Report No. 393564-01-R03

Test Report

Product	800MHz band Outdoor cellular Base Station
Name and address of the applicant	Damm Cellular Systems A/S Møllegade 68, DK-6400 Sønderborg, Denmark
Name and address of the manufacturer	Damm Cellular Systems A/S Møllegade 68, DK-6400 Sønderborg, Denmark
Model	BS422, 800MHz band, cellular base station
Rating	48Vdc
Trademark	DAMM
Serial number	Unit 1: 851 - 860MHz: SN-20037760 Unit 2: 860 - 869MHz: SN-20037761
Additional information	/
Tested according to	**FCC Part 90 subpart I** Private Land Mobile Services **Industry Canada RSS-119, Issue 12** Land Mobile and Fixed Equipment operating in the Frequency Range 27.41–960 MHz
Order number	393564
Tested in period	2021-02-26 - 2021-03-18
Issue date	2022-03-01
Name and address of the testing laboratory	Nemko Scandinavia AS Instituttveien 6, 2007 Kjeller, Norway CAB Number: FCC: NO0001 ISED: NO470

An accredited technical test executed under the Norwegian accreditation scheme

Prepared by [G.Suhanthakumar]	Approved by [Frode Sveinsen]

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1 INFORMATION

1.1 Test Item

Name	DAMM MultiTech Outdoor base station
FCC ID	Z5W-10520181
ISED ID	10159A-10520181
Model/version	BS422, 800 MHz band, cellular base station
Serial number	Unit 1: 851 – 860 MHz: SN-20037760 Unit 2: 860 – 869 MHz: SN-20037761
Hardware identity and/or version	Ver.10
Software identity and/or version	Ver.8.03
TX Frequency Range	851 – 860 MHz and 860 - 869 MHz
Channel Bandwidths	DMR 2 Slot TDMA data: 12.5 kHz Analogue Voice :6.25 KHz, 12.5 KHz, 25 kHz 0.20TETRA 4 slot TDMA: 30 kHz 0.35TETRA 4 slot TDMA: 30 kHz TEDS: 25 KHz, 50 kHz,100 kHz and 150 kHz
Type of Modulation	FM modulation
Emission designator	DMR 2 Slot TDMA data: 7K60FXW Analogue Voice, 2.5 kHz deviation: 16K0F3E,11K0F3E,6K00F3E 0.20TETRA 4 slot TDMA: 20K0D1W 0.35TETRA 4 slot TDMA: 21K0D1W TEDS: 25 KHz, 50 kHz,100 kHz and 150 kHz: 21K0D1W
Rated Output Power	10W, 25W and 61W
Type of Power Supply	-48Vdc
Antenna Connector	50ohm N-type
Desktop Charger	N/A

Theory of Operation

The EUT is base station with TETRA, DMR, Analog and TEDS modulation schemes.
The EUT also contains a Receiver.The RX frequency range is 805 – 825 MHz.

1.2 Normal test conditions

Temperature:	22 - 23 °C
Relative humidity:	30 - 50 %
Normal test voltage:	48 V DC

The values are the limit registered during the test period.

1.3 Test Engineer(s)

G.Suhanthakumar

1.4 Test Equipment

See list of test equipment in clause 5.

2 TEST REPORT SUMMARY

2.1 General

All measurements are tracable to national standards.

The tests were conducted for demonstrating compliance with FCC CFR 47 Part 90 subpart I and Industry Canada RSS-119 Issue 12.

Measurements were conducted in accordance with ANSI C63.26 – 2015, ANSI C63.4-2014 and ANSI C63.10-2013

Radiated tests were made in a semi-anechoic chamber at measuring distances of 3m.

A description of the test facility is on file with the FCC and Industry Canada.

☒ New Submission ☒ Production Unit

☐ Class II Permissive Change ☐ Pre-production Unit

TNB Equipment Code ☐ Family Listing

THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.

Deviations from, additions to, or exclusions from the test specifications are described in “Summary of Test Data”.

