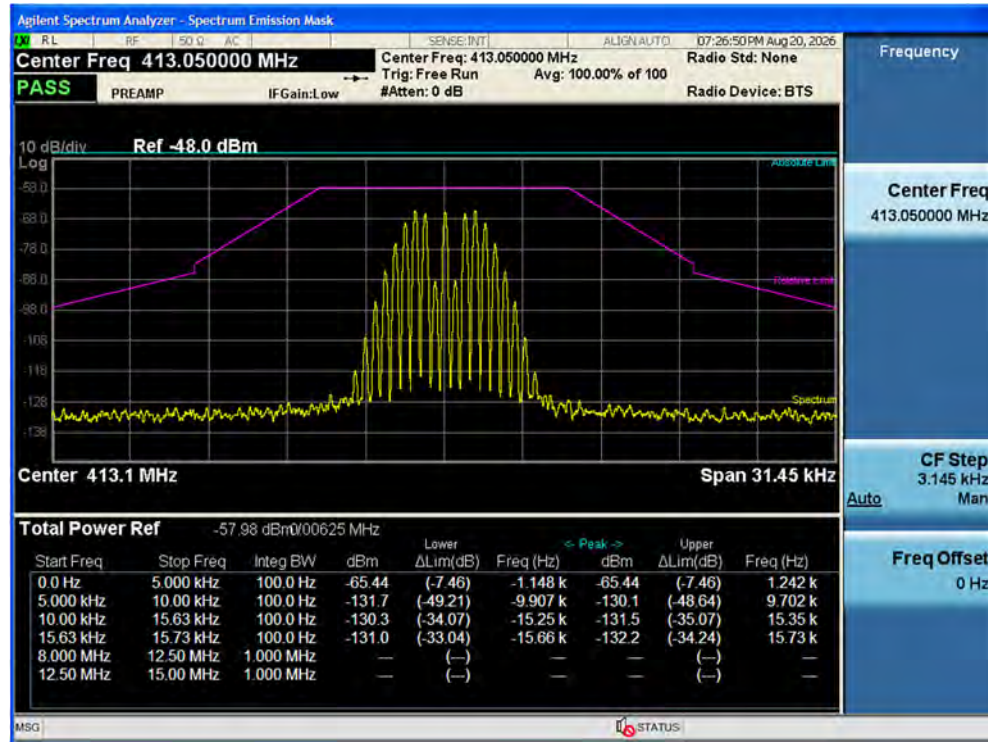
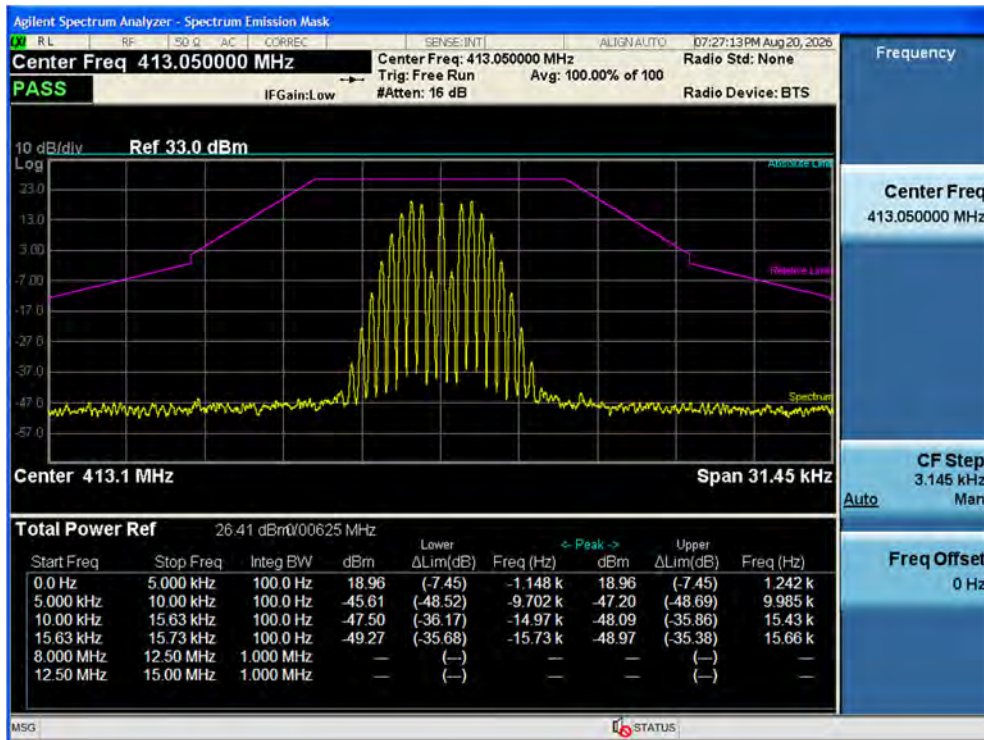


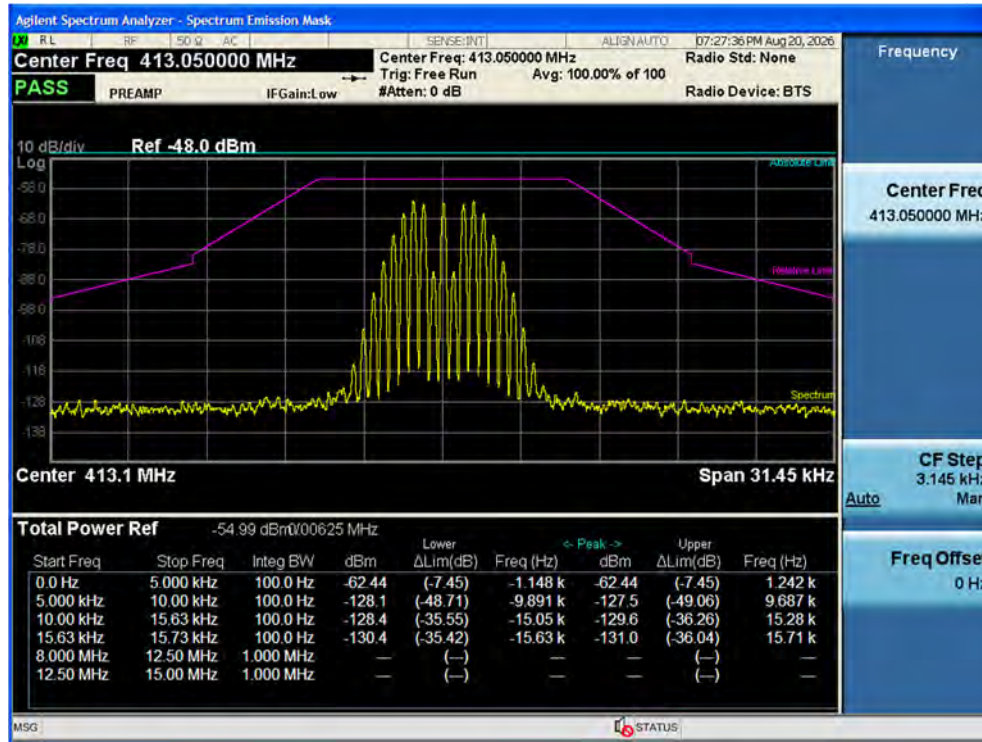
Input / UHF (406.1 ~ 420) / Uplink / FM (6.25 kHz) / Mask C



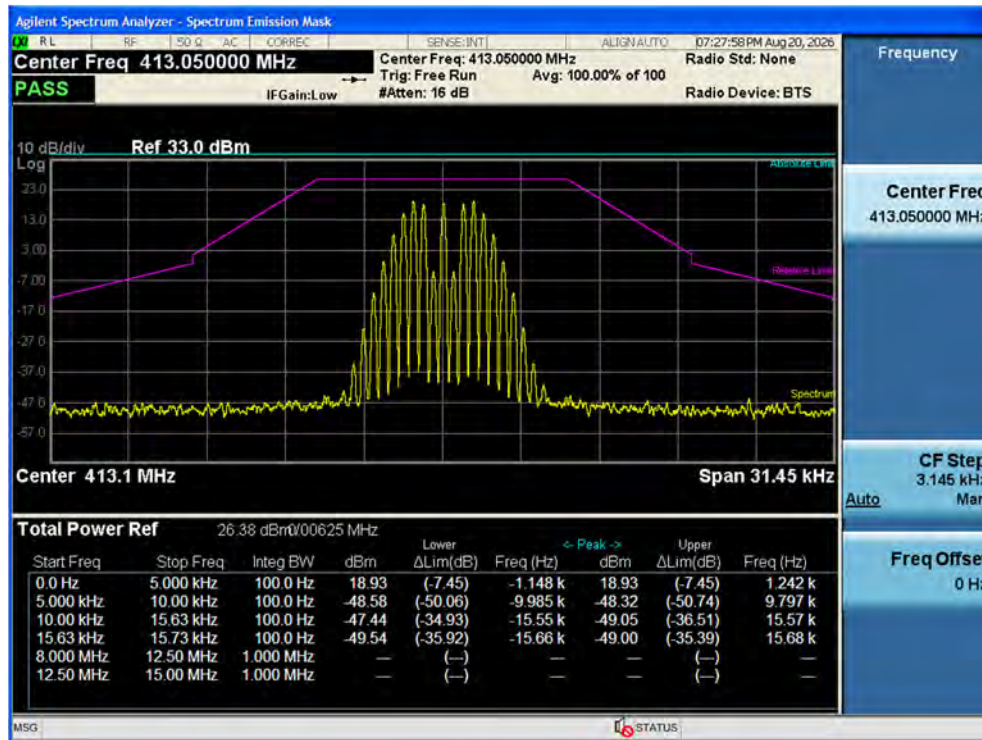
Output / UHF (406.1 ~ 420) / Uplink / FM (6.25 kHz) / Mask C



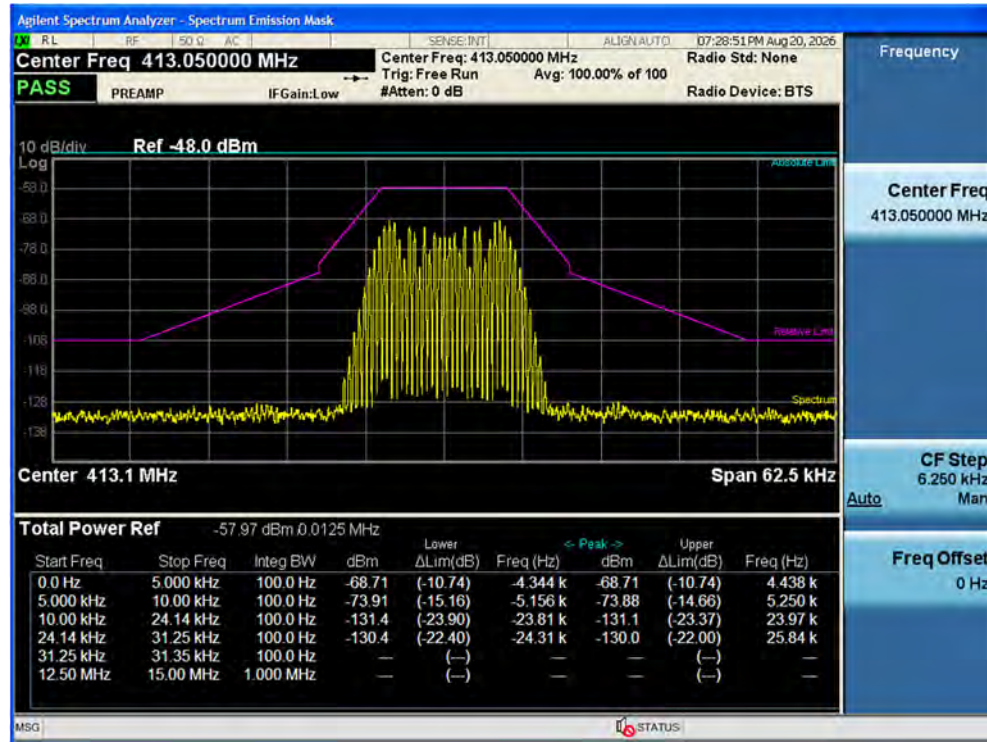
Input @ +3 dB AGC threshold / UHF (406.1 ~ 420) / Uplink / FM (6.25 kHz) / Mask C



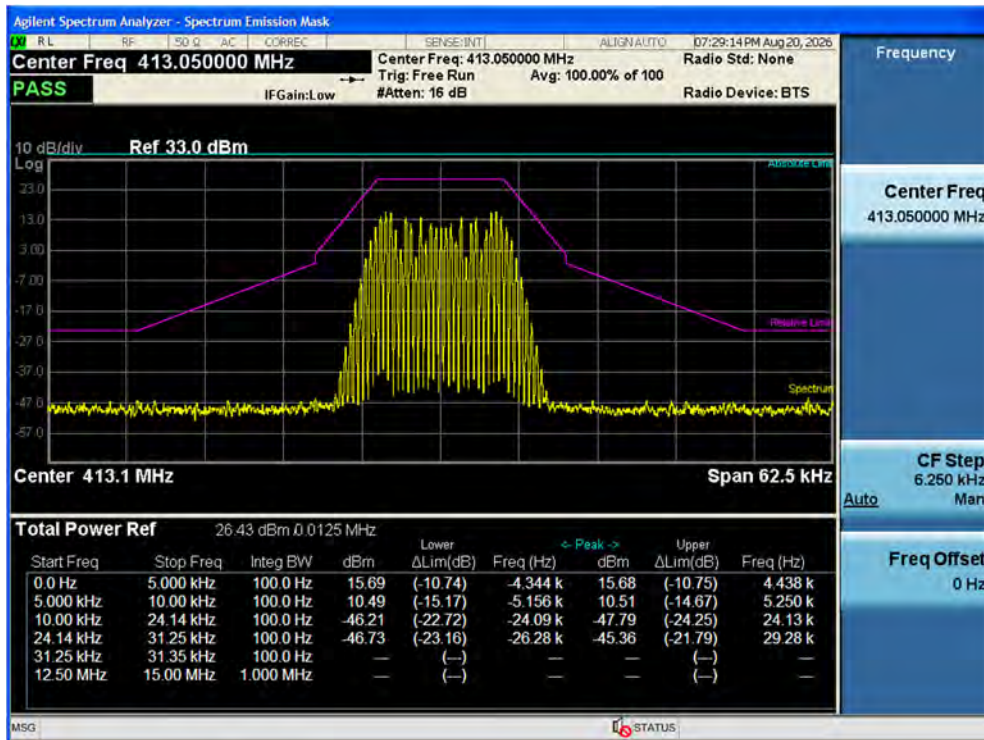
Output @ +3 dB AGC threshold / UHF (406.1 ~ 420) / Uplink / FM (6.25 kHz) / Mask C



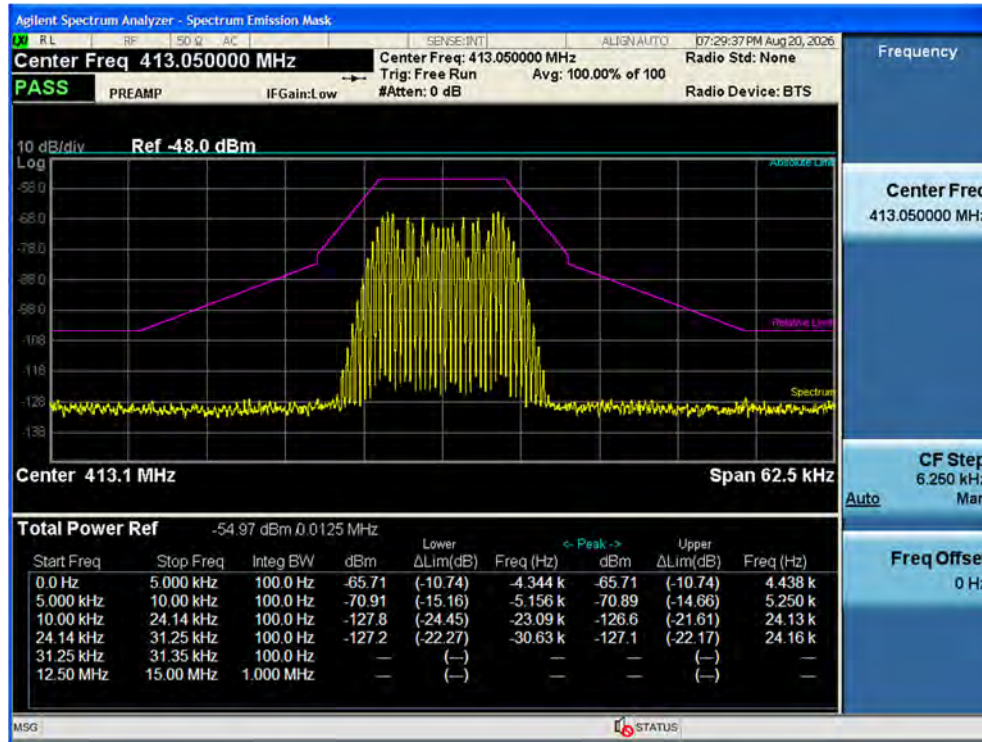
Input / UHF (406.1 ~ 420) / Uplink / FM (12.5 kHz) / Mask C



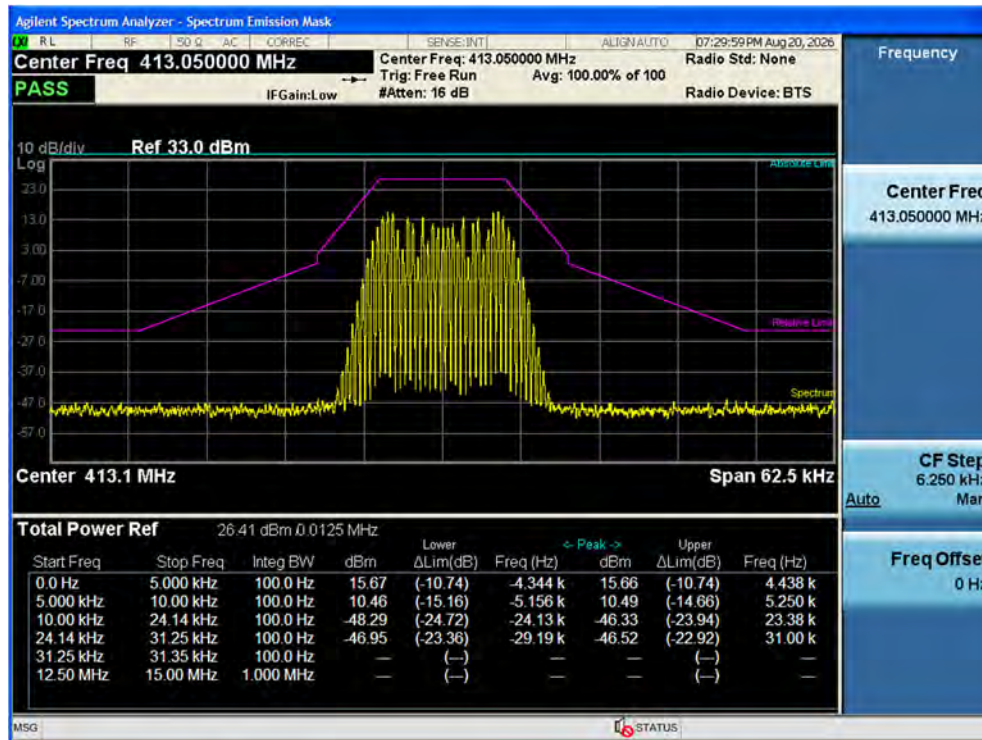
Output / UHF (406.1 ~ 420) / Uplink / FM (12.5 kHz) / Mask C



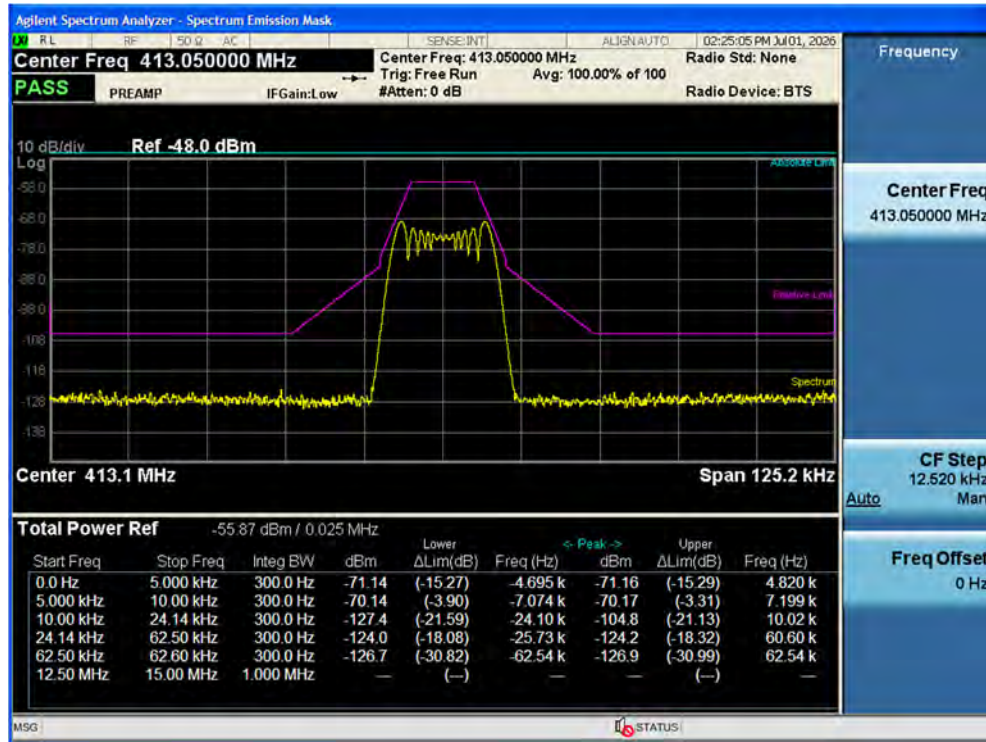
Input @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Uplink / FM (12.5 kHz) / Mask C



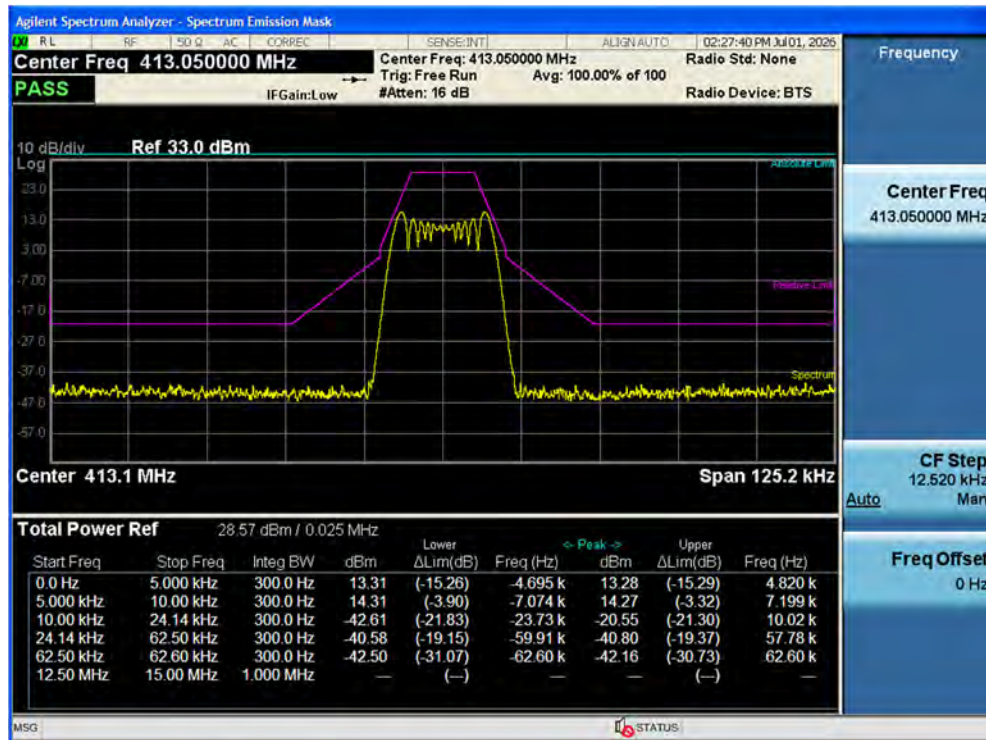
Output @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Uplink / FM (12.5 kHz) / Mask C



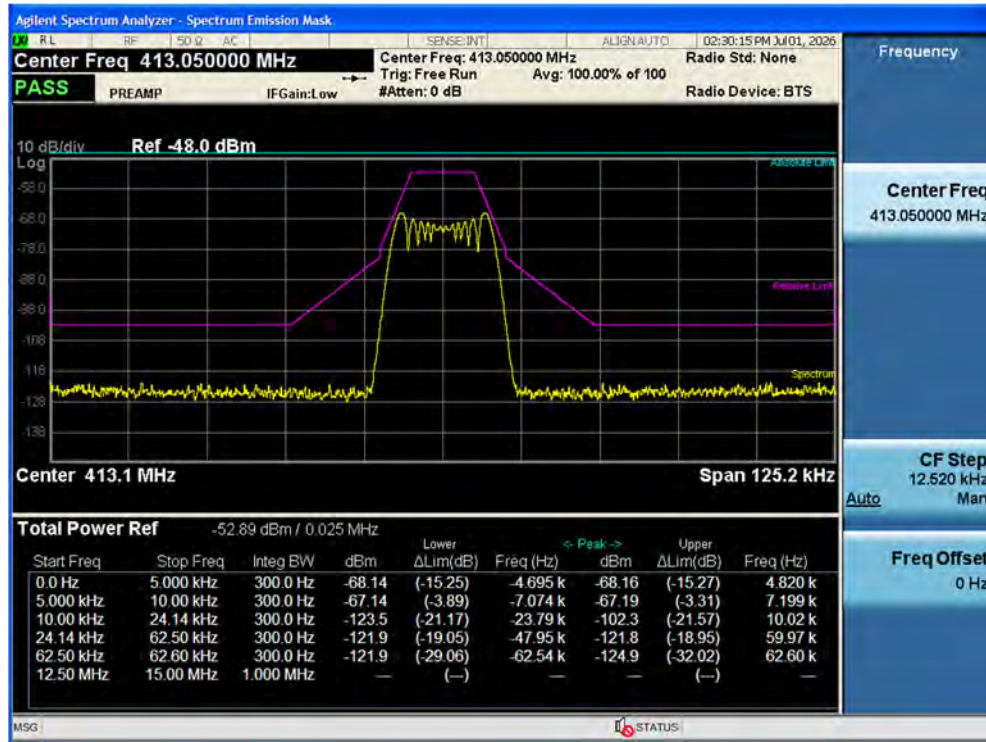
Input / UHF (406.1 ~ 420) / Uplink / FM (25 kHz) / Mask C



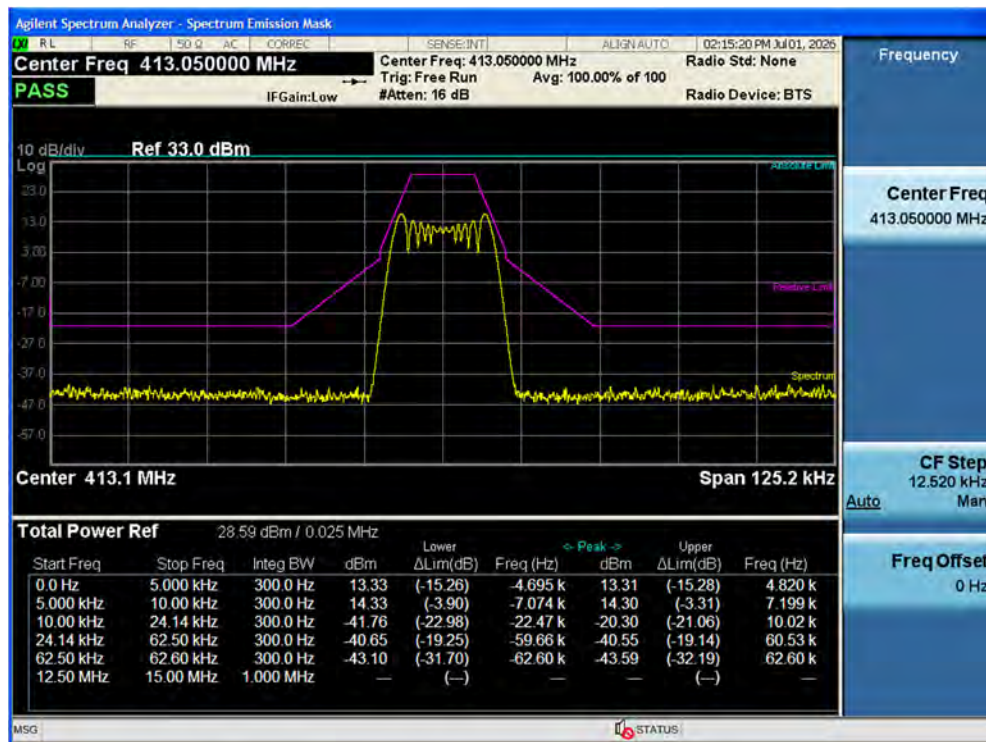
Output / UHF (406.1 ~ 420) / Uplink / FM (25 kHz) / Mask C



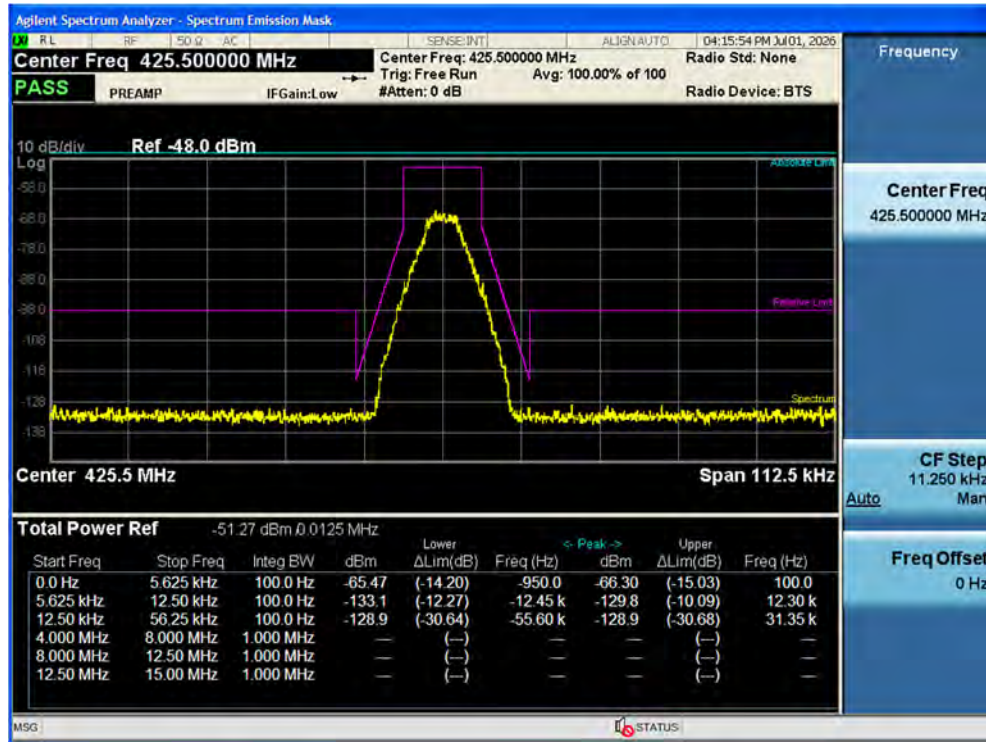
Input @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Uplink / FM (25 kHz) / Mask C



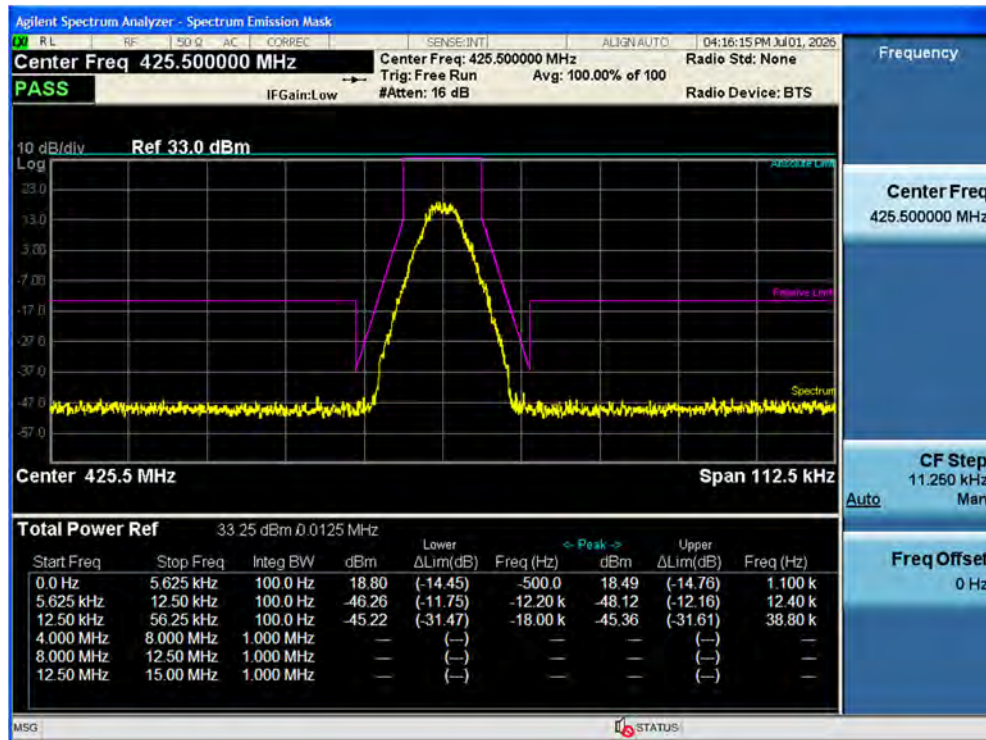
Output @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Uplink / FM (25 kHz) / Mask C



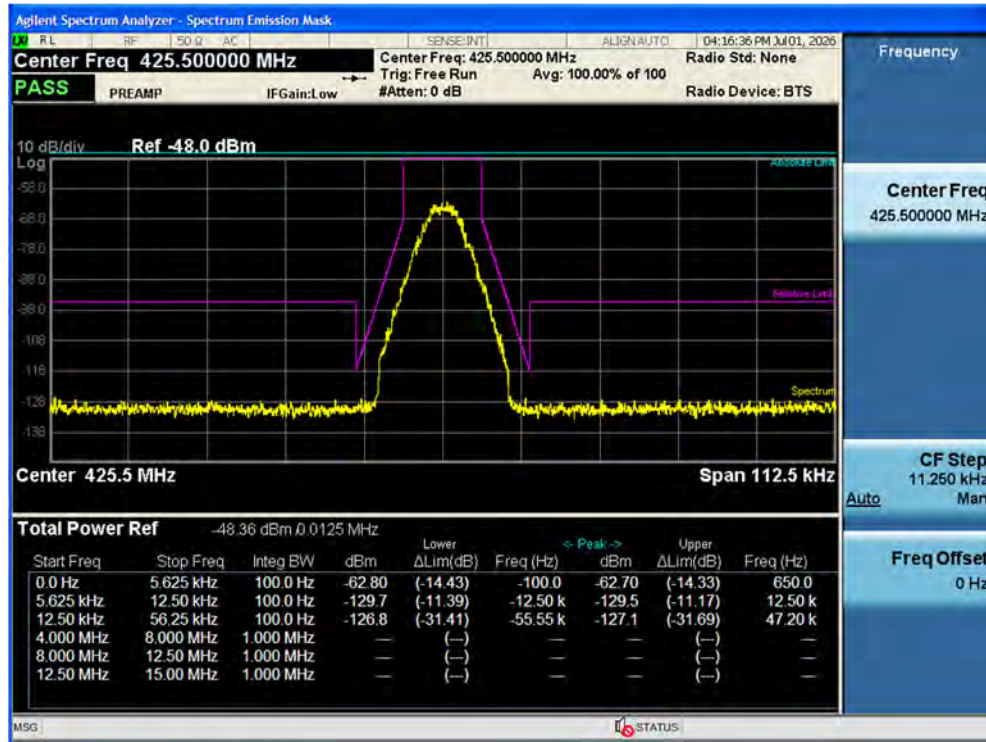
Input / UHF (421 ~ 430) / Uplink / P25 Phase 1 (C4FM) / Mask D



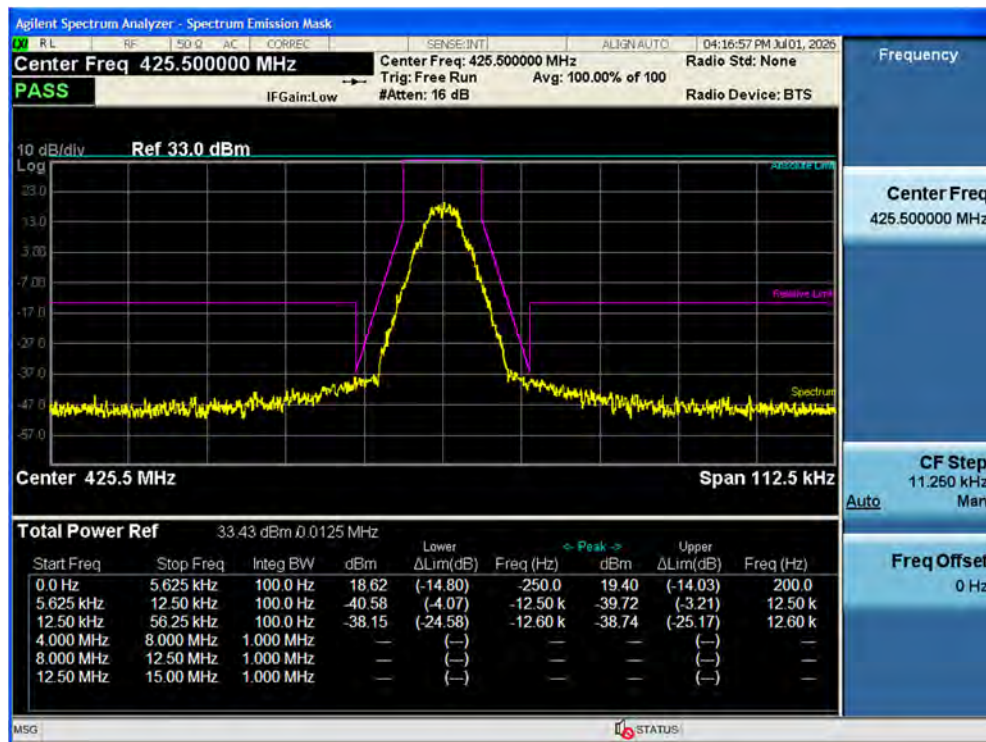
Output / UHF (421 ~ 430) / Uplink / P25 Phase 1 (C4FM) / Mask D



