



Test report no. : 231835-3

Item tested : CC1200EM-868-930

Type of equipment : Low Power Transceiver Module

FCC ID : ZAT1200EM900

Client : Texas Instruments Norway AS


FCC Part 15.249

Low Power Transmitter
902-928 MHz Band

RSS-210, Issue 8

Low-Power Licence-exempt Radiocommunications devices
902 – 928 MHz Band

29 April 2013

Authorized by : .....

Frode Sveinsen
Technical Verificator



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1 GENERAL INFORMATION

1.1 Testhouse info

Name : Nemko AS
Address : Nemko Kjeller
Instituttveien 6, Box 96
NO-2027 Kjeller, NORWAY
Telephone : +47 64 84 57 00
Fax : +47 64 84 57 05
Email: comlab@nemko.no
FCC test firm : 994405
IC OATS : 2040D-1
Total Number of Pages: 34

1.2 Client information

Name : Texas Instruments Norway AS
Address : Gaustadalléen 21,
NO-0349 Oslo, Norway
Telephone : +47 22 95 85 44
Fax : +47 22 95 85 46

Contact:

Name : Dag Grini
Telephone : +47 22 95 83 01
E-mail : d.grini@ti.com

1.3 Manufacturer

Same as client

2 TEST INFORMATION

2.1 Test item

Name :	Texas Instruments
Model/version :	CC1200EM-868-930
FCC ID:	ZAT1200EM900
IC ID:	451H-1200EM900
Serial number :	-
Hardware identity and/or version:	-
Software identity and/or version :	-
Frequency Range :	903.5 – 926.5 MHz
Number of Channels :	3
Operating Modes :	TX and RX
Type of Modulation :	2-GFSK
Data rate:	50 kbit/s
User Frequency Adjustment :	None, Software controlled
Conducted Output Power :	0.15 mW
Type of Power Supply :	Battery (tested with 2 AA batteries)
Antenna Connector :	SMA female
Antenna type:	Pulse W5017, rod antenna
Antenna Diversity Supported :	None

Description of test item

The CC1200EM-868-930 RF-transceiver module is an evaluation module developed for the sub-1 GHz ISM band and intended for development purposes. It is based on the CC1200 transceiver device.

2.2 Test environment

2.2.1 Normal test condition

Temperature:	20 – 21 °C
Relative humidity:	29 – 43 %
Normal test voltage:	3.0 V DC

The values are the limit registered during the test period.

2.3 Test period

Item received date:	2013-01-28
Test period :	from 2013-02-26 -2013-03-11

3 TEST REPORT SUMMARY

3.1 General

Manufacturer: Texas Instruments
Model No.: CC1200EM-868-930

All measurements are traceable to national standards.

The tests were conducted for the purpose of demonstrating compliance with FCC CFR 47 Part 15.249 and Industry Canada RSS-210, Issue 8 and RSS-GEN, Issue 3.

Radiated tests were conducted in accordance with ANSI C63.4-2003 and ANSI C63.10-2009. The radiated tests were made in a semi-anechoic chamber at measuring distances of 3 and 10 meters.

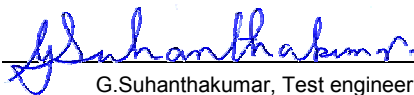
- | | |
|---|---|
| <input checked="" type="checkbox"/> New Submission | <input type="checkbox"/> Production Unit |
| <input type="checkbox"/> Class II Permissive Change | <input checked="" type="checkbox"/> Pre-production Unit |
| DXT Equipment Code | <input type="checkbox"/> Family Listing |

THIS TEST REPORT RELATES ONLY TO THE ITEM (S) TESTED.

Deviations from, additions to, or exclusions from the test specifications are described in "Summary of Test Data".



TEST REPORT #: 231835-3

TESTED BY:  DATE: 2013-04-04
G.Suhanthakumar, Test engineer

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This test report applies only to the items and configurations tested.

3.2 Test summary

Name of test	FCC Part 15 reference	RSS-210 Issue 8 & RSS-GEN Issue 3	Result
Supply Voltage Variations	15.31(e)	N/A	Complies ¹
Antenna Requirement	15.203	7.1.4 (RSS-GEN)	Complies ²
Power-line Conducted Emission	15.207(c)	7.2.2 (RSS-GEN)	N/A ¹
Occupied Bandwidth	N/A	4.6.1 (RSS-GEN)	-
Peak Power Output	15.249(a)(c)	A2.9	Complies
Band edge Emissions	15.249(d)	A.2.9	Complies
Spurious Emissions (Radiated)	15.249 (e) 15.209	A2.9 4.9 (RSS-GEN)	Complies

¹ EUT is battery powered.

² SMA connector "Professional Use Only"

RSS Gen issue 3 covers section 7 & 6

RSS 210 issue 8 covers section A2.9

3.3 Description of modification for modification filing

Not applicable.

3.4 Comments

The channels are selected by pressing a button on the mother board, TrxEB. The measurements are performed at channels near top , near middle and near bottom . And the output level is set to maximum in the software. The EUT complies at these channels.

The radiated measurements are tested on three axis.

Two fully charged AA batteries are used.

3.5 Family list rationale

Not Applicable.

4 TEST RESULTS

4.1 Transmitter Frequency Stability

Para. No.: 15.31(m)/7.2.4

Test Performed By: G.Suwanthakumar

Date of Test: 04-March-2013

Measurement Data:

Temperature	Channel nr.	Given Frequency (MHz)	Measured value (MHz)	Deviation (Hz)
20 ° C	-	903.500	903.49716	0.00284
	-	915.000	914.99707	0.00293
	-	926.500	926.49701	0.00300

Comment: Reported for information only. There are no requirements to frequency tolerance for low power devices in the 902-928 MHz band certified to 15.249 or RSS 210

4.2 20 dB Bandwidth

Para. No.: RSS-Gen

Test Performed By: G.Suwanthakumar	Date of Test: 04-March-2013
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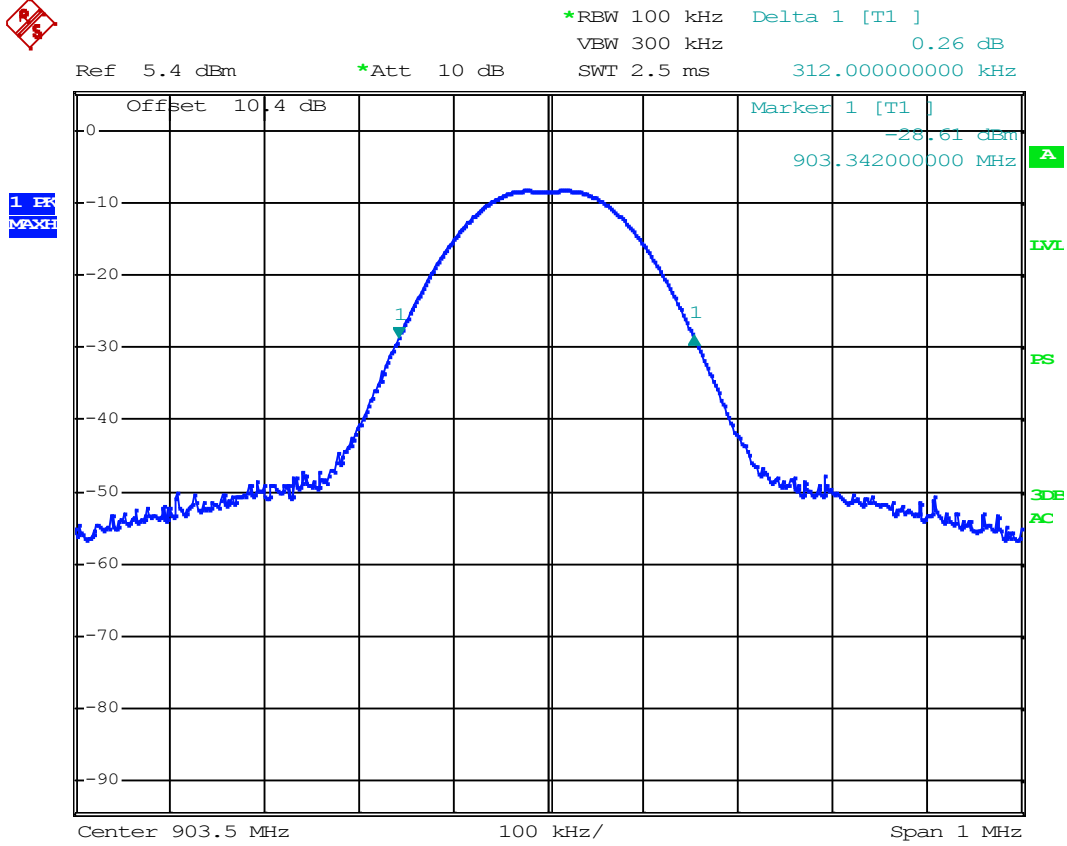
Test Results: Complies

Measurement Data:

Data Rate	20 dB Bandwidth (kHz)		
	903.500MHz	915.000MHz	926.500MHz
50kbps	312	312	316

Requirements:

For information only

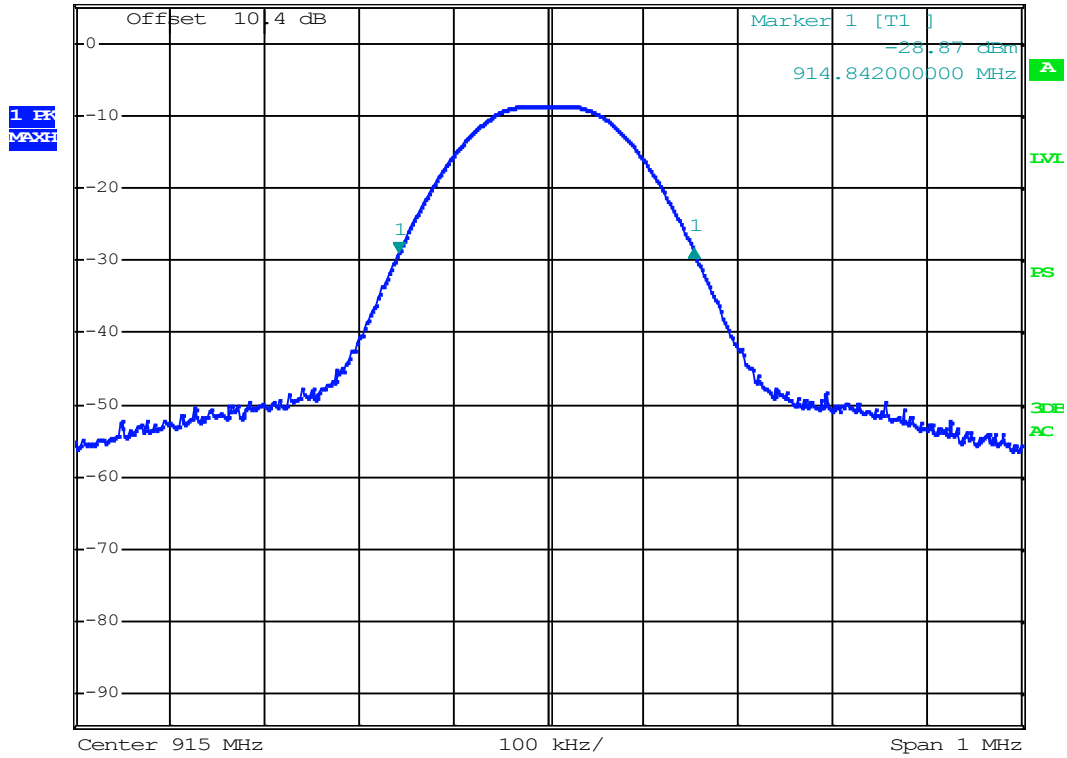


Date: 11.MAR.2013 12:39:51

903.5MHz – 20 dB bandwidth – 312kHz

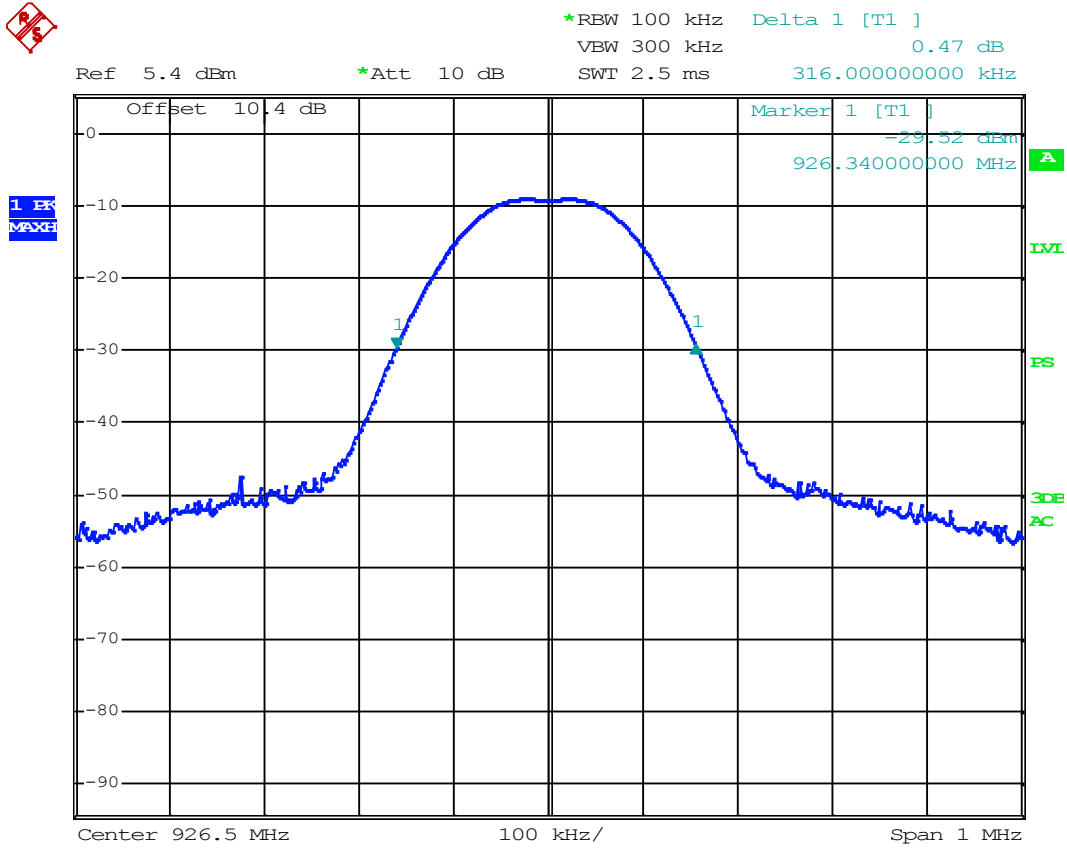


Ref 5.4 dBm *Att 10 dB *RBW 100 kHz Delta 1 [T1] VBW 300 kHz 0.51 dB SWI 2.5 ms 312.00000000 kHz



Date: 11.MAR.2013 12:38:56

915MHz – 20 dB bandwidth – 312kHz



Date: 11.MAR.2013 12:41:00

926.5MHz - 20 dB bandwidth - 316kHz

4.3 Peak power output

Para. No.: 15.249 (a) / A2.9

Test Performed By: G.Suhandhakumar	Date of Test: 18-Feb and 11-March-2013
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Test Results: Complies

Measurement data:

Maximum conducted peak output power

RF channel	903.5MHz	915MHz	926.5MHz
@ 50kbps, Measured value (dBm)	-8.3	-8.6	-9.1

Maximum field strength

RF channel	903.5MHz	915MHz	926.5MHz
VP: Measured value (dB μ V/m)	93.6	93.1	92.1
HP: Measured value (dB μ V/m)	81.2	83.7	85.8

Calculated erp & antenna gain

RF channel	903.5MHz	915MHz	926.5MHz
Radiated power (mW)	0.41	0.37	0.30
Radiated e.r.p. (dBm)	-3.8	-4.3	-5.3
Antenna gain dBd	4.5	4.3	3.8

Radiated measurements are performed at 3 m distance.

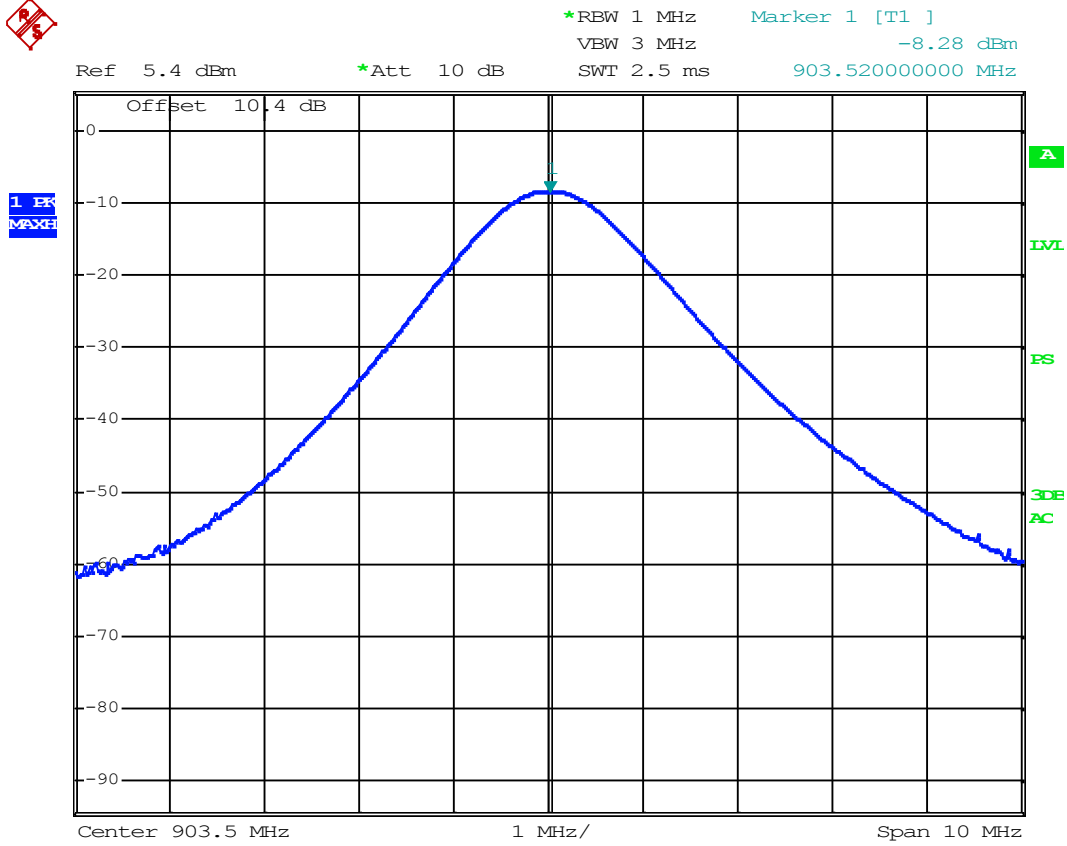
Radiated Power is calculated from measured field strength by the formulas in KDB 412172 D01 Determining ERP and EIRP v01.

