WamBlee

W420

Test Report of the W420 to the requirements of EN300098-2 and RTCM SC11901 Annex E.

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1 Summary of test conditions

1.1 Applied standard and reference

EN 300 098 -2 , V 1.2.1. , (2014-11) (new standard for MSLD MOB AIS mode); Essential Radio test suite clause: 4.2.1 , 4.2.2 , 4.2.3 , 4.2.4 , 4.2.5 , 4.2.6 , 4.2.7 and 4.2.8.

RTCM 11901.1 with Amendment 1 & 2, (Feb 5, 2015) , Annex E : AIS MSLD

1.2 Main specification

Operative frequency : AIS1 (161.975 MHz) and AIS2 (162.025 Mhz)

Nominal output RF power : > 500 mW , typ. 1 W , < 1.2 W

Modulation class : 16K0GXW

Power supply : 3 x 3V LiMn batteries , series layout

1.3 Normal and extreme conditions

Unit measurement		Value
Temperature	Standard condition	From +15 to 35 °C
	Extreme condition	From -20 to 55 °C
Humidity	Rated	From 20% to 75%
Voltage (DC supply)	Minimum	5.8 V
	Rated	9 V
	Maximum	9.9 V

1.4 Measurements and test site

- Wamblee laboratories, Faenza (RA), Italy (for almost test and measurement, otherwise specified).
- TecnoLab del Lago Maggiore, Verbania (VB), Italy (for radiated and immunity emission and ESD); FCC reg. Nmbr 868554.

1.5 Test reports

Tested by:

Simone Facchini

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Daniele Banfi

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2 EN 303 098-2

2.1 Clause 4.2.1: Frequency Error

Date of test	Jan 20, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

2.1.1 Method

The transmitter frequency error shall be as defined in EN 303 098-1, clause 8.1.1.

The frequency error of the transmitter is the difference between the measured carrier frequency in the absence of modulation and its required frequency.

The equipment was connected as illustrated below. The carrier frequency shall be measured in the absence of modulation. Test is performed on AIS1 and AIS2.

The measurement was made under normal test conditions and extreme test conditions.

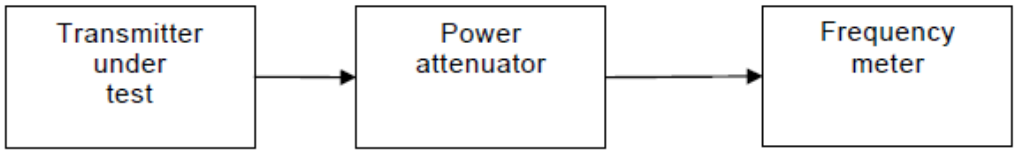

Figure 1: Frequency measurement setup

2.2 Results

Channel	Normal	-20°C		55°C		Error	Pass / Fail
		9.9V	5.8V	9.9V	5.8V		
AIS1	-177Hz	-60Hz	-62Hz	-237Hz	-235Hz	-237Hz	Pass
AIS2	-210Hz	-200Hz	-198Hz	-222Hz	-229Hz	-229Hz	Pass

Table 1: Paragraph 2.1, results

2.3 Limit

The frequency error under normal conditions shall not exceed ±500 Hz, and under extreme test conditions shall not exceed ±1 kHz.

2.4 Equipment used

7, 12, 17, 21

2.5 Clause 4.2.2: Conducted Power

Date of test	Jan 20, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

2.5.1 Method

The conducted power shall be as defined in EN 303 098-1, clause 8.2.1.

Connect the test unit to a power meter and record the conducted power at normal test conditions (P_{20}).

Repeat the test for extreme low and high temperatures and record the values obtained from these measurements (P_{-20} and P_{55}).

The differences between the normal and extreme conditions shall be determined:

$P_{diff1} = P_{norm} - P_{-20}$; $P_{diff2} = P_{norm} - P_{55}$

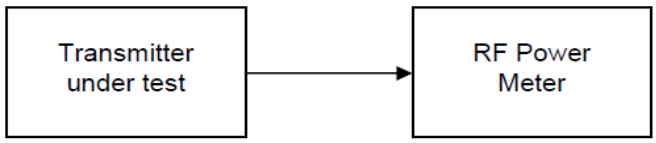

Figure 2: Conducted power measurement setup

2.5.2 Results

Channel	Normal	-20°C		55°C		$P_{diff(max)}$	Pass / Fail
		9.9V	5.8V	9.9V	5.8V		
AIS1	32.0dBm	32.6dBm	32.5dBm	32.1dBm	31.9dBm	+0.6 dB	Pass
AIS2	32.0dBm	32.6dBm	32.5dBm	32.1dBm	31.8dBm	+0.6 dB	Pass

Table 2: Paragraph 2.5, results

2.5.3 Limit

The P_{diff} shall be less of 3 dB

2.5.4 Equipment used

1,10,11,12,16

2.6 Clause 4.2.3: Radiated Power

Date of test	Feb. 4, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

2.6.1 Method

The radiated power shall be as defined in EN 303 098-1, clause 8.3.1.

The measurement is made in normal conditions for frequency AIS1 and repeated for AIS2.

On a test site selected from annex A, the equipment shall be placed on the support and according to the requirements of clause A.4. The transmitter shall be switched on to transmit continuously without modulation. We choose the clause A.4.2.

The receiver shall be tuned to the transmitter carrier frequency. The test antenna shall be orientated for vertical polarization. The test antenna shall be raised or lowered through the specified range of heights until a maximum signal level is detected on the measuring receiver.

The transmitter shall be rotated through 360° around a vertical axis in order to find the direction of the maximum signal. The maximum signal level detected by the measuring receiver shall be recorded. For equipment tested using the support described in clause A.4.2 only, the level detected at 90°, 180° and 270° from the maximum shall also be recorded avoiding nulls where possible by movement of the receive antenna by no more than 10°.

The transmitter shall be replaced by a substitution antenna as defined in annex A.

The substitution antenna shall be connected to a calibrated signal generator.

The frequency of the calibrated signal generator shall be adjusted to the transmit carrier frequency.

The input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver, if necessary.

The test antenna shall be raised or lowered through the specified range of heights to ensure that the maximum signal is received.

The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver that is equal to the level noted to that detected from the equipment under test corrected for the change in input attenuator setting of the measuring receiver.

The maximum ERP is equal to the power supplied by the signal generator, increased by the gain of the substitution antenna and corrected for the change in the attenuator.

2.6.2 Results

Channel	Power	Angle	Pass / Fail
AIS1	1.2 W	0	
	1.1 W	90	
	1.1 W	180	
	1.1 W	270	
	1.125 W	average	Pass
AIS2	1.2 W	0	
	1.1 W	90	
	1.1 W	180	
	1.1 W	270	
	1.125 W	average	Pass

Table 3: Paragraph 2.6, results

2.6.3 Limit

For equipment tested using the support described in clause A.4.2 the average of the four measurements recorded shall be 600 mW ±3 dB (max 1.2 W) .

2.6.4 Equipment used

From 23 to 41, as needed

2.7 Clause 4.2.4: Transmitter spectrum mask

Date of test	Jan 20, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

2.7.1 Method

The transmitter spectrum mask shall be as defined in EN 303 098-1, clause 8.4.1.

The transmitter spectrum mask defines the limits within the range fc ±75 kHz for the peak power of all modulated signals including all side bands associated with the carrier.

The transmitter shall be connected to an artificial antenna with a means of measuring the power delivered to the load. The equipment shall be operated from the test power source. Standard test signal number 3 (see clause EN 303 098-1 , clause 6.5.3) shall be used to modulate the transmitter in repeated packets.

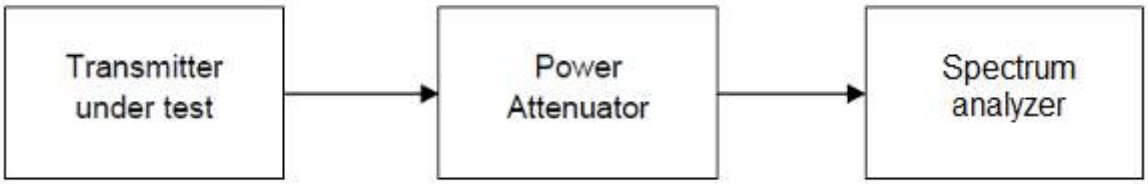

Figure 3: Spectrum mask measurement setup

The measurement shall be made under normal test conditions.

To determine the reference peak power and measure the emissions in the adjacent channels, the emission is suitably applied to the input of a spectrum analyser with the following preferred settings:

- Resolution bandwidth: 1 kHz;
- Video bandwidth: 3 kHz;
- Scan bandwidth: 150 kHz;
- Center frequency: Carrier frequency AIS1 and AIS2;
- Detector type: Peak hold.

A sufficient number of sweeps shall be used and sufficient transmission packets measured to ensure that the emission profile is fully developed. A reference carrier power shall be calculated as being the maximum power within the frequency limits set in clause 2.3. The emission profile shall then be normalized so that the reference carrier power is set to 0 dBc. The result is compared to the mask given in figure 4 . A measurement for frequency AIS1 shall be made and repeated for AIS2.

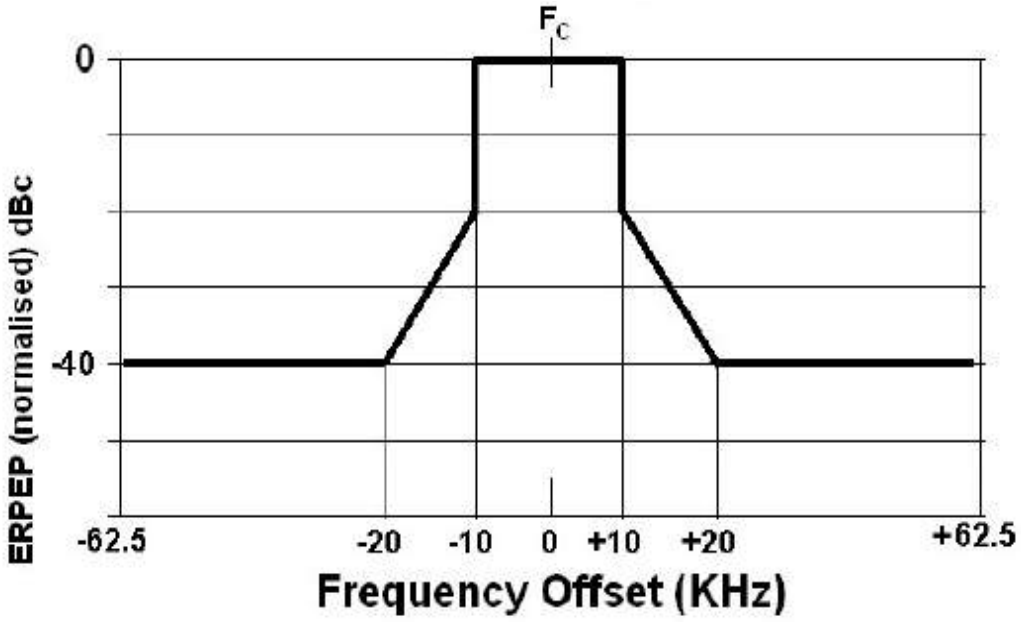

Figure 4: Emission mask

The mask is set as follows:

For ±10 kHz the limit is 0 dBc. From ±10 kHz to ±20 kHz the limit decreases linearly from -20 dBc to -40 dBc. From ±20 kHz to ±62,5 kHz the limit is -40 dBc.

2.7.2 Results

Pass – No emissions were above the limit line. See figure 35 and 36.

2.7.3 Limit

The transmission shall remain within the mask specified.

2.7.4 Equipment used

2, 12, 17

2.8 Clause 4.2.5: Transmitter transient behavior (output power)

Date of test	Jan 20, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

2.8.1 Method

The Transmitter transient behavior (output power) shall be as defined in EN 303 098-1, clause 8.5.1.

The transient behavior (output power) of the transmitter is determined by the time-dependency of the transmitter power when the transmitter output power is switched on and off. Within the scope of the present document, only the transmit power as a function of time is tested as shown in figure 5 and defined in table 8 where:

a) transmitter delay time (TA - T0) is the time between the start of the slot and the moment when the transmit power may exceed -50 dB of the steady-state power (PSS);

b) transmitter attack time (TB2 - TA) is the time between the transmit power exceeding -50 dBc and the moment when the transmit power maintains a level within +1,5 dB - 1 dB from PSS;

c) transmitter release time (TF - TE) is the time between the end flag being transmitted and the moment when the transmitter output power has reduced to a level 50 dB below PSS and remains below this level thereafter;

d) transmission duration (TF - TA) is the time from when power exceeds -50 dBc to when the power returns to and stays below -50 dBc.

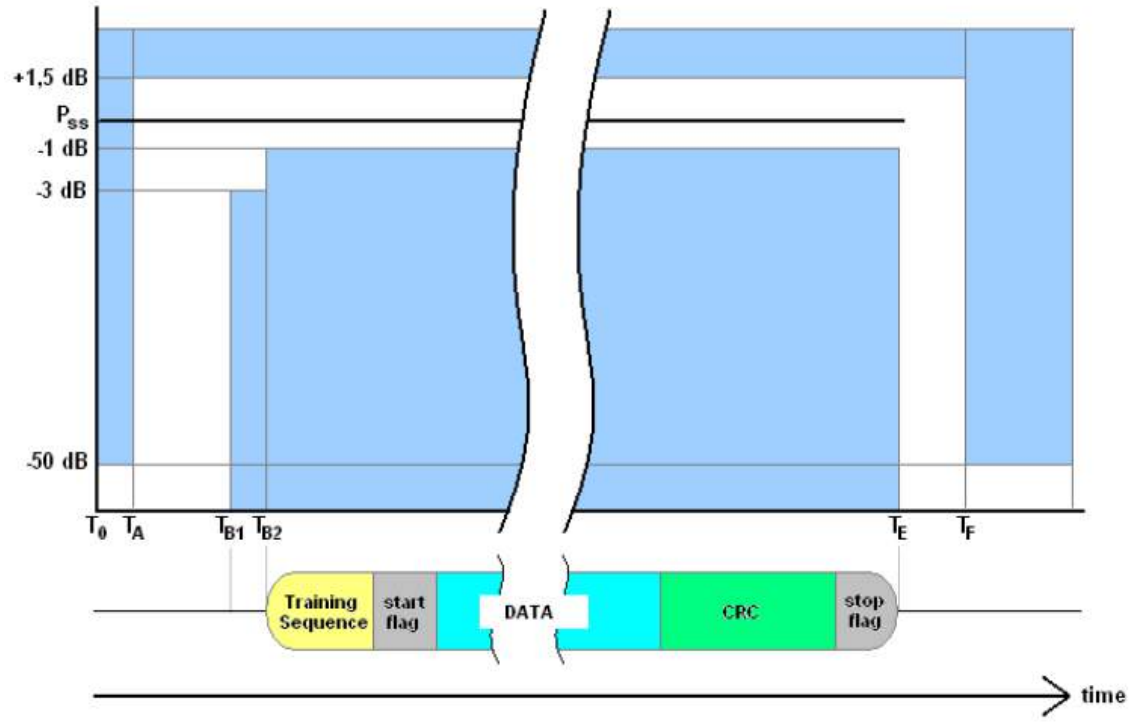

Figure 5: Power versus time mask

Reference		Bit periods	Time (ms)	Definition
T_0		0	0	Start of transmission slot. Power shall not exceed -50 dB of P_{SS} before T_0
T_A		0 to 6	0 to 0.625	T_A= point at which power exceeds -50 dB of P_{SS}
T_B	T_{B1}	6	0.625	Power shall be within +1.5 or -3 dB of P_{SS}
	T_{B2}	8	0.833	Power shall be within +1.5 or -1 dB of P_{SS}
T_E (includes 1 stuffing bit)		233	24.271	Power shall remain within +1.5 or -1 dB of P_{SS} during the period T_{B2} to T_E (see note)
T_F (includes 1 stuffing bit)		241	25.104	Power shall be ≤ -50 dB of P_{SS} and stay below this
T_G		256	26.667	Start of next transmission period
Note: There shall be no modulation of the RF after the termination of transmission (TE) until the power has reached zero and the next slot begins (TG)				

Table 4: Paragraph 2.8, limits

The measurement is made under normal conditions (see clause 6.7) for frequency AIS1 and repeated for AIS2. The transmitter shall be connected to an artificial antenna (see clause 6.4). The measurement shall be carried out by transmitting test signal number 1.

- A spectrum analyzer shall be used to make the measurements with the following preferred settings:
- Resolution bandwidth: 1 MHz
- Video bandwidth: 1 MHz

- Scan bandwidth: zero span
- Center frequency: Carrier frequency as measured in Paragraph 2.1
- Detector type: sample detector [single sweep mode]

The spectrum analyzer shall be synchronized to the nominal start time of the slot (T0), which is provided by a modified sample of the EUT submitted by the manufacturer (EN 303 098-1 , clause 6.5.4).

2.8.2 Results

Table 5 and 6 and figure 11 to 14

Reference AIS 1		Bit periods	Time (ms)	Power Pss (dB)	Pass/Fail
T_0		0	0	< -70 dBc	Pass
T_A		0 to 6	0 to 0.625		
T_B	T_{B1}	6	0.625	-0.4 dBc	Pass
	T_{B2}	8	0.833	-0.1 dBc	Pass
T_E (includes 1 stuffing bit)		233	24.271	0 dB	Pass
T_F (includes 1 stuffing bit)		241	25.104	< -60 dBc	Pass
T_G		256	26.667	< -70 dBc	Pass

Table 5: AIS1, output power

Reference AIS 2		Bit periods	Time (ms)	Power Pss (dB)	Pass/Fail
T_0		0	0	< -70 dBc	Pass
T_A		0 to 6	0 to 0.625		
T_B	T_{B1}	6	0.625	-0.4 dBc	Pass
	T_{B2}	8	0.833	-0.1 dBc	Pass
T_E (includes 1 stuffing bit)		233	24.271	0 dBc	Pass
T_F (includes 1 stuffing bit)		241	25.104	< -60 dBc	Pass
T_G		256	26.667	< -70 dBc	Pass

Table 6: AIS2, output power

2.8.3 Limit

The transmitter power shall remain within the mask shown in figure 5 and associated timings given in table 4.

2.8.4 Equipment used

2, 12, 17

2.9 Clause 4.2.6: Transmitter transient behavior (frequency deviation)

Date of test	Jan 20, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

2.9.1 Method

The Transmitter transient behavior (frequency deviation) shall be as defined in EN 303 098-1, clause 8.6.1.

The transient behavior (frequency deviation) of the transmitter is determined by the time-dependency of the frequency deviation during the transmission of an AIS message. A test to verify that the training sequence starts with a 0 and is a 0101 pattern of 24 bits. The peak frequency deviation is derived from the base band signal to verify modulation accuracy.

The measurement is made under normal and extreme conditions for frequency AIS1 and repeated for AIS2.

The transmitter shall be connected to an artificial antenna (EN 303 098-1, clause 6.4) comprising a power attenuator and a suitable measuring device either option A or option B of figure 6.

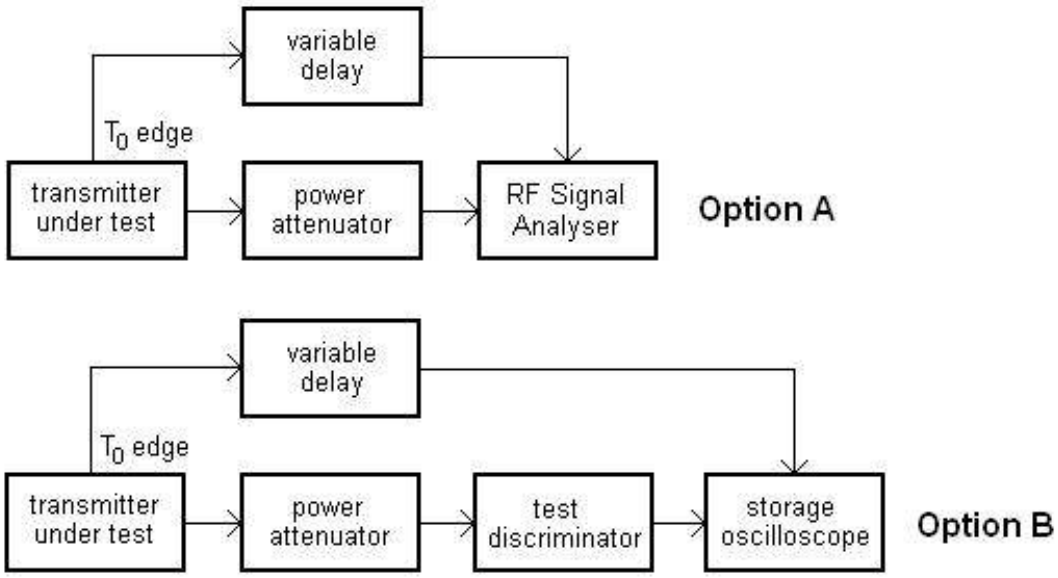

Figure 6: Measurement setup for modulation accuracy

NOTE: It is permissible to use data recovery filter between the test discriminator and the storage oscilloscope provided that it has a bandwidth of at least 100 KHz.

The measuring device shall be synchronized to the nominal start time of the first preamble bit (T_B), using

the modified sample of the EUT submitted by the manufacturer (EN 303 098-1, clause 6.5.4). Using test signal 2 the delay from the T_0 timing edge provided by EUT (EN 303 098-1, clause 6.5.4) is adjusted until the center position of the first data bit (bit 0) is determine as the trigger point T_B. Holding these settings test signal 2 is replaced with test signal 1 to confirm that TB has been correctly determined.

The transmitter shall be modulated with test signal number 2.

The deviation from the carrier frequency shall be measured as a function of time.

The transmitter shall be modulated with test signal number 1.

The deviation from the carrier frequency shall be measured as a function of time.

2.9.2 Results

Pass, See figures from 15 to 34

2.9.3 Limit

Measurement interval from centre to centre of each bit	**Test Signal 1**		**Test Signal 2**	
	Normal	**Extreme**	**Normal**	**Extreme**
Bit 0 to bit 1	<3400 Hz			
Bit 2 to bit 3	2400 Hz ±480 Hz			
Bit 4 to bit 31	2400 Hz ±240 Hz	2400 Hz ±480 Hz	2400 Hz ±240 Hz	2400 Hz ±480 Hz
Bit 32 to bit 199	1740 Hz ±175 Hz	1740 Hz ±350 Hz	2400 Hz ±240 Hz	2400 Hz ±480 Hz

Table 7: Paragraph 2.9, limits

2.9.4 Equipment used

2, 12, 17

2.10 Clause 4.2.7: Synchronization accuracy

Date of test	Jan 20, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

2.10.1 Method

The synchronization accuracy shall be as defined in EN 303 098-1, clause 8.7.1.

The synchronization accuracy defines the allowable time deviation including additive jitter in the transmission of an AIS message from ideal SOTDMA timing. The synchronization accuracy test verifies:

i. that the EUT transmission will be properly synchronized once UTC lock is acquired;

ii. that following UTC lock the EUT will continue properly synchronized transmission if UTC lock is subsequently lost.

This test requires analysis of the transmissions of the EUT in active mode. Care shall be taken to ensure that transmissions are not received by a nearby AIS receiver such as a coastal shore station. The EUT shall be programmed with valid UTC parameters as described in the user documentation or shall be precondition so as to have downloaded valid UTC parameters before the start of the test. The measurement is made under normal and extreme conditions (see clauses 6.8 and 6.9) for frequency AIS1 and repeated for AIS2.

The transmitter shall be connected to an artificial antenna (see clause 6.4). The EUT's GNSS receiver shall be connected to a GNSS simulator simulating more than 3 satellites and that additionally provides a UTC output and a 1 pps reference output with an accuracy of ±1uS or better (see figure 7).

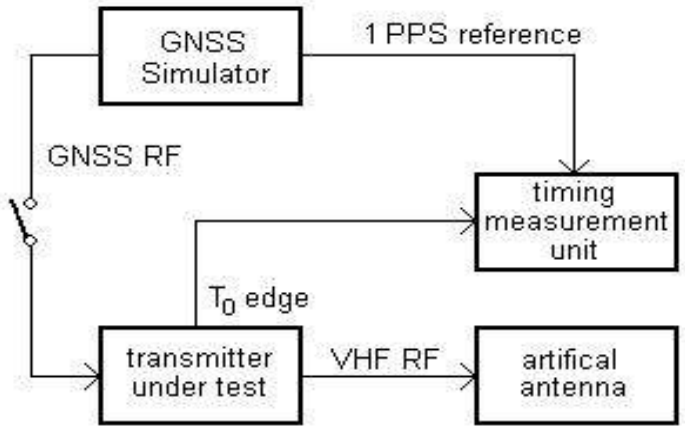

Figure 7: Measurement arrangement for synchronization accuracy

1. Activate the EUT in active mode with GNSS signal enabled and record transmissions for 40 minutes. After 40 minutes inhibit the GNSS signal and continue to record transmissions for a further 20 minutes.