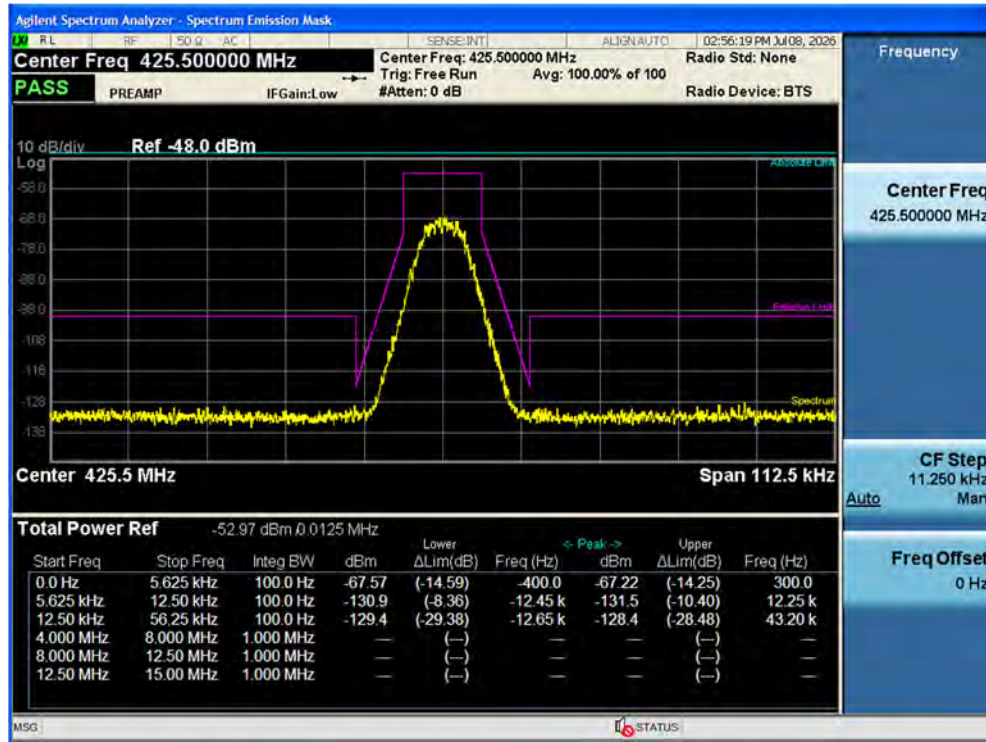
Input @ + 3 dB AGC threshold / UHF (421 ~ 430) / Uplink / P25 Phase 1 (C4FM) / Mask D



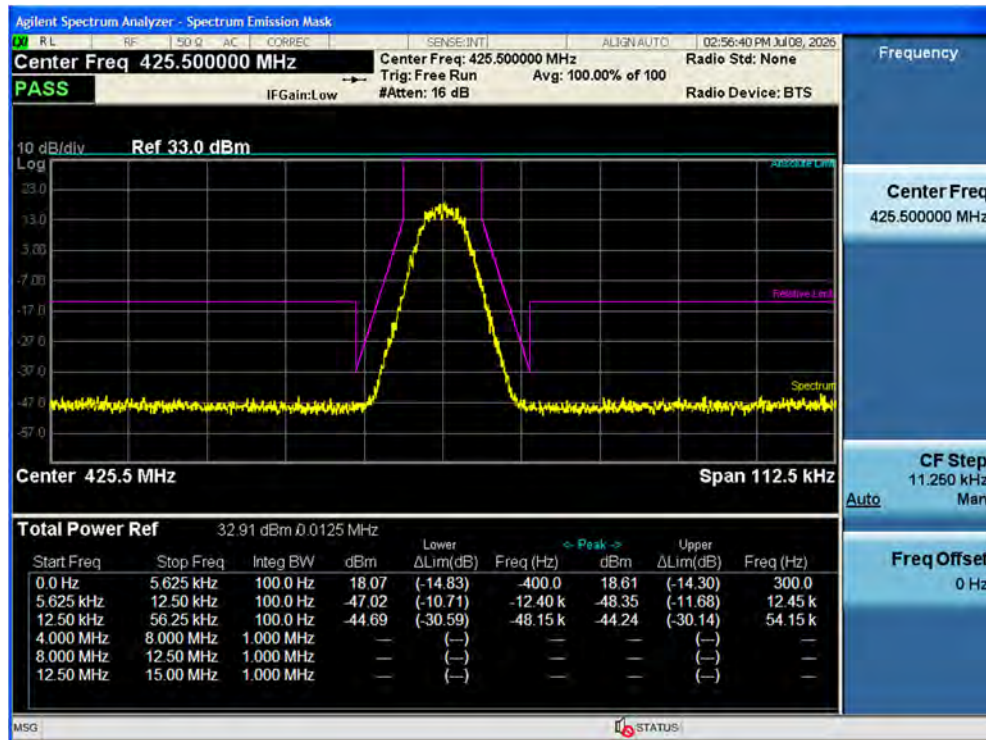
Output @ + 3 dB AGC threshold / UHF (421 ~ 430) / Uplink / P25 Phase 1 (C4FM) / Mask D



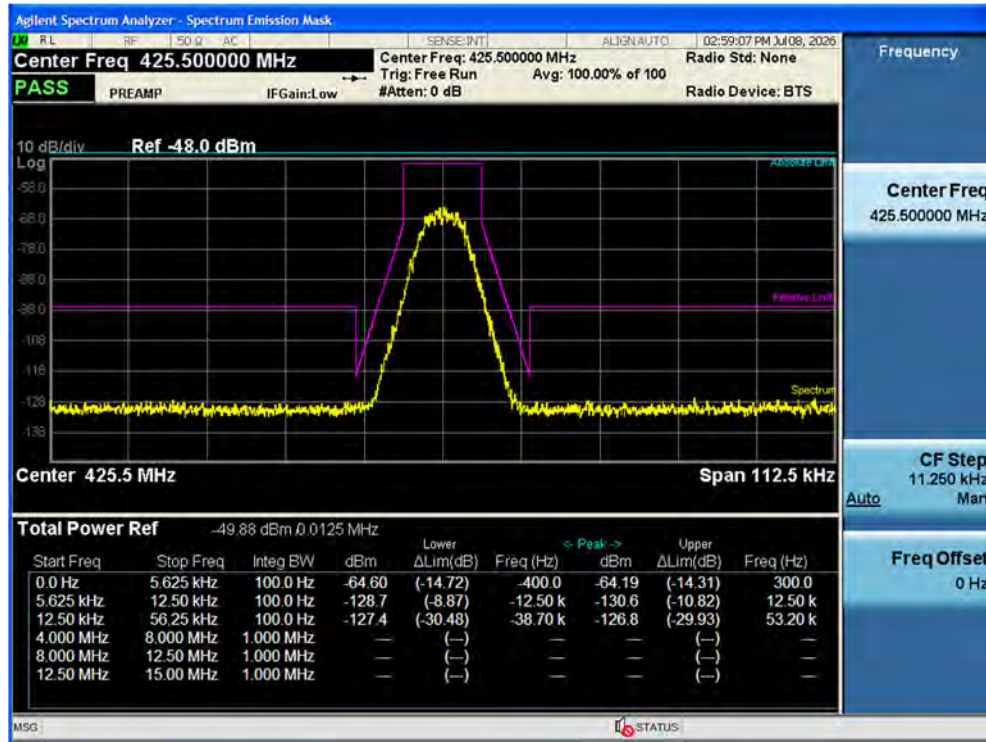
Input / UHF (421 ~ 430) / Uplink / P25 Phase 2 (H-CPM) / Mask D



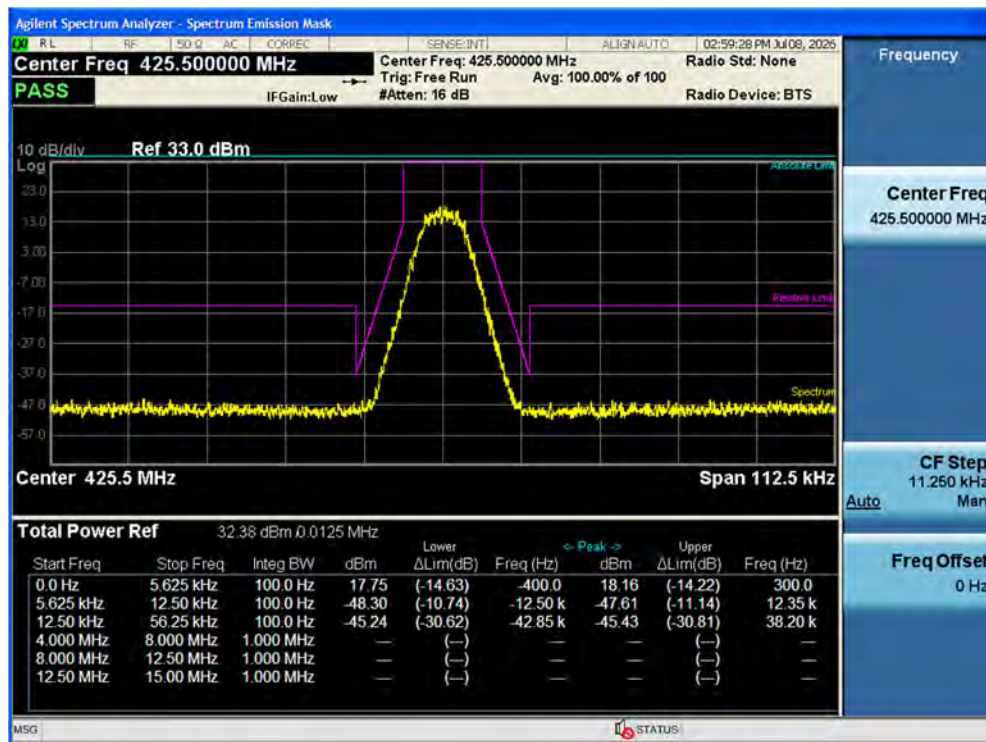
Output / UHF (421 ~ 430) / Uplink / P25 Phase 2 (H-CPM) / Mask D



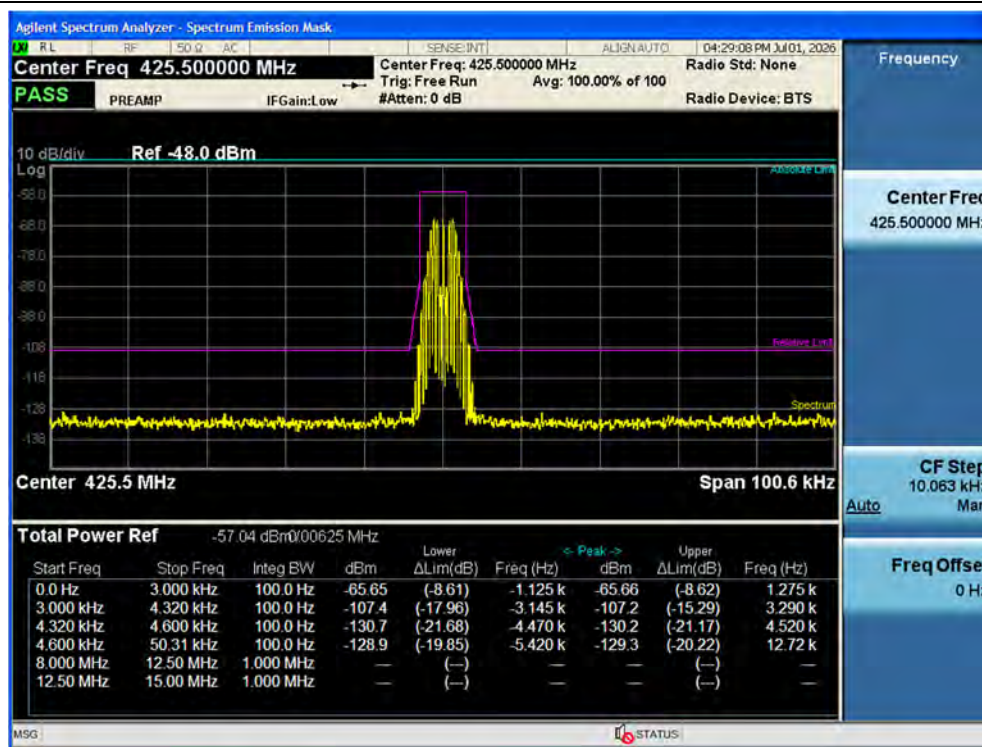
Input @ + 3 dB AGC threshold / UHF (421 ~ 430) / Uplink / P25 Phase 2 (H-CPM) / Mask D



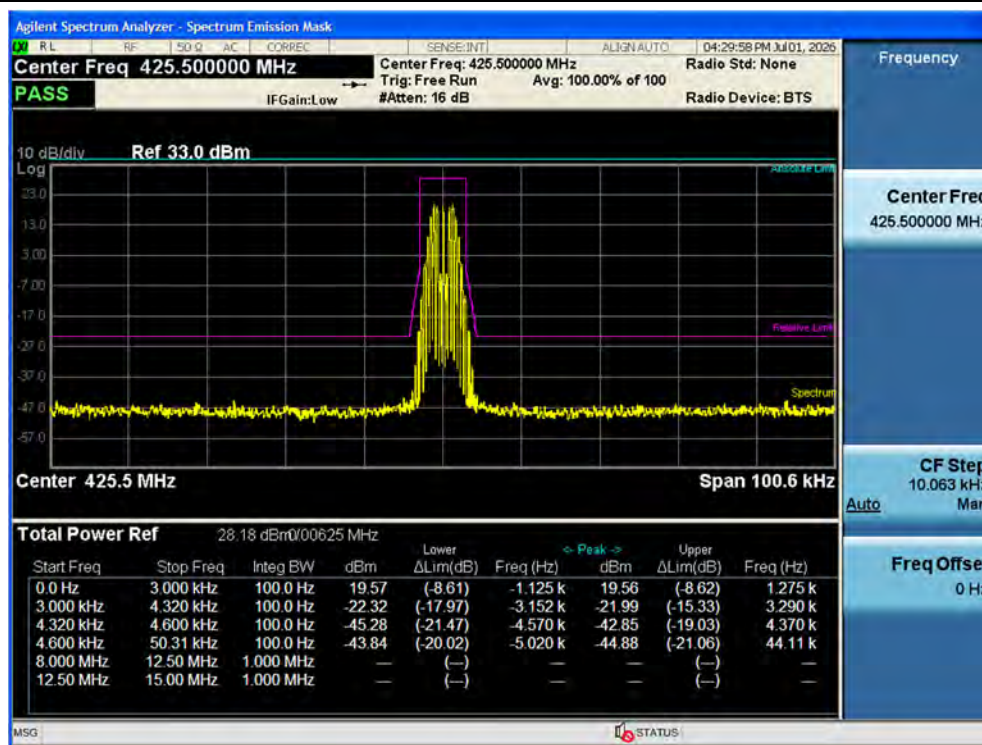
Output @ + 3 dB AGC threshold / UHF (421 ~ 430) / Uplink / P25 Phase 2 (H-CPM) / Mask D



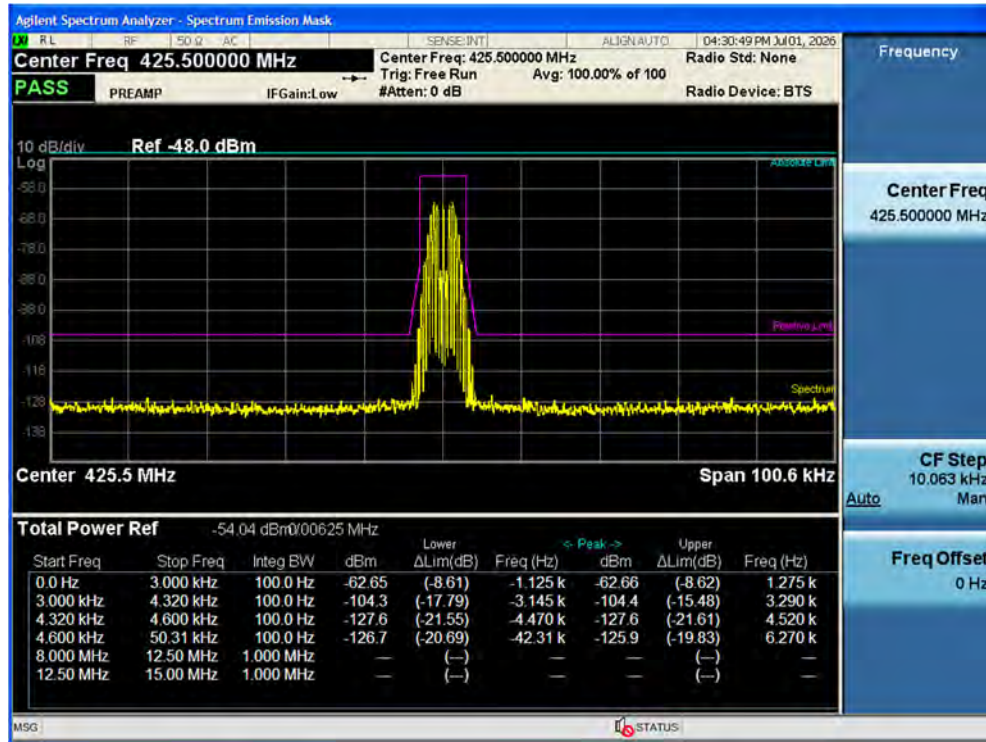
Input / UHF (421 ~ 430) / Uplink / FM (6.25 kHz) / Mask E



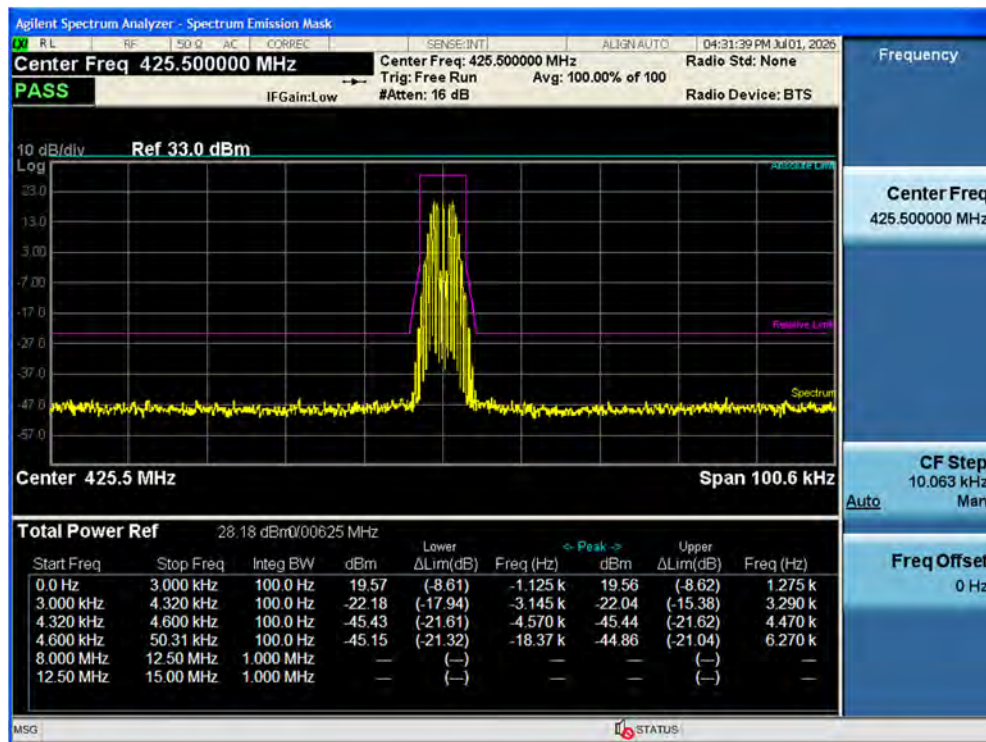
Output / UHF (421 ~ 430) / Uplink / FM (6.25 kHz) / Mask E



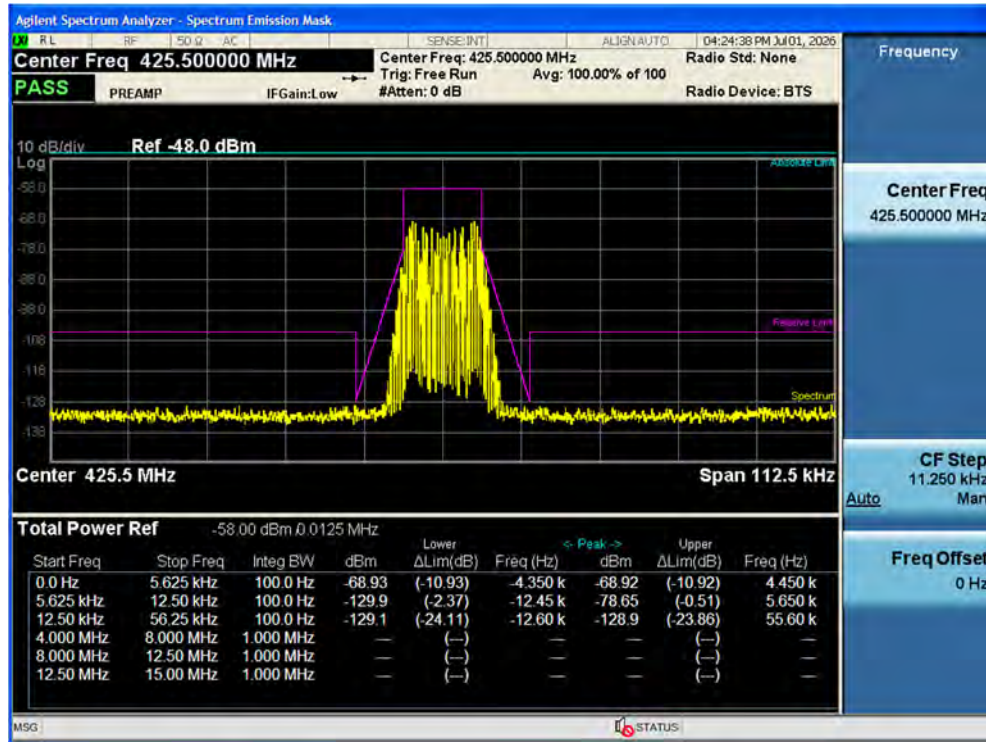
Input @ + 3 dB AGC threshold / UHF (421 ~ 430) / Uplink / FM (6.25 kHz) / Mask E



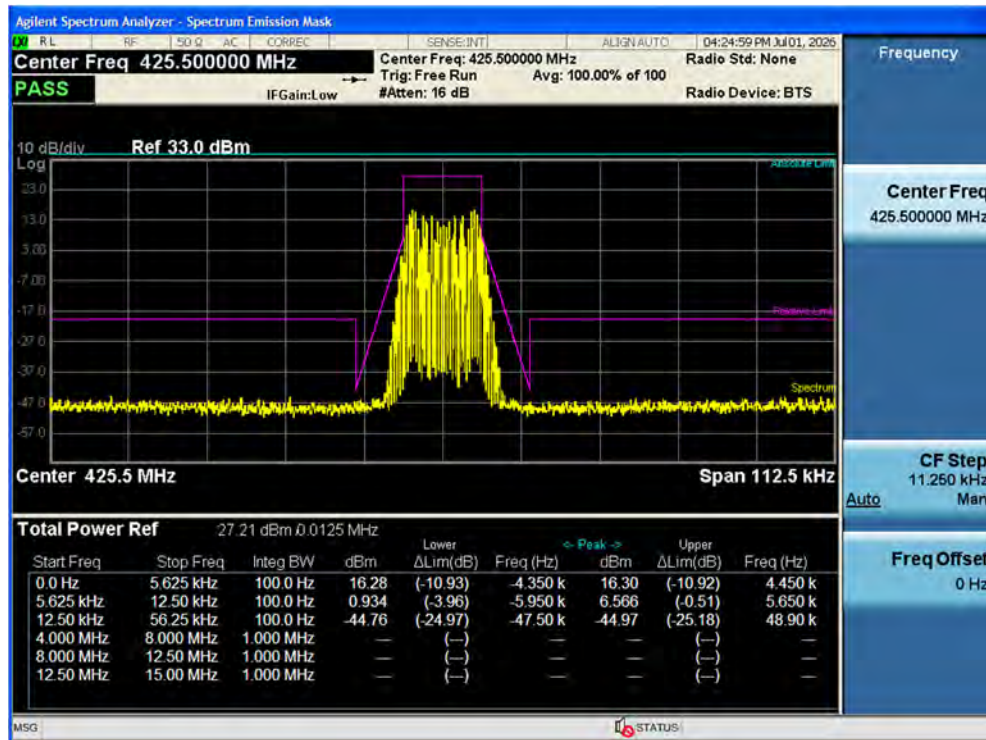
Output @ + 3 dB AGC threshold / UHF (421 ~ 430) / Uplink / FM (6.25 kHz) / Mask E



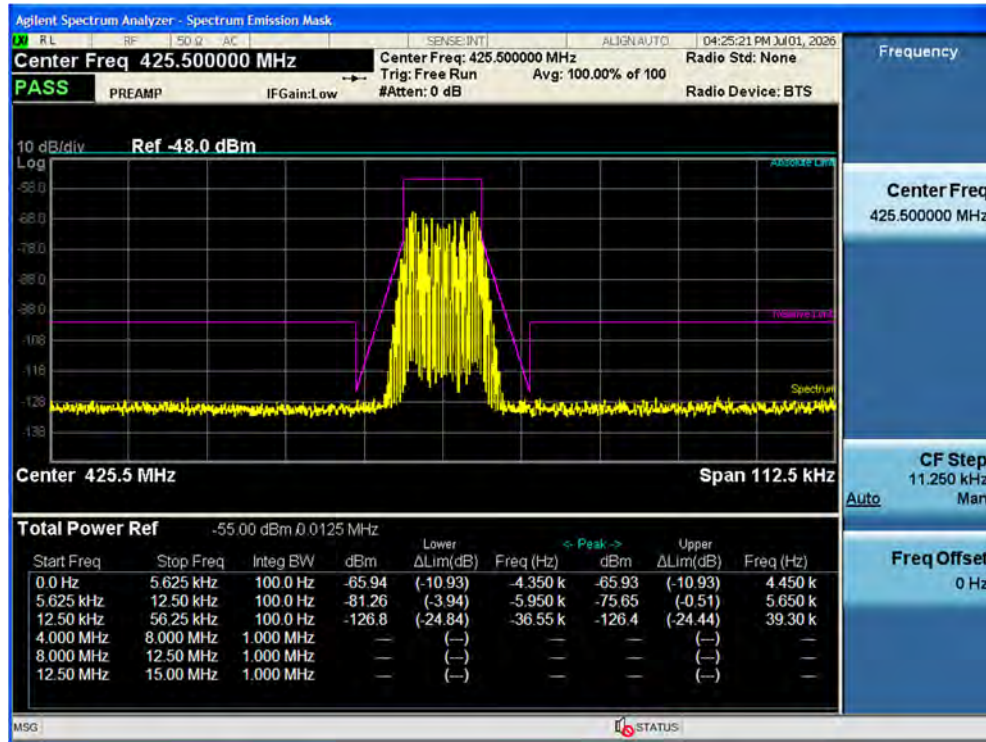
Input / UHF (421 ~ 430) / Uplink / FM (12.5 kHz) / Mask D



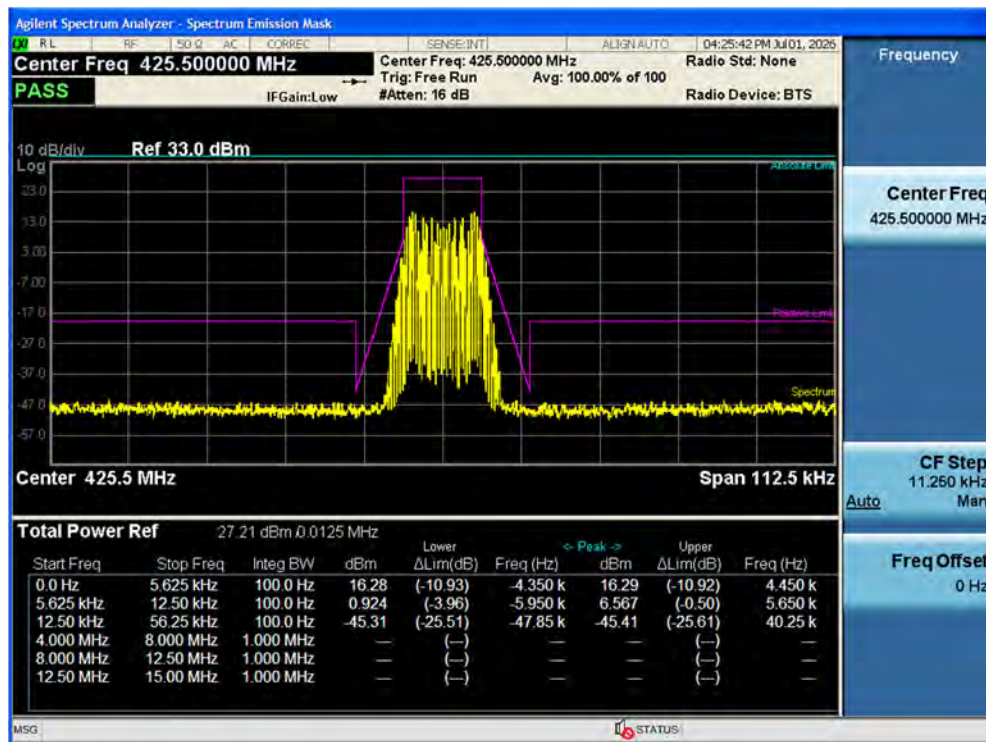
Output / UHF (421 ~ 430) / Uplink / FM (12.5 kHz) / Mask D



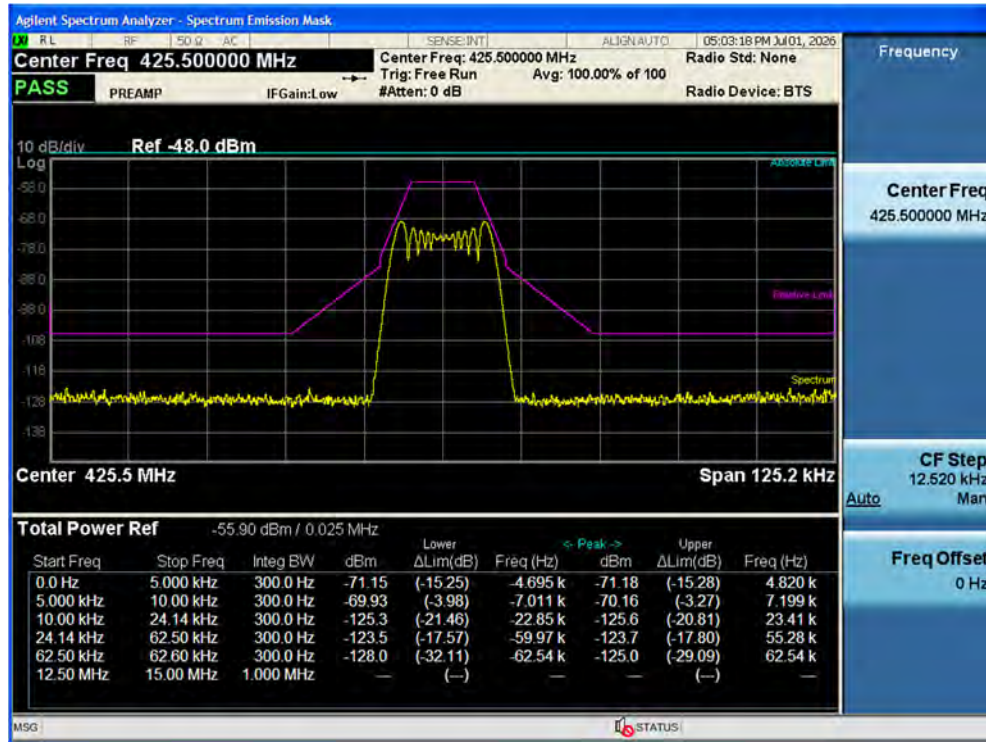
Input @ + 3 dB AGC threshold / UHF (421 ~ 430) / Uplink / FM (12.5 kHz) / Mask D



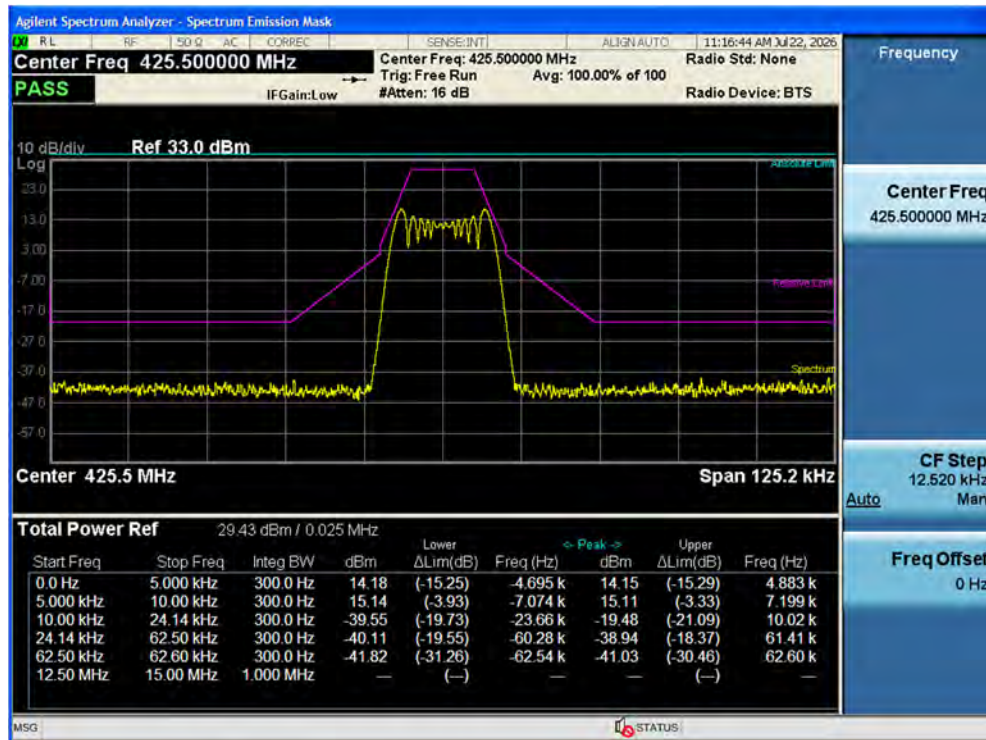
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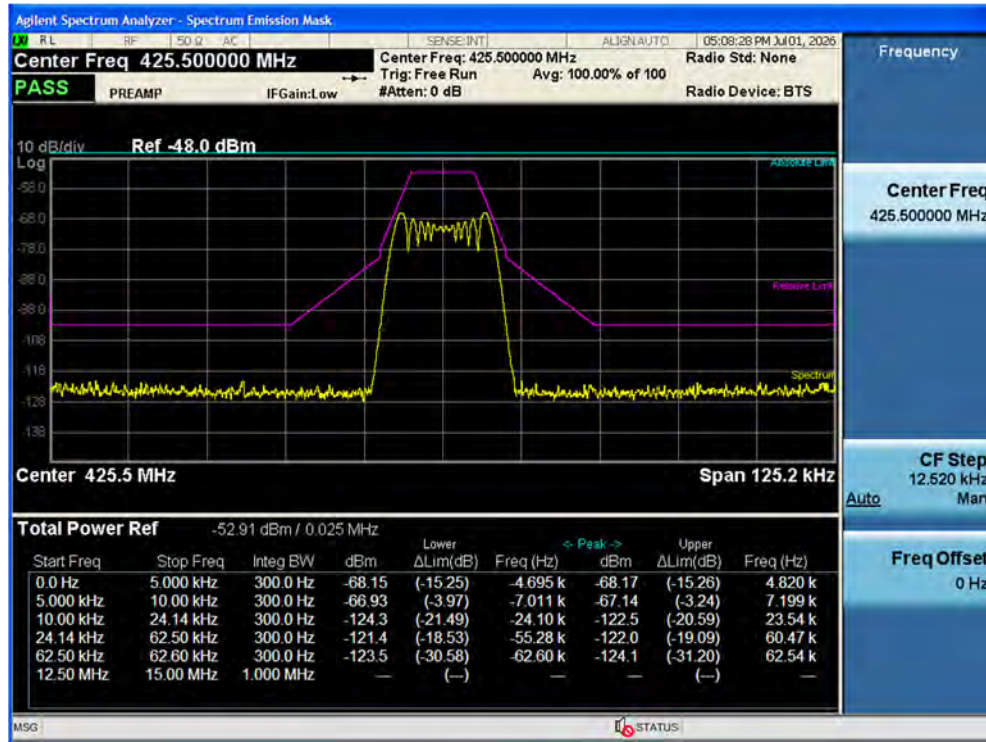
Input / UHF (421 ~ 430) / Uplink / FM (25 kHz) / Mask C