- Detachable antenna? Yes No
- If detachable, is the antenna connector non-standard? Yes No
- SMA connector "Professional Use Only"

New batteries were used.

Requirements:

The maximum peak output power shall be ≤ 94 dB μ V/m

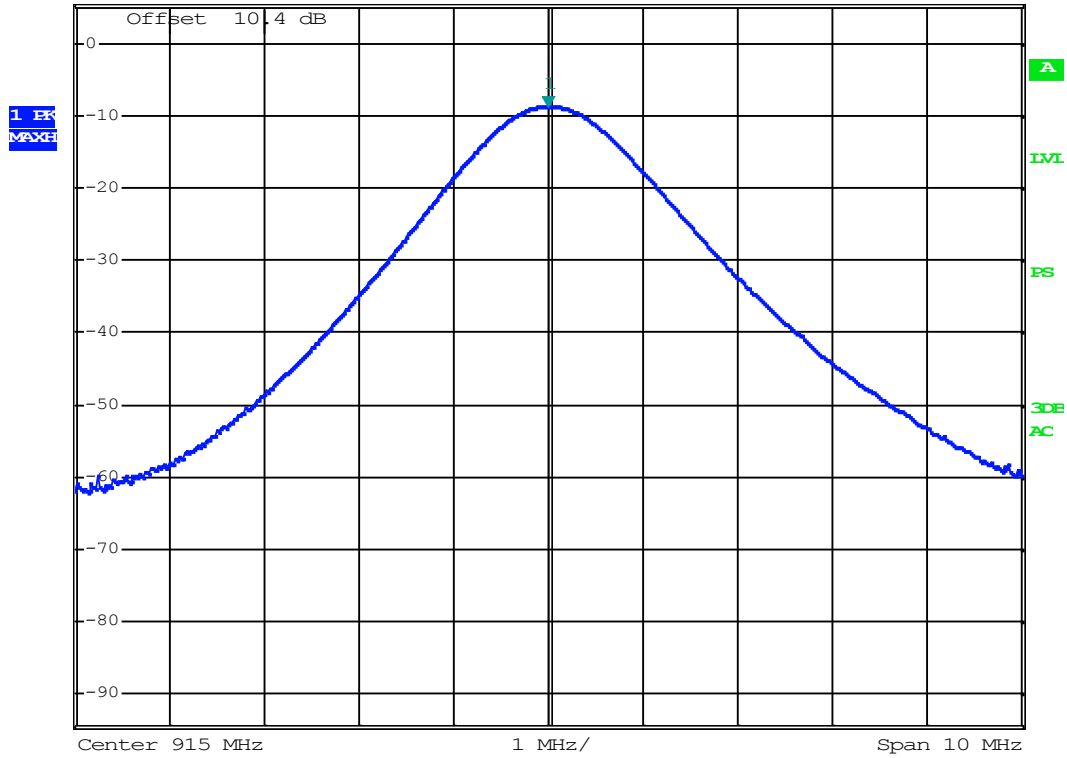


Date: 11.MAR.2013 12:35:53

Conducted power – 903.5MHz



Ref 5.4 dBm *Att 10 dB *RBW 1 MHz Marker 1 [T1]
 VBW 3 MHz -8.62 dBm
 SWI 2.5 ms 915.00000000 MHz

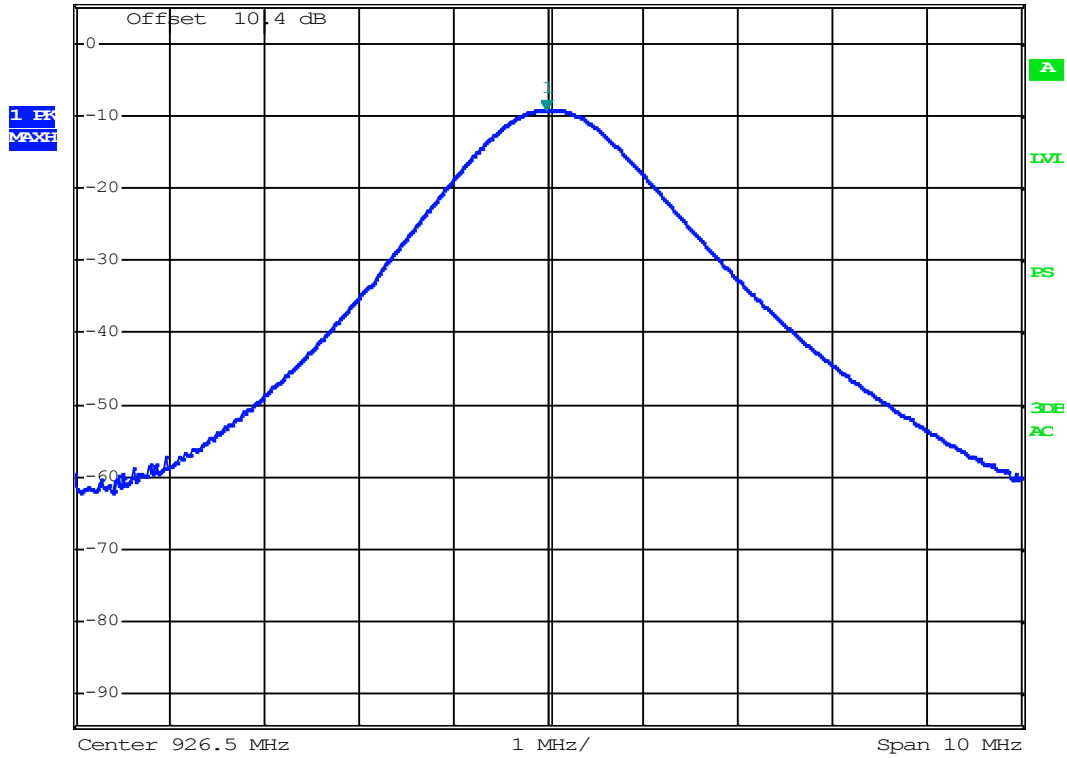


Date: 11.MAR.2013 12:37:08

Conducted power – 915MHz



Ref 5.4 dBm *Att 10 dB *RBW 1 MHz Marker 1 [T1]
VBW 3 MHz -9.05 dBm
SWT 2.5 ms 926.48000000 MHz

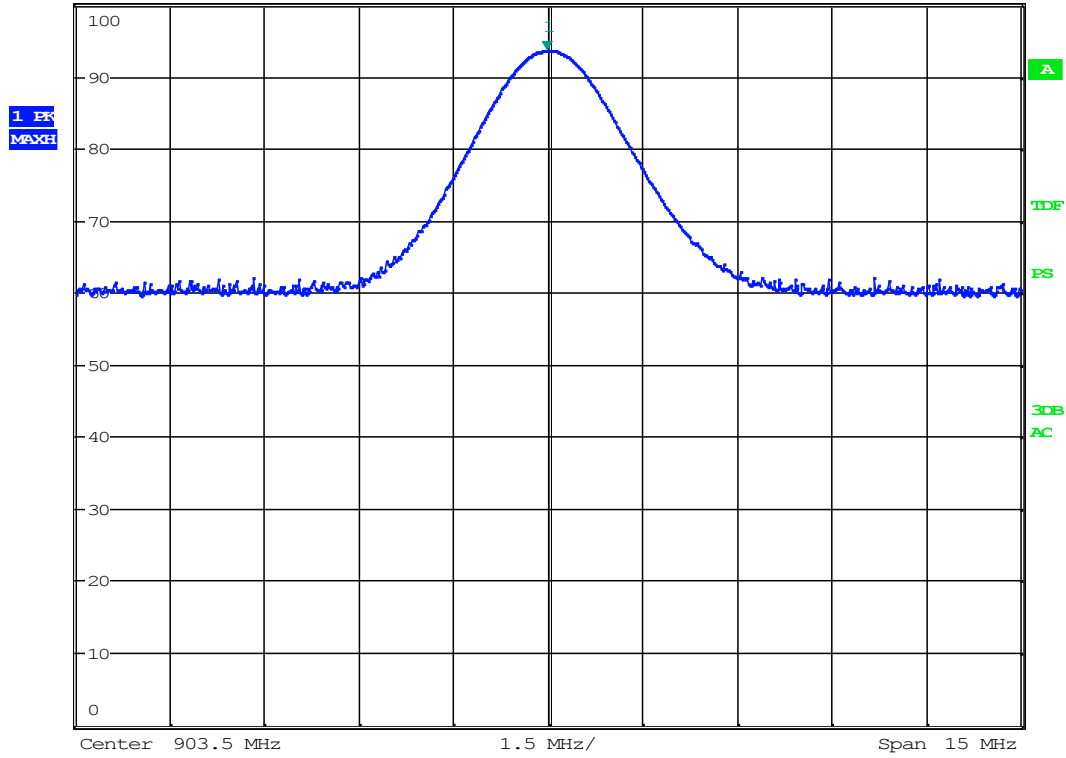


Date: 11.MAR.2013 12:36:34

Conducted power – 926.5MHz



Ref 100 dB μ V/m *Att 10 dB *RBW 1 MHz Marker 1 [T1]
 VBW 3 MHz 93.60 dB μ V/m
 SWT 2.5 ms 903.475961538 MHz

