

A RADIO TEST REPORT
FOR
DISPLAYDATA LTD
ON
AURA 29 ELECTRONIC LABEL
DOCUMENT NO.TRA-017329WUS1

HULL

Unit E, South Orbital Trading Park, Hedon Road, Hull, HU9 1NJ, UK.
T +44 (0)1482 801801 **F** +44 (0)1482 801806 **E** test@tracglobal.com
www.tracglobal.com

TRaC Wireless Test Report : TRA-017329WUS1

Applicant : Displaydata Ltd

Apparatus : Aura 29 Electronic Label

Specification(s) : CFR47 Part 15.249

Purpose of Test : Certification

FCCID : VC7120-0112

Authorised by

:



: Radio Product Manager

Issue Date

: 10th February 2014

Authorised Copy Number

: PDF

Contents

Section 1:	Introduction	4
1.1	General	4
1.2	Tests Requested By	5
1.3	Manufacturer	5
1.4	Apparatus Assessed	5
1.5	Test Result Summary	6
1.6	Notes Relating To The Assessment	7
1.7	Deviations from Test Standards	7
Section 2:	Measurement Uncertainty	8
2.1	Measurement Uncertainty Values	8
Section 3:	Modifications	10
3.1	Modifications Performed During Assessment	10
Appendix A:	Formal Emission Test Results	11
A1	Transmitter Intentional Emission Radiated	12
A2	Transmitter Bandwidth	13
A3	Radiated Electric Field Emissions	14
A4	Unintentional Radiated Emissions	17
Appendix B:	Supporting Graphical Data	19
Appendix C:	Additional Test and Sample Details	35
Appendix D:	Additional Information	41
Appendix E:	Calculation of the duty cycle correction factor	42
Appendix F:	Photographs and Figures	43
Appendix G:	MPE Calculation	46

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.

Test performed by: TRaC Global []
Unit E
South Orbital Trading Park
Hedon Road
Hull, HU9 1NJ.
United Kingdom.

Telephone: +44 (0) 1482 801801
Fax: +44 (0) 1482 801806

TRaC Global [X]
Unit 1
Pendle Place
Skelmersdale
West Lancashire, WN8 9PN
United Kingdom

Telephone: +44 (0) 1695 556666
Fax: +44 (0) 1695 577077

Email: test@tracglobal.com
Web site: <http://www.tracglobal.com>

Tests performed by: A Tosif

Report author: A Longley

This report must not be reproduced except in full without prior written permission from TRaC Global.

1.2 Tests Requested By

This testing in this report was requested by:

Displaydata Ltd

Building 3
Kingswood
Kings Ride
Ascot
Berkshire
SL5 8AD
United Kingdom

1.3 Manufacturer

As Above

1.4 Apparatus Assessed

The following apparatus was assessed between 18th December 2013 – 10th January 2014:

Aura 29 Electronic Label

The above device is a Radio Transceiver Module operating in the 902 – 928 MHz band.

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	Regulation	Measurement standard	Result
	Title 47 of the CFR: Part 15 Subpart (c)		
Intentional Emission Field Strength	15.249 (a)	ANSI C63.10:2009	Pass
Intentional Emission Band Occupancy	15.215 (c)	ANSI C63.10:2009	Pass
Spurious Emissions Radiated <1000MHz	15.209 & 15.249 (a) (d)	ANSI C63.10:2009	Pass
Unintentional Radiated Spurious Emissions	15.109	ANSI C63.10:2009	Pass

Abbreviations used in the above table:

ANSI C 63.10:2009 is outside the scope of the laboratories UKAS accreditation.

CFR : Code of Federal Regulations
REFE : Radiated Electric Field Emissions

ANSI : American National Standards Institution
PLCE : Power Line Conducted Emissions

1.6 Notes Relating To The 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 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 CFR47 Part 2 & RSS-Gen.

1.7 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 in accordance with note (iii) of Section 2.1 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:

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	Ref	: Reference
SE	: Support Equipment	Freq	: Frequency
L	: Live Power Line	MD	: Measurement Distance
N	: Neutral Power Line	SD	: Spec Distance
E	: Earth Power Line		
Pk	: Peak Detector	Pol	: Polarisation
QP	: Quasi-Peak Detector	H	: Horizontal Polarisation
Av	: Average Detector	V	: Vertical Polarisation
CDN	: Coupling & decoupling network		

A1 Transmitter Intentional Emission Radiated

Test Details:	
Regulation	Part 15.249 (a)
Measurement standard	ANSI C63.10:2009
EUT sample number	S11
Modification state	0
SE in test environment	None
SE isolated from EUT	S1, S3, TRaC Belkin Router
EUT set up	Refer to Appendix C
Temperature	21.5
Photographs	Appendix F

FREQ. (MHz)	MEASUREMENT Rx. READING (dBµV)	CABLE LOSS (dB)	ANT FACTOR (dB/m)	PRE AMP (dB)	FIELD STRENGTH (dBµV/m)	FIELD STRENGTH (mV/m)
902.5	68.0	2.8	20.8	N/A	91.6	38.0
927.5	67.9	2.8	20.8	N/A	91.5	37.6
Limit value @ fc			50mV/m @ 3m			

- Notes:**
- 1 Results quoted are extrapolated as indicated
 - 2 Receiver detector @ fc Quasi Peak 120kHz bandwidth
 - 3 When battery powered the EUT was powered with new batteries

- Test Method:**
- 1 As per Radio – Noise Emissions, ANSI C63.10:2009
 - 2 Measuring distances 3m
 - 3 EUT 0.8 metre above ground plane
 - 4 Emissions maximised by rotation of EUT, on an automatic turntable.
Raising and lowering the receiver antenna between 1m & 4m.
Horizontal and vertical polarisations, of the receive antenna.
EUT orientation in three orthogonal planes.
Maximum results recorded

A2 Transmitter Bandwidth

Test Details:	
Regulation	Part 15.215 (c)
Measurement standard	ANSI C63.10:2009
EUT sample number	S11
Modification state	0
SE in test environment	None
SE isolated from EUT	S1, S3, TRaC Belkin Router
EUT set up	Refer to Appendix C
Temperature	25

Band occupancy @ -20 dBc			
FREQ. (MHz)	f lower (MHz)	f higher (MHz)	Occ BW (kHz)
902.5	902.474038462	902.537980769	63.9423
927.5	927.475721154	927.538221154	62.5000

Notes:

The 20dB Band Width of the carrier must be contained within the frequency band 902-928MHz.

A3 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 emissions and harmonics emissions. The maximum permitted field strength is listed in Section 15.209. 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:	
Regulation	Part 15.209, 15.249 (a) & (d), Annex 2 A2.9(a)
Measurement standard	ANSI C63.10:2009
Frequency range	30MHz -10GHz
EUT sample number	S11
Modification state	0
SE in test environment	None
SE isolated from EUT	S1, S3, TRaC Belkin Router
EUT set up	Refer to Appendix C
Temperature	23.7
Photographs	Appendix F

The worst case radiated emission measurements for spurious emissions and harmonics that fall within the restricted bands are listed below:

Test Details: EUT Transmitting @ 902.5 MHz									
DET	FREQ. (MHz)	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (µV/m)	LIMIT (µV/m)
Qp	308.15	8	1.9	13.4	N/A	23.3	-	14.6	200
Qp	805.5	13.2	3.5	20.3	N/A	37.0	-	70.8	200
Qp	889.5	19.9	3.5	20.8	N/A	44.2	-	162.2	200
Qp	903.35	16.8	3.5	20.9	N/A	41.2	-	114.8	200
Qp	915.5	19.1	3.6	20.9	N/A	43.6	-	151.4	200
Qp	954.5	13.8	3.6	21.3	N/A	38.7	-	86.1	200
Pk	5415.04	54.73	3.5	34	35.8	56.7	-	683.9	5000
Av	5415.04	51.11	3.5	34	35.8	53.1	-	451.9	500

Test Details: EUT Transmitting @ 927.5 MHz									
DET	FREQ. (MHz)	MEAS Rx (dBμV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBμV/m)	EXTRAP FACT (dB)	FIELD ST'GH (μV/m)	LIMIT (μV/m)
Qp	823.5	11.8	3.4	20.3	N/A	35.5	-	59.6	200
Qp	875.52	13.6	3.5	20.4	N/A	37.5	-	75.0	200
Qp	914.5	17.3	3.6	20.9	N/A	41.8	-	123.0	200
Qp	940.5	17.2	3.6	21.1	N/A	41.9	-	124.5	200
Qp	979.5	14.0	3.6	21.7	N/A	39.3	-	92.3	200
Pk	5565.05	55.1	3.5	33.9	35.8	57.0	-	707.9	5000
Av	5565.05	51.3	3.5	33.9	35.8	53.2	-	457.1	500

Notes:

- 1 Any testing performed below 30 MHz was performed using a magnetic loop antenna in accordance with ANSI C63.10:2009: section 4.5, Table 1 For emissions below 30MHz the cable losses are assumed to be negligible.
- 2 In accordance with 15.35(b), above 1 GHz, emissions measured using a peak detector shall not exceed a level 20 dB above the average limit.
- 3 Testing was performed with the EUT orientated in three orthogonal planes and the maximum emissions level recorded. In addition, the EUT antenna was varied within its range of motion in order to maximise emissions.
- 4 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 RBW= 1MHz, VBW ≥ RBW
Average RBW= 1MHz, VBW ≥ RBW

The upper and lower frequency of the measurement range was decided according to 47 CFR Part 15 Clause 15.33(a) and 15.33(a)(1).

Radiated emission limits 47 CFR Part 15: Clause 15.209 for all emissions:

Frequency of emission (MHz)	Field strength $\mu\text{V/m}$	Measurement Distance m	Field strength $\text{dB}\mu\text{V/m}$
0.009-0.490	2400/F(kHz)	300	67.6/F (kHz)
0.490-1.705	24000/F(kHz)	30	87.6/F (kHz)
1.705-30	30	30	29.5
30-88	100	3	40.0
88-216	150	3	43.5
216-960	200	3	46.0
Above 960	500	3	54.0

- (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 C (ii) Parameter defined by client and / or single possible, refer to Appendix C (iii) Parameter had a negligible effect on emission levels, refer to Appendix C (iv) Worst case determined by initial measurement, refer to Appendix C				

A4 Unintentional Radiated Emissions

Preliminary scans were performed using a peak detector with the RBW = 100kHz. The radiated electric field emission test applies to all spurious emissions on directly related to the transmitter. The maximum permitted field strength is listed in Section 15.109. The EUT was set to operate in a transmit standby / receive mode.

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:	
Regulation	Title 47 of the CFR, Part 15 Subpart (c) Clause 15.109
Measurement standard	ANSI C63.10:2009
EUT sample number	S11
Modification state	0
SE in test environment	None
SE isolated from EUT	S1, S3, TRaC Belkin Router
EUT set up	Refer to Appendix C
Temperature	24.9
Photographs	Appendix F

The worst case radiated emission measurements for spurious emissions within the restricted bands are listed below:

Test Details: EUT Operating @ 902.5 MHz									
DET	FREQ. (MHz)	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (µV/m)	LIMIT (µV/m)
Pk	5414.08	55.4	3.5	34.0	35.8	57.1	-	716.1	5000
Av	5414.08	52.2	3.5	34.0	35.8	53.9	-	495.5	500

Test Details: EUT Operating @ 927.5 MHz									
DET	FREQ. (MHz)	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (µV/m)	LIMIT (µV/m)
Pk	1600.17	53.1	2.1	25.6	36.7	44.1	-	160.3	5000
Av	1600.17	38.9	2.1	25.6	36.7	29.9	-	31.3	500
Pk	5564.11	55.1	3.5	33.9	35.8	56.7	-	683.9	5000
Av	5564.11	51.5	3.5	33.9	35.8	53.1	-	451.9	500

Notes:

- 1 Any testing performed below 30 MHz was performed using a magnetic loop antenna in accordance with ANSI C63.10:2009: section 4.5, Table 1 For emissions below 30MHz the cable losses are assumed to be negligible.
- 2 In accordance with 15.35(b), above 1 GHz, emissions measured using a peak detector shall not exceed a level 20 dB above the average limit.
- 3 Testing was performed with the EUT orientated in three orthogonal planes and the maximum emissions level recorded. In addition, the EUT antenna was varied within its range of motion in order to maximise emissions.
- 4 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 RBW= 1MHz, VBW ≥ RBW
 Average RBW= 1MHz, VBW ≥ RBW

The upper and lower frequency of the measurement range was decided according to 47 CFR Part 15: Clause 15.33(a) and 15.33(a)(1).