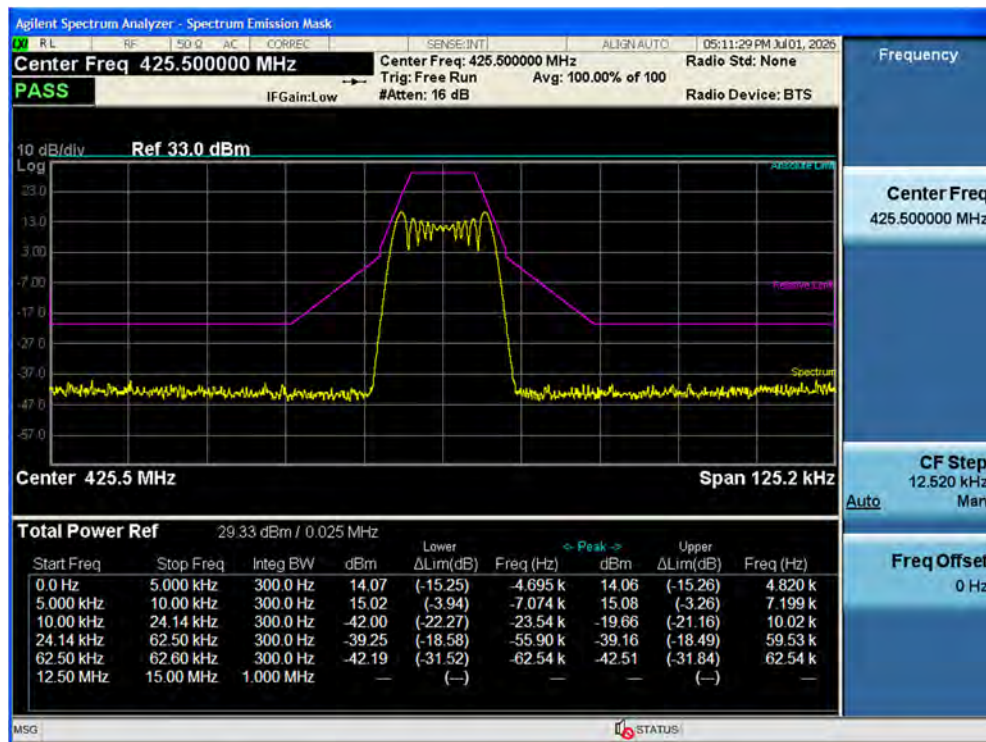
Output / UHF (421 ~ 430) / Uplink / FM (25 kHz) / Mask C



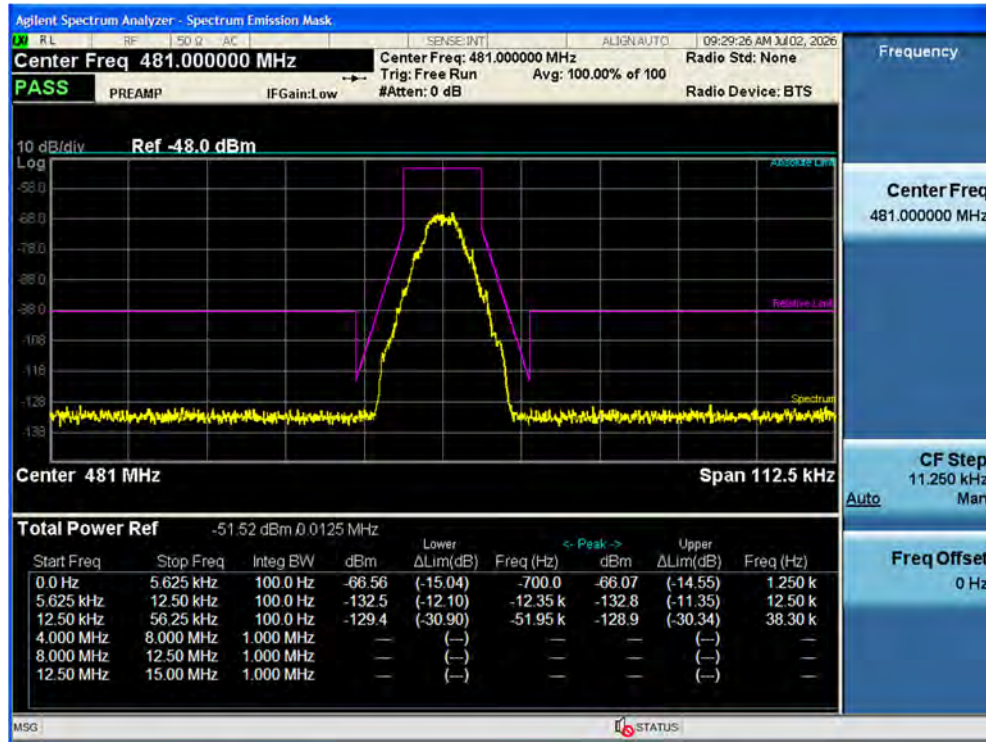
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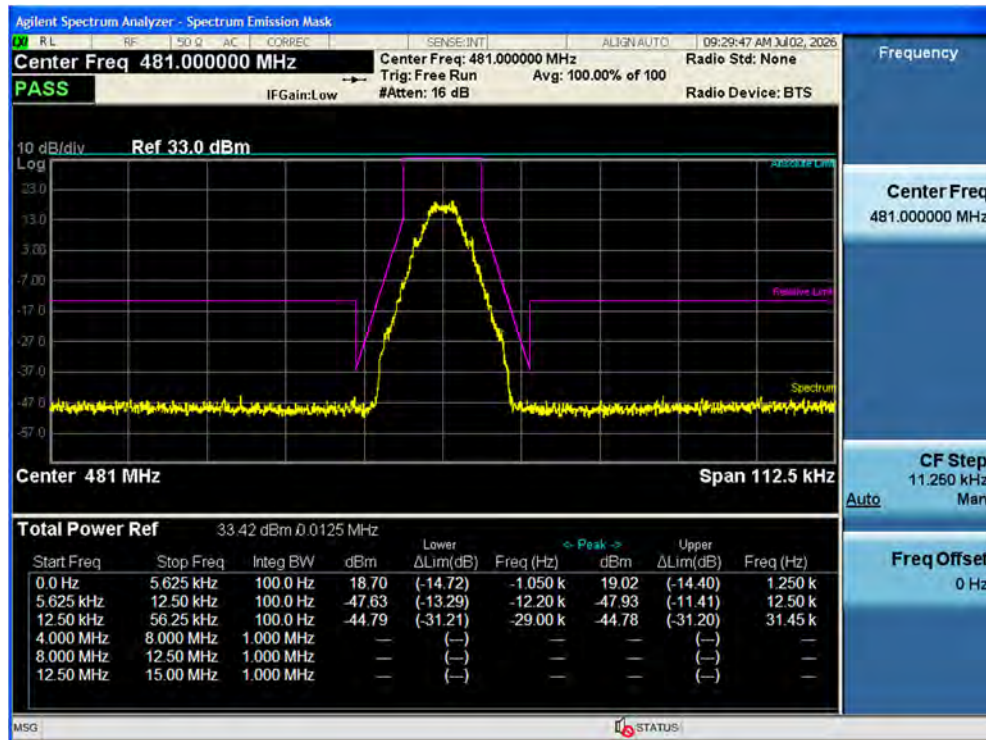
Output @ + 3 dB AGC threshold / UHF (421 ~ 430) / Uplink / FM (25 kHz) / Mask C



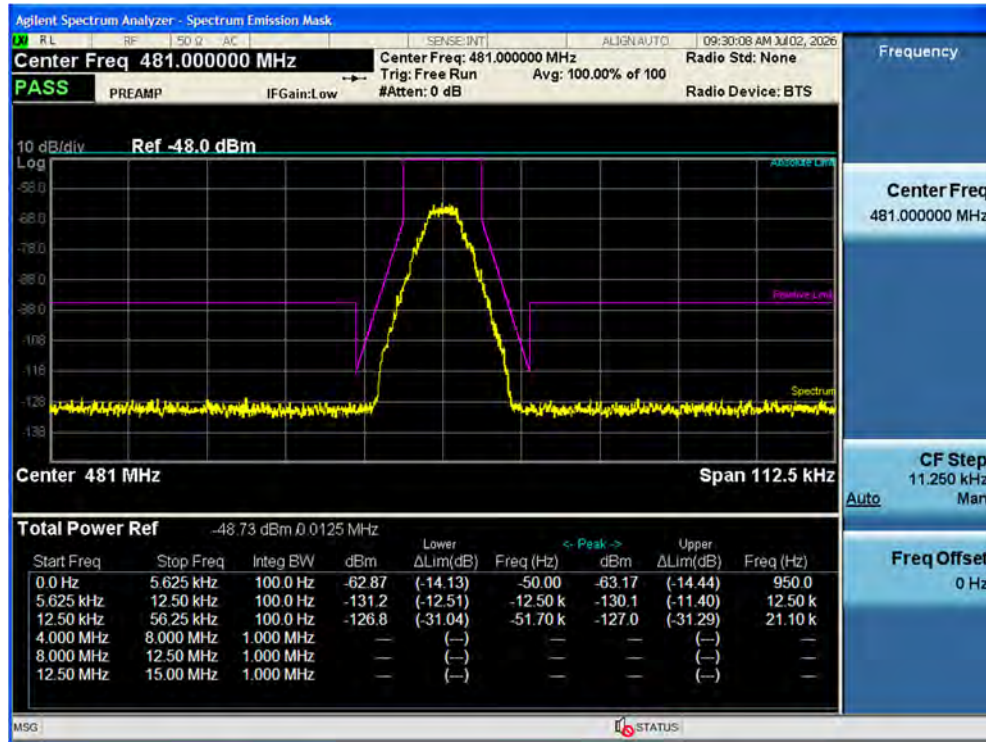
Input / UHF (450 ~ 512) / Uplink / P25 Phase 1 (C4FM) / Mask D



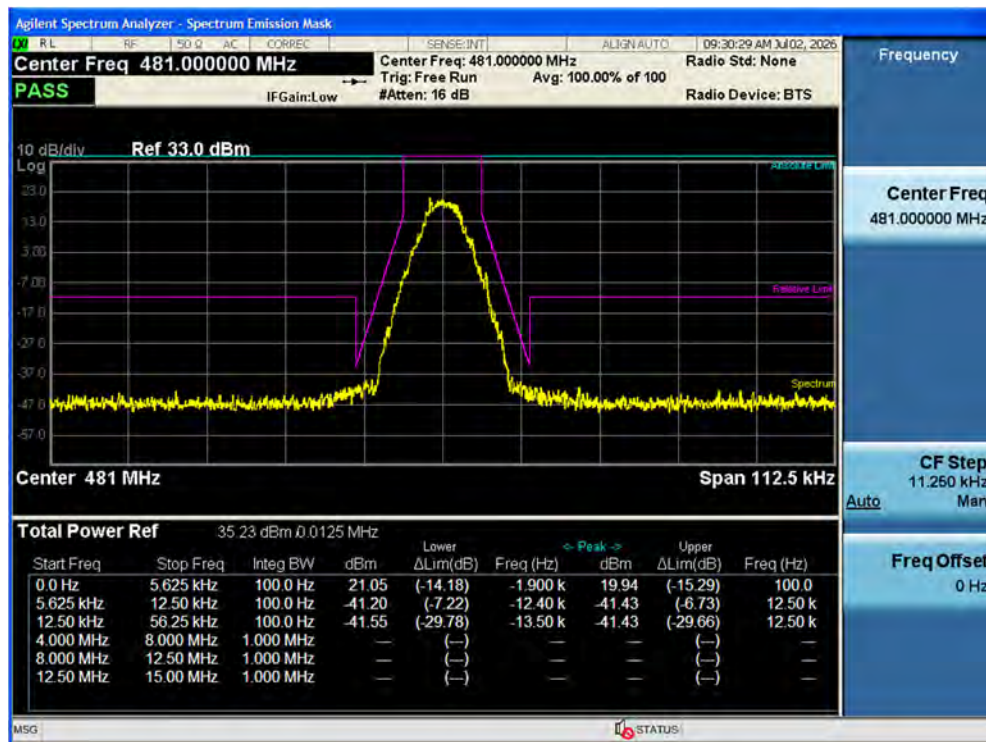
Output / UHF (450 ~ 512) / Uplink / P25 Phase 1 (C4FM) / Mask D



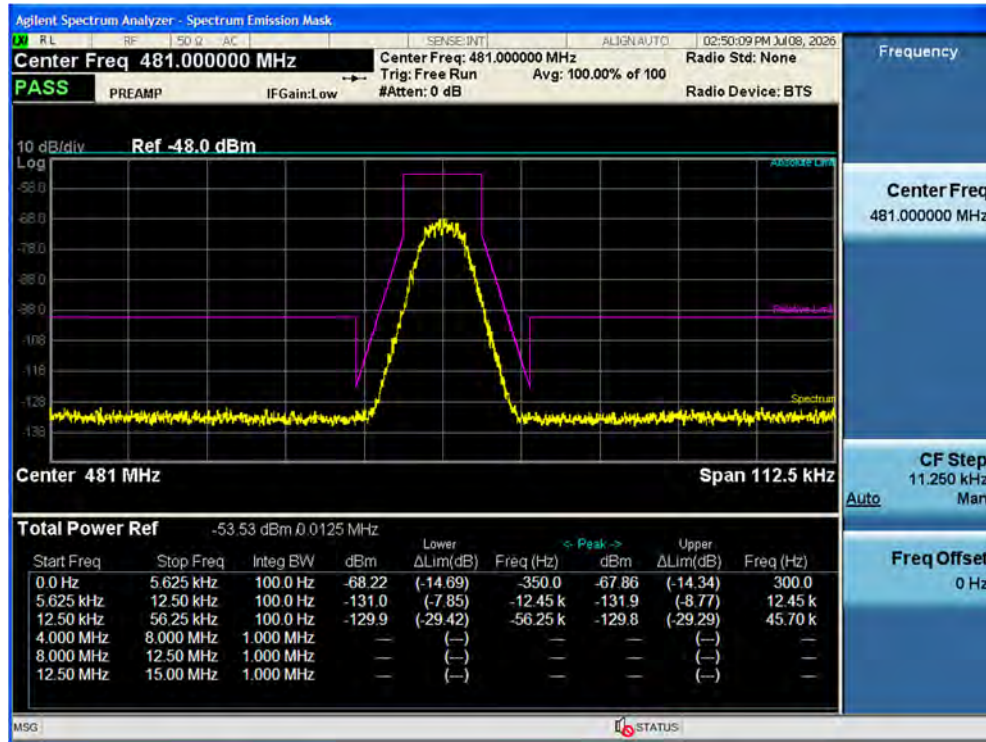
Input @ + 3 dB AGC threshold / UHF (450 ~ 512) / Uplink / P25 Phase 1 (C4FM) / Mask D



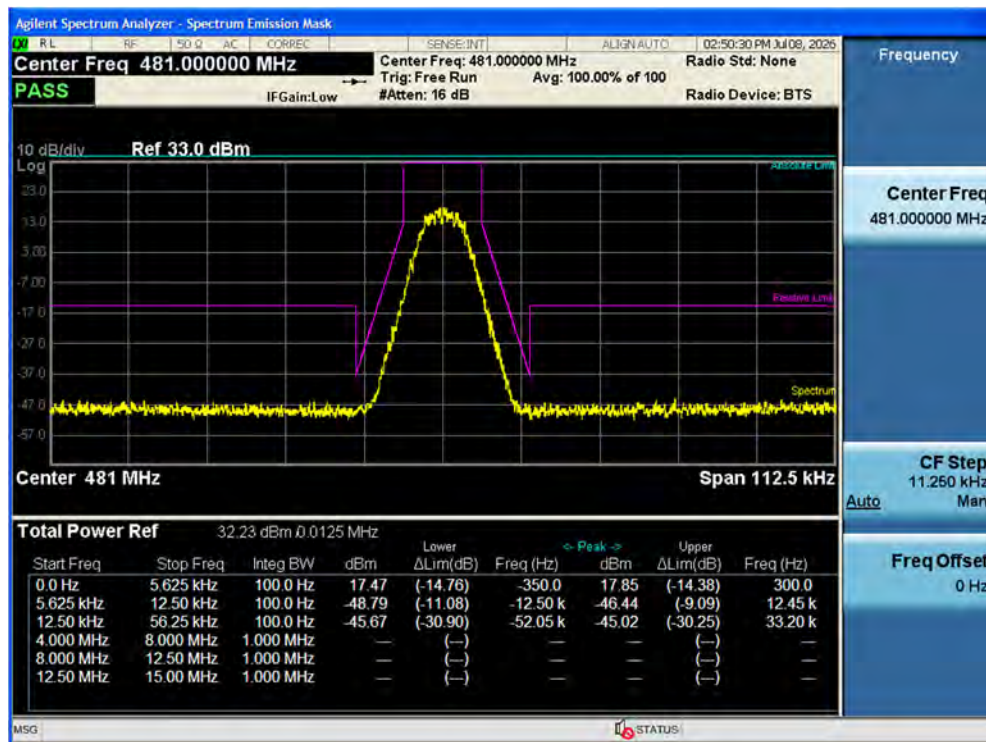
Output @ + 3 dB AGC threshold / UHF (450 ~ 512) / Uplink / P25 Phase 1 (C4FM) / Mask D



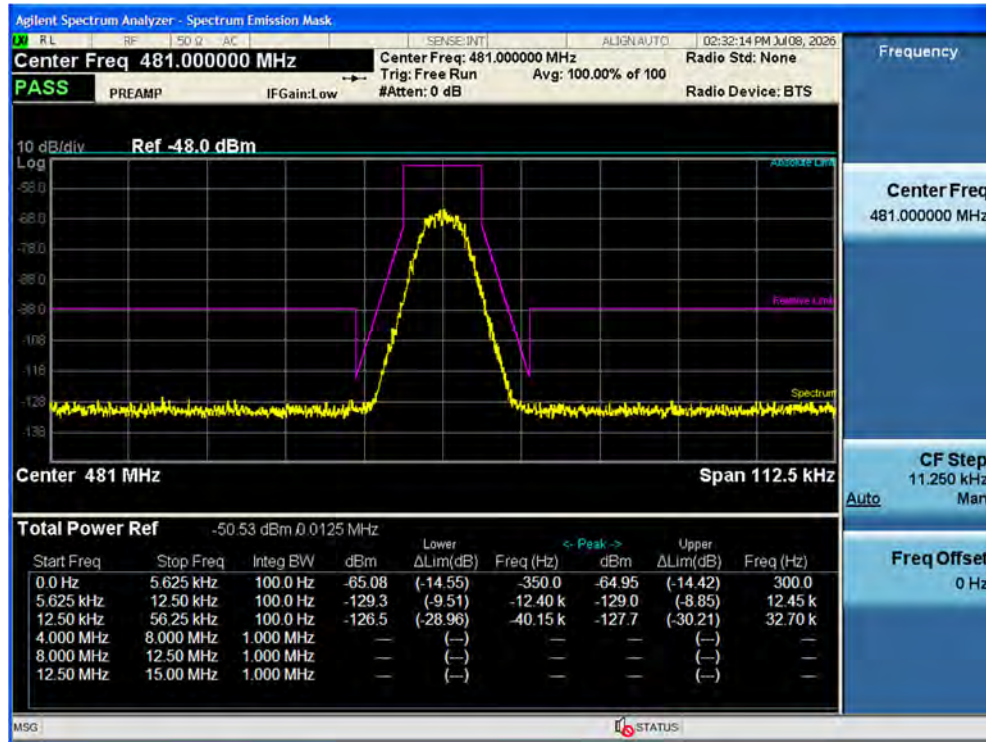
Input / UHF (450 ~ 512) / Uplink / P25 Phase 2 (H-CPM)/ Mask D



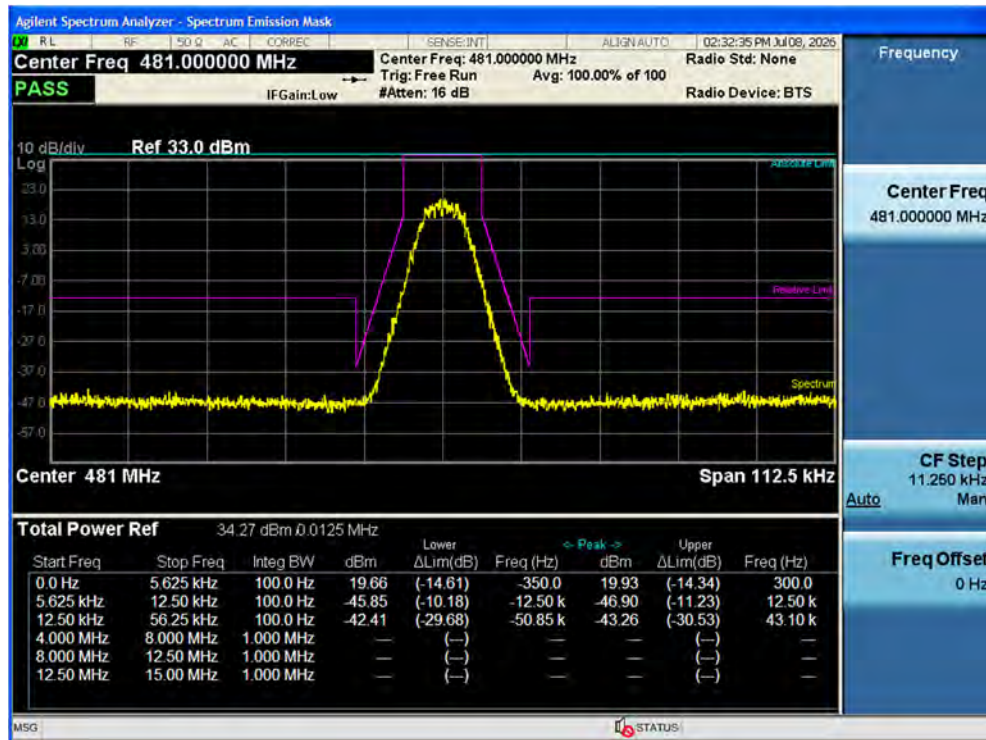
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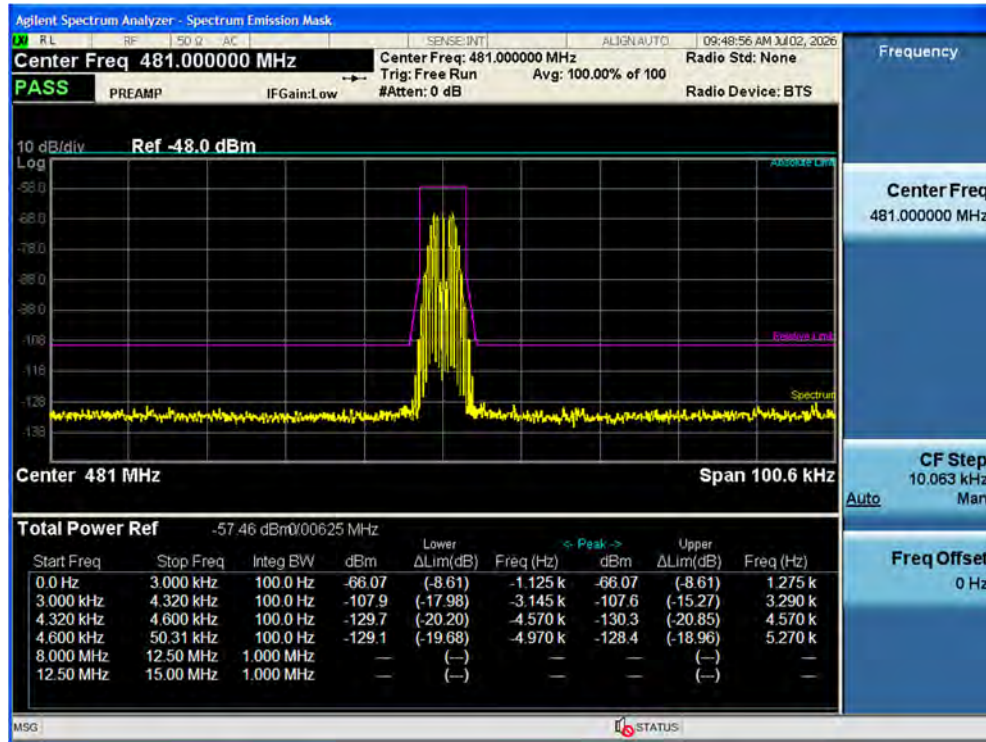
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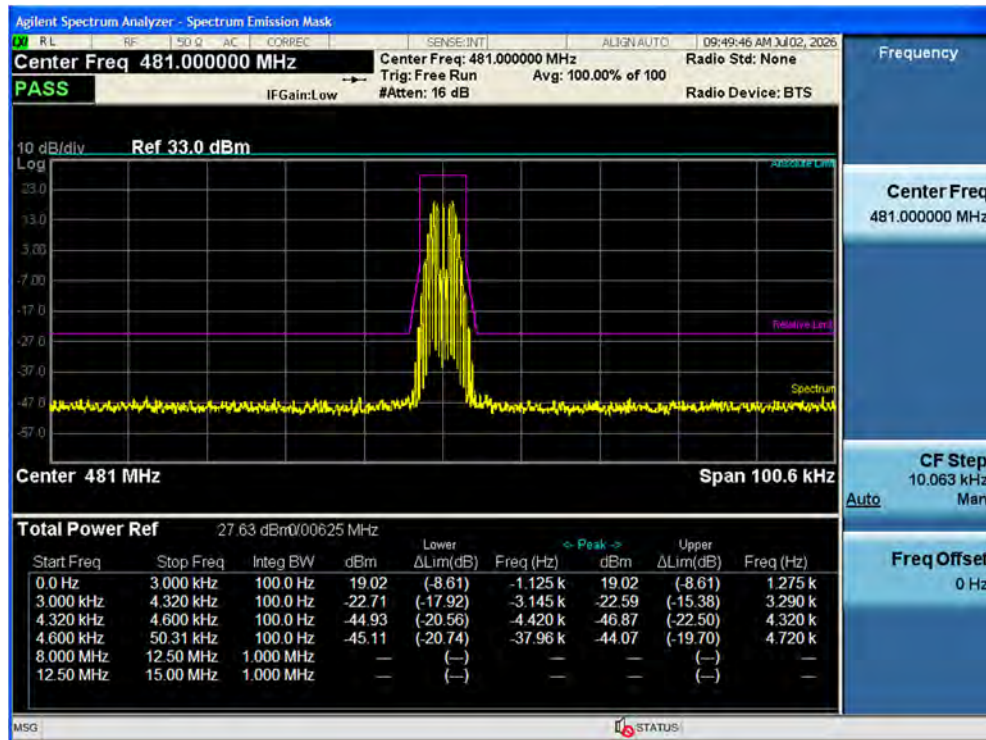
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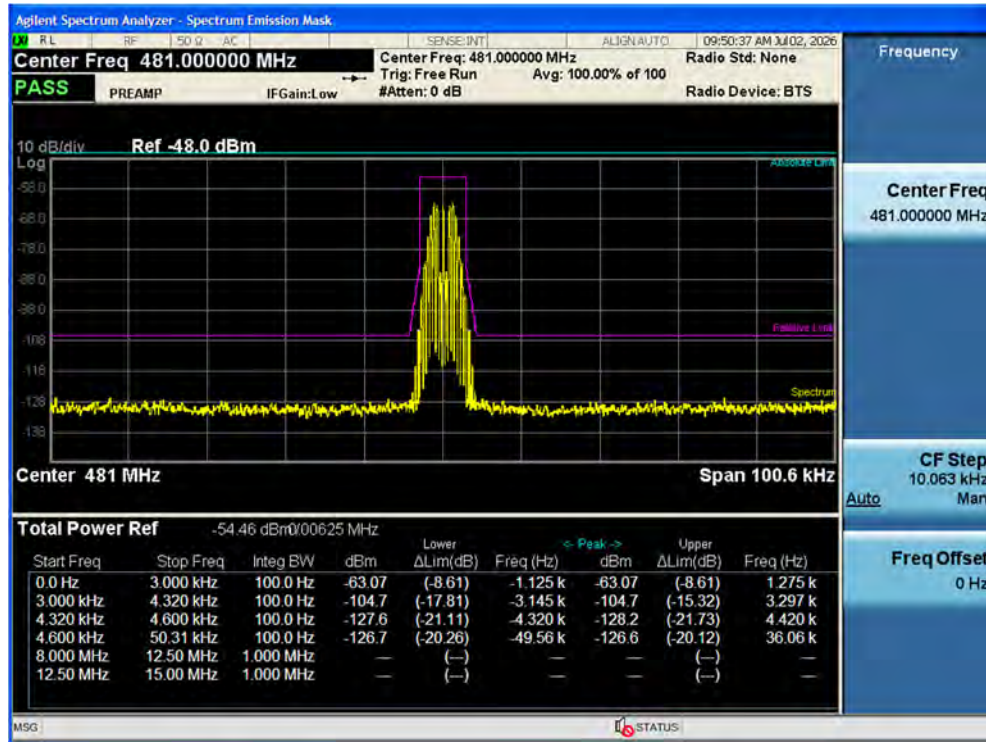
Input / UHF (450 ~ 512) / Uplink / FM (6.25 kHz) / Mask E



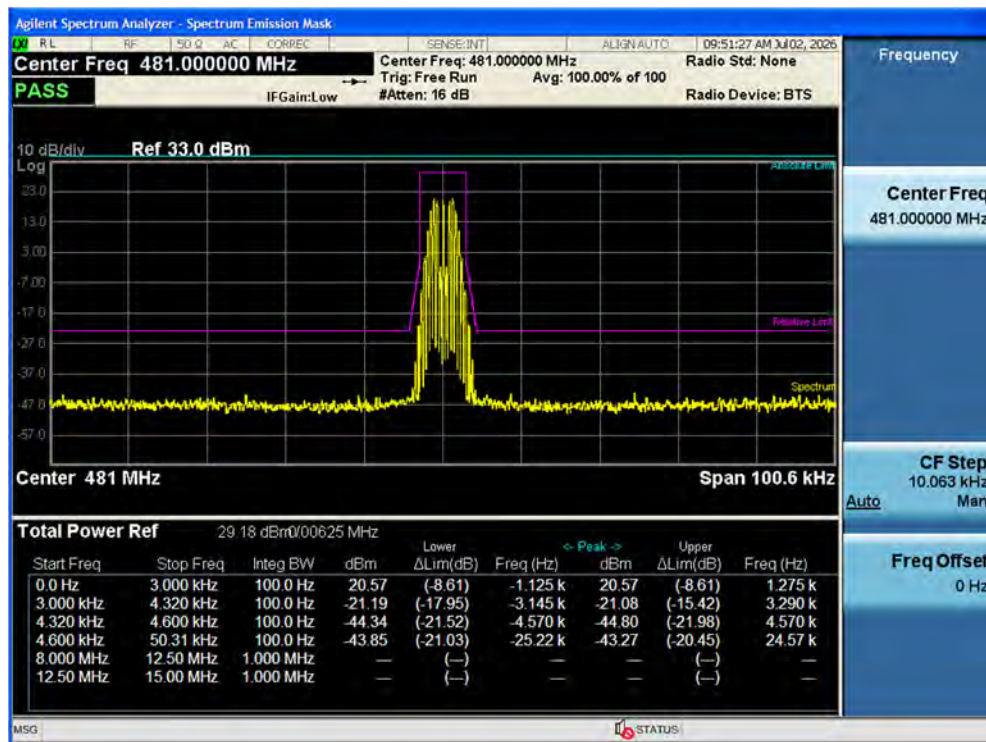
Output / UHF (450 ~ 512) / Uplink / FM (6.25 kHz) / Mask E



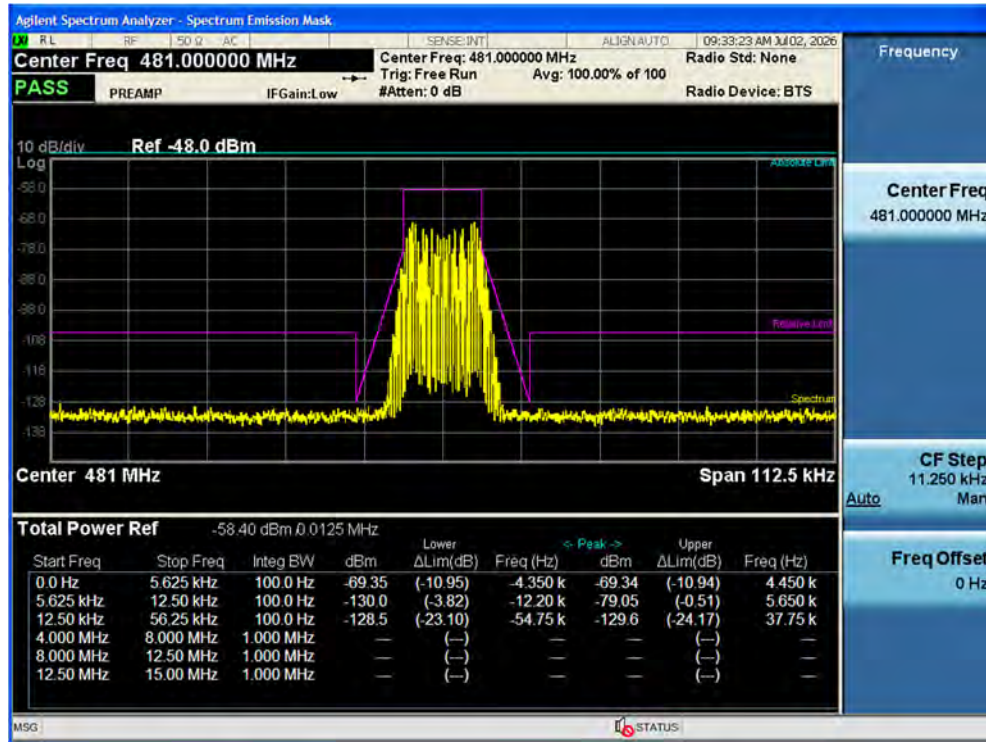
Input @ + 3 dB AGC threshold / UHF (450 ~ 512) / Uplink / FM (6.25 kHz) / Mask E



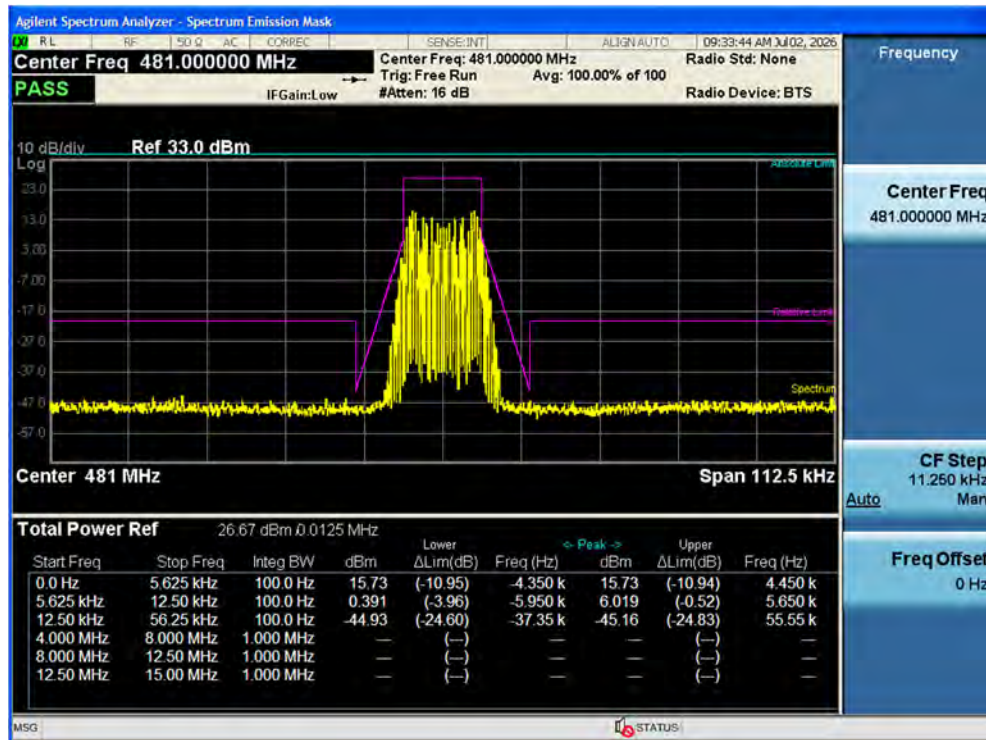
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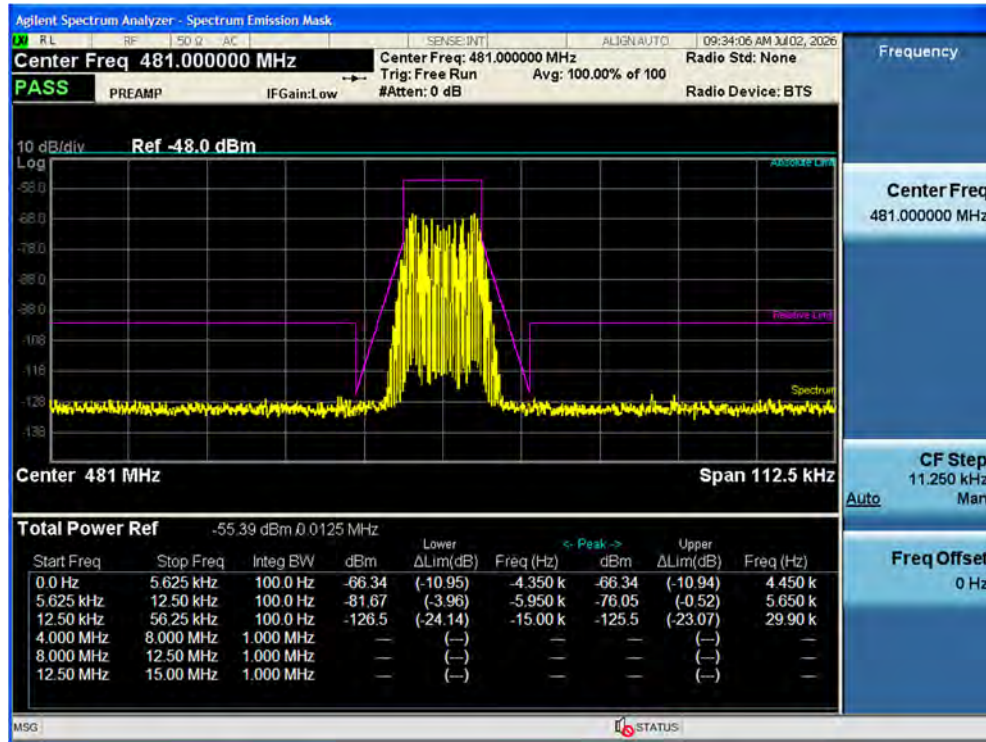
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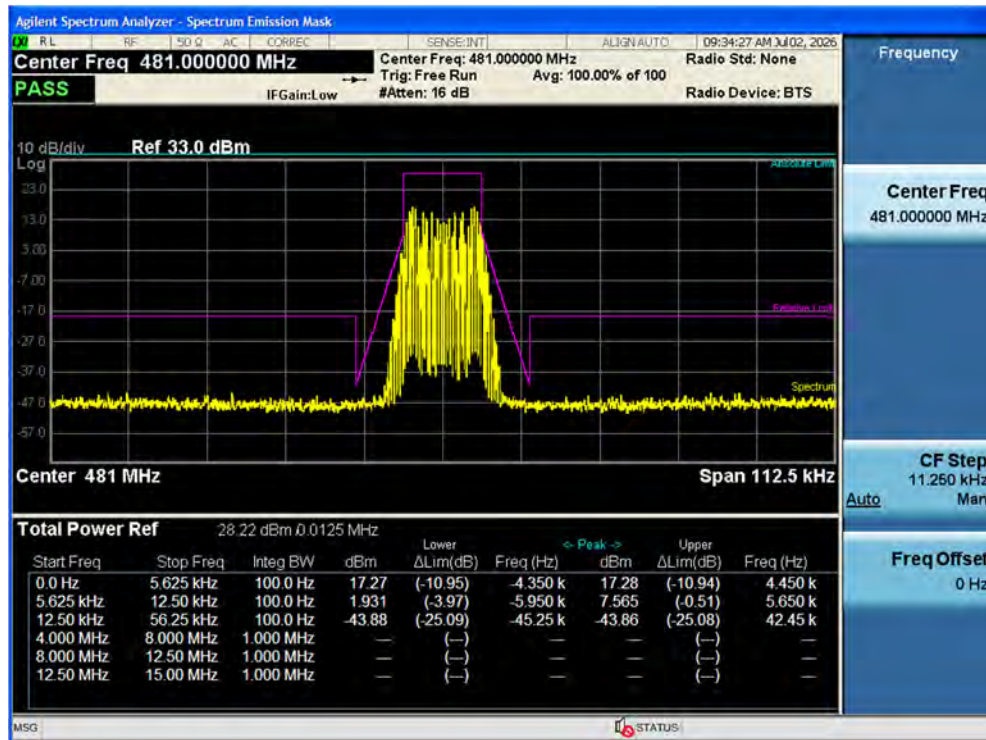
Output / UHF (450 ~ 512) / Uplink / FM (12.5 kHz) / Mask D



