



A RADIO TEST REPORT

FOR

WAVETREND EUROPE Ltd

ON

TGP-A

DOCUMENT NO. TRA-009817-00W-US-01

TRaC Wireless Test Report : TRA-009817-00-W-US-01

Applicant : WAVETREND EUROPE Ltd

Apparatus : TGP-A

Specification(s) : CFR47 Part 15.231 July 2010

Purpose of Test : CERTIFICATION

FCCID : 06XTGP-A

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 :

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1.3 Manufacturer

As Above

1.4 Apparatus Assessed

The following apparatus was assessed between 23rd April 2012 and 25th April 2012

EUT TGP-A

The above equipment was a 434 MHz transmitter operating in the 433.04 MHz to 434.79 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 |
|-------------------------------------------|--------------------------------------------------------------|----------------------|--------|
| Spurious Emissions Radiated <1000MHz | Title 47 of the CFR: Part 15 Subpart (c) 15.231e & 15.209 | ANSI C63.10 | Pass |
| Spurious Emissions Radiated >1000MHz | Title 47 of the CFR: Part 15 Subpart (c) 15.231e & 15.209 | ANSI C63.10 | Pass |
| AC Power conducted emissions | Title 47 of the CFR: Part 15 Subpart (c) 15.207 | ANSI C63.10 | N/A |
| Intentional Emission Frequency | Title 47 of the CFR: Part 15 Subpart (c) 15.231a | ANSI C63.10 | Pass |
| Intentional Emission Field Strength | Title 47 of the CFR: Part 15 Subpart (c) 15.231e | ANSI C63.10 | Pass |
| Intentional Emission Band Occupancy | Title 47 of the CFR: Part 15 Subpart (c) 15.215c | ANSI C63.10 | Pass |
| Intentional Emission ERP (mW) | Title 47 of the CFR: Part 15 Subpart (c) 15. | ANSI C63.10 | N/A |
| Unintentional Radiated Spurious Emissions | Title 47 of the CFR: Part 15 Subpart (b) 15.109 | ANSI C63.10 | N/A |
| Antenna Arrangements Integral: | Title 47 of the CFR: Part 15 Subpart (c) 15.203 | - | N/A |
| Antenna Arrangements External Connector | Title 47 of the CFR: Part 15 Subpart (c) 15.204 | - | Pass |
| Restricted Bands | Title 47 of the CFR: Part 15 Subpart (c) 15.205 | - | Pass |
| Maximum Frequency of Search | Title 47 of the CFR: Part 15 Subpart (c) 15.33 | - | Pass |
| Extrapolation Factor | Title 47 of the CFR: Part 15 Subpart (c) 15.31(f) | - | 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 | : 22 to 23 °C |
| Humidity | : 45 to 75 % |

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**

For the test data recorded in 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 (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

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%**

[11] Power Line Conduction

Uncertainty in test result = **3.4dB**

[12] Spectrum Mask Measurements

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

[13] Adjacent Sub Band Selectivity

Uncertainty in test result = **1.24dB**

[14] Receiver Blocking – Listen Mode, Radiated

Uncertainty in test result = **3.42dB**

[15] Receiver Blocking – Talk Mode, Radiated

Uncertainty in test result = **3.36dB**

[16] Receiver Blocking – Talk Mode, Conducted

Uncertainty in test result = **1.24dB**

[17] Receiver Threshold

Uncertainty in test result = **3.23dB**

[18] 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 |
| EUT | : Equipment Under Test | ATS | : Alternative Test Site |
| SE | : Support Equipment | Ref | : Reference |
| L | : Live Power Line | Freq | : Frequency |
| 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 Transmitter Intentional Emission Radiated

| Carrier power was verified with the EUT transmitting Test Details: | |
|---------------------------------------------------------------------------|---------------------------------------------------|
| Regulation | Title 47 of the CFR: Part15 Subpart (c) 15.231(e) |
| Measurement standard | ANSI C63.10:2009 |
| EUT sample number | S01 |
| Modification state | 0 |
| SE in test environment | None |
| SE isolated from EUT | None |
| EUT set up | Refer to Appendix C |
| Temperature | 20 |
| Photographs (Appendix F) | 1 & 2 |

| FREQ. (MHz) | MEASUREMENT Rx. READING (dBμV) | CABLE LOSS (dB) | ANT FACTOR (dB/m) | DUTY CYCLE CORRECTION (dB) | FIELD STRENGTH (dBμV/m) | FIELD STRENGTH (μV/m) |
|--------------------------|--------------------------------------|-----------------------|-------------------------|----------------------------------|-------------------------------|-----------------------------|
| 433.89 | 66.9 | 2.5 | 16.3 | -20 | 65.7 | 1927.52 |
| Limit value @ fc | | | 4398.2 μV/m | | | |
| Band occupancy @ -20 dBc | | | f lower | | f higher | |
| | | | 433.846314 | | 433.959294 | |
| | | | 112.98kHz | | | |

