Report on the Radio Testing

For

Pektron Group Ltd

on

BTLE Node

Report no. TRA-051982-45-20B

28th February 2023

Report Number: TRA-051982-45-20B
Issue: B

REPORT ON THE RADIO TESTING OF A
Pektron Group Ltd
BTLE Node
WITH RESPECT TO SPECIFICATION
FCC 47CFR 15.247 Limited Testing Only) & ISED RSS-247 (Limited Testing Only)
TO SATISFY MODULAR INTEGRATION REQUIREMENTS OF
KDB 178919 D01 v06 and RSP-100, Issue 12

TEST DATE: 2023-01-12

Tested by: D Garvey

Written by: D Garvey
Radio Test Engineer

Approved by: Digitally signed by John Charters
Date: 2023.02.28 09:53:39 Z
P.P D Winstanley
Radio Senior Test Engineer

Date: 28th February 2023

1 Revision Record

Issue Number	*Issue Date*	*Revision History*
A	17th January 2023	Original
B	28th February 2023	Updates after certification check

2 Summary

TEST REPORT NUMBER:	TRA-051982-45-20B
WORKS ORDER NUMBER:	TRA-051982-19
PURPOSE OF TEST:	Class 2 Permissive Change
TEST SPECIFICATION:	47CFR15.247 & RSS-247 (Limited Testing Only)
EQUIPMENT UNDER TEST (EUT):	BTLE Node
ISED IDENTIFIER:	10176A-12
FCC IDENTIFIER:	AQO012
EUT SERIAL NUMBER:	BJ10024914
MANUFACTURER/AGENT:	Pektron Group Ltd
ADDRESS:	Alfreton Road Derby Derbyshire DE21 4AP United Kingdom
CLIENT CONTACT:	Richard Jones ☎ 01332832424 ext 382 ✉ rjones@pektron.co.uk
ORDER NUMBER:	RJ/133/22
TEST DATE:	2023-01-12
TESTED BY:	D Garvey Element

2.1 Test Summary

Test Method and Description		*Requirement Clause RSS*	*Requirement Clause 47CFR15*	*Applicable to this equipment*	*Result / Note*
Radiated spurious emissions (restricted bands of operation and cabinet radiation)		247, 3.3	15.247 (d)	☒	*Pass*
AC power line conducted emissions		Gen, 8.8	15.207	☐	*Note 1*
Occupied bandwidth		247, 5.2 (a)	15.247 (a) (2)	☐	*Note 1*
Conducted carrier power	Peak	247, 5.4 (d)	15.247 (b) (3)	☒	*Pass*
	Max.			☐	
Out of band emissions		247, 5.5	15.247 (d)	☐	*Note 1*
Power spectral density		247, 5.2 (b)	15.247 (e)	☐	*Note 1*
Calculation of duty correction		15.35 (c)	-	☒	*N/A*

Specific Note:

1. Limited testing was performed to check transmitter radiated spurious emissions, peak conducted output power and duty cycle only on a single mode, as required by the client, to satisfy modular integration requirements of KDB 178919 D01 v06 and RSP-100.

General 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).

3 Contents

4 Introduction

This report TRA-051982-45-20B presents the results of the Radio testing on a Pektron Group Ltd, BTLE Node to specifications 47CFR15 Radio Frequency Devices (Limited Testing) and RSS-247 - Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices (Limited Testing).

The testing was carried out for Pektron Group Ltd by Element, at the address detailed below.

☒ Element Hull
Unit E
South Orbital Trading Park
Hedon Road
Hull
HU9 1NJ
UK

☐ Element Skelmersdale
Unit 1
Pendle Place
Skemersdale
West Lancashire
WN8 9PN
UK

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:
The test laboratory is accredited for the above sites under the following US-UK MRA, Designation numbers.

Element Hull	UK2007
Element Skelmersdale	UK2020

ISED Registration Numbers:

Element Hull	3483A
Element North West	3930B

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.
- ISED RSS-247, Issue 2, February 2017 – Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices.
- ISED RSS-Gen, Issue 5, March 2019 – General Requirements for Compliance of Radio Apparatus.
- 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.
- RSP-100, Issue 12, August 2019 – Certification of Radio Apparatus and Broadcasting Equipment.
- KDB178919 D01 Permissive Change Policy v06.

5.2 Deviations from Test Standards

Limited testing was performed to check transmitter radiated spurious emissions and maximum peak conducted output power only, as required by the client, to satisfy the CLASS II permissive change requirements of KDB 178919 D01 v06 and RSP-100.

6 Glossary of Terms

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

7 Equipment under Test

7.1 EUT Identification

- Name: BTLE Node
- Serial Number: BJ10024914
- Model Number: A-0819G13
- Software Revision: Bootloader: P0819B1.1.0 / Application: P0819A2.2.3
- Build Level / Revision Number: Production

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.

Customer Laptop
Node Test Box
CAN Dongle

7.3 EUT Mode of Operation

The unit was connected via CAN to the laptop and commands, provided by the manufacturer, were sent to the EUT via software called CANoe. The unit was put into test mode transmitting a modulated signal on the required frequencies.

7.4 EUT Radio Parameters

Frequency of operation:	2402 MHz – 2480 MHz
Modulation:	GFSK
Declared output power:	≤10.0 dBm
Antenna type:	PCB Trace
Antenna gain:	Unknown
Nominal supply voltage:	12 Vdc

7.5 EUT Description

The EUT is a BTLE node incorporating BTLE 2.4 GHz and LF 125 kHz radios, this test report only covers limited testing of the Bluetooth radio.

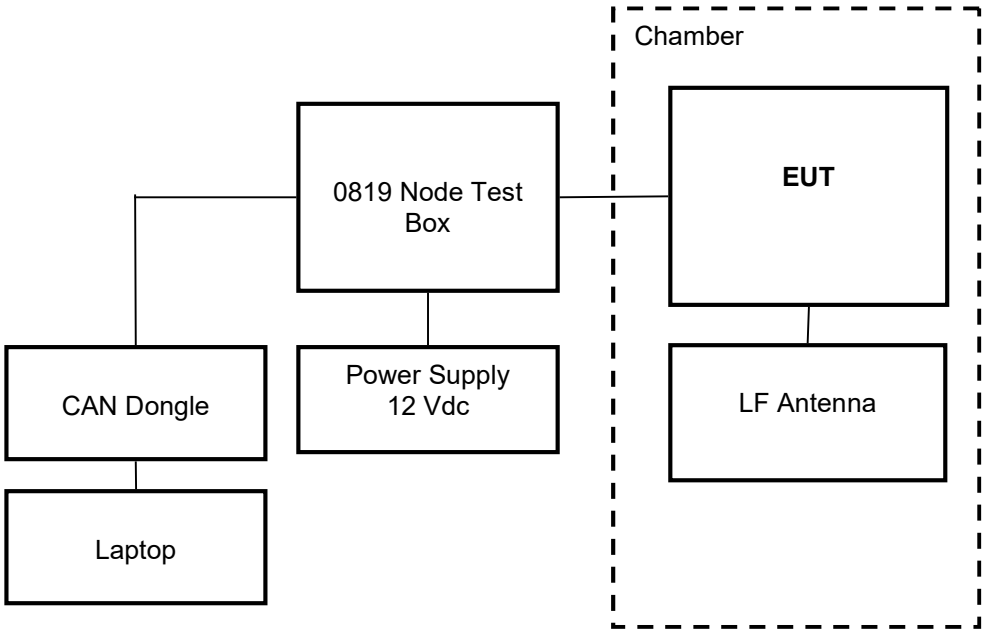
8 Modifications

No modifications were performed during this assessment.

