

FCC Carrier Aggregation REPORT

Certification

Applicant Name:
SAMSUNG Electronics Co., Ltd.

Date of Issue:
June 15, 2021

Address:
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Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

Location:
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Report No.: HCT-RF-2105-FC030-R1

FCC ID: A3LSMG990U

APPLICANT: SAMSUNG Electronics Co., Ltd.

Model(s): SM-G990U
 Additional Model(s): SM-G990U1/DS, SM-G990U1
 EUT Type: Mobile Phone
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
 FCC Rule Part(s): §27, §2

| Mode (PCC+SCC) | Tx Frequency (MHz) | Modulation | Emission Designator | EIRP | |
|-------------------|-----------------------|------------|------------------------|---------------------|-------------------|
| | | | | Max. Power (dBm) | Max. Power (W) |
| 5MHz+5MHz | 1712.5 - 1777.5 | QPSK | 9M23G7D | 22.70 | 0.186 |
| | | 16QAM | 9M22W7D | 22.31 | 0.170 |
| | | 64QAM | 9M24W7D | 19.74 | 0.094 |
| | | 256QAM | 9M26W7D | 17.83 | 0.061 |
| 5MHz+10MHz | 1712.8 - 1775.0 | QPSK | 13M9G7D | 22.69 | 0.186 |
| | | 16QAM | 13M8W7D | 22.22 | 0.167 |
| | | 64QAM | 13M9W7D | 19.03 | 0.080 |
| | | 256QAM | 13M8W7D | 17.63 | 0.058 |
| 10MHz+5MHz | 1715.0 - 1777.2 | QPSK | 13M9G7D | 22.58 | 0.181 |
| | | 16QAM | 13M9W7D | 22.10 | 0.162 |
| | | 64QAM | 13M9W7D | 18.85 | 0.077 |
| | | 256QAM | 13M9W7D | 17.57 | 0.057 |
| 5MHz+15MHz | 1713.0 - 1772.5 | QPSK | 18M2G7D | 22.61 | 0.182 |
| | | 16QAM | 18M2W7D | 21.87 | 0.154 |
| | | 64QAM | 18M1W7D | 18.71 | 0.074 |
| | | 256QAM | 18M1W7D | 17.41 | 0.055 |
| 15MHz+5MHz | 1717.5 - 1777.0 | QPSK | 18M2G7D | 22.36 | 0.172 |
| | | 16QAM | 18M2W7D | 21.56 | 0.143 |
| | | 64QAM | 18M2W7D | 18.43 | 0.070 |
| | | 256QAM | 18M2W7D | 17.06 | 0.051 |
| 10MHz+10MHz | 1715.0 - 1775.0 | QPSK | 18M7G7D | 22.50 | 0.178 |
| | | 16QAM | 18M8W7D | 21.82 | 0.152 |
| | | 64QAM | 18M8W7D | 18.71 | 0.074 |
| | | 256QAM | 18M7W7D | 17.43 | 0.055 |

The measurements shown in this report were made in accordance with the procedures specified in CFR47 section §2.947. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

Report No.: HCT-RF-2105-FC030-R1

REVIEWED BY



Report prepared by : Jae Mun Do
Engineer of Telecommunication Testing Center

Report approved by : Jong Seok Lee
Manager of Telecommunication Testing Center

This test results were applied only to the test methods required by the standard.

This laboratory is not accredited for the test results marked *.

The above Test Report is the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (HCT Accreditation No.: KT197)

* The report shall not be reproduced except in full(only partly) without approval of the laboratory.

Version

| TEST REPORT NO. | DATE | DESCRIPTION |
|----------------------|---------------|--|
| HCT-RF-2105-FC030 | May 26, 2021 | - First Approval Report |
| HCT-RF-2105-FC030-R1 | June 15, 2021 | - Revised the Additional model(s). (SM-G990U1 added) |

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.

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MEASUREMENT REPORT

1. GENERAL INFORMATION

| | |
|-----------------------------|--|
| Applicant Name: | SAMSUNG Electronics Co., Ltd. |
| Address: | 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea |
| FCC ID: | A3LSMG990U |
| Application Type: | Certification |
| FCC Classification: | PCS Licensed Transmitter Held to Ear (PCE) |
| FCC Rule Part(s): | §27, §2 |
| EUT Type: | Mobile Phone |
| Model(s): | SM-G990U |
| Additional Model(s): | SM-G990U1/DS, SM-G990U1 |
| Tx Frequency: | 1712.5 - 1777.5: 5MHz+5MHz 1712.8 - 1775.0: 5MHz+10MHz 1715.0 - 1777.2: 10MHz+5MHz 1713.0 - 1772.5: 5MHz+15MHz 1717.5 - 1777.0: 15MHz+5MHz 1715.0 - 1775.0: 10MHz+10MHz |
| Date(s) of Tests: | April 19, 2021 ~ May 18, 2021 |
| Serial number: | Radiated: R3CR315S6MD Conducted: R3CR3117FBH |
| LTE CA : | CA 66B (Uplink) |

2. INTRODUCTION

2.1. DESCRIPTION OF EUT

The EUT was a Mobile Phone with GSM/GPRS/EGPRS/UMTS, CDMA(BC0, 1, 10) and LTE, Sub6.

It also supports IEEE 802.11 a/b/g/n/ac/ax (HT20/40/80), Bluetooth, BT LE, NFC, WPT, mmWave(n260/261).

2.2. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

2.3. TEST FACILITY

The Fully-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.**

3. DESCRIPTION OF TESTS

3.1 TEST PROCEDURE

| Test Description | Test Procedure Used |
|---|---|
| Occupied Bandwidth | - KDB 971168 D01 v03r01 – Section 4.3 - ANSI C63.26-2015 – Section 5.4.4 |
| Band Edge | - KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7 |
| Spurious and Harmonic Emissions at Antenna Terminal | - KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7 |
| Peak- to- Average Ratio | - KDB 971168 D01 v03r01 – Section 5.7 - ANSI C63.26-2015 – Section 5.2.3.4 - ANSI C63.26-2015 – Section 5.2.6(only GSM) |
| Frequency stability | - ANSI C63.26-2015 – Section 5.6 |
| Effective Radiated Power/ Effective Isotropic Radiated Power | - KDB 971168 D01 v03r01 – Section 5.2 & 5.8 - ANSI/TIA-603-E-2016 – Section 2.2.17 |
| Radiated Spurious and Harmonic Emissions | - KDB 971168 D01 v03r01 – Section 6.2 - ANSI/TIA-603-E-2016 – Section 2.2.12 |

3.2 RADIATED POWER

Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

The equipment under test is placed on a non-conductive table 3-meters away from the receive antenna in accordance with ANSI/TIA-603-E-2016 Clause 2.2.17.

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW \geq 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points $>$ 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

Test Note

1. The turntable is rotated through 360 degrees, and the receiving antenna scans in order to determine the level of the maximized emission.
2. A half wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.

The power is calculated by the following formula;

$$P_{d(\text{dBm})} = P_{g(\text{dBm})} - \text{cable loss (dB)} + \text{antenna gain (dB)}$$

Where: P_d is the dipole equivalent power and P_g is the generator output power into the substitution antenna.

3. The maximum value is calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference

between the gain of the horn and an isotropic antenna are taken into consideration

4. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
5. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

3.3 RADIATED SPURIOUS EMISSIONS

Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA-603-E-2016.

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW $\geq 3 \times$ RBW
3. Span = 1.5 times the OBW
4. No. of sweep points $> 2 \times$ span / RBW
5. Detector = Peak
6. Trace mode = Max Hold
7. The trace was allowed to stabilize
8. Test channel : Low/ Middle/ High
9. Frequency range : We are performed all frequency to 10th harmonics from 9 kHz.

Test Note

1. Measurements value show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
2. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the test data
3. For spurious emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated. The spurious emissions is calculated by the following formula;

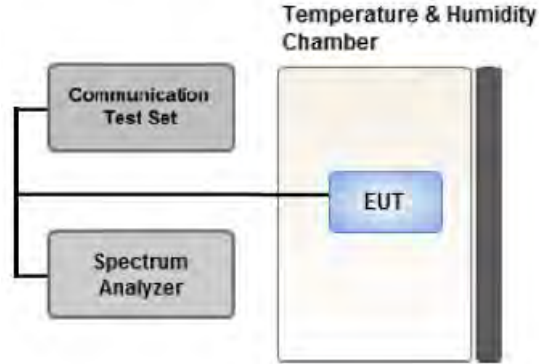
$$\text{Result}_{(\text{dBm})} = P_{g(\text{dBm})} - \text{cable loss}_{(\text{dB})} + \text{antenna gain}_{(\text{dBi})}$$

Where: P_g is the generator output power into the substitution antenna.

If the fundamental frequency is below 1GHz, RF output power has been converted to EIRP.

$$\text{EIRP}_{(\text{dBm})} = \text{ERP}_{(\text{dBm})} + 2.15$$

3.4 PEAK- TO- AVERAGE RATIO



Test setup

① CCDF Procedure for PAPR

Test Settings

1. Set resolution/measurement bandwidth \geq signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Set the measurement interval as follows:
 - for continuous transmissions, set to 1 ms,
 - or burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
4. Record the maximum PAPR level associated with a probability of 0.1%.

② Alternate Procedure for PAPR

Use one of the procedures presented in 5.2(ANSI C63.26-2015) to measure the total peak power and record as P_{Pk} .

Use one of the applicable procedures presented 5.2(ANSI C63.26-2015) to measure the total average power and record as P_{Avg} . Determine the P.A.R. from:

$$P.A.R_{(dB)} = P_{Pk (dBm)} - P_{Avg (dBm)} \quad (P_{Avg} = \text{Average Power} + \text{Duty cycle Factor})$$

Test Settings(Peak Power)

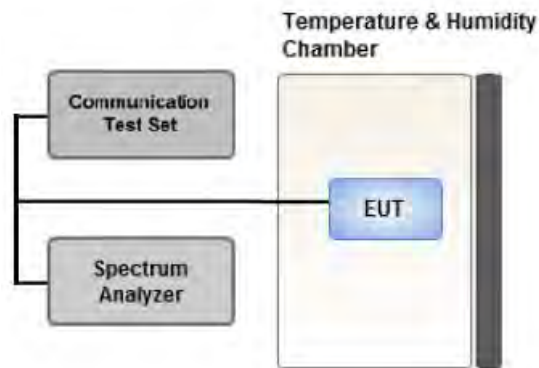
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW $\geq 3 \times$ RBW.

1. Set the RBW \geq OBW.
2. Set VBW $\geq 3 \times$ RBW.
3. Set span $\geq 2 \times$ OBW.
4. Sweep time $\geq 10 \times$ (number of points in sweep) \times (transmission symbol period).
5. Detector = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the peak amplitude level.

Test Settings(Average Power)

1. Set span to $2 \times$ to $3 \times$ the OBW.
2. Set RBW \geq OBW.
3. Set VBW $\geq 3 \times$ RBW.
4. Set number of measurement points in sweep $\geq 2 \times$ span / RBW.
5. Sweep time:
Set $\geq [10 \times (\text{number of points in sweep}) \times (\text{transmission period})]$ for single sweep (automation-compatible) measurement. The transmission period is the (on + off) time.
6. Detector = power averaging (rms).
7. Set sweep trigger to "free run."
8. 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 period 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.)
9. Use the peak marker function to determine the maximum amplitude level.
10. Add $[10 \log (1/\text{duty cycle})]$ to the measured maximum power level to compute the average power during continuous transmission. For example, add $[10 \log (1/0.25)] = 6 \text{ dB}$ if the duty cycle is a constant 25%.

3.5 OCCUPIED BANDWIDTH.



Test setup

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

The EUT makes a call to the communication simulator.

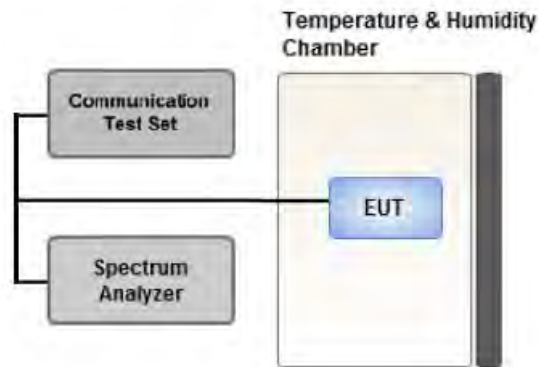
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW \geq 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

3.6 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



Test setup

Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic.

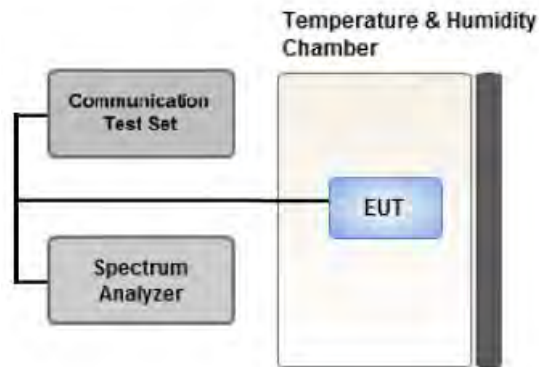
All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Settings

1. RBW = 1 MHz
2. VBW \geq 3 MHz
3. Detector = RMS
4. Trace Mode = trace average
5. Sweep time = auto
6. Number of points in sweep \geq 2 x Span / RBW

3.7 BAND EDGE



Test setup

Test Overview

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW > 1% of the emission bandwidth
4. VBW > 3 x RBW
5. Detector = RMS
6. Number of sweep points $\geq 2 \times \text{Span}/\text{RBW}$
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

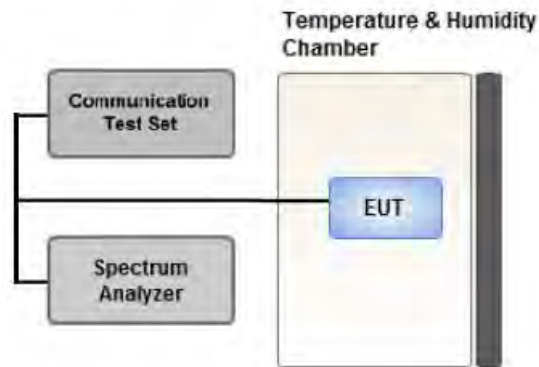
Test Notes

According to FCC 22.917, 24.238, 27.53 specified that power of any emission outside of The authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

All measurements were done at 2 channels(low and high operational frequency range.)

The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

3.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE



Test setup

Test Overview

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015.

The frequency stability of the transmitter is measured by:

1. Temperature:

The temperature is varied from -30°C to $+50^{\circ}\text{C}$ in 10°C increments using an environmental chamber.

2. Primary Supply Voltage:

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

- 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.

Test Settings

1. The carrier frequency of the transmitter is measured at room temperature

(20°C to provide a reference).

2. The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter.

Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.

3. Frequency measurements are made at 10°C intervals ranging from -30°C to $+50^{\circ}\text{C}$. A period of at

least one half-hour is provided to allow stabilization of the equipment at each temperature level.

4. LIST OF TEST EQUIPMENT

| Manufacture | Model/ Equipment | Serial Number | Calibration Date | Calibrati on Interval | Calibration Due |
|------------------|--|---------------|------------------|-----------------------|-----------------|
| T&M SYSTEM | FBSR-02B(WHK1.2/15G-10EF)/H.P.F | - | 03/02/2021 | Annual | 03/02/2022 |
| T&M SYSTEM | FBSR-02B(WHK3.3/18G-10EF)/H.P.F | - | 03/02/2021 | Annual | 03/02/2022 |
| Hewlett Packard | 11667B / Power Splitter(DC~26.5 GHz) | 11275 | 04/07/2021 | Annual | 04/07/2022 |
| Hewlett Packard | E3632A/DC Power Supply | MY40004427 | 09/16/2020 | Annual | 09/16/2021 |
| Schwarzbeck | UHAP/ Dipole Antenna | 557 | 04/05/2021 | Biennial | 04/05/2023 |
| Schwarzbeck | UHAP/ Dipole Antenna | 558 | 04/05/2021 | Biennial | 04/05/2023 |
| ESPEC | SU-642 / Chamber | 93008124 | 03/15/2021 | Annual | 03/15/2022 |
| Schwarzbeck | BBHA 9120D/ Horn Antenna(1~18GHz) | 147 | 08/29/2019 | Biennial | 08/29/2021 |
| Schwarzbeck | BBHA 9120D/ Horn Antenna(1~18GHz) | 9120D-1298 | 09/25/2019 | Biennial | 09/25/2021 |
| Schwarzbeck | BBHA 9170/ Horn Antenna(15~40GHz) | BBHA9170342 | 10/13/2020 | Biennial | 10/13/2022 |
| Schwarzbeck | BBHA 9170/ Horn Antenna(15~40GHz) | BBHA9170124 | 02/11/2020 | Biennial | 02/11/2022 |
| Agilent | N9020A/Signal Analyzer(10Hz~26.5GHz) | MY50200093 | 11/17/2020 | Annual | 11/17/2021 |
| Hewlett Packard | 8493C/ATTENUATOR(20dB) | 17280 | 06/04/2020 | Annual | 06/04/2021 |
| REOHDE & SCHWARZ | FSV40/Spectrum Analyzer(10Hz~40GHz) | 100931 | 10/14/2020 | Annual | 10/14/2021 |
| Agilent | 8960 (E5515C)/ Base Station | MY48360800 | 08/26/2020 | Annual | 08/26/2021 |
| Schwarzbeck | FMZB1513/ Loop Antenna(9kHz~30MHz) | 1513-333 | 03/19/2020 | Biennial | 03/19/2022 |
| Schwarzbeck | VULB9160/ Bilog Antenna | 3150 | 03/03/2021 | Biennial | 03/03/2023 |
| Schwarzbeck | VULB9168/ Hybrid Antenna | 760 | 02/22/2021 | Biennial | 02/22/2023 |
| Anritsu Corp. | MT8821C/Wideband Radio Communication Tester | 6262116770 | 07/22/2020 | Annual | 07/22/2021 |
| Anritsu Corp. | MT8820C/Wideband Radio Communication Tester | 6201026545 | 01/07/2021 | Annual | 01/07/2022 |
| REOHDE & SCHWARZ | SMB100A/ SIGNAL GENERATOR (100kHz~40GHz) | 177633 | 07/13/2020 | Annual | 07/13/2021 |
| KEYSIGHT | N9030B / Signal Analyzer(5Hz~40.0GHz) | MY55480167 | 06/04/2020 | Annual | 06/04/2021 |
| HCT CO., LTD., | FCC LTE Mobile Conducted RF Automation Test Software | - | - | - | - |

Note:

- Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
- Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

5. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4:2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

| Parameter | Expanded Uncertainty (\pm dB) |
|--|----------------------------------|
| Conducted Disturbance (150 kHz ~ 30 MHz) | 1.82 |
| Radiated Disturbance (9 kHz ~ 30 MHz) | 3.40 |
| Radiated Disturbance (30 MHz ~ 1 GHz) | 4.80 |
| Radiated Disturbance (1 GHz ~ 18 GHz) | 5.70 |
| Radiated Disturbance (18 GHz ~ 40 GHz) | 5.05 |

6. SUMMARY OF TEST RESULTS

6.1 Test Condition : Conducted Test

| Test Description | FCC Part Section(s) | Test Limit | Test Result |
|--|---------------------|--|-------------|
| Occupied Bandwidth | §2.1049 | N/A | PASS |
| Band Edge / Spurious and Harmonic Emissions at Antenna Terminal. | §2.1051, §27.53(h) | < 43 + 10log10 (P[Watts]) at Band Edge and for all out-of-band emissions | PASS |
| Peak- to- Average Ratio | 27.50(d)(5) | < 13 dB | PASS |
| Frequency stability / variation of ambient temperature | §2.1055, § 27.54 | Emission must remain in band | PASS |

6.2 Test Condition : Radiated Test

| Test Description | FCC Part Section(s) | Test Limit | Test Result |
|--|---------------------|---|-------------|
| Equivalent Isotropic Radiated Power | 27.50(d)(4) | < 1 Watts max. EIRP | PASS |
| Radiated Spurious and Harmonic Emissions | §2.1053, §27.53(h) | < 43 + 10log10 (P[Watts]) for all out-of band emissions | PASS |

7. SAMPLE CALCULATION

7.1 ERP Sample Calculation

| Ch./ Freq. | | Measured Level(dBm) | Substitute Level(dBm) | Ant. Gain (dBd) | C.L | Pol. | ERP | |
|------------|------------|---------------------|-----------------------|-----------------|------|------|-------|-------|
| channel | Freq.(MHz) | | | | | | W | dBm |
| 128 | 824.20 | -21.37 | 38.40 | -10.61 | 0.95 | H | 0.483 | 26.84 |

ERP = Substitute LEVEL(dBm) + Ant. Gain – CL(Cable Loss)

- 1) The EUT mounted on a non-conductive turntable is 2.5 meter above test site ground level.
- 2) During the test , the turn table is rotated until the maximum signal is found.
- 3) Record the field strength meter’s level.
- 4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
- 5) Increase the signal generator output till the field strength meter’s level is equal to the item (3).
- 6) The signal generator output level with Ant. Gain and cable loss are the rating of effective radiated power.

7.2 EIRP Sample Calculation

| Ch./ Freq. | | Measured Level(dBm) | Substitute Level(dBm) | Ant. Gain (dBi) | C.L | Pol. | EIRP | |
|------------|------------|---------------------|-----------------------|-----------------|------|------|-------|-------|
| channel | Freq.(MHz) | | | | | | W | dBm |
| 20175 | 1,732.50 | -15.75 | 18.45 | 9.90 | 1.76 | H | 0.456 | 26.59 |

EIRP = Substitute LEVEL(dBm) + Ant. Gain – CL(Cable Loss)

- 1) The EUT mounted on a non-conductive turntable is 2.5 meter above test site ground level.
- 2) During the test , the turn table is rotated until the maximum signal is found.
- 3) Record the field strength meter’s level.
- 4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
- 5) Increase the signal generator output till the field strength meter’s level is equal to the item (3).
- 6) The signal generator output level with Ant. Gain and cable loss are the rating of equivalent isotropic radiated power.

