Report on the Radio Testing

For

Ocado Innovation Limited

on

RCOM Base Station

Report no. TRA-059223-47-06B

20th July 2023

RF930 6.0

0026

Report Number: TRA-059223-47-06B
Issue: B

REPORT ON THE RADIO TESTING OF A
Ocado Innovation Limited
RCOM Base Station
WITH RESPECT TO SPECIFICATION
FCC 47CFR Subpart E

TEST DATE: 3rd - 11th May 2023

Tested by: D Winstanley, S Hodgkinson, S lung Siu

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Date: 20th July 2023

Disclaimers:

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[2] THE RESULTS CONTAINED IN THIS DOCUMENT RELATE ONLY TO THE ITEM(S) TESTED

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1 Revision Record

Issue Number	***Issue Date***	***Revision History***
A	28th June 2023	Original
B	20th July 2023	Update Modulation in section 7.4 & Table heading in section 17.5

2 Summary

TEST REPORT NUMBER:	TRA-059223-47-06B
WORKS ORDER NUMBER:	TRA-059223-07
PURPOSE OF TEST:	Testing of radio frequency equipment per the relevant authorization procedure of chapter 47 of CFR (code of federal regulations) Part 2, subpart J.
TEST SPECIFICATION:	47CFR15 Subpart E
EQUIPMENT UNDER TEST (EUT):	RCOM Base Station
FCC IDENTIFIER:	2AGHF-RCOMBS003
EUT SERIAL NUMBER:	OCAH00077
MANUFACTURER/AGENT:	Ocado Innovation Limited
ADDRESS:	Trident Place, Hatfield Business Park Mosquito Way, Hatfield Hertfordshire AL10 9UL United Kingdom
CLIENT CONTACT:	Ed Briggs ☎ 07557 860903 ✉ Ed.Briggs@Ocado.com
TEST DATE:	3rd - 11th May 2023
TESTED BY:	D Winstanley, S Hodgkinson, S lung Siu Element

2.1 Summary

Test Method and Description		*Requirement Clause 47CFR15*	*Applicable to this equipment*	*Result / Note*
Radiated spurious emissions (restricted bands of operation and cabinet radiation)		15.205	☒	*Pass*
AC power line conducted emissions		15.207	☒	*Pass*
Occupied bandwidth		15.407(e)	☒	*Pass*
Output power	Conducted	15.407(a)	☒	*Pass*
	PSD		☒	
	RPE		☐	
Conducted / radiated RF power out-of-band		15.407(b)	☒	*Pass*
Duty cycle		15.35(c)	☒	*Pass*
TPC and DFS		15.407(h)	☒	*Pass*
U-NII detection bandwidth		15.407(h)(2)	☒	*Pass*
CAC		15.407(h)(2)(ii)	☒	*Pass*
In-service monitoring		15.407(h)(2)(iii) & 15.407(h)(2)(iv)	☒	*Pass*
Statistical performance check		-	☒	*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).

General notes

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.

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4 Introduction

This report TRA-059223-47-06B presents the results of the Radio testing on a Ocado Innovation Limited, RCOM Base Station to specification 47CFR15 Radio Frequency Devices.

The testing was carried out for Ocado Innovation 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	☐	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 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 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 15 – Radio Frequency Devices.
- FCC KDB Publication 905462 D02 v01r02 – Compliance measurement procedures for unlicensed-national information infrastructure devices operating in the 5250-5350 MHz and 5470-5725 MHz bands incorporating dynamic frequency selection.
- ANSI C63.10-2013 – American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
- ANSI C63.4-2014 – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

5.2 Deviations from Test Standards

There were no deviations from the test standard.

6 Glossary of Terms

§	denotes a section reference from the standard, not this document
AC	Alternating Current
ANSI	American National Standards Institute
BW	bandwidth
C	Celsius
CAC	Channel Availability Check
CFR	Code of Federal Regulations
CW	Continuous Wave
dB	decibel
dBm	dB relative to 1 milliwatt
DC	Direct Current
DFS	Dynamic Frequency Selection
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 (now ISED)
ISED	Innovation, Science and Economic Development Canada
ITU	International Telecommunication Union
LBT	Listen Before Talk
LE-LAN	Licence-Exempt Local Area Network
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
PSD	Power Spectral Density
RF	Radio Frequency
RH	Relative Humidity
RMS	Root Mean Square
Rx	receiver
s	second
SVSWR	Site Voltage Standing Wave Ratio
TPC	Transmitter Power Control
Tx	transmitter
UKAS	United Kingdom Accreditation Service
U-NII	Unlicensed-National Information Infrastructure
V	volt
W	watt
Ω	ohm

7 Equipment Under Test

7.1 EUT Identification

- Name: RCOM Base Station
- Serial Number: OCAH00077
- Model Number: RCOM BS
- Software Revision: v12.0.18
- Build Level / Revision Number: 20058849 Rev 1.00

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 supplied Laptop
RCOM BCM

7.3 EUT Mode of Operation

7.3.1 Transmission

The EUT was set to transmit on the required channel in a communication link with a companion device (Bot Communications Module). A Laptop Supplied by the manufacturer containing Engineering Test Interface (ETIF) software, this software is used to select the region the EUT test scenario / operating mode and operating channel

7.4 EUT Radio Frequency Parameters

7.4.1 General

Frequency of operation:	5470 MHz – 5725 MHz
Modulation type(s):	OFDM
Occupied channel bandwidth(s):	10 MHz
Channel spacing:	10 MHz
Declared output power(s):	25 dBm EIRP
Nominal Supply Voltage:	24 Vdc

7.4.2 Antennas

Antenna Type:	airMAX 120 degree Sector Antenna
Frequency range:	5180 MHz – 5850 MHz
Impedance:	50 Ohms
Gain:	16.0 dBi gain 120 degree sector (with 2 dB cable loss) (Antenna Assembly Gain including cable = 14.0 dBi)
Polarisation:	Linear
Connector type:	RP-SMA
Environmental limits:	0 ºC to + 45 ºC
Mounting:	External

7.4.3 Product specific declarations

Multiple antenna configuration(s), e.g. MIMO:	Single Transmit, Receive Diversity
Fixed pt-pt operations (yes/no):	No

DFS Parameters:	
Highest and lowest EIRP:	25 dBm EIRP
Antenna used for testing:	None (pulses applied to both antenna A&B Simultaneously)
Antenna port impedance:	50 ohms
Channel loading / test file:	47.5 %
TPC description:	None
System architectures, data rates, U-NII channel bandwidths:	Frame based proprietary
Clients: Radar detection Master U-NII Device FCC ID	N/A

7.5 EUT Description

The EUT is part of a point to multipoint short range radio communications system, identified as RCOM, which operates in the frequency band 5470MHz to 5725MHz. The wireless part of this system comprises of two parts, the BS – Base Station (EUT) and the BCM – Bot Communications Module. One Base Station can be connected to many BCMs at any one time. The purpose of this radio system is to provide a low data rate, bi-directional, wireless connection to a large number of low speed factory floor machines which transport goods, in a controlled manner, around the facility. These machines are unmanned and the purpose of the wireless connection is to issue commands to the machines and relay status information back, from each of the machines, to a central point in the factory.

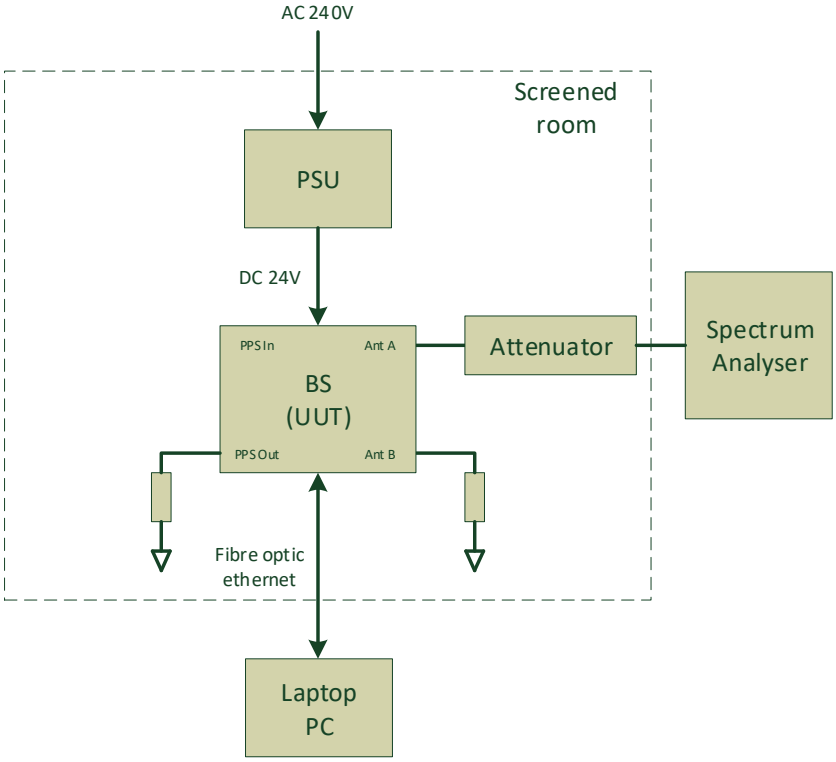
8 Modifications

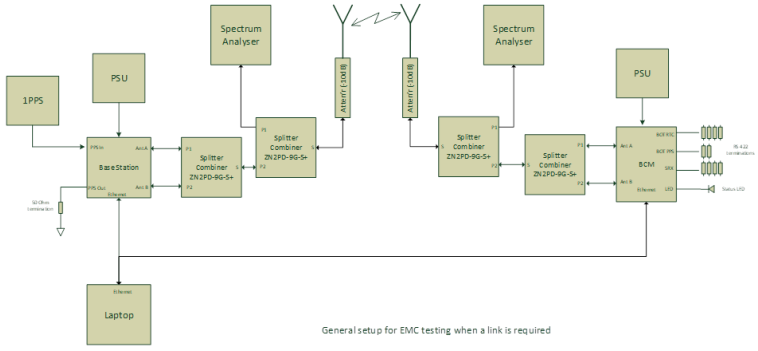
No modifications were performed during this assessment.

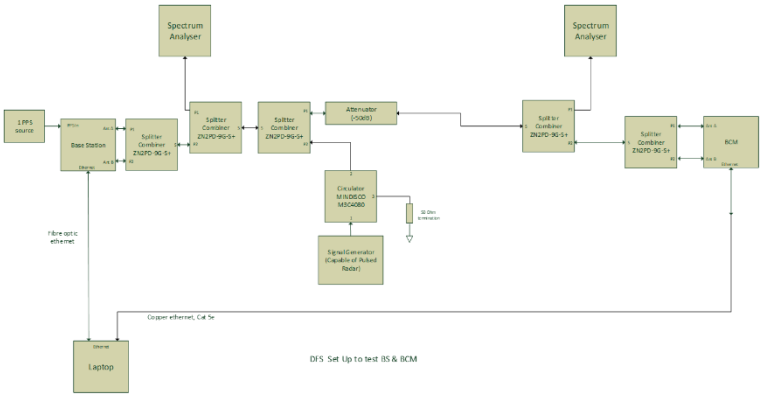
9 EUT Test Setup

9.1 Block Diagram

The following diagram shows basic EUT interconnections:



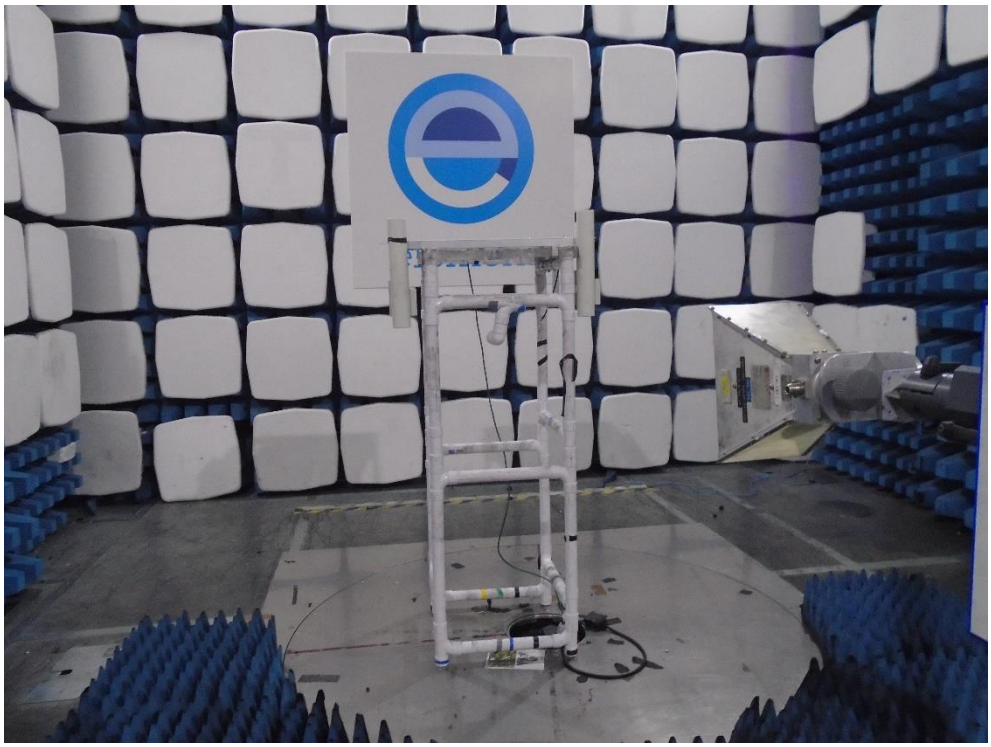




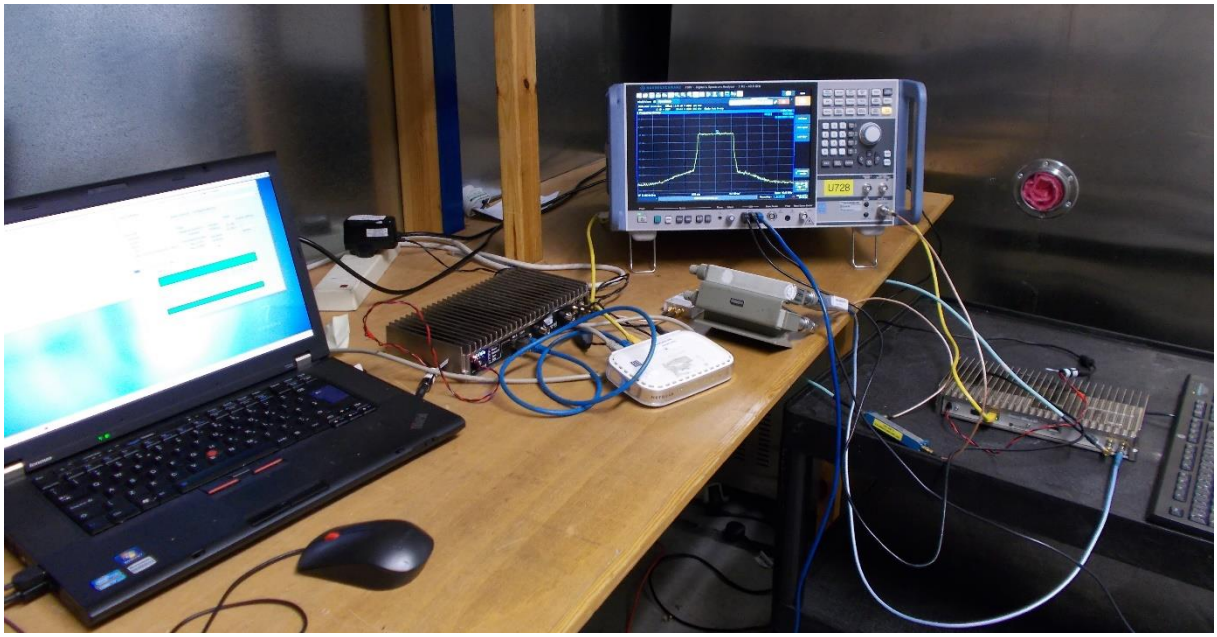
9.2 General Set-up Photograph

The following photograph shows basic EUT set-up:

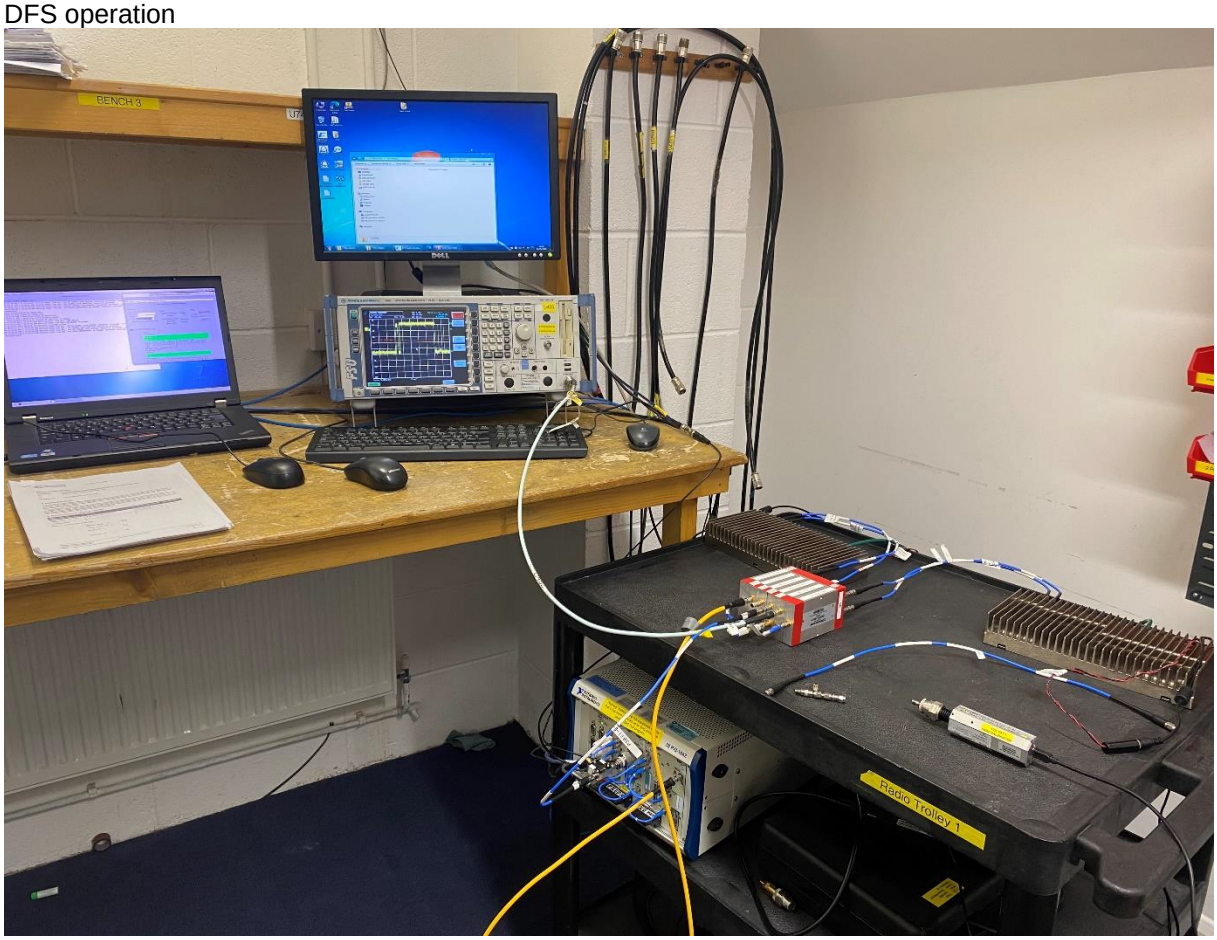
Radiated Emissions



Conducted Bench Test



DFS operation



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 V dc from a mains adaptor.

