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# Report On

FCC Testing of the Sharp Dual-band LTE (B1 / B26), Dual-band WCDMA (FDD I / V) &,Quad-band GSM (850/900/1800/1900) multi mode Cellular phone with Bluetooth, WLAN, SRD (NFC,FeliCa) and GPS in accordance with FCC 47 CFR Part 15C (FeliCa)

COMMERCIAL-IN-CONFIDENCE

FCC ID: APYHRO00236

**Document 75933584 Report 12 Issue 1** **May 2016**

Product Service

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**REPORT ON**

FCC Testing of the
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Document 75933584 Report 12 Issue 1

May 2016

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**DATED** 18 May 2016

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 15C. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

T Guy M Toubella

UKAS TESTING 0141

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**CONTENTS**

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**SECTION 1**

**REPORT SUMMARY**

FCC Testing of the
Sharp Dual-band LTE (B1 / B26), Dual-band WCDMA (FDD I / V) &,Quad-band GSM (850/900/1800/1900) multi mode Cellular phone with Bluetooth, WLAN, SRD (NFC,FeliCa) and GPS
In accordance with FCC 47 CFR Part 15C (FeliCa)

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## 1.1 INTRODUCTION

The information contained in this report is intended to show the verification of FCC Testing of the Sharp Dual-band LTE (B1 / B26), Dual-band WCDMA (FDD I / V) &,Quad-band GSM (850/900/1800/1900) multi mode Cellular phone with Bluetooth, WLAN, SRD (NFC,FeliCa) and GPS to the requirements of FCC 47 CFR Part 15C.

| | |
|---|---|
| Objective | To perform FCC Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out. |
| Manufacturer | Sharp Corporation |
| Serial Number(s) | IMEI 004401115794360 |
| Number of Samples Tested | 1 |
| Test Specification/Issue/Date | FCC 47 CFR Part 15C (2015) |
| Disposal<br>Reference Number<br>Date | Held Pending Disposal<br>Not Applicable<br>Not Applicable |
| Order Number<br>Date | 10753<br>17 February 2016 |
| Start of Test | 19 April 2016 |
| Finish of Test | 30 April 2016 |
| Name of Engineer(s) | T Guy<br>M Toubella |
| Related Document(s) | ANSI C63.10: 2013 |

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## 1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15C (FeliCa) is shown below.

| Section | Specification Clause | Test Description | Result | Comments/Base Standard |
|---|---|---|---|---|
| FeliCa | | | | |
| 2.1 | 15.225 and 15.215 (c) | 20 dB Bandwidth | Pass | |
| 2.2 | 15.225 (a)(b)(c)(d) | Field Strength of any Emission | Pass | |
| 2.3 | 15.225 (e) | Frequency Tolerance Under Temperature Variations | Pass | |

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## 1.3 PRODUCT TECHNICAL DESCRIPTION

Refer to Model Description APYHRO00236 Rev 1.0 document.

## 1.4 PRODUCT INFORMATION

### 1.4.1 Technical Description

The Equipment Under Test (EUT) was a Sharp Dual-band LTE (B1 / B26), Dual-band WCDMA (FDD I / V) &,Quad-band GSM (850/900/1800/1900) multi mode Cellular phone with Bluetooth, WLAN, SRD (NFC,FeliCa) and GPS. A full technical description can be found in the manufacturer's documentation.

## 1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure.

Radiated measurements were performed with the EUT powered using a battery.

FCC Measurement Facility Registration Number
90987 Octagon House, Fareham Test Laboratory

## 1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standard or test plan were made during testing.

## 1.7 MODIFICATION RECORD

Modification 0 - No modifications were made to the test sample during testing.

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**SECTION 2**

**TEST DETAILS**

FCC Testing of the
Sharp Dual-band LTE (B1 / B26), Dual-band WCDMA (FDD I / V) &,Quad-band GSM (850/900/1800/1900) multi mode Cellular phone with Bluetooth, WLAN, SRD (NFC,FeliCa) and GPS
In accordance with FCC 47 CFR Part 15C (FeliCa)

## 2.1 20 dB BANDWIDTH

### 2.1.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.225 and 15.215 (c)

### 2.1.2 Equipment Under Test and Modification State

S/N: IMEI 004401115794360 - Modification State 0

### 2.1.3 Date of Test

28 April 2016

### 2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.1.5 Test Procedure

The test was performed in accordance with ANSI C63.10, clause 6.9.2.