7.3. Emission Designator

GSM Emission Designator

Emission Designator = 249KGXW

GSM BW = 249 kHz

G = Phase Modulation

X = Cases not otherwise covered

W = Combination (Audio/Data)

EDGE Emission Designator

Emission Designator = 249KG7W

GSM BW = 249 kHz

G = Phase Modulation

7 = Quantized/Digital Info

W = Combination (Audio/Data)

WCDMA Emission Designator

Emission Designator = 4M17F9W

WCDMA BW = 4.17 MHz

F = Frequency Modulation

9 = Composite Digital Info

W = Combination (Audio/Data)

QPSK Modulation

Emission Designator = 4M48G7D

LTE BW = 4.48 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

QAM Modulation

Emission Designator = 4M48W7D

LTE BW = 4.48 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

8. TEST DATA

Test Overview

The EUT is set up to transmit two contiguous LTE channels. The power level of both carriers and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Note

1. All tests were evaluated for the two contiguous channels using various combinations of RB size, RB offset, modulation, and channel bandwidth.
2. Channel bandwidth is shown in the tables below based only on the channel bandwidths that were supported in this device.

| Channel Bandwidth (PCC) | Channel Bandwidth (SCC) | Maximum aggregated bandwidth (MHz) |
|------------------------------------|------------------------------------|---|
| 5 | 5 | 10 |
| 5 | 10 | 15 |
| 10 | 5 | 15 |
| 5 | 15 | 20 |
| 15 | 5 | 20 |
| 10 | 10 | 20 |

3. All modes of operation were investigated and the worst case configuration results are reported in this section.

Please refer to the table below.

- Worst case(Conducted Spurious Emissions, Band Edge)
: We have selected higher of the Conduction Output Power.
- Worst case(Radiated Spurious Emissions) : We have selected higher of the EIRP.
- Worst case(OBW, PAR, Frequency stability)
: All modes of operation were investigated and the worst case configuration results are reported.

[Worst case]

| Test Description | Mod | Operating frequency | PCC | | | | | SCC | | | | |
|---|------|---------------------|----------|-------------|--------|----|-----------|----------|-------------|--------|----|-----------|
| | | | BW (MHz) | Freq. (MHz) | Ch. | RB | RB Offset | BW (MHz) | Freq. (MHz) | Ch. | RB | RB Offset |
| Conducted Spurious Emissions/ Band Edge | QPSK | Low | 5 | 1712.5 | 131997 | 1 | 24 | 5 | 1717.3 | 132045 | 1 | 0 |
| | QPSK | Mid | 5 | 1752.6 | 132398 | 1 | 24 | 5 | 1757.4 | 132446 | 1 | 0 |
| | QPSK | High | 5 | 1767.8 | 132550 | 1 | 24 | 10 | 1775.0 | 132622 | 1 | 0 |
| | QPSK | Low | 5 | 1712.5 | 131997 | 1 | 0 | 5 | 1717.3 | 132045 | 1 | 24 |
| | QPSK | Mid | 5 | 1752.6 | 132398 | 1 | 0 | 5 | 1757.4 | 132446 | 1 | 24 |
| | QPSK | High | 5 | 1767.8 | 132550 | 1 | 0 | 10 | 1775.0 | 132622 | 1 | 49 |
| | QPSK | Low | 5 | 1712.8 | 132000 | 25 | 0 | 10 | 1720.0 | 132072 | 50 | 0 |
| | QPSK | Mid | 10 | 1752.5 | 132397 | 50 | 0 | 5 | 1759.7 | 132469 | 25 | 0 |
| | QPSK | High | 5 | 1767.8 | 132550 | 25 | 0 | 10 | 1775.0 | 132622 | 50 | 0 |
| | QPSK | Low | 10 | 1715.0 | 132022 | 50 | 0 | 10 | 1724.9 | 132121 | 50 | 0 |
| | QPSK | Mid | 10 | 1750.1 | 132373 | 50 | 0 | 10 | 1760.0 | 132472 | 50 | 0 |
| | QPSK | High | 10 | 1765.1 | 132523 | 50 | 0 | 10 | 1775.0 | 132622 | 50 | 0 |
| Radiated Spurious Emissions | QPSK | Low | 5 | 1712.5 | 131997 | 1 | 24 | 5 | 1717.3 | 132045 | 1 | 0 |
| | QPSK | Mid | 5 | 1752.6 | 132398 | 1 | 24 | 5 | 1757.4 | 132446 | 1 | 0 |
| | QPSK | High | 5 | 1772.7 | 132599 | 1 | 24 | 5 | 1777.5 | 132647 | 1 | 0 |

[Worst case]

| Test Description | Mod | Operating frequency | PCC | | | | | SCC | | | | |
|---------------------|----------------------------|---------------------|----------|-------------|--------|----|-----------|----------|-------------|--------|----|-----------|
| | | | BW (MHz) | Freq. (MHz) | Ch. | RB | RB Offset | BW (MHz) | Freq. (MHz) | Ch. | RB | RB Offset |
| OBW, PAR | QPSK, 16QAM, 64QAM, 256QAM | Mid | 5 | 1752.6 | 132398 | 25 | 0 | 5 | 1757.4 | 132446 | 25 | 0 |
| | | | 5 | 1750.3 | 132375 | 25 | 0 | 10 | 1757.5 | 132447 | 50 | 0 |
| | | | 10 | 1752.5 | 132397 | 50 | 0 | 5 | 1759.7 | 132469 | 25 | 0 |
| | | | 5 | 1748.1 | 132353 | 25 | 0 | 15 | 1757.4 | 132446 | 75 | 0 |
| | | | 15 | 1752.6 | 132398 | 75 | 0 | 5 | 1761.9 | 132491 | 25 | 0 |
| | | | 10 | 1750.1 | 132373 | 50 | 0 | 10 | 1760.0 | 132472 | 50 | 0 |
| Frequency stability | QPSK | Low | 5 | 1712.5 | 131997 | 25 | 0 | 5 | 1717.3 | 132045 | 25 | 0 |
| | | | 10 | 1715.0 | 132022 | 50 | 0 | 5 | 1722.2 | 132094 | 25 | 0 |
| | | | 15 | 1717.5 | 132047 | 75 | 0 | 5 | 1726.8 | 132140 | 25 | 0 |
| | | High | 5 | 1772.7 | 132599 | 25 | 0 | 5 | 1777.5 | 132647 | 25 | 0 |
| | | | 10 | 1770.0 | 132572 | 50 | 0 | 5 | 1777.2 | 132644 | 25 | 0 |
| | | | 15 | 1767.7 | 132549 | 75 | 0 | 5 | 1777.0 | 132642 | 25 | 0 |

8.1 Conducted Power

| Operating frequency | PCC | | | | | SCC | | | | | Conducted. Power [dBm] |
|---------------------|-----------------|---------------|---------------|----------|-----------|-----------------|---------------|---------------|----------|-----------|------------------------|
| | Bandwidth [MHz] | Freq. (MHz) | Channel | RB | RB Offset | Bandwidth [MHz] | Freq. (MHz) | Channel | RB | RB Offset | |
| Low | 5 | 1712.5 | 131997 | 1 | 24 | 5 | 1717.3 | 132045 | 1 | 0 | 24.42 |
| | 5 | 1712.8 | 132000 | 1 | 24 | 10 | 1720.0 | 132072 | 1 | 0 | 24.30 |
| | 10 | 1715.0 | 132022 | 1 | 49 | 5 | 1722.2 | 132094 | 1 | 0 | 24.28 |
| | 5 | 1713.0 | 132002 | 1 | 24 | 15 | 1722.3 | 132095 | 1 | 0 | 24.14 |
| | 15 | 1717.5 | 132047 | 1 | 74 | 5 | 1726.8 | 132140 | 1 | 0 | 24.00 |
| | 10 | 1715.0 | 132022 | 1 | 49 | 10 | 1724.9 | 132121 | 1 | 0 | 24.23 |
| Mid | 5 | 1752.6 | 132398 | 1 | 24 | 5 | 1757.4 | 132446 | 1 | 0 | 24.86 |
| | 5 | 1750.3 | 132375 | 1 | 24 | 10 | 1757.5 | 132447 | 1 | 0 | 24.69 |
| | 10 | 1752.5 | 132397 | 1 | 49 | 5 | 1759.7 | 132469 | 1 | 0 | 24.78 |
| | 5 | 1748.1 | 132353 | 1 | 24 | 15 | 1757.4 | 132446 | 1 | 0 | 24.82 |
| | 15 | 1752.6 | 132398 | 1 | 74 | 5 | 1761.9 | 132491 | 1 | 0 | 24.71 |
| | 10 | 1750.1 | 132373 | 1 | 49 | 10 | 1760.0 | 132472 | 1 | 0 | 24.71 |
| High | 5 | 1772.7 | 132599 | 1 | 24 | 5 | 1777.5 | 132647 | 1 | 0 | 24.60 |
| | 5 | 1767.8 | 132550 | 1 | 24 | 10 | 1775.0 | 132622 | 1 | 0 | 24.95 |
| | 10 | 1770.0 | 132572 | 1 | 49 | 5 | 1777.2 | 132644 | 1 | 0 | 24.63 |
| | 5 | 1763.2 | 132504 | 1 | 24 | 15 | 1772.5 | 132597 | 1 | 0 | 24.63 |
| | 15 | 1767.7 | 132549 | 1 | 74 | 5 | 1777.0 | 132642 | 1 | 0 | 24.51 |
| | 10 | 1765.1 | 132523 | 1 | 49 | 10 | 1775.0 | 132622 | 1 | 0 | 24.62 |

Note:

Modulation : QPSK(1RB)

| Operating frequency | PCC | | | | | SCC | | | | | Conducted. Power [dBm] |
|---------------------|-----------------|---------------|---------------|-----------|-----------|-----------------|---------------|---------------|-----------|-----------|------------------------|
| | Bandwidth [MHz] | Freq. (MHz) | Channel | RB | RB Offset | Bandwidth [MHz] | Freq. (MHz) | Channel | RB | RB Offset | |
| Low | 5 | 1712.5 | 131997 | 25 | 0 | 5 | 1717.3 | 132045 | 25 | 0 | 22.54 |
| | 5 | 1712.8 | 132000 | 25 | 0 | 10 | 1720.0 | 132072 | 50 | 0 | 22.60 |
| | 10 | 1715.0 | 132022 | 50 | 0 | 5 | 1722.2 | 132094 | 25 | 0 | 22.59 |
| | 5 | 1713.0 | 132002 | 25 | 0 | 15 | 1722.3 | 132095 | 75 | 0 | 22.43 |
| | 15 | 1717.5 | 132047 | 75 | 0 | 5 | 1726.8 | 132140 | 25 | 0 | 22.45 |
| | 10 | 1715.0 | 132022 | 50 | 0 | 10 | 1724.9 | 132121 | 50 | 0 | 22.52 |
| Mid | 5 | 1752.6 | 132398 | 25 | 0 | 5 | 1757.4 | 132446 | 25 | 0 | 22.62 |
| | 5 | 1750.3 | 132375 | 25 | 0 | 10 | 1757.5 | 132447 | 50 | 0 | 22.68 |
| | 10 | 1752.5 | 132397 | 50 | 0 | 5 | 1759.7 | 132469 | 25 | 0 | 22.70 |
| | 5 | 1748.1 | 132353 | 25 | 0 | 15 | 1757.4 | 132446 | 75 | 0 | 22.59 |
| | 15 | 1752.6 | 132398 | 75 | 0 | 5 | 1761.9 | 132491 | 25 | 0 | 22.63 |
| | 10 | 1750.1 | 132373 | 50 | 0 | 10 | 1760.0 | 132472 | 50 | 0 | 22.68 |
| High | 5 | 1772.7 | 132599 | 25 | 0 | 5 | 1777.5 | 132647 | 25 | 0 | 22.60 |
| | 5 | 1767.8 | 132550 | 25 | 0 | 10 | 1775.0 | 132622 | 50 | 0 | 22.80 |
| | 10 | 1770.0 | 132572 | 50 | 0 | 5 | 1777.2 | 132644 | 25 | 0 | 22.59 |
| | 5 | 1763.2 | 132504 | 25 | 0 | 15 | 1772.5 | 132597 | 75 | 0 | 22.79 |
| | 15 | 1767.7 | 132549 | 75 | 0 | 5 | 1777.0 | 132642 | 25 | 0 | 22.56 |
| | 10 | 1765.1 | 132523 | 50 | 0 | 10 | 1775.0 | 132622 | 50 | 0 | 22.56 |

Note:

Modulation : QPSK(Full RB)

| Operating frequency | PCC | | | | | SCC | | | | | Conducted. Power [dBm] |
|---------------------|-----------------|-------------|---------|----|-----------|-----------------|-------------|---------|----|-----------|------------------------|
| | Bandwidth [MHz] | Freq. (MHz) | Channel | RB | RB Offset | Bandwidth [MHz] | Freq. (MHz) | Channel | RB | RB Offset | |
| Low | 5 | 1712.5 | 131997 | 1 | 24 | 5 | 1717.3 | 132045 | 1 | 0 | 24.08 |
| Mid | 5 | 1752.6 | 132398 | 1 | 24 | 5 | 1757.4 | 132446 | 1 | 0 | 24.15 |
| High | 5 | 1767.8 | 132550 | 1 | 24 | 10 | 1775.0 | 132622 | 1 | 0 | 24.24 |
| Low | 5 | 1712.8 | 132000 | 25 | 0 | 10 | 1720.0 | 132072 | 50 | 0 | 21.84 |
| Mid | 10 | 1752.5 | 132397 | 50 | 0 | 5 | 1759.7 | 132469 | 25 | 0 | 21.89 |
| High | 5 | 1767.8 | 132550 | 25 | 0 | 10 | 1775.0 | 132622 | 50 | 0 | 21.95 |

Note:

Modulation : 16QAM

| Operating frequency | PCC | | | | | SCC | | | | | Conducted. Power [dBm] |
|---------------------|-----------------|-------------|---------|----|-----------|-----------------|-------------|---------|----|-----------|------------------------|
| | Bandwidth [MHz] | Freq. (MHz) | Channel | RB | RB Offset | Bandwidth [MHz] | Freq. (MHz) | Channel | RB | RB Offset | |
| Low | 5 | 1712.5 | 131997 | 1 | 24 | 5 | 1717.3 | 132045 | 1 | 0 | 20.71 |
| Mid | 5 | 1752.6 | 132398 | 1 | 24 | 5 | 1757.4 | 132446 | 1 | 0 | 21.61 |
| High | 5 | 1767.8 | 132550 | 1 | 24 | 10 | 1775.0 | 132622 | 1 | 0 | 22.37 |
| Low | 5 | 1712.8 | 132000 | 25 | 0 | 10 | 1720.0 | 132072 | 50 | 0 | 21.75 |
| Mid | 10 | 1752.5 | 132397 | 50 | 0 | 5 | 1759.7 | 132469 | 25 | 0 | 21.87 |
| High | 5 | 1767.8 | 132550 | 25 | 0 | 10 | 1775.0 | 132622 | 50 | 0 | 21.60 |

Note:

Modulation : 64QAM

| Operating frequency | PCC | | | | | SCC | | | | | Conducted. Power [dBm] |
|---------------------|-----------------|-------------|---------|----|-----------|-----------------|-------------|---------|----|-----------|------------------------|
| | Bandwidth [MHz] | Freq. (MHz) | Channel | RB | RB Offset | Bandwidth [MHz] | Freq. (MHz) | Channel | RB | RB Offset | |
| Low | 5 | 1712.5 | 131997 | 1 | 24 | 5 | 1717.3 | 132045 | 1 | 0 | 19.39 |
| Mid | 5 | 1752.6 | 132398 | 1 | 24 | 5 | 1757.4 | 132446 | 1 | 0 | 20.01 |
| High | 5 | 1767.8 | 132550 | 1 | 24 | 10 | 1775.0 | 132622 | 1 | 0 | 20.20 |
| Low | 5 | 1712.8 | 132000 | 25 | 0 | 10 | 1720.0 | 132072 | 50 | 0 | 19.88 |
| Mid | 10 | 1752.5 | 132397 | 50 | 0 | 5 | 1759.7 | 132469 | 25 | 0 | 19.97 |
| High | 5 | 1767.8 | 132550 | 25 | 0 | 10 | 1775.0 | 132622 | 50 | 0 | 19.94 |

Note:

Modulation : 256QAM

8.2 Equivalent Isotropic Radiated Power

| | PCC | | | SCC | | | Measured Level (dBm) | Substitute Level (dBm) | Ant. Gain (dBi) | C.L | Pol. | E.I.R.P | |
|------|----------|---------------|-------------|----------|---------------|------------|----------------------|------------------------|-----------------|-------------|----------|--------------|--------------|
| | BW [MHz] | Channel | RB/Offset | BW [MHz] | Channel | RB/Offset | | | | | | W | dBm |
| Low | 5 | 131997 | 1/24 | 5 | 132045 | 1/0 | -18.65 | 14.68 | 9.90 | 1.88 | H | 0.186 | 22.70 |
| | 5 | 132000 | 1/24 | 10 | 132072 | 1/0 | -18.66 | 14.67 | 9.90 | 1.88 | H | 0.186 | 22.69 |
| | 10 | 132022 | 1/49 | 5 | 132094 | 1/0 | -18.77 | 14.56 | 9.90 | 1.88 | H | 0.181 | 22.58 |
| | 5 | 132002 | 1/24 | 15 | 132095 | 1/0 | -18.74 | 14.59 | 9.90 | 1.88 | H | 0.182 | 22.61 |
| | 15 | 132047 | 1/74 | 5 | 132140 | 1/0 | -19.20 | 14.13 | 9.90 | 1.88 | H | 0.164 | 22.15 |
| | 10 | 132022 | 1/49 | 10 | 132121 | 1/0 | -18.85 | 14.48 | 9.90 | 1.88 | H | 0.178 | 22.50 |
| Mid | 5 | 132398 | 1/24 | 5 | 132446 | 1/0 | -19.26 | 14.04 | 10.02 | 1.91 | H | 0.164 | 22.15 |
| | 5 | 132375 | 1/24 | 10 | 132447 | 1/0 | -19.32 | 13.98 | 10.02 | 1.91 | H | 0.162 | 22.09 |
| | 10 | 132397 | 1/49 | 5 | 132469 | 1/0 | -19.44 | 13.86 | 10.02 | 1.91 | H | 0.157 | 21.97 |
| | 5 | 132353 | 1/24 | 15 | 132446 | 1/0 | -19.32 | 13.98 | 10.02 | 1.91 | H | 0.162 | 22.09 |
| | 15 | 132398 | 1/74 | 5 | 132491 | 1/0 | -19.33 | 13.97 | 10.02 | 1.91 | H | 0.161 | 22.08 |
| | 10 | 132373 | 1/49 | 10 | 132472 | 1/0 | -19.30 | 14.00 | 10.02 | 1.91 | H | 0.162 | 22.11 |
| High | 5 | 132599 | 1/24 | 5 | 132647 | 1/0 | -19.09 | 14.28 | 10.02 | 1.92 | H | 0.173 | 22.38 |
| | 5 | 132550 | 1/24 | 10 | 132622 | 1/0 | -19.23 | 14.14 | 10.02 | 1.92 | H | 0.167 | 22.24 |
| | 10 | 132572 | 1/49 | 5 | 132644 | 1/0 | -19.20 | 14.17 | 10.02 | 1.92 | H | 0.169 | 22.27 |
| | 5 | 132504 | 1/24 | 15 | 132597 | 1/0 | -19.46 | 13.91 | 10.02 | 1.92 | H | 0.159 | 22.01 |
| | 15 | 132549 | 1/74 | 5 | 132642 | 1/0 | -19.11 | 14.26 | 10.02 | 1.92 | H | 0.172 | 22.36 |
| | 10 | 132523 | 1/49 | 10 | 132622 | 1/0 | -19.19 | 14.18 | 10.02 | 1.92 | H | 0.169 | 22.28 |

Note:

1. Modulation : QPSK
2. Limit : < 2 Watts

| PCC | | | SCC | | | Measured Level (dBm) | Substitute Level (dBm) | Ant. Gain (dBi) | C.L | Pol. | E.I.R.P | |
|----------|---------|-----------|----------|---------|-----------|----------------------|------------------------|-----------------|------|------|---------|-------|
| BW [MHz] | Channel | RB/Offset | BW [MHz] | Channel | RB/Offset | | | | | | W | dBm |
| 5 | 131997 | 1/24 | 5 | 132045 | 1/0 | -19.04 | 13.88 | 10.75 | 2.32 | H | 0.170 | 22.31 |
| 5 | 132000 | 1/24 | 10 | 132072 | 1/0 | -19.13 | 13.79 | 10.75 | 2.32 | H | 0.167 | 22.22 |
| 10 | 132022 | 1/49 | 5 | 132094 | 1/0 | -19.25 | 13.67 | 10.75 | 2.32 | H | 0.162 | 22.10 |
| 5 | 132002 | 1/24 | 15 | 132095 | 1/0 | -19.48 | 13.44 | 10.75 | 2.32 | H | 0.154 | 21.87 |
| 15 | 132047 | 1/74 | 5 | 132140 | 1/0 | -19.79 | 13.13 | 10.75 | 2.32 | H | 0.143 | 21.56 |
| 10 | 132022 | 1/49 | 10 | 132121 | 1/0 | -19.53 | 13.39 | 10.75 | 2.32 | H | 0.152 | 21.82 |
| 5 | 132398 | 1/24 | 5 | 132446 | 1/0 | -19.93 | 12.85 | 10.98 | 2.35 | H | 0.140 | 21.48 |
| 5 | 132599 | 1/24 | 5 | 132647 | 1/0 | -19.82 | 12.94 | 11.10 | 2.39 | H | 0.146 | 21.65 |

Note:

1. Modulation : 16QAM
2. Limit : < 2 Watts

| PCC | | | SCC | | | Measured Level (dBm) | Substitute Level (dBm) | Ant. Gain (dBi) | C.L | Pol. | E.I.R.P | |
|----------|---------|-----------|----------|---------|-----------|----------------------|------------------------|-----------------|------|------|---------|-------|
| BW [MHz] | Channel | RB/Offset | BW [MHz] | Channel | RB/Offset | | | | | | W | dBm |
| 5 | 131997 | 1/24 | 5 | 132045 | 1/0 | -22.28 | 10.64 | 10.75 | 2.32 | H | 0.081 | 19.07 |
| 5 | 132000 | 1/24 | 10 | 132072 | 1/0 | -22.32 | 10.60 | 10.75 | 2.32 | H | 0.080 | 19.03 |
| 10 | 132022 | 1/49 | 5 | 132094 | 1/0 | -22.50 | 10.42 | 10.75 | 2.32 | H | 0.077 | 18.85 |
| 5 | 132002 | 1/24 | 15 | 132095 | 1/0 | -22.64 | 10.28 | 10.75 | 2.32 | H | 0.074 | 18.71 |
| 15 | 132047 | 1/74 | 5 | 132140 | 1/0 | -22.92 | 10.00 | 10.75 | 2.32 | H | 0.070 | 18.43 |
| 10 | 132022 | 1/49 | 10 | 132121 | 1/0 | -22.64 | 10.28 | 10.75 | 2.32 | H | 0.074 | 18.71 |
| 5 | 132398 | 1/24 | 5 | 132446 | 1/0 | -22.70 | 10.08 | 10.98 | 2.35 | H | 0.074 | 18.71 |
| 5 | 132599 | 1/24 | 5 | 132647 | 1/0 | -21.73 | 11.03 | 11.10 | 2.39 | H | 0.094 | 19.74 |

