ETELM
9 Avenue des 2 Lacs
P.A. de Villejust
91971 Courtaboeuf Cedex

TEST REPORT

SORT OF EQUIPMENT :	**Tetra Base Station Radio Module**
MARKETING NAME :	**NetisB25**
MANUFACTURER :	**ETELM, France**
ADDRESS :	**9 Avenue des 2 Lacs, P.A. de Villejust, 91971 Courtaboeuf Cedex FRANCE**
TELEPHONE :	**+33 1 69 31 79 00**

Tested under :

FCC 47 CFR Part 90, FCC 47 CFR Part 2 and
Industry Canada RSS-119 issue 12

Revision	Report Date	Reason for Revision
1	11/05/2015	Initial Issue
2	25/05/2016	Corrections

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Table of Contents

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I) Equipment Configuration

Model Tested	NeTISB25
EUT Specifications	**Primary Power Source :** 48 v DC
	FCC ID : 2AF3I-BSTETRA460
	IC ID : 20543-BSTETRA460
	Type of modulation : π/4 -DQPSK
	TX Frequency Range : 460.025-464.025 MHz
	RX Frequency Range : 465.025-469.025 MHz
	Effective radiated power : 25 W
	Channel separation : 25 kHz
	Number of channels : 1
	Antennna : 50 ohms
	Firmware : 9.05e
Environmental Test Conditions :	**Temperature :** 20 - 30 °C
	Relative humidity : 30 - 60 %
Tested by :	 VELTZ Stephane, Test Engineer

II) Summary of performed tests and test results

Specification Clause			Test name	Result
PART 90	Part 2	RSS-119		
90.205 (g)	2.1046	5.4	Maximum Conducted Output Power	PASS
90.207	-	-	Type of Emmission	PASS
-	2.1049	5.5.8	Occupied Bandwidth	PASS
90.210(g)	2.1051	5.8.10	Spuriours Emissions at Antenna Terminals	PASS
90.210(a)	2.1051	5.3	Frequency Stability	PASS
90.221(b1)	-	-	Adjacent Channel Power	PASS
-	-	5.11	Receiver Spurious Emissions	PASS
-	2.1047(d)	-	Modulation Characteristics	PASS

III) Photographs of the EUT

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IV) Maximum Conducted Output Power

Test Requirement(s) :
FCC 47 CFR Part 90,clause 90.205 (g)
FCC 47 CFR Part 2, Clause 2.1046
Industry Canada RSS-119, Clause 5.4

Tested by : VELTZ Stephane **Date of test :** 05/05/2015

Rated power : 25 W = 43.98 dBm.

Limit :

FCC 47 CFR Part 90, Limit Clause 90.205

Frequency (MHz)	Limit
< 25	1000 W
25 to 50	300 W
72 to 76	300 W
150 to 174	Refer to 90.205 (d) of the specification
217 to 220	Refer to 90.259 of the specification
220 to 222	Refer to 90.729 of the specification
421 to 430	Refer to 90.279 of the specification
450 to 470	Refer to 90.205 (h) of the specification
470 to 512	Refer to 90.307 and 90.309 of the specification
758 to 775 and 788 to 805	Refer to 90.541 and 90.542 of the specification
806 to 824, 851 to 869, 869 to 901 and 935 to 940	Refer to 90.635 of the specification
902 to 927.25	LMS systems operating pursuant to subpart M of the specification : 30 W
927.25 to 928	LMS equipment: 300 W
929 to 930	Refer to 90.494 of the specification
1427 to 1429.5 and 1429.5 to 1432	Refer to 90.259 of the specification
2450 to 2483.5	5 W
4940 to 4990	Refer to 90.1215 of the specification
5850 to 5925	Refer to subpart M of the specification
All other frequency bands	On a case by case basis

Industry Canada RSS-119, Limit Clause 5.4

The output power shall be within ±1.0 dB of the manufacturer's rated power. Typical transmitter output powers are 110 watts for base and/or fixed stations (paging transmitters excepted), and 30 watts for mobile stations. Higher powers may be certified, but it should be noted that mobile stations are normally only licensed up to 30 watts. See the SRSP relevant to the operating frequency for equipment power limits.

Equipment used for the test : FSW8

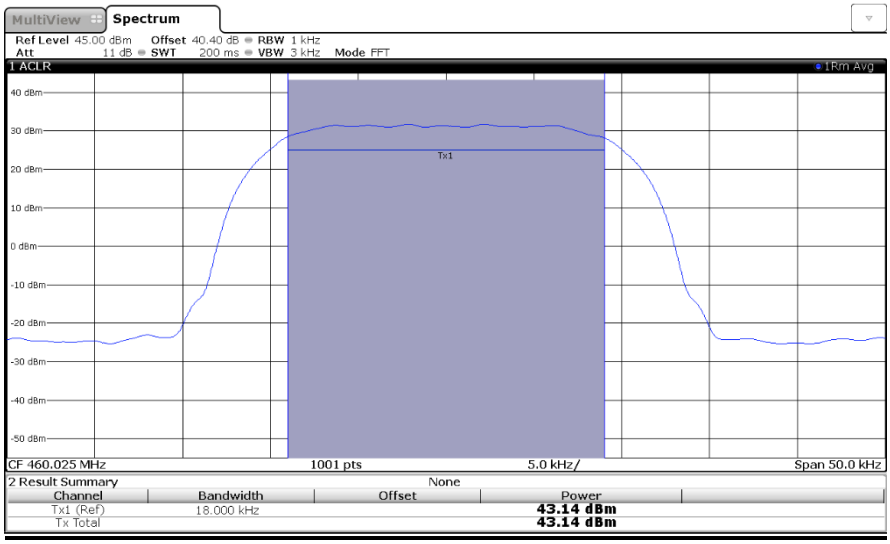
Method :

The conducted RF output power measurements were made at the RF antenna output connector of the EUT using an attenuator and a calibrated wideband power sensor.

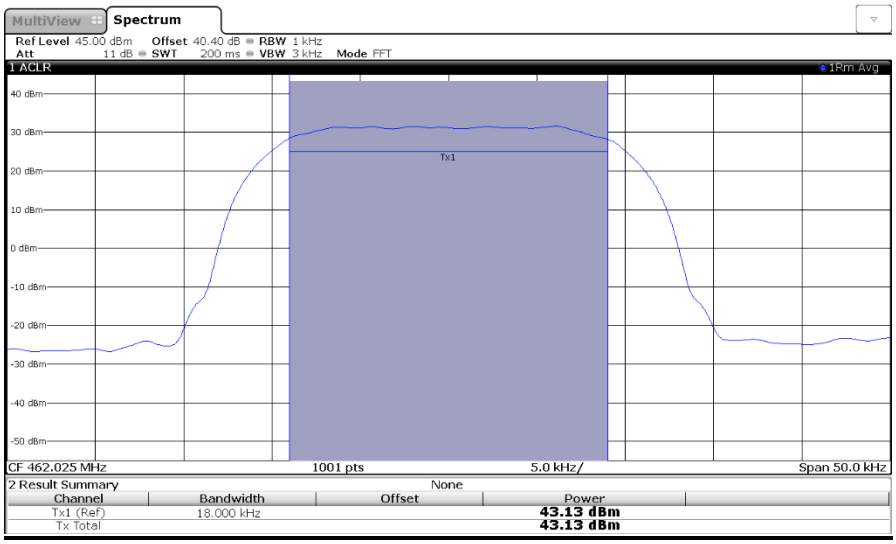
Test results :

Frequency (MHz)	Mesured output power (dBm)	Power (W)
LOW	43.14	20.61
MIDDLE	43.13	20.56
HIGH	43.11	20.46

