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**EMC testing of the Jannatec Technologies CC1020 Module RF device in
accordance with: FCC Part 15.249, ANSI C63.4-2014 and ANSI C63.10-2013**

FCC ID: 2AZ9PCC1020

Test Dates: 2022-09-08 To 2022-09-13

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Prepared for: Jannatec Technologies

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REVISION RECORD

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Release 1	2022-09-26	I. Akram	Sign Off
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1.0 INTRODUCTION

1.1 Scope

The purpose of this report is to present the results of compliance testing performed in accordance with FCC Part 15.249, ANSI C63.4-2014 and ANSI C63.10-2013 to gain FCC single modular approval. All test procedures, limits, criteria, and results described in this report apply only to the Jannatec Technologies CC1020 Module test sample, referred to herein as the EUT (Equipment Under Test).

This report does not imply product endorsement by the Electronics Test Centre, A2LA, nor any Canadian Government agency.

1.2 Applicant

This test report has been prepared for Jannatec Technologies, located in Sudbury, Ontario, Canada.

1.3 Test Sample Description

As provided to ETC (Airdrie) by Jannatec Technologies:

Product Name:		CC1020 Module
Frequency Band		902 – 928 MHz
TX Frequency Range		902.2 MHz Only
Type of Modulation		FSK
Antenna Connector		U.FL
Associated Antennas	PCB	Pulse Model#W3014 Chip antenna, Gain: -0.5dBi ±1 dB Radiation Pattern: omni, Polarization: Linear
	External	MOBILE Model#MLPV800 Mag mount antenna, Gain:3 dBi Radiation Pattern: omni, Polarization: Vertical
Model#		JAWS Transceiver Module
Serial#		JTM00005P
Power supply:		External Battery Powered, 5VDC

Note: CC1020 wireless module not commercially available, it's only for Jannatec Technologies internal use. It incorporates an internal and external antenna. Preliminary scans were performed on CC1020 module with PCB antenna (Gain -0.5dBi) via 26mm RG178 cable on all three axes and with external mag mount antenna (Gain 3dBi) via 17' of RG58 cable. Detail analysis was performed with external antenna.

1.4 General Test Conditions

The EUT was set up and exercised using the configurations, modes of operation and arrangements defined in this report only. All inputs and outputs to and from other equipment associated with the EUT were adequately simulated.

Where relevant, the EUT was only tested using the monitoring methods and test criteria defined in this report.

The environmental conditions are recorded during each test, and are reported in the relevant sections of this document.

1.5 Reference Standards

Standards	Description
FCC, title 47 CFR § 15.249	Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz.
FCC, title 47 CFR § 15.107	Radiated Emission Limits
FCC, title 47 CFR § 15.203	Antenna Requirement
FCC, title 47 CFR § 15.207	conducted emission limits
FCC, title 47 CFR § 15.209	Radiated emission limits; general requirements.
ANSI C63.10-2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
ANSI C63.10-2014	American National Standard for Methods of Measurement of Radio – Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 KHz to 40 GHz

1.6 Test Methodology

Test methods are specified in the Basic Standard as referenced and/or modified by the Product Standard in the part of Section 2 of this report associated with each particular test case.

1.6.1 Variations in Test Methodology

Any variance in methodology or deviation from the reference Standard is documented in the part of Section 2 of this report associated with each particular Test Case.

1.6.2 Test Sample Verification, Configuration & Modifications

EUT setup, configuration, protocols for operation and monitoring of EUT functions, and any modifications performed in order to meet the requirements, are detailed in each Test Case of Section 2 of this report.

1.6.3 Uncertainty of Measurement:

The factors contributing to measurement uncertainty are identified and calculated in accordance with CISPR 16-4-2: 2011.

This uncertainty estimate represents an expended uncertainty expressed at approximately 95% confidence using a coverage factor of $k = 2$.

Test Method	Uncertainty
Radiated Emissions Level (9 KHz – 1 GHz)	±5.8 dB
Radiated Emissions Level (1 GHz – 18 GHz)	±4.9 dB
Uncertainty Conducted Power level	±0.5 dB
Uncertainty Conducted Spurious emission level	±0.6 dB
Uncertainty for Bandwidth test	±1.5 %

2.0 TEST CONCLUSION

STATEMENT OF COMPLIANCE

The customer equipment referred to in this report was found to comply with the requirements, as summarized below.

The EUT was subjected to the following tests. Compliance status is reported as **Compliant** or **Non-compliant**. **N/A** indicates the test was Not Applicable to the EUT.

The sample has been provided by the customer.

The measurement uncertainty is not accounted for determination of the statement of compliance. The statement of compliance is based only on the measurement value recorded.

Note: Maintenance of compliance is the responsibility of the Manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the EUT with respect to the standards detailed in this test report.

The following table summarizes the tests performed in terms of the specification, class or performance criterion applied, and the EUT modification state.

Test Case	Test Type	FCC Rule Part No.	Test Sample	Mods	Config.	Result
2.1	AC Conducted Emissions	15.207(a)	CC1020 Module	none	see § 2.1	N/A
2.2	Occupied Bandwidth	2.1049	CC1020 Module	none	see § 2.2	Compliant
2.3	Band Edge	15.249(d)	CC1020 Module	none	see § 2.3	Compliant
2.4	Radiated Spurious Emission	15.249(e)	CC1020 Module	none	see § 2.4	Compliant
2.5	Radiated Emission	15.109	CC1020 Module	none	see § 2.5	Compliant
2.6	EUT Position	ANSI C63.10	CC1020 Module	none	see § 2.6	Compliant
2.7	RF Exposure	FCC Part 1.1307(b)(1)	CC1020 Module	none	-	Compliant

Refer to the test data for applicable test conditions.

2.1 AC Power Line Conducted Emissions

Test Lab: Electronics Test Centre, Airdrie	EUT: CC1020 Module
Test Personnel:	Standard: FCC Part 15.207
Date:	Basic Standard: ANSI C63.10-2013
EUT status: N/A	
Comments: EUT is battery powered. No direct or indirect connection to AC Main	

2.2 Channel Occupied Bandwidth

Test Lab: Electronics Test Centre, Airdrie	EUT: CC1020 Module
Test Personnel: I. Akram	Standard: 15.1049
Date: 2022-09-13 (23.3° C, 31.1 % RH)	Basic Standard: ANSI C63.10-2013
EUT status: Compliant	

15.215 Additional provisions to the general radiated emission limitations

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

2.2.1 Test Guidance: ANSI C63.10-2013, Clause 6.9

This measurement is performed with modulation.

The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation. If the EUT antenna is integral to the device, an antenna is placed to capture the transmitted signals.

The spectrum analyzer is set for a frequency span $\geq (1.5 * \text{OBW})$, $\leq (5 * \text{OBW})$, selected to clearly display the channel. The RBW is set such that $(1\% \text{ OBW}) \leq \text{RBW} \leq (5\% \text{ OBW})$. The VBW is set to $\geq (3 * \text{RBW})$. The Peak detector is used, with the trace set to Max Hold.

The automated 99% BW function of the spectrum analyzer is engaged, and the 20 dB OBW is measured with the x dB function.

2.2.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.2.3 Test Equipment

Testing was performed with the following equipment:

Equipment	Manufacturer	Model #	Asset #	Calibration Date	Calibration Due
EMI receiver	Agilent	N9038A	6130 FW 25.05	2022-07-12	2023-07-12

2.2.4 Test Sample Verification, Configuration & Modifications

The EUT was set to a selected channel with test-specific software. The output was modulated as in normal operation. The EUT met the requirements without modification.

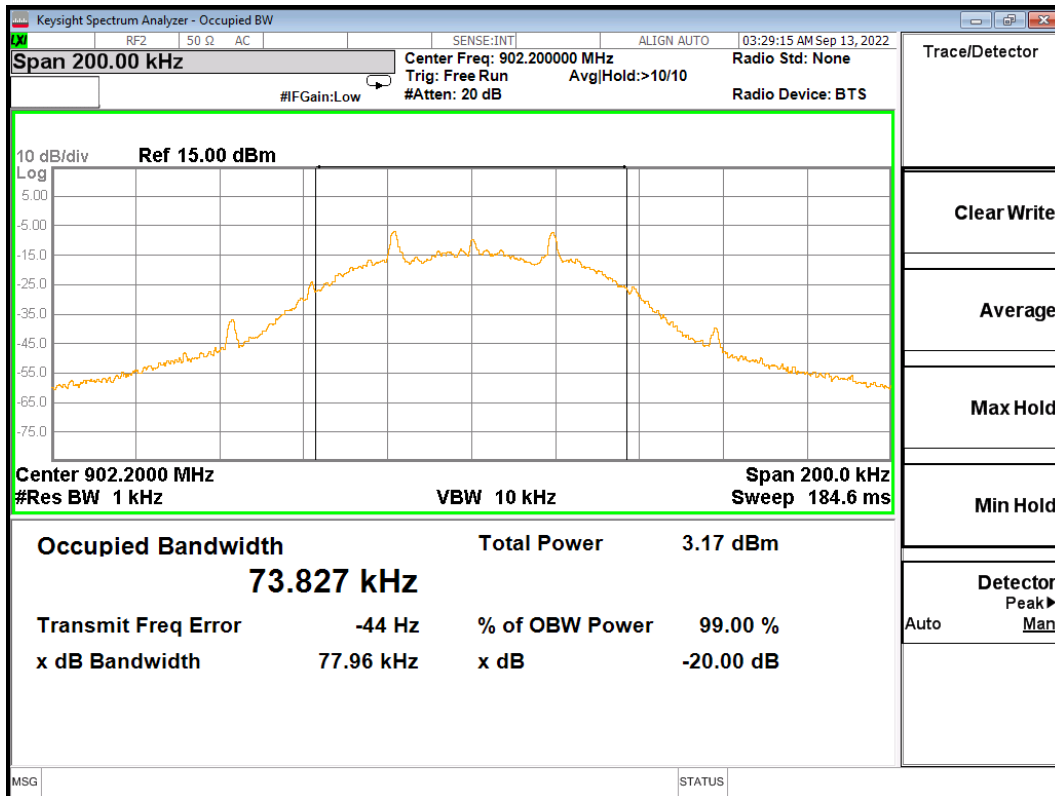
Test setup diagrams for Occupied Bandwidth testing:



2.2.5 Channel Occupied Bandwidth Data:

Freq. [MHz]	20 dB OBW [KHz]	99% OBW [KHz]
902.2	77.96	73.827

Screen Captures from the spectrum analyzer:



2.3 Band Edge Attenuation

Test Lab: Electronics Test Centre, Airdrie	EUT: CC1020 Module
Test Personnel: I. Akram/Janet Mijares	Standard: FCC Part 15.249
Date: 2022-09-09 (21.2° C, 28.9 % RH)	Basic Standard: ANSI C63.10-2013
EUT status: Compliant	

Specification: FCC Part 15.249(d)

Criteria: Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

2.3.1 Test Guidance: ANSI C63.10-2013 Clause 6.10.4 Authorized-band band-edge measurements (relative method)

This measurement is performed at the low and high frequencies, with modulation.

The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation. If the EUT antenna is integral to the device, the radiated output is measured.

The spectrum analyzer is set for a frequency span to show the band edge and the nearest channel. The RBW is set to ≥ 100 kHz. The VBW is set to $\geq \text{RBW} \times 3$. The Peak detector is used, with the trace set to Max Hold.

The attenuation is measured with the Marker Delta function.

2.3.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.3.3 Test Equipment

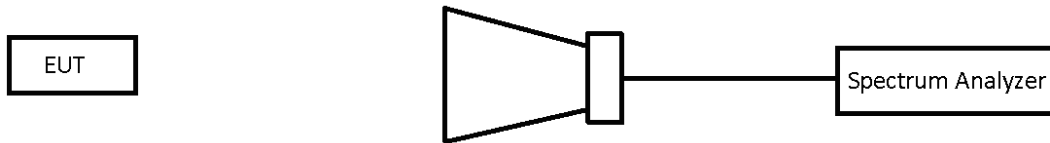
Testing was performed with the following equipment:

Equipment	Manufacturer	Model #	Asset #	Calibration Date	Calibration Due
EMC Software	UL	Ver. 9.5	ETC-SW-EMC 2.1	N/A	
EMI receiver	Agilent	N9038A FW 25.05	6130	2022-07-12	2023-07-12
Biconilog Antenna	SUNAR	JB1	6905	2021-10-29	2023-10-29
Emission Cable 9KHz – 1GHz	Insulated Wire	KPS-1501A- 3600-KPS 01102006	4419	2022-06-23	2023-06-23
Pre-Amplifier	Hp	8447D	9291	Monitored	

2.3.4 Test Sample Verification, Configuration & Modifications

The EUT was operating normally, in communication with an iPod. The EUT met the requirements without modification.

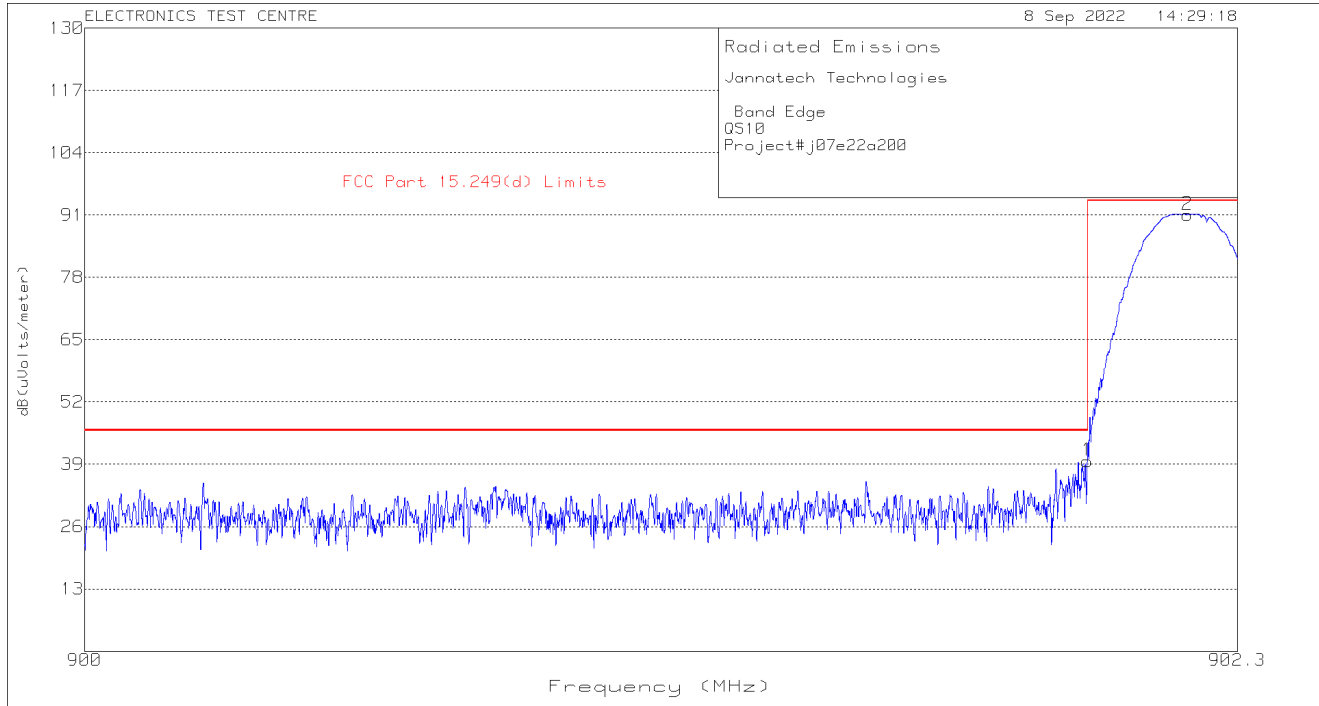
Radiated Test setup diagrams for Band Edge Attenuation testing:



2.3.5 Band Edge Attenuation Data

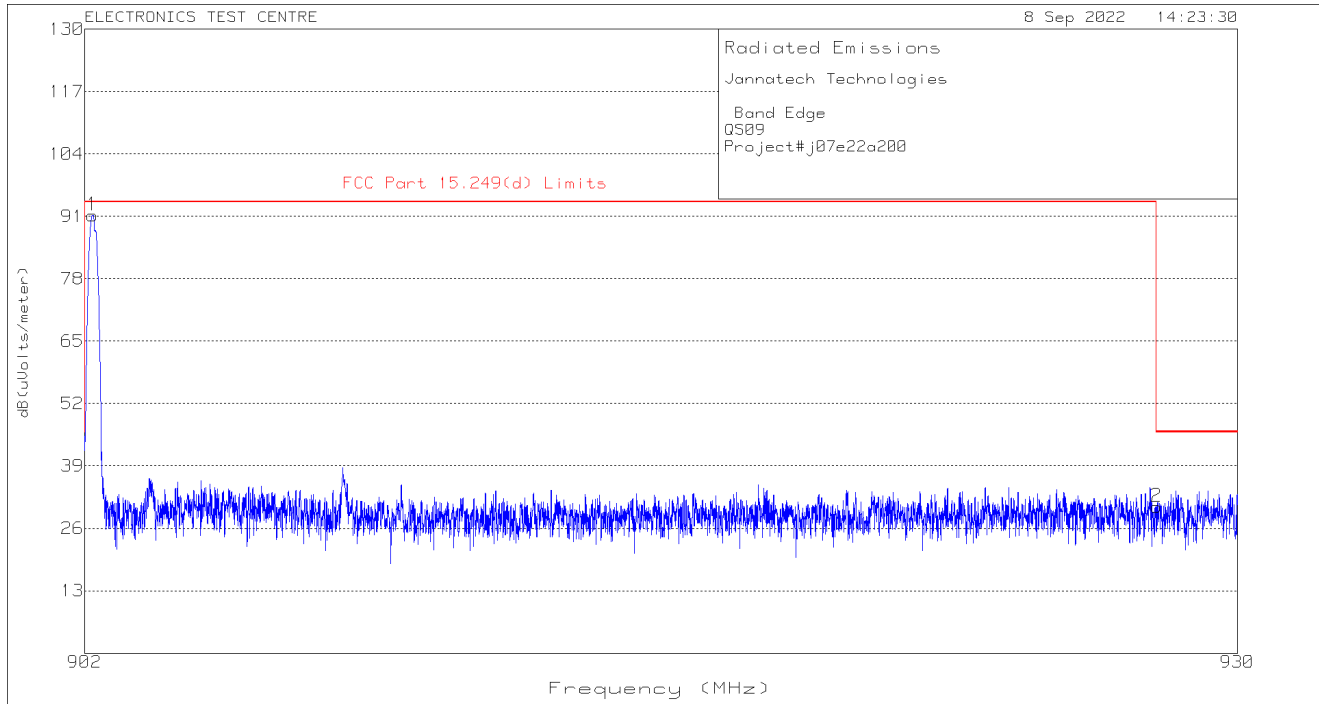
TX Channel	Frequency (MHz)	Measured (dB μ v/m)	Limit (dB μ v/m)	Result
902.2 MHz Lower Band Edge	902	39.69	46.02	PASS
902.2 MHz Upper Band Edge	928	30.53	46.02	PASS