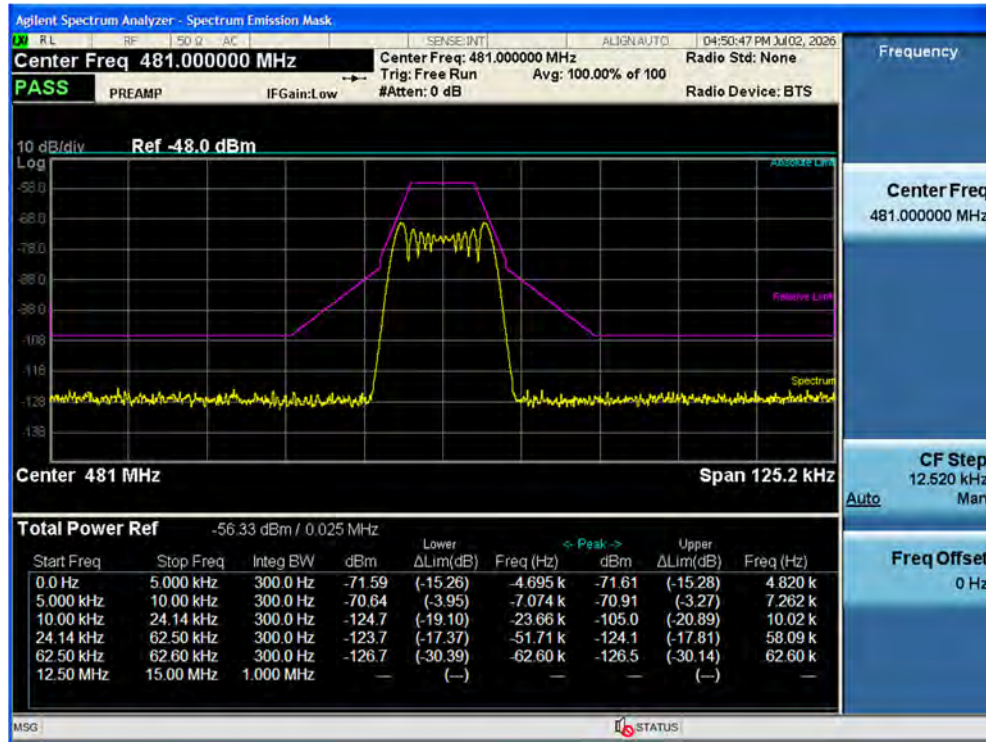
Input @ + 3 dB AGC threshold / UHF (450 ~ 512) / Uplink / FM (12.5 kHz) / Mask D



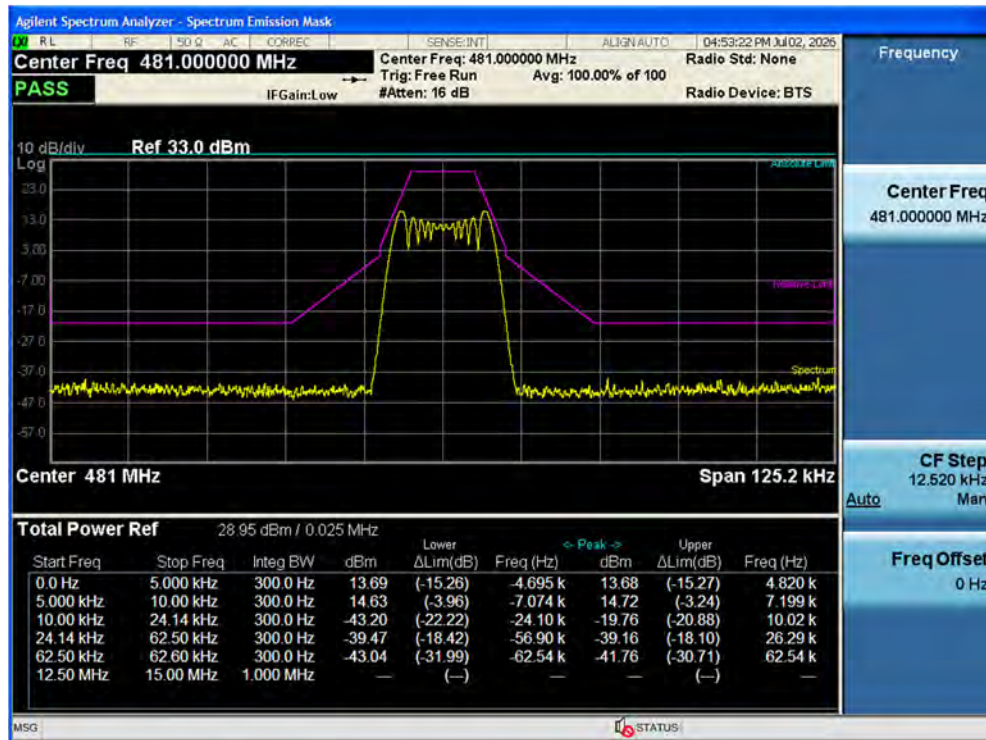
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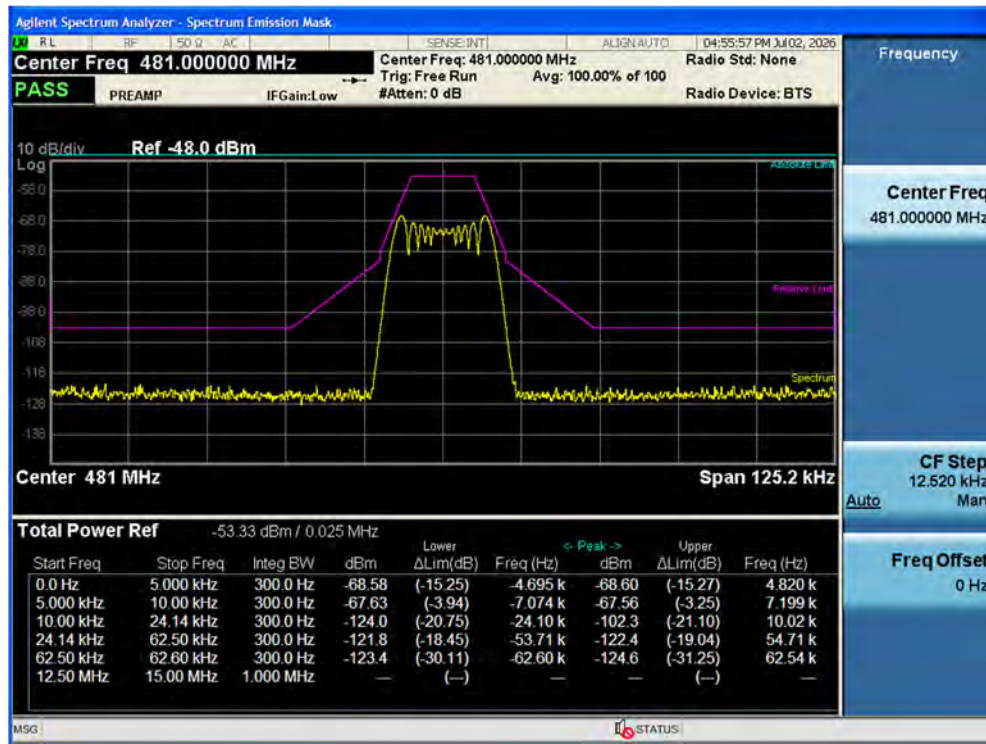
Input / UHF (450 ~ 512) / Uplink / FM (25 kHz) / Mask C



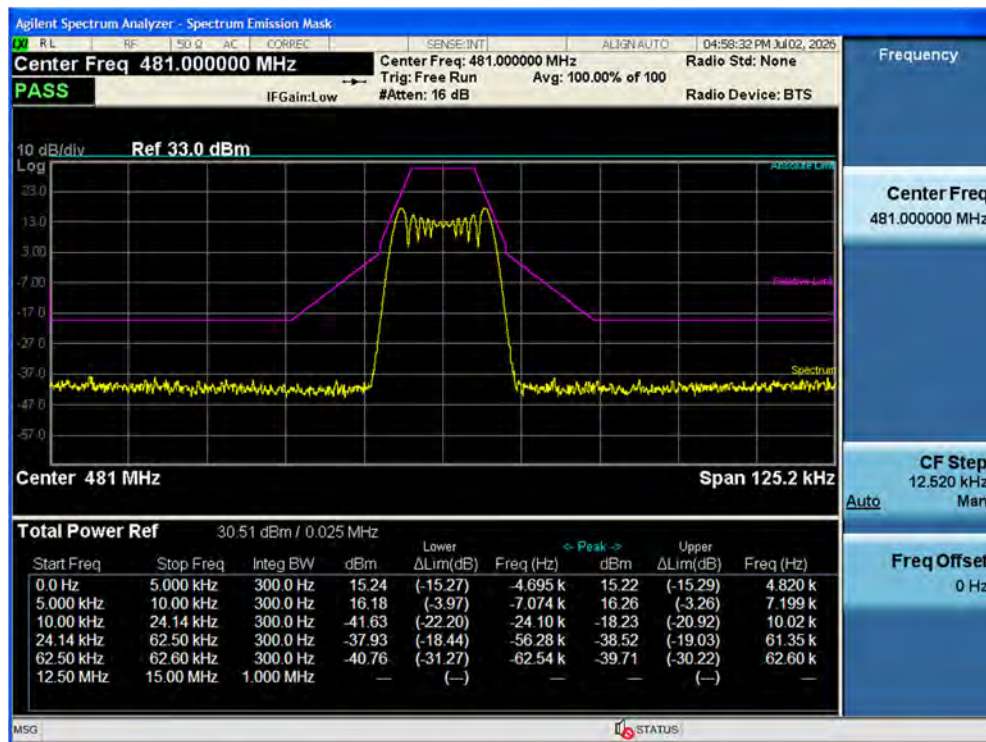
Output / UHF (450 ~ 512) / Uplink / FM (25 kHz) / Mask C



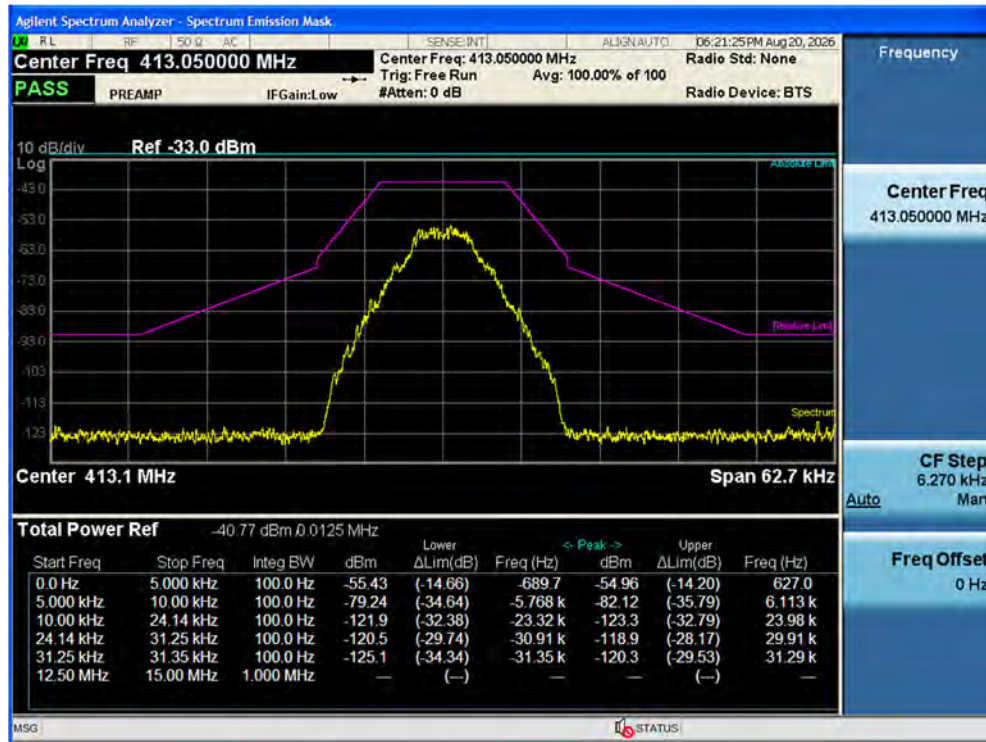
Input @ + 3 dB AGC threshold / UHF (450 ~ 512) / Uplink / FM (25 kHz) / Mask C



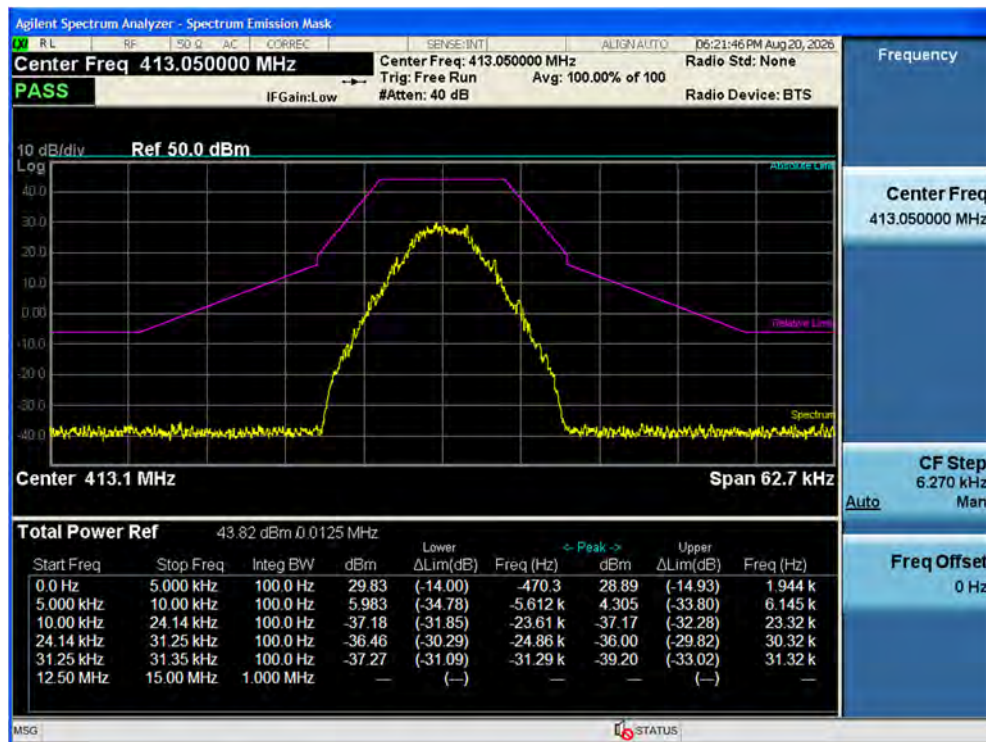
Output @ + 3 dB AGC threshold / UHF (450 ~ 512) / Uplink / FM (25 kHz) / Mask C



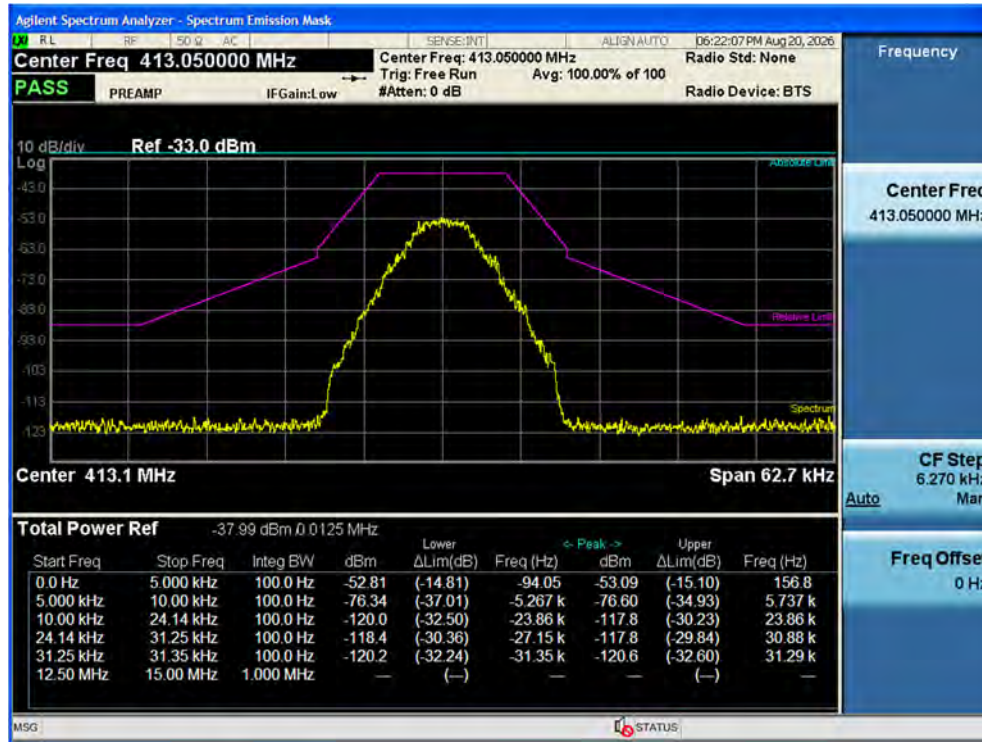
Input / UHF (406.1 ~ 420) / Downlink / P25 Phase 1 (C4FM) / Mask C



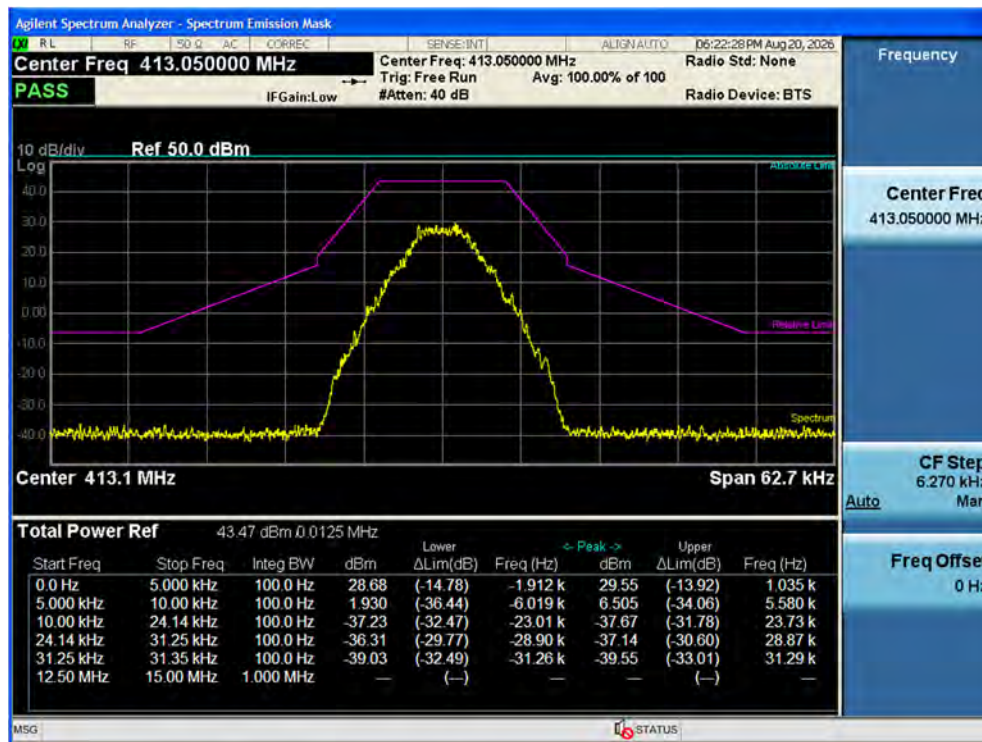
Output / UHF (406.1 ~ 420) / Downlink / P25 Phase 1 (C4FM) / Mask C



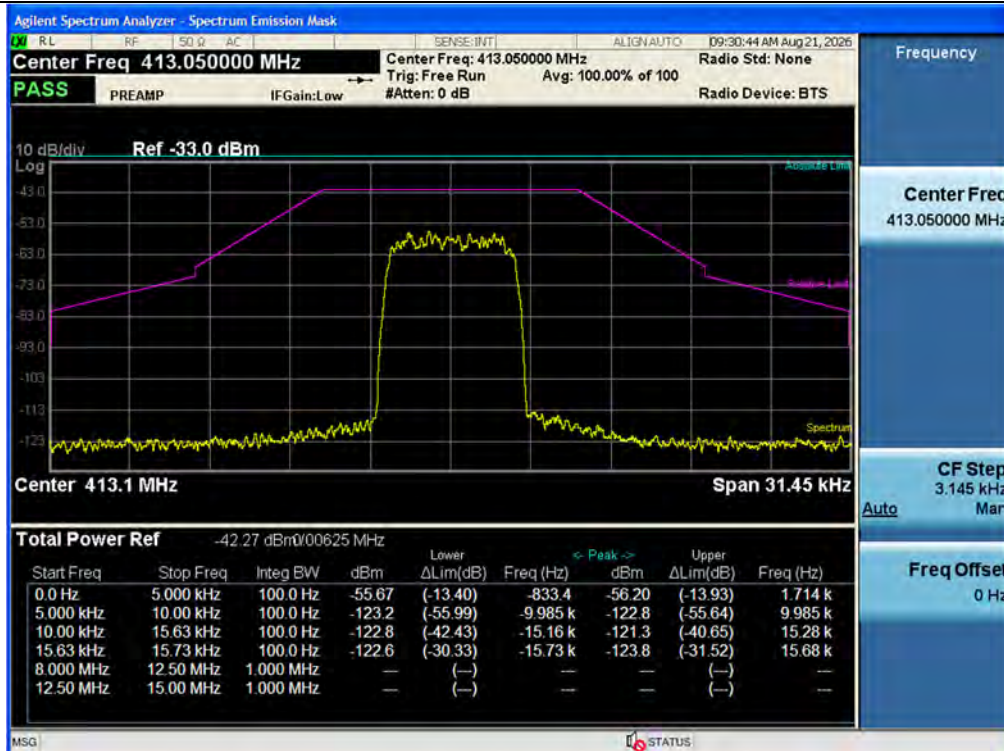
Input @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / P25 Phase 1 (C4FM) / Mask C



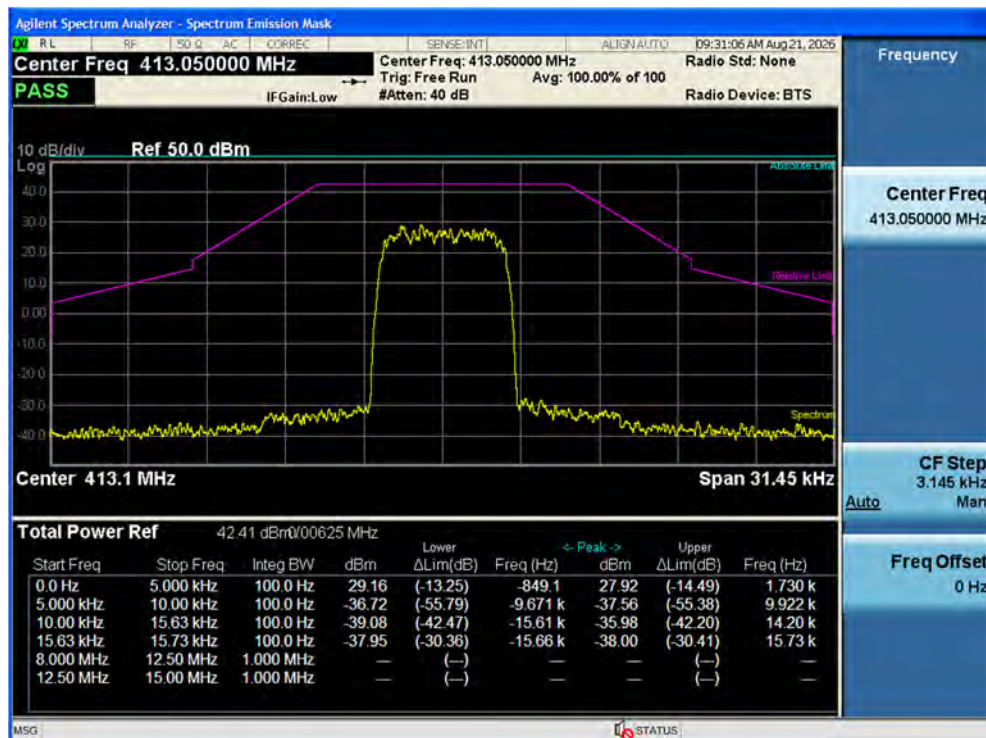
Output @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / P25 Phase 1 (C4FM) / Mask C



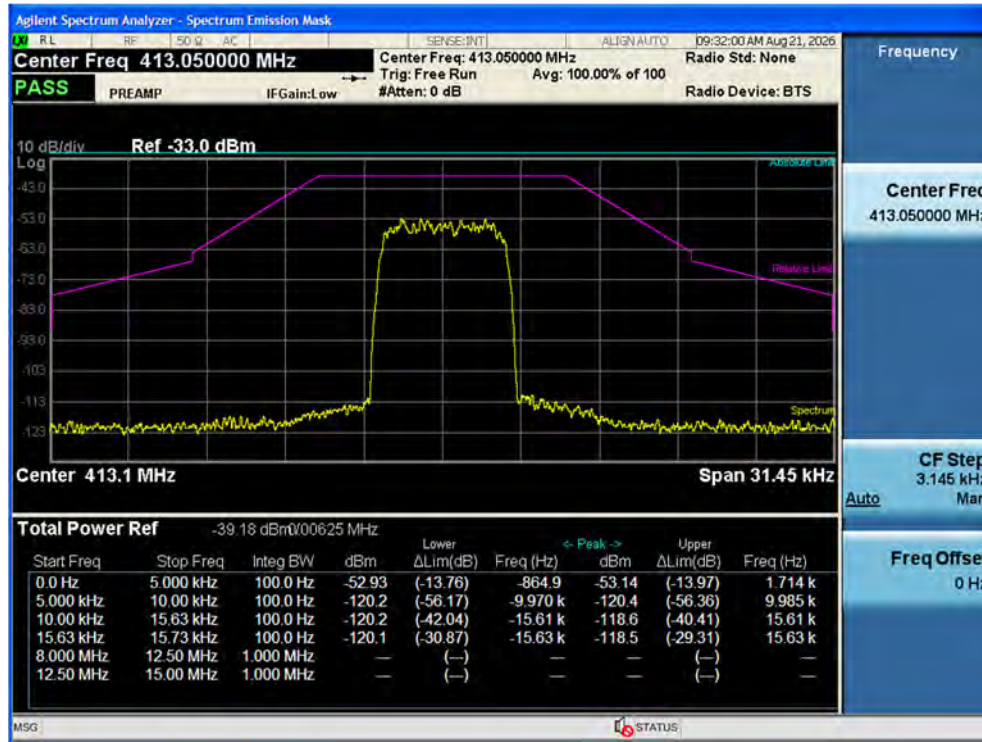
Input / UHF (406.1 ~ 420) / Downlink / P25 Phase 1 (CQPSK) / Mask C



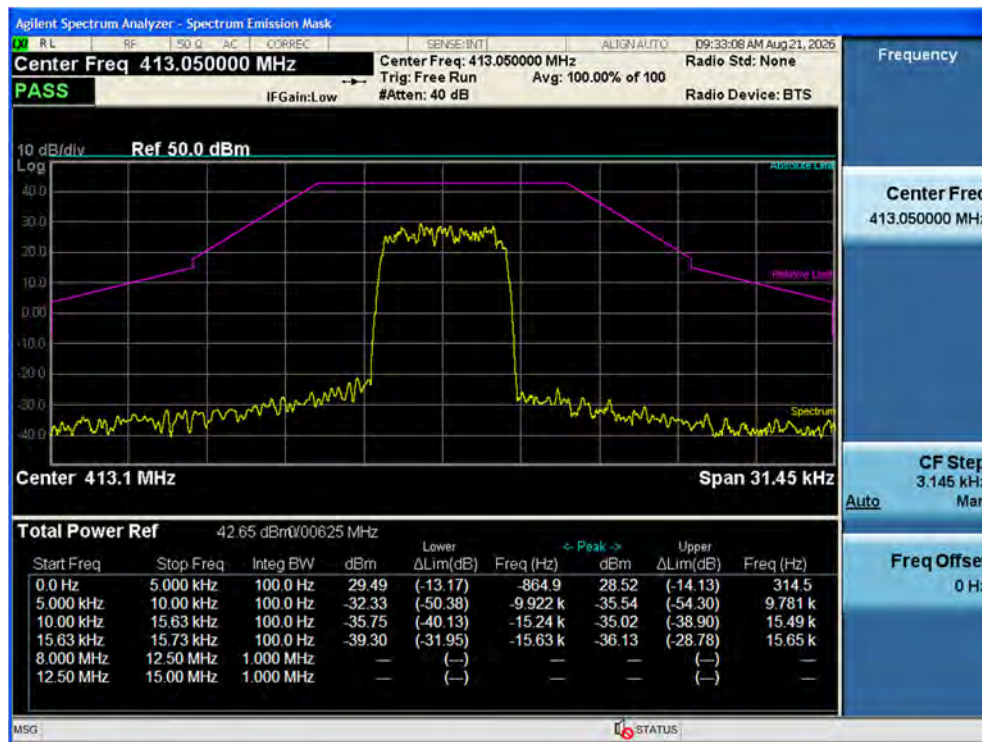
Output / UHF (406.1 ~ 420) / Downlink / P25 Phase 1 (CQPSK) / Mask C



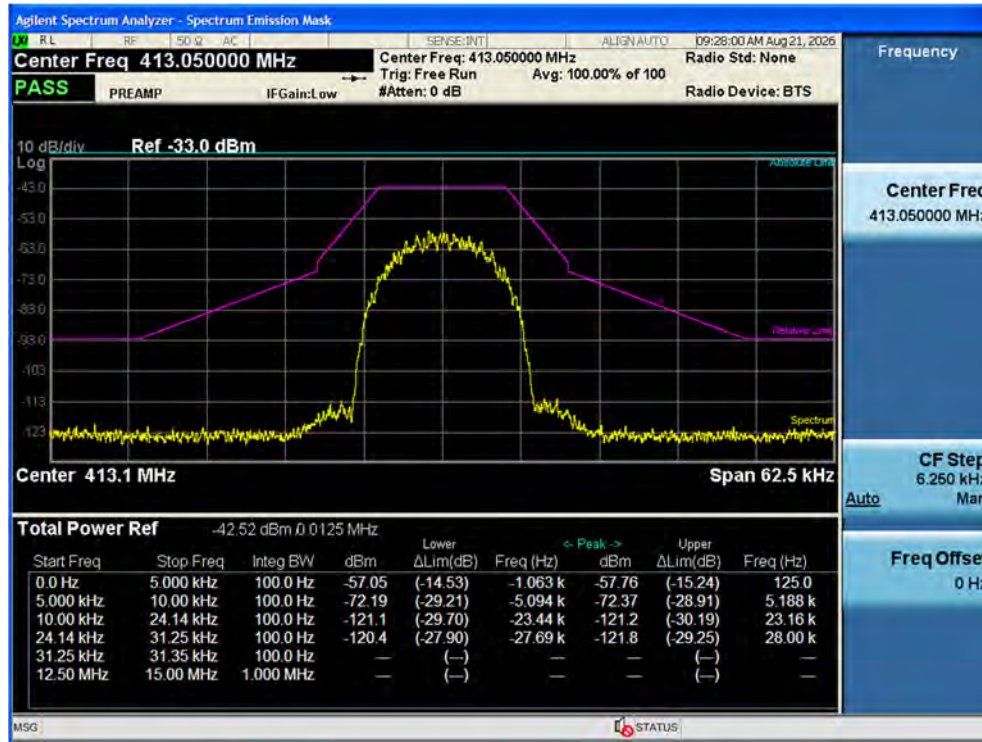
Input @ +3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / P25 Phase 1 (CQPSK) / Mask C



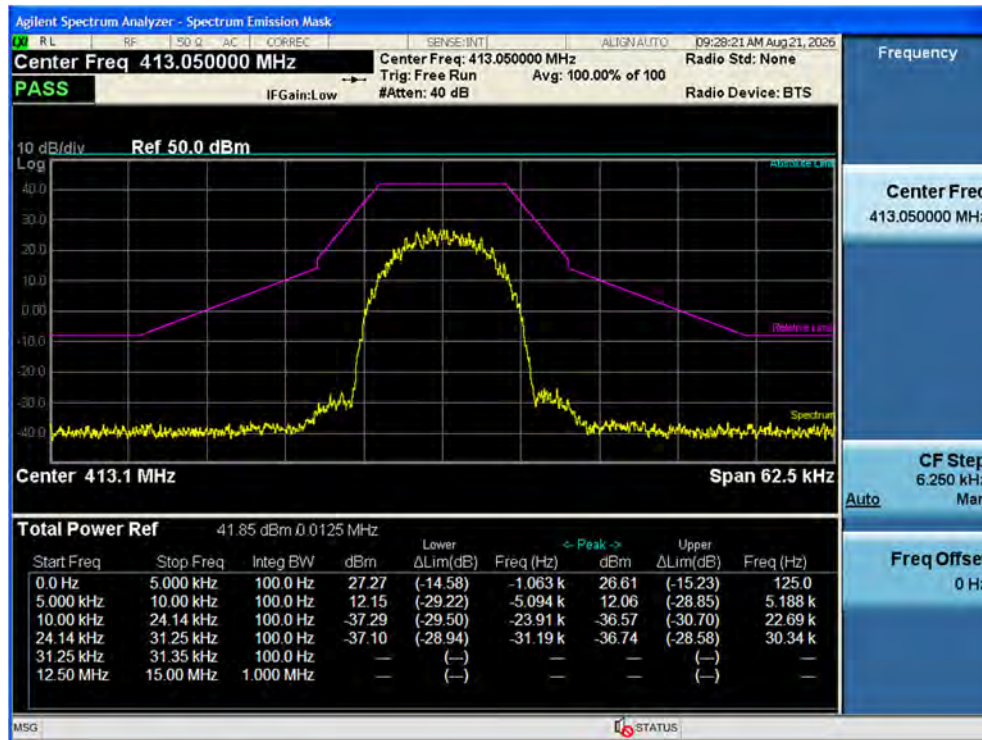
Output @ +3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / P25 Phase 1 (CQPSK) / Mask C



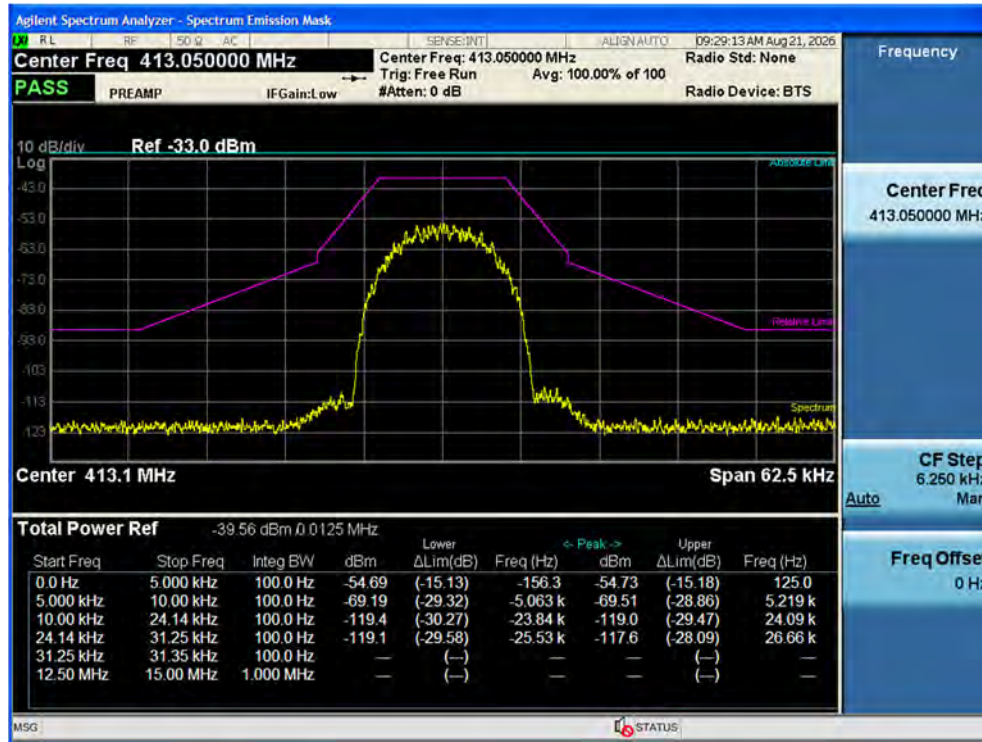
Input / UHF (406.1 ~ 420) / Downlink / P25 Phase 2 (H-DQPSK) / Mask C



