REGULATORY COMPLIANCE TEST REPORT

FCC CFR47 Part 95 Subpart L

Report No.: DEKR199-U4 Rev C

Company: Advanced Automotive Antennas, S.L

Test of: TCU-FITAX-3.5

REGULATORY COMPLIANCE TEST REPORT

Company: Advanced Automotive Antennas S.L

Test of: TCU-FITAX-3.5

To: FCC CFR47 Part 95 Subpart L

Test Report Serial No.: DEKR199-U4 Rev C

This report supersedes: DEKR199-U4 Rev B

Applicant: Advanced Automotive Antennas, S.L
Calle Gran Via Carles III,
Barcelona, 08028
Spain

Issue Date: 25th June 2020

This Test Report is Issued Under the Authority of:

MiCOM Labs, Inc.
575 Boulder Court
Pleasanton California 94566
USA
Phone: +1 (925) 462-0304
Fax: +1 (925) 462-0306
www.micomlabs.com

ACCREDITED
TESTING CERT #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

Table of Contents

1. ACCREDITATION, LISTINGS & RECOGNITION 4
1.1. TESTING ACCREDITATION 4
1.2. RECOGNITION 5
1.3. PRODUCT CERTIFICATION 6
2. DOCUMENT HISTORY 7
3. TEST RESULT CERTIFICATE 8
4. REFERENCES AND MEASUREMENT UNCERTAINTY 9
4.1. Normative References 9
4.2. Test and Uncertainty Procedure 10
5. PRODUCT DETAILS AND TEST CONFIGURATIONS 11
5.1. Technical Details 11
5.2. Scope Of Test Program 12
5.3. Equipment Model(s) and Serial Number(s) 13
5.4. Antenna Details 13
5.5. Cabling and I/O Ports 13
5.6. Test Configurations 14
5.7. Equipment Modifications 14
5.8. Deviations from the Test Standard 14
6. TEST EQUIPMENT CONFIGURATION(S) 15
6.1. Radiated Emissions - 3m Chamber 15
6.2. Conducted 17
7. TEST SUMMARY 19
8. TEST RESULTS 20
8.1. RF Output Power 20
8.2. Transmitter Spectrum Mask 25
8.3. Occupied Channel Bandwidth 28
8.4. Frequency Stability 31
8.5. Conducted Transmitter Unwanted Emissions 33
8.6. Radiated Transmitter Spurious Unwanted Emissions 35
8.6.2 Radiated Testing 36
A. APPENDIX - GRAPHICAL IMAGES 39
A.1. Spectrum Mask 40
A.2. Occupied Channel Bandwidth 43
A.3. Transmitter Unwanted Emissions in the Spurious Domain 46
A.4. Radiated Spurious Emissions 49

1. ACCREDITATION, LISTINGS & RECOGNITION

1.1. TESTING ACCREDITATION

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard ISO/IEC 17025:2017. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-01.pdf

Accredited Laboratory

A2LA has accredited

MICOM LABS

Pleasanton, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 24th day of February 2020.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2381.01
Valid to November 30, 2021

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

1.2. RECOGNITION

MiCOM Labs, Inc has widely recognized wireless testing and certification capabilities. In addition to being recognized for Testing and Certification under Phase 2 agreements with Canada, Europe and Japan, our international recognition includes Conformity Assessment Body designation under Phase 1 agreements with APEC MRA countries. MiCOM Labs test reports are accepted globally.

Country	Recognition Body	Status	MRA Phase	Identification No.
USA	Federal Communications Commission (FCC)	TCB	-	US0159 Test Firm Designation #: US1084
Canada	Industry Canada (ISED)	FCB	APEC MRA 2	US0159 ISED #: 4143A
Japan	MIC (Ministry of Internal Affairs and Communication)	CAB	Japan MRA 2	RCB 210
	Japan Approvals Institute for Telecommunication Equipment (JATE)			
	VCCI	--	--	A-0012
Europe	European Commission	NB	EU MRA 2	NB 2280
Mexico	Instituto Federal de Telecomunicaciones (IFT)	CAB	Mexico MRA 1	US0159
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	US0159
Hong Kong	Office of the Telecommunication Authority (OFTA)	CAB	APEC MRA 1	
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)	CAB	APEC MRA 1	
Singapore	Infocomm Development Authority (IDA)	CAB	APEC MRA 1	
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)	CAB	APEC MRA 1	
Vietnam	Ministry of Communication (MIC)	CAB	APEC MRA 1	

EU MRA – European Union Mutual Recognition Agreement
NB – Notified Body

APEC MRA – Asia Pacific Economic Community Mutual Recognition Agreement. Recognition agreement under which test lab is accredited to regulatory standards of the APEC member countries.

MRA Phase
Phase I - recognition for product testing
Phase II – recognition for both product testing and certification

1.3. PRODUCT CERTIFICATION

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard ISO/IEC 17065:2012. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.02. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-02.pdf

Accredited Product Certification Body

A2LA has accredited

MiCOM LABS

Pleasanton, CA

This product certification body is accredited in accordance with the recognized International Standard ISO/IEC 17065:2012 *Requirements for bodies certifying products, processes and services*. This product certification body also meets the *A2LA R322 – Specific Requirements – Notified Body Accreditation Requirements* and *A2LA R308 - Specific Requirements - ISO-IEC 17065 - Telecommunication Certification Body Accreditation Program*. This accreditation demonstrates technical competence for a defined scope and the operation of a management system.

Presented this 24th day of February 2020

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2381.02
Valid to November 30, 2021

For the product certification schemes to which this accreditation applies, please refer to the organization's Product Certification Scope of Accreditation.

United States of America – Telecommunication Certification Body (TCB)
Industry Canada – Certification Body, CAB Identifier – US0159
Europe – Notified Body (NB), NB Identifier - 2280
Japan – Recognized Certification Body (RCB), RCB Identifier - 210

2. DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft	9th March 2020	Draft for Client Review
Rev A	9th June 2020	Initial Release
Rev B	15th June 2020	Modified Page 13 DSRC antenna gain typo Correction to duty cycle offset Pages 23 & 24
Rev C	25th June 2020	Correction to Model and Company name on Page 2

In the above table the latest report revision will replace all earlier versions.

3. TEST RESULT CERTIFICATE

Manufacturer:	Advanced Automotive Antennas, S.L Calle Gran Via Carles III, Barcelona 08028 Spain	**Tested By:**	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Model:	TCU-FITAX-3.5	**Telephone:** **Fax:**	+1 925 462 0304 +1 925 462 0306
Equipment Type:	Dedicated Short Range Communication On-Board Unit (DSRC OBU)		
S/N's:	201944207078, 201944207079		
Test Date(s):	4th – 6th March 2020	**Website:**	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC CFR 47 Part 95 Subpart L	EQUIPMENT COMPLIES

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

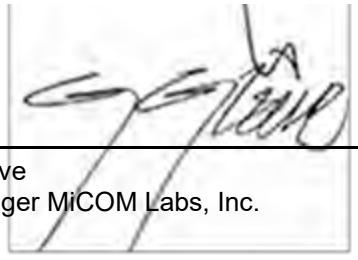
1. This document reports conditions under which testing was conducted and the results of testing performed.

2. Details of test methods used have been recorded and kept on file by the laboratory.

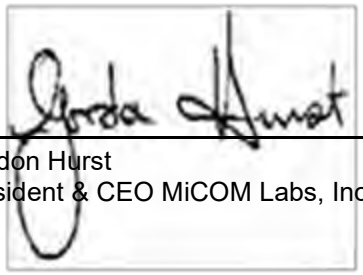
3. Test results apply only to the item(s) tested.

A2LA ACCREDITED
TESTING CERT #2381.01

Approved & Released for MiCOM Labs, Inc. by:



Graeme Grieve
Quality Manager MiCOM Labs, Inc.



Gordon Hurst
President & CEO MiCOM Labs, Inc.

4. REFERENCES AND MEASUREMENT UNCERTAINTY

4.1. Normative References

REF.	PUBLICATION	YEAR	TITLE
I	A2LA	October 2019	R105 - Requirement's When Making Reference to A2LA Accreditation Status
II	ETSI TR 100 028	2001-12	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
III	M 3003	Edition 3 Nov.2012	Expression of Uncertainty and Confidence in Measurements
IV	FCC CFR 47 Part 90 Subpart L and M	13th March 2020	Private Land Mobile Radio Services
V	FCC CFR 47 Part 95 L	13th March 2020	Title 47 CFR Part 95, Personal Radio Services
VI	ASTM E2213-03	2018	Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems — 5-GHz Band Dedicated Short-Range Communications (DSRC)
VII	ANSI/TIA 603-D	June 2010	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
VIII	ANSI C63.26	December 2015	Compliance Testing of Transmitters Used in Licensed Radio Services

4.2. Test and Uncertainty Procedure

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

MiCOM Labs, 575 Boulder Court, Pleasanton, California 94566 USA, Phone: +1 (925) 462 0304, Fax: +1 (925) 462 0306, www.micomlabs.com

5. PRODUCT DETAILS AND TEST CONFIGURATIONS

5.1. Technical Details

Details	Description
Purpose:	Test of the Advanced Automotive Antennas, S.L TCU-FITAX-3.5 to FCC CFR 47 Part 95 Subpart L Personal Radio Services
Applicant:	Advanced Automotive Antennas, S.L Calle Gran Via Carles III, Barcelona 08028 Spain
Manufacturer:	Advanced Automotive Antennas, S.L
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Test report reference number:	DEKR199-U4
Date EUT received:	Feb 26th 2020
Standard(s) applied:	FCC CFR 47 Part 95 Subpart L
Dates of test (from - to):	March 4th – 6th 2020
No of Units Tested:	2
Product Family Name:	FITAX
Model(s):	TCU-FITAX-3.5
Location for use:	Outdoors
Declared Frequency Range(s):	5855-5925 MHz
Type of Modulation:	TCU-FITAX-3.5
EUT Modes of Operation:	BPSK, QPSK, 16QAM, 64QAM
Declared Nominal Output Power (dBm):	20 dBm
Transmit/Receive Operation:	Transceiver
Rated Input Voltage and Current:	9-18V DC, 813 mA
Operating Temperature Range:	-40°C to 70°C
ITU Emission Designator:	10M0W7W
Equipment Dimensions:	143.8 / 34.5 / 141.4 mm
Weight:	470 grams
Hardware Rev:	51986582
Software Rev:	DSRC_GEN1.4

5.2. Scope of Test Program

Advanced Automotive Antennas, S.L TCU-FITAX-3.5

The scope of the test program was to test the Advanced Automotive Antennas, S.L TCU-FITAX-3.5, TCU-FITAX-3.5 configurations for compliance against the following specification. While the product is capable of BPSK, QPSK, 16QAM, and 64QAM, BPSK was found to provide the highest power and a consistent duty cycle, thus was tested as a worse case. The S.L TCU-FITAX-3.5 also has two antenna ports providing the same function however, only one is active at any given time and employs an algorithm to ensure the more efficient of the two ports is used for data transmission. No testing was performed on the second port which is a duplicate of port 1.