Transmit, Low Frequency, Maximum Conducted Output Power Plot



Transmit, Middle Frequency, Maximum Conducted Output Power Plot



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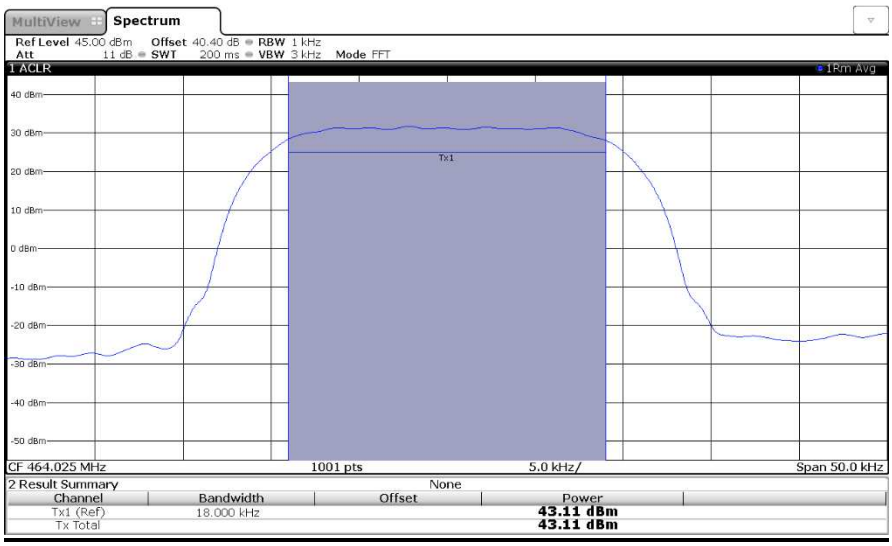
Transmit, High Frequency, Maximum Conducted Output Power Plot



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V) Type of emissions

Test Requirement(s) :
FCC 47 CFR Part 90, Clause 90.207

Tested by : VELTZ Stephane **Date of test :** 05/05/2015

Limit :

FCC 47 CFR Part 90, Limit Clause 90.207

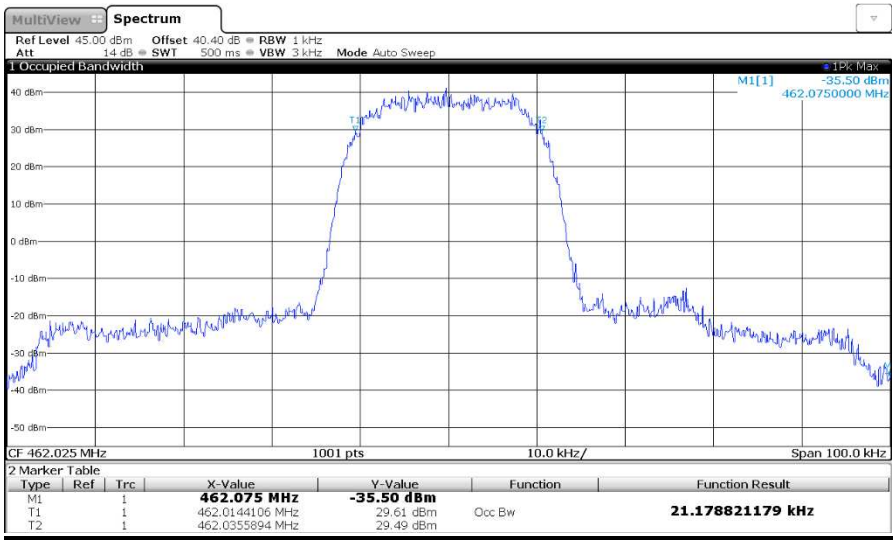
The class of emission declared is authorised for use within the scope of specification.

Equipment used for the test : FSW8

Method :
The class of emission has been chosen in accordance with FCC 47 CFR Part 90.207(a). A plot showing the bandwidth of the emission has been included for reference.

Test results : The class of the emission has been declared as G1D.

Transmit, Middle Frequency, Type of emissions Plot



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VI) Occupied Bandwidth

Test Requirement(s) :
FCC 47 CFR Part 2, Clause 2.1049
Industry Canada RSS-119, Clause 5.5.8

Tested by : VELTZ Stephane **Date of test :** 05/05/2015

Rated power : 25 W = 43.98 dBm.

Limit :
Equipment designed to operate with a 25 kHz channel bandwidth may be authorised up to a 22 kHz bandwidth if the equipment meets the adjacent channel power requirements of FCC 47 CFR Part, clause 90.221 and Industry Canada RSS-119, clause 5.8.9.1.

FCC 47 CFR Part 2, Limit Clause

None Specified.

Industry Canada RSS-119, Limit Clause 5.5.8

Frequency Band (MHz)	Related SRSP for Channelling Plan and e.r.p.	Channel Spacing (kHz)	Authorized Bandwidth (kHz)	Spectrum Masks with Audio Filter	Spectrum Masks Without Audio Filter
27.41-28.0 and 29.7-50.0	N/A	20	20	B	C
72-76	N/A	20	20	B	C
138-144; 148-149.9 and 150.05-174	SRSP-500	30	20	B	C
		15	11.25	D	D
		7.5	6	E	E
217-218 and 219-220	N/A	12.5	11.25	D or I	D or J
220-222	SRSP-512	5	4	F	F
406.1-430 and 450-470	SRSP-501	25	20	B	C (G, Note 1)
			22	Y	Y
		12.5	11.25	D	D
		6.25	6	E	E
764-776 and 794-806	SRSP-511	6.25 12.5 25 50	Note 2	Section 5.8.9	Section 5.8.9
806-821-/851-866 and 821-824/866-869	SRSP-502		20	B	G
		25	22	Y	Y
		12.5	11.25	D	D
896-901/935-940	SRSP-506	12.5	13.6	I	J (G, Note 3)
929-930 and 931-932	SRSP-504 (for aging)	25	20	B	G
928-929/952-953 and 932-932.5/941-941.5	SRSP-505	25	20	B	G
		12.5	11.25	D	D
932.5-935/941.5-944	SRSP-507	25	20	B	G
		12.5	11.25	D	D

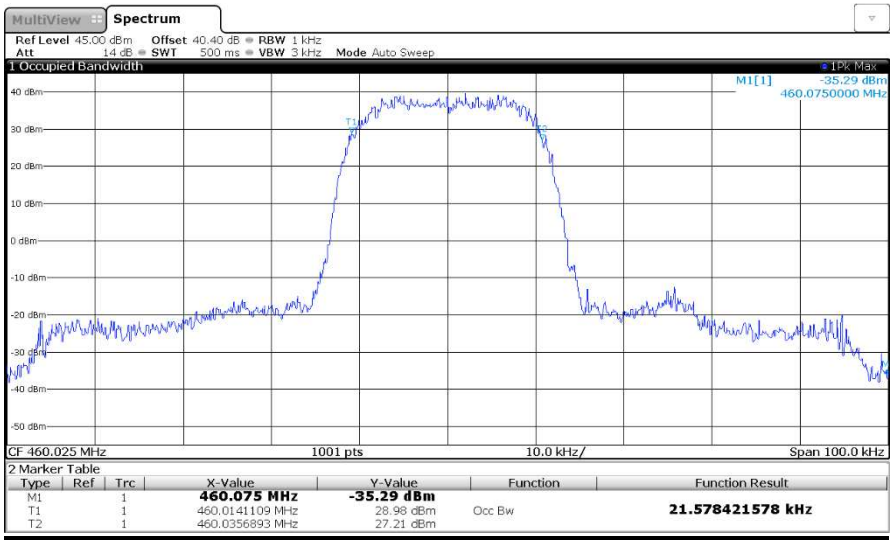
Equipment used for the test : FSW8

Method :
The test was performed in accordance with KDB 971168 D01 v02r02, clause 4.2.

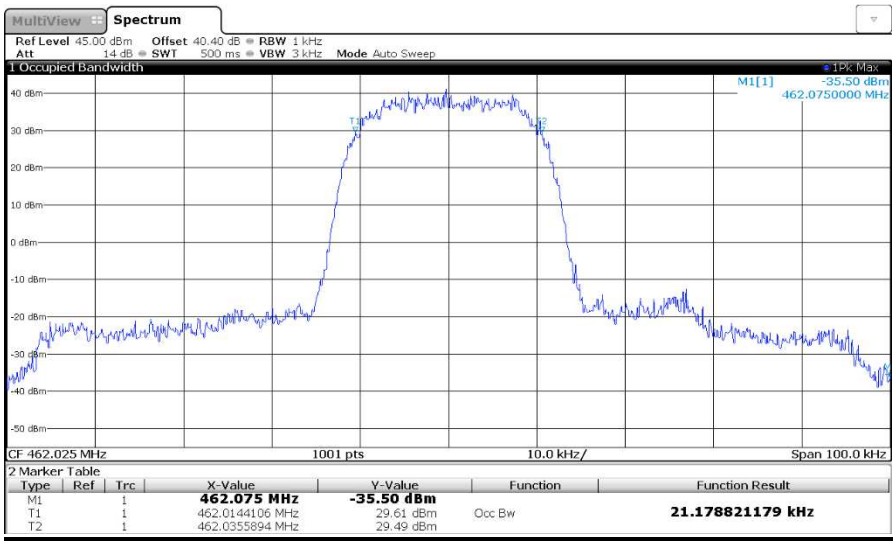
Test results :

