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TEST REPORT

FCC Test for FR-R5G39AO33ASUE

APPLICANT
FRTEK CO., LTD.

REPORT NO.
HCT-RF-2201-FC106

DATE OF ISSUE
February 10, 2022

Tested by
Kyung Soo Kang

Technical Manager
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Additional Model
-

Applicant	**FRTEK CO., LTD.** 11-25, Simin-daero 327beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, Republic of Korea
FCC ID	2AFEG-R5G39AO33ASUE
Product Name	PrimAer SU_E39
Model Name	FR-R5G39AO33ASUE
Date of Test	December 17, 2021 ~ February 11, 2022
Test Standard Used	CFR 47 Part 2, Part 30

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.
This test results were applied only to the test methods required by the standard.

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	February 10, 2022	Initial Release

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules under normal use and maintenance.

If this report is required to confirmation of authenticity, please contact to www.hct.co.kr

According to the Evaluation report, from section 5.1 to 5.5 of the data contained herein is reused from the reference FCC ID : 2AFEG-R5G39AO33ASUC report. (Report No. HCT-RF-2201-FC108)

CONTENTS

1. GENERAL INFORMATION

1.1. APPLICANT INFORMATION

Company Name	FRTEK CO., LTD.
Company Address	1001, Doosan Venture Digm, 415, Heungandaero, Dongan-Gu, Anyang-Si, Gyenggi-do, 431-755 Korea

1.2. PRODUCT INFORMATION

EUT Type	PrimAer SU_E39
EUT Serial Number	FRC40-21C-0001
Input Rating Power Port	-53.3 V
Power Supply	DC -53.3 V (-48~-53.3V)
Frequency Range	37 600 MHz ~ 40 000 MHz

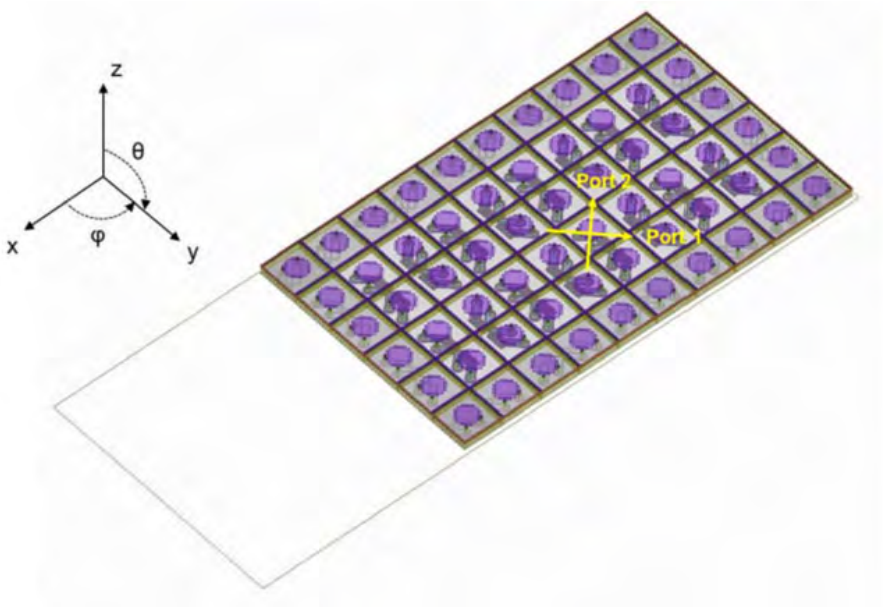
Output Power

Mode	EIRP (dBm)	Total (2 path) (dBm)
1CC	38.5	41.5
10CC	38.5	41.5

Max EIRP Density

Mode	[W]
1CC	15.187
10CC	1.668

Channel Bandwidths	1CC: 100 MHz ~ 10CC: 1 000 MHz
Modulation	QPSK, 16QAM, 64QAM

Antenna Specification (Antenna Array)	A high-performance 32-element (8x4) integrated antenna array is included in the SOB	
	Maximum Gain:	19.37 dBi
	Antenna pitch:	3.9 mm
	Antenna Size:	Length: 8 x 5.2 mm = 41.6 mm Width: 4 x 5.2 mm = 20.8 mm
	Lattice:	Rectangular
	Type:	Patch
		

1.3. TEST INFORMATION

FCC Rule Parts	CFR 47 Part 2, Part 30
Measurement standards	KDB 935210 D05 v01r04, ANSI C63.26-2015, KDB 971168 D01 v03r01, KDB 662911 D01 v02r01, KDB 662911 D02 v01, KDB 842590 D01 v01r02
Place of Test	HCT CO., LTD. 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

2. FACILITIES AND ACCREDITATIONS

2.1. FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA. The site is constructed in conformance with the requirements of ANSI C63.4 (Version: 2014) and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated April 02, 2018 (Registration Number: KR0032).

2.2. EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.
Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.
All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

3. TEST SPECIFICATIONS

3.1. STANDARDS

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 2, Part 30

Description	Reference	Results
AGC threshold	KDB 935210 D05 v01r04 3.2	Compliant
Out-of-band rejection	KDB 935210 D05 v01r04 3.3	Compliant
Occupied Bandwidth / Input-versus-output signal comparison	§ 2.1049	Compliant
EIRP Density	§ 30.202	Compliant
Equivalent Isotropic Radiated Power / Mean output power and amplifier/booster gain	§ 2.1046	Compliant
Out-of-band/out-of-block emissions (Band Edge)	§ 2.1051, § 30.203	Compliant
Radiated Spurious Emissions	§ 2.1051, § 30.203	Compliant
Frequency Stability	§ 2.1055	Compliant

3.2. ADDITIONAL DESCRIPTIONS ABOUT TEST

- The test was generally based on the method of KDB 935210 D05 v01r04 and only followed ANSI C63.26-2015 if there was no test method in KDB standard.
- All NR modulation types (QPSK, 16QAM, 64QAM) have been tested.
  But this report contains only worst case data.
- Except for the following cases, EUT was tested under normal operating conditions.
  : Out-of-band rejection test requires maximum gain condition without AGC.
- All tests is performed by radiated measurement and applied below conditions.
  : Used measurement distance with far field of test such as AGC threshold, Out-of-band rejection, OBW, EIRP and Band edge are as follow.

Wavelength = Speed of light / Measurement frequency = 30 / 4 000 = 0.0075 m

(2 X (EUT Antenna dimension)^2) / Wavelength = (2 X (0.04651)^2)/ 0.0075 = 0.58 ***m***

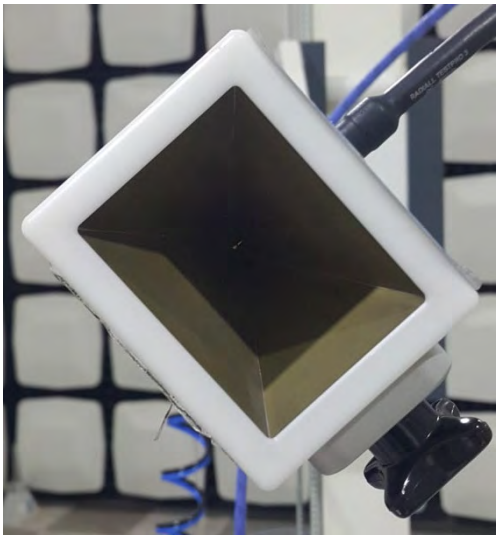
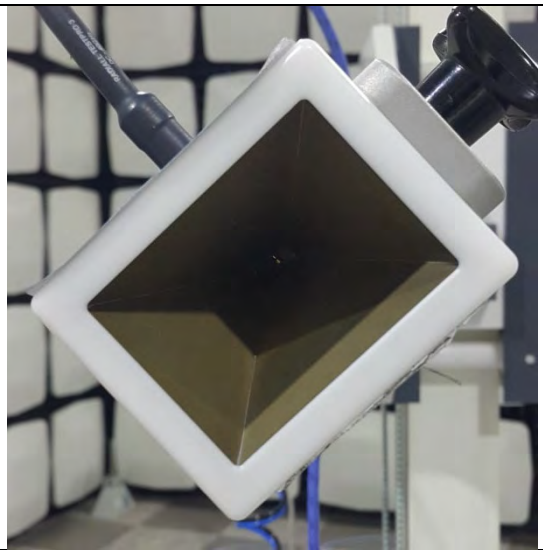
(2 X (Measurement Antenna dimension)^2) / Wavelength = (2 X (0.09605)^2)/ 0.0075 = 2.46 ***m***

In case of far-field distance for fundamental, we applied the measurement antenna dimension because the measurement antenna is bigger than the EUT antenna dimension. ***So, measurement distance is 3 m.***

: Spurious emissions measurement distance is shown in table below(Reference : Measurement Antenna Dimension).

Frequency Rage (GHz)	Wavelength (cm)	Far Field Distance (m)	Measurement Distance(m)
18 ~ 40	0.75	2.460	3.00
40 ~ 50	0.60	1.130	1.50
50 ~ 60	0.50	1.354	1.50
60 ~90	0.33	0.856	1.00
90 ~ 140	0.214	0.572	1.00
140 ~ 200	0.15	0.332	1.00

- Radiated test is performed on various angle of antenna and following location is worst test case.

45° (A)	135° (B)
	

- CC means component carriers and EUT support 1CC ~ 10CC.
- Test was performed the carrier 1 and 10 case having maximum output power and maximum PSD(It means the worst case.).
- Unwanted radiated emissions test was performed on state of all EUT antenna path is operated with a maximum output power level.
- Testing was completed with a signal generator creating a representative mmWave 5G NR signal, using DFT-s-OFDM scheme, various modulations including π/2-BPSK, QPSK, and QAM, 120kHz subcarrier spacing, with one and ten carrier configurations using 100MHz and 1000MHz bandwidths, full and single resource block allocations.
- Transmitter output signals are correlated.
- EUT was tested with following modulated signals provide by applicant.
  : NR 100 MHz (1CC, 10CC)

3.3. MAXIMUM MEASUREMENTUNCERTAINTY

Description	Condition	Uncertainty
Radiated Disturbance	9 kHz ~ 30 MHz	± 3.40 dB
	30 MHz ~ 1 GHz	± 4.80 dB
	1 GHz ~ 18 GHz	± 5.70 dB
	18 GHz ~ 40 GHz	± 5.05 dB

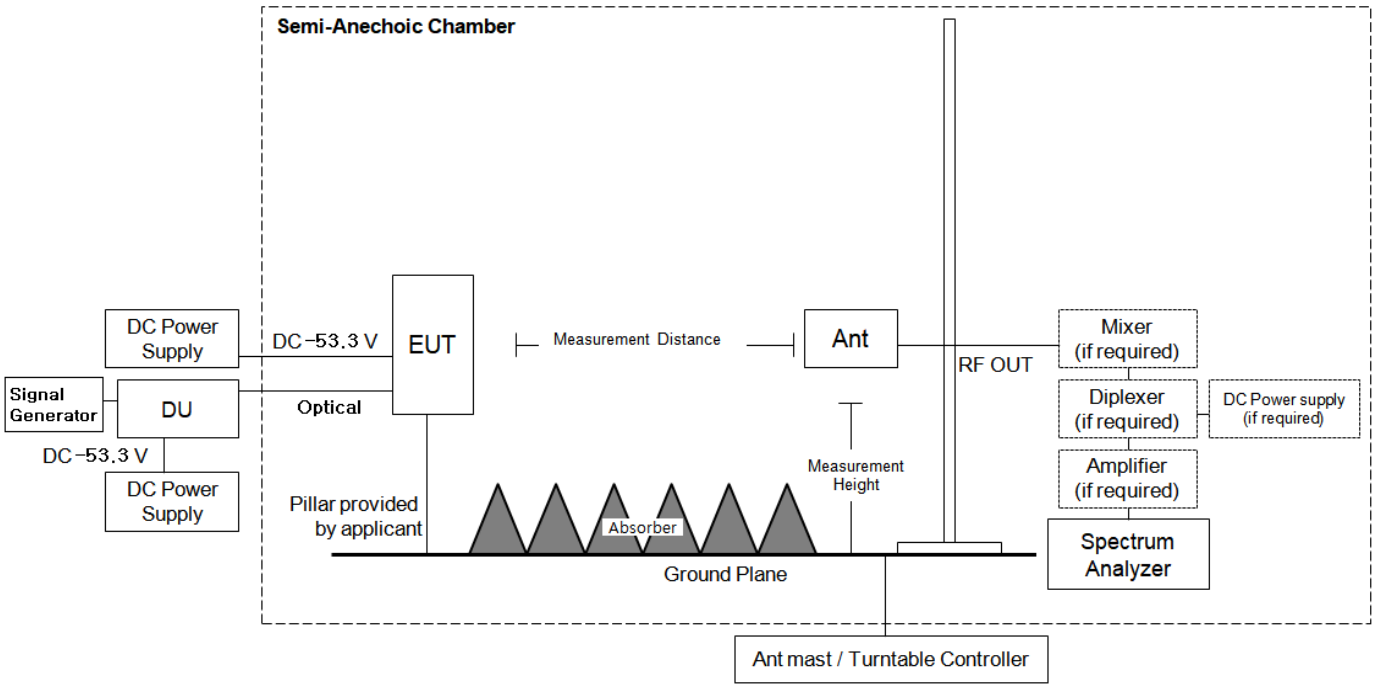
Coverage factor k = 2, Confidence levels of 95 %

3.4. STANDARDS ENVIRONMENTAL TEST CONDITIONS

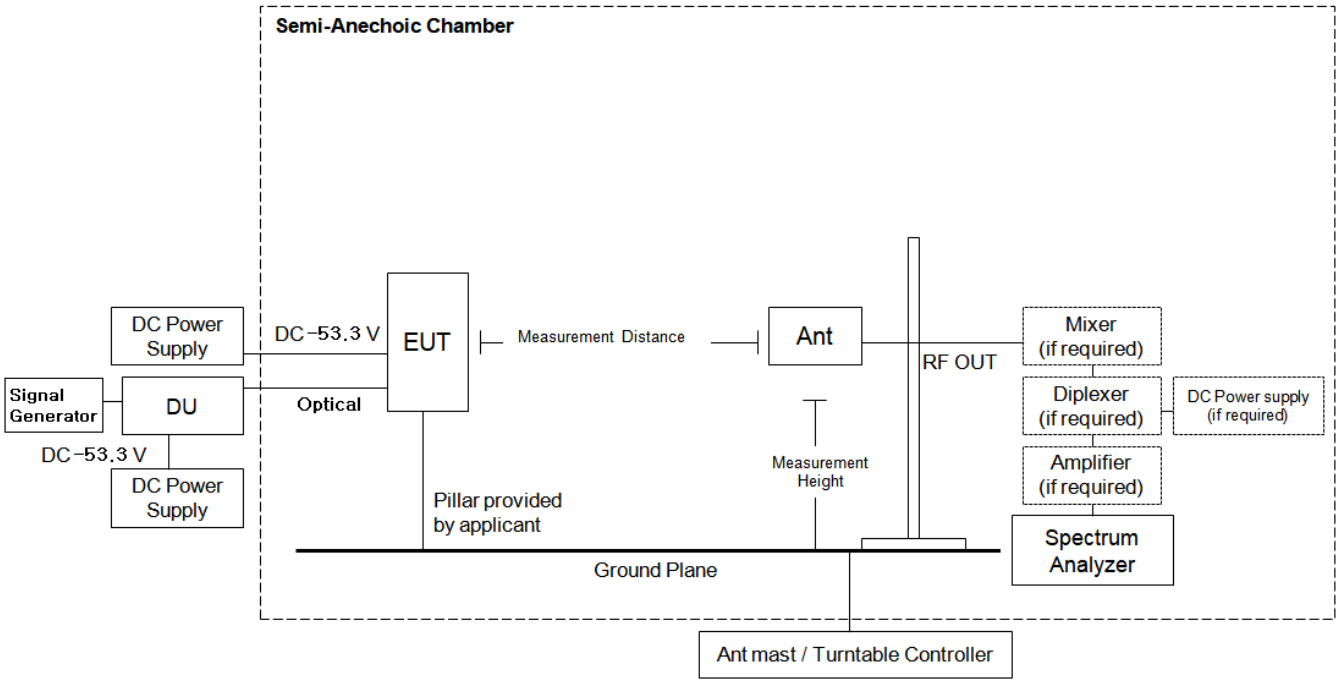
Temperature :	+15 °C to +35 °C
Relative humidity:	30 % to 60 %
Air pressure	860 mbar to 1 060 mbar

3.5. TEST DIAGRAMS

AGC / OOBR / Occupied Bandwidth / EIRP / Band Edge / Radiated Spurious Emissions in 1 GHz to 40 GHz



Radiated Spurious Emissions in other bands



4. TEST EQUIPMENTS

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
PXA Signal Analyzer	N9030B	Agilent	MY60070602	10/22/2022	Annual
Spectrum Analyzer	FSW	Rohde & Schwarz	101256	11/11/2022	Annual
Vector Signal Generator	SMW200A	Rohde & Schwarz	100988	03/15/2022	Annual
DC Power Supply	PWR800L	KIKUSUI	RE001154	03/04/2022	Annual
Controller(Antenna mast)	CO3000	Innco system	CO3000-4p	N/A	N/A
Antenna Position Tower	MA4640/800-XP-EP	Innco system	N/A	N/A	N/A
Controller	2090	Emco	060520	N/A	N/A
Turn Table	Turn Table	Ets	N/A	N/A	N/A
Turn Table	DS2000-S	Innco systems	N/A	N/A	N/A
Amp & Filter Bank Switch Controller	FBSM-01B	TNM system	N/A	N/A	N/A
Low Noise Amplifier	LLAU1183540Q	LTC Microwave	100	09/19/2022	Annual
Loop Antenna	Loop Antenna	Schwarzbeck	1513-175	06/04/2023	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	9168-0895	09/04/2022	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	02296	05/19/2022	Biennial
Horn Antenna	BBHA 9170	Schwarzbeck	BBHA9170541	11/16/2023	Biennial
Horn Antenna	WR-19 Horn Antenna	OML INC.	M19RH-160419-1	04/23/2022	Biennial
Horn Antenna	WR-19 Horn Antenna	OML INC.	M19RH-160419-2	04/23/2022	Biennial
Horn Antenna	WR-12 Horn Antenna	OML INC.	M12RH-160419-1	04/23/2022	Biennial
Horn Antenna	WR-12 Horn Antenna	OML INC.	M12RH-160419-2	04/23/2022	Biennial
Horn Antenna	WR-08 Horn Antenna	OML INC.	M08RH-160419-2	04/23/2022	Biennial
Horn Antenna	WR-08 Horn Antenna	OML INC.	M08RH-160419-1	04/23/2022	Biennial
Horn Antenna	WR-05 Horn Antenna	OML INC.	M05RH-160419-1	04/23/2022	Biennial
Horn Antenna	WR-05 Horn Antenna	OML INC.	M05RH-160419-2	04/23/2022	Biennial
SA Extension Module	WR19SAX-M	VDI	SAX771	03/17/2022	Annual
SA Extension Module	WR12SAX-M	VDI	SAX773	04/02/2022	Annual
SA Extension Module	WR8.0SAX-M	VDI	SAM779	04/02/2022	Annual
SA Extension Module	WR5.1SAX-M	VDI	SAX 774	04/02/2022	Annual
Source Module	WR-19	OML INC.	S19MS-A-160516-1	09/02/2022	Annual
Source Module	WR-12	OML INC.	S12MS-A-160419-1	09/02/2022	Annual
Source Module	WR-08	OML INC.	S08MS-A-160419-1	09/09/2022	Annual
Source Module	WR-05	OML INC.	S05MS-A-160419-1	09/07/2022	Annual
Temperature and Humidity Chamber	PL-4KP	ESPEC	14021890	08/11/2022	Annual

Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

5. TEST RESULT

5.1. AGC THRESHOLD

Test Requirement:

KDB 935210 D05 v01r04

Testing at and above the AGC threshold is required.

Test Procedures:

Measurements were in accordance with the test methods section 3.2 of KDB 935210 D05 v01r04.

In the case of fiber-optic distribution systems, the RF input port of the equipment under test (EUT) refers to the RF input of the supporting equipment RF to optical convertor; see also descriptions and diagrams for typical DAS booster systems in KDB Publication 935210 D02

Devices intended to be directly connected to an RF source (donor port) only need to be evaluated for any over-the-air transmit paths.

a) Connect a signal generator to the input of the EUT.
b) Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation as necessary.
c) The signal generator should initially be configured to produce either of the required test signals.
d) Set the signal generator frequency to the center frequency of the EUT operating band.
e) While monitoring the output power of the EUT, measured using the methods of ANSI C63.26-2015 subclause 5.2.4.4.1, increase the input level until a 1 dB increase in the input signal power no longer causes a 1 dB increase in the output signal power.
f) Record this level as the AGC threshold level.
g) Repeat the procedure with the remaining test signal.

Output power measurement in subclause 5.2.4.4.1 of ANSI C63.26

a) Set span to 2 × to 3 × the OBW.
b) Set RBW = 1% to 5% of the OBW.
c) Set VBW ≥ 3 × RBW.
d) Set number of measurement points in sweep ≥ 2 × span / RBW.
e) Sweep time: auto-couple
f) Detector = power averaging (rms).
g) If the EUT can be configured to transmit continuously, then set the trigger to free run.
h) Omit
i) Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over multiple symbols, it can be necessary to increase the number of traces to be averaged above 100 or, if using a manually configured sweep time, increase the sweep time.
j) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band or channel power

measurement function, with the band/channel limits set equal to the OBW band edges. If the instrument does not have a band or channel power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

Note:

1. Test distance is determined to 3.0 m by far field condition; see test descriptions on section 3.2.
2. The angle of antenna is set as maximum radiated power conditions.
3. EIRP is calculated from measured value according to section 5.2.7 of ANSI C63.26-2015, and the formula is as follow.

$$EIRP\ (dBm) = E\ (dB\mu V/m) + 20log(D) - 104.77$$

4. E (dBμV/m) value is considered Antenna Factor and Cable Loss (AFCL), and it as follow.

$$E\ (dB\mu V/m) = measurement\ value\ (dB\mu V) + AFCL$$

Test Results:

Path	CC	Center Frequency (GHz)	AGC Threshold Level (dBm)	Measured Level (dBuV)	Result (dBm)
A	1	38.800	-71.50	79.74	38.90
	10	38.800	-71.50	79.34	38.50
B	1	38.800	-71.50	79.50	38.67
	10	38.800	-71.50	79.10	38.27

5.2. OUT-OF-BAND REJECTION

Test Requirement:

KDB 935210 D05 v01r04

Out-of-band rejection required.

Test Procedures:

Measurements were in accordance with the test methods section 3.3 of KDB 935210 D05 v01r04.

A signal booster shall reject amplification of other signals outside of its passband. Adjust the internal gain control of the EUT (if so equipped) to the maximum gain for which equipment certification is sought.

a) Connect a signal generator to the input of the EUT.

b) Configure a swept CW signal with the following parameters:

   1) Frequency range = ±250 % of the passband, for each applicable CMRS band.

   2) Level = a sufficient level to affirm that the out-of-band rejection is > 20 dB above the noise floor and will not engage the AGC during the entire sweep.

   3) Dwell time = approximately 10 ms.

   4) Number of points = SPAN/(RBW/2).

c) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.

d) Set the span of the spectrum analyzer to the same as the frequency range of the signal generator.

e) Set the resolution bandwidth (RBW) of the spectrum analyzer to be 1 % to 5 % of the EUT passband, and the video bandwidth (VBW) shall be set to ≥ 3 × RBW.

f) Set the detector to Peak Max-Hold and wait for the spectrum analyzer's spectral display to fill.

g) Place a marker to the peak of the frequency response and record this frequency as f_0.

h) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the −20 dB down amplitude, to determine the 20 dB bandwidth.

i) Capture the frequency response of the EUT.

j) Repeat for all frequency bands applicable for use by the EUT.

Test Results:

Path A

Path B

5.3. OCCUPIED BANDWIDTH / INPUT-VERSUS-OUTPUT SIGNAL COMPARISON

Test Requirement:

§ 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 specified conditions of § 2.1049 (a) through (i) as applicable.

Test Procedures:

Measurements were in accordance with the test methods section 3.4 of KDB 935210 D05 v01r04.

A 26 dB bandwidth measurement shall be performed on the input signal and the output signal; alternatively, the 99% OBW can be measured and used. See KDB Publication 971168 [R8] for more information on measuring OBW.

a) Connect a signal generator to the input of the EUT.

b) Configure the signal generator to transmit the AWGN signal.

c) Configure the signal amplitude to be just below the AGC threshold level (see 3.2), but not more than 0.5 dB below.

d) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.

e) Set the spectrum analyzer center frequency to the center frequency of the operational band under test. The span range of the spectrum analyzer shall be between 2 times to 5 times the emission bandwidth (EBW) or alternatively, the OBW.

f) The nominal RBW shall be in the range of 1 % to 5 % of the anticipated OBW, and the VBW shall be ≥ 3 × RBW.

g) Set the reference level of the instrument as required to preclude the signal from exceeding the maximum spectrum analyzer input mixer level for linear operation. In general, the peak of the spectral envelope must be more than [10 log (OBW / RBW)] below the reference level. Steps f) and g) may require iteration to enable adjustments within the specified tolerances.

h) The noise floor of the spectrum analyzer at the selected RBW shall be at least 36 dB below the reference level.

i) Set spectrum analyzer detection function to positive peak.

j) Set the trace mode to max hold.

k) Determine the reference value: Allow the trace to stabilize. Set the spectrum analyzer marker to the highest amplitude level of the displayed trace (this is the reference value) and record the associated frequency as f0.

l) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the −26 dB down amplitude. The 26 dB EBW (alternatively OBW) is the positive frequency difference between the two markers. If the spectral envelope crosses the −26 dB down amplitude at multiple points, the lowest or highest frequency shall be selected as the frequencies that are the furthest removed from the center frequency at which the spectral envelope crosses the −26 dB down amplitude point.

m) Repeat steps e) to l) with the input signal connected directly to the spectrum analyzer (i.e., input signal measurement).

n) Compare the spectral plot of the input signal (determined from step m) to the output signal (determined from step l) to affirm that they are similar (in passband and rolloff characteristic features and relative spectral locations), and include plot(s) and descriptions in test report.

o) Repeat the procedure [steps e) to n)] with the input signal amplitude set to 3 dB above the AGC threshold.

p) Repeat steps e) to o) with the signal generator set to the narrowband signal.

q) Repeat steps e) to p) for all frequency bands authorized for use by the EUT.

