Report on the Radio Testing

For

Sepura Limited

on

SC20 Series (SC2020 and SC2024 Tested)

Report no. TRA-057920-45-21E

14th June 2023

Report Number: TRA-057920-45-21E
Issue: E

REPORT ON THE RADIO TESTING OF A
Sepura Limited
SC20 Series (SC2020 and SC2024 Tested)
WITH RESPECT TO SPECIFICATIONS
996369 D04 Module Integration Guide V02 and ISED RSS-GEN Issue 5
(Intermodulation Investigation)

TEST DATE: 2022-08-01

Tested by: D Garvey

Written by: D Garvey
Radio Test Engineer

Approved by: Digitally signed by John Charters Date: 2023.06.16 11:14:32 +01'00'
John Charters
Laboratory Manager

Date: 14th June 2023

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

Issue Number	*Issue Date*	*Revision History*
A	25th January 2023	Original
B	10th March 2023	Updates to FCC & ISED ID and serial number
C	3rd May 2023	Update to Build Level / Revision Number
D	12th June 2023	Section 11.2 – SC2020 and SC2024 added to frequencies to clarify which frequencies relate to which model Section 11.5 'SC2020' added to header New Section 11.6 'Test Results – SC2024' added to the report, , result from 11.5 relating to SC2024 moved under this new sub section
E	14th June 2023	Section 11.2 corrected typo '2025' changed to '2024'

2 Summary

TEST REPORT NUMBER:	TRA-057920-45-21E
WORKS ORDER NUMBER:	TRA-057920-10
PURPOSE OF TEST:	Intermodulation Investigation
TEST SPECIFICATION:	KDB 996369 D04 V02
EQUIPMENT UNDER TEST (EUT):	SC20 Series (SC2020 and SC2024 Tested)
FCC IDENTIFIER:	XX6SC2024M
ISED IDENTIFIER:	8739A-SC2024M
EUT SERIAL NUMBER:	1PR002224GK55E1 (SC2024) and 1PR002224GK55NH (SC2020)
MANUFACTURER/AGENT:	Sepura Limited
ADDRESS:	9000 Cambridge Research Park Beach Drive Waterbeach Cambridge CB25 9TL United Kingdom
CLIENT CONTACT:	James O'Reilly ☎ 01223 876000 ✉ James.OReilly@sepura.com
ORDER NUMBER:	PLC-PO022050-2
TEST DATE:	2022-08-01
TESTED BY:	D Garvey Element

2.1 Test Summary

Test Method and Description	*Requirement Clause*	*Applicable to this equipment*	*Result / Note*
Multi-radio equipment Spurious emissions and Intermodulation	6.2	☒	*Pass*

Notes:

Only limited testing was performed to check the intermod emissions.

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-057920-45-21E presents the results of the Radio testing on a Sepura Limited, SC20 Series (SC2020 and SC2024 Tested) to specification KDB 996369 D04 Module Integration Guide v02 - Modular transmitter integration guide -Guidance for host product manufacturers.

The testing was carried out for Sepura Limited 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
Skelmersdale
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 US-UK MRA,

Designation number(s):
Element Hull UK2007
Element Skelmersdale UK2020

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.
- FCC 47 CFR Ch. I – Part 2 - Code of Federal Regulations, Title 47, Part 2, “Frequency allocations and Radio Telemetry Matters; General Rules and Regulations”
- FCC 47 CFR Ch. I – Part 90 - Code of Federal Regulations, Title 47, Part 90, “Land Mobile Radio Service”
- TIA EIA-603-D Land Mobile FM or PM Communications Equipment Measurement and Performance StandardsANSI C63.10-2013 – American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
- ISED RSS-Gen, Issue 5, March 2019 – General Requirements for Compliance of Radio Apparatus.
- ISED RSS-119, Issue 12, May 2015 – Land Mobile and Fixed Equipment Operating in the Frequency Range 27.41-960 MHz
- ANSI C63.10-2013 – American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
- ANSI C63.26-2015 - American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
- 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.
- KDB996369 D04 Module Integration Guide v02 – Modular Transmitter Integration Guide - Guidance for Host Product Manufacturers.
- RSP-100, Issue 12, August 2019 – Certification of Radio Apparatus and Broadcasting Equipment.

5.2 Deviations from Test Standards

There were no deviations from the test standard.

6 Glossary of Terms

§	denotes a section reference from the standard, not this document
AC	Alternating Current
ACK	Acknowledgement signal
AFH	Adaptive Frequency Hopping
BW	bandwidth
C	Celsius
CCA	Clear Channel Assessment
COT	Channel Occupancy Time
CW	Continuous Wave
dB	decibel
dBm	dB relative to 1 milliwatt
DAA	Detect And Avoid
DC	Direct Current
EIRP	Equivalent Isotropically Radiated Power
EN	European Normative document
EUT	Equipment Under Test
FHSS	Frequency Hopping Spread Spectrum
Hz	hertz
IM	InterModulation
ITU	International Telecommunication Union
LBT	Listen Before Talk
m	metre
max	maximum
min	minimum
N/A	Not Applicable
PCB	Printed Circuit Board
PDF	Portable Document Format
R&TTE	Radio and Telecommunications Terminal Equipment
RE	Radio Equipment
RF	Radio Frequency
RH	Relative Humidity
RMS	Root Mean Square
Rx	receiver
s	second
Tx	transmitter
UKAS	United Kingdom Accreditation Service
V	volt
W	watt
Ω	ohm

7 Equipment Under Test

7.1 EUT Identification

- Name: SC20 Series (SC2020 and SC2024 Tested)
- Serial Number: 1PR002224GK55E1 (SC2024) and 1PR002224GK55NH (SC2020)
- Model Number: SC2020 & SC2024
- Software Revision: 2001 723 07367
- Build Level / Revision Number: PLX-2116515-01 (H/w mod state 11)

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.

Element Laptop
USB programming cable

7.3 EUT Mode of Operation

The unit was connected via the USB lead and scripts, provided by the manufacturer, were sent to the EUT via a terminal program. The unit was put into a mode transmitting a modulated signal on the required frequencies.

7.4 EUT Radio Parameters

Radio description:	2.4 GHz WiFi
Frequency of operation:	2412 MHz to 2462 MHz
Antenna type and gain:	Integral PCB 2.5 dBi
Declared output power:	IEEE 802.11b 19 dBm (max) EIRP
Nominal Supply Voltage:	7.4 Vdc (from rechargeable battery)

Radio description:	BT Classic
Frequency of operation:	2402 MHz to 2480 MHz
Antenna type and gain:	Integral PCB 2.5 dBi
Declared output power:	10 dBm EIRP
Nominal Supply Voltage:	7.4 Vdc (from rechargeable battery)

Radio description:	BT Low Energy
Frequency of operation:	2402 MHz to 2480 MHz
Antenna type and gain:	Integral PCB 2.5 dBi
Declared output power:	9 dBm EIRP
Nominal Supply Voltage:	7.4 Vdc (from rechargeable battery)

Radio description:	TETRA tested in the SC2020
Frequency of operation:	380 MHz to 430 MHz
Antenna type and gain:	Extended helical 300-00417 -1 dBi
Channel bandwidth:	25 kHz
Declared output power:	35 dBm ERP
Nominal Supply Voltage:	7.4 Vdc (from rechargeable battery)

Note: the antenna type 300-00417 has the widest passband and the highest gain of all the SC2020 antennas.

Radio description:	TETRA tested in the SC2024
Frequency of operation:	403 MHz to 470 MHz
Antenna type and gain:	Extended helical 300-00499 -1 dBi
Channel bandwidth:	25 kHz
Declared output power:	35 dBm ERP
Nominal Supply Voltage:	7.4 Vdc (from rechargeable battery)

Note: the antenna type 300-00499 has the widest passband and the highest gain of all the SC2024 antennas.

7.5 EUT Description

The EUT is a TETRA hand held portable radio with BT, BLE, 2.4 GHz WiFi and GNSS. This Reports only covers intermod testing.

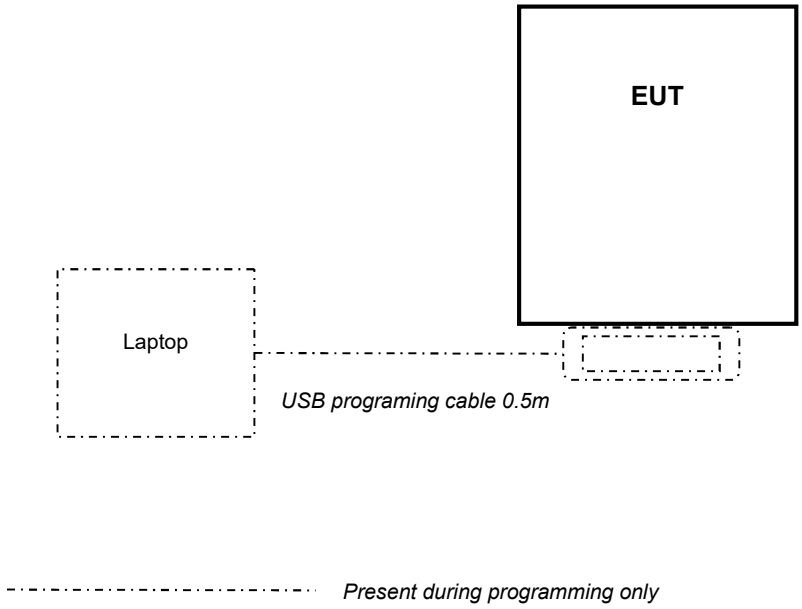
8 Modifications

No modifications were performed during this assessment.

9 EUT Test Setup

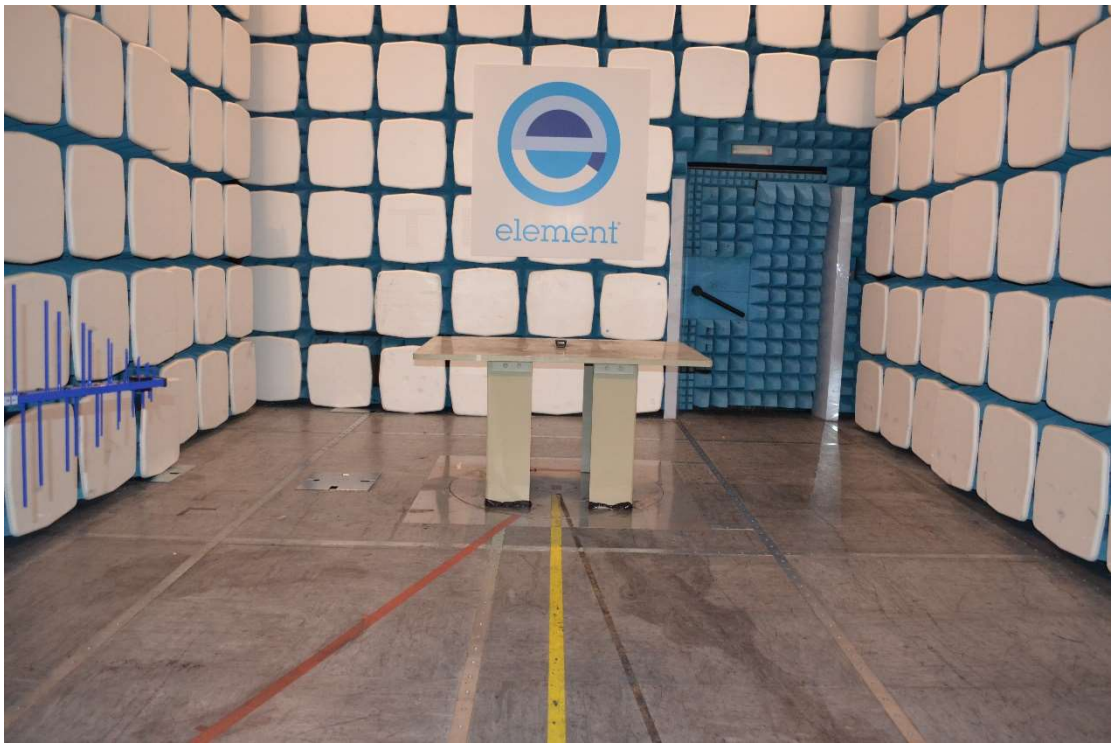
9.1 Block Diagram

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 7.4 Vdc from the lithium polymer rechargeable battery.

11 Transmitter Unwanted Emissions in the Spurious Domain and Intermodulation

11.1 Definitions

Spurious emissions
Transmitter unwanted emissions in the spurious domain are emissions outside the allocated band and outside the out-of-band domain when the equipment is in Transmit mode.
Inter-transmitter intermodulation
The phenomenon where one or more transmitters on a site inter-modulate, either within the transmitters themselves or within a non-linear component on site to produce intermodulation products.

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
Frequencies Measured:	SC2020 TETRA 405.000 MHz in combinations with 2.4GHz Wifi: 2437 MHz; BT Classic: 2442 MHz; BLE: 2442 MHz & SC2024 TETRA 450.025 MHz in combinations with 2.4GHz Wifi: 2437 MHz; BT Classic: 2442 MHz; BLE: 2442 MHz
Deviations From Standard:	None
Measurement BW	120 kHz (30 MHz – 1 GHz); 1 MHz (1 GHz – 26 GHz)
Measurement Detector	Below 1 GHz: Peak Above 1 GHz: Peak

Environmental Conditions (Normal Environment)

Radiated

Temperature: 22 °C	Standard Requirement: +15 ºC to +35 ºC
Humidity: 42 %RH	Standard Requirement: 20 %RH to 75 %RH
Supply: 7.4 Vdc	As declared

Test Limits

The applicable spurious emissions requirements and limits for multi-radio equipment are those specified in the relevant radio harmonized standards applicable to each radio product.

NOTE 1: In the majority of cases the requirements and limits for spurious emissions set out in radio harmonized standards are identical.

If the applicable harmonized radio standards contain different limits and measuring conditions, then the multi-radio equipment should be assessed to the harmonized radio standard that specifies the least stringent limits for the common part of the frequency measurement ranges, in those cases where more than one transmitter operates at the same time. To assess the remaining parts of the frequency measurement ranges, the limits from the relevant harmonized radio standard should be used.