Radiated emission limits 47 CFR Part 15: Clause 15.109 for all emissions:

Frequency of emission (MHz)	Field strength $\mu\text{V/m}$	Measurement Distance m	Field strength $\text{dB}\mu\text{V/m}$
0.009-0.490	2400/F(kHz)	300	67.6/F (kHz)
0.490-1.705	24000/F(kHz)	30	87.6/F (kHz)
1.705-30	30	30	29.5
30-88	100	3	40.0
88-216	150	3	43.5
216-960	200	3	46.0
Above 960	500	3	54.0

- (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 :

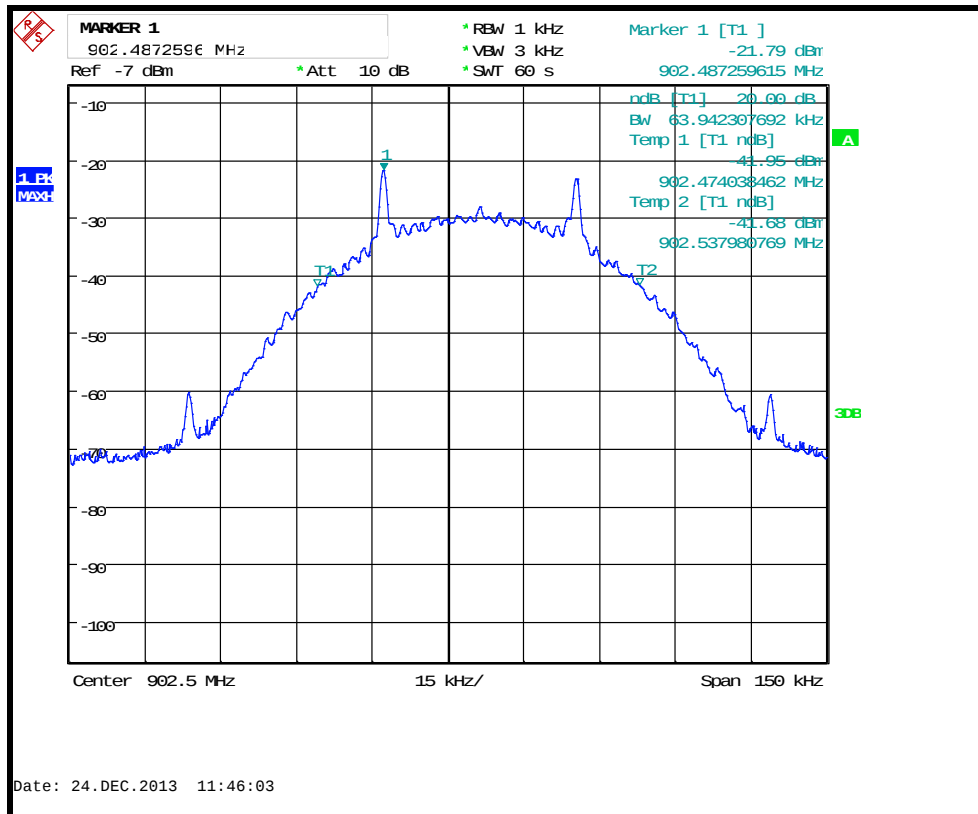
	See (i)	See (ii)	See (iii)	See (iv)
Effect of EUT operating mode on emission levels	✓			
Effect of EUT internal configuration on emission levels				✓
Effect of Position of EUT cables & samples on emission levels				✓
(i) Parameter defined by standard and / or single possible, refer to Appendix C (ii)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

Appendix B:**Supporting Graphical Data**

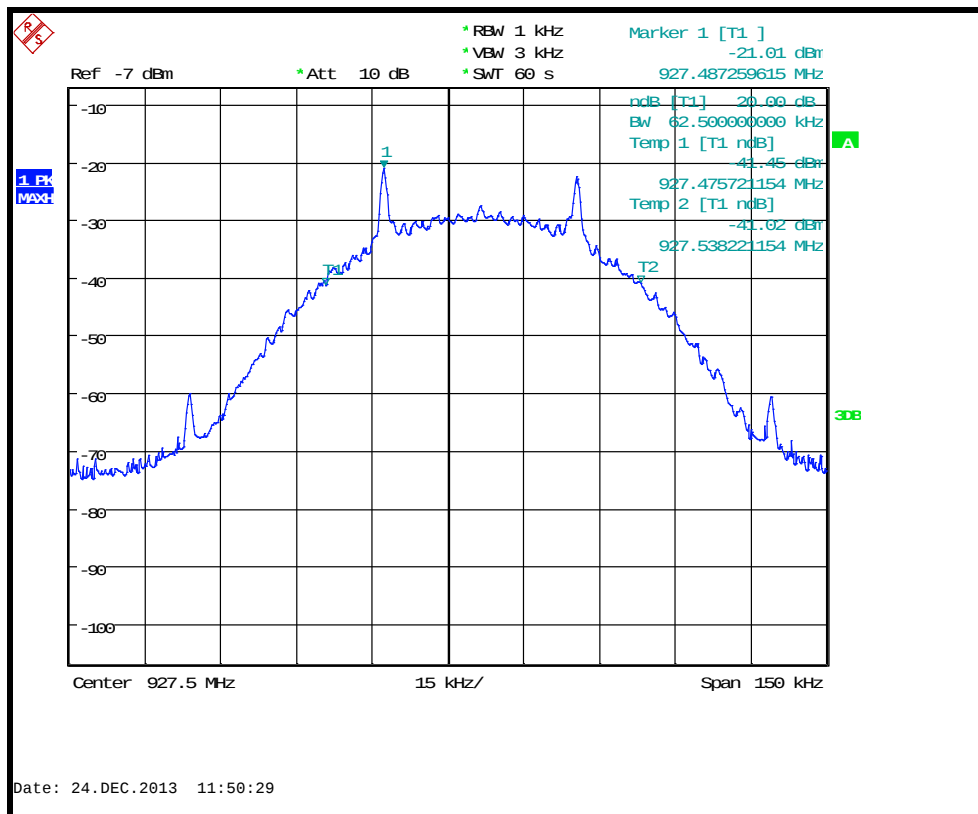
This appendix contains graphical data obtained during testing.

Notes:

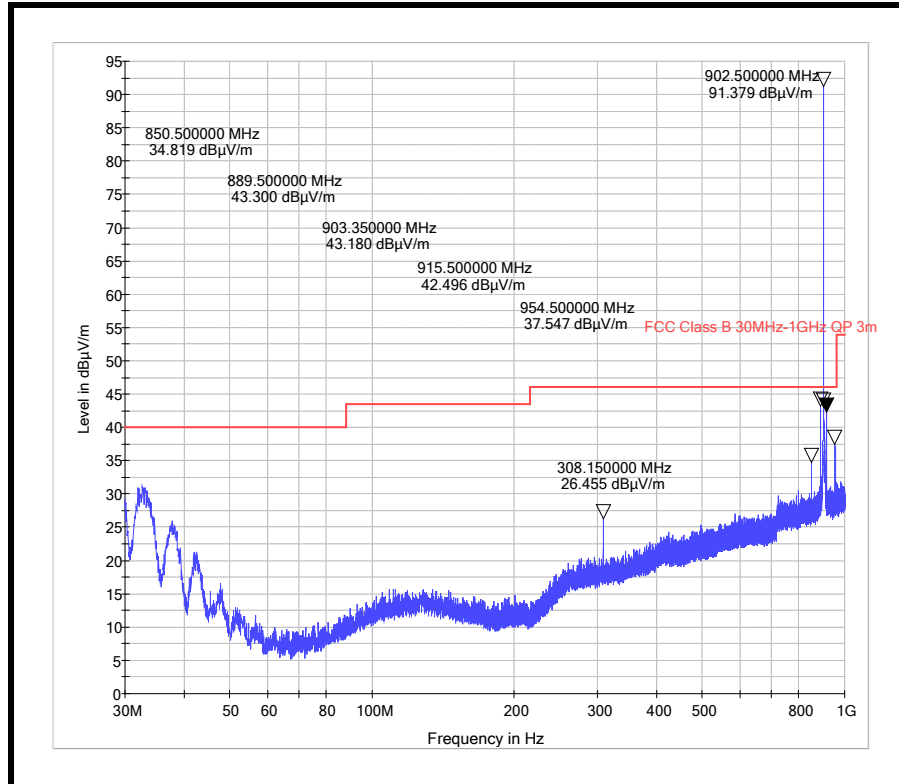
- (a) The radiated electric field emissions and conducted emissions graphical data in this appendix is preview data. For details of formal results, refer to Appendix A.
- (b) The time and date on the plots do not necessarily equate to the time of the test.
- (c) Where relevant, on power line conducted emission plots, the limit displayed is the average limit, which is stricter than the quasi peak limit.
- (d) Appendix C details the numbering system used to identify the sample and its modification state.
- (e) The plots presented in this appendix may not be a complete record of the measurements performed, but are a representative sample, relative to the final assessment.