2.2 Test Summary

Name of test	ANSI C63.26-2015 reference	FCC.90 subpart I reference	RSS-119, Issue 12 reference	Result
RF Power Output	5.2	2.1046, 90.205	5.4	Complies
Modulation Characteristics, - Audio Frequency Response - Modulation Limiting	5.3	2.1047 2.1047(a) 2.1047(b)	/ 	 Complies Complies
Occupied Bandwidth	5.4.4	2.1049,	5.5	Complies
Spurious Emissions and mask at antenna terminals	5.7.3 5.7.4	90.210 90.691	5.8	Complies
Field Strength of Transmitter Spurious Radiations	5.5	2.1053, 2.1057, 90.210	5.8	Complies
Frequency Stability	5.6	2.1055, 90.213	5.3	Complies
Transient Frequency Behaviour	6.5.2.2	90.214	5.9	N/A
Adacent Channel power	6.5.2.4	90.221 (c) (1) (2) (d)	/	Complies
Limitations on power and antenna height	/	90.635 (a) (b)		Complies

[1] The tested equipment transmits voice /transmits messages and uses digital modulation.

[2] The tested equipment has a 50ohm antenna connector.

2.3 Comments

The following remarks were noted:

The EUT can be supplied by battery, the switch on voltage is between 45 -47Vdc and the switch off voltage is between 40 – 42Vdc. The maximum supply voltage is 59.9Vdc. Hence frequency stability was tested for input voltage of -48Vdc (nominal) , maximum -55.2Vdc(this is 115% of nominal) and minimum -42Vdc (this 87.5% of nominal rather than 85%).

All ports were populated during spurious emission measurements.

3 TEST RESULTS

3.1 RF Output Power, ERP

FCC Para. No.: 2.1046, 90.205

RSS-119 Para. No.: 5.4

Measured Conducted Power:

Modulation Type	Rated output power (dBm)	Frequency (MHz)	Measured power (dBm)	Limit (dB)	Margin (dB)
7K60FXW	47	851.1	47.47	± 1	0.53
16K0F3E	47	851.1	47.46	± 1	0.54
0.35TETRA	44	851.1	44.51	± 1	0.49
25kHzTEDS	40	851.1	40.53	± 1	0.47
7K60FXW	47	860.0	47.55	± 1	0.45
16K0F3E	47	860.0	47.56	± 1	0.44
0.35TETRA	44	860.0	44.57	± 1	0.43
25kHzTEDS	40	860.0	40.60	± 1	0.40
150kHzTEDS	40	860.0	40.65	± 1	0.35
7K60FXW	47	868.8	47.75	± 1	0.25
16K0F3E	47	868.8	47.80	± 1	0.20
0.35TETRA	44	868.8	44.80	± 1	0.20
25kHzTEDS	40	868.8	40.80	± 1	0.20
150kHzTEDS	40	868.8	40.80	± 1	0.20

Calculated ERP:

Modulation Type	Frequency (MHz)	Measured power (dBm)	Antenna gain (dBd)	Calculated ERP (dBm)	Calculated ERP (W)	Limit (W) Note 1
7K60FXW	851.1	47.47	7.85	55.32	340.41	< 500
16K0F3E	851.1	47.46	7.85	55.31	339.63	< 500
0.35TETRA	851.1	44.51	7.85	52.36	172.19	< 500
25kHzTEDS	851.1	40.53	7.85	48.38	68.87	< 500
7K60FXW	860.0	47.55	7.85	55.40	346.74	< 500
16K0F3E	860.0	47.56	7.85	55.41	347.54	< 500
0.35TETRA	860.0	44.57	7.85	52.42	174.58	< 500
25kHzTEDS	860.0	40.60	7.85	48.45	69.98	< 500
150kHzTEDS	860.0	40.65	7.85	48.50	70.79	< 500
7K60FXW	868.8	47.75	7.85	55.60	363.08	< 500
16K0F3E	868.8	47.80	7.85	55.65	367.28	< 500
0.35TETRA	868.8	44.80	7.85	52.65	184.08	< 500
25kHzTEDS	868.8	40.80	7.85	48.65	73.28	< 500
150kHzTEDS	868.8	40.80	7.85	48.65	73.28	< 500

dBd = dBi - 2.15, ERP = EIRP - 2.15, EIRP = ERP + 2.15

Maximum ERP = Measured Power – Correction Attenuation + Correction Antenna Gain

dBd= 10-2.15=7.85

Note 1: The minimum antenna height is 6.5m

The measurement is performed with the power meter and with the EUT transmitting continuously.

Requirements:

The output power shall be within ±1 dB of the manufacturer’s rated power.

