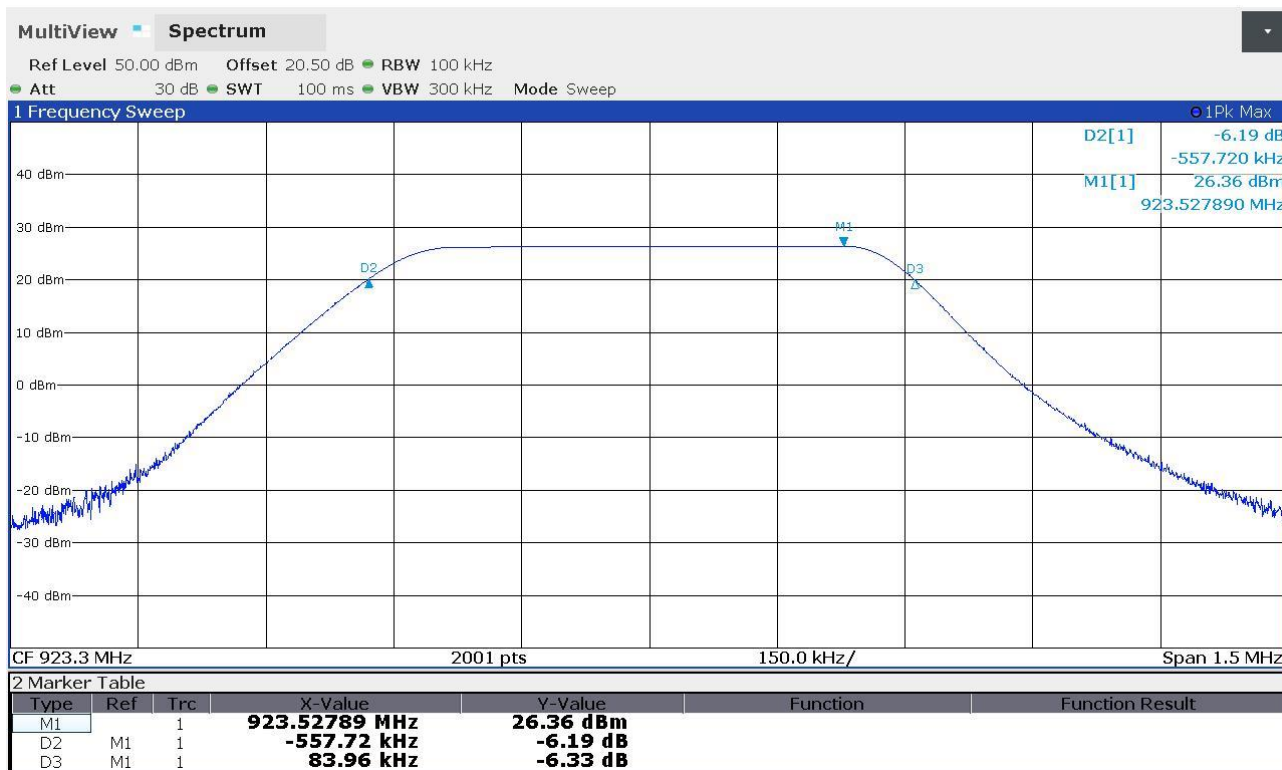
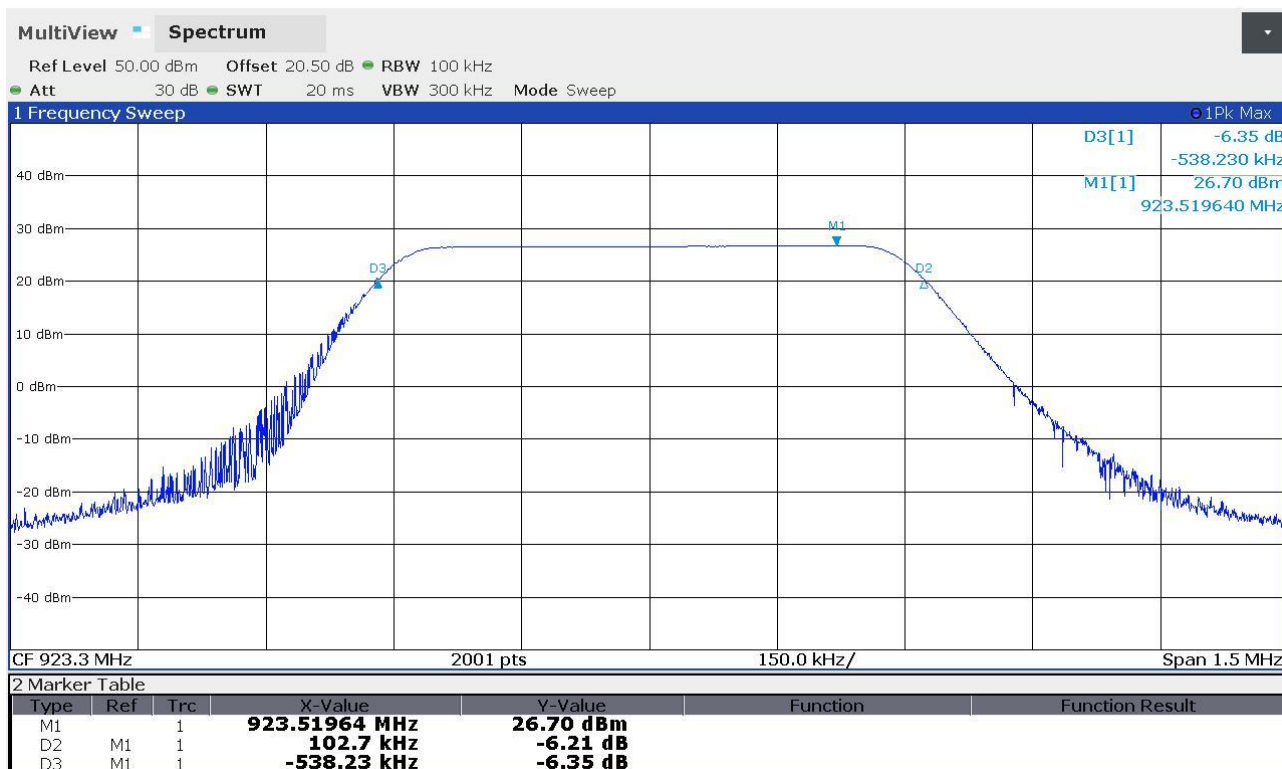


