Report on the Radio Testing

For

Intellian Ltd

on

C200 M

Report no. TRA-061097-47-00A

12th March 2024

Report Number: TRA-061097-47-00A
Issue: A

REPORT ON THE RADIO TESTING OF A
Intellian Ltd
C200 M
WITH RESPECT TO SPECIFICATION
THE FCC RULES CFR 47, Part 25

TEST DATE: 13th February to 21st February 2024

Written by:	Digitally signed by Steven Hodgkinson DN: cn=Steven Hodgkinson, o=Element, ou=Radio, email=steven.hodgkinson@element.com, c=GB Date: 2024.03.12 15:59:57 Z	S Hodgkinson Radio Test Engineer
Approved by:	Digitally signed by John Charters Date: 2024.03.12 16:47:38 Z	J Charters Laboratory Manager
Date:	12th March 2024	

1 Revision Record

Issue Number	*Issue Date*	*Revision History*
A	12th March 2024	Original

2 Summary

TEST REPORT NUMBER:	TRA-061097-47-00A
WORKS ORDER NUMBER:	TRA-061097-02
PURPOSE OF TEST:	Certification
TEST SPECIFICATION:	CFR47, Part 25
EQUIPMENT UNDER TEST (EUT):	C200 M
FCC IDENTIFIER:	2BAX4-INTC200M
MANUFACTURER/AGENT:	Intellian Ltd
ADDRESS:	4th Floor, The Charter Building, Charter Place, Uxbridge UB8 1JG United Kingdom
CLIENT CONTACT:	Sophie Michel ☎ 07546740157 ✉ sophie.michel@intelliantech.com
TEST DATE:	13th February to 21st February 2024
TESTED BY:	S Hodgkinson Element

2.1 Test Summary

Test Method and Description	*Requirement Clause*		*Applicable to this equipment*	**Result / Note**
	FCC PART 2	*FCC PART 25*		
RF Power Output	2.1046	25.204 (a)	☒	Pass
Emission Limitations	2.1049	25.202 (f)	☒	Pass
Protection of Radio Navigation satellite services	2.1051	25.202 (c) 25.216 (f)	☒	Pass
Spurious emissions-Radiated	2.1053	25.202 (f) 25.213	☒	Pass
Frequency Stability	2.1055	25.202 (d)	☒	Pass

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).

The decision rule for compliance is not inherent within this specification and compliance is based on the customer requesting a simple acceptance rule based on understanding and acceptance of Elements Measurement Uncertainty values.

3 Contents

4 Introduction

This report TRA-061097-47-00A presents the results of the Radio testing on a Intellian Ltd, C200 M Code of Federal regulations CFR47, Part 25.

The testing was carried out for Intellian 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 Skelmersdale West Lancashire WN8 9PN UK	☐	Element Surrey Hills Unit 15 B Henley Business Park Pirbright Road Normandy Guildford GU3 2DX UK

This report details the configuration of the equipment, the test methods used and any relevant modifications where appropriate.

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

Element Skelmersdale UK2020

The test site requirements of ANSI C63.4-2014 are met up to 1GHz.
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 2 – Frequency allocations and radio treaty matters; General rules and regulations.
- FCC 47 CFR Part 25 Satellite communications subpart B.
- ANSI C63.26-2015 American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

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
AGC	Automatic Gain Control
AM	Amplitude Modulated
AWGN	Additive White Gaussian Noise
BW	Bandwidth
C	Celcius
CW	Continuous Wave
dB	Decibels
dBm	dB relative to 1 milliwatt
CDMA	Code Division Multiple Access – a modulation technique used in cellular networks
DC	Direct Current
EIRP	Equivalent Isotropically Radiated Power
emf	electromotive force
erp	Effective Radiated Power
EUT	Equipment Under Test
f	Frequency
FCC	Federal Communications Commission
GSM	Group Special Mobile – a cellular network standard
Hz	Hertz
IC	Industry Canada (now ISED)
IF	Intermediate Frequency
ISED	Innovation, Science and Economic Development Canada
ITU	International Telecommunication Union
KDB	Knowledge Data Base (of the FCC Office of Engineering and Technology).
LO	Local Oscillator
m	metre
max	Maximum
min	Minimum
MSK	Minimum Shift Keying
N/A	Not Applicable
No.	Number
PCB	Printed Circuit Board
PDF	Portable Document Format
PLMR	Private Land Mobile Radio
RE	Radio Equipment
RF	Radio Frequency
RH	Relative Humidity
RMS	Root Mean Square
Rx	Receiver
s	Second
TDMA	Time Division Multiple Access
Tx	Transmitter
UKAS	United Kingdom Accreditation Service
V	Volt
W	Watt
Ω	Ohm

7 Equipment Under Test

7.1 EUT Identification

- Name: C200 M
- Serial Number: Not Stated
- Model Number: C200 M
- Software Revision: 1.0
- Build Level / Revision Number: Production Standard

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.

Support equipment: Lenovo Laptop/ C200 Below Deck Unit

7.3 EUT Mode of Operation

The mode of operation for Tx tests was as follows…
The supplied client test software was used to select the test frequencies/and the channel bandwidths.
C1 = 41.666 kHz, C2=83.333 kHz, C8= 333.333 kHz and 2C8Q = 666.666 kHz

7.4 EUT Radio Parameters

7.4.1 General

Frequency of operation (band or bands):	1616.0 MHz to 1626.5 MHz
Modulation type(s):	QPSK
Bandwidth(s):	C1 = 41.666 kHz C2 =83.333 kHz C8 =333.333 kHz 2XC8 =666.666 kHz
Declared output power(s):	C1=33 dBm C2=31 dBm C8=38 dBm 2C8=41 dBm
Antenna type(s) and gain(s):	Integral 1.2 dBi
Nominal Supply Voltage:	24 Vdc Via the below deck unit.

7.4.2 Signal types

Signal type	***Modulation type***	***No of Available Channels***	***Channel Bandwidth (kHz)***	***Comments***	***ITU Emission Designator***
C1	QPSK 30k symbols/second	240	41.666	Single Bearer	41K7Q7W
C2	QPSK 60k symbols/second	120	333.333	Single Bearer	83K4Q7W
C8	QPSK 120k symbols/second	30	333.333	Single Bearer	334KQ7W
2XC8	QPSK 240k symbols/second	15	666.666	2 Bearers of C8	667KQ7W

7.5 EUT Description

The C200M maritime satellite terminal utilizes the Iridium Next network of 66 Low-Earth Orbit (LEO) satellites, providing pole-to-pole communication. Using Certus® service, the Intellian C200M provides three high quality voice lines, and IP data speeds up-to 176 kbps upload and download. The Intellian C200M incorporates an efficient, high-performance RF design into a very compact, easy to install solution that satisfies customers' demand for a low cost of ownership in terms of deployment, installation and continued operation.