Frequency (MHz)	99% Occupied bandwidth (kHz)
LOW	21.58
MIDDLE	21.18
HIGH	21.38

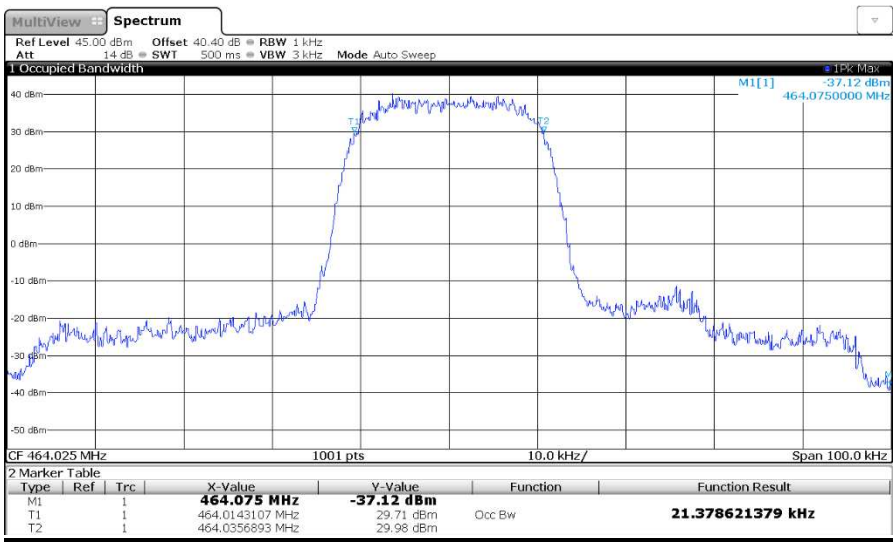
Transmit, Low Frequency, Occupied bandwidth Plot



Transmit, Middle Frequency, Occupied bandwidth Plot



Transmit, High Frequency, Occupied bandwidth Plot



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VII) Spurious Emissions at antenna terminals

Test Requirement(s) : FCC 47 CFR Part 90, Clause 90.210 (g) FCC 47 CFR Part 2, Clause 2.1051 Industry Canada RSS-119, Clause 5.8.10 2.4.2	
Tested by : VELTZ Stephane	**Date of test :** 05/05/2015

Method :

FCC 47 CFR Part 90, clause 90.210

For emissions within 421 MHz to 512 MHz and within 250% from the centre of the authorized bandwidth, measurements were performed against FCC 47 CFR Part 90, clause 90.210, emission mask C. The EUT was connected to a spectrum analyser via a cable and attenuator.
The spectrum emission mask measurement function of the spectrum analyser was used with the RBW configured to 100 Hz with RMS detector and trace averaging.

Emission mask C

Displacement Frequency, fd (kHz)	Minimum Attenuation (dB)
5 < fd ≤ 10	83 log10(fd/5)
10 < fd ≤ 250 % authorized bandwidth	whichever is the lesser attenuation: 50 or 29 log10(fd 2 /11)
fd > 250 % authorized bandwidth	43 + 10 log10(p)

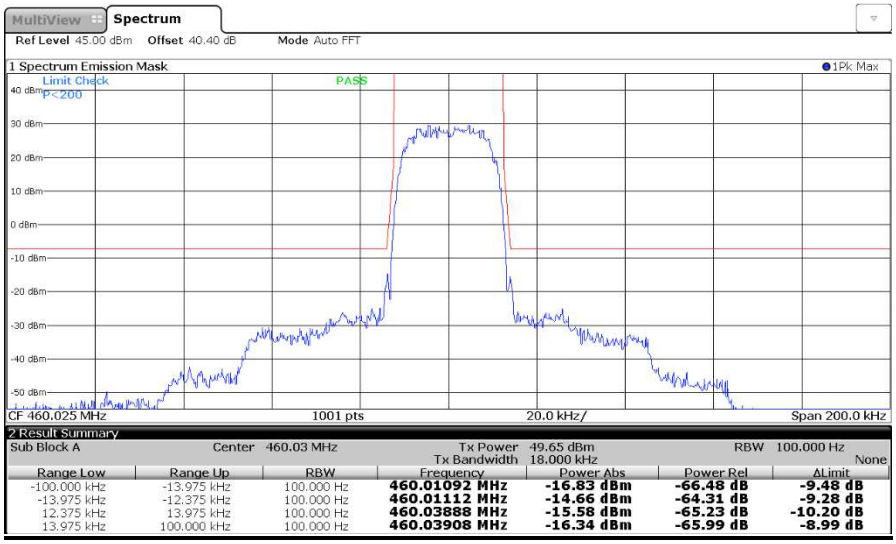
Industry Canada RSS-119, Clause 5.8.10 2.4.2

For emissions within 406.1 MHz to 430 MHz and 450 MHz to 470 MHz the applicable spectrum mask is mask Y for an authorized bandwidth of 22kHz.
The EUT was connected to a spectrum analyser via a cable and attenuator.
The spectrum emission mask measurement function of the spectrum analyser was used with the RBW configured to 100 Hz with RMS detector and trace averaging.

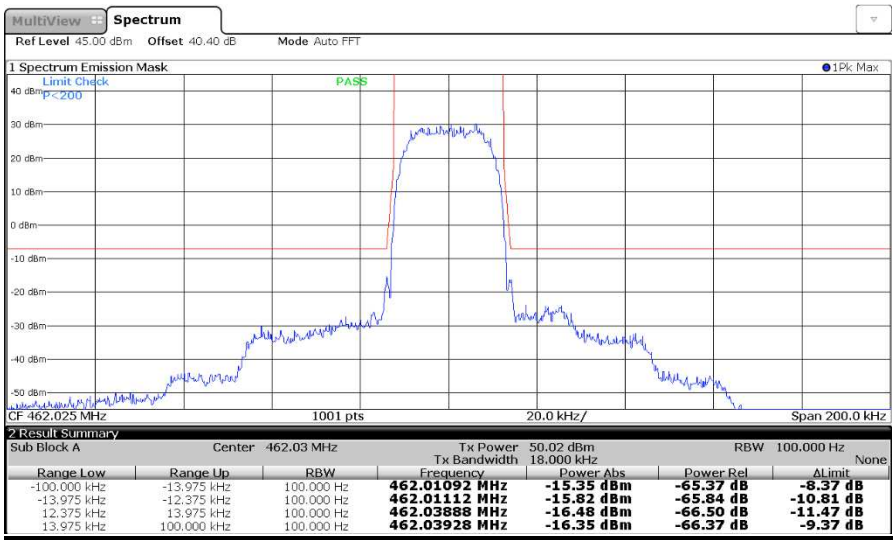
Emission mask Y

Displacement Frequency, fd (kHz)	Minimum Attenuation (dB)	Resolution Bandwidth (Hz)
12.375 < fd ≤ 13.975	whichever is the lesser attenuation: 30 + 16.67(fd–12.375) or 55 + 10 log10(p)	Specified in Section 4.2.2
fd > 13.975	whichever is the lesser attenuation: 57 or 55 + 10 log10(p)	Specified in Section 4.2.2

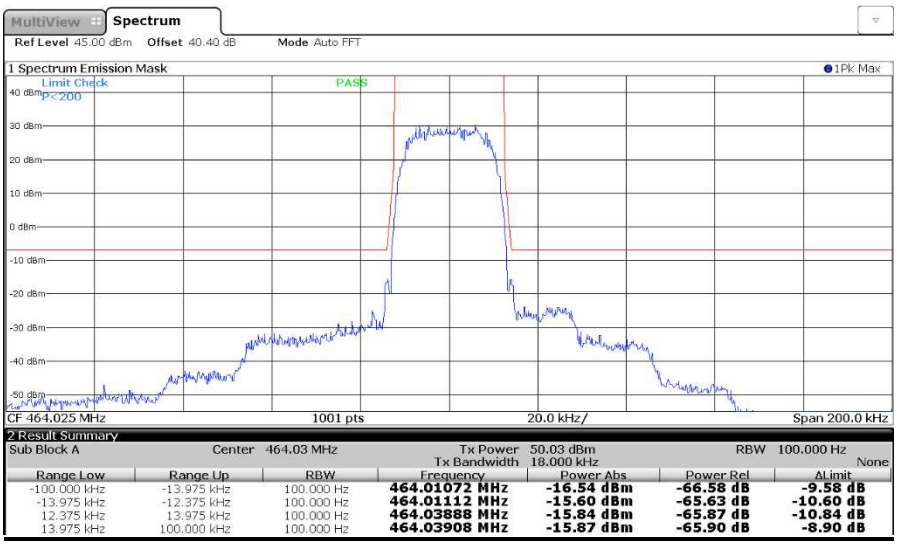
Transmit, Low Frequency, Emission mask Y, Spuriours Emissions at Antenna Terminals Plot



