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RADIO TEST REPORT

REPORT NUMBER: M2107001-10 V3

TEST STANDARD: FCC PART 15 SUBPART C
SECTION 15.225

ISED RSS-210

MANUFACTURER: GREYSCAN AUSTRALIA PTY LTD

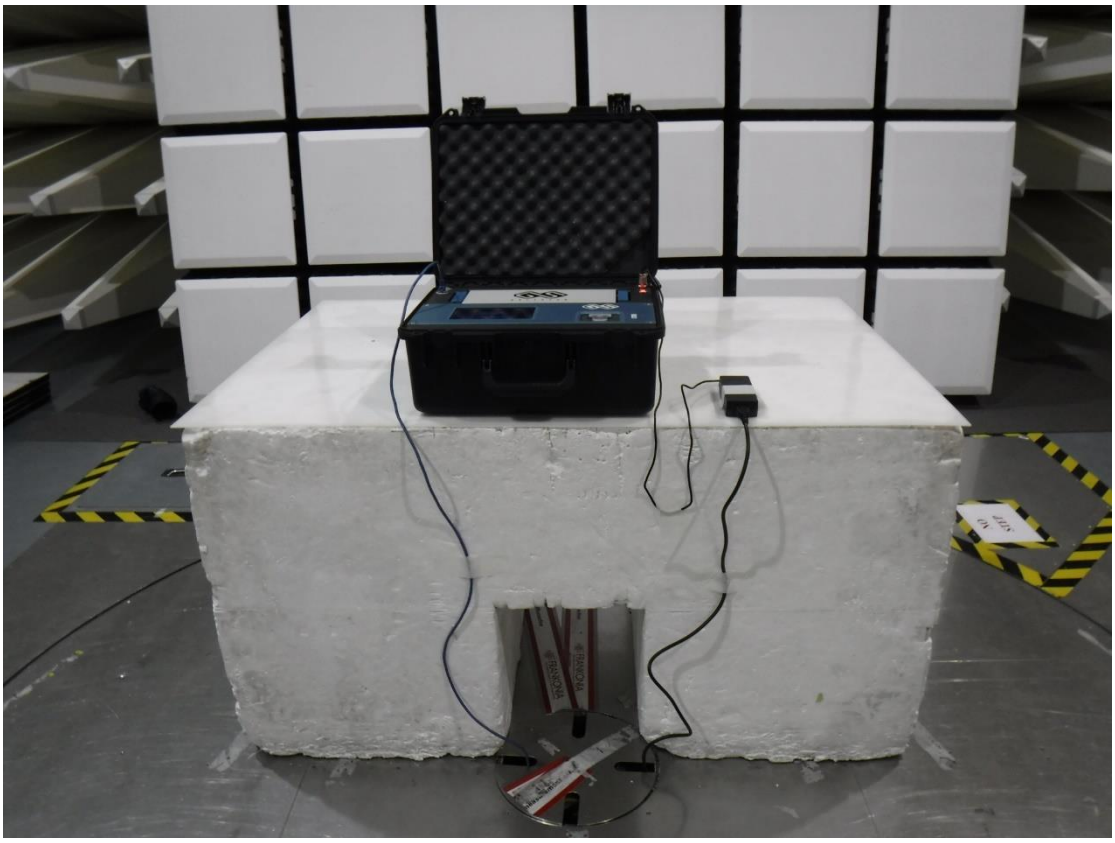
DEVICE: GREYSCAN ETD-100

MODEL: ETD-100

FCC ID: 2A2S7-ETD100

IC ID: 27603-ETD100

DATE OF ISSUE: 27 SEPTEMBER 2021



Equipment Under Test: GreyScan ETD-100

REVISION TABLE

Version	Sec/Para Changed	Change Made	Date
1		Initial issue of document	27/08/2021
2	Page 1 Page 5	Added Manufacturer Updated Phone Number	3/09/2021
3	Page 6 Page 13	Added statement on Test Summary Added Fundamental Frequency Field Strength Table	27/09/2021

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CERTIFICATE OF COMPLIANCE

Device:	GreyScan ETD-100
Model Number:	ETD-100
FCC ID:	2A2S7-ETD100
IC ID:	27603-ETD100
Tested for:	GreyScan Australia Pty Ltd
Contact:	Anup Aundhakar
Email:	anup@c-prav.com.au
Manufacturer:	GreyScan Australia Pty Ltd
Address:	Unit 9, 435 Williamstown Road Port Melbourne VIC 3207, Australia
Phone Number:	+61 3 9112 0333
Contact:	Behrudin Bektic
Email:	rudi.bektic@greyscandetection.com
Standard:	FCC Part 15 – Radio Frequency Devices Subpart C – Intentional Radiators Section 15.225 Operation within the band 13.110-14.010 MHz RSS – 210 Issue 10 Spectrum Management and Telecommunications Radio Standards Specification— Licence-Exempt Radio Apparatus: Category I Equipment
Result:	The GreyScan ETD-100 complied with the applicable requirements of the standard above. Refer to Report M2107001-10 V3 for full details
Test Date(s):	5, 13 & 14 July 2021
Issue Date:	27 September 2021

