

AN ENGINEERING DOCUMENT

FOR

BUDDI LTD.

ON

BUDDI V8

DOCUMENT NUMBER TTR-004493WUS2

HULL

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TRaC Wireless Test Report : TTR-004493WUS2

Applicant : Buddi Ltd.

Apparatus : Buddi V8

Specification(s) : CFR47 Part 15, 22, 24, July 2008

Purpose of Test : Certification

FCCID : ZDLB83

Authorised by :



: Radio Product Manager

Issue Date : 24th May 2011

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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:

Buddi Ltd.
Kingfisher House
Walton Street
Aylesbury
Bucks HP21 7AY
England

1.3 Manufacturer

Same as above

1.4 Apparatus Assessed

The following apparatus was assessed between 3rd of May and 19th of May 2011:

Buddi V8

The above equipment is a portable, passive, discreet GPS/PCS device with an ISM transmitter operating in the 850MHz/1900MHz 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.

FCC Reference (47 CFR)	Industry Canada Reference	Measurement	Result
GSM 850			
Part 2.1053 / 22.917	RSS-132.4.5	Transmitter Out of Band Radiated Emissions	Pass
PCS 1900			
Part 2.1053 / 24.238	RSS-133 6.5	Transmitter Out of Band Radiated Emissions	Pass

Abbreviations used in the above table:

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 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.

1.7 Deviations from Test Standards

There were no deviations from the standards tested to.

Section 2:

Measurement Uncertainty

2.1 Measurement Uncertainty Values

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 (Equipment - TRLUH120) = **2.18dB**

Uncertainty in test result (Equipment – TRL05) = **1.08dB**

Uncertainty in test result (Equipment – TRL479) = **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 (Equipment - TRLUH120) = **119ppm**

Uncertainty in test result (Equipment – TRL05) = **0.113ppm**

Uncertainty in test result (Equipment – TRL479) = **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 Emissions

Uncertainty in test result (Equipment TRL479) Up to 8.1GHz = **3.31dB**

Uncertainty in test result (Equipment TRL479) 8.1GHz – 15.3GHz = **4.43dB**

Uncertainty in test result (Equipment TRL479) 15.3GHz – 21GHz = **5.34dB**

Uncertainty in test result (Equipment TRLUH120) 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		
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 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 Part 2.1053 / 22.917. 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 2.1053 / 22.917
Measurement standard	ANSI C63.4
Frequency range	30 MHz to 9 GHz
EUT sample number	S03, S04
Modification state	0
SE in test environment	N/A
SE isolated from EUT	N/A
EUT set up	Refer to Appendix C
Temperature	20 deg C
Photographs (Appendix F)	Photograph 1

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

Band Used	Transmitting Channel	Frequency (MHz)	Measured Level (dBm)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
GSM 850	128	3296.8	-41.91	-32	-13	-19
GSM 850	128	4124	-38.22	-24.5	-13	-11.5
GSM 850	190	3346.4	-37.46	-28	-13	-15
GSM 850	190	4183	-44.71	-32.8	-13	-19.8
GSM 850	251	3395.2	-36.81	-30.8	-13	-17.8
PCS 1900	810	3189.42	-35.38	-24.8	-13	-11.83
PCS 1900	810	5729.32	-41.36	-29.8	-13	-16.78
PCS 1900	810	7638.87	-47.56	-31.6	-13	-18.6
PCS 1900	810	9548.94	-47.08	-27.4	-13	-14.41
PCS 1900	661	3759.98	-38.16	-25.6	-13	-12.61
PCS 1900	661	5639.98	-41.77	-28.3	-13	-15.27
PCS 1900	661	9399.98	-46.9	-29.6	-13	-16.61
PCS 1900	512	3700.41	-35.57	-25.3	-13	-12.27
PCS 1900	512	5550.59	-43.27	-28.9	-13	-15.88
PCS 1900	512	9250.99	-45.42	-29.2	-13	-16.17

Notes:

- 1 Any testing performed below 30 MHz was performed using a magnetic loop antenna in accordance with ANSI C63.10: 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=VBW= 1MHz
Average RBW=VBW= 1MHz

The upper and lower frequency of the measurement range was decided according to 47 CFR 15:2008 Clause 15.33(a) and 15.33(a)(1).

Radiated emission limits 47 CFR 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 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				

A2 Power Line Conducted Emissions

Test Details	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) Clause 15.207
Measurement standard	ANSI C63.10
Frequency range	150kHz to 30MHz
EUT sample number	S01, S02
Modification state	0
SE in test environment	N/A
SE isolated from EUT	N/A
EUT set up	Refer to Appendix C
Photographs (Appendix F)	Photograph 3

Preview power line conducted emission measurements were performed with a peak detector in a screened room. The effect of the EUT set-up on the measurements is summarised in note (b). Where applicable formal measurements of the emissions were performed with a peak, average and/or quasi peak detector. The EUT was set to transmit on its lowest, centre and highest carrier frequency in turn. The formal measurements are detailed below:

The worst-case power line conducted emission measurements are listed below:

Results measured using the average detector compared to the average limit

Ref No.	Freq (MHz)	Conduct or	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)	Result Summary
No significant emissions within 20 dB of the limit.						

Results measured using the quasi-peak detector compared to the quasi-peak limit

Ref No.	Freq (MHz)	Conduct or	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)	Result Summary
No significant emissions within 20 dB of the limit.						

Appendix B:

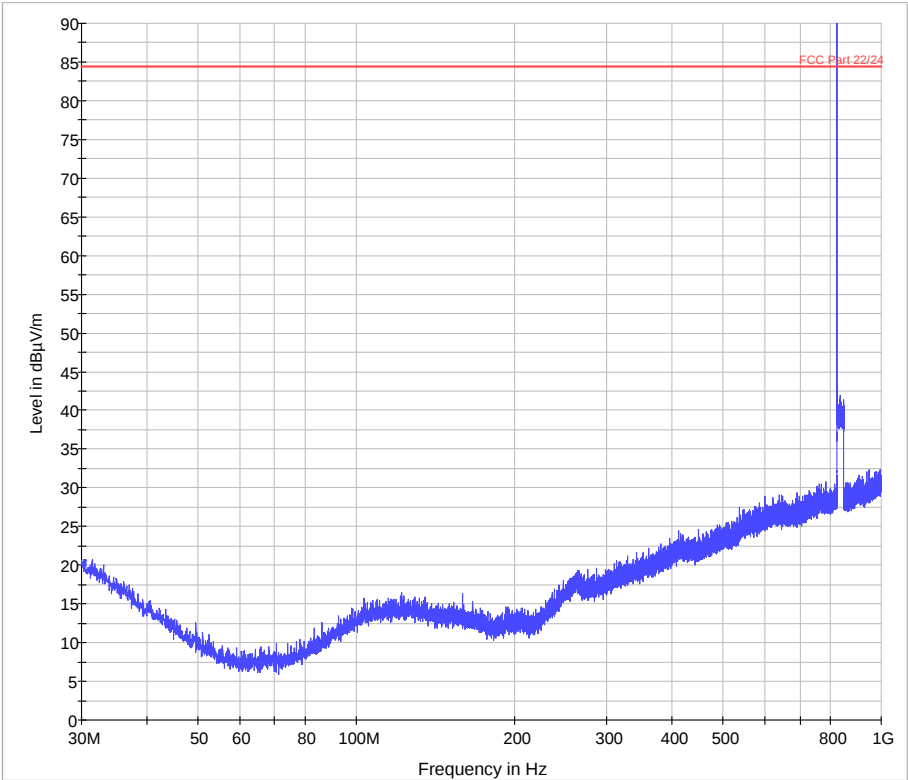
Supporting Graphical Data

This appendix contains graphical data obtained during testing.

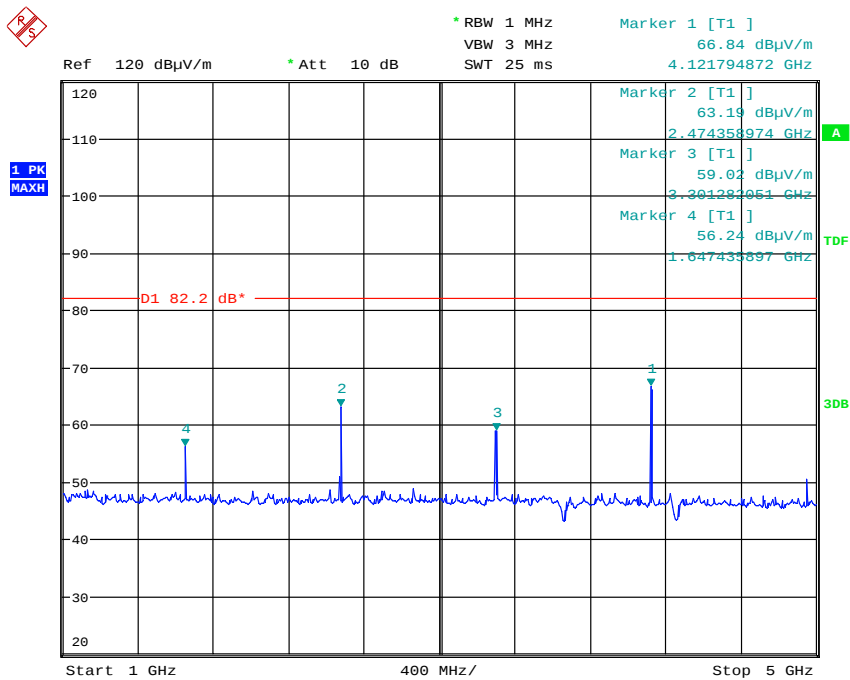
Notes:

- (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 and Appendix B.
- (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.