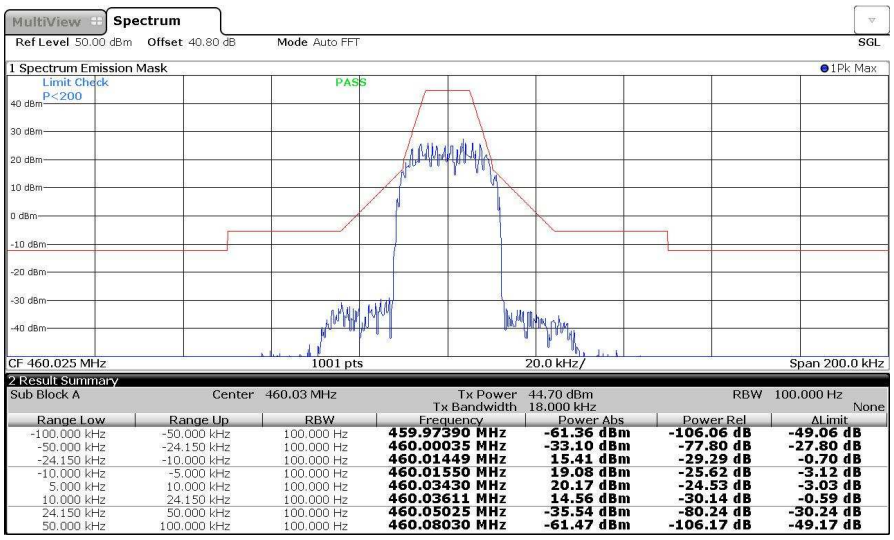
Transmit, Middle Frequency, Emission mask Y, Spuriours Emissions at Antenna Terminals Plot



Transmit, High Frequency, Emission mask Y, Spuriours Emissions at Antenna Terminals Plot

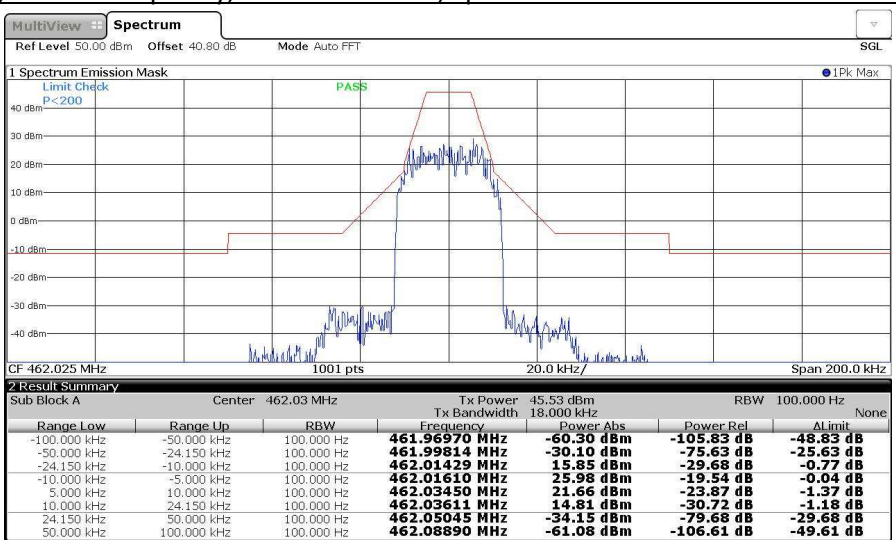


Transmit, Low Frequency, Emission mask C, Spuriours Emissions at Antenna Terminals Plot



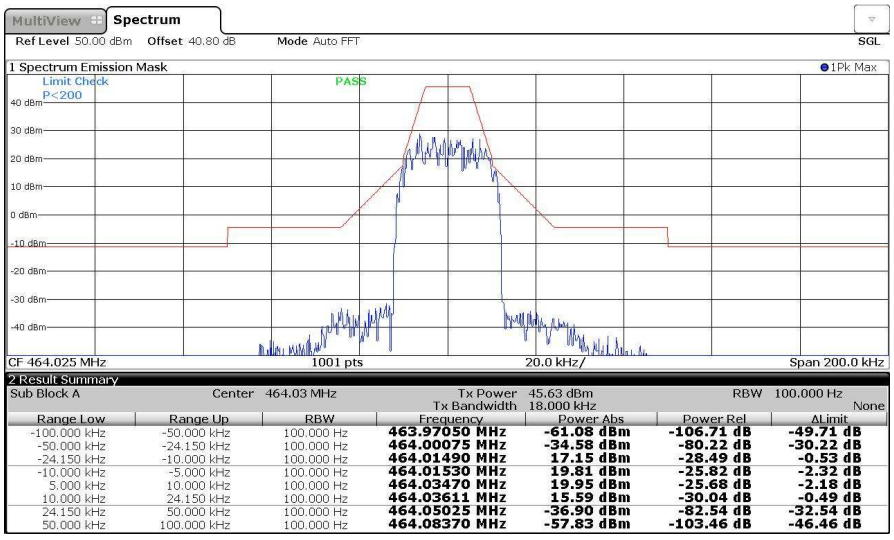
Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-100.000 kHz	-50.000 kHz	100.000 Hz	**459.97390 MHz**	**-61.36 dBm**	**-106.06 dB**	**-49.06 dB**
-50.000 kHz	-24.150 kHz	100.000 Hz	**460.00035 MHz**	**-33.10 dBm**	**-77.80 dB**	**-27.80 dB**
-24.150 kHz	-10.000 kHz	100.000 Hz	**460.01449 MHz**	**15.41 dBm**	**-29.29 dB**	**-0.70 dB**
-10.000 kHz	-5.000 kHz	100.000 Hz	**460.01550 MHz**	**19.08 dBm**	**-25.62 dB**	**-3.12 dB**
5.000 kHz	10.000 kHz	100.000 Hz	**460.03430 MHz**	**20.17 dBm**	**-24.53 dB**	**-3.03 dB**
10.000 kHz	24.150 kHz	100.000 Hz	**460.03611 MHz**	**14.56 dBm**	**-30.14 dB**	**-0.59 dB**
24.150 kHz	50.000 kHz	100.000 Hz	**460.05025 MHz**	**-35.54 dBm**	**-80.24 dB**	**-30.24 dB**
50.000 kHz	100.000 kHz	100.000 Hz	**460.08030 MHz**	**-61.47 dBm**	**-106.17 dB**	**-49.17 dB**

Transmit, Middle Frequency, Emission mask C, Spuriours Emissions at Antenna Terminals Plot



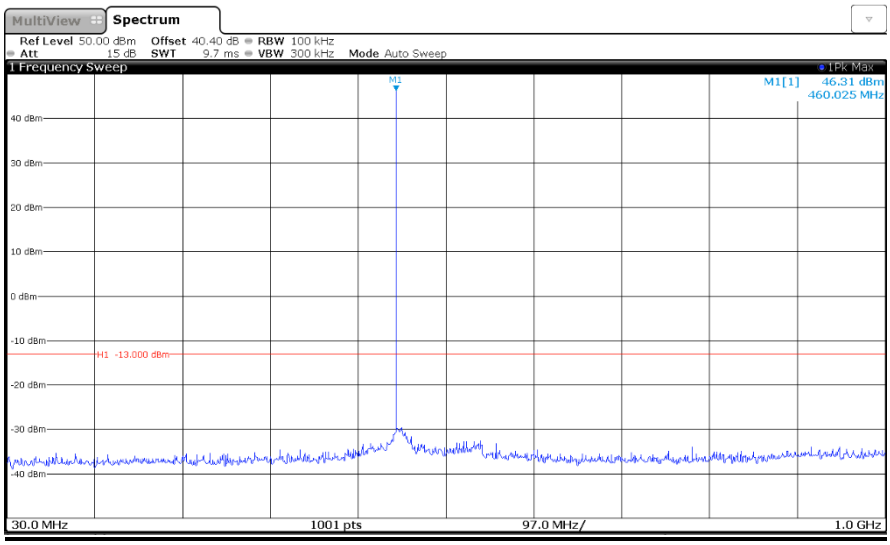
Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-100.000 kHz	-50.000 kHz	100.000 Hz	**461.96970 MHz**	**-60.30 dBm**	**-105.83 dB**	**-48.83 dB**
-50.000 kHz	-24.150 kHz	100.000 Hz	**461.99814 MHz**	**-30.10 dBm**	**-75.63 dB**	**-25.63 dB**
-24.150 kHz	-10.000 kHz	100.000 Hz	**462.01429 MHz**	**15.85 dBm**	**-29.68 dB**	**-0.77 dB**
-10.000 kHz	-5.000 kHz	100.000 Hz	**462.01610 MHz**	**25.98 dBm**	**-19.54 dB**	**-0.04 dB**
5.000 kHz	10.000 kHz	100.000 Hz	**462.03450 MHz**	**21.66 dBm**	**-23.87 dB**	**-1.37 dB**
10.000 kHz	24.150 kHz	100.000 Hz	**462.03611 MHz**	**14.81 dBm**	**-30.72 dB**	**-1.18 dB**
24.150 kHz	50.000 kHz	100.000 Hz	**462.05045 MHz**	**-34.15 dBm**	**-79.68 dB**	**-29.68 dB**
50.000 kHz	100.000 kHz	100.000 Hz	**462.08890 MHz**	**-61.08 dBm**	**-106.61 dB**	**-49.61 dB**