Test Engineer(s): Wilson Xiao, Ian Paul Ng

Attestation: *I hereby certify that the device(s) described herein were tested as described in this report and that the data included is that which was obtained during such testing.*

Authorised Signatory: Shabbir Ahmed, PhD
Technical Director

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RADIO REPORT

1 TEST SUMMARY

Section	Description	FCC	ISED	Result(s)
6.1	Antenna Requirement	§15.203	RSS-Gen 6.8	Complied
6.2	Conducted Limits	§15.207	RSS-Gen 8.8	Complied
6.3	Field Strength of Emissions within the band 13.110-14.010 MHz	§15.225 (a)(b)(c)	RSS-210 B.6(a)	Complied
6.4	Radiated Spurious Emissions	§15.225(d)	RSS-210 7.2	Complied
6.5	Frequency Tolerance	§15.225(e)	RSS-210 B.6(b)	Complied
Note: The Radio fundamental and its spurious emissions comply with the limits of §15.225 and §15.209 respectively.				

2 TEST FACILITY

2.1 General

EMC Technologies Pty Ltd is accredited by the FCC as a test laboratory able to perform compliance testing for the public. EMC Technologies Pty Ltd has also been designated as a Conformity Assessment Body (CAB) by Australian Communications and Media Authority (ACMA) under the APECTEL MRA and is designated to perform compliance testing on equipment subject to Declaration of Conformity (DoC) and Certification under Parts 15 and 18 of the FCC Commission's rules – **Registration Number 494713 & Designation number AU0001**.

EMC Technologies Pty Ltd is also an ISED Canada recognized testing laboratory – **ISED company number: 9626A** and **CAB identifier number: AU0001.**

2.2 NATA Accreditation

NATA is the Australian National laboratory accreditation body and has accredited EMC Technologies to operate to the IEC/ISO17025 requirements. A major requirement for accreditation is the assessment of the company and its personnel as being technically competent in testing to the standards. This requires fully documented test procedures, continued calibration of all equipment to the National Standard at the National Measurements Institute (NMI) and an internal quality system similar to ISO 9002. NATA has mutual recognition agreements with the National Voluntary Laboratory Accreditation Program (NVLAP) and the American Association for Laboratory Accreditation (A^2LA).

All testing in this report has been conducted in accordance with EMC Technologies' scope of NATA accreditation to ISO 17025 for both testing and calibration and ISO 17020 for Inspection – **Accreditation Number 5292**.

The current full scope of accreditation can be found on the NATA website: www.nata.com.au

3 TEST EQUIPMENT CALIBRATION

Measurement instrumentation and transducers were calibrated in accordance with the applicable standards by an independent NATA registered laboratory such as Agilent Technologies (Australia) Pty Ltd or the National Measurement Institute (NMI) or in-house. All equipment calibration is traceable to Australian national standards at the National Measurements Institute.

Equipment Type	Make/Model/Serial Number	Last Cal. dd/mm/yyyy	Due Date dd/mm/yyyy	Cal. Interval
Chamber	Frankonia SAC-10-2 (R-139)	03/10/2010	03/10/2021	3 Year*1
Environment Chamber	Weiss C1000/70 Sn:546260057800010 (E-010)	21/05/2021	21/05/2022	1 Year*2
EMI Receiver	R&S ESR7 Sn: 101804 (R-142)	17/08/2020	17/08/2021	1 Year*2
Antennas	SUNOL JB1 Sn. A012312 (A-363)	23/06/2020	23/06/2022	2 Year*2
	EMCO 6502 Active Loop Antenna Sn:2021 (A-310)	31/08/2020	31/08/2022	2Year*2
Cables*3	Huber & Suhner Sucoflex 104A Sn: 507097 (C-487)	27/11/2020	27/11/2021	1 Year*1
	Huber & Suhner Sucoflex 104A Sn: 800458 (C-523)	27/11/2020	27/11/2021	1 Year*1
LISN	Teseq Single Phase LISN NNB51 Sn: 47416 (L-072)	02/12/2020	02/12/2021	1 Year*1

Note *1. Internal NATA calibration.
Note *2. External NATA / A2LA calibration.
Note *3. Cables are verified before measurements are taken.