Screen Capture from the spectrum analyzer: Lower Band Edge



Marker NO.	Frequency (MHz)	Reading (dBμV)	Antenna Factor (dB/m)	Pre-Amp Gain (dB)	Corrected Value (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	902	31.69	26.3	-18.3	39.69	46.03	-6.34	Detector Peak
2	902.2	83.03	26.3	-18.3	91.03	93.98	-2.95	Fundamental Detector Peak

Screen Capture from the spectrum analyzer: Upper Band Edge



Marker NO.	Frequency (MHz)	Reading (dBμV)	Antenna Factor (dB/m)	Pre-Amp Gain (dB)	Corrected Value (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remarks
1	902.2	83.16	26.3	-18.3	91.16	93.98	-2.82	Fundamental Detector Peak
2	928	22.63	26.3	-18.3	30.53	46.02	-15.5	Detector Peak

2.4 Radiated Spurious Emissions

Test Lab: Electronics Test Centre, Airdrie	EUT: CC1020 Module
Test Personnel: Janet Mijares	Standard: FCC Part 15.249
Date: 2022-09-08/09 (21.0° C, 31.2% RH)	Basic Standard: ANSI C63.10-2013
EUT status: Compliant	

Specification: FCC Part 15.249(a, c, e)

- (a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (mv/m)	Field strength of fundamental (dBµv/m)	Field strength of harmonics (µv/m)	Field strength of harmonics (dBµv/m)
902-928 MHz	50	93.98	500	53.98
2400-2483.5 MHz	50	93.98	500	53.98
5725-5875 MHz	50	93.98	500	53.98
24.0-24.25 GHz	250	107.96	2500	67.98

- (c) Field strength limits are specified at a distance of 3 meters.

(e) As shown in § 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

15.209 Radiated emission limits; general requirements.

- (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

15.35 (b)

Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, e.g., see §§ 15.250, 15.252, 15.253(d), 15.255, 15.256, and 15.509 through 15.519, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device, e.g., the total peak power level. Note that the use of a pulse desensitization correction factor may be needed to determine the total peak emission level. The instruction manual or application note for the measurement instrument should be consulted for determining pulse desensitization factors, as necessary.

2.4.1 Test Guidance: ANSI C63.10-2013, Clause 6.6.4

From 9kHz to 150 kHz (resolution bandwidth of 200 Hz) and from 150 kHz to 30 MHz (resolution bandwidth 9 kHz) measurements are performed with a loop antenna.

From 30 MHz to 1000 MHz, measurements are performed with a broadband biconilog antenna and a resolution bandwidth of 120 kHz.

Above 1000 MHz, measurements are performed with a DRG Horn antenna or a Standard Gain horn, and a resolution bandwidth of 1 MHz. The EUT is raised to 150 cm above the ground plane, and the area between the EUT and the antenna mast is covered with RF absorbent material.

The scan is performed at discreet increments of turntable azimuth and antenna height, which are selected in accordance with the applicable standard in order to assure capture of frequencies of interest. Optimization is performed based on the scan data.

Frequencies having peak emissions within 10dB of the limits are optimized. The EUT is rotated in azimuth over 360 degrees and the direction of maximum emission is noted.

Antenna height is varied from 1 – 4 meters at this azimuth to obtain the maximum emission. Then the maximum level is measured with the appropriate detector and recorded. Up to 1 GHz, measurements are performed with a Quasi-Peak detector. Above 1 GHz, measurements are recorded with Peak and/or Average detectors, as applicable.

Note: The EUT was assessed for worst-case orientation. All radiated testing was performed with this orientation, as shown in the test setup photos.

2.4.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.4.3 Test Equipment

Testing was performed with the following equipment:

Equipment	Manufacturer	Model #	Asset #	Calibration Date	Calibration Due
EMC Software	UL	Ver. 9.5	ETC-SW-EMC 2.1	N/A	
EMI receiver	Agilent	N9038A FW 25.05	6130	2022-07-12	2023-07-12
Loop Antenna	EMCO	6502	10868	2021-05-11	2023-05-11
Biconilog Antenna	SUNAR	JB1	6905	2021-10-29	2023-10-29
DRG Horn	Tensor	4105	9588	2021-05-10	2023-05-10
Emission Cable 9KHz – 1GHz	Insulated Wire	KPS-1501A- 3600-KPS 01102006	4419	2022-06-23	2023-06-23
Emission Cable 1GHz – 26.5GHz	A.H. System	SAC-26G-8.23	6187	2022-06-29	2023-06-29
Pre-Amplifier	Hp	8447D	9291	Monitored	
Low Noise Amplifier (1 – 18 GHz)	MITEQ	JS43- 01001800-21- 5P	4354	Monitored	

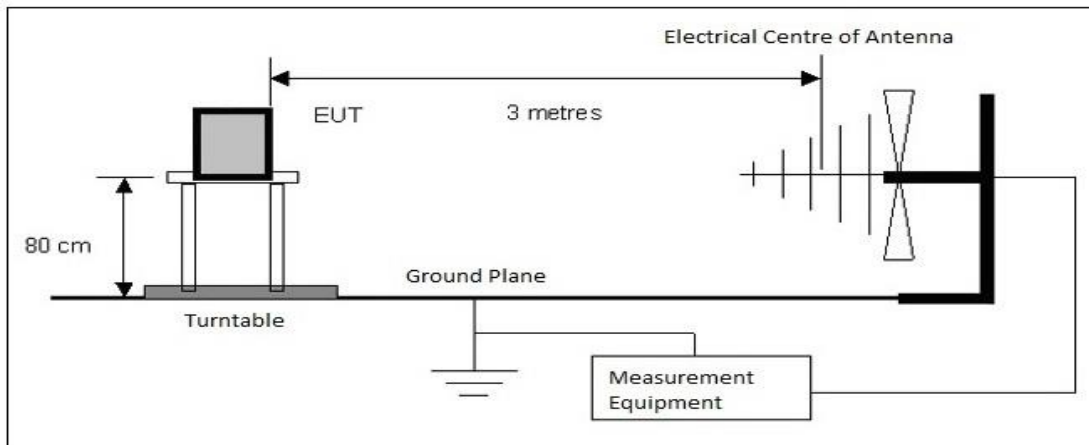
2.4.4 Test Sample Verification, Configuration & Modifications

The EUT was set to a selected channel with test-specific software. The output was modulated as in normal operation.

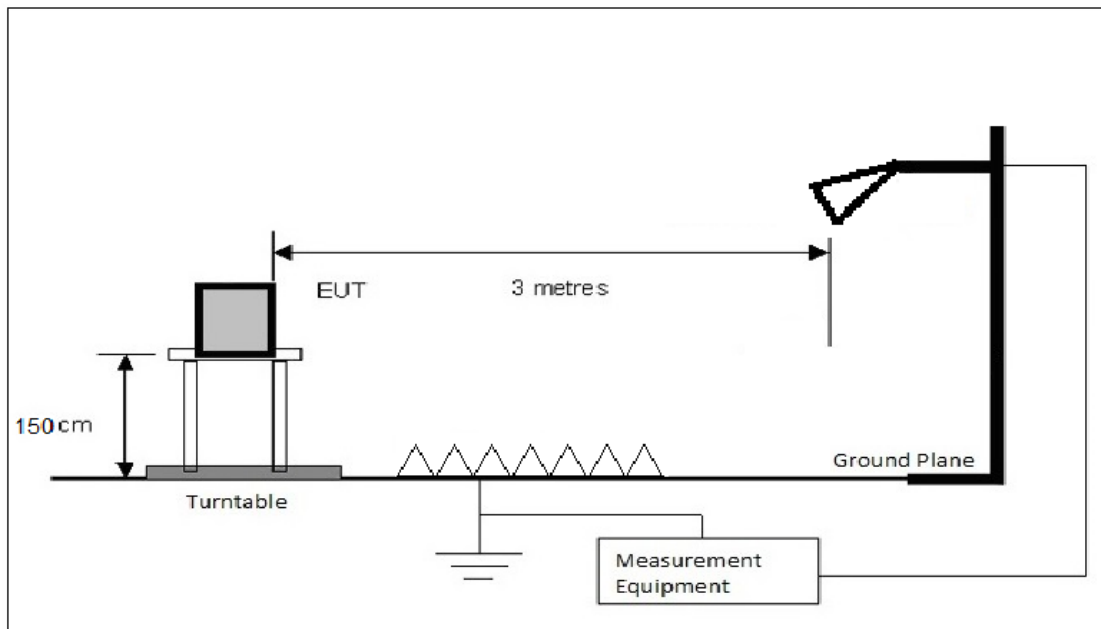
The EUT met the requirements without modification.

