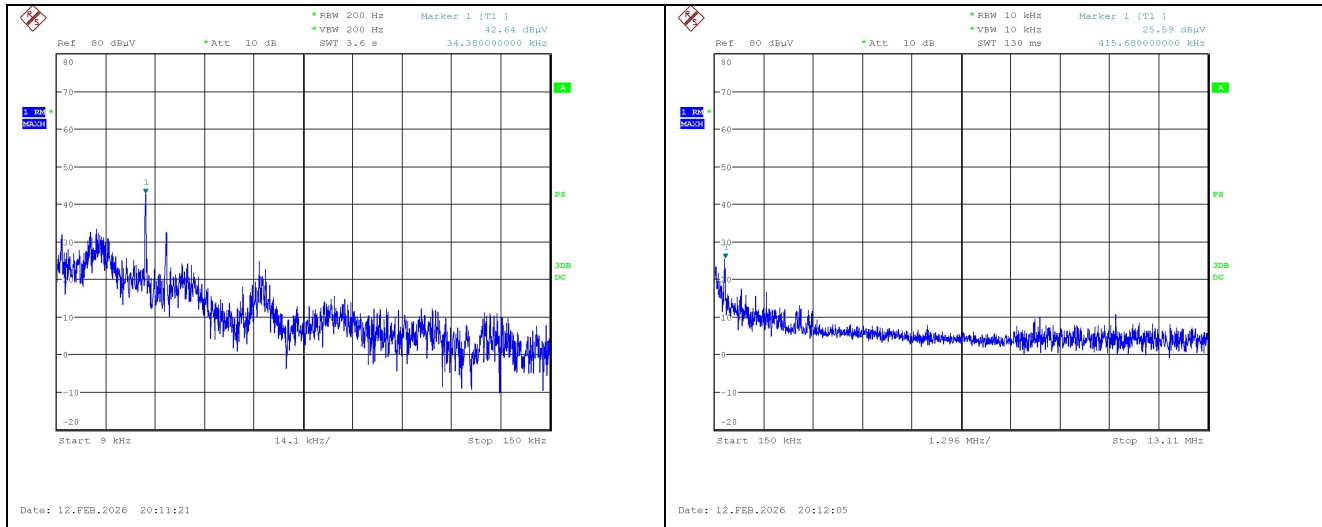
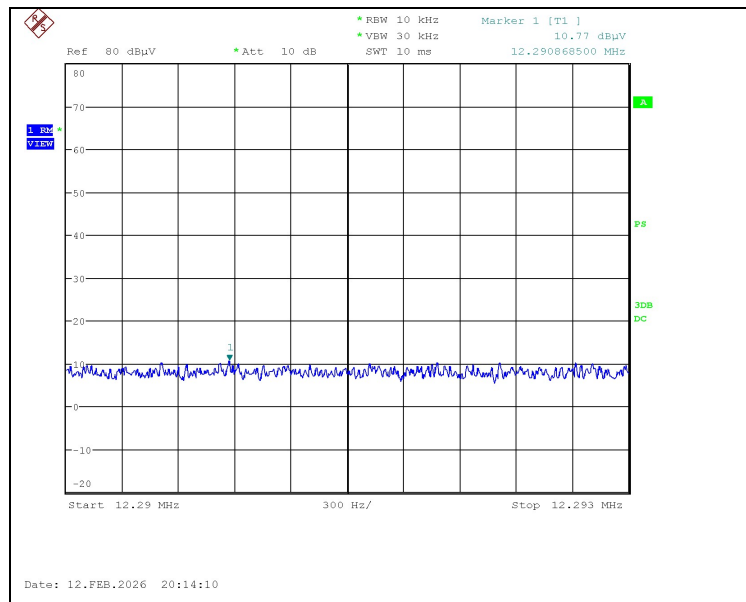