2. Operate the test facility on the EUT with GNSS signal enabled and record transmissions for 6 minutes.
3. Operate the test facility on the EUT with GNSS signal inhibited and record transmissions for 6 minutes.

Whenever a transmission is recorded the associated timing difference between the EUT generated T0 (EN 303 098-1, clause 6.5.4) edge and the GNSS simulator generated 1 pps reference shall also be recorded. The EUT may pick any one of 75 slots in any two second period. The legitimate timings for both even and odd seconds are given in table 8.

Even	Odd	Even	Odd	Even	Odd	Even	Odd
26667	13333	293333	280000	560000	546667	826667	813333
53333	40000	320000	306667	586667	573333	853333	840000
80000	66667	346667	333333	613333	600000	880000	866667
106667	93333	373333	360000	640000	626667	906667	893333
133333	120000	400000	386667	666667	653333	933333	920000
160000	146667	426667	413333	693333	680000	960000	946667
186667	173333	453333	440000	720000	706667	986667	973333
213333	200000	480000	466667	746667	733333	-	-
240000	226667	506667	493333	773333	760000	-	-
266667	253333	533333	520000	800000	786667	-	-

Table 8: Legitimate T0 timings (µS) in any second

The UTC output from the simulator is used by the timing measurement unit to determine when even or odd slot timing measurements apply. The time difference between a legitimate slot start and the measured T0 shall be compared to the limit of EN 303 098, clause 8.7.2.

2.10.2 Results

Pass, worst case @ 9.9V , T=+55C, see Figure 10

2.10.3 Limit

Verify that in case 2.10.1(1) and 2.10.1(2) the EUT transmits a valid position within 5 minutes and that all transmissions with a valid position have a synchronization error (including additive jitter) of less than ±312 µs.

Verify that in case 2.10.1(1) Transmission synchronization error after 40 minutes may drift outside the limit of ±312 µs. The absolute maximum value of the synchronization error after 40 minutes shall be recorded in the test report.

Verify that in cases 2.10.1(3) the EUT does not transmit at all.

2.10.4 Equipment used

2,6,7,12,16,21

2.11 Clause 4.2.8: Spurious emissions

Date of test	Feb. 4, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

2.11.1 Method

The spurious emission shall be as defined in EN 303 098-1, clause 8.8.1.

Emission(s) on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products, and frequency conversion products, but exclude out-of-band emissions.

Spurious emissions shall be measured using a test site described in annex A.

The measurement shall be performed with the locating device in its standard position (annex A) and according to the requirements of clause A.4.

The method of measurement described in clause 8.3 shall be used to search for spurious emissions in the frequency band 30 MHz to 2 GHz, excluding the frequency band tested in clause 8.4.

The measuring receiver shall have a bandwidth of 100 kHz to 120 kHz.

The measurement shall only be performed under normal test conditions (see clause 6.8), the locating device being rotated until the maximum emission is detected. The measurement is also made when the locating device has been activated but is not transmitting.

2.11.2 Results

Pass in TX mode, see figure from 37 to 42.

Pass in STBY mode, see figure from 43 to 44.

2.11.3 Limit

The power of any spurious emission component when transmitting shall not exceed 25 µW between 108 MHz to 137 MHz, 156 MHz to 161,5 MHz, and 1 525 MHz to 1 610 MHz.

The power of any spurious emission component when not transmitting (even when activated) shall not exceed 2 nW between 30 MHz and 1 GHz and 20 nW between 1 GHz and 2 GHz.

2.11.4 Equipment used

From 23 to 41, as needed

3 RTCM 11901.1 with Amendment 1 & 2, (Feb 5, 2015) , Annex E : AIS MSLD

3.1 Clause E.7.1.1.1: Frequency error

3.1.1 Notes

The method and the limits required for this test are identical to the EN 303098-1 clause 4.2.1, whose test report is in paragraph 2.1 - page 11 of this document.

3.1.2 Additional tests in accordance with CFR47 part 2.1055

Temp (Deg C)	Supply (V)	Frequency Error (Hz)	
		AIS 1	AIS2
-20	9.9	-60	-200
-20	9	-60	-201
-20	5.8	-62	-198
-10	9.9	-82	-178
-10	9	-82	-177
-10	5.8	-84	-178
0	9.9	-106	-184
0	9	-107	-185
0	5.8	-107	-185
10	9.9	-129	-197
10	9	-130	-195
10	5.8	-130	-196
20	9.9	-154	-205
20	9	-155	-205
20	5.8	-155	-204
30	9.9	-180	-209
30	9	-180	-210
30	5.8	-182	-210
40	9.9	-200	-218
40	9	-201	-219
40	5.8	-199	-217
50	9.9	-224	-227
50	9	-224	-227
50	5.8	-224	-228
55	9.9	-237	-222
55	9	-237	-222
55	5.8	-235	-229

Table 9: Additional test, frequency

3.2 Clause E.7.2 : Conducted power

Date of test	Jan 20, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

3.2.1 Method

Connect the test unit to a power meter and record the conducted power at normal test conditions (P_{20}).

Repeat the test for extreme low and high temperatures and record the values obtained from these measurements (P_{-20} and P_{55}). Calculate the gain of the AU antenna using the following equation:

$G = P_r - P_{20} - P_d$

where

G is the antenna gain (dB);

P_r is the radiated power level as measured in E.7.3 (dBm);

P_{20} is the conducted power level measured at normal test conditions (dBm);

P_d is the power output difference given in E.6.2 (dB).

Hence G(dB) = 31 – 32 - 0 = -1 dB

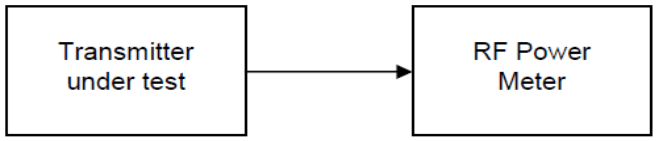

Figure 8: Conducted power measurement setup

3.2.2 Results

Channel	Normal	-20°C		55°C		Pass / Fail
		9.9V	5.8V	9.9V	5.8V	
AIS1	32.0 dBm	32.6 dBm	32.5 dBm	32.1 dBm	31.9 dBm	Pass
AIS1+G		31.6 dBm	31.5 dBm	31.1 dBm	30.9 dBm	Pass
AIS2	32.0 dBm	32.6 dBm	32.5 dBm	32.1 dBm	31.8 dBm	Pass
AIS2+G		31.6 dBm	31.5 dBm	31.1 dBm	30.8 dBm	Pass

Table 10: Paragraph 3.2, results

3.2.3 Limit

The conducted power corrected for antenna gain shall be at least 27dBm

3.2.4 Equipment used

1,10,11,12,16

3.3 Clause E.7.3.3 : Radiated power

Date of test	Feb 4, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

3.3.1 Method

This test is only required to be performed at normal test conditions and shall use an AU whose battery has been ON for a minimum of 11 h. If the test exceeds 1h, the battery may be replaced by another which has been pre-conditioned with at least 11 h of ON time.

Measurement of the radiated signals shall be made at a point 5 m or more from the AU.

The ground plane should be resting on the ground. For an AU that floats autonomously the ground plane should be extended so that it completely encloses and presents a snug fit to the AU. For an AU that attaches to a life jacket or other buoyant device the AU shall be mounted on the buoyant device and deployed in a representative manner on the ground plane with its antenna base at a height of 10 ± 3cm.

The measurement antenna shall have vertical polarization mounted on a non-conducting support with its cable lying horizontally on the boom and run back to the supporting mast. The other end of the measurement antenna cable shall be connected to a measurement receiver located at the foot of the mast.

The measurement shall be performed on a test site with a conductive ground plane of at least 3m diameter and the height of the measurement antenna shall be adjusted to obtain the maximum reading on the measurement receiver up to a maximum of 30° elevation.

Record the measured receive level at 4 different points in the azimuth plane by rotating the AU in steps of 90°. The minimum received level (PREC) shall be recorded and used to calculate the radiated power at the normal operating temperature using the following equation:

$P_r = P_{REC} - G_{REC} + L_C + L_P$

where

P_R is the radiated power level from the AU (dBm);

P_{REC} is the measured power level from the measurement receiver (dBm);

G_{REC} is the antenna gain of the search antenna (dB);

L_C is the receive system attenuator and cable loss (dB);

L_P is the free space propagation loss (dB)

3.3.2 Results

Channel	Power	Pass / Fail
AIS1	1.2 W	Pass
AIS2	1.2 W	Pass

Table 11: Paragraph 3.3, results

3.3.3 Limit

The radiated power shall be at least 27dBm

3.3.4 Equipment used

From 23 to 41, as needed

3.4 Clause E.7.3.1.4: Modulation spectrum slotted transmission

3.4.1 Notes

The method and the limits required for this test are identical to the EN 303098-1 clause 4.2.4, whose test report is in paragraph 2.7 - page 15 of this document.

3.5 Clause E.7.4: Transmitter transient behavior (frequency)

3.5.1 Notes

The method and the limits required for this test are identical to the EN 303098-1 clause 4.2.6, whose test report is in paragraph 2.9 - page 20 of this document.

3.6 Clause E.7.5: Transmitter transient behavior (output power)

3.6.1 Notes

The method and the limits required for this test are identical to the EN 303098-1 clause 4.2.5, whose test report is in paragraph 2.8 - page 17 of this document.

3.7 Clause E.7.6: Transmitter spurious emission

Date of test	Jan 20, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

3.7.1 Method

The measurements shall be made at the transmitter output at 50 Ω using a receiver or a spectrum analyzer with its bandwidth set to between 100 kHz and 120 kHz or its nearest setting thereto, over the following frequency bands:

108 MHz to 137 MHz, 156 MHz to 161,5 MHz, 406,0 MHz to 406,1 MHz and 1 525 MHz to 1 610 MHz.

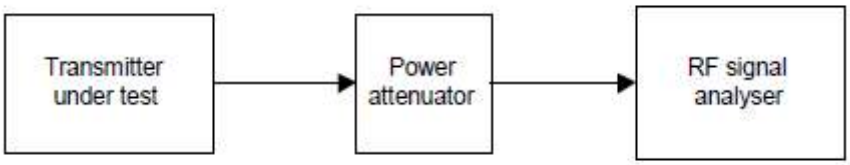

Figure 9: Spurious measurement setup

3.7.2 Results

Pass, see figure from 37 to 40

3.7.3 Limit

No signal level within these bands shall exceed 25 µW.

3.7.4 Equipment used

2,12,16

3.8 Clause E.8.1: Synchronization accuracy

3.8.1 Notes

The method and the limits required for this test are identical to the EN 303098-1 clause 4.2.7, whose test report is in paragraph 2.10 - page 22 of this document.

3.9 Clause E.8.2 Active mode tests

Date of test	Jan 21, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

3.9.1 Method

Activate the EUT in active mode and record transmissions for 40 minutes. Inhibit GNSS data and record transmissions for a further 20 minutes. Record the activation time of the EUT. For all transmitted messages record:

- transmission time (UTC);
- transmission slot;
- in-slot timing;
- transmission channel;
- message content.

The records will be evaluated in the following test items.

3.10 Results

See Tables from 20 to 45.

3.10.1.1 Message content of Message 1 - Required results (Clause E.8.2.1.3)

For position reports transmitted after 5 minutes and before 40 minutes the following is required (next page):

Item	Pass/Fail
a) Message ID = 1.	Pass
b) Repeat indicator = 0.	Pass
c) User ID as configured in the EUT.	Pass
d) Navigational status = 14.	Pass
e) Rate of turn = default.	Pass
f) SOG = actual SOG from GNSS receiver.	Pass
g) Position accuracy = according to the RAIM result if provided, otherwise 0.	Pass
h) Position = actual position from internal GNSS receiver.	Pass
i) Position is updated at least once per minute, for each burst.	Pass
j) COG = actual COG from internal GNSS receiver.	Pass
k) True heading = default.	Pass
l) Time stamp = actual UTC second (0...59).	Pass
m) Verify correct indication according to manufacturer's documentation.	Pass

Table 12: Message 1 content, Active mode

3.10.1.2 Message content of Message 14 - Required results (Clause E.8.2.1.4)

Item	Pass/Fail
a) Message ID = 14.	Pass
b) Repeat indicator = 0.	Pass
c) Source ID = as configured in the EUT.	Pass
d) Text = "MOB ACTIVE".	Pass

Table 13: Message 14 content, Active mode

3.10.1.3 Transmission schedule for Message 1 - Required results (Clause E.8.2.1.5)

Item	Pass/Fail
a) Verify that the AU has operated in sync mode 0 (UTC direct)	Pass
b) The AU transmits one burst of messages one per minute	Pass
c) The duration of burst is 14 s.	Pass
d) A burst consist of 8 messages	Pass
e) The transmissions in a burst are alternating between AIS 1 and AIS 2	Pass
f) Consecutive messages are 75 slots apart and on the other channel.	Pass
g) The same set of slots are used in each burst for 8 min.	Pass
h) A new set of slots is randomly selected after 8 min.	Pass
i) The first slot of the new set of slots is within the interval of 1 min ± 6 s from the first slot of the previous set of slots, that is the increment is randomly selected in the range 2025 to 2475 slots.	Pass
j) The manufacturer is to provide documentation on how the increment is selected randomly (See paragraph 3.10.1.7)	Pass

Table 14: Message 1, Transmission schedule, Active mode

3.10.1.4 Communication state for Message 1 - Required results (Clause E.8.2.1.6)

For position reports transmitted after 15 minutes and before 40 minutes the following applies:

Item	Pass/Fail
a) The SOTDMA communication state as defined for message 1 is used.	Pass
b) The sync state = 0.	Pass
c) The time-out starts with 7 for all messages of the first burst after a change in slots.	Pass
d) The time-out value is decremented by 1 for each frame.	Pass
e) The time-out value is reset to 7 after time-out = 0.	Pass
f) The sub message for time-out 3,5,7 = number of received stations (0).	Pass
g) The sub message for time-out 2,4,6 = slot number.	Pass
h) The sub message for time-out 1 = UTC hour and minute.	Pass
i) The sub message for time-out 0 = slot offset to the transmission slot in the next frame.	Pass

Table 15: Message 1 comm state, Active mode

3.10.1.5 Transmission schedule of Message 14 - Required results (Clause E.8.2.1.7)

Item	Pass/Fail
a) Message 14 is transmitted every 4 minutes.	Pass
b) The transmissions of Message 14 are alternating between AIS1 and AIS2.	Pass
c) Message 14 is transmitted in a Message 1 slot, replacing the Message 1, on the channel for which the Message 1 was scheduled.	Pass
d) Message 14 did not replace a Message 1 with a time-out value = 0.	Pass

Table 16: Message 14 comm state, Active mode

3.10.1.6 Transmission with lost GNSS - Required results (Clause E.8.2.1.8)

For position reports transmitted after 45 minutes the following applies:

Item	Pass/Fail
a) The EUT continues transmission.	Pass
b) The same transmission schedule is used as with GNSS data available.	Pass
c) Communication State Sync state = 3.	Pass
d) SOG = last valid SOG.	Pass
e) Position accuracy = low.	Pass
f) Position = last valid position.	Pass
g) COG = last valid COG.	Pass
h) Time stamp = 62.	Pass
i) RAIM-flag = 0.	Pass
j) Verify correct indication as per manufacturer's documentation.	Pass

Table 17: Transmission with lost GNSS

3.10.1.7 Random function

For the random function we use a linear congruential generator(LCG) . A linear congruential generator (LCG) is an algorithm that yields a sequence of pseudo-randomized numbers calculated with a discontinuous piece wise linear equation.

The random generator is 'seeded' with the last 4 digits of the MMSI (ID) code, that change with ID changes..

3.10.2 Equipment used

12,16,101,102

3.11 Clause 8.2.1.9 Test mode tests

Date of test	Jan 22, 2016
Temperature	Between 19 and 22 °C
Humidity	Between 40 and 70 % RH

3.11.1 Test Modes with EPFS data available (Clause E.8.2.1.11)

3.11.2 Method

Activate the EUT in test mode with EPFS data available and record transmissions.

3.11.3 Results

Pass, see tables from 46 to 59.

3.11.3.1 Transmission sequence (Clause E.8.2.1.13)

The following is required:

Item	Pass/Fail
a) The EUT starts transmission after valid GNSS data is available.	Pass
b) A single burst of 8 messages in the correct order and correctly populated as per clause B.2.	Pass
c) User ID as configured in the EUT.	Pass
d) Navigational status = 15 (not defined).	Pass
e) SOG = actual SOG from GNSS receiver.	Pass
f) Position accuracy = according to the RAIM result if provided, otherwise 0.	Pass
g) Position = actual position from internal GNSS receiver.	Pass
h) COG = actual COG from internal GNSS receiver.	Pass
i) Time stamp = actual UTC second (0...59).	Pass
j) The communication state time-out always = 0 with sub message = 0.	Pass
k) The transmission of Messages 1 and 14 stops after one burst of 8	Pass
l) The text message in Message 14 is "MOB TEST".	Pass
m) Verify correct indication as per manufacturer's documentation.	Pass

Table 18: Test Modes with EPFS data available requirements

3.11.4 Test Modes without EPFS data available

3.11.5 Method

Activate the EUT in test mode with no EPFS data available and record transmissions.

3.11.6 Results

Pass.

3.11.6.1 Transmission sequence (Clause E.8.2.1.16)

The following is required:

Item	Pass/Fail
a) The EUT does not transmit within 5 minutes.	Pass

Table 19: Test Modes without EPFS data available requirements

3.12 Equipment used

12,16,101,102

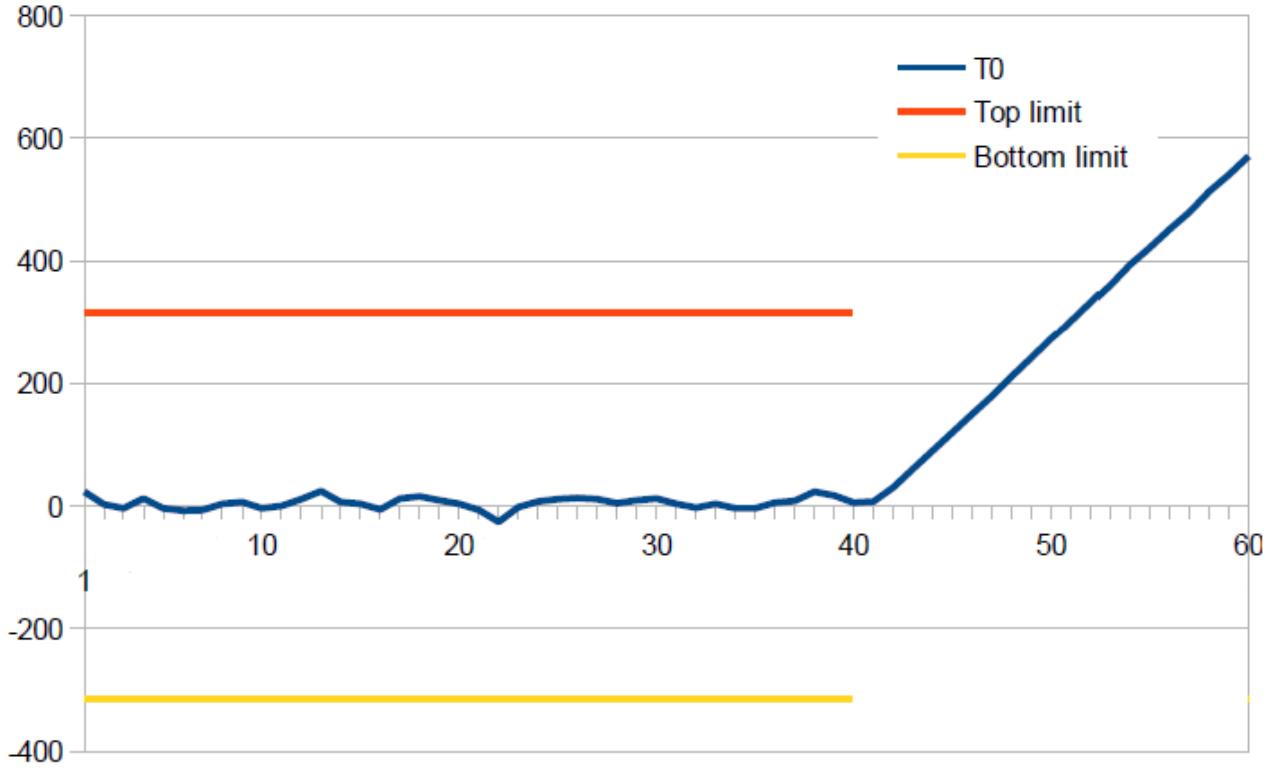

Figure 10: Synchronization accuracy, worst case

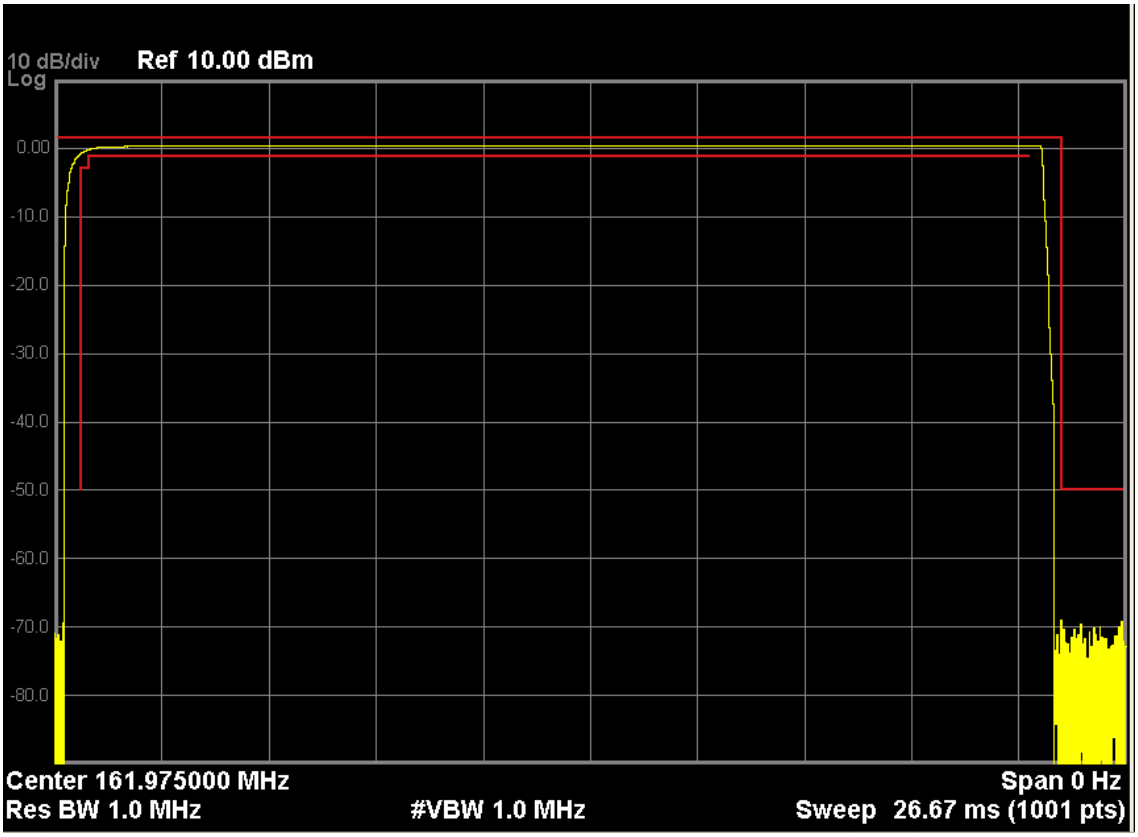

Figure 11: Transmitter transient behavior at AIS1 frequency under normal conditions