4 MEASUREMENT UNCERTAINTY

EMC Technologies has evaluated the equipment and the methods used to perform the emissions testing. The estimated measurement uncertainties for emissions tests shown within this report are as follows:

Conducted Emissions:	9 kHz to 30 MHz	±3.2 dB
Radiated Emissions:	9 kHz to 30 MHz	±4.1 dB
	30 MHz to 300 MHz	±5.1 dB
	300 MHz to 1000 MHz	±4.7 dB
	1 GHz to 18 GHz	±4.6 dB
Peak Output Power:		±1.5 dB

The above expanded uncertainties are based on standard uncertainties multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

5 DEVICE DETAILS

(Information supplied by the Client)

The test sample is an automated explosive trace detection (ETD) device to detect homemade inorganic explosives. GreyScan ETD-100 can detect homemade inorganic explosives (nitrate, chlorate, perchlorate ions) with a high degree of sensitivity.

5.1 EUT (Transmitter) Details

Radio:	ST CR95HF transceiver IC
Operating frequency:	13.56 MHz
No. of Channels:	1
Modulation:	ASK
Antenna:	Taoglas Circular Flexible NFC (Near-Field Communications) Antenna
Antenna Part Number:	FXR.07.A
Antenna Gain:	Unknown

5.2 EUT (Host) Details

Device under Test:	GreyScan ETD-100
Model Number:	ETD-100
Part Number:	GSN-1518-1092
Serial Number:	0351
Power requirements:	MEAN WELL AC/DC SWITCHING ADAPTOR MODEL: GST90A24 INPUT: 100 -240 VAC, 50/60 Hz, 1.3A OUTPUT: 24 VDC, 3.75 A, 90W Max

5.3 Test Configuration

Testing was performed with the radio module set to continuously transmit.

5.4 Modifications

All tests are witnessed by the client. There are no EUT modifications performed by EMC Technologies. EMC Technologies takes no responsibility under the stated EUT test conditions. The manufacturer must check that any modifications made for compliance must meet all product design, functional, safety and any other compliance requirements.

6 RESULTS

6.1 §15.203 & RSS-Gen 6.8 Antenna Requirement

The transceiver incorporates Inductive coil antenna which is mounted on the device and cannot be replaced by another type.

Antenna Type: Taoglas Circular Flexible NFC (Near-Field Communications) Antenna
Antenna Part Number: FXR.07.A
Antenna gain: Unknown
Connector: Not Applicable

6.2 §15.207 & RSS-Gen 8.8 Conducted Limits

The EUT is powered by an AC Adapter as detailed below:

Plug pack:	MEAN WELL AC/DC SWITCHING ADAPTOR
Model:	GST90A24
Input supply:	100-240VAC, 50/60 Hz, 1.3A
Output supply:	24VDC, 3.75A

6.2.1 Test Procedure

The arrangement specified in ANSI C63.10: 2013 was adhered to for the conducted EMI measurements. The EUT was placed in the RF screened enclosure and a CISPR EMI Receiver as defined in ANSI C63.2: 2009 was used to perform the measurements.

The specified 0.15 MHz to 30 MHz frequency range was sub-divided into sub-ranges to ensure that all short duration peaks were captured. For each of the sub-ranges, the EMI receiver was set to continuous scan with the Peak detector set to Max-Hold mode. The Quasi-Peak detector and the Average detector were then invoked to measure the actual Quasi-Peak and Average level of the most significant peaks, which were detected.

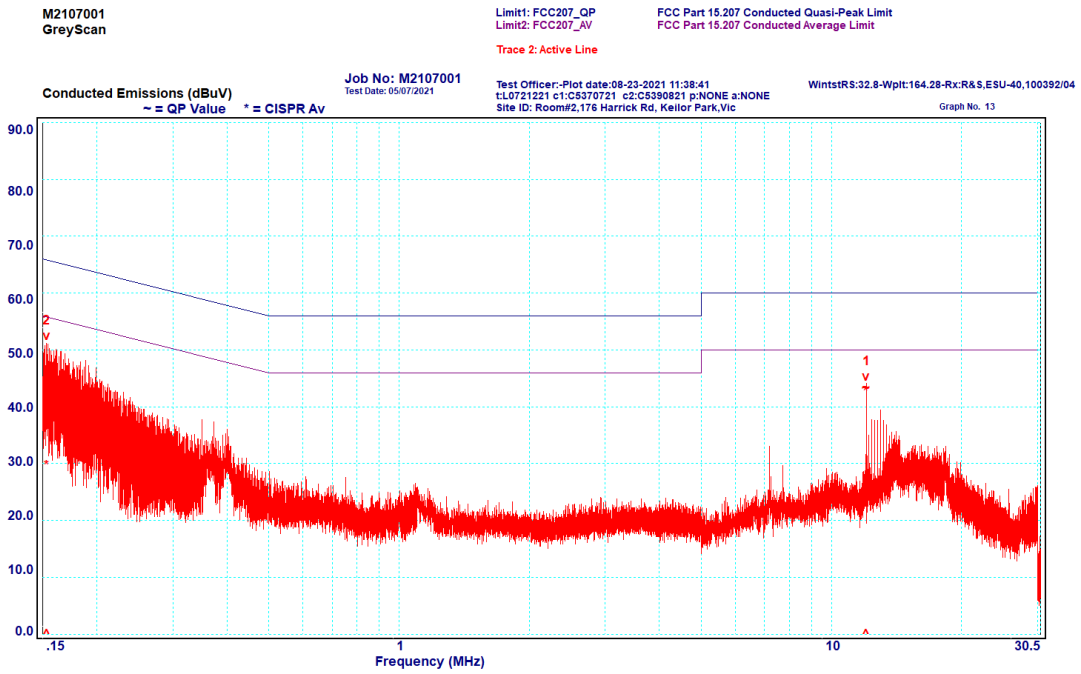
6.2.2 Limits

The limit applied was in accordance to the conducted limits defined in §15.207 & RSS-Gen 8.8.

