# Regulatory Compliance Test Report 15.247 DTS - FCC/IC

| | | |
|---|---|---|
| **Test Lab Information** | **Name** | **CELLTECH LABS INC.** |
| | **Address** | 21-364 Lougheed Road, Kelowna, British Columbia V1X 7R8 Canada |
| **Test Lab Registration No.(s)** | **FCC** | 714830 |
| | **IC** | 3874A-1 |
| **Applicant Information** | **Name** | **BLACKLINE GPS** |
| | **Address** | **Suite 101, 1215 13th Street SE Calgary, Alberta, T2G 3J4, Canada** |
| **Standard(s) & Procedure(s)** | **FCC** | **47 CFR Part 15.247** |
| | **IC** | **RSS-210 Issue 8; RSS-Gen Issue 3** |
| | **ANSI** | C63.4-2003 |
| **Device Classification(s)** | **FCC** | Part 15, Bluetooth LE Transmitter (DTS). |
| | **IC** | Bluetooth 4.0, DTS Transmitter. |
| **Application Type(s)** | **FCC/IC** | TCB/CB Certification |
| **Device Identifier(s)** | **FCC ID:** | W77LNRDUO. |
| | **IC:** | 8255A-LNRDUO |
| **Device Name:**<br>**Device Model #:** | Loner DUO<br>101724 | |
| **Test Sample Serial No.** | #1 | |
| **Transmit Frequency Band** | 2400 - 2483.5 MHz | |
| **Transmit Frequency Range** | 2402.0 - 2480.0 MHz | |
| **Max. RF Output Power** | 0 dBm (1mW). | |
| **Antenna Type(s) Tested** | Integral, 3.0 dBi | |

This wireless device has demonstrated compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in FCC 47 CFR Part 15.247; Industry Canada RSS-210 Issue 8 and RSS-Gen Issue 3; and ANSI C63.4-2003.

I attest to the accuracy of data. All measurements were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

The results and statements contained in this report pertain only to the device(s) evaluated.

This report shall not be reproduced partially or in full without the prior written approval of Celltech Labs Inc.

| | | | | |
|---|---|---|---|---|
| **Test Report Approved By** |  | **Glen Westwell** | **Laboratory Manager** | **Celltech Labs Inc.** |

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## TEST SUMMARY

| Referenced Standard(s): | | FCC CFR Title 47 Part 15.247 Subpart C, RSS-210 Annex 8. DTS Radio | | | |
|---|---|---|---|---|---|
| **Section** | **Description of Test** | **Procedure Reference** | **Limit Reference** | **Test Dates** | **Result** |
| 6.0 | 6.0 dB OCC. BW. | KDB558074, ANSI C63.4 | 15.247(a)(1), RSS-210, A8.1 | Sept-Oct/2014 | Pass |
| 7.0 | Peak TX Power | KDB558074, ANSI C63.4 | 15.247(a)(1), RSS-210, A8.1 | | Pass |
| 8.0 | Conducted Spurious Emissions | KDB558074, ANSI C63.4 | 15.247(a)(1), RSS-210, A8.1 | | Pass |
| 9.0 | Power Spectral Density | KDB558074, ANSI C63.4 | 15.247(a)(1), RSS-210, A8.1 | | Pass |
| 10.0 | RF Output Power | KDB558074, ANSI C63.4 | 15.247(b), RSS-210, A8.4 | | Pass |
| 11.0 | Restricted Band Emissions | KDB558074, ANSI C63.4 | 15.247(d), RSS-210, A8.5 | | Pass |

## REVISION LOG

| Revision | Description | Implemented By | Issue Date |
|---|---|---|---|
| 1.0 | Initial Release | Glen Westwell | 10/10/2014 |

## SIGNATORIES

| Prepared By | Glen Westwell | Reviewed By | Art Voss | Date |
|---|---|---|---|---|
| | | | | 10/10/2014 |

## 1.0 SCOPE

This report outlines the measurements made and results collected during electromagnetic emissions testing of Loner DUO, model 101724. The measurement results were applied against the applicable FCC requirements and limits outlined in the technical rules and regulations set forth in the Federal Communication's Commission Code of Federal Regulations Title 47 Part 15 Subpart C and Industry Canada Radio Standards Specification RSS-210 Issue 8 and RSS-Gen Issue 3.

## 2.0 REFERENCES

### 2.1 Normative References

| | |
|---|---|
| ANSI/ISO 17025:2005 | General Requirements for competence of testing and calibration laboratories |
| IEEE/ANSI C63.4-2003 | Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz |
| CFR Title 47 Part 15C | Code of Federal Regulations<br>Title 47: Telecommunication<br>Part 15C: Intentional Radiators |
| IC Spectrum Management & Telecommunications Policy | Radio Standards Specification<br>RSS-210 Issue 8 - Low-Power License-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment<br>RSS-Gen Issue 3 - General Requirements and Information for the Certification of Radiocommunication Equipment |

## 3.0 PASS/FAIL CRITERIA

Unless otherwise noted in the Appendices, the pass/fail criteria is the limit set forth in the reference standards. The DUT is considered to have passed the requirements if the data collected during the described measurement procedure is no greater than the specified limits as defined. The pass/fail statements made in this report only apply to the unit tested.

## 4.0 FACILITIES AND ACCREDITATIONS

The facilities used in collecting the test results outlined in this report are located at 21-364 Lougheed Road, Kelowna, British Columbia, Canada V1X 7R8. The radiated emissions site conforms to the requirements set forth in ANSI C63.4 and is filed and listed with the FCC under Test Firm Registration Number 714830 and Industry Canada under Test Site File Number IC 3874A-1.

## 5.0 GENERAL INFORMATION

### 5.1 DUT Description & Specifications

| | | |
|---|---|---|
| **Device Type:** | Part 15.247 DTS Bluetooth LE transmitter. | |
| **Device Model(s):** | 101724 | |
| **Test Sample Serial No.:** | T/A Sample - Identical Prototype | |
| **Device Identifier(s):** | **FCC ID:**<br>**Ind. Can.:** | W77LNRDUO<br>8255A-LNRDUO |
| **Band of Operation:** | 2400-2483.5 MHz | |
| **Transmit Frequency Range of DUT:** | 2402-2480 MHz (40 Channels). | |
| **Channel Spacing:** | 2 MHz | |
| **Modulation & Data Rate:** | GFSK / 1Mbit/s | |
| **Manuf. Max. Rated Output Power:** | 0.0 dBm / 1mW (Conducted). | |
| **Max. RF Peak Output Power Measured:** | 0.73 dBm / 1.18mW (Conducted) | |
| **Antenna Gain:** | Integral PCB Trace, 3.0 dBi. | |
| **DUT Power Source:** | Internal DC cell. | |
| **Type of Equipment:** | Digital transmission System (DTS) | |
| **Deviation(s) from standard/procedure:** | None | |
| **Modification of DUT:** | • 50 ohm connection to the RF output for conducted measurements.<br>• Test SW provided for channel & modulation selection.<br>Note: In test mode the transmit duty cycle is at maximum. Under normal operation the duty cycle = 2.286% (TX on time). | |

## DUT Description

This device is a Bluetooth LE information technology device (ITE) that utilized digital transmissions and acts as a cell phone accessory.

## 6.0 6 DB OCCUPIED BANDWIDTH (DTS BANDWIDTH)

| A.1 REFERENCES | |
|---|---|
| **Normative Reference Standard** | FCC CFR 15.247(a)(2), RSS-210, Annex 8 |