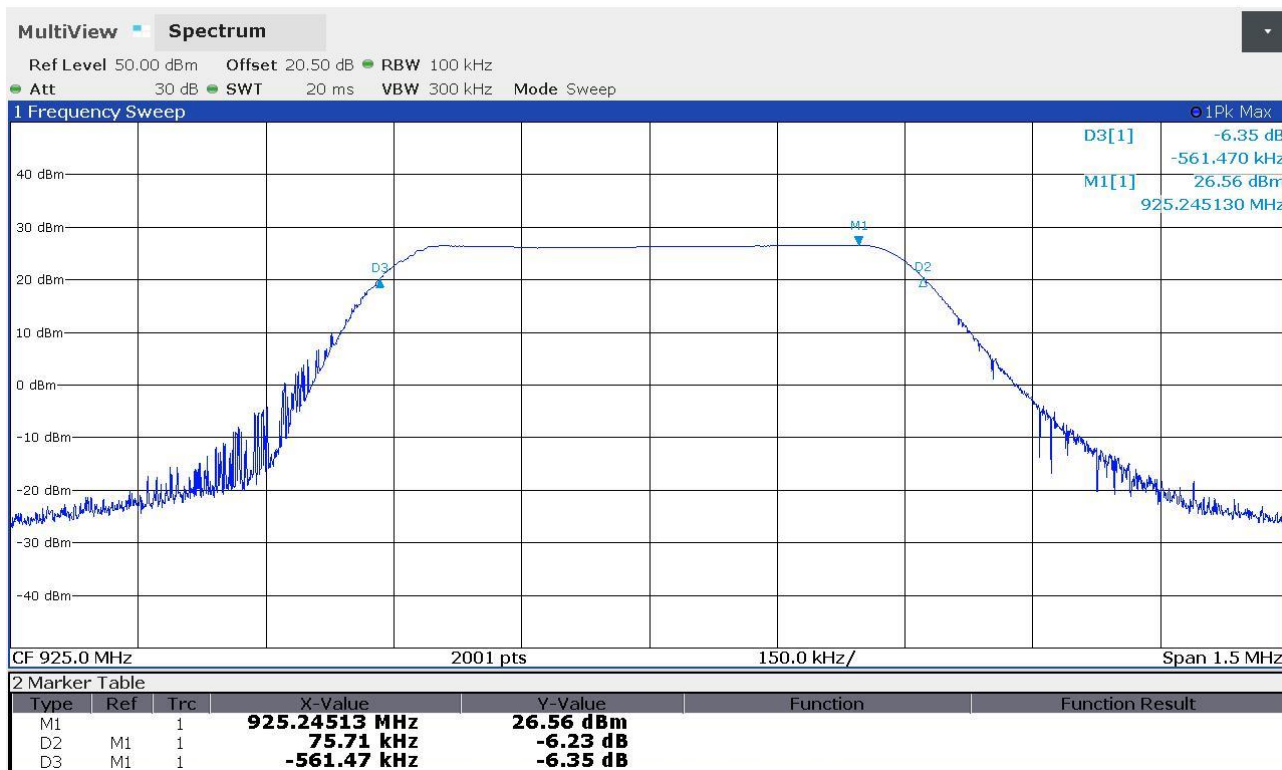
Panozzo 21232465



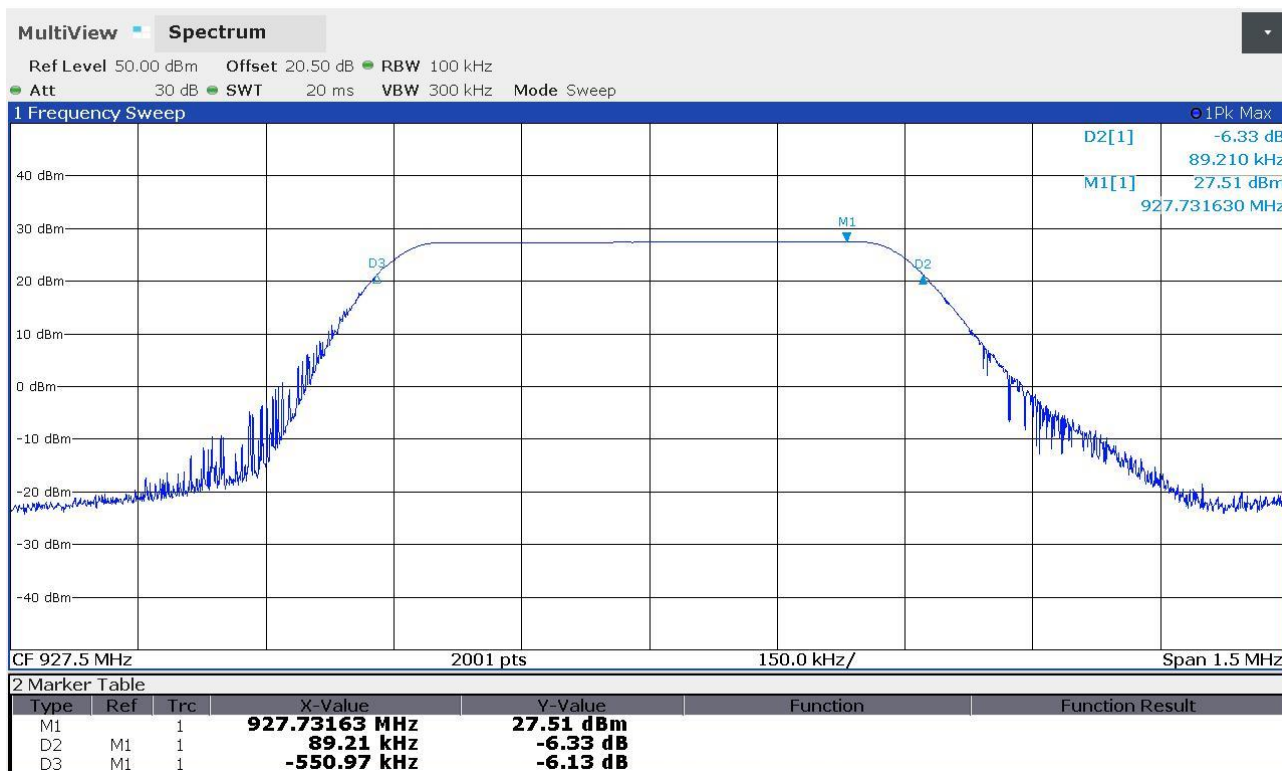
Panozzo 21232480



Panozzo 21232481



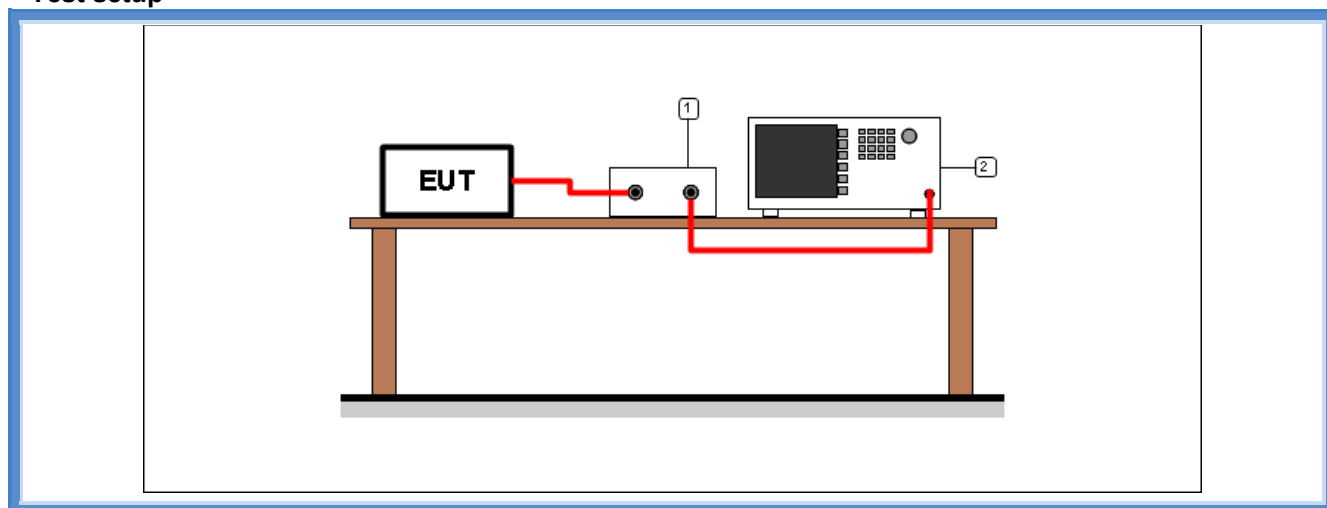
Panozzo 21232482



9.5 20 dB bandwidth

Tested by	C. Panozzo
Test date	27.10.2021
Test location (stand)	Laboratory
Reference standards	FCC Rules and Regulation; Titles 47 Part. 15.215 (c) ANSI C63.10 cl. 7.8.7
Supplementary test set-up description	--
Supplementary information.....	--

Test setup



Test setup PR002_01				
Nr.	Id. Number	Manufacturer	Model	Description
2	CMC S295	Rohde & Schwarz	FSW43	Spectrum Analyzer 43GHz
1	--	--	--	Cable + attenuator (calibrated before the test)

Result – LoRa 125 kHz, spread factor 10

<i>Frequency (MHz)</i>	<i>Graphs</i>	<i>20 dB bandwidth (kHz)</i>
903,90	G212324A24	130,68
904,50	G212324A25	130,69
905,30	G212324A26	129,93

Result – LoRa 125 kHz, spread factor 7

<i>Frequency (MHz)</i>	<i>Graphs</i>	<i>20 dB bandwidth (kHz)</i>
903,90	G21232497	135,18
904,50	G21232498	135,41
905,30	G21232499	135,68

Result – LoRa 500 kHz, spread factor 12

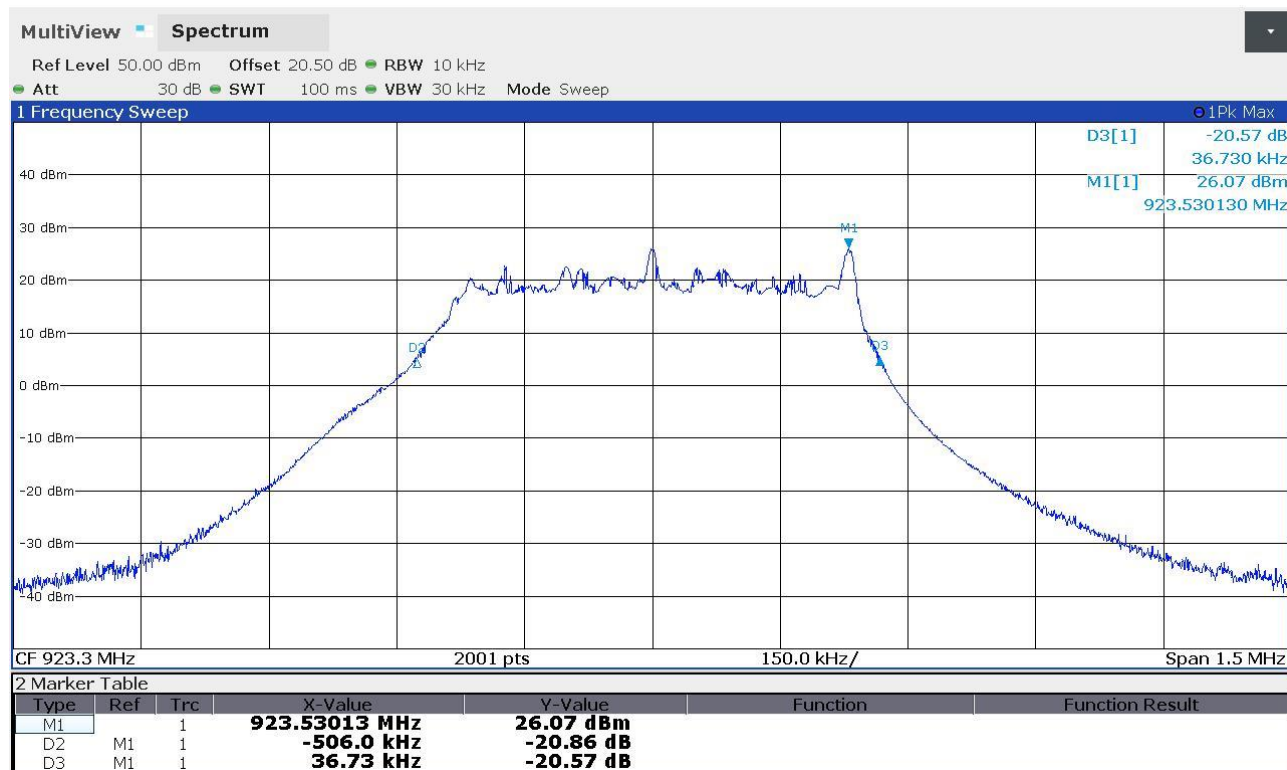
<i>Frequency (MHz)</i>	<i>Graphs</i>	<i>20 dB bandwidth (kHz)</i>
923,30	G21232486	544,23
925,00	G21232487	547,22
927,50	G21232488	548,73

Result – LoRa 500 kHz, spread factor 7

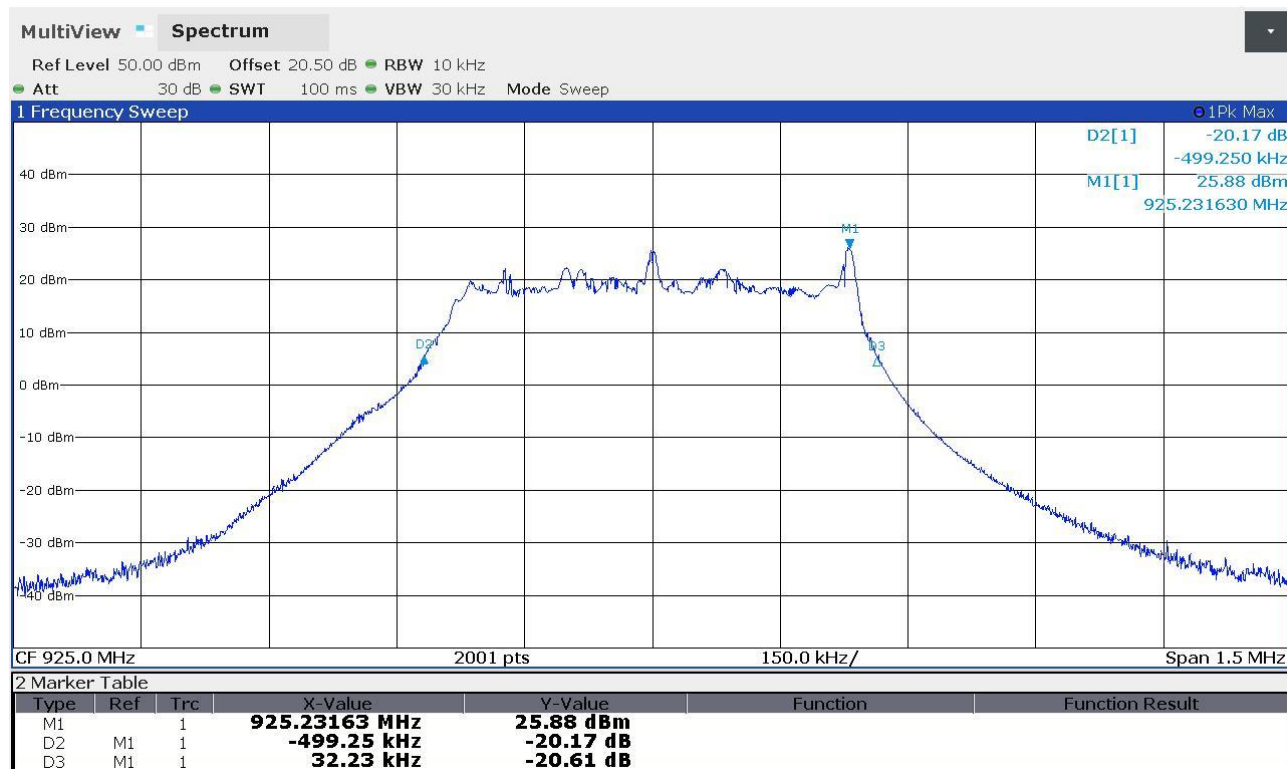
<i>Frequency (MHz)</i>	<i>Graphs</i>	<i>20 dB bandwidth (kHz)</i>
923,30	G21232466	542,73
925,00	G21232467	531,48
927,50	G21232468	583,21