- 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
 - 4 Limit = Linear interpolation 260MHz = 1500 μV/m / 470MHz = 5000μV/m
 - 5 See Appendix E for duty cycle correction

- Test Method:**
- 1 As per Radio – Noise Emissions, ANSI C63.10
 - 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 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 15.231(e) & 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 | Title 47 of the CFR, Part 15 Subpart (c) Clause 15.231(e) & 15.209 |
| Measurement standard | ANSI C63.10:2009 |
| Frequency range | 30 MHz – 4.5GHz |
| EUT sample number | S01 |
| Modification state | 0 |
| SE in test environment | None |
| SE isolated from EUT | None |
| EUT set up | Refer to Appendix C |
| Temperature | 20 |
| Photographs (Appendix F) | 1 & 2 |

The worst case radiated emission measurements for spurious emissions and harmonics

| Ref No. | FREQ. (MHz) | MEAS Rx (dBμV) | CABLE LOSS (dB) | ANT FACT (dB/m) | PRE AMP (dB) | FIELD ST'GH (dBμV/m) | DUTY CYCLE CORRECTION (dB) | FIELD ST'GH (μV/m) | LIMIT (μV/m) |
|---------|----------------------|----------------|-----------------|-----------------|--------------|----------------------|----------------------------|--------------------|--------------|
| 1. | 126.95 _{QP} | 19.00 | 1.8 | 8.4 | N/A | 29.20 | N/A | 28.80 | 150.0 |
| 2. | 420.35 _{QP} | 15.20 | 2.4 | 16.6 | N/A | 34.14 | -20 | 5.09 | 376.7 |
| 3. | 447.45 _{QP} | 14.20 | 2.5 | 16.3 | N/A | 33.00 | -20 | 4.46 | 440.5 |
| 4. | 867.80 _{QP} | 31.50 | 3.4 | 20.3 | N/A | 55.30 | -20 | 58.21 | 500 |
| 5. | 1301.7 _P | 70.02 | 1.7 | 25.3 | 37 | 60.02 | N/A | 1023.29pk | 5000 |
| 6. | 1301.7 _A | 69.35 | 1.7 | 25.3 | 37 | 59.35 | -20 | 92.79Av | 500 |
| 7. | 1735.59 _P | 67.87 | 2.0 | 26.8 | 36.1 | 60.57 | - N/A | 1067.82pk | 5000 |
| 8. | 1735.59 _A | 66.76 | 2.0 | 26.8 | 36.1 | 59.46 | -20 | 93.97Av | 500 |
| 9. | 2169.5 _P | 69.35 | 2.1 | 27.8 | 35.6 | 63.65 | N/A | 1522.29pk | 5000 |
| 10. | 2169.5 _P | 68.22 | 2.1 | 27.8 | 35.6 | 62.52 | -20 | 133.66Av | 500 |
| 11. | 2603.46 _P | 60.45 | 2.0 | 28.8 | 35.5 | 55.75 | N/A | 613.05pk | 5000 |
| 12. | 2603.46 _A | 58.04 | 2.0 | 28.8 | 35.5 | 53.34 | -20 | 46.45Av | 500 |

Radiated emissions continued.