Transmit, High Frequency, Emission mask C, Spuriours Emissions at Antenna Terminals Plot

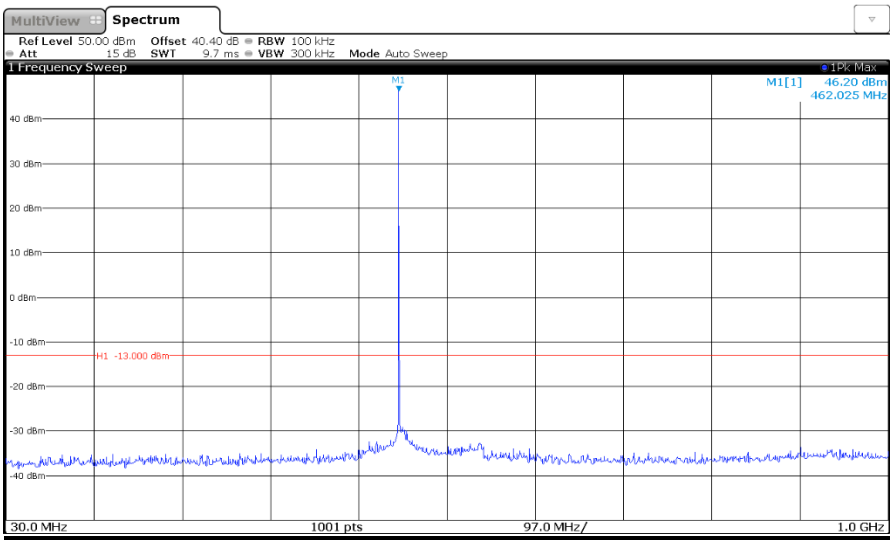


Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-100.000 kHz	-50.000 kHz	100.000 Hz	**463.97050 MHz**	**-61.08 dBm**	**-106.71 dB**	**-49.71 dB**
-50.000 kHz	-24.150 kHz	100.000 Hz	**464.00075 MHz**	**-34.58 dBm**	**-80.22 dB**	**-30.22 dB**
-24.150 kHz	-10.000 kHz	100.000 Hz	**464.01490 MHz**	**17.15 dBm**	**-28.49 dB**	**-0.53 dB**
-10.000 kHz	-5.000 kHz	100.000 Hz	**464.01530 MHz**	**19.81 dBm**	**-25.82 dB**	**-2.32 dB**
5.000 kHz	10.000 kHz	100.000 Hz	**464.03470 MHz**	**19.95 dBm**	**-25.68 dB**	**-2.18 dB**
10.000 kHz	24.150 kHz	100.000 Hz	**464.03611 MHz**	**15.59 dBm**	**-30.04 dB**	**-0.49 dB**
24.150 kHz	50.000 kHz	100.000 Hz	**464.05025 MHz**	**-36.90 dBm**	**-82.54 dB**	**-32.54 dB**
50.000 kHz	100.000 kHz	100.000 Hz	**464.08370 MHz**	**-57.83 dBm**	**-103.46 dB**	**-46.46 dB**

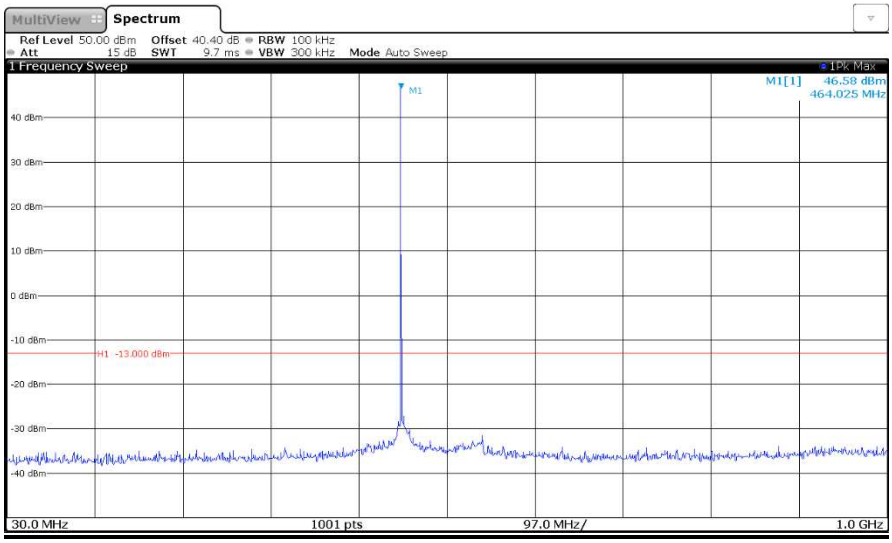
Transmit, Low Frequency, 30 MHz to 1 GHz, Spuriours Emissions at Antenna Terminals Plot



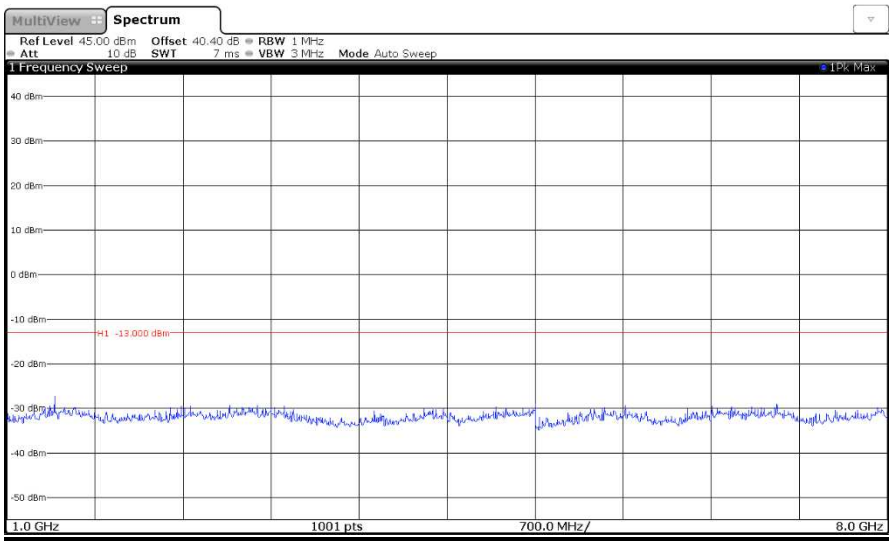
Transmit, Middle Frequency, 30 MHz to 1 GHz, Spuriours Emissions at Antenna Terminals Plot



