

FCC TITLE 47 PART 15 SUBPART C TEST REPORT

Client:	Sato Vicinity Pty Ltd
Address:	42 Burrows Road, St Peters, NSW 2044, Australia
Report No.:	0912SAT_MDR-4330AT_FCCPT15C (Replacing previous reports listed in Section 1, Report Revision History)
Test Date(s):	5 th to 20 th March 2025 and 12 th to 18 th August 2025
Project No.:	SAT241212B
Equipment Name:	MDR-4330AT
Equipment Model No(s).:	MDR-4330AT
FCC ID No.:	2ACXQ- MDR4330AT
Equipment Description	Sato MDR 4330AT PJM RFID reader writer
Result:	COMPLIED (Refer to Test Summary page for clarifications)
Prepared by:	Steven Garnham Authoring Engineer 
Approved by:	Richard Turner Assessment Engineer 
Issue Date:	12 th September 2025
Results appearing herein relate only to the sample(s) tested.	
This report is issued errors and omissions exempt and is subject to withdrawal at Austest Laboratories discretion.	

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1 REPORT REVISION HISTORY

Date	Report Number	Changes
16/04/2025	0415SAT_MDR-4330AT_FCCPT15C-C2PC	Original Report.
29/08/2025	0829SAT_MDR-4330AT_FCCPT15C	Additional conducted and extreme testing. FCC ID updated.
03/09/2025	0903SAT_MDR-4330AT_FCCPT15C	EUT description revision (cover and section 5.1), antenna gain exclusion justification added (under Section 5 table), page 4 corrections.
12/09/2025	0912SAT_MDR-4330AT_FCCPT15C	Inclusion of toroid details, tabulated conducted emissions data, 20dB bandwidth measurement.

2 REFERENCES

Document		Issue/ Amended
FCC Title 47	FCC Title 47 Part 15 – Radio Frequency Devices	Current as of August 2025
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	2013
ANSI C63.4	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	2014
KDB 174176	AC Power Line Conducted Emissions Frequently Asked Questions	v01 r02 07/08/2025
Client Test Plan	Not Supplied (Client witnessed testing).	-

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3 COMPLIANCE SUMMARY

DISCLAIMER: Austest Laboratories makes no claim regarding the consistency of production versions of the EUT. The results in this report apply only to the sample tested, as described in Section 5 of this report.

FCC Part 15, Subpart C – Intentional Radiators		Result	Notes
15.203	Antenna Requirement	Complied	-
15.205	Restricted Bands of Operation	Complied	(i)
15.207	Conducted Limits	Complied	(ii)
15.209	Radiated Emission Limits, General Requirements	Complied	-
15.215	Additional provisions to the general radiated emission limitations.	Complied	(iii)
15.225 (a)	Operation Within the Band 13.553 -13.567 MHz:-Field Strength	Complied	-
15.225 (b)	Operation Within the Band 13.410 -13.553 MHz; 13.567 – 13.710 MHz	Complied	-
15.225 (c)	Operation Within the Band 13.110 -14.010 MHz; 13.710 – 14.010 MHz	Complied	-
15.225 (e)	Operation Within the Band 13.553 -13.567 MHz:- Frequency Tolerance	Complied	

Notes

- (i) The EUT was assessed as a single fixed frequency RFID reader at 13.560MHz
- (ii) Tested both with antennas connected and with a dummy load, as per KDB 174176 D01.
- (iii) The 20 dB bandwidth of the 13.56 MHz emission was within the operating band specified in section 15.225 (13.110 – 14.010 MHz).

4 MODIFICATIONS / CONDITIONS REQUIRED FOR COMPLIANCE

- No modifications were made to the EUT.
- The manufacturer supplied a shielded Ethernet cable with an attached Common Mode toroid (NEOSID Toroid 63.00/38.00/25.00, Grade F10), which was required to achieve compliance. Toroid data sheet is provided on the following page.

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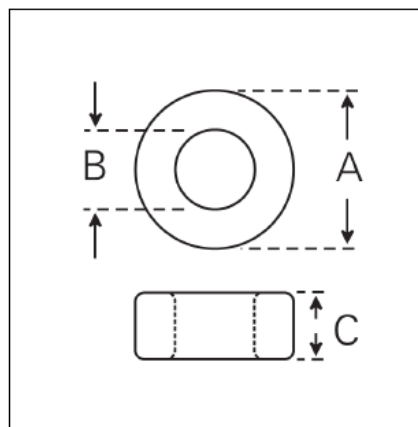


Soft Ferrite Cores

Toroid 63.00/38.00/25.00

Dimensions

Symbol	Value (mm)	±
'A'	63.00	2.00
'B'	38.00	1.20
'C'	25.00	0.80



Effective Geometric Parameters

Parameter	Symbol	Value	Unit
$\Sigma(l/A)$	C_i	0.497	mm^{-1}
effective magnetic path length	ℓ_e	152.08	mm
effective area of magnetic path	A_e	305.92	mm^2
effective volume	V_e	46528	mm^3

Electrical Specification

Grade	A_L	Tolerance on A_L (%)	Coating	μ_i	Part No.
F16	316	+30/-20	No Coating	≈ 125	28-061-32
F5	5055	+30/-20	No Coating	≈ 2000	28-061-25
F48	5814	+30/-20	No Coating	≈ 2300	28-061-48
F9	11100	+30/-20	No Coating	≈ 4400	28-061-36
F9C	12638	+30/-20	Epoxy	≈ 5000	28-761-36C
F10	15170	+30/-20	Epoxy triple coated	≈ 6000	28-761-37P

Please note all dimensions are nominal and given for uncoated cores.

Coating Characteristics

Dielectric breakdown strength and approximate thickness per surface for coated cores is as follows:

Epoxy 1000V dc for cores up to 10mm outside diameter
 1500V dc for cores >10mm and ≤20mm outside diameter
 2000V dc for cores >20mm outside diameter
 Coating thickness is approximately 0.25mm

Enamel Cores are coated for identification purposes only.
 They can be either fully or partially coated and no breakdown strength can be guaranteed.
 Coating thickness is approximately 0.25mm

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5 EQUIPMENT UNDER TEST INFORMATION

Name:	MDR-4330AT
Model No(s):	MDR-4330AT
Serial No(s):	JH502577
EUT FCC ID:	2ACXQ- MDR4330AT
Power Supply Rating:	12VDC / 4 Amp Via supplied Power Adaptor:-Cincon Electronics TRH50A120; 100 – 240VAC / 12V @ 4.2A
Highest Internal/Operating Frequency:	50 MHz
Transmit Frequency Range:	Single Channel, 13.56 MHz only
Transmit Power settings:	Internal antenna *: Sub axis 0 = 1 Sub axis 1 = 3 Sub axis 2 = 3 Sub axis 3 = 3 Sub axis 4 = 3 Sub axis 5 = 1 External Wand antenna*: Level 1
Modulation Technique:	Phase Jitter Modulation
Number of Channels:	1
Antenna Specifications:	Internal antenna: 430 x 280mm PCB antenna (p/n:083-10-1003-PCB vB1). External wand antenna: Model:-tethered-124, (p/n: 031-70-035). The client indicated both antennas have a directivity of 2.15dBi which when considering efficiency gives a theoretical gain (directivity × efficiency) of -36.94 dBi.

*Power level settings as defined in the EUT operating firmware and set by the manufacturer.

Antenna gain information is not provided as all fundamental and spurious emissions were radiated measurements only. The antenna gains have been accounted for in the radiated measurements as the EUT was tested with the antennas in place.

5.1 EUT Description

The equipment under test (EUT) was a Sato MDR 4330AT PJM RFID reader writer operating at 13.56 MHz. The EUT had two antennas, one being installed inside the reader and the second antenna was an external hand wand antenna which connected to an external antenna RF port mounted on the reader. The EUT was designed to energise and communicate with passive RFID tags.

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5.2 EUT Operating Mode(s)

Mode #	Description
1	Internal antenna reading a passive RFID tag.
2	External hand wand antenna positioned in the three orthogonal orientations, X, Y, Z, while reading a passive RFID tag placed adjacent to the reader antenna. Positions X (horizontal) and Y (vertical) produced the measured worst-case results.
3	Internal antenna with no passive RFID tag present.
4	External hand wand antenna positioned in the three orthogonal orientations, X, Y, Z, with no passive RFID tag present. Positions X (horizontal) and Y (vertical) produced the measured worst-case results.

EUT was powered from a 120V Vac, 60 Hz supply for all tests.

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6 TEST SETUP AND EUT CONFIGURATION

Test setup photographs are in Appendix B.

The client supplied laptop PC was used to control the EUT transmission and selection of the antenna via the connected Ethernet cable.

Since only one antenna transmitted at a time, testing was separately performed in both modes 1 and 2 shown in section 5.2 of this report.

The following transmit power levels were set by the client:

Internal antenna : Sub axis 0 = 1
 Sub axis 1 = 3
 Sub axis 2 = 3
 Sub axis 3 = 3
 Sub axis 4 = 3
 Sub axis 5 = 1

External Wand antenna: Level =1

The supplied 13.56 MHz dummy load was only used to replace the internal and external antennas during a specific AC mains power conducted emission test as per FCC KDB 174176 D01.

6.1 Supporting Equipment

Equipment	Brand & Model
Passive RFID Tag	Client supplied
Test PC (Client supplied)	Dell Inspiron N5050
Supplied software on the test PC	"Reader Manager" software MDR-4330AT-JH502577
AC Adaptor	CINCON Electronic TRH50A120
Special 13.56 MHz dummy antenna load	Client supplied a purpose-built load to replicate the unique antenna impedances. Used for mains conducted tests.

6.2 Cables

EUT Port	Cable	Length (m)	Source/Load
LAN	Supplied shielded with C.M. core (NEOSID Toroid 63.00/38.00/25.00, Grade F10)	1.8m + 8 turns through core	Test PC *
USB Host**	Shielded USB type A	1.8	USB Device port
USB Device**	Shielded USB type B	1.8	USB Host port
RF Port	Coax with BNC / Reverse TNC	1.5	RF ID Wand
Power	Shielded DC power cable with fitted ferrite at the EUT connection	0.7	Permanently attached to the AC adaptor
Mains Power (AC adaptor)	Unshielded 3 core IEC mains lead	1.8	120VAC 60Hz mains supply

*For radiated emissions test the PC was placed away from the test area.

**The manufacturer supplied a cable that was looped between the Host and Device USB ports.

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7 TEST SPECIFICATIONS

7.1 7.1 Accreditations & Listings

Austest Laboratories are A2LA accredited, Certificate Number 2765.02. The tests reported herein have been performed in accordance with its terms of accreditation.

7.2 Deviations from Standards and/or Accreditations

None.

7.3 Test Facility

7.3.1 46 Glenola Farm Lane, Yarramalong Valley, New South Wales 2259, Australia.

- Radiated emissions testing was performed at an Open Area Test Site (OATS) compliant with ANSI C63.4:2014 and C63.4a:2017. Where some ambient signals may exceed the continuous disturbance limit, the possibility of missing an emission during testing was eliminated by performing pre-scans in a shielded enclosure prior to the final OATS measurements.

7.3.2 Austest Laboratories (Yarramalong and Castle Hill test facilities) is a Conformity Assessment Body (CAB) under the ACMA-FCC APEC-TEL MRA - Designation Number AU0003 / Reg. number 520620.

7.4 Test Equipment

All critical items are maintained on a scheduled calibration recall program or verified with equipment maintained on a scheduled calibration program. Emission measurements are traceable to Australian National standards or international equivalents.

Test Equipment	Brand & Model	ID/Serial No.	Cal Due Date
EMI Receiver	HP8574B	72	21/12/2025
Pre-Amplifier 30 MHz to 1 GHz	HP 8447E/X	74	13/07/2025
BiLog Antenna	CBL6141B	1591	16/10/2025
OATS	OATS 1	83	Verified
Loop Antenna	EM6876	225	29/06/2025
Spectrum Analyser	FSP40	1385	16/4/2025
AC Source	Chroma 6512	320	Verified
Test Software	HP85869PC	-	Verified
Additional Equipment for mains conducted: August 2025 testing			
LISN	Com-Power LI-215	795	17/05/2026
Temperature Chamber	CDW-128	-	Verified

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7.5 Measurement Uncertainty

Measurement uncertainty U_{Lab} was calculated for a 95% level of confidence and based on a coverage factor of $k=2$.

Emissions Tests

Measurement	Uncertainty	
	U_{Cispr}	U_{Lab}
RF Frequency	-	± 5 part in 10^{10}
Radiated Emissions – < 1000 MHz	6.3 dB	± 4.7 dB
Mains Conducted - < 30 MHz	3.4 dB	± 2.7 dB

7.6 Test Criteria

<u>EMISSIONS</u>
The EUT was considered to have passed an emissions test if emission levels were less than the relevant limit.

7.7 Test Witnesses

Tai Wai Pong, plus two other Sato Vicinity Pty Ltd Engineers.

8 ANTENNA REQUIREMENT, §15.203

For the external antenna port, the EUT used a unique reverse polarity TNC connector.

The EUT complied with the requirement of this Section due to this unique antenna connector.

9 RESTRICTED BANDS OF OPERATION, §15.205

The EUT complied with the requirements of this Section since it did not operate within the listed Restricted Bands of Operation. The EUT operated only at 13.56 MHz.

10 MAINS PORT CONDUCTED, §15.207

The EUT complied with the requirements of this section with either the internal antenna or the external antenna operating.

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11 CONDUCTED EMISSIONS (AC Power Lines): , §15.207

Test Date:	12 th August 2025	Temperature:	17 °C
Test Engineer(s):	Steve Garnham	Humidity:	57 %
Test Location:	Austest Laboratories (Yarramalong)		

Test Standard: FCC Part 15C / ANSI C63.10:2013.

11.1 EUT Operating Mode

Refer to sections 5.3 and 6.

Tested in both modes with individual internal and external antennas separately connected and also with a dummy load, as per KDB 174176 D01.

The EUT was tested in normal operation with a tag and configured with power settings as indicated in section 6 of this report for both the internal and external antennas.

The antenna port was also connected to a 13.56 MHz dummy load, replacing either of the internal or external antennas.

A prescan test was performed with and without the tag being present.

The highest worst case recorded emission levels occurred with a tag being present.

Final tests were performed in this worst-case condition.

11.2 Test Method

- Performed in accordance with the standard ANSI C63.10:2013 and KDB 174176.D01.
- The EUT was set up on a non-conductive table, 0.8 m above a conductive ground plane.
- Rear of the EUT kept 0.4 m away from a conductive vertical reference plane (in electrical contact with the ground plane), and 0.8 m away from any other conductive surfaces.
- EUT power via 0.8 m $\pm 10\%$ cable length, was supplied from the EUT LISN (Line Impedance Stabilisation Network) which was grounded to the ground plane.
- When applicable, supporting equipment power supplied from a separate LISN grounded to the ground plane.
- Where possible, interconnecting cables draped over the table edge and kept 40 cm above the ground plane.
- Excess cable lengths folded back and forth to form a 30 cm to 40 cm bundle at the centre of and parallel to the cable.
- Conducted emission measurements made on both Active and Neutral ports of the EUT at the respective LISN measurement points.