9 EUT Test Setup

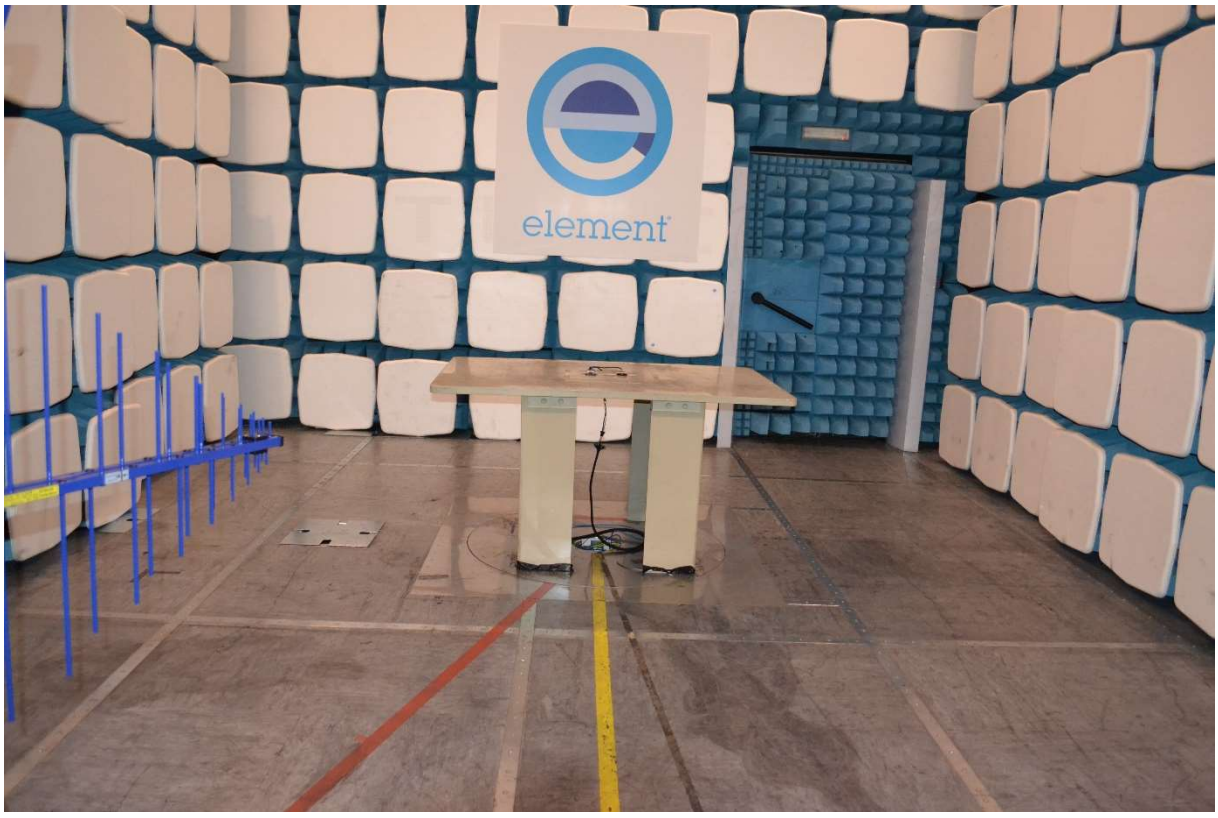
9.1 Block Diagram

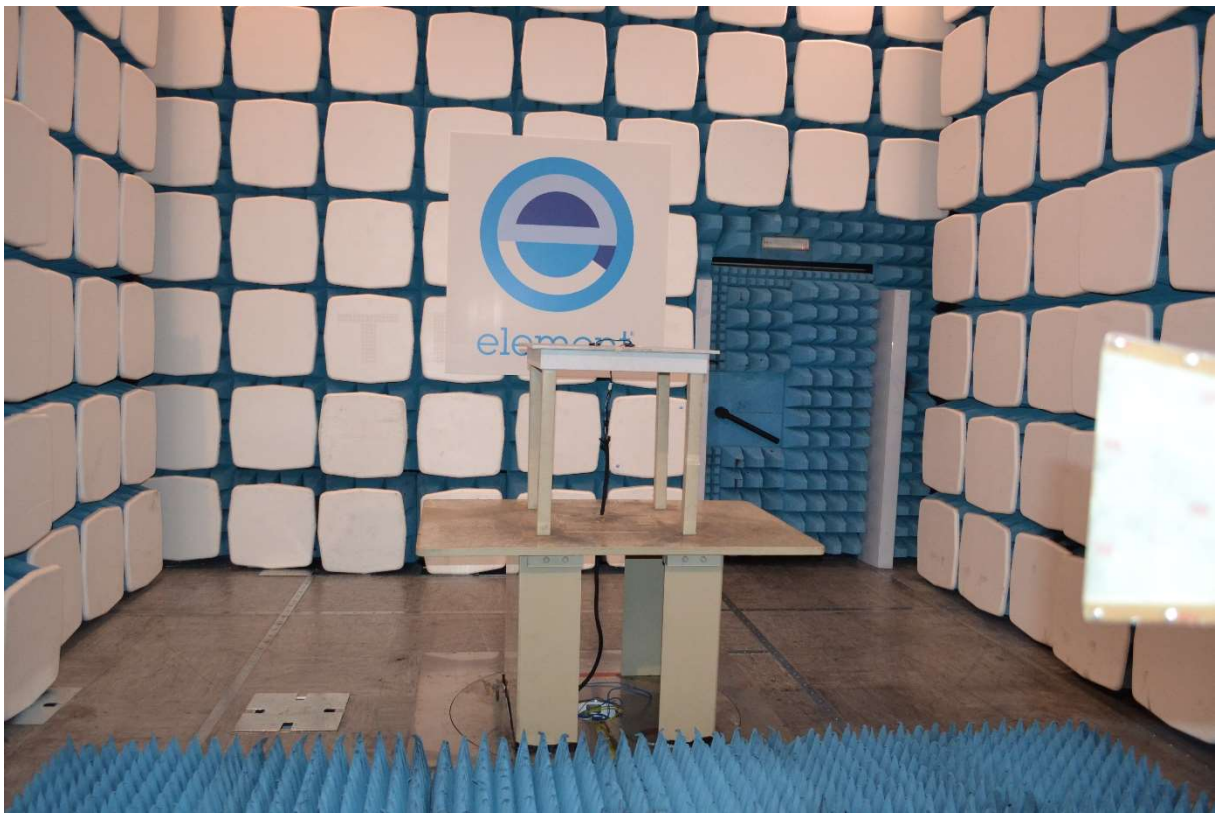
The following diagram shows basic EUT interconnections:



9.2 General Set-up Photograph

The following photograph shows basic EUT set-up:





9.3 Measurement software

Where applicable, the following software was used to perform measurements contained within this report.

Element Emissions R5

10 General Technical Parameters

10.1 Normal Conditions

The EUT was tested under the normal environmental conditions of the test laboratory, except where otherwise stated. The normal power source applied was 12 Vdc from an external power supply.

11 Radiated emissions

11.1 Definitions

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 Hull
Test Chamber:	Wireless Lab 2
Test Standard and Clause:	ANSI C63.10-2013, Clause 6.5 and 6.6
EUT Frequencies Measured:	2402 MHz, 2440 MHz & 2480 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: CISPR average and Peak

Environmental Conditions (Normal Environment)

Temperature: 21 °C	+15 ºC to +35 ºC (as declared)
Humidity: 40 %RH	20 %RH to 75 %RH (as declared)

Test Limit

Unwanted emissions that fall within the restricted frequency bands shall comply with the limits specified:

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

Frequency (MHz)	*Field Strength (µV/m at 3 m)*	*Field Strength (dBµV/m at 3 m)*
30 to 88	100	40.0
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

On frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function. On frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit.

11.3 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:

$$FS = PR + CL + AF – PA + DC – CF$$

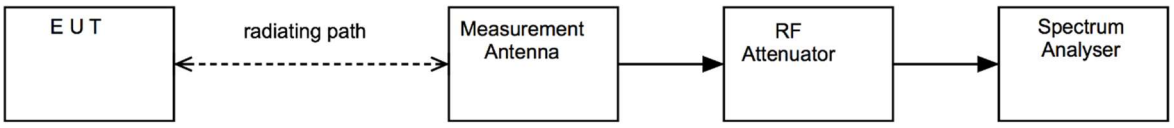
Where,

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);

$$Factor = CL + AF - PA$$

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

Figure i Test Setup



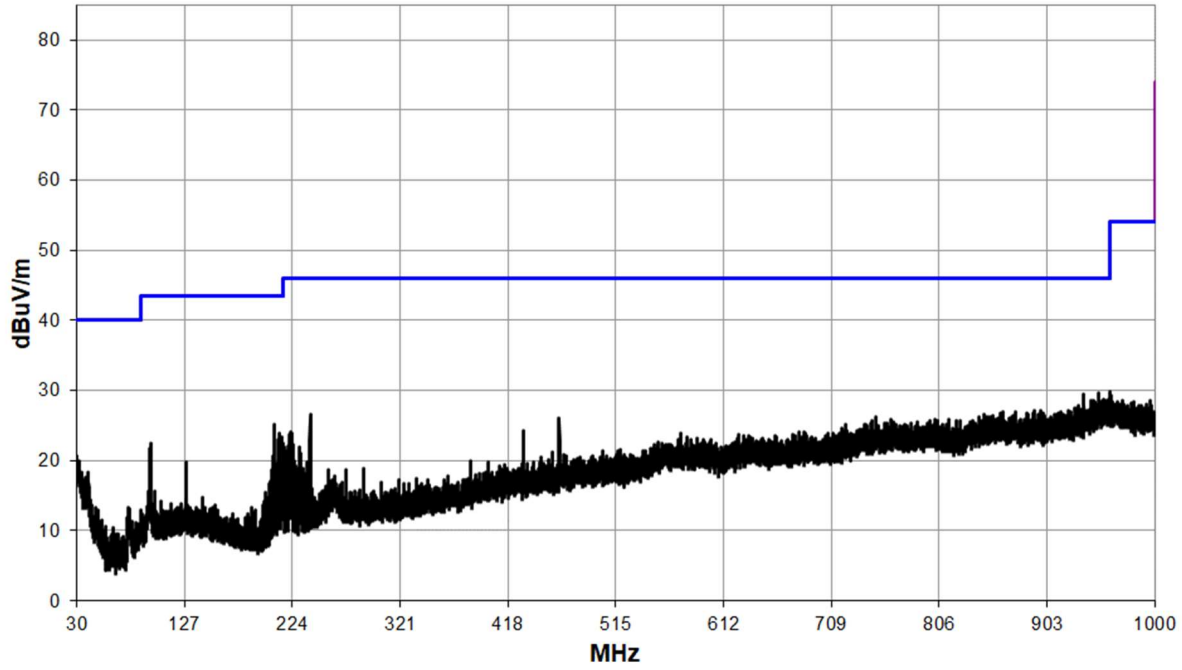
11.4 Test Equipment

Equipment Type	*Manufacturer*	*Equipment Description*	*Element No*	*Due For Calibration*
Ferrite Lined Chamber	Rainford	Chamber	REF886	2024-06-15
FSU26	R&S	Spectrum Analyser	REF909	2023-08-05
CBL6111D	TESEQ	Bilog Antenna	REF2385	2024-06-24
3115	EMCO	Horn Antenna	RFG129	2024-01-24
LB-180400-25-C-KF	A Info Inc	Horn Antenna	REF2245	2024-09-23
LB-180400-25-C-KF	A Info Inc	Horn Antenna	REF2246	2024-09-23
Pre-Amp (9 kHz – 1 GHz)	Sonoma	310	REF2389	2023-09-02
Pre-Amp (1 – 26.5 GHz)	Agilent	8449B	REF913	2023-03-24
SN 4478	BSC	Band Stop Filter	REF2158	Cal in use
Emissions R5	Element	Radiated Test Software	REF9000	Cal not required