Test Results:

Tabular Data of Output Occupied Bandwidth

Path	CC	Center Frequency (GHz)	99% OBW (MHz)
A	1	38.800	94.542
	10	38.800	982.70
B	1	38.800	94.733
	10	38.800	981.61

Tabular Data of Input Occupied Bandwidth

Path	CC	Center Frequency (GHz)	99% OBW (MHz)
A	1	38.800	94.128
	10	38.800	996.29
B	1	38.800	93.961
	10	38.800	997.17

Tabular Data of +3 dB above the AGC threshold Output Occupied Bandwidth

Path	CC	Center Frequency (GHz)	99% OBW (MHz)
A	1	38.800	94.390
	10	38.800	982.26
B	1	38.800	94.419
	10	38.800	982.30

Tabular Data of +3 dB above the AGC threshold Input Occupied Bandwidth

Path	CC	Center Frequency (GHz)	99% OBW (MHz)
A	1	38.800	94.046
	10	38.800	993.03
B	1	38.800	93.991
	10	38.800	992.27

Measured Occupied Bandwidth Comparison

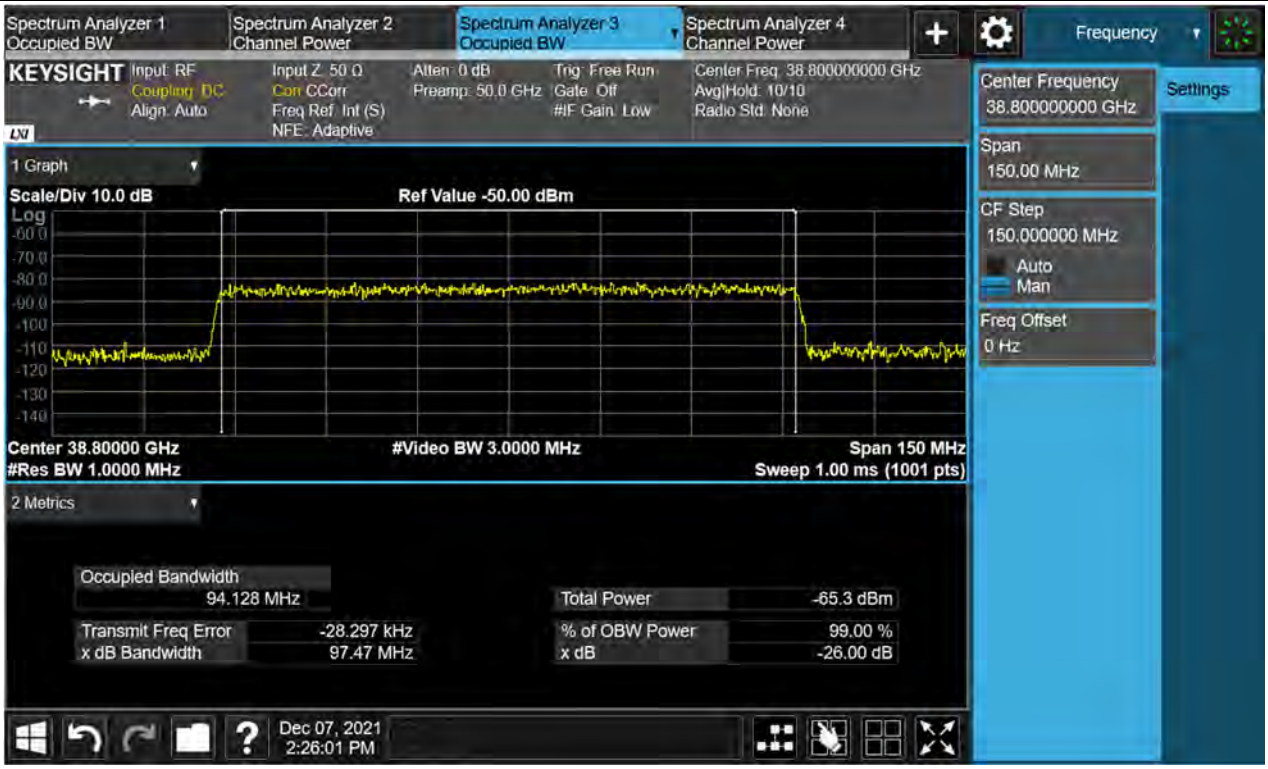
Path	CC	Variant of Input and output Occupied Bandwidth (%)	Variant of Input and +3 dB above the AGC threshold output Occupied Bandwidth (%)
A	1	0.440	0.366
	10	-1.364	-1.084
B	1	0.822	0.455
	10	-1.561	-1.004

**** Change in input-output OBW is less than ±5 %.***

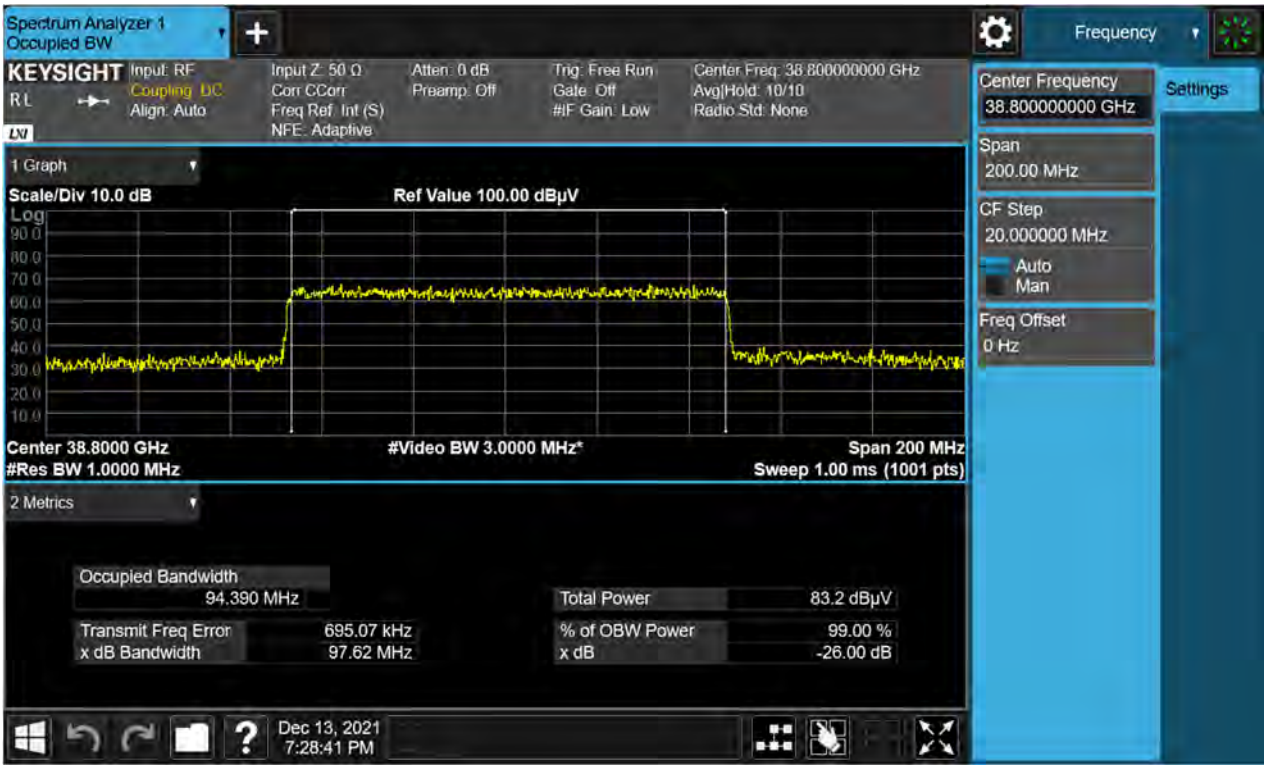
Plot Data of RF Occupied Bandwidth

Output / Path A / 1cc

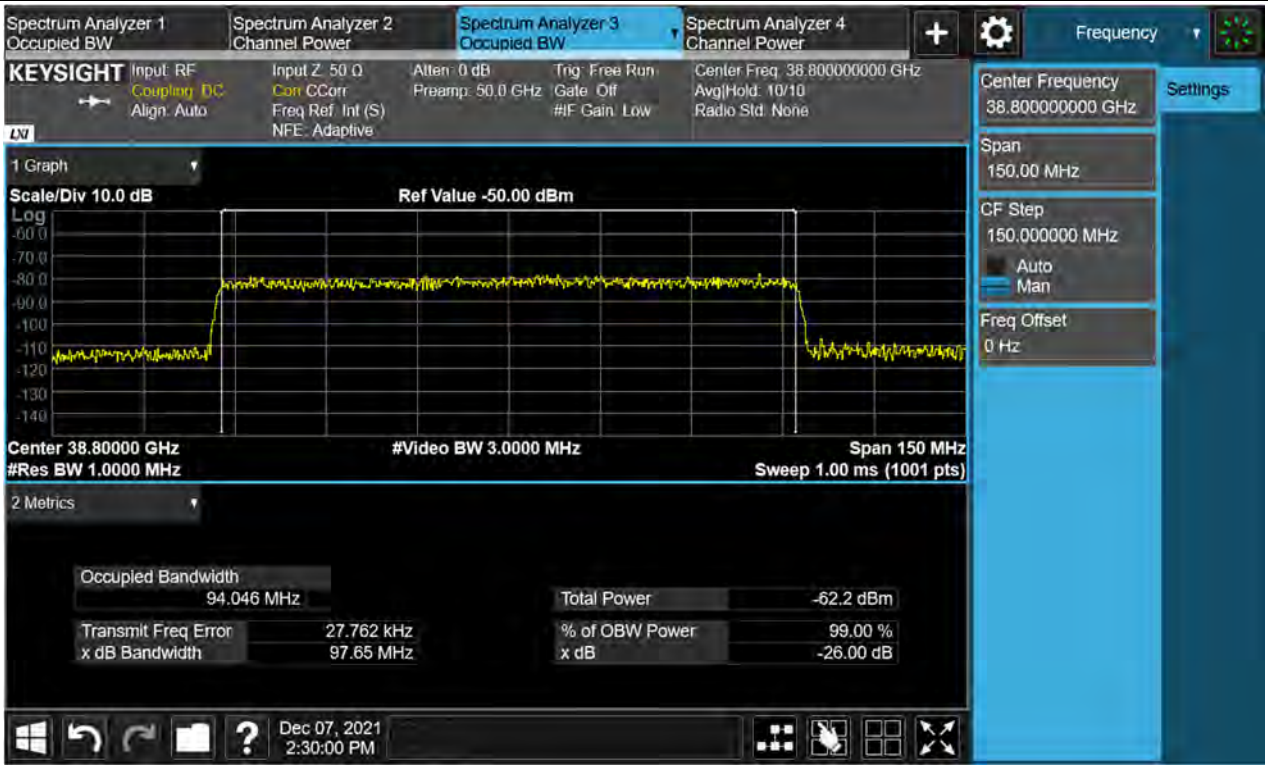
Input / Path A / 1cc



+3 dB above the AGC threshold output / Path A / 1cc

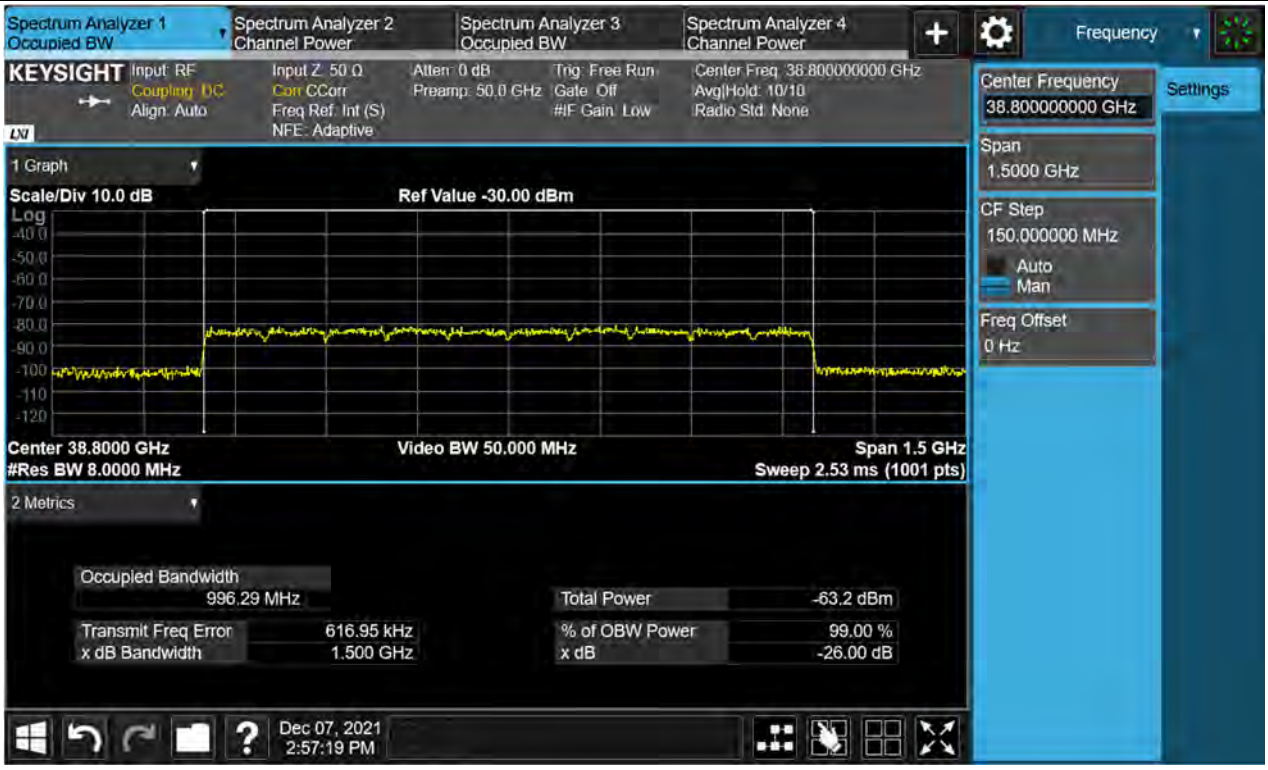


+3 dB above the AGC threshold Input / Path A / 1cc



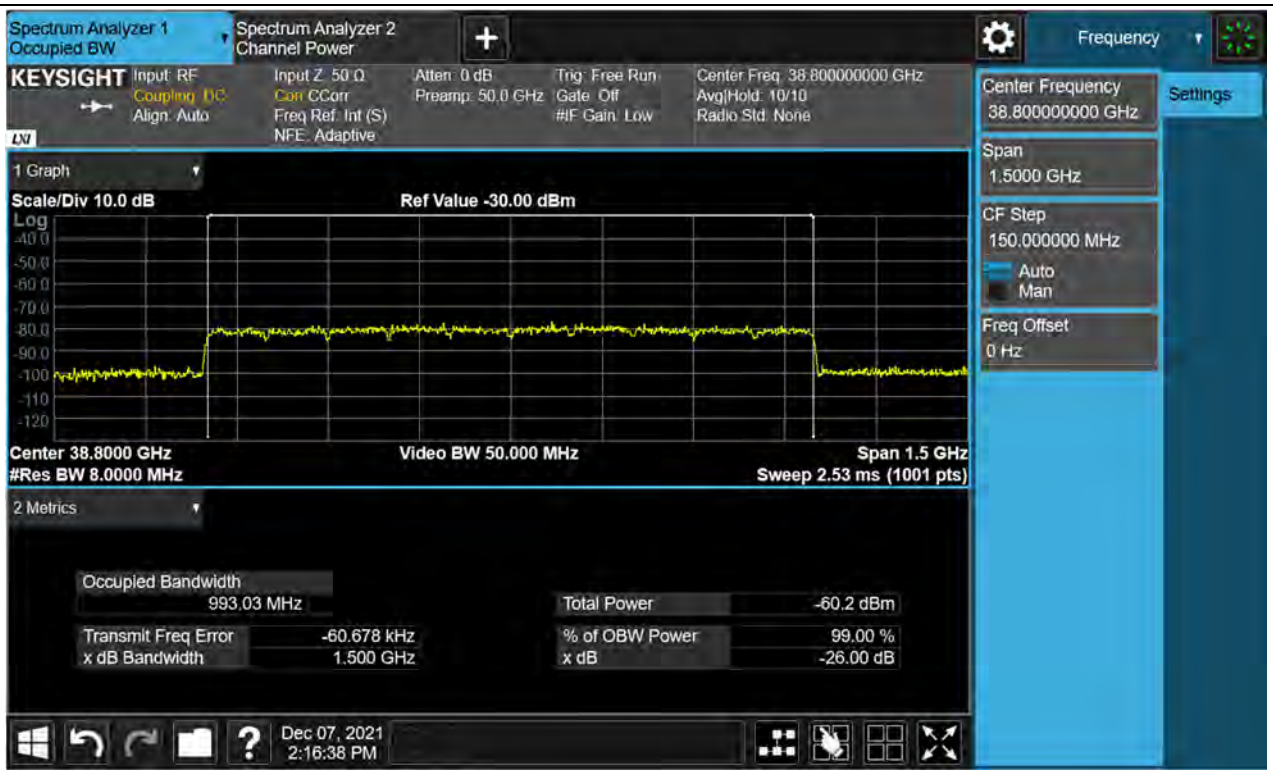
Output / Path A / 10cc

Input / Path A / 10cc



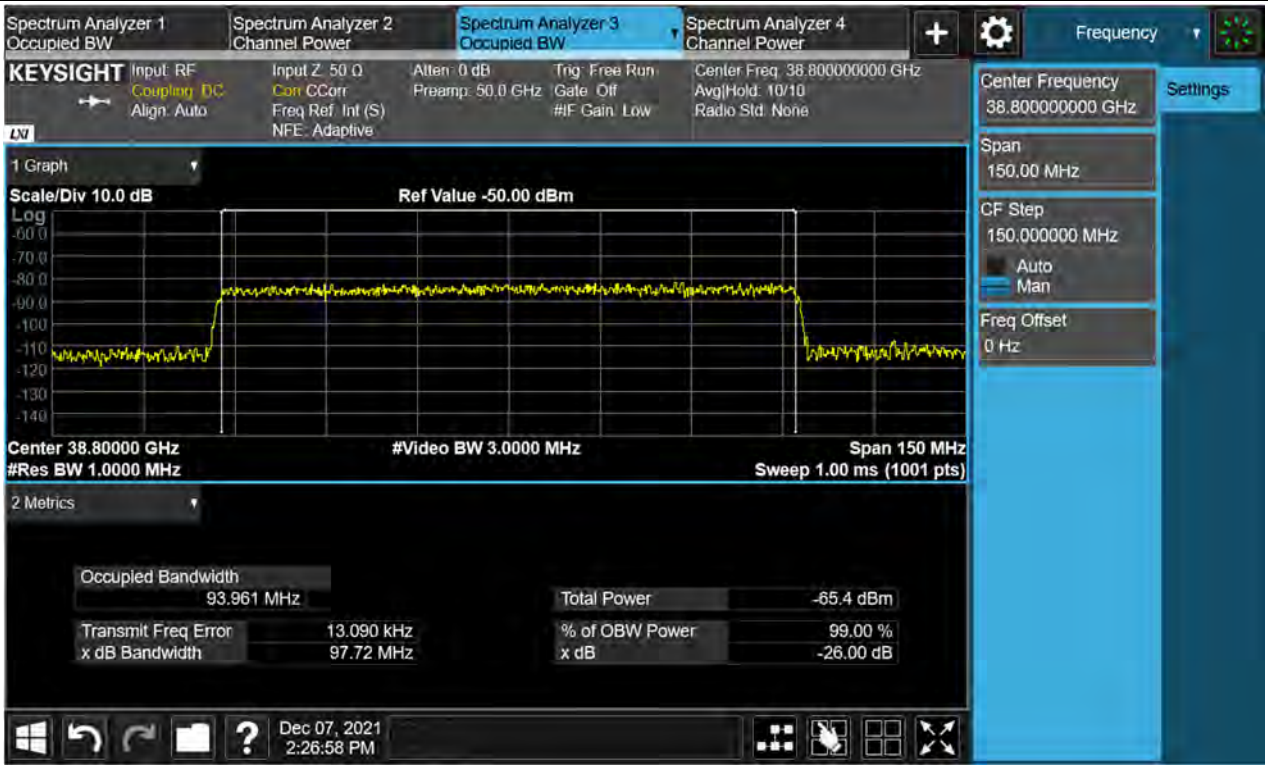
+3 dB above the AGC threshold output / Path A / 10cc

+3 dB above the AGC threshold Input / Path A / 10cc



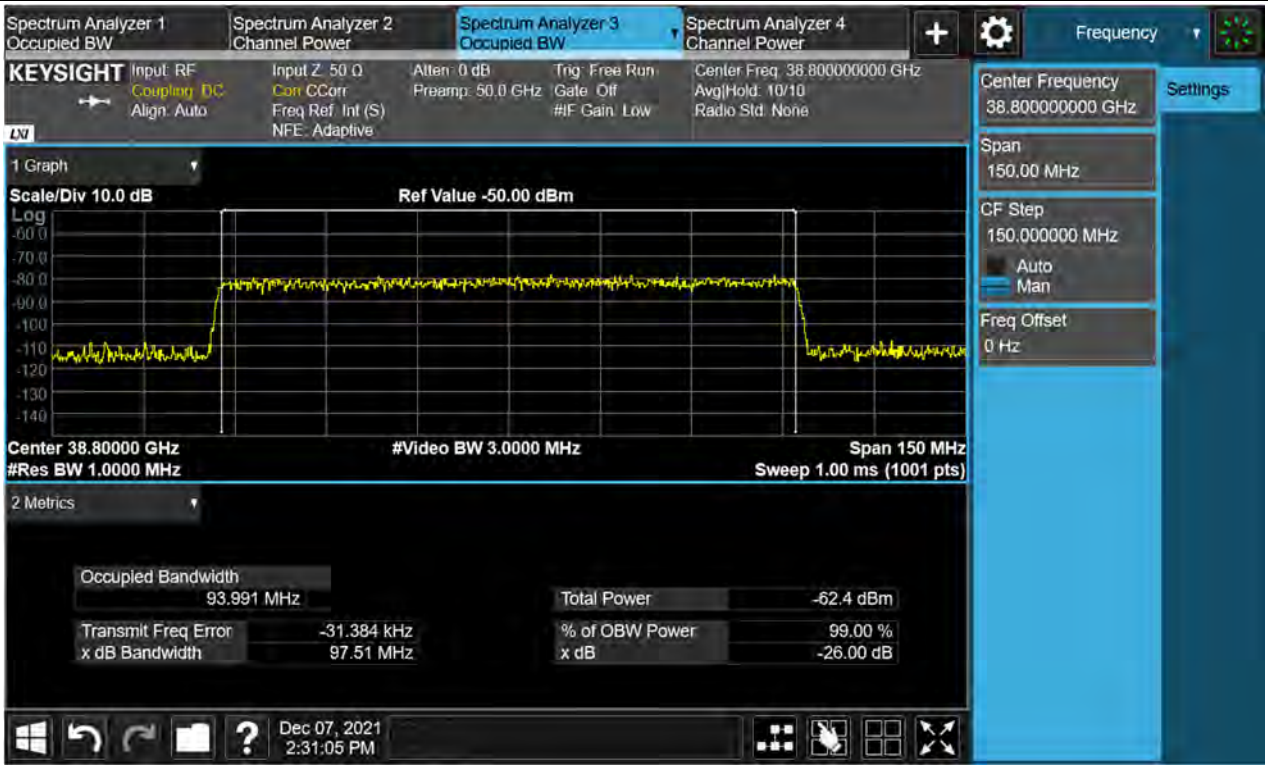
Output / Path B / 1cc

Input / Path B / 1cc



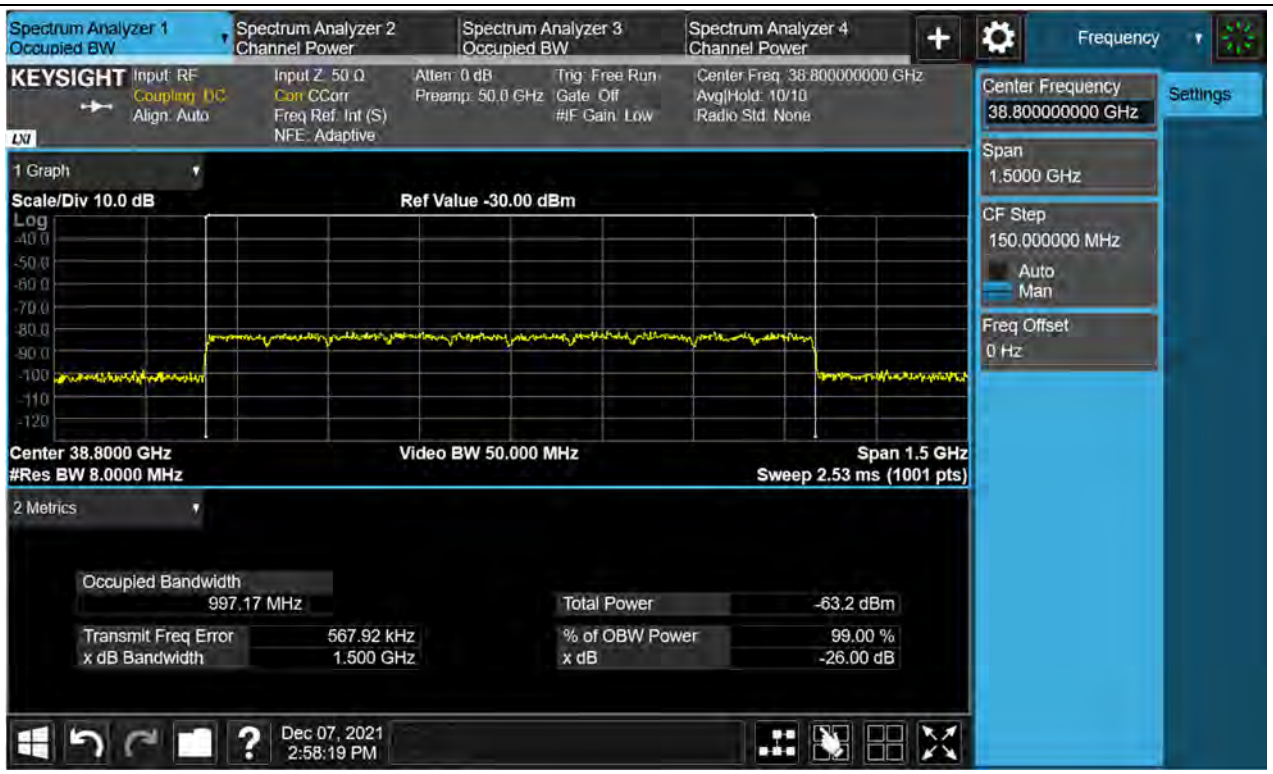
+3 dB above the AGC threshold output / Path B / 1cc

+3 dB above the AGC threshold Input / Path B / 1cc



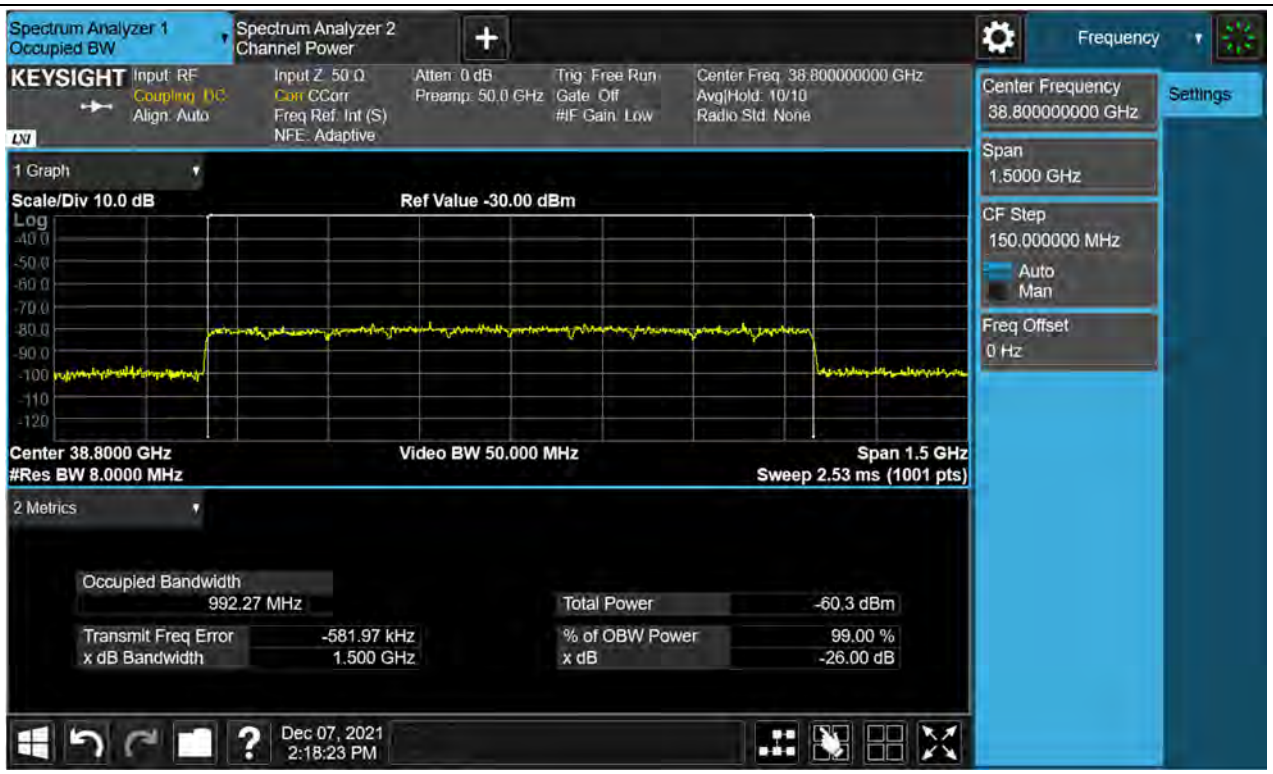
Output / Path B / 10cc

Input / Path B / 10cc



+3 dB above the AGC threshold output / Path B / 10cc

+3 dB above the AGC threshold Input / Path B / 10cc



5.4. EIRP DENSITY

Test Requirements:

§ 30.202 Power limits.

(a) For fixed and base stations operating in connection with mobile systems, the average power of the sum of all antenna elements is limited to an equivalent isotopically radiated power (EIRP) density of +75dBm/100 MHz. For channel bandwidths less than 100 megahertz the EIRP must be reduced proportionally and linearly based on the bandwidth relative to 100 megahertz.

Test Procedures:

The measurement is performed in accordance with Section 5.2.4.4.2 of ANSI C63.26.

a) Set span to 2 × to 3 × the OBW.

b) Set RBW = 1% to 5% of the OBW.

c) Set VBW ≥ 3 × RBW.

d) Set number of measurement points in sweep ≥ 2 × span / RBW.

e) Sweep time:

1) Set = auto-couple, or

2) Set ≥ [10 × (number of points in sweep) × (transmission symbol period)] for single sweep (automation-compatible) measurement.

f) Detector = power averaging (rms).

g) Set sweep trigger to “free run.”

h) Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over the on and off time of the transmitter, it can be necessary to increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time.

i) Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band or channel power measurement function with band/channel limits set equal to the OBW band edges. If the instrument does not have a band or channel power function, sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

j) Add 10 log (1/duty cycle) to the measured power level to compute the average power during continuous transmission.

Note:

1. Test distance is determined to 3.0 m by far field condition; see test descriptions on section 3.2.
2. The angle of antenna is set as maximum radiated power conditions.
3. EIRP is calculated from measured value according to section 5.2.7 of ANSI C63.26-2015, and the formula is as follows.

   EIRP (dBm) = E (dBμV/m) + 20log(D) – 104.77
4. E (dBμV/m) value is considered Antenna Factor and Cable Loss (AFCL), and it as follow.