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11.3 Sample Calculations for Emissions

11.3.1 Conducted Emissions

Final voltage levels were obtained from the measurement equipment software which automatically applied all the stored calibration factors. The calibration / correction factors were applied as follows:

Formula	Example Calculation
$V_c = V + L_{cbl} + L_{AMN} + L_{limiter}$	For $V = 25 \text{ dB}\mu\text{V}$, $L_{cbl} = 0.1 \text{ dB}$, $L_{AMN} = 0.1 \text{ dB}$, $L_{limiter} = 15 \text{ dB}$
	$V_c = 25 + 0.1 + 0.1 + 15 = 40.2 \text{ dB}\mu\text{V}$
Where: V_c = Corrected voltage level in $\text{dB}\mu\text{V}$ for comparison against the limit. V = EMI Receiver measured signal input voltage in $\text{dB}\mu\text{V}$. L_{cbl} = Total cable insertion loss in dB. L_{AMN} = Voltage division factor (insertion loss) of AMN in dB. $L_{limiter}$ = Insertion loss of voltage limiter in dB.	

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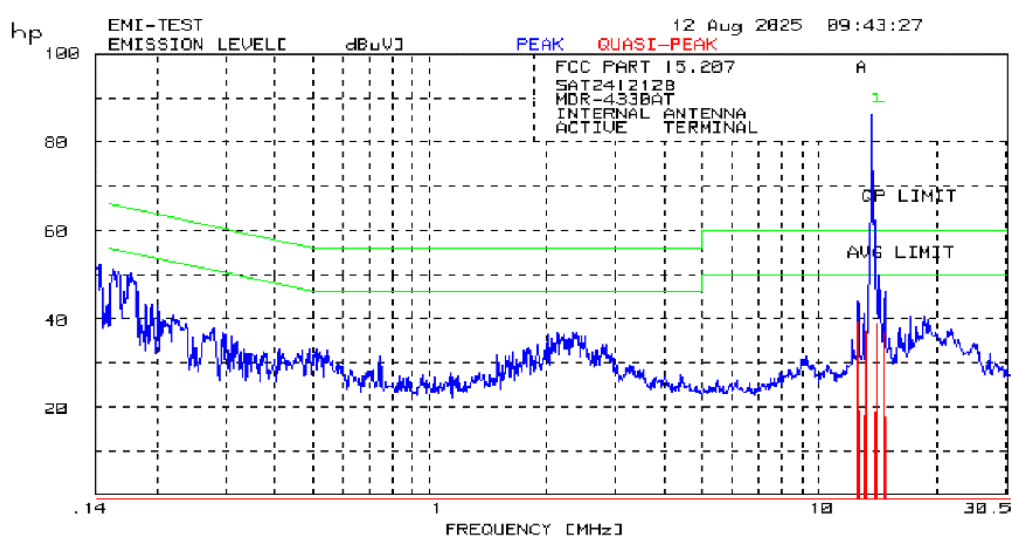
11.4 Test Results

Tabulated worst-case results:

Normal operation using the internal antenna.

Note: Data excludes the in-band intentional 13.56 MHz emissions as per KDB 174176.D01 (Refer to results with dummy load.)

Frequency (MHz)	Port Active	Peak / Quasi-Peak (dBμV)			Average (dBμV)		
		Level	Limit	Margin	Level	Limit	Margin
0.150	Active	52.1 Pk	66.0	-13.9	36.2	56.0	-19.8
0.163	Active	50.5 Pk	65.3	-14.8	37.4	55.3	-17.9
12.49	Active	39.1 QP	60.0	-20.9	38.8	50.0	-11.2
13.98	Active	38.6 QP	60.0	-21.4	38.4	50.0	-11.6
13.11	Active	37.1 QP	60.0	-22.9	36.7	50.0	-13.3
14.6	Active	36.9 QP	60.0	-23.1	36.5	50.0	-13.5



Conducted Emissions (Power Ports) – Active Port – Normal operation into internal antenna.

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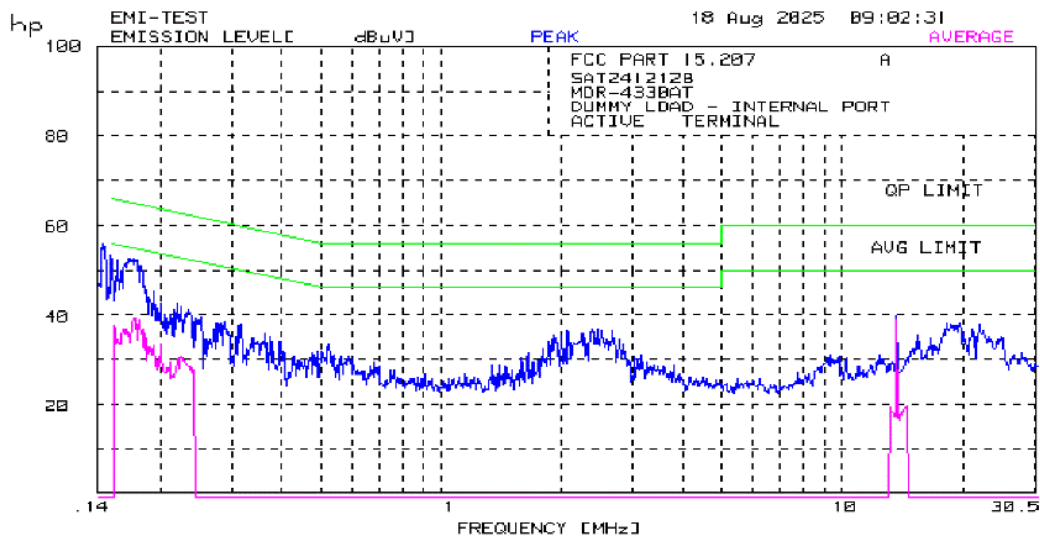


Tabulated worst-case results:

Operation with internal antenna replaced by dummy load.

Frequency (MHz)	Port Active	Peak / Quasi-Peak (dBμV)			Average (dBμV)		
		Level	Limit	Margin dB	Level	Limit	Margin dB
13.56	Active	38.9 QP	60.0	>-20	38.8	50.0	-11.2
0.173	Active	52.2 Pk	64.8	-12.6	39.1	54.8	-15.7
0.176	Active	51.9 Pk	64.6	-12.7	38.8	54.6	-15.8
0.180	Active	50.1 Pk	64.4	-14.3	36.9	54.4	-17.5
0.163	Active	50.0 Pk	65.3	-15.3	36.9	55.3	-18.4
0.153	Active	53.9 Pk	65.8	-11.9	37.3	55.8	-18.5

A negative margin indicates the margin was below the limit.



Conducted Emissions (Power Ports) – Active Port, Internal Antenna Selected but Antenna replaced with Dummy Load.

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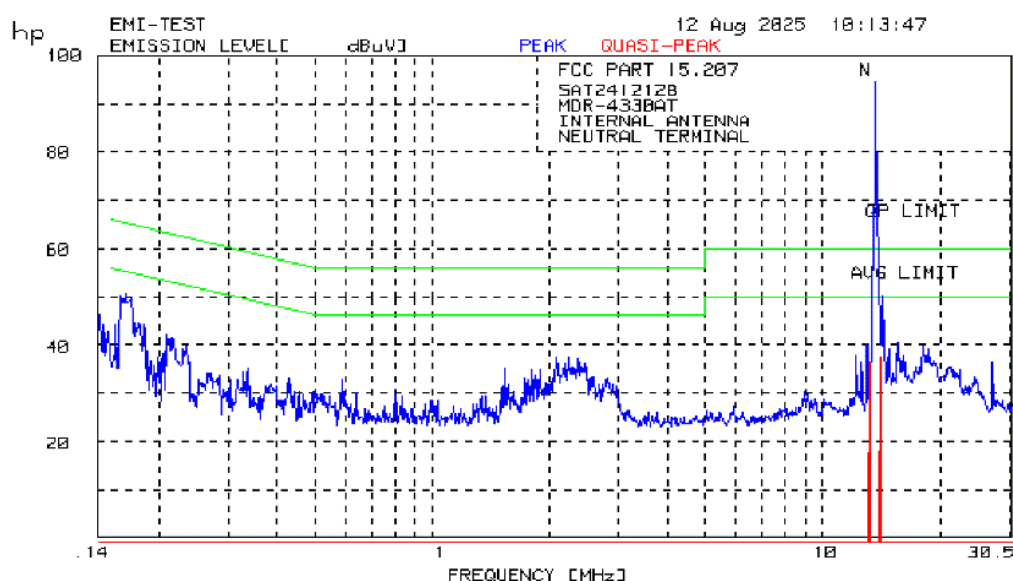


Tabulated worst-case results:

Normal operation using the internal antenna.

Note: Data excludes the in-band intentional 13.56MHz emissions as per KDB 174176.D01. (Refer to further results with dummy load.)

Frequency (MHz)	Port Neutral	Pk / Quasi-Peak (dBμV)			Average (dBμV)		
		Level	Limit	Margin	Level	Limit	Margin
0.173	Neutral	49.9 Pk	64.8	-14.9	38.7	54.8	-16.1
0.176	Neutral	49.8 Pk	64.6	-14.8	38.4	54.6	-16.2
0.180	Neutral	44.9 Pk	64.4	-19.5	36.3	54.4	-18.1
0.163	Neutral	49.5 Pk	65.3	-15.8	36.2	55.3	-19.1
13.98	Neutral	37.5 QP	60.0	-22.5	37.2	50.0	-12.8
13.11	Neutral	36.5 QP	60.0	-23.5	36.1	50.0	-13.9



Conducted Emissions (Power Ports) – Neutral Port - Normal Operation into Internal Antenna

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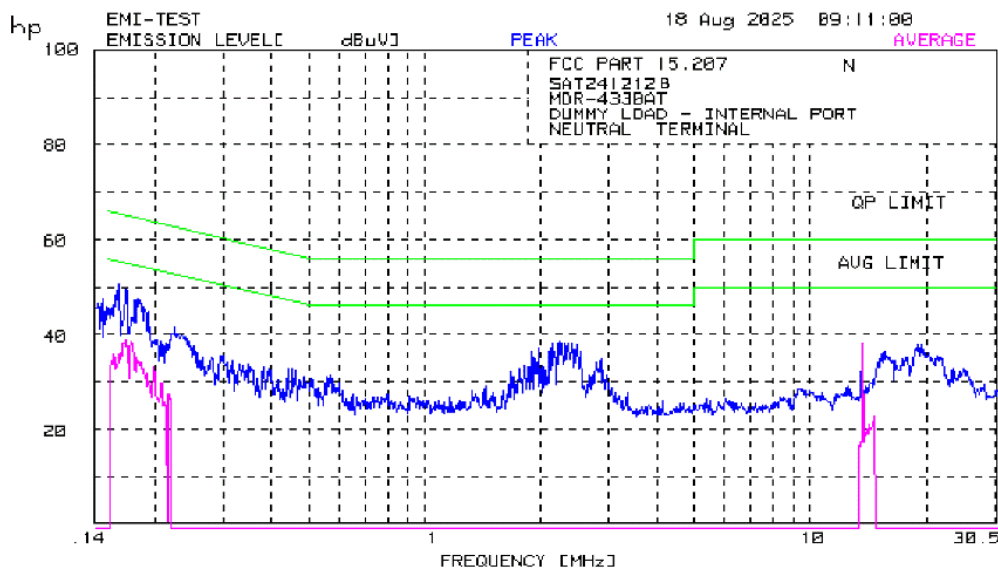


Tabulated worst-case results:

Operation with internal antenna replaced by dummy load.

Frequency (MHz)	Port	Pk / Quasi-Peak (dBμV)			Average (dBμV)		
		Level	Limit	Margin dB	Level	Limit	Margin dB
13.56	Neutral	38.3 QP	60.0	>-20	38.2	50.0	-11.8
0.167	Neutral	50.0 Pk	65.0	-15.0	38.8	55.0	-16.2
0.174	Neutral	49.5 Pk	64.7	-15.2	38.3	54.7	-16.4
0.163	Neutral	48.2 Pk	65.3	-17.1	36.1	55.3	-19.2
0.179	Neutral	49.3 Pk	64.5	-15.2	35.1	54.5	-19.4
0.157	Neutral	47.1 Pk	65.6	-18.5	35.7	55.6	-19.9

A negative margin indicates the margin was below the limit.



Conducted Emissions (Power Ports) – Neutral Port Internal Antenna Selected but Antenna replaced with Dummy Load.

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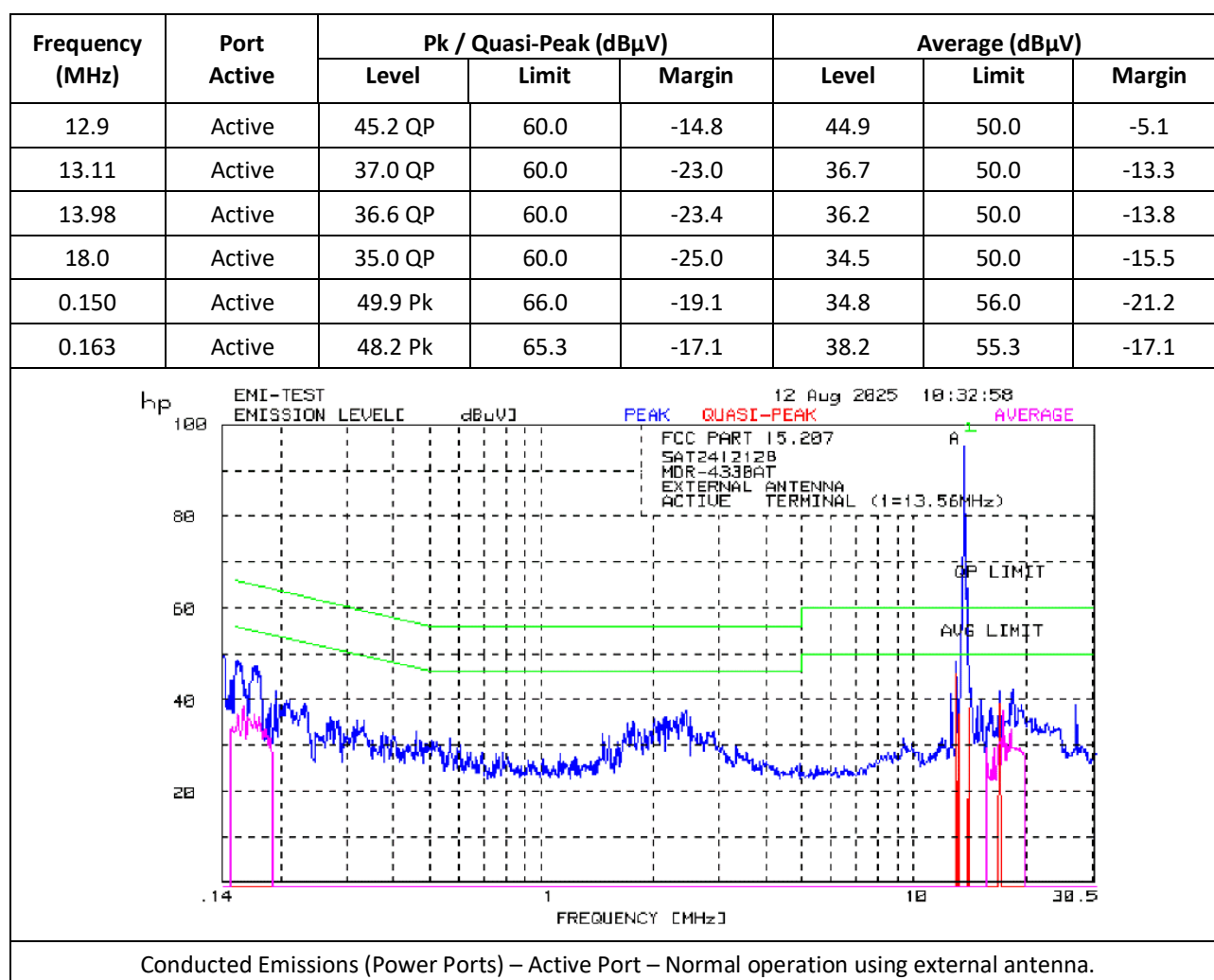
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Tabulated worst-case results:

Normal operation using the external antenna.



