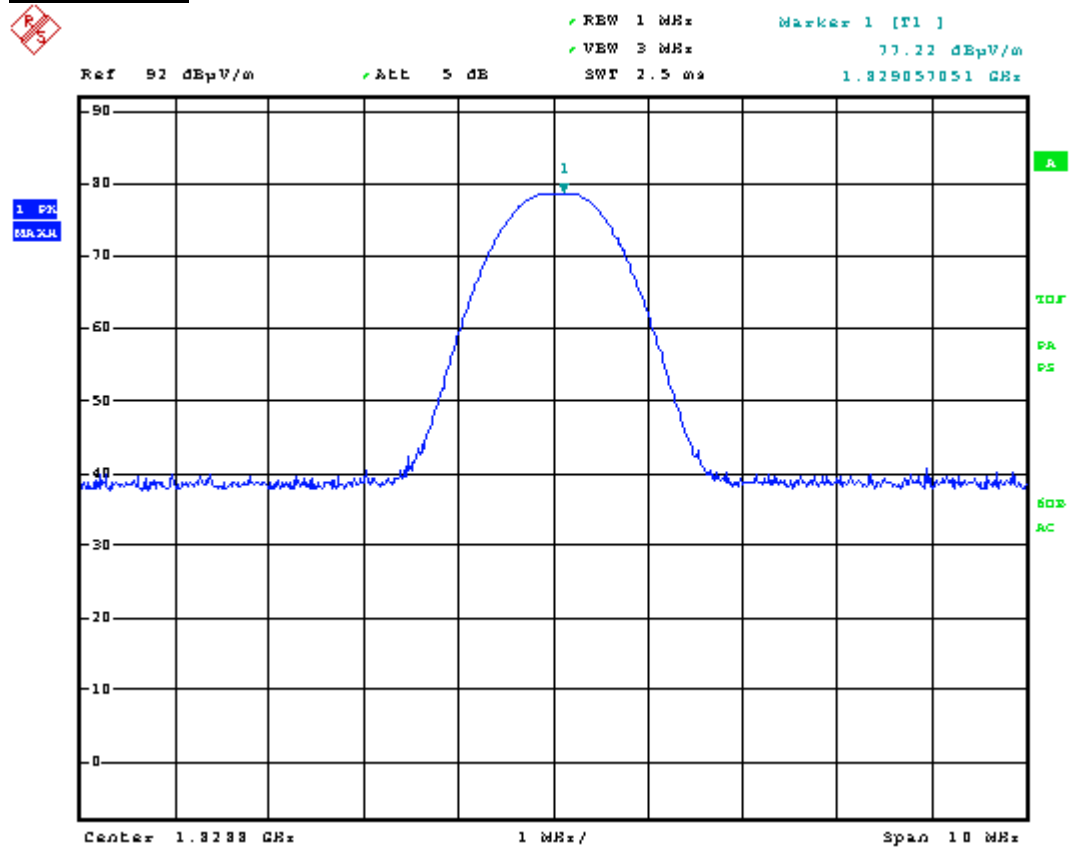
Plot 3.4.57 Radiated emission measurements from 2900 MHz to 4000 MHz at the 914.4 MHz carrier frequency (step 800 kHz)



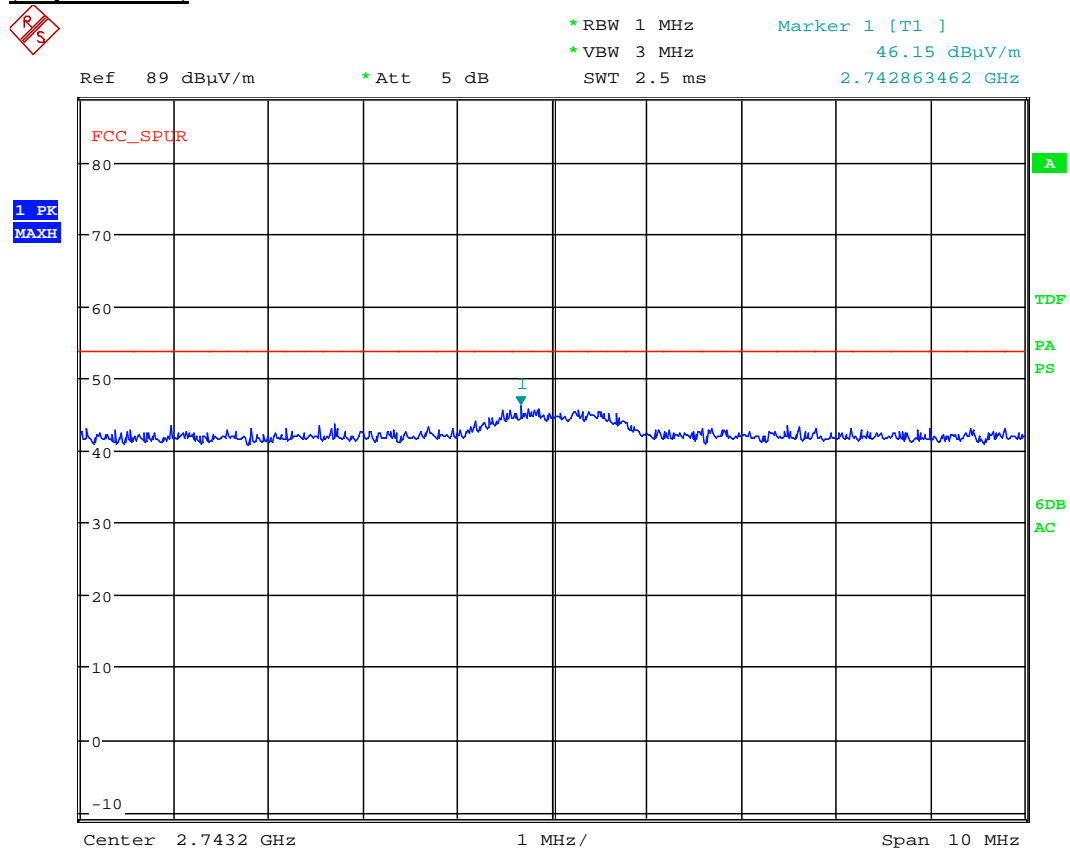
Plot 3.4.58 Radiated emission measurements from 4000 MHz to 10000 MHz at the 914.4 MHz carrier frequency (step 800 kHz)



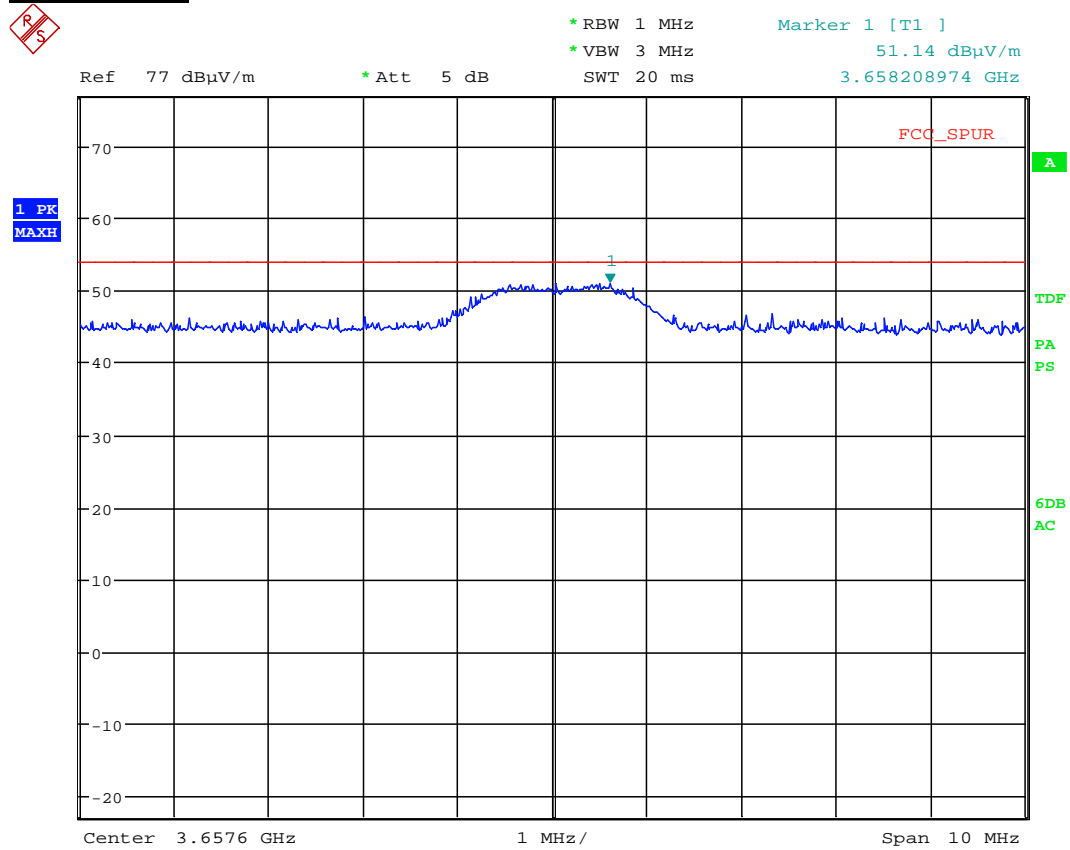
Plot 3.4.59 Radiated emission measurements at the second harmonic of 914.4 MHz carrier frequency (step 800 kHz)