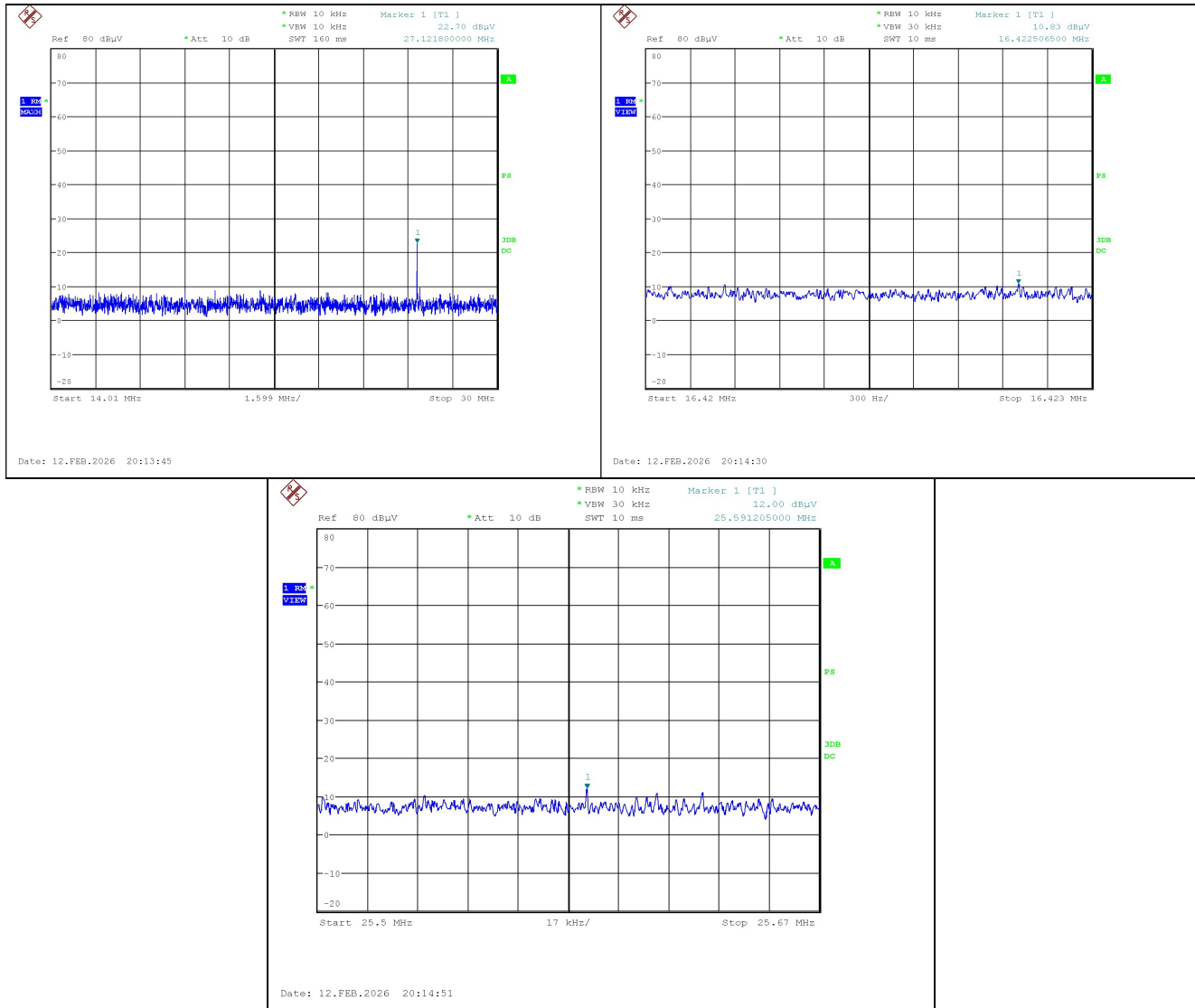
- Spurious emission within the bands 9 MHz – 13.110 MHz



