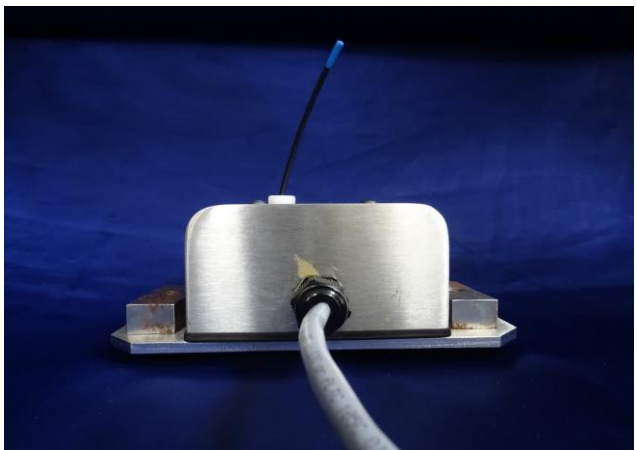


Prüfbericht-Nr.: <i>Test report no.:</i>	IN24AVES 001	Auftrags-Nr.: <i>Order no.:</i>	146785551 010	Seite 1 von 52 Page 1 of 52
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	2269507	Auftragsdatum: <i>Order date:</i>	2023-04-26	
Auftraggeber: <i>Client:</i>	Trimble Inc. 5475 Kellenburger Road , Building 2, Dayton, Ohio 45424, United States			
Prüfgegenstand: <i>Test item:</i>	Wireless Boom Angle Sensor and Powered Boom Angle Sensor			
Bezeichnung <i>Identification</i>	GS010-01-V2 & GS010-01-PV-V2	Serien -Nr.: <i>Serial no.:</i>	Engineering Sample	
Auftrags-Inhalt: <i>Order content:</i>	Testing and issue of Test Report and Grant Certificate			
Prüfgrundlage: <i>Test specification:</i>	FCC Part 15 Subpart C 15.247,15.205, 15.207 & 15.209 RSS 247 Issue 3, RSS Gen Issue 5			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2023-10-18			
Prüfmuster-Nr.: <i>Test sample no:</i>	A003584412-013 A003584412-031			
Prüfzeitraum: <i>Testing period:</i>	2023-10-19 - 2023-11-05			
Ort der Prüfung: <i>Place of testing:</i>	Wireless laboratory, Bangalore			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (India) Pvt. Ltd. 27/B,2nd cross road, Electronic city Phase1, Bangalore-560100, India FCC Test Site Registration No: 496599 IC Test Site Registration No: 3466E-1			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	genehmigt von: <i>authorized by:</i>			
Datum: <i>Date:</i> 2024-08-12			Ausstellatum: <i>Issue date:</i> 2024-08-12	
Stellung / Position:	Yogesh V Senior Engineer	Stellung / Position:	Madhu K N Asst. Manager	
Sonstiges / Other:	FCC ID: S9E-GS200C IC: 5817A-GS000C			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

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1	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. <i>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i>
2	Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben. <i>As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged.</i>
3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. <i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i> <i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i>
4	Die Entscheidungsregel für Konformitätserklärungen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. <i>The decision rule for statements of conformity in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report.</i>

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TEST SUMMARY

Test Item	FCC	ISED	Result
Maximum conducted (average) output power	FCC 15.247(b)(3)	RSS 247 Issue 3, Section 5.4 (d)	Pass
Maximum Power Spectral Density	FCC 15.247(e)	RSS 247 Issue 3, Section 5.2 (b)	Pass
Occupied bandwidth and 6dB Bandwidth	15.247 (a) (2)	RSS-247 issue 3 5.1 (c)	Pass
Emissions in non-restricted frequency bands	15.247 (d)	RSS-247 issue 3 5.5	Pass
Spurious Radiated Emissions and Restricted Bands of Operation	FCC 15.209 / FCC 15.205	RSS-GEN issue 3 Clause 8.9, 8.10	Pass
Conducted Spurious Emission on AC Power lines	FCC 15.207	RSS-Gen Issue 5,Section 8.8	Pass

Product Category: Electronics Testing
Test Discipline: EMC Test Facility

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REVISION HISTORY OF THIS REPORT

Report Number	Version	Description	Issue date
IN24AVES 001	01	Initial issue of report	2024-08-12

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1 GENERAL REMARKS

1.1 Attachments

All attachments are part of this test report and are issued in separate document

1. TEST SETUP PHOTOS
2. EUT EXTERNAL PHOTOS
3. EUT INTERNAL PHOTOS
4. FCC LABEL AND LABEL LOCATION
5. BLOCK DIAGRAM
6. SPECIFICATION OF EUT
7. SCHEMATIC DIAGRAMS
8. BILL OF MATERIAL
9. USER MANUAL
10. Maximum Permissible Exposure Information

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2 TEST SITES

2.1 Testing Facilities

1. TÜV Rheinland (India) Pvt.Ltd.,
27/B, 2nd Cross,
ElectronicCityPhase1
Bangalore – 560 100,
India
2. TUV Rheinland (India) Pvt.Ltd.,
108 , Beside ISBR Business School,
Electronic city Phase I
Bangalore - 560 100,
India

2.2 List of Test and Measurement Instruments

Table 1: List of test and measurement instruments

Equipment	Manufacturer	Model Name	Serial Number	Firmware Versions	Calibration Due Date	Periodicity	Test Facility
EMI Receiver	Rohde & Schwarz	ESW 44	101732	4.73 SP5	04.08.2024	Yearly	Radiated Spurious Emission
EMI Receiver	Rohde & Schwarz	ESW 44	101733	1.72SP1	15.02.2024	Yearly	
Horn Antenna	Schwarzbeck	HAX-18	HAX18-802	-	03.09.2024	Yearly	
Balun & Biconical Antenna	Schwarzbeck Mess-Elektronik	BBA 9106+VHBB 9124	9124-1117	-	05.05.2024	Yearly	
Log-Periodic Antenna	Schwarzbeck mess-elektronik	VUSLP 9111B	9111B-111	-	17.02.2024	Yearly	
Fully Anechoic Chamber	Albatross	-	-	-	-	-	Antenna – Port Conducted Test
Signal Analyser	Anritsu Corporation	MS2830A	6261983953	-	31.10.2024	Yearly	
Spectrum Analyzer	Agilent	E4407B	US41192772	A.14.06	27.12.2023	Yearly	

Table 2: Instrument application Software versions

SL. No.	Test Type	Application software	Version
1	Radiated spurious emission measurement in FAC	EMC 32	10.60.20
2	Radiated spurious emission measurement in 10mtr SAC	BAT EMC	3.20.0.17

3 GENERAL PRODUCT INFORMATION

3.1 Product Function and Intended Use

The Wireless Boom Angle Sensor is used in crane lifting applications. This battery-operated device measures the angle of the boom of crane and reports the data to be displayed on GS920 Display.

The Powered Boom Angle Sensor is used in crane lifting applications. This externally powered sensor measures the angle of the boom of crane and reports the data to be displayed on GS920 Display.

3.2 Ratings and System Details of Equipment under Test

Table 3: Ratings and System Details as declared by Client*

Protocol	Sub-GHz
Operating Frequency Range	902MHz to 928MHz
Channel Spacing	1MHz
Tx Transmitting Power	10 dBm
Maximum measured e.i.r.p	9.04 dBm @ 902MHz
Modulation	2FSK
Data Rate	19.2Kbps
Number of antennas	1
Antenna Gain & Antenna Type	Monopole & refer clause 4.7 for antenna gain
Supply Voltage to Product	Wireless Boom Angle Sensor: 3.6 VDC Powered Boom Angle Sensor: 10-30 VDC
Environmental conditions	-40 to 60°C humidity range 0% to 100%
EUT Dimension(LxWxH)	6.5*2.9*5.9 inches

***Disclaimer:** The information/data is supplied by the client and the same is considered to arrive at the final value. Any changes made apart from the specified specification, can directly impact on the tests results. Refer the products user manual for more details.

3.3 Measurement Uncertainty:

Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$

Table 4: Measurement Uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	$\pm 5 \%$
RF output power, conducted	$\pm 1.5 \text{ dB}$
Power Spectral Density, conducted	$\pm 3 \text{ dB}$
Unwanted Emissions, conducted	$\pm 3 \text{ dB}$
All emissions, radiated	$\pm 6 \text{ dB}$
Temperature	$\pm 3 \text{ }^{\circ}\text{C}$
Supply Voltages	$\pm 3 \%$
Time	$\pm 5 \%$

4 TEST SET-UP AND OPERATION MODE

4.1 Principle of Configuration Selection

Transmission was enabled with highest possible duty cycle on low, mid and high channels.

4.2 Test Operation and Test Software

Hardware Version : MB104-00-SD-A

Software version : 3108

Software Name: BoomAngle_FCC

Hardware Name: Wireless Boom Angle Sensor and Powered Boom Angle Sensor

4.3 Special Accessories and Auxiliary Equipment

- None

4.4 Countermeasures to achieve EMC Compliance

- None

4.5 Simultaneous Transmission

This product does not support Simultaneous operation.

4.6 List of frequencies

Frequency Band (GHz)	Channel No.	Frequency (MHz)
Sub-GHz (902 MHz – 928 MHz)	Low	903
	:	:
	Mid	916
	:	:
	High	927

Table 5: List of SubGHz Center frequencies

Channel used for SubGHz testing

Channel Low : 903MHz

Channel Mid : 916MHz

Channel High : 927MHz

4.7 Antenna Gain

Frequency (MHz)	Antenna Gain TUV
902	1.68
916	0.40
927	0.38

Table 6: Antenna Gain

Note:

1. TUV Sample Identification number : A003584412-013 – A003584412-031 Radiated & Conducted test Sample.

5 OPERATIONAL DESCRIPTION

The Sensors sends the data to the gateway using the sub-GHz band. The sub-GHz module is a communication module that works within the frequency band of 902 MHz to 928 MHz and uses 2-FSK modulation to communicate. Data rate is 19.2kbps

The Wireless Boom Angle Sensor is used in crane lifting applications. This battery-operated device measures the angle of the boom of crane and reports the data to be displayed on GS920 Display.

The Powered Boom Angle Sensor is used in crane lifting applications. This externally powered sensor measures the angle of the boom of crane and reports the data to be displayed on GS920 Display.

6 TEST METHODOLOGY

6.1 Radiated Emission Test

The radiated emission measurement was performed according to the procedures in ANSI C63.10-2013. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable for below 1 GHz & 1.5 m height for above 1 GHz measurement, and the EUT is 3 meters far from the measuring antenna. The turntable was rotated 360° for obtaining the maximum emission. The height of the measuring antennas was scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained. The measurement above 1000 MHz was performed by horn antenna, The measurement below 30 MHz was performed by loop antenna, Measurement from 30 MHz to 200 MHz was performed by Baloon and Biconical Antenna, and measurement from 200 MHz to 1 GHz was performed by Log-Periodic Antenna.

The EUT was rotated around the X-, Y-, and Z-Axis and the results from worst case axis are recorded

6.1.1 Test Setup Configuration

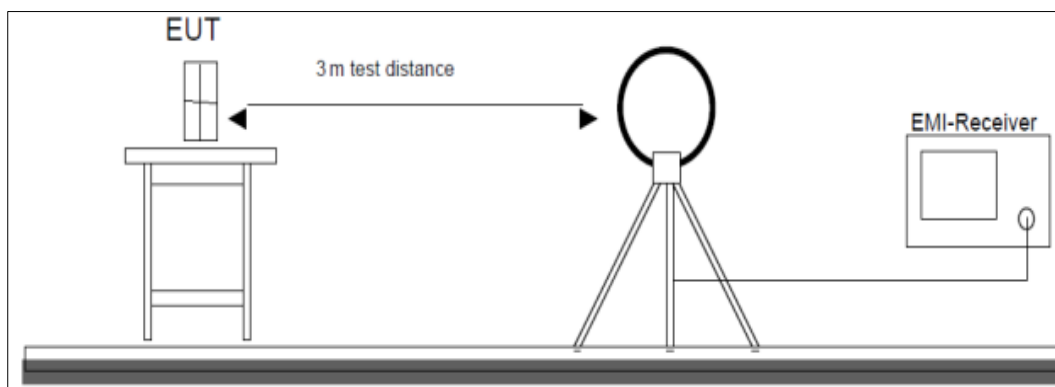


Figure 1: Frequency Range 9 kHz- 30 MHz

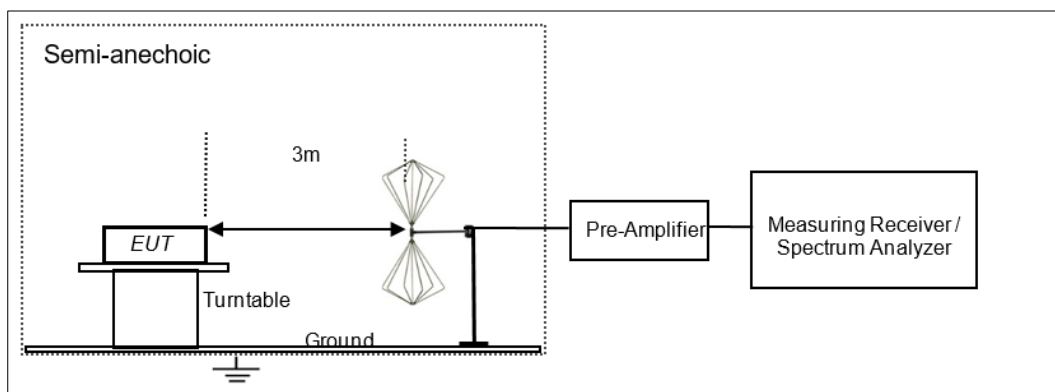


Figure 2: Frequency Range 30 MHz – 200 MHz

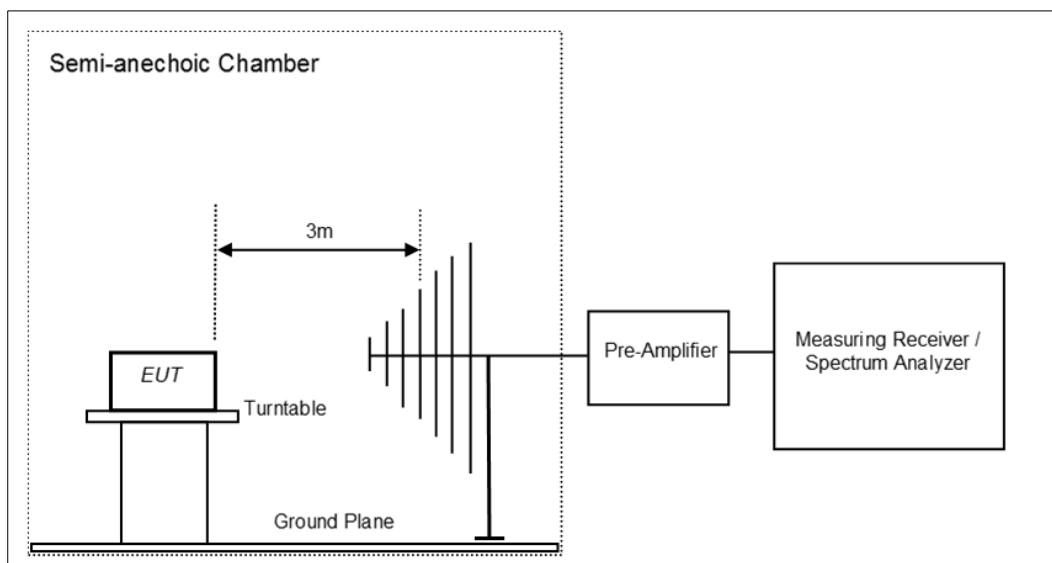


Figure 3: Frequency Range 200 MHz - 1GHz

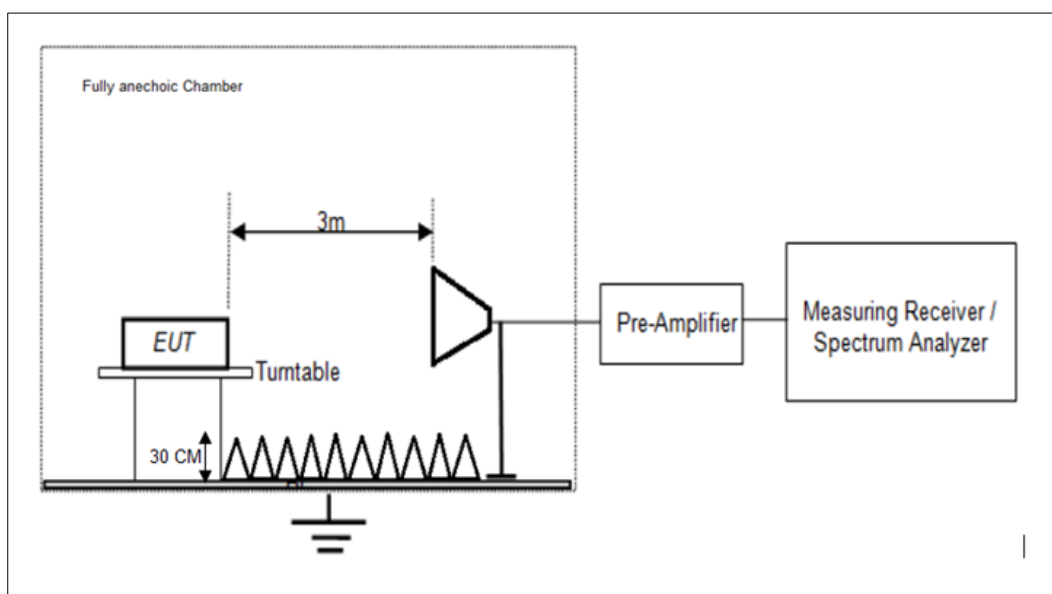


Figure 4: Frequency Range above 1 GHz

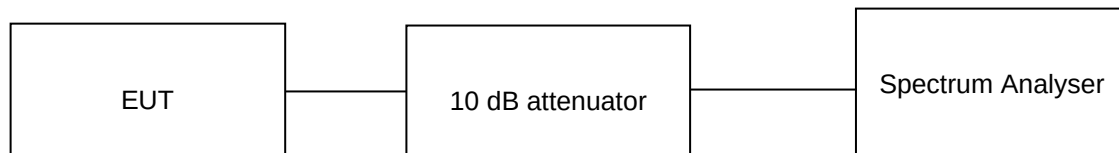
7 TEST RESULTS

7.1 Maximum Average Conducted Output Power

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (b)(2) RSS-247 issue 3, section 5.4 (d)
Test Method	Subclause 11.9.2.2.2 of ANSI C63.10
Measurement Bandwidth	10kHz
Detector	Average sample detector method
Port of testing	Antenna port
Requirement	Power ≤ 1 W (30 dBm) & e.i.r.p ≤ 4 W (36 dBm)



Test Condition

Normal Test Condition:

Temperature (Norm) = + 21.5 °C Voltage = Wireless Boom Angle Sensor: 3.6 VDC Relative humidity: 63%
 Powered Boom Angle Sensor: 10-30 VDC

KDB Guidelines applied:

Measurements were made as per section 9(b) in KDB 558074 D01 15.247 Measurement Guidance v05r02.