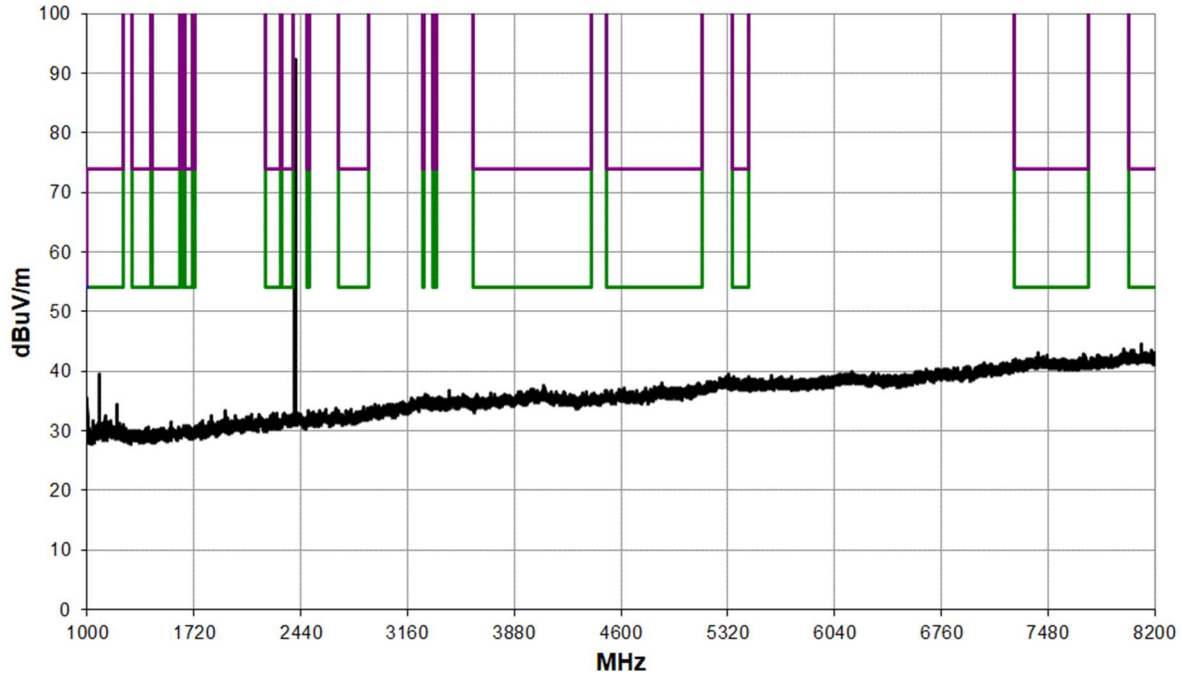
11.5 Test Results

Frequency: 2402 MHz; Power Setting: 13; Modulation: GFSK								
Detector	***Freq. (MHz)***	***Meas'd Emission (dBµV)***	***Factor (dB)***	***Duty Cycle Corr'n (dB)***	***Distance Extrap'n Factor (dB)***	***Field Strength (dBµV/m)***	***Limit (dBµV/m)***	***Margin (dB)***
No spurious emissions were detected within 20 dB of the limit.								