EUT configuration for Radiated Spurious Emissions testing:

Below 1 GHz



Above 1GHz



2.4.5 Radiated Emissions Data:

The emissions data are presented in tabular form, showing turntable azimuth, antenna height and polarization, the uncorrected spectrum analyzer reading, the correction factors applied, the net result, the value of the limit at the frequency investigated, and the Delta between the result and the limit.

Meter Reading in dBμV + Antenna Factor in dB/m + Gain/Loss Factor in dB = Corrected Field Strength in dBμV/m.

Delta = Field Strength - Limit

Notes:

- When a preamp is used, the resulting gain is compensated, producing a negative value for the Cable Loss.
- Measurements reported are the result of adjusting the turntable azimuth and antenna height to obtain the maximum EUT emission. This may produce a different reading than the plot trace. The plot is a Peak Hold function obtained at discreet increments of height and azimuth, while the reported measurement is obtained with the appropriate Quasi Peak, Average and peak detector after the height and azimuth have been adjusted for maximum emission.
- Preliminary scans were performed for both PCB and external antenna. The external antenna with higher gain was selected as the worst-case condition for detailed examination.
- In Transmit mode, the EUT was assessed up to 10GHz. Above 1GHz to prevent LNA saturation, a band-reject filter was used to block frequencies between 902-928 MHz.
- QP: Quasi-Peak detector, AV: Average detector, PK: Peak Detector

Negative values for Delta indicate compliance.

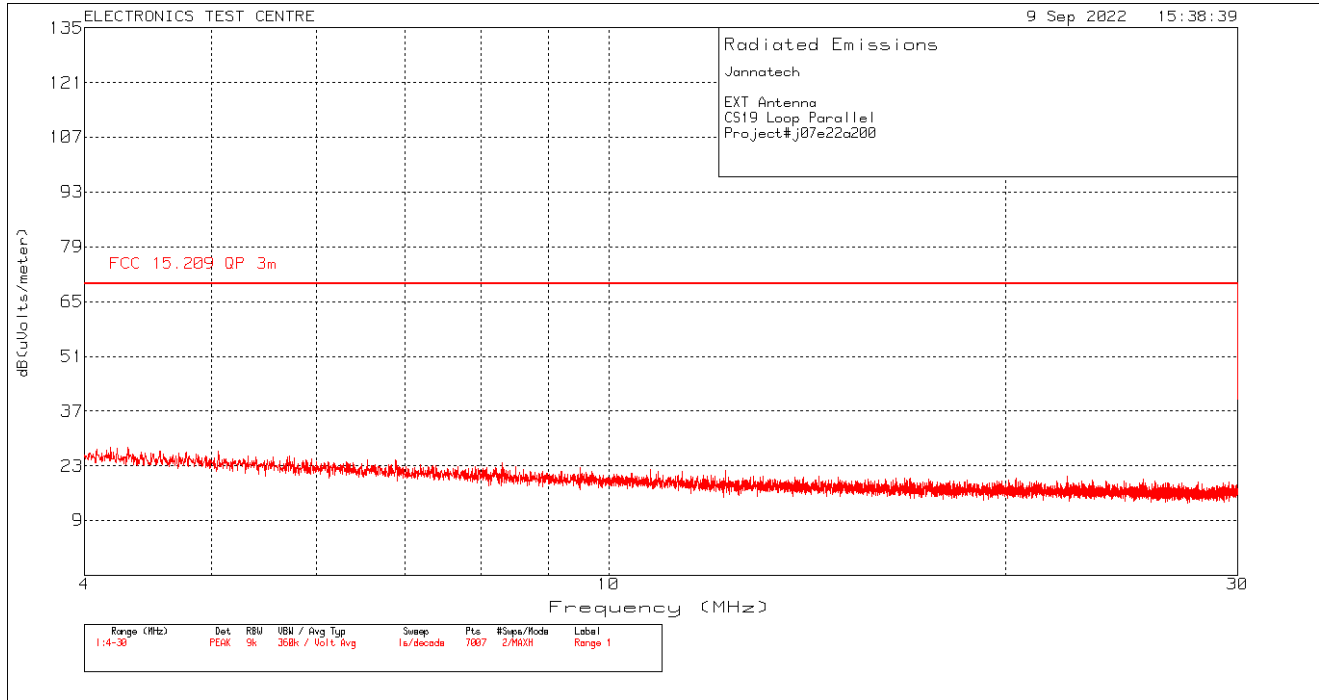
Freq. Marker	Freq. [MHz]	Raw reading[dBμv]	Det	Antenna Factor [dB/m]	Pre-AMP Gain [dB]	Corrected Reading [dBμv/m]	FCC 15.209 Limit [dBμv/m]	Delta [dB]	Azimuth [Deg]	Height [cm]	Polarization
-	*902.2	79.6	PK	26.3	-18.3	87.6	93.98	-5.38	313	105	Horizontal
-	*902.2	83.31	PK	26.3	-18.3	91.31	93.98	-2.67	114	107	Vertical
1	110.6	34.3	QP	16.6	-23.3	27.6	43.53	-15.93	114	105	Vertical
1	*1804.4	48.72	AV	26.7	-34.3	41.12	53.98	-12.86	123	273	Horizontal
1	*1804.4	51.54	PK	26.7	-34.3	43.94	73.98	-30.06	123	273	Horizontal
2	¹ 2443.5	27.06	AV	28.3	-33.7	21.66	53.98	-32.32	121	100	Horizontal
2	¹ 2443.5	39.51	PK	28.3	-33.7	24.11	73.98	-39.89	121	100	Horizontal
3	*7217.6	33.19	AV	36.5	-28.2	41.49	53.98	-12.49	6	179	Horizontal
3	*7217.6	38.76	PK	36.5	-28.2	47.06	73.98	-26.94	6	179	Horizontal
4	*1804.4	49.32	AV	26.7	-34.3	41.72	53.98	-12.26	324	105	Vertical
4	*1804.4	52.08	PK	26.7	-34.3	44.48	73.98	-29.52	324	105	Vertical
5	*7217.6	34.19	AV	36.5	-28.2	42.49	53.98	-11.49	32	106	Vertical
5	*7217.6	39.92	PK	36.5	-28.2	48.22	73.98	-25.78	32	106	Vertical

