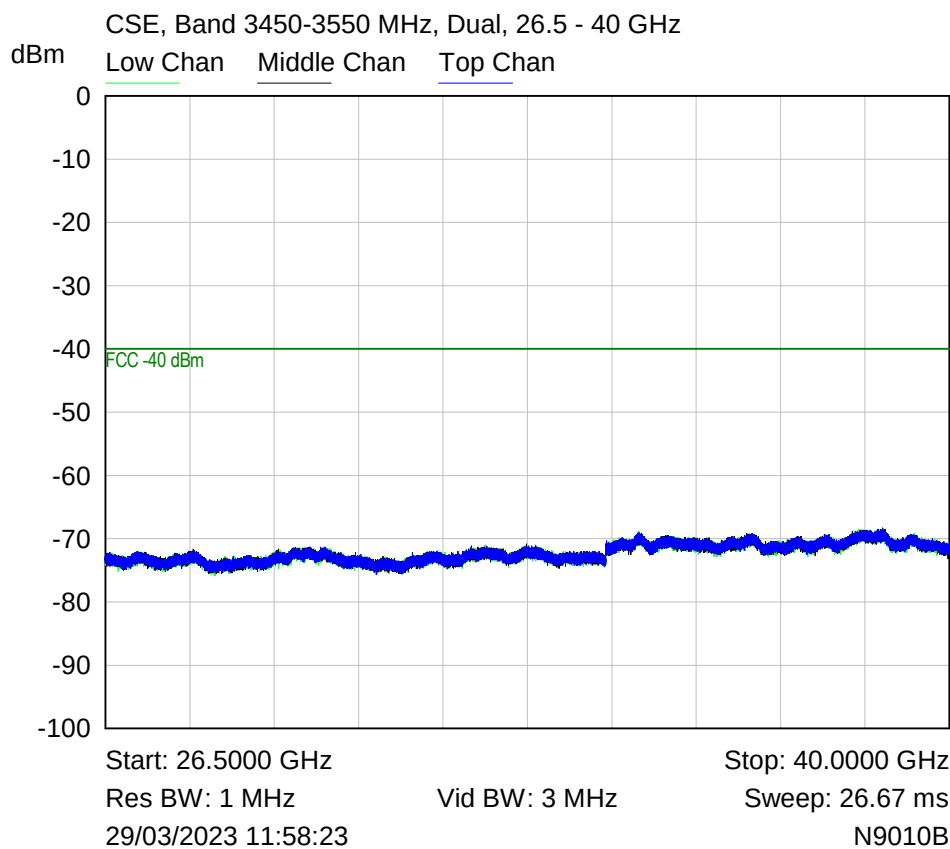
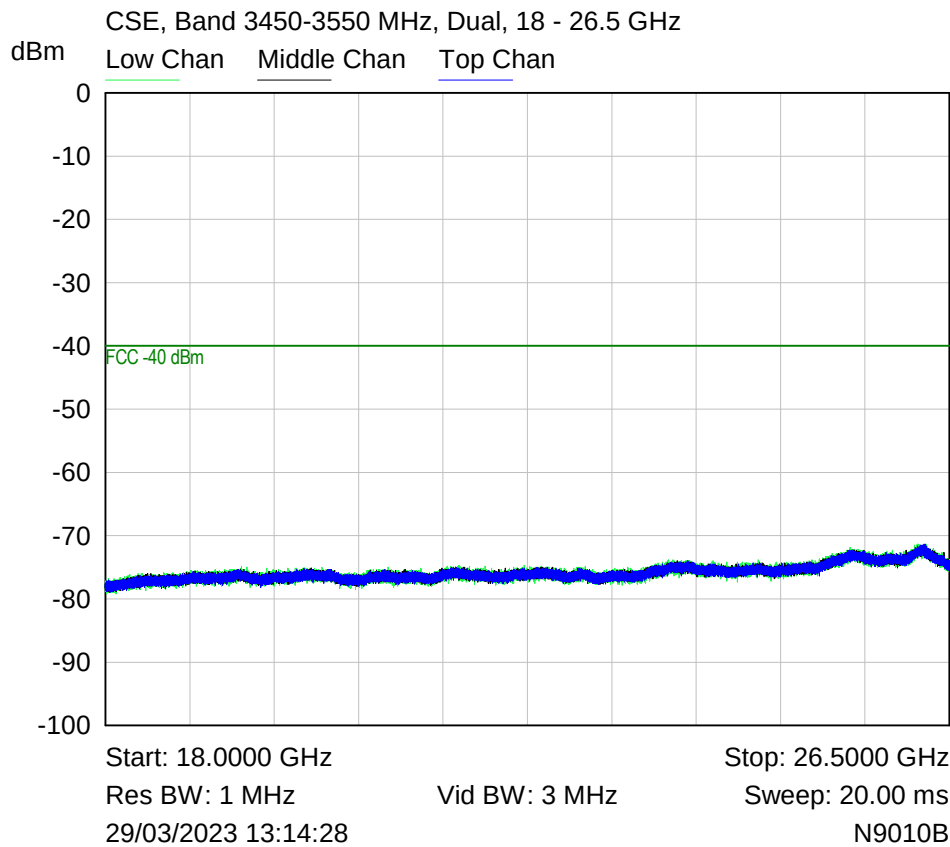
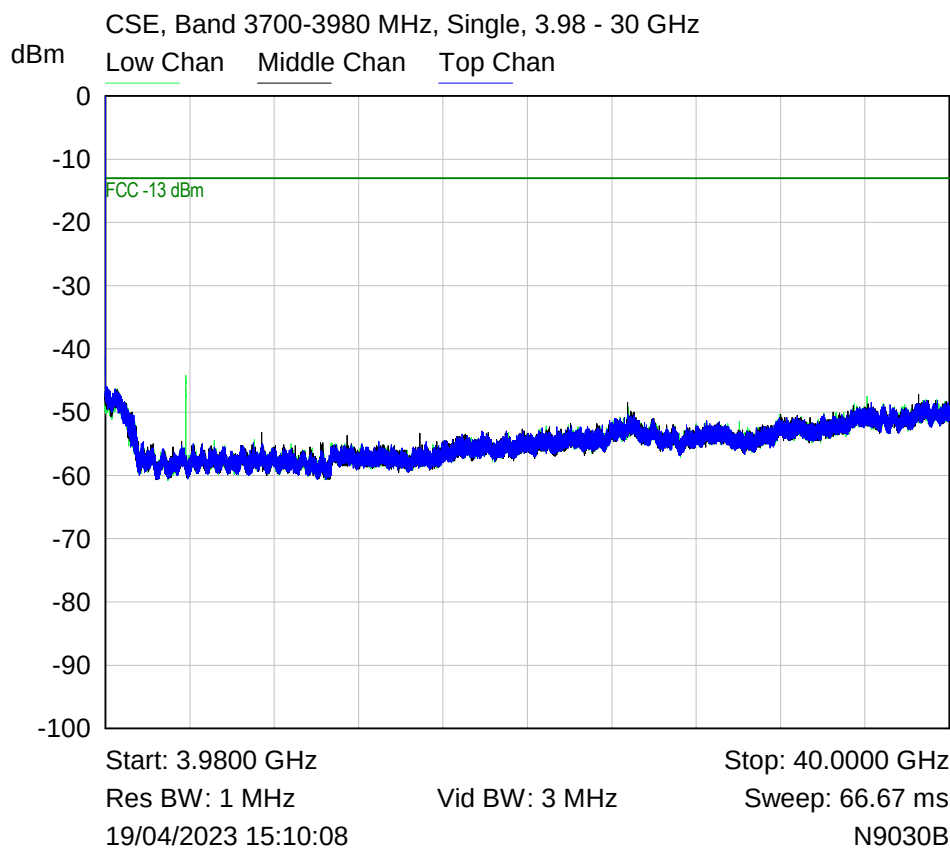
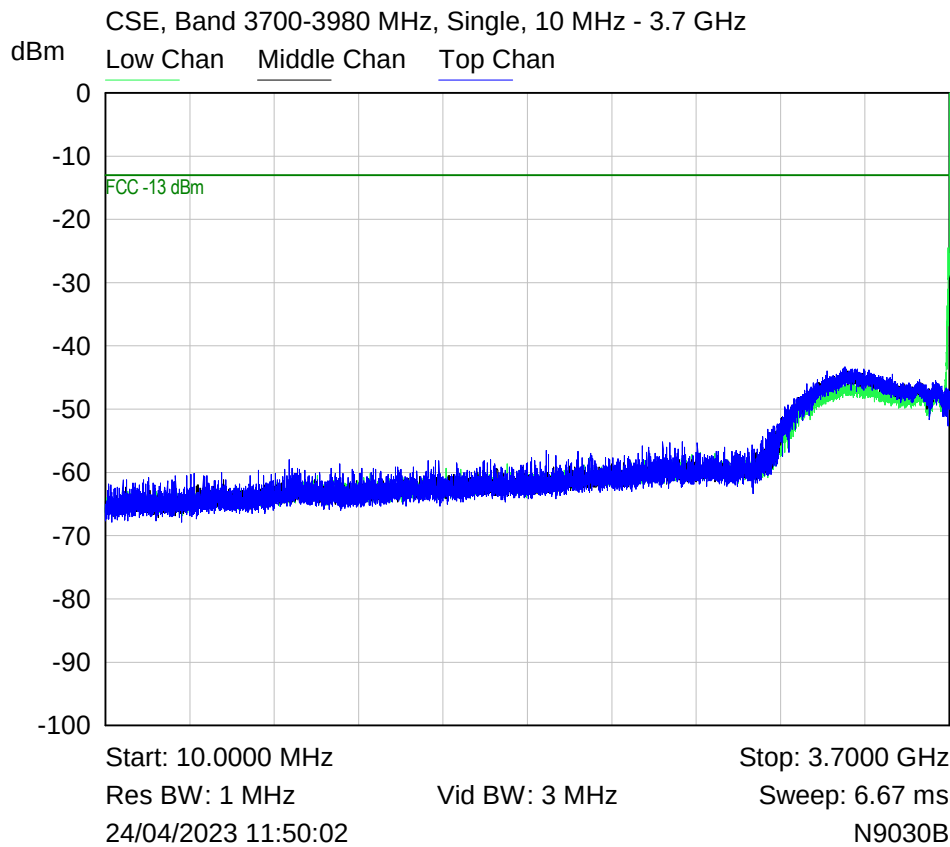
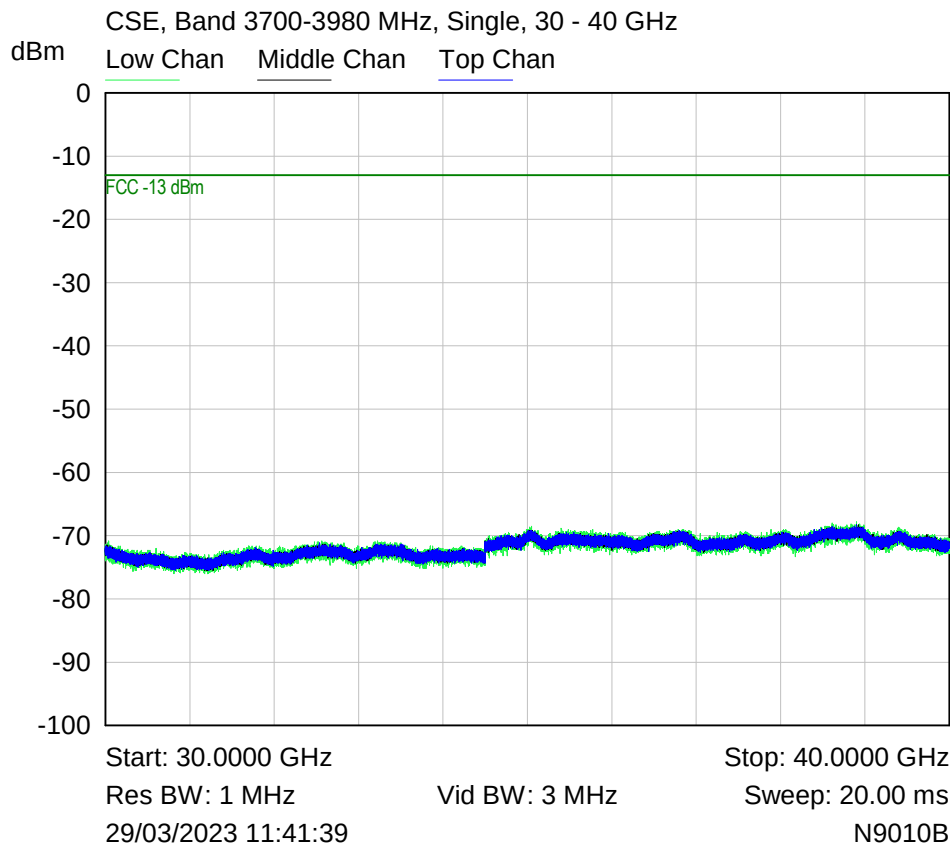


