

(E MARKING

ELECTROMAGNETIC COMPATIBILITY
ELECTRICAL SAFETY
LASER SPECTROSCOPY
ENVIRONMENTAL PHYSICS

G.S.D. S.r.l.

Certified in accordance with UNI EN ISO 9001:2008

by

TÜV Rheinland Italia S.r.l. Certificate N. 39 00 1850509

Address Via Midpoint 18, 1 Dalton Way Middlewich CW10 0HU United Kingdom Test Family Name IRFID500 FCC ID: 2AIZEEXTRFID00001 Testing Laboratory Name Address Via Marmiceto, 8 56121 Pisa (PI) Italy Tel/Fax +39 050 984254 / +39 050 984262 P.IVA/VAT 01343950505 http - e-mail www.gsd.it - info@gsd.it				
Address Via Midpoint 18, 1 Dalton Way Middlewich CW10 0HU United Kingdom Test Family Name iRFID500 FCC ID: 2AIZEEXTRFID00001 Testing Laboratory Name G.S.D. S.r.l. Address Via Marmiceto, 8 56121 Pisa (PI) Italy Tel/Fax +39 050 984254 / +39 050 984262 P.IVA/VAT 01343950505 http - e-mail www.gsd.it - info@gsd.it	=	Test Report n. FCC-16721	Rev. 01	
Middlewich CW10 0HU United Kingdom				
FCC ID: 2AIZEEXTRFID00001 Testing Laboratory Name G.S.D. S.r.l. Address Via Marmiceto, 8 56121 Pisa (PI) Italy Tel/Fax +39 050 984254 / +39 050 984262 P.IVA/VAT 01343950505 http - e-mail www.gsd.it - info@gsd.it	Address	Middlewich CW10 0HU		
Testing Laboratory Name G.S.D. S.r.l. Address Via Marmiceto, 8 56121 Pisa (PI) Italy Tel/Fax +39 050 984254 / +39 050 984262 P.IVA/VAT 01343950505 http - e-mail www.gsd.it - info@gsd.it	Test Family Name	iRFID500		
Address Via Marmiceto, 8 56121 Pisa (PI) Italy Tel/Fax +39 050 984254 / +39 050 984262 P.IVA/VAT 01343950505 http - e-mail www.gsd.it - info@gsd.it		FCC ID: 2AIZEEXTRFID00001		
56121 Pisa (PI) Italy Tel/Fax +39 050 984254 / +39 050 984262 P.IVA/VAT 01343950505 http - e-mail www.gsd.it - info@gsd.it	Testing Laboratory Name	G.S.D. S.r.l.		
P.IVA/VAT 01343950505 http – e-mail www.gsd.it - info@gsd.it	Address	56121 Pisa (PI)		
http – e-mail <u>www.gsd.it</u> - <u>info@gsd.it</u>	Tel/Fax			
		01343950505		
	http – e-mail			
FCC Listed. Registration Number: 424037.		FCC Listed. Registration Number: 424037.		
Location and Date of Issue Pisa, 2016 October, 12	Location and Date of Issue	Pisa, 2016 October, 12		

G.S.D. s.r.l.
Via Marmiceto, 8
56121 OSPEDALETTO - PISA

Tel. 050.984254 - Fax 050.984262 P. IVA 01343950505

SENIOR EMOTEST MANAGER
Dr. Gian Luca Genovesi

Quality manager Dr. David Pelliccia

INDEX 1. Manufacturer and Eut identification 2. Reference Standards...... 3. Result, Condition, Measurement uncertainty..... 4. Radiated emissions..... 6. Operation within the Band 902 - 928 MHz......24 6.1. Number of Hopping Channel. 24 6.3 Time of Occupancy 28 7. RADIATED OPERATION WITHIN THE BAND 902 - 928 MHz......56 7.1 Spurious Radiated Emissions 56 **Report Revision History** Revision details Date Page No.(s) Details 2016 September, 30 62 Rev 00 Initial issue 2016 October, 12 62 Rev 01 Measurement uncertainty added Restricted band results added into Summary of Test Results

1. Manufacturer and Eut identification ¹				
Manufacturer	Extronics Ltd			
Address	Via Midpoint 18, 1 Dalton Way Middlewich CW10 0HU			
	United Kingdom			
Test Family Name	iRFID500			
	FCC ID: 2AIZEEXTRFID00001			
Date of reception	2016 August 22			
Sampling	Laboratory sample for certification			
Test Item Description	RFID Device			
Nominal Input Voltage	5 Vdc (USB)			

¹A detailed documentation is preserved in the internal fascicle.



