

A RADIO TEST REPORT
FOR
AXELL WIRELESS LIMITED
ON
MBF - 4317 - 4319

DOCUMENT NO. TRA-017640-47-00-B

HULL

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TRaC Wireless Test Report : TRA-017640-47-00-B

Applicant : Axell Wireless Limited

Apparatus : MBF- 43170-4319

Specification(s) : CFR47, Part 24E, Part 27

Purpose of Test : Certification

FCCID : NEOMBF4050

Authorised by :

: Radio Product Manager

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Section 1:**Introduction****1.1 General**

This report contains an assessment of an apparatus against Electromagnetic Compatibility Standards based upon tests carried out on samples submitted to the Laboratory.

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1.2 Tests Requested By

This testing in this report was requested by :

Axell Wireless Limited
Aerial House
Asheridge Road
Chesham
Buckinghamshire
HP5 1TU

1.3 Manufacturer

Axell Wireless Limited
Aerial House
Asheridge Road
Chesham
Buckinghamshire
HP5 1TU

1.4 Apparatus Assessed

The following apparatus was assessed between 14th April and 3rd December 2014

Fibre Optic (F/O) Remote Unit

The Multi-Band Fibre Optic system is composed of two building blocks: OMU (Optical Master unit) and MBF-40 series (Fibre Distributed Antenna System) Remote Unit. This is an indoor solution for single or multi operator use.

Technical specifications			
Frequency Range	Uplink	Downlink	CFR 47 Rule Part
1900 MHz (PCS)	1850 - 1910 MHz	1930 - 1990 MHz	24, Subpart E
1700 MHz (AWS)	1710 - 1755 MHz	2110 - 2155 MHz	27, Subpart A

1.5 Test Result Summary

Full details of test results are contained within Appendix A. The following table summarises the results of the assessment.

The statements relating to compliance with the standards below apply ONLY as qualified in the notes and deviations stated in sections 1.6 to 1.7 of this test report.

Full details of test results are contained within Appendix A. The following table summarises the results of the assessment.

Test Type	FCC Part 2	CFR 47 Part 24 Subpart E	CFR 47 Part 27 Subpart A	Appendix in Report
RF Power Output	2.1046	24.232(a)	27.50 (a)	A1 & B1
Intermodulation Spurious Emissions	2.1051	24.238(a)	27.53(c) & (g)	A2 & B2
Occupied Bandwidth & Modulation	2.1049 KDB 935210	N/A	N/A	A3 & B3
Spurious Emissions at Antenna Terminals Less than 1 MHz	2.1051	24.238(a)	27.53(c) & (g)	A4 & B4
Spurious Emissions at Antenna Terminals Greater than 1MHz	2.1051	24.238(a)	27.53(c) & (g)	A5 & B5
Field Strength of Spurious Emissions	2.1053	24.238(a)	27.53(c),(f) & (g)	A6 & B6
Passband Gain & 20dB bandwidth	KDB 935210	N/A	N/A	A7 & B7
Frequency Stability	2.1055	24.135	27.54	N/A(note 1)
Transient behaviour	2.1055	N/A	N/A	N/A(note 2)
Audio Frequency Response (a)	TIA EIA-603.3.2.6	N/A	N/A	N/A
Modulation Limiting	TIA EIA-603.3.2.6	N/A	N/A	N/A
Signal Booster Labelling Requirements	20.21(f)(1)(ii)	N/A	N/A	N/A

Notes:

1 The EUT does not contain modulation circuitry; therefore the test was not performed.

2 The EUT is not a keyed carrier system; therefore the test was not performed.

Abbreviations used in the above table:

CFR : Code of Federal Regulations
 REFE : Radiated Electric Field Emissions
 A Uplink Results Appendix

ANSI : American National Standards Institution
 PLCE : Power Line Conducted Emissions
 B Downlink Results Appendix

1.6 Equipment Test Conditions

Product class:	Uplink	Class A ☐ Class B ☒
	Downlink	Class A ☐ Class B ☒
Product Use:	Cellular / PCS Signal Booster	
Supply Voltages:	Vnom	110Vac
Note: Vnom voltages are as stated above unless otherwise shown on the test report page		
Equipment Category:	Single channel	☐
	Two channel	☐
	Multi-channel	☒
Channel spacing:	Wideband	Uplink
	Wideband	Downlink
Test Location	TRaC Global	
	Skelmersdale	☒
	Hull	☐
	Other	☐ Please Specify

1.7 Standard References

47 CFR 2	Code of Federal Regulations, Title 47, Part 2, "Frequency allocations and Radio Telemetry Matters; General Rules and Regulations"
47 CFR 24	Code of Federal Regulations, Title 47, Part 24," Personal Communications Services"
47 CFR 27	Code of Federal Regulations, Title 47, Part 27," Miscellaneous Wireless Communications Services"
47 CFR 15	Code of Federal Regulations, Title 47, Part 15,"Radio Frequency Devices" Subpart B, "Unintentional Radiators"
TIA EIA-603-D	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
KDB 935210 D01	Booster Definitions v02
KDB 935210 D02	Certification Requirements v02r01
KDB 935210 D03	Signal Booster Measurements v02r01

1.8 Notes Relating To Assessment

With regard to this assessment, the following points should be noted:

The results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

The apparatus was set up and exercised using the configurations, modes of operation and arrangements defined in this report only.

Particular operating modes, apparatus monitoring methods and performance criteria required by the standards tested to have been performed except where identified in Section 1.7 of this test report (Deviations from Test Standards).

For emissions testing, throughout this test report, "Pass" indicates that the results for the sample as tested were below the specified limit (refer also to Section 2, Measurement Uncertainty).

Where relevant, the apparatus was only assessed using the monitoring methods and susceptibility criteria defined in this report.

All testing with the exception of testing at the Open Area Test Site was performed under the following environmental conditions:

Temperature	: 17 to 23 °C
Humidity	: 45 to 75 %
Barometric Pressure	: 86 to 106 kPa

All dates used in this report are in the format dd/mm/yy.

This assessment has been performed in accordance with the requirements of ISO/IEC 17025.

1.9 Deviations from Test Standards

There were no deviations from the standards tested to.

Section 2:

Measurement Uncertainty

2.1 Measurement Uncertainty Values

For the test data recorded the following measurement uncertainty was calculated:

Radio Testing – General Uncertainty Schedule

All statements of uncertainty are expanded standard uncertainty using a coverage factor of 1.96 to give a 95% confidence where no required test level exists.

[1] Adjacent Channel Power

Uncertainty in test result = **1.86dB**

[2] Carrier Power

Uncertainty in test result (Power Meter) = **1.08dB**

Uncertainty in test result (Spectrum Analyser) = **2.48dB**

[3] Effective Radiated Power

Uncertainty in test result = **4.71dB**

[4] Spurious Emissions

Uncertainty in test result = **4.75dB**

[5] Maximum frequency error

Uncertainty in test result (Frequency Counter) = **0.113ppm**

Uncertainty in test result (Spectrum Analyser) = **0.265ppm**

[6] Radiated Emissions, field strength OATS 14kHz-18GHz Electric Field

Uncertainty in test result (14kHz – 30MHz) = **4.8dB**,

Uncertainty in test result (30MHz – 1GHz) = **4.6dB**,

Uncertainty in test result (1GHz – 18GHz) = **4.7dB**

[7] Frequency deviation

Uncertainty in test result = **3.2%**

[8] Magnetic Field Emissions

Uncertainty in test result = **2.3dB**

[9] Conducted Spurious

Uncertainty in test result – Up to 8.1GHz = **3.31dB**

Uncertainty in test result – 8.1GHz – 15.3GHz = **4.43dB**

Uncertainty in test result – 15.3GHz – 21GHz = **5.34dB**

Uncertainty in test result – Up to 26GHz = **3.14dB**

[10] Channel Bandwidth

Uncertainty in test result = **15.5%**

[11] Amplitude and Time Measurement – Oscilloscope

Uncertainty in overall test level = **2.1dB**,
Uncertainty in time measurement = **0.59%**,
Uncertainty in Amplitude measurement = **0.82%**

[12] Power Line Conduction

Uncertainty in test result = **3.4dB**

[13] Spectrum Mask Measurements

Uncertainty in test result = **2.59% (frequency)**
Uncertainty in test result = **1.32dB (amplitude)**

[14] Adjacent Sub Band Selectivity

Uncertainty in test result = **1.24dB**

[15] Receiver Blocking – Listen Mode, Radiated

Uncertainty in test result = **3.42dB**

[16] Receiver Blocking – Talk Mode, Radiated

Uncertainty in test result = **3.36dB**

[17] Receiver Blocking – Talk Mode, Conducted

Uncertainty in test result = **1.24dB**

[18] Receiver Threshold

Uncertainty in test result = **3.23dB**

[19] Transmission Time Measurement

Uncertainty in test result = **7.98%**

Section 3:

Modifications

3.1 Modifications Performed During Assessment

No modifications were performed during the assessment

Appendix A:**Uplink Formal Emission Test Results**

Abbreviations used in the tables in this appendix:

Spec	: Specification	ALSR	: Absorber Lined Screened Room
Mod	: Modification	OATS	: Open Area Test Site
		ATS	: Alternative Test Site
EUT	: Equipment Under Test		
SE	: Support Equipment	Ref	: Reference
		Freq	: Frequency
L	: Live Power Line		
N	: Neutral Power Line	MD	: Measurement Distance
E	: Earth Power Line	SD	: Spec Distance
Pk	: Peak Detector	Pol	: Polarisation
QP	: Quasi-Peak Detector	H	: Horizontal Polarisation
Av	: Average Detector	V	: Vertical Polarisation
CDN	: Coupling & decoupling network		

A1 RF Gain and Output Power

Test Details:	
Measurement standard	Part 2.1046, 24.232(a), 27.50(a),
EUT sample number	S01 & S02
Modification state	0
SE in test environment	None
SE isolated from EUT	None
Temperature	22°C
Humidity	47%
EUT set up	Refer to Appendix C

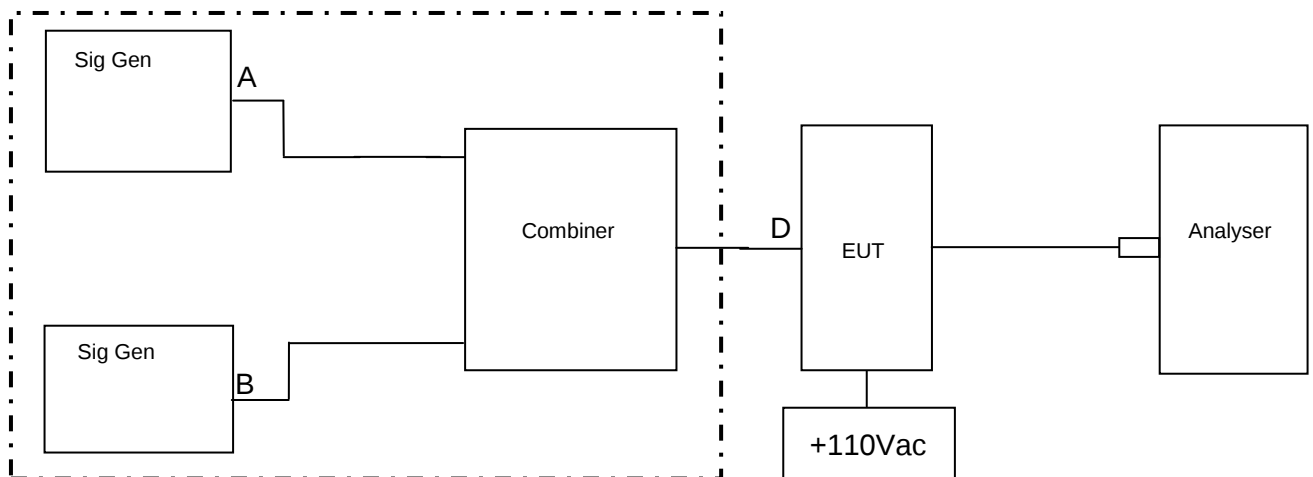
Frequency (MHz)	Signal Generator input level (dBm)	Input Cable Loss (dB)	Input Level (dBm)	Level at Spectrum Analyser (dBm)	Output Cable & Attenuator loss (dB)	Gain (dB)	Conducted Output Power (dBm)	Gain after 10dB input level increase (dB)
1700MHz								
1710.00	-60.80	0.60	-61.40	-31.06	0.60	30.94	-30.46	20.97
1732.50	-63.30	0.60	-63.90	-31.29	0.60	33.21	-30.69	23.25
1755.00	-63.10	0.60	-63.70	-31.17	0.60	33.13	-30.57	23.21
1800MHz								
1850.00	-52.70	0.8	-53.50	-31.46	0.8	22.84	-30.66	12.90
1882.50	-53.50	0.80	-54.30	-31.36	0.80	23.74	-30.56	13.82
1915.00	-49.60	0.80	-50.40	-31.32	0.80	19.88	-30.52	9.92

Notes:

1. The signal generator input was increased by 10dBs and the level of the output signal re measured.
2. As per Annex .3 Policies + Procedures (k) of KDB 935210 D02 Signal Boosters Certification v02 the EUT was tested at compression and 10dB into compression to show AGC operation

A2 Amplifier Intermodulation Spurious Emissions

Test Details:	
Measurement standard	Part 2.1053, 22.917(a), 24.238(a), 27.53(c) & (g)
EUT sample number	S01 & S02
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C



2 Signals at	Frequency (MHz)	Level (dBm)	Limit (dBm)
1700 MHz			
No Emissions Within 10 dB of the limit			-13
1800 MHz			
No Emissions Within 10 dB of the limit			-13

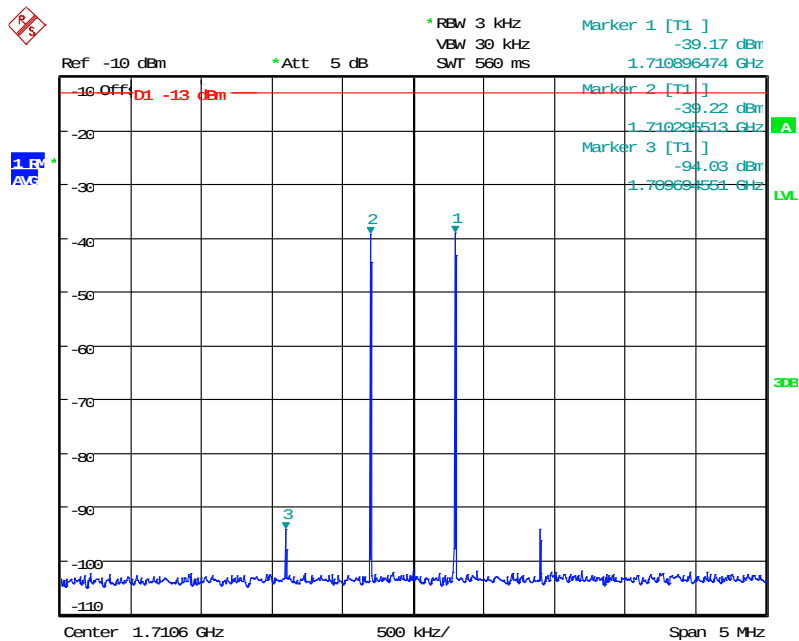
Sweep data is shown on the next page:

Results

The EUT was found to comply with the limits

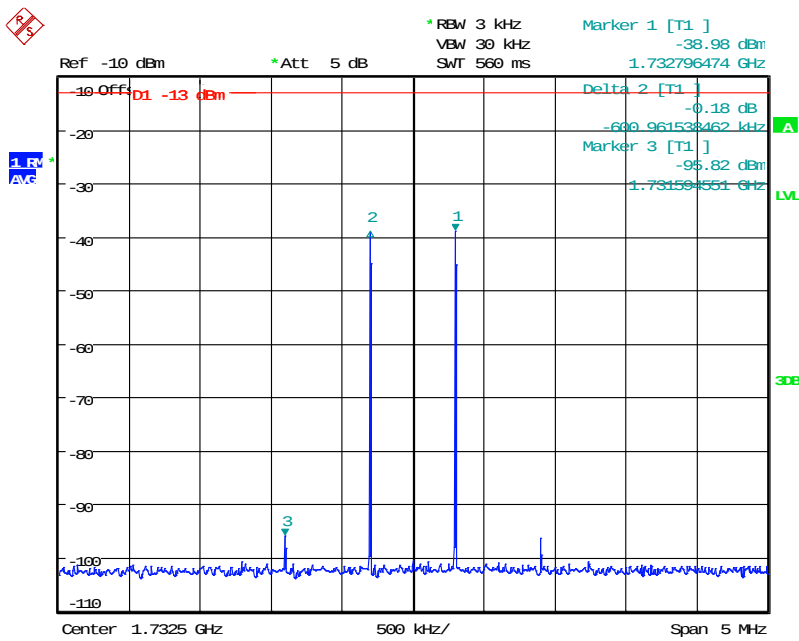
See plots below

1700 MHz Intermodulation close Views



Date: 18.SEP.2014 16:51:02

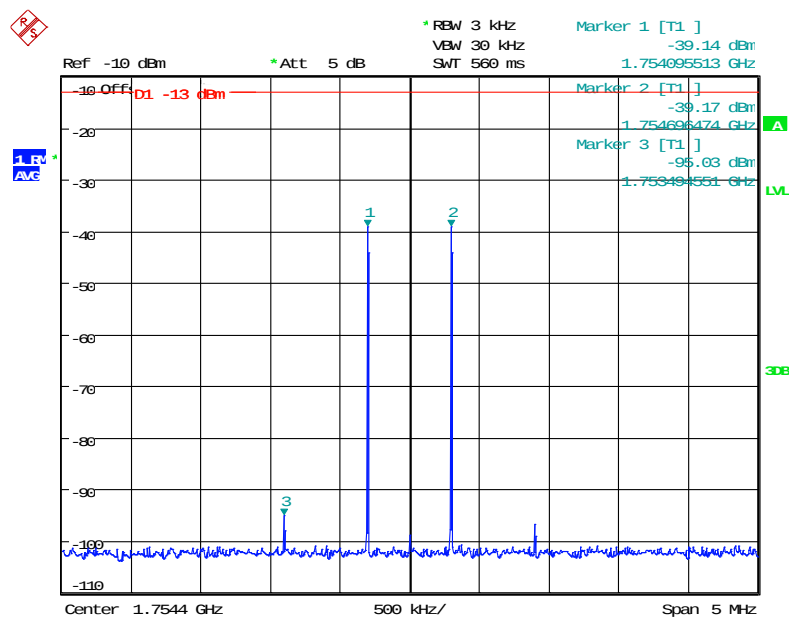
2 Signals at bottom end of band



Date: 18.SEP.2014 16:47:45

2 Signals at Middle of the band

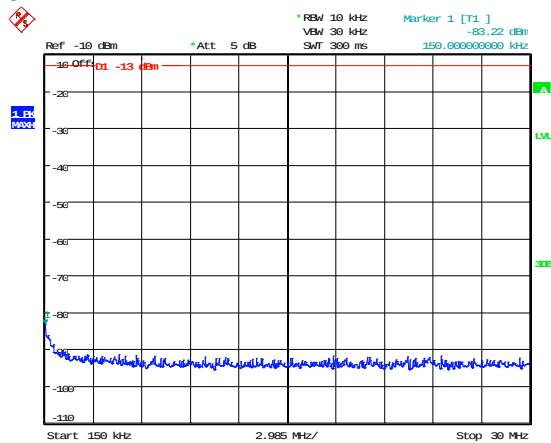
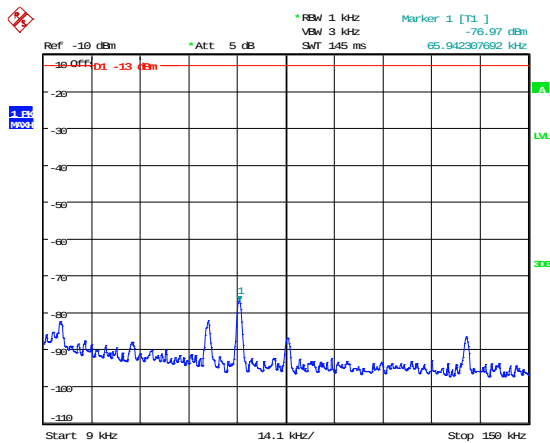
1700 MHz Intermodulation close Views



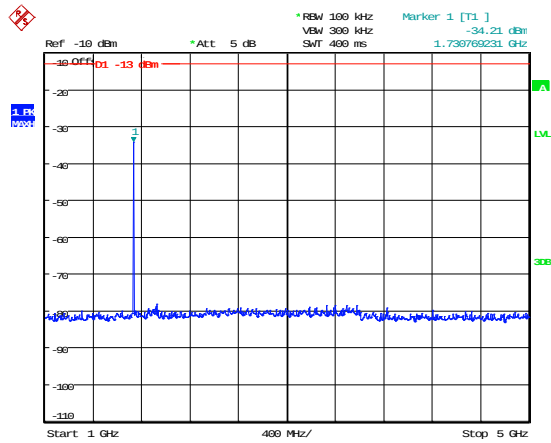
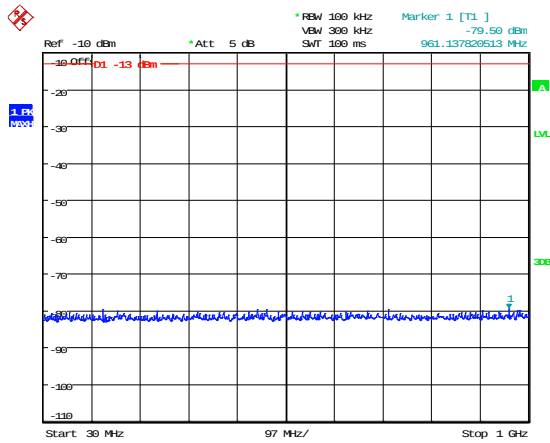
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2 Signals at top of the band

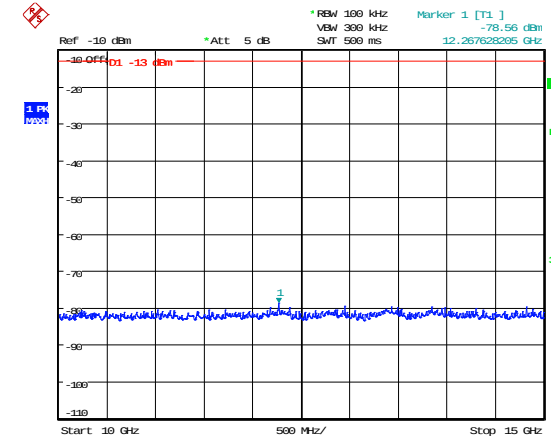
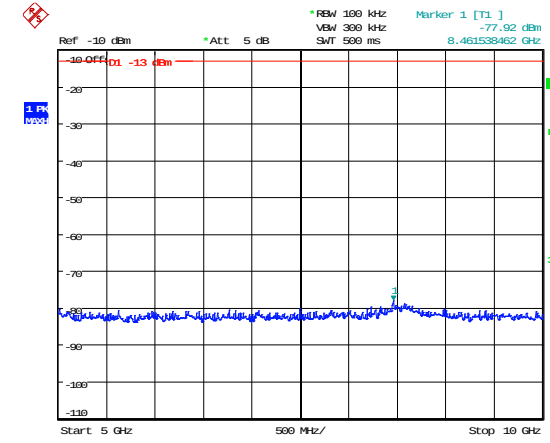
1700 MHz



9 – 150kHz

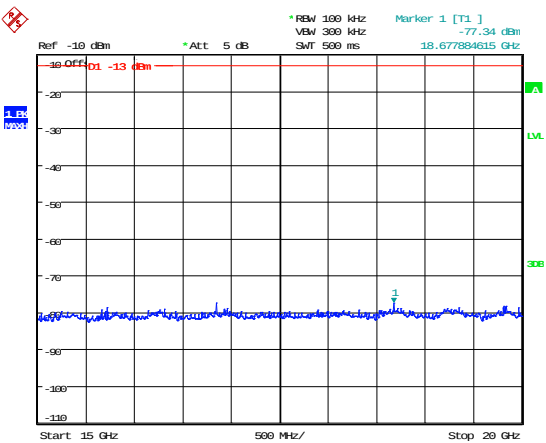


30MHz – 1GHz



5GHz – 10GHz

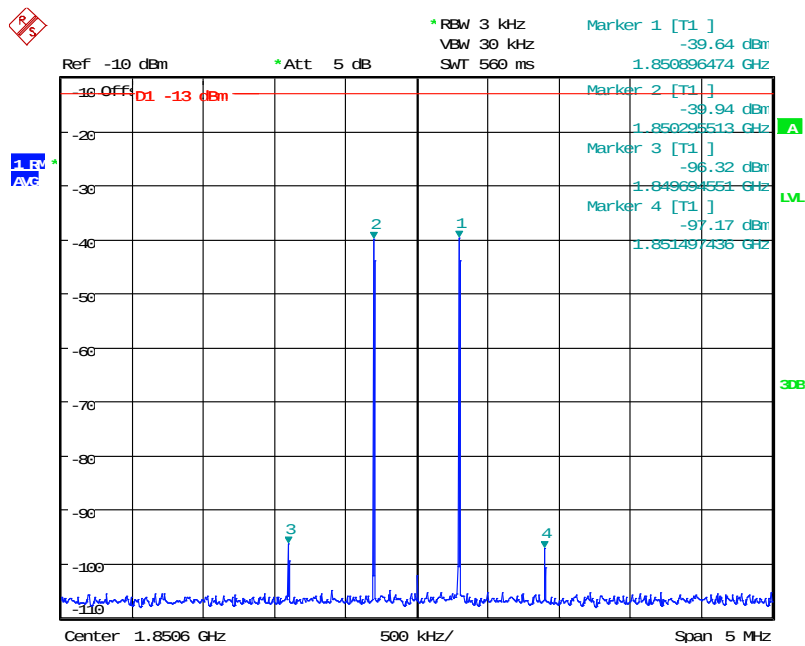
10GHz – 15GHz



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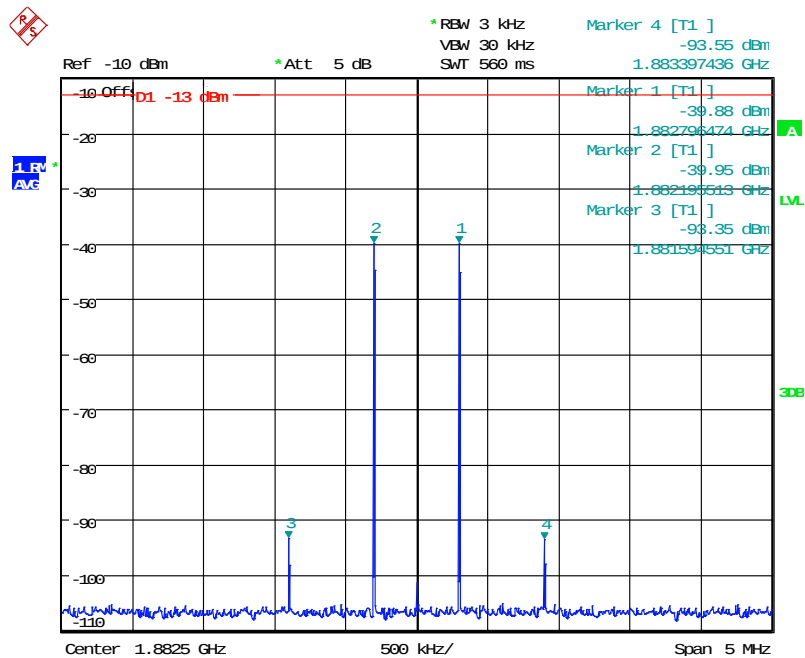
15GHz – 20GHz

1800 MHz Intermodulation close Views



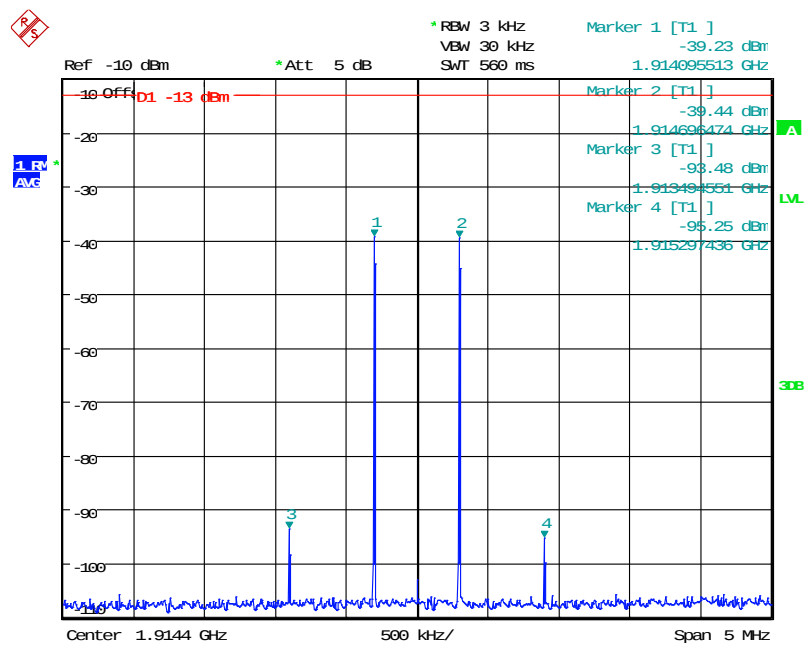
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2 Signals at bottom end of band



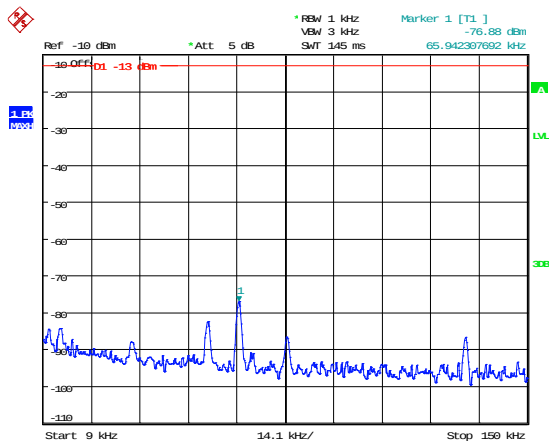
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2 Signals at bottom end of band

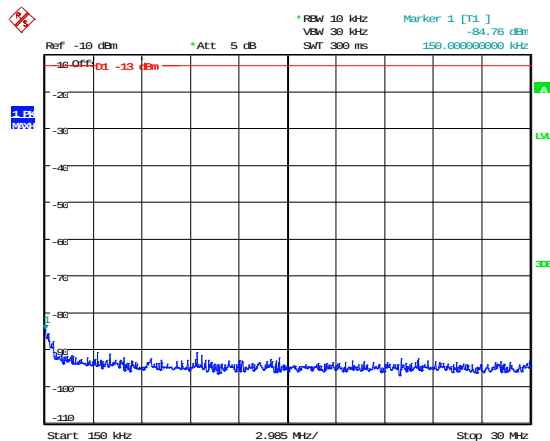


Date: 18.SEP.2014 16:30:47

2 Signals at top end of band

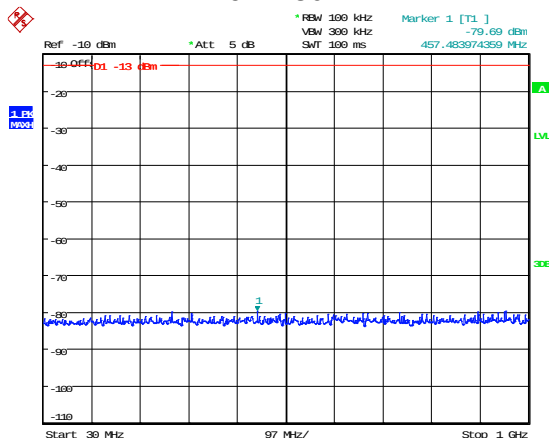


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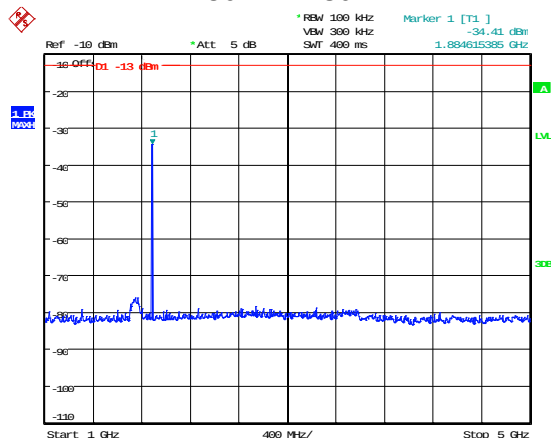
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9 – 150kHz



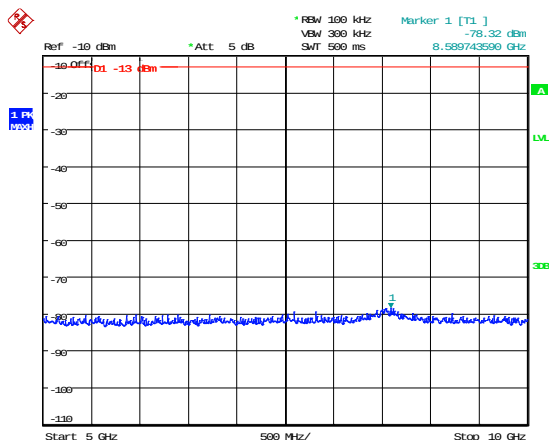
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150kHz – 30MHz



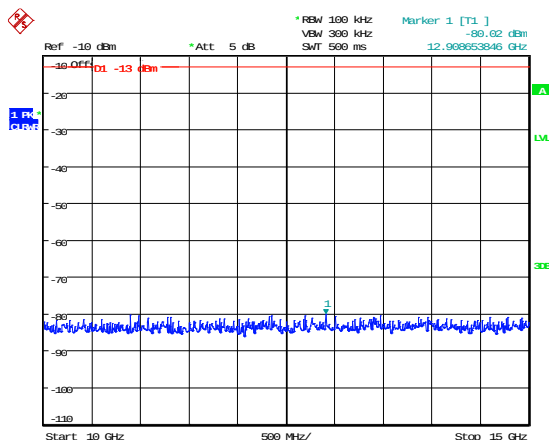
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30MHz -1GHz



Date: 18.SEP.2014 16:35:43

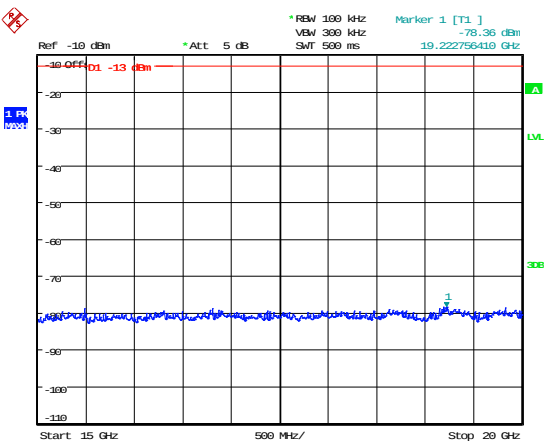
1GHz – 5GHz



Date: 18.SEP.2014 16:39:04

5GHz – 10GHz

10GHz-15GHz



Date: 18.SEP.2014 16:41:03

15GHz-20GHz

A3 Amplifier Modulated Channel Test

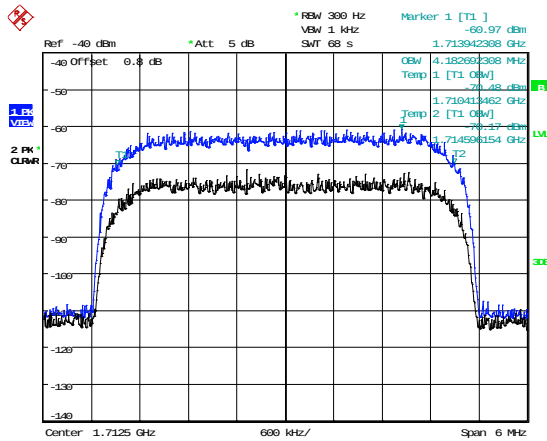
Test Details:	
Measurement standard	D.3 Policies + Procedures (j) of KDB 935210 D02 Signal Boosters Certification v02
EUT sample number	S01 & S02
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Frequency Of Operation Channel	Modulation Type				
	CDMA	GSM	WCDMA	LTE 1.4 MHz	LTE 20.0 MHz
1710.0 MHz	N/A	N/A	4.182MHz	1.089MHz	17.875MHz
1732.5 MHz	N/A	N/A	4.173MHz	1.086MHz	17.910MHz
1755.0 MHz	N/A	N/A	4.173MHz	1.086MHz	17.910MHz
1850.0 MHz	1.269MHz	248.397kHz	4.173MHz	1.086MHz	17.875MHz
1882.5 MHz	1.272MHz	248.397kHz	4.182MHz	1.089MHz	17.875MHz
1915.0 MHz	1.275MHz	248.397kHz	4.173MHz	1.089MHz	17.875MHz

Waveforms applied to selected bands as requested.