- Spurious emission within the bands 12.290 MHz – 12.293 MHz

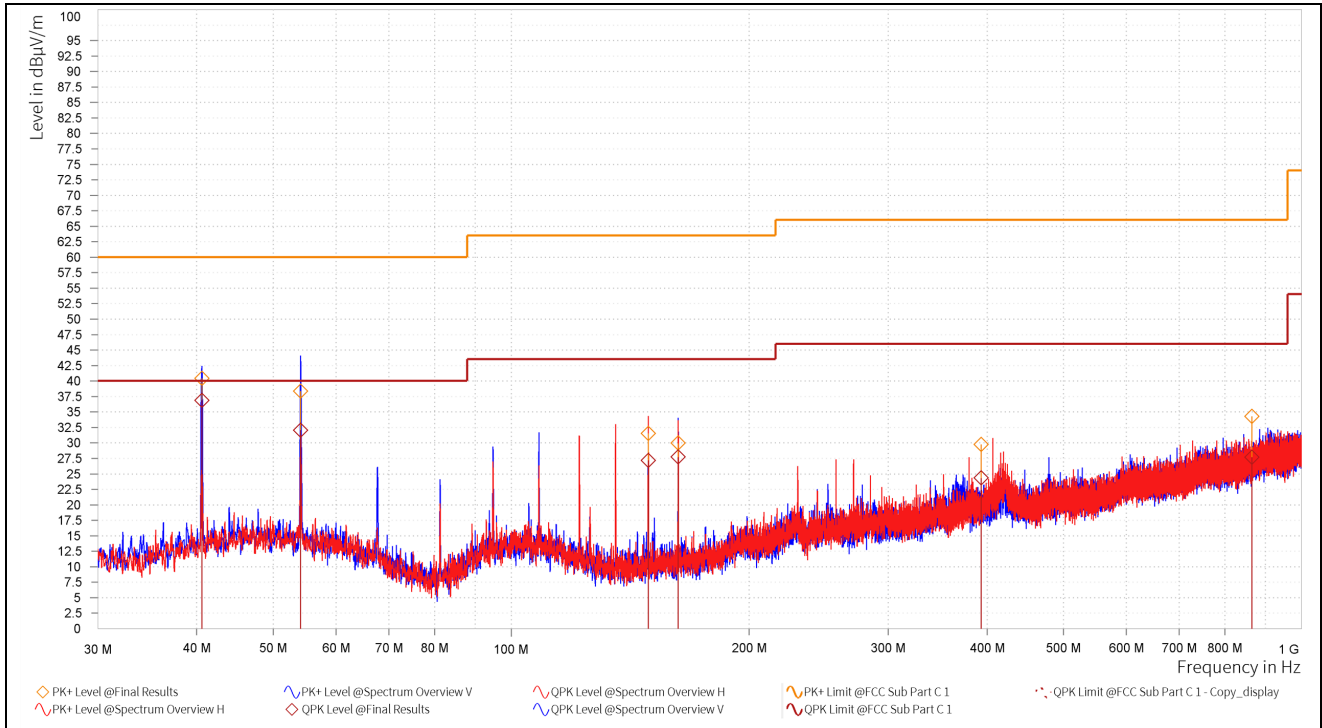


- Spurious emission within the bands 14.010 MHz – 30 MHz

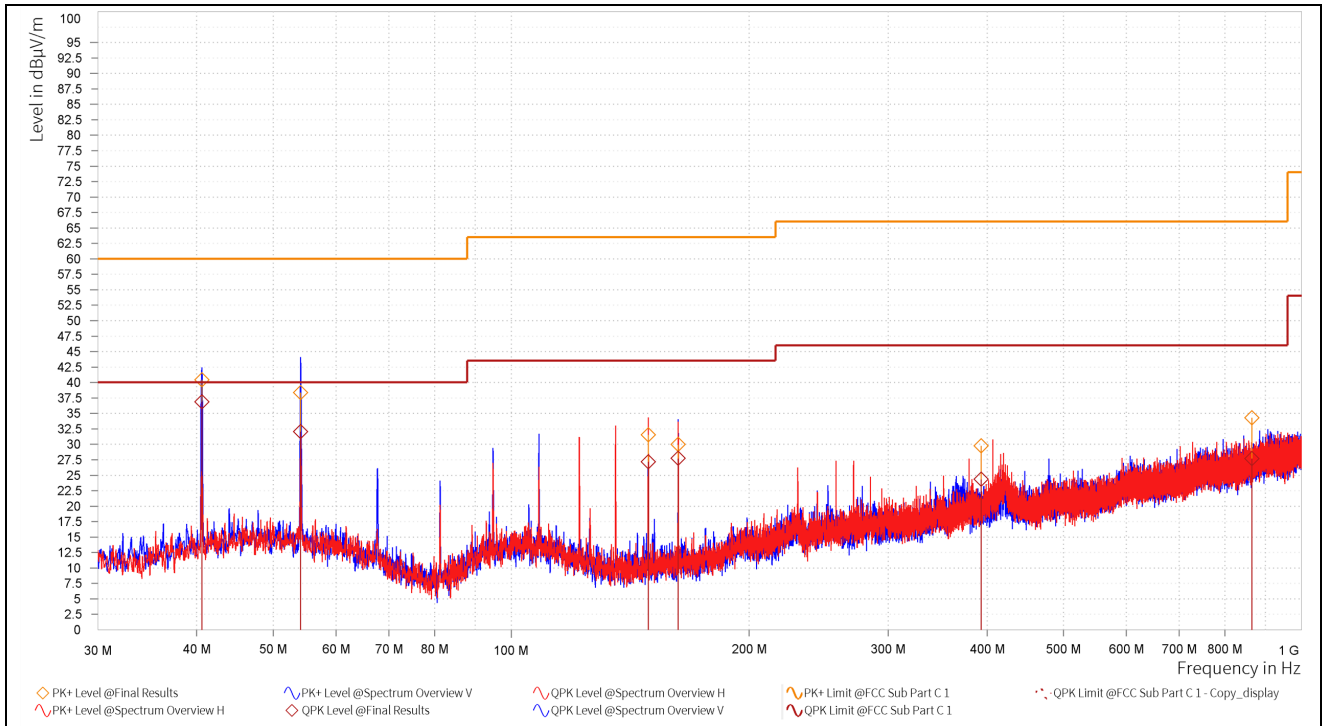


- Spurious emission above 30 MHz

Ant.1

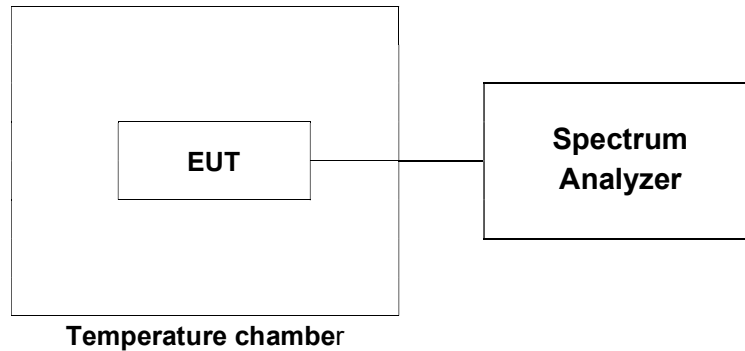


Ant.2



4. Frequency Stability

4.1. Test Setup



4.2. Limit

FCC

According to §15.225(e), the frequency tolerance of the carrier signal shall be maintained within ± 0.01 % of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

IC

According to RSS-210 Issue 11, Annex B, Section B.6
 The carrier frequency stability shall not exceed ± 100 ppm.

