

Report on the Radio Testing

For

Pektron Group Ltd

on

0775 McLaren P14 Key Fob

Report no. TRA-022854-04-47-00A

2nd November 2015



Report Number: TRA-022854-04-47-00A  
Issue: A

REPORT ON THE RADIO TESTING OF A  
Pektron Group Ltd  
0775 McLaren P14 Key Fob  
WITH RESPECT TO SPECIFICATION  
FCC 47CFR 15.231

TEST DATE: 6th - 20th October 2015

Written by: D Winstanley

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Date: 2nd November 2015

Disclaimers:

- [1] THIS DOCUMENT MAY BE REPRODUCED ONLY IN ITS ENTIRETY AND WITHOUT CHANGE  
[2] THE RESULTS CONTAINED IN THIS DOCUMENT RELATE ONLY TO THE ITEM(S) TESTED



## 1 Revision Record

<i>Issue Number</i>	<i>Issue Date</i>	<i>Revision History</i>
A	2nd November 2015	Original

## 2 Summary

TEST REPORT NUMBER: TRA-022854-04-47-00A

WORKS ORDER NUMBER: TRA-022854-04

PURPOSE OF TEST: USA: Testing of radio frequency equipment per the relevant authorization procedure of chapter 47 of CFR (code of federal regulations) Part 2, subpart J.

TEST SPECIFICATION(S): 47CFR15.231

EQUIPMENT UNDER TEST (EUT): 0775 McLaren P14 Key Fob

FCC IDENTIFIER: AQO003

EUT SERIAL NUMBER: Not Applicable

MANUFACTURER/AGENT: Pektron Group Ltd

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United Kingdom

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ORDER NUMBER: Not Applicable

TEST DATE: 6th - 20th October 2015

TESTED BY: D Winstanley  
Element

## 2.1 Test Summary

<i>Test Method and Description</i>	<i>Requirement Clause</i>		
	<i>47CFR15</i>	<i>Applicable to this equipment</i>	<i>Result / Note</i>
Radiated spurious emissions	15.231(b) 15.209	<input checked="" type="checkbox"/>	<i>Pass</i>
AC power line conducted emissions	15.207	<input type="checkbox"/>	<i>N/A</i>
Occupied bandwidth	15.215(c)	<input checked="" type="checkbox"/>	<i>Pass</i>
Field strength of fundamental	15.231(b)	<input checked="" type="checkbox"/>	<i>Pass</i>
Transmitter Timings	15.231(a)	<input checked="" type="checkbox"/>	<i>Pass</i>

### Notes:

The results contained in this report relate only to the items tested, in the condition at time of test, 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. Any modifications made are identified in Section 8 of this report.

Particular operating modes, apparatus monitoring methods and performance criteria required by the standards tested to have been performed except where identified in Section 5.2 of this test report (Deviations from Test Standards).

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## 4 Introduction

This report TRA-022854-04-47-00A presents the results of the Radio testing on a Pektron Group Ltd, 0775 McLaren P14 Key Fob to specification 47CFR15 Radio Frequency Devices. The testing was carried out for Pektron Group Ltd by Element, at the address(es) detailed below.

<input type="checkbox"/>	Element Hull Unit E South Orbital Trading Park Hedon Road Hull HU9 1NJ UK	<input checked="" type="checkbox"/>	Element Skelmersdale Unit 1 Pendle Place Skemersdale West Lancashire WN8 9PN UK
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This report details the configuration of the equipment, the test methods used and any relevant modifications where appropriate.

All test and measurement equipment under the control of the laboratory and requiring calibration is subject to an established programme and procedures to control and maintain measurement standards. The quality management system meets the principles of ISO 9001, and has quality control procedures for monitoring the validity of tests undertaken. Records and sufficient detail are retained to establish an audit trail of calibration records relating to its test results for a defined period. Under control of the established calibration programme, key quantities or values of the test & measurement instrumentation are within specification and comply with the relevant traceable internationally recognised and appropriate standard specifications, which are UKAS calibrated as such where these properties have a significant effect on results. Participation in inter-laboratory comparisons and proficiency testing ensures satisfactory correlation of results conform to Elements own procedures, as well as statistical techniques for analysis of test data providing the appropriate confidence in measurements.

Throughout this report EUT denotes equipment under test.

FCC Site Listing:

Element is accredited for the above sites under the US-EU MRA, Designation number UK0009.

The test site requirements of ANSI C63.4-2014 are met up to 1 GHz.

The test site SVSWR requirements of CISPR 16-1-4:2010 are met over the frequency range 1 GHz to 18 GHz.

## **5 Test Specifications**

### **5.1 Normative References**

- FCC 47 CFR Ch. I – Part 15 – Radio Frequency Devices.
- ANSI C63.10-2013 – American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
- ANSI C63.4-2014 – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

### **5.2 Deviations from Test Standards**

There were no deviations from the test standard.