* Harmonic

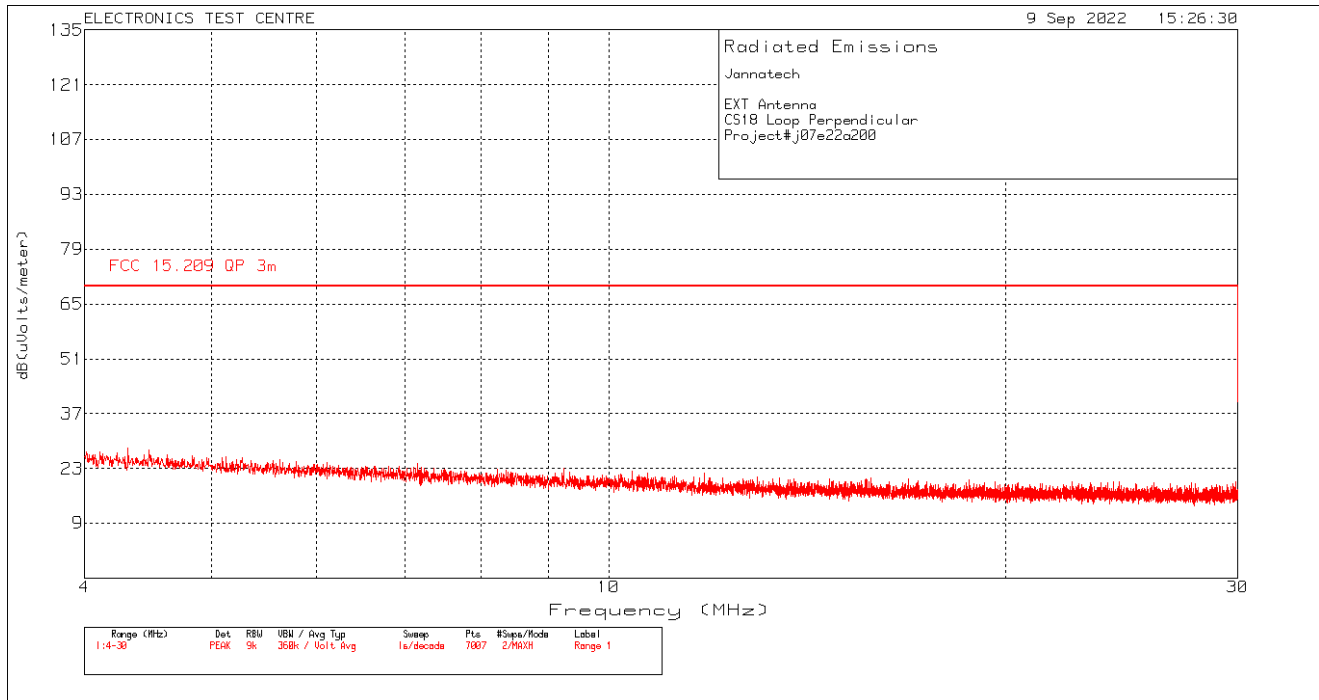
¹ Not from EUT. Ambient noise

² Fundamental Frequency

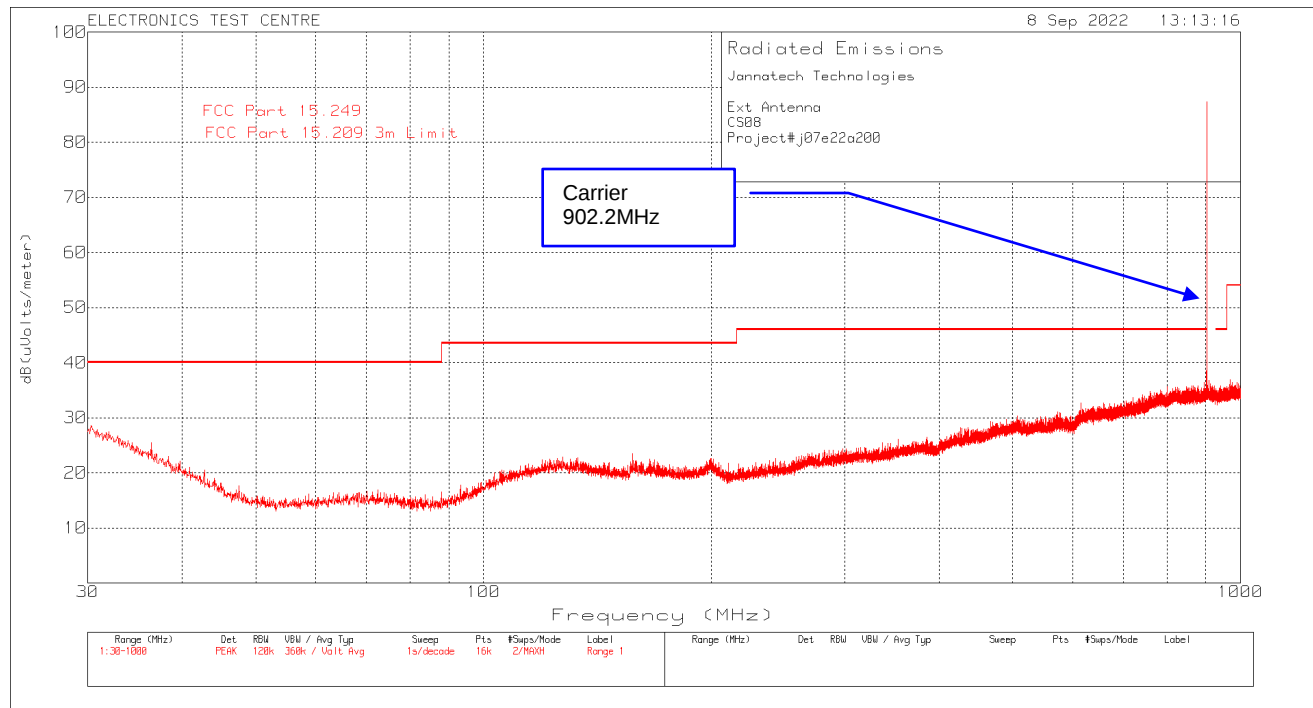
Plot of Radiated Emissions: Measuring Antenna 1st Orientation



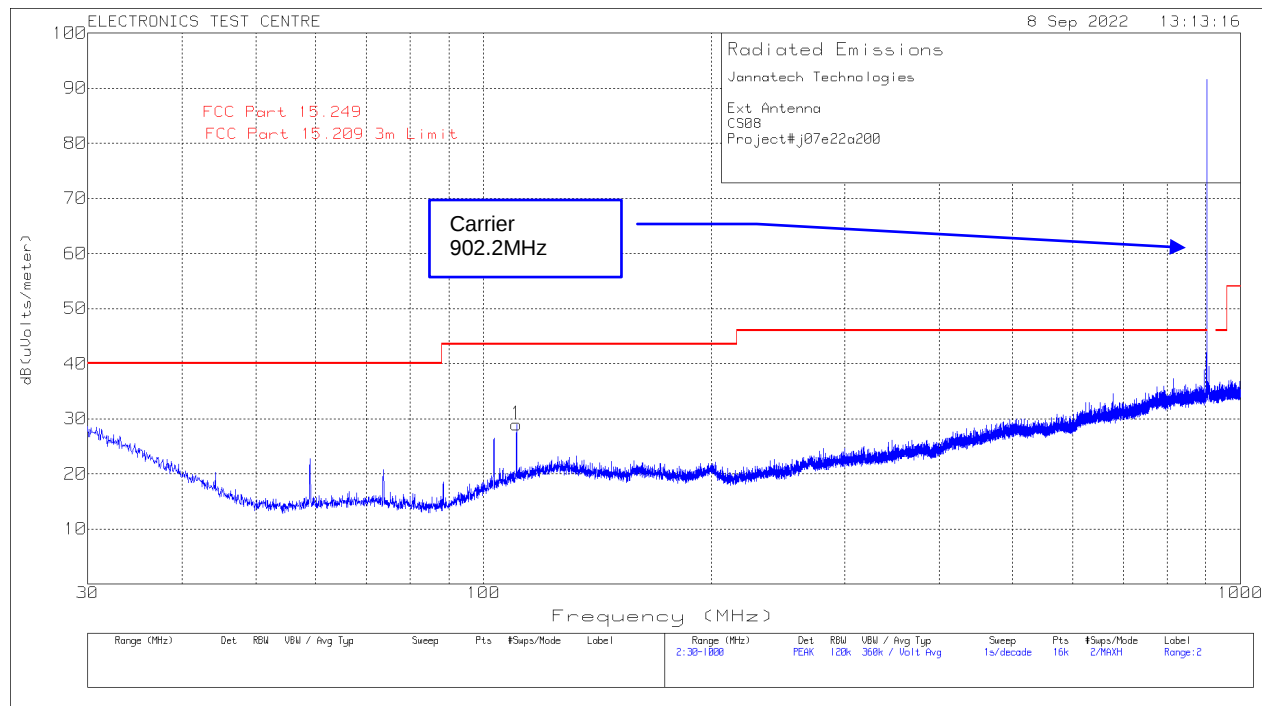
Plot of Radiated Emissions: Measuring Antenna 2nd Orientation



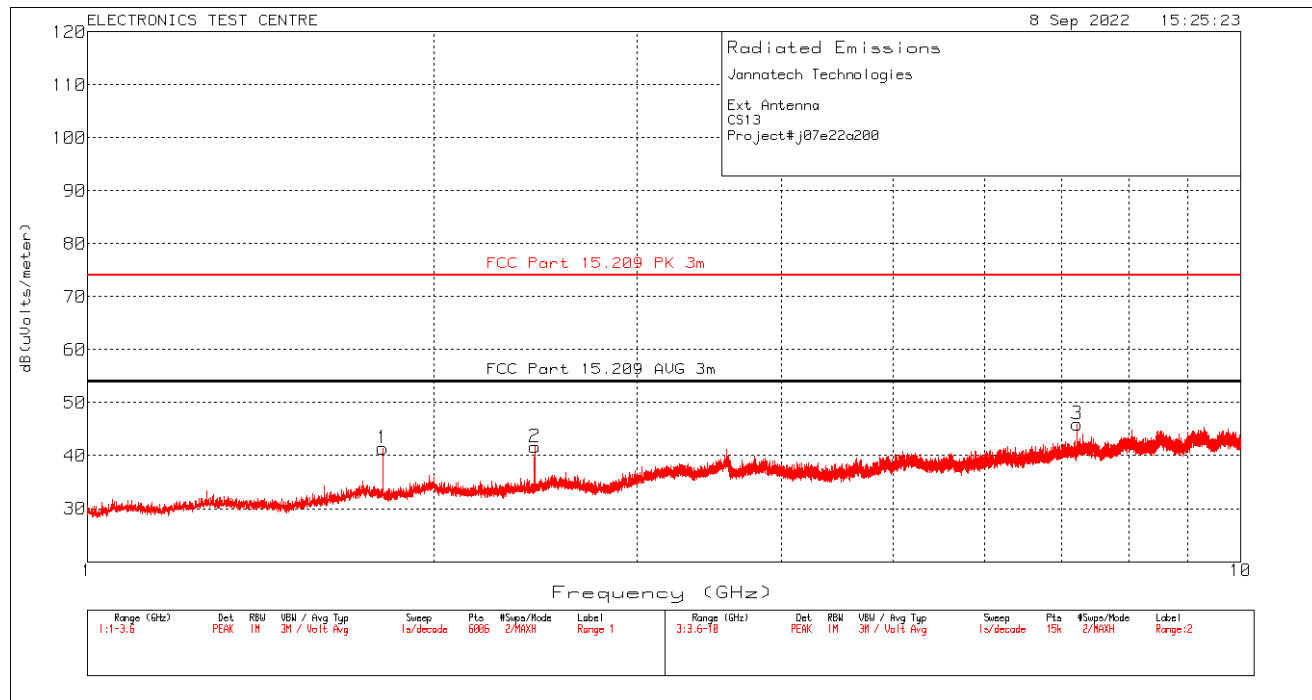
Plot of Radiated Emissions: Horizontal polarization