4.3. Test Procedures

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the environment into appropriate environment.
4. Set the spectrum analyzer as RBW = 100 Hz, VBW = 100 Hz, Span = 10 kHz, Sweep time = auto.
5. Mark the peak frequency and measure the frequency tolerance using frequency counter function.
6. Repeat until all the results are investigated.

4.4. Test Result

Ambient temperature : (23 ± 1) °C
 Relative humidity : 47 %

Operating Frequency : 13 560 000 Hz
 Deviation Limit : ± 0.01 % = ± 1 356 Hz

Startup

Ant.1

Temperature Variations

Power (V _{d.c})	Temperature (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
12.00	-20	13 560 700	700	0.005 162
	-10	13 560 800	800	0.005 900
	0	13 560 600	600	0.004 425
	+10	13 560 500	500	0.003 687
	+20	13 560 500	500	0.003 687
	+30	13 560 500	500	0.003 687
	+40	13 560 450	450	0.003 319
	+50	13 560 550	550	0.004 056

Voltage Variations

Power (V _{d.c})	Temperature (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
115 % (13.80)	+20	13 560 700	700	0.005 162
85 % (10.20)	+20	13 560 500	500	0.003 687

2 minutes

Temperature Variations

Power (V _{d.c})	Temperature (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
12.00	-20	13 560 600	600	0.004 425
	-10	13 560 700	700	0.005 162
	0	13 560 300	300	0.002 212
	+10	13 560 700	700	0.005 162
	+20	13 560 500	500	0.003 687
	+30	13 560 700	700	0.005 162
	+40	13 560 550	550	0.004 056
	+50	13 560 600	600	0.004 425

Voltage Variations

Power (V _{d.c})	Temperature (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
115 % (13.80)	+20	13 560 600	600	0.004 425
85 % (10.20)	+20	13 560 500	500	0.003 687

5 minutes

Temperature Variations

Power (V _{d.c})	Temperature (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
12.00	-20	13 560 700	700	0.005 162
	-10	13 560 600	600	0.004 425
	0	13 560 600	600	0.004 425
	+10	13 560 500	500	0.003 687
	+20	13 560 500	500	0.003 687
	+30	13 560 600	600	0.004 425
	+40	13 560 500	500	0.003 687
	+50	13 560 400	400	0.002 950

Voltage Variations

Power (V _{d.c})	Temperature (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
115 % (13.80)	+20	13 560 700	700	0.005 162
85 % (10.20)	+20	13 560 400	400	0.002 950

10 minutes

Temperature Variations

Power (V _{d.c})	Temperature (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
12.00	-20	13 560 600	600	0.004 425
	-10	13 560 600	600	0.004 425
	0	13 560 500	500	0.003 687
	+10	13 560 400	400	0.002 950
	+20	13 560 500	500	0.003 687
	+30	13 560 500	500	0.003 687
	+40	13 560 600	600	0.004 425
	+50	13 560 500	500	0.003 687

Voltage Variations

Power (V _{d.c})	Temperature (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
115 % (13.80)	+20	13 560 600	600	0.004 425
85 % (10.20)	+20	13 560 400	400	0.002 950

Ant.2

Temperature Variations

Power (V _{d.c})	Temperature (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
12.00	-20	13 560 600	600	0.004 425
	-10	13 560 400	400	0.002 950
	0	13 560 400	400	0.002 950
	+10	13 560 300	300	0.002 212
	+20	13 560 500	500	0.003 687
	+30	13 560 500	500	0.003 687
	+40	13 560 450	450	0.003 319
	+50	13 560 300	300	0.002 212

Voltage Variations

Power (V _{d.c})	Temperature (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
115 % (13.80)	+20	13 560 500	500	0.003 687
85 % (10.20)	+20	13 560 500	500	0.003 687

2 minutes

Temperature Variations

Power (V _{d.c})	Temperature (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
12.00	-20	13 560 600	600	0.004 425
	-10	13 560 500	500	0.003 687
	0	13 560 400	400	0.002 950
	+10	13 560 300	300	0.002 212
	+20	13 560 500	500	0.003 687
	+30	13 560 500	500	0.003 687
	+40	13 560 400	400	0.002 950
	+50	13 560 300	300	0.002 212