## 6 Glossary of Terms

<b>§</b>	denotes a section reference from the standard, not this document
<b>AC</b>	Alternating Current
<b>ANSI</b>	American National Standards Institute
<b>BW</b>	bandwidth
<b>C</b>	Celsius
<b>CFR</b>	Code of Federal Regulations
<b>CW</b>	Continuous Wave
<b>dB</b>	decibel
<b>dBm</b>	dB relative to 1 milliwatt
<b>DC</b>	Direct Current
<b>DSSS</b>	Direct Sequence Spread Spectrum
<b>EIRP</b>	Equivalent Isotropically Radiated Power
<b>ERP</b>	Effective Radiated Power
<b>EUT</b>	Equipment Under Test
<b>FCC</b>	Federal Communications Commission
<b>FHSS</b>	Frequency Hopping Spread Spectrum
<b>Hz</b>	hertz
<b>IC</b>	Industry Canada
<b>ITU</b>	International Telecommunication Union
<b>LBT</b>	Listen Before Talk
<b>m</b>	metre
<b>max</b>	maximum
<b>MIMO</b>	Multiple Input and Multiple Output
<b>min</b>	minimum
<b>MRA</b>	Mutual Recognition Agreement
<b>N/A</b>	Not Applicable
<b>PCB</b>	Printed Circuit Board
<b>PDF</b>	Portable Document Format
<b>Pt-mpt</b>	Point-to-multipoint
<b>Pt-pt</b>	Point-to-point
<b>RF</b>	Radio Frequency
<b>RH</b>	Relative Humidity
<b>RMS</b>	Root Mean Square
<b>Rx</b>	receiver
<b>s</b>	second
<b>SVSWR</b>	Site Voltage Standing Wave Ratio
<b>Tx</b>	transmitter
<b>UKAS</b>	United Kingdom Accreditation Service
<b>V</b>	volt
<b>W</b>	watt
<b>Ω</b>	ohm

## 7 Equipment Under Test

### 7.1 EUT Identification

- Name: 0775 McLaren P14 Key Fob
- Model Number: 3 Button: A-0775G02  
4 Button: A-0775G04
- Software Revision: Not Applicable
- Build Level / Revision Number: Not Applicable
- Serial Numbers
  - 3-Button Normal Operation: TK0046 and TK0047
  - 3-Button Constant Transmit: TK0048 and TK0049
  - 4-Button Normal Operation: TK0023 and TK0042
  - 4-Button Constant Transmit: TK0043 and TK0044

The 3 Button and 4 Button variants have identical circuit, electronics and software. The difference between 3 button and 4 Button variants is the keypad membrane.

Fundamental power of both 3 Button and 4 Button Variants was found to be identical see Section 13, all further testing was performed on the 3 button A-0775G02 Variant.

### 7.2 System Equipment

Equipment listed below forms part of the overall test setup and is required for equipment functionality and/or monitoring during testing. The compliance levels achieved in this report relate only to the EUT and not items given in the following list.

*Not Applicable – No support/monitoring equipment required.*

### 7.3 EUT Mode of Operation

#### 7.3.1 Transmission

The mode of operation for Tx tests was as follows...

EUT was set to permanent transmission using test software for Fundamental carrier power, spurious emissions and occupied bandwidth.

A unit operating in normal mode was utilised for measurement on transmission times

#### 7.3.2 Reception

Not applicable

## 7.4 EUT Radio Parameters

### 7.4.1 General

<b>Frequency of operation:</b>	433.96 MHz
<b>Modulation type(s):</b>	ASK
<b>Channel spacing:</b>	Not Applicable
<b>ITU emission designator(s):</b>	A1D
<b>Warning against use of alternative antennas in user manual (yes/no):</b>	Not Applicable Integral PCB antenna
<b>Nominal Supply Voltage:</b>	3.0Vdc
<b>Frequency stability:</b>	Not Applicable
<b>Location of notice for license exempt use:</b>	Label / user manual / both.

### 7.4.2 Antennas

<b>Type:</b>	Integral PCB Track
<b>Frequency range:</b>	433.96 MHz
<b>Impedance:</b>	50 Ohms
<b>Connector type:</b>	Not Applicable
<b>Mounting:</b>	Not Applicable

## 7.5 EUT Description

The EUT is a car Key Fob transmitter operating at 433.96 MHz

## **8 Modifications**

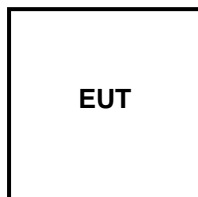
No modifications were performed during this assessment.

## 9 EUT Test Setup

### 9.1 Block Diagram

The following diagram shows basic EUT interconnections with cable type and cable lengths identified:

EUT is a battery powered device with no external connections



## 9.2 General Set-up Photograph

The following photograph shows basic EUT set-up:



## 10 General Technical Parameters

### 10.1 Normal Conditions

The E U T was tested under the normal environmental conditions of the test laboratory, except where otherwise stated. The normal power source applied was approx. 3 V dc from alkaline batteries.

### 10.2 Varying Test Conditions

There are no specific frequency stability requirements for the type of device. The results contained in this report demonstrate that the occupied bandwidth is contained within the authorised band and the manufacturer has declared sufficient frequency stability.

Variation of supply voltage is required to ensure stability of the declared output power. During carrier power testing the following variations were made:

	<b>Category</b>	<b>Nominal</b>	<b>Variation</b>
<input type="checkbox"/>	Mains	110 V ac +/-2 %	85 % and 115 %
<input checked="" type="checkbox"/>	Battery	New battery	N/A

## 11 Radiated emissions

### 11.1 Definitions

#### *Out-of-band emissions*

Emissions on a frequency or frequencies immediately outside the necessary bandwidth which result from the modulation process, but exclude spurious emissions.