10.2 Varying Test Conditions

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

	Category	***Nominal***	***Variation***
☐	Mains	110V ac +/-2%	85% and 115%
☐	Battery	New battery	N/A
☒	Other	24 Vdc	N/A

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 Skelmersdale
Test Chamber:	Radio Chamber / EMC Chamber 1
Test Standard and Clause:	ANSI C63.10-2013, Clause 6.5 and 6.6
EUT Channels / Frequencies Measured:	5482.5MHz & 5712.5MHz
EUT Channel Bandwidths:	10 MHz
Deviations From Standard:	None
Measurement BW:	30 MHz to 1 GHz: 120 kHz Above 1 GHz: 1 MHz
Measurement Detector:	Up to 1 GHz: quasi-peak Above 1 GHz: RMS average and Peak

Environmental Conditions (Normal Environment)

Temperature: 21 °C	+15 ºC to +35 ºC (as declared)
Humidity: 50 %RH	20%RH to 75%RH (as declared)

Test Limits
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 3m)***
30-88	100
88-216	150
216-960	200
Above 960	500

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 100kHz 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:

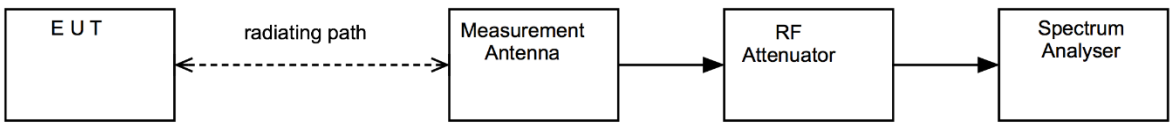
$$FS = PR + CL + AF - PA + DC - CF$$
$$Factor = CL + AF - PA$$

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. where average detector on pulsed harmonic understates the power);
CF is the distance factor in dB (where measurement distance different to limit distance);

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

Figure i Test Setup



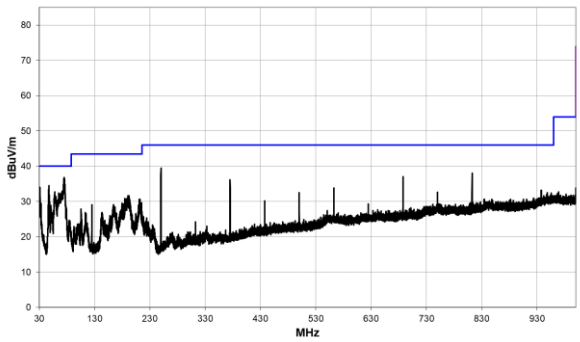
11.4 Test Equipment

Equipment Description	*Manufacturer*	*Equipment Type*	*Element No*	*Last Cal Calibration*	*Calibration Period*	*Due For Calibration*
PreAmp	Watkins Johnson	6201-69	U372	2023-03-01	1 Year	2024-03-07
Bilog	Chase	CBL611/B	U573	2021-01-28	2 Year	2024-02-13
Bilog	Chase	CBL611/A	U191	2020-11-10	2 Year	2025-02-23
Horn Antenna	EMCO	3115	L138	2022-05-23	1 Year	2024-05-23
Spectrum Analyser	R&S	FSU46	REF910	2022-12-22	1 Year	2024-01-10
Pre Amp	Agilent	8449B	L572	2022-10-24	1 Year	2023-10-24
EMI Receiver	R&S	ESR26	U489	2021-03-04	1 Year	2023-09-30
PreAmp	Com-power	PAM-840A	REF2390	2021-09-02	1 Year	2023-09-02
Horn Antenna	A-INFOMW	LB-180400-25-C-K	REF2246	2022-07-21	2 Year	2024-09-12

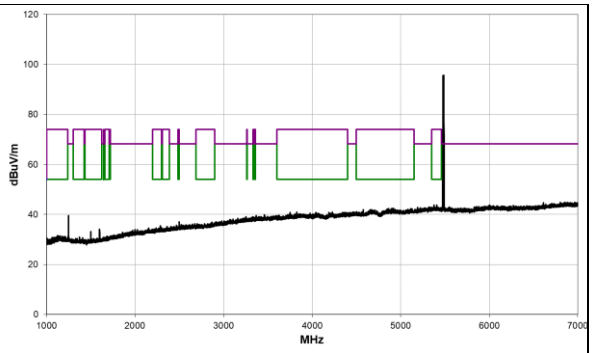
11.5 Test Results

Channel: 5482.5 MHz								
Detector	***Freq. (MHz)***	***Meas'd Emission (dBµV)***	***Factor***	***Duty Cycle Corr'n (dB)***	***Field Strength (dBµV/m)***	***Distance Extrap'n Factor (dB)***	***Limit (dBuV/m)***	***Margin (dB)***
QP	75.076	48.5	-15.5	0	33.0	0	40.0	-7.0
QP	74.741	48.0	-15.5	0	32.5	0	40.0	-7.5
QP	250.029	45.6	-8.9	0	36.7	0	46.0	-9.3
QP	30.000	34.3	-3.7	0	30.6	0	40.0	-9.4
QP	75.183	45.8	-15.5	0	30.3	0	40.0	-9.7
QP	47.294	42.6	-13.1	0	29.5	0	40.0	-10.5

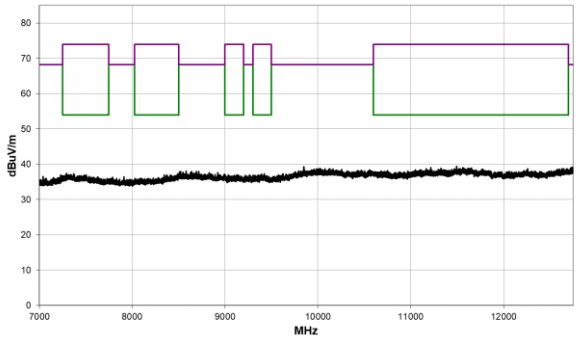
Frequency: 5482.5MHz								
Detector	***Freq. (MHz)***	***Meas'd Emission (dBµV)***	***Factor***	***Duty Cycle Corr'n (dB)***	***Field Strength (dBµV/m)***	***Distance Extrap'n Factor (dB)***	***Limit (dBuV/m)***	***Margin (dB)***
No Emission with 20dB of the limits								



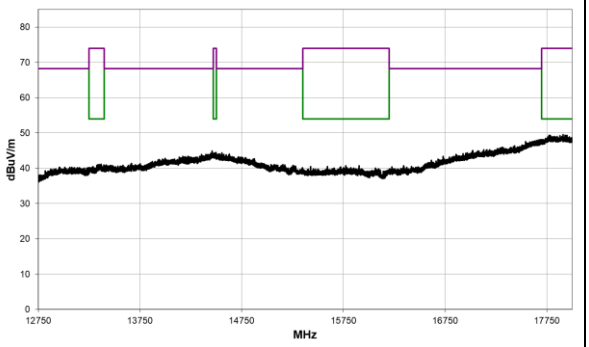
30MHz – 1GHz



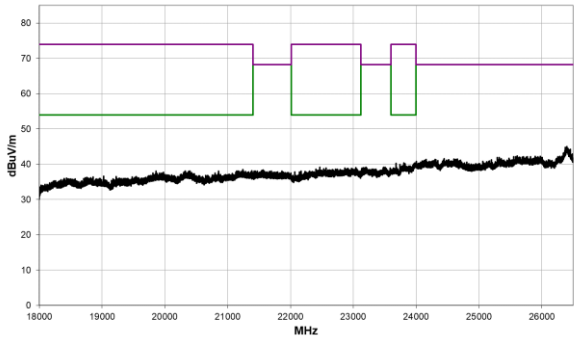
1GHz – 7GHz



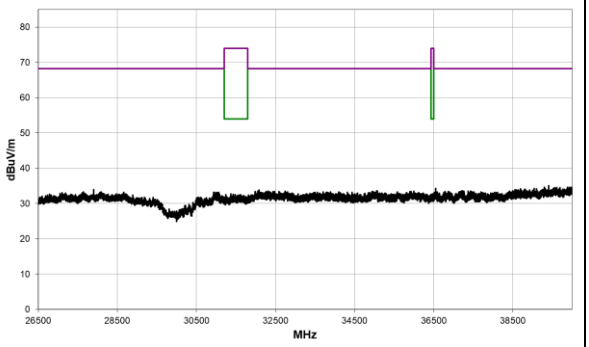
7GHz – 12.75 GHz



12.75GHz – 18GHz

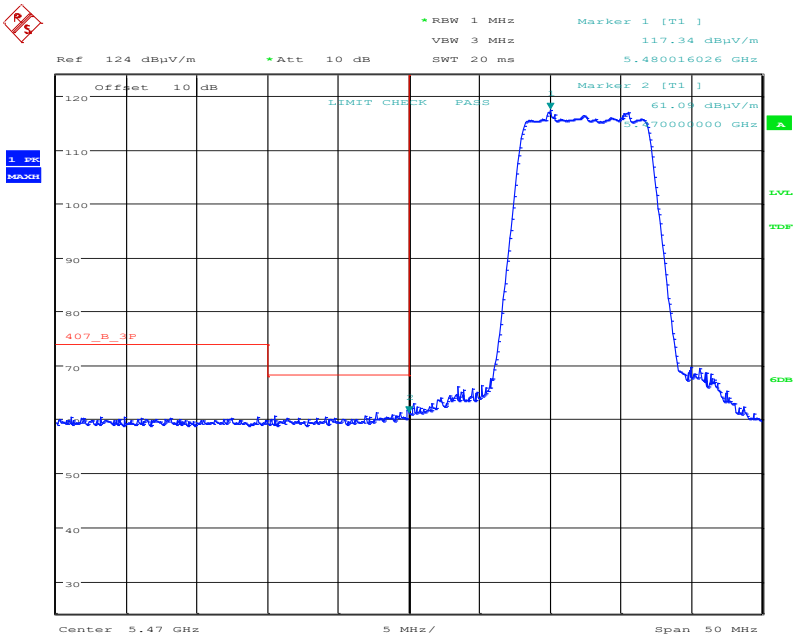


18GHz – 26.5GHz



26.5GHz – 40GHz

Band Edge Peak Limit:



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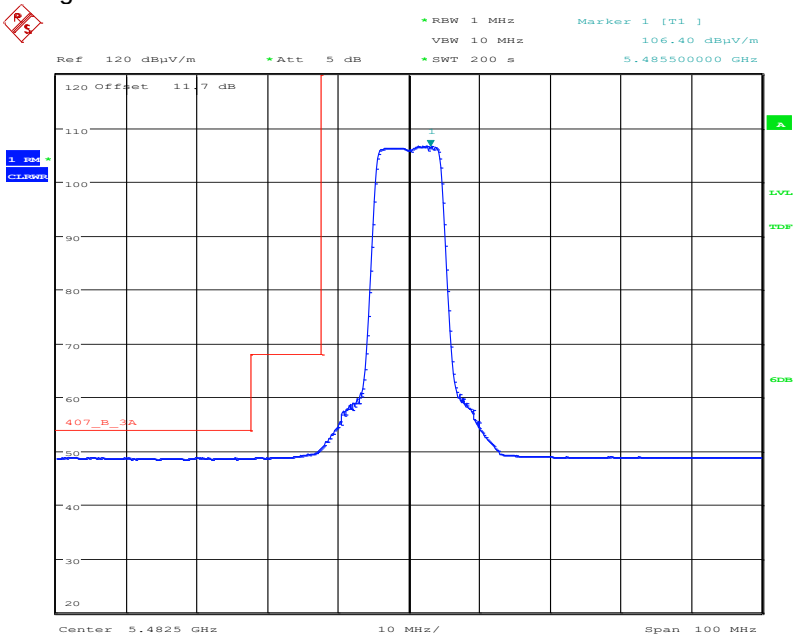
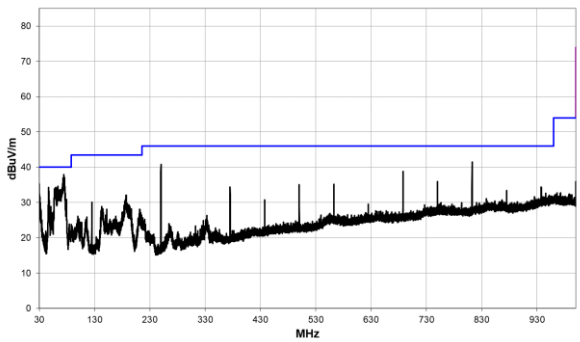
Band Edge Average Limit:

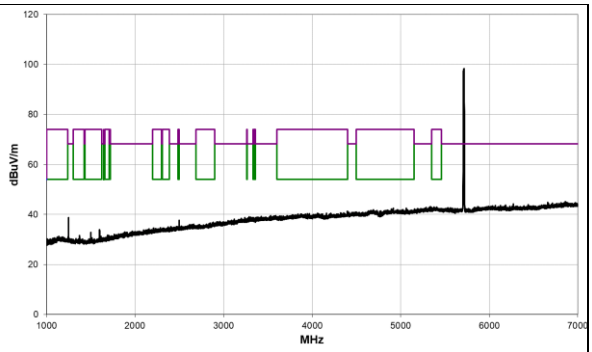


Date: 2.MAY.2023 12:39:40

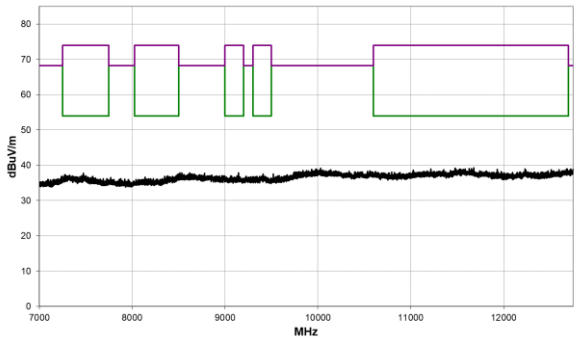
Frequency: 5712.5MHz								
Detector	***Freq. (MHz)***	***Meas'd Emission (dBµV)***	***Factor***	***Duty Cycle Corr'n (dB)***	***Field Strength (dBµV/m)***	***Distance Extrap'n Factor (dB)***	***Limit (dBuV/m)***	***Margin (dB)***
No Emission with 20dB of the limits								



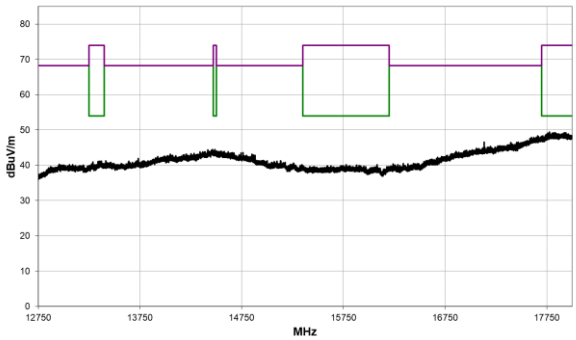
30MHz – 1GHz



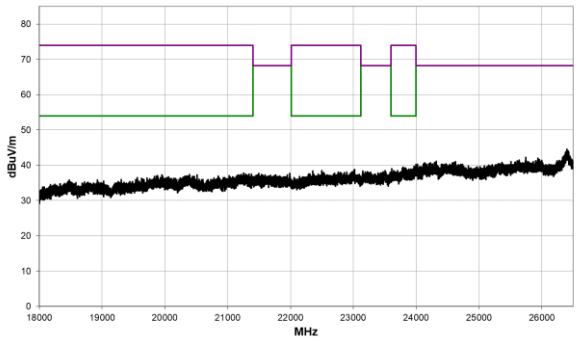
1GHz – 7GHz



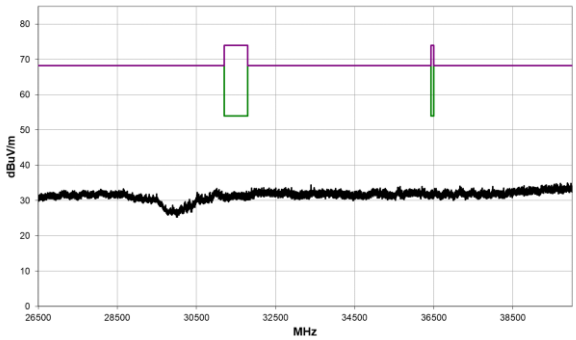
7GHz – 12.75GHz



12.75GHz – 18GHz

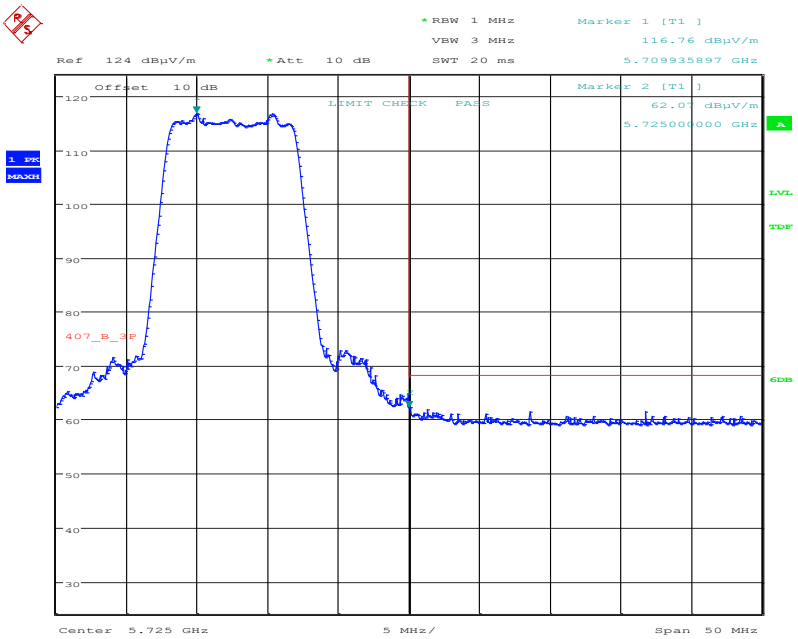


18GHz – 26.5GHz



26.5GHz – 40GHz

Band Edge Peak Limit:



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12 AC power-line conducted emissions

12.1 Definition

Line-to-ground radio-noise voltage that is conducted from all of the EUT current-carrying power input terminals that are directly (or indirectly via separate transformers or power supplies) connected to a public power network.

12.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Transient Laboratory
Test Standard and Clause:	ANSI C63.10-2013, Clause 6.2
EUT Channels / Frequencies Measured:	Mid
EUT Channel Bandwidths:	10 MHz
EUT Modulation:	OFDM
Deviations From Standard:	None
Measurement BW:	10 kHz
Measurement Detectors:	Quasi-Peak and Average, RMS

Environmental Conditions (Normal Environment)

Temperature: 18 °C	+15 ºC to +35 ºC (as declared)
Humidity: 64 %RH	20%RH to 75%RH (as declared)

Test Limits

A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz-30 MHz, shall not exceed the limits in Table 3.

Table 3 – AC Power Line Conducted Emission Limits

Frequency (MHz)	***Conducted limit (dBµV)***	
	Quasi-Peak	***Average****
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5.0	56	46
5.0 – 30.0	60	50

* The level decreases linearly with the logarithm of the frequency.
** A linear average detector is required.

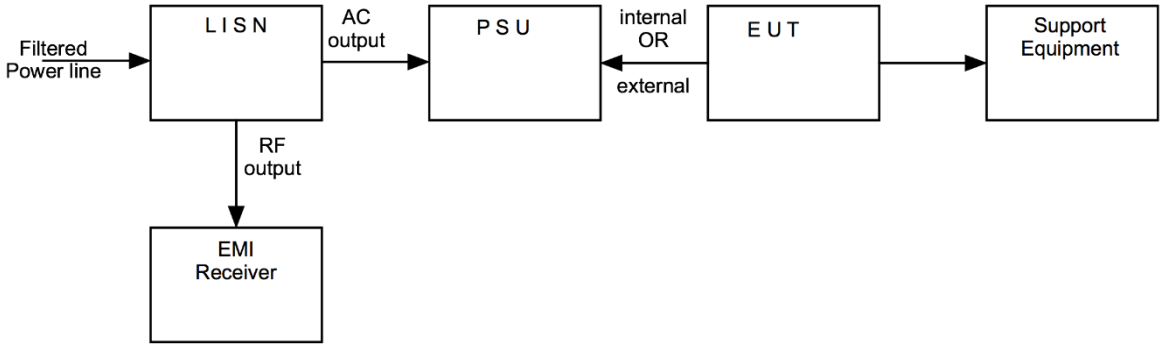
12.3 Test Method

With the EUT setup in a screened room, as per section 9 of this report and connected as per Figure ii, the power line emissions were measured on a spectrum analyzer / EMI receiver.

AC power line conducted emissions from the EUT are checked first by preview scans with peak and average detectors covering both live and neutral lines. A spectrum analyzer is used to determine if any periodic emissions are present.

Formal measurements using the correct detector(s) and bandwidth are made on frequencies identified from the preview scans. Final measurements were performed with EUT set at its maximum duty in transmit and receive modes.

Figure ii Test Setup

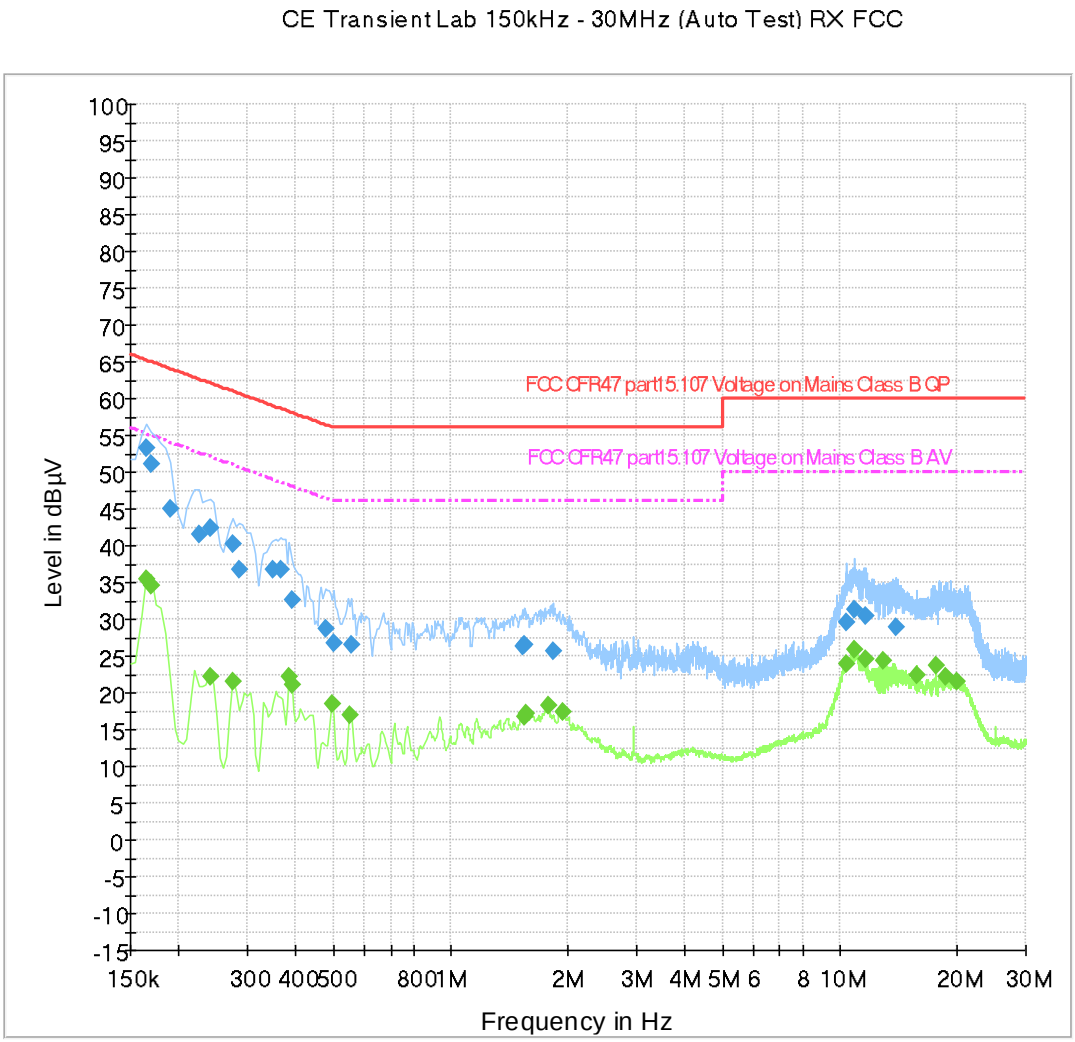


Test Setup Photograph(s)

12.4 Test Equipment

Equipment Description	*Manufacturer*	*Equipment Type*	*Element No*	*Last Cal Calibration*	*Calibration Period*	*Due For Calibration*
Receiver	R&S	ESHS10	U003	2023-02-14	12	2024-02-14
Lisn	R&S	ENV216	U396	2022-05-23	12	2023-05-23

12.5 Test Results



Results measured using the quasi-peak detector								
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.165000	53.3	2000.0	10.000	Off	L1	19.5	11.9	65.2
0.170000	51.0	2000.0	10.000	Off	N	19.5	13.9	65.0
0.190000	44.9	2000.0	10.000	Off	N	19.5	19.1	64.0
0.225000	41.5	2000.0	10.000	Off	N	19.5	21.1	62.6
0.240000	42.4	2000.0	10.000	Off	L1	19.5	19.7	62.1
0.275000	40.2	2000.0	10.000	Off	N	19.6	20.8	61.0
0.285000	36.8	2000.0	10.000	Off	L1	19.6	23.8	60.7
0.350000	36.7	2000.0	10.000	Off	L1	19.6	22.3	59.0
0.365000	36.7	2000.0	10.000	Off	L1	19.6	21.9	58.6
0.390000	32.5	2000.0	10.000	Off	L1	19.6	25.5	58.1
0.475000	28.6	2000.0	10.000	Off	L1	19.6	27.8	56.4
0.500000	26.7	2000.0	10.000	Off	L1	19.6	29.4	56.0
0.555000	26.5	2000.0	10.000	Off	L1	19.6	29.5	56.0
1.525000	26.2	2000.0	10.000	Off	N	19.6	29.8	56.0
1.550000	26.5	2000.0	10.000	Off	L1	19.6	29.5	56.0
1.830000	25.7	2000.0	10.000	Off	N	19.6	30.3	56.0
10.375000	29.5	2000.0	10.000	Off	N	19.9	30.5	60.0
10.910000	31.3	2000.0	10.000	Off	N	19.9	28.7	60.0
11.585000	30.4	2000.0	10.000	Off	L1	19.9	29.6	60.0
13.925000	29.0	2000.0	10.000	Off	L1	19.9	31.0	60.0

Results measured using the average detector								
Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.165000	35.4	2000.0	10.000	Off	L1	19.5	19.8	55.2
0.170000	34.5	2000.0	10.000	Off	N	19.5	20.4	55.0
0.240000	22.2	2000.0	10.000	Off	N	19.5	29.9	52.1
0.275000	21.4	2000.0	10.000	Off	L1	19.6	29.5	51.0
0.385000	22.2	2000.0	10.000	Off	N	19.6	26.0	48.2
0.390000	21.0	2000.0	10.000	Off	N	19.6	27.1	48.1
0.495000	18.5	2000.0	10.000	Off	N	19.6	27.6	46.1
0.550000	17.1	2000.0	10.000	Off	L1	19.6	28.9	46.0
1.540000	16.8	2000.0	10.000	Off	N	19.6	29.2	46.0
1.555000	17.1	2000.0	10.000	Off	N	19.6	28.9	46.0
1.780000	18.2	2000.0	10.000	Off	L1	19.6	27.8	46.0
1.945000	17.4	2000.0	10.000	Off	L1	19.6	28.6	46.0
10.370000	23.9	2000.0	10.000	Off	L1	19.9	26.1	50.0
10.890000	25.9	2000.0	10.000	Off	N	19.9	24.1	50.0
11.585000	24.6	2000.0	10.000	Off	L1	19.9	25.4	50.0
12.920000	24.3	2000.0	10.000	Off	L1	19.9	25.7	50.0
15.690000	22.5	2000.0	10.000	Off	N	19.9	27.5	50.0
17.575000	23.8	2000.0	10.000	Off	N	19.9	26.2	50.0
18.635000	22.1	2000.0	10.000	Off	N	19.9	27.9	50.0
19.915000	21.5	2000.0	10.000	Off	N	19.9	28.5	50.0

13 Occupied Bandwidth

13.1 Definition

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

13.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	ANSI C63.10-2013, Clause 6.9
EUT Channels / Frequencies Measured:	5482.5 MHz / 5592.5 MHz / 5712.5 MHz
EUT Channel Bandwidths:	10 MHz
EUT Test Modulations:	OFDM
Deviations From Standard:	None
Measurement BW:	100 kHz
Spectrum Analyzer Video BW	300 kHz
Measurement Span:	20 MHz
Measurement Detector:	Peak

Environmental Conditions (Normal Environment)

Temperature: 22 °C	+15 ºC to +35 ºC (as declared)
Humidity: 40 %RH	20%RH to 75%RH (as declared)

Test Limits

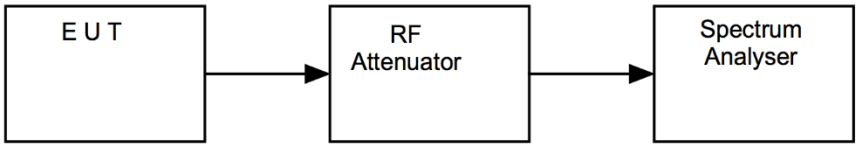
Within the 5.725–5.85 GHz band, the minimum 6 dB bandwidth of U–NII devices shall be at least 500 kHz.