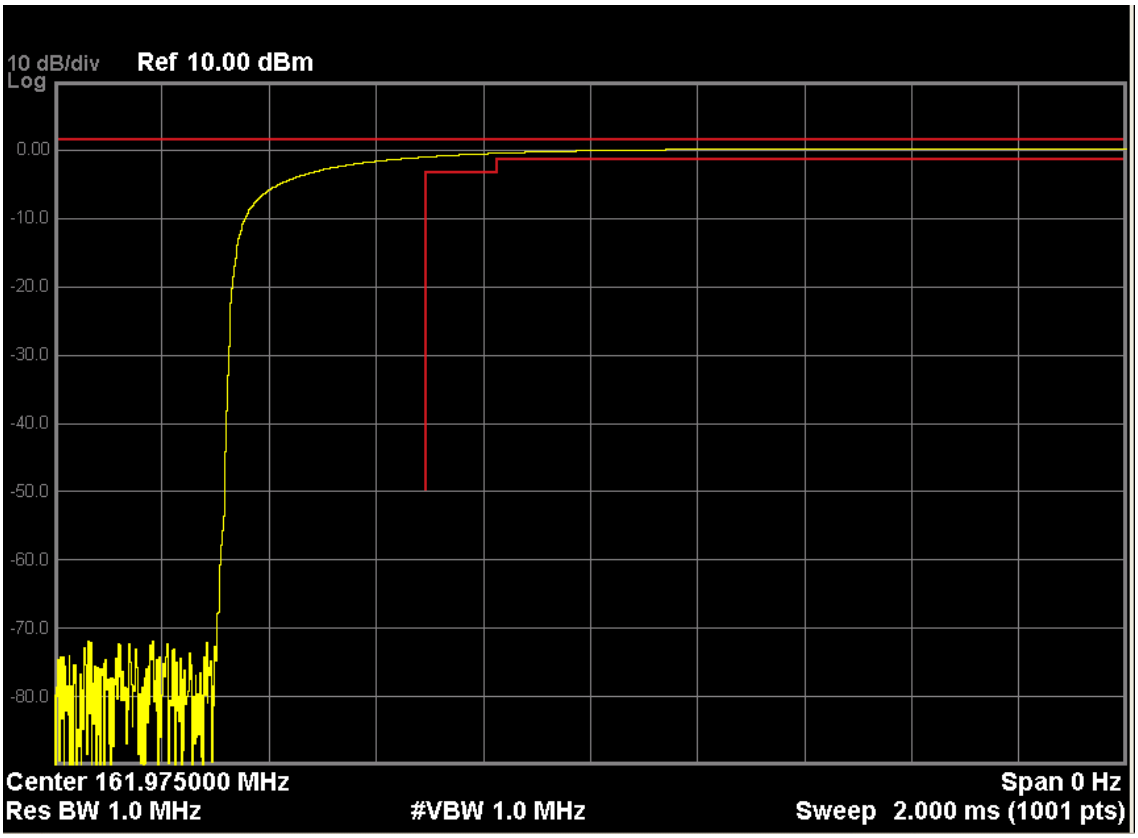

Figure 12: Close up showing first 2mS of ramp. (See figure 11)

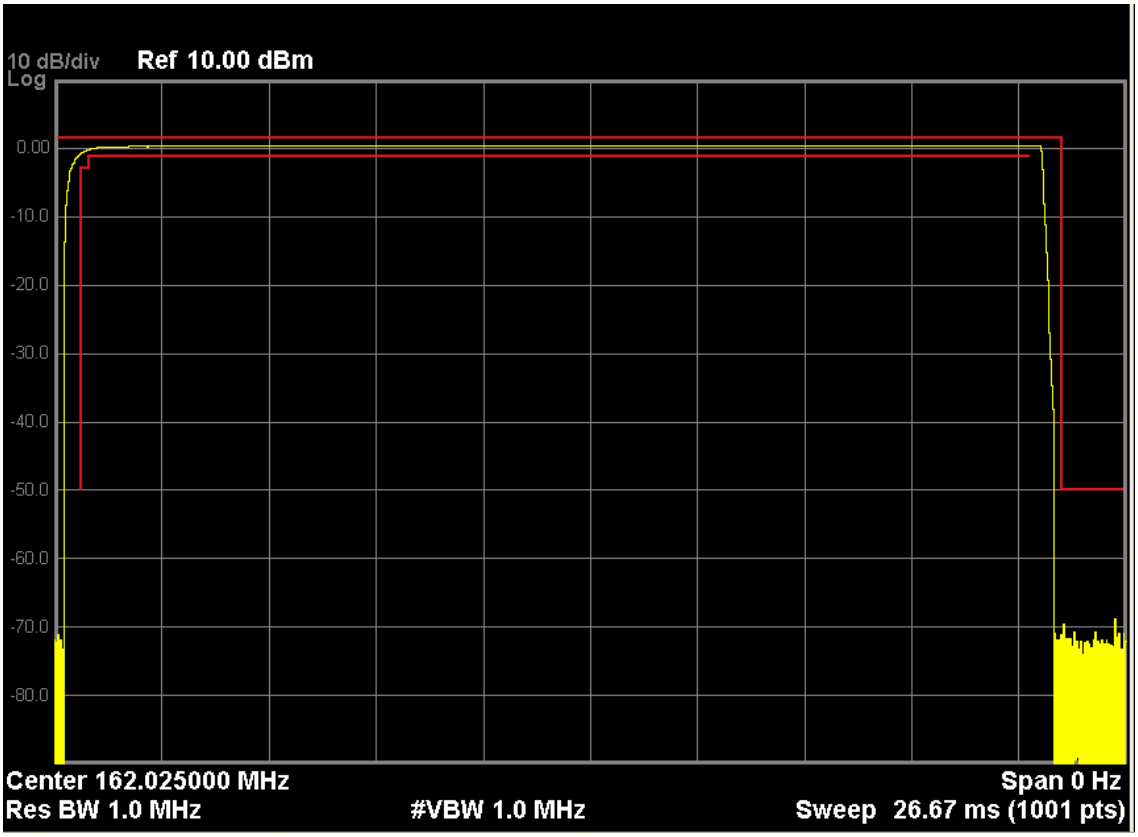

Figure 13: Transmitter transient behavior at AIS2 frequency under normal conditions

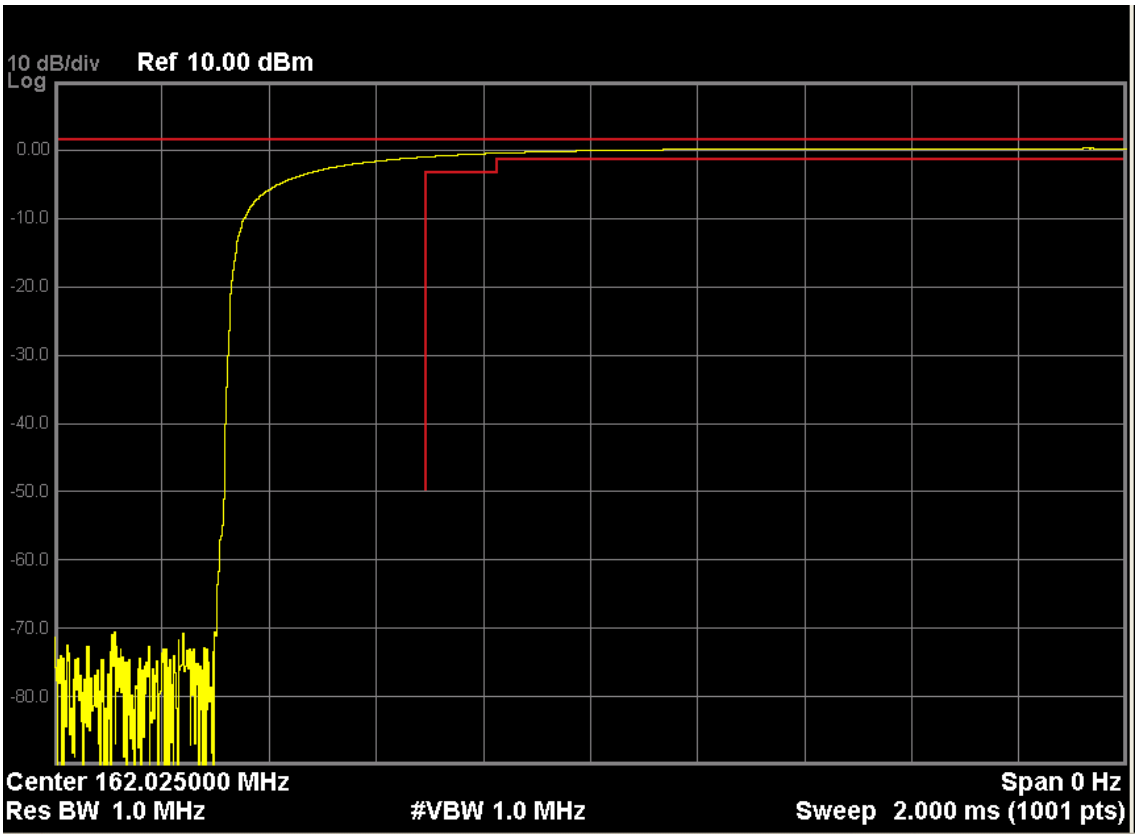

Figure 14: Close up showing first 2mS of ramp. (See figure 13)