Note:

1. Modulation : 64QAM
2. Limit : < 2 Watts

| PCC | | | SCC | | | Measured Level (dBm) | Substitute Level (dBm) | Ant. Gain (dBi) | C.L | Pol. | E.I.R.P | |
|----------|---------|-----------|----------|---------|-----------|----------------------|------------------------|-----------------|------|------|---------|-------|
| BW [MHz] | Channel | RB/Offset | BW [MHz] | Channel | RB/Offset | | | | | | W | dBm |
| 5 | 131997 | 1/24 | 5 | 132045 | 1/0 | -23.52 | 9.40 | 10.75 | 2.32 | H | 0.061 | 17.83 |
| 5 | 132000 | 1/24 | 10 | 132072 | 1/0 | -23.72 | 9.20 | 10.75 | 2.32 | H | 0.058 | 17.63 |
| 10 | 132022 | 1/49 | 5 | 132094 | 1/0 | -23.78 | 9.14 | 10.75 | 2.32 | H | 0.057 | 17.57 |
| 5 | 132002 | 1/24 | 15 | 132095 | 1/0 | -23.94 | 8.98 | 10.75 | 2.32 | H | 0.055 | 17.41 |
| 15 | 132047 | 1/74 | 5 | 132140 | 1/0 | -24.29 | 8.63 | 10.75 | 2.32 | H | 0.051 | 17.06 |
| 10 | 132022 | 1/49 | 10 | 132121 | 1/0 | -23.92 | 9.00 | 10.75 | 2.32 | H | 0.055 | 17.43 |
| 5 | 132398 | 1/24 | 5 | 132446 | 1/0 | -24.22 | 8.56 | 10.98 | 2.35 | H | 0.052 | 17.19 |
| 5 | 132599 | 1/24 | 5 | 132647 | 1/0 | -23.89 | 8.87 | 11.10 | 2.39 | H | 0.057 | 17.58 |

Note:

1. Modulation : 256QAM
2. Limit : < 2 Watts

8.3 Conducted Spurious Emissions

| Operating frequency | PCC | | | | SCC | | | | Measurement | Factor (dB) | Measurement | Result (dBm) |
|---------------------|----------|--------|-------------|-----------|----------|--------|-------------|-----------|-------------------------|-------------|--------------------|--------------|
| | BW [MHz] | Ch. | Freq. (MHz) | RB/Offset | BW [MHz] | Ch. | Freq. (MHz) | RB/Offset | Maximum Frequency (GHz) | | Maximum Data (dBm) | |
| Low | 5 | 131997 | 1712.5 | 1/24 | 5 | 132045 | 1717.3 | 1/0 | 7.2119 | 28.591 | -76.17 | -47.58 |
| Mid | 5 | 132398 | 1752.6 | 1/24 | 5 | 132446 | 1757.4 | 1/0 | 3.5100 | 27.976 | -76.14 | -48.17 |
| High | 5 | 132550 | 1767.8 | 1/24 | 10 | 132622 | 1775.0 | 1/0 | 7.9895 | 28.591 | -75.74 | -47.15 |
| Low | 5 | 131997 | 1712.5 | 1/0 | 5 | 132045 | 1717.3 | 1/24 | 8.0229 | 28.591 | -76.34 | -47.75 |
| Mid | 5 | 132398 | 1752.6 | 1/0 | 5 | 132446 | 1757.4 | 1/24 | 3.1451 | 27.976 | -76.26 | -48.28 |
| High | 5 | 132550 | 1767.8 | 1/0 | 10 | 132622 | 1775.0 | 1/49 | 3.2673 | 27.976 | -76.02 | -48.04 |
| Low | 5 | 132000 | 1712.8 | 25/0 | 10 | 132072 | 1720.0 | 50/0 | 5.9980 | 28.591 | -75.57 | -46.98 |
| Mid | 10 | 132397 | 1752.5 | 50/0 | 5 | 132469 | 1759.7 | 25/0 | 7.4616 | 28.591 | -76.38 | -47.79 |
| High | 5 | 132550 | 1767.8 | 25/0 | 10 | 132622 | 1775.0 | 50/0 | 7.4382 | 28.591 | -76.77 | -48.18 |
| Low | 10 | 132022 | 1715.0 | 50/0 | 10 | 132121 | 1724.9 | 50/0 | 3.7777 | 27.976 | -76.45 | -48.47 |
| Mid | 10 | 132373 | 1750.1 | 50/0 | 10 | 132472 | 1760.0 | 50/0 | 6.0454 | 28.591 | -75.88 | -47.29 |
| High | 10 | 132523 | 1765.1 | 50/0 | 10 | 132622 | 1775.0 | 50/0 | 8.0269 | 28.591 | -76.23 | -47.64 |

Note:

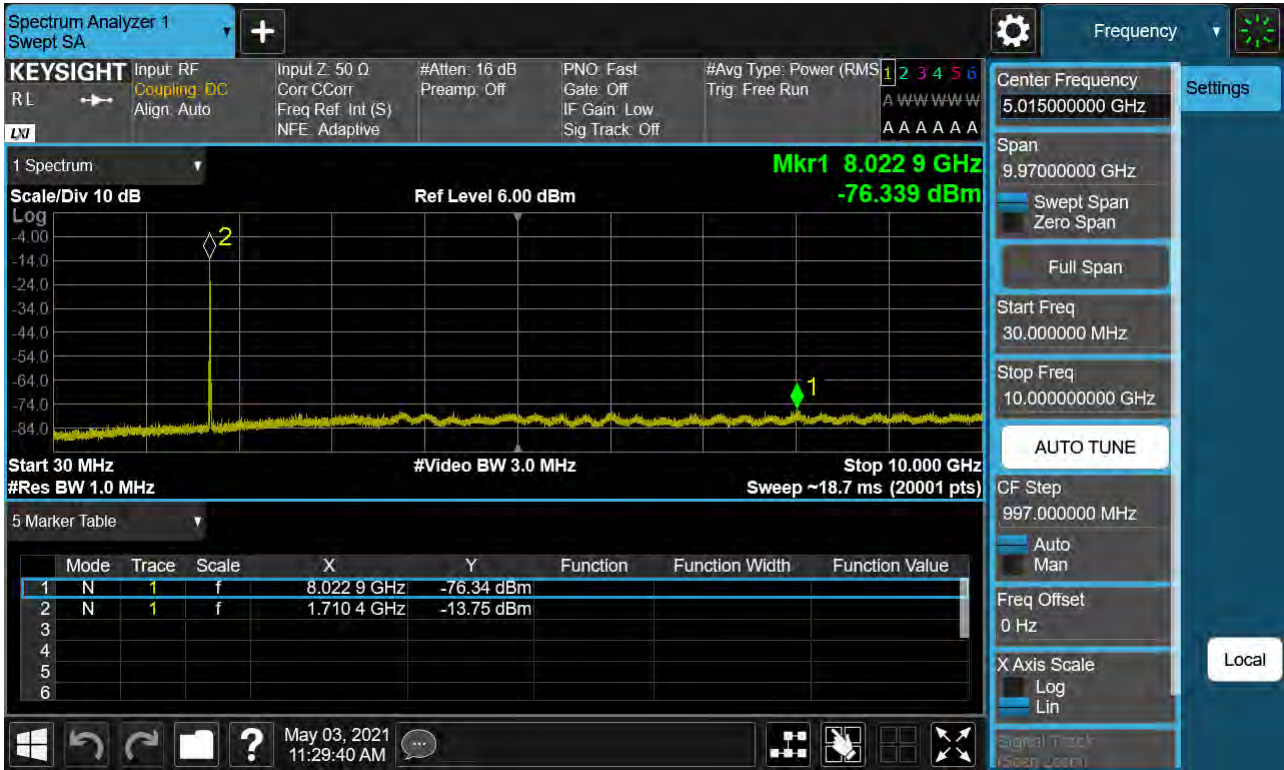
1. Modulation : QPSK
2. Factor(dB) = Cable Loss + Ext. Attenuator + Power Splitter
3. Factors for frequency :

| Frequency Range (GHz) | Factor [dB] |
|-----------------------|-------------|
| 0.03 – 1 | 25.270 |
| 1 – 5 | 27.976 |
| 5 – 10 | 28.591 |
| 10 – 15 | 29.116 |
| 15 – 20 | 29.489 |
| Above 20(26.5) | 30.131 |

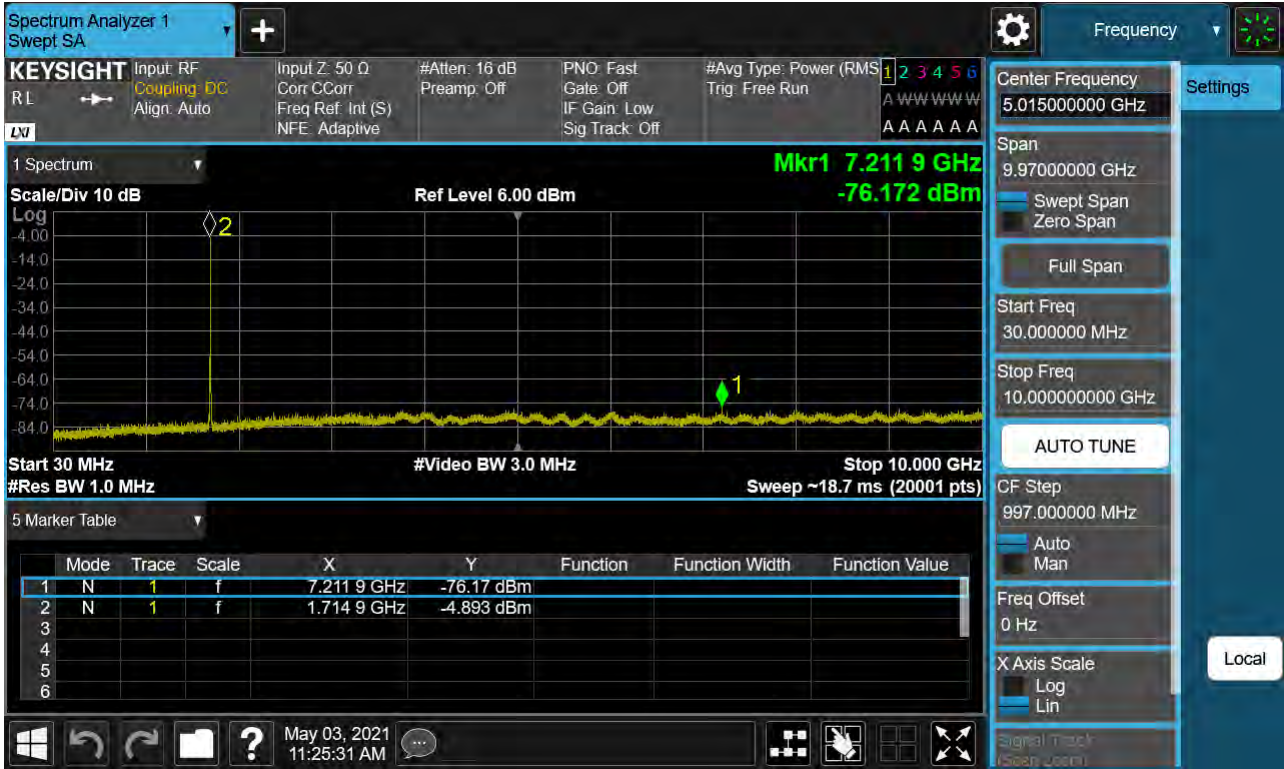
4. Limit : -13.0 dBm

Frequency Range : 30MHz ~ 10GHz

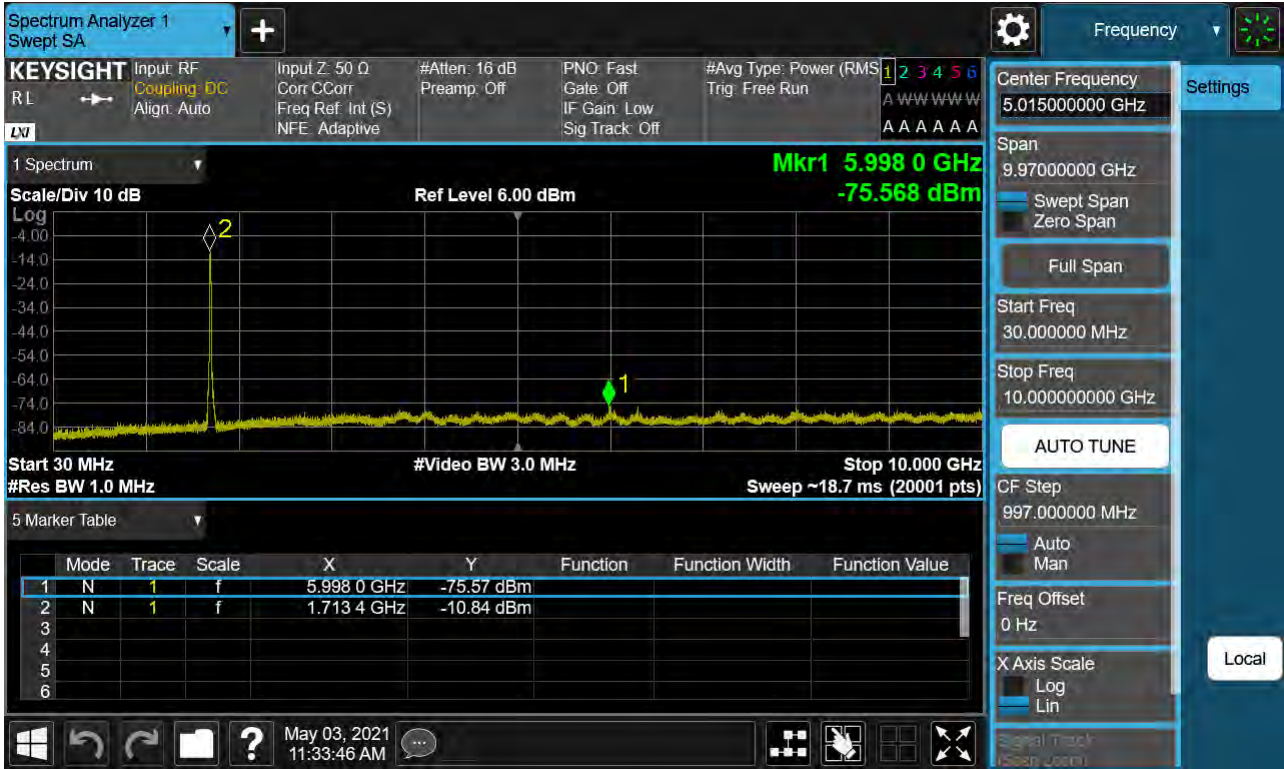
PCC 5MHz Ch131997 RB1 Offset0 SCC 5MHz Ch132045 RB1 Offset24



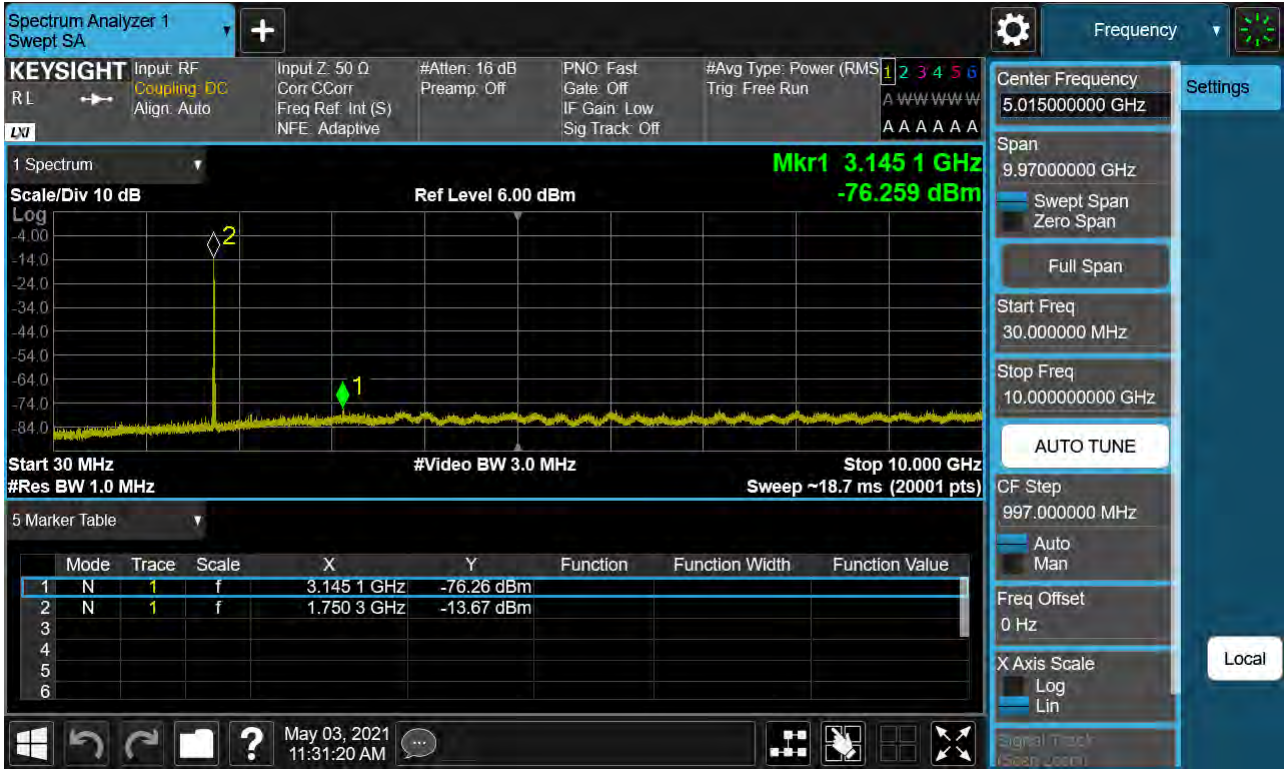
PCC 5MHz Ch131997 RB1 Offset24 SCC 5MHz Ch132045 RB1 Offset0



PCC 5MHz Ch132000 RB25 Offset0 SCC 10MHz Ch132072 RB50 Offset0



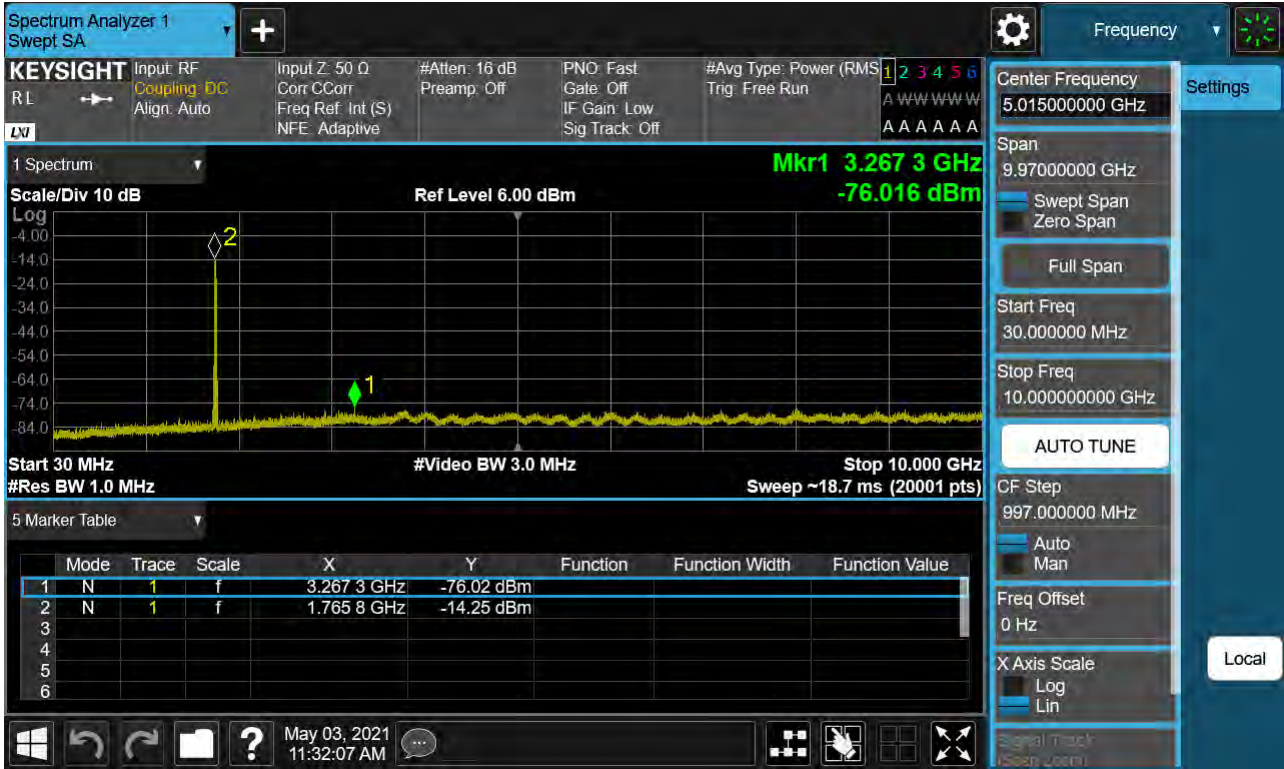
PCC 5MHz Ch132398 RB1 Offset0 SCC 5MHz Ch132446 RB1 Offset24