There are no requirements outside of this band Bandwidth are taken for information and use in calculations relating to other requirements.

13.3 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure iii, the bandwidth of the EUT was measured on a spectrum analyser.
The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst-case configuration in each bandwidth.

Figure iii Test Setup

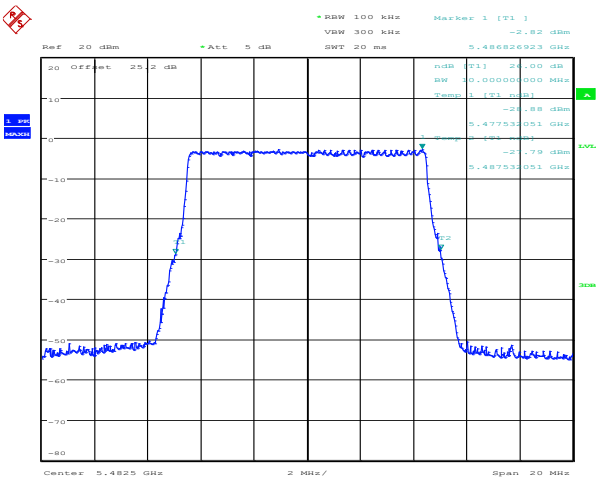


13.4 Test Equipment

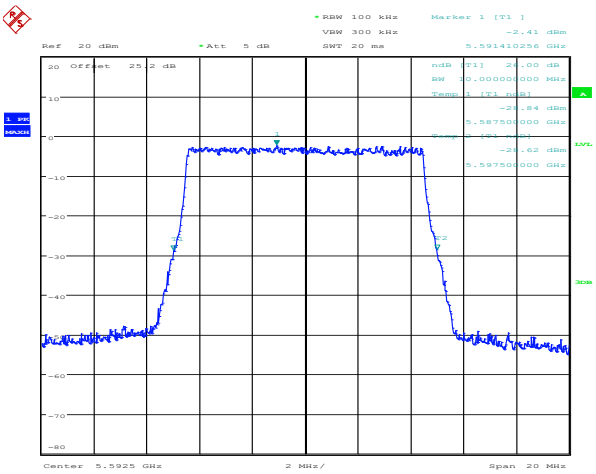
Equipment Description	Manufacturer	Equipment Type	Element No	Last Cal Calibration	Calibration Period	Due For Calibration
Spectrum Analyser	R&S	FSU50	U544	2022-11-18	12	2023-11-18
20dB SMA attenuator	Atlantec	AA18-20H	U631	Calibrate in use		

13.5 Test Results

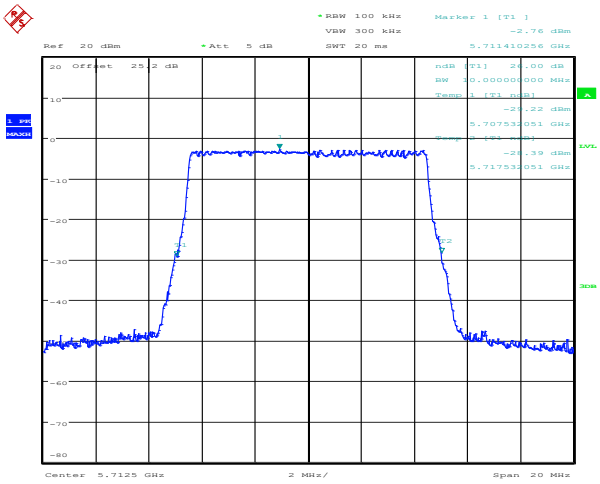
Modulation: OFDM; Power setting: Maximum				
Channel Frequency (MHz)	F_L (MHz)	F_H (MHz)	26dB Bandwidth (kHz)	Result
5482.5	5477.532051	5487.532051	10000	PASS
5592.5	5587.500000	5597.500000	10000	PASS
5712.5	5707.532051	5717.532051	10000	PASS



5482.5 MHz

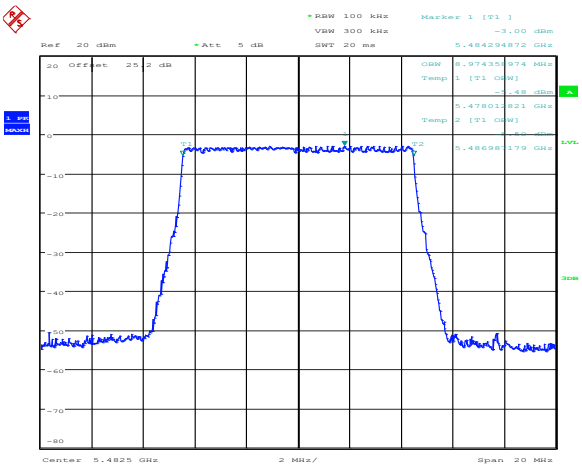


5592.5 MHz

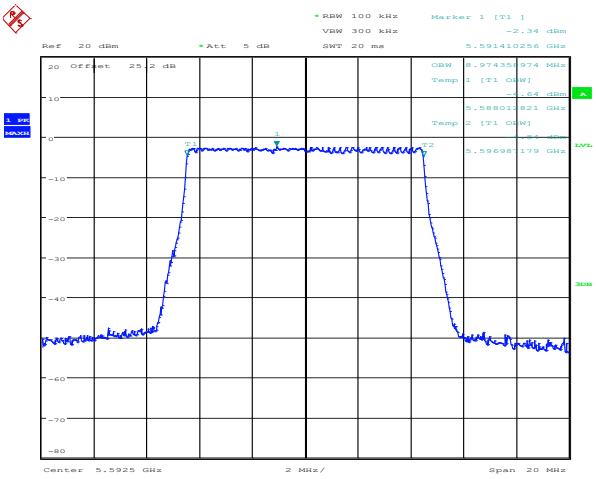


5712.5 MHz

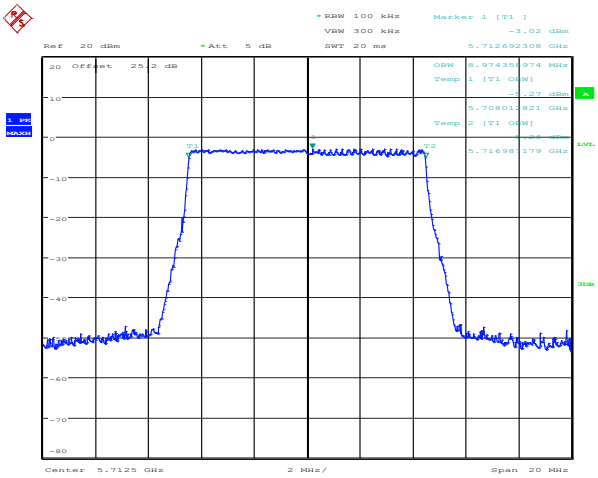
Modulation: OFDM; Power setting: Maximum				
Channel Frequency (MHz)	**F_L (MHz)**	**F_H (MHz)**	**99% Bandwidth (kHz)**	**Result**
5482.5	5478.012821	5486.987179	8974.358	PASS
5592.5	5588.012821	5596.987179	8974.358	PASS
5712.5	5708.012821	5716.987179	8974.358	PASS



5482.5 MHz



5592.5 MHz



5712.5 MHz

14 Maximum conducted output power

14.1 Definition

The maximum conducted output power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level.

14.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	ANSI C63.10-2013, Clause 12.3
EUT Channels / Frequencies Measured:	5482.5 MHz / 5592.5 MHz / 5712.5 MHz
EUT Occupied Bandwidths:	10 MHz
EUT Duty Cycle:	37.2 %
Deviations From Standard:	None
Measurement BW:	Wideband Power Meter, Gated Measurement
Measurement Span:	Wideband Power Meter, Gated Measurement
Measurement Points:	Wideband Power Meter, Gated Measurement
Measurement Detector:	RMS

Environmental Conditions (Normal Environment)

Temperature: 22 °C	+15 ºC to +35 ºC (as declared)
Humidity: 38 %RH	20%RH to 75%RH (as declared)

Test Limits

For an access point operating in the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.
For mobile and portable client devices in the 5.15–5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW.
For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.
For the band 5.725–5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Fixed point-to-point U–NII devices operating in the band 5.725-5.85 GHz may employ antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power.

Fixed point-to-point U-NII devices operating in other bands may employ antennas with directional gain up to 23dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.

Maximum Conducted Output Power Limit							
Mode of Operation	***Band Of Operation (GHz)***	***Minimum 26 dB BW (MHz)***	***11 dBm + 10 log B (mW)***	***Fixed Limit (mW)***	****Applicable Limit***	***Antenna Assembly gain (dBi)***	***Maximum Conducted Output Power Limit (mW)***
Normal	5.47–5.725	10.0	125.9	250	125.9	14.0	20.0

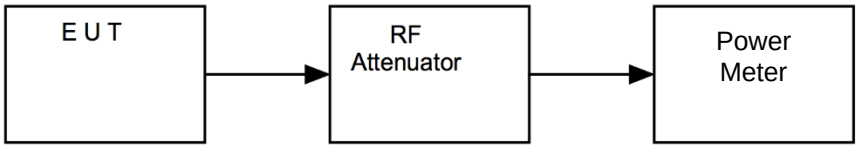
*the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz

The Antenna gain for the EUT +16 dBi (with 2 dB cable loss) giving an Antenna Assembly Gain including cable loss = 14.0 dBi, which is above 6 dBi, therefore a reduction of the limit by 8 dB is required.

14.3 Test Method

The EUT was setup as per section 9 of this report and, as per Figure iv, the analyser was used to measure each antenna output in turn, having taken account of all path losses. The resolution bandwidth of the spectrum analyser was set between 1 and 5 % of the EUT occupied bandwidth and the analyser band power function used to calculate the average power. The results were summed as in the tables below.
The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst case configuration in each bandwidth.

Figure iv Test Setup



14.4 Test Equipment

Equipment Description	*Manufacturer*	*Equipment Type*	*Element No*	*Last Cal Calibration*	*Calibration Period*	*Due For Calibration*
Power Meter	ETS Lindgren	7002-006	REF2286	2022-11-03	12	2023-11-03
20dB SMA attenuator	Atlantec	AA18-20H	U631	Calibrate in use		

14.5 Test Results

Modulation: OFDM; Power setting: Maximum						
Channel Frequency (MHz)	*Power Meter Level (dBm)*	*Cable loss (dB)*	*Maximum conducted output power (mW)*	*Antenna gain (dBi)*	*E.I.R.P. (mW)*	*Result*
5482.5	-17.10	25.20	6.46	14	162.18	PASS
5592.5	-16.80	25.20	6.92	14	173.78	PASS
5712.5	-17.40	25.15	5.96	14	149.62	PASS

15 Power spectral density

15.1 Definition

The power spectral density is the total energy output per unit bandwidth from a pulse or sequence of pulses for which the transmit power is at its maximum level, divided by the total duration of the pulses.

15.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	ANSI C63.10-2013, Clause 12.5 (Method SA-2)
EUT Channels / Frequencies Measured:	5482.5 MHz / 5592.5 MHz / 5712.5 MHz
EUT Channel Bandwidths:	10 MHz
Deviations From Standard:	None
Measurement BW:	1 MHz
Spectrum Analyzer Video BW:	3 MHz
Measurement Span:	12 MHz
Measurement Detector:	RMS

Environmental Conditions (Normal Environment)

Temperature: 22 °C	+15 ºC to +35 ºC (as declared)
Humidity: 38 %RH	20%RH to 75%RH (as declared)

Test Limits

For an access point operating in the band 5.15–5.25 GHz the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band.
For mobile and portable client devices in the 5.15–5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.
For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.
For the band 5.725–5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Assembly gain is 14.0 dBi, which exceeds 6 dBi by 8 dB therefore all applicable limits are reduced by 8 dB.

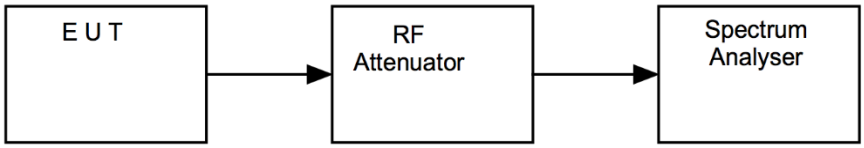
For the band 5.725–5.85 GHz, the maximum power spectral density shall not exceed 22 dBm in any 500-kHz band.

Fixed point- to-point U–NII devices may employ antennas with directional gain up to 23dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.

15.3 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure v, the peak emission of the EUT was measured on a spectrum analyser, with path losses taken into account.
The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst case configuration in each bandwidth.

Figure v Test Setup

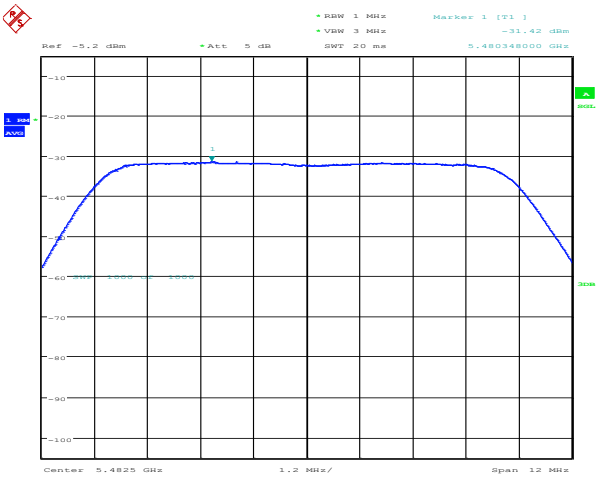


15.4 Test Equipment

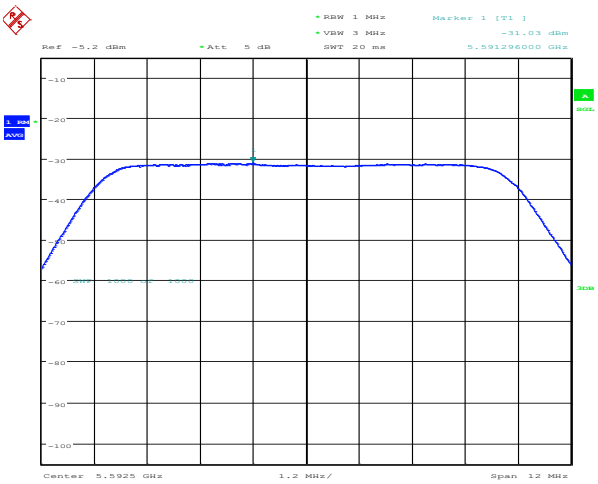
Equipment Description	*Manufacturer*	*Equipment Type*	*Element No*	*Last Cal Calibration*	*Calibration Period*	*Due For Calibration*
Spectrum Analyser	R&S	FSU50	U544	2022-11-18	12	2023-11-18
20dB SMA attenuator	Atlantec	AA18-20H	U631	Calibrate in use		

15.5 Test Results

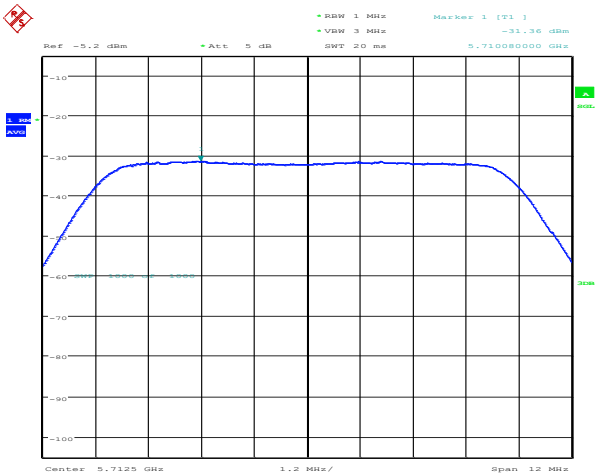
Modulation: OFDM; Power setting: Maximum						
Measurement Bandwidth (MHz)	**Channel Frequency (MHz)**	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Duty Cycle (dB)**	**PSD (dBm/MHz)**	**Result**
1.0	5482.5	-31.4	25.2	4.3	-2.0	PASS
1.0	5592.5	-31.0	25.2	4.3	-1.6	PASS
1.0	5712.5	-31.5	25.2	4.3	-2.0	PASS



5482.5 MHz



5592.5 MHz



5712.5 MHz

16 Out-of-band spurious emissions

16.1 Definition

Out-of-band emission.
Emission on a frequency or frequencies immediately outside the necessary bandwidth that results from the modulation process but excluding spurious emissions.

Spurious emission.
Emission on a frequency or frequencies that 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.

16.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Chamber / EMC Chamber 1
Test Standard and Clause:	ANSI C63.10-2013, Clause 12.7.3
EUT Channels / Frequencies Measured: (requirement as close to upper and lower frequency band edges as the design of the equipment permits).	5482.5 MHz / 5712.5 MHz
EUT Channel Bandwidths:	10 MHz
Deviations From Standard:	None
Measurement BW:	1 MHz
Spectrum Analyzer Video BW: (requirement at least 3x RBW)	3 MHz
Measurement Detector:	Peak
Measurement Range:	1 GHz to 40 GHz
Antenna Gain: (required if conducted measurement made)	N/A Radiated Measurement

Environmental Conditions (Normal Environment)

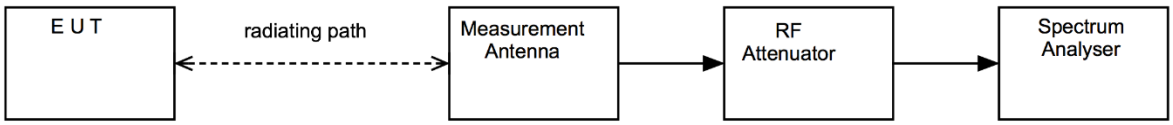
Temperature: 21 °C	+15 ºC to +35 ºC (as declared)
Humidity: 50 %RH	20%RH to 75%RH (as declared)

Test Limits
15.407(b):
(1) For transmitters operating in the 5.15–5.25 GHz band: All emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
(2) For transmitters operating in the 5.25–5.35 GHz band: All emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
(3) For transmitters operating in the 5.47–5.725 GHz band: All emissions outside of the 5.47–5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
(4) For transmitters operating in the 5.725–5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

16.3 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure vii, the emissions from the EUT were measured on a spectrum analyser.
The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst case configuration in each bandwidth.

Figure vii Test Setup



16.4 Test Equipment

Equipment Description	*Manufacturer*	*Equipment Type*	*Element No*	*Last Cal Calibration*	*Calibration Period*	*Due For Calibration*
PreAmp	Watkins Johnson	6201-69	U372	2023-03-01	1 Year	2024-03-07
Bilog	Chase	CBL611/B	U573	2021-01-28	2 Year	2024-02-13
Bilog	Chase	CBL611/A	U191	2020-11-10	2 Year	2025-02-23
Horn Antenna	EMCO	3115	L138	2022-05-23	1 Year	2024-05-23
Spectrum Analyser	R&S	FSU46	REF910	2022-12-22	1 Year	2024-01-10
Pre Amp	Agilent	8449B	L572	2022-10-24	1 Year	2023-10-24
EMI Receiver	R&S	ESR26	U489	2021-03-04	1 Year	2023-09-30
PreAmp	Com-power	PAM-840A	REF2390	2021-09-02	1 Year	2023-09-02
Horn Antenna	A-INFOMW	LB-180400-25-C-K	REF2246	2022-07-21	2 Year	2024-09-12

16.5 Test Results

Channel: 5482.5 MHz; Modulation: OFDM; Power setting: Maximum						
Emission Frequency (MHz)	***Peak Field Strength (dBµV/m)***	***Distance (m)***	***Power (dBm)***	***Limit (dBm)***	***Margin (dB)***	***Result***
No Significant Emissions Within 20 dB of Limit						PASS

Channel: 5712.5 MHz; Modulation: OFDM; Power setting: Maximum						
Emission Frequency (MHz)	***Peak Field Strength (dBµV/m)***	***Distance (m)***	***Power, eirp (dBm)***	***Limit (dBm)***	***Margin (dB)***	***Result***
No Significant Emissions Within 20 dB of Limit						PASS

Conversion from field strength to eirp is as follows:

$$EIRP = E + 20\log(d) - 104.77, \text{ where}$$

EIRP is the equivalent isotropically radiated power in dBm;
E is field strength in dBµV/m;
d is the measurement distance in meters.