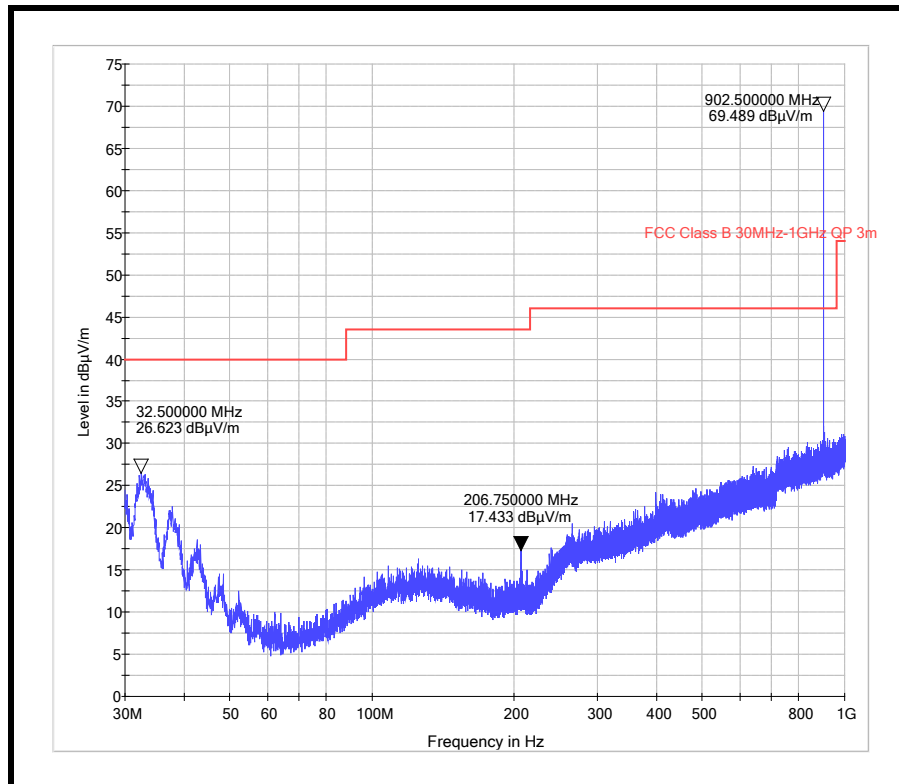
Fc = 902.5 MHz - 20dB Bandwidth



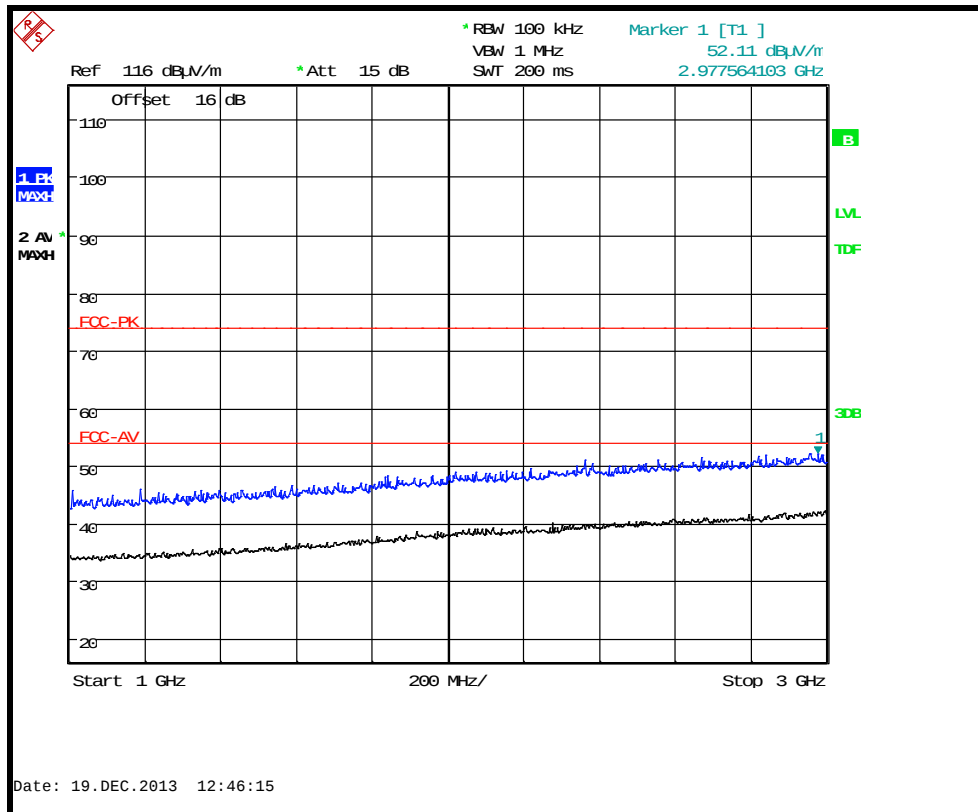
Fc = 927.5 MHz - 20dB Bandwidth



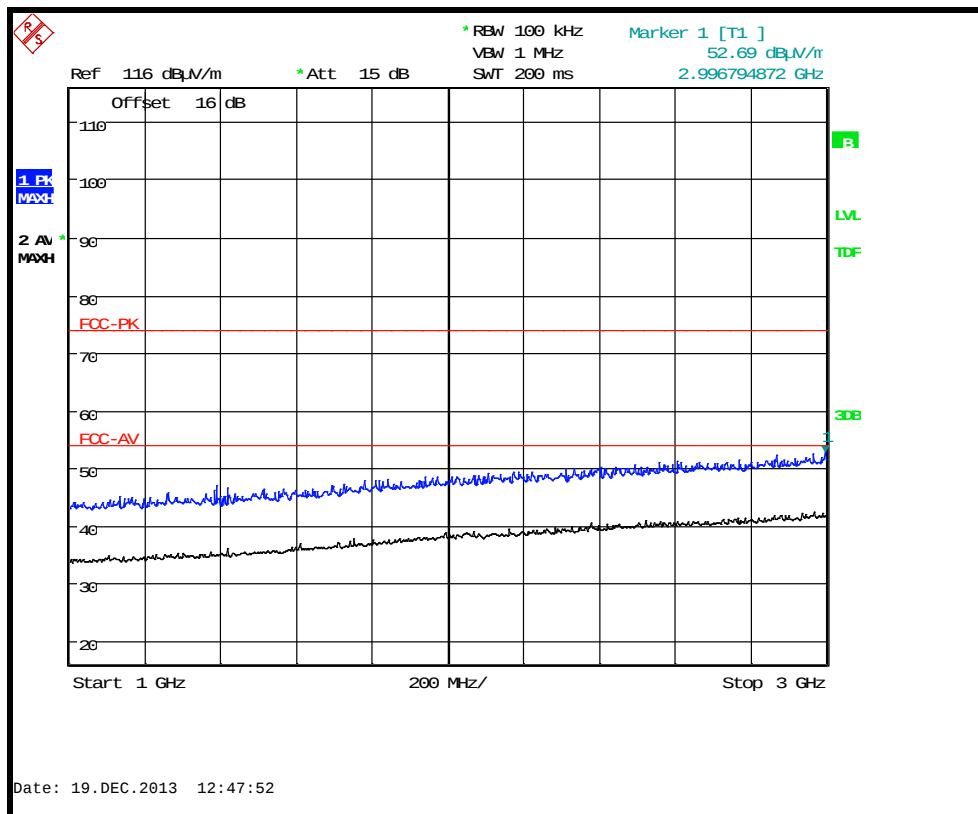
Fc = 902.5 MHz Radiated spurious emissions 30 MHz to 1 GHz Horizontal



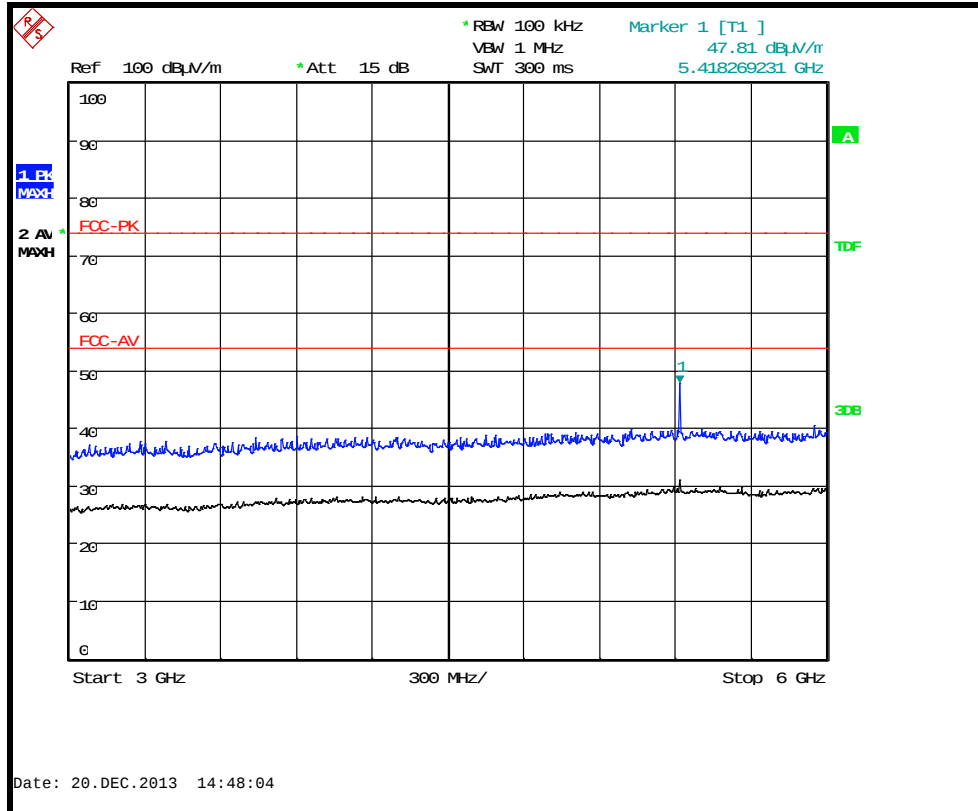
Fc = 902.5 MHz Radiated spurious emissions 30 MHz to 1 GHz Vertical



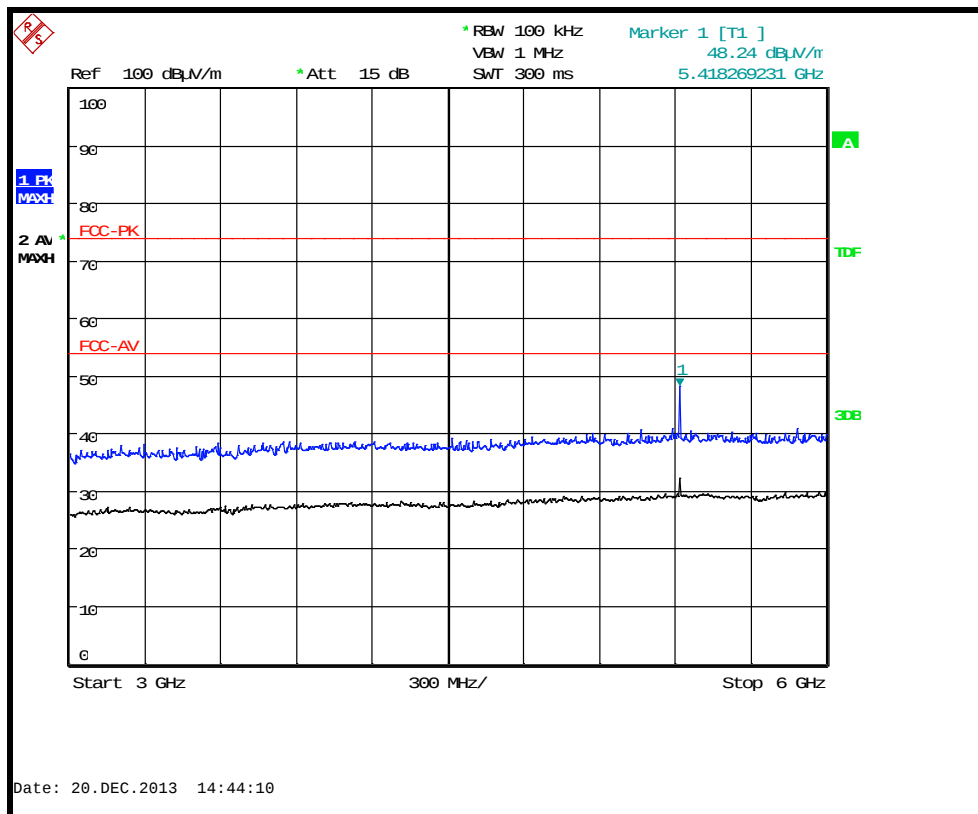
Fc = 902.5 MHz Radiated spurious emissions 1 GHz to 3 GHz Horizontal



