



**Telecommunications & Telematics
for Transports Lab.**

TEST REPORT

Ref. No. ARSG00176

Date: 2007-02-07

Measurements performed in accordance with:



**FCC Rules : Code of Federal Regulations (CFR) no. 47 -
PART 15 – RADIO FREQUENCY DEVICES**

PRODUCT : Radio Module for Emergency lighting equipment

TESTED MODEL : 8976

FCC ID : TAE8976

APPLICANT : BEGHELLI S.p.A. – Via Mozzeghine, 13-15, I-40050 Monteveglio (BO)

MANUFACTURER : BEGHELLI S.p.A. – Via Mozzeghine, 13-15, I-40050 Monteveglio (BO)

TRADEMARK : BEGHELLI CANADA

SERIES : /

OTHER INFORMATION

Testing dates : 2006-08-30 ÷ 2007-02-06

Tested samples No. : 1

Testing Laboratory : IMQ S.p.A. Via Quintiliano, 43 I-20138 MILANO

Tested by : R. Radice Signature: *Roberto Radice* Date : 2006-12-14

Checked by: R. Colombo (EMC and R&TTE Lab. deputy) Signature: *Roberto Colombo* Date : 2007-02-07

Revision Sheet

Release No.	Date	Revision Description
Rev. 0	2006-12-14	Test Results and Evaluation Report
Rev. 1	2007-02-07	Conducted measurement Peak Output Power

NOTICE: The results of tests and checks reported in this Test Report refer exclusively to the samples tested and described in the Report itself. This report shall not be reproduced partially or in its entirety without the written approval of IMQ S.p.A.

IMQ S.p.A. - Via Quintiliano, 43 – I-20138 MILANO

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1 GENERAL DESCRIPTION OF EQUIPMENT UNDER TEST

1.1 APPLICANT

NAME	BEGHELLI S.p.A.
ADDRESS	Via Mozzeghine, 13-15, I-40050 Monteveglio
COUNTRY	Italy

1.2 MANUFACTURER

NAME	BEGHELLI S.p.A.
ADDRESS	Via Mozzeghine, 13-15, I-40050 Monteveglio
COUNTRY	Italy

1.3 EQUIPMENT CLASSIFICATION

According to the definition 15.3 (o) EUT is a **Frequency Hopping (Spread Spectrum) Intentional Radiator operating within the bands 902-928 MHz** so it shall fulfil provisions of 47CFR Part 15 Subpart C – Intentional radiators – and Section 15.247.

1.4 BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Parameters	Value
Type of equipment :	▪ Radio Module for Emergency lighting equipment
Model :	▪ 8976
FCC ID. :	▪ TAE8976
Trade Name	▪ BEGHELLI CANADA
Data cable :	▪ /
Telecom cable :	▪ /
Power supply type :	▪ D.C. Power
AC power input cable :	▪ /
DC power input cable :	▪ /

1.5 FEATURE OF EQUIPMENT UNDER TEST

Power specification	▪ DC 5 V
Operating frequency:	▪ 902-928 MHz (32 Channels)
Maximum RF output power:	▪ < 250 mW
Modulation:	▪ Frequency Hopping (Spread Spectrum)
Processor	▪ /
Main Battery	▪ /
Main SW identification	▪ /
Main HW Board identification	▪ /
Peripherals included (for system application)	▪ None
Interfaces :	▪ None
Integrated interfaces :	▪ None
AC adapter:	▪ None

CHANNEL CONFIGURATION

Channel (No.)	Frequency (MHz)	Channel (No.)	Frequency (MHz)
00	903.375	16	915.375
01	904.125	17	916.125
02	904.875	18	916.875
03	905.625	19	917.625
04	906.375	20	918.375
05	907.125	21	919.125
06	907.875	22	919.875
07	908.625	23	920.625
08	909.375	24	921.375
09	910.125	25	922.125
10	910.875	26	922.875
11	911.625	27	923.625
12	912.375	28	924.375
13	913.125	29	925.125
14	913.875	30	925.875
15	914.625	31	926.625

2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST

2.1 ENVIRONMENTAL CONDITIONS

TEST CONDITIONS	MEASURED
Ambient Temperature	20 ÷ 25 °C
Relative Humidity	50 ÷ 60 %
Atmospheric Pressure	900 ÷ 1000 mbar

2.2 DESCRIPTION OF SUPPORT EQUIPMENT

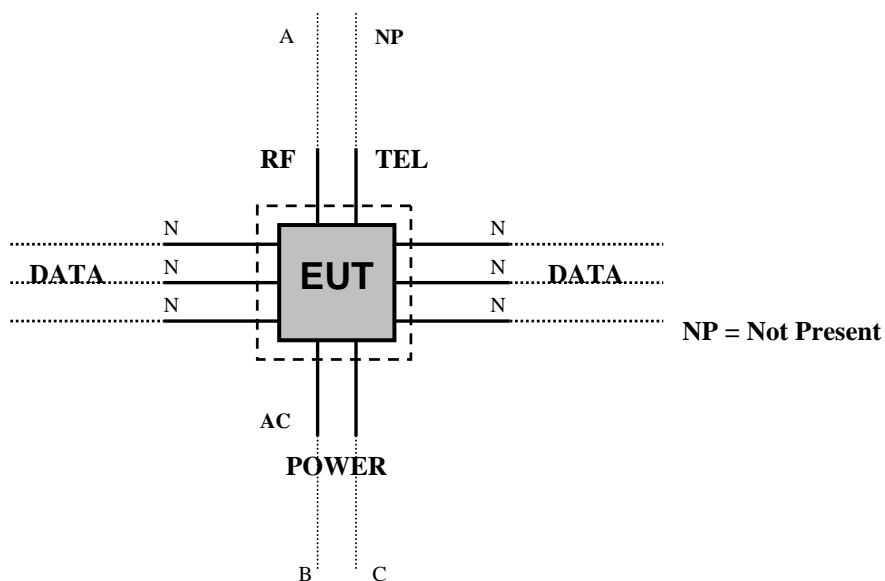
Here following the details concerning equipment needed for correct operation or loading of the EUT (only for AC Conducted Emission Measurement):

Emergency lighting equipment type:

1. **ESM6272LR9WCT**
2. **ESL6362LRTM9WCT**
3. **HWE63002LR9WCT**
4. **WLXSALR1W2LR654CT**
5. **EST-12-100-2LR9W-CT/ETL**
6. **HDT-12-100-2LR9W-CT/ETL**

manufactured by BEGHELLI CANADA used as host equipment for testing according to full requirements of the applied standard.

2.3 INTERFACE IDENTIFICATION AND CONNECTION DIAGRAM OF TEST SYSTEM



#	Interface	Description	Maximum length	Ref. Document
1	Enclosure	Open frame board	/	/
2	AC mains power input/output port of Host equipment	AC input power port	> 3m	/
3	Antenna port (RF)	Dedicated antenna	/	/

3 OPERATION OF EQUIPMENT UNDER TEST

3.1 OPERATING TEST CONDITIONS

Ref.	Description
#1	Continuous operation with lamp and battery charger turned on and transmission disabled
#2	Continuous operation with hopping function enabled
#3	Continuous operation with hopping function disabled (single channel transmission)

4 TESTS IDENTIFICATION AND RESULTS

SUMMARY OF TESTS

CFR47 Part 15 Section	Title	Operating condition	Result	Test No.
15.203/15.204	Antenna Requirements	/	PASS	1
15.207	Conducted Emission	#1	PASS	2
15.209	Radiated Emission	#3	PASS	3
15.247 (a)	Frequency Hopping Spread Spectrum Specifications			
15.247(a)(1)(i)	Number of Hopping Channels Used	#2	PASS	4
15.247(a)(1)(i)	20 dB Bandwidth	#3	PASS	5
15.247(a)(1)	Carrier frequency (Hopping Channel) Separation	#2	PASS	6
15.247(a)(1)(i)	Time occupancy (Dwell Time) of Each Channel (ch) within a $0,4 \times N_{ch}$ (sec) Period	#2	PASS	7
15.247(a)(2)	6dB Minimum Bandwidth	Comply to par. 15.247(a)(1)(i)		
15.247(b)	Maximum Peak Output Power			
15.247(b) (2)	Peak Output Power	#3	PASS	8 / 9
15.247(b) (4)	Antenna gain	Comply to par. 15.203 / 15.204		
15.247(c)	Operation with directional antenna gains greater than 6 dBi	Not applicable		
15.247 (d)	100 kHz Bandwidth of Frequency Band Edges	#2 #3	PASS	10

15.247 (e)	Power Spectral Density	Not applicable		
15.247 (f)	Hybrid systems	Not applicable		
15.247 (g)	FHSS Transmission characteristics	/	PASS	/
15.247 (h)	Recognition of occupied channel and multiple transmission system	Not applicable		
15.247(i) (§ 47CFR 1.1307(b)(1))	RF humane exposure	#3	PASS	11

4.1 METHODS OF MEASUREMENT

All compliance measurements have been carried out using the procedures described in the standard ANSI C63.4-2003 (excluding sub-par. 4.1.5.2, 5.7 9 and 14) and Section 15.31 of CFR47 Part 15 – Subpart A (General).

Additional test requirements have been adopted according to the reference Section indicated in the Test Table

4.2 FREQUENCY RANGE INVESTIGATED

- a. Conducted emission tests : from 150 kHz to 30 MHz
- b. Radiated emission tests : from 30 MHz to tenth harmonic of the highest fundamental frequency

5 MEASUREMENTS AND TESTS DATA

TEST No. 1	Title “Antenna Requirements”	47CFR Part 15 Ref. Section
		15.203 / 15.204
TEST REQUIREMENTS	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.	

Antenna specifications	
N° of authorized antenna types:	▪ 1
Antenna type :	▪ Dedicated antenna DYNAFLEX type DY9898
Total gain :	▪ 2.14 dBi (0 dBd)
External R.F. power amplifiers:	▪ Not present

Test Result:

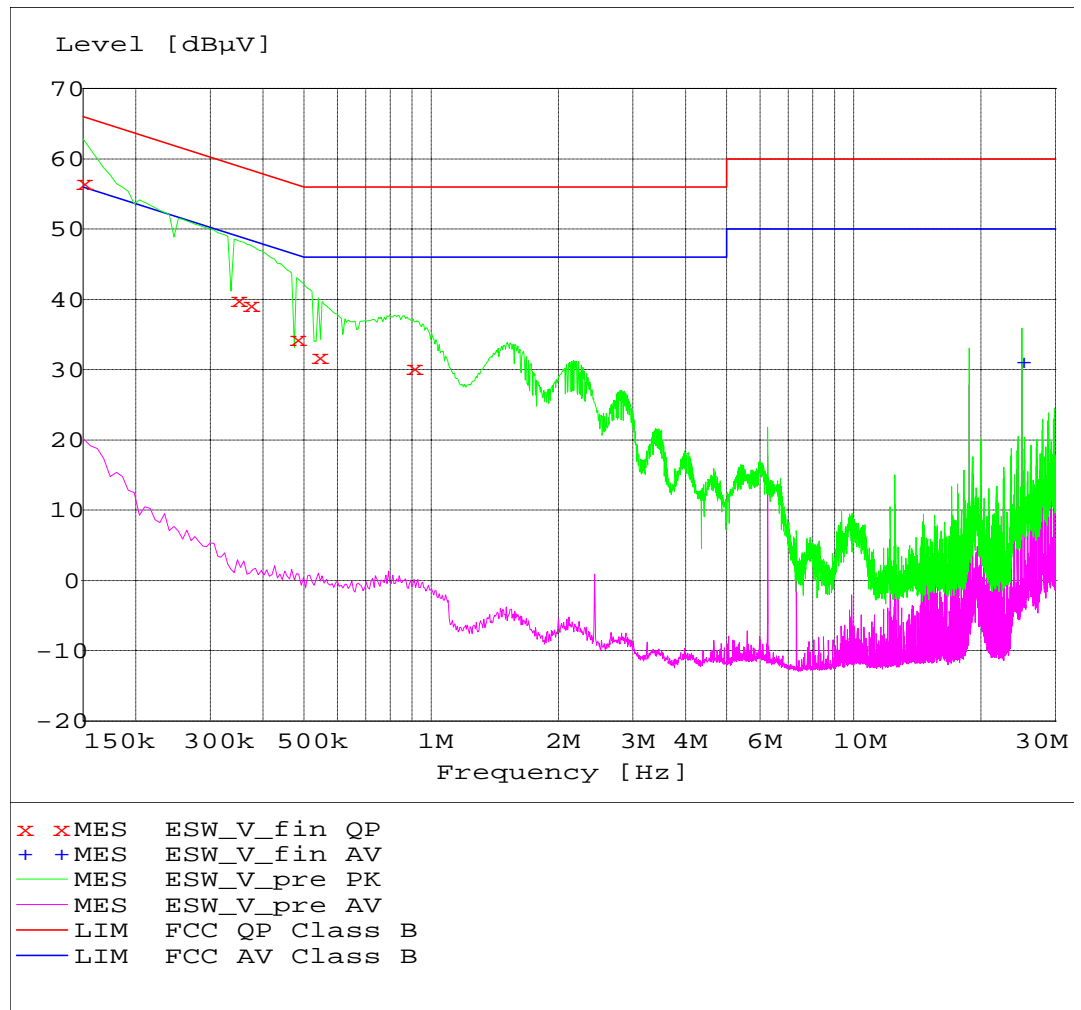
The transmitter meets the requirements of section 15.203 and 15.204

TEST No. 2	Title “Conducted emission”	47CFR Part 15 Ref. Section
		15.207
TEST REQUIREMENTS	Test setup	ANSI C63.4
	Limits of mains terminal disturbance voltage	15.207 (a)
	Frequency range	150 kHz – 30 MHz
	IF bandwidth	9 kHz
	EMC class	B

TEST DATA	PORT UNDER TEST	OPERATING CONDITION	RESULT
	AC mains power input port	#1	Complies
	Note: In search of max noise (phase(s) and neutral). The measurements with Quasi-Peak detector are performed only for frequencies for which the Peak values are \geq (Q.P. limit - 6 dB).		

