FCC PART 90
TEST REPORT

For

Commsignia, Inc.

5201 Great America Pkwy., Suite 320,
Santa Clara, CA 95054, USA

FCC ID: 2AOZ5-CM-RS4

Report Type:	**Product Type:**
Original Report	Road-Side Unit

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Report Number:	R1910115-90
Report Date:	2020-04-10
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ACCREDITED
CERTIFICATE #3297.02

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1910115-90	Original Report	2020-04-10

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test report was prepared on behalf of, *Commsignia, Inc*, and their product model: *ITS-RS4-M-W-C495-BL5-S-SGLB*, and series models: *ITS-RS4-M-SPEW, ITS-RS4-M-SM66*; *FCC ID: 2AOZ5-CM-RS4* or the "EUT" as referred to in this report. All three models are declared to be electrically identical (Refer to Annex E for manufacturer declaration of similarity letter). Model: *ITS-RS4-M-W-C495-BL5-S-SGLB* was selected to be tested to show compliance. The EUT is a Safety Road Side Unit and operates in the 5850-5925 MHz band with an antenna gain of 7.6 dBi.

Model: ITS-RS4-M-W-C495-BL5-S-SGLB also contains a pre-certified cellular radio module with the following spec.

Additional Radio	EG25-G Mini PCIe
FCC ID	XMR201903EG25G
Operating Frequency	GSM850: 824-849 MHz; PCS: 1850-1910 MHz WCDMA: 1850-1910 MHz (Band II), 824-849 MHz (Band IV) LTE 1850-1910 MHz (B2), 1710-1755 MHz (B4) 824-849 MHz (B5), 2500-2570 MHz (B7) 699-716 MHz (B12), 777-787 MHz (B13) 1850-1915 MHz (B25), 814-849 MHz (B26) 2570-2620 MHz (B38), 2496-2690 MHz (B41)
Modulation	GMSK/8PSK/QPSK/16QAM
Antenna Gain	0 dBi (Band 5/12/13/26), 2.5 dBi (Band 2/4/25) 3.5 dBi (Band 7/38/41)
Average RF output power	25.81 dBm (GSM850), 22.81 dBm (PCS) 25 dBm (WCDMA/LTE)

1.2 Mechanical Description of EUT

The data gathered are from production samples provided by manufacturer with the following information,

The EUT model: ITS-RS4-M-W-C495-BL5-S-SGLB, serial number: 1906401000866 assigned by Commsignia measures 26 cm (L), 23 cm (W), 8 cm (H), and weigh 2.6 kg.

The EUT model: ITS-RS4-M-SPEW, serial number: R1910115-1 assigned by BACL measures 31 cm (L), 30 cm (W), 8 cm (H), and weigh 2.85 kg.

The EUT model: ITS-RS4-M-SM66, serial number: R1910115-2 assigned by BACL measures 30 cm (L), 22 cm (W), 6 cm (H), and weigh 1.9 kg.

1.3 Objective

This report was prepared on behalf of Commsignia, Inc. in accordance with Part 2, Part 90 and Part 15. The objective was to determine compliance with FCC Part 90 and Part 15.

1.4 Related Submittal(s)/Grant(s)

N/A

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI TIA-603-D and ASTM E2213-03

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR16-4-2:2011, The Treatment of Uncertainty in EMC Measurements, the values ranging from ±2.0 dB for Conducted Emissions tests and ±4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

1.7 Test Facility Registrations

BACLs test facilities that are used to perform Radiated and Conducted Emissions tests are currently recognized by the Federal Communications Commission as Accredited with NIST Designation Number US1129.

BACL's test facilities that are used to perform Radiated and Conducted Emissions tests are currently registered with Industry Canada under Registration Numbers: 3062A-1, 3062A-2, and 3062A-3.

BACL is a Chinese Taipei Bureau of Standards Metrology and Inspection (BSMI) validated Conformity Assessment Body (CAB), under Appendix B, Phase I Procedures of the APEC Mutual Recognition Arrangement (MRA). BACL's BSMI Lab Code Number is: SL2-IN-E-1002R

BACL's test facilities that are used to perform AC Line Conducted Emissions, Telecommunications Line Conducted Emissions, Radiated Emissions from 30 MHz to 1 GHz, and Radiated Emissions from 1 GHz to 6 GHz are currently recognized as Accredited in accordance with the Voluntary Control Council for Interference [VCCI] Article 15 procedures under Registration Number A-0027.

1.8 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

A- ***An independent, 3rd-Party, Commercial Test Laboratory accredited to ISO/IEC 17025:2005 by A2LA (Test Laboratory Accreditation Certificate Number 3297.02),*** in the fields of: Electromagnetic Compatibility and Telecommunications. Unless noted by an Asterisk (*) in the Compliance Matrix (See Section 3 of this Test Report), BACL's ISO/IEC 17025:2005 Scope of Accreditation includes all of the Test Method Standards and/or the Product Family Standards detailed in this Test Report..

BACL's ISO/IEC 17025:2005 Scope of Accreditation includes a comprehensive suite of EMC Emissions, EMC Immunity, Radio, RF Exposure, Safety and wireline Telecommunications test methods applicable to a wide range of product categories. These product categories include Central Office Telecommunications Equipment [including NEBS - Network Equipment Building Systems], Unlicensed and Licensed Wireless and RF devices, Information Technology Equipment (ITE); Telecommunications Terminal Equipment (TTE); Medical Electrical Equipment; Industrial, Scientific and Medical Test Equipment; Professional Audio and Video Equipment; Industrial and Scientific Instruments and Laboratory Apparatus; Cable Distribution Systems, and Energy Efficient Lighting.

B- ***A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3297.03)*** to certify

- For the USA (Federal Communications Commission):
  - 1- All Unlicensed radio frequency devices within FCC Scopes A1, A2, A3, and A4;
  - 2- All Licensed radio frequency devices within FCC Scopes B1, B2, B3, and B4;
  - 3- All Telephone Terminal Equipment within FCC Scope C.
- For the Canada (Industry Canada):
  - 1 All Scope 1-Licence-Exempt Radio Frequency Devices;
  - 2 All Scope 2-Licensed Personal Mobile Radio Services;
  - 3 All Scope 3-Licensed General Mobile & Fixed Radio Services;
  - 4 All Scope 4-Licensed Maritime & Aviation Radio Services;
  - 5 All Scope 5-Licensed Fixed Microwave Radio Services
  - 6 All Broadcasting Technical Standards (BETS) in the Category I Equipment Standards List.
- For Singapore (Info-Communications Development Authority (IDA)):
  - 1 All Line Terminal Equipment: All Technical Specifications for Line Terminal Equipment – Table 1 of IDA MRA Recognition Scheme: 2011, Annex 2
  - 2. All Radio-Communication Equipment: All Technical Specifications for Radio-Communication Equipment – Table 2 of IDA MRA Recognition Scheme: 2011, Annex 2
- For the Hong Kong Special Administrative Region:
  - 1 All Radio Equipment, per KHCA 10XX-series Specifications;
  - 2 All GMDSS Marine Radio Equipment, per HKCA 12XX-series Specifications;
  - 3 All Fixed Network Equipment, per HKCA 20XX-series Specifications.
- For Japan:
  - 1 MIC Telecommunication Business Law (Terminal Equipment):
    - All Scope A1 - Terminal Equipment for the Purpose of Calls;
    - All Scope A2 - Other Terminal Equipment
  - 2 Radio Law (Radio Equipment):
    - All Scope B1 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 1 of the Radio Law
    - All Scope B2 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 2 of the Radio Law
    - All Scope B3 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 3 of the Radio Law

C- ***A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3297.01)*** to certify Products to USA's Environmental Protection Agency (EPA) ENERGY STAR Product Specifications for:

1 Electronics and Office Equipment:
- for Telephony (ver. 3.0)
- for Audio/Video (ver. 3.0)
- for Battery Charging Systems (ver. 1.1)
- for Set-top Boxes & Cable Boxes (ver. 4.1)
- for Televisions (ver. 6.1)
- for Computers (ver. 6.0)
- for Displays (ver. 6.0)
- for Imaging Equipment (ver. 2.0)
- for Computer Servers (ver. 2.0)

2 Commercial Food Service Equipment
- for Commercial Dishwashers (ver. 2.0)
- for Commercial Ice Machines (ver. 2.0)
- for Commercial Ovens (ver. 2.1)
- for Commercial Refrigerators and Freezers

3 Lighting Products
- For Decorative Light Strings (ver. 1.5)
- For Luminaires (including sub-components) and Lamps (ver. 1.2)
- For Compact Fluorescent Lamps (CFLs) (ver. 4.3)
- For Integral LED Lamps (ver. 1.4)

4 Heating, Ventilation, and AC Products
- for Residential Ceiling Fans (ver. 3.0)
- for Residential Ventilating Fans (ver. 3.2)

5 Other
- For Water Coolers (ver. 3.0)

D- ***A NIST Designated Phase-I and Phase-II Conformity Assessment Body (CAB) for the following economies and regulatory authorities under the terms of the stated MRAs/Treaties:***

- Australia: ACMA (Australian Communication and Media Authority) – APEC Tel MRA -Phase I;
- Canada: (Innovation, Science and Economic development Canada - ISED) Foreign Certification Body – FCB – APEC Tel MRA -Phase I & Phase II;
- Chinese Taipei (Republic of China – Taiwan):
  - BSMI (Bureau of Standards, Metrology and Inspection) APEC Tel MRA -Phase I;
  - NCC (National Communications Commission) APEC Tel MRA -Phase I;
- European Union:
  - EMC Directive 2014/30/EU US-EU EMC & Telecom MRA CAB (NB)
  - Radio Equipment (RE) Directive 2014/53/EU US-EU EMC & Telecom MRA CAB (NB)
  - Low Voltage Directive (LVD) 2014/35/EU
- Hong Kong Special Administrative Region: (Office of the Telecommunications Authority – OFTA) APEC Tel MRA -Phase I & Phase II
- Israel – US-Israel MRA Phase I
- Republic of Korea (Ministry of Communications - Radio Research Laboratory) APEC Tel MRA -Phase I
- Singapore: (Infocomm Media Development Authority - IMDA) APEC Tel MRA -Phase I & Phase II;
- Japan: VCCI - Voluntary Control Council for Interference US-Japan Telecom Treaty VCCI Side Letter-
- USA:
  - ENERGY STAR Recognized Test Laboratory – US EPA
  - Telecommunications Certification Body (TCB) – US FCC;
  - Nationally Recognized Test Laboratory (NRTL) – US OSHA
- Vietnam: APEC Tel MRA -Phase I;

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to TIA-603-D and ASTM E2213-03.

The EUT was tested in a testing mode to represent worst-case results during the final qualification test. The power setting used for final formal testing are listed below.

Channel	Frequency (MHz)	Power Setting	
		Chain 0	Chain 1
172	5860	17	23
178	5890	14	23
180	5900	14	13
182	5910	14	13
184	5920	14	23

2.2 EUT Exercise Software

The test utilities used were Terminal and Terraterm.

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 Local Support Equipment

Manufacturer	Description	Model
Dell	Laptop	Latitude E7450

2.5 EUT Internal Configuration Details

Manufacturer	Description	Model	S/N
Toradex	Computer on Module	Apalis iMX6Q 2 GB IT V1.1C	-
Commsignia	Main Board	CM-ITS-OB4 rev. 1.4 – E0	-

2.6 External I/O Cabling List and Details

Cable Descriptions	Length (m)	From	To
Ethernet cable	1.5	EUT	POE Switch
Ethernet cable	1.5	POE Switch	Laptop

2.7 EUT External Power Supply List and Details

Manufacturer	Description	Model	Serial number
PHIHONG	POE Power Switch	POE36U-1AT-R	P51101605D1

3 Summary of Test Results

Results reported relate only to the product tested.

FCC Rules	Description of Test	Results
FCC §2.1091	RF Exposure	Compliant
ASTM E2213-03 8.9.1 & FCC §90.377	Output Power	Compliant
ASTM E2213-03 8.9.1 & FCC §90.379	Transmit Spectrum Mask	Compliant
FCC §2.1049 & §90.209	Emission Bandwidth	Compliant
ASTM E2213-03 8.9.4 & FCC §2.1055	Frequency Stability	Compliant
ASTM E2213-03 8.9.2 & FCC §2.1051	Transmitter Spurious Emission-Conducted	Compliant
ASTM E2213-03 8.9.2 & FCC §2.1053	Transmitter Spurious Emission-Radiated	Compliant

4 FCC §2.1091 - RF Exposure

4.1 Applicable Standard

According to FCC §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	* (100)	30
1.34-30	824/f	2.19/f	* ($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

4.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

4.3 MPE Results

Chain 0

Maximum peak output power at antenna input terminal (dBm):	13.4
Maximum peak output power at antenna input terminal (mW):	21.88
Prediction distance (cm):	20
Prediction frequency (MHz):	5860
Maximum Antenna Gain, typical (dBi):	7.6
Maximum Antenna Gain (numeric):	5.75
Power density of prediction frequency at 20 cm (mW/cm^2):	0.0250
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1

Chain 1

Maximum peak output power at antenna input terminal (dBm):	18.43
Maximum peak output power at antenna input terminal (mW):	69.66
Prediction distance (cm):	20
Prediction frequency (MHz):	5860
Maximum Antenna Gain, typical (dBi):	7.6
Maximum Antenna Gain (numeric):	5.75
Power density of prediction frequency at 20 cm (mW/cm^2):	0.0797
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1

Additional Radios MPE Evaluation

LTE

Maximum peak output power at antenna input terminal (dBm):	25
Maximum peak output power at antenna input terminal (mW):	316.23
Prediction distance (cm):	20
Prediction frequency (MHz):	2498.5
Maximum Antenna Gain, typical (dBi):	3.5
Maximum Antenna Gain (numeric):	2.24
Power density of prediction frequency at 20 cm (mW/cm^2):	0.141
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1

Radio Co-location MPE Evaluation

DSRC + Cellular

$$0.0797/1+0.141/1=0.2207 \leq 1.0$$

Conclusion

The device compliances with FCC MPE limit at 20 cm distance.

5 ASTM E2213-03 8.9.1 & FCC §90.377 - Output Power

5.1 Applicable Standard

According to ASTM E2213-03 8.9.1:

Public Safety and Private RSU installations operating in Channels 172, 174, 175, and 176 are used to implement small and medium range operations. RSU installation transmissions in Channels 172,174, and 176 shall not exceed 28.8 dBm antenna input power and 33 dBm EIRP. RSU installation transmissions in Channel 175 shall not exceed 10 dBm antenna input power and 23 dBm EIRP. Public Safety RSU installation transmissions in Channel 178 shall not exceed 28.8 dBm antenna input power and 44.8 dBm EIRP. Private RSU installation transmissions in Channel 178 shall not exceed 28.8 dBm antenna input power and 33 dBm EIRP.
The DSRC Channels 180, 181, and 182 are used to implement small zone operations. Public Safety and Private RSU installation in these channels shall not exceed 10 dBm antenna input power and 23 dBm EIRP. These installations shall also use an antenna with a minimum 6 dBi gain. 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.