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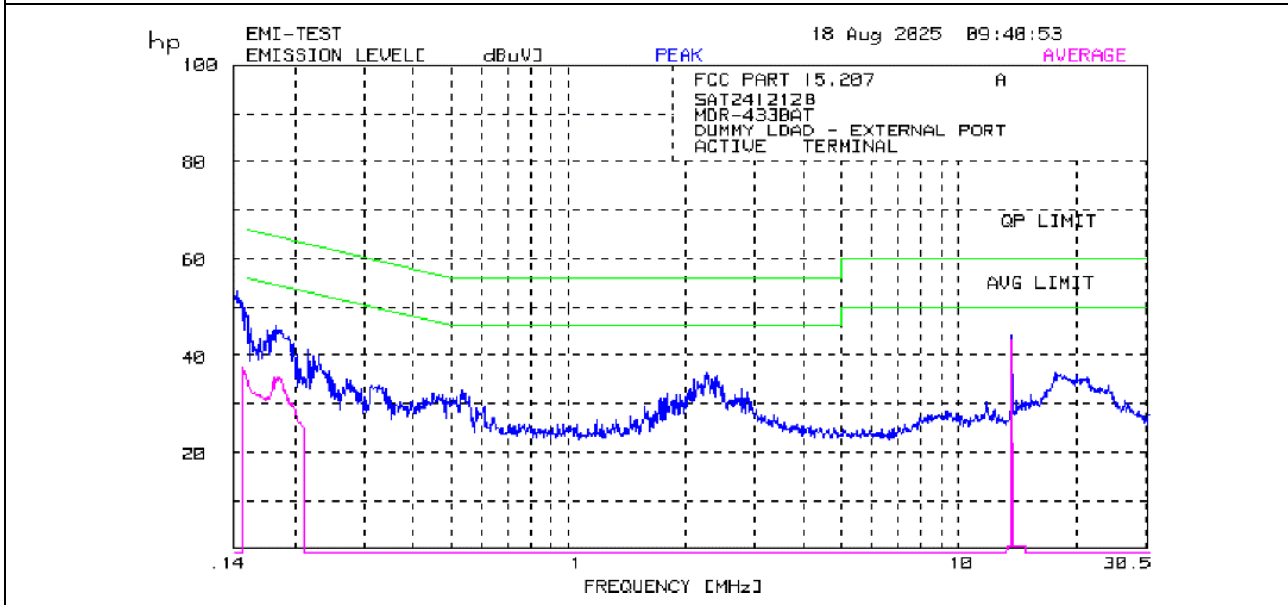


Tabulated worst-case results:

Operation with external antenna replaced by dummy load.

Frequency (MHz)	Port Active	Pk / Quasi-Peak (dBμV)			Average (dBμV)		
		Level	Limit	Margin dB	Level	Limit	Margin dB
13.56	Active	43.3 QP	60.0	-16.7	43.1	50.0	-6.9
0.182	Active	44.5 Pk	64.3	-19.8	35.4	54.3	-18.9
0.177	Active	43.9 Pk	64.6	-20.7	35.3	54.6	-19.3
0.179	Active	43.6 Pk	64.5	-20.9	34.9	54.5	-19.6
0.151	Active	52.4 Pk	65.9	-13.5	35.9	55.9	-20.0
0.176	Active	43.1 Pk	64.6	-21.5	34.5	54.6	-20.1

A negative margin indicates the margin was below the limit.



Conducted Emissions (Power Ports) – Active Port, External Antenna Selected but Antenna replaced with Dummy Load.

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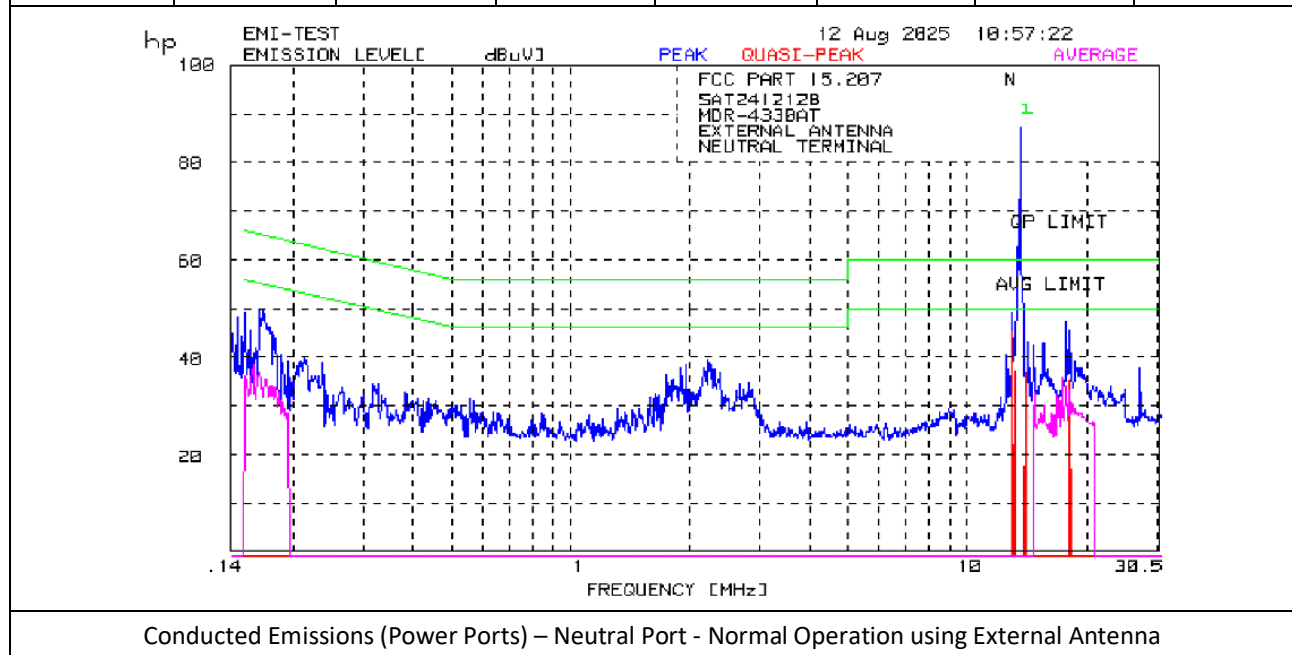


Tabulated worst-case results:

Normal operation using the external antenna.

Note: Data excludes the in-band intentional 13.56MHz emissions as per KDB 174176.D01. (Refer to further results with dummy load.)

Frequency (MHz)	Port Neutral	Pk / Quasi-Peak (dBμV)			Average (dBμV)		
		Level	Limit	Margin	Level	Limit	Margin
12.9	Neutral	45.2 QP	60.0	-14.8	43.7	50.0	-6.3
13.11	Neutral	37.0 QP	60.0	-23.0	35.6	50.0	-14.4
13.98	Neutral	36.6 QP	60.0	-23.4	35.9	50.0	-14.1
18.0	Neutral	35.0 QP	60.0	-25.0	34.1	50.0	-15.9
0.163	Neutral	48.2 Pk	65.3	-17.1	37.8	55.3	-17.5
0.174	Neutral	49.9 Pk	64.7	-14.8	38.5	54.7	-16.2



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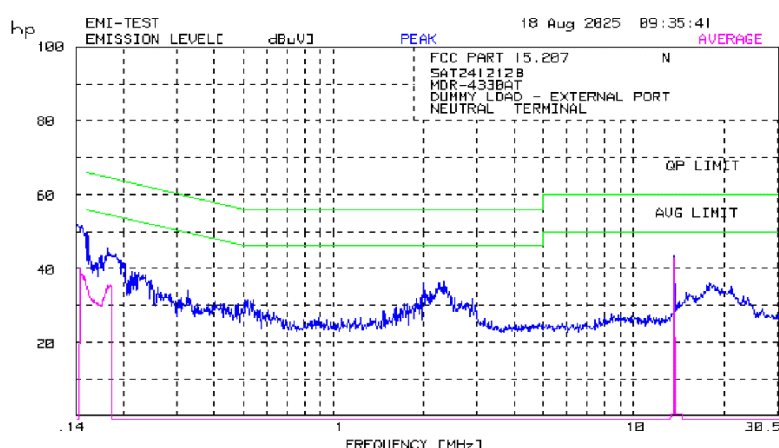


Tabulated worst-case results:

Operation with external antenna replaced by dummy load.

Frequency (MHz)	Port	Pk / Quasi-Peak (dBμV)			Average (dBμV)		
		Level	Limit	Margin dB	Level	Limit	Margin dB
13.56	Neutral	43.1 QP	60.0	-16.9	42.9	50.0	-7.1
0.181	Neutral	43.5 Pk	64.4	-20.9	35.4	54.4	-19.0
0.177	Neutral	42.9 Pk	64.6	-21.7	35.3	54.6	-19.3
0.159	Neutral	51.0 Pk	65.5	-14.5	31.4	55.5	-24.1
0.164	Neutral	50.5 Pk	65.1	-14.6	30.7	55.1	-24.4
0.168	Neutral	50.1 Pk	65.0	-14.9	30.0	55.0	-25.0

A negative margin indicates the margin was below the limit.



Conducted Emissions (Power Ports) – Neutral Port External Antenna Selected but Antenna replaced with Dummy Load.

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12 RADIATED EMISSIONS §15.209

12.1 EUT Operating Mode

- Refer to Section 5.2 and 6 of this report.
- A pre-scan test was performed with and without the tag being present.
- The highest worst-case recorded emission levels occurred with a tag being present.
- Final tests were performed in this worst-case condition.

12.2 Test Method

- a. Measurements were performed in accordance with ANSI C63.10:2013. Peak measurements were performed using a Peak Detector; Quasi Peak measurements were performed using a QP detector, Average measurements were performed with an average detector; video averaging was not employed.

- b. The measuring receiver BW settings were:

Frequency Range	Antenna	Measurement	Detector	RBW	VBW
9kHz to 150 kHz	60 cm Loop	Pre-scan	Peak	200 Hz	1 kHz
		Final Quasi-Peak	Quasi-Peak	200 Hz	-
0.15 to 30 MHz	60 cm Loop	Pre-scan	Peak	9 kHz	30 kHz
		Final Quasi-Peak	Quasi-Peak	9 kHz	-
30 to 1000 MHz	Hybrid (Bicon/log)	Pre-scan Peak	Peak	120 kHz	300 kHz
		Final Quasi-Peak	Quasi-Peak	120 kHz	-

- c. The EUT was setup on a non-conductive turntable: -
- i. For measurements 30 MHz to 1 GHz at a height of 0.8 m above the chamber conductive ground plane and at the indicated test distance away from the measuring antenna.
 - ii. For measurements below 30 MHz, at a height of 0.8 m, initially above a metallic ground plane, then final measurements over a non-metallic ground plane at the indicated test distance away from the measuring antenna.
- d. To maximise emissions, the EUT was rotated through 360° and the measuring antenna height adjusted between 1 m to 4 m (30 MHz to 1 GHz) in the following antenna orientations, except for the loop antenna below 30MHz: -
- i. Loop antenna (9 kHz to 30 MHz) over a non-metallic ground plane, – Coaxial, Coplanar and horizontal (parallel to ground) orientations, at a fixed height above ground of 1m to the lowest height of the loop antenna (C63.10:2013 section 6.4.6).
 - ii. Bilog antenna (30 MHz to 1 GHz) - Both vertical and horizontal polarizations.
 - iii. When applicable; DRG Horn antenna (>1 GHz) over pyramidal absorber covered ground plane.
- e. The maximised emission level was measured and the above repeated for all measurement frequencies
- f. When applicable Average level measurements were not made where the peak level did not exceed the average limit.
- g. Linearity of the measuring system was checked, reducing gain when required.
- h. Test distances: Where the actual test distance used was different to that specified, then the test data results shown in any tables were extrapolated to the required distance using the formula specified within ANSI C63.10:2013. For simplicity, the test data plots have the limit lines adjusted to reflect any different test distance giving a visual indication of the relative margins.

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- i. **Ambient Emissions:** Measurements were performed at an Open Area Test Site (OATS), where some ambient signals may exceed the limit. The possibility of missing an emission during testing was removed by performing pre-scans in a shielded enclosure prior to the final OATS measurements. The ambient emissions are indicated as a '1' or 'A' on the scans, refer to the notes after the graphs.

12.3 Example Calculation

The final field strength levels were obtained from the measurement equipment software which automatically applied all the stored calibration factors. The calibration / correction factors were applied as follows:

Calculation	Example	
$E = V + AF + L_{cbl} - G_{pre}$	$V = 40.0 \text{ dB}\mu\text{V}$ $AF = 12.0 \text{ dB/m}$	$L_{cbl} = 2.9 \text{ dB}$ $G_{pre} = 22.5 \text{ dB}$ $E = 40 + 12 + 2.9 - 22.5$ $= 32.4 \text{ dB}\mu\text{V/m}$

Where

- E = Radiated Electric Field Strength in dBμV/m,
- V = EMI Receiver measured signal input voltage in dBμV,
- AF = Antenna Factor of the measuring antenna in dB/m,
- L_{cbl} = Total cable insertion loss in dB and
- G_{pre} = Preamplifier gain in dB.