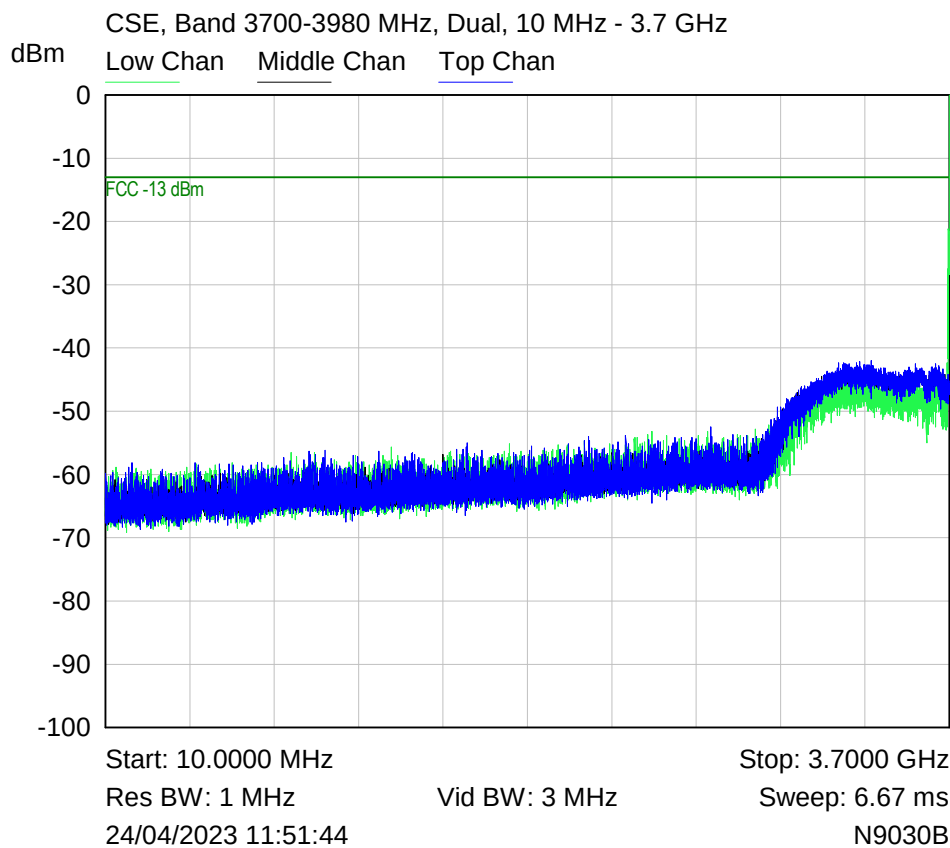


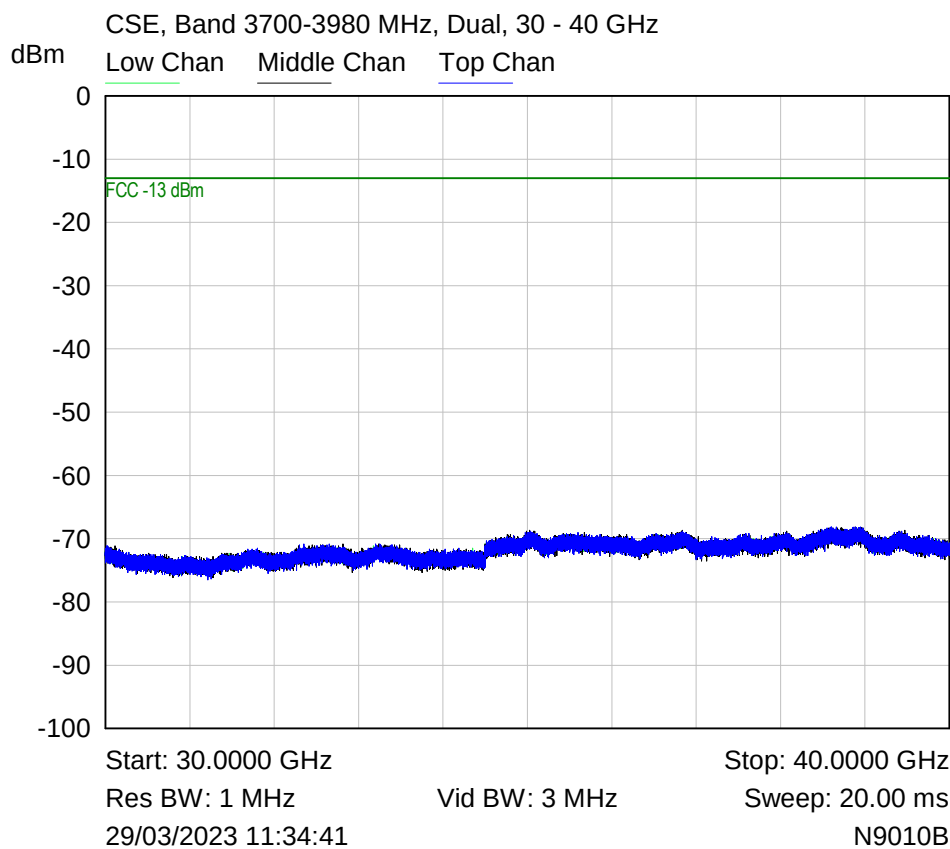
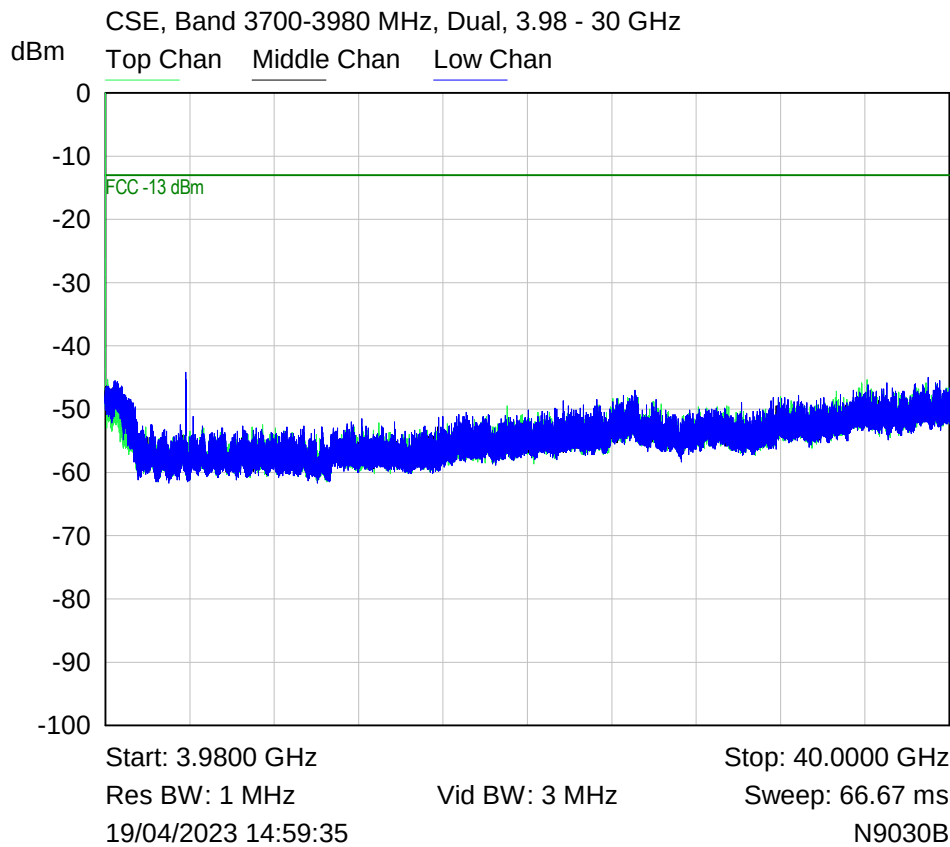
RF Parameters: Band 3700-3980 MHz, Power 24 dBm, Channel Spacing 5 MHz, Modulation
AWGN, single channel mode





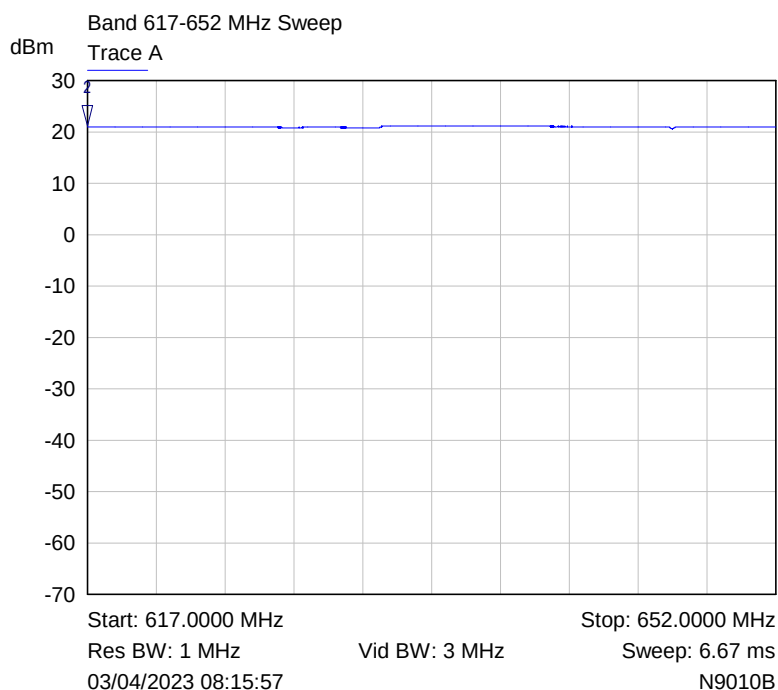
RF Parameters: Band 3700-3980 MHz, Power 24 dBm, Channel Spacing 5 MHz, Modulation
AWGN, Dual channel mode





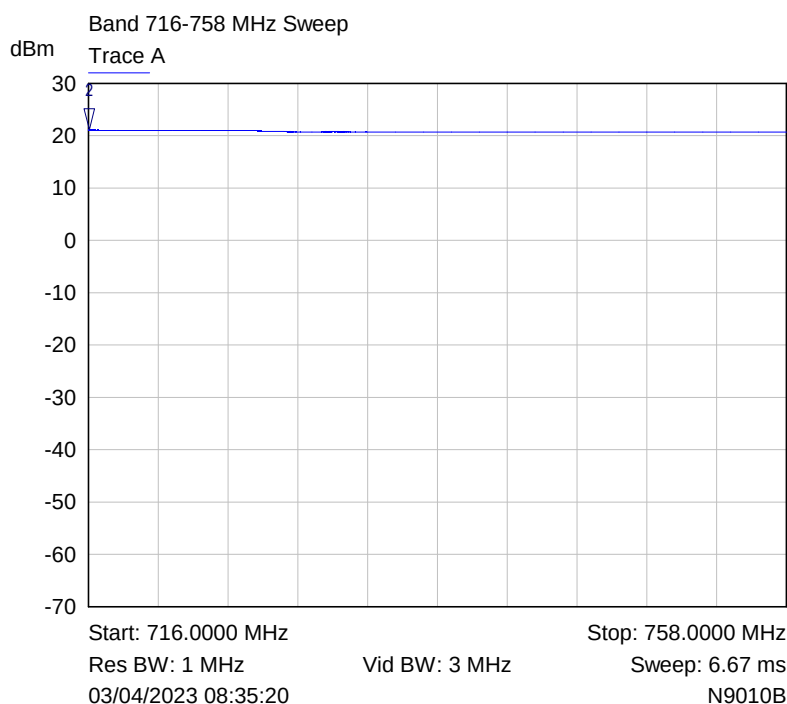
6.4 Determination of f_o

RF Parameters: Band 617-652 MHz, Power 21 dBm, CW frequency sweep, determination of f_o



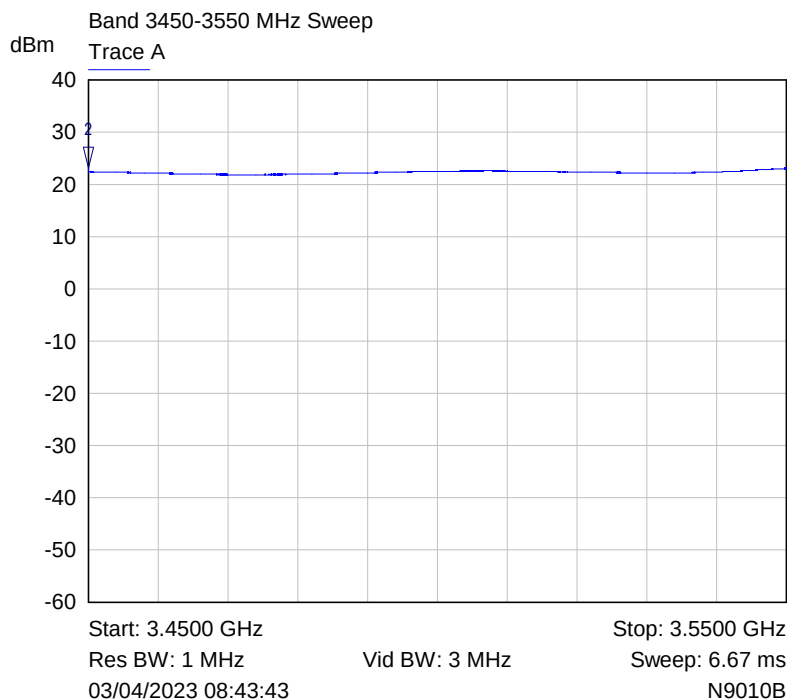
Mkr	Trace	X-Axis	Value	Notes
2 ▾	Trace A	617.0014 MHz	21.16 dBm	

RF Parameters: Band 716-756 MHz, Power 21 dBm, CW frequency sweep, determination of f_o



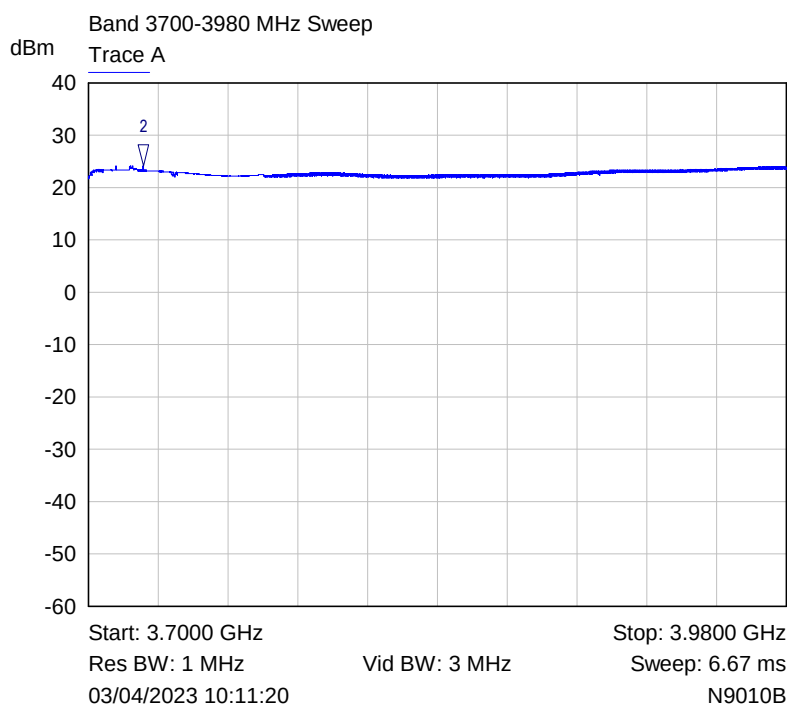
Mkr	Trace	X-Axis	Value	Notes
2 ▾	Trace A	716.0567 MHz	21.10 dBm	

RF Parameters: Band 3450-3550 MHz, Power 23 dBm, CW frequency sweep, determination of f_o



Mkr	Trace	X-Axis	Value	Notes
2 ▾	Trace A	3.4500 GHz	23.12 dBm	

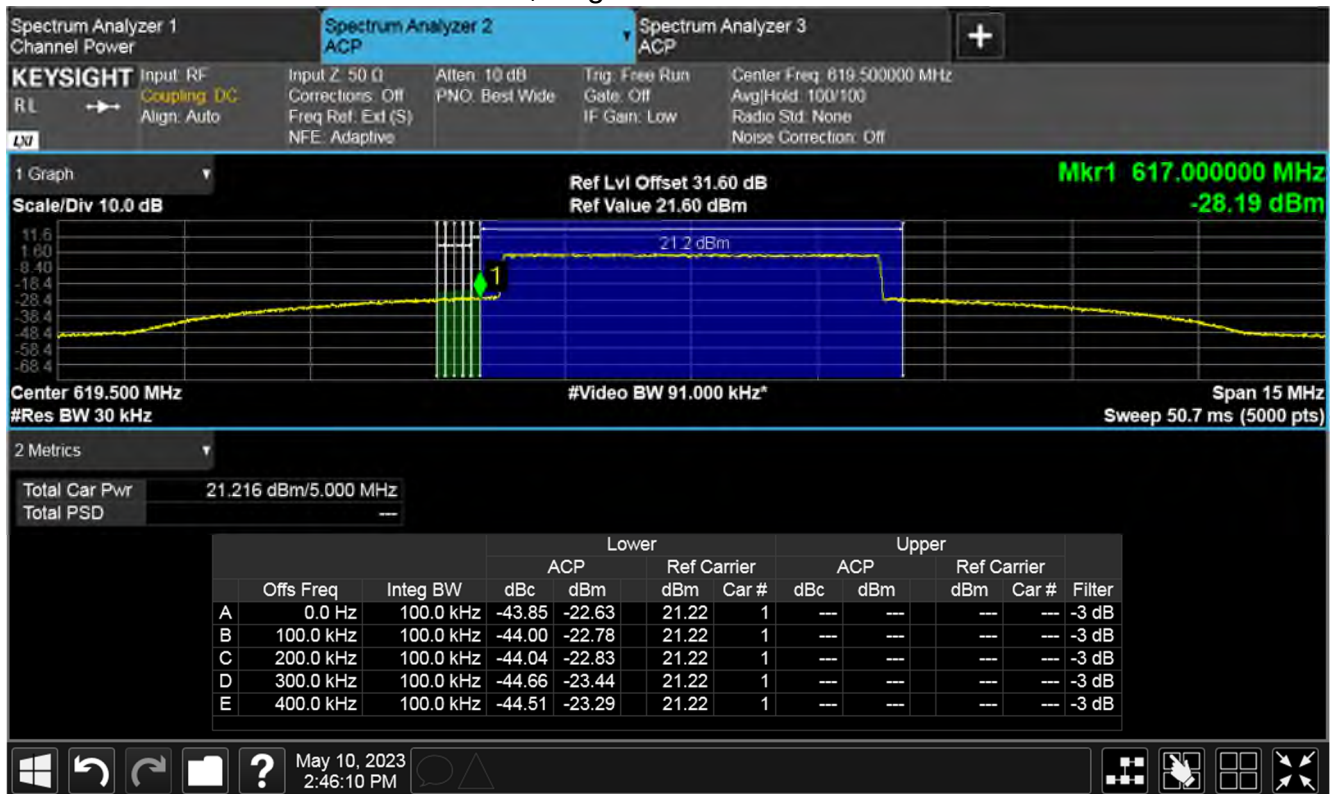
RF Parameters: Band 3700-3980 MHz, Power 24 dBm, CW frequency sweep, determination of f_o