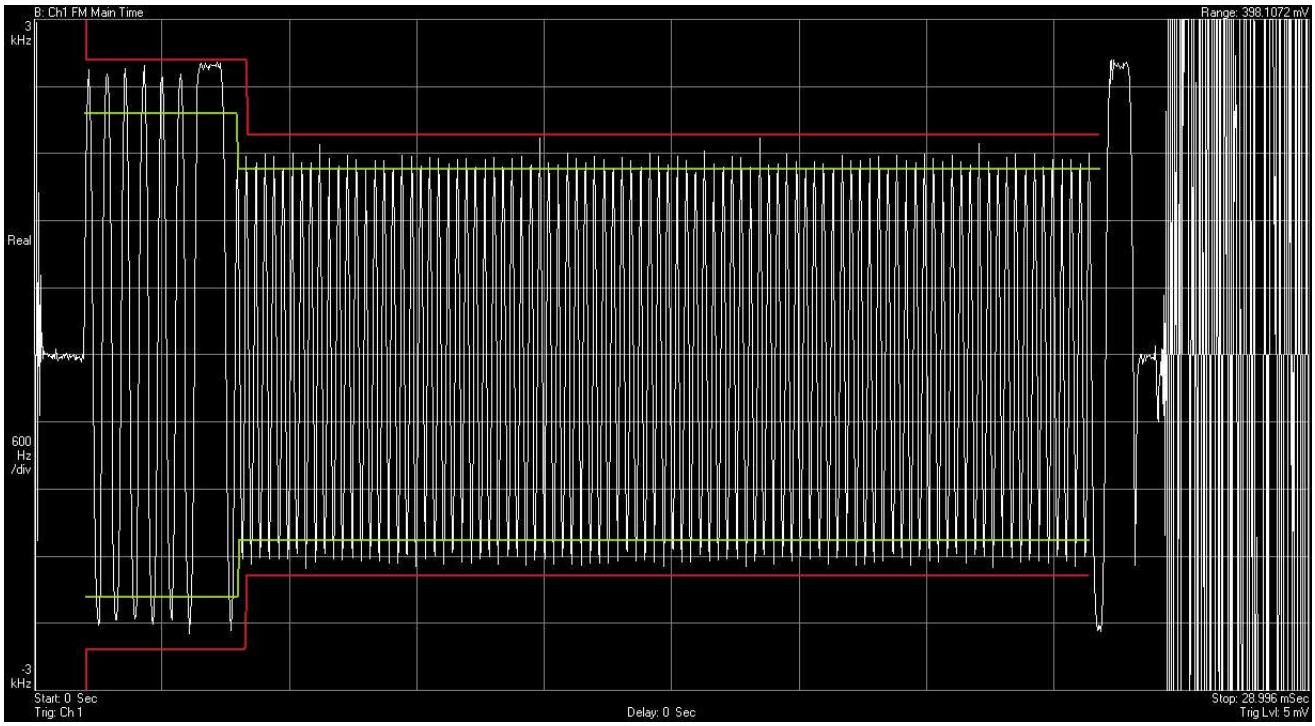

Figure 15: AIS1 , normal conditions, signal test 1

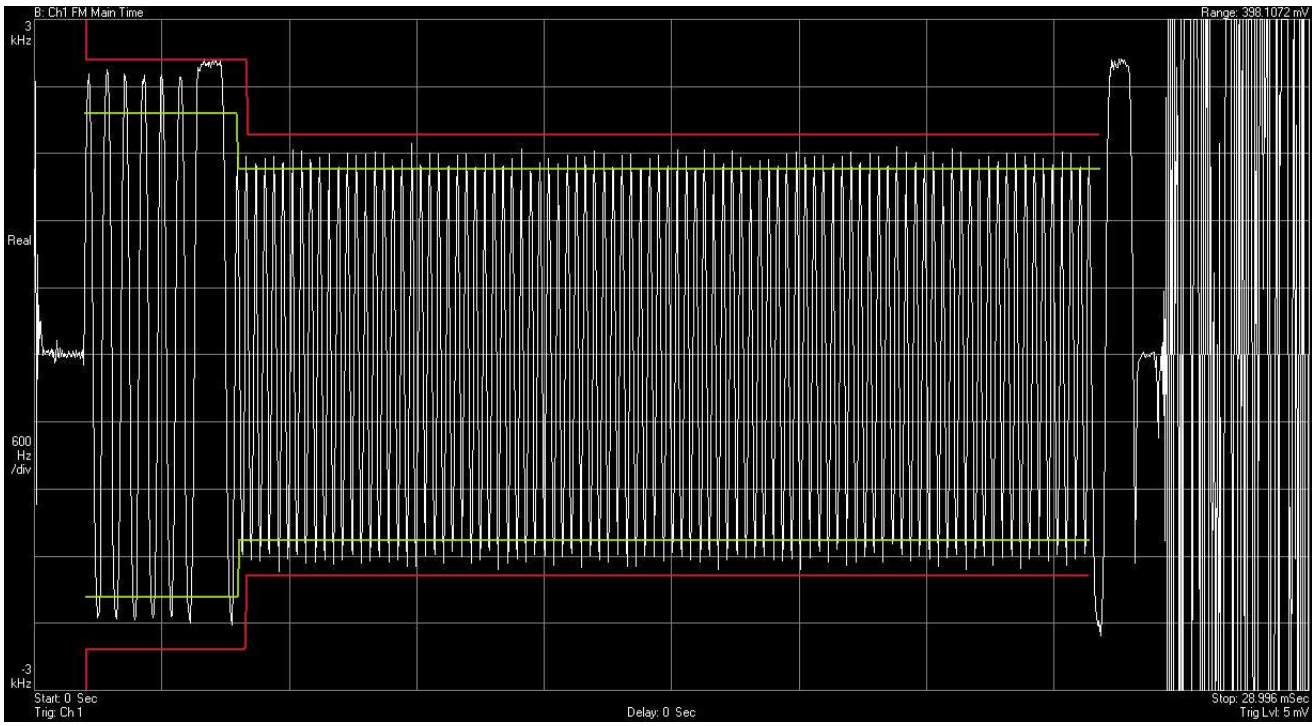

Figure 16: AIS2 , normal conditions, signal test 1

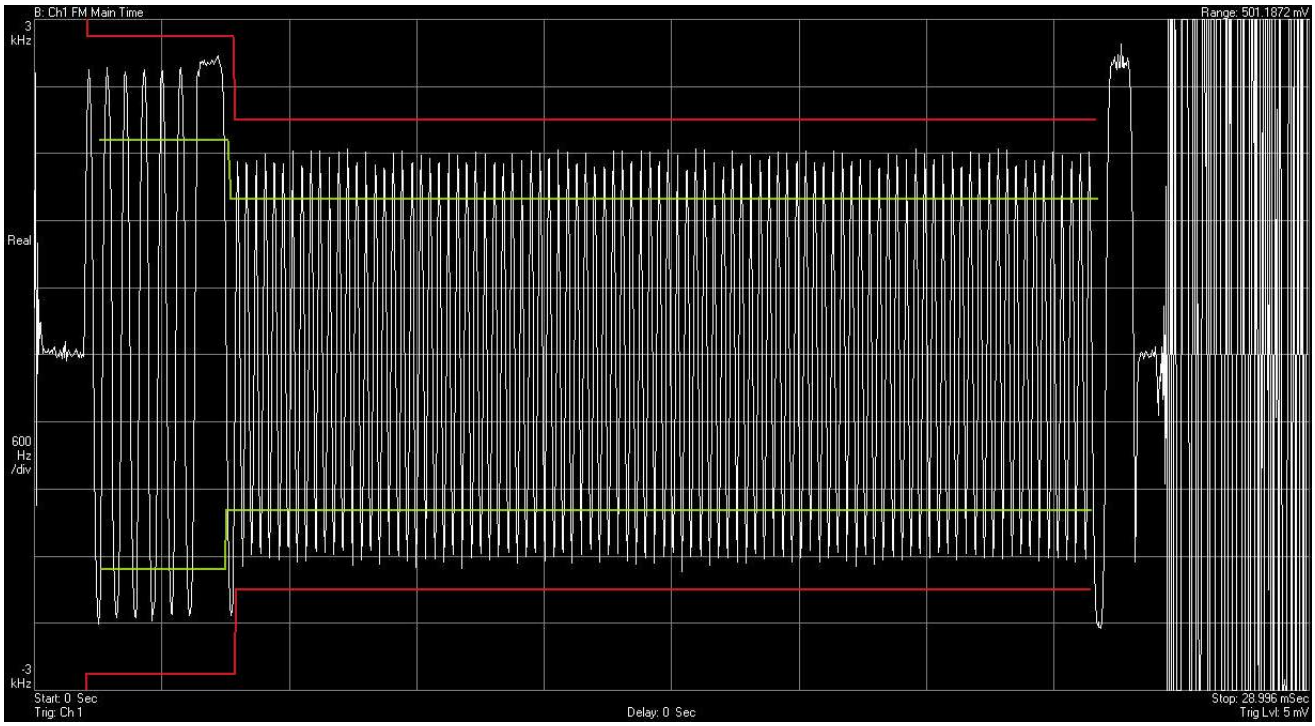

Figure 17: AIS1 , 5.8 V , Extreme temp. +55C , signal test 1

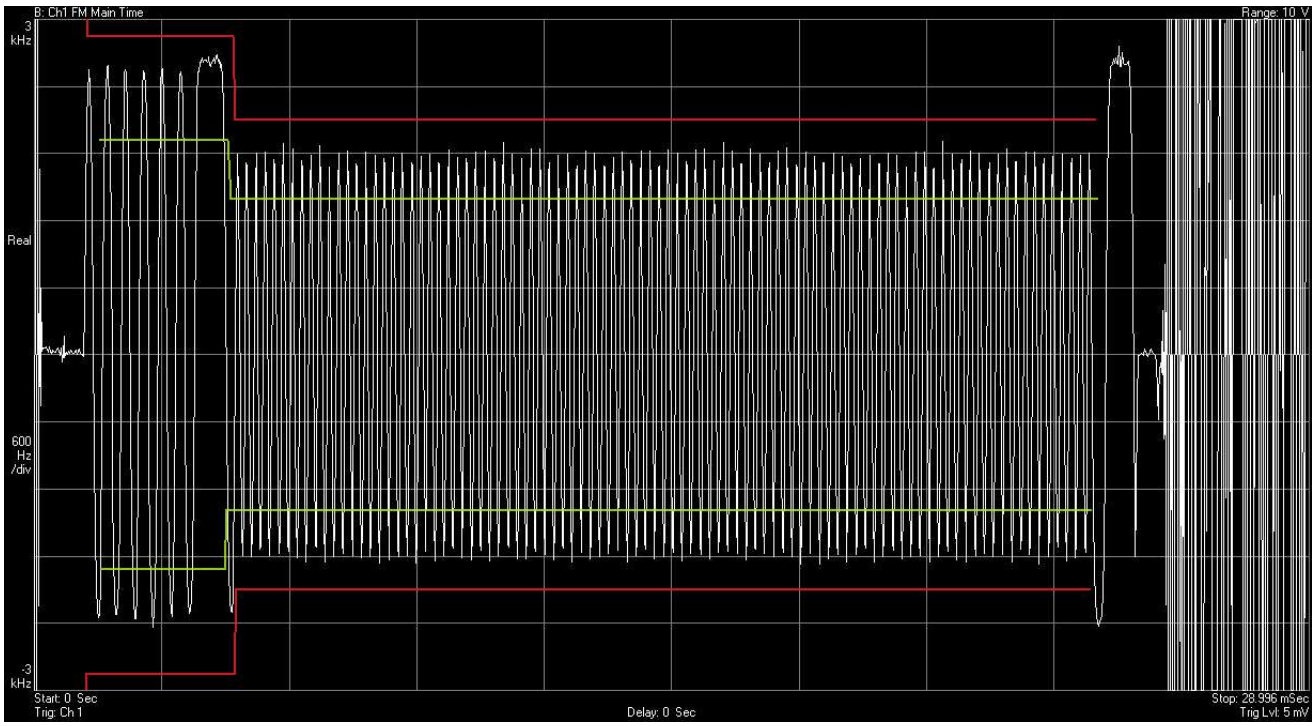

Figure 18: AIS2 , 5.8 V , Extreme temp. +55C , signal test 1

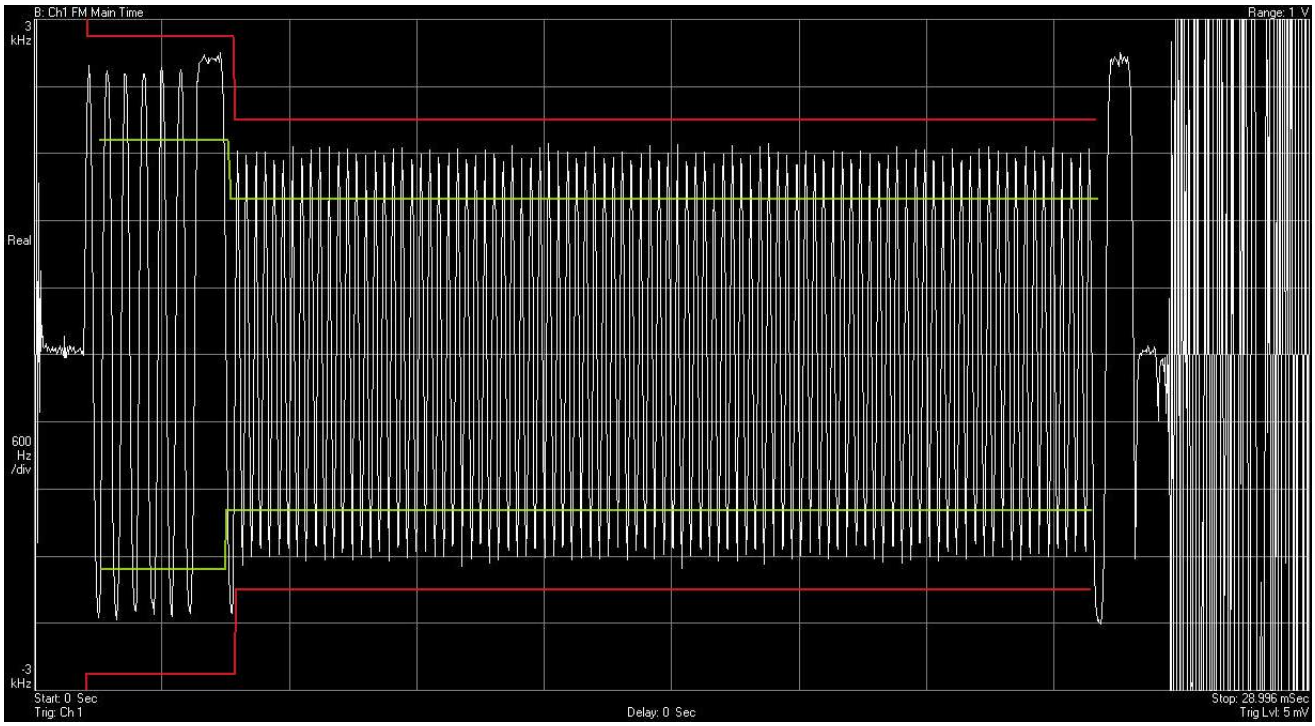

Figure 19: AIS1 , 9.9 V , Extreme temp. +55C , signal test 1

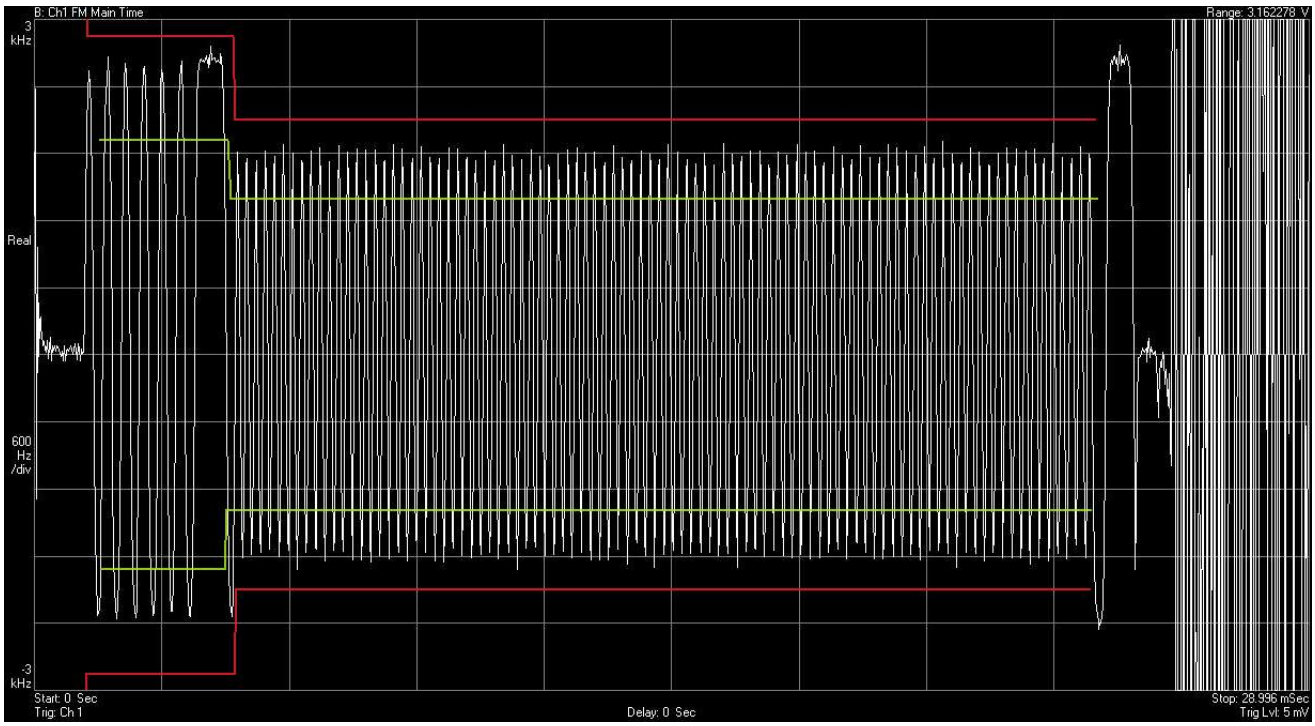

Figure 20: AIS2 , 9.9 V , Extreme temp. +55C , signal test 1

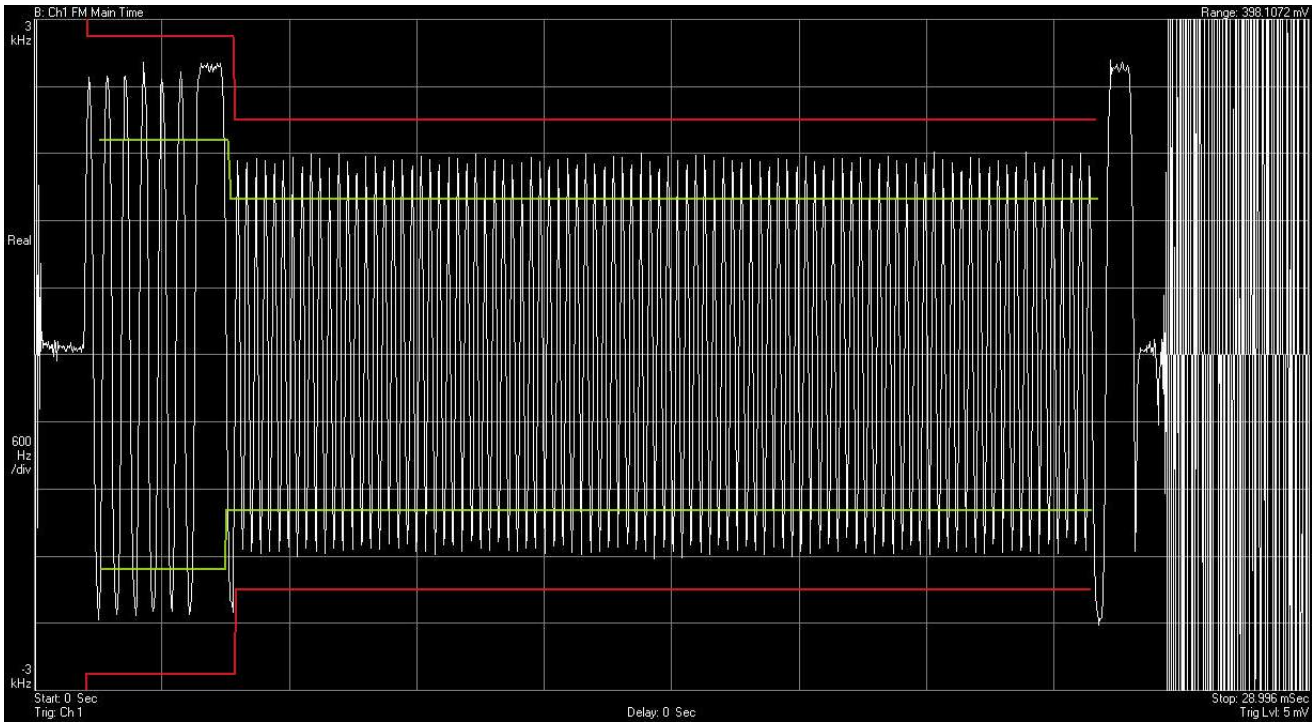

Figure 21: AIS1 , 5.8 V , Extreme temp. -20C , signal test 1

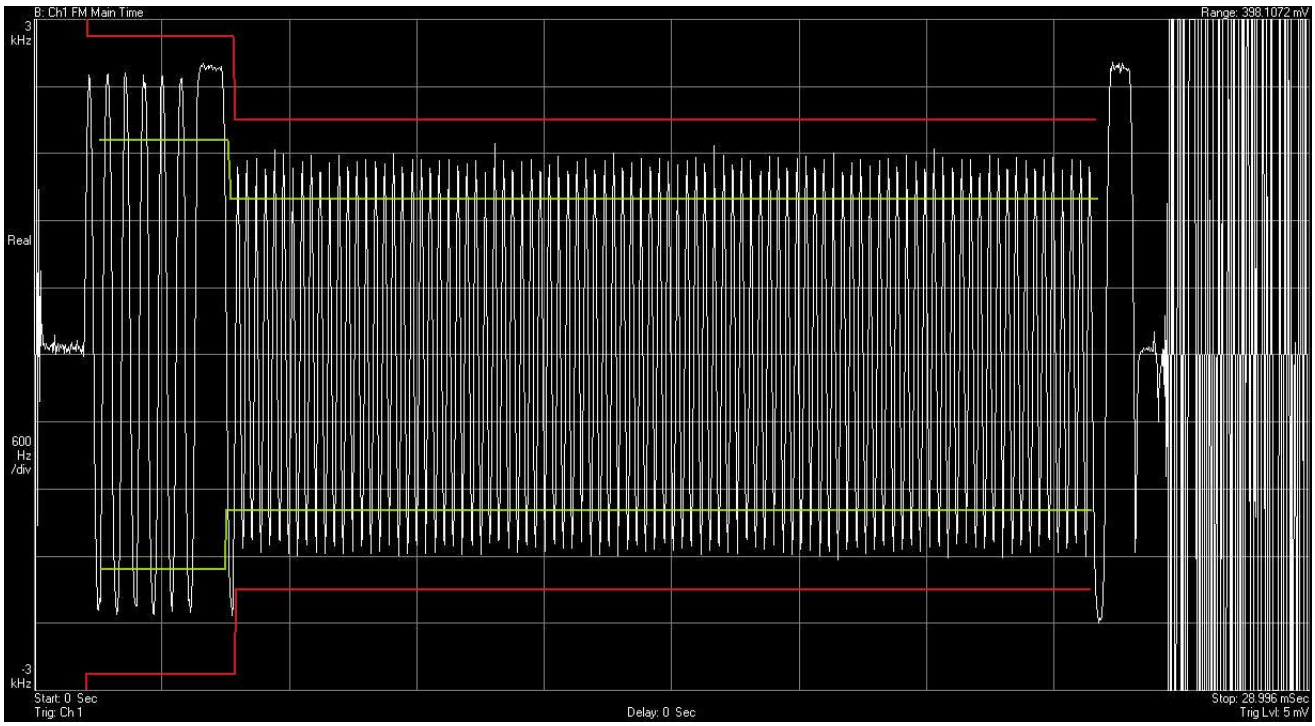

Figure 22: AIS2 , 5.8 V , Extreme temp. -20C , signal test 1

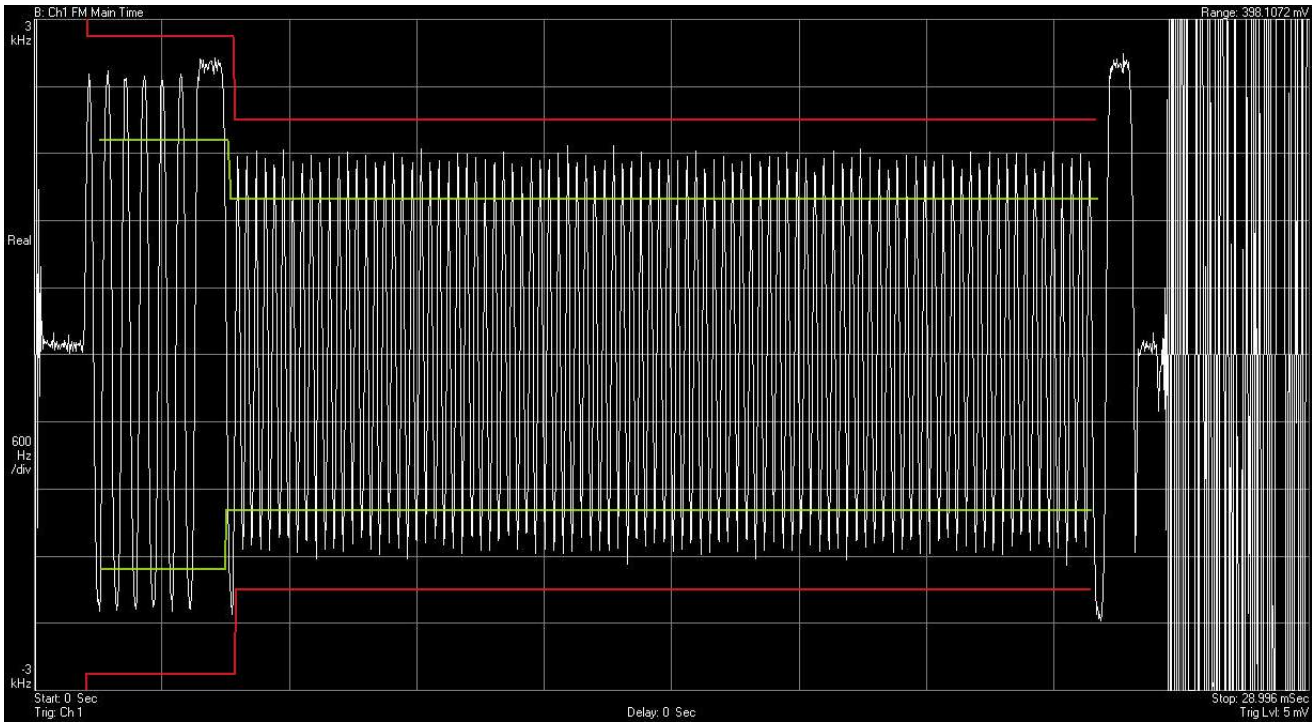

Figure 23: AIS1 , 9.9 V , Extreme temp. -20C , signal test 1

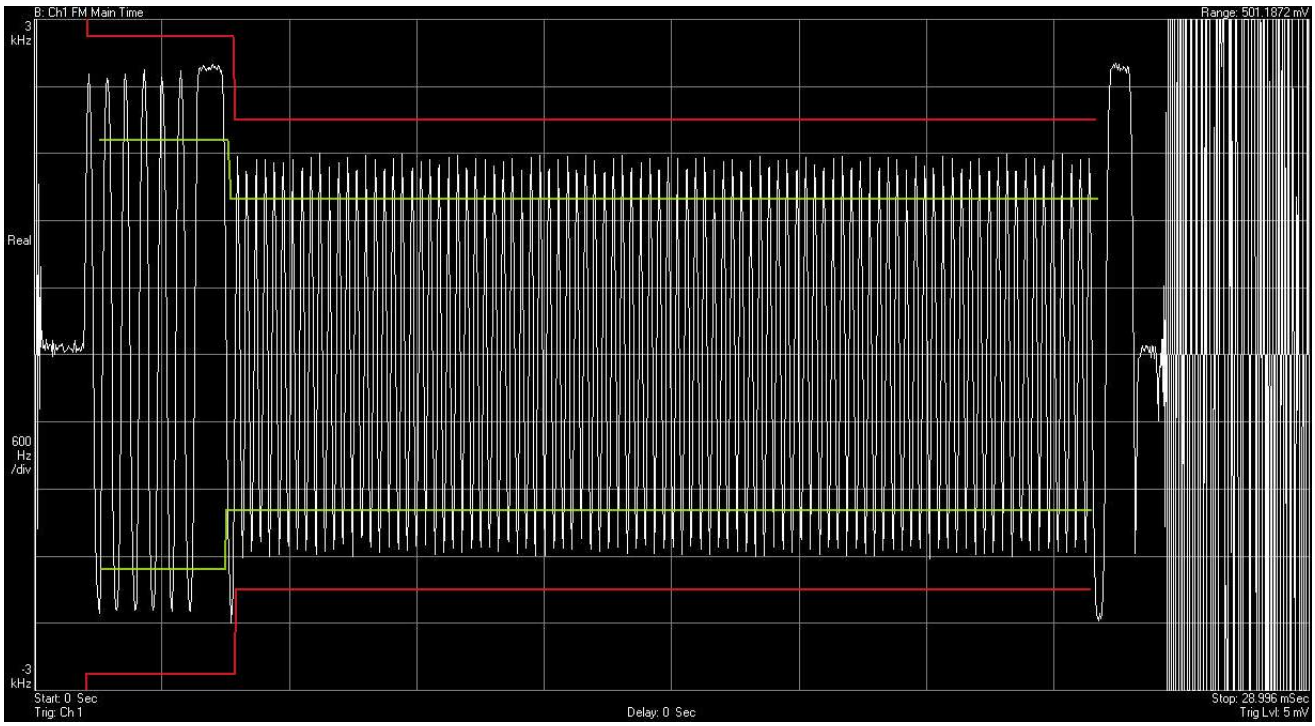

Figure 24: AIS2 , 9.9 V , Extreme temp. -20C , signal test 1

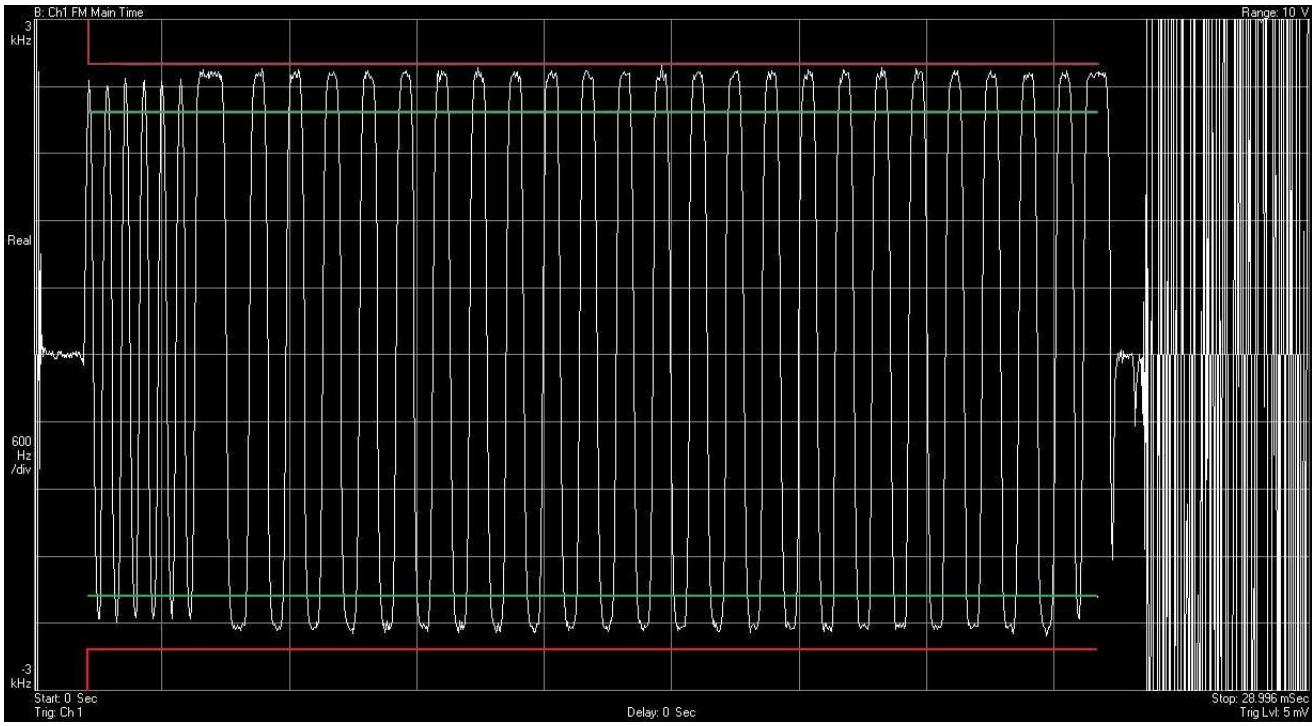

Figure 25: AIS1 , normal conditions, signal test 2

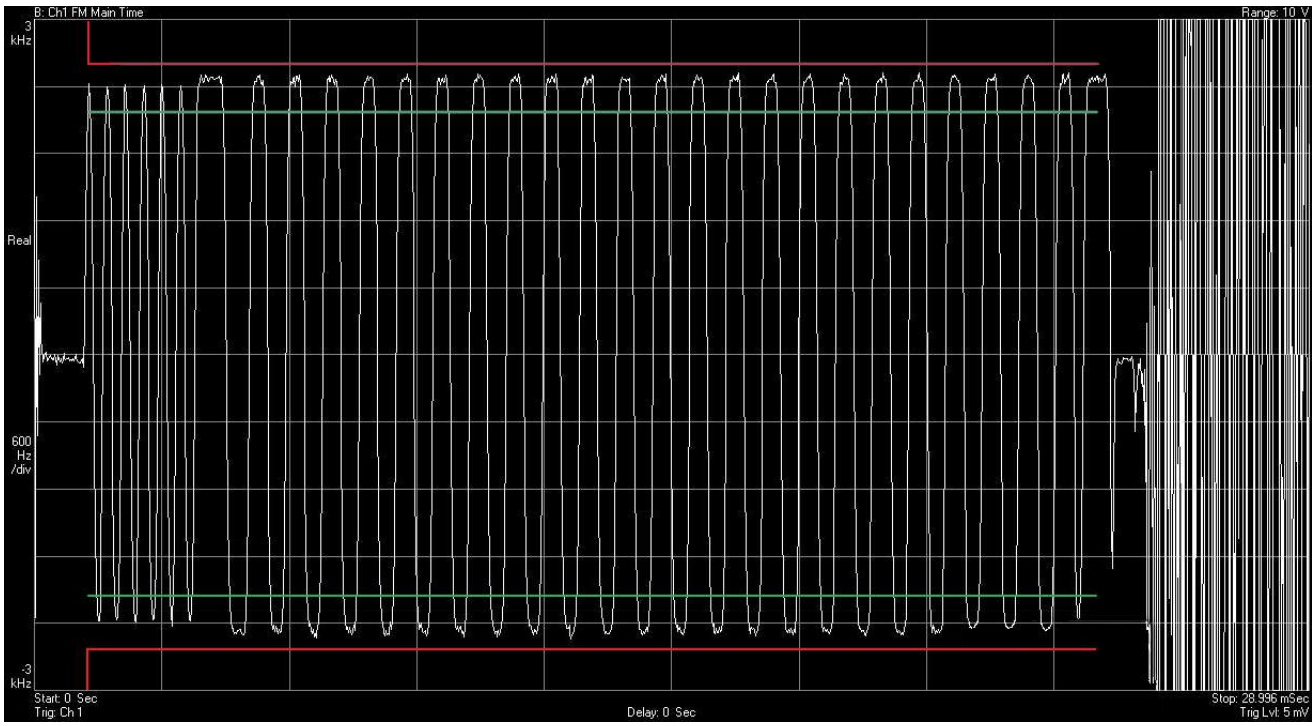

