

An additional consideration when performing conducted measurements of restricted-band emissions is that unwanted emissions radiating from the EUT cabinet, control circuits, power leads, or intermediate circuit elements will likely go undetected in a conducted measurement configuration. To address this concern, a radiated test shall be performed to ensure that emissions emanating from the EUT cabinet (rather than from the antenna port) also comply with the applicable limits.

For these cabinet radiated spurious emission measurements, the EUT transmit antenna may be replaced with a termination matching the nominal impedance of the antenna. Procedures for performing radiated measurements are specified in 6.3, 6.5, and 6.6. All detected emissions shall comply with the applicable requirements.

This test is required for any spurious emission or modulation product that falls in an Unrestricted Band, as defined in Section 15.209. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:

Span	=	wide enough to fully capture the emission being measured
RBW	=	1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz
VBW	=	$\geq$ RBW
Sweep	=	auto
Detector function	=	peak
Trace	=	max hold

Follow the guidelines in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization, etc. A pre-amp and a high pass filter are required for this test, in order to provide the measuring system with sufficient sensitivity. Allow the trace to stabilize. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, which must comply with the limit specified in Section 15.35(b). Submit this data.

Now repeat the measurement using the average detector of the spectrum analyzer. Submit this data.

Note 1: Limit listed is the general limit as specified in 15.209 in order to show compliance with the restricted bands of operation as well as the out of band limit in 15.247. No other identifiable signals were observed in the restricted bands as specified in 15.205.

Note 2: Highest frequency investigated was the tenth harmonic of the fundamental, no radiated emissions were detected above the 1st harmonic.

Requirement: FCC Part 15.247 Clause (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

Client: SnapRays LLC

Date: 10 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: General limit of 15.209

Tech: CL Payne

Result: Pass

Radiated Spurious												
Chl	Freq in MHz	Meter Reading (dBuV/m)	Pre-Amp (dB)	Cable (dB)	Antenna (dB)	Corr'd Reading (dBuV/m)	Limit (dBuV/m)	Delta	Azimuth (degrees)	Height (m)	Polarity	Meas Type
Low	4824	37.5	25.7	5.9	33.2	50.92	74.0	-23.08	314	232	Vert	PK
Low	4824	26.9	25.7	5.9	33.2	40.37	54.0	-13.63	314	232	Vert	AVE
Low	4824	39.4	25.7	5.9	33.2	52.79	74.0	-21.21	332	237	Horz	PK
Low	4824	30.4	25.7	5.9	33.2	43.85	54.0	-10.15	332	237	Horz	AVE
Mid	4872	38.6	25.7	5.9	33.3	52.22	74.0	-21.78	329	240	Vert	PK
Mid	4872	29.2	25.7	5.9	33.3	42.82	54.0	-11.18	329	240	Vert	AVE
Mid	4872	42.3	25.7	5.9	33.3	55.91	74.0	-18.09	257	261	Horz	PK
Mid	4872	29.6	25.7	5.9	33.3	43.27	54.0	-10.73	257	261	Horz	AVE
High	4928	43.2	25.6	6.0	33.5	57.08	74.0	-16.92	302	221	Vert	PK
High	4928	30.6	25.6	6.0	33.5	44.50	54.0	-9.50	302	221	Vert	AVE
High	4928	43.3	25.6	6.0	33.5	57.16	74.0	-16.84	328	253	Horz	PK
High	4928	31.4	25.6	6.0	33.5	45.24	54.0	-8.76	328	253	Horz	AVE

There were no discernable radiated readings above the ground floor above the first harmonic.

EUT was mounted as it would be in normal operating mode.

11.12.2 Antenna-port conducted measurements

11.12.2.1 General

Antenna-port conducted measurements may also be used as an alternative to radiated measurements for determining compliance in the restricted frequency bands requirements. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case emissions is required.

11.12.2.2 General procedure for conducted measurements in restricted bands

The general procedure for conducted measurements in restricted bands is as follows:

- a) Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency (see 11.12.2.3 through 11.12.2.5 for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).
- b) Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP (see 11.12.2.6 for guidance on determining the applicable antenna gain).
- c) Add the appropriate maximum ground reflection factor to the EIRP (6 dB for frequencies ≤ 30 MHz; 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive; and 0 dB for frequencies > 1000 MHz).
- d) For MIMO devices, measure the power of each chain and sum the EIRP of all chains in linear terms (i.e., watts and mW).
- e) Convert the resultant EIRP to an equivalent electric field strength using the following relationship:

$$E = \text{EIRP} - 20 \log d + 104.8$$

where

E is the electric field strength in dB μ V/m

EIRP is the equivalent isotropically radiated power in dBm

d is the specified measurement distance in m

- f) Compare the resultant electric field strength level with the applicable regulatory limit.
- g) Perform the radiated spurious emission test.

15.247 (d) Restricted Bands - *continued*

Note: With respect to steps e) and f) a limit line (EIRP) based upon the dBuV/m limit was calculated and put on the plots to satisfy the requirement of step f) above. Formula is: $(E + 20 \log d) - 104.8 = (\text{EIRP limit})$. The appropriate correction factor from step c) was included in the final calculation.

Limit Calculation:

Formula: $E - 104.8 + 20\log(3) - \text{antenna gain} - \text{ground reflection factor}$

30 MHz - 88 MHz	$40 - 104.8 + 20\log(d) - 2 - 4.7$	= -61.96 dBm
88 MHz - 216 MHz	$43 - 104.8 + 20\log(d) - 2 - 4.7$	= -58.96 dBm
216 MHz - 960 MHz	$46 - 104.8 + 20\log(d) - 2 - 4.7$	= -55.96 dBm
960 MHz - 1000 MHz	$54 - 104.8 + 20\log(d) - 2 - 4.7$	= -47.96 dBm
> 1000 MHz	$54 - 104.8 + 20\log(d) - 2 - 0$	= -43.26 dBm

Note: $(d) = \text{Measurement distance in meters} = 3 \text{ meters}$

Requirement: FCC Part 15.247 Clause (d)

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

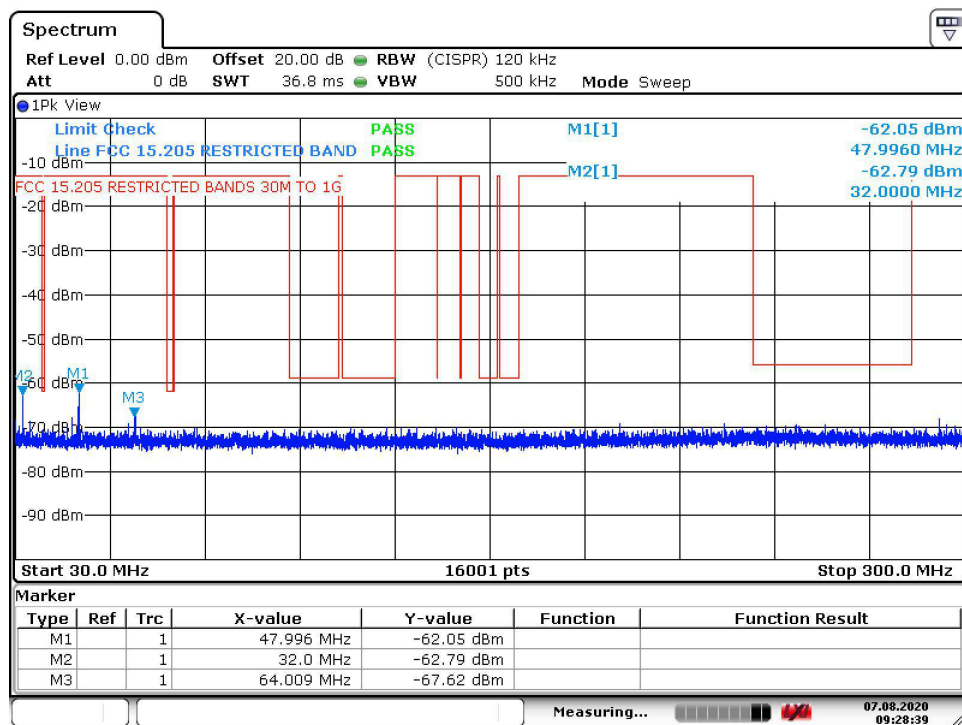
Low Channel: 2412 MHz

Data Rate: 1Mb/s

Frequency Range: 30 MHz to 300 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 09:28:39