6.2.3 Results

The sample complied with the conducted emission limits of §15.207 & RSS-Gen 8.8.

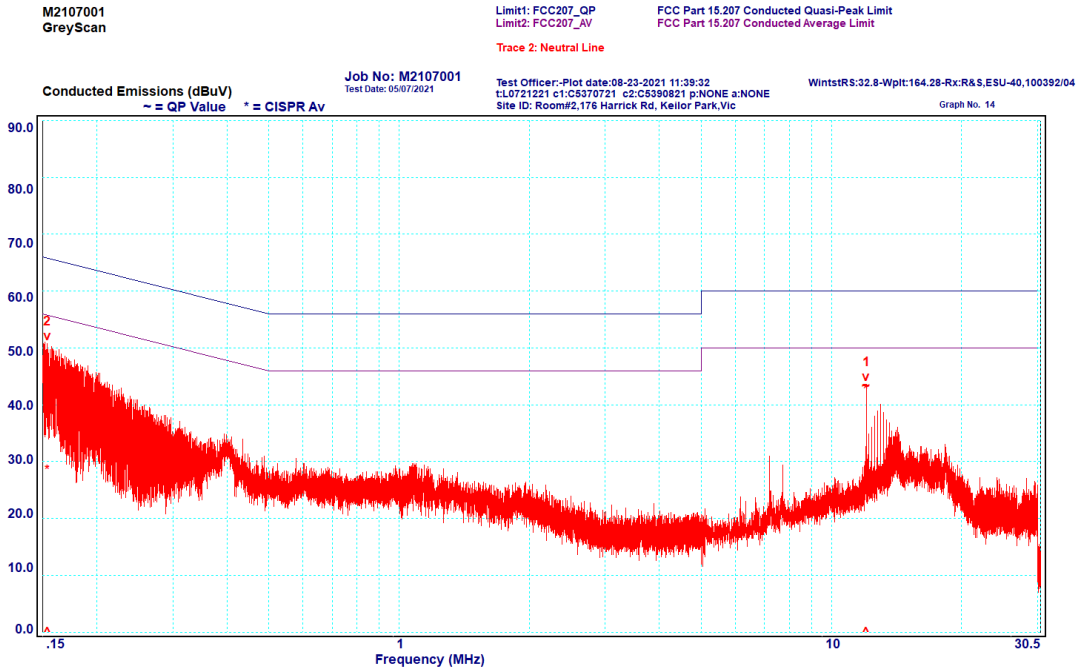
Testing was performed over the frequency range of 150 kHz to 30 MHz at 120V AC, 60 Hz.



Graph 6-1: Active Line (0.15 MHz to 30 MHz)

Table 6-1: Active Line (0.15 MHz to 30 MHz)

Peak	Frequency [MHz]	Line	Quasi-Peak			Average		
			Level [dBµV]	Limit [dBµV]	Margin [dB]	Level [dBµV]	Limit [dBµV]	Margin [dB]
1	12.05	Active	43.2	60	-16.8	42.8	50	-7.2
2	0.153	Active	43.6	65.8	-22.2	29.7	55.8	-26.1



Graph 6-2: Neutral Line (0.15 MHz to 30 MHz)

Table 6-2: Neutral Line (0.15 MHz to 30 MHz)

Peak	Frequency [MHz]	Line	Quasi-Peak			Average		
			Level [dBµV]	Limit [dBµV]	Margin [dB]	Level [dBµV]	Limit [dBµV]	Margin [dB]
1	12.05	Neutral	43.3	60	-16.7	42.7	50	-7.3
2	0.154	Neutral	43	65.8	-22.8	28.5	55.8	-27.3

6.3 §15.225 (a)(b)(c) & RSS-210 B.6(a) Field Strength of Emissions within the band

6.3.1 Test Procedure

The field strength of emissions within the band was measured inside a semi-anechoic chamber compliant with ANSI C63.4: 2014.

The EUT was positioned on a test turn-table and slowly rotated through 360° to determine the highest emissions with the spectrum analyser set to Max-hold using a Peak detector and a resolution bandwidth of 9 kHz. The measurement antenna was also varied between 1 and 4 metres height. A calibrated active loop antenna was used for the measurements. Measurements were conducted in all polarisations (Parallel to EUT, Perpendicular to EUT and Ground Parallel).