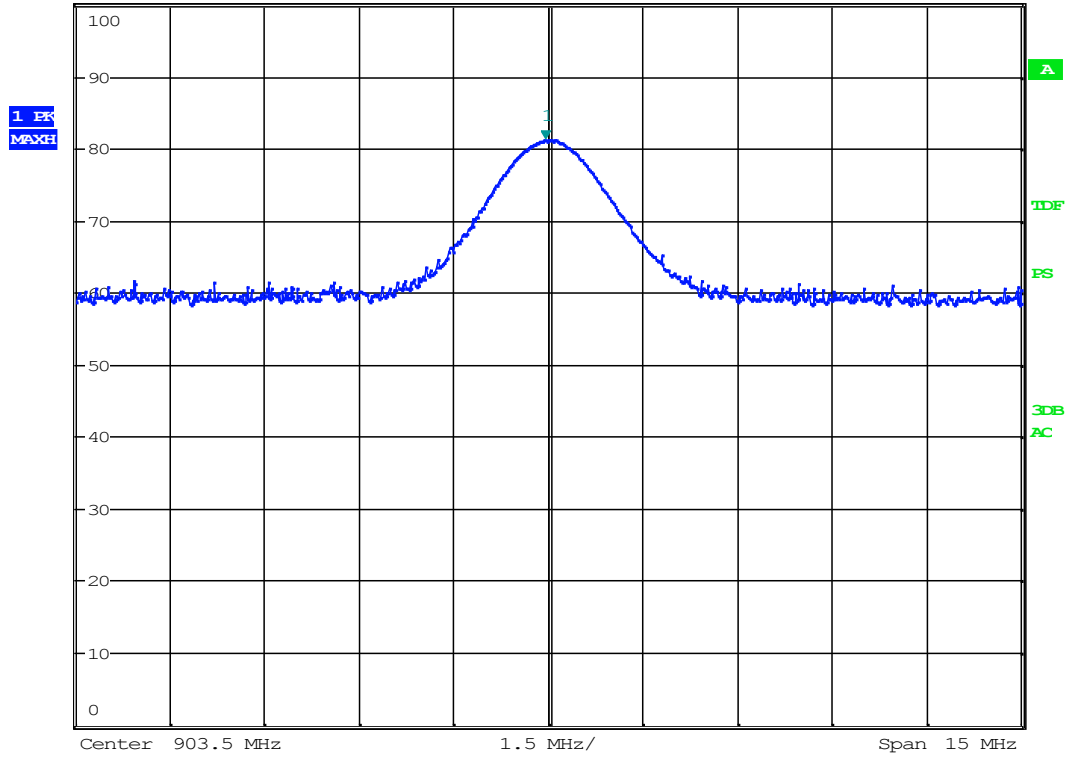


Date: 18.FEB.2013 14:28:13

VP: 903.5MHz – Field strength

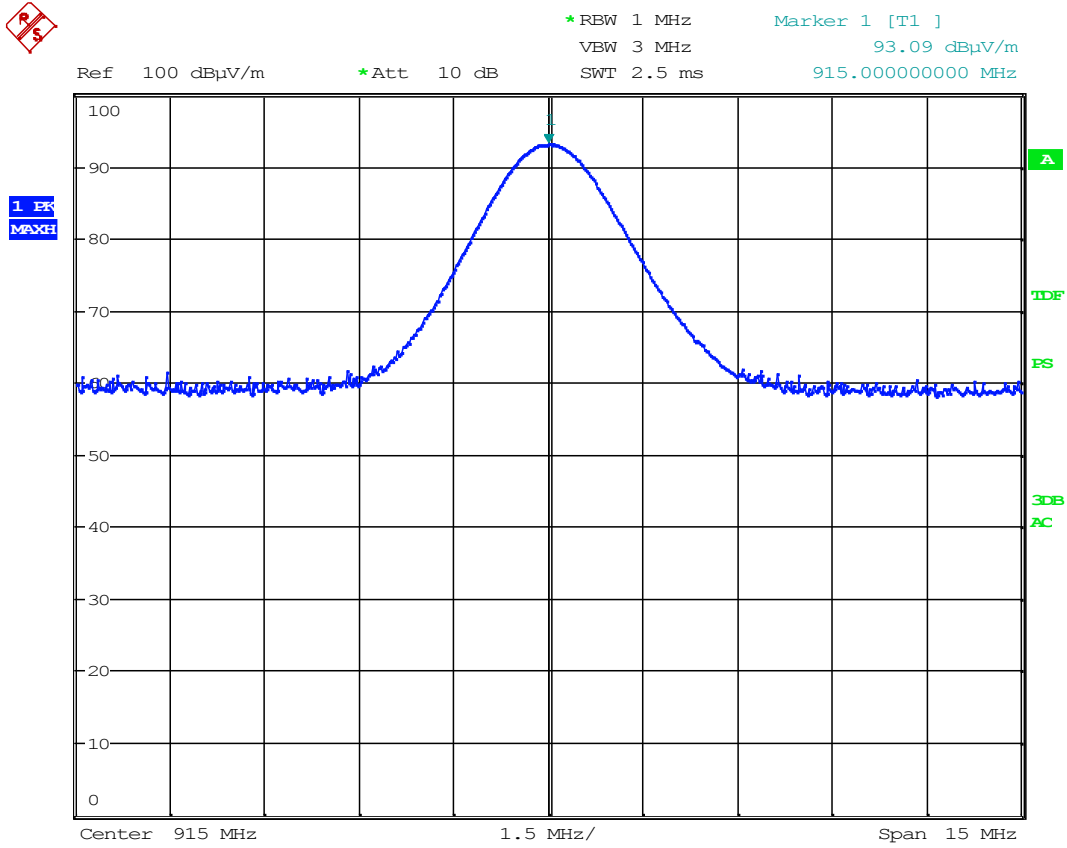


Ref 100 dB μ V/m *Att 10 dB *RBW 1 MHz Marker 1 [T1]
VBW 3 MHz 81.20 dB μ V/m
SWT 2.5 ms 903.451923077 MHz