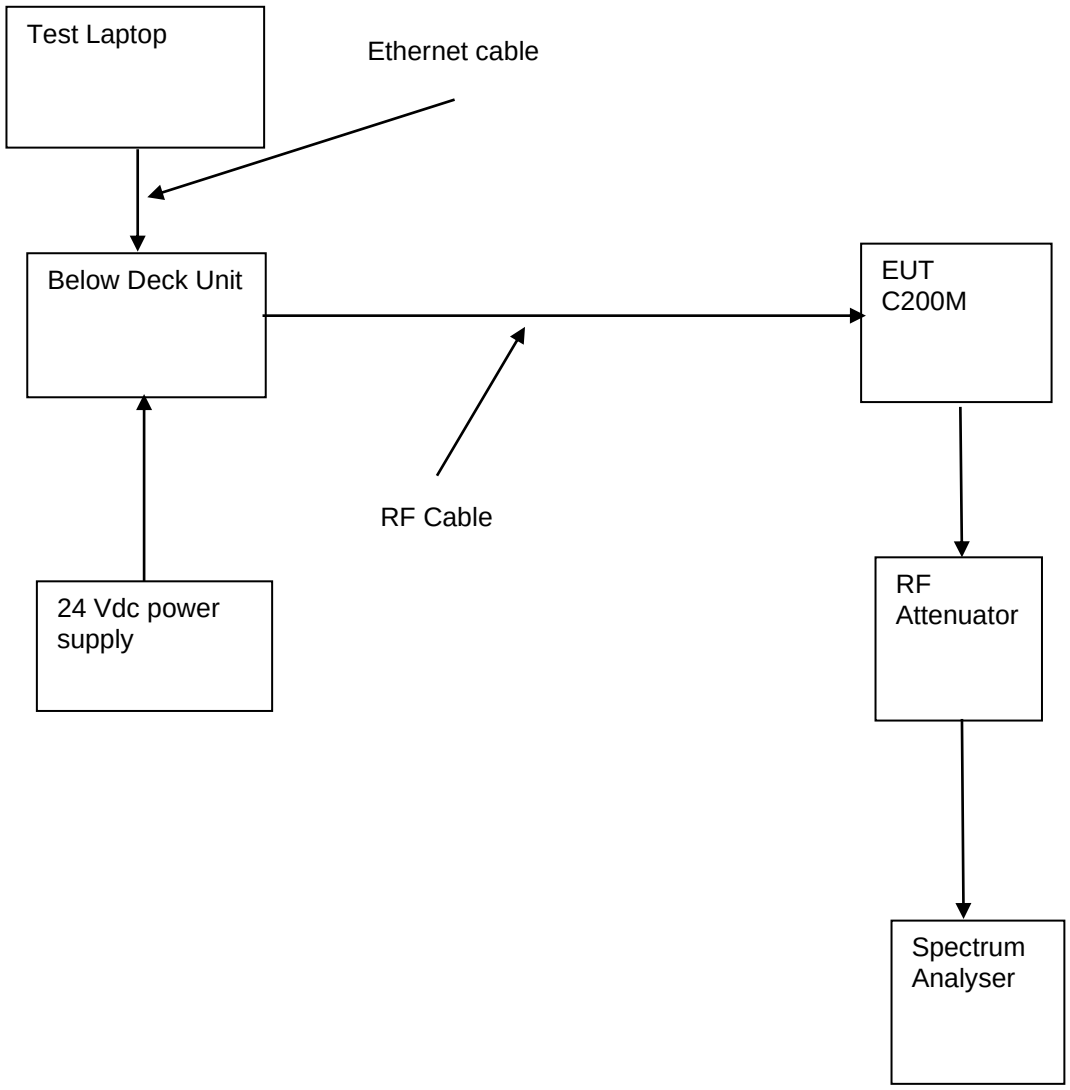
8 Modifications

No modifications were performed during this assessment.

9 EUT Test Setup

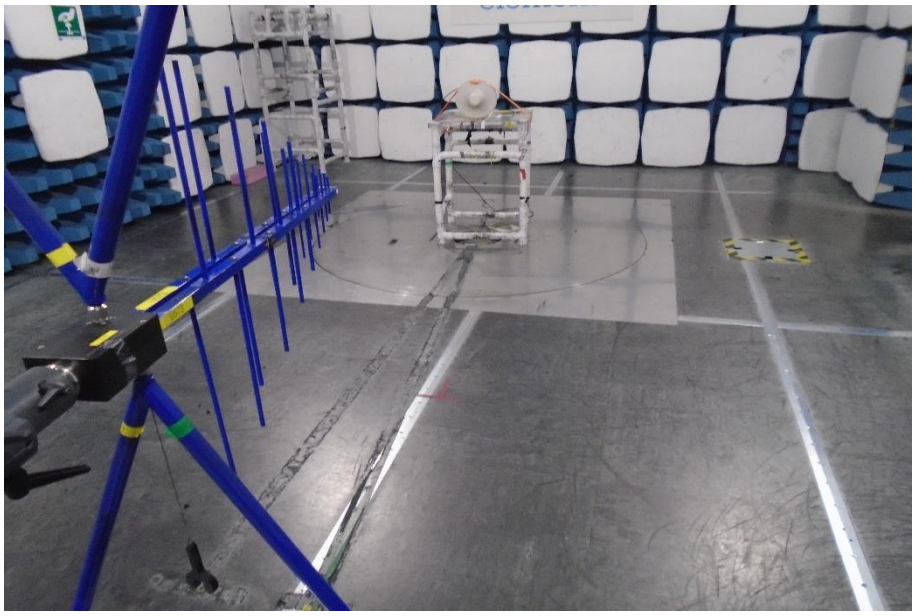
9.1 Block Diagram

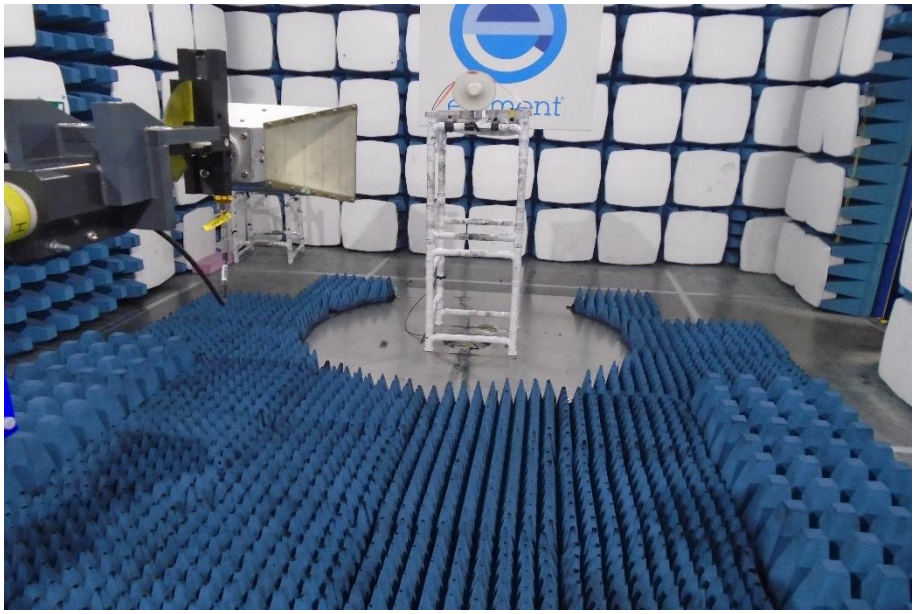
The following diagram shows basic EUT interconnections:



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 (See Note)
Element Transmitter Bench Test (See Note)
ETS Lindgren EMPower V1.0.4.2

Note:

The version of the Element software used is recorded in the results sheets contained within this report.

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 24.0 Vdc from the below decks unit.

10.1 Extreme Test Conditions

Extreme temperatures and voltages are required to be tested, the following extremes were used:

Voltage	***Temperature***
Nominal	-30°C to +50°C in 10°C steps
10.8 Vdc	20°C
30.0 Vdc	20°C

Extreme voltages are applied to the Below Deck Unit

11 RF power output (mean output power)

11.1 Definition

The average power supplied to the antenna transmission line by a transmitter during an interval of time sufficiently long compared with the lowest frequency encountered in the modulation taken under normal operating conditions.

