Report No. 267780-1

Test Report

Product	Wireless 2.4GHz ISM product
Name and address of the applicant	Nordic Semiconductor ASA Otto Nielsens veg 12, N-7004 Trondheim
Name and address of the manufacturer	Nordic Semiconductor ASA Otto Nielsens veg 12, N-7004 Trondheim
Model	nRF51822 CEAAEA
Rating	3.3Vdc , Battery Powered
Trademark	Nordic Semiconductor
Serial number	-
Additional information	-
Tested according to	ETSI EN 300 328 V1.8.1 (2012-06)
Order number	267780
Tested in period	2014-08-23 – 2014-08-29
Issue date	2014-09-03
Name and address of the testing laboratory	**Nemko Group** Nemko AS Gaustadalléen 30, P.O.Box 73 Blindern, 0314 Oslo, Norway Telephone (+47) 22 96 03 30 Fax (+47) 22 96 05 50

An accredited technical test executed under the Norwegian accreditation scheme

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1 Test Information

1.1 Tested Item

Name :	Nordic Semiconductor
Model/version :	nRF51822 CEAAEA
Serial number :	-
Hardware identity and/or version:	PCA 10018 r1.1.0
Software identity and/or version :	nDTM 3.1 r4581
Frequency Range :	2402 – 2480 MHz
Number of Channels :	78 (channel spacing : 1MHz)
Type of Modulation :	GFSK
Data rate:	1 Mbps & 2 Mbps
Conducted Output:	0 dBm & +4 dBm
User Frequency Adjustment :	None
Type of Power Supply :	3.0 V DC
Antenna Connector :	SMA(Antenna type: Antenova Titans 2.4GHz Swivel AMA antenna)
Antenna Diversity Supported :	No
Desktop Charger :	None

Description of Test Item

Mode 2: nRF 1Mbs (GFSK BT: 0.5, Modulation Index: 0.32) – 36.6% duty cycle
Mode 3: nRF 2Mbs (GFSK BT: 0.5, Modulation Index: 0.32) – 28.26% duty cycle
Mode 4: BLE 1Mbs (GFSK BT: 0.5, Modulation Index: 0.50) – 33.4% duty cycle

The QM board contains the RS232 interface and also supply's the module board with power. The USB interface on the QM board is used for power supply.

The QM board has a built in USB to RS232 serial converter (optional usage).

The nRFGO module board contains the PCA 10018 r1.1.0 nRF51822 CEAAEA device that tested.

1.2 Test Environment

1.2.1 Normal test condition

Temperature:	20 - 23 °C
Relative humidity:	20 - 40 %
Normal test voltage:	3.3Vdc

The values are the limit registered during the test period.

1.2.2 Extreme test conditions

Not Tested

1.3 Test Engineer

G.Suhanthakumar

1.4 Test Equipment

See list of test equipment in clause 6.

1.5 Other Comments

The QM board contains the RS232 interface and also supply's the module board with power. The USB interface on the QM board is used for power supply.

The QM board has a built in USB to RS232 serial converter (optional usage).

The nRFGO module board contains the PCA 10018 r1.1.0 nRF51822 CEAAEA device that tested.

2 TEST REPORT SUMMARY

2.1 General

The tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with

EN 300 328 V1.8.1 (2012-06):
Wideband Transmission systems; Data transmission equipment operating in the 2,4GHz ISM band and using spread spectrum modulation techniques

The test methods have been in accordance with Comlab 1003 and EN 300 328 where applicable.

Radiated tests were performed is accordance with Comlab 1003 and EN 300 328. Radiated emissions are made in a 3m anechoic chamber.

☐ Production Unit

☒ Pre-production Unit

2.2 Test Report Summary

Abbreviations

The following abbreviations are used in the test summary:

Pass The test results are inside the limits given in EN 300328.

Fail The test results are outside the limits given in EN 300328.

NA Not applicable. The testcase is not applicable for the tested equipment.

NT Not tested. The testcase is not covered by this test report.

Harmonized Standard EN 300 328

The following requirements and test specifications are relevant to the presumption of conformity under the article 3.2 of the R&TTE Directive

Technical Reqirement reference			Technical Requirement Conditionality		Test Specification		
No	Description	Reference Clause No	U/C	Condition	E/O	Reference Clause No	Verdict (P/F/NA)
1	RF Output Power	4.3.1.1 or 4.3.2.1	U		E	5.3.2	P
2	Power Spectral Density	4.3.2.2	C	Only for modulations other than FHSS	E	5.3.3	NT§
3	Duty cycle, Tx-Sequence, Tx-gap	4.3.1.2 or 4.3.2.3	C	Only for non-adaptive equipment	E	5.3.2	NA
4	Dwell time, Minimum Frequency Occupation & Hopping Sequence	4.3.1.3	C	Only for FHSS	E	5.3.4	NA
5	Hopping Frequency Separation	4.3.1.4	C	Only for FHSS	E	5.3.5	NA
6	Medium Utilisation	4.3.1.5 or 4.3.2.4	C	Only for non-adaptive equipment	E	5.3.2	NA[1]
7	Adaptivity	4.3.1.6 or 4.3.2.5	C	Only for adaptive equipment	E	5.3.7	NA
8	Occupied Channel Bandwidth	4.3.1.7 or 4.3.2.6	U		E	5.3.8	P
9	Transmitter unwanted emissions in the OOB domain	4.3.1.8 or 4.3.2.7	U		E	5.3.9	P*
10	Transmitter unwanted emissions in the spurious domain	4.3.1.9 or 4.3.2.8	U		E	5.3.10	P
11	Receiver spurious emissions	4.3.1.10 or 4.3.2.9	U		E	5.3.11	P
12	Receiver Blocking	4.3.1.11 or 4.3.2.10	C	Only for adaptive equipment	E	5.3.7	NA

§ Not requested by the manufacturer.

*Tested only in nominal environment conditions.

[1] The EUT has output power less than 10 dBm e.i.r.p.

[2] Tested radiated with the supplied antenna.

3 Test Results

3.1 RF output power, Radiated

ETSI EN 300328 subclause 4.3.2.1

Mode 4 (+4dBm)

Channel / Frequency	Measured conducted values (dBm)	Antenna gain (dBi)	Calculated eirp (dBm)
		VP	
2402 MHz	2.9	2.6	5.5
2440 MHz	3.1	1.9	5.0
2480 MHz	3.1	2.8	5.9
Verdict	Pass	Pass	Pass
Measurement Uncertainty U_{95}	±2.23 dB		

Mode 4 (0dBm)

Channel / Frequency	Measured conducted values (dBm)	Antenna gain (dBi)	Calculated eirp (dBm)
		VP	
2402 MHz	-0.5	2.6	2.1
2440 MHz	-0.1	1.9	1.8
2480 MHz	0.0	2.8	2.8
Verdict	Pass	Pass	Pass
Measurement Uncertainty U_{95}	±2.23 dB		

Antenna gain is measured in an anechoic chamber.

The maximum eirp is obtained in VP polarization and XY plane.

The EUT was programmed to transmit modulated continuously during testing (duty cycle = 34%).

The Power was measured on a modulated carrier using a power meter.

Measured in nominal conditions.

Limits: Clause 4.3.2.1.2

Maximum Effective Radiated Power shall be less than or equal to 100 mW (20 dBm) e.i.r.p.

Test Equipment Used: 1- 5,7,8,11,12

Duty Cycle, Tx-sequence, Tx-gap

DUT Frequency (MHz)	Duty Cycle (%)	Limit Duty Cycle (%)	Number of Bursts	Number of Gaps	Maximum Tx-sequence (ms)	Limit Maximum Tx-sequence (ms)	Minimum Tx-gap (ms)	Limit Minimum Tx-gap (ms)	Minimum Tx-On (ms)
2402.000000	34.349	---	1602	0	---	---	---	---	0.214

(continuation of the "Duty Cycle, Tx-sequence, Tx-gap" table from column 10 ...)

DUT Frequency (MHz)	Maximum Tx-On (ms)	Minimum Tx-Off (ms)	Maximum Tx-Off (ms)	Measurement Time (ms)	DC Result	Tx-Seq Result	Tx-Gap Result
2402.000000	0.215	0.410	0.411	1001.248	EIRP < 10 dBm	EIRP < 10 dBm	EIRP < 10 dBm

(continuation of the "Duty Cycle, Tx-sequence, Tx-gap" table from column 17 ...)

DUT Frequency (MHz)	Comment
2402.000000	

3.2 Occupied Channel Bandwidth

ETSI EN 300328 subclause 4.3.2.6

Radiated measurements – Mode 4 (+4dBm)

Channel Frequency	Channel Center Frequency (MHz)	Occupied Channel Bandwidth (MHz)	Lower Band Edge (MHz)	Upper Band Edge (MHz)
2402 MHz	2402.010838	1.015291	2401.503193	2402.518484
2440 MHz	2440.035267	1.103308	2439.483613	2440.586921
2480 MHz	2480.038007	1.099704	2479.488155	2480.587860
Measurement Uncertainty	+13 /-12 KHz			

Radiated measurements – Mode 4 (0dBm)

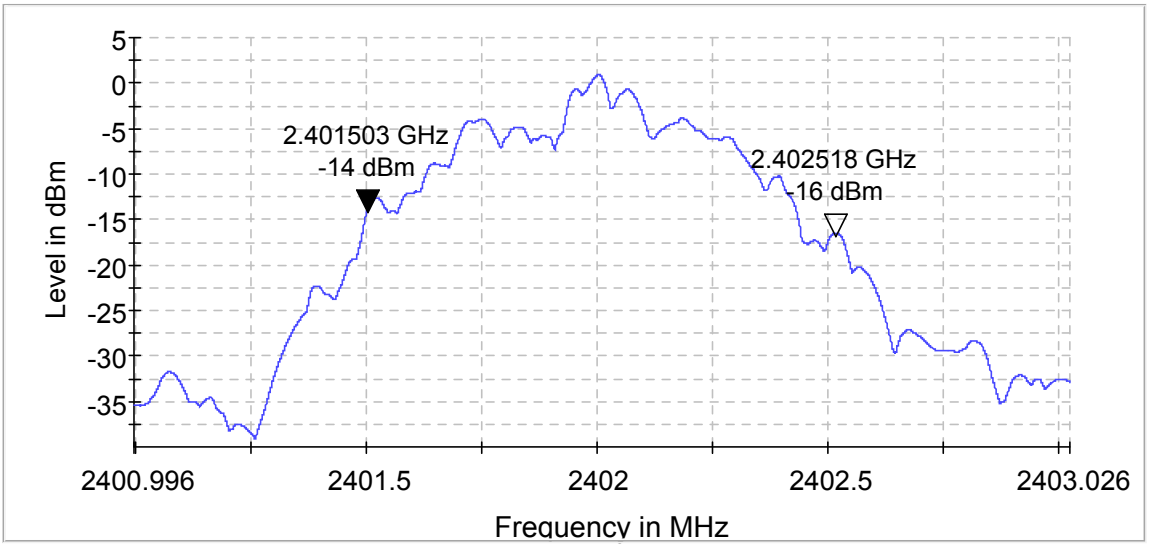
Channel Frequency	Channel Center Frequency (MHz)	Occupied Channel Bandwidth (MHz)	Lower Band Edge (MHz)	Upper Band Edge (MHz)
2402 MHz	2402.001660	0.993501	2401.504910	2402.498411
2440 MHz	2440.002531	0.990508	2439.507277	2440.497785
2480 MHz	2480.003394	0.997345	2479.504722	2480.502066
Measurement Uncertainty	+13 /-12 KHz			

The EUT was programmed to transmit modulated continuously during testing (duty cycle = 34%).
The OBW was measured on a modulated carrier using a Spectrum Analyzer with RMS Detector.
Please see attached graphs for nominal conditions.

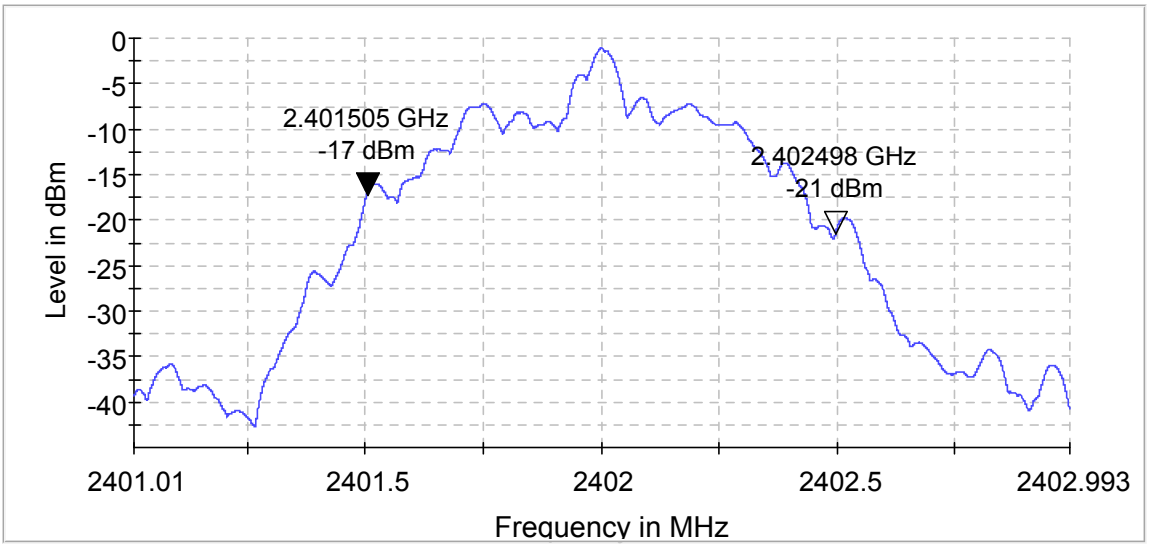
Limits: Clause 4.3.2.6.3

The Occupied Channel Bandwidth shall fall completely within the 2400 – 2483.5 MHz band. In addition, for non-adaptive systems using wide band modulations other than FHSS and with e.i.r.p greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz

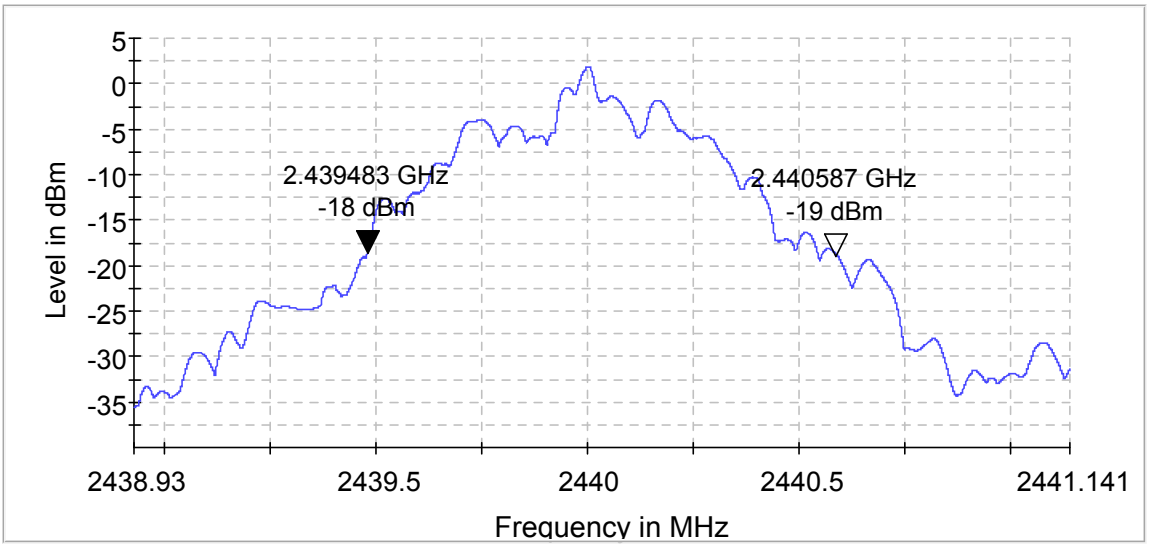
Test Equipment Used: 7,8,11,12



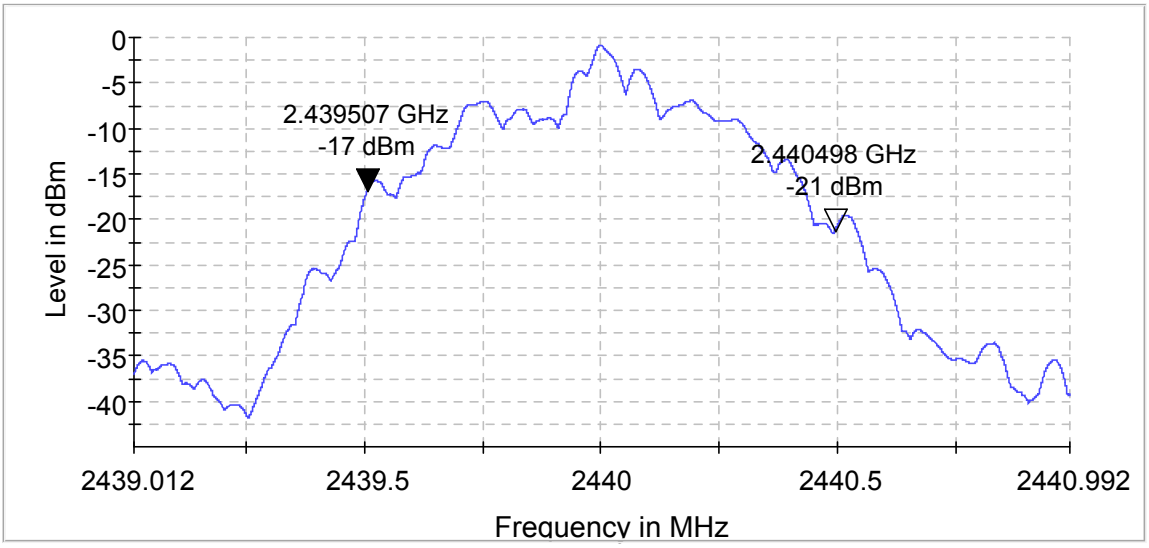
+4dBm: Occupied Channel Bandwidth (OBW) – Ch 2402MHz



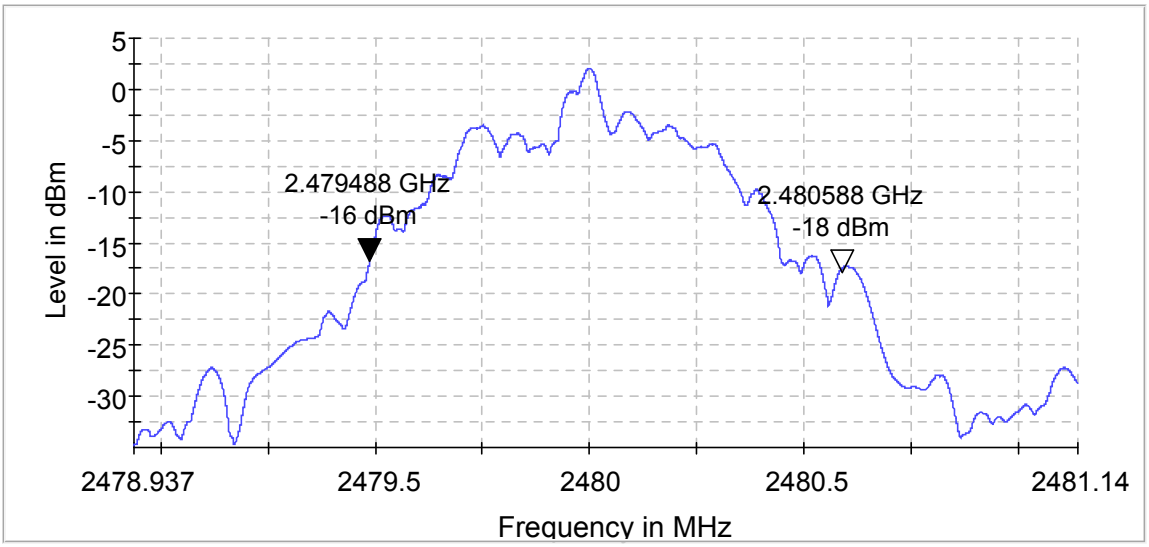
0dBm: Occupied Channel Bandwidth (OBW) – Ch 2402MHz