Date: 18.FEB.2013 14:21:43

HP: 903.5MHz – Field strength

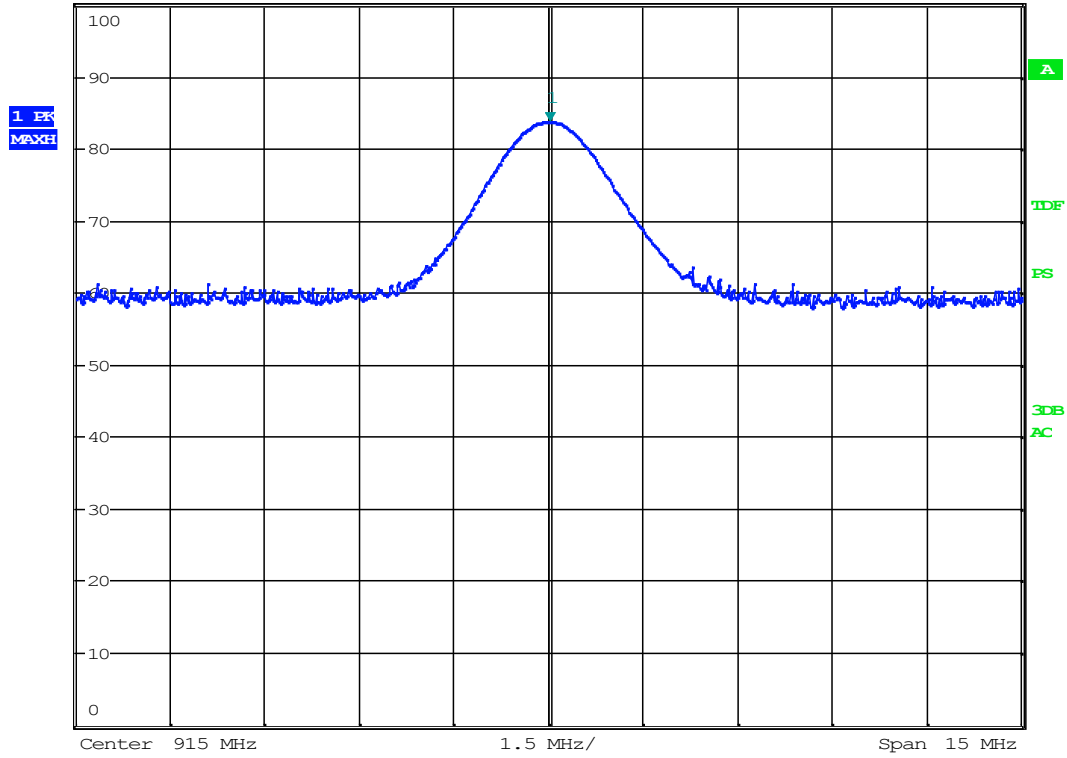


Date: 18.FEB.2013 14:13:26

VP: 915MHz – Field strength

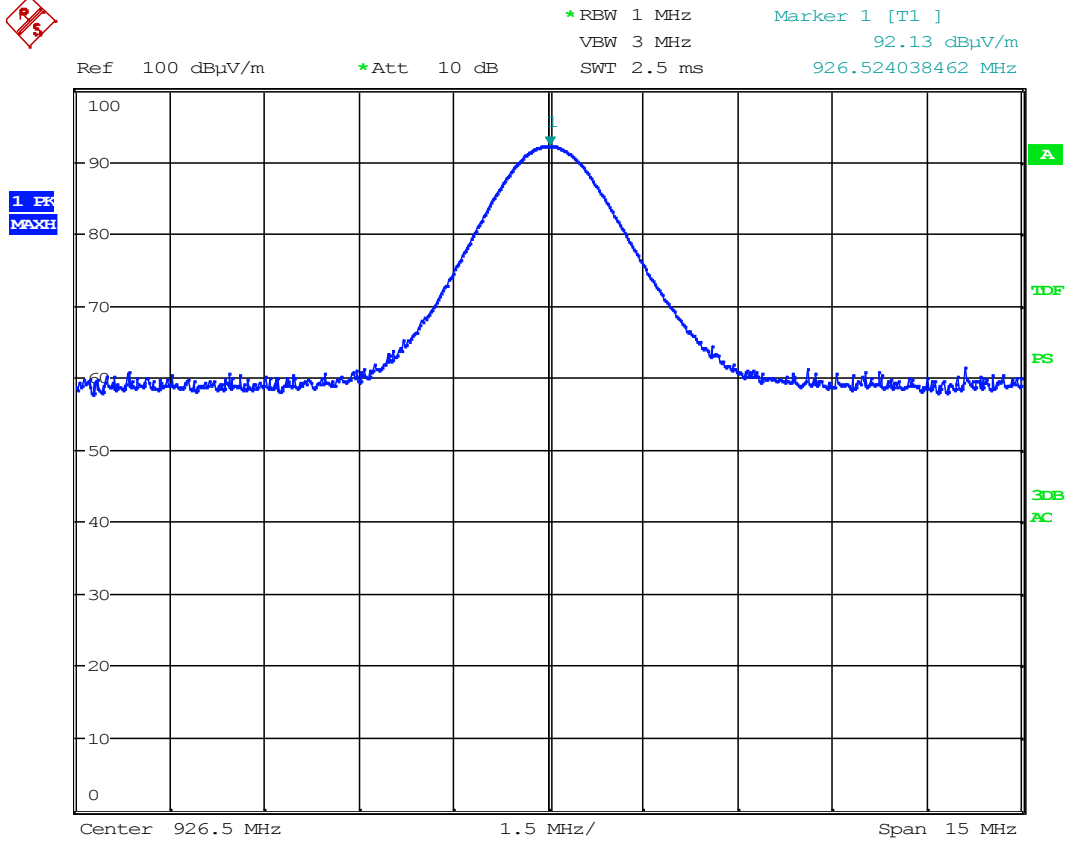


Ref 100 dB μ V/m *Att 10 dB *RBW 1 MHz Marker 1 [T1]
 VBW 3 MHz 83.74 dB μ V/m
 SWT 2.5 ms 915.024038462 MHz



Date: 18.FEB.2013 14:12:43

HP: 915MHz – Field strength

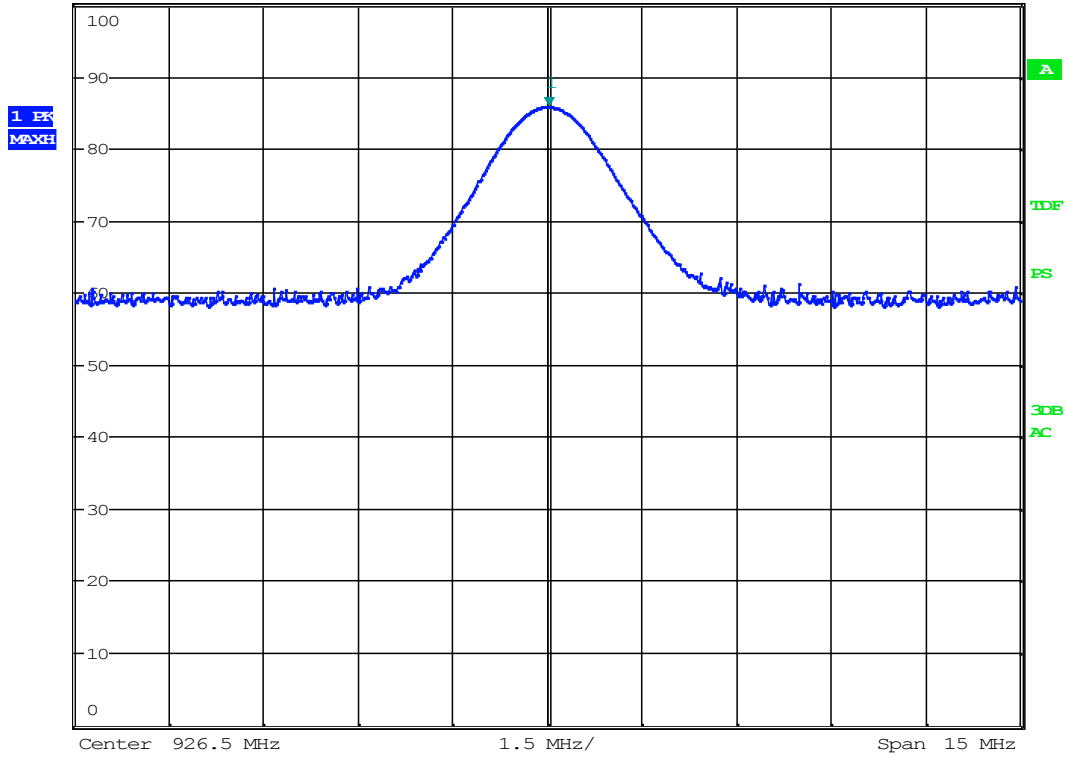


Date: 18.FEB.2013 14:02:56

VP: 926.5MHz – Field strength



Ref 100 dB μ V/m *Att 10 dB *RBW 1 MHz Marker 1 [T1]
 VBW 3 MHz 85.84 dB μ V/m
 SWT 2.5 ms 926.524038462 MHz



Date: 18.FEB.2013 14:02:05

HP: 926.5MHz – Field strength

4.4 Spurious emissions (radiated)

Para. No.: 15.209 / 15.249 (e) / A2.9 / 4.9

Test Performed By: G.Suhandhakumar	Date of Test: 18 March.2013
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Test Results: Complies

Measurement Data:

Radiated Emissions with antenna, 1-10 GHz

1-10 GHz measured at a distance of 3m.

Measured with Peak Detector:

Frequency	Dist. corr. factor	Field strength, Peak	Duty cycle corr. factor	Limit	Margin
GHz	dB	dB μ V/m	dB	dB μ V/m	dB
1 - 10	0	<52.5	-	74	>22

Average Detector:

Frequency	Dist. corr. factor	Field strength, AV	Duty cycle corr. factor	Limit	Margin
GHz	dB	dB μ V/m	dB	dB μ V/m	dB
1 - 10	0	<52.5	-	54	>2

The maximum is observed in Vertical polarization

The test sample was transmitting with 100% duty cycle for all tests.