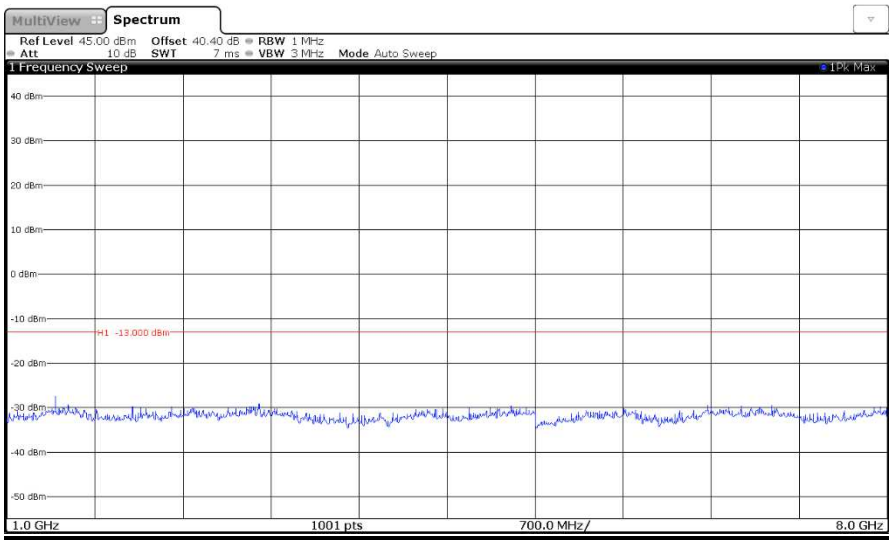
Transmit, High Frequency, 30 MHz to 1 GHz, Spuriours Emissions at Antenna Terminals Plot



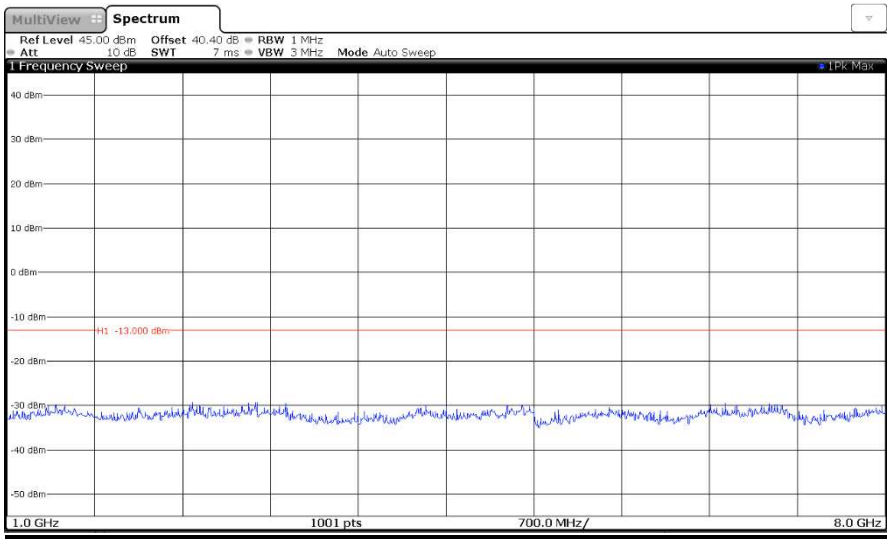
Transmit, Low Frequency, 1 GHz to 8 GHz, Spuriours Emissions at Antenna Terminals Plot



Transmit, Middle Frequency, 1 GHz to 8 GHz, Spuriours Emissions at Antenna Terminals Plot



Transmit, High Frequency, 1 GHz to 8 GHz, Spuriours Emissions at Antenna Terminals Plot



Remarks :

As specified in FCC document 12-114, TETRA equipment exceeds the Part 90 occupied bandwidth limits and emission masks: it operates with a bandwidth of up to 22 kilohertz, and excursions of up to five decibels from Part 90 emission masks B, C and G. In 2009, the TETRA Association requested waivers of the Part 90 occupied bandwidth limits and emission masks in order to permit implementation of TETRA technology in the United States.

VIII) Frequency stability

Test Requirement(s) : FCC 47 CFR Part 90, Clause 90.213 (a) FCC 47 CFR Part 2, Clause 2.1055 Industry Canada RSS-119, Clause 5.3	
Tested by : VELTZ Stephane	**Date of test :** 04/05/2015

Limit :

FCC 47 CFR Part 90, Limit Clause 90.213

In the frequency range 421-512 MHz, the frequency error shall not exceed 2.5 ppm.

Industry Canada RSS-119, Limit Clause 5.3

In the frequency range 406.1-430 and 450-470, the frequency error shall not exceed 0.5 ppm.

Equipment used for the test : AEROFLEX 3920, TESTO 608 H2

Method :

Measurements were performed in accordance with FCC 47 CFR Part 2, clause 2.1055.
The EUT is connected to a Tetra Radio test set AEROFLEX 3920. A GPS signal was supplied to the EUT as representative of normal operation.
The frequency error is measured with frequency meter option of the AEROFLEX 3920.

Test results :

a) Frequency stability vs voltage variations

Frequency Stability vs Voltage: Vary primary supply voltage from 85% to 115% of the nominal value under normal temperature condition.

Test Datas :

Voltage (V)	Frequency error (ppm)
40.8	-0.09
48.0	-0.08
55.2	-0.10

b) Frequency stability vs temperature variations

The frequency tolerance measurements over temperature variations were made over the temperature range of –30ºC to +50ºC.

The EUT was placed inside a climatic chamber and the temperature was raised hourly in 10°C steps from –30°C up to +50°C.

Test Datas :

Temperature (°C)	Frequency error (ppm)
-30	0.10
-20	0.08
-10	-0.08
0	-0.10
+10	-0.09
+20	-0.05
+30	-0.07
+40	0.10
+50	0.09

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IX) Adjacent Channel Power

Test Requirement(s) : FCC 47 CFR Part 90, Clause 90.221 (b1)	
Tested by : VELTZ Stephane	**Date of test :** 06/05/2015

Limit :

FCC 47 CFR Part 90, Clause 90.221 (b1)

Frequency offset (kHz)	Maximum ACP (dBc) for devices above 1 watt
±75	-70
±50	-70
±25	-60

Equipment used for the test : FSW8

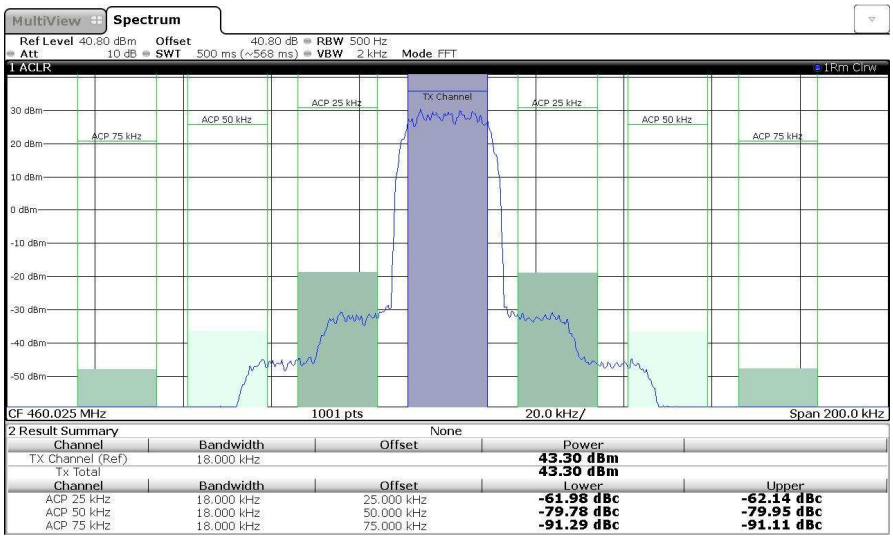
Method :

The EUT was configured to operate at maximum power with modulation as described in the manufacturer's documentation. The EUT was connected to a spectrum analyser using a cable and attenuator. The adjacent channel power measurement function of the spectrum analyser was used configured using the TETRA radio standard mode.