#### *Spurious emissions*

Emissions on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions.

#### *Restricted bands*

A frequency band in which intentional radiators are permitted to radiate only spurious emissions but not fundamental signals.

### 11.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio laboratory
Test Standard and Clause:	ANSI C63.10-2013, Clause 6.5 and 6.6
EUT Channels / Frequencies Measured:	433.96 MHz
Deviations From Standard:	None
Measurement BW:	30 MHz to 1 GHz: 120 kHz Above 1 GHz: 1 MHz
Measurement Detector:	Up to 1 GHz: quasi-peak Above 1 GHz: RMS average and Peak

#### **Environmental Conditions (Normal Environment)**

Temperature: 22 °C	+15 °C to +35 °C (as declared)
Humidity: 44 % RH	20 % RH to 75 % RH (as declared)
Supply: 3.0 V dc	3.0 V dc



### 11.3 Test Limit

In addition to the provisions of 15.205, the field strength of emissions from intentional radiators shall not exceed the following:

<b>Fundamental Frequency (MHz)</b>	<b>Field Strength (<math>\mu\text{V/m}</math> at 3 m)</b>
40.66 – 40.70	225
70 – 130	125
130 – 174	125 to 375
174 – 260	375
260 – 470	375 to 1,250
Above 470	1,250

The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in § 15.209 (below), whichever limit permits a higher field strength.

#### General Field Strength Limits for License-Exempt Transmitters at Frequencies above 30 MHz

<b>Frequency (MHz)</b>	<b>Field Strength (<math>\mu\text{V/m}</math> at 3 m)</b>
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

n.b. per FCC 47CFR15.35(b) peak limit is 20 dB above average.

**11.4 Test Method**

With the EUT setup as per section 9 of this report and connected as per Figure i, the emissions from the EUT were measured on a spectrum analyzer / EMI receiver.

Radiated electromagnetic emissions from the EUT are checked first by preview scans. Preview scans for all spectrum and modulation characteristics are checked, using a peak detector and where applicable worst-case determined for function, operation, orientation, etc. for both vertical and horizontal polarisations. Pre-scan plots are shown with a peak detector and 100 kHz RBW.

If the EUT connects to auxiliary equipment and is table or floor standing, the configurations prescribed in ANSI C63.10 are followed. Alternatively, a layout closest to normal use (as declared by the provider) is employed, (see EUT setup photographs for more detail).

Emissions between 30 MHz and 1 GHz are measured using calibrated broadband antennas. Emissions above 1 GHz are characterized using standard gain horn antennas. Pre-amplifiers and filters are used where required. Care is taken to ensure that test receiver resolution bandwidth, video bandwidth and detector type(s) meet the regulatory requirements.

For both horizontal and vertical polarizations, the EUT is then rotated through 360 degrees in azimuth until the highest emission is detected. At the previously determined azimuth the test antenna is raised and lowered from 1 to 4 m in height until a maximum emission level is detected, this maximum value is recorded.

Power values measured on the test receiver / analyzer are converted to field strength, FS, in dBµV/m at the regulatory distance, using:

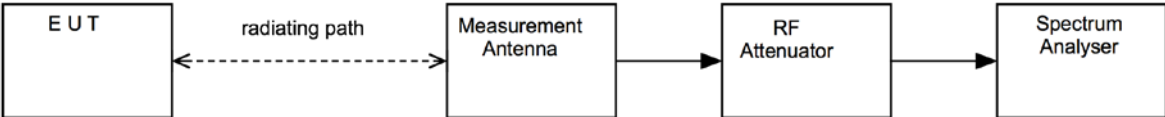
$$FS = PR + CL + AF - PA + DC - CF$$

Where,

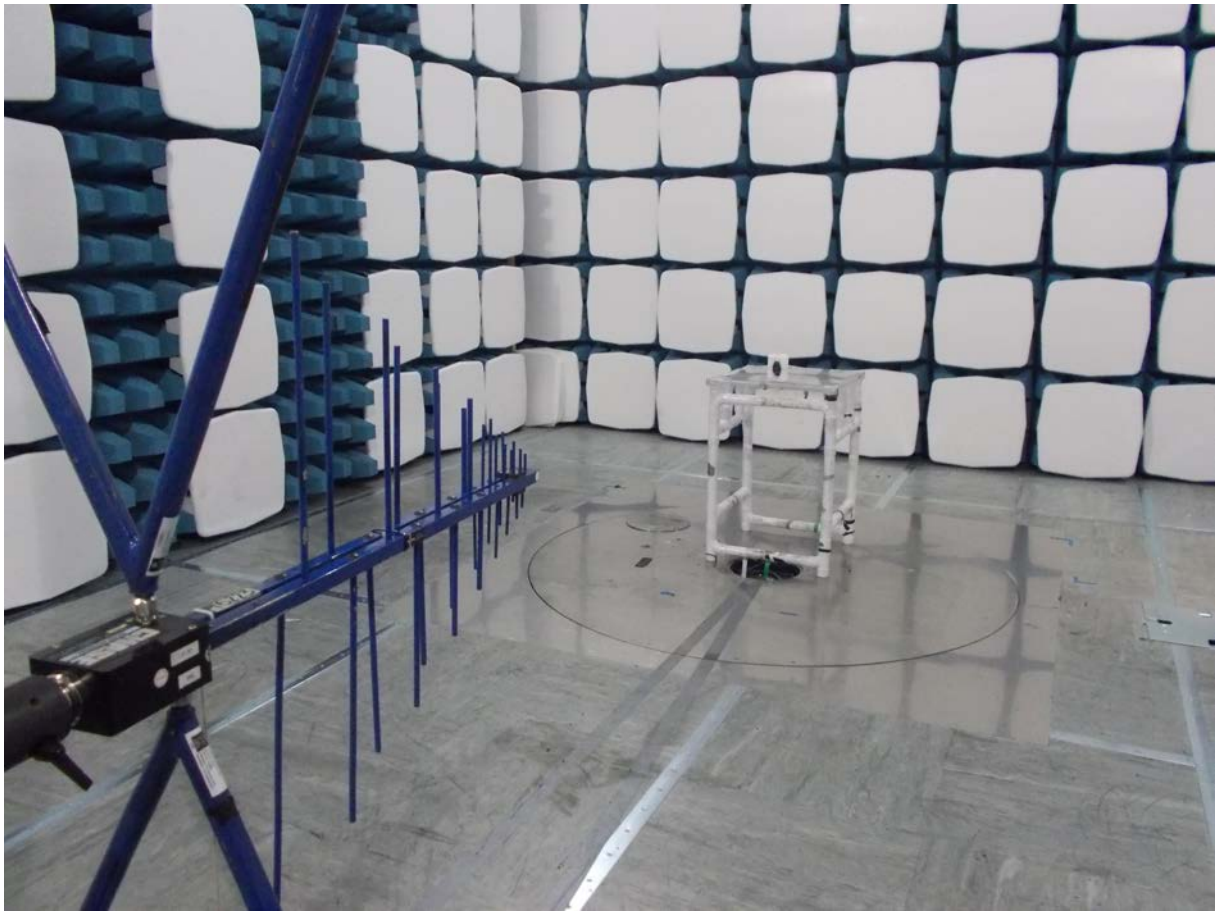
- PR is the power recorded on the receiver / spectrum analyzer in dBµV;
- CL is the cable loss in dB;
- AF is the test antenna factor in dB/m;
- PA is the pre-amplifier gain in dB (where used);
- DC is the duty correction factor in dB (where used, e.g. harmonics of pulsed fundamental);
- CF is the distance factor in dB (where measurement distance different to limit distance);

This field strength value is then compared with the regulatory limit.