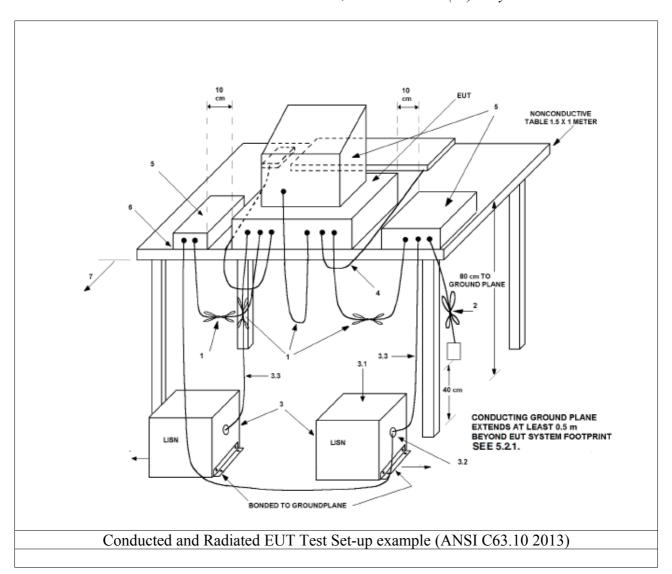
Fig. 1.1 Equipment Photo

2.	Reference Standards	
----	---------------------	--

Tests and measurements are performed accordingly to the reference standards given in the table below:

Test	Standard
Emissions: Conducted and Radiated -	FCC Rules ad Regulations, Title 47 Part 15 – Sub
Section 15.207 and 15.209	part C
	ANSI C63.4 2014 – American National Standard for
	Methods of Measuring of Radio-Noise Emissions
	from Low Voltage Electrical and Electronic
	Equipment in the Range of 9 kHz – 40 GHz
	ANSI C63.10 2013 – American National Standard of
	Procedures for Compliance Testing of
	Unlicensed Wireless Devices
Operation within the band 902-928 MHz:	FCC Rules ad Regulations, Title 47 Part 15 – Sub
Alternative Test Procedures 15.247 (b) and	part C
(c), and (a) Bandwidth and average time of occupancy, Band Edge 15.247 (d)	DA 00-705 (30 March 2000) – Filing and
of occupancy, Band Edge 13.247 (d)	Measurement Guidelines for Frequency Hopping
	Spread Spectrum Systems
	ANSI C63.4 2014 – American National Standard for
	Methods of Measuring of Radio-Noise Emissions
	from Low Voltage Electrical and Electronic
	Equipment in the Range of 9 kHz – 40 GHz
	ANSI C63.10 2013 – American National Standard of
	Procedures for Compliance Testing of
	Unlicensed Wireless Devices
	412172 D01 Determining ERP and EIRP v01r01
	GUIDELINES FOR DETERMINING THE
	EFFECTIVE RADIATED POWER (ERP)
	AND EQUIVALENT ISOTROPICALLY
	RADIATED POWER (EIRP) OF AN RF TRANSMITTING SYSTEM
	TIVINOMITTINO STSTEM