All measurements were made at 3 metres. Final measurements on the fundamental emissions were done using a Quasi-Peak detector.

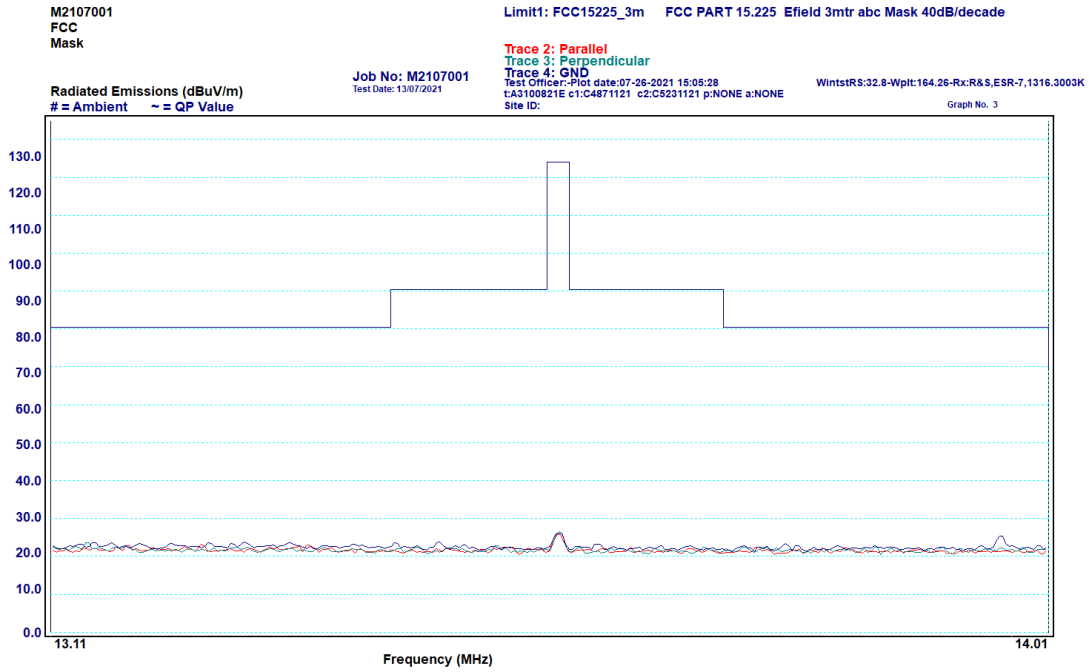
6.3.2 Limits

Table 6-3: Field Strength of Emissions within the band 13.110 MHz to 14.010 MHz

Frequency range (MHz)	Field Strength (µV/m) at 30m	Field Strength (dBµV/m) at 30m	Field Strength (dBµV/m) at 3m
13.110 to 13.410	106	40.5	80.5
13.410 to 13.553	334	50.5	90.5
13.553 to 13.567	15848	84.0	124.0
13.567 to 13.710	334	50.5	90.5
13.710 to 14.010	106	40.5	80.5

6.3.3 Results

All emissions within the band 13.110 MHz to 14.010 MHz complied with requirement of the standard.



Graph 6-3: Field Strength of Emissions within the band 13.110 MHz to 14.010 MHz

Table 6-4: Fundamental Frequency Field Strength

Frequency [MHz]	Polarisation	Level [dBµV/m]@3m	Limit [dBµV/m]	Results
13.56	Parallel	27.3	124.0	Complied
13.56	Perpendicular	27.5	124.0	Complied
13.56	Ground	28.9	124.0	Complied

6.4 §15.225 (d) & RSS-210 7.2 Radiated Spurious Emission limits

6.4.1 Test procedure

Radiated emissions measurements were performed in a semi-anechoic chamber compliant with ANSI C63.4: 2014.

The test frequency range was sub-divided into smaller bands with the defined resolution bandwidths to permit reliable display and identification of emissions.

Frequency range [MHz]	Measurement Bandwidth [kHz]	Measurement Distance [m]	Antenna
0.009 to 0.150	0.2	3	0.6 metre loop antenna
0.150 to 30	9	3	
30 to 1000	120	3	Biconilog hybrid

EUT was set at 0.8 m for measurements below 1000 MHz.

The sample was slowly rotated with the spectrum analyser set to Max-Hold. This was performed for at least two antenna heights. When an emission was located, it was positively identified and its maximum level found by rotating the automated turntable and by varying the antenna height. For below 1000 MHz the emissions were measured with a Quasi-Peak detector.