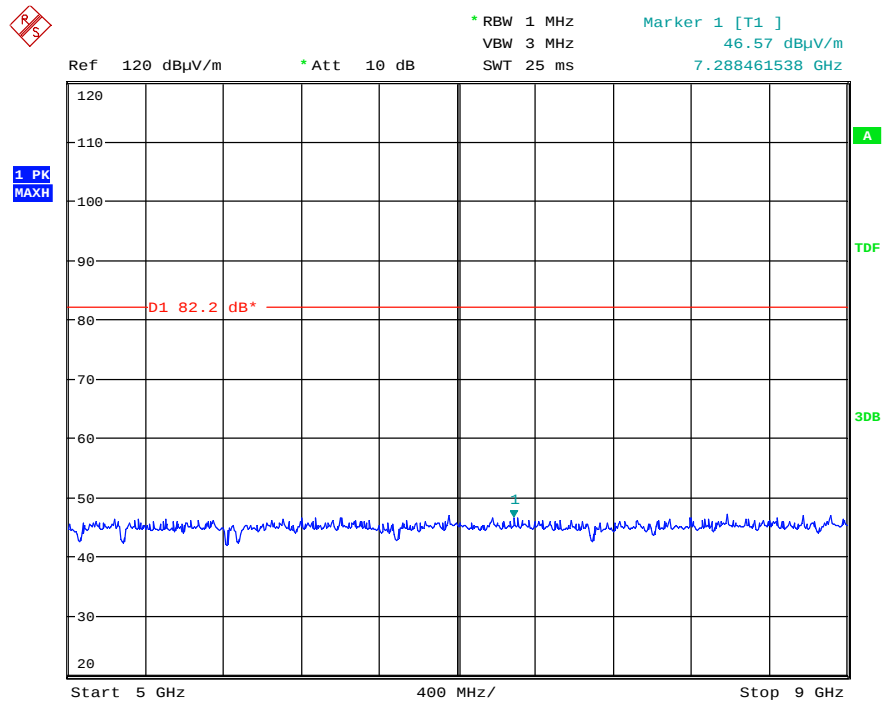
Radiated spurious emissions 30 MHz to 1 GHz (CH 128)



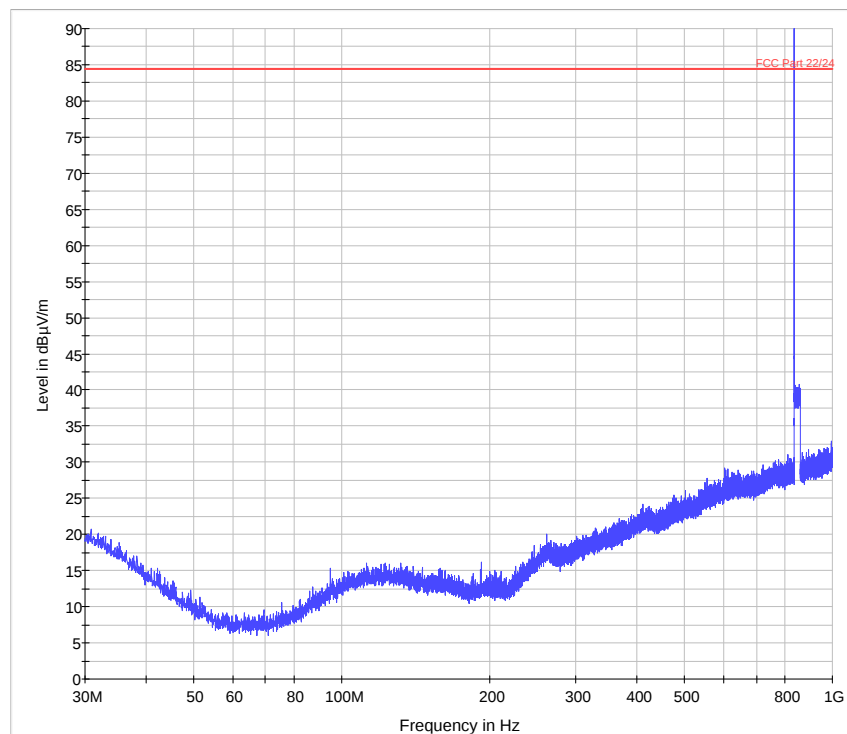
Radiated spurious emissions 1 GHz to 5 GHz (CH 128)



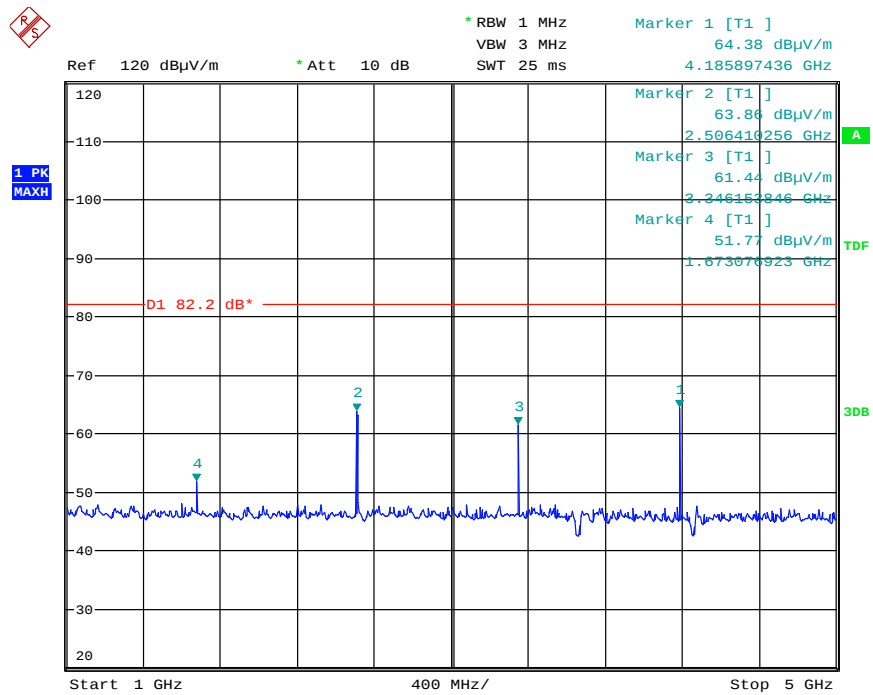
Date: 4.MAY.2011 10:09:23

Radiated spurious emissions 5 GHz to 9 GHz (CH 128)

Date: 4.MAY.2011 10:10:05

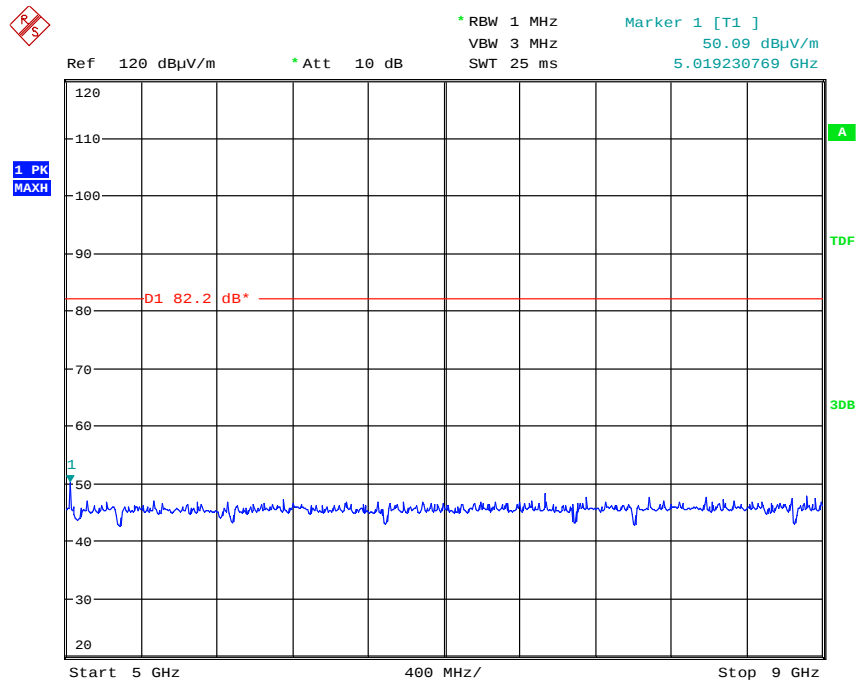
Radiated spurious emissions 30 MHz to 1 GHz (CH 190)

Radiated spurious emissions 1 GHz to 5 GHz (CH 190)