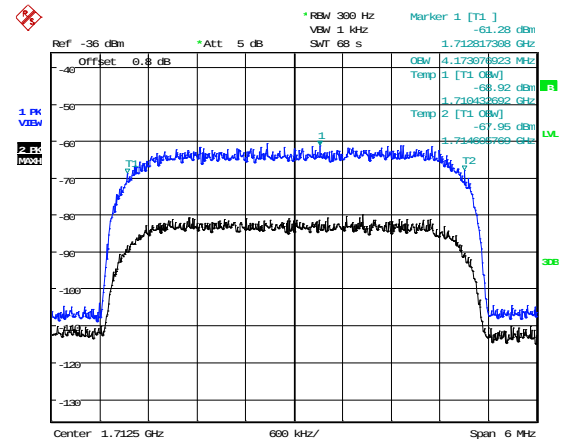
As per Annex .3 Policies + Procedures (k) of KDB 935210 D02 Signal Boosters Certification v02 the EUT was tested at compression and 10dB into compression to show AGC operation, worst case results taken.

WCDMA



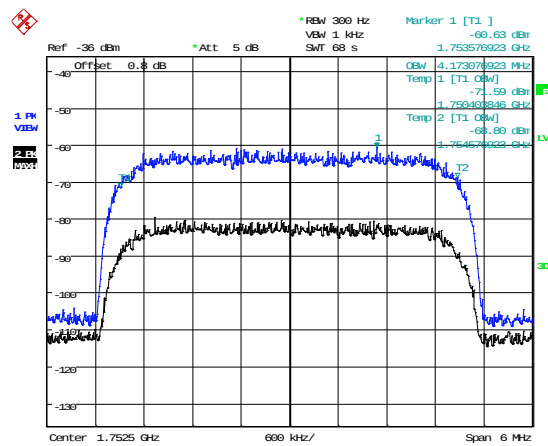
Date: 23.SEP.2014 14:22:23

1710MHz



Date: 23.SEP.2014 14:31:52

1732.5MHz

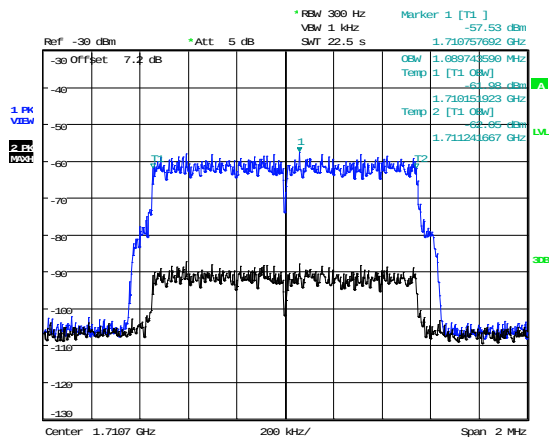


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1755MHz

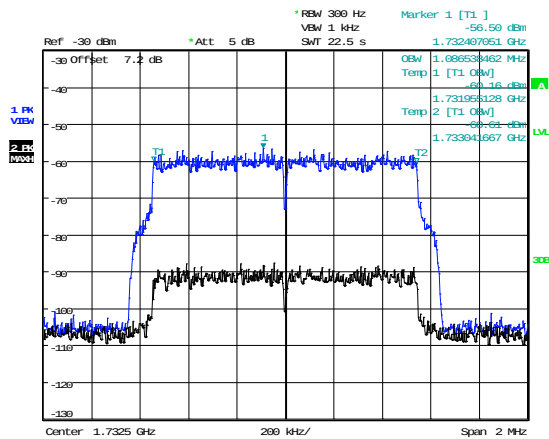
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

1.4MHz LTE Modulation



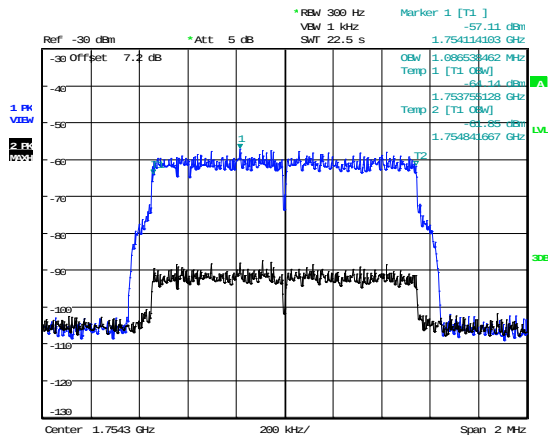
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1710MHz



Date: 3.DEC.2014 11:57:39

1732.5MHz

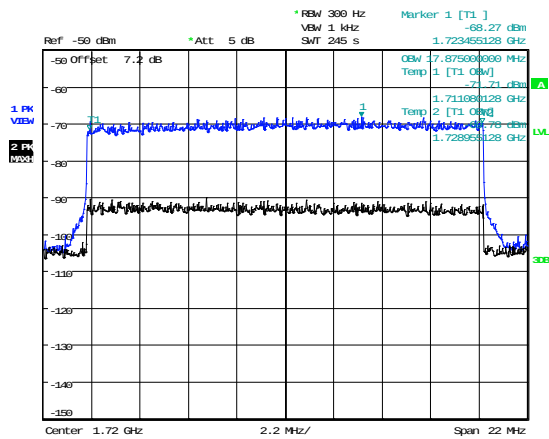


Date: 3.DEC.2014 12:01:48

1755MHz

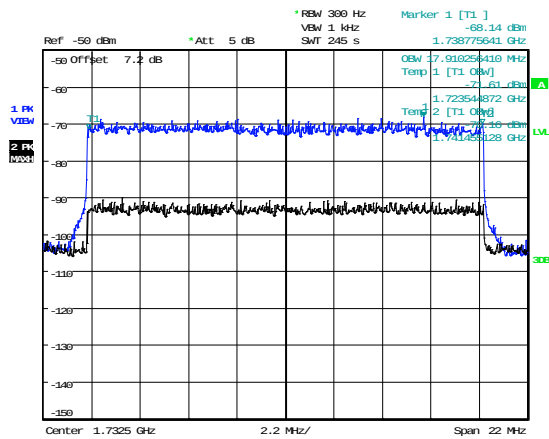
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

LTE 20MHz Modulation



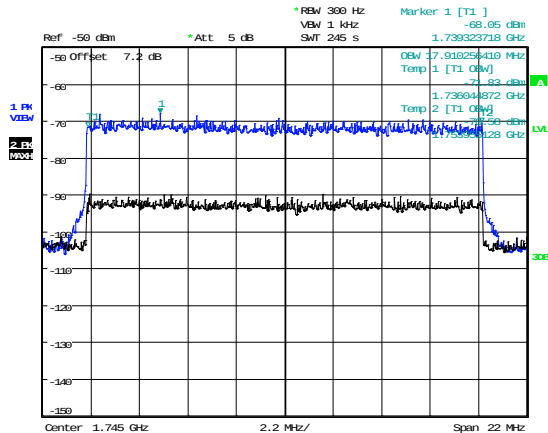
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1710MHz



Date: 3.DEC.2014 12:27:33

1732.5MHz

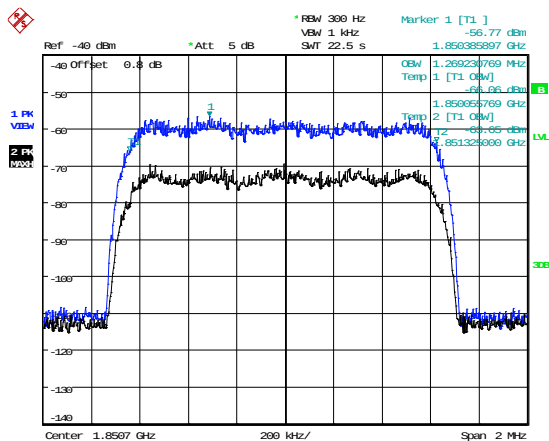


Date: 3.DEC.2014 12:17:28

1755MHz

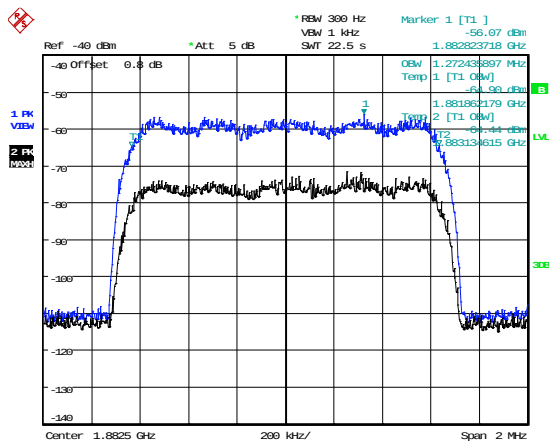
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

CDMA Modulation



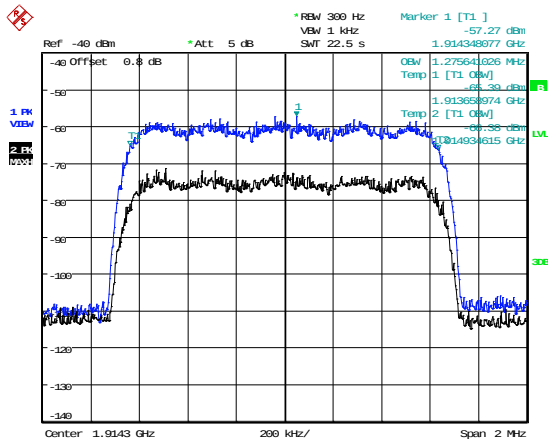
Date: 23.SEP.2014 13:08:03

1850MHz



Date: 23.SEP.2014 13:13:16

1882.5 MHz

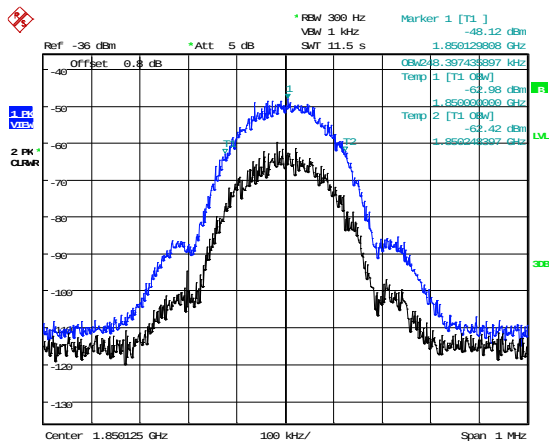


Date: 23.SEP.2014 14:07:57

1915 MHz

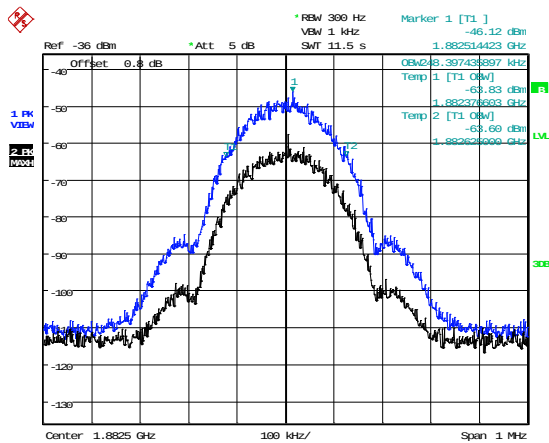
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

GSM Modulation



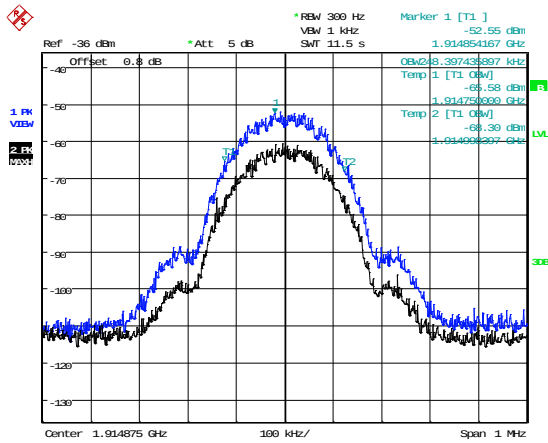
Date: 24.SEP.2014 09:59:46

1850MHz



Date: 24.SEP.2014 10:03:57

1882.5MHz

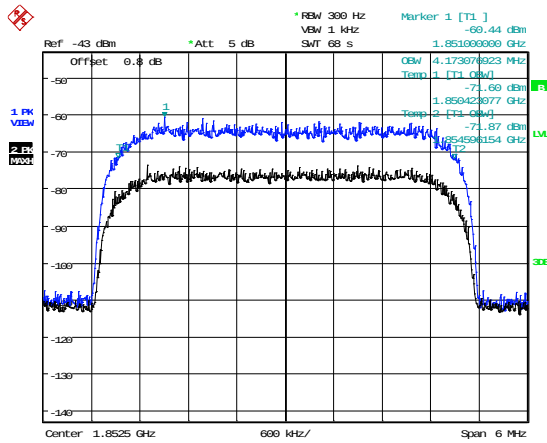


Date: 24.SEP.2014 10:07:43

1915MHz

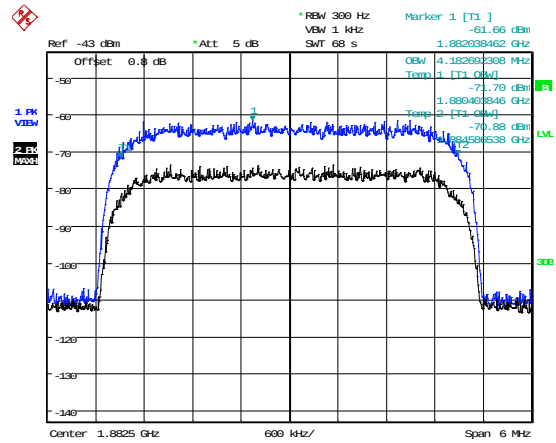
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

WCDMA Modulation



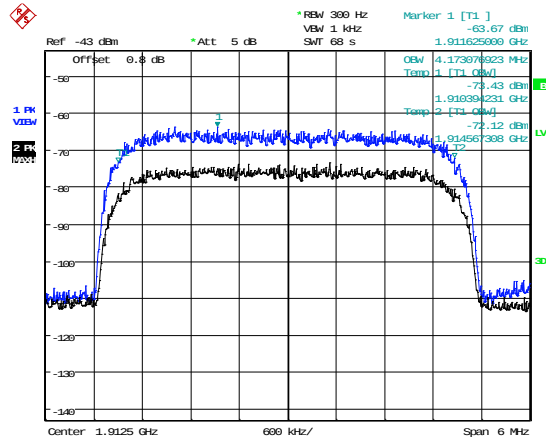
Date: 23.SEP.2014 14:59:47

1850 MHz



Date: 23.SEP.2014 15:14:41

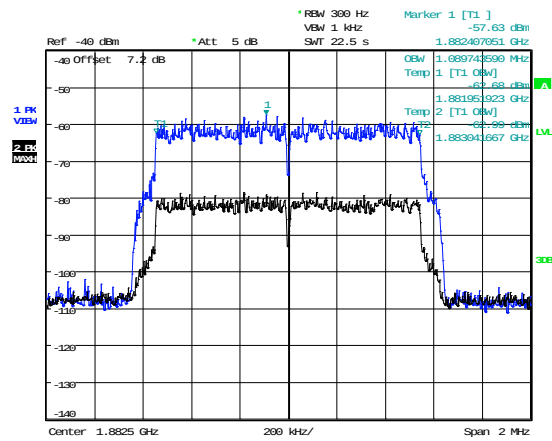
1882.5 MHz



Date: 23.SEP.2014 15:25:38

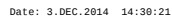
1915.0 MHz

The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

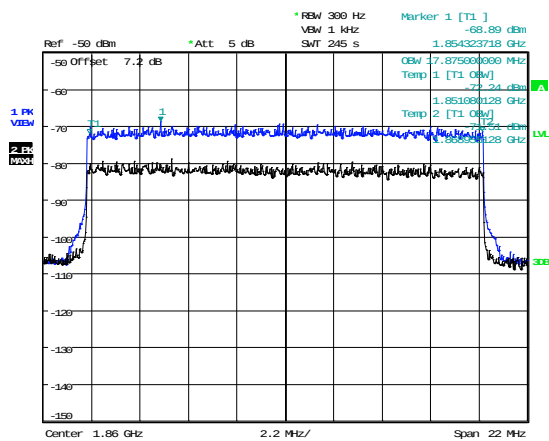


Date: 3.DEC.2014 14:37:09

1882.5 MHz

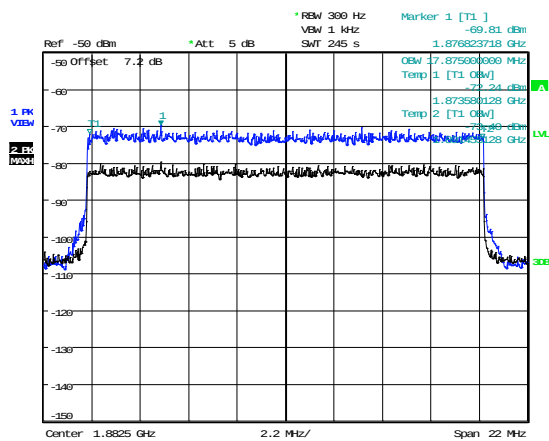


20 MHz LTE Modulation



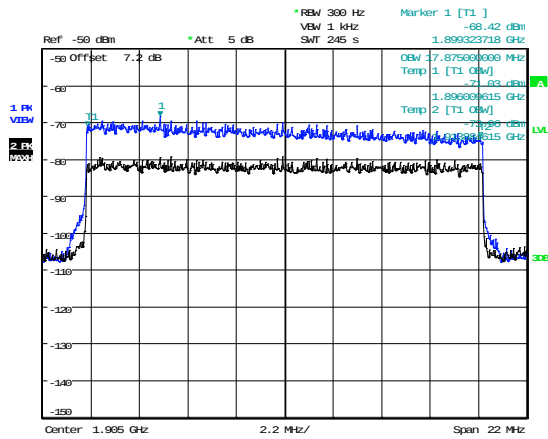
Date: 3.DEC.2014 14:12:02

1850MHz



Date: 3.DEC.2014 12:59:53

1882.5MHz



Date: 3.DEC.2014 14:22:13

1915MHz

The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

A4 Spurious Emissions at Antenna Terminals Less than 1MHz

Test Details:	
Measurement standard	Part 2.1053, 24.238(a), 27.53(c) & (g),
EUT sample number	S01 & S02
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Note: The spurious emissions at the antenna terminals less than 1MHz, in the uplink direction was not performed, as the output power was below the -13dBm spurious limit (-30.46dBm).

A5 Spurious Emissions at Antenna Terminals Greater than 1 MHz

Test Details:	
Measurement standard	Part 2.1053, 24.238(a), 27.53(c) & (g),
EUT sample number	S01 & S02
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Frequency (MHz)	Frequency Range (MHz)	Freq. of Emission (MHz)	Measured Level (dBm)	Attenuator & Cable Losses (dB)	Spurious Emission Level (dBm)	Limit (dBm)
1700 MHz						
1710.000	No Significant Emissions Within 20 dB of limit					-13
1732.500						-13
1755.000						-13
1800 MHz						
1850.000	No Significant Emissions Within 20 dB of limit					-13
1882.500						-13
1915.000						-13

Limit is determined by the outermost step of the emissions mask and is calculated as follows:

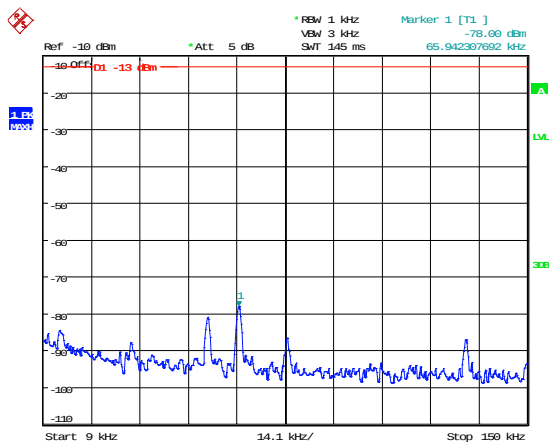
At least $43 + 10 \log P$ dB

$$(10\log P_{\text{watts}}) - (43 + 10\log (P_{\text{watts}} * 1000)) = \text{LIMIT} = -13 \text{ dBm}$$