| Ref No. | FREQ. (MHz) | MEAS Rx (dBμV) | CABLE LOSS (dB) | ANT FACT (dB/m) | PRE AMP (dB) | FIELD ST'GH (dBμV/m) | DUTY CYCLE CORRECTION (dB) | FIELD ST'GH (μV/m) | LIMIT (μV/m) |
|---------|-------------|----------------|-----------------|-----------------|--------------|----------------------|----------------------------|--------------------|--------------|
| 13. | 3037.35 | 52.43 | 2.5 | 30.1 | 35.5 | 49.53 | N/A | 299.57pk | 5000 |
| 14. | 3037.35 | 45.72 | 2.5 | 30.1 | 35.5 | 42.82 | -20 | 13.83Av | 500 |
| 15. | 3471.19 | 54.14 | 2.7 | 31.0 | 35.6 | 52.24 | N/A | 409.26pk | 5000 |
| 16. | 3471.19 | 47.37 | 2.7 | 31.0 | 35.6 | 45.47 | -20 | 18.77Av | 500 |
| 17. | 4339.01 | 52.57 | 2.5 | 32.0 | 35.6 | 51.47 | N/A | 374.54pk | 5000 |
| 18. | 4339.01 | 44.52 | 2.5 | 32.0 | 35.6 | 43.42 | -20 | 14.82Av | 500 |

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 Part 15:2008 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) Where results have been corrected for duty cycle see appendix E for calculations.
- (d) 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 | | | | |

Appendix B:

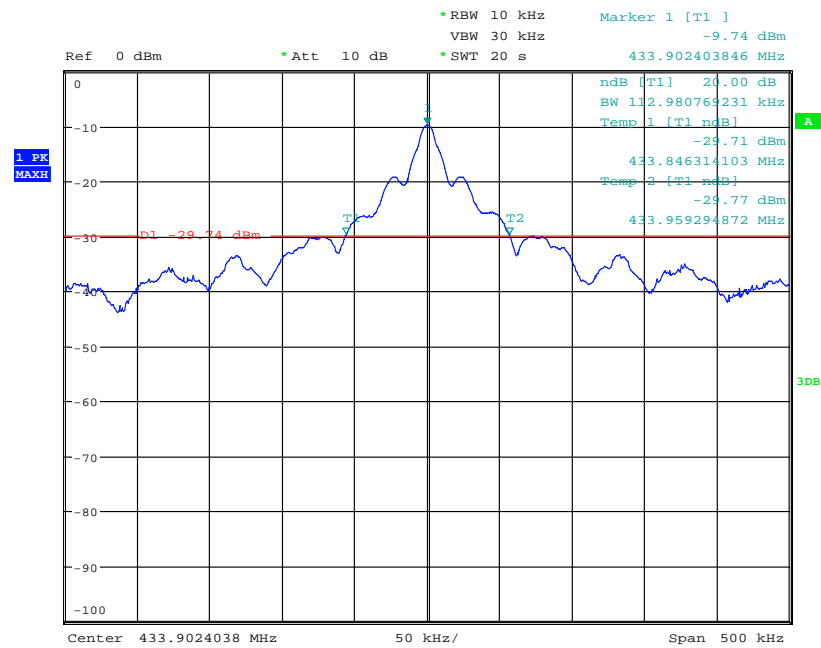
Supporting Graphical Data

This appendix contains graphical data obtained during testing.

Notes:

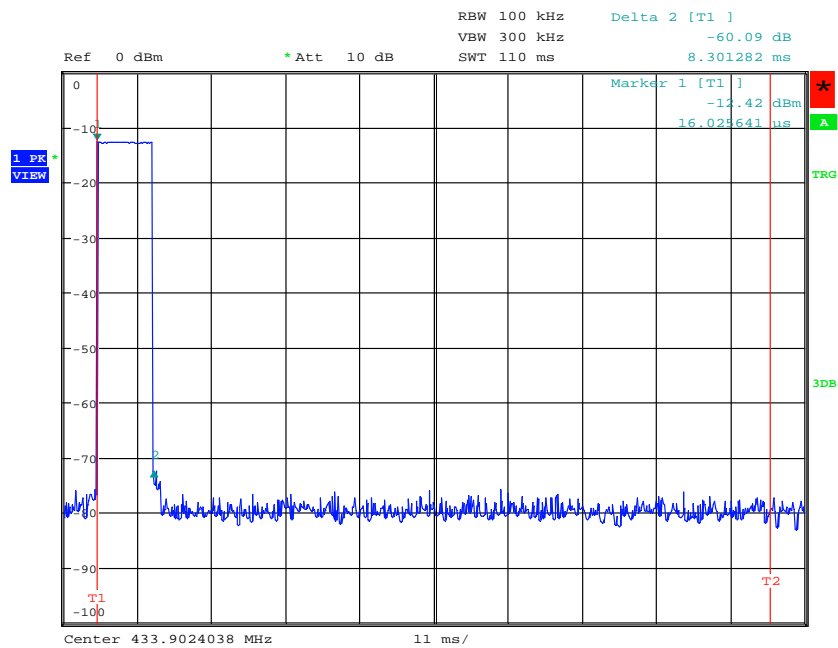
- (a) The radiated electric field emissions and conducted emissions graphical data in this appendix is preview data. For details of formal results, refer to Appendix A and Appendix B.
- (b) The time and date on the plots do not necessarily equate to the time of the test.
- (c) Where relevant, on power 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.