Summary of Test Results		
TEST		RESULT
Emissions: conducted		Pass
Section 15.207		1 400
Emissions: radiated		Pass
Section 15.209 Randwidth and Avarage Time of Occupancy		
Bandwidth and Average Time of Occupancy Section 15.247 (a)		Pass
Operation within the band 902-928 MHz:		
Section 15.247 (b) and (c)		Pass
Band Edge		Pass
Section 15.247 (d)		
Restricted Bands		Pass
Measurement uncertainty		
Measurement uncertainty		
Measurement uncertainty Test		Expanded Uncertainty
	MHz)	EXPANDED UNCERTAINTY ± 3.5 dB
T_{EST} Conducted Emission – 50Ω/50μH (150 kHz - 30 N		
T _{EST} Conducted Emission – 50Ω/50μH (150 kHz - 30 M) Radiated Emission – (Semianechoic Room) (30 M)		± 3.5 dB
Test		± 3.5 dB ± 4.7 dB
T _{EST} Conducted Emission – 50Ω/50μH (150 kHz - 30 M) Radiated Emission – (Semianechoic Room) (30 M) Bandwidth – Frequency Separation		± 3.5 dB ± 4.7 dB < 1%
T _{EST} Conducted Emission – 50Ω/50μH (150 kHz - 30 M) Radiated Emission – (Semianechoic Room) (30 M) Bandwidth – Frequency Separation		± 3.5 dB ± 4.7 dB < 1%
Test Conducted Emission – 50Ω/50μH (150 kHz - 30 M) Radiated Emission – (Semianechoic Room) (30 M) Bandwidth – Frequency Separation Time of occupancy		± 3.5 dB ± 4.7 dB < 1%
Test Conducted Emission – 50Ω/50μH (150 kHz - 30 M) Radiated Emission – (Semianechoic Room) (30 M) Bandwidth – Frequency Separation Time of occupancy Climatic Conditions Parameter		± 3.5 dB ± 4.7 dB < 1% < 0.5%
Test Conducted Emission – 50Ω/50μH (150 kHz - 30 M) Radiated Emission – (Semianechoic Room) (30 M) Bandwidth – Frequency Separation Time of occupancy Climatic Conditions PARAMETER Temperature		± 3.5 dB ± 4.7 dB < 1% < 0.5% Value (294 ± 3) K
Test Conducted Emission – 50Ω/50μH (150 kHz - 30 M) Radiated Emission – (Semianechoic Room) (30 M) Bandwidth – Frequency Separation Time of occupancy Climatic Conditions PARAMETER		± 3.5 dB ± 4.7 dB < 1% < 0.5%
Test Conducted Emission – 50Ω/50μH (150 kHz - 30 M) Radiated Emission – (Semianechoic Room) (30 M) Bandwidth – Frequency Separation Time of occupancy Climatic Conditions PARAMETER Temperature		± 3.5 dB ± 4.7 dB < 1% < 0.5% Value (294 ± 3) K
Test Conducted Emission – 50Ω/50μH (150 kHz - 30 M) Radiated Emission – (Semianechoic Room) (30 M) Bandwidth – Frequency Separation Time of occupancy Climatic Conditions PARAMETER Temperature		± 3.5 dB ± 4.7 dB < 1% < 0.5% Value (294 ± 3) K
Test Conducted Emission – 50Ω/50μH (150 kHz - 30 M) Radiated Emission – (Semianechoic Room) (30 M) Bandwidth – Frequency Separation Time of occupancy Climatic Conditions PARAMETER Temperature Relative humidity		± 3.5 dB ± 4.7 dB < 1% < 0.5% Value (294 ± 3) K



4. RADIATED EMISSIONS

In the following table you can find the limits established by the reference standard:

FREQUENCY RANGE	Field Strength PEAK	Field Strength	Field Strength
(MHz)	LIMITS	QUASI-PEAK LIMITS	AVERAGE LIMITS
(1/1112)	[dΒ (μV/m)]	$[dB (\mu V/m)]$	$[dB (\mu V/m)]$
0.009 - 0.490		48.15 – 13.8 @ <i>300m</i>	
0.490 - 1.705		33.8 – 23 @ <i>30m</i>	
1.705 - 30		29.5 @ 30m	
$30 \div 88$		40 @ 3m	
88 ÷ 216		43,5 @ 3m	
216 ÷ 960		46 @ 3m	
960÷ 1000		54 @ 3m	
>1000	74 @ 3m		54 @ 3m