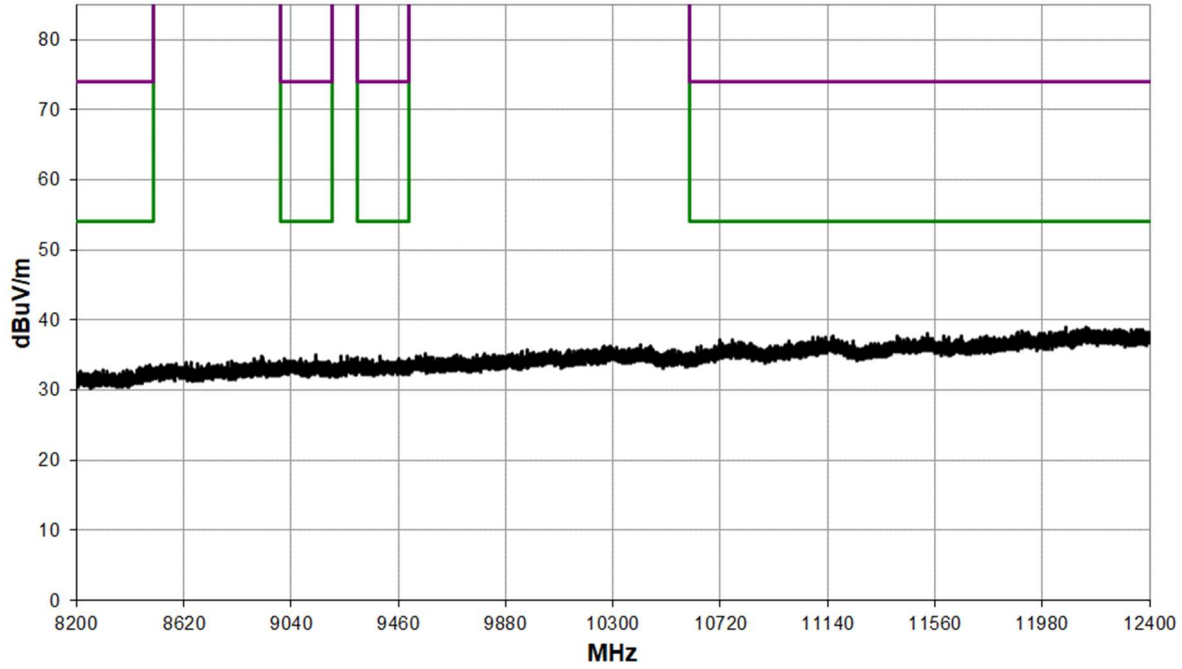
30 MHz to 1 GHz



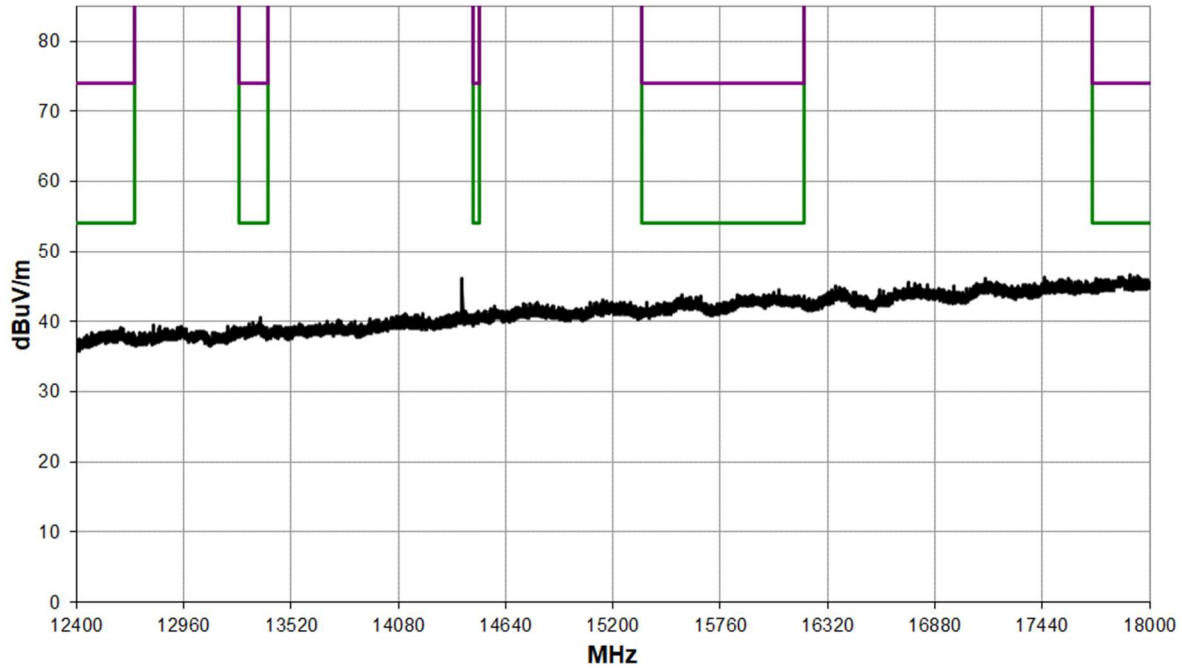
1 GHz to 8.2 GHz



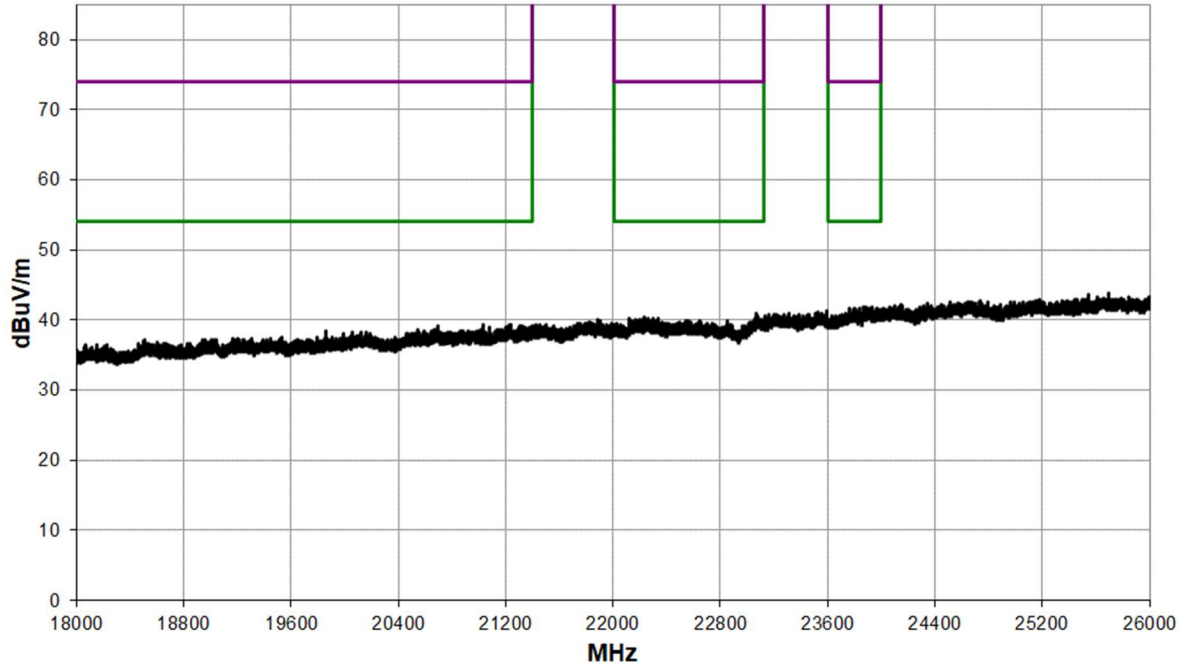
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz

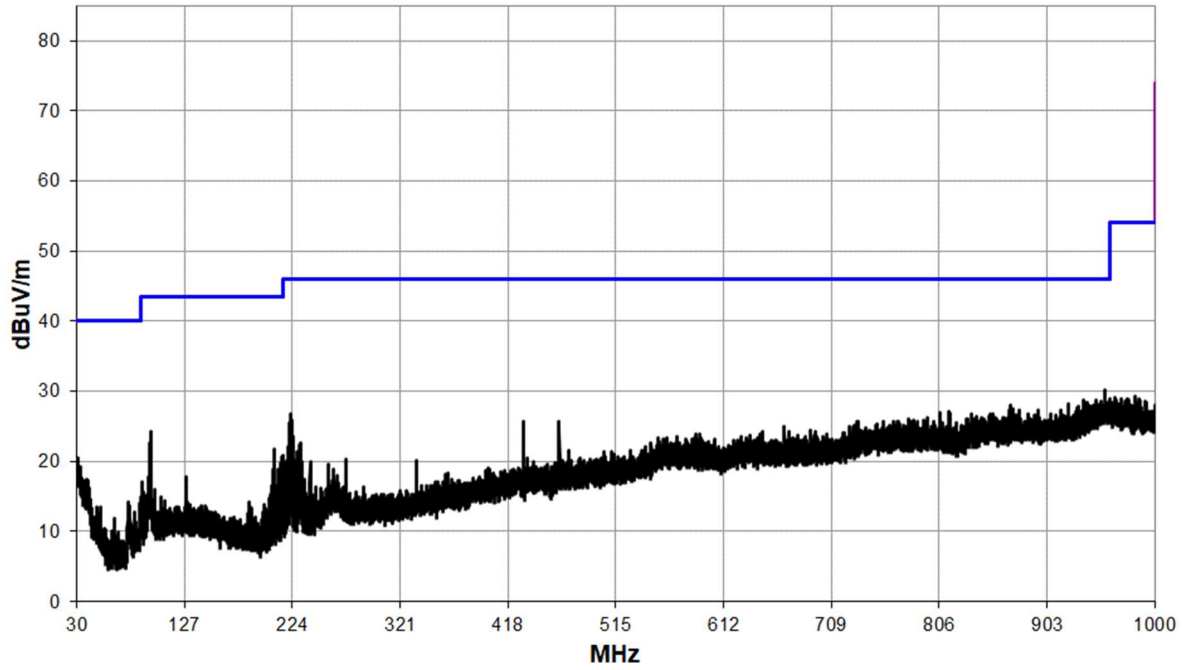


18 GHz to 26 GHz

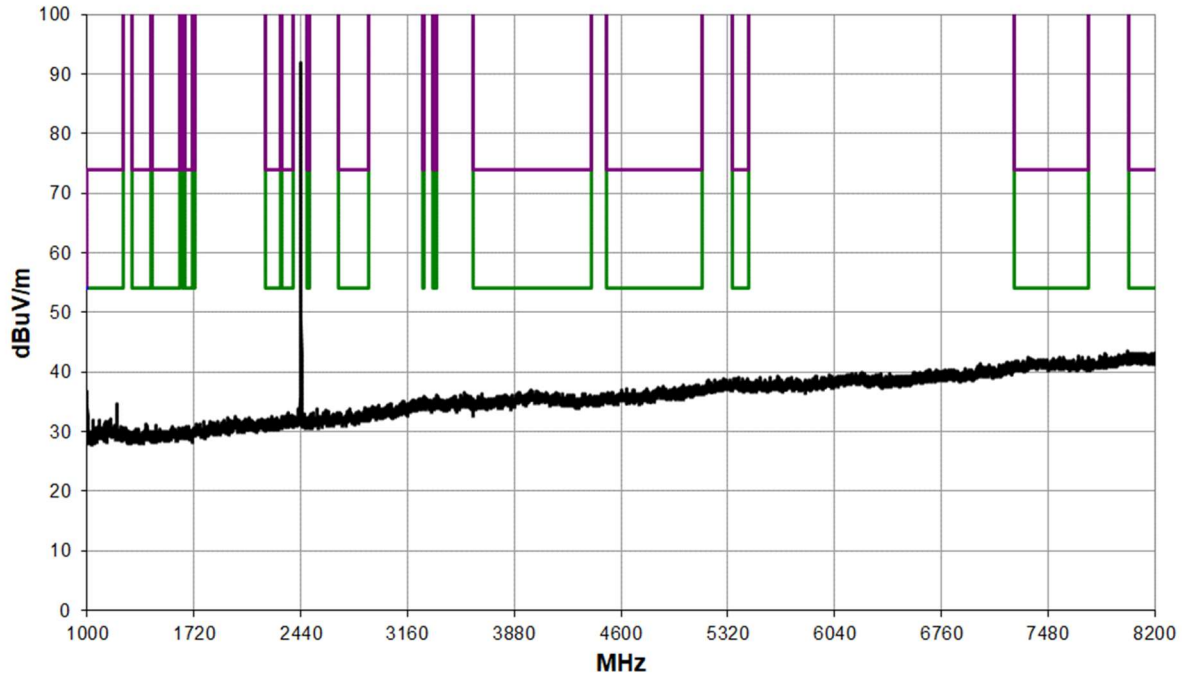


Frequency: 2440 MHz; Power Setting: 13; Modulation: GFSK								
Detector	***Freq. (MHz)***	***Meas'd Emission (dBµV)***	***Factor (dB)***	***Duty Cycle Corr'n (dB)***	***Distance Extrap'n Factor (dB)***	***Field Strength (dBµV/m)***	***Limit (dBµV/m)***	***Margin (dB)***
No spurious emissions were detected within 20 dB of the limit.								