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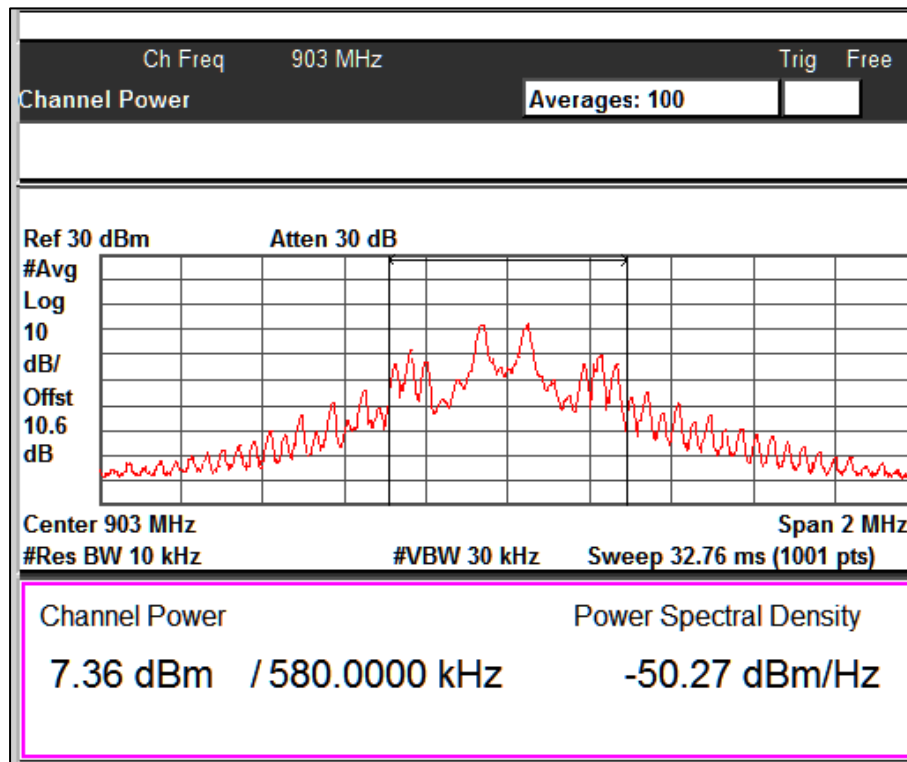
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Test results:

Note:

1. All the losses are included during measurement and final values are mentioned in the test report
2. Total Output power (dBm) = Measured power (dBm) + Attenuator factor (10dB) + Cable loss (0.6dB)
3. This product do not support additional beamforming gain / directional gain, it uses single antenna and hence Directional gain of the single antenna can be referred in clause 4.7 Antenna Gain

Channel Frequency (MHz)	Measured Average power (dBm)	e.i.r.p (dBm)	Power Limit(dBm)	e.i.r.p Limit (dBm)
903	7.36	9.04	30.00	36.00
916	6.99	7.39	30.00	36.00
927	6.64	7.02	30.00	36.00

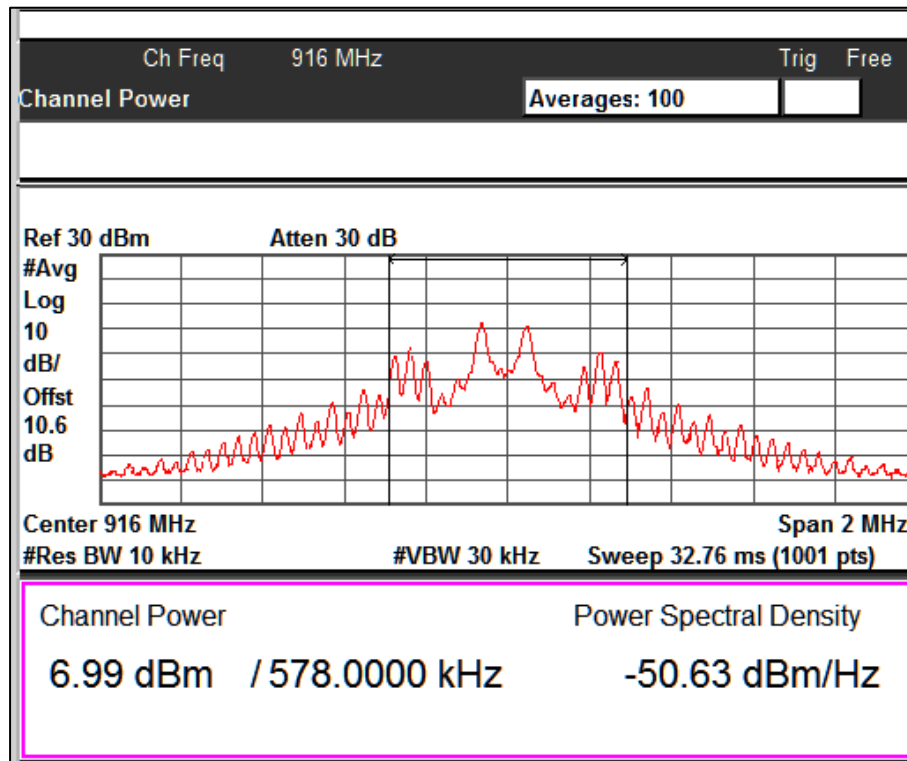


Channel Frequency: 903MHz

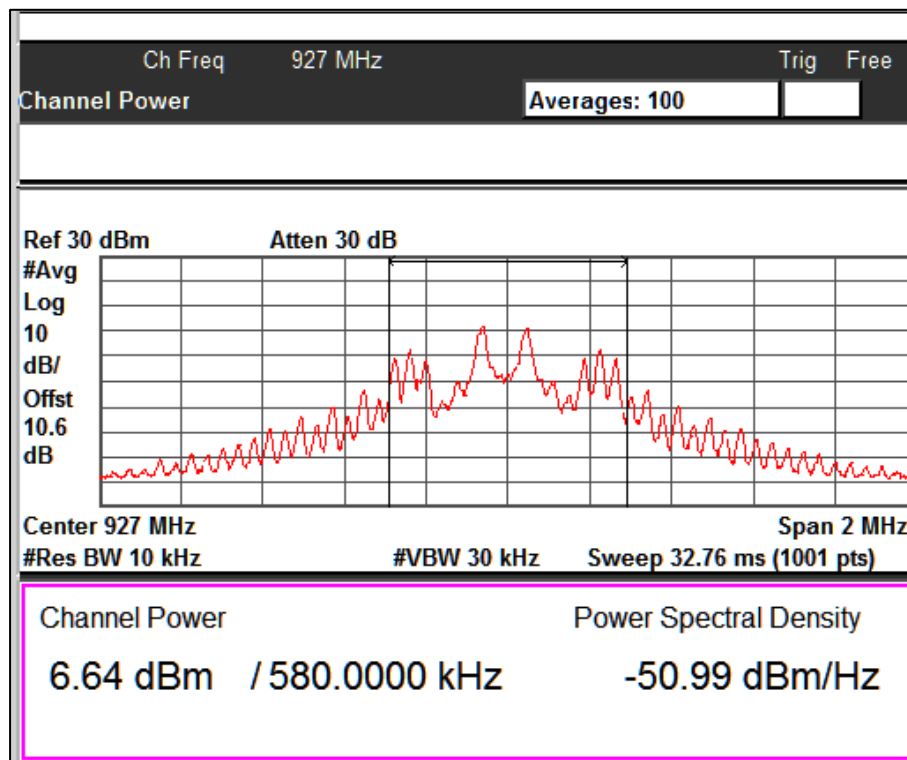
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Channel Frequency: 916MHz



Channel Frequency: 927MHz

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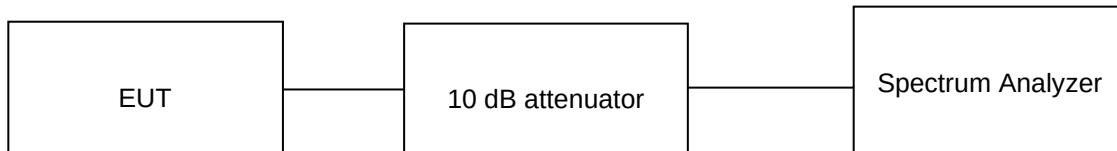
7.2 Maximum Power Spectral Density

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (e) / RSS 247 Issue 3, Section 5.2 (b)
Test Method	Subclause 11.10.3 of ANSI C63.10
Measurement Bandwidth	100 kHz
Detector	Average sample detector mode
Port of testing	Antenna port
Requirement	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm

Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 21.5 °C Voltage = Wireless Boom Angle Sensor: 3.6 VDC Relative humidity: 63%
 Powered Boom Angle Sensor: 10-30 VDC

KDB Guidelines applied:

Measurements were made as per section 8.4 in KDB 558074 D01 15.247 Measurement Guidance v05r02.

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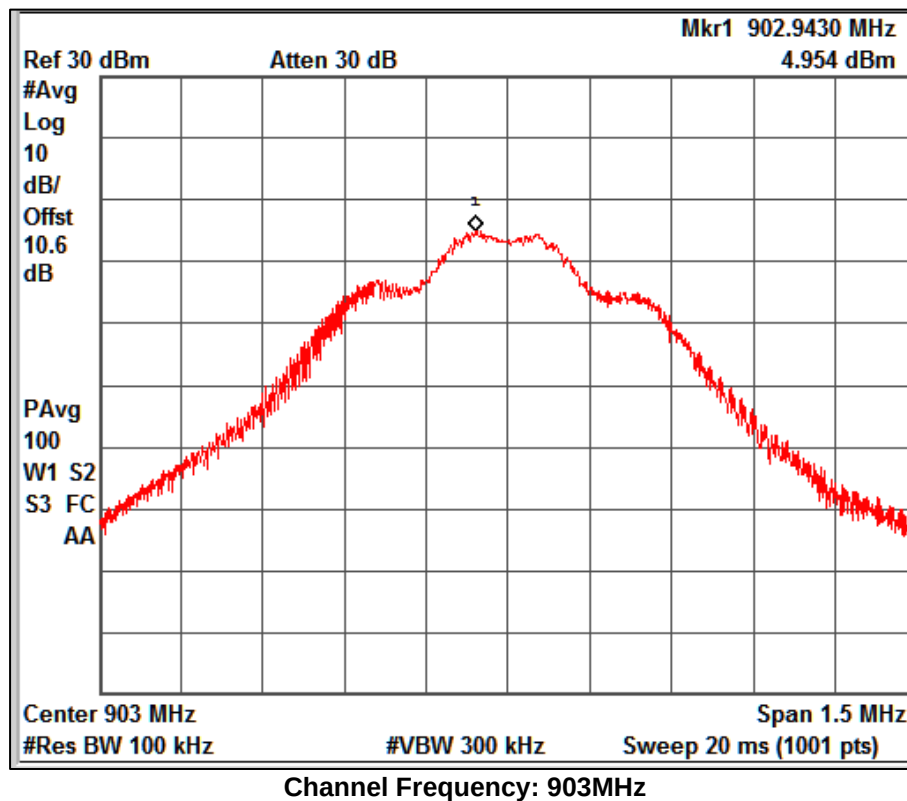
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Test results:

Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. Total Average PSD (dBm) = Measured PSD (dBm) + Attenuator factor (10dB) + Cable loss (0.6dB)
3. This product do not support additional beamforming gain / directional gain, it uses signal antenna and hence directional gain of the single antenna can be referred in clause 4.7 Antenna Gain

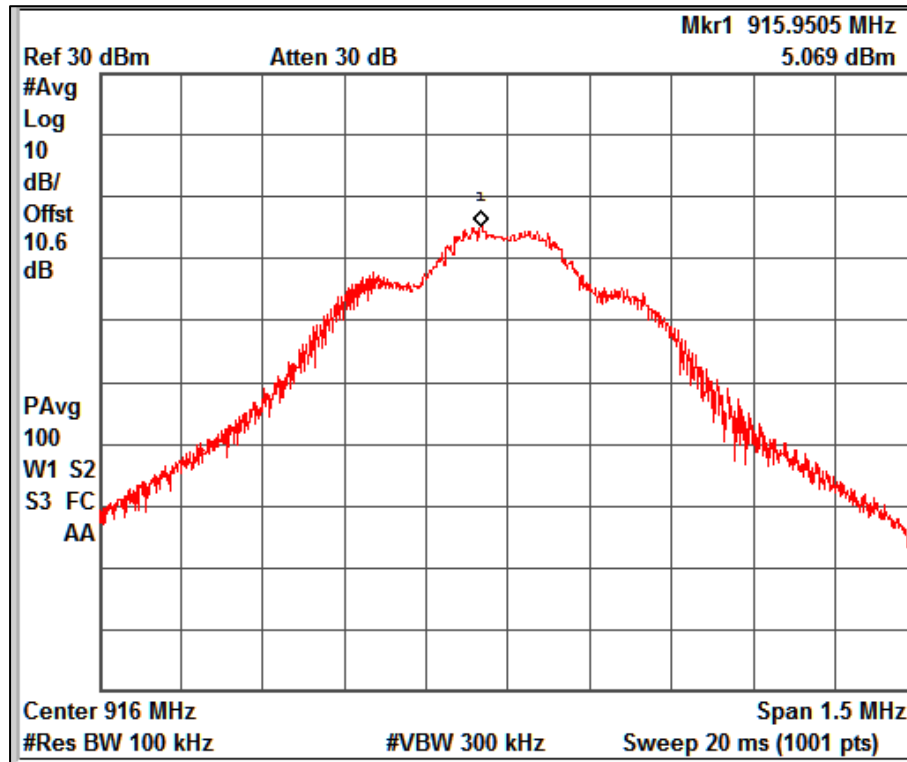
Channel Frequency (MHz)	Measured PSD (dBm)	e.i.r.p PSD (dBm)	PSD Limit (dBm/100KHz)
903	4.95	6.63	8
916	5.06	5.46	8
927	4.26	4.64	8



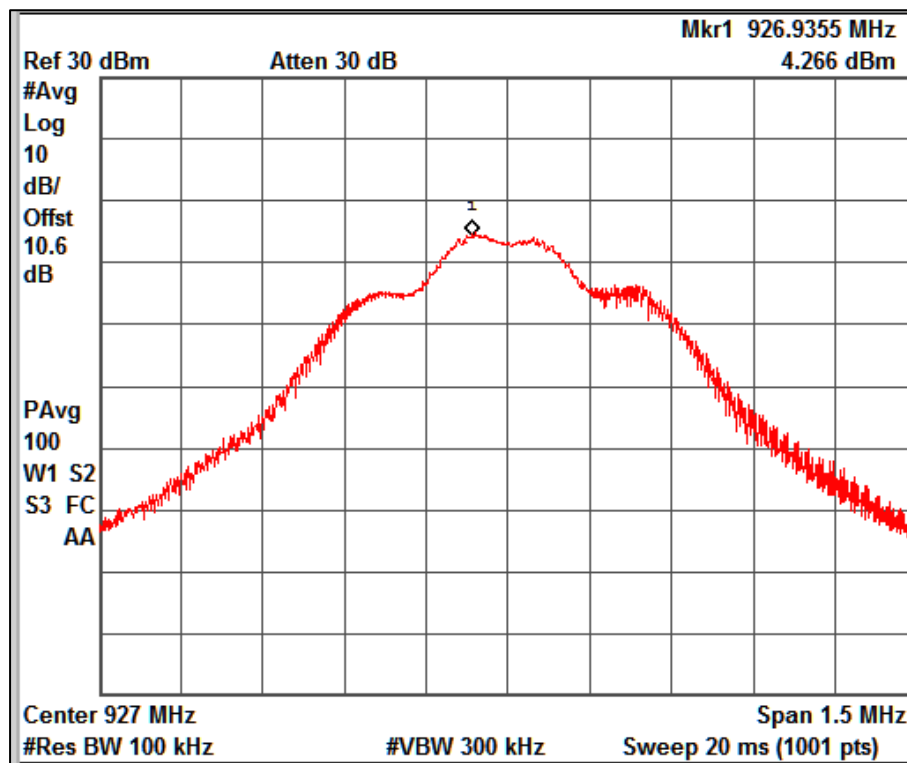
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Channel Frequency: 916MHz



Channel Frequency: 927MHz

7.3 Occupied bandwidth

Result

Pass

Test Specification

FCC part 15 Subpart C 15.247 (a) (i)
RSS-247 issue 3, section 5.1 (c)

Test Method

Subclause 11.8.1 & 6.9.2 of ANSI C63.10

Measurement Bandwidth

100 kHz

Detector

Peak

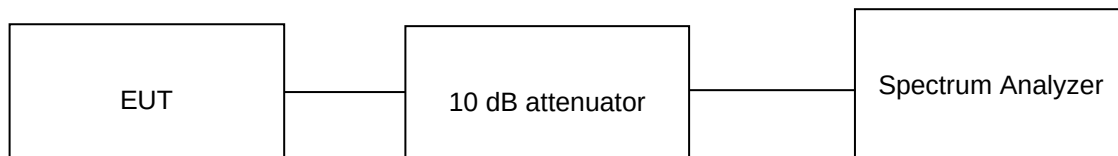
Port of testing

Antenna port

Requirement

The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 21.5 °C

Voltage = Wireless Boom Angle Sensor: 3.6 VDC

Relative humidity: 63%

Powered Boom Angle Sensor: 10-30 VDC

KDB Guidelines applied:

Measurements were made as per section 9(b) in KDB 558074 D01 15.247 Measurement Guidance v05r02.