11.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	Part 25.204 (a)
Deviations From Standard:	None
Modulations:	C1-QPSK= 41.666 kHz C2-QPSK =83.333 kHz C8-QPSK=333.333 kHz 2XC8-QPSK=666.666 kHz

Environmental Conditions (Normal Environment)

Temperature: 21°C	+15 ºC to +35 ºC (as declared)
Humidity: 36%RH	20%RH to 75%RH (as declared)
Supply: 24.0 Vdc	

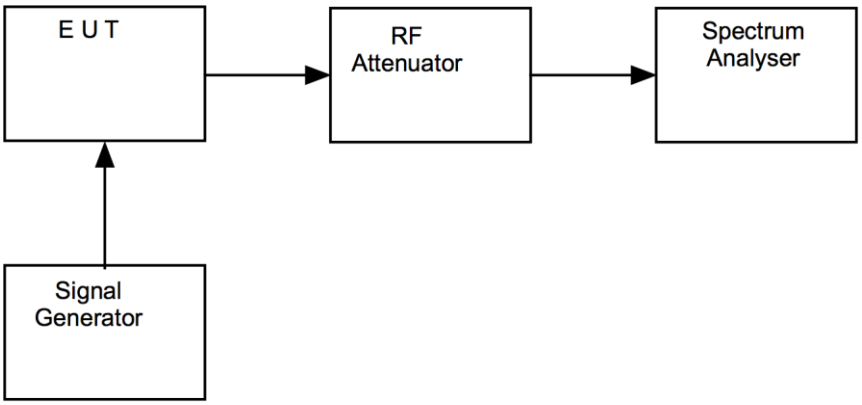
11.3 Test Limits

+ 40 dBW in any 4 kHz band

11.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure i, the power of the EUT at the frequency of maximum response was calculated by taking into account any cable and attenuator calibration factors. It was confirmed that at the maximum input level there was no compression. The measurement was repeated with 3dB greater input signal.
Gain was calculated by removing the EUT from the setup and measuring the signal generator to EUT levels.

Figure i Test Setup



11.5 Test Equipment

Equipment Description	*Manufacturer*	*Equipment Type*	*Element No*	*Due For Calibration*
Power Meter	Dare	RPR3006W	REF2223	2024-03-03
Attenuator	Radiall	R417030110	U730	Cal in use
Attenuator	AtlanTecRF	AS7836	U598	Cal in use
Spectrum Analyser	R&S	FSU26	U405	2024-05-22
Signal Generator	R&S	SMBV100A	U674	2024-05-02

11.6 Test Results

*C1 Transmitter output power setting = 220 = 32 dBm**							
Channel	***Channel Frequency (MHz)***	***Attenuation Loss (dB)***	***Level at Power meter (dBm)***	***Antenna Gain (dBi)***	***EIRP Carrier Power (dBm)***	***EIRP Carrier power (dBW)***	***Limit (dBW)***
1	1616.020833	53.6	-21.30	1.2	33.50	3.50	40.00
80	1619.312500	53.6	-21.50	1.2	33.30	3.30	40.00
160	1622.645800	53.3	-20.40	1.2	34.10	4.10	40.00
240	1625.979174	53.4	-20.50	1.2	34.10	4.10	40.00

*2C8Q Transmitter output power setting = 270 = 41 dBm**							
Channel	***Channel Frequency (MHz)***	***Attenuation Loss (dB)***	***Level at Power meter (dBm)***	***Antenna Gain (dBi)***	***EIRP Carrier Power (dBm)***	***EIRP Carrier power (dBW)***	***Limit (dBW)***
8	1616.333000	53.9	-13.00	1.2	42.10	12.10	40.00
80	1619.333000	53.6	-12.80	1.2	42.00	12.00	40.00
160	1622.666000	53.8	-12.30	1.2	42.70	12.70	40.00
232	1625.666000	53.8	-11.90	1.2	43.10	13.10	40.00

*C2 Transmitter output power setting = 210 = 31 dBm**							
Channel	***Channel Frequency (MHz)***	***Attenuation Loss (dB)***	***Level at Power meter (dBm)***	***Antenna Gain (dBi)***	***EIRP Carrier Power (dBm)***	***EIRP Carrier power (dBW)***	***Limit (dBW)***
1	1616.041600	54.00	-22.8	1.2	32.40	2.40	40.00
80	1619.290400	54.00	-22.8	1.2	32.40	2.40	40.00
160	1622.623000	54.00	-21.7	1.2	33.50	3.50	40.00
240	1625.959000	54.00	-21.3	1.2	33.90	3.90	40.00

*C8 Transmitter output power setting = 270 = 38 dBm**							
Channel	***Channel Frequency (MHz)***	***Attenuation Loss (dB)***	***Level at Power meter (dBm)***	***Antenna Gain (dBi)***	***EIRP Carrier Power (dBm)***	***EIRP Carrier power (dBW)***	***Limit (dBW)***
4	1616.167000	54.20	-16.1	1.2	39.30	9.30	40.00
80	1619.157000	53.90	-16.3	1.2	38.80	8.80	40.00
160	1622.490000	54.00	-15.8	1.2	39.40	9.40	40.00
236	1625.833000	54.00	-15.3	1.2	39.90	9.90	40.00

Notes: 1: The RF power meter takes into account the duty cycle.
2: Correction factor for dBm to dBW = 30dB

Note: * Client expected output power for a given power setting within the GUI.

12 Emission Limitations

12.1 Definition

The emission mask is the required attenuation relative to the channel power up to 250% of the channel bandwidth. For frequencies greater than 250% of the authorized bandwidth, refer to spurious emission measurement.

12.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	Part 25.202 (f)
Deviations From Standard:	None
Source Modulations:	C1 / C2 / C8 / 2C8Q
Measurement BW, RBW:	3 kHz
Video BW: (requirement 3x RBW) Measurement Detector	30 kHz Av

Environmental Conditions (Normal Environment)

Temperature: 20°C	+15 ºC to +35 ºC (as declared)
Humidity: 36 %RH	20%RH to 75%RH (as declared)
Supply: 24.0 Vdc	

12.3 Test Limits

Emission limitations. Except for SDARS terrestrial repeaters and as provided for in paragraph (i), the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the schedule set forth in paragraphs (f)(1) through (f)(4) of this section. The out-of-band emissions of SDARS terrestrial repeaters shall be attenuated in accordance with the schedule set forth in paragraph (h) of this section.

(1) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: 25 dB;

(2) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: 35 dB;

(3) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: An amount equal to 43 dB plus 10 times the logarithm (to the base 10) of the transmitter power in watts;

12.4 Test Method

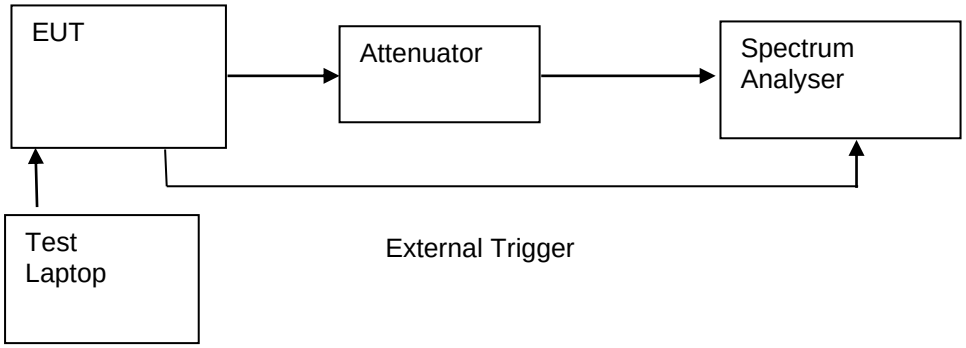
With the EUT setup as per section 9 of this report and connected as per Figure iii, the RF spectrum mask was measured on a spectrum analyser.

The plots shown below make use of a gated scan during Tx period only.

Tested on the bottom/top and two evenly spaced channels.

Spectrum analyser offsets include cable and attenuator losses, antenna gain and 3kH – 4 kHz bandwidth correction (1.2 dB).