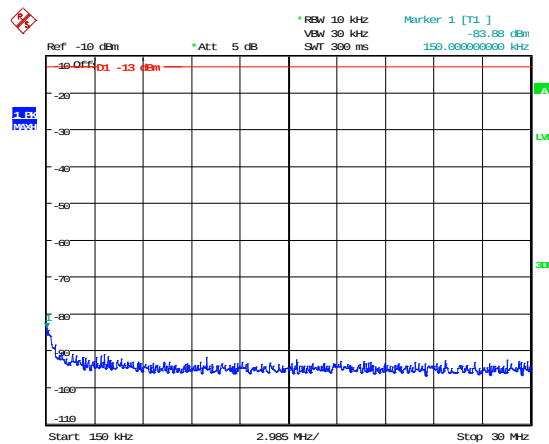
Result

The EUT was found to comply with the limits

Conducted spurious 1710MHz



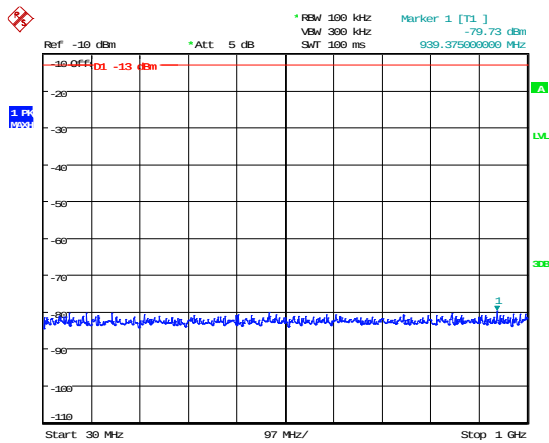
Date: 18.SEP.2014 17:21:05



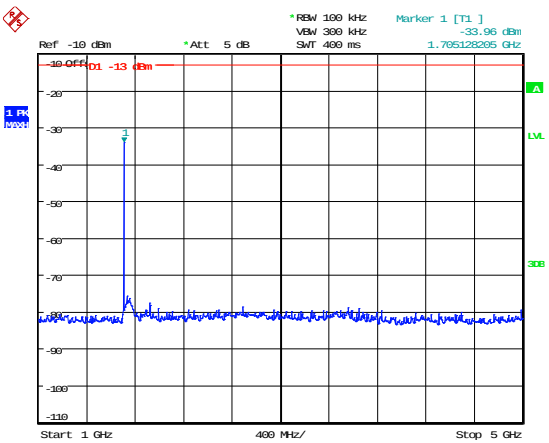
Date: 18.SEP.2014 17:21:33

9-150kHz

150kHz – 30MHz



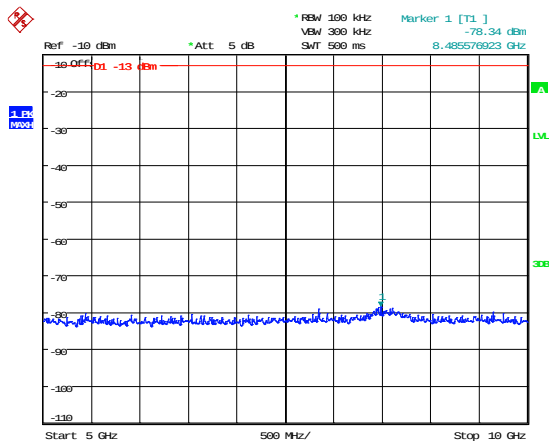
Date: 18.SEP.2014 17:21:44



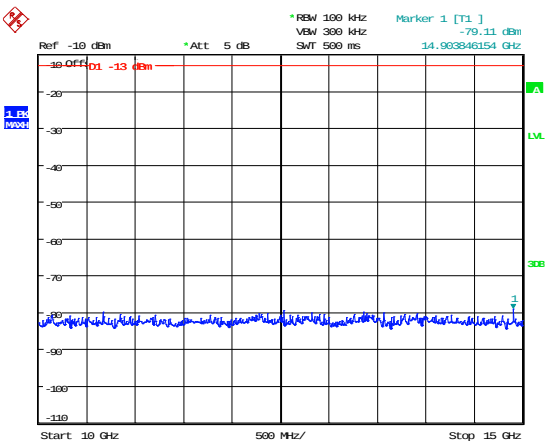
Date: 18.SEP.2014 17:21:57

30MHz – 1GHz

1GHz – 5GHz



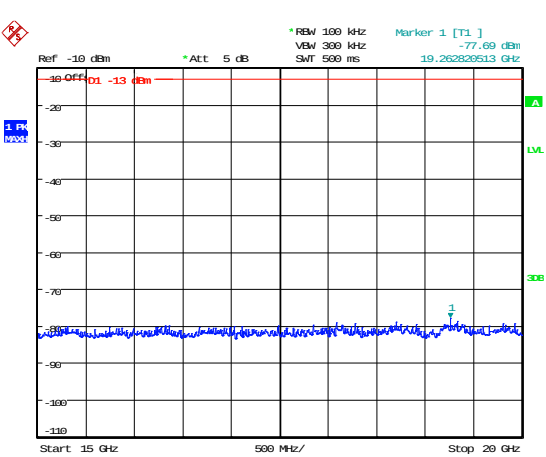
Date: 18.SEP.2014 17:22:08



Date: 18.SEP.2014 17:20:44

5GHz – 10GHz

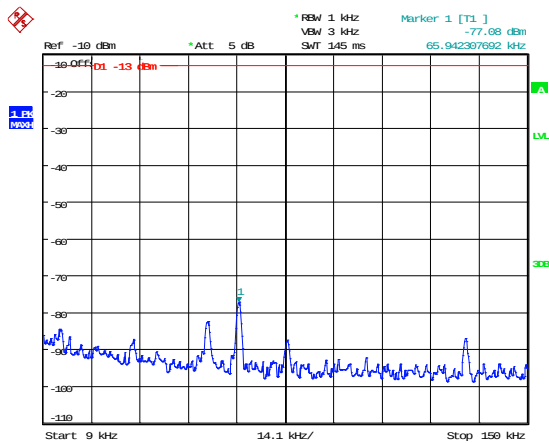
10GHz – 15GHz



Date: 18.SEP.2014 17:20:54

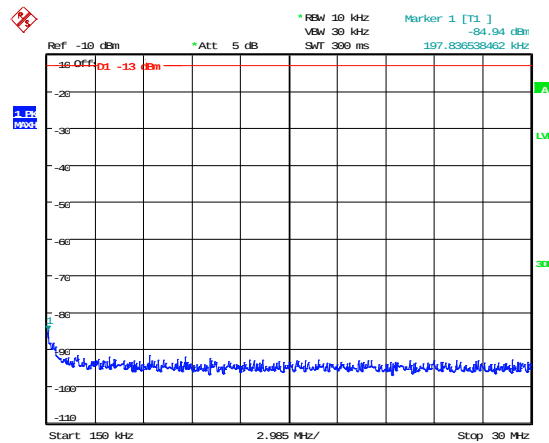
15GHz – 20GHz

Conducted spurious 1732.5MHz



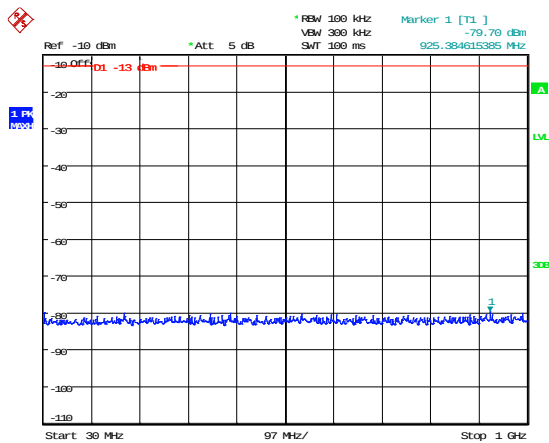
Date: 18.SEP.2014 17:18:50

9-150kHz



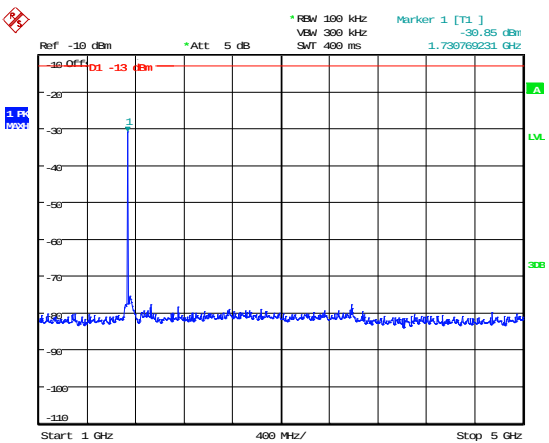
Date: 18.SEP.2014 17:19:08

150kHz- 30MHz



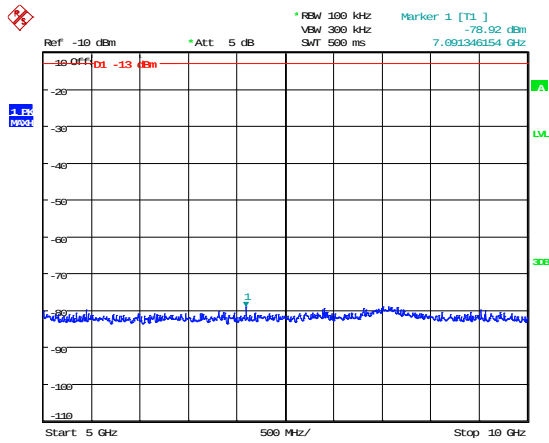
Date: 18.SEP.2014 17:19:24

30MHz – 1GHz



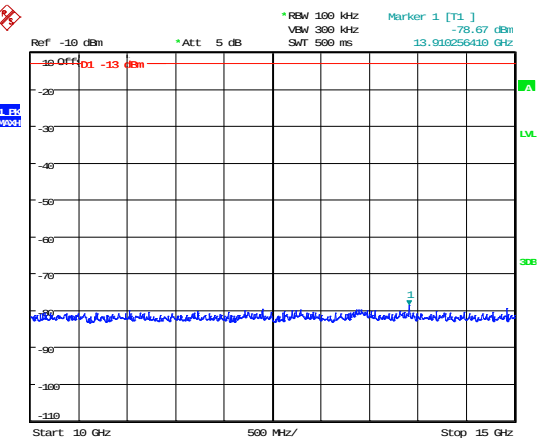
Date: 18.SEP.2014 17:19:34

1GHz – 5GHz



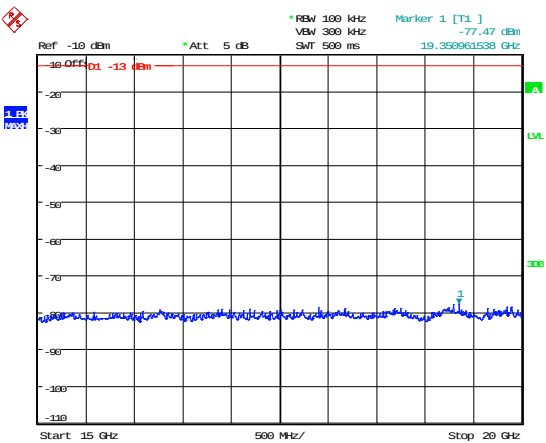
Date: 18.SEP.2014 17:19:47

5GHz – 10GHz



Date: 18.SEP.2014 17:19:58

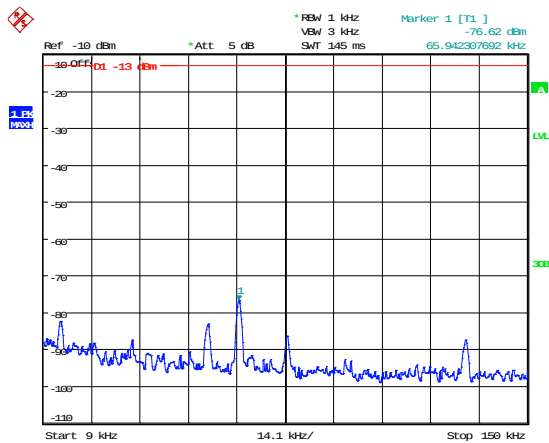
10GHz – 15GHz



Date: 18.SEP.2014 17:18:38

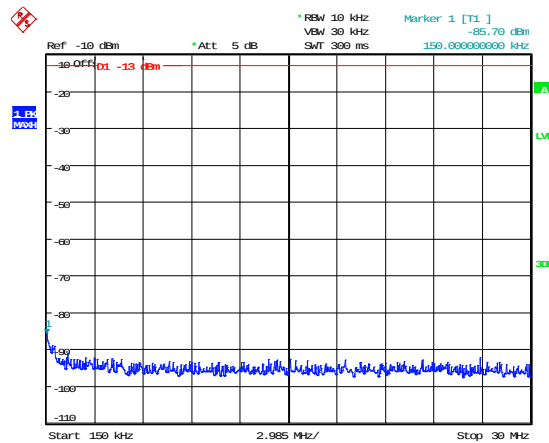
15GHz – 20GHz

Conducted spurious 1755MHz



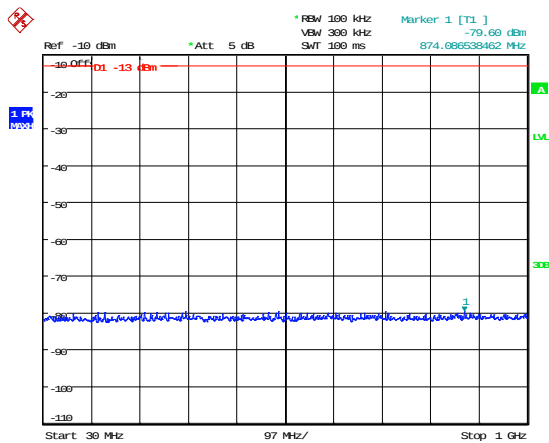
Date: 18.SEP.2014 17:12:23

9kHz – 150kHz



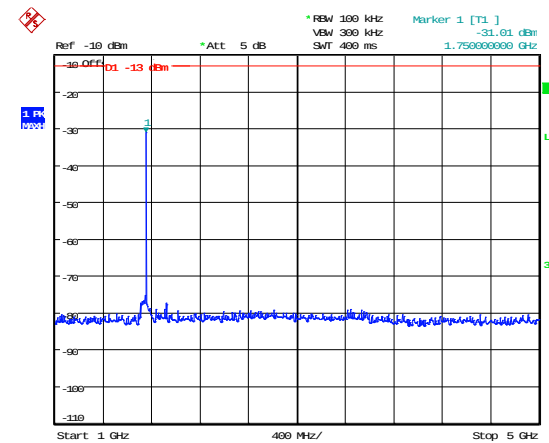
Date: 18.SEP.2014 17:12:40

150kHz – 30MHz



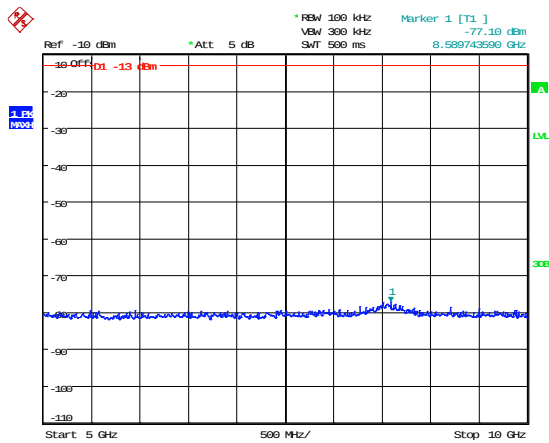
Date: 18.SEP.2014 17:12:11

30MHz – 1GHz



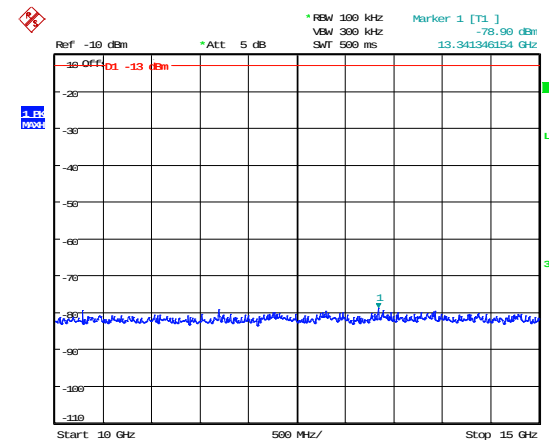
Date: 18.SEP.2014 17:12:51

1GHz – 5GHz



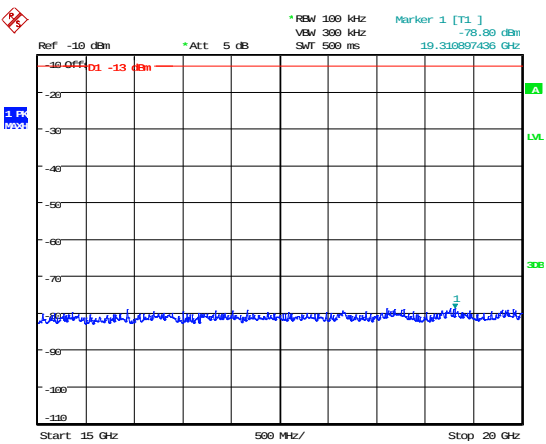
Date: 18.SEP.2014 17:15:34

5GHz-10GHz



Date: 18.SEP.2014 17:17:39

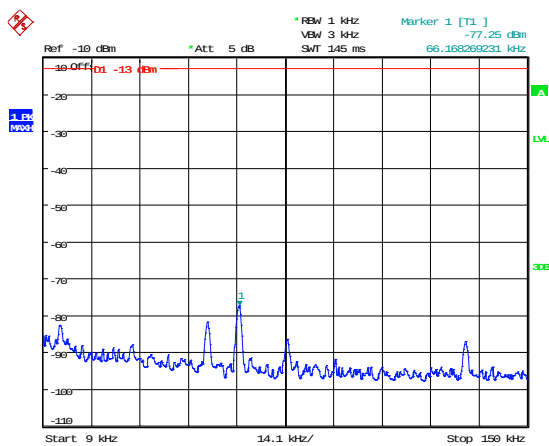
10GHz – 15GHz



Date: 18.SEP.2014 17:17:56

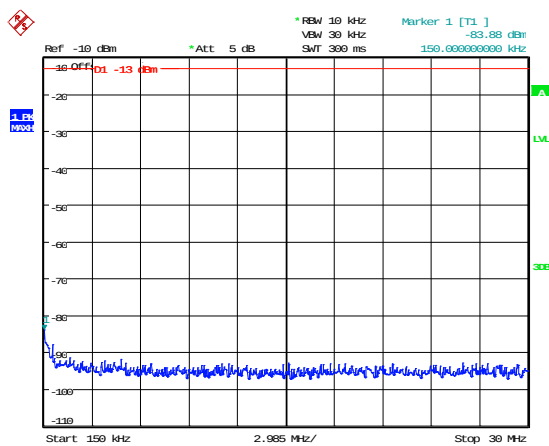
15GHz – 20GHz

Conducted spurious 1850MHz



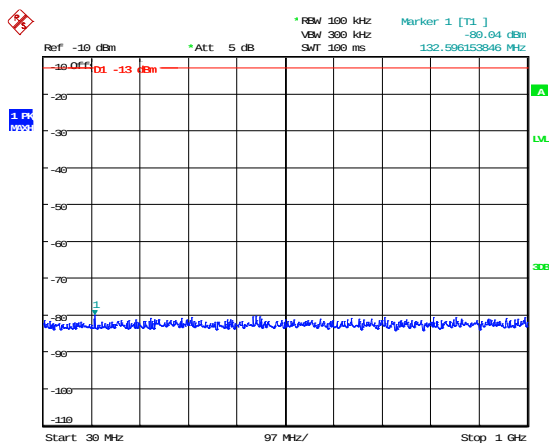
Date: 18.SEP.2014 17:28:27

9kHz – 150kHz



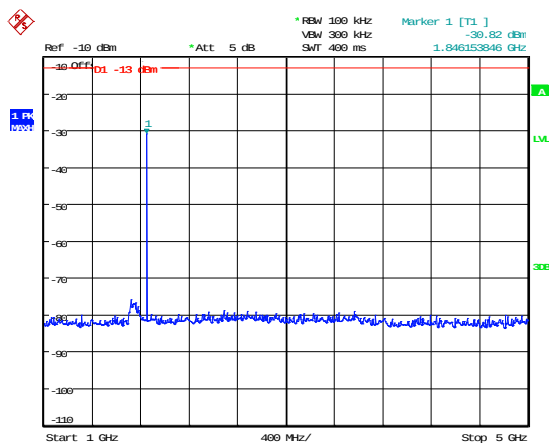
Date: 18.SEP.2014 17:28:42

150kHz – 30MHz



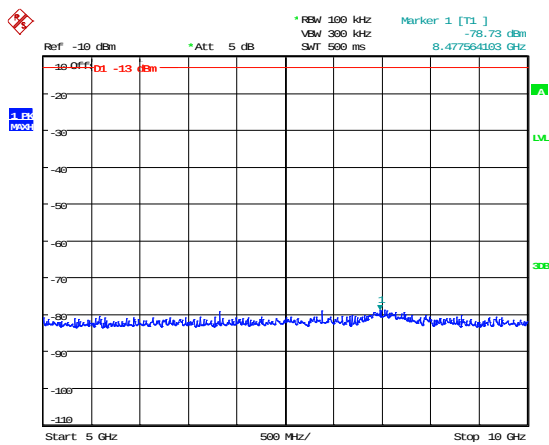
Date: 18.SEP.2014 17:27:21

30MHz – 1GHz



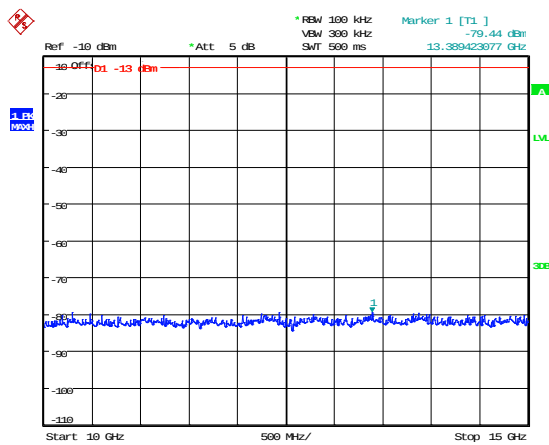
Date: 18.SEP.2014 17:27:33

1GHz – 5GHz



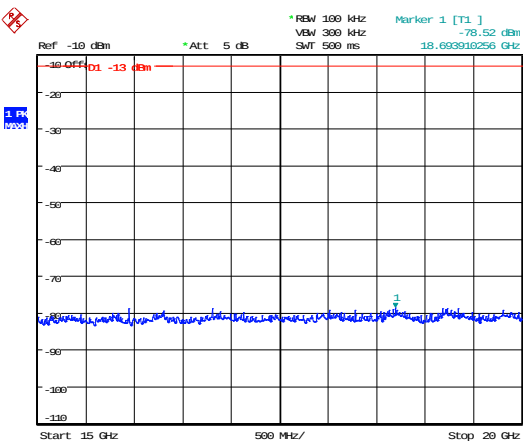
Date: 18.SEP.2014 17:27:43

5GHz – 10GHz



Date: 18.SEP.2014 17:27:57

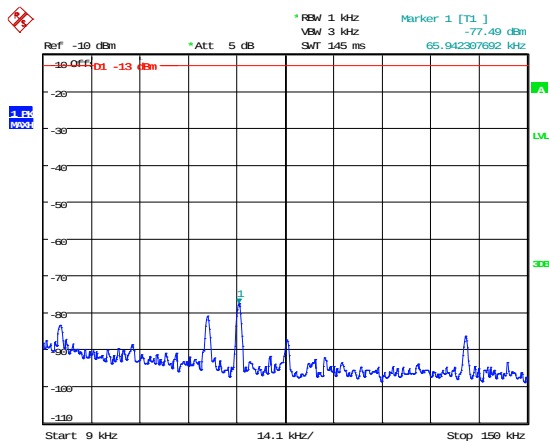
10GHz – 15GHz



Date: 18.SEP.2014 17:28:09

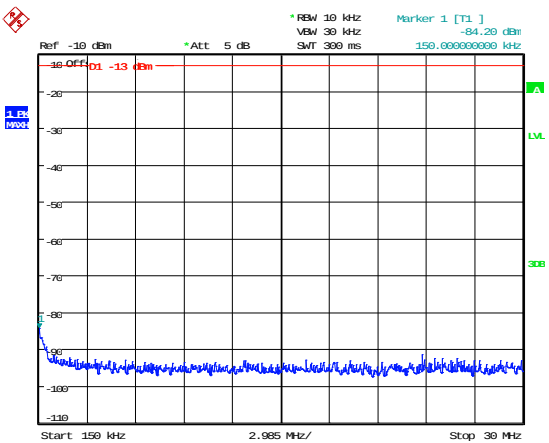
15GHz – 20GHz

Conducted spurious 1882.5MHz



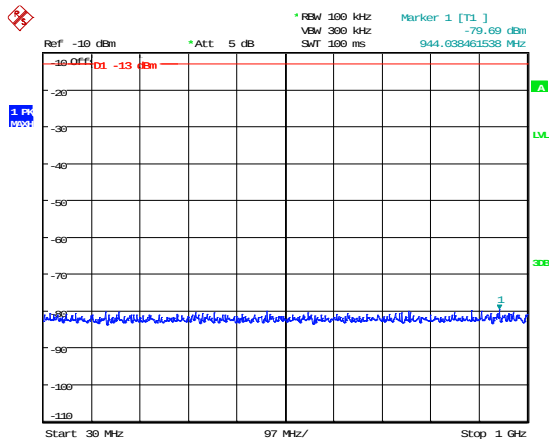
Date: 18.SEP.2014 17:26:12

9kHz – 150kHz



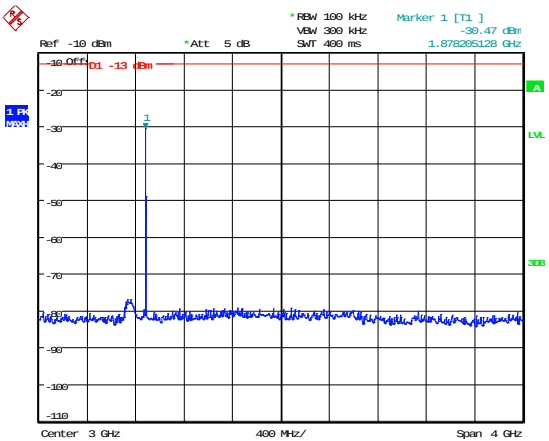
Date: 18.SEP.2014 17:26:29

150kHz – 30MHz



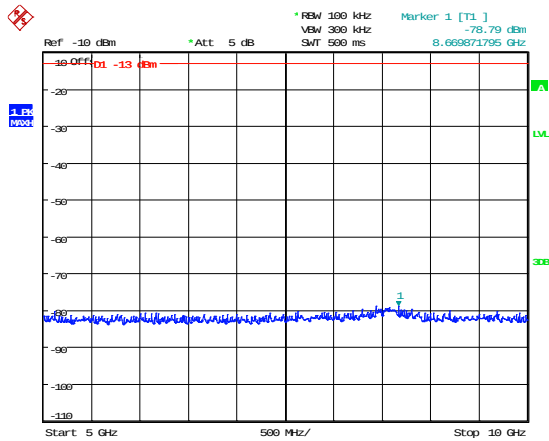
Date: 18.SEP.2014 17:26:42

30MHz – 1GHz



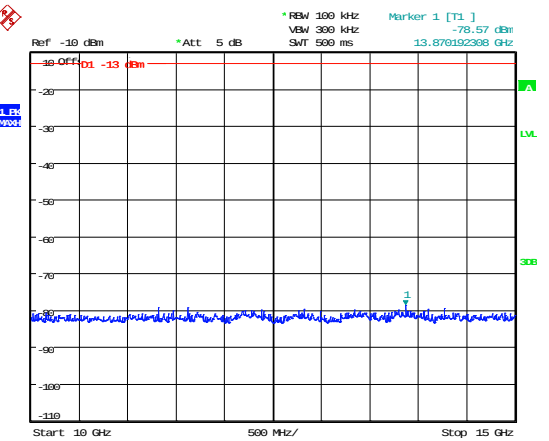
Date: 18.SEP.2014 17:25:27

1GHz – 5GHz



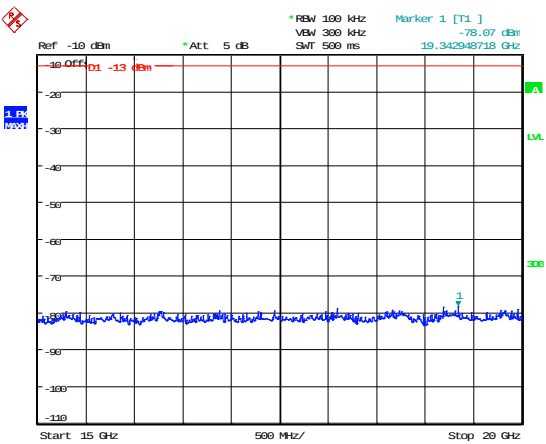
Date: 18.SEP.2014 17:25:39

5GHz - 10GHz



Date: 18.SEP.2014 17:25:50

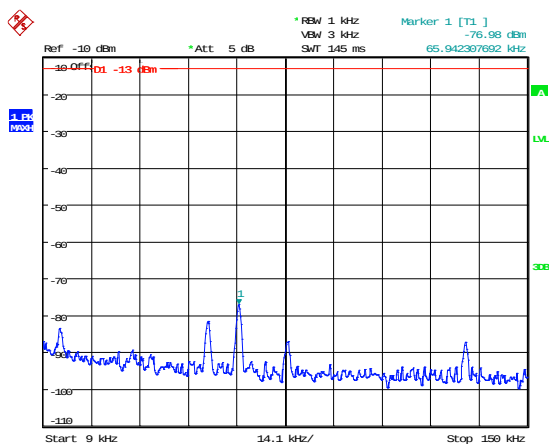
10GHz – 15GHz



Date: 18.SEP.2014 17:26:00

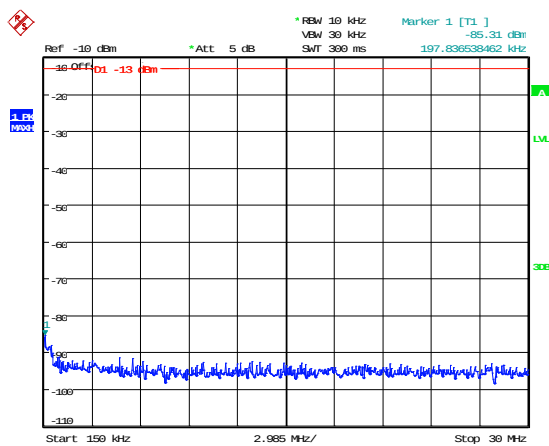
15GHz – 20GHz

Conducted spurious 1915MHz



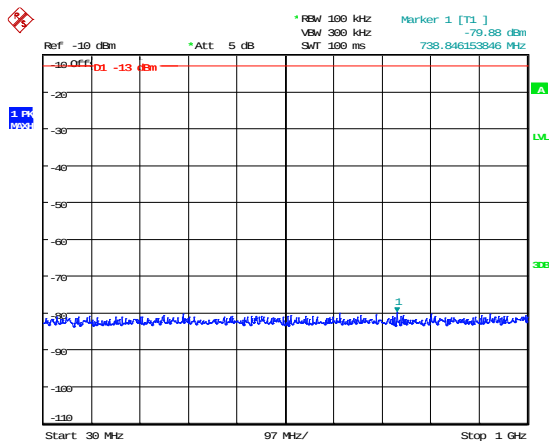
Date: 18.SEP.2014 17:23:41

9kHz – 150kHz



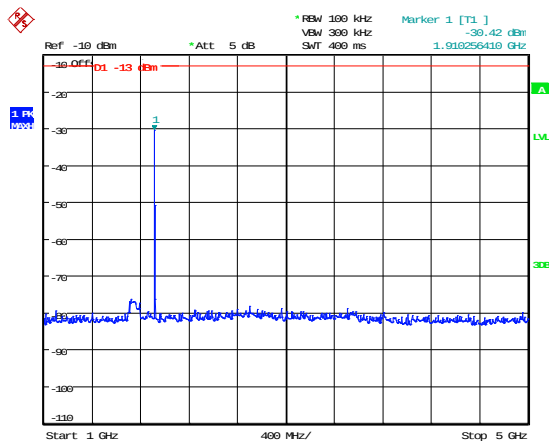
Date: 18.SEP.2014 17:23:54

150kHz – 30MHz



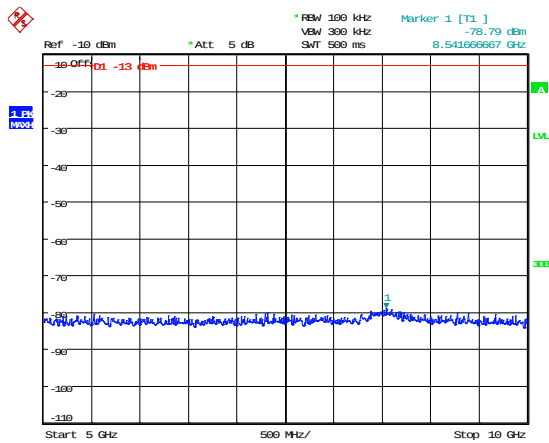
Date: 18.SEP.2014 17:24:07

30MHz – 1GHz



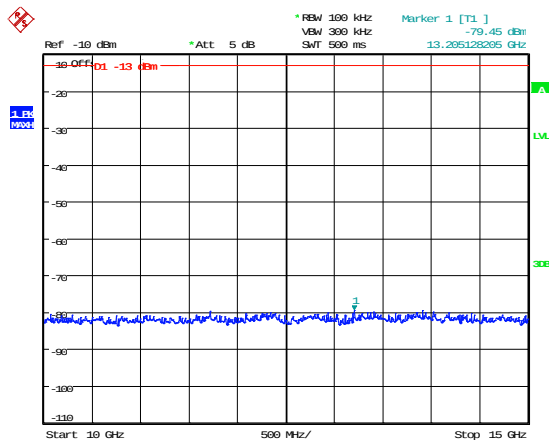
Date: 18.SEP.2014 17:24:27

1GHz – 5GHz



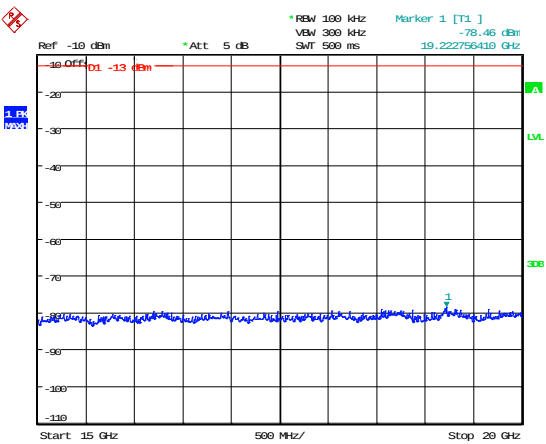
Date: 18.SEP.2014 17:23:03

5GHz – 10GHz



Date: 18.SEP.2014 17:23:15

10GHz – 15GHz



Date: 18.SEP.2014 17:23:29

15GHz – 20GHz

A6 Radiated Electric Field Emissions

Preliminary scans were performed using a peak detector with the RBW = 100kHz. The radiated electric field emission test applies to all spurious and harmonic emissions. The EUT was set to transmit as required.

The following test site was used for final measurements as specified by the standard tested to:

3m open area test site : ☐

3m alternative test site : ☒

The effect of the EUT set-up on the measurements is summarised in note (c) below.

Test Details:	
Measurement standard	Part 2.1053, 22.917(a), 24.238(a), 27.53(c) & (g)
Frequency range	30 MHz – 22 GHz
EUT sample number	S01 & S02
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs	Appendix F

Frequency (MHz)	Freq. of Emission (MHz)	ERP/EIRP (dBm)	Limit (dBm)
1700 MHz			
1710.000	No Significant Emissions Within		-13
1732.500			-13
1755.000			-13
1800MHz			
1710.000	No Significant Emissions Within		-13
1732.500			-13
1755.000			-13

Result

The EUT was found to comply with the limits

Notes:

1. Emissions Checked up to 10 times Fc.
2. The unit was mounted on a turntable and rotated through 360° and in 3 orthogonal planes to find the worst case emission.
3. For Frequencies below 1 GHz, RBW = 120 kHz, testing was performed with CISPR16 compliant test receiver with QP detector. Above 1 GHz tests were performed using a spectrum analyser using the following settings:

Peak Detector RBW = 1MHz; VBW = ≥RBW

4. Limit is determined as the outermost step of the emissions mask and is calculated as follows.

At least $43 + 10 \log P$ dB

$$(10 \log P_{\text{watts}}) - (43 + 10 \log (P_{\text{watts}} * 1000)) = \text{LIMIT} = -13 \text{ dBm}$$

The upper and lower frequency of the measurement range was decided according to 47 CFR Part 2.1057.

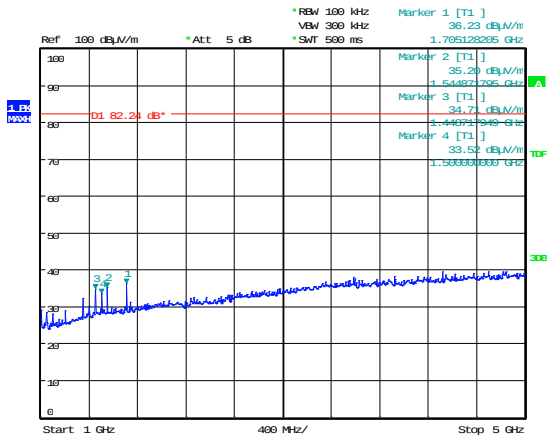
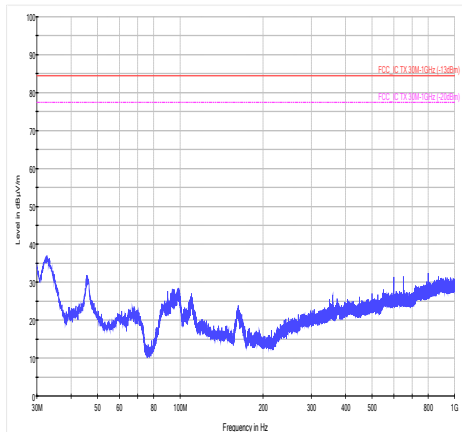
- (a) Where results have been measured at one distance, and a signal level displayed at another, the results have been extrapolated using the following formula:

$$\text{Extrapolation (dB)} = 20 \log_{10} \left(\frac{\text{measurement distance}}{\text{specification distance}} \right)$$

- (b) The levels may have been rounded for display purposes.
- (c) The following table summarises the effect of the EUT operating mode, internal configuration and arrangement of cables / samples on the measured emission levels :

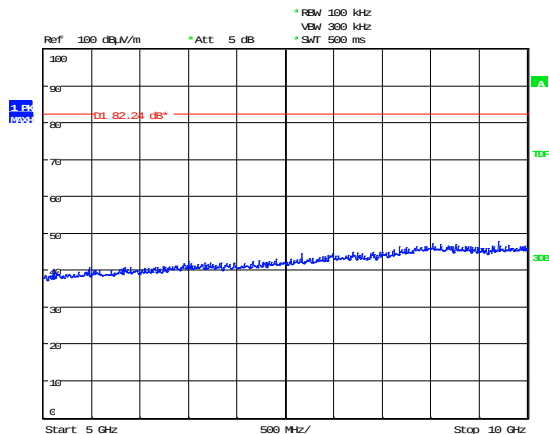
	See (i)	See (ii)	See (iii)	See (iv)
Effect of EUT operating mode on emission levels	✓			
Effect of EUT internal configuration on emission levels	✓			
Effect of Position of EUT cables & samples on emission levels			✓	
(i) Parameter defined by standard and / or single possible, refer to Appendix D (ii) Parameter defined by client and / or single possible, refer to Appendix D (iii) Parameter had a negligible effect on emission levels, refer to Appendix D (iv) Worst case determined by initial measurement, refer to Appendix D				

1710 MHz



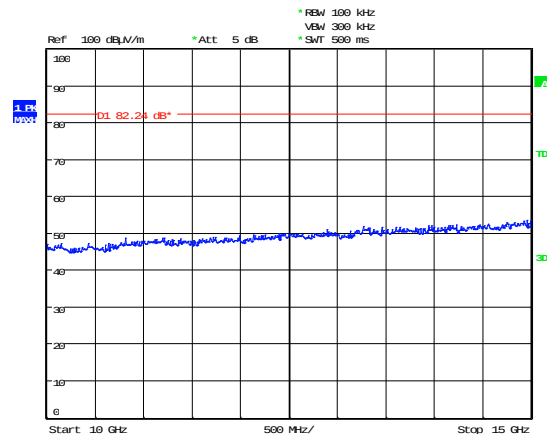
Date: 25.NOV.2014 16:17:29

30MHz – 1GHz



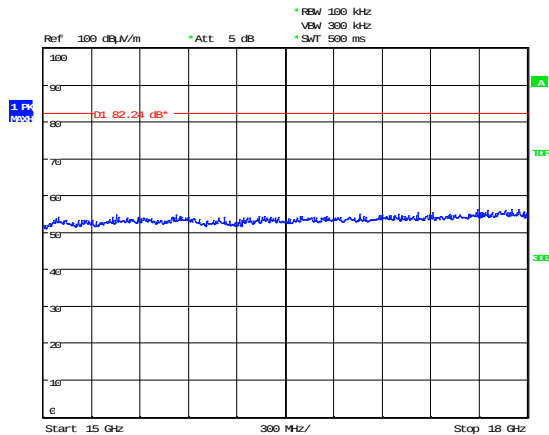
Date: 25.NOV.2014 16:06:46

1GHz – 5GHz



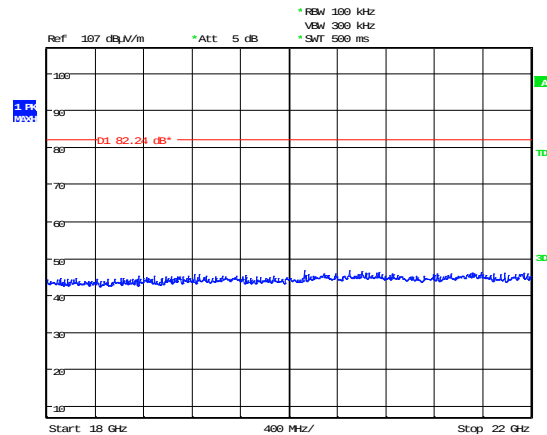
Date: 25.NOV.2014 16:13:14

5GHz – 10GHz



Date: 25.NOV.2014 16:14:48

10GHz – 15GHz

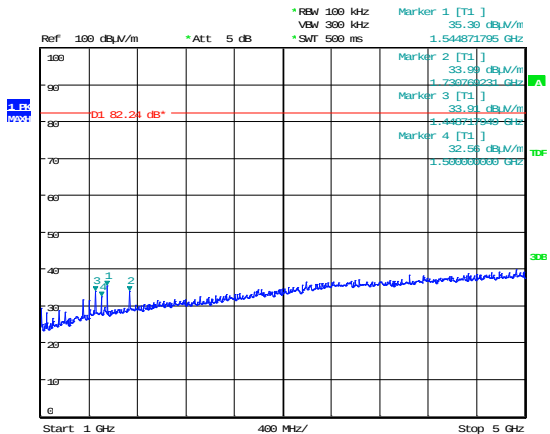
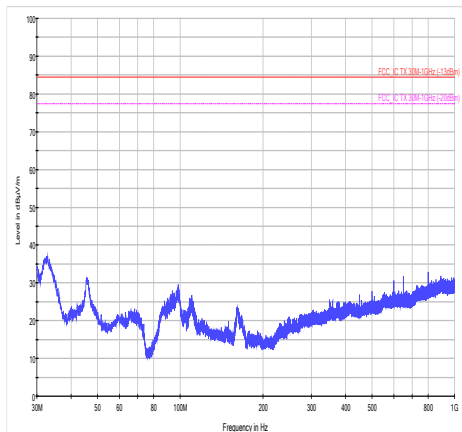