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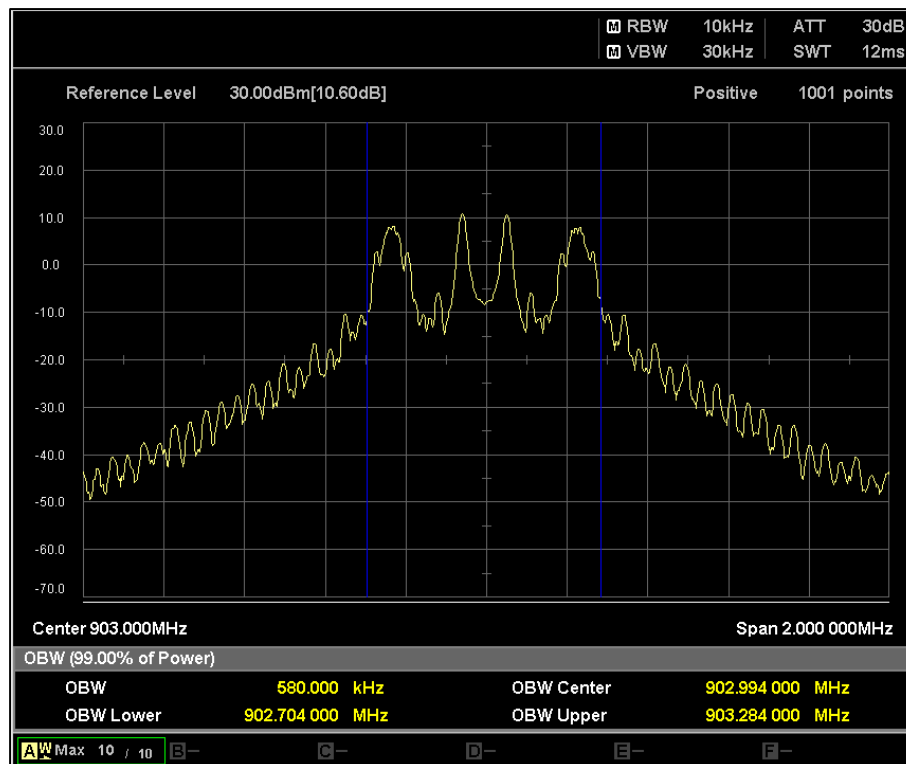
Test results:

Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. Total Peak Output power (dBm) = Measured Peak power (dBm) + Attenuator factor (10dB) + Cable loss (0.6dB)
3. This product do not support additional beamforming gain / directional gain, it uses single antenna and hence Directional gain of the single antenna can be referred in clause 4.7 Antenna Gain.

Channel Frequency (MHz)	99% OBW (KHz)	6dB BW (KHz)	Minimum Limit (KHz)
903	580	832.97	250
916	578	822.37	250
927	580	823.14	250

99% Band width

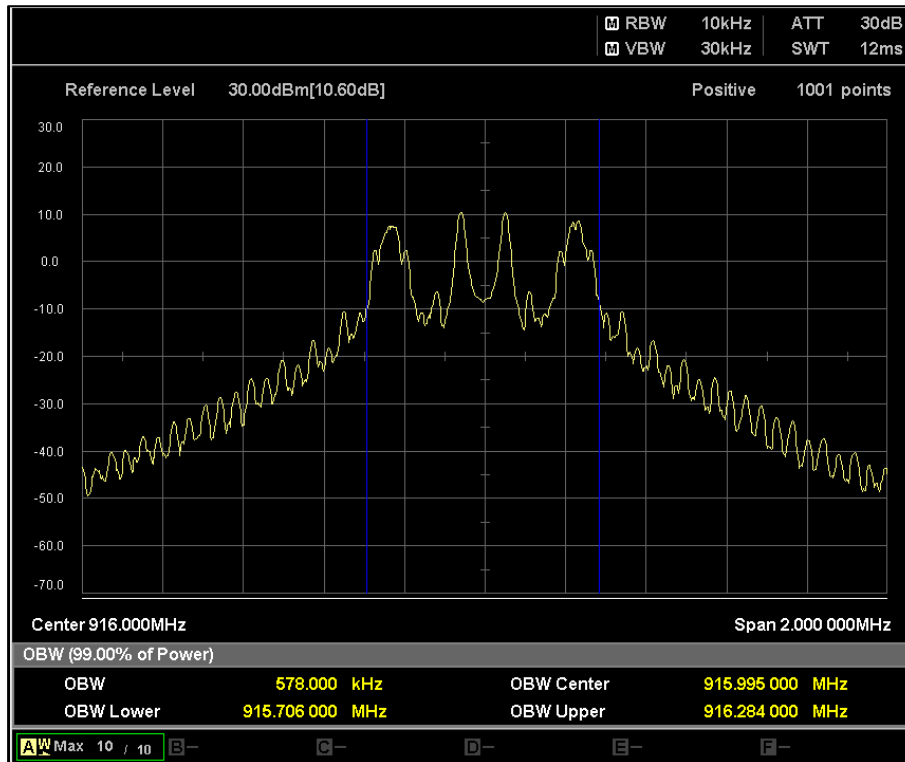


Channel Frequency: 903MHz

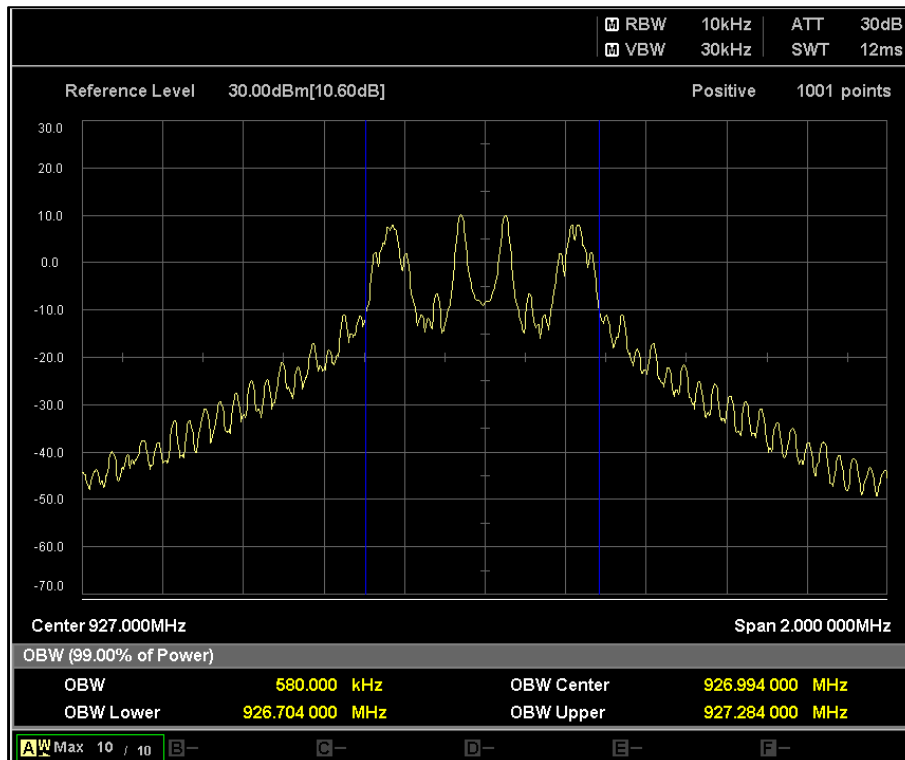
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Channel Frequency: 916MHz



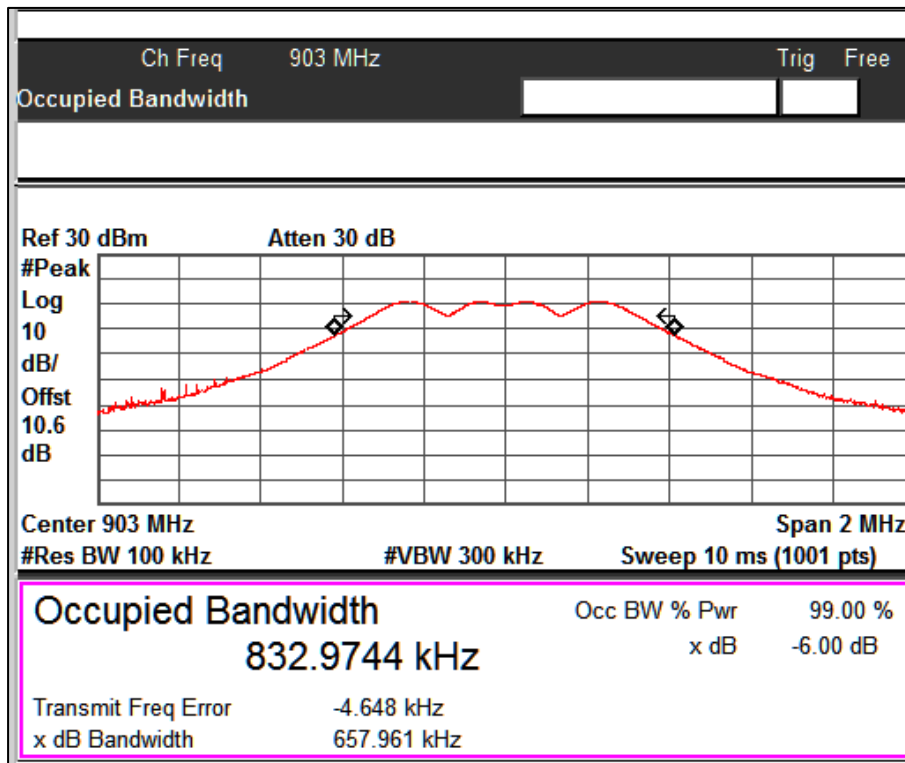
Channel Frequency: 927MHz

Prüfbericht - Nr.:
Test Report No.:

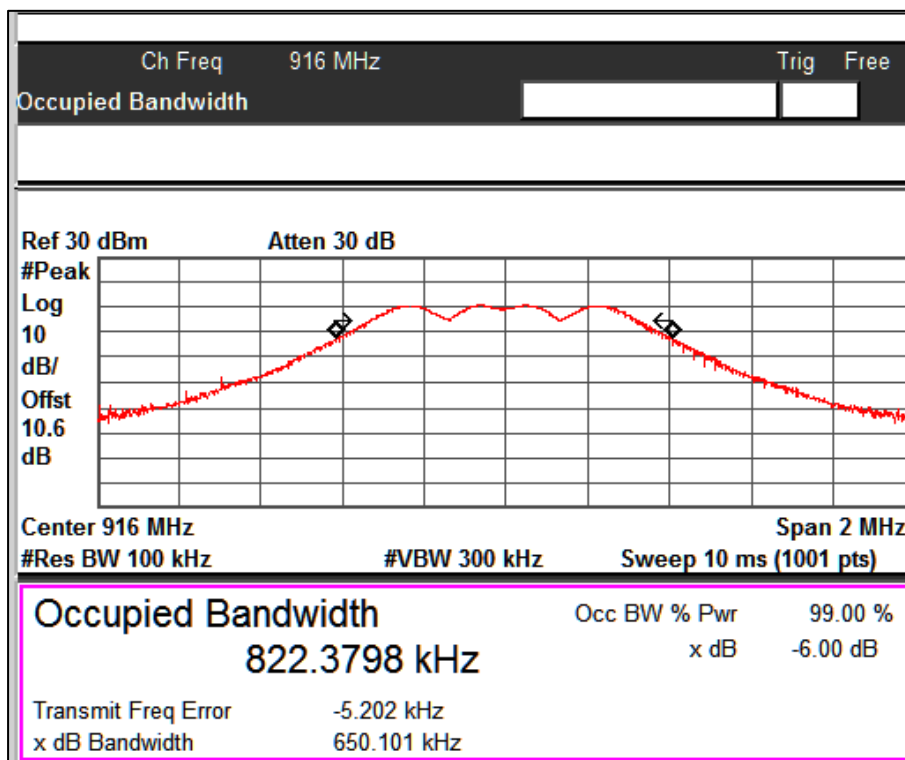
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DTS Band width



Channel Frequency: 903MHz



Channel Frequency: 916MHz

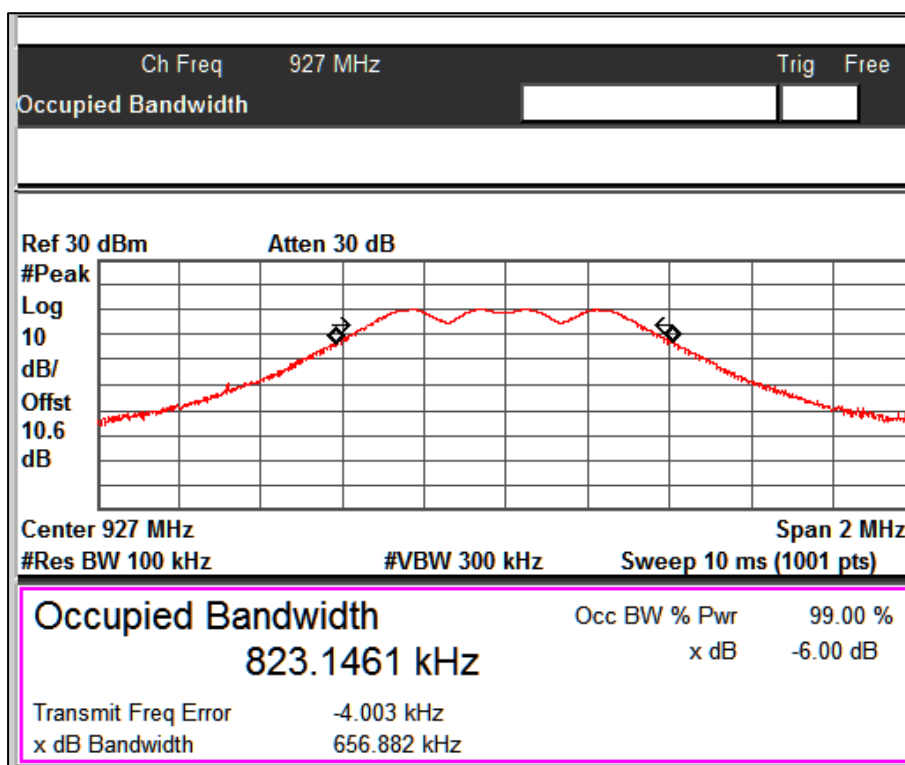
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Channel Frequency: 927MHz

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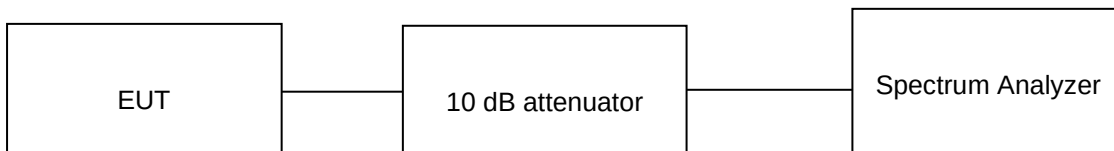
7.4 Emissions in non-restricted frequency bands and Conducted Spurious Emission

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (d) RSS-247 issue 3, section 5.5
Test Method	Subclause 11.11.3 of ANSI C63.10
Measurement Bandwidth	100 kHz
Detector	Peak
Port of testing	Antenna port
Requirement	In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits

Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 21.5 °C Voltage = Wireless Boom Angle Sensor: 3.6 VDC Relative humidity: 63%
 Powered Boom Angle Sensor: 10-30 VDC

KDB Guidelines applied:

Measurements were made as per section 9(b) in KDB 558074 D01 15.247 Measurement Guidance v05r02.

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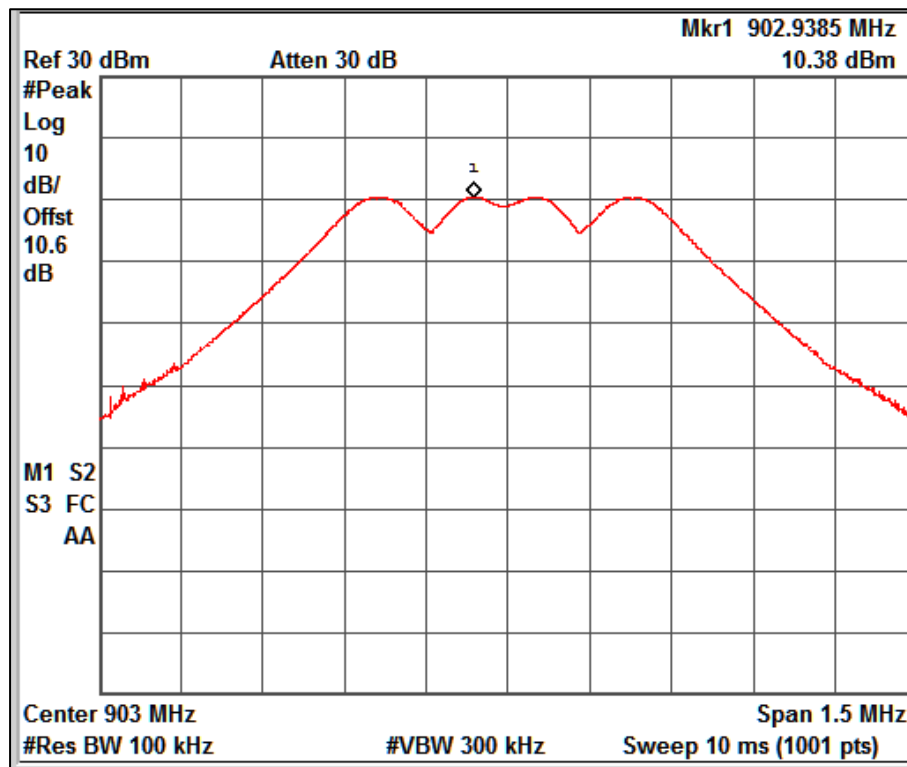
Test results:

Note:

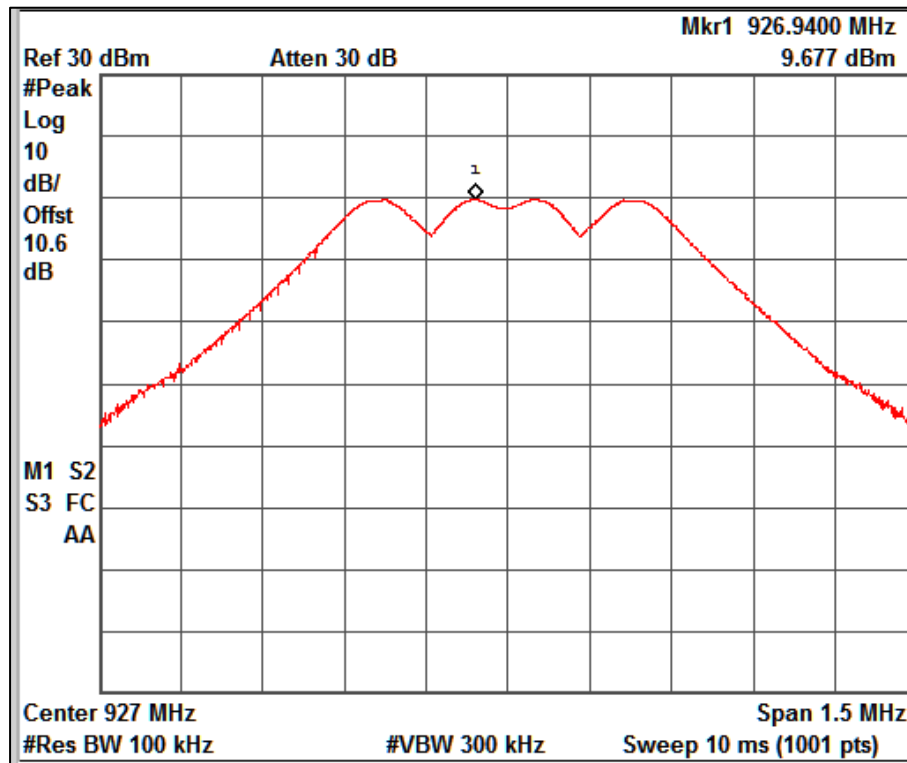
1. All the losses are included during measurement and final values are mentioned in the test report
2. Final Value (dBm) = Measured Value (dBm) + Attenuator factor (10dB) + Cable loss (0.6dB)
3. This product do not support additional beamforming gain / directional gain, it uses single antenna and hence Directional gain of the single antenna can be referred in clause 4.7 Antenna Gain