Figure iii Test Setup

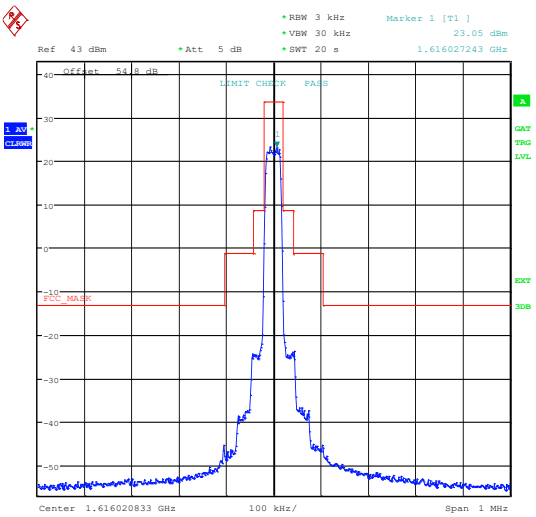


12.5 Test Equipment

Equipment Description	*Manufacturer*	*Equipment Type*	*Element No*	*Due For Calibration*
Attenuator	Radiall	R417030110	U730	Cal in use
Attenuator	AtlanTecRF	AS7836	U598	Cal in use
Spectrum Analyser	R&S	FSU26	U405	2024-05-22
Signal Generator	R&S	SMBV100A	U674	2024-05-02

12.6 Test Results

CH 1 C1



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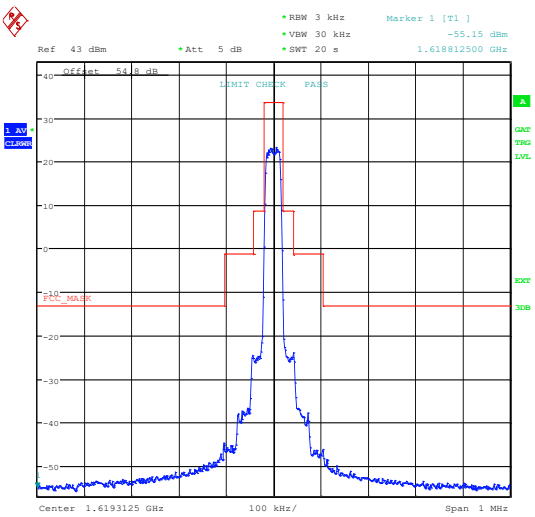
CH 80 C1



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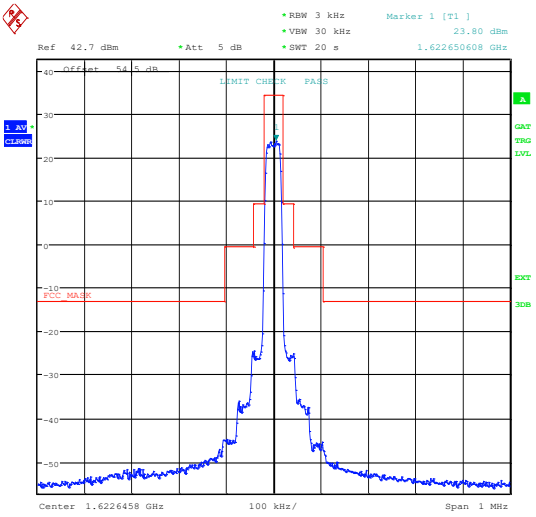
CH 160 C1



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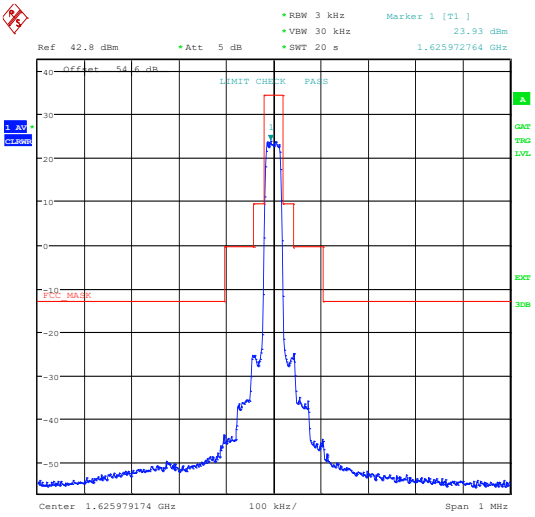
CH 240 C1



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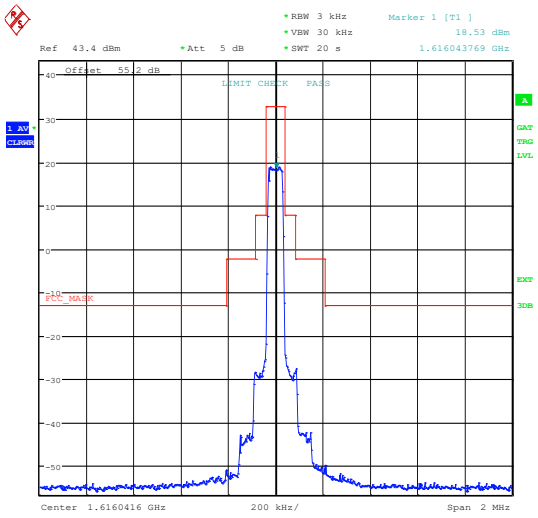
CH 1 C2



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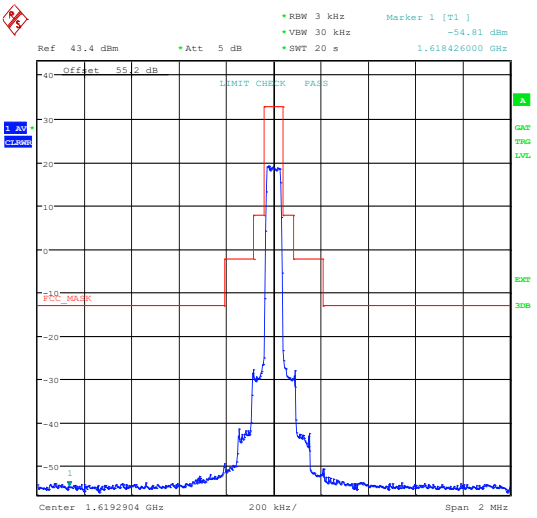

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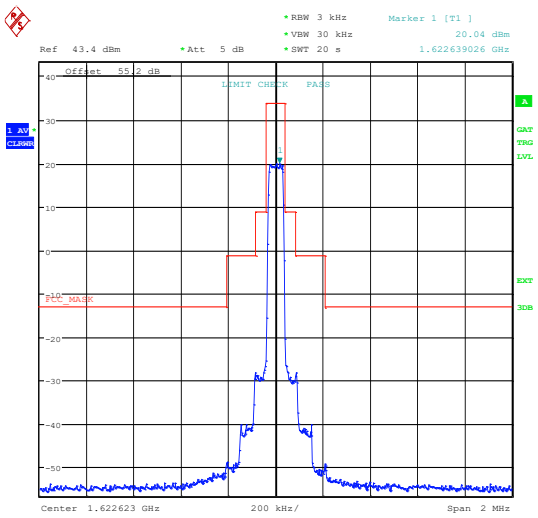

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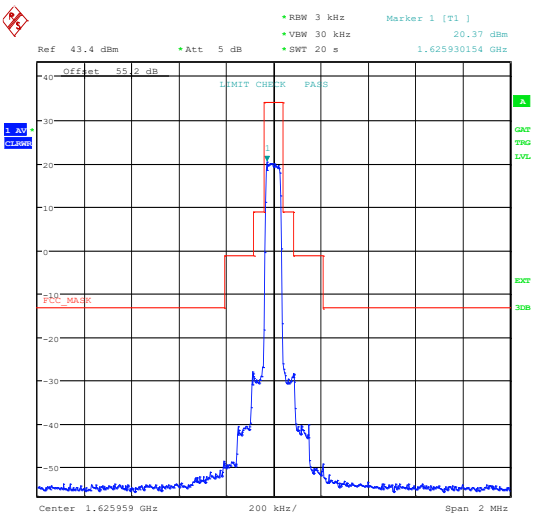
CH 240 C2



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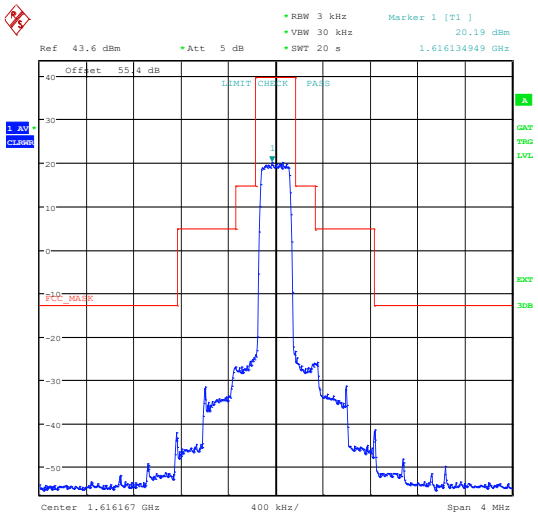
CH 4 C8