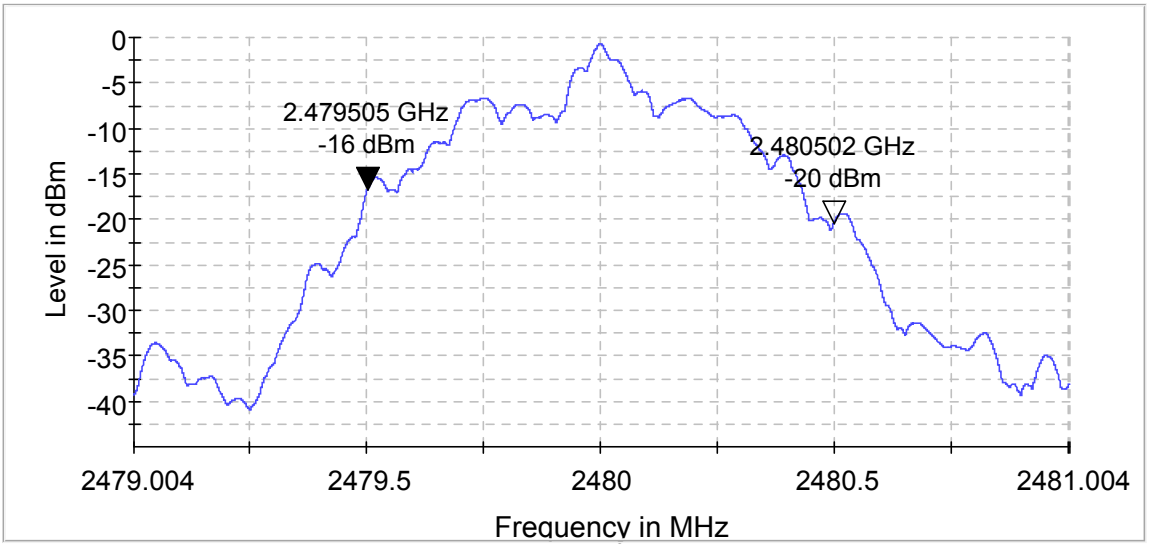
+4dBm: Occupied Channel Bandwidth (OBW) – Ch 2440MHz



0dBm: Occupied Channel Bandwidth (OBW) – Ch 2440MHz



+4dBm: Occupied Channel Bandwidth (OBW) – Ch 2480MHz



0dBm: Occupied Channel Bandwidth (OBW) – Ch 2480MHz

3.3 Transmitter unwanted emissions in the Out-of-band domain-Lower band

ETSI EN 300328 subclause 4.3.2.7

Conducted measurements – Mode 3 (+4dBm)

DUT Frequency (MHz)	DUT Bandwidth (MHz)	Frequency (MHz)	Level (dBm)	Limit (dBm)	Result
2402.000000	1.800000	2396.866951	-45.4	-20.0	PASS
2402.000000	1.800000	2397.683475	-45.0	-20.0	PASS
2402.000000	1.800000	2398.683475	-47.7	-10.0	PASS
2402.000000	1.800000	2399.500000	-38.8	-10.0	PASS
2402.000000	1.800000	2484.000000	-61.3	-10.0	PASS
2402.000000	1.800000	2484.816525	-61.2	-10.0	PASS
2402.000000	1.800000	2485.816525	-61.2	-20.0	PASS
2402.000000	1.800000	2486.633049	-61.6	-20.0	PASS
Measurement Uncertainty			±2.23 dB		

Conducted measurements – Mode 3 (0dBm)

DUT Frequency (MHz)	DUT Bandwidth (MHz)	Frequency (MHz)	Level (dBm)	Limit (dBm)	Result
2402.000000	1.790000	2396.909494	-40.1	-20.0	PASS
2402.000000	1.790000	2397.704747	-41.2	-20.0	PASS
2402.000000	1.790000	2398.704747	-41.3	-10.0	PASS
2402.000000	1.790000	2399.500000	-42.4	-10.0	PASS
2402.000000	1.790000	2484.000000	-61.3	-10.0	PASS
2402.000000	1.790000	2484.795253	-61.1	-10.0	PASS
2402.000000	1.790000	2485.795253	-61.1	-20.0	PASS
2402.000000	1.790000	2486.590506	-60.5	-20.0	PASS
Measurement Uncertainty			±2.23 dB		

Measured OBW is approxmately 1.8 MHz in mode 3

See attached graphs below.

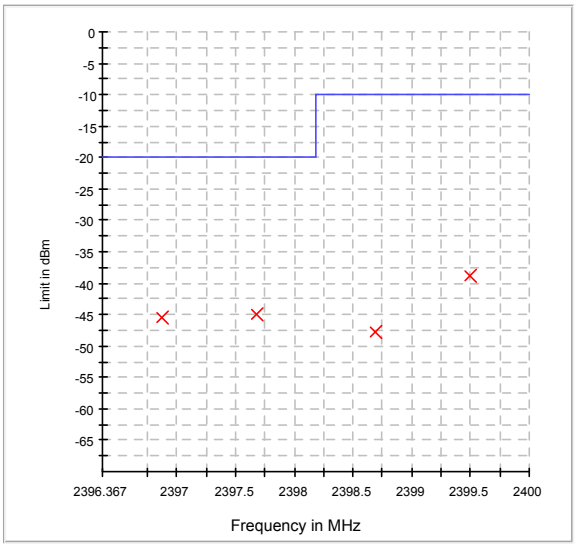
The EUT was programmed to transmit modulated continuously during testing (duty cycle = 29.9%).

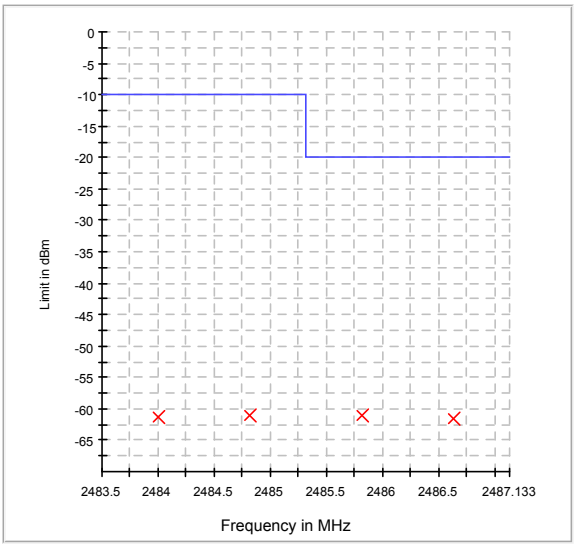
The transmitter unwanted emissions in the out-of-band domain was measured on a modulated carrier using a Spectrum Analyzer with RMS Detector.

Limits: Clause 4.3.2.7.2

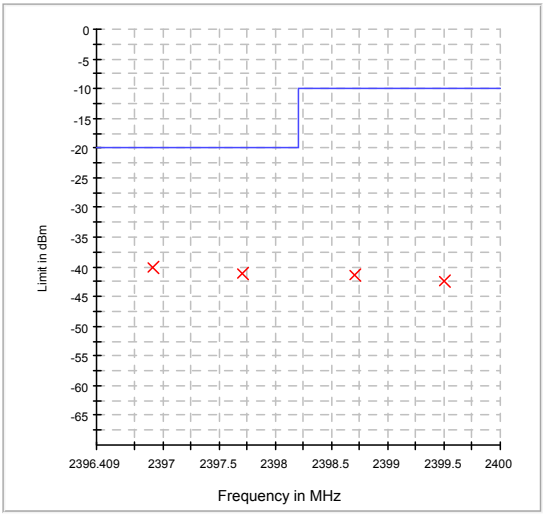
The Occupied Channel Bandwidth shall fall completely within the 2400 – 2483.5 MHz band. The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in figure 3.	
Out of Band Domain	**Limit (dBm/MHz)**
A	-10 dBm/MHz e.i.r.p.
B	-20 dBm/MHz e.i.r.p.
C	-30 dBm/MHz e.i.r.p.

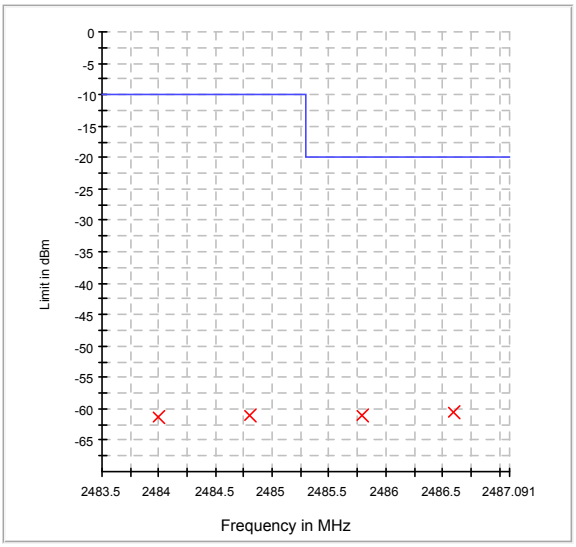
Test Equipment Used: 7,8,11,12





+4dBm: Transmitter unwanted emissions in the OOB — Ch2402MHz- Nominal conditions





0dBm: Transmitter unwanted emissions in the OOB — Ch2402MHz- Nominal conditions

3.4 Transmitter unwanted emissions in the Out-of-band domain-Upper band

ETSI EN 300328 subclause 4.3.2.7

Conducted measurements – Mode 3 (+4dBm)

DUT Frequency (MHz)	DUT Bandwidth (MHz)	Frequency (MHz)	Level (dBm)	Limit (dBm)	Result
2480.000000	1.800000	2396.859121	-61.5	-20.0	PASS
2480.000000	1.800000	2397.679560	-62.1	-20.0	PASS
2480.000000	1.800000	2398.679560	-59.7	-10.0	PASS
2480.000000	1.800000	2399.500000	-61.0	-10.0	PASS
2480.000000	1.800000	2484.000000	-41.5	-10.0	PASS
2480.000000	1.800000	2484.820440	-49.1	-10.0	PASS
2480.000000	1.800000	2485.820440	-51.3	-20.0	PASS
2480.000000	1.800000	2486.640879	-51.2	-20.0	PASS
Measurement Uncertainty			±2.23 dB		

Conducted measurements – Mode 3 (0dBm)

DUT Frequency (MHz)	DUT Bandwidth (MHz)	Frequency (MHz)	Level (dBm)	Limit (dBm)	Result
2480.000000	1.800000	2396.905456	-61.0	-20.0	PASS
2480.000000	1.800000	2397.702728	-61.8	-20.0	PASS
2480.000000	1.800000	2398.702728	-61.3	-10.0	PASS
2480.000000	1.800000	2399.500000	-58.3	-10.0	PASS
2480.000000	1.800000	2484.000000	-46.5	-10.0	PASS
2480.000000	1.800000	2484.797272	-47.1	-10.0	PASS
2480.000000	1.800000	2485.797272	-45.0	-20.0	PASS
2480.000000	1.800000	2486.594544	-45.0	-20.0	PASS
Measurement Uncertainty			±2.23 dB		

Measured OBW is approxmately 1.8 MHz in mode 3

See attached graphs below.

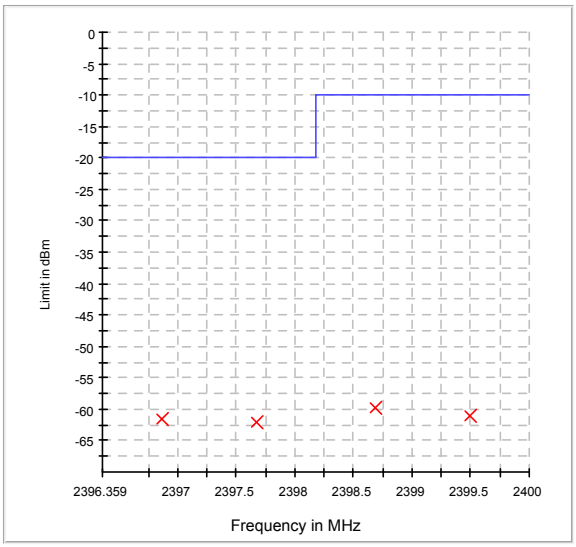
The EUT was programmed to transmit modulated continuously during testing (duty cycle = 29.9%).

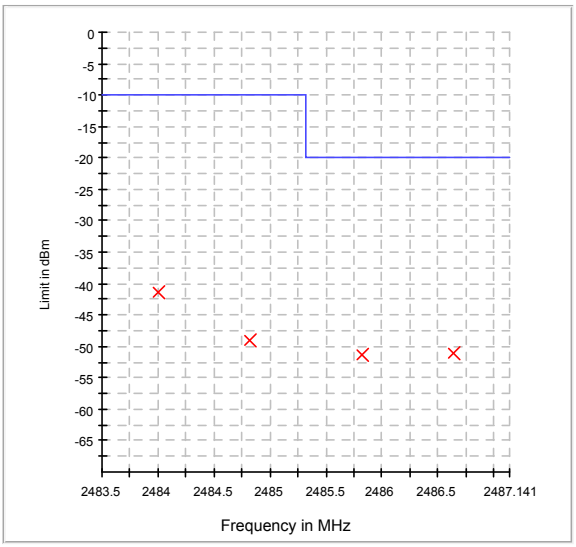
The transmitter unwanted emissions in the out-of-band domain was measured in frequency domain on a modulated carrier using a Spectrum Analyzer with RMS Detector.

Limits: Clause 4.3.2.7.2

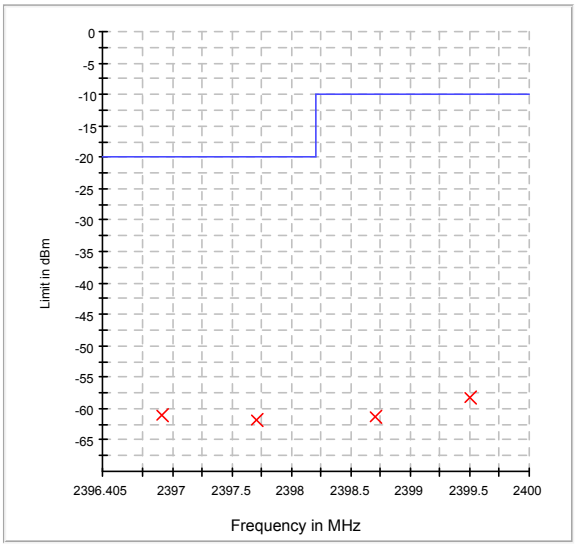
The Occupied Channel Bandwidth shall fall completely within the 2400 – 2483.5 MHz band. The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in figure 3.	
Out of Band Domain	**Limit (dBm/MHz)**
A	-10 dBm/MHz e.i.r.p.
B	-20 dBm/MHz e.i.r.p.
C	-30 dBm/MHz e.i.r.p.

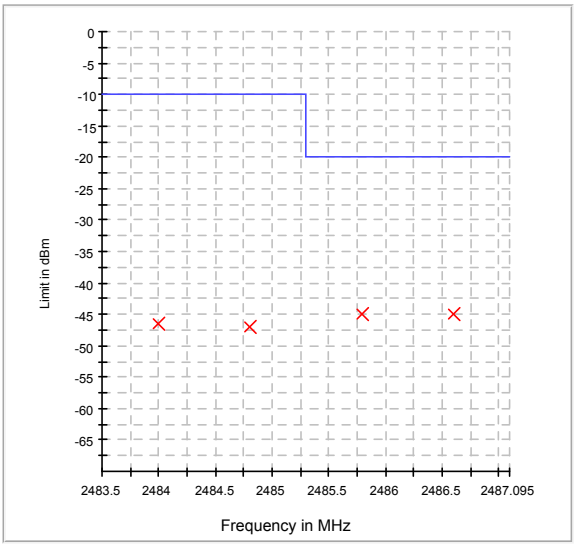
Test Equipment Used: **7,8,11,12**





+4dBm: Transmitter unwanted emissions in the OOB — Ch2480MHz- Nominal conditions





0dBm: Transmitter unwanted emissions in the OOB — Ch2480MHz- Nominal conditions

3.5 Transmitter spurious emissions - Radiated (Operating)

ETSI EN 300328 subclause 4.3.2.8

Mode 4 (+4 dBm & 0 dBm)

Frequency (MHz)	Spurious Emission Level (dBm)
30 - 1000MHz	**< -54 dBm**
1000 – 12750MHz	**< -36 dBm**
2320MHz	**-33.98 dBm(rms)**
2497MHz	**-30.30 dBm(rms)**
Measurement Uncertainty	**25 - 80MHz ± 4.23 dB** **80 - 180MHz ± 2.80 dB** **180 - 1000MHz ± 2.54 dB** **1 - 18 GHz ± 2.23 dB**

The detected spurious emissions during pre-scan are more than 6 dB below the limit, that is why fine measurements are not necessary at detected emissions. Please refer the standard.Except one frequency , i.e 2.571GHz

The EUT was programmed to transmit modulated continuously during testing (duty cycle = 34%).

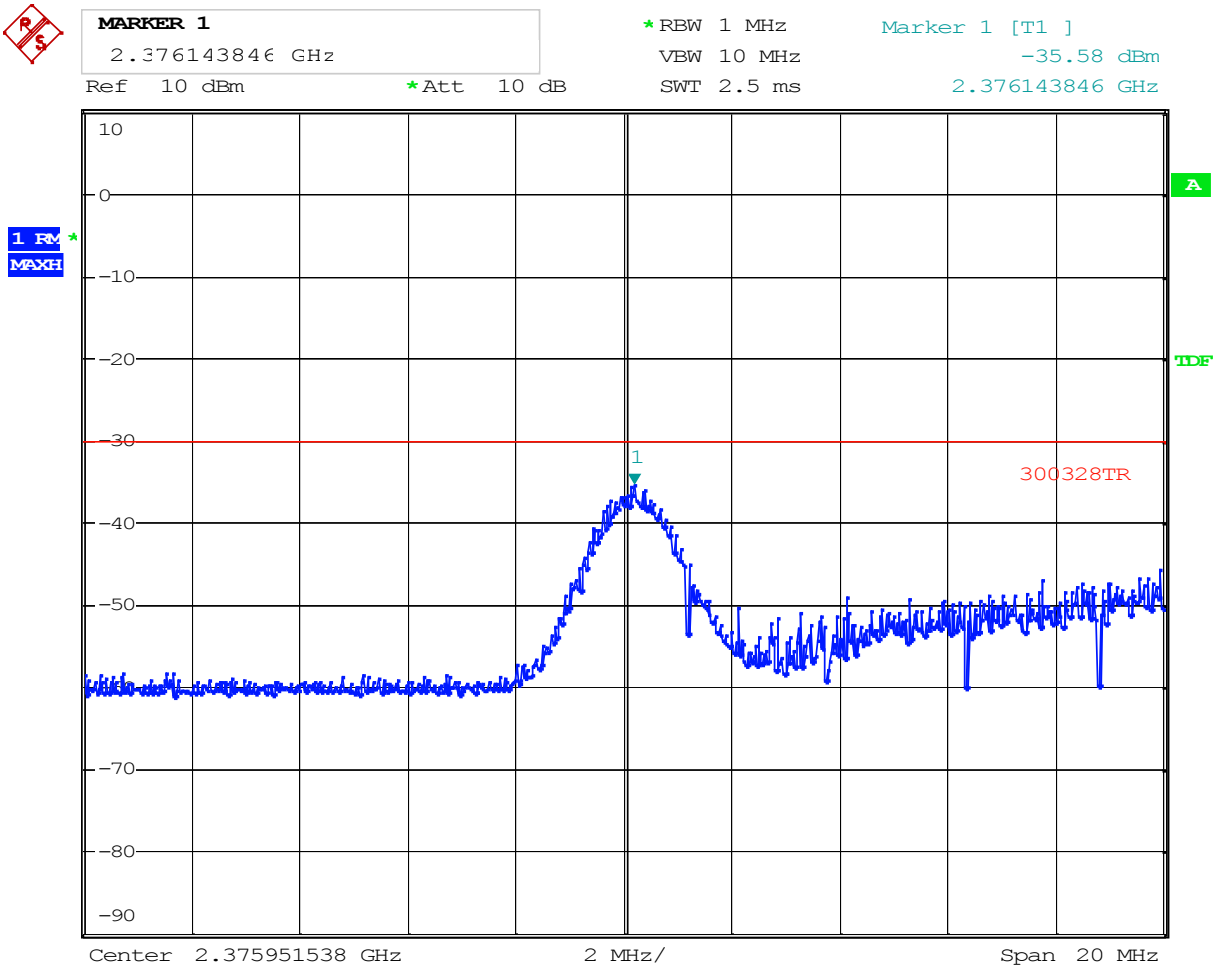
The spurious levels were measured on a modulated carrier using a Spectrum Analyzer with RMS Detector, but pre-scan is performed with peak detector.

Please see attached graphs for nominal conditions.