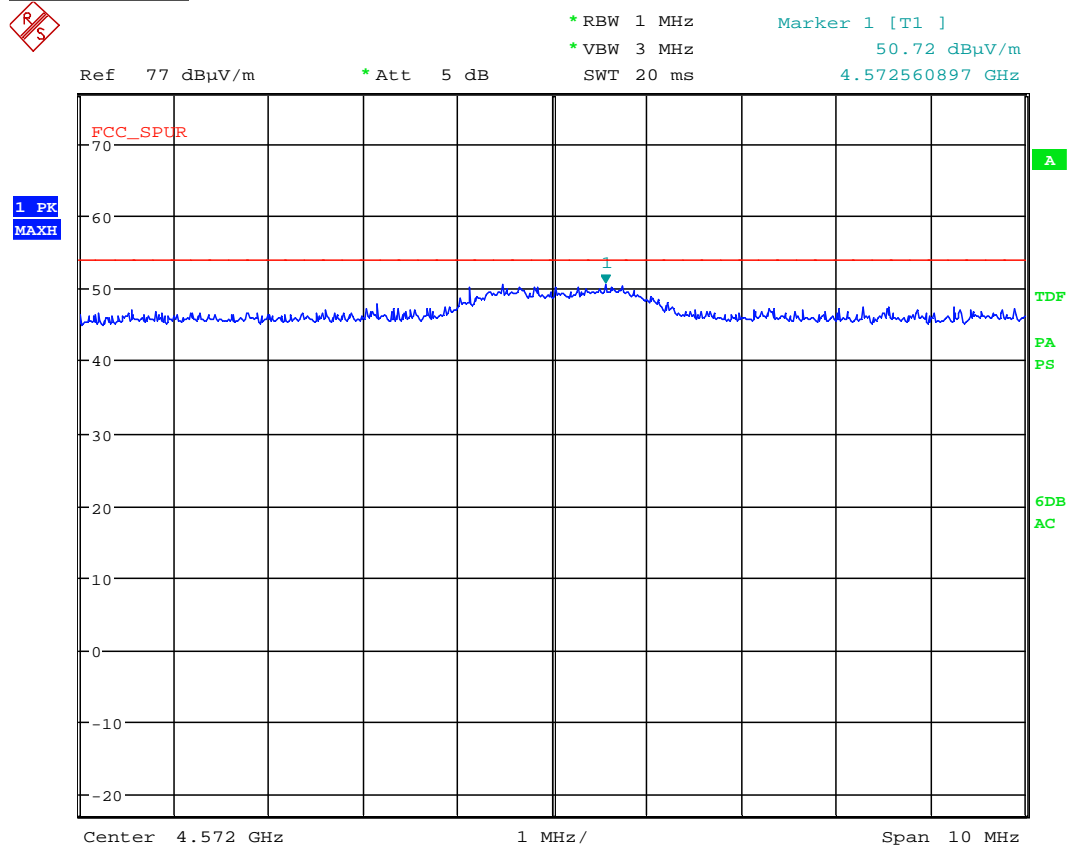
Plot 3.4.60 Radiated emission measurements at the third harmonic of 914.4 MHz carrier frequency (step 800 kHz)



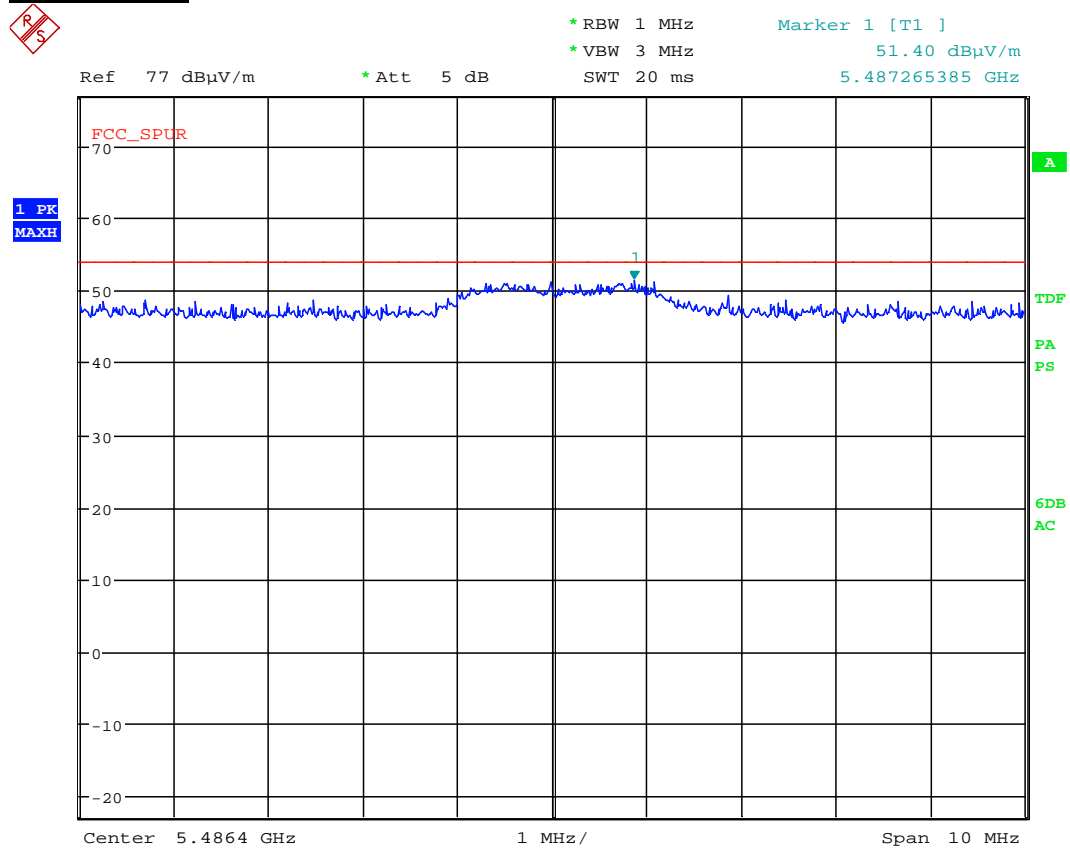
Plot 3.4.61 Radiated emission measurements at the fourth harmonic of 914.4 MHz carrier frequency (step 800 kHz)



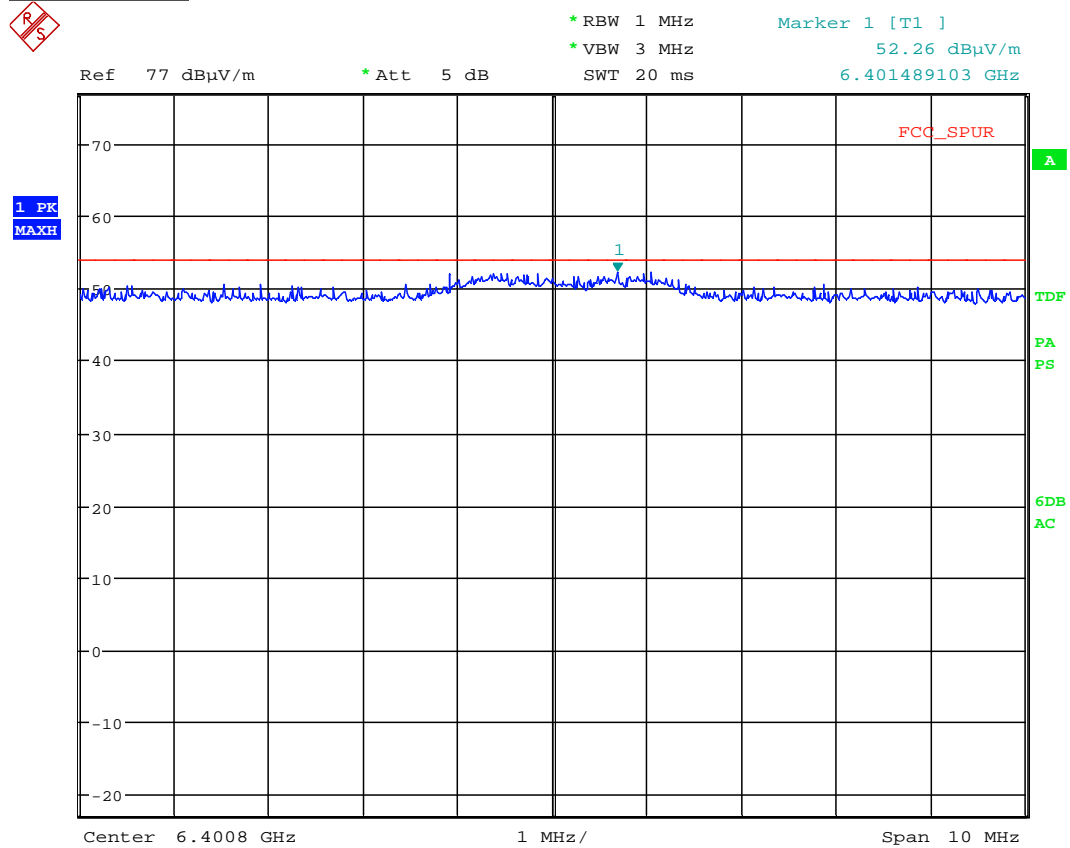
Plot 3.4.62 Radiated emission measurements at the fifth harmonic of 914.4 MHz carrier frequency (step 800 kHz)