15.247 & RSS-247:

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.

FCC 47 CFR Part 90, Clause 90.210 & Industry Canada RSS-119, Clause 5.8

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

Table 4C: Transmitter limits for spurious emissions

Frequency (MHz)	***Field Strength (µV/m at 3 m)***	***Field Strength (dBµV/m at 3 m)***
Above 30	12882.5	82.2

The limit line on the prescan plots was calculated from equation c) in clause 5.2.7 of ANSI C63.26

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 C63.26 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:

$$FS = PR + CL + AF – PA + DC – CF$$

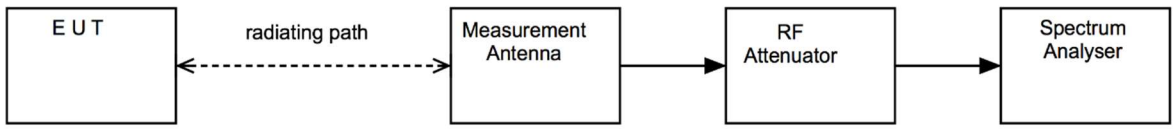
Where,

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-b Test Setup



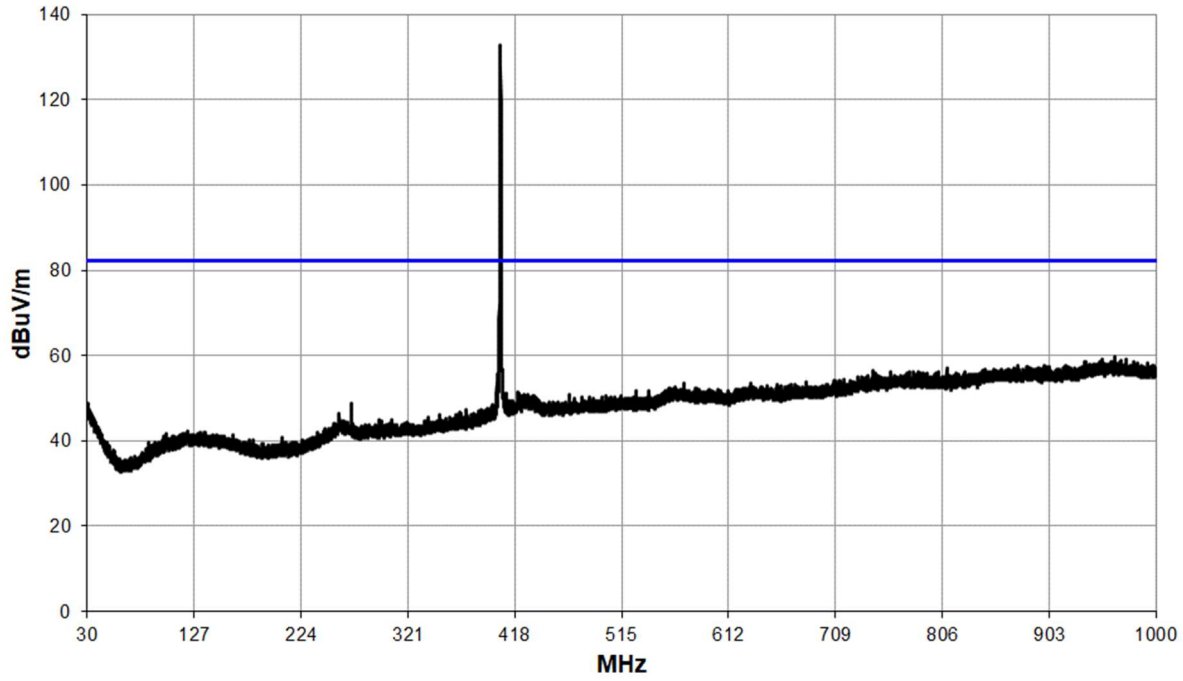
11.4 Test Equipment

Equipment Type	Manufacturer	Equipment Description	Element No	Due For Calibration
Ferrite Lined Chamber	Rainford	Chamber	REF886	2024-06-15
N9030A	Agilent	Spectrum Analyser	REF2167	2022-08-25
CBL6111D	TESEQ	Bilog Antenna	REF2385	2024-06-24
3115	EMCO	Horn Antenna	RFG129	2024-01-24
Pre-Amp (9 kHz – 1 GHz)	Sonoma	310	REF927	2023-07-18
Pre-Amp (1 – 26.5 GHz)	Agilent	8449B	REF913	2023-03-24
Emissions R5	Element	Radiated Test Software	REF9000	Cal Not Required
F-HPC5-730008-S5S5	AtlanTecRF	High Pass Filter	REF2315	Calibrate In Use
VHF-740+	Mini-Circuits	High Pass Filter	REF2226	Calibrate In Use
VHF-3500+	Mini-Circuits	High Pass Filter	REF2285	Calibrate In Use
4478	BSC	Band Stop Filter	REF2158	Calibrate In Use

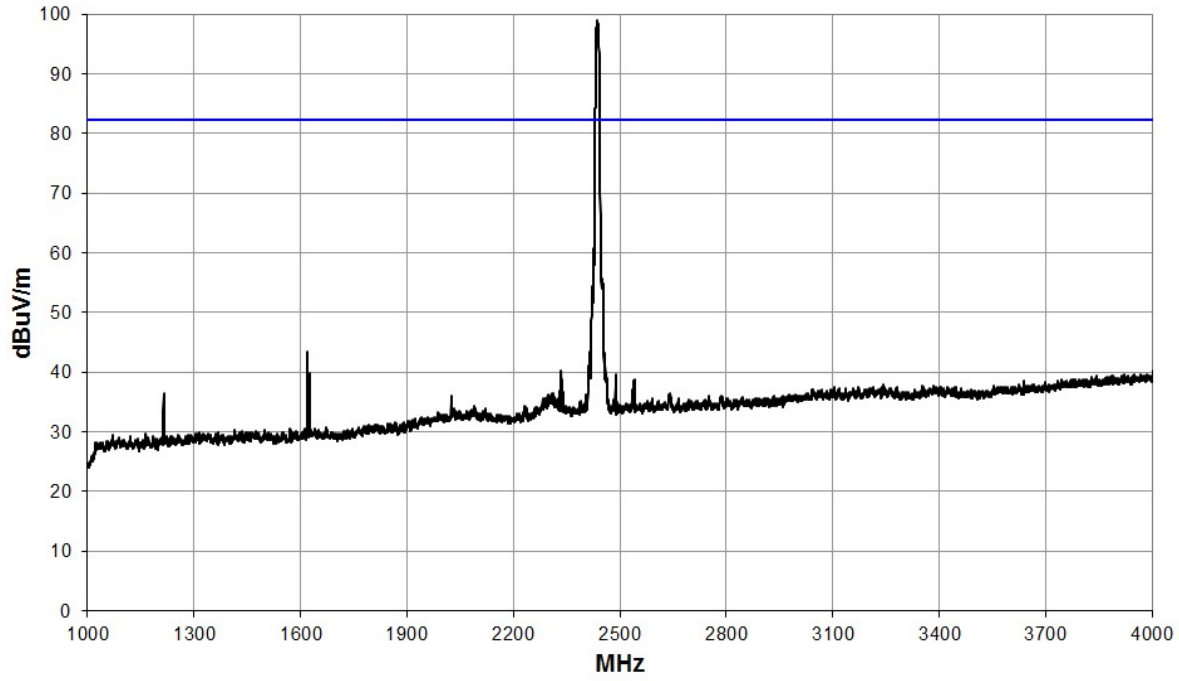
11.5 Test Results – SC2020

TETRA Frequency: 405.000 MHz; Power Setting: 35 dBm; Modulation: Burst with Wifi Frequency: 2437 MHz; Power Setting: 17 dBm					
Emission	***Frequency (MHz)***	***Level (dBm)***	***Limit (dBm)***	***Margin (dB)***	***Result***
No Intermodulation emissions were detected within 10 dB of the limit.					