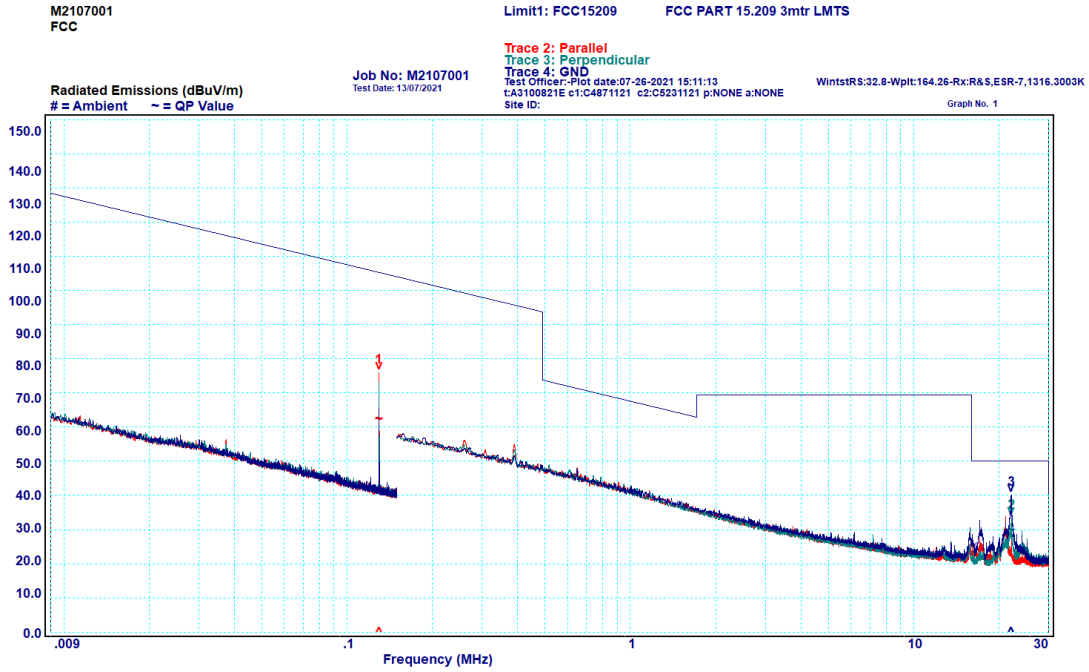
The measurement data for each frequency range was corrected for cable losses, antenna factors and preamplifier gain. This process was performed for both horizontal and vertical polarisations of the measurement antenna.

6.4.2 Limits

The limit applied is in accordance to the radiated emission limits defined in §15.209 Radiated emission limits; general requirements.

6.4.3 Results: Frequency Band: 9kHz - 30MHz

All spurious emissions measured in the frequency band 9 kHz – 30 MHz complied with the requirements of §15.209.



Graph 6-4: Spurious Emissions, 9 kHz – 30 MHz

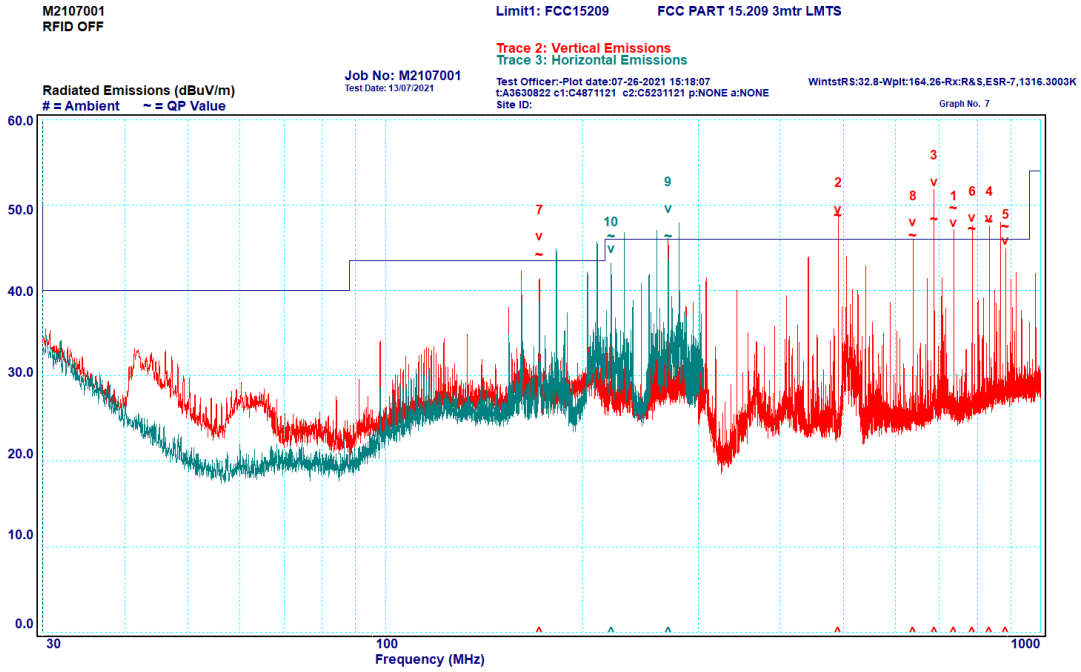
Table 6-5: Spurious Emissions, 9 kHz – 30 MHz