Graphs

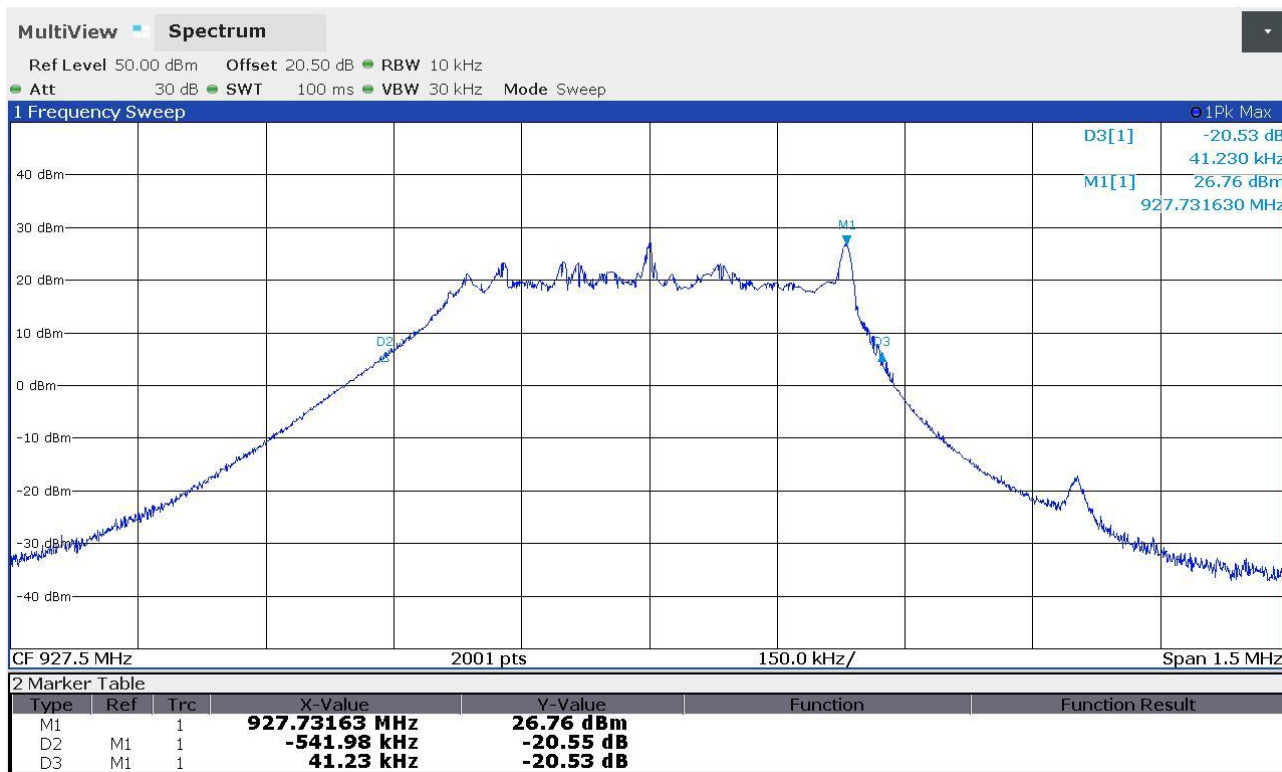
Panozzo 21232466



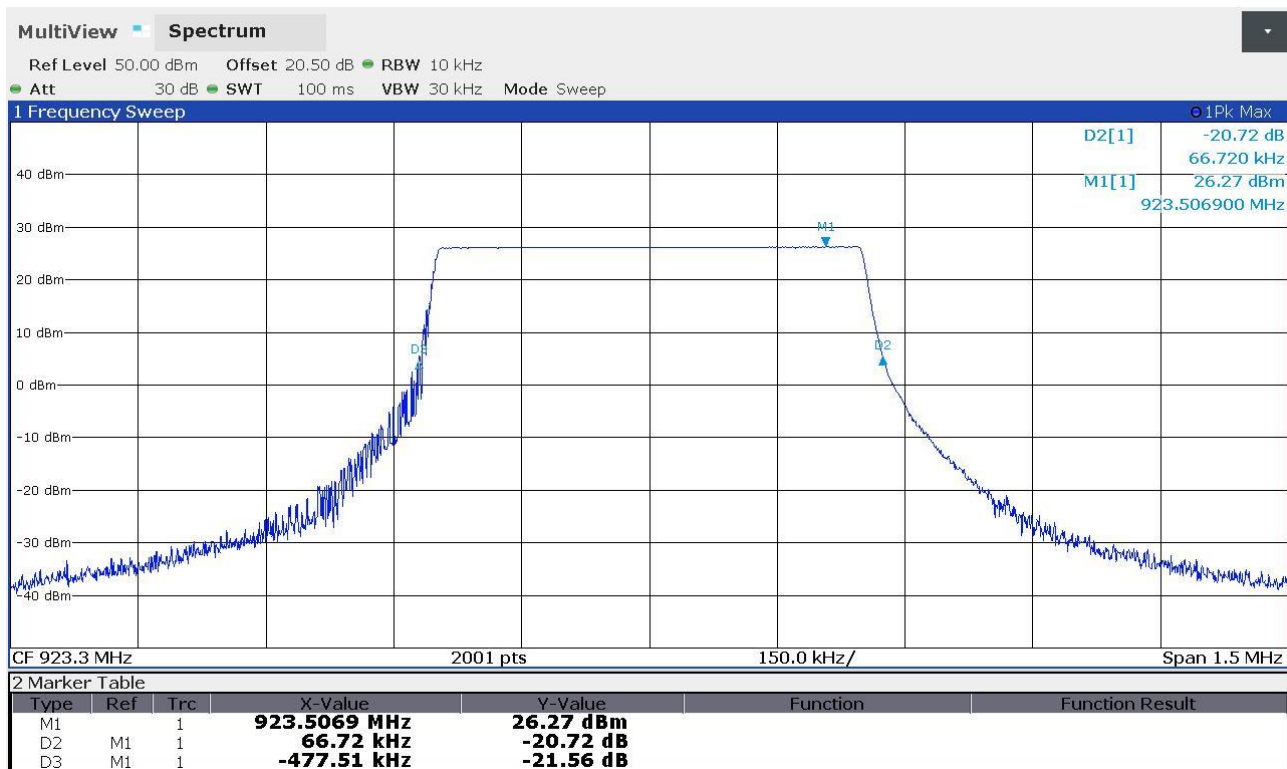
Panozzo 21232467



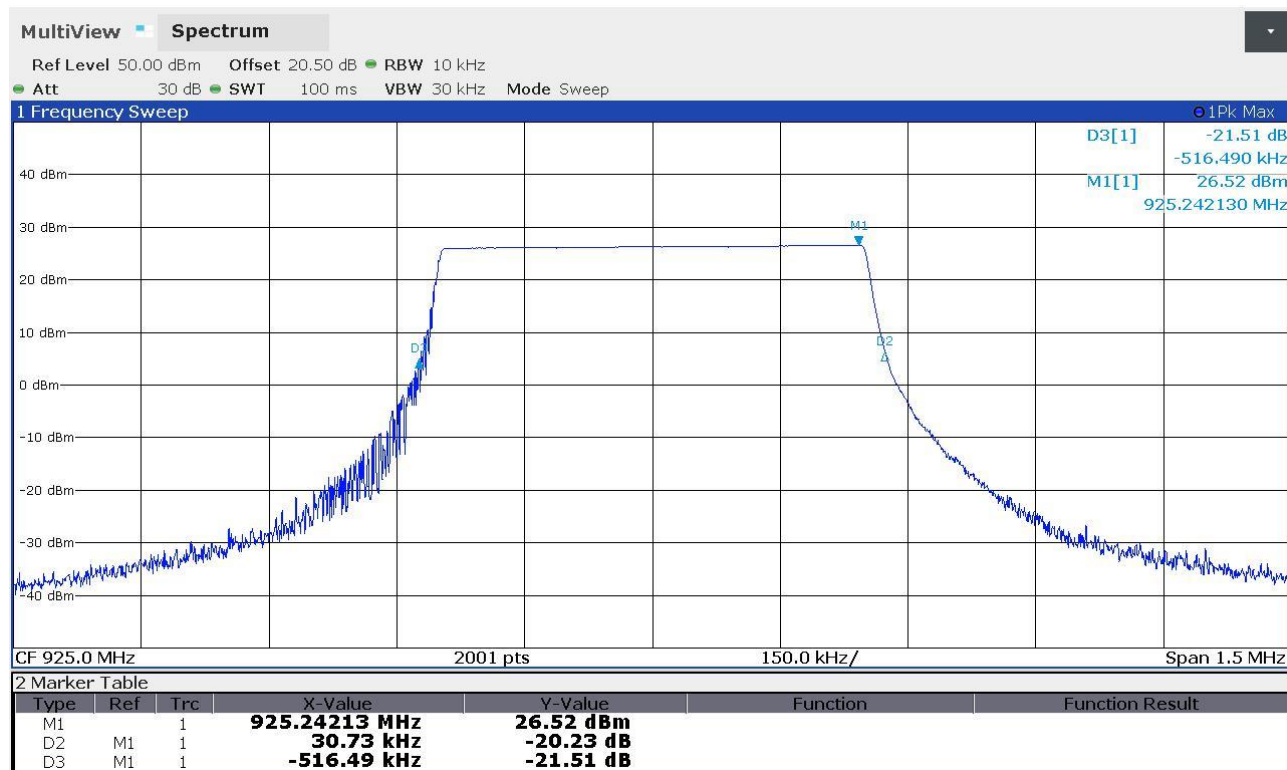
Panozzo 21232468



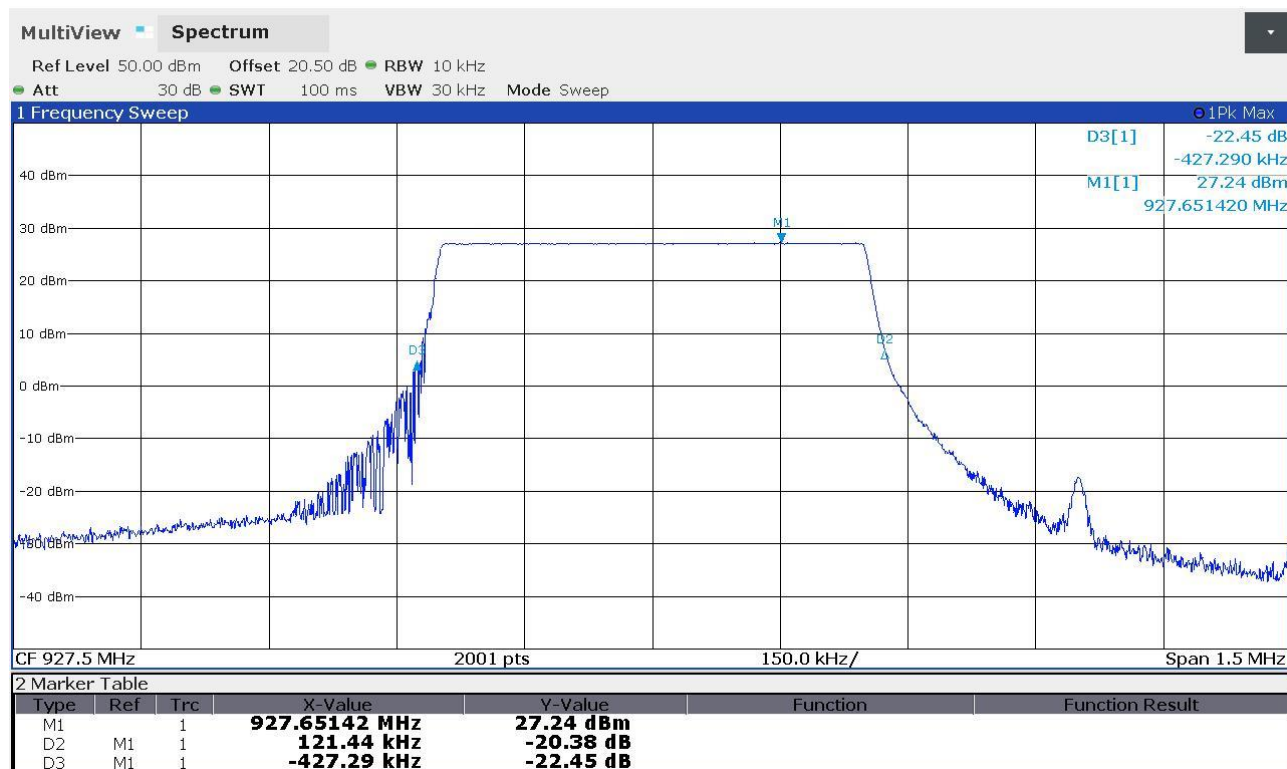
Panozzo 21232486



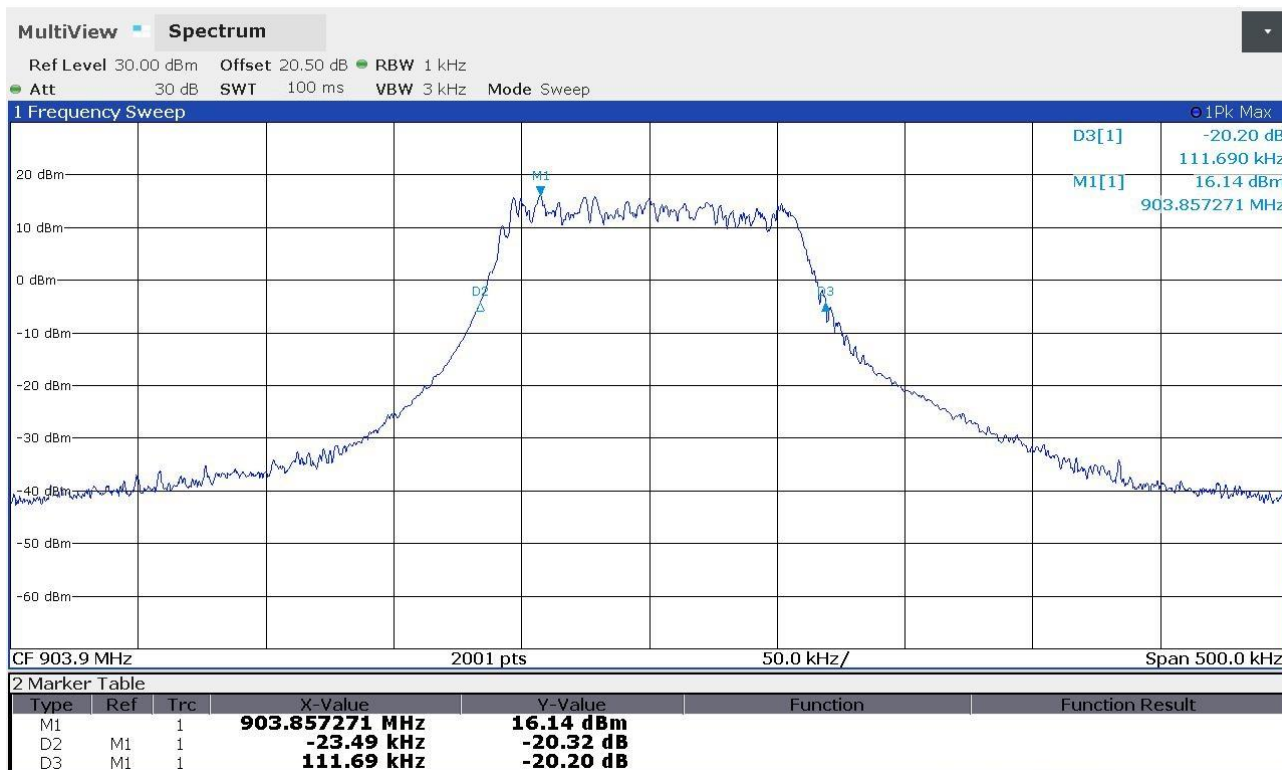
Panozzo 21232487



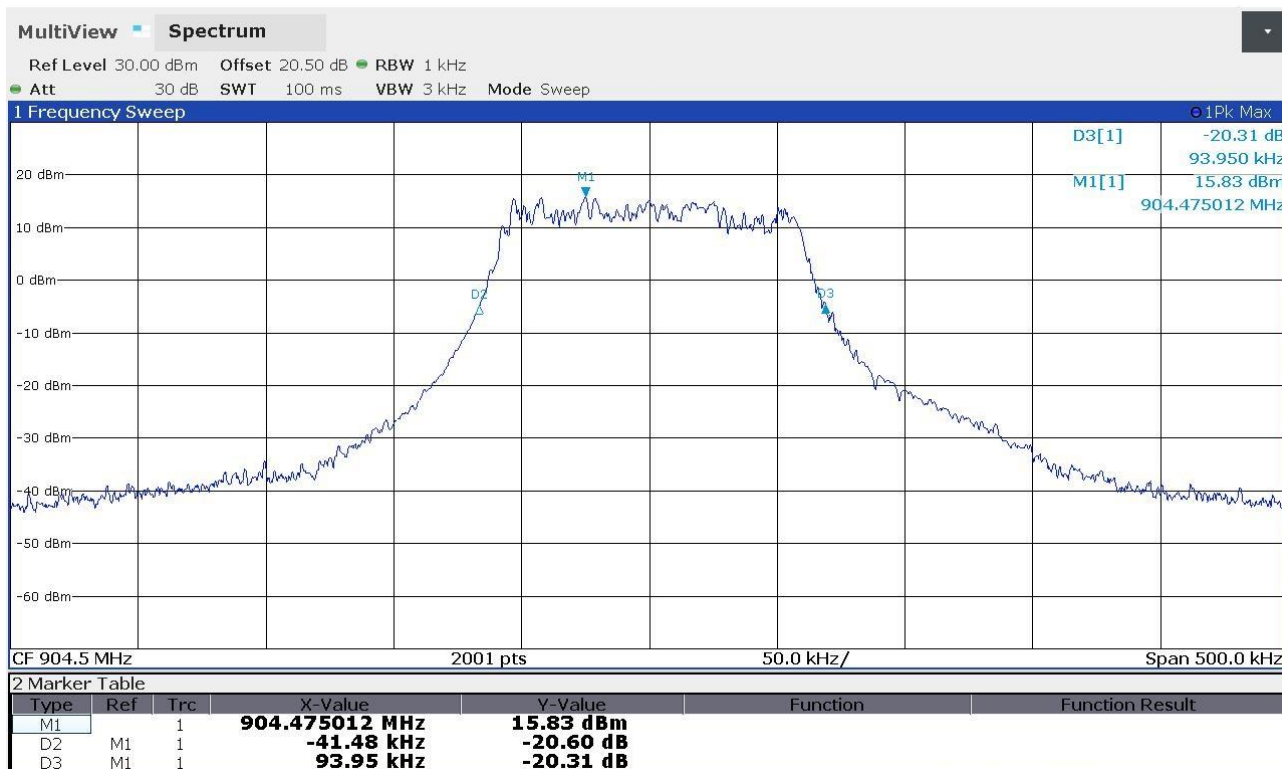
Panozzo 21232488



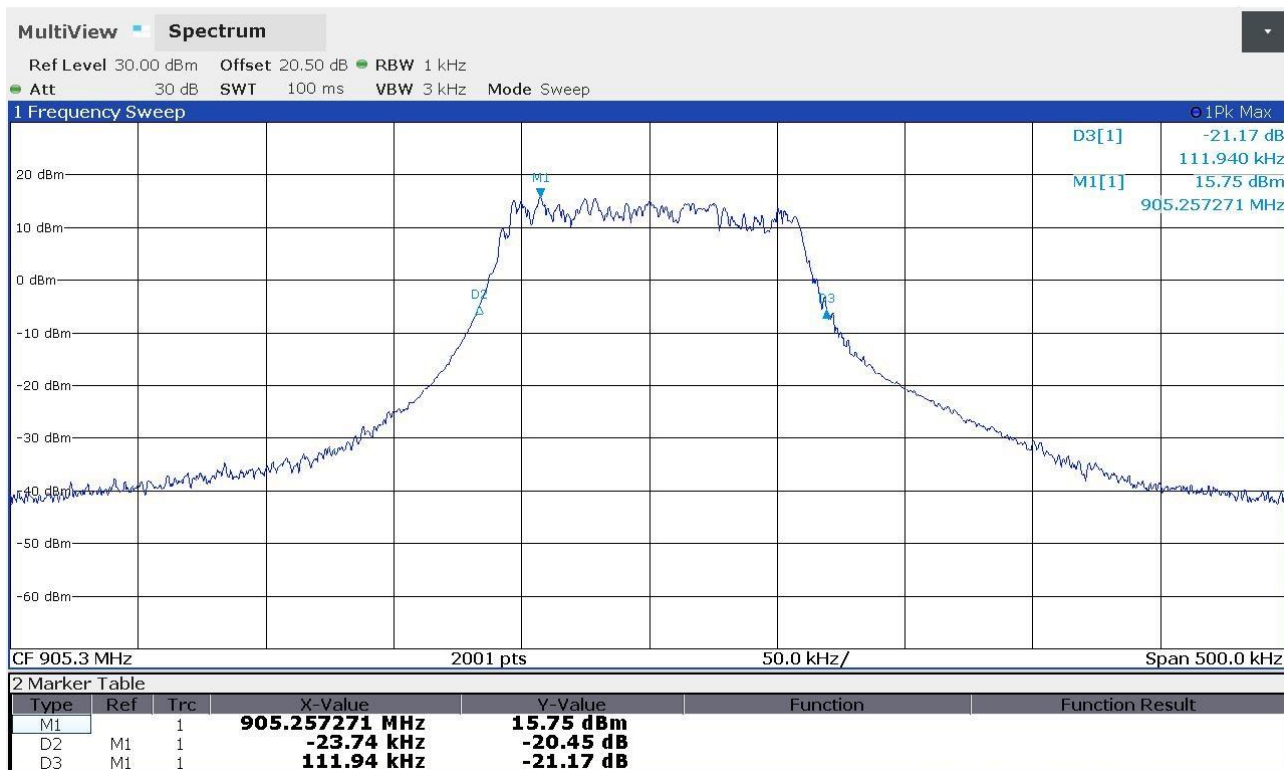
Panozzo 21232497



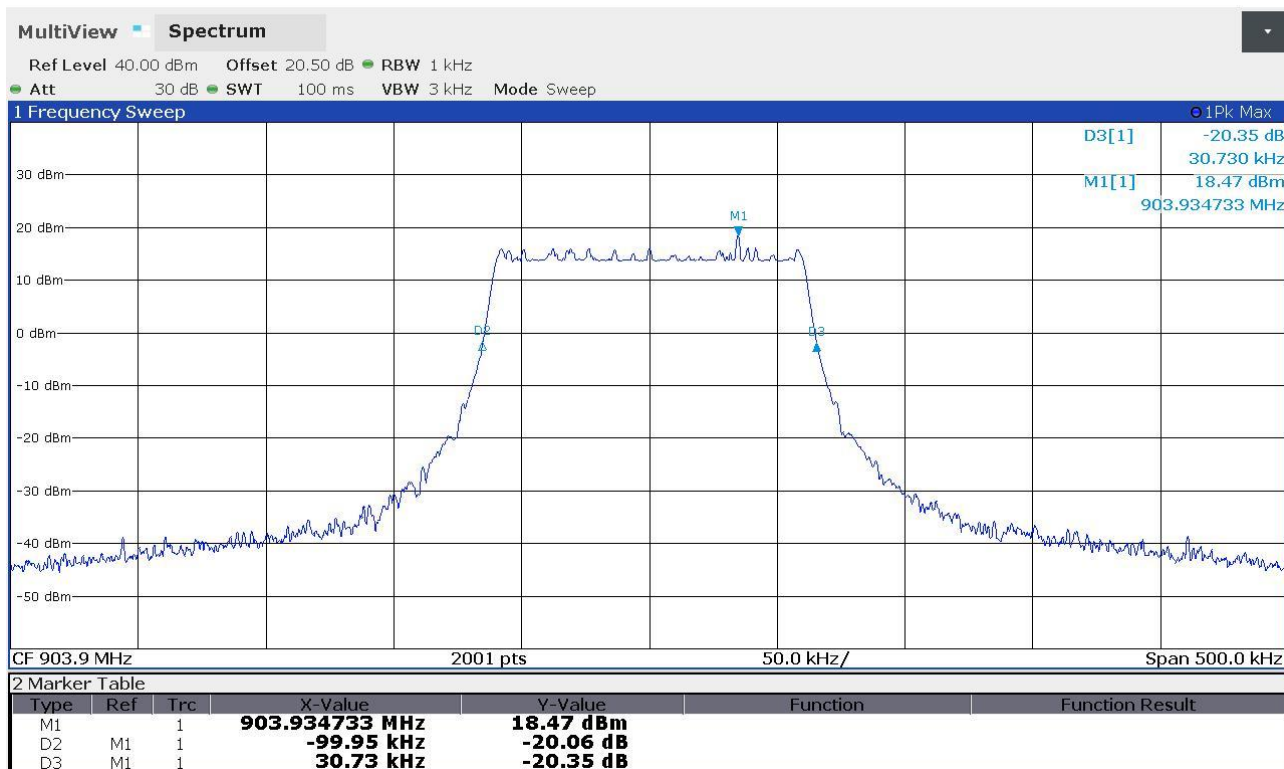
Panozzo 21232498



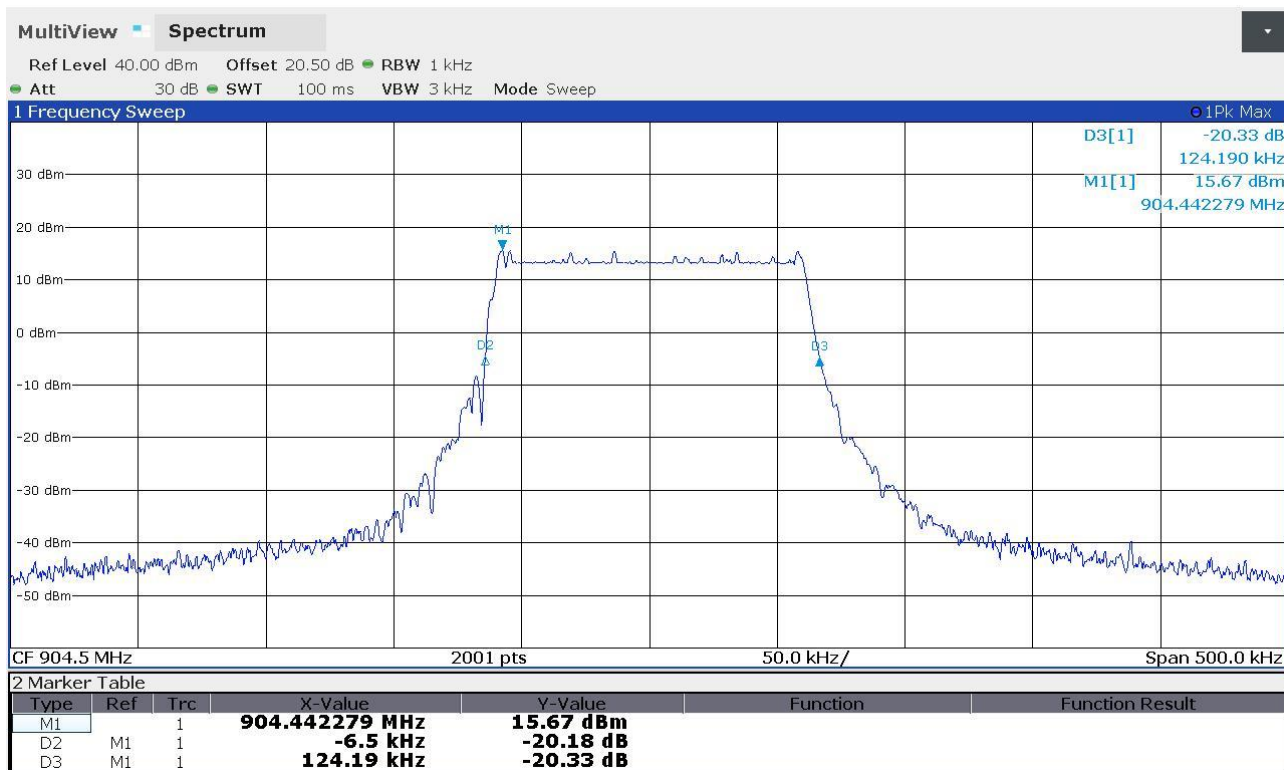
Panozzo 21232499



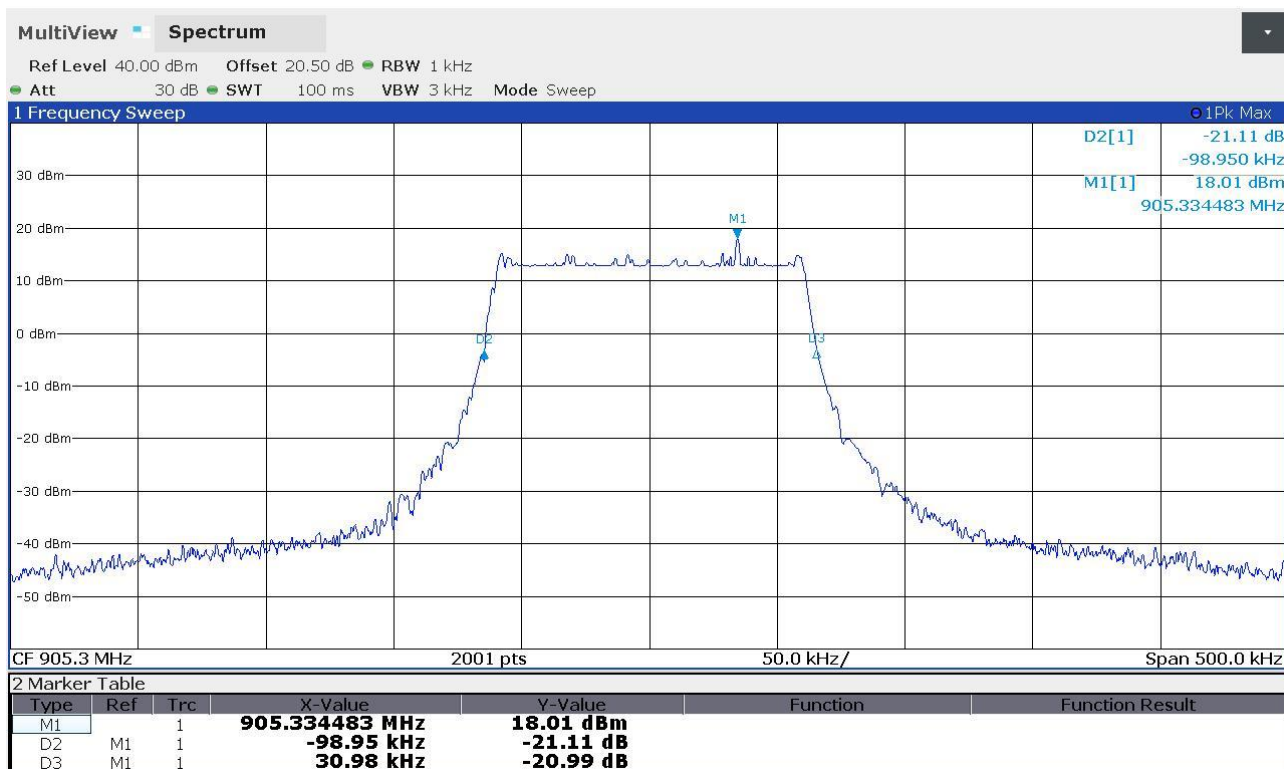
Panozzo 212324a24