Figure 26: AIS2 , normal conditions, signal test 2

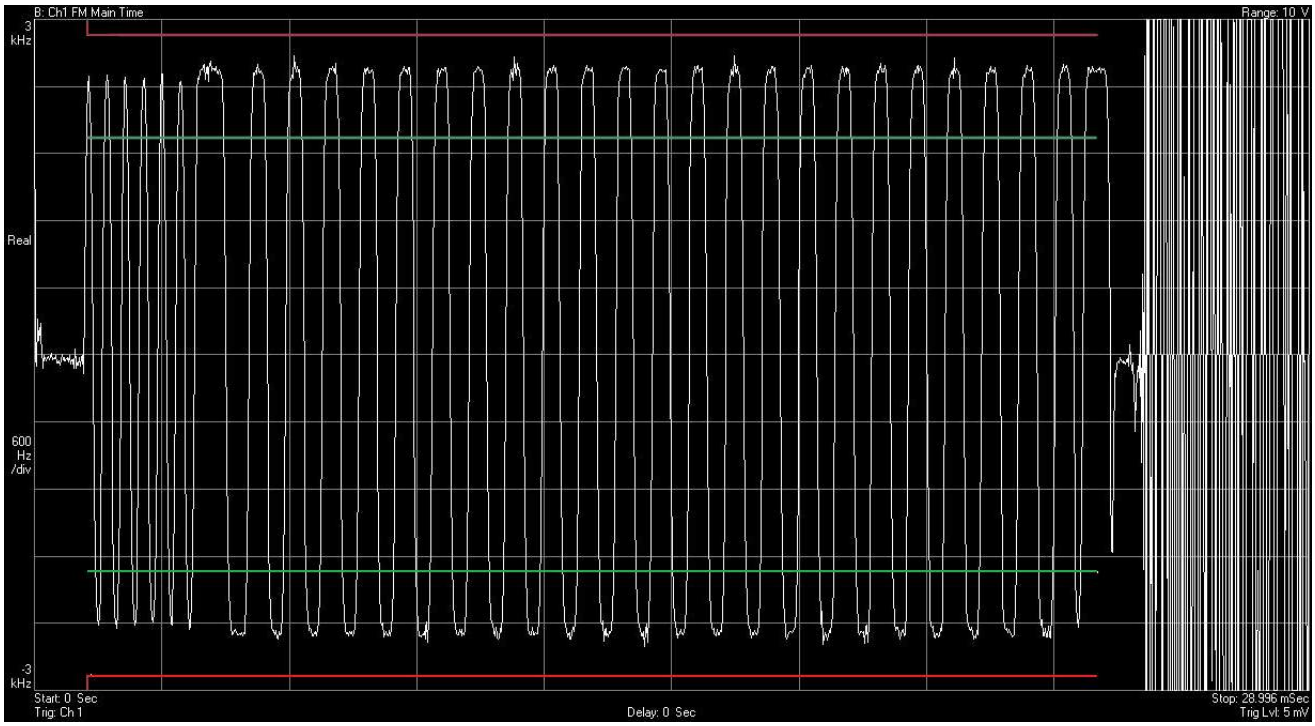

Figure 27: AIS1 , 5.8 V , Extreme temp. +55C , signal test 2

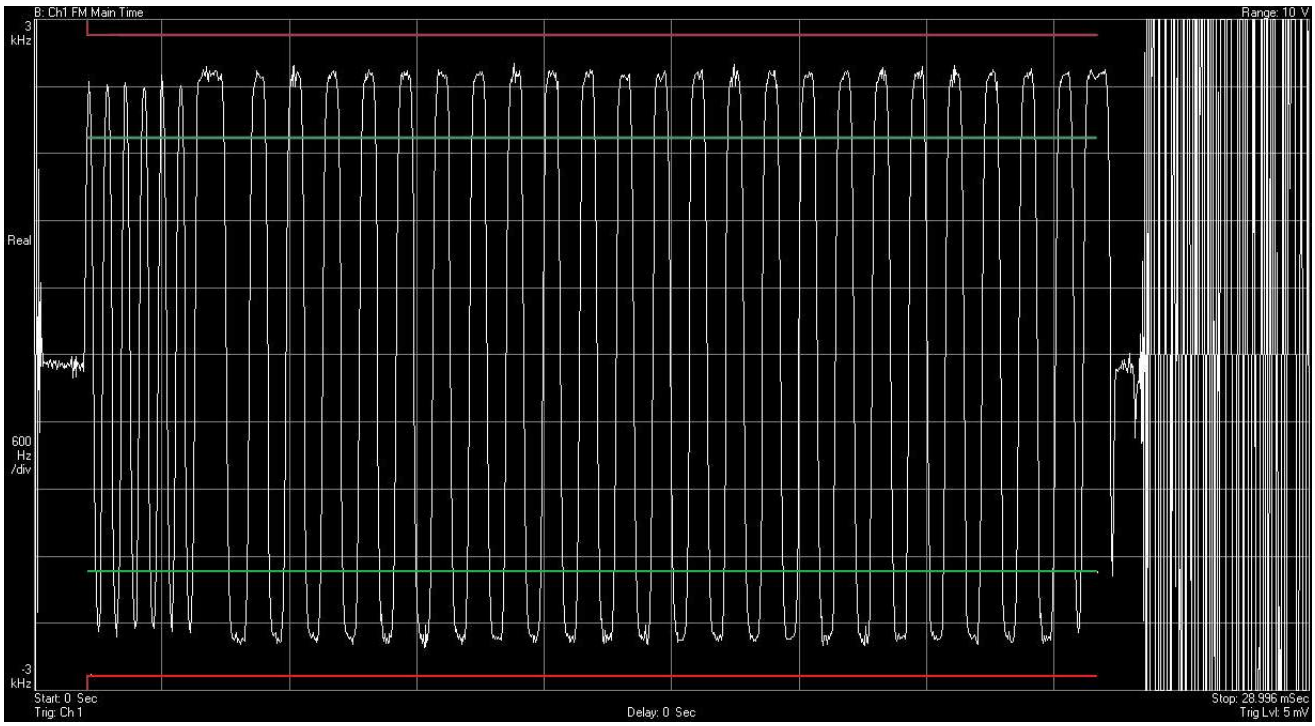

Figure 28: AIS2 , 5.8 V , Extreme temp. +55C , signal test 2

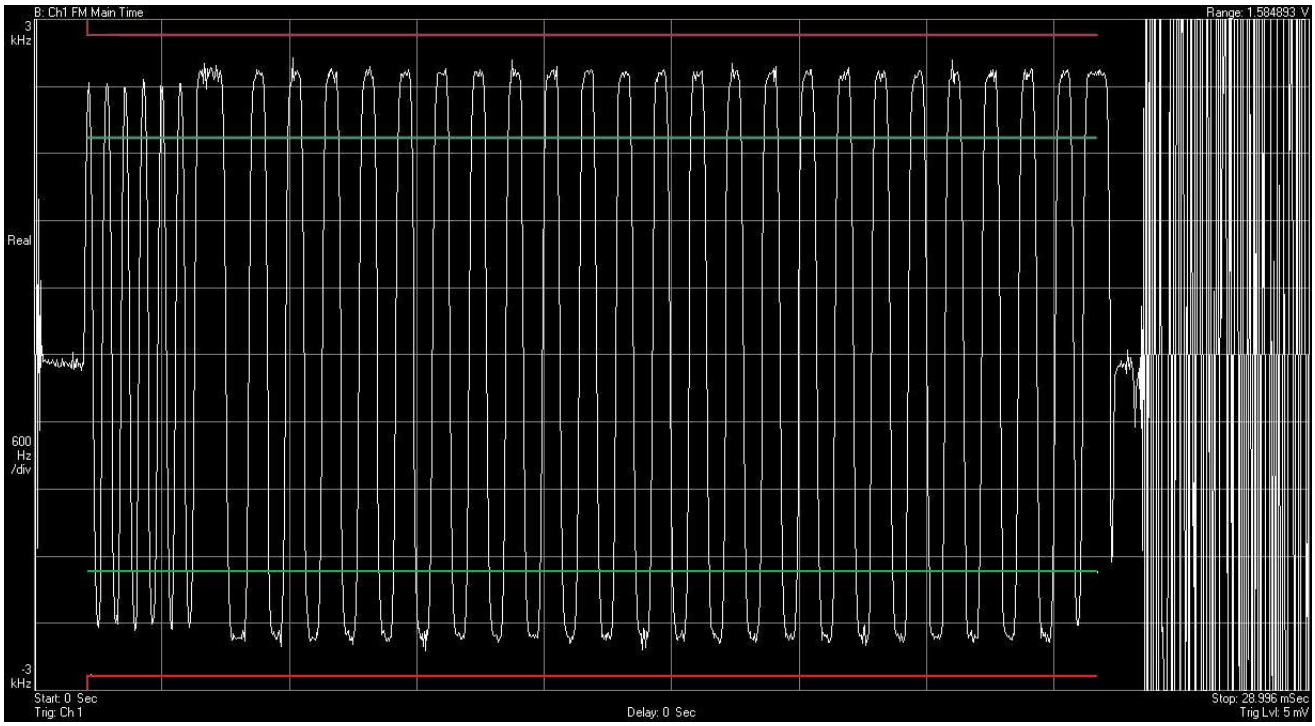

Figure 29: AIS1 , 9.9 V , Extreme temp. +55C , signal test 2

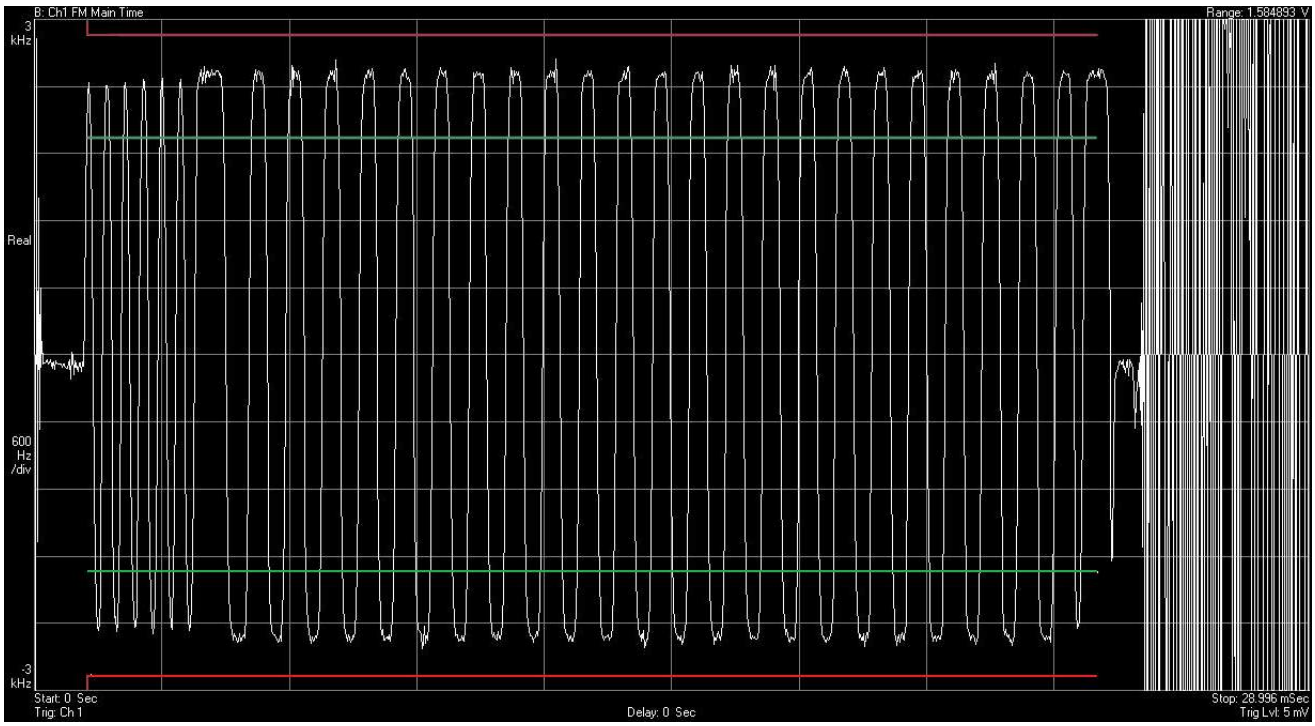

Figure 30: AIS2 , 9.9 V , Extreme temp. +55C , signal test 2

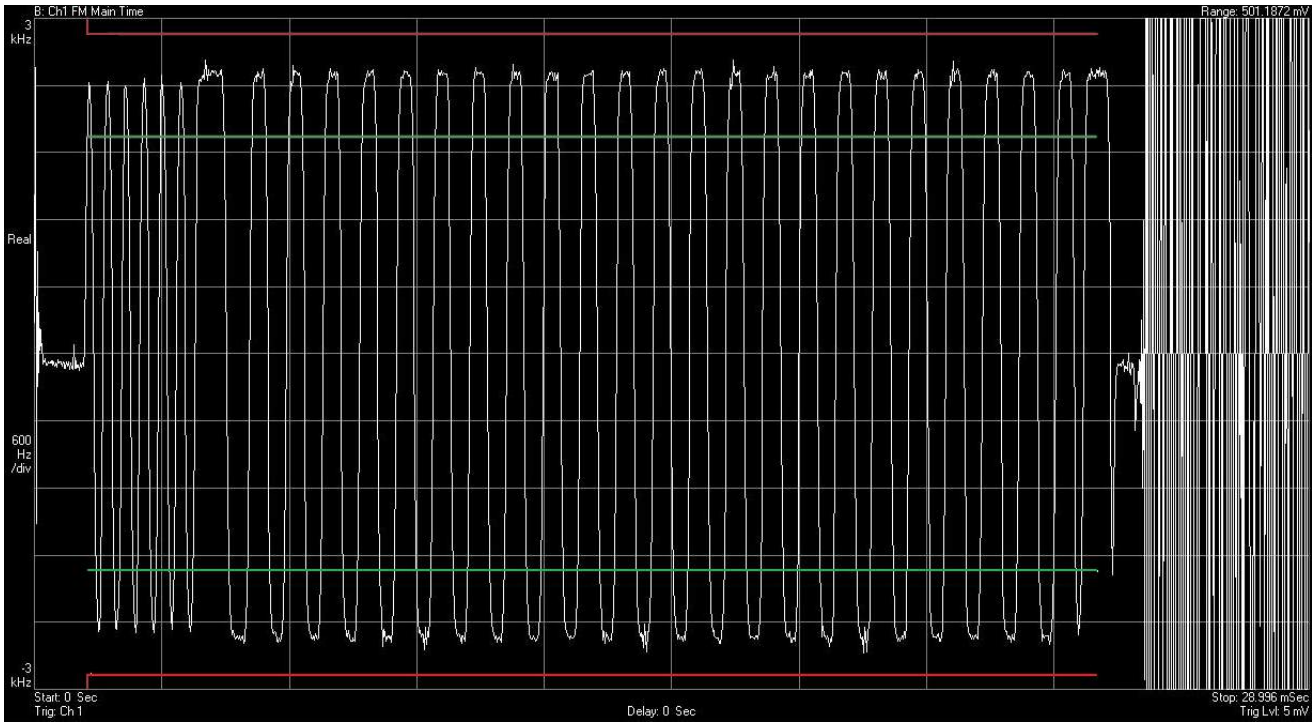

Figure 31: AIS1 , 5.8 V , Extreme temp. -20C , signal test 2

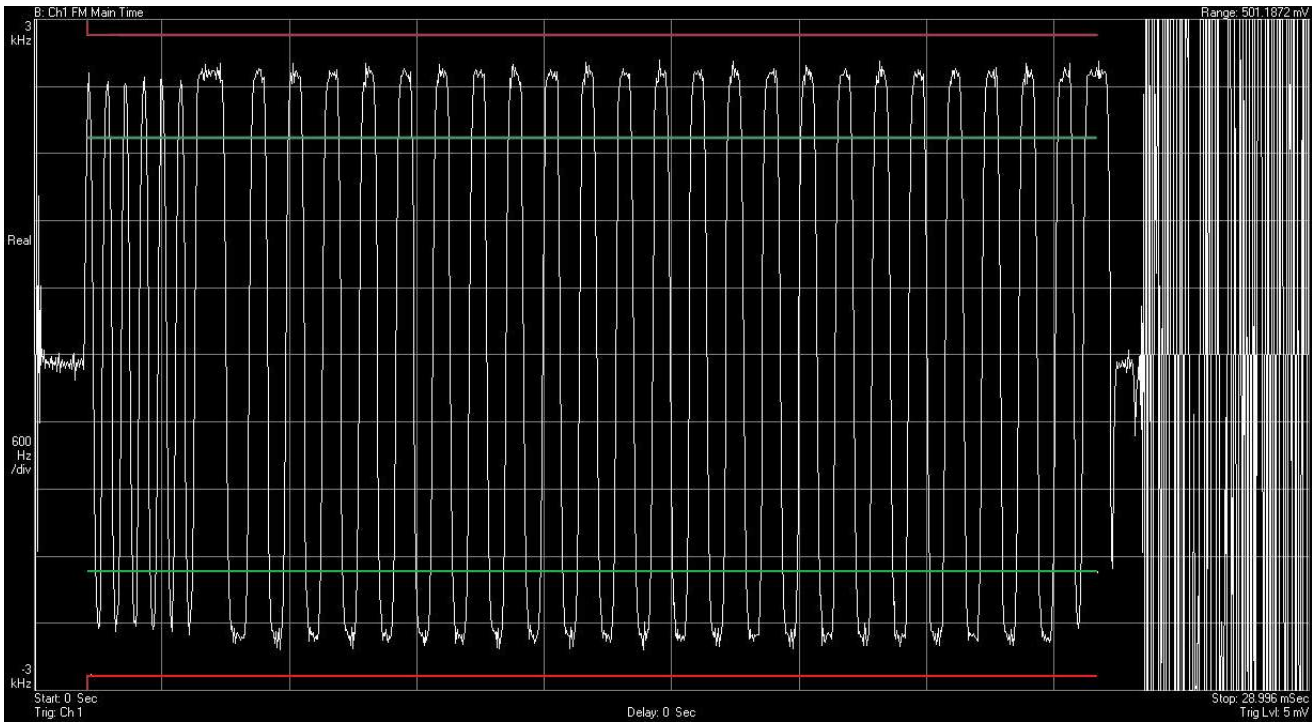

Figure 32: AIS2 , 5.8 V , Extreme temp. -20C , signal test 2

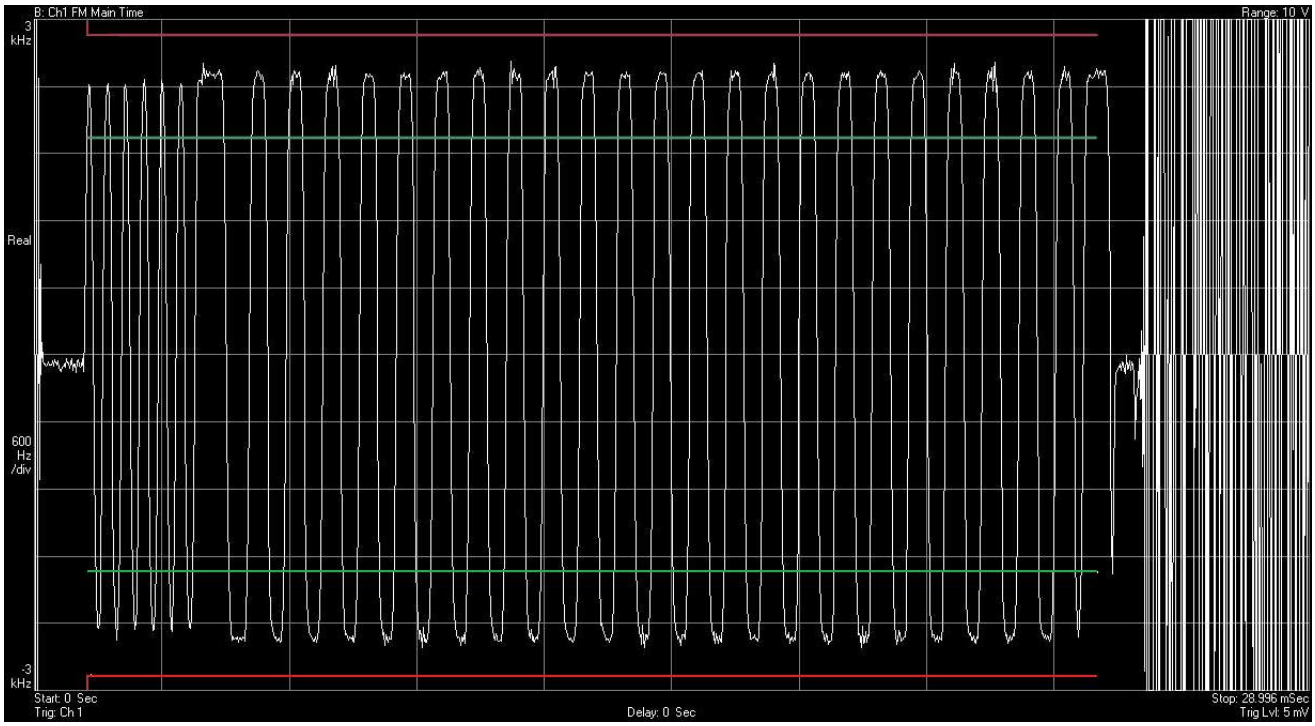

Figure 33: AIS1 , 9.9 V , Extreme temp. -20C , signal test 2

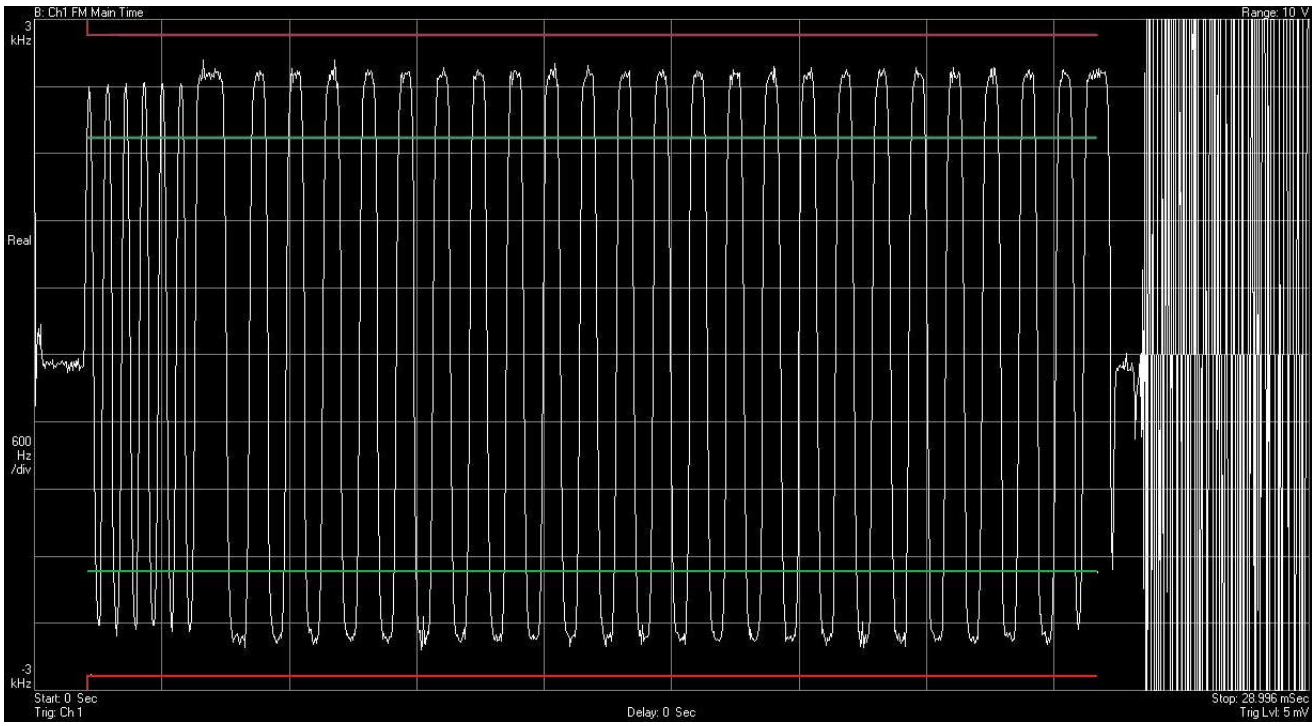

Figure 34: AIS2 , 9.9 V , Extreme temp. -20C , signal test 2

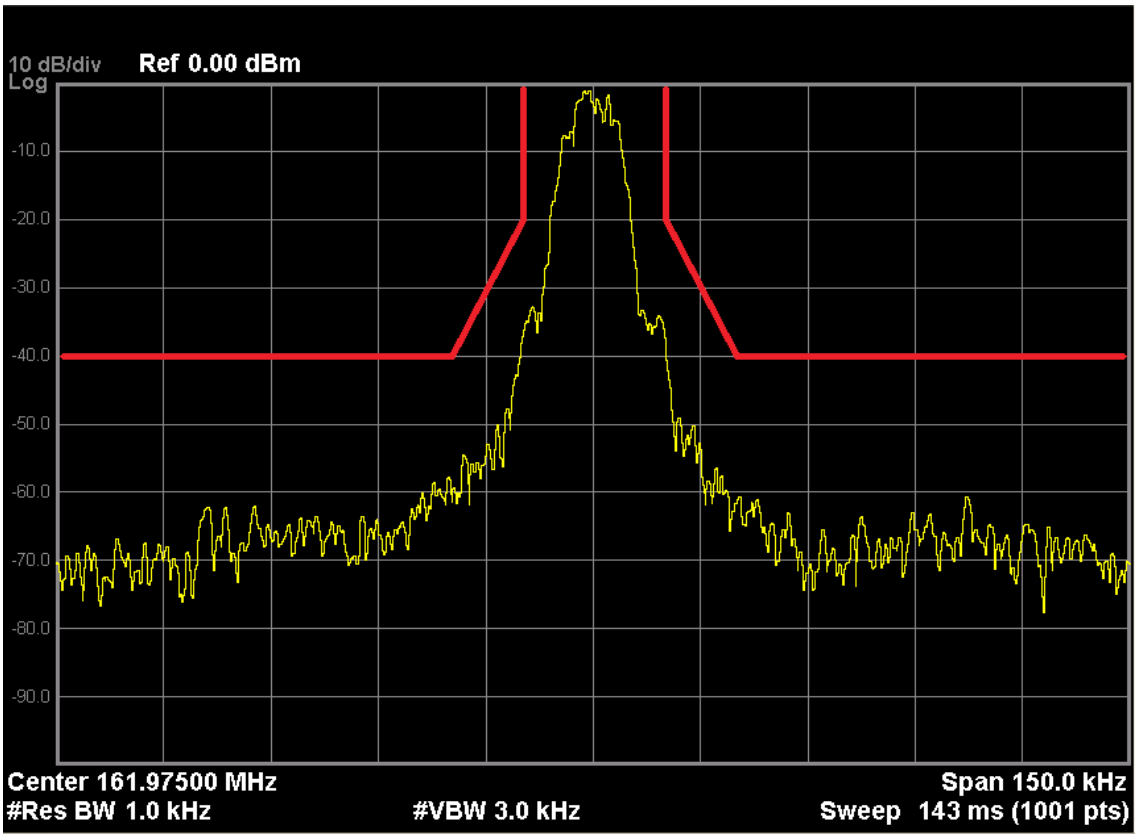

Figure 35: AIS1 Spectrum

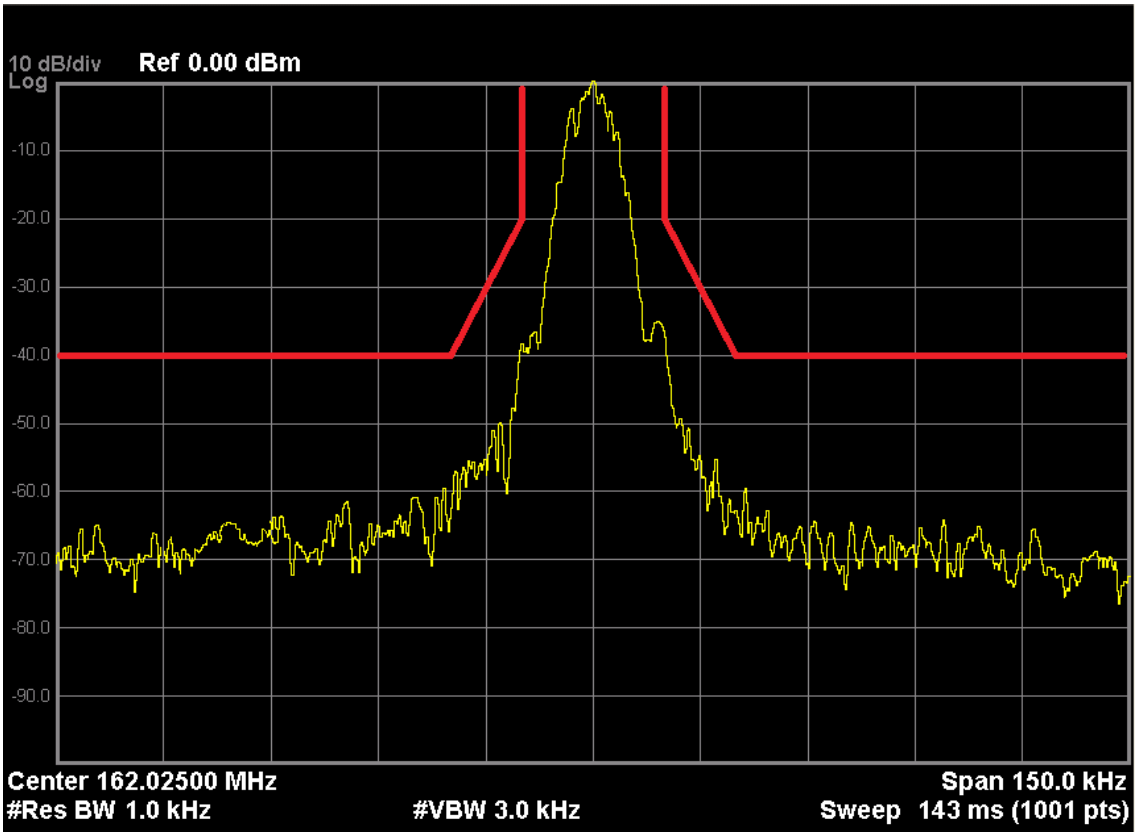

Figure 36: AIS2 Spectrum

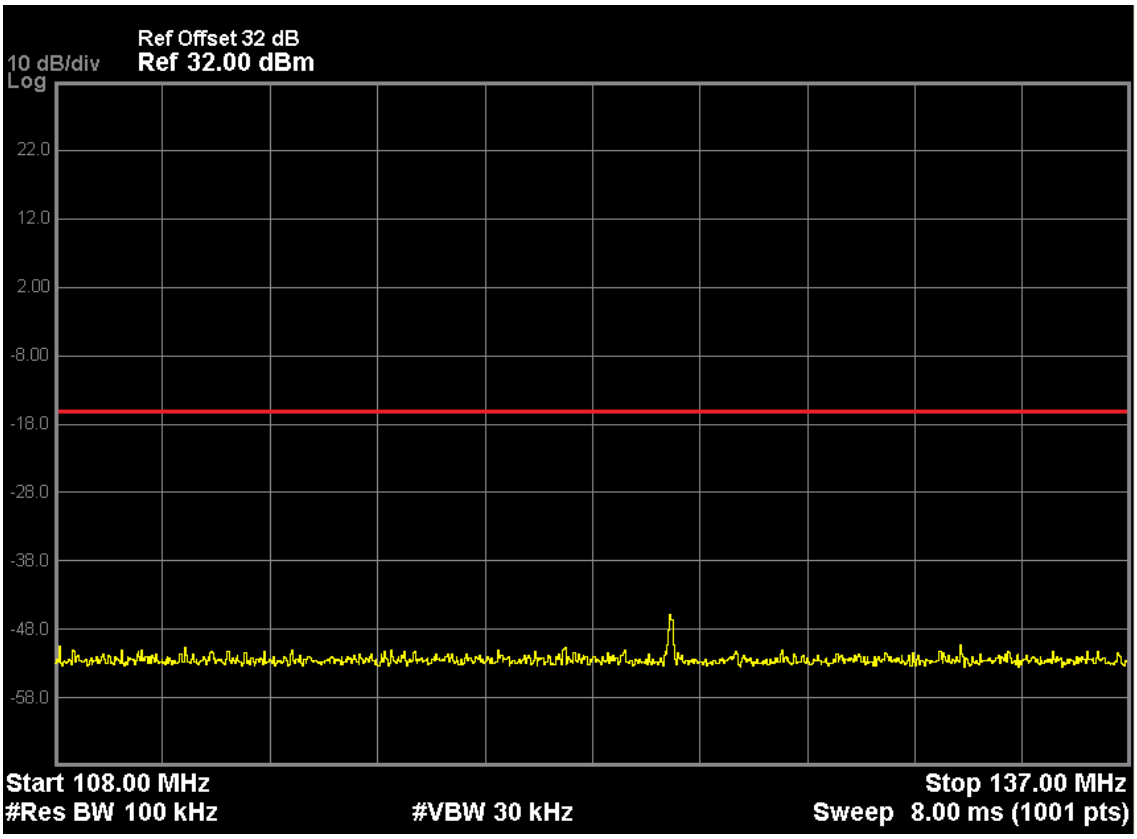

Figure 37: Conducted spurious emission (108-137 MHz)