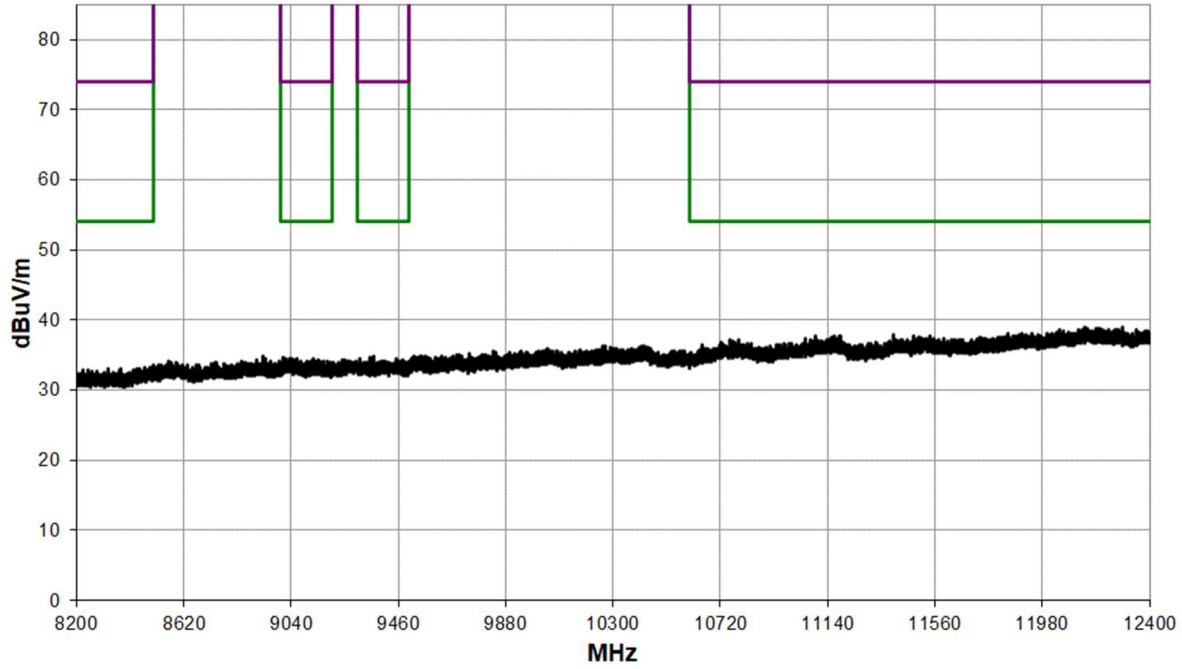
30 MHz to 1 GHz



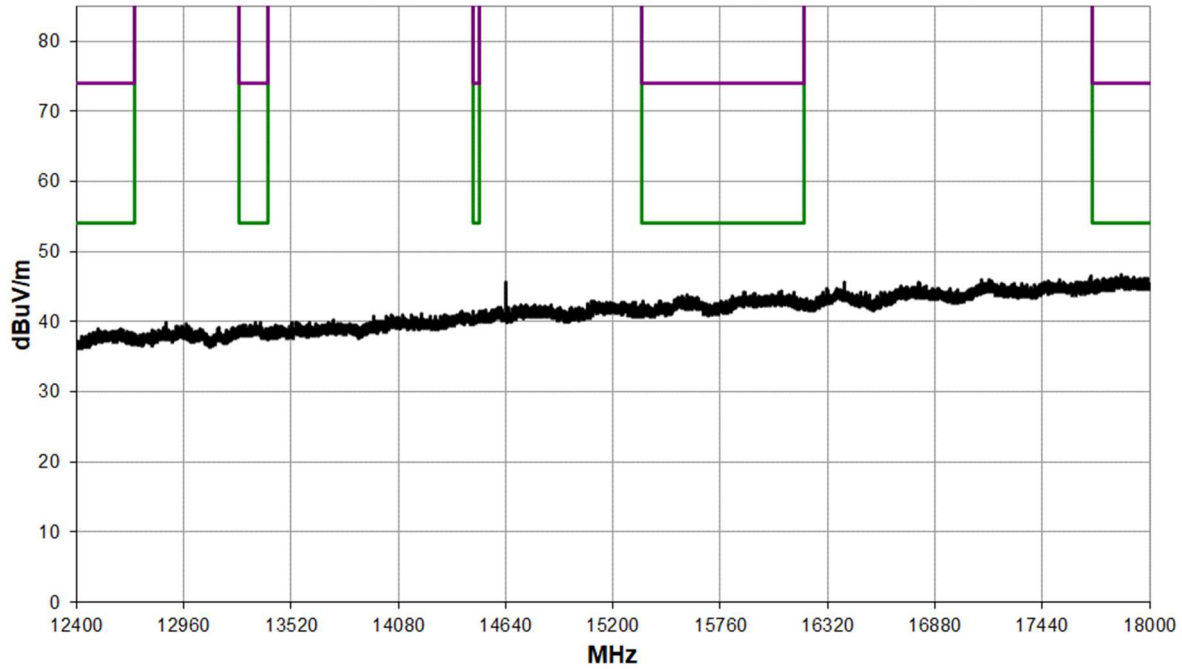
1 GHz to 8.2 GHz



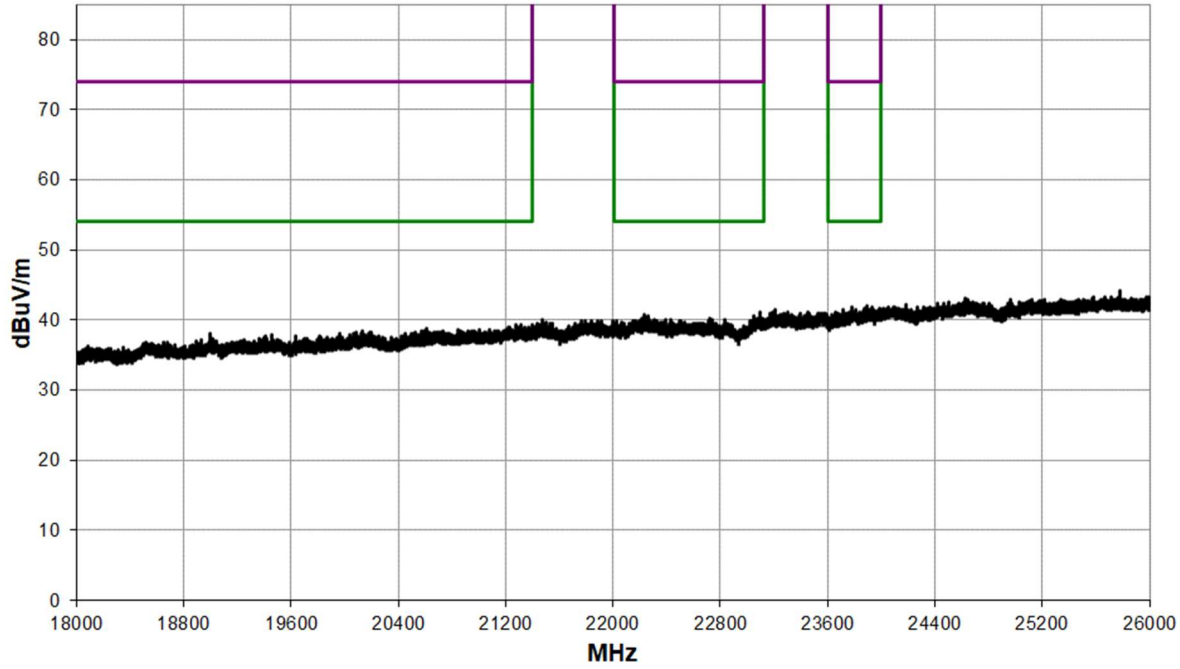
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz