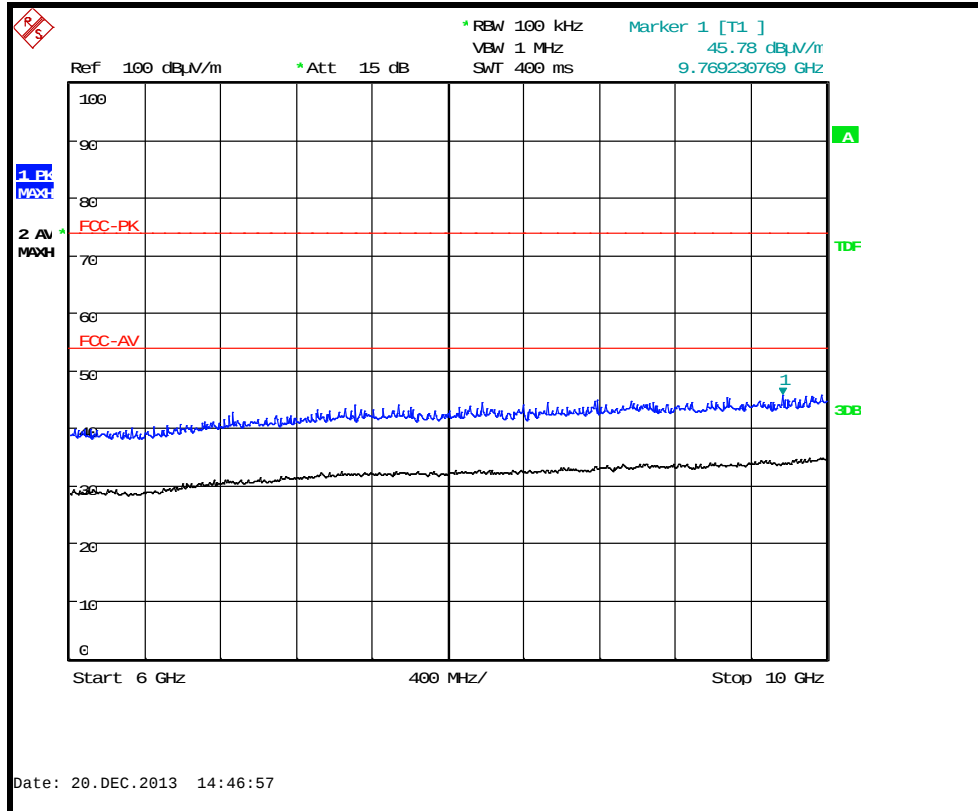
Fc = 902.5 MHz Radiated spurious emissions 1 GHz to 3 GHz Vertical



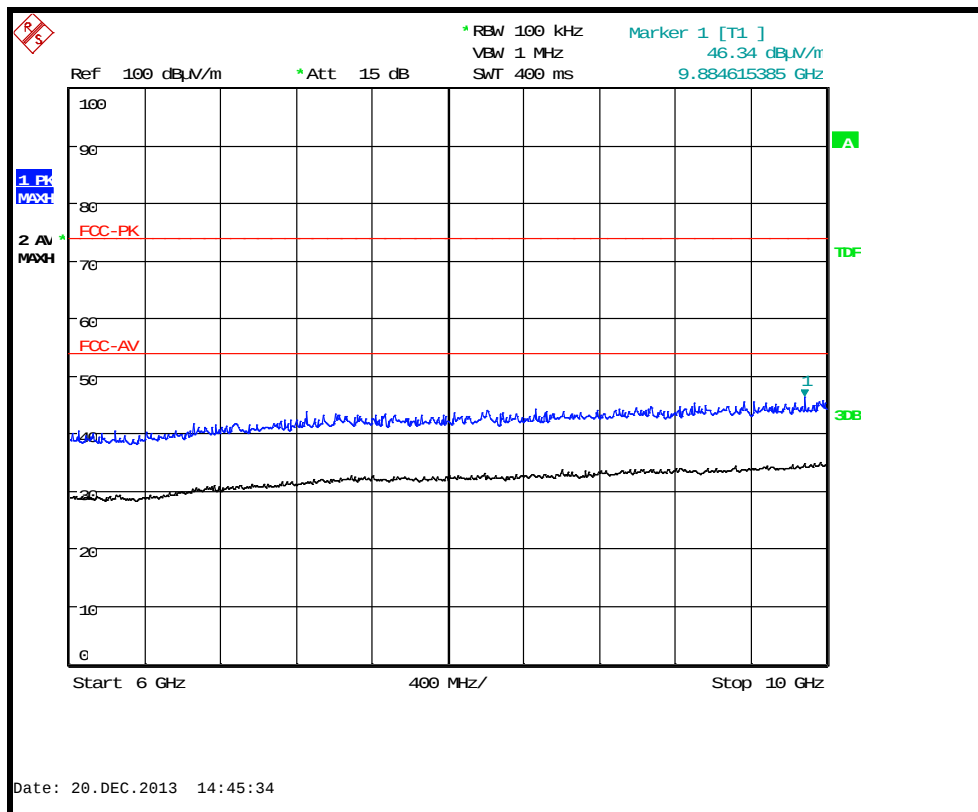
Fc = 902.5 MHz Radiated spurious emissions 3 GHz to 6 GHz Horizontal



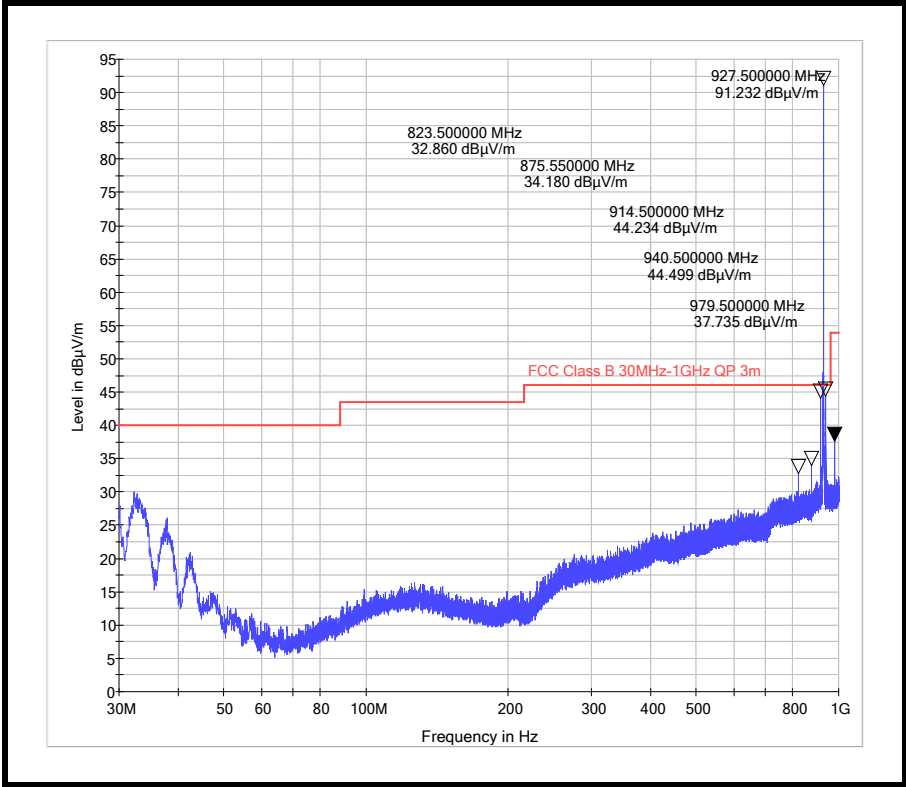
Fc = 902.5 MHz Radiated spurious emissions 3 GHz to 6 GHz Vertical



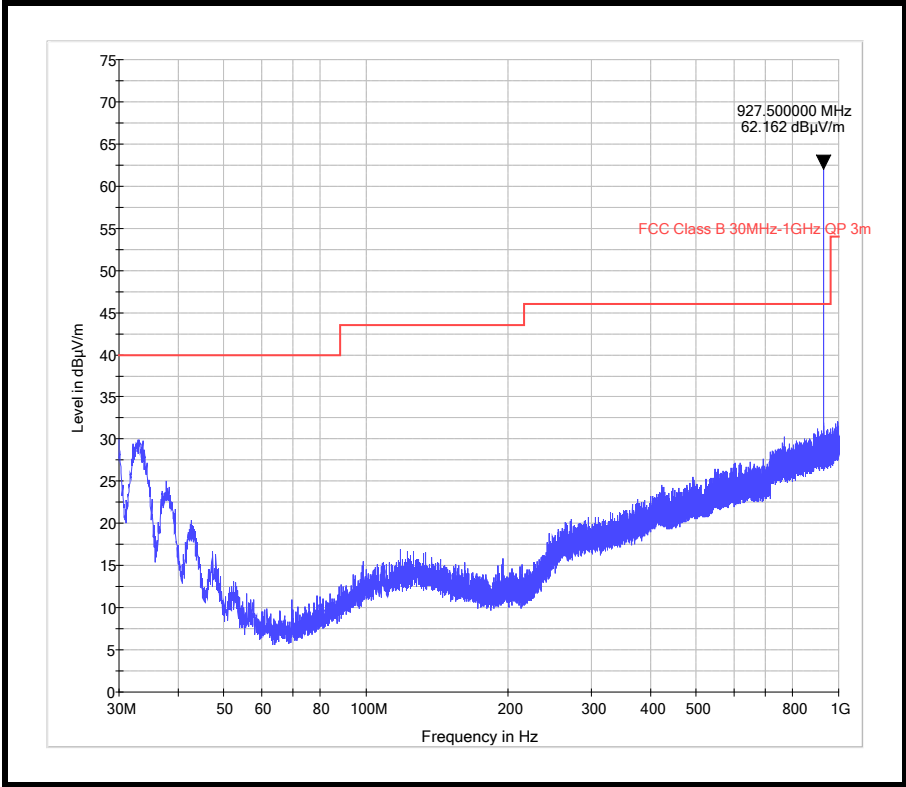
Fc = 902.5 MHz Radiated spurious emissions 6 GHz to 10 GHz Horizontal



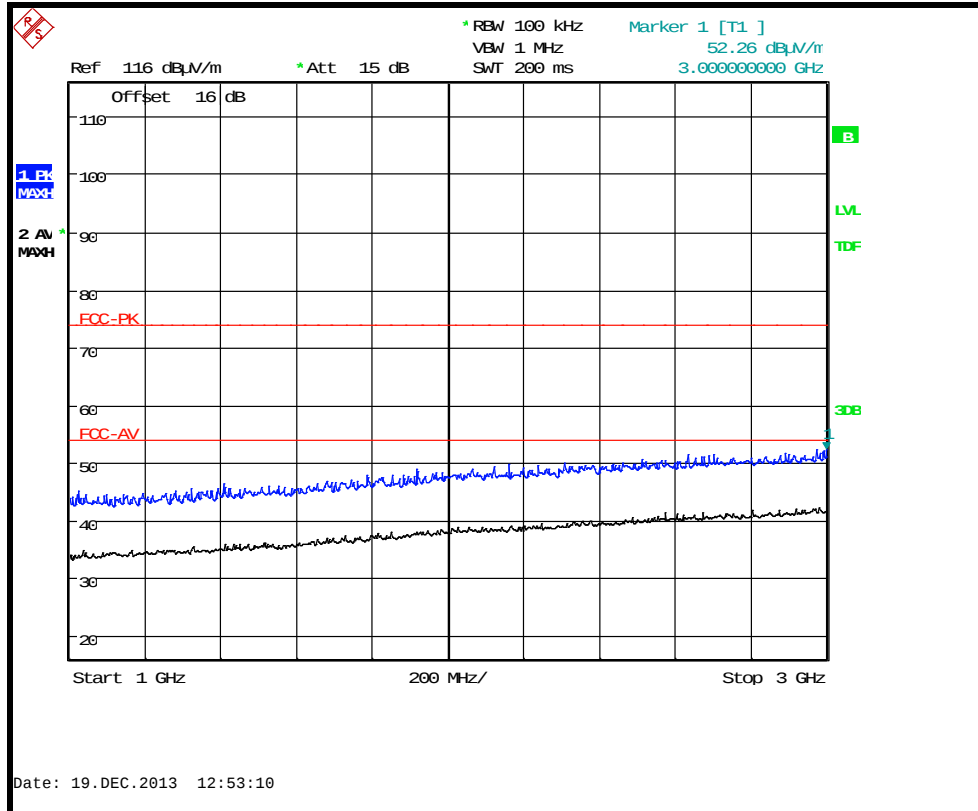
Fc = 902.5 MHz Radiated spurious emissions 6 GHz to 10 GHz Vertical