**Figure i Test Setup**



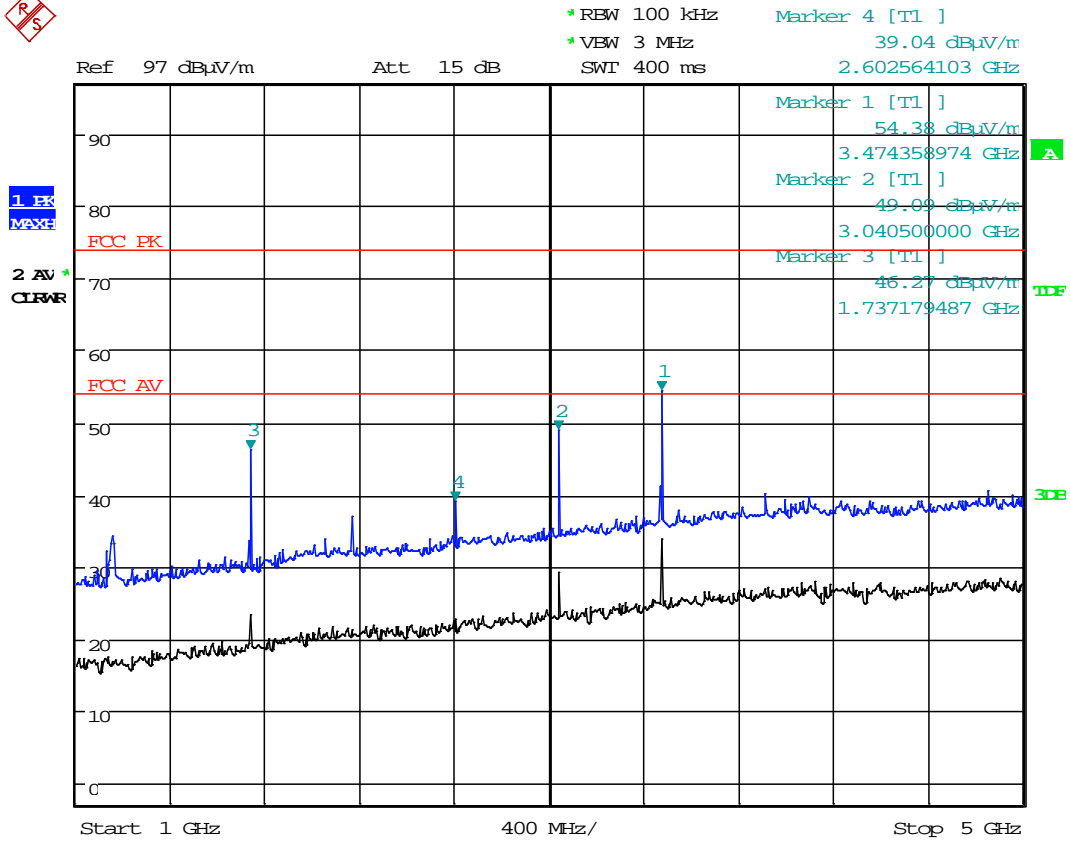
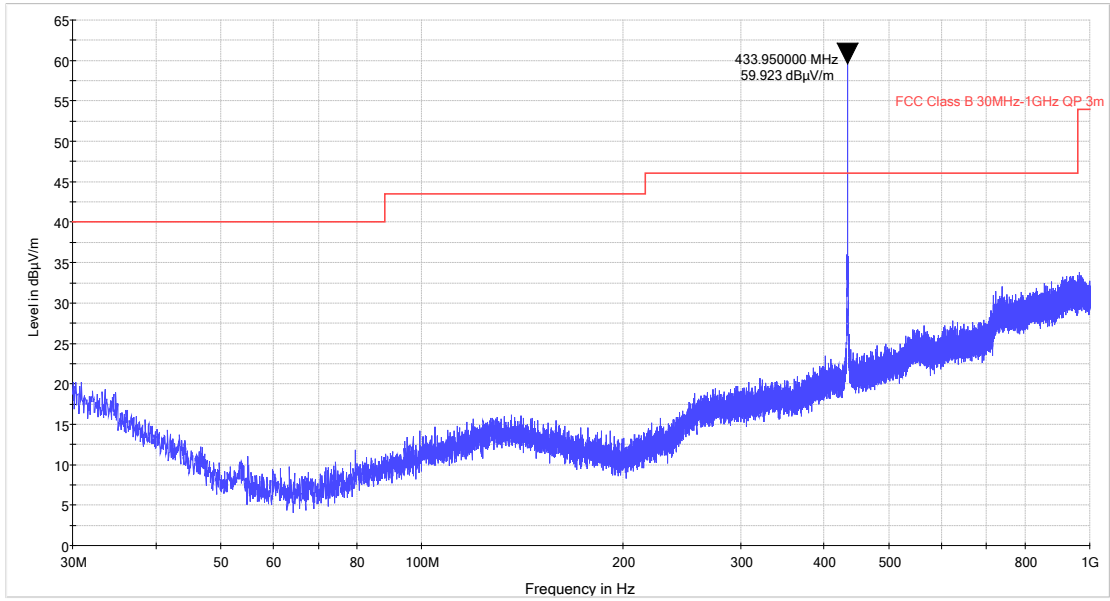
### 11.5 Test Set-up Photograph



### 11.6 Test Equipment

<i>Type of Equipment</i>	<i>Maker/Supplier</i>	<i>Model Number</i>	<i>Element Number</i>	<i>Calibration Due Date</i>
Bilog	Chase	CBL611/A	UH191	26/02/2017
ESVS10	R&S	ESVS10	L352	07/08/2016
Spectrum Analyser	R&S	FSU26	REF909	13/02/2016
Horn Antenna	EMCO	3115	TRL139	20/09/2015
Pre-Amplifier	Agilent	8449B	TRL572	10/02/2016

### 11.7 Test Results



<i>Detector</i>	<i>Freq. (MHz)</i>	<i>Meas'd Emission (dB<math>\mu</math>V)</i>	<i>Cable Loss (dB)</i>	<i>Antenna Factor (dB/m)</i>	<i>Pre-amp Gain (dB)</i>	<i>Duty Cycle Corr'n (dB)</i>	<i>Distance Extrap'n Factor (dB)</i>	<i>Field Strength (dB<math>\mu</math>V/m)</i>	<i>Field Strength (<math>\mu</math>V/m)</i>	<i>Limit (<math>\mu</math>V/m)</i>
Pk	1301.0	52.2	3.4	25.5	37.2	0.0	0.0	43.9	156.68	10990
Av	1301.0	44.0	3.4	25.5	37.2	0.0	0.0	35.6	60.46	1099
Pk	1735.0	57.7	4.0	26.7	36.5	0.0	0.0	52.0	396.73	10990
Av	1735.0	54.3	4.0	26.7	36.5	0.0	0.0	48.6	268.23	1099
Pk	2169.0	51.1	2.8	28.0	36.2	0.0	0.0	45.7	192.09	10990
Av	2169.0	49.5	2.8	28.0	36.2	0.0	0.0	44.1	159.96	1099
Pk	2603.0	58.0	3.2	28.6	36.1	0.0	0.0	53.7	483.62	10990
Av	2603.0	50.7	3.2	28.6	36.1	0.0	0.0	46.4	208.45	1099
Pk	3037.0	61.8	4.2	29.9	36.1	0.0	0.0	59.8	979.49	10990
Av	3037.0	50.2	4.2	29.9	36.1	0.0	0.0	48.2	256.74	1099
Pk	3470.0	61.3	4.0	31.2	36.1	0.0	0.0	60.4	1044.72	10990
Av	3470.0	56.2	4.0	31.2	36.1	0.0	0.0	55.2	576.77	1099

## 12 Occupied Bandwidth

### 12.1 Definitions

#### *Occupied bandwidth*

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to 0.5 % of the emitted power. This is also known as the *99 % emission bandwidth*. For transmitters in which there are multiple carriers, contiguous or non-contiguous in frequency, the occupied bandwidth is to be the sum of the occupied bandwidths of the individual carriers.