Panozzo 212324a25



Panozzo 212324a26



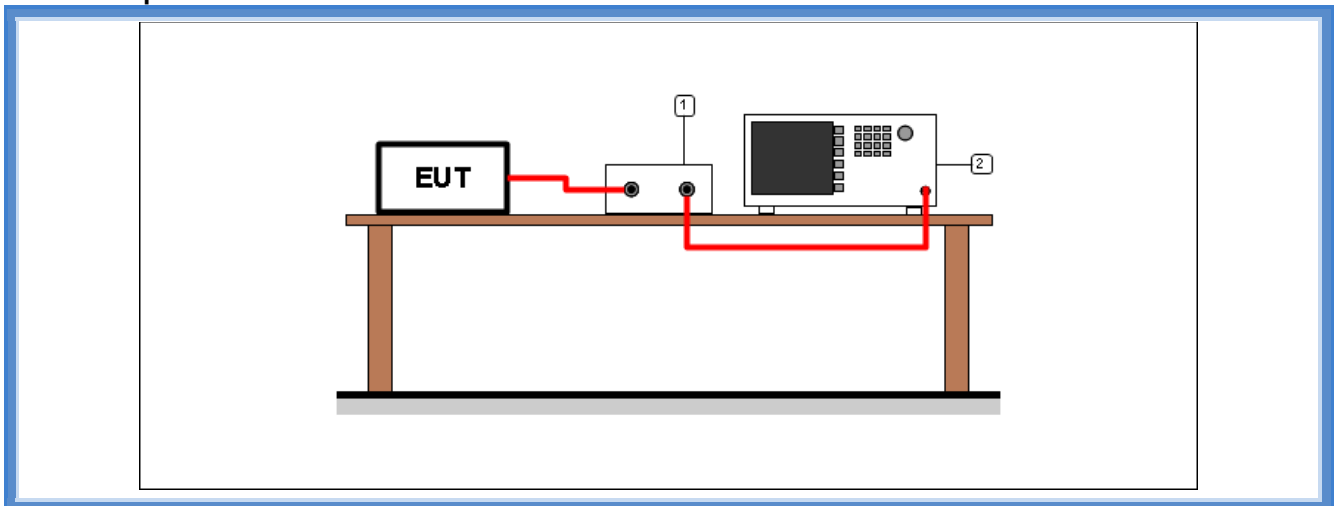
9.6 Channel separation

Tested by	C. Panozzo
Test date	27.10.2021
Test location (stand)	Laboratory
Reference standards	FCC Rules and Regulation; Titles 47 Part. 15.247 KDB 558074 D01 15.247 Meas Guidance v05r02 cl. 9 b) ANSI C63.10 cl. 7.8.2
Supplementary test set-up description	--
Supplementary information.....	--

Acceptance limits

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Test setup



Test setup PR002_01				
Nr.	Id. Number	Manufacturer	Model	Description
2	CMC S295	Rohde & Schwarz	FSW43	Spectrum Analyzer 43GHz