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12.4 Test Results 15.209– Transmission from Internal Antenna: 9 kHz to 1 GHz

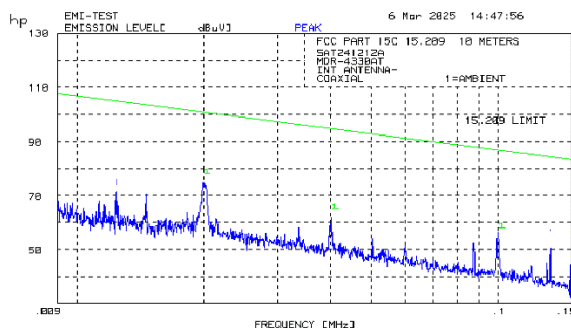
12.4.1 Radiated Emissions: 9 kHz to 150 kHz at 10 m distance.

Test Date:	6 th March 2025	Temperature:	25°C
Test Officer:	Steven Garnham	Humidity:	70%
Test Location:	Austest Laboratories (Yarramalong, NSW)		

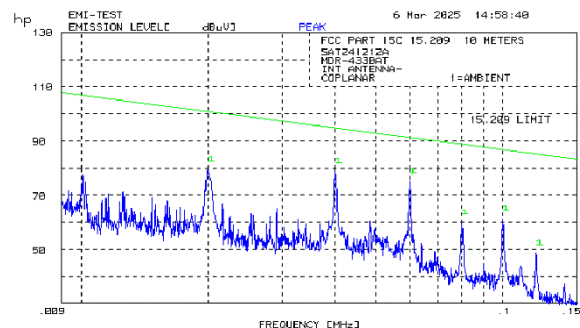
Measured data at the indicated distance of 10 m would be extrapolated to the distance defined by limits (300 m for 9–490 kHz using an extrapolation factor of 40 dB/decade, refer ANSI C63.10:2013, clause 6.4.4.2 and Table 5.

Measurements were initially performed on an OATS ground plane and finally over a non-conductive ground plane as specified in ANSI C63.10:2013, clause 5.2.

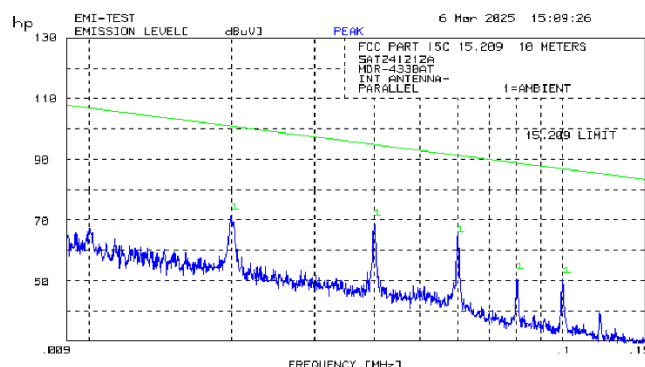
Frequency (kHz)	Mode	Receiving Antenna Orientation	Quasi-Peak / Linear Avg (dBμV/m)			
			Measured Level 10m dBuV/	Extrapolated Level dBuV/ to Limit Distance	300m Limit dBuV/	Margin
Example 9 kHz (Noise Floor)	Internal Antenna	Coaxial, Coplanar, Parallel	65	5.9	48.5	>-20
All measured out of band emissions were greater than 20 dB below the limits specified in 15.209.						



Radiated Emissions (Coaxial)



Radiated Emissions (Coplanar)



Radiated Emissions (Parallel)

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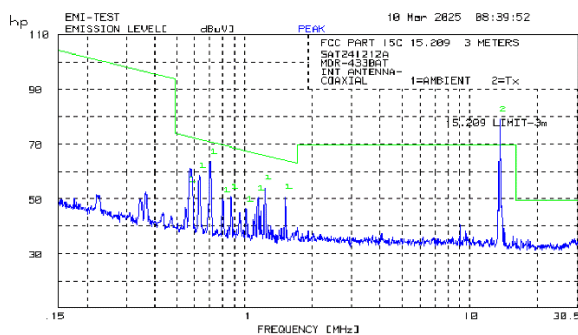
12.4.2 Radiated Emissions: 150 kHz to 30 MHz at 3 m distance.

Test Date:	10 th March 2025	Temperature:	25°C
Test Officer:	Steven Garnham	Humidity:	83%
Test Location:	Austest Laboratories (Yarramalong, NSW)		

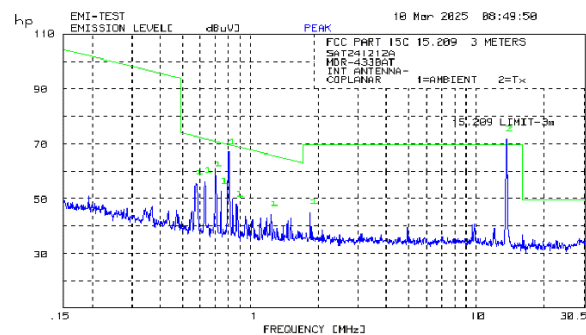
Measured data at the indicated distance of 3 m would be extrapolated to the distance defined by the limits (300 m for 9 – 490 kHz and 30m for 490 kHz – 30 MHz). The extrapolation factor of 40 dB/decade applies for frequencies between 9 kHz and 16 MHz, and 20 dB/decade for frequencies above 16 MHz, refer ANSI C63.10:2013, clause 6.4.4.2 and Table 5.

Measurements were initially performed on an OATS ground plane and finally over a non-conductive ground plane as specified in ANSI C63.10:2013, clause 5.2.

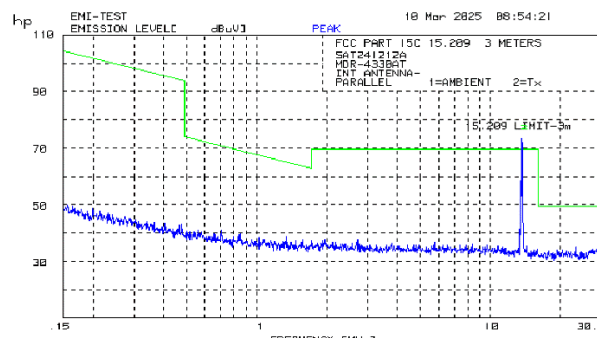
Frequency (MHz)	Mode	Receiving Antenna Orientation	Quasi-Peak / Linear Avg (dBμV/m)			
			Measured Level 3m dBuV/	Extrapolated Level dBuV/ to Limit Distance	30m Limit dBuV/	Margin
Example: 2 MHz (Noise Floor)	Internal Antenna	Coaxial, Coplanar, Parallel	37	-3	29.5	>-20
All measured out of band emissions were greater than 20 dB below the limits specified in 15.209.						



Radiated Emissions (Coaxial)



Radiated Emissions (Coplanar)



Radiated Emissions (Parallel)

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12.4.3 Radiated Emissions: 30 MHz to 1000 MHz at 3 m distance.

Test Date:	5 th March 2025	Temperature:	26°C
Test Officer:	Steve Garnham	Humidity:	75%
Test Location:	Austest Laboratories (Yarramalong, NSW)		

EUT Operating Mode:

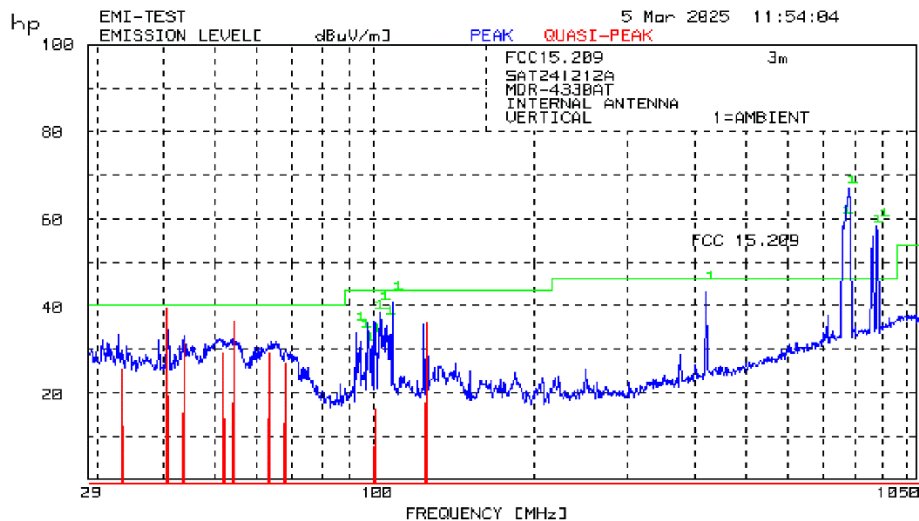
Refer to Section 5.2 and 6 of this report.

Tabulated worst-case results:-(Internal Antenna)

Test Distance:	3 m			
Frequency (MHz)	Measurement Antenna Pol.	Quasi-Peak (dBμV/m)		
		Level	Limit (3 m)	Margin
40.68	Vertical	39.5	40.0	*-0.5
54.24	Vertical	36.3	40.0	*-3.7
125.0	Vertical	35.9	43.5	-7.6
43.8	Vertical	31.2	40.0	-8.8
67.8	Vertical	26.8	40.0	-13.2

A negative margin indicates the margin was below the limit.

*Results were within the Laboratory's measurement uncertainty.



Radiated Emissions (30 MHz to 1 GHz) – Vertical Polarisation

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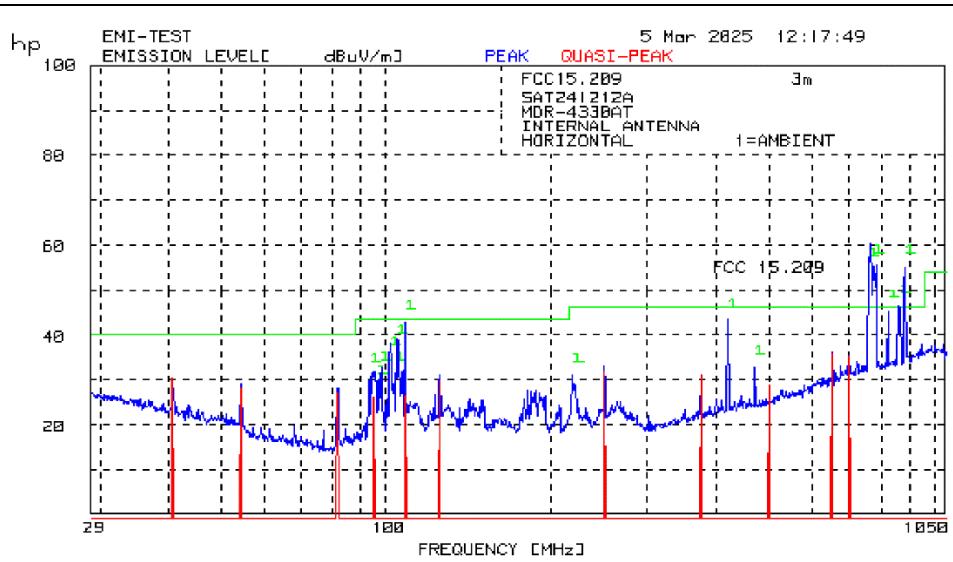
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Test Distance:	3 m			
Frequency (MHz)	Measurement Antenna Pol.	Quasi-Peak (dB μ V/m)		
		Level	Limit (3 m)	Margin
40.68	Horizontal	30.3	40.0	-9.7
650.0	Horizontal	35.6	46.0	-10.4
700.0	Horizontal	35.1	46.0	-10.9

A negative margin indicates the margin was below the limit.



Radiated Emissions (30 MHz to 1 GHz) – Horizontal Polarisation

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12.5 Test Results 15.209–Transmission from External Wand Antenna, 9 kHz to 1 GHz

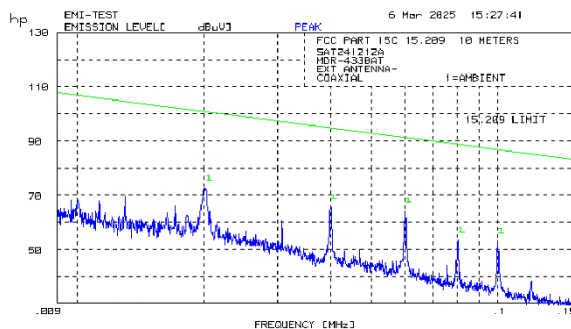
12.5.1 Radiated Emissions: 9 kHz to 150 kHz at 10 m distance.

Test Date:	6 th March 2024	Temperature:	25°C
Test Officer:	Steven Garnham	Humidity:	70%
Test Location:	Austest Laboratories (Yarramalong, NSW)		

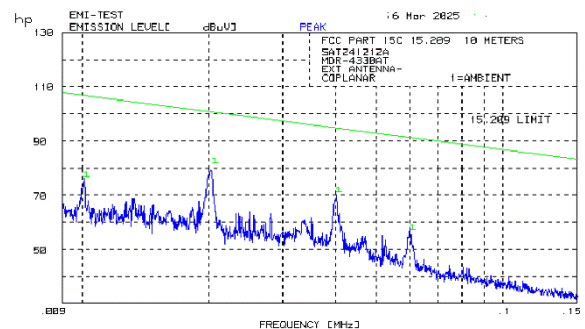
Measured data at the indicated distance of 10 m would be extrapolated to the distance defined by limits (300 m for 9–490 kHz using an extrapolation factor of 40 dB/decade, refer ANSI C63.10:2013, clause 6.4.4.2 and Table 5.

Measurements were initially performed on an OATS ground plane and finally over a non-conductive ground plane as specified in ANSI C63.10:2013, clause 5.2.

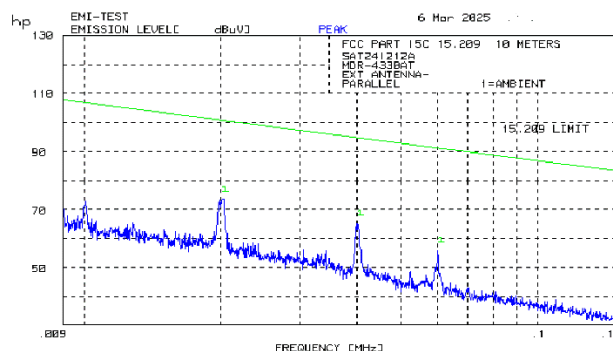
Frequency (kHz)	Mode External Antenna Orientation	Receiving Antenna Orientation	Quasi-Peak / Linear Avg (dBμV/m)			
			Measured Level 10m dBuV/	Extrapolated Level dBuV/ to Limit Distance	300m Limit dBuV/	Margin
Example: 9 kHz (Noise Floor)	X, Y, Z	Coaxial, Coplanar, Parallel	65	5.9	48.5	>-20
All measured out of band emissions were greater than 20 dB below the limits specified in 15.209.						



Radiated Emissions (Coaxial)



Radiated Emissions (Coplanar)



Radiated Emissions (Parallel)

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12.5.2 Radiated Emissions: 150 kHz to 30 MHz at 3 m distance.