5.2 Test Procedure

According to TIA-603-D

5.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
ETS- Lingerin	Power Sensor	7002-006	160097	2018-12-31	2 years
-	SMA cable	-	-	Each time[1]	N/A
-	10dB attenuator	-	-	Each time[1]	N/A

Note[1]: cable included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 02 Octomber 2018) "A2LA Policy on Metrological Traceability".*

5.4 Test Environmental Conditions

Temperature:	22-26° C
Relative Humidity:	42-46 %
ATM Pressure:	101-102 kPa

The testing was performed by Christian McCaig on 2020-01-24 at RF site.

5.5 Test Results

Channel	Frequency (MHz)	Conducted Output Power			Antenna Gain (dBi)	E.I.R.P		
		Chain 0 (dBm)	Chain 1 (dBm)	Limit (dBm)		Chain 0 (dBm)	Chain 1 (dBm)	Limit (dBm)
172	5860	13.4	18.43	20	7.6	21	26.03	33
178	5890	9.45	18.02	20	7.6	17.05	25.62	33
180	5900	9.67	9.23	10	7.6	17.27	16.83	23
182	5910	9.75	9.32	10	7.6	17.35	16.92	23
184	5920	9.10	18.3	20	7.6	16.7	25.9	33

6 ASTM E2213-03 8.9.2 - Transmit Spectrum Mask

6.1 Applicable Standard

TABLE 9 DSRC Device Classes and Transmit Power Levels[A]

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

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

TABLE 10 DSRC Spectrum Mask[A]

NOTE—Reduction in Power Spectral Density, dBr.

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.

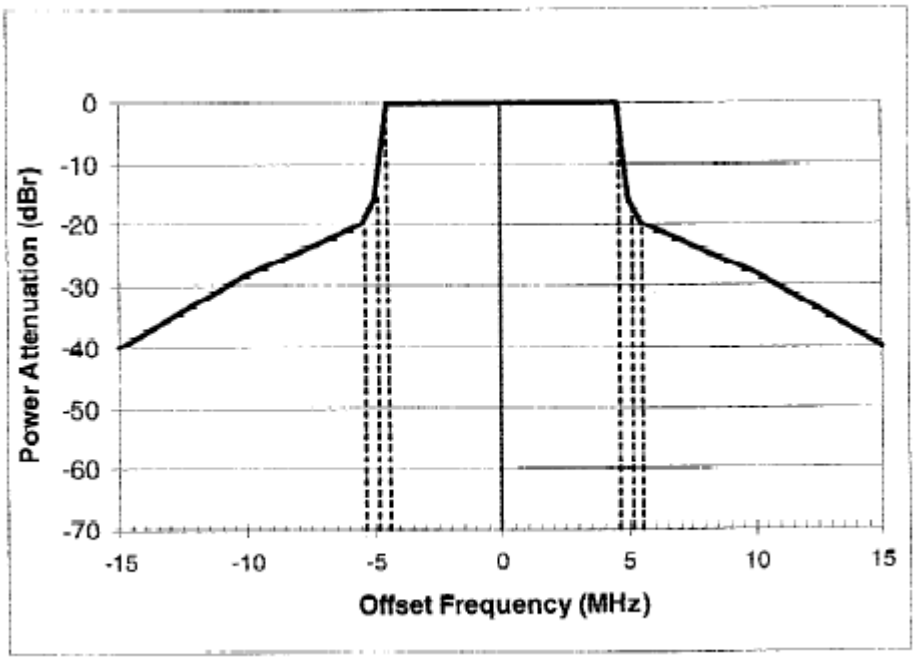


FIG. 13 Class B Transmit Spectrum Mask

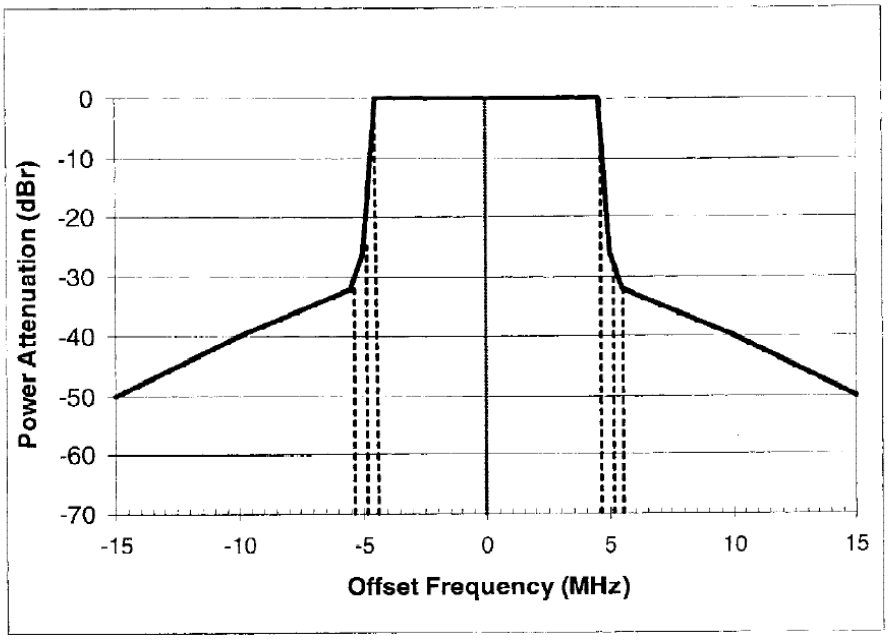


FIG. 14 Class C Transmit Spectrum Mask

6.2 Test Procedure

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 10.5 The measurements shall be made using a 100 kHz resolution bandwidth and a 30 kHz video bandwidth.

6.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Analyzer, Spectrum	FSQ26	200749	2019-11-07	2 years
-	SMA cable	-	-	Each time[1]	N/A
-	10dB attenuator	-	-	Each time[1]	N/A

Note[1]: cable included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 02 Octomber 2018) "A2LA Policy on Metrological Traceability".*

6.4 Test Environmental Conditions

Temperature:	22-26° C
Relative Humidity:	42-46 %
ATM Pressure:	101-102 kPa

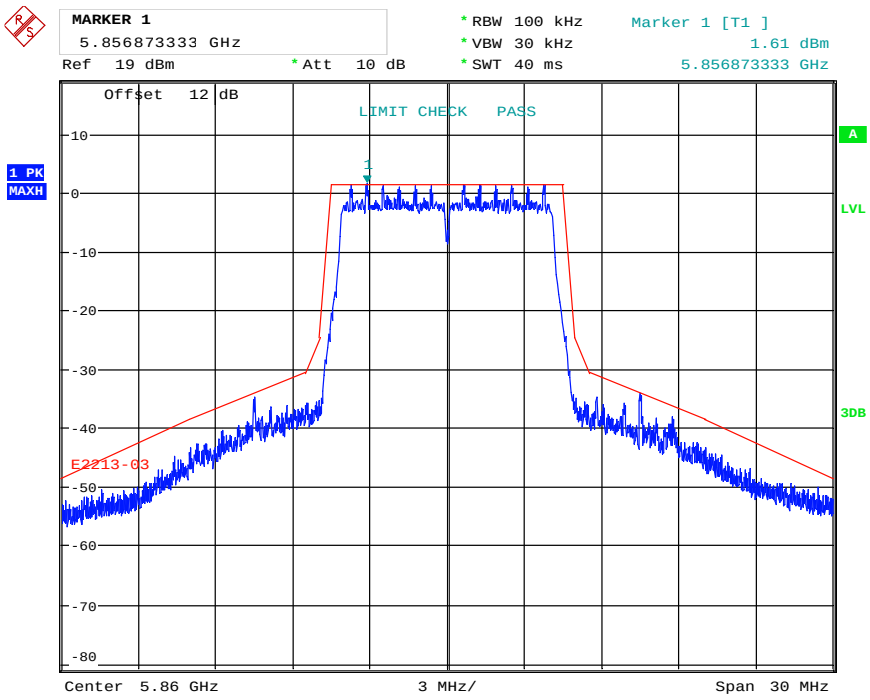
The testing was performed by Christian McCaig from 2020-01-21 to 2020-01-28 at RF site.

6.5 Test Results

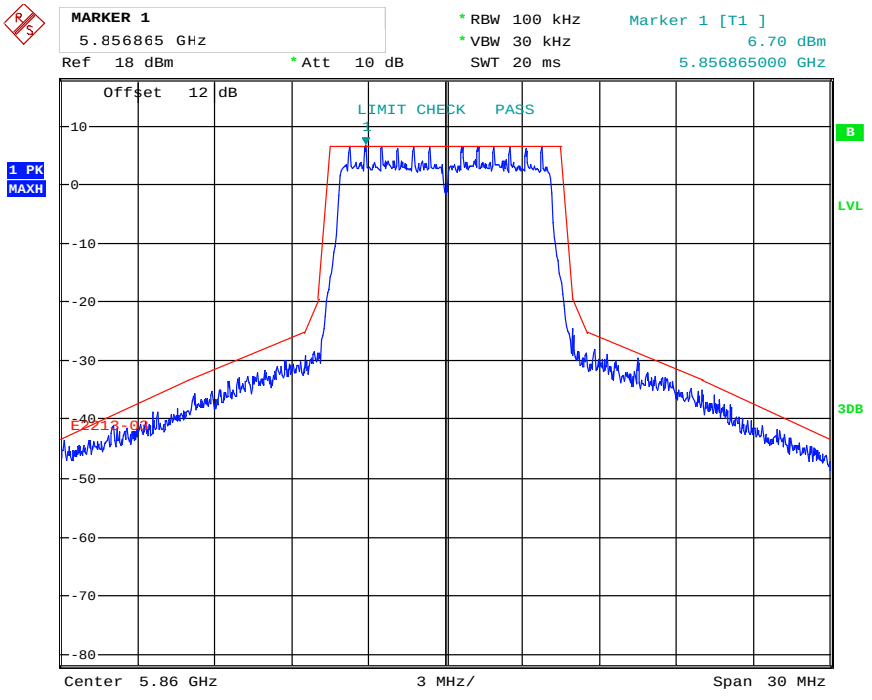
Class B mask is utilized for configurations with conducted output power lower than 10 dBm.
Class C mask is utilized for configurations with conducted output power lower than 20 dBm.

Please refer to the following plots for the test result

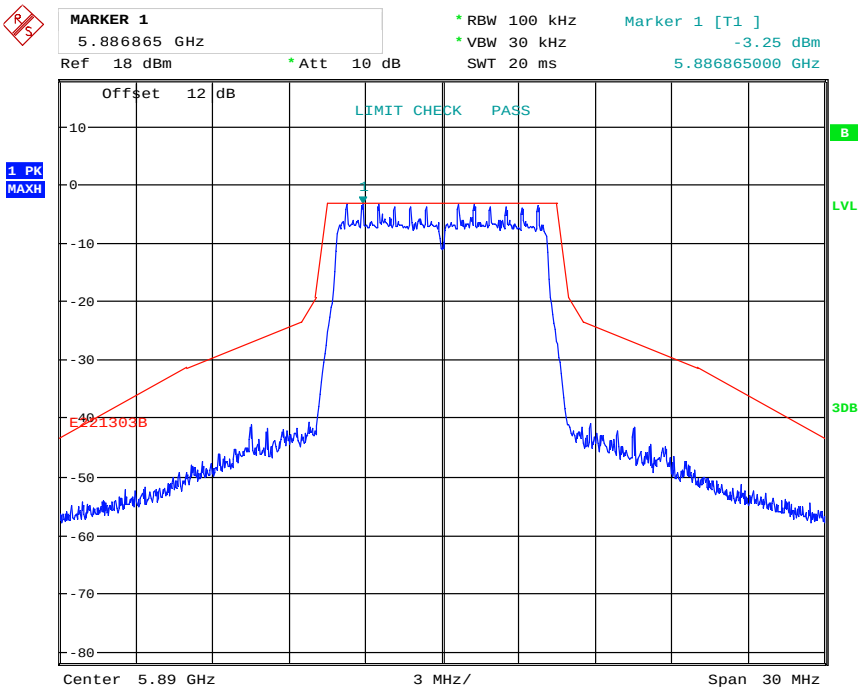
Low Channel, 5860 MHz Chain 0, Emission Mask C



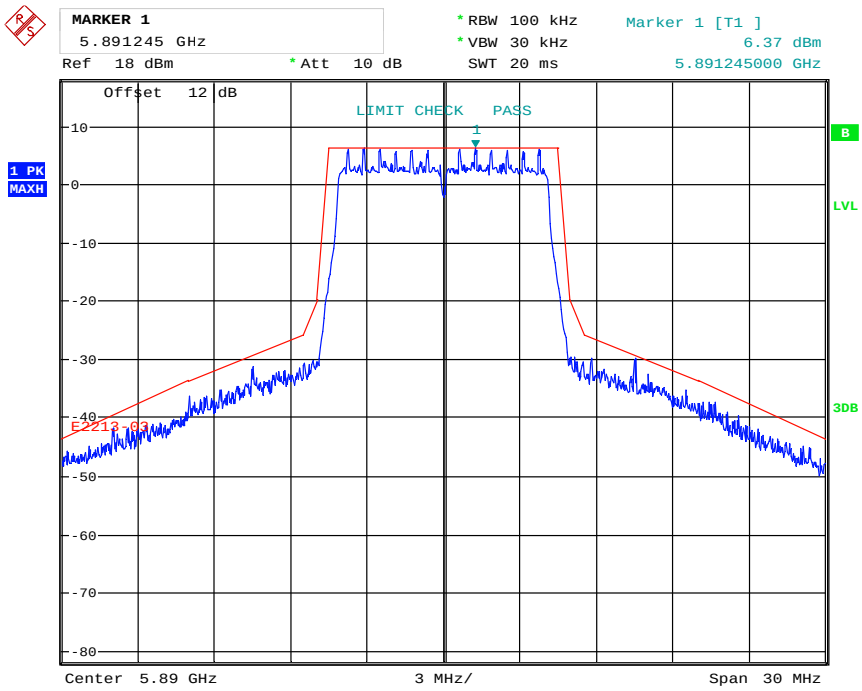
Low Channel, 5860 MHz Chain 1, Emission Mask C