   E (dBμV/m) = measurement value (dBμV) + AFCL
5. The output tolerance of the EUT in the specification is ±3 dB and test result satisfies this condition.
6. Sample calculation:

   [Full RB] 79.77 dBμV (measured Value) + 20log(3) – 104.77 + 54.396 (AFCL) = 38.93 dBm (Final EIRP)

   [1 RB] 77.05 dBμV (measured Value) + 20log(3) – 104.77 + 54.396 (AFCL) + RBW Correction (10log(100/1))

   = 56.22 dBm (Final EIRP)

Test Results:

[Full RB] Tabular Data of EIRP Density per path

Path	CC	Channel	Frequency (GHz)	Measured Level (dBuV)	Calculated EIRP (dBm/100MHz)	Limit (dBm/100MHz)
A	1	Low	37.650	79.49	37.60	75
		Middle	38.800	79.77	38.93	
		High	39.950	79.18	37.00	
	10	Low	38.550	68.64	27.71	
		Middle	38.650	69.46	28.53	
		High	39.250	70.64	29.31	
B	1	Low	37.650	79.32	37.44	
		Middle	38.800	79.50	38.67	
		High	39.950	79.31	37.14	
	10	Low	38.250	69.72	28.30	
		Middle	38.850	70.45	29.80	
		High	39.650	69.97	28.12	

[Full RB] MIMO Tabular Data of EIRP Density

Path	CC	Channel	Frequency (GHz)	Path A EIRP (dBm/100MHz)	Path B EIRP (dBm/100MHz)	Calculated EIRP (dBm/100MHz)
A+B	1	Low	37.650	37.60	37.44	40.53
		Middle	38.800	38.93	38.67	41.81
		High	39.950	37.00	37.14	40.08
	10	Low	38.550	27.71	28.30	31.03
		Middle	38.650	28.53	29.80	32.22
		High	39.250	29.31	28.12	31.77

[1 RB] Tabular Data of EIRP Density per path

Path	CC	Channel	RB Size/Offset	Frequency (GHz)	Measured Level (dBuV)	Calculated EIRP (dBm/100MHz)	Limit (dBm/100MHz)
A	1	Low	1/0	37.604	76.19	53.60	75
		Middle	1/32	38.800	77.05	56.22	
		High	1/65	39.997	76.96	54.60	
	10	Low	1/0	38.506	69.63	39.95	
		Middle	1/32	38.648	70.55	40.25	
		High	1/65	39.298	71.89	41.65	
B	1	Low	1/0	37.604	77.01	54.42	
		Middle	1/32	38.800	76.61	55.78	
		High	1/65	39.997	77.02	54.66	
	10	Low	1/0	38.303	71.94	41.50	
		Middle	1/32	39.049	72.03	42.05	
		High	1/65	39.496	70.65	39.76	

[1 RB] MIMO Tabular Data of EIRP Density

Path	CC	Channel	Path A EIRP (dBm/100MHz)	Path B EIRP (dBm/100MHz)	Calculated EIRP (dBm/100MHz)
A+B	1	Low	53.60	54.42	57.04
		Middle	56.22	55.78	59.02
		High	54.60	54.66	57.64
	10	Low	39.95	41.50	43.80
		Middle	40.25	42.05	44.25
		High	41.65	39.76	43.81