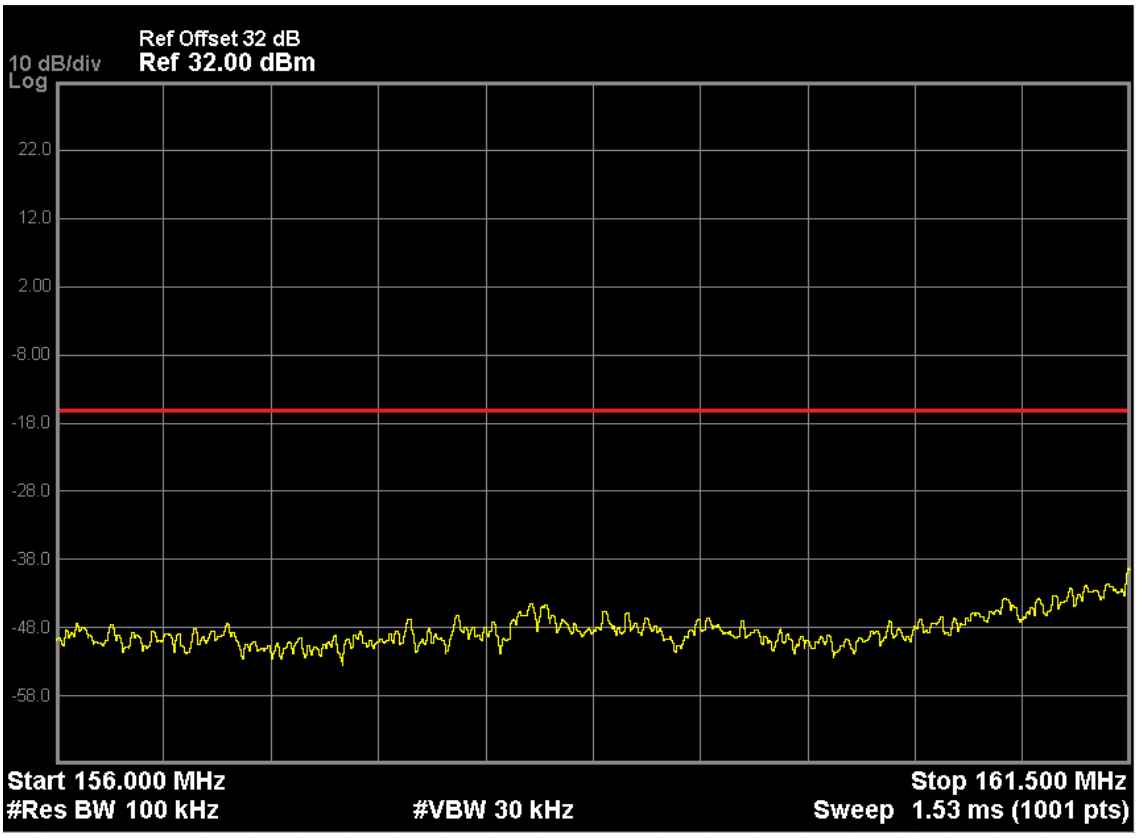

Figure 38: Conducted spurious emission (156-161.5 MHz)

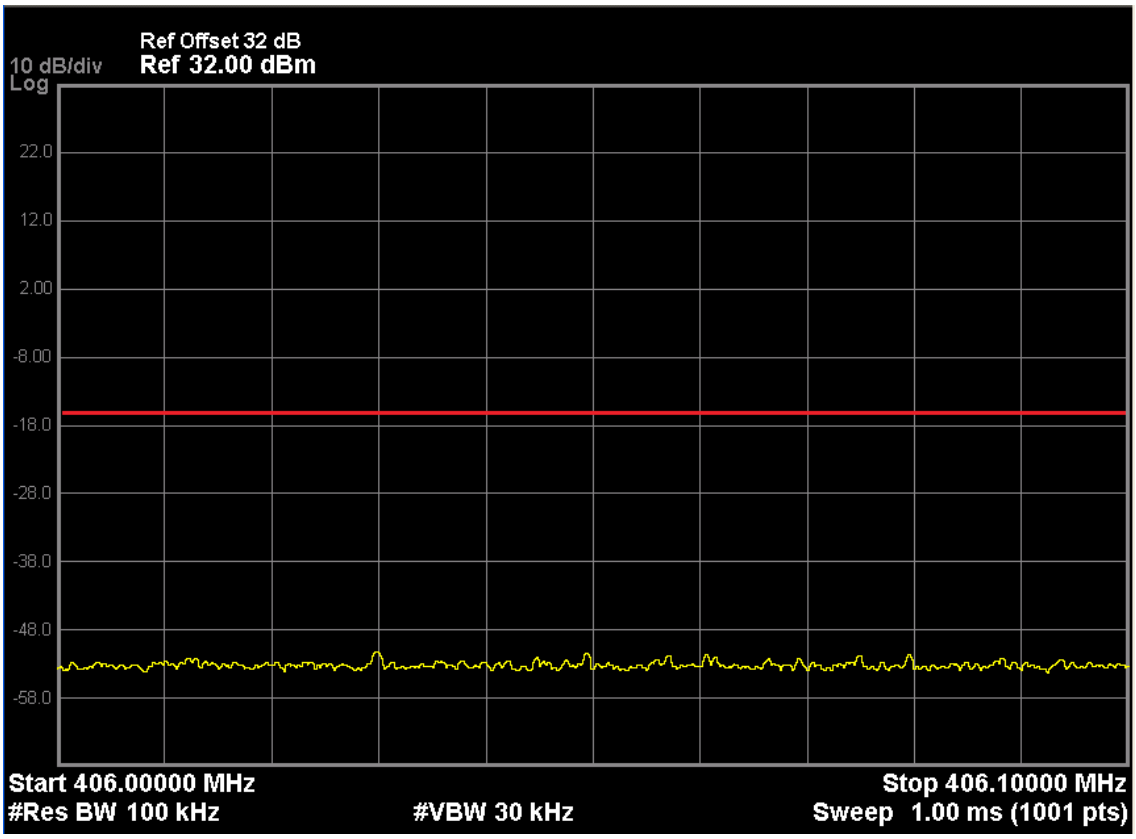

Figure 39: Conducted spurious emission (406-406.1 MHz)

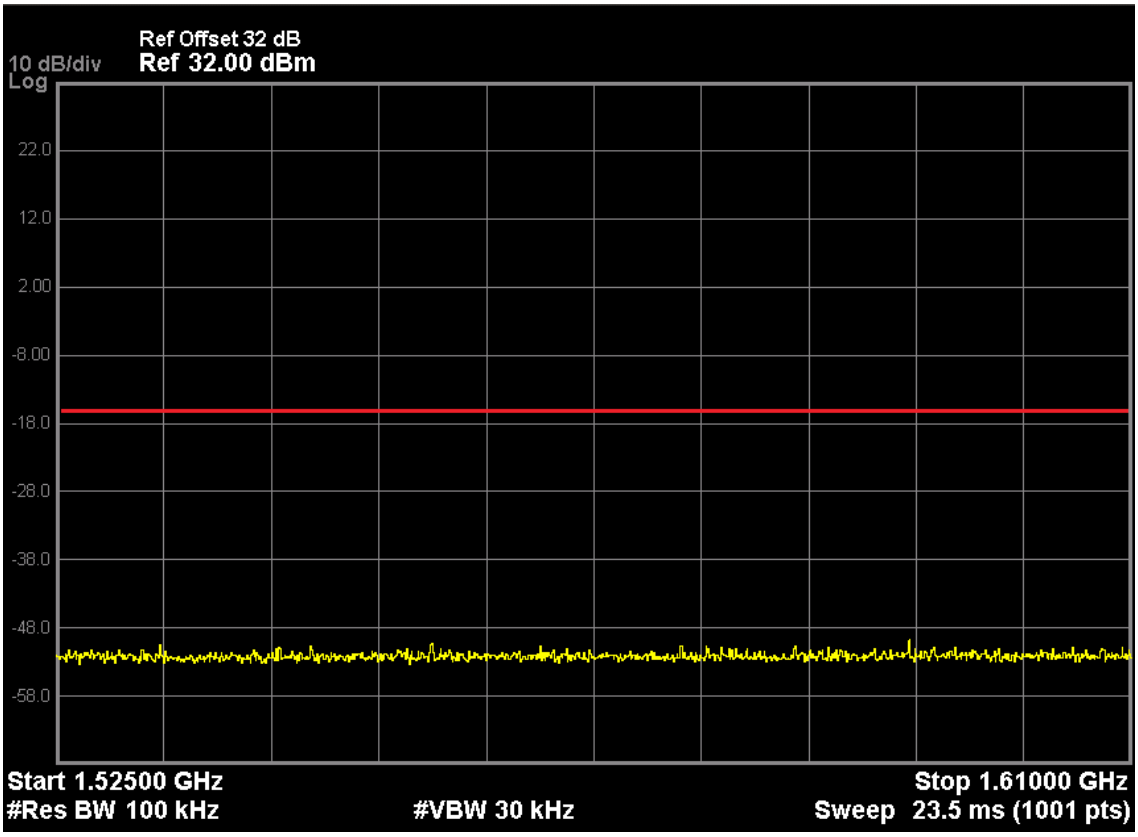

Figure 40: Conducted spurious emission (1525 - 1610 MHz)

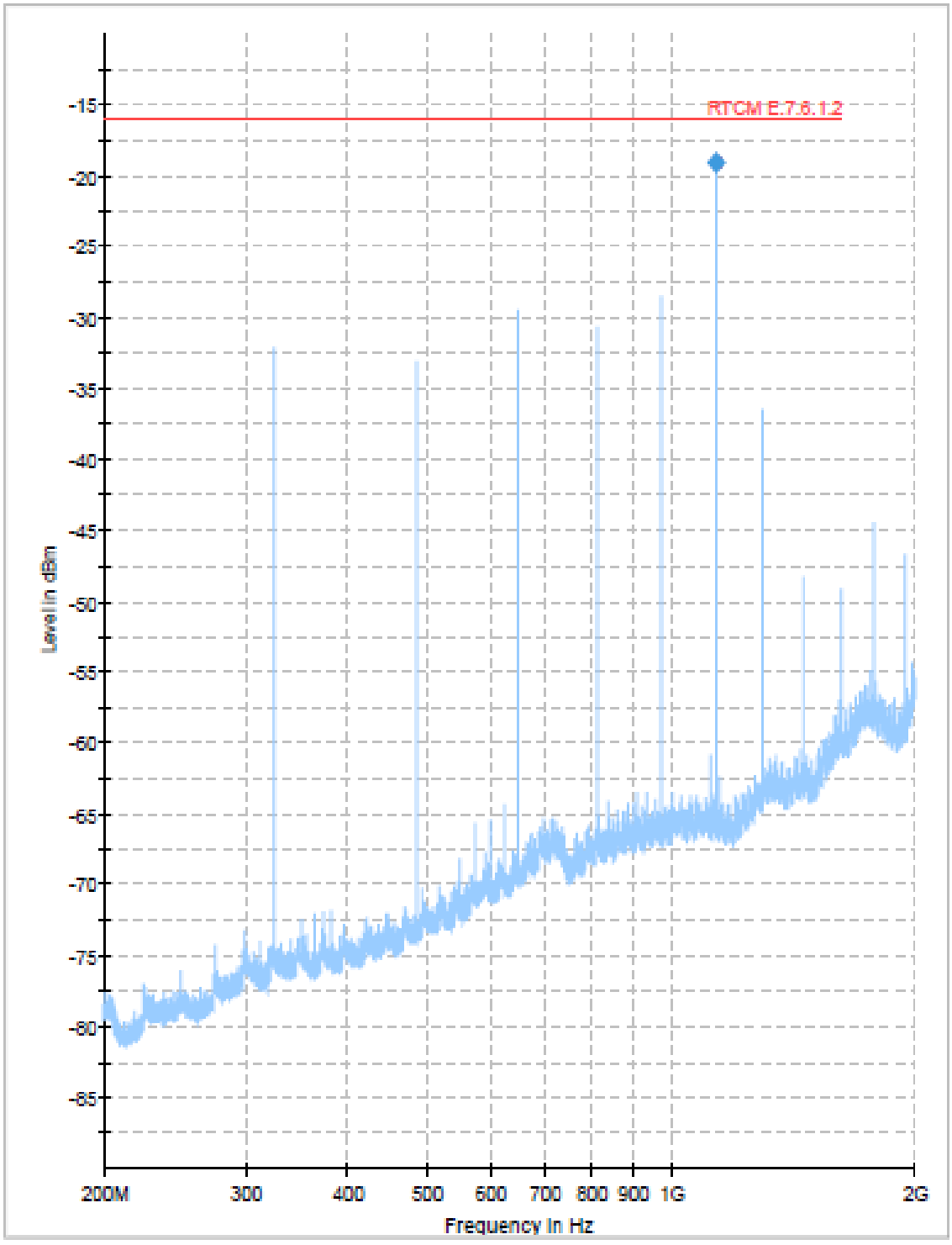

Figure 41: Radiated spurious emission in TX mode (200-2000 MHz)

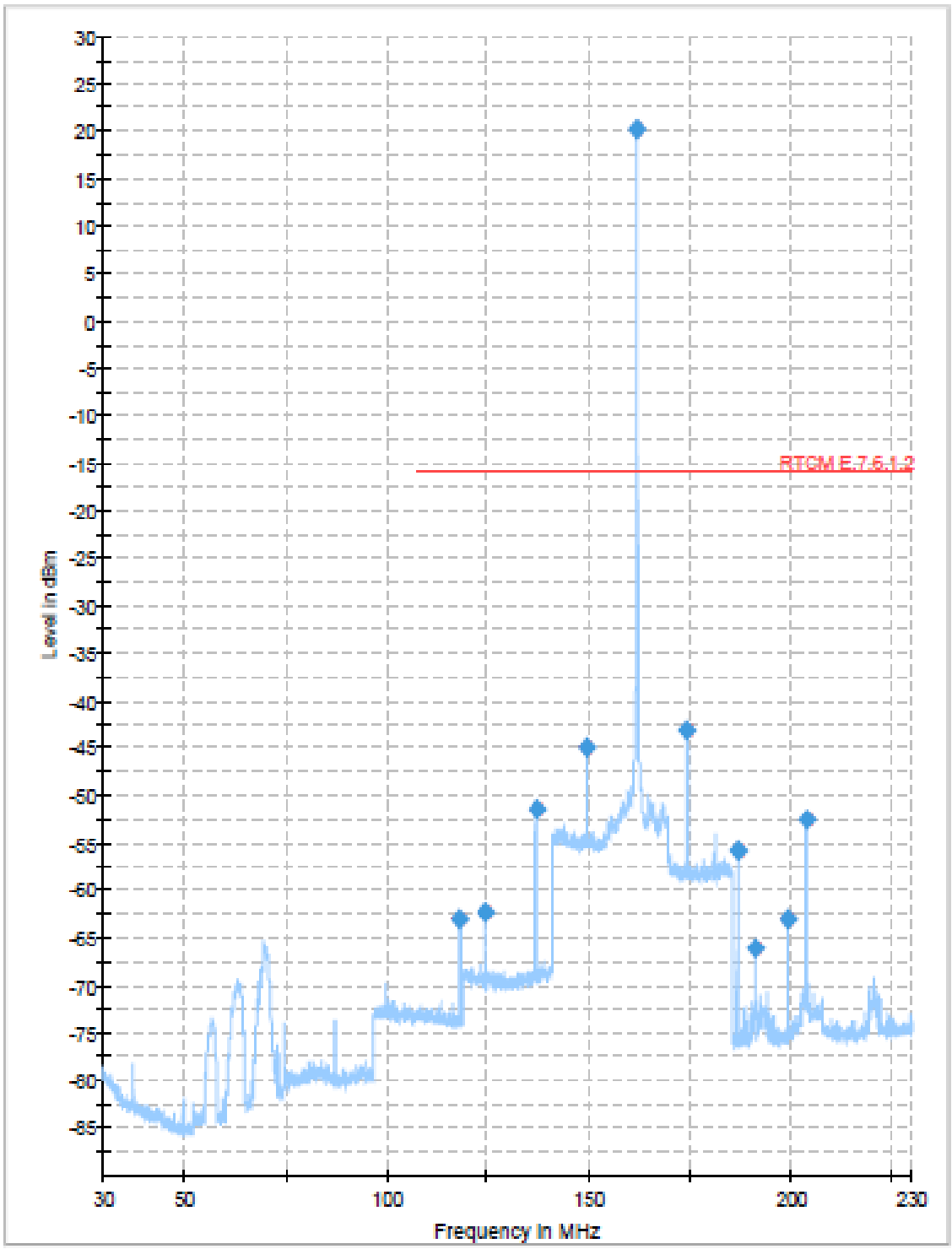

Figure 42: Radiated spurious emission in TX mode (30-230 MHz)

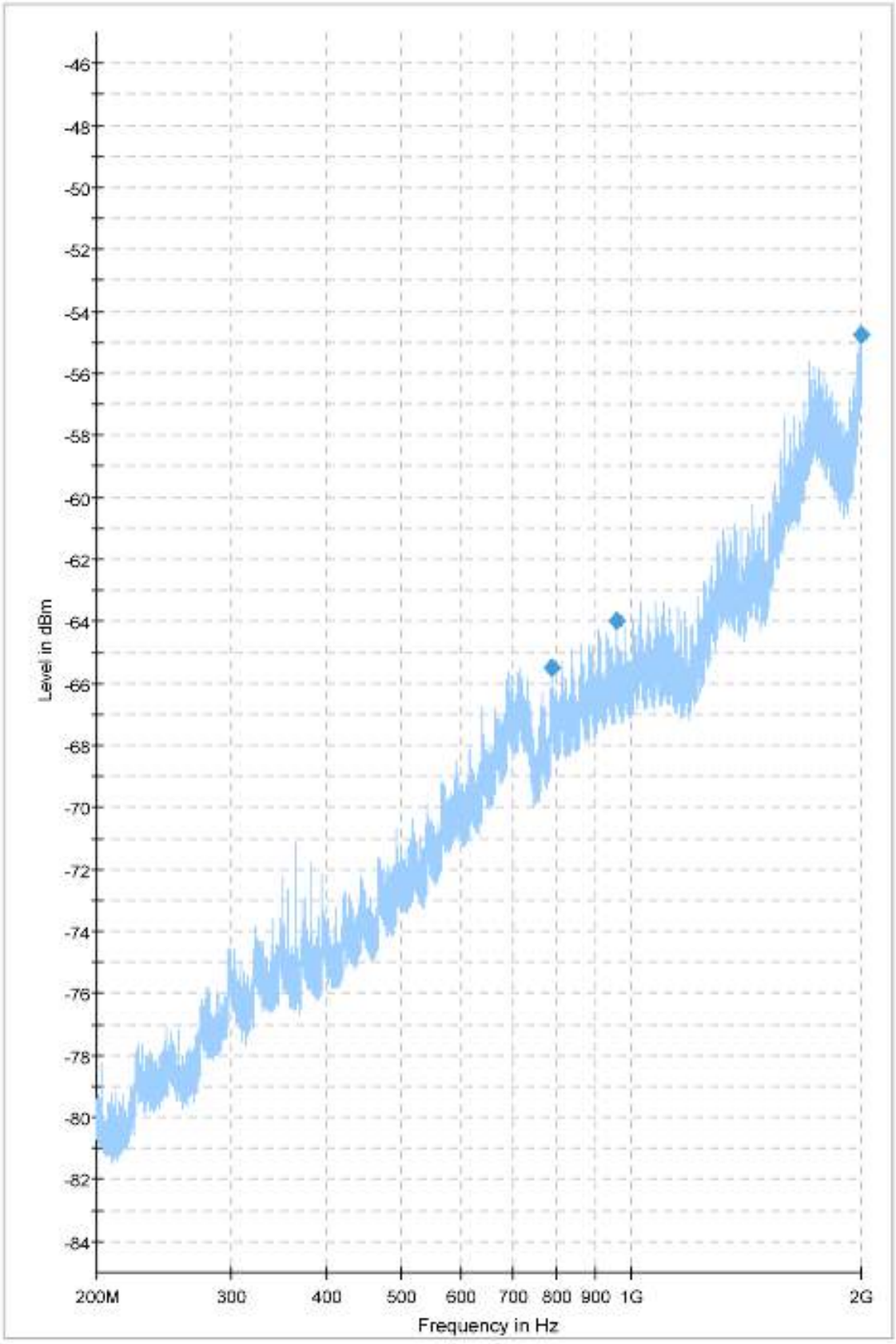

Figure 43: Radiated spurious emission in STBY mode (200-2000 MHz)