Test Equipment

EQUIPMENT	Manufacturer	Model	CAL. DUE
MXE EMI Receiver	Agilent/Keysight	N9038A	01/2017
Anechoic Chamber	Comtest	CSA01	01/2017
Bilog Antenna	Schaffner	CBL6112B	01/2017
Horn Antenna	EMCO	3115	01/2017
Controller	Deisel	HD100	01/2017
Turn Table	Deisel	MA240	01/2017
LISN	GSD	NTW06	01/2017

Test procedure: RE22R02

Notes

Azimuth position EUT-Antenna corresponding to 0° identifies the rotating table orientation (TT) in which the instrument to be tested shows the front part turned towards the antenna. Positive grades individuate clockwise rotations of TT when this one is observed from the top. For negative degrees, TT rotation is counter-clockwise.

Antenna height respect to the mass plane is conventionally individuated with: MA=XXX where XXX indicates the height (always positive and greater than 100) expressed in cm.

Antenna horizontal polarisation is indicated by POL=H.

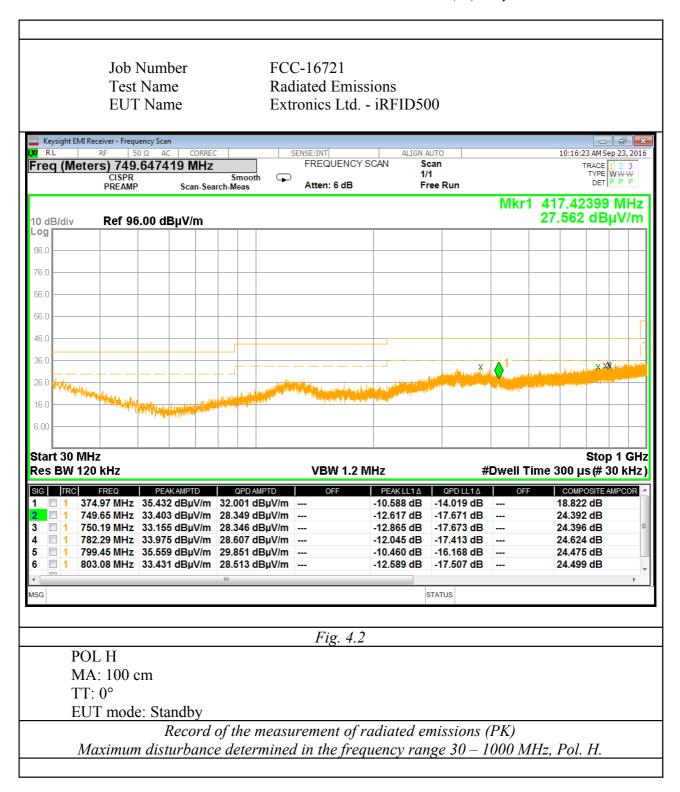
Antenna vertical polarisation is indicated by POL=V.

EUT was tested in the three orthogonal planes.

Results and conclusions

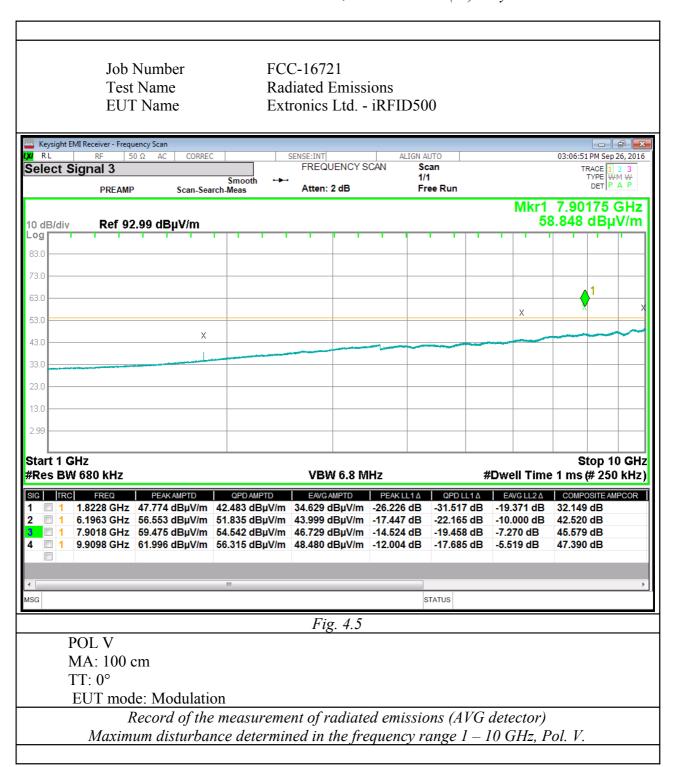
In all the operative conditions, equipment complied with the standard limits. Graphics in following figures show the most significant registrations of the performed measurements.