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

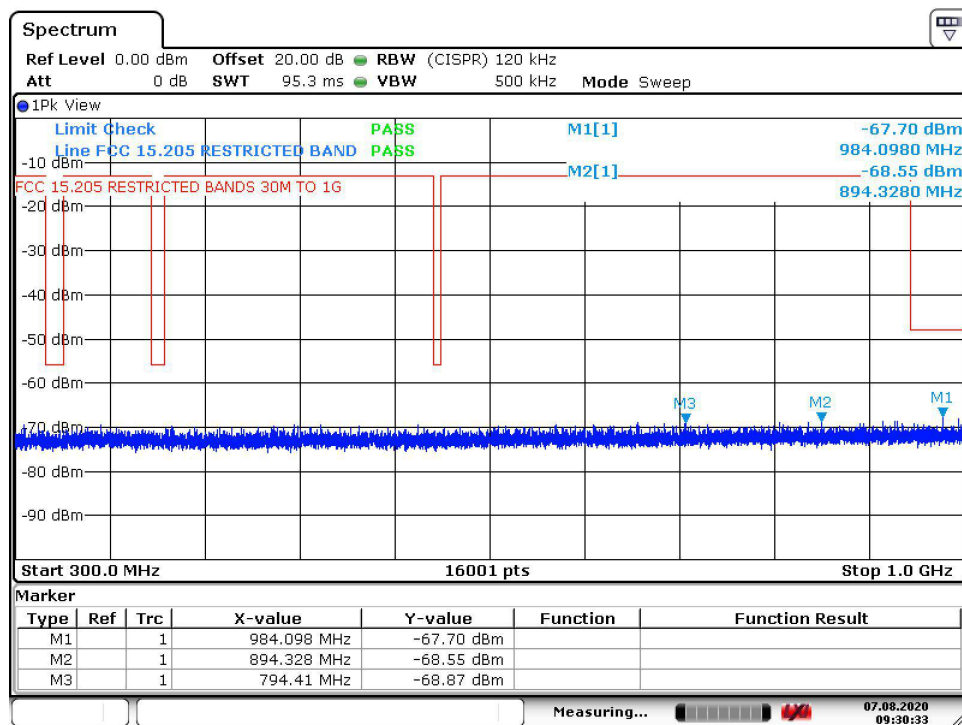
Low Channel: 2412 MHz

Data Rate: 1Mb/s

Frequency Range: 300 MHz to 1000 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 09:30:33

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

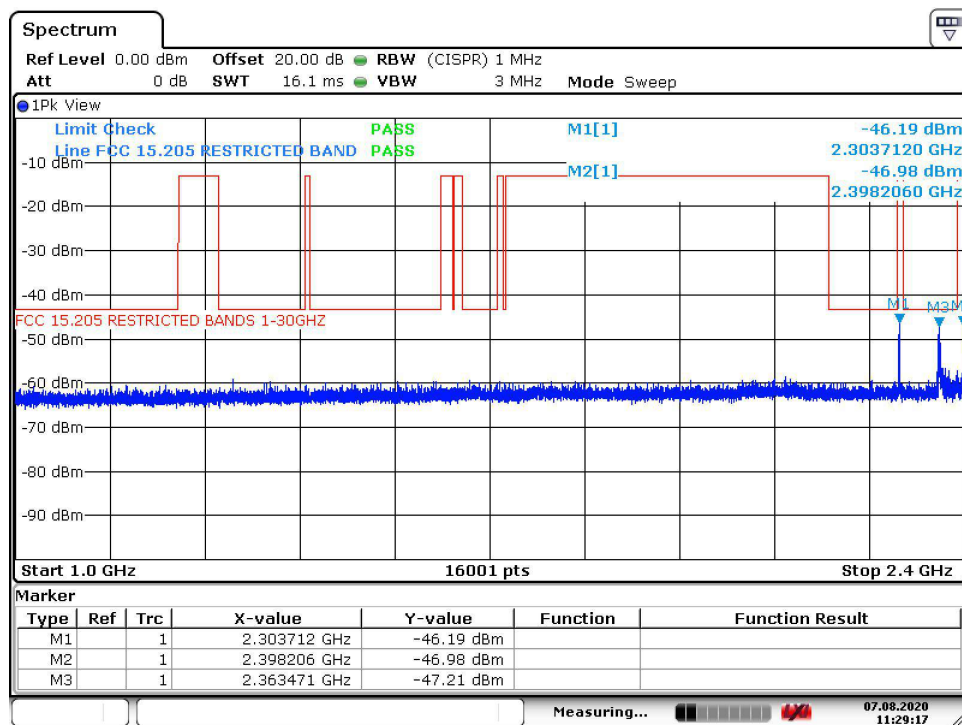
Low Channel: 2412 MHz

Data Rate: 1Mb/s

Frequency Range: 1000 MHz to 2400 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 11:29:17

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

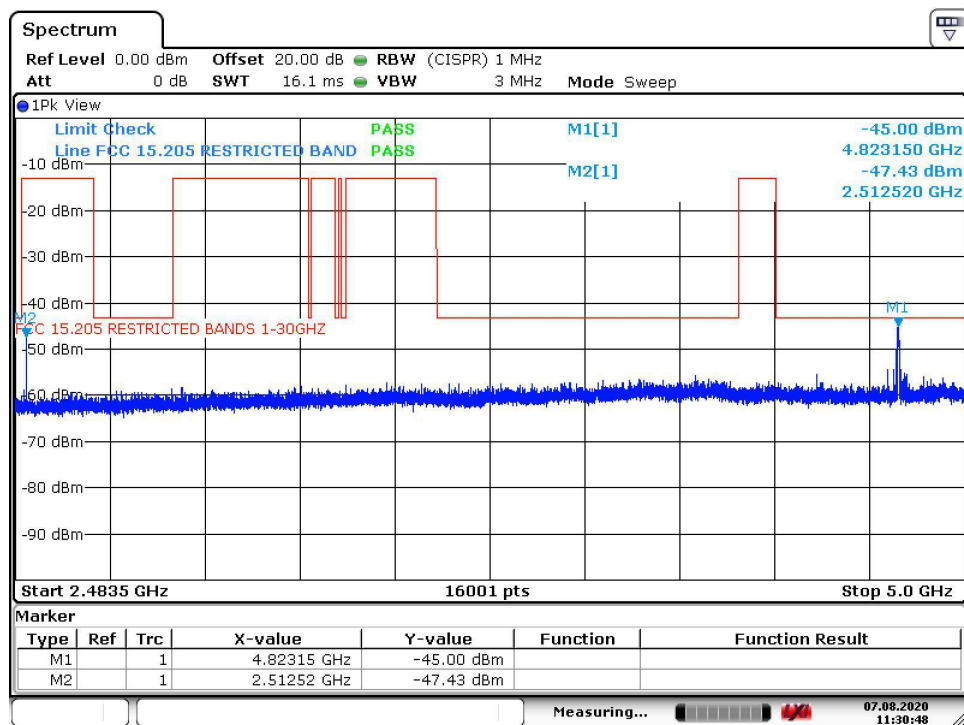
Low Channel: 2412 MHz

Data Rate: 1Mb/s

Frequency Range: 2483.5 MHz to 5000 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 11:30:48