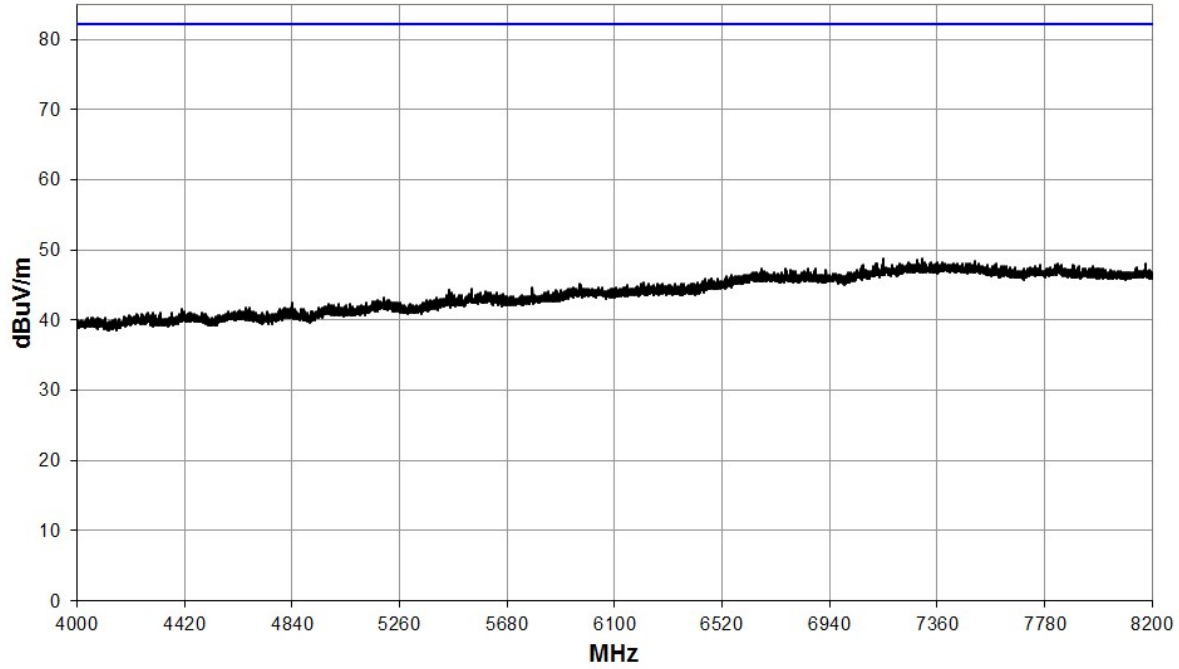
30 MHz to 1 GHz



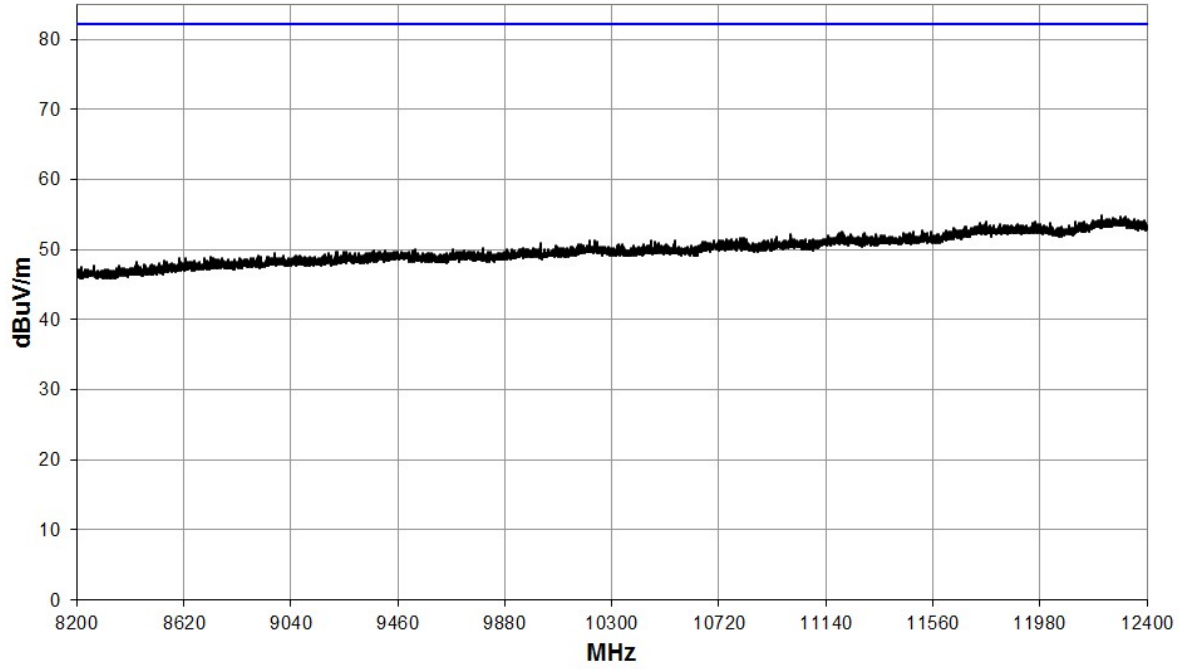
1 GHz to 4 GHz



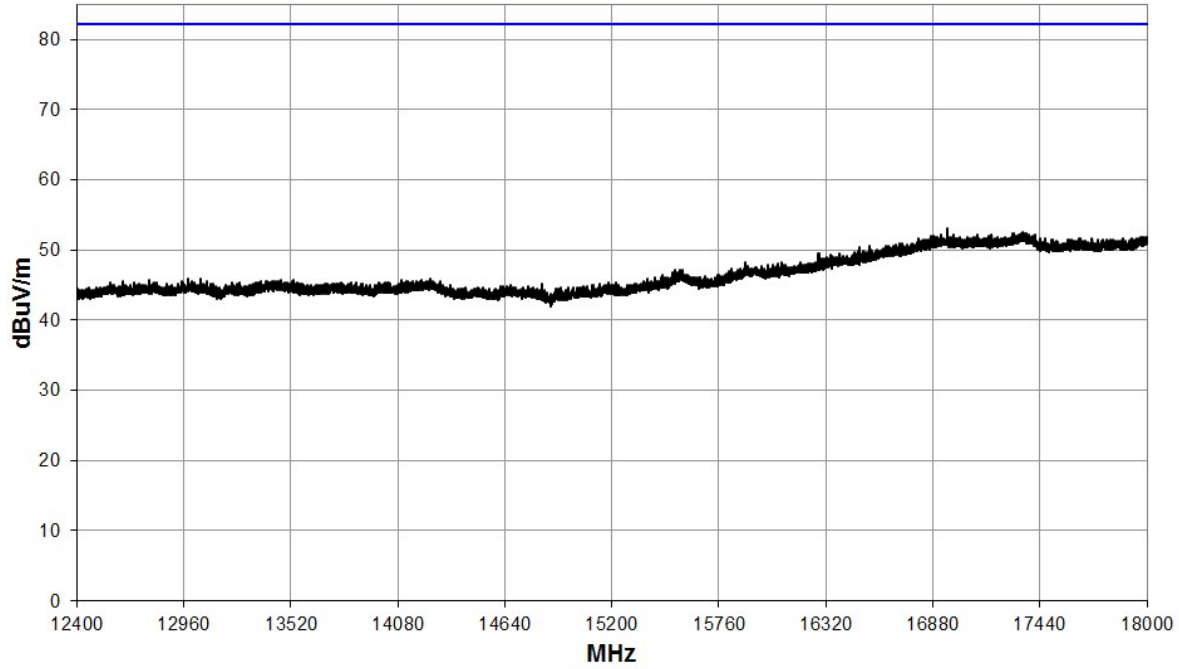
4 GHz to 8.2 GHz



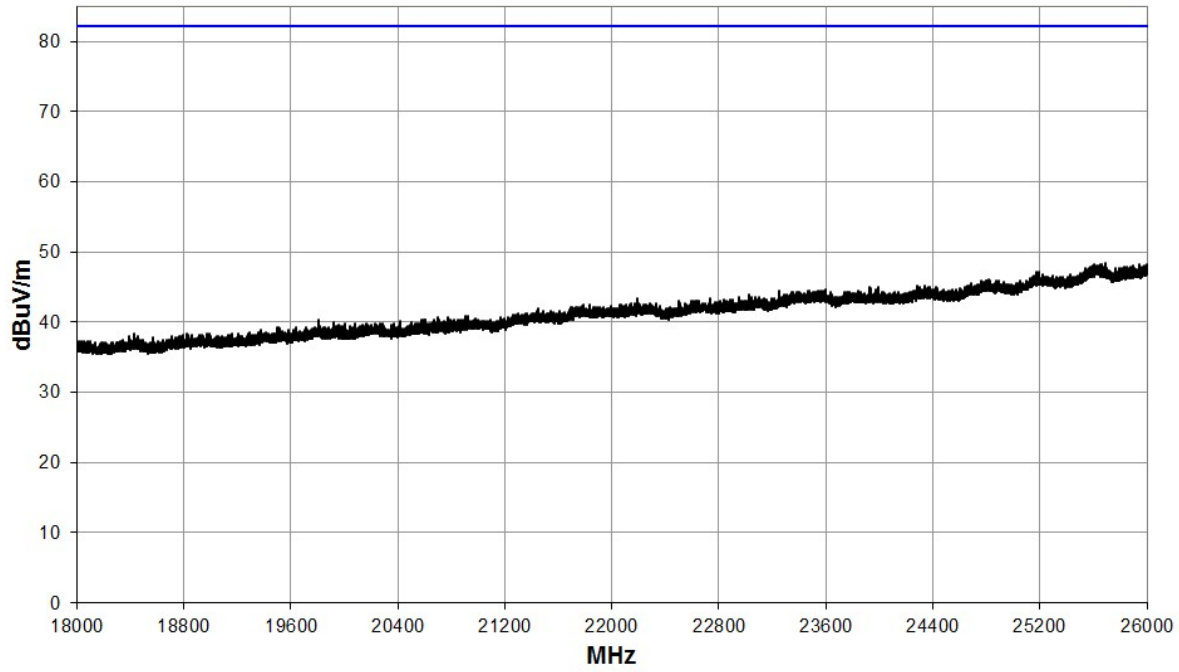
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz

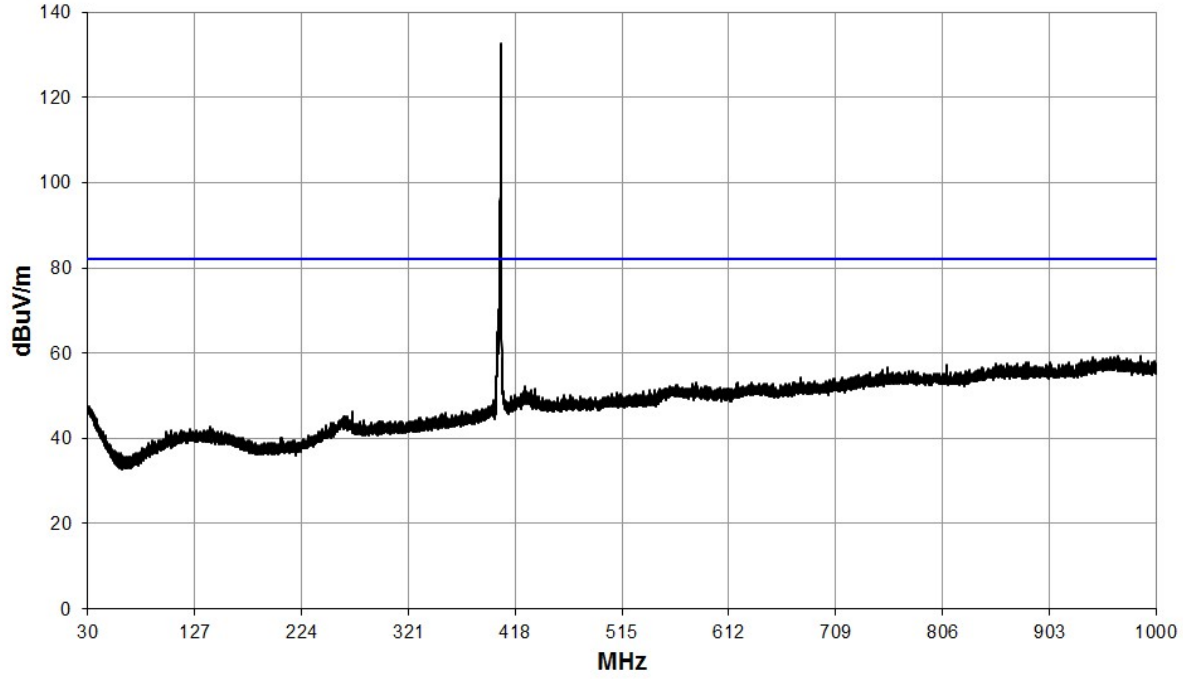


18 GHz to 26 GHz

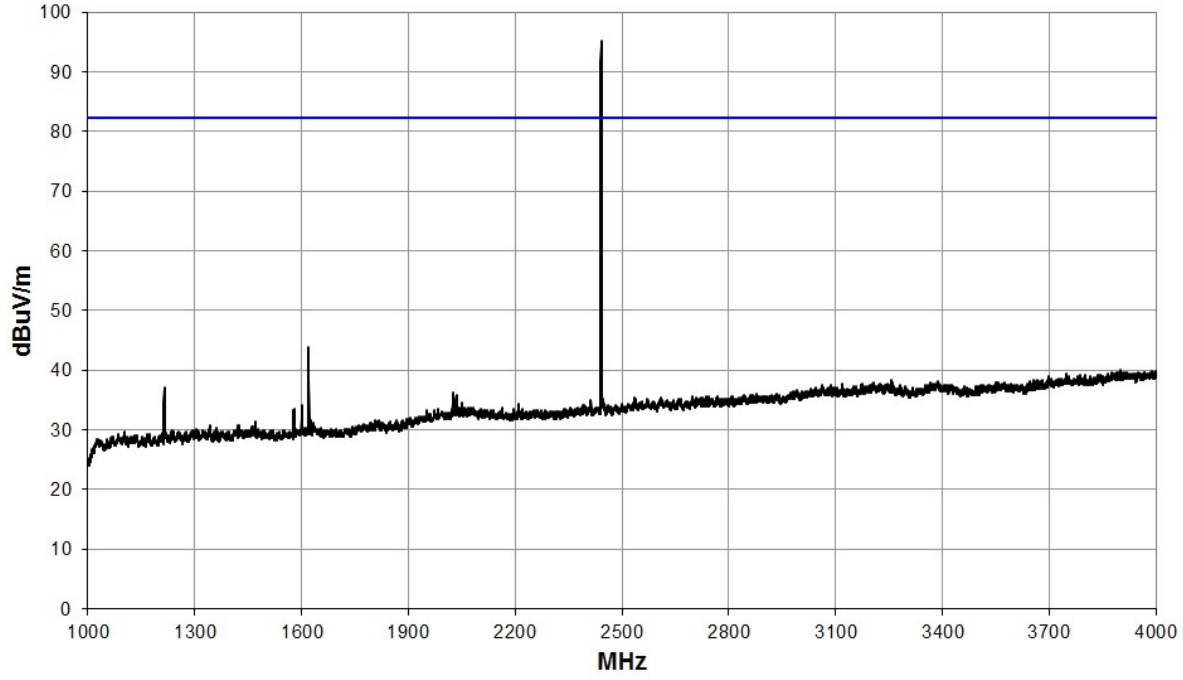


TETRA Frequency: 405.000 MHz; Power Setting: 35 dBm; Modulation: Burst with BT Classic Frequency: 2442 MHz; Power Setting: default					
Emission	**Frequency (MHz)**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**	**Result**
No Intermodulation emissions were detected within 10 dB of the limit.					