Date: 26.NOV.2014 15:38:11

15GHz – 18GHz

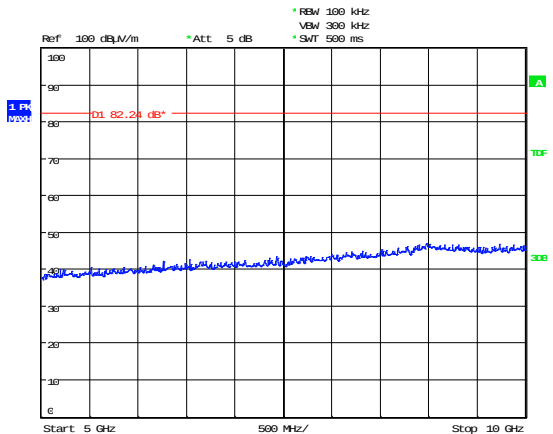
18GHz – 22GHz

1732.5 MHz



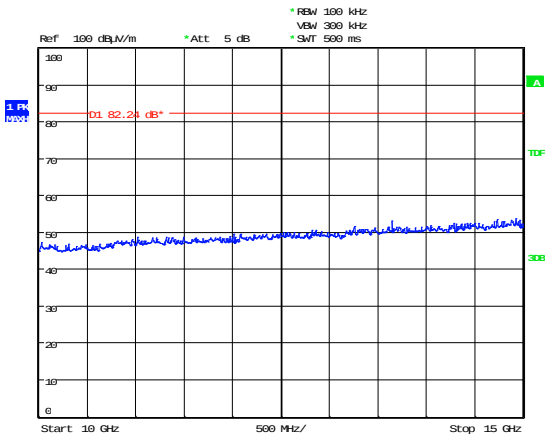
Date: 25.NOV.2014 16:48:48

30MHz – 1GHz



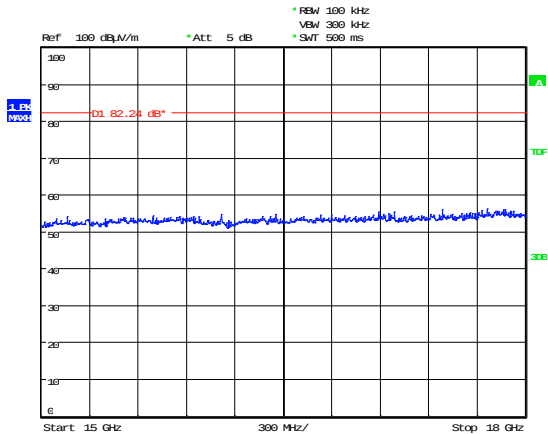
Date: 25.NOV.2014 16:34:42

1GHz – 5GHz



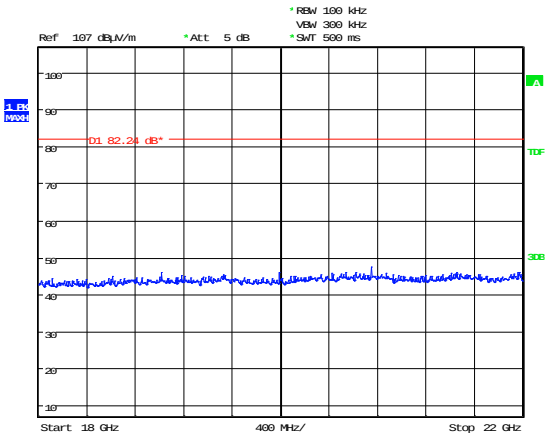
Date: 25.NOV.2014 16:36:29

5GHz – 10GHz



Date: 25.NOV.2014 16:38:40

10GHz – 15GHz

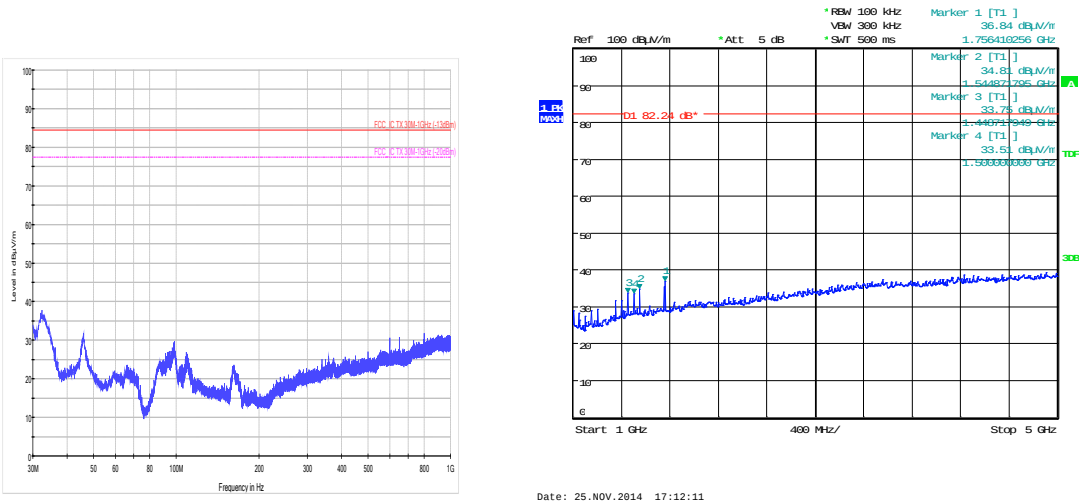


Date: 26.NOV.2014 15:48:01

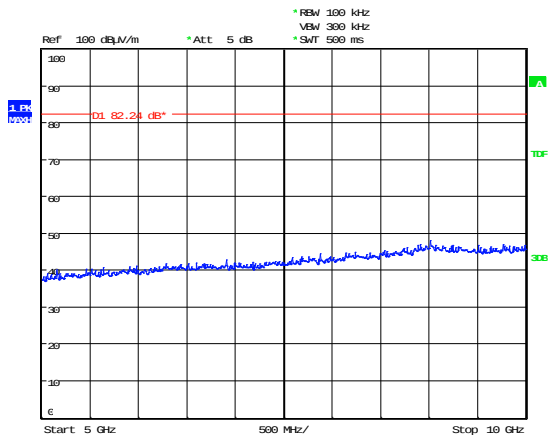
15GHz – 18GHz

18GHz – 22GHz

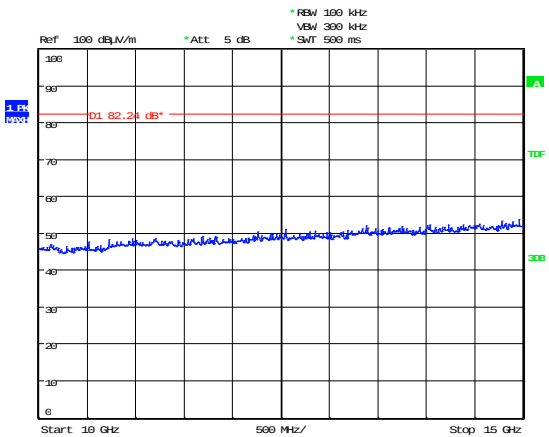
1755 MHz



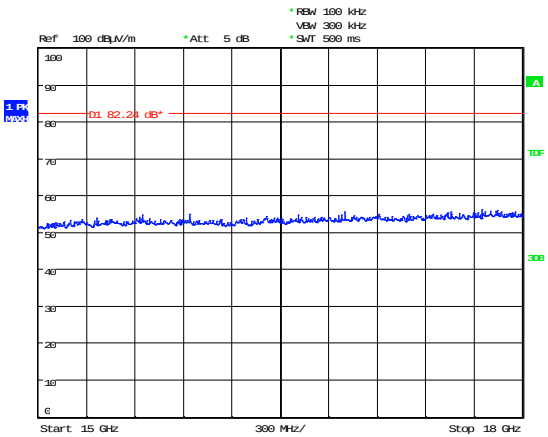
30MHz – 1GHz



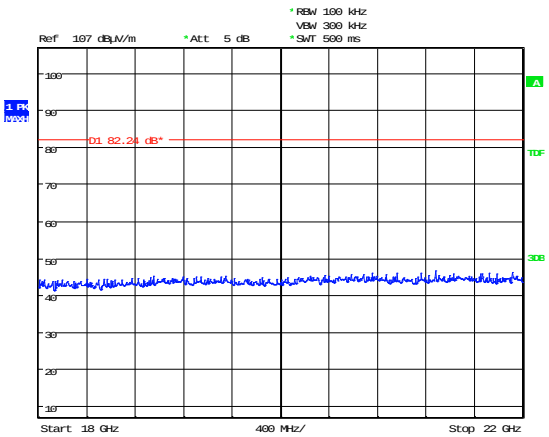
1GHz – 5GHz



5GHz – 10GHz



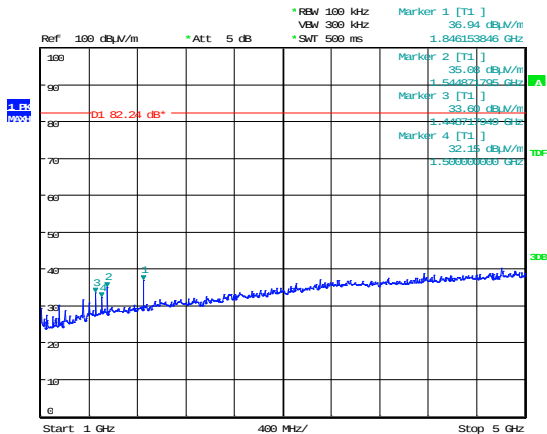
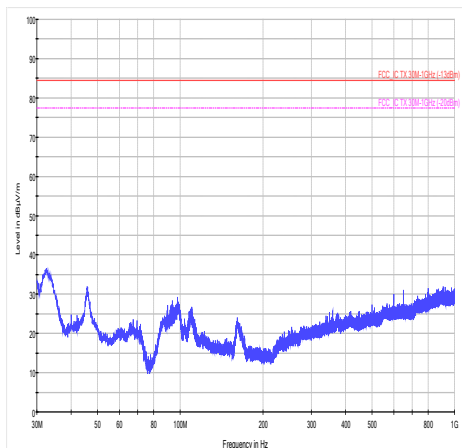
10GHz – 15GHz



15GHz – 18GHz

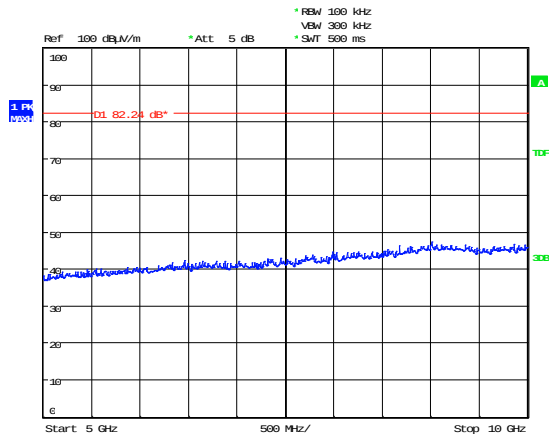
18GHz – 22GHz

1850 MHz



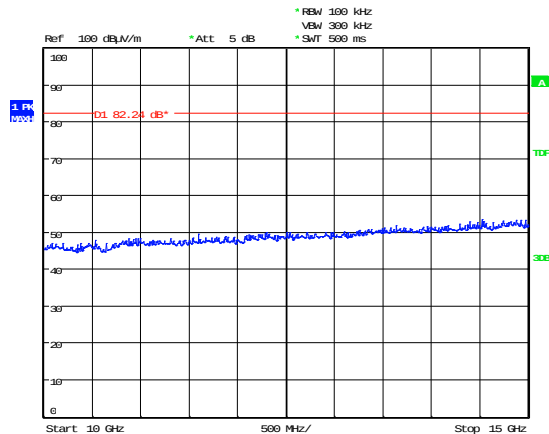
Date: 25.NOV.2014 17:35:01

30MHz – 1GHz



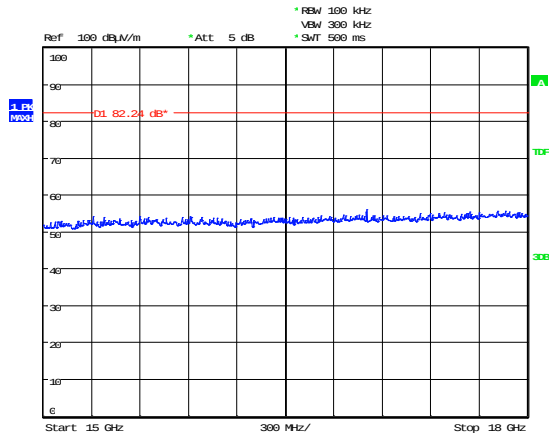
Date: 25.NOV.2014 17:29:22

1GHz – 5GHz



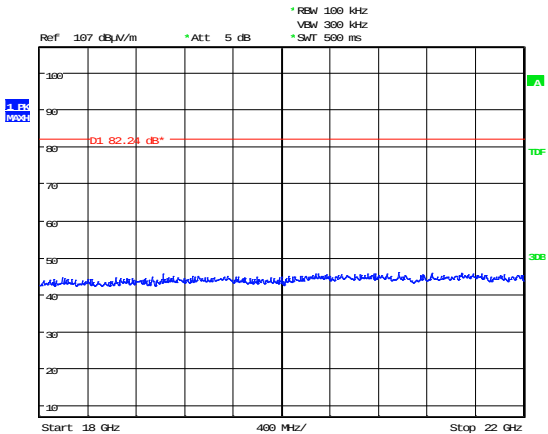
Date: 25.NOV.2014 17:31:05

5GHz – 10GHz



Date: 25.NOV.2014 17:32:17

10GHz – 15GHz

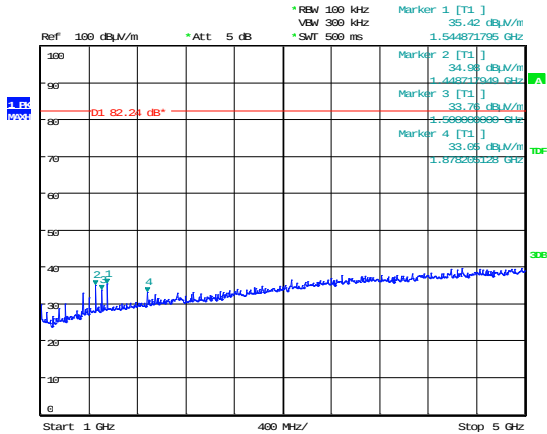
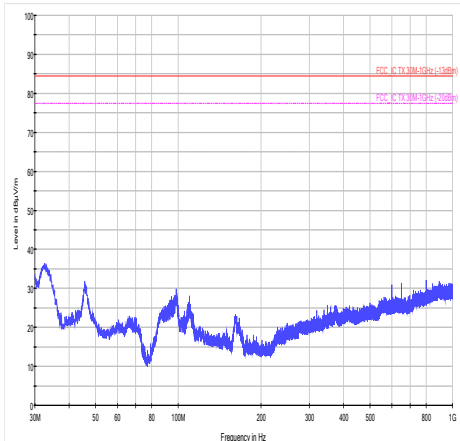


Date: 26.NOV.2014 15:43:42

15GHz – 18GHz

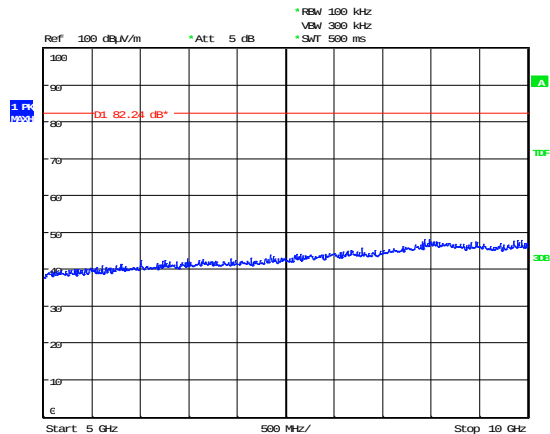
18GHz – 22GHz

1882.5 MHz



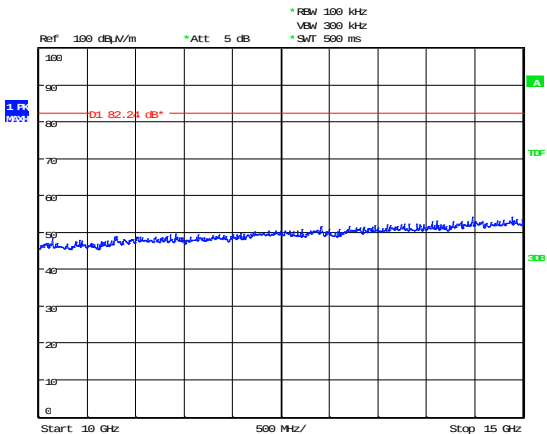
Date: 26.NOV.2014 09:57:12

30MHz – 1GHz



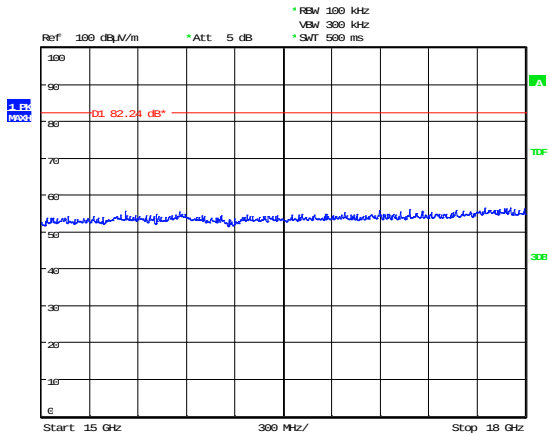
Date: 26.NOV.2014 09:51:28

1GHz – 5GHz



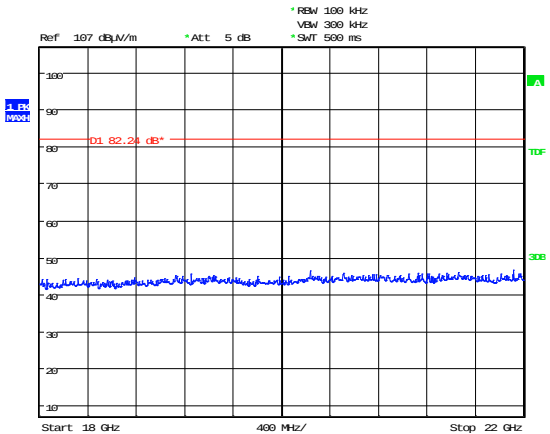
Date: 26.NOV.2014 09:53:48

5GHz – 10GHz



Date: 26.NOV.2014 09:54:42

10GHz – 15GHz

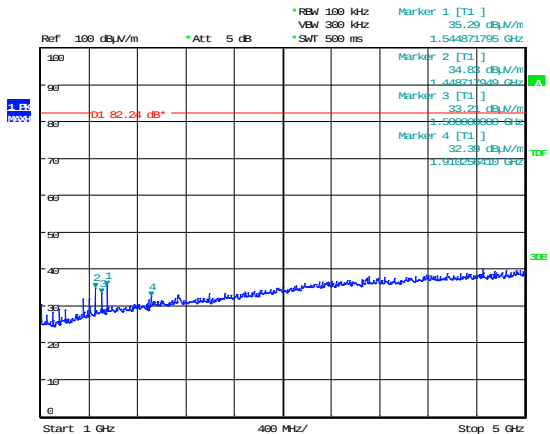
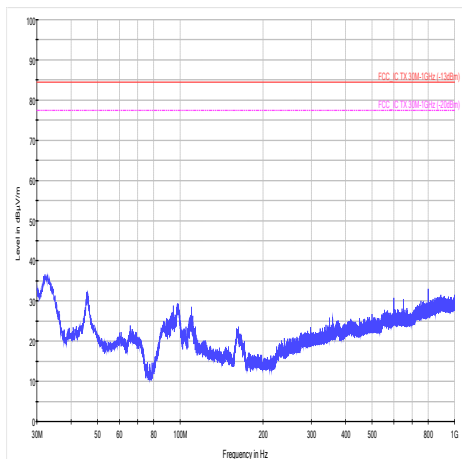


Date: 26.NOV.2014 15:45:58

15GHz – 18GHz

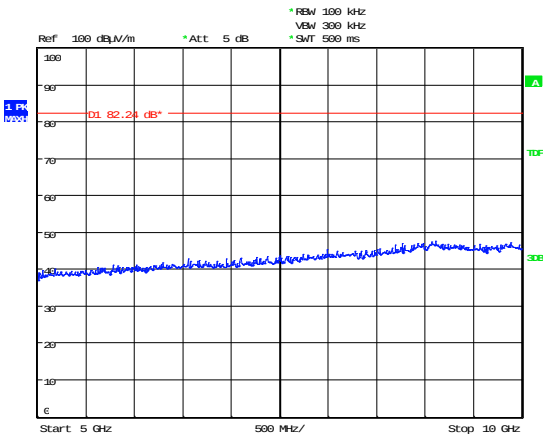
18GHz – 22GHz

1915 MHz



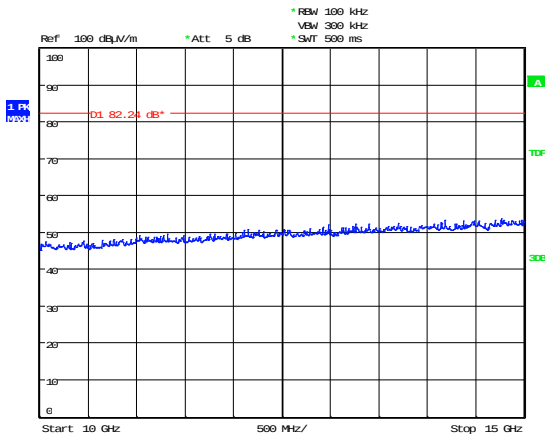
Date: 26.NOV.2014 10:31:53

30MHz – 1GHz



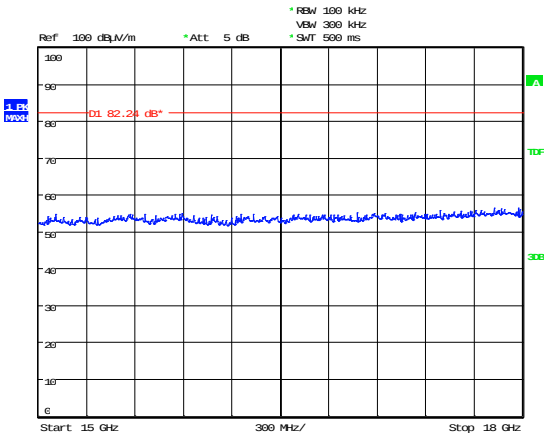
Date: 26.NOV.2014 10:26:19

1GHz – 5GHz



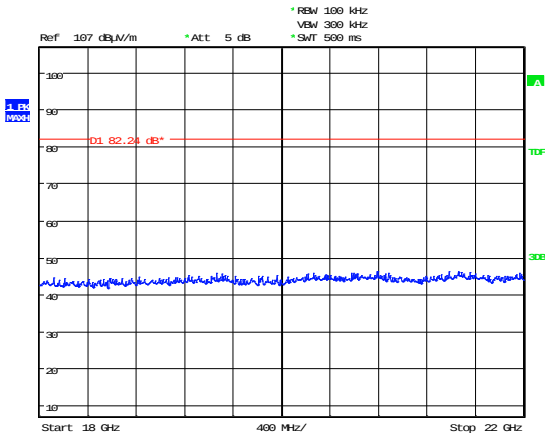
Date: 26.NOV.2014 10:27:23

5GHz – 10GHz



Date: 26.NOV.2014 10:28:31

10GHz – 15GHz



Date: 26.NOV.2014 15:46:27

15GHz – 18GHz

18GHz – 22GHz

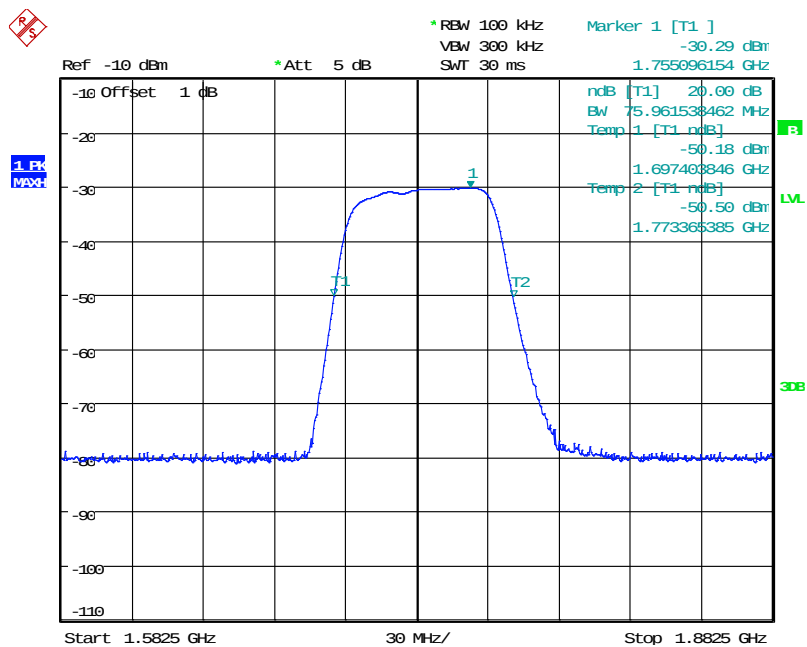
A7 Passband Gain & Bandwidth

Test Details:	
Measurement standard	D.3 Policies + Procedures (k) of KDB 935210 D02 Signal Boosters Certification v02
EUT sample number	S01 & S02
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

BAND	Frequency MHz	f _l	f _h	20 dB Bandwidth
1700 MHz (AWS)	1710 - 1755 MHz	1.697403MHz	1.773365MHz	75.961MHz
1900 MHz (PCS)	1850 – 1910 MHz	1.837788MHz	1.918557MHz	80.769MHz

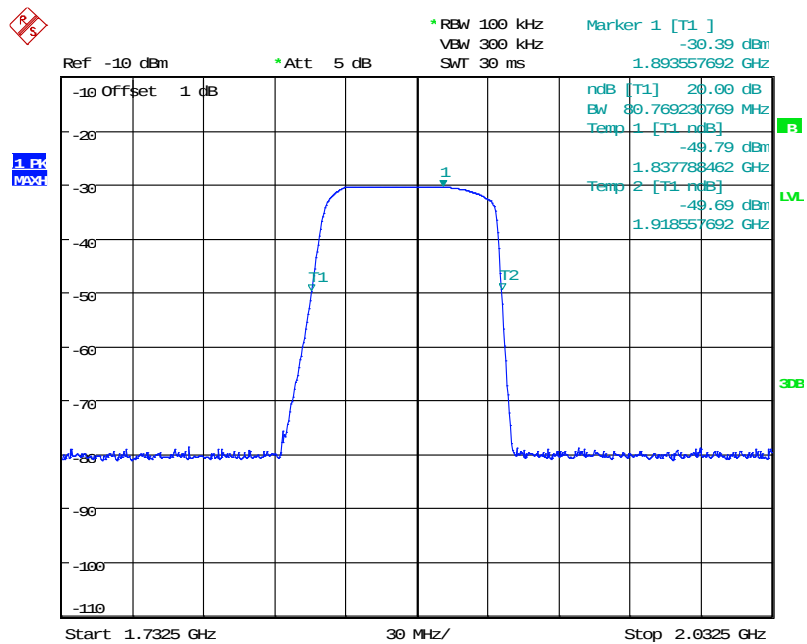
See below for plots showing passband gain & bandwidth

With the aid of a CW Swept signal generator and spectrum analyser, the bandwidth and frequency response of the open channel (i.e. at the point where the gain has fallen by 20 dB) is measured. This measurement shows the gain-versus-frequency response of the open channel from the midband frequency f_0 of the channel up to at least $f_0 + 250\%$ of the 20 dB bandwidth.



Date: 19.SEP.2014 12:02:08

1700 MHz



Date: 19.SEP.2014 11:55:20

1800MHz

Appendix B:**Downlink Formal Emission Test Results**

Abbreviations used in the tables in this appendix:

Spec	: Specification	ALSR	: Absorber Lined Screened Room
Mod	: Modification	OATS	: Open Area Test Site
		ATS	: Alternative Test Site
EUT	: Equipment Under Test		
SE	: Support Equipment	Ref	: Reference
		Freq	: Frequency
L	: Live Power Line		
N	: Neutral Power Line	MD	: Measurement Distance
E	: Earth Power Line	SD	: Spec Distance
Pk	: Peak Detector	Pol	: Polarisation
QP	: Quasi-Peak Detector	H	: Horizontal Polarisation
Av	: Average Detector	V	: Vertical Polarisation
CDN	: Coupling & decoupling network		

B1 RF Gain and Output Power

Test Details:	
Measurement standard	Part 2.1046,22.913(a), 24.232(a), 27.50(a),
EUT sample number	S01 & S02
Modification state	0
SE in test environment	None
SE isolated from EUT	None
Temperature	22°C
Humidity	47%
EUT set up	Refer to Appendix C

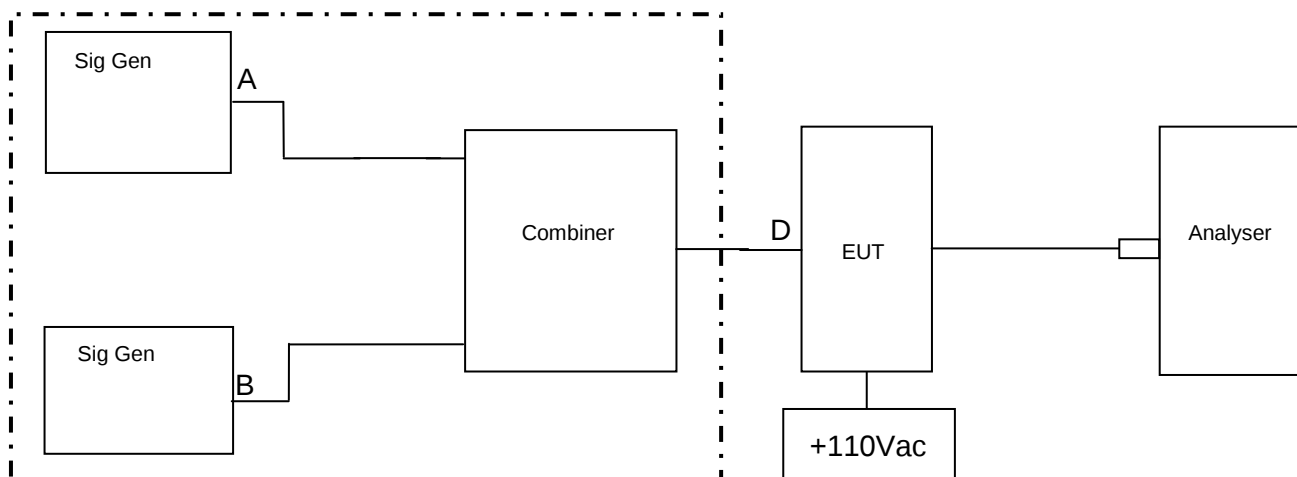
Frequency (MHz)	Signal Generator input level (dBm)	Input Cable Loss (dB)	Input Level (dBm)	Level at Spectrum Analyser (dBm)	Output Cable & Attenuator loss (dB)	Gain (dB)	Conducted Output Power (dBm)	Gain after 10dB input level increase (dB)
1900MHz								
1930.000000	10.00	0.58	9.42	-8.83	50.52	32.27	41.69	22.27
1960.000000	7.08	0.58	6.50	-8.16	50.67	36.01	42.51	26.00
1990.000000	8.68	0.59	8.09	-8.43	50.55	34.03	42.12	24.03
2100 MHz								
2110.000000	8.72	0.57	8.15	-7.99	50.56	34.42	42.57	24.43
2132.500000	6.36	0.70	5.66	-8.15	50.59	36.78	42.44	26.82
2155.000000	7.72	0.61	7.11	-8.54	50.73	35.08	42.19	25.09

Notes:

1. The signal generator input was increased by 10dBs and the level of the output signal re measured.
2. As per Annex .3 Policies + Procedures (k) of KDB 935210 D02 Signal Boosters Certification v02 the EUT was tested at compression and 10dB into compression to show AGC operation

B2 Amplifier Intermodulation Spurious Emissions

Test Details:	
Measurement standard	Part 2.1053, 22.917(a), 24.238(a), 27.53(c) & (g)
EUT sample number	S01 & S02
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C



2 Signals at	Frequency (MHz)	Level (dBm)	Limit (dBm)
1900 MHz			
Middle of the band	1959.09	-20.58	-13
2100 MHz			
Top end of band	2111.497	-18.55	-13

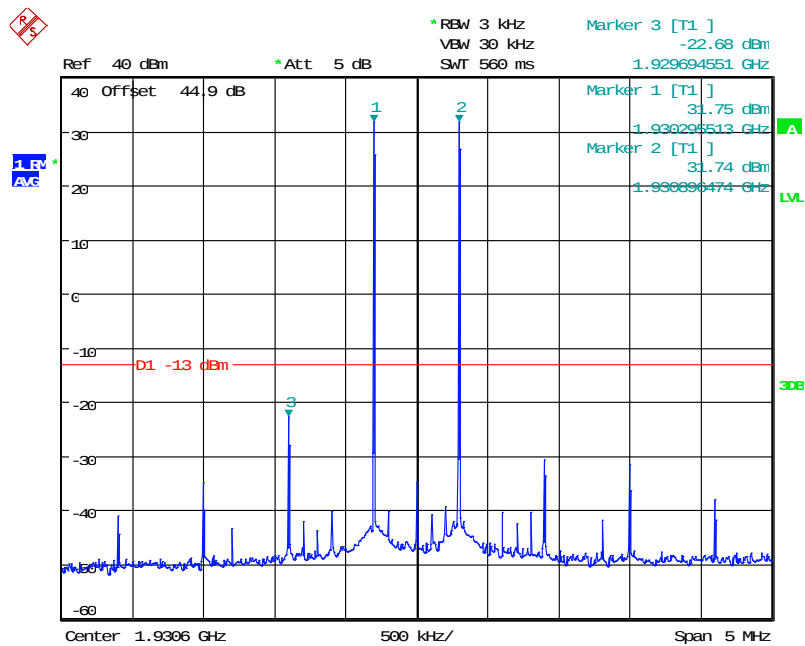
Sweep data is shown on the next page:

Results

The EUT was found to comply with the limits

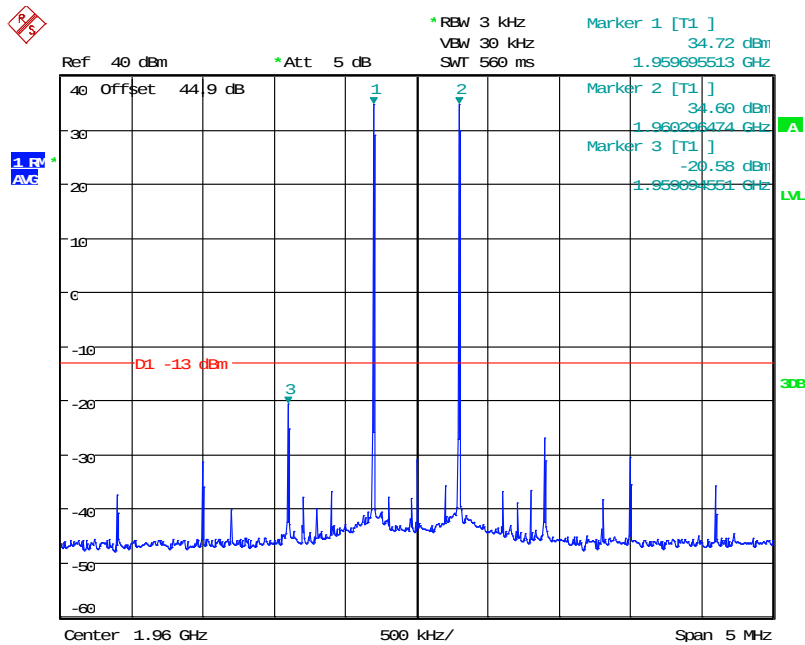
See plots below

1900 MHz Intermodulation close View



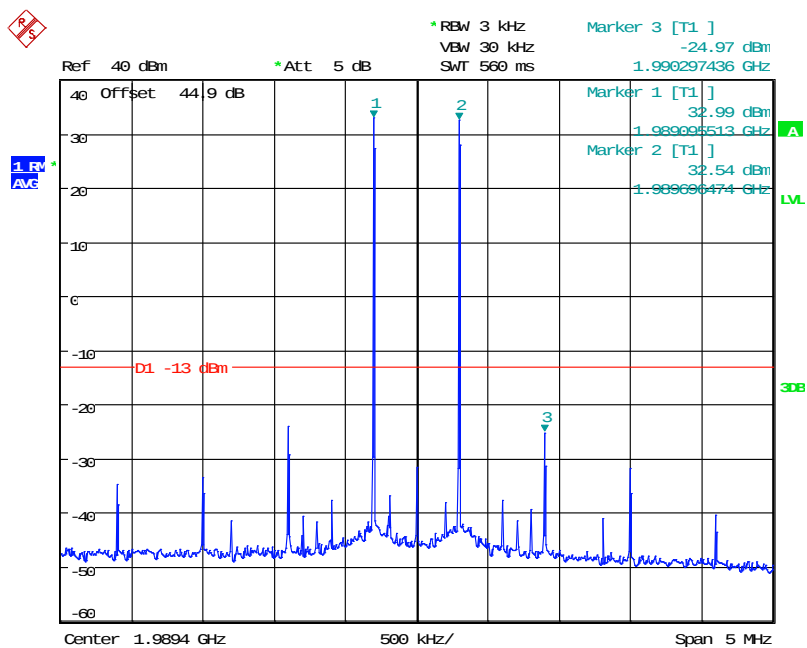
Date: 18.SEP.2014 15:27:18

2 Signals at bottom end of band



Date: 18.SEP.2014 15:27:58

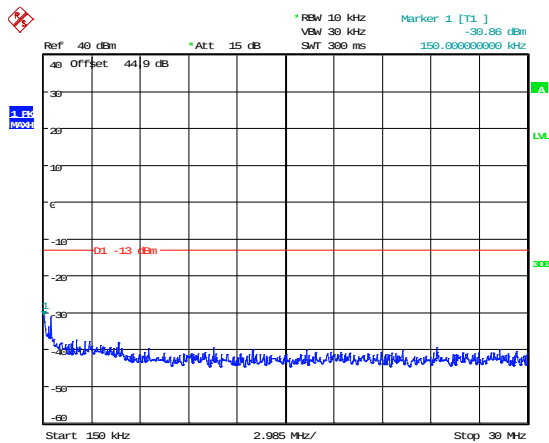
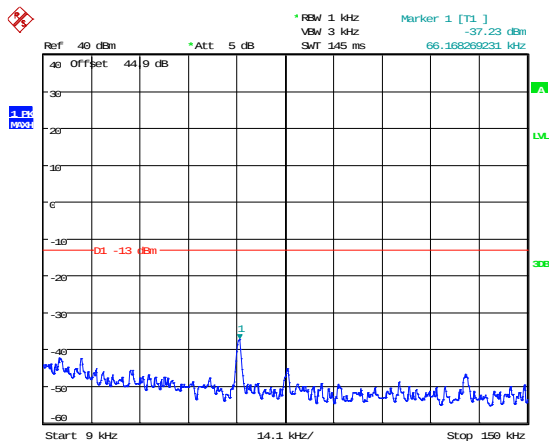
2 Signals at middle of the band



Date: 18.SEP.2014 15:35:40

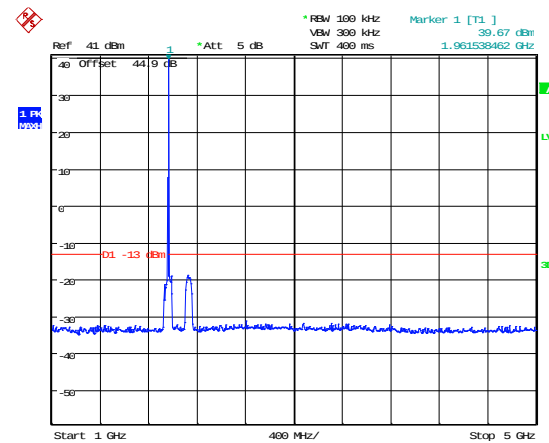
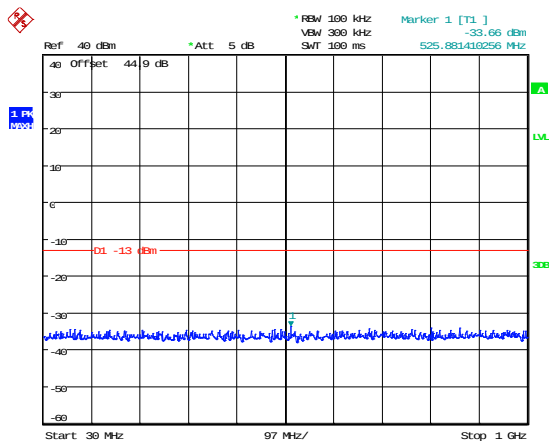
2 Signals at top end of band

1900 MHz Intermodulation



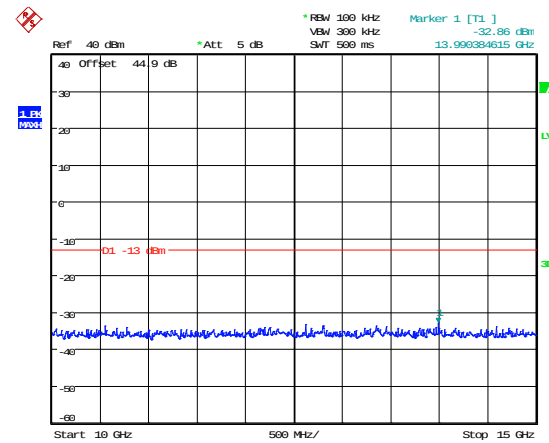
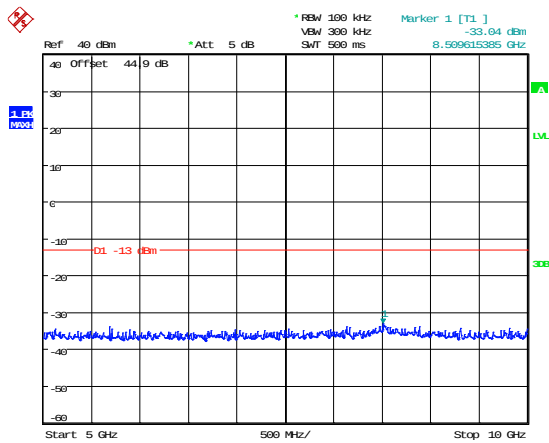
9 – 150kHz

150kHz – 30MHz



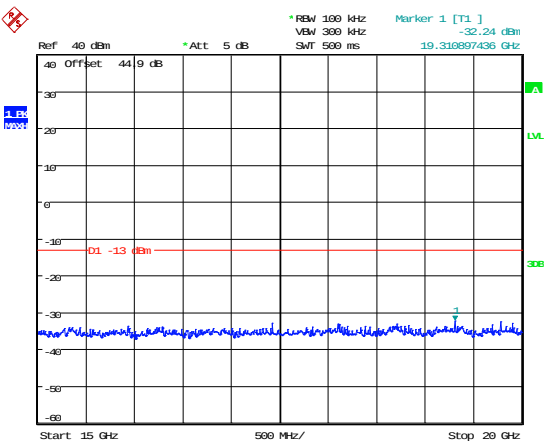
30MHz – 1GHz

1GHz – 5GHz



5GHz – 10GHz

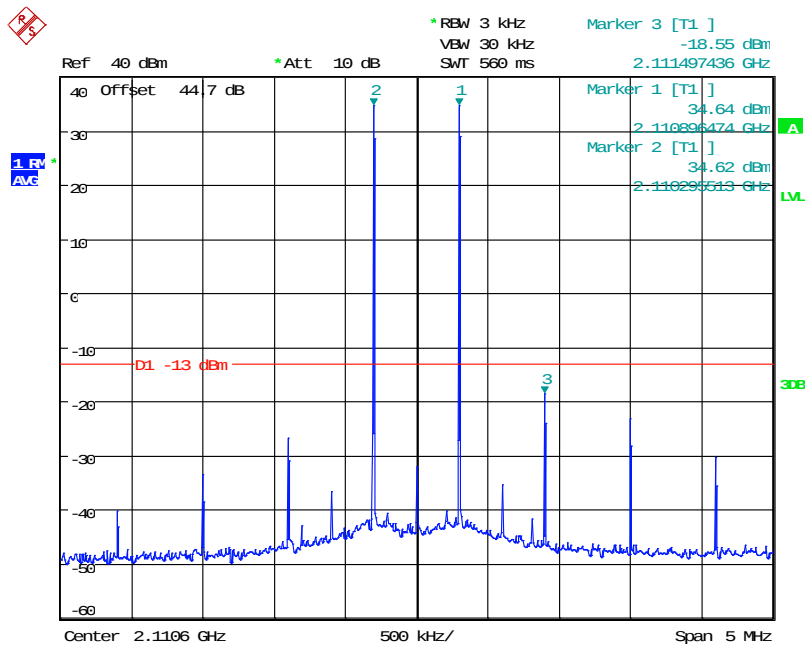
10GHz – 15GHz



Date: 18.SEP.2014 15:47:37

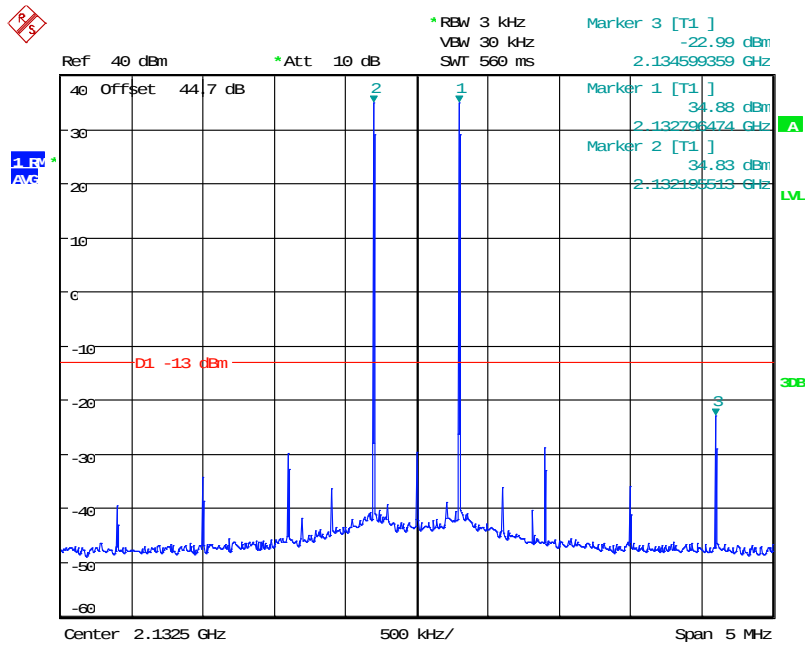
15GHz – 20GHz

2100 MHz Intermodulation close View



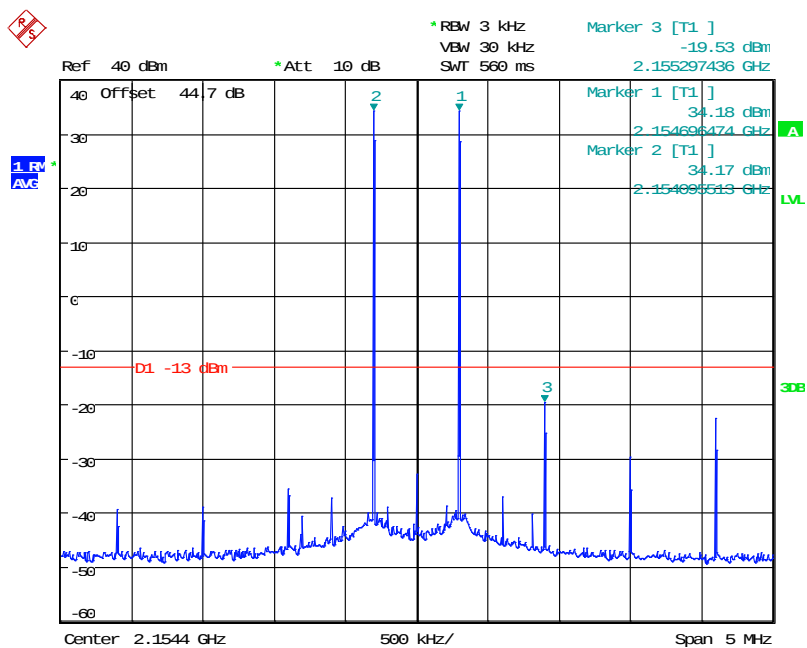
Date: 18.SEP.2014 14:52:40

2 Signals at bottom end of band



Date: 18.SEP.2014 15:12:58

2 Signals at middle end of band

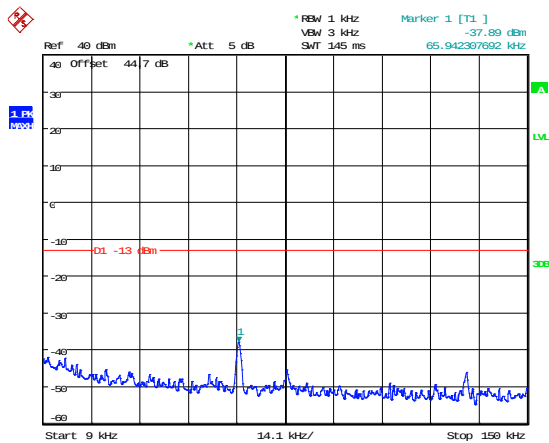


Date: 18.SEP.2014 15:10:41

2 Signals at top end of band

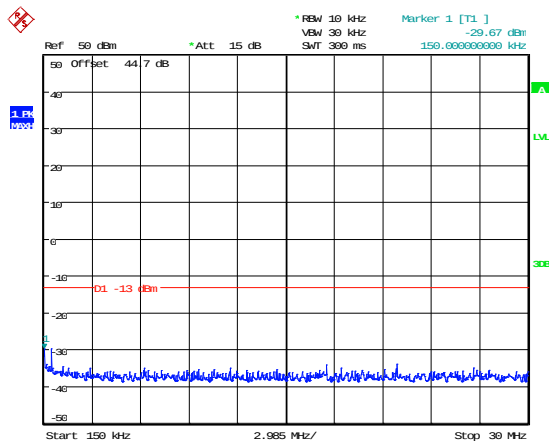
2100 MHz Intermodulation

9 – 150kHz



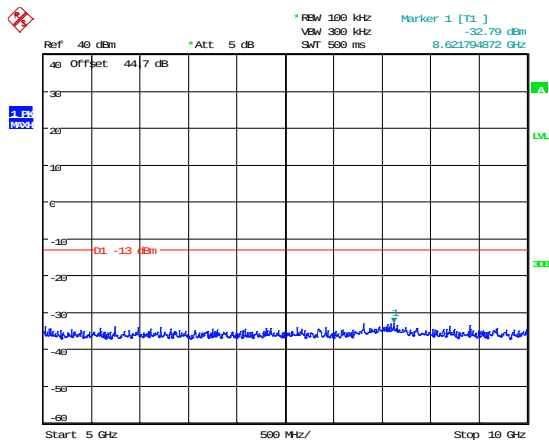
Date: 18.SEP.2014 15:16:06

150kHz – 30MHz



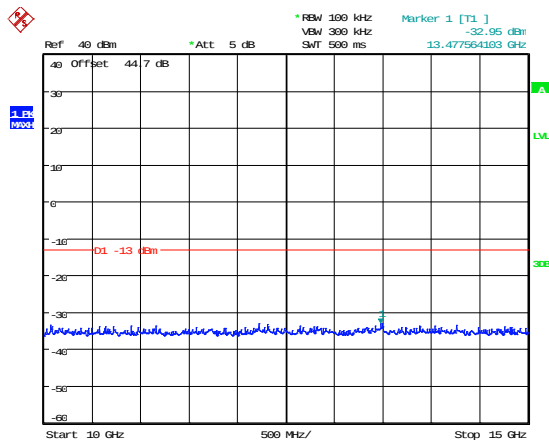
Date: 18.SEP.2014 15:17:16

30MHz – 1GHz



Date: 18.SEP.2014 15:14:50

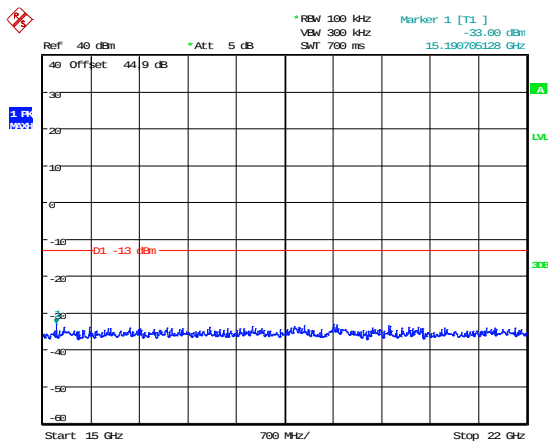
1GHz – 5GHz



Date: 18.SEP.2014 15:15:27

5GHz – 10GHz

10GHz – 15GHz



Date: 18.SEP.2014 15:49:28

15GHz - 22GHz

B3 Amplifier Modulated Channel Test

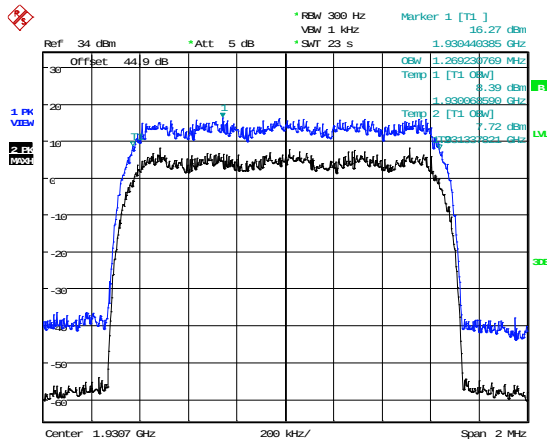
Test Details:	
Measurement standard	D.3 Policies + Procedures (j) of KDB 935210 D02 Signal Boosters Certification v02
EUT sample number	S01 & S02
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Frequency Of Operation Channel	Modulation Type					
	CDMA	GSM	GSM EDGE	WCDMA	LTE 1.4 MHz	LTE 20.0 MHz
1930.000	1.269MHz	246.794kHz	245.192kHz	4.182MHz	1.086MHz	17.839MHz
1960.000	1.269MHz	245.192kHz	246.794kHz	4.173MHz	1.086MHz	17.910MHz
1990.000	1.272MHz	245.192kHz	246.794kHz	4.163MHz	1.086MHz	17.875MHz
2110.000	N/A	N/A	N/A	4.192MHz	1.086MHz	17.875MHz
2132.500	N/A	N/A	N/A	4.173MHz	1.086MHz	17.875MHz
2155.000	N/A	N/A	N/A	4.163MHz	1.086MHz	17.910MHz

Waveforms applied to selected bands as requested.

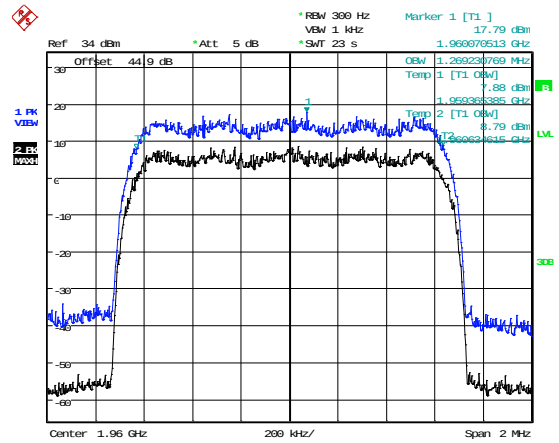
As per Annex .3 Policies + Procedures (k) of KDB 935210 D02 Signal Boosters Certification v02 the EUT was tested at compression and 10dB into compression to show AGC operation, worst case results taken.

CDMA Modulation



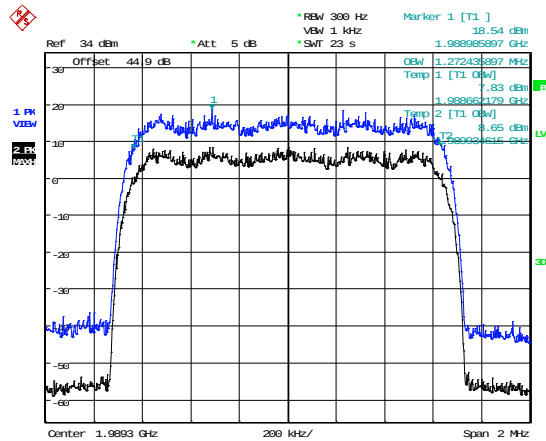
Date: 23.SEP.2014 09:37:52

1930.0 MHz



Date: 23.SEP.2014 10:22:13

1960.0 MHz

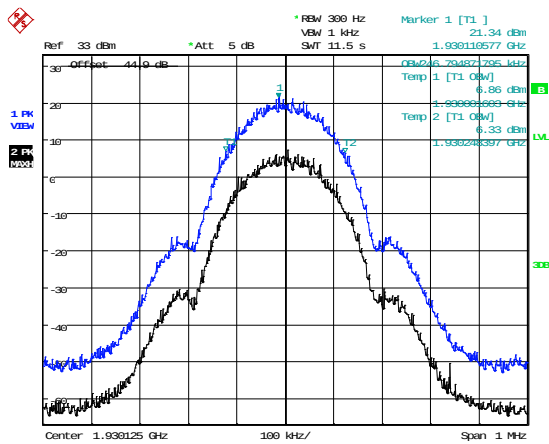


Date: 23.SEP.2014 10:34:20

1990.0 MHz

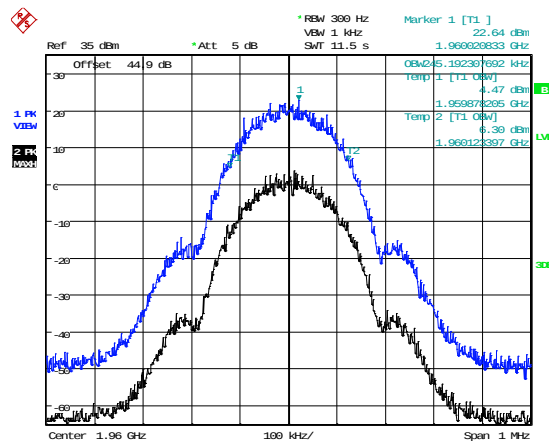
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

GSM Modulation



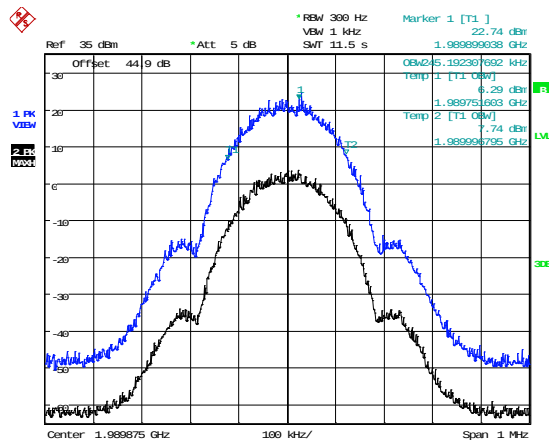
Date: 23.SEP.2014 17:04:38

1930.0 MHz



Date: 24.SEP.2014 09:35:07

1960.0MHz

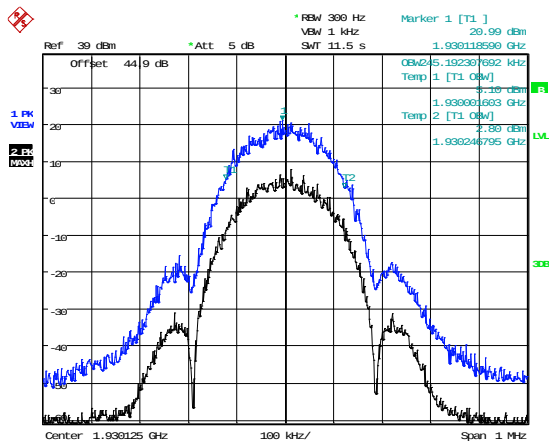


Date: 23.SEP.2014 17:29:00

1990.0 MHz

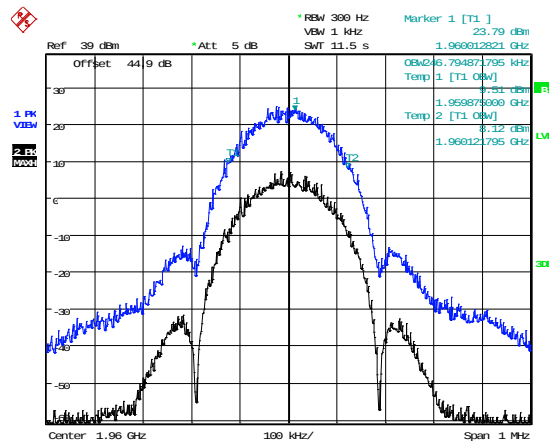
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

GSM Edge Modulation



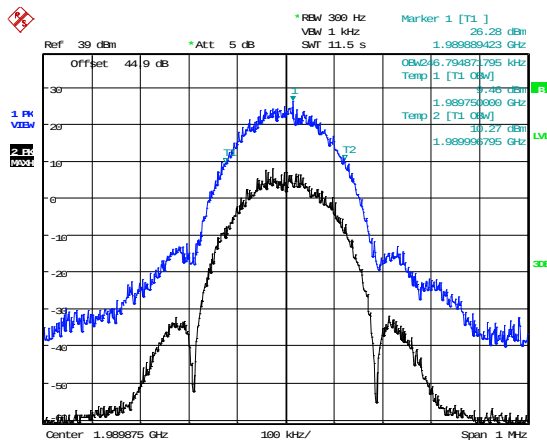
Date: 26.SEP.2014 10:10:16

1930.0 MHz



Date: 26.SEP.2014 10:02:59

1960.0 MHz

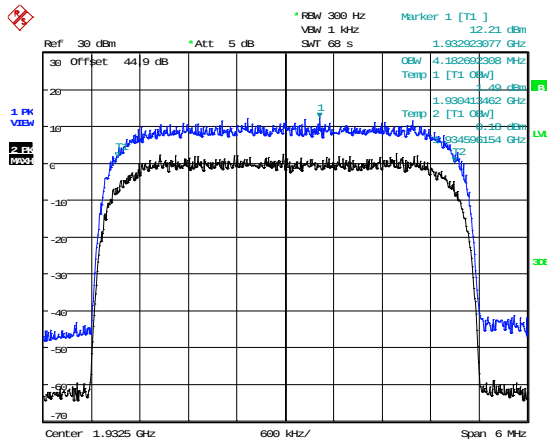


Date: 26.SEP.2014 10:14:31

1990.0 MHz

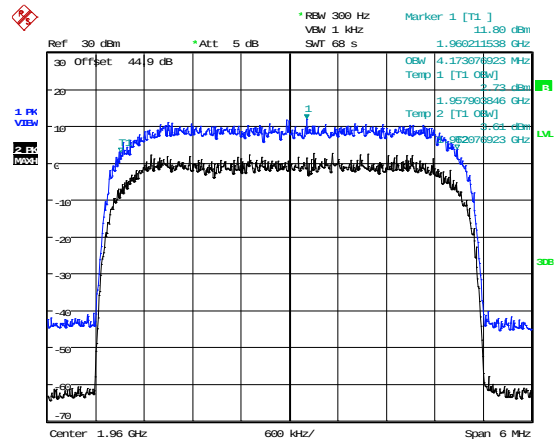
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

WCDMA Modulation



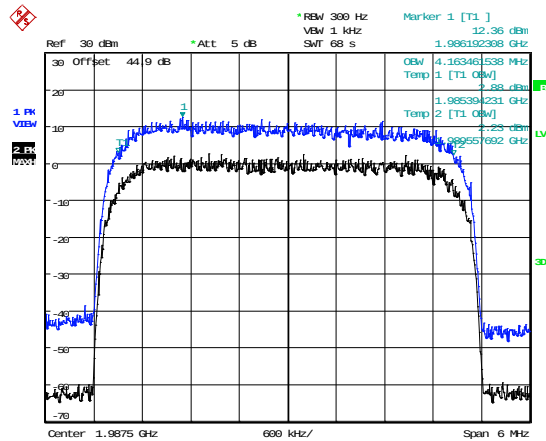
Date: 23.SEP.2014 15:55:40

1930 MHz



Date: 23.SEP.2014 16:01:05

1960 MHz

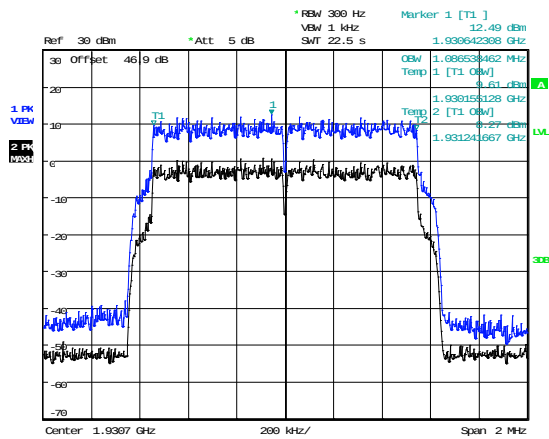


Date: 23.SEP.2014 16:07:49

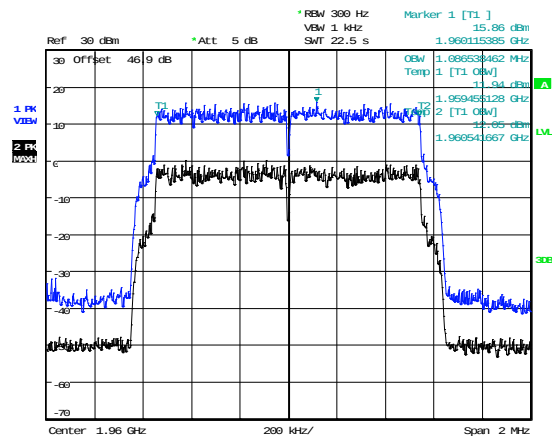
1990 MHz

The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

1.4 MHz LTE Modulation



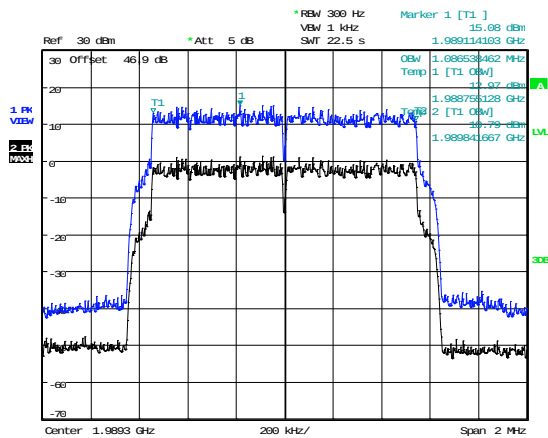
Date: 3.DEC.2014 11:47:45



Date: 3.DEC.2014 11:44:33

1930.0 MHz

1960.0 MHz

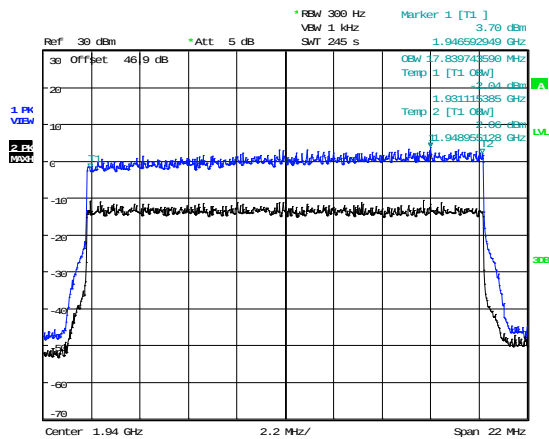


Date: 3.DEC.2014 11:41:59

1990.0 MHz

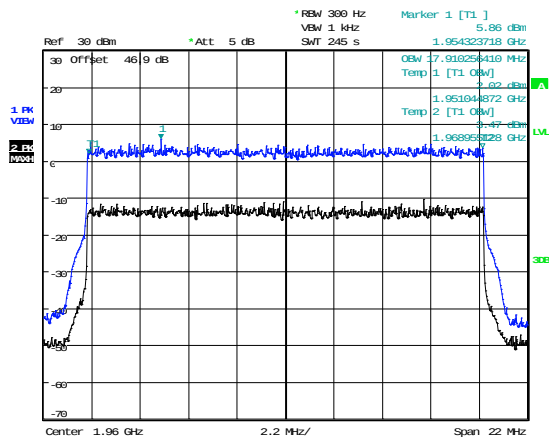
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