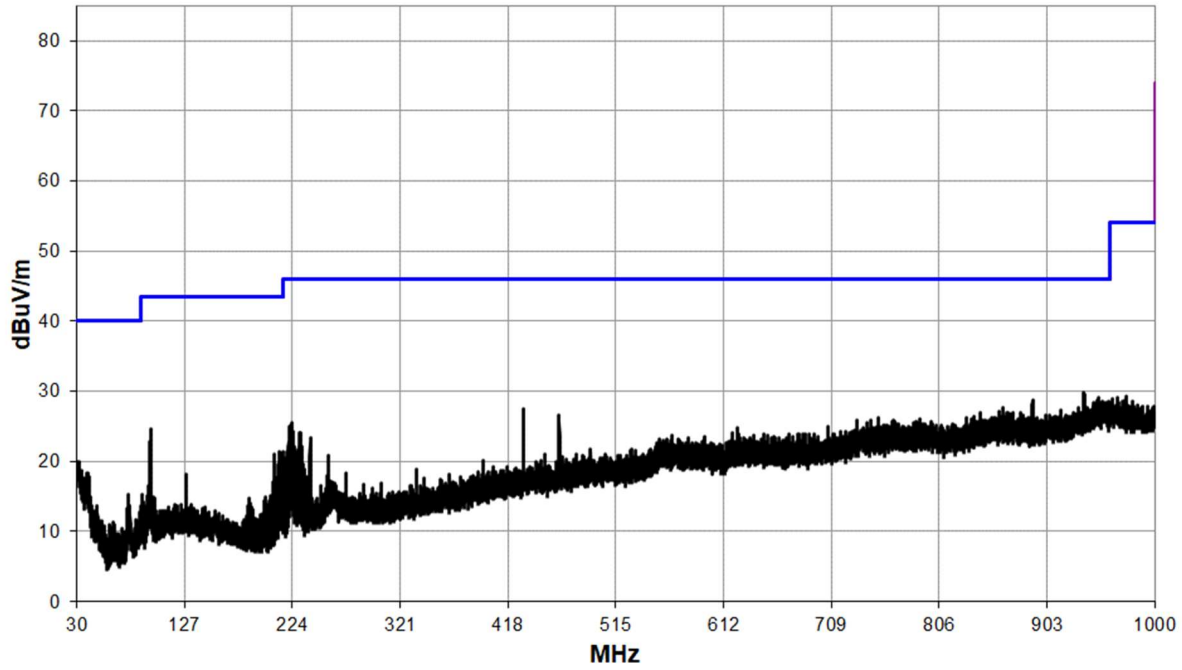


18 GHz to 26 GHz

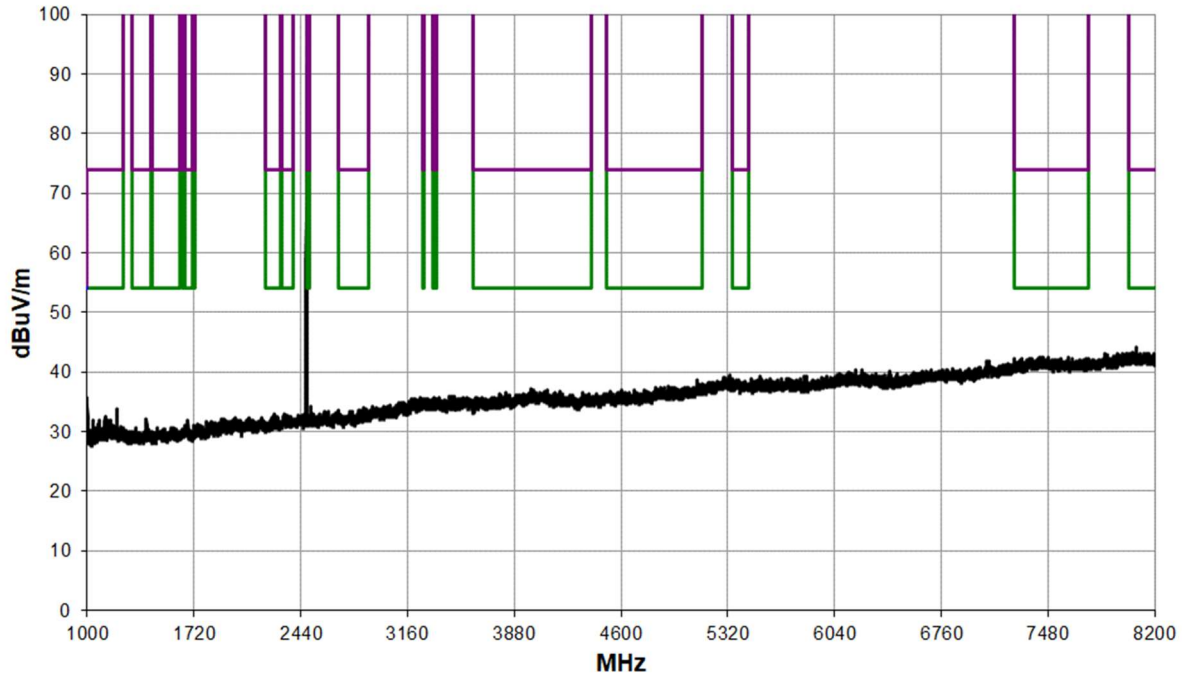


Frequency: 2480 MHz; Power Setting: 13; Modulation: GFSK								
Detector	***Freq. (MHz)***	***Meas'd Emission (dBµV)***	***Factor (dB)***	***Duty Cycle Corr'n (dB)***	***Distance Extrap'n Factor (dB)***	***Field Strength (dBµV/m)***	***Limit (dBµV/m)***	***Margin (dB)***
No spurious emissions were detected within 20 dB of the limit.								