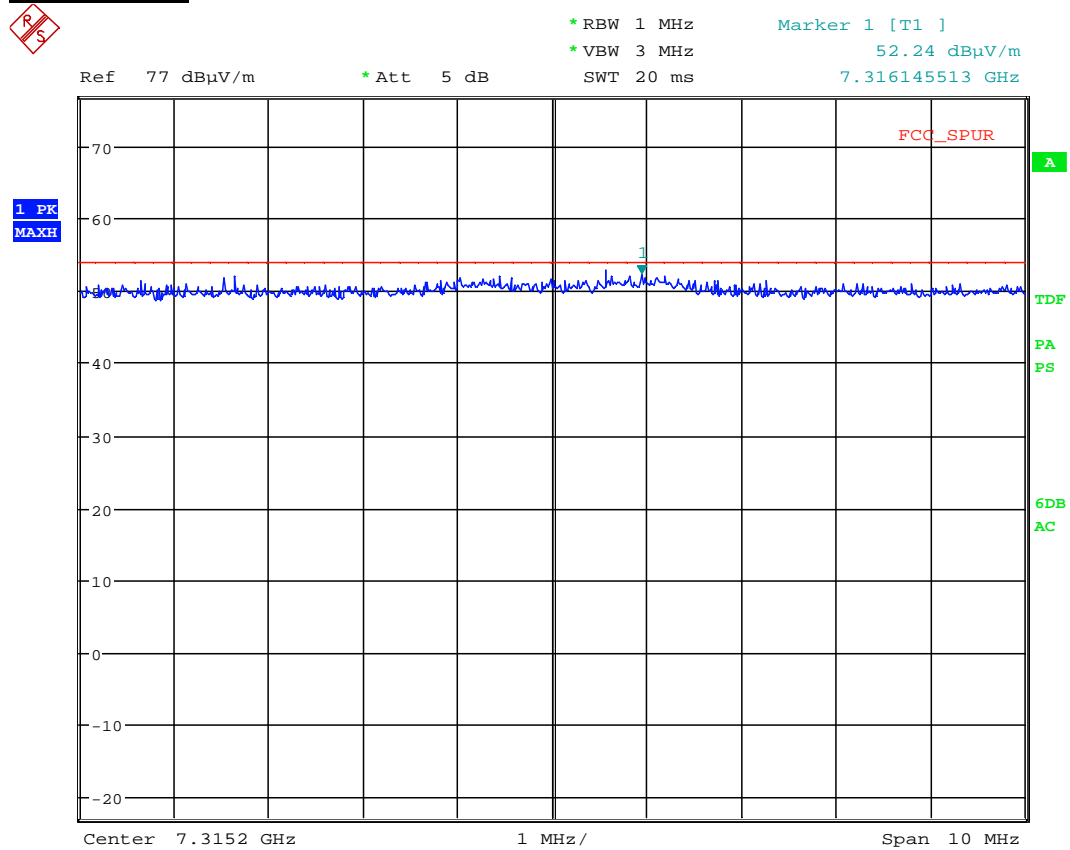
Plot 3.4.63 Radiated emission measurements at the sixth harmonic of 914.4 MHz carrier frequency (step 800 kHz)



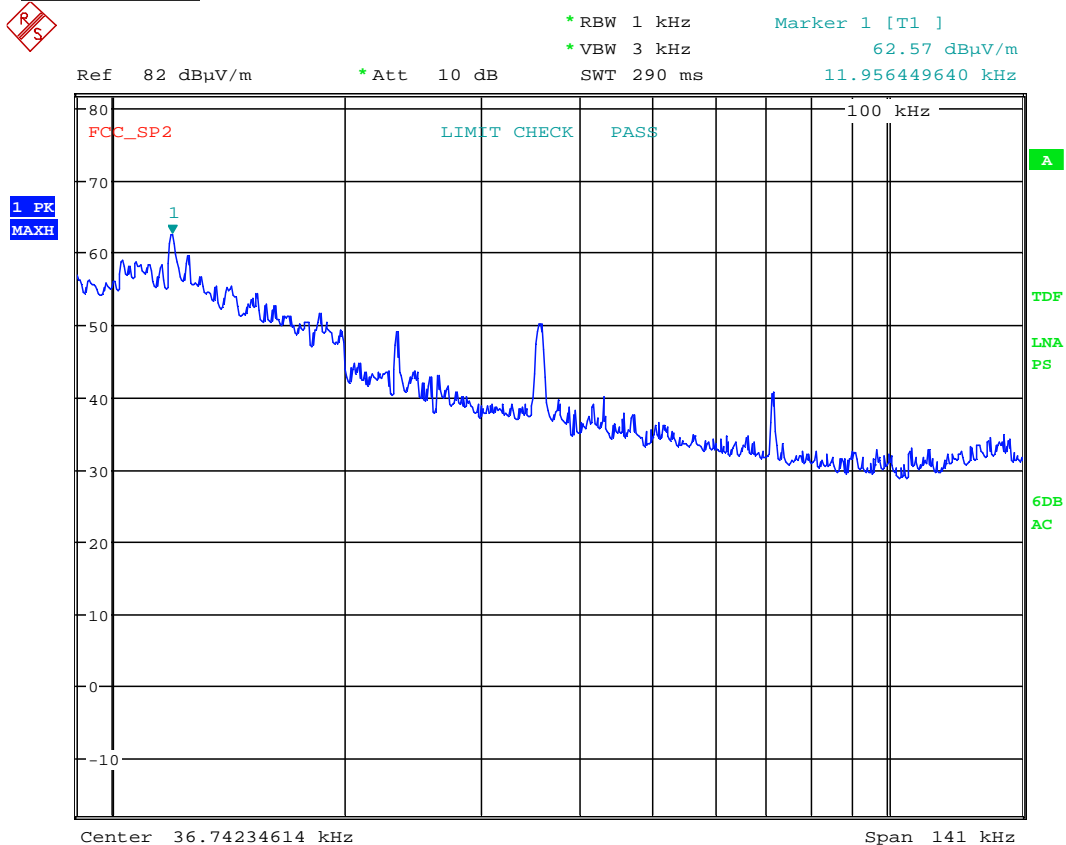
Plot 3.4.64 Radiated emission measurements at the seventh harmonic of 914.4 MHz carrier frequency (step 800 kHz)



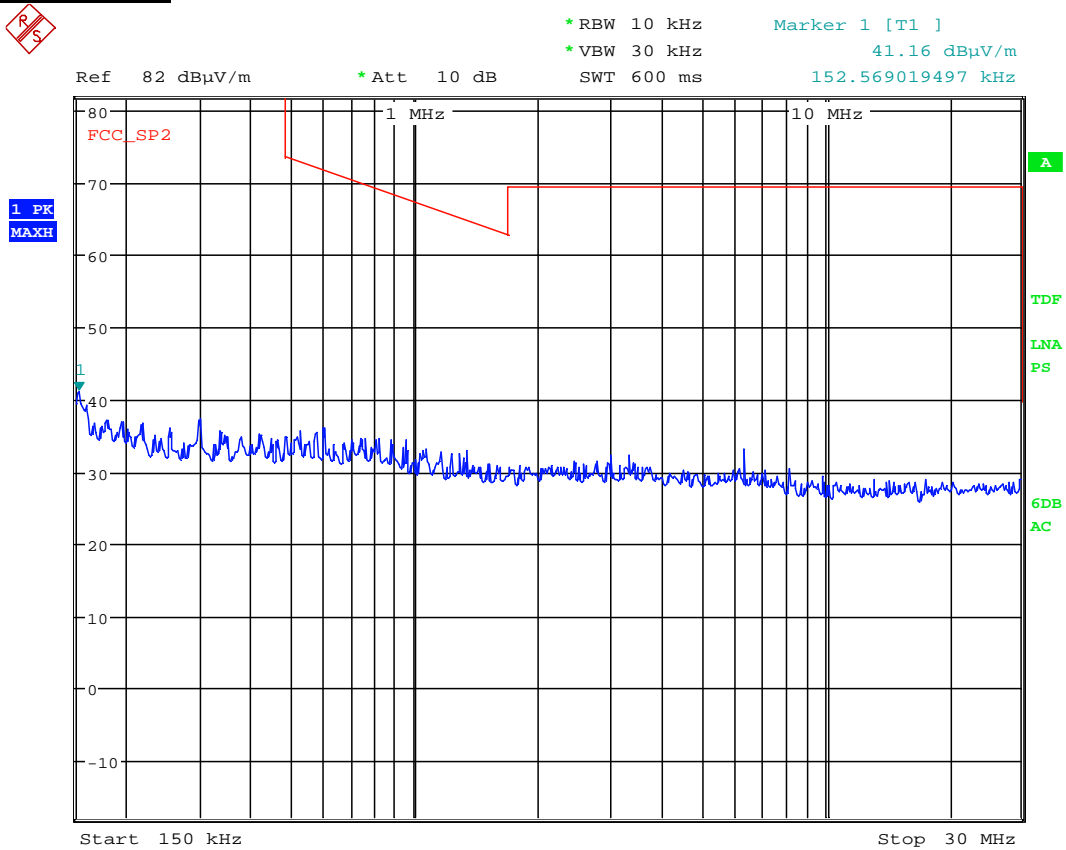
Plot 3.4.65 Radiated emission measurements at the eighth harmonic of 914.4 MHz carrier frequency (step 800 kHz)