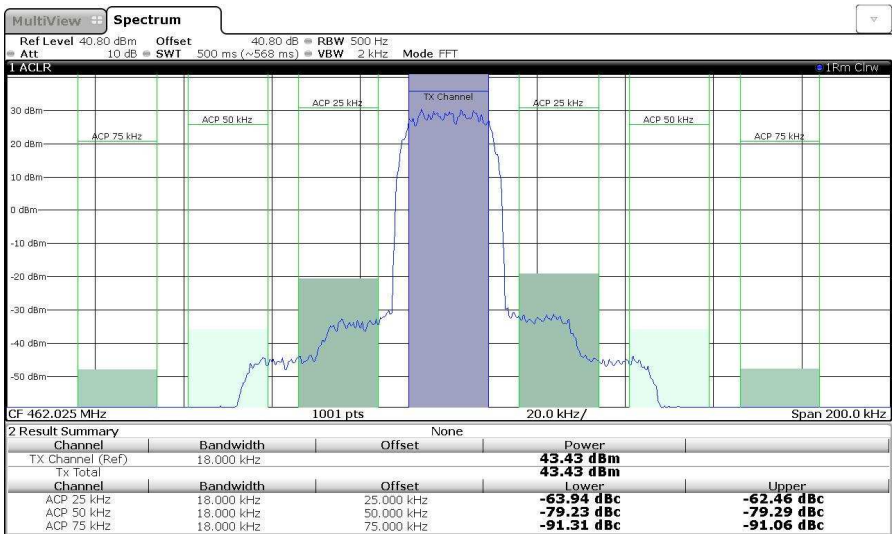
Test results :

Frequency offset (kHz)	Low Frequency	Middle Frequency	High Frequency
-75	-91.29 dBc	-91.31 dBc	-91.30 dBc
-50	-79.78 dBc	-79.23 dBc	-77.42 dBc
-25	-61.98 dBc	-63.94 dBc	-62.24 dBc
+25	-62.14 dBc	-62.46 dBc	-63.01 dBc
+50	-79.95 dBc	-79.29 dBc	-79.39 dBc
+75	-91.11 dBc	-91.06 dBc	-91.11 dBc

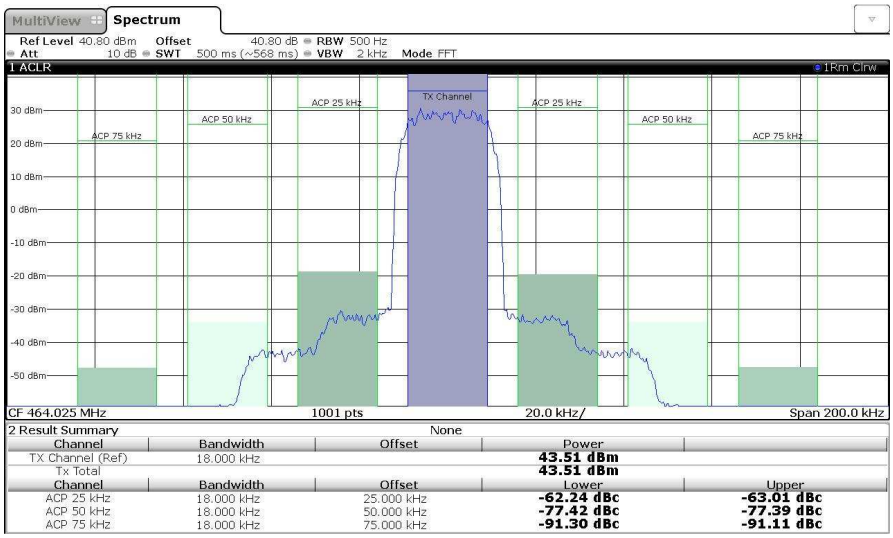
Transmit, Low Frequency, Adjacent Channel Power Plot



Transmit, Middle Frequency, Adjacent Channel Power Plot



Transmit, High Frequency, Adjacent Channel Power Plot



X) Receiver Spurious Emissions

Test Requirement(s) : RSS-119 section 5.11	
Tested by : VELTZ Stephane	**Date of test :** 06/05/2015

Limit :

RSS-Gen, clause 7.1.3

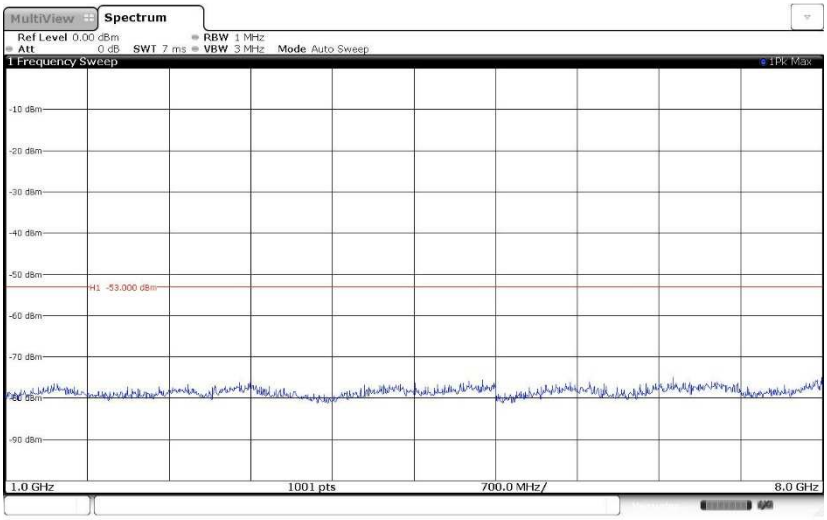
From 30 MHZ to 1 GHz, no spurious > 2 nW (-57 dBm)
Upper 1 GHz, no spurious > 5 nW (-53 dBm)

Equipment used for the test : FSW8

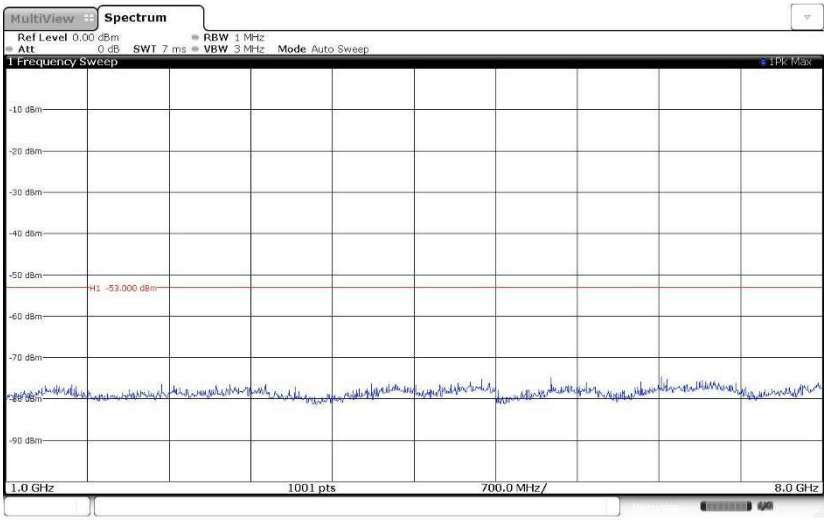
Method :
The EUT was programmed for receive mode only. Conducted measurements were taken at the antenna port of the EUT. 100 kHz resolution bandwidth was used from 30 Mhz to 1 GHz and 1 Mhz resolution was used above 1 GHz. All plots are corrected for cable loss.

Test results :

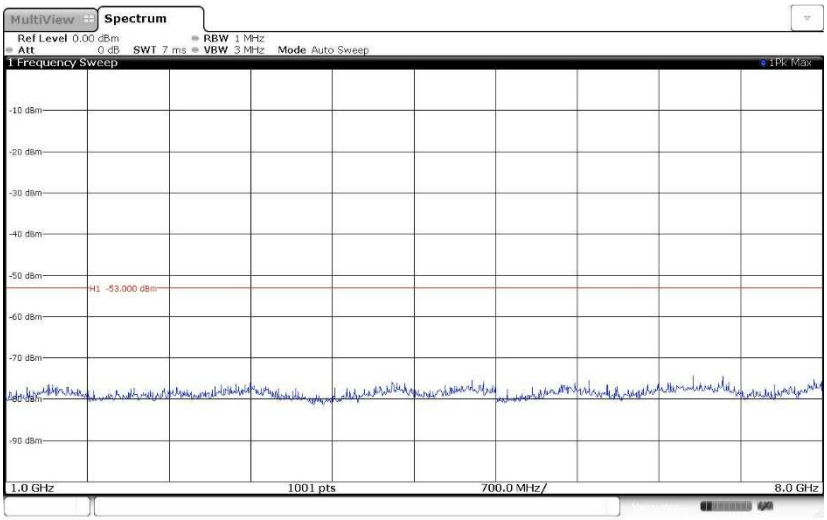
Receiver, Low Frequency, Receiver Conducted Limits Plot from 30MHz up to 1 GHz