17 Duty Cycle

17.1 Definition

Duty cycle (x), as used in this clause, refers to the fraction of time over which the transmitter is on and is transmitting at its maximum power control level.

17.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	ANSI C63.10-2013, Clause 12.2
EUT Channels / Frequencies Measured:	5482.5 MHz
EUT Channel loading and modulation:	Full, OFDM
Deviations From Standard:	None
Temperature Extreme Environment Test Range:	N/A
Voltage Extreme Environment Test Range:	N/A

Environmental Conditions (Normal Environment)

Temperature: 22 °C	+15 ºC to +35 ºC (as declared)
Humidity: 38 %RH	20%RH to 75%RH (as declared)

Test Limits
N/A.

17.3 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure viii, 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 completely characterise the system.

[1] Single antenna output devices

Duty was measured at the antenna port / at a distance of 3m.

[2] Multiple antenna output devices

Duty was measured as the combination of all ports simultaneously / at a distance of 3m.

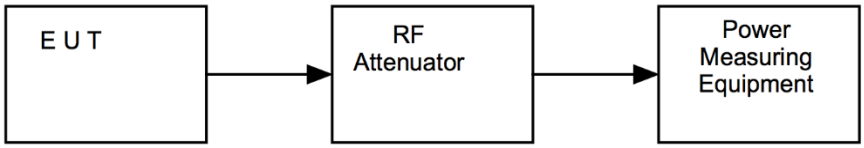
The duty cycle correction factor, DC, shall be added to the measurement results prior to comparing with the emission limit to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as:

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 ($D \geq 98\%$) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Figure viii Test Setup

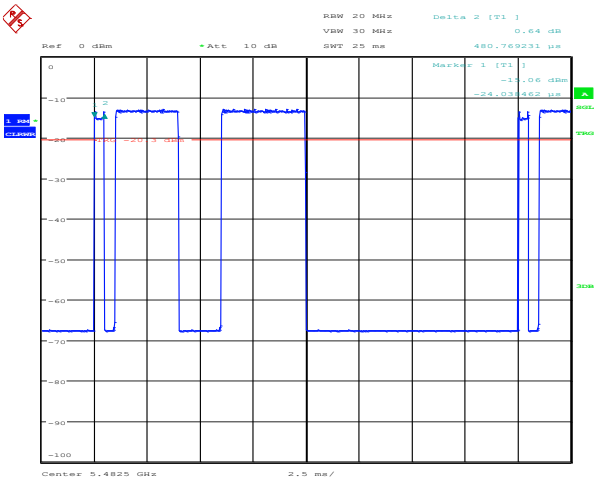


17.4 Test Equipment

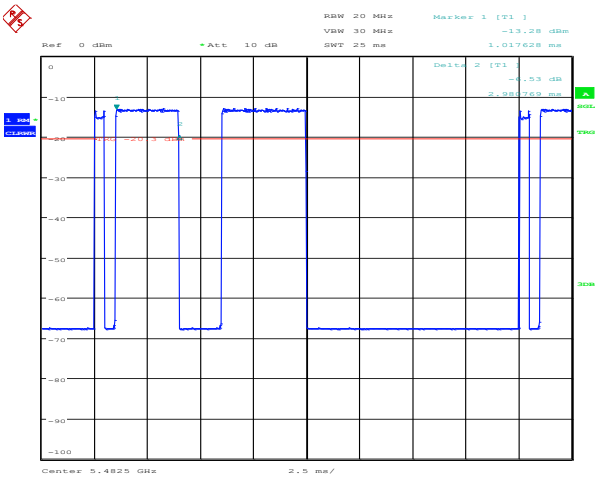
Equipment Description	*Manufacturer*	*Equipment Type*	*Element No*	*Last Cal Calibration*	*Calibration Period*	*Due For Calibration*
Spectrum Analyser	R&S	FSU26	U405	2022-04-21	12	2023-04-21
20dB SMA attenuator	Atlantec	AA18-20H	U631	Calibrate in use		

17.5 Test Results

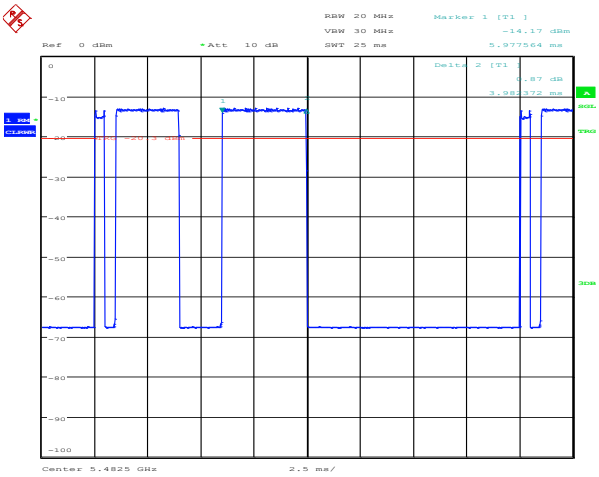
Frequency: 5482.5 MHz; Modulation: OFDM							
TxOn time (ms)			Total TxOn time (ms)	Observation period (ms)	Duty (%)	Calculated Factor (dB)	
Ton 1	Ton 2	Ton 3				RMS Detector	Average Detector
0.48077	2.98077	3.98237	7.44	20	37.22	4.3	8.6



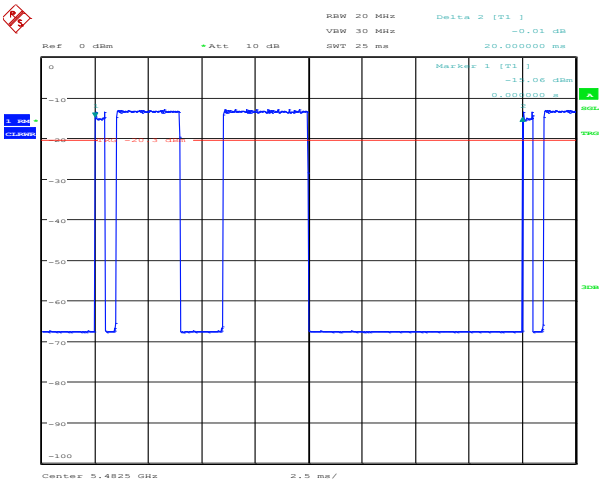
Ton 1



Ton 2



Ton 3



T Frame

18 Dynamic Frequency Selection (DFS)

18.1 General

An U-NII network will employ a Dynamic Frequency Selection (DFS) function to detect interference from radar systems (radar detection) and to avoid co-channel operation with these systems.
Within the context of the operation of the DFS function, a U-NII device will operate in either *Master Mode* or *Client Mode*. U-NII devices operating in *Client Mode* can only operate in a network controlled by a U-NII device operating in *Master Mode.*

18.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	KDB 905462 D02, Clause 7.8
EUT Tested Channel Bandwidths:	10 MHz
EUT Test Channel Loading:	Internal data pattern repeated every 20ms, 37.2% duty.
EUT Output Power Setting:	Max.
EUT Tested Modes:	Master
Deviations From Standard:	None
Temperature Extreme Environment Test Range:	N/A
Voltage Extreme Environment Test Range:	N/A

Environmental Conditions (Normal Environment)

Temperature: 22 °C	Usually: +15 ºC to +35 ºC
Humidity: 38 %RH	Usually: 20%RH to 75%RH

Test Limits

Refer to individual tests for applicable tables, as defined below.

Table 3: Interference threshold values

Maximum Transmit Power	***Value (see notes 1, 2 and 3)***
EIRP ≥ 200 mW	-64 dBm
EIRP < 200 mW and PSD < 10 dBm/MHz	-62 dBm
EIRP < 200 mW that do not meet the PSD requirement	-64 dBm
NOTE 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. NOTE 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. NOTE 2: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

Table 4: DFS requirement values

Parameter	***Value***
Non-Occupancy Period	Min. 30 minutes
Channel Availability Check Time	60 s
Channel Move Time	10 s (see note 1).
Channel Closing Transmission Time	200 ms + an aggregate of 60 ms over remaining 10 s period (see notes 1 & 2).
U-NII Detection Bandwidth	Min. 100 % of the U-NII 99% transmission power bandwidth (see note 3).
Maximum Off-Channel CAC Time	4 hours (see note 2)
NOTE 1: *Channel Move Time* and the *Channel Closing Transmission Time* should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. NOTE 2: The *Channel Closing Transmission Time* is comprised of 200 ms starting at the beginning of the *Channel Move Time* plus any additional intermittent control signals required to facilitate a channel move (an aggregate of 60 ms) during the remainder of the 10 s period. The aggregate duration of control signals will not count quiet periods in-between transmissions. NOTE 3: During the *U-NII Detection Bandwidth* detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 %. Measurements are performed with no data traffic.	

Table 5: Short pulse radar test signals

Radar type	***Pulse width (µs)***	***PRI (µs)***	***Number of pulses***	***Min. % of successful detection***	***Min. number of trials***
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a	Roundup: 1/360 x 19.10^6/PRI	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 µs, with a minimum increment of 1 µs, excluding PRI values selected in Test A			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120
NOTE 1: Short pulse radar type 0 should be used for detection bandwidth test, channel move time and channel closing time tests.					

Table 5a: Pulse repetition intervals for test A

Pulse repetition frequency number	*Pulse repetition frequency (pulses / s)*	*Pulse repetition interval (µs)*
1	1930.5	518
2	1858.7	538
3	1792.1	558
4	1730.1	578
5	1672.2	598
6	1618.1	618
7	1567.4	638
8	1519.8	658
9	1474.9	678
10	1432.7	698
11	1392.8	718
12	1355	738
13	1319.3	758
14	1285.3	778
15	1253.1	798
16	1222.5	818
17	1193.3	838
18	1165.6	858
19	1139	878
20	1113.6	898
21	1089.3	918
22	1066.1	938
23	326.2	3066

Table 6: Long pulse radar test signal

Radar type	*Pulse width (µs)*	*Chirp width (MHz)*	*PRI (µs)*	*Number of pulses per burst*	*Number of bursts*	*Min. % of successful detection*	*Min. number of trials*
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

Table 7: Frequency hopping radar test signal

Radar type	*Pulse width (µs)*	*PRI (µs)*	*Pulses per hop*	*Hopping rate (kHz)*	*Hopping sequence length (ms)*	*Min. % of successful detection*	*Min. number of trials*
6	1	333	9	0.333	300	70%	30

18.3 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure ix, the wanted signal (Gen A) was set to establish a reliable link (approx. 10 dB above receiver threshold). The interfering signal (Gen B) was then introduced at the specified Radar Detection Threshold level, plus 1dB.

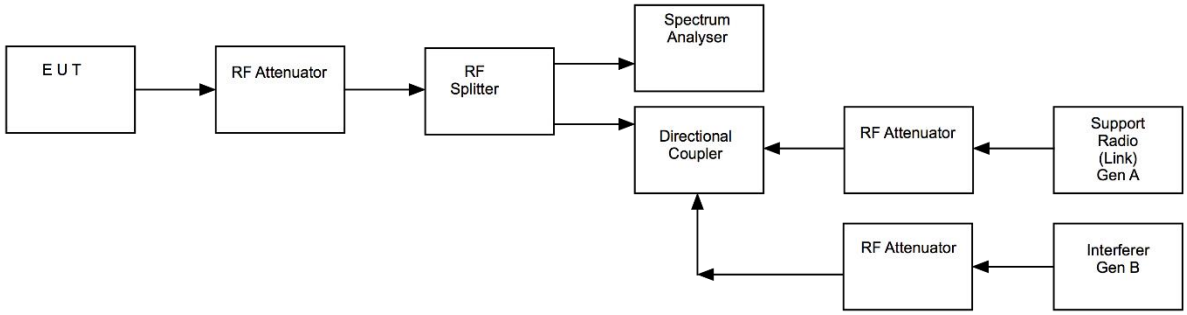
[1] Conducted method

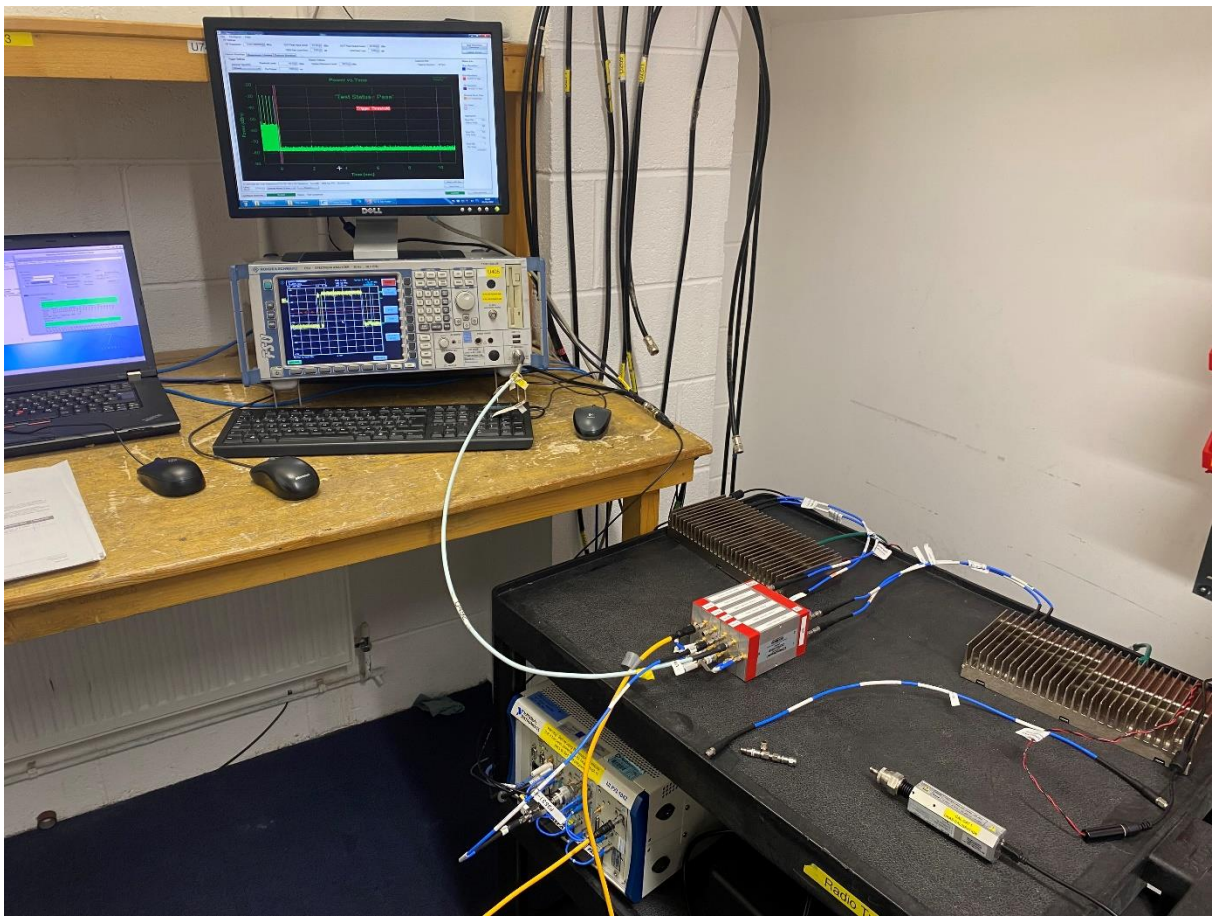
Received power was measured at the antenna port. For multiple port devices, equal splitting was employed to ensure the same level was received at each antenna port.

[2] Radiated method

Received power was measured at the centre of the EUT.

Figure ix Test Setup





18.4 Calibration

Antenna Gain
Declared antenna gain = 14.0 dBi (including loss of antenna assembly cable).

DFS Radar Waveforms
The RF attenuator nearest the EUT was set to provide sufficient attenuation not to overload the analyser whilst the EUT was at maximum power. The RF attenuator nearest the support radio was then set by increasing to the point where the EUT could no longer receive the signal (receiver threshold), then backing off 10dB. The RF attenuator nearest the signal generator was then set to provide sufficient isolation between the generator and the support radio.

The interferer (Gen B) was set to the centre of the test channel, Ch_r, in CW mode. The EUT was replaced with the spectrum analyser, whilst the analyser was replaced with a 50 ohm load. The level of the generator was adjusted to find the appropriate DFS threshold +1dB, adjusted for min. antenna gain 14.0dB, measured on the spectrum analyser. The analyser and EUT were then returned to position and an offset added to the analyser to read the same level as measured at the EUT.

Each radar signal required was then observed on the spectrum analyser in a 3MHz RBW with peak detector.

19 U-NII Detection Bandwidth

19.1 Definition

Detection bandwidth.
That part of the
Emission bandwidth.
For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

19.2 Additional Test Parameters

EUT Test Channels, Ch_r.	5482.5 MHz
EUT Operating Channels / Bandwidths: (all bandwidths must be tested)	10 MHz

Test Limits
U– NII devices operating with any part of its 26 dB emission bandwidth in the 5.25–5.35 GHz and 5.47–5.725 GHz bands shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems.
The device must sense for radar signals at 100 percent of its emission bandwidth.

19.3 Test Method

The EUT was switched on without an associated client/master and no traffic and set to channel, Ch_r. The interferer (Gen B) was set to the same frequency, Ch_r, and radar test signal # 0, of table 5 (at the threshold level). The interferer was present for one burst only and the EUT was observed for radar detections. The test signal and observations were repeated a further 9 times as recorded in the results.

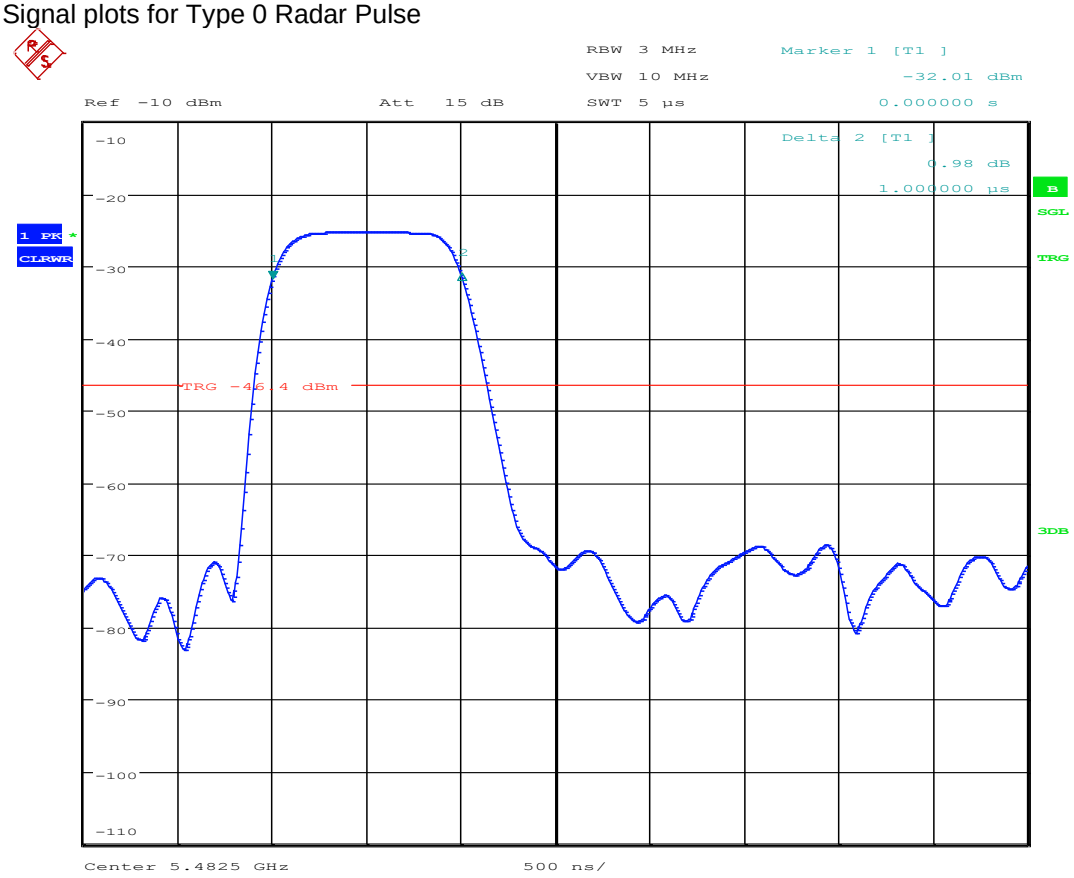
This test was repeated in 5 MHz, then 1 MHz, increments of the interferer to find the upper and lower points where the detection rate fell below the requirement.