| A.2 LIMITS | |
|---|---|
| 15,247(a)(1)(i)<br>RSS-210, A8.2(a) | >500 kHz |

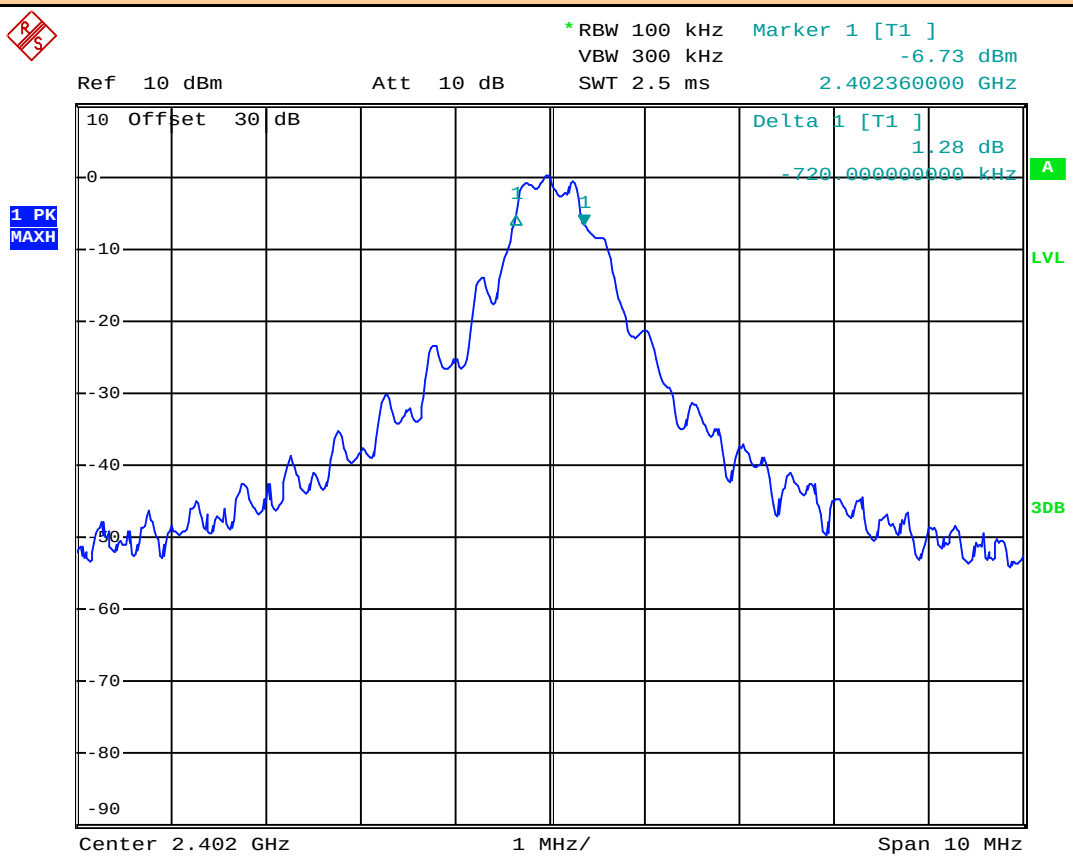
| A.3 ENVIRONMENTAL CONDITIONS | |
|---|---|
| **Temperature** | 20 ºC |
| **Humidity** | 40 +/- 10 % |
| **Barometric Pressure** | 101 +/- 3 kPa |

| ASSET NUMBER | MANUFACTURER | MODEL | DESCRIPTION | LAST CAL - CAL DUE |
|---|---|---|---|---|
| 00241 | R&S | FSP40 | Spec. Analyzer | 4/9/2013 - 4/9/2015 |
| 00101 | Pasternack | PE7013-3030 | 30 dB attenuator | COU |

| Ch. | Measured 6 dB Occ. BW. | Limit |
|---|---|---|
| Bottom | 720.0 kHz | >500 kHz |
| Mid | 740.0 kHz | >500 kHz |
| Top | 680.0 kHz | >500 kHz |

## A.4 TEST RESULTS: BOTTOM CH., COMPLIES

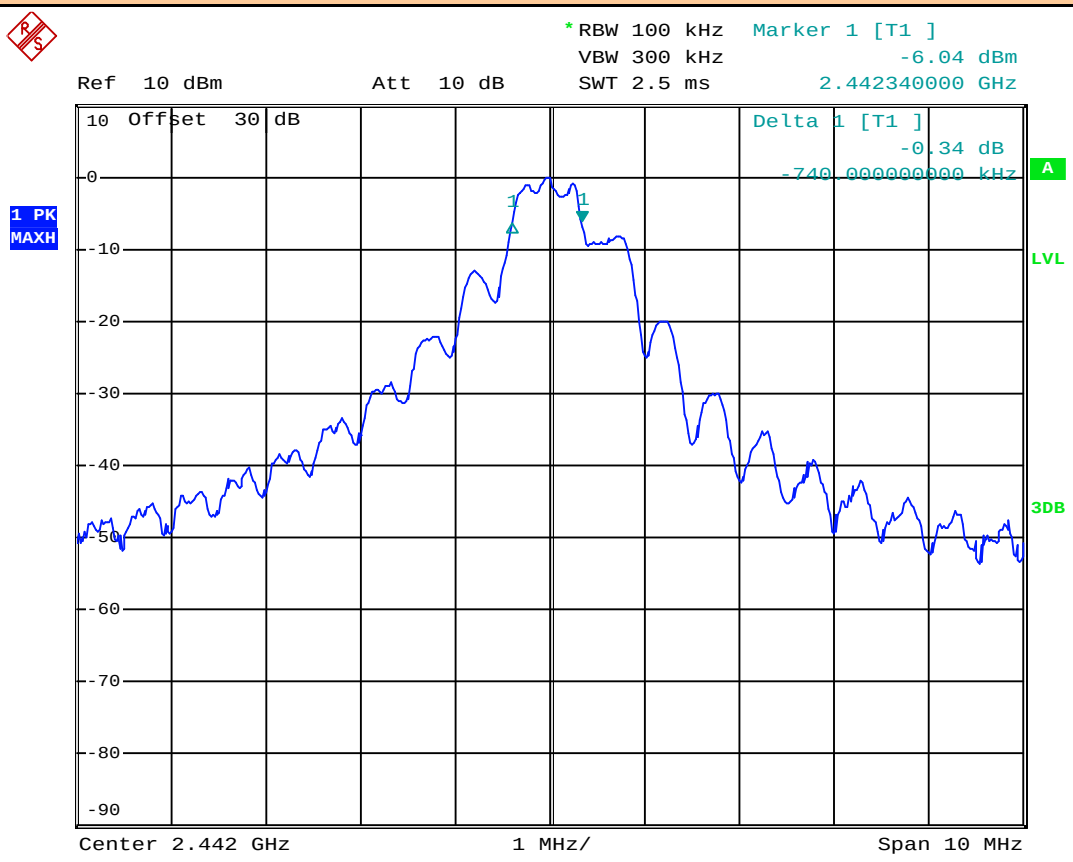
Bottom Channel.




Date: 29.AUG.2014 18:38:15

## A.5 TEST RESULTS: MID CH., COMPLIES

Mid. Channel

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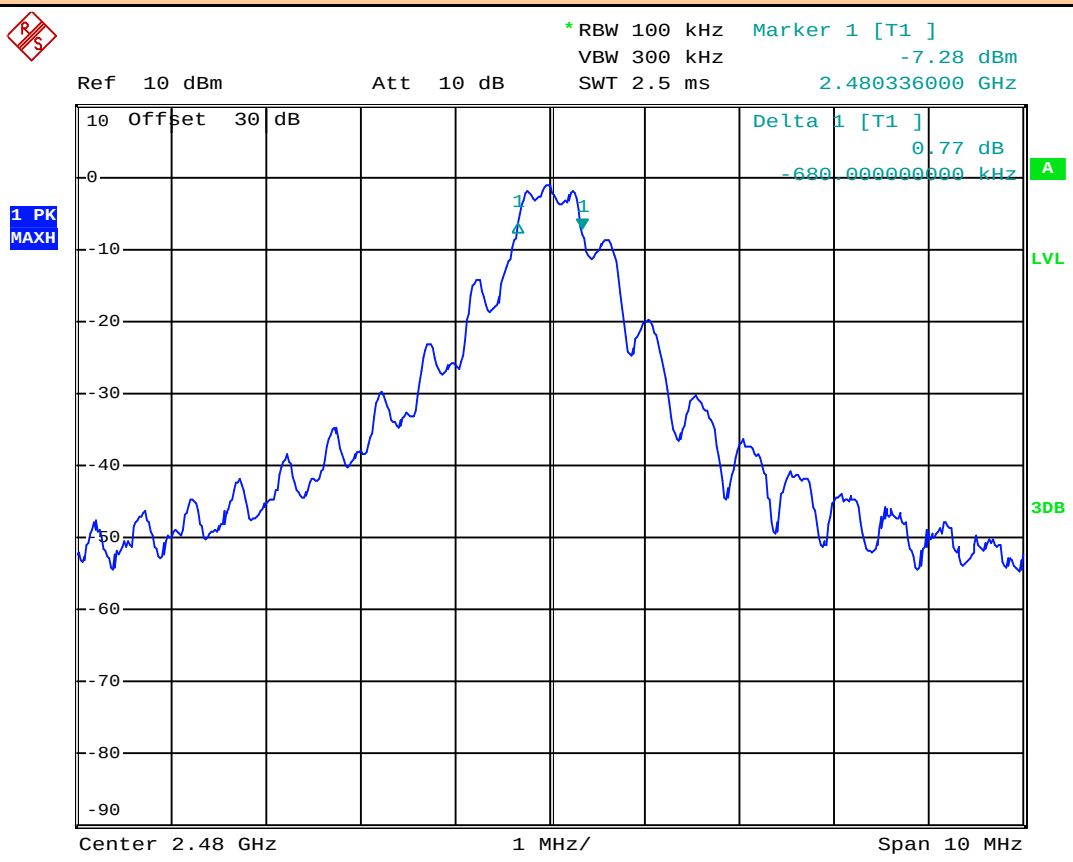
## A.6 TEST RESULTS: TOP CH., COMPLIES

Top Channel




Date: 29.AUG.2014 18:35:58

## A.7 SIGN-OFF

I attest to the accuracy of the data. All measurements reported herein were performed by me and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements.

Glen Westwell
Lab Manager
Celltech Labs Inc.