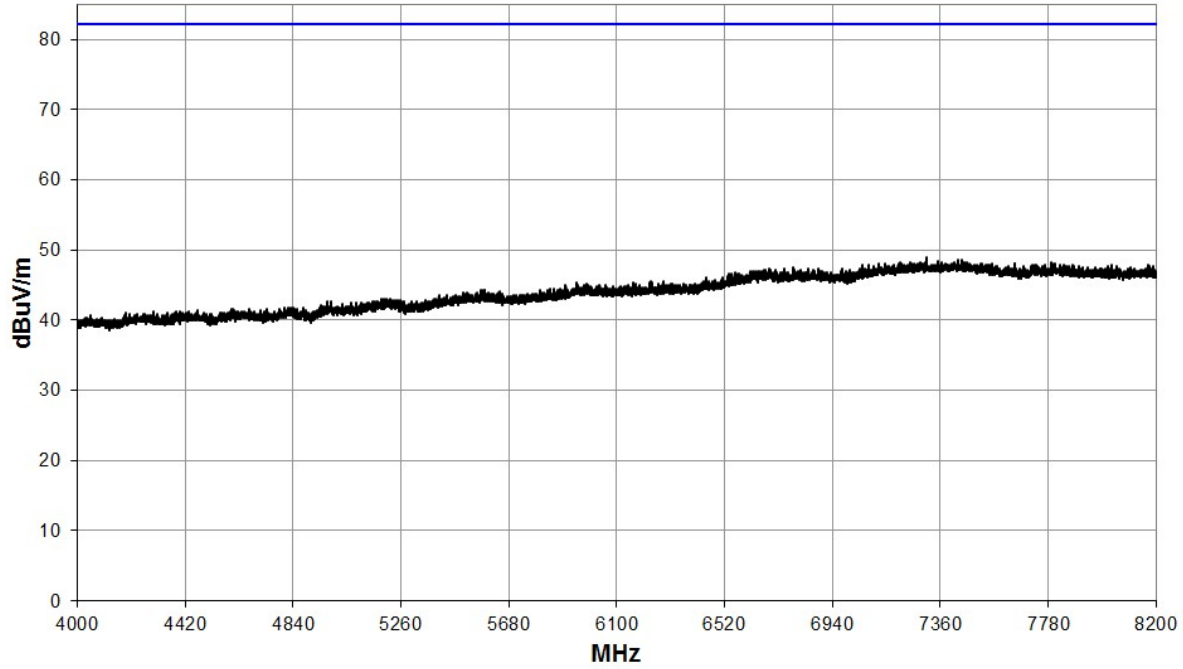
30 MHz to 1 GHz



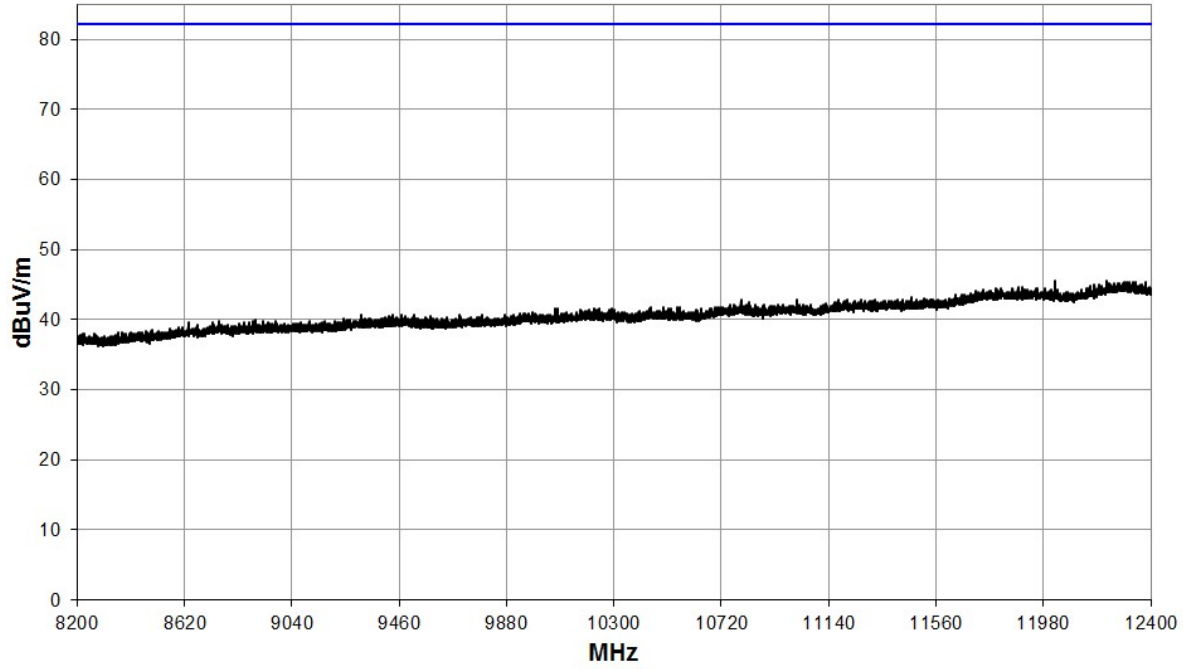
1 GHz to 4 GHz



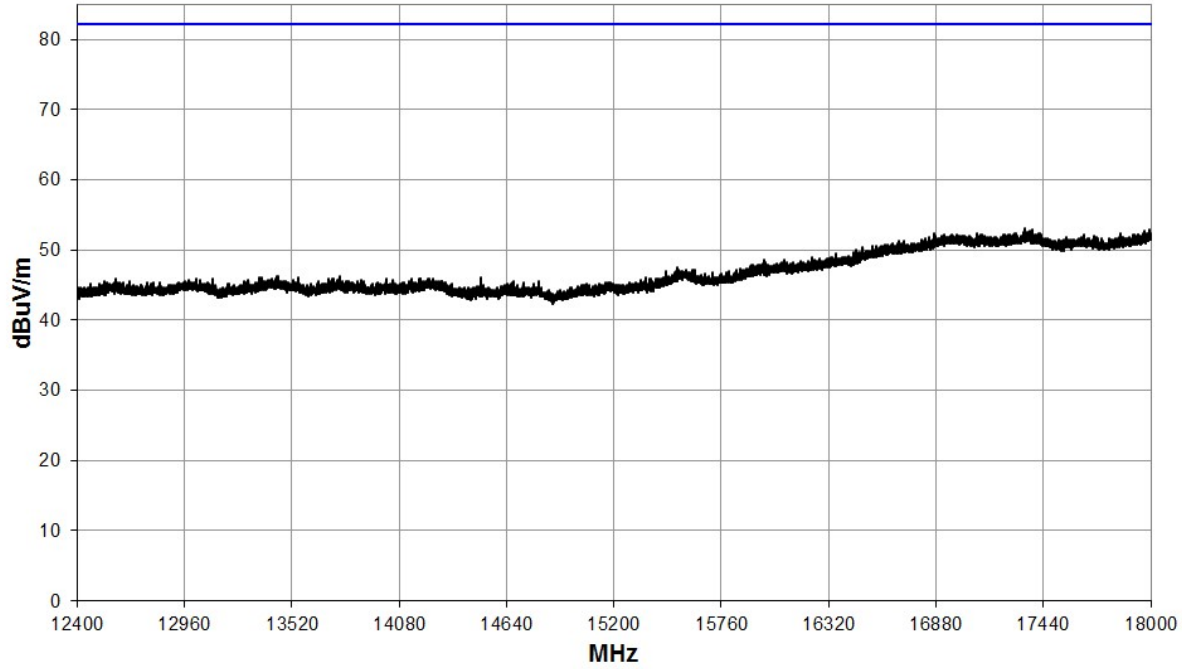
4 GHz to 8.2 GHz



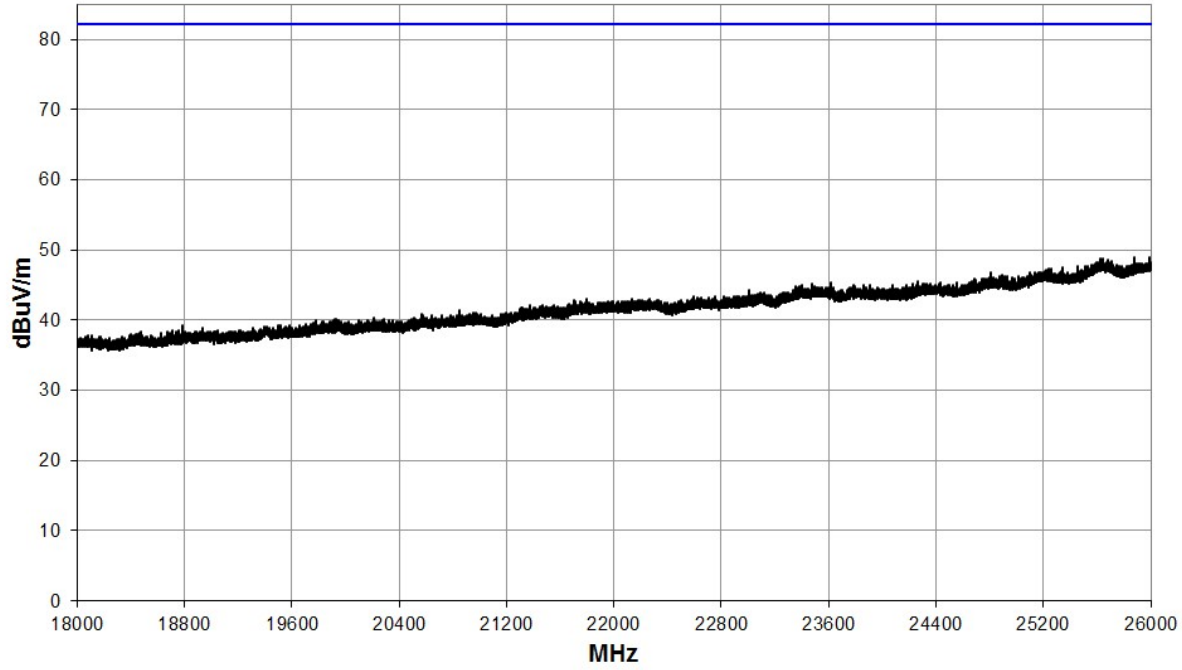
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz

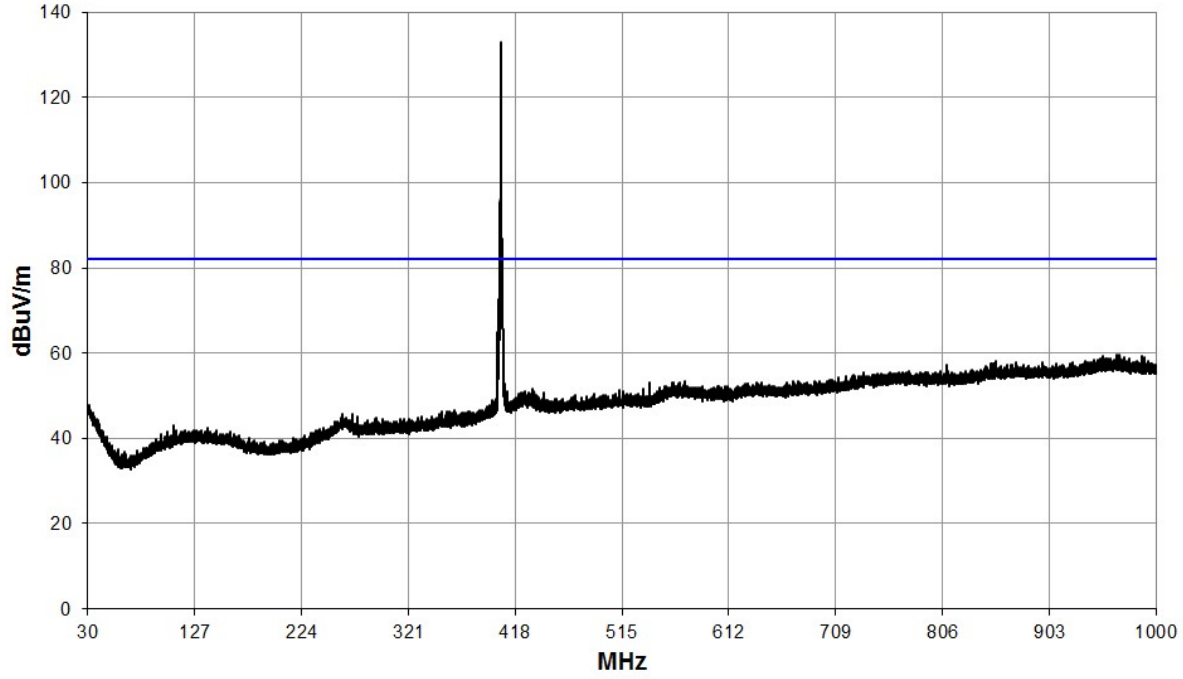


18 GHz to 26 GHz

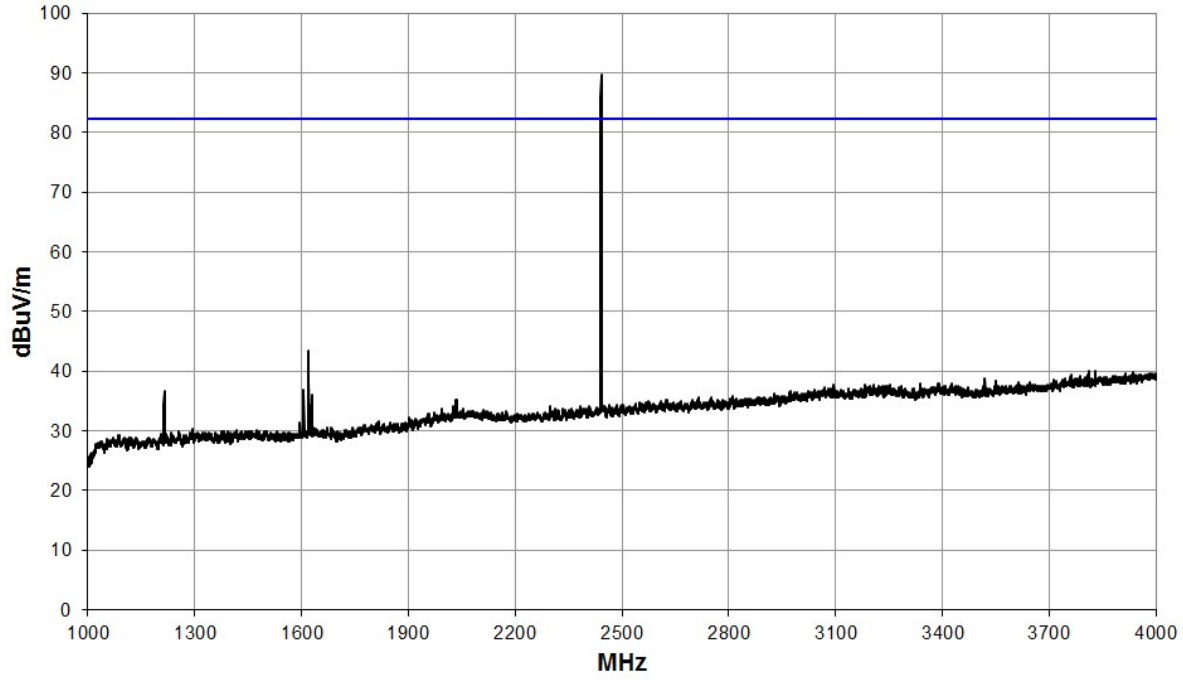


TETRA Frequency: 405.000 MHz; Power Setting: 35 dBm; Modulation: Burst with BLE Frequency: 2442 MHz; Power Setting: default					
Emission	***Frequency (MHz)***	***Level (dBm)***	***Limit (dBm)***	***Margin (dB)***	***Result***
No Intermodulation emissions were detected within 10 dB of the limit.					