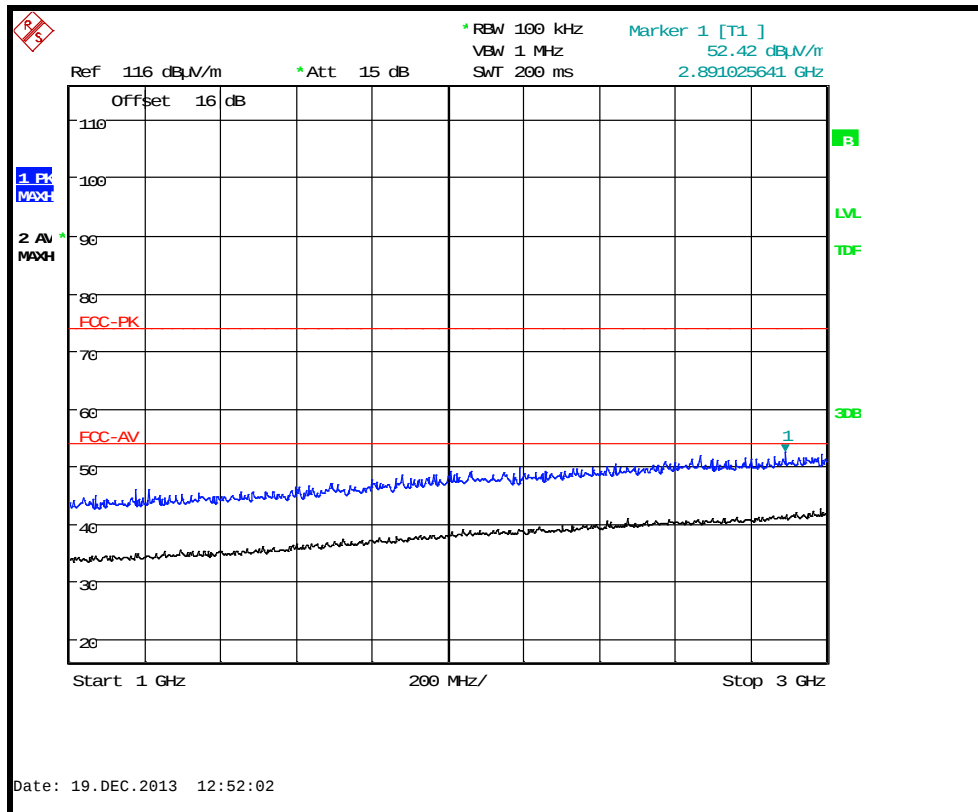
Fc = 927.5 MHz Radiated spurious emissions 30 MHz to 1 GHz Horizontal



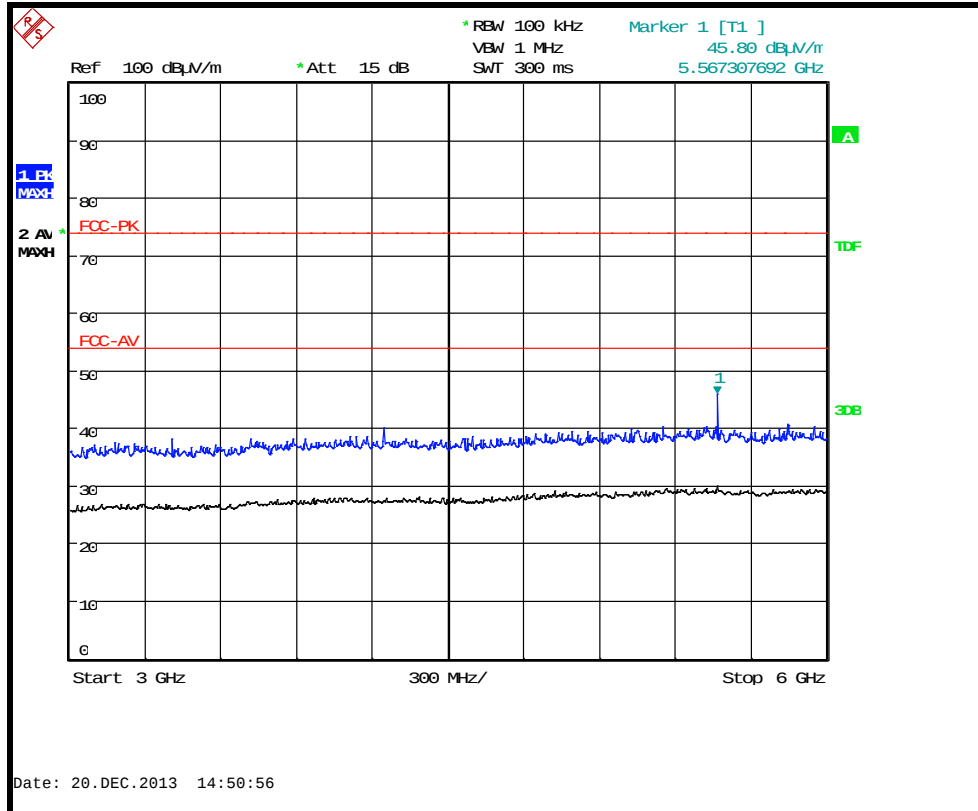
Fc = 927.5 MHz Radiated spurious emissions 30 MHz to 1 GHz Vertical



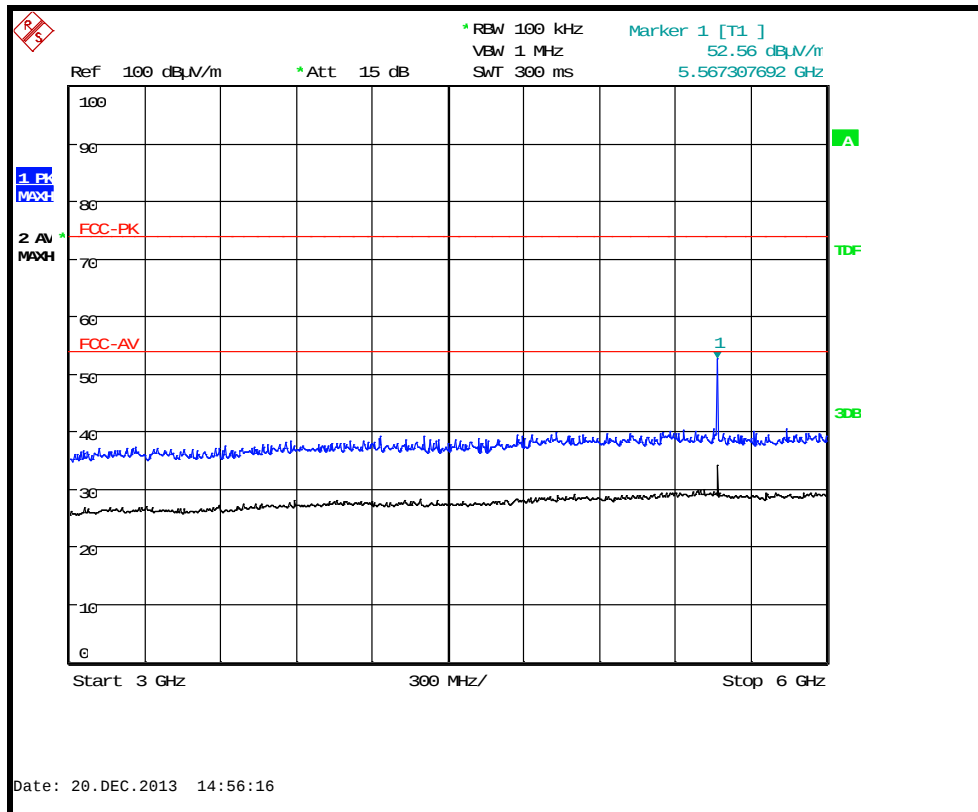
Fc = 927.5 MHz Radiated spurious emissions 1 GHz to 3 GHz Horizontal



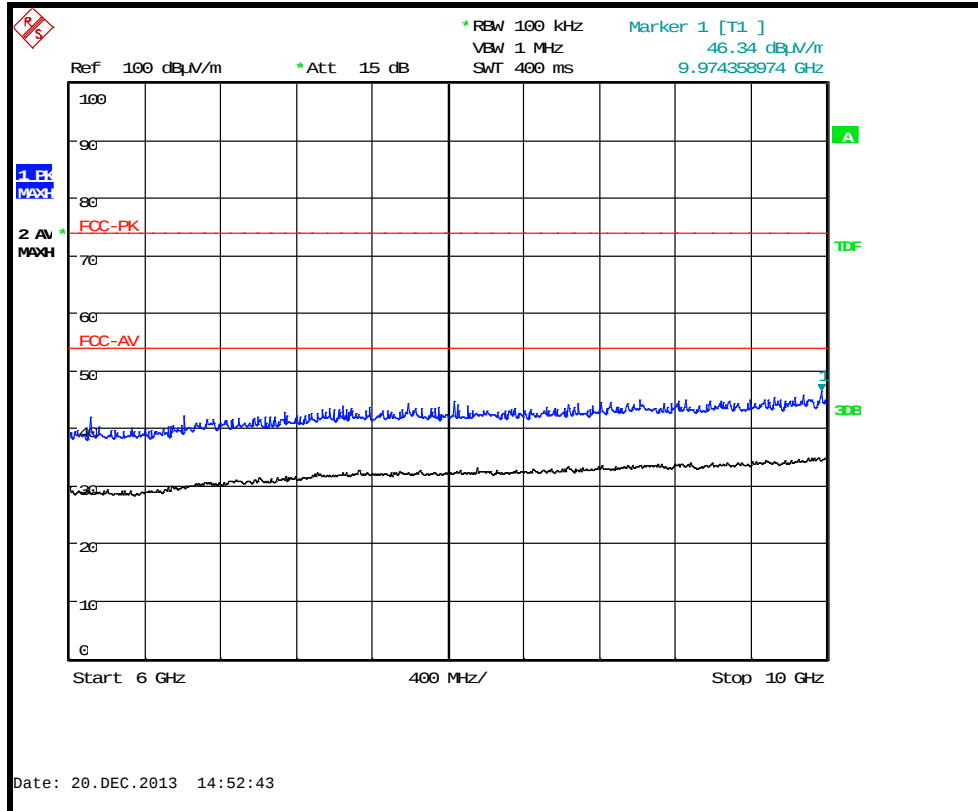
Fc = 927.5 MHz Radiated spurious emissions 1 GHz to 3 GHz Vertical



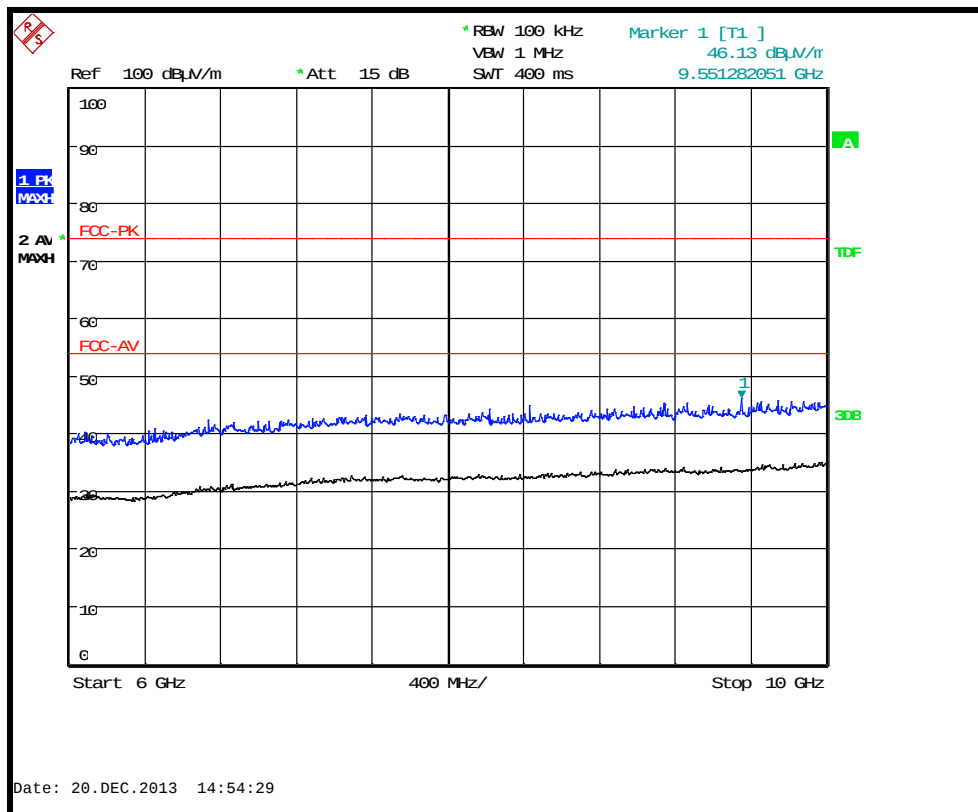
Fc = 927.5 MHz Radiated spurious emissions 3 GHz to 6 GHz Horizontal