[Full RB] Plot Data of EIRP Density Tabular per path

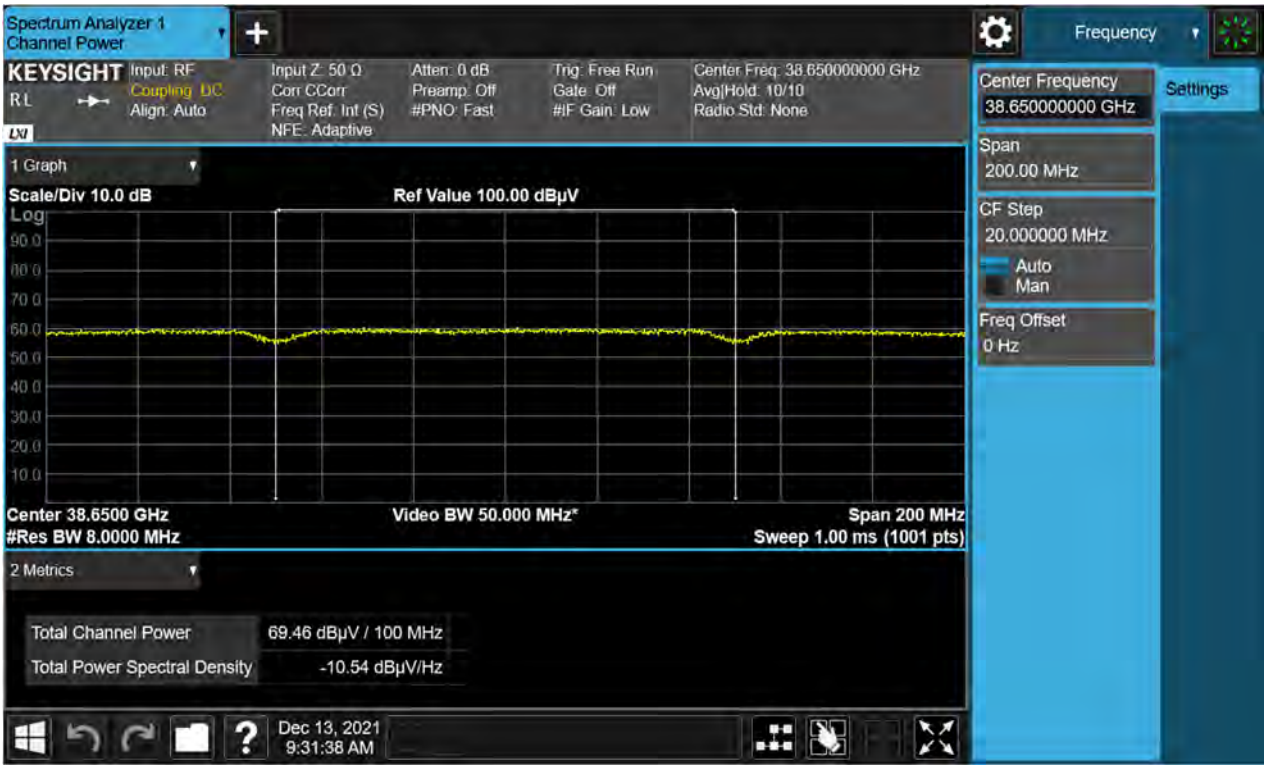
Path A / 1cc / Low

Path A / 1cc / Middle

Path A / 1cc / High

Path A / 10cc / Low

Path A / 10cc / Middle



Path A / 10cc / High

Path B / 1cc / Low

Path B / 1cc / Middle

Path B / 1cc / High

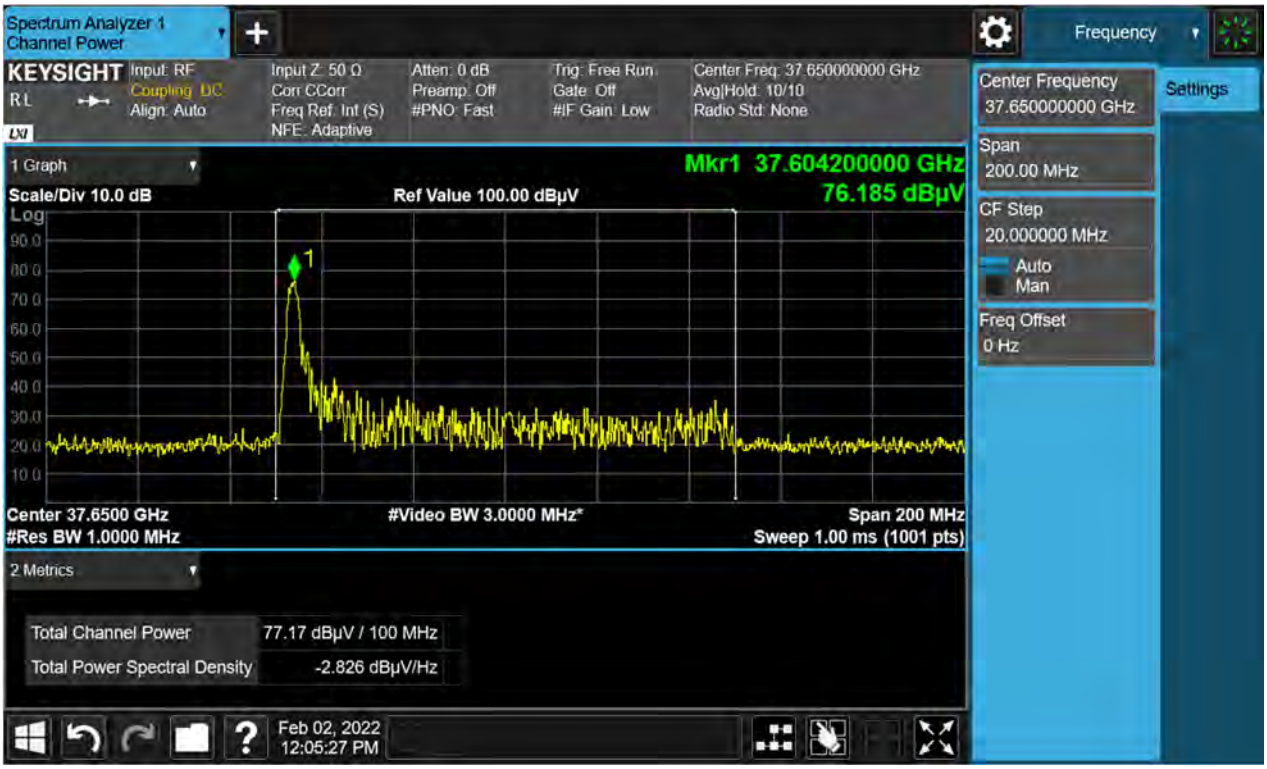
Path B / 10cc / Low

Path B / 10cc / Middle

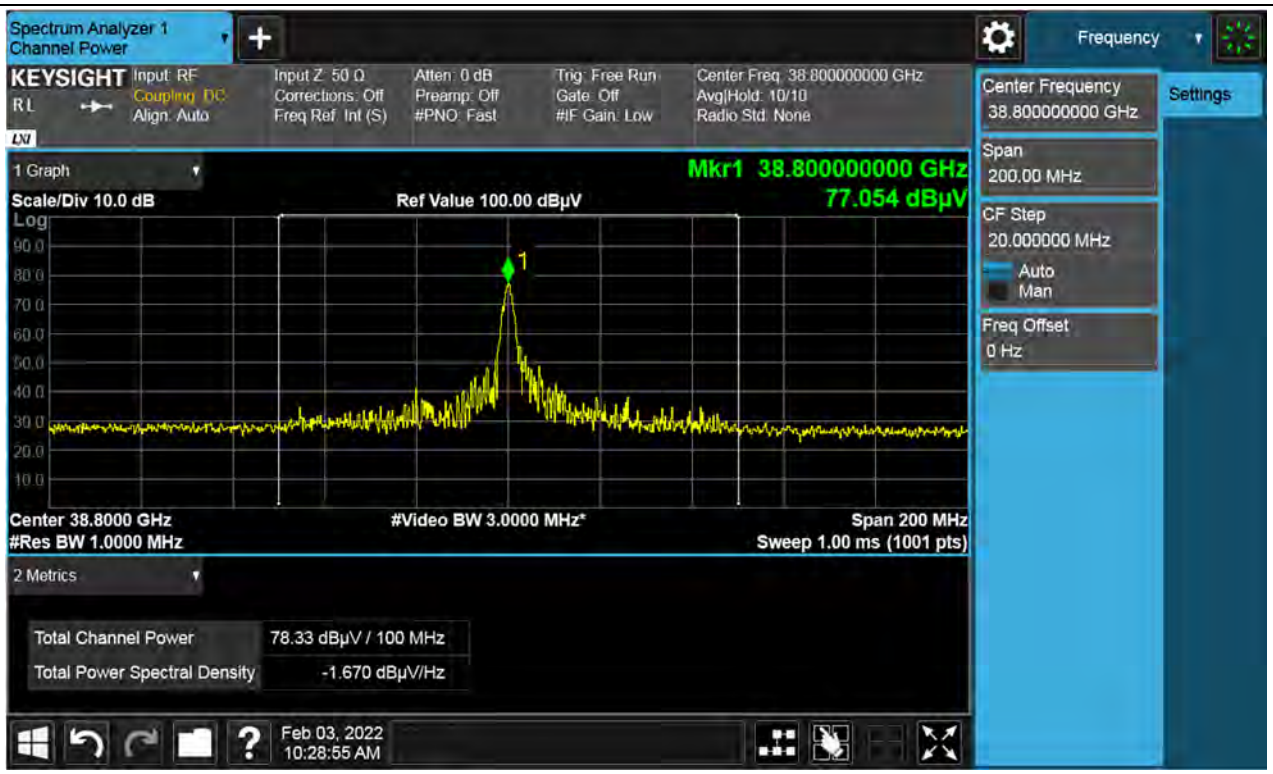
Path B / 10cc / High

[1 RB] Plot Data of EIRP Density Tabular per path

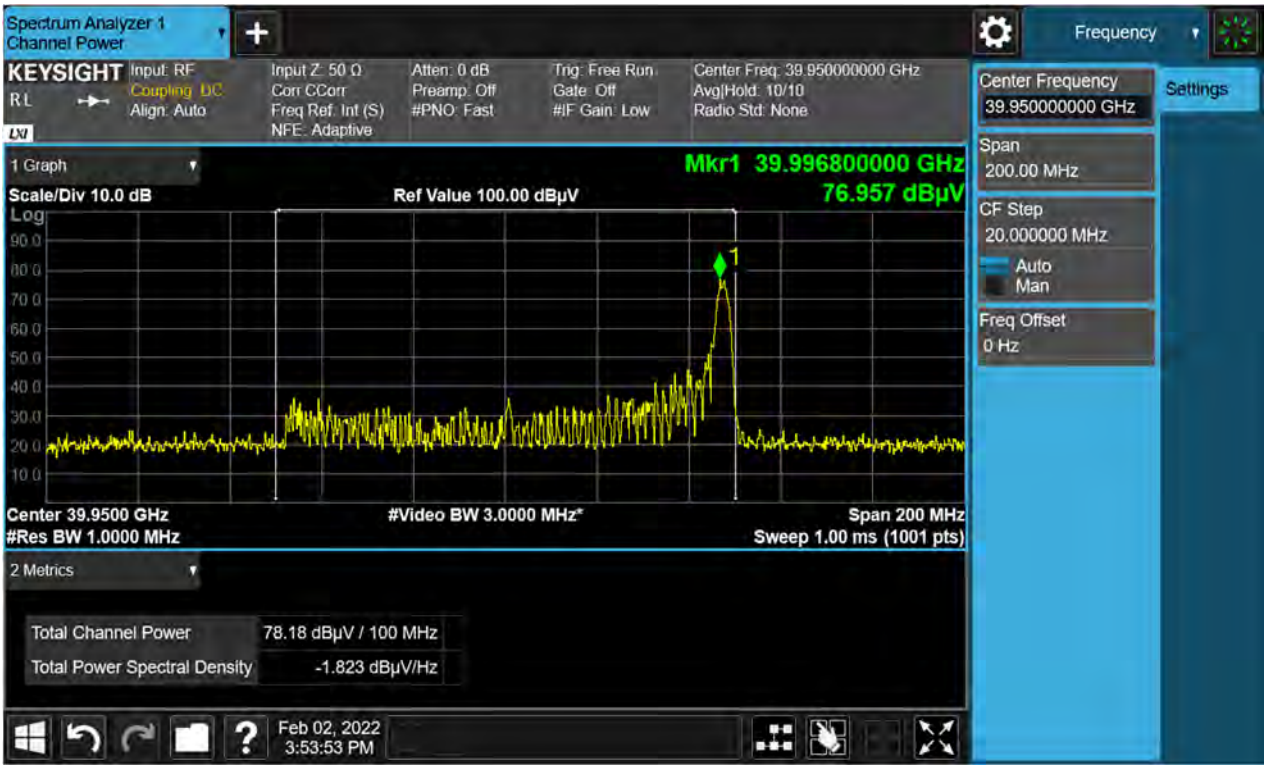
Path A / 1cc / Low



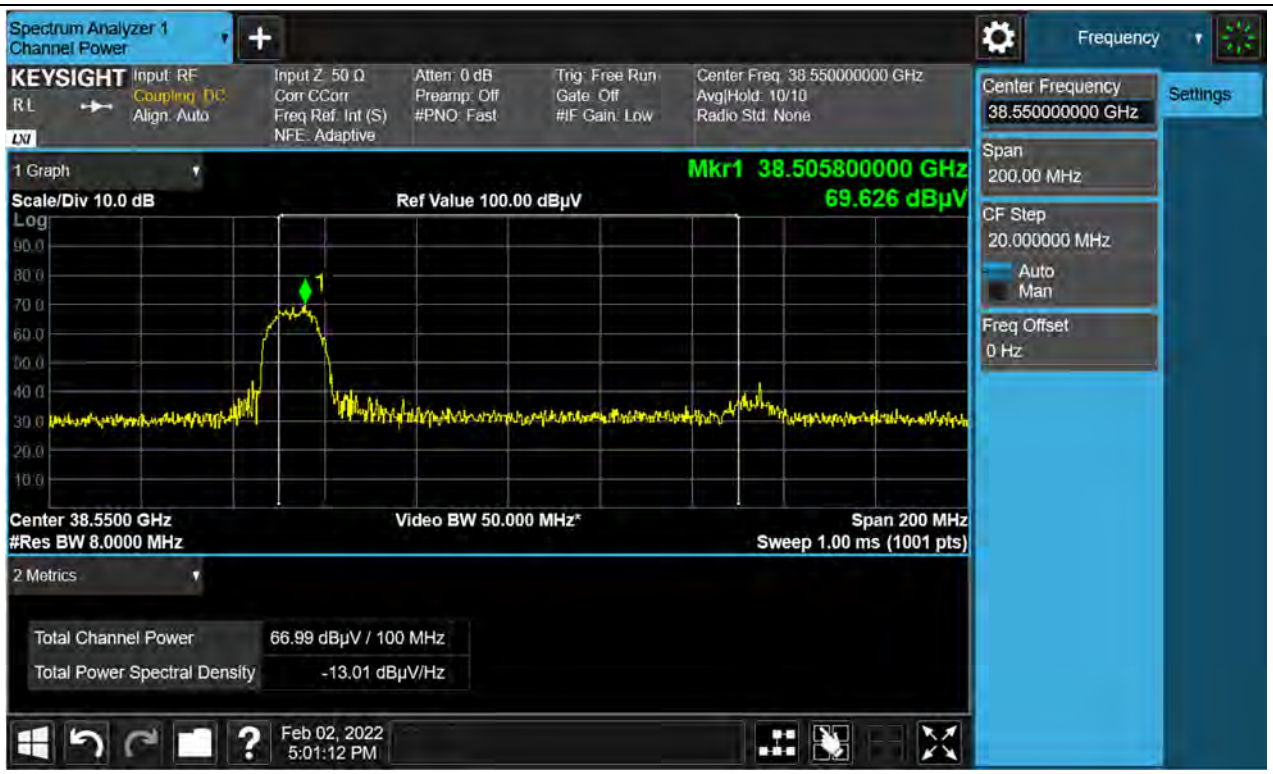
Path A / 1cc / Middle



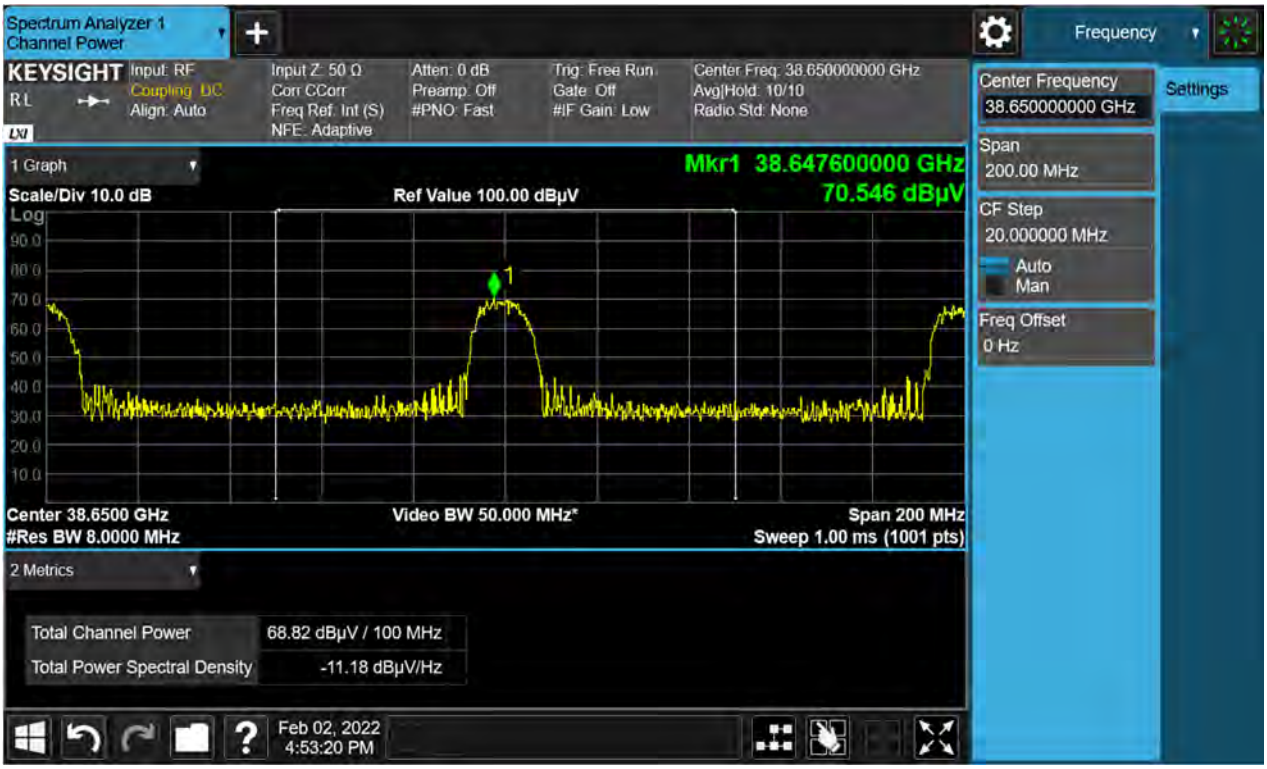
Path A / 1cc / High



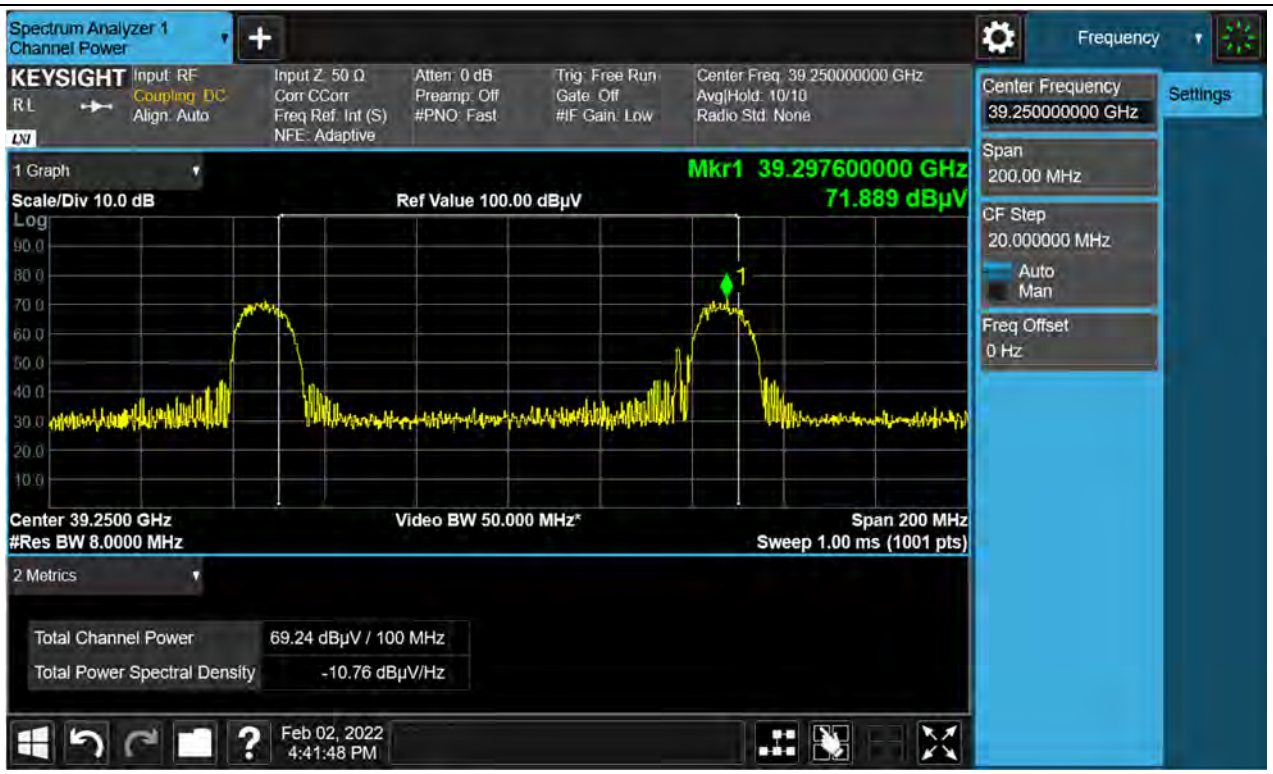
Path A / 10cc / Low



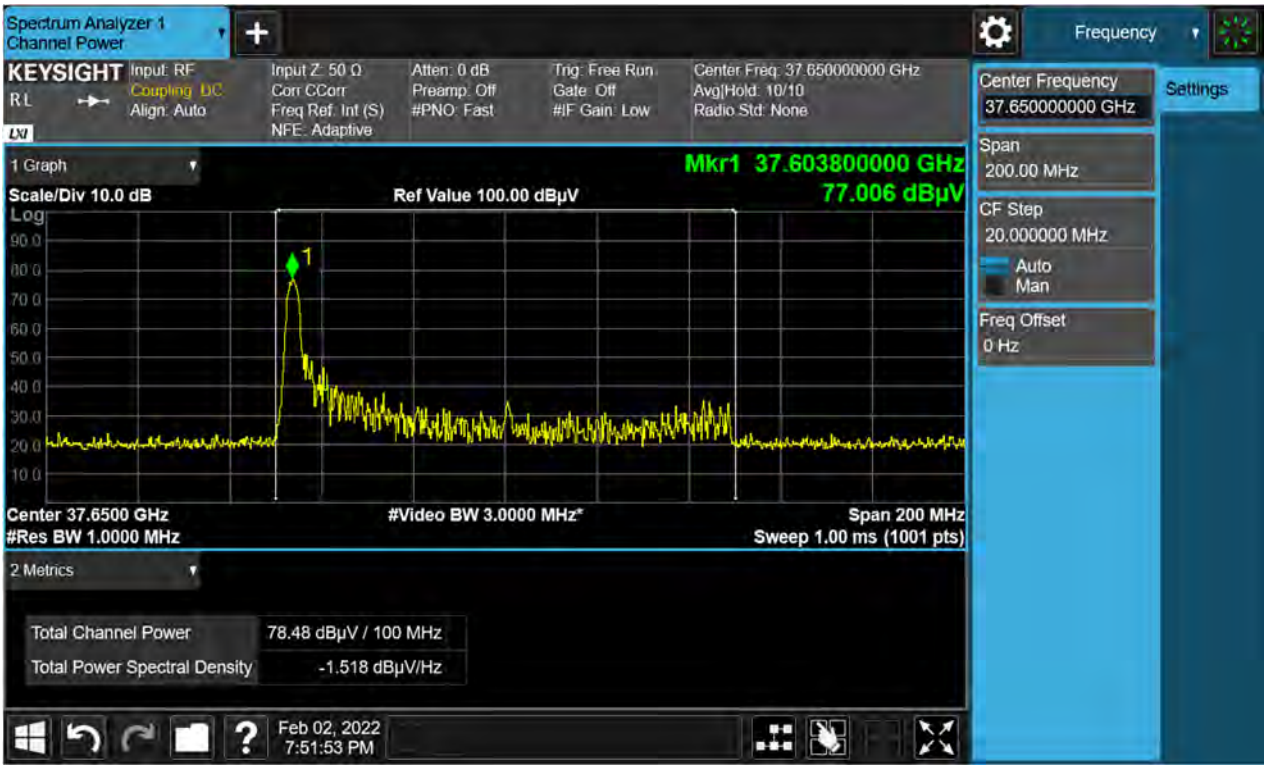
Path A / 10cc / Middle



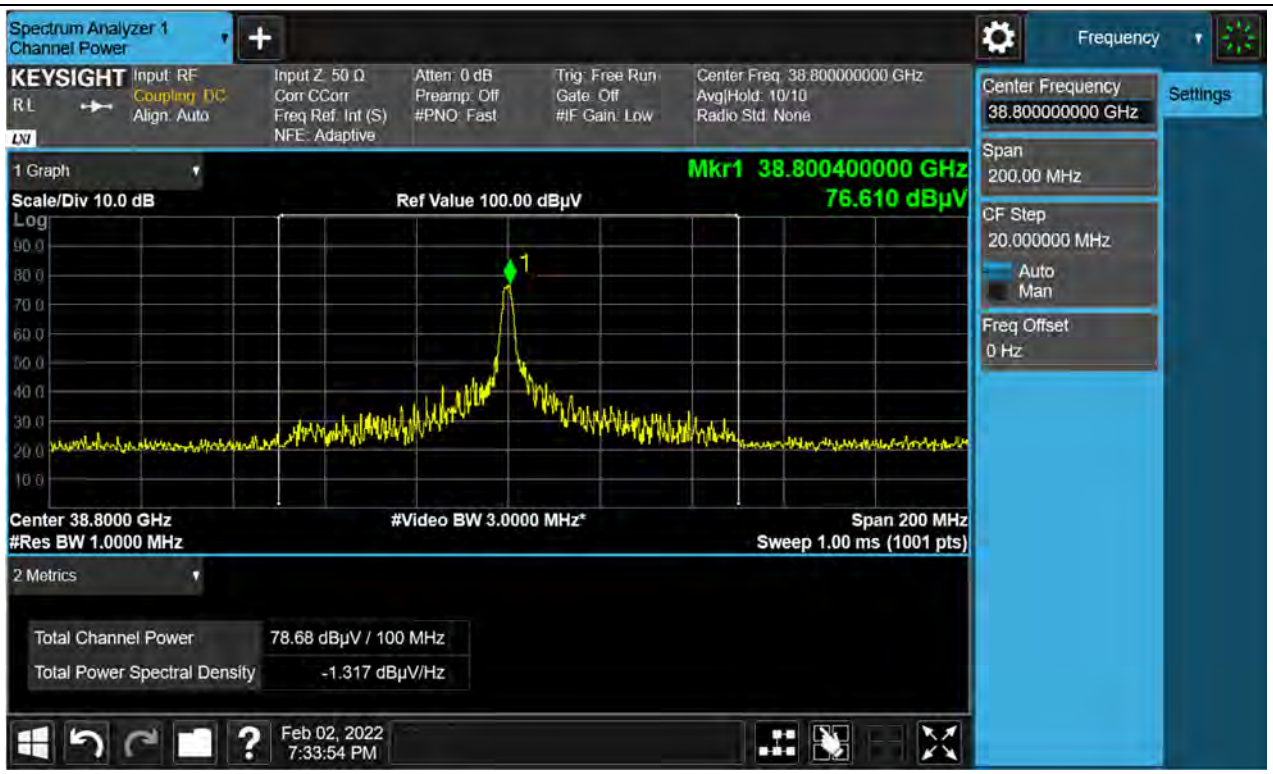
Path A / 10cc / High



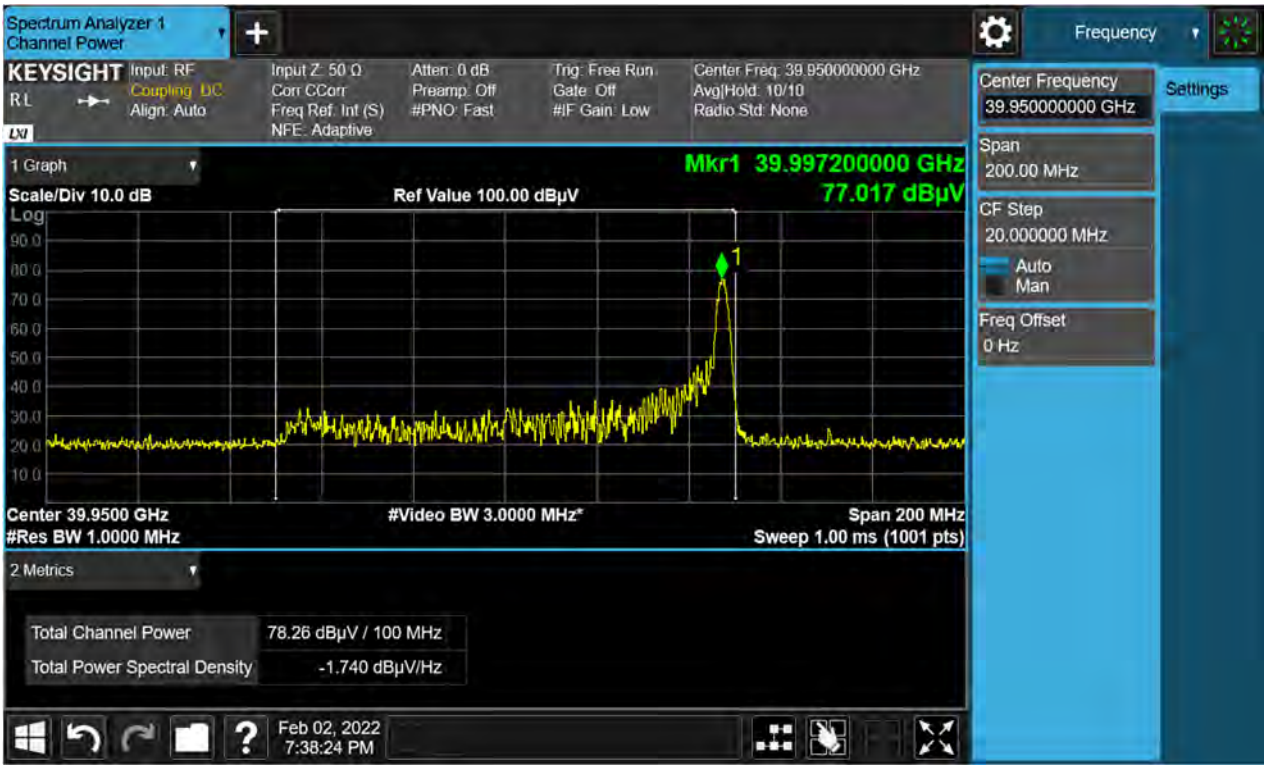
Path B / 1cc / Low



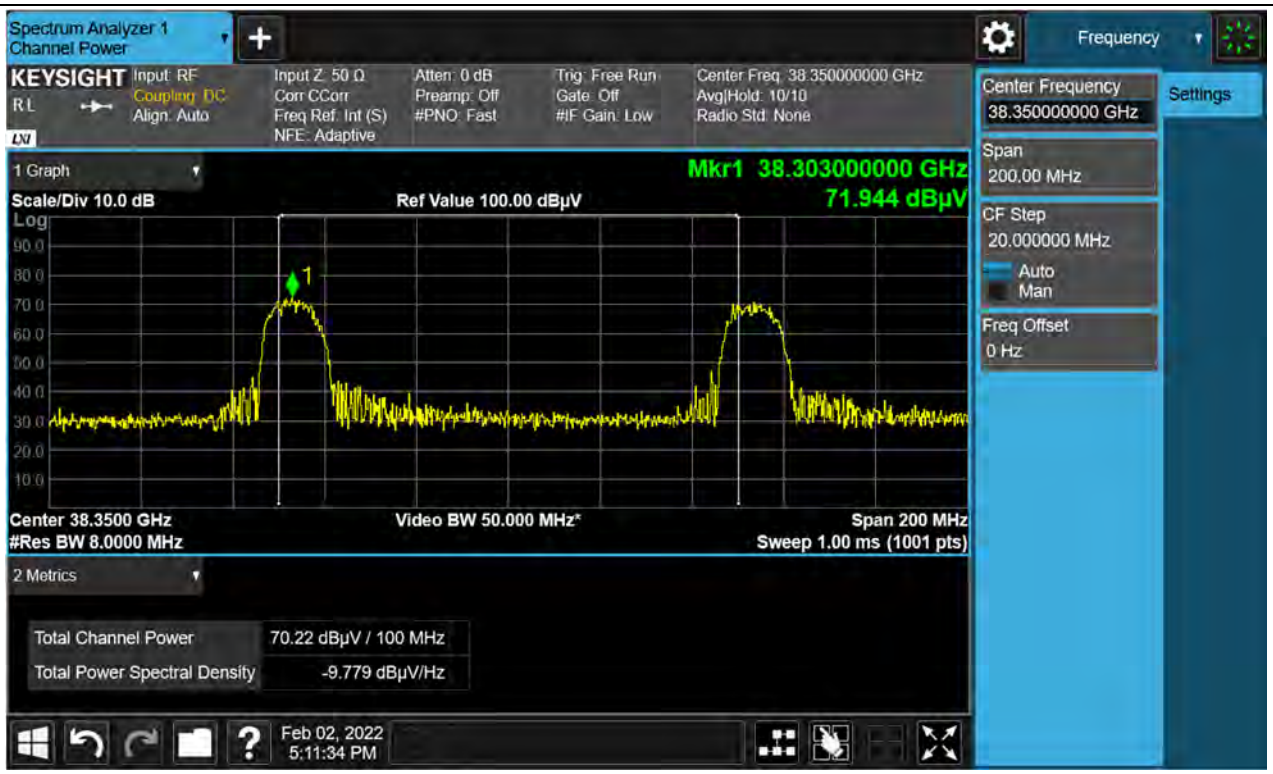
Path B / 1cc / Middle



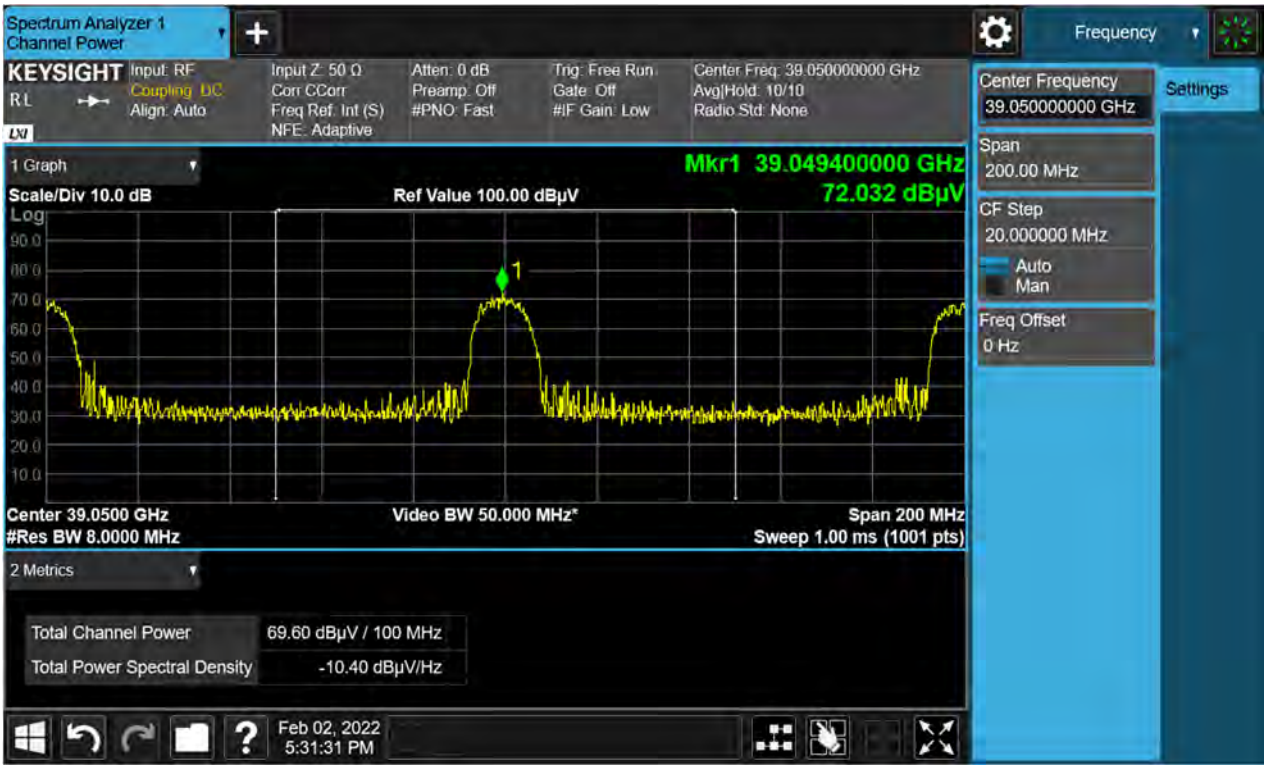
Path B / 1cc / High



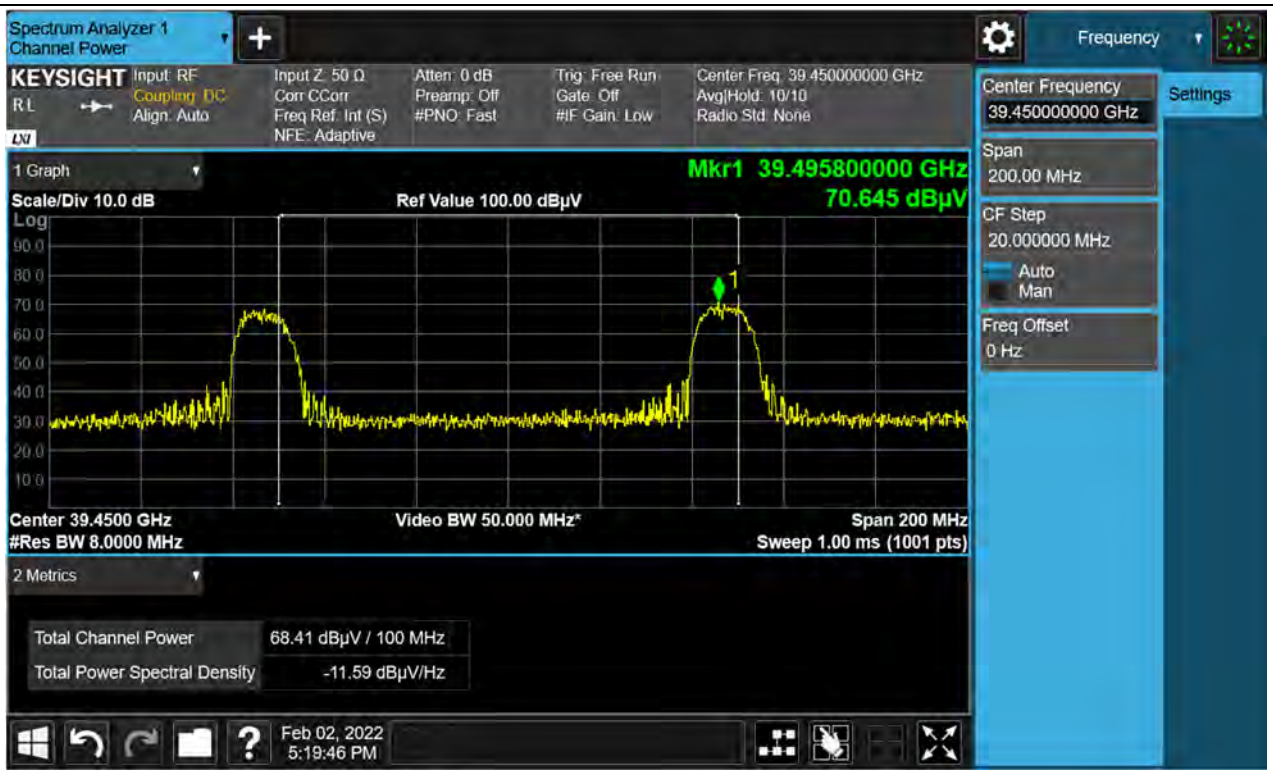
Path B / 10cc / Low



Path B / 10cc / Middle



Path B / 10cc / High



5.5. EQUIVALENT ISOTROPIC RADIATED POWER / MEAN OUTPUT POWER AND AMPLIFIER/BOOSTER GAIN

FCC Rules

Test Requirements:

§ 2.1046 Measurements required: RF power output.

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in § 2.1033(c)(8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

(b) For single sideband, independent sideband, and single channel, controlled carrier radiotelephone transmitters the procedure specified in paragraph (a) of this section shall be employed and, in addition, the transmitter shall be modulated during the test as specified and applicable in § 2.1046 (b) (1-5). In all tests, the input level of the modulating signal shall be such as to develop rated peak envelope power or carrier power, as appropriate, for the transmitter.

(c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

Test Procedures:

Measurements were in accordance with the test methods section 3.5 of KDB 935210 D05 v01r04.

Adjust the internal gain control of the EUT to the maximum gain for which the equipment certification is being sought. Any EUT attenuation settings shall be set to their minimum value.

Input power levels (uplink and downlink) should be set to maximum input ratings while confirming that the device is not capable of operating in saturation (non-linear mode) at the rated input levels, including during the performance of the input/output power measurements.

3.5.2 Measuring the EUT mean input and output power

a) Connect a signal generator to the input of the EUT.

b) Configure to generate the test signal.

c) The frequency of the signal generator shall be set to the frequency f_0 as determined from out-of-band rejection test.

d) Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation as necessary.

e) Set the signal generator output power to a level that produces an EUT output level that is just below the AGC threshold, but not more than 0.5 dB below.

f) Measure and record the output power of the EUT; use ANSI C63.26-2015 subclause 5.2.4.4.1, for power measurement.

g) Remove the EUT from the measurement setup. Using the same signal generator settings, repeat the power measurement at the signal generator port, which was used as the input signal to the EUT, and record as the input power. EUT gain may be calculated as described in 3.5.5.

h) Repeat steps f) and g) with input signal amplitude set to 3 dB above the AGC threshold level.

i) Repeat steps e) to h) with the narrowband test signal.

j) Repeat steps e) to i) for all frequency bands authorized for use by the EUT.

3.5.5 Calculating amplifier, repeater, or industrial booster gain

After the input and output power levels have been measured as described in the preceding subclauses, the gain of the EUT can be determined from:

Gain (dB) = output power (dBm) − input power (dBm).

Report the gain for each authorized operating frequency band, and each test signal stimulus.

Note:

1. If f_0 that determined from out-of-band test is smaller or greater than difference of test signal's center frequency and operation band block, test is performed at the lowest or the highest frequency that test signals can be passed.
2. Sample calculation:

80.32 dBμV (measured Value) + 20log(3) – 104.77 + 54.334(AFCL) = 39.42 dBm (Final EIRP)

Test Results:

[Full RB] Tabular Data of Input & Output Power (E.I.R.P.) and Gain

Path	CC	f_0 Frequency (MHz)	Input Power	Output Power		Gain (dB)
			Measured Level (dBm)	Measured Level (dBuV)	Calculated EIRP (dBm)	
A	1	38.567	-71.51	80.32	39.42	110.93
	10	38.567	-71.49	80.11	39.22	110.71
B	1	38.423	-71.52	80.18	38.73	110.25
	10	38.423	-71.50	80.09	38.65	110.15

[Full RB] MIMO Tabular Data of Input & Output Power (E.I.R.P.)

Path	CC	Path A EIRP (dBm)	Path B EIRP (dBm)	Calculated EIRP (dBm)
A+B	1	39.42	38.73	42.10
	10	39.22	38.65	41.95

[Full RB] Tabular Data of +3 dB above AGC threshold Input & Output Power (E.I.R.P.)

Path	CC	f_0 Frequency (MHz)	Input Power	Output Power	
			Measured Level (dBm)	Measured Level (dBuV)	Calculated EIRP (dBm)
A	1	38.567	-68.45	80.43	39.53
	10	38.567	-68.50	80.10	39.20
B	1	38.423	-68.47	80.26	38.81
	10	38.423	-68.53	80.07	38.62

[Full RB] MIMO Tabular Data of +3 dB above AGC threshold Input & Output Power (E.I.R.P.)

Path	CC	Path A EIRP (dBm)	Path B EIRP (dBm)	Calculated EIRP (dBm)
A+B	1	39.53	38.81	42.20
	10	39.20	38.62	41.93

[1 RB] Tabular Data of Input & Output Power (E.I.R.P.) and Gain

Path	CC	f_0 Frequency (MHz)	Input Power	Output Power		Gain (dB)
			Measured Level (dBm)	Measured Level (dBuV)	Calculated EIRP (dBm)	
A	1	38.567	-71.56	78.68	37.79	109.35
	10	38.567	-71.48	78.69	37.80	109.28
B	1	38.423	-71.55	78.87	37.42	108.97
	10	38.423	-71.59	78.67	37.22	108.81

[1 RB] MIMO Tabular Data of Input & Output Power (E.I.R.P.)

Path	CC	Path A EIRP (dBm)	Path B EIRP (dBm)	Calculated EIRP (dBm)
A+B	1	37.79	37.42	40.62
	10	37.80	37.22	40.53

[1 RB] Tabular Data of +3 dB above AGC threshold Input & Output Power (E.I.R.P.)

Path	CC	RB Size/Offset	f_0 Frequency (MHz)	Input Power	Output Power	
				Measured Level (dBm)	Measured Level (dBuV)	Calculated EIRP (dBm)
A	1	1/32	38.567	-68.41	79.42	38.53
	10	1/32	38.567	-68.53	78.52	37.63
B	1	1/32	38.423	-68.45	78.61	37.16
	10	1/32	38.423	-68.53	78.65	37.20

[1 RB] MIMO Tabular Data of +3 dB above AGC threshold Input & Output Power (E.I.R.P.)

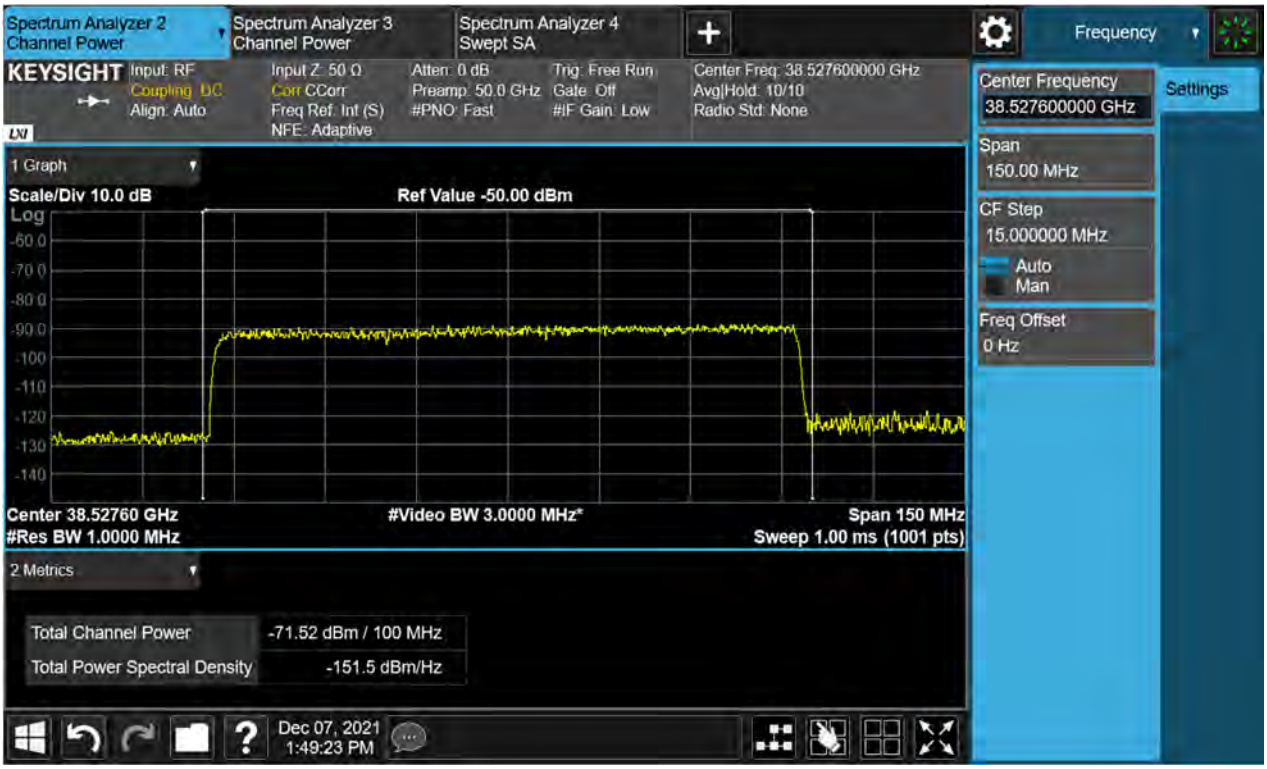
Path	CC	Path A EIRP (dBm)	Path B EIRP (dBm)	Calculated EIRP (dBm)
A+B	1	38.53	37.16	40.91
	10	37.63	37.20	40.43

[Full RB] Plot Data of Input & Output Power (E.I.R.P.)

Input Power (E.I.R.P.) / Path A / 1cc

Input Power (E.I.R.P.) / Path A / 10cc

Input Power (E.I.R.P.) / Path B / 1cc



Input Power (E.I.R.P.) / Path B / 10cc

Output Power (E.I.R.P.) / Path A / 1cc

Output Power (E.I.R.P.) / Path A / 10cc

Output Power (E.I.R.P.) / Path B / 1cc

Output Power (E.I.R.P.) / Path B / 10cc

[Full RB] Plot Data of +3 dB above AGC threshold Input & Output Power (E.I.R.P.)

+3 dB above AGC threshold Input Power (E.I.R.P.) / Path A / 1cc

+3 dB above AGC threshold Input Power (E.I.R.P.) / Path A / 10cc

+3 dB above AGC threshold Input Power (E.I.R.P.) / Path B / 1cc

+3 dB above AGC threshold Input Power (E.I.R.P.) / Path B / 10cc

+3 dB above AGC threshold Output Power (E.I.R.P.) / Path A / 1cc

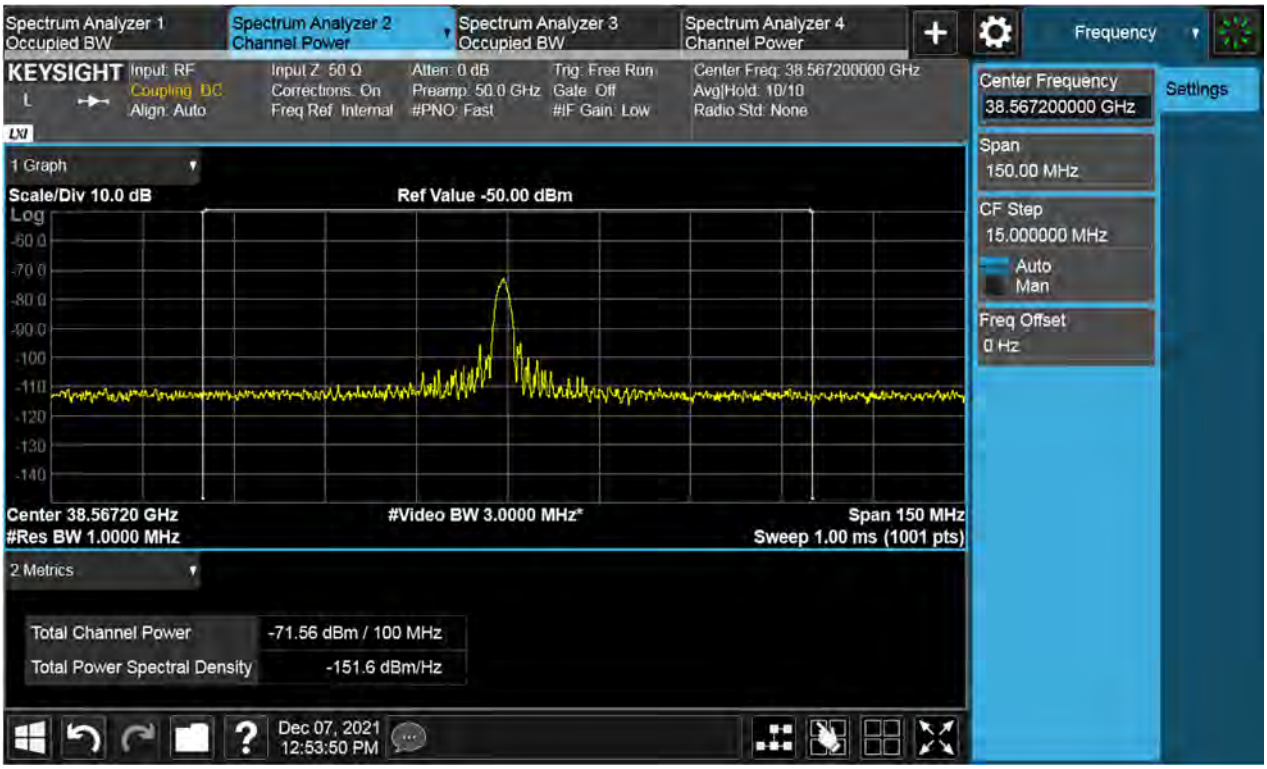
+3 dB above AGC threshold Output Power (E.I.R.P.) / Path A / 10cc

+3 dB above AGC threshold Output Power (E.I.R.P.) / Path B / 1cc

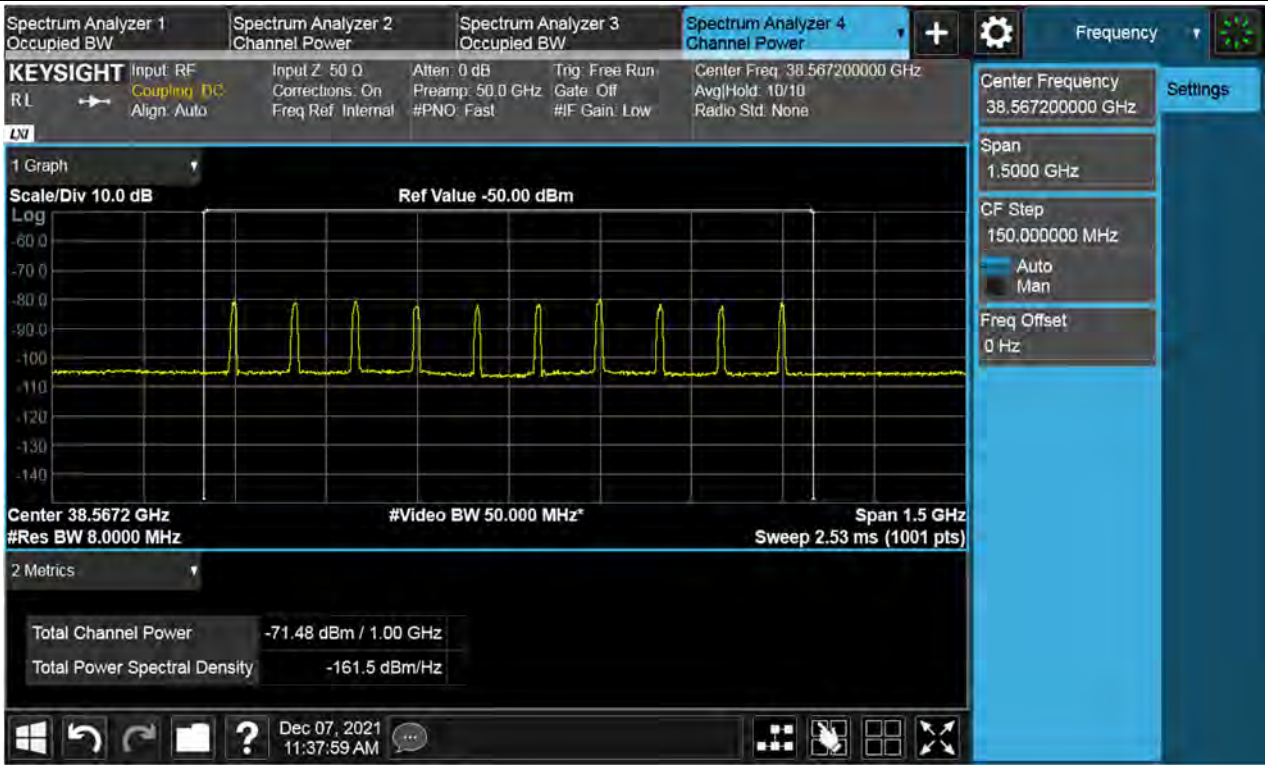
+3 dB above AGC threshold Output Power (E.I.R.P.) / Path B / 10cc

[1 RB] Plot Data of Input & Output Power (E.I.R.P.)