Mkr	Trace	X-Axis	Value	Notes
2 ▾	Trace A	3.7219 GHz	24.14 dBm	

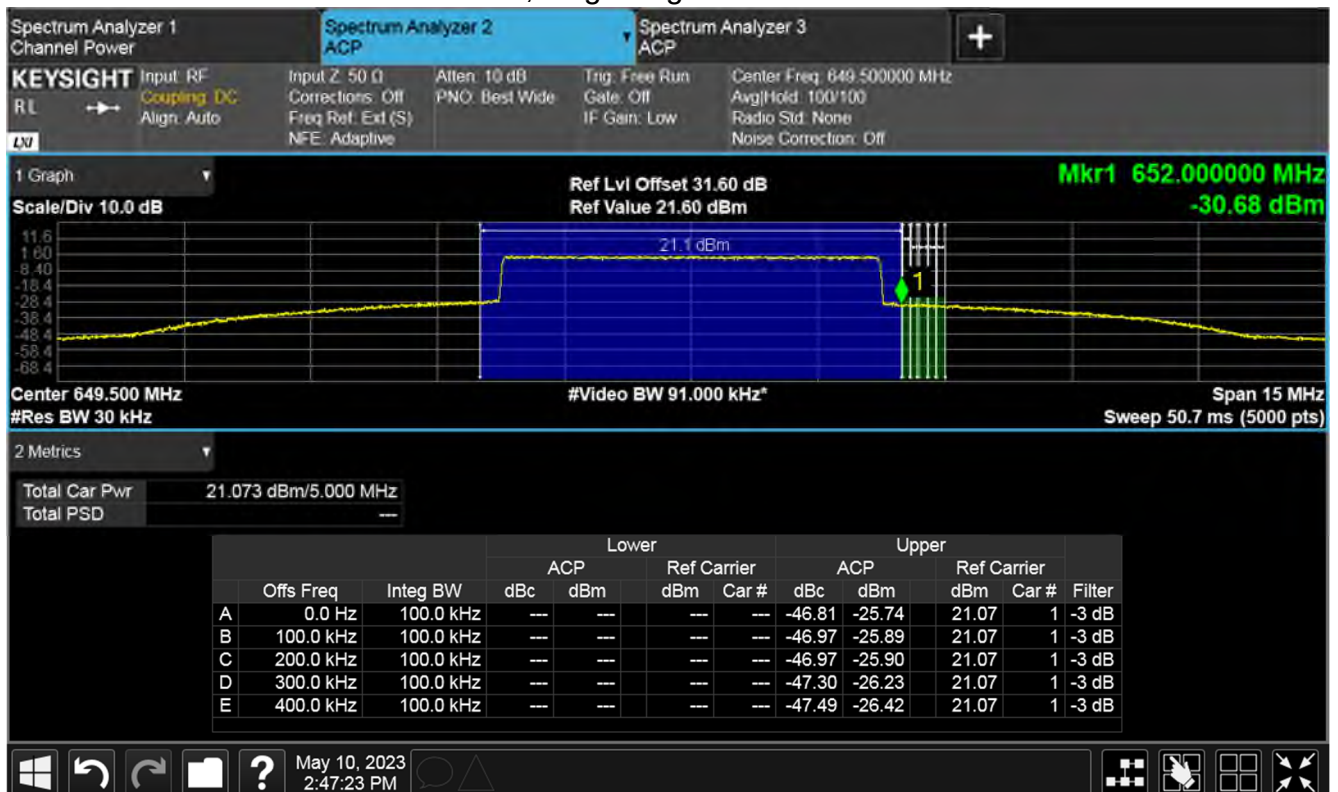
6.5 Band edges

RF Parameters: Band 617-652 MHz, Power 21 dBm, Channel Spacing 5 MHz, Modulation AWGN, single Low channel mode



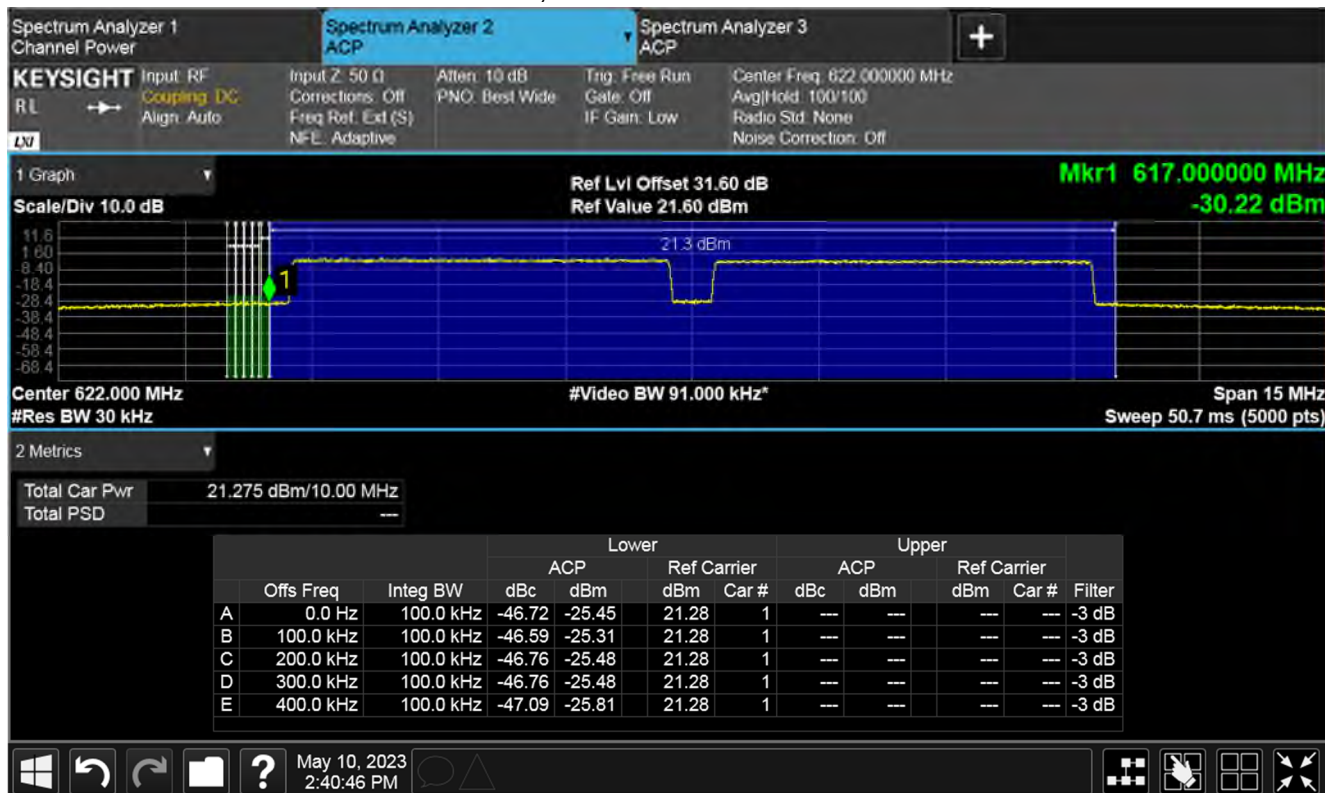
Low channel Band edge

RF Parameters: Band 617-652 MHz, Power 21 dBm, Channel Spacing 5 MHz, Modulation AWGN, single High channel mode



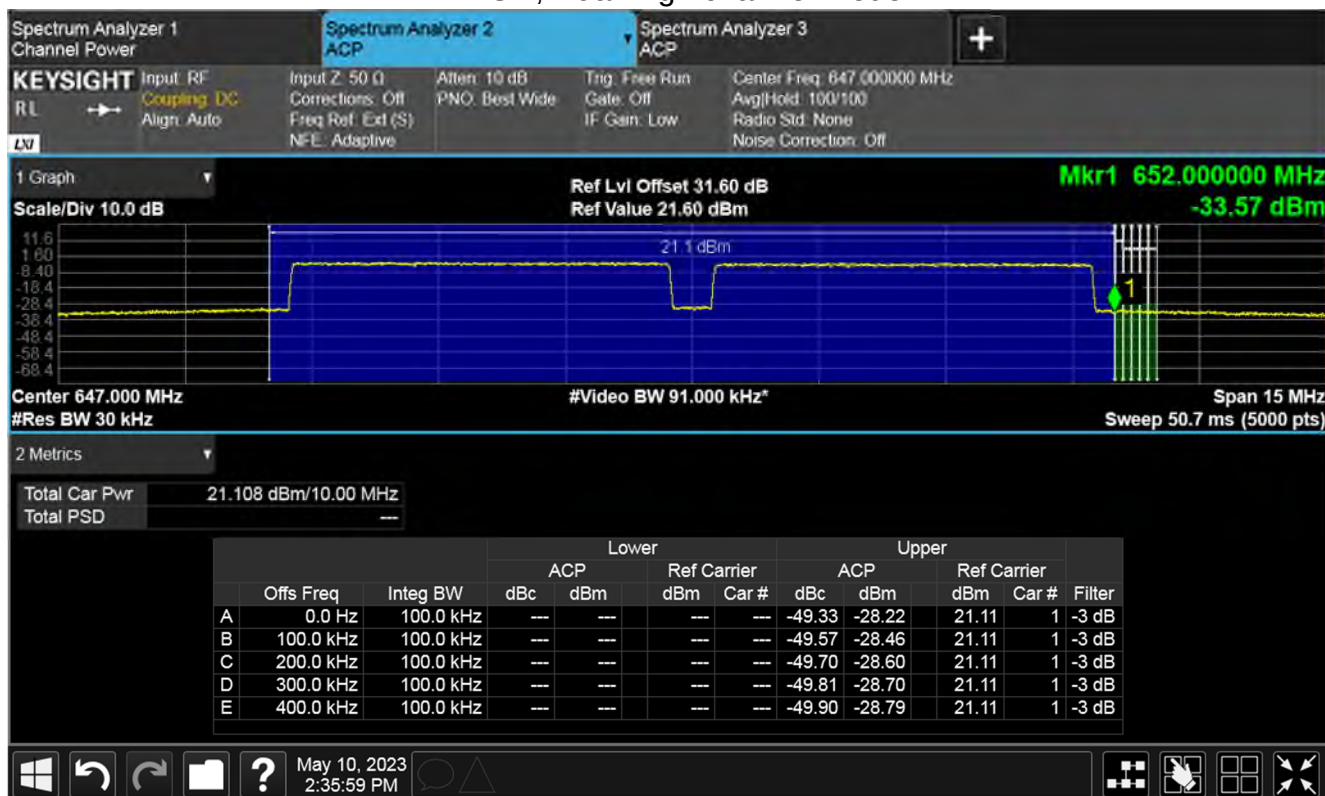
High channel Band edge

RF Parameters: Band 617-652 MHz, Power 21 dBm, Channel Spacing 5 MHz, Modulation AWGN, Dual Low channel mode



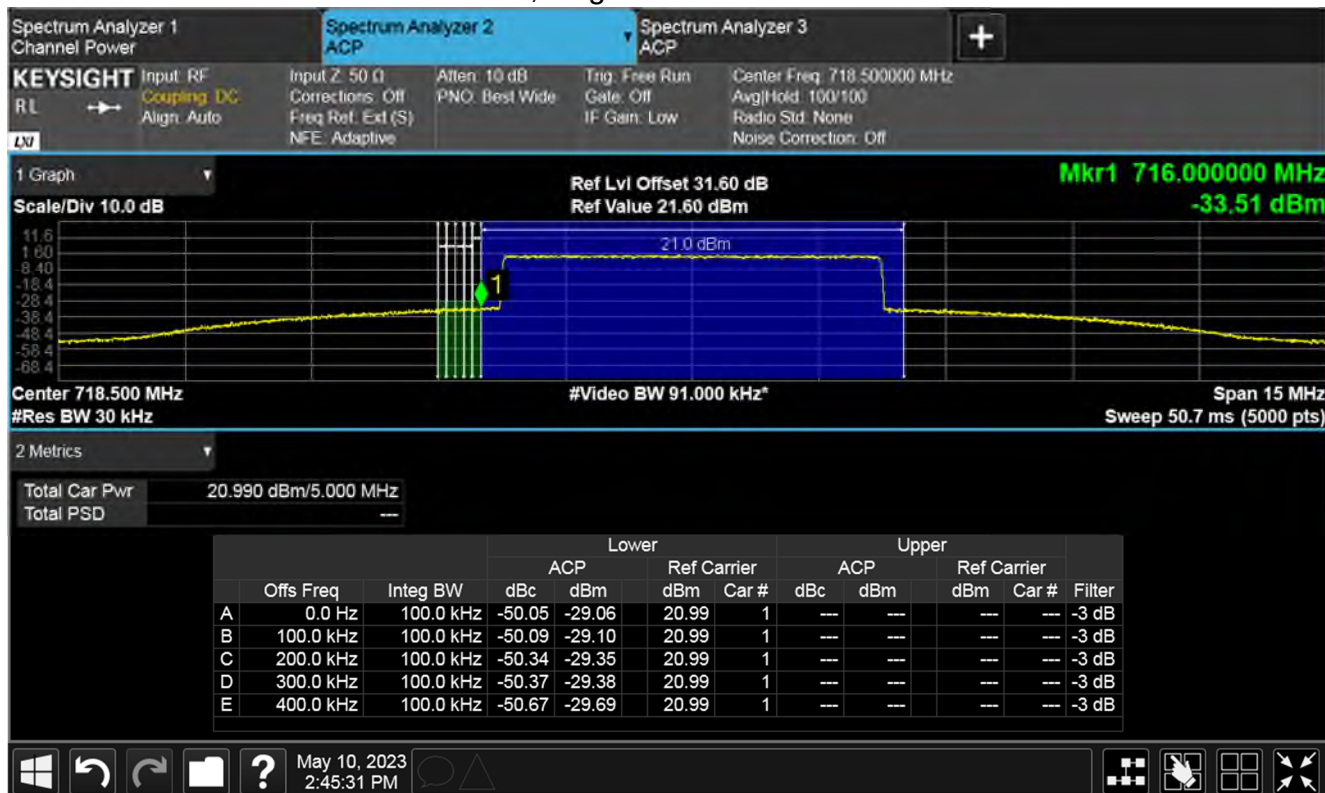
Dual Low channel Band edge

RF Parameters: Band 617-652 MHz, Power 21 dBm, Channel Spacing 5 MHz, Modulation AWGN, Dual High channel mode