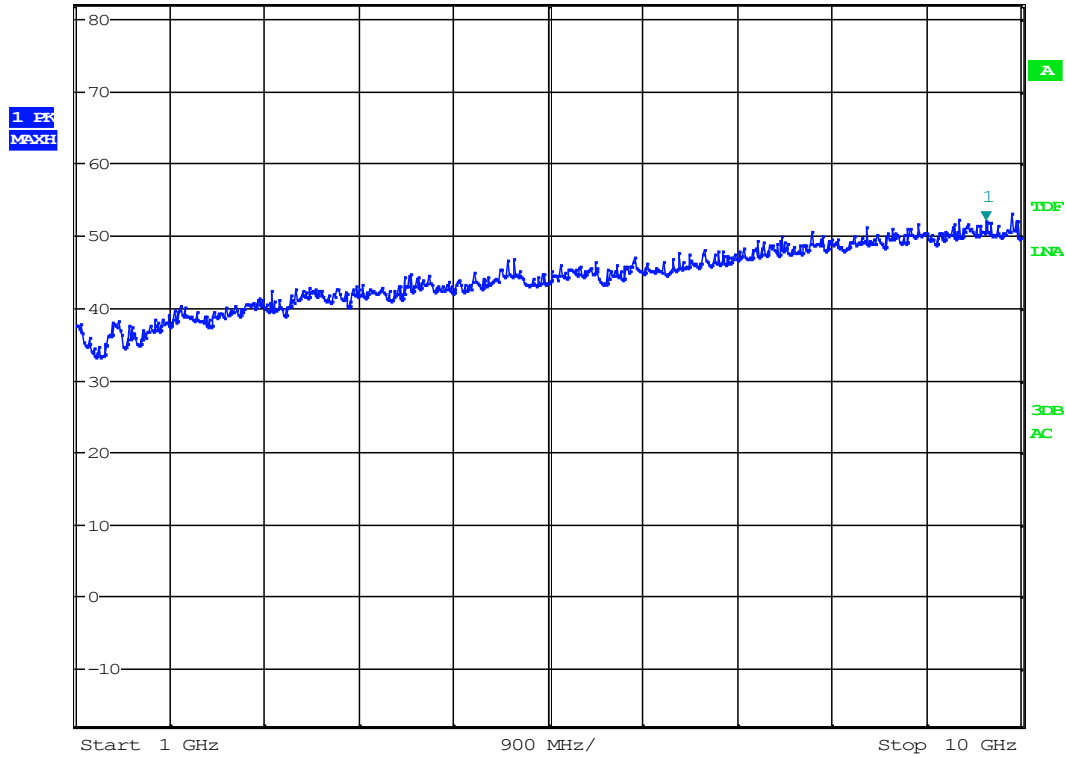
Antenna factor, amplifier gain and cable loss are included in spectrum analyzer "Transducer factor".

Requirement:

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.



Ref 82 dBµV *Att 10 dB *RBW 1 MHz Marker 1 [T1]
 VBW 3 MHz 52.02 dBµV
 SWI 55 ms 9.668269231 GHz

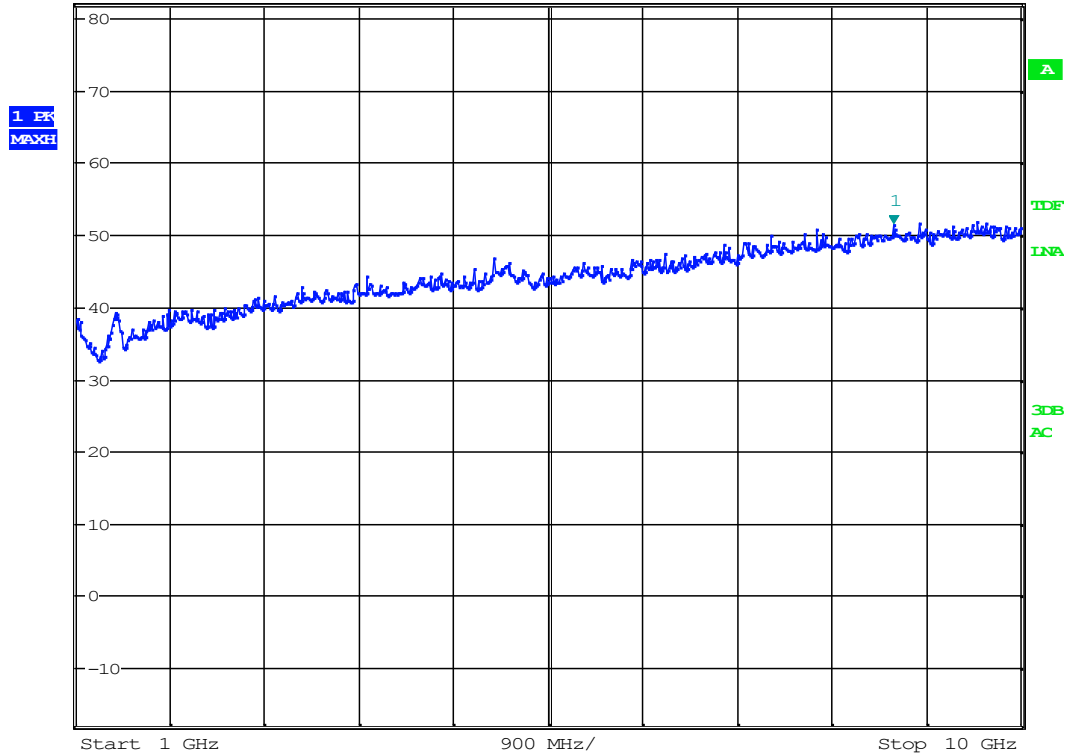


Date: 18.FEB.2013 15:38:59

VP: pre-view scan 1 - 10 GHz -Pk with HP-filter - ch903.5MHz



Ref 82 dB μ V *Att 10 dB *RBW 1 MHz Marker 1 [T1]
 VBW 3 MHz 51.42 dB μ V
 SWT 55 ms 8.788461538 GHz

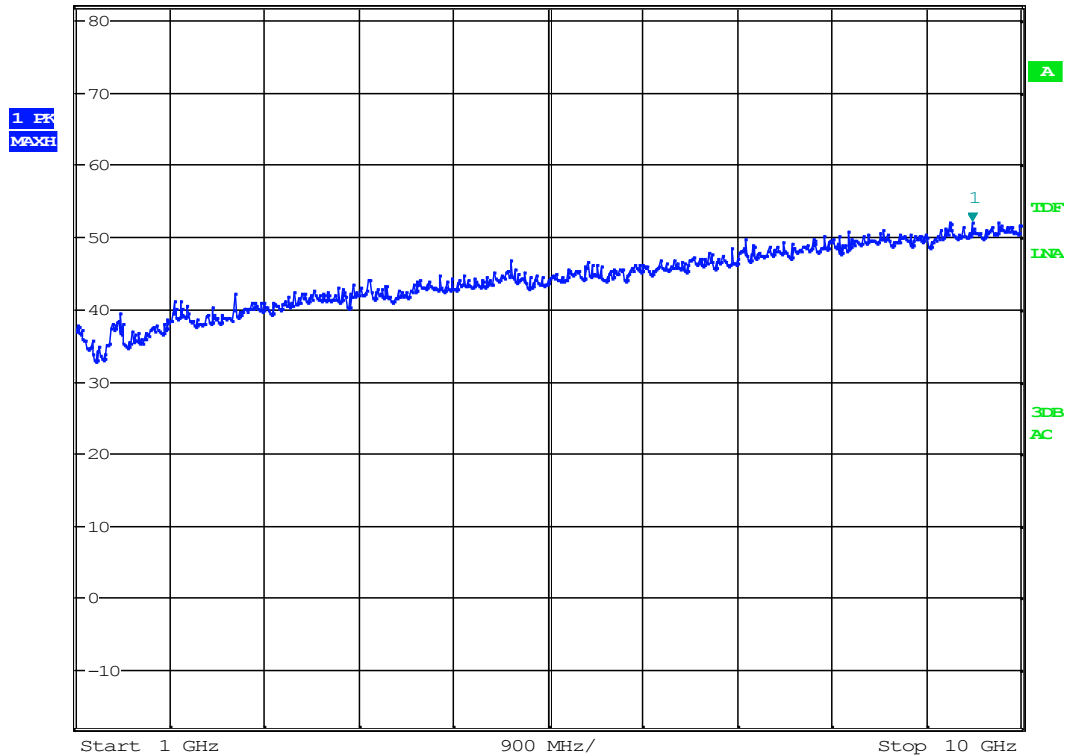


Date: 18.FEB.2013 15:38:37

HP: pre-view scan 1 - 10 GHz -Pk with HP-filter - ch903.5MHz



Ref 82 dB μ V *Att 10 dB *RBW 1 MHz Marker 1 [T1]
 VBW 3 MHz 52.14 dB μ V
 SWT 55 ms 9.538461538 GHz