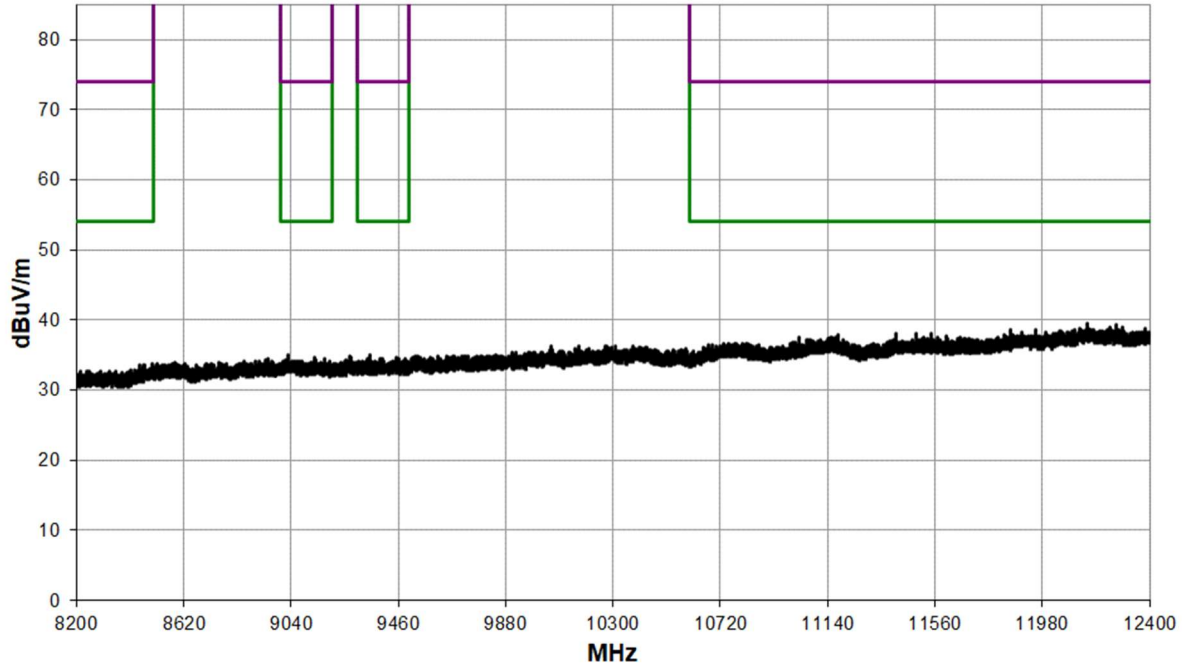
30 MHz to 1 GHz



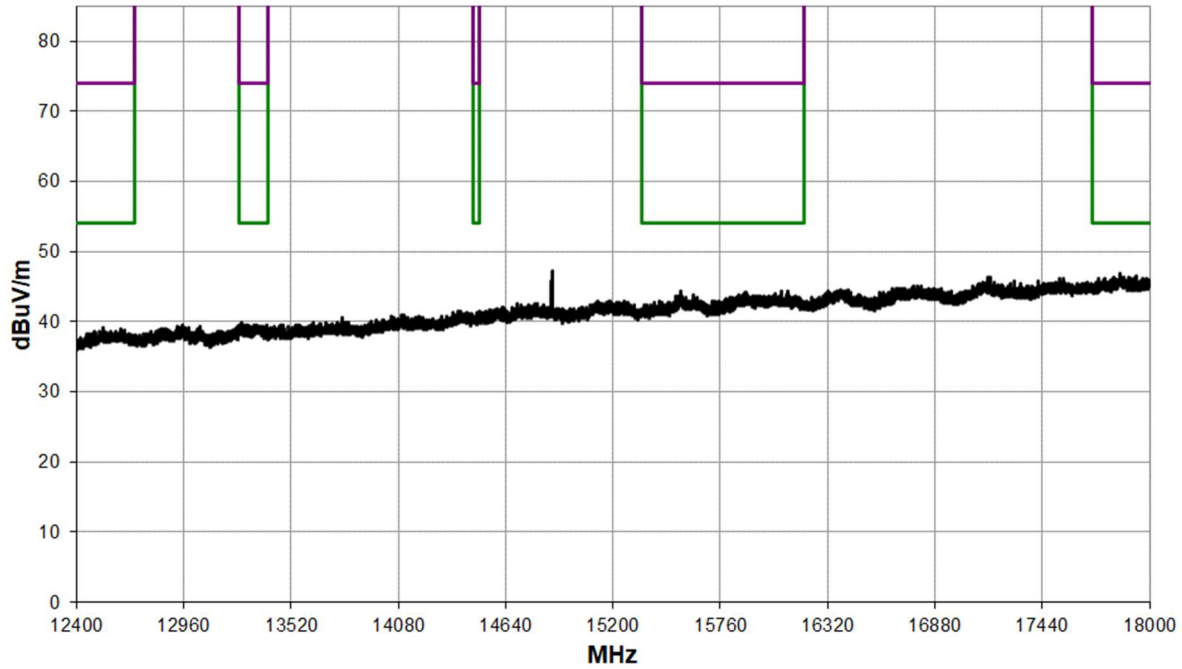
1 GHz to 8.2 GHz



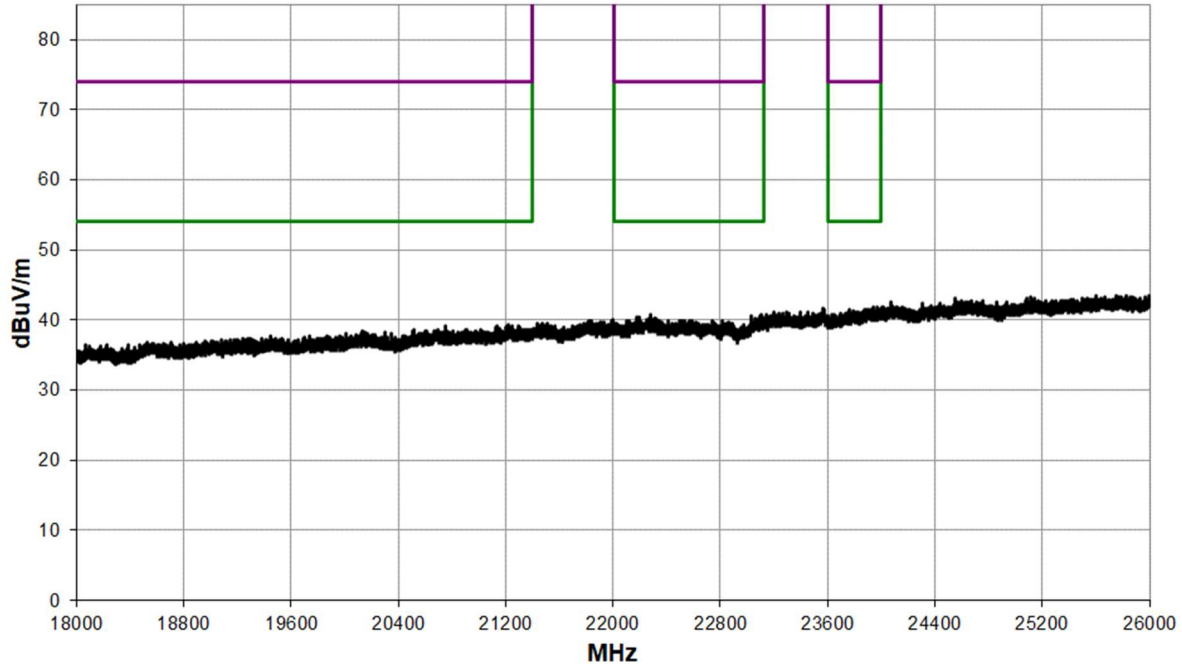
8.2 GHz to 12.4 GHz



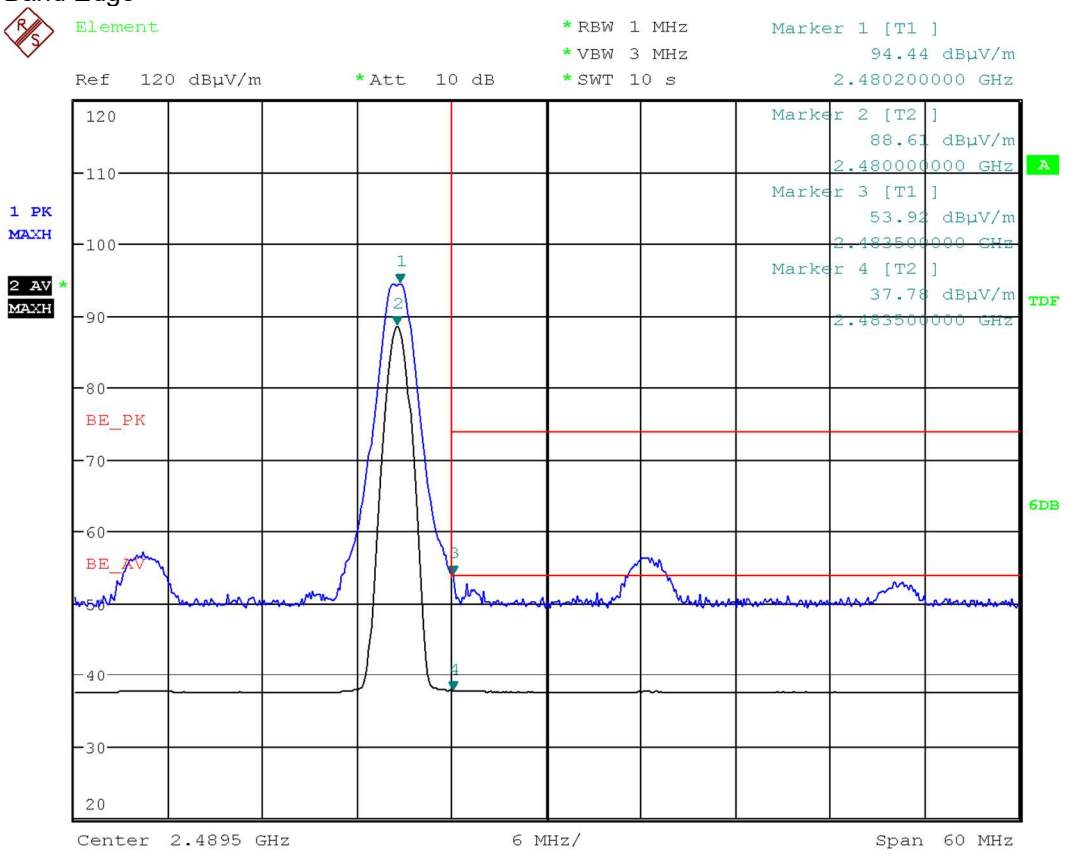
12.4 GHz to 18 GHz



18 GHz to 26 GHz



Band Edge



Date: 12.JAN.2023 16:24:37

Band Edge Measurement; Frequency: 2480 MHz; Power Setting: 13						
Detector	***Freq. (MHz)***	***Meas'd Emission (dBµV/m)***	***Duty Cycle Corr'n (dB)***	***Field Strength (dBµV/m)***	***Limit (dBµV/m)***	***Margin (dB)***
AV	2483.5	37.78	5.0	42.78	54.0	11.22

12 Maximum Peak Conducted Output Power & Effective Isotropic Radiated Power

12.1 Definition

The maximum peak conducted output power is defined as the maximum power level measured with a peak detector using a filter with width and shape of which is sufficient to accept the signal bandwidth.

The effective isotropic radiated power (EIRP) is defined as the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna.

12.2 Test Parameters

Test Location:	Element Hull
Test Chamber:	Wireless Lab 2
Test Standard and Clause:	ANSI C63.10-2013, Clause 11.9.1
Frequencies Measured:	2402 MHz, 2440 MHz & 2480 MHz
Deviations From Standard:	None
Measurement Detector:	Peak
Voltage Extreme Environment Test Range:	N/A

Environmental Conditions (Normal Environment)

Temperature: 21 °C	+15 ºC to +35 ºC (as declared)
Humidity: 40 %RH	20 %RH to 75 %RH (as declared)

Test Limit

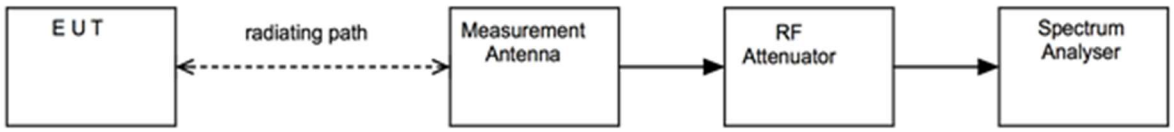
For systems employing digital modulation techniques operating in the bands 902 to 928 MHz, 2400 to 2483.5 MHz and 5725 to 5850 MHz, the maximum peak conducted output power shall not exceed 1 W. The EIRP shall not exceed 4 W.

12.3 Test Method

With the EUT setup as per section 9 of this report the peak level of the fundamental emission was measured with a wide band power meter.

The measurements were performed and recorded for worst case operation only.

Figure iv Test Setup



12.4 Test Equipment

Equipment Type	*Manufacturer*	*Equipment Description*	*Element No*	*Due For Calibration*
Ferrite Lined Chamber	Rainford	Chamber	REF886	2024-06-15
FSU26	R&S	Spectrum Analyser	REF909	2023-08-05
3115	EMCO	Horn Antenna	RFG129	2024-01-24
Pre-Amp (1 – 26.5 GHz)	Agilent	8449B	REF913	2023-03-24
N1911A	Agilent	Power Meter	REF836	2023-09-13
N1922A	Agilent	Power Sensor	REF835	2023-09-13
Emissions R5	Element	Radiated Test Software	REF9000	Cal not required

12.5 Test Results

The following formula may be used to convert field strength (FS) in volts/metre to transmitter output power (TP) in watts:

$$TP = (FS \times D)^2 / (30)$$

where D is the distance in metres between the two antennas and G is the antenna numerical gain referenced to isotropic gain.

Modulation: GFSK; Data Rate 1 Mb/s; Power Setting: 13				
Frequency (MHz)	*Peak Field Strength (dBµV/m)*	*Distance (m)*	*EIRP (mW)*	*Verdict*
2402	95.5	3	1.06	Pass
2440	95.0	3	0.95	Pass
2480	94.5	3	0.85	Pass

Note: power measurement was taken radiated as antenna gain was unknown.

13 Duty Cycle

13.1 Definition

The ratio of the sum of all pulse durations to the total period, during a specified period of operation.

13.2 Test Parameters

Test Location:	Element Hull
Test Chamber:	Wireless Lab 2
Test Standard and Clause:	ANSI C63.10-2013, Clause 11.6
Deviations From Standard:	None
Temperature Extreme Environment Test Range:	N/A
Voltage Extreme Environment Test Range:	N/A

Environmental Conditions (Normal Environment)

Temperature: 21 °C	+15 ºC to +35 ºC (as declared)
Humidity: 42 %RH	20 %RH to 75 %RH (as declared)

Test Limit

N/A.

13.3 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure vii, the duty of the EUT was calculated from the sum of total on and off times over the observation period.

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

[1] Single antenna output devices

Duty was measured at a distance of 3 m.

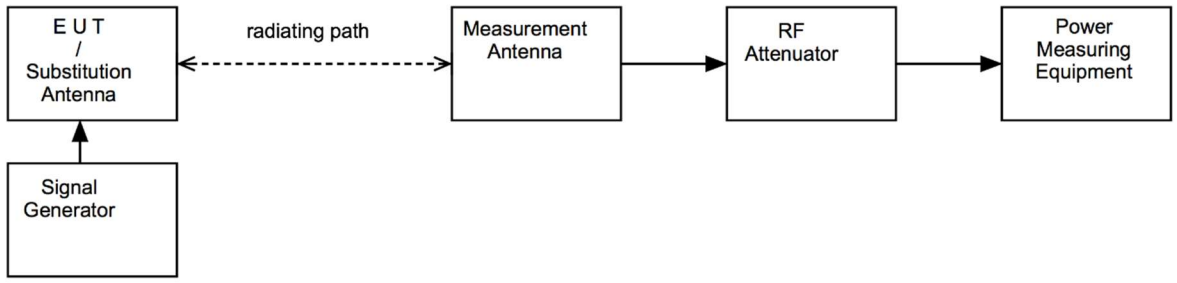
The duty cycle correction factor, DC, shall be added to the measurement results prior to comparing with the emission limit to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as:

1) If power averaging (rms) mode was used in step f), then the applicable correction factor is [10 log (1 / *D*)], where *D* is the duty cycle.

2) If linear voltage averaging mode was used in step f), then the applicable correction factor is [20 log (1 / *D*)], where *D* is the duty cycle.