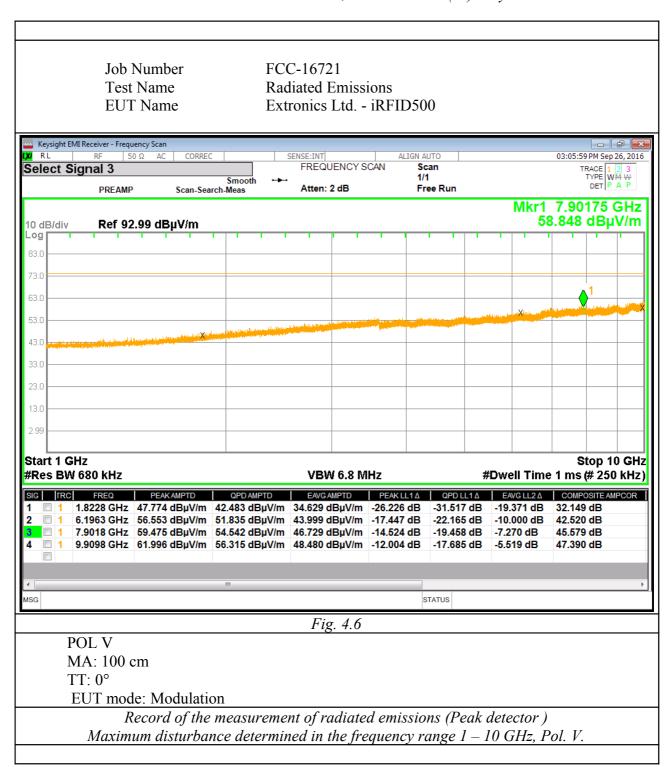


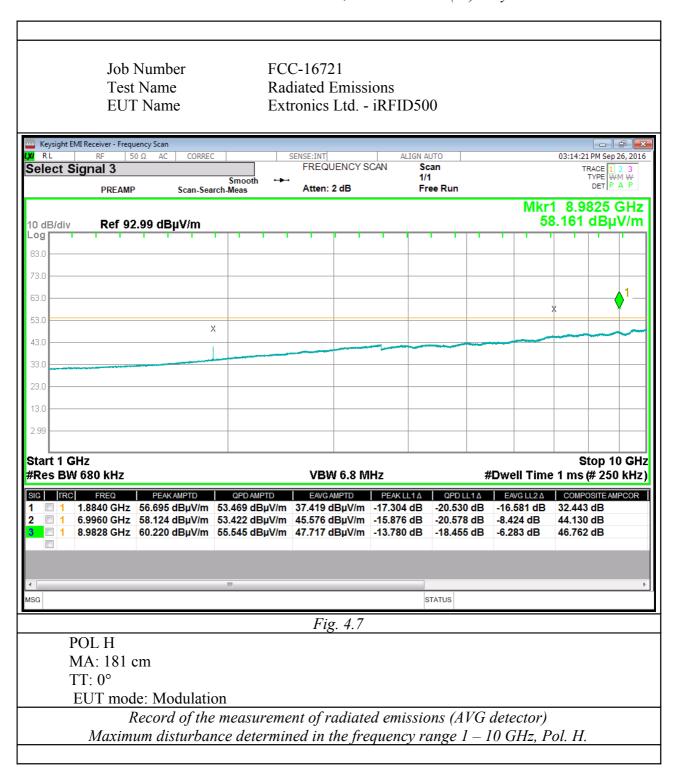


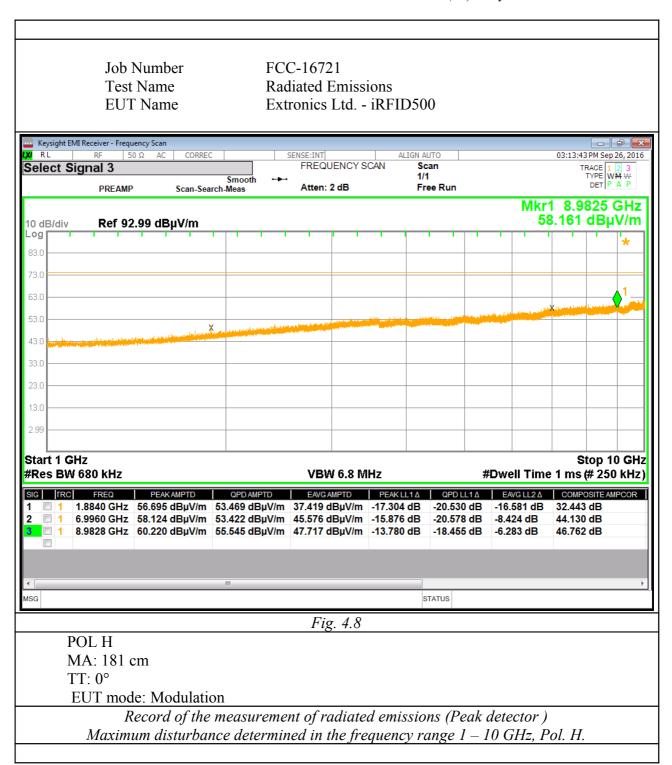


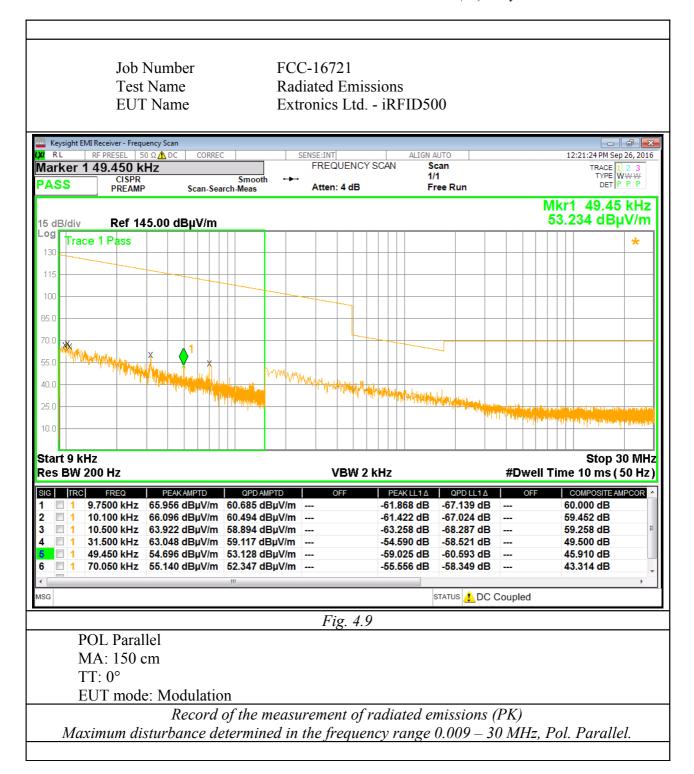


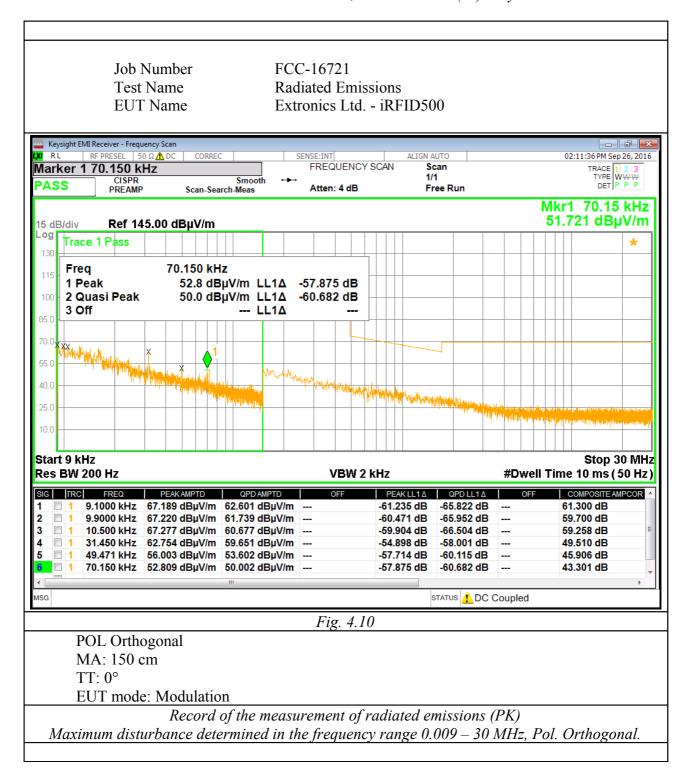












5. Power Lines Conducted Emissions

Equipment shall meet the limits below when using a CISPR16 quasi-peak and average detector receivers.

FCC 15.207