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

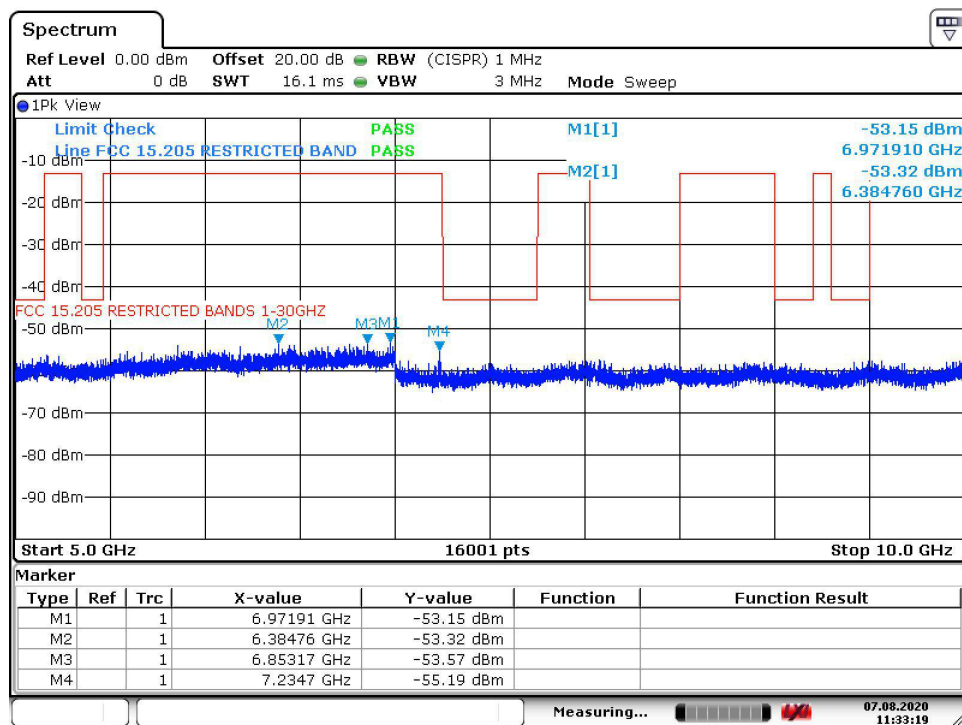
Low Channel: 2412 MHz

Data Rate: 1Mb/s

Frequency Range: 5000 MHz to 10000 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 11:33:19

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

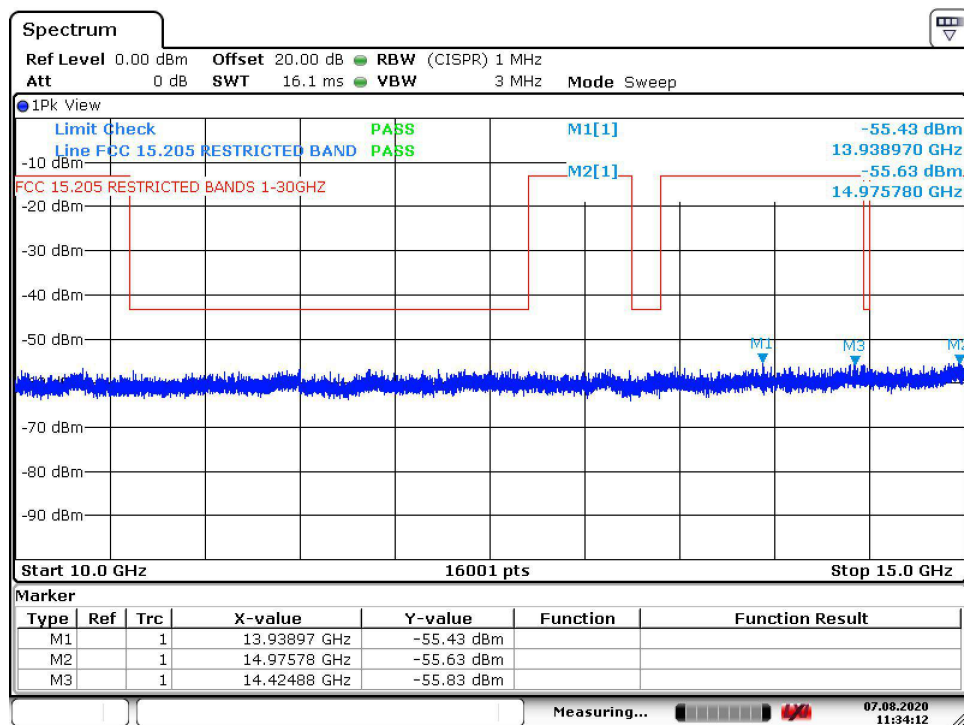
Low Channel: 2412 MHz

Data Rate: 1Mb/s

Frequency Range: 10000 MHz to 15000 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 11:34:12

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

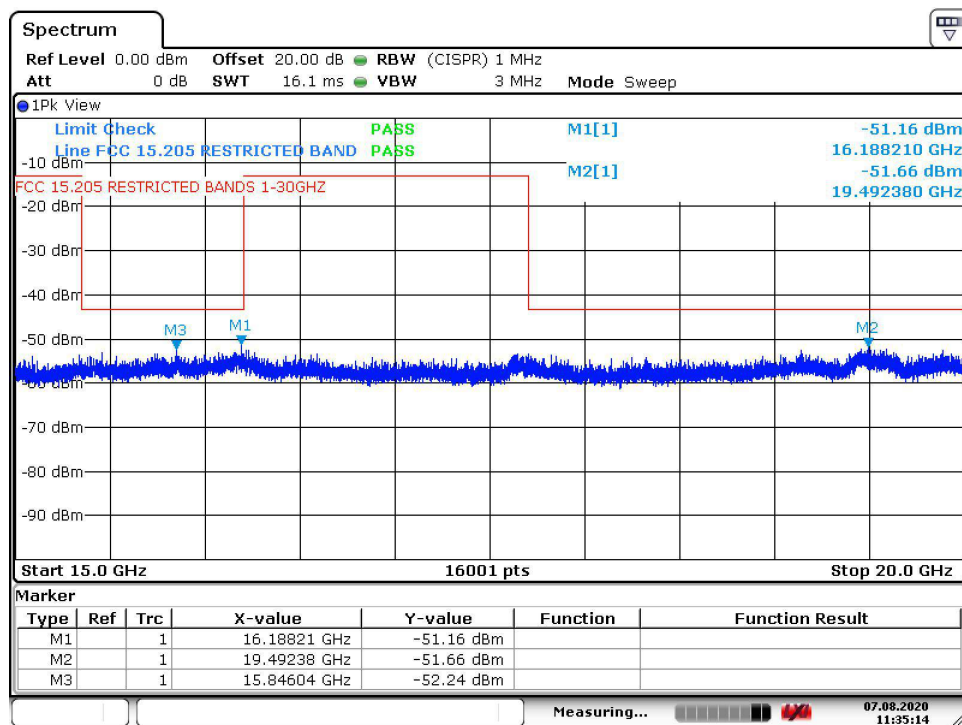
Low Channel: 2412 MHz

Data Rate: 1Mb/s

Frequency Range: 15000 MHz to 20000 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 11:35:14