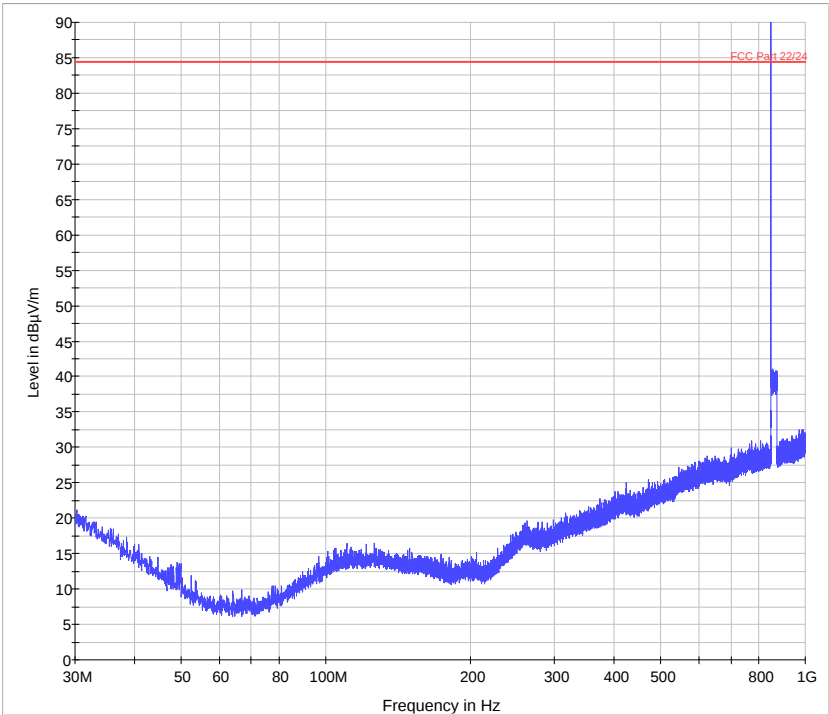
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Radiated spurious emissions 5 GHz to 9 GHz (CH 190)

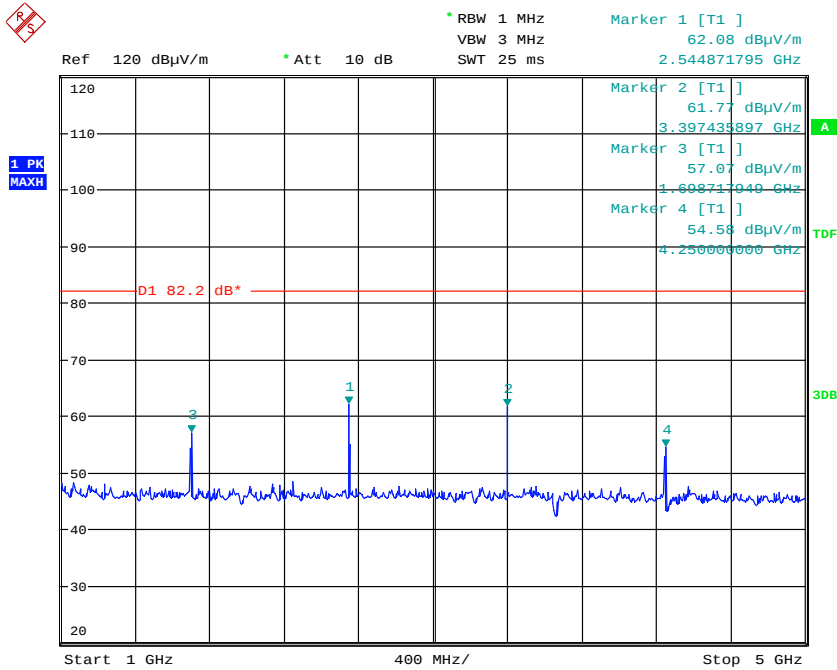


Date: 4.MAY.2011 10:19:20

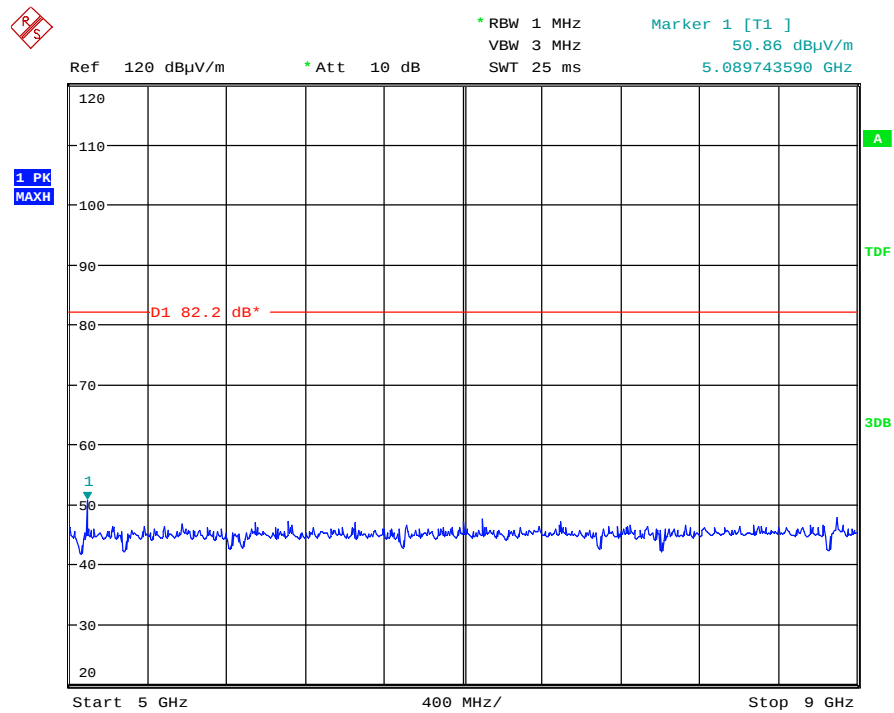
Radiated spurious emissions 30 MHz to 1 GHz (CH 251)



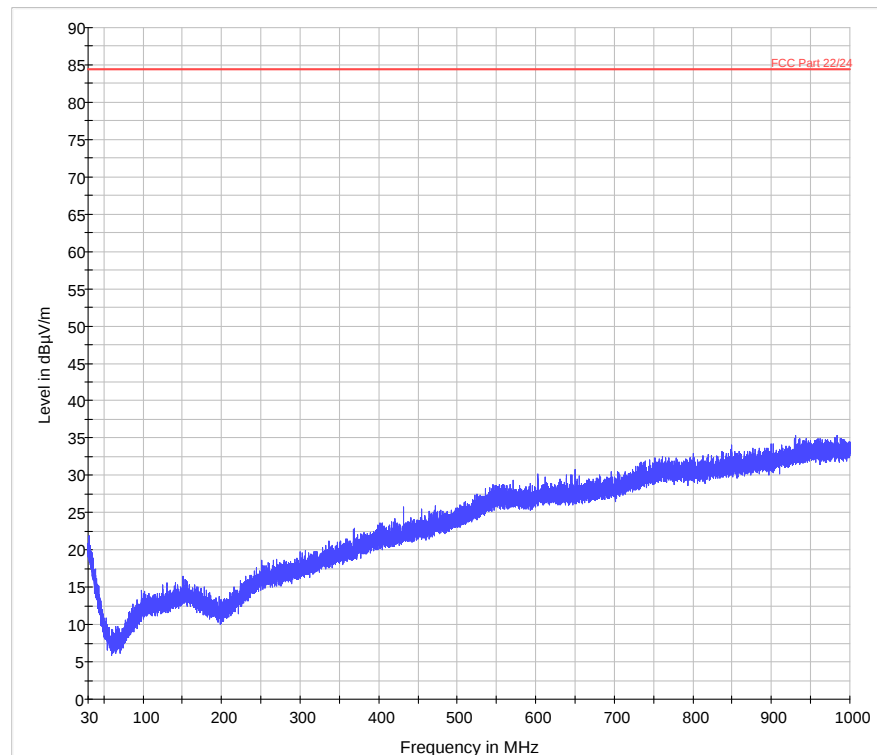
Radiated spurious emissions 1 GHz to 5 GHz (CH 251)



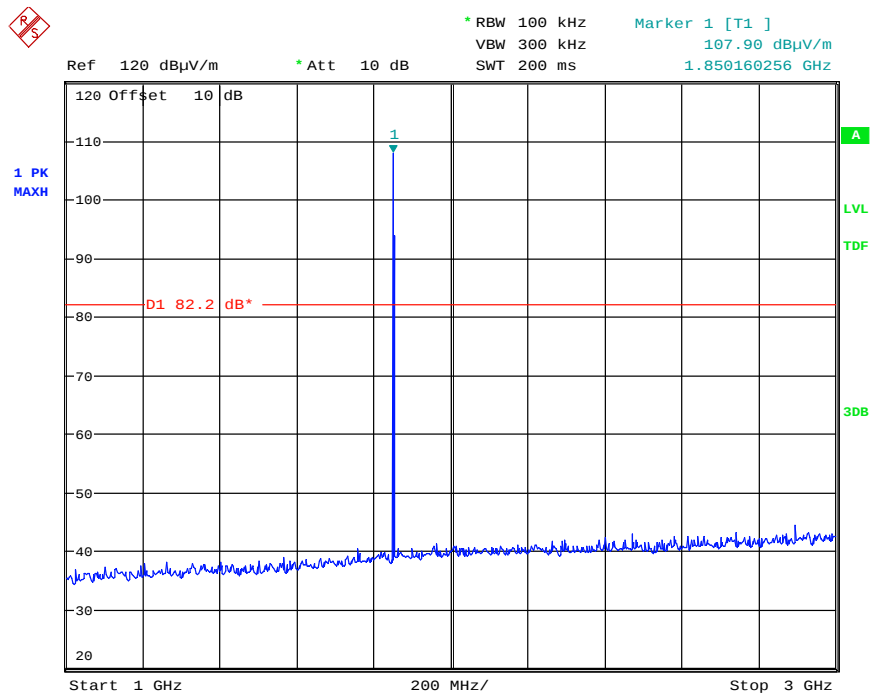
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Radiated spurious emissions 5 GHz to 9 GHz (CH 251)