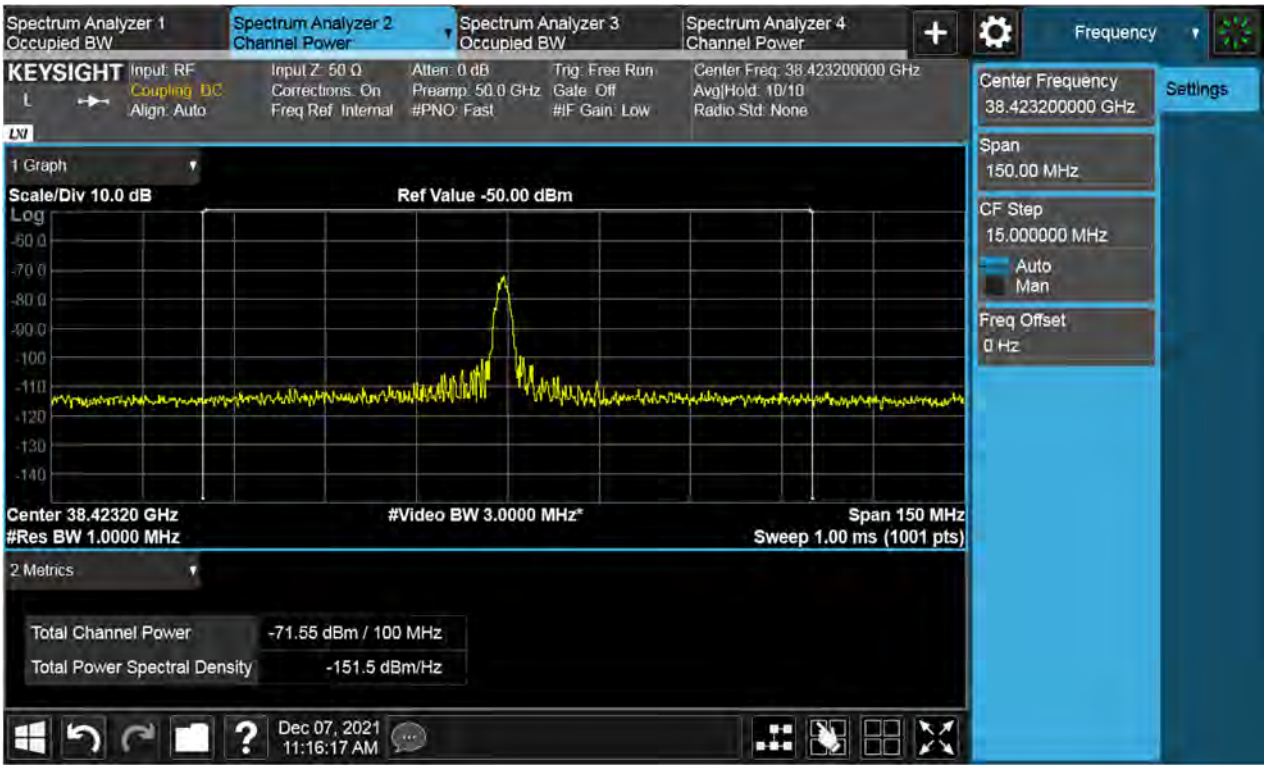
Input Power (E.I.R.P.) / Path A / 1cc



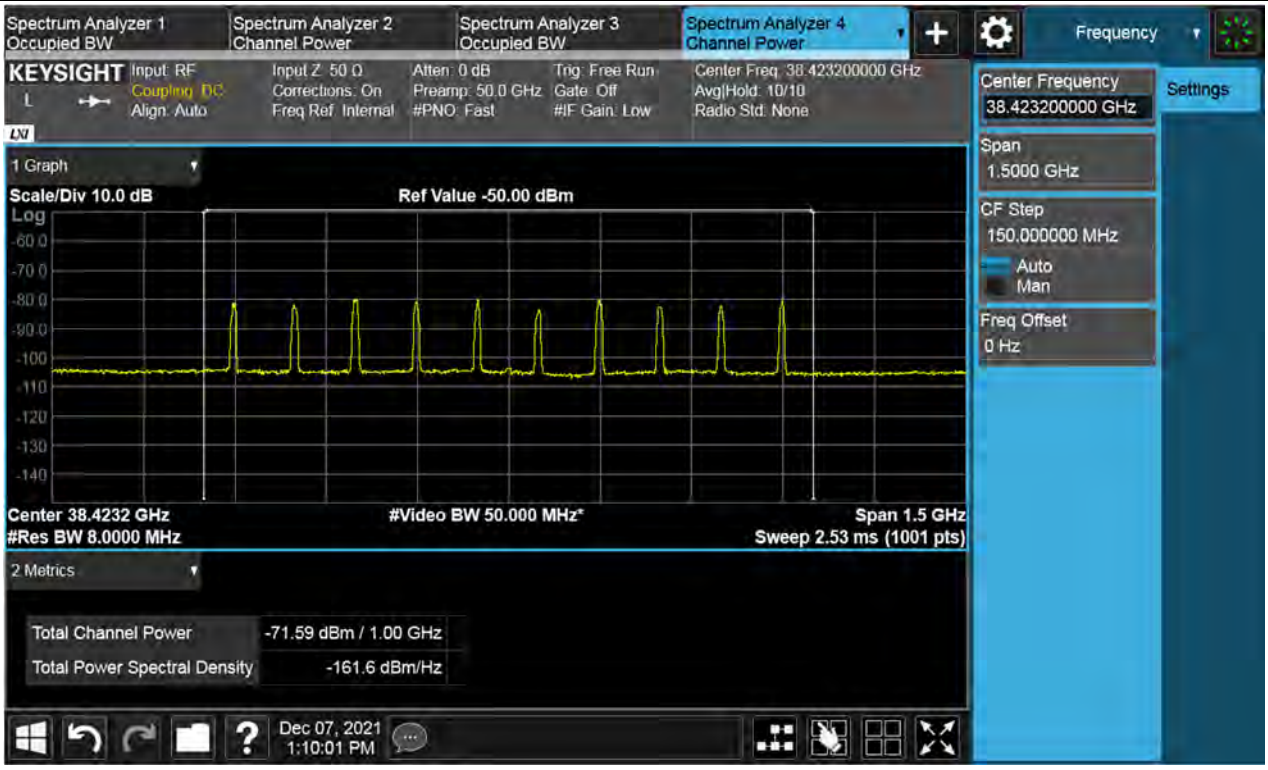
Input Power (E.I.R.P.) / Path A / 10cc



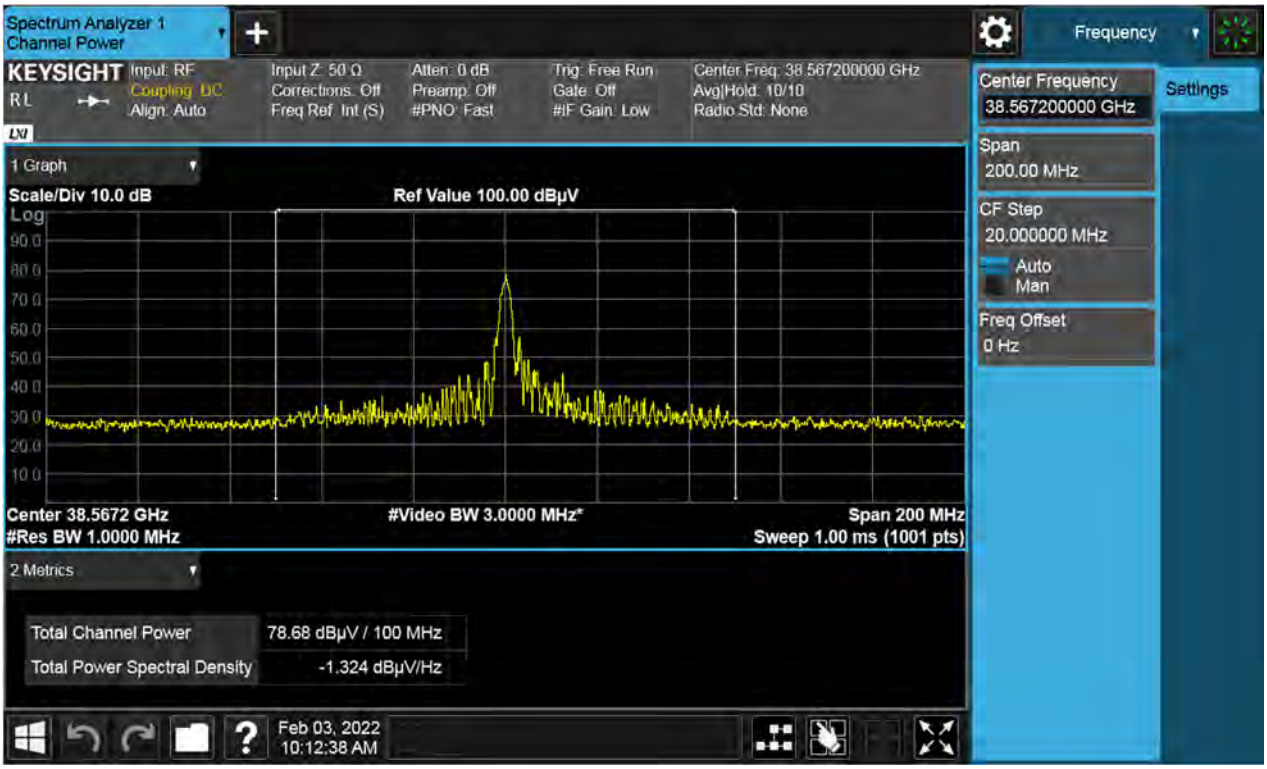
Input Power (E.I.R.P.) / Path B / 1cc



Input Power (E.I.R.P.) / Path B / 10cc

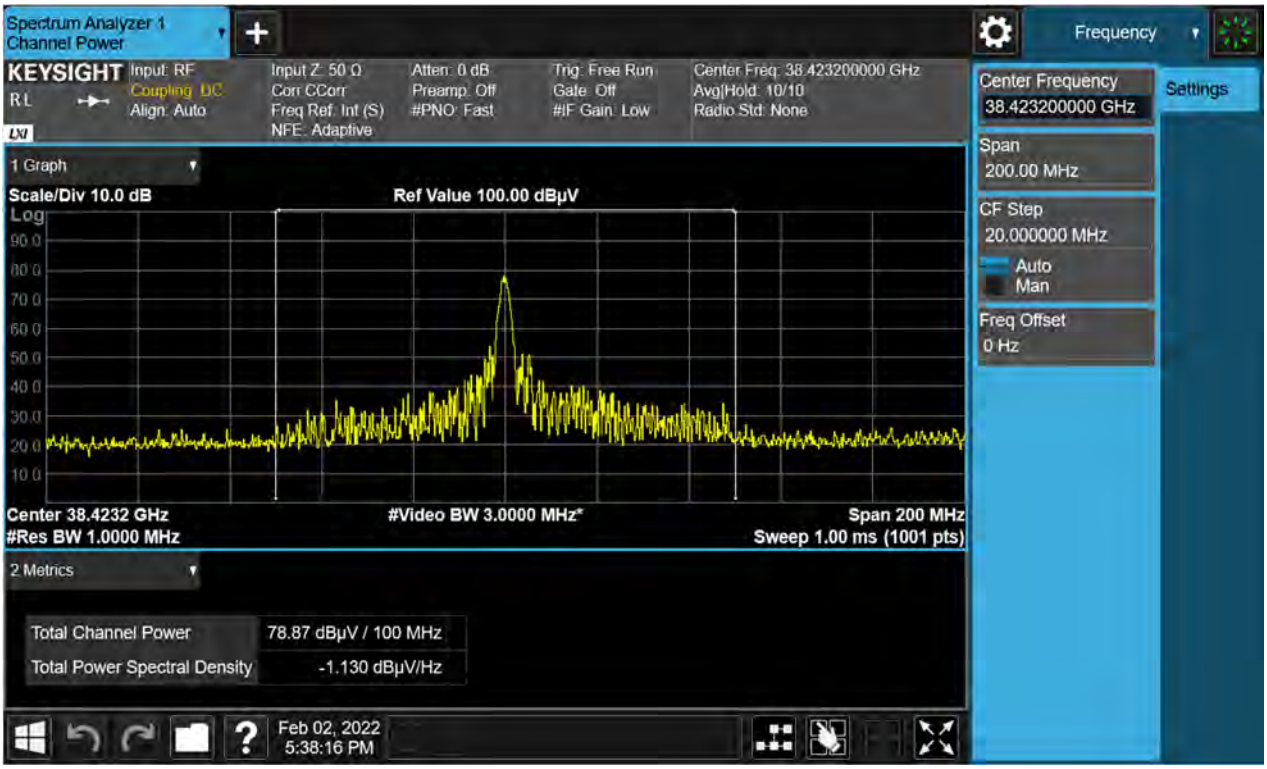


Output Power (E.I.R.P.) / Path A / 1cc

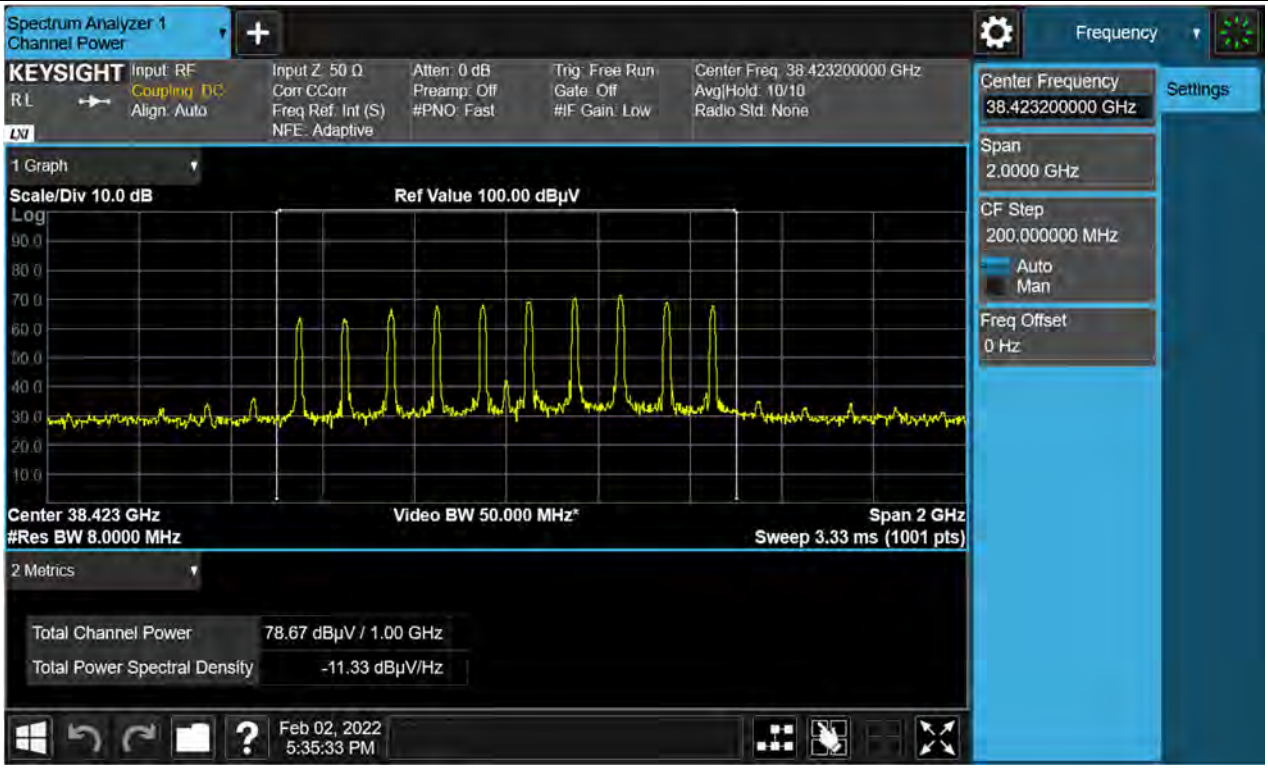


Output Power (E.I.R.P.) / Path A / 10cc

Output Power (E.I.R.P.) / Path B / 1cc

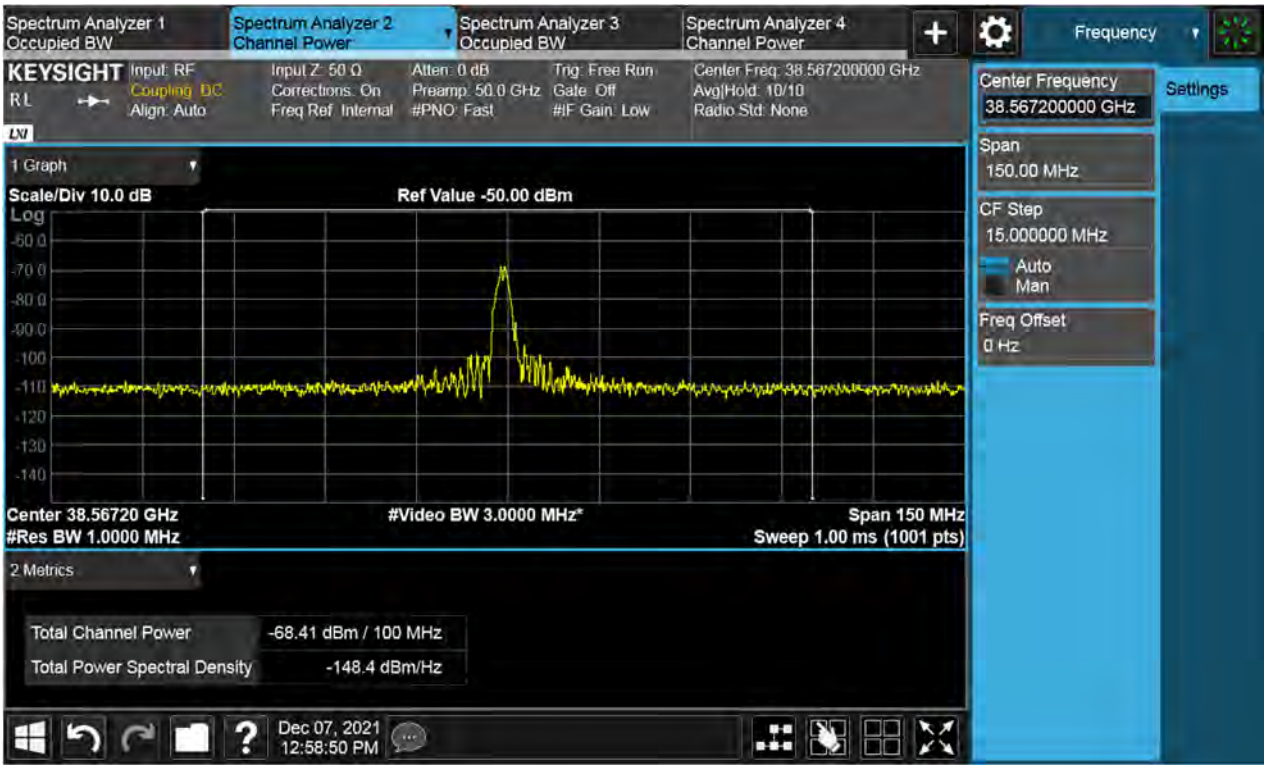


Output Power (E.I.R.P.) / Path B / 10cc

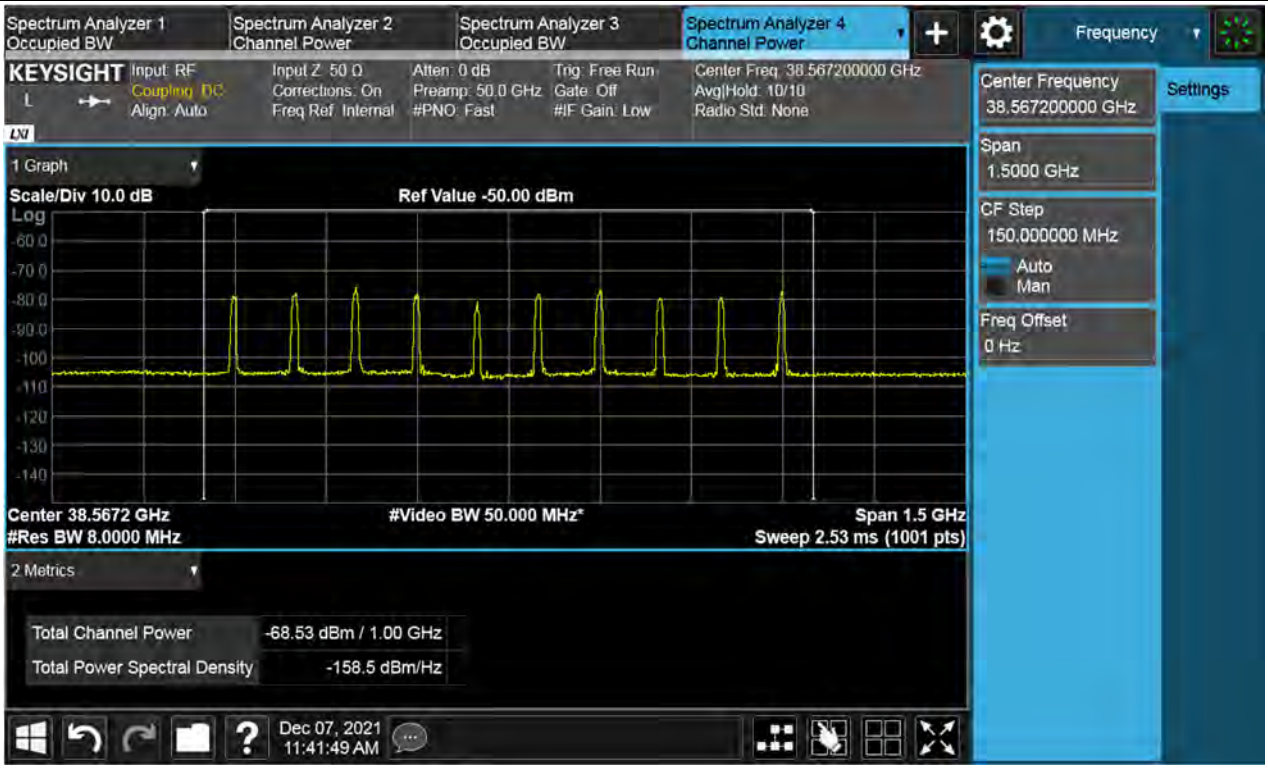


[1 RB] Plot Data of +3 dB above AGC threshold Input & Output Power (E.I.R.P.)

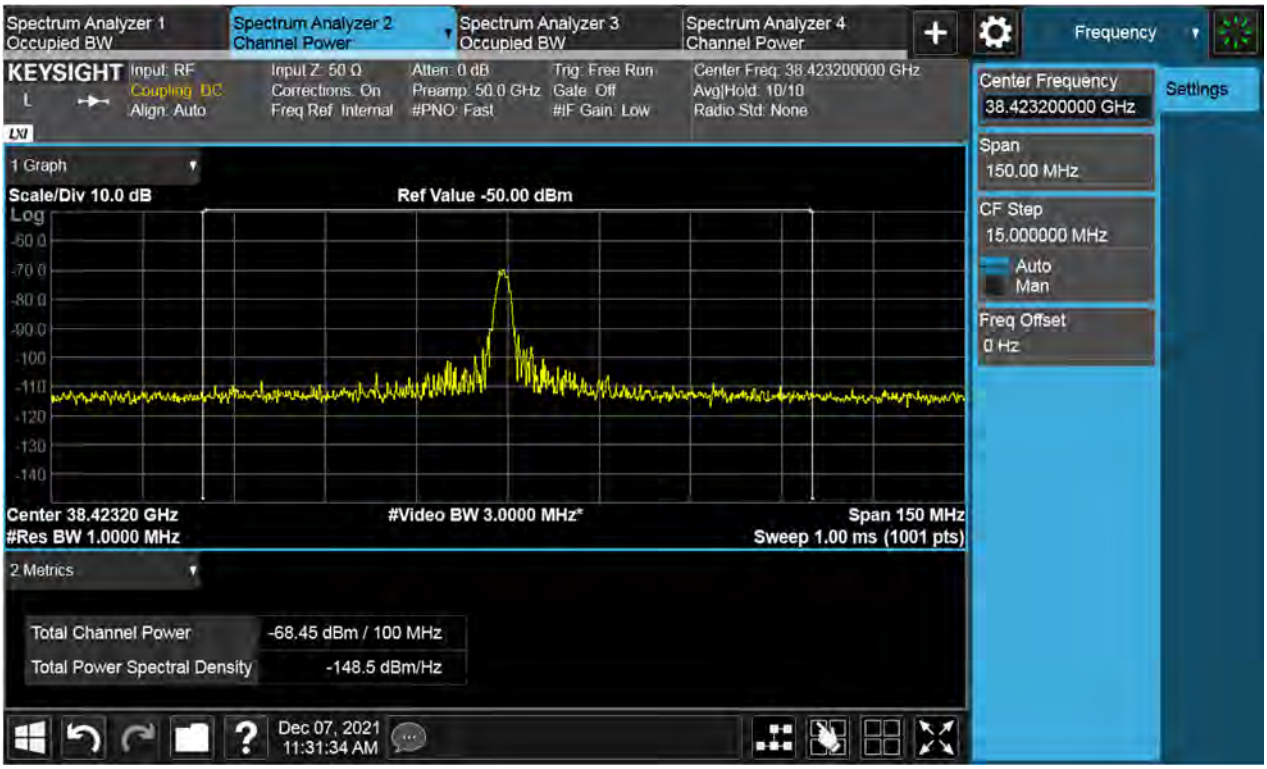
+3 dB above AGC threshold Input Power (E.I.R.P.) / Path A / 1cc



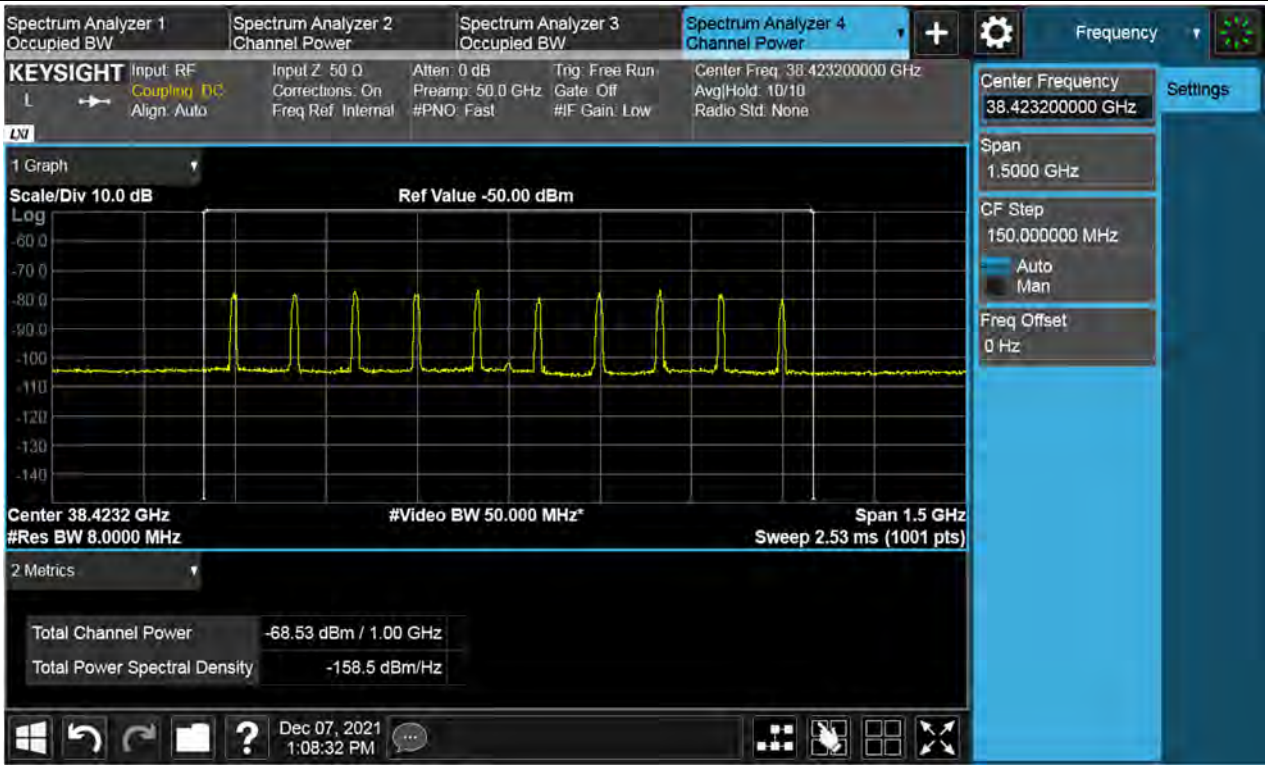
+3 dB above AGC threshold Input Power (E.I.R.P.) / Path A / 10cc