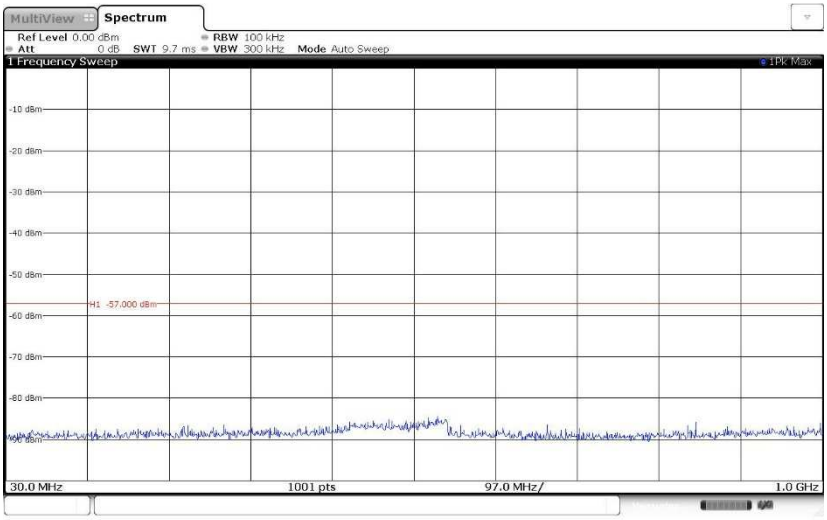
Receiver, Middle Frequency, Receiver Conducted Limits Plot from 30MHz up to 1 GHz



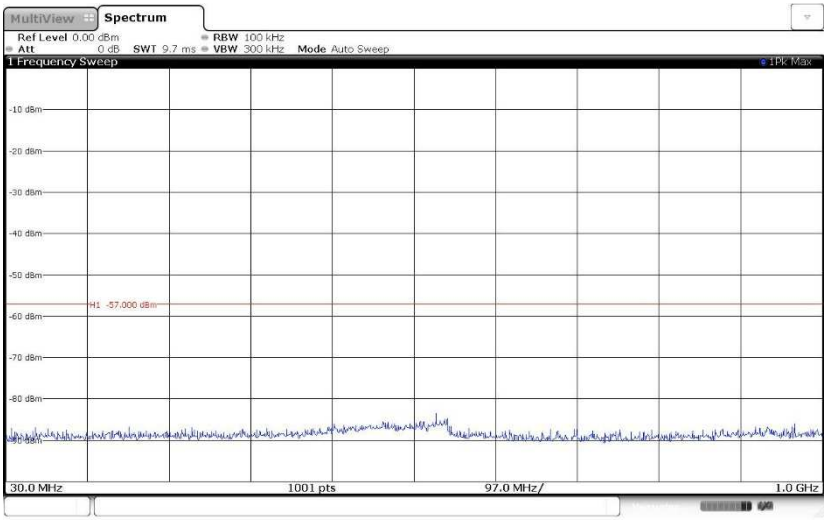
Receiver, High Frequency, Receiver Conducted Limits Plot from 30MHz up to 1 GHz



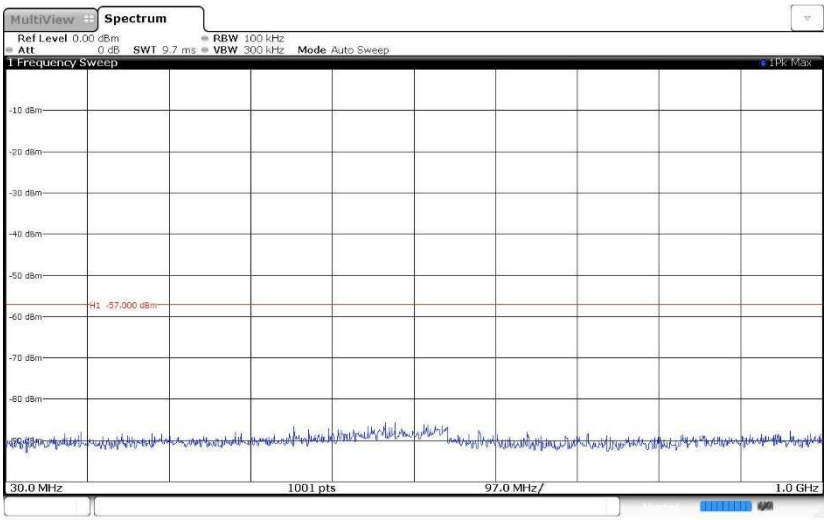
Receiver, Low Frequency, Receiver Conducted Limits Plot from 1 GHz up to 8 GHz



Receiver, Middle Frequency, Receiver Conducted Limits Plot from 1 GHz up to 8 GHz



Receiver, High Frequency, Receiver Conducted Limits Plot from 1 GHz up to 8 GHz



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P.A. de Villejust
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XI) Modulation Characteristics

Test Requirement(s) :
FCC 47 CFR Part 2, Clause 2.1047 (d)

Tested by : VELTZ Stephane **Date of test :** 06/05/2015

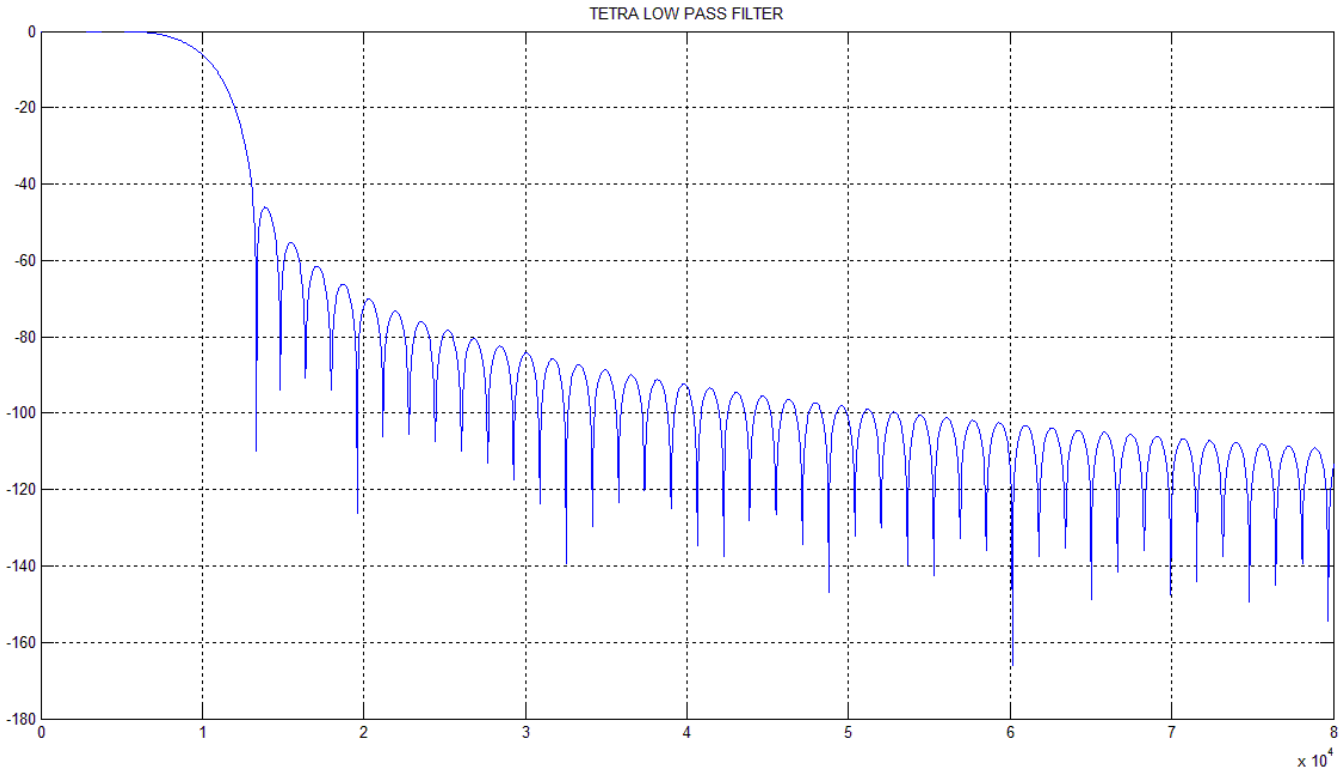
Limit :

FCC 47 CFR Part 2, Limit Clause 2.1047 (d)

A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

Test results :

Transmit, Modulation Characteristics



XII) Test equipments

Conducted measurements equipments list :

Type of equipment	Manufacturer	Model	Serial	Last Cal Date	Cal Due Date
Spectrum analyzer	ROHDE & SCHWARZ	FSW8	101388	15/05/14	15/05/15
Tetra radio test set	AEROFLEX	3920	299001852	12/02/15	12/02/16
Thermometer	TESTO	608-H2	41430078	15/04/15	15/04/16
Hygrometer	TESTO	608-H2	41430078	15/04/15	15/04/16

END OF THE REPORT