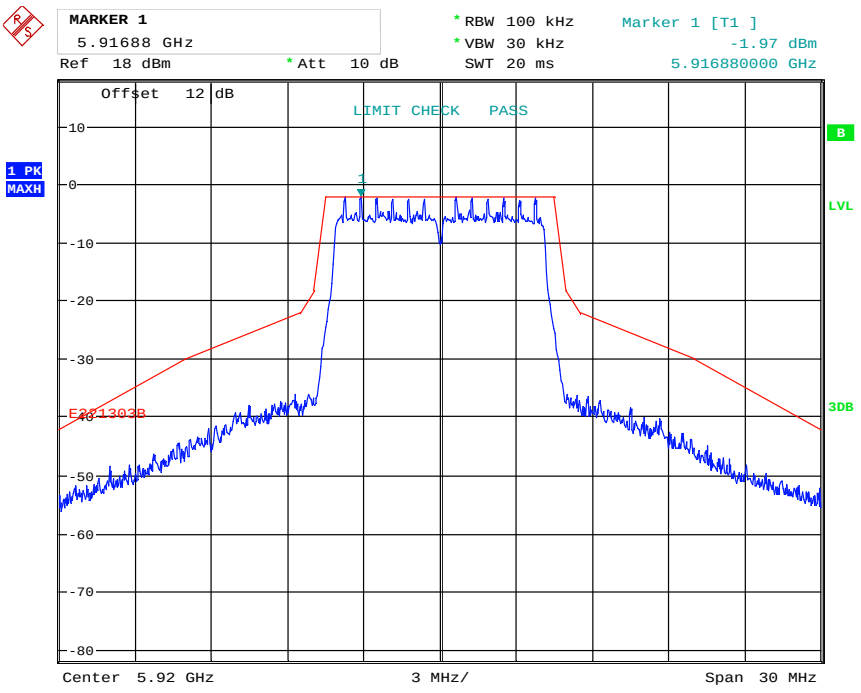
Middle Channel, 5890 MHz Chain 0, Emission Mask B



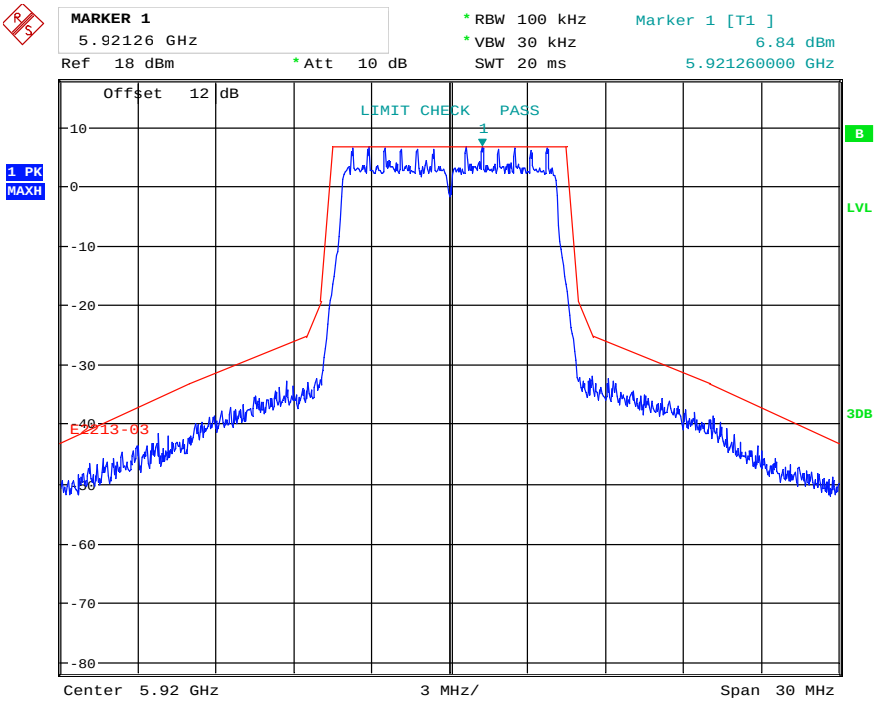
Middle Channel, 5890 MHz Chain 1, Emissions Mask C



High Channel, 5920 MHz Chain 0, Emissions Mask B



High Channel, 5920 MHz Chain 1, Emission Mask C



7 FCC §2.1049 - Emission Bandwidths

7.1 Applicable Standard

FCC §2.1049

7.2 Test Procedure

The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold my produce a wider bandwidth than actual.

The trace data points are recovered and directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between two recorded frequencies is the occupied bandwidth.

7.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Analyzer, Spectrum	FSQ26	200749	2019-11-07	2 years
-	SMA cable	-	-	Each time[1]	N/A
-	10dB attenuator	-	-	Each time[1]	N/A

Note[1]: cable included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements,* ***Statement of Traceability: BACL Corp.*** *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 02 Octomber 2018) "A2LA Policy on Metrological Traceability".*

7.4 Test Environmental Conditions

Temperature:	22-26° C
Relative Humidity:	42-46 %
ATM Pressure:	101-102 kPa

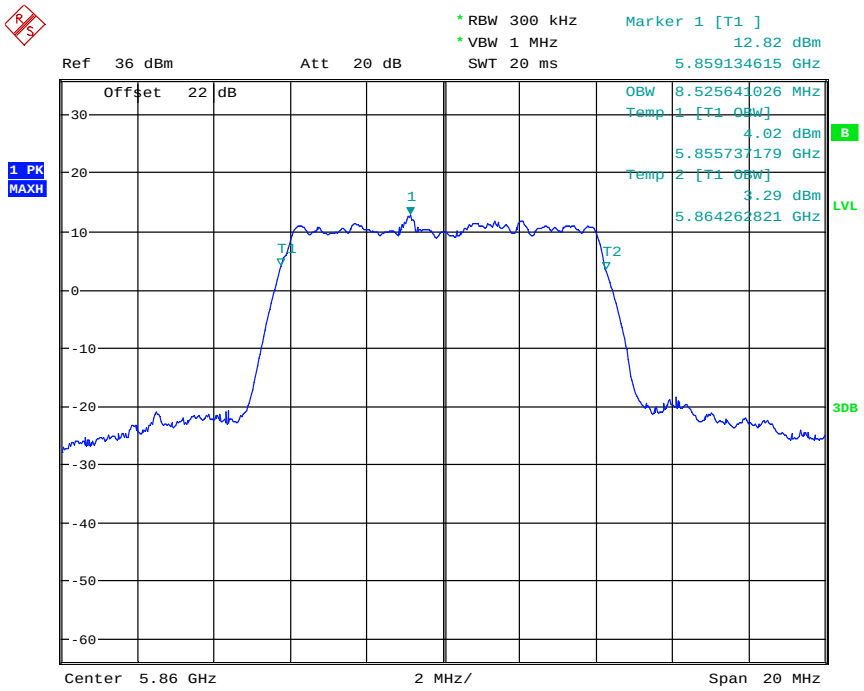
The testing was performed by Christian McCaig on 2020-02-27 at RF site.

7.5 Test Results

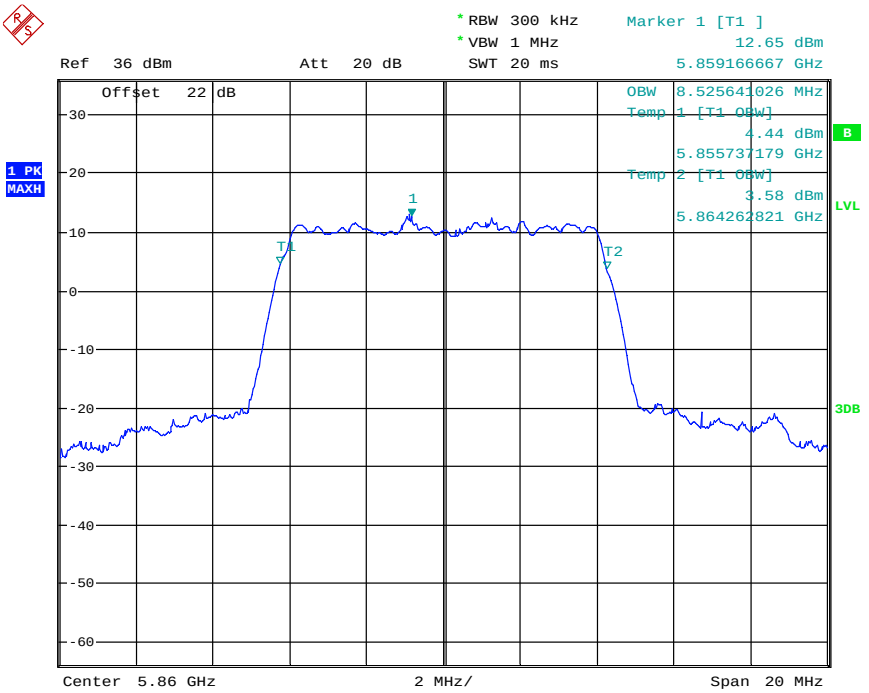
Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)
Low	5860	8.5256	8.5256
Middle	5890	8.5897	8.5256
High	5920	8.6218	8.5256

Please refer to the following plots for the test results

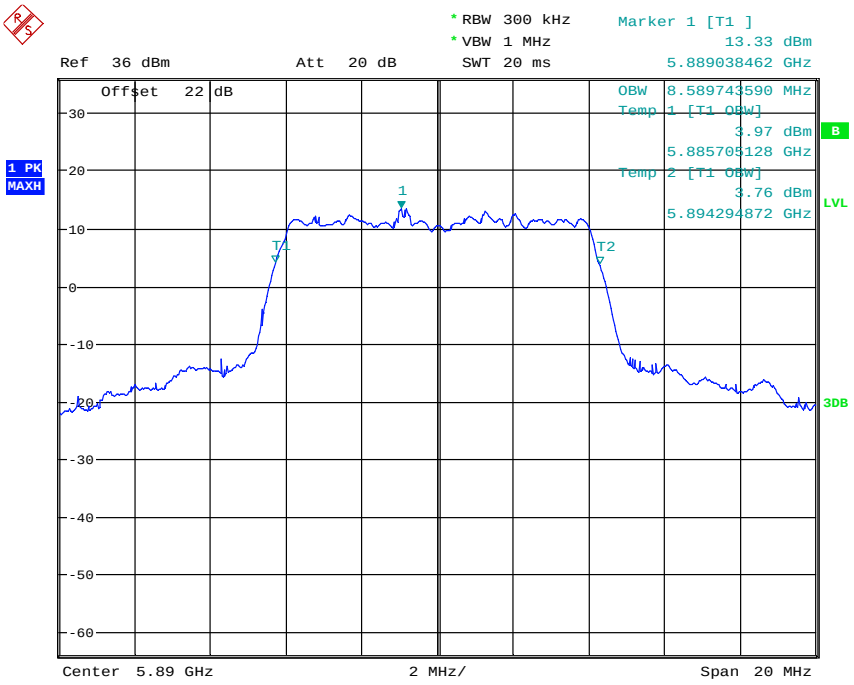
Low Channel, 5860 MHz Chain 0



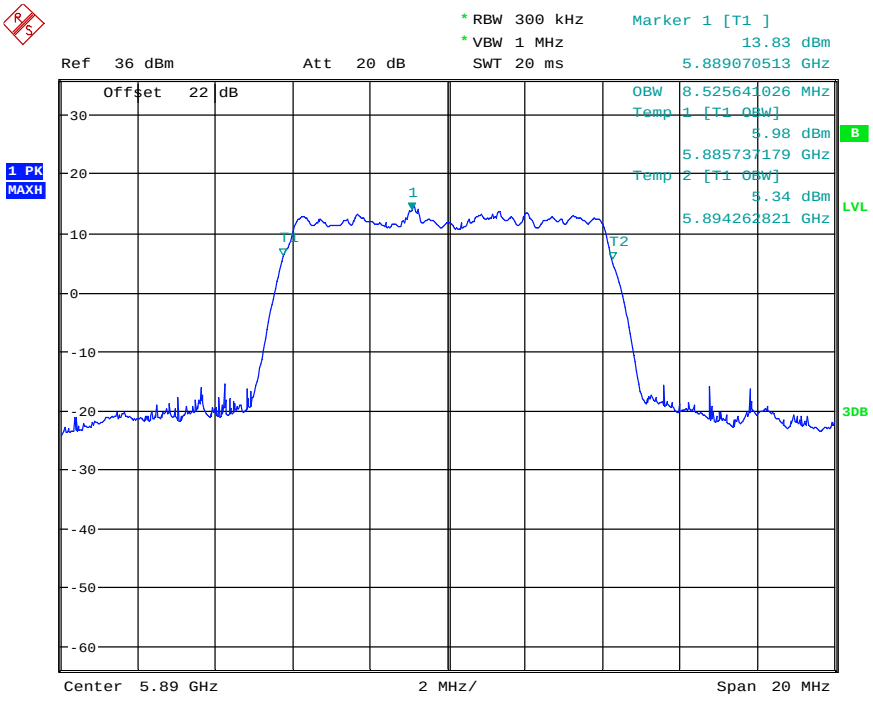
Low Channel, 5860 MHz Chain 1



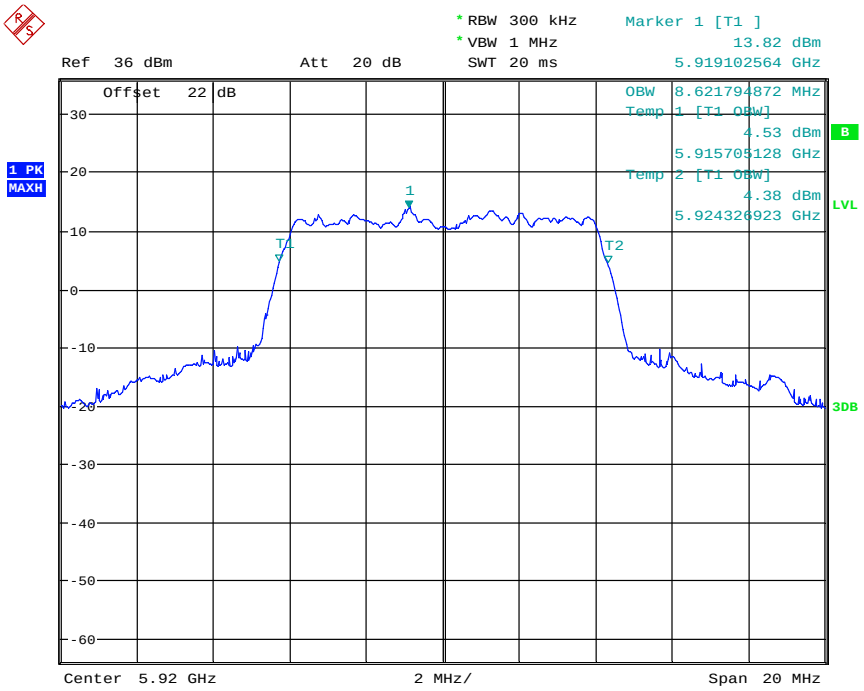
Middle Channel, 5890 MHz Chain 0



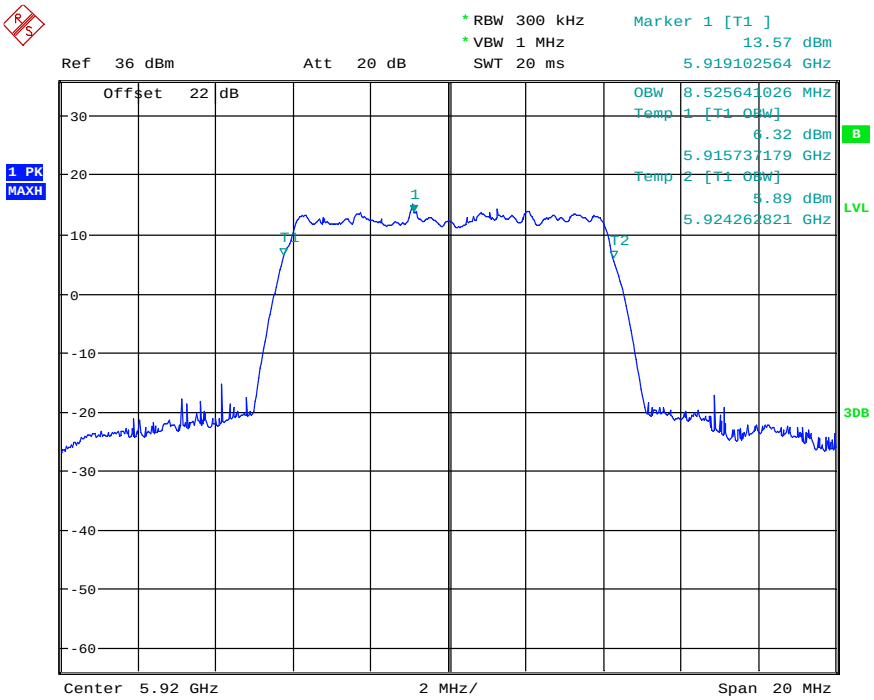
Middle Channel, 5890 MHz Chain 1



High Channel, 5920 MHz Chain 0



High Channel, 5920 MHz Chain 1



8 ASTM E2213-03 8.9.4 & FCC §2.1055 - Frequency Tolerance

8.1 Applicable Standard

According to FCC §2.1055 and ASTM E2213-03 8.9.4

8.2 Measurement Procedure

According to ANSI/TIA-D 2010 section 2.2.2, the carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

The measurement method is as following:

- Operate the equipment in standby conditions for 15 minutes before proceeding.
- Record the carrier frequency of the transmitter as MCF MHz.
- Calculate the ppm frequency error by the following:

Ppm error = ((MCF/ACF) - 1) * 10^6

Where

MCF is the Measured Carrier Frequency in MHz
ACF is the Assigned Carrier Frequency in MHz

- The value recorded above is the carrier frequency stability.