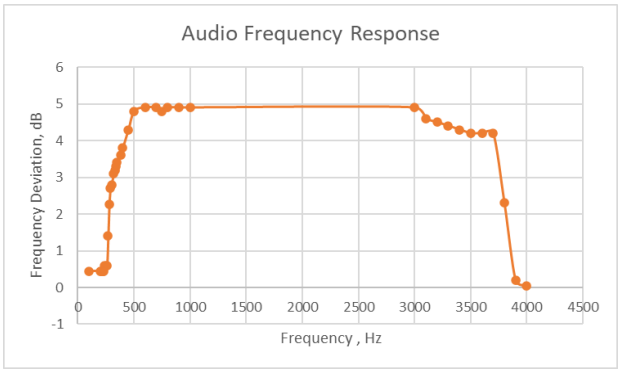
3.2 Audio Frequency Response and Modulation limiting

Para. No.: 2.1047

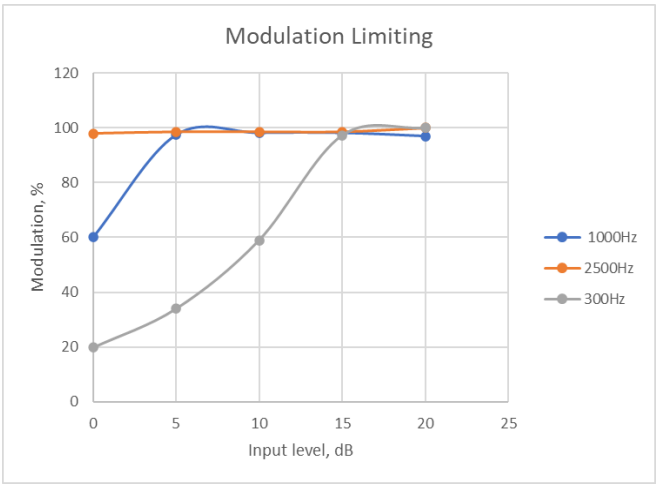
Detector Mode	**Peak**
Demodulation Bandwidth	**25kHz**
Trace mode	**Max Hold**

Test Results: Complies

Measurement Data:



Audio Frequency response, 16K0F3E



Modulation limiting, 16K0F3E

Requirements:

(a) Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.

(b) Equipment which employs modulation limiting. A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.

3.3 Occupied Bandwidth

FCC Para. No.: 2.1049

RSS-119 Para. No.: 5.5

Test Results: Complies

Detector Mode	**Peak**
Resolution Bandwidth	**100Hz and 300Hz**
Video Bandwidth	**1kHz**
Trace mode	**Max Hold**

Measurement Data:

Modulation type	Frequency (MHz)	Measured OBW 99% (kHz)	Limt (kHz)	Margin (KHz)
7K60FXW	860	8.01	11.25	3.24
16K0F3E	860	12.33	20.00	7.67
11K0F3E	860	7.56	11.25	3.69
6K00F3E	860	4.16	6.00	1.84
0.20TETRA	860	19.39	20.00	0.61
0.35TETRA	860	20.91	25.00	4.09
25kHzTEDS	860	21.31	25.00	3.69
50kHzTEDS	860	42.79	50.00	7.21
100kHzTEDS	860	85.58	100.00	14.42
150kHzTEDS	860	128.21	150.00	21.79

For analog modulations, the modulating audio frequency is 1 kHz. Audio level at 16 dB above 50% modulation
50% modulation frequency deviations are 2.4 kHz for 16k0F3E, 1.2 kHz for 11k0F3E, and 0.5 kHz for 6k00F3E

For this test, the EUT was made to transmit continuously with modulation activated.

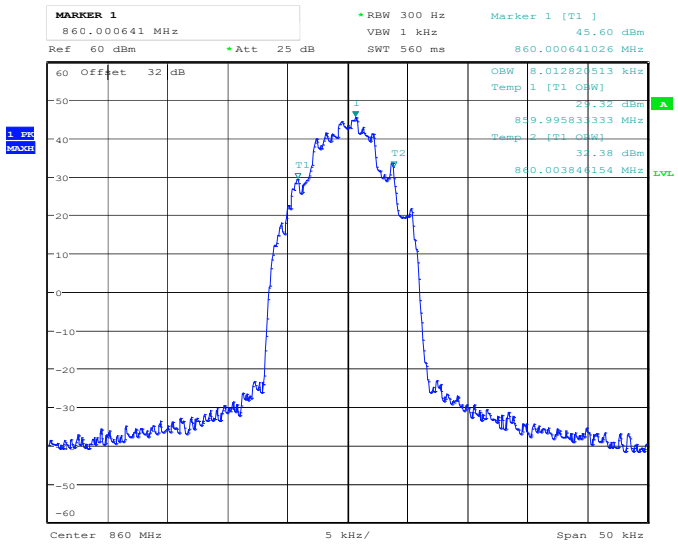
See attached graph.