FCC CFR 47 Part 95 Subpart L DSRCS ON-Board Units

5.3. Equipment Model(s) and Serial Number(s)

Type (EUT/ Support)	Equipment Description	Mfr	Model No.	Serial No.
EUT	Dedicated Short Range Communication On-Board Unit (DSRC OBU	Advanced Automotive Antennas.	TCU-FITAX-3.5	201944207078, 201944207079

5.4. Antenna Details

Type	Manufacturer	Family	Gain (dBi)	BF Gain	Dir BW	X-Pol	Frequency Band (MHz)
LTE	Ficosa	Flexible Foil	2.0				698-798 (LTE 700)
LTE	Ficosa	Flexible Foil	2.5				791-862 (LTE 800)
LTE	Ficosa	Flexible Foil	3.0				880-960 (GSM 900)
LTE	Ficosa	Flexible Foil	4.0				1710-1990 (GSM1800, PCS 1900)
LTE	Ficosa	Flexible Foil	5.5				1900-2200 (UMTS)
LTE	Ficosa	Flexible Foil	3.5				2500-2690 (LTE 2600)
WiFi/BT	Ficosa	Flexible Foil	-1.5				2400-2485, 5014-5925
DSRC	Mobile Mark	Volumetric	7.0				5800-6000
DSRC	Mobile Mark	Volumetric	7.0				5800-6000
GPS	Mobile Mark	Patch	5.0				1575.42 +/- 2
GPS	Mobile Mark	Patch	5.0				1575.42 +/- 2

BF Gain - Beamforming Gain
Dir BW - Directional BeamWidth
X-Pol - Cross Polarization

5.5. Cabling and I/O Ports

Port Type	Max Cable Length	# of Ports	Screened	Conn Type	Data Type	Bit Rate (Mbit/s)	Environment
Main	>10m	1	No	Multi	DC and Digital	?	End-User
GNSS	> 3m	1	Yes	Fakra	Digital	?	End-User
V2X	> 3m	2	Yes	Fakra	Digital	< 24	End-User
LTE	> 3m	2	Yes	Fakra	Digital	?	End-User
WiFi/BT	>3m	1	Yes	Fakra	Digital	?	End-User
USB	Not Connect*	1	Yes	USB	Digital	?	NC*
HDMI	Not Connect*	1	Yes	HDMI	Digital	?	NC*
CAN Bus	Not Connect*	1	No	Multi	Digital	?	NC*

*NC, Not Connected, manufacturer declares not used in normal operation.

5.6. Test Configurations

Results for the following configurations are provided in this report:

Operational Mode(s) (802.11p)	Data Rate	Channel Frequency (MHz)		
		Low	Mid	High
5850 - 5925 MHz				
BPSK	3	5860.00	5890.00	5920.00
QPSK	6	5860.00	5890.00	5920.00
16QAM	12	5860.00	5890.00	5920.00
64QAM	24	5860.00	5890.00	5920.00

5.7. Equipment Modifications

The following modifications were required to bring the equipment into compliance:
1. NONE

5.8. Deviations from the Test Standard

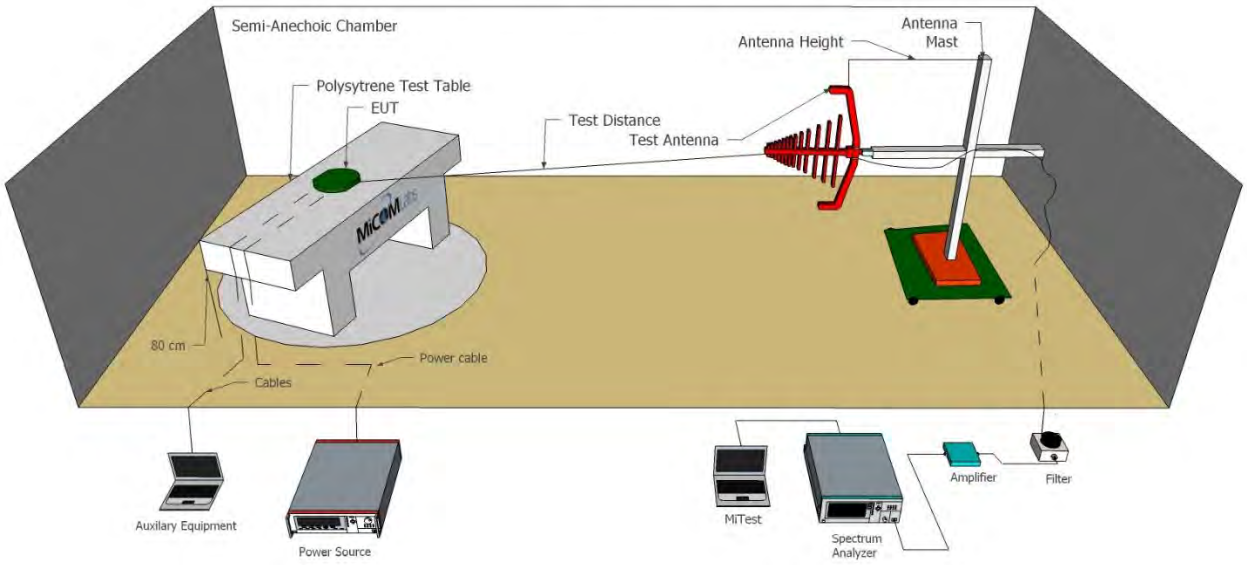
The following deviations from the test standard were required to complete the test program:
1. NONE

6. TEST EQUIPMENT CONFIGURATION(S)

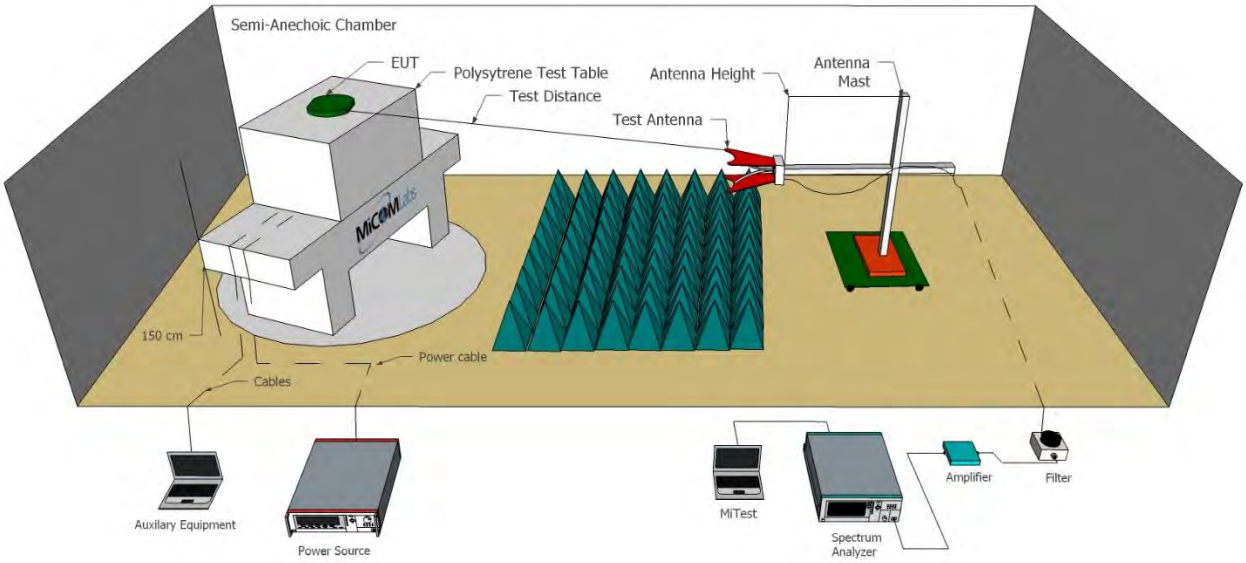
6.1. Radiated Emissions - 3m Chamber

The following tests were performed using the radiated test set-up shown in the diagram below. Radiated emissions below 1GHz. Radiated Emissions above 1GHz.

Radiated Emissions Below 1GHz Test Setup



Radiated Emissions Above 1GHz Test Setup

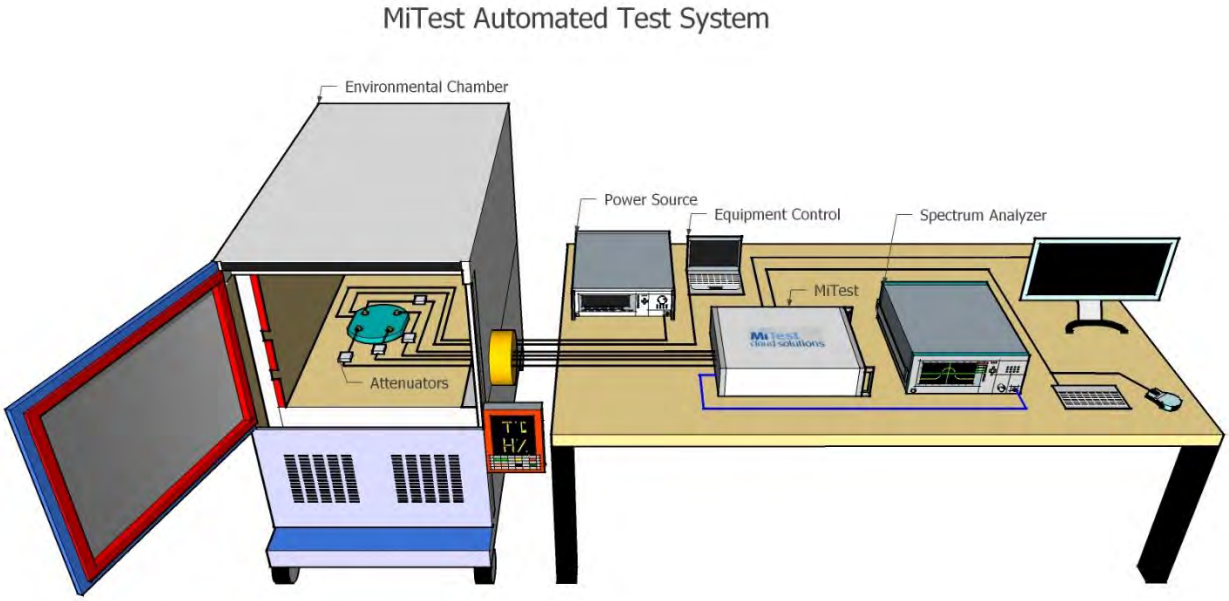


A full system calibration was performed on the test station and any resulting system losses (or gains) were taken into account in the production of all final measurement data.

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
170	Video System Controller for Semi Anechoic Chamber	Panasonic	WV-CU101	04R08507	Not Required
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	8 Oct 2020
298	3M Radiated Emissions Chamber Maintenance Check	MiCOM	3M Chamber	298	26 Nov 2020
338	Sunol 30 to 3000 MHz Antenna	Sunol	JB3	A052907	4 Apr 2021
373	26III RMS Multimeter	Fluke	Fluke 26 series III	76080720	21 Sep 2020
377	Band Rejection Filter 5150 to 5880MHz	Microtronics	BRM50716	034	3 Sep 2020
378	Rohde & Schwarz 40 GHz Receiver with Generator	Rhode & Schwarz	ESIB40	100107/040	12 Oct 2020
396	2.4 GHz Notch Filter	Microtronics	BRM50701	001	3 Sep 2020
397	Amp 10 - 2500MHz	MiCOM Labs	Amp 10 - 2500 MHz	NA	6 Sep 2020
399	ETS 1-18 GHz Horn Antenna	ETS	3117	00154575	12 Oct 2020
406	Amplifier for Radiated Emissions	MiCOM Labs	40dB 1 to 18GHz Amp	0406	9 Sep 2020
410	Desktop Computer	Dell	Inspiron 620	WS38	Not Required
411	Mast/Turntable Controller	Sunol Sciences	SC98V	060199-1D	Not Required
412	USB to GPIB Interface	National Instruments	GPIB-USB HS	11B8DC2	Not Required
413	Mast Controller	Sunol Science	TWR95-4	030801-3	Not Required
414	DC Power Supply 0-60V	HP	6274	1029A01285	Cal when used
415	Turntable Controller	Sunol Sciences	Turntable Controller	None	Not Required
447	MiTest Rad Emissions Test Software	MiCOM	Rad Emissions Test Software Version 1.0	447	Not Required
462	Schwarzbeck cable from Antenna to Amplifier.	Schwarzbeck	AK 9513	462	5 Sep 2020
463	Schwarzbeck cable from Amplifier to Bulkhead.	Schwarzbeck	AK 9513	463	5 Sep 2020
464	Schwarzbeck cable from Bulkhead to Receiver	Schwarzbeck	AK 9513	464	9 Sep 2020
466	Low Pass Filter DC-1500 MHz	Mini-Circuits	NLP-1750+	VUU10401438	3 Sep 2020
480	Cable - Bulkhead to Amp	SRC Haverhill	157-3050360	480	9 Sep 2020
481	Cable - Bulkhead to Receiver	SRC Haverhill	151-3050787	481	9 Sep 2020
510	Barometer/Thermometer	Control Company	68000-49	170871375	20 Dec 2020
518	Cable - Amp to Antenna	SRC Haverhill	157-3051574	518	9 Sep 2020
87	Uninterruptible Power Supply	Falcon Electric	ED2000-1/2LC	F3471 02/01	Cal when used
CC05	Confidence Check	MiCOM	CC05	None	4 Oct 2020

6.2. Conducted

Conducted RF Emission Test Set-up(s) The following tests were performed using the conducted test set-up shown in the diagram below



A full system calibration was performed on the test station and any resulting system losses (or gains) were taken into account in the production of all final measurement data.