Test Date:	10 th March 2025	Temperature:	25°C
Test Officer:	Steven Garnham	Humidity:	83%
Test Location:	Austest Laboratories (Yarramalong, NSW)		

Measured data at the indicated distance of 3 m would be extrapolated to the distance defined by the limits (300 m for 9 – 490 kHz and 30 m for 490 kHz – 30 MHz). The extrapolation factor of 40 dB/decade applies for frequencies between 9 kHz and 16 MHz, and 20 dB/decade for frequencies above 16 MHz, refer ANSI C63.10:2013, clause 6.4.4.2 and Table 5.

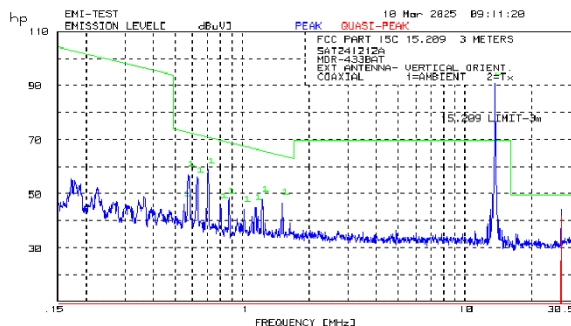
Measurements were initially performed on an OATS ground plane and finally over a non-conductive ground plane as specified in ANSI C63.10:2013, clause 5.2.

The EUT's external wand antenna was initially positioned in X, Y, Z orientations, with the Y (vertical) and X (horizontal) axis being worst case.

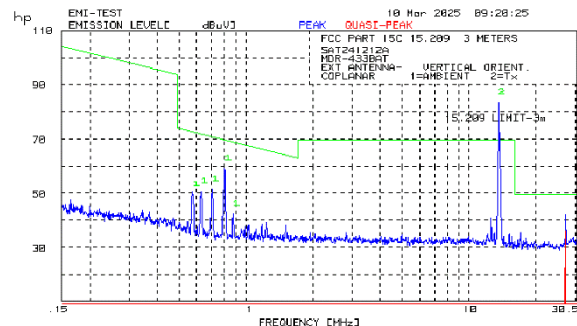
Frequency (MHz)	Receive Antenna	EUT Antenna Orientation	Quasi-Peak (dBμV/m)			
			**Measured at 3 m	Extrapolated to 30 m (20dB/)	30 m Limit	Margin
27.12	Coaxial	Vertical	41.4	21.4	29.5	-8.1
27.12	Coplanar	Vertical	36.0	16.0	29.5	-13.5
27.12	Parallel	Vertical	45.0	25.0	29.5	*-4.5

* Result was within the Laboratory's measurement uncertainty.

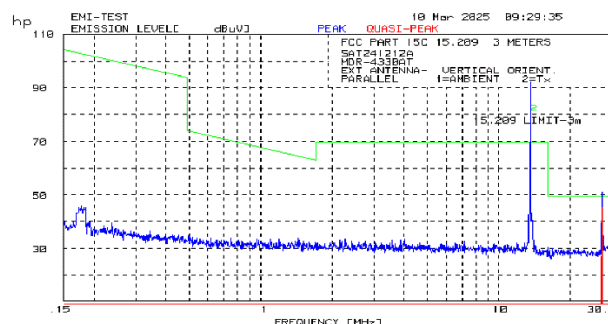
**Measured at a 3 m distance. In accordance with ANSI C63.10:2013 table 5, measured field strength values were extrapolated to a 30 m distance using an extrapolation factor of 20 dB/decade.



Radiated Emissions (Coaxial)



Radiated Emissions (Coplanar)



Radiated Emissions (Parallel)

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Radiated Emissions: 150 kHz to 30 MHz at 3 m distance (continued).

Test Date:	20 th March 2025	Temperature:	25°C
Test Officer:	Steven Garnham	Humidity:	83%
Test Location:	Austest Laboratories (Yarramalong, NSW)		

Measured data at the indicated distance of 3 m would be extrapolated to the distance defined by the limits (300 m for 9 – 490 kHz and 30 m for 490 kHz – 30 MHz). The extrapolation factor of 40 dB/decade applies for frequencies between 9 kHz and 16 MHz, and 20dB/decade for frequencies above 16 MHz, refer ANSI C63.10:2013, clause 6.4.4.2 and Table 5.

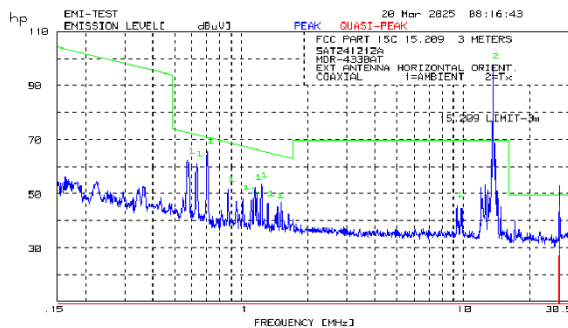
Measurements were initially performed on an OATS ground plane and finally over a non-conductive ground plane as specified in ANSI C63.10:2013, clause 5.2.

The EUT external wand antenna was initially positioned in X, Y, Z orientations, with the Y (vertical) and X (horizontal) axis being worst case.

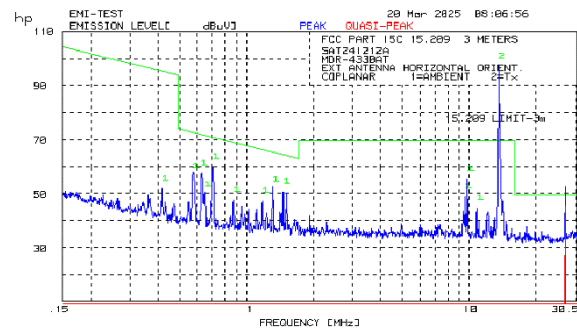
Frequency (MHz)	Receive Antenna	EUT Antenna Orientation	Quasi-Peak (dBμV/m)			
			**Measured at 3 m	Extrapolated to 30 m (20dB/)	30 m Limit	Margin
27.12	Coaxial	Horizontal	44.9	24.9	29.5	*-4.6
27.12	Coplanar	Horizontal	44.9	24.9	29.5	*-4.6
27.12	Parallel	Horizontal	41.6	21.6	29.5	-7.9

* Results were within the Laboratory's measurement uncertainty.

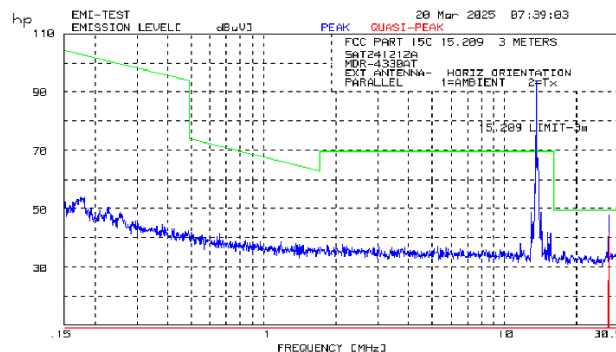
**Measured at a 3 m distance. In accordance with ANSI C63.10:2013 table 5, measured field strength values were extrapolated to a 30 m distance using an extrapolation factor of 20 dB/decade.



Radiated Emissions (Coaxial)



Radiated Emissions (Coplanar)



Radiated Emissions (Parallel)

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12.5.3 Radiated Emissions: 30 MHz to 1000 MHz at 3 m distance.

Test Date:	6 th March 2025	Temperature:	22°C
Test Officer:	Steve Garnham	Humidity:	73%
Test Location:	Austest Laboratories (Yarramalong, NSW)		

EUT Operating Mode:

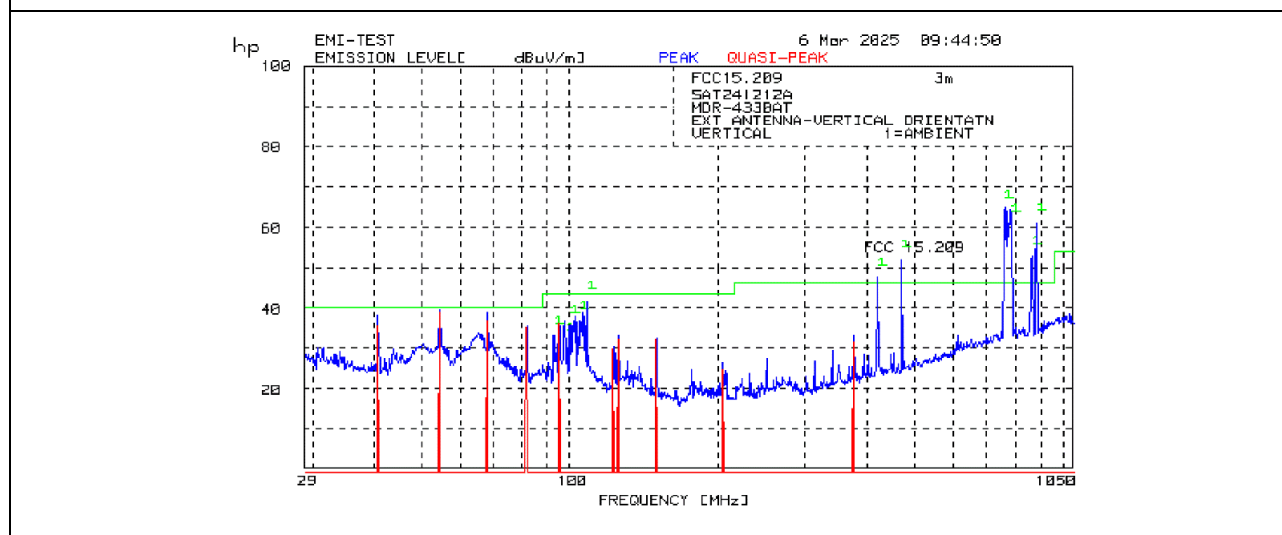
Refer to Section 5.2 and 6 of this report.

Tabulated worst-case results: (external wand antenna in Vertical (Y) orientation)

Test Distance:	3m			
Frequency (MHz)	Antenna Pol.	Quasi-Peak (dBμV/m)		
		Level	Limit (3 m)	Margin
54.2	Vertical	38.8	40.0	*-1.2
67.8	Vertical	36.6	40.0	*-3.4
40.7	Vertical	35.4	40.0	*-4.6
81.4	Vertical	35.0	40.0	-5.0
94.9	Vertical	36.0	43.5	-7.5
149.2	Vertical	32.1	43.5	-11.4

A negative margin indicates the margin was below the limit.

*Results were within the Laboratory's measurement uncertainty.



Radiated Emissions (30 MHz to 1 GHz) – Vertical Polarisation

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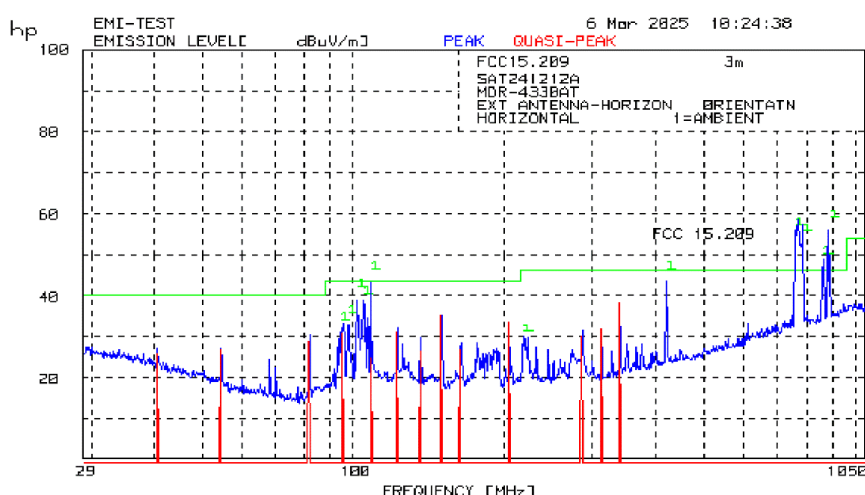
EUT Operating Mode:

Refer to Section 5.2 and 6 of this report

Tabulated worst-case results: (external wand antenna in Horizontal (X) orientation).

Test Distance:	3m			
Frequency (MHz)	Antenna Pol.	Quasi-Peak (dBμV/m)		
		Level	Limit (3 m)	Margin
339.0	Horizontal	38.1	46.0	-7.9
149.2	Horizontal	35.0	43.5	-8.5
203.4	Horizontal	33.5	43.5	-10.0
81.4	Horizontal	28.7	40.0	-11.3

A negative margin indicates the margin was below the limit.



Radiated Emissions (30 MHz to 1 GHz) – Horizontal Polarisation

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13 20dB Bandwidth, §15.207 (c).

Test Date:	19 th March 2025	Temperature / Humidity:	19 °C / 73 %
Test Engineer(s):	Steve Garnham		
Test Location:	Austest Laboratories (Yarramalong)		

Test Standard: FCC Part 15C / ANSI C63.10:2013.

13.1 EUT Operating Mode

- Refer to sections 5.3 and 6.
- Tested in both modes with individual internal and external antennas separately connected.
- Measurements were performed with tag present.

13.2 Test Method

- Performed in accordance with the standard ANSI C63.10:2013 clause 6.9.2.
- Preliminary measurement was made to ensure all emissions within the operating band of 13.110 MHz to 14.010 MHz were > 20 dB below the peak level measured at 13.56 MHz
- Final measurement of 20dB bandwidth was made with a reduced span centred on 13.56 MHz with 3kHz RBW and 10 kHz VBW selected.
- Once peak level at 13.56 MHz was measured, the 20dB bandwidth measurement points were ascertained and frequencies recorded.