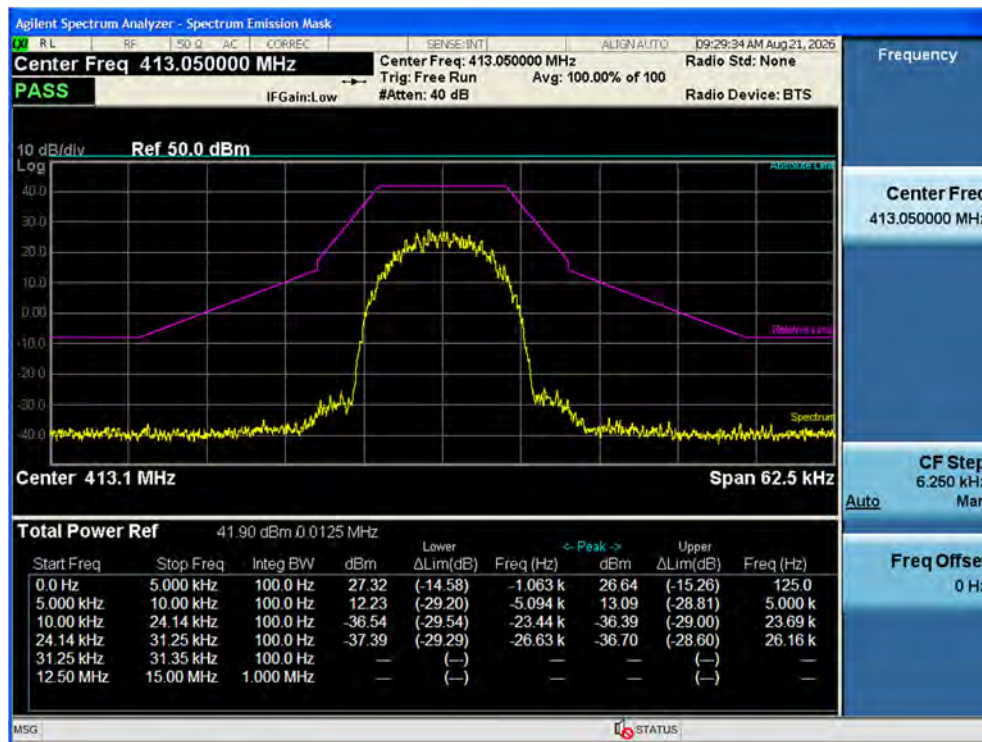
Output / UHF (406.1 ~ 420) / Downlink / P25 Phase 2 (H-DQPSK) / Mask C



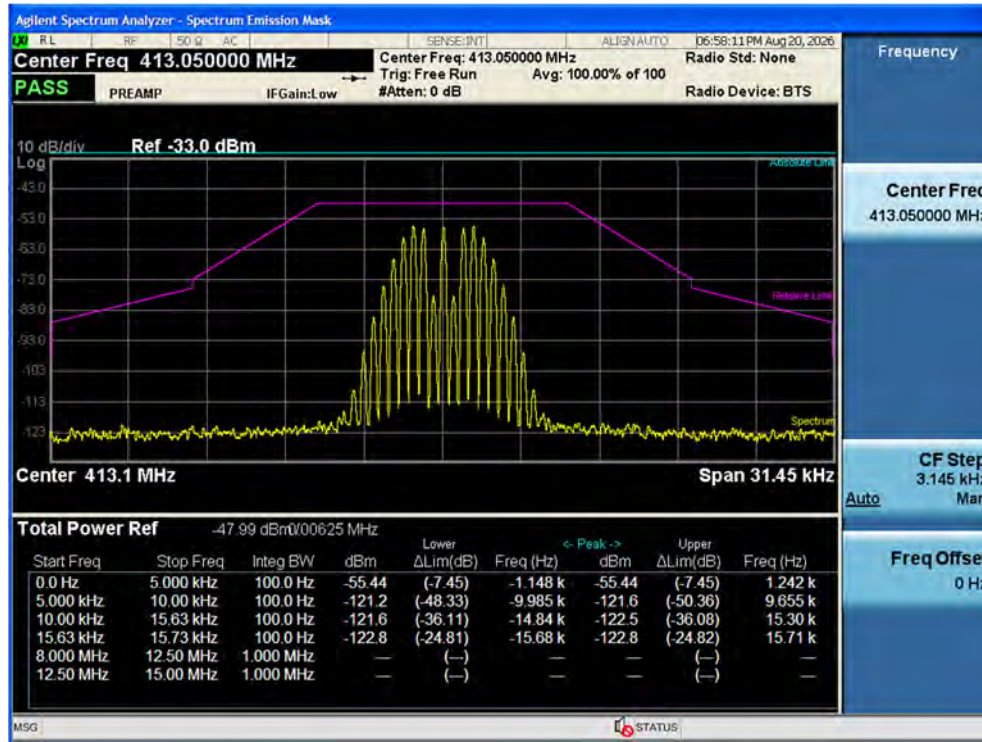
Input @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / P25 Phase 2 (H-DQPSK) / Mask C



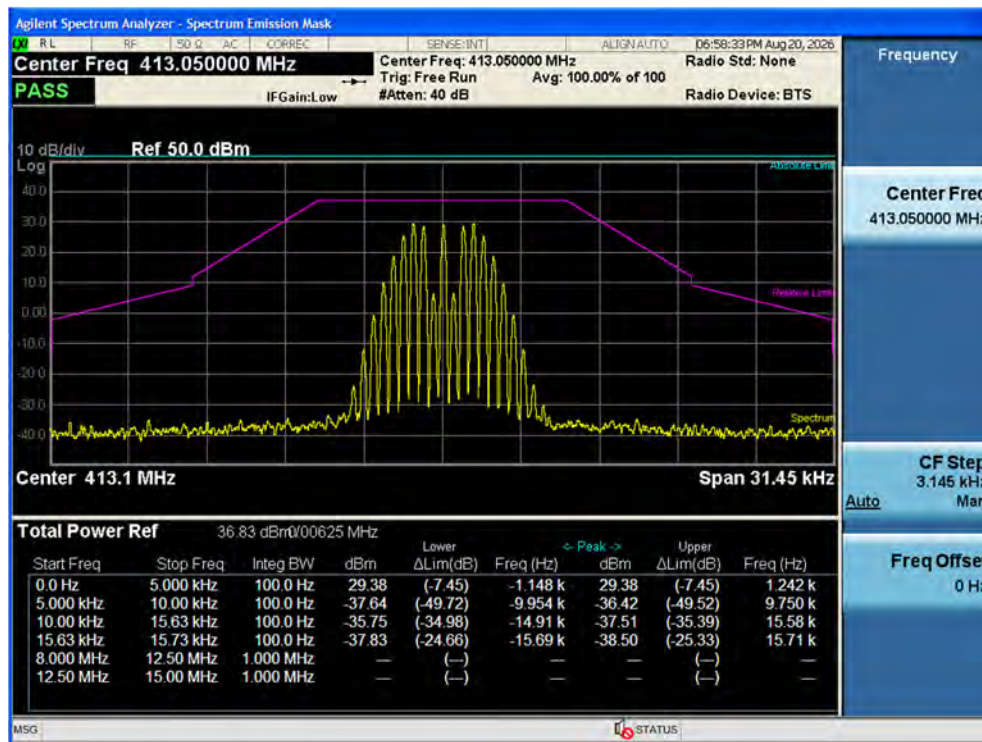
Output @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / P25 Phase 2 (H-DQPSK) / Mask C



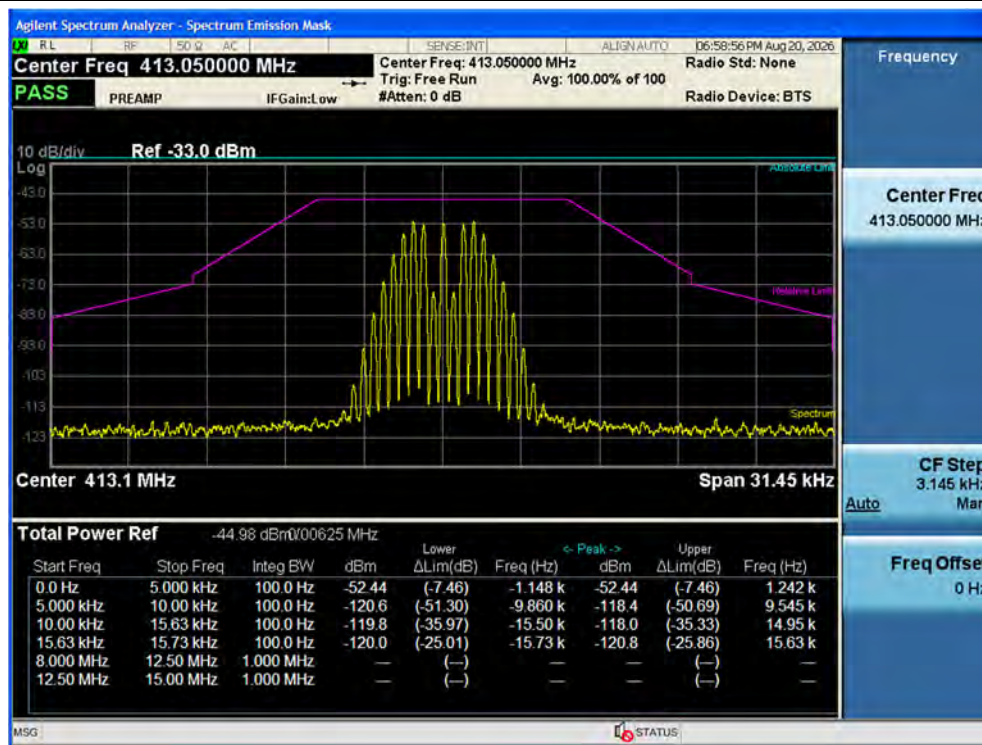
Input / UHF (406.1 ~ 420) / Downlink / FM (6.25 kHz) / Mask C



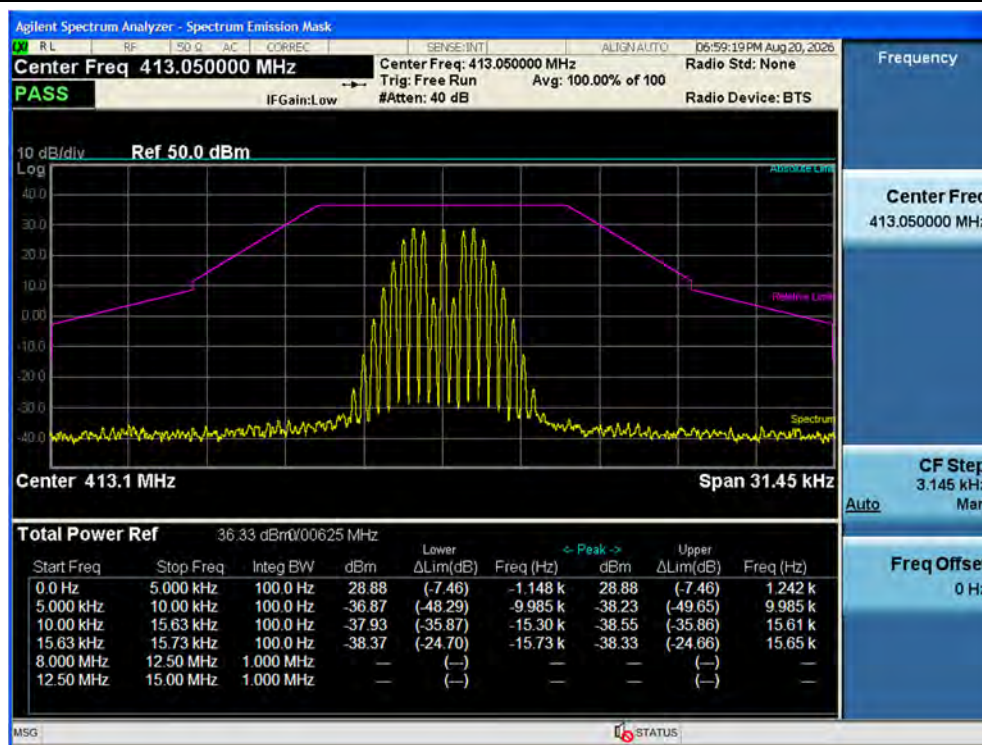
Output / UHF (406.1 ~ 420) / Downlink / FM (6.25 kHz) / Mask C



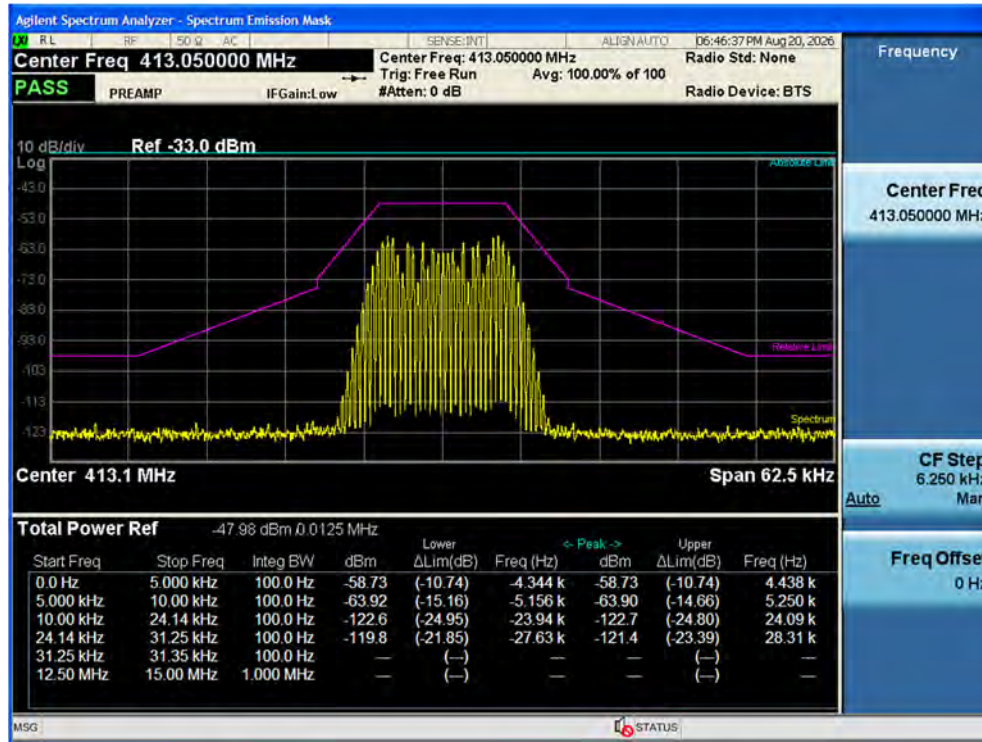
Input @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / FM (6.25 kHz) / Mask C



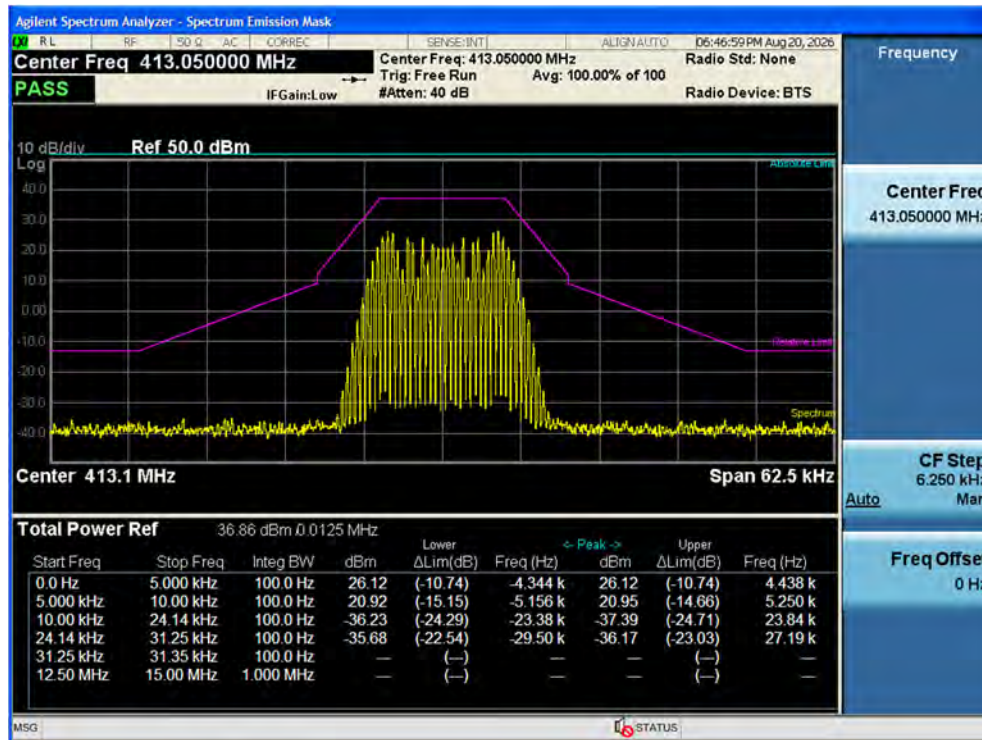
Output @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / FM (6.25 kHz) / Mask C



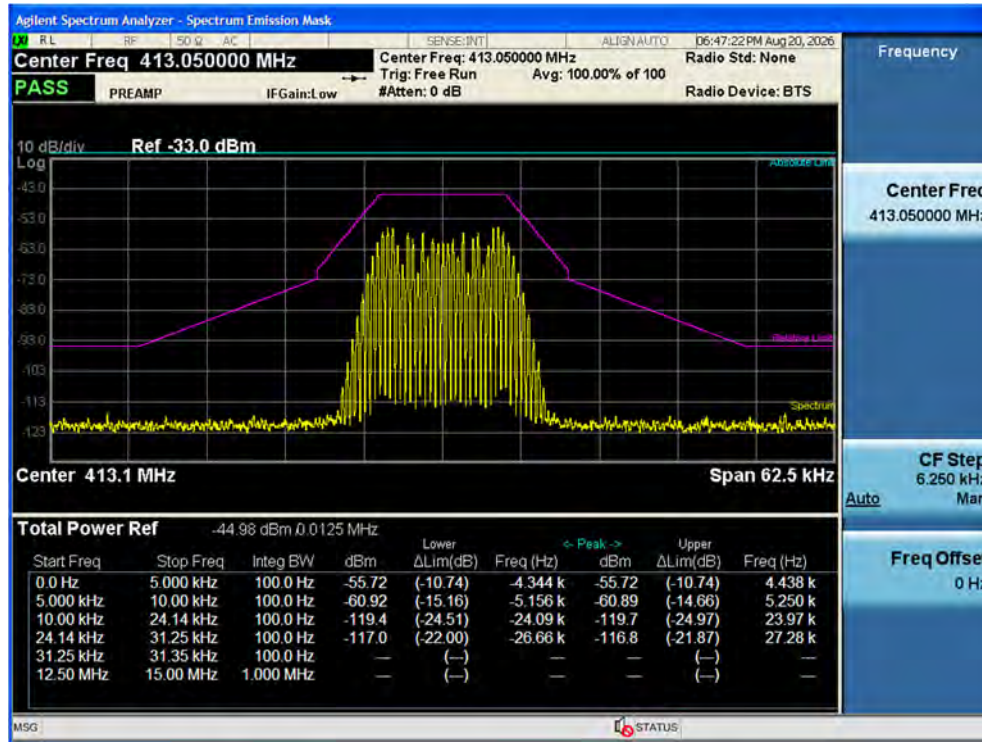
Input / UHF (406.1 ~ 420) / Downlink / FM (12.5 kHz) / Mask C



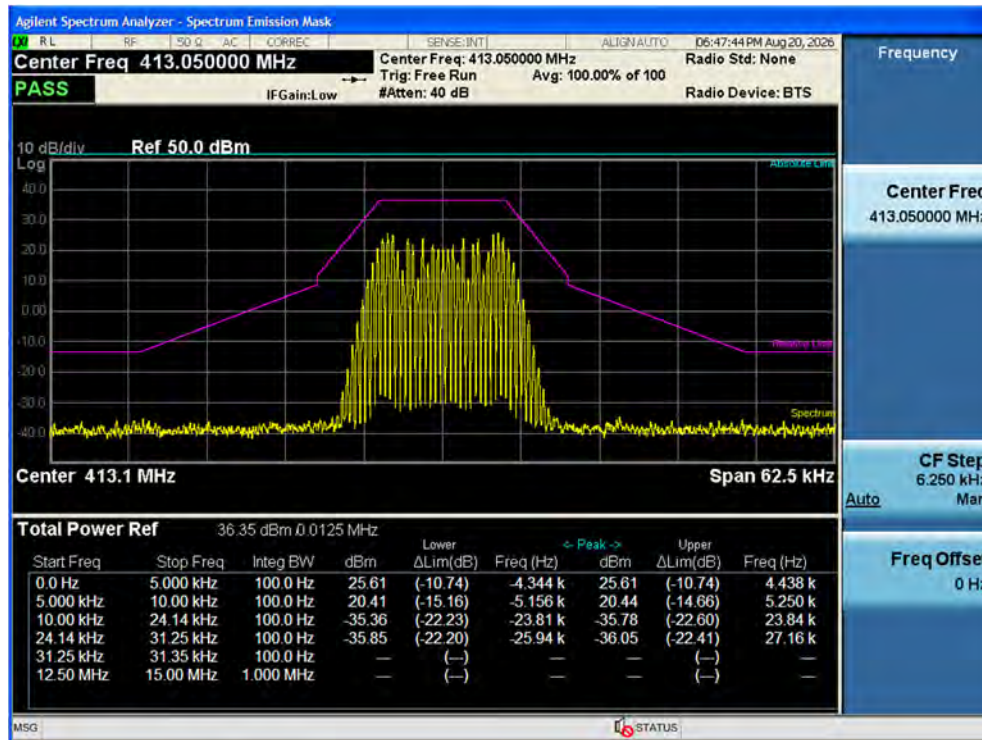
Output / UHF (406.1 ~ 420) / Downlink / FM (12.5 kHz) / Mask C



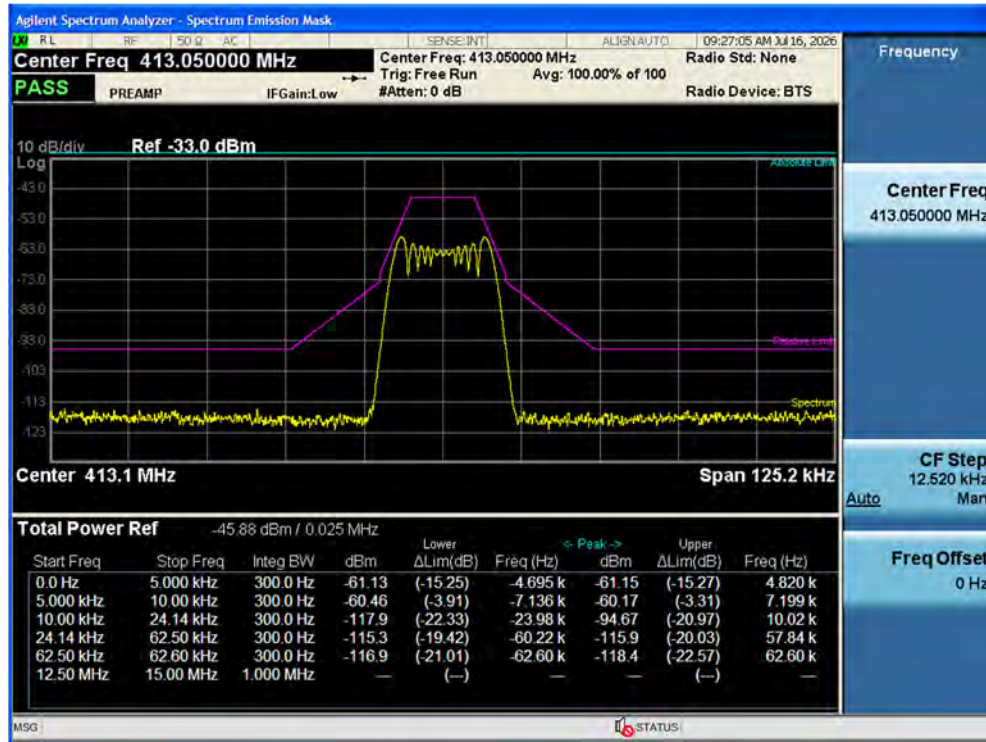
Input @ + 3 dB AGC threshold / UHF (406.1 ~ 420) / Downlink / FM (12.5 kHz) / Mask C



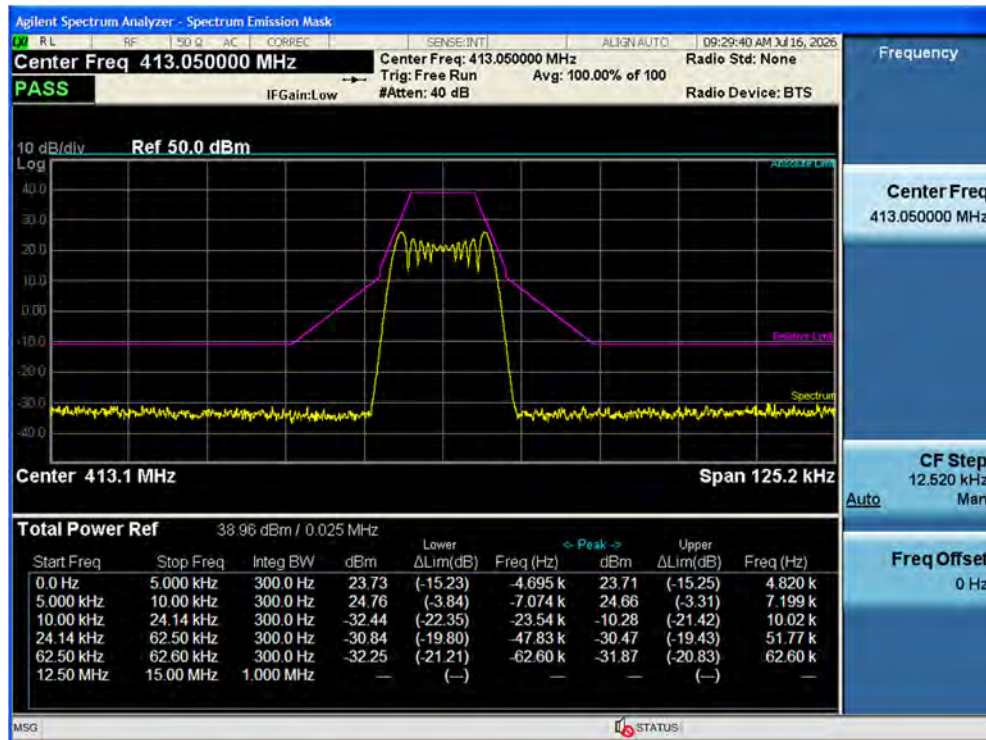
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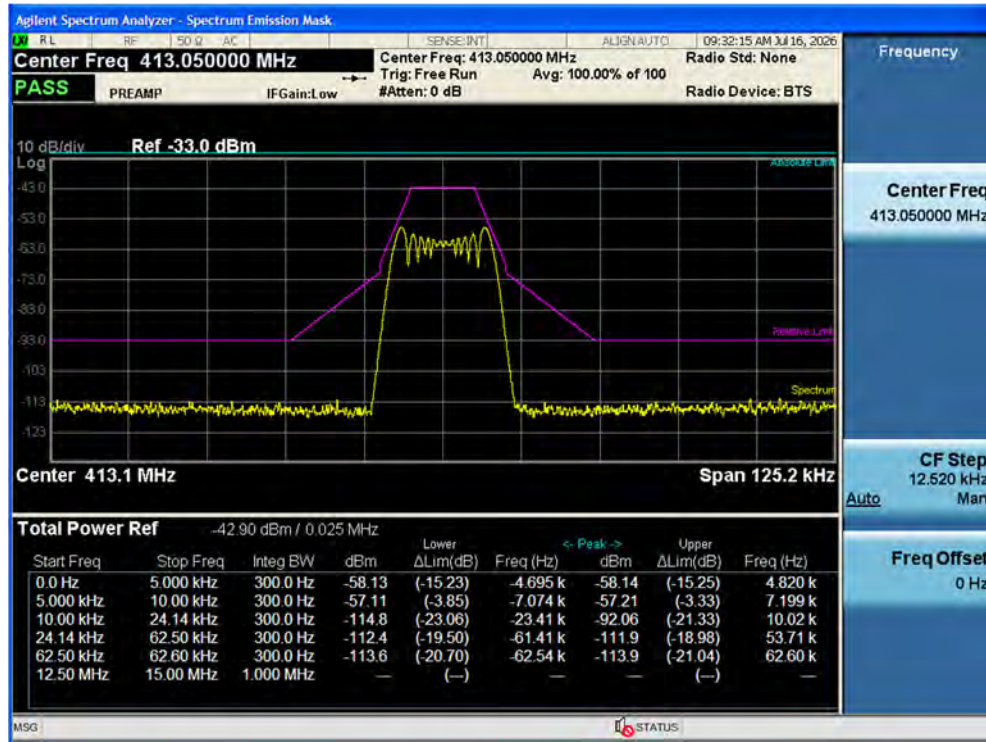
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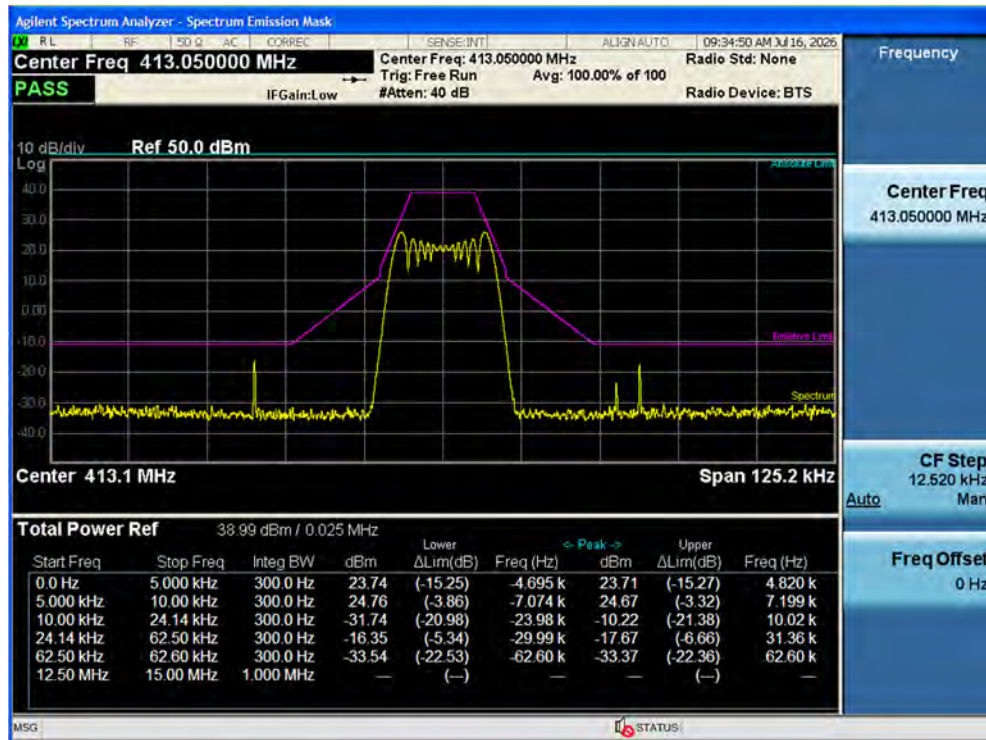
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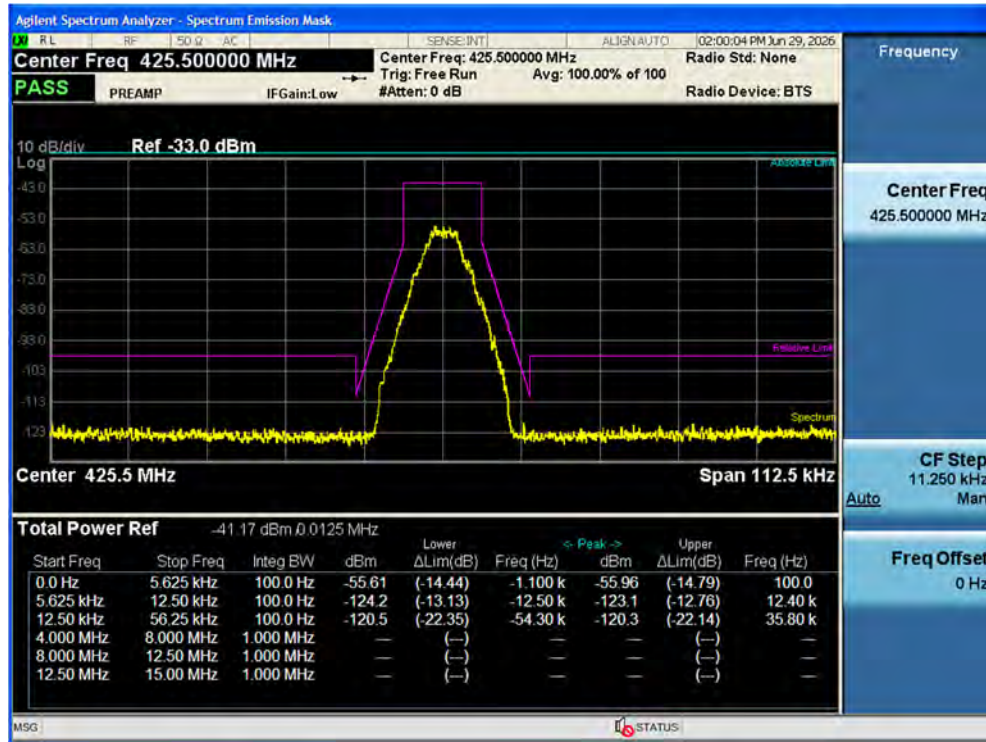
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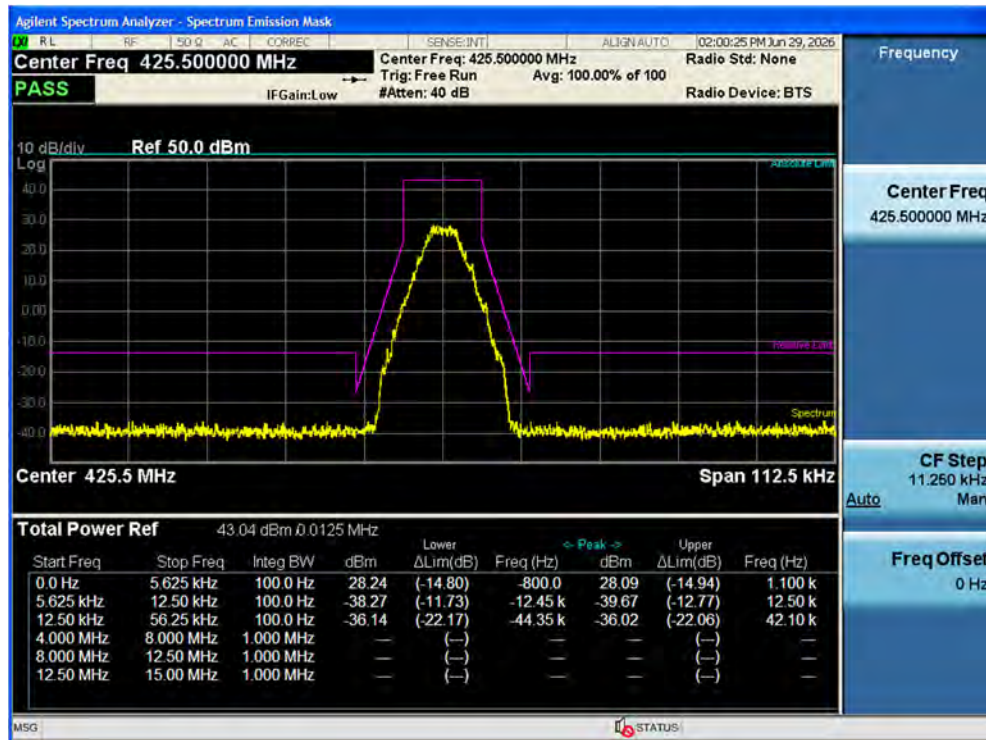
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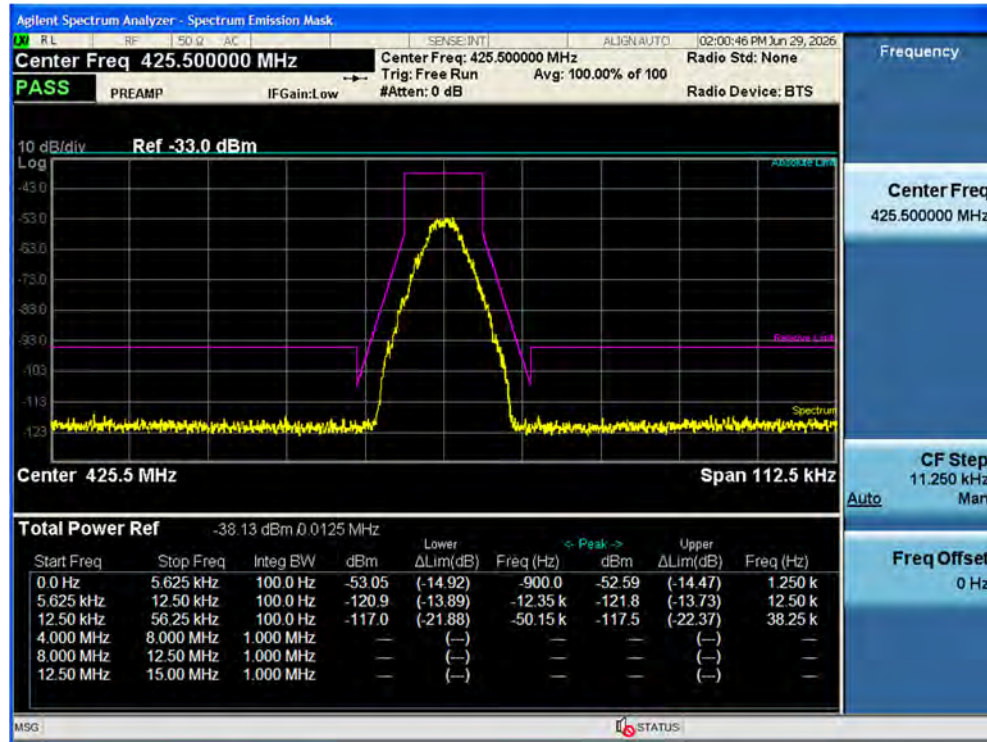
Input / UHF (421 ~ 430) / Downlink / P25 Phase 1 (C4FM) / Mask D