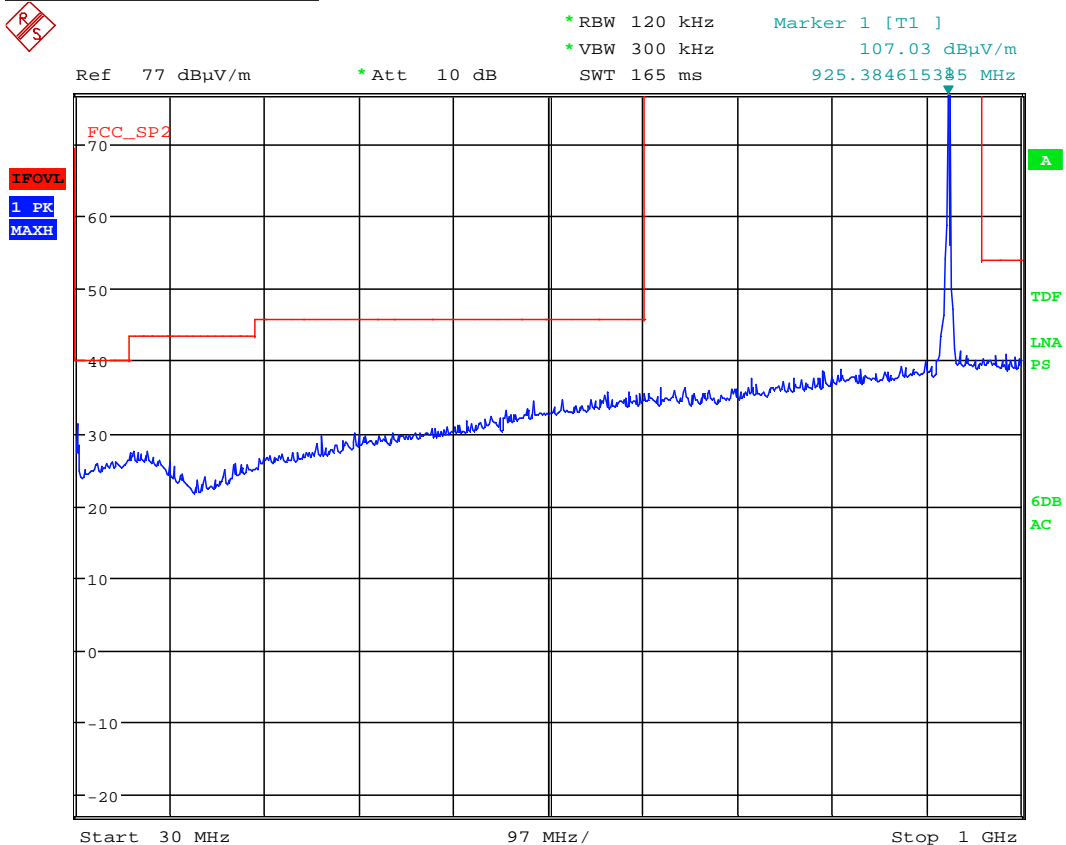
Plot 3.4.66 Radiated emission measurements from 9 kHz to 150 kHz at the 924.8 MHz carrier frequency (step 800 kHz)



Plot 3.4.67 Radiated emission measurements from 150 kHz to 30 MHz at the 924.8 MHz carrier frequency (step 800 kHz)



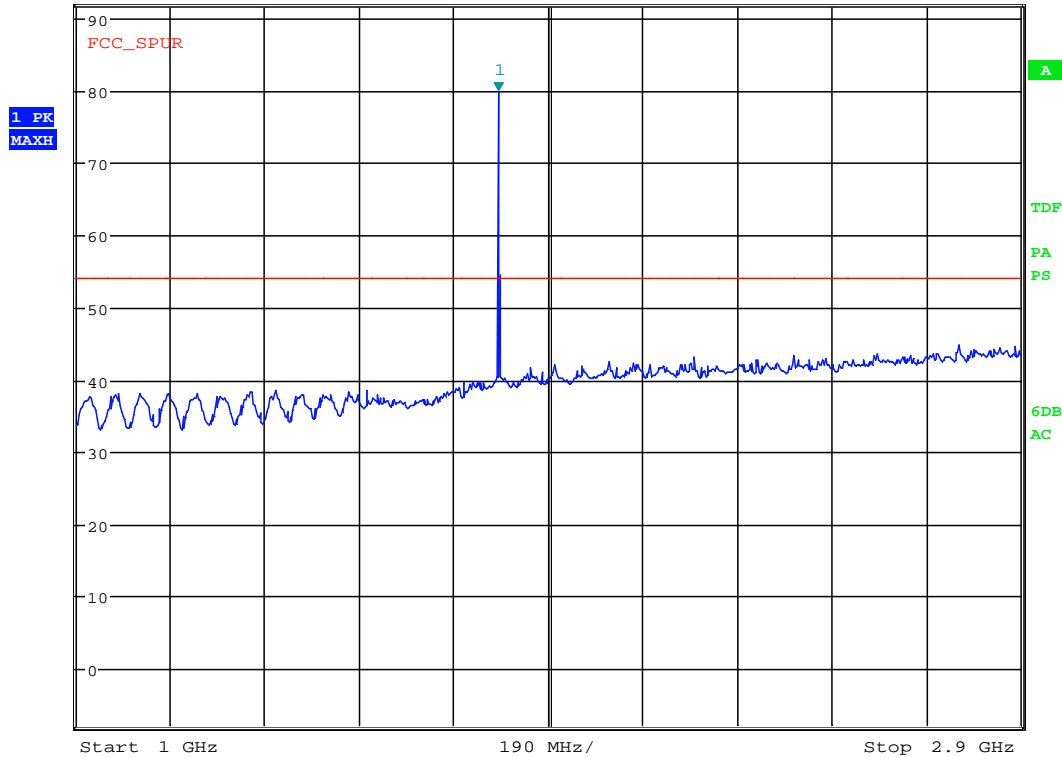
Plot 3.4.68 Radiated emission measurements from 30 MHz to 1000 MHz at the 924.8 MHz carrier frequency (step 800 kHz)



Plot 3.4.69 Radiated emission measurements from 1000 MHz to 2900 MHz at the 924.8 MHz carrier frequency (step 800 kHz)*



Ref 92 dB μ V/m *Att 5 dB *RBW 1 MHz Marker 1 [T1] 79.83 dB μ V/m
*VBW 3 MHz 1.849519231 GHz
SWT 10 ms

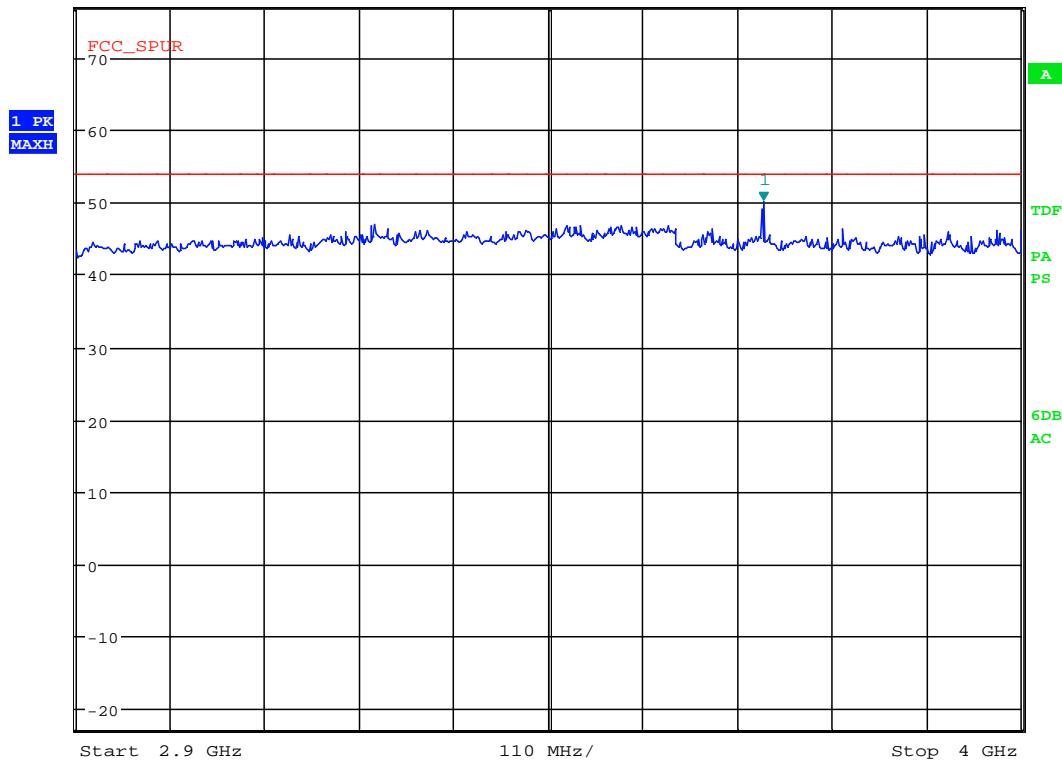


* - limit for restricted bands does not apply to the second harmonic (924.8 MHz)

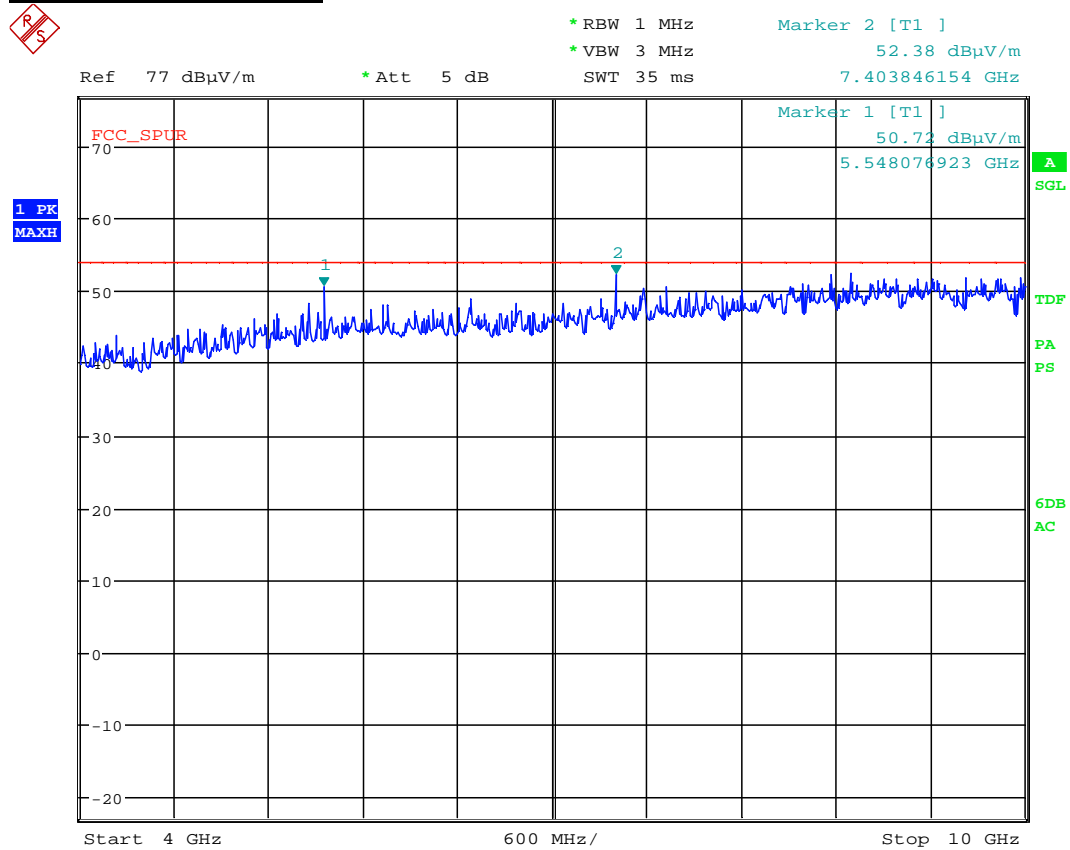
Plot 3.4.70 Radiated emission measurements from 2900 MHz to 4000 MHz at the 924.8 MHz carrier frequency (step 800 kHz)