20dB Bandwidth



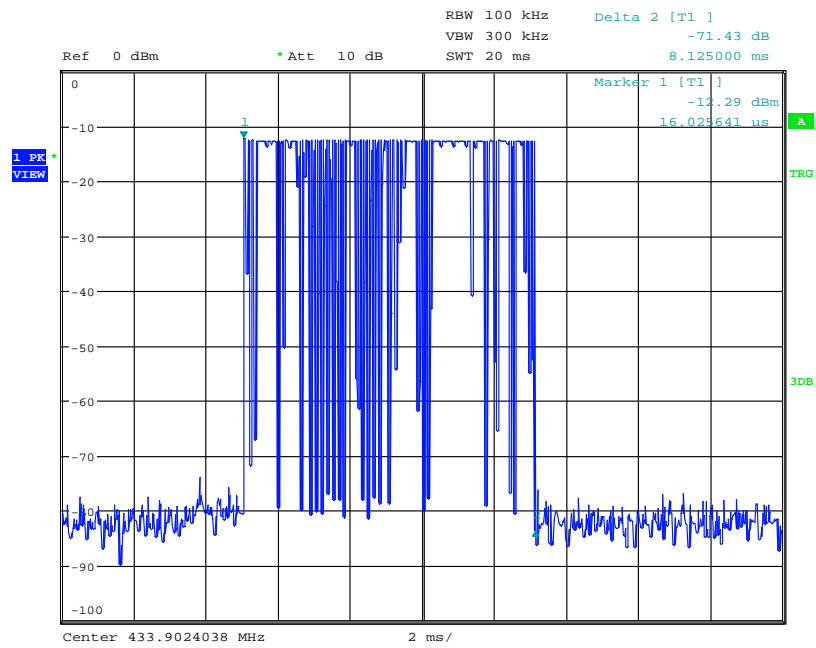
Date: 23.APR.2012 15:33:53

Ton in a 100ms Period auto mode



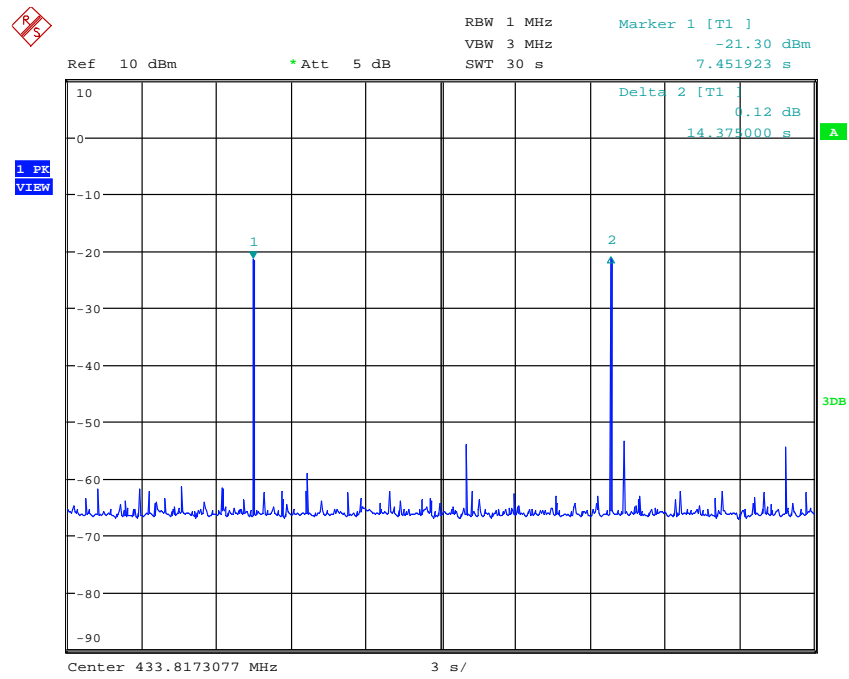
Date: 25.APR.2012 08:49:19

Ton auto mode



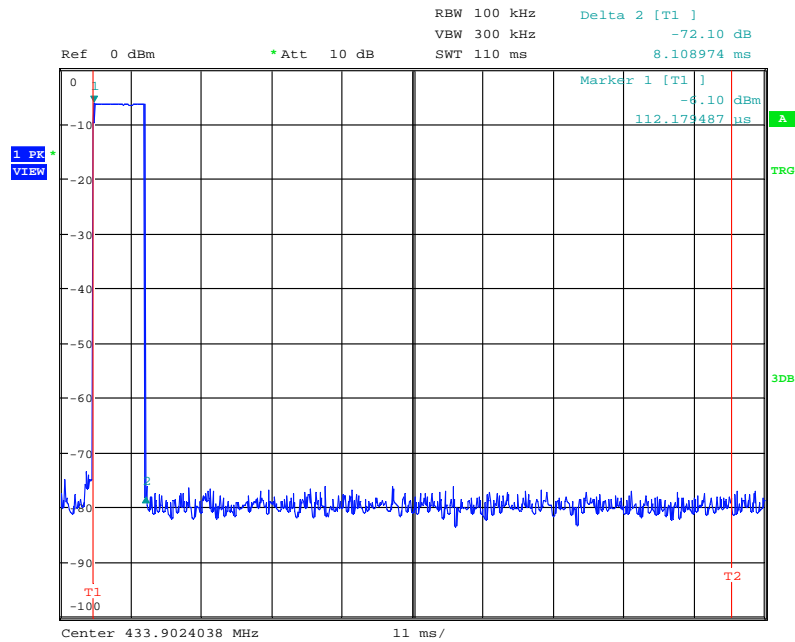
Date: 25.APR.2012 08:48:29

Time Period in Auto mode