1	--	--	--	Cable + attenuator (calibrated before the test)

Result – LoRa 125 kHz, spread factor 10

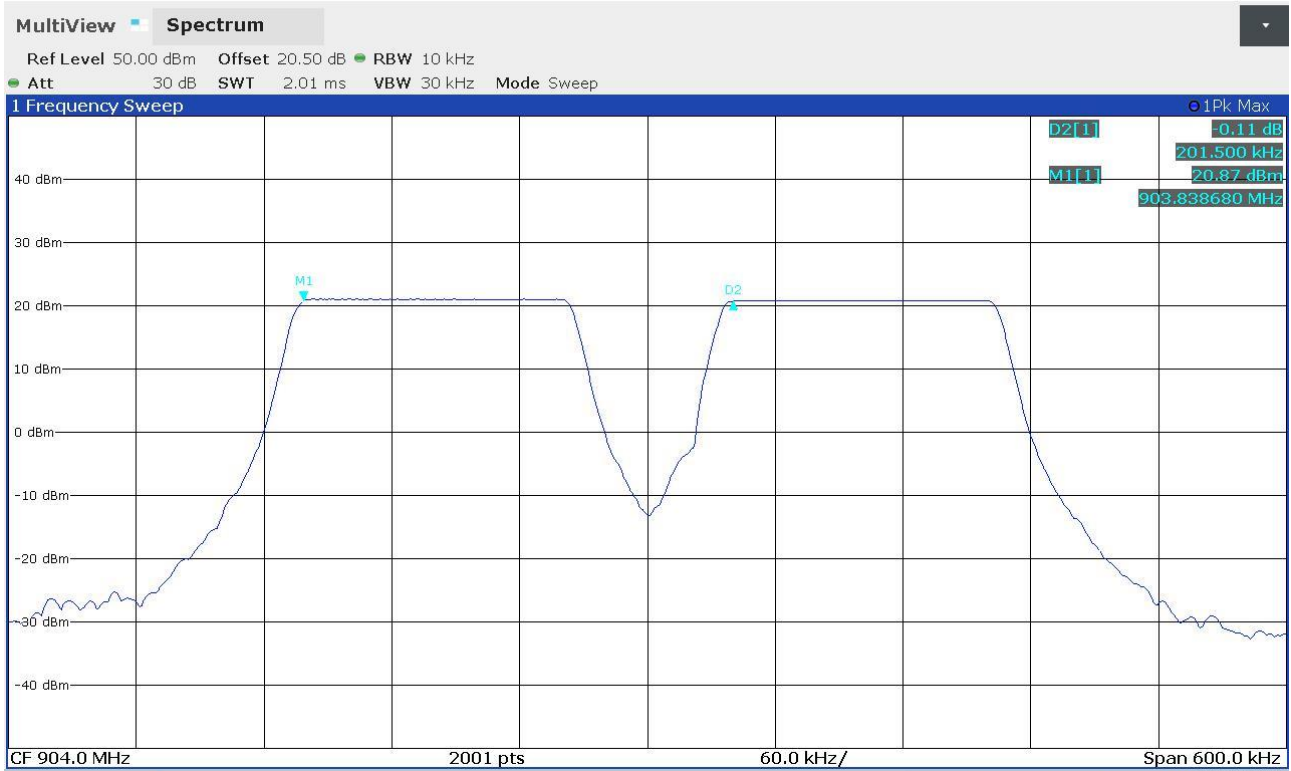
<i>Frequency band (MHz)</i>	<i>Graphs</i>	<i>Channel separation (kHz)</i>	<i>Minimum channel separation required (kHz)</i>	<i>Results</i>
902 – 928	G212324A34	201,50	25	Complies

Result – LoRa 125 kHz, spread factor 7

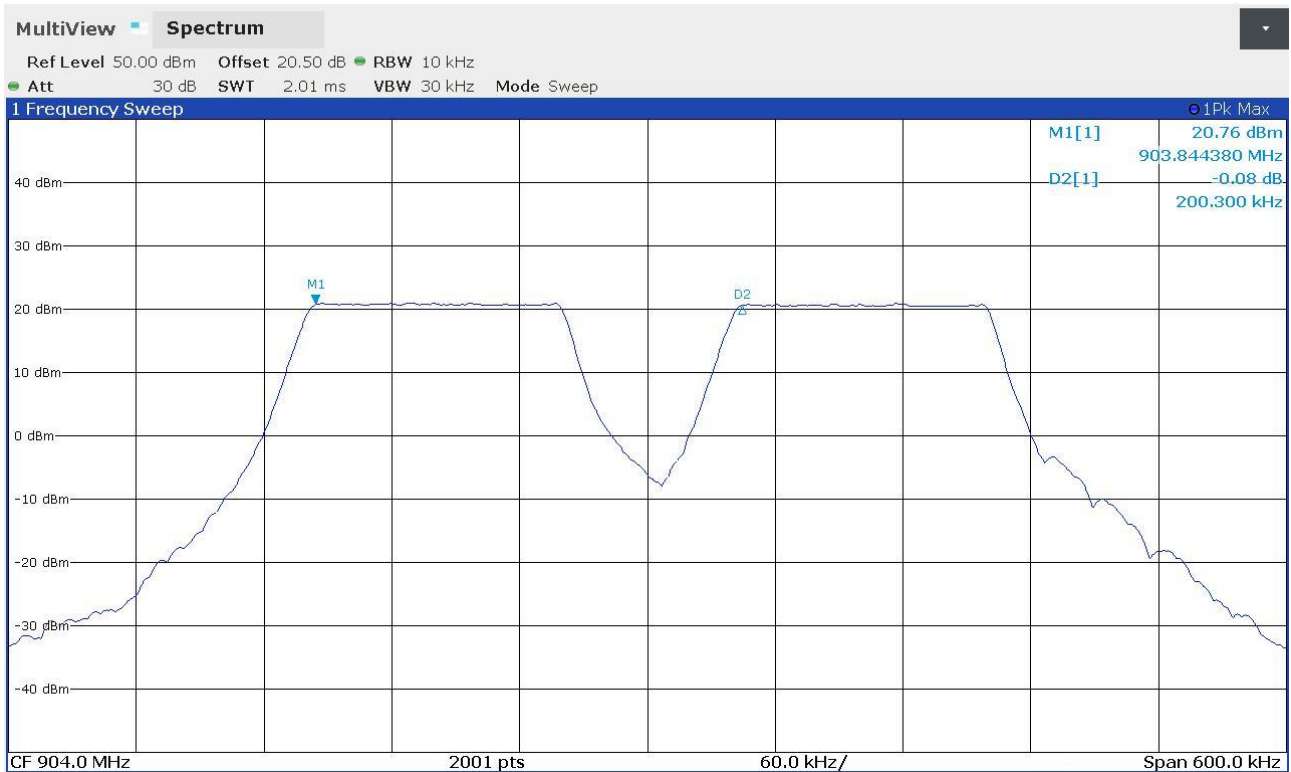
<i>Frequency band (MHz)</i>	<i>Graphs</i>	<i>Channel separation (kHz)</i>	<i>Minimum channel separation required (kHz)</i>	<i>Results</i>
902 – 928	G212324A35	200,30	25	Complies

Graphs

Panozzo 212324a34



Panozzo 212324a35