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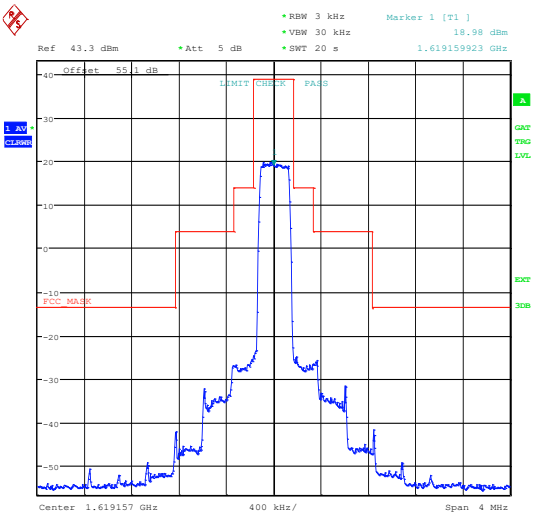
CH 80 C8



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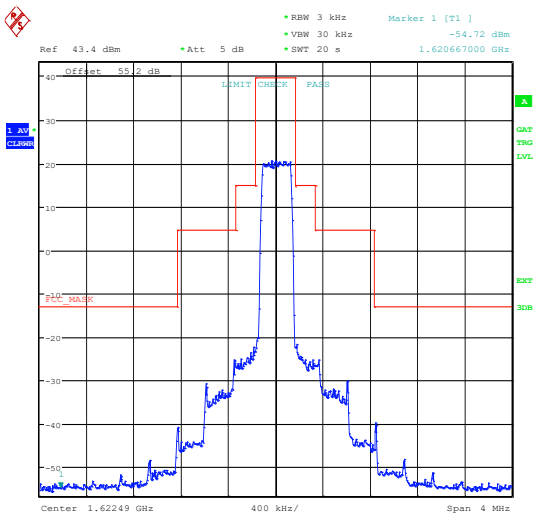
CH 160 C8



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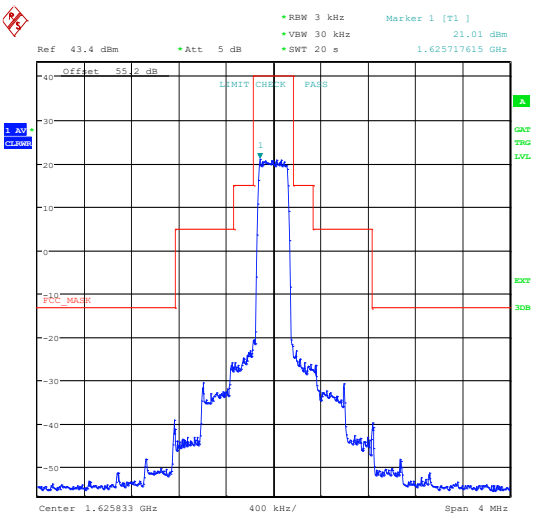
CH 236 C8



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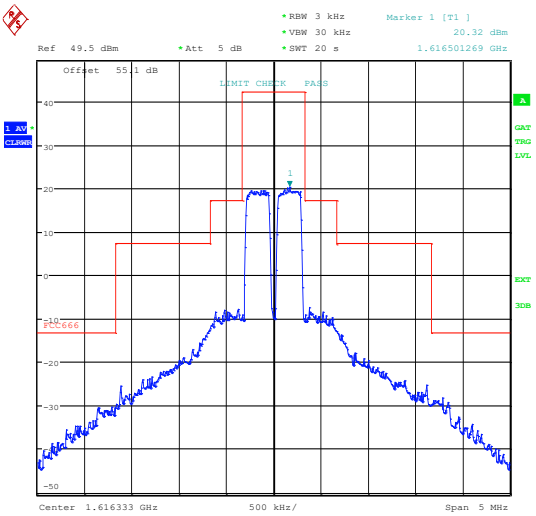
CH 8 2C8Q



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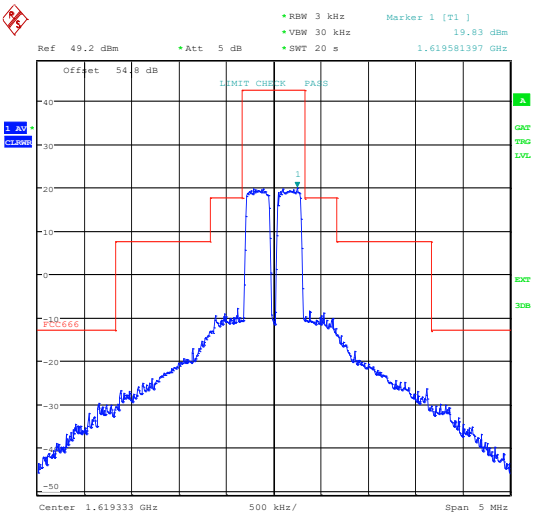
CH 80 2C8Q



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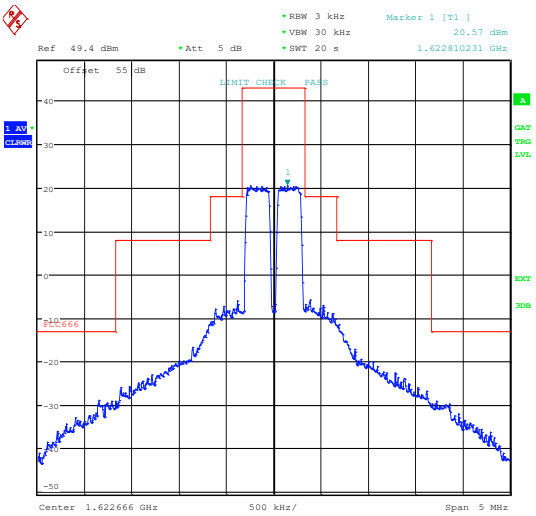

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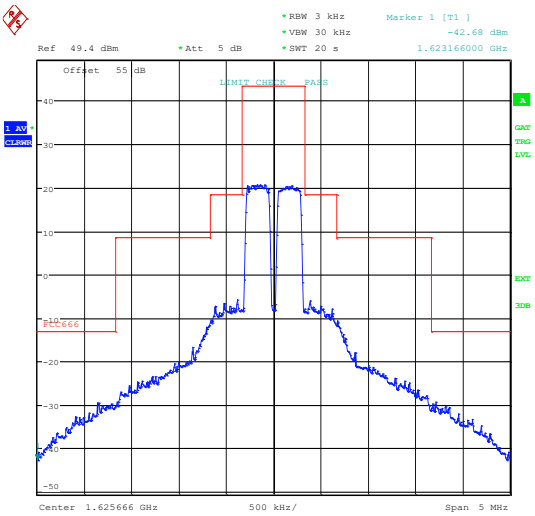
CH 232 2C8Q



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Note: the reference level offset takes into account the attenuator and cable loss, and antenna gain, and the 3 kHz to 4 kHz bandwidth correction factor.

13 Field strength of spurious radiation

13.1 Definitions

Spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation.