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
#3 SA	MiTest Box to SA	Fairview Microwave	SCA1814-0101-72	#3 SA	9 Sep 2020
#3P1	EUT to MiTest box port 1	Fairview Microwave	SCA1814-0101-72	#3P1	9 Sep 2020
#3P2	EUT to MiTest box port 2	Fairview Microwave	SCA1814-0101-72	#3P2	9 Sep 2020
#3P3	EUT to MiTest box port 3	Fairview Microwave	SCA1814-0101-72	#3P3	9 Sep 2020
#3P4	EUT to MiTest box port 4	Fairview Microwave	SCA1812-0101-72	#3P4	9 Sep 2020
249	Resistance Thermometer	Thermotronics	GR2105-02	9340 #2	30 Oct 2020
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	8 Oct 2020
378	Rohde & Schwarz 40 GHz Receiver with Generator	Rhode & Schwarz	ESIB40	100107/040	12 Oct 2020
398	MiTest RF Conducted Test Software	MiCOM	MiTest ATS	Version 4.1	Not Required
405	DC Power Supply 0-60V	Agilent	6654A	MY4001826	Cal when used
408	USB to GPIB interface	National Instruments	GPIB-USB HS	14C0DE9	Not Required
440	USB Wideband Power Sensor	Boonton	55006	9178	22 Sep 2020
441	USB Wideband Power Sensor	Boonton	55006	9179	20 Sep 2020
442	USB Wideband Power Sensor	Boonton	55006	9181	19 Sep 2020
445	PoE Injector	D-Link	DPE-101GL	QTAH1E2000625	Not Required
461	Spectrum Analyzer	Agilent	E4440A	MY46185537	20 Sep 2020
510	Barometer/Thermometer	Control Company	68000-49	170871375	20 Dec 2020
515	MiTest Cloud Solutions RF Test Box	MiCOM	2nd Gen with DFS	515	9 Sep 2020
534	Power Sensor 50 GHz - 70dBm to +20dBm	R&S	NRP50SN	1419.0093K02-100888-SB	26 Feb 2021
75	Environmental Chamber	Thermatron	SE-300-2-2	27946	20 Feb 2021

7. TEST SUMMARY

List of Measurements

Test Header	Result	Data Link
RF Output Power	Complies	View Data
Transmit Spectrum Mask	Complies	View Data
Occupied Channel Bandwidth	Complies	View Data
Conducted Transmitter Spurious Emissions	Complies	View Data
Radiated Transmitter Spurious Emissions	Complies	View Data
Frequency Stability	Complies	View Data

8. TEST RESULTS

8.1. RF Output Power

Conducted Test Conditions for RF Output Power			
Standard:	CFR 47 Part 95 L / ASTM E2213-02	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	RF Output Power	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	95.3189 / 8.10	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Applicability
This requirement applies to all DSRCS On-Board Units
On-Board Unit transmitter types operating in the 5850-5925 MHz band must be designed to comply with the technical standard ASTM E2213-03, Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems—5 GHz Band Dedicated Short-range Communications (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) Specifications

ASTM E2213-03 8.10.1
8.10.1.5 Public safety RSU and OBU operations in Channel 184 shall not exceed 28.8 dBm antenna input power and 40 dBm EIRP. Private RSU operations in Channel 184 shall not exceed 28.8 dBm antenna input power and 33 dBm EIRP.
8.10.1.6 Private OBU operations in Channels 172, 174, 176, 178, and 184 shall not exceed 28.8 dBm antenna input power and 33 dBm EIRP. Private OBU operations in Channel 175 shall not exceed 10 dBm antenna input power and 23 dBm EIRP. Private OBU operations in Channels 180, 181, and 182 shall not exceed 20 dBm antenna input power and 23 dBm EIRP.
8.10.1.7 Public safety OBU operations in Channels 172, 174, and 176 shall not exceed 28.8 dBm antenna input power and 33 dBm EIRP. Public safety OBU operations in Channel 175 shall not exceed 10 dBm antenna input power and 23 dBm EIRP.
8.10.1.8 Public safety OBU operations in Channel 178 shall not exceed 28.8 dBm antenna input power and 44.8 dBm EIRP.
8.10.1.9 The RSUs and OBUs shall transmit only the power needed to communicate over the distance required by the application being supported.
8.10.1.10 Four classes of operation are specified for DSRC devices in the 5.850 to 5.925-GHz band and are shown in Table 9.

TABLE 9 DSRC Device Classes and Transmit Power Level

Device Class	Maximum Device Output Power, dBm
A	0
B	10
C	20
D	28.8 or more

Test Process
Test Procedure for Fundamental Emission Output Power Measurement
In the case of average power measurements an average power sensor was utilized.

For peak power measurements the spectrum analyzer built-in power function was used to integrate peak power over the 20 dB bandwidth.

Testing was performed under ambient conditions at nominal voltage only. Where the device operated with multiple antenna ports i.e. MIMO device, each port was measured, summed (Σ) and reported.

Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document.
Supporting Information
Calculated Power = A + G + Y+ 10 log (1/x) dBm

A = Total Power [10*Log10 ($10^{a/10}$ + $10^{b/10}$ + $10^{c/10}$ + $10^{d/10}$)]
G = Antenna Gain
Y = Beamforming Gain
x = Duty Cycle (average power measurements only)
.
Test configuration and setup used for the measurement was per Section 'Conducted RF Emissions Test Set-up' in this report.

Limit
Manufacturer declared device type C, Maximum Output power is 20 dBm

Equipment Configuration for Output Power			
Variant:	802.11p	**Duty Cycle (%):**	80.0
Data Rate:	3 MBit/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	BPSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Output Power (dBm) Port(s)				Calculated Total Power Σ Port(s) + DCCF (0.96 dB)	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	dBm	dBm	dB	
5860.0	18.99	--	--	--	19.95	20.00	-0.05	20
5890.0	18.87	--	--	--	19.83	20.00	-0.17	20
5900.0	18.87	--	--	--	19.83	20.00	-0.17	20
5910.0	18.91	--	--	--	19.87	20.00	-0.13	20
5920.0	18.49	--	--	--	19.45	20.00	-0.55	20

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Measurement Uncertainty:	±1.33 dB

Equipment Configuration for Output Power			
Variant:	802.11p	**Duty Cycle (%):**	69
Data Rate:	6.00 MBit/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	QPSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Output Power (dBm) Port(s)				Calculated Total Power Σ Port(s) + DCCF (1.6 dB)	Limit	Margin	EUT Power Setting
MHz	**a**	**b**	**c**	**d**	**dBm**	**dBm**	**dB**	
5860.0	17.44	--	--	--	19.04	20.00	-0.96	20
5890.0	17.47	--	--	--	19.07	20.00	-0.93	20
5900.0	17.40	--	--	--	19.00	20.00	-1.00	20
5910.0	17.46	--	--	--	19.06	20.00	-0.94	20
5920.0	17.43	--	--	--	19.03	20.00	-0.97	20

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Measurement Uncertainty:	±1.33 dB

Equipment Configuration for Output Power			
Variant:	802.11p	**Duty Cycle (%):**	50.0
Data Rate:	12.00 MBit/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	16QAM	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Output Power (dBm) Port(s)				Calculated Total Power Σ Port(s) + DCCF (3.0 dB)	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	dBm	dBm	dB	
5860.0	16.83	--	--	--	19.83	20.00	-0.17	19*
5890.0	16.81	--	--	--	19.81	20.00	-0.19	19*
5900.0	16.90	--	--	--	19.90	20.00	-0.10	19*
5910.0	16.92	--	--	--	19.92	20.00	-0.08	19*
5920.0	16.85	--	--	--	19.85	20.00	-0.15	19*

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Measurement Uncertainty:	±1.33 dB

*Note: Power reduced to meet limit

Equipment Configuration for Output Power			
Variant:	802.11p	**Duty Cycle (%):**	50.0
Data Rate:	24.00 MBit/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	64QAM	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Output Power (dBm) Port(s)				Calculated Total Power Σ Port(s) + DCCF (3.0 dB)	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	dBm	dBm	dB	
5860.0	16.81	--	--	--	19.81	20.00	-0.19	19*
5890.0	16.77	--	--	--	19.77	20.00	-0.23	19*
5900.0	16.90	--	--	--	19.90	20.00	-0.10	19*
5910.0	16.88	--	--	--	19.88	20.00	-0.12	19*
5920.0	16.85	--	--	--	19.85	20.00	-0.15	19*

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Measurement Uncertainty:	±1.33 dB

*Note: Power reduced to meet limit

8.2. Transmitter Spectrum Mask

Conducted Test Conditions for Power Spectral Density			
Standard:	CFR 47 Part 95 L / ASTM E2213-02	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Power Spectral Density	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	95.3189 / 8.10	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Applicability
This requirement applies to all DSRCS On-Board Units
On-Board Unit transmitter types operating in the 5850-5925 MHz band must be designed to comply with the technical standard ASTM E2213-03, Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems—5 GHz Band Dedicated Short-range Communications (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) Specifications

ASTM E2213-03 8.10.2
8.10.2.1 The DSRC transmitted spectrum mask is relative to the device class of operation. The power in the transmitted spectrum for all DSRC devices shall be −25 dBm or less within 100 kHz outside all channel and band edges. This will be accomplished by attenuating the transmitted signal 100 kHz outside the channel and band edges by 55 + 10log(*P*) dB, where *P* is the total transmitted power in watts. The transmitted spectral density of the transmitted signal for all devices shall fall within the spectral mask, as detailed in Table 10. The measurements shall be made using a 100-kHz resolution bandwidth and a 30-kHz video bandwidth.
8.10.2.2 The transmitted spectral mask for class A, B, C, and D devices are shown in Figs. 12-15. In addition, all DSRC site installations shall limit the EIRP in the transmitted spectrum to −25 dBm or less in the 100 kHz at the channel edges
and the band edges. Additional filtering that supplements the filtering provided by the transmitter may be needed for some antenna/transmitter combinations.

TABLE 10 DSRC Spectrum Mask

NOTE 1—Reduction in Power Spectral Density, dBr[A].

Class	±4.5-MHz Offset	±5.0-MHz Offset	±5.5-MHz Offset	±10-MHz Offset	±15-MHz Offset
Class A	0	–10	–20	–28	–40
Class B	0	–16	–20	–28	–40
Class C	0	–26	–32	–40	–50
Class D	0	–35	–45	–55	–65

[A]*From* IEEE 802.11a. Copyright 1999 IEEE. All rights reserved.