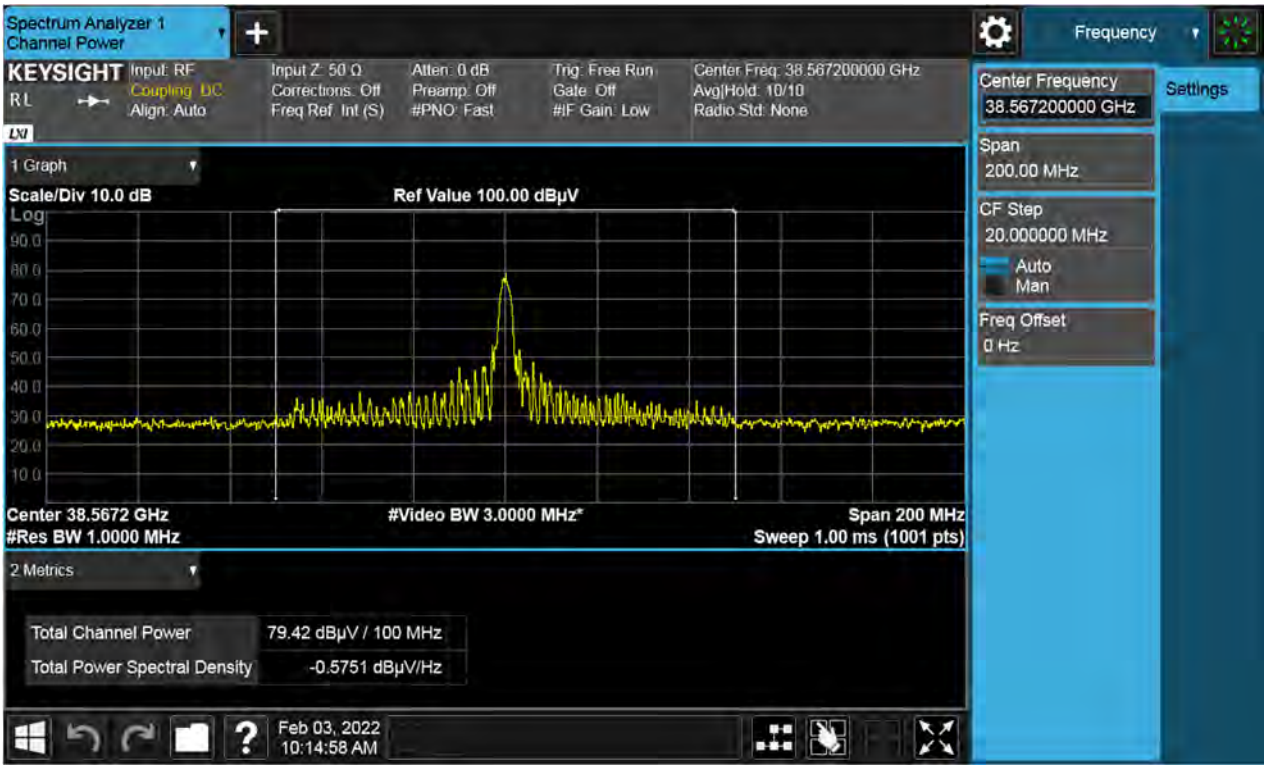
+3 dB above AGC threshold Input Power (E.I.R.P.) / Path B / 1cc



+3 dB above AGC threshold Input Power (E.I.R.P.) / Path B / 10cc

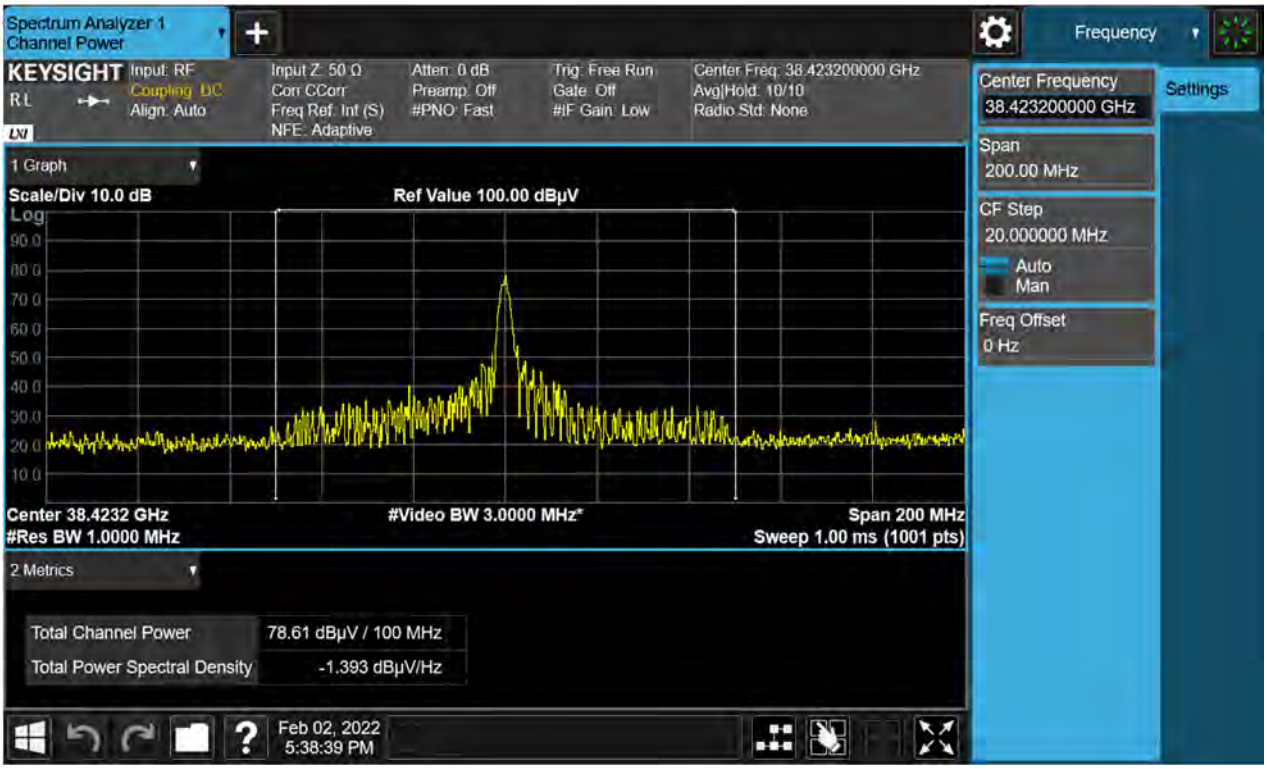


+3 dB above AGC threshold Output Power (E.I.R.P.) / Path A / 1cc



+3 dB above AGC threshold Output Power (E.I.R.P.) / Path A / 10cc

+3 dB above AGC threshold Output Power (E.I.R.P.) / Path B / 1cc



+3 dB above AGC threshold Output Power (E.I.R.P.) / Path B / 10cc

5.6. BAND EDGE / OUT-OF-BAND/OUT-OF-BLOCK EMISSIONS AND SPURIOUS EMISSIONS

Test Requirements:

§ 2.1051 Measurements required: Spurious emissions at antenna terminals.

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§ 30.203 Emission limits.

(a) The conductive power or the total radiated power of any emission outside a licensee's frequency block shall be −13 dBm/MHz or lower. However, in the bands immediately outside and adjacent to the licensee's frequency block, having a bandwidth equal to 10 percent of the channel bandwidth, the conductive power or the total radiated power of any emission shall be −5 dBm/MHz or lower.

(b) (1) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater.

(2) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges as the design permits.

(3) The measurements of emission power can be expressed in peak or average values.

Test Procedures:

Measurements were in accordance with the test methods section 3.6 of KDB 935210 D05 v01r04.

Spurious emissions shall be measured using a single test signal sequentially tuned to the low, middle, and high channels or frequencies within each authorized frequency band of operation.

Out-of-band/out-of-block emissions (including intermodulation products) shall be measured under each of the following two stimulus conditions:

a) two adjacent test signals sequentially tuned to the lower and upper frequency band/block edges;

b) a single test signal, sequentially tuned to the lowest and highest frequencies or channels within the frequency band/block under examination.

NOTE—Single-channel boosters that cannot accommodate two simultaneous signals within the passband may be excluded from the test stipulated in step a).

The measurement is performed in accordance with Section 5.7.3 of ANSI C63.26.

5.7.3 Out-of-band unwanted emissions measurements

a) Set the spectrum analyzer center frequency to the block, band, or channel edge frequency.

b) Set the span wide enough to capture the fundamental emission closest to the authorized block or band edge, and to include all modulation products that spill into the immediately adjacent frequency band. In some cases, it may be possible to set

the center frequency and span so as to encompass the fundamental emission and the unwanted out-of-band (band-edge) emissions on either side of the authorized block, band, or channel. This can be accomplished with a single (slow) sweep, if adequate overload protection and sufficient dynamic range can be maintained.

c) Set the number of points in sweep ≥ 2 × span / RBW.

d) Sweep time should be auto for peak detection. For rms detection the sweep time should be set as follows:

1), 2) Omitted

3) If the device cannot be configured to transmit continuously (duty cycle < 98%) and a free running sweep must be used, set the sweep time so that the averaging is performed over multiple on/off cycles by setting the sweep time > (number of points in sweep) × (transmitter period) (i.e., the transmit on-time + the off-time). The spectrum analyzer readings shall subsequently be corrected by [10 log (1/duty cycle)]. This assumes that the transmission period and duty cycle is relatively constant (duty cycle variation ≤ ±2%).

4) Omitted

e) The test report shall include the plots of the measuring instrument display and the measured data.

f) See Annex I for example emission mask plots.

Note:

1. In the band edge test of path A, B are individually operated and measured at the maximum emission position of each path, and the respective measurement results are summed.
2. Band edge value is calculated as follows.

$$Band\ Edge = Measured\ Value + AFCL + 20log(D) - 104.77 - Ant.\ Gain$$

3. Sample calculation:

$$36.510dB\mu V\ (measured\ Value) + 20log(3) - 104.77 + 52.867(AFCL) - 19.37\ (Ant.\ Gain) = -25.221\ dBm$$

4. Antenna Gain of the above formula was applied from actual measurement data of the radiation pattern document.
5. Intermodulation test is not performed for 10CC (1 000 MHz) signal, because the specification cannot accommodate two signals. (BW 1GHz among 37.6 GHz~40 GHz)
6. We considered all test conditions, and only the worst case plots for Full RB and 1 RB are attached.

Test Results:

[Full RB] Tabular Data of Band Edge (Two Adjacent Test Signal)

Path	Distance (m)	cc	Channel	Pol.	Frequency (GHz)	Measured Level (dBuV)	EIRP (dBm/MHz)	Ant. Gain (dBi)	Result (dBm/MHz)	Limit (dBm/MHz)
A	3.00	1	Low	Co	37.596	27.539	-13.950	18.46	-32.410	-5
				Cross	37.597	23.448	-18.041	18.46	-36.501	
			High	Co	40.000	27.881	-14.480	19.37	-33.850	
				Cross	40.000	23.570	-18.791	19.37	-38.161	

Path	Distance (m)	cc	Channel	Pol.	Frequency (GHz)	Measured Level (dBuV)	EIRP (dBm/MHz)	Ant. Gain (dBi)	Result (dBm/MHz)	Limit (dBm/MHz)
B	3.00	1	Low	Co	37.593	23.242	-18.247	18.46	-36.707	-5
				Cross	37.595	24.135	-17.354	18.46	-35.814	
			High	Co	40.004	25.432	-16.929	19.37	-36.299	
				Cross	40.008	24.550	-17.811	19.37	-37.181	

[Full RB] MIMO Tabular Data of Band Edge (Two Adjacent Test Signal)

Mode	cc	Edge	Pol.	Result (dBm/MHz)
A+B	1	Low	Co	-31.037
			Cross	-33.133
		High	Co	-31.893
			Cross	-34.633

[Full RB] Tabular Data of +3 dB above AGC threshold Band Edge (Two Adjacent Test Signal)

Path	Distance (m)	cc	Channel	Pol.	Frequency (GHz)	Measured Level (dBuV)	EIRP (dBm/MHz)	Ant. Gain (dBi)	Result (dBm/MHz)	Limit (dBm/MHz)
A	3.00	1	Low	Co	37.590	25.938	-15.551	18.46	-34.011	-5
				Cross	37.590	22.995	-18.494	18.46	-36.954	
			High	Co	40.010	27.311	-15.050	19.37	-34.420	
				Cross	40.013	23.524	-18.837	19.37	-38.207	

Path	Distance (m)	cc	Channel	Pol.	Frequency (GHz)	Measured Level (dBuV)	EIRP (dBm/MHz)	Ant. Gain (dBi)	Result (dBm/MHz)	Limit (dBm/MHz)
B	3.00	1	Low	Co	37.593	23.603	-17.886	18.46	-36.346	-5
				Cross	37.590	23.543	-17.946	18.46	-36.406	
			High	Co	40.009	25.083	-17.278	19.37	-36.648	
				Cross	40.007	23.830	-18.531	19.37	-37.901	

[Full RB] MIMO Tabular Data of +3 dB above AGC threshold Band Edge (Two Adjacent Test Signal)

Mode	cc	Edge	Pol.	Result (dBm/MHz)
A+B	1	Low	Co	-32.013
			Cross	-33.661
		High	Co	-32.382
			Cross	-35.041

[Full RB] Tabular Data of Band Edge (Single Test Signal)

Path	Distance (m)	cc	Channel	Pol.	Frequency (GHz)	Measured Level (dBuV)	EIRP (dBm/MHz)	Ant. Gain (dBi)	Result (dBm/MHz)	Limit (dBm/MHz)
A	3.00	1	Low	Co	37.598	29.687	-12.902	18.46	-31.362	-5
				Cross	37.593	24.046	-18.543	18.46	-37.003	
			High	Co	40.000	30.536	-11.825	19.37	-31.195	
				Cross	40.001	25.276	-17.085	19.37	-36.455	
		10	Low	Co	37.599	24.339	-17.150	18.46	-35.610	
				Cross	37.595	22.817	-19.888	18.46	-38.348	
			High	Co	40.000	25.354	-17.007	19.37	-36.377	
				Cross	40.002	23.789	-18.572	19.37	-37.942	

Path	Distance (m)	cc	Channel	Pol.	Frequency (GHz)	Measured Level (dBuV)	EIRP (dBm/MHz)	Ant. Gain (dBi)	Result (dBm/MHz)	Limit (dBm/MHz)
B	3.00	1	Low	Co	37.597	24.916	-17.673	18.46	-36.133	-5
				Cross	37.596	22.590	-19.999	18.46	-38.459	
			High	Co	40.000	27.362	-14.999	19.37	-34.369	
				Cross	40.003	23.59	-18.771	19.37	-38.141	
		10	Low	Co	37.588	23.009	-19.696	18.46	-38.156	
				Cross	37.579	22.874	-19.424	18.46	-37.884	
			High	Co	40.001	24.317	-18.044	19.37	-37.414	
				Cross	40.001	24.290	-18.071	19.37	-37.441	

[Full RB] MIMO Tabular Data of Band Edge (Single Test Signal)

Mode	cc	Edge	Pol.	Result (dBm/MHz)
A+B	1	Low	Co	-30.112
			Cross	-34.660
		High	Co	-29.488
			Cross	-34.206
	10	Low	Co	-33.688
			Cross	-35.099
		High	Co	-33.854
			Cross	-34.674

[Full RB] Tabular Data of +3 dB above AGC threshold Band Edge (Single Test Signal)

Path	Distance (m)	cc	Channel	Pol.	Frequency (GHz)	Measured Level (dBuV)	EIRP (dBm/MHz)	Ant. Gain (dBi)	Result (dBm/MHz)	Limit (dBm/MHz)
A	3.00	1	Low	Co	37.599	29.637	-12.952	18.46	-31.412	-5
				Cross	37.599	24.096	-18.493	18.46	-36.953	
			High	Co	40.003	30.96	-11.401	19.37	-30.771	
				Cross	40.002	25.887	-16.474	19.37	-35.844	
		10	Low	Co	37.569	24.438	-18.267	18.46	-36.727	
				Cross	37.583	22.893	-19.405	18.46	-37.865	
			High	Co	40.006	24.401	-17.960	19.37	-37.330	
				Cross	40.004	23.238	-19.123	19.37	-38.493	

Path	Distance (m)	cc	Channel	Pol.	Frequency (GHz)	Measured Level (dBuV)	EIRP (dBm/MHz)	Ant. Gain (dBi)	Result (dBm/MHz)	Limit (dBm/MHz)
B	3.00	1	Low	Co	37.597	24.908	-17.681	18.46	-36.141	-5
				Cross	37.593	23.663	-18.926	18.46	-37.386	
			High	Co	40.005	26.944	-15.417	19.37	-34.787	
				Cross	40.008	25.138	-17.223	19.37	-36.593	
		10	Low	Co	37.504	24.075	-18.503	18.46	-36.963	
				Cross	37.562	23.991	-18.714	18.46	-37.174	
			High	Co	40.002	24.097	-18.264	19.37	-37.634	
				Cross	40.003	23.347	-19.014	19.37	-38.384	

[Full RB] MIMO Tabular Data of +3 dB above AGC threshold Band Edge (Single Test Signal)

Mode	cc	Edge	Pol.	Result (dBm/MHz)
A+B	1	Low	Co	-30.152
			Cross	-34.153
		High	Co	-29.320
			Cross	-33.192
	10	Low	Co	-33.833
			Cross	-34.495
		High	Co	-34.469
			Cross	-35.427

[1 RB] Tabular Data of Band Edge (Two Adjacent Test Signal)

Path	Distance (m)	cc	Channel	Pol.	Frequency (GHz)	Measured Level (dBuV)	EIRP (dBm/MHz)	Ant. Gain (dBi)	Result (dBm/MHz)	Limit (dBm/MHz)
A	3.00	1	Low	Co	37.591	22.857	-19.732	18.46	-38.192	-5
				Cross	37.591	22.697	-19.601	18.46	-38.061	
			High	Co	40.007	22.633	-19.728	19.37	-39.098	
				Cross	40.007	22.621	-19.740	19.37	-39.110	

Path	Distance (m)	cc	Channel	Pol.	Frequency (GHz)	Measured Level (dBuV)	EIRP (dBm/MHz)	Ant. Gain (dBi)	Result (dBm/MHz)	Limit (dBm/MHz)
B	3.00	1	Low	Co	37.597	22.733	-19.856	18.46	-38.316	-5
				Cross	37.591	22.137	-20.161	18.46	-38.621	
			High	Co	40.008	23.029	-19.332	19.37	-38.702	
				Cross	40.009	22.914	-19.447	19.37	-38.817	

[1 RB] MIMO Tabular Data of Band Edge (Two Adjacent Test Signal)

Path	cc	Edge	Pol.	Result (dBm/MHz)
A+B	1	Low	Co	-35.243
			Cross	-35.321
		High	Co	-35.885
			Cross	-35.950

[1 RB] Tabular Data of +3 dB above AGC threshold Band Edge (Two Adjacent Test Signal)

Path	Distance (m)	cc	Channel	Pol.	Frequency (GHz)	Measured Level (dBuV)	EIRP (dBm/MHz)	Ant. Gain (dBi)	Result (dBm/MHz)	Limit (dBm/MHz)
A	3.00	1	Low	Co	37.588	22.396	-19.902	18.46	-38.362	-5
				Cross	37.593	21.931	-20.658	18.46	-39.118	
			High	Co	40.009	22.345	-20.016	19.37	-39.386	
				Cross	40.013	21.842	-20.519	19.37	-39.889	

Path	Distance (m)	cc	Channel	Pol.	Frequency (GHz)	Measured Level (dBuV)	EIRP (dBm/MHz)	Ant. Gain (dBi)	Result (dBm/MHz)	Limit (dBm/MHz)
B	3.00	1	Low	Co	37.588	22.209	-20.089	18.46	-38.549	-5
				Cross	37.590	22.032	-20.557	18.46	-39.017	
			High	Co	40.010	22.915	-19.446	19.37	-38.816	
				Cross	40.015	22.832	-19.529	19.37	-38.899	

[1 RB] MIMO Tabular Data of +3 dB above AGC threshold Band Edge (Two Adjacent Test Signal)

Path	cc	Edge	Pol.	Result (dBm/MHz)
A+B	1	Low	Co	-35.444
			Cross	-36.056
		High	Co	-36.081
			Cross	-36.355

[1 RB] Tabular Data of Band Edge (Single Test Signal)

Path	Distance (m)	cc	Channel	Pol.	Frequency (GHz)	Measured Level (dBuV)	EIRP (dBm/MHz)	Ant. Gain (dBi)	Result (dBm/MHz)	Limit (dBm/MHz)
A	3.00	1	Low	Co	37.600	25.796	-16.793	18.46	-35.253	-5
				Cross	37.600	22.213	-20.376	18.46	-38.836	
			High	Co	40.000	34.968	-7.393	19.37	-26.763	
				Cross	40.000	23.347	-19.014	19.37	-38.384	
		10	Low	Co	37.504	30.297	-12.281	18.45	-30.731	
				Cross	37.504	22.483	-20.095	18.45	-38.545	
			High	Co	40.001	36.510	-5.851	19.37	-25.221	
				Cross	40.001	23.944	-18.417	19.37	-37.787	

Path	Distance (m)	cc	Channel	Pol.	Frequency (GHz)	Measured Level (dBuV)	EIRP (dBm/MHz)	Ant. Gain (dBi)	Result (dBm/MHz)	Limit (dBm/MHz)
B	3.00	1	Low	Co	37.600	24.783	-17.806	18.46	-36.266	-5
				Cross	37.599	22.053	-20.536	18.46	-38.996	
			High	Co	40.000	33.641	-8.720	19.37	-28.090	
				Cross	40.000	24.443	-17.918	19.37	-37.288	
		10	Low	Co	37.600	32.073	-10.516	18.46	-28.976	
				Cross	37.599	22.908	-19.681	18.46	-38.141	
			High	Co	40.001	35.327	-7.034	19.37	-26.404	
				Cross	40.001	27.002	-15.359	19.37	-34.729	

[1 RB] MIMO Tabular Data of Band Edge (Single Test Signal)

Path	cc	Edge	Pol.	Result (dBm/MHz)
A+B	1	Low	Co	-32.719
			Cross	-35.905
		High	Co	-24.365
			Cross	-34.791
	10	Low	Co	-26.755
			Cross	-35.328
		High	Co	-22.762
			Cross	-32.984

[1 RB] Tabular Data of +3 dB above AGC threshold Band Edge (Single Test Signal)

Path	Distance (m)	cc	Channel	Pol.	Frequency (GHz)	Measured Level (dBuV)	EIRP (dBm/MHz)	Ant. Gain (dBi)	Result (dBm/MHz)	Limit (dBm/MHz)
Path A	3.00	1	Low	Co	37.600	24.660	-17.929	18.46	-36.389	-5
				Cross	57.599	22.040	-20.549	18.46	-39.009	
			High	Co	40.000	33.347	-9.014	19.37	-28.384	
				Cross	40.000	22.828	-19.533	19.37	-38.903	
		10	Low	Co	37.598	34.781	-7.808	18.46	-26.268	
				Cross	37.520	22.810	-19.710	18.45	-38.160	
			High	Co	40.001	35.596	-6.765	19.37	-26.135	
				Cross	40.002	34.991	-7.370	19.37	-26.740	

Path	Distance (m)	cc	Channel	Pol.	Frequency (GHz)	Measured Level (dBuV)	EIRP (dBm/MHz)	Ant. Gain (dBi)	Result (dBm/MHz)	Limit (dBm/MHz)
Path B	3.00	1	Low	Co	37.599	24.686	-17.903	18.46	-36.363	-5
				Cross	37.596	22.609	-19.980	18.46	-38.440	
			High	Co	40.000	32.112	-10.249	19.37	-29.619	
				Cross	40.000	25.688	-16.673	19.37	-36.043	
		10	Low	Co	37.599	31.403	-11.186	18.46	-29.646	
				Cross	37.590	22.348	-19.950	18.46	-38.410	
			High	Co	40.000	36.500	-5.861	19.37	-25.231	
				Cross	40.001	24.577	-17.784	19.37	-37.154	

[1 RB] MIMO Tabular Data of +3 dB above AGC threshold Band Edge (Single Test Signal)

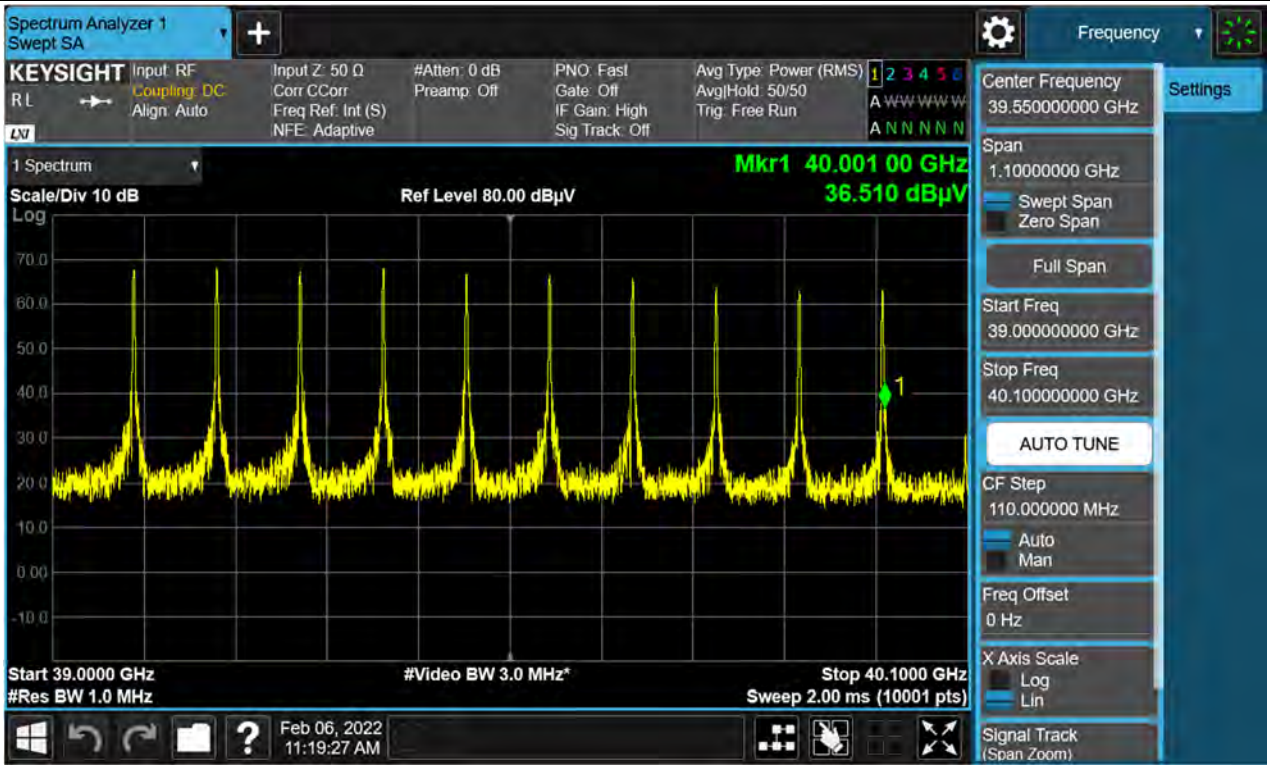
Path	cc	Edge	Pol.	Result (dBm/MHz)
A+B	1	Low	Co	-33.365
			Cross	-35.704
		High	Co	-25.947
			Cross	-34.231
	10	Low	Co	-24.626
			Cross	-35.272
		High	Co	-22.649
			Cross	-26.362

[Full RB] Plot data of Band Edge

+3 dB above AGC threshold Single Test Signal / MAX Ant. A Position / 1cc / High / Co-Pol.

[1 RB] Plot data of Band Edge

Single Test Signal / MAX Ant. A Position / 10cc / High / Co-Pol.



5.7. RADIATED SPURIOUS EMISSIONS

FCC Rules

Test Requirements:

§ 2.1051 Measurements required: Spurious emissions at antenna terminals.

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§ 30.203 Emission limits.

(a) The conductive power or the total radiated power of any emission outside a licensee's frequency block shall be −13 dBm/MHz or lower. However, in the bands immediately outside and adjacent to the licensee's frequency block, having a bandwidth equal to 10 percent of the channel bandwidth, the conductive power or the total radiated power of any emission shall be −5 dBm/MHz or lower.

(b) (1) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater.

(2) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges as the design permits.

(3) The measurements of emission power can be expressed in peak or average values.

Test Procedures:

The measurement is performed in accordance with Section 5.7.4 of ANSI C63.26.