#### *20 dB bandwidth*

The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal.

### 12.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	ANSI C63.10-2013, Clause 6.9
EUT Channels / Frequencies Measured:	433.96 MHz
Deviations From Standard:	None
Measurement BW: (requirement: 1 % to 5 % OBW)	500Hz
Spectrum Analyzer Video BW: (requirement at least 3x RBW)	1kHz
Measurement Span: (requirement 2 to 5 times OBW)	50 kHz
Measurement Detector:	Peak

#### **Environmental Conditions (Normal Environment)**

Temperature: 21 °C	+15 °C to +35 °C (as declared)
Humidity: 44 % RH	20 % RH to 75 % RH (as declared)
Supply: 3.0 V dc	(as declared)

### 12.3 Test Limit

#### Federal Communications Commission:

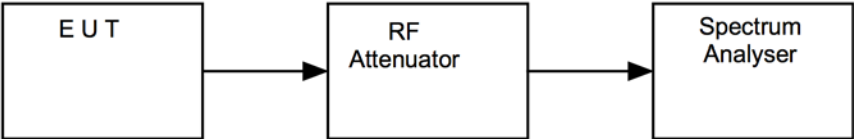
Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

**12.4 Test Method**

With the EUT setup as per section 9 of this report and connected as per Figure iii, the bandwidth of the EUT was measured on a spectrum analyser.

The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst-case configuration in each bandwidth.

**Figure iii Test Setup**

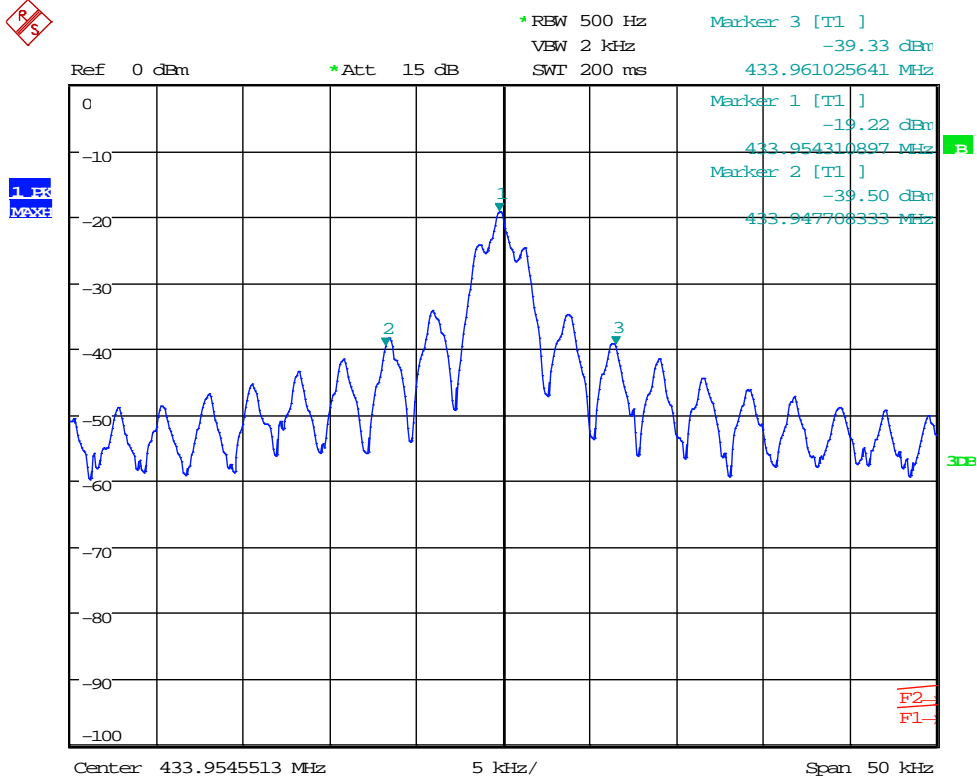


**12.5 Test Equipment**

<i>Type of Equipment</i>	<i>Maker/Supplier</i>	<i>Model Number</i>	<i>Element Number</i>	<i>Calibration Due Date</i>
Spectrum Analyser	R&S	FSU26	UH405	11/05/2015

12.6 Test Results

20 dB Bandwidth				
Channel Frequency (MHz)	$F_L$ (MHz)	$F_H$ (MHz)	20dB Bandwidth (kHz)	Result
433.96	433.9477083	433.9610256	13.317	PASS



Date: 27.OCT.2015 08:23:54



## 13 Transmitter output power (fundamental radiated emission)

### 13.1 Definition

The RF power dissipated in the standard output termination when operating under the rated duty cycle selected by the applicant for approval.