### 2.1.6 Environmental Conditions

| | |
|---|---|
| Ambient Temperature | 21.2°C |
| Relative Humidity | 34.3% |

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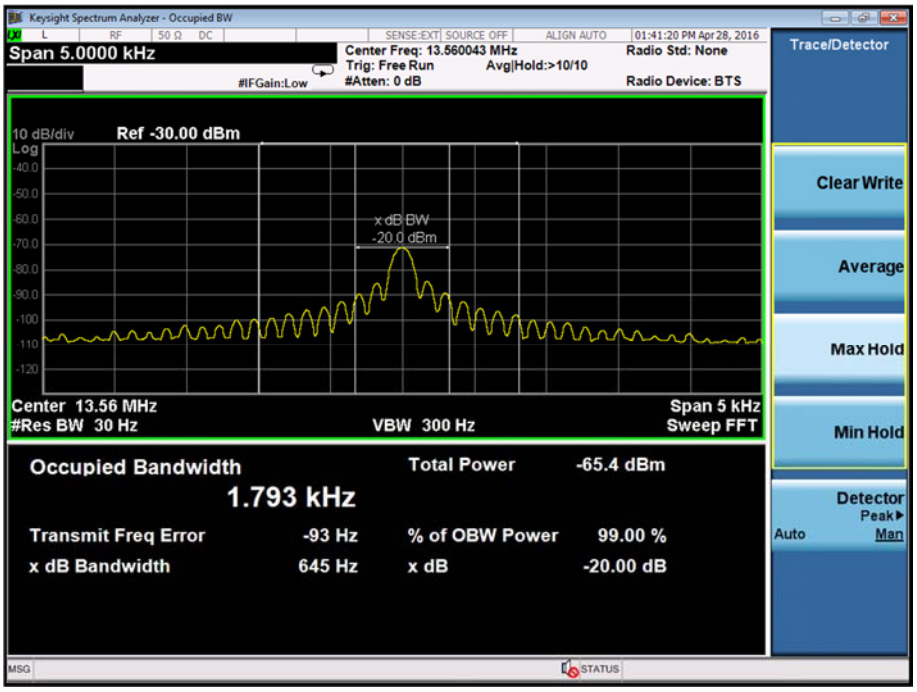
### 2.1.7 Test Results

4.0 V DC Supply

FeliCa, 20 dB Bandwidth Result

| Frequency (MHz) | 20 dB Bandwidth (Hz) |
|---|---|
| 13.56 | 645 |

FeliCa, 20 dB Bandwidth Plot




FCC 47 CFR Part 15, Limit Clause 15.215 (c)

The 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

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## 2.2 FIELD STRENGTH OF ANY EMISSION

### 2.2.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.225 (a)(b)(c)(d)

### 2.2.2 Equipment Under Test and Modification State

S/N: IMEI 004401115794360 - Modification State 0

### 2.2.3 Date of Test

29 April 2016 & 30 April 2016

### 2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.2.5 Test Procedure

The test was performed in accordance with ANSI C63.10, clause 6.3, 6.4 and 6.5.

Remarks

Modulation Type 424 kbps was proven to be the worst case modulation scheme available. The orientation that produced the highest Transmitter power was with the EUT in an upright position.

### 2.2.6 Environmental Conditions

| | |
|---|---|
| Ambient Temperature | 18.3 - 20.5°C |
| Relative Humidity | 29.0 - 33.7% |