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

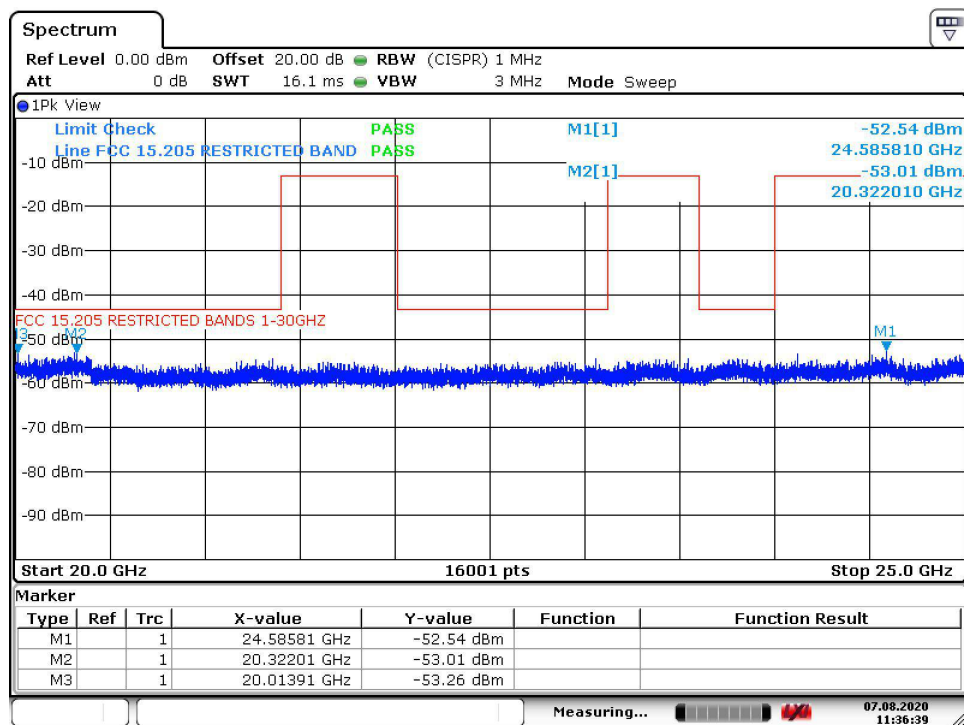
Low Channel: 2412 MHz

Data Rate: 1Mb/s

Frequency Range: 20000 MHz to 25000 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 11:36:39

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

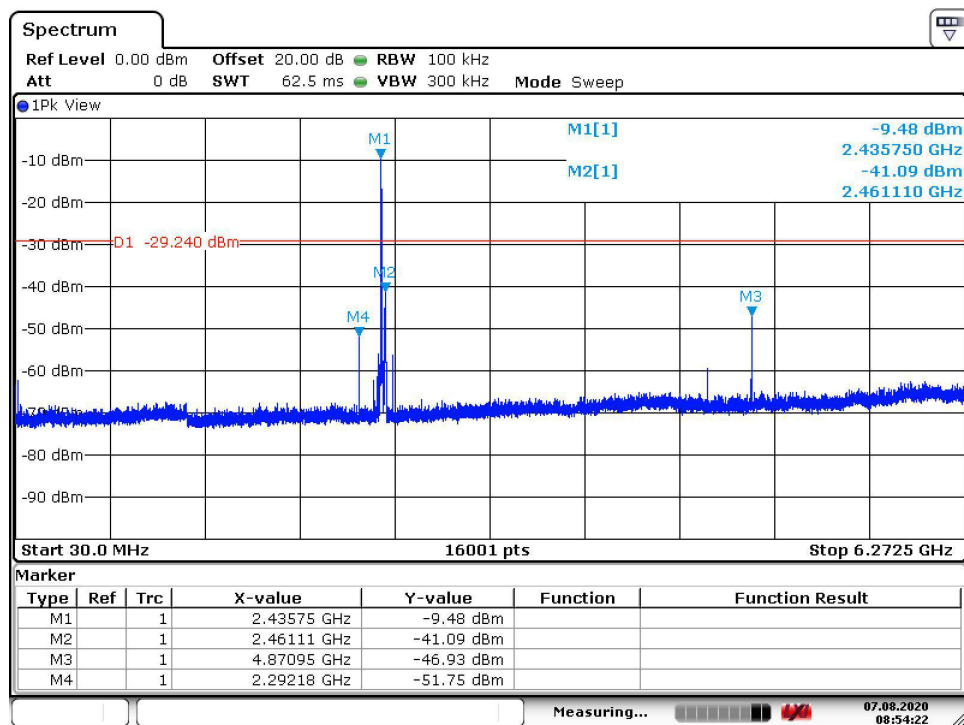
Mid Channel: 2436 MHz

Data Rate: 1Mb/s

Frequency Range: 30 MHz to 300 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 08:54:23

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

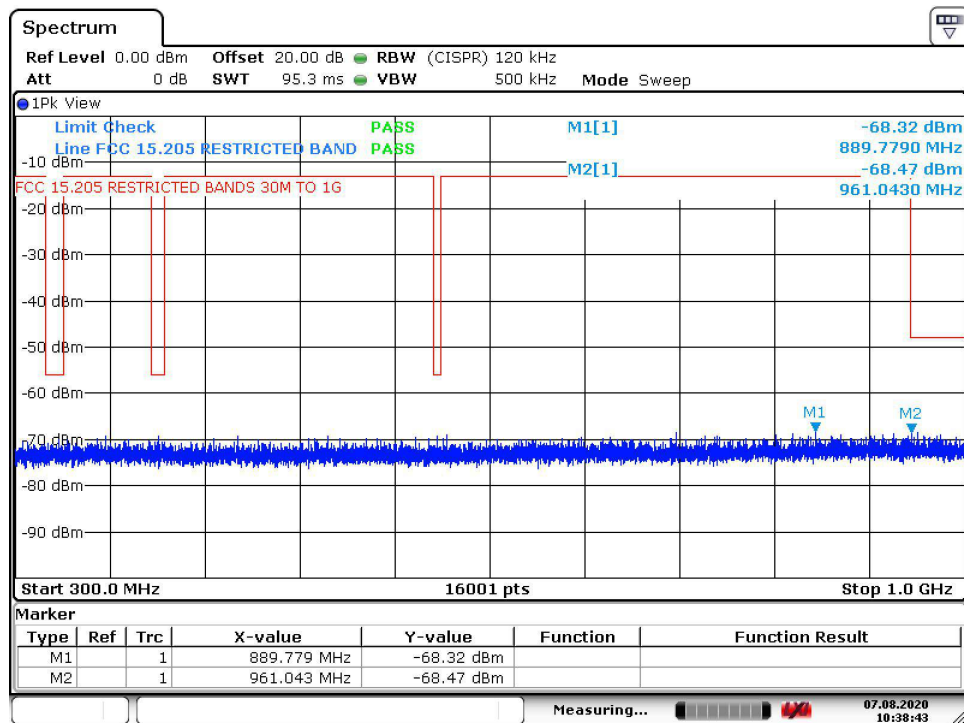
Mid Channel: 2436 MHz

Data Rate: 1Mb/s

Frequency Range: 300 MHz to 1000 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 10:38:43

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

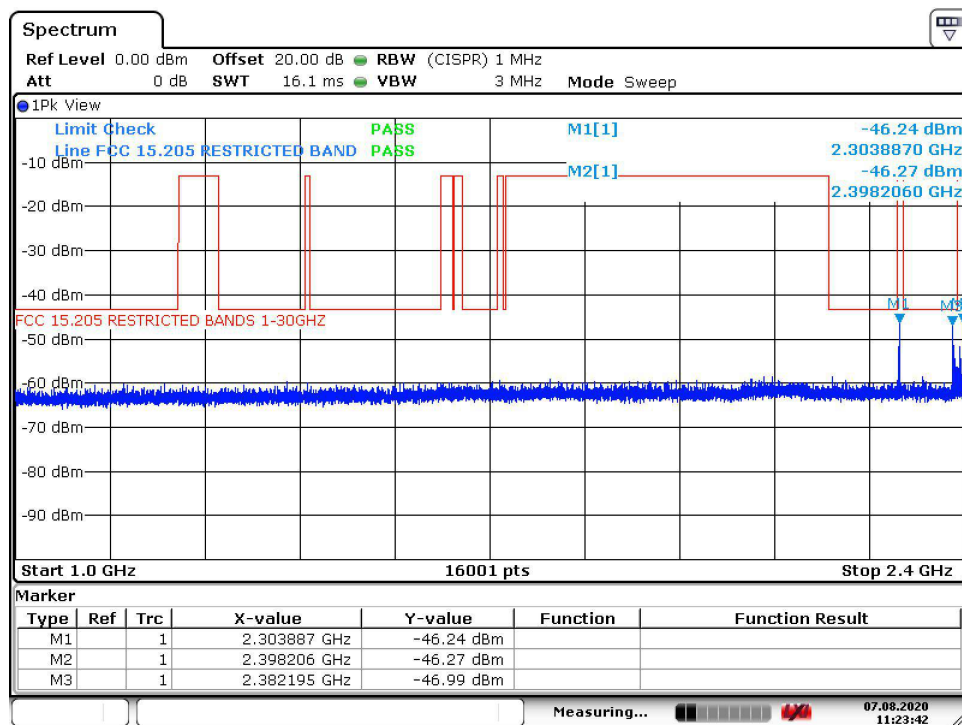
Mid Channel: 2436 MHz

Data Rate: 1Mb/s

Frequency Range: 1000 MHz to 2400 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 11:23:42