Date: 4.MAY.2011 10:22:38

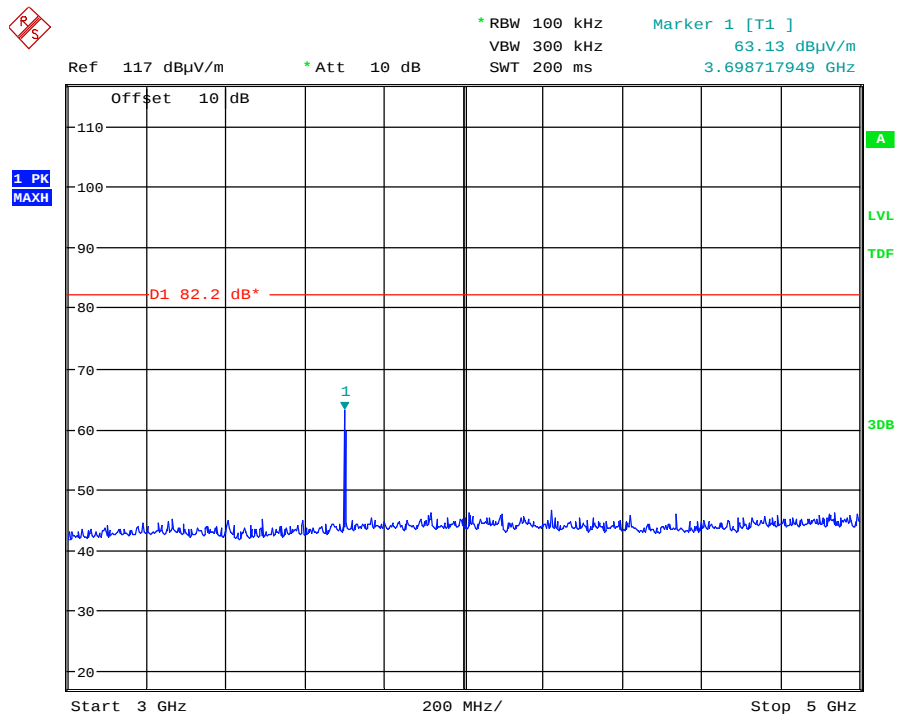
Radiated spurious emissions 30 MHz to 1 GHz (CH 512)

Radiated spurious emissions 1 GHz to 3 GHz (CH 512)



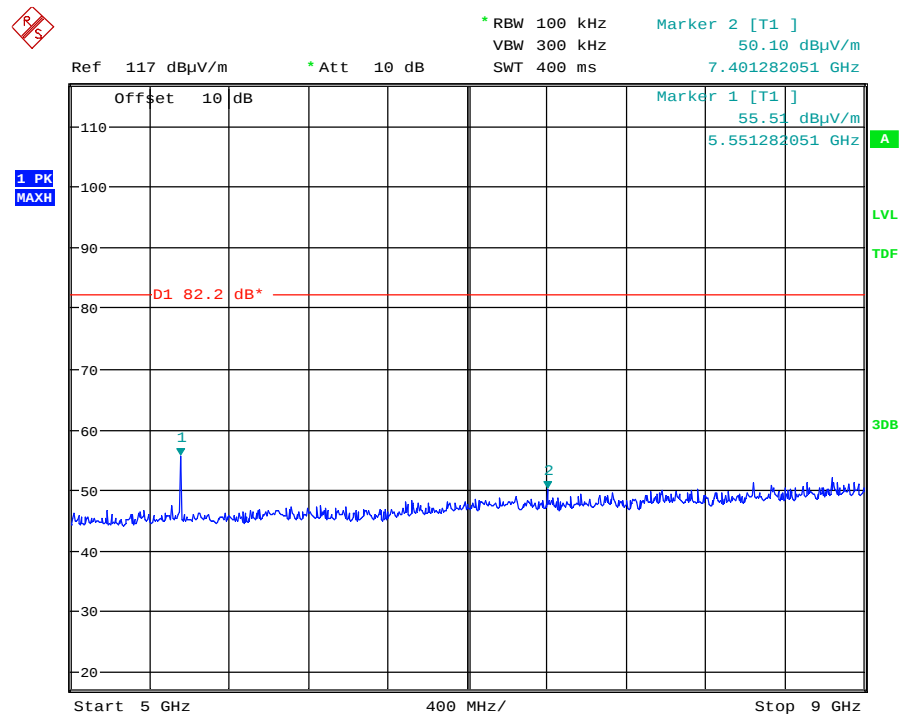
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Radiated spurious emissions 3 GHz to 5 GHz (CH 512)



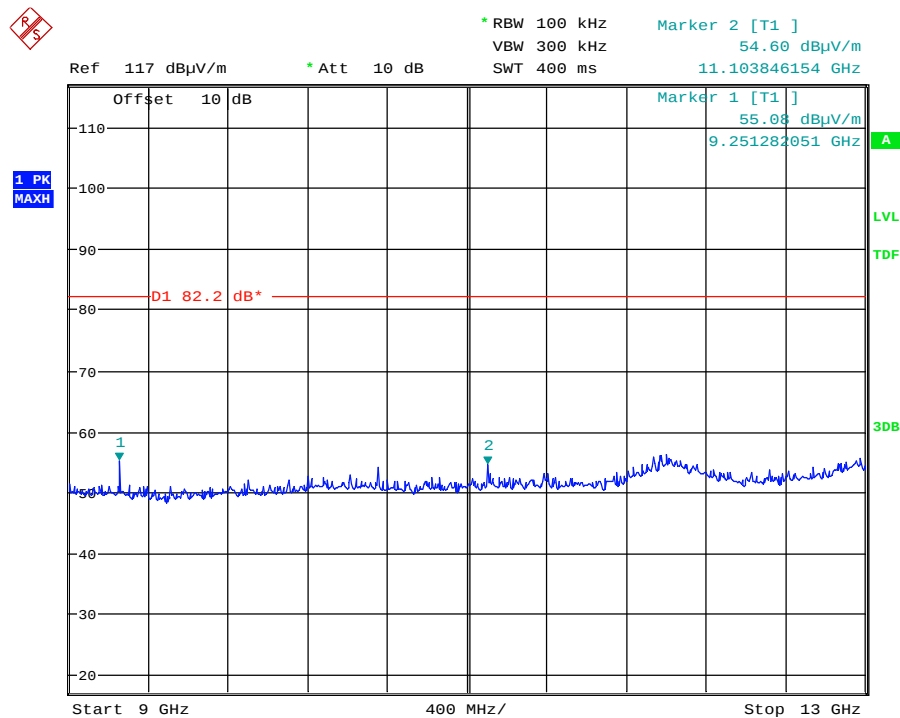
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Radiated spurious emissions 5 GHz to 9 GHz (CH 512)