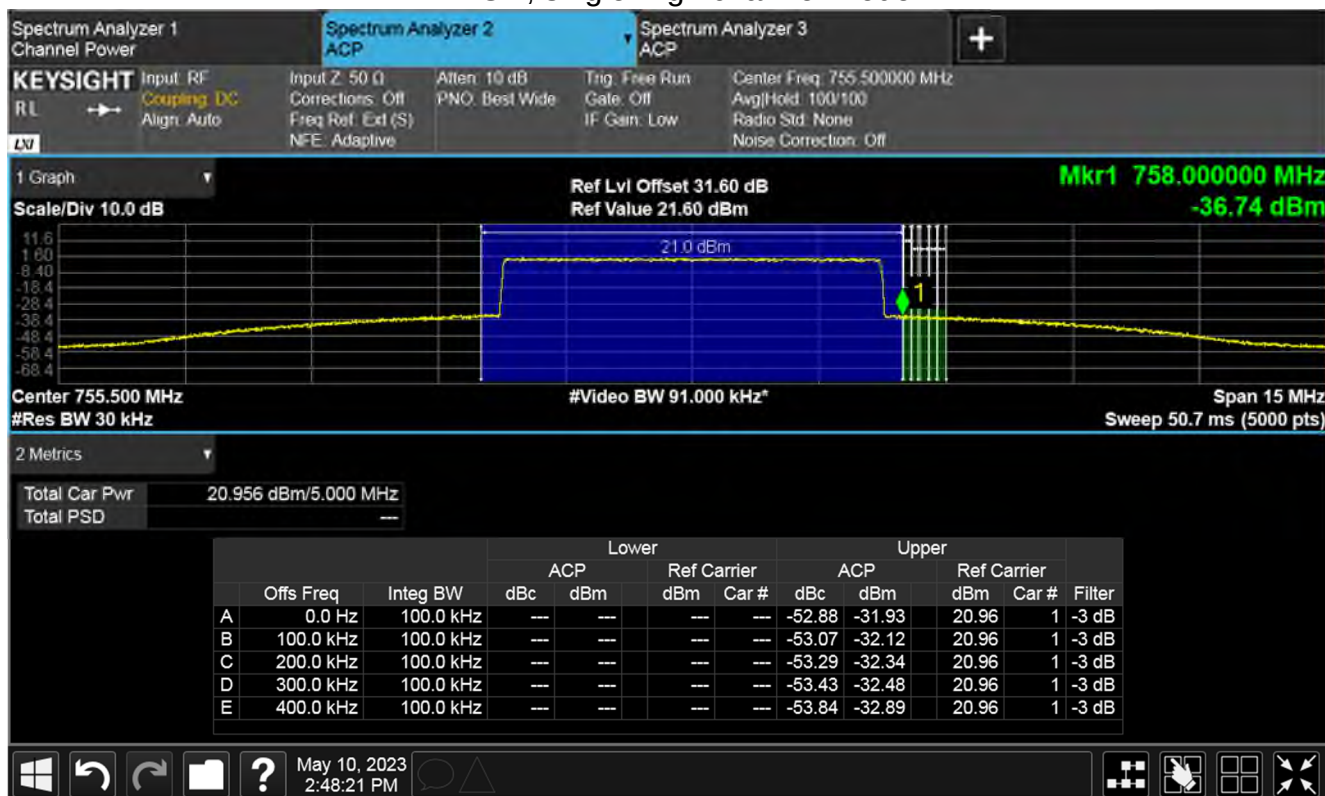
Dual High channel Band edge

RF Parameters: Band 716-756 MHz, Power 21 dBm, Channel Spacing 5 MHz, Modulation
AWGN, single Low channel mode



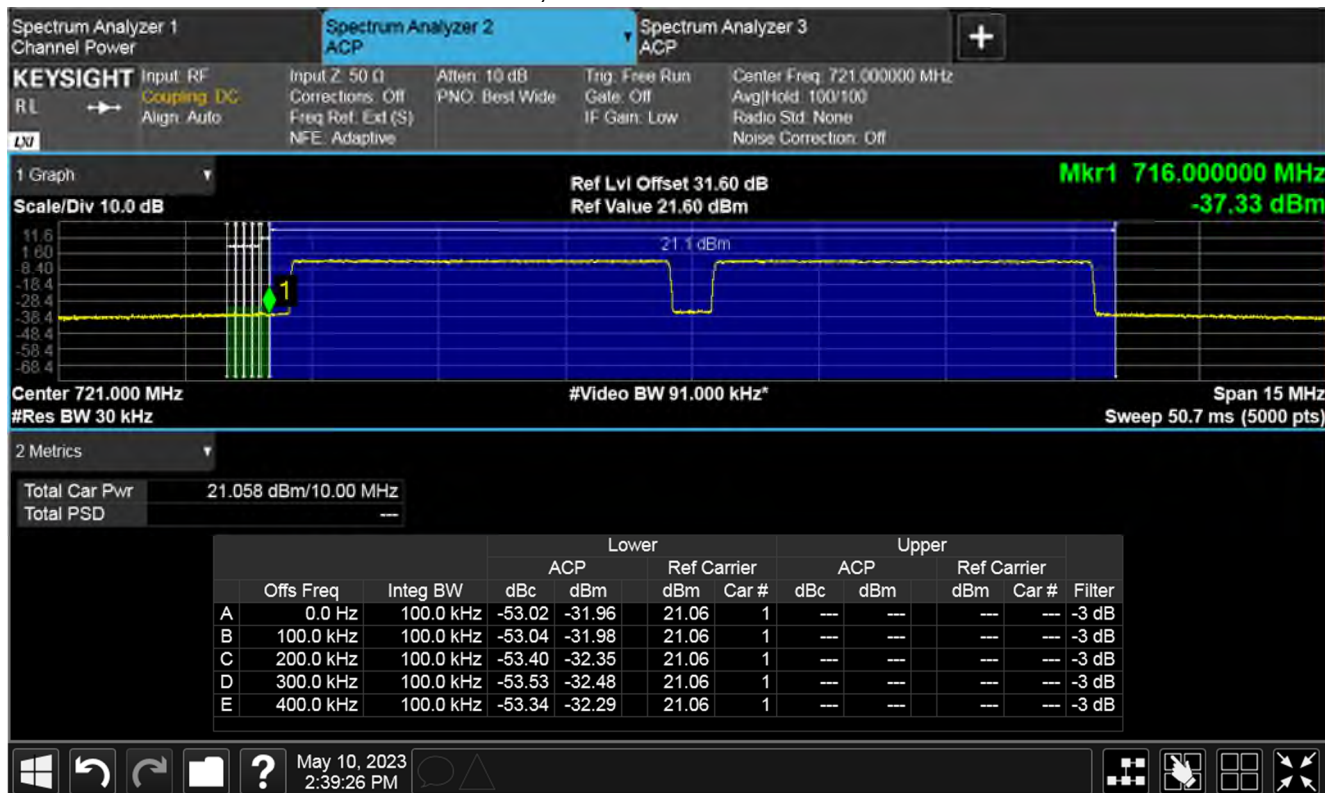
Low channel Band edge

RF Parameters: Band 716-756 MHz, Power 21 dBm, Channel Spacing 5 MHz, Modulation
AWGN, single High channel mode



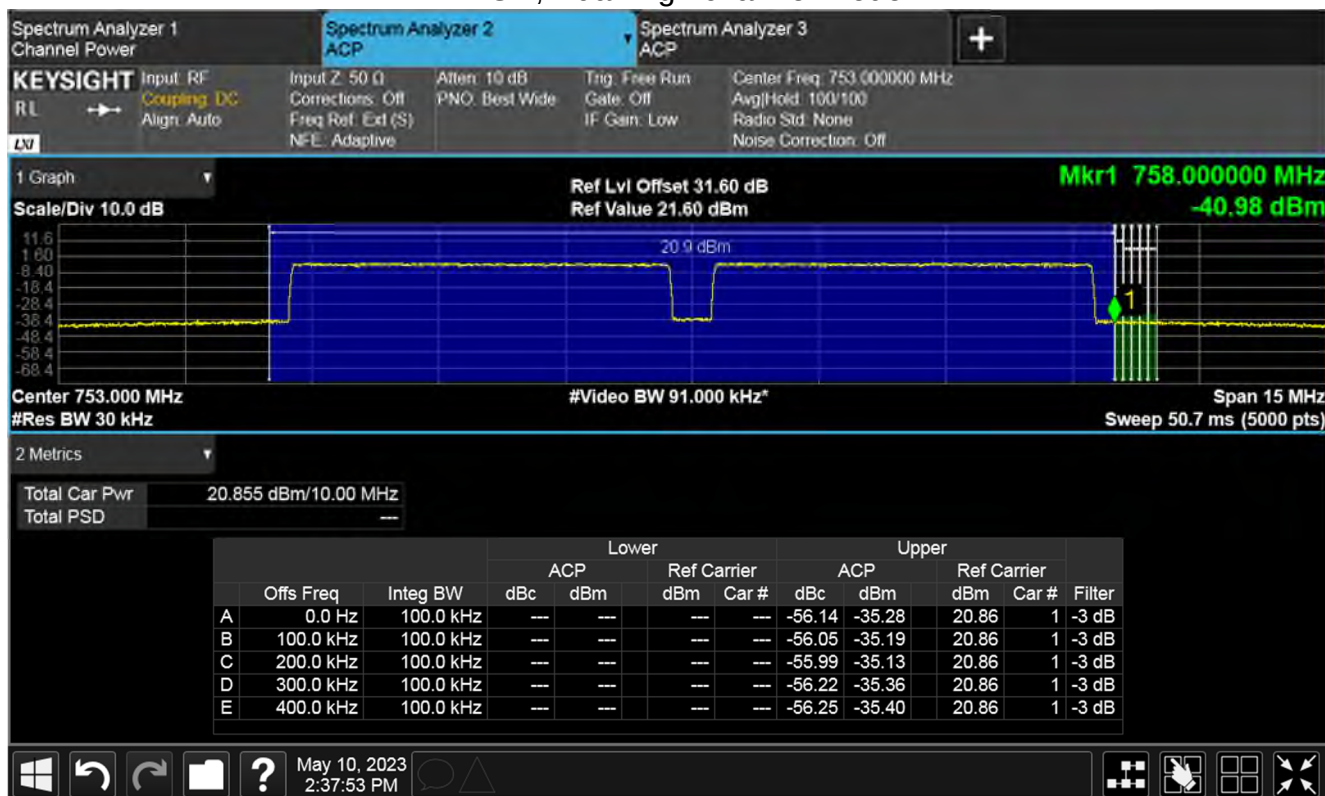
High channel Band edge

RF Parameters: Band 716-756 MHz, Power 21 dBm, Channel Spacing 5 MHz, Modulation
AWGN, Dual Low channel mode



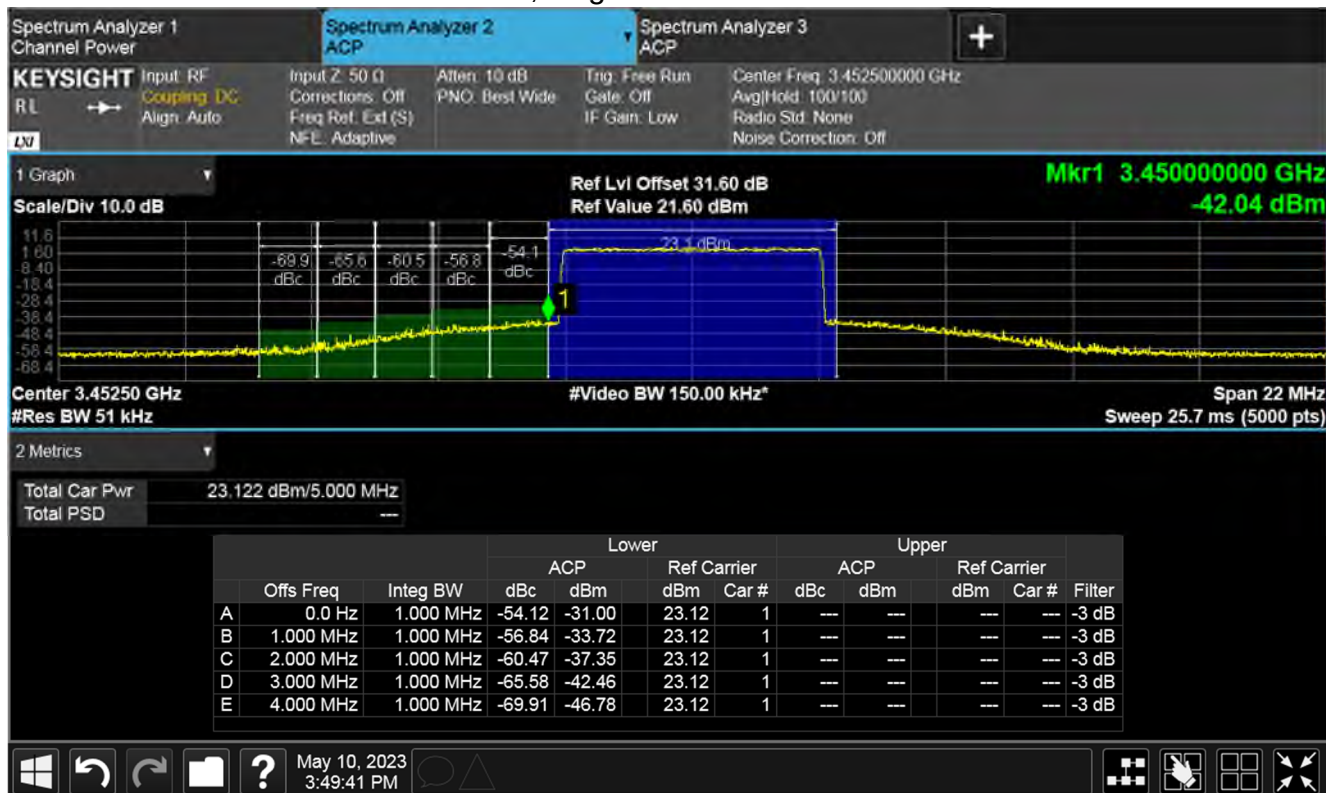
Dual Low channel Band edge

RF Parameters: Band 716-756 MHz, Power 21 dBm, Channel Spacing 5 MHz, Modulation
AWGN, Dual High channel mode