7.4.1 Band edge and reference plots

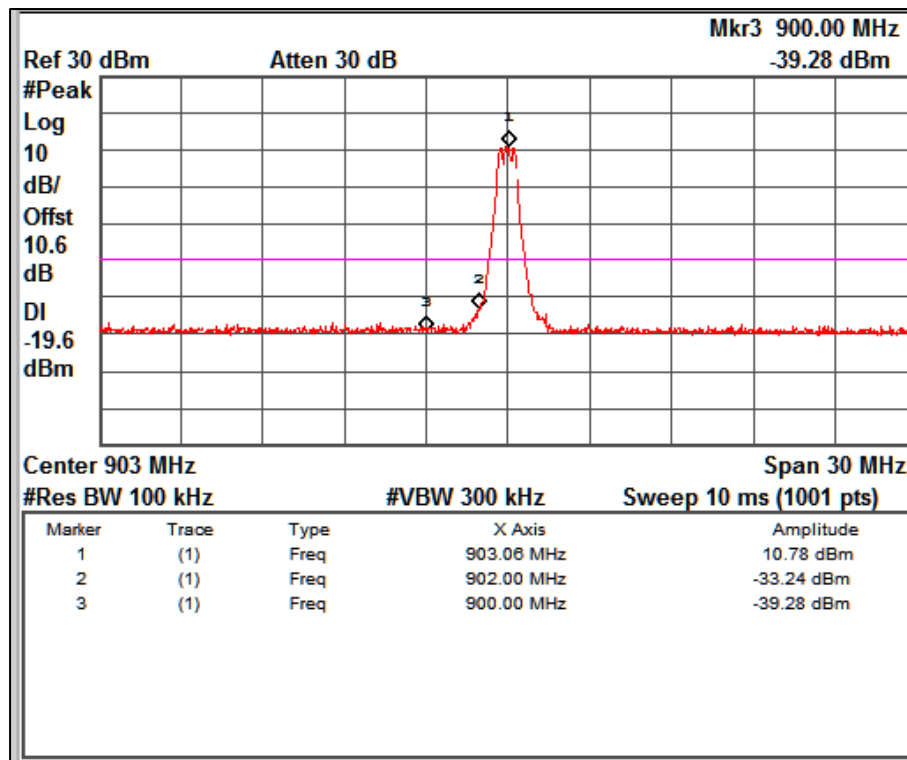
Channel Frequency (MHz)	Band edge frequency (MHz)	Value at band edge (A) (dBm)	Reference value (B) (dBm)	A-B (dBc)	Minimum Limit (dBc)
903	902.00	-33.24	10.38	-43.62	-30
927	928.00	-34.18	9.67	-43.85	-30



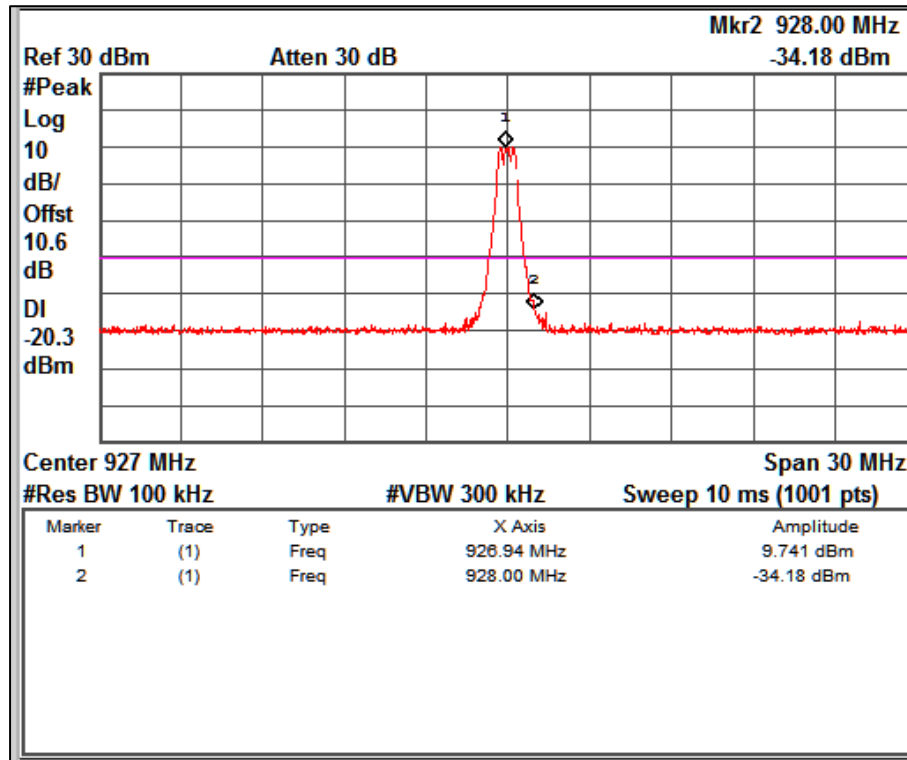
Reference plot for 903MHz



Reference plot for 927MHz

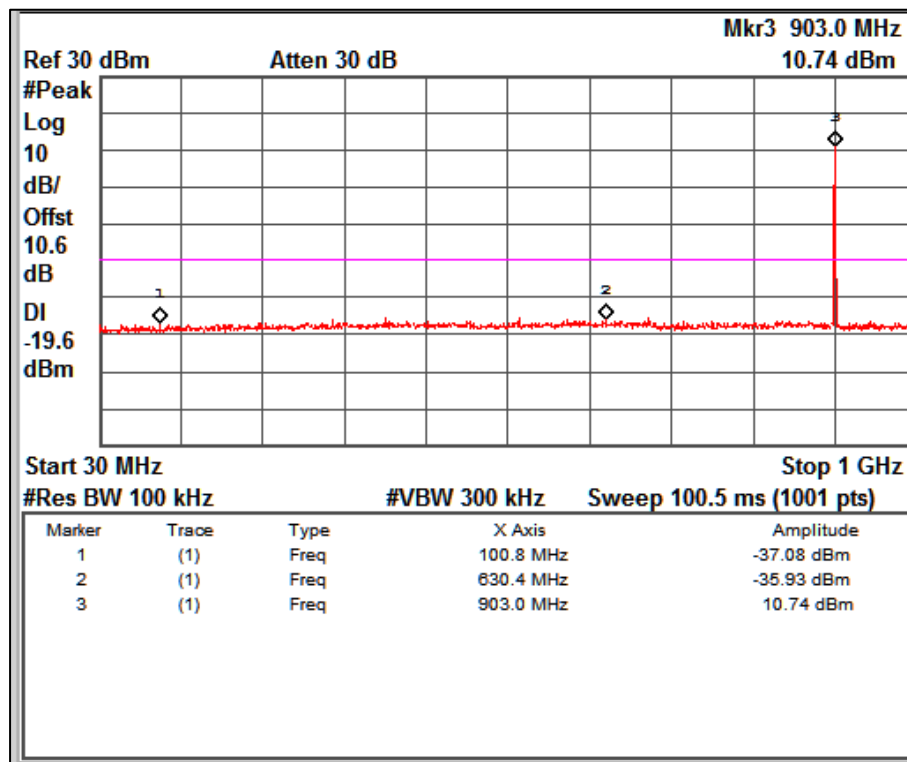


Band edge Channel Frequency 903MHz

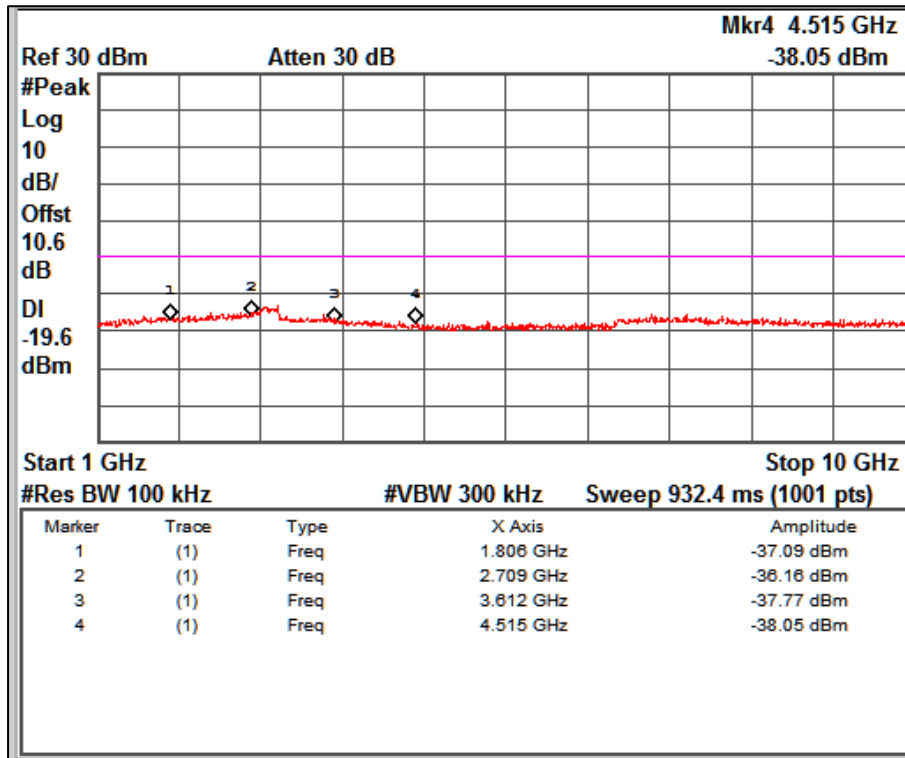


Band edge Channel Frequency 927MHz

7.4.2 Out-Of-Band Emissions

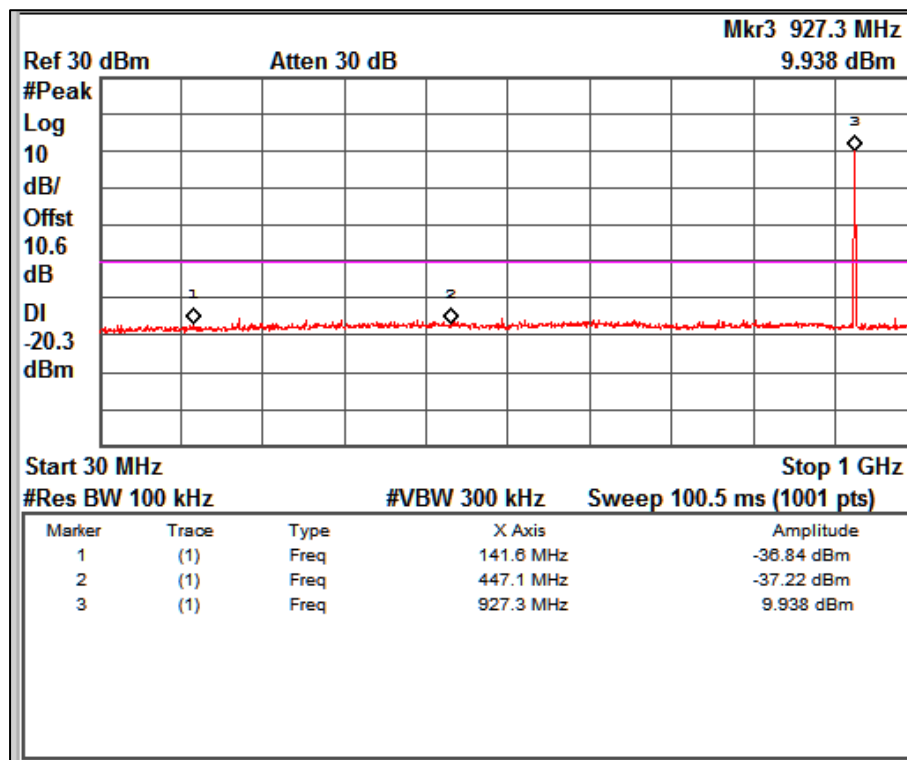


Channel Frequency 903MHz Frequency Range 30MHz – 1GHz



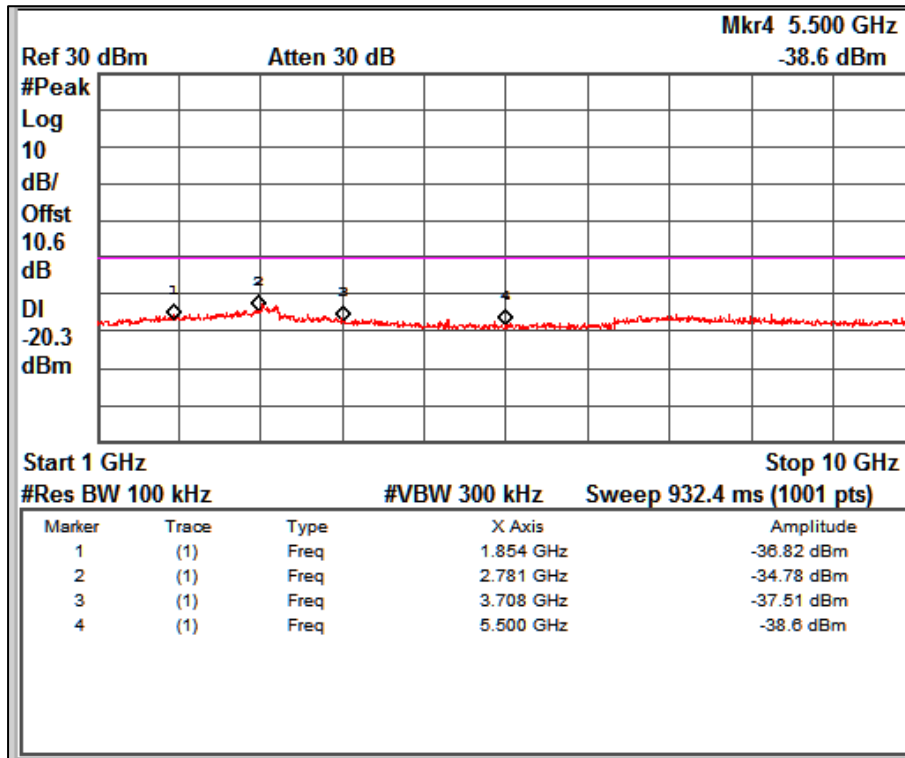
Channel Frequency 903MHz

Frequency Range 1GHz – 10GHz



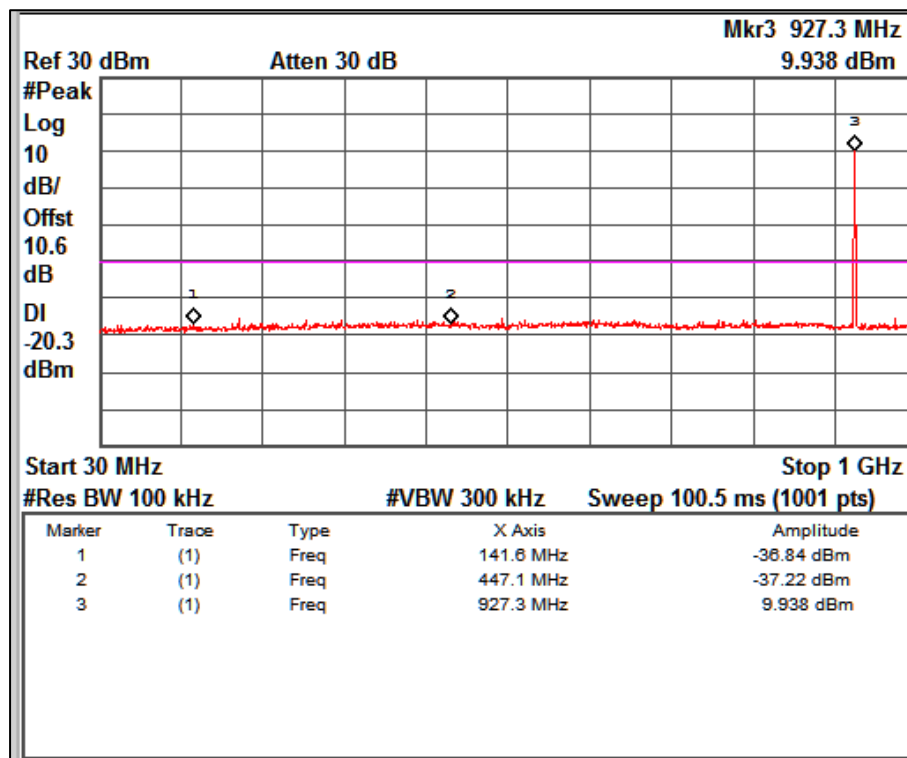
Channel Frequency 916MHz

Frequency Range 30MHz – 1GHz



Channel Frequency 916MHz

Frequency Range 1GHz – 10GHz



Channel Frequency 927MHz

Frequency Range 30MHz – 1GHz

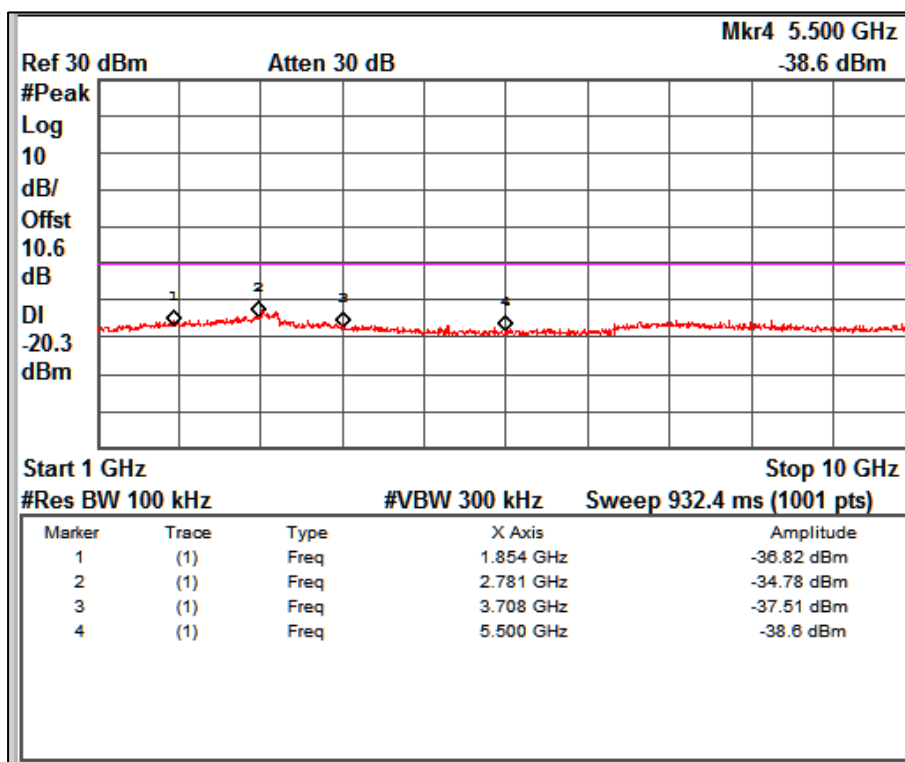
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Channel Frequency 927MHz

Frequency Range 1GHz – 10GHz

7.5 Spurious Radiated Emissions & Restricted Bands of Operation

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (d) / (15.209 & 15.205) RSS-GEN issue 5 clause 8.9, 8.10
Test Method	ANSI C63.10
Measurement Location	Semi Anechoic Chamber 9kHz - 1 GHz Fully Anechoic Chamber 1 GHz - 40GHz
Measurement Bandwidth	100 kHz for frequency range < 1GHz 1 MHz for Frequency range >1GHz
Detector	Refer remarks below
Measuring Distance	3 m
Requirement	As per the limits mentioned in the below table
Test setup	Refer TEST METHODOLOGY

Table 7: Transmitter limits for Radiated emission

Frequency (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Distance of Measurement (m)
0.009 – 0.490	2400/F(kHz)	48.50 – 13.80	300*
0.490 – 1.705	24000/F(kHz)	33.80 – 23.00	30*
1.705 -30	30	29.54	30*
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Remark: * The limit shows in the table above of frequency range 0.009 – 0.490, 0.490 – 1.705 MHz and 1.705-30MHz is at 300 meter, 30 meter and 30 meter range respectively, which corresponds to 128.51 – 93.80, 73.80 – 62.96 and 69.54 dBµV/m at 3m range by extrapolation calculation and the measurement of loop antenna.