Limits: Clause 4.3.2.8.2

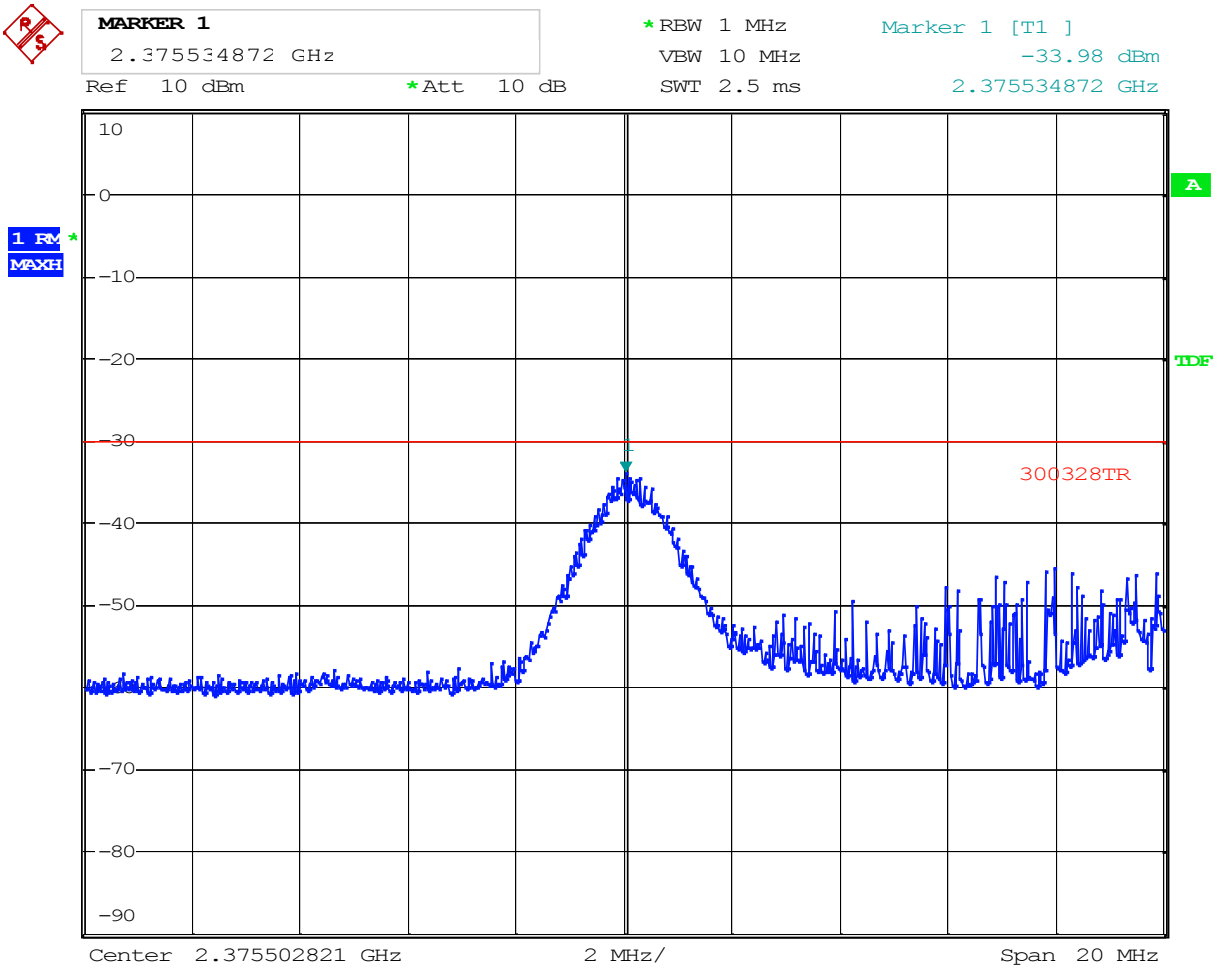
Frequency Range	Maximum power e.r.p. (≤ 1 GHz) e.i.r.p (> 1 GHz)	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87.5 MHz	-36 dBm	100 kHz
87.5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 862 MHz	-54 dBm	100 kHz
862 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12.75 GHz	-30 dBm	1 MHz