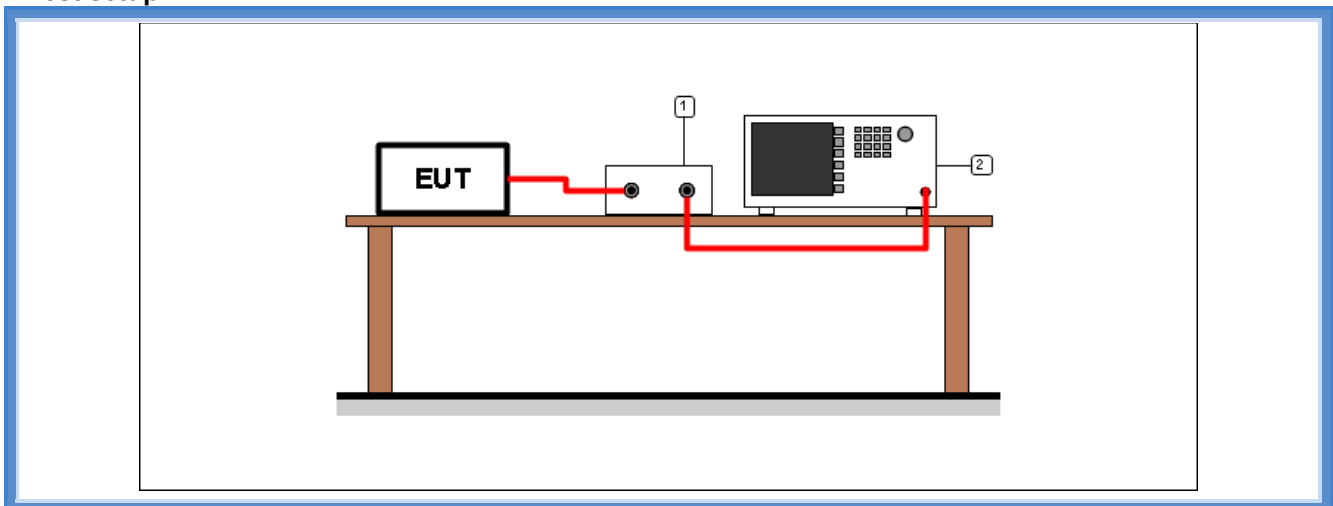
9.7 Number of hopping channels

Tested by	C. Panozzo
Test date	03.11.2021
Test location (stand)	Laboratory
Reference standards	FCC Rules and Regulation; Titles 47 Part. 15.247 KDB 558074 D01 15.247 Meas Guidance v05r02 cl. 10 b) 4) ANSI C63.10 cl. 7.8.3
Supplementary test set-up description	--
Supplementary information.....	--

Acceptance limits

There is no minimum number of hopping channels associated with this type of hybrid system. While there is not a specific minimum limit, the hop sequence is required to appear as pseudorandom per Section 15.247(a)(1) (see Section 3 of KDB 558074 D01).