Test Result:

Within the specifications

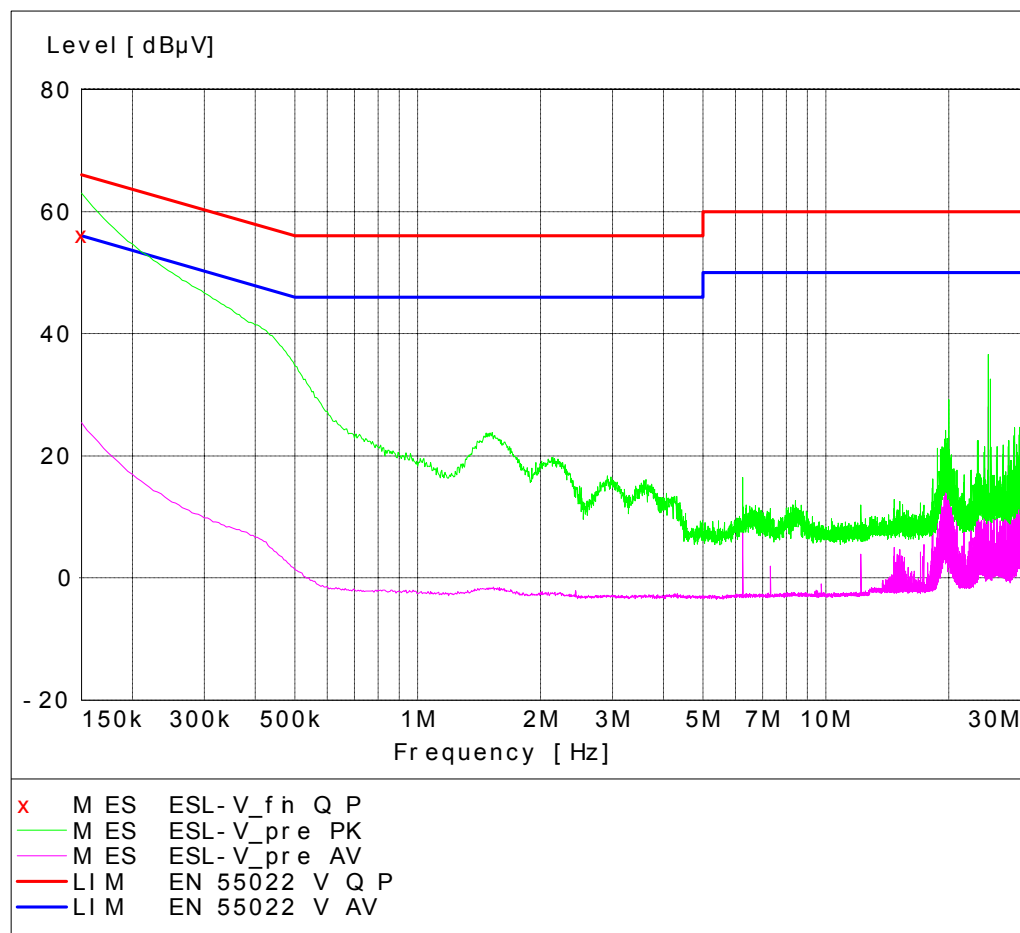
MEASUREMENTS RESULTS**CONDUCTED DISTURBANCE ON AC MAINS POWER PORT OF
EMERGENCY LIGHTING EQUIPMENT TYPE ESM6272LR9WCT**

FINAL TEST (QUASI-PEAK DETECTOR)

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dBµV	dB	dBµV	dB		
0.150000	56.60	10.40	66.00	9.40	L1	GND
0.348000	40.00	10.40	59.00	19.00	L1	GND
0.372000	39.30	10.40	58.50	19.10	L1	GND
0.480000	34.50	10.40	56.30	21.90	L1	GND
0.540000	31.80	10.40	56.00	24.20	L1	GND
0.906000	30.30	10.40	56.00	25.70	L1	GND

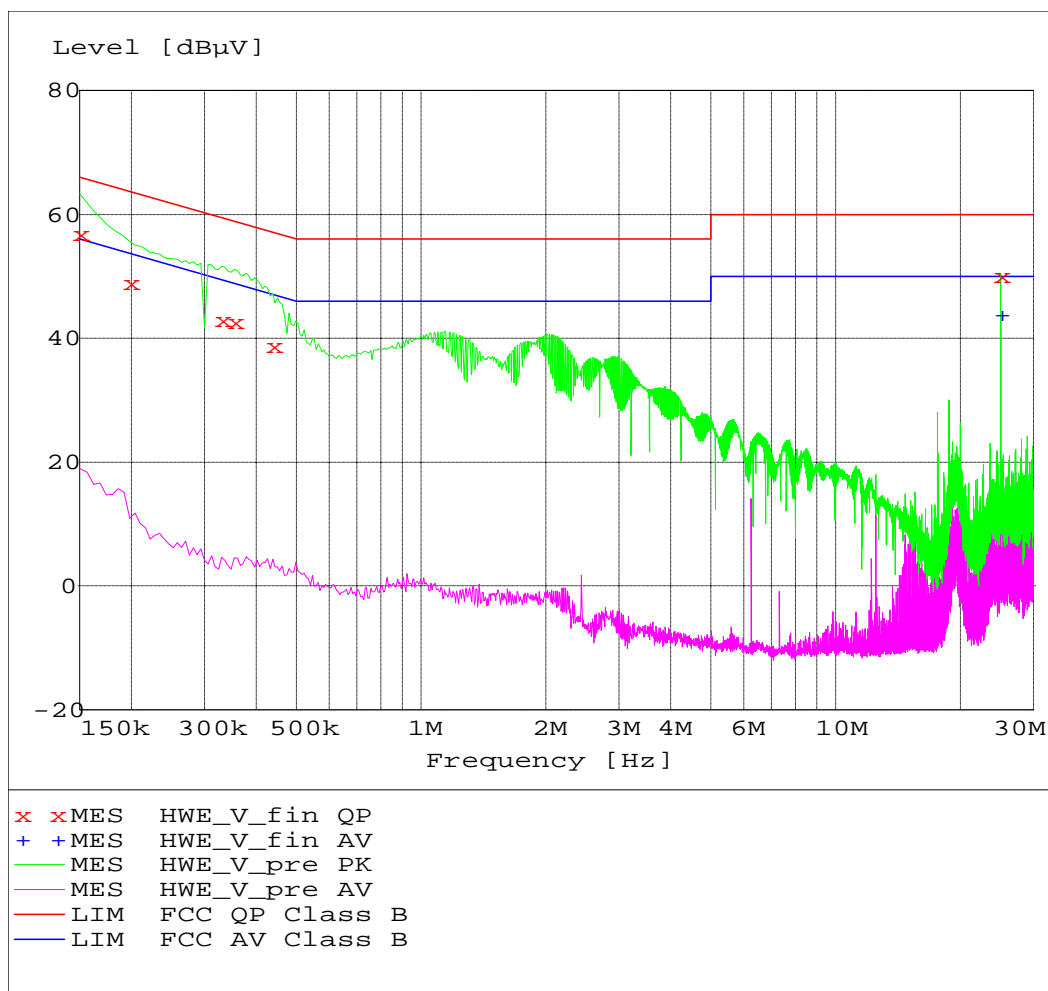
FINAL TEST (AVERAGE DETECTOR)

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dBµV	dB	dBµV	dB		
25.002000	31.10	11.00	50.00	18.90	L1	GND

**CONDUCTED DISTURBANCE ON AC MAINS POWER PORT OF
EMERGENCY LIGHTING EQUIPMENT TYPE ESL6362LRTM9WCT****FINAL TEST (QUASI-PEAK DETECTOR)**

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dBμV	dB	dBμV	dB		
0.150000	56.10	10.40	66.00	9.90	N	GND

CONDUCTED DISTURBANCE ON AC MAINS POWER PORT OF EMERGENCY LIGHTING EQUIPMENT TYPE HWE63002LR9WCT

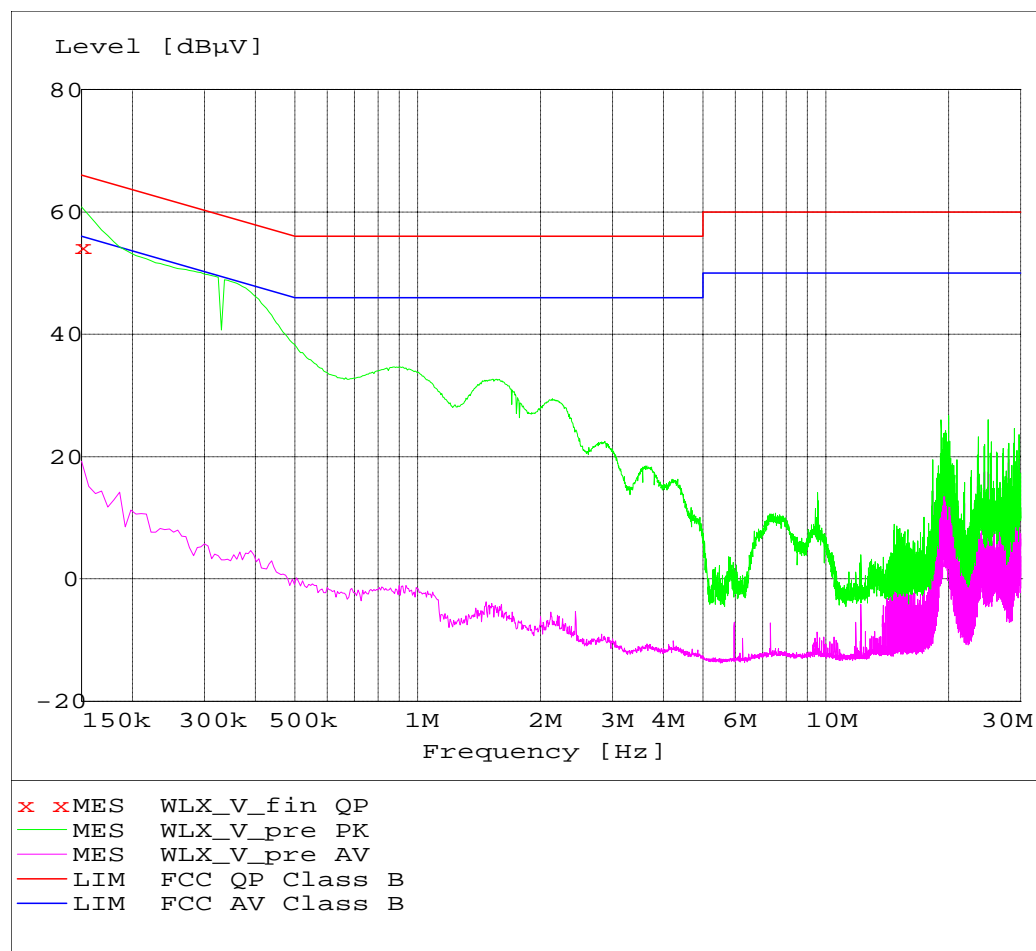


FINAL TEST (QUASI-PEAK DETECTOR)