10/10/2014
Date

## 7.0 PEAK OUTPUT POWER

| A.8 REFERENCES | |
|---|---|
| **Normative Reference Standard** | FCC CFR 15.247(b)(3), RSS-210, Annex 8. |

| A.9 LIMITS | |
|---|---|
| 15,247(a)(1)<br>RSS-210, A8.4 | 1W (30dBm) conducted, 4W (36dBm) E.I.R.P. |

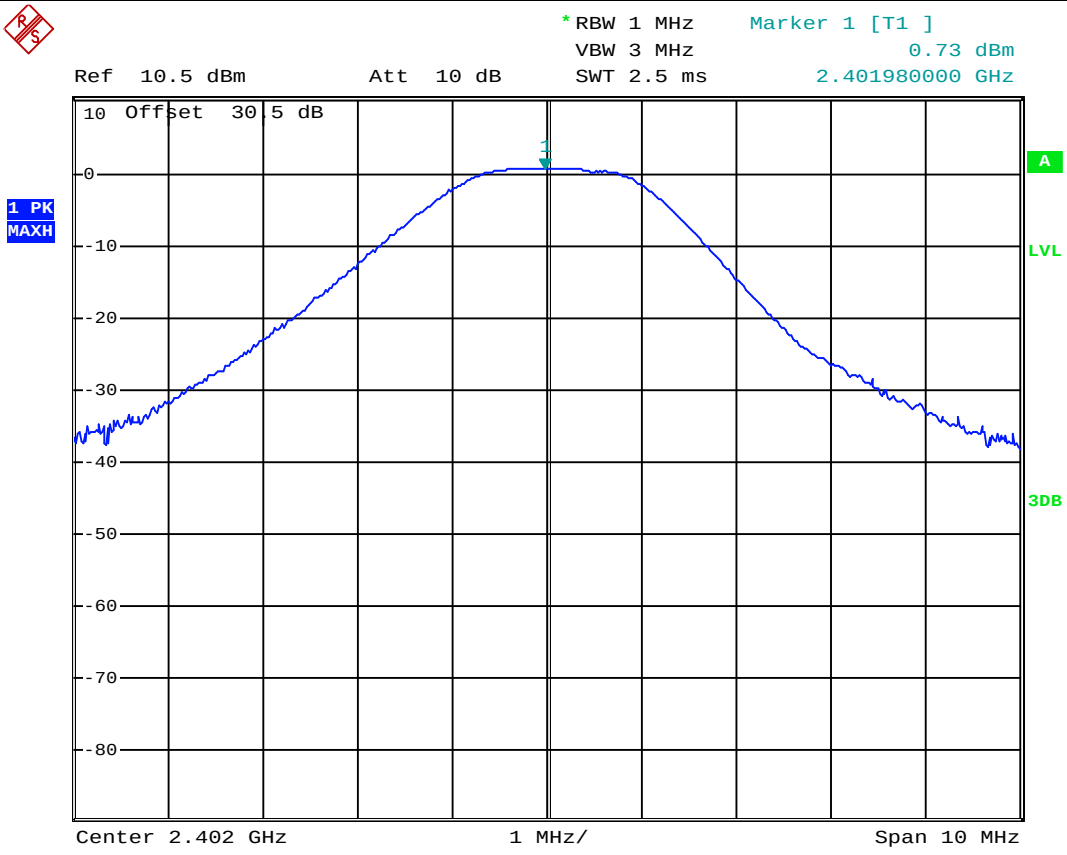
| A.10 ENVIRONMENTAL CONDITIONS | |
|---|---|
| **Temperature** | 20 ºC |
| **Humidity** | 40 +/- 10 % |
| **Barometric Pressure** | 101 +/- 3 kPa |

| ASSET NUMBER | MANUFACTURER | MODEL | DESCRIPTION | LAST CAL - CAL DUE |
|---|---|---|---|---|
| 00241 | R&S | FSP40 | Spec. Analyzer | 4/9/2013 - 4/9/2015 |
| 00101 | Pasternack | PE7013-3030 | 30 dB attenuator | COU |

| Conducted TX Peak Power, 15.247(b)(3) | | | |
|---|---|---|---|
| CH. | Measured Peak Power (dBm) | Limit (dBm) | Margin (dB) |
| Bottom | 0.73 | 30.0 | -29.27 |
| Mid | 0.35 | 30.0 | -29.65 |
| Top | -0.41 | 30.0 | -30.41 |

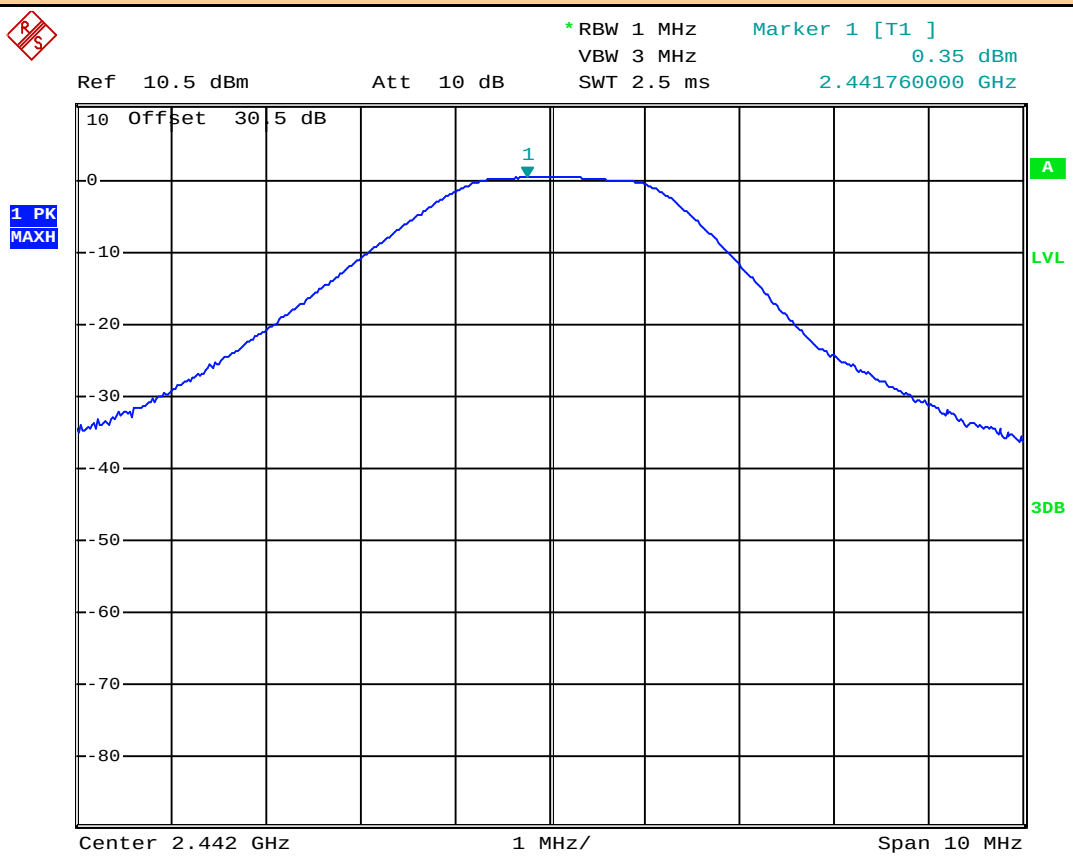
| E.I.R.P., 15.247(b)(4) | | | | | |
|---|---|---|---|---|---|
| CH. | Measured Peak Power (dBm) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
| Bottom | 0.73 | 3.0 | 3.73 | 36.0 | -32.27 |
| Mid | 0.35 | 3.0 | 3.35 | 36.0 | -32.65 |
| Top | -0.41 | 3.0 | 2.59 | 36.0 | -33.41 |