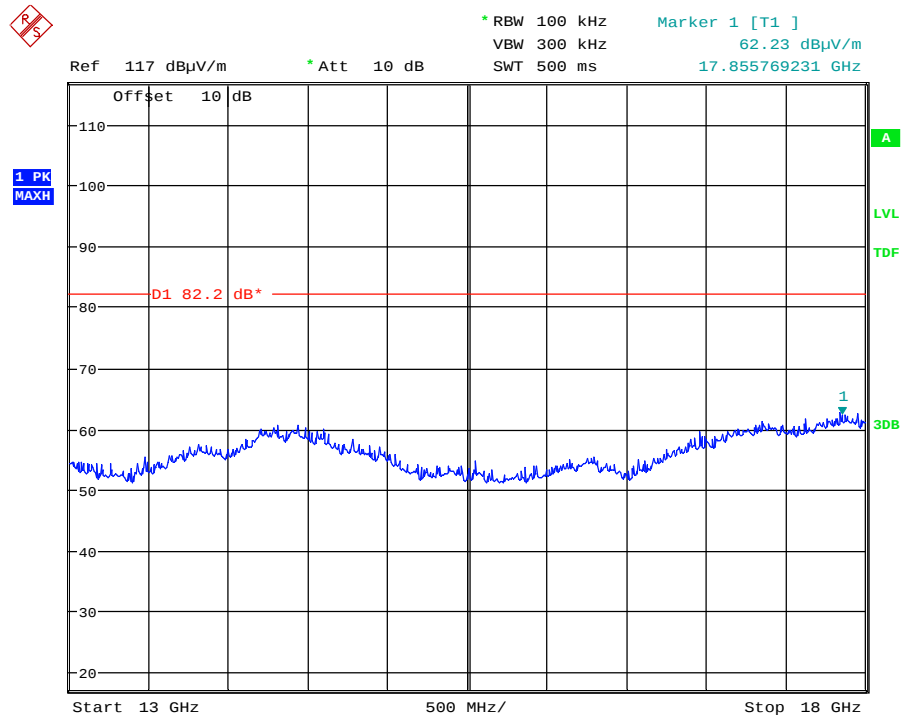


Date: 17.MAY.2011 09:57:30

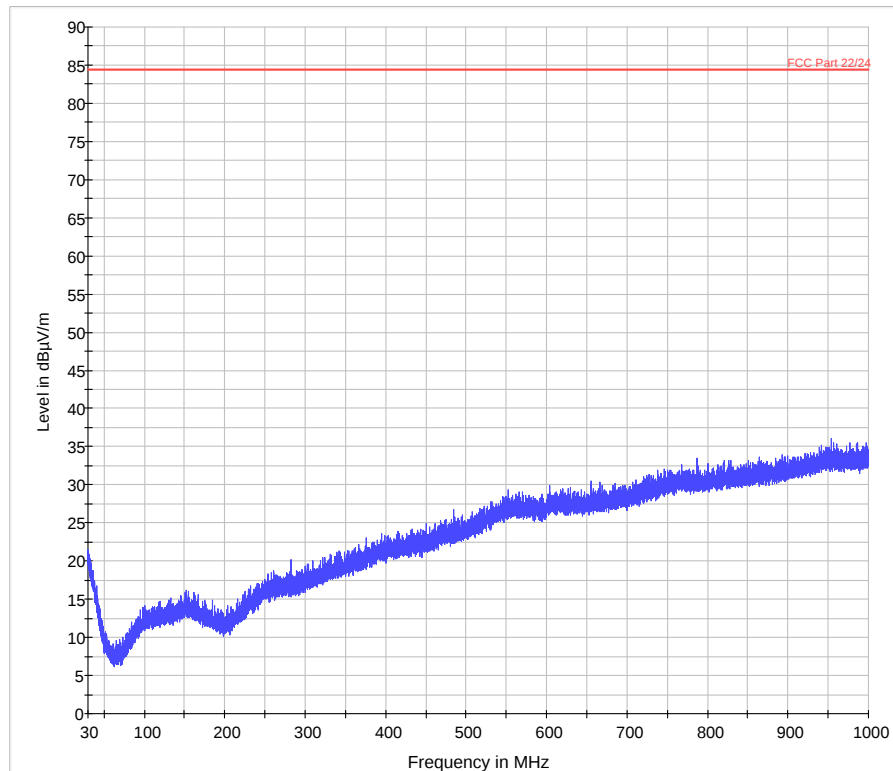
Radiated spurious emissions 9 GHz to 13 GHz (CH 512)



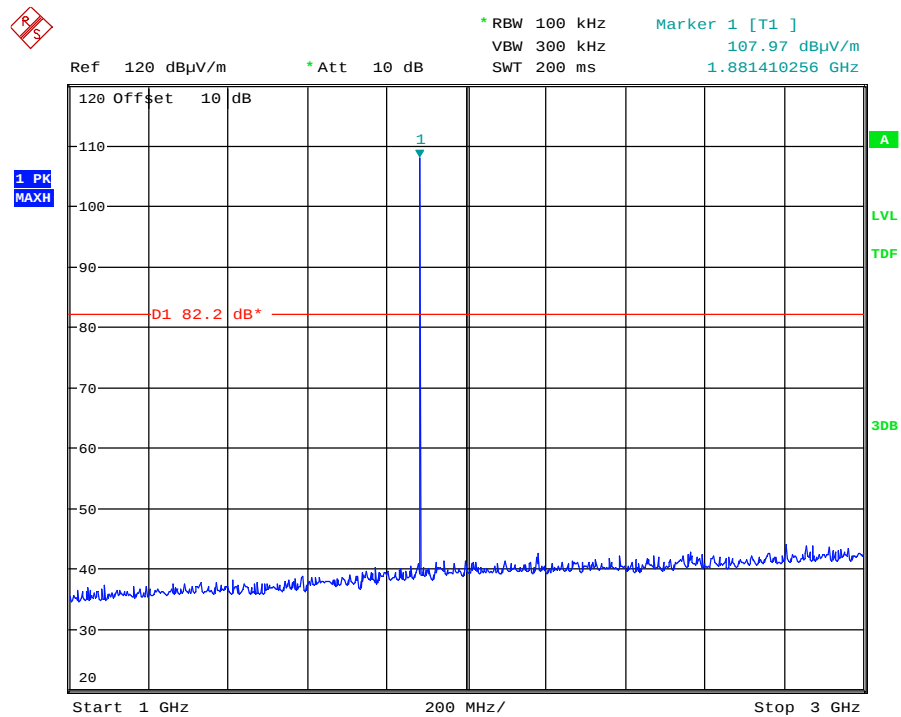
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Radiated spurious emissions 13 GHz to 18 GHz (CH 512)

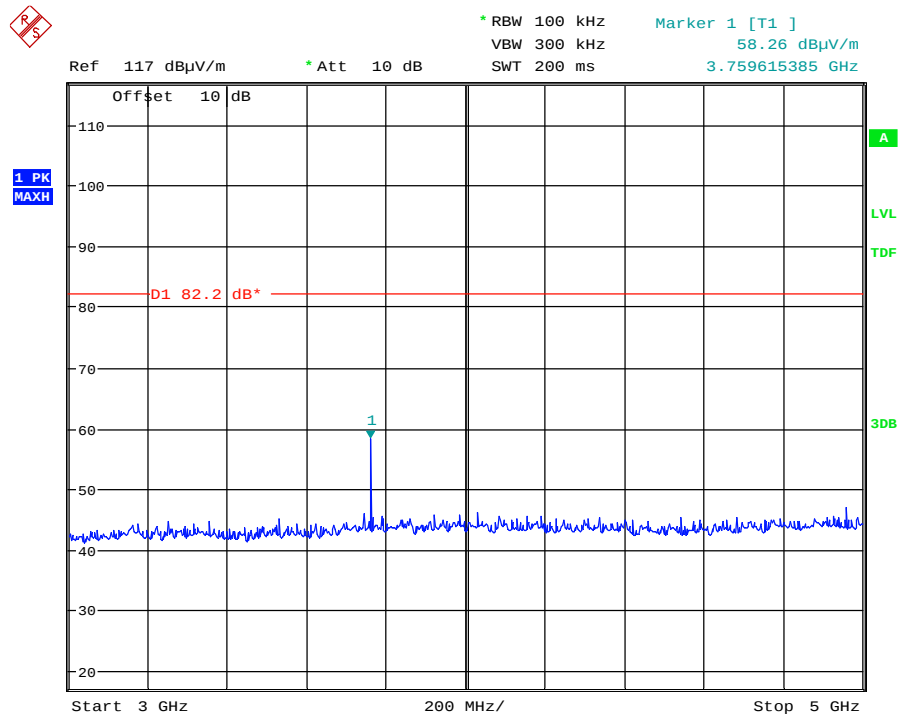
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Radiated spurious emissions 30 MHz to 1 GHz (CH 661)

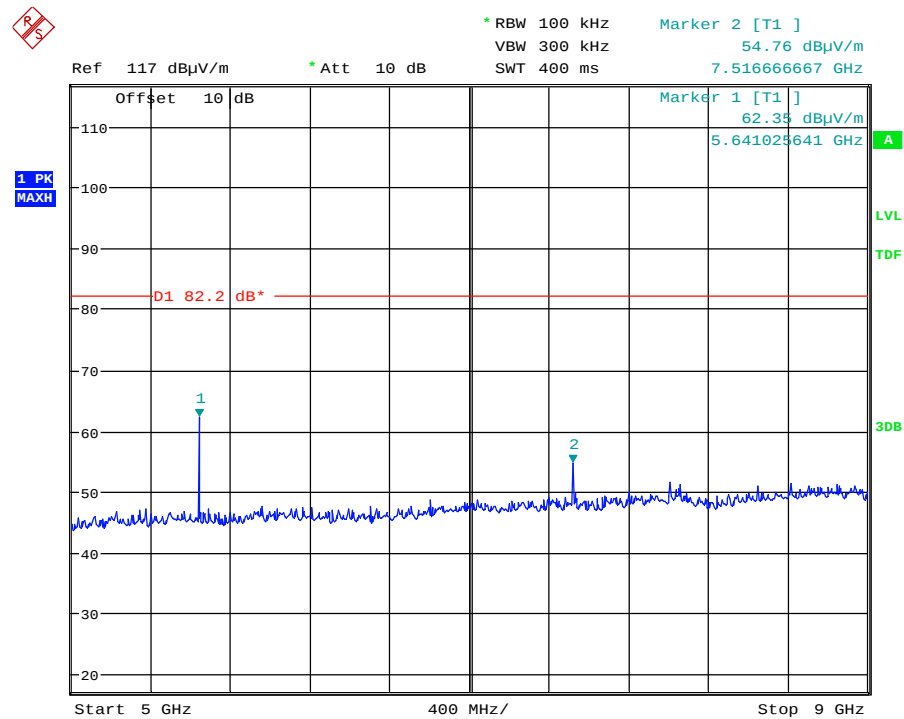
Radiated spurious emissions 1 GHz to 3 GHz (CH 661)



Radiated spurious emissions 3 GHz to 5 GHz (CH 661)