Test setup



Test setup PR002_01				
Nr.	Id. Number	Manufacturer	Model	Description
2	CMC S295	Rohde & Schwarz	FSW43	Spectrum Analyzer 43GHz
1	--	--	--	Cable + attenuator (calibrated before the test)

Result – LoRa 125 kHz, spread factor 10

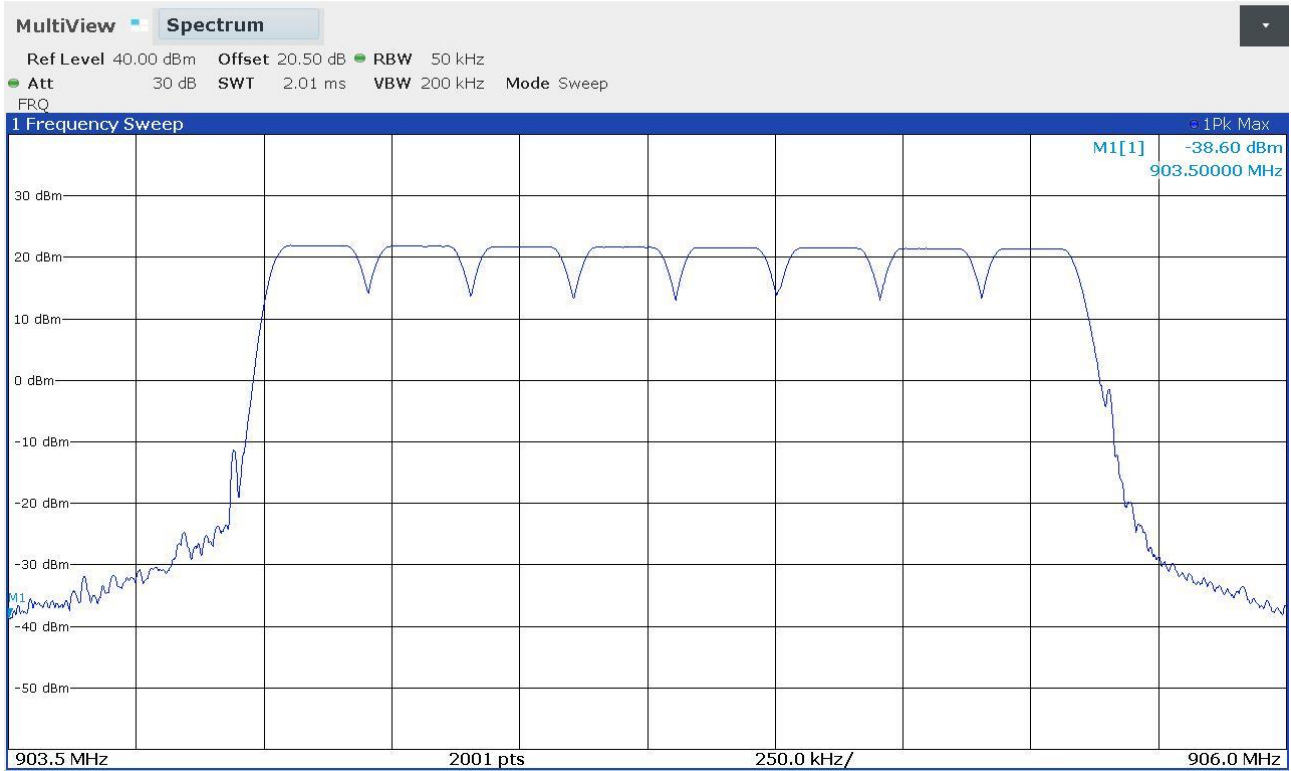
<i>Frequency band (MHz)</i>	<i>Graphs</i>	<i>Number of hopping channels</i>
902 – 928	G212324A37	8

Result – LoRa 125 kHz, spread factor 7

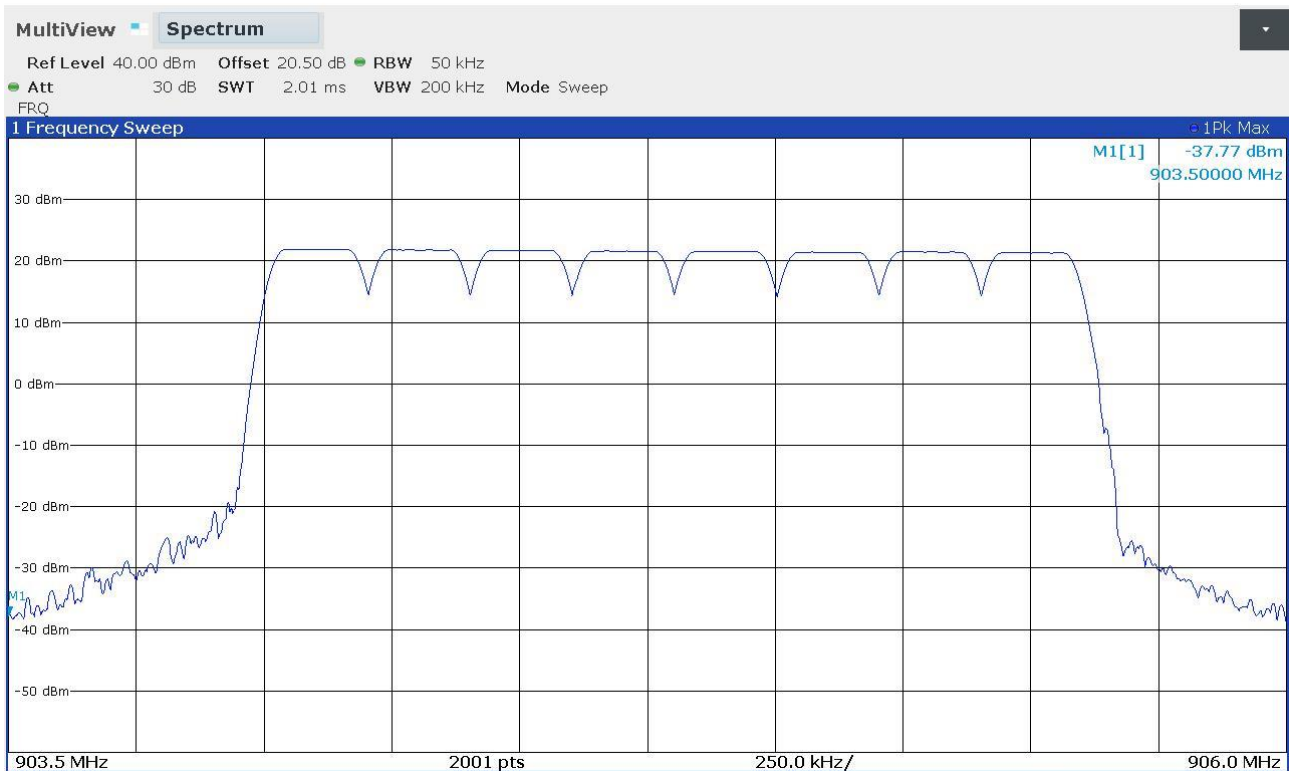
<i>Frequency band (MHz)</i>	<i>Graphs</i>	<i>Number of hopping channels</i>
902 – 928	G212324A36	8

Graphs

Panozzo 212324a36



Panozzo 212324a37



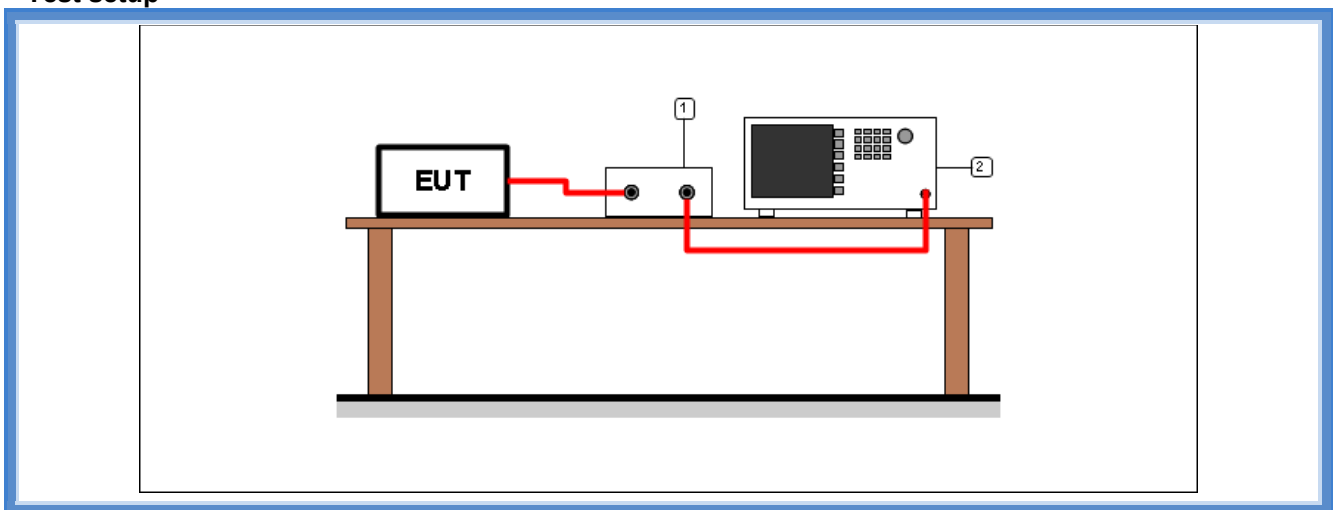
9.8 Time of occupancy

Tested by	C. Panozzo
Test date	03.11.2021
Test location (stand)	Laboratory
Reference standards	FCC Rules and Regulation; Titles 47 Part. 15.247 KDB 558074 D01 15.247 Meas Guidance v05r02 cl. 10 b) 2) ANSI C63.10 cl. 7.8.4
Supplementary test set-up description	--
Supplementary information.....	--

Acceptance limits

The transmission must comply with a 0,4 second/channel maximum dwell time when the hopping function is turned on.