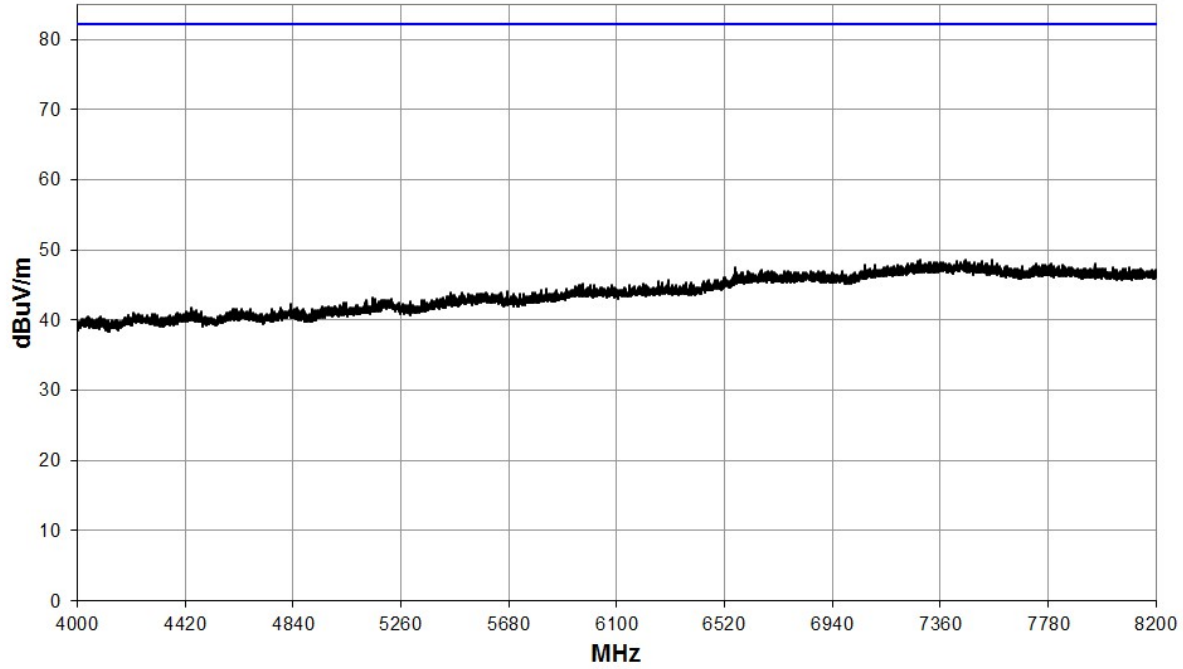
30 MHz to 1 GHz



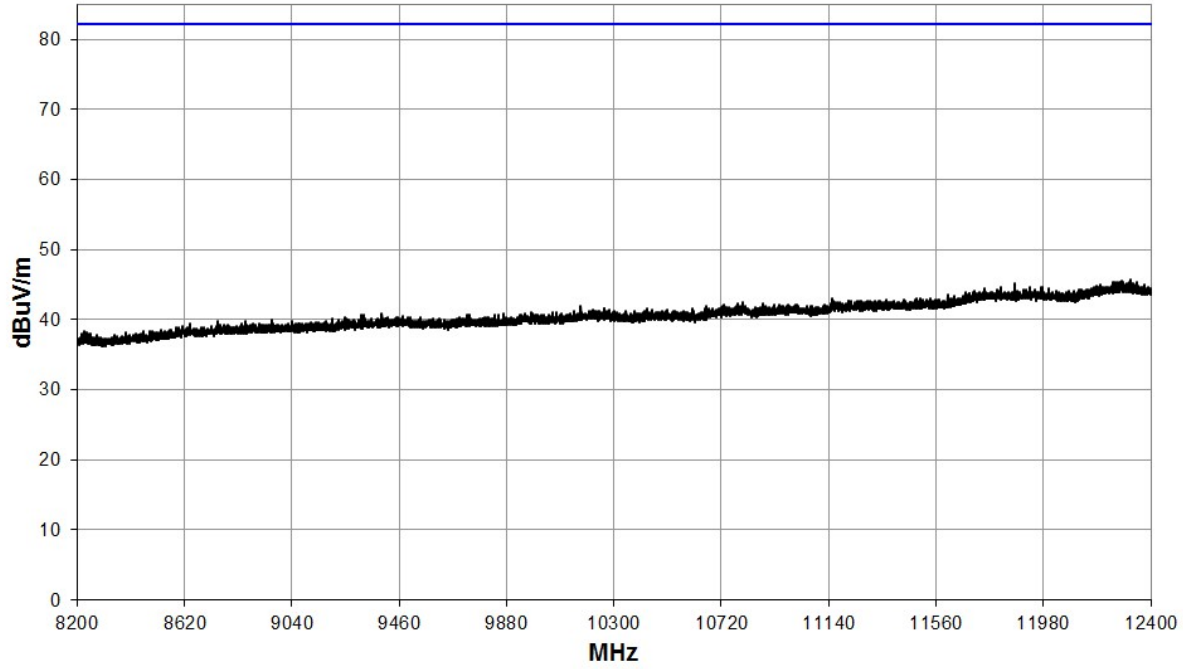
1 GHz to 4 GHz



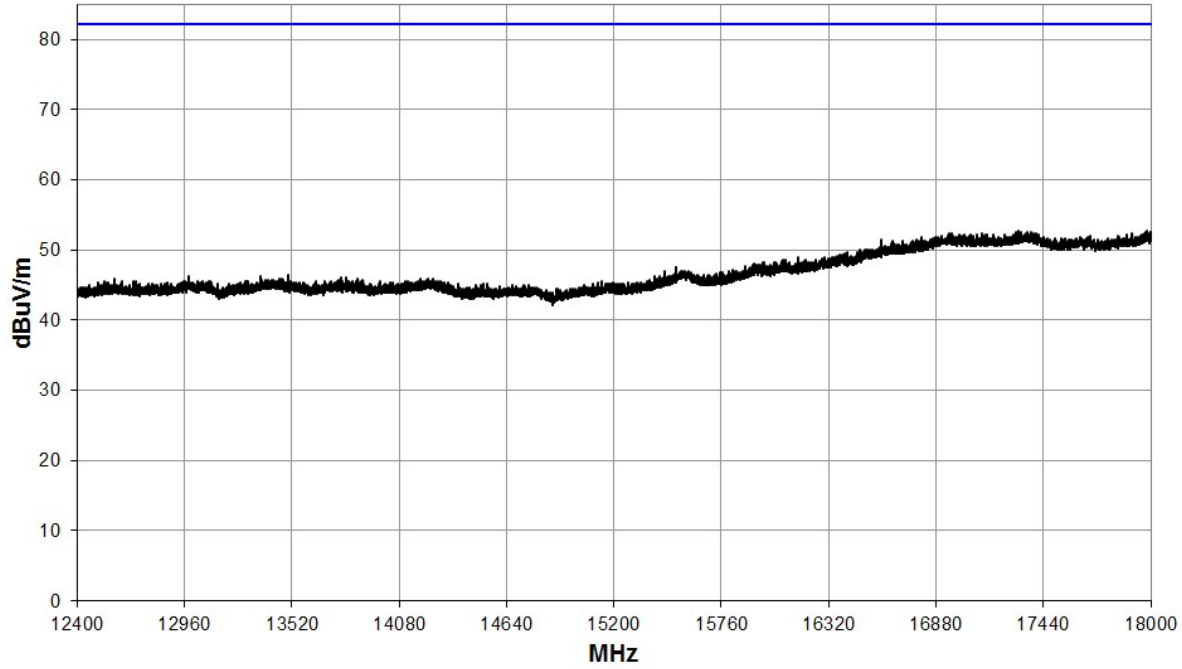
4 GHz to 8.2 GHz



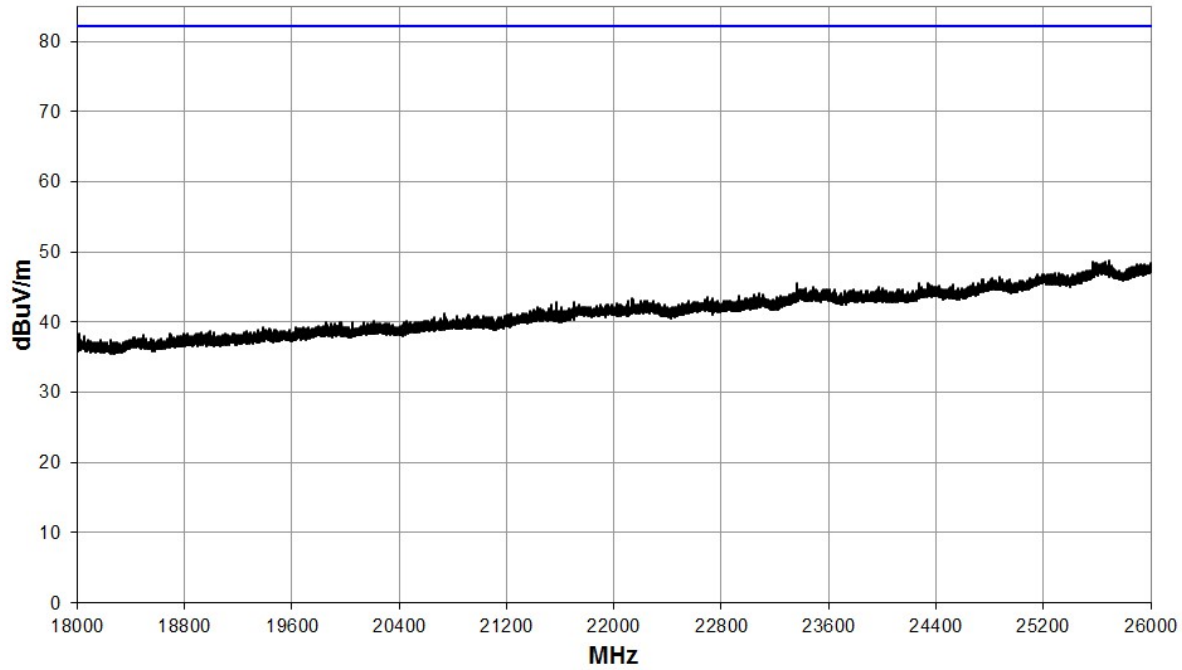
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz



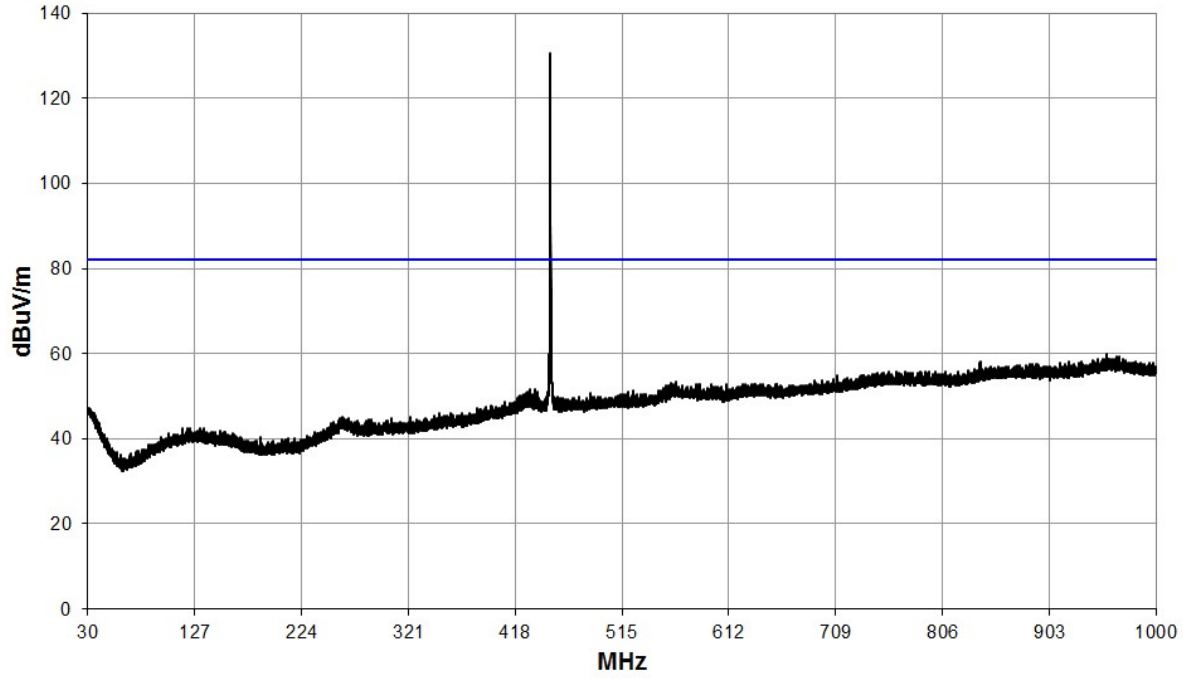
18 GHz to 26 GHz



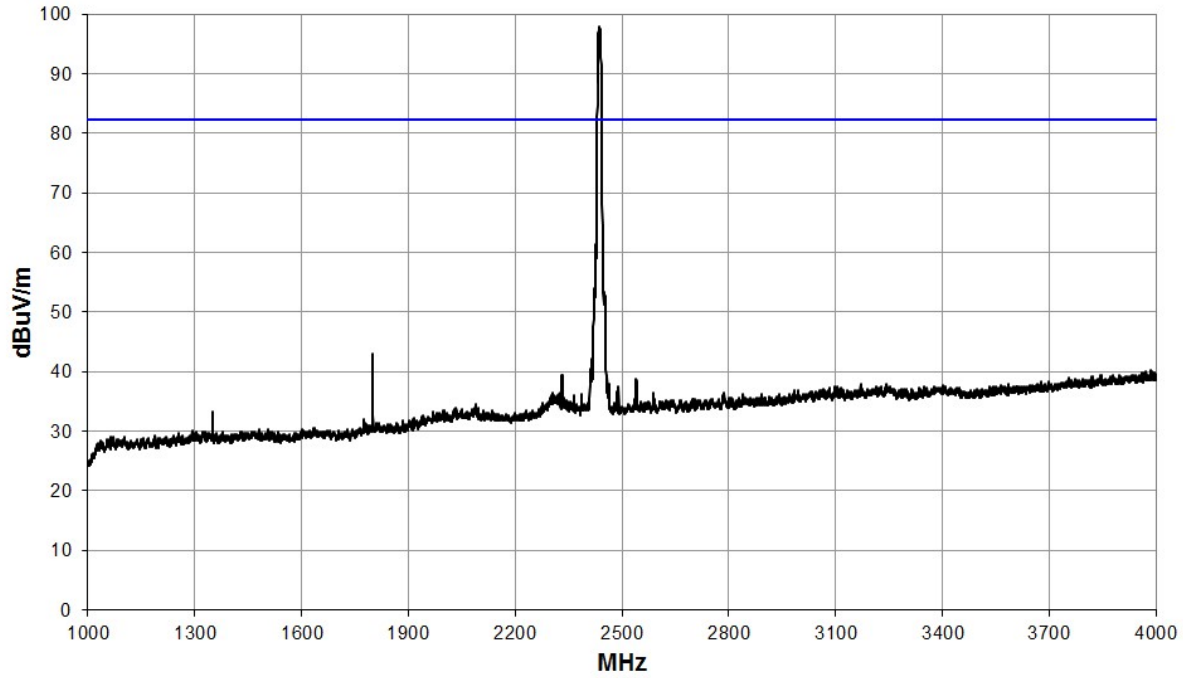
11.6 Test Results – SC2024

TETRA Frequency: 450.025 MHz; Power Setting: 35 dBm; Modulation: Burst with Wifi Frequency: 2437 MHz; Power Setting: 17 dBm					
Emission	***Frequency (MHz)***	***Level (dBm)***	***Limit (dBm)***	***Margin (dB)***	***Result***
No Intermodulation emissions were detected within 10 dB of the limit.					