### 13.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Chamber (REF940)
Test Standard and Clause:	ANSI C63.10-2013, Clause 6.5 / 6.6
EUT Channels / Frequencies Measured:	433.96 MHz
Deviations From Standard:	None
Measurement BW:	120 kHz
Spectrum Analyzer Video BW: (requirement at least 3x RBW)	Not Applicable
Measurement Detector:	Up to 1 GHz: Quasi-peak Above 1 GHz: Average RMS and Peak
Voltage Extreme Environment Test Range:	Mains Power = 85 % and 115 % of Nominal (FCC only requirement); Battery Power = new battery.

### Environmental Conditions (Normal Environment)

Temperature: 22 °C	+15 °C to +35 °C (as declared)
Humidity: 44 % RH	20 % RH to 75 % RH (as declared)

### 13.3 Test Limit

The field strength measured at 3 metres shall not exceed the limits in the following table:

**Field Strength Limits for License-Exempt Transmitters for Any Application**

<i>Fundamental frequency (MHz)</i>	<i>Field strength of fundamental (<math>\mu\text{V/m}</math> at 3 m)</i>	<i>Detector</i>
260 - 470	3750 - 12500	Quasi-Peak

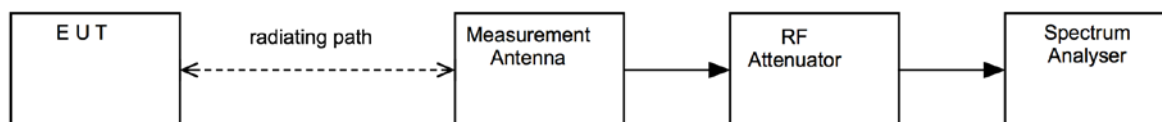
Linear Interpolation

### 13.4 Test Method

The EUT setup as per section 9 of this report and connected as per Figure iv.

The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst-case configuration in each bandwidth.

**Figure iv Test Setup**



### 13.5 Test Equipment

Type of Equipment	Maker/Supplier	Model Number	Element Number	Calibration Due Date
Bilog	Chase	CBL611/A	UH191	26/02/2017
ESVS10	R&S	ESVS10	L352	07/08/2016

### 13.6 Test Results

Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp Gain (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
3 Button: A-0775G02								
QP	433.95	45.2	2.89	16	N/A	64.09	1601.40	10995.85
4 Button: A-0775G04								
QP	433.95	45.2	2.89	16	N/A	64.09	1601.40	10995.85

Fundamental power of both 3 Button and 4 Button Variants was found to be identical.

## 14 Evaluation of certain unlicensed wireless devices with periodic emissions

### 14.1 Definition

An unlicensed wireless device operating with periodic emissions shall address compliance with the applicable regulatory requirements

### 14.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio lab
Test Standard and Clause:	ANSI C63.10-2013, Clause 7.6.1
EUT Channels / Frequencies Measured:	433.96 MHz
Deviations From Standard:	None
Temperature Extreme Environment Test Range:	N/A
Voltage Extreme Environment Test Range:	N/A

### Environmental Conditions (Normal Environment)

Temperature: 22 °C	+15 °C to +35 °C (as declared)
Humidity: 42 % RH	20 % RH to 75 % RH (as declared)
Supply: 3.0 V dc	3.0 V dc (as declared)

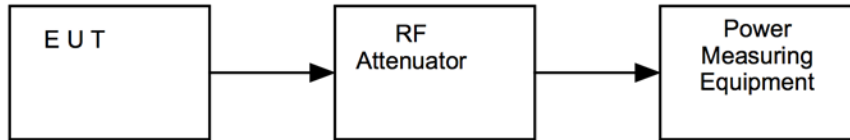
### 14.3 Test Limit

- 1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
- 2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
- 3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.
- 4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition

**14.4 Test Method**

EUT is triggered by all means available (manual / Automatic / Supervision). The length of transmission for each type of trigger is measured and compared to the relevant limit.