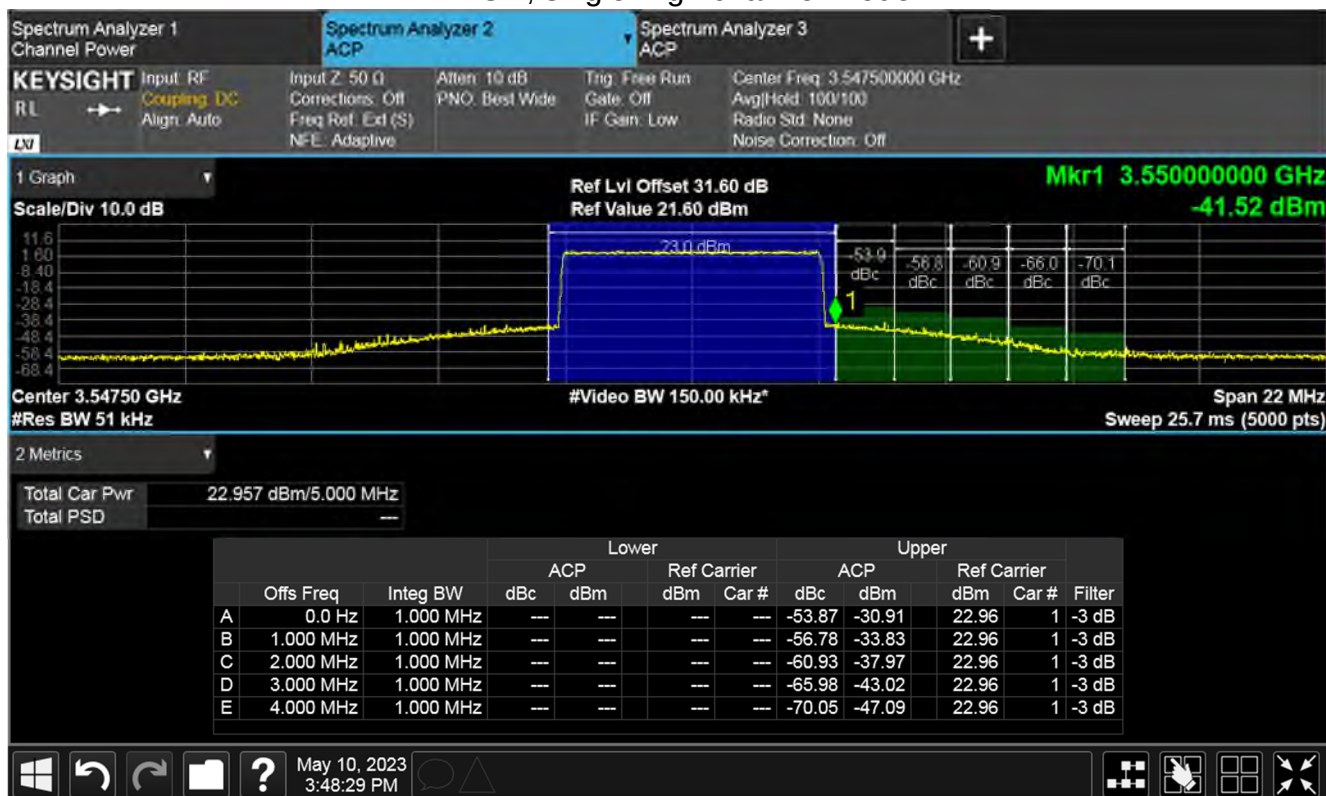
Dual High channel Band edge

RF Parameters: Band 3450-3550 MHz, Power 23 dBm, Channel Spacing 5 MHz, Modulation AWGN, single Low channel mode



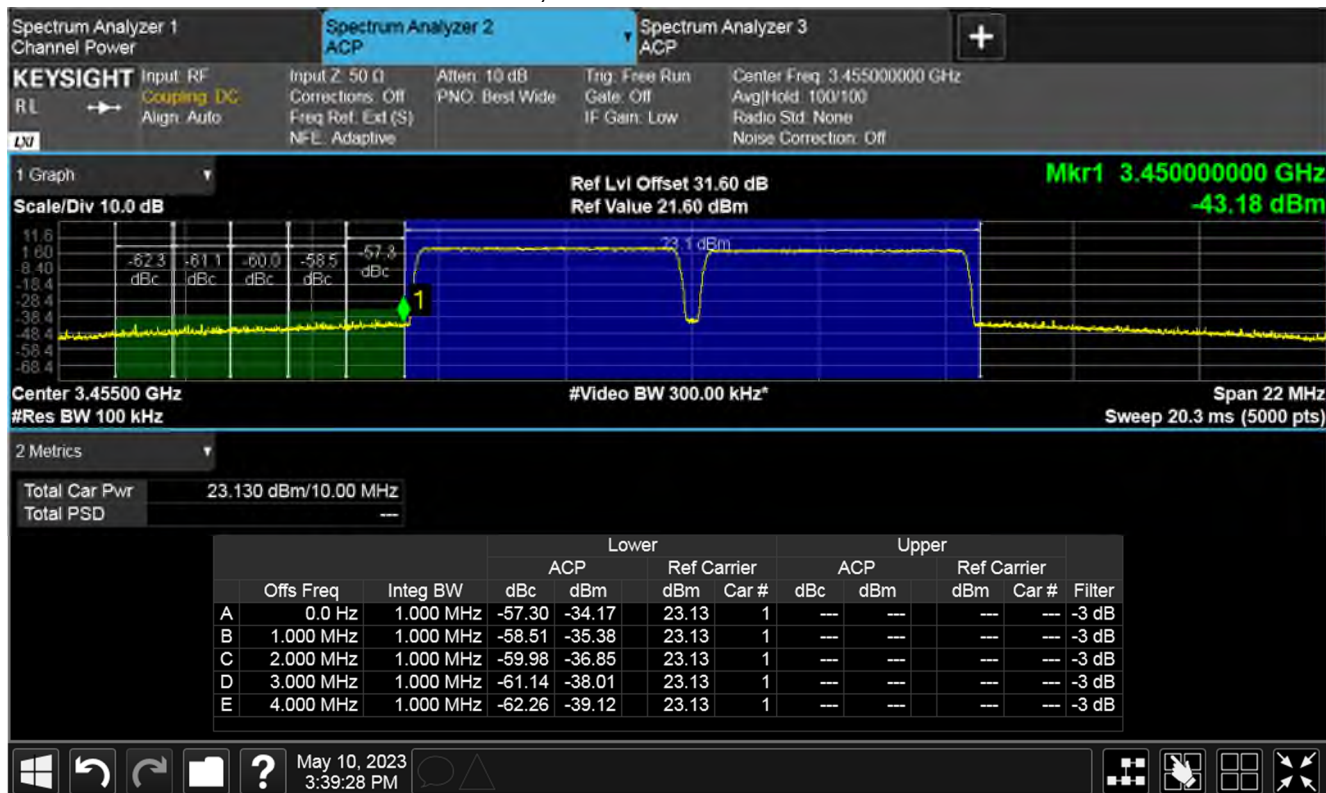
Low channel Band edge

RF Parameters: Band 3450-3550 MHz, Power 23 dBm, Channel Spacing 5 MHz, Modulation AWGN, single High channel mode



High channel Band edge

RF Parameters: Band 3450-3550 MHz, Power 23 dBm, Channel Spacing 5 MHz, Modulation AWGN, Dual Low channel mode



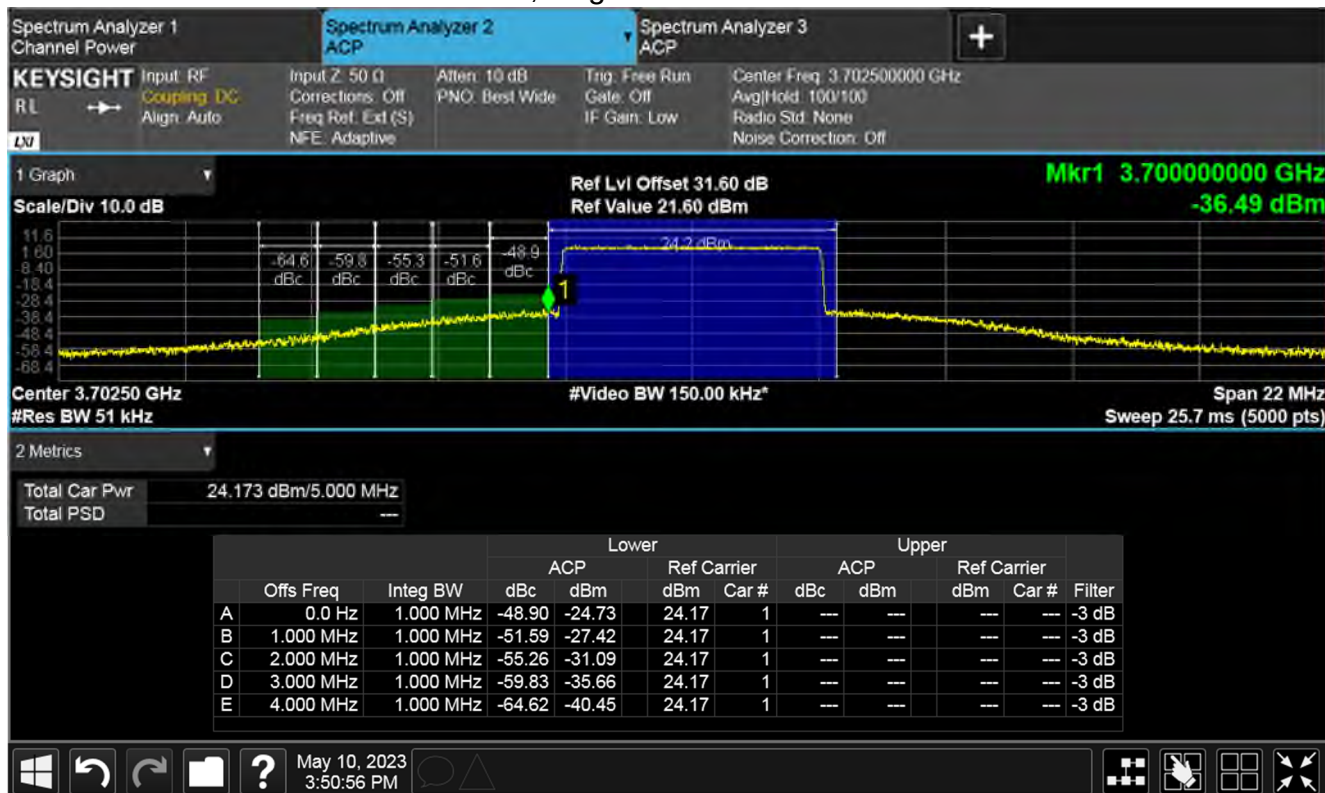
Dual Low channel Band edge

RF Parameters: Band 3450-3550 MHz, Power 23 dBm, Channel Spacing 5 MHz, Modulation AWGN, Dual High channel mode



Dual High channel Band edge

RF Parameters: Band 3700-3980 MHz, Power 24 dBm, Channel Spacing 5 MHz, Modulation AWGN, single Low channel mode



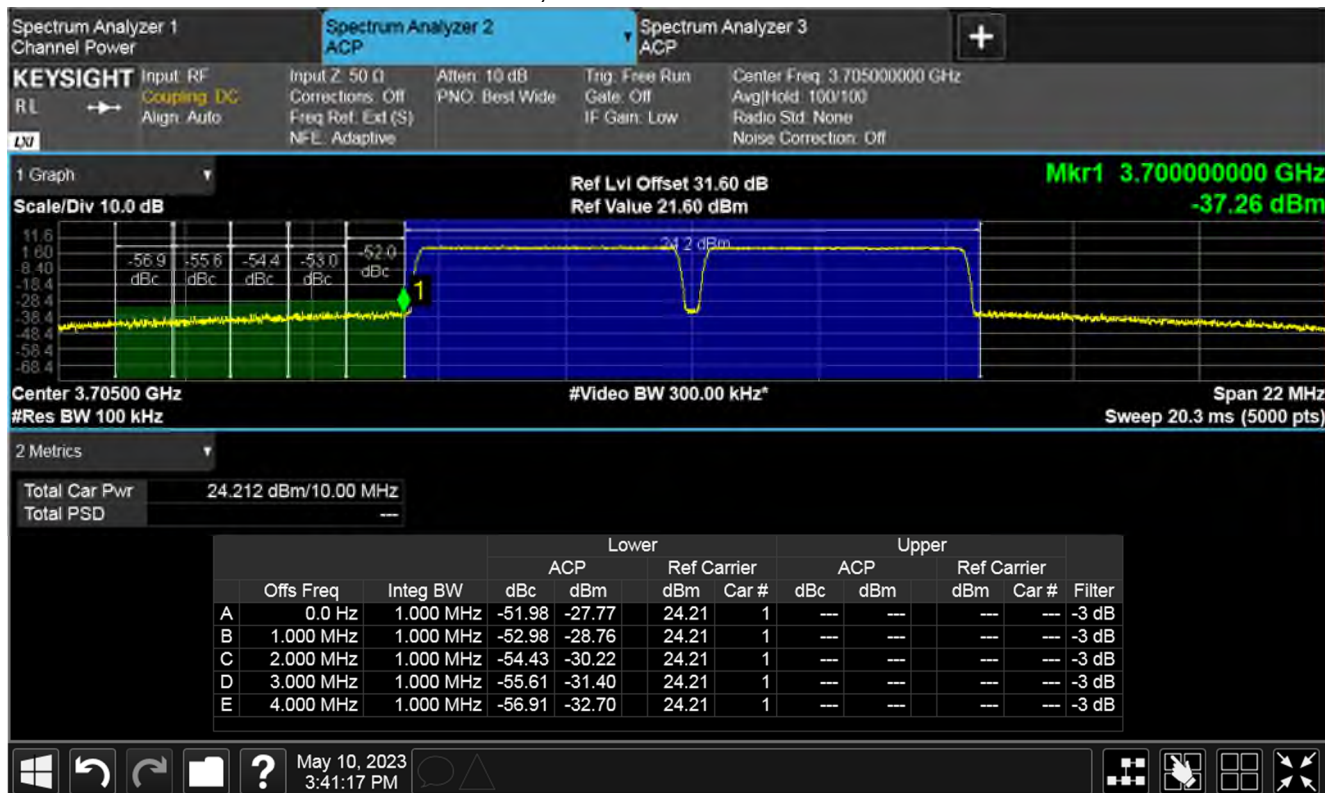
Low channel Band edge

RF Parameters: Band 3700-3980 MHz, Power 24 dBm, Channel Spacing 5 MHz, Modulation AWGN, single High channel mode



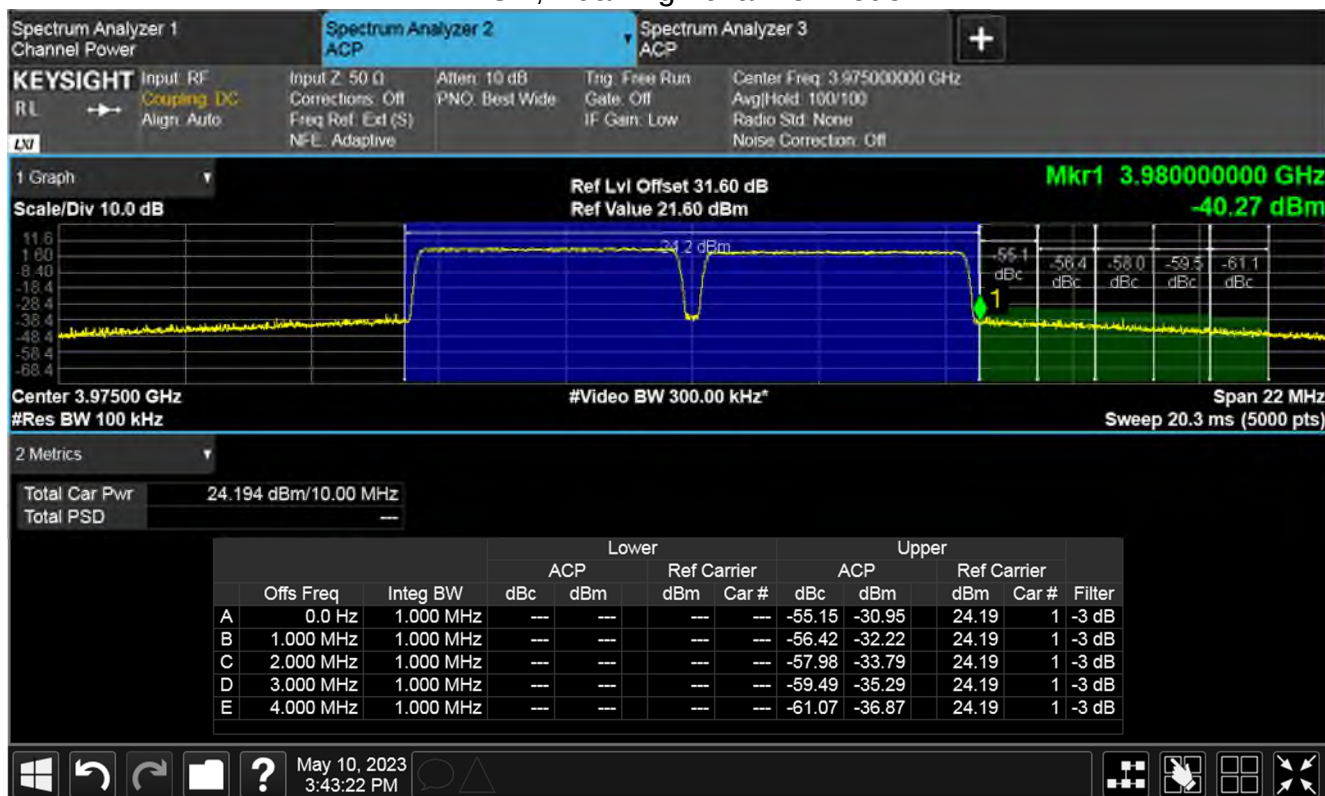
High channel Band edge

RF Parameters: Band 3700-3980 MHz, Power 24 dBm, Channel Spacing 5 MHz, Modulation AWGN, Dual Low channel mode