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dB μ V	dB	dB μ V	dB		
0.150000	56.80	10.40	66.00	9.20	L1	GND
0.198000	48.80	10.40	63.70	14.90	L1	GND
0.330000	42.90	10.40	59.50	16.50	N	GND
0.354000	42.50	10.40	58.90	16.40	L1	GND
0.438000	38.70	10.40	57.10	18.40	N	GND
25.008000	50.00	11.00	60.00	10.00	L1	GND

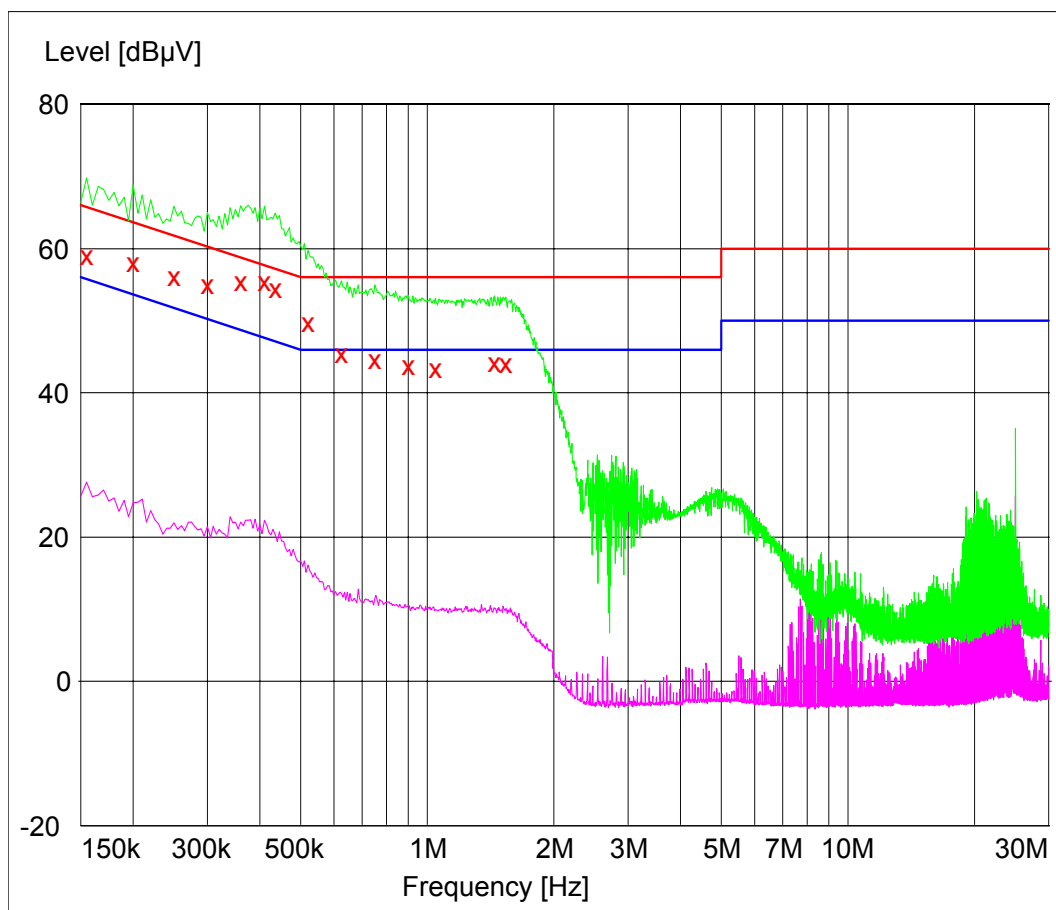
FINAL TEST (AVERAGE DETECTOR)

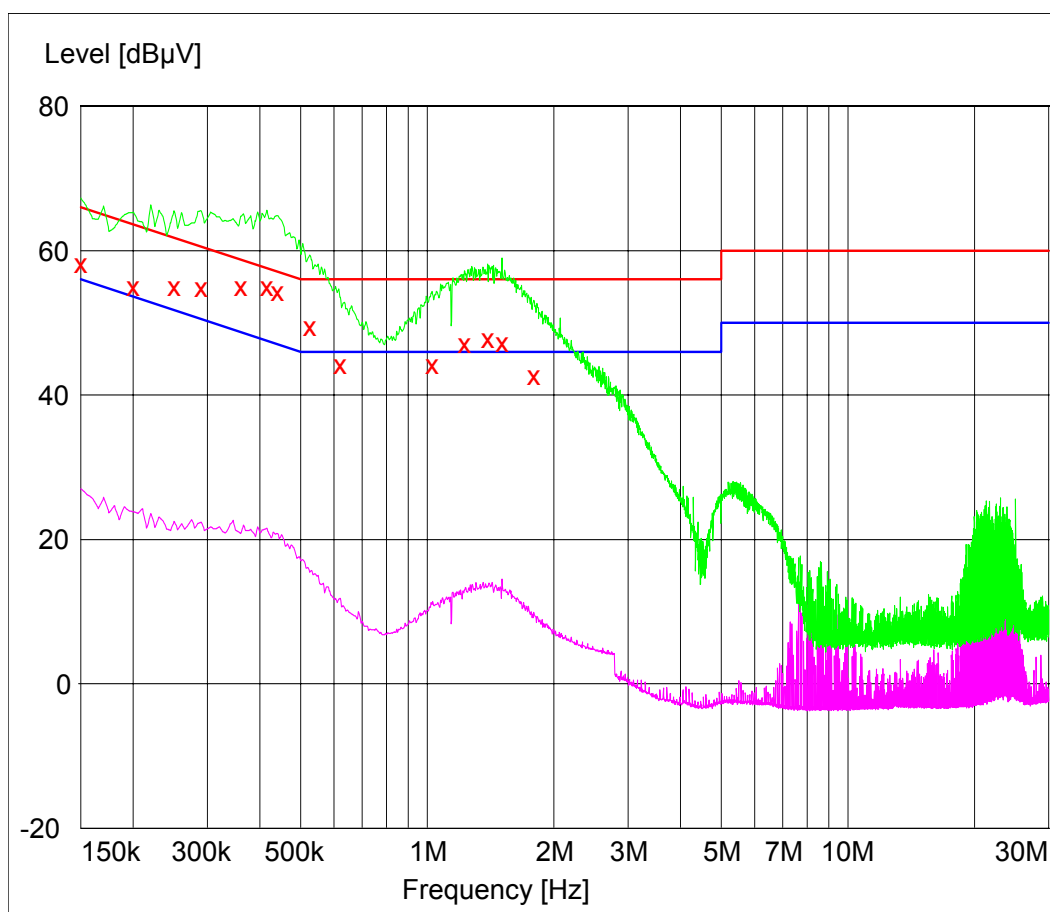
Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dB μ V	dB	dB μ V	dB		
25.008000	43.80	11.00	50.00	6.20	L1	GND

**CONDUCTED DISTURBANCE ON AC MAINS POWER PORT OF
EMERGENCY LIGHTING EQUIPMENT TYPE WLXSALR1W2LR654CT****FINAL TEST (QUASI-PEAK DETECTOR)**

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dBμV	dB	dBμV	dB		
0.150000	54.20	10.40	66.00	11.80	N	GND

CONDUCTED DISTURBANCE ON AC MAINS POWER PORT OF EMERGENCY LIGHTING EQUIPMENT TYPE EST-12-100-2LR9W-CT/ETL



**CONDUCTED DISTURBANCE ON AC MAINS POWER PORT OF
EMERGENCY LIGHTING EQUIPMENT TYPE HDT-12-100-2LR9W-CT/ETL**

TEST No. 3	Title “Radiated disturbances”	47CFR Part 15 Ref. Section
		15.209
TEST REQUIREMENTS	Test setup	ANSI C63.4
	Test facility	Anechoic chamber
	Test distance	3 m
	Limits for radiated disturbances	15.209 (a)
	Frequency range	30 MHz to tenth harmonic of the highest fundamental frequency
	IF bandwidth (below 1000 MHz)	100 kHz
	IF bandwidth (above 1000 MHz)	1 MHz
	EMC class	B

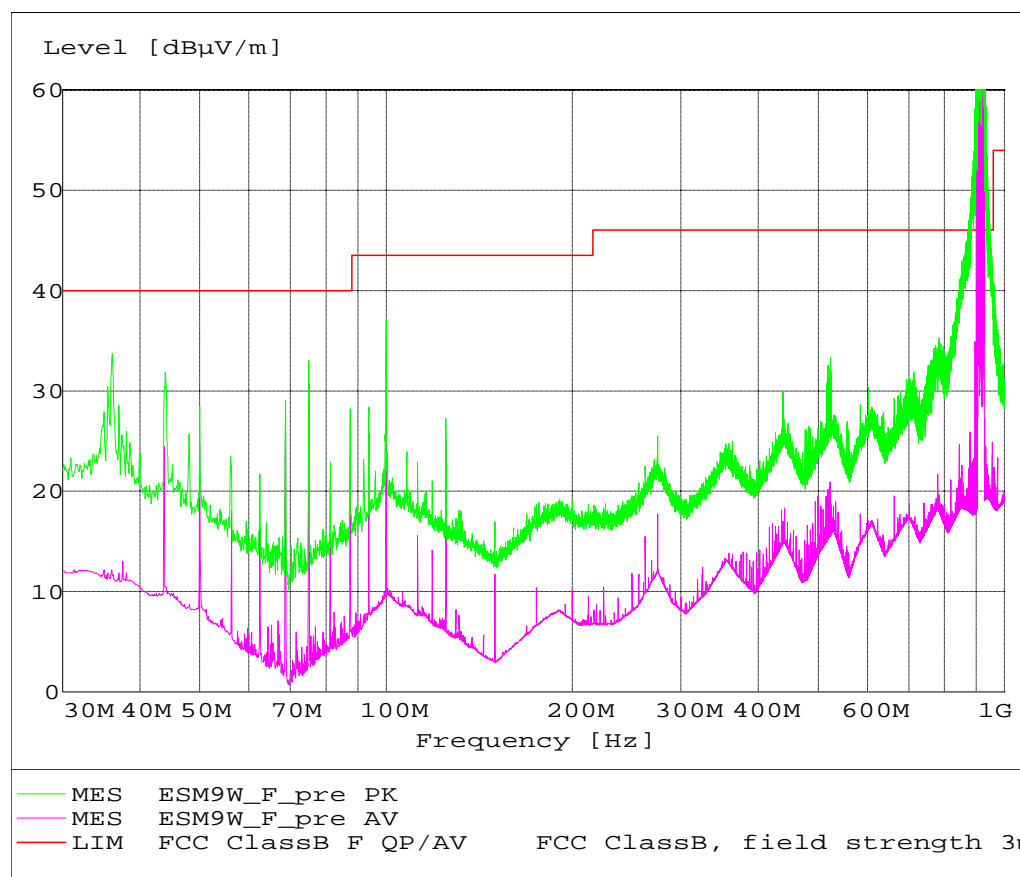
TEST DATA	PORT UNDER TEST	OPERATING CONDITION	RESULT
	Enclosure	#2	Complies
	Note: In search of max noise (EUT rotation: from 0° to 360°; receiving antenna height: from 1 to 4 m; receiving antenna polarization: horizontal and vertical).		

Test Result:

Within the specifications

MEASUREMENTS RESULTS

MEASUREMENTS RESULTS (below 1000 MHz)



Remark: All the measured field strength levels above the permitted limits are inside the assigned frequency band.