Manufacturer Declared Device type is C

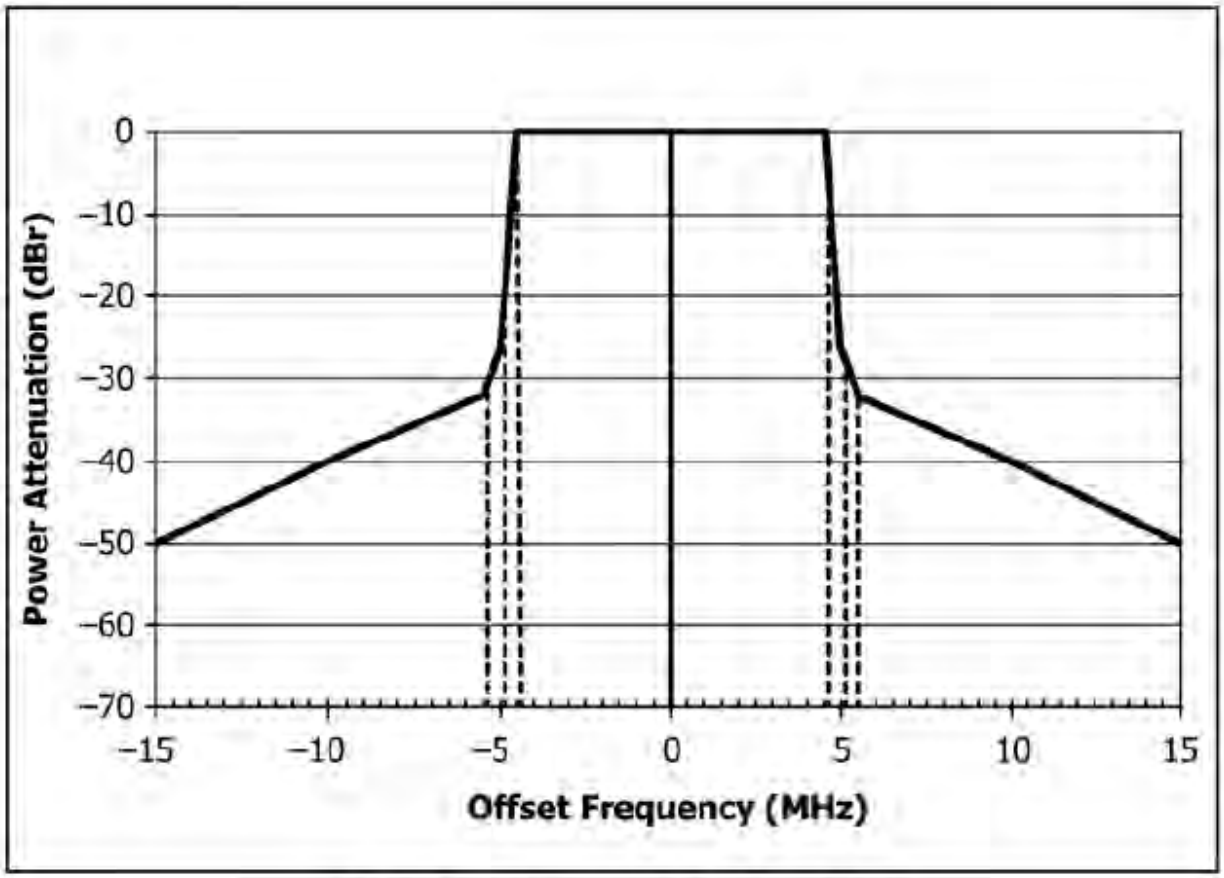


FIG. 14 Class C Transmit Spectrum Mask

Test Configuration
Test configuration and setup used for the measurement was per Section 'Conducted RF Emissions Test Set-up' in this report.

Equipment Configuration for Transmitter Spectrum Mask			
Variant:	802.11p	**Duty Cycle (%):**	80
Data Rate:	3 MBit/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	BPSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results			
Test Frequency	**Peak Marker**	**Limit**	**Power Setting**
MHz	**dBm**	**dBm**	
5860.0	8.3	-25.0	20
5890.0	7.4	-25.0	20
5920.0	7.74	-25.0	20

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

* This value is the maximum RF Output Power measurement

Note: click the links in the above matrix to view the graphical image (plot).

8.3. Occupied Channel Bandwidth

Conducted Test Conditions for Occupied Channel Bandwidth			
Standard:	CFR 47 Part 95 L / Part 2 ASTM E2213-03	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Occupied Channel Bandwidth	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	95.3163 / 2.1049 ASTM E2213-03: 8.9.1	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Applicability
This requirement applies to all types of intentional transmitter equipment types.

Definition
The Occupied Channel Bandwidth is the bandwidth that contains 99 % of the power of the signal.

Limits
§95.3163:
The following table lists the channels allotted for use by On-Board Units (OBUs):

Channel No.	Channel use	Frequency range (MHz)
170	Reserved	5850-5855
172	Service	5855-5865
174	Service	5865-5875
175	Service	5865-5885
176	Service	5875-5885
178	Control	5885-5895
180	Service	5895-5905
181	Service	5895-5915
182	Service	5905-5915
184	Service	5915-5925

(a) Channels 174 and 176 may be combined to create a 20 MHz bandwidth channel designated as Channel 175.
(b) Channels 180 and 182 may be combined to create a 20 MHz bandwidth channel designated as Channel 181.
(c) Channels 172 and 184 are designated for public safety applications involving safety of life and property.

§2.1049 Measurements required: Occupied bandwidth.
The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

(h) Transmitters employing digital modulation techniques—when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at the discretion of the user.

Limit:
ASTM E2213-03: 8.9.1 -

TABLE 6 Major Parameters of the OFDM PHY[A]

Information Data Rate	3, 4.5, 6, 9, 12, 18, 24, and 27 Mbit/s (3, 6, and 12 Mbit/s are Mandatory)
Modulation	BPSK OFDM QPSK OFDM 16-QAM OFDM 64-QAM OFDM
Error correcting code	K = 7 (64 states) convolutional code
Coding rate	1/2, 2/3, 3/4
Number of subcarriers	52
OFDM symbol duration	8.0 µs
Guard interval	1.6 µs[2] (T_{GI})
Occupied bandwidth	8.3 MHz

[A] From IEEE 802.11a. Copyright 1999 IEEE. All rights reserved.

Test Configuration
Test configuration and setup used for the measurement was per Section 'Conducted RF Emissions Test Set-up' in this report.

Equipment Configuration for Occupied Channel Bandwidth			
Variant:	802.11p	**Duty Cycle (%):**	80
Data Rate:	3 MBit/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	BPSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Temperature: 20.0°C	Voltage: 12 Vdc	99% Occupied Bandwidth Markers		Pass/Fail
Test Frequency: MHz	99% Channel Bandwidth	Marker T1	Marker T2	
	MHz	MHz	MHz	
5860.00	8.257	5855.852	5864.108	PASS
5890.00	8.257	5885.852	5894.108	PASS
5920.00	8.257	5915.852	5924.108	PASS

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Note: click the links in the above matrix to view the graphical image (plot).

8.4. Frequency Stability

Conducted Test Conditions for Frequency Stability			
Standard:	CFR 47 Part 95 L / Part 2 ASTM E2213-03	**Ambient Temp. (ºC):**	20.0 - 24.5
Test Heading:	Frequency Stability	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	ASTM 2213-03: 8.10.4	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Applicability
This requirement applies to all intentional transmitters falling under this standard

Definition
Carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

Limits
ASTM 2213-03 8.10.4: ±10 ppm
Temperature range requirements: -20 to +50º C.
Voltage Variation +, -15%
±10 PPM

Equipment Configuration for Frequency Stability			
Variant:	802.11p	**Duty Cycle (%):**	80
Data Rate:	3 MBit/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	BPSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:	Channel Frequency 5890.0 MHz		

Test Measurement Results

Test frequency	5890.00 MHz	M1 Frequency	M2 Frequency	(M1 + M2) /2 Center Frequency	Freq Error		Limit	Margin
Temperature	**Voltage**	**MHz**	**MHz**	**MHz**	**kHz**	**ppm**	**ppm**	**ppm**
20 °C	**12.0 Vdc**	5885.261	5894.721	5889.991	-9.00	-1.5280	±10.0	-8.4720
20 °C	**10.8 Vdc**	5885.261	5894.720	5889.991	-9.00	-1.5280	±10.0	-8.4720
20 °C	**13.2 Vdc**	5885.261	5894.723	5889.992	-8.00	-1.3582	±10.0	-8.6418
-30 °C	**12.0 Vdc**	5885.271	5894.741	5890.006	6.00	1.0187	±10.0	-8.9813
-20 °C	**12.0 Vdc**	5885.350	5894.669	5890.010	10.00	1.6978	±10.0	-8.3022
-10 °C	**12.0 Vdc**	5885.281	5894.738	5890.010	10.00	1.6978	±10.0	-8.3022
0 °C	**12.0 Vdc**	5885.300	5894.719	5890.010	10.00	1.6978	±10.0	-8.3022
10 °C	**12.0 Vdc**	5885.291	5894.721	5890.006	6.00	1.0187	±10.0	-8.9813
30 °C	**12.0 Vdc**	5885.320	5894.699	5890.010	10.00	1.6978	±10.0	-8.3022
40 °C	**12.0 Vdc**	5885.340	5894.679	5890.010	10.00	1.6978	±10.0	-8.3022
50 °C	**12.0 Vdc**	5885.31	5894.709	5890.010	10.00	1.6978	±10.0	-8.3022

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-02 MEASURING FREQUENCY
Measurement Uncertainty:	0.86 ppm

8.5. Conducted Transmitter Unwanted Emissions

Conducted Test Conditions for Transmitter Unwanted Emissions			
Standard:	CFR 47 Part 95 L / Part 2 ASTM E2213-03	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Transmitter Unwanted Emissions	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	95.3189/ 2.1053 ASTM E2213-03: 8.10.3	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Applicability
This requirement applies to all types of intentional transmitter equipment types.

Definition
Transmitter unwanted emissions in the out-of-band domain are spurious emissions when the equipment is in Transmit mode,

Limits Transmitter Unwanted Emissions
ASTM E2213-03: 8.10.2 … In addition, all DSRC site installations shall limit the EIRP in the transmitted spectrum to −25 dBm or less in the 100 kHz at the channel edges and the band edges. And per inference to the rest of the Transmitter spectrum

Test Configuration
Test configuration and setup used for the measurement was per Section 'Conducted RF Emissions Test Set-up' in this report.

Only Noise floor was detected above 26 GHz

Equipment Configuration for Conducted Spurious Emissions - Peak			
Variant:	802.11p	**Duty Cycle (%):**	80
Data Rate:	3 MBit/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	BPSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Frequency Range	Conducted Spurious Emissions - Peak (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	SE	Limit	SE	Limit	SE	Limit	SE	Limit
2412.0	30.0 - 26000.0	-30.215	-25.00	--	--	--	--	--	--
2437.0	30.0 - 26000.0	-30.087	-25.00	--	--	--	--	--	--
2462.0	30.0 - 26000.0	-30.247	-25.00	--	--	--	--	--	--

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	<=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the links in the above matrix to view the graphical image (plot).

8.6. Radiated Transmitter Spurious Unwanted Emissions

Test Conditions for Transmitter Unwanted Emissions in the Spurious Domain			
Standard:	CFR 47 Part 95 L / Part 2 ASTM E2213-03	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Transmitter Unwanted Emissions	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	95.3189/ 2.1053 ASTM E2213-03: 8.10.3	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Applicability
This requirement applies to all types of intentional transmitter equipment types.

Definition
Transmitter unwanted emissions in the out-of-band domain are spurious emissions when the equipment is in Transmit mode,

Limits Transmitter Unwanted Emissions
ASTM E2213-03: 8.10.2 … In addition, all DSRC site installations shall limit the EIRP in the transmitted spectrum to −25 dBm or less in the 100 kHz at the channel edges and the band edges. And per inference to the rest of the Transmitter spectrum.
Limit in dBuV/m = EIRP Limit in dBm – 20log(D) + 104.8; where D is the measurement distance.
70.2 = (-25)-(20log(3)+104.8 = (-25)-(9.54)+104.8

Test Configuration
Test configuration and setup used for the measurement was per Section 'Conducted RF Emissions Test Set-up' in this report.

Only Noise floor was detected above 18 GHz

Per ANSI C63.26: 2015, section 5.5.1:
Substitution is not required on direct radiated emissions performed on a validated test site per requirements of C63.10
.