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

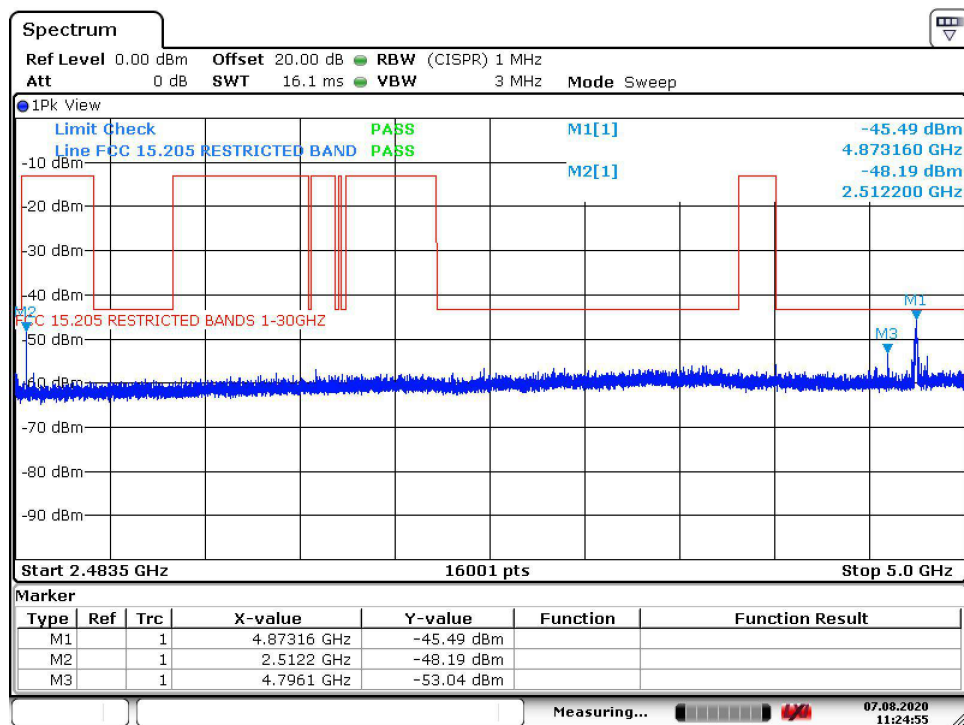
Mid Channel: 2436 MHz

Data Rate: 1Mb/s

Frequency Range: 2483.5 MHz to 5000 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 11:24:55

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

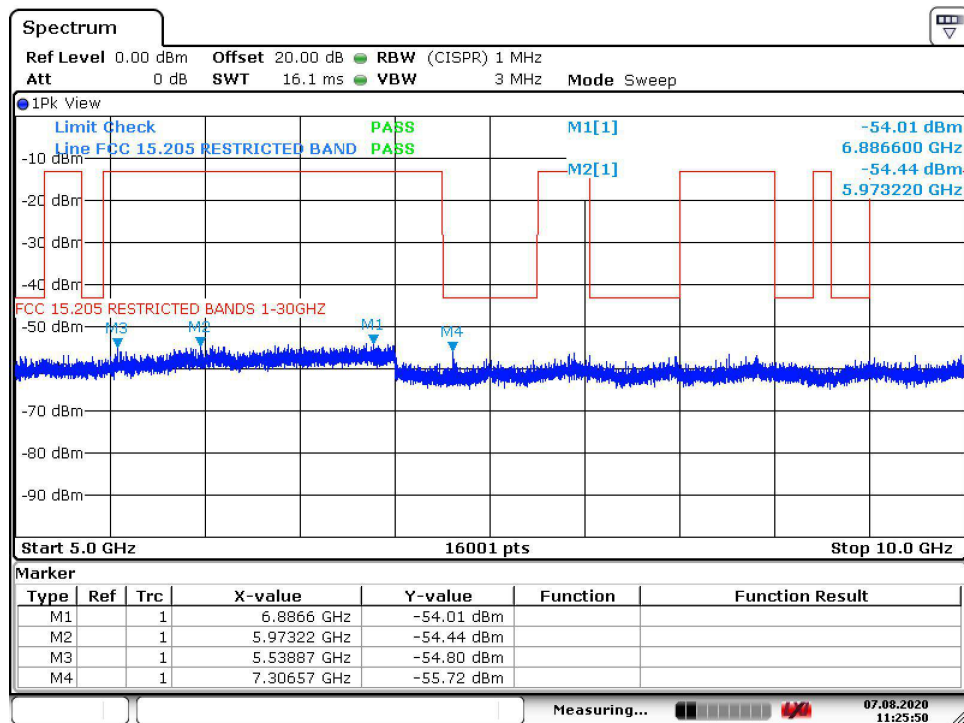
Mid Channel: 2436 MHz

Data Rate: 1Mb/s

Frequency Range: 5000 MHz to 10000 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 11:25:50

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

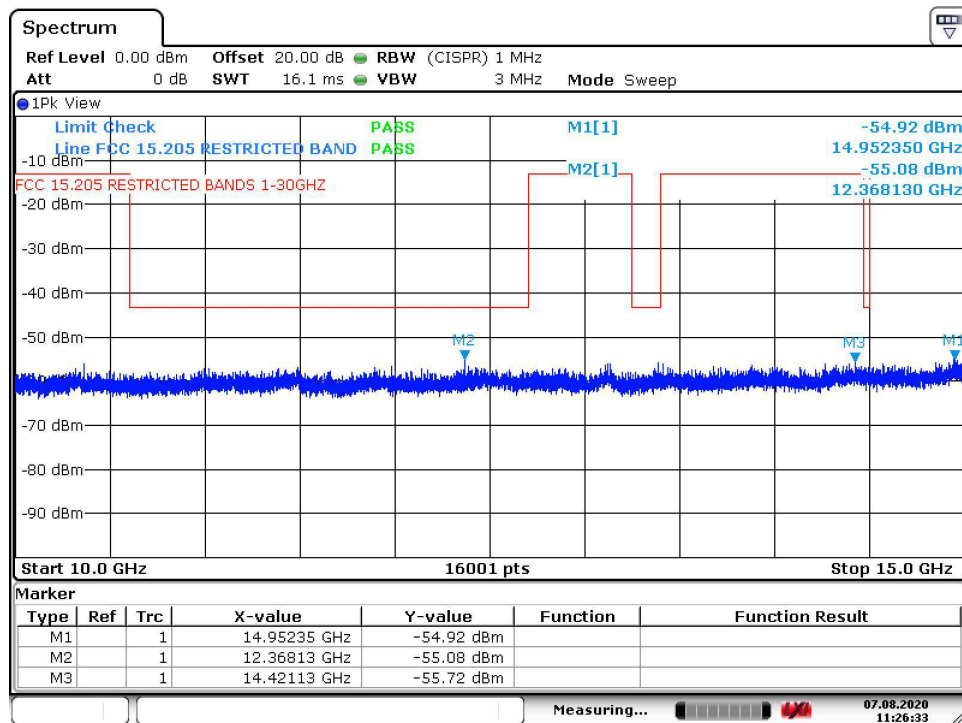
Mid Channel: 2436 MHz

Data Rate: 1Mb/s

Frequency Range: 10000 MHz to 15000 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 11:26:33