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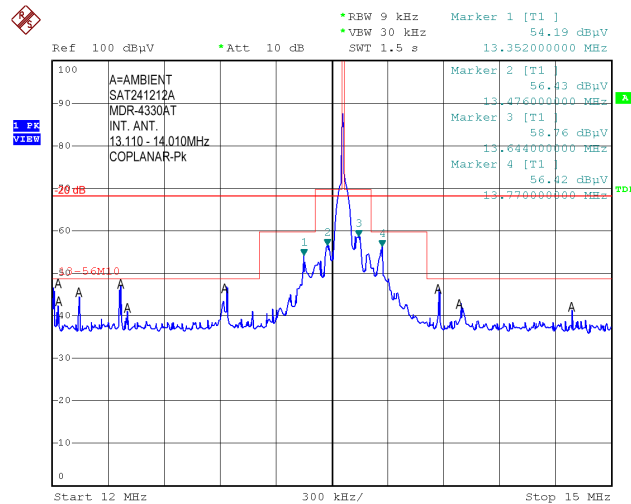
13.3 Test Results - Internal Antenna

Measured 20dB bandwidth (BW): 74.9 kHz

Lower 20dB BW frequency: 13.5232 MHz

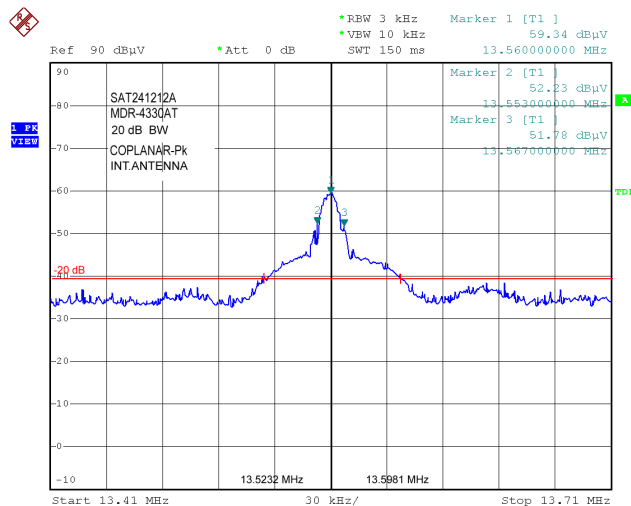
Higher 20 dB BW frequency: 13.5981 MHz

The 20 dB bandwidth is within the operating frequency band between 13.110 MHz and 14.010 MHz



Date: 19.MAR.2025 08:59:31

Preliminary measurement



Date: 19.MAR.2025 10:47:24

20 dB Bandwidth Measurement

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14 RADIATED FIELD STRENGTH, §15.225(a), (b), (c)

Test Date:	18 th March 2025	Temperature:	23°C	Humidity:	52%
	19 th March 2025		29°C		46%
Test Officer:	Steven Garnham				
Test Location:	Austest Laboratories (Yarramalong)				

EUT Operating Mode:

- Refer to Section 5.2 and 6 of this report.
- A pre-scan test was performed with and without the tag being present.
- The highest worst-case recorded emission levels occurred with a tag being present.
- Final tests were performed in this worst-case condition.

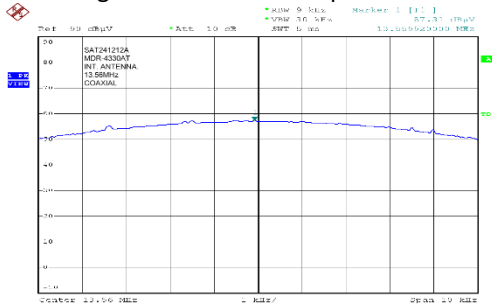
14.1 Test Results 15.225(a): Field Strength, within the band 13.553-13.567 MHz at 10 m.

14.1.1 Internal antenna

Frequency MHz	Antenna Orientation	Measured Pk @ 10m dBuV/m	*Measured Qp @ 10m dBuV/m	Equivalent Qp @ 30m dBuV/m	Limit @ 30m dBuV/m	Margin dB
13.560	Coaxial	57.3	57.3	38.2	84.0	-45.8
13.560	Coplanar	60	58.7	39.6	84.0	-44.4
13.560	Parallel	44.3	43.9	24.8	84.0	-59.2

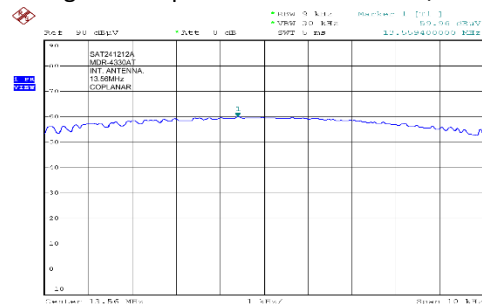
A negative margin indicates the margin was below the limit

*Measured at a 10 m distance. In accordance with ANSI C63.10:2013, clause 6.4.4.2 and Table 5, measured field strength values were extrapolated to a 30 m distance using an extrapolation factor of 40 dB/decade.



Date: 18.MAR.2025 10:05:43

Radiated Field Strength (Coaxial)



Date: 18.MAR.2025 10:06:17

Radiated Field Strength (Coplanar)

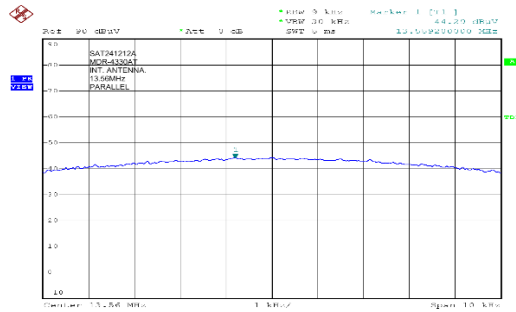
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Date: 18.MAR.2025 11:10:37

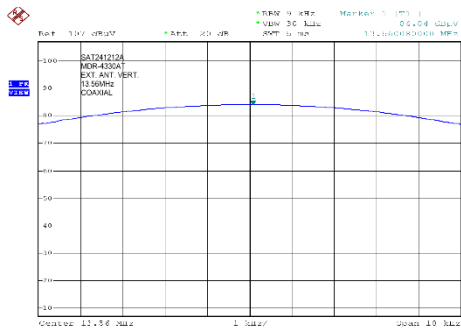
Radiated Field Strength (Parallel)

14.1.2 External Wand Antenna, Vertical (Y) Orientation

Frequency MHz	Antenna Orientation	Measured Pk @ 10m dBuV/m	*Measured Qp @ 10m dBuV/m	Equivalent Qp @ 30m dBuV/m	Limit @ 30m dBuV/m	Margin dB
13.560	Coaxial	84.0	84.0	64.9	84.0	-19.1
13.560	Coplanar	86.8	83.7	64.6	84.0	-19.4
13.560	Parallel	71.2	71.1	52.0	84.0	-32.0

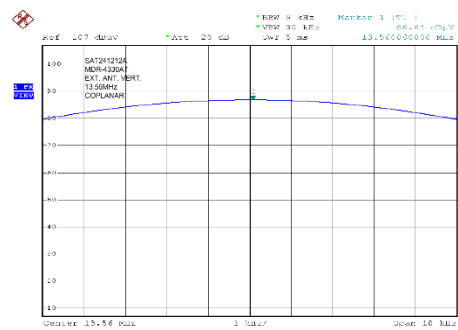
A negative margin indicates the margin was below the limit

*Measured at a 10 m distance. In accordance with ANSI C63.10:2013, clause 6.4.4.2 and Table 5, measured field strength values were extrapolated to a 30 m distance using an extrapolation factor of 40 dB/decade.



Date: 18.MAR.2025 10:04:00

Radiated Field Strength (Coaxial)



Date: 18.MAR.2025 00:56:19

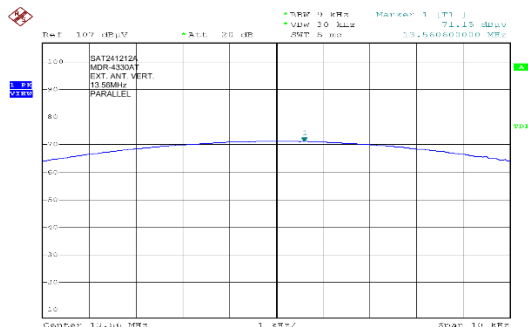
Radiated Field Strength (Coplanar)

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Date: 13.MAR.2025 11:01:29

Radiated Field Strength (Parallel)

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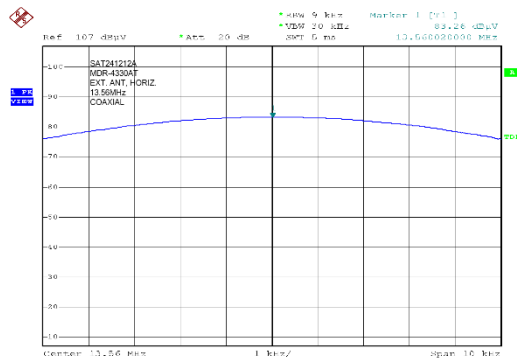


14.1.3 External Wand Antenna, Horizontal (X) Orientation

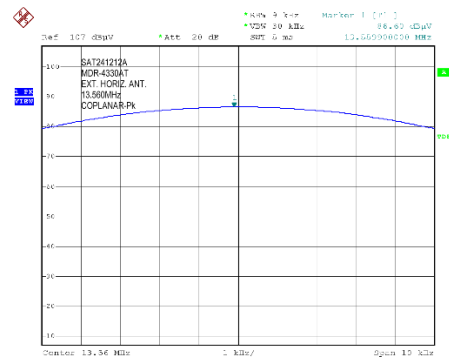
Frequency MHz	Antenna Orientation	Measured Pk @ 10m dBuV/m	*Measured Qp @ 10m dBuV/m	Equivalent Qp @ 30m dBuV/m	Limit @ 30m dBuV/m	Margin dB
13.560	Coaxial	83.3	80.1	61.0	84.0	-23.0
13.560	Coplanar	86.6	86.6	67.5	84.0	-16.5
13.560	Parallel	72.0	68.5	49.4	84.0	-34.6

A negative margin indicates the margin was below the limit

*Measured at a 10 m distance. In accordance with ANSI C63.10:2013, clause 6.4.4.2 and Table 5, measured field strength values were extrapolated to a 30 m distance using an extrapolation factor of 40 dB/decade.



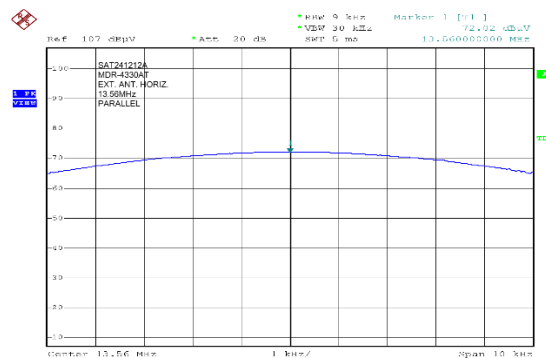
Date: 13.MAR.2025 12:31:26



Date: 13.MAR.2025 12:41:49

Radiated Field Strength (Coaxial)

Radiated Field Strength (Coplanar)



Date: 13.MAR.2025 14:08:08

Radiated Field Strength (Parallel)

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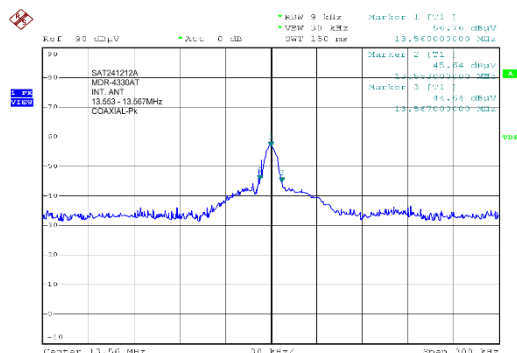
14.2 Test Results: 15.225 (b) within the band 13.410–13.553 MHz, 13.567–13.710 MHz at 10m.

14.2.1 Internal Antenna

Frequency MHz Band Edges	Antenna Orientation	Measured Pk @ 10m dBuV/m	*Measured Qp @ 10m dBuV/m	Equivalent Qp @ 30m dBuV/m	Limit @ 30m dBuV/m	Margin dB
13.553	Coaxial	45.6	42.0	22.9	50.5	-27.6
13.553	Coplanar	52.2	44.5	25.4	50.5	-25.1
13.553	Parallel	35.1	-	16	50.5	-34.5
13.567	Coaxial	44.6	41.6	22.5	50.5	-28.0
13.567	Coplanar	51.8	44.1	25.0	50.5	-25.5
13.567	Parallel	35.0	-	<16	50.5	>-34.5

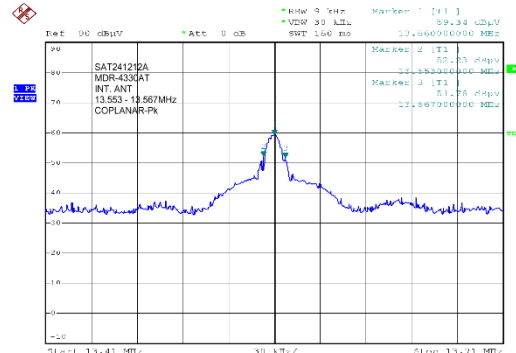
A negative margin indicates the margin was below the limit

*Measured at a 10 m distance. In accordance with ANSI C63.10:2013, clause 6.4.4.2 and Table 5, measured field strength values were extrapolated to a 30 m distance using an extrapolation factor of 40 dB/decade.



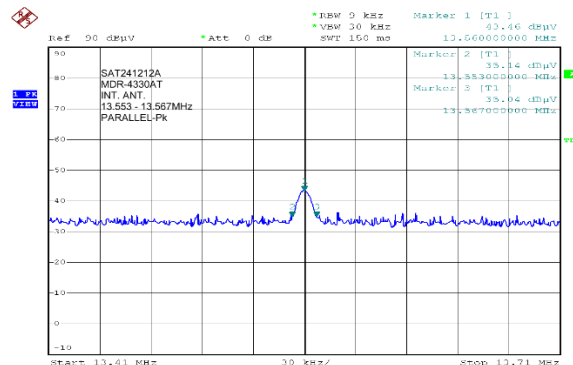
Date: 18.MAR.2025 10:12:15

Coaxial Orientation – 13.410 MHz to 13.710 MHz



Date: 18.MAR.2025 10:47:24

Coplanar Orientation – 13.410 MHz to 13.710 MHz



Date: 18.MAR.2025 11:25:01

Parallel Orientation – 13.410 MHz to 13.710 MHz

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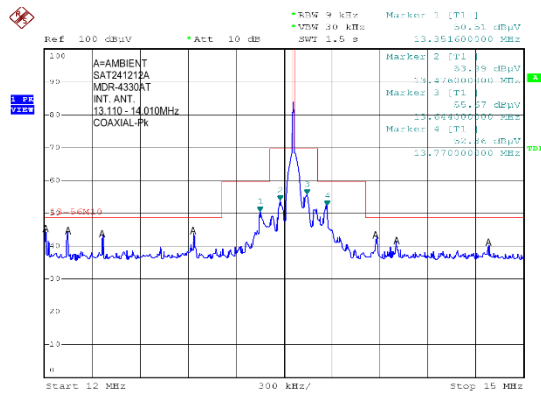


Internal Antenna

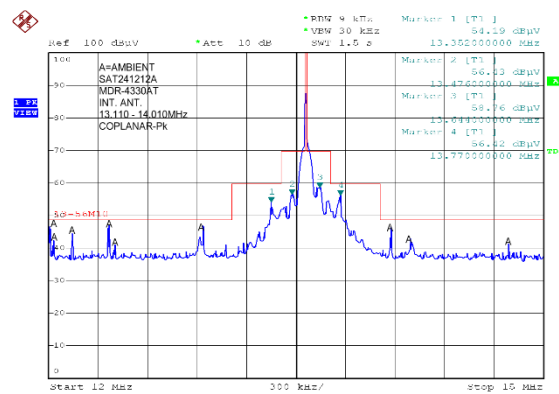
Frequency MHz	Antenna Orientation	Measured Pk @ 10m dBuV/m	*Measured Qp @ 10m dBuV/m	Equivalent Qp @ 30m dBuV/m	Limit @ 30m dBuV/m	Margin dB
13.48	Coaxial	53.9	45.6	26.5	50.5	-24
13.48	Coplanar	56.4	49.0	29.9	50.5	-20.6
13.48	Parallel	40.9	-	<22	50.5	-28.5
13.64	Coaxial	55.7	47.8	28.7	50.5	-21.8
13.64	Coplanar	58.8	51.8	32.7	50.5	-17.8
13.65	Parallel	43.0	-	<24	50.5	-26.5

A negative margin indicates the margin was below the limit

*Measured at a 10 m distance. In accordance with ANSI C63.10:2013, clause 6.4.4.2 and Table 5, measured field strength values were extrapolated to a 30 m distance using an extrapolation factor of 40 dB/decade.