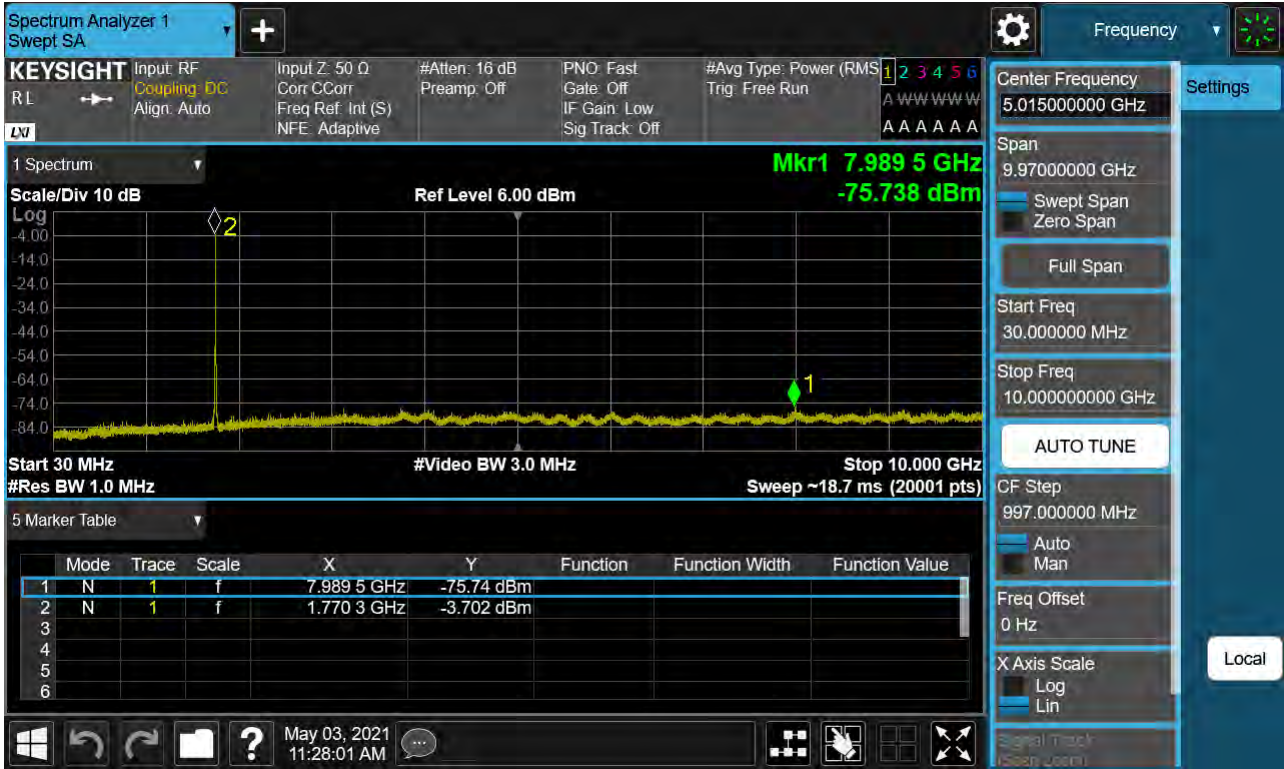
PCC 5MHz Ch132398 RB1 Offset24 SCC 5MHz Ch132446 RB1 Offset0



PCC 5MHz Ch132550 RB1 Offset0 SCC 10MHz Ch132622 RB1 Offset49



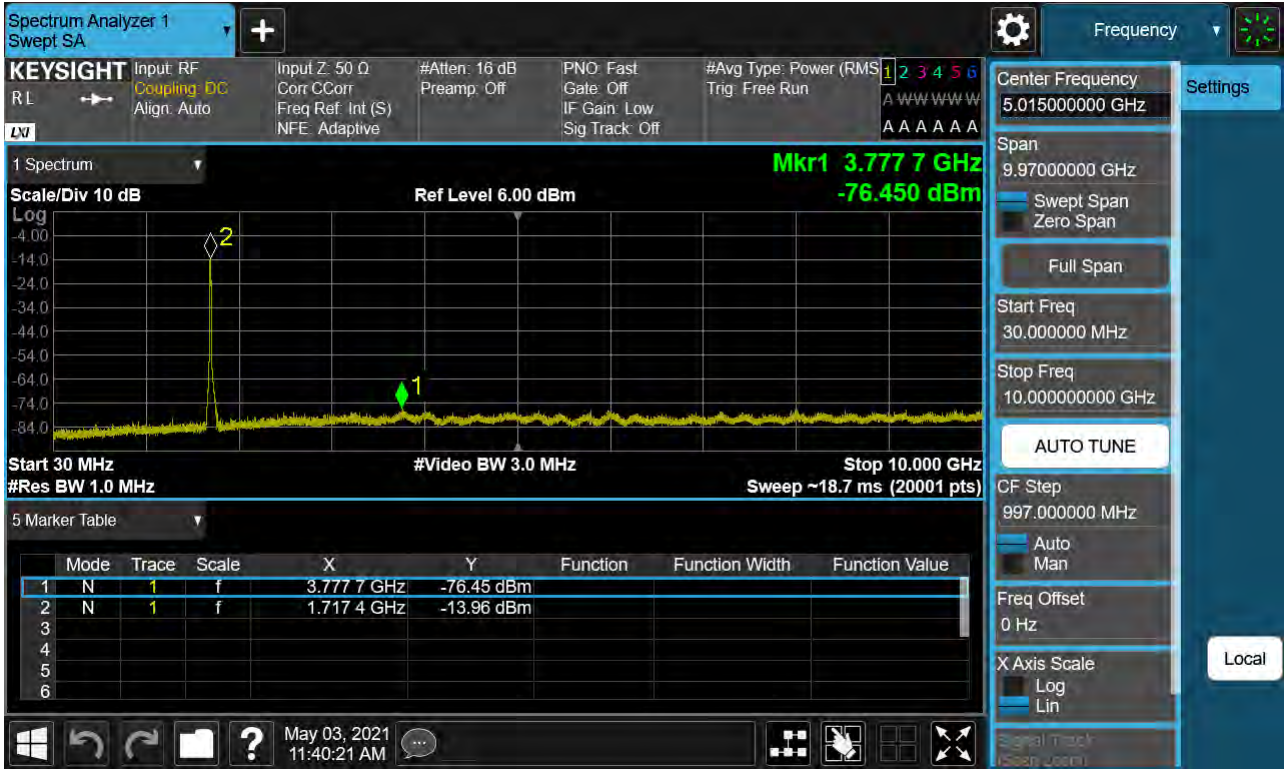
PCC 5MHz Ch132550 RB1 Offset24 SCC 10MHz Ch132622 RB1 Offset0



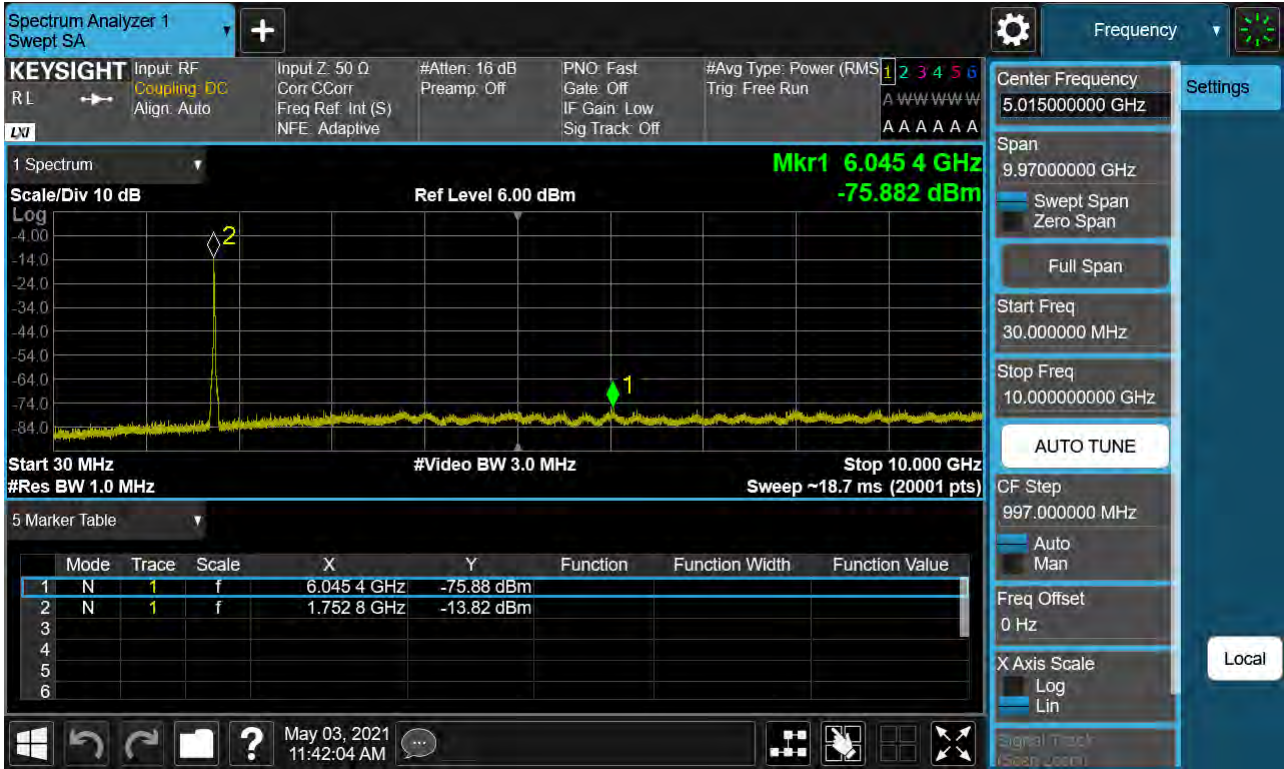
PCC 5MHz Ch132550 RB25 Offset0 SCC 10MHz Ch132622 RB50 Offset0



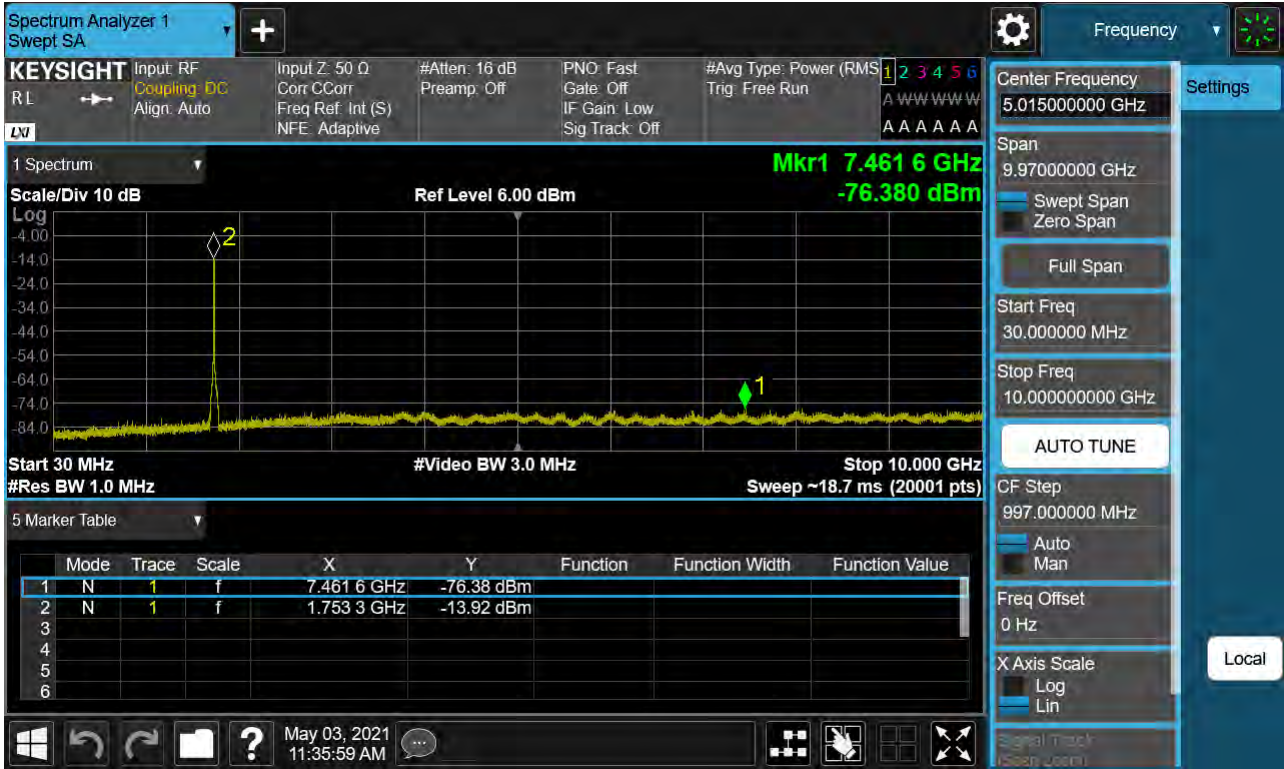
PCC 10MHz Ch132022 RB50 Offset0 SCC 10MHz Ch132121 RB50 Offset0



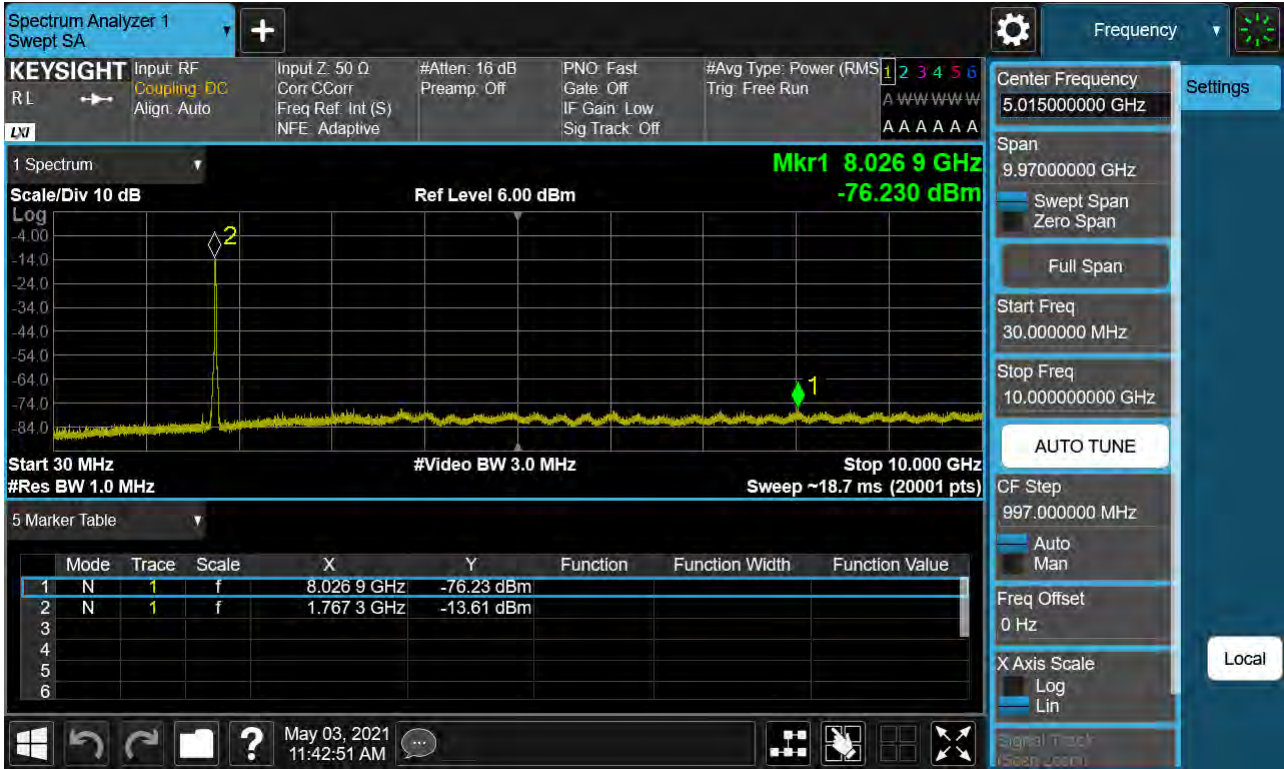
PCC 10MHz Ch132373 RB50 Offset0 SCC 10MHz Ch132472 RB50 Offset0



PCC 10MHz Ch132397 RB50 Offset0 SCC 5MHz Ch132469 RB25 Offset0

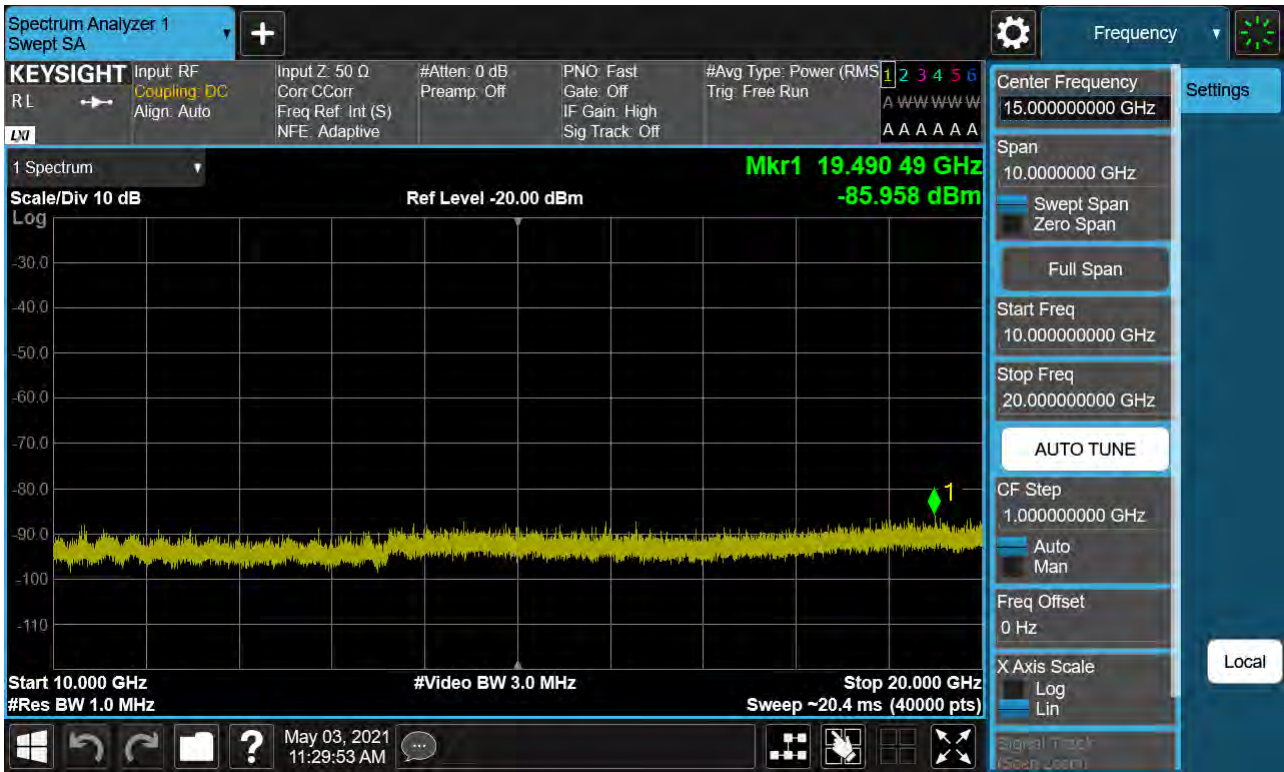


PCC 10MHz Ch132523 RB50 Offset0 SCC 10MHz Ch132622 RB50 Offset0

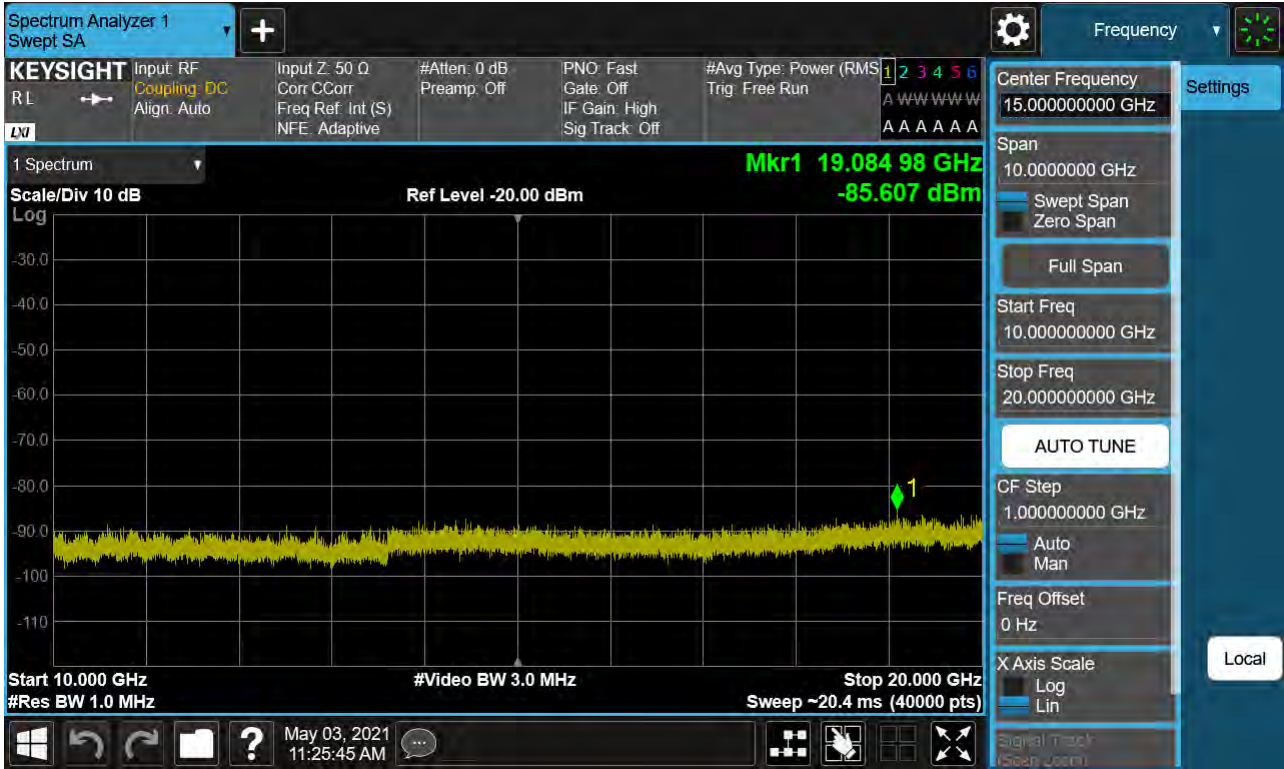


Frequency Range : 10GHz ~ 26.5GHz

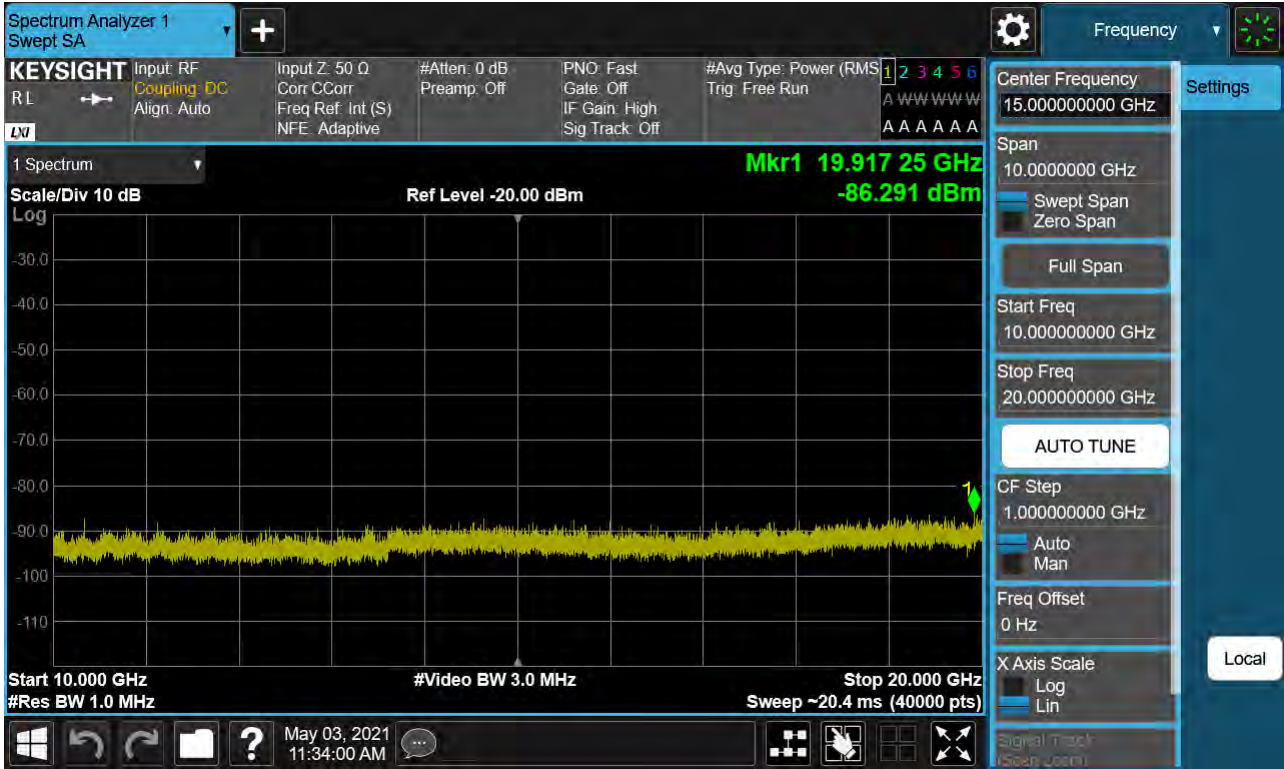
PCC 5MHz Ch131997 RB1 Offset0, SCC 5MHz Ch132045 RB1 Offset24