3) If a specific emission is demonstrated to be continuous (*D* ≥ 98%) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Figure vii Test Setup

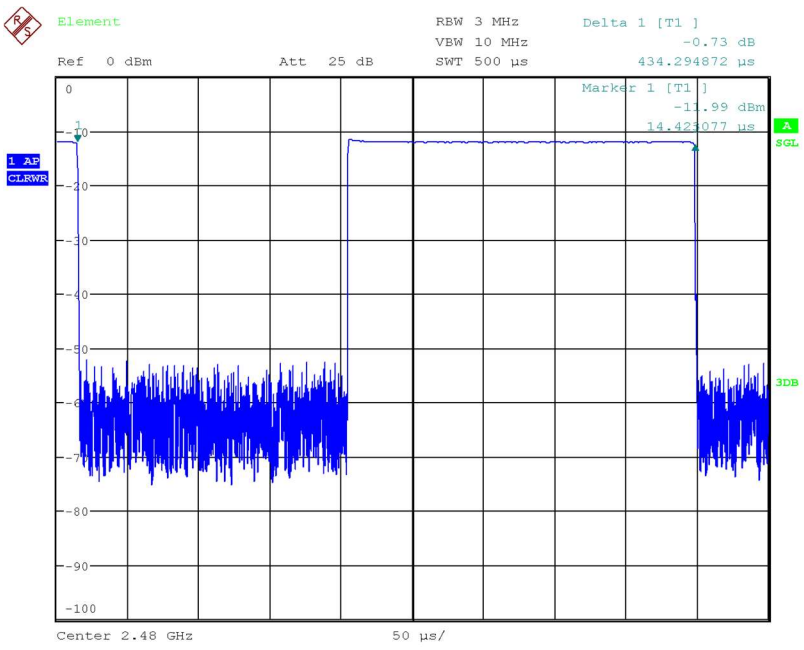


13.4 Test Equipment

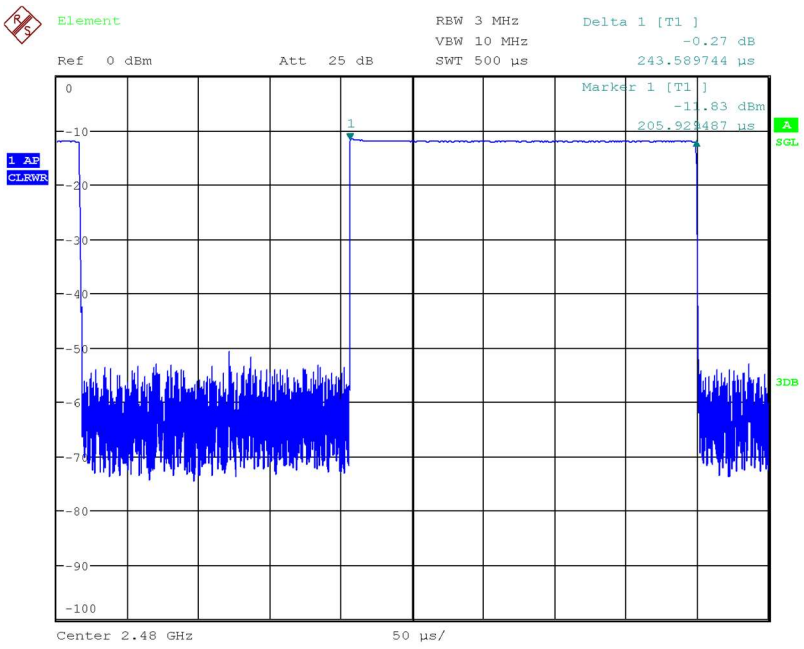
Equipment Type	*Manufacturer*	*Equipment Description*	*Element No*	*Due For Calibration*
ATS	Rainford	Ferrite Lined Chamber	REF886	2024-06-15
FSU26	R&S	Spectrum Analyser	REF909	2023-08-05
3115	EMCO	Horn Antenna	RFG129	2024-01-31

13.5 Test Results

2.4 GHz BLE; Power Setting: 13				
Test Environment		TxOn time (us)	Frame Period (us)	Calculated Factor (dB)
$V_{nominal}$	$T_{nominal}$	243.589744	434.294872	-5.0



Date: 12.JAN.2023 16:29:08



Date: 12.JAN.2023 16:31:12

14 Measurement Uncertainty

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.

Test/Measurement	Budget Number	MU
Conducted RF Power, Power Spectral Density, Adjacent Channel Power and Spurious emissions		
Absolute RF power (via antenna connecter) Dare RPR3006W Power Head	MU4001	**0.9 dB**
Carrier Power and PSD - Spectrum Analysers	MU4004	**0.9 dB**
Adjacent Channel Power	MU4002	**1.9 dB**
Transmitter conducted spurious emissions	MU4041	**0.9 dB**
Conducted power and spurious emissions 40 GHz to 50 GHz	MU4042	**2.4 dB**
Conducted power and spurious emissions 50 GHz to 75 GHz	MU4043	**2.5 dB**
Conducted power and spurious emissions 75 GHz to 110 GHz	MU4044	**2.4 dB**
Radiated RF Power and Spurious emissions ERP and EIRP		
Effective Radiated Power Reverb Chamber	MU4020	**3.7 dB**
Effective Radiated Power	MU4021	**4.7 dB**
TRP Emissions 30 MHz to 1 GHz using CBL6111 or CBL6112 Bilog Antenna	MU4046	**5.3 dB**
TRP Emissions 1 GHz to 18 GHz using HL050 Log Periodic Antenna	MU4047	**5.1 dB**
TRP Emissions 18 GHz to 26.5 GHz using Standard Gain Horn	MU4048	**2.7 dB**
TRP Emissions 26.5 GHz to 40 GHz using Standard Gain Horn	MU4049	**2.7 dB**
Spurious Emissions Electric and Magnetic Field		
Radiated Spurious Emissions 30 MHz to 1 GHz	MU4037	**4.7 dB**
Radiated Spurious Emissions 1-18 GHz	MU4032	**4.5 dB**
E Field Emissions 18GHz to 26 GHz	MU4024	**3.2 dB**
E Field Emissions 26GHz to 40 GHz	MU4025	**3.3 dB**
E Field Emissions 40GHz to 50 GHz	MU4026	**3.5 dB**
E Field Emissions 50GHz to 75 GHz	MU4027	**3.6 dB**
E Field Emissions 75GHz to 110 GHz	MU4028	**3.6 dB**
Radiated Magnetic Field Emissions	MU4031	**2.3 dB**
Frequency Measurements		
Frequency Deviation	MU4022	**0.316 kHz**
Frequency error using CMTA test set	MU4023	**113.441 Hz**
Frequency error using GPS locked frequency source	MU4045	**0.0413 ppm**
Bandwidth/Spectral Mask Measurements		
Channel Bandwidth	MU4005	**3.87 %**
Transmitter Mask Amplitude	MU4039	**1.3 dB**
Transmitter Mask Frequency	MU4040	**2.59 %**
Time Domain Measurements		
Transmission Time	MU4038	**4.40 %**
Dynamic Frequency Selection (DFS) Parameters)		
DFS Analyser - Measurement Time	MU4006	**679 µs**
DFS Generator - Frequency Error	MU4007	**92 Hz**
DFS Threshold Conducted	MU4008	**1.3 dB**
DFS Threshold Radiated	MU4009	**3.2 dB**

Test/Measurement	Budget Number	MU
Receiver Parameters		
EN300328 Receiver Blocking	MU4010	**1.1 dB**
EN301893 Receiver Blocking	MU4011	**1.1 dB**
EN303340 Adjacent Channel Selectivity	MU4012	**1.1 dB**
EN303340 Overloading	MU4013	**1.1 dB**
EN303340 Receiver Blocking	MU4014	**1.1 dB**
EN303340 Receiver Sensitivity	MU4015	**0.9 dB**
EN303372-1 Image Rejection	MU4016	**1.4 dB**
EN303372-1 Receiver Blocking	MU4017	**1.1 dB**
EN303372-2 Adjacent Channel Selectivity	MU4018	**1.1 dB**
EN303372-2 Dynamic Range	MU4019	**0.9 dB**
Receiver Blocking Talk Mode Conducted	MU4033	**1.2 dB**
Receiver Blocking Talk Mode- radiated	MU4034	**3.4 dB**
Rx Blocking, listen mode, blocking level	MU4035	**3.2 dB**
Rx Blocking, listen mode, radiated Threshold Measurement	MU4036	**3.4 dB**
Adjacent Sub Band Selectivity	MU4003	**4.2 dB**

15 Customer Declaration

THE QUEEN'S AWARDS FOR ENTERPRISE: 2017

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16th January 2023

We, Pektron, declare the following to be true:

Element Materials Technology performed testing against a fully populated sample, A-0819G17 and depopulated unit A-0819G13.

Original versions certified
A-0819G02 - BTLE/NFC/LF Node with a plastic sheath over the cables
A-0819G03 - BTLE/LF with no plastic sheath over the cables. This is a depopulated unit to physically remove the NFC components from the PCB. NFC is not used on this variant
A-0819G06 - BTLE/LF with a plastic sheath over the cables. This is a depopulated unit to physically remove the NFC components from the PCB. NFC is not used on this variant
A-0819G07 - BTLE/NFC/LF with a plastic sheath over the cables

A Hardware Modification to the 125KHz Radio was found to be required for Compliance and new versions were produced with this modification as follows:
A-0819G12 - BTLE/NFC/LF Node with a plastic sheath over the cables
A-0819G13 - BTLE/LF with no plastic sheath over the cables. This is a depopulated unit to physically remove the NFC components from the PCB. NFC is not used on this variant
A-0819G16 - BTLE/LF with a plastic sheath over the cables. This is a depopulated unit to physically remove the NFC components from the PCB. NFC is not used on this variant
A-0819G17 - BTLE/NFC/LF with a plastic sheath over the cables

The modification affects the Transmit of the 125KHz LF Radio ONLY, therefore prior testing of the A-0819G02 to A-0819G07 Nodes remains valid for the A-0819G12 to A-0819G17 Nodes and is therefore referenced in the Reports.

The are no other differences between the A-0819G02 to A-0819G07 and A-0819G12 to A-0819G17 Nodes.

Regards,

Richard Jones
Electrical Test Manager

bsi. ISO 9001 Quality Management FM 00812 | ISO 14001 Environmental Management EMS 55245 | IATF 16949 Automotive Quality Management 518883

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