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### 2.2.7 Test Results

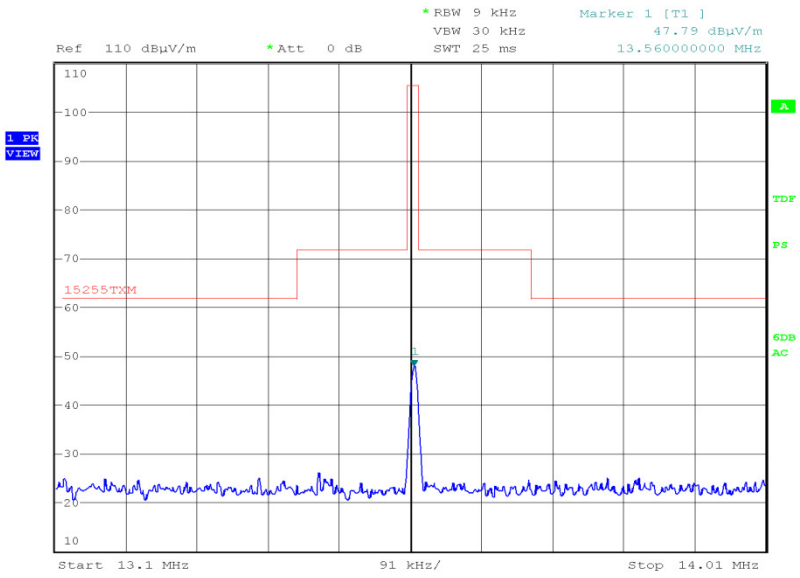
4.0 V DC Supply

FeliCa, Carrier Results

| Frequency (MHz) | Quasi-Peak Level (dBµV/m) at 3m | Quasi-Peak Level (dBµV/m) at 30m* | Quasi-Peak Level (µV/m) at 3m | Quasi-Peak Level (µV/m) at 30m* | Angle (°) | Height (m) | Polarisation |
|---|---|---|---|---|---|---|---|
| 13.56 | 47.26 | 25.87 | 230.67 | 19.65 | 177 | 1.00 | Face On |

*The level at 30m was calculated using the dBµV/m measurement at 3m and extrapolating this result to produce a level at 30m as per the equation in ANSI C63.10, claus 6.4.4.2. This value was then converted to obtain the value in µV/m.

FeliCa, Carrier Plot



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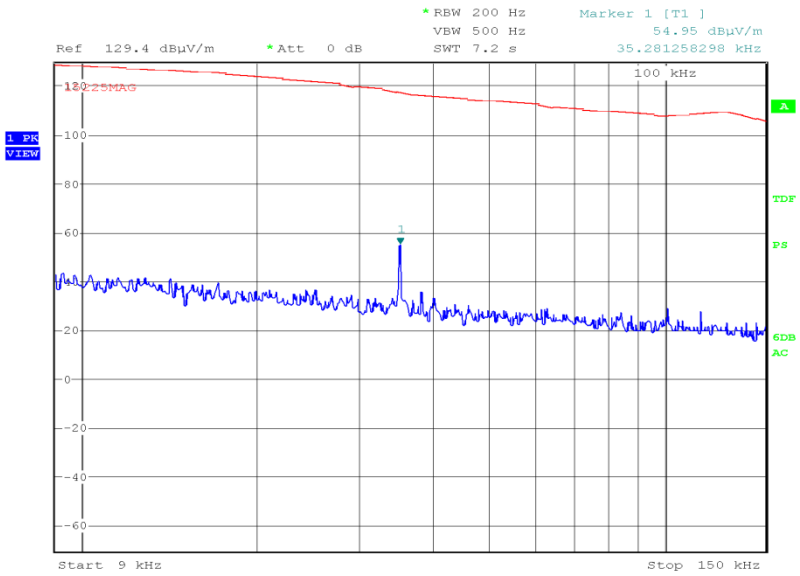
FeliCa, 9 kHz to 30 MHz, Field Strength of any Emission Results

| Frequency (MHz) | Quasi-Peak Level (dBµV/m) at 3m | Quasi-Peak Level (dBµV/m) at 30m | Quasi-Peak Level (µV/m) at 3m | Quasi-Peak Level (µV/m) at 30m | Angle (°) | Height (m) | Polarisation |
|---|---|---|---|---|---|---|---|
| * | | | | | | | |

*No emissions were detected within 10 dB of the limit.

FeliCa, 9 kHz to 150 kHz, Field Strength of any Emission Plot




Date: 29.APR.2016 05:42:14

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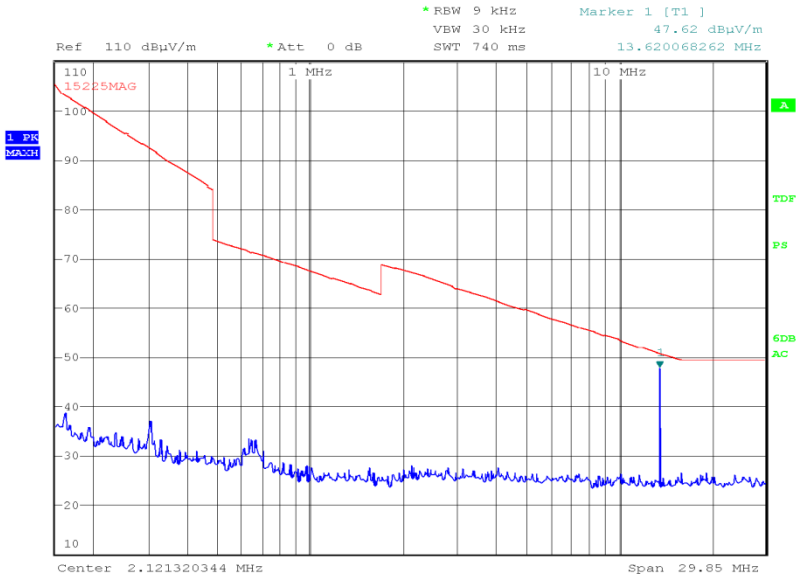
FeliCa, 150 kHz to 30 MHz, Field Strength of any Emission Plot