Peak	Frequency [MHz]	Polarisation	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]
1	0.13	Parallel	62.4	105.3	-42.9
2	22.09	Perpendicular	29.8	50	-20.2
3	22.09	Ground	28.1	50	-21.9

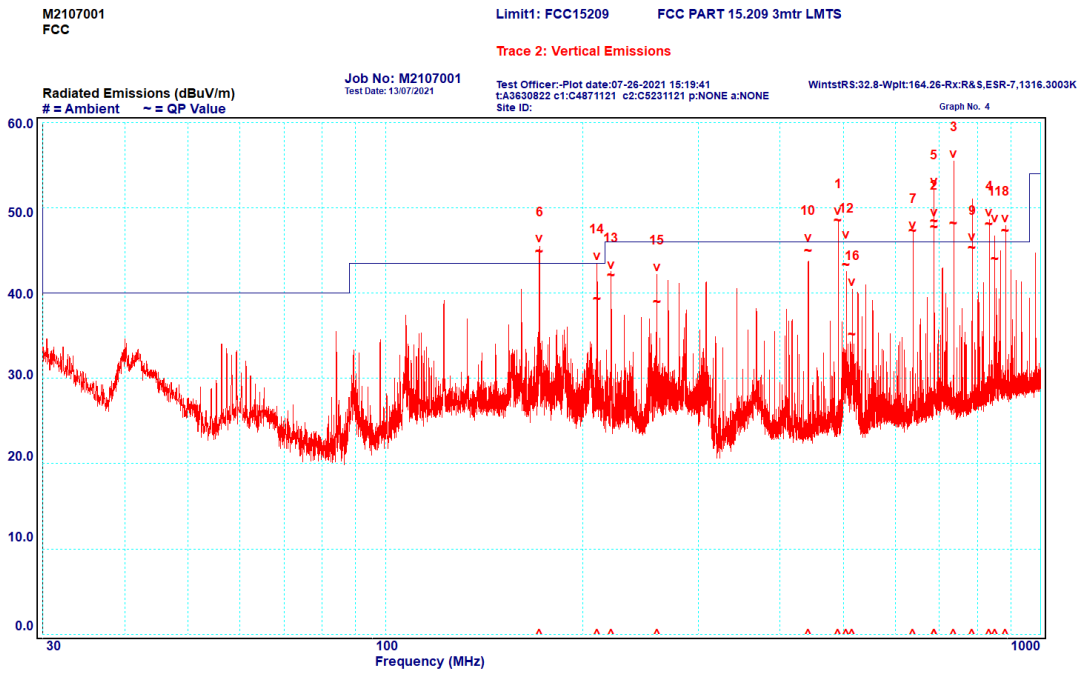
6.4.4 Results: Frequency Band: 30 – 1000 MHz

All spurious emissions measured in the frequency band 30 MHz to 1000 MHz complied with the requirements of §15.209.

Baseline Check (Radio module switched off)