Voltage Variations

Power (V _{d.c})	Temperature (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
115 % (13.80)	+20	13 560 500	500	0.003 687
85 % (10.20)	+20	13 560 300	300	0.002 212

5 minutes

Temperature Variations

Power (V _{d.c})	Temperature (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
12.00	-20	13 560 500	500	0.003 687
	-10	13 560 400	400	0.002 950
	0	13 560 400	400	0.002 950
	+10	13 560 400	400	0.002 950
	+20	13 560 500	500	0.003 687
	+30	13 560 500	500	0.003 687
	+40	13 560 300	300	0.002 212
	+50	13 560 500	500	0.003 687

Voltage Variations

Power (V _{d.c})	Temperature (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
115 % (13.80)	+20	13 560 500	500	0.003 687
85 % (10.20)	+20	13 560 400	400	0.002 950

10 minutes

Temperature Variations

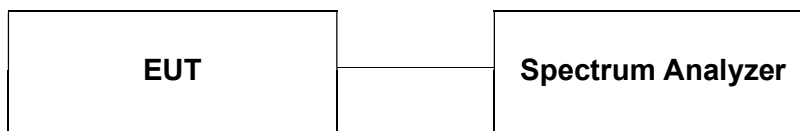
Power (V _{d.c})	Temperature (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
12.00	-20	13 560 600	600	0.004 425
	-10	13 560 400	400	0.002 950
	0	13 560 400	400	0.002 950
	+10	13 560 300	300	0.002 212
	+20	13 560 500	500	0.003 687
	+30	13 560 500	500	0.003 687
	+40	13 560 400	400	0.002 950
	+50	13 560 500	500	0.003 687

Voltage Variations

Power (V _{d.c})	Temperature (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
115 % (13.80)	+20	13 560 400	400	0.002 950
85 % (10.20)	+20	13 560 500	500	0.003 687

5. 20 dB Bandwidth & 99 % Bandwidth

5.1. Test Setup



5.2. Limit

None; for reporting purposes only.

5.3. Test Procedures

20 dB Bandwidth

1. Span = set to capture all products of the modulation process, including the emission skirts. RBW = 200 Hz, VBW > 3 x RBW, Sweep = auto, Detector = peak, Trace = max hold.
2. The marker-to-peak function to set the mark to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is 20 dB bandwidth of the emission.

99 % Bandwidth

1. Set the spectrum analyzer as Span = set to capture all products of the modulation process, including the emission skirts, RBW = 200 Hz, VBW > 3 x RBW, Detector = Peak, Trace mode = max hold.
2. Measure lowest and highest frequencies are placed in a running sum until 0.5 % and 99.5 % of the total is reached.
3. The difference between the two recorded frequencies is the occupied bandwidth.

5.4. Test Result

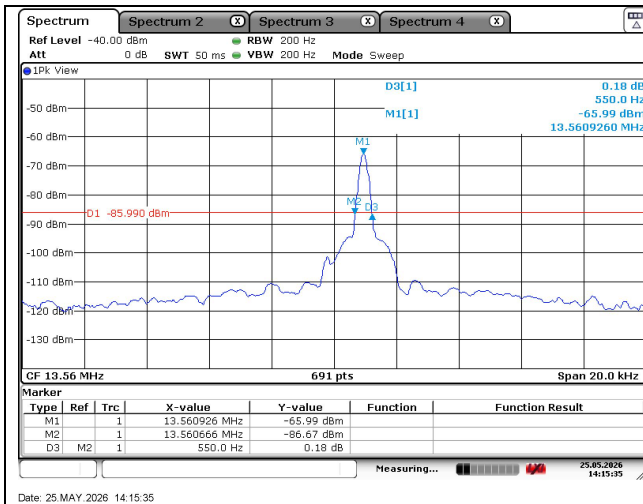
Ambient temperature : (23 ± 1) °C
 Relative humidity : 47 %