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

Test Conditions:

Temperature (Norm) = + 21.5 °C Voltage = Wireless Boom Angle Sensor: 3.6 VDC Relative humidity: 63%
 Powered Boom Angle Sensor: 10-30 VDC

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Test results:

Note: All the losses are included during measurement and final values are mentioned in the test report. Refer TEST METHODOLOGY for more details

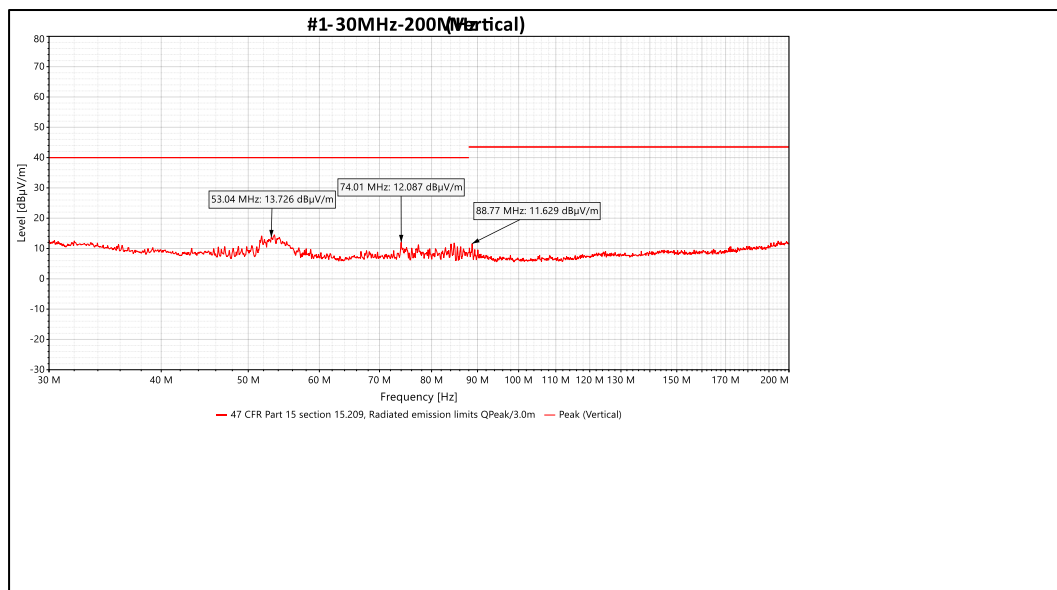
Test results for frequency range 9kHz – 30MHz

No emissions found in frequency range 9 kHz to 30 MHz, and measured levels are below 20dB from the limit line, hence not reported

Table 8: Test results for frequency range 30MHz – 200MHz

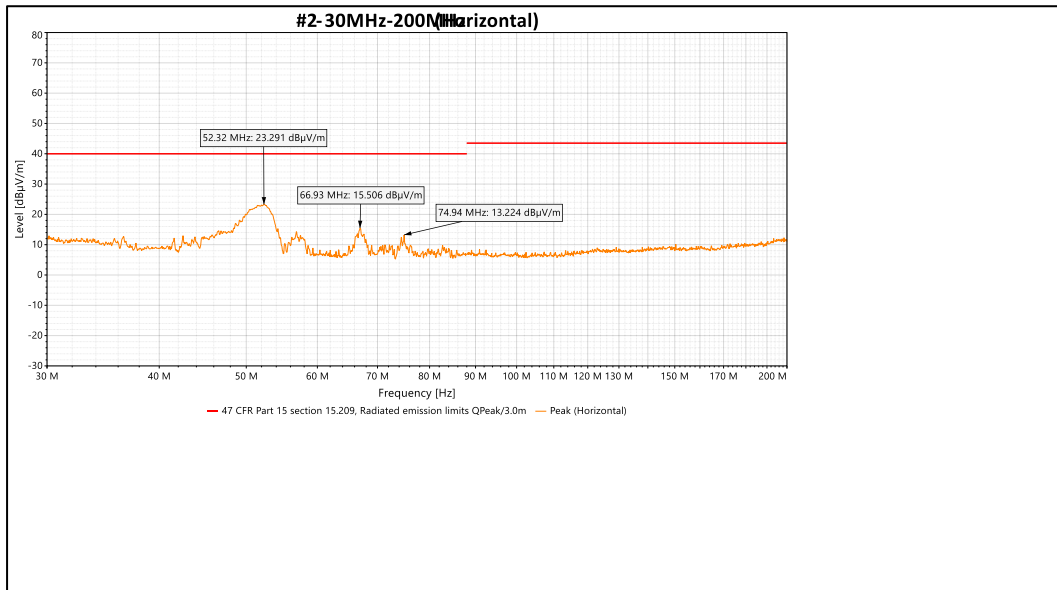
Boom Angle Sensor:

Antenna Polarization	Measured Frequency (MHz)	Measured Emission (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
Vertical	53.04	13.72	40	-26.28
	74.01	12.08	40	-27.92
	88.77	11.62	43.5	-31.88
Horizontal	52.32	23.29	40	-16.71
	66.93	15.50	40	-24.50
	74.94	13.22	40	-26.78



Channel Frequency 30MHz – 200MHz

Polarization Vertical

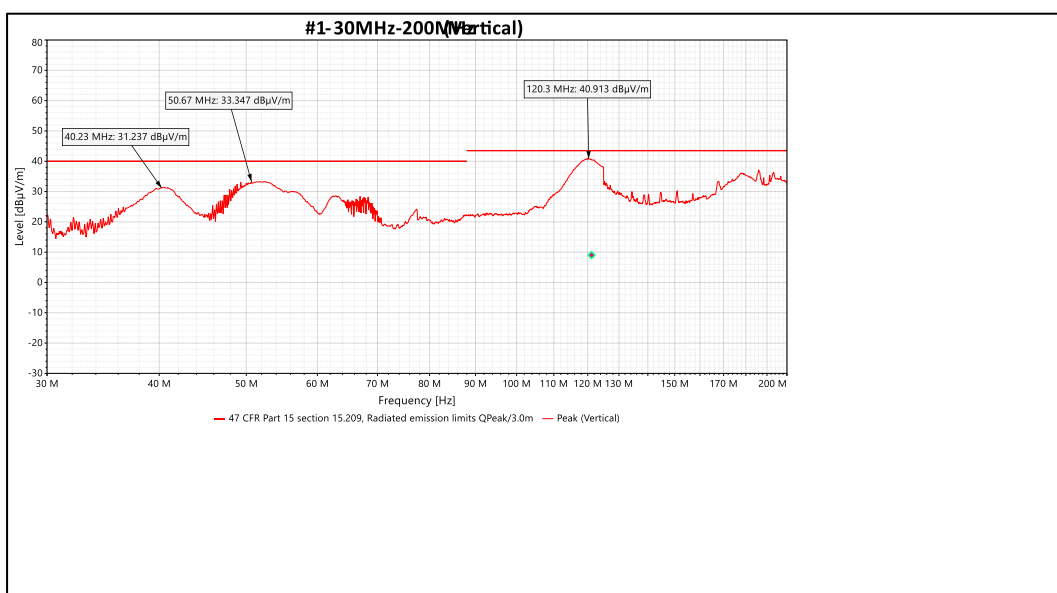


Channel Frequency 30MHz – 200MHz

Polarization Horizontal

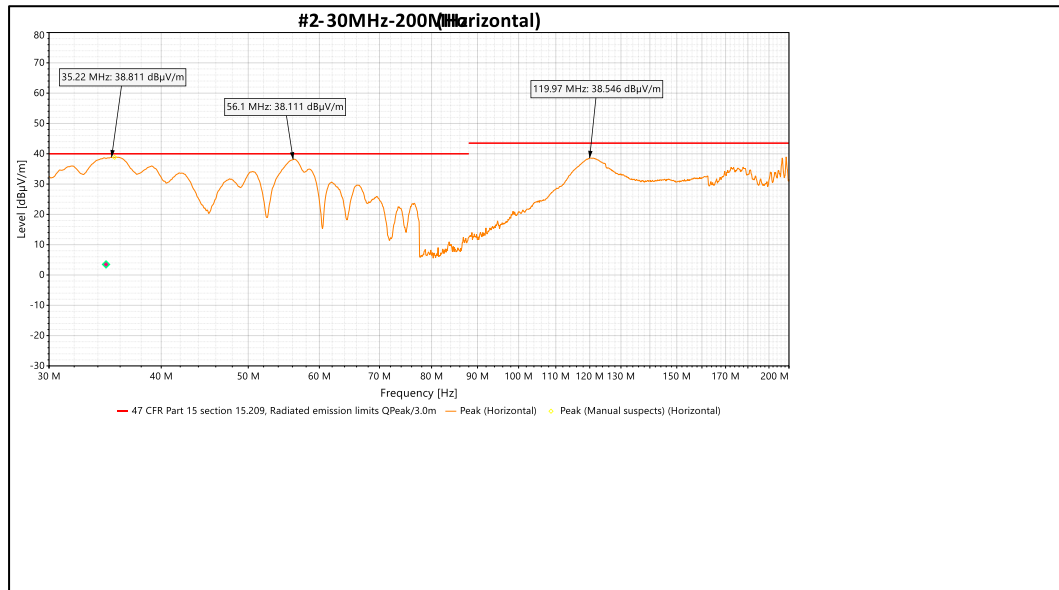
Power Boom Angle:

Antenna Polarization	Measured Frequency (MHz)	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	40.23	31.23	40.00	-8.77
	50.67	33.34	40.00	-6.66
	121.17 (Qp)	9.01	43.50	-34.49
Horizontal	34.722 (Qp)	3.49	40.00	-36.52
	56.802 (Qp)	0.22	40.00	-39.78
	119.97	38.54	43.50	-4.96



Channel Frequency 30MHz – 200MHz

Polarization Vertical



Channel Frequency 30MHz – 200MHz

Polarization Horizontal

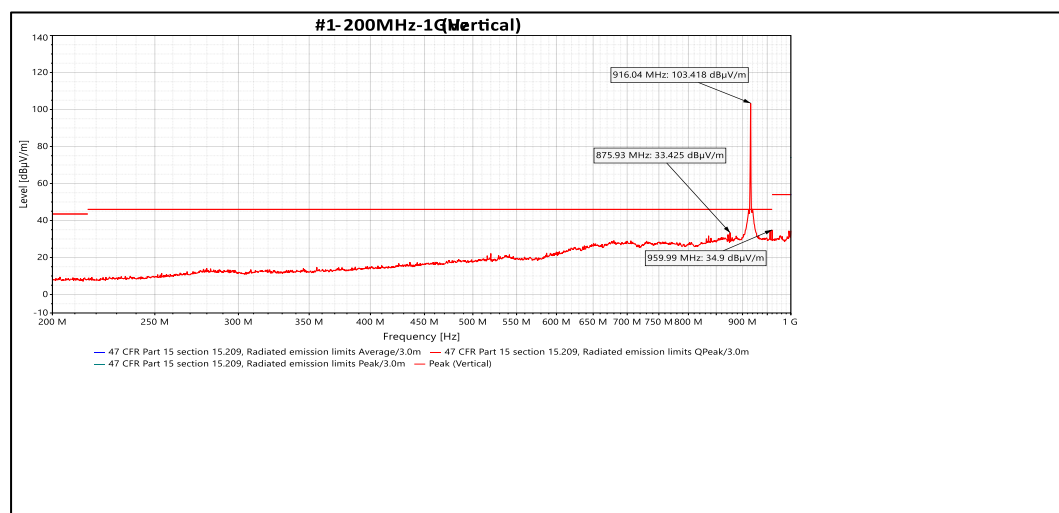
Table 9: Test results for frequency range 200MHz – 1GHz

Boom Angle Sensor:

Channel Frequency: 916MHz

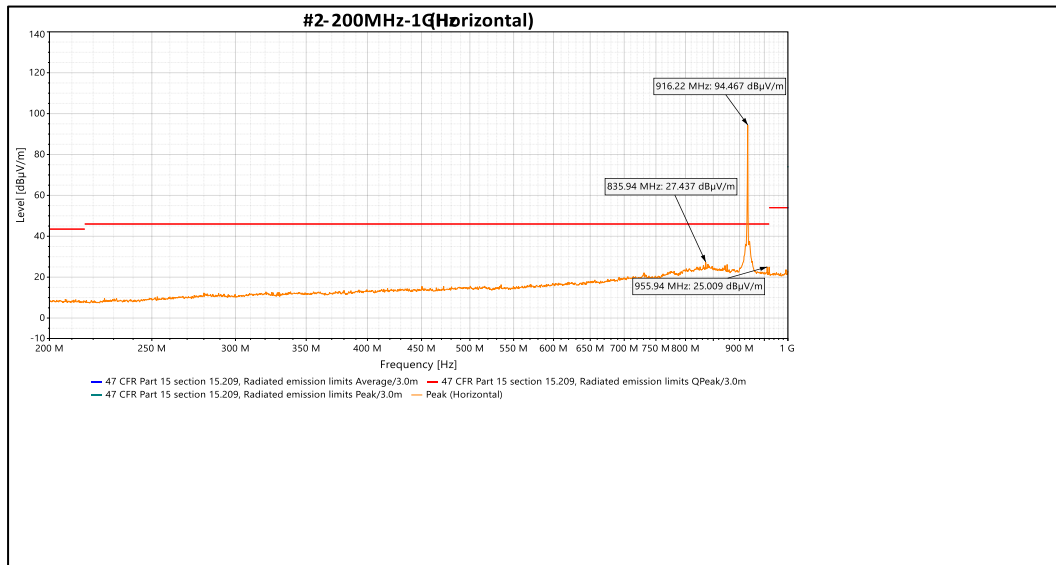
Antenna Polarization	Measured Frequency (MHz)	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	875.93	33.42	46	-12.58
	916.04*	103.41	46	57.41
	959.99	34.90	46	-11.10
Horizontal	835.94	27.43	46	-18.57
	916.22*	94.46	46	48.46
	955.94	25.00	46	-21.00

Channel Frequency: 916MHz



Channel Frequency 200MHz – 1GHz

Polarization Vertical



Channel Frequency 200MHz – 1GHz

Polarization Horizontal

Channel Frequency: 903MHz

Antenna Polarization	Measured Frequency (MHz)	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	452.21	26.55	46.00	-19.45
	680.00	36.16	46.00	-9.84
	863.06	36.12	46.00	-9.88
	902.78	104.27	46.00	58.27
	982.94	36.87	54.00	-17.13
Horizontal	251.69	37.86	46.00	-8.14
	264.23	37.15	46.00	-8.85
	800.00	32.67	46.00	-13.33
	903.05	94.62	46.00	48.62
	967.07	26.93	46.00	-19.07

Channel Frequency: 916MHz

Antenna Polarization	Measured Frequency (MHz)	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	456.86	27.31	46.00	-18.69
	876.05	34.95	46.00	-11.05
	915.95	103.84	46.00	57.84
	959.99	35.59	46.00	-10.41
Horizontal	299.15	24.32	46.00	-21.68
	760.01	32.15	46.00	-13.85
	872.09	28.56	46.00	-17.44
	915.95	94.89	46.00	48.89
	960.02	25.56	46.00	-20.44

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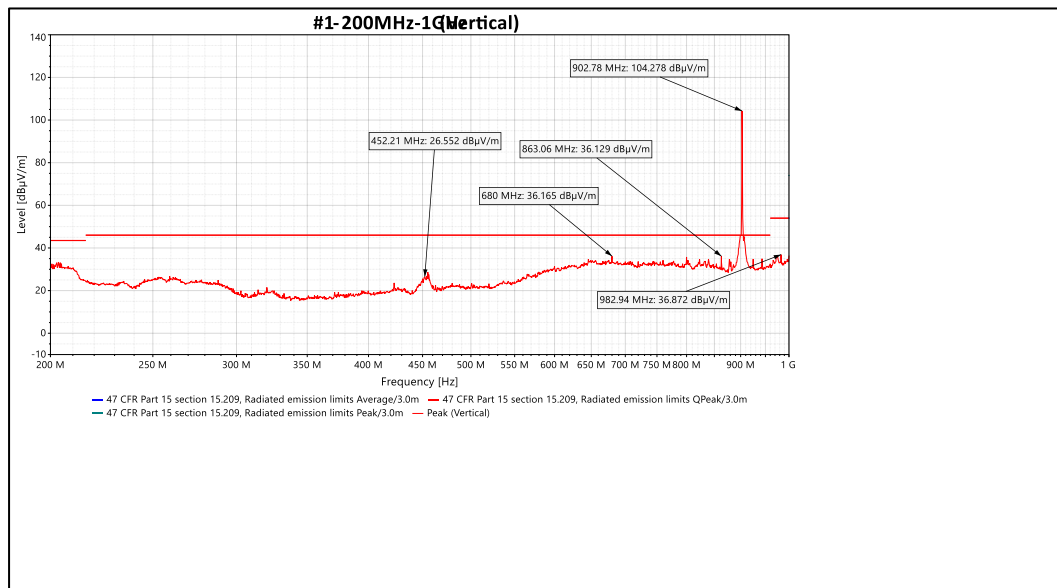
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Channel Frequency: 927MHz