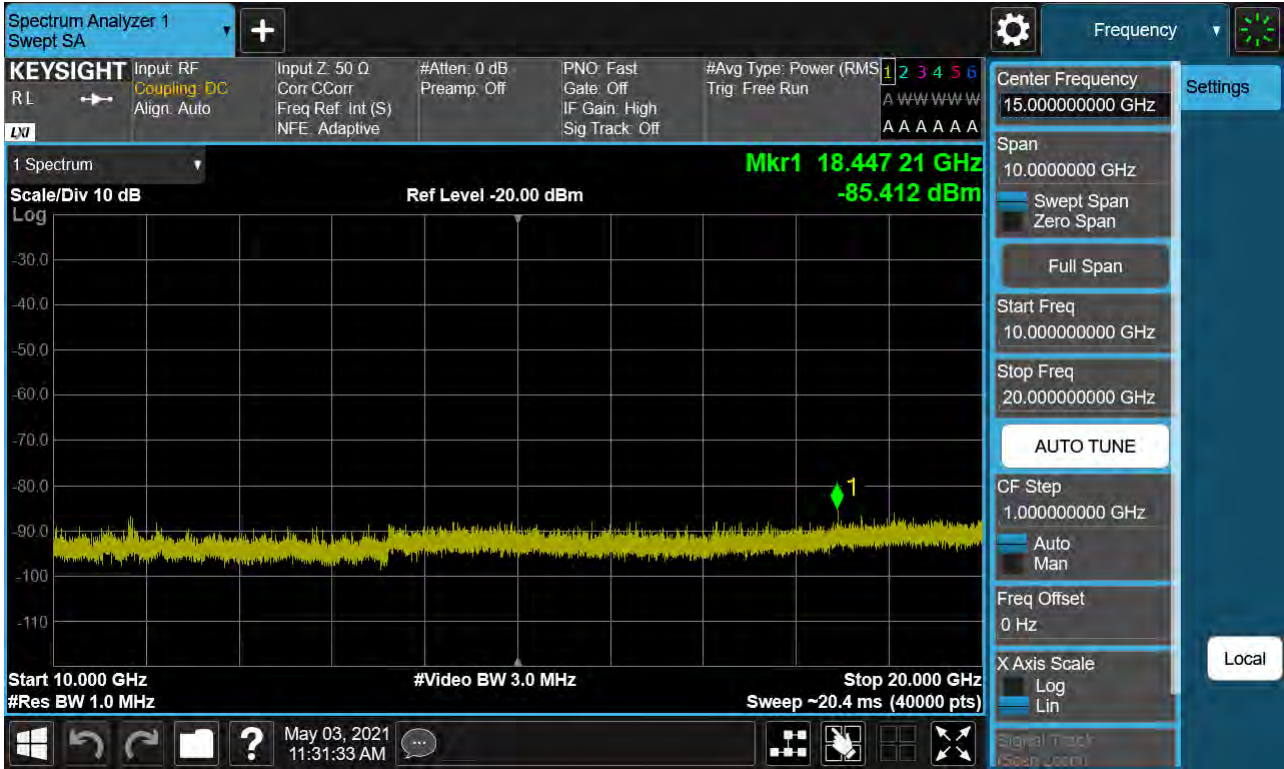
PCC 5MHz Ch131997 RB1 Offset24, SCC 5MHz Ch132045 RB1 Offset0



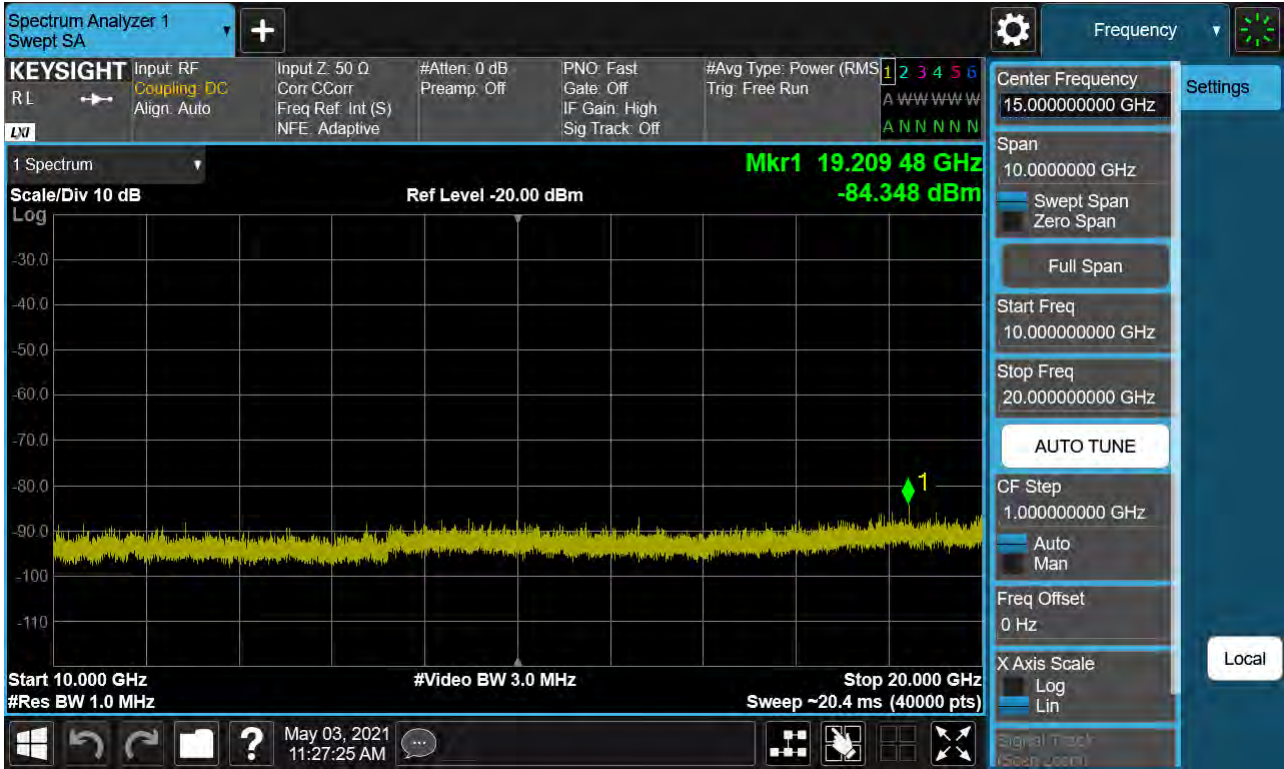
PCC 5MHz Ch132000 RB25 Offset0, SCC 10MHz Ch132072 RB50 Offset0



PCC 5MHz Ch132398 RB1 Offset0, SCC 5MHz Ch132446 RB1 Offset24



PCC 5MHz Ch132398 RB1 Offset24, SCC 5MHz Ch132446 RB1 Offset0



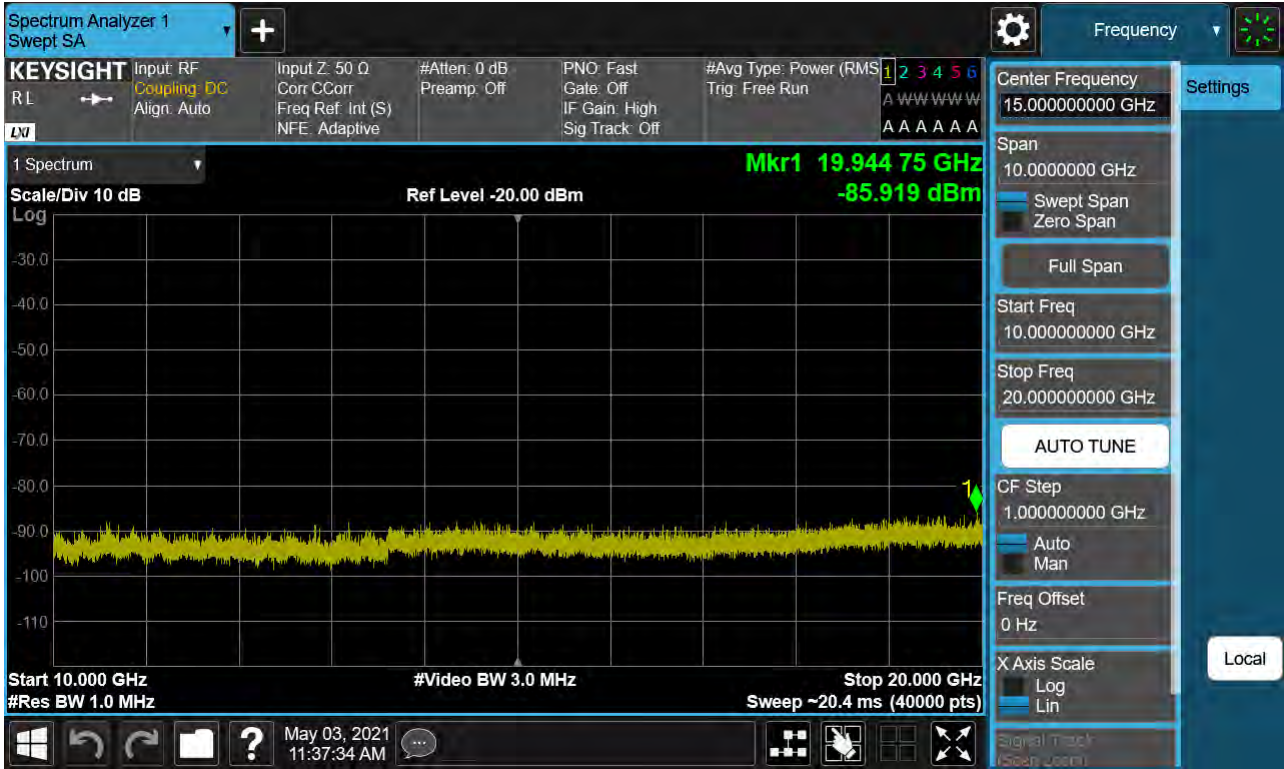
PCC 5MHz Ch132550 RB1 Offset0, SCC 10MHz Ch132622 RB1 Offset49



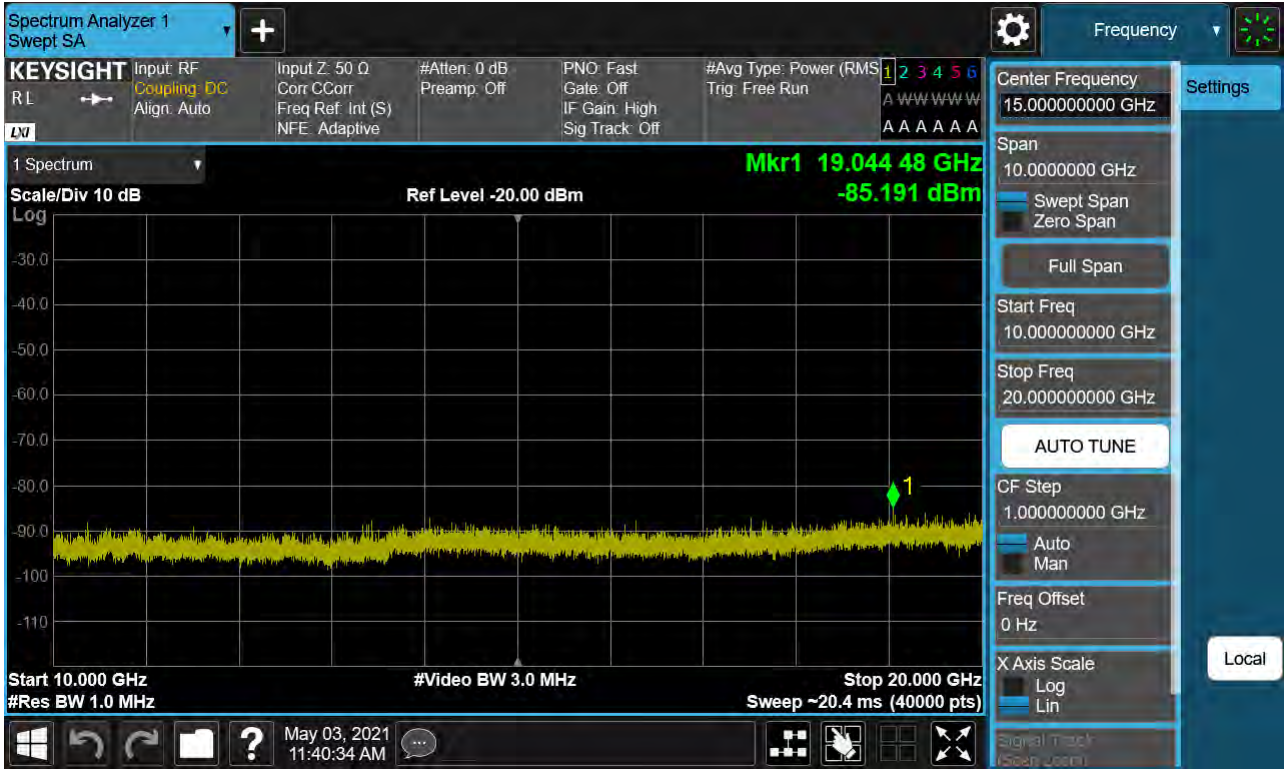
PCC 5MHz Ch132550 RB1 Offset24, SCC 10MHz Ch132622 RB1 Offset0



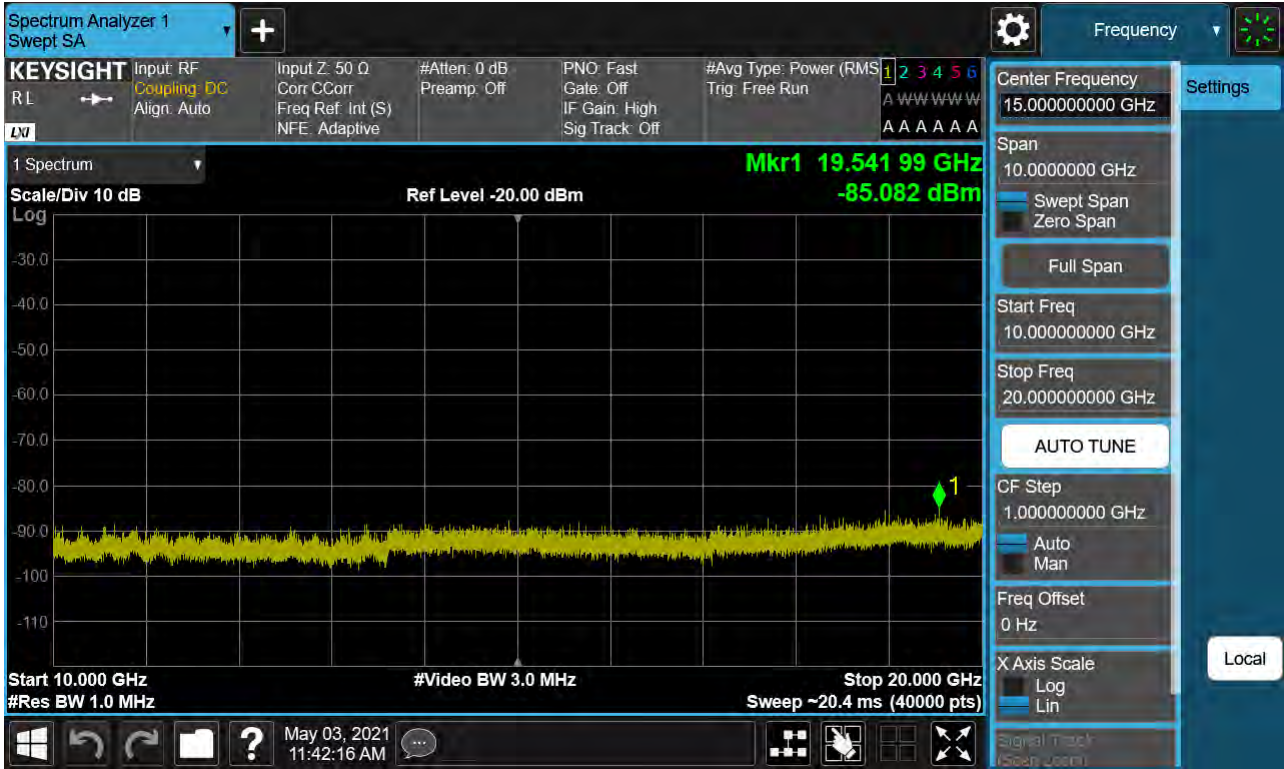
PCC 5MHz Ch132550 RB25 Offset0, SCC 10MHz Ch132622 RB50 Offset0



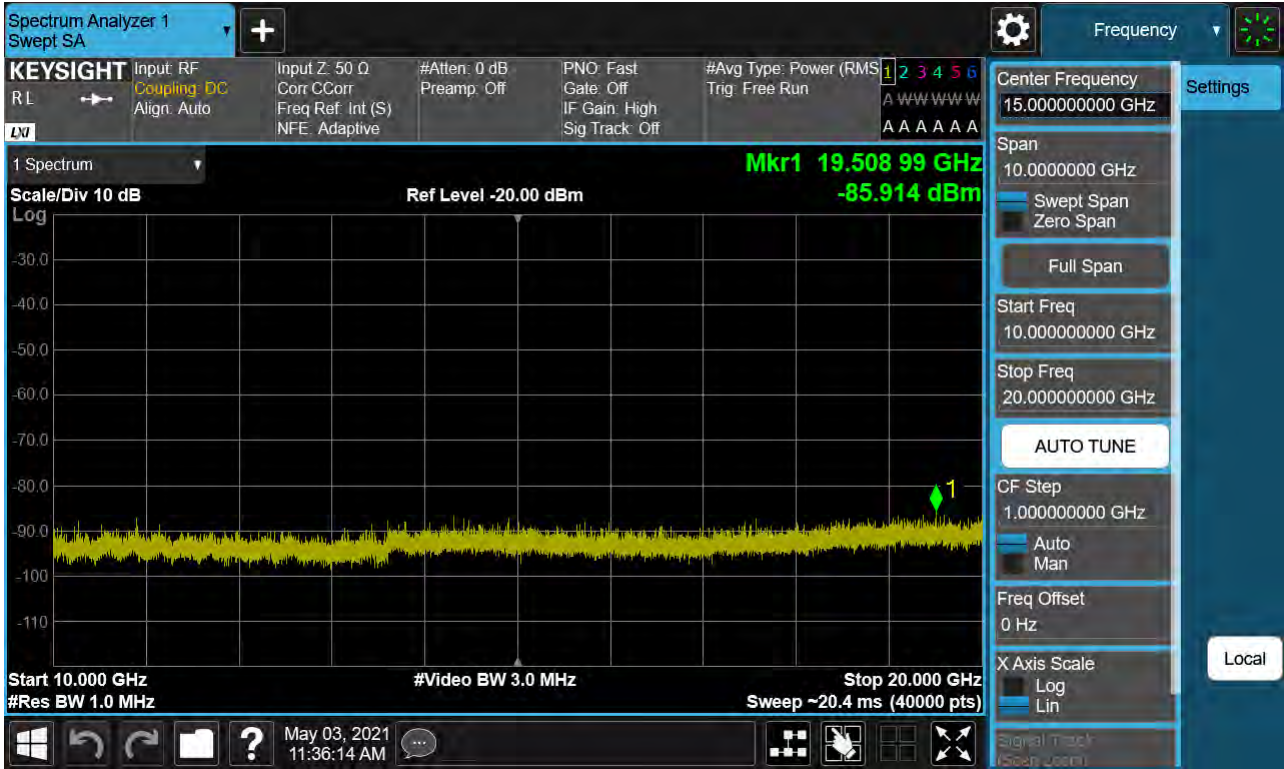
PCC 10MHz Ch132022 RB50 Offset0, SCC 10MHz Ch132121 RB50 Offset0