## A.11 TEST RESULTS: COMPLIES



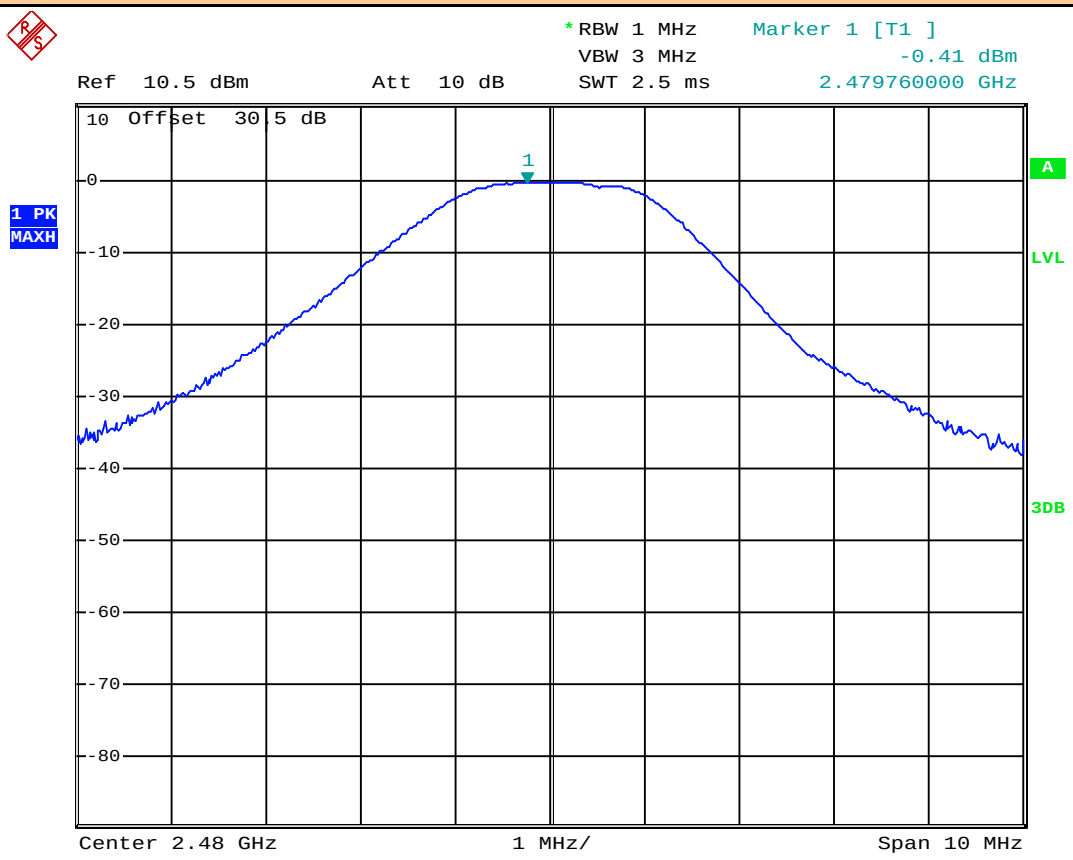

Date: 29.AUG.2014 18:51:35

## A.12 TEST RESULTS: COMPLIES




Date: 29.AUG.2014 18:49:48

## A.13 TEST RESULTS: COMPLIES




Date: 29.AUG.2014 18:52:50

## A.14 SIGN-OFF

I attest to the accuracy of the data. All measurements reported herein were performed by me and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements.

Glen Westwell
Lab Manager
Celltech Labs Inc.

10/10/2014
Date

## 8.0 CONDUCTED SPURIOUS EMISSIONS & BAND-EDGE

| A.15 REFERENCES | |
|---|---|
| **Normative Reference Standard** | FCC CFR 15.247(d), RSS-210, Annex 8. |

| A.16 LIMITS | |
|---|---|
| 15.247(d)<br>RSS-210, A8.5 | >20 dBc |

| A.17 ENVIRONMENTAL CONDITIONS | |
|---|---|
| **Temperature** | 20 ºC |
| **Humidity** | 40 +/- 10 % |
| **Barometric Pressure** | 101 +/- 3 kPa |

| ASSET NUMBER | MANUFACTURER | MODEL | DESCRIPTION | LAST CAL - CAL DUE |
|---|---|---|---|---|
| 00241 | R&S | FSP40 | Spec. Analyzer | 4/9/2013 - 4/9/2015 |
| 00101 | Pasternack | PE7013-3030 | 30 dB attenuator | COU |

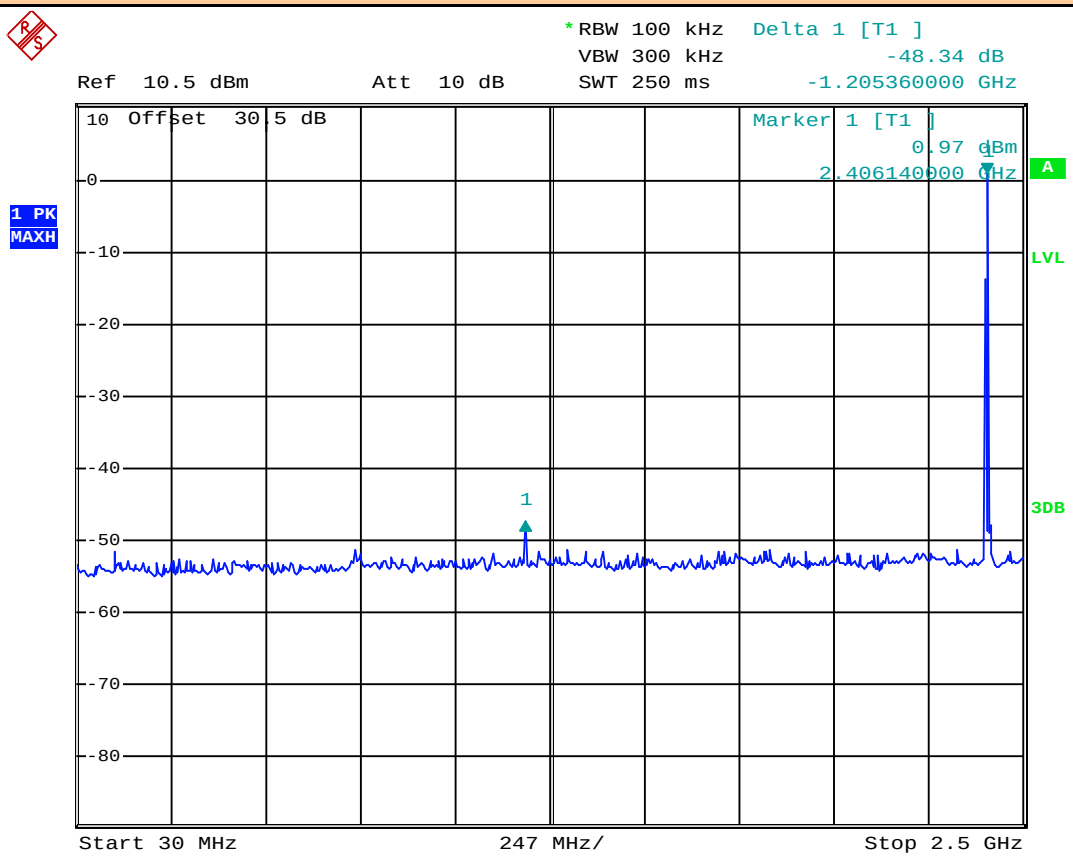
Note:
(1) Worst case data presented. The spectrum was spanned out for emission search up to the 10th harmonic. All relevant emissions have been presented.
(2) When the Li-Ion battery is being recharged, the product automatically powers down the radios and turns itself off.

| Emission Freq. (MHz) | Emission Level (dBm) | dBc | Limit (dBc) | Margin (dB) |
|---|---|---|---|---|
| Lower Band Edge | | | | |
| 2400.0 | -31.77 | 32.45 | 20 | -12.45 |
| 1205.36 | -47.37 | 48.34 | 20 | -28.34 |
| Upper Band Edge | | | | |
| 2483.5 | -43.81 | 44.27 | 20 | -24.27 |
| >2483.5 | -50.57 | 50.74 | 20 | -30.74 |