Test Equipment Used: 1 – 8



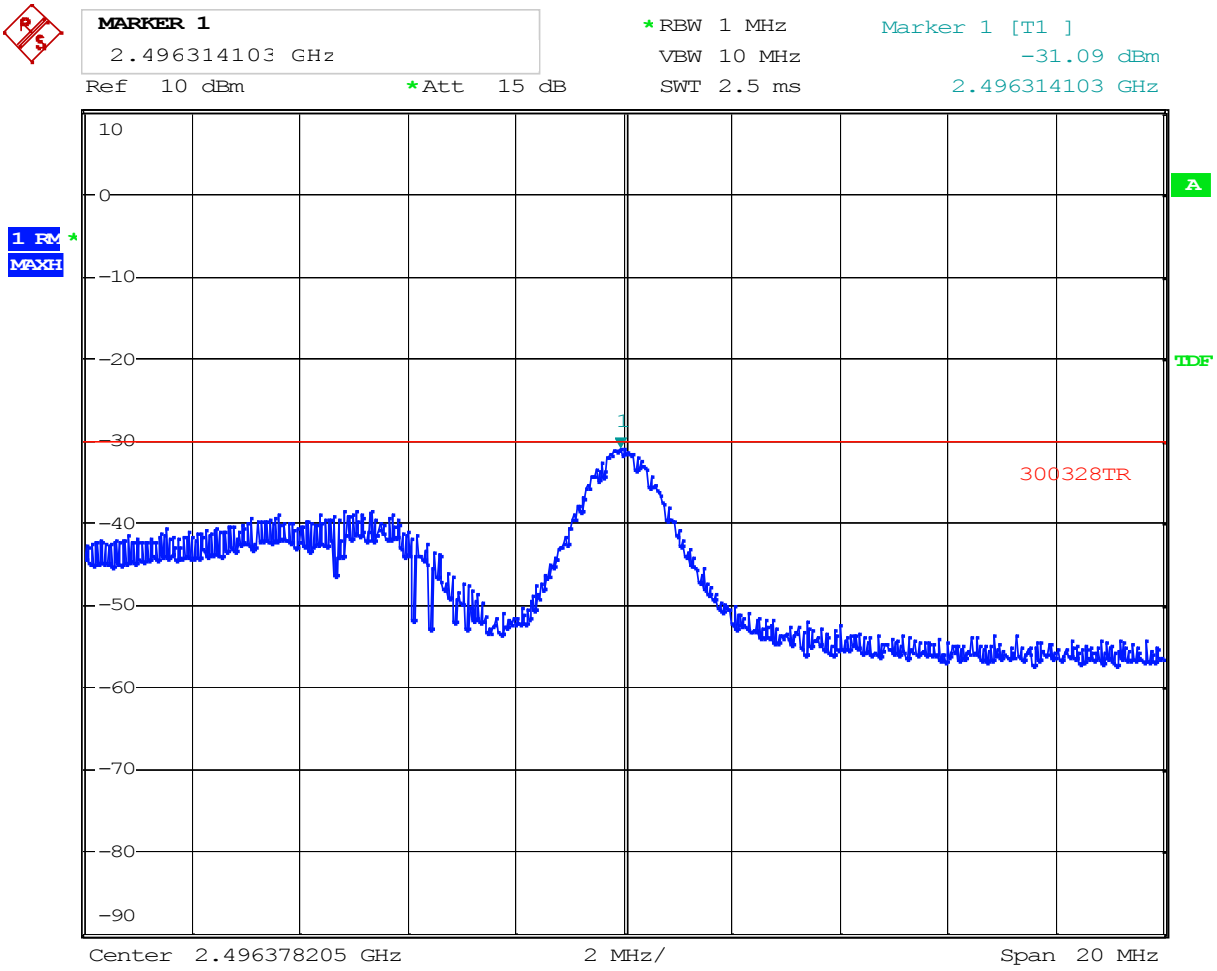
Date: 25.AUG.2014 13:43:40

+4 dBm, Emission at 2.37GHz, VP ch2402MHz-Mode 4, RMS



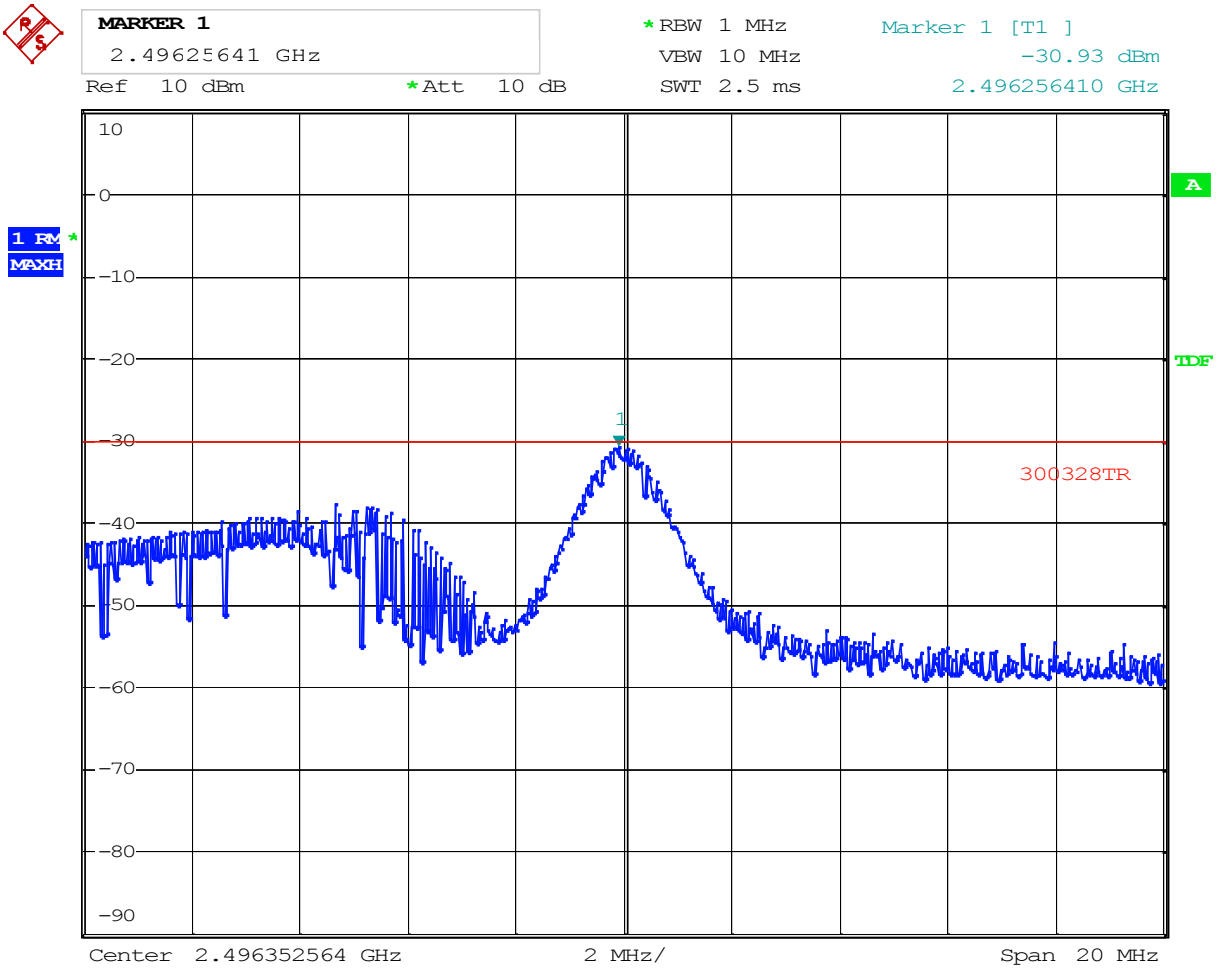
Date: 25.AUG.2014 13:45:27

0 dBm, Emission at 2.37GHz, VP ch2402MHz-Mode 4, RMS



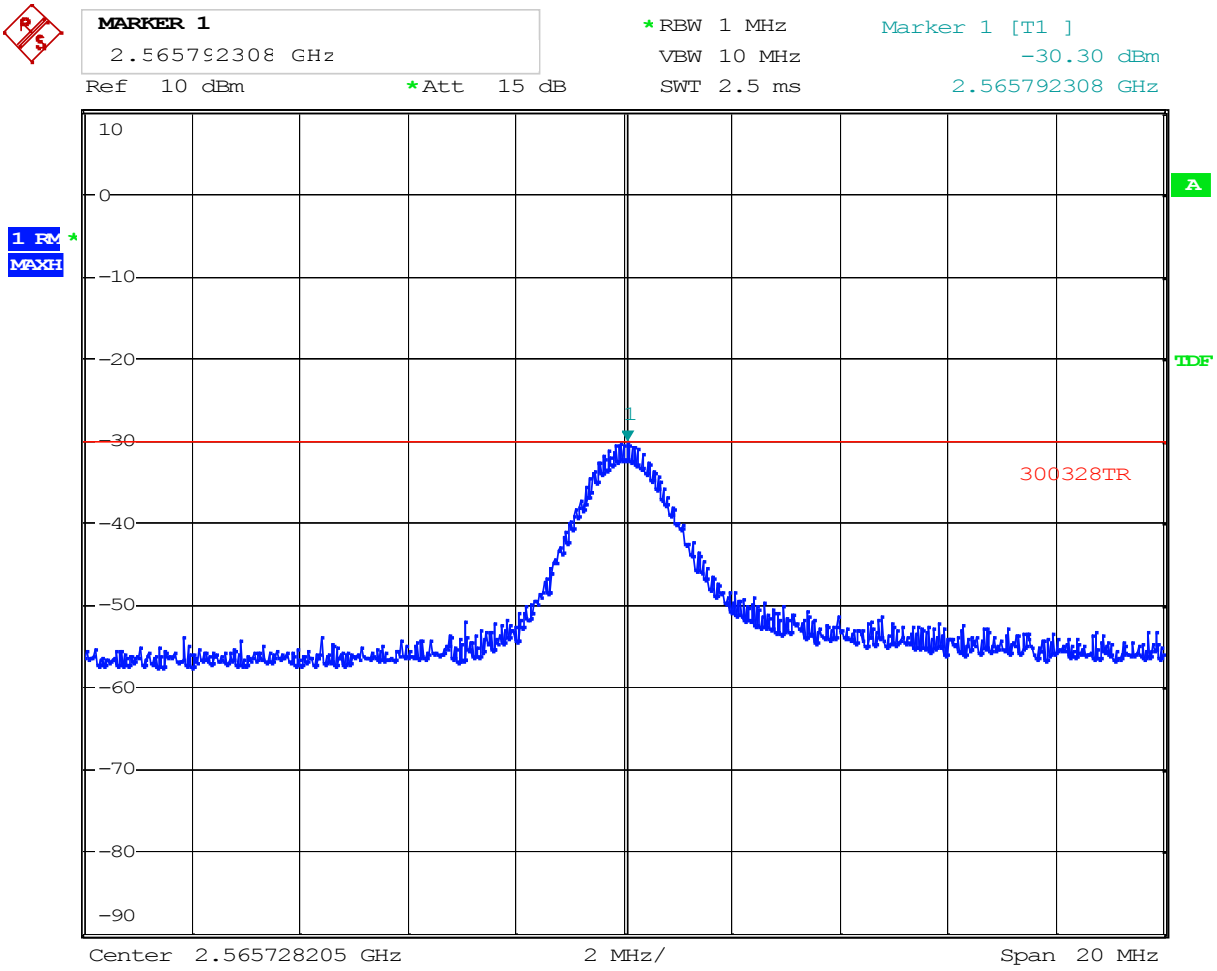
Date: 25.AUG.2014 13:23:56

+4 dBm, Emission at 2.496GHz, VP ch2480MHz-Mode 4, RMS



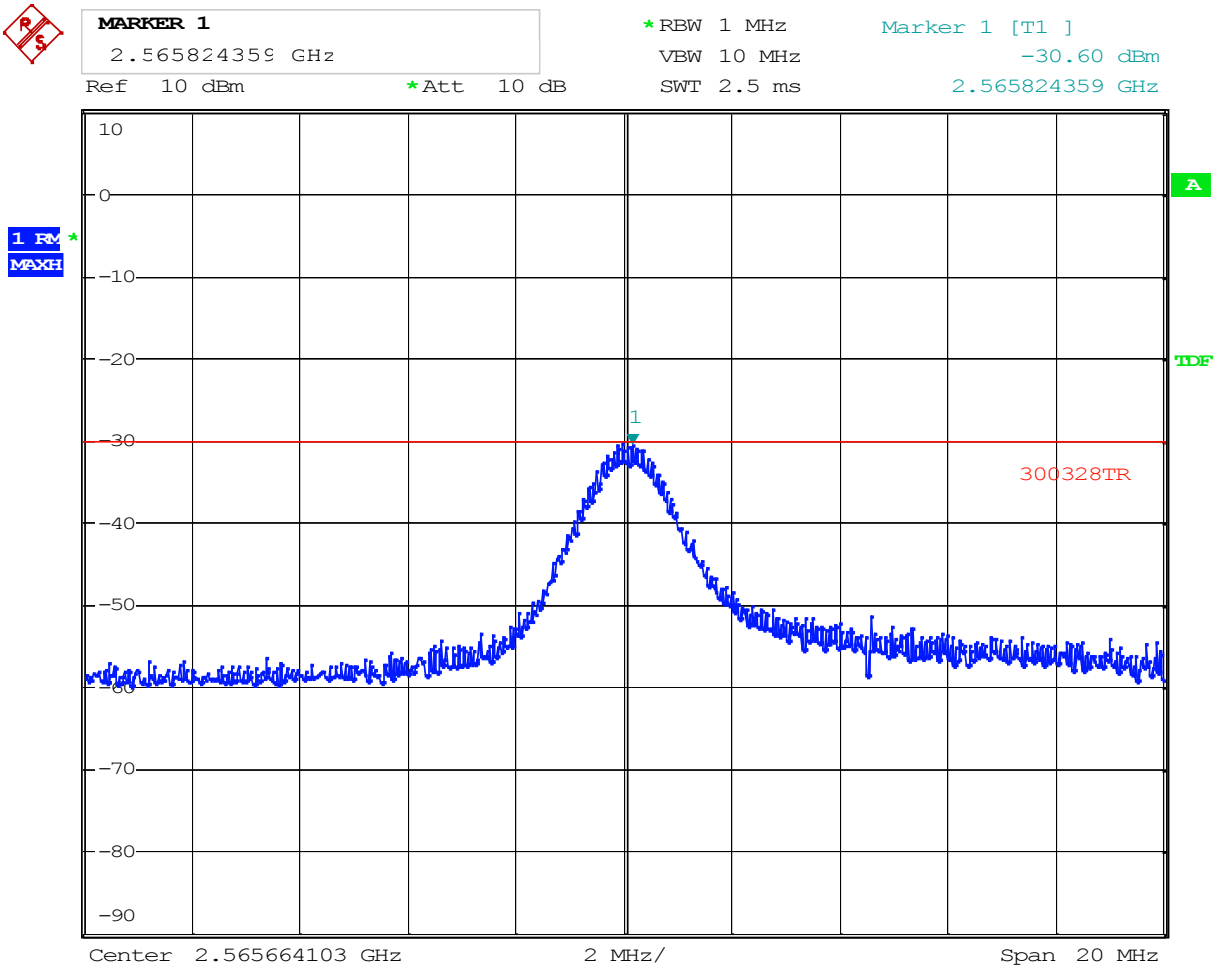
Date: 25.AUG.2014 13:48:20

0 dBm, Emission at 2.496GHz, VP ch2480MHz-Mode 4, RMS

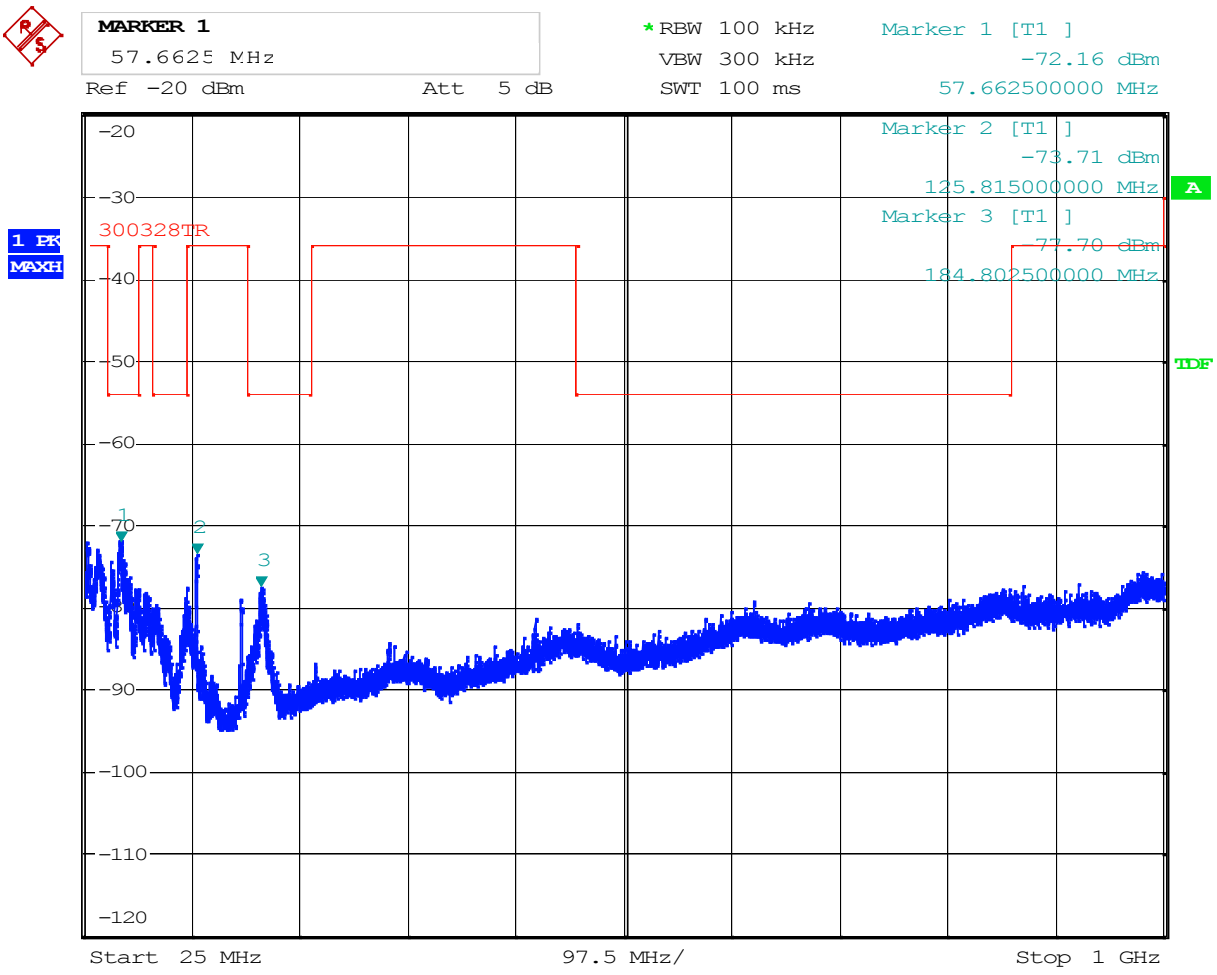


Date: 25.AUG.2014 13:26:42

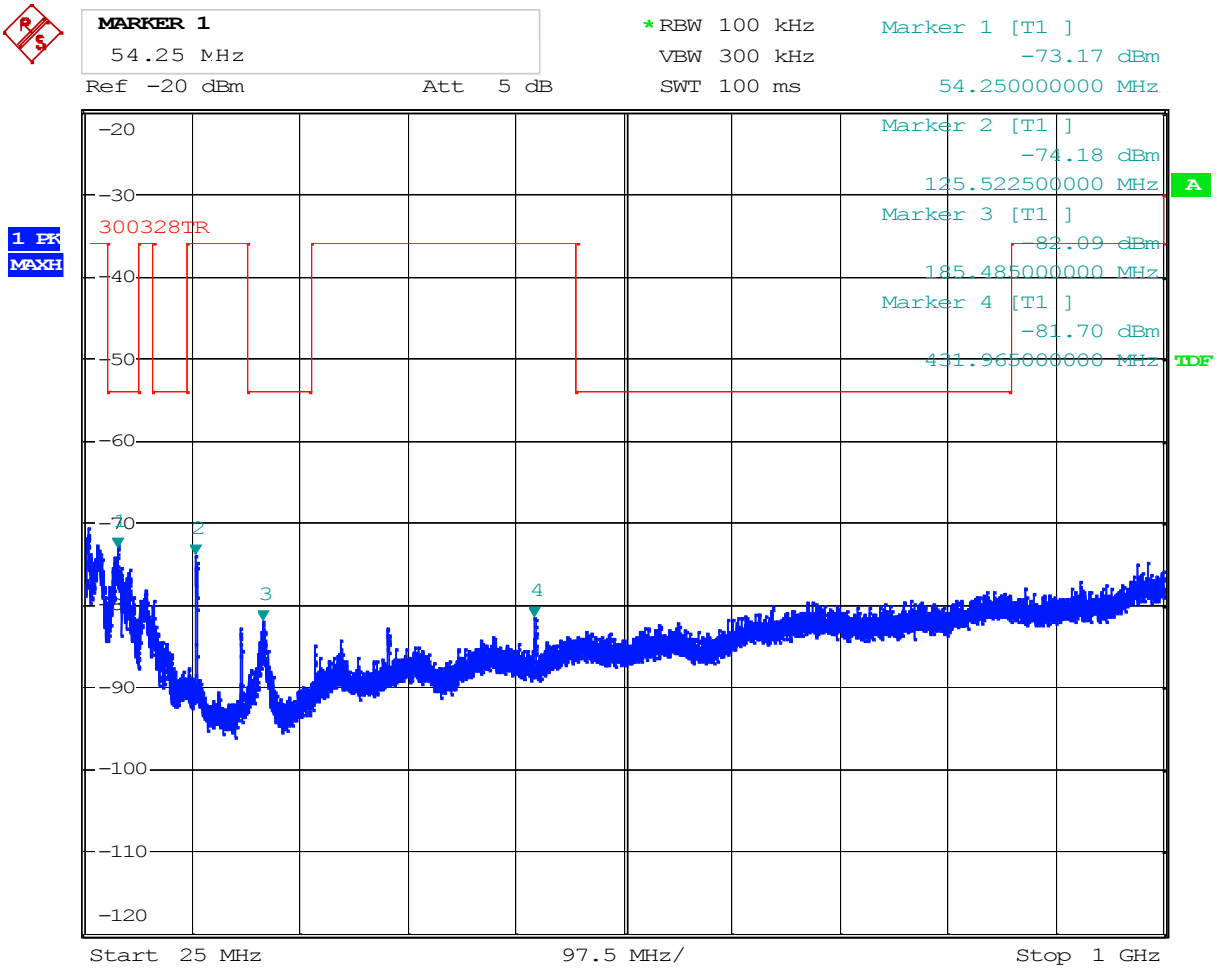
+4 dBm, Emission at 2.565GHz, VP ch2480MHz-Mode 4, RMS