Test setup



Test setup PR002_01				
Nr.	Id. Number	Manufacturer	Model	Description
2	CMC S295	Rohde & Schwarz	FSW43	Spectrum Analyzer 43GHz
1	--	--	--	Cable + attenuator (calibrated before the test)

Result – LoRa 125 kHz, spread factor 10

<i>Frequency (MHz)</i>	<i>Graphs</i>	<i>Dwell time (ms)</i>
905,30	G212324A53	207,20

<i>Frequency (MHz)</i>	<i>Graphs</i>	<i>Number of transmissions</i>	<i>Period</i>
905,30	G212324A54	1	3,20 s

<i>Time of occupancy (Dwell time x Nr. transmissions)</i>	<i>Maximum allowed time of occupancy</i>	<i>Results</i>
0,2072 s/channel	0,4 s/channel	Complies

Result – LoRa 125 kHz, spread factor 7

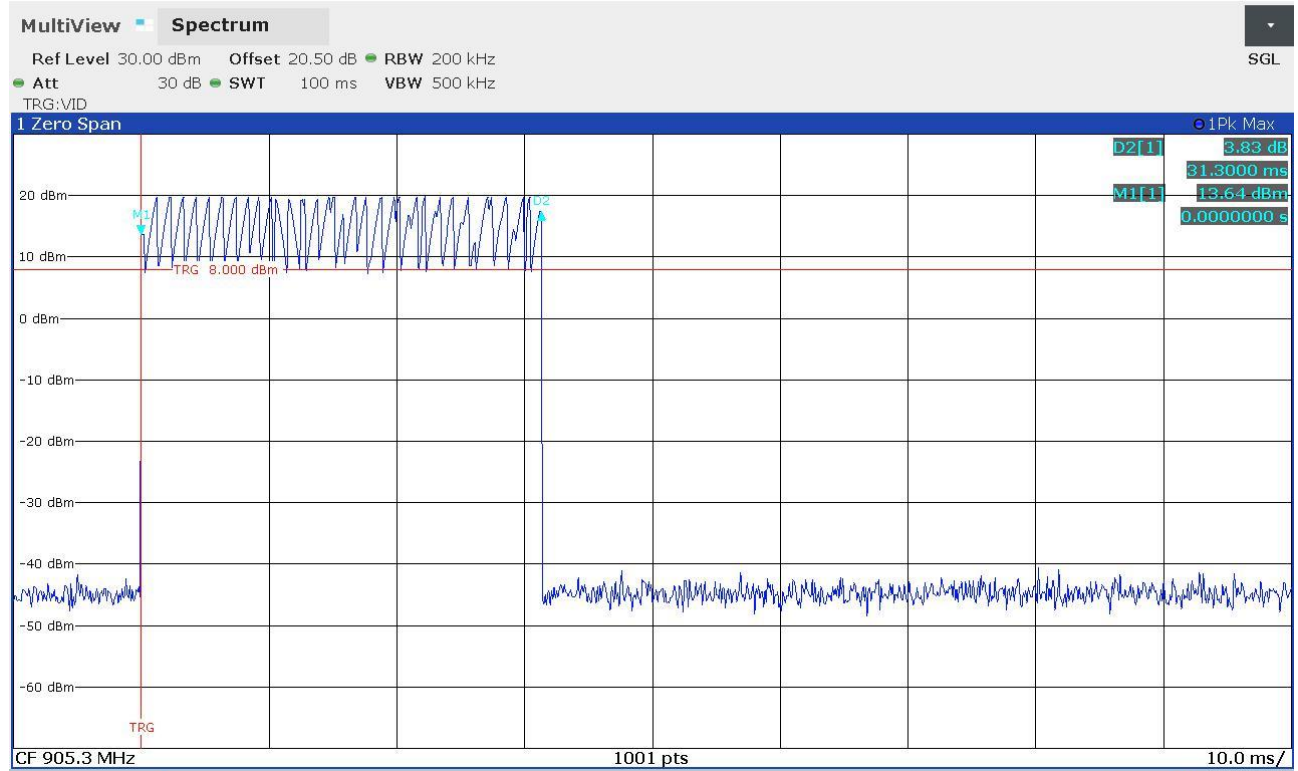
<i>Frequency (MHz)</i>	<i>Graphs</i>	<i>Dwell time (ms)</i>
905,30	G212324A51	31,30

<i>Frequency (MHz)</i>	<i>Graphs</i>	<i>Number of transmissions</i>	<i>Period</i>
905,30	G212324A52	1	3,20 s

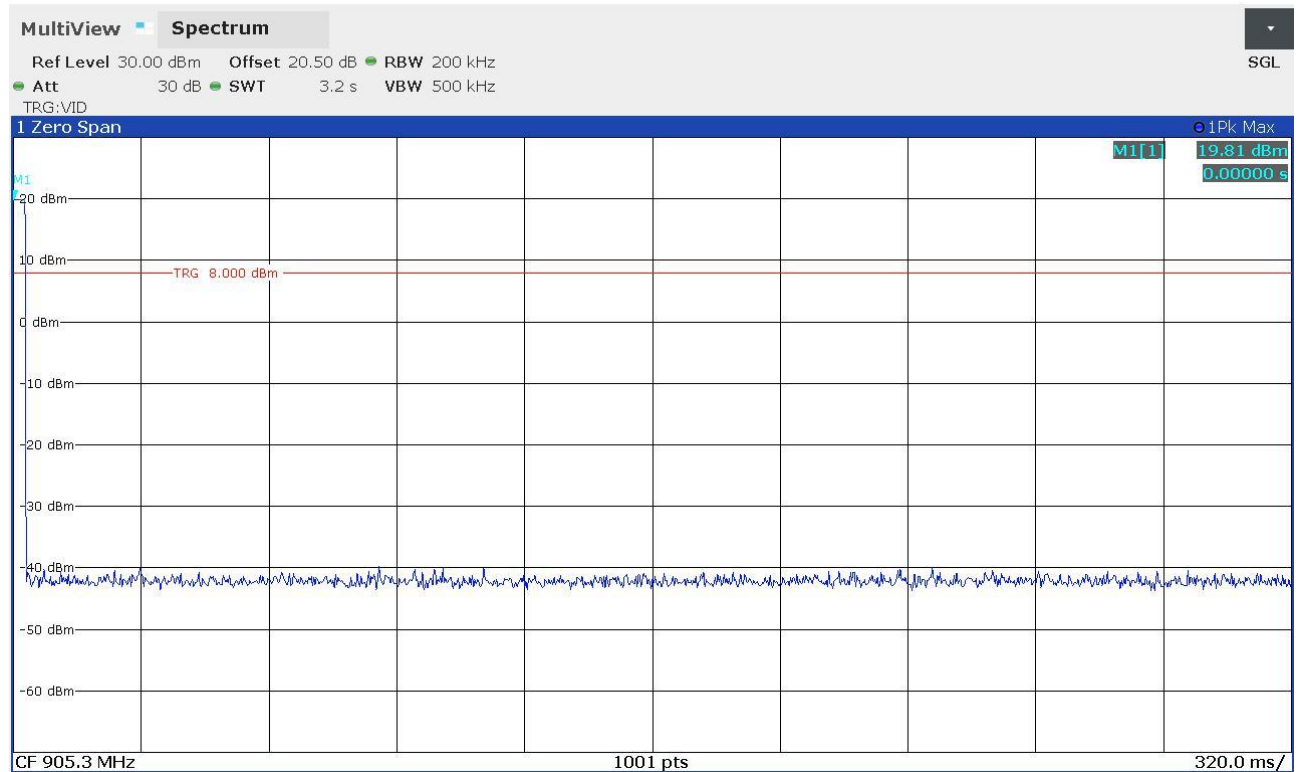
<i>Time of occupancy (Dwell time x Nr. transmissions)</i>	<i>Maximum allowed time of occupancy</i>	<i>Results</i>
0,0313 s/channel	0,4 s/channel	Complies

Graphs

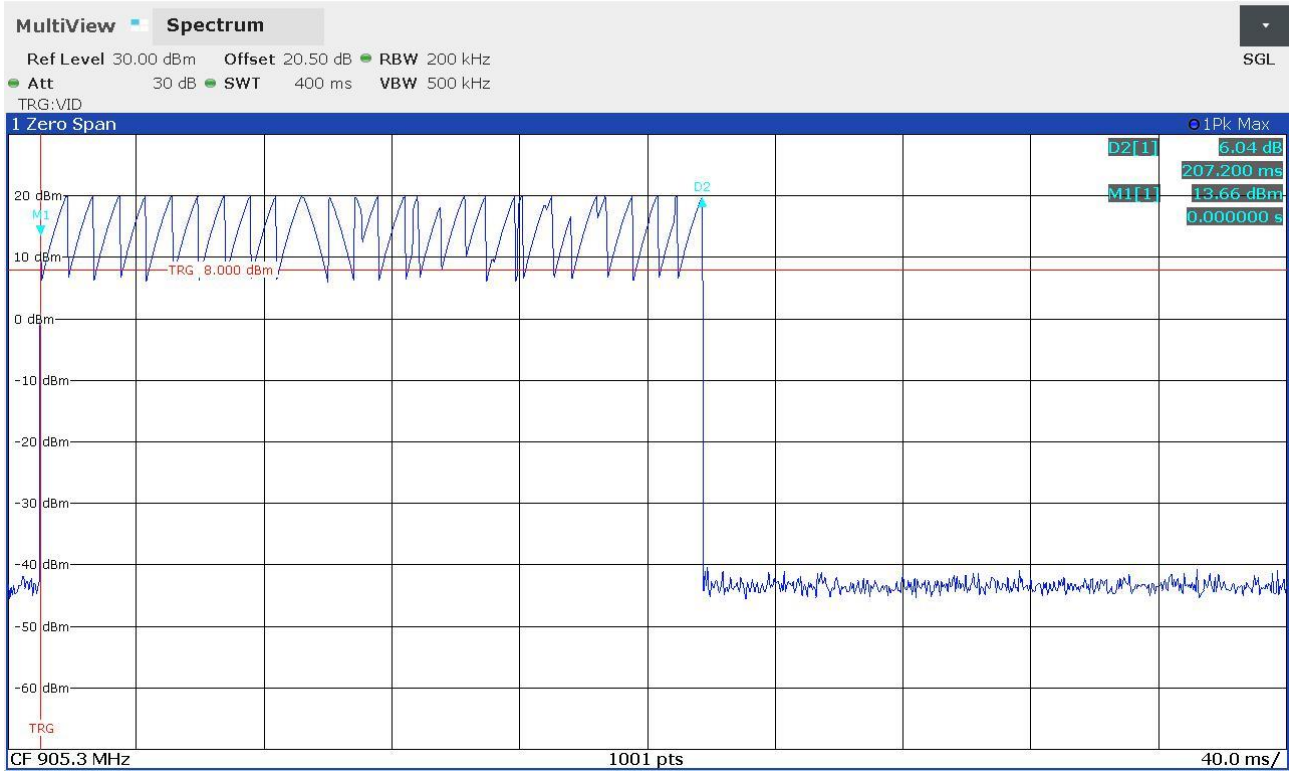
212324a51



212324a52



212324a53



212324a54