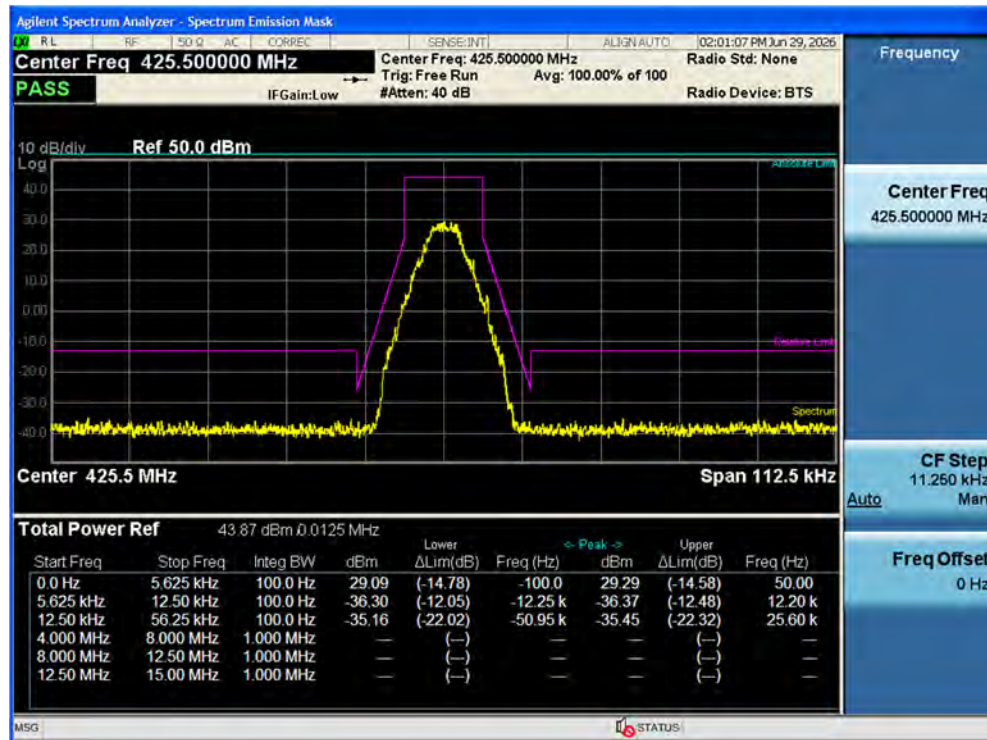
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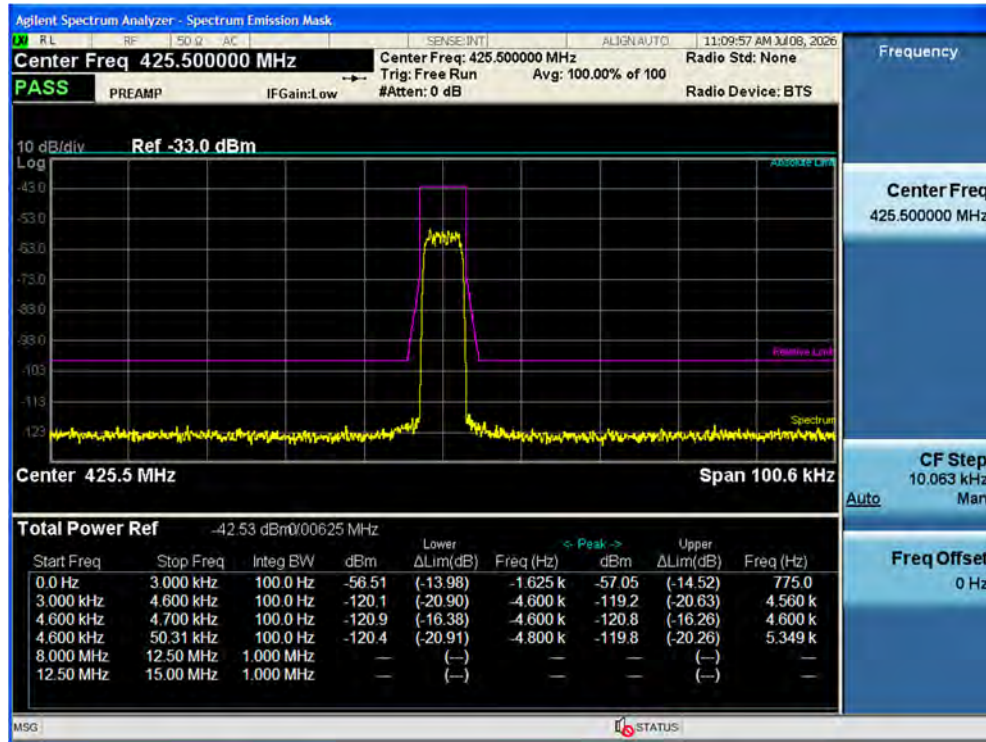
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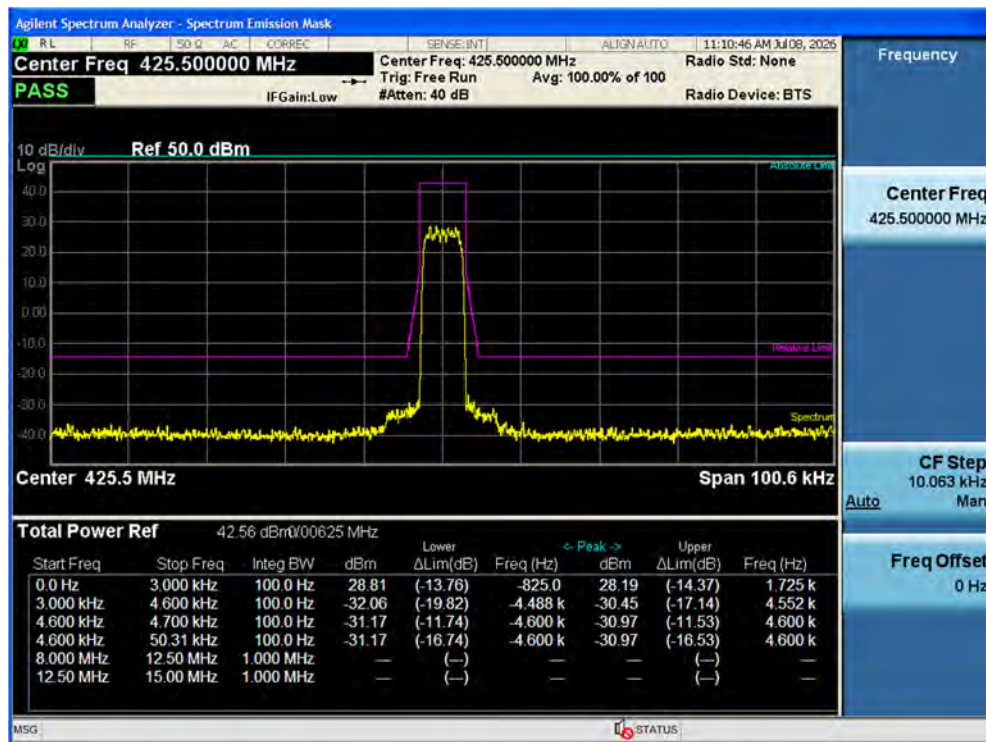
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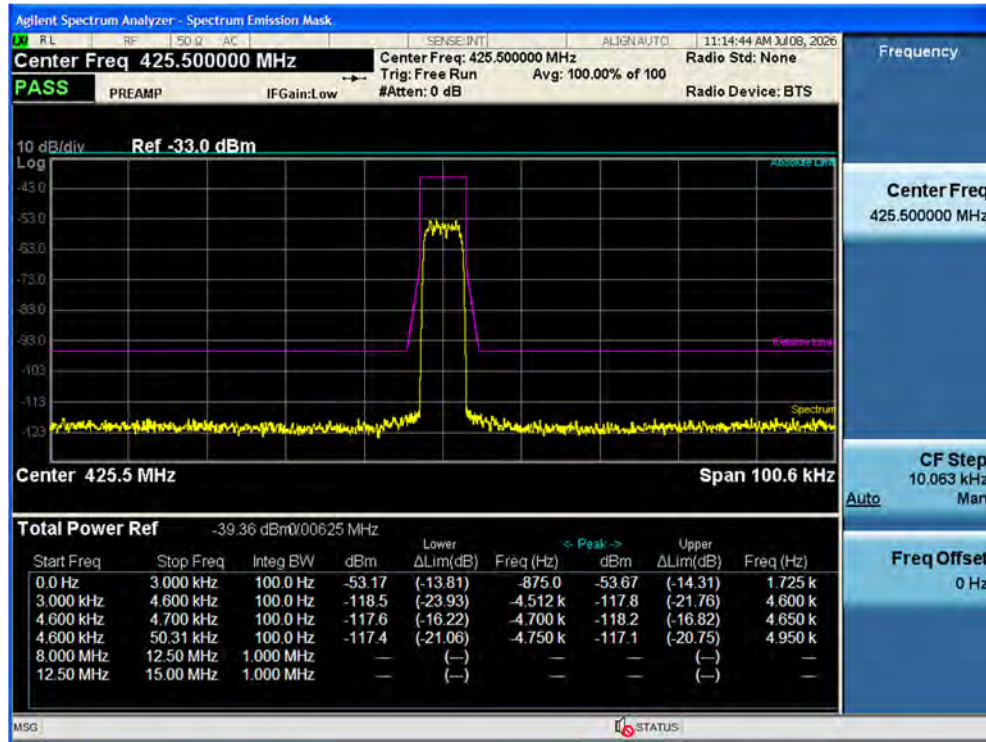
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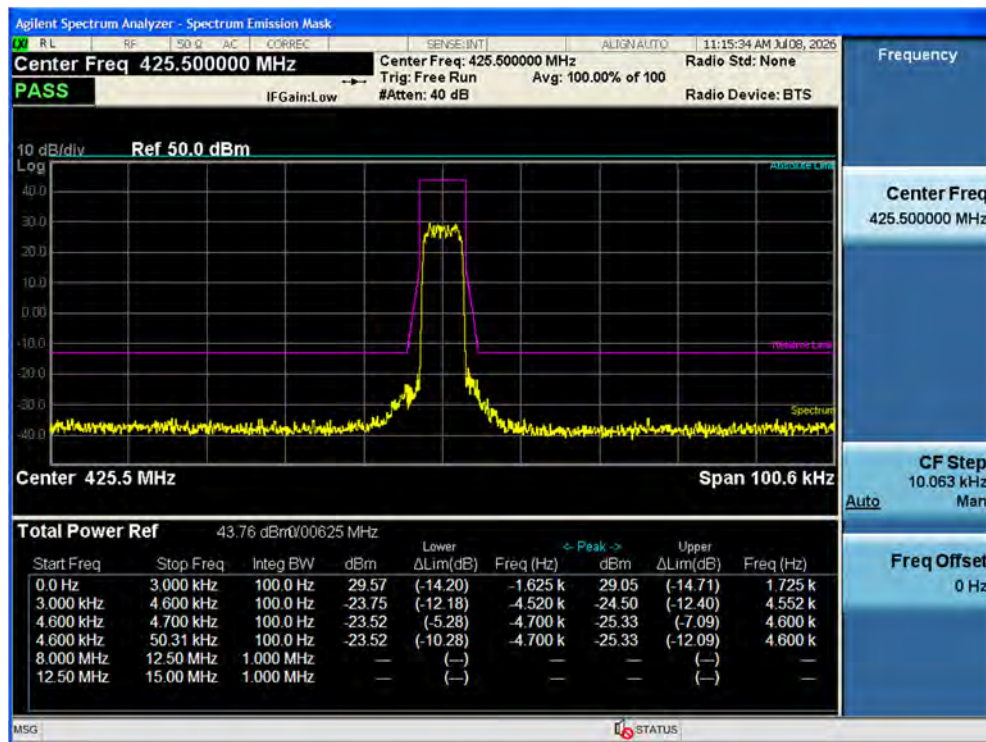
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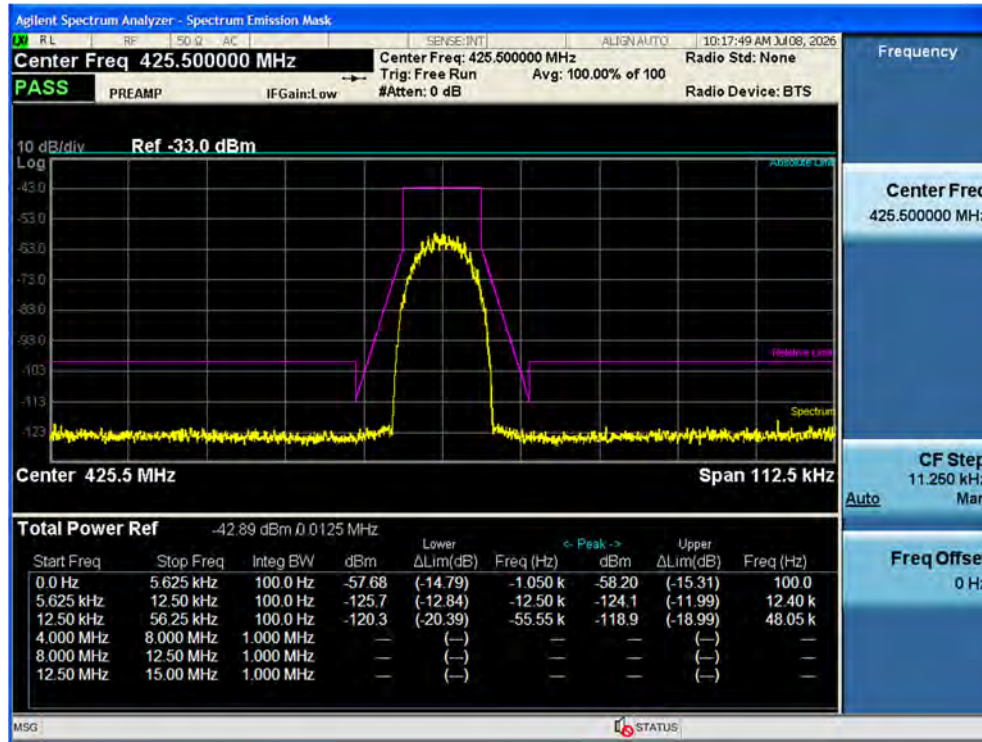
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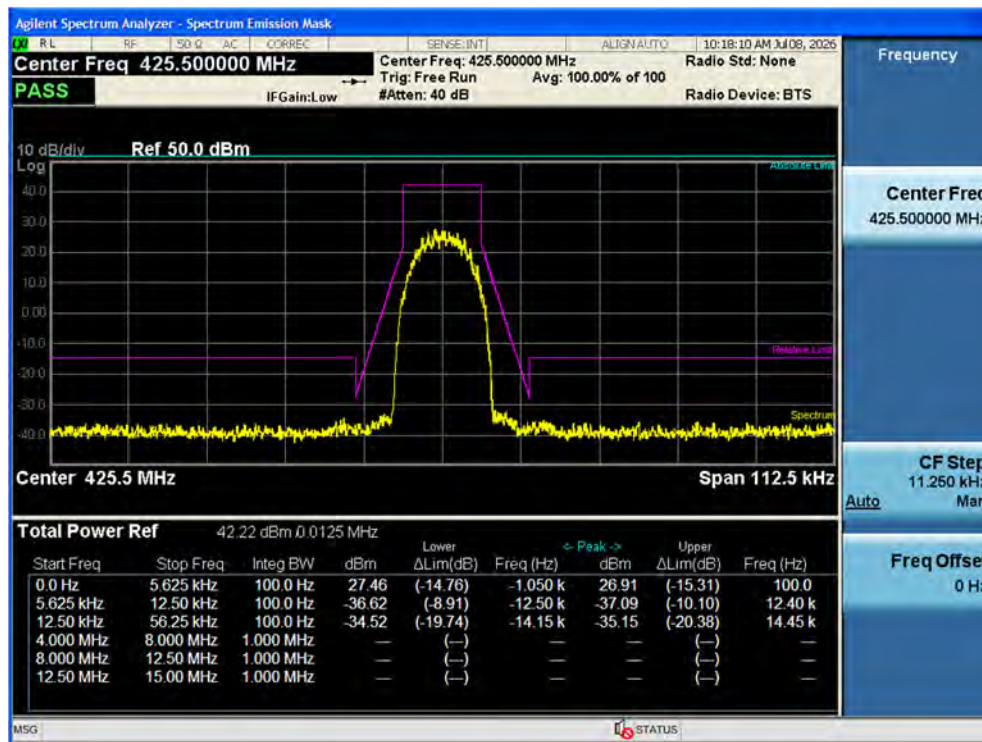
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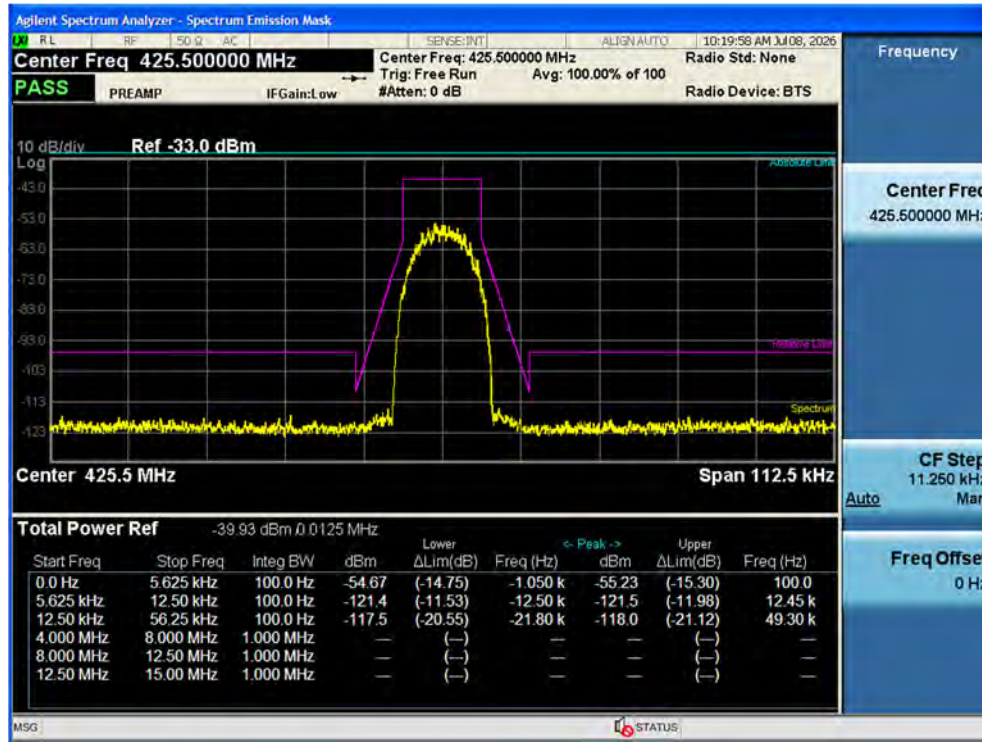
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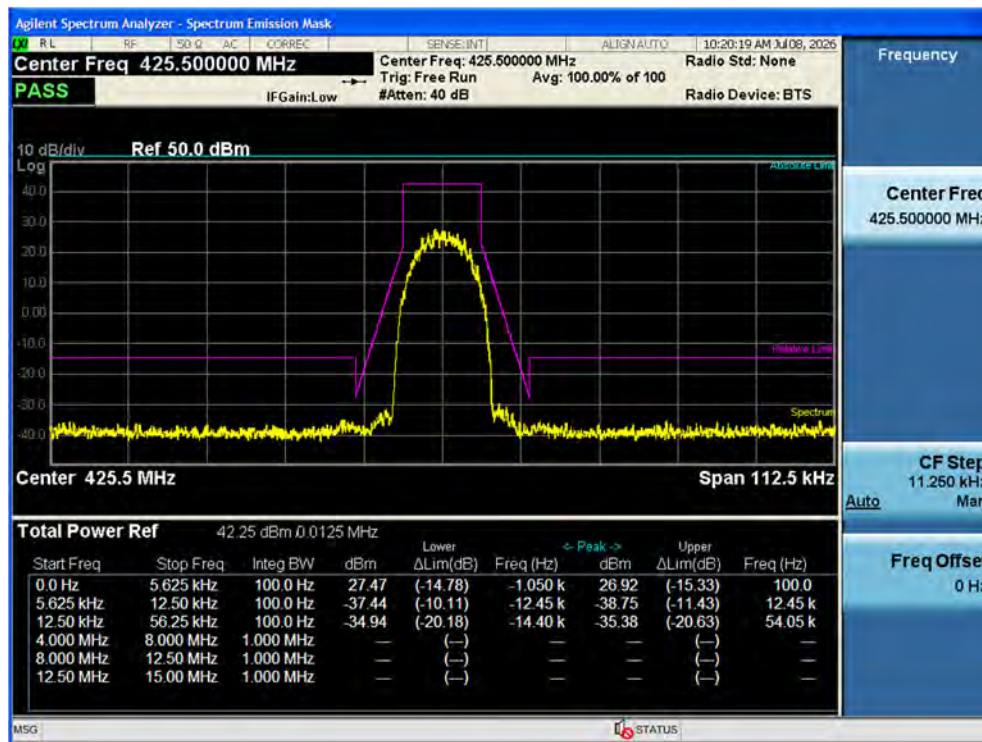
Output / UHF (421 ~ 430) / Downlink / P25 Phase 2 (H-DQPSK) / Mask D



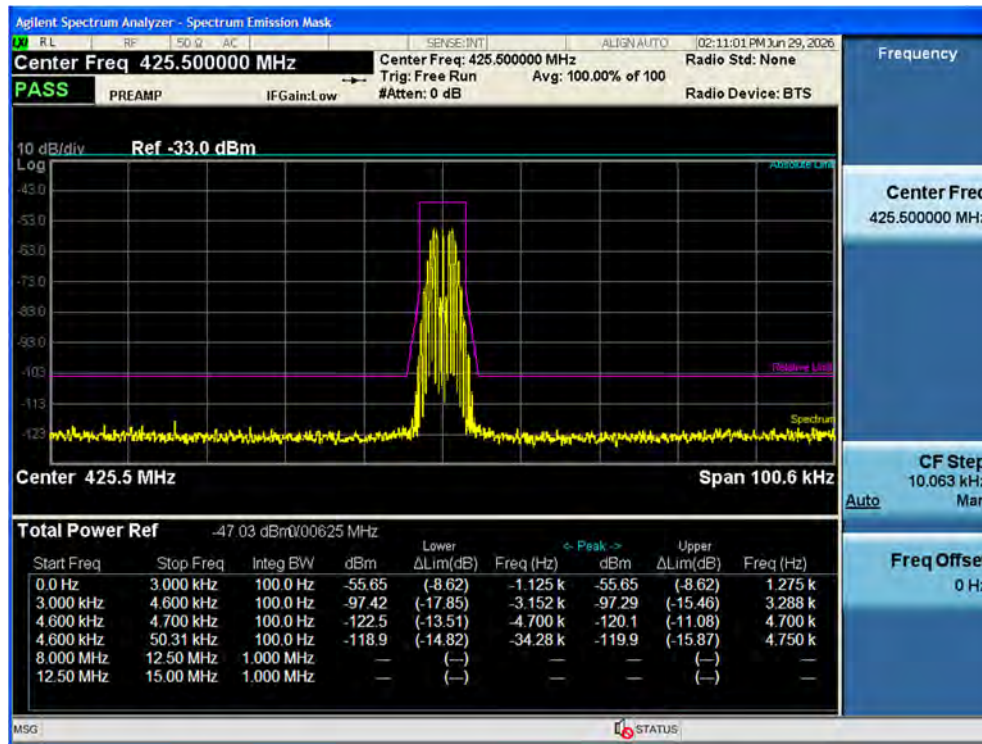
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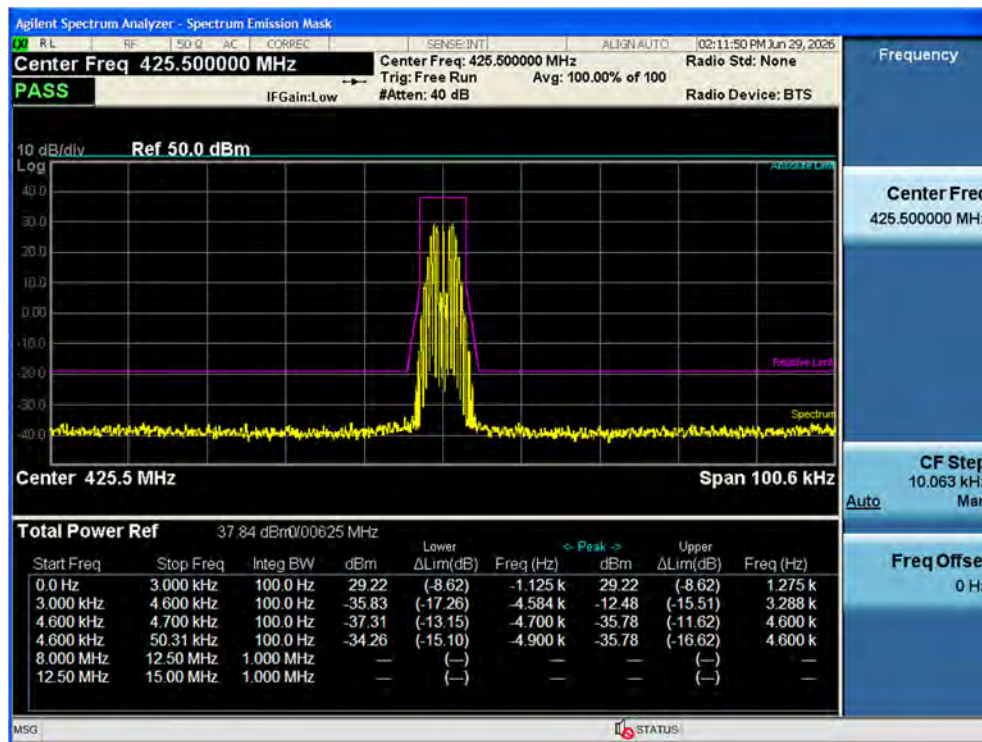
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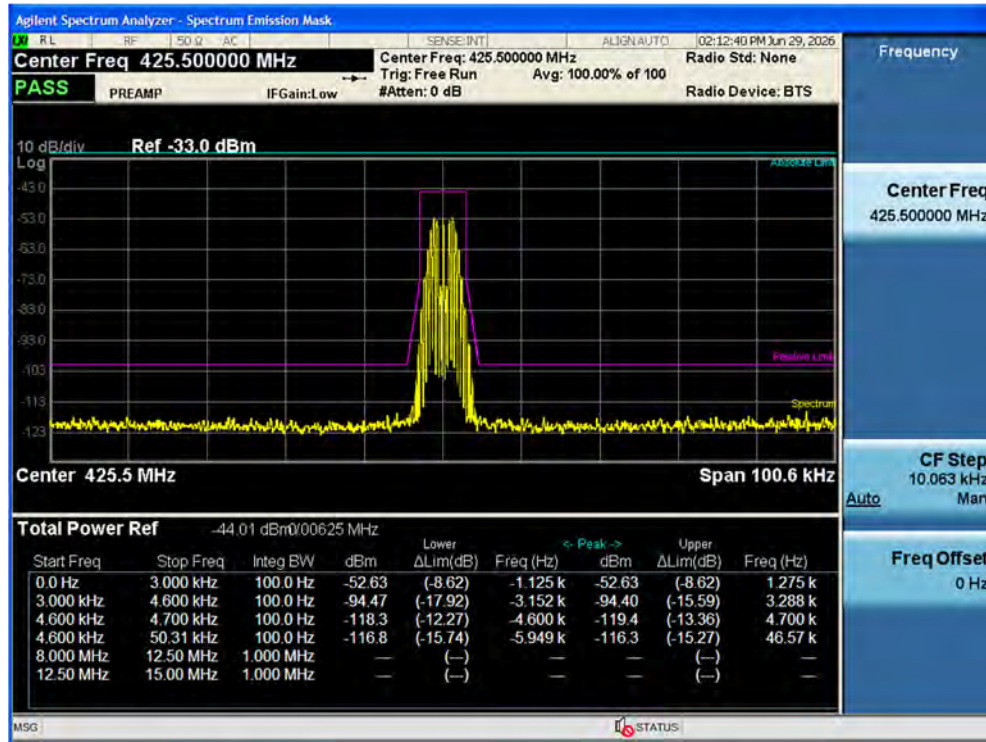
Input / UHF (421 ~ 430) / Downlink / FM (6.25 kHz) / Mask E



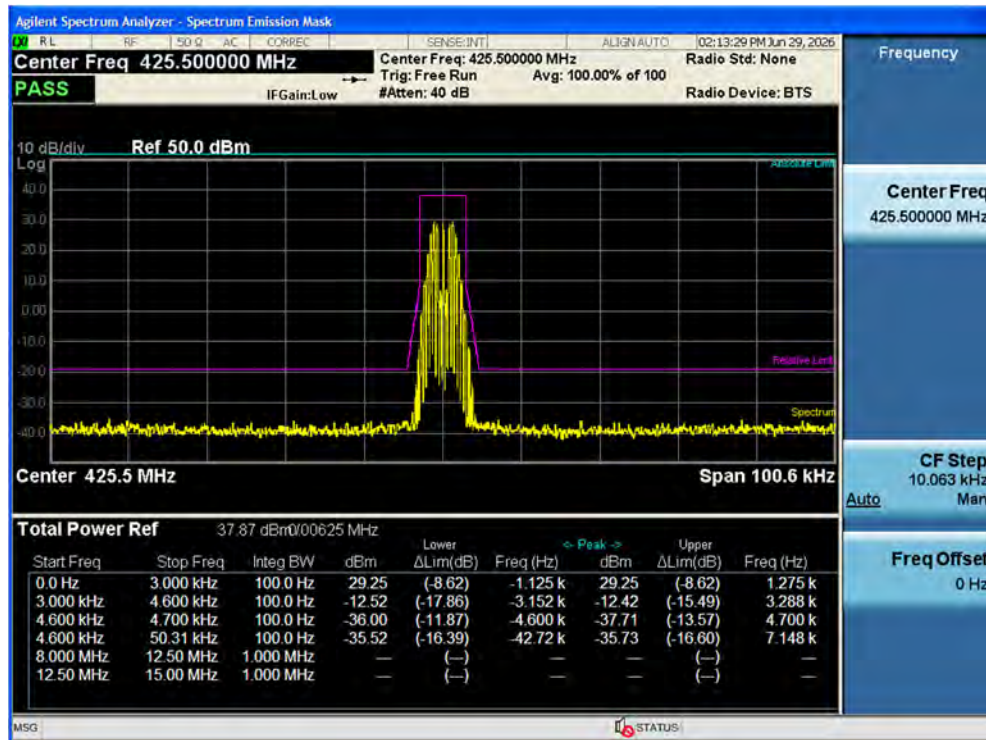
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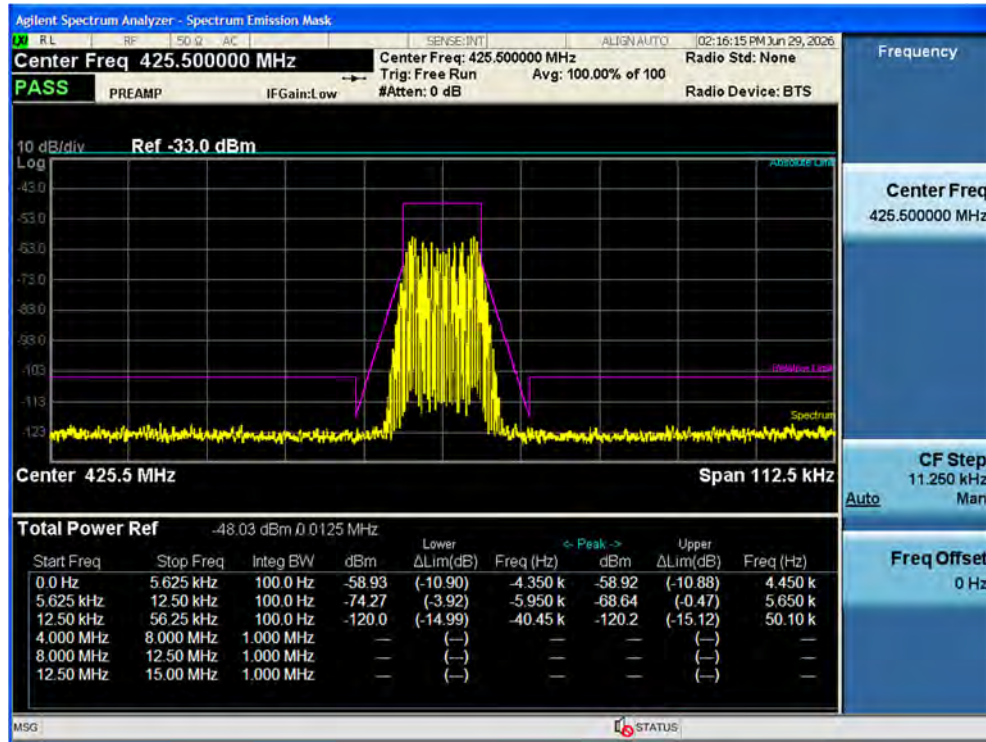
Input @ + 3 dB AGC threshold / UHF (421 ~ 430) / Downlink / FM (6.25 kHz) / Mask E



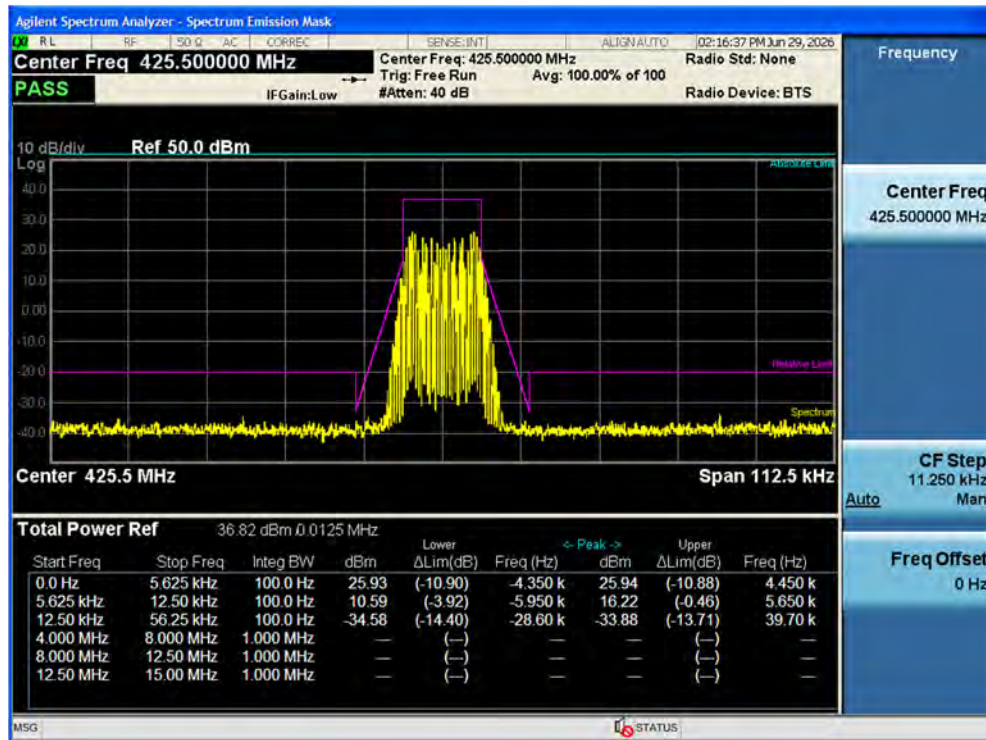
Output @ + 3 dB AGC threshold / UHF (421 ~ 430) / Downlink / FM (6.25 kHz) / Mask E



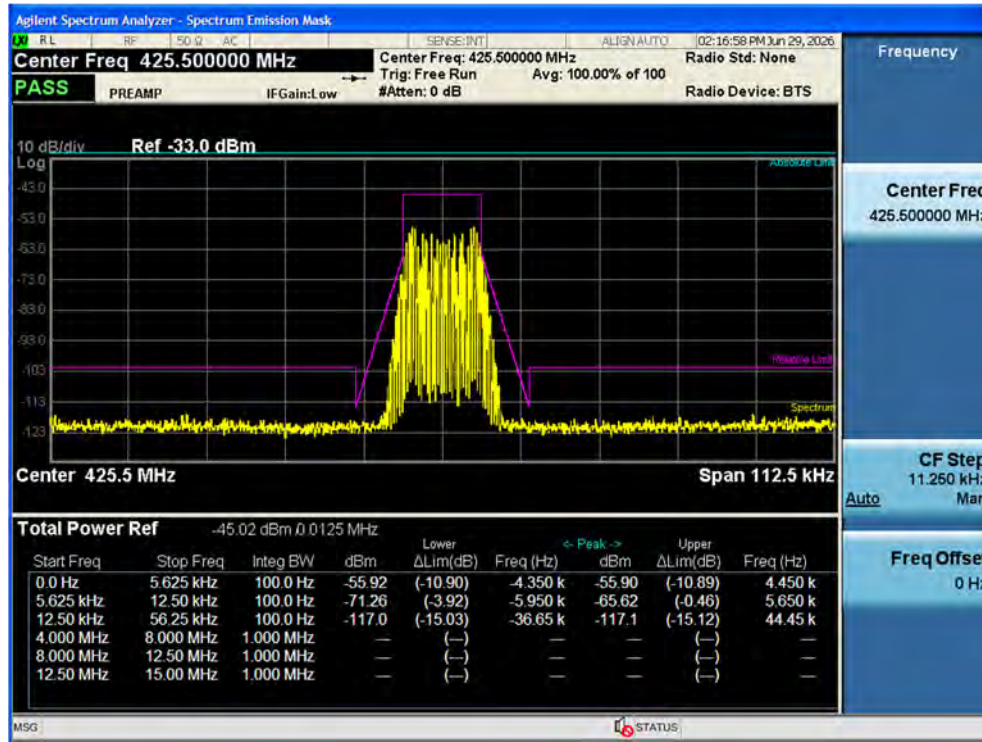
Input / UHF (421 ~ 430) / Downlink / FM (12.5 kHz) / Mask D