NOTE: Any e*missions found within < 6 dB of the limit line and ≥ to the limit line are evaluated in more detail in order to prove compliance. The Evaluation Table identifies emissions that fall within this criteria and are presented at the end of the test data for that particular operational mode*

8.6.2 Radiated Testing

Equipment Configuration for Radiated Transmitter Unwanted Emissions in the Spurious Domain

Antenna:	50 Ω Term	**Variant:**	802.11p
Antenna Gain (dBi):	Not Applicable	**Modulation:**	BPSK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	80
Channel Frequency (MHz):	5860.00	**Data Rate:**	3 MBit/s
Power Setting:	20	**Tested By:**	JMH

Test Measurement Results

1000.00 - 18000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	11721.16	68.18	4.49	-5.52	67.15	Max Peak	Vertical	116	186	70.2	-3.1	Pass
Test Notes: EUT powered by 12 V, Antenna ports terminated. 2.4G and 5G Notch in front of amp to prevent overload												

Note: click the links in the above matrix to view the graphical image (plot).

MiCOM Labs, 575 Boulder Court, Pleasanton, California 94566 USA, Phone: +1 (925) 462 0304, Fax: +1 (925) 462 0306, www.micomlabs.com

Equipment Configuration for Restricted Band Spurious Emissions

Antenna:	50 Ohm Term	**Variant:**	802.11p
Antenna Gain (dBi):	Not Applicable	**Modulation:**	BPSK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	84
Channel Frequency (MHz):	5890.00	**Data Rate:**	3 MBit/s
Power Setting:	20	**Tested By:**	JMH

Test Measurement Results

1000.00 - 18000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	11779.32	68.90	4.84	-5.49	68.25	Max Peak	Vertical	115	186	70.2	-2.0	Pass
Test Notes: EUT powered by 12 V, Antenna ports terminated. 2.4G and 5G Notch in front of amp to prevent overload												

Note: click the links in the above matrix to view the graphical image (plot).

MiCOM Labs, 575 Boulder Court, Pleasanton, California 94566 USA, Phone: +1 (925) 462 0304, Fax: +1 (925) 462 0306, www.micomlabs.com

Equipment Configuration for Restricted Band Spurious Emissions

Antenna:	50 Ohm Term	**Variant:**	802.11p
Antenna Gain (dBi):	Not Applicable	**Modulation:**	BPSK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	84
Channel Frequency (MHz):	5920.00	**Data Rate:**	3 MBit/s
Power Setting:	20	**Tested By:**	JMH

Test Measurement Results

1000.00 - 18000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	11841.12	70.07	4.50	-5.89	68.68	Max Peak	Vertical	110	180	70.2	-1.5	Pass
Test Notes: EUT powered by 12 V, Antenna ports terminated. 2.4G and 5G Notch in front of amp to prevent overload												

Note: click the links in the above matrix to view the graphical image (plot).

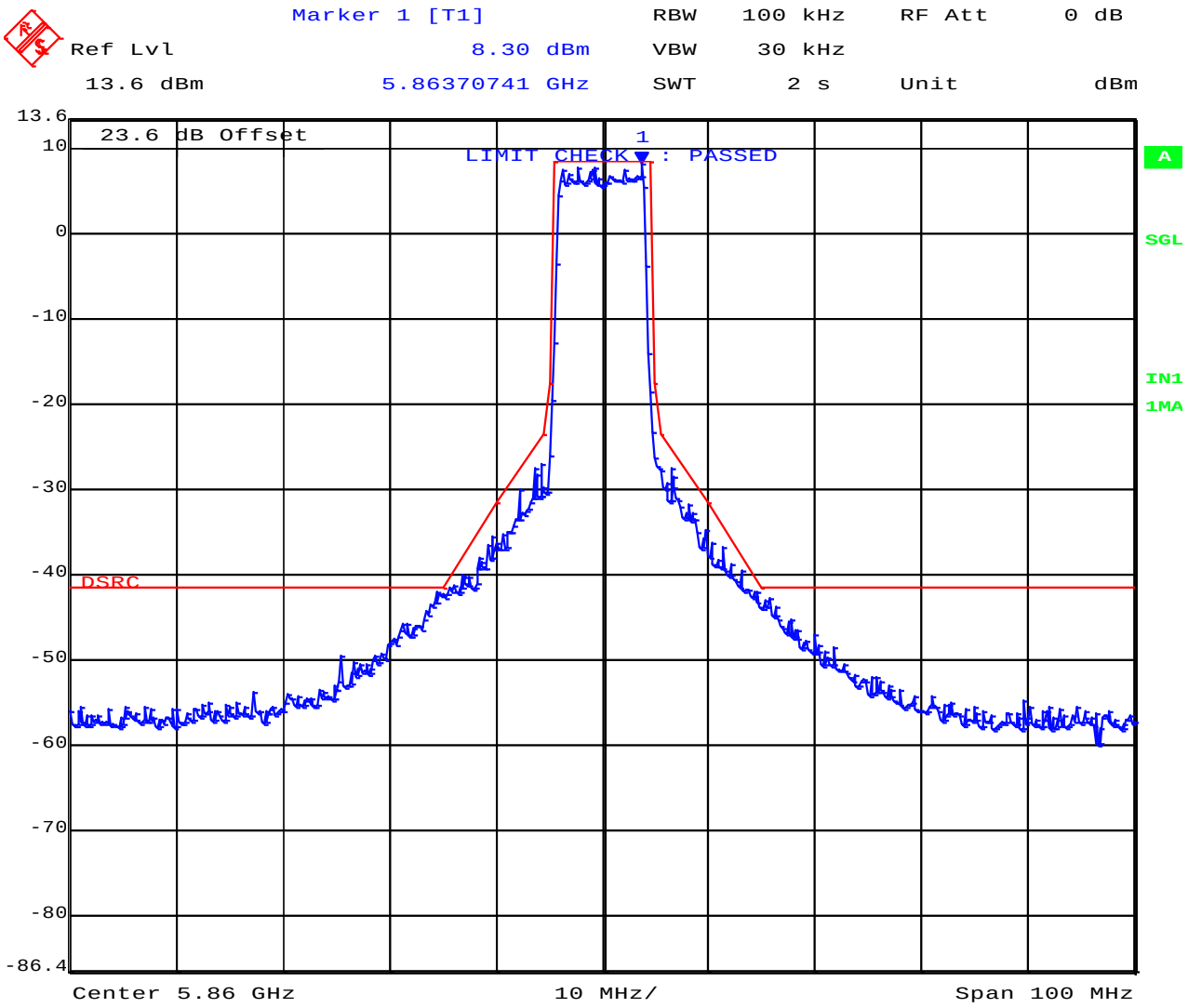
MiCOM Labs, 575 Boulder Court, Pleasanton, California 94566 USA, Phone: +1 (925) 462 0304, Fax: +1 (925) 462 0306, www.micomlabs.com

A. APPENDIX - GRAPHICAL IMAGES

A.1. Spectrum Mask

Spectrum Mask

Variant: 802.11p, Channel: 5860.00 MHz, Temp: 20, Voltage: 12 Vdc



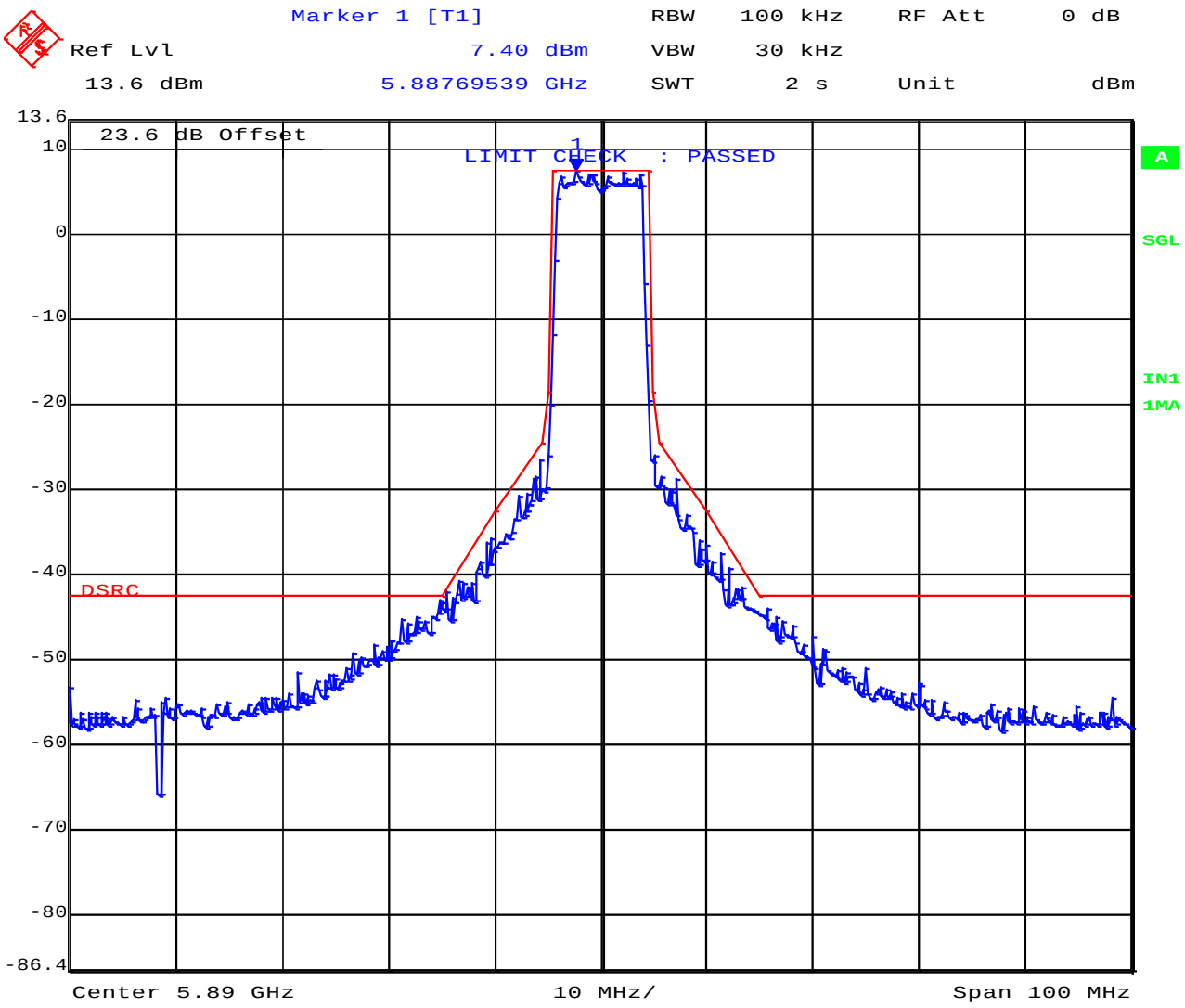
Date: 5.MAR.2020 10:27:39

Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = Peak Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 5863.707 MHz : 8.300 dBm	Channel Frequency: 5860.00 MHz