Dual Low channel Band edge

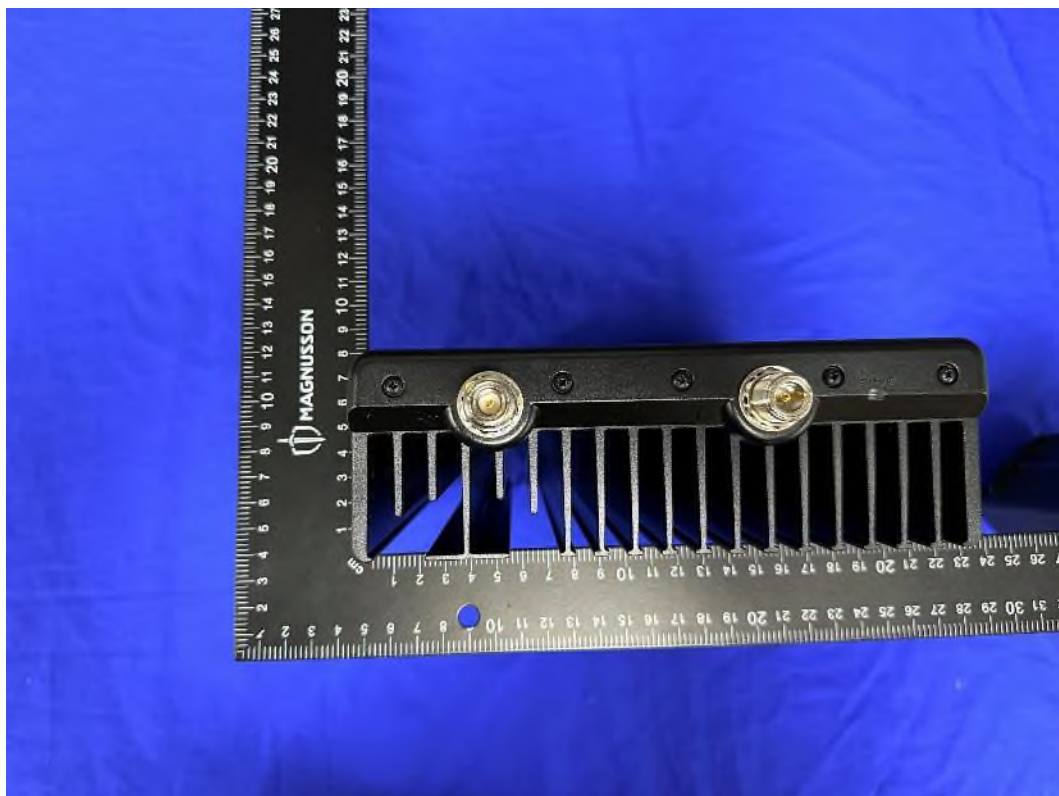
RF Parameters: Band 3700-3980 MHz, Power 24 dBm, Channel Spacing 5 MHz, Modulation AWGN, Dual High channel mode



Dual High channel Band edge

7 Photographs

7.1 EUT Front View



7.2 EUT Reverse Angle





7.3 EUT Left side View



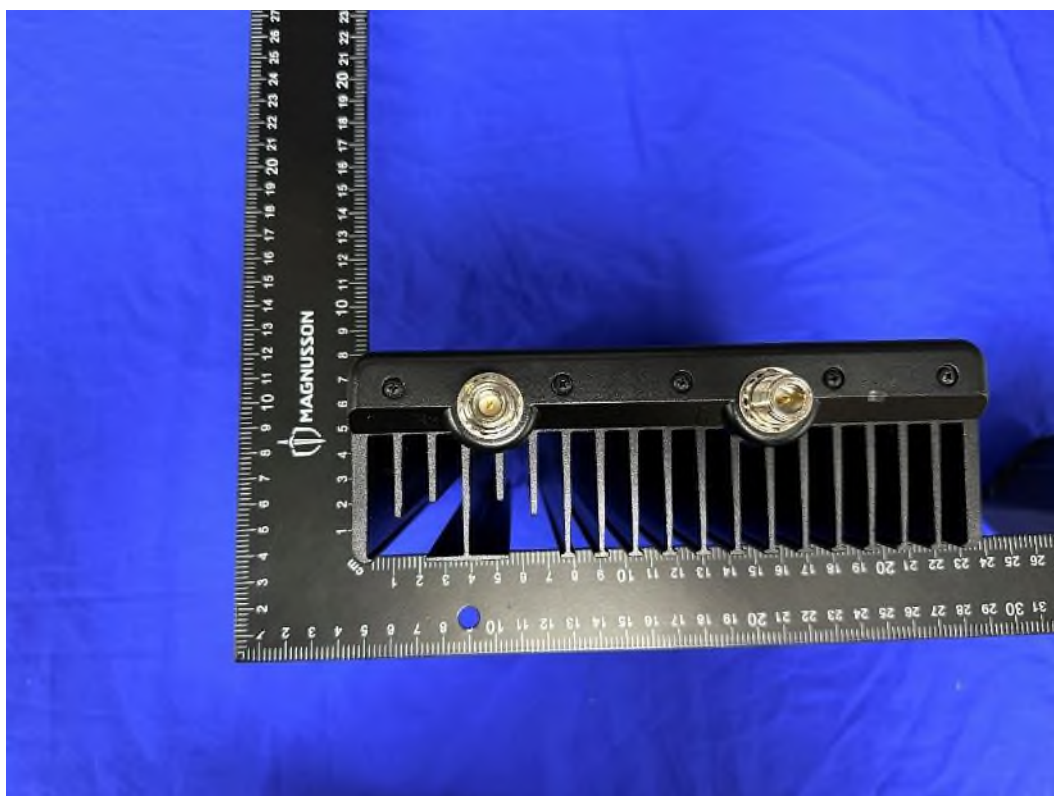
7.4 EUT Right side View



7.5 EUT Antenna Ports



7.6 EUT Display & Controls



7.7 EUT Internal photos

EUT not disassembled for internal photographs due to complexity of unit.

7.8 EUT ID Label



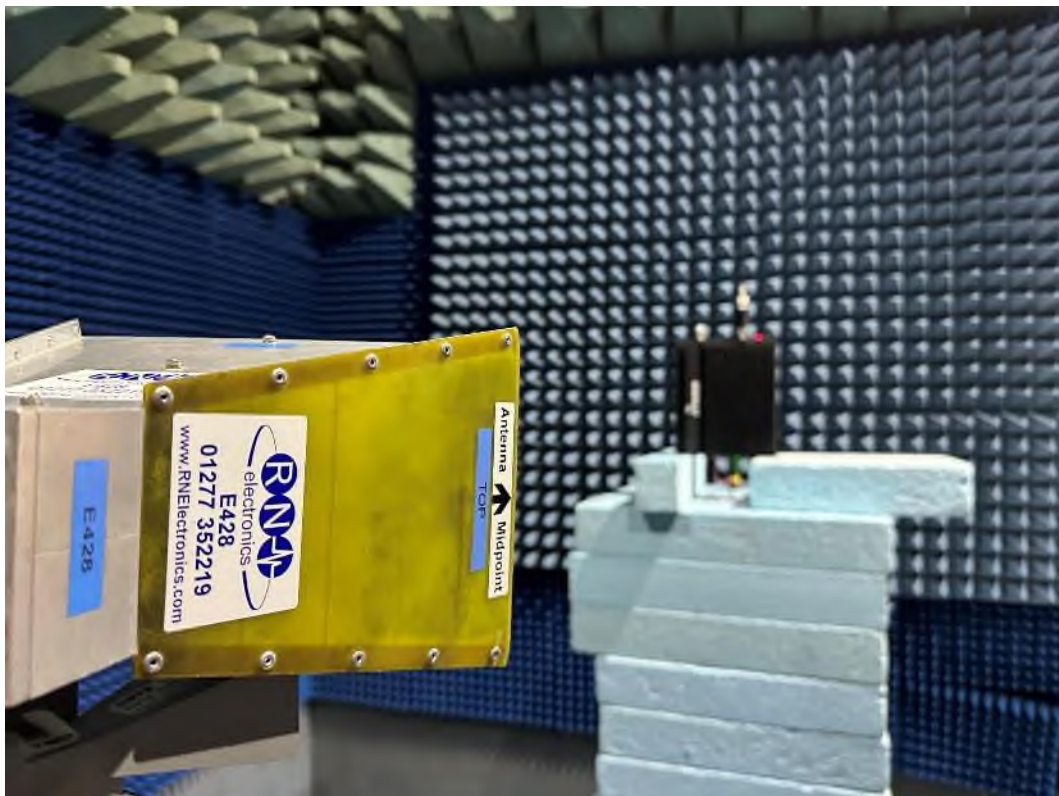
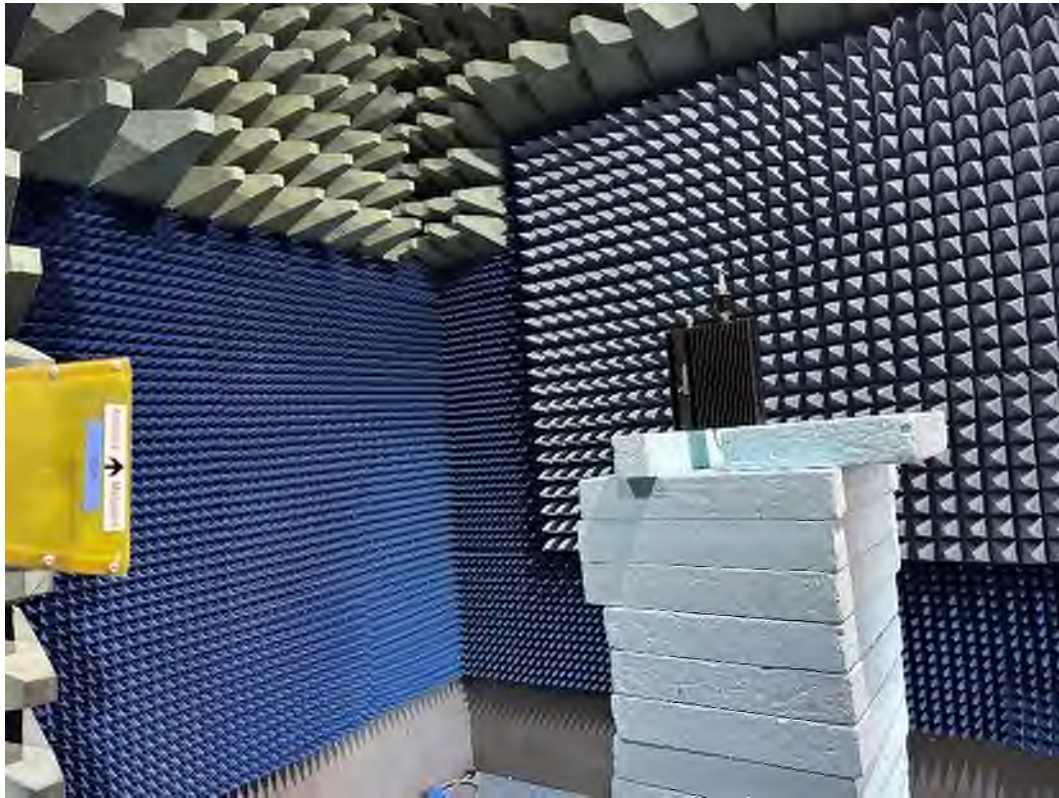