0 dBm, Emission at 2.565GHz, VP ch2480MHz-Mode 4, RMS

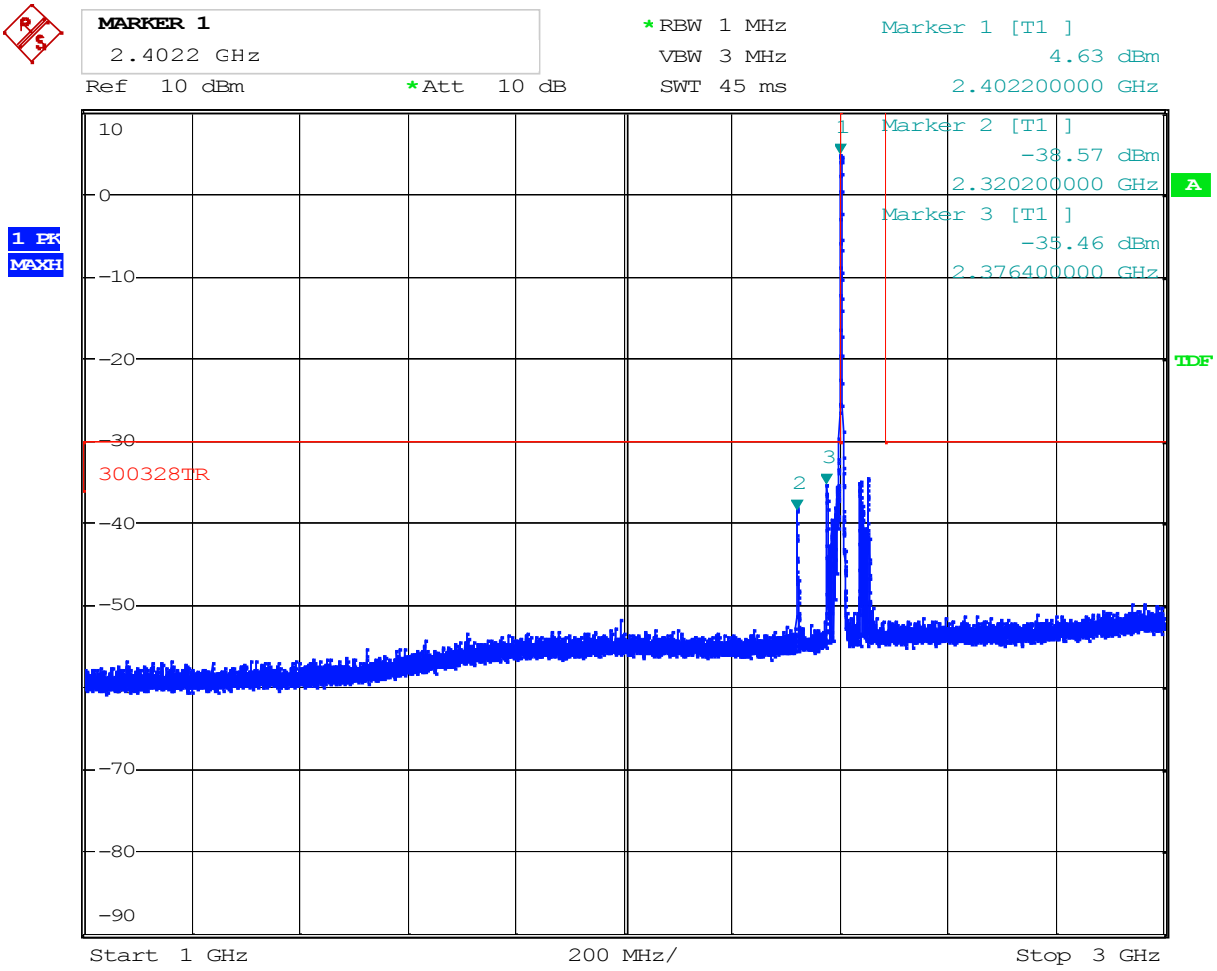


VP: 30 - 1000MHz – pre scan



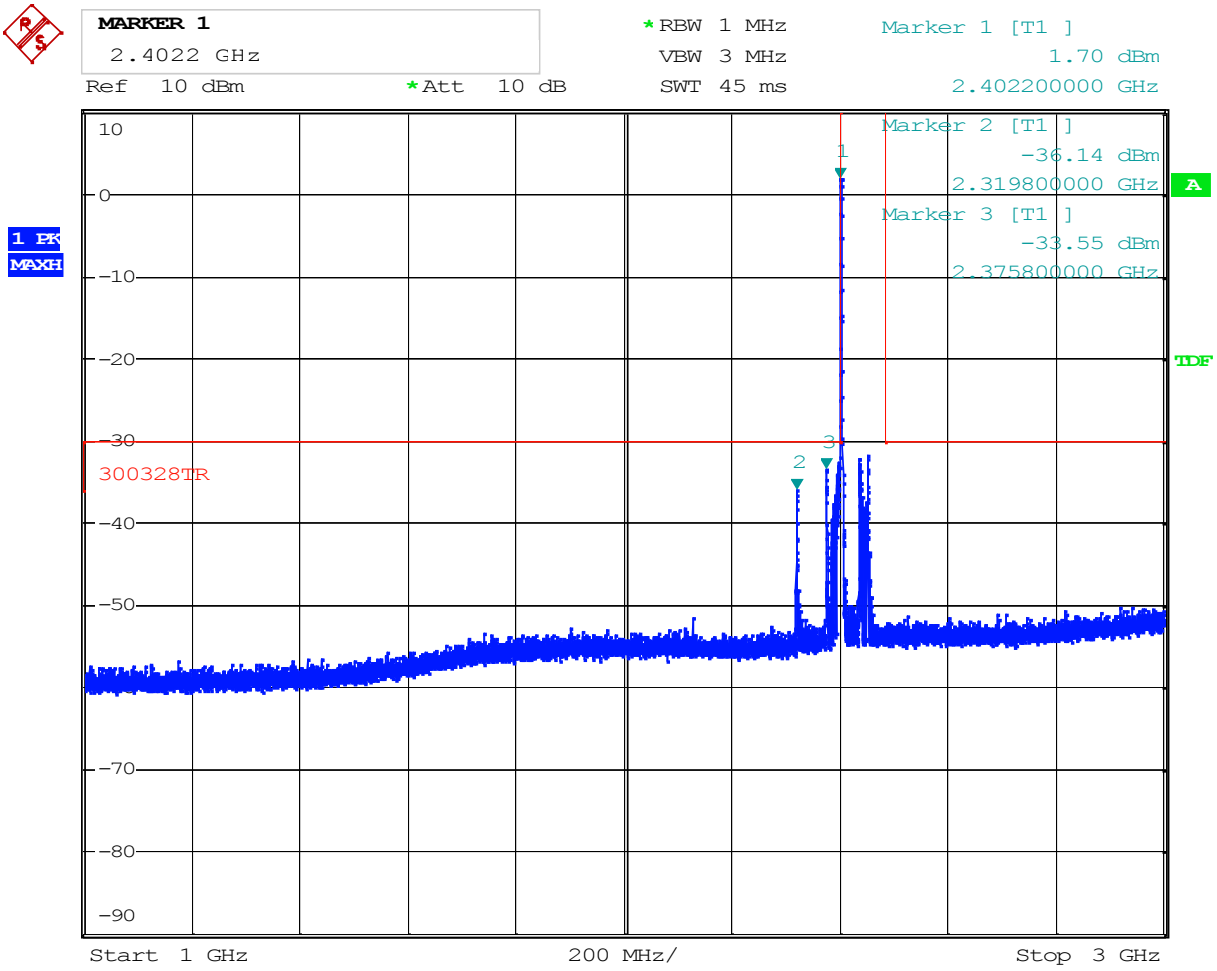
Date: 25.AUG.2014 09:52:25

HP: 30 - 1000MHz –pre scan



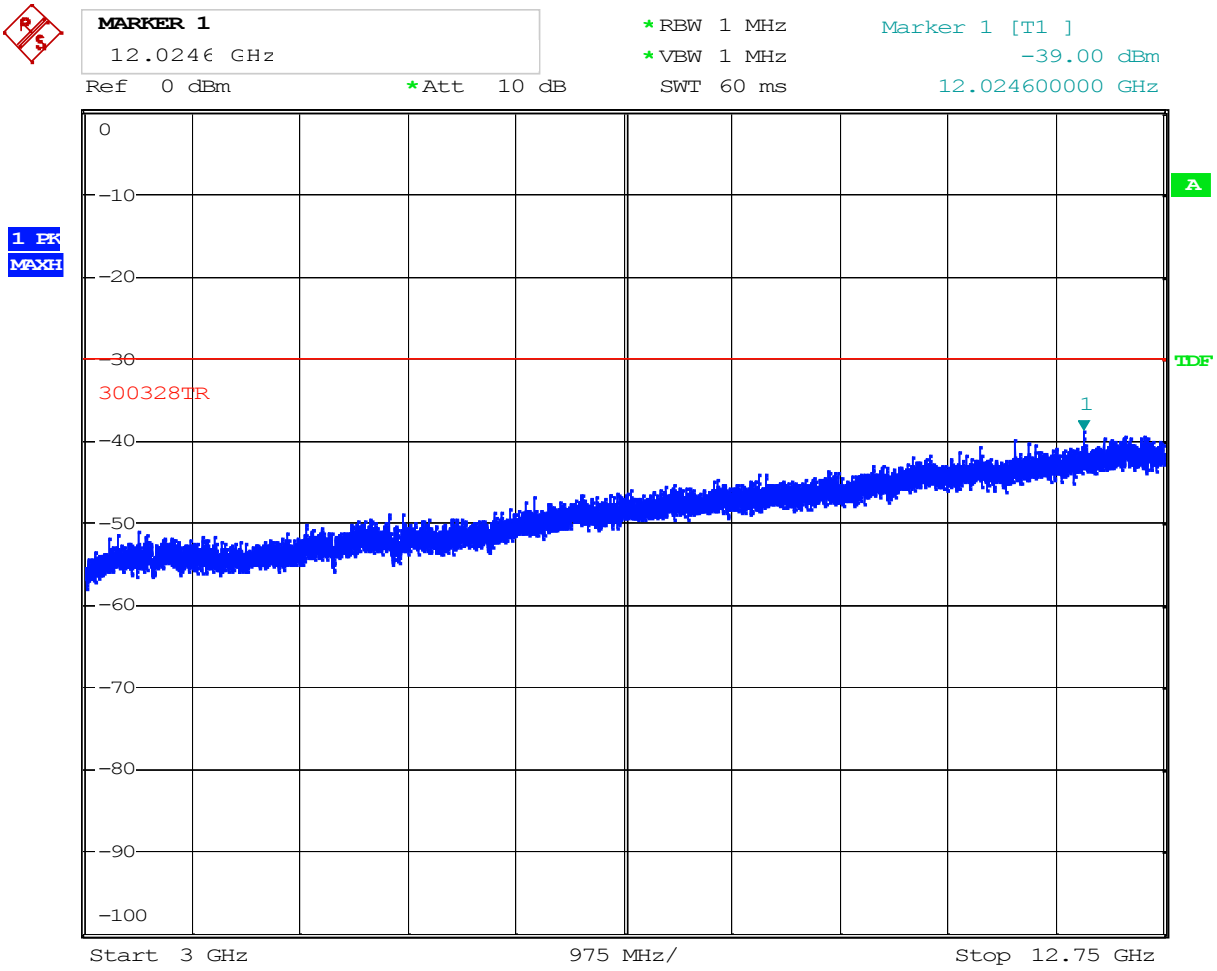
Date: 25.AUG.2014 13:38:57

+4dBm: VP : 1 – 3GHz – ch2402MHz –prescan



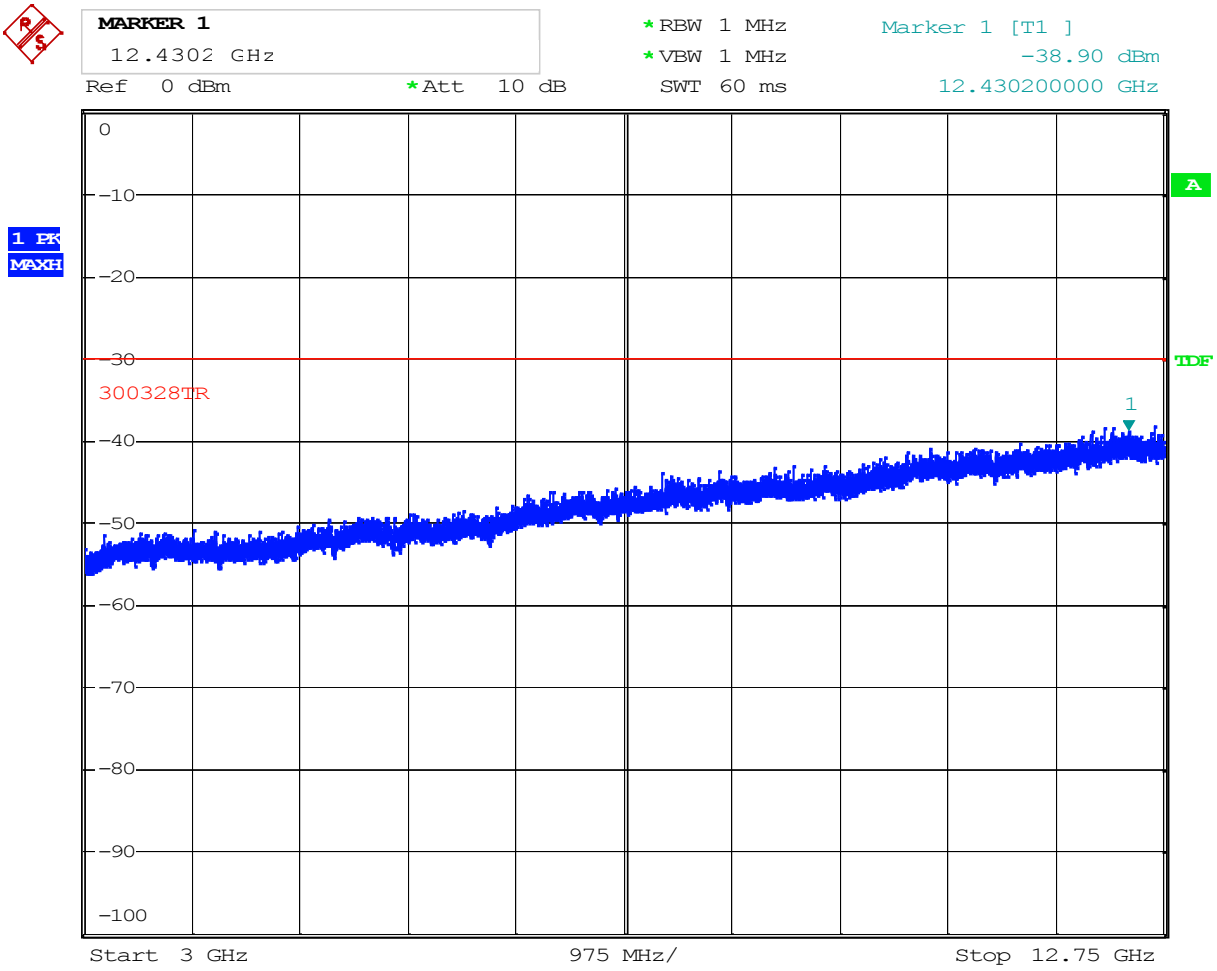
Date: 25.AUG.2014 13:32:19

0dBm: VP : 1 – 3GHz – ch2402MHz –prescan



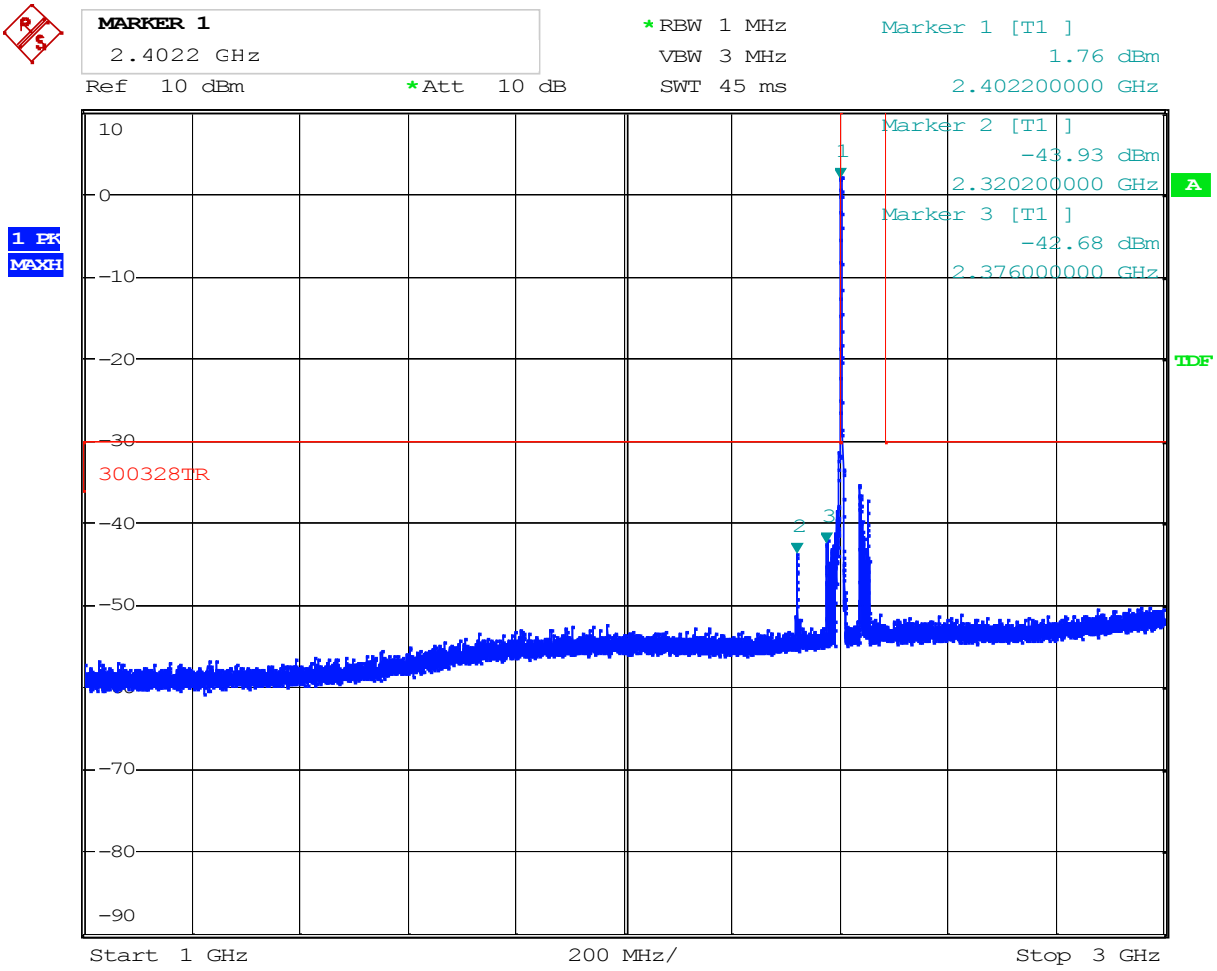
Date: 25.AUG.2014 14:11:35

+4dBm: VP : 3 - 12.75GHz – ch2402MHz –prescan- measured with HP filter



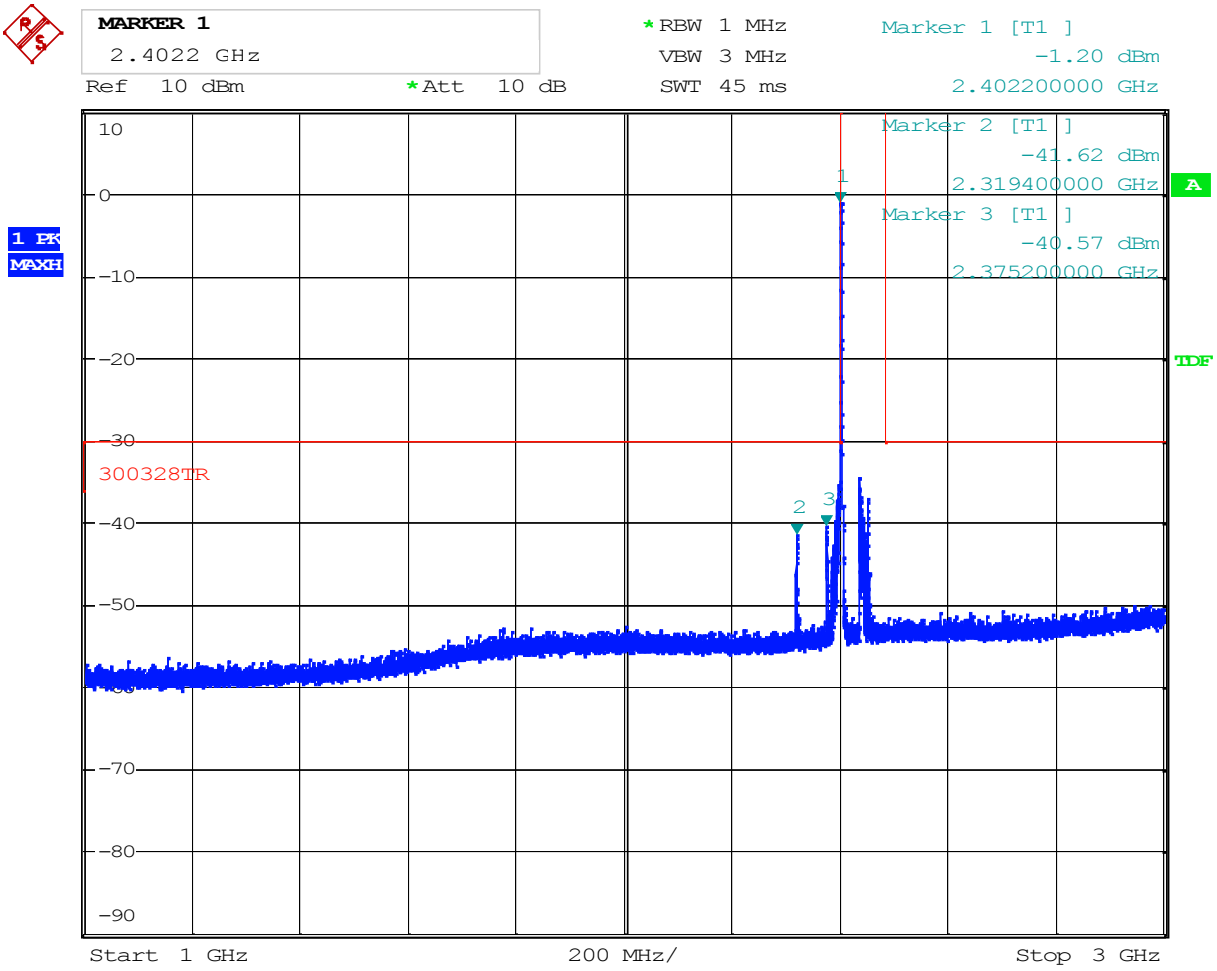
Date: 25.AUG.2014 14:05:06

0dBm: VP : 3 - 12.75GHz – ch2402MHz –prescan- measured with HP filter



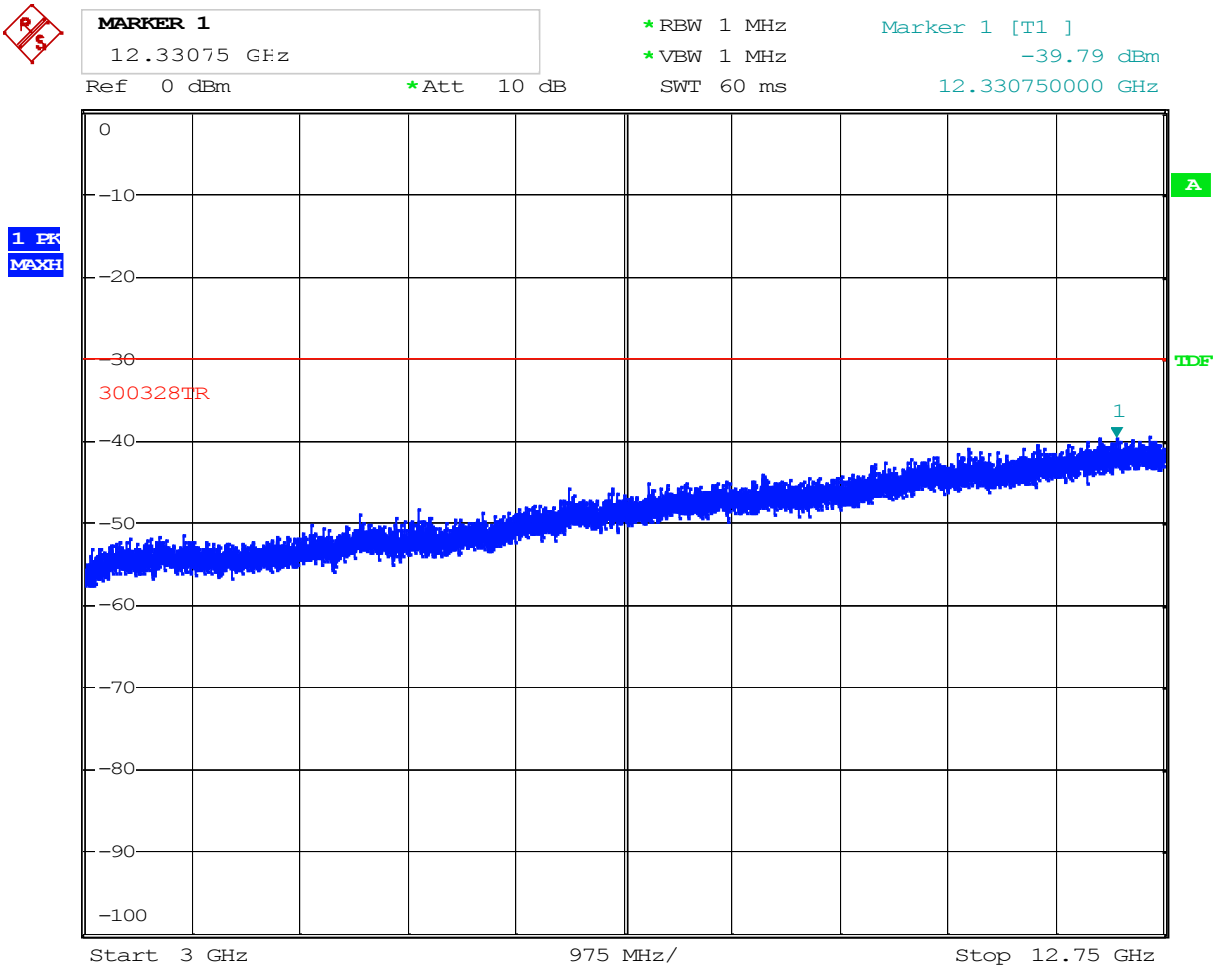
Date: 25.AUG.2014 13:37:28

+4dBm: HP : 1 - 3GHz – ch2402MHz –prescan



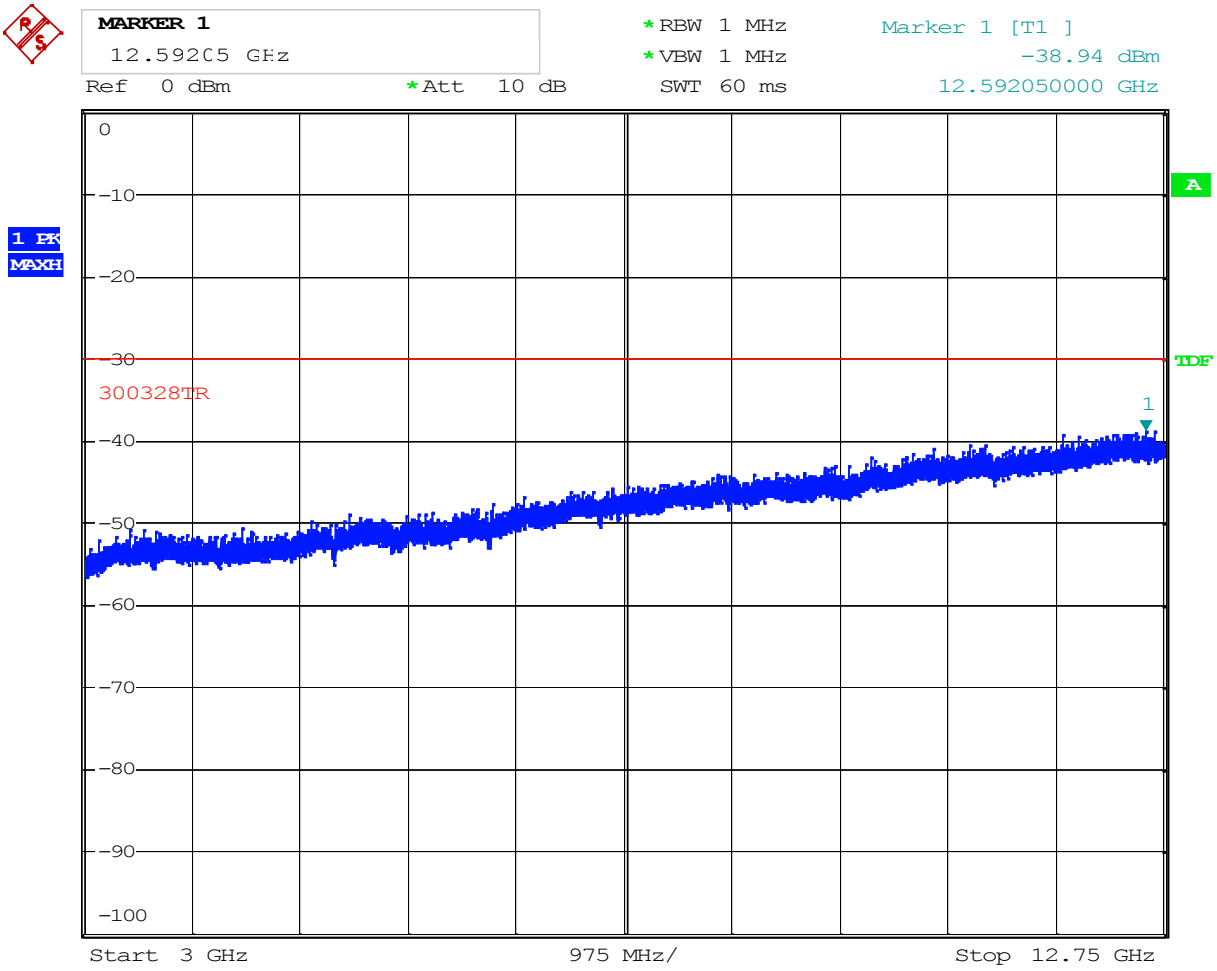
Date: 25.AUG.2014 13:35:13

0dBm: HP : 1 - 3GHz – ch2402MHz –prescan