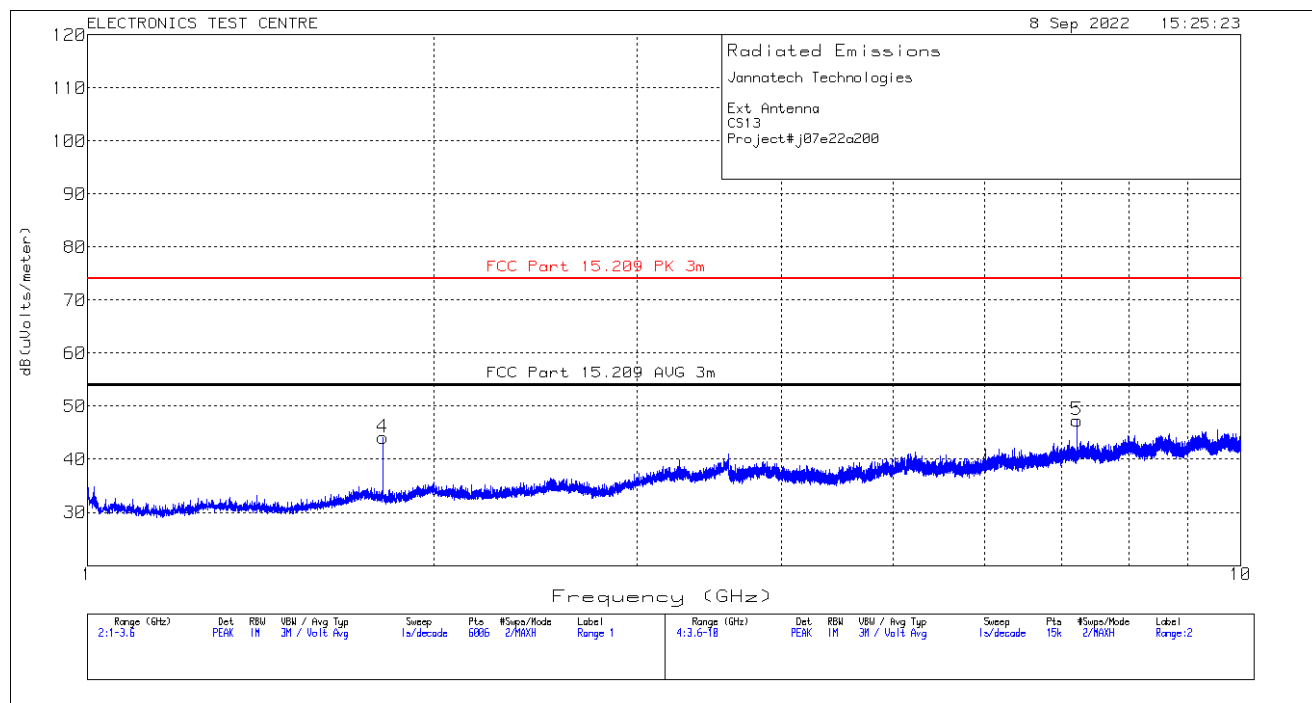
Plot of Radiated Emissions: Vertical polarization



Plot of Radiated Emissions: Horizontal polarization



Plot of Radiated Emissions: Vertical polarization



2.5 Radiated Emissions (Rx Mode)

Test Lab: Electronics Test Centre, Airdrie	EUT: CC1020 Module
Test Personnel: Janet Mijares	Standard: FCC Part 15.109
Date: 2022-09-09 (21.2° C, 28.9 % RH)	Basic Standard: ANSI C63.4-2014
EUT status: Compliant	

15.109 Radiated emission limits.

Frequency Of Emission (MHz)	Field Strength (dBµv/m)
30 – 88	40
88 – 216	43.52
216 – 960	46.02
Above 960	53.98
Criteria: The radiated emissions produced by a device, measured at a distance of 3 meters, shall not exceed the limits as specified.	

2.5.1 Test Guidance: ANSI C63.4-2014,

From 30 MHz to 1000 MHz, measurements are performed with a broadband biconilog antenna and a resolution bandwidth of 120 kHz.

Above 1000 MHz, measurements are performed with a DRG Horn antenna or a Standard Gain horn, and a resolution bandwidth of 1 MHz.

The scan is performed at discreet increments of turntable azimuth and stepped antenna height, with peak detector and Max Hold function which are selected in accordance with the applicable standard in order to assure capture of frequencies of interest. Optimization is performed based on the scan data.

After the pre-scan is completed, the frequencies of interest are optimized. The EUT is rotated in azimuth over 360 degrees and the direction of maximum emission is noted.

Antenna height is varied from 1 – 4 meters at this azimuth to obtain the maximum emission. Then the maximum level is measured with the appropriate detector and recorded. This may produce a different reading than the pre scan trace. Up to 1 GHz, measurements are performed with a Quasi-Peak detector. Above 1 GHz, measurements are recorded with Peak and/or Average detectors, as applicable.

2.5.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.5.3 Test Equipment

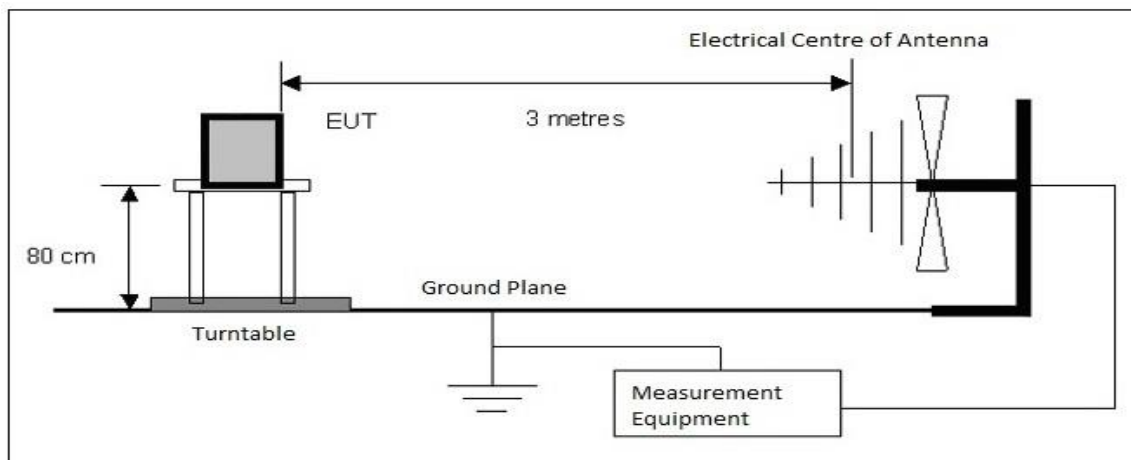
Testing was performed with the following equipment:

Equipment	Manufacturer	Model #	Asset #	Calibration Date	Calibration Due
EMC Software	UL	Ver. 9.5	ETC-SW-EMC 2.1	N/A	
EMI receiver	Agilent	N9038A FW 25.05	6130	2022-07-12	2023-07-12
Loop Antenna	EMCO	6502	10868	2021-05-11	2023-05-11
Biconilog Antenna	SUNAR	JB1	6905	2021-10-29	2023-10-29
DRG Horn	Tensor	4105	9588	2021-05-10	2023-05-10
Emission Cable 9KHz – 1GHz	Insulated Wire	KPS-1501A- 3600-KPS 01102006	4419	2022-06-23	2023-06-23
Emission Cable 1GHz – 26.5GHz	A.H. System	SAC-26G-8.23	6187	2022-06-29	2023-06-29
Pre-Amplifier	Hp	8447D	9291	Monitored	
Low Noise Amplifier (1 – 18 GHz)	MITEQ	JS43- 01001800-21- 5P	4354	Monitored	

2.5.4 Test Sample Verification, Configuration & Modifications

To cover the unintentional radiated emission. The both radios were configured in receive mode. Unit was placed at the center of turntable in semi-anechoic chamber 80cm above the ground plane and at a distance of 3m from the test receive antenna. The EUT met the requirements without modification.

EUT configuration for Radiated Spurious Emissions testing:



2.5.5 Radiated Emissions Data:

The emissions data are presented in tabular form, showing turntable azimuth, antenna height and polarization, the uncorrected spectrum analyzer reading, the correction factors applied, the net result, the value of the limit at the frequency investigated, and the Delta between the result and the limit.

Meter Reading in dBμV + Antenna Factor in dB/m + Gain/Loss Factor in dB = Corrected Field Strength in dBμV/m.

Delta = Field Strength - Limit

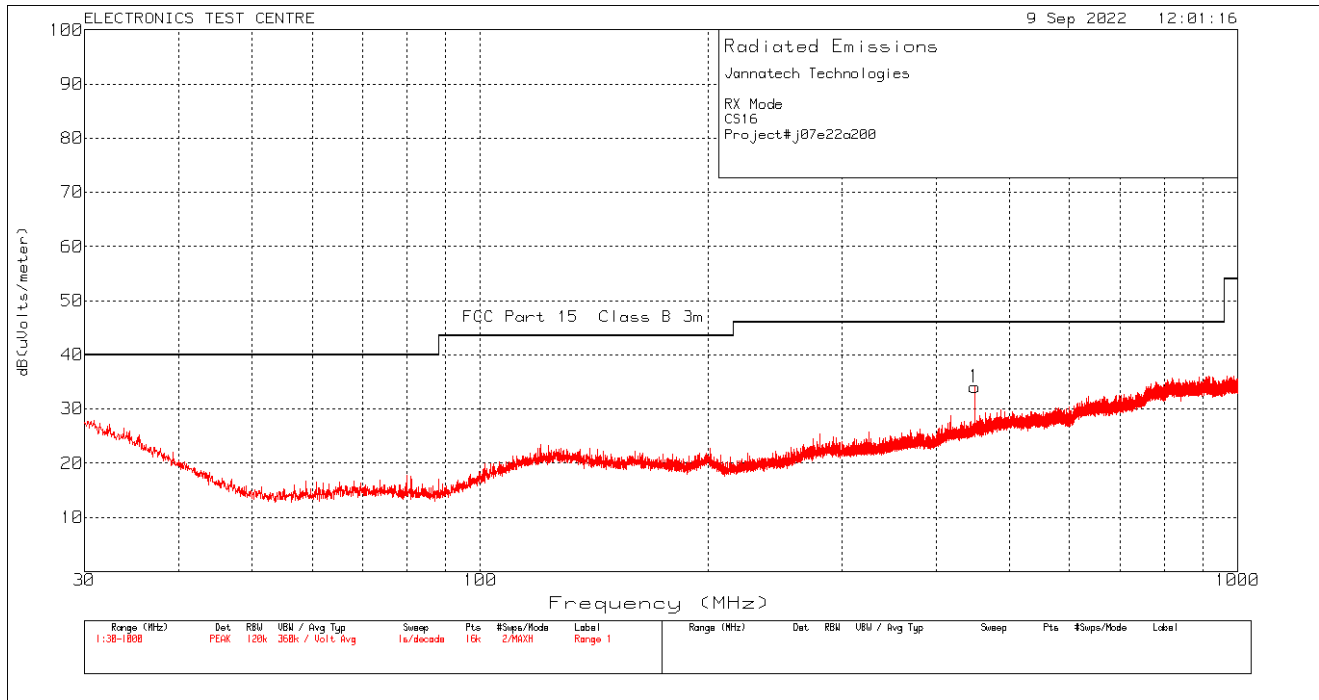
Notes:

- When a preamp is used, the resulting gain is compensated, producing a negative value for the Cable Loss.
- Measurements reported are the result of adjusting the turntable azimuth and antenna height to obtain the maximum EUT emission. This may produce a different reading than the plot trace. The plot is a Peak Hold function obtained at discreet increments of height and azimuth, while the reported measurement is obtained with the appropriate Quasi Peak or Average detector after the height and azimuth have been adjusted for maximum emission.
- QP: Quasi-Peak Detector, AV: Average Detector

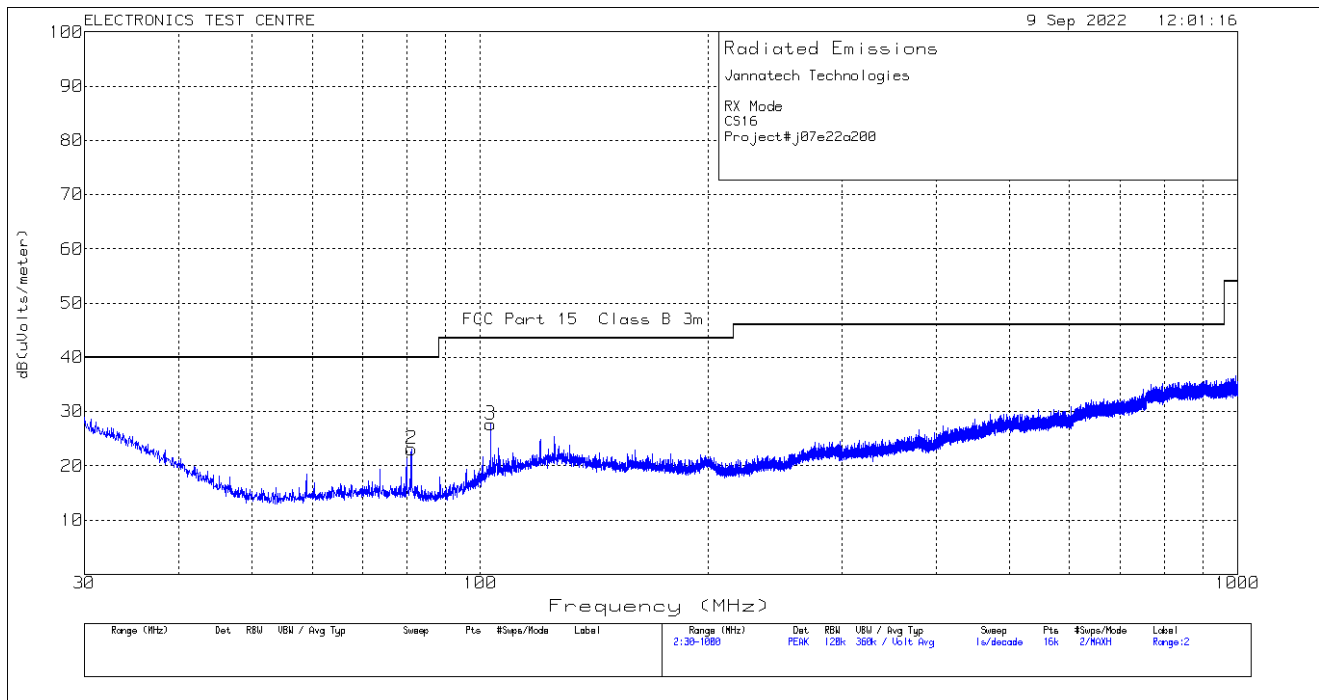
Negative values for Delta indicate compliance.

Freq. Marker	Freq. [MHz]	Raw reading [dBμV]	Det	Antenna Factor [dB/m]	Pre-AMP Gain [dB]	Corrected Reading [dBμV/m]	FCC 15.109 Limit [dBμV/m]	Delta [dB]	Azimuth [Deg]	Height [cm]	Polarization
1	449.73	31.55	QP	20.6	-20.9	31.25	46.02	-14.78	185	106	Horizontal
2	81.1	34.68	QP	11.6	-23.7	22.58	40.0	-17.43	99	105	Vertical
3	103.23	34.18	QP	15.1	-23.4	25.88	43.53	-17.65	97	108	Vertical
1	1803.4	44.27	AV	26.7	-34.3	36.67	53.98	-17.3	359	174	Horizontal
2	1803.3	45.03	AV	26.7	-34.3	37.43	53.98	-16.54	248	236	Vertical

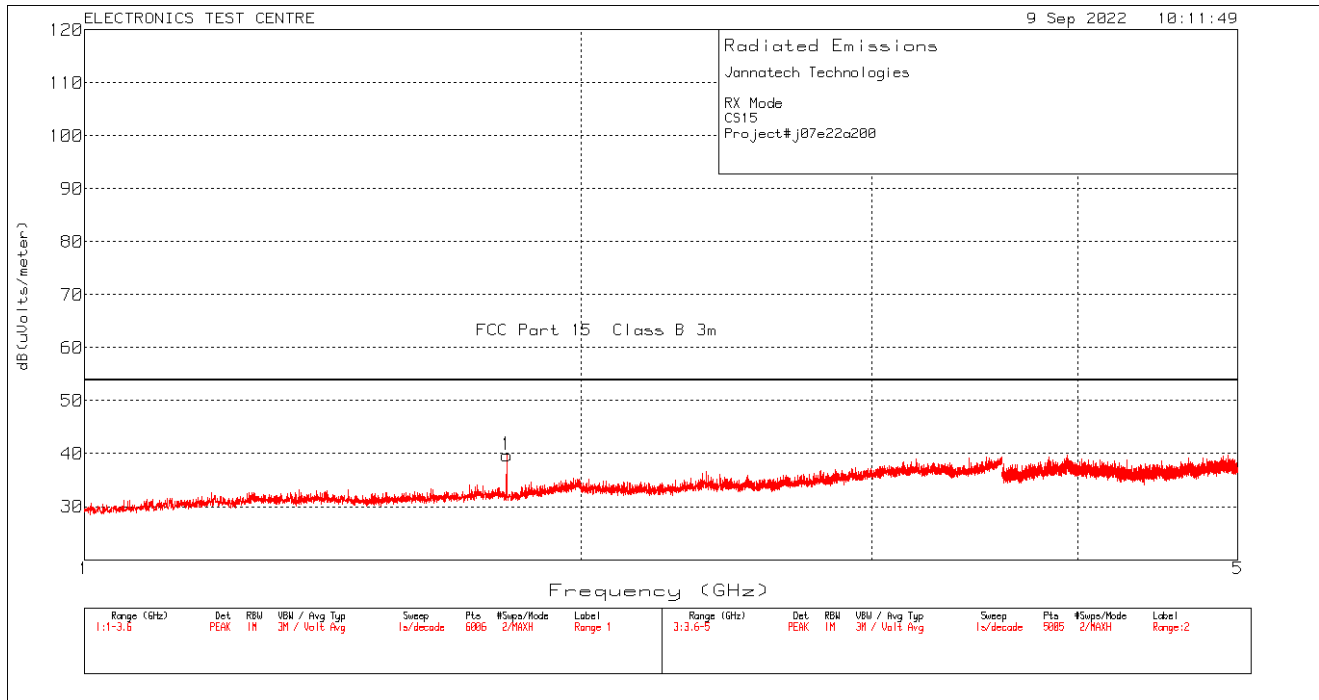
Plot of Radiated Emissions: Horizontal polarization