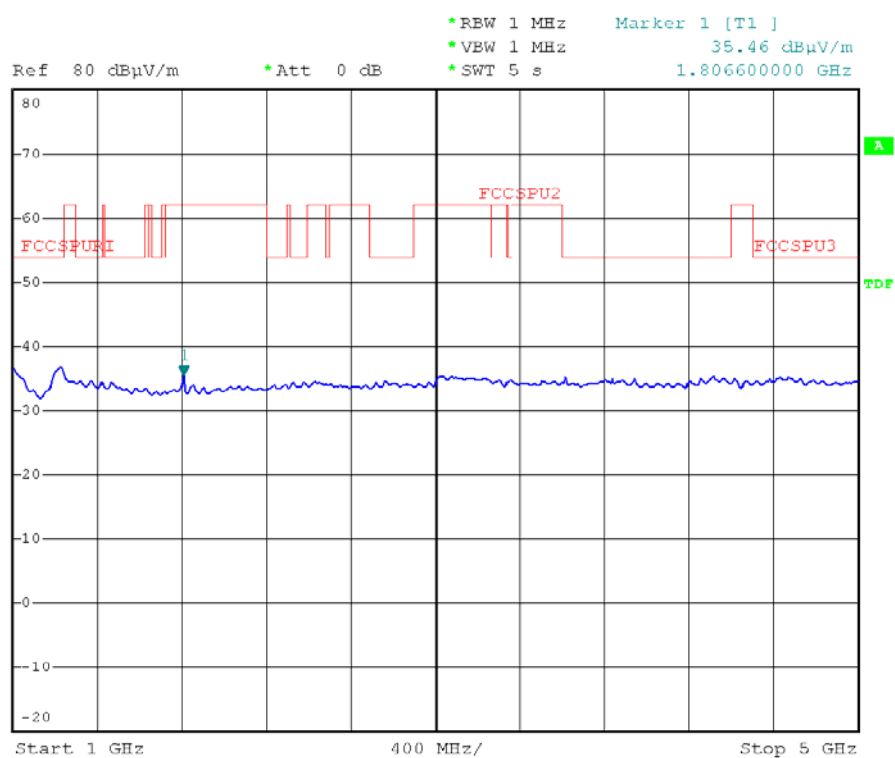
MEASUREMENTS RESULTS

MEASUREMENTS RESULTS (1000 MHz to 5000 MHz)

Quasi-Peak detector (X marked points) []

Average detector []

Peak detector [X]



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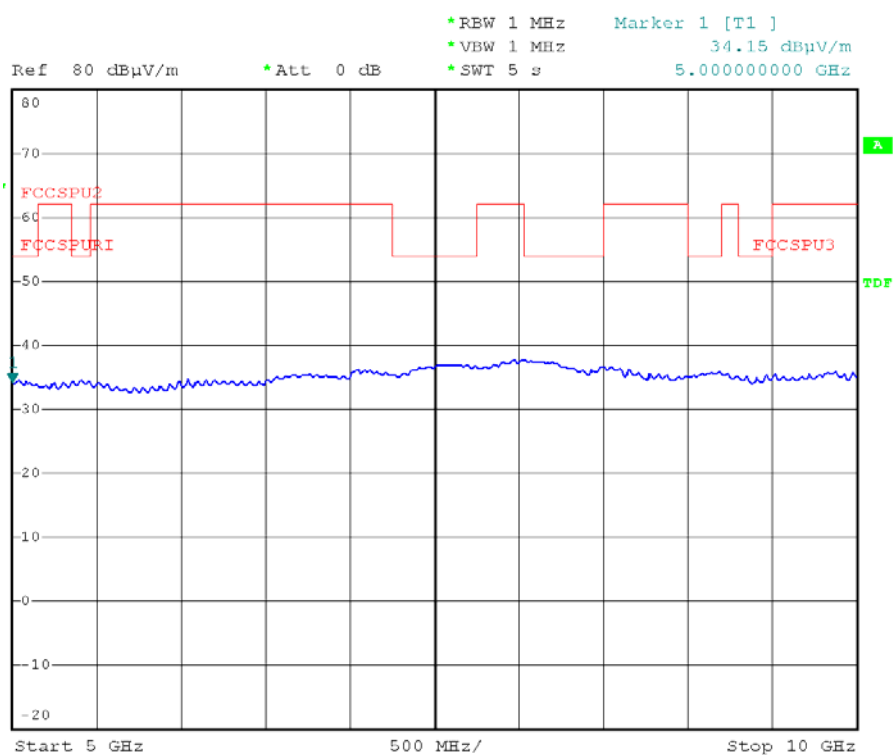
MEASUREMENTS RESULTS

MEASUREMENTS RESULTS (5000 MHz to 10000 MHz)

Quasi-Peak detector (X marked points) []

Average detector []

Peak detector [X]



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**SPURIOUS EMISSION channel n°00: 903,375 MHz
(PEAK DETECTOR)**

Frequency (MHz)	Reading Level (dBμVm)	Average Limit (Microvolt/meter)	Average Limit (dBμV/m)	Margin (dB)	Pol. (Vert /Hor)
903,375 (fundamental)	109,47	-----	-----	-----	Vertical
1806,8	44,89	94100	89,47	44,58	Vertical
2710,1	39,04	500	54,00	14,96	Vertical
3613,5	41,25	500	54,00	12,75	Vertical
4516,8	36,30	500	54,00	17,7	Vertical
5420,1	<34	500	54,00	>20	Vertical
6323,5	<34	94100	89,47	>55,47	Vertical

**SPURIOUS EMISSION channel n°15: 914,625 MHz
(PEAK DETECTOR)**

Frequency (MHz)	Reading Level (dBμVm)	Average Limit (Microvolt/meter)	Average Limit (dBμV/m)	Margin (dB)	Pol. (Vert /Hor)
914,625 (fundamental)	106,99	-----	-----	-----	Vertical
1829,5	43,37	70750	86,99	43,62	Vertical
2743,8	40,73	500	54,00	13,27	Vertical
3658,5	40,58	500	54,00	13,42	Vertical
4573,0	36,02	500	54,00	17,98	Vertical
5487,7	<34	70750	86,99	>52,9	Vertical
6402,3	<34	70750	86,99	>52,9	Vertical

**SPURIOUS EMISSION channel n°31: 926,625 MHz
(PEAK DETECTOR)**

Frequency (MHz)	Reading Level (dBμV/m)	Average Limit (Microvolt/meter)	Average Limit (dBμV/m)	Margin (dB)	Pol. (Vert /Hor)
926,625 (fundamental)	105,98	-----	-----	-----	Vertical
1853,2	45,21	63000	85,98	40,77	Vertical
2779,8	39,26	500	54,00	14,74	Vertical
3706,4	38,76	500	54,00	15,24	Vertical
4633,1	35,41	500	54,00	18,59	Vertical
5559,7	<34	63000	85,98	>51,9	Vertical
6486,3	<34	63000	85,98	>51,9	Vertical

TEST No.4	Title “ Number of Hopping Frequencies”	47CFR Part 15 Ref. Section
		15.247 (a) (1) (i)
TEST SET-UP & REQUIREMENTS	Spectrum analyzer settings	
	Span	Assigned frequency band
	Resolution (or IF) Bandwidth (RBW)	100 kHz
	Video (or Average) Bandwidth (VBW)	100 kHz
	Sweep time	100 ms
	Detector function	Peak
	Trace	max hold
	Attenuator	/
	LIMIT	> 25

The transmitter output was connected to the spectrum analyzer through a test fixture (radio frequency coupling device associated with the dedicated antenna of the equipment under test)

Once the trace is stabilized, by the marker-delta function the separation between the peaks of the adjacent channels was determined detect all hopping frequencies

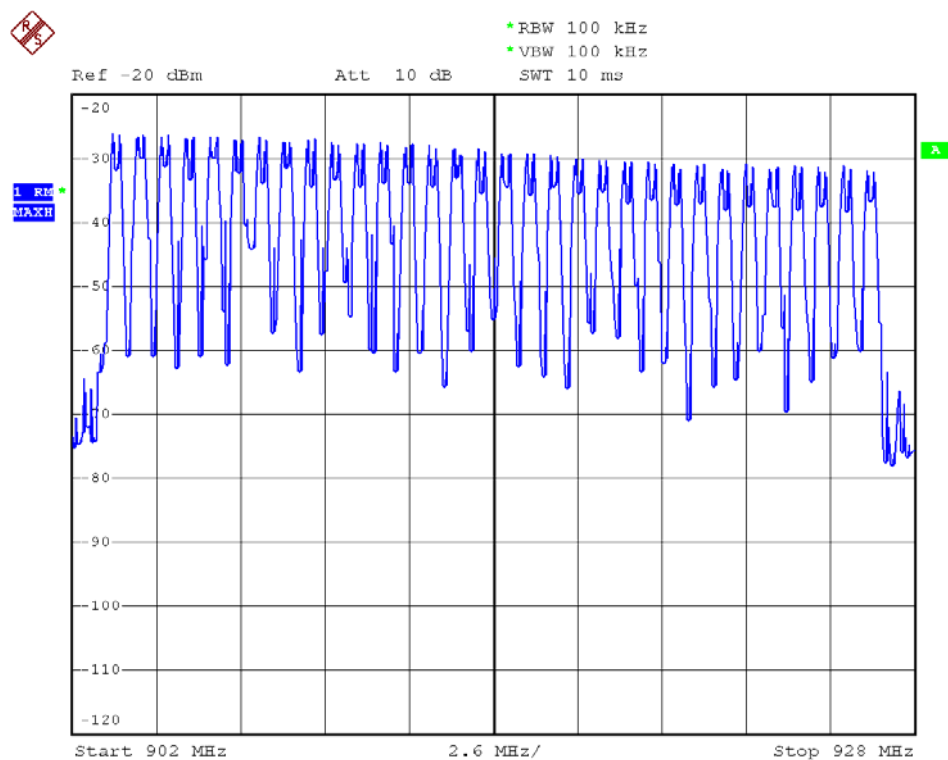
Test Result:

Number of measured Hopping Frequency channels (No.)	Plot (No.)
32	1

Test Result:

Within the specifications

Plot No. 1:



Date: 30.AUG.2006 10:08:33

TEST No.5	Title "20 dB Bandwidth"	47CFR Part 15 Ref. Section
		15.247 (a) (1) (i)
TEST SET-UP & REQUIREMENTS	Spectrum analyzer settings	
	Span	1 MHz
	Resolution (or IF) Bandwidth (RBW)	10 kHz
	Video (or Average) Bandwidth (VBW)	10 kHz
	Sweep time	100 ms
	Detector function	Peak
	Trace	max hold
	Attenuator	/
	LIMIT	500 kHz

The EUT is set to transmit has its maximum data rate.

The transmitter output was connected to the spectrum analyzer through a test fixture (radio frequency coupling device associated with the dedicated antenna of the equipment under test)

The Hopping Channel bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20 dB.

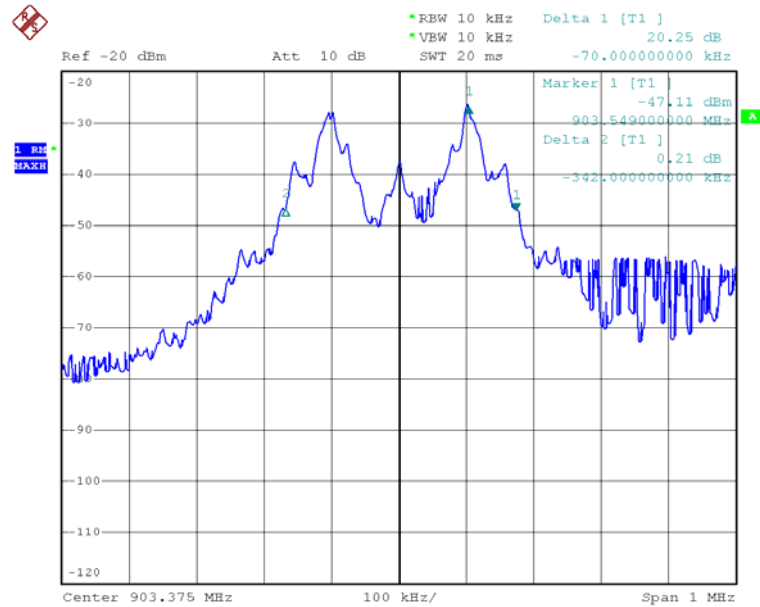
Test Result:

Channel (No.)	Frequency (MHz)	Hopping Channel Bandwidth (kHz)	Plot (No.)
00	903.375	342	1
15	914.625	344	2
31	926.625	342	3

Test Result:

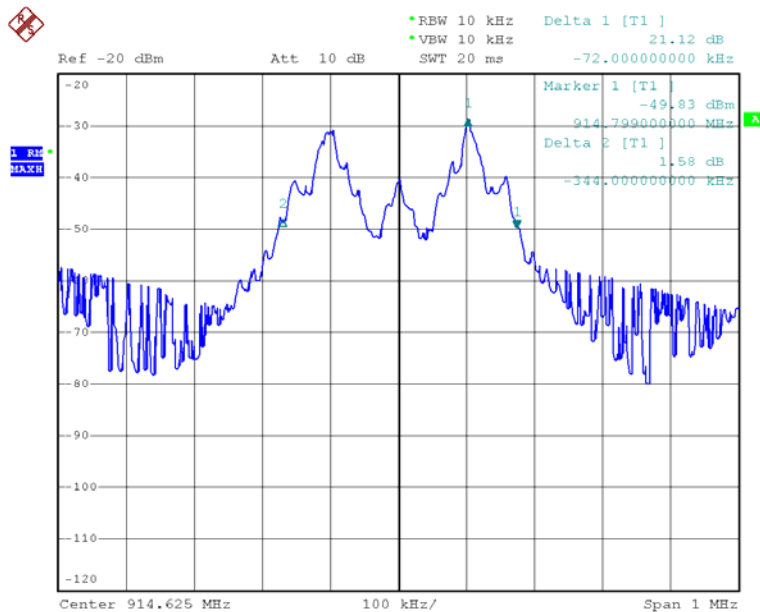
Within the specifications

■ Plot No. 1:



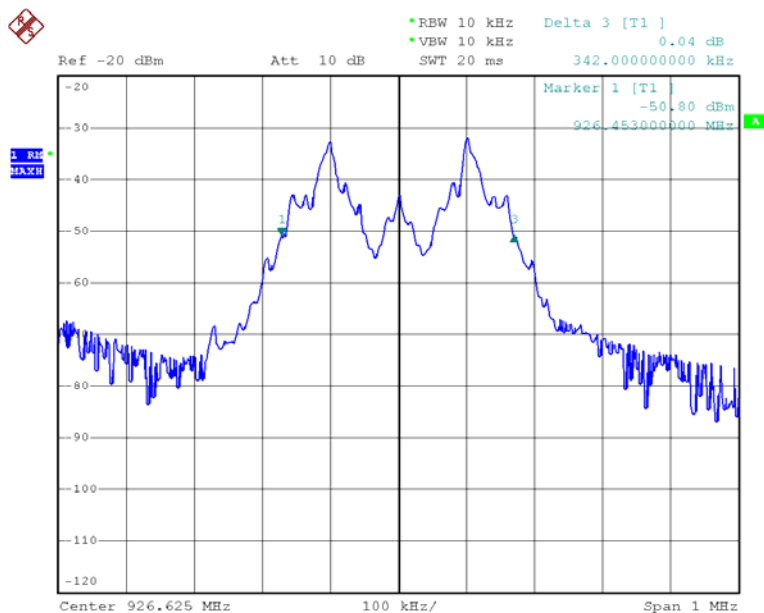
Date: 30.AUG.2006 10:17:32

■ Plot No. 2:



Date: 30.AUG.2006 10:24:00

Plot No. 3:



Date: 30.AUG.2006 10:28:53

TEST No.6	Title “ Carrier Frequency Separation”		47CFR Part 15 Ref. Section
			15.247 (a) (1)
TEST SET-UP & REQUIREMENTS	Spectrum analyzer settings		
	Span	1.5 MHz (wide enough to capture the peaks of two adjacent channels)	
	Resolution (or IF) Bandwidth (RBW)	10 kHz	
	Video (or Average) Bandwidth (VBW)	10 kHz	
	Sweep time	50 ms	
	Detector function	Peak	
	Trace	max hold	
	Attenuator	/	
	LIMIT	>25 kHz or 20 dB bandwidth	

The transmitter output was connected to the spectrum analyzer through a test fixture (radio frequency coupling device associated with the dedicated antenna of the equipment under test)

The Hopping Channel Separation is defined as the channel is separated with the next channel.

Once the trace is stabilized, by the marker-delta function the separation between the peaks of the adjacent channels was determined

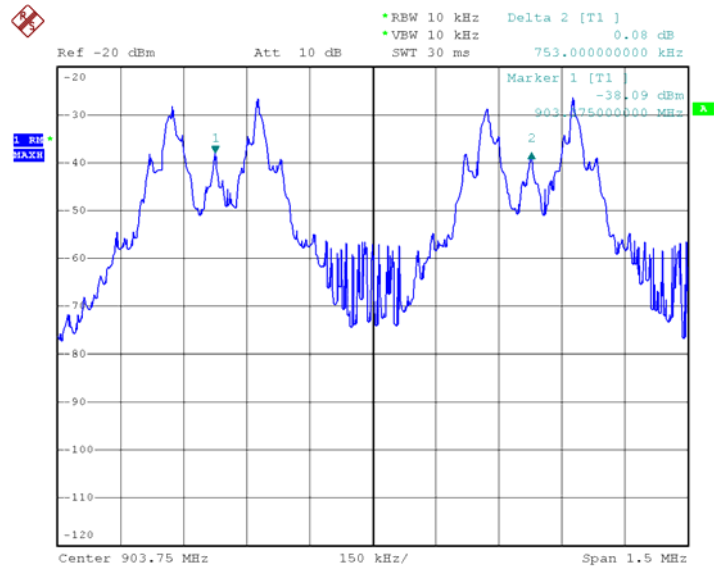
Test Result:

Channel (No.)	Frequency (MHz)	Hopping Channel Separation (KHz)	Plot (No.)
00	903.375	753	1
15	914.625	750	2
31	926.625	753	3

Test Result:

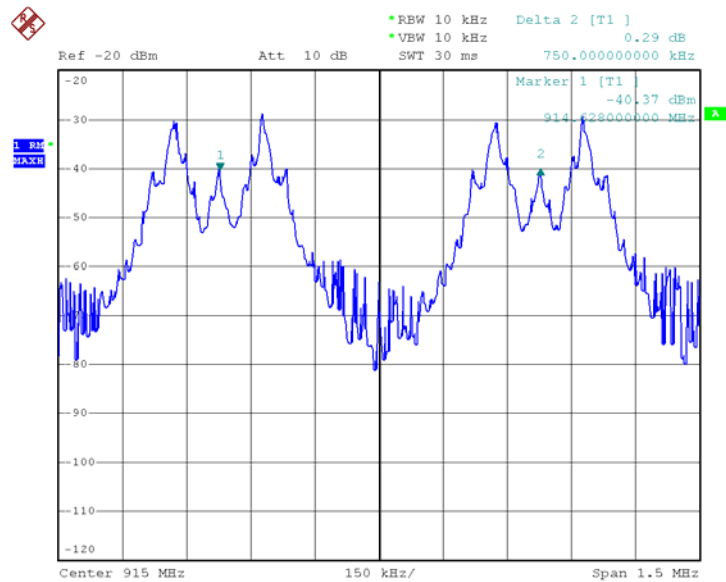
Within the specifications

Plot No. 1:



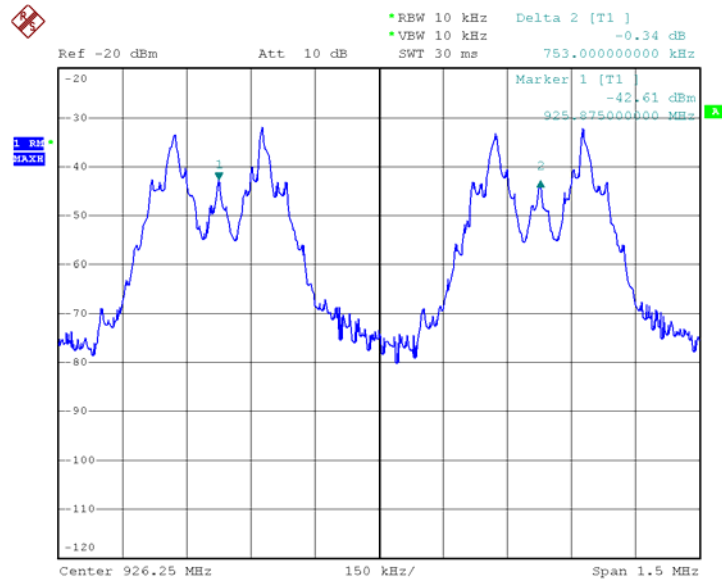
Date: 30.AUG.2006 10:35:04

Plot No. 2:



Date: 30.AUG.2006 10:38:13

Plot No. 3:



Date: 30.AUG.2006 10:42:53

TEST No.7	Title “ Time of Occupancy (Dwell Time)”	47CFR Part 15 Ref. Section
		15.247 (a) (1) (i)
TEST SET-UP & REQUIREMENTS	Spectrum analyzer settings	
	Span	zero span, centered on a hopping channel
	Resolution (or IF) Bandwidth (RBW)	100 kHz
	Video (or Average) Bandwidth (VBW)	100 kHz
	Sweep time	100 ms
	Detector function	Peak
	Trace	max hold
	Attenuator	/
	LIMIT	< 0.4 seconds within a 10 seconds period

The transmitter output was connected to the spectrum analyzer through a test fixture (radio frequency coupling device associated with the dedicated antenna of the equipment under test)

The video out of spectrum analyzer is connected to an Oscilloscope and a Counter to define the average time of occupancy on a selected frequency.

Once the trace is stabilized, by the marker-delta function determine the dwell time was determined multiplying the maximum number of observed pulse within 10 seconds with the single pulse length.

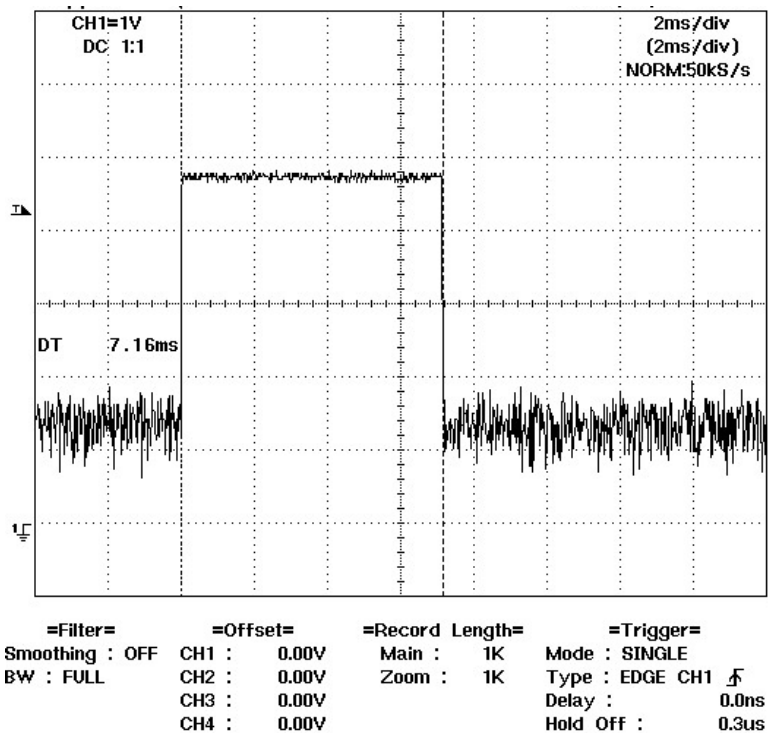
Test Result:

Channel (No.)	Frequency (MHz)	Maximum number of observed pulse within 10 seconds	Dwell Time (sec.)	Plot (No.)
00	903.375	27	0.193	1 / 2
15	914.625	23	0.164	1 / 2
31	926.625	20	0.143	1 ÷ 10

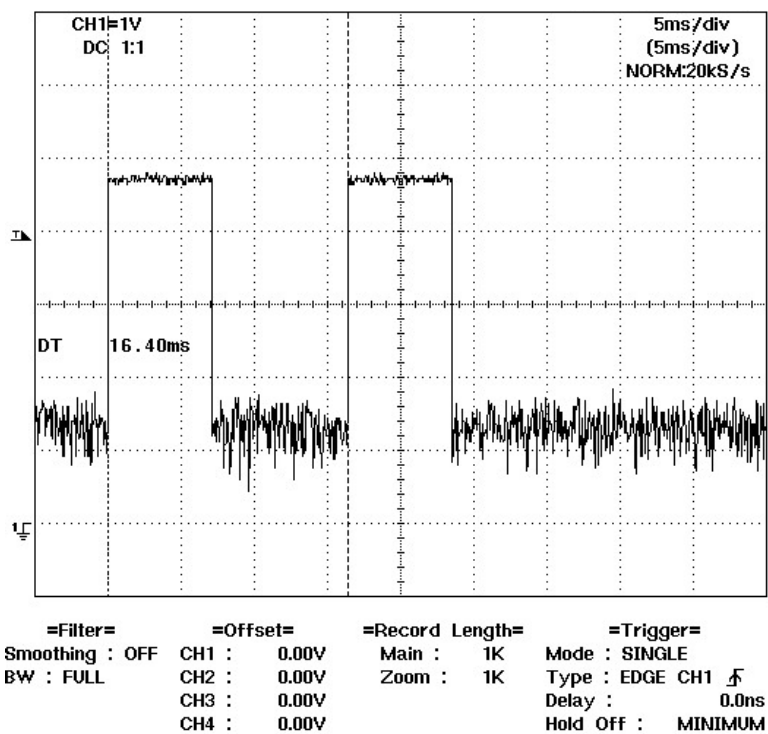
Test Result:

Within the specifications

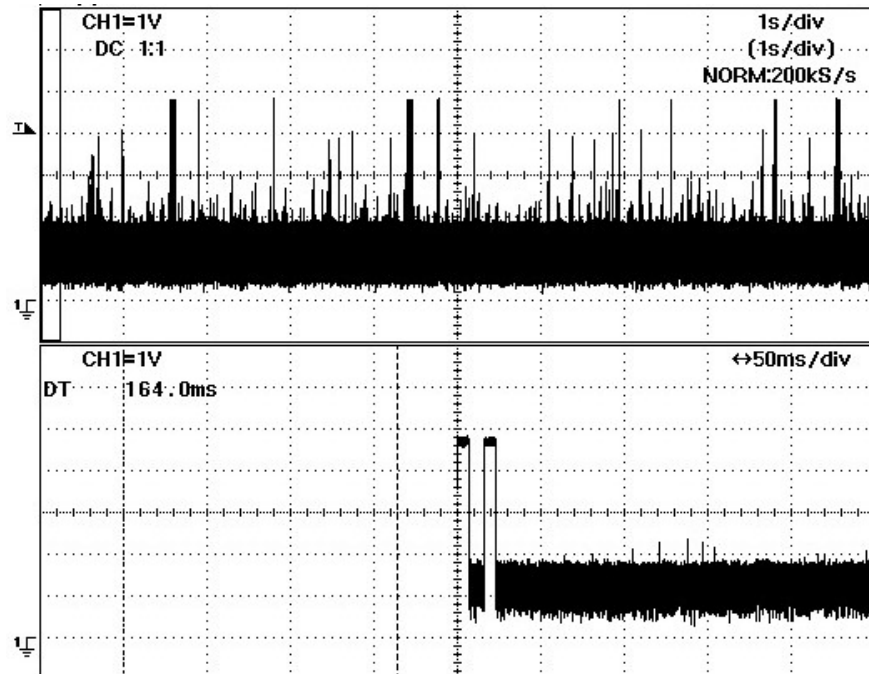
▪ Plot No. 1:_single pulse



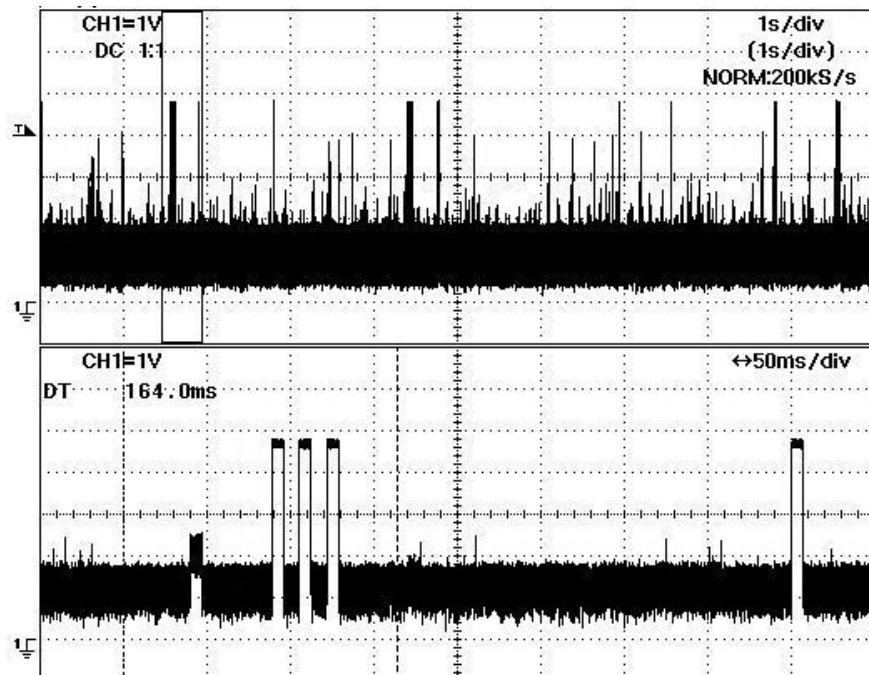
▪ Plot No. 2:_Minimum distance between successive pulse



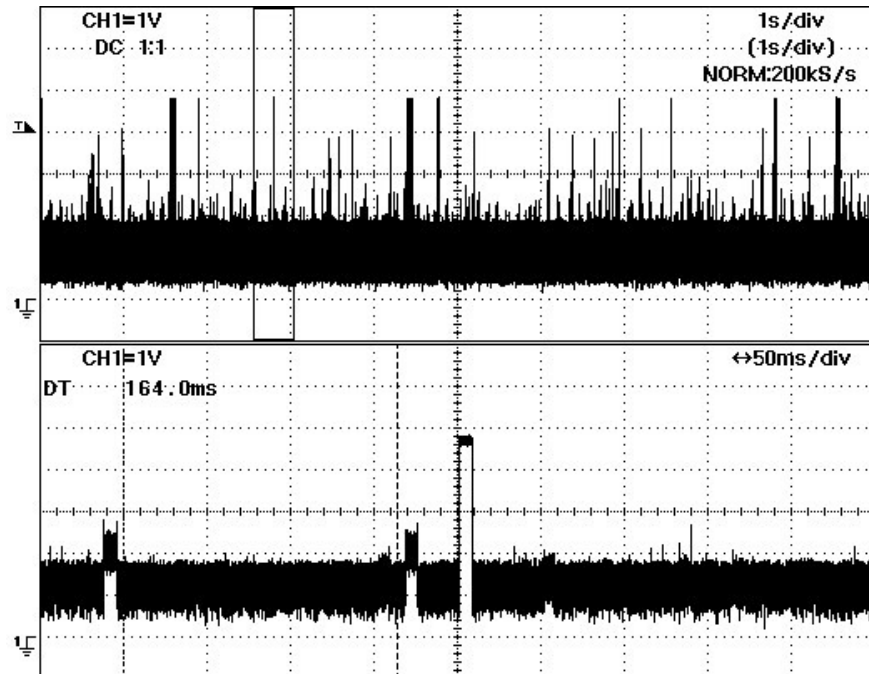
- Plot No. 3: Observed pulse within a 10 seconds period



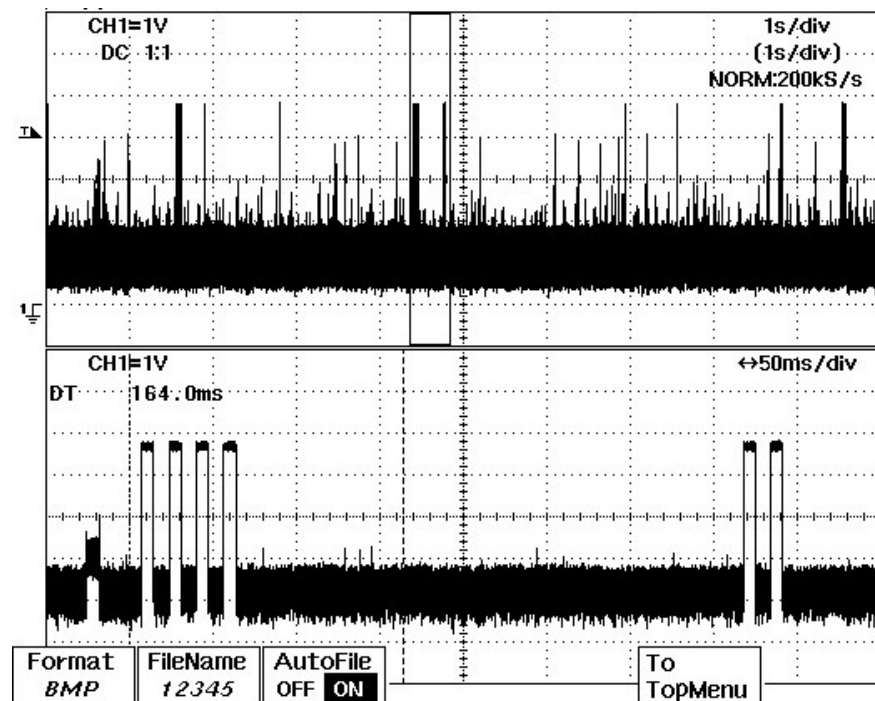
- Plot No. 4: Observed pulse within a 10 seconds period



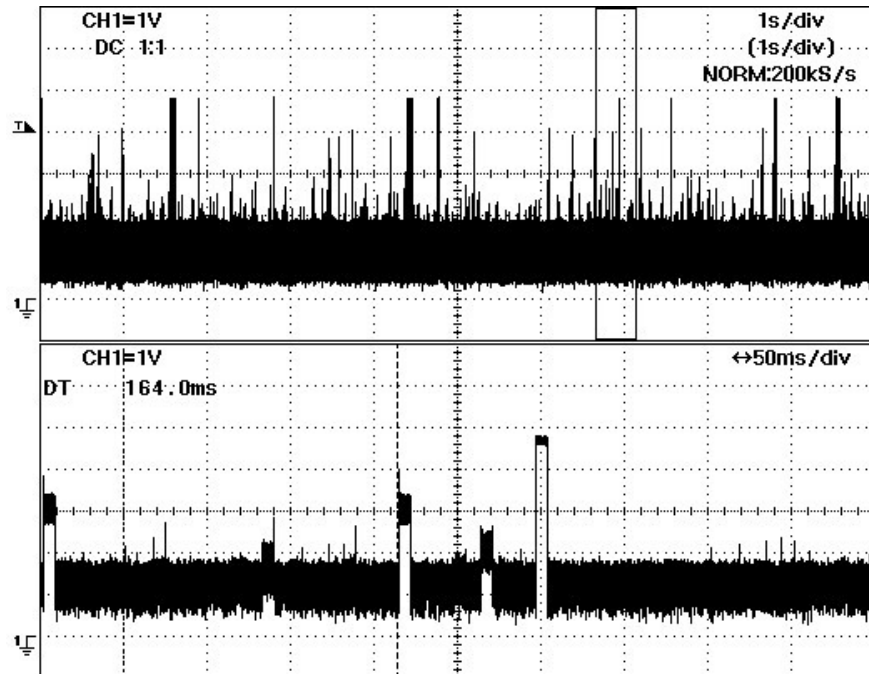
- Plot No. 5: Observed pulse within a 10 seconds period



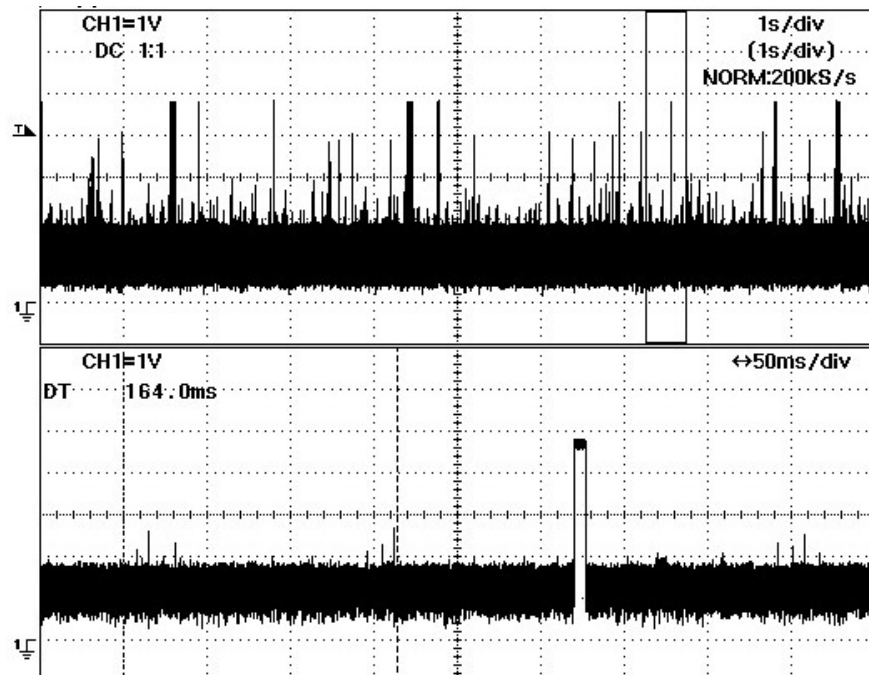
- Plot No. 6: Observed pulse within a 10 seconds period