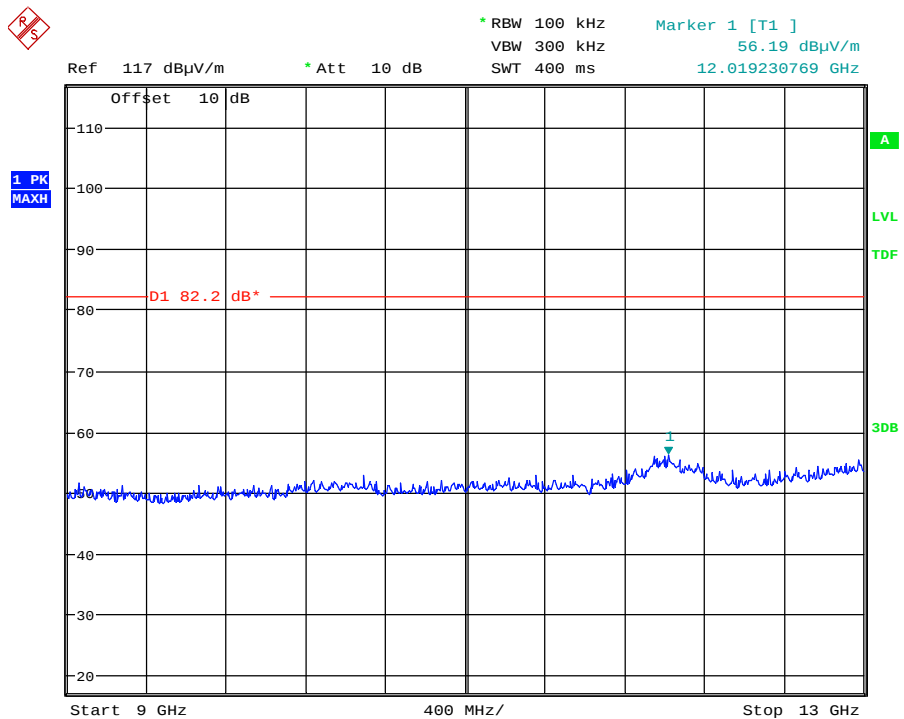


Radiated spurious emissions 5 GHz to 9 GHz (CH 661)



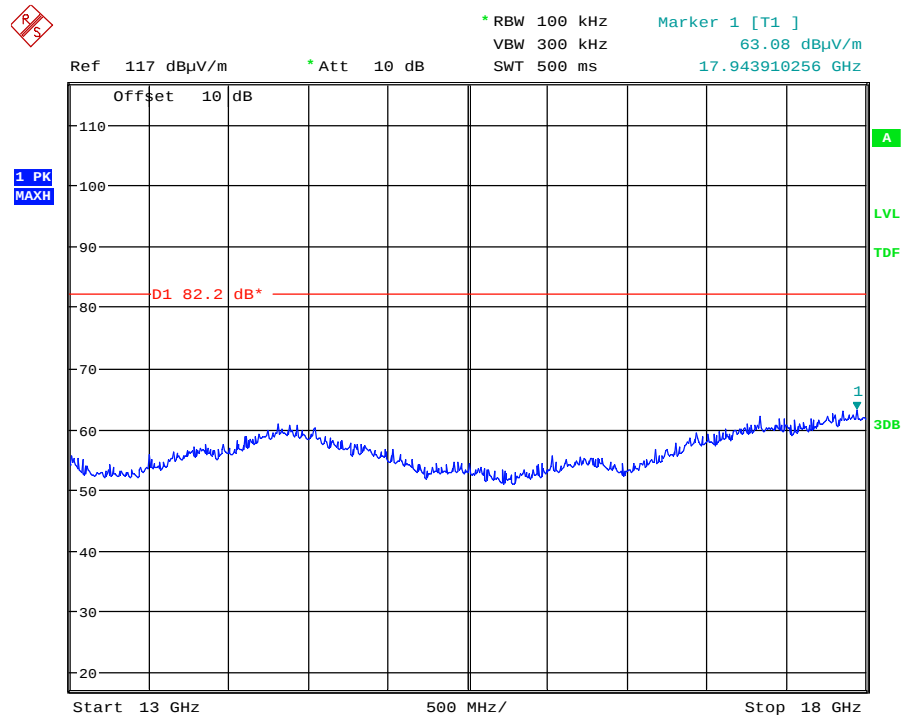
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Radiated spurious emissions 9 GHz to 13 GHz (CH 661)



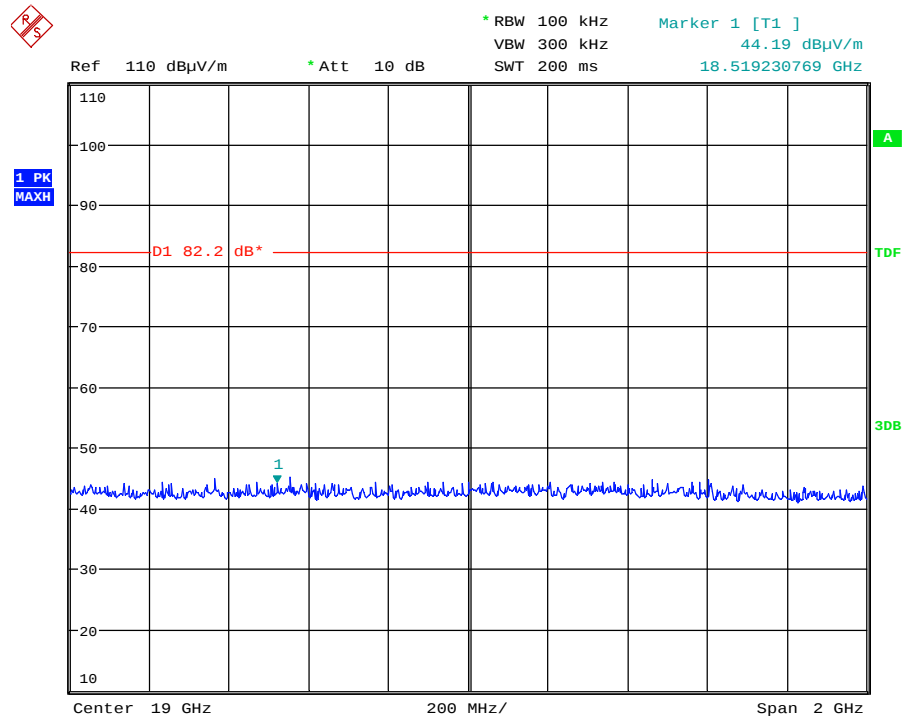
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Radiated spurious emissions 13 GHz to 18 GHz (CH 661)

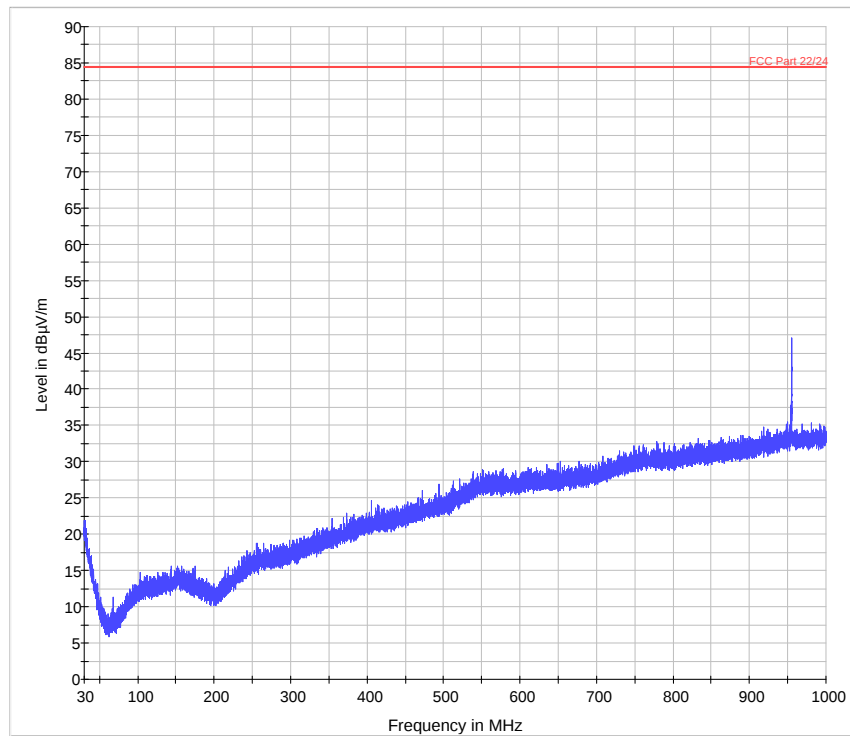
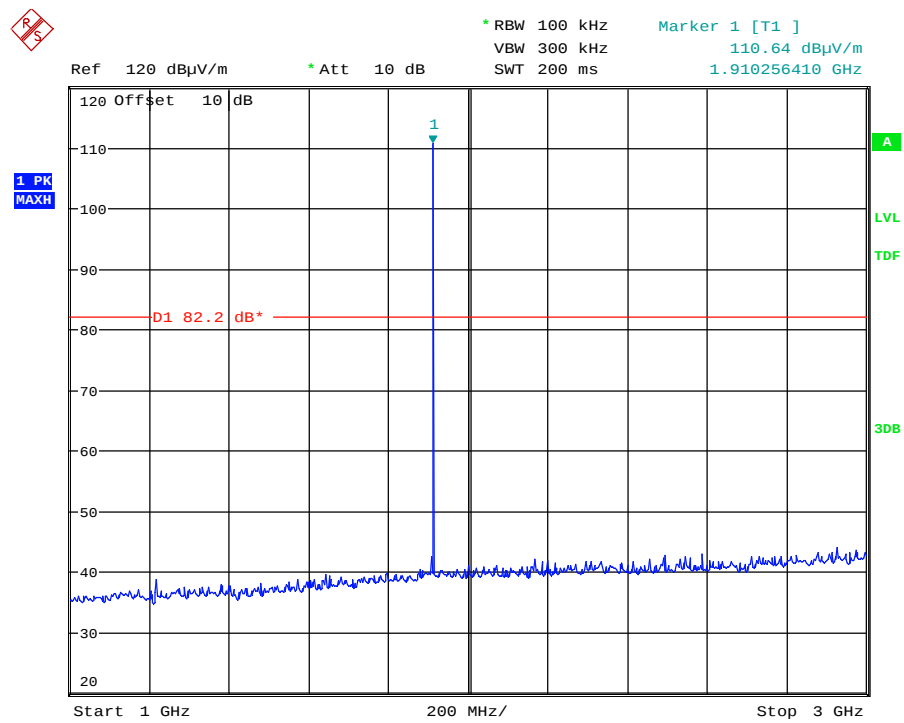