13.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Chamber 1
Test Standard and Clause:	Part 25.202(f) Part 25.216(c)(f) Part 2.1052
Deviations From Standard:	None
Frequency Range Examined:	30 MHz – 18 GHz
Measurement BW:	30 MHz to 1 GHz: 120 kHz; Above 1 GHz: 1 MHz
Measurement Detector:	Pre Scan Up to 1 GHz: Peak/ Maximised emissions RMS Pre scan Above 1 GHz: Peak/ Maximised emissions RMS

Environmental Conditions (Normal Environment)

Temperature: 21 °C	+15 ºC to +35 ºC (as declared)
Humidity: 36 %RH	20%RH to 75%RH (as declared)

13.3 Test Limits

Part 25:202(f)(3)
In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: An amount equal to 43 dB plus 10 times the logarithm (to the base 10) of the transmitter power in watts

The spurious limit was calculated as follows:

$$(10\log P_{watts}*1000) - (43+10\log(P_{watts})) = \text{limit-13 dBm}$$

Protection of the radio navigation satellite service

Part 25:216(f)
The e.i.r.p. density of emissions from mobile earth stations placed in service after July 21, 2002 with assigned uplink frequencies between 1610 MHz and 1660.5 MHz shall not exceed −70 dBW/MHz, averaged over any 2 millisecond active transmission interval, in the band 1559–1605 MHz. The e.i.r.p. of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed −80 dBW, averaged over any 2 millisecond active transmission interval, in the 1559–1605 MHz band.

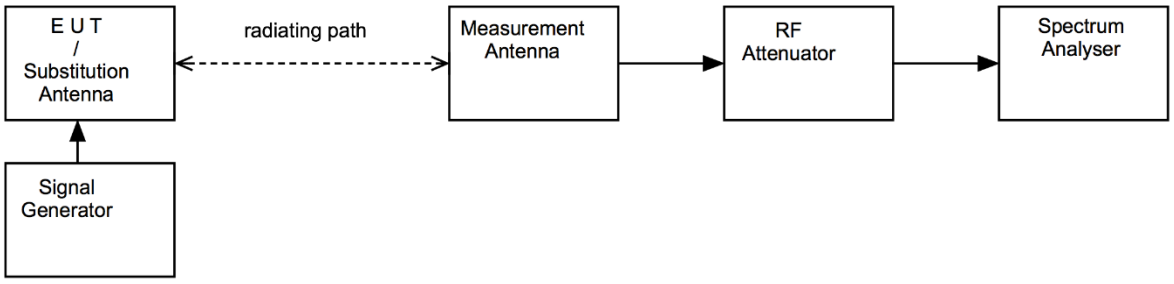
Part 25:216(f)
Mobile earth stations placed in service after July 21, 2002 with assigned uplink frequencies in the 1610–1660.5 MHz band shall suppress the power density of emissions in the 1605–1610 MHz band to an extent determined by linear interpolation from −70 dBW/MHz at 1605 MHz to −10 dBW/MHz at 1610 MHz.

13.4 Test Method

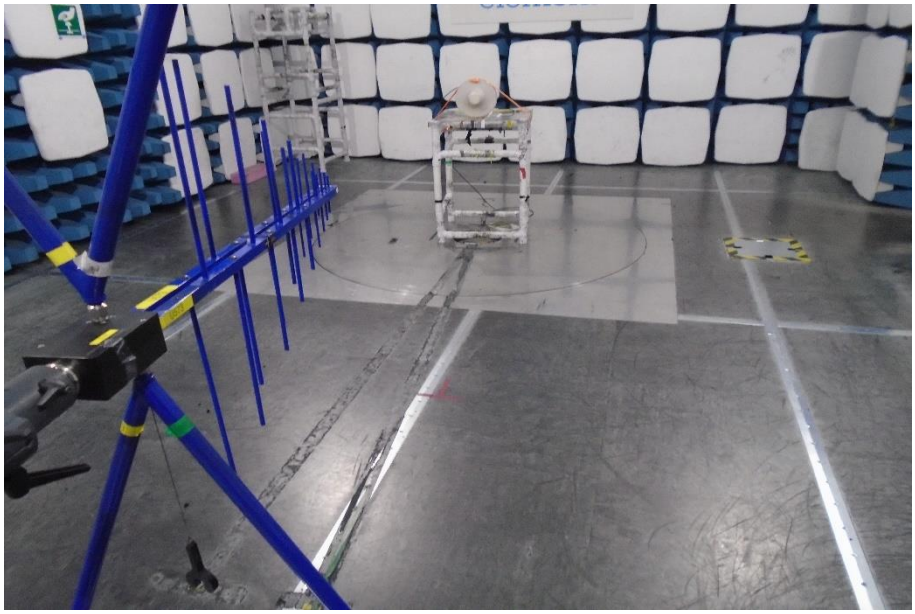
With the EUT setup as per section 9 of this report and connected as per Figure vi and with the EUT's antenna replaced by a non-radiating load, the emissions from the EUT were measured on a spectrum analyzer / EMI receiver. The EUT was rotated in three orthogonal planes and the measurement antenna height scanned (below 1GHz, from 1 to 4 m; above 1GHz as necessary) in order to maximise emissions.
The measurements were performed with EUT set at its maximum gain. All modulation schemes, data rates and power settings were used to observe the worst-case configuration at each frequency.
The EUT was substituted with a known generator and antenna and for the same level achieved at the analyser, the effective radiated power was recorded.
Pre-scan plots are shown with a peak detector and 100kHz RBW.

TCH_2C8Q mode was tested, as this mode provided the highest output power.
GUI transmitter output power setting = 270

Figure vi Test Setup



Test Setup Photograph(s)

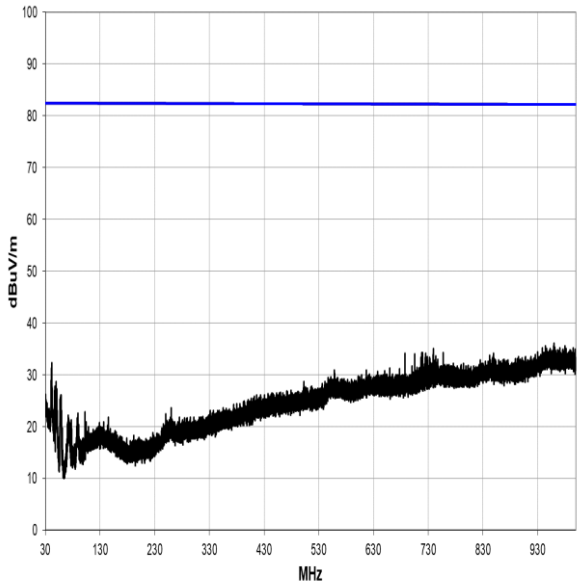


13.5 Test Equipment

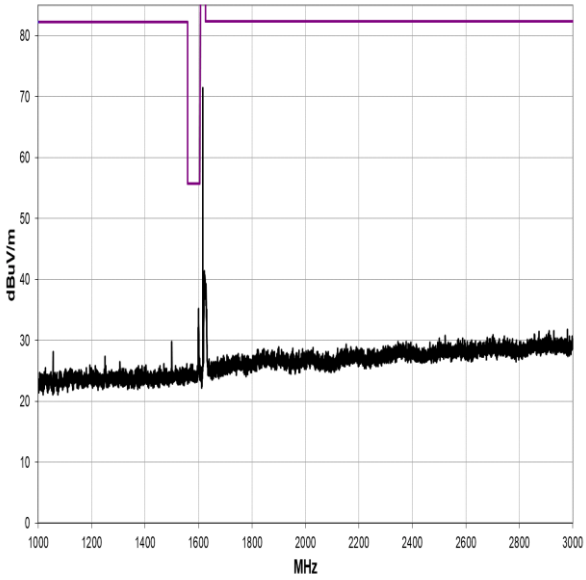
Equipment Description	*Manufacturer*	*Equipment Type*	*Element No*	*Due For Calibration*
Spectrum Analyser	R&S	FSU26	U405	2024-05-22
Bilog	Chase	CBL611/B	U573	2024-10-14
Biconical Antenna	Schwarzbeck	VUBA9117	REF859	2025-08-05
Bicoical Antenna	Schwarzbeck	VHBA 9123	UH029	2025-03-09
Radio Chamber - PP	Rainford EMC	ATS	REF940	2026-01-29
PreAmp	Watkins Johnson	6201-69	UH372	2024-03-07
Pre Amp	Agilent	8449B	L572	2024-10-30
Signal Generator	R&S	SMB100A	U677	2025-02-01
1-18GHz Horn	EMCO	3115	L139	2024-07-01
High Pass Filter	BSC	SH4141	REF977	2025-02-15
Horn Antenna	EMCO	3115	TRL138	2024-05-23
Tuneable Notch Filter 1GHz - 2GHz	K&L Microwave Inc	3TNF-1000/2000-N	U694	Calibrate in Use
High Pass Filter	BSC	SH4141	REF977	2025-02-15