Date: 29.APR.2016 05:39:48

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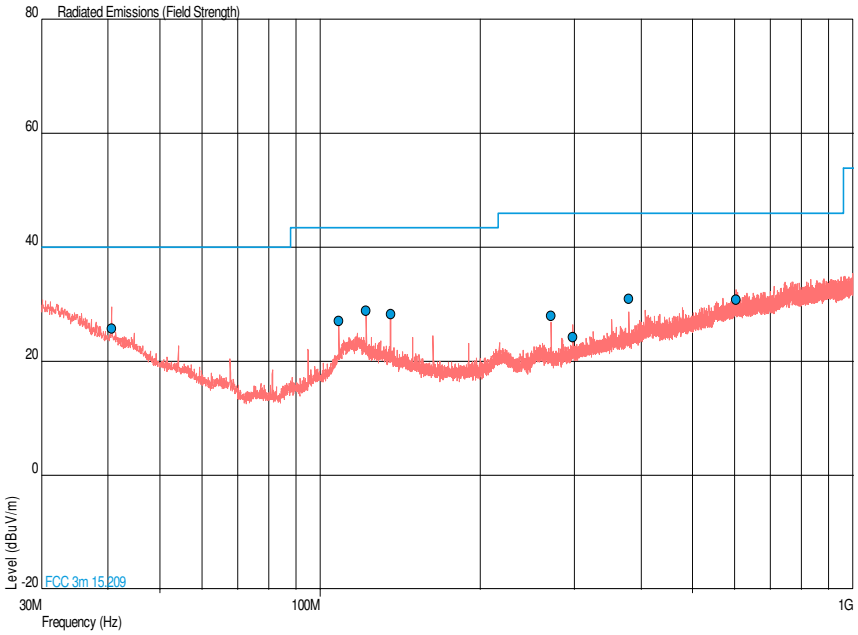
FeliCa, 30 MHz to 1 GHz, Field Strength of any Emission Results

| Frequency (MHz) | Quasi-Peak Level (dBµV/m) | Quasi-Peak Level (µV/m) | Quasi-Peak Margin (dµV/m) | Quasi-Peak Margin (µV/m) | Angle (°) | Height (m) | Polarisation |
|---|---|---|---|---|---|---|---|
| 40.621 | 25.8 | 19.5 | -14.2 | -80.5 | 85 | 1.00 | Vertical |
| 108.476 | 27.1 | 22.6 | -16.4 | -127.4 | 360 | 1.00 | Vertical |
| 122.034 | 28.9 | 27.9 | -14.6 | -122.1 | 297 | 1.00 | Vertical |
| 135.592 | 28.3 | 26.0 | -15.2 | -124.0 | 0 | 1.00 | Vertical |
| 271.195 | 28.0 | 25.1 | -18.0 | -174.9 | 272 | 1.00 | Horizontal |
| 298.288 | 24.2 | 16.2 | -21.8 | -183.8 | 250 | 1.38 | Horizontal |
| 379.673 | 30.9 | 35.1 | -15.1 | -164.9 | 136 | 1.92 | Vertical |
| 603.124 | 30.8 | 34.7 | -15.2 | -165.3 | 289 | 1.00 | Horizontal |

FeliCa, 30 MHz to 1 GHz, Field Strength of any Emission Plot



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FCC 47 CFR Part 15, Limit Clause 15.225 (a)(b)(c)(d)

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

FCC 47 CFR Part 15, Limit Clause 15.209

| Frequency (MHz) | Field Strength (µV/m) | Measurement Distance (m) |
|---|---|---|
| 0.009 to 0.490 | 2400/F (kHz) | 300 |
| 0.490 to 1.705 | 24000/F (kHz) | 30 |
| 1705 to 30 | 30 | 30 |
| 30 to 88 | 100** | 3 |
| 88 to 216 | 150** | 3 |
| 216 to 960 | 200** | 3 |
| Above 960 | 500 | 5 |

## 2.3 FREQUENCY TOLERANCE UNDER TEMPERATURE VARIATIONS

### 2.3.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.225 (e)

### 2.3.2 Equipment Under Test and Modification State

S/N: IMEI 004401115794360 - Modification State 0

### 2.3.3 Date of Test

26 April 2016 & 28 April 2016

### 2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.3.5 Test Procedure

The test was performed in accordance with ANSI C63.10, clause 6.8.