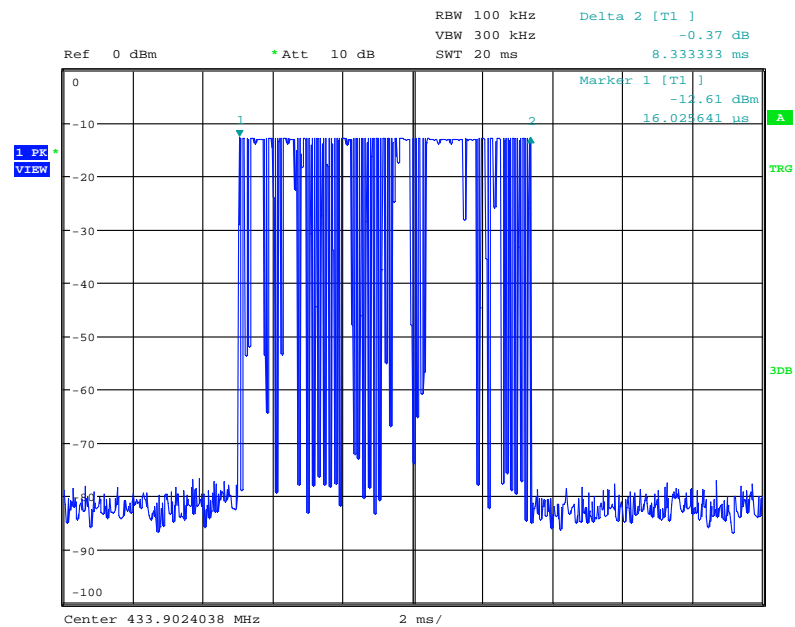
Date: 28.MAY.2012 15:01:01

Ton in a 100ms Period motion mode



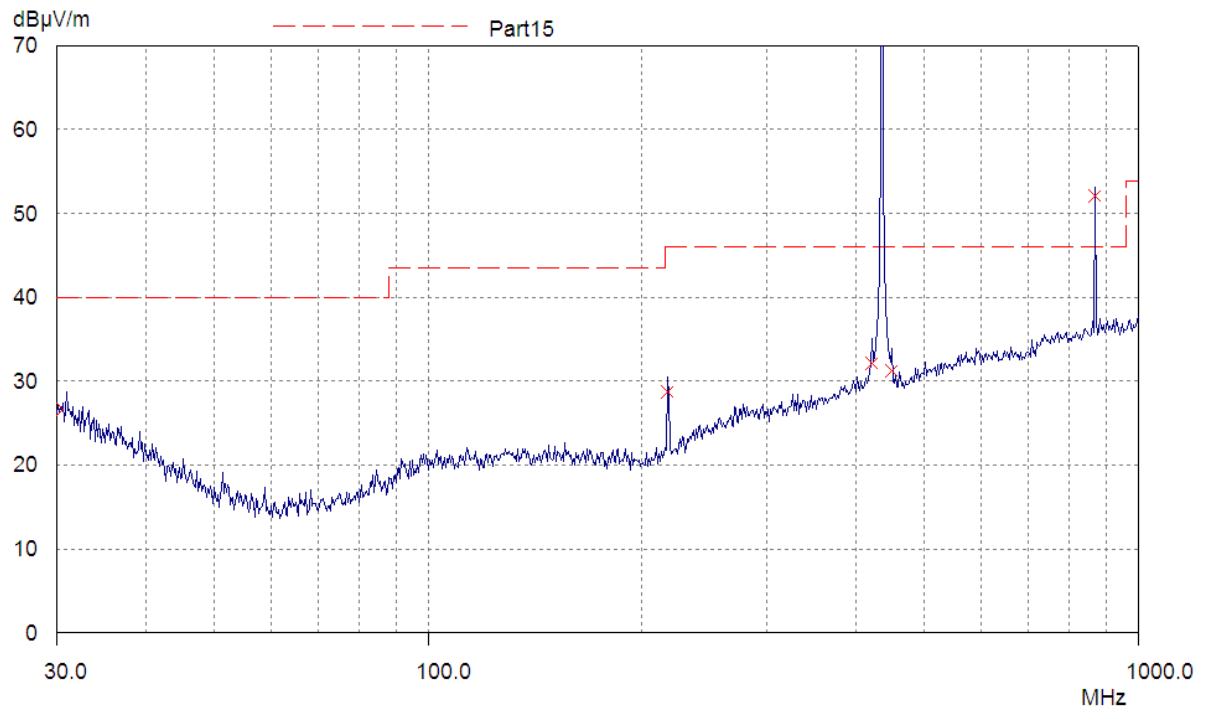
Date: 25.APR.2012 08:45:07

Ton motion mode

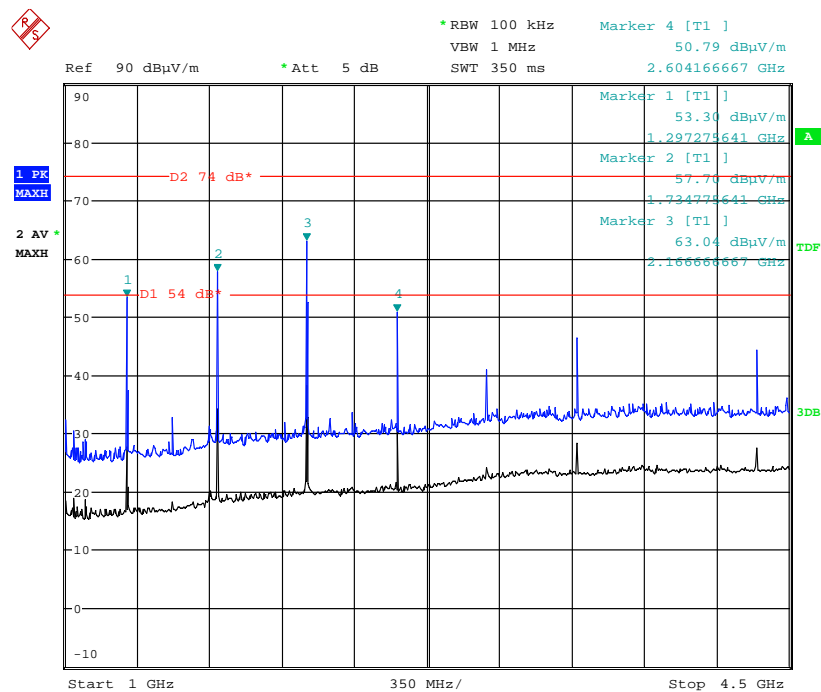


Date: 25.APR.2012 08:47:20

Radiated spurious emissions 30 MHz to 1 GHz



Radiated spurious emissions 1 GHz to 4.5 GHz



Date: 25.APR.2012 08:34:46

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 |
|------------|-----------------|----------------|
| S01 | TGP-A CW mode | N/A |
| S02 | TGP-A Modulated | N/A |
| | | |

C2) EUT Operating Mode During Testing.