13.6 Test Results

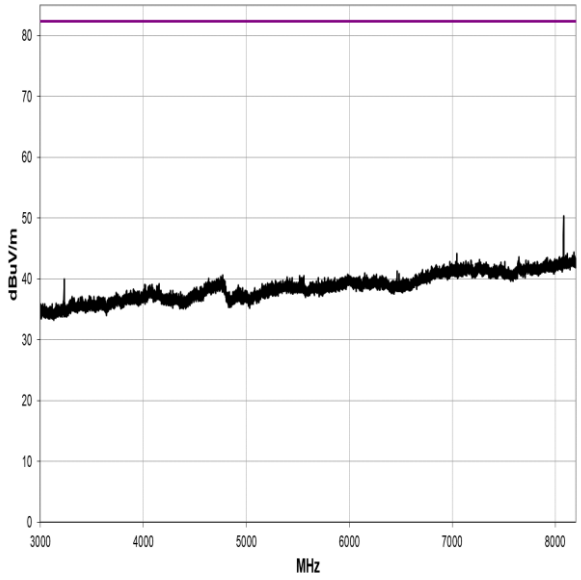
CH 8 - 30 MHz-1GHz



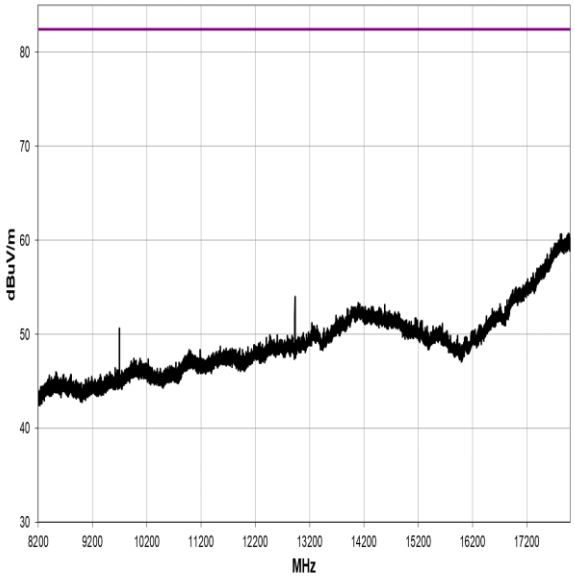
CH 8 - 1 GHz - 3 GHz
(Notch Filter U694)



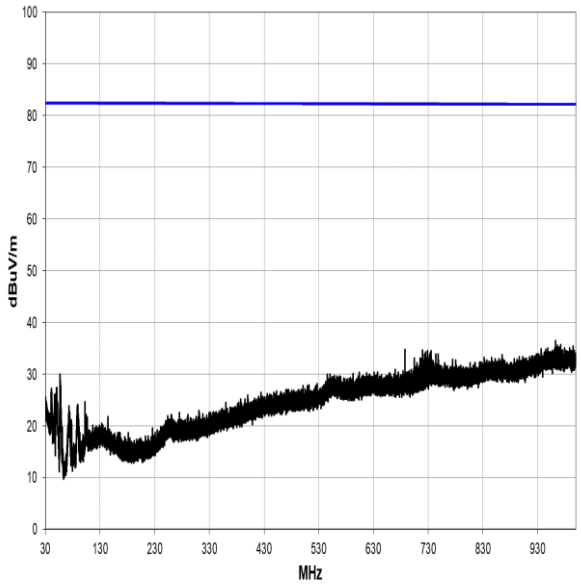
CH 8 - 3 GHz - 8.2 GHz
(Filter REF977)



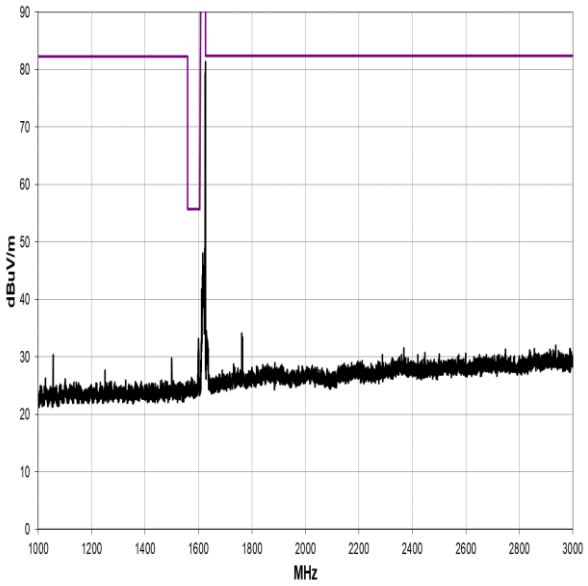
CH 8 - 8.2 GHz - 18 GHz
(Filter REF977)



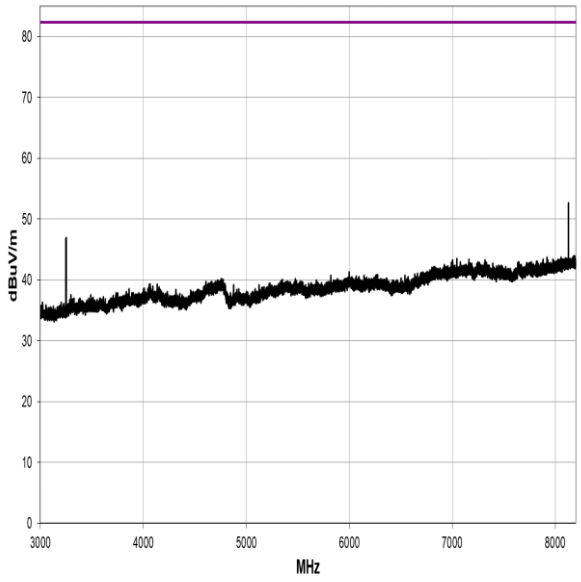
CH 232 - 30 MHz-1GHz



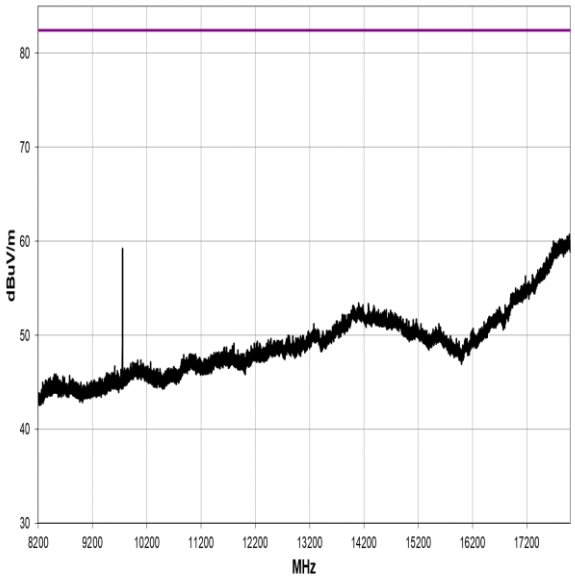
CH 8 - 1 GHz - 3 GHz
(Notch Filter U694)



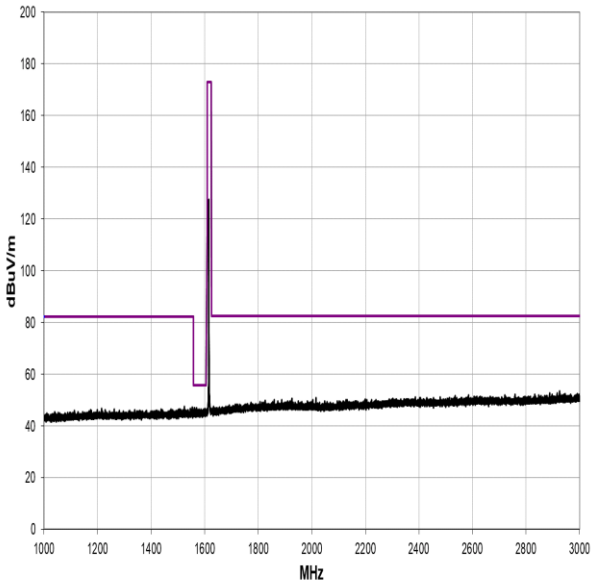
CH 232 - 3 GHz - 8.2 GHz
(Filter REF977)