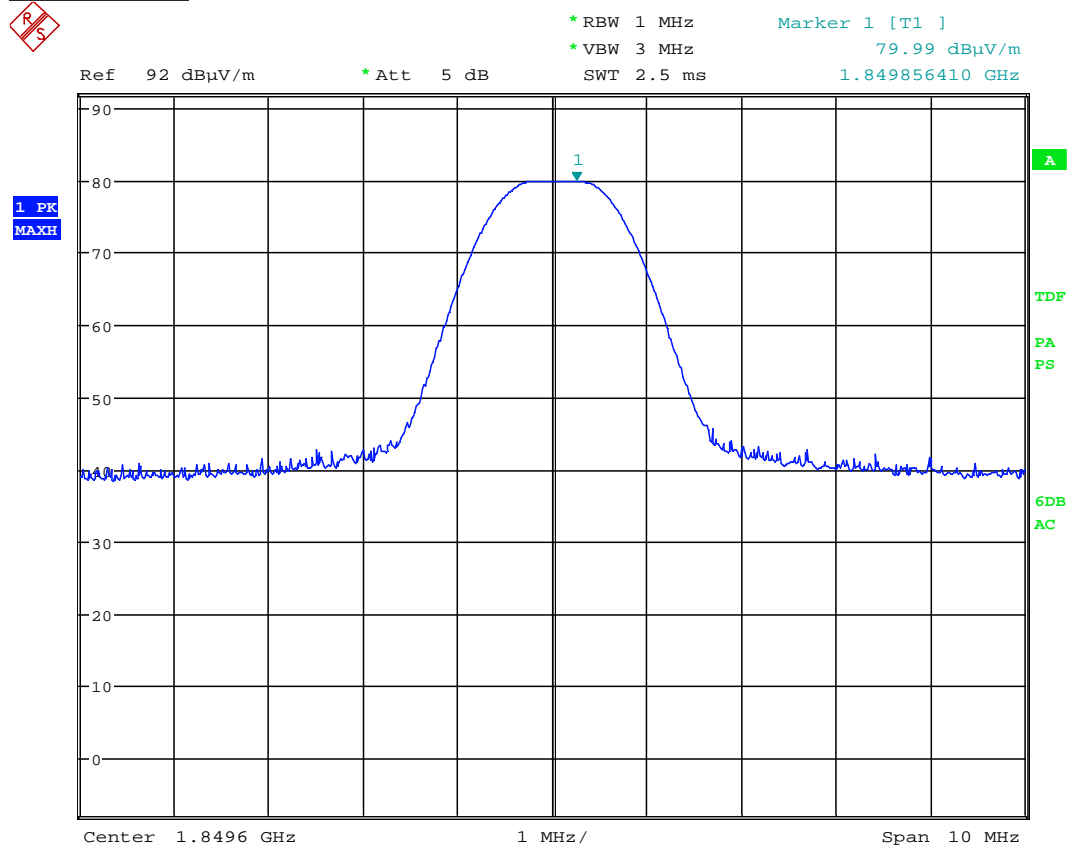
Ref 77 dB μ V/m *Att 5 dB *RBW 1 MHz Marker 1 [T1] 50.13 dB μ V/m
*VBW 3 MHz 3.700320513 GHz
SWT 20 ms



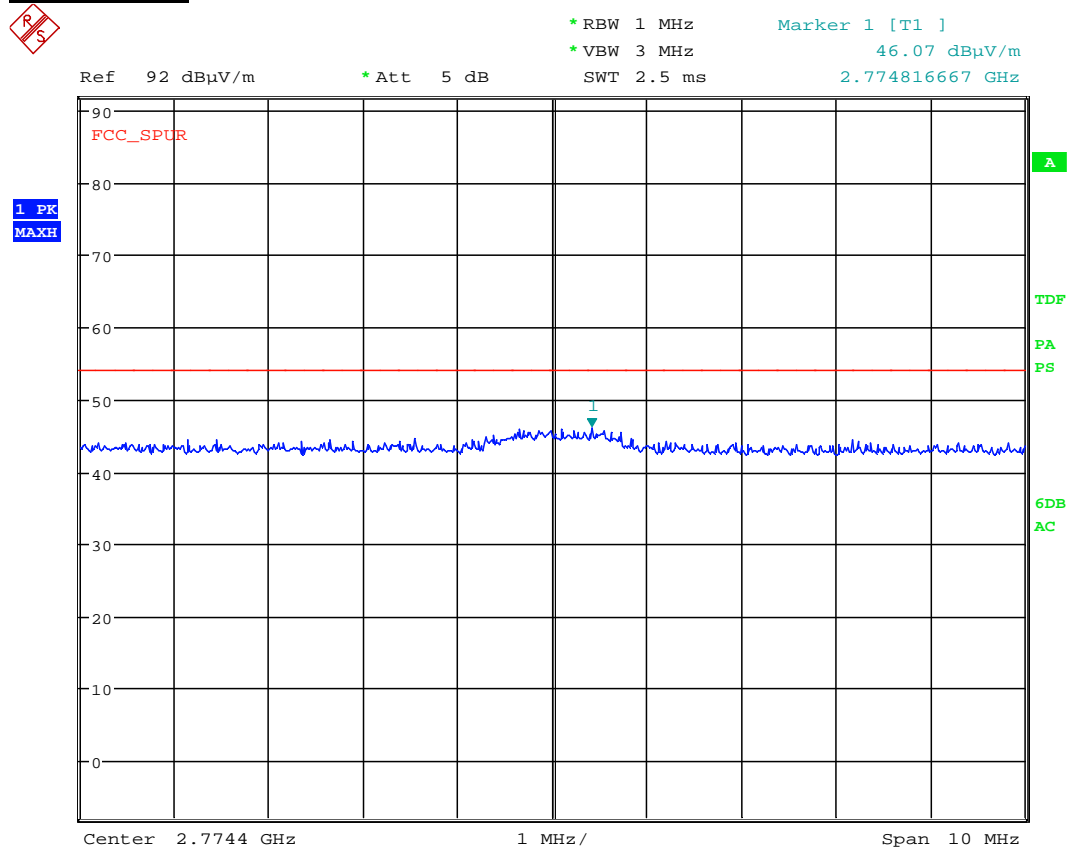
Plot 3.4.71 Radiated emission measurements from 4000 MHz to 10000 MHz at the 924.8 MHz carrier frequency (step 800 kHz)



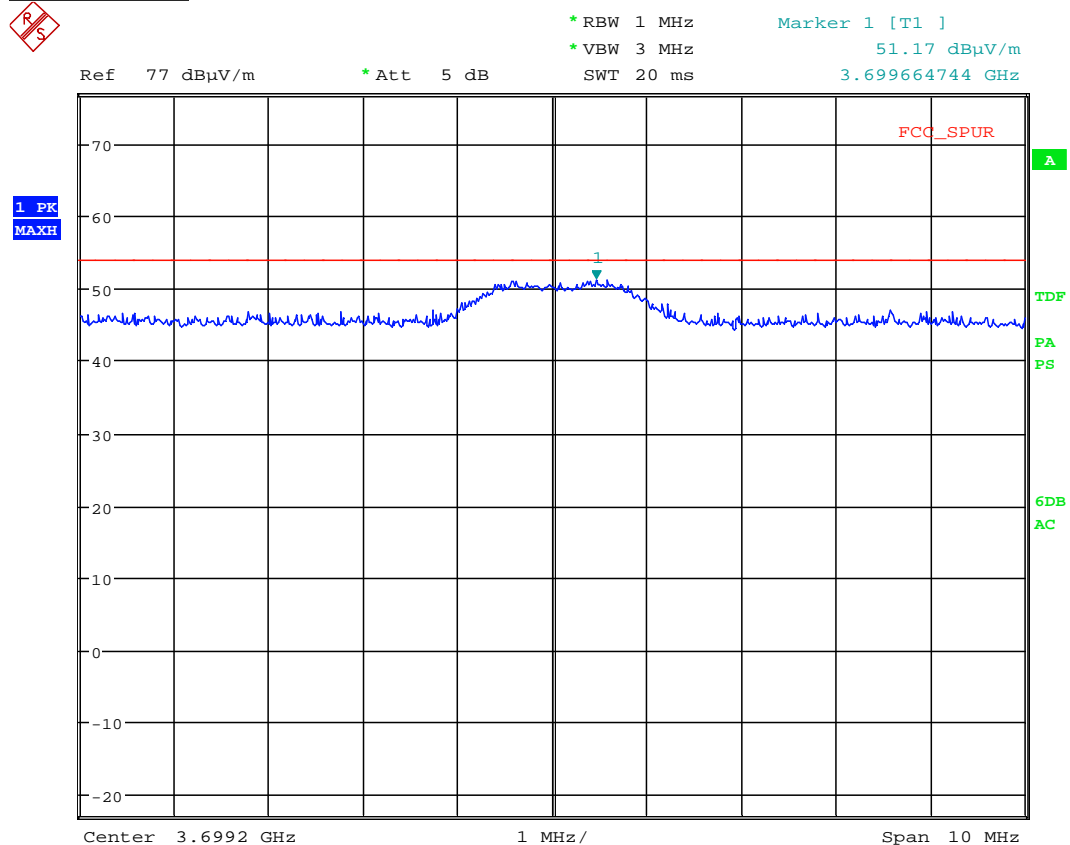
Plot 3.4.72 Radiated emission measurements at the second harmonic of 924.8 MHz carrier frequency (step 800 kHz)