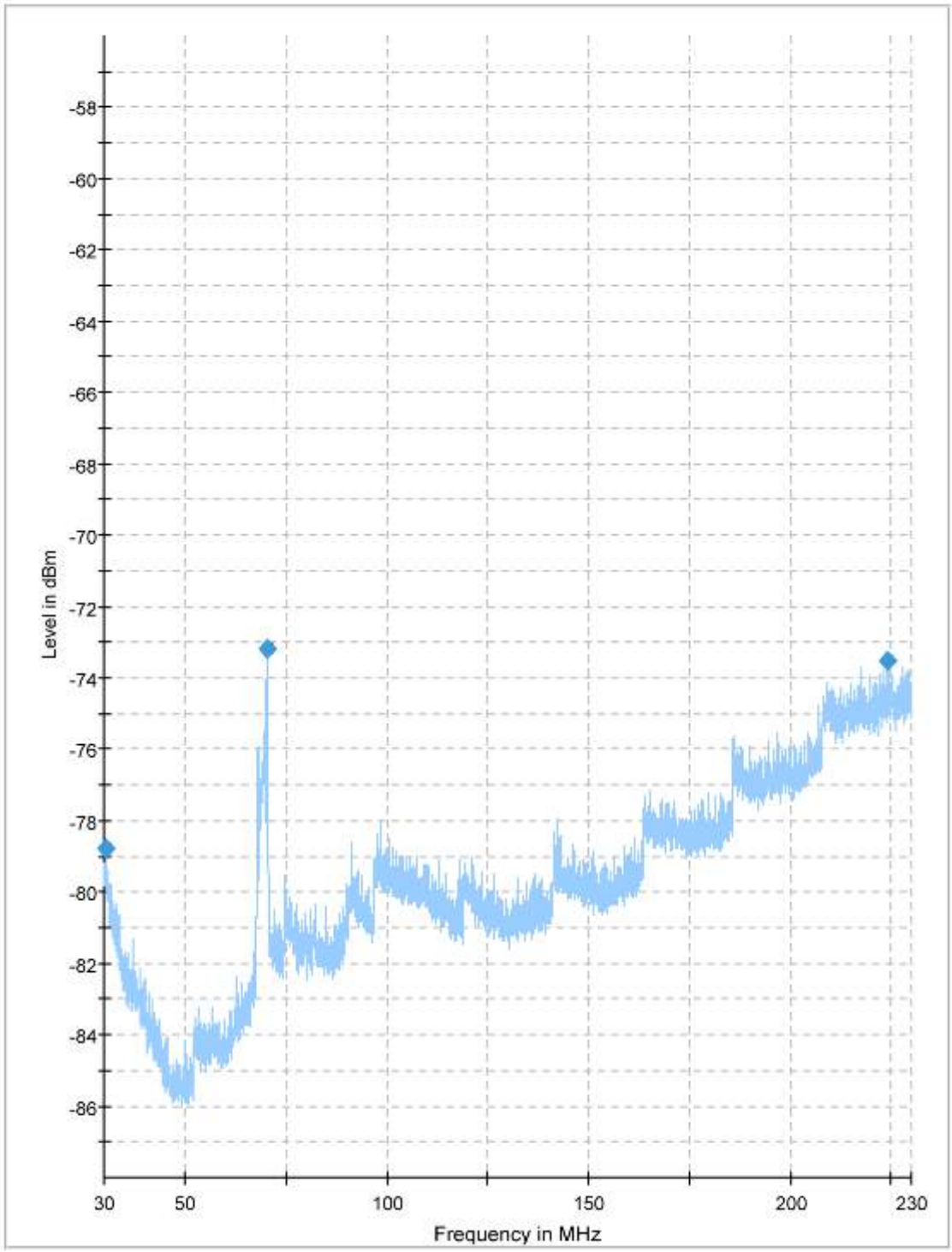

Figure 44: Radiated spurious emission in STBY mode (30-230 MHz)

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	1	1	1	1	14	14	1	1
8:19:02	1	1	1	1	1	1	1	1
8:20:02	1	1	1	1	1	1	1	1
8:21:02	1	1	1	1	1	1	1	1
8:21:58	1	1	1	1	14	14	1	1
8:22:58	1	1	1	1	1	1	1	1
8:23:58	1	1	1	1	1	1	1	1
8:24:58	1	1	1	1	1	1	1	1
8:25:58	1	1	1	1	14	14	1	1
8:26:58	1	1	1	1	1	1	1	1
8:27:58	1	1	1	1	1	1	1	1
8:28:58	1	1	1	1	1	1	1	1
8:30:01	1	1	1	1	14	14	1	1
8:31:01	1	1	1	1	1	1	1	1
8:32:01	1	1	1	1	1	1	1	1
8:33:01	1	1	1	1	1	1	1	1
8:34:01	1	1	1	1	14	14	1	1
8:35:01	1	1	1	1	1	1	1	1
8:36:01	1	1	1	1	1	1	1	1
8:37:01	1	1	1	1	1	1	1	1
8:38:02	1	1	1	1	14	14	1	1
8:39:02	1	1	1	1	1	1	1	1
8:40:02	1	1	1	1	1	1	1	1
8:41:02	1	1	1	1	1	1	1	1
8:42:02	1	1	1	1	14	14	1	1
8:43:02	1	1	1	1	1	1	1	1
8:44:02	1	1	1	1	1	1	1	1
8:45:02	1	1	1	1	1	1	1	1
8:46:00	1	1	1	1	14	14	1	1
8:47:00	1	1	1	1	1	1	1	1
8:48:00	1	1	1	1	1	1	1	1
8:49:00	1	1	1	1	1	1	1	1
8:50:00	1	1	1	1	14	14	1	1
8:51:00	1	1	1	1	1	1	1	1
8:52:00	1	1	1	1	1	1	1	1
8:53:00	1	1	1	1	1	1	1	1
8:53:55	1	1	1	1	14	14	1	1

Table 20: Message type, from T_5 to T_{40}, ETSI EN 303-098 9.1.3 & 9.1.4

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	0	0	0	0	0	0	0	0
8:19:02	0	0	0	0	0	0	0	0
8:20:02	0	0	0	0	0	0	0	0
8:21:02	0	0	0	0	0	0	0	0
8:21:58	0	0	0	0	0	0	0	0
8:22:58	0	0	0	0	0	0	0	0
8:23:58	0	0	0	0	0	0	0	0
8:24:58	0	0	0	0	0	0	0	0
8:25:58	0	0	0	0	0	0	0	0
8:26:58	0	0	0	0	0	0	0	0
8:27:58	0	0	0	0	0	0	0	0
8:28:58	0	0	0	0	0	0	0	0
8:30:01	0	0	0	0	0	0	0	0
8:31:01	0	0	0	0	0	0	0	0
8:32:01	0	0	0	0	0	0	0	0
8:33:01	0	0	0	0	0	0	0	0
8:34:01	0	0	0	0	0	0	0	0
8:35:01	0	0	0	0	0	0	0	0
8:36:01	0	0	0	0	0	0	0	0
8:37:01	0	0	0	0	0	0	0	0
8:38:02	0	0	0	0	0	0	0	0
8:39:02	0	0	0	0	0	0	0	0
8:40:02	0	0	0	0	0	0	0	0
8:41:02	0	0	0	0	0	0	0	0
8:42:02	0	0	0	0	0	0	0	0
8:43:02	0	0	0	0	0	0	0	0
8:44:02	0	0	0	0	0	0	0	0
8:45:02	0	0	0	0	0	0	0	0
8:46:00	0	0	0	0	0	0	0	0
8:47:00	0	0	0	0	0	0	0	0
8:48:00	0	0	0	0	0	0	0	0
8:49:00	0	0	0	0	0	0	0	0
8:50:00	0	0	0	0	0	0	0	0
8:51:00	0	0	0	0	0	0	0	0
8:52:00	0	0	0	0	0	0	0	0
8:53:00	0	0	0	0	0	0	0	0
8:53:55	0	0	0	0	0	0	0	0

Table 21: Repeat indicator, from T5 to T40, ETSI EN 303-098 9.1.3 & 9.1.4

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:19:02	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:20:02	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:21:02	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:21:58	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:22:58	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:23:58	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:24:58	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:25:58	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:26:58	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:27:58	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:28:58	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:30:01	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:31:01	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:32:01	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:33:01	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:34:01	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:35:01	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:36:01	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:37:01	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:38:02	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:39:02	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:40:02	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:41:02	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:42:02	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:43:02	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:44:02	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:45:02	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:46:00	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:47:00	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:48:00	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:49:00	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:50:00	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:51:00	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:52:00	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:53:00	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
8:53:55	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000

Table 22: MMSI (ID), from T5 to T40, ETSI EN 303-098 9.1.3 & 9.1.4

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	14	14	14	14			14	14
8:19:02	14	14	14	14	14	14	14	14
8:20:02	14	14	14	14	14	14	14	14
8:21:02	14	14	14	14	14	14	14	14
8:21:58	14	14	14	14			14	14
8:22:58	14	14	14	14	14	14	14	14
8:23:58	14	14	14	14	14	14	14	14
8:24:58	14	14	14	14	14	14	14	14
8:25:58	14	14	14	14			14	14
8:26:58	14	14	14	14	14	14	14	14
8:27:58	14	14	14	14	14	14	14	14
8:28:58	14	14	14	14	14	14	14	14
8:30:01	14	14	14	14			14	14
8:31:01	14	14	14	14	14	14	14	14
8:32:01	14	14	14	14	14	14	14	14
8:33:01	14	14	14	14	14	14	14	14
8:34:01	14	14	14	14			14	14
8:35:01	14	14	14	14	14	14	14	14
8:36:01	14	14	14	14	14	14	14	14
8:37:01	14	14	14	14	14	14	14	14
8:38:02	14	14	14	14			14	14
8:39:02	14	14	14	14	14	14	14	14
8:40:02	14	14	14	14	14	14	14	14
8:41:02	14	14	14	14	14	14	14	14
8:42:02	14	14	14	14			14	14
8:43:02	14	14	14	14	14	14	14	14
8:44:02	14	14	14	14	14	14	14	14
8:45:02	14	14	14	14	14	14	14	14
8:46:00	14	14	14	14			14	14
8:47:00	14	14	14	14	14	14	14	14
8:48:00	14	14	14	14	14	14	14	14
8:49:00	14	14	14	14	14	14	14	14
8:50:00	14	14	14	14			14	14
8:51:00	14	14	14	14	14	14	14	14
8:52:00	14	14	14	14	14	14	14	14
8:53:00	14	14	14	14	14	14	14	14
8:53:55	14	14	14	14			14	14

Table 23: Navigation status, from T5 to T40 , ETSI EN 303-098 9.1.3

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	-128	-128	-128	-128			-128	-128
8:19:02	-128	-128	-128	-128	-128	-128	-128	-128
8:20:02	-128	-128	-128	-128	-128	-128	-128	-128
8:21:02	-128	-128	-128	-128	-128	-128	-128	-128
8:21:58	-128	-128	-128	-128			-128	-128
8:22:58	-128	-128	-128	-128	-128	-128	-128	-128
8:23:58	-128	-128	-128	-128	-128	-128	-128	-128
8:24:58	-128	-128	-128	-128	-128	-128	-128	-128
8:25:58	-128	-128	-128	-128			-128	-128
8:26:58	-128	-128	-128	-128	-128	-128	-128	-128
8:27:58	-128	-128	-128	-128	-128	-128	-128	-128
8:28:58	-128	-128	-128	-128	-128	-128	-128	-128
8:30:01	-128	-128	-128	-128			-128	-128
8:31:01	-128	-128	-128	-128	-128	-128	-128	-128
8:32:01	-128	-128	-128	-128	-128	-128	-128	-128
8:33:01	-128	-128	-128	-128	-128	-128	-128	-128
8:34:01	-128	-128	-128	-128			-128	-128
8:35:01	-128	-128	-128	-128	-128	-128	-128	-128
8:36:01	-128	-128	-128	-128	-128	-128	-128	-128
8:37:01	-128	-128	-128	-128	-128	-128	-128	-128
8:38:02	-128	-128	-128	-128			-128	-128
8:39:02	-128	-128	-128	-128	-128	-128	-128	-128
8:40:02	-128	-128	-128	-128	-128	-128	-128	-128
8:41:02	-128	-128	-128	-128	-128	-128	-128	-128
8:42:02	-128	-128	-128	-128			-128	-128
8:43:02	-128	-128	-128	-128	-128	-128	-128	-128
8:44:02	-128	-128	-128	-128	-128	-128	-128	-128
8:45:02	-128	-128	-128	-128	-128	-128	-128	-128
8:46:00	-128	-128	-128	-128			-128	-128
8:47:00	-128	-128	-128	-128	-128	-128	-128	-128
8:48:00	-128	-128	-128	-128	-128	-128	-128	-128
8:49:00	-128	-128	-128	-128	-128	-128	-128	-128
8:50:00	-128	-128	-128	-128			-128	-128
8:51:00	-128	-128	-128	-128	-128	-128	-128	-128
8:52:00	-128	-128	-128	-128	-128	-128	-128	-128
8:53:00	-128	-128	-128	-128	-128	-128	-128	-128
8:53:55	-128	-128	-128	-128			-128	-128

Table 24: Rate of Turn, from T5 to T40 , ETSI EN 303-098 9.1.3

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	0	0	0	0			0	0
8:19:02	0	0	0	0	0	0	0	0
8:20:02	0	0	0	0	0	0	0	0
8:21:02	0	0	0	0	0	0	0	0
8:21:58	0	0	0	0			0	0
8:22:58	0	0	0	0	0	0	0	0
8:23:58	0	0	0	0	0	0	0	0
8:24:58	0	0	0	0	0	0	0	0
8:25:58	0	0	0	0			0	0
8:26:58	0	0	0	0	0	0	0	0
8:27:58	0	0	0	0	0	0	0	0
8:28:58	0	0	0	0	0	0	0	0
8:30:01	0	0	0	0			0	0
8:31:01	0	0	0	0	0	0	0	0
8:32:01	0	0	0	0	0	0	0	0
8:33:01	0	0	0	0	0	0	0	0
8:34:01	0	0	0	0			0	0
8:35:01	0	0	0	0	0	0	0	0
8:36:01	0	0	0	0	0	0	0	0
8:37:01	0	0	0	0	0	0	0	0
8:38:02	0	0	0	0			0	0
8:39:02	0	0	0	0	0	0	0	0
8:40:02	0	0	0	0	0	0	0	0
8:41:02	0	0	0	0	0	0	0	0
8:42:02	0	0	0	0			0	0
8:43:02	0	0	0	0	0	0	0	0
8:44:02	0	0	0	0	0	0	0	0
8:45:02	0	0	0	0	0	0	0	0
8:46:00	0	0	0	0			0	0
8:47:00	0	0	0	0	0	0	0	0
8:48:00	0	0	0	0	0	0	0	0
8:49:00	0	0	0	0	0	0	0	0
8:50:00	0	0	0	0			0	0
8:51:00	0	0	0	0	0	0	0	0
8:52:00	0	0	0	0	0	0	0	0
8:53:00	0	0	0	0	0	0	0	0
8:53:55	0	0	0	0			0	0

Table 25: SOG, from T5 to T40, ETSI EN 303-098 9.1.3

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	0	0	0	0			0	0
8:19:02	0	0	0	0	0	0	0	0
8:20:02	0	0	0	0	0	0	0	0
8:21:02	0	0	0	0	0	0	0	0
8:21:58	0	0	0	0			0	0
8:22:58	0	0	0	0	0	0	0	0
8:23:58	0	0	0	0	0	0	0	0
8:24:58	0	0	0	0	0	0	0	0
8:25:58	0	0	0	0			0	0
8:26:58	0	0	0	0	0	0	0	0
8:27:58	0	0	0	0	0	0	0	0
8:28:58	0	0	0	0	0	0	0	0
8:30:01	0	0	0	0			0	0
8:31:01	0	0	0	0	0	0	0	0
8:32:01	0	0	0	0	0	0	0	0
8:33:01	0	0	0	0	0	0	0	0
8:34:01	0	0	0	0			0	0
8:35:01	0	0	0	0	0	0	0	0
8:36:01	0	0	0	0	0	0	0	0
8:37:01	0	0	0	0	0	0	0	0
8:38:02	0	0	0	0			0	0
8:39:02	0	0	0	0	0	0	0	0
8:40:02	0	0	0	0	0	0	0	0
8:41:02	0	0	0	0	0	0	0	0
8:42:02	0	0	0	0			0	0
8:43:02	0	0	0	0	0	0	0	0
8:44:02	0	0	0	0	0	0	0	0
8:45:02	0	0	0	0	0	0	0	0
8:46:00	0	0	0	0			0	0
8:47:00	0	0	0	0	0	0	0	0
8:48:00	0	0	0	0	0	0	0	0
8:49:00	0	0	0	0	0	0	0	0
8:50:00	0	0	0	0			0	0
8:51:00	0	0	0	0	0	0	0	0
8:52:00	0	0	0	0	0	0	0	0
8:53:00	0	0	0	0	0	0	0	0
8:53:55	0	0	0	0			0	0

Table 26: Position accuracy, from T5 to T40, ETSI EN 303-098 9.1.3

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989			11.8550 / 44.2989	11.8550 / 44.2989
8:19:02	11.8551 / 44.2988	11.8551 / 44.2988	11.8551 / 44.2988	11.8551 / 44.2988	11.8551 / 44.2988	11.8551 / 44.2988	11.8551 / 44.2988	11.8551 / 44.2988
8:20:02	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990
8:21:02	11.8551 / 44.2988	11.8551 / 44.2988	11.8551 / 44.2988	11.8551 / 44.2988	11.8551 / 44.2988	11.8551 / 44.2988	11.8551 / 44.2988	11.8551 / 44.2988
8:21:58	11.8552 / 44.2987	11.8552 / 44.2987	11.8552 / 44.2987	11.8552 / 44.2987			11.8552 / 44.2987	11.8552 / 44.2987
8:22:58	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989
8:23:58	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990
8:24:58	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990
8:25:58	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990			11.8549 / 44.2990	11.8549 / 44.2990
8:26:58	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990
8:27:58	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990
8:28:58	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990
8:30:01	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990			11.8549 / 44.2990	11.8549 / 44.2990
8:31:01	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990
8:32:01	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990
8:33:01	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990
8:34:01	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990			11.8549 / 44.2990	11.8549 / 44.2990
8:35:01	11.8551 / 44.2989	11.8551 / 44.2989	11.8551 / 44.2989	11.8551 / 44.2989	11.8551 / 44.2989	11.8551 / 44.2989	11.8551 / 44.2989	11.8551 / 44.2989
8:36:01	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990
8:37:01	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990
8:38:02	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990			11.8549 / 44.2990	11.8549 / 44.2990
8:39:02	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990
8:40:02	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:41:02	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990
8:42:02	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990			11.8549 / 44.2990	11.8549 / 44.2990
8:43:02	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990
8:44:02	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990
8:45:02	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990
8:46:00	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990			11.8549 / 44.2990	11.8549 / 44.2990
8:47:00	11.8549 / 44.2987	11.8549 / 44.2987	11.8549 / 44.2987	11.8549 / 44.2987	11.8549 / 44.2987	11.8549 / 44.2987	11.8549 / 44.2987	11.8549 / 44.2987
8:48:00	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990
8:49:00	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990
8:50:00	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990			11.8549 / 44.2990	11.8549 / 44.2990
8:51:00	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990
8:52:00	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990
8:53:00	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990	11.8551 / 44.2990
8:53:55	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990			11.8549 / 44.2990	11.8549 / 44.2990

Table 27: Position, from T5 to T40

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	306	306	306	306			306	306
8:19:02	306	306	306	306	306	306	306	306
8:20:02	306	306	306	306	306	306	306	306
8:21:02	306	306	306	306	306	306	306	306
8:21:58	306	306	306	306			306	306
8:22:58	306	306	306	306	306	306	306	306
8:23:58	306	306	306	306	306	306	306	306
8:24:58	306	306	306	306	306	306	306	306
8:25:58	306	306	306	306			306	306
8:26:58	306	306	306	306	306	306	306	306
8:27:58	306	306	306	306	306	306	306	306
8:28:58	306	306	306	306	306	306	306	306
8:30:01	306	306	306	306			306	306
8:31:01	306	306	306	306	306	306	306	306
8:32:01	306	306	306	306	306	306	306	306
8:33:01	306	306	306	306	306	306	306	306
8:34:01	306	306	306	306			306	306
8:35:01	306	306	306	306	306	306	306	306
8:36:01	306	306	306	306	306	306	306	306
8:37:01	306	306	306	306	306	306	306	306
8:38:02	306	306	306	306			306	306
8:39:02	306	306	306	306	306	306	306	306
8:40:02	306	306	306	306	306	306	306	306
8:41:02	306	306	306	306	306	306	306	306
8:42:02	306	306	306	306			306	306
8:43:02	306	306	306	306	306	306	306	306
8:44:02	306	306	306	306	306	306	306	306
8:45:02	306	306	306	306	306	306	306	306
8:46:00	306	306	306	306			306	306
8:47:00	306	306	306	306	306	306	306	306
8:48:00	306	306	306	306	306	306	306	306
8:49:00	306	306	306	306	306	306	306	306
8:50:00	306	306	306	306			306	306
8:51:00	306	306	306	306	306	306	306	306
8:52:00	306	306	306	306	306	306	306	306
8:53:00	306	306	306	306	306	306	306	306
8:53:55	306	306	306	306			306	306

Table 28: COG, from T5 to T40, ETSI EN 303-098 9.1.3

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	511	511	511	511			511	511
8:19:02	511	511	511	511	511	511	511	511
8:20:02	511	511	511	511	511	511	511	511
8:21:02	511	511	511	511	511	511	511	511
8:21:58	511	511	511	511			511	511
8:22:58	511	511	511	511	511	511	511	511
8:23:58	511	511	511	511	511	511	511	511
8:24:58	511	511	511	511	511	511	511	511
8:25:58	511	511	511	511			511	511
8:26:58	511	511	511	511	511	511	511	511
8:27:58	511	511	511	511	511	511	511	511
8:28:58	511	511	511	511	511	511	511	511
8:30:01	511	511	511	511			511	511
8:31:01	511	511	511	511	511	511	511	511
8:32:01	511	511	511	511	511	511	511	511
8:33:01	511	511	511	511	511	511	511	511
8:34:01	511	511	511	511			511	511
8:35:01	511	511	511	511	511	511	511	511
8:36:01	511	511	511	511	511	511	511	511
8:37:01	511	511	511	511	511	511	511	511
8:38:02	511	511	511	511			511	511
8:39:02	511	511	511	511	511	511	511	511
8:40:02	511	511	511	511	511	511	511	511
8:41:02	511	511	511	511	511	511	511	511
8:42:02	511	511	511	511			511	511
8:43:02	511	511	511	511	511	511	511	511
8:44:02	511	511	511	511	511	511	511	511
8:45:02	511	511	511	511	511	511	511	511
8:46:00	511	511	511	511			511	511
8:47:00	511	511	511	511	511	511	511	511
8:48:00	511	511	511	511	511	511	511	511
8:49:00	511	511	511	511	511	511	511	511
8:50:00	511	511	511	511			511	511
8:51:00	511	511	511	511	511	511	511	511
8:52:00	511	511	511	511	511	511	511	511
8:53:00	511	511	511	511	511	511	511	511
8:53:55	511	511	511	511			511	511

Table 29: HDG, from T5 to T40, ETSI EN 303-098 9.1.3

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	2	2	2	2			2	2
8:19:02	2	2	2	2	2	2	2	2
8:20:02	2	2	2	2	2	2	2	2
8:21:02	2	2	2	2	2	2	2	2
8:21:58	58	58	58	58			58	58
8:22:58	58	58	58	58	58	58	58	58
8:23:58	58	58	58	58	58	58	58	58
8:24:58	58	58	58	58	58	58	58	58
8:25:58	58	58	58	58			58	58
8:26:58	58	58	58	58	58	58	58	58
8:27:58	58	58	58	58	58	58	58	58
8:28:58	58	58	58	58	58	58	58	58
8:30:01	1	1	1	1			1	1
8:31:01	1	1	1	1	1	1	1	1
8:32:01	1	1	1	1	1	1	1	1
8:33:01	1	1	1	1	1	1	1	1
8:34:01	1	1	1	1			1	1
8:35:01	1	1	1	1	1	1	1	1
8:36:01	1	1	1	1	1	1	1	1
8:37:01	1	1	1	1	1	1	1	1
8:38:02	2	2	2	2			2	2
8:39:02	2	2	2	2	2	2	2	2
8:40:02	2	2	2	2	2	2	2	2
8:41:02	2	2	2	2	2	2	2	2
8:42:02	2	2	2	2			2	2
8:43:02	2	2	2	2	2	2	2	2
8:44:02	2	2	2	2	2	2	2	2
8:45:02	2	2	2	2	2	2	2	2
8:46:00	0	0	0	0			0	0
8:47:00	0	0	0	0	0	0	0	0
8:48:00	0	0	0	0	0	0	0	0
8:49:00	0	0	0	0	0	0	0	0
8:50:00	0	0	0	0			0	0
8:51:00	0	0	0	0	0	0	0	0
8:52:00	0	0	0	0	0	0	0	0
8:53:00	0	0	0	0	0	0	0	0
8:53:55	55	55	55	55			55	55

Table 30: Time stamp, from T5 to T40, ETSI EN 303-098 9.1.3

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:58					MOB ACTIVE	MOB ACTIVE		
8:21:58					MOB ACTIVE	MOB ACTIVE		
8:25:58					MOB ACTIVE	MOB ACTIVE		
8:30:01					MOB ACTIVE	MOB ACTIVE		
8:34:01					MOB ACTIVE	MOB ACTIVE		
8:38:02					MOB ACTIVE	MOB ACTIVE		
8:42:02					MOB ACTIVE	MOB ACTIVE		
8:46:00					MOB ACTIVE	MOB ACTIVE		
8:50:00					MOB ACTIVE	MOB ACTIVE		
8:53:55					MOB ACTIVE	MOB ACTIVE		