back to matrix

Spectrum Mask

Variant: 802.11p, Channel: 5890.00 MHz, Temp: 20, Voltage: 12 Vdc

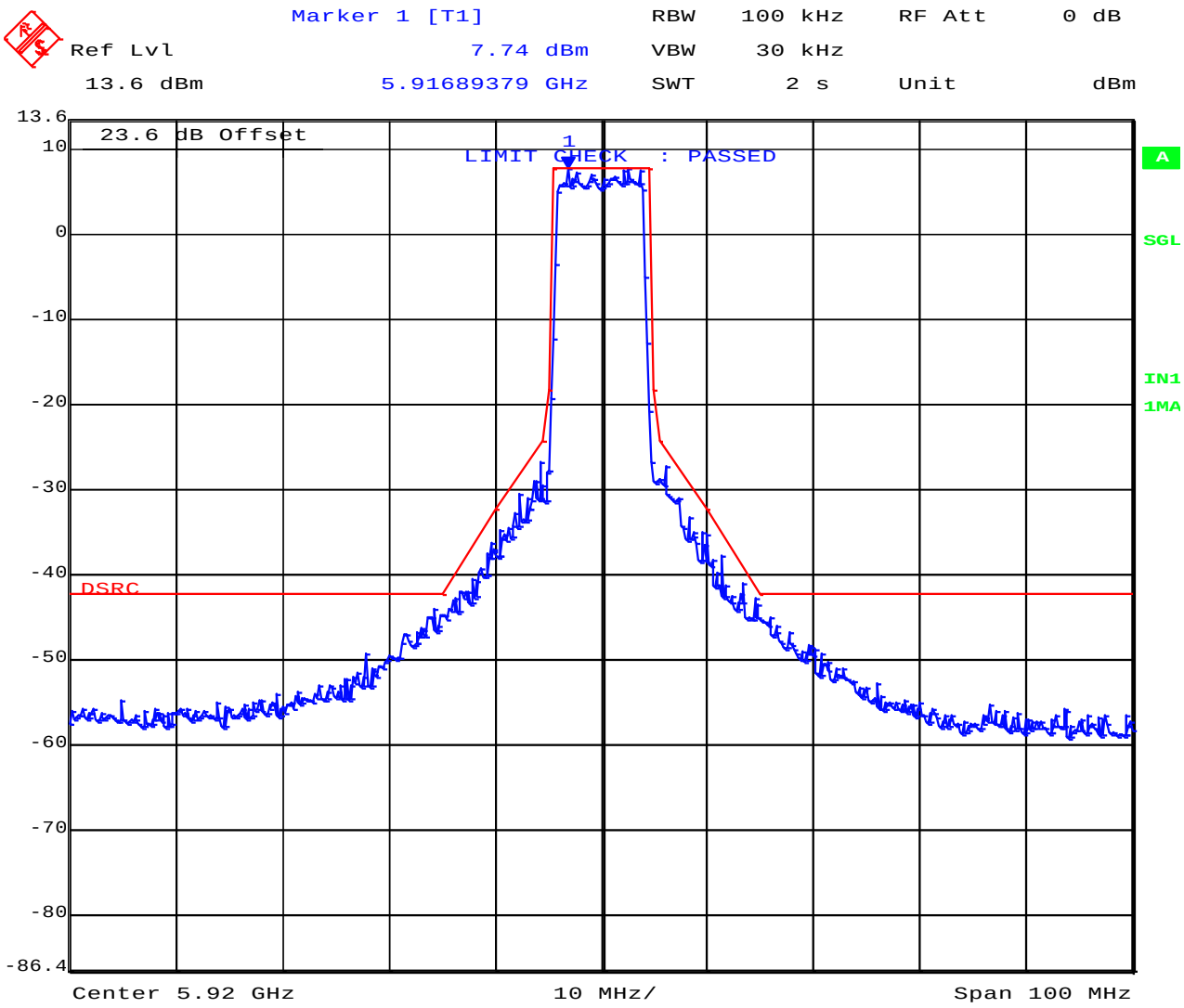


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = Detector = Peak Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 5887.69 MHz : 7.4 dBm	Channel Frequency: 5890.00 MHz

back to matrix

Spectrum Mask

Variant: 802.11p, Channel: 5920.00 MHz, Temp: 20, Voltage: 12 Vdc



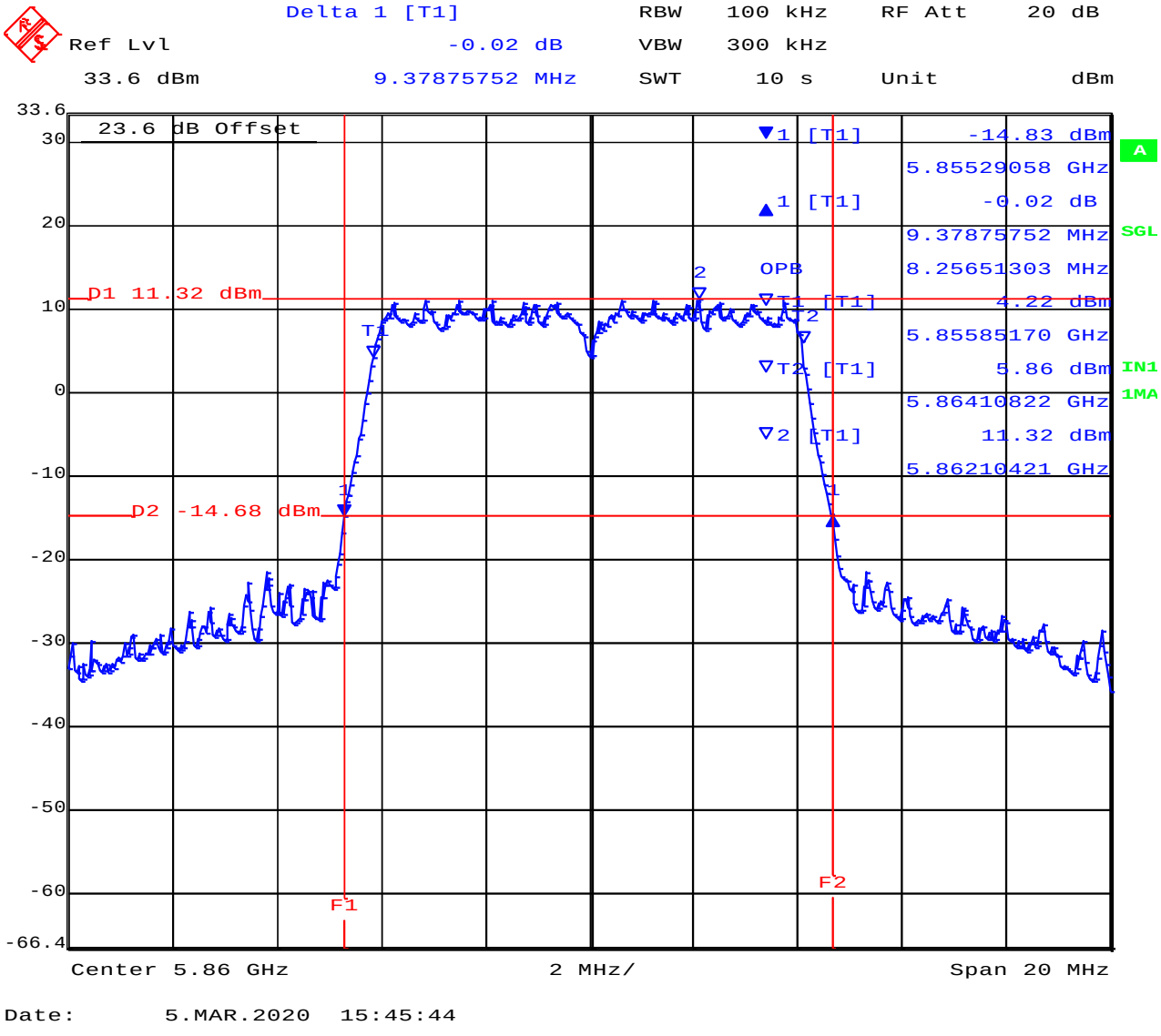
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = Detector = Peak Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 5916.89 MHz : 7.74 dBm	Channel Frequency: 5890.00 MHz

back to matrix

A.2. Occupied Channel Bandwidth

OCCUPIED CHANNEL BANDWIDTH

Variant: 802.11p, Channel: 5860.00 MHz, Chain a, Temp: 20, Voltage: 12 Vdc

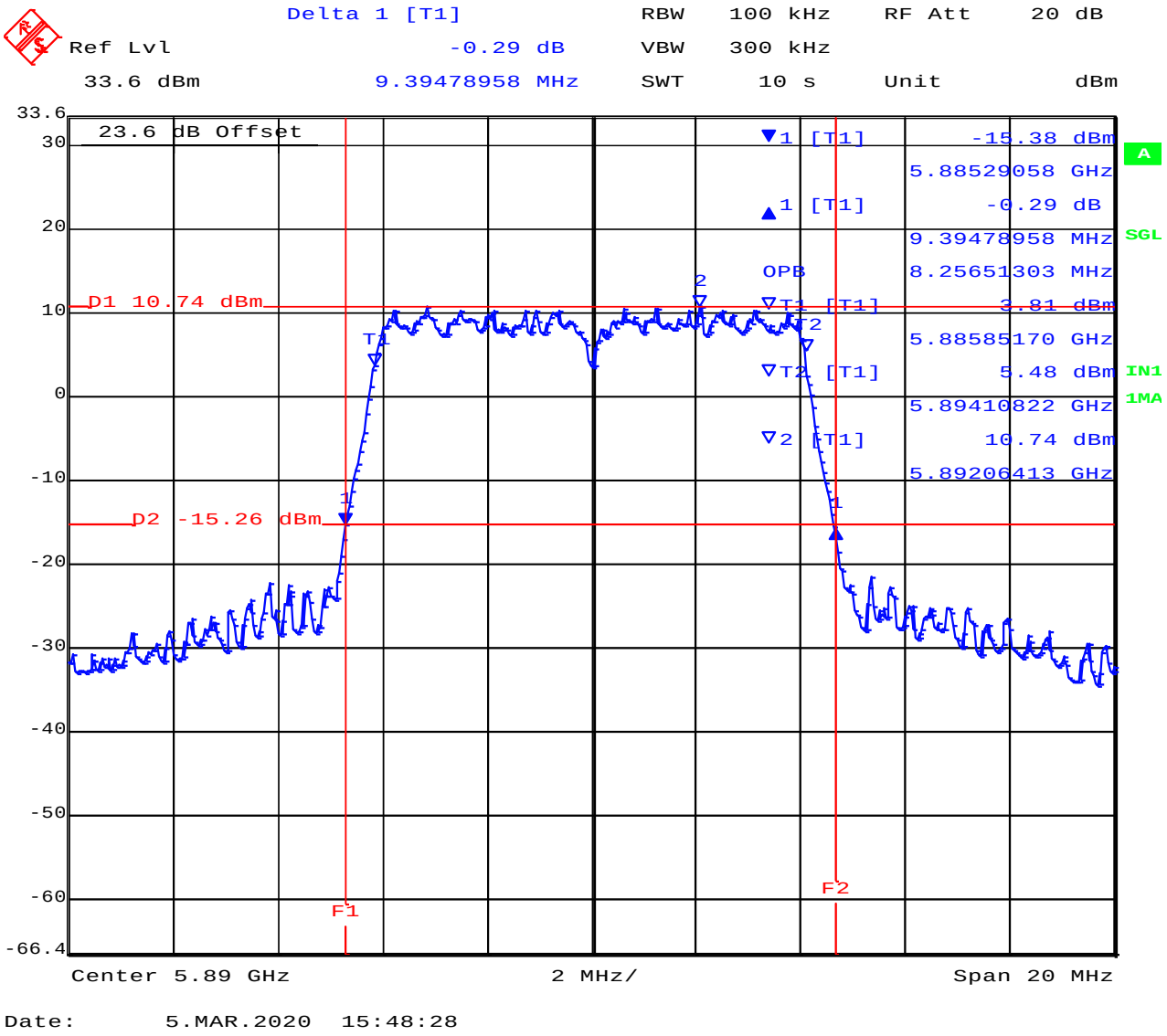


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = Peak Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = MAX HOLD	OBW: 8.257 MHz Marker T1: 5855.852 MHz Marker T2: 5864.108 MHz	Channel Frequency: 5860 MHz Occupied Bandwidth: 8.257 MHz