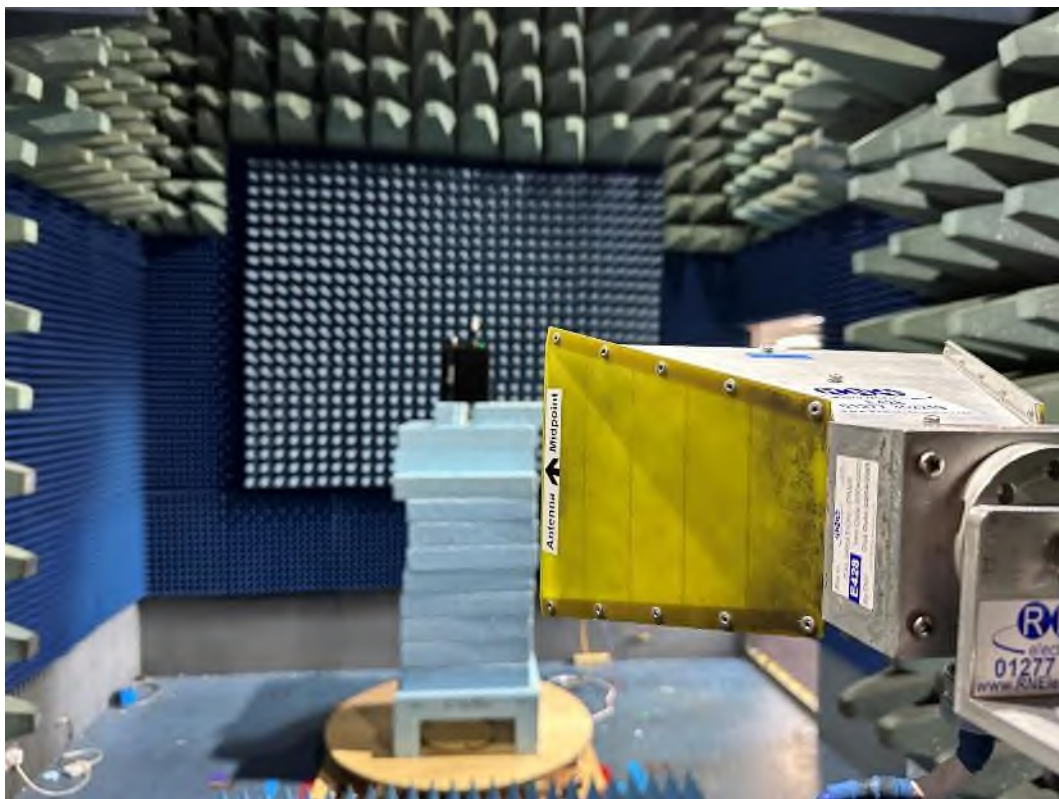


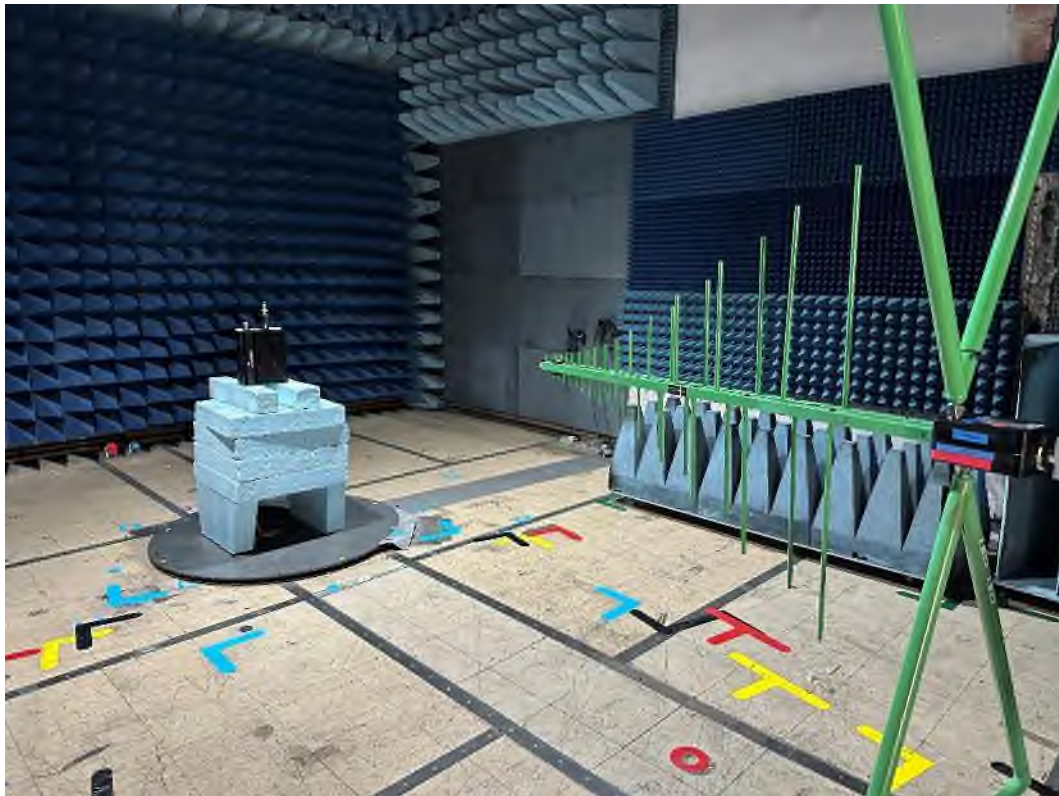
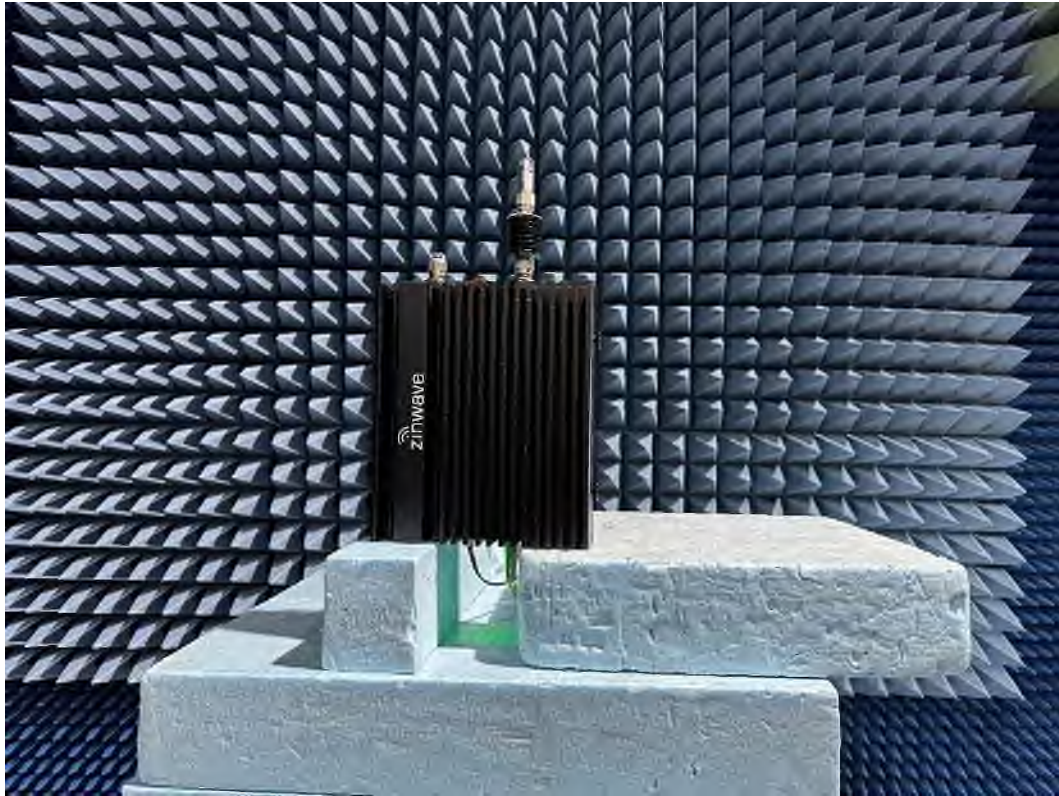
7.9 EUT Chassis

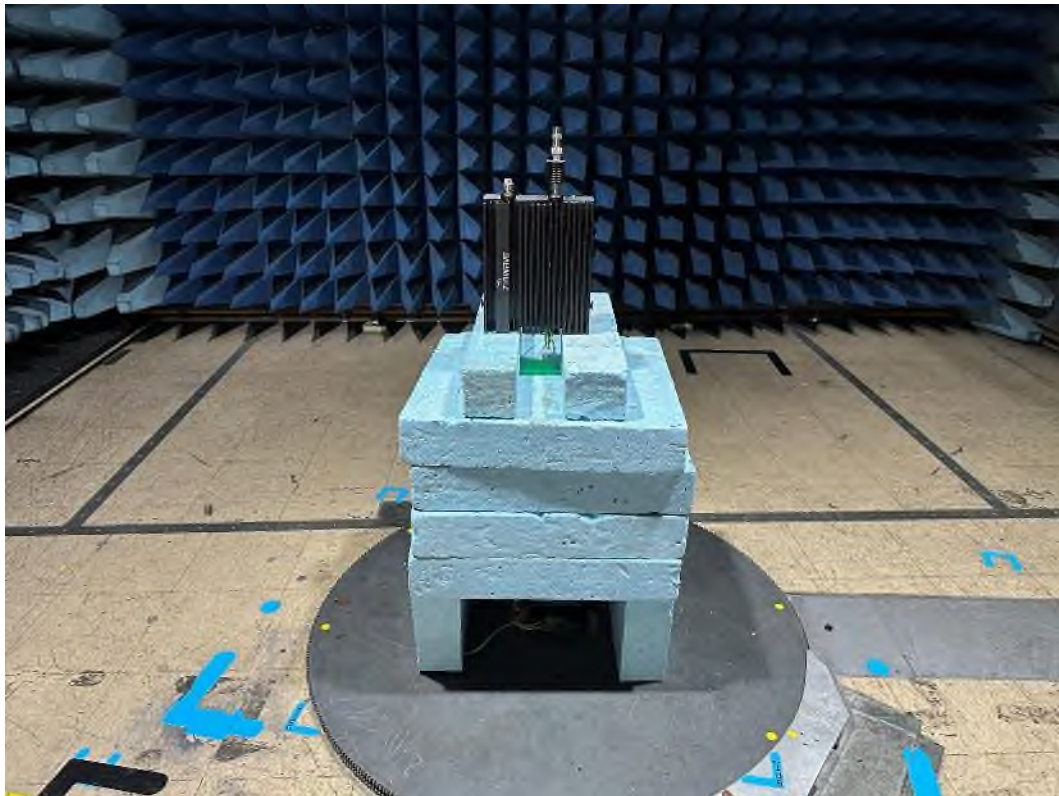
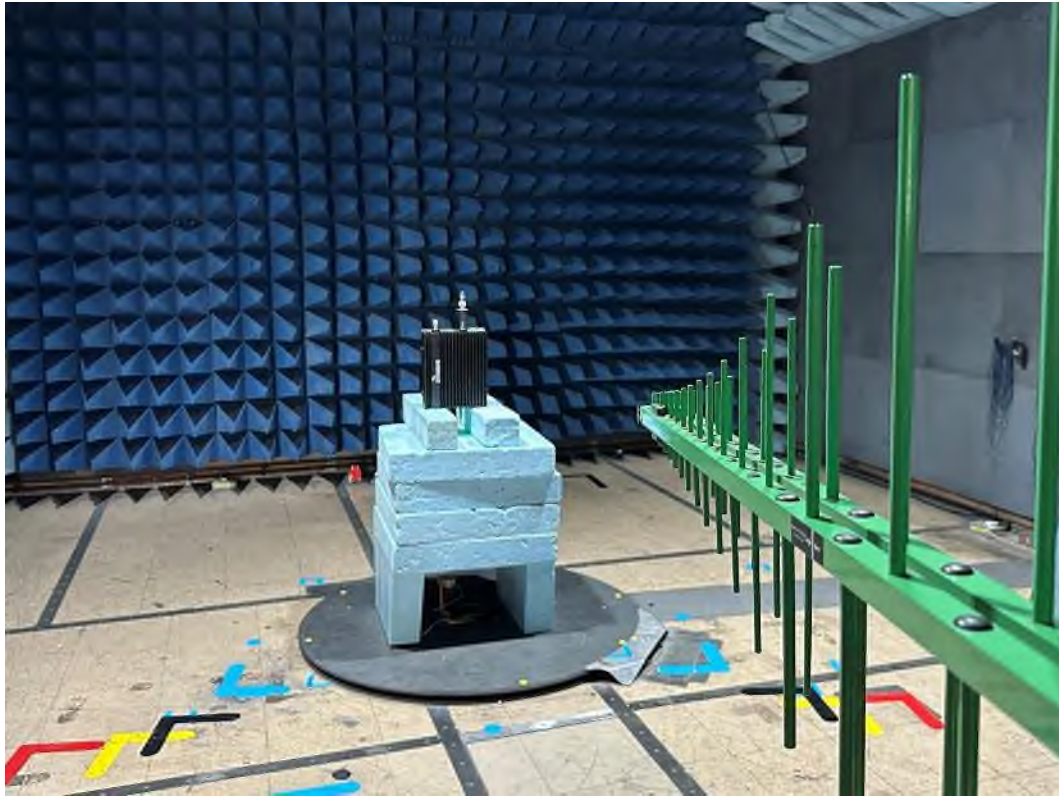