PCC 10MHz Ch132373 RB50 Offset0, SCC 10MHz Ch132472 RB50 Offset0



PCC 10MHz Ch132397 RB50 Offset0, SCC 5MHz Ch132469 RB25 Offset0

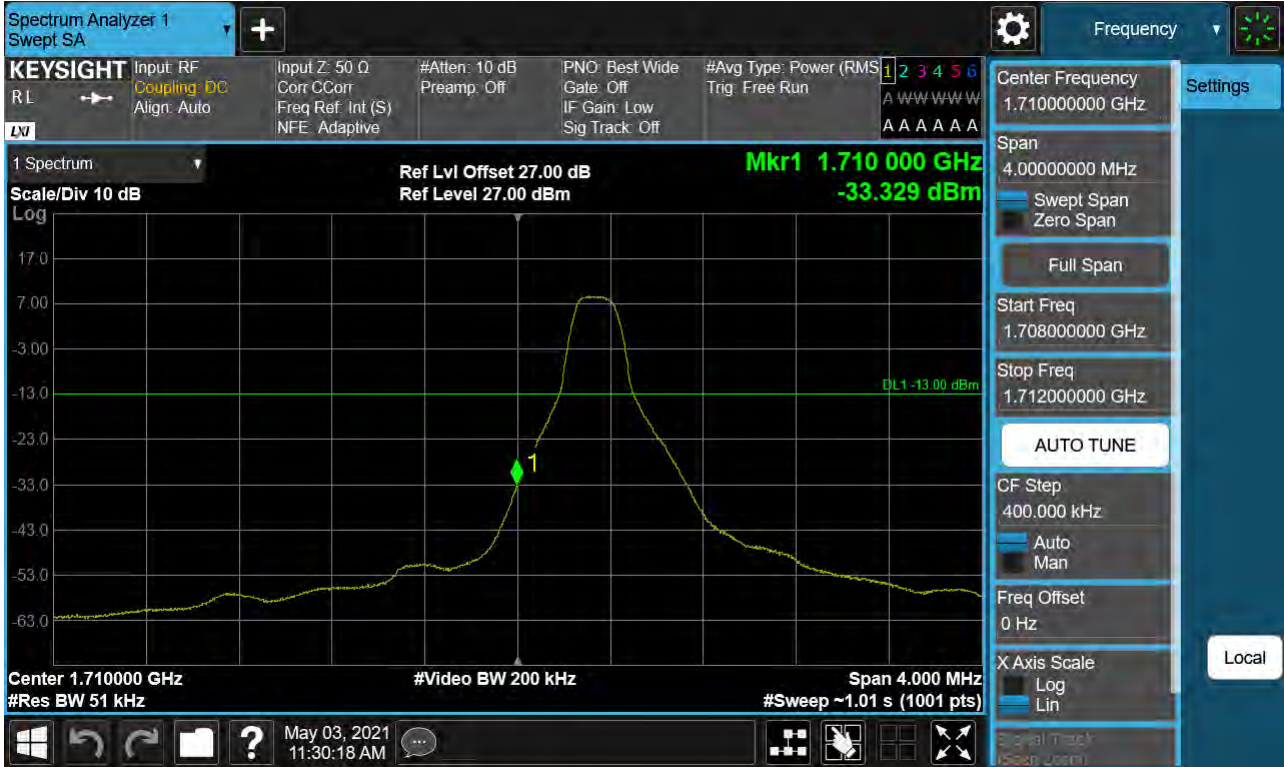


PCC 10MHz Ch132523 RB50 Offset0, SCC 10MHz Ch132622 RB50 Offset0

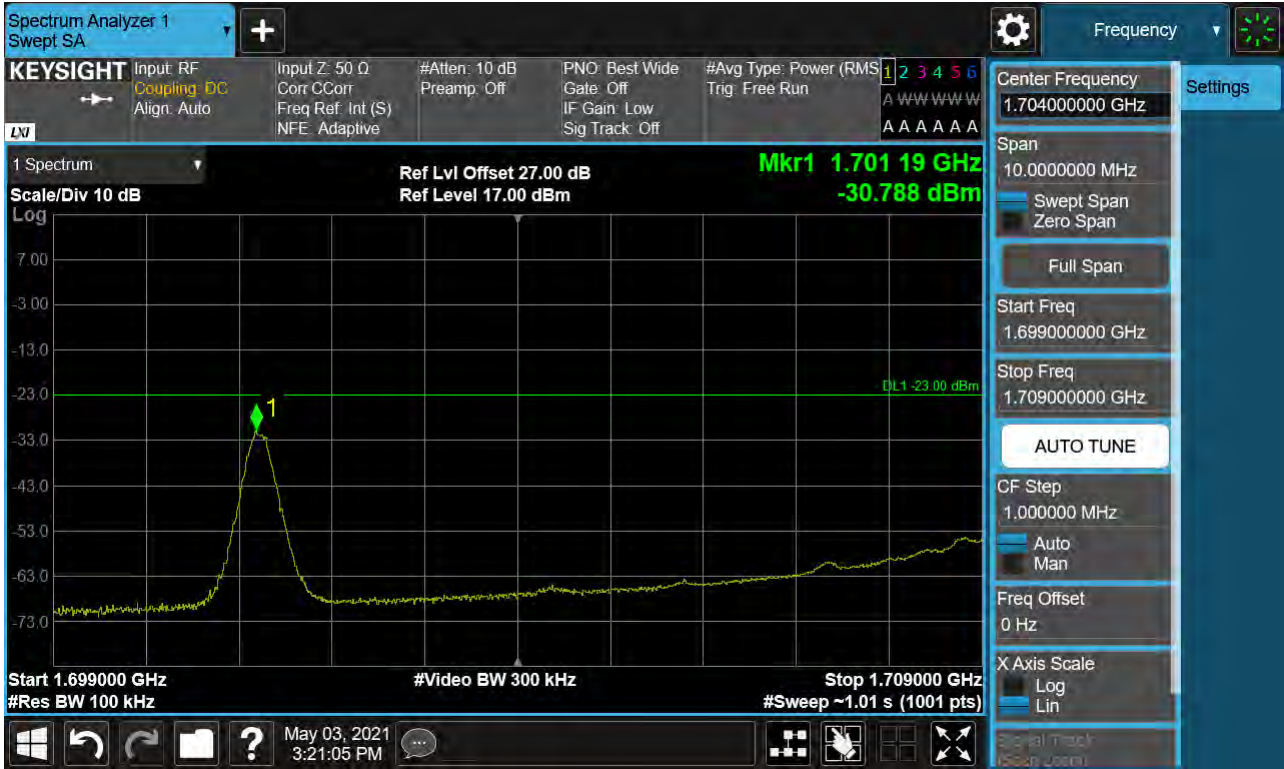


8.4 Channel Edge

Lowest Channel_PCC 5MHz Ch131997 RB1 Offset0 SCC 5MHz Ch132045 RB1 Offset24(1)



Highest Channel_PCC 5MHz Ch132550 RB1 Offset0 SCC 10MHz Ch132622 RB1 Offset49(2)

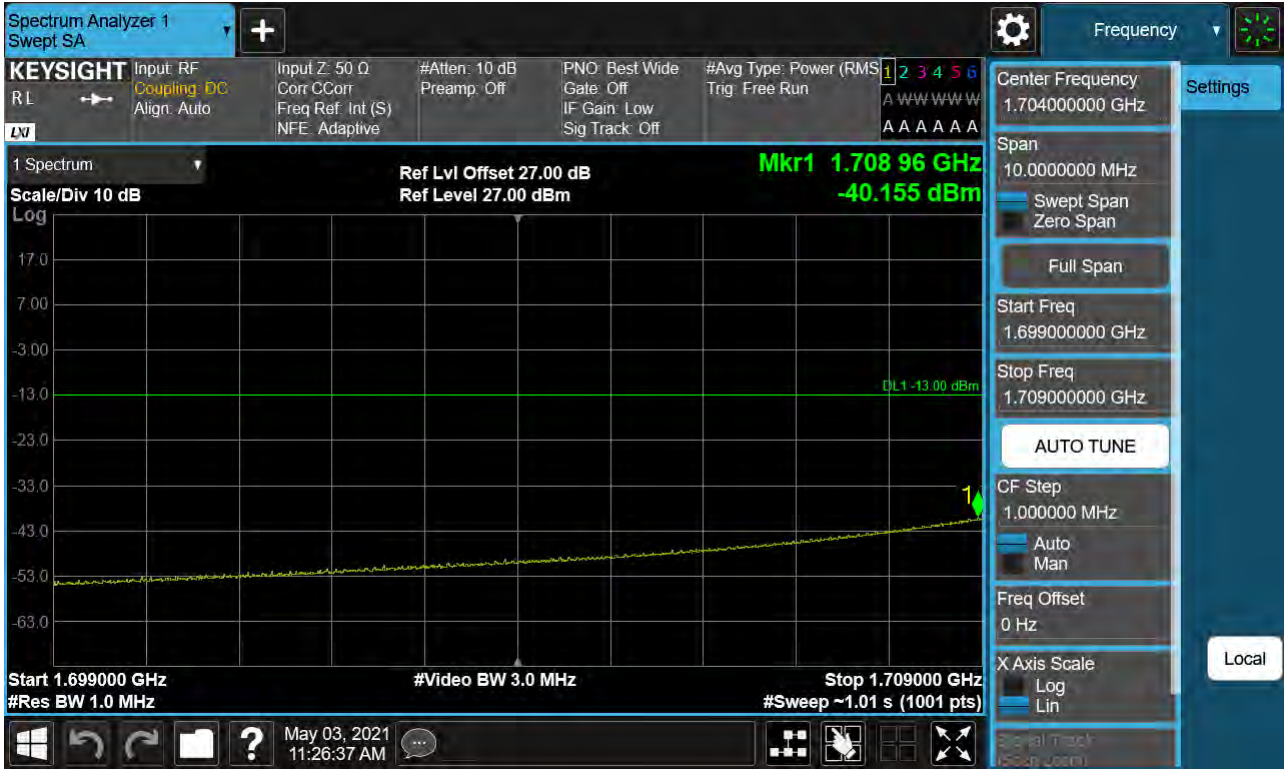


Note: on the above plot, it was measured at 100 KHz and 300 KHz.

Lowest Channel_PCC 5MHz Ch131997 RB1 Offset24 SCC 5MHz Ch132045 RB1 Offset0(1)



Lowest Channel_PCC 5MHz Ch131997 RB1 Offset24 SCC 5MHz Ch132045 RB1 Offset0(2)



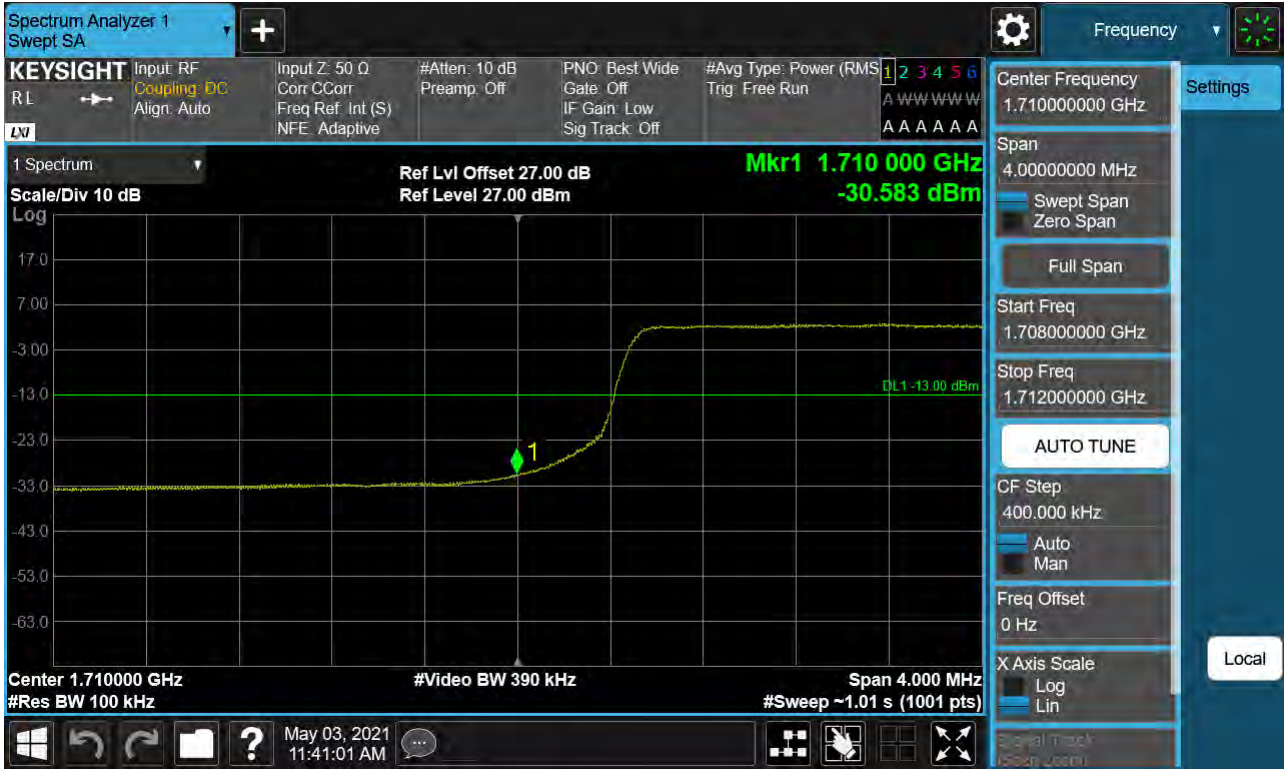
Lowest Channel_PCC 5MHz Ch132000 RB25 Offset0 SCC 10MHz Ch132072 RB50 Offset0(1)



Lowest Channel_PCC 5MHz Ch132000 RB25 Offset0 SCC 10MHz Ch132072 RB50 Offset0(2)



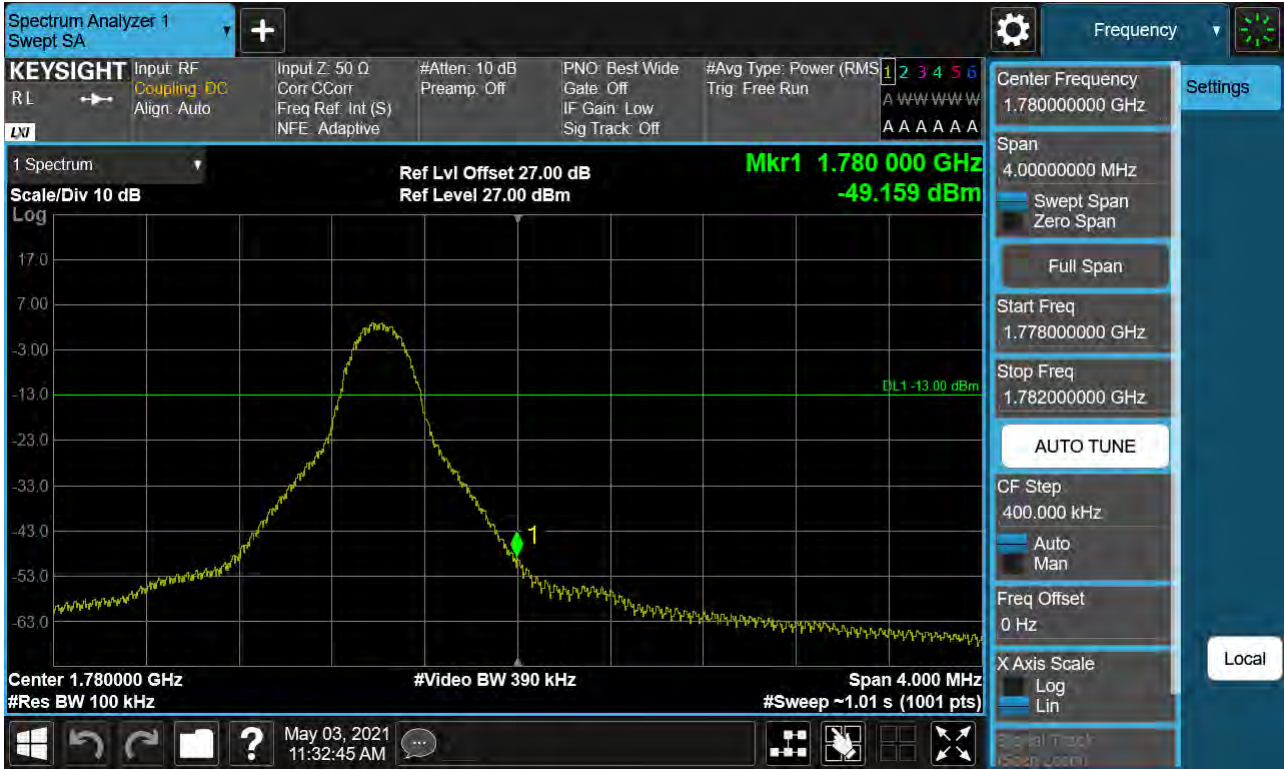
Lowest Channel_PCC 10MHz Ch132022 RB50 Offset0 SCC 10MHz Ch132121 RB50 Offset0(1)



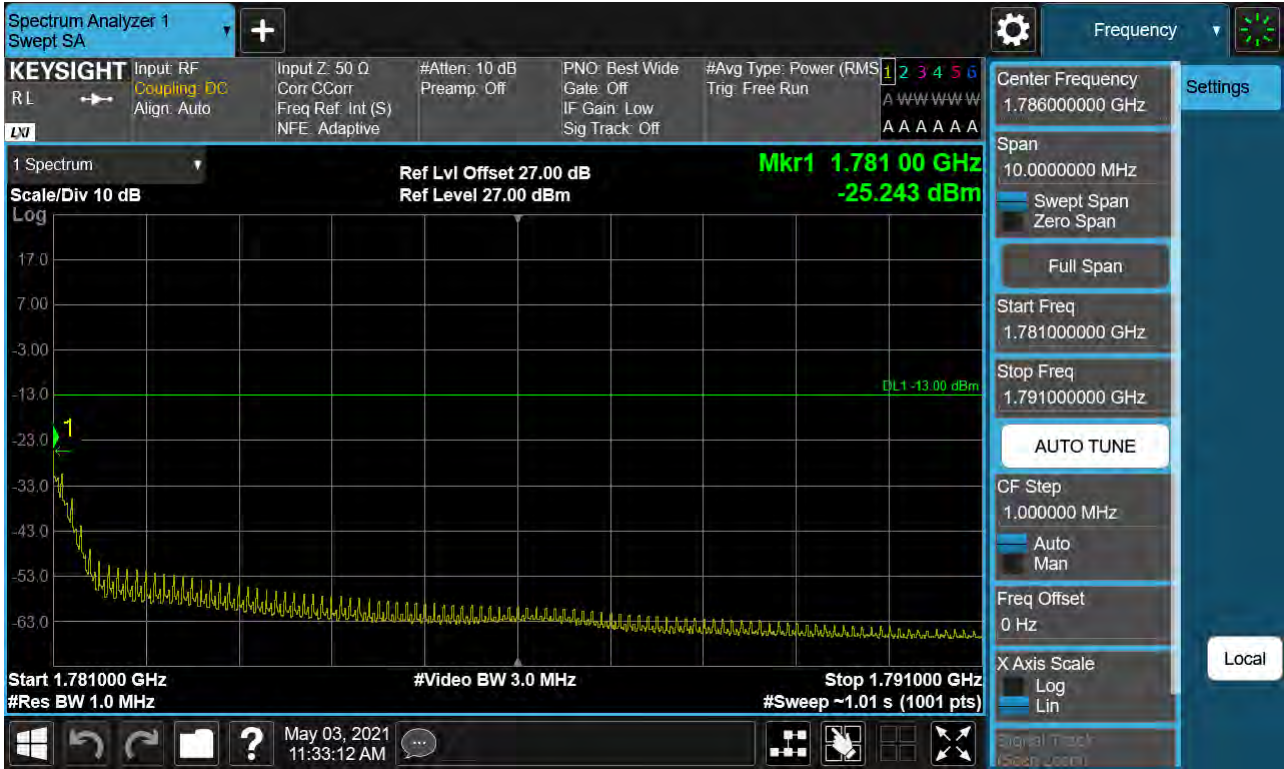
Lowest Channel_PCC 10MHz Ch132022 RB50 Offset0 SCC 10MHz Ch132121 RB50 Offset0(2)



Highest Channel_PCC 5MHz Ch132550 RB1 Offset0 SCC 10MHz Ch132622 RB1 Offset49(1)