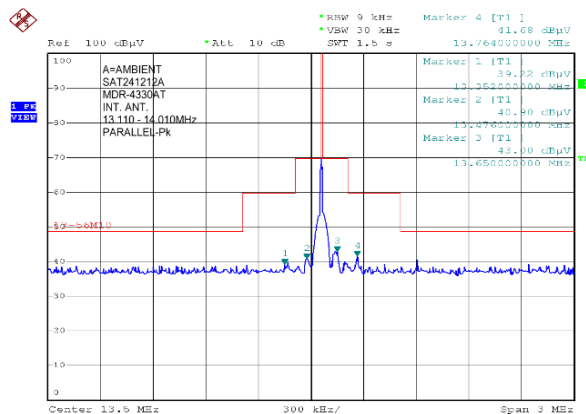
Date: 19.MAR.2025 08:31:58



Date: 19.MAR.2025 08:59:31

Coaxial Orientation – 13.410 MHz to 13.710 MHz

Coplanar Orientation – 13.410 MHz to 13.710 MHz



Date: 19.MAR.2025 09:14:56

Parallel Orientation – 13.410 MHz to 13.710 MHz

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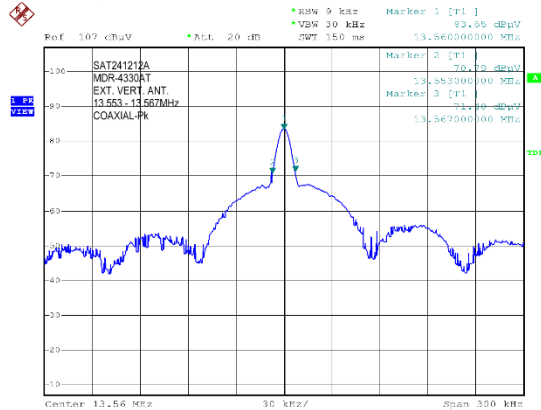
14.2.2 External Wand Antenna: Vertical (Y) Orientation

Frequency MHz Band Edges	Antenna Orientation	Measured Pk @ 10m dBuV/m	*Measured Qp @ 10m dBuV/m	Equivalent Qp @ 30m dBuV/m	Limit @ 30m dBuV/m	Margin dB
13.553	Coaxial	70.8	65.8	46.7	50.5	** -3.8
13.553	Coplanar	73.8	69.2	50.1	50.5	** -0.4
13.553	Parallel	58.7	58.6	39.5	50.5	-11.0
13.567	Coaxial	71.4	65.6	46.5	50.5	** -4.0
13.567	Coplanar	74.6	68.9	49.8	50.5	** -0.7
13.567	Parallel	59.0	58.8	39.7	50.5	-10.8

A negative margin indicates the margin was below the limit

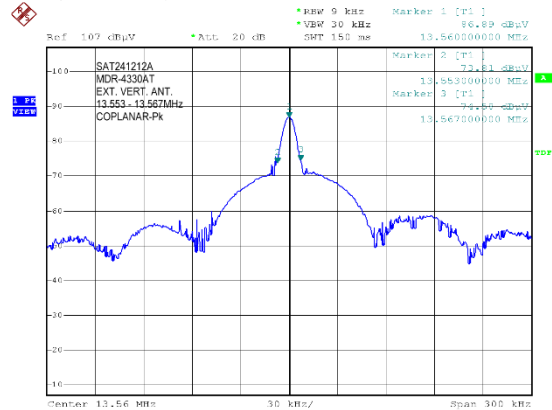
**Results were within the Laboratory's measurement uncertainty.

*Measured at a 10 m distance. In accordance with ANSI C63.10:2013, clause 6.4.4.2 and Table 5, measured field strength values were extrapolated to a 30 m distance using an extrapolation factor of 40 dB/decade.



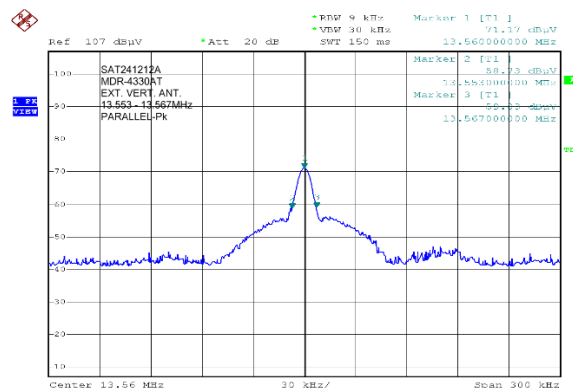
Date: 13.MAR.2025 10:10:58

Coaxial Orientation – 13.410 MHz to 13.710 MHz



Date: 13.MAR.2025 09:32:00

Coplanar Orientation – 13.410 MHz to 13.710 MHz



Date: 13.MAR.2025 11:40:17

Parallel Orientation – 13.410 MHz to 13.710 MHz

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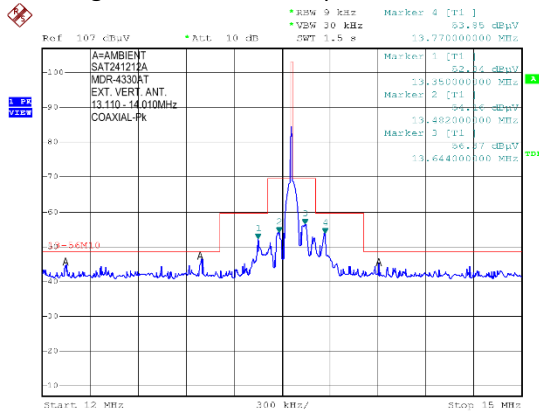


External Wand Antenna: Vertical (Y) Orientation

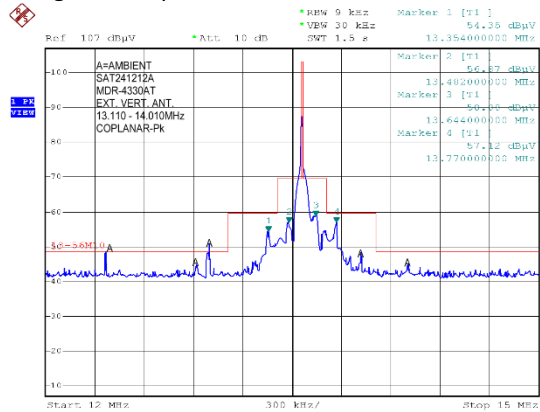
Frequency MHz	Antenna Orientation	Measured Pk @ 10m dBuV/m	*Measured Qp @ 10m dBuV/m	Equivalent Qp @ 30m dBuV/m	Limit @ 30m dBuV/m	Margin dB
13.48	Coaxial	54.2	45.7	26.6	50.5	-23.9
13.48	Coplanar	56.9	48.7	29.6	50.5	-20.9
13.48	Parallel	<43 (Noise)	Noise Floor	<24	50.5	-26.5
13.64	Coaxial	56.4	47.9	28.8	50.5	-21.7
13.64	Coplanar	58.9	50.8	31.7	50.5	-18.8
13.64	Parallel	45	-	<26	50.5	-24.5

A negative margin indicates the margin was below the limit

*Measured at a 10 m distance. In accordance with ANSI C63.10:2013, clause 6.4.4.2 and Table 5, measured field strength values were extrapolated to a 30 m distance using an extrapolation factor of 40 dB/decade.



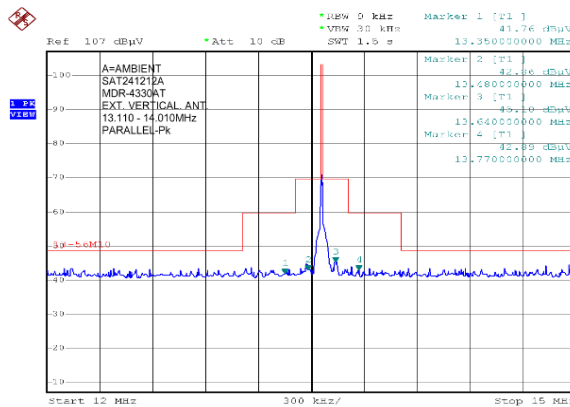
Date: 19.MAR.2025 09:29:23



Date: 19.MAR.2025 10:02:19

Coaxial Orientation – 13.410 MHz to 13.710 MHz

Coplanar Orientation – 13.410 MHz to 13.710 MHz



Date: 19.MAR.2025 10:17:10

Parallel Orientation – 13.410 MHz to 13.710 MHz

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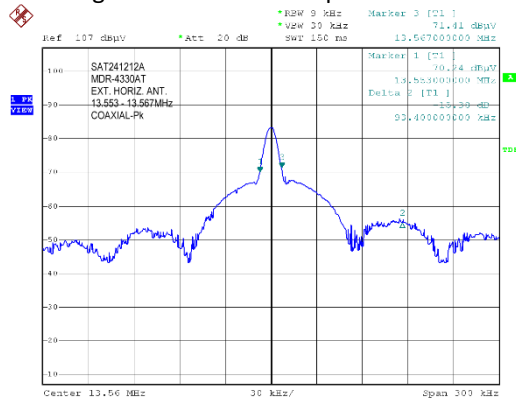
14.2.3 External Wand Antenna: Horizontal (X) Orientation.

Frequency MHz Band Edges	Antenna Orientation	Measured Pk @ 10m dBuV/m	*Measured Qp @ 10m dBuV/m	Equivalent Qp @ 30m dBuV/m	Limit @ 30m dBuV/m	Margin dB
13.553	Coaxial	70.2	65.5	46.4	50.5	** -4.1
13.553	Coplanar	73.8	68.8	49.7	50.5	** -0.8
13.553	Parallel	58.8	54.0	34.9	50.5	-15.6
13.567	Coaxial	71.4	65.3	46.2	50.5	** -4.3
13.567	Coplanar	74.6	68.8	49.7	50.5	** -0.8
13.567	Parallel	60.1	53.8	34.7	50.5	-15.8

A negative margin indicates the margin was below the limit

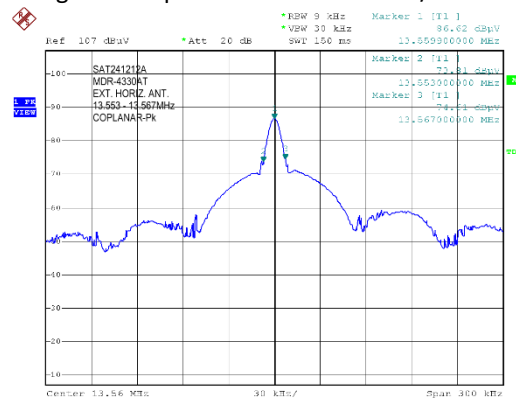
** Results were within the Laboratory's measurement uncertainty.

*Measured at a 10 m distance. In accordance with ANSI C63.10:2013, clause 6.4.4.2 and Table 5, measured field strength values were extrapolated to a 30 m distance using an extrapolation factor of 40 dB/decade.



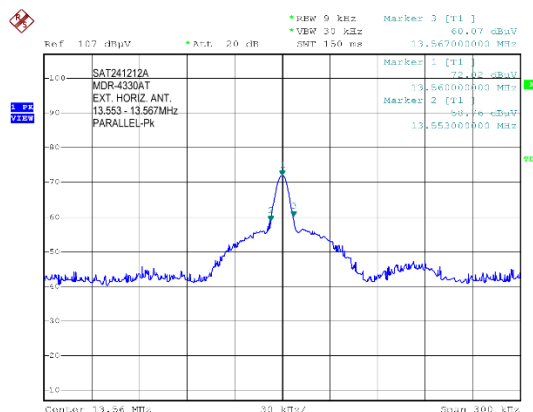
Date: 13.MAR.2025 13:12:05

Coaxial Orientation – 13.410 MHz to 13.710 MHz



Date: 13.MAR.2025 13:45:08

Coplanar Orientation – 13.410 MHz to 13.710 MHz



Date: 13.MAR.2025 14:11:28

Parallel Orientation – 13.410 MHz to 13.710 MHz

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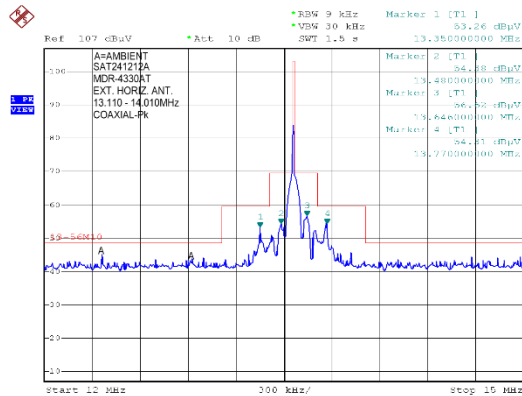


External Wand Antenna: Horizontal (X) Orientation

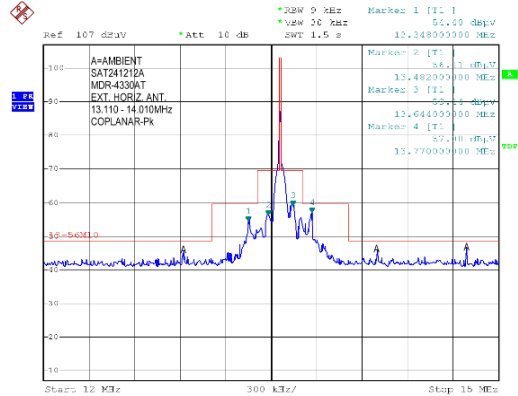
Frequency MHz	Antenna Orientation	Measured Pk @ 10m dBuV/m	*Measured Qp @ 10m dBuV/m	Equivalent Qp @ 30m dBuV/m	Limit @ 30m dBuV/m	Margin dB
13.48	Coaxial	54.4	45.4	26.3	50.5	-24.2
13.48	Coplanar	56.1	48.6	29.5	50.5	-21.0
13.48	Parallel	42	-	<23	50.5	-27.5
13.64	Coaxial	56.6	47.6	28.5	50.5	-22.0
13.64	Coplanar	59.1	51.2	32.1	50.5	-18.4
13.64	Parallel	45	-	<26	50.5	-24.5

A negative margin indicates the margin was below the limit

*Measured at a 10 m distance. In accordance with ANSI C63.10:2013, clause 6.4.4.2 and Table 5, measured field strength values were extrapolated to a 30 m distance using an extrapolation factor of 40 dB/decade.