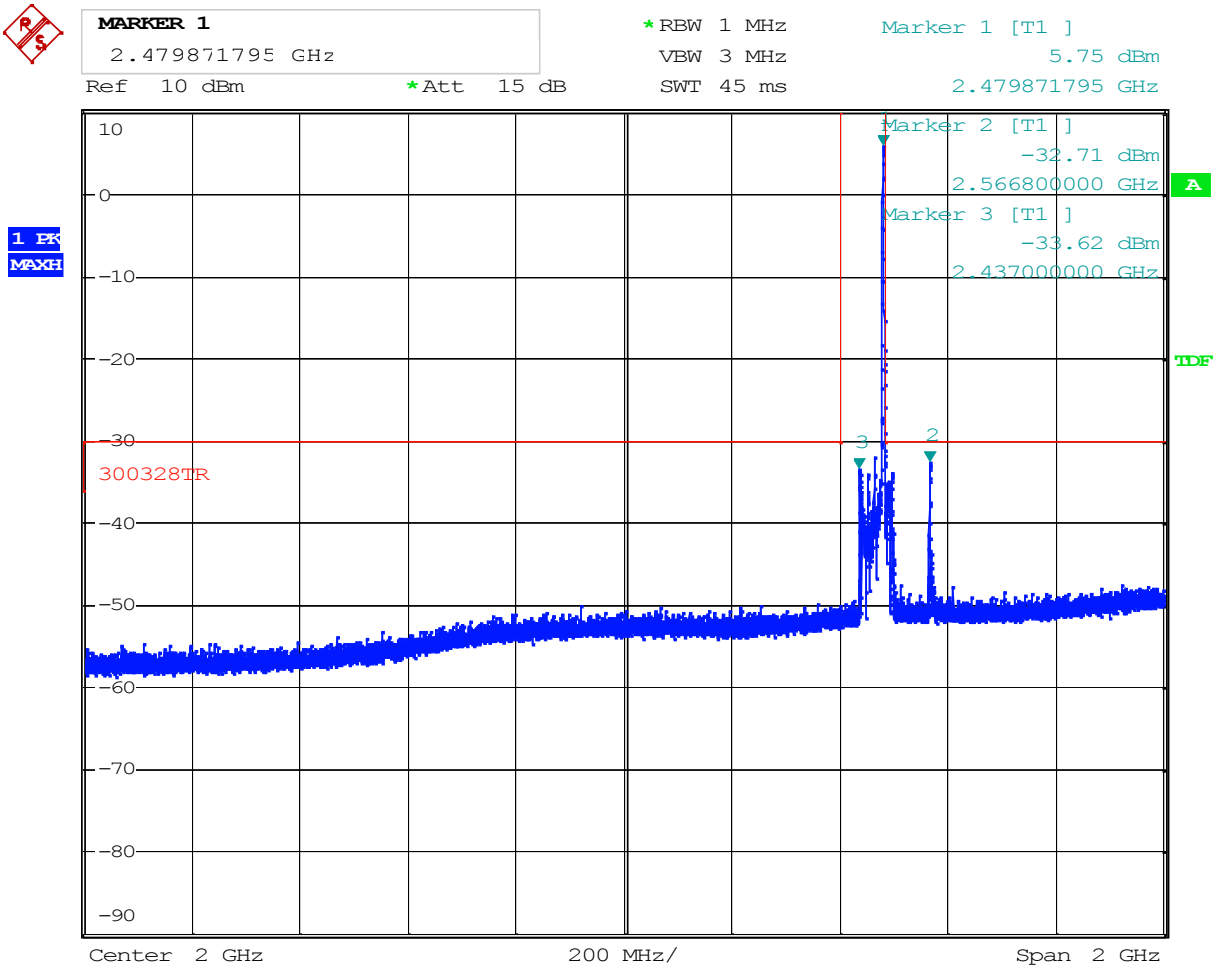
Date: 25.AUG.2014 14:12:20

+4 dBm: HP : 3 – 12.75GHz – ch2402MHz –prescan- Measured with HP filter



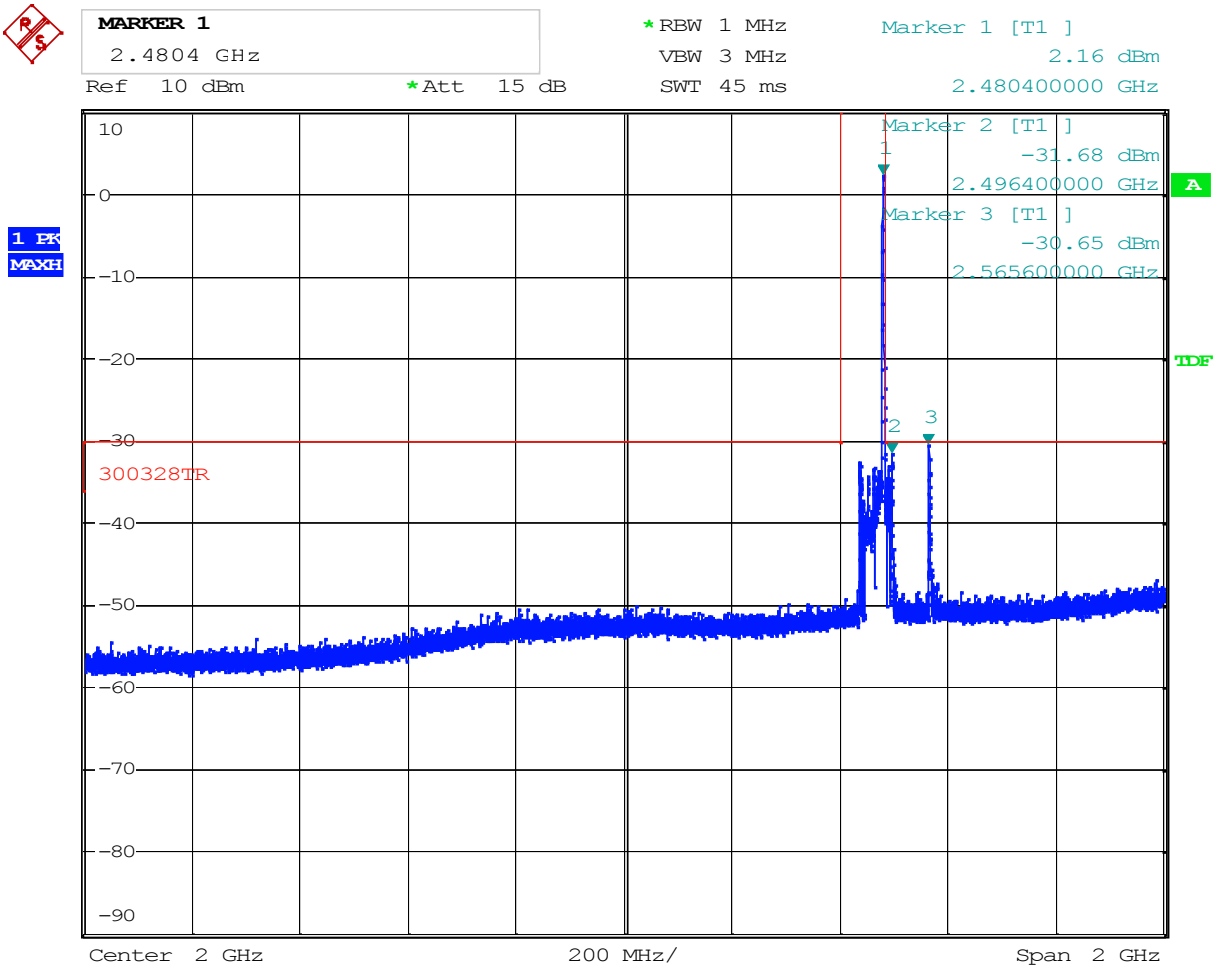
Date: 25.AUG.2014 14:06:55

0 dBm: HP : 3 – 12.75GHz – ch2402MHz –prescan- Measured with HP filter



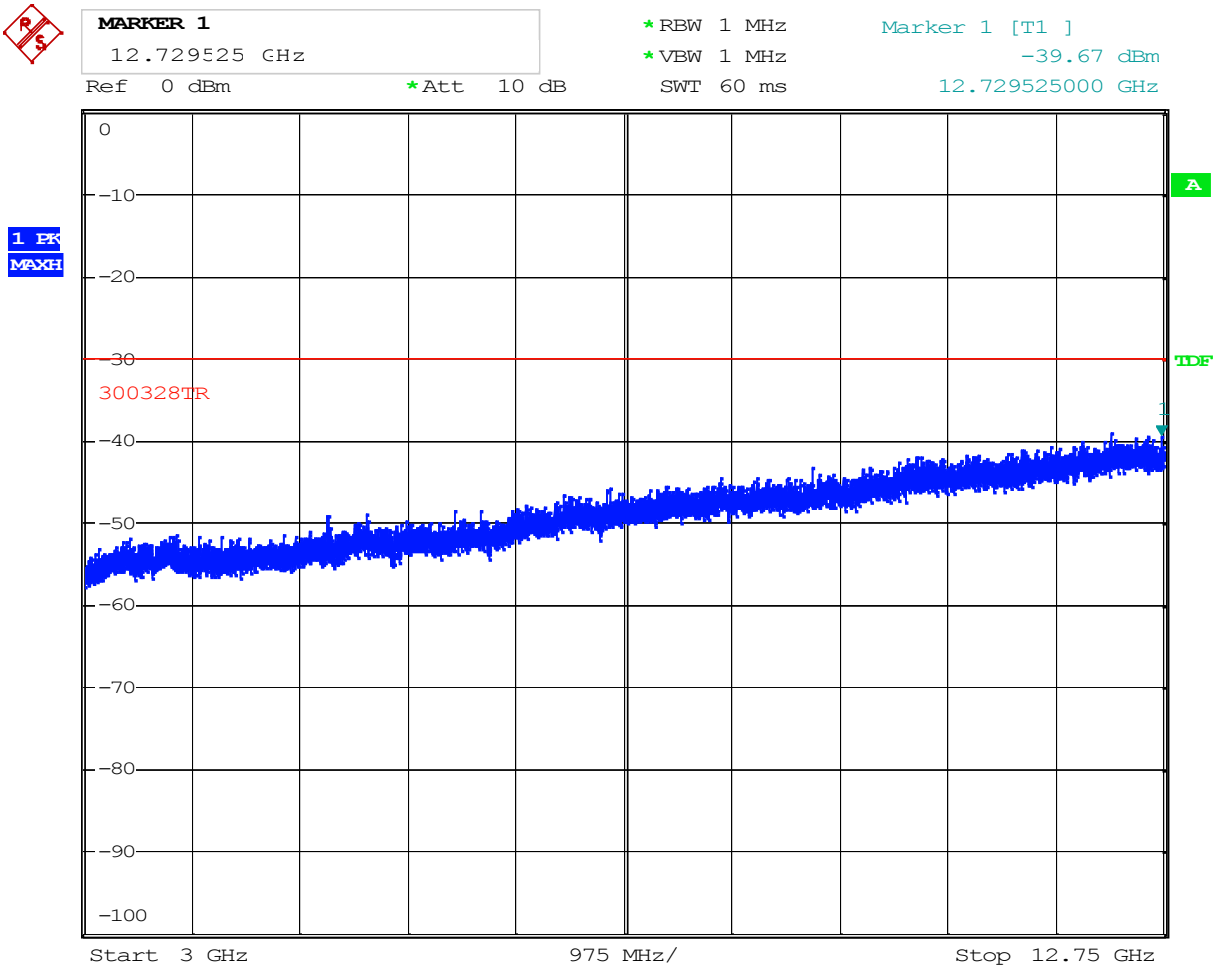
Date: 25.AUG.2014 11:02:40

+4dBm: VP : 1 – 3GHz – ch2480MHz – prescan



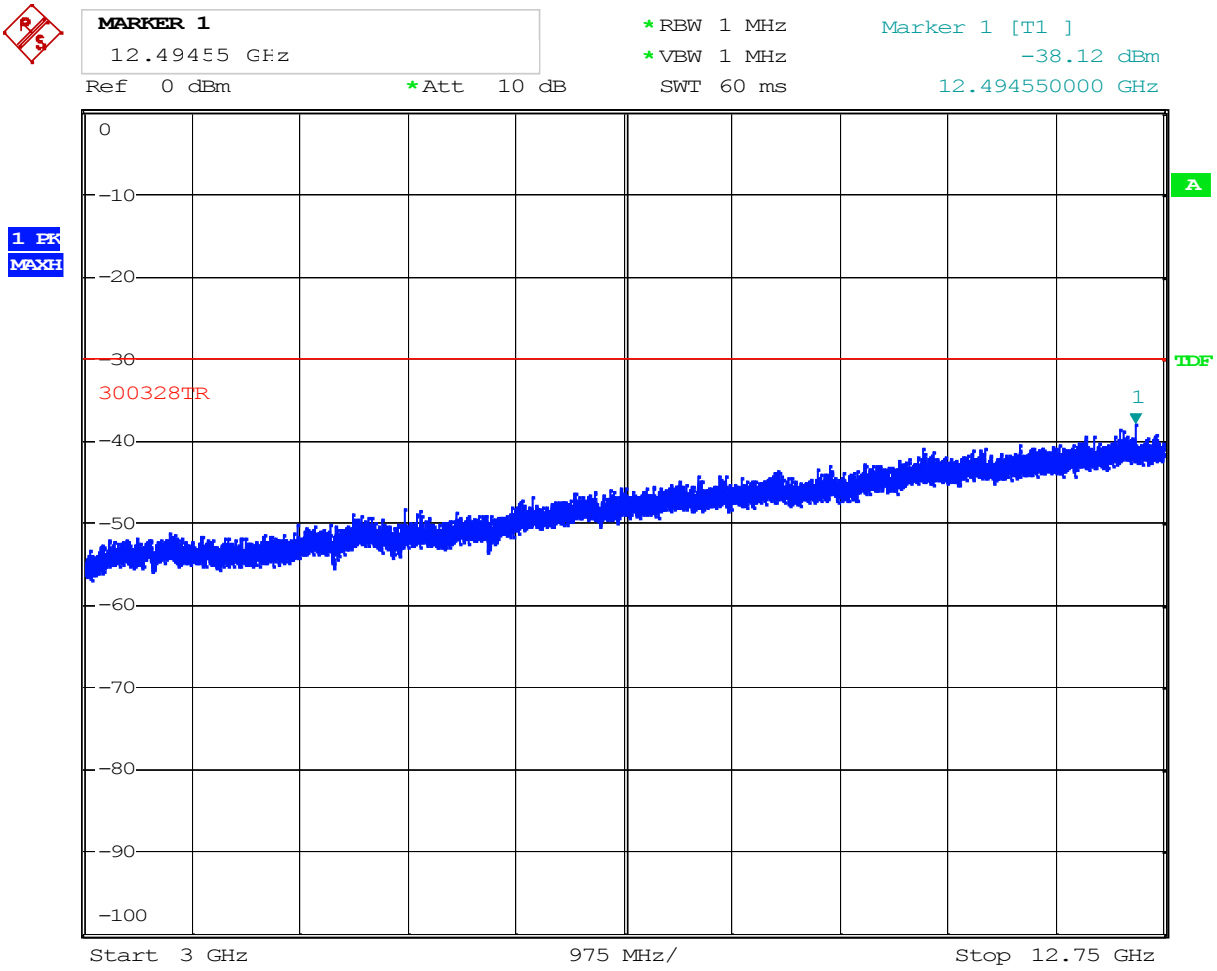
Date: 25.AUG.2014 13:18:04

0dBm: VP : 1 – 3GHz – ch2480MHz – prescan



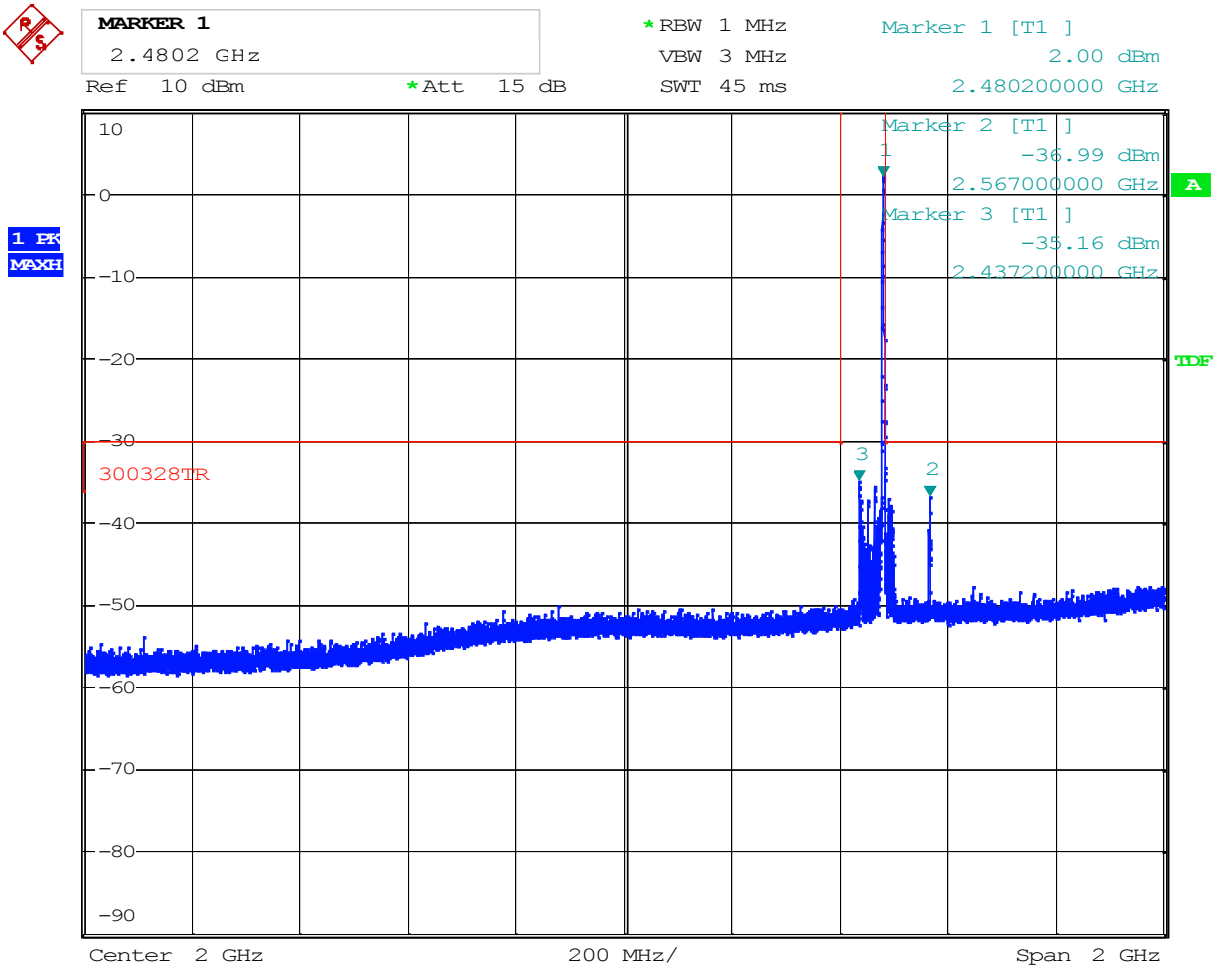
Date: 25.AUG.2014 14:13:40

+4dBm: VP : 3 - 12.75GHz – ch2480MHz – pre-scan- measured with HP filter



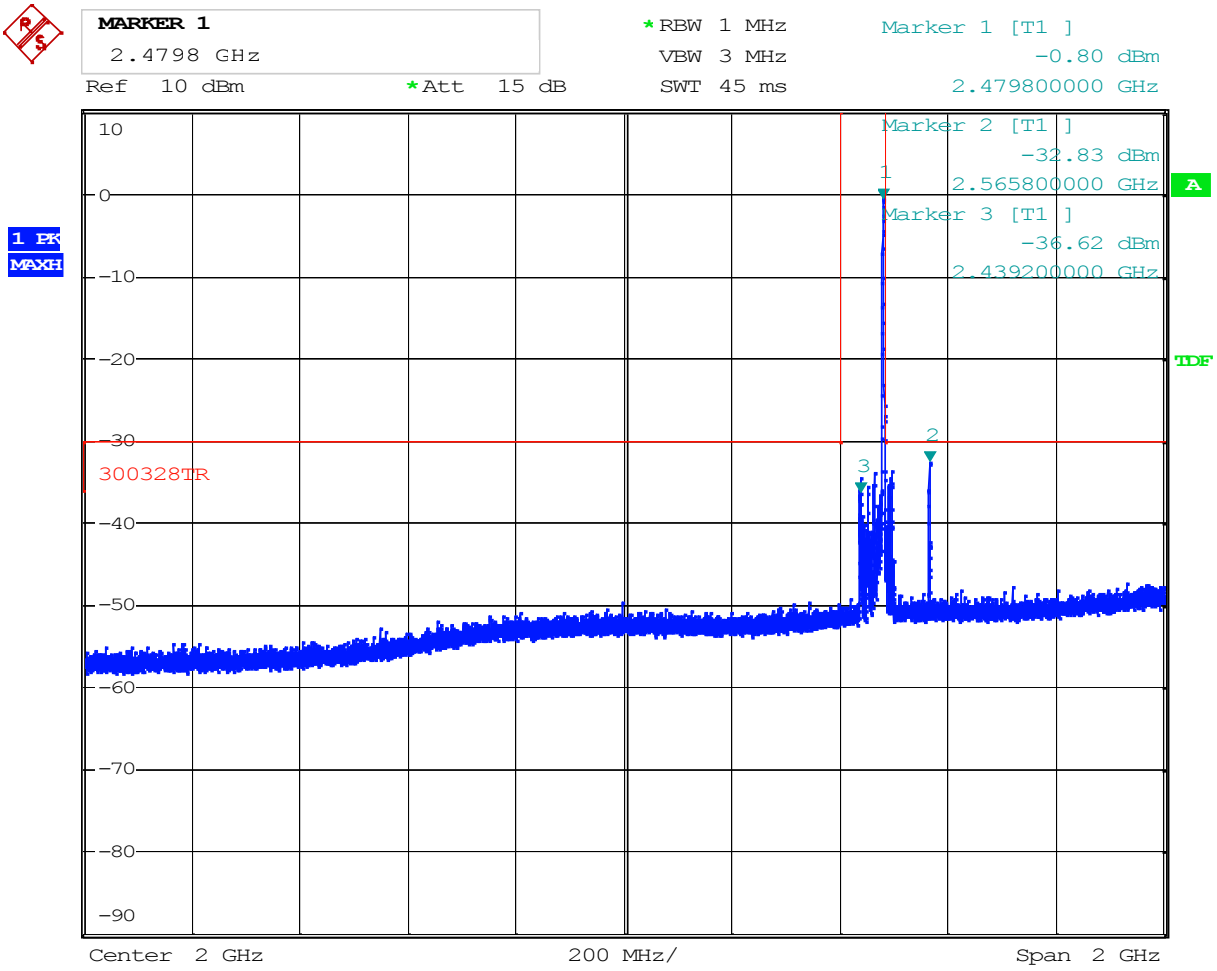
Date: 25.AUG.2014 14:10:02

0dBm: VP : 3 - 12.75GHz – ch2480MHz – pre-scan- measured with HP filter



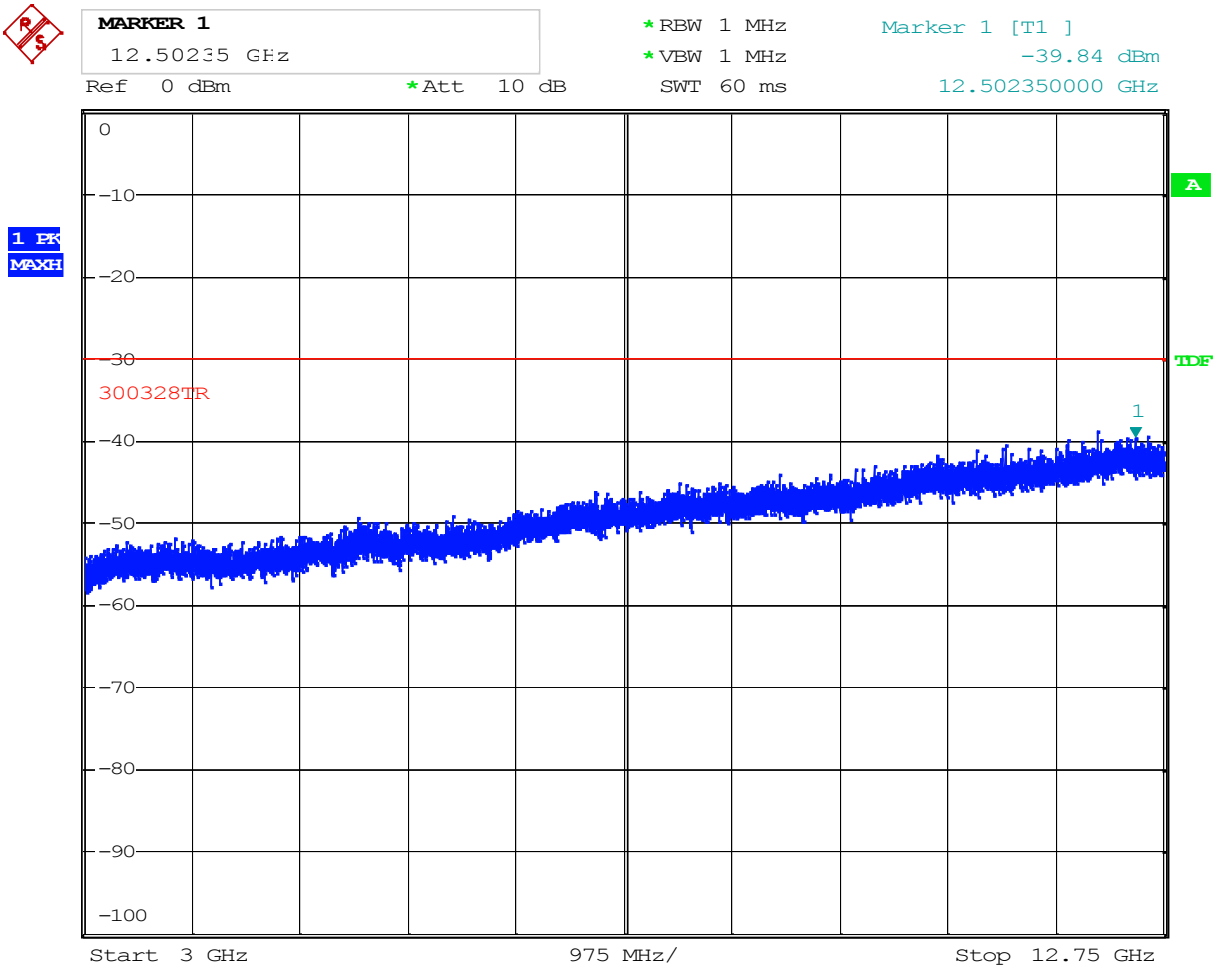
Date: 25.AUG.2014 11:04:55

+4dBm: HP : 1 - 3GHz – ch2480MHz – pre-scan



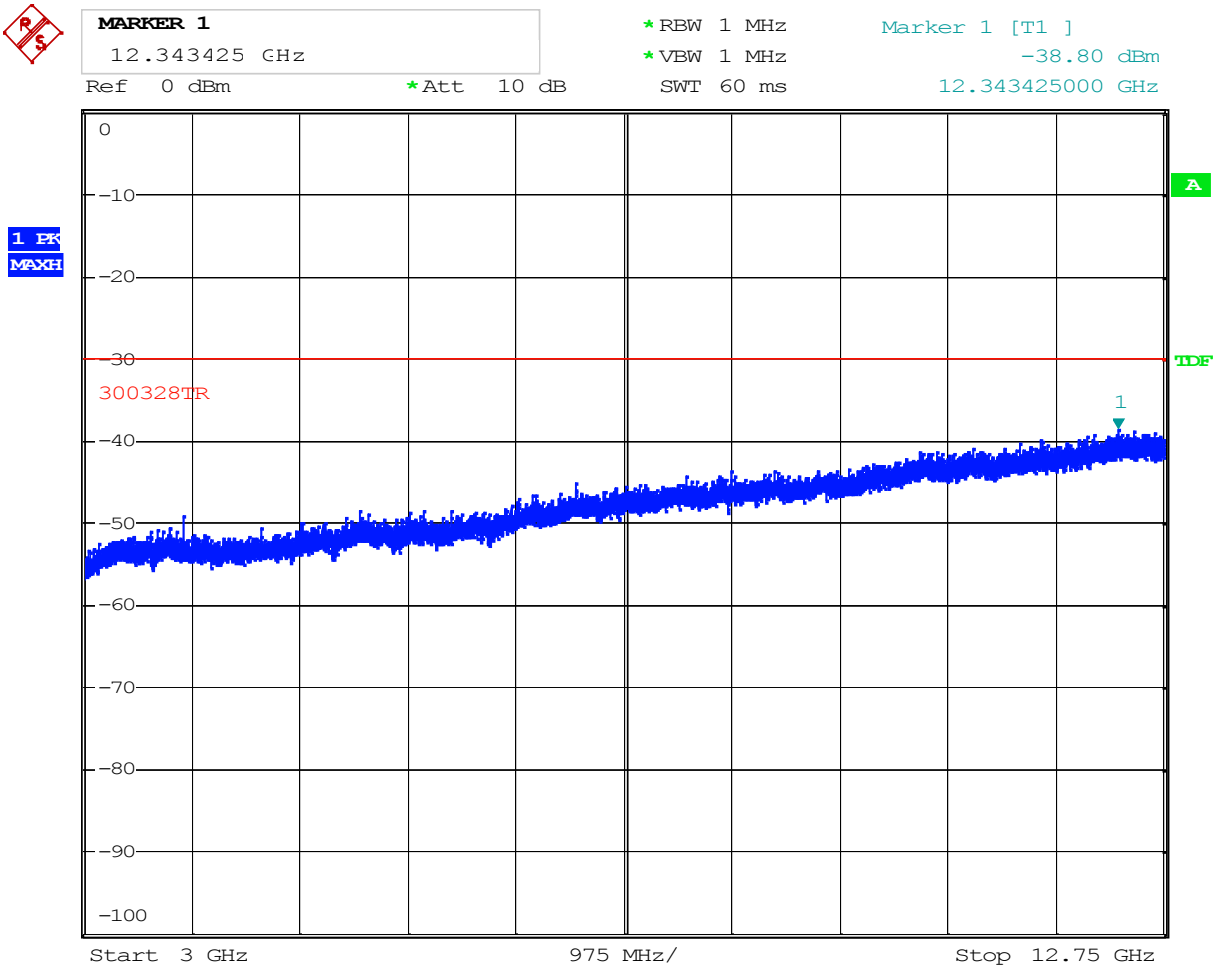