Antenna Polarization	Measured Frequency (MHz)	Measured Emission (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
Vertical	205.01	35.49	43.50	-8.01
	847.04	36.95	46.00	-9.05
	927.05	104.97	46.00	58.97
Horizontal	285.29	34.85	46.00	-11.15
	760.01	33.71	46.00	-12.29
	927.23	93.46	46.00	47.46

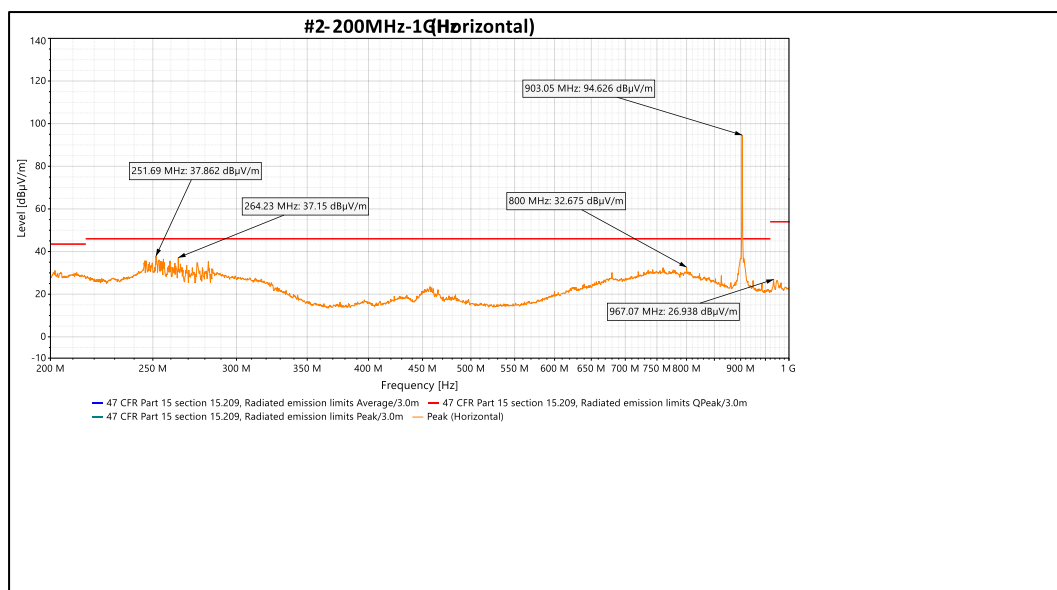
Note: -* indicates the Nominal Frequency of a device

Channel Frequency: 903MHz



Channel Frequency 200MHz – 1GHz

Polarization Vertical



Channel Frequency 200MHz – 1GHz

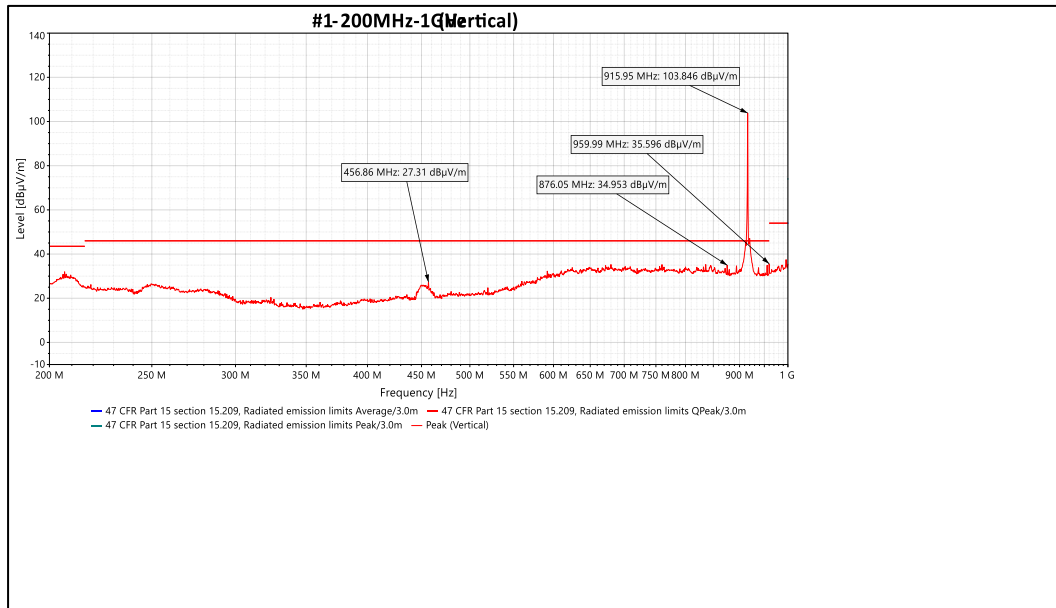
Polarization Horizontal

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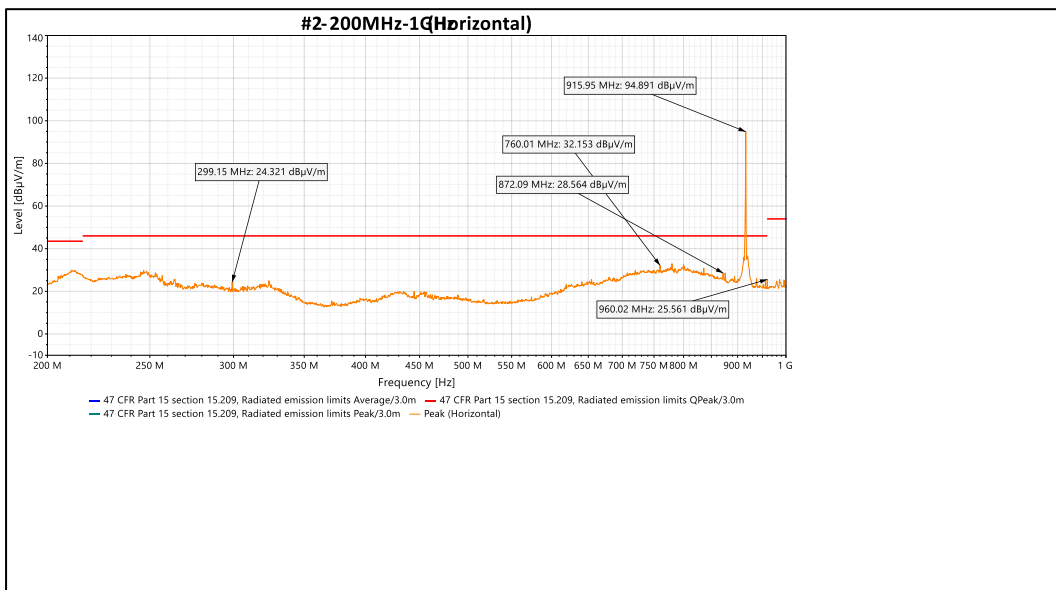
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Channel Frequency: 916MHz



Channel Frequency 200MHz – 1GHz

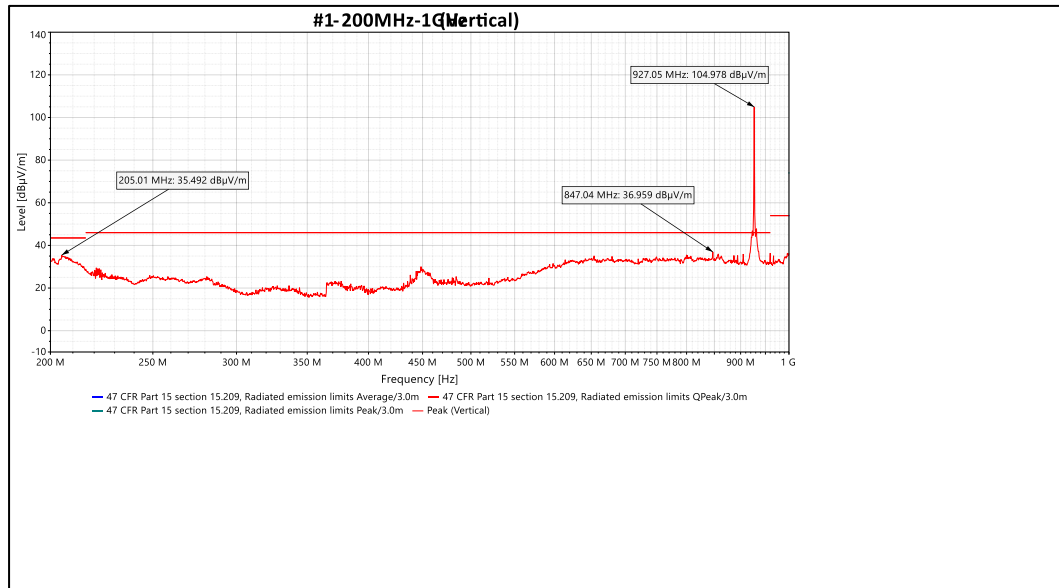
Polarization Vertical



Channel Frequency 200MHz – 1GHz

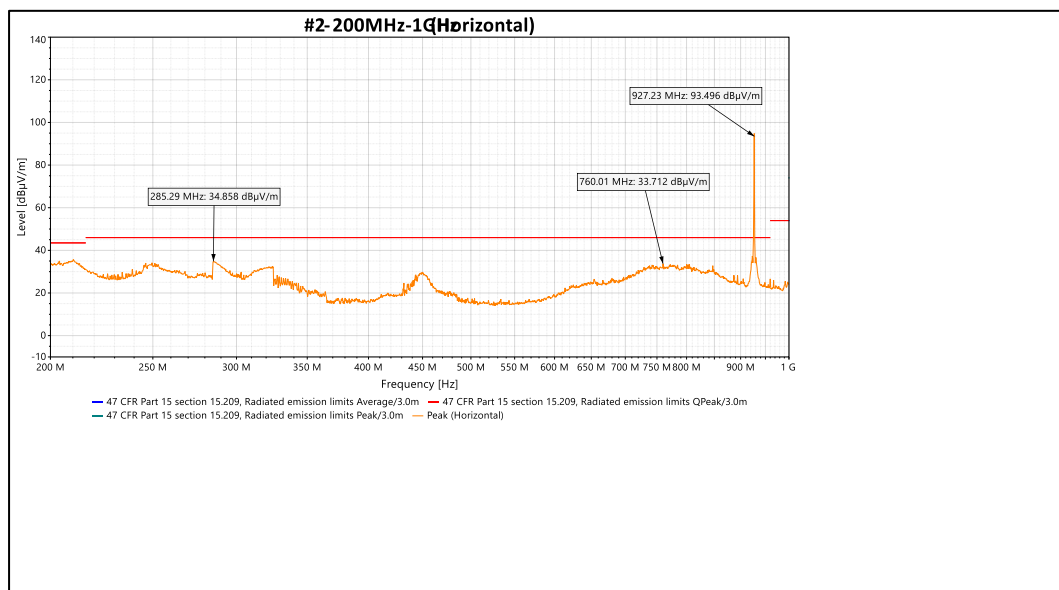
Polarization Horizontal

Channel Frequency: 927MHz



Channel Frequency 200MHz – 1GHz

Polarization Vertical



Channel Frequency 200MHz – 1GHz

Polarization Horizontal

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Table 10: Test results for the frequencies above 1GHz:

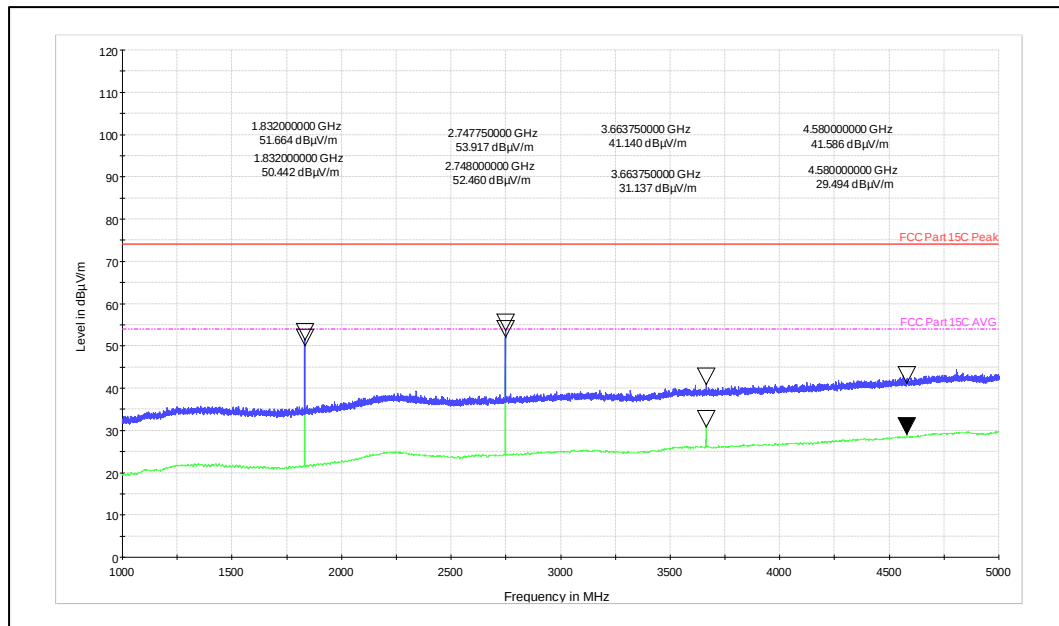
Boom Angle Sensor:

Channel Frequency: 916MHz

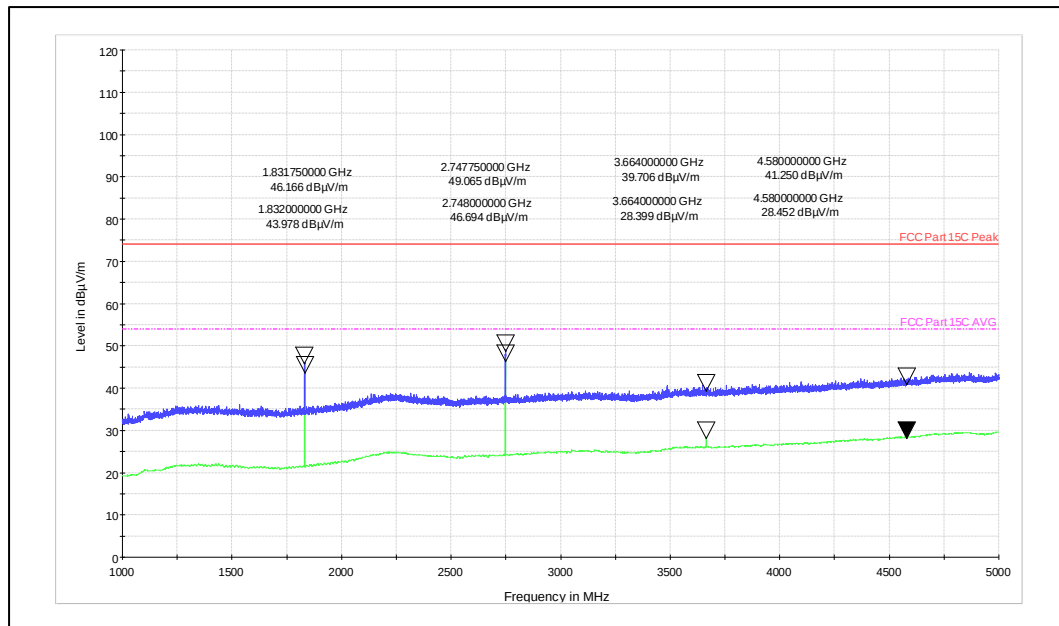
Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission (dBµV/m)	Duty Correction Factor (dB)	Final Measured Value (dBµV/m)	Limit (dBµV/m)	Margin (dB)
916	1806(Pk)	Vertical	51.66	-	51.66	74	-22.34
	1806(Av)		50.44	17.72	32.72	54	-21.28
	2709(Pk)		53.91	-	53.91	74	-20.09
	2709(Av)		52.46	17.72	34.74	54	-19.26
	3612(Pk)		41.14	-	41.14	74	-32.86
	3612(Av)		31.13	17.72	13.41	54	-40.59
	4515(Pk)		41.58	-	41.58	74	-32.42
	4515(Av)		29.49	17.72	11.77	54	-42.23
	5418(Pk)		42.41	-	42.41	74	-31.59
	5418(Av)		29.89	17.72	12.17	54	-41.83
	6321(Pk)		45.56	-	45.56	74	-28.44
	6321(Av)		31.75	17.72	14.03	54	-39.97
	7224(Pk)		47.71	-	47.71	74	-26.29
	7224(Av)		34.88	17.72	17.16	54	-36.84
	8127(Pk)		49.04	-	49.04	74	-24.96
	8127(Av)		36.65	17.72	18.93	54	-35.07
	1806(Pk)	Horizontal	46.16	-	46.16	74	-27.84
	1806(Av)		43.97	17.72	26.25	54	-27.75
	2709(Pk)		49.06	-	49.06	74	-24.94
	2709(Av)		46.69	17.72	28.97	54	-25.03
	3612(Pk)		39.70	-	39.70	74	-34.30
	3612(Av)		28.39	17.72	10.67	54	-43.33
	4515(Pk)		41.25	-	41.25	74	-32.75
	4515(Av)		28.45	17.72	10.73	54	-43.27
	5418(Pk)		42.57	-	42.57	74	-31.43
	5418(Av)		29.91	17.72	12.19	54	-41.81
	6321(Pk)		44.59	-	44.59	74	-29.41
	6321(Av)		31.51	17.72	13.79	54	-40.21
	7224(Pk)		47.81	-	47.81	74	-26.19
	7224(Av)		34.84	17.72	17.12	54	-36.88
	8127(Pk)		48.82	-	48.82	74	-25.18
	8127(Av)		36.68	17.72	18.96	54	-35.04