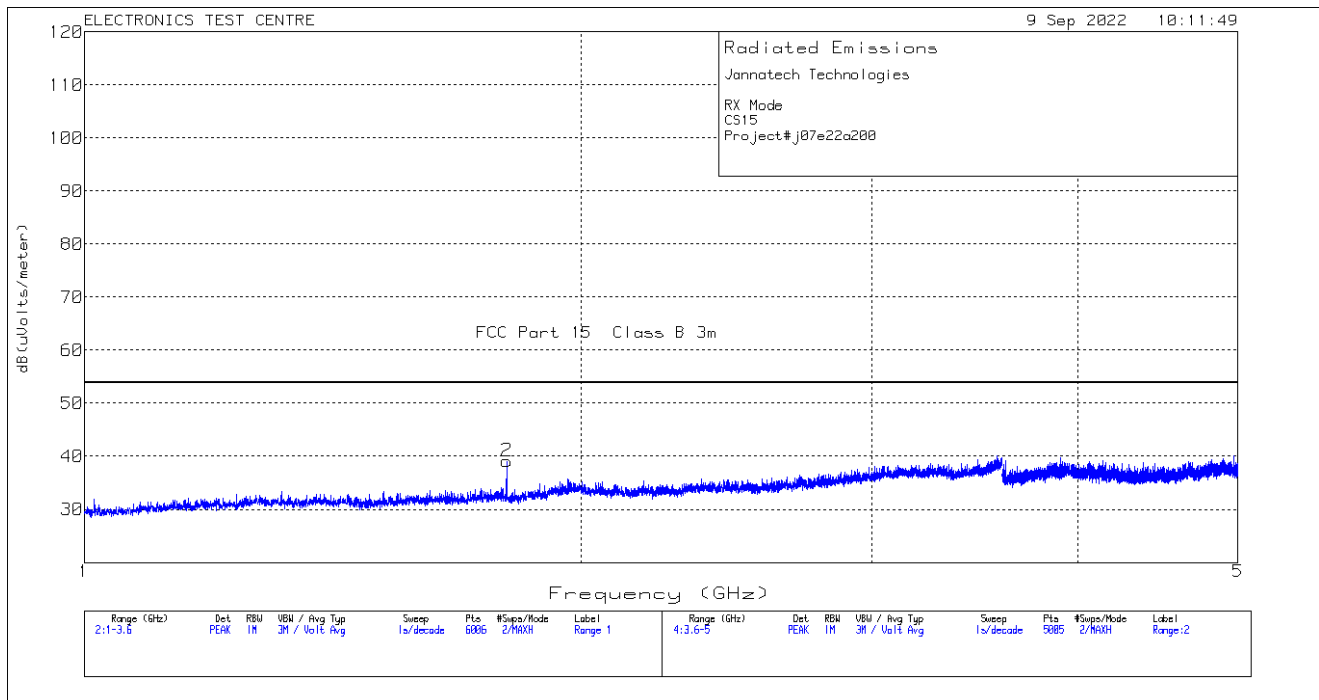
Plot of Radiated Emissions: Vertical polarization



Plot of Radiated Emissions: Horizontal polarization



Plot of Radiated Emissions: Vertical polarization

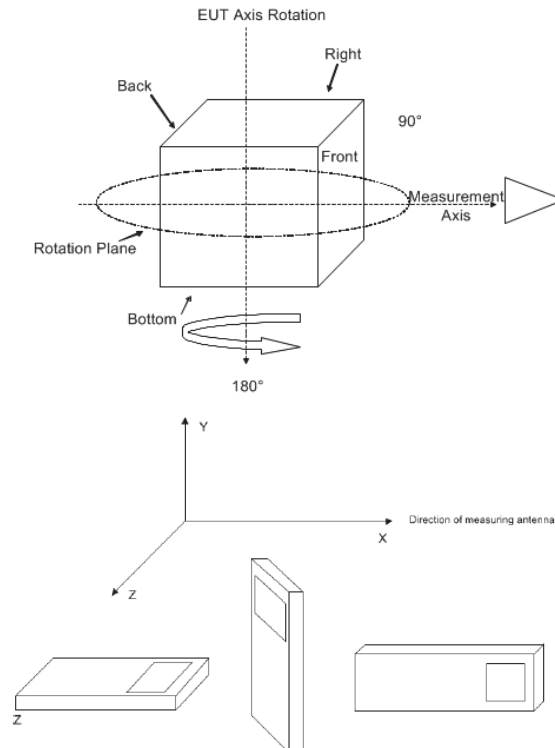


2.6 EUT Positioning Assessment

Test Lab: Electronics Test Centre, Airdrie	EUT: CC1020 Module
Test Personnel: Janet Mijares	Standard: FCC Part 15.249
Date: 2022-09-08 (21.0° C, 31.2% RH)	Basic Standard: ANSI C63.4-2014
EUT status: Assessed	
Radio module is tested with PCB Antenna on three axis's. Overall field Strength of PCB antenna is less than external antenna. Higher gain external antenna was used for detail analysis.	
Antenna	Worse Field Strength (dB μ v/m)
PCB Mount	73.68
External Mag Mount	91.8

Specification: ANSI C63.4-2014, Clause 6.3.2.1

Portable, small, lightweight, or modular devices that may be handheld, worn on the body, or placed on a table during operation shall be positioned on a non-conducting platform, the top of which is 80 cm above the reference ground plane. The preferred area occupied by the EUT arrangement is 1 m by 1.5 m, but it may be larger or smaller to accommodate various sized EUTs. For testing purposes, ceiling- and wall-mounted devices also shall be positioned on a tabletop. In making any tests involving handheld, body-worn, or ceiling-mounted equipment, it is essential to recognize that the measured levels may be dependent on the orientation (attitude) of the three orthogonal axes of the EUT. Thus, exploratory tests shall be carried out for various axes orientations to determine the attitude having maximum or near-maximum emission level.



2.7 RF Exposure

Test Lab: Electronics Test Centre, Airdrie	EUT: CC1020 Module Standard: FCC Part 1.1307(b)(1)
EUT status: Compliant	

Exempt: See the Environmental Assessment provided in a separate Exhibit.

3.0 TEST FACILITY

3.1 Location

The CC1020 Module was tested for emissions at the Electronics Test Centre laboratory located in Airdrie, Alberta, Canada. The Radio Frequency Anechoic Chamber (RFAC), identified as Chamber 1, has a usable working space measuring 10.6 m long x 7.3 m wide x 6.5 m high.

Measurements taken at this site are accepted by Industry Canada as evidence of conformity per registration file # 2046A. This site is also listed with the FCC under Registration Number CA2046.

The floor, walls and ceiling consist of annealed steel panels. The walls and ceiling are covered with ferrite tile, augmented by RF absorbant foam material on the end wall nearest the turntable, and on the adjacent walls and the ceiling. The chamber floor supports a 15 cm high internal floor, constructed of annealed steel panels, that forms the ground plane, and is bonded to the chamber walls.

The 3-m diameter turntable is flush-mounted with the floor. A sub-floor cable-way is provided to route cables between the turntable pit and EUT support equipment located in the Control Room. Cables reach the EUT through an opening in the centre of the turntable.

Test instrumentation and EUT support equipment is located in the Control Room, consisting of two shielded vestibules joined together at the side of the main room. Cables are routed through bulkhead panels between the rooms and the test chamber as required. Power feeds are routed into the main room and vestibules through line filters providing at least 100 dB of attenuation between 10 kHz and 10 GHz.

Either floor mounted or table-top equipment can be tested at this facility.

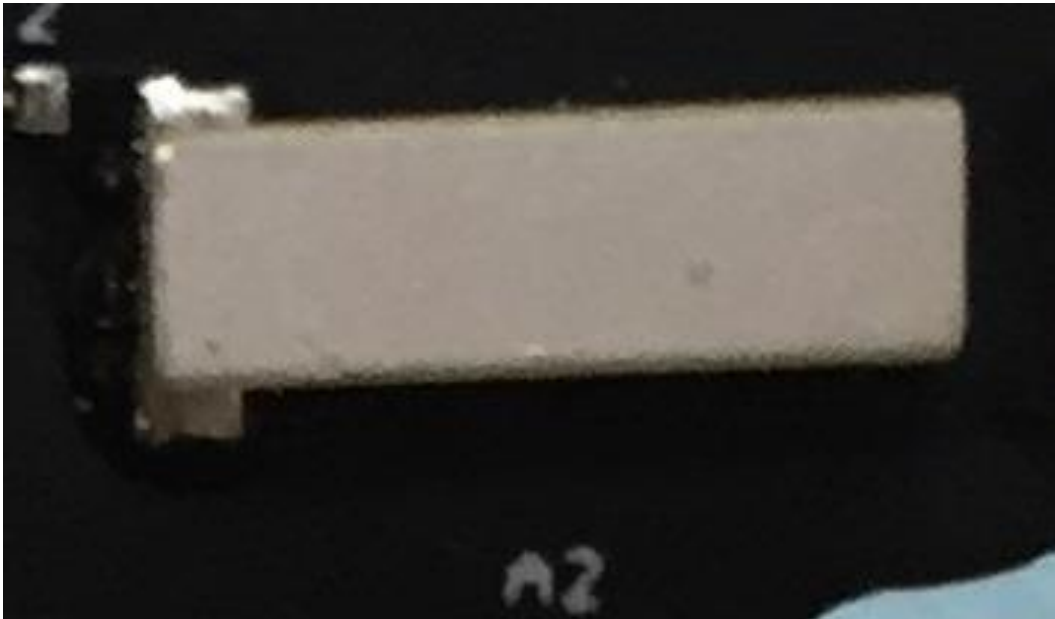
3.2 Grounding Plan

The CC1020 Module was placed at the centre of the test chamber turntable on top of a polystyrene foam table. The EUT was no external ground connected to unit.

3.3 Power Supply

All EUT power was supplied by a DC power supply.

W3014 PCB Antenna



MOBILE Model# MLPV800 Mag mount antenna



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