back to matrix

OCCUPIED CHANNEL BANDWIDTH

Variant: 802.11p, Channel: 5860.00 MHz, Chain a, Temp: 20, Voltage: 12 Vdc

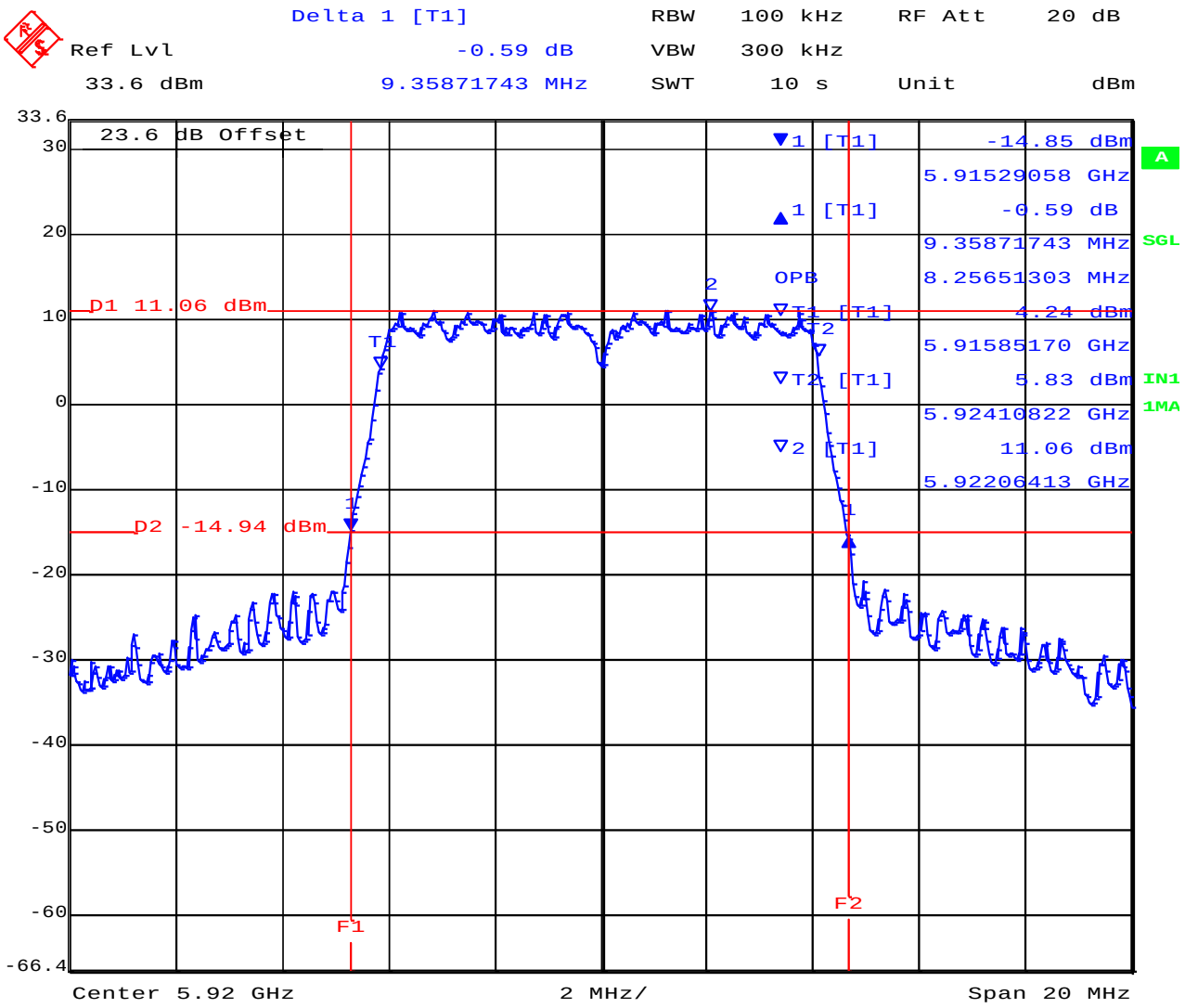


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = Peak Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = MAX HOLD	OBW: 8.257 MHz Marker T1: 5885.852 MHz Marker T2: 5894.108 MHz	Channel Frequency: 5890 MHz Occupied Bandwidth: 8.257 MHz

back to matrix

OCCUPIED CHANNEL BANDWIDTH

Variant: 802.11p, Channel: 5860.00 MHz, Chain a, Temp: 20, Voltage: 12 Vdc



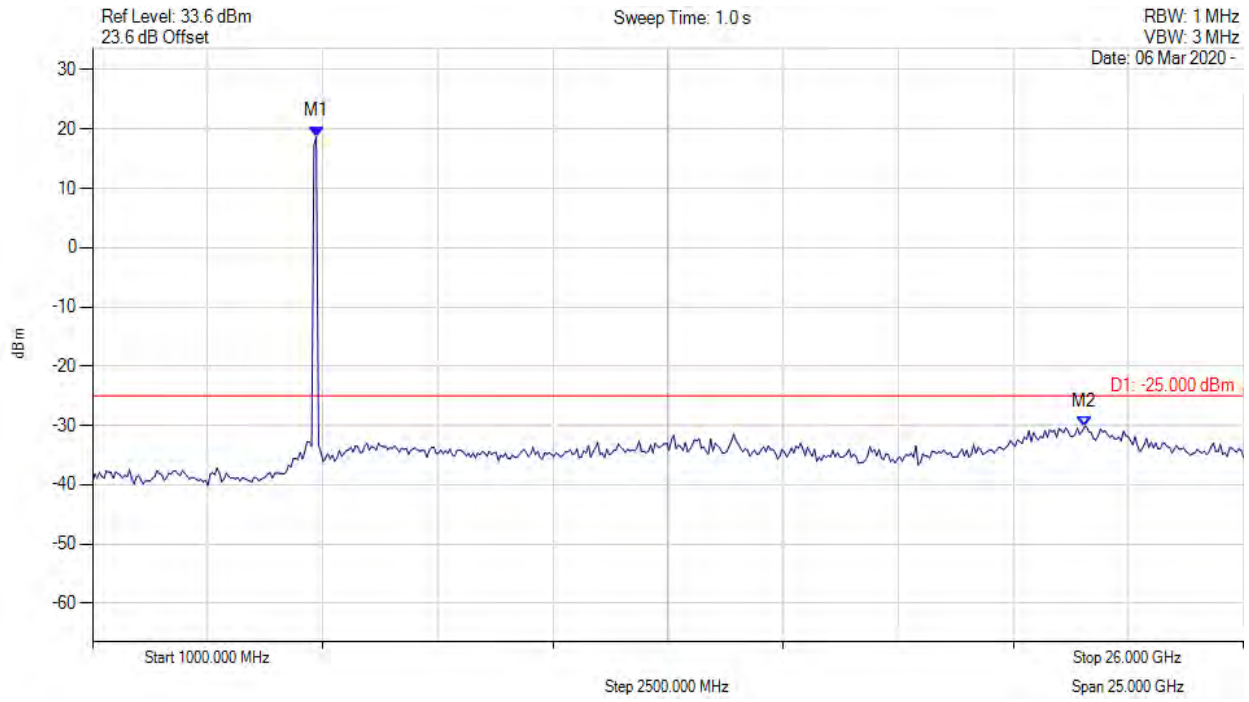
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = Peak Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = MAX HOLD	OBW: 8.257 MHz Marker T1: 5915.852 MHz Marker T2: 5924.108 MHz	Channel Frequency: 5920 MHz Occupied Bandwidth: 8.257 MHz

back to matrix

A.3. Transmitter Unwanted Emissions in the Spurious Domain

CONDUCTED SPURIOUS EMISSIONS - PEAK

Variant: 802.11p, Channel: 5860.00 MHz, Chain a, Temp: 20, Voltage: 12 Vdc

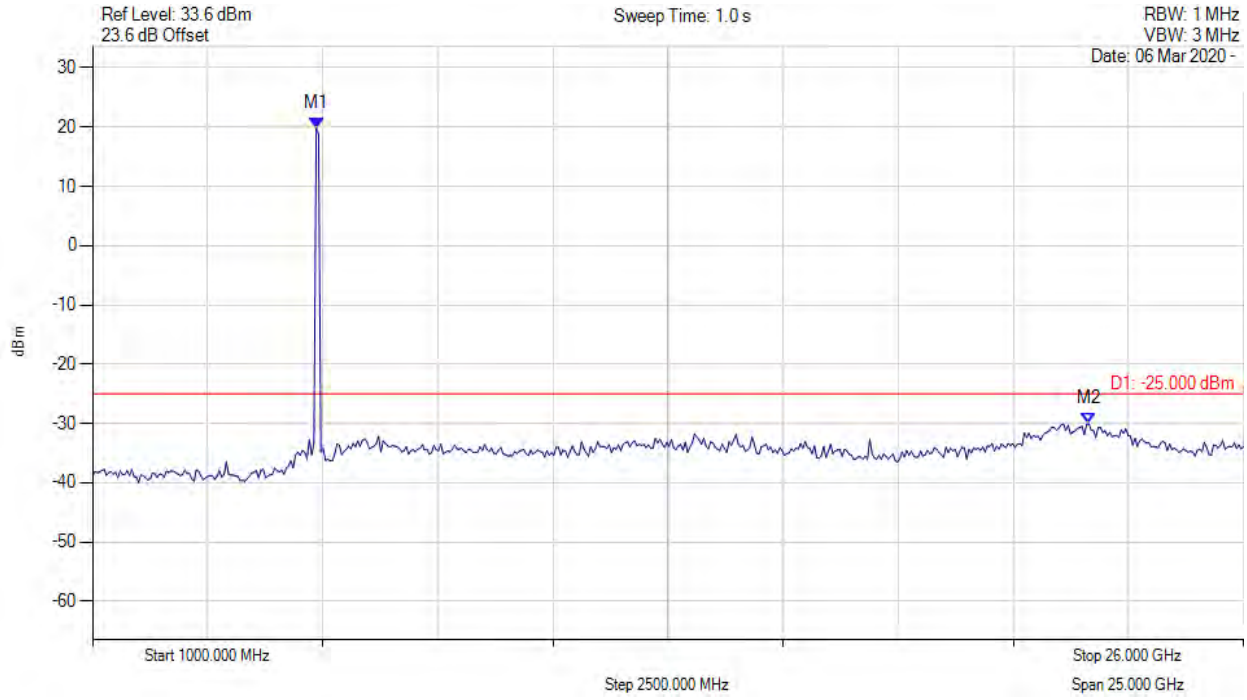


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = CLR/WRITE	M1 : 5859.719 MHz : 18.729 dBm M2 : 22.543 GHz : -30.215 dBm	Channel Frequency: 5860.00 MHz

back to matrix

CONDUCTED SPURIOUS EMISSIONS - PEAK

Variant: 802.11p, Channel: 5890.00 MHz, Chain a, Temp: 20, Voltage: 12 Vdc

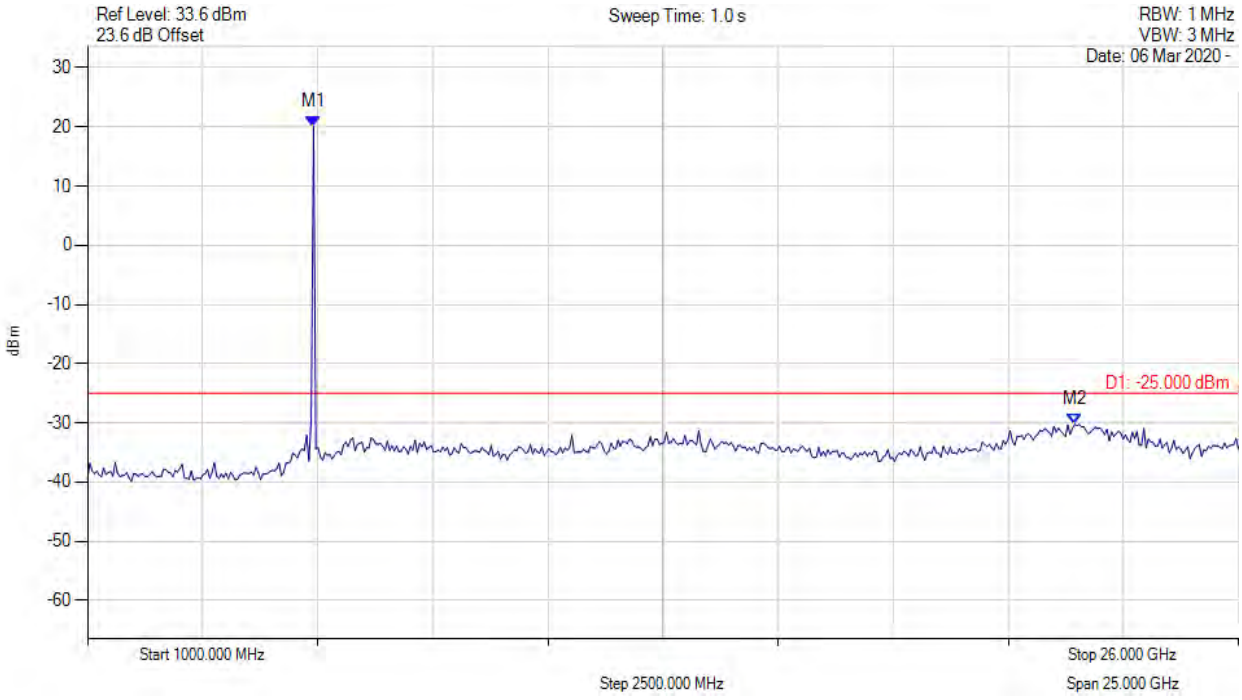


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = CLR/WRITE	M1 : 5859.719 MHz : 19.880 dBm M2 : 22.643 GHz : -30.087 dBm	Channel Frequency: 5890.00 MHz