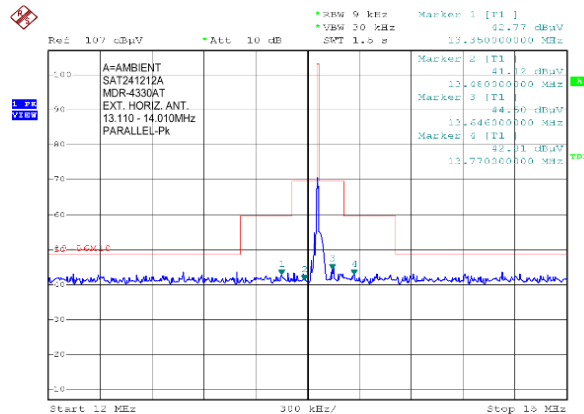
Date: 19.MAR.2025 10:38:05



Date: 19.MAR.2025 11:06:24

Coaxial Orientation – 13.410 MHz to 13.710 MHz

Coplanar Orientation – 13.410 MHz to 13.710 MHz



Date: 19.MAR.2025 10:33:23

Parallel Orientation – 13.410 MHz to 13.710 MHz

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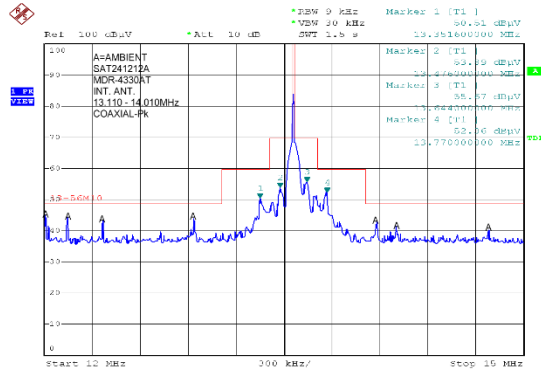
14.3 Test Results 15.225 (c) within the band 13.110-13.410 MHz, 13.710-14.010 MHz at 10 m.

14.3.1 Internal Antenna:

Frequency MHz	Antenna Orientation	Measured Pk @ 10m dBuV/m	*Measured Qp @ 10m dBuV/m	Equivalent Qp @ 30m dBuV/m	Limit @ 30m dBuV/m	Margin dB
13.35	Coaxial	50.5	45.8	26.7	40.5	-13.8
13.35	Coplanar	54.2	49.2	30.1	40.5	-10.4
13.35	Parallel	39.2	-	<20.1	40.5	-20.4
13.77	Coaxial	52.4	48.3	29.2	40.5	-11.3
13.77	Coplanar	56.4	52.8	33.7	40.5	-6.8
13.76	Parallel	41.7	-	<22.6	40.5	-17.9

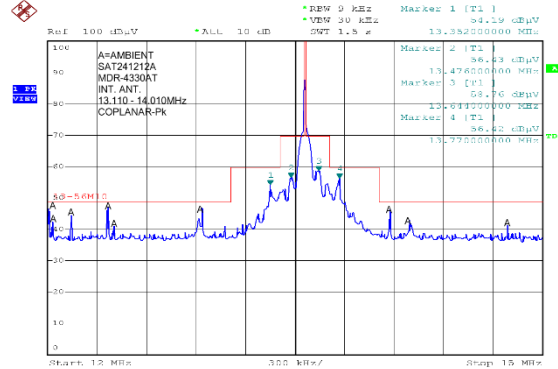
A negative margin indicates the margin was below the limit

*Measured at a 10 m distance. In accordance with ANSI C63.10:2013, clause 6.4.4.2 and Table 5, measured field strength values were extrapolated to a 30 m distance using an extrapolation factor of 40 dB/decade.



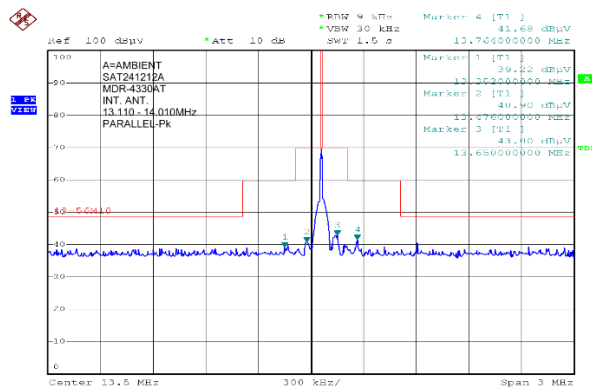
Date: 19.MAR.2025 08:31:58

Coaxial Orientation – 13.410 MHz to 13.710 MHz



Date: 19.MAR.2025 08:59:31

Coplanar Orientation – 13.410 MHz to 13.710 MHz



Date: 19.MAR.2025 09:14:56

Parallel Orientation – 13.410 MHz to 13.710 MHz

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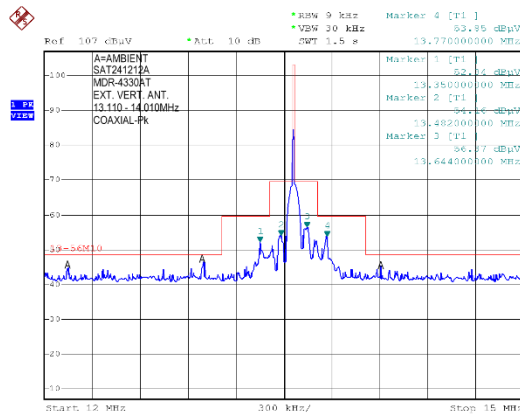


14.3.2 External Wand Antenna: Vertical (Y) Orientation

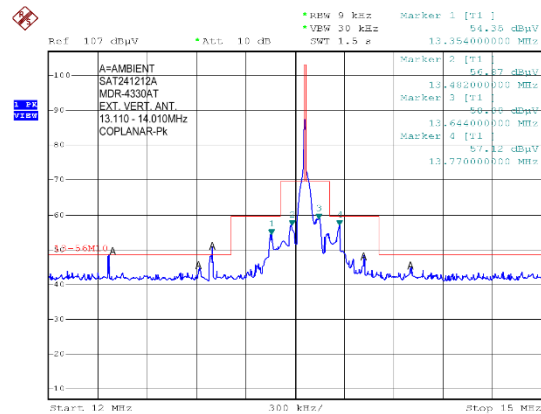
Frequency MHz	Antenna Orientation	Measured Pk @ 10m dBuV/m	*Measured Qp @ 10m dBuV/m	Equivalent Qp @ 30m dBuV/m	Limit @ 30m dBuV/m	Margin dB
13.35	Coaxial	52.3	46.4	27.3	40.5	-13.2
13.35	Coplanar	54.4	49.0	29.9	40.5	-10.6
13.35	Parallel	42 Noise	-	<22.9	40.5	-17.6
13.77	Coaxial	53.9	48.7	29.6	40.5	-10.9
13.77	Coplanar	57.1	51.8	32.7	40.5	-7.8
13.77	Parallel	43	-	<24	40.5	-16.5

A negative margin indicates the margin was below the limit

*Measured at a 10 m distance. In accordance with ANSI C63.10:2013, clause 6.4.4.2 and Table 5, measured field strength values were extrapolated to a 30 m distance using an extrapolation factor of 40 dB/decade.



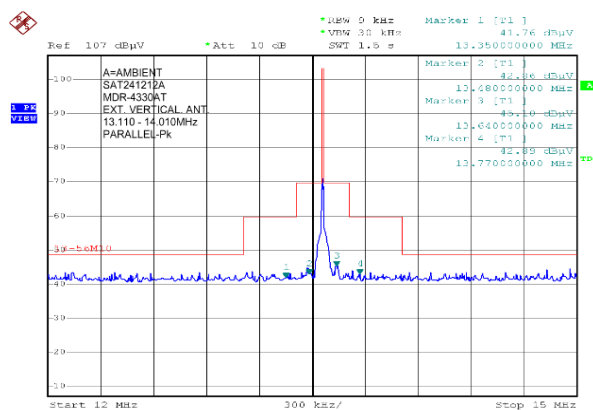
Date: 19.MAR.2025 09:29:23



Date: 19.MAR.2025 10:02:19

Coaxial Orientation – 13.410 MHz to 13.710 MHz

Coplanar Orientation – 13.410 MHz to 13.710 MHz



Date: 19.MAR.2025 10:17:10

Parallel Orientation – 13.410 MHz to 13.710 MHz

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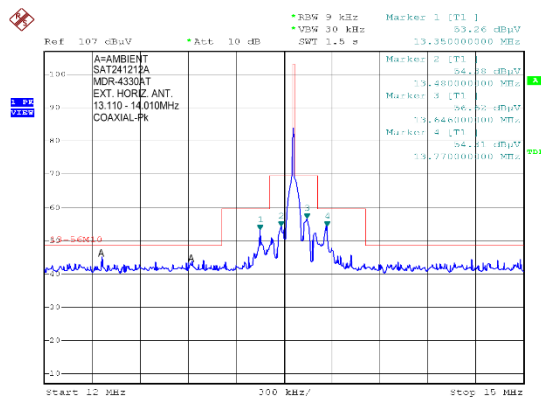


14.3.3 External Wand Antenna: Horizontal (X) Orientation

Frequency MHz	Antenna Orientation	Measured Pk @ 10m dBuV/m	*Measured Qp @ 10m dBuV/m	Equivalent Qp @ 30m dBuV/m	Limit @ 30m dBuV/m	Margin dB
13.35	Coaxial	53.3	46.7	27.6	40.5	-12.9
13.35	Coplanar	54.4	49.8	30.7	40.5	-9.8
13.35	Parallel	43 Noise	-	<24	40.5	-16.5
13.77	Coaxial	54.3	48.7	29.6	40.5	-10.9
13.77	Coplanar	57.1	52.3	33.2	40.5	-7.3
13.77	Parallel	43	-	<24	40.5	-16.5

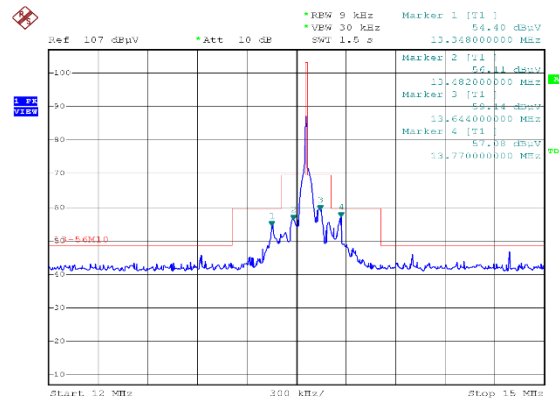
A negative margin indicates the margin was below the limit

*Measured at a 10 m distance. In accordance with ANSI C63.10:2013, clause 6.4.4.2 and Table 5, measured field strength values were extrapolated to a 30 m distance using an extrapolation factor of 40 dB/decade.



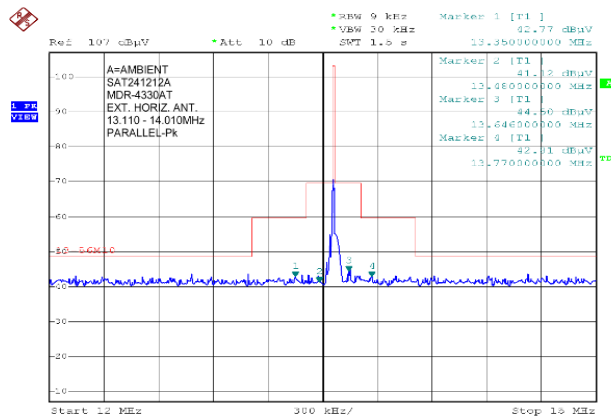
Date: 19.MAR.2025 10:38:08

Coaxial Orientation – 13.410 MHz to 13.710 MHz



Date: 19.MAR.2025 11:06:24

Coplanar Orientation – 13.410 MHz to 13.710 MHz



Date: 19.MAR.2025 10:33:23

Parallel Orientation – 13.410 MHz to 13.710 MHz

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15 FREQUENCY TOLERANCE, §15.225(e)

Test Date:	13 th August 2025
Test Officer:	Steven Garnham
Test Location:	Austest Laboratories (Yarramalong)

15.1 EUT Operating Mode and configuration

- The EUT was placed inside the environmental chamber and configured for constant transmission into the external antenna. An RF pick-up probe was placed adjacent to the antenna and connected to the spectrum analyser.

15.2 Test Method

Frequency Stability Under Temperature Variations

- Set analyser RBW and Span to obtain the required resolution, (RBW 1 kHz, span 10 kHz, resolution of 0.1 Hz).
- With the EUT powered on for approximately 30 minutes, measure and record the EUT operating frequency at an initial temperature of 20°C as the reference, with a mains supply at the nominal voltage (120 V).
- Turn the EUT off and raise the temperature to the maximum 50°C. After the temperature has stabilised for approximately 30 minutes, turn on and record the frequency.
- Repeat the above but decrease the chamber temperature to the required temperature and after stabilisation record the frequency at this new temperature.

Frequency Stability Under Supply Voltage Variations

- With the chamber and EUT temperature stabilised at 20°C, set the supply voltage to the normal rated operating voltage.
- Vary the supply voltage over the required range of $\pm 15\%$ and record the frequency.

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Test Results: 15.225 (e)

Frequency Stability verses Temperature							
Temperature	Frequency (kHz)				Measured Tolerance (ppm)	Limit ±0.01% (±100 ppm)	Result / Margin
	Initial	After 2 mins	After 5 mins	After 10 mins			
-20°C	13.559945	13.559948	13.559950	13.559952	2.4	±100	Pass
-10°C	13.559933	13.559936	13.559938	13.559939	1.4		Pass
0°C	13.559923	13.559926	13.559930	13.559930	0.7	±100	Pass
10°C	13.559917	13.559919	13.559919	13.559919	0.2	±100	Pass
20°C (Ref.)	13.559920	13.559919	13.559918	13.559917	0.2	±100	Reference
30°C	13.559930	13.559929	13.559929	13.559928	0.7	±100	Pass
40°C	13.559923	13.559926	13.559927	13.559929	0.7	±100	Pass
50°C	13.559918	13.559917	13.559917	13.559917	0.2	±100	Pass
Frequency Stability verses Voltage							
Supply Voltage (at 20°C Ref)	Frequency (kHz)	Measured Tolerance (Hz)			Measured Tolerance (ppm)	Limit ±0.01% ((±100 ppm)	
120V (Nominal) Reference 100%	13.559917	0			0	±100	Reference
102V (85%)	13.559917	0			0	±100	Pass
138 (115%)	13.559917	0			0	±100	Pass
Frequency Stability verses Voltage							
Supply Voltage (at 20°C Ref)	Frequency (kHz)	Measured Tolerance (Hz)			Measured Tolerance (ppm)	Limit ±0.01% ((±100 ppm)	
230V (Nominal) Reference	13.559917	0			0	±100	Reference
195.5V (85%)	13.559917	0			0	±100	Pass
264.5V (115%)	13.559917	0			0	±100	Pass

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