Requirements:

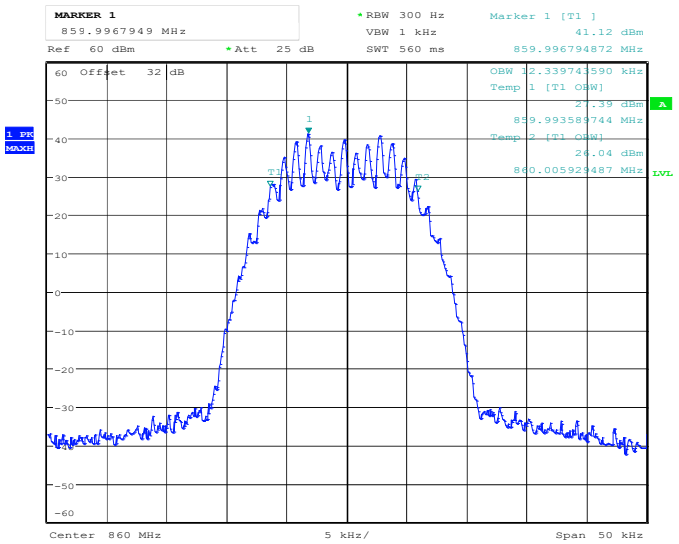
For the purpose of this document, channel bandwidth is the channel width in which the equipment is designed to operate.
The maximum permissible occupied bandwidth shall not exceed the authorized bandwidth specified in Table 3 for the equipment's frequency band. The authorized bandwidth is defined as the maximum width of the band of frequencies used to derive spectrum masks and is not necessarily equivalent to the bandwidth found on radio and spectrum licences.

The channel bandwidths, authorized bandwidths and spectrum masks are given in Table 3 for equipment having an output power greater than 120 mW. For equipment with an output power that does not exceed 120 mW, Section 5.10 applies.

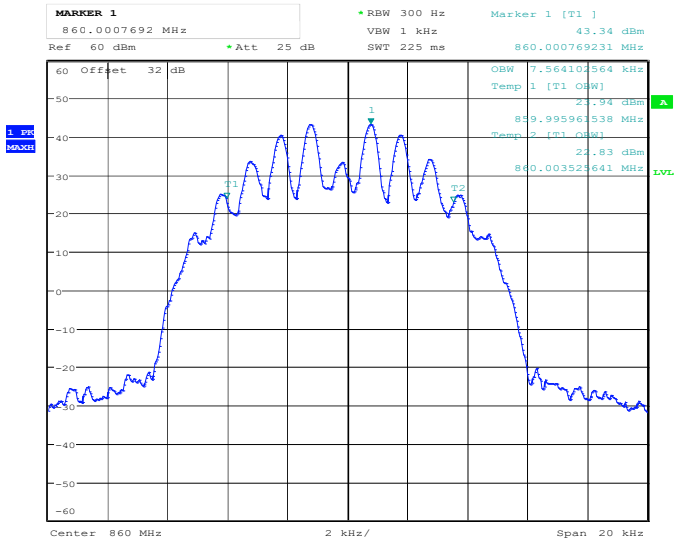
Frequency band (MHz)	Related SRSP for channeling plan and ERP	Channel Bandwidth (kHz)	Authorized Bandwidth (kHz)	Spectrum Masks for Equipment with Audio Filter	Spectrum Masks for Equipment without audio filter
806-821/851-866 and 821-824/866-869	SRSP-502	25	20 22	B Y	G Y
		12.5	11.25	D	D
		6.25	6	E	E