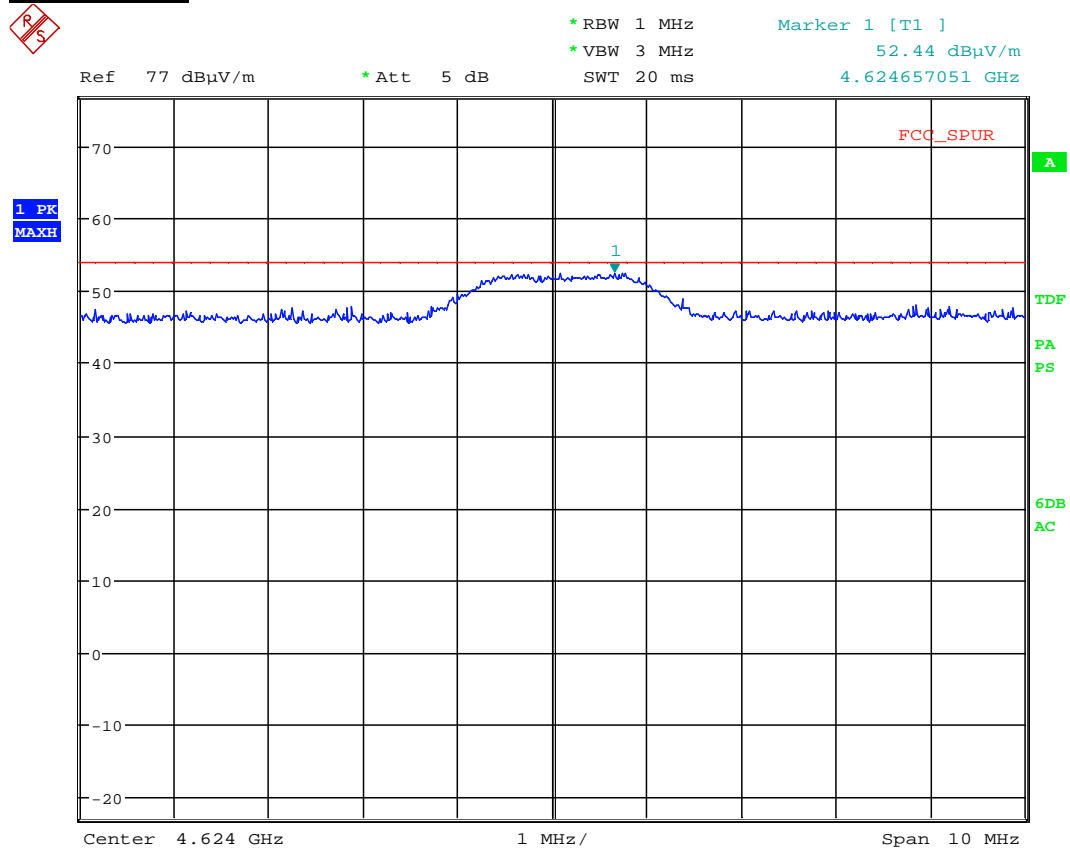
Plot 3.4.73 Radiated emission measurements at the third harmonic of 924.8 MHz carrier frequency (step 800 kHz)



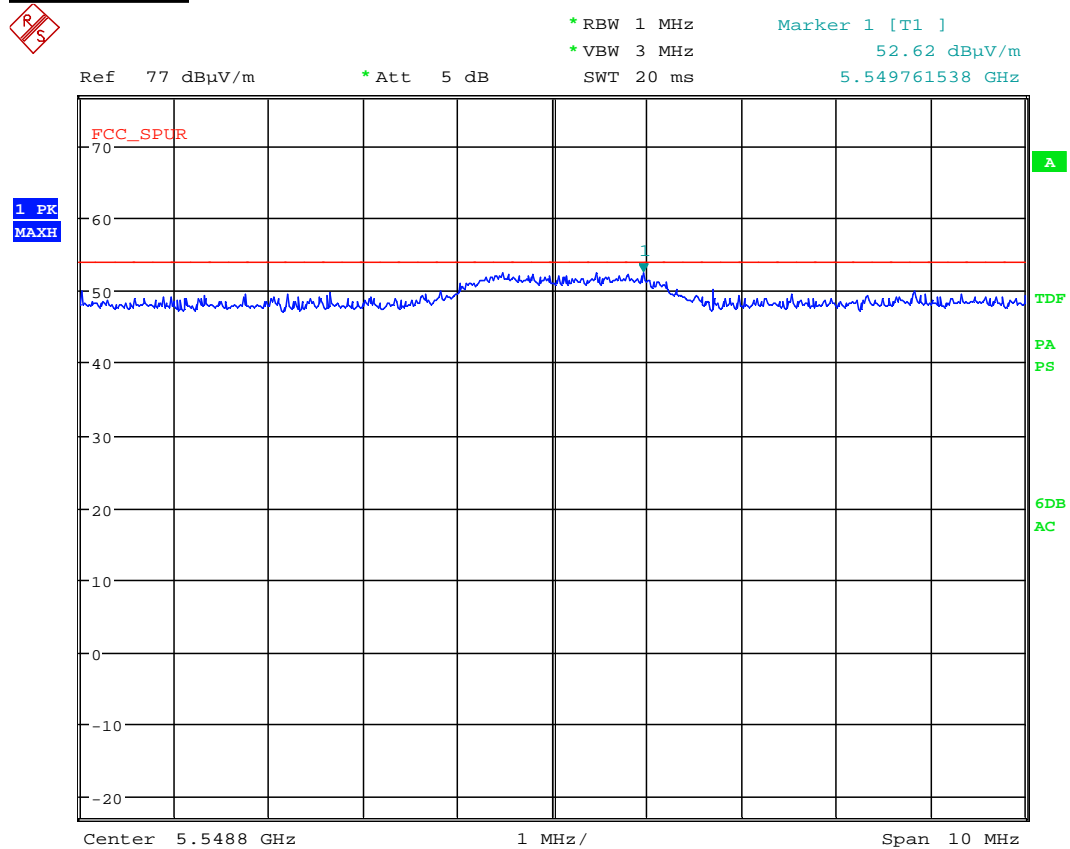
Plot 3.4.74 Radiated emission measurements at the fourth harmonic of 924.8 MHz carrier frequency (step 800 kHz)



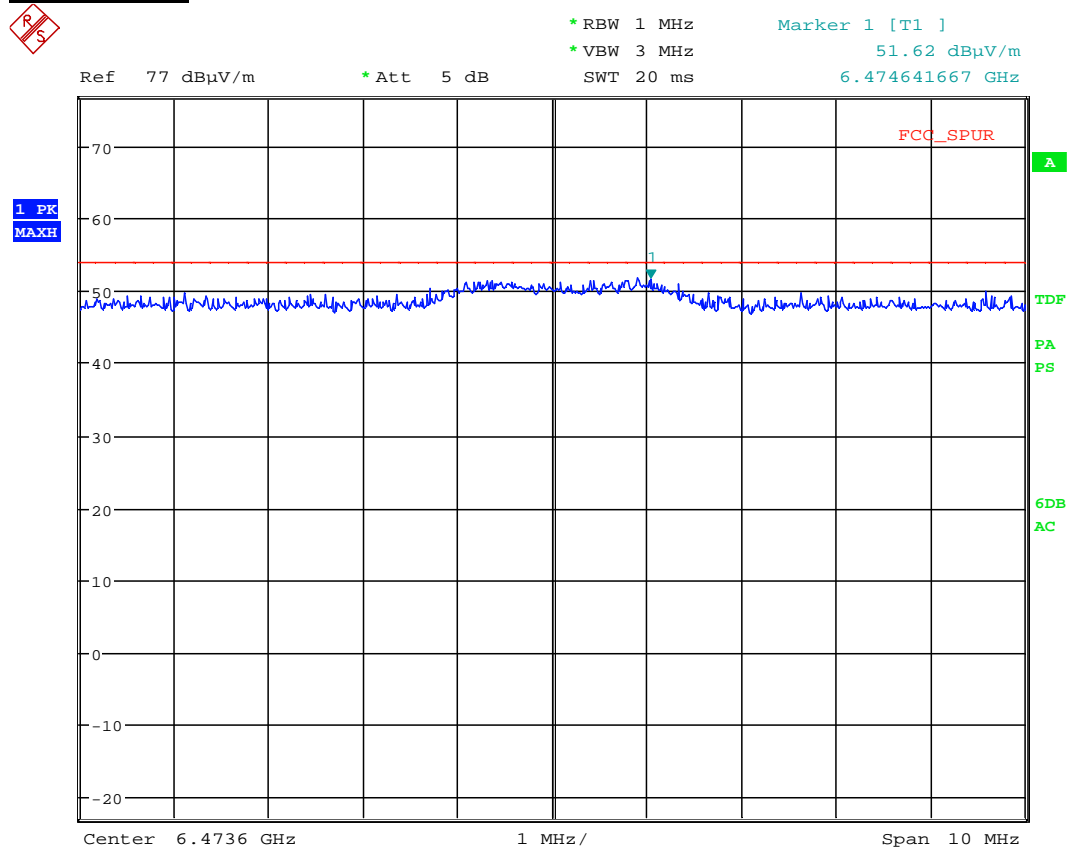
Plot 3.4.75 Radiated emission measurements at the fifth harmonic of 924.8 MHz carrier frequency (step 800 kHz)