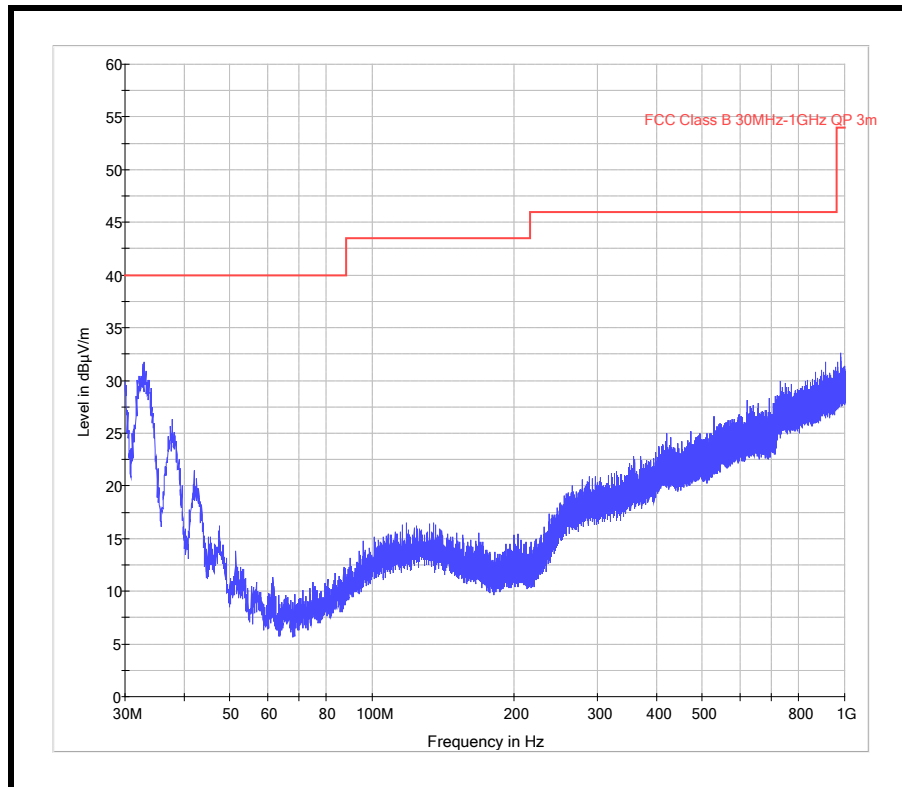
Fc = 927.5 MHz Radiated spurious emissions 3 GHz to 6 GHz Vertical



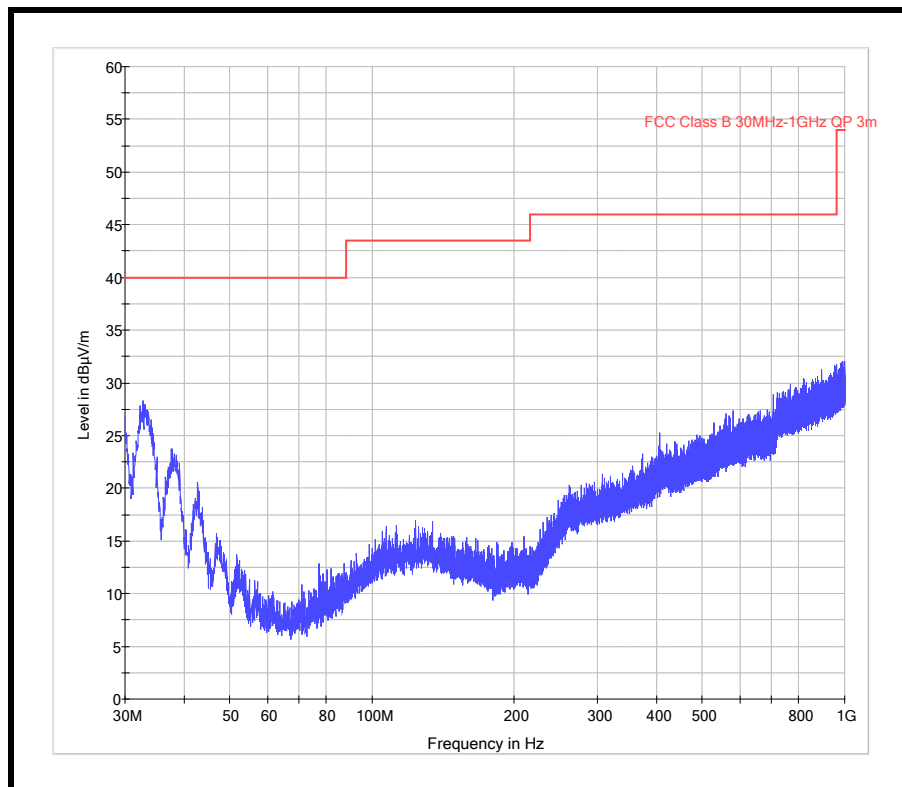
Fc = 927.5 MHz Radiated spurious emissions 6 GHz to 10 GHz Horizontal



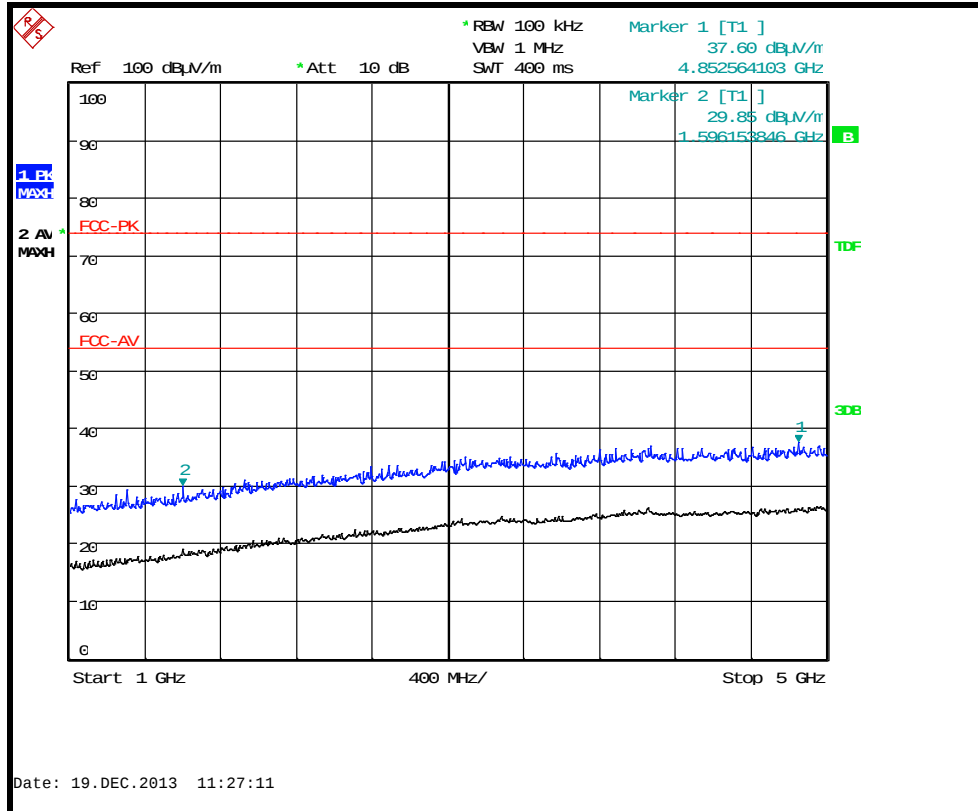
Fc = 927.5 MHz Radiated spurious emissions 6 GHz to 10 GHz Vertical



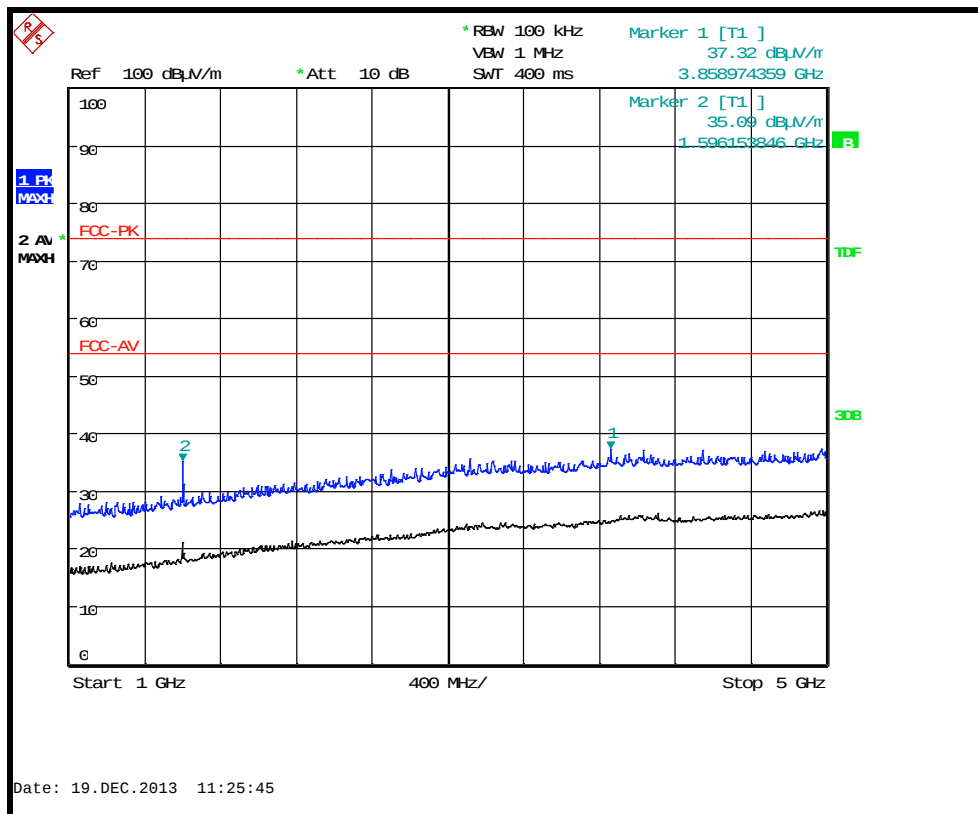
Fc = 902.5 MHz Unintentional Radiated spurious emissions 30 MHz to 1 GHz Horizontal