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

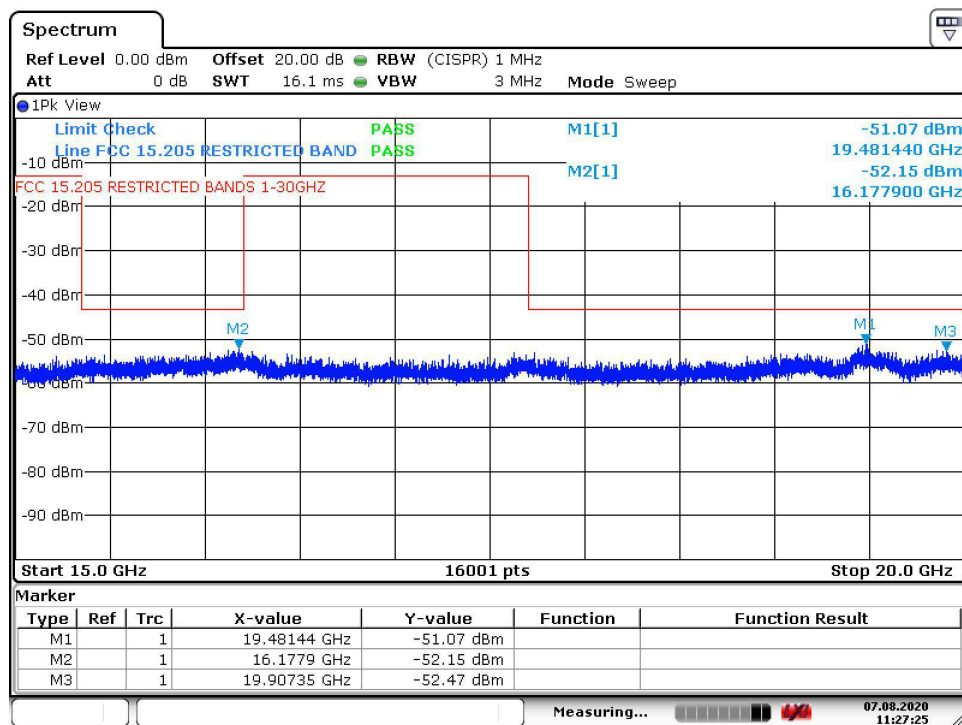
Mid Channel: 2436 MHz

Data Rate: 1Mb/s

Frequency Range: 15000 MHz to 20000 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 11:27:25

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

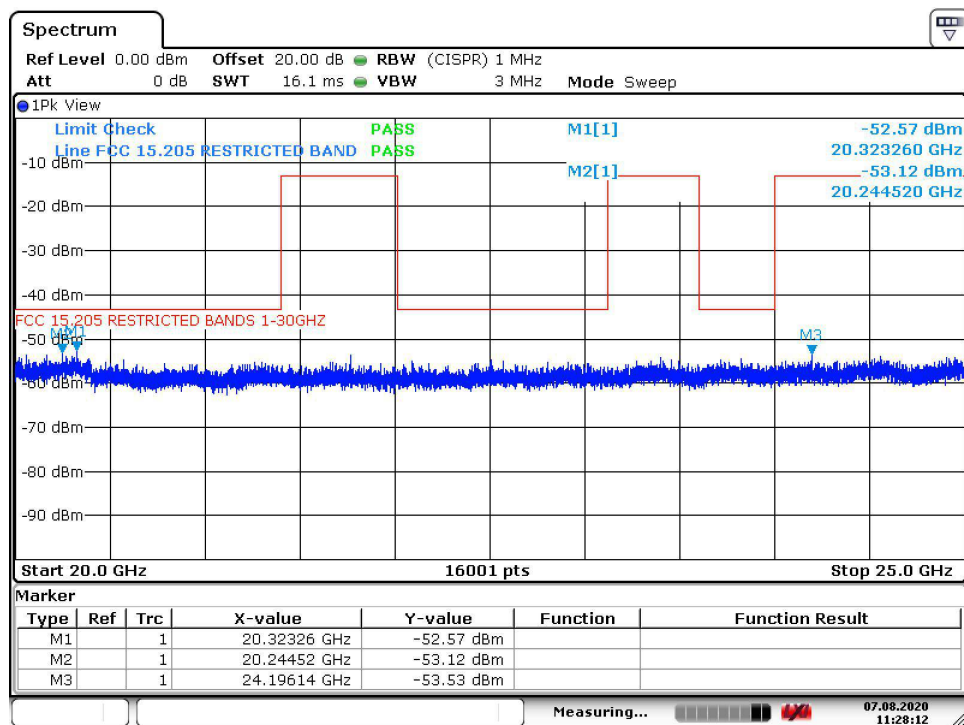
Mid Channel: 2436 MHz

Data Rate: 1Mb/s

Frequency Range: 20000 MHz to 25000 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 11:28:12

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

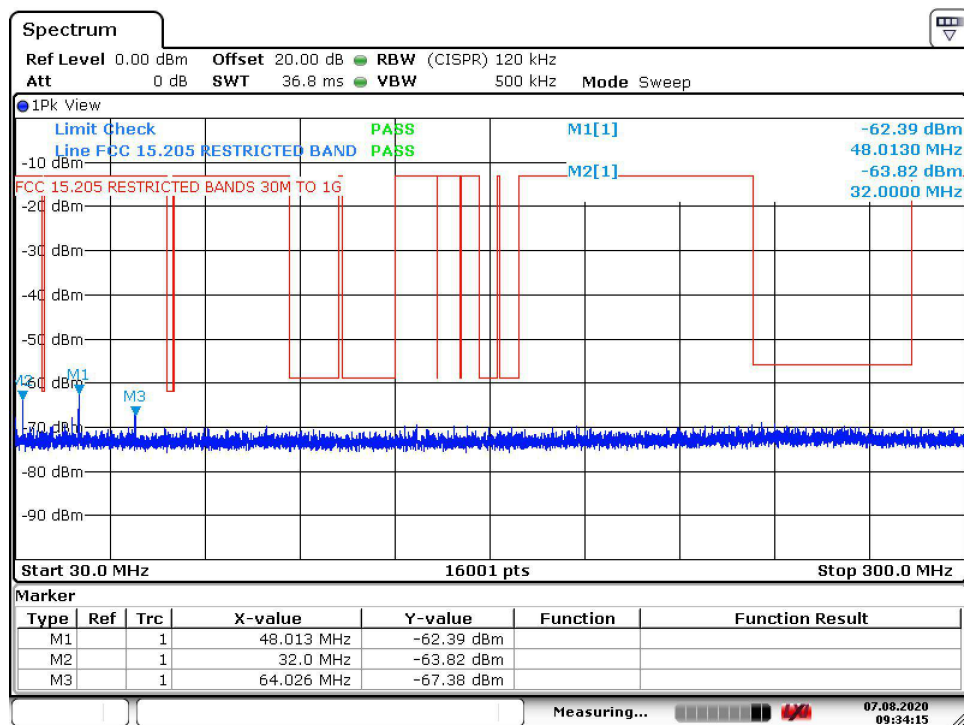
High Channel: 2464 MHz

Data Rate: 1Mb/s

Frequency Range: 30 MHz to 300 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 09:34:15