20.0 MHz LTE Modulation



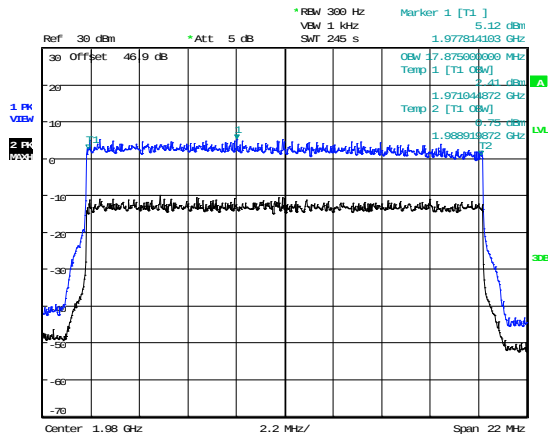
Date: 3.DEC.2014 11:11:07

1930.0 MHz



Date: 3.DEC.2014 10:54:56

1960.0 MHz

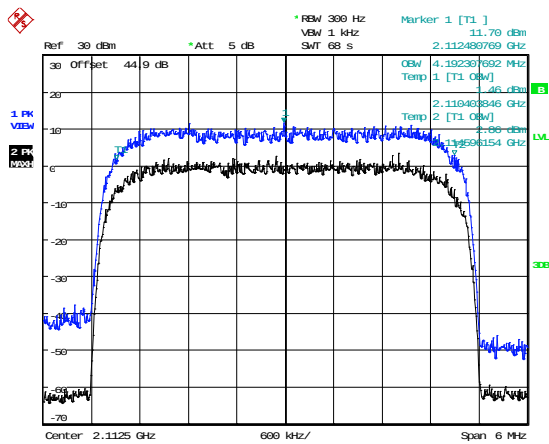


Date: 3.DEC.2014 11:29:51

1990.0 MHz

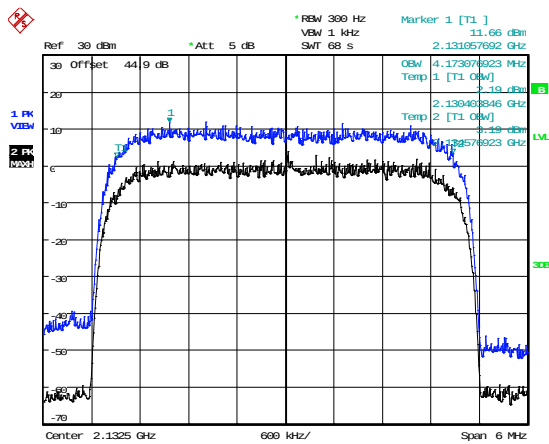
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

WCDMA Modulation



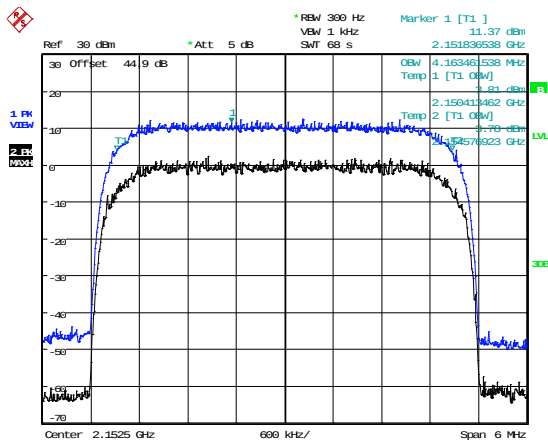
Date: 23.SEP.2014 16:18:58

2110 MHz



Date: 23.SEP.2014 16:24:52

2132.5MHz

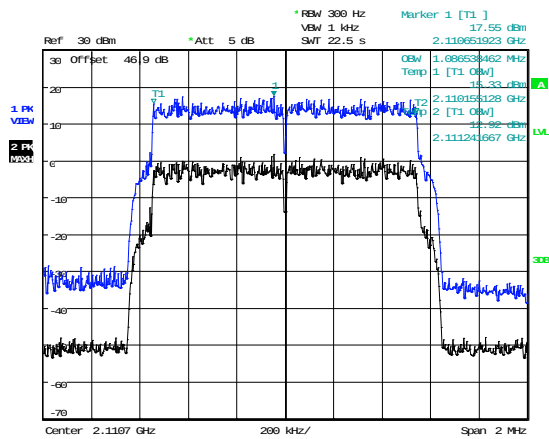


Date: 23.SEP.2014 16:48:35

2155 MHz

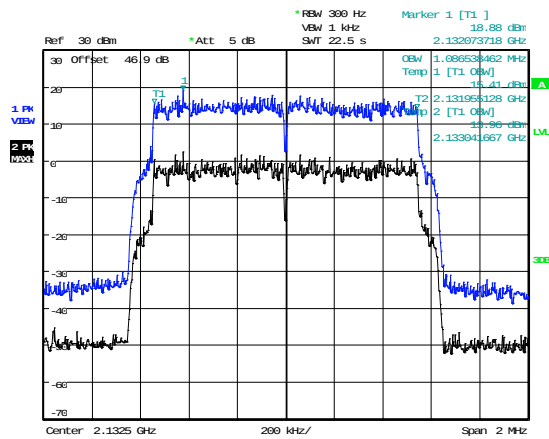
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

1.4 MHz LTE Modulation



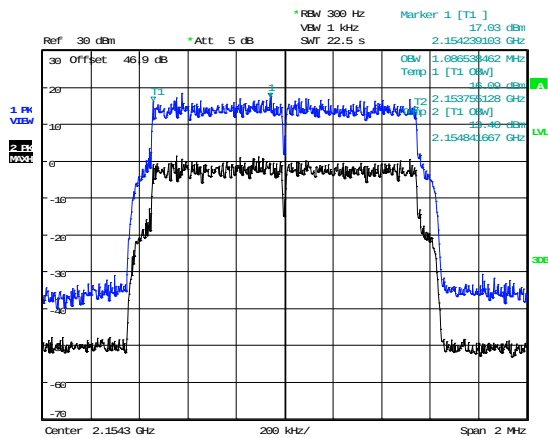
Date: 3.DEC.2014 09:45:23

2110 MHz



Date: 3.DEC.2014 09:42:16

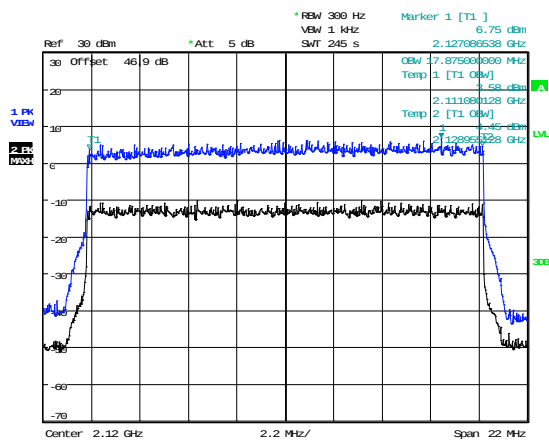
2132.5MHz



Date: 3.DEC.2014 09:39:26

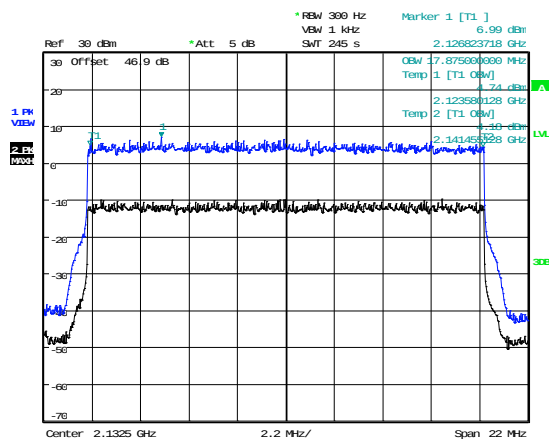
2155MHz

20 MHz LTE Modulation



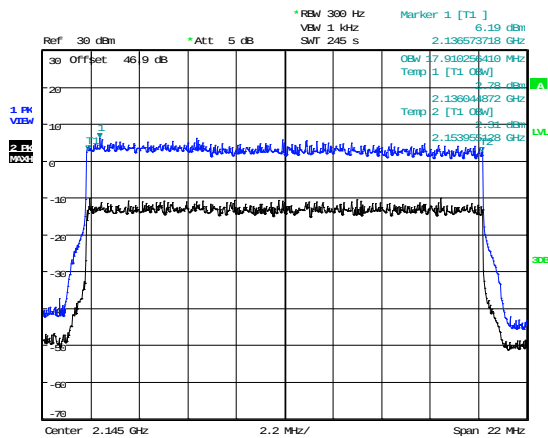
Date: 3.DEC.2014 10:05:10

2110 MHz



Date: 3.DEC.2014 10:29:44

2132.5MHz



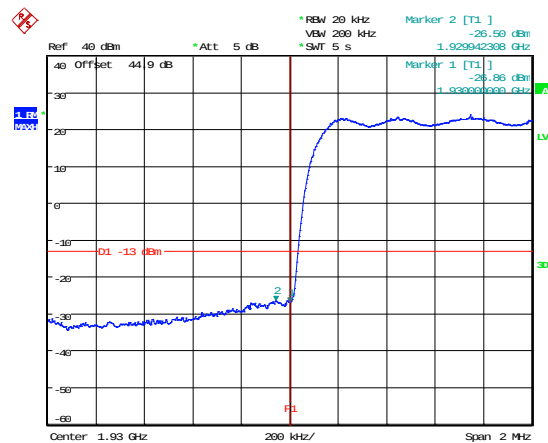
Date: 3.DEC.2014 10:39:37

2155MHz

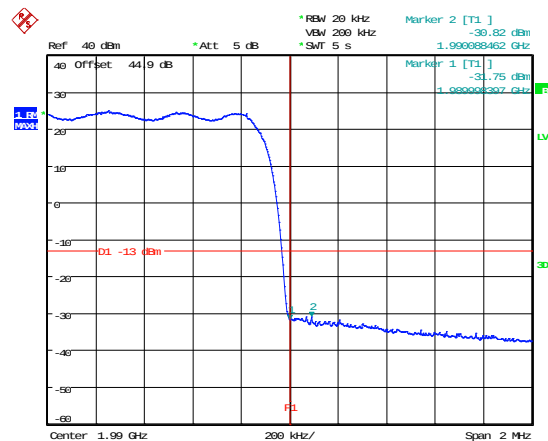
B4 Spurious Emissions at Antenna Terminals Less than 1MHz

Test Details:	
Measurement standard	Part 2.1053, 24.238(a), 27.53(c) & (g),
EUT sample number	S01 & S02
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Modulation Type	Bandedge	Carrier Centre Frequency (MHz)	Max Level @ upto 1MHz from Bandedge (dBm)
CDMA	1900 MHz Lower	1930.75	-26.50
	1900 MHz Upper	1989.25	-30.82



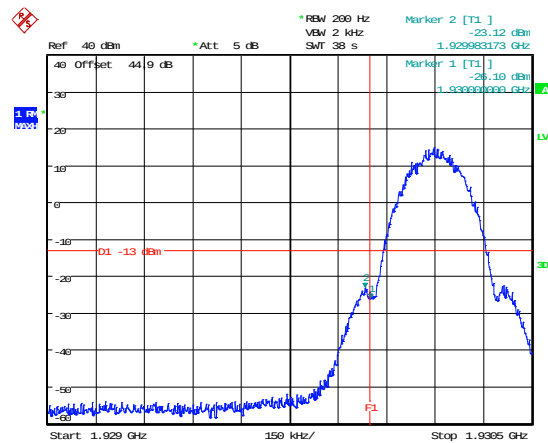
Date: 19.SEP.2014 10:18:31

Lower bandedge

Date: 19.SEP.2014 10:20:48

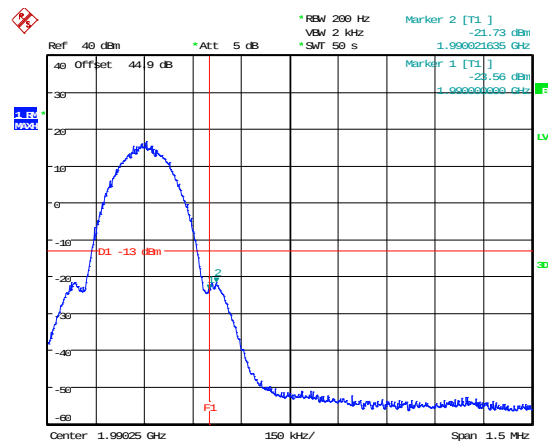
Upper Bandedge

Modulation Type	Bandedge	Carrier Centre Frequency (MHz)	Max Level @ upto 1MHz from Bandedge (dBm)
GSM	1900 MHz Lower	1930.20	-23.12
	1900 MHz Upper	1989.80	-21.73



Date: 19.SEP.2014 10:00:14

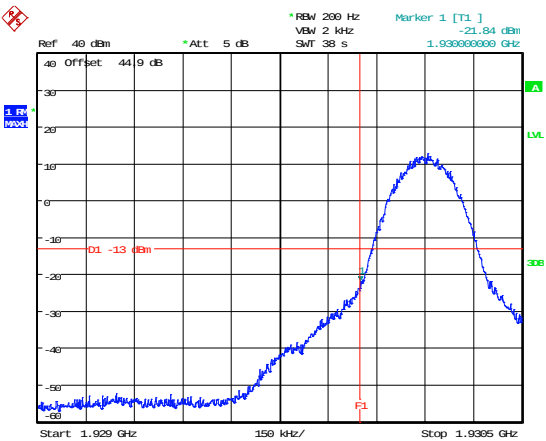
Lower Bandedge



Date: 19.SEP.2014 09:56:17

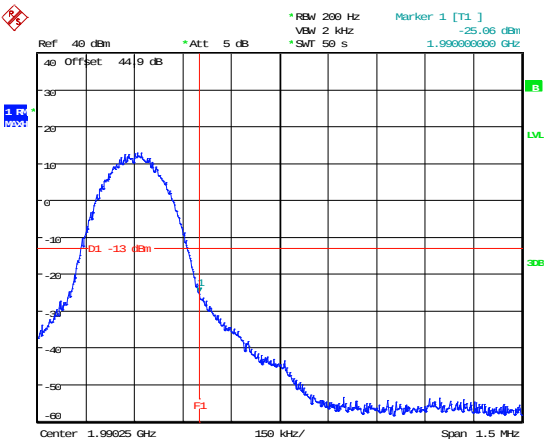
Upper Bandedge

Modulation Type	Bandedge	Carrier Centre Frequency (MHz)	Max Level @ upto 1MHz from Bandedge (dBm)
GSM EDGE	1900 MHz Lower	1930.20	-21.84
	1900 MHz Upper	1989.80	-25.06



Date: 19.SEP.2014 10:03:43

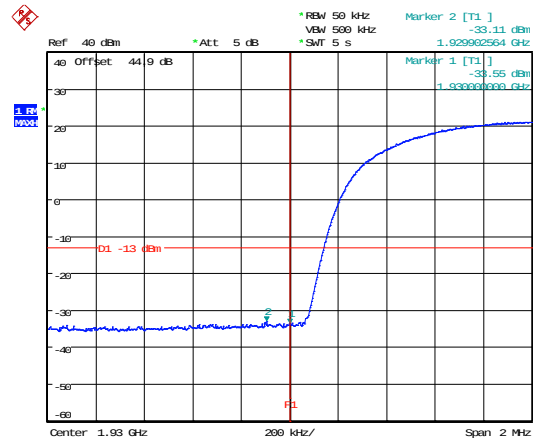
Lower Bandedge



Date: 19.SEP.2014 10:05:57

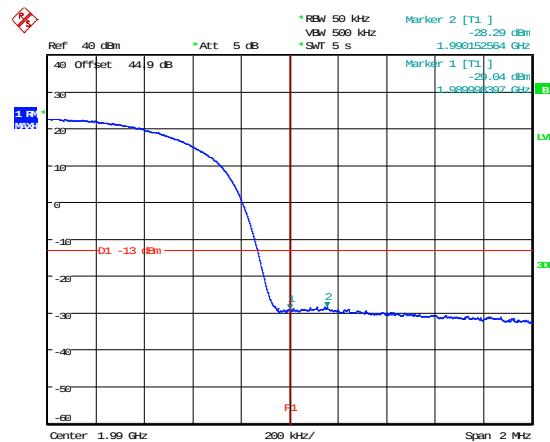
Upper Bandedge

Modulation Type	Bandedge	Carrier Centre Frequency (MHz)	Max Level @ upto 1MHz from Bandedge (dBm)
WCDMA	1900 MHz Lower	1932.5	-33.11
	1900 MHz Upper	1987.5	-28.29



Date: 19.SEP.2014 10:46:46

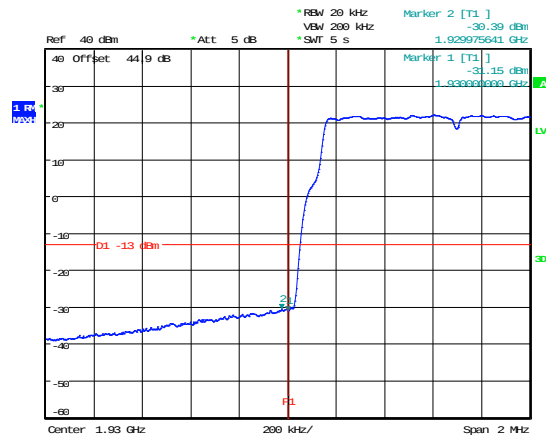
Lower Bandedge



Date: 19.SEP.2014 10:39:39

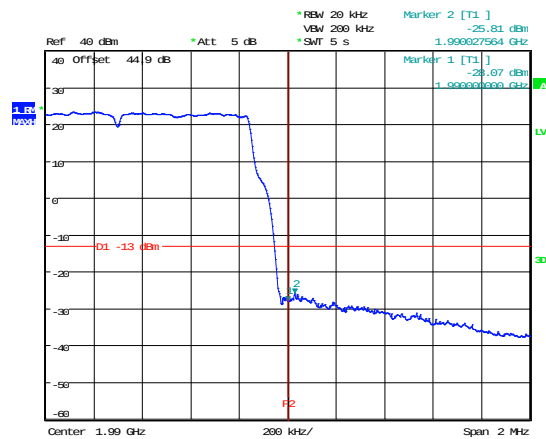
Upper Bandedge

Modulation Type	Bandedge	Carrier Centre Frequency (MHz)	Max Level @ upto 1MHz from Bandedge (dBm)
LTE 1.4 MHz	1900 MHz Lower	1930.7	-30.39
	1900 MHz Upper	1989.30	-25.81



Date: 2.DEC.2014 17:10:26

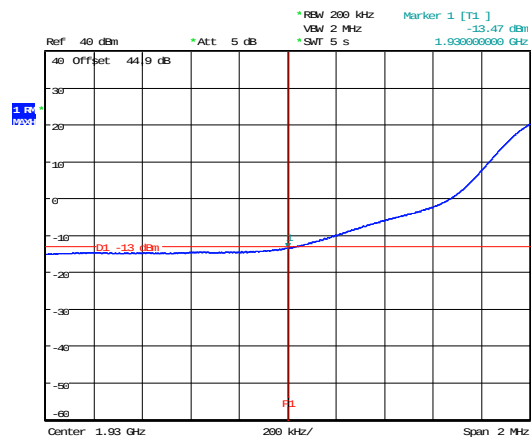
Lower Bandedge



Date: 2.DEC.2014 17:14:34

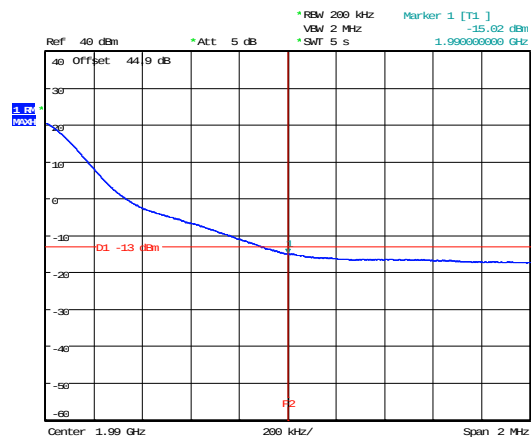
Upper bandedge

Modulation Type	Bandedge	Carrier Centre Frequency (MHz)	Max Level @ upto 1MHz from Bandedge (dBm)
LTE 20.0 MHz	1900 MHz Lower	1940.0	-13.47
	1900 MHz Upper	1985.0	-15.02



Date: 2.DEC.2014 17:11:39

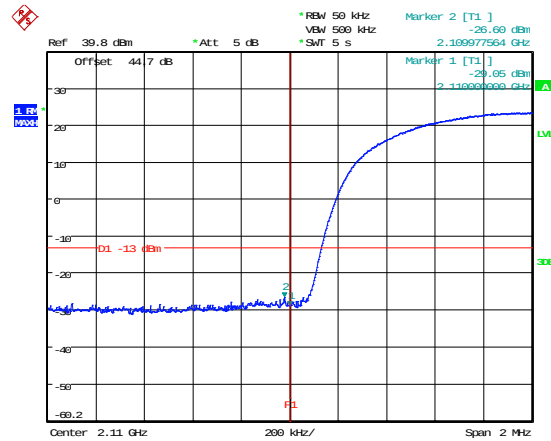
Lower Bandedge



Date: 2.DEC.2014 17:13:33

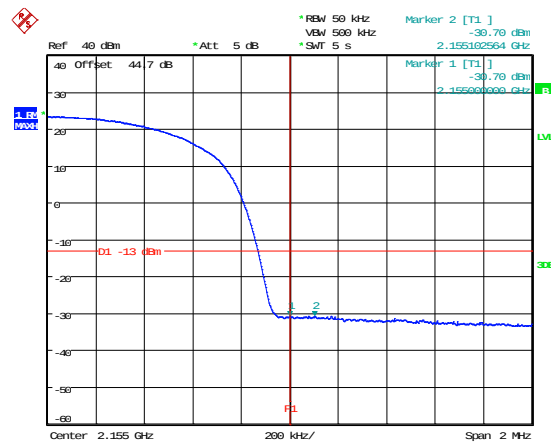
Upper Bandedge

Modulation Type	Bandedge	Carrier Centre Frequency (MHz)	Max Level @ upto 1MHz from Bandedge (dBm)
WCDMA	2100 MHz Lower	2112.50	-26.60
	2100 MHz Upper	2152.50	-30.70



Date: 19.SEP.2014 10:48:31

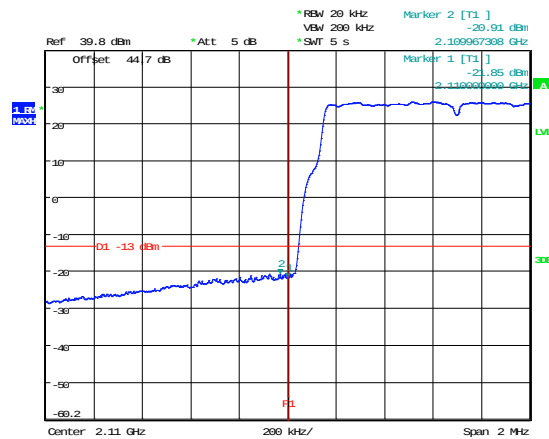
Lower Bandedge



Date: 19.SEP.2014 10:43:35

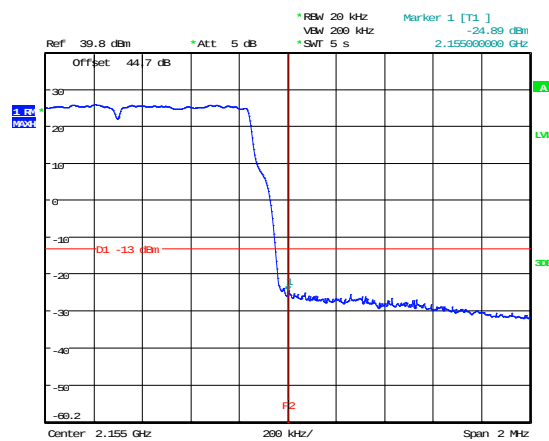
Upper Bandedge

Modulation Type	Bandedge	Carrier Centre Frequency (MHz)	Max Level @ upto 1MHz from Bandedge (dBm)
1.4MHz LTE	2100 MHz Lower	2110.70	-20.91
	2100 MHz Upper	2154.30	-24.89



Date: 2.DEC.2014 17:16:54

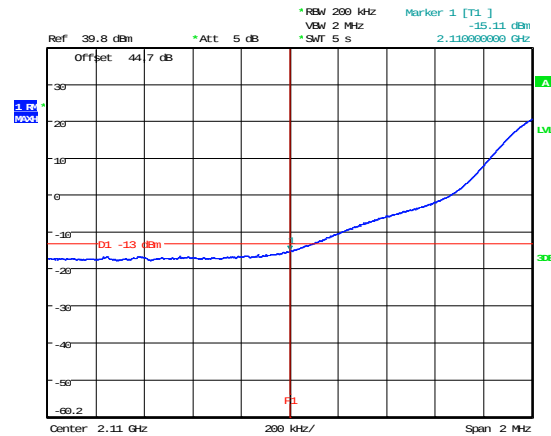
Lower Bandedge



Date: 2.DEC.2014 17:25:29

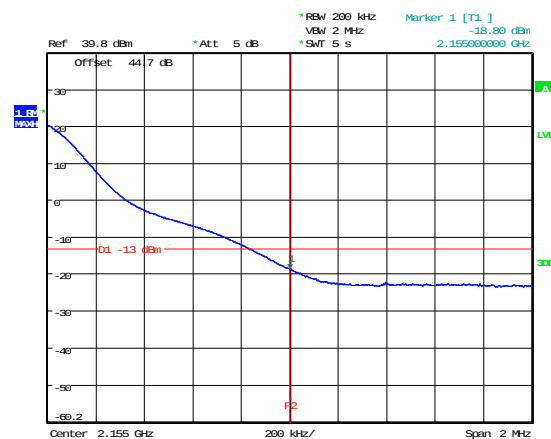
Upper Bandedge

Modulation Type	Bandedge	Carrier Centre Frequency (MHz)	Max Level @ upto 1MHz from Bandedge (dBm)
20MHz LTE	2100 MHz Lower	2120.00	-15.11
	2100 MHz Upper	2145.00	-18.80



Date: 2.DEC.2014 17:18:27

Lower Bandedge



Date: 2.DEC.2014 17:19:59

Upper Bandedge

B5 Spurious Emissions at Antenna Terminals Greater than 1MHz

Test Details:	
Measurement standard	Part 2.1053, 22.917(a), 24.238(a), 27.53(c) & (g), 90.691(a)(1) & (2)
EUT sample number	S01 & S02
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Frequency (MHz)	Frequency Range (MHz)	Freq. of Emission (MHz)	Measured Level (dBm)	Attenuator & Cable Losses (dB)	Spurious Emission Level (dBm)	Limit (dBm)
1900 MHz						
1930.000	No Significant Emissions Within 20 dB of limit					-13
1960.000						-13
1990.000						-13
2100 MHz						
2110.000	No Significant Emissions Within 20 dB of limit					-13
2132.500						-13
2155.000						-13

Limit is determined by the outermost step of the emissions mask and is calculated as follows:

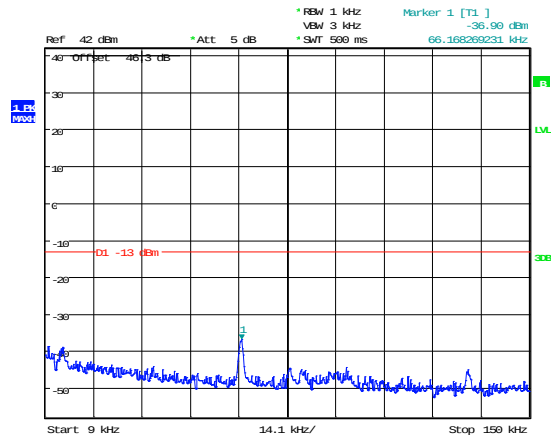
At least $43 + 10 \log P$ dB

$$(10\log P_{\text{watts}}) - (43 + 10\log (P_{\text{watts}} * 1000)) = \text{LIMIT} = -13 \text{ dBm}$$