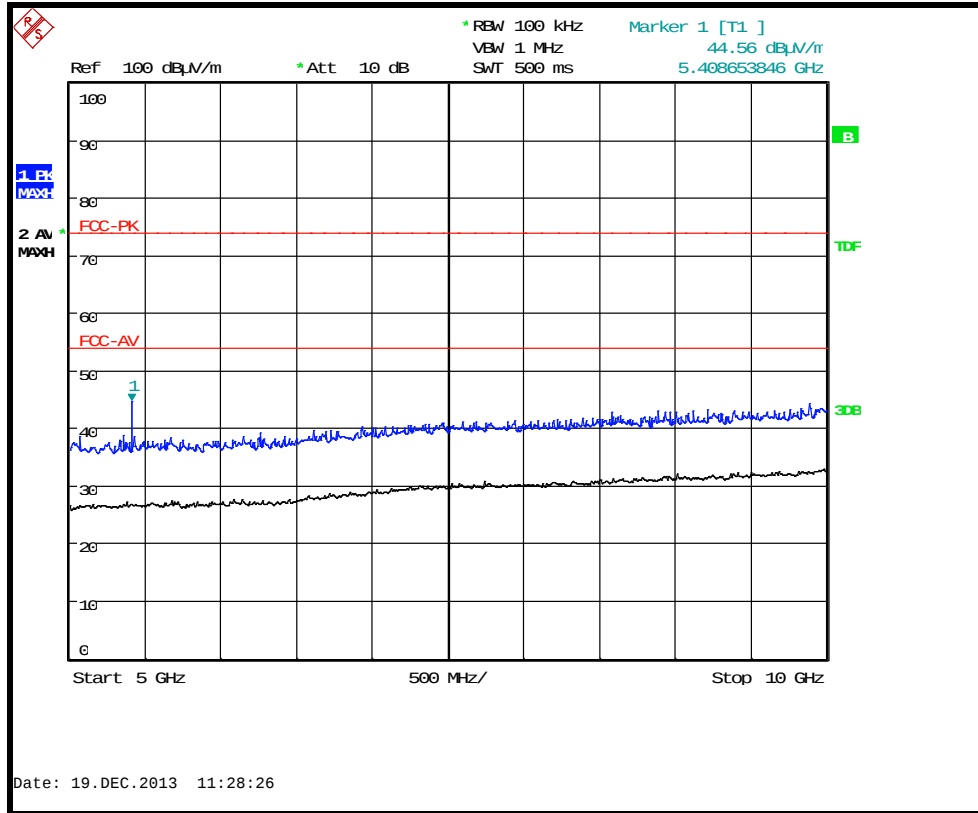
Fc = 902.5 MHz Unintentional Radiated spurious emissions 30 MHz to 1 GHz Vertical



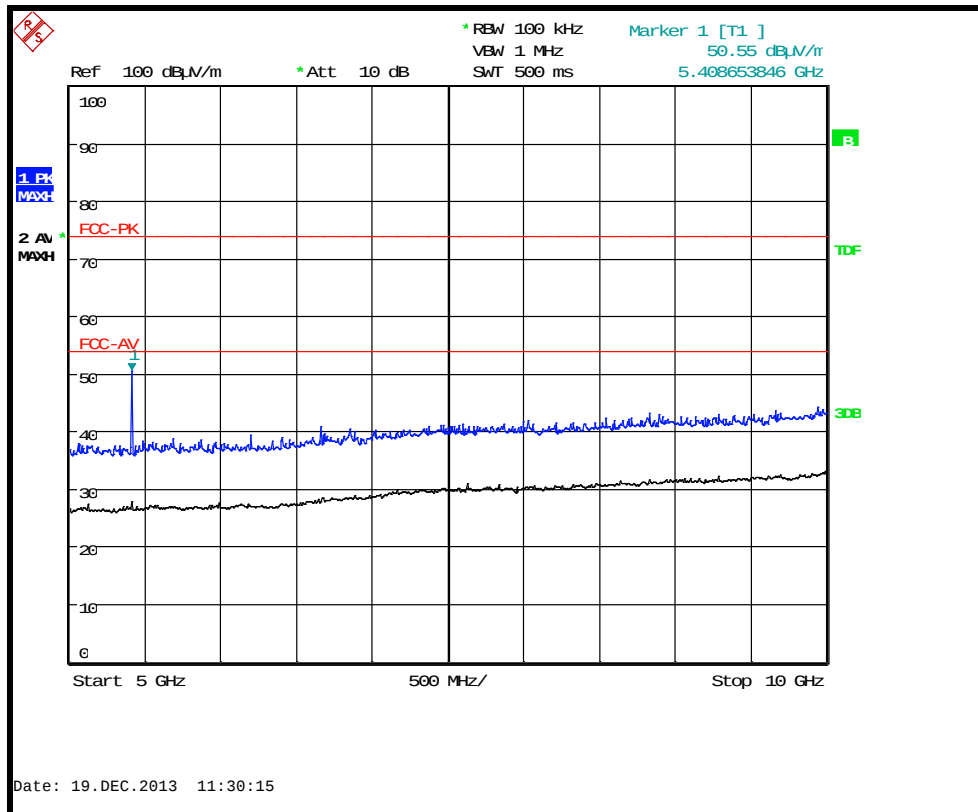
Fc = 902.5 MHz Unintentional Radiated spurious emissions 1 GHz to 5 GHz Horizontal



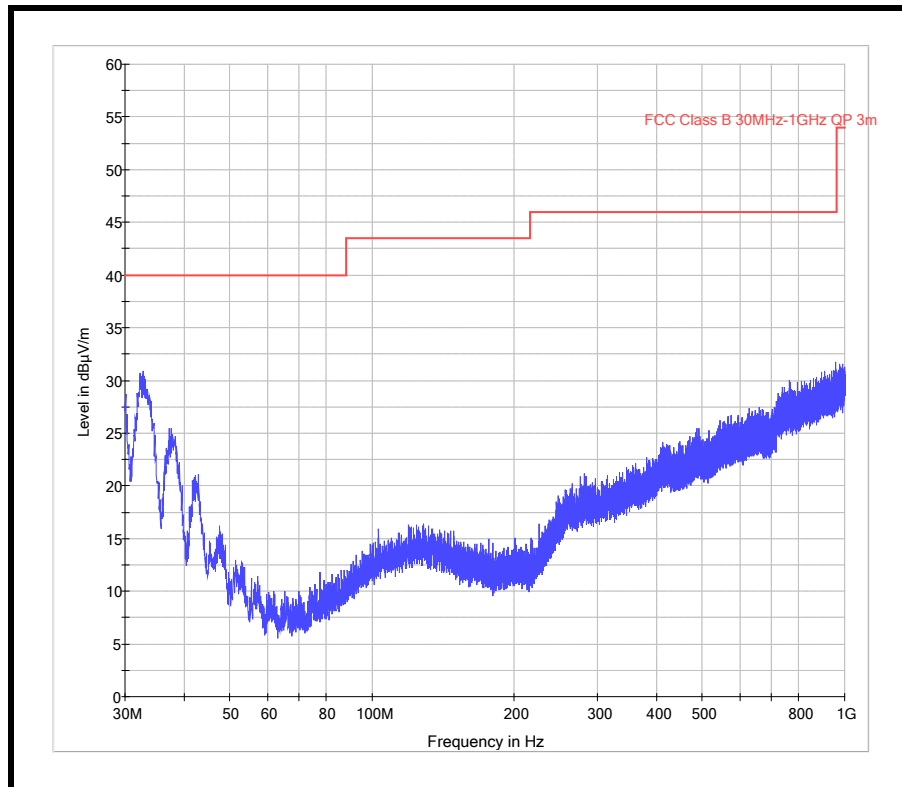
Fc = 902.5 MHz Unintentional Radiated spurious emissions 1 GHz to 5 GHz Vertical



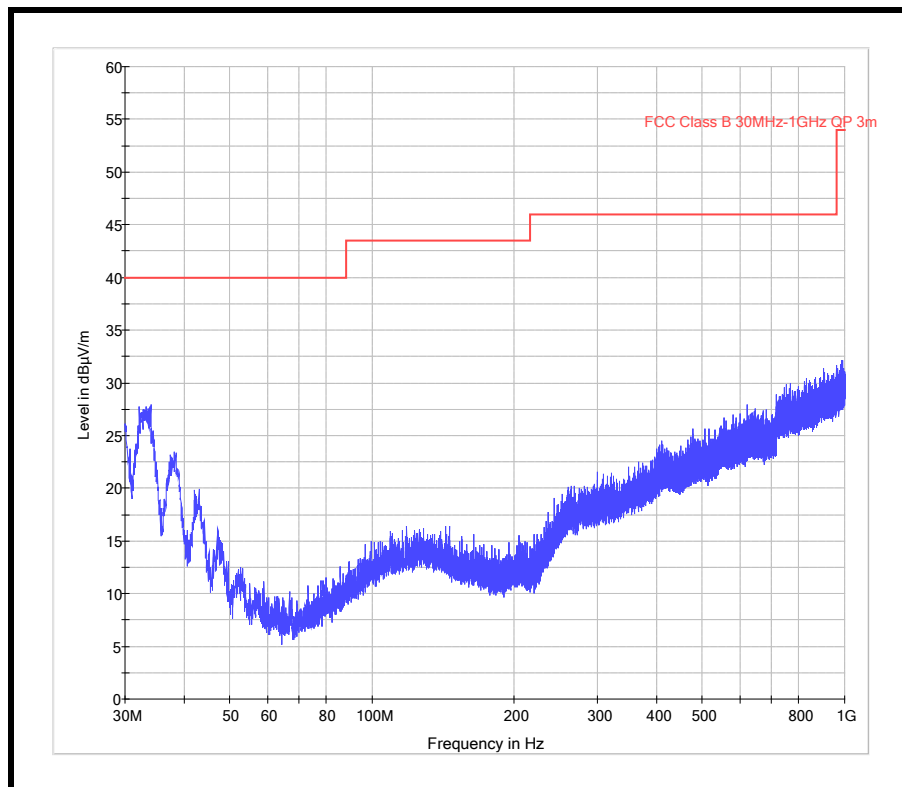
Fc = 902.5 MHz Unintentional Radiated spurious emissions 5 GHz to 10 GHz Horizontal



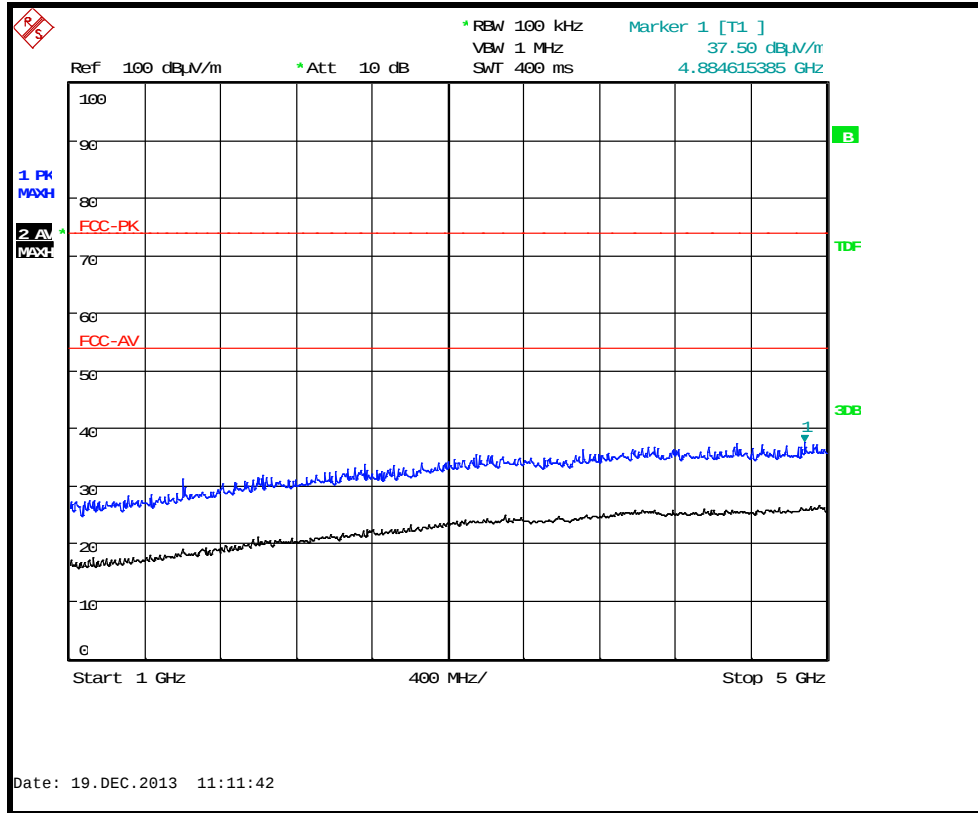
Fc = 902.5 MHz Unintentional Radiated spurious emissions 5 GHz to 10 GHz Vertical