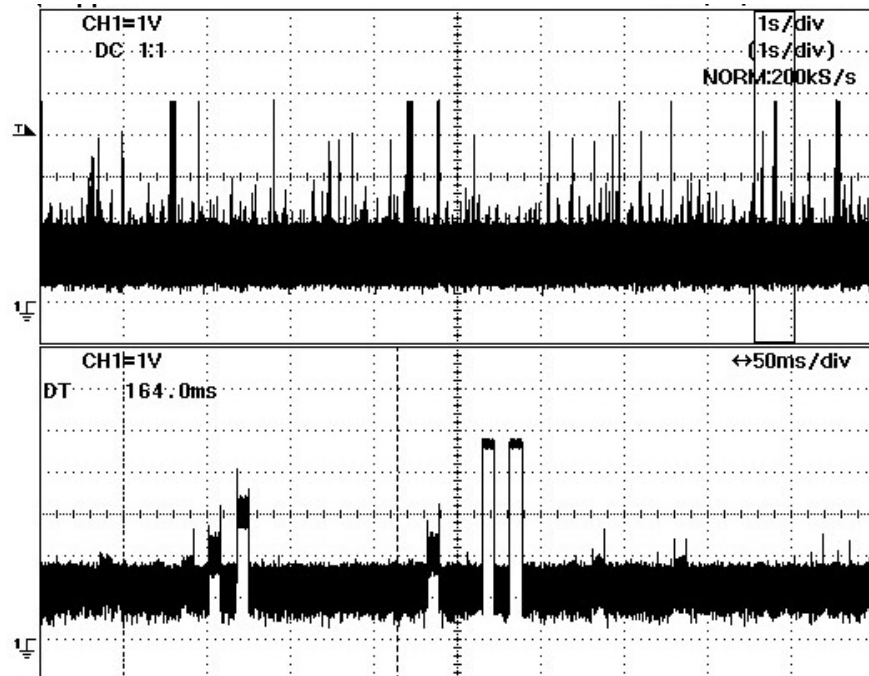
- Plot No. 7: Observed pulse within a 10 seconds period



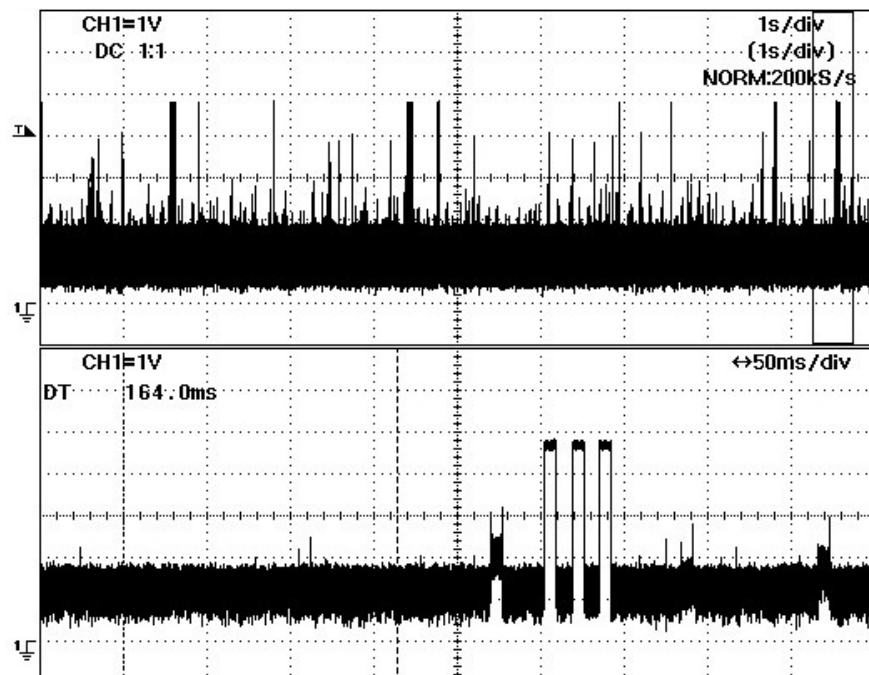
- Plot No. 8: Observed pulse within a 10 seconds period



- Plot No. 9: Observed pulse within a 10 seconds period



- Plot No. 10: Observed pulse within a 10 seconds period



TEST No.8	Title “ Maximum Peak Output Power with External Antenna (De Facto EIRP)”		47CFR Part 15 Ref. Section
			15.247 (b) (2)
TEST SET-UP & REQUIREMENTS	Spectrum analyzer settings		
	Span	1 MHz	
	Resolution (or IF) Bandwidth (RBW)	100 kHz	
	Video (or Average) Bandwidth (VBW)	100 kHz	
	Sweep time	as necessary to capture the entire dwell time per hopping channel	
	Detector function	Peak	
	Trace	max hold	
	Attenuator	/	
	LIMIT	250 mW	

The EUT has its hopping function enabled.

As the EUT is supplied with a dedicated antenna, the effective radiated power is measured in a 3 m anechoic chamber with the substitution antenna method.

Test Result:

Channel (No.)	Frequency (MHz)	Measured Output Power (mW)	Measured Output Power (dBμV/m)
00	903.375	26,5	109.47
15	914.625	15,0	106.99
31	926.625	11,9	105.98

Test Result:

Within the specifications

TEST No.9	Title “ Maximum Peak Output Power “		47CFR Part 15 Ref. Section
			15.247 (b) (2)
TEST SET-UP & REQUIREMENTS	Spectrum analyzer settings		
	Span	5 MHz	
	Resolution (or IF) Bandwidth (RBW)	1 MHz (Greater than 6 dB bandwidth)	
	Video (or Average) Bandwidth (VBW)	3 MHz	
	Sweep time	as necessary to capture the entire dwell time per hopping channel	
	Detector function	Peak	
	Trace	max hold	
	Attenuator	/	
	LIMIT	250 mW	

The EUT has its hopping function disabled.

Test Result:

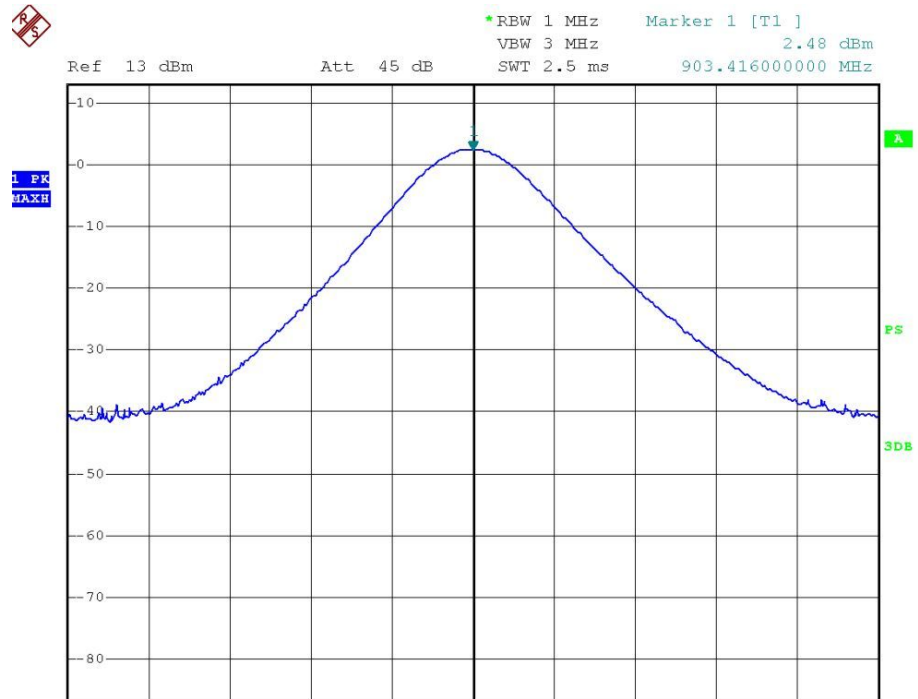
Conducted measure (Peak detector)

Channel (No.)	Frequency (MHz)	Measured Output Power (dBm)	Attenuator + Cable loss (dB)	Antenna Gain (dBi)	Calculated Output Power	
					dBm	mW
00	903.375	2,48	+10,50	2,14	15,12	32,5
15	914.625	2,49			15,13	32,6
31	926.625	2,39			15,04	31,9

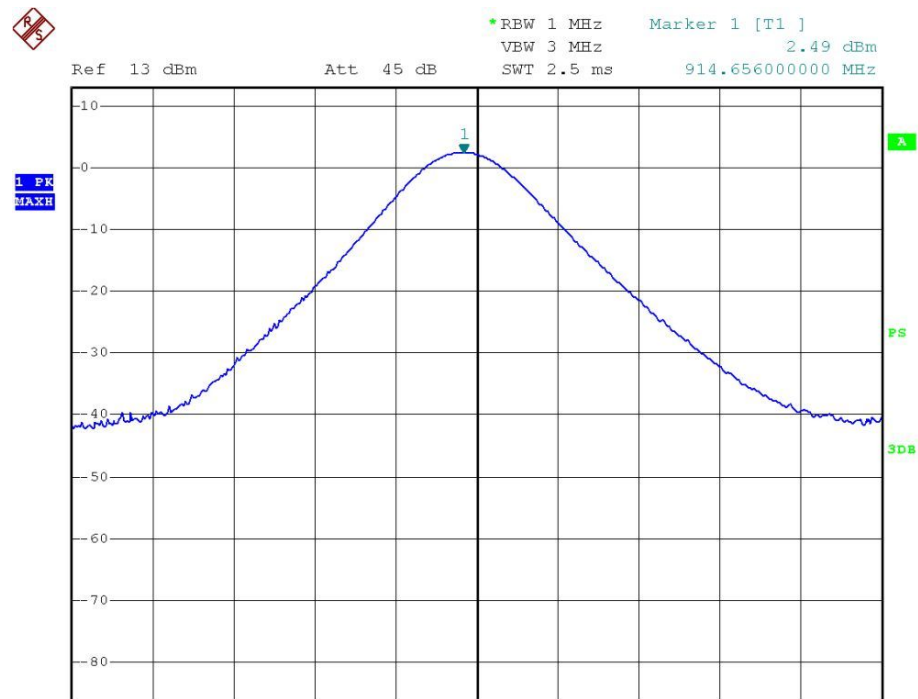
Test Result:

Within the specifications

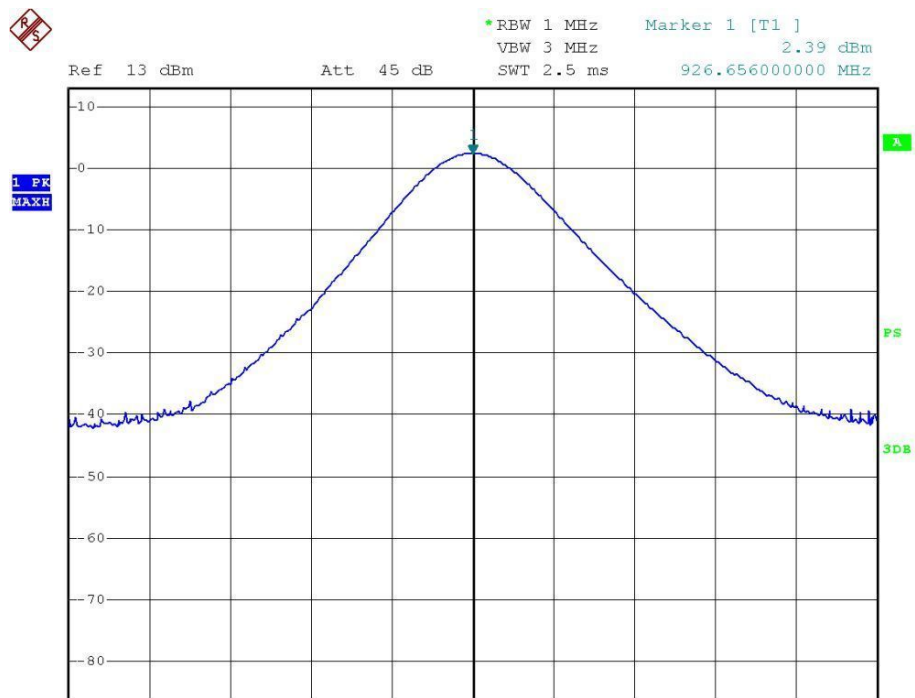
Plot No. 1:



Plot No. 2:



Plot No. 3:



TEST No. 10	Title “Band-edge Compliance of RF Conducted Emissions “		47CFR Part 15 Ref. Section
			15.247 (c)
TEST SET-UP & REQUIREMENTS	Spectrum analyzer settings		
	Span	Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation	
	Resolution (or IF) Bandwidth (RBW)	100 kHz	
	Video (or Average) Bandwidth (VBW)	100 kHz	
	Sweep time	Auto	
	Detector function	Peak	
	Trace	Max hold	
	Attenuator	/	
	LIMIT	> 20 dB below that in the 100 kHz bandwidth within the assigned band	

The transmitter output was connected to the spectrum analyzer through a test fixture (radio frequency coupling device associated with the dedicated antenna of the equipment under test)

Once the trace is stabilized, by the marker the emission at the band edge (or on the highest modulation product outside of the band, if this level is greater than that at the band edge) was set.