## A.18 TEST RESULTS, LOWER BAND-EDGE: COMPLIES

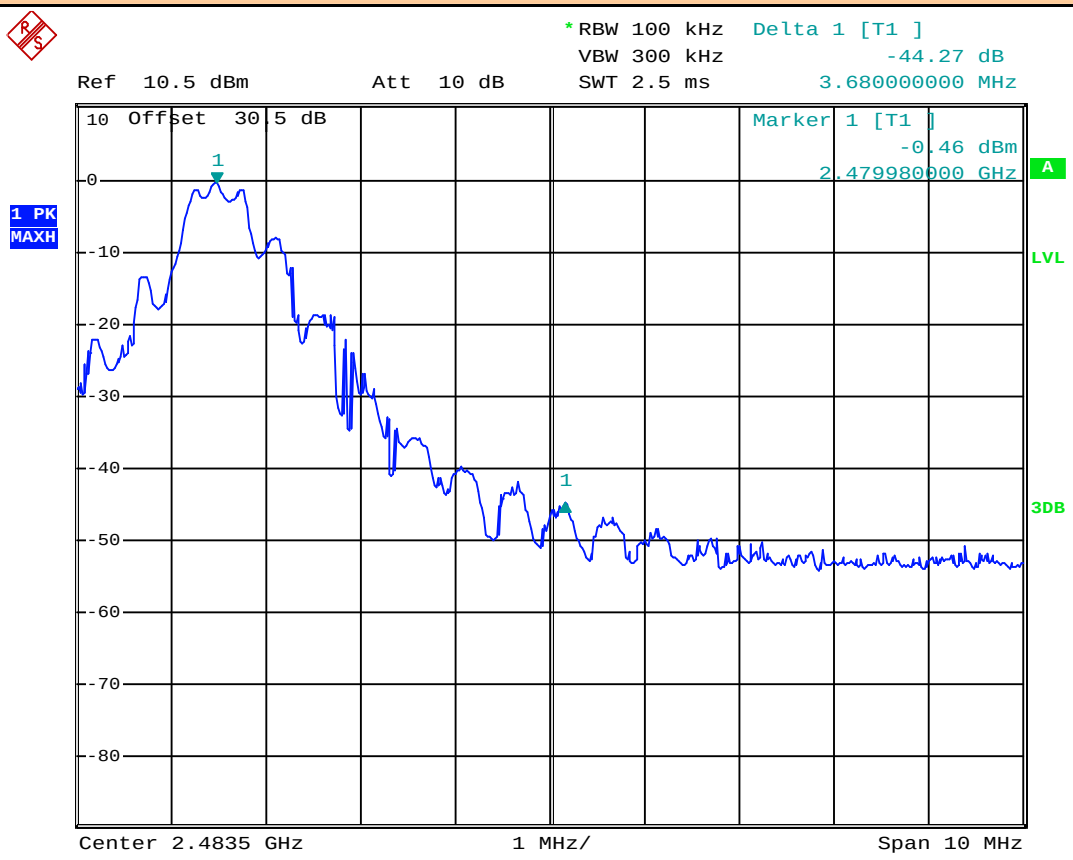

Date: 29.AUG.2014 18:57:04

## A.19 TEST RESULTS, LOWER BAND-EDGE: COMPLIES



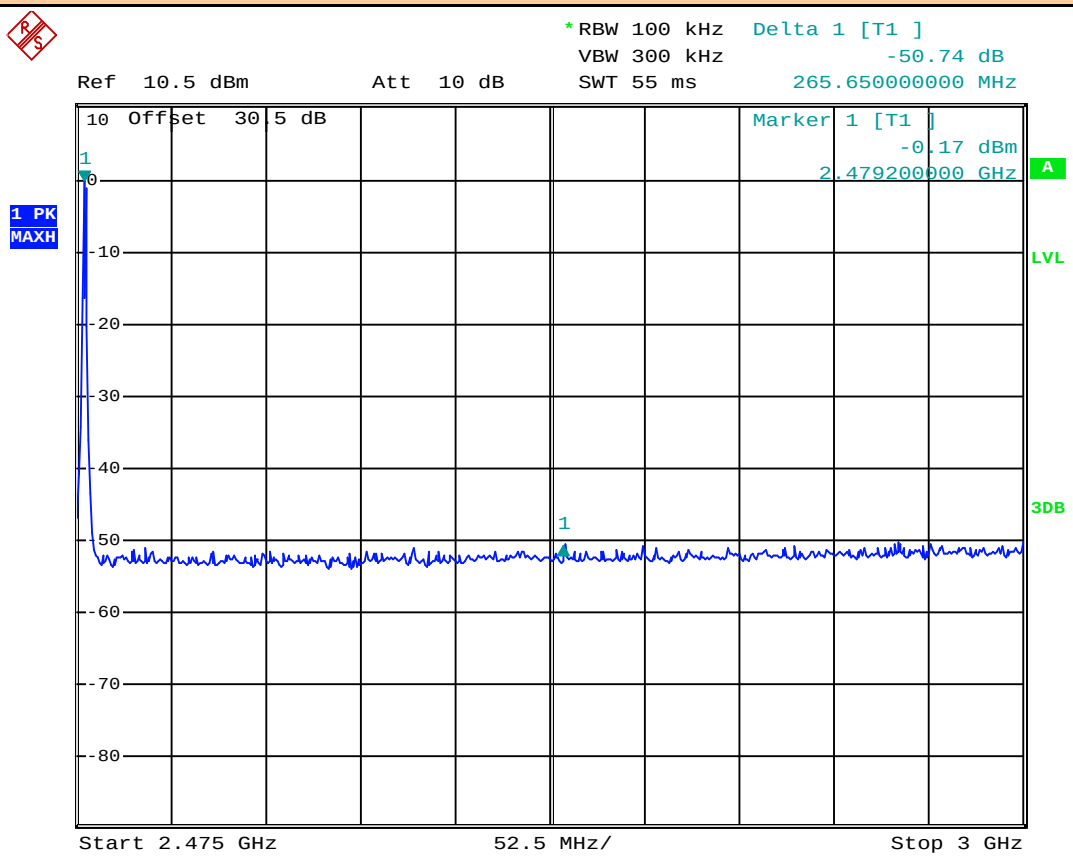

Date: 29.AUG.2014 19:22:09

## A.20 TEST RESULTS, UPPER BAND-EDGE: COMPLIES




Date: 29.AUG.2014 18:54:59

## A.21 TEST RESULTS: COMPLIES




Date: 29.AUG.2014 19:27:33

## A.22 SIGN-OFF

I attest to the accuracy of the data. All measurements reported herein were performed by me and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements.

Glen Westwell
Lab Manager
Celltech Labs Inc.

10/10/2014
Date

## 9.0 PEAK POWER SPECTRAL DENSITY

| A.23 REFERENCES | |
|---|---|
| **Normative Reference Standard** | FCC CFR 15.247(e), RSS-210, Annex 8. |

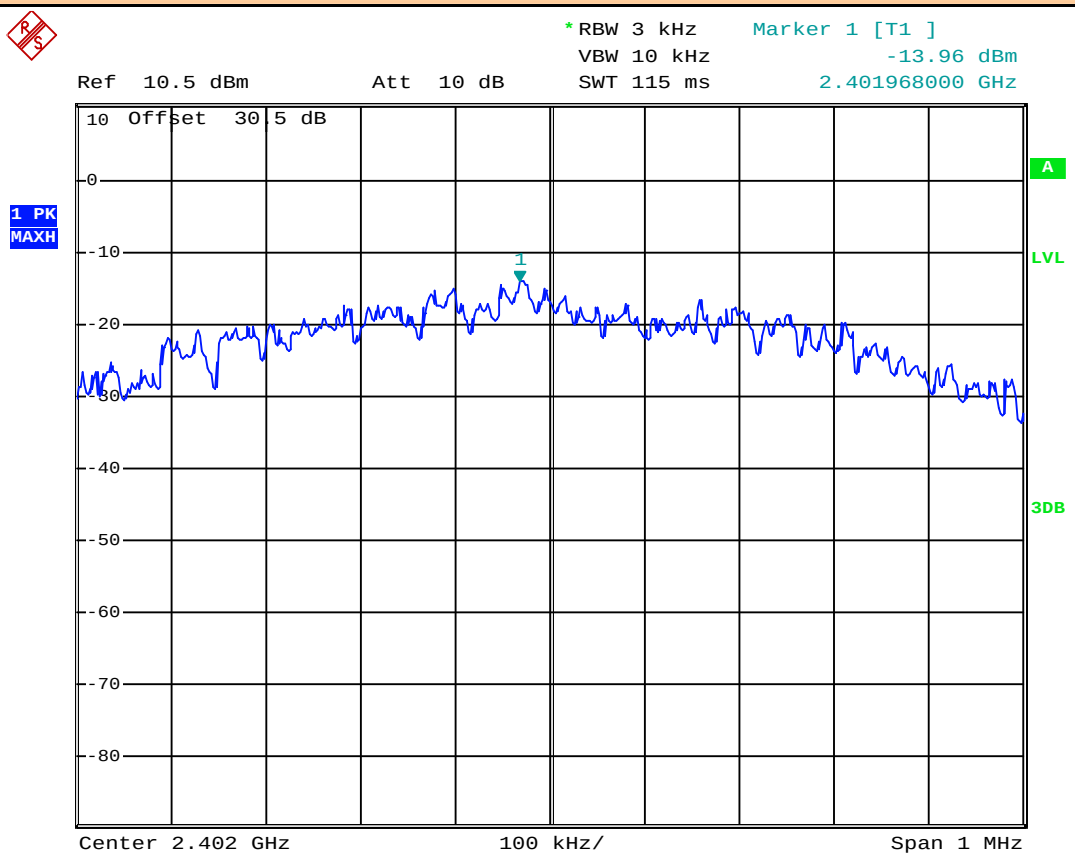
| A.24 LIMITS | |
|---|---|
| 15,247(e)<br>RSS-210, A8.2(b) | <8dBm/3kHz |

| A.25 ENVIRONMENTAL CONDITIONS | |
|---|---|
| **Temperature** | 20 ºC |
| **Humidity** | 40 +/- 10 % |
| **Barometric Pressure** | 101 +/- 3 kPa |

| ASSET NUMBER | MANUFACTURER | MODEL | DESCRIPTION | CAL DUE |
|---|---|---|---|---|
| 00241 | R&S | FSP40 | Spec. Analyzer | 4/9/2015 |
| 00101 | Pasternack | PE7013-3030 | 30 dB attenuator | COU |