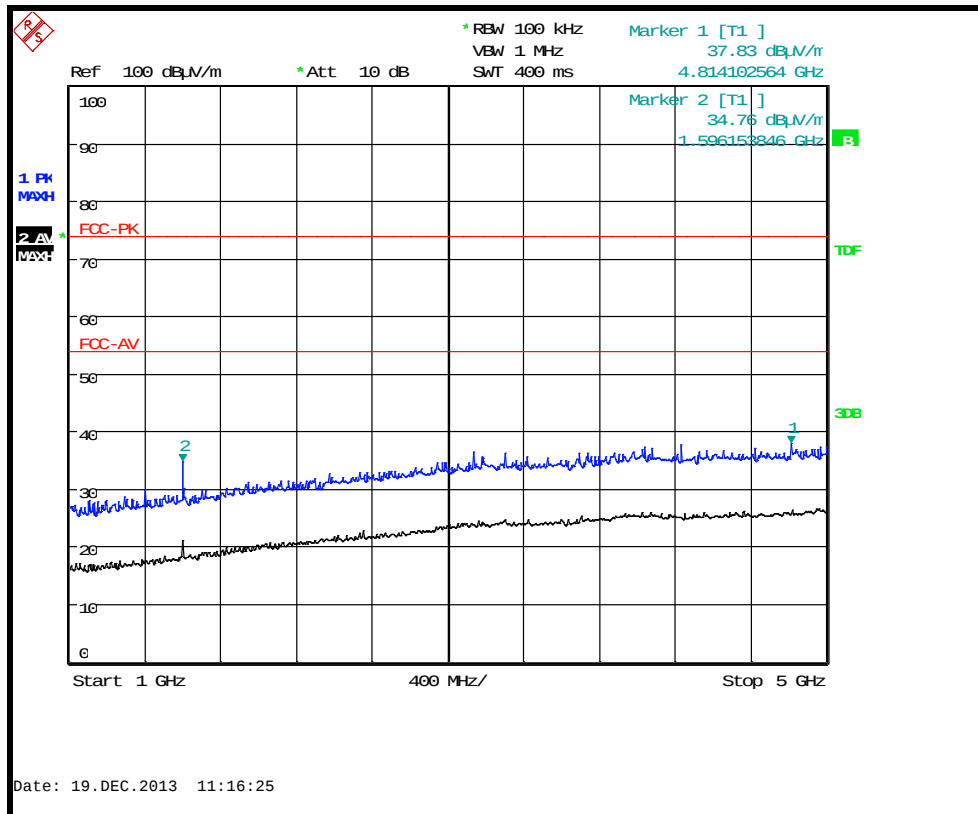
Fc = 927.5 MHz Unintentional Radiated spurious emissions 30 MHz to 1 GHz Horizontal



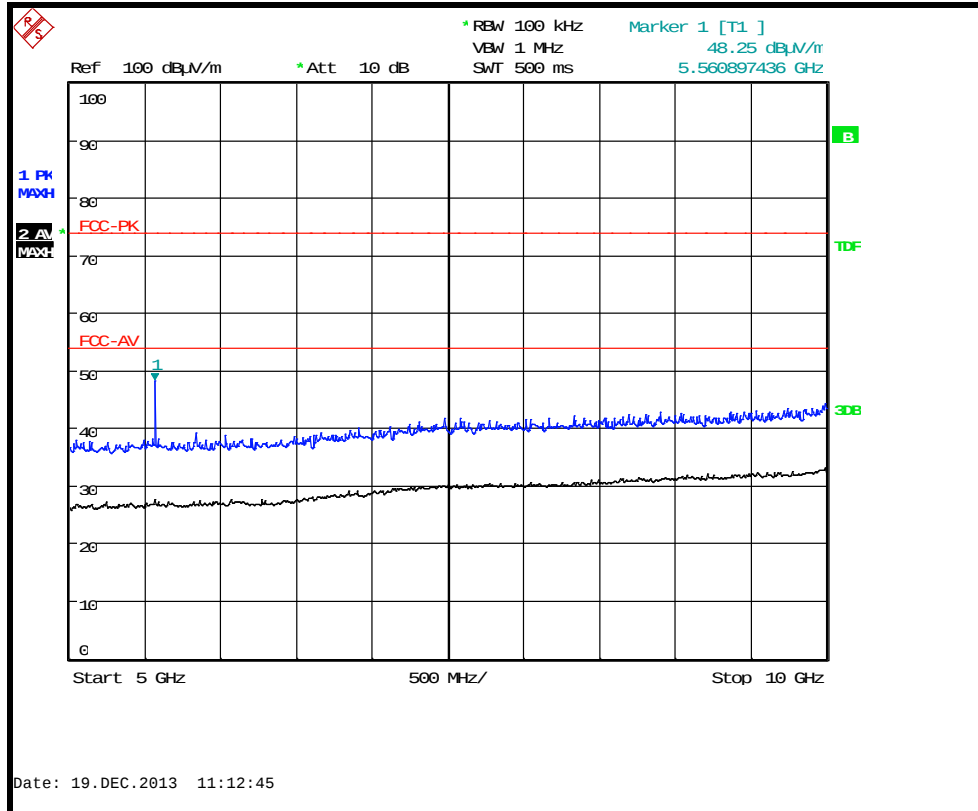
Fc = 927.5 MHz Unintentional Radiated spurious emissions 30 MHz to 1 GHz Vertical



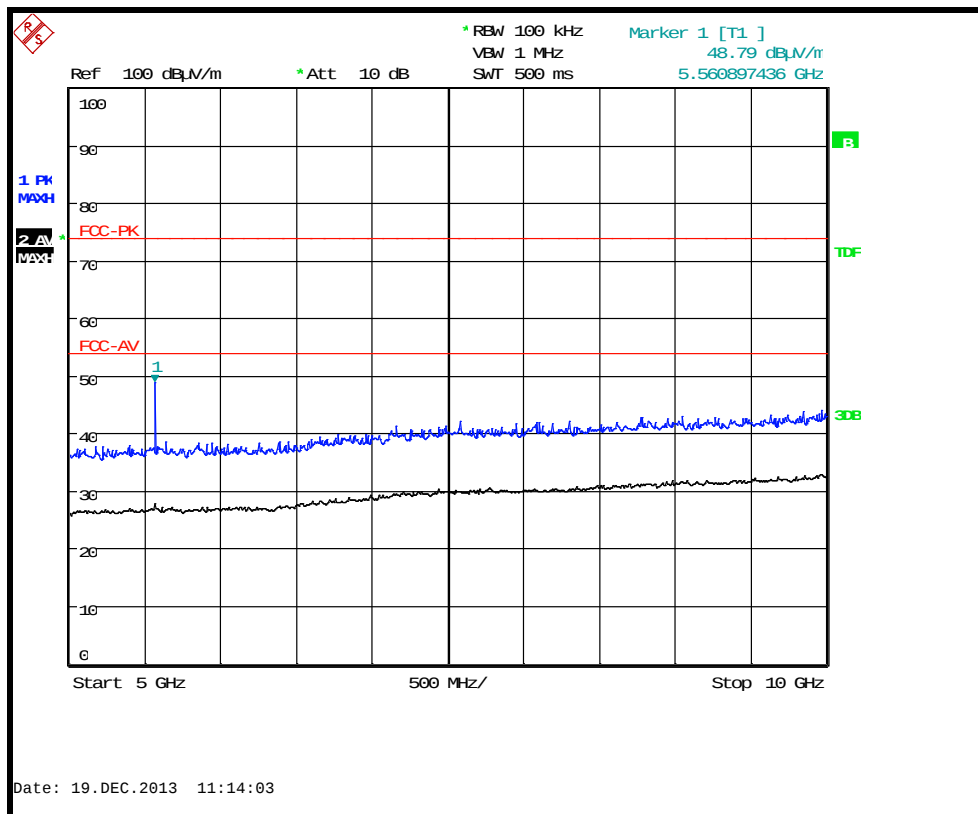
Fc = 927.5 MHz Unintentional Radiated spurious emissions 1 GHz to 5 GHz Horizontal



Fc = 927.5 MHz Unintentional Radiated spurious emissions 1 GHz to 5 GHz Vertical



Fc = 927.5 MHz Unintentional Radiated spurious emissions 5 GHz to 10 GHz Horizontal



Fc = 927.5 MHz Unintentional Radiated spurious emissions 5 GHz to 10 GHz Vertical

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	Identification
S11	Aura 29	KA00000168B

The following samples of apparatus were submitted by the client as host, support or drive equipment (auxiliary equipment):

Sample No.	Description	Identification
S01	Toshiba Laptop	None
S04	Ethernet Communicator RFV13 915 MHz	ZE000000528

The following samples of apparatus were supplied by TRaC Global as support or drive equipment (auxiliary equipment):

Identification	Description
F5D7231-4	Belkin Router

C2) EUT Operating Mode During Testing.

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

Test	Description of Operating Mode:
Carrier power Radiated Spurious Emissions Bandwidth	EUT active Transmitting on top and bottom channel as required.

Test	Description of Operating Mode:
Unintentional radiated spurious emissions	EUT active but non-transmitting on the top or bottom channel as required

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 : S11
Tests : Radiated Emissions

Port	Description of Cable Attached	Cable length	Equipment Connected
None	The equipment is battery powered with no external ports		

C5 Details of Equipment Used

TRaC No	Equipment Type	Equipment Description	Manufacturer	Last Cal Calibration	Calibration Period	Due For Calibration
UH004	ESVS10	Receiver	R&S	11/02/2013	12	11/02/2014
UH093	CBL6112B	Bilog	Chase	08/07/2013	24	08/07/2015
UH281	FSU46	Spectrum Analyser	R&S	06/03/2013	12	06/03/2014
UH387	ATS	Chamber 1	Rainford EMC	04/07/2013	12	04/07/2014
L138	3115	1-18GHz Horn	EMCO	17/10/2013	24	17/10/2015
L572	8449B	Pre Amp	Agilent	12/12/2012	24	12/12/2014
REF940	ATS	Radio Chamber - PP	Rainford EMC	09/07/2013	12	09/07/2014
REF977	SH4141	High Pass Filter	BSC	25/02/2013	24	25/02/2015

Appendix D:

Additional Information

No Additional Information was provided by the client to support the assessment.

Appendix E: **Calculation of the duty cycle correction factor**

Duty cycle correction is not required by the device covered in this report.

Appendix F:

Photographs and Figures

The following photographs were taken of the test samples:

1. Radiated electric field emissions arrangement: Overview.
2. Radiated electric field emissions arrangement: close up.



Photograph 1



Photograph 2

Appendix G:**MPE Calculation**

OET Bulletin No. 65, Supplement C 01-01

47 CFR §§1.1307 and 2.1091

2.1091 Radio frequency radiation exposure evaluation: mobile devices.

For purposes of these requirements mobile devices are defined by the FCC as transmitters designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimetres is normally maintained between radiating structures and the body of the user or nearby persons. These devices are normally evaluated for exposure potential with relation to the MPE limits. As the 20cm separation specified under FCC rules may not be achievable under normal operation of the EUT, an RF exposure calculation is needed to show the minimum distance required to be less than 0.6mW/cm² power density limit, as required under FCC rules

Prediction of MPE limit at a given distance

Equation from page 20 of OET Bulletin 65, Edition 97-01

$$S = \frac{1.64ERP}{4\pi R^2} \text{ re - arranged } R = \sqrt{\frac{1.64ERP}{S 4\pi}}$$

where:

S = power density

R = distance to the centre of radiation of the antenna

ERP = EUT Maximum power

Result:

Prediction Frequency (MHz)	Maximum ERP (mW)	Power density limit (S) (mW/cm ²)	Distance (R) cm required to be less than 0.6mW/cm ²
902.5	26.4	0.6	2.4