8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Analyzer, Spectrum	FSQ26	200749	2019-11-07	2 years
Tenney	Temperature Chamber	TUJR	27445-06	2019-03-26	1 year
interpower	International Power Source	85510510	39711	N/A	N/A
-	SMA cable	-	-	Each time[1]	N/A
-	10dB attenuator	-	-	Each time[1]	N/A

Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 02 Octomber 2018) "A2LA Policy on Metrological Traceability".*

8.4 Test Environmental Conditions

Temperature:	22-26° C
Relative Humidity:	42-46 %
ATM Pressure:	101-102 kPa

The testing was performed by Christian McCaig from 2020-01-24 to 2020-01-27and on 2020-03-24 at RF site.

8.5 Test Results

Chain 0

Condition	Measured Carrier Freq. (MHz)	Assigned Carrier Freq. (MHz)	Result (ppm)	Limit (ppm)
-30°C	5889.9817	5890	-3.1126486	± 10
-20°C	5889.9950	5890	-0.8488964	± 10
-10°C	5889.9800	5890	-3.3955857	± 10
0°C	5889.9833	5890	-2.8297114	± 10
10°C	5889.9867	5890	-2.2637521	± 10
20°C	5889.9783	5890	-3.6785229	± 10
30°C	5889.9733	5890	-4.5274194	± 10
40°C	5889.9900	5890	-1.6977929	± 10
50°C	5890.0183	5890	3.1126486	± 10
102 VAC	5889.9940	5890	-1.0186757	± 10
138 VAC	5890.0000	5890	0	± 10

Chain 1

Condition	Measured Carrier Freq. (MHz)	Assigned Carrier Freq. (MHz)	Result (ppm)	Limit (ppm)
-30°C	5890.0033	5890	0.5659593	± 10
-20°C	5890.0000	5890	0	± 10
-10°C	5890.0017	5890	0.2826825	± 10
0°C	5890.0050	5890	0.8488964	± 10
10°C	5890.0033	5890	0.5659593	± 10
20°C	5890.0067	5890	1.1318336	± 10
30°C	5889.9733	5890	-4.5274194	± 10
40°C	5889.9883	5890	-1.9807301	± 10
50°C	5890.0183	5890	3.1126486	± 10
102VAC	5890.0135	5890	2.2920204	± 10
138VAC	5890.0000	5890	0	± 10

9 ASTM E2213-03 8.9.2 & FCC §2.1051 - Transmitter Conducted Spurious Emission

9.1 Applicable Standard

According to ASTM EN2213-03 8.9.2:

8.9.2.1 The DSRC transmitted spectral 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.

9.2 Measurement Procedure

The measurements shall was made using a 100 kHz resolution bandwidth and a 30 kHz video bandwidth.

9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Analyzer, Spectrum	E4446A	MY48250238	2019-06-26	1 year
Rohde & Schwarz	Analyzer, Spectrum	FSQ26	200749	2019-11-07	2 years
-	SMA cable	-	-	Each time[1]	N/A
-	10dB attenuator	-	-	Each time[1]	N/A

Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 02 Octomber 2018) "A2LA Policy on Metrological Traceability".*

9.4 Test Environmental Conditions

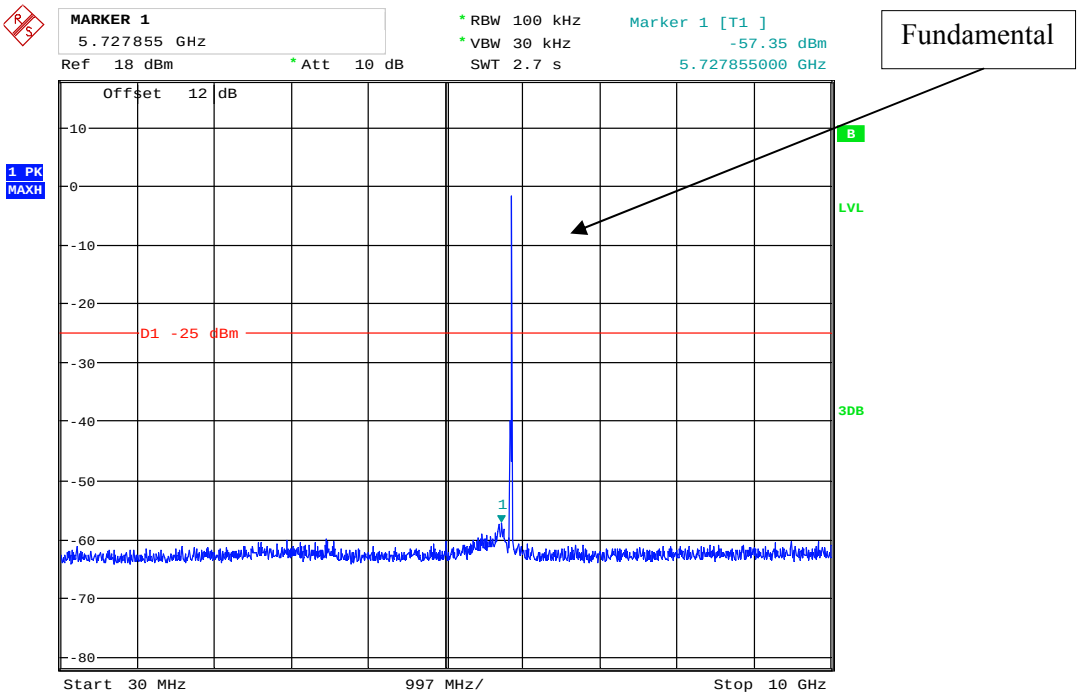
Temperature:	22-26° C
Relative Humidity:	42-46 %
ATM Pressure:	101-102 kPa

The testing was performed by Christian McCaig on 2020-01-23 and 2020-03-24 at RF site.

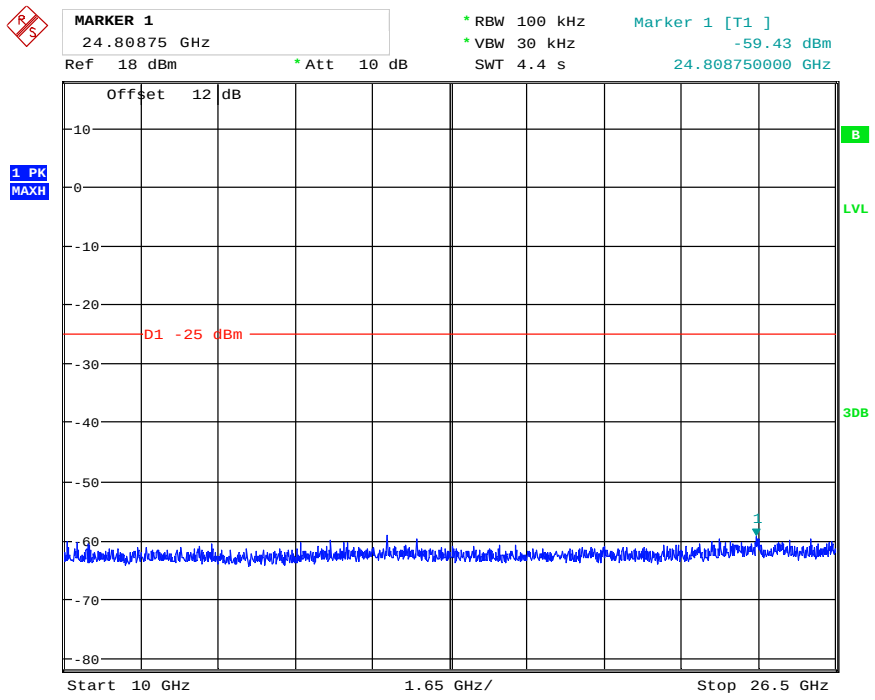
9.5 Test Results

Please refer to the following plots for the test results

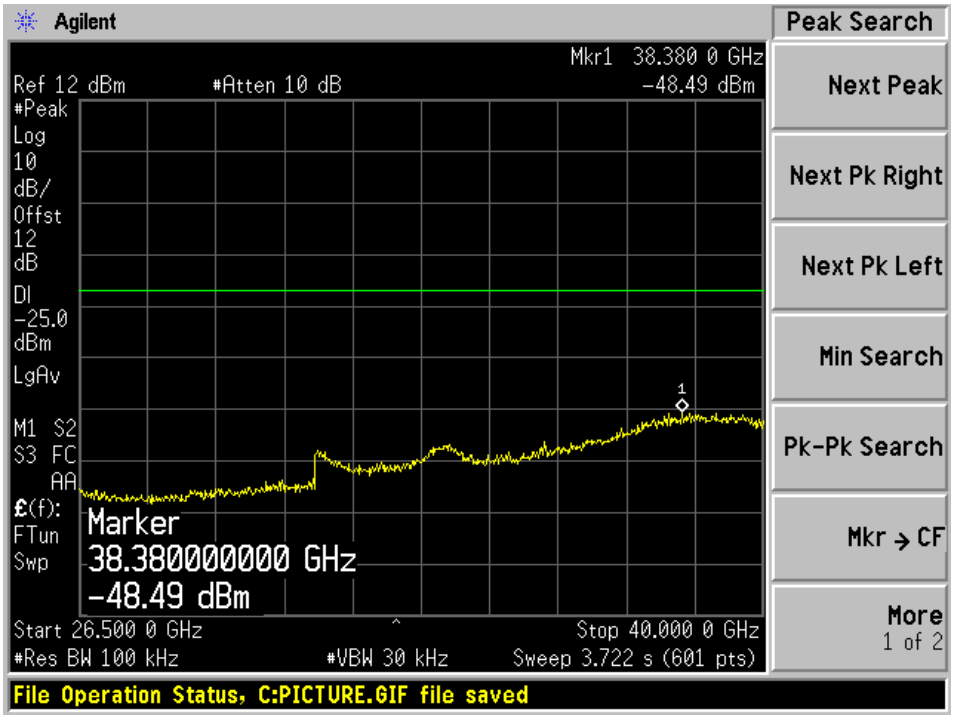
Chain 0, Low Channel 5860 MHz, 30MHz – 10GHz



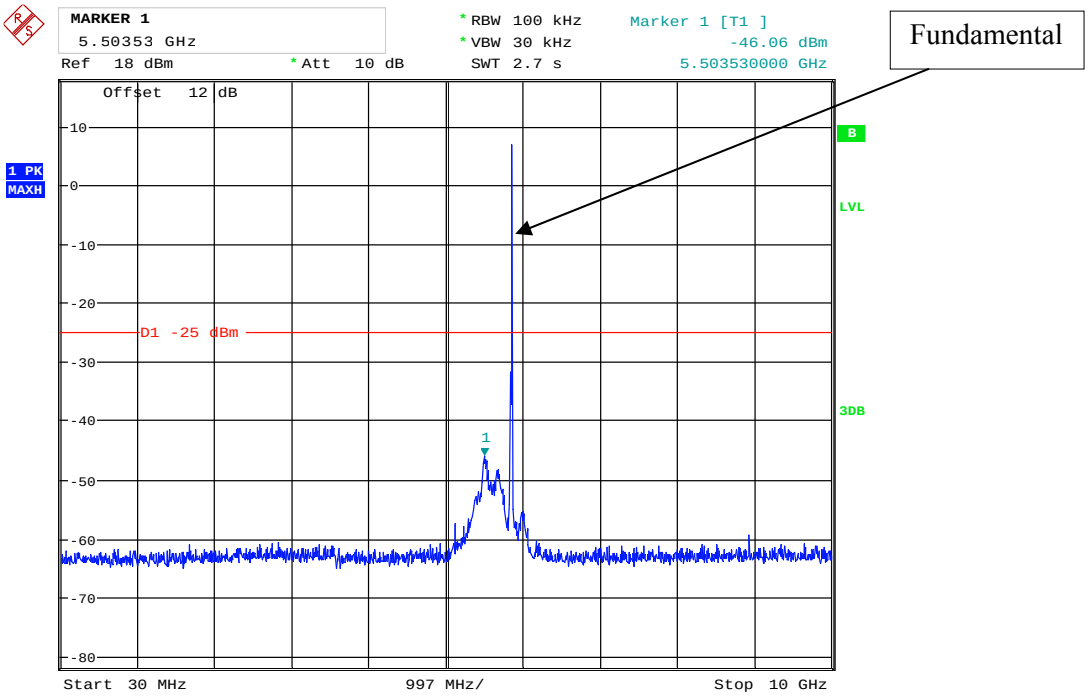
Chain 0, Low Channel 5860 MHz, 10GHz – 26.5GHz