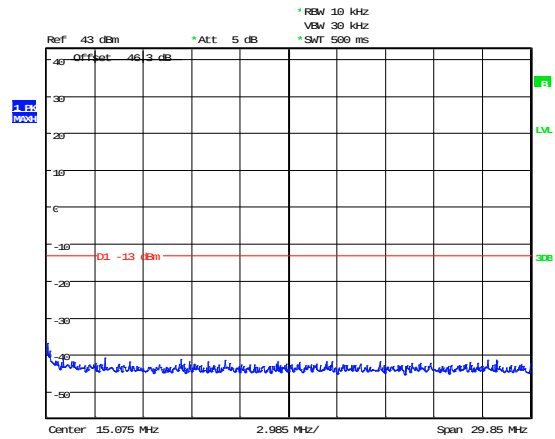
Result

The EUT was found to comply with the limits

1930.0 MHz



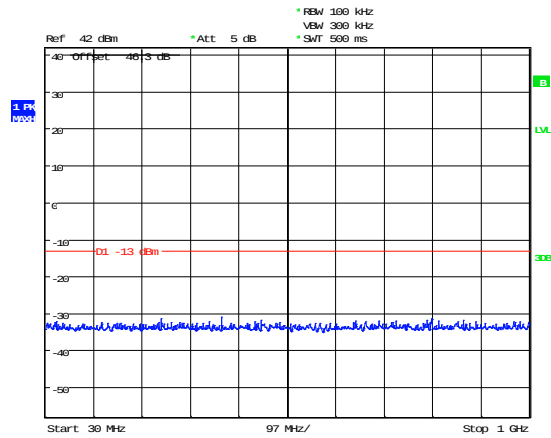
Date: 17.APR.2014 15:03:01



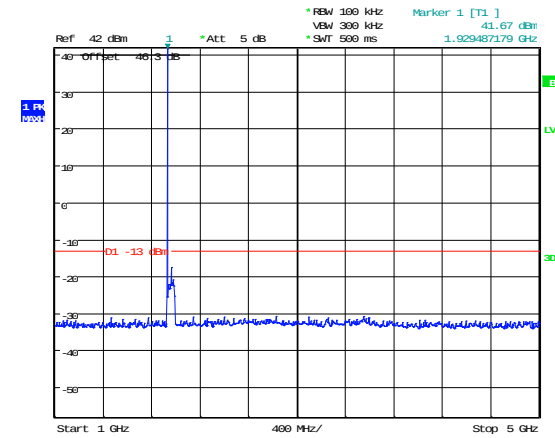
Date: 17.APR.2014 15:15:47

9kHz - 150kHz

150kHz – 30MHz



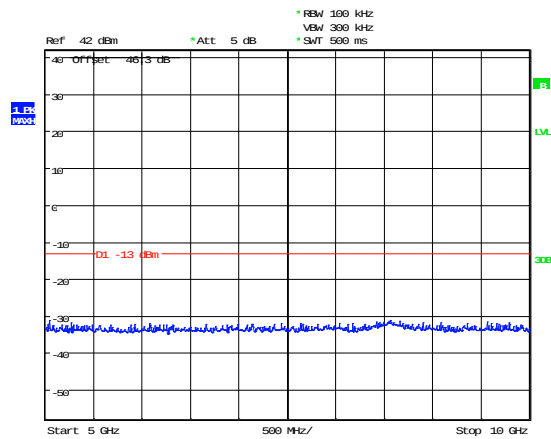
Date: 17.APR.2014 15:02:20



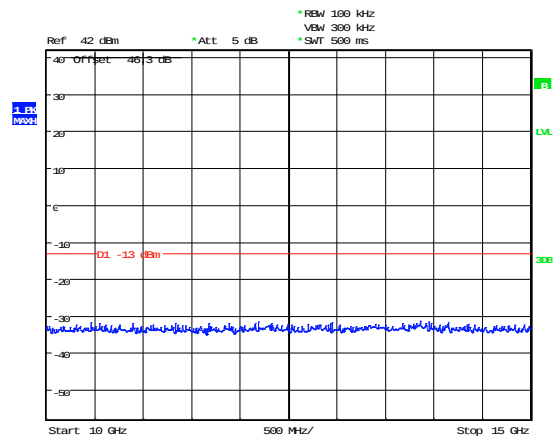
Date: 17.APR.2014 14:49:42

30MHz – 1GHz

1GHz – 5GHz



Date: 17.APR.2014 15:00:48



Date: 17.APR.2014 15:01:15

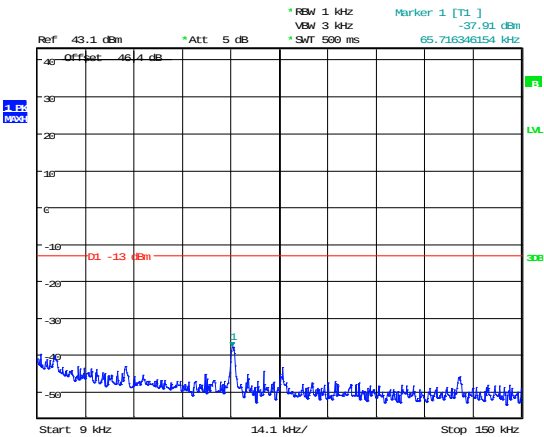
5GHz – 10GHz

10GHz – 15GHz

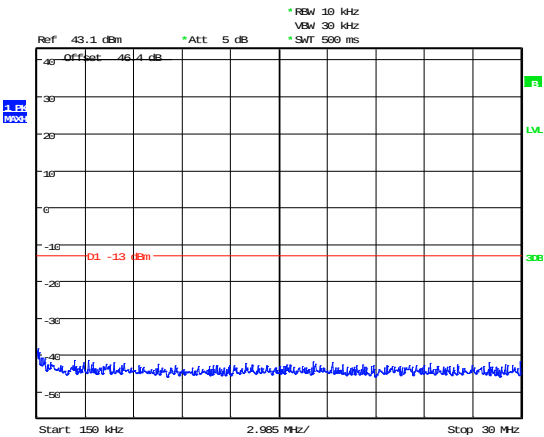


15GHz – 20GHz

1960.0 MHz



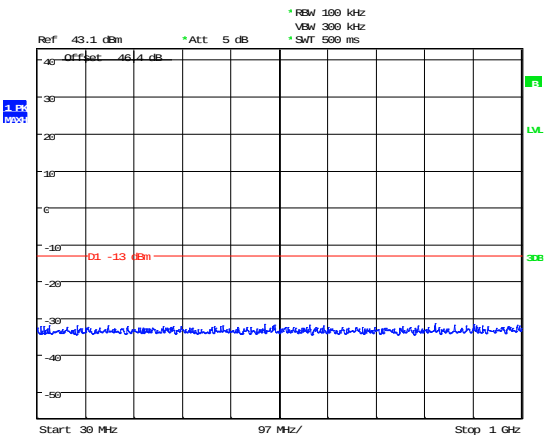
Date: 17.APR.2014 15:23:17



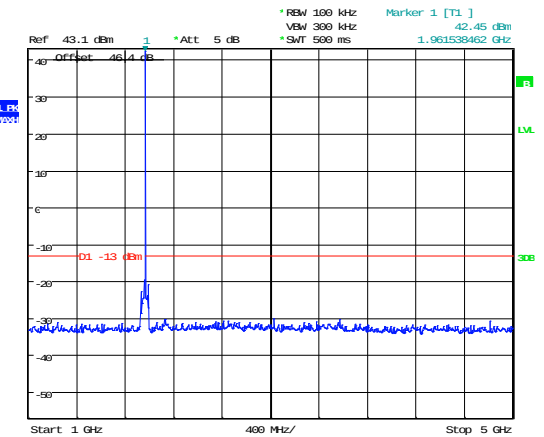
Date: 17.APR.2014 15:23:42

9kHz - 150kHz

150kHz – 30MHz



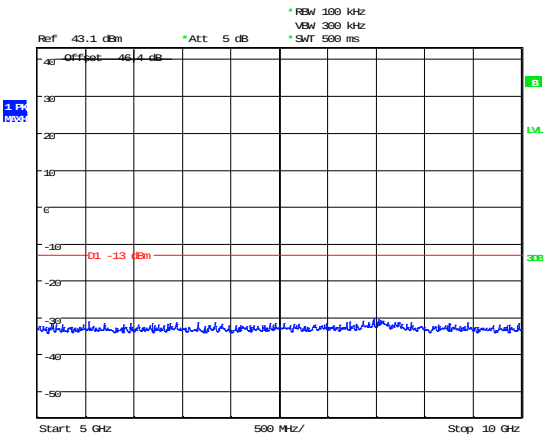
Date: 17.APR.2014 15:24:04



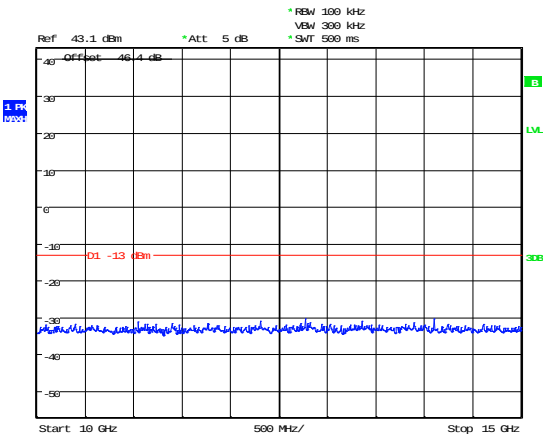
Date: 17.APR.2014 15:21:48

30MHz – 1GHz

1GHz – 5GHz



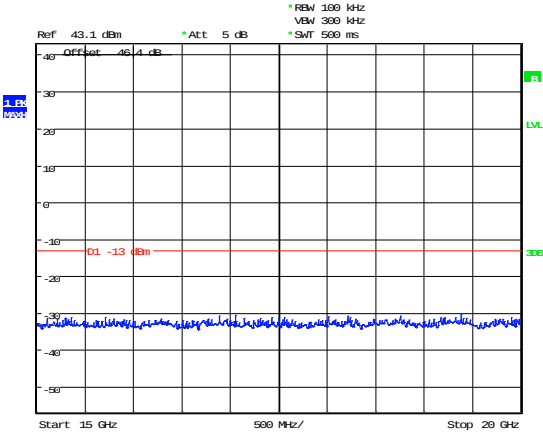
Date: 17.APR.2014 15:22:18



Date: 17.APR.2014 15:22:35

5GHz – 10GHz

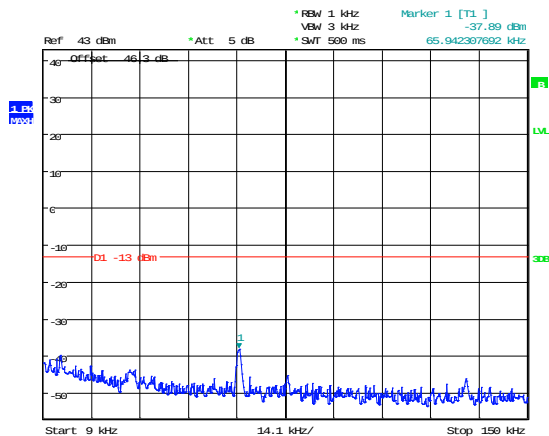
10GHz – 15GHz



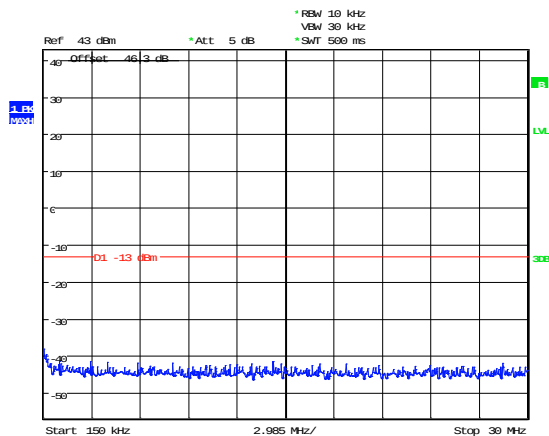
Date: 17.APR.2014 15:22:55

15GHz – 20GHz

1990 MHz



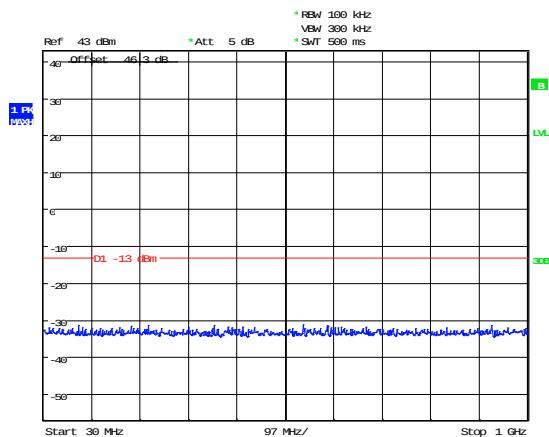
Date: 17.APR.2014 15:32:09



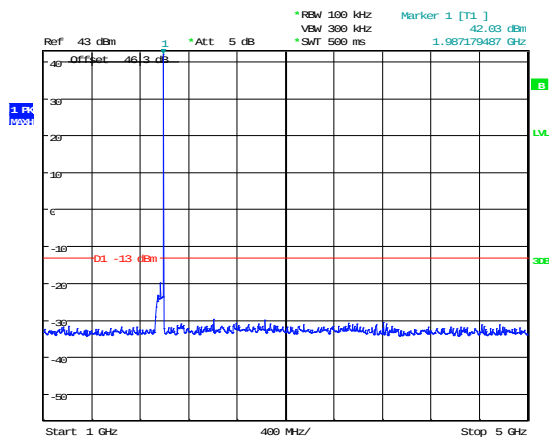
Date: 17.APR.2014 15:32:32

9kHz - 150kHz

150kHz – 30MHz



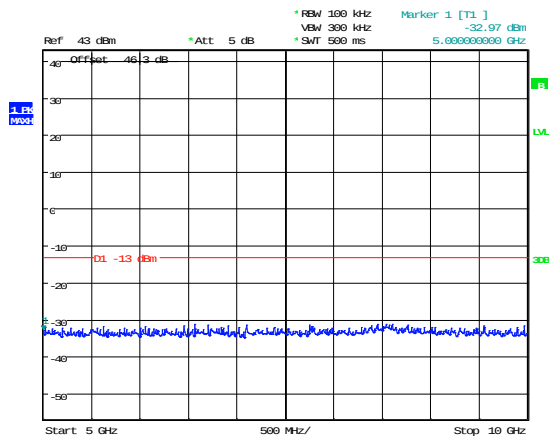
Date: 17.APR.2014 15:32:55



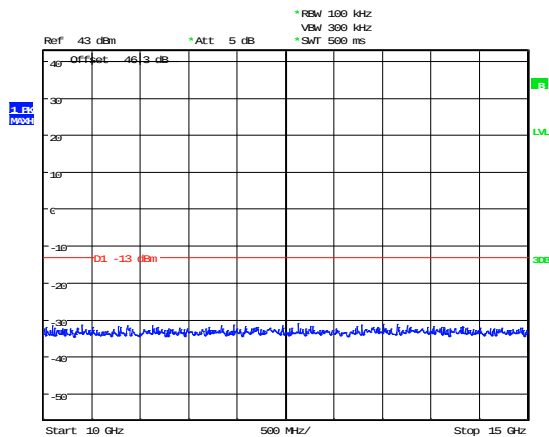
Date: 17.APR.2014 15:33:15

30MHz – 1GHz

1GHz – 5GHz



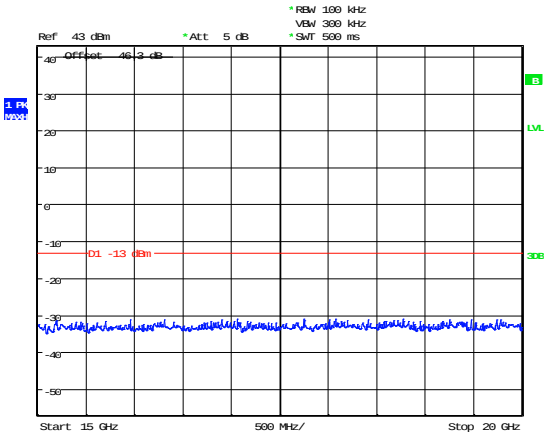
Date: 17.APR.2014 15:33:32



Date: 17.APR.2014 15:33:58

5GHz – 10GHz

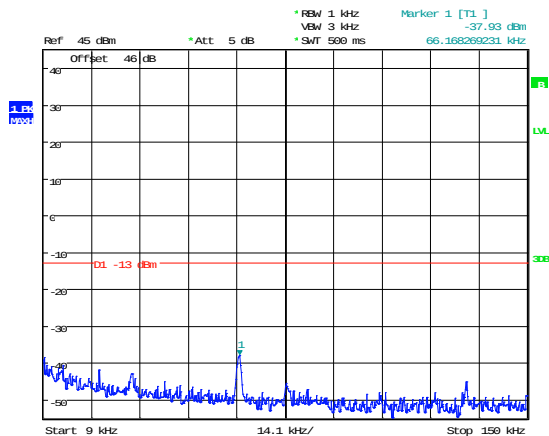
10GHz – 15GHz



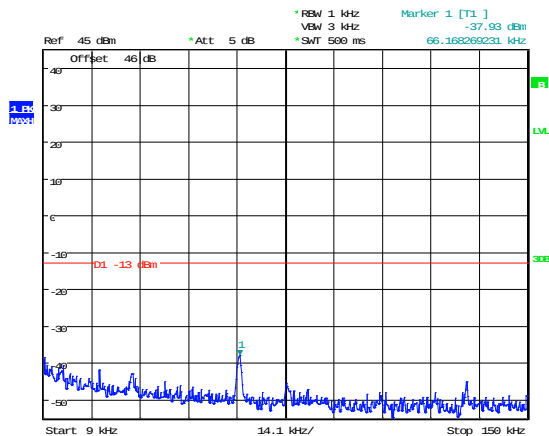
Date: 17.APR.2014 15:34:27

15GHz – 20GHz

2110 MHz

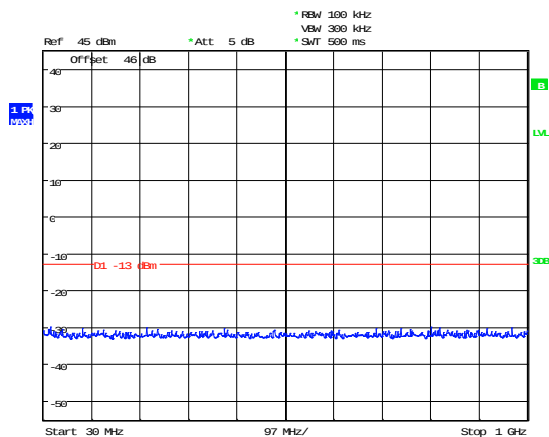


Date: 17.APR.2014 15:47:28



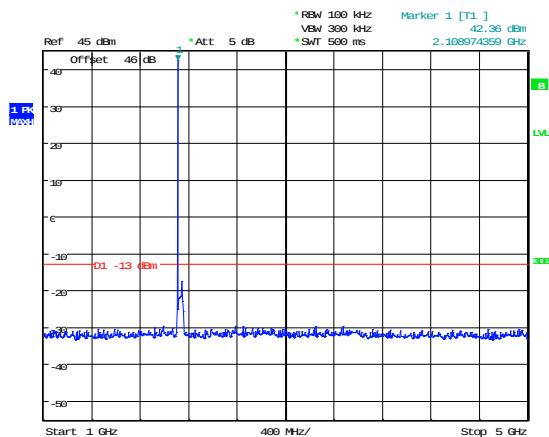
Date: 17.APR.2014 15:47:28

9kHz - 150kHz



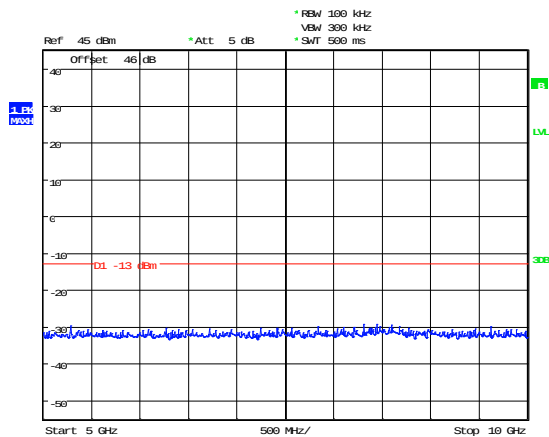
Date: 17.APR.2014 15:48:13

150kHz - 30MHz



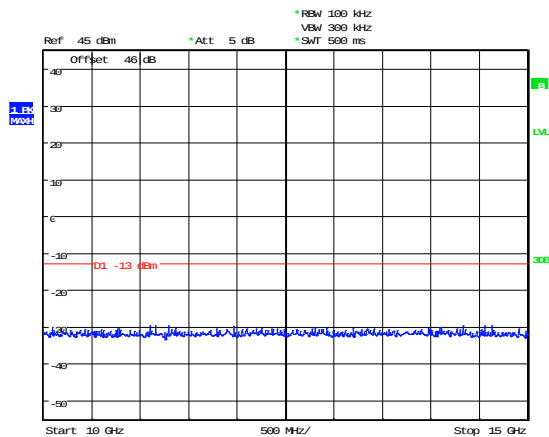
Date: 17.APR.2014 15:44:11

30MHz - 1GHz



Date: 17.APR.2014 15:52:50

1GHz - 5GHz



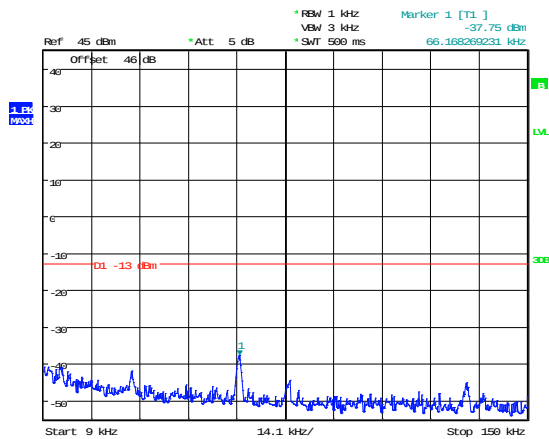
Date: 17.APR.2014 15:46:04

5GHz - 10GHz

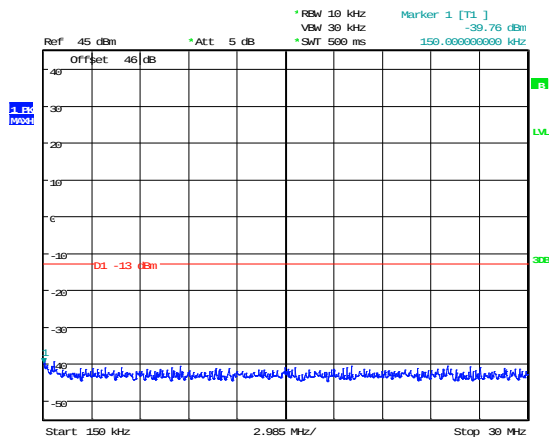
10GHz - 15GHz



2132.5 MHz



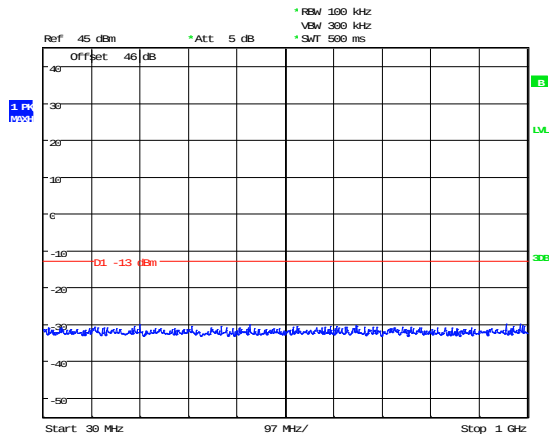
Date: 17.APR.2014 15:53:58



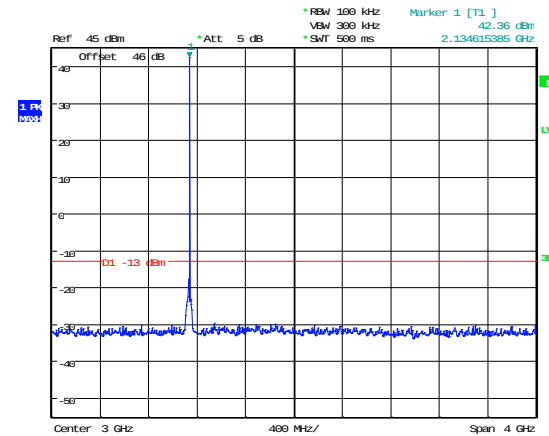
Date: 17.APR.2014 15:54:22

9kHz - 150kHz

150kHz – 30MHz



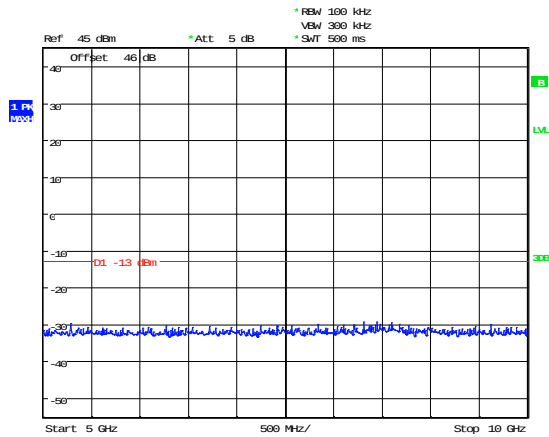
Date: 17.APR.2014 15:54:44



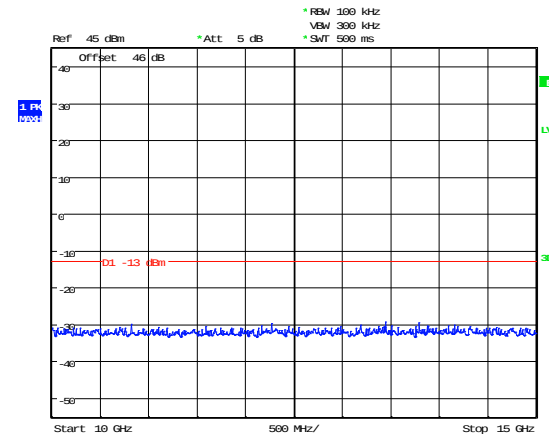
Date: 17.APR.2014 15:52:03

30MHz – 1GHz

1GHz – 5GHz



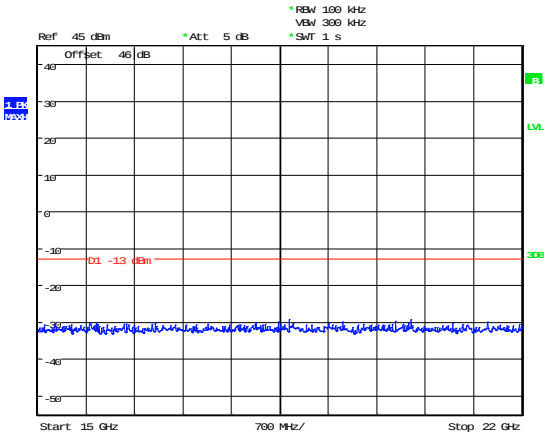
Date: 17.APR.2014 15:52:50



Date: 17.APR.2014 15:53:11

5GHz – 10GHz

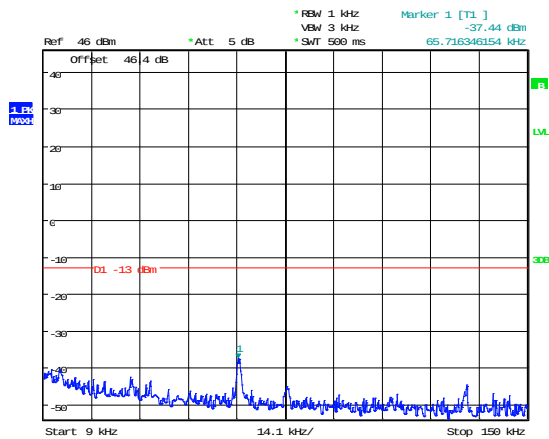
10GHz – 15GHz



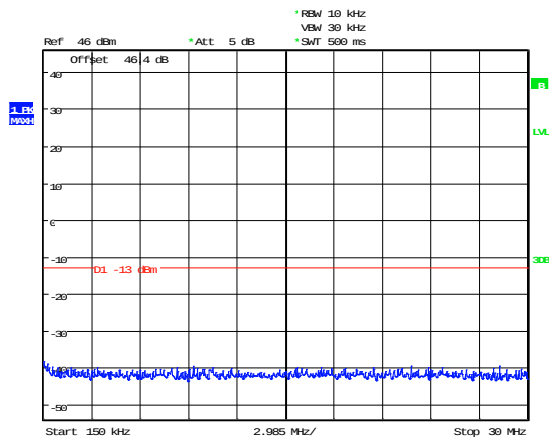
Date: 17.APR.2014 15:53:30

15GHz – 22GHz

2155.0 MHz



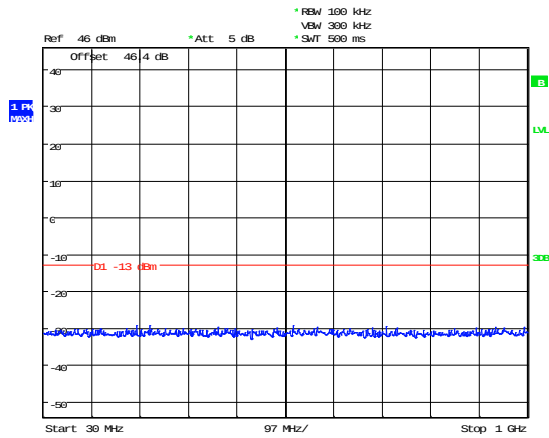
Date: 17.APR.2014 16:33:35



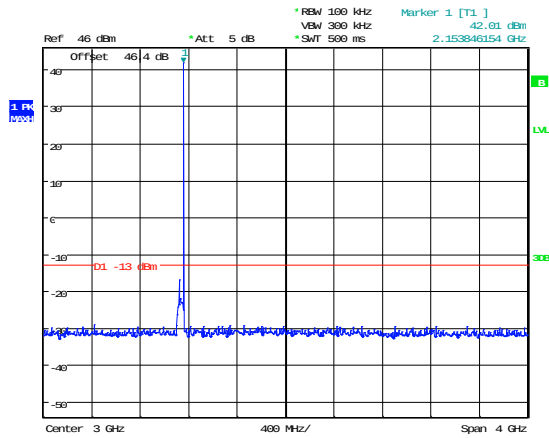
Date: 17.APR.2014 16:33:59

9kHz - 150kHz

150kHz – 30MHz



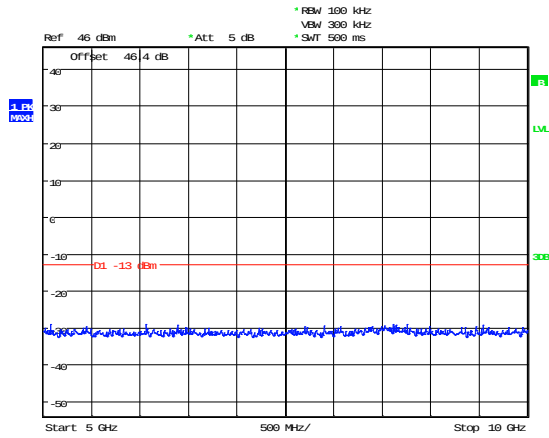
Date: 17.APR.2014 16:34:18



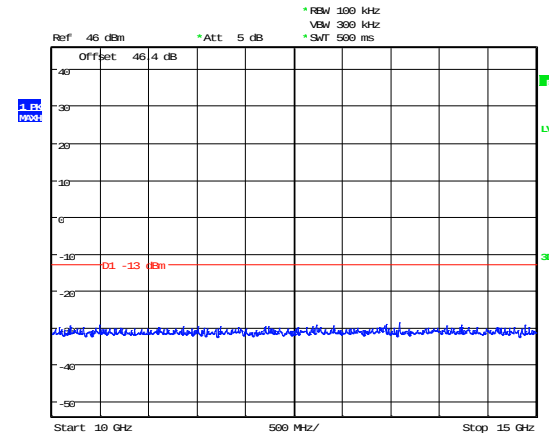
Date: 17.APR.2014 16:28:58

30MHz – 1GHz

1GHz – 5GHz



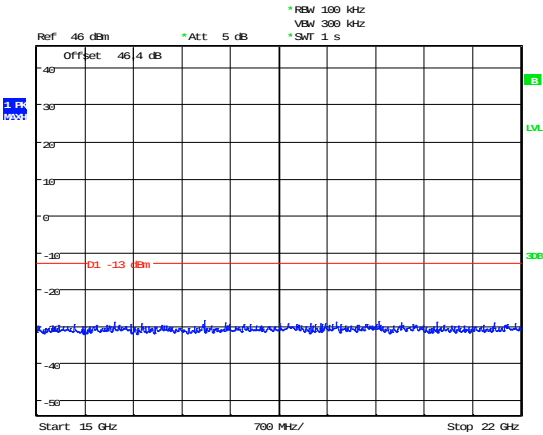
Date: 17.APR.2014 16:29:16



Date: 17.APR.2014 16:29:36

5GHz – 10GHz

10GHz – 15GHz



Date: 17.APR.2014 16:30:01

15GHz – 22GHz

B6 Radiated Electric Field Emissions

Preliminary scans were performed using a peak detector with the RBW = 100kHz. The radiated electric field emission test applies to all spurious and harmonic emissions. The EUT was set to transmit as required.

The following test site was used for final measurements as specified by the standard tested to:

3m open area test site : ☐

3m alternative test site : ☒

The effect of the EUT set-up on the measurements is summarised in note (c) below.

Test Details:	
Measurement standard	Part 2.1053, 22.917(a), 24.238(a), 27.53(c) & (g)
Frequency range	30 MHz – 22 GHz
EUT sample number	S01 & S02
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Frequency (MHz)	Freq. of Emission (MHz)	ERP/EIRP (dBm)	Limit (dBm)
1900 MHz			
1930.000	No Significant Emissions Within		-13
1962.500			-13
1995.000			-13
2100MHz			
2110.000	4219.990	-26.5	-13
2132.500	4265.000	-30.7	-13
2155.000	4310.000	-30.3	-13

Result

The EUT was found to comply with the limits

Notes:

1. Emissions Checked up to 10 times Fc.
2. The unit was mounted on a turntable and rotated through 360° and in 3 orthogonal planes to find the worst case emission.
3. For Frequencies below 1 GHz, RBW = 120 kHz, testing was performed with CISPR16 compliant test receiver with QP detector. Above 1 GHz tests were performed using a spectrum analyser using the following settings:

Peak Detector RBW = 1MHz; VBW = ≥RBW

4. Limit is determined as the outermost step of the emissions mask and is calculated as follows.

At least $43 + 10 \log P$ dB

$$(10 \log P_{\text{watts}}) - (43 + 10 \log (P_{\text{watts}} * 1000)) = \text{LIMIT} = -13 \text{ dBm}$$

The upper and lower frequency of the measurement range was decided according to 47 CFR Part 2.1057.

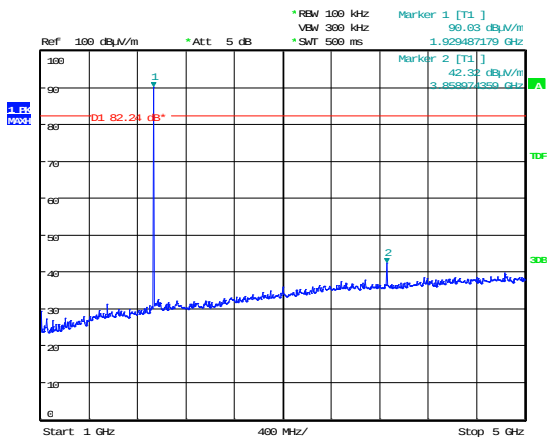
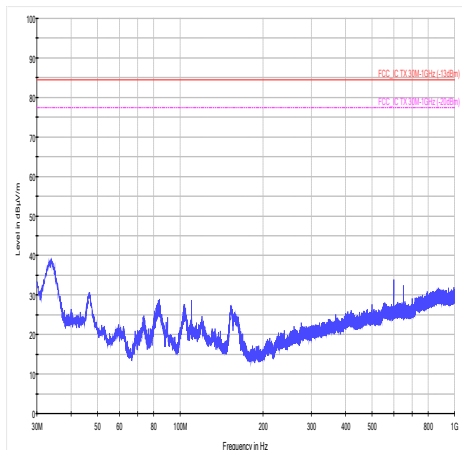
- (a) Where results have been measured at one distance, and a signal level displayed at another, the results have been extrapolated using the following formula:

$$\text{Extrapolation (dB)} = 20 \log_{10} \left(\frac{\text{measurement distance}}{\text{specification distance}} \right)$$

- (b) The levels may have been rounded for display purposes.
- (c) The following table summarises the effect of the EUT operating mode, internal configuration and arrangement of cables / samples on the measured emission levels :

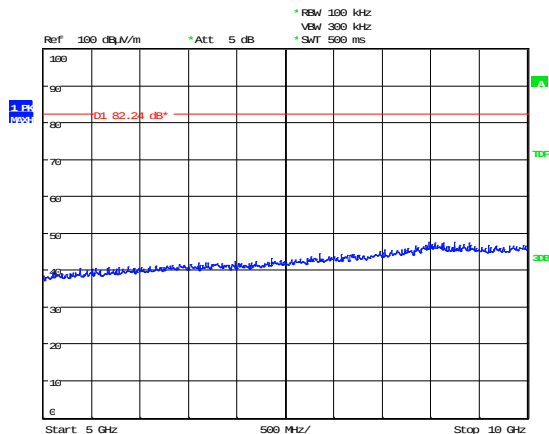
	See (i)	See (ii)	See (iii)	See (iv)
Effect of EUT operating mode on emission levels	✓			
Effect of EUT internal configuration on emission levels	✓			
Effect of Position of EUT cables & samples on emission levels			✓	
(i) Parameter defined by standard and / or single possible, refer to Appendix D (ii) Parameter defined by client and / or single possible, refer to Appendix D (iii) Parameter had a negligible effect on emission levels, refer to Appendix D (iv) Worst case determined by initial measurement, refer to Appendix D				