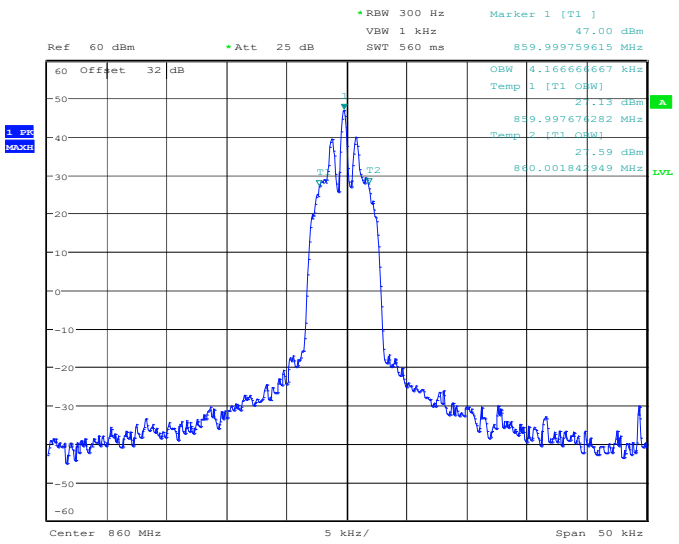
OBW, 860MHz,7K60FXW modulation



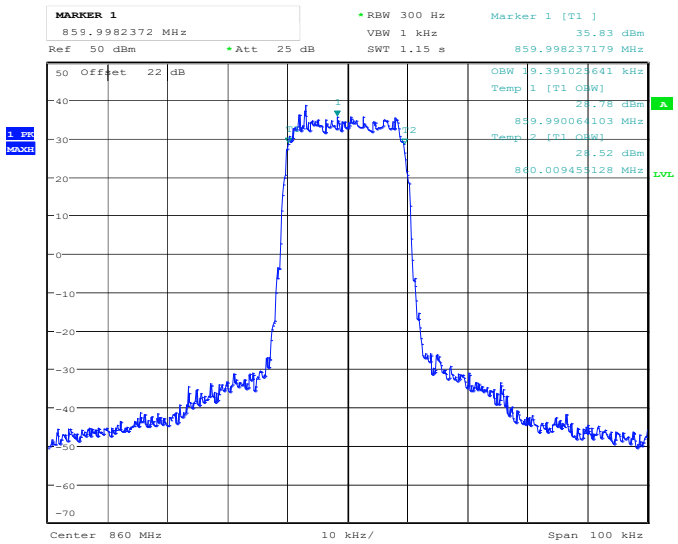
OBW, 860MHz,16K0F3E modulation



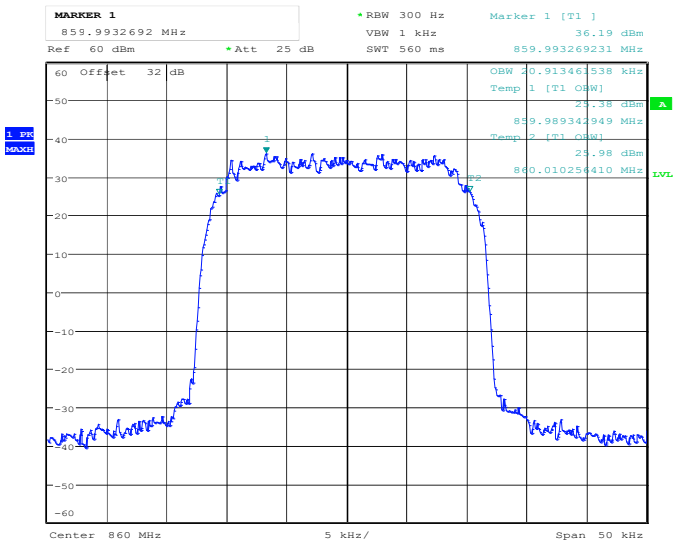
OBW, 860MHz,11K0F3E modulation



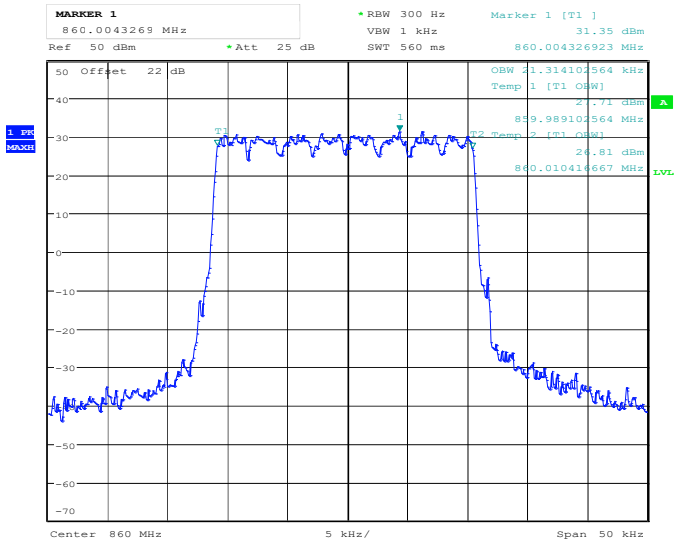
OBW, 860MHz,6K00F3E modulation