Date: 25.AUG.2014 13:16:04

0dBm: HP : 1 - 3GHz – ch2480MHz – pre-scan



Date: 25.AUG.2014 14:12:58

+4dBm: HP : 3 - 12.75GHz – ch2480MHz – pre-scan- measured with HP filter



Date: 25.AUG.2014 14:09:05

0dBm: HP : 3 - 12.75GHz – ch2480MHz – pre-scan- measured with HP filter

3.6 Receiver spurious emissions - Radiated

ETSI EN 300328 subclause 4.3.2.9

Mode 4

Frequency (MHz)	Spurious Emission Level (dBm)
30 - 1000	**< -57**
1000 - 12750	**< -47**
Measurement uncertainty	**25 - 80MHz ± 4.23 dB** **80 - 180MHz ± 2.80 dB** **180 - 1000MHz ± 2.54 dB** **1 - 18 GHz ± 2.23 dB**

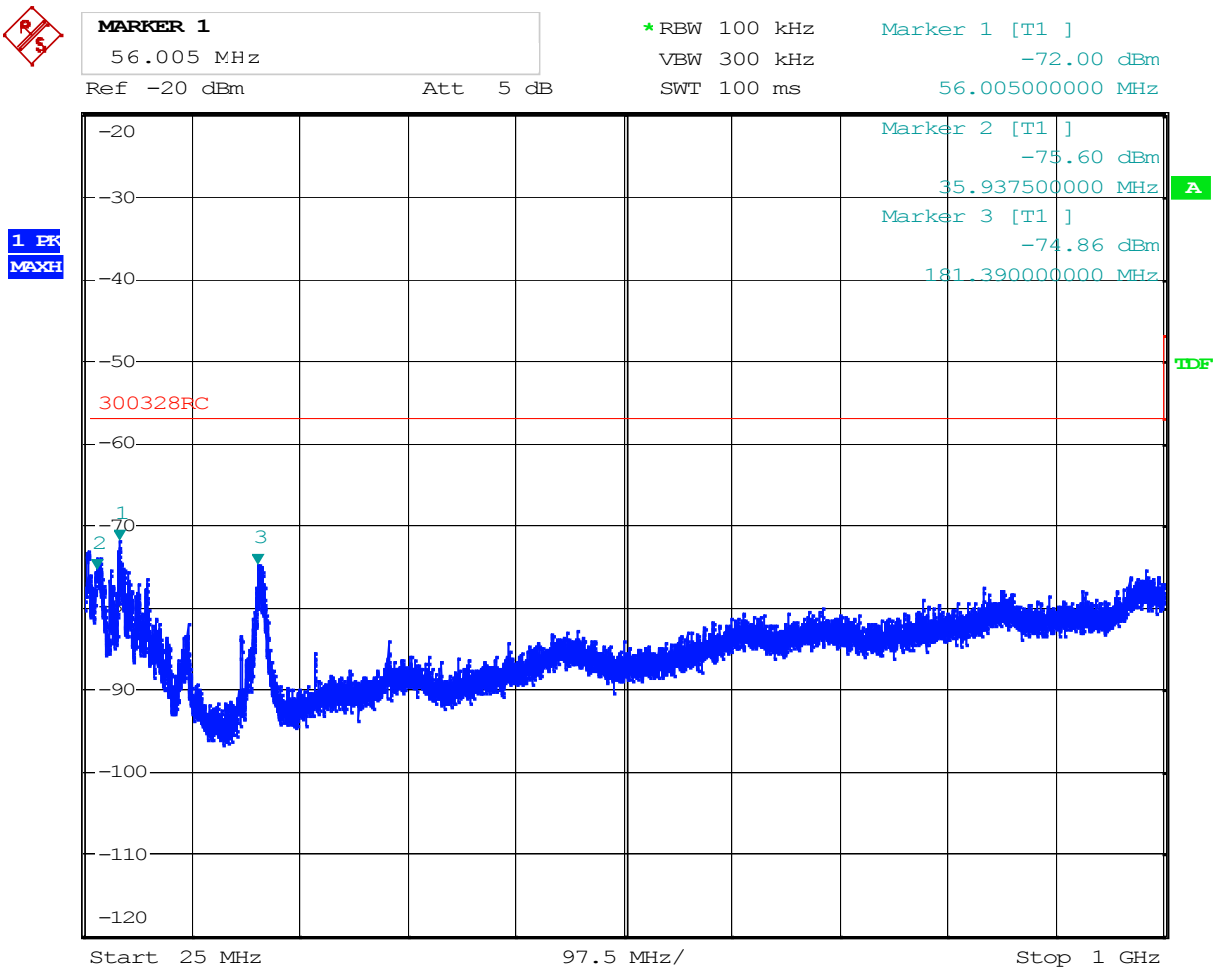
The EUT was programmed to stay in continious RX mode.

The spurious levels were measured in RX mode using a Spectrum Analyzer with RMS Detector, but pre-scan is performed with peak detector up to 12.75GHz.

Limits: Clause 4.3.2.9.2

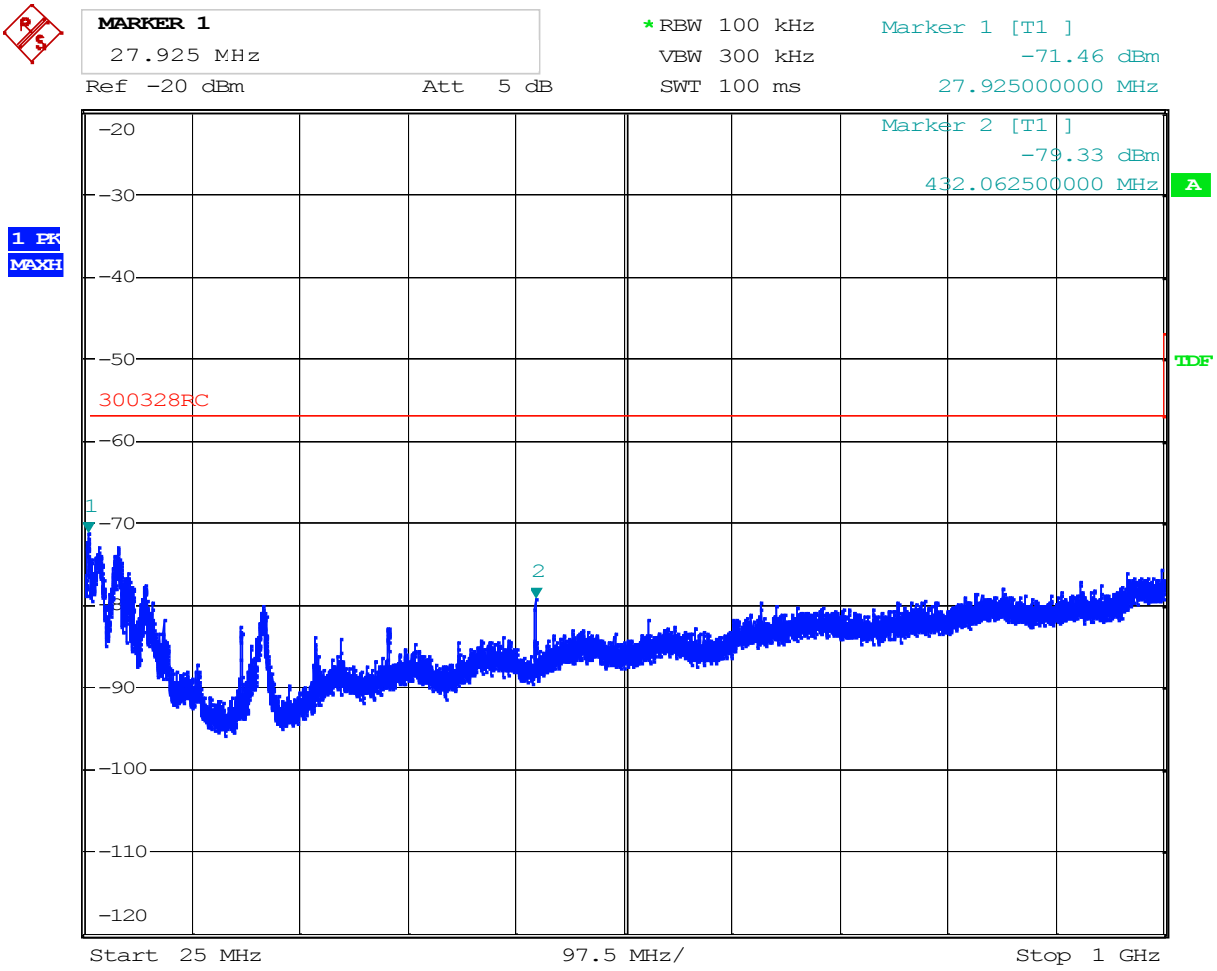
Frequency Range	Limit
30 MHz to 1 GHz	-57 dBm
above 1 GHz to 12,75 GHz	-47 dBm