1930.0 MHz



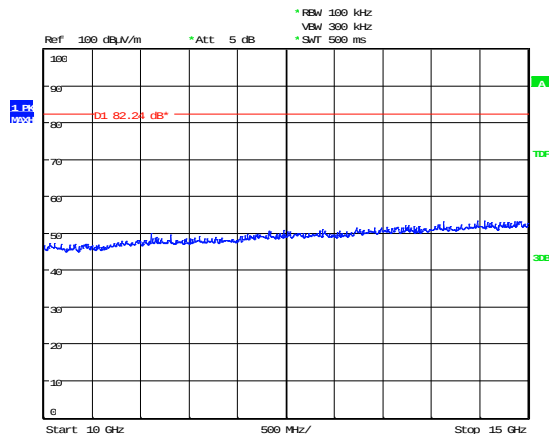
Date: 26.NOV.2014 10:59:10

30MHz – 1GHz



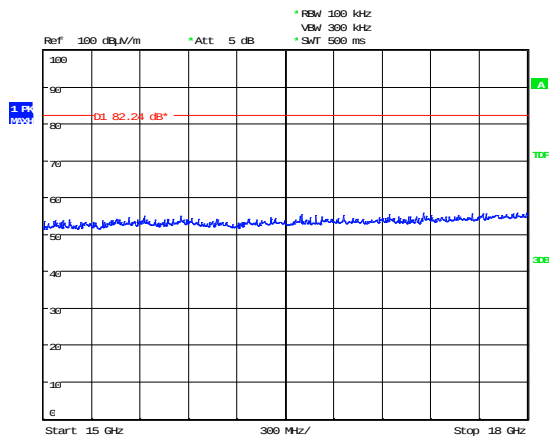
Date: 26.NOV.2014 11:00:22

1GHz – 5GHz



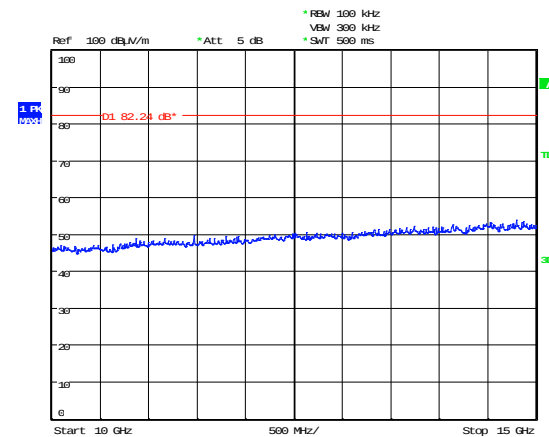
Date: 26.NOV.2014 11:01:28

5GHz – 10GHz



Date: 26.NOV.2014 11:02:40

10GHz – 15GHz

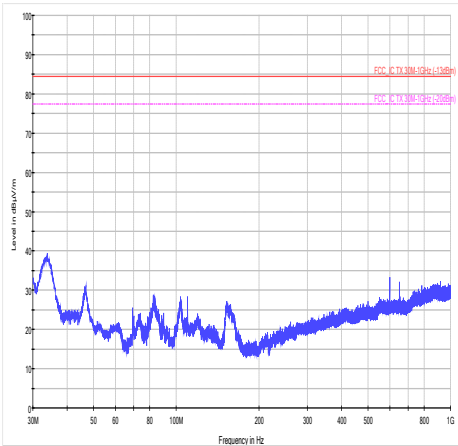


Date: 26.NOV.2014 11:07:35

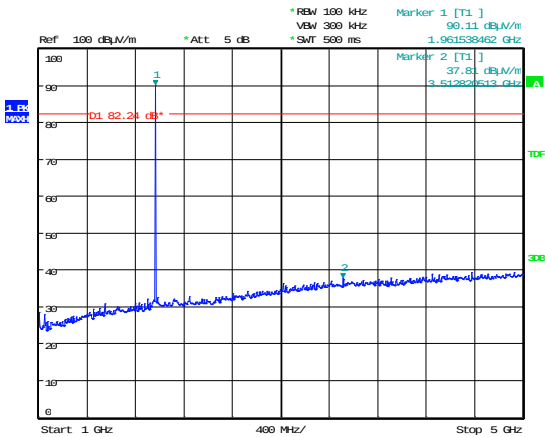
15GHz – 18GHz

18GHz – 22GHz

1960.0 MHz

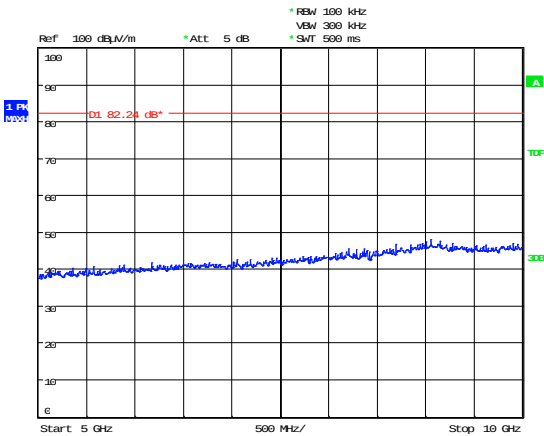


30MHz – 1GHz



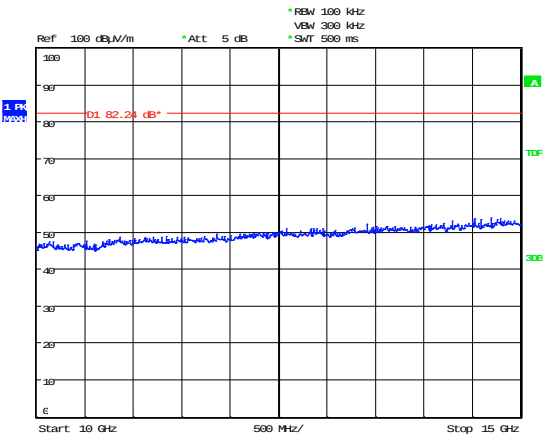
Date: 26.NOV.2014 11:12:14

1GHz – 5GHz



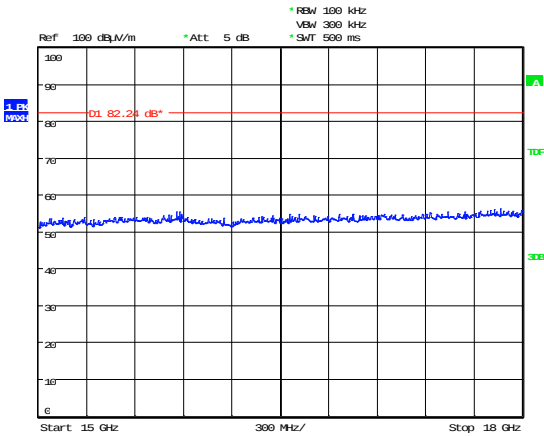
Date: 26.NOV.2014 11:13:16

5GHz – 10GHz



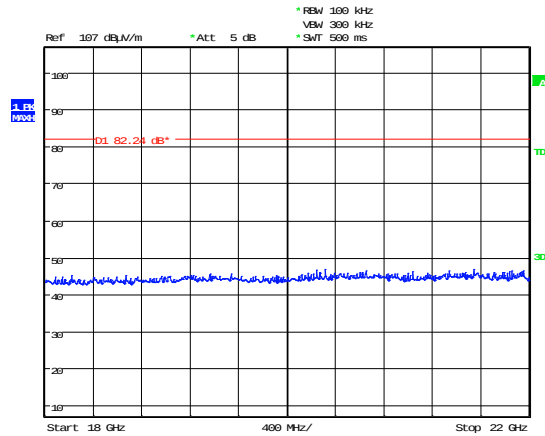
Date: 26.NOV.2014 11:14:49

10GHz – 15GHz



Date: 26.NOV.2014 11:15:50

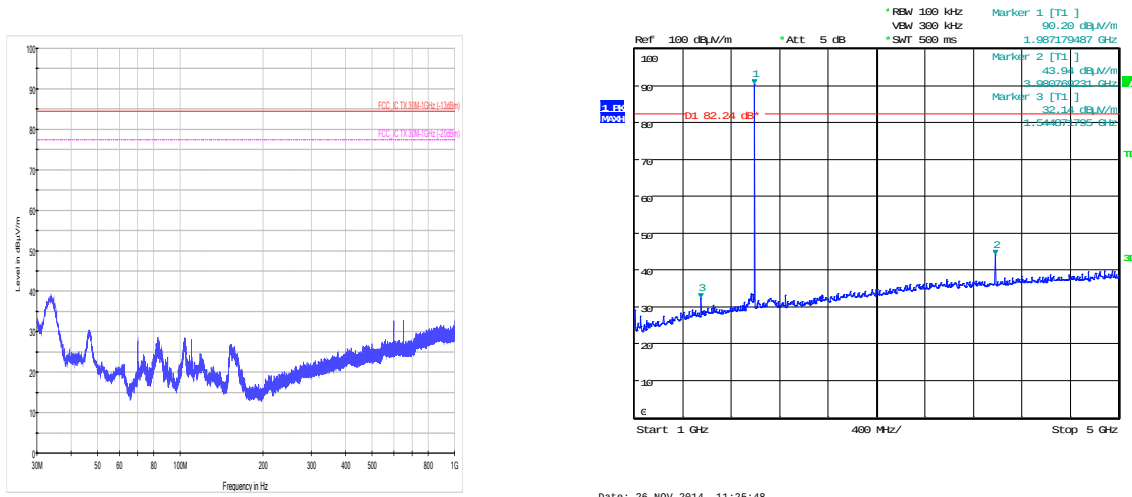
15GHz – 18GHz



Date: 26.NOV.2014 15:12:18

18GHz – 22GHz

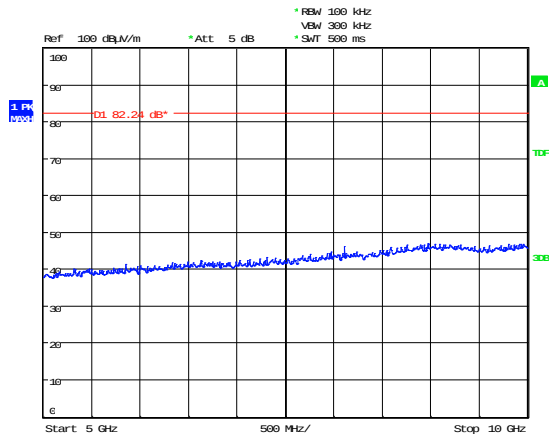
1995.0 MHz



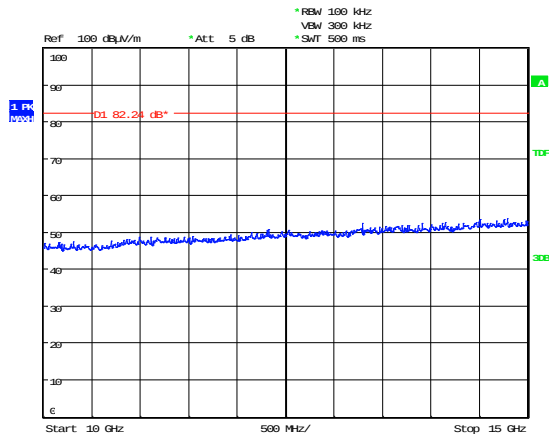
Date: 26.NOV.2014 11:25:48

30MHz – 1GHz

1GHz – 5GHz



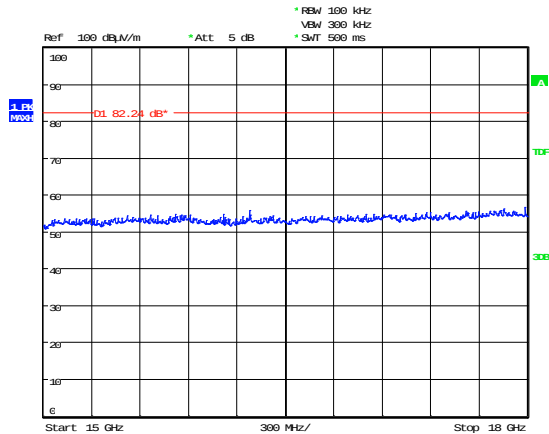
Date: 26.NOV.2014 11:27:11



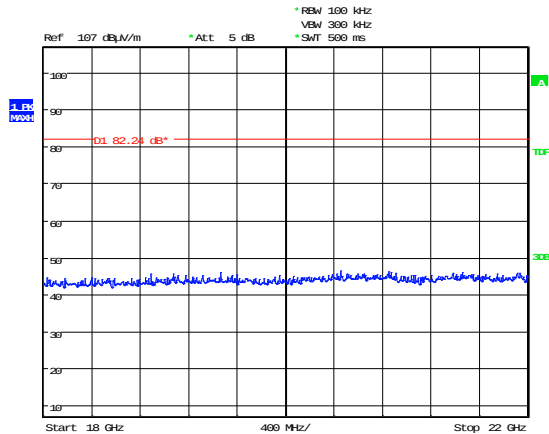
Date: 26.NOV.2014 11:28:18

5GHz – 10GHz

10GHz – 15GHz



Date: 26.NOV.2014 11:30:08

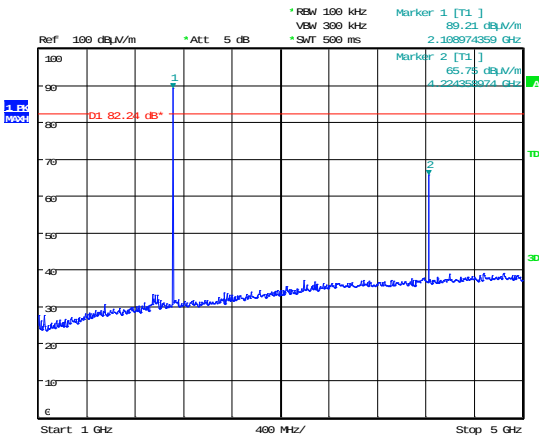
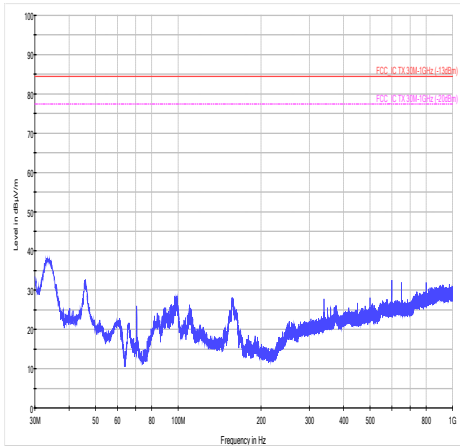


Date: 26.NOV.2014 15:13:01

15GHz – 18GHz

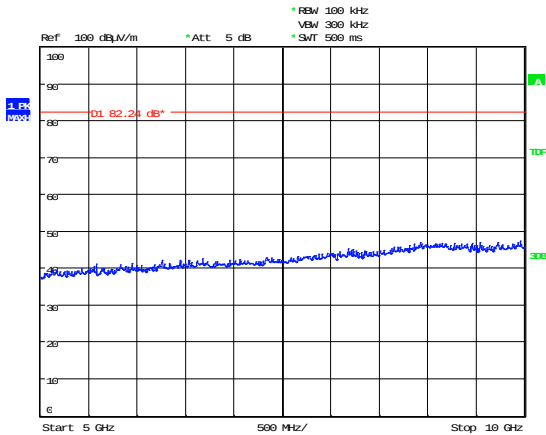
18GHz – 22GHz

2110.0 MHz



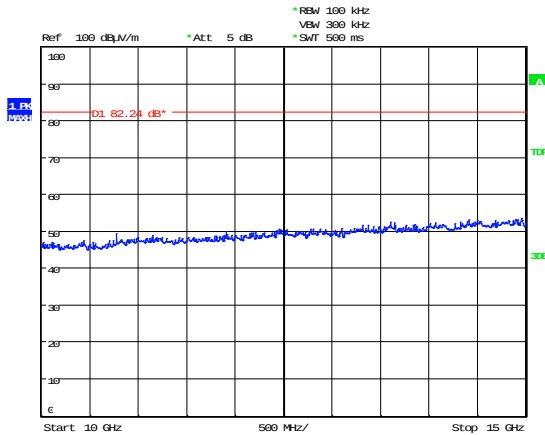
Date: 26.NOV.2014 11:53:51

30MHz – 1GHz



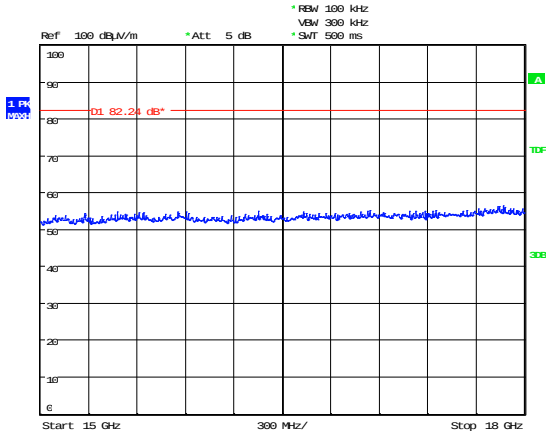
Date: 26.NOV.2014 11:54:59

1GHz – 5GHz



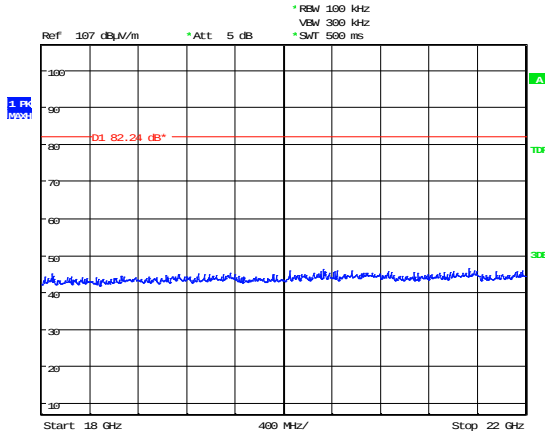
Date: 26.NOV.2014 11:55:58

5GHz – 10GHz



Date: 26.NOV.2014 11:56:58

10GHz – 15GHz

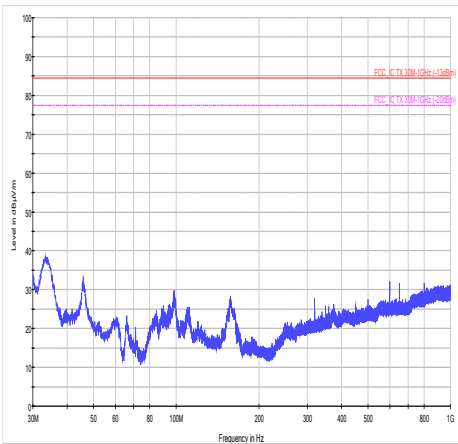


Date: 26.NOV.2014 15:27:00

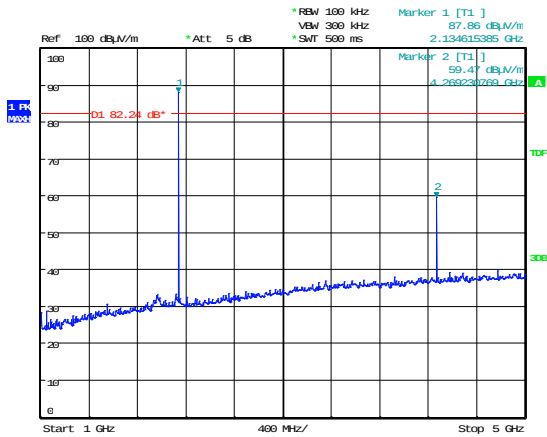
15GHz – 18GHz

18GHz – 22GHz

2132.5 MHz

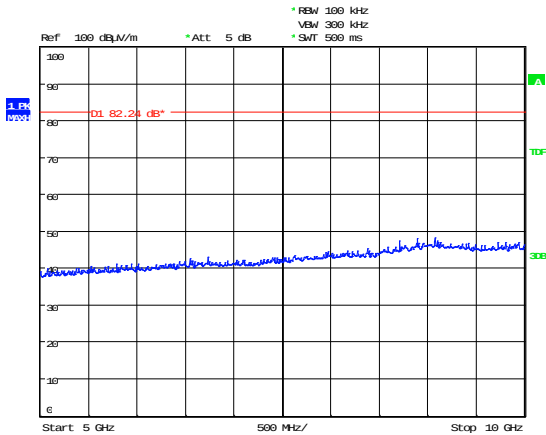


30MHz – 1GHz



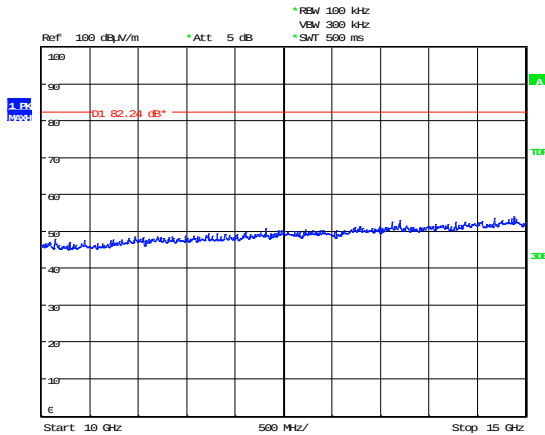
1GHz – 5GHz

Date: 26.NOV.2014 12:04:21



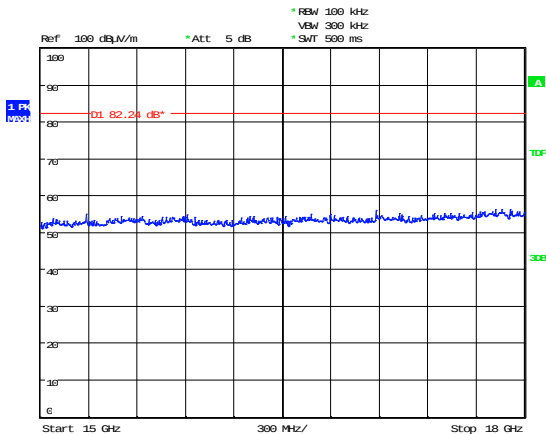
5GHz – 10GHz

Date: 26.NOV.2014 12:10:45



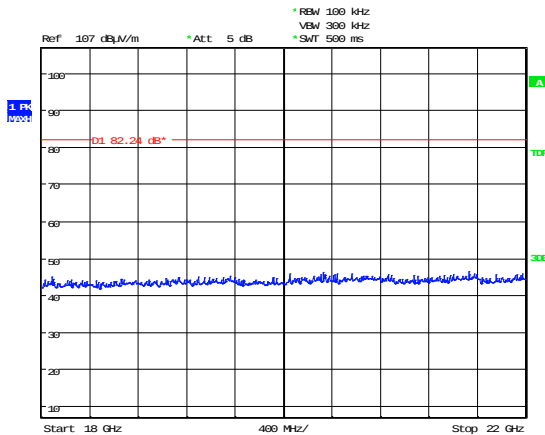
10GHz – 15GHz

Date: 26.NOV.2014 12:06:31



15GHz – 18GHz

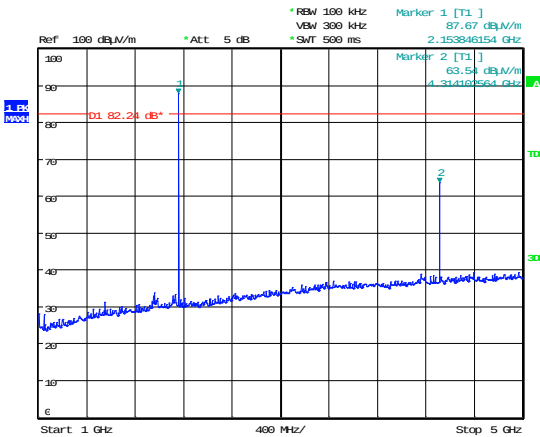
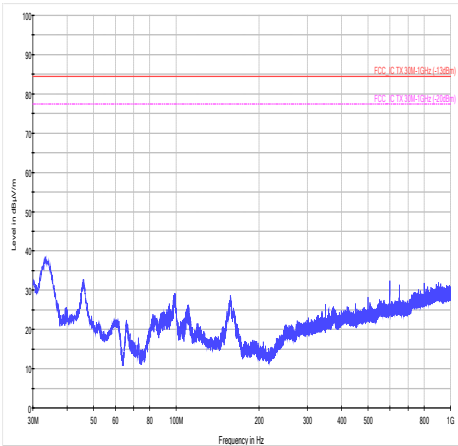
Date: 26.NOV.2014 12:07:41



18GHz – 22GHz

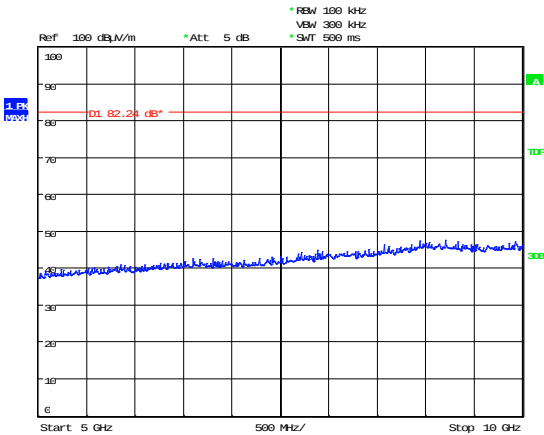
Date: 26.NOV.2014 15:27:00

2155.0 MHz



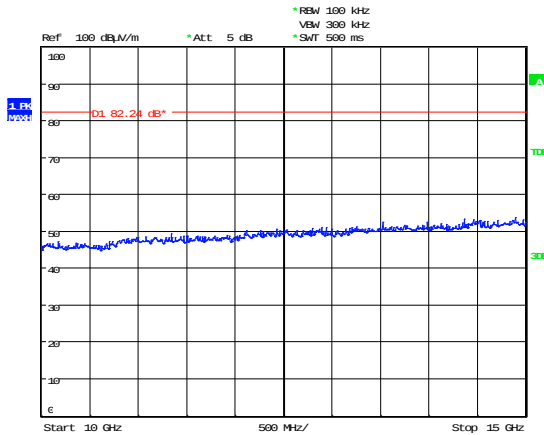
Date: 26.NOV.2014 12:19:36

30MHz – 1GHz



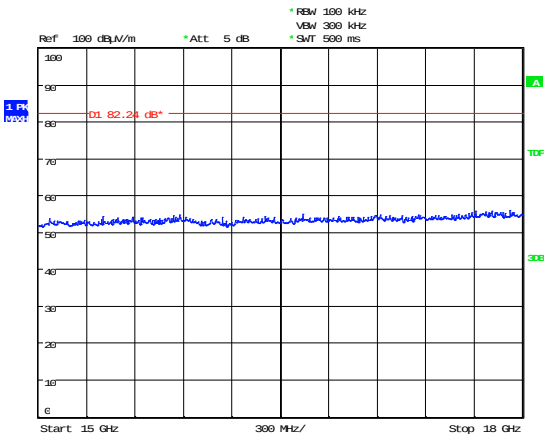
Date: 26.NOV.2014 12:20:41

1GHz – 5GHz



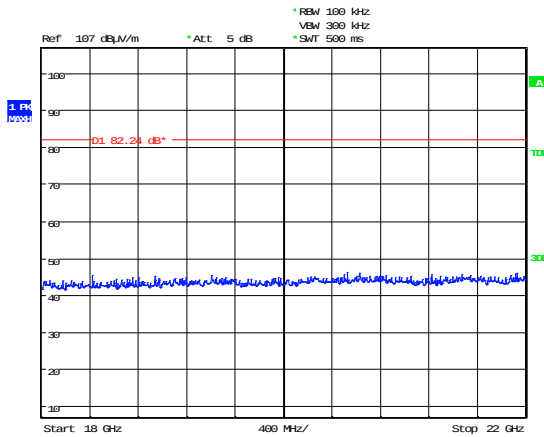
Date: 26.NOV.2014 12:21:44

5GHz – 10GHz



Date: 26.NOV.2014 12:22:56

10GHz – 15GHz



Date: 26.NOV.2014 15:29:35

15GHz – 18GHz

18GHz – 22GHz

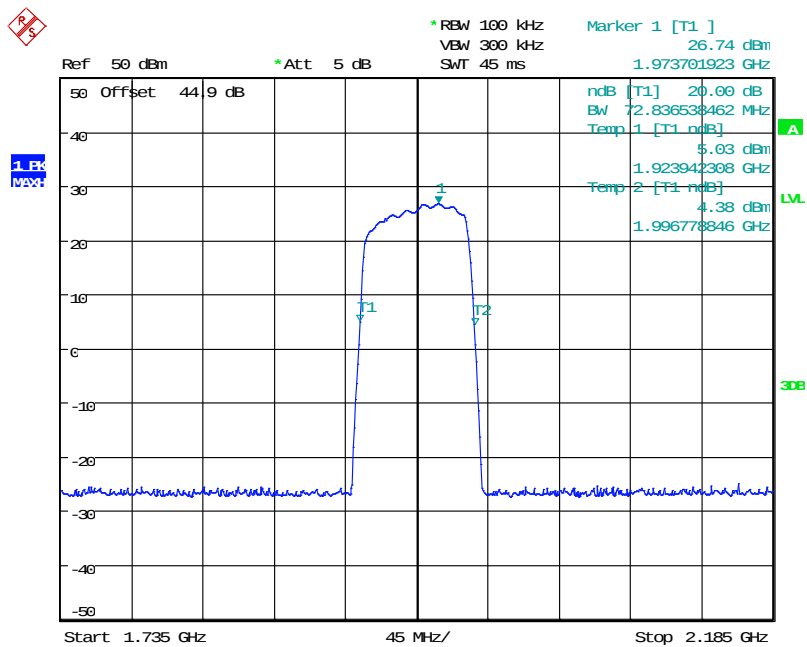
B7 Passband Gain & Bandwidth

Test Details:	
Measurement standard	D.3 Policies + Procedures (k) of KDB 935210 D02 Signal Boosters Certification v02
EUT sample number	S03
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

BAND	Frequency MHz	fl	fh	20 dB Bandwidth
1900 MHz Upper	1930 - 1990 MHz	1.923943GHz	1.996778GHz	72.836MHz
1700 MHz (AWS)	2110 - 2155 MHz	2.098605GHz	2.167115GHz	68.509MHz

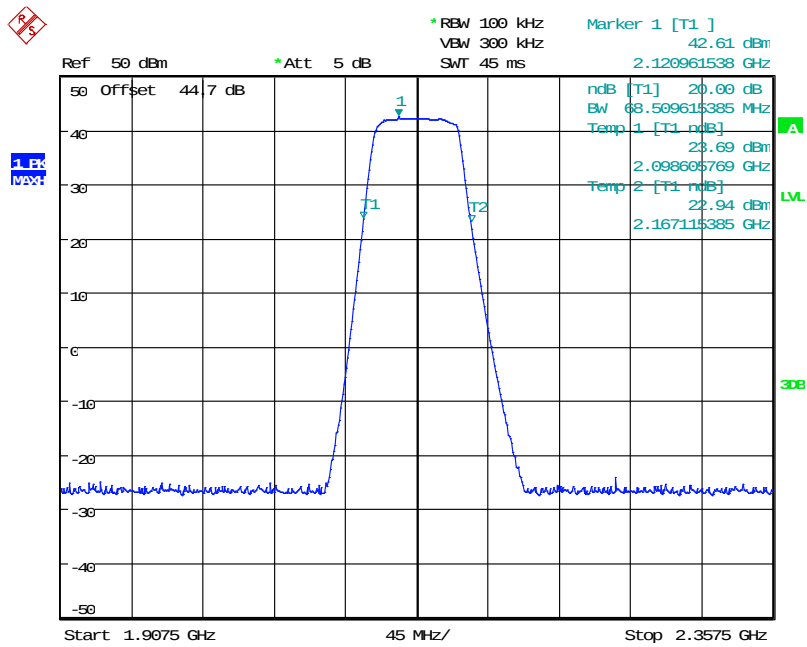
See below for plots showing passband gain & bandwidth

With the aid of a CW Swept signal generator and spectrum analyser, the bandwidth and frequency response of the open channel (i.e. at the point where the gain has fallen by 20 dB) is measured. This measurement shows the gain-versus-frequency response of the open channel from the midband frequency f_0 of the channel up to at least $f_0 + 250\%$ of the 20 dB bandwidth.



Date: 19.SEP.2014 12:35:03

1900 MHz



Date: 19.SEP.2014 11:19:19

2100MHz

Appendix C:**Additional Test and Sample Details**

This appendix contains details of:

1. The samples submitted for testing.
2. Details of EUT operating mode(s)
3. Details of EUT configuration(s) (see below).
4. EUT arrangement (see below).

Throughout testing, the following numbering system is used to identify the sample and it's modification state:

Sample No: Sxx Mod w

where:

xx	= sample number	eg. S01
w	= modification number	eg. Mod 2

The following terminology is used throughout the test report:

Support Equipment (SE) is any additional equipment required to exercise the EUT in the applicable operating mode. Where relevant SE is divided into two categories:

SE in test environment: The SE is positioned in the test environment and is not isolated from the EUT (e.g. on the table top during REFE testing).

SE isolated from the EUT: The SE is isolated via filtering from the EUT. (e.g. equipment placed externally to the ALSR during REFE testing).

EUT configuration refers to the internal set-up of the EUT. It may include for example:

- Positioning of cards in a chassis.
- Setting of any internal switches.
- Circuit board jumper settings.
- Alternative internal power supplies.

Where no change in EUT configuration is **possible**, the configuration is described as "single possible configuration".

EUT arrangement refers to the termination of EUT ports / connection of support equipment, and where relevant, the relative positioning of samples (EUT and SE) in the test environment.

For further details of the test procedures and general test set ups used during testing please refer to the related document "EMC Test Methods - An Overview", which can be supplied by TRaC Global upon request.

C1) Test samples

The following samples of the apparatus were submitted by the client for testing :

Sample No.	Description
S01	MBF-4317-4319
S02	OMU

C2) EUT Operating Mode During Testing.

During testing, the EUT was exercised as described in the following tables :

Test	Description of Operating Mode:
All tests detailed in this report	EUT active, operating at maximum gain and output power

C3) EUT Configuration Information.

The EUT was submitted for testing in one single possible configuration.

C4) List of EUT Ports

The tables below describe the termination of EUT ports:

Sample : S01 & S02
Tests : Conducted

Port	Description of Cable Attached	Cable length	Equipment Connected
Server / Donor	Coaxial	2m	Measurement System
Power	Multi core	1.5m	AC Mains

Sample : S01 & S02
Tests : Radiated Emissions

Port	Description of Cable Attached	Cable length	Equipment Connected
Server / Donor	Coaxial	2m	Measurement System
Power	Multi core	1.5m	AC Mains

* Only connected during setup.

C5 Details of Equipment Used

TRaC No	Equipment Type	Equipment Description	Manufacturer	Last Cal	Cal Period	Due For Cal
L352	ESVS10	Receiver	R&S	21/03/2014	12	21/03/2015
UH093	CBL6112B	Bilog	Chase	08/07/2013	24	08/07/2015
UH281	FSU46	Spectrum Analyser	R&S	26/03/2014	12	26/03/2015
UH405	FSU26	Spectrum Analyser	R&S	16/04/2014	12	16/04/2015
L138	3115	1-18GHz Horn	EMCO	17/10/2013	24	17/10/2015
L139	3115	1-18GHz Horn	EMCO	20/09/2013	24	20/09/2015
L300	20240-20	Horn 18-26GHz	Flann	10/02/2014	24	10/02/2016
L572	8449B	Pre Amp	Agilent	11/02/2014	24	11/02/2015
REF916	SMBV100A	Signal Generator	R&S	19/02/2014	12	19/02/2015
REF940	ATS	Radio Chamber - PP	Rainford EMC	08/09/2014	12	08/09/2016
REF976	34405a	Multimeter	Agilent	19/05/2014	12	19/05/2015
UH272	N TYPE	Cable	TRaC	Cal in use		
UH273	N TYPE	Cable	TRaC	Cal in use		
UH274	N TYPE	Cable	TRaC	Cal in use		
TRLUH225	Attenuator	100W/20dB	Spinner	Cal in use		
TRL112	Attenuator	75W/10dB	Bird	Cal in use		
N/A	Attenuator	10W/20dB	Axell Wireless	Cal in use		

Appendix D:

Additional Information

No additional information is included within this test report.

Appendix E:

Photographs and Figures

The following photographs were taken of the test samples:

1. Radiated electric field emissions arrangement

Photograph 1