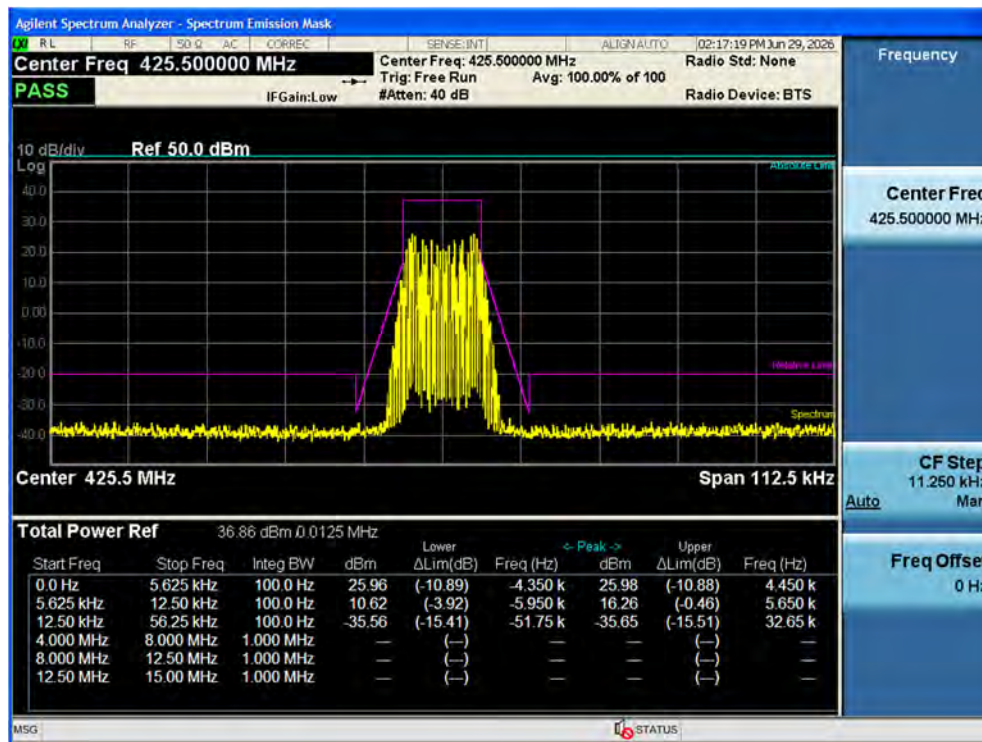
Output / UHF (421 ~ 430) / Downlink / FM (12.5 kHz) / Mask D



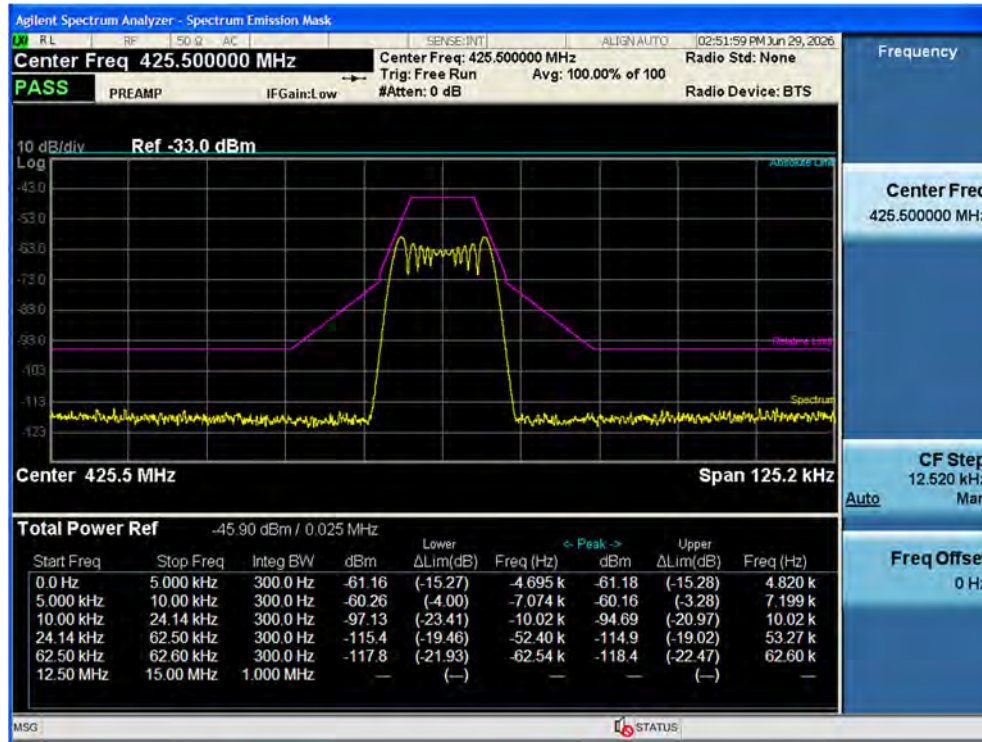
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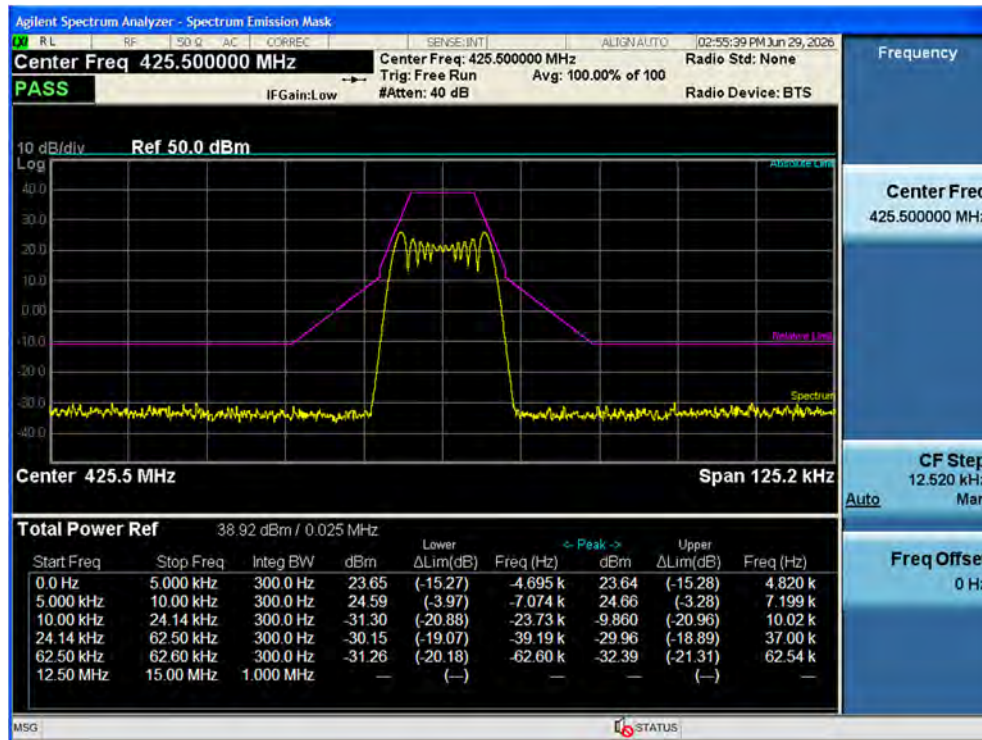
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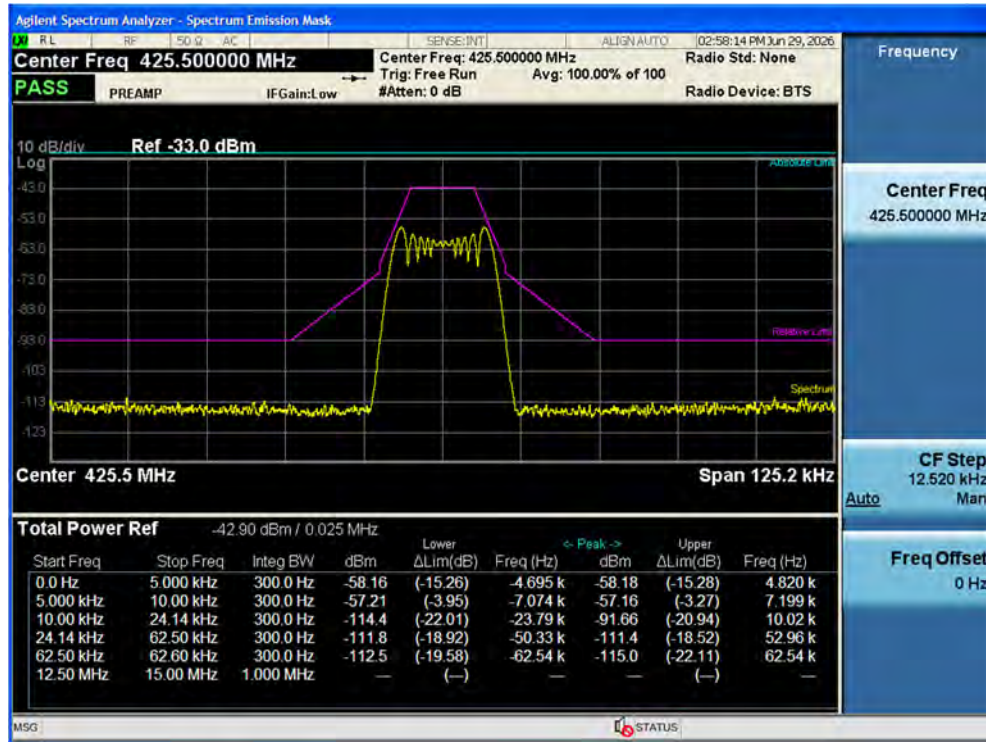
Input / UHF (421 ~ 430) / Downlink / FM (25 kHz) / Mask C



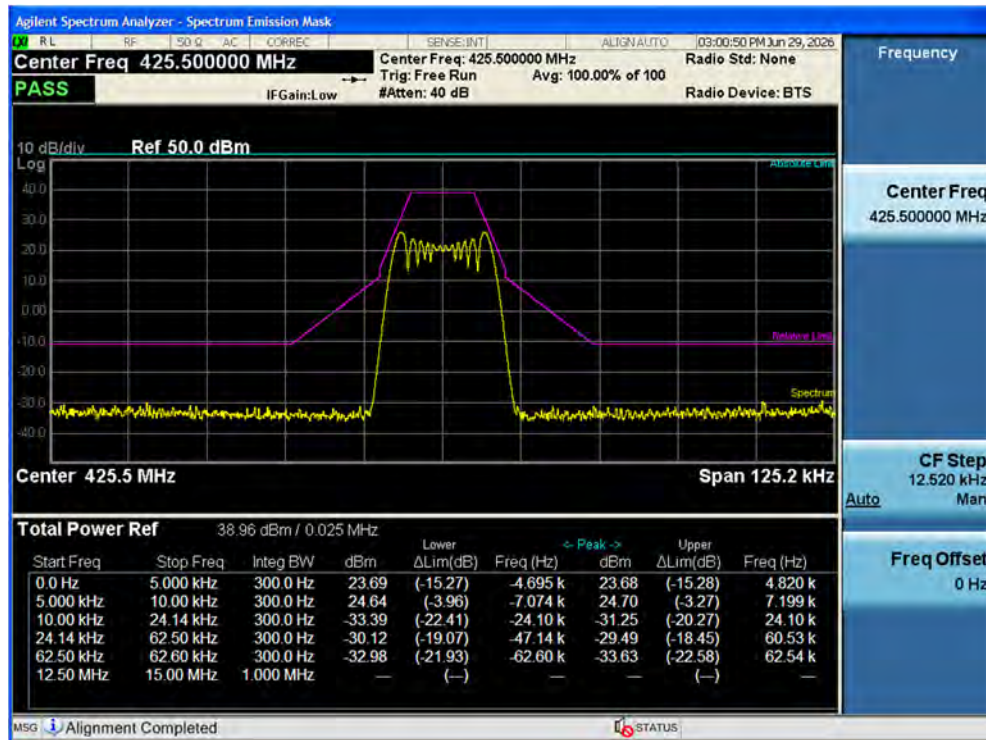
Output / UHF (421 ~ 430) / Downlink / FM (25 kHz) / Mask C



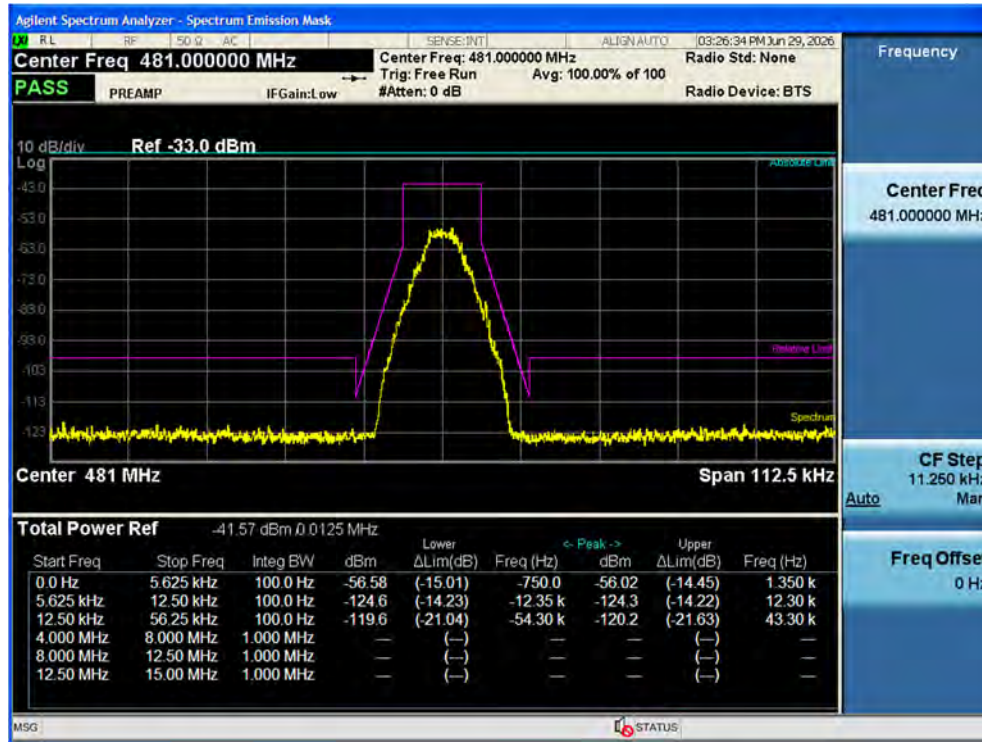
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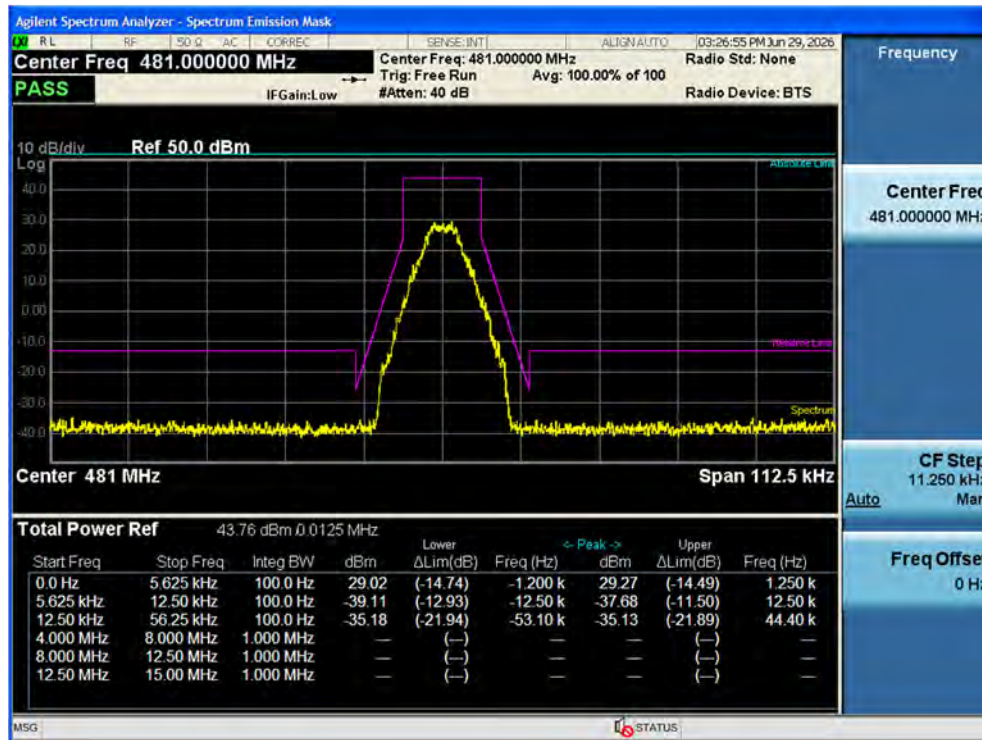
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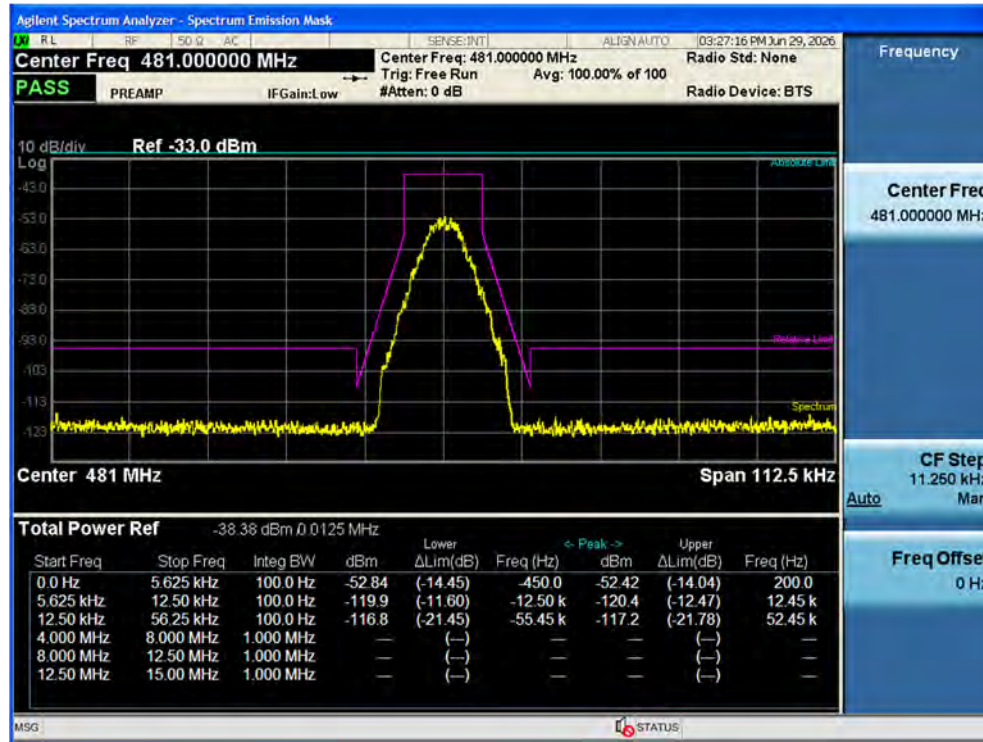
Input / UHF (450 ~ 512) / Downlink / P25 Phase 1 (C4FM) / Mask D



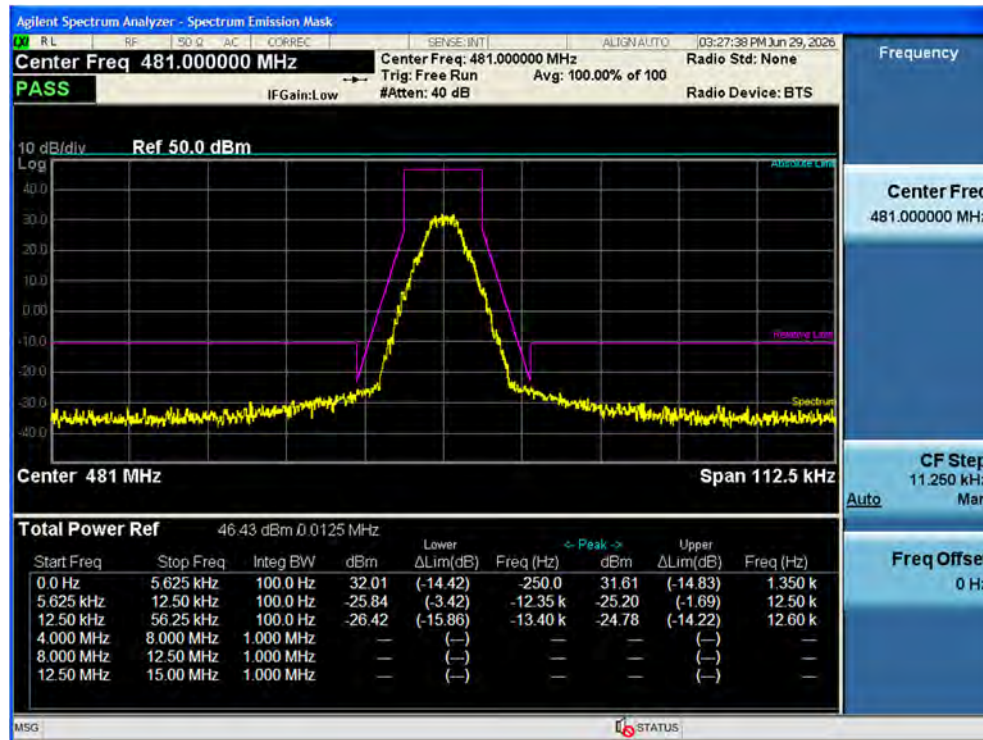
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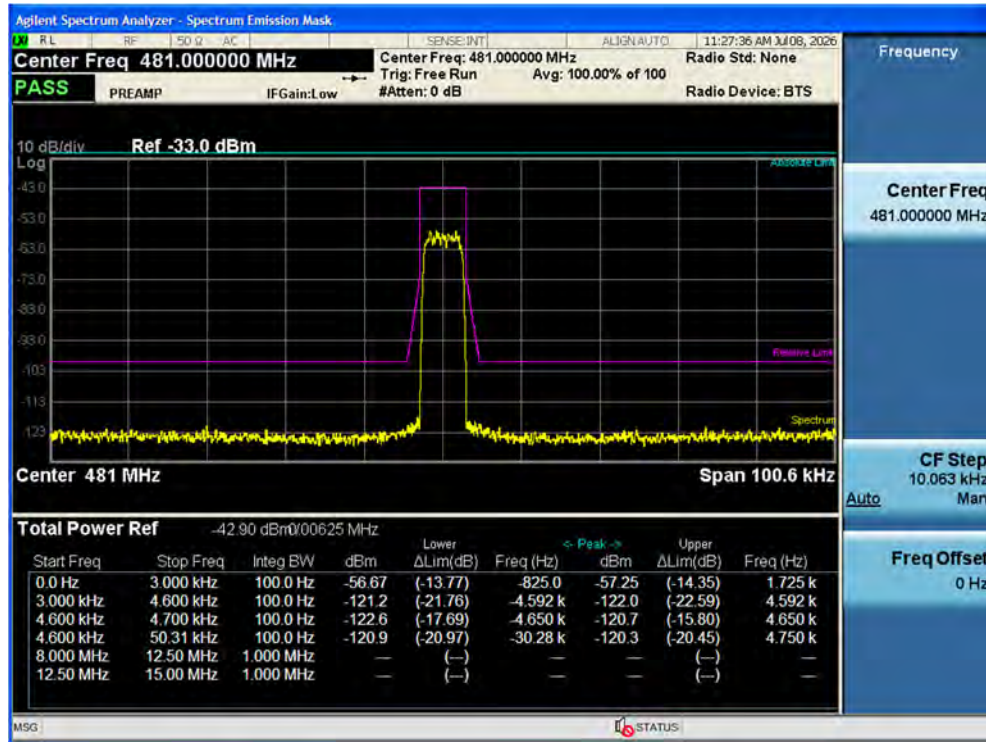
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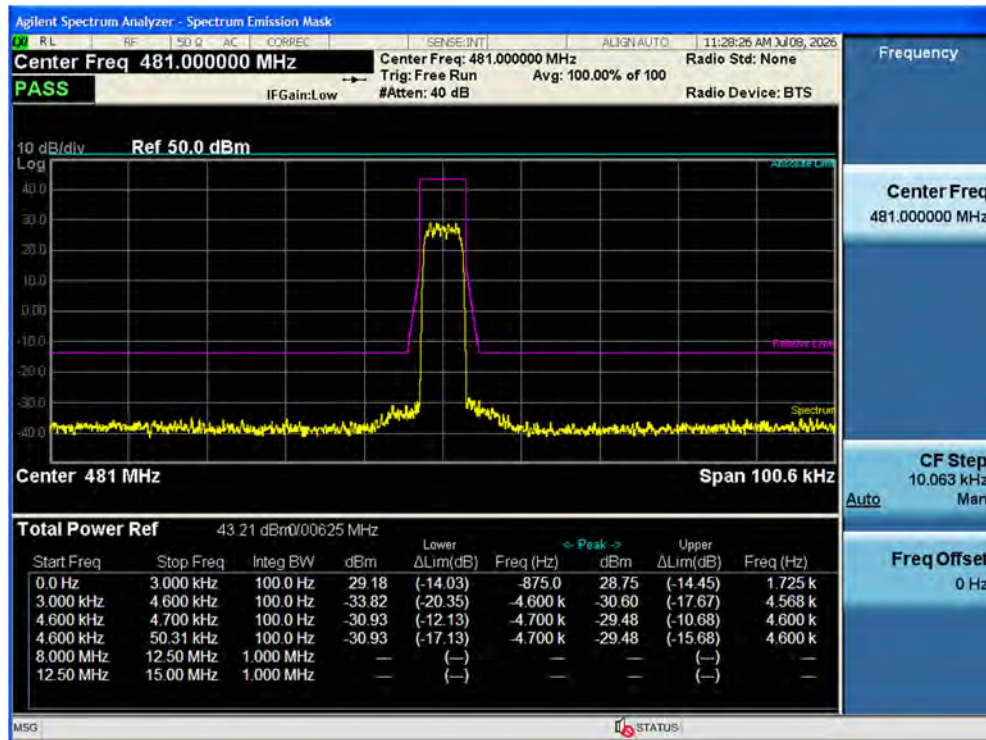
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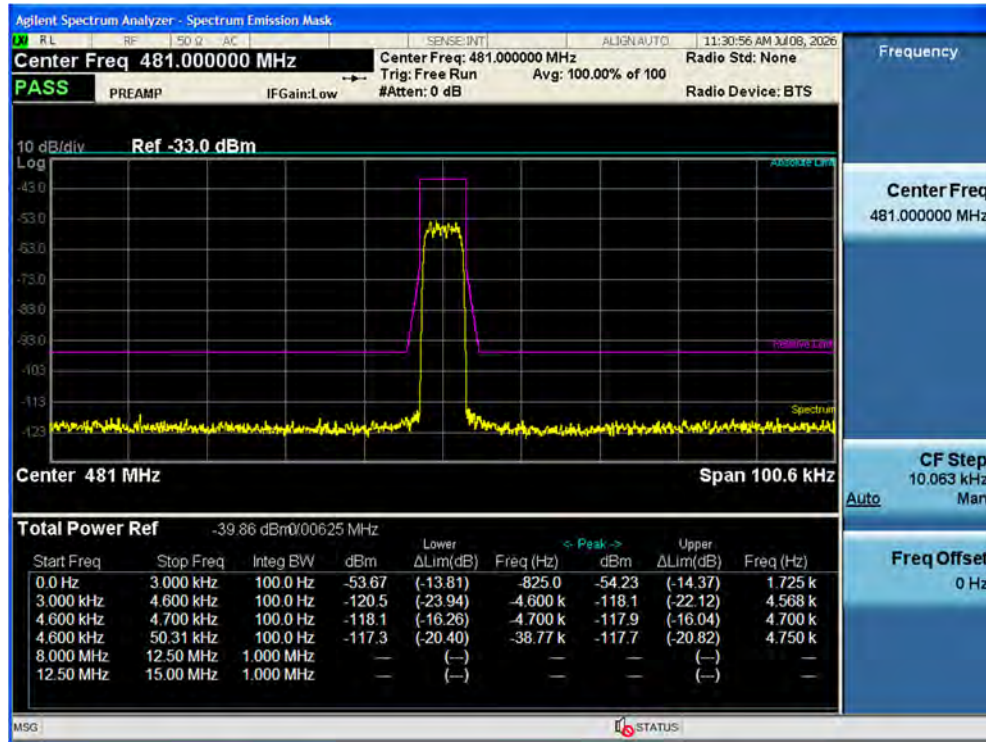
Input / UHF (450 ~ 512) / Downlink / P25 Phase 1 (CQPSK) / Mask E



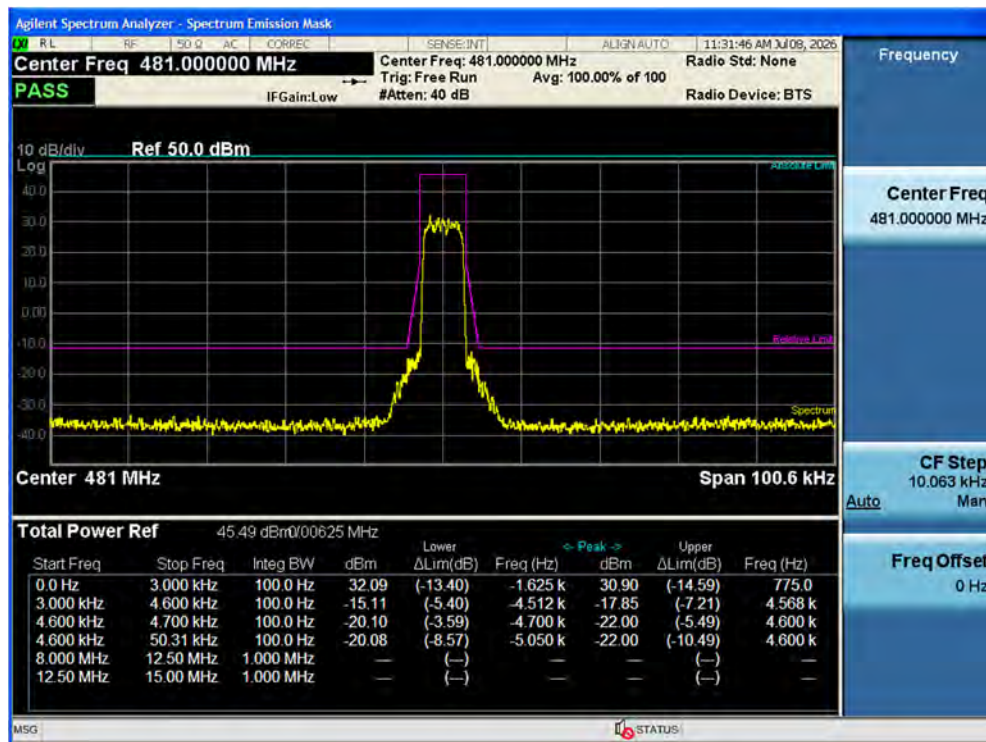
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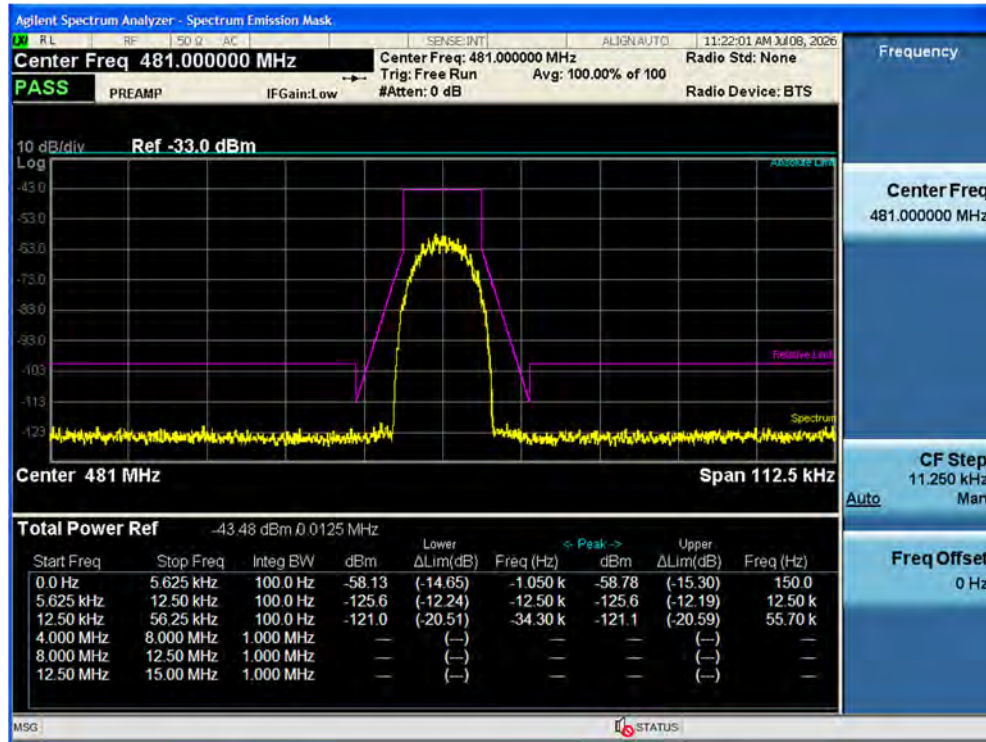
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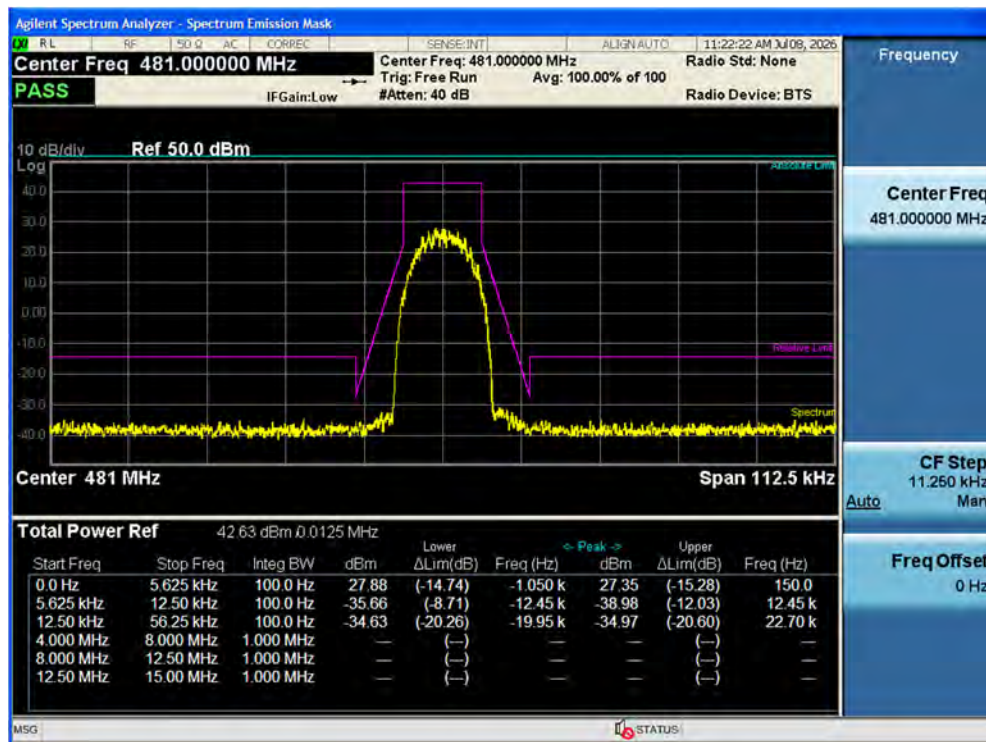
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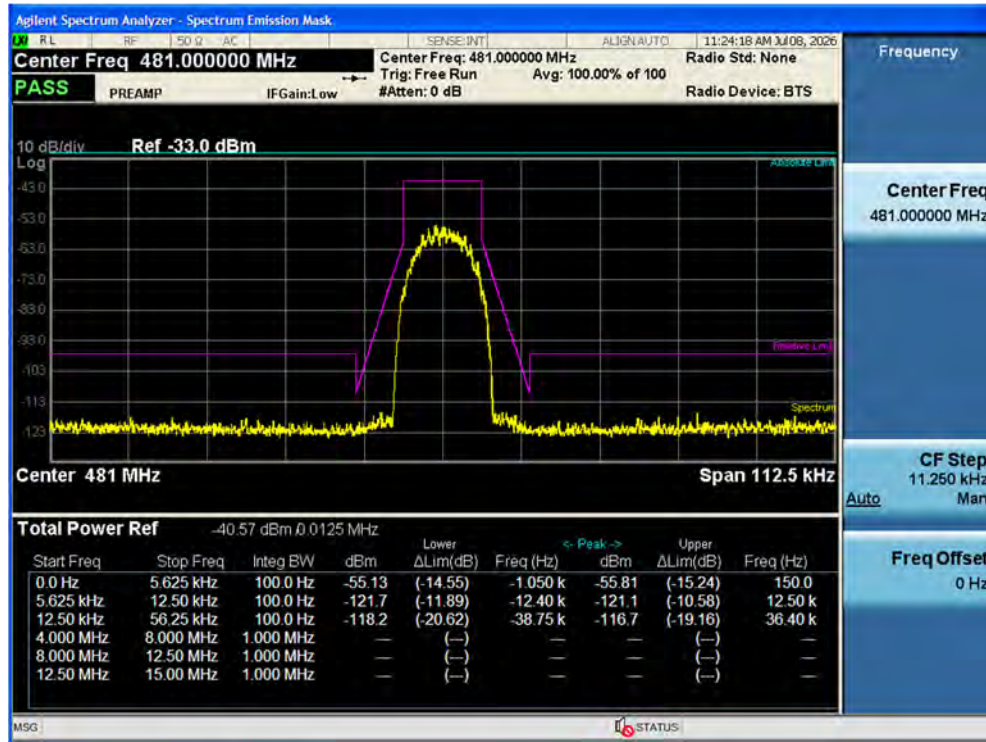
Input / UHF (450 ~ 512) / Downlink / P25 Phase 2 (H-DQPSK) / Mask D