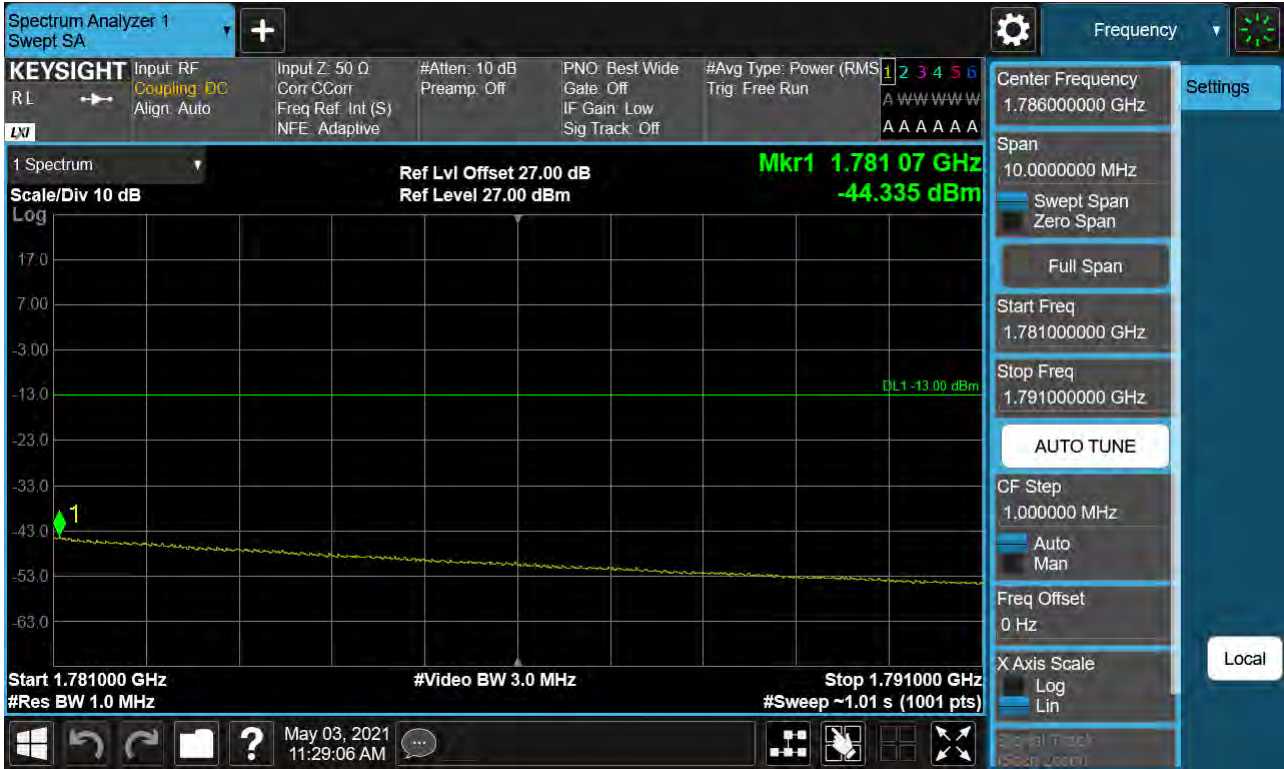
Highest Channel_PCC 5MHz Ch132550 RB1 Offset0 SCC 10MHz Ch132622 RB1 Offset49(2)



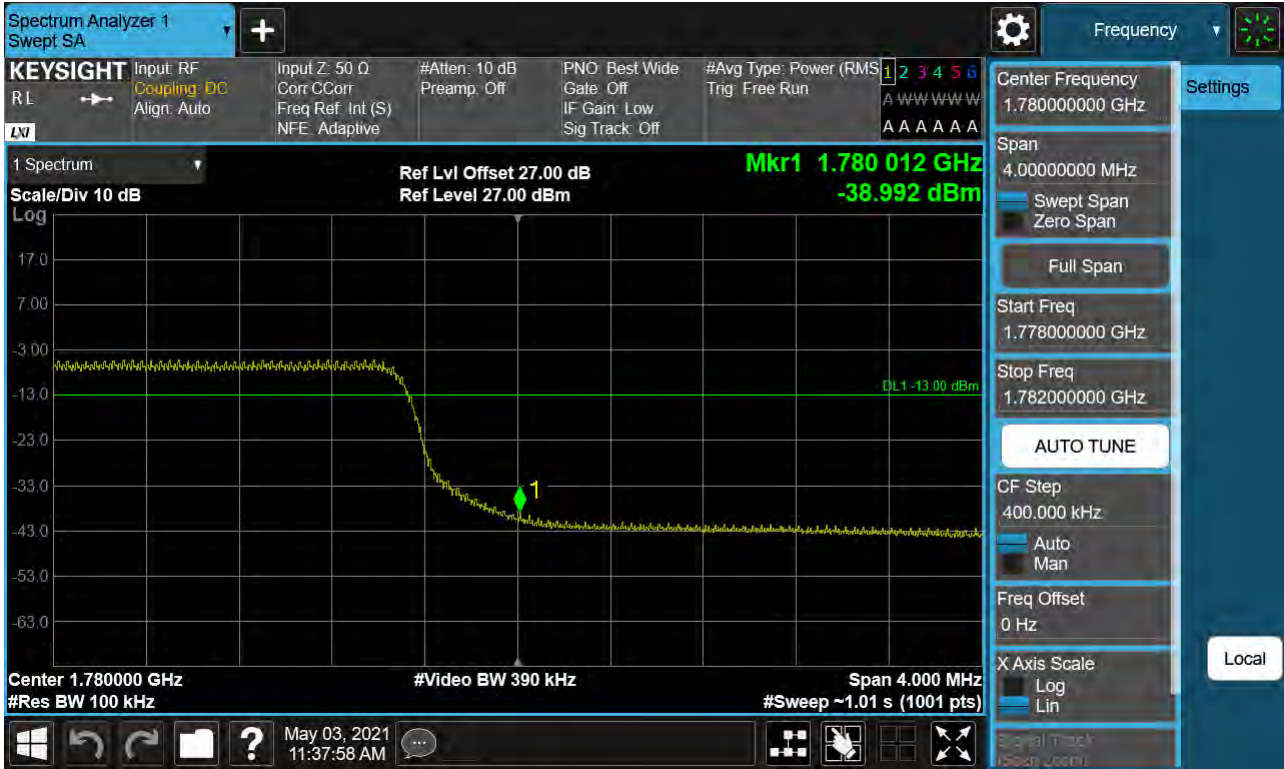
Highest Channel_PCC 5MHz Ch132550 RB1 Offset24 SCC 10MHz Ch132622 RB1 Offset0(1)



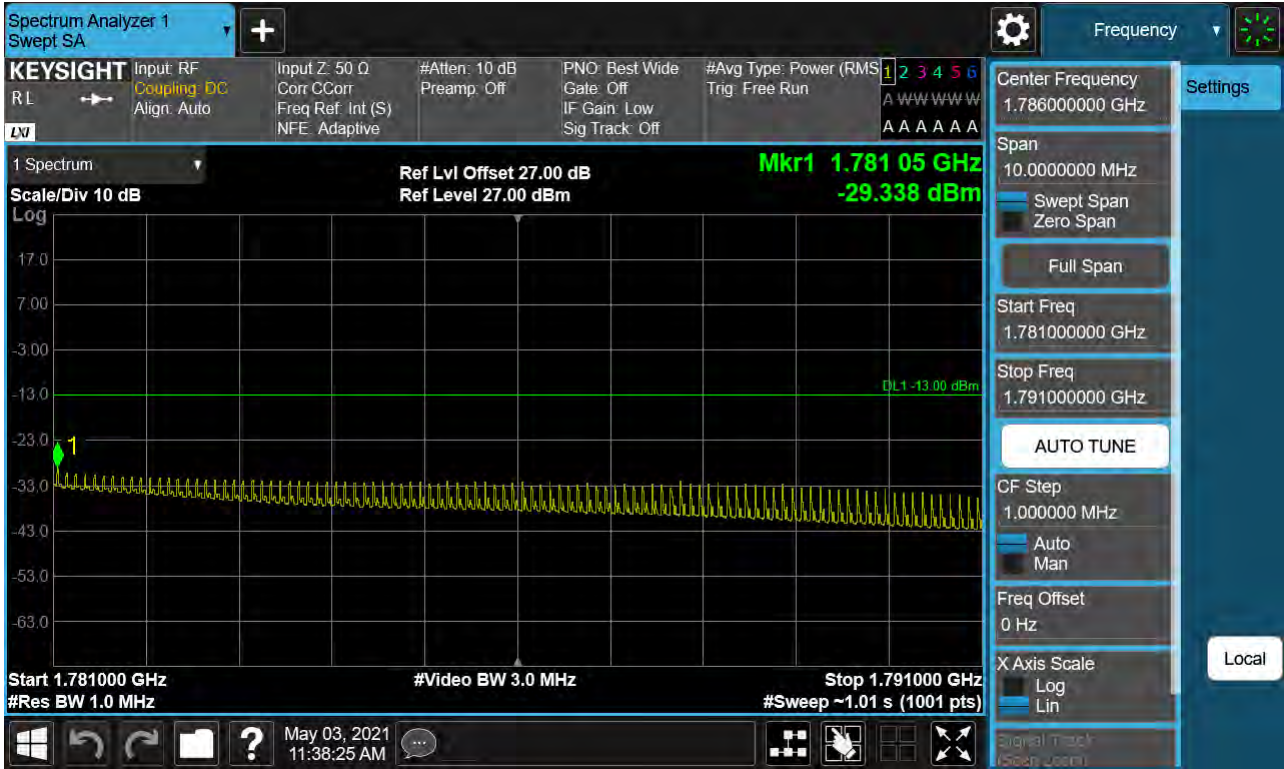
Highest Channel_PCC 5MHz Ch132550 RB1 Offset24 SCC 10MHz Ch132622 RB1 Offset0(2)



Highest Channel_PCC 5MHz Ch132550 RB25 Offset0 SCC 10MHz Ch132622 RB50 Offset0(1)



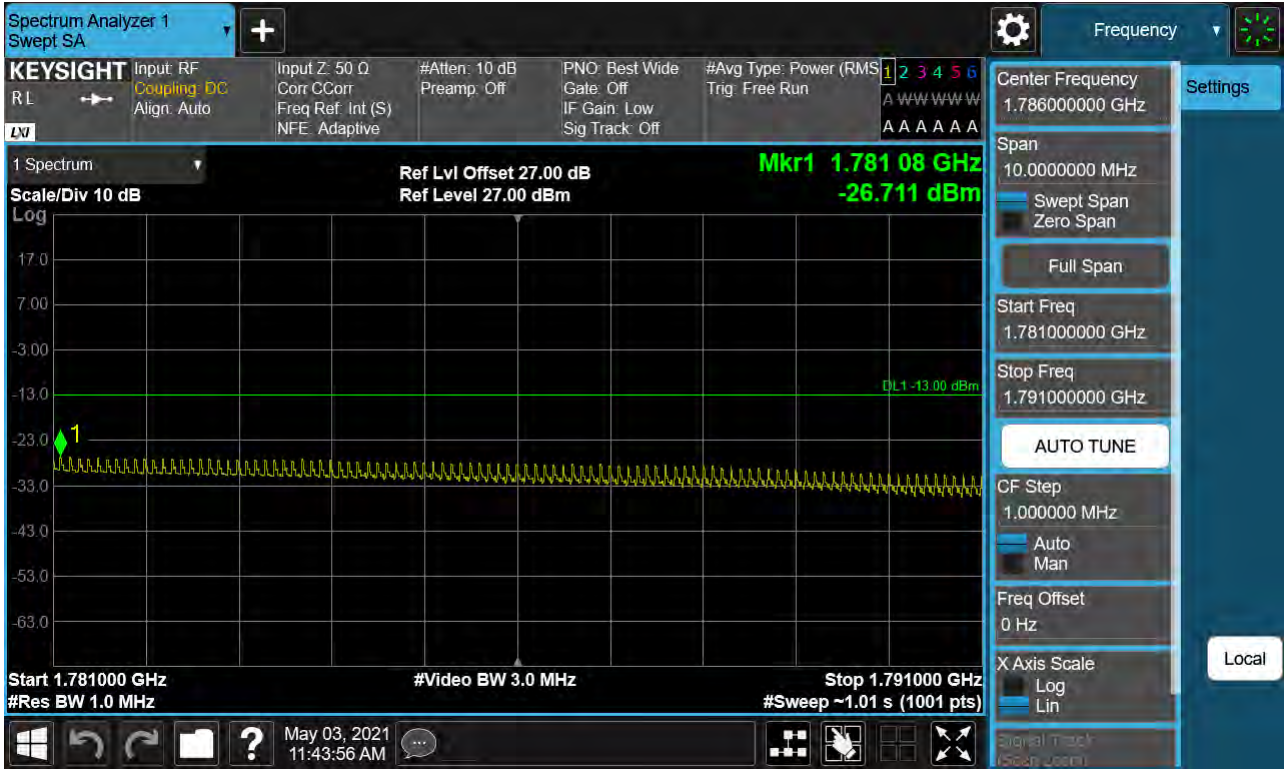
Highest Channel_PCC 5MHz Ch132550 RB25 Offset0 SCC 10MHz Ch132622 RB50 Offset0(2)



Highest Channel_PCC 10MHz Ch132523 RB50 Offset0 SCC 10MHz Ch132622 RB50 Offset0(1)



Highest Channel_PCC 10MHz Ch132523 RB50 Offset0 SCC 10MHz Ch132622 RB50 Offset0(2)



8.5 Frequency Stability / Variation Of Ambient Temperature

- ▣ PCC Channel: 131997
- ▣ PCC Frequency: 1712.5 MHz
- ▣ PCC BandWidth: 5 MHz
- ▣ SCC Channel: 132045
- ▣ SCC Frequency: 1717.3 MHz
- ▣ SCC BandWidth: 5 MHz
- ▣ Voltage : 3.880 VDC
- ▣ LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (°C) | PPM | | Frequency Error (MHz) | |
|----------------|-------------|------------|--------|--------|-----------------------|------------|
| | | | PCC | SCC | PCC | SCC |
| 100% | 3.880 | +20(Ref) | 0.036 | -0.028 | 1712.500 | 1717.29995 |
| 100% | | -30 | 0.037 | 0.037 | 1712.500 | 1717.30006 |
| 100% | | -20 | -0.037 | -0.035 | 1712.500 | 1717.29994 |
| 100% | | -10 | 0.030 | 0.045 | 1712.500 | 1717.30008 |
| 100% | | 0 | 0.043 | -0.039 | 1712.500 | 1717.29993 |
| 100% | | 10 | -0.039 | -0.036 | 1712.500 | 1717.29994 |
| 100% | | 30 | 0.037 | 0.035 | 1712.500 | 1717.30006 |
| 100% | | 40 | -0.032 | 0.042 | 1712.500 | 1717.30007 |
| 100% | | 50 | 0.030 | -0.040 | 1712.500 | 1717.29993 |
| Batt. Endpoint | | 3.650 | 20 | 0.036 | 0.030 | 1712.500 |

- ▣ PCC Channel: 132022
- ▣ PCC Frequency: 1715.0 MHz
- ▣ PCC BandWidth: 10 MHz
- ▣ SCC Channel: 132094
- ▣ SCC Frequency: 1722.2 MHz
- ▣ SCC BandWidth: 5 MHz
- ▣ Voltage : 3.880 VDC
- ▣ LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (°C) | PPM | | Frequency Error (MHz) | |
|----------------|-------------|------------|-------|--------|-----------------------|------------|
| | | | PCC | SCC | PCC | SCC |
| 100% | 3.880 | +20(Ref) | 0.044 | 0.027 | 1715.00008 | 1722.20005 |
| 100% | | -30 | 0.031 | 0.028 | 1715.00005 | 1722.20005 |
| 100% | | -20 | 0.028 | -0.040 | 1715.00005 | 1722.19993 |
| 100% | | -10 | 0.043 | 0.040 | 1715.00007 | 1722.20007 |
| 100% | | 0 | 0.036 | 0.031 | 1715.00006 | 1722.20005 |
| 100% | | 10 | 0.046 | 0.035 | 1715.00008 | 1722.20006 |
| 100% | | 30 | 0.041 | 0.037 | 1715.00007 | 1722.20006 |
| 100% | | 40 | 0.040 | 0.028 | 1715.00007 | 1722.20005 |
| 100% | | 50 | 0.044 | -0.028 | 1715.00007 | 1722.19995 |
| Batt. Endpoint | 3.650 | 20 | 0.028 | -0.028 | 1715.00005 | 1722.19995 |

- PCC Channel: 132047
- PCC Frequency: 1717.5 MHz
- PCC BandWidth: 15 MHz
- SCC Channel: 132140
- SCC Frequency: 1726.8 MHz
- SCC BandWidth: 5 MHz
- Voltage : 3.880 VDC
- LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (°C) | PPM | | Frequency Error (MHz) | |
|----------------|-------------|------------|--------|--------|-----------------------|------------|
| | | | PCC | SCC | PCC | SCC |
| 100% | 3.880 | +20(Ref) | 0.036 | 0.033 | 1717.50006 | 1726.80006 |
| 100% | | -30 | 0.045 | 0.043 | 1717.50008 | 1726.80007 |
| 100% | | -20 | -0.045 | -0.047 | 1717.49992 | 1726.79992 |
| 100% | | -10 | 0.028 | -0.034 | 1717.50005 | 1726.79994 |
| 100% | | 0 | -0.037 | -0.040 | 1717.49994 | 1726.79993 |
| 100% | | 10 | 0.034 | 0.033 | 1717.50006 | 1726.80006 |
| 100% | | 30 | 0.046 | 0.046 | 1717.50008 | 1726.80008 |
| 100% | | 40 | 0.045 | 0.030 | 1717.50008 | 1726.80005 |
| 100% | | 50 | -0.034 | 0.043 | 1717.49994 | 1726.80007 |
| Batt. Endpoint | 3.650 | 20 | 0.027 | 0.043 | 1717.50005 | 1726.80007 |

- PCC Channel: 132599
- PCC Frequency: 1772.7 MHz
- PCC BandWidth: 5 MHz
- SCC Channel: 132647
- SCC Frequency: 1777.5 MHz
- SCC BandWidth: 5 MHz
- Voltage : 3.880 VDC
- LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (°C) | PPM | | Frequency Error (MHz) | |
|----------------|-------------|------------|--------|--------|-----------------------|------------|
| | | | PCC | SCC | PCC | SCC |
| 100% | 3.880 | +20(Ref) | 0.029 | -0.034 | 1772.70005 | 1777.49994 |
| 100% | | -30 | 0.047 | 0.045 | 1772.70008 | 1777.50008 |
| 100% | | -20 | 0.033 | 0.044 | 1772.70006 | 1777.50008 |
| 100% | | -10 | -0.031 | -0.040 | 1772.69994 | 1777.49993 |
| 100% | | 0 | 0.031 | -0.027 | 1772.70005 | 1777.49995 |
| 100% | | 10 | -0.038 | 0.045 | 1772.69993 | 1777.50008 |
| 100% | | 30 | 0.030 | -0.028 | 1772.70005 | 1777.49995 |
| 100% | | 40 | -0.032 | 0.047 | 1772.69994 | 1777.50008 |
| 100% | | 50 | -0.040 | 0.037 | 1772.69993 | 1777.50007 |
| Batt. Endpoint | | 3.650 | 20 | 0.031 | -0.044 | 1772.70005 |

- PCC Channel: 132572
- PCC Frequency: 1770.0 MHz
- PCC BandWidth: 10 MHz
- SCC Channel: 132644
- SCC Frequency: 1777.2 MHz
- SCC BandWidth: 5 MHz
- Voltage : 3.880 VDC
- LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (°C) | PPM | | Frequency Error (MHz) | |
|----------------|-------------|------------|--------|--------|-----------------------|------------|
| | | | PCC | SCC | PCC | SCC |
| 100% | 3.880 | +20(Ref) | 0.042 | -0.028 | 1770.00007 | 1777.19995 |
| 100% | | -30 | 0.038 | -0.042 | 1770.00007 | 1777.19992 |
| 100% | | -20 | -0.041 | 0.044 | 1769.99993 | 1777.20008 |
| 100% | | -10 | 0.033 | -0.041 | 1770.00006 | 1777.19993 |
| 100% | | 0 | -0.035 | -0.045 | 1769.99994 | 1777.19992 |
| 100% | | 10 | 0.032 | -0.042 | 1770.00006 | 1777.19993 |
| 100% | | 30 | 0.047 | 0.040 | 1770.00008 | 1777.20007 |
| 100% | | 40 | 0.030 | 0.036 | 1770.00005 | 1777.20006 |
| 100% | | 50 | -0.033 | -0.046 | 1769.99994 | 1777.19992 |
| Batt. Endpoint | | 3.650 | 20 | -0.042 | 0.034 | 1769.99993 |

- PCC Channel: 132549
- PCC Frequency: 1767.7 MHz
- PCC BandWidth: 15 MHz
- SCC Channel: 132642
- SCC Frequency: 1777.0 MHz
- SCC BandWidth: 5 MHz
- Voltage : 3.880 VDC
- LIMIT: Emission must remain in band

| Voltage (%) | Power (VDC) | Temp. (°C) | PPM | | Frequency Error (MHz) | |
|----------------|-------------|------------|--------|--------|-----------------------|------------|
| | | | PCC | SCC | PCC | SCC |
| 100% | 3.880 | +20(Ref) | 0.031 | 0.037 | 1767.70006 | 1777.00007 |
| 100% | | -30 | -0.035 | 0.035 | 1767.69994 | 1777.00006 |
| 100% | | -20 | 0.033 | -0.043 | 1767.70006 | 1776.99992 |
| 100% | | -10 | -0.040 | 0.036 | 1767.69993 | 1777.00006 |
| 100% | | 0 | -0.034 | 0.033 | 1767.69994 | 1777.00006 |
| 100% | | 10 | -0.034 | -0.041 | 1767.69994 | 1776.99993 |
| 100% | | 30 | -0.029 | -0.038 | 1767.69995 | 1776.99993 |
| 100% | | 40 | -0.039 | 0.034 | 1767.69993 | 1777.00006 |
| 100% | | 50 | -0.045 | 0.047 | 1767.69992 | 1777.00008 |
| Batt. Endpoint | | 3.650 | 20 | 0.043 | -0.041 | 1767.70008 |

8.6 Radiated Spurious Emissions

- ▣ PCC Channel : 131997 (1712.5MHz)
- ▣ PCC BW(MHz) : 5
- ▣ PCC RB/ RB Offset : 1/ 24
- ▣ SCC Channel : 132045 (1717.3MHz)
- ▣ SCC BW(MHz) : 5
- ▣ SCC RB/ RB Offset : 1/ 0
- ▣ DISTANCE: 3 meters
- ▣ LIMIT: -13.0 dBm

| Freq.(MHz) | Measured Level [dBm] | Ant. Gain (dBi) | Substitute Level [dBm] | C.L | Pol. | Result (dBm) |
|------------|----------------------|-----------------|------------------------|------|------|--------------|
| 3 429.80 | -53.73 | 12.60 | -59.52 | 2.96 | H | -49.88 |
| 5 144.70 | -56.56 | 12.48 | -53.85 | 3.66 | H | -45.03 |
| 6 859.60 | -55.90 | 12.18 | -49.12 | 4.27 | V | -41.21 |

- ▣ PCC Channel : 132398 (1752.6MHz)
- ▣ PCC BW(MHz) : 5
- ▣ PCC RB/ RB Offset : 1/ 24
- ▣ SCC Channel : 132446 (1757.4MHz)
- ▣ SCC BW(MHz) : 5
- ▣ SCC RB/ RB Offset : 1/ 0
- ▣ DISTANCE: 3 meters
- ▣ LIMIT: -13.0 dBm

| Freq.(MHz) | Measured Level [dBm] | Ant. Gain (dBi) | Substitute Level [dBm] | C.L | Pol. | Result (dBm) |
|------------|----------------------|-----------------|------------------------|------|------|--------------|
| 3 510.00 | -53.57 | 12.25 | -59.27 | 2.98 | V | -50.00 |
| 5 265.00 | -55.75 | 13.28 | -54.95 | 3.72 | H | -45.39 |
| 7 020.00 | -56.26 | 11.60 | -47.62 | 4.32 | V | -40.34 |