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

| Test | Description of Operating Mode: Transmit |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Carrier power Spurious Emissions | Permanently Transmitting Carrier Wave |
| 20dB Occupied bandwidth Transmitter timing | Normally Transmitting Modulated Carrier Normally Transmitting Modulated Carrier/auto mode/ motion mode |

| Test | Description of Operating Mode: Receive mode |
|----------------|---------------------------------------------|
| Not Applicable | |

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
Tests : Radiated

| Port | Description of Cable Attached | Cable length | Equipment Connected |
|-------------------|-------------------------------|--------------|---------------------|
| Battery Connector | None | 0 | Battery |
| | | | |
| | | | |

C5 Details of Equipment Used

For All Measurements:

| TRAC Ref | Type | Description | Manufacturer | Date Calibrated. |
|----------|----------|----------------------------|-----------------|------------------|
| TRLUH281 | FSU46 | Spectrum Analyser | Rhode & Schwarz | 09/02/2012 |
| TRL138 | 3115 | 1-18GHz Horn Antenna | EMCO | 08/11/2011 |
| TRL139 | 3115 | 1-18GHz Horn Antenna | EMCO | 14/09/2011 |
| TRL572 | 8499B | 1 – 26.5 GHz Pre Amplifier | Agilent | 24/11/2010 |
| TRLUH004 | ESVS10 | Receiver | Rhode & Schwarz | 12/01/2012 |
| TRLUH191 | CBL611/A | BiLog Periodic Antenna | York | 08/11/2010 |

Appendix D:

Additional Information

No additional information is included within this test report.

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

Using a spectrum analyser in zero span mode, centred on the fundamental carrier frequency with a RBW of 100kHz and a VBW > RBW the sweep time was set accordingly to capture the pulse train. The transmit pulsewidths and period was measured. A plots of the pulse train is contained in Appendix B of this test report.

If the pulse train was less than 100 ms, including blanking intervals, the duty cycle was calculated by averaging the sum of the pulsewidths over one complete pulse train. However if the pulse train exceeds 100ms then the duty cycle was calculated by averaging the sum of the pulsewidths over the 100ms width with the highest average value. (The duty cycle is the value of the sum of the pulse widths in one period (or 100ms), divided by the length of the period (or 100ms). The duty cycle correction factor was then expressed in dB and the peak emissions adjusted accordingly to give an average value of the emission.

Correction factor dB = $20 \times (\text{Log}_{10} \text{ Calculated Duty Cycle})$

Therefore the calculated duty cycle was determined:

The pulse train period was greater than >100ms and in as shown from the plots in contained in appendix B of this test report.

Duty cycle = $\frac{\text{the sum of the highest average value pulsewidths over 100ms}}{100\text{ms}}$

e.g

$$= \frac{7.580\text{ms}}{100\text{ms}} = 0.0758$$

0.0758 or 7.58%

Correction factor (dB) = $20 \times (\text{Log}_{10} 0.0758) = -22.41\text{dB}$

Maximum allowable correction is -20 dB

TGP-A correction factor for auto mode = $20\log(8.12 \div 100) = -21.8\text{dB}$

Maximum allowable correction is -20 dB

TGP-A correction factor for motion mode = $20\log(8.33 \div 100) = -21.58\text{dB}$

Maximum allowable correction is -20 dB

Appendix F: Photographs and Figures

The following photographs were taken of the test samples:

1. Radiated electric field emissions arrangement: Over view.
2. Radiated electric field emissions arrangement: Close up.
3. Photo of the Component Side
4. Photo of the Track Side