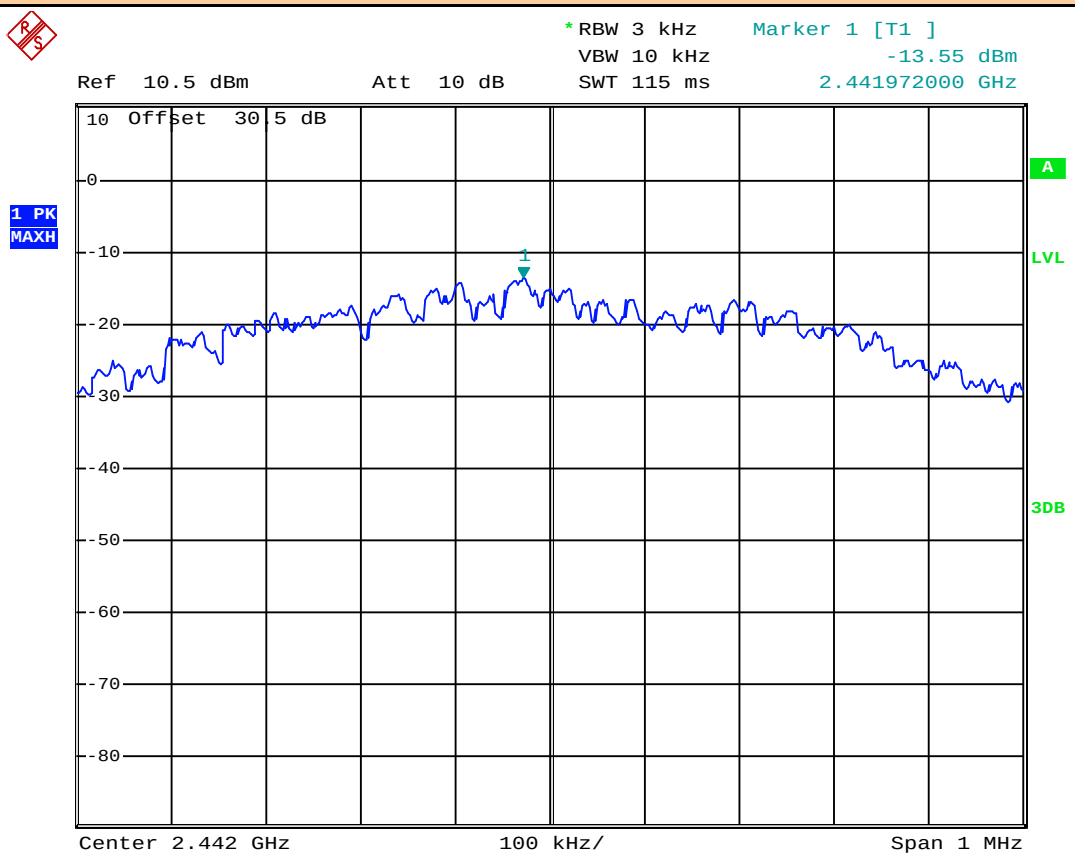
| Peak Power Spectral Density/3kHz, 15.247(e) | | | |
|---|---|---|---|
| CH. (MHz) | Measured Power Density/3kHz (dBm) | Limit (dBm) | Margin (dB) |
| 2402 | -13.96 | 8.0 | -21.96 |
| 2442 | -13.55 | 8.0 | -21.55 |
| 2480 | -13.24 | 8.0 | -21.24 |

## A.26 TEST RESULTS: COMPLIES



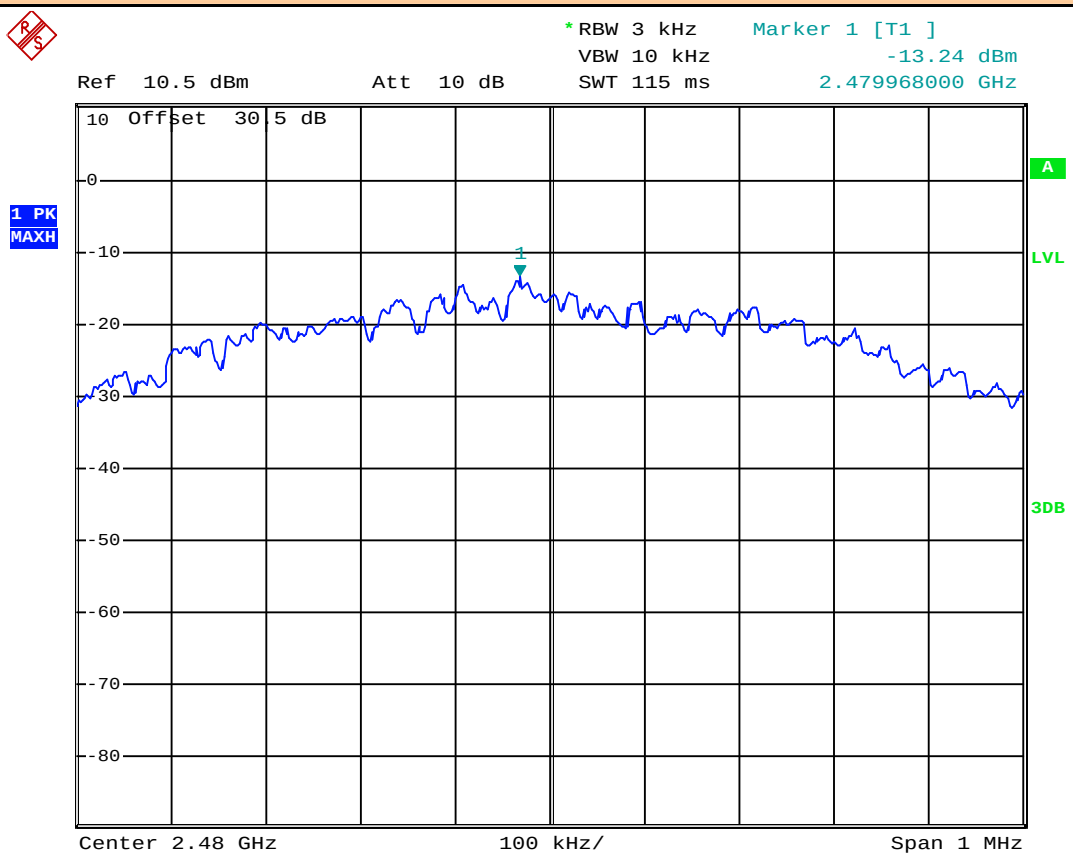

Date: 2.SEP.2014 14:33:25

## A.27 TEST RESULTS: COMPLIES




Date: 2.SEP.2014 14:34:19

## A.28 TEST RESULTS: COMPLIES




Date: 2.SEP.2014 14:29:47

## A.29 SIGN-OFF

Glen Westwell
Lab Manager
Celltech Labs Inc.

10/10/2014
Date

## 10.0 FIELD STRENGTH OF SPURIOUS & RESTRICTED BAND EMISSIONS

| REFERENCES | |
|---|---|
| **Normative Reference Standard** | FCC CFR 47 §15.209, RSS-210, Annex 8.5, IECS-003 |
| **Procedure Reference** | ANSI C63.4:2003 |

| ENVIRONMENTAL CONDITIONS | |
|---|---|
| **Temperature** | 25 +/- 5 ºC |
| **Humidity** | 40 +/- 10 % |
| **Barometric Pressure** | 101 +/- 3 kPa |

**EQUIPMENT LIST**

| ASSET NUMBER | MANUFACTURER | MODEL | DESCRIPTION | LAST CAL / CAL DUE |
|---|---|---|---|---|
| 00051 | HP | 8566B | Spectrum Analyzer RF Section | 30 Apr 14 / 30 Apr 16 |
| 00049 | HP | 85650A | Quasi-peak Adapter | 30 Apr 14 / 30 Apr 16 |
| 00047 | HP | 85685A | RF Preselector | 30 Apr 14 / 30 Apr 16 |
| 00072 | EMCO | 2075 | Mini-mast | n/a |
| 00073 | EMCO | 2080 | Turn Table | n/a |
| 00071 | EMCO | 2090 | Multi-Device Controller | n/a |
| 00239 | MITEQ | JS4-00102600-35 | LNA | COU |
| 00050 | Chase | CBL-6111A | Bilog Antenna | 25 Apr 14 / 25 Apr 16 |
| 00034 | ETS | 3115 | Double Ridged Guide Horn | 06 Dec 12 / 06 Dec 14 |
| 00193 | Micro-Tronics | HPM50112 | High Pass Filter | COU |
| 00101 | Pasternack | PE7013-3030 | 30 dB attenuator | COU |

**MEASUREMENT EQUIPMENT SETUP**

**MEASUREMENT EQUIPMENT CONNECTIONS**

For the field strength measurements, the measurement equipment was connected as shown below. Various antenna types may be required to cover the applicable frequency range tested. The ranges in which each antenna was used are shown below.

| Frequency Range | RX Antenna | TX Antenna |
|---|---|---|
| 9kHz – 30Mhz | Active Loop | N/a |
| 30 MHz - 1GHz | Bilog | N/a |
| 1 GHz - 18 GHz | ETS 3115 Horn | N/a |
| 18-26.5 GHz | Waveline Horn | N/a |

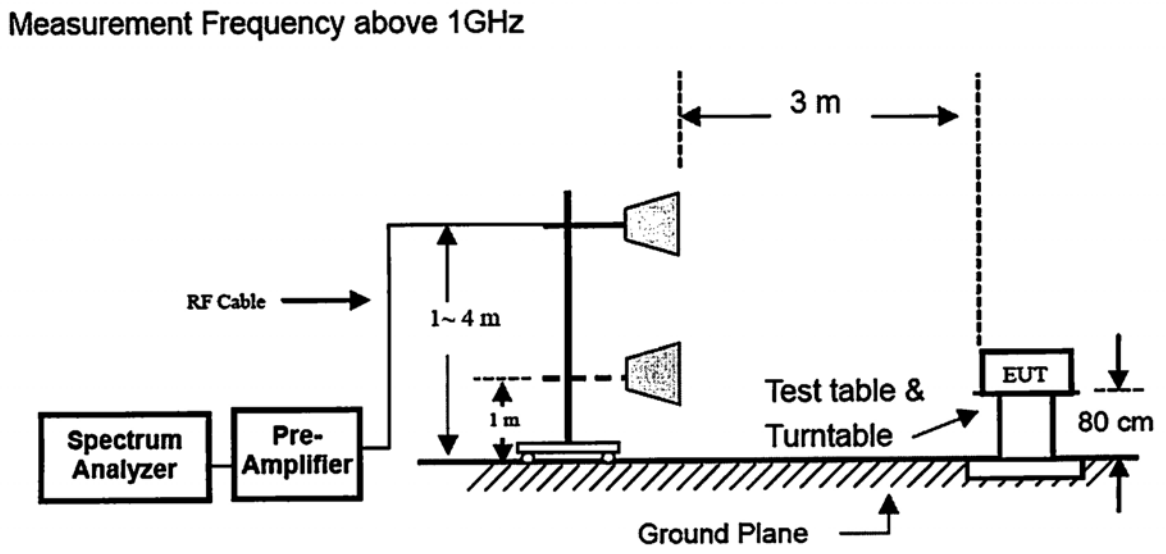
**MEASUREMENT EQUIPMENT SETTINGS**

For the spurious out-of-band emissions, the spectrum analyzer was set to the following settings:

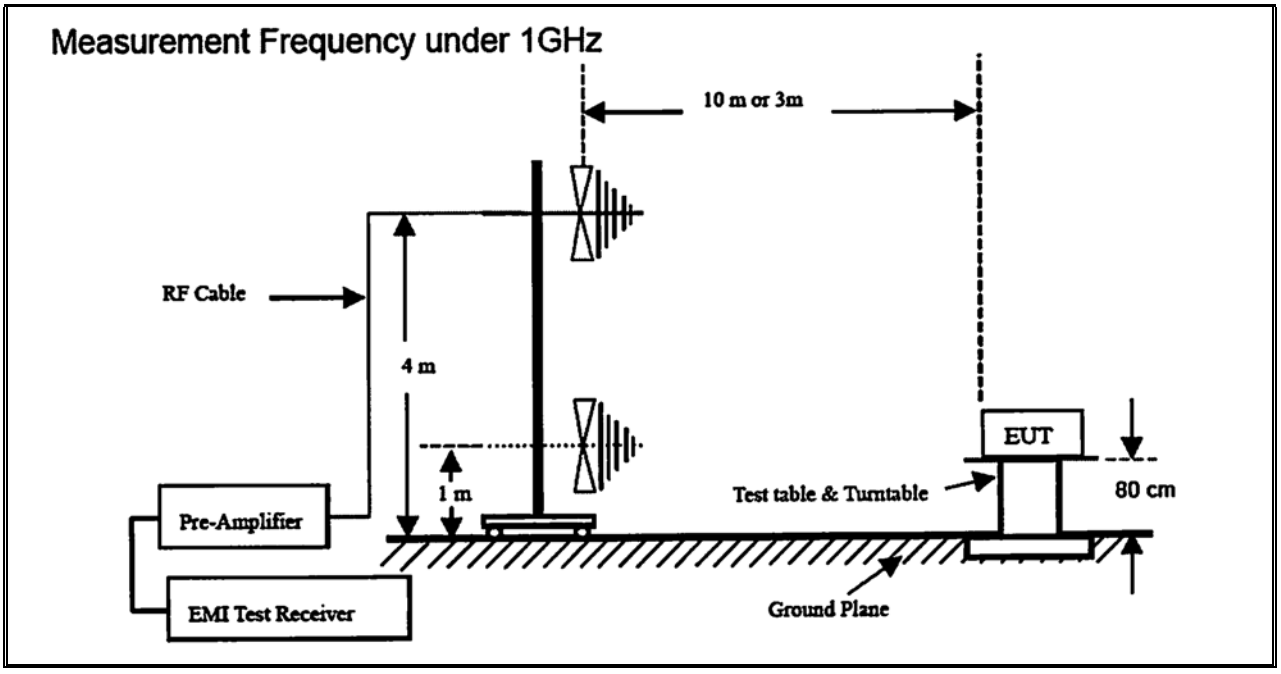
| Measurement | RBW | VBW | Detector |
|---|---|---|---|
| | kHz | kHz | |
| < 1 GHz | 100 | 300 | Peak* |
| > 1 GHz | 1000 | 3000 | Peak* |

- The spectrum was searched from the lowest frequency generated by the EUT to the 10th harmonic of the fundamental.
- All detected emissions are reported.

## SETUP DRAWING, SETUP DRAWING – RADIATED TX SPURIOUS EMISSIONS (> 1 GHZ)

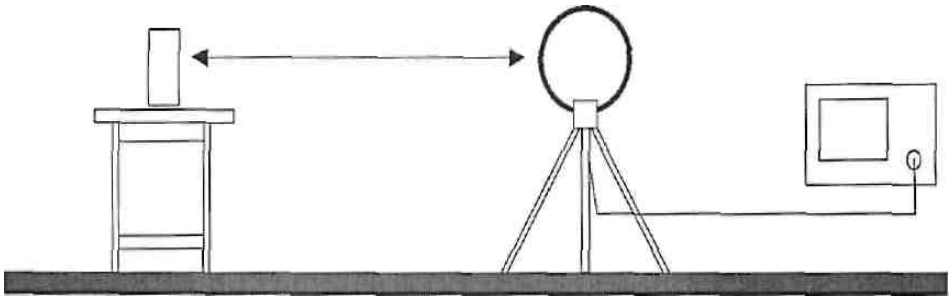



## SETUP DRAWING, SETUP DRAWING – RADIATED TX SPURIOUS EMISSIONS (< 1 GHZ)



## SETUP DRAWING, 9KHZ-30MHZ

Active Loop Ant.



Note:
(1) Worst case data presented. The spectrum was spanned out for emission search up to the 10th harmonic. All relevant emissions have been presented.
(2) When the Li-Ion battery is being recharged, the product automatically powers down the radios and turns itself off.
(3) In test mode the transmit duty cycle is at maximum. Under normal operation the duty cycle = 2.286% (TX on time). This correction factor is not incorporated in to the result because it was not required to comply with the limits.

## 15.205 Restricted Band Emissions (worst case)
## 2402.00 MHz

| Frequency (MHz) | Antenna Pol. | Emission Level (dBuV/m) @1m | Antenna Factor (dB) | *Amp Gain. (dB) | Distance Correction | Emission Level (dBuV/m@3m) | **Limit (dBuV/m@3m) | Margin |
|---|---|---|---|---|---|---|---|---|
| 4804.0 | V | 29.2 | 32.9 | ---- | -9.54 | 52.56 | 54.0 | -1.44 |
| 12010.0 | V | N.D. | 39.1 | -30.4 | -9.54 | N.D. | 54.0 | N.D. |
| | H | N.D. | 38.9 | -30.4 | -9.54 | N.D. | 54.0 | N.D. |
| 19216.0 | V | N.D. | 43.0 | -30.6 | -9.54 | N.D. | 54.0 | N.D. |
| | H | N.D. | 43.0 | -30.6 | -9.54 | N.D. | 54.0 | N.D. |

**Data presented using a Pk detector results compared to average limits.
Device characterization was performed on 3 orthogonal axis to determine worst case orientation.
The device was tested using a fresh charge throughout all testing.
* Amp gain value includes cable & notch filter loss.
N.D. = Not Detected.

## 15.205 Restricted Band Emissions (worst case)
## 2442.0 MHz

| Frequency (MHz) | Antenna Pol. | Emission Level (dBuV/m) @1m | Antenna Factor (dB) | *Amp Gain. (dB) | Distance Correction | Emission Level (dBuV/m@3m) | **Limit (dBuV/m@3m) | Margin |
|---|---|---|---|---|---|---|---|---|
| 4884.0 | V | 29.3 | 33.0 | ---- | -9.54 | 52.76 | 54.0 | -1.24 |
| 7326.0 | V | 42.1 | 36.3 | -30.4 | -9.54 | 38.46 | 54.0 | -15.54 |
| 12210.0 | V | N.D. | 39.0 | -30.6 | -9.54 | N.D. | 54.0 | N.D. |
| | H | N.D. | 38.9 | -30.6 | -9.54 | N.D. | 54.0 | N.D. |
| 19530.0 | V | N.D. | 43.0 | -28.5 | -9.54 | N.D. | 54.0 | N.D. |
| | H | N.D. | 43.0 | -28.5 | -9.54 | N.D. | 54.0 | N.D. |

** Data presented using a Pk detector results compared to average limits.
Device characterization was performed on 3 orthogonal axis to determine worst case orientation.
The device was tested using a fresh charge throughout all testing.
* Amp gain value includes cable & notch filter loss.
N.D. = Not Detected.