- ▣ PCC Channel : 132599 (1772.7MHz)
- ▣ PCC BW(MHz) : 5
- ▣ PCC RB/ RB Offset : 1/ 24
- ▣ SCC Channel : 132647 (1777.5MHz)
- ▣ SCC BW(MHz) : 5
- ▣ SCC RB/ RB Offset : 1/ 0
- ▣ DISTANCE: 3 meters
- ▣ LIMIT: -13.0 dBm

| Freq.(MHz) | Measured Level [dBm] | Ant. Gain (dBi) | Substitute Level [dBm] | C.L | Pol. | Result (dBm) |
|------------|----------------------|-----------------|------------------------|------|------|--------------|
| 3 550.20 | -54.10 | 12.10 | -59.31 | 3.02 | V | -50.23 |
| 5 325.30 | -56.63 | 13.35 | -55.53 | 3.73 | H | -45.91 |
| 7 100.40 | -56.63 | 11.30 | -47.93 | 4.36 | V | -40.99 |

8.7 Occupied Bandwidth

| PCC | | | | | SCC | | | | | Data (MHz) |
|----------|--------|------------|------|-----------|----------|--------|------------|------|-----------|------------|
| BW [MHz] | Ch | Freq [MHz] | Mod | RB/Offset | BW [MHz] | Ch | Freq [MHz] | Mod | RB/Offset | |
| 5 | 132398 | 1752.6 | QPSK | 25/ 0 | 5 | 132446 | 1757.4 | QPSK | 25/ 0 | 9.2274 |
| 5 | 132375 | 1750.3 | QPSK | 25/ 0 | 10 | 132447 | 1757.5 | QPSK | 50/ 0 | 13.848 |
| 10 | 132397 | 1752.5 | QPSK | 50/ 0 | 5 | 132469 | 1759.7 | QPSK | 25/ 0 | 13.903 |
| 5 | 132353 | 1748.1 | QPSK | 25/ 0 | 15 | 132446 | 1757.4 | QPSK | 75/ 0 | 18.154 |
| 15 | 132398 | 1752.6 | QPSK | 75/ 0 | 5 | 132491 | 1761.9 | QPSK | 25/ 0 | 18.244 |
| 10 | 132373 | 1750.1 | QPSK | 50/ 0 | 10 | 132472 | 1760.0 | QPSK | 50/ 0 | 18.741 |

| PCC | | | | | SCC | | | | | Data (MHz) |
|----------|--------|------------|-------|-----------|----------|--------|------------|-------|-----------|------------|
| BW [MHz] | Ch | Freq [MHz] | Mod | RB/Offset | BW [MHz] | Ch | Freq [MHz] | Mod | RB/Offset | |
| 5 | 132398 | 1752.6 | 16QAM | 25/ 0 | 5 | 132446 | 1757.4 | 16QAM | 25/ 0 | 9.2238 |
| 5 | 132375 | 1750.3 | 16QAM | 25/ 0 | 10 | 132447 | 1757.5 | 16QAM | 50/ 0 | 13.832 |
| 10 | 132397 | 1752.5 | 16QAM | 50/ 0 | 5 | 132469 | 1759.7 | 16QAM | 25/ 0 | 13.872 |
| 5 | 132353 | 1748.1 | 16QAM | 25/ 0 | 15 | 132446 | 1757.4 | 16QAM | 75/ 0 | 18.209 |
| 15 | 132398 | 1752.6 | 16QAM | 75/ 0 | 5 | 132491 | 1761.9 | 16QAM | 25/ 0 | 18.228 |
| 10 | 132373 | 1750.1 | 16QAM | 50/ 0 | 10 | 132472 | 1760.0 | 16QAM | 50/ 0 | 18.756 |

| PCC | | | | | SCC | | | | | Data (MHz) |
|----------|--------|------------|-------|-----------|----------|--------|------------|-------|-----------|------------|
| BW [MHz] | Ch | Freq [MHz] | Mod | RB/Offset | BW [MHz] | Ch | Freq [MHz] | Mod | RB/Offset | |
| 5 | 132398 | 1752.6 | 64QAM | 25/ 0 | 5 | 132446 | 1757.4 | 64QAM | 25/ 0 | 9.2416 |
| 5 | 132375 | 1750.3 | 64QAM | 25/ 0 | 10 | 132447 | 1757.5 | 64QAM | 50/ 0 | 13.860 |
| 10 | 132397 | 1752.5 | 64QAM | 50/ 0 | 5 | 132469 | 1759.7 | 64QAM | 25/ 0 | 13.878 |
| 5 | 132353 | 1748.1 | 64QAM | 25/ 0 | 15 | 132446 | 1757.4 | 64QAM | 75/ 0 | 18.118 |
| 15 | 132398 | 1752.6 | 64QAM | 75/ 0 | 5 | 132491 | 1761.9 | 64QAM | 25/ 0 | 18.195 |
| 10 | 132373 | 1750.1 | 64QAM | 50/ 0 | 10 | 132472 | 1760.0 | 64QAM | 50/ 0 | 18.758 |

| PCC | | | | | SCC | | | | | Data (MHz) |
|----------|--------|------------|--------|-----------|----------|--------|------------|--------|-----------|------------|
| BW [MHz] | Ch | Freq [MHz] | Mod | RB/Offset | BW [MHz] | Ch | Freq [MHz] | Mod | RB/Offset | |
| 5 | 132398 | 1752.6 | 256QAM | 25/ 0 | 5 | 132446 | 1757.4 | 256QAM | 25/ 0 | 9.2595 |
| 5 | 132375 | 1750.3 | 256QAM | 25/ 0 | 10 | 132447 | 1757.5 | 256QAM | 50/ 0 | 13.787 |
| 10 | 132397 | 1752.5 | 256QAM | 50/ 0 | 5 | 132469 | 1759.7 | 256QAM | 25/ 0 | 13.871 |
| 5 | 132353 | 1748.1 | 256QAM | 25/ 0 | 15 | 132446 | 1757.4 | 256QAM | 75/ 0 | 18.061 |
| 15 | 132398 | 1752.6 | 256QAM | 75/ 0 | 5 | 132491 | 1761.9 | 256QAM | 25/ 0 | 18.223 |
| 10 | 132373 | 1750.1 | 256QAM | 50/ 0 | 10 | 132472 | 1760.0 | 256QAM | 50/ 0 | 18.724 |

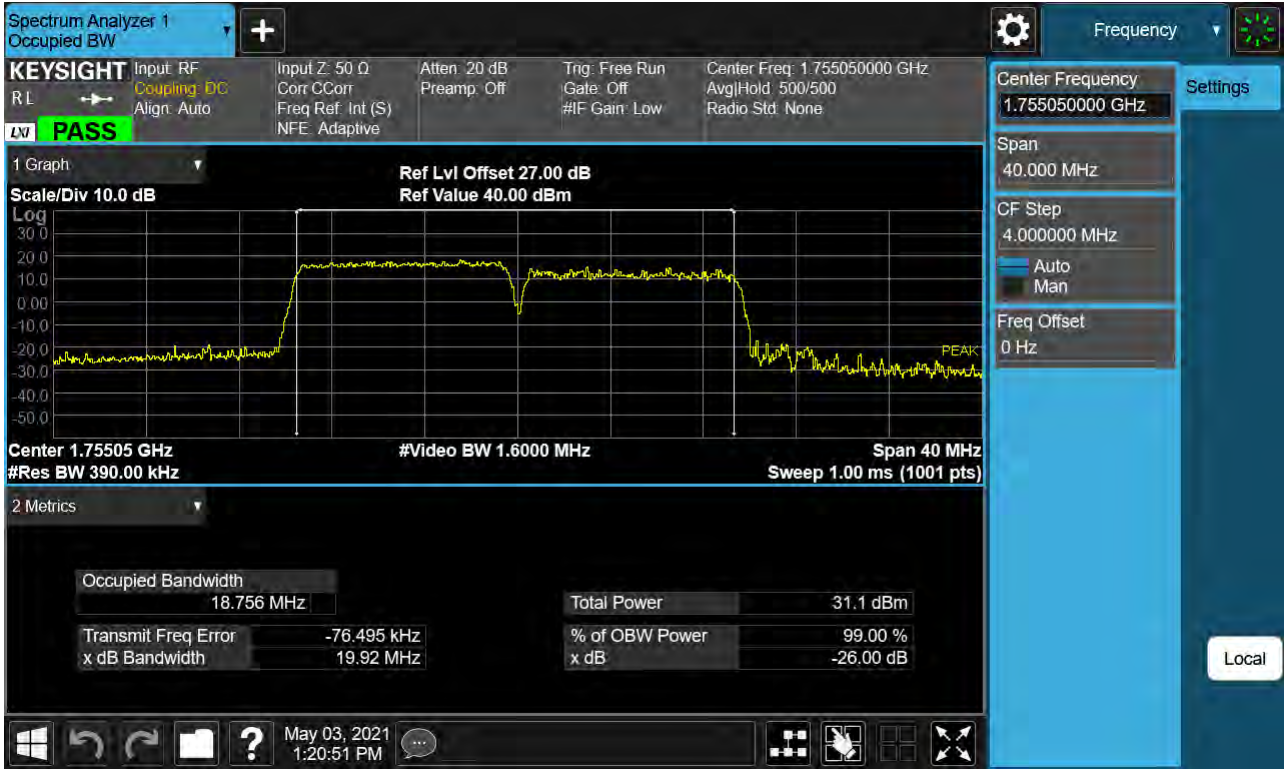
Note:

In order to simplify the report, attached plots were only Max.Bandwidth(10+10)

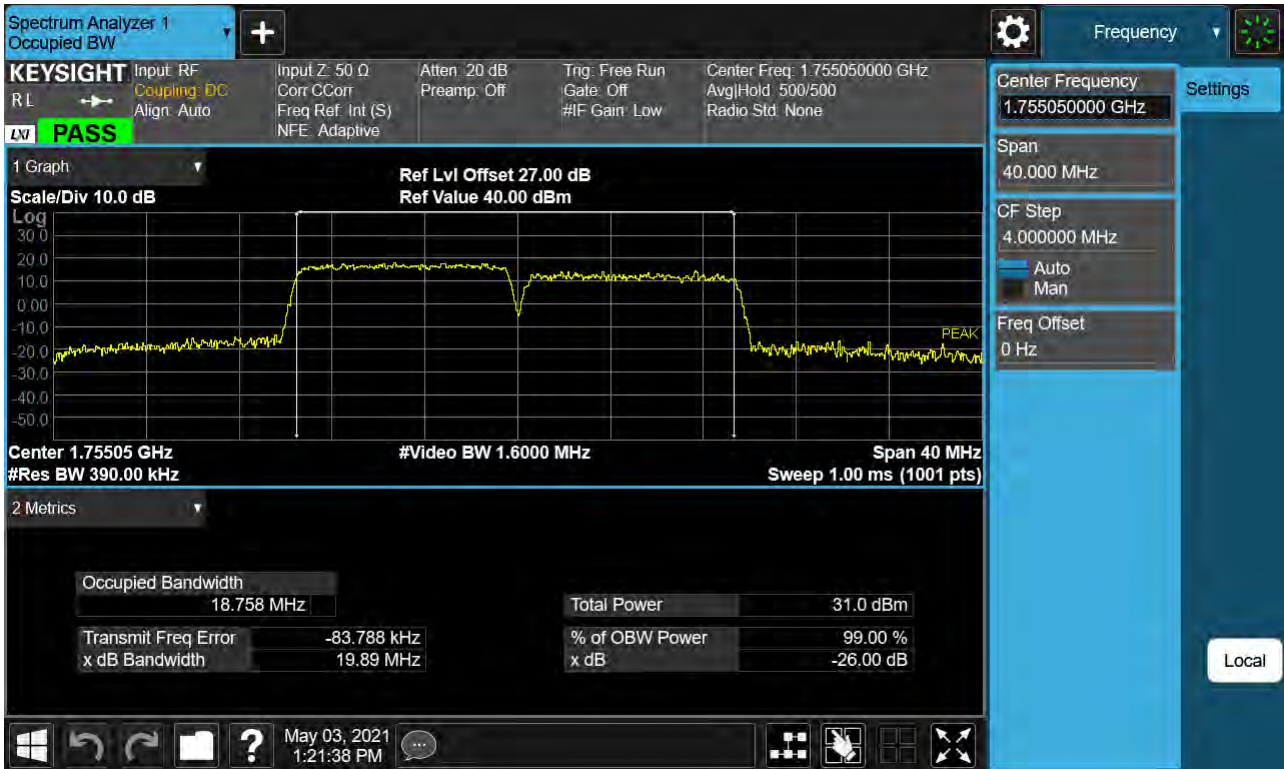
PCC 10MHz Ch132373 RB50 Offset0, SCC 10MHz Ch132472 RB50 Offset0_(QPSK)



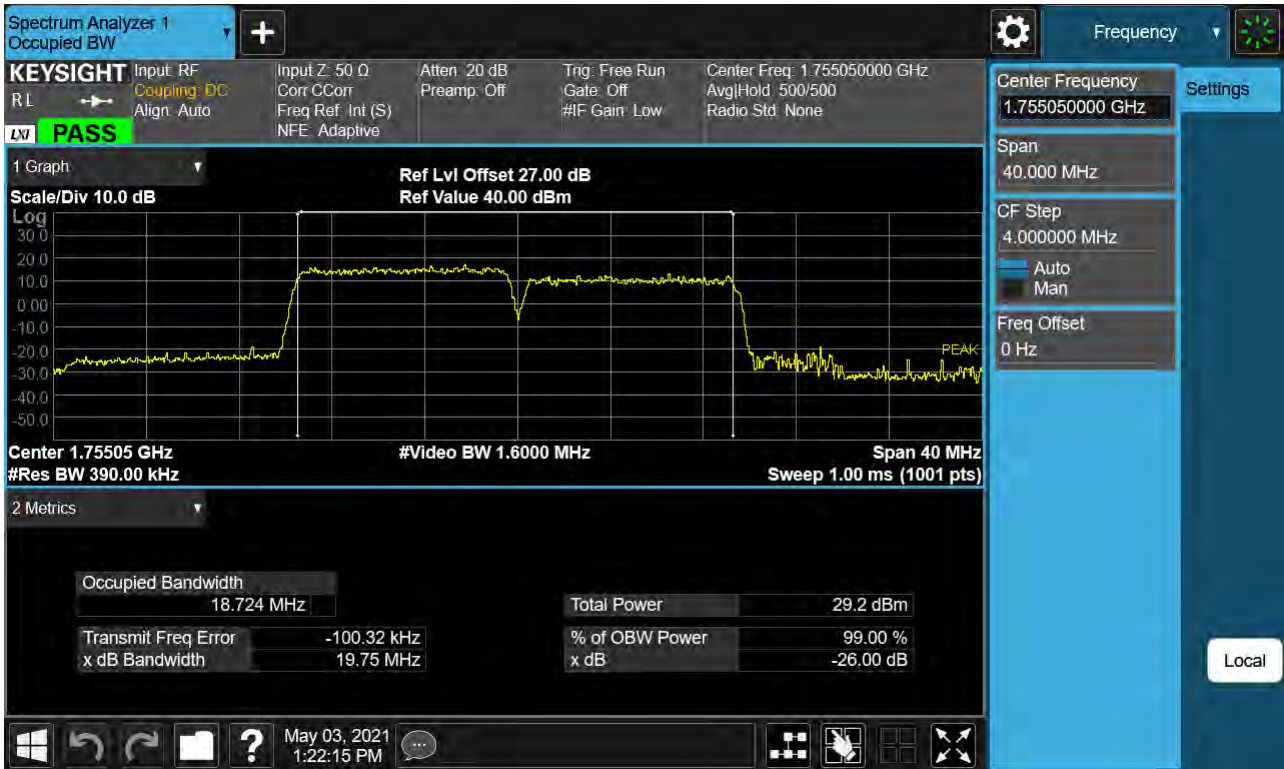
PCC 10MHz Ch132373 RB50 Offset0, SCC 10MHz Ch132472 RB50 Offset0_(16QAM)



PCC 10MHz Ch132373 RB50 Offset0, SCC 10MHz Ch132472 RB50 Offset0_(64QAM)



PCC 10MHz Ch132373 RB50 Offset0, SCC 10MHz Ch132472 RB50 Offset0_(256QAM)



8.8 Peak- to- Average Ratio

| PCC | | | | | SCC | | | | | Data (dBm) |
|----------|--------|------------|------|-----------|----------|--------|------------|------|-----------|------------|
| BW [MHz] | Ch | Freq [MHz] | Mod | RB/Offset | BW [MHz] | Ch | Freq [MHz] | Mod | RB/Offset | |
| 5 | 132398 | 1752.6 | QPSK | 25/ 0 | 5 | 132446 | 1757.4 | QPSK | 25/ 0 | 5.93 |
| 5 | 132375 | 1750.3 | QPSK | 25/ 0 | 10 | 132447 | 1757.5 | QPSK | 50/ 0 | 5.94 |
| 10 | 132397 | 1752.5 | QPSK | 50/ 0 | 5 | 132469 | 1759.7 | QPSK | 25/ 0 | 5.96 |
| 5 | 132353 | 1748.1 | QPSK | 25/ 0 | 15 | 132446 | 1757.4 | QPSK | 75/ 0 | 5.96 |
| 15 | 132398 | 1752.6 | QPSK | 75/ 0 | 5 | 132491 | 1761.9 | QPSK | 25/ 0 | 5.92 |
| 10 | 132373 | 1750.1 | QPSK | 50/ 0 | 10 | 132472 | 1760.0 | QPSK | 50/ 0 | 6.01 |

| PCC | | | | | SCC | | | | | Data (dBm) |
|----------|--------|------------|-------|-----------|----------|--------|------------|-------|-----------|------------|
| BW [MHz] | Ch | Freq [MHz] | Mod | RB/Offset | BW [MHz] | Ch | Freq [MHz] | Mod | RB/Offset | |
| 5 | 132398 | 1752.6 | 16QAM | 25/ 0 | 5 | 132446 | 1757.4 | 16QAM | 25/ 0 | 6.85 |
| 5 | 132375 | 1750.3 | 16QAM | 25/ 0 | 10 | 132447 | 1757.5 | 16QAM | 50/ 0 | 6.57 |
| 10 | 132397 | 1752.5 | 16QAM | 50/ 0 | 5 | 132469 | 1759.7 | 16QAM | 25/ 0 | 6.59 |
| 5 | 132353 | 1748.1 | 16QAM | 25/ 0 | 15 | 132446 | 1757.4 | 16QAM | 75/ 0 | 6.60 |
| 15 | 132398 | 1752.6 | 16QAM | 75/ 0 | 5 | 132491 | 1761.9 | 16QAM | 25/ 0 | 6.55 |
| 10 | 132373 | 1750.1 | 16QAM | 50/ 0 | 10 | 132472 | 1760.0 | 16QAM | 50/ 0 | 6.59 |

| PCC | | | | | SCC | | | | | Data (dBm) |
|----------|--------|------------|-------|-----------|----------|--------|------------|-------|-----------|------------|
| BW [MHz] | Ch | Freq [MHz] | Mod | RB/Offset | BW [MHz] | Ch | Freq [MHz] | Mod | RB/Offset | |
| 5 | 132398 | 1752.6 | 64QAM | 25/ 0 | 5 | 132446 | 1757.4 | 64QAM | 25/ 0 | 7.02 |
| 5 | 132375 | 1750.3 | 64QAM | 25/ 0 | 10 | 132447 | 1757.5 | 64QAM | 50/ 0 | 6.60 |
| 10 | 132397 | 1752.5 | 64QAM | 50/ 0 | 5 | 132469 | 1759.7 | 64QAM | 25/ 0 | 6.89 |
| 5 | 132353 | 1748.1 | 64QAM | 25/ 0 | 15 | 132446 | 1757.4 | 64QAM | 75/ 0 | 6.90 |
| 15 | 132398 | 1752.6 | 64QAM | 75/ 0 | 5 | 132491 | 1761.9 | 64QAM | 25/ 0 | 6.81 |
| 10 | 132373 | 1750.1 | 64QAM | 50/ 0 | 10 | 132472 | 1760.0 | 64QAM | 50/ 0 | 7.33 |

| PCC | | | | | SCC | | | | | Data (dBm) |
|----------|--------|------------|--------|-----------|----------|--------|------------|--------|-----------|------------|
| BW [MHz] | Ch | Freq [MHz] | Mod | RB/Offset | BW [MHz] | Ch | Freq [MHz] | Mod | RB/Offset | |
| 5 | 132398 | 1752.6 | 256QAM | 25/ 0 | 5 | 132446 | 1757.4 | 256QAM | 25/ 0 | 7.35 |
| 5 | 132375 | 1750.3 | 256QAM | 25/ 0 | 10 | 132447 | 1757.5 | 256QAM | 50/ 0 | 6.98 |
| 10 | 132397 | 1752.5 | 256QAM | 50/ 0 | 5 | 132469 | 1759.7 | 256QAM | 25/ 0 | 6.92 |
| 5 | 132353 | 1748.1 | 256QAM | 25/ 0 | 15 | 132446 | 1757.4 | 256QAM | 75/ 0 | 6.95 |
| 15 | 132398 | 1752.6 | 256QAM | 75/ 0 | 5 | 132491 | 1761.9 | 256QAM | 25/ 0 | 6.86 |
| 10 | 132373 | 1750.1 | 256QAM | 50/ 0 | 10 | 132472 | 1760.0 | 256QAM | 50/ 0 | 7.84 |

Note:

In order to simplify the report, attached plots were only Max.Bandwidth(10+10)

PCC 10MHz Ch132373 RB50 Offset0, SCC 10MHz Ch132472 RB50 Offset0_(QPSK)



PCC 10MHz Ch132373 RB50 Offset0, SCC 10MHz Ch132472 RB50 Offset0_(16QAM)



PCC 10MHz Ch132373 RB50 Offset0, SCC 10MHz Ch132472 RB50 Offset0_(64QAM)



FCC 10MHz Ch132373 RB50 Offset0, SCC 10MHz Ch132472 RB50 Offset0_(256QAM)



9. ANNEX A_ TEST SETUP PHOTO

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

| No. | Description |
|-----|---------------------|
| 1 | HCT-RF-2105-FC030-P |