Date: 17.MAY.2011 10:13:35

Radiated spurious emissions 18 GHz to 20 GHz (CH 661)

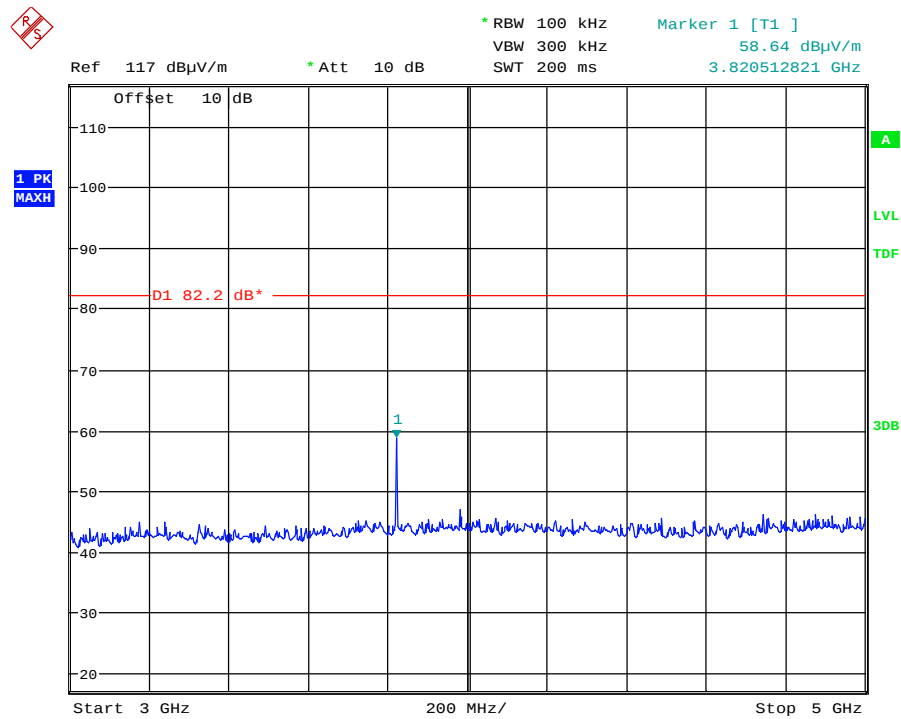


Date: 17.MAY.2011 13:27:05

Radiated spurious emissions 30 MHz to 1 GHz (CH 810)**Radiated spurious emissions 1 GHz to 3 GHz (CH 810)**

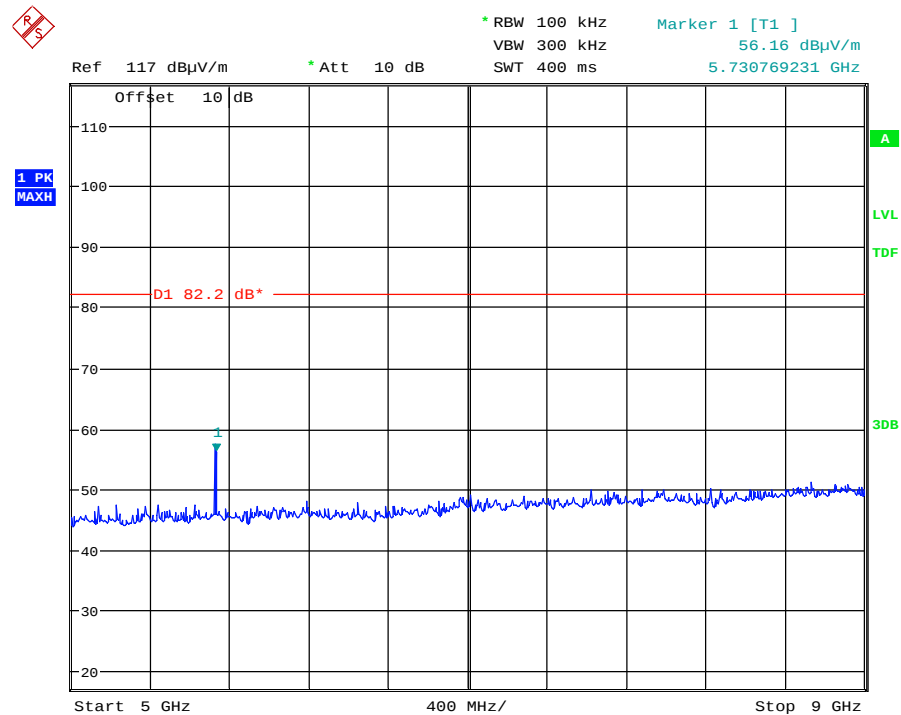
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Radiated spurious emissions 3 GHz to 5 GHz (CH 810)



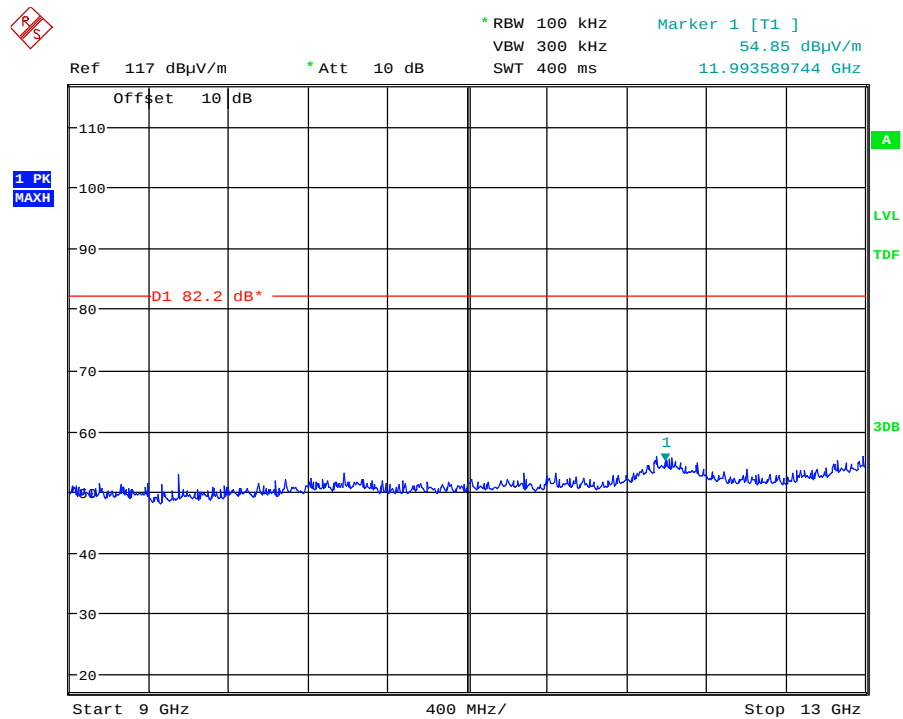
Date: 17.MAY.2011 10:24:09

Radiated spurious emissions 5 GHz to 9 GHz (CH 810)



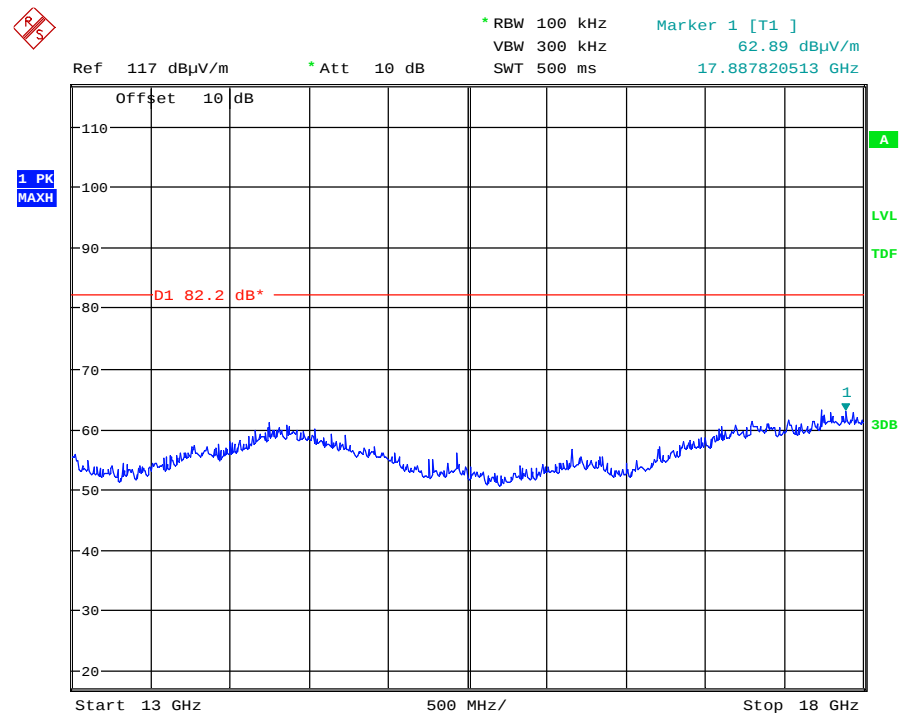
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Radiated spurious emissions 9 GHz to 13 GHz (CH 810)