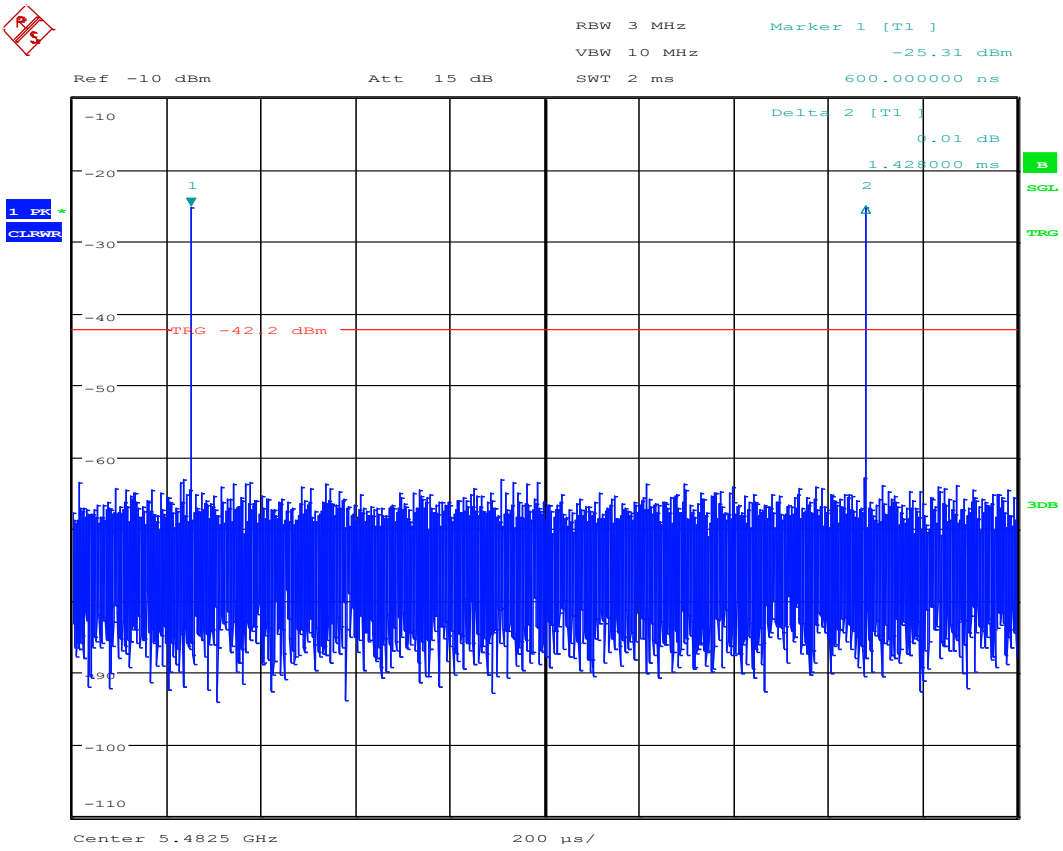
19.4 Test Equipment

Equipment Description	*Manufacturer*	*Equipment Type*	*Element No*	*Last Cal Calibration*	*Calibration Period*	*Due For Calibration*
DFS Test System	Aeroflex	PXI-1042	REF2152	Calibrate in Use		
Spectrum Analyser	R&S	FSU26	U405	2022-04-21	12	2023-04-21

19.5 Test Results

Test Signal plots for Type 0 Radar Pulse





EUT Channel: 5482.5 MHz; Bandwidth: 10 MHz;			
Radar test signal #0; Interference level: -49.0 dBm			
Test Frequency (MHz)	***Number of bursts***	***Number detected***	***Requirement***
Ch_r	10	10	90%
Ch_r+ 5	10	10	90%
Ch_r+ 6	10	0	90%
Ch_r- 5	10	10	90%
Ch_r- 6	10	0	90%

F_H (MHz)	***F_L (MHz)***	***U-NII Detection Bandwidth (MHz)***	***Emission bandwidth (MHz)***	***Result***
5477.5	5487.5	10	10	PASS

20 Channel Availability Check

20.1 Definition

The *Channel Availability Check (CAC)* is defined as a mechanism by which an U-NII device checks channels for the presence of radar signals. This mechanism is used for identifying *Available Channels*.

There shall be no transmissions by the U-NII device on the channels being checked during the initial CAC process.

If no radars have been detected on a channel, then that channel becomes an *Available Channel.*

20.2 Additional Test Parameters

EUT Channels At Switch On:	5482.5 MHz
EUT CAC Channel Bandwidths:	10 MHz

Test Limits
The U–NII device may start using the channel if no radar signal with a power level greater than the interference threshold values (listed in table 3) is detected within 60 seconds.

20.3 Test Method

[1] Length of CAC.
The EUT channel was selected, then switched off. The spectrum analyser was set to time domain (zero span) with sufficient bandwidth to capture all intentional emissions from the EUT. The EUT was then switched on and the analyser Element synchronised to the moment when the power-up sequence was completed. The length of the CAC is the time difference between the completion of the power-up sequence and the initiation of transmission on the selected channel.

[2] Radar detection.
The interferer (Gen B) was set to one of the signal types of table 5 at the reference level of table 3, increased by 1dB and muted. The EUT channel was selected, then switched off. The spectrum analyser was set to time domain (zero span) with sufficient bandwidth to capture all intentional emissions from the EUT. The EUT was then switched on and upon completion of the power-up sequence, the interferer (Gen B) was unmuted for a single burst. The spectrum analyser was monitored to ensure no transmissions occurred.

The test was repeated, but with a delay of approx. 54s prior to unmuting the interferer.

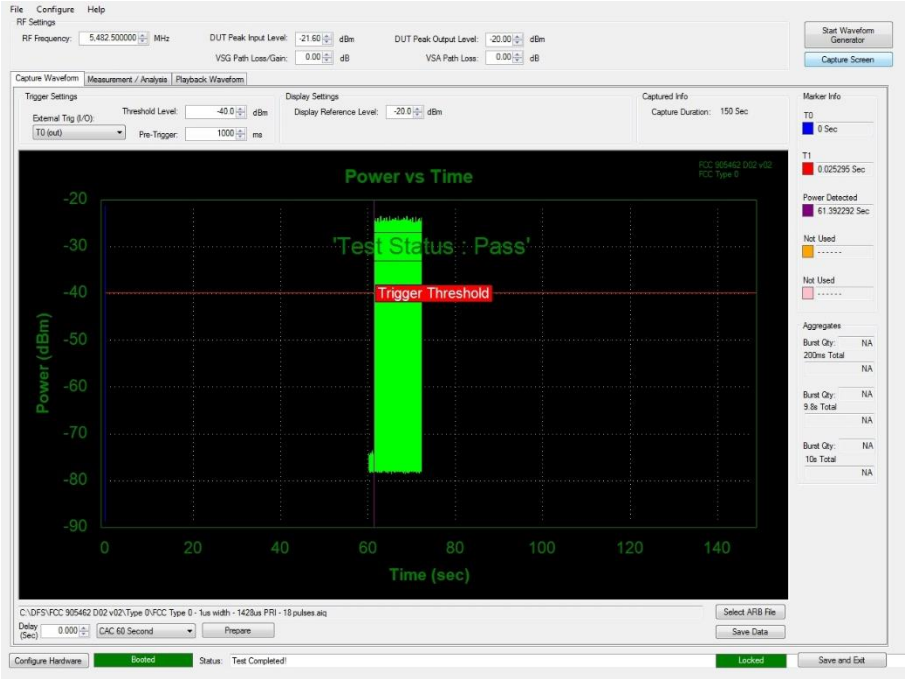
20.4 Test Equipment

Equipment Description	*Manufacturer*	*Equipment Type*	*Element No*	*Last Cal Calibration*	*Calibration Period*	*Due For Calibration*
DFS Test System	Aeroflex	PXI-1042	REF2152	Calibrate in Use		
Spectrum Analyser	R&S	FSU26	U405	2022-04-21	12	2023-04-21

20.5 Test Results

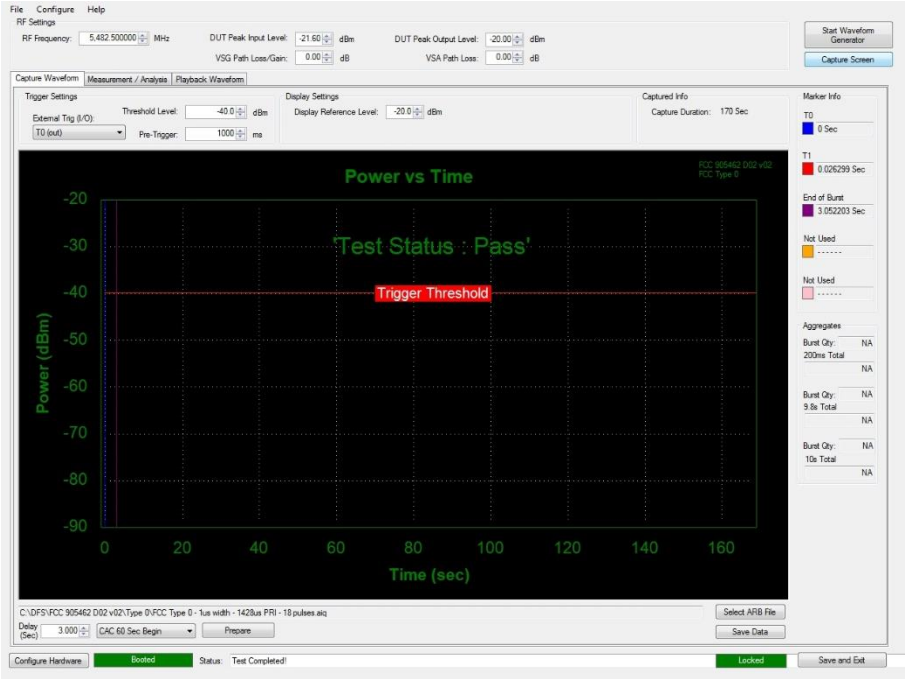
[1] Length of CAC

Channel Bandwidth: 10 MHz					
Channel (MHz)	***Completion of power-up sequence (s)***	***Start of transmission (s)***	***CAC length (s)***	***EUT transmissions during CAC***	***Result***
5482.5	0	61.392292	61.392292	None	PASS

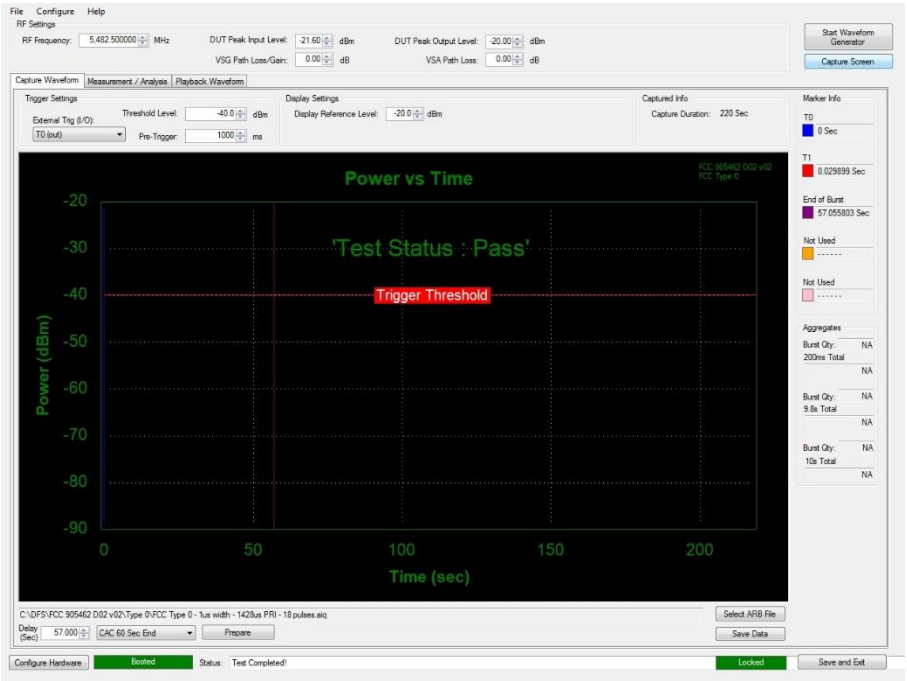


[2] Radar detection

Channel: 5482.5 MHz; Bandwidth: 10 MHz; Interference level: -49.0 dBm				
Time of injection (s)	***Radar test signal #***	***Pulse width (µs)***	***PRI (µs)***	***EUT transmits (Yes/No)***
T1 + 3s	0	1	1428	No



Channel: 5482.5 MHz; Bandwidth: 10 MHz; Interference level: -49.0 dBm				
Time of injection (s)	***Radar test signal #***	***Pulse width (µs)***	***PRI (µs)***	***EUT transmits (Yes/No)***
T1 + 57s	0	1	1428	No



21 In-Service Monitoring

21.1 Definition

21.1.1 Channel Closing

The *Channel Closing* is defined as the process initiated by the U-NII device on an *Operating Channel* after a radar signal has been detected during the *In-Service Monitoring* on that channel.

The master device shall instruct all associated slave devices to stop transmitting on this channel, which they shall do within the *Channel Move Time*.

Slave devices with a Radar Interference Detection function, shall stop their own transmissions on an *Operating Channel* within the *Channel Move Time* upon detecting a radar signal within this channel.

The aggregate duration of all transmissions of the U-NII device on this channel during the *Channel Move Time* shall be limited to the *Channel Closing Transmission Time.* The aggregate duration of all transmissions shall not include quiet periods in-between transmissions.

For equipment having simultaneous transmissions on multiple (adjacent or non-adjacent) operating channels, only the channel(s) containing the frequency on which radar was detected is subject to the *Channel Closing* requirement. The equipment is allowed to continue transmissions on other *Operating Channels*.

21.1.2 Non-Occupancy Period

The *Non-Occupancy Period* is defined as the time during which the U-NII device shall not make any transmissions on a channel after a radar signal was detected on that channel.

For equipment having simultaneous transmissions on multiple (adjacent or non-adjacent) operating channels, only the channel(s) containing the frequency on which radar was detected is subject to the *Non-Occupancy Period* requirement. The equipment is allowed to continue transmissions on other *Operating Channels*.

After the *Non-Occupancy Period*, the channel needs to be identified again as an *Available Channel* before the U-NII device may start transmitting again on this channel.

21.2 Additional Test Parameters

EUT Test Channels, Ch_r.	5482.5 MHz
EUT Operating Channels / Bandwidths:	10 MHz
Master Uniform Spreading:	Disabled

Test Limits

The *Channel Move Time* shall not exceed the limit defined in table 4.

The *Channel Closing Transmission Time* shall not exceed the limit defined in table 4.

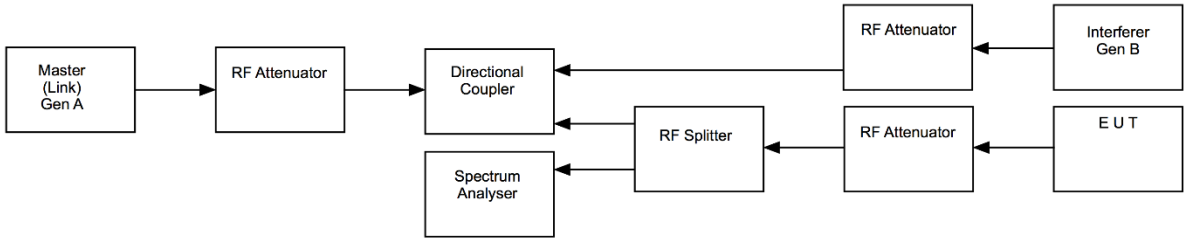
The *Non-Occupancy Period* shall not be less than the value defined in table 4.

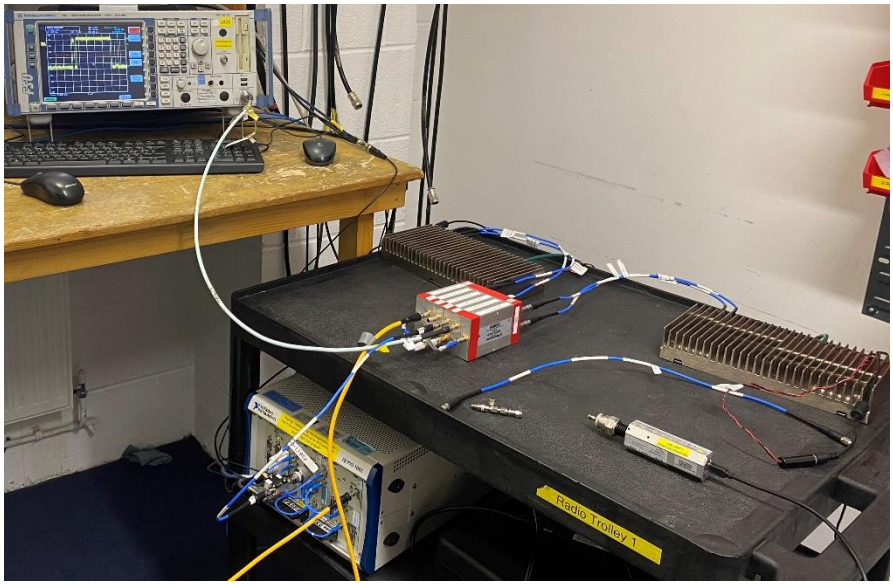
21.3 Test Method

The EUT channel for both data and control signals, Ch_r, was selected, then transmissions to the paired device commenced. The interferer (Gen B) was set to the same frequency, Ch_r, and a radar test signal of table 5 (to appear at the Master at the threshold level + 1dB) then muted. The spectrum analyser was set to time domain (zero span) with sufficient bandwidth to capture all intentional emissions from the EUT. The analyser was then synchronised to the switching of the interferer – the interferer (Gen B) level was unmuted for a single burst. Transmissions from the EUT continued to be observed for a further 30 min.

Note, the set-up of figure x was required to test slave mode, where the master is not the EUT.

Figure x Test Setup



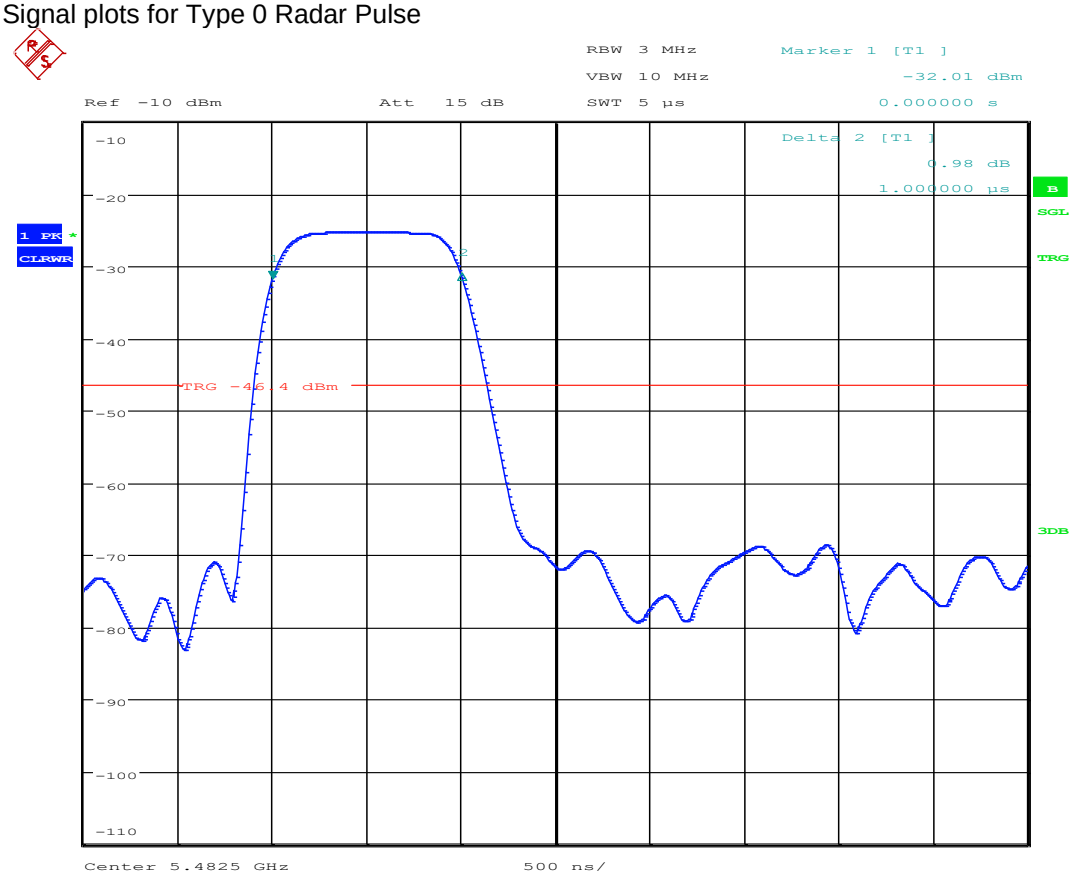


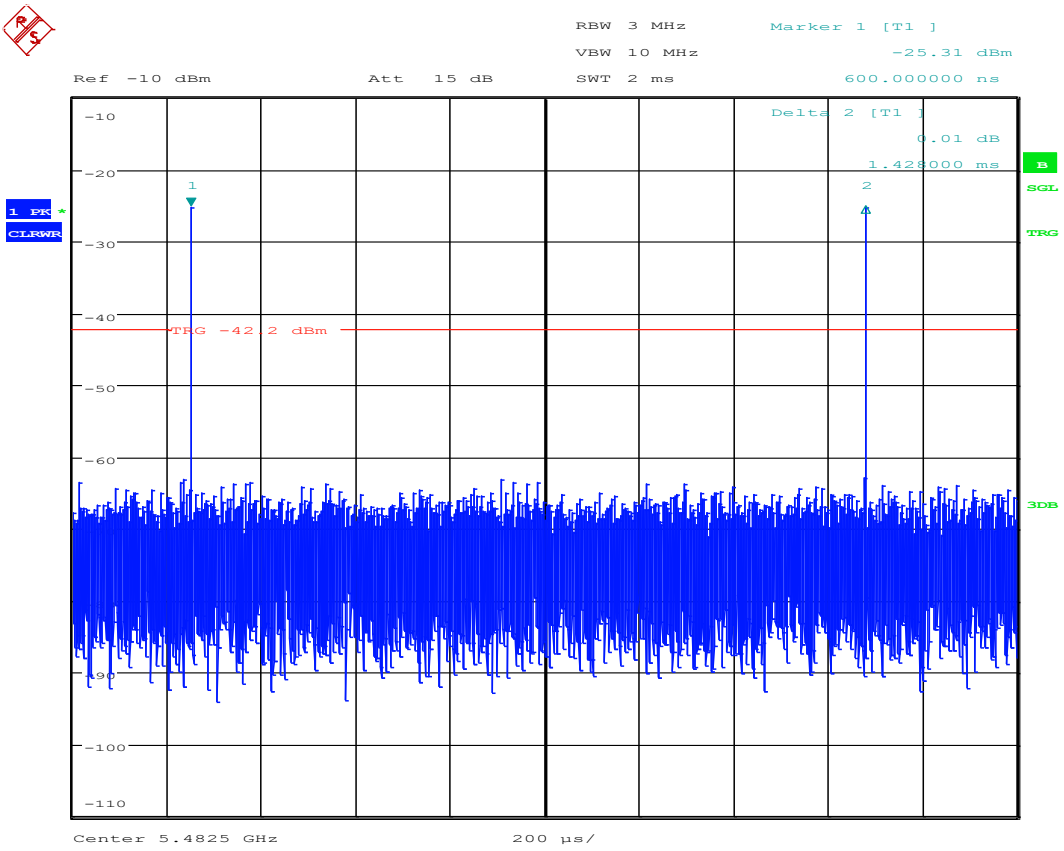
21.4 Test Equipment

Equipment Description	*Manufacturer*	*Equipment Type*	*Element No*	*Last Cal Calibration*	*Calibration Period*	*Due For Calibration*
DFS Test System	Aeroflex	PXI-1042	REF2152	Calibrate in Use		
Spectrum Analyser	R&S	FSU26	U405	2022-04-21	12	2023-04-21

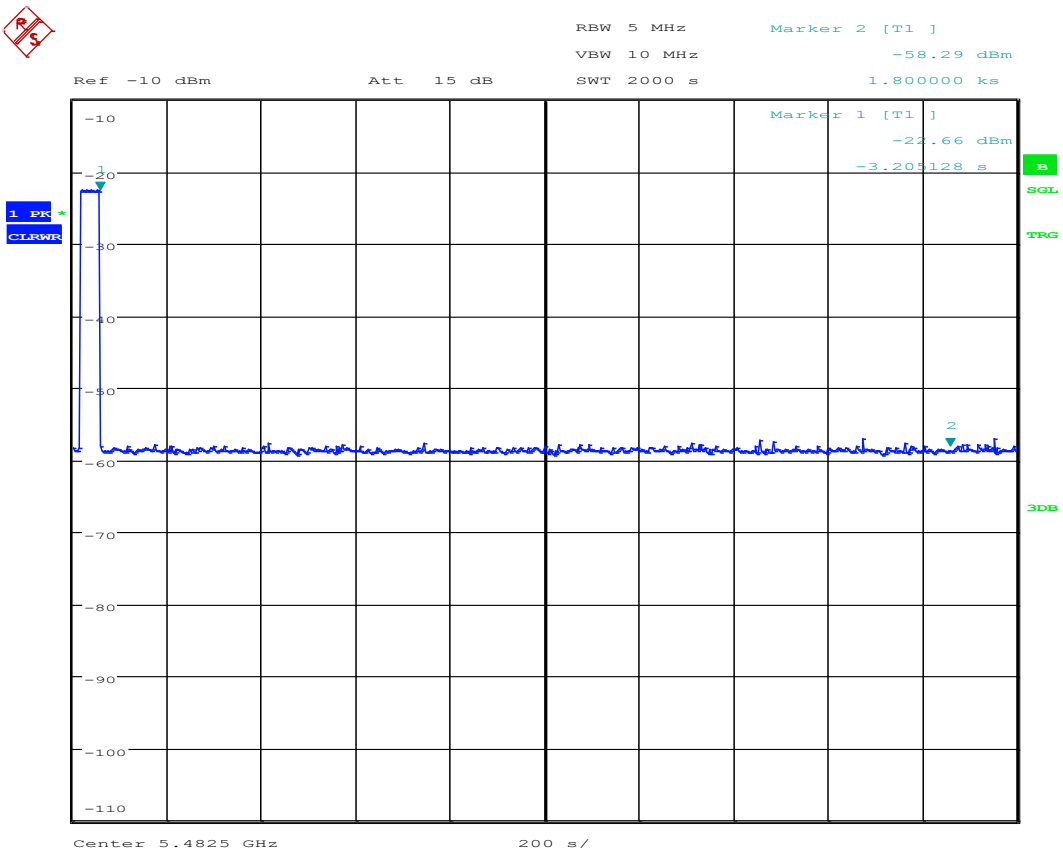
21.5 Test Results

Test Signal plots for Type 0 Radar Pulse





Bandwidth: 10 MHz					
Channel (MHz)	***Interference level (dBm)***	***Channel move time (s)***	***Channel Closing Transmission Time (ms)***	***Transmissions during non-occupancy period***	***Result***
5482.5	-49.0	0.049394	0.000374	None	PASS



This plot shows that there were no transmissions during the 30 minute period following the application of the test signal, which is indicated by Marker 1 at the trigger point.