**Figure vii Test Setup**

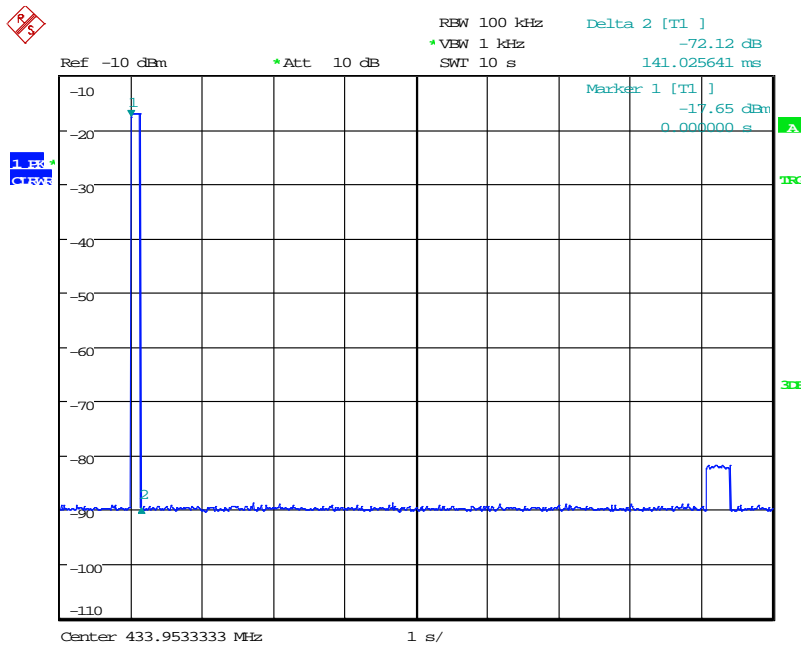


**14.5 Test Equipment**

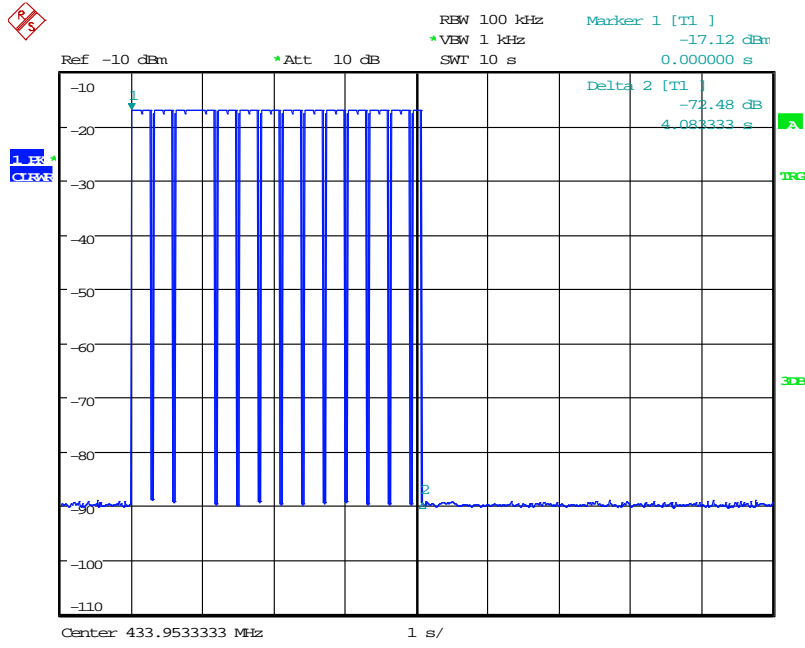
Type of Equipment	Maker/Supplier	Model Number	Element Number	Calibration Due Date
Spectrum Analyser	R&S	FSU26	REF909	13/02/2016

**14.6 Test Results**

Trigger Type	TxOn time (ms)	Limit (Seconds)	Results
Manual Short Button Press	141.025	<5	Pass
Manual Long Button Press	4083.3	<5	Pass
Automatic Transmission	Not Applicable, No Automatic Transmissions		
Supervision Transmission	Not Applicable, No Supervisions Transmissions		



Date: 20.OCT.2015 16:30:22



Date: 20.OCT.2015 16:26:39

## 15 Measurement Uncertainty

### Calculated Measurement Uncertainties

All statements of uncertainty are expanded standard uncertainty using a coverage factor of 1.96 to give a 95 % confidence:

#### [1] Carrier power

Uncertainty in test result (Power Meter) = **1.08 dB**

Uncertainty in test result (Spectrum Analyser) = **2.48 dB**

#### [2] Spurious emissions

Uncertainty in test result (30 MHz to 1 GHz) = **4.6 dB**

Uncertainty in test result (1 GHz to 18 GHz) = **4.7 dB**

#### [3] AC power line conducted emissions

Uncertainty in test result = **3.4 dB**

#### [4] Occupied bandwidth

Uncertainty in test result = **15.5 %**

#### [5] Maximum frequency error

Uncertainty in test result (Power Meter) = **0.113 ppm**

Uncertainty in test result (Spectrum Analyser) = **0.265 ppm**

#### [6] Duty cycle

Uncertainty in test result = **7.98 %**

## 16 RF Exposure

### KDB 447498

#### Section 4.3 General SAR test reduction and exclusion guidance

For Standalone SAR exclusion consideration, when SAR exclusion Threshold requirement in KDB 447498 is satisfied, standalone SAR evaluation for general population exposure conditions by measurement or numerical simulation is not required.

In the frequency range below 100 MHz to 6 GHz and test separation distance of 50mm, the SAR Test Exclusion Threshold for operation at 433.96 MHz will be determined as follows

SAR Exclusion Threshold (SARET)

SAR Exclusion Threshold = Step 1 + Step 2

Step 1

$$NT = [(MP/TSDA) * \sqrt{fGHz}]$$

NT = Numeric Threshold (3.0 for 1-g SAR and 7.5 for 10-g SAR)

MP = Max Power of channel (mW) (inc tune up)

TSDA = Min Test separation Distance or 5mm (whichever is lower) = 5

We can transpose this formula to allow us to find the maximum power of a channel allowed and compare this to the measured maximum power.

$$= [(NT \times TSDA) / \sqrt{fGHz}]$$

Operating Frequency 433.96 MHz

$$= [(3 \times 5) / \sqrt{0.43396}]$$

$$= 15 / 0.658$$

$$= 22.78 \text{ mW}$$

Calculated output power as per ANSI C63.10 Section 9.5 = 0.0007mW

The calculated output power 0.007mw (Peak) is less than the SAR Exclusion Threshold of 22.78mW.

Therefore standalone SAR evaluation for general population exposure conditions by measurement or numerical simulation is not required. Section 4.3 General SAR test reduction and exclusion guidance