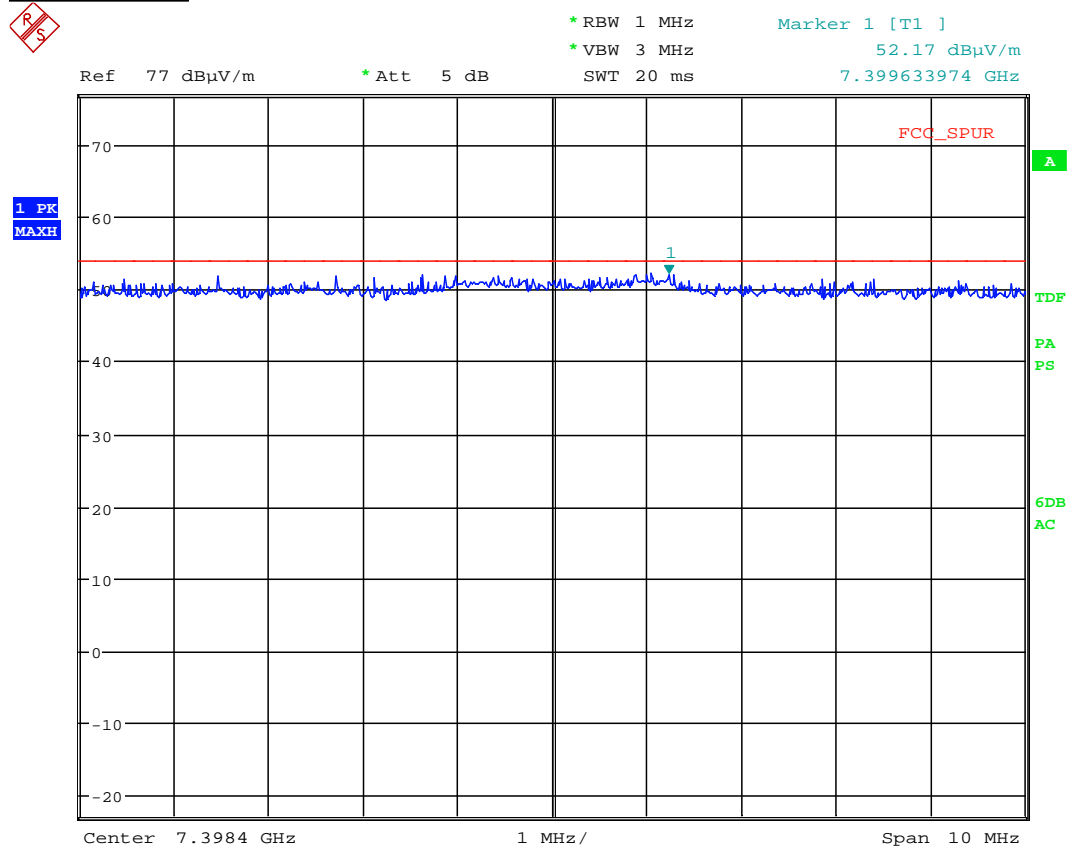
Plot 3.4.76 Radiated emission measurements at the sixth harmonic of 924.8 MHz carrier frequency (step 800 kHz)



Plot 3.4.77 Radiated emission measurements at the seventh harmonic of 924.8 MHz carrier frequency (step 800 kHz)



Plot 3.4.78 Radiated emission measurements at the eighth harmonic of 924.8 MHz carrier frequency (step 800 kHz)



3.5 Radiated Emission

3.5.1 Test requirements 15.109 Class B

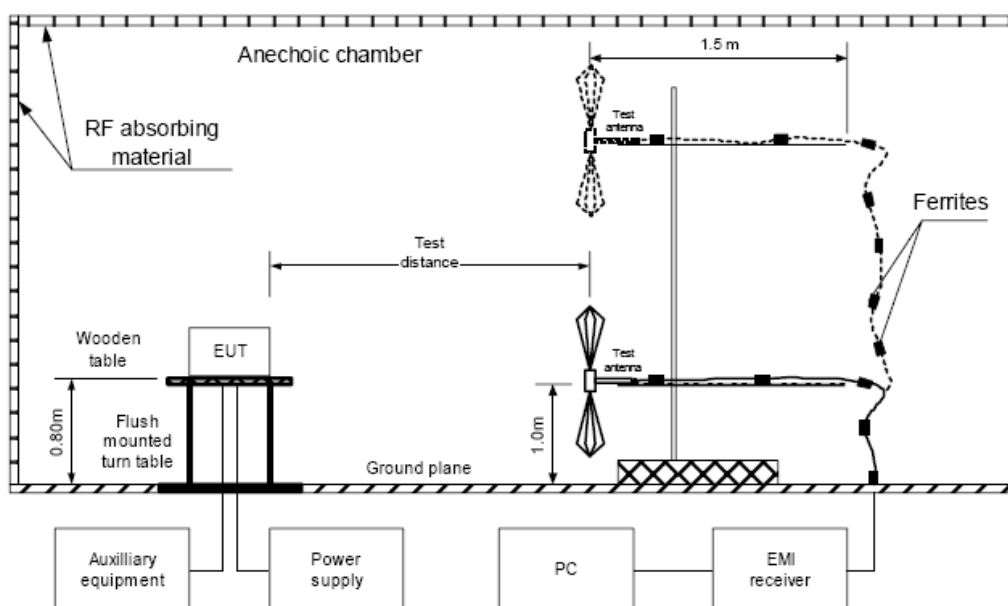
Frequency of emission (MHz)	Field strength (microvolts/meter)	Field Strength (dB μ V/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

3.5.2 Test procedure (ANSI C63.4, Sections 11.6 and 12.1.4)

The test was performed to measure radiated emissions from the equipment under test enclosure. The measurement was made in the anechoic chamber at measurement distance of 3m in two bands: (30-1000) MHz, (1000-10000) MHz.

- 1) The equipment under test was set to stand-by mode.
- 2) In the band of (30-1000) MHz the measurement was made in anechoic chamber with metal floor. The turntable was rotated, the antenna height was altered in the range of 1m - 4m, the polarization of biconical antenna was changed from horizontal to vertical in a process of seeking for the maximum result. Settings of the test receiver: RBW = 120 kHz; Video Detector = Positive Peak during prequalification measurement, Quasi-Peak - during final measurement.
- 3) In the band of (1000-10000) MHz the measurement was made in fully anechoic chamber. The height of test antenna was fixed while the turntable was rotated and the polarization of horn test antenna was changed from horizontal to vertical in a process of seeking for the maximum result. Settings of the test receiver: RBW = 1000 kHz; Video Detector = Positive Peak during prequalification measurement, Average - during final measurement.
- 4) The worst test results (the lowest margins) were recorded and shown in the associated plots.

Figure 3.5.1 Test setup layout (above 30 MHz and below 10 GHz)



3.5.3 Test result

Temperature: +18 °C

Relative humidity: 45 %

EUT OPERATING MODE: Receive / Stand-by

Table 3.5.2 Radiated emission test result (904.8 MHz, step 400 kHz)

Frequency, MHz	Turntable position, degrees	Antenna height, m	Antenna polarization	Peak detector emission, dB μ V/m	Quasi-Peak Detector Emission, dB μ V/m	Average detector emission, dB μ V/m	Limit, dB μ V/m	Result (Pass, Fail, N/A)
41.321411	0	1.0	V	21.1	14.7	-	40.0	Pass
44.467296	90	1.0	V	19.6	14.7	-	40.0	Pass
69.804345	0	2.0	H	20.2	17.1	-	40.0	Pass
104.025284	90	1.5	V	25.8	22.4	-	43.5	Pass
125.243504	90	1.0	H	18.5	13.1	-	43.5	Pass
217.781772	90	3.0	V	20.6	15.1	-	46.0	Pass
357.959782	180	3.5	V	25.3	19.2	-	46.0	Pass
479.069610	270	4.0	V	27.0	22.3	-	46.0	Pass
682.216336	90	2.5	V	30.5	25.3	-	46.0	Pass
947.786405	270	1.0	H	35.0	29.0	-	46.0	Pass
1125.723258	0	3.0	V	36.8	-	24.1	54.0	Pass
1324.767017	90	3.5	V	38.6	-	23.6	54.0	Pass
1986.382082	180	1.5	H	40.6	-	28.0	54.0	Pass
2431.672423	180	2.5	V	42.9	-	30.6	54.0	Pass
3226.584029	0	2.0	V	43.5	-	30.6	54.0	Pass
3976.009559	180	2.5	H	48.1	-	33.8	54.0	Pass
4961.598877	180	2.5	H	48.9	-	35.8	54.0	Pass
6288.681858	90	1.0	V	50.8	-	37.1	54.0	Pass
7749.772462	0	3.5	V	53.3	-	39.7	54.0	Pass
9895.995513	90	3.5	V	55.7	-	41.2	54.0	Pass