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

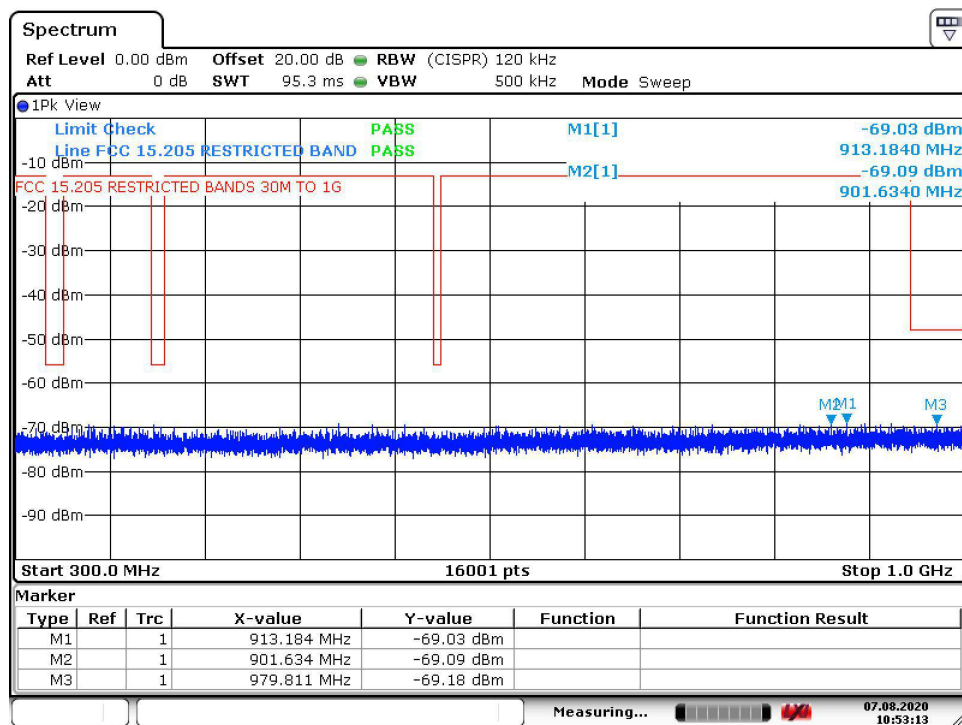
High Channel: 2464 MHz

Data Rate: 1Mb/s

Frequency Range: 300 MHz to 1000 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 10:53:13

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

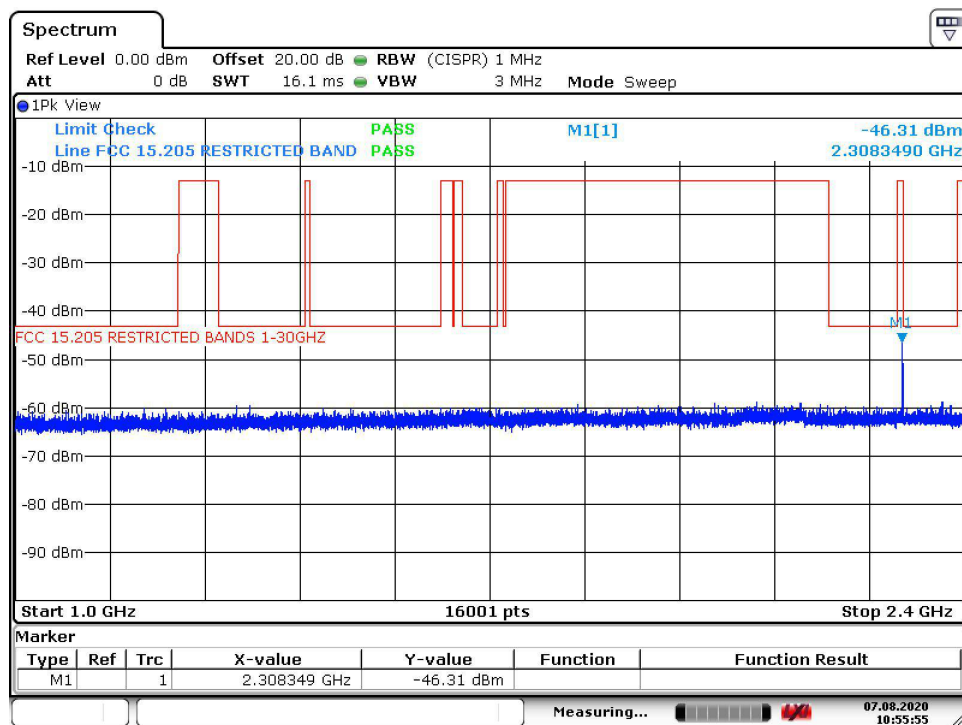
High Channel: 2464 MHz

Data Rate: 1Mb/s

Frequency Range: 1000 MHz to 2400 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 10:55:55

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

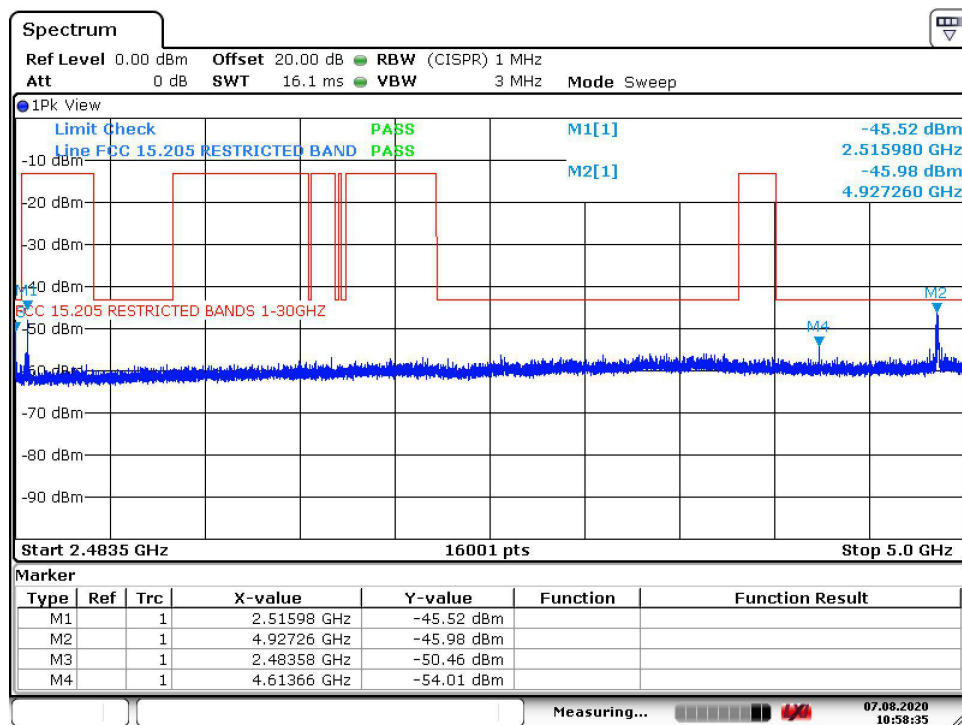
High Channel: 2464 MHz

Data Rate: 1Mb/s

Frequency Range: 2483.5 MHz to 5000 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 10:58:35

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

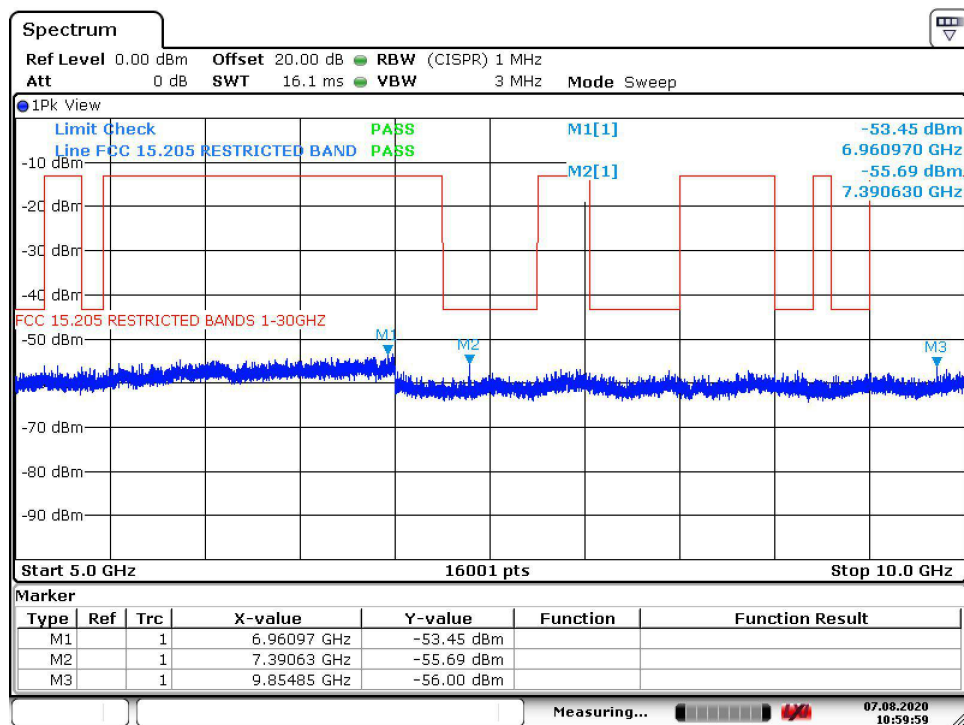
High Channel: 2464 MHz

Data Rate: 1Mb/s

Frequency Range: 5000 MHz to 10000 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 10:59:59