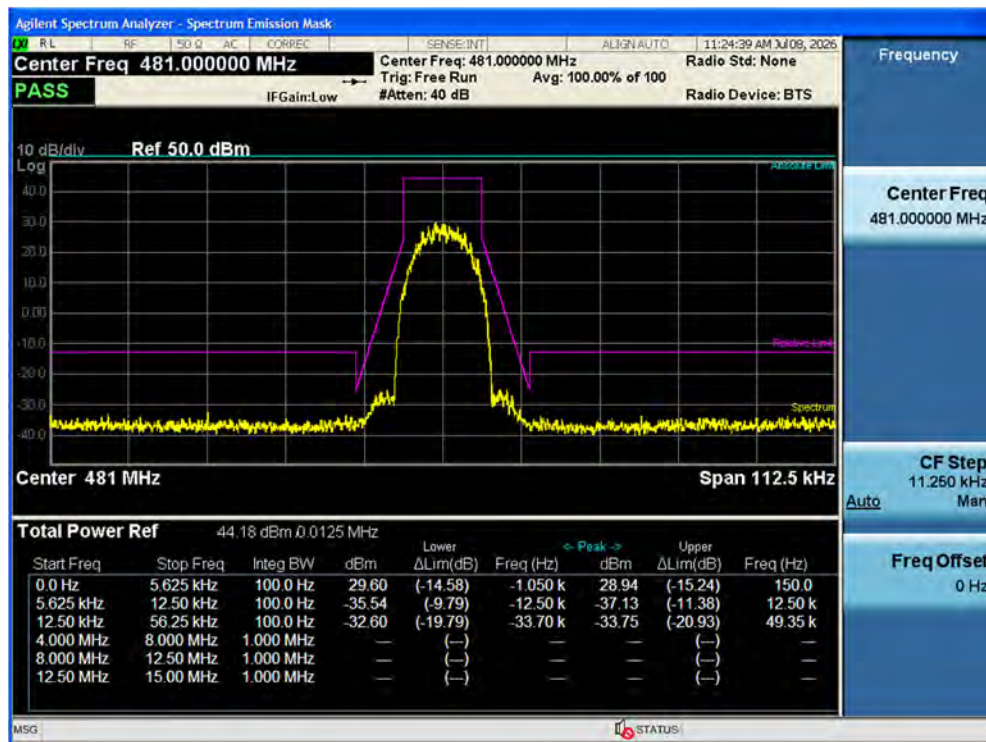
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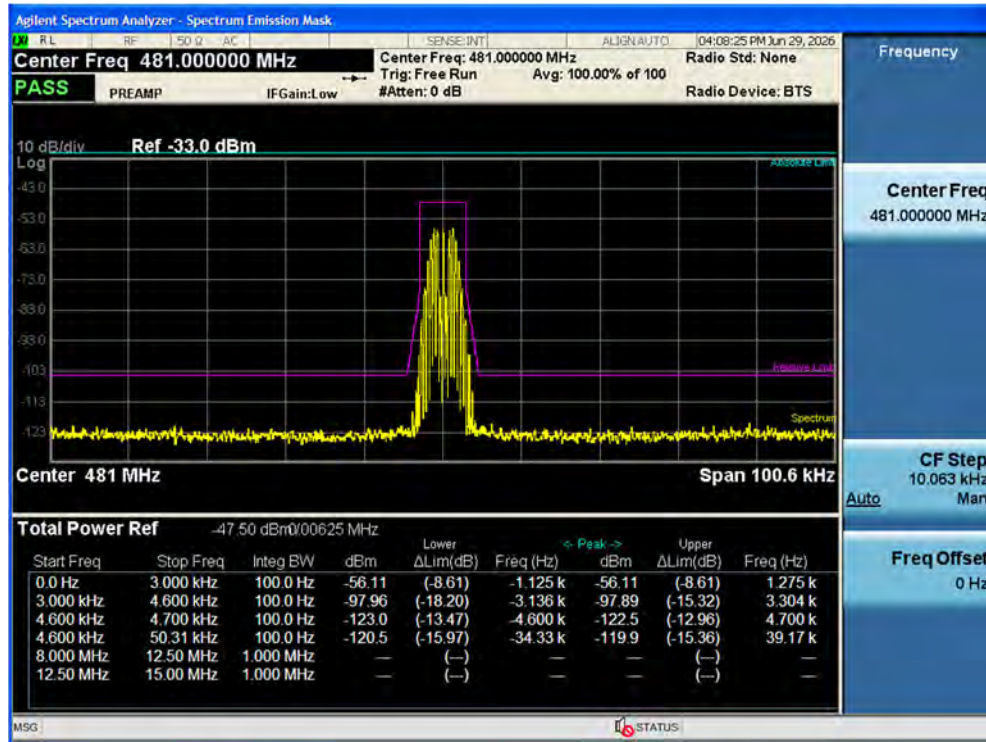
Input @ + 3 dB AGC threshold / UHF (450 ~ 512) / Downlink / P25 Phase 2 (H-DQPSK) / Mask D



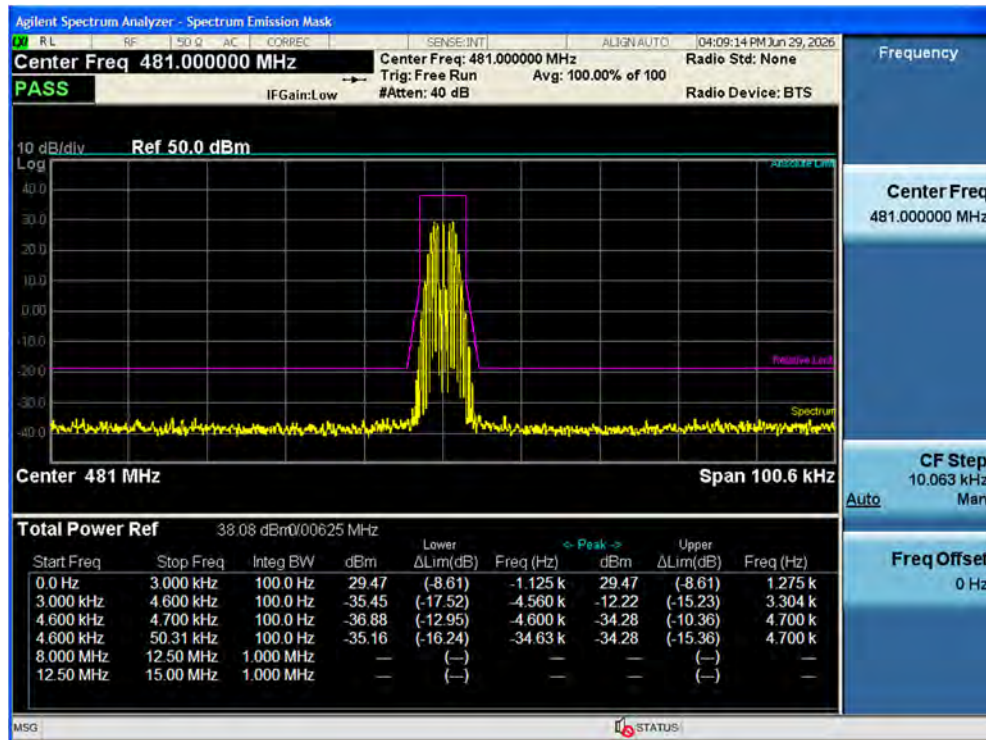
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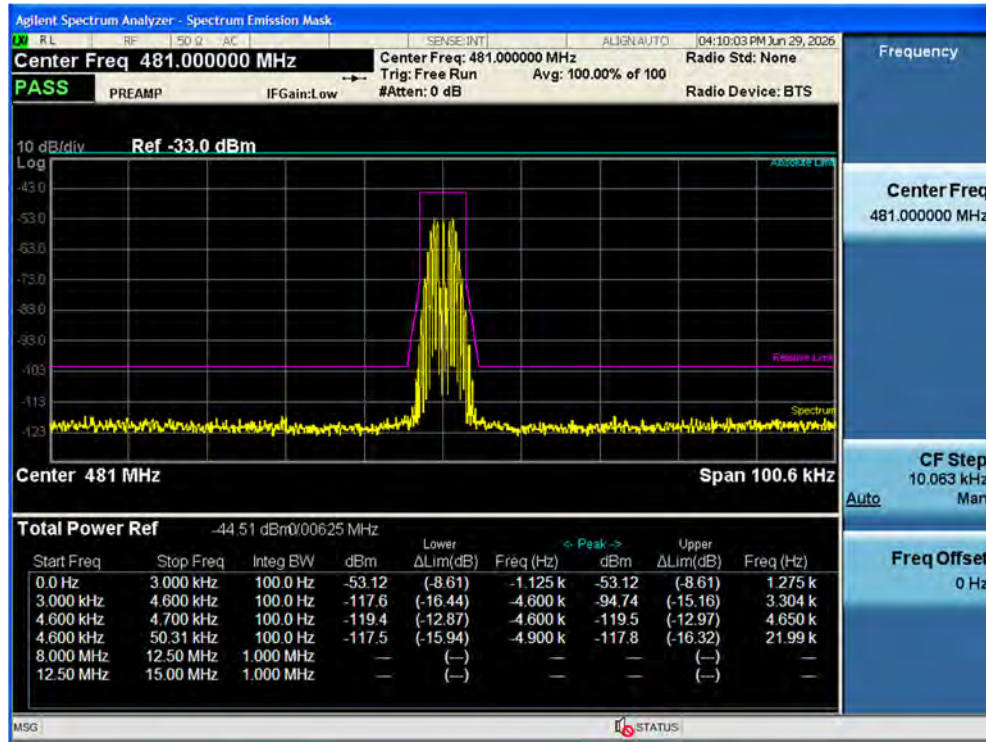
Input / UHF (450 ~ 512) / Downlink / FM (6.25 kHz) / Mask E



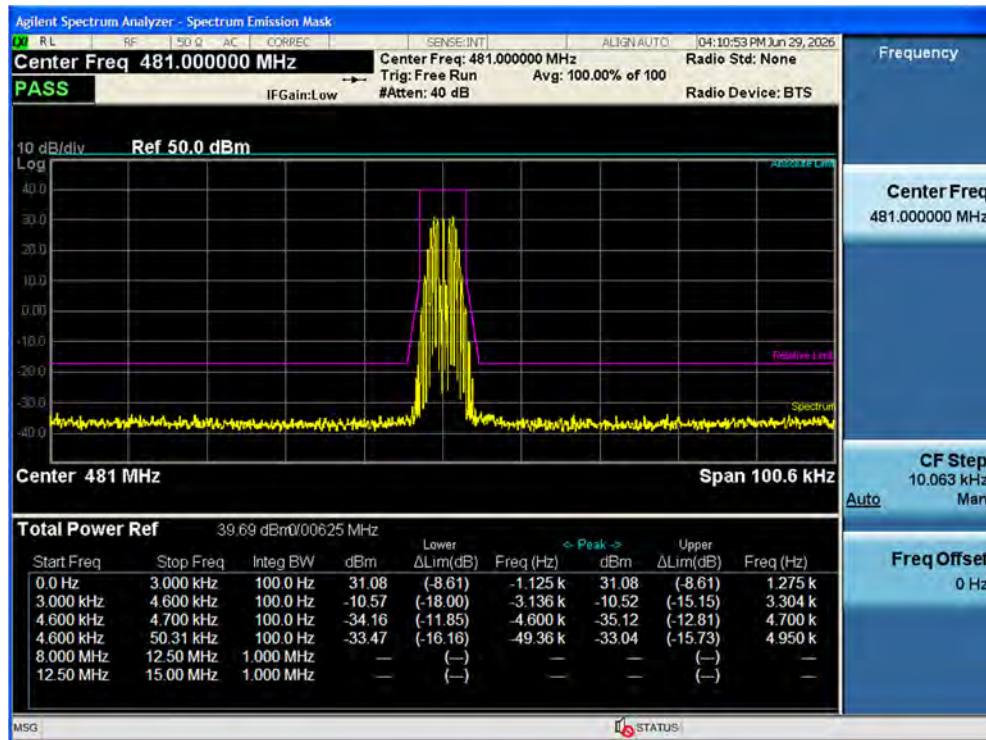
Output / UHF (450 ~ 512) / Downlink / FM (6.25 kHz) / Mask E



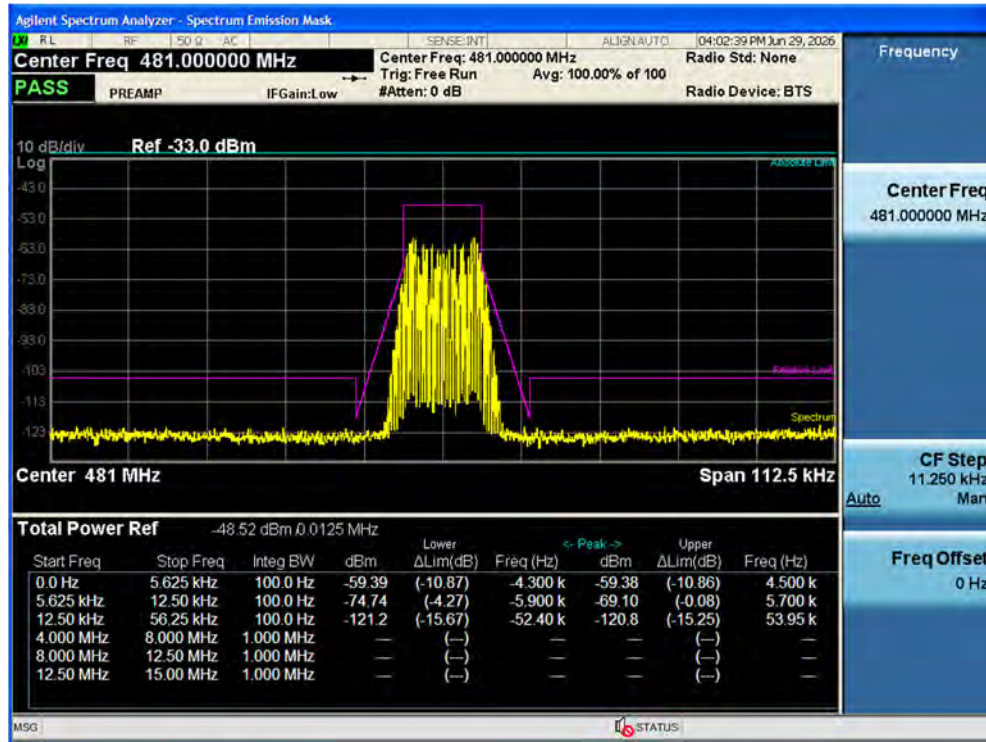
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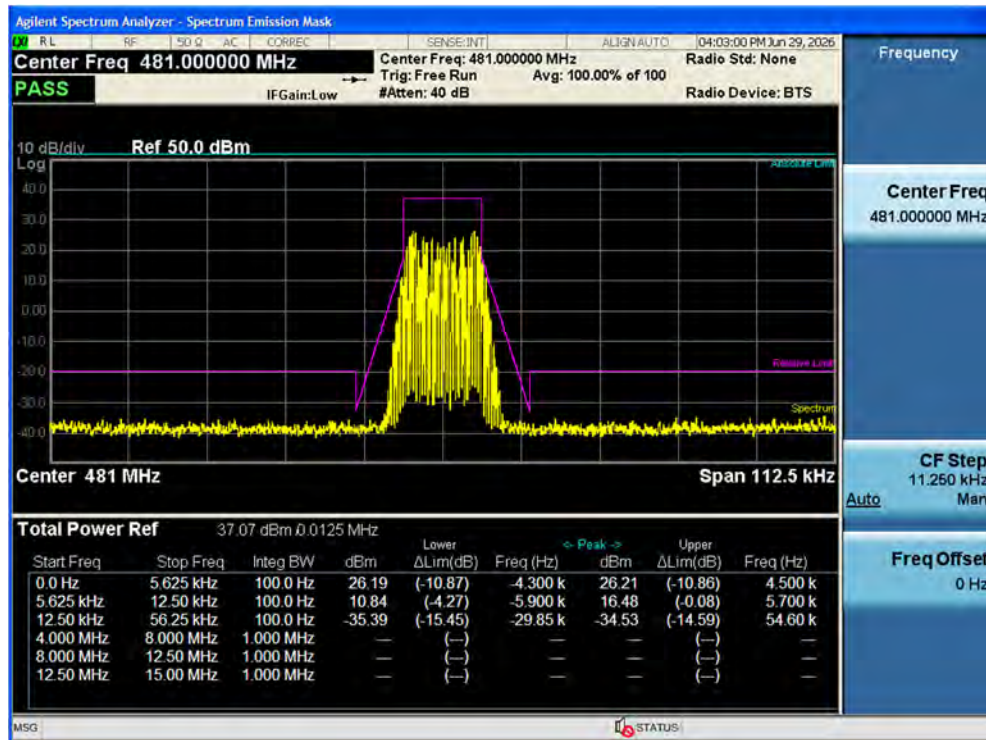
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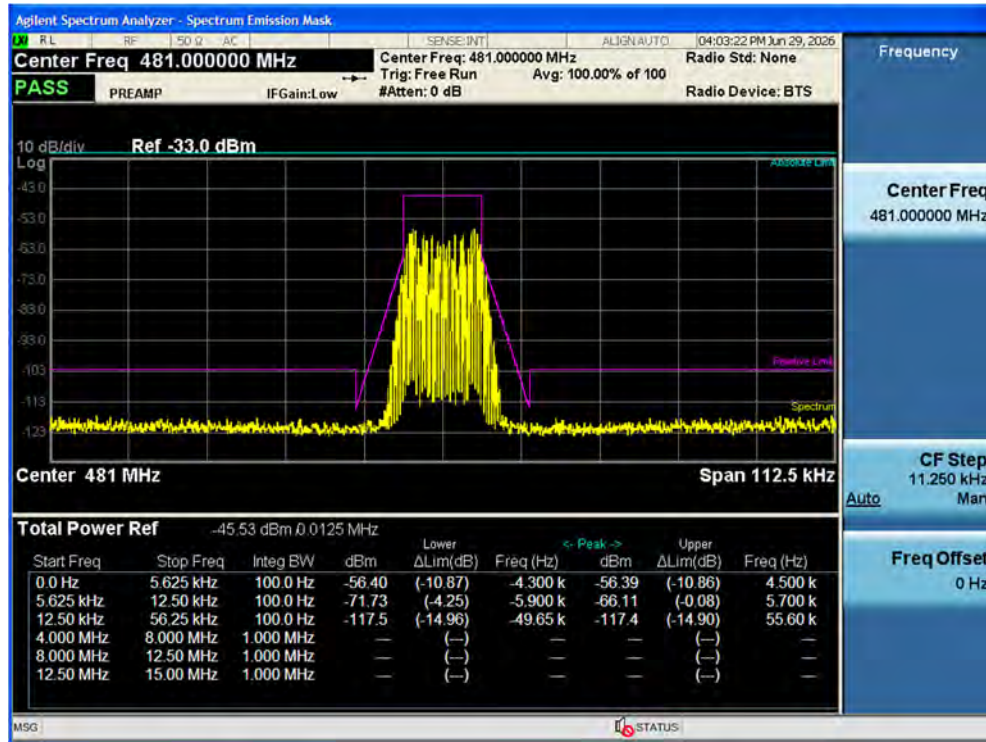
Input / UHF (450 ~ 512) / Downlink / FM (12.5 kHz) / Mask D



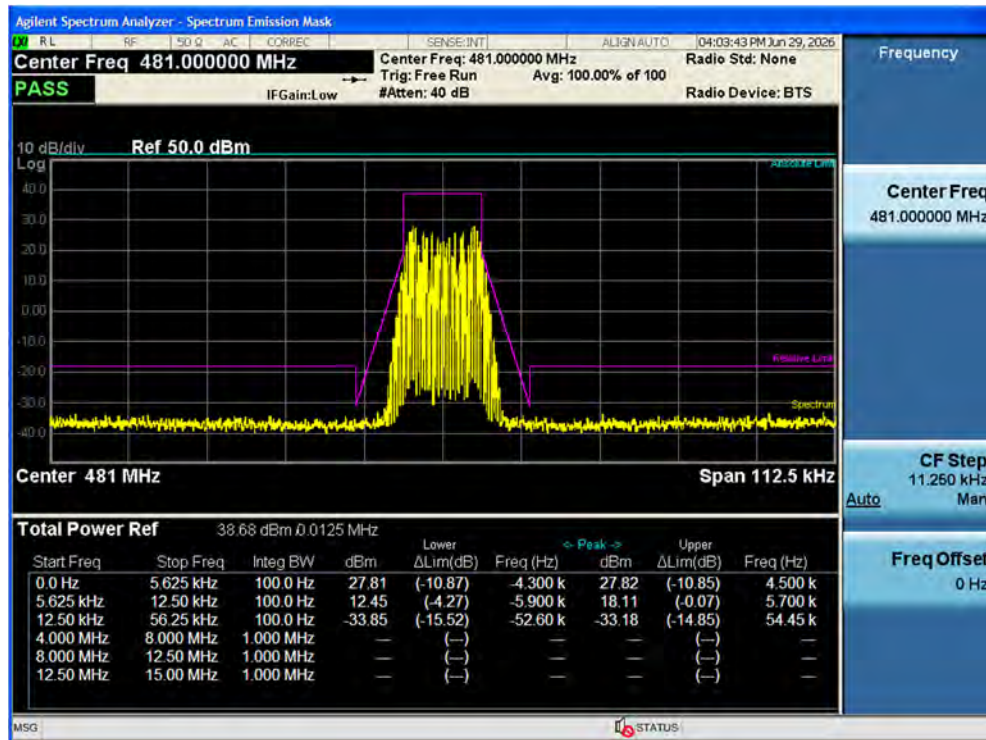
Output / UHF (450 ~ 512) / Downlink / FM (12.5 kHz) / Mask D



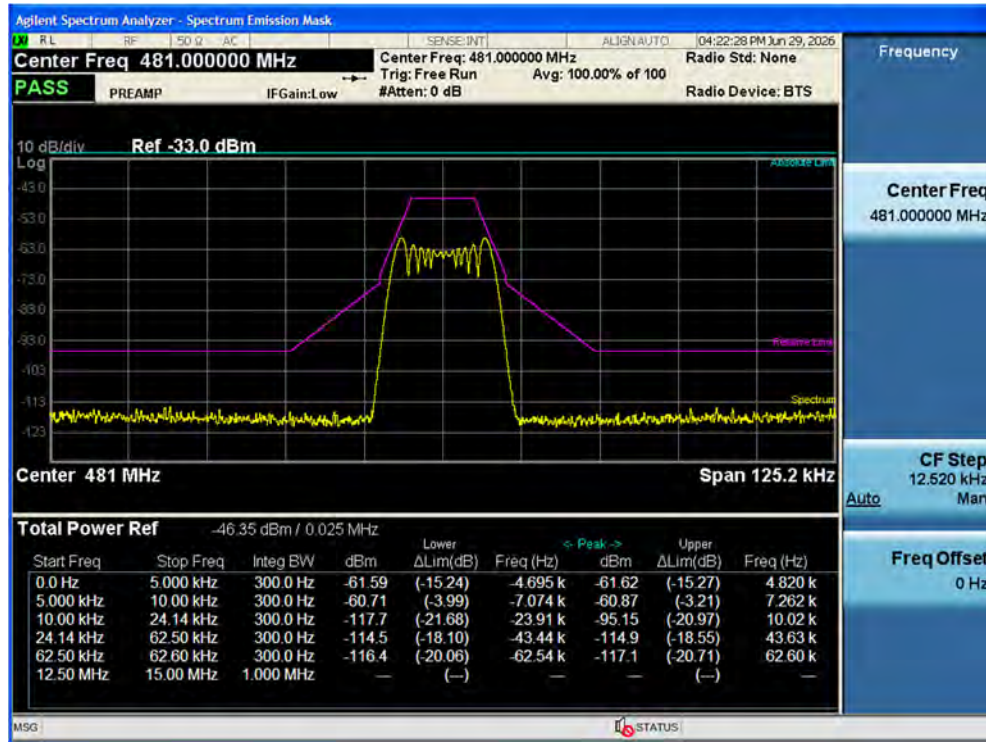
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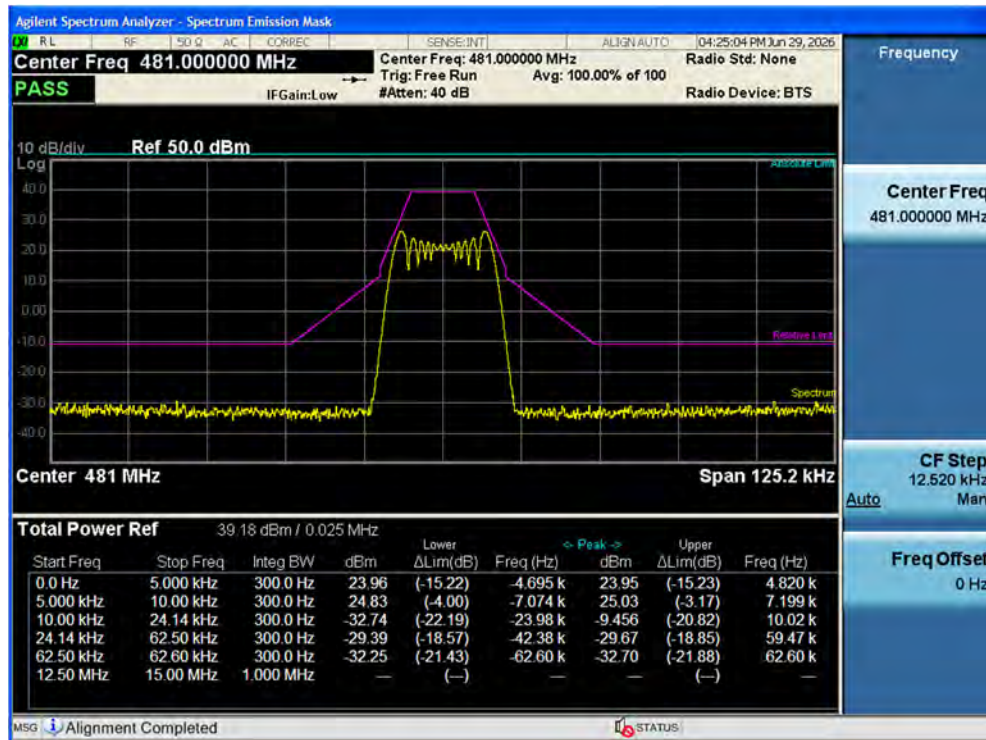
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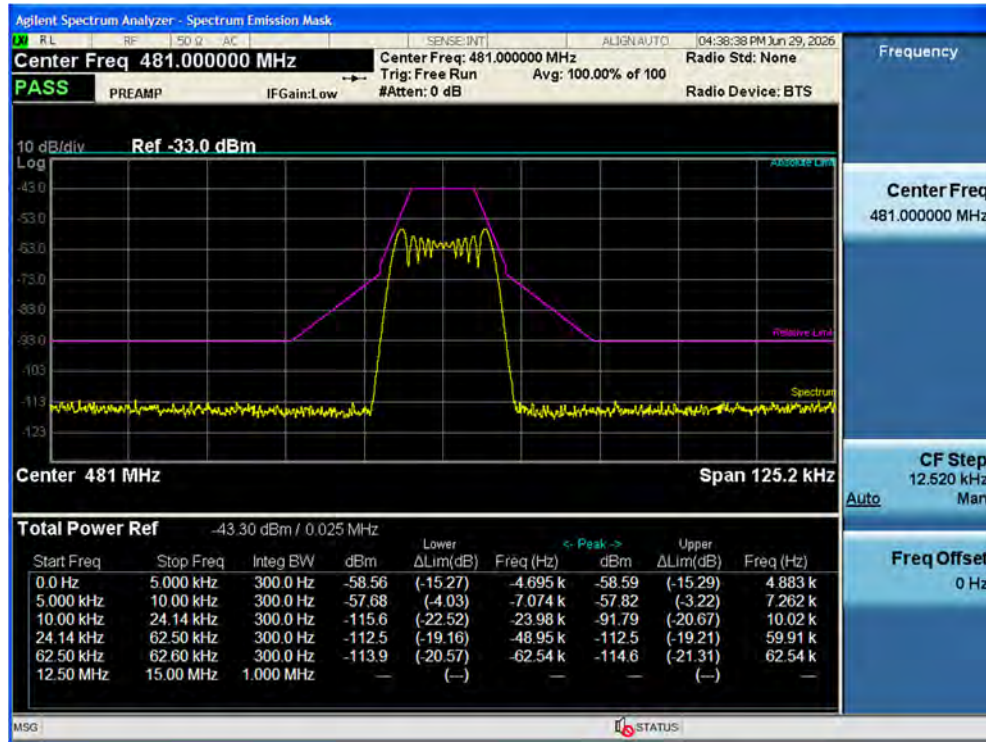
Input / UHF (450 ~ 512) / Downlink / FM (25 kHz) / Mask C



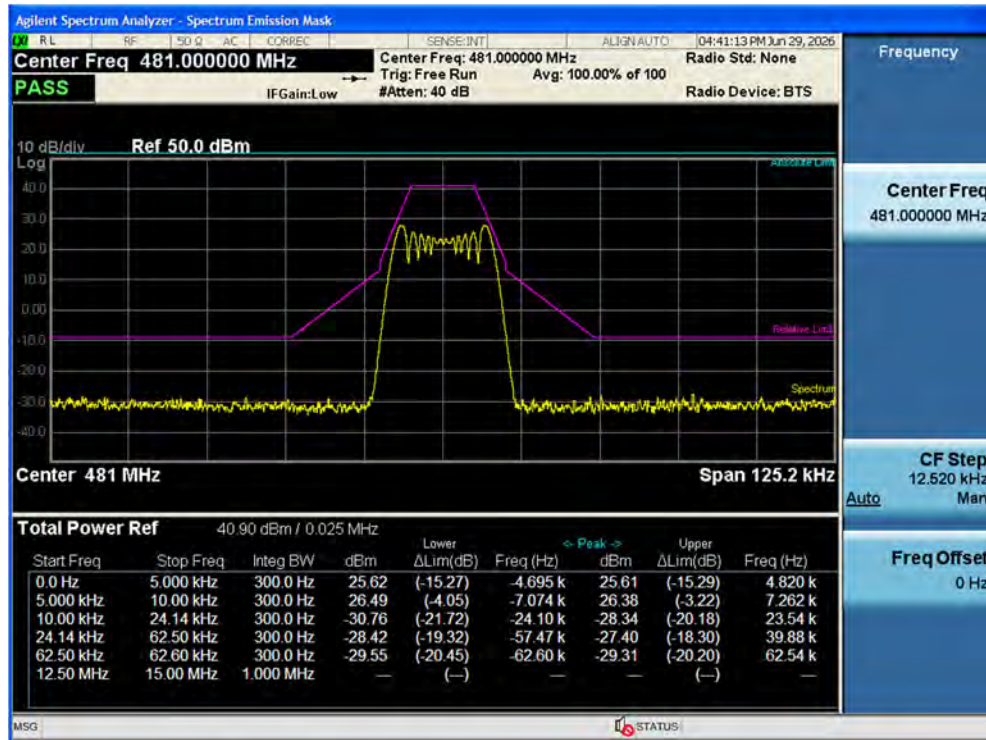
Output / UHF (450 ~ 512) / Downlink / FM (25 kHz) / Mask C



Input @ + 3 dB AGC threshold / UHF (450 ~ 512) / Downlink / FM (25 kHz) / Mask C



Output @ + 3 dB AGC threshold / UHF (450 ~ 512) / Downlink / FM (25 kHz) / Mask C



5.5. INPUT/OUTPUT POWER AND AMPLIFIER/BOOSTER GAIN

Test Requirement:

§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.

§90.219 Use of signal boosters.

- (e) Device Specifications. In addition to the general rules for equipment certification in §90.203(a)(2) and part 2, subpart J of this chapter, a signal booster must also meet the rules in this paragraph.
 - (1) The output power capability of a signal booster must be designed for deployments providing a radiated power not exceeding 5 Watts ERP for each retransmitted channel.

Test Procedures:

Measurements were in accordance with the test methods section 4.5 of KDB 935210 D05 v01r04.

4.5.2 Measuring input and output power levels for determining amplifier/booster gain

Apply the same guidance as in 3.5.2 to measure the maximum input and output power levels necessary for computing the mean EUT gain, but with the following modifications:

- a) Configure the signal generator for CW operation, instead of AWGN,
- b) Select the spectrum analyzer positive peak detector, instead of the power averaging (rms) detector,
- c) Activate the max hold function, instead of the trace averaging function,
- d) Use in conjunction with the guidance in 4.5.3.

4.5.3 Power measurement Method 1: using a spectrum or signal analyzer

- a) Set the span to at least 1 MHz.
- b) Set the RBW 100 kHz.
- c) Set the VBW to $\geq 3 \times$ RBW.
- d) Set the detector to PEAK with the trace to MAX HOLD.
- e) Place a marker on the peak of the signal, and record the value as the maximum power.
- f) Repeat step e) but with the EUT in place.
- g) EUT gain may be calculated as described in 4.5.5.

4.5.5 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:

$$\text{Gain (dB)} = \text{output power (dBm)} - \text{input power (dBm)}.$$

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

Note:

1. If the f_0 determined from the out-of-band rejection test is smaller or greater than the difference between the test signal's center frequency and the operating band block, the test is performed at the lowest or highest frequency at which the test signals can pass.
2. The Uplink/Downlink ERP is calculated as follows.
 - Uplink ERP = Uplink Output Power + Peak Ant. Gain(dBd) + Cable Loss
 $= 26.84 \text{ dBm} + 10.85 \text{ dBd} - 1.89 \text{ dB} = 35.80 \text{ dBm}$
 $= 27.36 \text{ dBm} + 9.85 \text{ dBd} - 1.89 \text{ dB} = 35.32 \text{ dBm}$
 - Downlink ERP = Downlink Output Power + Peak Ant. Gain(dBd) + Cable Loss
 $= 37.45 \text{ dBm} + 0.85 \text{ dBd} - 1.89 \text{ dB} = 36.41 \text{ dBm}$

Test Results:

Tabular data of Input / Output Power and Gain

Test Band	Link	Signal	f ₀ Frequency	Input Power	Output Power	Gain	Total Gain	E.R.P.	
			(MHz)	(dBm)		(dB)	(dBd)	(dBm)	(W)
UHF (406.1 ~ 420)	Uplink	CW	417.95	-57.56	26.84	84.40	8.98	35.82	3.82
	Downlink		408.88	-47.74	37.02	84.76	-1.02	36.00	3.98
UHF (421 ~ 430)	Uplink		426.03	-57.62	26.79	84.41	7.98	34.77	3.00
	Downlink		424.76	-47.58	36.91	84.49	-1.02	35.89	3.88
UHF (450 ~ 512)	Uplink		456.69	-57.80	27.36	85.16	7.98	35.34	3.42
	Downlink		457.22	-47.85	37.29	85.14	-1.02	36.27	4.23

Gain(dB) = Output power(dBm) - Input power(dBm)

Total Gain = Peak Antenna Gain + Cable Loss (See page 5)

E.R.P.(dBm) = Output Power(dBm) + Peak Ant. Gain(dBd)

Tabular data of Input / Output Power and Gain at 3 dB above the AGC threshold

Test Band	Link	Signal	f ₀ Frequency	Input Power	Output Power	Total Gain	E.R.P.	
			(MHz)	(dBm)		(dBd)	(dBm)	(W)
UHF (406.1 ~ 420)	Uplink	CW	417.95	-54.59	26.82	8.98	35.80	3.80
	Downlink		408.88	-44.74	37.01	-1.02	35.99	3.97
UHF (421 ~ 430)	Uplink		426.03	-54.63	26.78	7.98	34.76	2.99
	Downlink		424.76	-44.58	36.92	-1.02	35.90	3.89
UHF (450 ~ 512)	Uplink		456.69	-54.84	27.15	7.98	35.13	3.26
	Downlink		457.22	-44.86	37.45	-1.02	36.43	4.40

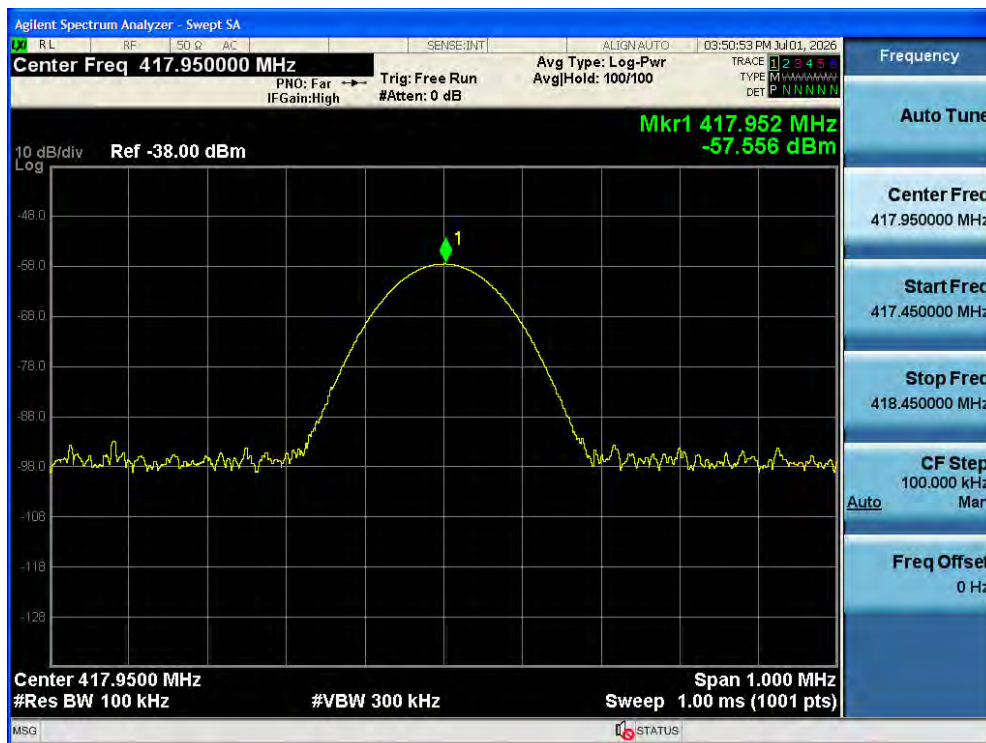
Gain(dB) = Output power(dBm) - Input power(dBm)

Total Gain = Peak Antenna Gain + Cable Loss (See page 5)

E.R.P.(dBm) = Output Power(dBm) + Peak Ant. Gain(dBd)

Plot data of Input / Output Power

Input / UHF (406.1 ~ 420) / Uplink



Output/ UHF (406.1 ~ 420) / Uplink