5.7.4 Spurious unwanted emission measurements

a) Set the spectrum analyzer start frequency to the lowest frequency generated by the EUT, without going below 9 kHz, and the stop frequency to the lower frequency covered by the measurements previously performed in 5.7.3. As an alternative, the stop frequency can be set to the value specified in 5.1.1, depending on the EUT operating range, if the resulting plot can clearly demonstrate compliance for all frequencies not addressed by the out-of-band emissions measurements performed as per 5.7.3.

b) When using an average power (rms) detector, ensure that the number of points in the sweep ≥ 2 × (span / RBW). This may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the spectrum analyzer capabilities. This requirement does not apply to peak-detected power measurements. When average power is specified by the applicable regulation, a peak-detector can be utilized for preliminary measurements to accommodate wider frequency spans. Any emissions found in the preliminary measurement to exceed the applicable limit(s) shall be further examined using a power averaging (rms) detector with the minimum number of measurement points as defined above.

c) The sweep time should be set to auto-couple for performing peak-detector measurements. For measurements that use a power averaging (rms) detector, the sweep time shall be set as described for out-of-band emissions measurements in item d) of 5.7.3.

d) Identify and measure the highest spurious emission levels in each frequency range. It is not necessary to re-measure the out-of-band emissions as a part of this test. Record the frequencies and amplitudes corresponding to the measured emissions and capture the data plots.

e) Repeat step b) through step d) for the upper spurious emission frequency range if not already captured by a wide span measurement performed as per the alternative provided in step a). The upper frequency for this measurement is defined in 5.1.1 as a function of the EUT operating range.

f) Compare the results with the corresponding limit in the applicable regulation.

g) The test report shall include the data plots of the measuring instrument display and the measured data.

TRP Test Procedures:

The measurement is performed in accordance with Section 4.4.3.3.2 of KDB 842590 v01 (2021-04).

a) Align the EUT with a chosen xy-plane and the xz-plane of the antenna measurement coordinate system.
NOTE 1: For harmonics and spurious emission frequencies which are beamforming as identified in exploratory scan, it may be required to align the orthogonal cuts to include the peak based on exploratory scans.

b) Measure the EUT dimensions, i.e., depth (d), width (w), and height (h); see Figure A.1 in Appendix A.

c) Calculate the spherical and cylindrical diameters (D and Dcyl) using Equations (A.1) and (A.2) (see Appendix A).

d) For the highest frequency (smallest wavelength) of the frequency band measured, calculate the reference angular steps $\Delta\theta$ref and $\Delta\phi$ref using Equations (A.3) and (A.4).

e) Set the grid spatial sampling step $\Delta\theta \leq \Delta\theta$ref for the vertical angle and $\Delta\phi \leq \Delta\phi$ref for the horizontal cut.

f) For each emission frequency, measure the EIRP (as a sum of two orthogonal polarizations) at each spatial sampling step on the selected grid.

g) For each emission frequency, calculate the average EIRP for both the cuts separately, and then take the average of these two average values.

h) Add 2 dB as a correction factor to the averaged value computed in step g).

i) If the TRP limit is exceeded, a third orthogonal cut in the yz-plane and using the $\Delta\theta$ angular step, can be added. Now, calculate the average values in all three cuts separately, and then take the average value of these three average values.

j) Add 1.5 dB as a correction factor to the averaged value computed in step i).

k) Evaluate the pass/fail decision by comparing TRP from step h) or step j) against the applicable TRP limit.

Note:

1. Spurious emission test is performed up to 100 GHz frequency according to section 5.1.1 of ANSI C63.26 -2015.
2. Measurement distance is applied far field condition; see test descriptions on section 3.2.
3. In case of 9 kHz to 30 MHz and 30 MHz to 1 GHz, the reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
4. Test plots doesn't include any factors and all factors such as AFCL is calculated in tabular data.
5. We were performed the test in MIMO mode.
6. In this test, AFCL factor consists of antenna factor, cable loss, mixer loss, and amplifier gain.
7. Emissions value is first converted by distance factor as follow.

   Converted value (dBm) = Measured Value (dBuV) + 20 LOG(D) - 104.77
8. Final spurious emissions result is calculated as follow.

   Spurious Emissions = Converted Value (dBm) + AFCL
9. Sample calculation:

   57.87 dBμV (measured Value) – 95.2 + 5.8(AFCL) = -31.53 dBm
10. We considered all test conditions, and only the worst case plots for Full RB and 1 RB are attached.

Test Results:

[Full RB] Tabular Data of Radiated Spurious Emissions

Freq.	Distance (m)	Ant. Path	Carrier	Channel	Frequency (GHz)	Measured (dBuV)	Result (dBm/MHz)	Limit (dBm/MHz)
9 kHz ~ 30 MHz	No critical peaks found							
30 MHz ~ 1 GHz	No critical peaks found							
1 GHz ~ 18 GHz	3.0	A	1	High	1105.825	60.08	-52.06	-13
					1228.650	56.63	-55.01	
					11268.000	57.71	-31.69	
			10	Middle	1106.675	60.01	-52.13	
					1229.500	56.77	-54.87	
					11268.850	57.87	-31.53	
		B	1	Low	1105.825	60.26	-51.88	
					1228.650	56.73	-54.91	
					11268.000	56.68	-32.72	
			10	Middle	1106.675	60.35	-51.79	
					1229.500	56.74	-54.90	
					11268.850	57.63	-31.77	

Note: Only peak value is recorded in this report.

Freq.	Distance (m)	Ant. Path	Carrier	Channel	Frequency (GHz)	Measured (dBuV)	Result (dBm/MHz)	Limit (dBm/MHz)	TRP (dBm)
18 GHz ~ Low Edge	3.0	A	1	Low	37.33579	29.931	-12.367*	-13	-17.048
				Middle	35.22111	22.781	-24.071		-
				High	34.44261	27.899	-20.192		-
			10	Low	37.40400	22.587	-19.991		-
				Middle	34.83145	21.754	-25.739		-
				High	34.20721	24.133	-24.342		-
		B	1	Low	37.38400	26.165	-16.133		-
				Middle	35.76883	22.113	-24.137		-
				High	34.00012	31.808	-16.283		-
			10	Low	37.80600	21.599	-26.277		-
				Middle	35.58441	21.524	-20.773		-
				High	34.40531	22.879	-25.597		-
High Edge ~ 50 GHz	1.5	A	1	Low	49.61374	30.236	-19.687	-13	-
				Middle	49.12764	30.015	-20.292		-
				High	40.01100	39.291	-11.026*		-16.225
			10	Low	49.09470	30.805	-19.052		-
				Middle	49.98474	30.194	-20.114		-
				High	40.78181	32.284	-18.012		-
		B	1	Low	49.61877	30.798	-19.492		-
				Middle	49.39314	30.286	-19.650		-
				High	40.19349	39.154	-11.163*		-16.339
			10	Low	49.81799	30.250	-19.694		-
				Middle	40.16542	30.035	-20.267		-
				High	41.12336	30.985	-19.308		-
50 GHz ~ 60 GHz	1.5	A	1	Low	59.68203	29.595	-17.513	-13	-
				Middle	59.55357	29.967	-17.142		-
				High	59.79055	29.528	-17.580		-
			10	Low	58.95350	29.437	-17.671		-
				Middle	59.25407	29.772	-17.336		-
				High	59.42425	30.236	-16.872		-
		B	1	Low	59.40583	29.629	-17.479		-
				Middle	59.45338	29.534	-17.574		-
				High	59.29531	29.801	-17.307		-
			10	Low	59.10448	29.943	-17.165		-
				Middle	58.95284	29.952	-17.156		-
				High	59.20697	29.129	-17.979		-

60 GHz ~ 90 GHz	1.0	A	1	Low	74.25571	3.784	-37.948	-13	-
				Middle	76.94634	5.180	-36.308		-
				High	69.21424	3.856	-40.883		-
			10	Low	75.71971	2.837	-35.577		-
				Middle	77.93272	2.949	-41.018		-
				High	78.28951	3.313	-41.514		-
		B	1	Low	65.11710	6.854	-39.219		-
				Middle	70.78191	2.586	-43.019		-
				High	69.20549	6.123	-38.617		-
			10	Low	66.08444	4.721	-41.913		-
				Middle	75.92659	2.439	-35.981		-
				High	68.15465	5.877	-39.707		-
90 GHz ~ 140 GHz	1.0	A	1	Low	98.42889	5.420	-37.590	-13	-
				Middle	99.30738	5.488	-38.138		-
				High	98.66254	5.114	-38.545		-
			10	Low	138.87845	5.637	-32.137		-
				Middle	138.79055	6.064	-37.625		-
				High	138.62204	5.867	-31.907		-
		B	1	Low	139.22071	5.048	-31.440		-
				Middle	139.68412	6.142	-31.632		-
				High	138.58113	4.790	-38.899		-
			10	Low	139.12506	5.845	-31.100		-
				Middle	139.03745	5.723	-30.765		-
				High	139.89840	5.331	-31.614		-
140 GHz ~ 200 GHz	1.0	A	1	Low	184.84707	5.020	-35.024	-13	-
				Middle	185.27600	5.243	-34.842		-
				High	184.81852	5.512	-34.532		-
			10	Low	185.09439	5.338	-34.706		-
				Middle	184.76069	4.520	-35.524		-
				High	184.99699	5.063	-34.981		-
		B	1	Low	184.26750	4.739	-35.305		-
				Middle	184.32163	4.833	-35.211		-
				High	185.44353	4.726	-35.359		-
			10	Low	184.90430	4.692	-35.352		-
				Middle	185.43343	4.537	-35.548		-
				High	186.12579	5.186	-34.858		-

Note: '*' This checked frequency is measured by TRP, because Result value is fail or insufficient margin.

[1 RB] Tabular Data of Radiated Spurious Emissions

Freq.	Distance (m)	Ant. Path	Carrier	Channel	Frequency (GHz)	Measured (dBuV)	Result (dBm/MHz)	Limit (dBm/MHz)
9 kHz ~ 30 MHz	No critical peaks found							
30 MHz ~ 1 GHz	No critical peaks found							
1 GHz ~ 18 GHz	3.0	A	1	Middle	1105.825	59.85	-52.29	-13
					1228.650	57.19	-54.45	
					11268.000	57.85	-31.55	
			10	Low	1105.825	59.91	-52.23	
					1228.650	57.26	-54.38	
					11268.000	58.15	-31.25	
		B	1	High	1105.825	59.90	-52.24	
					1228.650	56.91	-54.73	
					11268.000	57.64	-31.76	
			10	Low	1105.825	59.83	-52.31	
					1228.650	56.82	-54.82	
					11268.000	57.46	-31.94	

Note: Only peak value is recorded in this report.

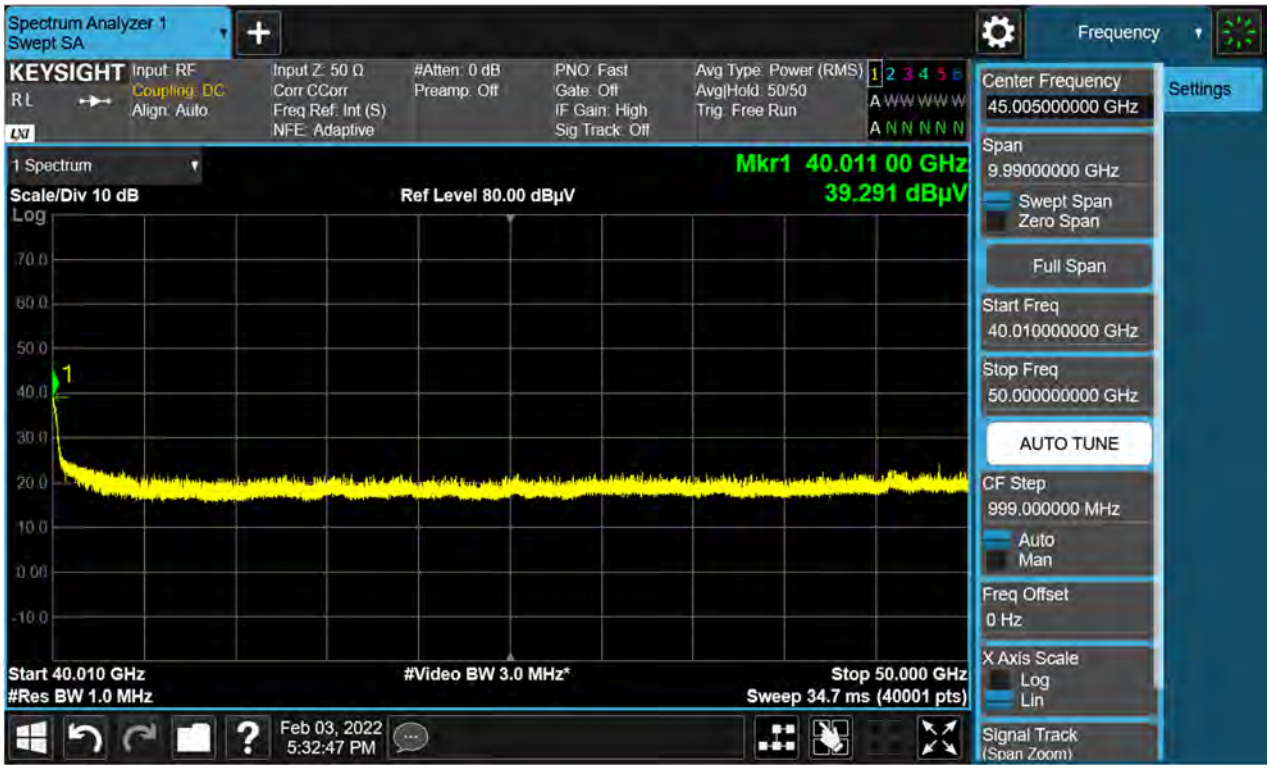
Freq.	Distance (m)	Ant. Path	Carrier	Channel	Frequency (GHz)	Measured (dBuV)	Result (dBm/MHz)	Limit (dBm/MHz)	TRP (dBm)
18 GHz ~ Low Edge	3.0	A	1	Low	37.22893	22.660	-20.044	-13	-
				Middle	34.64856	21.266	-25.856		-
				High	34.31821	22.584	-24.537		-
			10	Low	37.40400	30.040	-12.657*		-16.525
				Middle	34.64326	21.392	-23.667		-
				High	34.03215	20.969	-26.560		-
		B	1	Low	36.71848	23.936	-18.768		-
				Middle	35.59907	22.102	-25.019		-
				High	33.46119	27.659	-20.457		-
			10	Low	37.72693	27.218	-15.479*		-18.922
				Middle	35.41681	23.989	-24.635		-
				High	34.05094	22.509	-26.115		-
High Edge ~ 50 GHz	1.5	A	1	Low	49.61040	24.196	-26.199	-13	-
				Middle	48.88812	23.384	-27.011		-
				High	40.01771	28.491	-21.867		-
			10	Low	48.68665	24.372	-26.023		-
				Middle	40.00815	26.916	-23.443		-
				High	40.20484	35.182	-15.136*		-18.607
		B	1	Low	49.53908	24.377	-26.018		-
				Middle	49.09257	23.607	-26.822		-
				High	40.58747	29.759	-20.599		-
			10	Low	49.21488	24.209	-26.142		-
				Middle	40.14637	29.976	-20.382		-
				High	40.62673	36.397	-13.921*		-17.701
50 GHz ~ 60 GHz	1.5	A	1	Low	59.62507	29.217	-17.891	-13	-
				Middle	59.42313	28.757	-18.351		-
				High	59.56646	28.247	-18.861		-
			10	Low	58.42229	28.342	-18.766		-
				Middle	59.14621	28.334	-18.775		-
				High	58.72812	28.826	-18.282		-
		B	1	Low	58.91929	28.012	-19.097		-
				Middle	59.36587	28.231	-18.877		-
				High	59.03551	28.205	-18.903		-
			10	Low	58.83824	28.691	-18.417		-
				Middle	58.76801	28.468	-18.641		-
				High	58.91550	28.849	-18.259		-

60 GHz ~ 90 GHz	1.0	A	1	Low	73.58452	3.115	-38.618	-13	-
				Middle	76.48262	4.655	-36.833		-
				High	68.80417	3.844	-40.895		-
			10	Low	75.30696	2.400	-36.014		-
				Middle	77.23991	2.417	-41.550		-
				High	77.81531	2.822	-42.006		-
		B	1	Low	64.53164	6.426	-39.646		-
				Middle	70.48482	2.178	-43.427		-
				High	69.00158	5.831	-38.908		-
			10	Low	65.53743	4.237	-42.397		-
				Middle	75.43873	2.390	-36.030		-
				High	67.54127	5.416	-40.168		-
90 GHz ~ 140 GHz	1.0	A	1	Low	98.63119	4.784	-38.225	-13	-
				Middle	98.59237	4.799	-38.827		-
				High	98.59603	4.966	-38.694		-
			10	Low	138.42144	5.584	-32.190		-
				Middle	138.39735	6.062	-37.627		-
				High	138.02914	5.668	-32.106		-
		B	1	Low	138.61191	4.583	-31.905		-
				Middle	139.19348	5.587	-32.187		-
				High	137.95764	5.377	-32.377		-
			10	Low	138.47640	5.365	-32.391		-
				Middle	138.87557	5.388	-31.549		-
				High	139.75103	5.101	-31.837		-
140 GHz ~ 200 GHz	1.0	A	1	Low	184.33515	4.413	-35.631	-13	-
				Middle	185.00286	5.153	-34.932		-
				High	184.68027	4.980	-35.064		-
			10	Low	184.77582	4.811	-35.233		-
				Middle	184.53662	4.357	-35.687		-
				High	184.87141	4.408	-35.636		-
		B	1	Low	183.65856	4.673	-35.371		-
				Middle	184.00132	4.362	-35.682		-
				High	185.43481	4.707	-35.378		-
			10	Low	184.36974	4.366	-35.678		-
				Middle	184.78166	3.885	-36.200		-
				High	186.07607	4.599	-35.445		-

Note: '*' This checked frequency is measured by TRP, because Result value is fail or insufficient margin.

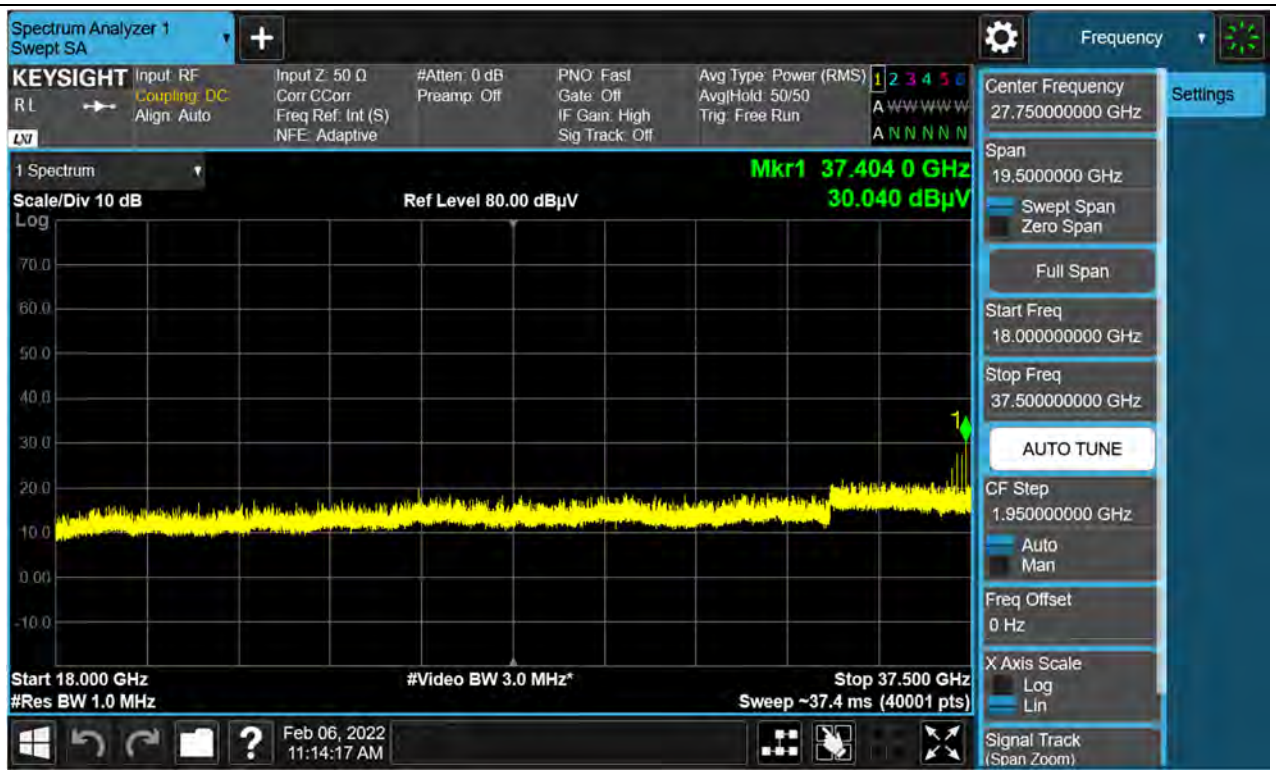
[Full RB] Plot data of Radiated Spurious Emissions

Path A / High Edge ~ 50 GHz / 1CC / High



[1 RB] Plot data of Radiated Spurious Emissions

Path A / 18 GHz ~ Low Edge / 10CC / Low



5.8. FREQUENCY STABILITY

FCC Rules

Test Requirements:

§ 2.1055 Measurements required: Frequency stability.

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From −30° to + 50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

Test Procedures:

The measurement is performed in accordance with Section 5.6.3, 5.6.4 and 5.6.5 of ANSI C63.26.

5.6.3 Procedure for frequency stability testing

Frequency stability is a measure of the frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at +20 °C and rated supply voltage.

The operating carrier frequency shall be set up in accordance with the manufacturer's published operation and instruction manual prior to the commencement of these tests. No adjustment of any frequency determining circuit element shall be made subsequent to this initial set-up. Frequency stability is tested:

a) At 10 °C intervals of temperatures between −30 °C and +50 °C at the manufacturer's rated supply voltage, and

b) At +20 °C temperature and ±15% supply voltage variations. If a product is specified to operate over a range of input voltage then the −15% variation is applied to the lowermost voltage and the +15% is applied to the uppermost voltage.

During the test all necessary settings, adjustments and control of the EUT have to be performed without disturbing the test environment, i.e., without opening the environmental chamber. The frequency stabilities can be maintained to a lesser temperature range provided that the transmitter is automatically inhibited from operating outside the lesser temperature range. For handheld equipment that is only capable of operating from internal batteries and the supply voltage cannot be varied, the frequency stability tests shall be performed at the nominal battery voltage and the battery end point voltage specified by the manufacturer. An external supply voltage can be used and set at the internal battery nominal voltage, and again at the battery operating end point voltage which shall be specified by the equipment manufacturer.

If an unmodulated carrier is not available, the mean frequency of a modulated carrier can be obtained by using a frequency counter with gating time set to an appropriately large multiple of bit periods (gating time depending on the required accuracy). Full details on the choice of values shall be included in the test report.

5.6.4 Frequency stability over variations in temperature

a) Supply the EUT with a nominal 60 Hz ac voltage, dc voltage, or install a new or fully charged battery in the EUT.

b) If possible a dummy load should be connected to the EUT because an antenna near the metallic walls of an environmental test chamber could affect the output frequency of the EUT. If the EUT is equipped with a permanently attached, adjustable-length antenna, the EUT should be placed in the center of the chamber with the antenna adjusted to the shortest length possible.

c) Turn on the EUT, and tune it to the center frequency of the operating band.

d) Couple the transmitter output to the measuring instrument through a suitable attenuator and coaxial cable. If connection

to the EUT output is not possible, make the measurement by connecting an antenna to the measuring instrument with a suitable length of coaxial cable and placing the measuring antenna near the EUT (e.g., 15 cm away).

NOTE—An instrument that has an adequate level of accuracy as specified by the procuring or regulatory authority is the recommended measuring instrument.

e) Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument, but is strong enough to allow measurement of the operating or fundamental frequency of the EUT). Adjust the detector bandwidth and span settings to achieve a resolution capable of accurate frequency measurements over the applicable frequency stability limits.

f) Turn the EUT off, and place it inside the environmental temperature chamber. For devices that have oscillator heaters, energize only the heater circuit.

g) Set the temperature control on the chamber to the Highest temperature specified in the regulatory requirements for the type of device, and allow the oscillator heater and the chamber temperature to stabilize. Unless otherwise instructed by the regulatory authority, this temperature should be 50 °C.

h) While maintaining a constant temperature inside the environmental chamber, turn on the EUT and allow sufficient time for the EUT temperature to stabilize.

i) Measure the frequency.

j) Switch off the EUT, but do not switch off the oscillator heater.

k) Lower the chamber temperature to the next level that is required by the standard and allow the temperature inside the chamber to stabilize. Unless otherwise instructed by the regulators, this temperature step should be 10 °C.

l) Repeat step h) through step k) down to the lowest specified temperature. Unless otherwise instructed by the regulators, this temperature should be −30 °C. When the frequency stability limit is stated as being sufficient such that the fundamental emissions stay within the authorized bands of operation, a reference point shall be established at the applicable unwanted emissions limit using a RBW equal to the RBW required by the unwanted emissions specification of the applicable regulatory standard. These reference points measured using the lowest and Highest channel of operation shall be identified as f_L and f_H respectively. The worst-case frequency offset determined in the above methods shall be added or subtracted from the values of f_L and f_H and the resulting frequencies must remain within the band.

m) Omitted

5.6.5 Frequency stability when varying supply voltage

a) Couple the transmitter output to the measuring instrument through a suitable attenuator and coaxial cable. If connection to the EUT output is not possible make the measurement by connecting an antenna to the measuring instrument with a suitable length of coaxial cable and placing the measuring antenna near the EUT (e.g., 15 cm away)

b) Supply the EUT with nominal ac or dc voltage. The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

c) Turn on the EUT, and couple its output to a frequency counter or other frequency-measuring instrument.

d) Tune the EUT to the center frequency of the operating band. Adjust the location of the measurement antenna and the

controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument, but is strong enough to allow measurement of the operating or fundamental frequency of the EUT). Adjust the detector bandwidth and span settings to achieve a resolution capable of accurate frequency measurements over the applicable frequency stability limits.

NOTE—An instrument that has an adequate level of accuracy as specified by the procuring or regulatory authority is the recommended measuring instrument.

e) Measure the frequency.

f) Unless otherwise specified, vary primary supply voltage from 85% to 115% of the nominal value for other than hand carried battery equipment.

g) For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.

h) Repeat the frequency measurement.

NOTE—For band-edge compliance, it can be required to make these measurements at the low and High channel of the operating band.

Note:

7. The results of the frequency stability test shown above the frequency deviation measured values are very small and similar trend for each path, so we are attached only the worst case data.
8. Test signal is CW signal for frequency stability.

Test Results:

Reference: - 53.3 Vdc at 20°C **Freq.** = 38,799,986,201 Hz

Voltage	Temp.	Frequency	Frequency	Deviation	ppm
(%)	(°C)	(Hz)	Error (Hz)	(Hz)	
100%	+20(Ref)	38799 986 420	218.524	0.000	0.00000
	-30	38799 986 217	15.692	-202.832	-0.00523
	-20	38799 986 288	86.508	-132.016	-0.00340
	-10	38799 986 396	194.762	-23.763	-0.00061
	0	38799 986 238	37.005	-181.519	-0.00468
	+10	38799 986 247	45.910	-172.614	-0.00445
	+30	38799 986 329	128.117	-90.407	-0.00233
	+40	38799 986 286	84.847	-133.677	-0.00345
	+50	38799 986 276	75.180	-143.344	-0.00369
115%	+20	38799 986 253	52.250	-166.275	-0.00429

6. EXTENSION MODULE VERIFICATION CERTIFICATE & CHECK

열 람 용
This certificate may not be reproduced other than in full except with permission of the issuing laboratory.

교 정 성 적 서
CALIBRATION CERTIFICATE

경기도 이천시 마장면 서이천로 578번길 74
TEL : 031-645-6900, FAX : 031-645-6969

성적서발급번호(Certificate No) : IC-2021-22854
교 정 번 호(Calibration No) : C-2021-028508

페이지(page) : 1 of 3

1. 의뢰자 (Client)
- 기관명 (Name) : (주)에이치시티
- 주 소 (Address) : 경기도 이천시 마장면 서이천로 578번길 74

2. 측정기 (Calibration Subject) ◇ 등록번호 : 415233
- 기기명 (Description) : SA EXTENSION MODULE
- 제작회사 및 형식(Manufacturer and Model Name) : VDI / SAX WR19
- 기기번호 (Serial Number) : SAX 771

3. 교정일자 (Date of Calibration) : 2021.03.17 **차기교정예정일자** : 2022.03.17
(The due date of next Calibration)

4. 교정환경 (Environment)
- 온도(Temperature) : (22.8 ± 0.1) ℃ - 습도(Humidity) : (48 ± 1) % R.H.
- 교정장소 (Location) : 고정표준실(Permanent Calibration Lab)
(주소: 경기도 이천시 마장면 서이천로 578번길 74)

5. 측정표준의 소급성 (Traceability) ◇Field code : 40641(RF SPECTRUM ANALYZER)

교정방법 및 소급성 서술 (Calibration method and/or brief description)

상기 기기는 고주파 스펙트럼 분석기의 교정절차(HCT-CS-125-40641)에 따라 국가측정표준기관으로부터 측정의 소급성이 확보된 아래의 표준장비를 이용하여 교정 되었음.