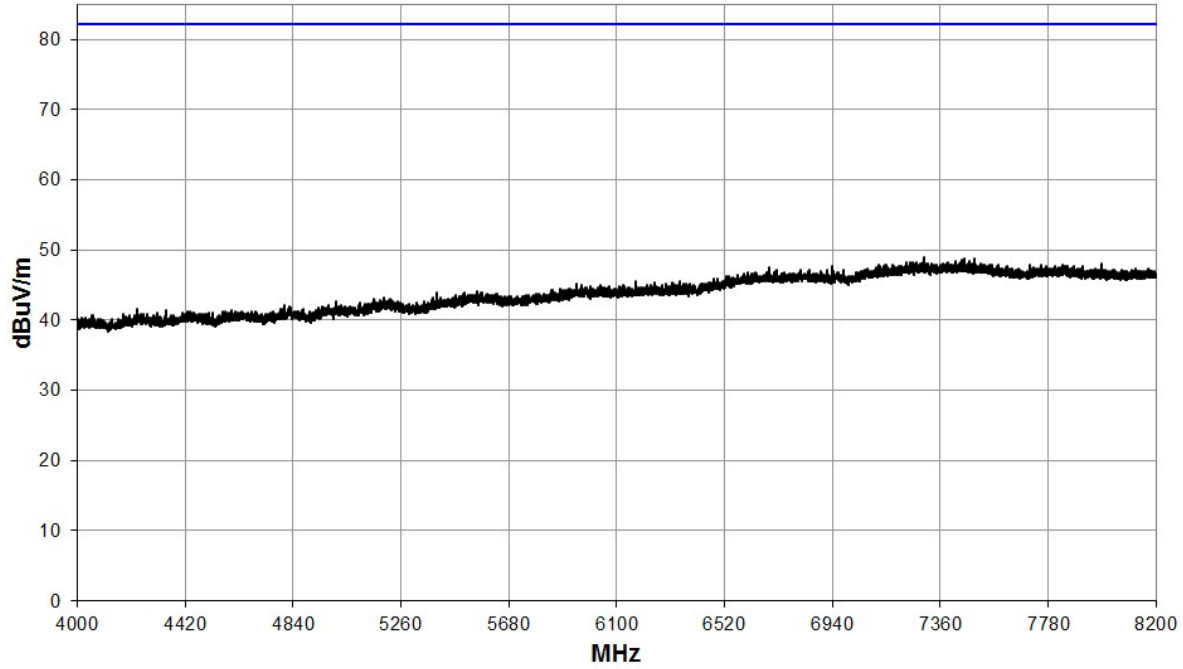
30 MHz to 1 GHz



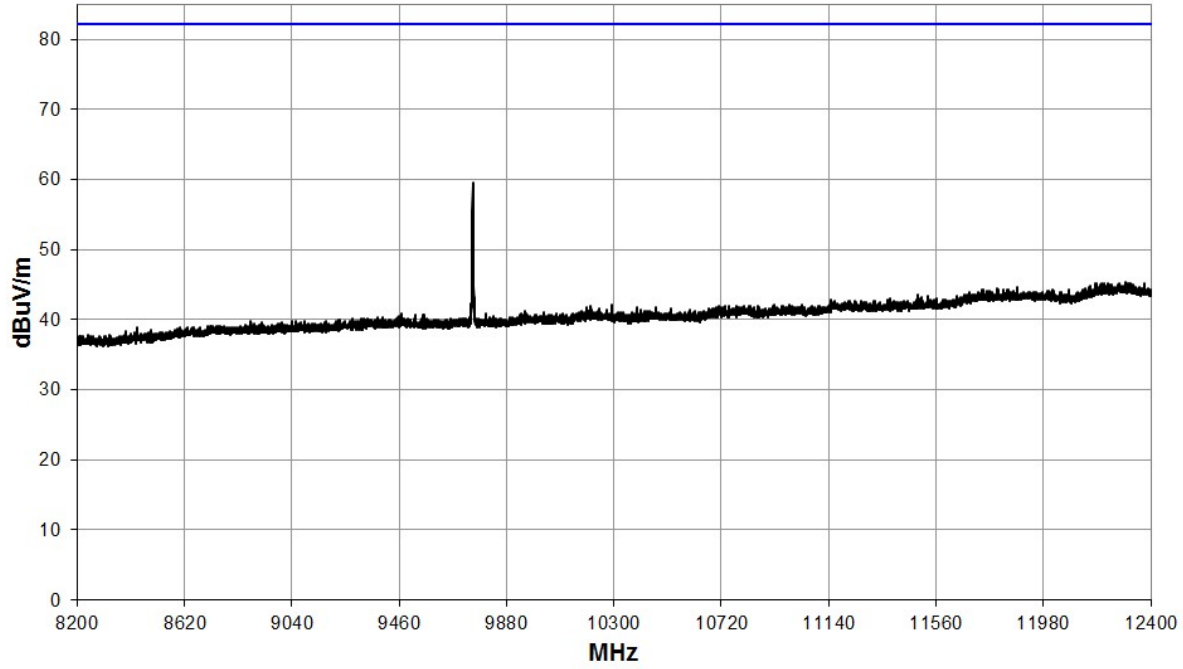
1 GHz to 4 GHz



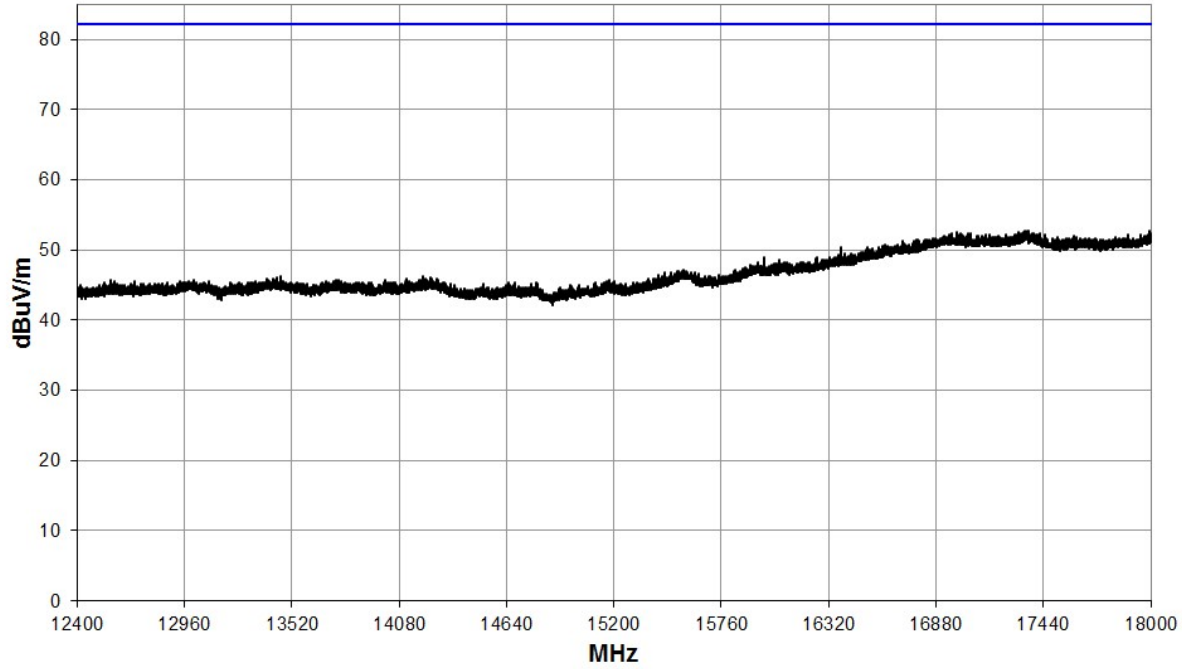
4 GHz to 8.2 GHz



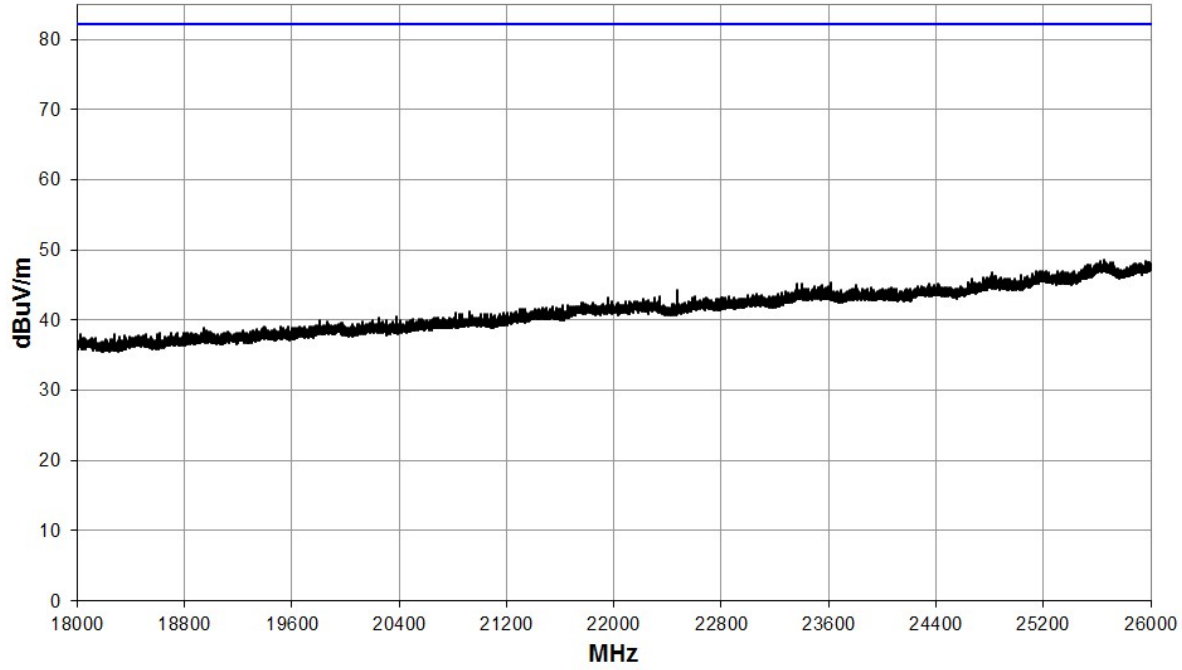
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz

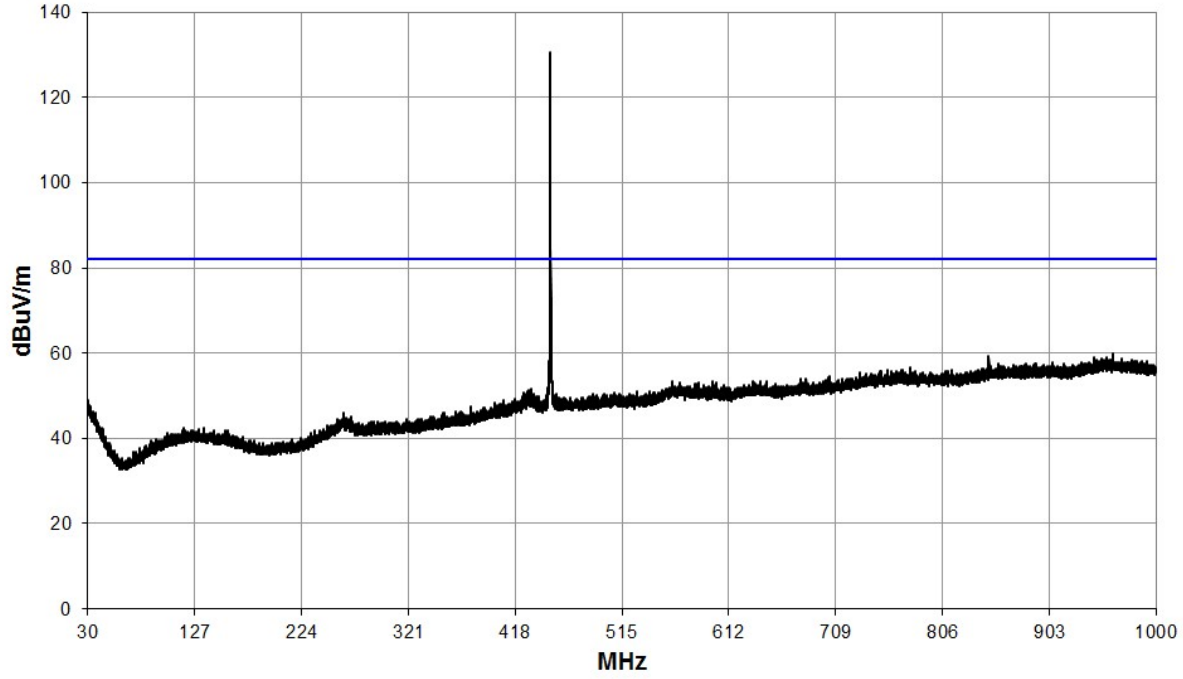


18 GHz to 26 GHz

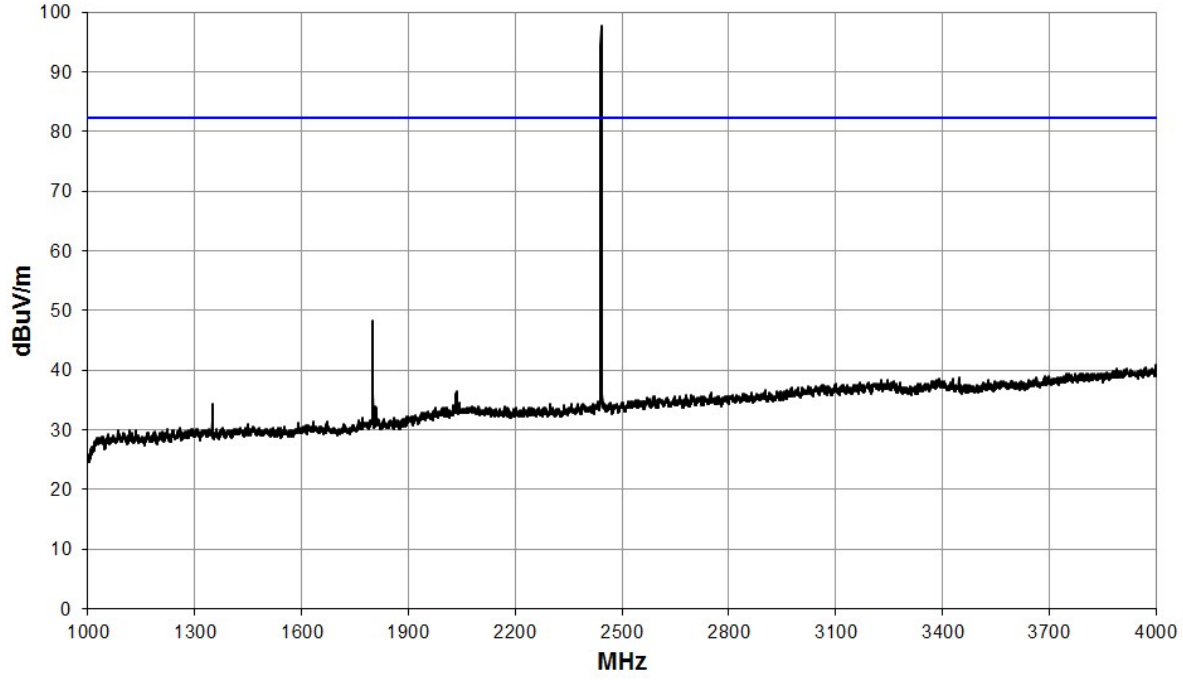


TETRA Frequency: 450.025 MHz; Power Setting: 35 dBm; Modulation: Burst with BT Classic Frequency: 2442 MHz; Power Setting: default					
Emission	***Frequency (MHz)***	***Level (dBm)***	***Limit (dBm)***	***Margin (dB)***	***Result***
No Intermodulation emissions were detected within 10 dB of the limit.					