Test Equipment Used: 1-6



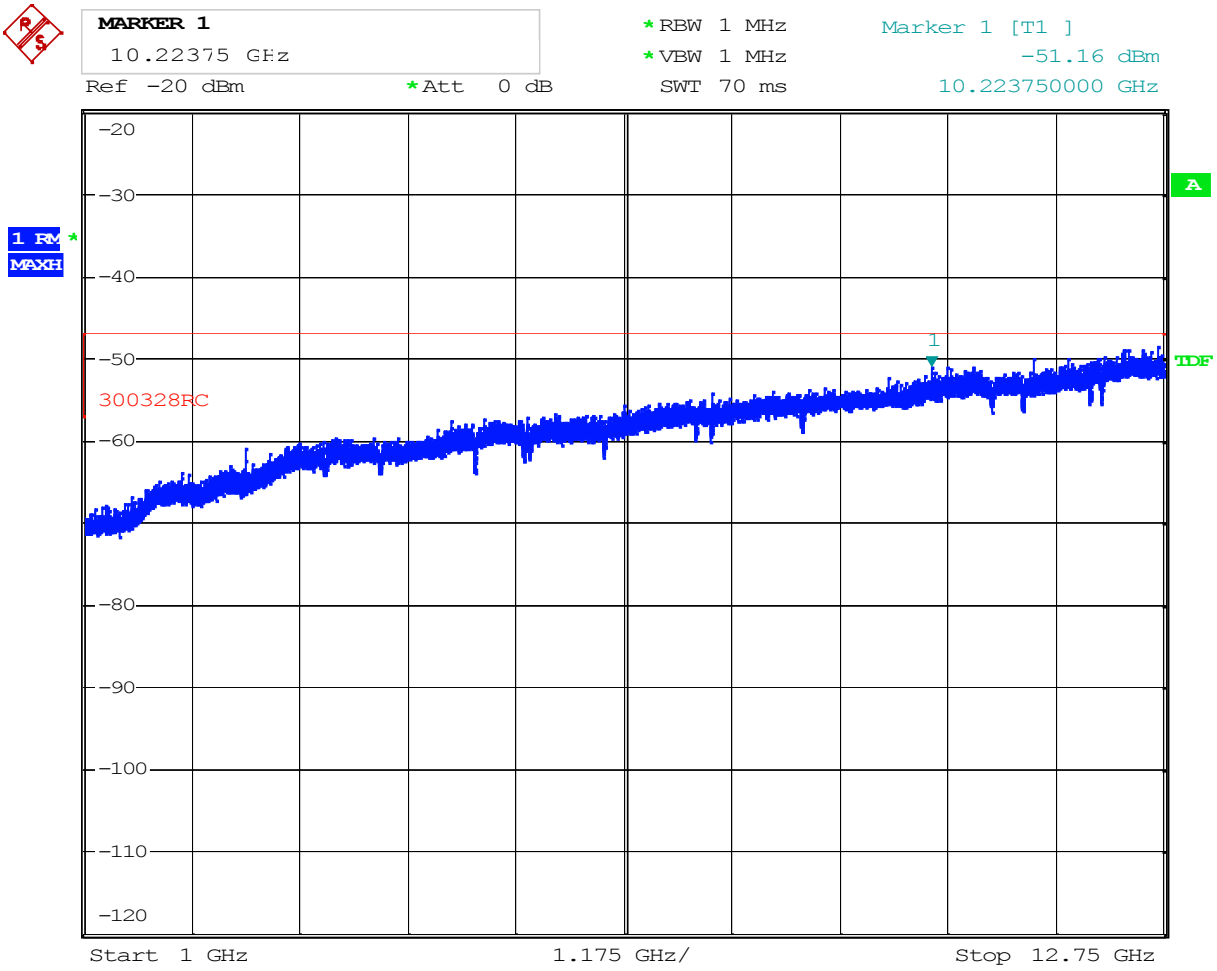
Date: 25.AUG.2014 09:41:16

VP: 30 - 1000MHz, PK



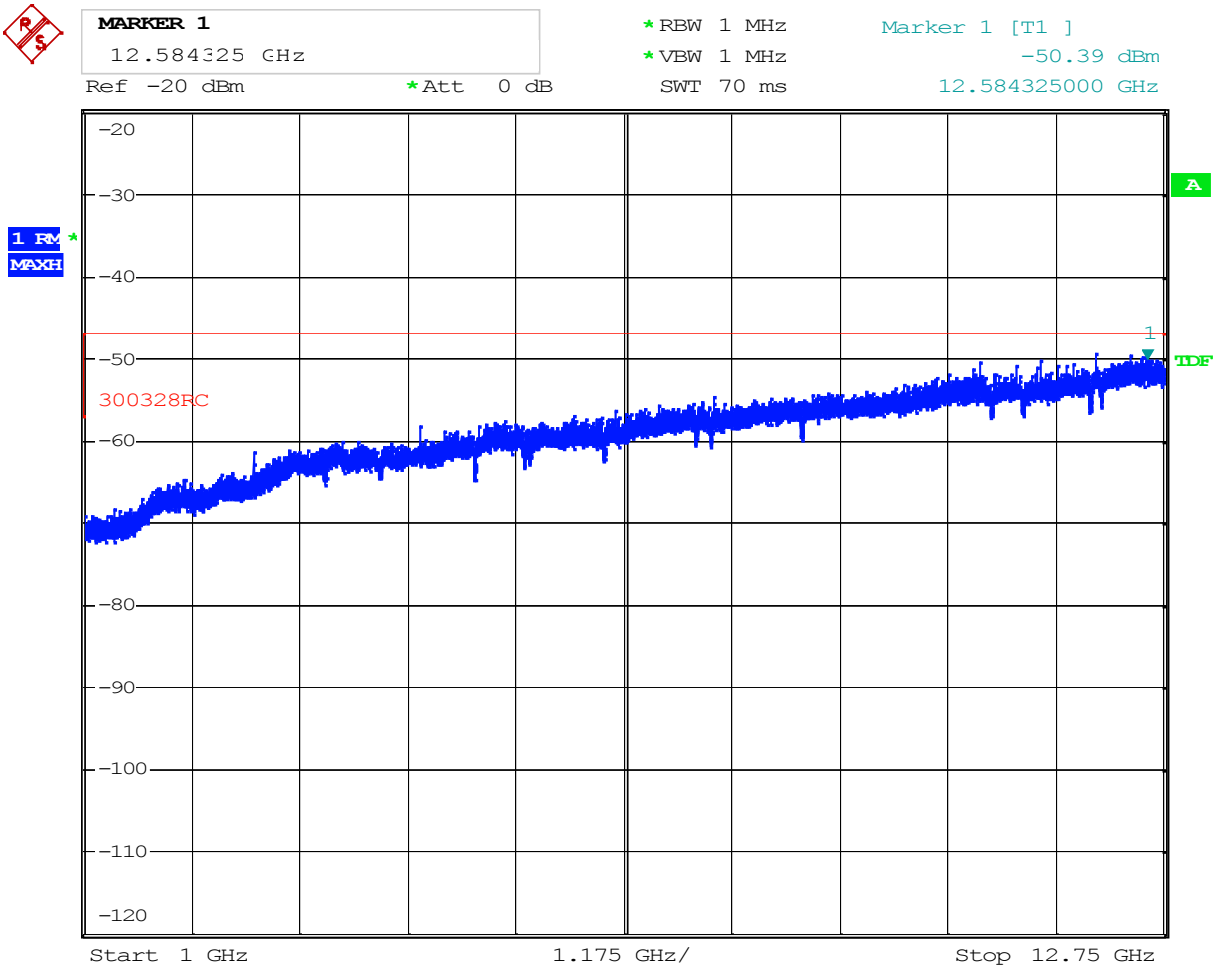
Date: 25.AUG.2014 09:43:28

HP: 30 - 1000MHz,PK



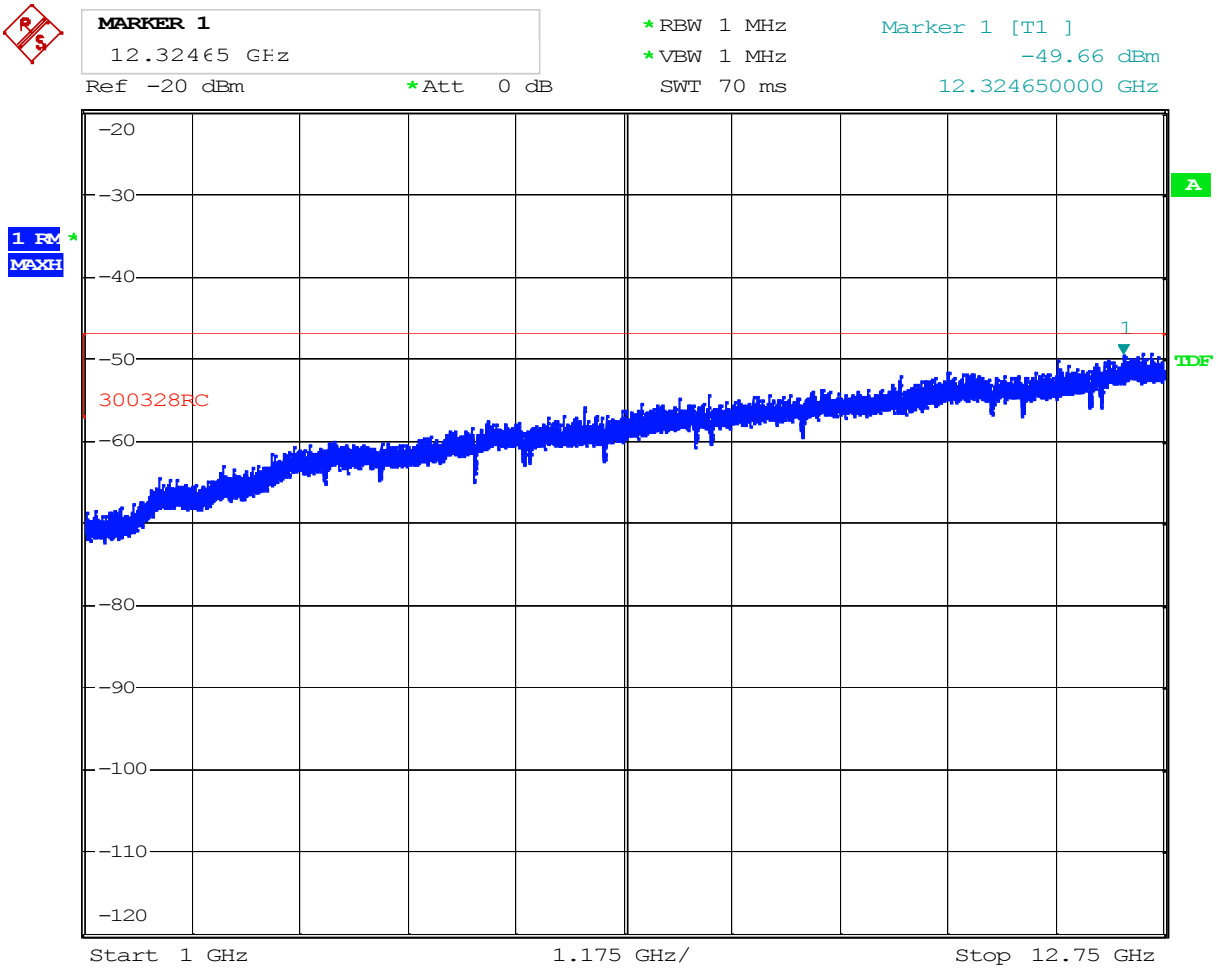
Date: 25.AUG.2014 13:57:58

RX: VP – 1 - 12.75GHz, ch2402 –prescan,RMS



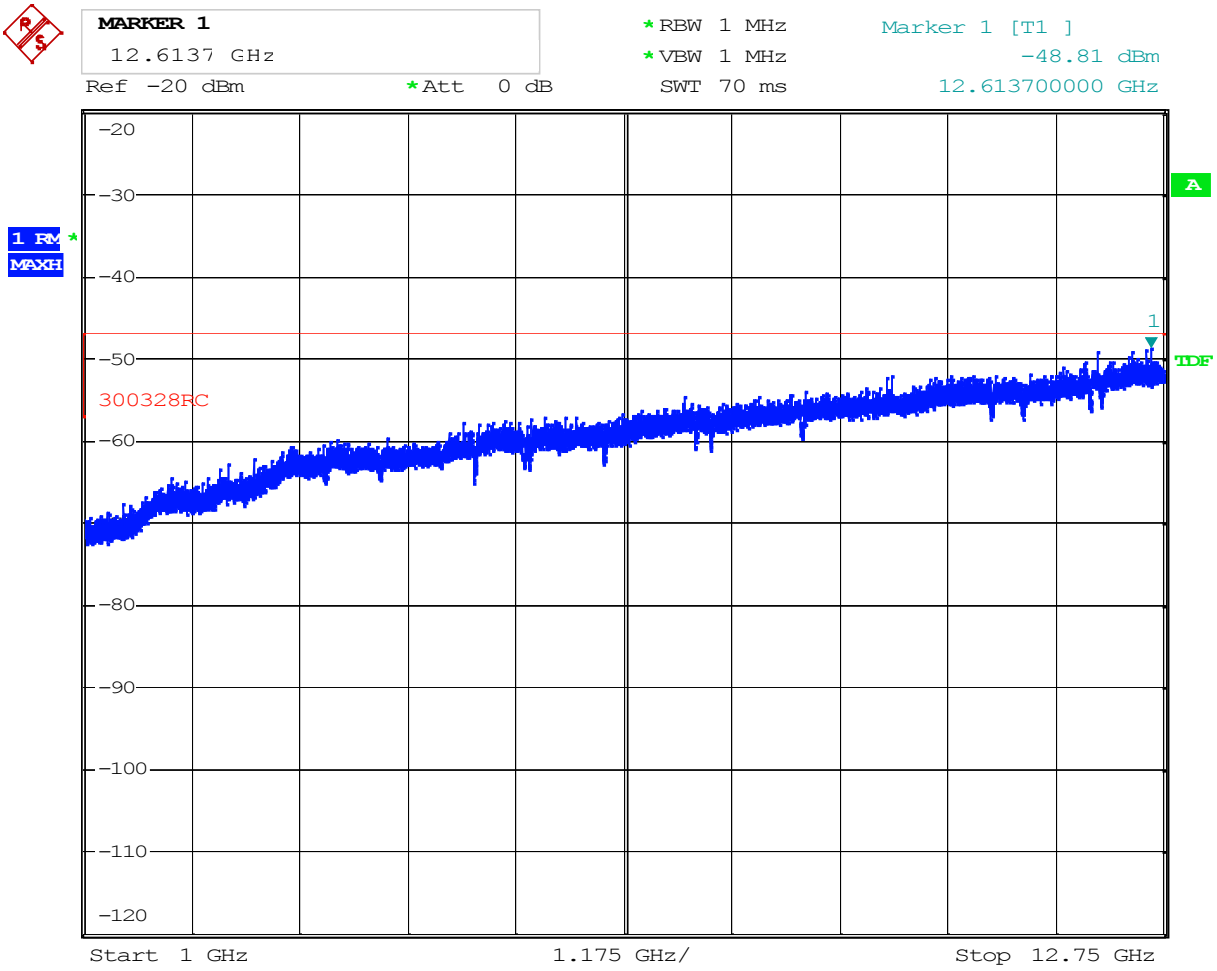
Date: 25.AUG.2014 14:01:09

RX: VP – 1 - 12.75GHz, ch2480 –prescan,RMS



Date: 25.AUG.2014 13:59:15

RX: HP – 1 - 12.75GHz, ch2402 –prescan,RMS



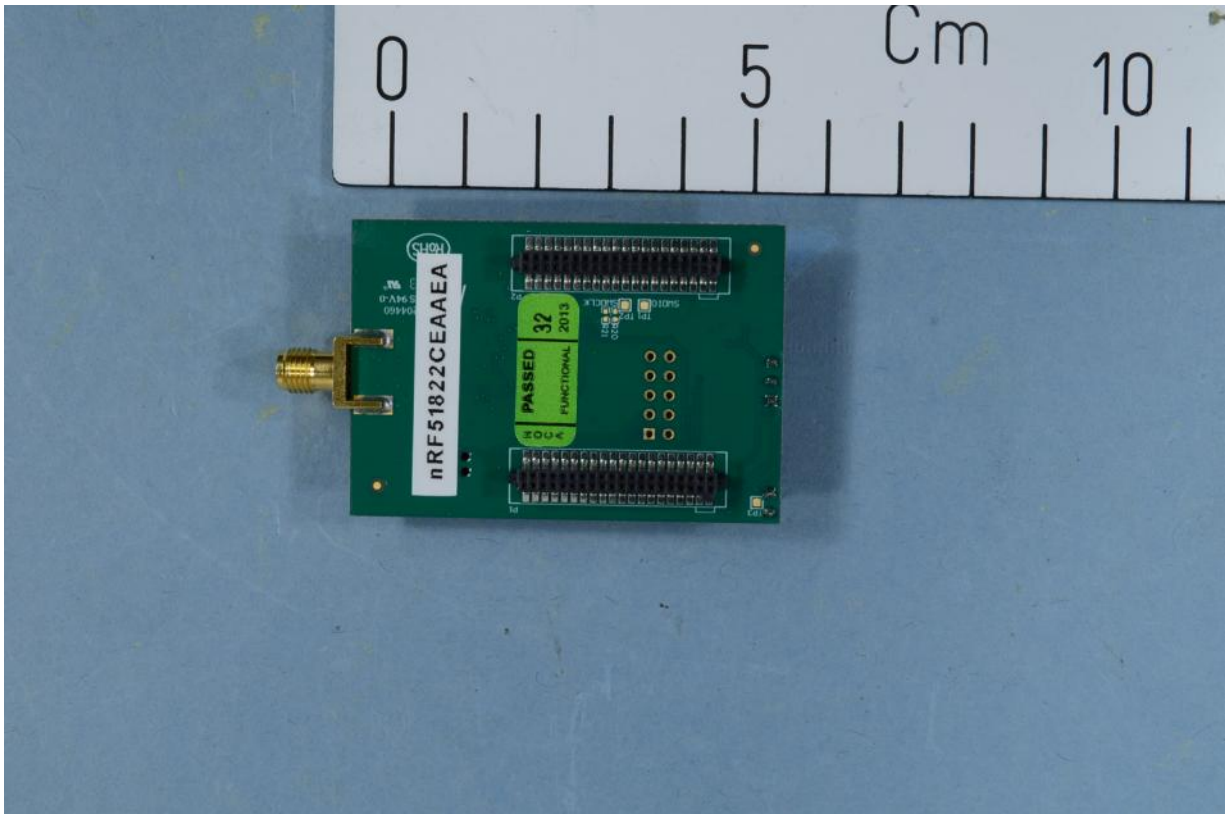
Date: 25.AUG.2014 14:00:00

RX: HP – 1 - 12.75GHz, ch2480 –prescan,RMS

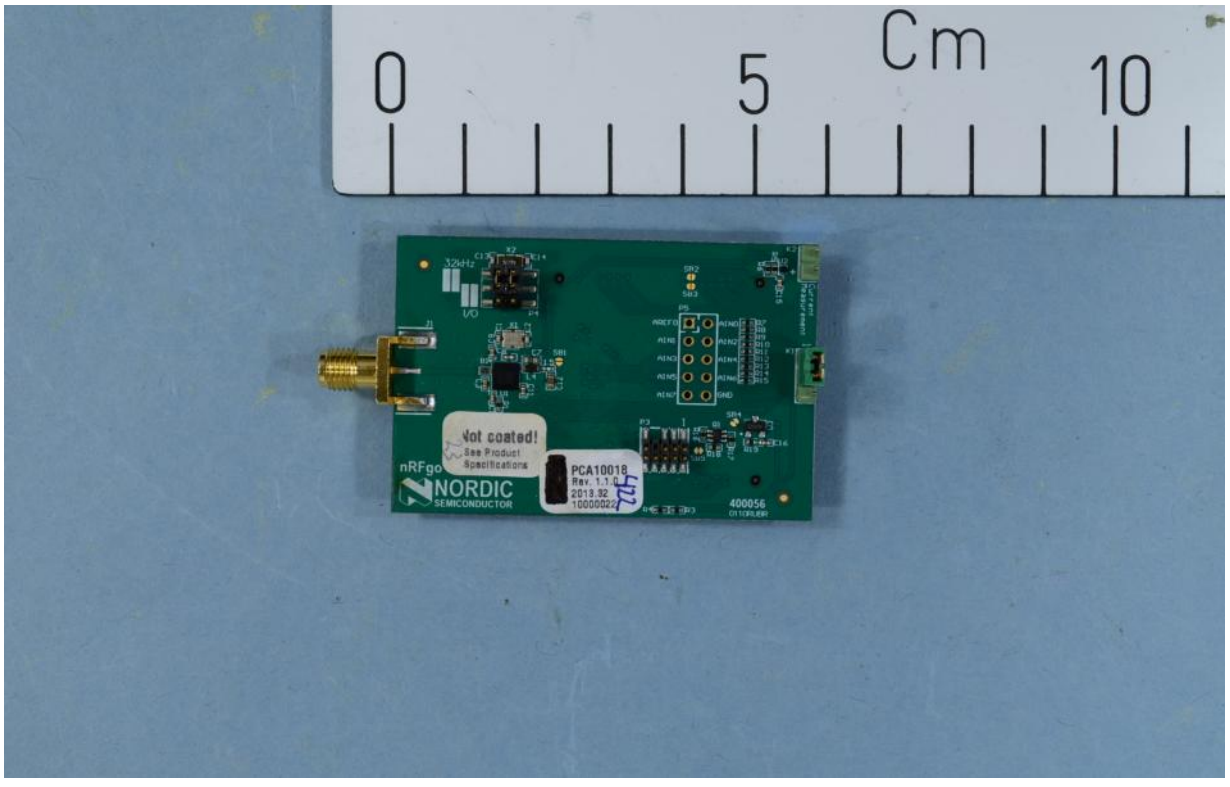
4 Test Setups

Radiated measurement set-up

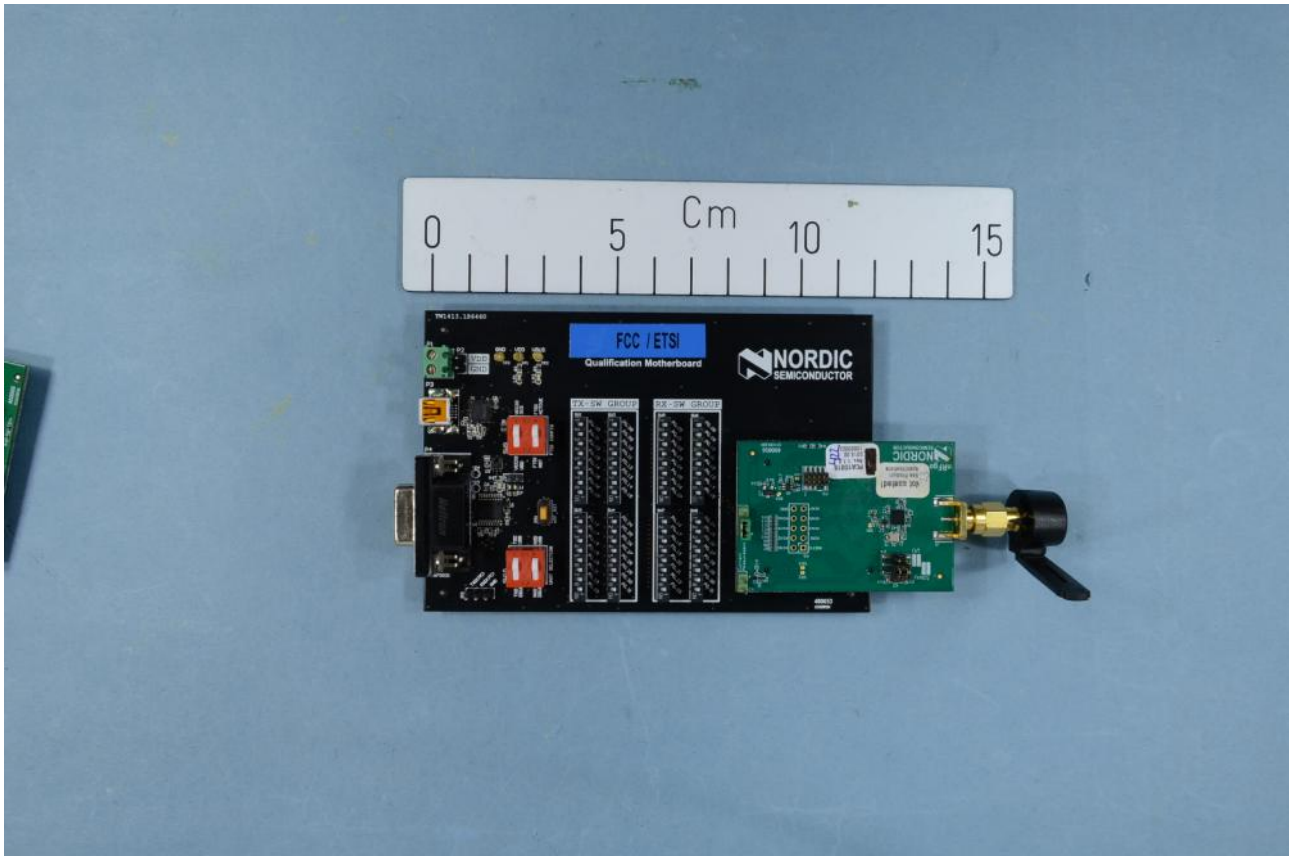
5 Photos of the EUT



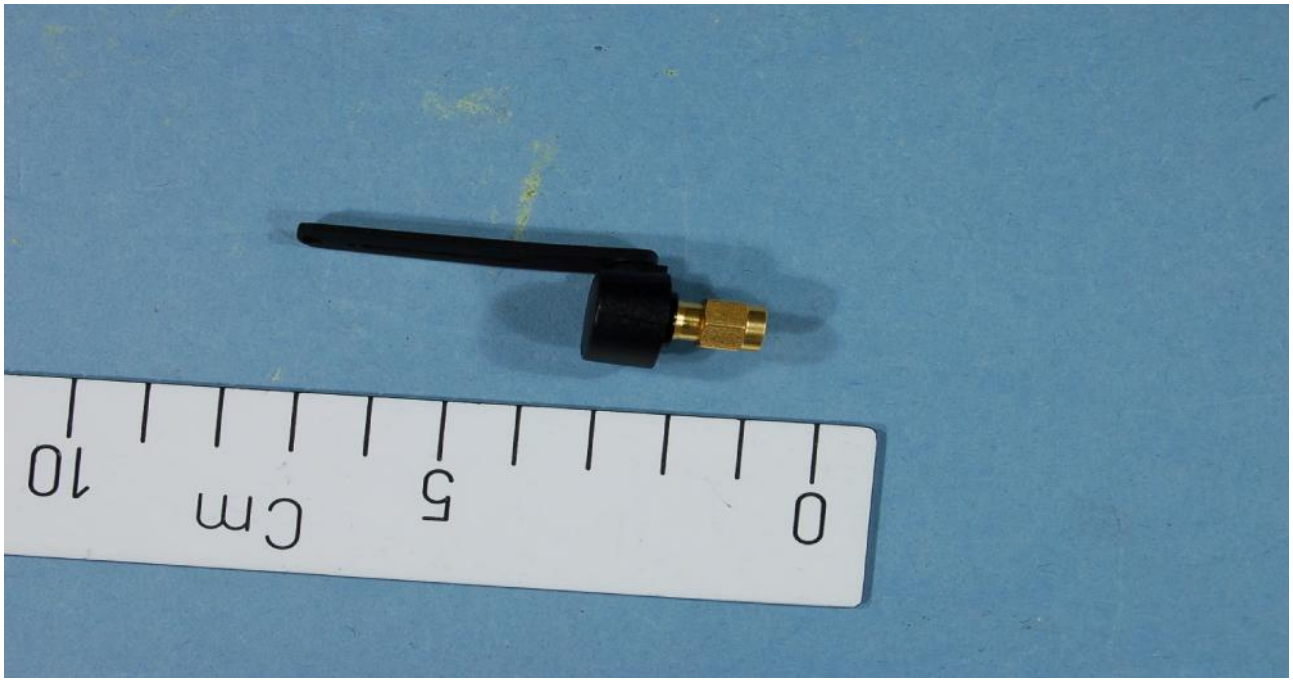
nRFGO module, View from rear, EUT for measurements



nRFGO module, View of component side, EUT for measurements



With mother board , QM



Antenna

6 Test Equipment Used

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the testhouse.

No	Ref. No	Description	Manufacturer	Type	Cal. date	Cal. due
1.	1504	Spectrum Analyzer	R&S	FSU	06.12.2013	06.12.2015
2.	1226	Antenna Horn	EMCO	3115	18.12.2013	18.12.2018
3.	1499	Antenna Ultralog Broadband	R&S	HL562	16.08.2010	16.08.2018
4.	1552	Amplifier, preamp	Miteq	AFS4	10.09.2013	10.09.2014
5.	1570	Shielded room	Rainford	Anechoic	-	
6.	1614	HP filter	Trilthic	-	Calb4use	
7.	1654	Spectrum analyser	R&S	FSV	18.07.2013	18.07.2015
8.	1657	Power meter	R&S	OSP	18.07.2013	18.07.2015
9.	1139	Attenuator	Suhner	6810.17.A	17.10.2013	17.10.2015
10.	1188	Generator, SHF	Gigatr.	7200/.01-20	31.10.2012	31.10.2014
11.	1597	Multimeter, Digital	Fluke	87	28.10.2013	28.10.2014
12.	1083	Climatic chamber	ACS	TY804101	14.05.2012	14.05.2014
13.		Cable			Calb4use	
14.	666	Power supply	Oltronix	B603D	Calb4use	
15.	1518	Test fixture	Nemko	2.4GHz	Calb4use	