교정에 사용한 표준장비 명세 (List of used standards/specifications)

기기명 (Description)	제작회사 및 형식 (Manufacturer and Model Name)	기기번호 (Serial Number)	차기교정예정일자 (The due date of next Calibration)	교정기관 (Calibration laboratory)
EXG ANALOG SIGNAL GENERATOR	KEYSIGHT N5173B	MY53270544	2021/06/23	(주)에이치시티
EPM SERIES POWER METER	AGILENT E4419B	GB42420565	2021/11/02	(주)에이치시티
POWER SENSOR	AGILENT 8487A	MY41092450	2022/01/11	(주)에이치시티
POWER SENSOR	KEYSIGHT V8486A	MY56330017	2022/01/25	Keysight Technologies
WR-19 MULTIPLIER SOURCE MODULE	OML S19MS-A	160516-1	2021/09/09	(주)에이치시티

6. 교정결과 (Calibration result) : **교정결과 참조** (Refer to attachment)

7. 측정불확도 (Measurement uncertainty) : **교정결과 참조** (Refer to attachment)
신뢰수준 약 95 %, k = 2 (Confidence level about 95 %, k = 2)

확 인 (affirmation)	작성자 (Measurements performed by)	승인자 (Approved by)
	성명 (Name) 박 민 지	직위 (Title) 기술책임자(Technical Cal. Manager) (서명)
		성명 (Name) 이 승 찬

위 성적서는 국제시험기관인정협력체(International Laboratory Accreditation Cooperation) 상호인정협정(Mutual Recognition Arrangement)에 서명한 한국인정기구(KOLAS)로부터 공인 받은 분야의 교정결과입니다.

2021. 03. 17

한국인정기구 인정
Accredited by KOLAS, Republic of KOREA

㈜에이치시티 대표이사
President, HCT Co., Ltd.

㈜ 이 성적서는 측정기의 정밀정확도에 영향을 미치는 요소(과부하, 온도, 습도 등)의 급격한 변화가 발생한 경우에는 무효가 됩니다.
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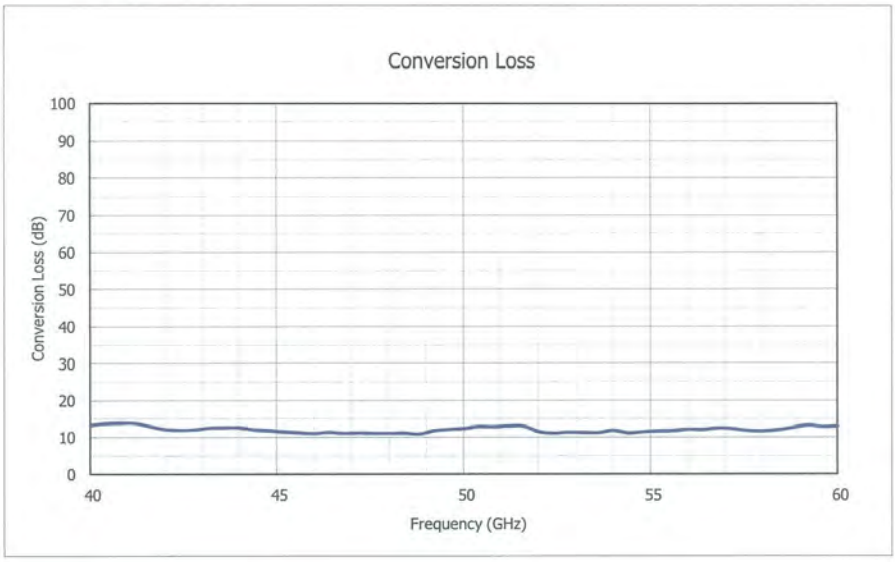
F-02P-02-008 (Rev.02)

교 정 결 과
CALIBRATION RESULT

성적서발급번호(Certificate No) : IC-2021-22854
교 정 번 호(Calibration No) : C-2021-028508

1. Conversion Loss Graph



Note 1) Keysight N9030B (SN MY55480167)와 함께 교정된 결과임.

F-02P-02-008 (Rev.02)

교 정 결 과
CALIBRATION RESULT

성적서발급번호(Certificate No) : IC-2021-22854
교 정 번 호(Calibration No) : C-2021-028508

2. Conversion Loss Data

Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)	Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)
40.0	13.2	2.4	50.4	12.8	2.4
40.4	13.7	2.4	50.8	12.7	2.4
40.8	13.8	2.4	51.2	13.0	2.4
41.2	13.8	2.4	51.6	12.9	2.4
41.6	13.0	2.4	52.0	11.5	2.4
42.0	12.1	2.4	52.4	11.1	2.4
42.4	12.0	2.4	52.8	11.3	2.4
42.8	12.0	2.4	53.2	11.2	2.4
43.2	12.5	2.4	53.6	11.2	2.4
43.6	12.6	2.4	54.0	11.8	2.4
44.0	12.6	2.4	54.4	11.1	2.4
44.4	12.0	2.4	54.8	11.4	2.4
44.8	11.8	2.4	55.2	11.6	2.4
45.2	11.5	2.4	55.6	11.7	2.4
45.6	11.2	2.4	56.0	12.1	2.4
46.0	11.0	2.4	56.4	12.0	2.4
46.4	11.3	2.4	56.8	12.4	2.4
46.8	11.1	2.4	57.2	12.2	2.4
47.2	11.1	2.4	57.6	11.7	2.4
47.6	11.1	2.4	58.0	11.6	2.4
48.0	11.0	2.4	58.4	11.9	2.4
48.4	11.1	2.4	58.8	12.5	2.4
48.8	10.8	2.4	59.2	13.2	2.4
49.2	11.7	2.4	59.6	12.7	2.4
49.6	12.1	2.4	60.0	13.0	2.4
50.0	12.3	2.4	-	-	-

끝.

F-02P-02-008 (Rev.02)

교 정 성 적 서
CALIBRATION CERTIFICATE

경기도 이천시 마장면 서이천로 578번길 74
TEL : 031-645-6900, FAX : 031-645-6969

성적서발급번호(Certificate No) : IC-2021-26221
교 정 번 호(Calibration No) : C-2021-031387

1. 의뢰자 (Client)
- 기관명 (Name) : (주)에이치시티
- 주소 (Address) : 경기도 이천시 마장면 서이천로 578번길 74

2. 측정기 (Calibration Subject) ◇ 등록번호 : 415873
- 기기명 (Description) : SA EXTENSION MODULE
- 제작회사 및 형식(Manufacturer and Model Name) : VDI / SAX WR12
- 기기번호 (Serial Number) : SAX773

3. 교정일자 (Date of Calibration) : 2021.04.02 **차기교정예정일자** : 2022.04.02 (The due date of next Calibration)

4. 교정환경 (Environment)
- 온도(Temperature) : (22.5 ± 0.5) ℃ - 습도(Humidity) : (46 ± 4) % R.H.
- 교정장소 (Location) : 고정표준실(Permanent Calibration Lab) (주소: 경기도 이천시 마장면 서이천로 578번길 74)

5. 측정표준의 소급성 (Traceability) ◇Field code : 40641(RF SPECTRUM ANALYZER)

교정방법 및 소급성 서술 (Calibration method and/or brief description)

상기 기기는 고주파 스펙트럼 분석기의 교정절차(HCT-CS-125-40641)에 따라 국가측정표준기관으로부터 측정의 소급성이 확보된 아래의 표준장비를 이용하여 교정 되었음.

교정에 사용한 표준장비 명세 (List of used standards/specifications)

기기명 (Description)	제작회사 및 형식 (Manufacturer and Model Name)	기기번호 (Serial Number)	차기교정예정일자 (The due date of next Calibration)	교정기관 (Calibration laboratory)
EXG ANALOG SIGNAL GENERATOR	KEYSIGHT N5173B	MY53270544	2021/06/23	(주)에이치시티
EPM SERIES POWER METER	AGILENT E4419B	GB42420565	2021/11/02	(주)에이치시티
POWER SENSOR	KEYSIGHT V8486A	MY56330017	2022/01/25	Keysight Technologies
POWER SENSOR	KEYSIGHT W8486A	MY56370005	2022/01/20	Keysight Technologies
WR-12 MULTIPLIER SOURCE MODULE	OML S12MS-A	160419-1	2021/09/09	(주)에이치시티

6. 교정결과 (Calibration result) : **교정결과 참조** (Refer to attachment)

7. 측정불확도 (Measurement uncertainty) : **교정결과 참조** (Refer to attachment)
신뢰수준 약 95 %, k = 2 (Confidence level about 95 %, k = 2)

확 인 (affirmation)	작성자 (Measurements performed by)	승인자 (Approved by)
	성명 (Name) 박 인 지	직위 (Title) 기술책임자(Technical Cal. Manager) (서명)
		성명 (Name) 이 승 찬

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2021. 04. 02

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㈜에이치시티 대표이사
President, HCT Co., Ltd.

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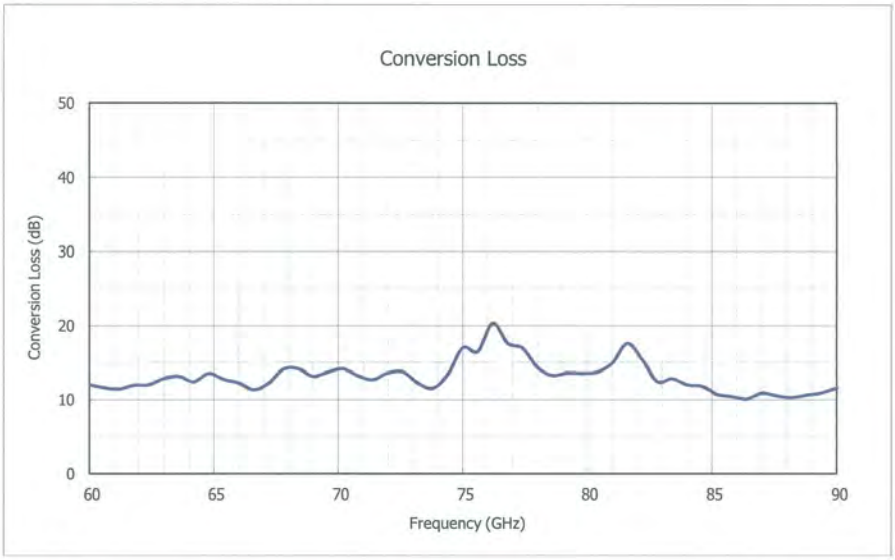
F-02P-02-008 (Rev.02)

교 정 결 과
CALIBRATION RESULT

성적서발급번호(Certificate No) : IC-2021-26221
교 정 번 호(Calibration No) : C-2021-031387

1. Conversion Loss Graph



Note 1) Keysight N9030B (SN MY55480167) 와 함께 교정된 결과임.

F-02P-02-008 (Rev.02)

교 정 결 과
CALIBRATION RESULT

성적서발급번호(Certificate No) : IC-2021-26221
교 정 번 호(Calibration No) : C-2021-031387

2. Conversion Loss Data

Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)	Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)
60.0	12.04	0.89	75.6	16.47	0.82
60.6	11.61	0.89	76.2	20.31	0.82
61.2	11.44	0.89	76.8	17.58	0.82
61.8	11.94	0.89	77.4	16.92	0.82
62.4	12.02	0.89	78.0	14.33	0.82
63.0	12.86	0.89	78.6	13.25	0.82
63.6	13.15	0.89	79.2	13.59	0.82
64.2	12.42	0.89	79.8	13.51	0.82
64.8	13.51	0.89	80.4	13.71	0.82
65.4	12.73	0.89	81.0	14.94	0.82
66.0	12.25	0.89	81.6	17.55	0.82
66.6	11.34	0.89	82.2	15.37	0.82
67.2	12.19	0.89	82.8	12.44	0.82
67.8	14.11	0.89	83.4	12.81	0.82
68.4	14.15	0.89	84.0	11.99	0.82
69.0	13.13	0.89	84.6	11.79	0.82
69.6	13.71	0.89	85.2	10.69	0.82
70.2	14.14	0.89	85.8	10.41	0.82
70.8	13.20	0.89	86.4	10.08	0.82
71.4	12.69	0.89	87.0	10.86	0.82
72.0	13.58	0.89	87.6	10.49	0.82
72.6	13.73	0.89	88.2	10.28	0.82
73.2	12.23	0.89	88.8	10.62	0.82
73.8	11.53	0.89	89.4	10.90	0.82
74.4	13.38	0.89	90.0	11.58	0.82
75.0	16.97	0.82	-	-	-

끝.

F-02P-02-008 (Rev.02)

교 정 성 적 서
CALIBRATION CERTIFICATE

경기도 이천시 마장면 서이천로 578번길 74
TEL : 031-645-6900, FAX : 031-645-6969

성적서발급번호(Certificate No) : IC-2021-24401
교 정 번 호(Calibration No) : C-2021-030478

1. 의뢰자 (Client)
- 기관명 (Name) : (주)에이치시티
- 주소 (Address) : 경기도 이천시 마장면 서이천로 578번길 74

2. 측정기 (Calibration Subject) ◇ 등록번호 : 415877
- 기기명 (Description) : SA EXTENSION MODULE
- 제작회사 및 형식(Manufacturer and Model Name) : VDI / SAX WR8.0
- 기기번호 (Serial Number) : SAX779

3. 교정일자 (Date of Calibration) : 2021.04.02 **차기교정예정일자** : 2022.04.02 (The due date of next Calibration)

4. 교정환경 (Environment)
- 온도(Temperature) : (22.5 ± 0.5) ℃ - 습도(Humidity) : (46 ± 4) % R.H.
- 교정장소 (Location) : 고정표준실(Permanent Calibration Lab) (주소: 경기도 이천시 마장면 서이천로 578번길 74)

5. 측정표준의 소급성 (Traceability) ◇Field code : 40641(RF SPECTRUM ANALYZER)

교정방법 및 소급성 서술 (Calibration method and/or brief description)

상기 기기는 고주파 스펙트럼 분석기의 교정절차(HCT-CS-125-40641)에 따라 국가측정표준기관으로부터 측정의 소급성이 확보된 아래의 표준장비를 이용하여 교정 되었음.

교정에 사용한 표준장비 명세 (List of used standards/specifications)

기기명 (Description)	제작회사 및 형식 (Manufacturer and Model Name)	기기번호 (Serial Number)	차기교정예정일자 (The due date of next Calibration)	교정기관 (Calibration laboratory)
EXG ANALOG SIGNAL GENERATOR	KEYSIGHT N5173B	MY53270544	2021/06/23	(주)에이치시티
EPM SERIES POWER METER	AGILENT E4419B	GB42420565	2021/11/02	(주)에이치시티
POWER SENSOR	KEYSIGHT W8486A	MY56370005	2022/01/20	Keysight Technologies
WR-08 MULTIPLIER SOURCE MODULE	OML S08MS-A	164019-1	2021/09/09	(주)에이치시티

6. 교정결과 (Calibration result) : **교정결과 참조** (Refer to attachment)

7. 측정불확도 (Measurement uncertainty) : **교정결과 참조** (Refer to attachment)
신뢰수준 약 95 %, k = 2 (Confidence level about 95 %, k = 2)

확 인 (affirmation)	작성자 (Measurements performed by)	승인자 (Approved by)
	성명 (Name) 박 민 지	직위 (Title) 기술책임자(Technical Cal. Manager) (서명)
		성명 (Name) 이 승 찬

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2021. 04. 02

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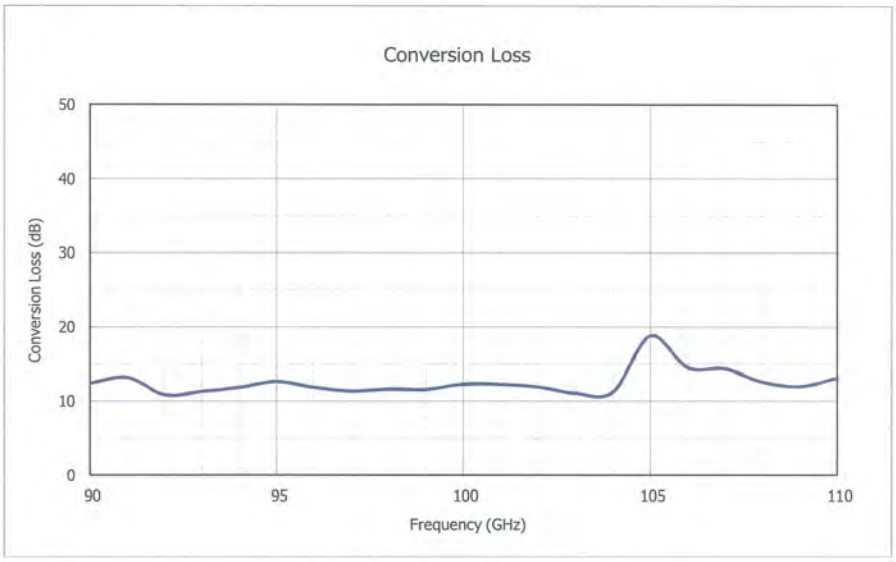
F-02P-02-008 (Rev.02)

교 정 결 과
CALIBRATION RESULT

성적서발급번호(Certificate No) : IC-2021-24401
교 정 번 호(Calibration No) : C-2021-030478

1. Conversion Loss Graph



Note 1) Keysight N9030B (SN MY55480167) 와 함께 교정된 결과임.

F-02P-02-008 (Rev.02)

교 정 결 과
CALIBRATION RESULT

성적서발급번호(Certificate No) : IC-2021-24401
교 정 번 호(Calibration No) : C-2021-030478

2. Conversion Loss Data

Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)	Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)
90.0	12.39	0.89	101.0	12.24	0.89
91.0	13.17	0.89	102.0	11.89	0.89
92.0	10.84	0.89	103.0	11.03	0.89
93.0	11.28	0.89	104.0	11.20	0.89
94.0	11.83	0.89	105.0	18.77	0.89
95.0	12.63	0.89	106.0	14.50	0.89
96.0	11.83	0.89	107.0	14.34	0.89
97.0	11.32	0.89	108.0	12.59	0.89
98.0	11.60	0.89	109.0	11.97	0.89
99.0	11.55	0.89	110.0	13.10	0.89
100.0	12.26	0.89	-	-	-

끝.

Measurement Report

74, Seoicheon-ro 578beon-gil, Majang-myeon,
Icheon-si, Gyeonggi-do, Korea 17383
Tel :82-31-645-6900, www.hct.co.kr

보고서번호(Report No) : IC-2021-27675
측 정 번 호(Measurement No) : C-2021-033180

1. 의뢰자 (Client)
- 기관명 (Name) : (주)에이치시티
- 주소 (Address) : 경기도 이천시 마장면 서이천로 578번길 74

2. 대상품목 (Measurement Item) ◇ HCT 등록번호 : 416612
- 기기명 (Description) : SA EXTENSION MODULE
- 제작회사 및 형식(Manufacturer and Model Name) : VDI / SAX WR8.0
- 기기번호 (Serial Number) : SAX779

3. 측정일자 (Measurement date) : 2021.04.02

4. 측정환경 (Environment)
- 온도(Temperature) : (22.5 ± 0.5) ℃ - 습도(Humidity) : (46 ± 4) % R.H.

5. 측정방법 (Measurement method used)

상기 기기는 고주파 스펙트럼 분석기의 교정절차(HCT-CS-125-40641)에 따라 국가측정표준기관으로부터 측정의 소급성이 확보된 아래의 표준장비를 이용하여 교정 되었음.

측정에 사용한 표준장비 명세 (List of used standards/specifications)

기기명 (Description)	제작회사 및 형식 (Manufacturer and Model Name)	기기번호 (Serial Number)	차기교정예정일자 (The due date of next Calibration)	교정기관 (Calibration laboratory)
EXG ANALOG SIGNAL GENERATOR	KEYSIGHT N5173B	MY53270544	2021/06/23	(주)에이치시티
ERICKSON POWER METER	VDI PM5	394V	측정	(주)에이치시티
WR-08 MULTIPLIER SOURCE MODULE	OML S08MS-A	160419-1	측정	(주)에이치시티

6. 측정결과 (Messurement result) : **측정결과 참조** (Refer to attachment)

㈜ 이 측정결과는 의뢰자가 제시한 시료 및 시료명에만 한정됩니다.
The messuremen results shown in this report refer only to the sample(s) measured unless otherwise stated.

확 인 (Affirmation)	작성자 (Tested by) 성명 (Name) : 박 민 지	승인자 (Approved by) 직위 (Title) 기술책임자(Technical Manager) 성명 (Name) 이 승 찬 (서명)

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2021. 04. 02

㈜에이치시티 대표이사
President, HCT Co., Ltd.

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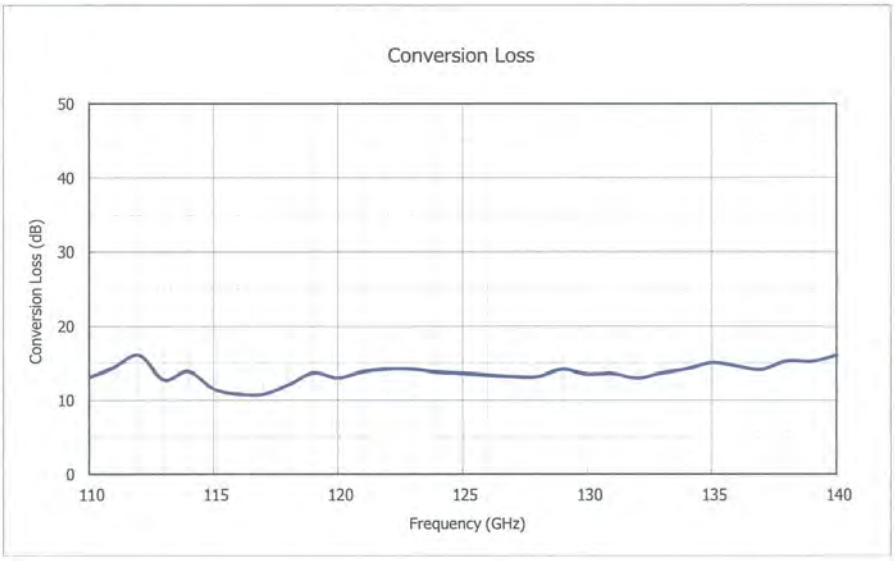
F-02P-02-010 (Rev.01)

MEASUREMENT RESULT

보고서번호(Report No) : IC-2021-27675
측 정 번 호(Measurement No) : C-2021-033180

1. Conversion Loss Graph



Note 1) Keysight N9030B (SN MY55480167) 와 함께 교정된 결과임.
Note 2) 110 GHz 초과 대역의 전력에 대해 국제적인 소급표준이 없으므로 HCT에서 자체 점검된 기준기로 점검되었음.
- In the absence of power standards above 110 GHz, power measurements above 110 GHz are to confirm operation functionality and traceable only to HCT.

F-02P-02-010 (Rev.01)

MEASUREMENT RESULT

2. Conversion Loss Data

Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)	Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)
110.0	13.1	0.82	126.0	13.4	0.82
111.0	14.4	0.82	127.0	13.2	0.82
112.0	16.1	0.82	128.0	13.2	0.82
113.0	12.8	0.82	129.0	14.1	0.82
114.0	13.9	0.82	130.0	13.5	0.82
115.0	11.5	0.82	131.0	13.6	0.82
116.0	10.8	0.82	132.0	13.0	0.82
117.0	10.8	0.82	133.0	13.6	0.82
118.0	12.0	0.82	134.0	14.2	0.82
119.0	13.7	0.82	135.0	15.0	0.82
120.0	13.0	0.82	136.0	14.5	0.82
121.0	13.8	0.82	137.0	14.1	0.82
122.0	14.2	0.82	138.0	15.2	0.82
123.0	14.1	0.82	139.0	15.2	0.82
124.0	13.8	0.82	140.0	16.0	0.82
125.0	13.6	0.82	-	-	-

끝.

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Measurement Report

74, Seoicheon-ro 578beon-gil, Majang-myeon,
Icheon-si, Gyeonggi-do, Korea 17383
Tel :82-31-645-6900, www.hct.co.kr

보고서번호(Report No) : IC-2021-24399
측 정 번 호(Measurement No) : C-2021-030476

1. 의뢰자 (Client)
- 기관명 (Name) : (주)에이치시티
- 주소 (Address) : 경기도 이천시 마장면 서이천로 578번길 74

2. 대상품목 (Measurement Item) ◇ HCT 등록번호 : 415876
- 기기명 (Description) : SA EXTENSION MODULE
- 제작회사 및 형식(Manufacturer and Model Name) : VDI / SAX WR5.1
- 기기번호 (Serial Number) : SAX774

3. 측정일자 (Measurement date) : 2021.04.02

4. 측정환경 (Environment)
- 온도(Temperature) : (22.5 ± 0.5) ℃ - 습도(Humidity) : (46 ± 4) % R.H.

5. 측정방법 (Measurement method used)

상기 기기는 고주파 스펙트럼 분석기의 교정절차(HCT-CS-125-40641)에 따라 국가측정표준기관으로부터 측정의 소급성이 확보된 아래의 표준장비를 이용하여 교정 되었음.

측정에 사용한 표준장비 명세 (List of used standards/specifications)

기기명 (Description)	제작회사 및 형식 (Manufacturer and Model Name)	기기번호 (Serial Number)	차기교정예정일자 (The due date of next Calibration)	교정기관 (Calibration laboratory)
EXG ANALOG SIGNAL GENERATOR	KEYSIGHT N5173B	MY53270544	2021/06/23	(주)에이치시티
ERICKSON POWER METER	VDI PM5	394V	측정	(주)에이치시티
WR-05 MULTIPLIER SOURCE MODULE	OML S05MS-A	160419-1	측정	(주)에이치시티

6. 측정결과 (Messurement result) : **측정결과 참조** (Refer to attachment)

㈜ 이 측정결과는 의뢰자가 제시한 시료 및 시료명에만 한정됩니다.
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확 인 (Affirmation)	작성자 (Tested by) 성명 (Name) : 박 민 지	승인자 (Approved by) 직위 (Title) 기술책임자(Technical Manager) 성명 (Name) 이 승 찬 (서명)

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2021. 04. 02

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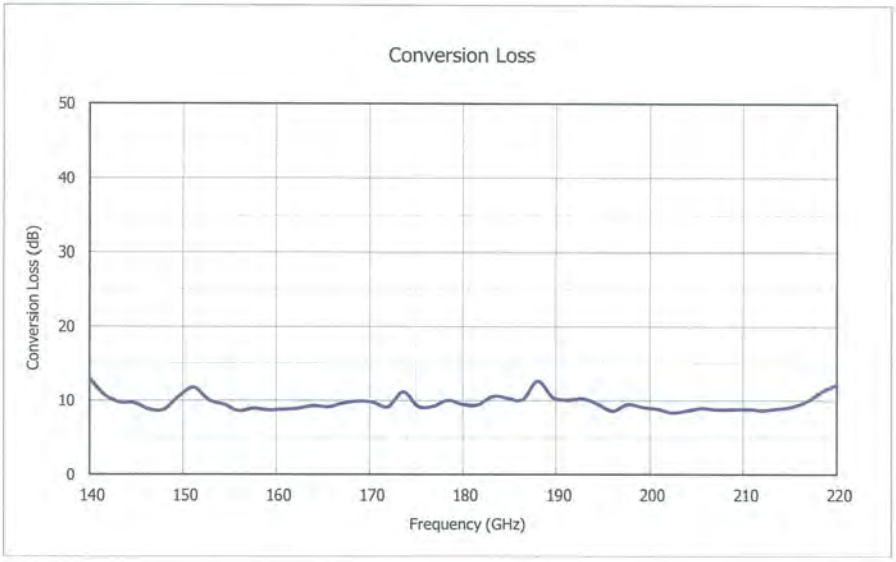
F-02P-02-010 (Rev.01)

MEASUREMENT RESULT

보고서번호(Report No) : IC-2021-24399
측 정 번 호(Measurement No) : C-2021-030476

1. Conversion Loss Graph



Note 1) Keysight N9030B (SN MY55480167) 와 함께 교정된 결과임.
Note 2) 110 GHz 초과 대역의 전력에 대해 국제적인 소급표준이 없으므로 HCT에서 자체 점검된 기준기로 점검되었음.
- In the absence of power standards above 110 GHz, power measurements above 110 GHz are to confirm operation functionality and traceable only to HCT.

F-02P-02-010 (Rev.01)

MEASUREMENT RESULT

2. Conversion Loss Data

Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)	Frequency (GHz)	Conversion Loss (dB)	Measurement Uncertainty (dB)
140.0	12.9	0.86	181.6	9.4	0.86
141.6	10.7	0.86	183.2	10.5	0.86
143.2	9.7	0.86	184.8	10.3	0.86
144.8	9.6	0.86	186.4	10.1	0.86
146.4	8.8	0.86	188.0	12.6	0.86
148.0	8.8	0.86	189.6	10.4	0.86
149.6	10.6	0.86	191.2	10.0	0.86
151.2	11.7	0.86	192.8	10.2	0.86
152.8	10.0	0.86	194.4	9.5	0.86
154.4	9.4	0.86	196.0	8.5	0.86
156.0	8.6	0.86	197.6	9.4	0.86
157.6	8.9	0.86	199.2	9.1	0.86
159.2	8.7	0.86	200.8	8.8	0.86
160.8	8.8	0.86	202.4	8.3	0.86
162.4	8.9	0.86	204.0	8.6	0.86
164.0	9.3	0.86	205.6	8.9	0.86
165.6	9.1	0.86	207.2	8.7	0.86
167.2	9.6	0.86	208.8	8.7	0.86
168.8	9.9	0.86	210.4	8.8	0.86
170.4	9.7	0.86	212.0	8.6	0.86
172.0	9.1	0.86	213.6	8.8	0.86
173.6	11.2	0.86	215.2	9.1	0.86
175.2	9.2	0.86	216.8	9.9	0.86
176.8	9.2	0.86	218.4	11.2	0.86
178.4	10.0	0.86	220.0	12.1	0.86
180.0	9.4	0.86	-	-	-

끝.

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7. Annex B_EUT AND TEST SETUP PHOTO

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-2201-FC106-P