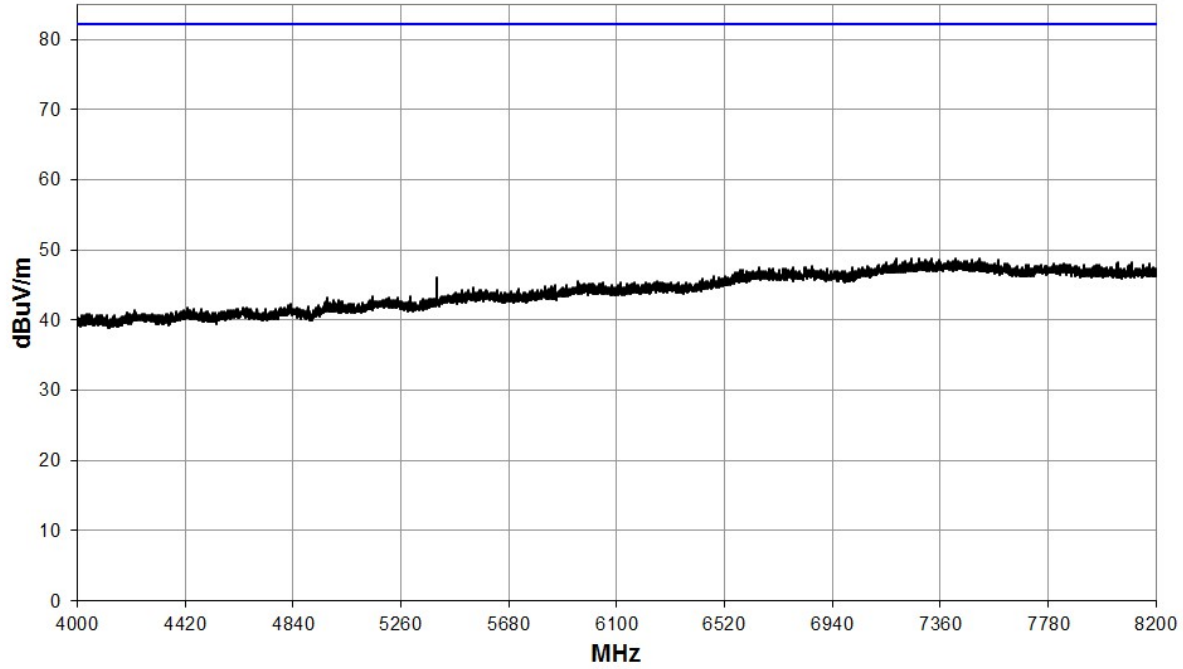
30 MHz to 1 GHz



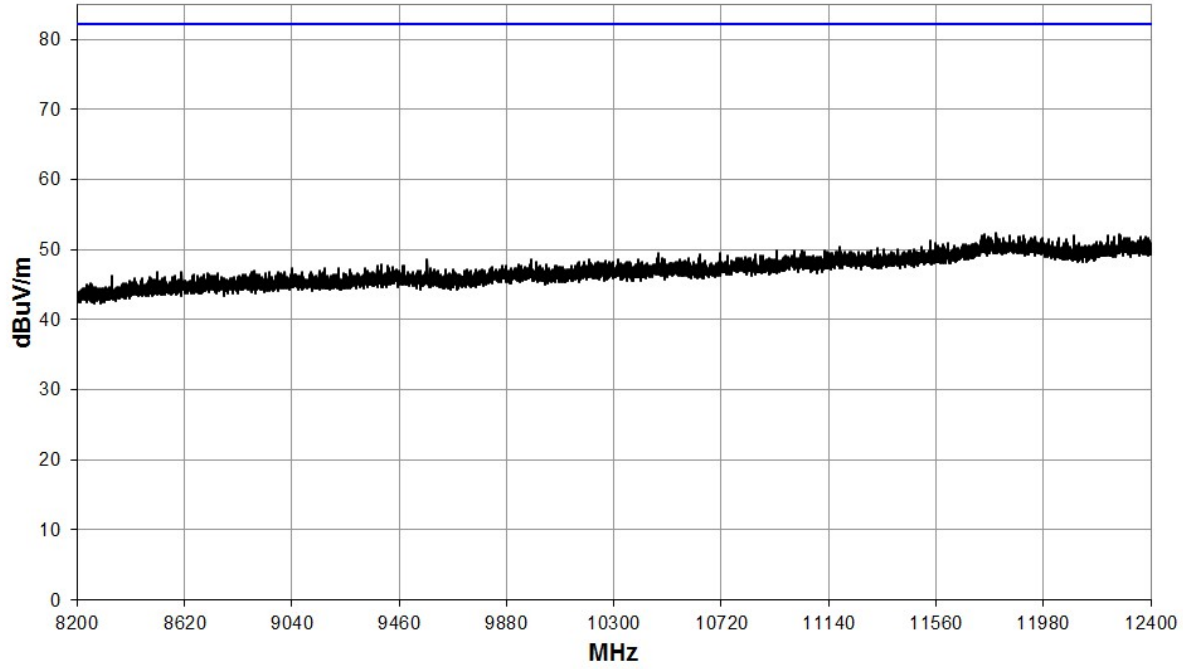
1 GHz to 4 GHz



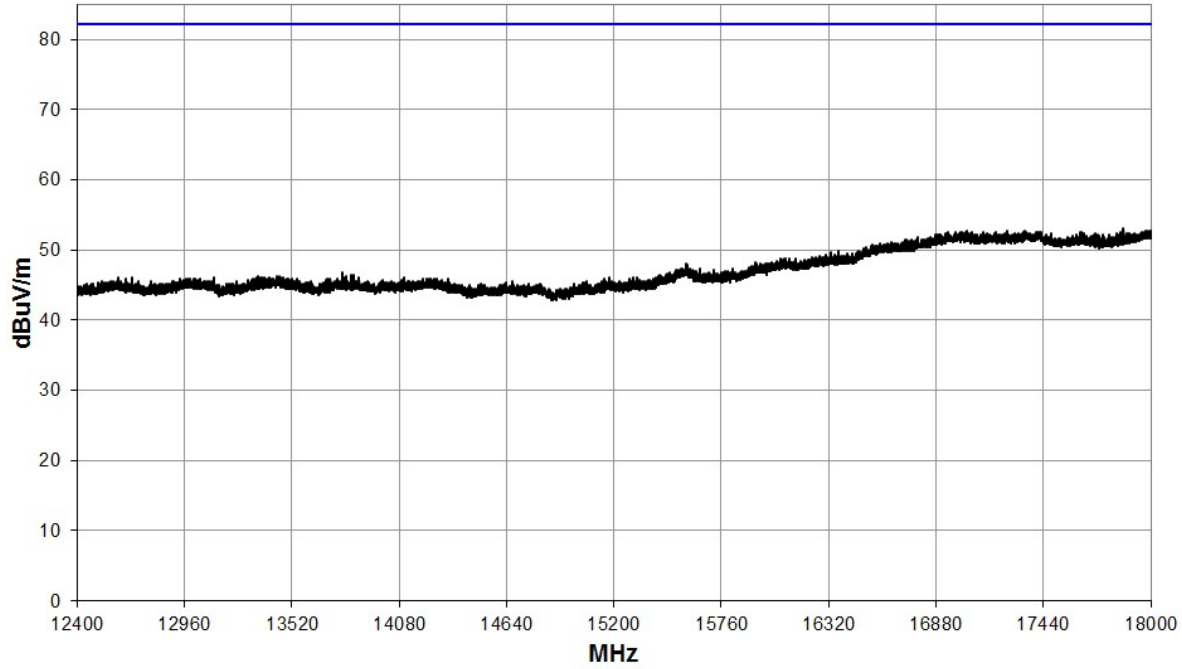
4 GHz to 8.2 GHz



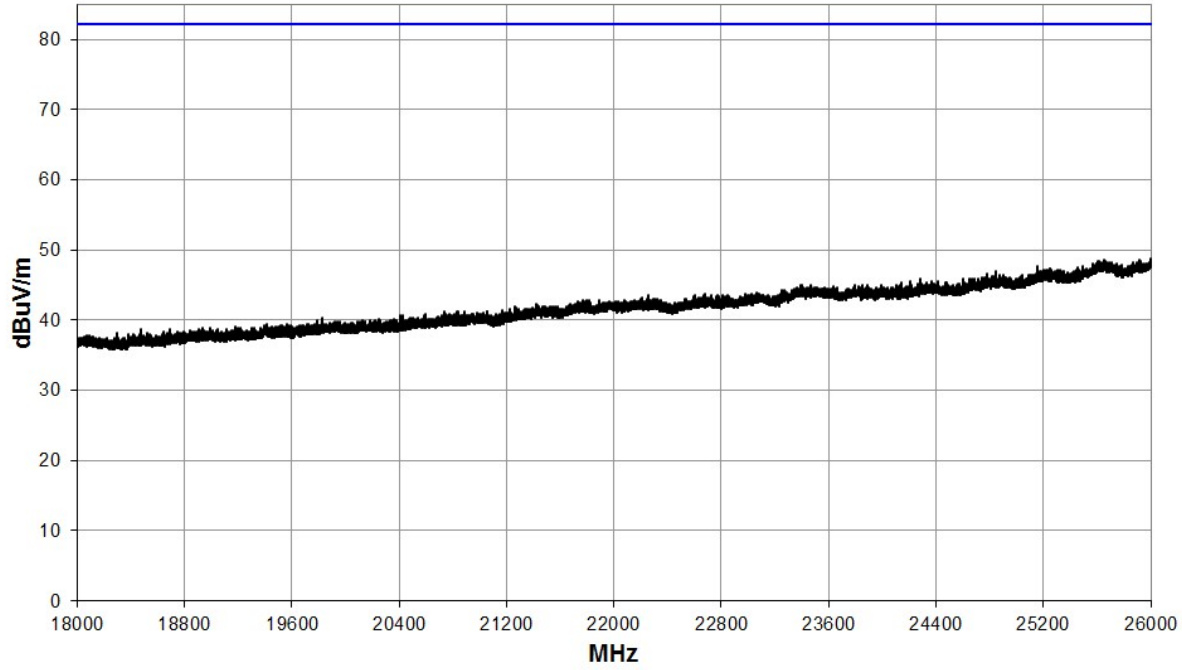
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz