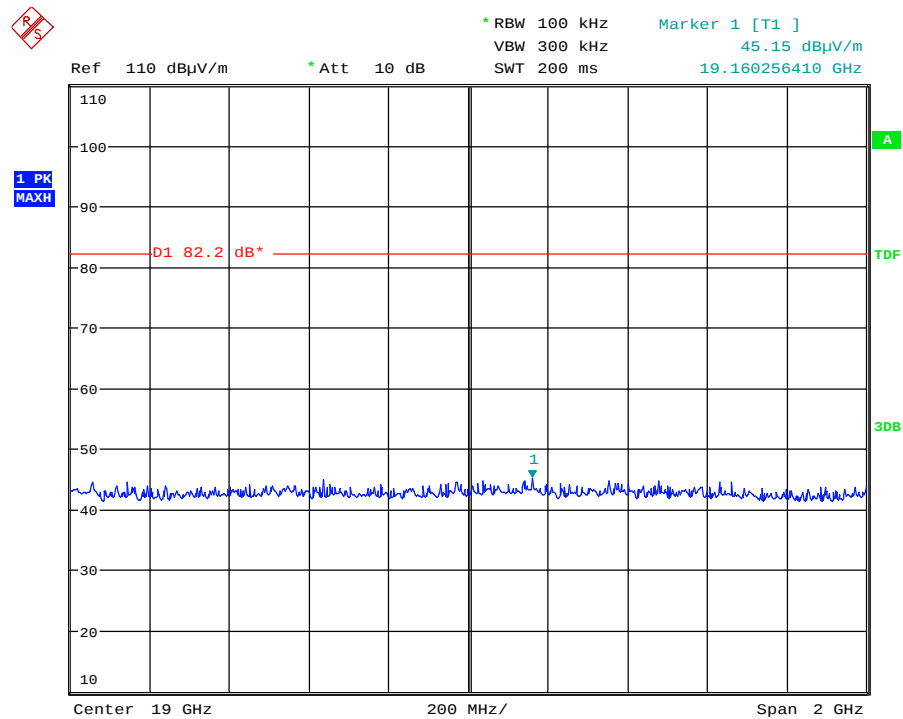
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Radiated spurious emissions 13 GHz to 18 GHz (CH 810)



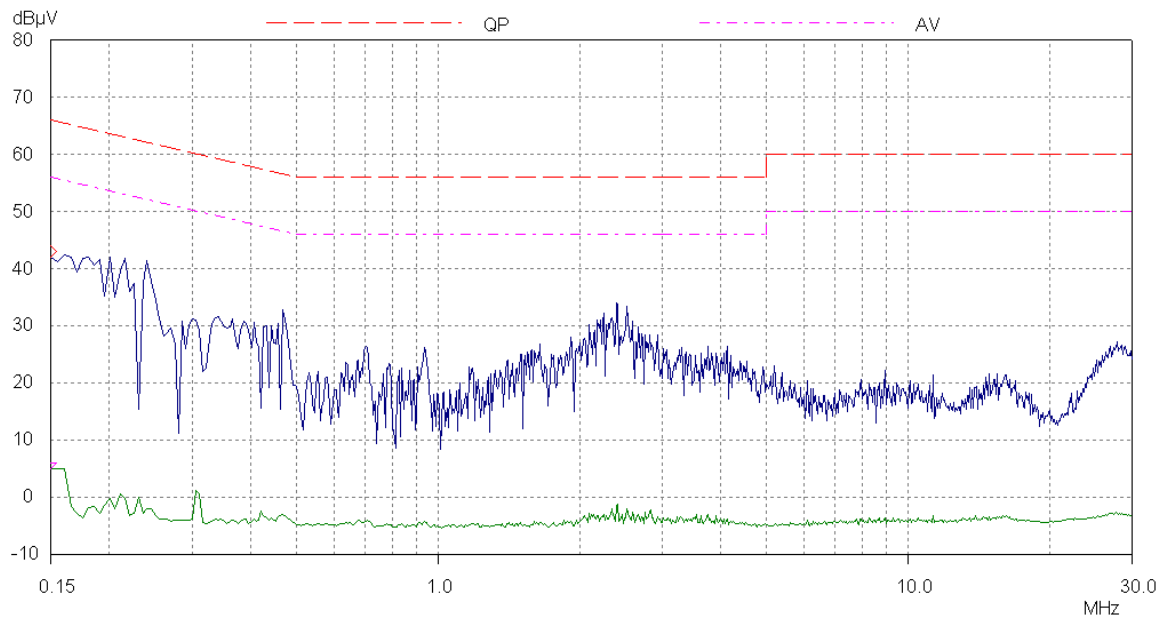
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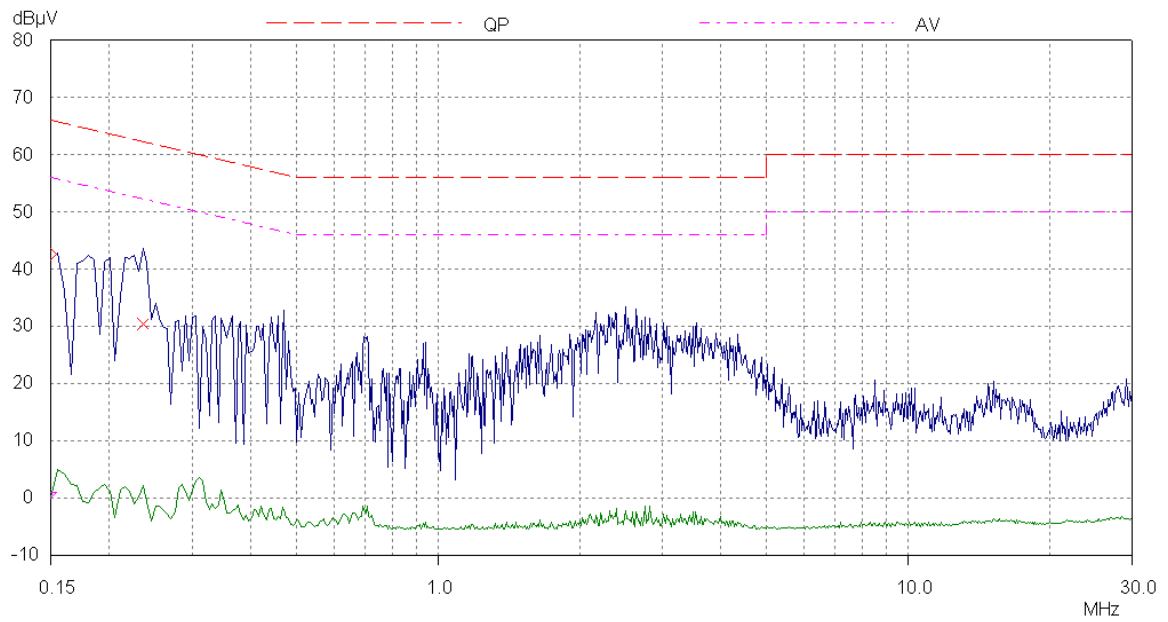
Radiated spurious emissions 18 GHz to 20 GHz (CH 810)



Date: 17.MAY.2011 13:28:47

Power Line conducted emissions plot (Transmitting in GSM 850 band)



Power Line conducted emissions plot (Transmitting in PCS 1900 band)

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 Telecoms & Radio upon request.

C1 Test samples

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

Sample No.	Description	Identification
S03, S04	Buddi V8 Portable Device	None
S09, S11	Power Adapter	None

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 actively transmitting

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:

Port	Description of Cable Attached	Cable length	Equipment Connected
No ports/cables were used whilst the EUT was tested.			

C5 Details of Equipment Used

TRAC Ref	Type	Description	Manufacturer	Date Calibrated.
TRLUH281	FSU46	Spectrum Analyser	Rhode & Schwarz	28/10/2008
TRL138	3115	1-18GHz Horn Antenna	EMCO	23/05/2007
TRL139	3115	1-18GHz Horn Antenna	EMCO	23/05/2007
TRL572	8499B	1 – 26.5 GHz Pre Amplifier	Agilent	04/07/2008
TRLUH186	ESHS10	Receiver	Rhode & Schwarz	03/04/2009
TRLUH191	CBL611/A	BiLog Periodic Antenna	York	01/10/2008
TRLUH28	UHALP 9108	Bicone elements	Schwarzbeck	30/05/2007
TRLUH372	6201-69	30MHz – 1 GHz Pre Amplifier	Watkins Johnson	27/11/2008
TRLUH340	83630B	Signal Generator	HP	03/06/2009
UH377	ESU 26	Receiver	R&S	11/06/2010

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