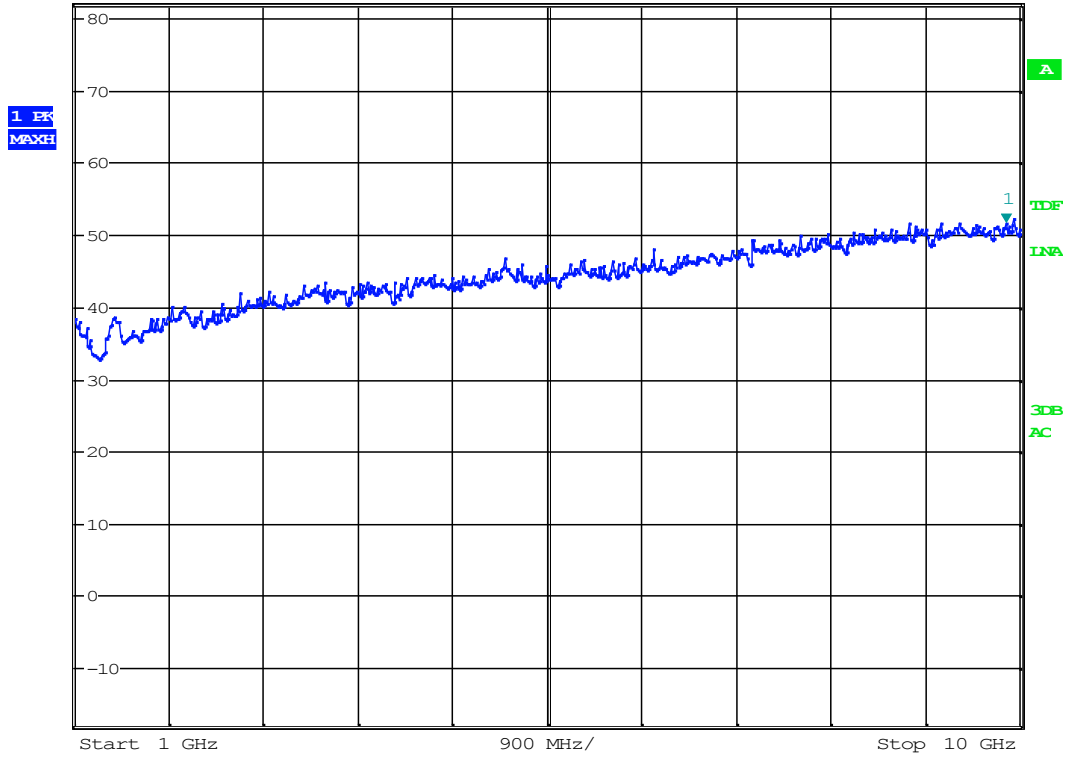


Date: 18.FEB.2013 15:37:15

VP: pre-view scan 1 - 10 GHz -Pk with HP-filter - ch915MHz



Ref 82 dB μ V *Att 10 dB *RBW 1 MHz Marker 1 [T1]
 VBW 3 MHz 51.65 dB μ V
 SWT 55 ms 9.870192308 GHz

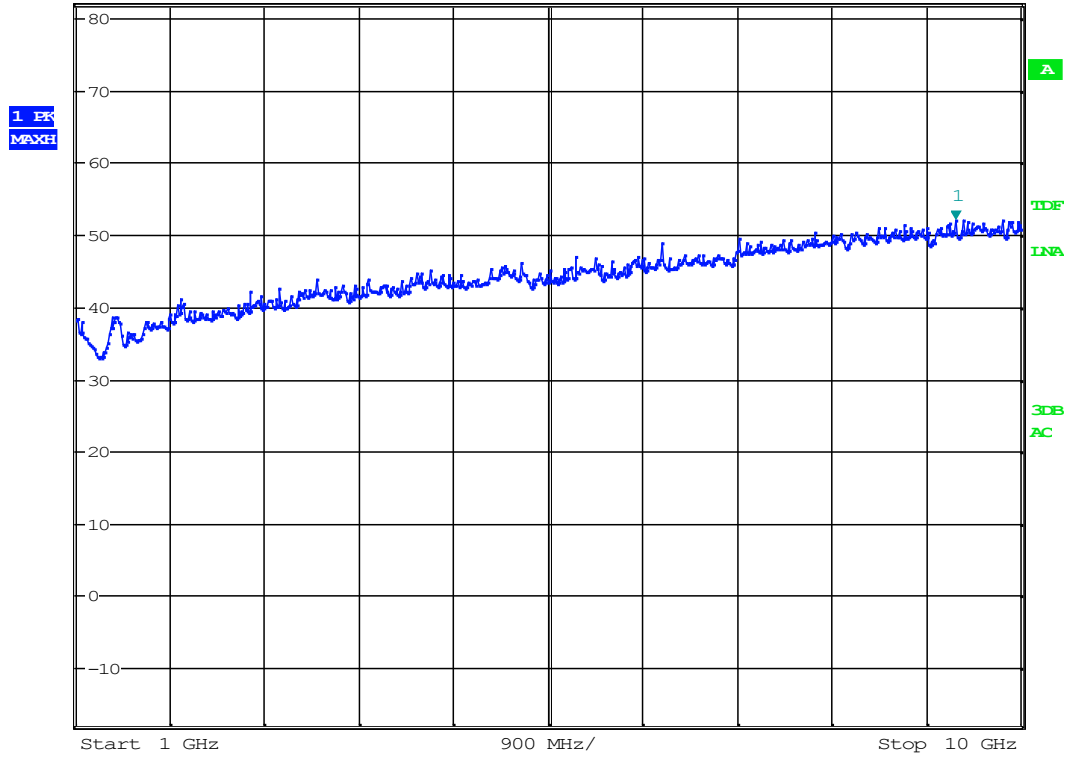


Date: 18.FEB.2013 15:37:44

HP: pre-view scan 1 - 10 GHz -Pk with HP-filter - ch915MHz



Ref 82 dB μ V *Att 10 dB *RBW 1 MHz Marker 1 [T1]
 VBW 3 MHz 52.04 dB μ V
 SWT 55 ms 9.379807692 GHz

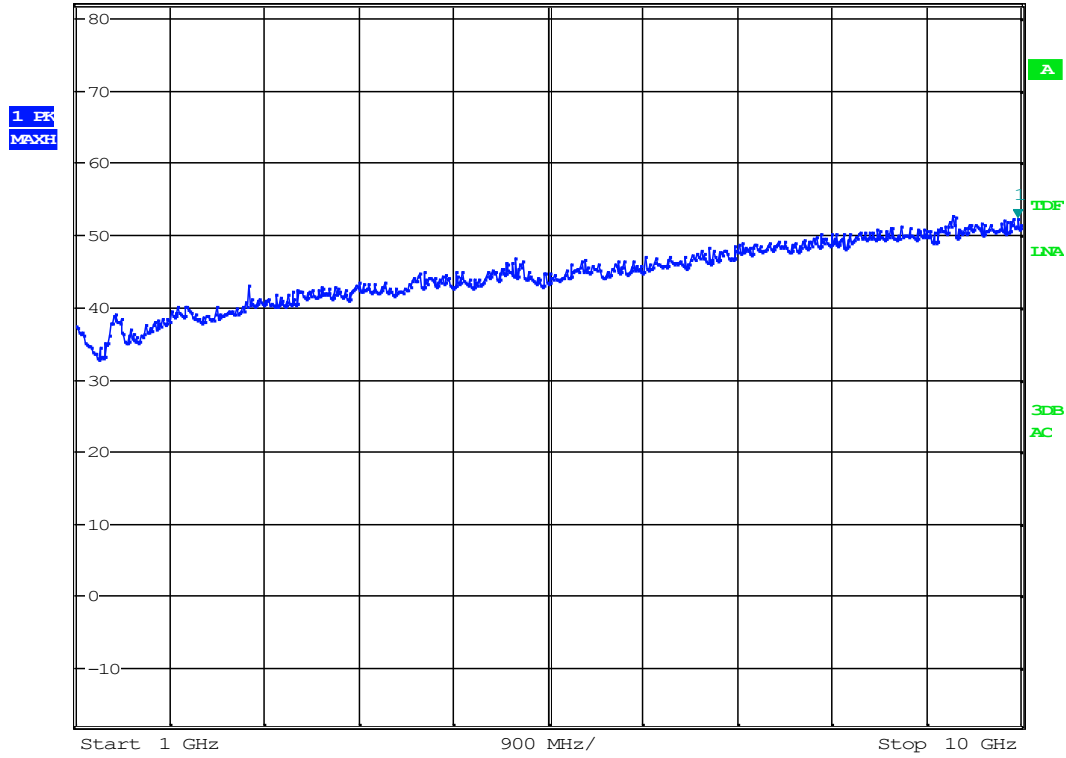


Date: 18.FEB.2013 15:36:14

VP: pre-view scan 1 - 10 GHz -Pk with HP-filter - ch926.5MHz



Ref 82 dB μ V *Att 10 dB *RBW 1 MHz Marker 1 [T1]
 VBW 3 MHz 52.34 dB μ V
 SWT 55 ms 9.971153846 GHz