### 2.3.6 Environmental Conditions

| | |
|---|---|
| Ambient Temperature | 21.2 - 23.2°C |
| Relative Humidity | 26.6 - 27.7% |

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### 2.3.7 Test Results

FeliCa, Felica, Frequenecy Tolerance Under Temperature Variations Results

| Temperature Interval | Voltage | Fundamental Frequency (MHz) | Fundamental Frequency Deviation (%) |
|---|---|---|---|
| -20 °C | 4.0 V DC | 13.56 | -0.00011 |
| -10 °C | 4.0 V DC | 13.56 | 0.00016 |
| 0 °C | 4.0 V DC | 13.56 | 0.00018 |
| +10 °C | 4.0 V DC | 13.56 | 0.00006 |
| +20 °C | 4.0 V DC | 13.56 | -0.00043 |
| +20 °C | 4.0 V DC | 13.56 | -0.00043 |
| +30 °C | 4.0 V DC | 13.56 | -0.00058 |
| +40 °C | 4.0 V DC | 13.56 | -0.00080 |
| +50 °C | 4.0 V DC | 13.56 | -0.00094 |

FCC 47 CFR Part 15, Limit Clause 15.225 (e)

The frequency tolerance of the carrier signal shall be maintained within ± 0.01 % of the operating frequency.

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**SECTION 3**

**TEST EQUIPMENT USED**

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## 3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

| Instrument | Manufacturer | Type No. | TE No. | Calibration Period (months) | Calibration Due |
|---|---|---|---|---|---|
| **Section 2.1 – 20 dB Bandwidth** | | | | | |
| RF Coupler | TUV SUD Product Service | RFC1 | 414 | - | TU |
| Hygrometer | Rotronic | I-1000 | 2891 | 12 | 19-Aug-2016 |
| 1 Metre SMA Cable | Rhophase | 3PS-1801A-1000-3PS | 4101 | 12 | 6-Nov-2016 |
| PXA Signal Analyser | Keysight Technologies | N9030A | 4654 | 12 | 8-Oct-2016 |
| **Section 2.2 - Field Strength of Emissions** | | | | | |
| Turntable Controller | Inn-Co GmbH | CO 1000 | 1606 | - | TU |
| Antenna (Bilog) | Chase | CBL6143 | 2904 | 24 | 11-Jun-2017 |
| EMI Test Receiver | Rohde & Schwarz | ESU40 | 3506 | 12 | 2-Nov-2016 |
| Tilt Antenna Mast | maturo Gmbh | TAM 4.0-P | 3916 | - | TU |
| Mast Controller | maturo Gmbh | NCD | 3917 | - | TU |
| **Section 2.3 - Frequency Tolerance** | | | | | |
| Digital Temperature Indicator + T/C | Fluke | 51 | 412 | 12 | 2-Mar-2017 |
| RF Coupler | TUV SUD Product Service | RFC1 | 414 | - | TU |
| Temperature Chamber | Montford | 2F3 | 467 | - | O/P Mon |
| Rubidium Standard | Rohde & Schwarz | XSRM | 1316 | 6 | 3-Sep-2016 |
| Frequency Standard | Spectracom | Secure Sync 1200-0408-0601 | 4393 | 6 | 3-Sep-2016 |
| PXA Signal Analyser | Keysight Technologies | N9030A | 4654 | 12 | 8-Oct-2016 |

TU – Traceability Unscheduled
O/P MON – Output Monitored with Calibrated Equipment

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## 3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

| Test Discipline | MU |
|---|---|
| Field Strength of any Emission | 9 kHz to 1 GHz: ± 5.1 dB |
| 20 dB Bandwidth | ± 8.20 Hz |
| Frequency Tolerance Under Temperature Variations | ± 3.54 Hz |

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## SECTION 4

## ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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## 4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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