Pk: Peak Detector.
Av: Average Detector

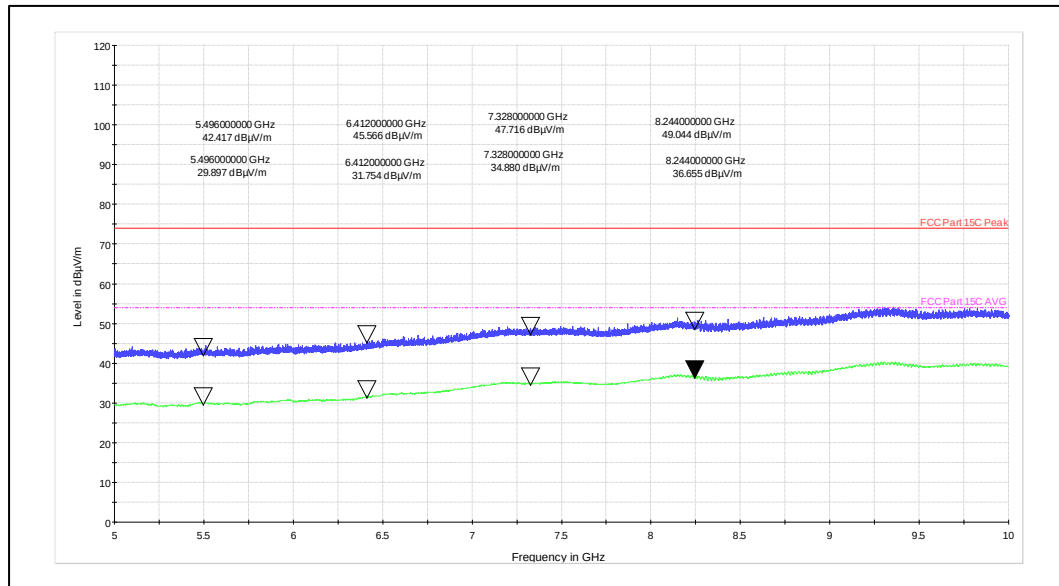
Ch-916MHz_PWR-10.5dBm_1-5GHz_Vertical



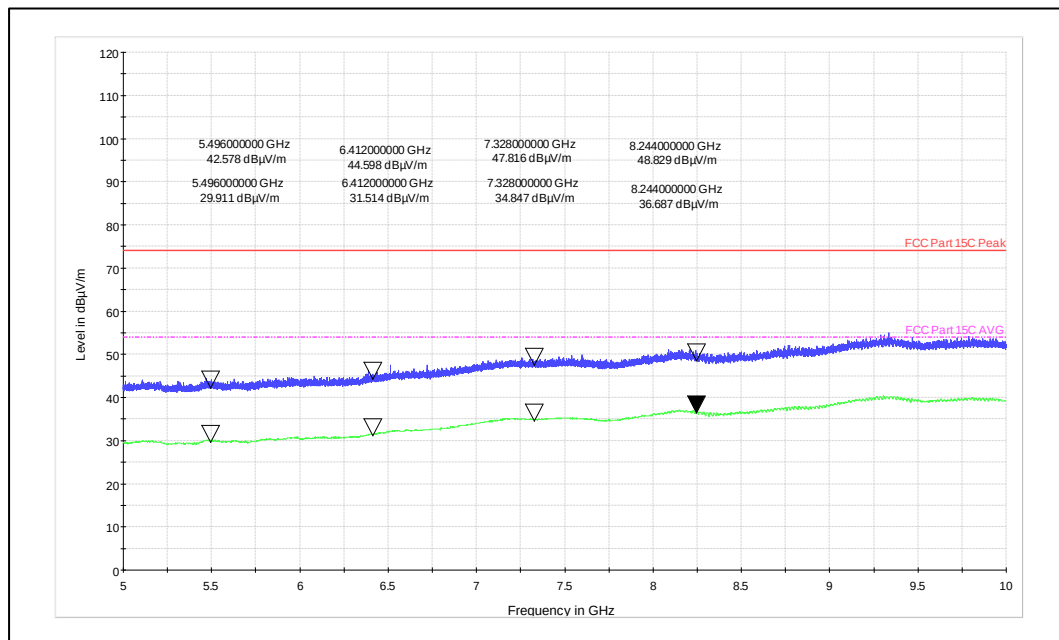
Ch-916MHz_PWR-10.5dBm_1-5GHz_Horizontal



Ch-916MHz_PWR-10.5dBm_5-10GHz_Vertical



Ch-916MHz_PWR-10.5dBm_5-10GHz_Horizontal



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Power Boom Angle:

Channel Frequency: 903MHz

Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission (dBµV/m)	Duty Correction Factor (dB)	Final Measured Value (dBµV/m)	Limit (dBµV/m)	Margin (dB)
903	1806(Pk)	Vertical	54.42	-	54.42	74	-19.58
	1806(Av)		53.55	17.72	35.83	54	-18.17
	2709(Pk)		57.42	-	57.42	74	-16.58
	2709(Av)		56.50	17.72	38.78	54	-15.22
	3612(Pk)		43.55	-	43.55	74	-30.45
	3612(Av)		36.40	17.72	18.68	54	-35.32
	4515(Pk)		41.79	-	41.79	74	-32.21
	4515(Av)		29.86	17.72	12.14	54	-41.86
	5418(Pk)		42.27	-	42.27	74	-31.73
	5418(Av)		30.08	17.72	12.36	54	-41.64
	6321(Pk)		44.15	-	44.15	74	-29.85
	6321(Av)		31.28	17.72	13.56	54	-40.44
	7224(Pk)		47.63	-	47.63	74	-26.37
	7224(Av)		35.19	17.72	17.47	54	-36.53
	8127(Pk)		49.33	-	49.33	74	-24.67
	8127(Av)		36.82	17.72	19.10	54	-34.90
	1806(Pk)	Horizontal	55.41	-	55.41	74	-18.59
	1806(Av)		54.71	17.72	36.99	54	-17.01
	2709(Pk)		55.93	-	55.93	74	-18.07
	2709(Av)		54.52	17.72	36.80	54	-17.20
	3612(Pk)		42.04	-	42.04	74	-31.96
	3612(Av)		34.79	17.72	17.07	54	-36.93
	4515(Pk)		41.11	-	41.11	74	-32.89
	4515(Av)		29.03	17.72	11.31	54	-42.69
	5418(Pk)		42.26	-	42.26	74	-31.74
	5418(Av)		29.94	17.72	12.22	54	-41.78
	6321(Pk)		43.79	-	43.79	74	-30.21
	6321(Av)		30.94	17.72	13.22	54	-40.78
	7224(Pk)		47.25	-	47.25	74	-26.75
	7224(Av)		35.1	17.72	17.38	54	-36.62
	8127(Pk)		50.44	-	50.44	74	-23.56
	8127(Av)		36.85	17.72	19.13	54	-34.87

Pk: Peak Detector;
Av: Average Detect

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Channel Frequency: 916MHz

Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission (dBµV/m)	Duty Correction Factor (dB)	Final Measured Value (dBµV/m)	Limit (dBµV/m)	Margin (dB)
916	1832(Pk)	Vertical	48.90	-	48.90	74	-25.10
	1832(Av)		46.88	17.72	29.16	54	-24.84
	2748(Pk)		58.72	-	58.72	74	-15.28
	2748(Av)		57.58	17.72	39.86	54	-14.14
	3664(Pk)		43.66	-	43.66	74	-30.34
	3664(Av)		36.43	17.72	18.71	54	-35.29
	4580(Pk)		42.26	-	42.26	74	-31.74
	4580(Av)		28.55	17.72	10.83	54	-43.17
	5496(Pk)		43.04	-	43.04	74	-30.96
	5496(Av)		30.41	17.72	12.69	54	-41.31
	6412(Pk)		44.35	-	44.35	74	-29.65
	6412(Av)		31.65	17.72	13.93	54	-40.07
	7328(Pk)		48.24	-	48.24	74	-25.76
	7328(Av)		34.76	17.72	17.04	54	-36.96
	8244(Pk)		49.53	-	49.53	74	-24.47
	8244(Av)		36.48	17.72	18.76	54	-35.24
	1832(Pk)	Horizontal	48.52	-	48.52	74	-25.48
	1832(Av)		46.52	17.72	28.80	54	-25.20
	2748(Pk)		59.22	-	59.22	74	-14.78
	2748(Av)		58.07	17.72	40.35	54	-13.65
	3664(Pk)		41.14	-	41.14	74	-32.86
	3664(Av)		31.80	17.72	14.08	54	-39.92
	4580(Pk)		41.27	-	41.27	74	-32.73
	4580(Av)		28.52	17.72	10.80	54	-43.20
	5496(Pk)		42.21	-	42.21	74	-31.79
	5496(Av)		30.1	17.72	12.38	54	-41.62
	6412(Pk)		44.2	-	44.20	74	-29.80
	6412(Av)		31.41	17.72	13.69	54	-40.31
	7328(Pk)		47.43	-	47.43	74	-26.57
	7328(Av)		34.77	17.72	17.05	54	-36.95
	8244(Pk)		48.85	-	48.85	74	-25.15
	8244(Av)		36.47	17.72	18.75	54	-35.25

Pk: Peak Detector;
Av: Average Detector

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Test Report No.:

IN24AVES 001

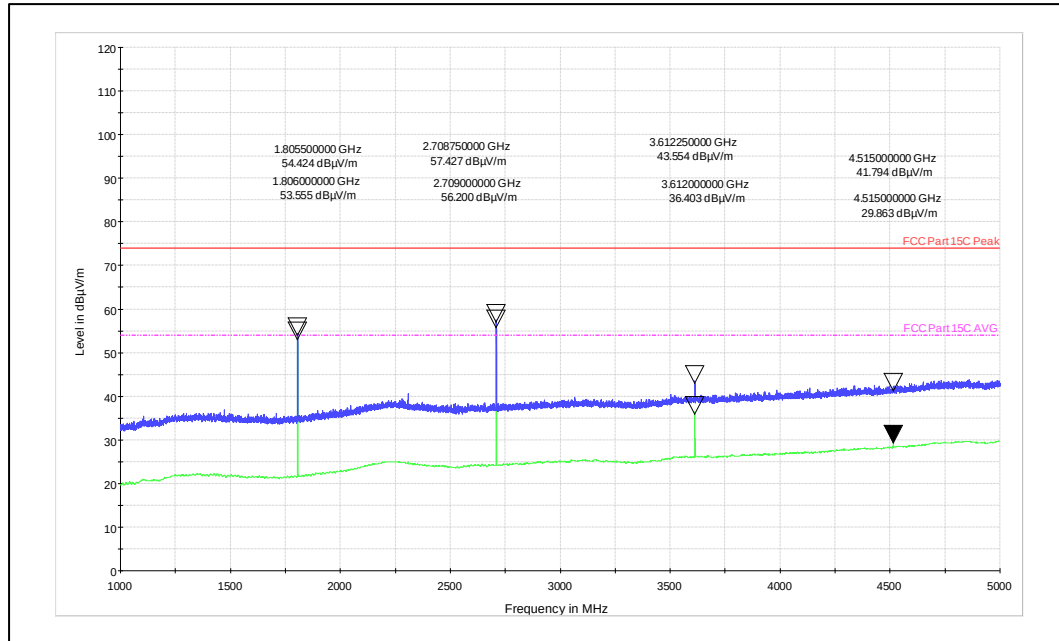
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Channel Frequency: 927MHz

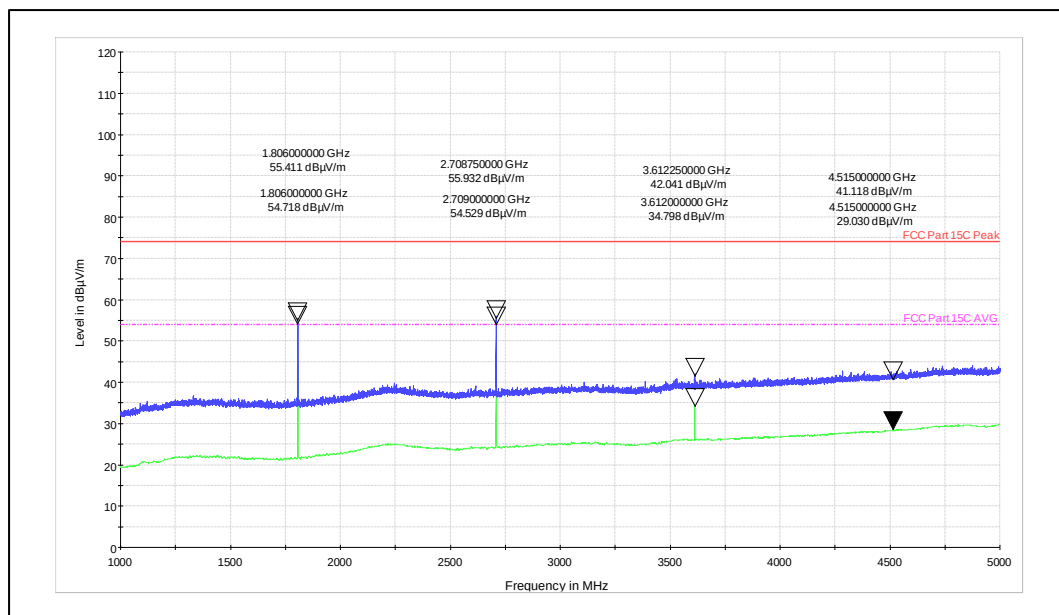
Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission (dBµV/m)	Duty Correction Factor (dB)	Final Measured Value (dBµV/m)	Limit (dBµV/m)	Margin (dB)
927	1854(Pk)	Vertical	49.01	-	49.01	74	-24.99
	1854(Av)		47.00	17.72	29.28	54	-24.72
	2781(Pk)		56.26	-	56.26	74	-17.74
	2781(Av)		54.53	17.72	36.81	54	-17.19
	3708(Pk)		42.23	-	42.23	74	-31.77
	3708(Av)		33.67	17.72	15.95	54	-38.05
	4635(Pk)		41.61	-	41.61	74	-32.39
	4635(Av)		28.62	17.72	10.90	54	-43.10
	5562(Pk)		42.36	-	42.36	74	-31.64
	5562(Av)		30.25	17.72	12.53	54	-41.47
	6489(Pk)		45.07	-	45.07	74	-28.93
	6489(Av)		32.06	17.72	14.34	54	-39.66
	7416(Pk)		47.42	-	47.42	74	-26.58
	7416(Av)		34.99	17.72	17.27	54	-36.73
	8343(Pk)		49.51	-	49.51	74	-24.49
	8343(Av)		36.37	17.72	18.65	54	-35.35
	1854(Pk)	Horizontal	50.33	-	50.33	74	-23.67
	1854(Av)		46.97	17.72	29.25	54	-24.75
	2781(Pk)		55.92	-	55.92	74	-18.08
	2781(Av)		54.63	17.72	36.91	54	-17.09
	3708(Pk)		40.82	-	40.82	74	-33.18
	3708(Av)		31.91	17.72	14.19	54	-39.81
	4635(Pk)		41.59	-	41.59	74	-32.41
	4635(Av)		28.54	17.72	10.82	54	-43.18
	5562(Pk)		42.52	-	42.52	74	-31.48
	5562(Av)		29.69	17.72	11.97	54	-42.03
	6489(Pk)		44.52	-	44.52	74	-29.48
	6489(Av)		31.86	17.72	14.14	54	-39.86
	7416(Pk)		47.79	-	47.79	74	-26.21
	7416(Av)		35.01	17.72	17.29	54	-36.71
	8343(Pk)		49.6	-	49.60	74	-24.40
	8343(Av)		36.37	17.72	18.65	54	-35.35