7.9 Spurious emission Test Set-up photos



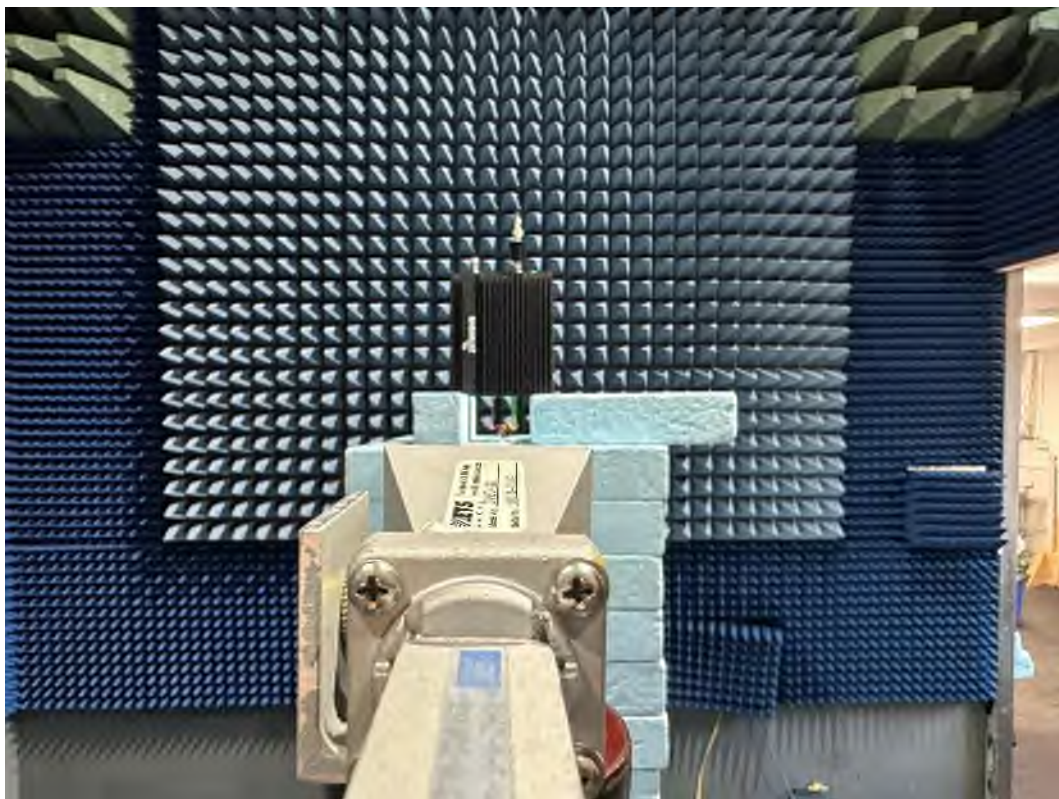












7.12 Radiated emission diagrams

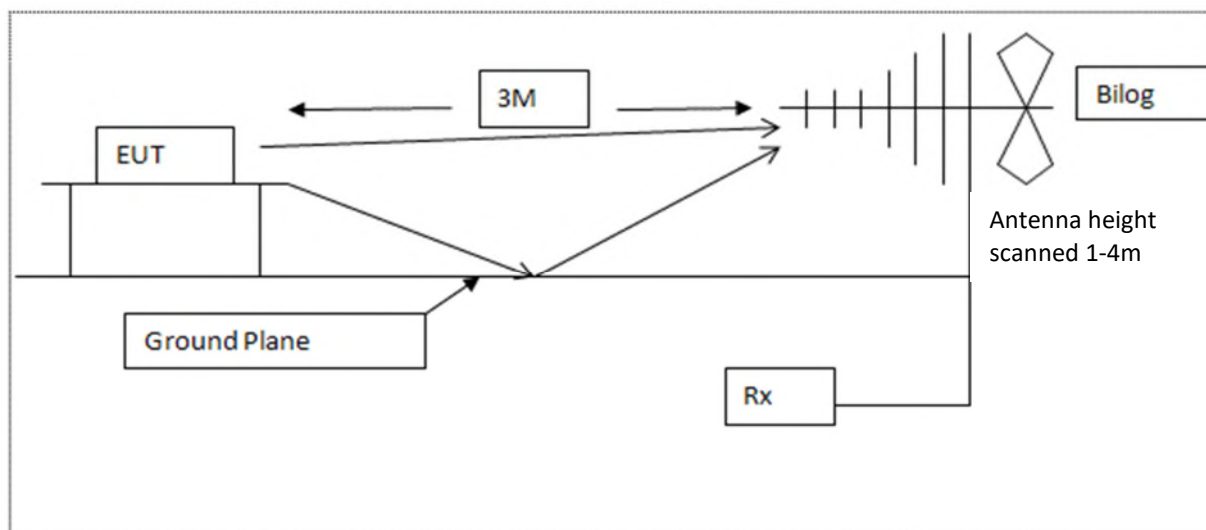


Diagram of the radiated emissions test setup 30 - 1000 MHz

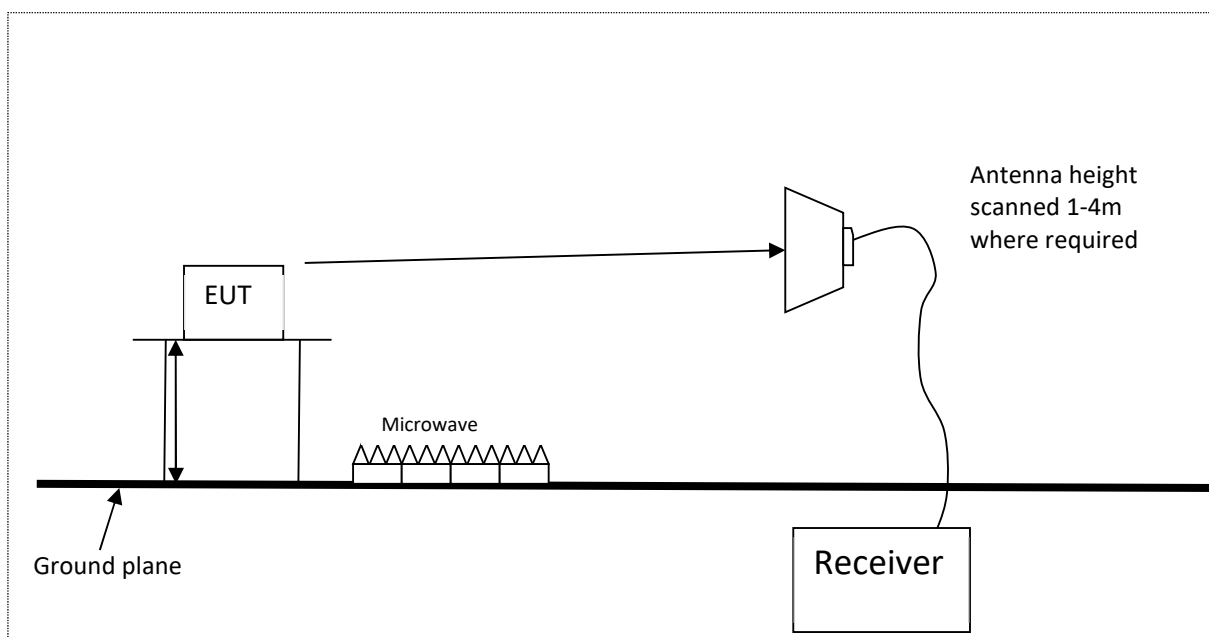


Diagram of the radiated emissions test setup above 1GHz

8 Test equipment calibration list

The following is a list of the test equipment used by R.N. Electronics Ltd to test the unit detailed within this report. In line with our procedures, the equipment was within calibration for the period during which testing was carried out.

RN No.	Model No.	Description	Manufacturer	Calibration date	Cal period
CAL07	MWX221	Cable N Type to SMA Blue 2m	Junflon	16-Dec-2022	6 months
CAL08	MWX221	Cable N Type to SMA Blue 2m	Junflon	12-Aug-2022	12 months
E007-2	VHA9103	Antenna Bi-con	Schwarzbeck	23-Apr-2021	36 months
E136	3105	Horn Antenna 1 - 12.5 GHz	EMCO	#02-Apr-2023	12 months
E268	BHA 9118	Horn Antenna 1 - 18 GHz	Schaffner	#02-Apr-2023	12 months
E296-2	11970A	Harmonic Mixer 26.5-40GHz	Hewlett Packard	27-Jun-2022	12 months
E330	2224-20	Horn Antenna 26.5-40GHz	Flann (FMI)	22-Apr-2022	12 months
E383	SB029	Filter Band pass 11 - 18 GHz	Filtronic Components Ltd	Checked prior to use	
E411	N9039A	9 kHz - 1 GHz RF Filter Section	Agilent Technologies	07-Jul-2022	12 months
E412	E4440A	PSA 3 Hz - 26.5 GHz	Agilent Technologies	21-Jun-2022	24 months
E428	HF906	Horn Antenna 1 - 18 GHz	Rohde & Schwarz	#02-Apr-2023	12 months
E433	MG3693A	Signal Generator 2 GHz - 30 GHz	Anritsu	03-Oct-2022	12 months
E558	18N20W-30dB	Attenuator 30dB 20W	Inmet	17-Mar-2023	12 months
E615	4768-10	Attenuator 10dB 40GHz	Narda	28-Feb-2023	12 months
E624	E4440A	PSA 3 Hz - 26.5 GHz	Agilent Technologies	06-Jul-2022	24 months
E642	E4440A	PSA 3 Hz - 26.5 GHz	Agilent Technologies	06-Dec-2022	24 months
E701	MG3710A	Signal Generator 0.1 - 6000 MHz	Anritsu	09-Feb-2023	12 months
E743	2017 4/2dB	Attenuator 4/2dB 30-1000MHz	RN Electronics	15-Mar-2023	12 months
E777	MG3695B	Signal Generator 8 MHz - 50 GHz	Anritsu	21-Jun-2022	12 months
E853	C-2.4PKP-1501-500mm	Cable 2.4mm to 2.92mm 50cm Yellow	Intelliconnect	Checked prior to use	
E856	N9039A	9 kHz - 1 GHz RF Filter Section	Agilent Technologies	06-Dec-2022	12 months
E904	5086-7805	Pre-Amplifier 1GHz - 26.5GHz	Hewlett Packard	#03-May-2023	12 months
E932	N5181A	Signal Generator 100kHz to 6GHz	Agilent Technologies	08-Jun-2022	12 months
E937	RA28-K-F-1A-A	Transition WR28 to 3.5mm	CMT Hampton	Checked prior to use	
E970	35WR42KF	WR42 to 2.92mm adaptor	Anritsu	25-May-2022	12 months
F021	QRA22-815127	Transition WR28 to 2.92mm female	Quasar Microwave	19-Jul-2022	12 months
F030	X6L120-1250-0017-0001-00	Filter Low Pass 1250MHz	K&L Microwave Inc	Checked prior to use	
F031	X6L120-1250-0017-0001-00	Filter Low Pass 1250MHz	K&L Microwave Inc	Checked prior to use	
F081	AA18-20H	Attenuator SMA 20dB 18GHz	AtlanTecRF	19-Aug-2022	12 months
F190	UFA210A	Cable Light blue 92cm(36") SMA m to SMA m	Micro-Coax Utiflex	11-Oct-2022	6 months
F191	UFA210A	Cable Light blue 92cm(36") SMA m to SMA m	Micro-Coax Utiflex	11-Oct-2022	6 months
G002	20093-SF40	WR42 to SMA adaptor 17.6GHz to 26.7GHz	Flann (FMI)	Checked prior to use	
H071	N9010B	EXA Signal Analyser 10 Hz to 44 GHz	Keysight Technologies	12-Dec-2022	24 months
LPE364	CBL6112A	Antenna BiLog 30MHz - 2GHz	Chase Electronics Ltd	28-Mar-2022	24 months
TMS78	3160-08	Horn Std Gain 12.4 - 18 GHz	ETS Systems	30-Sep-2022	12 months
TMS79	3160-09	Horn Std Gain 18 - 26.5 GHz	ETS Systems	25-May-2022	12 months
TMS812	MP534A MP651A	Dipole Set 200 - 1700 MHz	Anritsu	16-Jun-2022	12 months
TMS82	8449B	Pre-Amplifier 1GHz - 26.5GHz	Agilent Technologies	16-Dec-2022	12 months

Equipment was within calibration dates for tests and has been re-calibrated since/during date of tests.

9 Auxiliary and peripheral equipment

9.1 Customer supplied equipment

Item No.	Model No.	Description	Manufacturer	Serial No.
1	308-0001	Primary Hub	Zinwave Ltd	00-17-68-00-31-E2
2	4977761	Secondary Hub	Zinwave Ltd	620200002612 Artesyn

9.2 RN Electronics supplied equipment

RN No.	Model No.	Description	Manufacturer	Serial No
E558	18N20W-30dB	Attenuator 30dB 20W	Inmet	-
E701	MG3710A	Signal Generator 0.1 - 6000 MHz	Anritsu	6201305571
F390	908A	Termination N Type m 4GHz	Hewlett Packard	-
F391	R404131000	Termination N type 4GHz	Radiall	-
I258	HP 250 G6	Laptop HP 250 G6	Hewlett Packard	CND82494B7

10 Condition of the equipment tested

In order for the EUT to produce the results shown within this report the following modifications, if any, were implemented.

10.1 Modifications before test

Software was upgraded from 0.01(b5b8d31) to 0.01(4b3aq2e) in the primary hub before test to so its internal calibration could be performed correctly. Although the Primary hub is not under test the EUT can't operate without it and it contributes to test results.

10.2 Modifications during test

Software was upgraded from 0.01(4b3aq2e) to 0.01(e15853b) in the primary hub during test to resolve a emissions problem at 91 MHz away from the fundamental which was cause by fibre communication. Only test performed after this was Conducted spurious emission in the band 3450-3550 MHz & 3700-3980 MHz. Although the Primary hub is not under test the EUT can't operate without it and it contributes to test results.

11 Description of test sites

Site A	Radio Laboratory and Anechoic Chamber
Site B	Semi-Anechoic Chamber and Control Room FCC Registration No. 293246, ISED Registration No. 5612A-4
Site C	Transient Laboratory
Site D	Screened Room (Conducted Immunity)
Site E	Screened Room (Control Room for Site D)
Site F	Screened Room (Conducted Emissions)
Site G	Screened Room (Control Room for Site H)
Site H	3m Semi-Anechoic Chamber (indoor OATS) FCC Registration No. 293246, ISED Registration No. 5612A-2, VCCI Registration No. 4065
Site J	Transient Laboratory
Site K	Screened Room (Control Room for Site M)
Site M	3m Semi-Anechoic Chamber (indoor OATS) FCC Registration No. 293246, ISED Registration No. 5612A-3
Site N	Radio Laboratory
Site Q	Fully-Anechoic Chamber
Site OATS	3m and 10m Open Area Test Site FCC Registration No. 293246, ISED Registration No. 5612A-1
Site R	Screened Room (Conducted Immunity)
Site S	Safety Laboratory
Site T	Transient Laboratory

RN Electronics CAB identifier as issued by Innovation, Science and Economic Development Canada is UK0002
RN Electronics CAB identifier as issued by FCC is UK0015

12 Abbreviations and units

%	Percent	dBμV	decibels relative to 1μV
λ	Wavelength	dBμV/m	decibels relative to 1μV/m
μA/m	microAmps per metre	dBc	decibels relative to Carrier
μV	microVolts	dBd	decibels relative to dipole gain
μW	microWatts	dBi	decibels relative to isotropic gain
AC	Alternating Current	dBm	decibels relative to 1mW
ACK	ACKnowledgement	dB	decibels relative to a maximum value
ACP	Adjacent Channel Power	dBW	decibels relative to 1W
AFA	Adaptive Frequency Agility	DC	Direct Current
ALSE	Absorber Lined Screened Enclosure	DFS	Dynamic Frequency Selection
AM	Amplitude Modulation	DMO	Dynamic Modulation Order
Amb	Ambient	DSSS	Direct Sequence Spread Spectrum
ANSI	American National Standards Institute	DTA	Digital Transmission Analyser
ATPC	Automatic Transmit Power Control	EIRP	Equivalent Isotropic Radiated Power
AVG	Average	emf	electromotive force
AWGN	Additive White Gaussian Noise	ERC	European Radiocommunications Committee
BER	Bit Error Rate	ERP	Effective Radiated Power
BPSK	Binary Phase Shift Keying	ETSI	European Telecommunications Standards Institute
BT	Bluetooth	EU	European Union
BLE	Bluetooth Low Energy	EUT	Equipment Under Test
BW	Bandwidth	FCC	Federal Communications Commission
°C	Degrees Celsius	FER	Frame Error Rate
C/I	Carrier / Interferer	FHSS	Frequency Hopping Spread Spectrum
CAC	Channel Availability Check	FM	Frequency Modulation
CCA	Clear Channel Assessment	FSK	Frequency Shift Keying
CEPT	European Conference of Postal and Telecommunications Administrations	FSS	Fixed Satellite Service
CFR	Code of Federal Regulations	g	Grams
CISPR	Comité International Spécial des Perturbations Radioélectriques	GHz	GigaHertz
cm	centimetre	GNSS	Global Navigation Satellite System
COFDM	Coherent OFDM	GPS	Global Positioning System
COT	Channel Occupancy Time	Hz	Hertz
CS	Channel Spacing	IEEE	Institute of Electrical and Electronics Engineers
CW	Continuous Wave	IF	Intermediate Frequency
DAA	Detect And Avoid	ISED	Innovation Science and Economic Development
dB	decibels	ITU	International Telecommunications Union
dBμA/m	decibels relative to 1μA/m	KDB	Knowledge DataBase

kg	kilogram	pW	picoWatts
kHz	kiloHertz	QAM	Quadrature Amplitude Modulation
kPa	Kilopascal	QP	Quasi Peak
LBT	Listen Before Talk	QPSK	Quadrature Phase Shift Keying
LISN	Line Impedance Stabilisation Network	RBW	Resolution Band Width
LNA	Low Noise Amplifier	RED	Radio Equipment Directive
LNB	Low Noise Block	R&TTE	Radio and Telecommunication Terminal Equipment
LO	Local Oscillator	Ref	Reference
m	metre	RF	Radio Frequency
mA	milliAmps	RFC	Remote Frequency Control
max	maximum	RFID	Radio Frequency IDentification
Mbit/s	MegaBits per second	RLAN	Radio Local Area Network
MCS	Modulation and Coding Scheme	RMS	Root Mean Square
MHz	MegaHertz	RNSS	Radio Navigation Satellite Service
mic	Microphone	RSL	Received Signal Level
MIMO	Multiple Input, Multiple Output	RSSI	Received Signal Strength Indicator
min	minimum	RTP	Room Temperature and Pressure
mm	millimetres	RTPC	Remote Transmit Power Control
ms	milliseconds	Rx	Receiver
mW	milliWatts	s	Seconds
NA	Not Applicable	SINAD	Signal to Noise And Distortion
NFC	Near Field Communications	SRD	Short Range Device
nom	Nominal	Tx	Transmitter
nW	nanoWatt	UKAS	United Kingdom Accreditation Service
OATS	Open Area Test Site	UKCA	United Kingdom Conformity Assessed
OBW	Occupied Band Width	UKRER	United Kingdom Radio Equipment Regulations
OCW	Occupied Channel Width	UHF	Ultra High Frequency
OFDM	Orthogonal Frequency Division Multiplexing	U-NII	Unlicensed National Information Infrastructure
OOB	Out Of Band	USB	Universal Serial Bus
ppm	Parts per million	UWB	Ultra Wide Band
PER	Packet Error Rate	V	Volts
PK	Peak	V/m	Volts per metre
PMR	Private Mobile Radio	VBW	Video Band Width
PRBS	Pseudo Random Bit Sequence	VHF	Very High Frequency
PRF	Pulse Repetition Frequency	VSAT	Very Small Aperture Terminal
PSD	Power Spectral Density	W	Watts
PSU	Power Supply Unit		

===== END OF TEST REPORT =====