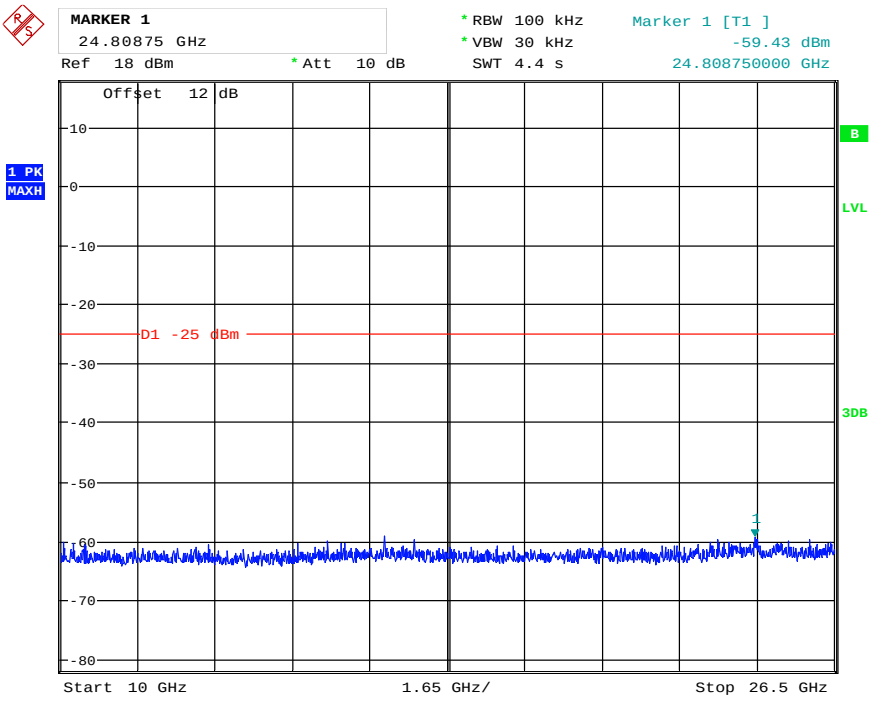
Chain 0, Low Channel 5860 MHz, 26.5MHz – 40GHz



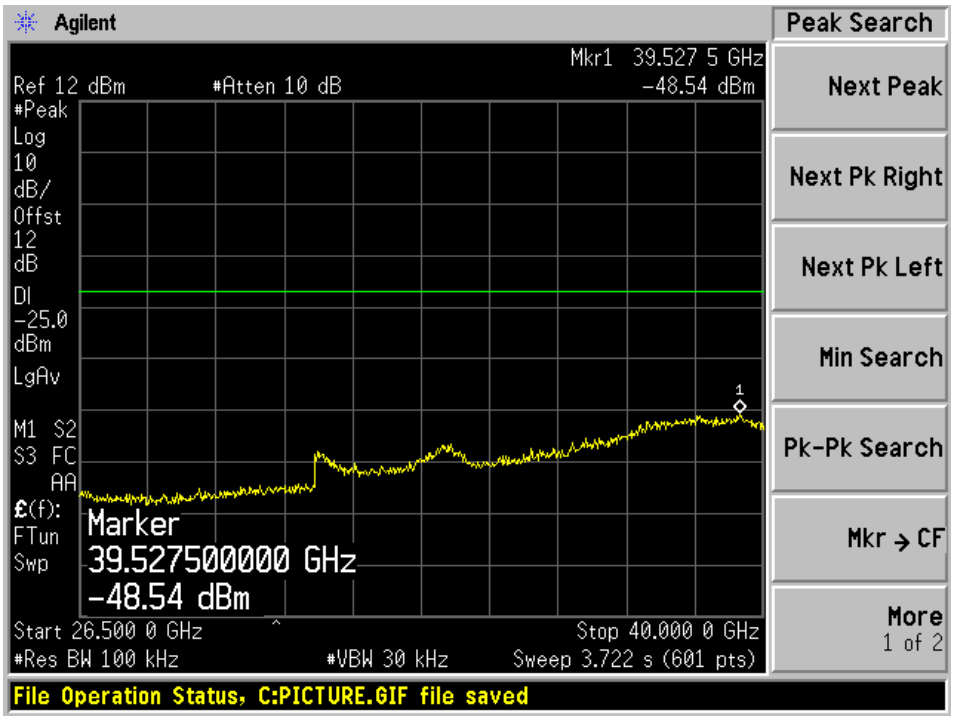
Chain 1, Low Channel 5860 MHz, 30MHz – 10GHz



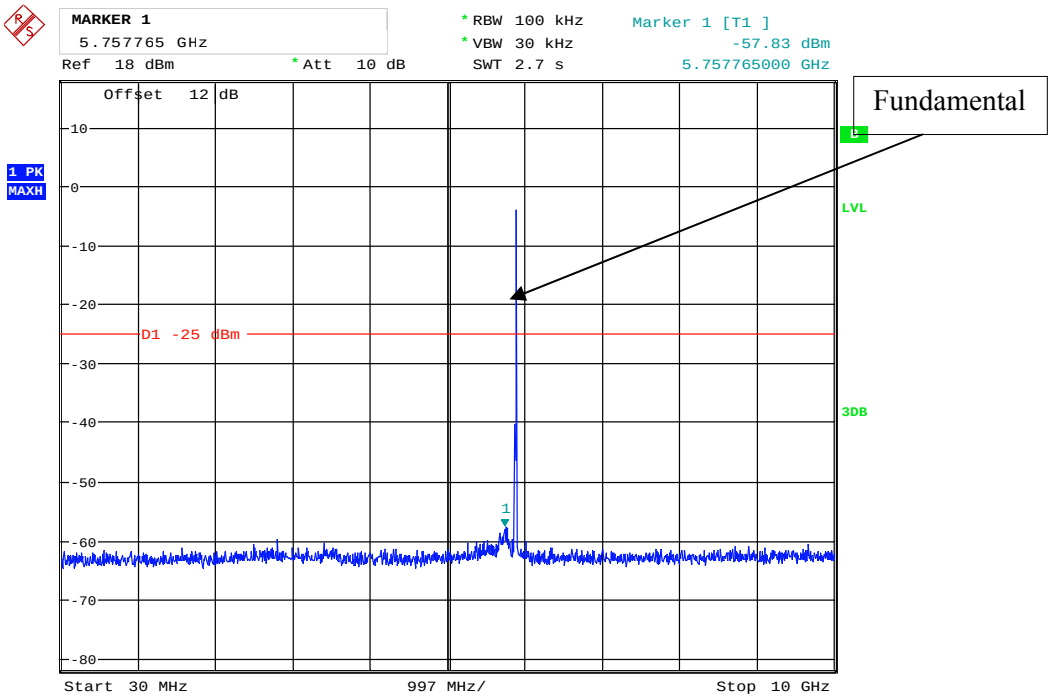
Chain 1, Low Channel 5860 MHz, 10GHz – 26.5GHz



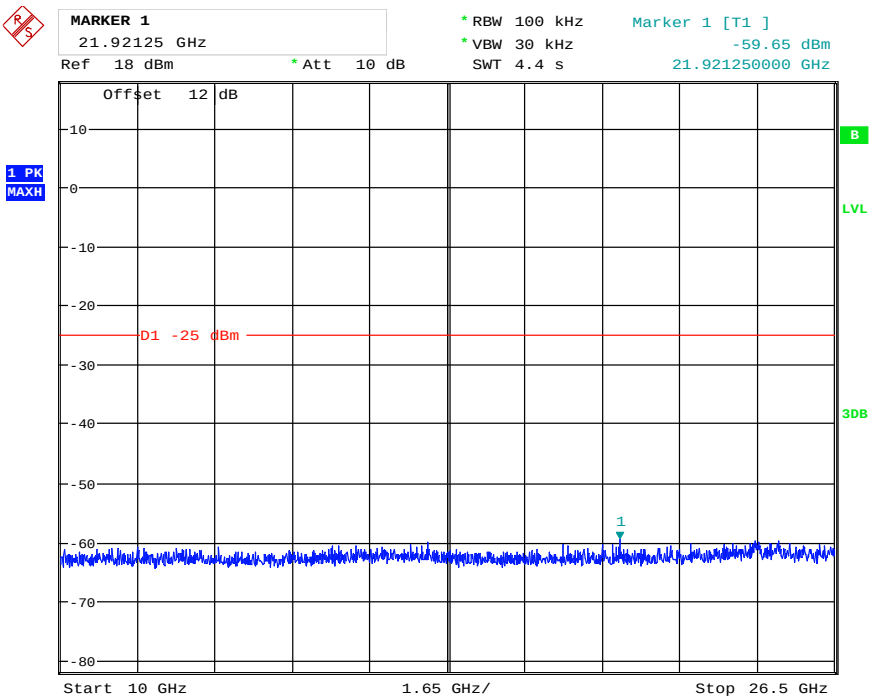
Chain 1, Low Channel 5860 MHz, 26.5MHz – 40GHz



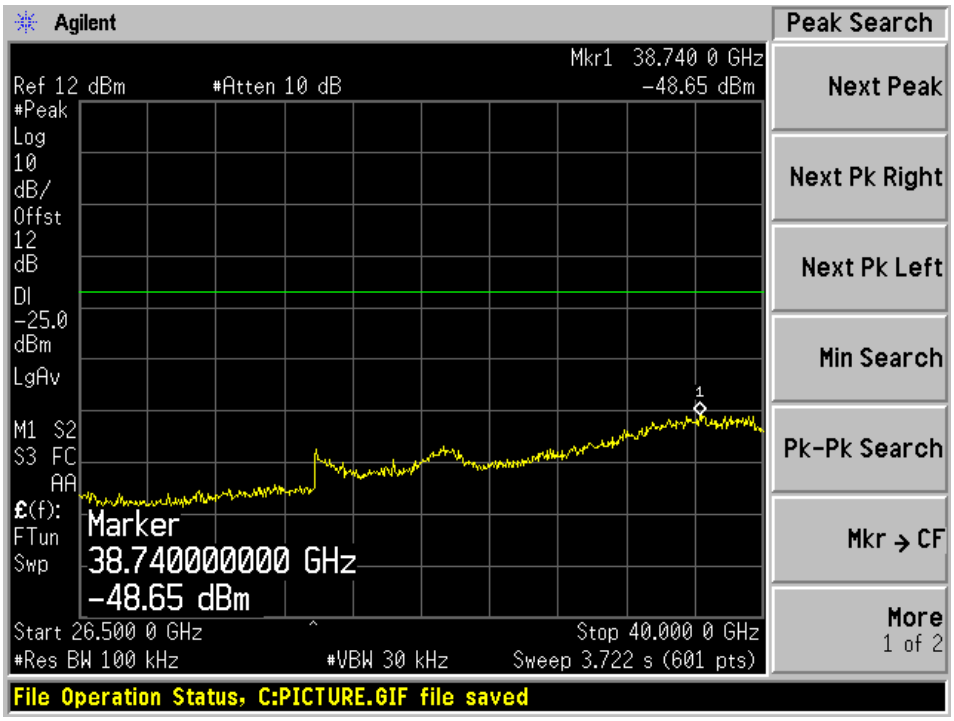
Chain 0, Mid Channel 5890 MHz, 30MHz – 10GHz



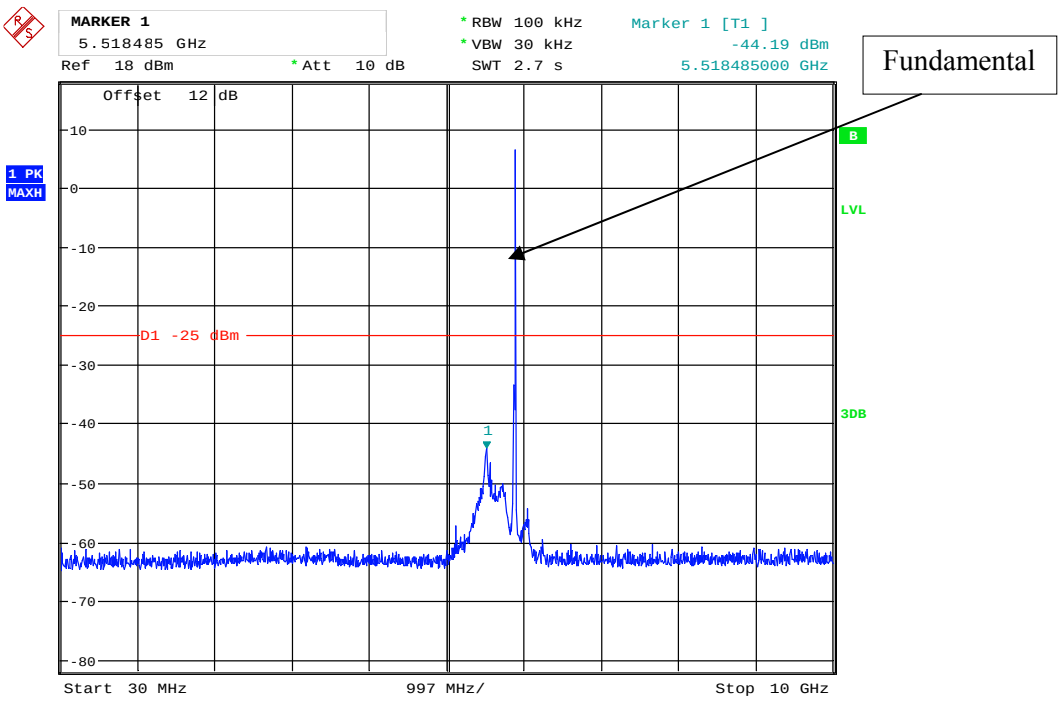
Chain 0, Mid Channel 5890 MHz, 10GHz – 26.5GHz



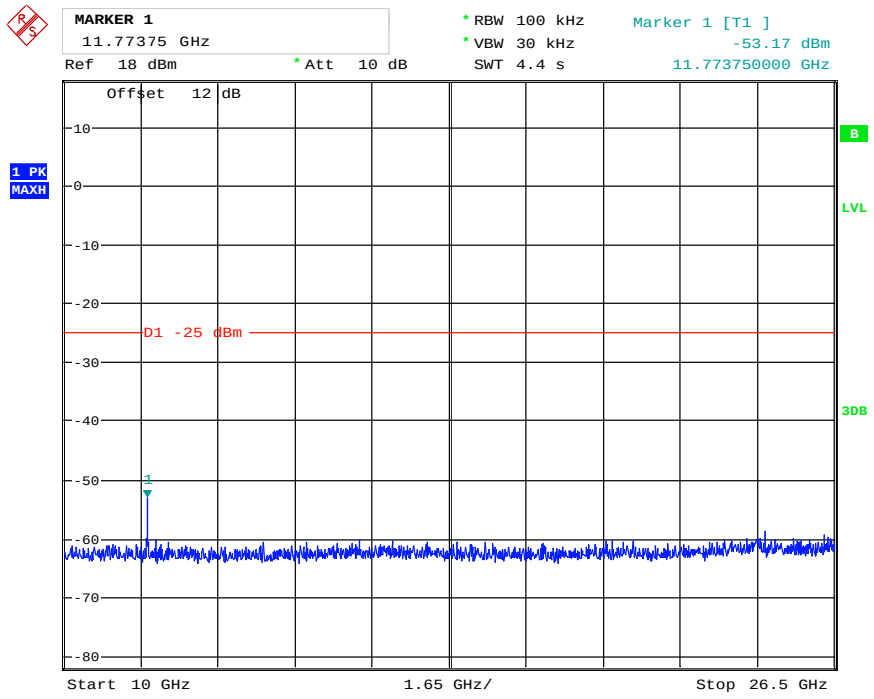
Chain 0, Mid Channel 5890 MHz, 26.5MHz – 40GHz