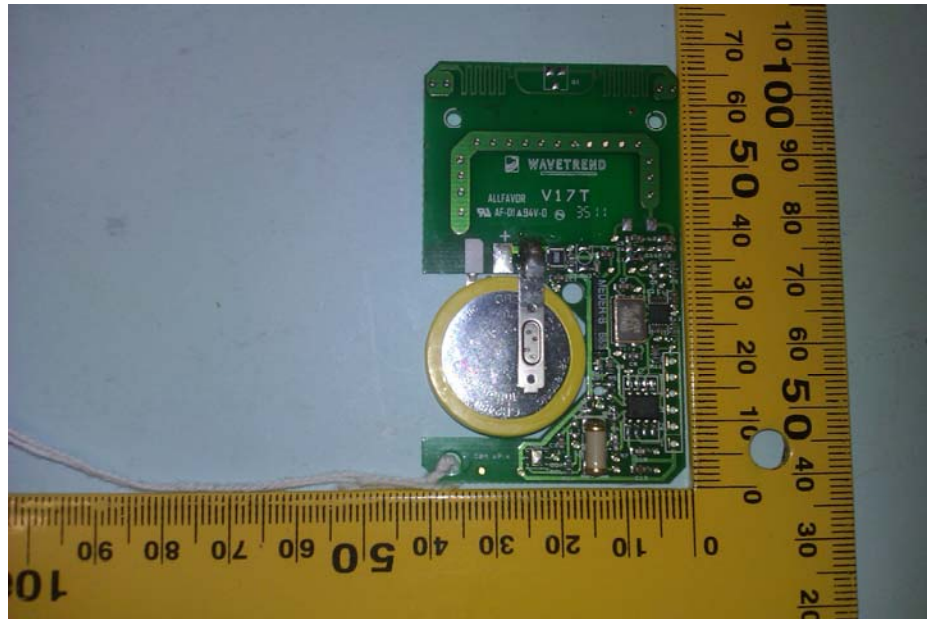
Photograph 1



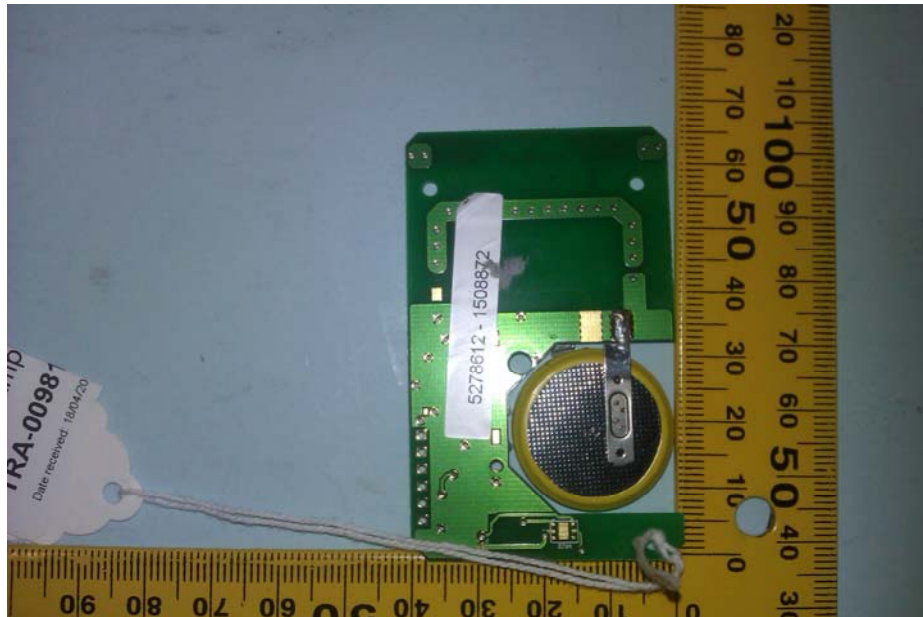
Photograph 2



Photograph 3



Photograph 4



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 0.289mW/cm² power density limit, as required under FCC rules.

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

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

where:

S = power density

R = distance to the centre of radiation of the antenna

EIRP = EUT Maximum power

Note:

The EIRP measurement was performed using a signal substitution method.

Result

| Prediction Frequency (MHz) | Maximum ERP (mW) | Power density limit (S) (mW/cm ²) | Distance (R) cm required to be less than 0.289 mW/cm ² |
|----------------------------|------------------|-----------------------------------------------|-------------------------------------------------------------------|
| 433.9 | 0.0007 | 0.289 | 0.014 cm |

Appendix G:**Variants**

| Model | Tested | Variation from tested Model |
|-------|--------|-----------------------------|
| | | |
| | | |
| | | |