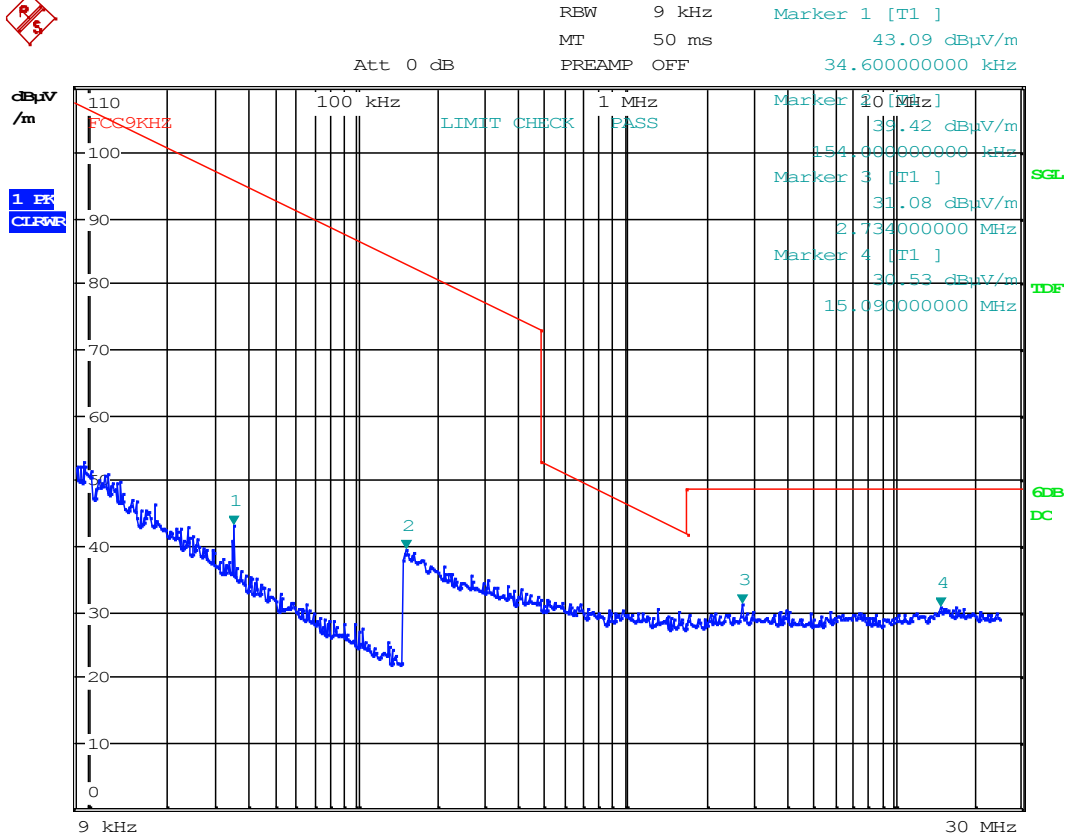
Date: 18.FEB.2013 15:35:43

HP: pre-view scan 1 - 10 GHz -Pk with HP-filter - ch926.5MHz

Radiated emissions 9kHz – 30 MHz.

Detector: Peak

Measuring distance 10 m.



Date: 18.FEB.2013 15:55:08

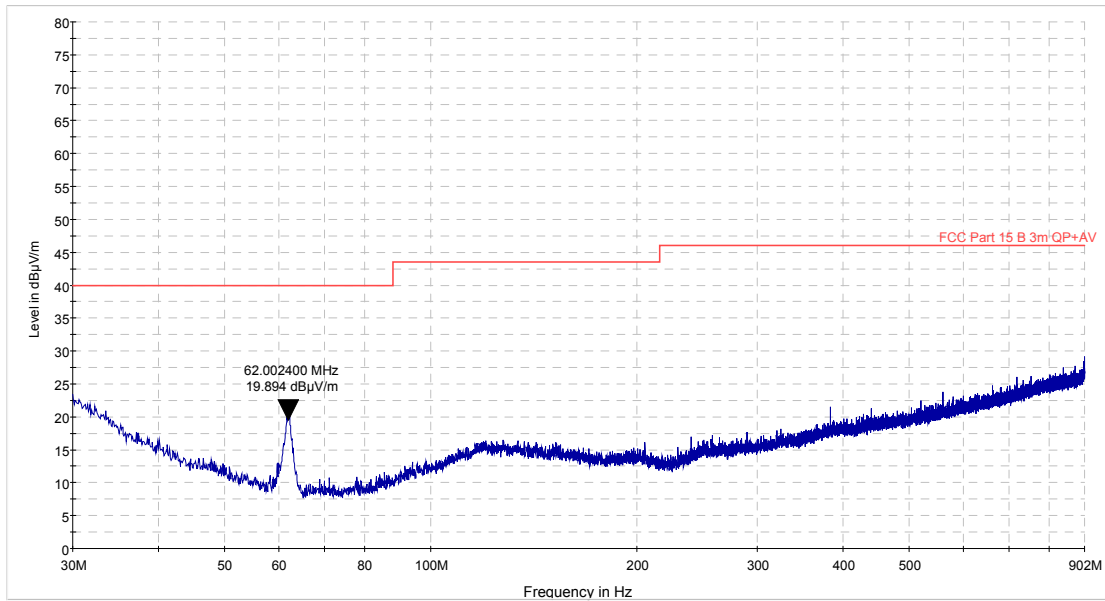
Radiated emissions 30 – 1000 MHz.

Detector: Peak

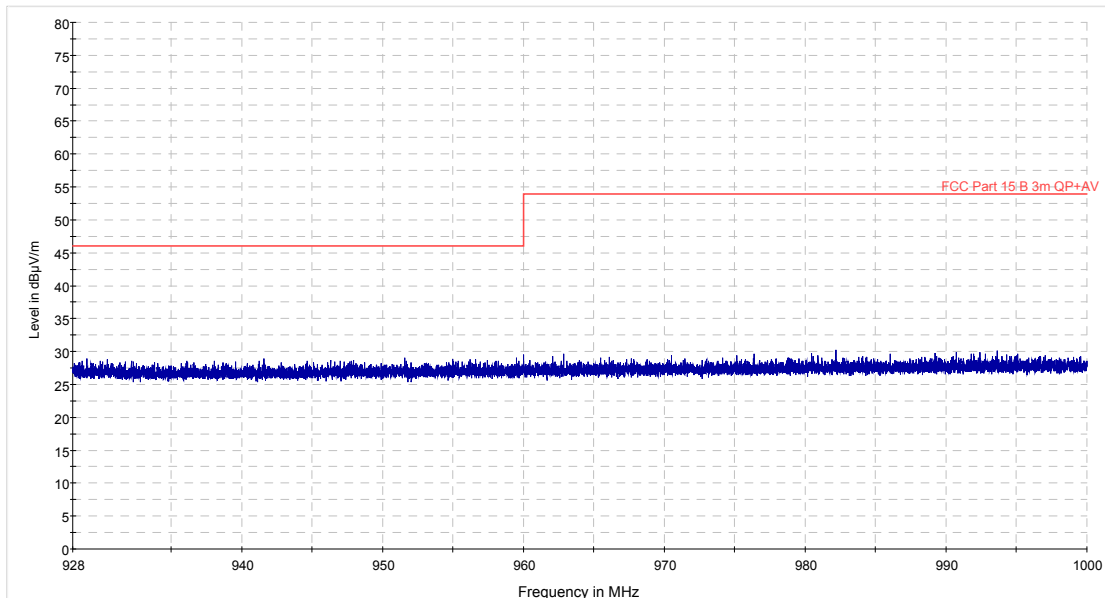
Measuring distance 3 m.

The graph shows peak scan and highest values. Since there is no spurious found no QP values are measured.

FCC Pt15 Class B 30-1000 MHz 3m



30 - 902MHz - channel 903.5 MHz



928 - 1000MHz – Channel 926.5MHz

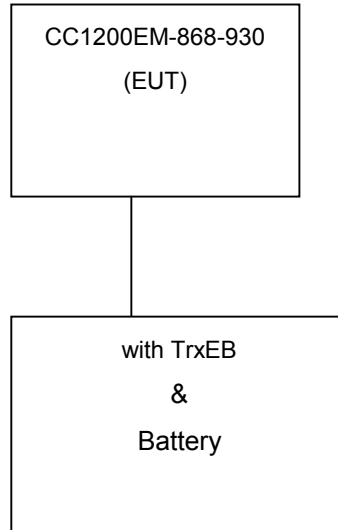
5 LIST OF TEST EQUIPMENT

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 Test Laboratory.

No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1.	ESU40	EMI Receiver	Rohde & Schwarz	LR1639	2010.06	2013.06
2.	3115	Antenna horn	EMCO	LR 1330	2010.08.05	2013.08.05
3.	6810.17A	Attenuator	Suhner	LR 1185	2011.10.18	2013.10.18
4.	87V	Multimeter, Digital	Fluke	LR1599	2012.12.15	2014.12.15
5.	8449B	Amplifier	Hewlett Packard	LR 1322	2012.09.20	2013.09.20
6.	HFH2-Z2	Antenna loop	Rohde and Schwarz	LR 285	2010.10.08	2013.10.08
7.	10855A	Amplifier	Hewlett Packard	LR 1445	2012.09.20	2013.09.20
8.	HL223	Antenna log.per	Rohde & Schwarz	LR 1261	2010.05.09	2013.05.09
9.	HK116	Antenna biconic	Rohde & Schwarz	LR 1260	2010.05.09	2013.05.09
10.	LNA6900	Amplifier, low noise	Teseq	LR1593	2011.11.24	2013.11.24
11.	VULB9163	Antenna Trilog	Schwarzbeck	LR1616	2011.08.29	2013.08.29
12.	6HC 1500-18000	HP filter	Trithlic	LR1612	Cal b4 use	
13.	FA210A1010003030	Microwave cable	Rosenberger	LR1566	Cal b4 use	

6 BLOCK DIAGRAM

6.1 System set up for radiated measurements



Test equipment: 1- 12

6.2 Test site radiated emission