back to matrix

CONDUCTED SPURIOUS EMISSIONS - PEAK

Variant: 802.11p, Channel: 5920.00 MHz, Chain a, Temp: 20, Voltage: 12 Vdc

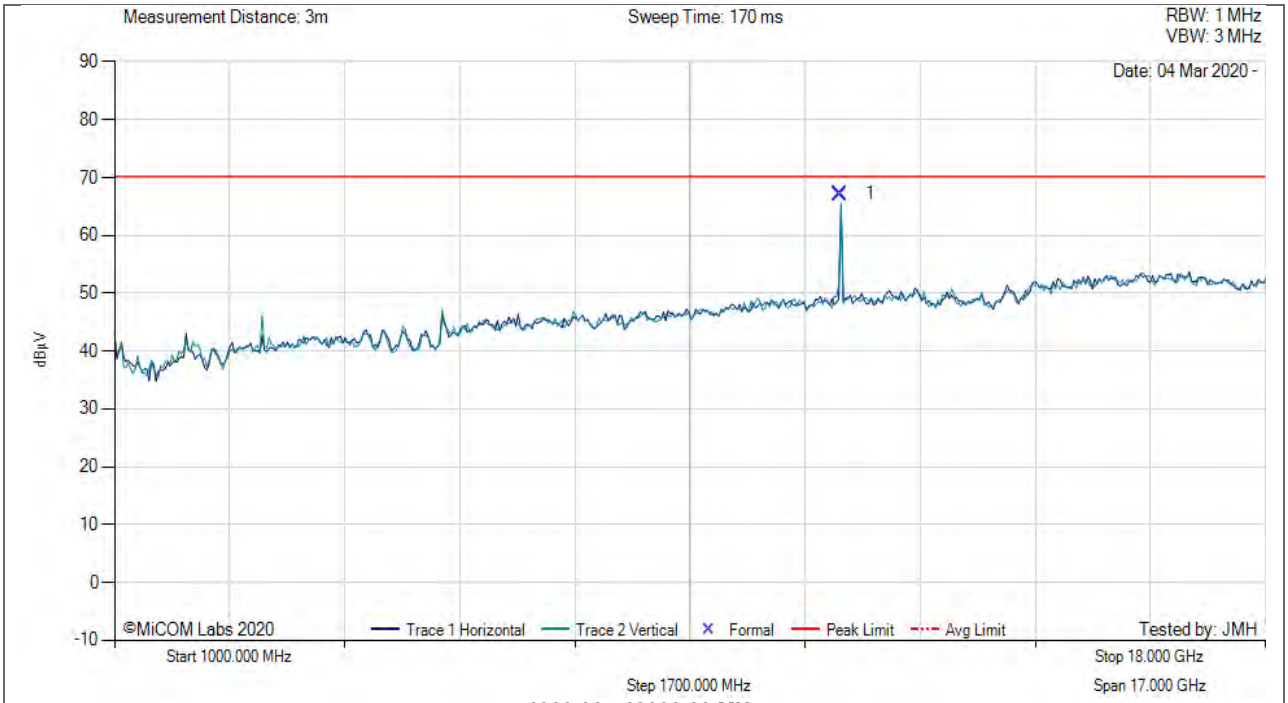


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = CLR/WRITE	M1 : 5909.820 MHz : 20.021 dBm M2 : 22.443 GHz : -30.247 dBm	Channel Frequency: 5920.00 MHz

back to matrix

A.4. Radiated Spurious Emissions

Variant: , Test Freq: 5860.00 MHz, Power Setting: 20, Duty Cycle (%): 80



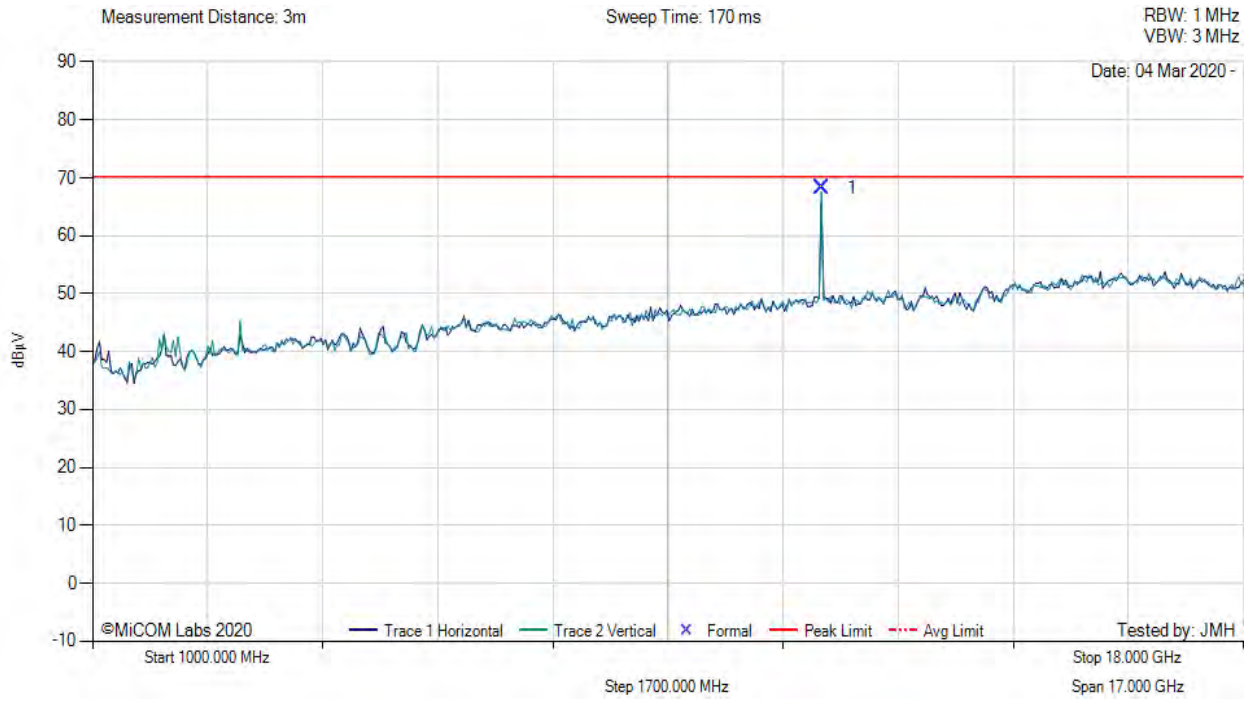
1000.00 - 18000.00 MHz

Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	11721.16	68.18	4.49	-5.52	67.15	Max Peak	Vertical	116	186	70.2	-3.1	Pass

Test Notes: EUT powered by 12 V, Antenna ports terminated. 2.4G and 5G Notch in front of amp to prevent overload

back to matrix

Variant: , Test Freq: 5890.00 MHz, Power Setting: 20, Duty Cycle (%): 80

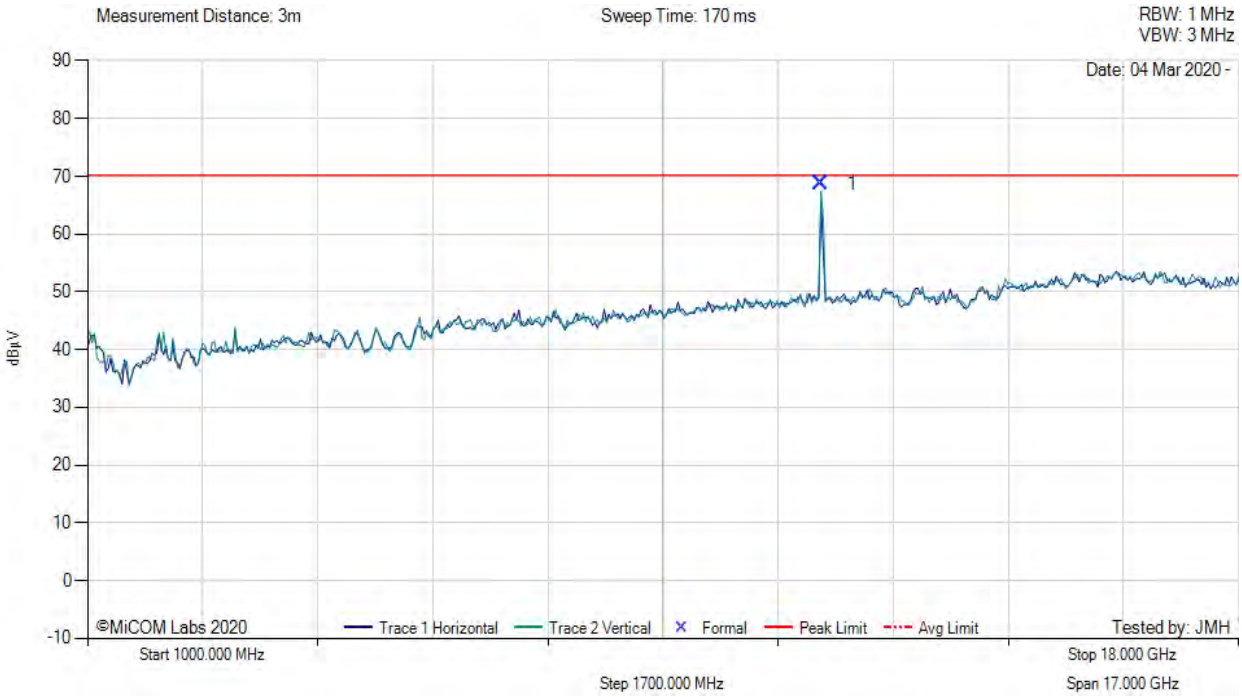


1000.00 - 18000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	11779.32	68.90	4.84	-5.49	68.25	Max Peak	Vertical	115	186	70.2	-2.0	Pass

Test Notes: EUT powered by 12 V, Antenna ports terminated. 2.4G and 5G Notch in front of amp to prevent overload

back to matrix

Variant: , Test Freq: 5920.00 MHz, Power Setting: 20, Duty Cycle (%): 80



1000.00 - 18000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	11841.12	70.07	4.50	-5.89	68.68	Max Peak	Vertical	110	180	70.2	-1.5	Pass

Test Notes: EUT powered by 12 V, Antenna ports terminated. 2.4G and 5G Notch in front of amp to prevent overload

back to matrix

575 Boulder Court
Pleasanton, California 94566, USA
Tel: +1 (925) 462 0304
Fax: +1 (925) 462 0306
www.micomlabs.com