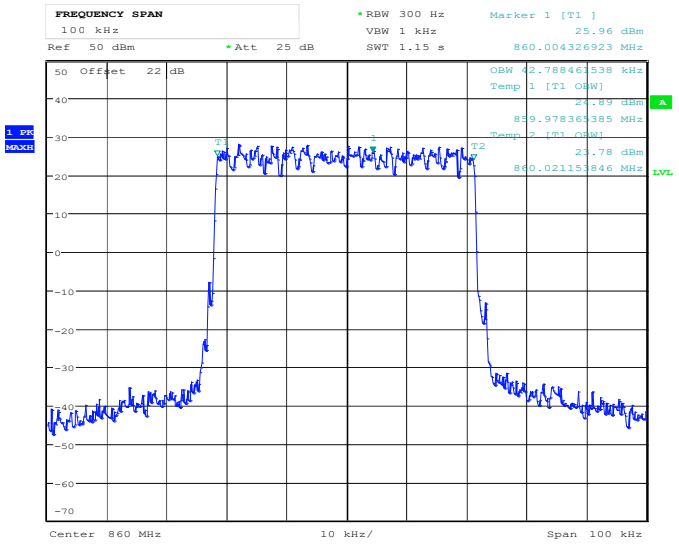
OBW, 860MHz,0.20TETRA modulation



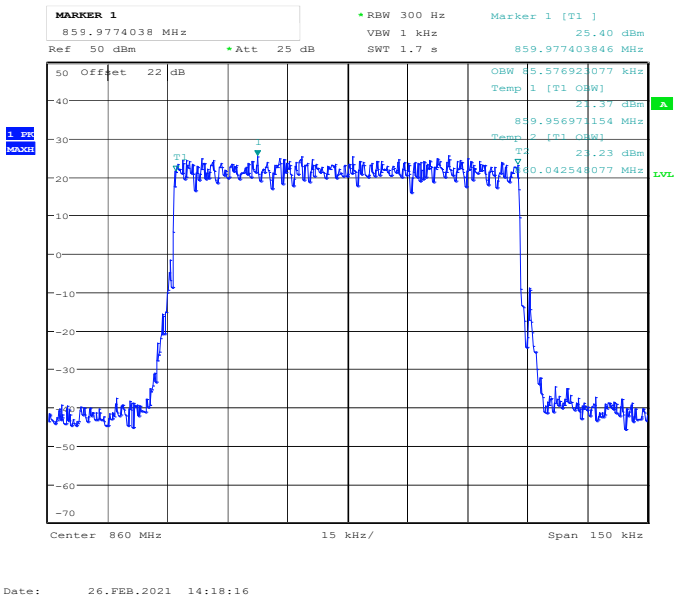
OBW, 860MHz,0.35TETRA modulation



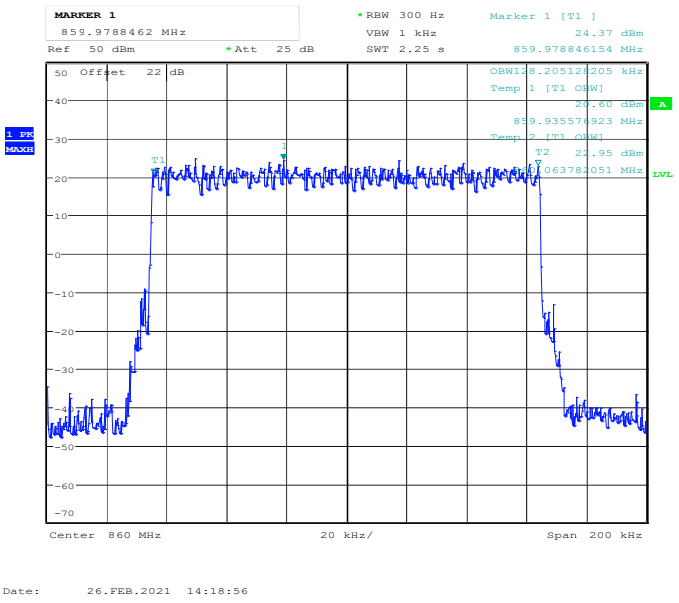
OBW, 860MHz,25kHzTEDS modulation



OBW, 860MHz,50kHzTEDS modulation



OBW, 860MHz,100kHzTEDS modulation



OBW, 860MHz,150kHzTEDS modulation