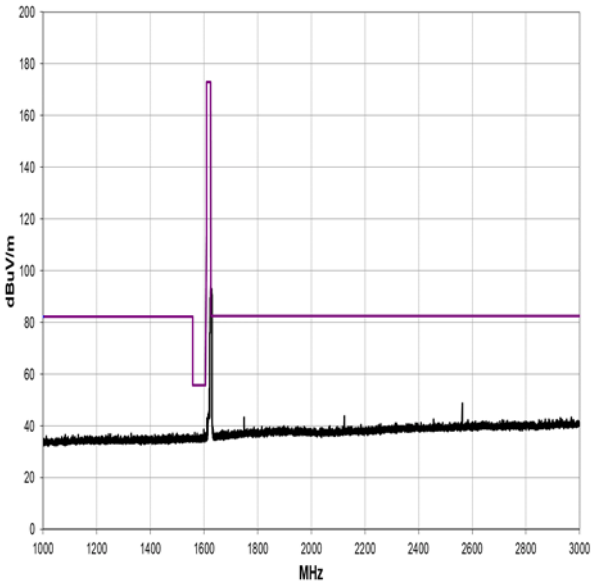
CH 232 - 8.2 GHz - 18 GHz
(Filter REF977)



CH 8 - 1 GHz - 3 GHz No filter



CH 232 - 1 GHz - 3 GHz No filter



Note: Channel 232 plot 1 GHz-3 GHz with no filter fitted, does not show the full power of the signal due to the pulsed nature of the transmit signal.

14 Frequency stability

14.1 Definition

Frequency stability is a measure of the frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at +20C and rated supply voltage.

14.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	Part 25.202 (d) Part 2.1055
Deviations From Standard:	None
Temperature Extreme Environment Test Range:	-30 to +50 C
Voltage Extreme Environment Test Range:	Vmax 30.0 Vdc & Vmin 10.8 Vdc As declared

Environmental Conditions (Normal Environment)

Temperature: 22.5 °C Standard Requirement: +20 ºC

Humidity: 40.6 %RH

Extreme Environment test Levels

$T_{nominal}$	20 ºC
$T_{minimum}$	-30 ºC
$T_{maximum}$	+50 ºC
$V_{nominal}$	24.0 Vdc
$V_{minimum}$	10.8 Vdc
$V_{maximum}$	30.0 Vdc

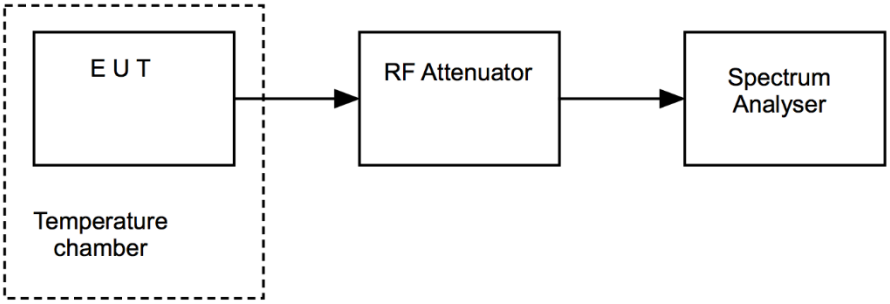
14.3 Test Limits

Frequency tolerance, Earth stations. The carrier frequency of each earth station transmitter authorized in these services shall be maintained within 0.001 percent of the reference frequency.

14.4 Test Method

Frequency stability is a measure of the frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at +20 °C and rated supply voltage.
The operating carrier frequency shall be set up in accordance with the manufacturer's published operation and instruction manual prior to the commencement of these tests. No adjustment of any frequency determining circuit element shall be made subsequent to this initial set-up. Frequency stability is tested:
a) At 10 °C intervals of temperatures between −30 °C and +50 °C at the manufacturer's rated supply voltage, and
b) At +20 °C temperature and ±15% supply voltage variations. If a product is specified to operate over a range of input voltage then the −15% variation is applied to the lowermost voltage and the +15% is applied to the uppermost voltage.
During the test all necessary settings, adjustments and control of the EUT have to be performed without disturbing the test environment, i.e., without opening the environmental chamber. The frequency stabilities can be maintained to a lesser temperature range provided that the transmitter is automatically inhibited from operating outside the lesser temperature range. For handheld equipment that is only capable of operating from internal batteries and the supply voltage cannot be varied, the frequency stability tests shall be performed at the nominal battery voltage and the battery end point voltage specified by the manufacturer. An external supply voltage can be used and set at the internal battery nominal voltage, and again at the battery operating end point voltage which shall be specified by the equipment manufacturer.

Figure vii Test Setup



14.5 Test Equipment

Equipment Description	*Manufacturer*	*Equipment Type*	*Element No*	*Due For Calibration*
Attenuator	Radiall	R417030110	U730	Cal in use
Attenuator	AtlanTecRF	AS7836	U598	Cal in use
Spectrum Analyser	R&S	FSU26	U405	2024-05-22
Signal Generator	R&S	SMBV100A	U674	2024-05-02
Temperature Indicator	Fluke	52 Series II	L426	2024-07-19
Temperature Chamber	Votsch	VT 4002	U521	Use L426 or U720
Power Supply	Farnell	AP60/50	U194	Use U764
Digital Voltmeter	Amprobe	33XR-A	U764	2024-07-28

14.6 Test Results

EUT Low Frequency:1616.020833 MHz					
Test Environment		*Measured Frequency (MHz)*	*Frequency error (kHz)*	*Frequency error (%)*	*Result*
-30 C	$V_{nominal}$	1616.020272	0.16	0.000010	PASS
-20 C	$V_{nominal}$	1616.019952	0.16	0.000010	PASS
-10 C	$V_{nominal}$	1616.020032	0.08	0.000005	PASS
0 C	$V_{nominal}$	1616.020232	0.12	0.000007	PASS
+10 C	$V_{nominal}$	1616.020392	0.28	0.000017	PASS
+20 C	$V_{minimum}$	1616.020032	0.08	0.000005	PASS
	$V_{nominal}$	1616.020112	N/A	N/A	PASS
	$V_{maximum}$	1616.019832	0.28	0.000017	PASS
+30 C	$V_{nominal}$	1616.019912	0.20	0.000012	PASS
+40 C	$V_{nominal}$	1616.020032	0.08	0.000005	PASS
+50 C	$V_{nominal}$	1616.020272	0.16	0.000010	PASS

EUT High Frequency: 1625.979174 MHz					
Test Environment		*Measured Frequency (MHz)*	*Frequency error (kHz)*	*Frequency error (%)*	*Result*
-30 C	$V_{nominal}$	1625.978613	0.36	0.000022	PASS
-20 C	$V_{nominal}$	1625.978253	0.00	0.000000	PASS
-10 C	$V_{nominal}$	1625.978052	0.20	0.000012	PASS
0 C	$V_{nominal}$	1625.978573	0.32	0.000020	PASS
+10 C	$V_{nominal}$	1625.978693	0.44	0.000027	PASS
+20 C	$V_{minimum}$	1625.978333	0.08	0.000005	PASS
	$V_{nominal}$	1625.978253	N/A	N/A	PASS
	$V_{maximum}$	1625.978253	0.00	0.000000	PASS
+30 C	$V_{nominal}$	1625.978093	0.16	0.000010	PASS
+40 C	$V_{nominal}$	1625.978293	0.04	0.000002	PASS
+50 C	$V_{nominal}$	1625.978333	0.08	0.000005	PASS

15 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**