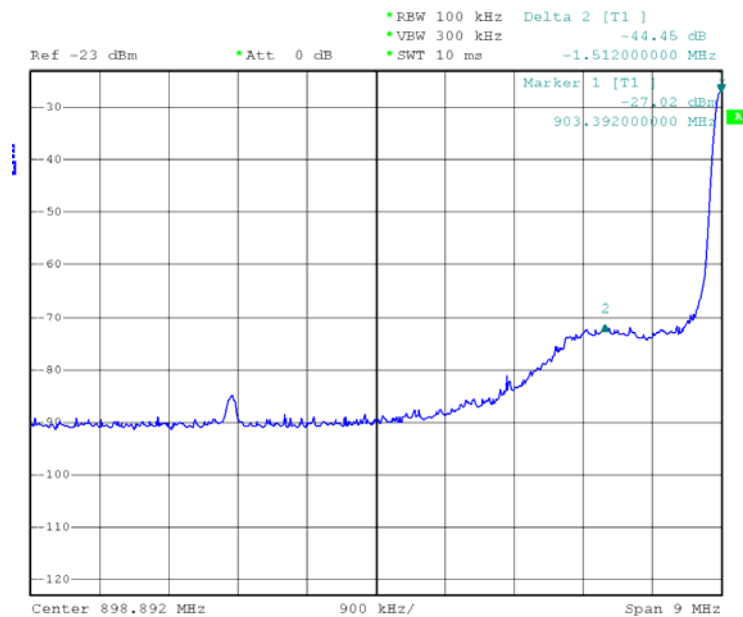
The n by the marker-delta function and the marker-to-peak function the peak of the in-band emission was selected. The marker-delta value displayed was compared with the limit specified in this Section.

Test Result:

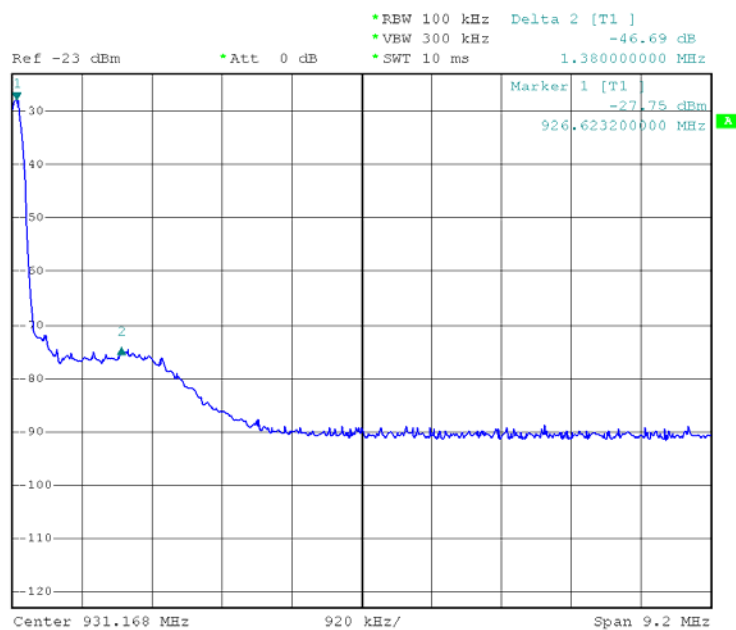
Within the specifications

Test Result:

Band-edge compliance, lower band edge, hopping off

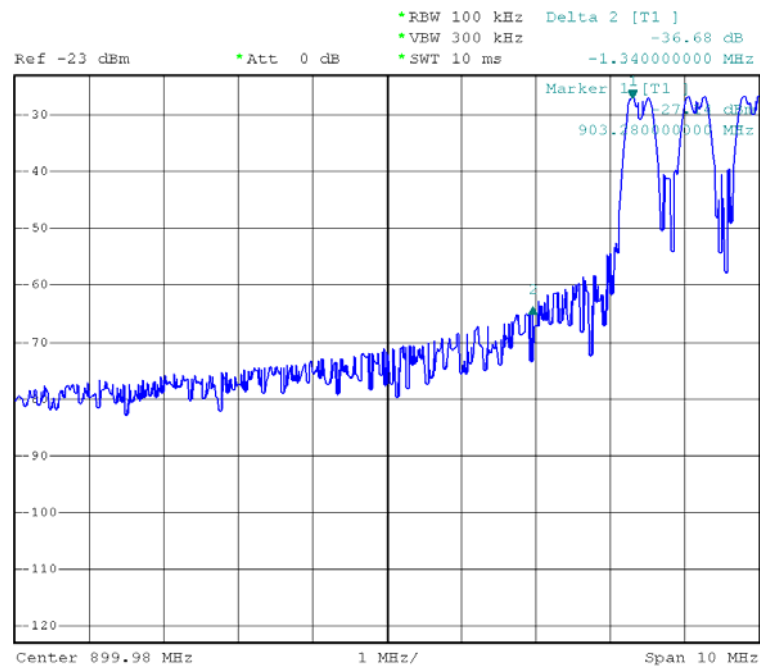


Band-edge compliance, upper band edge, hopping off

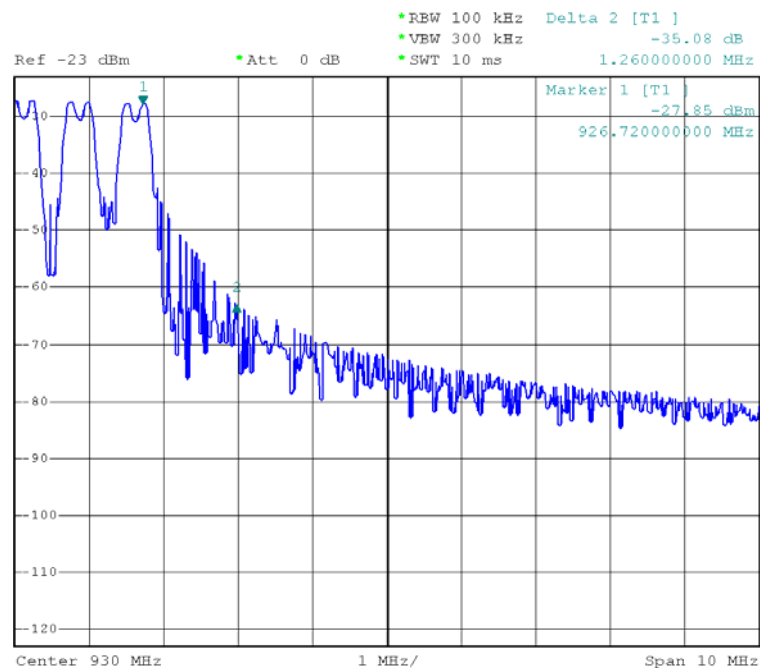


Band-edge compliance				
Band edge	Different to the signal peak (dB)	Field strength measured (dB μ V/m)	Field strength at the band-edge	Limit (at least 20dB below from peak of RF.)
Lower	44,45	109,47	65,02	89,47
Upper	46,69	105,98	59,29	85,98
Within the limit				

Band-edge compliance, lower band edge, hopping on



Band-edge compliance, upper band edge, hopping on



Band-edge compliance				
Band edge	Different to the signal peak (dB)	Field strength measured (dB μ V/m)	Field strength at the band-edge (dB μ V/m)	Limit (at least 20dB below from peak of RF.) (dB μ V/m)
Lower	36,68	109,47	72,79	89,47
Upper	35,08	105,98	70,90	85,98
Within the limit				

TEST No. 11	Title “RF Exposure Evaluation”	47CFR Part 15 Ref. Section
		15.247 (i)
TEST SET-UP & REQUIREMENTS	Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this Chapter.	
	EUT classification (fixed, mobile or portable devices)	Fixed
	LIMITS	See table below

Limit for maximum permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Average Time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3÷3.0	614	1.63	(100)*	6
3.0÷30	1842/f	4.89/f	(900/f ²)*	6
30÷300	61.4	0.163	1.0	6
300÷1500	--	--	f/300	6
1500÷100,000	--	--	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3÷3.0	614	1.63	(100)*	30
3.0÷30	824/f	2.19/f	(180/f ²)*	30
30÷300	27.5	0.073	0.2	30
300÷1500	--	--	f/1500	30
1500÷100,000	--	--	1.0	30

F = Frequency in MHz *Plane-wave equivalent power density

The distance from the device's transmitting antenna where the exposure level reaches the maximum permitted limit is calculated using the general equation:

$$S = P \cdot G / 4\pi R^2$$

Where:

S = Power Density (mW/cm²)

P = Conducted power (mW)

G = Linear power gain relative to isotropic radiator (numeric gain)

R = Distance (cm)

RF Exposure evaluation Distance:

Channel (No.)	Frequency (MHz)	Output power to antenna (dBm)	Power density @ 20 cm (mW/cm ²)	Distance where the exposure level reaches the limit (cm)	Limits (mW/cm ²)
00	903.375	12,98	0,006	2,08	0,60
15	914.625	12,99	0,006	2,08	0,60
31	926.625	12,89	0,006	2,06	0,61

Test Result:

The EUT operates at low power level so it does not exceed the Commission's RF exposure guidelines limits; furthermore, Spread spectrum transmitters operate according to the Section 15.247 are categorically excluded from routine environmental evaluation.
RF exposure limit warning or SAR test are not required.

6 ADDITIONAL TECHNICAL INFORMATION

6.1 ELECTROMAGNETICALLY RELEVANT COMPONENTS:

Components	N°	Manufacturer	Type – Technical data
Radio Module			
See Technical document			
Host Equipment			
Transformer	1	MOTOR	TR40109/E
Electronic board	1	BEGHELLI	820.000.000

6.2 RFI SUPPRESSION DEVICES:

Components	N°	Manufacturer	Type – Technical data
None			

6.3 EMI PROTECTION DEVICES:

Components	N°	Manufacturer	Type – Technical data
None			

7 TECHNICAL DOCUMENTATION

DOCUMENT	REFERENCE
Bill of materials	HOPPLA.DBG
Electronic diagram	HOPPLA.SSC
Radio Layout	HOPPLA.CCC
Radio functional block	2005/05/18

8 PHOTOGRAPHIC DOCUMENTATION

8.1 EUT IDENTIFICATION



A. RADIO MODULE VIEW

8.2 TEST SET-UP



B. RADIATED TEST SET-UP VIEW



C. CONDUCTED TEST SET-UP VIEW

9 MEASUREMENT AND TEST EQUIPMENT INSTRUMENTATION

INSTRUMENTS	MANUFACTURER	MODEL	IMQ SERIAL NUMBER	Ref. TEST
Receiver/Spectrum analyzer	Rohde & Schwarz	ESVP	S04197	3
Spectrum Analyzer	Rohde & Schwarz	FSP40	S03629	3-4-5-6-7-8-9
Antenna BilogP	ARA	LPD-2513	S02385	3-4-5-6-7-8-9
Antenna ridged horn	Schwarzbeck	BBHA9120D	S03464	3
Pre-amplifier	HP	HP 8449 B	S03542	3
Software for test automation	Rohde & Schwarz	ES-K1 V.1.60	-	2-3
Artificial Mains V-network	Rohde & Schwarz	ESH2-Z5	S02314	2
Pulse limiter	Rohde & Schwarz	ESH3-Z2	S02153	2
Emi Receiver	Rohde & Schwarz	ESHS10	S03494	2
Oscilloscope	Yokogawa	DL 7200	S03745	7