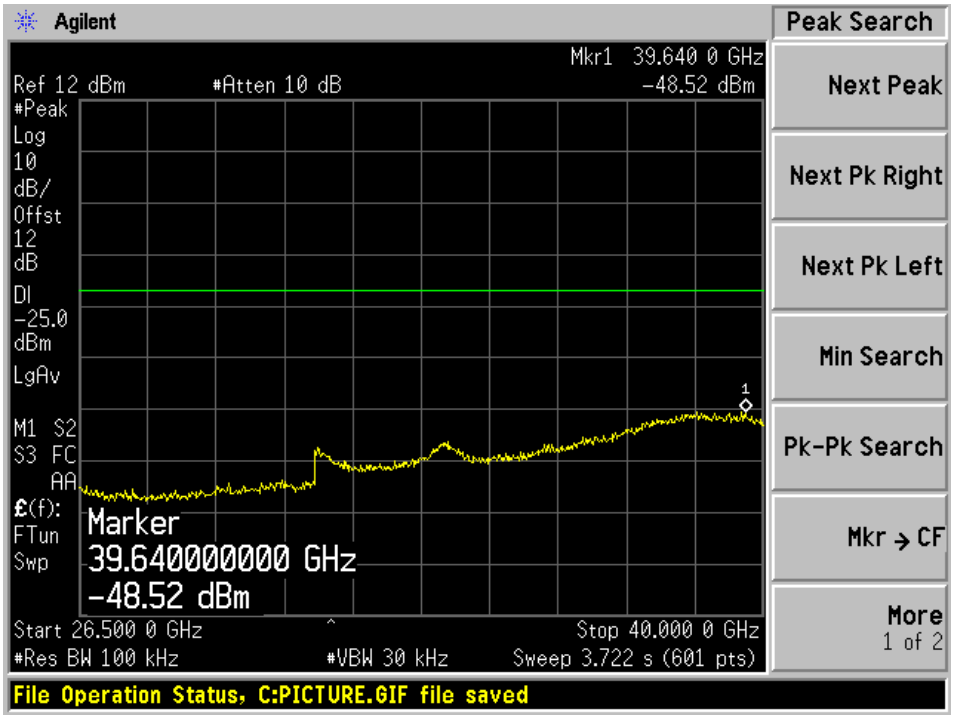
Chain 1, Mid Channel 5890 MHz, 30MHz – 10GHz



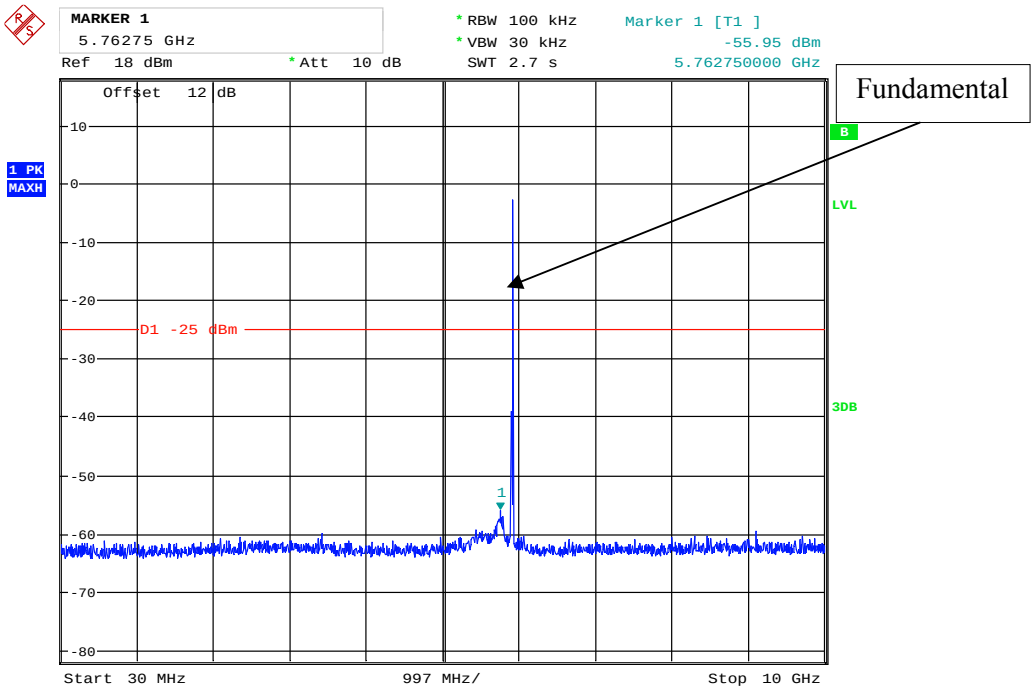
Chain 1, Mid Channel 5890 MHz, 10GHz – 26.5GHz



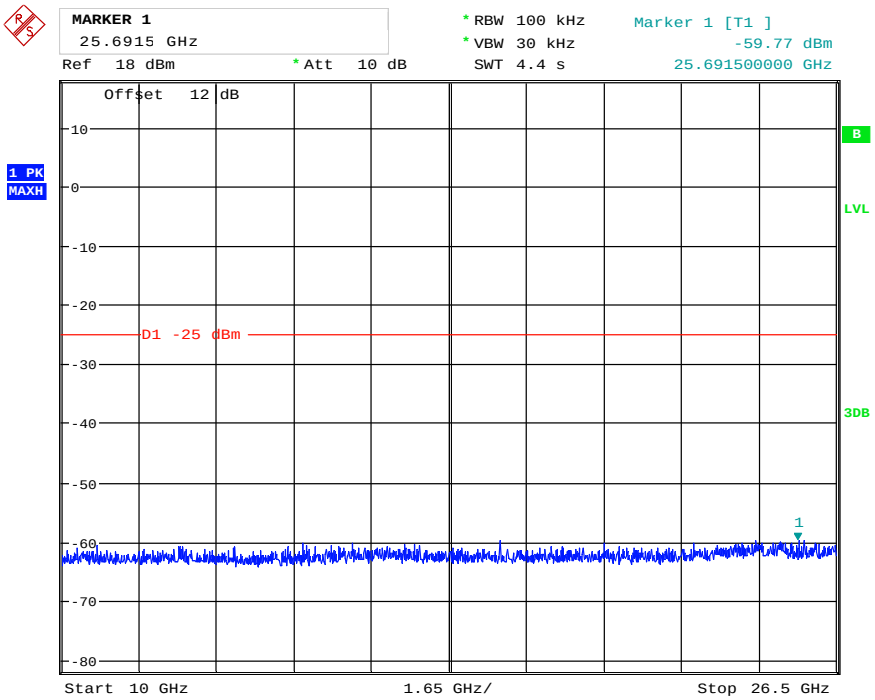
Chain 1, Mid Channel 5890 MHz, 26.5MHz – 40GHz



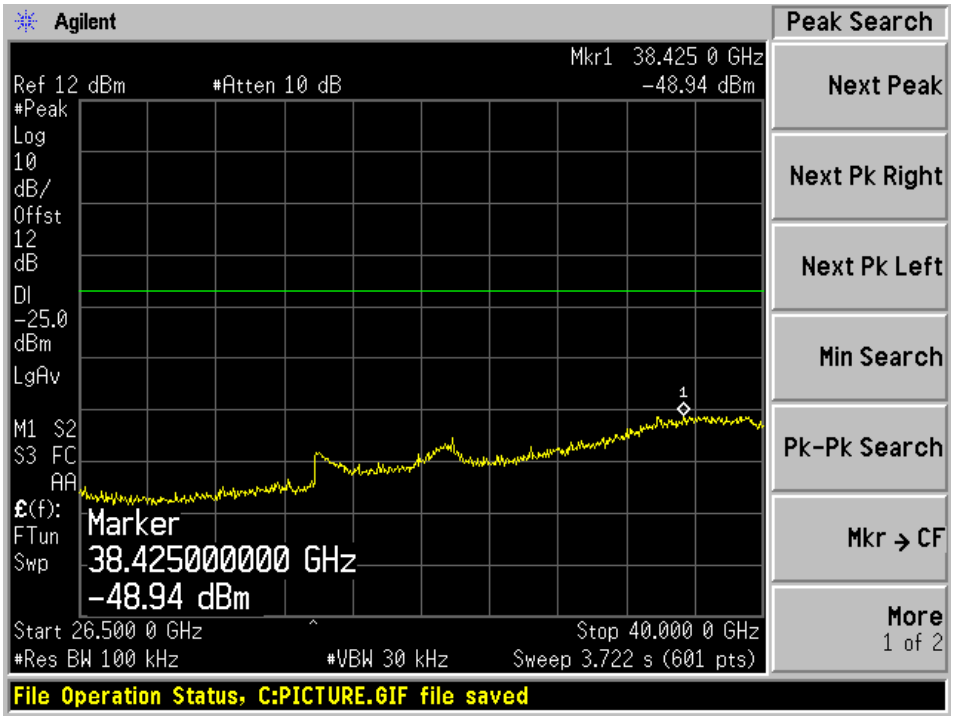
Chain 0, High Channel 5920 MHz, 30MHz – 10GHz



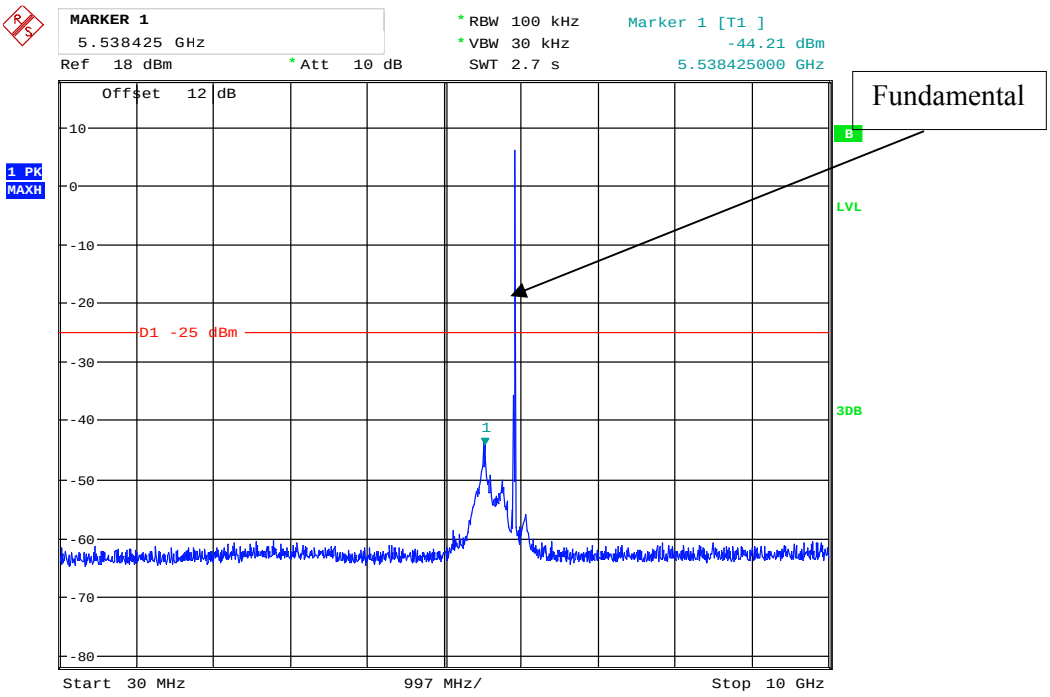
Chain 0, High Channel 5920 MHz, 10GHz – 26.5GHz



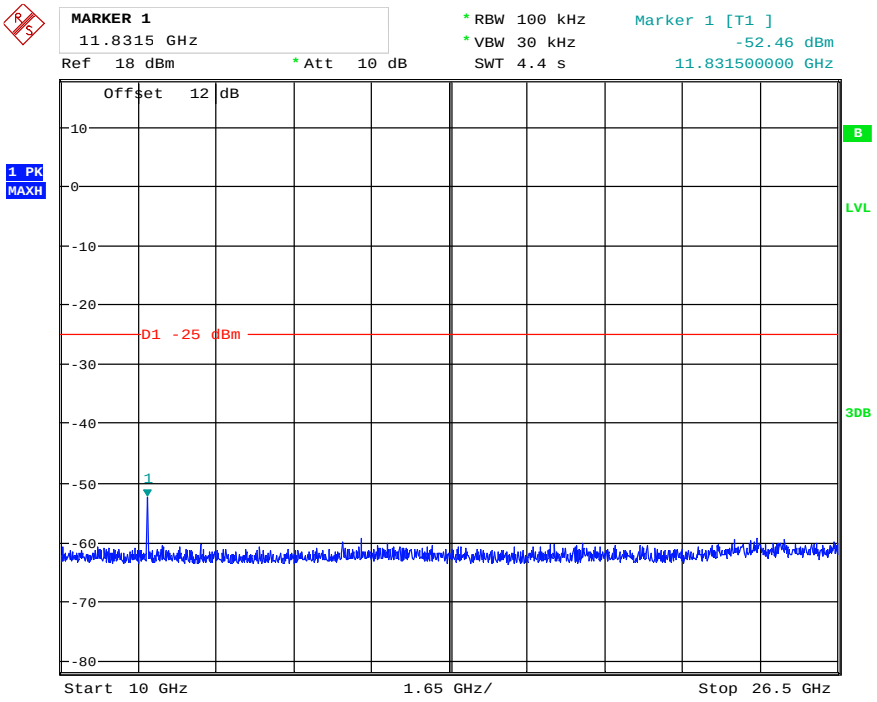
Chain 0, High Channel 5920 MHz, 26.5MHz – 40GHz



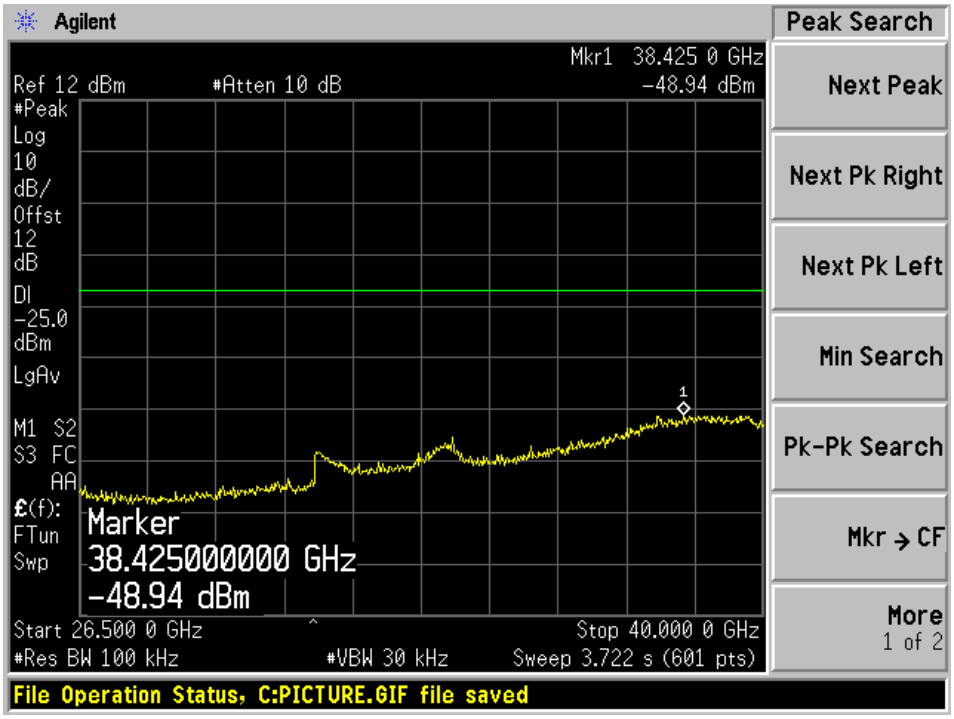
Chain 1, High Channel 5920 MHz, 30MHz – 10GHz



Chain 1, High Channel 5920 MHz, 10GHz – 26.5GHz



Chain 1, High Channel 5920 MHz, 26.5MHz – 40GHz



10 ASTM E2213-03 8.9.2 & FCC §2.1053 - Field Strength of Spurious Emission

10.1 Applicable Standard

According to ASTM EN2213-03 8.9.2:

8.9.2.1 The DSRC transmitted spectral 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.

10.2 Measurement Procedure

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 10.5 The measurements shall be made using a 100 kHz resolution bandwidth and a 30 kHz video bandwidth.