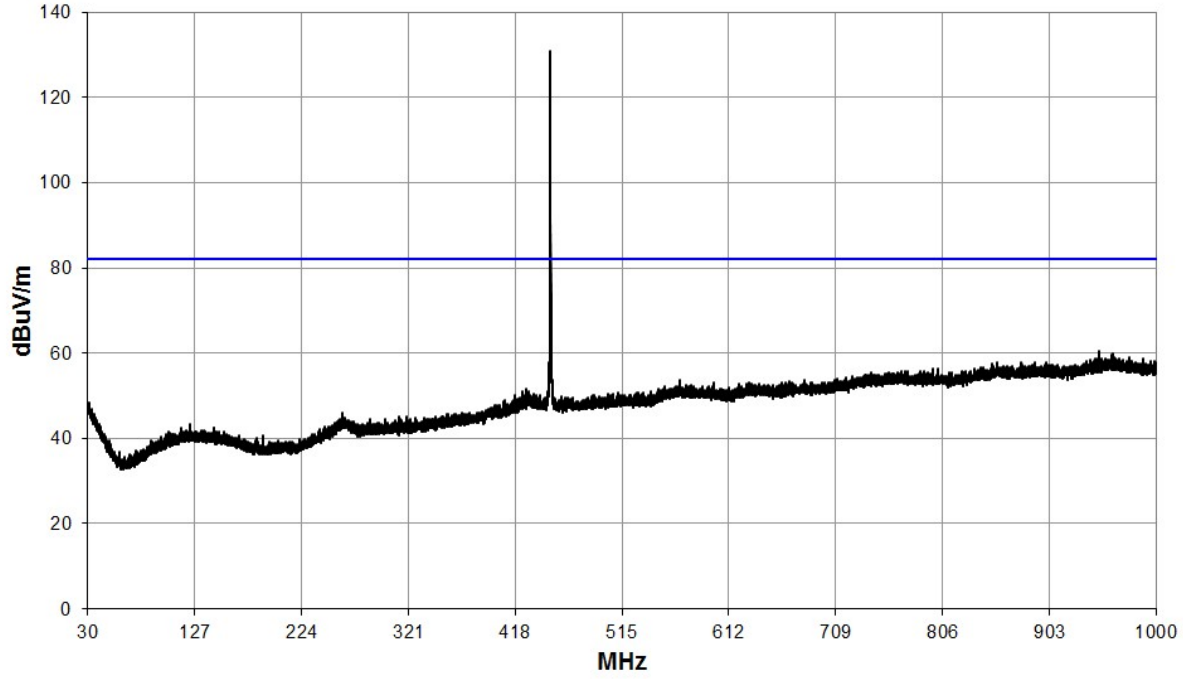


18 GHz to 26 GHz

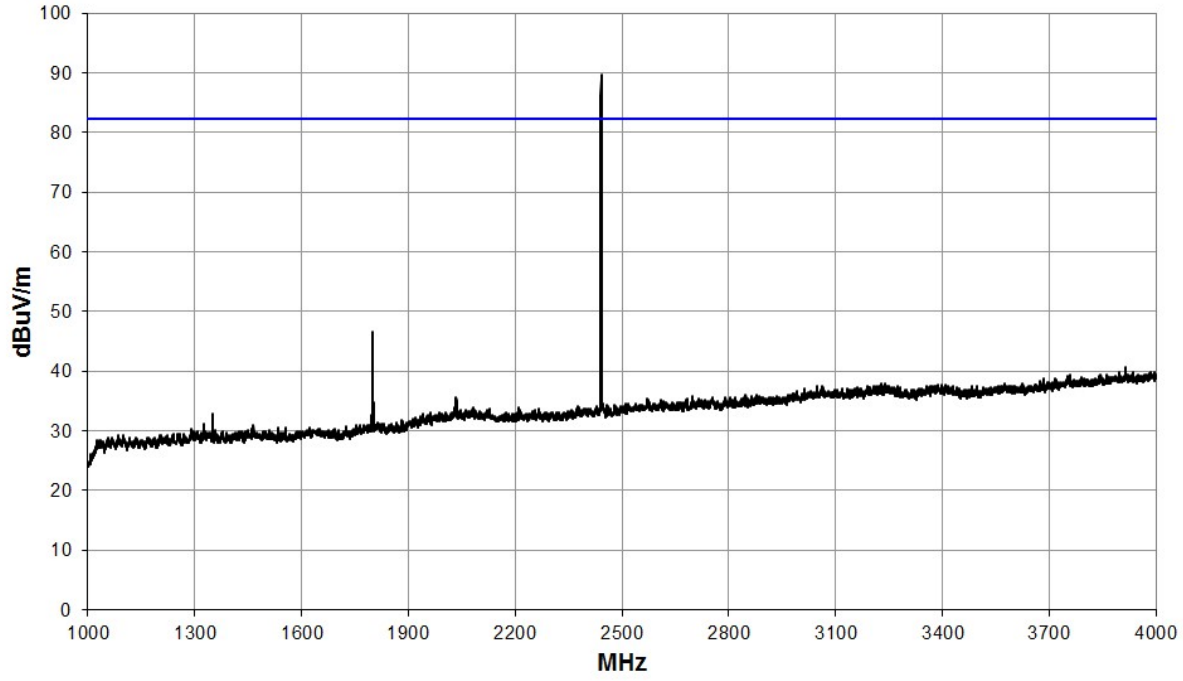


TETRA Frequency: 450.025 MHz; Power Setting: 35 dBm; Modulation: Burst with BLE Frequency: 2442 MHz; Power Setting: default					
Emission	***Frequency (MHz)***	***Level (dBm)***	***Limit (dBm)***	***Margin (dB)***	***Result***
No Intermodulation emissions were detected within 10 dB of the limit.					

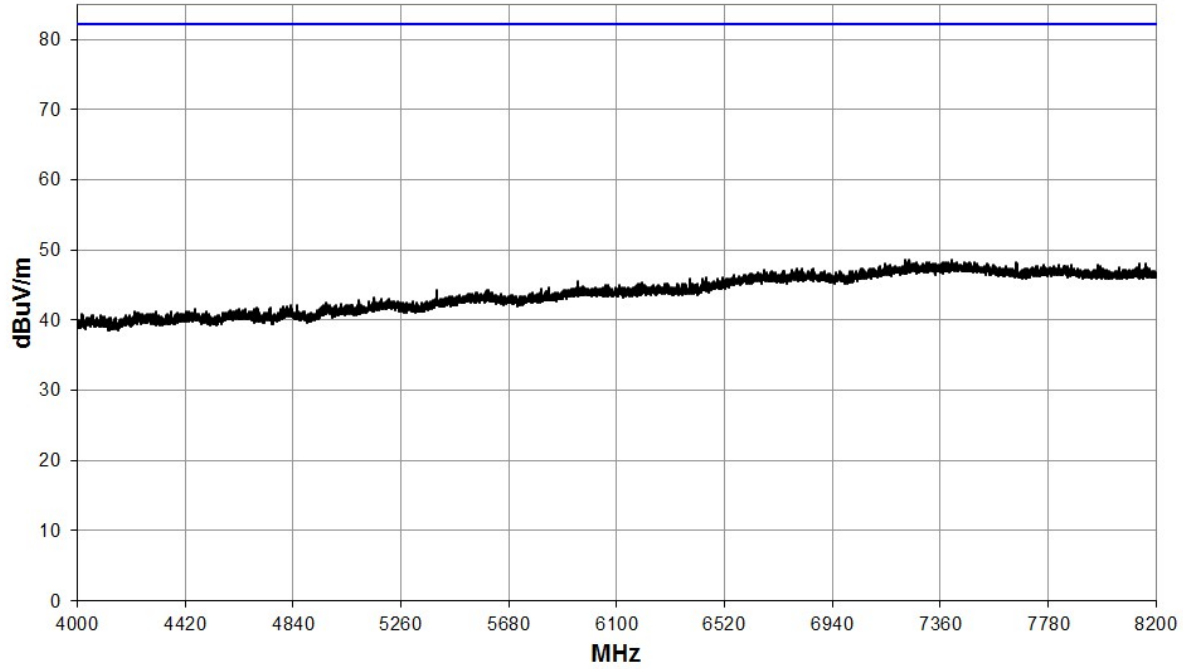
30 MHz to 1 GHz



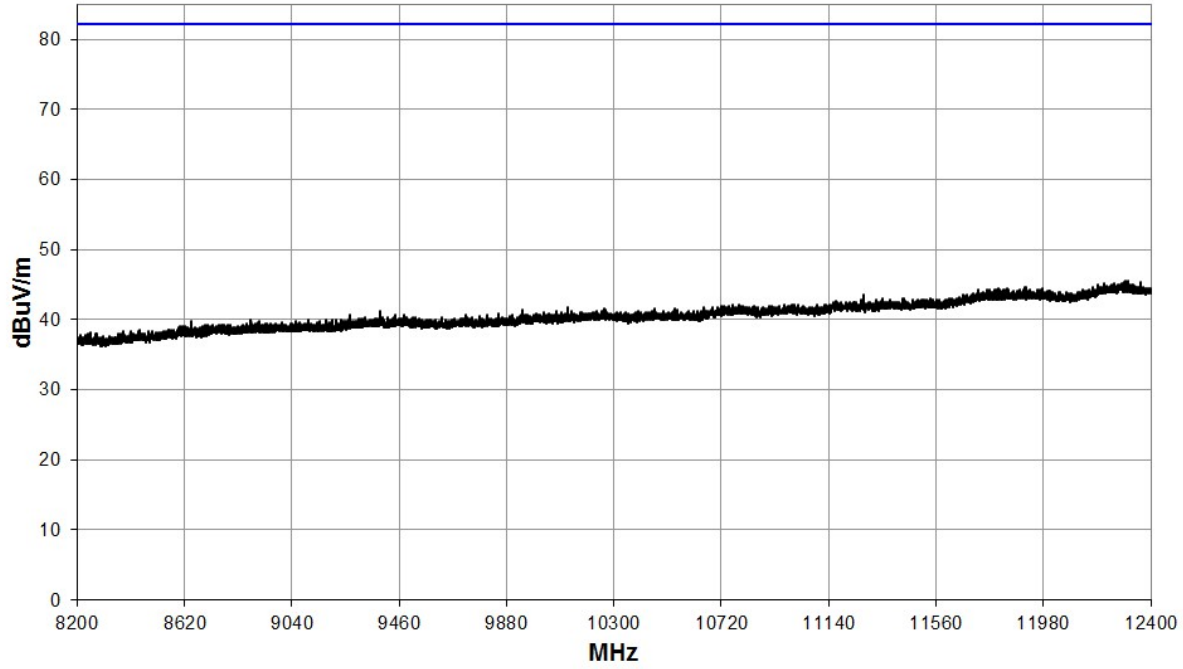
1 GHz to 4 GHz



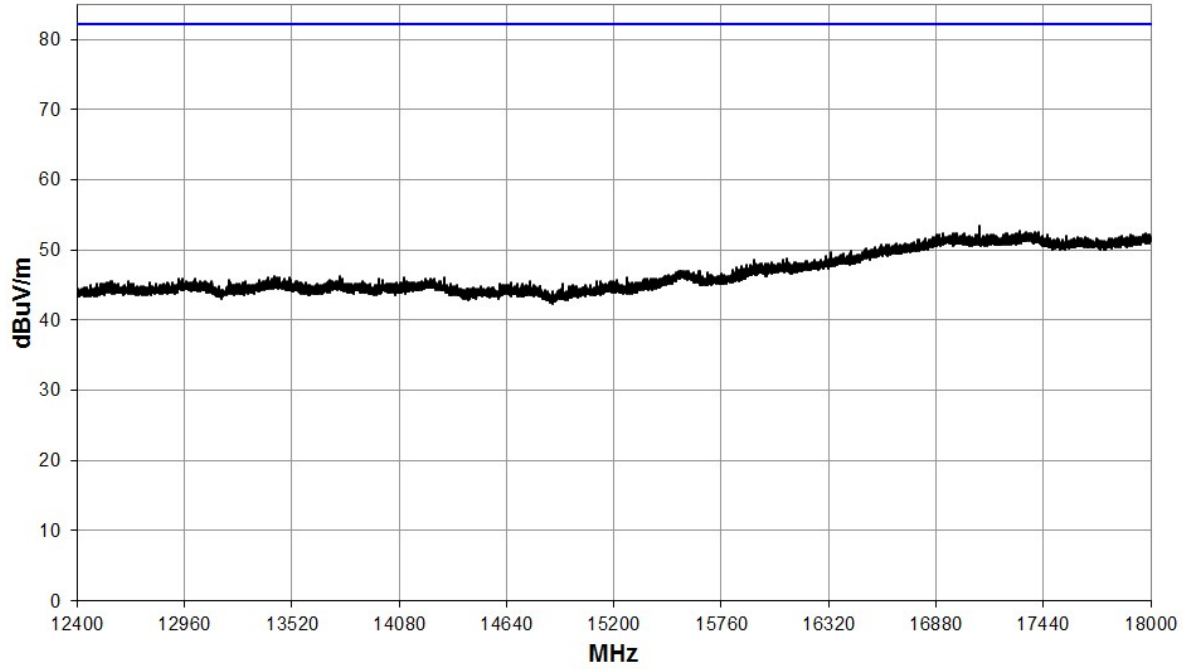
4 GHz to 8.2 GHz



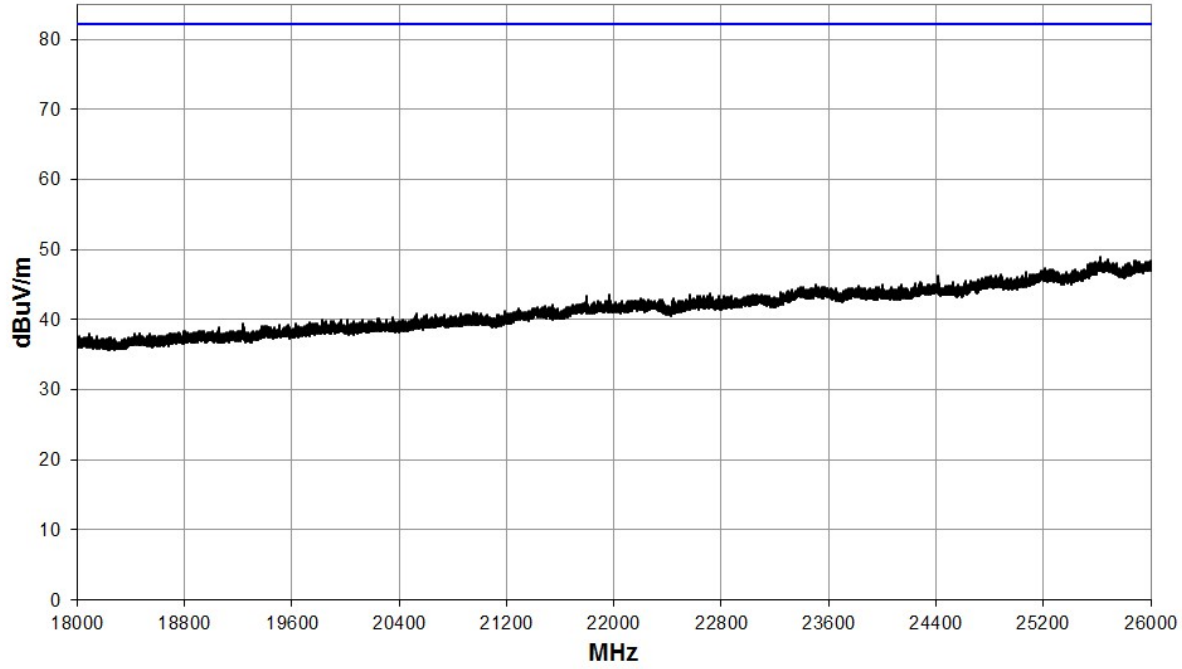
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz



18 GHz to 26 GHz



12 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**

13 Customer Declaration

27 July 2022

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Declaration no performance differences of Bluetooth, Wi-Fi and GNSS between SC20 models.

SC20 series radios including the following models but not limited to SC2020, SC2021, SC2024 & SC2028 use the same Bluetooth & Wi-Fi module (LBEE59B1LV-TEMP) along with a new GNSS module (u-blox m10). The electronic implementation/design of these parts in each model of SC20 radios are identical and no performance difference between them. the only difference between each model is the Tetra frequency range.

Signed for and on behalf of Sepura Limited:

James O'Reilly
Conformance engineer

Dated: 27 July 2022