## 15.205 Restricted Band Emissions (worst case)
## 2480.0 MHz

| Frequency (MHz) | Antenna Pol. | Emission Level (dBuV/m) @1m | Antenna Factor (dB) | *Amp Gain. (dB) | Distance Correction | Emission Level (dBuV/m@3m) | Limit (dBuV/m@3m) | Margin |
|---|---|---|---|---|---|---|---|---|
| 4960.0 | V | 32.1 | 33.1 | ---- | -9.54 | 55.66 | 74.0 | -18.34 |
| 4960.0 | V | 27.4 | 33.1 | ---- | -9.54 | 50.96 | 54.0 | -3.04 |
| 7440.0 | V | 39.4 | 36.4 | -30.4 | -9.54 | 35.86 | **54.0 | -18.4 |
| 12400.0 | V | N.D. | 38.8 | -30.6 | -9.54 | N.D. | **54.0 | N.D. |
| | H | N.D. | 38.6 | -30.6 | -9.54 | N.D. | **54.0 | N.D. |
| 19840.0 | V | N.D. | 43.0 | -29.7 | -9.54 | N.D. | **54.0 | N.D. |
| | H | N.D. | 43.0 | -29.7 | -9.54 | N.D. | **54.0 | N.D. |
| 22320.0 | V | N.D. | 41.0 | -28.5 | -9.54 | N.D. | **54.0 | N.D. |
| | H | N.D. | 41.0 | -28.5 | -9.54 | N.D. | **54.0 | N.D. |

** Data presented using a Pk detector results compared to average limits.
Device characterization was performed on 3 orthogonal axis to determine worst case orientation.
The device was tested using a fresh charge throughout all testing.
* Amp gain value includes cable & notch filter loss.
N.D. = Not Detected.

## 11.0 ANTENNA REQUIREMENT §15.203

**§ 15.203 Antenna Requirement**

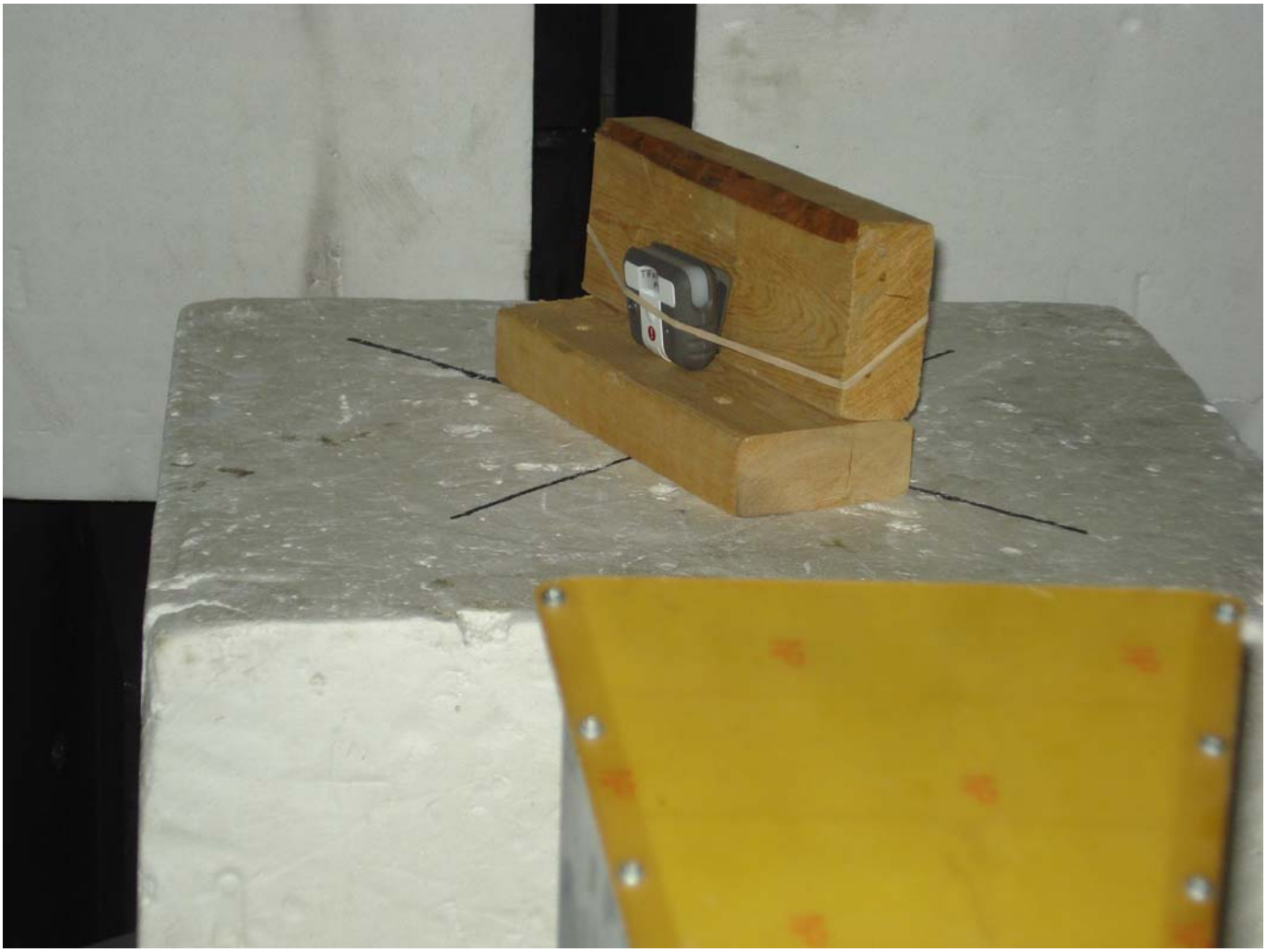
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

The DUT complies with the antenna requirements of 15.203 as follows:

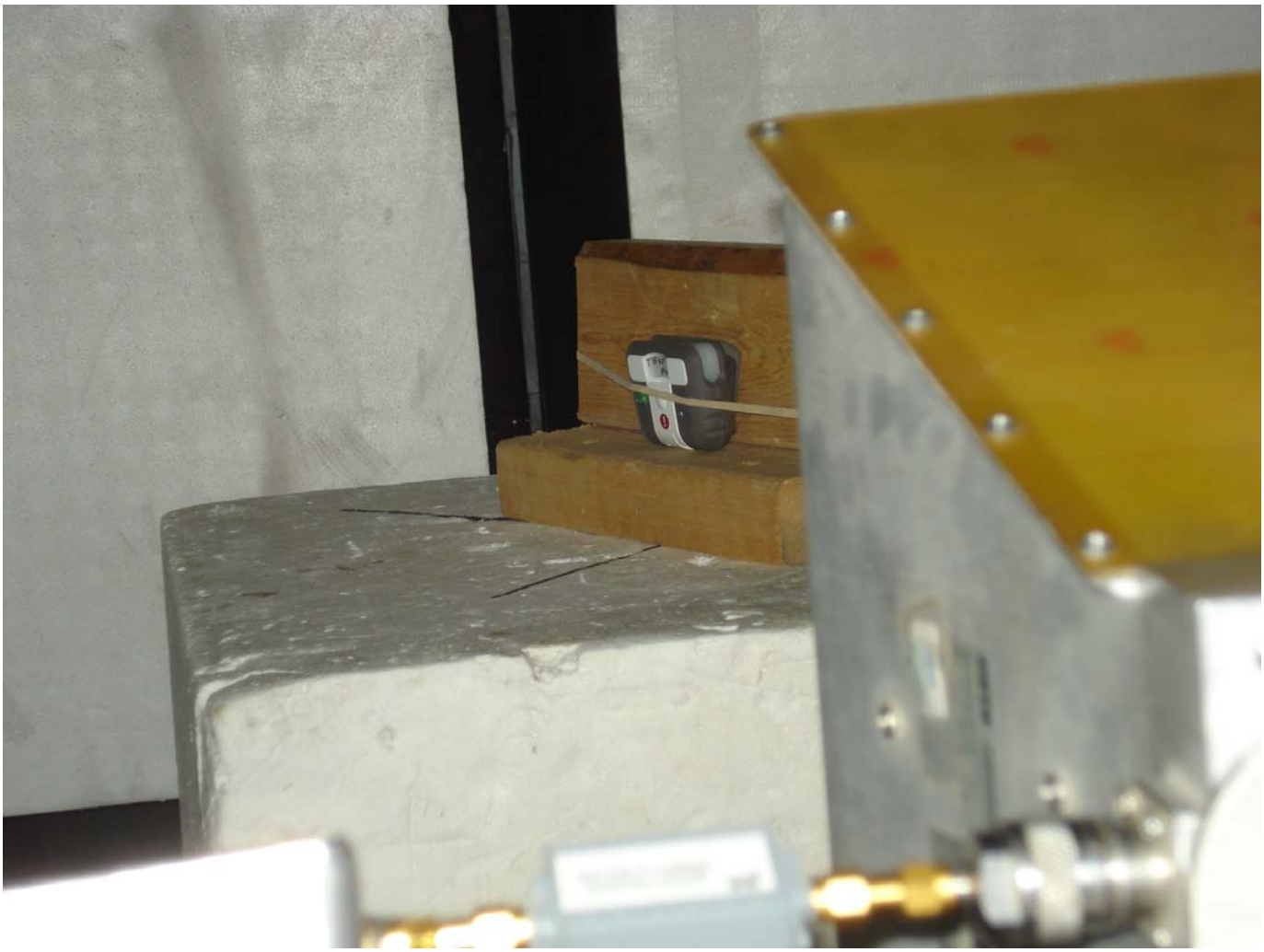
Integral antenna is used.

## 12.0 TEST SET UP PHOTO'S

Loner DUO, TSup 1.



Loner DUO, TSup 2.



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