For co-location scans: For the radiated emissions test, the EUT host, and all support equipment power cords were connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT was set 3 meter away from the testing antenna, which was varied from 1-4 meter, and the EUT was placed on a turntable, which was 0.8 meter and 1.5 meter above the ground plane for below and above 1000 MHz measurements, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna's polarity should be changed between horizontal and vertical.

The spectrum analyzer or receiver was set as:

Below 1000 MHz:

RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

Above 1000 MHz:

(1) Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto
(2) Average: RBW = 1MHz / VBW = 10Hz or 1/T / Sweep = Auto

10.3 Test Equipment List and Details

Standalone radio testing equipment:

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Sunol Science Corp	System Controller	SC99V	122303-1	N/R	N/R
Rhode & Schwarz	Signal Analyzer	FSV40	1321.3008K39 -101203-UW	2019-08-06	1 Year
Agilent	Amplifier, Pre	8447D	2944A10187	2019-04-11	1 Year
HP/ Agilant	Pre Amplifier	8449B OPT HO2	3008A0113	2019-09-30	1 Year
A.R.A.	Antenna, Horn	DRG-118/A	1132	2018-02-13	2 Years
Sunol Sciences	Antenna, Horn	DRH-118	A052704	2019-04-02	2 Years
Sunol Sciences	Antenna, Biconi-Log	JB1	A013105-3	2018-02-26	2 Years
COM-POWER	Antenna, Dipole	AD-100 DB-4	721033DB1/2/ 3,521921	2019-03-06	2 Years
Keysight Technologies	Vector Signal Generator	N5182B	MY51350070	2019-01-29	1 Year
IW Microwave	150 Series 2.92mm Cable	KPS1501AN-3780-KPS	DC 1925	2019-09-11	1 Year
MDP Digital	Times Microwave LMR 400 UltraFex Coaxial Cable 35\'	LMR400UF	BACL190416 1	2019-04-16	1 Year

Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 02 Octomber 2018) "A2LA Policy on Metrological Traceability".*

Colocation testing equipment:

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
ETS Lindgren	Horn Antenna	3117	00218973	2019-02-13	2 Years
A.R.A.	Horn Antenna	DRG-118/A	1132	2020-02-25	2 Years
Sunol Sciences	Biconilog Antenna	JB3	A020106-2	2019-11-20	2 Years
COM-POWER	Antenna, Dipole	AD-100 DB-4	721033DB1/2/3,521921	2019-03-06	2 Years
Rohde & Schwarz	Receiver, EMI Test	ESCI 1166.5950.03	100338	2018-07-05	2 Years
Agilent	Analyzer, Spectrum	E4446A	US44300386	2019-06-26	1 Year
-	SMA cable	-	C0002	Each time[1]	N/A
WiseWave	Horn Antenna	ARH-4223-02	10555-02	2020-02-05	2 Years
WiseWave	Horn Antenna	ARH-2823-02	10555-01	2020-02-05	2 Years
-	Notch Filter	-	-	Each time[1]	N/A
AH Systems	Preamplifier	PAM 1840 VH	170	2019-09-24	1 Year
HP	Preamplifier	8447D	2443A04374	2019-08-13	1 Year
Rohde & Schwarz	Wideband Radio Communication Tester	CMW 500	1201.0002K50	N/R	N/R
Sunol Sciences	Horn Antenna	DRH-118	A052704	2019-04-02	2 Years
-	Sensitivity Box	-	-	2019-10-02	1 Year

Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 02 Octomber 2018) "A2LA Policy on Metrological Traceability".*

10.4 Test Environmental Conditions

Temperature:	22-26° C
Relative Humidity:	42-46 %
ATM Pressure:	101-102 kPa

The testing for ITS-RS4-M-SPEW was performed by Matthew Riego de Dios on 2020-01-28 at 5 meter Chamber 3.

The testing for ITS-RS4-M-F-W-C495-BL5-S-SGLB was performed by Matthew Riego de Dios from 2020-01-15 to 2020-01-16 at 5 meter Chamber 3.

The testing for ITS-RS4-M-SM66 was performed by Christopher Casteel from 2020-01-16 to 2020-01-17 at 5 meter Chamber 3.

The testing for colocation configurations were performed by Christian McCaig from2020-04-03to 2020-04-06 at 5 meter Chamber 3.

10.5 Test Results

Model: ITS-RS4-M-SPEW

Note: Both chains are NOT transmitting simultaneously at the same channel.

Chain 0:

Low Channel Frequency: 5860 MHz

Freq. (MHz)	S.A. Amp. (dBμV)	Table Azimuth Degrees	Test Antenna		Substitution				Absolute Level (dBm)	FCC	
			Height (m)	Polar (H/V)	S.G Freq. (MHz)	S.G Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
265	44.06	256	235	H	265	-60.33	1.6	0.58	-59.31	-25	-34.31
265	40.92	0	100	V	265	-62.51	1.6	0.58	-61.49	-25	-36.49
528	40.49	85	100	H	528	-60.04	1.8	0.66	-58.9	-25	-33.9
528	36.61	40	100	V	528	-62.15	1.8	0.66	-61.01	-25	-36.01
1750	51.05	0	100	H	1750	-58.32	9.565	2.77	-51.525	-25	-26.525
1750	50.61	0	100	V	1750	-59.41	9.565	2.77	-52.615	-25	-27.615
1810	50.69	0	100	H	1810	-58.16	9.604	3.16	-51.716	-25	-26.716
1810	50.66	0	100	V	1810	-58.3	9.604	3.16	-51.856	-25	-26.856

Middle Channel Frequency: 5890 MHz

Freq. (MHz)	S.A. Amp. (dBμV)	Table Azimuth Degrees	Test Antenna		Substitution				Absolute Level (dBm)	FCC	
			Height (m)	Polar (H/V)	S.G Freq. (MHz)	S.G Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
265	43.67	254	232	H	265	-60.72	1.6	0.58	-59.7	-25	-34.7
265	40.44	0	100	V	265	-62.99	1.6	0.58	-61.97	-25	-36.97
528	40.24	89	100	H	528	-60.29	1.8	0.66	-59.15	-25	-34.15
528	37.16	30	100	V	528	-61.6	1.8	0.66	-60.46	-25	-35.46
1750	51.05	0	100	H	1750	-58.32	9.565	2.77	-51.525	-25	-26.525
1750	50.29	0	100	V	1750	-59.73	9.565	2.77	-52.935	-25	-27.935
1810	50.79	0	100	H	1810	-58.06	9.604	3.16	-51.616	-25	-26.616
1810	51.07	0	100	V	1810	-57.89	9.604	3.16	-51.446	-25	-26.446

High Channel Frequency: 5920 MHz

Freq. (MHz)	S.A. Amp. (dBµV)	Table Azimuth Degrees	Test Antenna		Substitution				Absolute Level (dBm)	FCC	
			Height (m)	Polar (H/V)	S.G Freq. (MHz)	S.G Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
265	43.58	250	239	H	265	-60.81	1.6	0.58	-59.79	-25	-34.79
265	40.4	0	100	V	265	-63.03	1.6	0.58	-62.01	-25	-37.01
528	39.91	91	100	H	528	-60.62	1.8	0.66	-59.48	-25	-34.48
528	36.26	27	100	V	528	-62.5	1.8	0.66	-61.36	-25	-36.36
1750	51.29	0	100	H	1750	-58.08	9.565	2.77	-51.285	-25	-26.285
1750	50.35	0	100	V	1750	-59.67	9.565	2.77	-52.875	-25	-27.875
1810	50.7	0	100	H	1810	-58.15	9.604	3.16	-51.706	-25	-26.706
1810	50.05	0	100	V	1810	-58.91	9.604	3.16	-52.466	-25	-27.466

Chain 1:

Low Channel Frequency: 5860 MHz

Freq. (MHz)	S.A. Amp. (dBµV)	Table Azimuth Degrees	Test Antenna		Substitution				Absolute Level (dBm)	FCC	
			Height (m)	Polar (H/V)	S.G Freq. (MHz)	S.G Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
265	42.46	246	239	H	265	-61.93	1.6	0.58	-60.91	-25	-35.91
265	40.14	0	100	V	265	-63.29	1.6	0.58	-62.27	-25	-37.27
528	39.69	88	100	H	528	-60.84	1.8	0.66	-59.7	-25	-34.7
528	36.29	26	100	V	528	-62.47	1.8	0.66	-61.33	-25	-36.33
1750	51.52	0	100	H	1750	-57.85	9.565	2.77	-51.055	-25	-26.055
1750	50.58	0	100	V	1750	-59.44	9.565	2.77	-52.645	-25	-27.645
1810	50.75	0	100	H	1810	-58.1	9.604	3.16	-51.656	-25	-26.656
1810	50.62	0	100	V	1810	-58.34	9.604	3.16	-51.896	-25	-26.896

Middle Channel Frequency: 5890 MHz

Freq. (MHz)	S.A. Amp. (dBµV)	Table Azimuth Degrees	Test Antenna		Substitution				Absolute Level (dBm)	FCC	
			Height (m)	Polar (H/V)	S.G Freq. (MHz)	S.G Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
265	42.59	237	220	H	265	-61.8	1.6	0.58	-60.78	-25	-35.78
265	40.43	0	100	V	265	-63	1.6	0.58	-61.98	-25	-36.98
528	40.19	86	100	H	528	-60.34	1.8	0.66	-59.2	-25	-34.2
528	36.41	29	100	V	528	-62.35	1.8	0.66	-61.21	-25	-36.21
1750	51.52	0	100	H	1750	-57.85	9.565	2.77	-51.055	-25	-26.055
1750	50.19	0	100	V	1750	-59.83	9.565	2.77	-53.035	-25	-28.035
1810	51.51	0	100	H	1810	-57.34	9.604	3.16	-50.896	-25	-25.896
1810	50.09	0	100	V	1810	-58.87	9.604	3.16	-52.426	-25	-27.426

High Channel Frequency: 5920 MHz

Freq. (MHz)	S.A. Amp. (dBµV)	Table Azimuth Degrees	Test Antenna		Substitution				Absolute Level (dBm)	FCC	
			Height (m)	Polar (H/V)	S.G Freq. (MHz)	S.G Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
265	44.3	249	239	H	265	-60.09	1.6	0.58	-59.07	-25	-34.07
265	39.58	0	100	V	265	-63.85	1.6	0.58	-62.83	-25	-37.83
528	40.22	84	100	H	528	-60.31	1.8	0.66	-59.17	-25	-34.17
528	37.14	33	100	V	528	-61.62	1.8	0.66	-60.48	-25	-35.48
1750	50.63	0	100	H	1750	-58.74	9.565	2.77	-51.945	-25	-26.945
1750	59.95	0	100	V	1750	-50.07	9.565	2.77	-43.275	-25	-18.275
1810	50.47	0	100	H	1810	-58.38	9.604	3.16	-51.936	-25	-26.936
1810	49.85	0	100	V	1810	-59.11	9.604	3.16	-52.666	-25	-27.666

Model: ITS-RS4-M-W-C495-BL5-S-SGLB

Note: Both chains are NOT transmitting simultaneously at the same channel.

Chain 0:

Low Channel Frequency: 5860 MHz

Freq. (MHz)	S.A. Amp. (dBμV)	Table Azimuth Degrees	Test Antenna		Substitution				Absolute Level (dBm)	FCC	
			Height (m)	Polar (H/V)	S.G Freq. (MHz)	S.G Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
375	41.09	122	133	H	375	-64.67	1.5	0.45	-63.62	-25	-38.62
375	37.84	351	100	V	375	-66.64	1.5	0.45	-65.59	-25	-40.59
528	36.33	106	100	H	528	-64.2	1.8	0.66	-63.06	-25	-38.06
528	35.01	190	100	V	528	-63.75	1.8	0.66	-62.61	-25	-37.61
1510	51.46	0	100	H	1510	-60.79	8.841	1.49	-53.439	-25	-28.439
1510	51.98	0	100	V	1510	-59.97	8.841	1.49	-52.619	-25	-27.619
1720	51.3	0	100	H	1720	-59.91	9.678	1.81	-52.042	-25	-27.042
1720	50.91	0	100	V	1720	-60.19	9.678	1.81	-52.322	-25	-27.322

Middle Channel Frequency: 5890 MHz

Freq. (MHz)	S.A. Amp. (dBμV)	Table Azimuth Degrees	Test Antenna		Substitution				Absolute Level (dBm)	FCC	
			Height (m)	Polar (H/V)	S.G Freq. (MHz)	S.G Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
375	40.39	117	135	H	375	-65.37	1.5	0.45	-64.32	-25	-39.32
375	37.7	348	100	V	375	-66.78	1.5	0.45	-65.73	-25	-40.73
528	36.12	93	100	H	528	-64.41	1.8	0.66	-63.27	-25	-38.27
528	35.21	186	100	V	528	-63.55	1.8	0.66	-62.41	-25	-37.41
1510	51.62	0	100	H	1510	-60.63	8.841	1.49	-53.279	-25	-28.279
1510	51.94	0	100	V	1510	-60.01	8.841	1.49	-52.659	-25	-27.659
1720	51.42	0	100	H	1720	-59.79	9.678	1.81	-51.922	-25	-26.922
1720	51.04	0	100	V	1720	-60.06	9.678	1.81	-52.192	-25	-27.192

High Channel Frequency: 5920 MHz

Freq. (MHz)	S.A. Amp. (dBµV)	Table Azimuth Degrees	Test Antenna		Substitution				Absolute Level (dBm)	FCC	
			Height (m)	Polar (H/V)	S.G Freq. (MHz)	S.G Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
375	39.91	122	130	H	375	-65.85	1.5	0.45	-64.8	-25	-39.8
375	36.64	355	100	V	375	-67.84	1.5	0.45	-66.79	-25	-41.79
528	36.42	102	100	H	528	-64.11	1.8	0.66	-62.97	-25	-37.97
528	35.62	187	100	V	528	-63.14	1.8	0.66	-62	-25	-37
1510	51.78	0	100	H	1510	-60.47	8.841	1.49	-53.119	-25	-28.119
1510	51.54	0	100	V	1510	-60.41	8.841	1.49	-53.059	-25	-28.059
1720	51.33	0	100	H	1720	-59.88	9.678	1.81	-52.012	-25	-27.012
1720	51.12	0	100	V	1720	-59.98	9.678	1.81	-52.112	-25	-27.112