Table 31: Text for message 14, from T5 to T40, ETSI EN 303-098 9.1.4

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:26:58	A	B	A	B	A	B	A	B
8:27:58	A	B	A	B	A	B	A	B
8:28:58	A	B	A	B	A	B	A	B
8:30:01	A	B	A	B			A	B
8:31:01	A	B	A	B	A	B	A	B
8:32:01	A	B	A	B	A	B	A	B
8:33:01	A	B	A	B	A	B	A	B
8:34:01	A	B	A	B			A	B
8:35:01	A	B	A	B	A	B	A	B
8:36:01	A	B	A	B	A	B	A	B
8:37:01	A	B	A	B	A	B	A	B
8:38:02	A	B	A	B			A	B
8:39:02	A	B	A	B	A	B	A	B
8:40:02	A	B	A	B	A	B	A	B
8:41:02	A	B	A	B	A	B	A	B
8:42:02	A	B	A	B			A	B
8:43:02	A	B	A	B	A	B	A	B
8:44:02	A	B	A	B	A	B	A	B
8:45:02	A	B	A	B	A	B	A	B
8:46:00	A	B	A	B			A	B
8:47:00	A	B	A	B	A	B	A	B
8:48:00	A	B	A	B	A	B	A	B
8:49:00	A	B	A	B	A	B	A	B
8:50:00	A	B	A	B			A	B
8:51:00	A	B	A	B	A	B	A	B
8:52:00	A	B	A	B	A	B	A	B
8:53:00	A	B	A	B	A	B	A	B
8:53:55	A	B	A	B			A	B

Table 32: AIS channels, from T15 to T40, ETSI EN 303-098 9.1.5

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	0	0	0	0			0	0
8:19:02	0	0	0	0	0	0	0	0
8:20:02	0	0	0	0	0	0	0	0
8:21:02	0	0	0	0	0	0	0	0
8:21:58	0	0	0	0			0	0
8:22:58	0	0	0	0	0	0	0	0
8:23:58	0	0	0	0	0	0	0	0
8:24:58	0	0	0	0	0	0	0	0
8:25:58	0	0	0	0			0	0
8:26:58	0	0	0	0	0	0	0	0
8:27:58	0	0	0	0	0	0	0	0
8:28:58	0	0	0	0	0	0	0	0
8:30:01	0	0	0	0			0	0
8:31:01	0	0	0	0	0	0	0	0
8:32:01	0	0	0	0	0	0	0	0
8:33:01	0	0	0	0	0	0	0	0
8:34:01	0	0	0	0			0	0
8:35:01	0	0	0	0	0	0	0	0
8:36:01	0	0	0	0	0	0	0	0
8:37:01	0	0	0	0	0	0	0	0
8:38:02	0	0	0	0			0	0
8:39:02	0	0	0	0	0	0	0	0
8:40:02	0	0	0	0	0	0	0	0
8:41:02	0	0	0	0	0	0	0	0
8:42:02	0	0	0	0			0	0
8:43:02	0	0	0	0	0	0	0	0
8:44:02	0	0	0	0	0	0	0	0
8:45:02	0	0	0	0	0	0	0	0
8:46:00	0	0	0	0			0	0
8:47:00	0	0	0	0	0	0	0	0
8:48:00	0	0	0	0	0	0	0	0
8:49:00	0	0	0	0	0	0	0	0
8:50:00	0	0	0	0			0	0
8:51:00	0	0	0	0	0	0	0	0
8:52:00	0	0	0	0	0	0	0	0
8:53:00	0	0	0	0	0	0	0	0
8:53:55	0	0	0	0			0	0

Table 33: AIS sync state, from T5 to T40, ETSI EN 303-098 9.1.6

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	0	0	0	0			0	0
8:19:02	200	275	350	425	500	575	650	725
8:20:02	8:20	8:20	8:20	8:20	8:20	8:20	8:20	8:20
8:21:02	2118	2118	2118	2118	2118	2118	2118	2118
8:21:58	0	0	0	0			0	0
8:22:58	68	143	218	293	368	443	518	593
8:23:58	0	0	0	0	0	0	0	0
8:24:58	68	143	218	293	368	443	518	593
8:25:58	0	0	0	0			0	0
8:26:58	68	143	218	293	368	443	518	593
8:27:58	8:28	8:28	8:28	8:28	8:28	8:28	8:28	8:28
8:28:58	2338	2338	2338	2338	2338	2338	2338	2338
8:30:01	0	0	0	0			0	0
8:31:01	156	231	306	381	456	531	606	681
8:32:01	0	0	0	0	0	0	0	0
8:33:01	156	231	306	381	456	531	606	681
8:34:01	0	0	0	0			0	0
8:35:01	156	231	306	381	456	531	606	681
8:36:01	8:36	8:36	8:36	8:36	8:36	8:36	8:36	8:36
8:37:01	2317	2317	2317	2317	2317	2317	2317	2317
8:38:02	0	0	0	0			0	0
8:39:02	223	298	373	448	523	598	673	748
8:40:02	0	0	0	0	0	0	0	0
8:41:02	223	298	373	448	523	598	673	748
8:42:02	0	0	0	0			0	0
8:43:02	223	298	373	448	523	598	673	748
8:44:02	8:44	8:44	8:44	8:44	8:44	8:44	8:44	8:44
8:45:02	2148	2148	2148	2148	2148	2148	2148	2148
8:46:00	0	0	0	0			0	0
8:47:00	121	196	271	346	421	496	571	646
8:48:00	0	0	0	0	0	0	0	0
8:49:00	121	196	271	346	421	496	571	646
8:50:00	0	0	0	0			0	0
8:51:00	121	196	271	346	421	496	571	646
8:52:00	8:52	8:52	8:52	8:52	8:52	8:52	8:52	8:52
8:53:00	2077	0	2077	2077	2077	2077	2077	2077
8:53:55	0	0	0	0			0	0

Table 34: AIS sub message, from T5 to T40, ETSI EN 303-098 9.1.6

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:59:55	1	1	1	1	14	14	1	1
9:00:55	1	1	1	1	1	1	1	1
9:01:55	1	1	1	1	1	1	1	1
9:02:55	1	1	1	1	1	1	1	1
9:03:51	1	1	1	1	14	14	1	1
9:04:51	1	1	1	1	1	1	1	1
9:05:51	1	1	1	1	1	1	1	1
9:06:51	1	1	1	1	1	1	1	1
9:07:51	1	1	1	1	14	14	1	1
9:08:51	1	1	1	1	1	1	1	1
9:09:51	1	1	1	1	1	1	1	1
9:10:51	1	1	1	1	1	1	1	1
9:11:49	1	1	1	1	14	14	1	1
9:12:49	1	1	1	1	1	1	1	1
9:13:49	1	1	1	1	1	1	1	1

Table 35: Message type, >T45 , ETSI EN 303-098 9.1.8

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:59:55	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
9:00:55	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
9:01:55	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
9:02:55	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
9:03:51	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
9:04:51	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
9:05:51	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
9:06:51	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
9:07:51	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
9:08:51	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
9:09:51	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
9:10:51	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
9:11:49	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
9:12:49	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000
9:13:49	972580000	972580000	972580000	972580000	972580000	972580000	972580000	972580000

Table 36: MMSI (ID), >T45 , ETSI EN 303-098 9.1.8

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:59:55	0	0	0	0			0	0
9:00:55	0	0	0	0	0	0	0	0
9:01:55	0	0	0	0	0	0	0	0
9:02:55	0	0	0	0	0	0	0	0
9:03:51	0	0	0	0			0	0
9:04:51	0	0	0	0	0	0	0	0
9:05:51	0	0	0	0	0	0	0	0
9:06:51	0	0	0	0	0	0	0	0
9:07:51	0	0	0	0			0	0
9:08:51	0	0	0	0	0	0	0	0
9:09:51	0	0	0	0	0	0	0	0
9:10:51	0	0	0	0	0	0	0	0
9:11:49	0	0	0	0			0	0
9:12:49	0	0	0	0	0	0	0	0
9:13:49	0	0	0	0	0	0	0	0

Table 37: SOG, >T45 , ETSI EN 303-098 9.1.8

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:59:55	0	0	0	0			0	0
9:00:55	0	0	0	0	0	0	0	0
9:01:55	0	0	0	0	0	0	0	0
9:02:55	0	0	0	0	0	0	0	0
9:03:51	0	0	0	0			0	0
9:04:51	0	0	0	0	0	0	0	0
9:05:51	0	0	0	0	0	0	0	0
9:06:51	0	0	0	0	0	0	0	0
9:07:51	0	0	0	0			0	0
9:08:51	0	0	0	0	0	0	0	0
9:09:51	0	0	0	0	0	0	0	0
9:10:51	0	0	0	0	0	0	0	0
9:11:49	0	0	0	0			0	0
9:12:49	0	0	0	0	0	0	0	0
9:13:49	0	0	0	0	0	0	0	0

Table 38: Position accuracy, >T45 , ETSI EN 303-098 9.1.8

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989			11.8550 / 44.2989	11.8550 / 44.2989
8:19:02	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989
8:20:02	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989
8:21:02	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989
8:21:58	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989			11.8550 / 44.2989	11.8550 / 44.2989
8:22:58	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989
8:23:58	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989
8:24:58	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989
8:25:58	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989			11.8550 / 44.2989	11.8550 / 44.2989
8:26:58	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989
8:27:58	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989
8:28:58	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989
8:30:01	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989			11.8550 / 44.2989	11.8550 / 44.2989
8:31:01	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989
8:32:01	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989	11.8550 / 44.2989

Table 39: Position, >T45 , ETSI EN 303-098 9.1.8

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:59:55	268	268	268	268			268	268
9:00:55	268	268	268	268	268	268	268	268
9:01:55	268	268	268	268	268	268	268	268
9:02:55	268	268	268	268	268	268	268	268
9:03:51	268	268	268	268			268	268
9:04:51	268	268	268	268	268	268	268	268
9:05:51	268	268	268	268	268	268	268	268
9:06:51	268	268	268	268	268	268	268	268
9:07:51	268	268	268	268			268	268
9:08:51	268	268	268	268	268	268	268	268
9:09:51	268	268	268	268	268	268	268	268
9:10:51	268	268	268	268	268	268	268	268
9:11:49	268	268	268	268			268	268
9:12:49	268	268	268	268	268	268	268	268
9:13:49	268	268	268	268	268	268	268	268

Table 40: COG, >T45 , ETSI EN 303-098 9.1.8

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:59:55	63	63	63	63			63	63
9:00:55	63	63	63	63	63	63	63	63
9:01:55	63	63	63	63	63	63	63	63
9:02:55	63	63	63	63	63	63	63	63
9:03:51	63	63	63	63			63	63
9:04:51	63	63	63	63	63	63	63	63
9:05:51	63	63	63	63	63	63	63	63
9:06:51	63	63	63	63	63	63	63	63
9:07:51	63	63	63	63			63	63
9:08:51	63	63	63	63	63	63	63	63
9:09:51	63	63	63	63	63	63	63	63
9:10:51	63	63	63	63	63	63	63	63
9:11:49	63	63	63	63			63	63
9:12:49	63	63	63	63	63	63	63	63
9:13:49	63	63	63	63	63	63	63	63

Table 41: Time stamp, >T45 , ETSI EN 303-098 9.1.8

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:59:55					MOB ACTIVE	MOB ACTIVE		
9:03:51					MOB ACTIVE	MOB ACTIVE		
9:07:51					MOB ACTIVE	MOB ACTIVE		
9:11:49					MOB ACTIVE	MOB ACTIVE		

Table 42: Text for message 14, >T45, ETSI EN 303-098 9.1.8

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:59:55	A	B	A	B	A	B	A	B
9:00:55	A	B	A	B	A	B	A	B
9:01:55	A	B	A	B	A	B	A	B
9:02:55	A	B	A	B	A	B	A	B
9:03:51	A	B	A	B	A	B	A	B
9:04:51	A	B	A	B	A	B	A	B
9:05:51	A	B	A	B	A	B	A	B
9:06:51	A	B	A	B	A	B	A	B
9:07:51	A	B	A	B	A	B	A	B
9:08:51	A	B	A	B	A	B	A	B
9:09:51	A	B	A	B	A	B	A	B
9:10:51	A	B	A	B	A	B	A	B
9:11:49	A	B	A	B	A	B	A	B
9:12:49	A	B	A	B	A	B	A	B
9:13:49	A	B	A	B	A	B	A	B

Table 43: AIS channels, >T45, ETSI EN 303-098 9.1.8

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:59:55	3	3	3	3			3	3
9:00:55	3	3	3	3	3	3	3	3
9:01:55	3	3	3	3	3	3	3	3
9:02:55	3	3	3	3	3	3	3	3
9:03:51	3	3	3	3			3	3
9:04:51	3	3	3	3	3	3	3	3
9:05:51	3	3	3	3	3	3	3	3
9:06:51	3	3	3	3	3	3	3	3
9:07:51	3	3	3	3			3	3
9:08:51	3	3	3	3	3	3	3	3
9:09:51	3	3	3	3	3	3	3	3
9:10:51	3	3	3	3	3	3	3	3
9:11:49	3	3	3	3			3	3
9:12:49	3	3	3	3	3	3	3	3
9:13:49	3	3	3	3	3	3	3	3

Table 44: AIS sync state, >T45, ETSI EN 303-098 9.1.8

Time frame (min)	Slot Timeout	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:59:55	3	0	0	0	0			0	0
9:00:55	2	2198	23	98	173	248	323	398	473
9:01:55	1	8:57	8:57	8:57	8:57	8:57	8:57	8:57	8:57
9:02:55	0	2095	0	2095	2095	2095	2095	2095	2095
9:03:51	7	0	0	0	0			0	0
9:04:51	6	2043	2118	2193	18	93	168	243	318
9:05:51	5	0	0	0	0	0	0	0	0
9:06:51	4	2043	2118	2193	18	93	168	243	318
9:07:51	3	0	0	0	0			0	0
9:08:51	2	2043	2118	2193	18	93	168	243	318
9:09:51	1	8:57	8:57	8:57	8:57	8:57	8:57	8:57	8:57
9:10:51	0	2191	2191	2191	2191	2191	2191	2191	2191
9:11:49	7	0	0	0	0			0	0
9:12:49	6	2059	2134	2209	34	109	184	259	334
9:13:49	5	0	0	0	0	0	0	0	0

Table 45: AIS sub message, >T45, ETSI EN 303-098 9.1.8

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	14	1	1	1	1	1	1	14

Table 46: Message type, Test mode with GNSS ETSI EN 303-098 9.2.2

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	0	0	0	0	0	0	0	0

Table 47: Repeat indicator, Test mode with GNSS ETSI EN 303-098 9.2.2

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	0	972580000	972580000	972580000	972580000	972580000	972580000	972580000

Table 48: MMSI (ID), Test mode with GNSS, ETSI EN 303-098 9.2.2

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02		0	0	0	0	0	0	

Table 49: SOG, Test mode with GNSS, ETSI EN 303-098 9.2.2

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02		0	0	0	0	0	0	

Table 50: Accuracy, Test mode with GNSS, ETSI EN 303-098 9.2.2

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02		15	15	15	15	15	15	

Table 51: Navigation status, Test mode with GNSS, ETSI EN 303-098 9.2.2

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02		-128	-128	-128	-128	-128	-128	

Table 52: ROT, Test mode with GNSS, ETSI EN 303-098 9.2.2

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02		11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	11.8549 / 44.2990	

Table 53: Coordinate, Test mode with GNSS, ETSI EN 303-098 9.2.2

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02		360	360	360	360	360	360	

Table 54: COG, Test mode with GNSS, ETSI EN 303-098 9.2.2

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02		511	511	511	511	511	511	

Table 55: HDG, Test mode with GNSS, ETSI EN 303-098 9.2.2

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	MOB TEST							MOB TEST

Table 56: Text for message 14, Test mode with GNSS, ETSI EN 303-098 9.2.2

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	2	2	2	2	2	2	2	2

Table 57: Time stamp, Test mode with GNSS, ETSI EN 303-098 9.2.2

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	2	2	2	2	2	2	2	2

Table 58: AIS sub message, Test mode with GNSS, ETSI EN 303-098 9.2.2

Time frame (min)	1st msg	2nd msg	3rd msg	4th msg	5th msg	6th msg	7th msg	8th msg
8:18:02	A	B	A	B	A	B	A	B

Table 59: AIS channels, Test mode with GNSS, ETSI EN 303-098 9.2.2

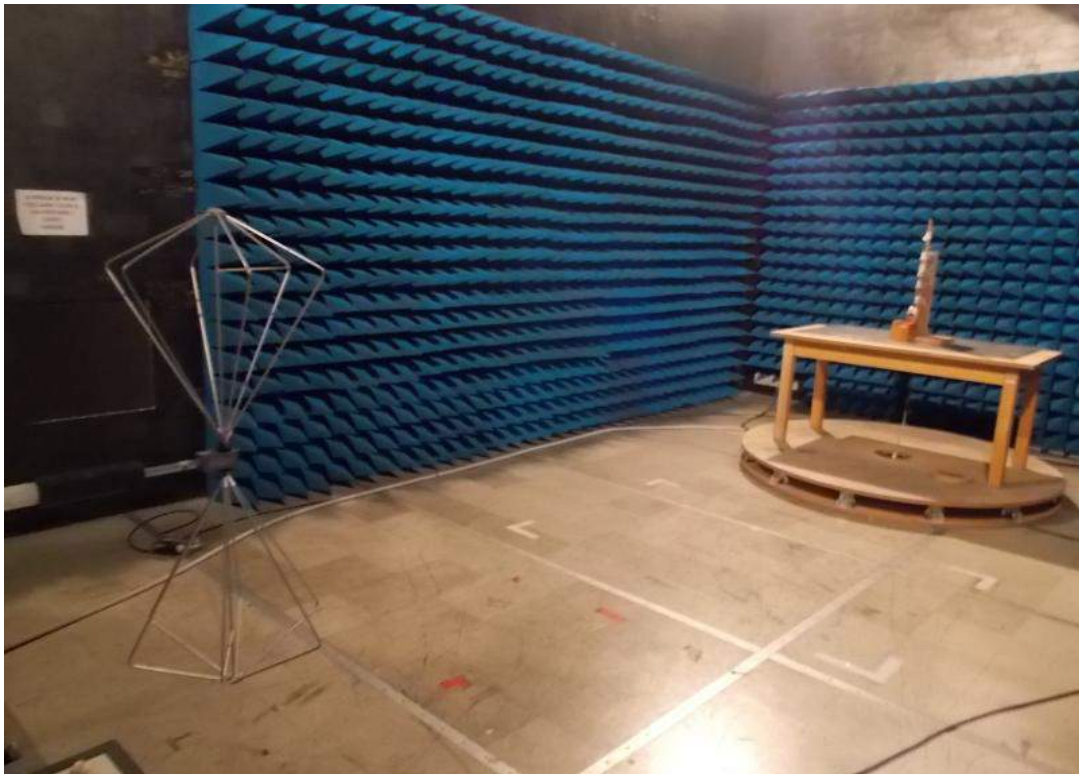

Figure 45: Emission test set-up

Figure 46: Spurious emission (30-230 MHz)

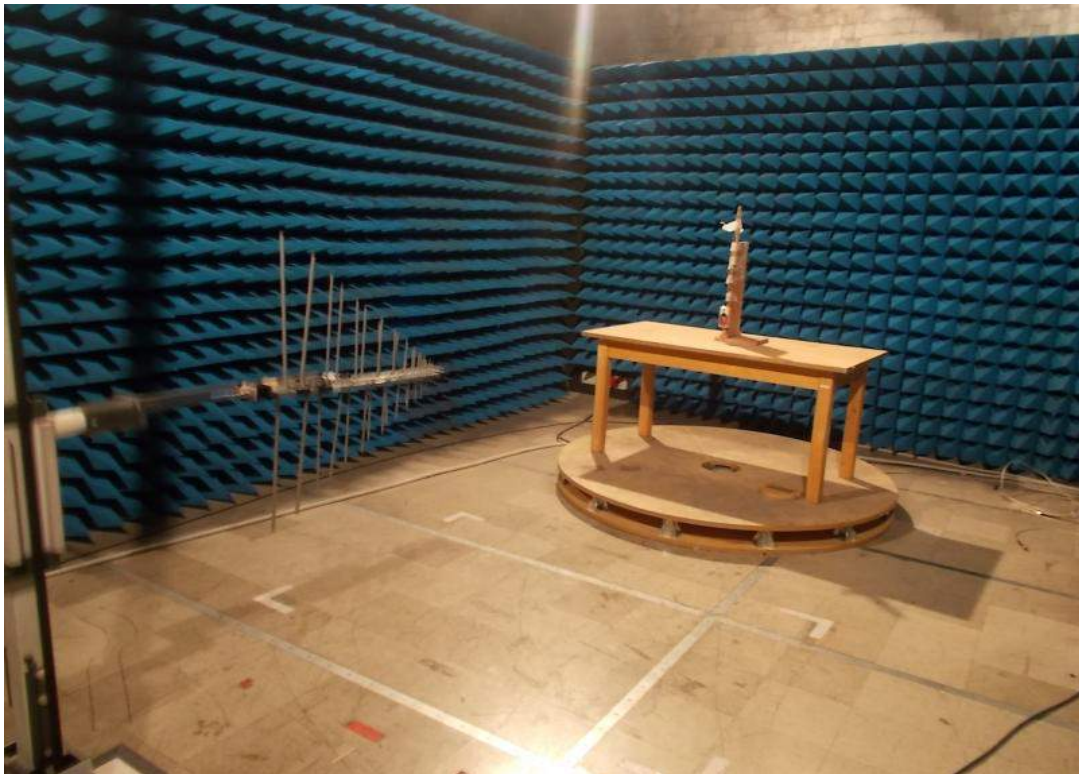

Figure 47: Spurious emission (230-2000 MHz)

Figure 48: Wamblee labs facilities

Figure 49: Wamblee labs facilities

4 List of instruments and facilities used

Ref	Item	Description	Serial nº	Cal. Date
1	Angelantoni AnyVib 600-15	Climatic chamber	47055	18/10/16
2	Agilent N9020A	Spectrum analyzer	MY47380272	20/11/16
3	R&S FSP	Spectrum analyzer	100581	20/11/16
4	Agilent N5181A	RF generator	MY47400004	20/11/16
5	R&S SMB100M	RF generator	101497	20/11/16
6	Agilent DSO8064A	Oscilloscope	MY45002550	20/11/16
7	Agilent 53131A	Frequenzimeter	MY40021333	20/11/16
8	Agilent 33220A	20 Mhz generator	MY44031999	20/11/16
9	Agilent E5062A	Vector / Network analyzer	MY44204194	20/11/16
10	Agilent N1911A	Bolometer	MY45101308	20/11/16
11	Agilent N1921A	Bolometer (sensor)	MY45200360	20/11/16
12	Agilent 8498A	Power attenuator 30dB	MY39260675	20/11/16
13	Agilent 8491A	6 dB Attenuator	MY39264741	-
14	Agilent 8491A	10 dB Attenuator	MY39264795	-
15	Agilent 8491A	20 dB Attenuator	MY39264776	-
16	Agilent 3645A	DC Power supply	MY40004154	20/11/16
17	Agilent 3644A	DC Power supply	MY40006619	20/11/16
18	Agilent 3644A	DC Power supply	MY40003240	20/11/16
19	Agilent 85092-60010	ECAL calibration Kit	3610	20/11/16
20	Agilent 3499A	Switch control	MY42003902	-
21	Agilent 58503A (Z3805)	GPS Time/Frequency receiver	3710A01191	-
22	Wamblee Salty man	Salty man toolkit	-	-
23[1]	Semi-anechoic chamber	Panashield-TDK-Protecno	-	-
24[1]	R&S ESR26	EMI Test receiver 10Hz / 26.5 Ghz	-	27/09/16
25[1]	BBDA-20/300	Biconical Power Antenna	-	-
26[1]	EMCO 3110B	Biconical Antenna	-	18/06/16
27[1]	EMCO 3148	Log periodic antenna	-	18/06/16
28[1]	Schaffner BBHA9120D	Horn antenna	-	18/06/16
29[1]	TESTO 615	Digital thermoigrometer	-	20/10/16
30[1]	Agilent N5183A	20 GHz RF Generator	-	06/07/17
31[1]	Kalmus 715 FC	200-1000 MHz power amplifier	-	12/03/16
32[1]	Kalmus 116 FC	0,01-225 MHz power amplifier	-	12/03/16
33[1]	MilMega ASO104-30R	1-4 GHz power amplifier	-	12/03/16
34[1]	Booton 4232A	Power meter	-	08/10/16

1 Instruments used in TecnoLab del Lago Maggiore, Verbania (Italy)

Ref	Item	Description	Serial nº	Cal. Date
35[1]	Booton 51013	Power sensor	-	08/10/16
36[1]	HP 773D	Bidirectional coupler	-	24/02/16
37[1]	MEB RK100\	Bidirectional coupler	-	24/02/16
38[1]	LP Instrument CH213-30	Bidirectional coupler	-	24/02/16
39[1]	Narda769-20	20 dB Attenuator	-	02/03/16
40[1]	Schaffner CBL6140A	Bilog antenna	-	-
41[1]	EMTEST ESD30N	ESD gun	-	10/03/16
101	Standard Horizon GX2100	VHF AIS Received with NMEA port	-	-
102	AIS Decoder software	AIS Decoder	Ver. 3.3.138	-

1 Instruments used in TecnoLab del Lago Maggiore, Verbania (Italy)

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