Antenna	Frequency (MHz)	20 dB Bandwidth (kHz)	99 % Bandwidth (kHz)
1	13.56	0.550	0.530
2	13.56	0.579	0.574

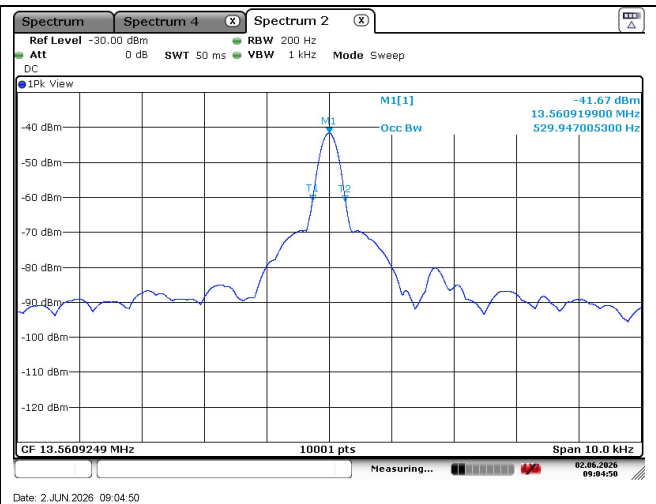
-Test plots

Ant.1

20 dB Bandwidth

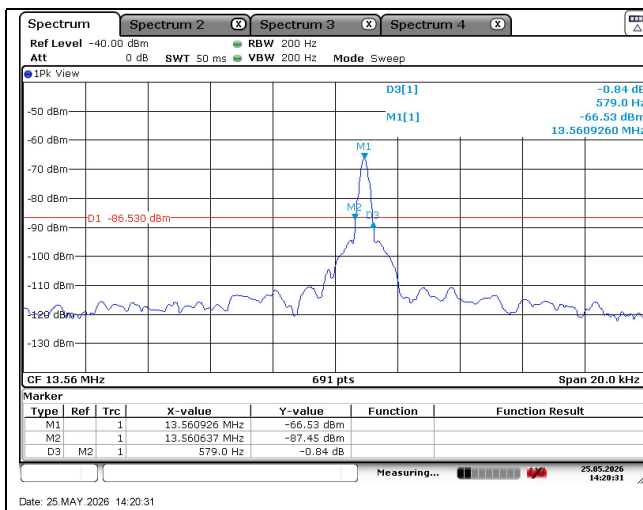


99 % Bandwidth

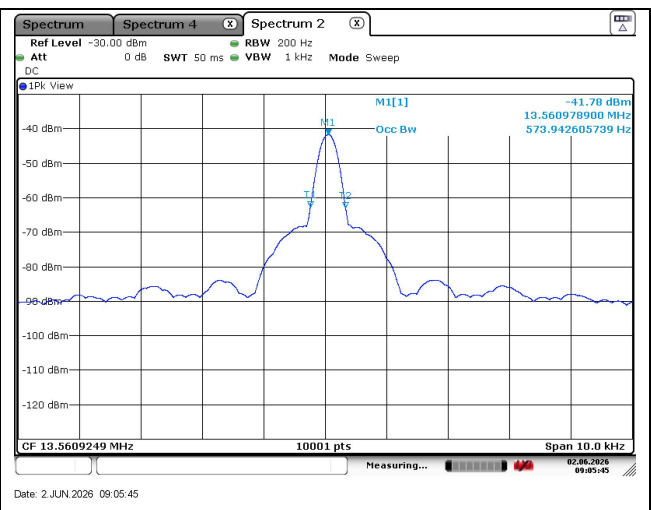


Ant.2

20 dB Bandwidth



99 % Bandwidth



6. Antenna Requirement

6.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

-End of the Test report-