22 Statistical Performance Check

22.1 Definition

The *In-Service Monitoring* is defined as the process by which a U-NII device monitors each *Operating Channel* for the presence of radar signals.

22.2 Additional Test Parameters

EUT Test Channels, Ch_r.	5482.5 MHz
EUT Operating Channels / Bandwidths:	10 MHz

Test Limits
The *In-Service Monitoring* shall be used to monitor each *Operating Channel*.

The *In-Service-Monitoring* shall start immediately after the U-NII device has started transmissions on a channel.

During the *In-Service Monitoring*, the U-NII device shall be capable of detecting any of the radar test signals that fall within the ranges given by tables 5-7 with a level above the *Radar Detection Threshold* defined in table 3.

The minimum required detection probability associated with a given radar test signal is defined in tables 5-7.

22.3 Test Method

The EUT channel for both data and control signals, Ch_r, was selected, then transmissions to the paired device commenced. The interferer (Gen B) was set to the same frequency, Ch_r, and a radar test signal of table 5-7 (to appear at the Master at the threshold level + 1dB). The interferer was present for one burst only and the EUT was observed for radar detections.

22.4 Test Equipment

Equipment Description	***Manufacturer***	***Equipment Type***	***Element No***	***Last Cal Calibration***	***Calibration Period***	***Due For Calibration***
DFS Test System	Aeroflex	PXI-1042	REF2152	Calibrate in Use		
Spectrum Analyser	R&S	FSU26	U405	2022-04-21	12	2023-04-21

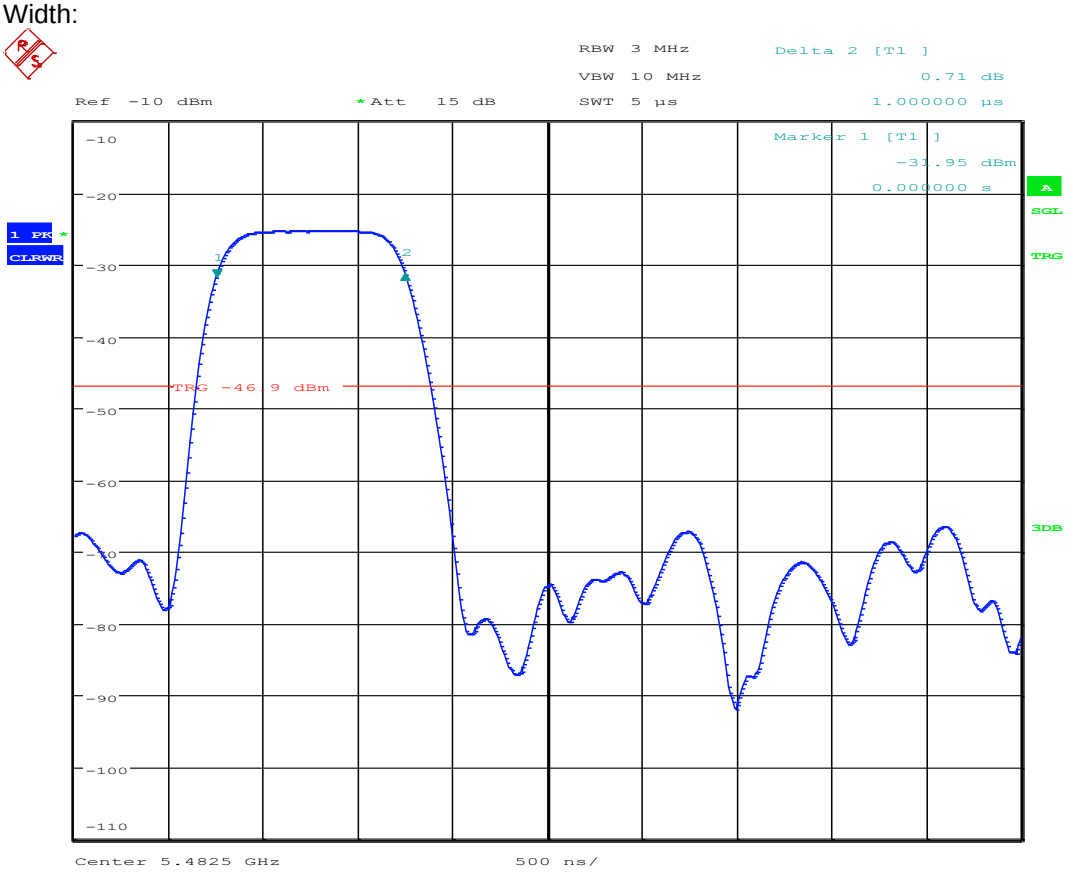
22.5 Test Results

Summary				
Radar Type	***Number of trials***	***% successful***	***Limit (%)***	***Result***
1	30	100	60	PASS
2	30	100	60	PASS
3	30	100	60	PASS
4	30	100	60	PASS
1-4	120	100	80	PASS
5	30	100	80	PASS
6	30	96.7	70	PASS

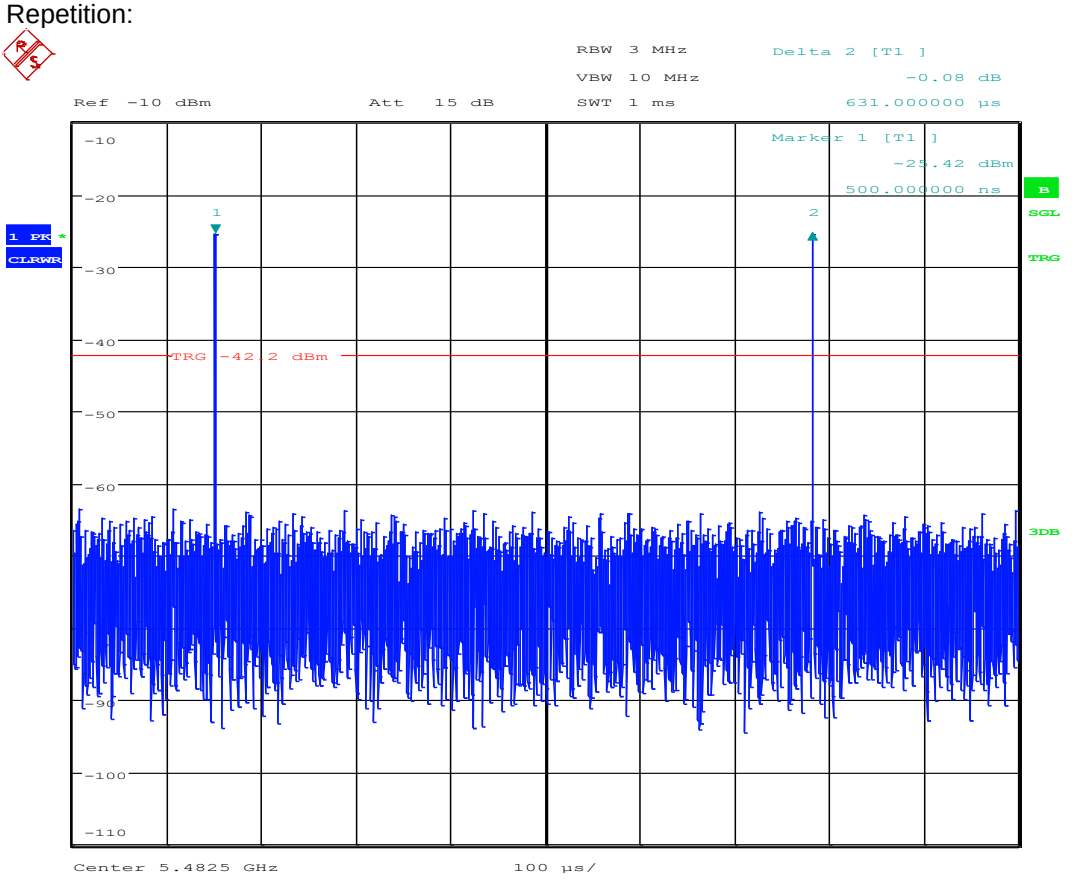
Note: on the following pages the pulse plots shown were taken using the test number highlighted in yellow in the associated tables.

Sample pulse parameters for Type 1 Pulses:

Pulse Width:



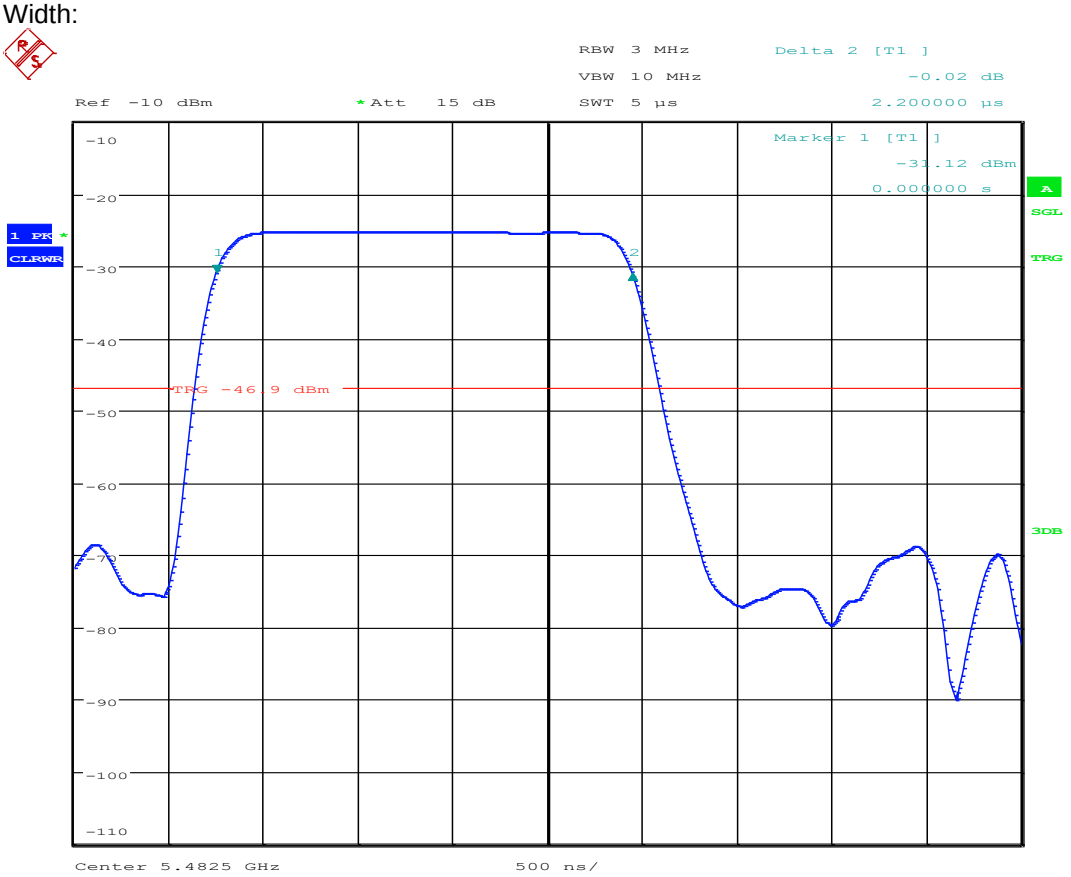
Pulse Repetition:



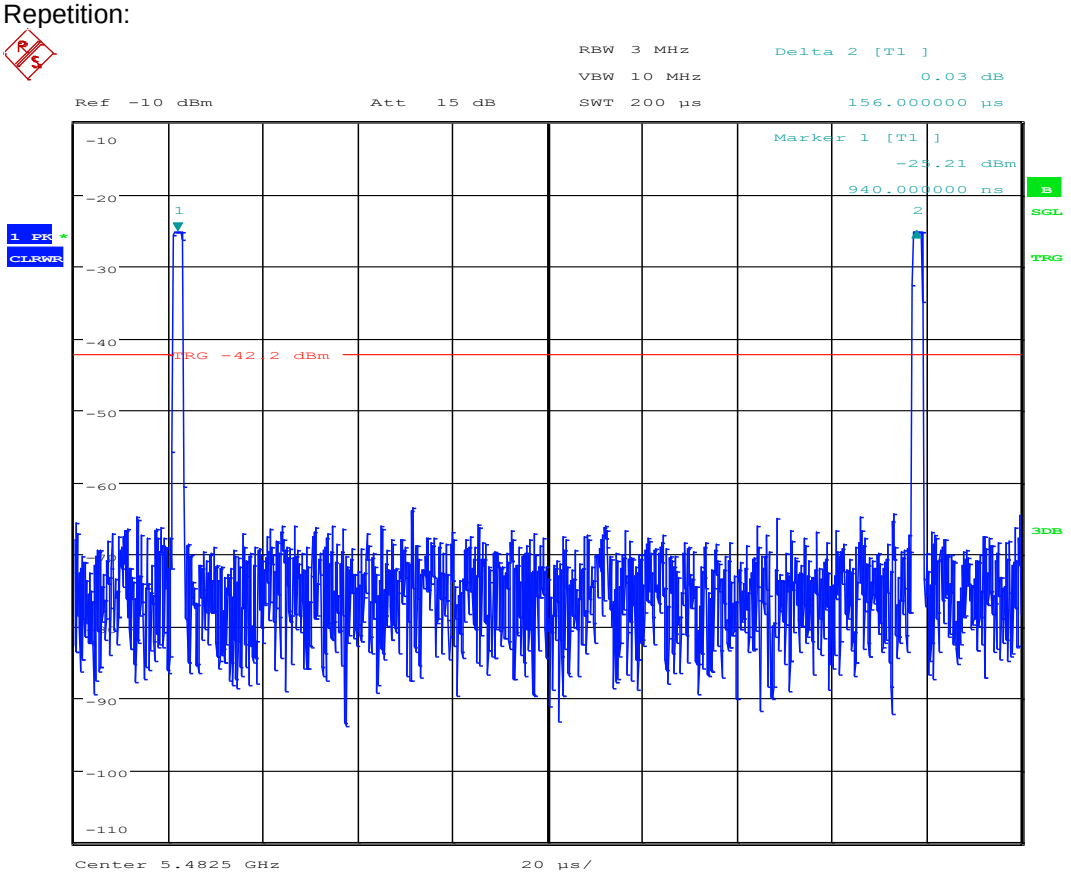
Pulse 1					
Channel: 5482.5 MHz; Bandwidth: 10 MHz; Interference level: -49.0 dBm					
Test #	Pulse width (µs)	Pulse repetition frequency (pulses / s)	PRI (µs)	Number of pulses	Detected (Yes/No)
1	1	1066	938	57	Yes
2	1	1475	678	78	Yes
3	1	1114	898	59	Yes
4	1	1253	798	67	Yes
5	1	1089	918	58	Yes
6	1	1859	538	99	Yes
7	1	1319	758	70	Yes
8	1	1672	598	89	Yes
9	1	326	3066	18	Yes
10	1	1166	858	62	Yes
11	1	1730	578	92	Yes
12	1	1139	878	61	Yes
13	1	1355	738	72	Yes
14	1	1792	558	95	Yes
15	1	1193	838	63	Yes
16	1	995	1005	53	Yes
17	1	485	2062	26	Yes
18	1	699	1430	37	Yes
19	1	411	2435	22	Yes
20	1	354	2825	19	Yes
21	1	1038	963	55	Yes
22	1	1546	647	82	Yes
23	1	396	2527	21	Yes
24	1	1585	631	84	Yes
25	1	554	1804	30	Yes
26	1	597	1676	32	Yes
27	1	438	2284	24	Yes
28	1	518	1930	28	Yes
29	1	427	2340	23	Yes
30	1	598	1672	32	Yes

Sample pulse parameters for Type 2 Pulses:

Pulse Width:



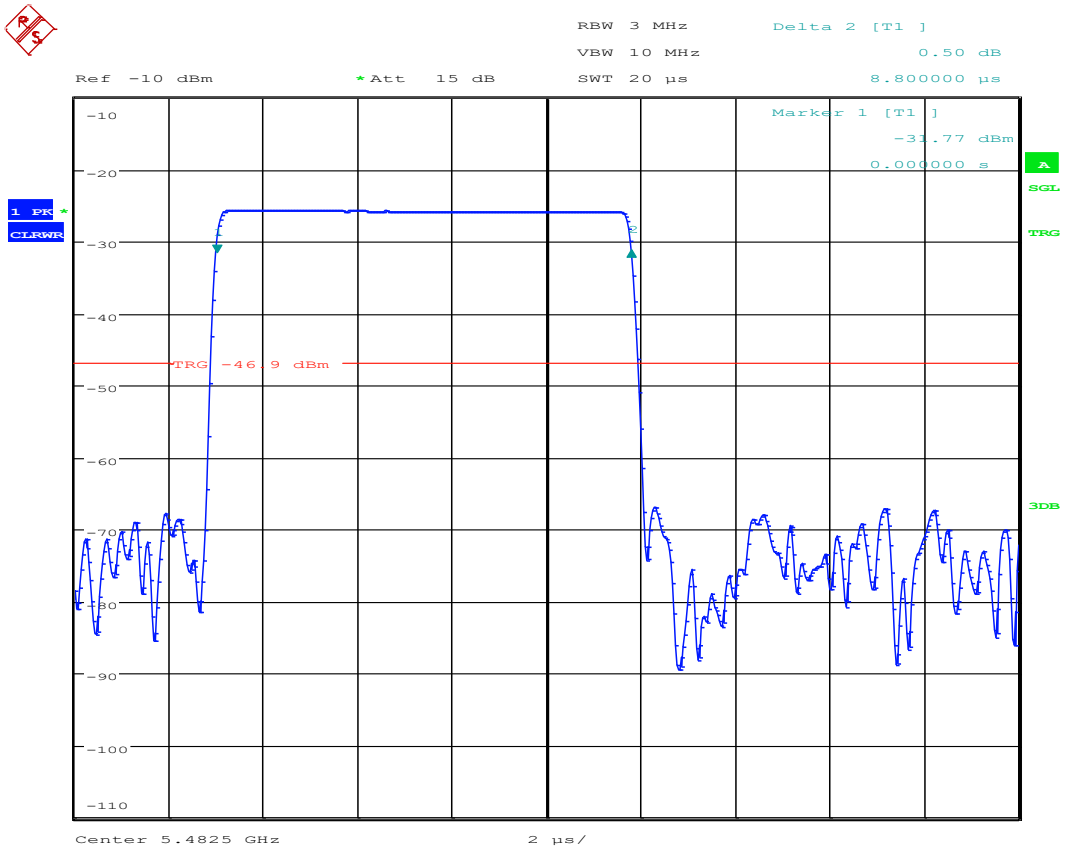
Pulse Repetition:



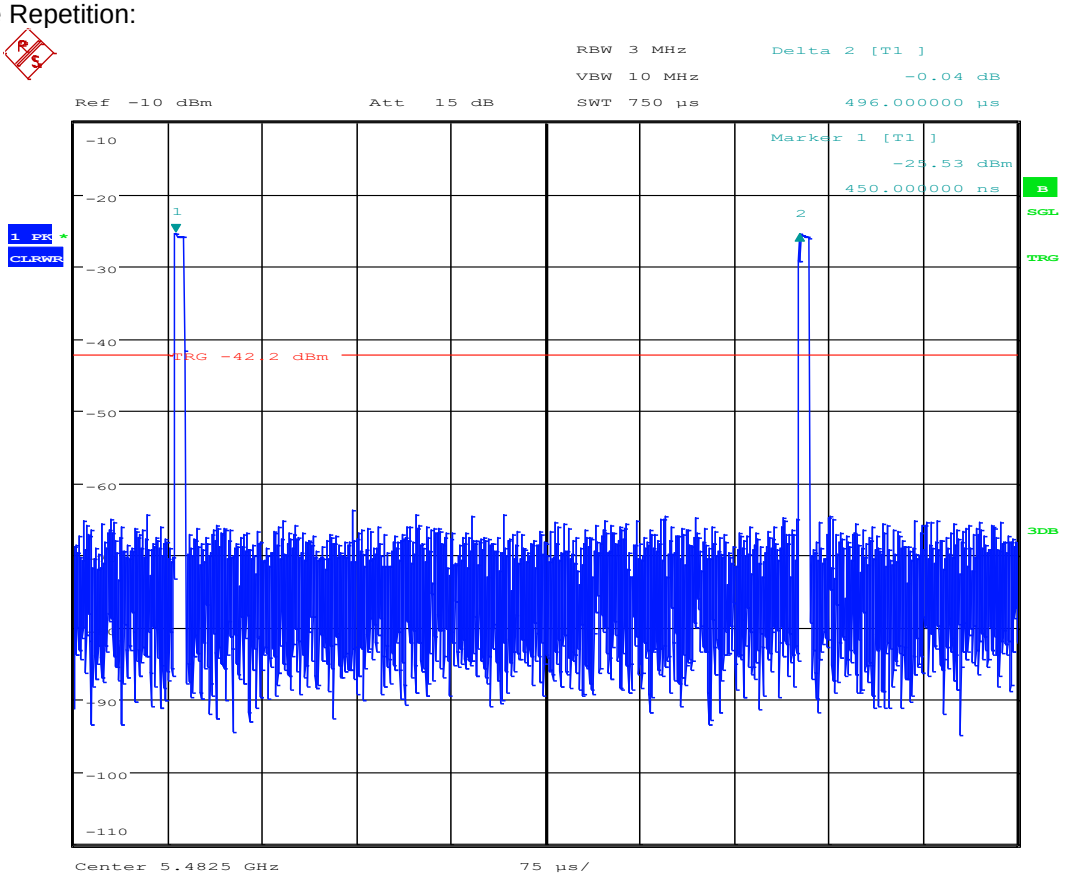
Pulse 2					
Channel: 5482.5 MHz; Bandwidth: 10 MHz; Interference level: -49.0 dBm					
Test #	Pulse width (µs)	Pulse repetition frequency (pulses / s)	PRI (µs)	Number of pulses	Detected (Yes/No)
1	1	4673	214	25	Yes
2	4.5	4975	201	28	Yes
3	1.9	4926	203	29	Yes
4	4.8	4975	201	25	Yes
5	2.1	5495	182	29	Yes
6	1.1	4608	217	29	Yes
7	3.8	5435	184	24	Yes
8	3.3	4975	201	29	Yes
9	4	5128	195	23	Yes
10	1.1	6579	152	26	Yes
11	3	6410	156	24	Yes
12	2.1	6211	161	27	Yes
13	3	4950	202	26	Yes
14	4.5	4405	227	29	Yes
15	3	4630	216	24	Yes
16	4.2	4739	211	25	Yes
17	1.2	5348	187	27	Yes
18	4.3	4587	218	24	Yes
19	1.7	5405	185	24	Yes
20	2.5	6289	159	23	Yes
21	4	6061	165	27	Yes
22	2.5	5405	185	26	Yes
23	1.4	4348	230	24	Yes
24	2.6	5155	194	24	Yes
25	2.7	4587	218	26	Yes
26	2.2	6410	156	28	Yes
27	3.6	4405	227	28	Yes
28	3.8	4386	228	26	Yes
29	4.5	4902	204	24	Yes
30	5	6329	158	27	Yes

Sample pulse parameters for Type 3 Pulses:

Pulse Width:



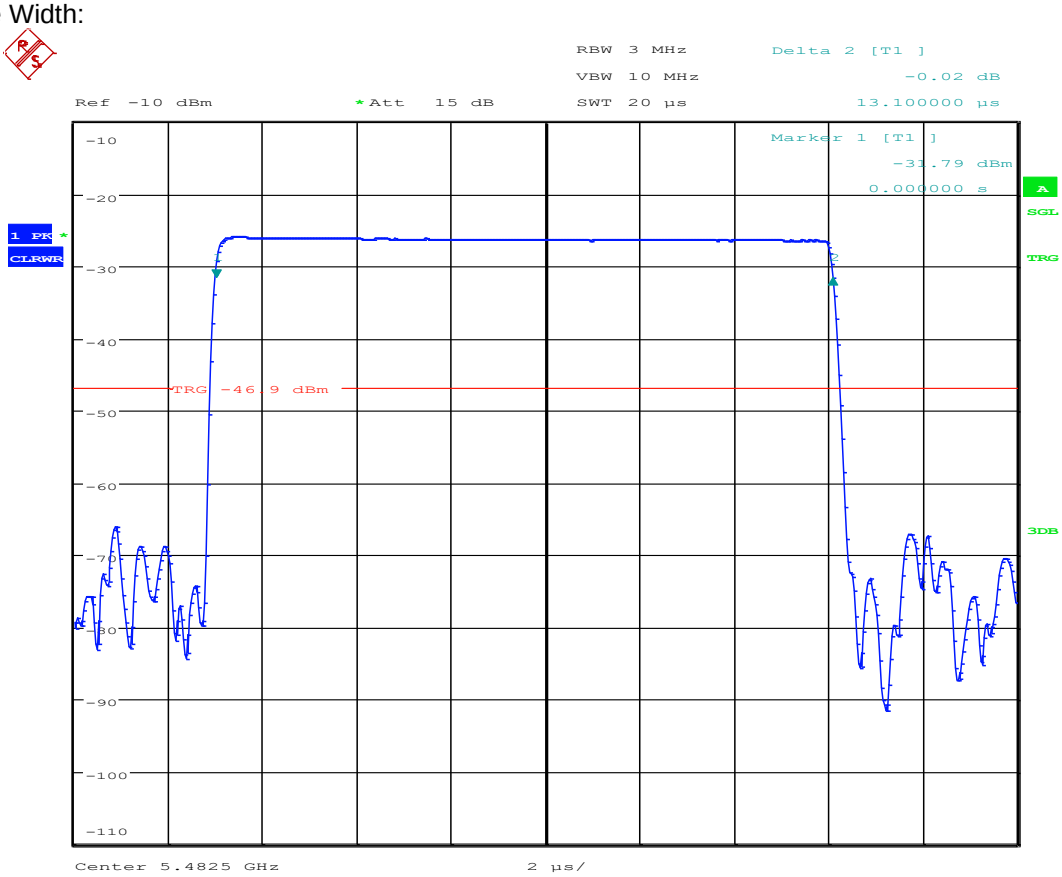
Pulse Repetition:



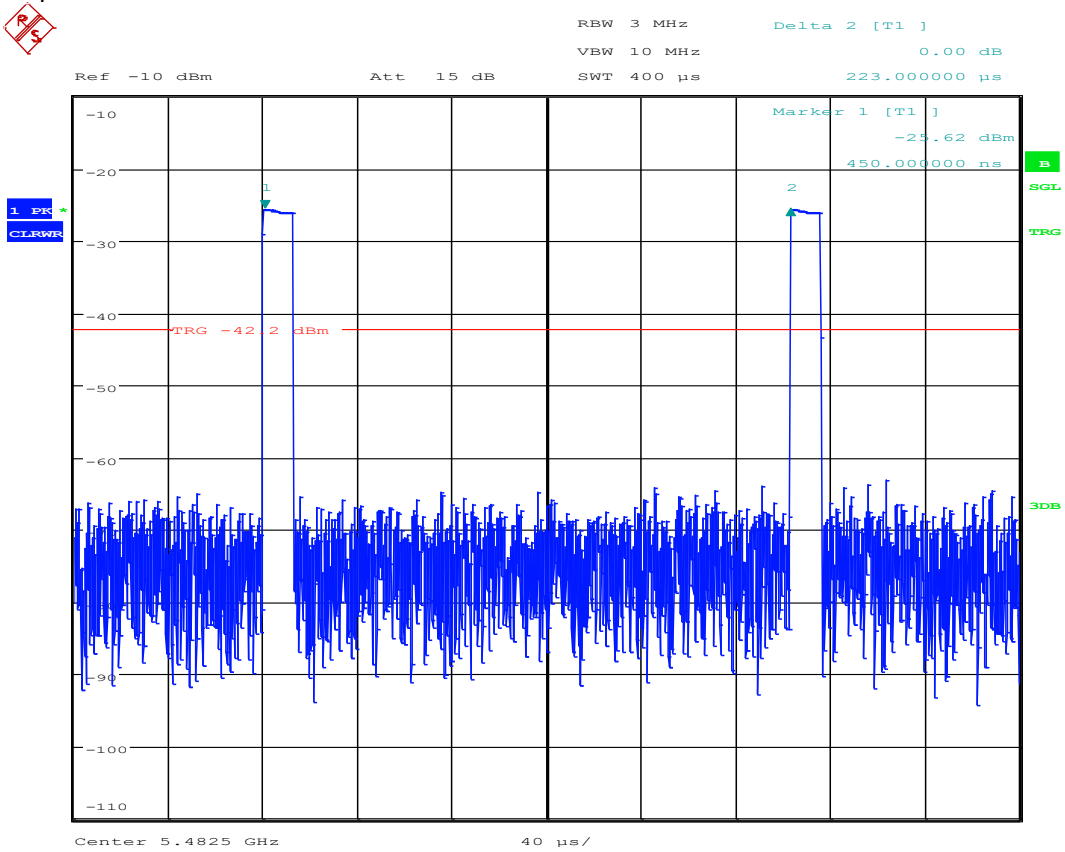
Pulse 3					
Channel: 5482.5 MHz; Bandwidth: 10 MHz; Interference level: -49.0 dBm					
Test #	Pulse width (µs)	Pulse repetition frequency (pulses / s)	PRI (µs)	Number of pulses	Detected (Yes/No)
1	7.7	4348	230	17	Yes
2	7.5	4310	232	18	Yes
3	7.3	4329	231	17	Yes
4	8.9	2463	406	18	Yes
5	6.5	2488	402	18	Yes
6	7.8	3115	321	18	Yes
7	9.3	2165	462	17	Yes
8	7.4	2381	420	16	Yes
9	7.1	4695	213	16	Yes
10	6.2	2809	356	18	Yes
11	7.3	4255	235	18	Yes
12	8.2	2033	492	17	Yes
13	8.6	4762	210	18	Yes
14	8.8	2016	496	18	Yes
15	7.7	2075	482	16	Yes
16	6.1	2710	369	16	Yes
17	8.6	3067	326	16	Yes
18	6.9	3984	251	16	Yes
19	7.4	4464	224	17	Yes
20	7.5	4292	233	16	Yes
21	8.2	3521	284	17	Yes
22	8.5	3145	318	17	Yes
23	9.5	2618	382	18	Yes
24	7.9	2268	441	17	Yes
25	7	4219	237	18	Yes
26	7.5	2114	473	18	Yes
27	9.6	3690	271	17	Yes
28	9.7	3155	317	16	Yes
29	8	4444	225	18	Yes
30	8.7	3968	252	18	Yes

Sample pulse parameters for Type 4 Pulses:

Pulse Width:



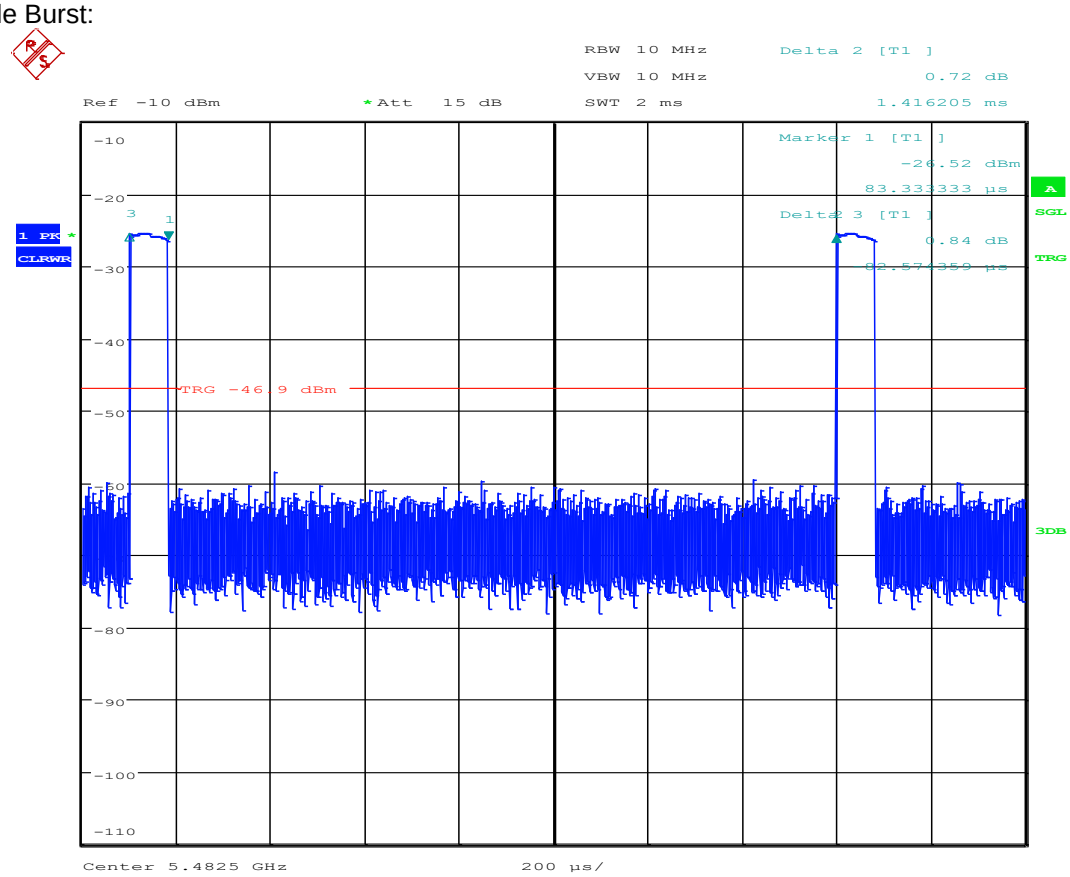
Pulse Repetition:



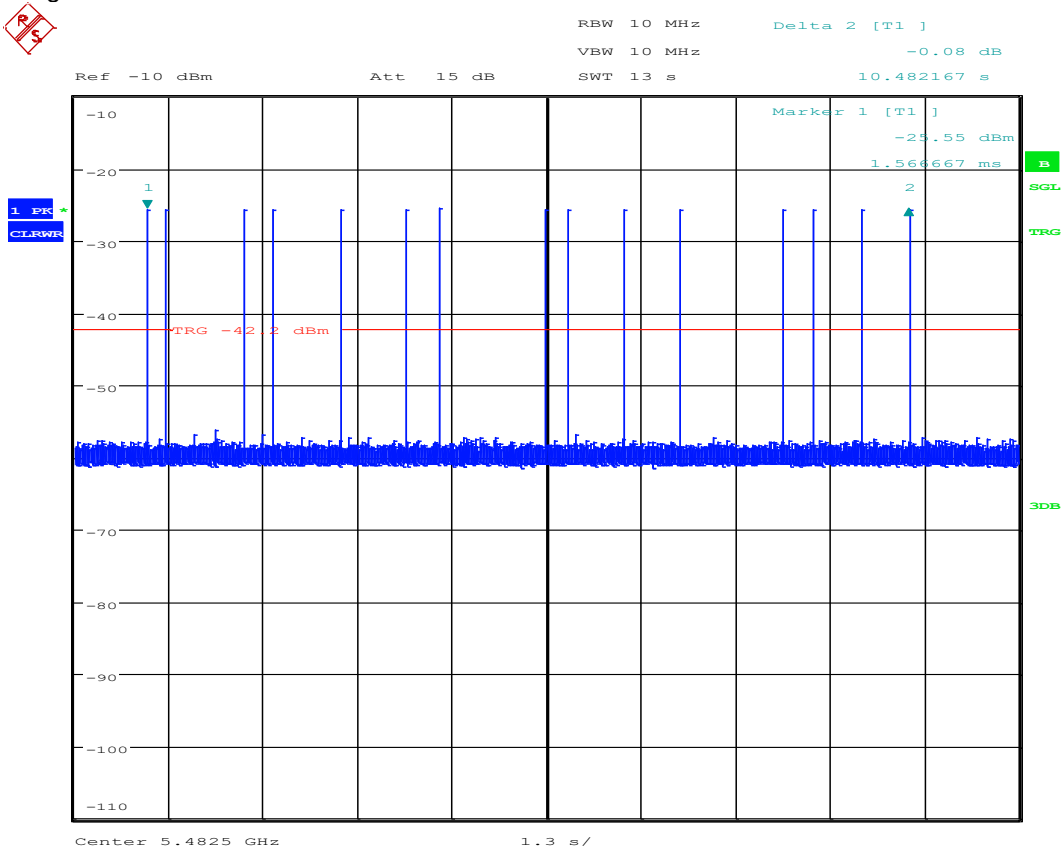
Pulse 4					
Channel: 5482.5 MHz; Bandwidth: 10 MHz; Interference level: -49.0 dBm					
Test #	Pulse width (µs)	Pulse repetition frequency (pulses / s)	PRI (µs)	Number of pulses	Detected (Yes/No)
1	11.7	3584	279	16	Yes
2	17.1	4132	242	15	Yes
3	14.5	2247	445	14	Yes
4	17.3	4032	248	16	Yes
5	16.4	3876	258	15	Yes
6	19.2	2024	494	12	Yes
7	14.1	2016	496	12	Yes
8	16.2	2882	347	16	Yes
9	16.2	2558	391	16	Yes
10	15.4	4202	238	13	Yes
11	16.6	3817	262	14	Yes
12	18.3	3175	315	14	Yes
13	15	2681	373	16	Yes
14	12.6	2012	497	12	Yes
15	13.2	3922	255	12	Yes
16	15.7	3390	295	12	Yes
17	15.3	2653	377	12	Yes
18	19.1	3378	296	12	Yes
19	17.5	2849	351	15	Yes
20	11.4	4348	230	14	Yes
21	18.3	2123	471	15	Yes
22	13.1	4484	223	16	Yes
23	15.8	2283	438	16	Yes
24	11.7	2967	337	14	Yes
25	11.6	4049	247	16	Yes
26	11.7	3367	297	13	Yes
27	18.2	4608	217	13	Yes
28	17.3	4975	201	14	Yes
29	12.8	2392	418	16	Yes
30	13.1	4425	226	16	Yes

Sample pulse parameters for Type 5 Pulses (Test #18):

Single Burst:



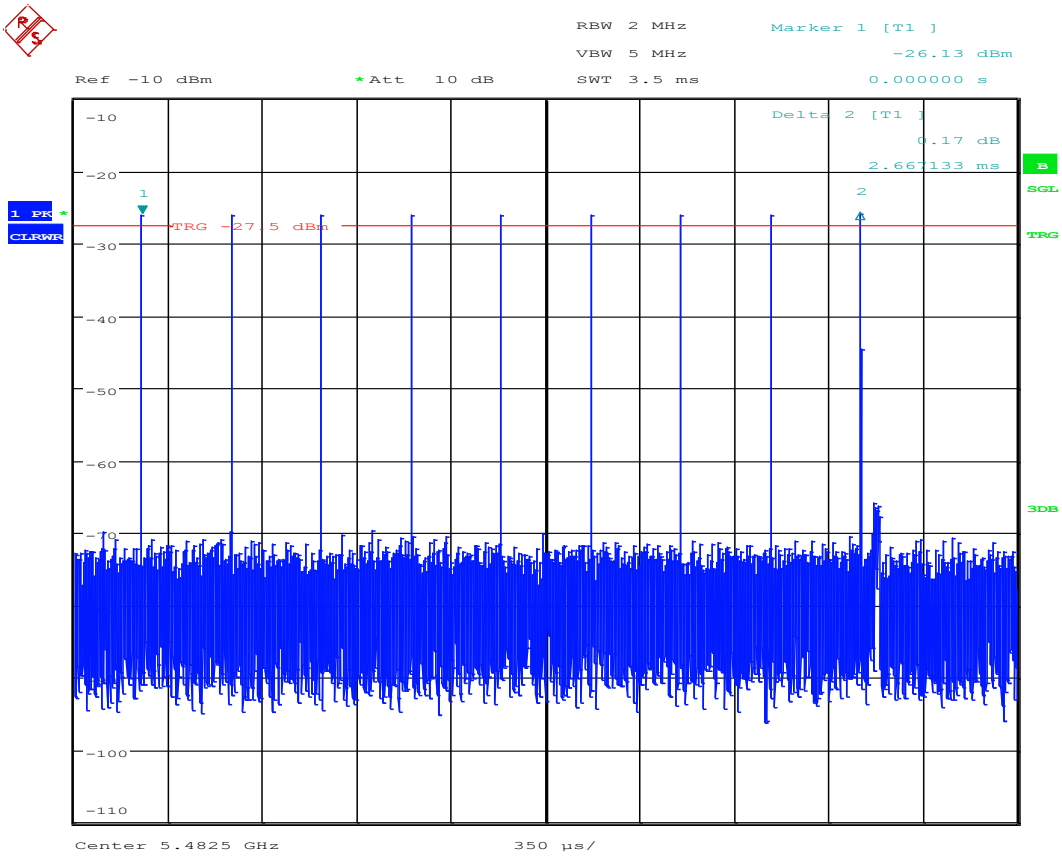
Total Length:



Pulse 5					
Channel: 5482.5 MHz; Bandwidth: 10 MHz; Interference level: -49.0 dBm					
Test #	***Detected (Yes/No)***	***Test #***	***Detected (Yes/No)***	***Test #***	***Detected (Yes/No)***
1	Yes	***11***	Yes	***21***	Yes
2	Yes	***12***	Yes	***22***	Yes
3	Yes	***13***	Yes	***23***	Yes
4	Yes	***14***	Yes	***24***	Yes
5	Yes	***15***	Yes	***25***	Yes
6	Yes	***16***	Yes	***26***	Yes
7	Yes	***17***	Yes	***27***	Yes
8	Yes	***18***	Yes	***28***	Yes
9	Yes	***19***	Yes	***29***	Yes
10	Yes	***20***	Yes	***30***	Yes

Sample pulse parameters for Type 6 Pulses (Test #11):

Full Burst:



Pulse 6					
Channel: 5482.5 MHz; Bandwidth: 10 MHz; Interference level: -49.0 dBm					
Test #	***Detected (Yes/No)***	***Test #***	***Detected (Yes/No)***	***Test #***	***Detected (Yes/No)***
1	Yes	***11***	Yes	***21***	Yes
2	Yes	***12***	Yes	***22***	Yes
3	Yes	***13***	Yes	***23***	Yes
4	Yes	***14***	Yes	***24***	Yes
5	Yes	***15***	Yes	***25***	Yes
6	Yes	***16***	Yes	***26***	Yes
7	Yes	***17***	Yes	***27***	Yes
8	Yes	***18***	Yes	***28***	Yes
9	Yes	***19***	Yes	***29***	Yes
10	No	***20***	Yes	***30***	Yes

Type 5 Burst Parameters:

Type 5 Burst Number 000								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	2	11	62369	74	1301	0	642064	705882
2	2	11	89246	50	1056	0	615480	705882
3	3	11	93269	76	1312	1324	609749	705882
4	3	11	450205	92	1070	1104	253227	705882
5	1	11	180584	74	0	0	525224	705882
6	1	11	82682	59	0	0	623141	705882
7	3	11	44241	57	977	1295	659198	705882
8	1	11	655711	85	0	0	50086	705882
9	1	11	654590	53	0	0	51239	705882
10	2	11	475962	89	1817	0	227925	705882
11	1	11	471908	60	0	0	233914	705882
12	1	11	215829	90	0	0	489963	705882
13	2	11	632398	70	1425	0	71919	705882
14	3	11	199868	52	1397	1648	502813	705882
15	1	11	200954	72	0	0	504856	705882
16	1	11	177874	59	0	0	527949	705882
17	3	11	578787	88	975	1620	124236	705882
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 001								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	1	6	219380	89	0	0	703607	923076
2	2	6	802371	64	1900	0	118677	923076
3	1	6	907102	79	0	0	15895	923076
4	2	6	687966	91	1204	0	233724	923076
5	2	6	226341	73	1264	0	695325	923076
6	1	6	36484	61	0	0	886531	923076
7	3	6	658042	75	1232	1450	262127	923076
8	2	6	557408	66	1376	0	364160	923076
9	2	6	485115	99	1748	0	436015	923076
10	2	6	318698	86	1574	0	602632	923076
11	3	6	506511	74	1755	932	413656	923076
12	2	6	825289	95	1351	0	96246	923076
13	2	6	669680	72	1228	0	252024	923076
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 002								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	1	14	122990	51	0	0	734101	857142
2	1	14	732357	97	0	0	124688	857142
3	2	14	715209	77	1466	0	140313	857142
4	3	14	655882	82	1351	1883	197780	857142
5	2	14	847790	91	1703	0	7467	857142
6	2	14	28110	89	1311	0	827543	857142
7	2	14	67605	52	1370	0	788063	857142
8	3	14	750067	96	1791	1045	103951	857142
9	3	14	164133	70	1547	1420	689832	857142
10	2	14	150600	87	1404	0	704964	857142
11	3	14	699430	64	1106	1504	154910	857142
12	2	14	81206	74	1053	0	774735	857142
13	2	14	828569	75	1661	0	26762	857142
14	3	14	201676	92	912	1676	652602	857142
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 003								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	3	17	88902	81	1575	1614	764808	857142
2	3	17	186717	51	1296	1227	667749	857142
3	2	17	271865	53	1447	0	583724	857142
4	3	17	194548	55	1808	1753	658868	857142
5	3	17	228589	80	1613	1744	624956	857142
6	2	17	511292	57	1865	0	343871	857142
7	3	17	188987	74	1350	1124	665459	857142
8	3	17	406704	71	1253	1559	447413	857142
9	2	17	114933	53	1363	0	740740	857142
10	3	17	201142	94	1136	1348	653234	857142
11	2	17	121329	99	1616	0	733999	857142
12	3	17	54576	50	1487	1128	799801	857142
13	3	17	699525	69	990	1893	154527	857142
14	2	17	679549	78	1715	0	175722	857142
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 004								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	3	18	462010	95	1404	1390	734911	1200000
2	2	18	554757	57	1499	0	643630	1200000
3	3	18	1086954	98	939	1095	110718	1200000
4	1	18	87831	81	0	0	1112088	1200000
5	2	18	820121	73	1116	0	378617	1200000
6	2	18	288704	68	1459	0	909701	1200000
7	2	18	1172222	75	1184	0	26444	1200000
8	2	18	46718	52	1029	0	1152149	1200000
9	2	18	571124	73	1680	0	627050	1200000
10	1	18	741144	88	0	0	458768	1200000
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 005								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	3	20	544062	61	1789	1290	84254	631578
2	1	20	515237	77	0	0	116264	631578
3	2	20	821	72	1259	0	629354	631578
4	1	20	342278	62	0	0	289238	631578
5	3	20	558872	62	1908	1779	68833	631578
6	2	20	545034	95	1693	0	84661	631578
7	3	20	91211	80	1376	1437	537314	631578
8	3	20	441574	79	1767	1252	186748	631578
9	3	20	345961	56	1621	1835	281993	631578
10	2	20	55552	86	1076	0	574778	631578
11	2	20	276901	88	949	0	353552	631578
12	1	20	318424	60	0	0	313094	631578
13	3	20	253391	90	1687	1879	374351	631578
14	3	20	170162	72	1913	1280	458007	631578
15	2	20	404713	51	1620	0	225143	631578
16	3	20	266484	74	1596	1382	361894	631578
17	2	20	263551	65	1289	0	366608	631578
18	2	20	504185	59	1357	0	125918	631578
19	1	20	607018	55	0	0	24505	631578
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 006								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	1	9	1030857	82	0	0	169061	1200000
2	3	9	1191564	53	1310	1246	5721	1200000
3	3	9	1019527	85	1453	1195	177570	1200000
4	3	9	315961	75	1371	1672	880771	1200000
5	2	9	964152	100	1681	0	233967	1200000
6	1	9	442125	82	0	0	757793	1200000
7	2	9	32215	90	1898	0	1165707	1200000
8	1	9	468715	94	0	0	731191	1200000
9	1	9	870219	67	0	0	329714	1200000
10	1	9	71298	89	0	0	1128613	1200000
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 007								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	1	9	649069	71	0	0	273936	923076
2	2	9	497574	91	1047	0	424273	923076
3	2	9	400246	97	1257	0	521379	923076
4	3	9	461585	80	1093	1390	458768	923076
5	2	9	629042	61	1372	0	292540	923076
6	2	9	415483	65	1904	0	505559	923076
7	3	9	877854	57	1108	1448	42495	923076
8	2	9	779440	83	1604	0	141866	923076
9	1	9	325024	92	0	0	597960	923076
10	1	9	752123	80	0	0	170873	923076
11	1	9	265422	93	0	0	657561	923076
12	1	9	754746	84	0	0	168246	923076
13	1	9	869503	90	0	0	53483	923076
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 008								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	2	8	463233	78	1549	0	166640	631578
2	3	8	490008	93	1367	1159	138765	631578
3	3	8	291182	99	935	1448	337716	631578
4	3	8	218571	88	917	1445	410381	631578
5	1	8	521674	70	0	0	109834	631578
6	2	8	180818	60	1777	0	448863	631578
7	1	8	399991	65	0	0	231522	631578
8	3	8	459006	67	1156	1562	169653	631578
9	3	8	206598	55	1005	1055	422755	631578
10	3	8	92200	95	1755	1732	535606	631578
11	1	8	467698	91	0	0	163789	631578
12	2	8	7934	99	971	0	622475	631578
13	1	8	479035	80	0	0	152463	631578
14	3	8	565264	89	1052	1335	63660	631578
15	2	8	390005	80	1084	0	240329	631578
16	3	8	513245	66	1685	1340	115110	631578
17	2	8	563483	79	1608	0	66329	631578
18	1	8	142887	68	0	0	488623	631578
19	2	8	595897	100	1166	0	34315	631578
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 009								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	2	13	1188296	66	1497	0	310075	1500000
2	1	13	1305216	82	0	0	194702	1500000
3	3	13	316925	54	1912	1583	1179418	1500000
4	3	13	1276981	69	1658	1161	219993	1500000
5	3	13	1777	75	1330	1849	1494819	1500000
6	2	13	88702	69	1049	0	1410111	1500000
7	1	13	409553	77	0	0	1090370	1500000
8	3	13	1344813	94	1384	1780	151741	1500000
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 010								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	1	18	138258	59	0	0	461683	600000
2	1	18	546138	77	0	0	53785	600000
3	2	18	408958	81	969	0	189911	600000
4	1	18	299450	100	0	0	300450	600000
5	1	18	262241	57	0	0	337702	600000
6	2	18	386375	81	1542	0	211921	600000
7	3	18	240092	59	1616	968	357147	600000
8	2	18	54500	82	1237	0	544099	600000
9	1	18	590652	67	0	0	9281	600000
10	2	18	402608	94	1081	0	196123	600000
11	2	18	8060	69	1801	0	590001	600000
12	2	18	260393	89	1244	0	338185	600000
13	3	18	373698	62	971	1892	223253	600000
14	2	18	165179	52	1201	0	433516	600000
15	1	18	525446	97	0	0	74457	600000
16	2	18	118279	60	1660	0	479941	600000
17	1	18	317069	59	0	0	282872	600000
18	3	18	370431	67	1270	1491	226607	600000
19	1	18	502709	74	0	0	97217	600000
20	1	18	365486	88	0	0	234426	600000

Type 5 Burst Number 011								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	3	7	405562	62	1228	1101	925256	1333333
2	3	7	112555	85	1569	1033	1217921	1333333
3	3	7	222095	56	1896	1243	1107931	1333333
4	2	7	980763	83	1589	0	350815	1333333
5	1	7	587134	62	0	0	746137	1333333
6	1	7	907639	70	0	0	425624	1333333
7	2	7	798767	91	1061	0	533323	1333333
8	3	7	1038190	75	1592	1078	292248	1333333
9	1	7	1216945	63	0	0	116325	1333333
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 012								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	2	19	617535	75	1800	0	180515	800000
2	1	19	347872	82	0	0	452046	800000
3	3	19	310000	93	1214	1349	487158	800000
4	1	19	676997	94	0	0	122909	800000
5	3	19	384299	70	1079	1820	412592	800000
6	3	19	105941	94	1447	959	691371	800000
7	2	19	136892	52	1918	0	661086	800000
8	1	19	386813	95	0	0	413092	800000
9	1	19	111928	89	0	0	687983	800000
10	3	19	614791	68	1599	1763	181643	800000
11	1	19	769781	87	0	0	30132	800000
12	3	19	632734	58	1539	1368	164185	800000
13	1	19	497710	94	0	0	302196	800000
14	1	19	59711	51	0	0	740238	800000
15	1	19	762284	86	0	0	37630	800000
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 013								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	3	15	381955	79	1386	1418	281670	666666
2	2	15	198447	98	1183	0	466840	666666
3	3	15	211726	51	1477	1689	451621	666666
4	1	15	98608	62	0	0	567996	666666
5	3	15	102307	85	1811	1451	560842	666666
6	1	15	194083	83	0	0	472500	666666
7	2	15	22253	90	1370	0	642863	666666
8	3	15	17001	71	1788	1479	646185	666666
9	1	15	520369	59	0	0	146238	666666
10	1	15	293282	69	0	0	373315	666666
11	1	15	85391	66	0	0	581209	666666
12	1	15	234610	63	0	0	431993	666666
13	3	15	565390	90	1816	1749	97441	666666
14	3	15	348394	63	1863	1041	315179	666666
15	2	15	617135	90	1116	0	48235	666666
16	2	15	345938	75	1172	0	319406	666666
17	1	15	652039	59	0	0	14568	666666
18	3	15	597436	58	1875	1398	65783	666666
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 014								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	3	9	333277	61	965	1125	521592	857142
2	3	9	166589	89	1901	1466	686919	857142
3	3	9	786168	80	1522	1545	67667	857142
4	2	9	35279	93	1885	0	819792	857142
5	2	9	58782	91	1612	0	796566	857142
6	2	9	319960	87	1008	0	536000	857142
7	1	9	833938	82	0	0	23122	857142
8	2	9	405	98	1193	0	855348	857142
9	1	9	427539	95	0	0	429508	857142
10	1	9	228533	71	0	0	628538	857142
11	1	9	807722	82	0	0	49338	857142
12	1	9	614024	80	0	0	243038	857142
13	2	9	463396	68	1726	0	391884	857142
14	1	9	736696	74	0	0	120372	857142
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 015								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	3	11	440190	57	1361	1386	1056892	1500000
2	2	11	872333	80	1281	0	626226	1500000
3	3	11	591863	99	1210	1502	905128	1500000
4	1	11	1042643	56	0	0	457301	1500000
5	2	11	286465	89	1208	0	1212149	1500000
6	3	11	780315	50	963	977	717595	1500000
7	1	11	130003	69	0	0	1369928	1500000
8	3	11	846115	96	996	1131	651470	1500000
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 016								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	1	16	129937	86	0	0	960886	1090909
2	3	16	260622	78	1190	1282	827581	1090909
3	2	16	1043001	70	1904	0	45864	1090909
4	3	16	92374	71	1319	1843	995160	1090909
5	3	16	440220	62	1171	1072	648260	1090909
6	2	16	244301	89	1456	0	844974	1090909
7	1	16	990729	85	0	0	100095	1090909
8	3	16	329055	54	982	1105	759605	1090909
9	1	16	485791	100	0	0	605018	1090909
10	1	16	1006435	87	0	0	84387	1090909
11	2	16	675853	89	1303	0	413575	1090909
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 017								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	2	6	791033	84	1413	0	7386	800000
2	1	6	256498	73	0	0	543429	800000
3	1	6	541068	80	0	0	258852	800000
4	1	6	125093	67	0	0	674840	800000
5	2	6	264422	100	1566	0	533812	800000
6	3	6	362733	66	1872	1733	433464	800000
7	2	6	9228	70	1398	0	789234	800000
8	1	6	667055	66	0	0	132879	800000
9	2	6	180259	50	1745	0	617896	800000
10	2	6	157526	81	1521	0	640791	800000
11	3	6	124889	94	1526	1622	671681	800000
12	3	6	730980	68	1625	1031	66160	800000
13	2	6	355842	97	1637	0	442327	800000
14	2	6	210848	65	1545	0	587477	800000
15	1	6	74494	65	0	0	725441	800000
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 018								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	2	20	206513	100	1068	0	649361	857142
2	2	20	577081	75	1045	0	278866	857142
3	3	20	741437	69	1399	1345	112754	857142
4	3	20	851910	61	1581	1691	1777	857142
5	3	20	335877	68	1026	1569	518466	857142
6	1	20	309347	96	0	0	547699	857142
7	2	20	383065	81	1137	0	472778	857142
8	1	20	338595	55	0	0	518492	857142
9	3	20	394312	59	1658	1930	459065	857142
10	3	20	567308	59	1921	1184	286552	857142
11	2	20	670557	63	969	0	185490	857142
12	2	20	349300	69	1553	0	506151	857142
13	1	20	131522	69	0	0	725551	857142
14	3	20	281512	90	1516	978	572866	857142
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 019								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	2	20	102184	73	1210	0	987369	1090909
2	2	20	561394	50	1942	0	527473	1090909
3	2	20	318119	83	1207	0	771417	1090909
4	2	20	1058539	69	1783	0	30449	1090909
5	3	20	990557	92	1788	1486	96802	1090909
6	1	20	42833	80	0	0	1047996	1090909
7	3	20	431350	86	1155	1890	656256	1090909
8	1	20	144606	96	0	0	946207	1090909
9	2	20	856975	59	1416	0	232400	1090909
10	2	20	14527	72	1830	0	1074408	1090909
11	3	20	128429	53	1830	1916	958575	1090909
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 020								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	3	18	350188	52	1770	1698	1146188	1500000
2	2	18	413631	87	1000	0	1085195	1500000
3	3	18	1163494	62	1040	1580	333700	1500000
4	1	18	591701	56	0	0	908243	1500000
5	3	18	1369222	58	1832	1263	127509	1500000
6	1	18	620208	80	0	0	879712	1500000
7	3	18	517019	94	1692	1744	979263	1500000
8	2	18	1285075	96	1882	0	212851	1500000
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 021								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	2	19	584072	68	1618	0	271316	857142
2	3	19	117019	55	1144	1872	736942	857142
3	2	19	664067	63	1173	0	191776	857142
4	3	19	106788	74	1160	1887	747085	857142
5	2	19	197047	93	1892	0	658017	857142
6	2	19	804150	65	1518	0	51344	857142
7	1	19	199994	97	0	0	657051	857142
8	1	19	671859	56	0	0	185227	857142
9	1	19	466059	54	0	0	391029	857142
10	1	19	406939	52	0	0	450151	857142
11	1	19	613459	60	0	0	243623	857142
12	1	19	62191	73	0	0	794878	857142
13	3	19	732363	82	927	1801	121805	857142
14	2	19	269092	98	1755	0	586099	857142
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 022								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	2	20	74456	51	1334	0	674108	750000
2	3	20	608085	93	1175	1600	138861	750000
3	1	20	702745	74	0	0	47181	750000
4	3	20	362998	70	1385	1116	384291	750000
5	3	20	580028	66	1067	1780	166927	750000
6	1	20	714804	81	0	0	35115	750000
7	3	20	270691	68	1005	1773	476327	750000
8	1	20	502432	73	0	0	247495	750000
9	1	20	5676	60	0	0	744264	750000
10	2	20	265186	69	1406	0	483270	750000
11	2	20	640635	72	1568	0	107653	750000
12	1	20	243380	85	0	0	506535	750000
13	2	20	355512	70	1136	0	393212	750000
14	3	20	424646	100	1396	994	322664	750000
15	3	20	366887	88	1058	1719	380072	750000
16	1	20	338758	93	0	0	411149	750000
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 023								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	1	5	127106	77	0	0	472817	600000
2	2	5	262376	76	1034	0	336438	600000
3	3	5	243255	84	1316	1052	354125	600000
4	2	5	535813	63	1543	0	62518	600000
5	3	5	289409	82	1806	1250	307289	600000
6	1	5	378437	52	0	0	221511	600000
7	1	5	137401	96	0	0	462503	600000
8	3	5	112306	94	1157	1500	484755	600000
9	3	5	155113	59	1367	1731	441612	600000
10	3	5	4825	84	1280	1417	592226	600000
11	3	5	197261	85	1346	1270	399868	600000
12	3	5	129965	60	1536	1465	466854	600000
13	2	5	55796	81	1440	0	542602	600000
14	2	5	369281	79	1123	0	229438	600000
15	3	5	481572	89	1024	1345	115792	600000
16	3	5	487115	75	1160	1759	109741	600000
17	2	5	312820	86	1864	0	285144	600000
18	3	5	118988	74	1290	1287	478213	600000
19	3	5	159712	79	1264	1388	437399	600000
20	3	5	400614	69	1555	1231	196393	600000

Type 5 Burst Number 024								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	3	9	729152	88	979	1395	268210	1000000
2	3	9	856593	69	1820	1414	139966	1000000
3	1	9	384945	52	0	0	615003	1000000
4	3	9	778425	91	1177	950	219175	1000000
5	1	9	118409	87	0	0	881504	1000000
6	2	9	537964	65	976	0	460930	1000000
7	1	9	707659	93	0	0	292248	1000000
8	2	9	563965	66	1129	0	434774	1000000
9	2	9	961147	75	1882	0	36821	1000000
10	3	9	985203	52	1048	1530	12063	1000000
11	2	9	479874	86	944	0	519010	1000000
12	1	9	307367	54	0	0	692579	1000000
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 025								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	2	6	379935	76	1551	0	249940	631578
2	1	6	278549	65	0	0	352964	631578
3	1	6	270136	98	0	0	361344	631578
4	1	6	289485	84	0	0	342009	631578
5	1	6	334667	83	0	0	296828	631578
6	2	6	533344	94	909	0	97137	631578
7	2	6	291282	50	1630	0	338566	631578
8	3	6	352823	82	1584	1199	275726	631578
9	1	6	339845	61	0	0	291672	631578
10	3	6	589124	66	1676	1610	38970	631578
11	3	6	538115	66	1594	1456	90215	631578
12	1	6	336138	84	0	0	295356	631578
13	1	6	352422	50	0	0	279106	631578
14	2	6	127698	98	1642	0	502042	631578
15	1	6	456373	53	0	0	175152	631578
16	2	6	543052	92	1072	0	87270	631578
17	2	6	292817	82	1078	0	337519	631578
18	3	6	85782	60	1451	1818	542347	631578
19	2	6	411043	100	1492	0	218843	631578
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 026								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	1	10	724126	76	0	0	75798	800000
2	1	10	337405	97	0	0	462498	800000
3	2	10	487499	55	1860	0	310531	800000
4	2	10	573803	50	1184	0	224913	800000
5	2	10	617491	58	1778	0	180615	800000
6	1	10	22606	89	0	0	777305	800000
7	2	10	372224	69	1330	0	426308	800000
8	1	10	701901	72	0	0	98027	800000
9	1	10	286733	69	0	0	513198	800000
10	1	10	768210	82	0	0	31708	800000
11	3	10	186434	59	1618	1774	609997	800000
12	2	10	196526	96	1428	0	601854	800000
13	3	10	127247	59	1128	1218	670230	800000
14	2	10	653653	63	1090	0	145131	800000
15	2	10	768387	90	1225	0	30208	800000
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 027								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	2	13	1004443	96	1884	0	326814	1333333
2	3	13	506991	77	1175	1343	823593	1333333
3	1	13	540888	99	0	0	792346	1333333
4	2	13	794903	50	1490	0	536840	1333333
5	3	13	279826	75	1040	1463	1050779	1333333
6	1	13	376386	87	0	0	956860	1333333
7	2	13	719470	95	1130	0	612543	1333333
8	2	13	1046119	92	1553	0	285477	1333333
9	1	13	388060	58	0	0	945215	1333333
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 028								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	1	12	709952	78	0	0	289970	1000000
2	2	12	3519	89	1718	0	994585	1000000
3	1	12	773222	56	0	0	226722	1000000
4	1	12	19048	64	0	0	980888	1000000
5	3	12	294834	91	1756	1508	701629	1000000
6	1	12	697590	58	0	0	302352	1000000
7	2	12	711322	54	1257	0	287313	1000000
8	3	12	348462	77	1552	1108	648647	1000000
9	1	12	214810	86	0	0	785104	1000000
10	1	12	946140	85	0	0	53775	1000000
11	2	12	470844	97	1345	0	527617	1000000
12	3	12	75280	54	1154	1057	922347	1000000
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

Type 5 Burst Number 029								
Burst Segment	***Number of Pulses***	***Chirp Width (MHz)***	***t1 (µs)***	***Pulse Width t2 (µs)***	***t3 (µs)***	***t4 (µs)***	***t5 (µs)***	***Total Segment Length (µs)***
1	3	12	951086	92	1847	1365	136335	1090909
2	1	12	831415	58	0	0	259436	1090909
3	3	12	891103	74	1325	1815	196444	1090909
4	1	12	4294	69	0	0	1086546	1090909
5	3	12	959871	73	1364	990	128465	1090909
6	1	12	481074	94	0	0	609741	1090909
7	2	12	463575	93	1699	0	625449	1090909
8	2	12	256597	60	1909	0	832283	1090909
9	2	12	865821	75	1568	0	223370	1090909
10	1	12	477886	95	0	0	612928	1090909
11	3	12	509899	52	1323	1898	577633	1090909
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0

23 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**

24 RF Exposure

U-NII devices are subject to the radio frequency radiation exposure requirements specified in §1.1307(b), §2.1091 and §2.1093 of chapter 47 of the CFR, as appropriate. All equipment shall be considered to operate in a ‘‘general population/uncontrolled’’ environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

Prediction of MPE limit at a given distance

For purposes of these requirements mobile devices are defined by the FCC as transmitters designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between radiating structures and the body of the user or nearby persons. These devices are normally evaluated for exposure potential with relation to the MPE limits. As the 20 cm separation specified under FCC rules may not be achievable under normal operation of the EUT, an RF exposure calculation is needed to show the minimum distance required to be less than the power density limit, as required under FCC rules.

Equation from IEEE C95.1

$$S = \frac{EIRP}{4\pi R^2} \quad \text{re-arranged } R = \sqrt{\frac{EIRP}{S4\pi}}$$

Where:

S = power density
R = distance to the centre of radiation of the antenna
EIRP = EUT Maximum power

Result

Operating Band (MHz)	***EIRP (mW)***	***Power density limit (S) (mW/cm²)***	***Distance (R) cm required to be less than the power density limit***
5470 - 5725	173.78	1.0	3.7