Chain 1:

Low Channel Frequency: 5860 MHz

Freq. (MHz)	S.A. Amp. (dBµV)	Table Azimuth Degrees	Test Antenna		Substitution				Absolute Level (dBm)	FCC	
			Height (m)	Polar (H/V)	S.G Freq. (MHz)	S.G Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
375	39.76	140	133	H	375	-66	1.5	0.45	-64.95	-25	-39.95
375	37.31	353	100	V	375	-67.17	1.5	0.45	-66.12	-25	-41.12
528	36.42	105	100	H	528	-64.11	1.8	0.66	-62.97	-25	-37.97
528	35.22	181	100	V	528	-63.54	1.8	0.66	-62.4	-25	-37.4
1510	51.6	0	100	H	1510	-60.65	8.841	1.49	-53.299	-25	-28.299
1510	51.94	0	100	V	1510	-60.01	8.841	1.49	-52.659	-25	-27.659
1720	53.68	0	100	H	1720	-57.53	9.678	1.81	-49.662	-25	-24.662
1720	50.76	0	100	V	1720	-60.34	9.678	1.81	-52.472	-25	-27.472

Middle Channel Frequency: 5890 MHz

Freq. (MHz)	S.A. Amp. (dBµV)	Table Azimuth Degrees	Test Antenna		Substitution				Absolute Level (dBm)	FCC	
			Height (m)	Polar (H/V)	S.G Freq. (MHz)	S.G Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
375	39.88	132	126	H	375	-65.88	1.5	0.45	-64.83	-25	-39.83
375	37.52	347	100	V	375	-66.96	1.5	0.45	-65.91	-25	-40.91
528	36.5	104	100	H	528	-64.03	1.8	0.66	-62.89	-25	-37.89
528	35.31	180	100	V	528	-63.45	1.8	0.66	-62.31	-25	-37.31
1510	51.75	0	100	H	1510	-60.5	8.841	1.49	-53.149	-25	-28.149
1510	52.28	0	100	V	1510	-59.67	8.841	1.49	-52.319	-25	-27.319
1720	51.75	0	100	H	1720	-59.46	9.678	1.81	-51.592	-25	-26.592
1720	51.54	0	100	V	1720	-59.56	9.678	1.81	-51.692	-25	-26.692

High Channel Frequency: 5920 MHz

Freq. (MHz)	S.A. Amp. (dBµV)	Table Azimuth Degrees	Test Antenna		Substitution				Absolute Level (dBm)	FCC	
			Height (m)	Polar (H/V)	S.G Freq. (MHz)	S.G Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
375	39.83	128	133	H	375	-65.93	1.5	0.45	-64.88	-25	-39.88
375	37.15	350	100	V	375	-67.33	1.5	0.45	-66.28	-25	-41.28
528	36.68	95	100	H	528	-63.85	1.8	0.66	-62.71	-25	-37.71
528	34.34	183	100	V	528	-64.42	1.8	0.66	-63.28	-25	-38.28
1510	51.65	0	100	H	1510	-60.6	8.841	1.49	-53.249	-25	-28.249
1510	51.49	0	100	V	1510	-60.46	8.841	1.49	-53.109	-25	-28.109
1720	51.95	0	100	H	1720	-59.26	9.678	1.81	-51.392	-25	-26.392
1720	50.68	0	100	V	1720	-60.42	9.678	1.81	-52.552	-25	-27.552

Model: ITS-RS4-M-SM66

Note: Both chains are NOT transmitting simultaneously at the same channel.

Chain 0:

Low Channel Frequency: 5860 MHz

Freq. (MHz)	S.A. Amp. (dBµV)	Table Azimuth Degrees	Test Antenna		Substitution				Absolute Level (dBm)	FCC	
			Height (m)	Polar (H/V)	S.G Freq. (MHz)	S.G Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
60	53.89	300	300	H	60	-53.65	2	0.58	-52.23	-25	-27.23
60	57.67	178	100	V	60	-49.11	2	0.58	-47.69	-25	-22.69
375	48.12	265	148	H	375	-57.64	1.5	0.45	-56.59	-25	-31.59
375	46.5	129	110	V	375	-57.98	1.5	0.45	-56.93	-25	-31.93
725	35.32	333	256	H	725	-62.14	2.1	1.05	-61.09	-25	-36.09
725	34.04	260	100	V	725	-59.95	2.1	1.05	-58.9	-25	-33.9
1056	58.61	234	272	H	1056	-50.17	6.644	1.49	-45.016	-25	-20.016
1056	57.21	281	287	V	1056	-51.87	8.841	1.49	-44.519	-25	-19.519
1584	68.37	222	178	H	1584	-42.61	9.678	1.81	-34.742	-25	-9.742
1584	57.64	214	300	V	1584	-53.98	9.678	1.81	-46.112	-25	-21.112

Middle Channel Frequency: 5890 MHz

Freq. (MHz)	S.A. Amp. (dBµV)	Table Azimuth Degrees	Test Antenna		Substitution				Absolute Level (dBm)	FCC	
			Height (m)	Polar (H/V)	S.G Freq. (MHz)	S.G Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
60	47.36	306	108	H	60	-60.18	2	0.58	-58.76	-25	-33.76
60	55.22	14	110	V	60	-51.56	2	0.58	-50.14	-25	-25.14
375	47.77	83	158	H	375	-57.99	1.5	0.45	-56.94	-25	-31.94
375	48.24	232	100	V	375	-56.24	1.5	0.45	-55.19	-25	-30.19
528	36.57	274	189	H	528	-63.96	1.8	0.66	-62.82	-25	-37.82
528	32.92	34	138	V	528	-65.84	1.8	0.66	-64.7	-25	-39.7
1056	57.74	243	273	H	1056	-51.04	6.644	1.49	-45.886	-25	-20.886
1056	55.54	223	272	V	1056	-53.54	8.841	1.49	-46.189	-25	-21.189
1584	66.97	225	174	H	1584	-44.01	9.678	1.81	-36.142	-25	-11.142
1584	58.85	23	300	V	1584	-52.77	9.678	1.81	-44.902	-25	-19.902

High Channel Frequency: 5920 MHz

Freq. (MHz)	S.A. Amp. (dBµV)	Table Azimuth Degrees	Test Antenna		Substitution				Absolute Level (dBm)	FCC	
			Height (m)	Polar (H/V)	S.G Freq. (MHz)	S.G Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
60	48.78	305	100	H	60	-58.76	2	0.58	-57.34	-25	-32.34
60	56.66	233	100	V	60	-50.12	2	0.58	-48.7	-25	-23.7
375	51.34	257	135	H	375	-54.42	1.5	0.45	-53.37	-25	-28.37
375	48.34	184	134	V	375	-56.14	1.5	0.45	-55.09	-25	-30.09
725	36.03	218	115	H	725	-61.43	2.1	1.05	-60.38	-25	-35.38
725	32.02	228	141	V	725	-61.97	2.1	1.05	-60.92	-25	-35.92
1056	57.42	238	270	H	1056	-51.36	6.644	1.49	-46.206	-25	-21.206
1056	57.71	288	293	V	1056	-51.37	8.841	1.49	-44.019	-25	-19.019
1584	70.34	230	179	H	1584	-40.64	9.678	1.81	-32.772	-25	-7.772
1584	57.19	212	271	V	1584	-54.43	9.678	1.81	-46.562	-25	-21.562

Chain 1:

Low Channel Frequency: 5860 MHz

Freq. (MHz)	S.A. Amp. (dBµV)	Table Azimuth Degrees	Test Antenna		Substitution				Absolute Level (dBm)	FCC	
			Height (m)	Polar (H/V)	S.G Freq. (MHz)	S.G Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
60	49.28	283	109	H	60	-58.26	2	0.58	-56.84	-25	-31.84
60	58.28	46	106	V	60	-48.5	2	0.58	-47.08	-25	-22.08
375	50.91	265	142	H	375	-54.85	1.5	0.45	-53.8	-25	-28.8
375	45.7	79	117	V	375	-58.78	1.5	0.45	-57.73	-25	-32.73
625	33.33	237	278	H	625	-63.53	1.9	0.91	-62.54	-25	-37.54
625	30.28	10	110	V	625	-64.48	1.9	0.91	-63.49	-25	-38.49
1056	58.11	239	269	H	1056	-50.67	8.841	1.49	-43.319	-25	-18.319
1056	55.84	222	268	V	1056	-53.24	8.841	1.49	-45.889	-25	-20.889
1584	67.12	228	175	H	1584	-43.86	9.678	1.81	-35.992	-25	-10.992
1584	61.03	267	270	V	1584	-50.59	9.678	1.81	-42.722	-25	-17.722

Middle Channel Frequency: 5890 MHz

Freq. (MHz)	S.A. Amp. (dBμV)	Table Azimuth Degrees	Test Antenna		Substitution				Absolute Level (dBm)	FCC	
			Height (m)	Polar (H/V)	S.G Freq. (MHz)	S.G Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
60	49.81	277	110	H	60	-57.73	2	0.58	-56.31	-25	-31.31
60	58.98	49	106	V	60	-47.8	2	0.58	-46.38	-25	-21.38
375	51.44	254	138	H	375	-54.32	1.5	0.45	-53.27	-25	-28.27
375	47.45	188	131	V	375	-57.03	1.5	0.45	-55.98	-25	-30.98
528	33.67	275	109	H	528	-66.86	1.8	0.66	-65.72	-25	-40.72
528	30.84	79	148	V	528	-67.92	1.8	0.66	-66.78	-25	-41.78
1056	62.22	240	153	H	1056	-46.56	8.841	1.49	-39.209	-25	-14.209
1056	56.88	281	281	V	1056	-52.2	8.841	1.49	-44.849	-25	-19.849
1584	67.48	224	177	H	1584	-43.5	9.678	1.81	-35.632	-25	-10.632
1584	60	254	300	V	1584	-51.62	9.678	1.81	-43.752	-25	-18.752

High Channel Frequency: 5920 MHz

Freq. (MHz)	S.A. Amp. (dBμV)	Table Azimuth Degrees	Test Antenna		Substitution				Absolute Level (dBm)	FCC	
			Height (m)	Polar (H/V)	S.G Freq. (MHz)	S.G Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
60	48.3	285	109	H	60	-59.24	2	0.58	-57.82	-25	-32.82
60	57.92	81	106	V	60	-48.86	2	0.58	-47.44	-25	-22.44
375	51.46	250	137	H	375	-54.3	1.5	0.45	-53.25	-25	-28.25
375	46.02	81	119	V	375	-58.46	1.5	0.45	-57.41	-25	-32.41
528	33.89	277	111	H	528	-66.64	1.8	0.66	-65.5	-25	-40.5
528	30.94	76	148	V	528	-67.82	1.8	0.66	-66.68	-25	-41.68
1056	62.77	241	152	H	1056	-46.01	8.841	1.49	-38.659	-25	-13.659
1056	57.67	284	289	V	1056	-51.41	8.841	1.49	-44.059	-25	-19.059
1584	67.43	223	218	H	1584	-43.55	9.678	1.81	-35.682	-25	-10.682
1584	60.22	212	266	V	1584	-51.4	9.678	1.81	-43.532	-25	-18.532

Model: ITS-RS4-M-W-C495-BL5-S-SGLB Colocation (DSRC + Cellular):

Freq. (MHz)	S.A. Amp. (dBµV)	Table Azimuth Degrees	Test Antenna		Substitution				Absolute Level (dBm)	FCC	
			Height (m)	Polar (H/V)	S.G Freq. (MHz)	S.G Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
102.00	46.36	145	131	V	102.00	-55.43	0.70	0.12	-54.85	-25	-29.85
32.63	34.50	220	131	V	32.63	-70.70	-0.2	0.10	-71.00	-25	-46.00
71.15	38.98	229	106	V	71.15	-66.22	1.80	0.10	-64.52	-25	-39.52
130.97	38.32	85	148	H	130.97	-67.05	1.50	0.12	-65.67	-25	-40.67
165.11	39.34	126	131	V	165.11	-63.96	1.20	0.12	-62.88	-25	-37.88
42.91	38.50	44	113	V	42.91	-66.70	0.50	0.10	-66.30	-25	-41.30
7555.58	39.94	335	124	H	7555.58	-57.52	10.83	1.22	-47.91	-25	-22.91
7555.58	29.81	186	116	V	7555.58	-67.92	10.90	1.22	-58.24	-25	-33.24

11 Annex B (Normative) – Test Setup Photographs

Please refer to attachment.

12 Annex C (Normative) – EUT External Photographs

Please refer to attachment.

13 Annex D (Normative) – EUT Internal Photographs

Please refer to attachment.

14 Annex E (Informative) – Manufacturer Declaration of Similarity

commsignia

Commsignia, Inc.
5201 Great America Parkway, Suite 320,
Santa Clara, CA 95054, United States
info@commsignia.com

DECLARATION OF SIMILARITY

March 26, 2020

To:

FEDERAL COMMUNICATIONS COMMISSIONS
Authorization and Evaluation Division
7435 Oakland Mills Road
Columbia, MD 21046

Dear Sir or Madam:

We *Commsignia, Inc.* hereby declare that product: *ITS-RS4-M*, model: *ITS-RS4-M-F-SPEW and ITS-RS4-M-F-SM66 are* electrically identical with the same electromagnetic emissions and electromagnetic compatibility characteristics as model: *ITS-RS4-M-F-W-C495-BL5-S-SGLB* tested by BACL, the results of which are featured in BACL project: *R1910115*

A description of the differences between the tested model and those that are declared similar are as follows:

Model number	Description	Difference
ITS-RS4-M-F-W-C495-BL5-S-SGLB	Test Model	Model Name: GTT SGLB
ITS-RS4-M-F-SPEW	Similar Model	Model Name: SunParl SPE-W Different shape of enclosure
ITS-RS4-M-F-SM66	Similar Model	Model Name: RF Elements SM66 Different shape of enclosure

Please contact me should there be need for any additional clarification or information.

Best Regards,

On behalf of Commsignia

Laszlo Virag, CTO

5201 Great America Parkway, Suite 320,
Santa Clara, CA 95054, United States

15 Annex F (Normative) - A2LA Electrical Testing Certificate

Accredited Laboratory

A2LA has accredited

BAY AREA COMPLIANCE LABORATORIES CORP.

Sunnyvale, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets A2LA *R222 - Specific Requirements EPA ENERGY STAR Accreditation Program*. 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 2nd day of October 2018.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3297.02
Valid to September 30, 2020
Revised June 5, 2019

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

Please follow the web link below for a full ISO 17025 scope

https://www.a2la.org/scopepdf/3297-02.pdf

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