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

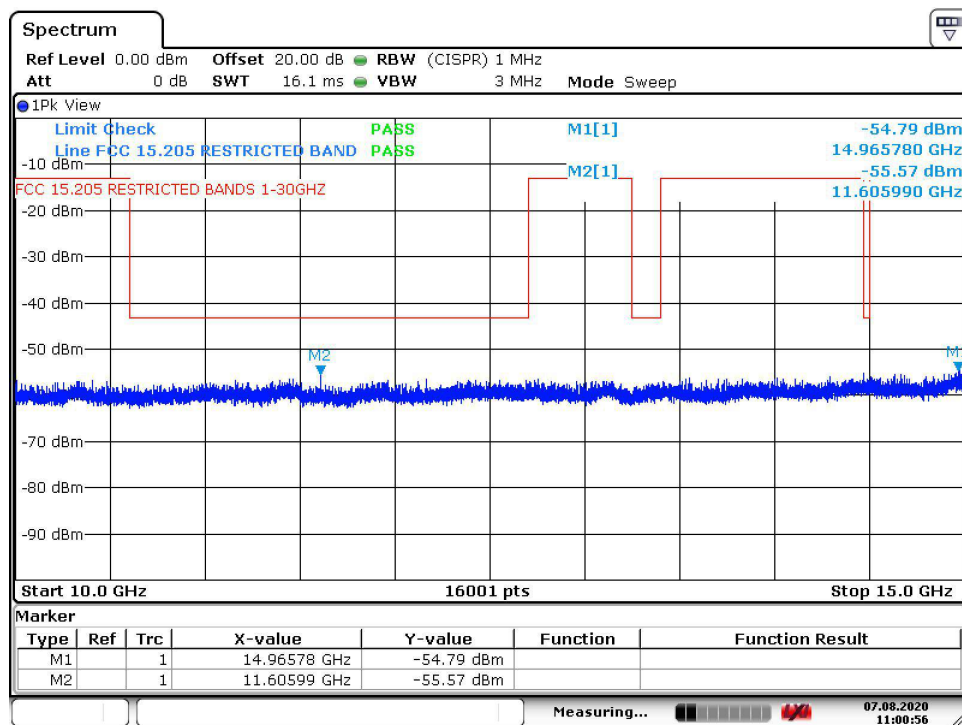
High Channel: 2464 MHz

Data Rate: 1Mb/s

Frequency Range: 10000 MHz to 15000 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 11:00:56

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

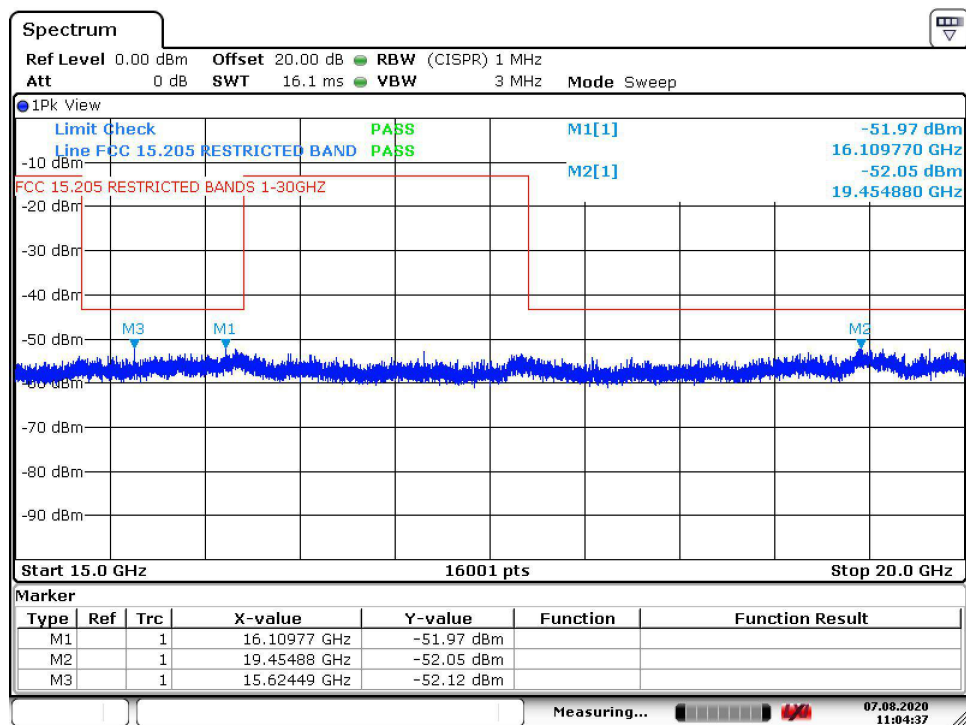
High Channel: 2464 MHz

Data Rate: 1Mb/s

Frequency Range: 15000 MHz to 20000 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 11:04:37

Client: SnapRays LLC

Date: 7 Aug 2020

DNB Job: 16015

EUT: DTS Transmitter

Model No: 01CL-###-SM10

Requirement: Emissions Below Restricted Band Limits

Tech: CL Payne

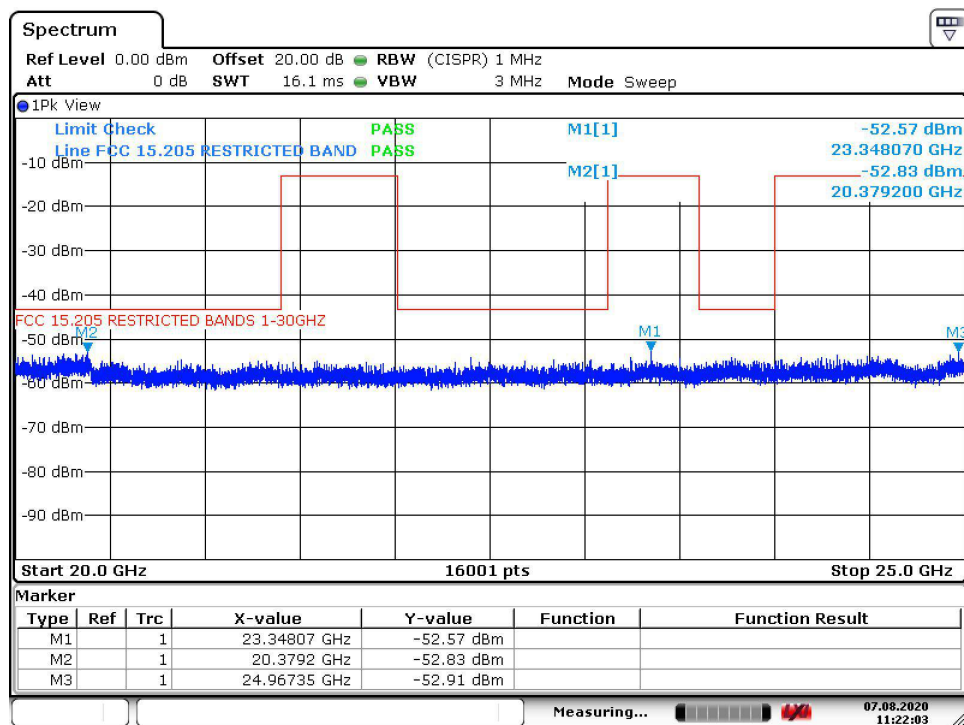
High Channel: 2464 MHz

Data Rate: 1Mb/s

Frequency Range: 20000 MHz to 25000 MHz

Result: Pass

Detector Function: Peak



Date: 7.AUG.2020 11:22:04

End of Report UT16015A-002