Graph 6-5: Spurious Emissions, 30 - 1000 MHz, Baseline Check

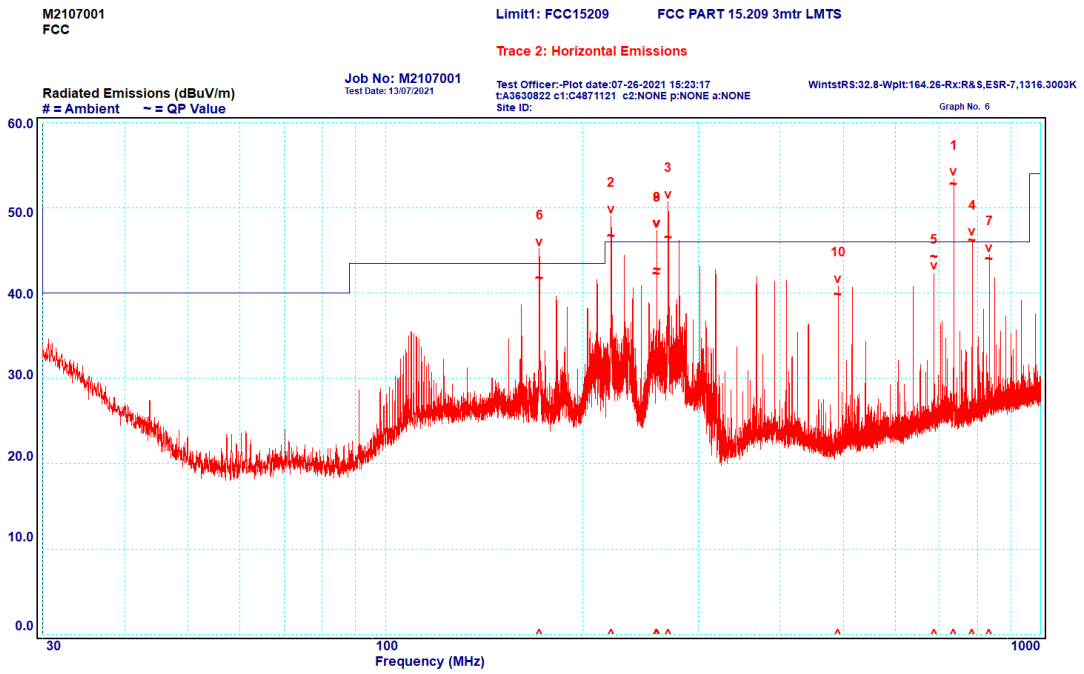


Graph 6-6: Spurious Emissions, 30 - 1000 MHz, Vertical

Table 6-6: Spurious Emissions, 30 - 1000 MHz, Vertical

Peak	Frequency [MHz]	Polarisation	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]
1*	490.9	Vertical	N/A	N/A	N/A
2*	687.27	Vertical	N/A	N/A	N/A
3*	736.37	Vertical	N/A	N/A	N/A
4*	834.54	Vertical	N/A	N/A	N/A
5*	687.26	Vertical	N/A	N/A	N/A
6*	171.85	Vertical	N/A	N/A	N/A
7*	638.16	Vertical	N/A	N/A	N/A
8*	883.63	Vertical	N/A	N/A	N/A
9	785.45	Vertical	45.2	46	-0.8
10	441.82	Vertical	44.9	46	-1.1
11	851.63	Vertical	44	46	-2
12	504.94	Vertical	43.3	46	-2.7
13	220.93	Vertical	42	46	-4
14	210.39	Vertical	39.2	43.5	-4.3
15	259.49	Vertical	38.9	46	-7.1
16	515.44	Vertical	35.1	46	-10.9

*Note, Peaks 1- 8 are identified emission which are unrelated to the Radio module under test and are not subject to the spurious emission limit of the standard.



Graph 6-7: Spurious Emissions, 30 - 1000 MHz, Horizontal

Table 6-7: Spurious Emissions, 30 - 1000 MHz, Horizontal

Peak	Frequency [MHz]	Polarisation	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]
1*	736.36	Horizontal	N/A	N/A	N/A
2*	220.89	Horizontal	N/A	N/A	N/A
3*	270.02	Horizontal	N/A	N/A	N/A
4*	785.45	Horizontal	N/A	N/A	N/A
5	687.27	Horizontal	44.2	46	-1.8
6	171.78	Horizontal	41.7	43.5	-1.8
7	834.54	Horizontal	44	46	-2
8	259.49	Horizontal	42.8	46	-3.2
9	259.48	Horizontal	42.2	46	-3.8
10	490.9	Horizontal	39.8	46	-6.2

*Note, Peaks 1- 4 are identified emission which are unrelated to the Radio module under test and are not subject to the spurious emission limit of the standard.

6.5 §15.225 (e) & RSS-210 B.6(b) Frequency Tolerance

6.5.1 Test procedure

The Frequency Tolerance was measured using the procedure from ANSI C63.10 section 6.8.

The frequency tolerance of the carrier signal was measured over

a. a temperature variation of 5ºC to 50ºC at normal supply and
b. a variation in the primary supply voltage from 85% to 115% of the rated voltage at a temperature of 20 ºC

Note, EUT operating temperature is 5ºC to 55ºC and tests were performed between 5ºC to 50ºC only.

6.5.2 Limits

The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency.

6.5.3 Results

Table 6-8: Frequency Tolerance vs Temperature

Voltage: 120V, 60 Hz							
Temperature (ºC)	Measured Frequency (MHz)				Max Frequency Deviation		Result
	Start up	2 min	5 min	10 min	MHz	%	
5	13.5594	13.5592	13.5595	13.5594	-0.0004	-0.00295	Complied
15	13.5596	13.5593	13.5593	13.5596	-0.0003	-0.00221	Complied
25	13.5596	13.5594	13.5592	13.5596*	-0.0004	-0.00295	Complied
35	13.5594	13.5592	13.5596	13.5595	-0.0004	-0.00295	Complied
45	13.5593	13.5592	13.5596	13.5594	-0.0004	-0.00295	Complied
50	13.5596	13.5593	13.5597	13.5596	-0.0003	-0.00221	Complied

* Reference operating frequency: 13.5596 MHz at 25 ºC 10 mins.

Table 6-9: Frequency Tolerance vs Voltage

Temperature: 20ºC				
Voltage (V)	Frequency (MHz)	Frequency Deviation (MHz)	Frequency Deviation (%)	Result
102	13.5594	0	0	Complied
120	13.5594*	0	0	Complied
138	13.5595	-0.0001	-0.00074	Complied

* Reference operating frequency: 13.5594 MHz at 120V, 60 Hz.

END OF REPORT