Table 3.5.3 Radiated emission test result (914.4 MHz, step 400 kHz)

Frequency, MHz	Turntable position, degrees	Antenna height, m	Antenna polarization	Peak detector emission, dB μ V/m	Quasi-Peak Detector Emission, dB μ V/m	Average detector emission, dB μ V/m	Limit, dB μ V/m	Result (Pass, Fail, N/A)
42.045574	90	1.0	H	21.2	15.8	-	40.0	Pass
56.730145	0	2.5	H	19.1	14.5	-	40.0	Pass
63.692784	0	4.0	V	21.1	15.2	-	40.0	Pass
102.573774	90	1.5	V	26.5	16.7	-	43.5	Pass
105.610328	270	1.0	H	18.8	24.3	-	43.5	Pass
127.037935	180	3.5	V	19.9	13.9	-	43.5	Pass
207.295037	180	3.0	H	25.0	14.1	-	43.5	Pass
353.233184	0	2.5	V	27.4	18.8	-	46.0	Pass
490.923498	180	1.0	V	30.5	22.1	-	46.0	Pass
689.699273	90	1.5	V	35.1	24.8	-	46.0	Pass
957.585498	90	1.0	H	37.4	15.8	-	46.0	Pass
1143.124538	180	3.5	H	38.1	-	23.2	54.0	Pass
1560.524335	270	4.0	H	40.6	-	24.4	54.0	Pass
1951.884413	90	3.5	H	42.5	-	27.3	54.0	Pass
2695.740950	0	1.5	H	44.4	-	29.7	54.0	Pass
3164.576008	0	2.0	H	47.1	-	31.9	54.0	Pass
3904.492010	0	1.0	V	48.7	-	34.4	54.0	Pass
4982.456826	90	1.5	H	50.4	-	35.9	54.0	Pass
6137.856676	0	1.0	V	52.4	-	36.5	54.0	Pass
7739.270264	270	1.5	V	54.5	-	39.6	54.0	Pass
9738.808361	90	1.0	V	54.7	-	42.2	54.0	Pass

Table 3.5.4 Radiated emission test result (924.8 MHz, step 400 kHz)

Frequency, MHz	Turntable position, degrees	Antenna height, m	Antenna polarization	Peak detector emission, dB μ V/m	Quasi-Peak Detector Emission, dB μ V/m	Average detector emission, dB μ V/m	Limit, dB μ V/m	Result (Pass, Fail, N/A)
42.829643	90	1.5	H	20.0	14.8	-	40.0	Pass
45.156631	0	1.0	H	19.2	14.9	-	40.0	Pass
65.769977	90	3.0	V	21.5	14.7	-	40.0	Pass
102.501630	0	2.5	V	26.5	19.2	-	43.5	Pass
131.135182	90	1.0	V	18.1	12.4	-	43.5	Pass
208.735536	0	2.5	H	19.6	14.5	-	43.5	Pass
316.236177	0	2.0	V	25.4	19.9	-	46.0	Pass
492.911166	180	1.5	H	28.0	22.9	-	46.0	Pass
689.298492	270	2.0	V	31.1	25.3	-	46.0	Pass
964.268885	0	3.5	V	33.9	30.3	-	54.0	Pass
1252.946676	90	2.0	H	37.8	-	23.5	54.0	Pass
1409.467114	90	4.0	H	38.8	-	24.8	54.0	Pass
1954.071788	0	2.5	H	39.9	-	26.7	54.0	Pass
2451.561353	270	3.5	H	43.4	-	28.9	54.0	Pass
3074.769808	0	1.5	V	43.6	-	31.0	54.0	Pass
3984.123381	0	1.5	H	47.4	-	33.3	54.0	Pass
4965.624512	90	2.0	H	47.8	-	35.4	54.0	Pass
6137.623974	0	4.0	V	49.6	-	35.9	54.0	Pass
7552.875902	180	1.5	V	52.4	-	38.5	54.0	Pass
9844.327532	0	1.5	V	55.8	-	42.3	54.0	Pass

Table 3.5.5 Radiated emission test result (904.8 MHz, step 800 kHz)

Frequency, MHz	Turntable position, degrees	Antenna height, m	Antenna polarization	Peak detector emission, dB μ V/m	Quasi-Peak Detector Emission, dB μ V/m	Average detector emission, dB μ V/m	Limit, dB μ V/m	Result (Pass, Fail, N/A)
40.940683	90	1.0	V	20.9	15.4	-	40.0	Pass
58.815798	90	2.5	H	20.1	14.7	-	40.0	Pass
67.985983	0	3.0	H	21.1	13.9	-	40.0	Pass
103.811300	0	1.5	H	26.6	20.8	-	43.5	Pass
139.411548	180	1.0	V	19.0	11.9	-	43.5	Pass
207.009490	90	1.5	H	20.2	14.5	-	43.5	Pass
349.250253	0	2.0	H	25.9	19.8	-	46.0	Pass
489.830897	270	4.0	H	27.9	22.3	-	46.0	Pass
675.150850	180	3.5	H	30.8	24.8	-	46.0	Pass
961.224384	0	2.0	V	34.9	29.0	-	54.0	Pass
1175.889226	180	3.5	H	37.4	-	24.1	54.0	Pass
1328.011598	90	4.0	V	38.4	-	24.4	54.0	Pass
1987.179558	0	1.5	V	40.7	-	28.1	54.0	Pass
2416.980367	270	3.5	V	43.3	-	30.1	54.0	Pass
3160.052899	0	2.5	V	44.0	-	31.3	54.0	Pass
3898.663303	90	2.5	V	47.8	-	33.6	54.0	Pass
4892.412773	180	1.5	H	48.5	-	36.2	54.0	Pass
6197.559187	90	1.0	H	50.4	-	36.8	54.0	Pass
7768.708882	180	1.5	V	53.1	-	39.4	54.0	Pass
9946.613625	90	1.5	V	55.5	-	42.3	54.0	Pass

Table 3.5.6 Radiated emission test result (914.4 MHz, step 800 kHz)

Frequency, MHz	Turntable position, degrees	Antenna height, m	Antenna polarization	Peak detector emission, dB μ V/m	Quasi-Peak Detector Emission, dB μ V/m	Average detector emission, dB μ V/m	Limit, dB μ V/m	Result (Pass, Fail, N/A)
41.607042	270	3.0	H	20.0	15.3	-	40.0	Pass
56.792496	90	3.5	H	19.4	15.3	-	40.0	Pass
61.746505	90	2.0	H	21.1	14.7	-	40.0	Pass
102.472860	0	1.5	V	26.1	21.3	-	43.5	Pass
125.778114	180	3.5	V	18.5	13.3	-	43.5	Pass
205.123799	270	1.0	H	19.9	14.2	-	43.5	Pass
345.381231	90	1.0	V	25.2	19.9	-	46.0	Pass
483.589020	0	4.0	V	28.1	22.1	-	46.0	Pass
692.185312	180	3.0	V	30.5	24.9	-	46.0	Pass
931.829739	90	3.5	H	35.0	30.0	-	46.0	Pass
1267.285331	90	3.5	V	36.4	-	24.0	54.0	Pass
1536.849244	90	3.5	V	38.7	-	24.5	54.0	Pass
1976.956573	270	2.0	H	41.0	-	27.8	54.0	Pass
2589.916888	0	2.5	V	43.7	-	29.4	54.0	Pass
3125.784773	180	1.5	H	43.8	-	30.7	54.0	Pass
3954.858584	0	2.5	H	47.7	-	33.4	54.0	Pass
5032.405468	0	3.0	V	48.2	-	35.6	54.0	Pass
6084.435486	0	1.5	V	49.6	-	36.2	54.0	Pass
7341.635278	180	1.5	V	53.6	-	38.7	54.0	Pass
9842.815918	180	1.5	V	55.3	-	41.6	54.0	Pass

Table 3.5.7 Radiated emission test result (924.8 MHz, step 800 kHz)

Frequency, MHz	Turntable position, degrees	Antenna height, m	Antenna polarization	Peak detector emission, dB μ V/m	Quasi-Peak Detector Emission, dB μ V/m	Average detector emission, dB μ V/m	Limit, dB μ V/m	Result (Pass, Fail, N/A)
40.707693	90	3.0	V	21.7	14.8	-	40.0	Pass
55.547666	0	2.5	V	20.7	15.2	-	40.0	Pass
60.032572	0	1.0	H	21.2	15.3	-	40.0	Pass
102.259410	90	1.0	H	26.8	22.6	-	43.5	Pass
121.087054	90	2.0	H	19.2	12.8	-	43.5	Pass
215.730947	370	4.0	H	20.9	15.4	-	43.5	Pass
342.401743	180	2.0	H	26.4	19.1	-	46.0	Pass
486.184355	180	3.5	V	28.5	22.3	-	46.0	Pass
697.493257	270	3.0	V	31.3	25.2	-	46.0	Pass
951.036312	0	2.0	H	35.2	29.2	-	46.0	Pass
1167.692351	0	1.5	V	37.8	-	23.7	54.0	Pass
1592.827261	90	3.0	H	38.7	-	25.6	54.0	Pass
1934.914821	0	3.0	V	41.1	-	26.9	54.0	Pass
2528.380558	90	2.5	H	44.0	-	28.9	54.0	Pass
3125.338376	0	3.0	V	44.7	-	30.3	54.0	Pass
3873.228616	180	3.0	H	47.8	-	34.0	54.0	Pass
4998.236342	180	2.0	H	48.5	-	35.4	54.0	Pass
6174.394823	90	1.5	V	50.7	-	37.0	54.0	Pass
7544.249979	270	1.5	V	53.2	-	38.4	54.0	Pass
9981.281473	90	2.0	H	55.8	-	42.7	54.0	Pass