Pk: Peak Detector;
Av: Average Detector

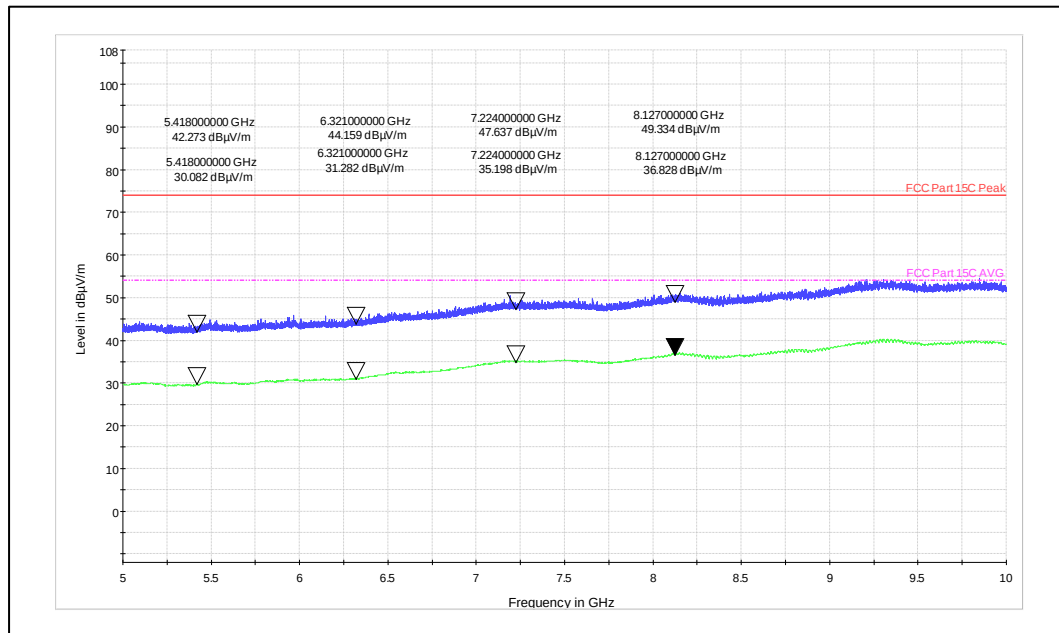
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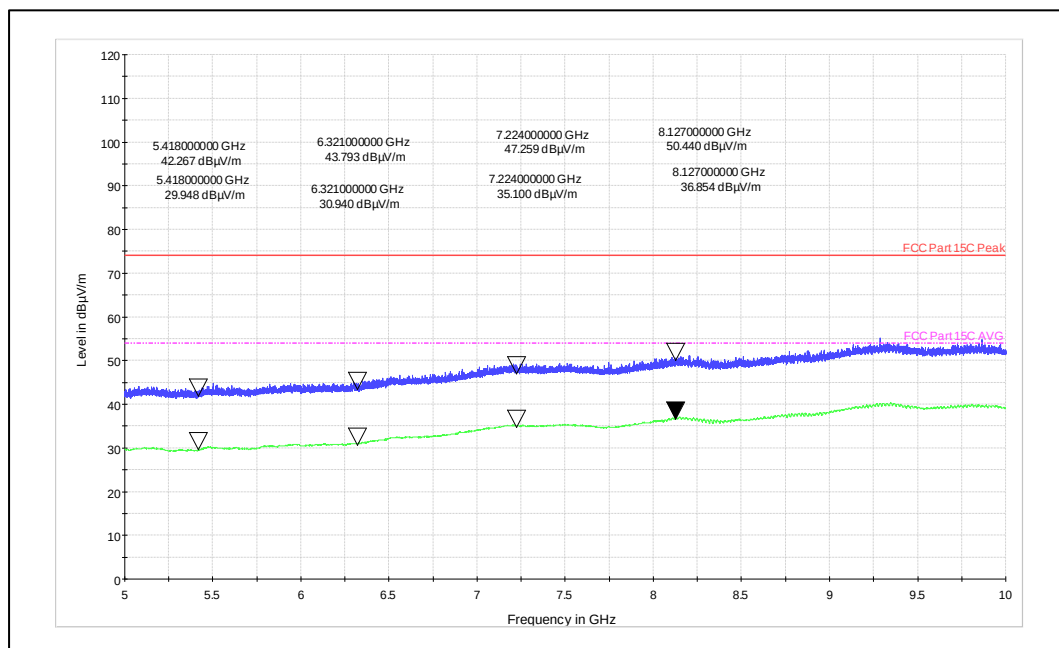
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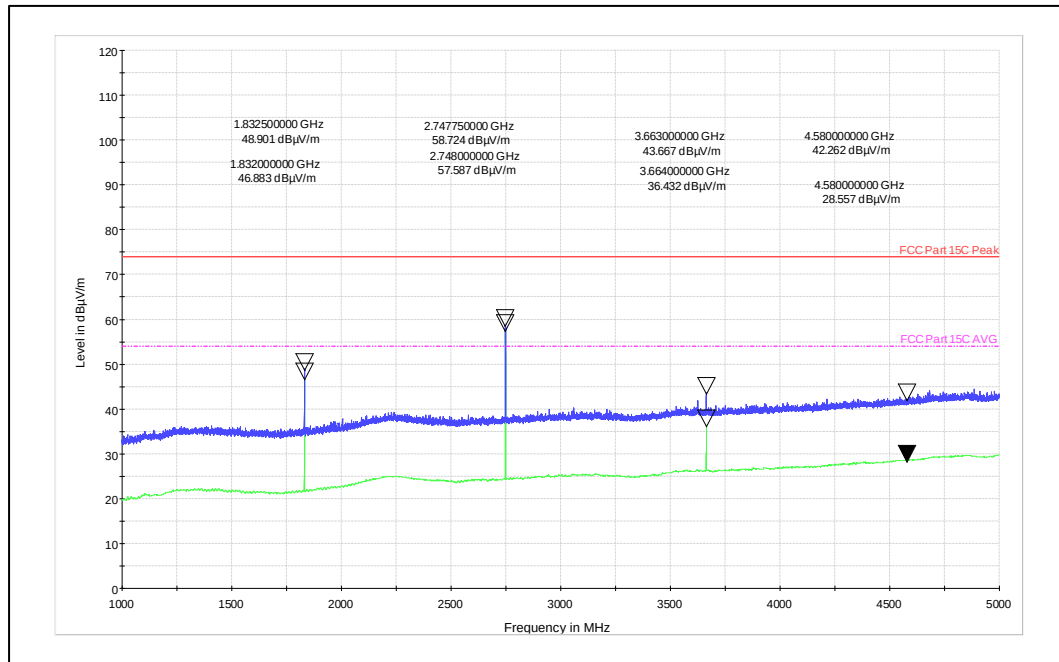
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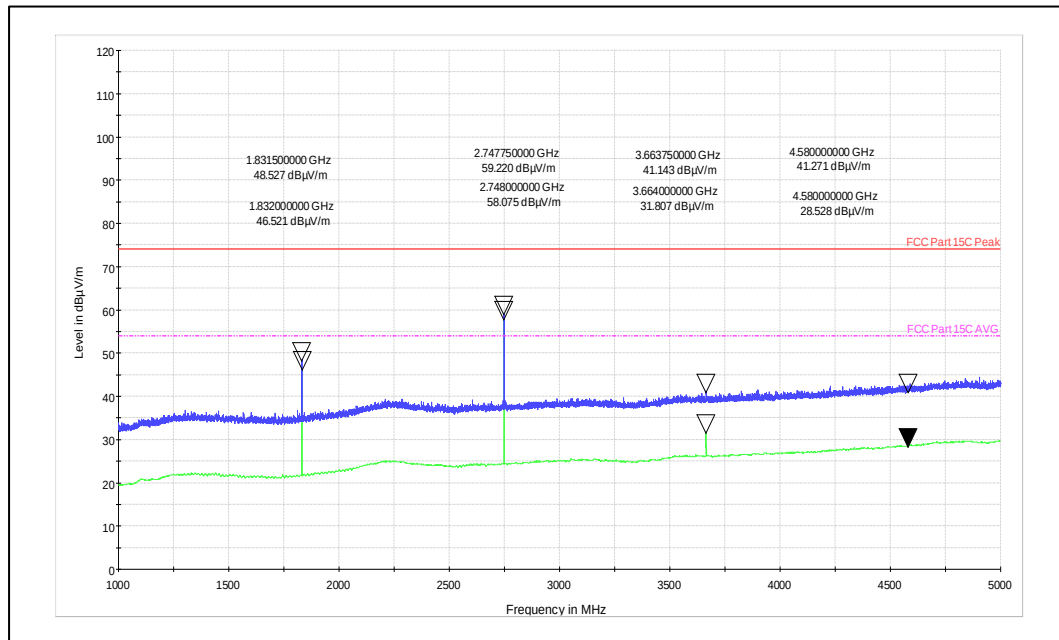
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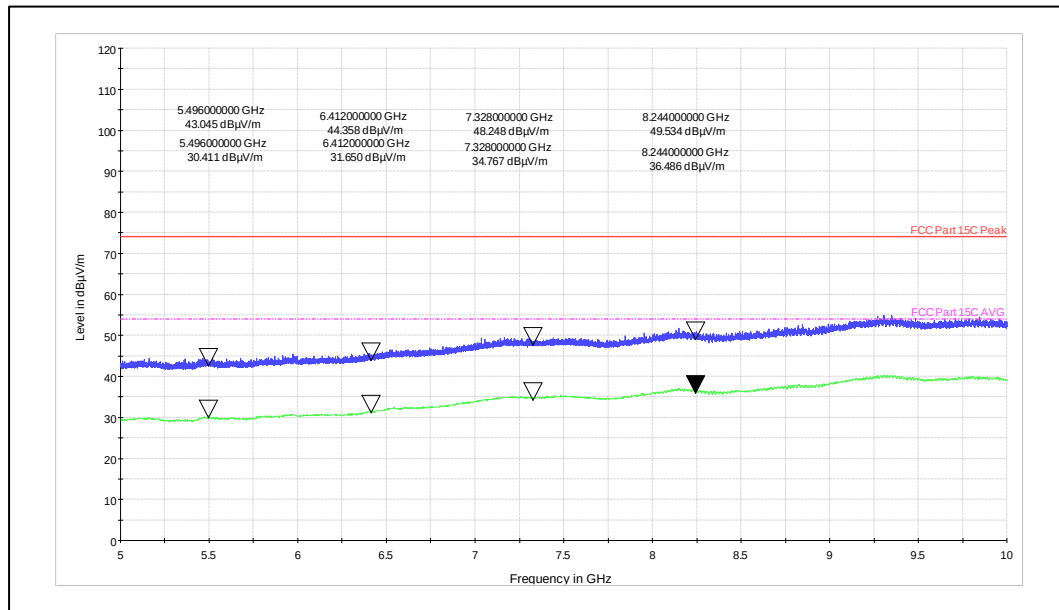
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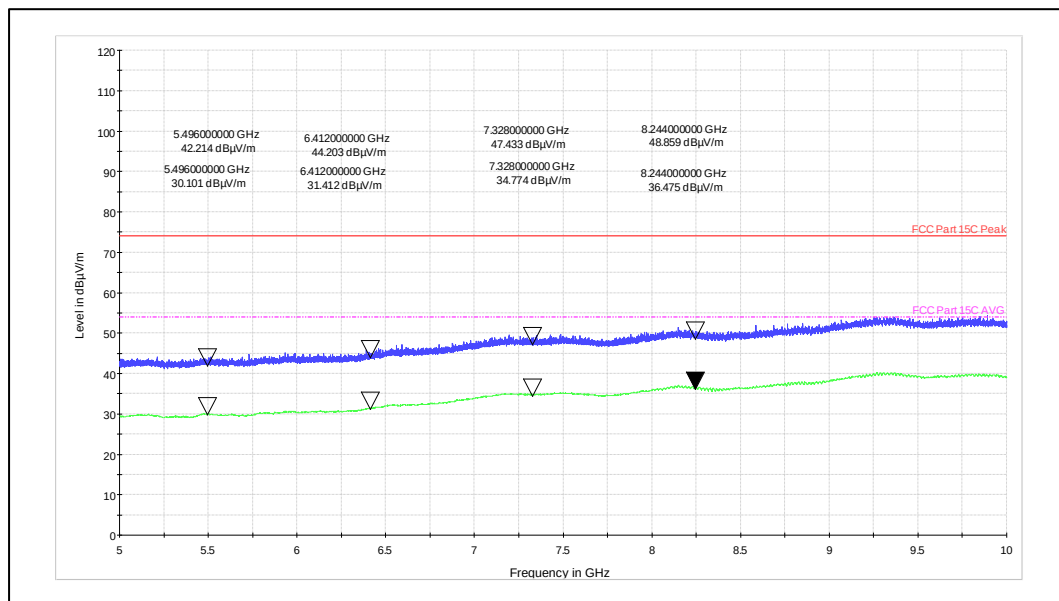
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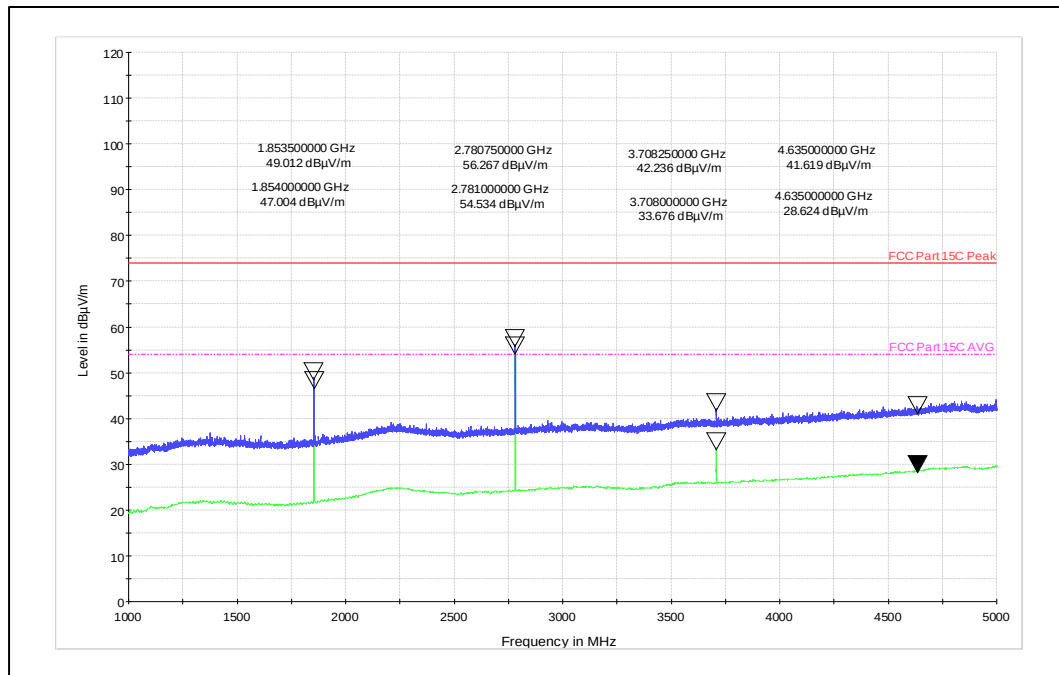
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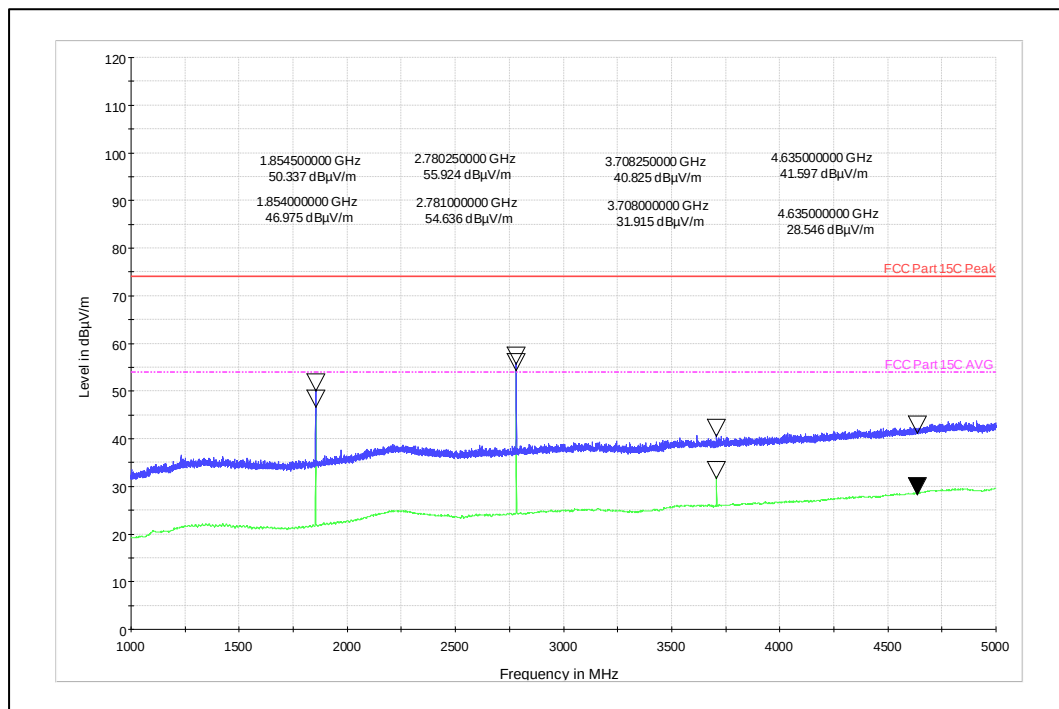
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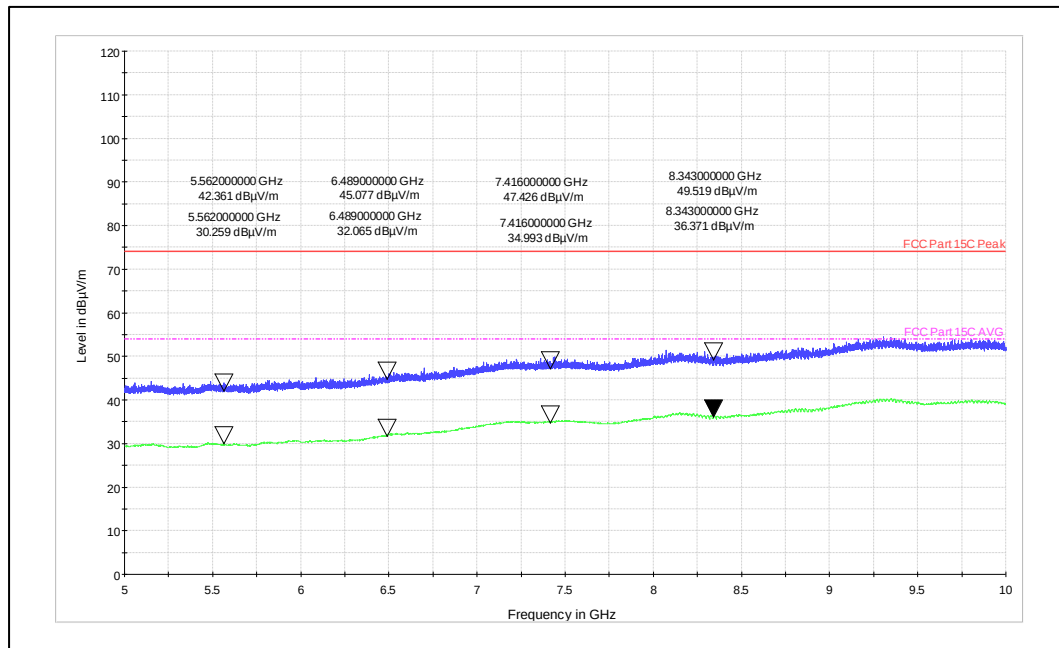
Ch-927MHz_ PWR-10.5dBm 1-5GHz_Vertical



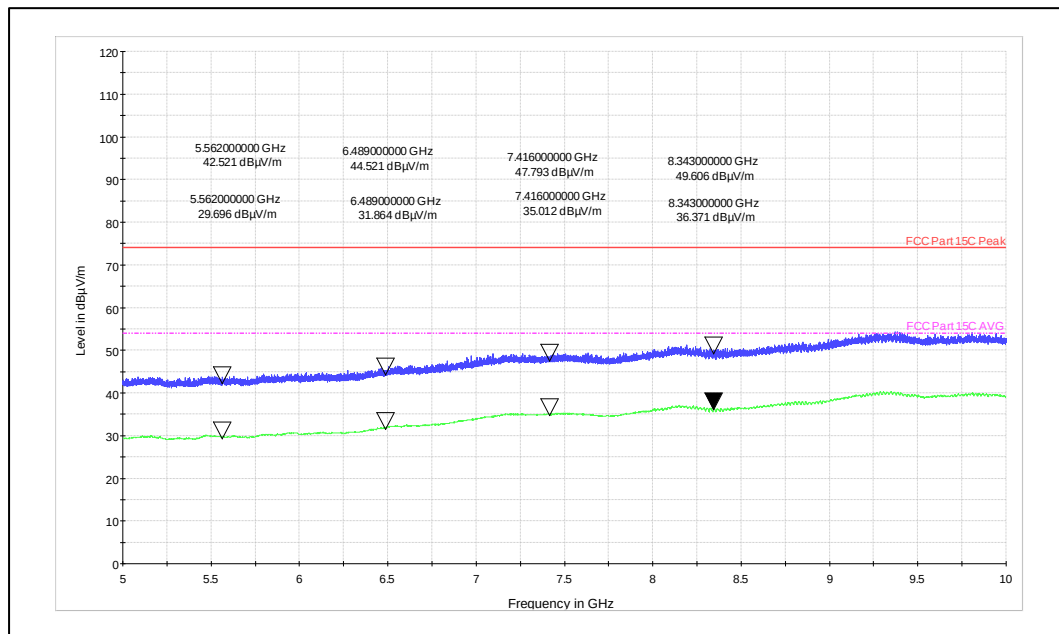
Ch-927MHz_ PWR-10.5dBm 1-5GHz_Horizontal



Ch-927MHz_ PWR-10.5dBm 5-10GHz_Vertical



Ch-927MHz_ PWR-10.5dBm 5-10GHz_Horizontal



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*****End of test report*****