Frequency range	Q UASI-PEAK LIMIT	Average Limit
(MHz)	[dB (μV)]	[dB (μV)]
0.15 - 0.50	$66 - 56^{(*)}$	56 – 46 ^(*)
0.50 - 5	56	46
5 – 30	60	50

^(*) Limit decreasing linearly with logarithm of frequency

Test Equipment

EQUIPMENT	Manufacturer	Model	CAL. DUE
MXE EMI Receiver	Agilent/Keysight	N9038A	01/2017
Screened Room	GSD	CSC01	01/2017
LISN	GSD	NTW06	01/2017

Test procedure: CE22R01

The EUT power cable was connected to a LISN and the monitored output of the LISN was connected to a spectrum analyzer by a transient limiter. The conducted emissions from 150 kHz to 30 MHz were monitored and compared to the specification limits

Test method

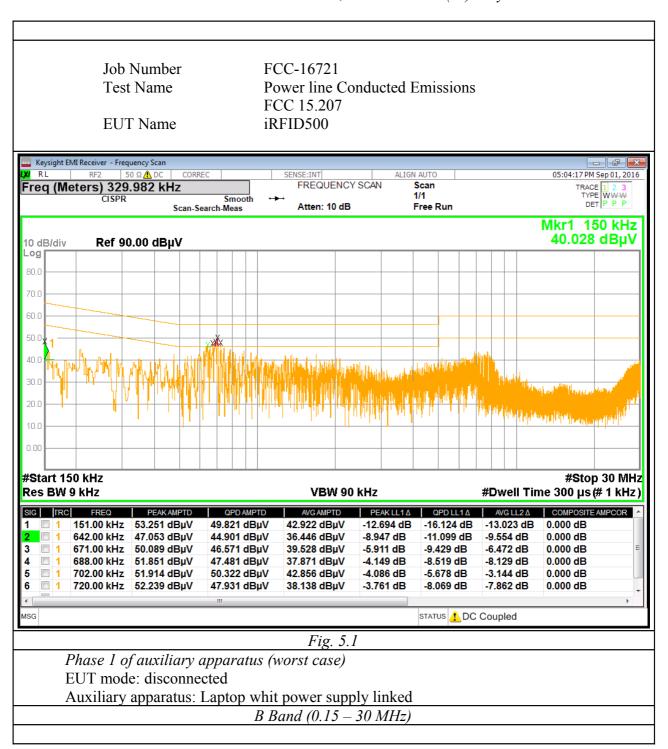
Test method was in accordance with the reference standard.

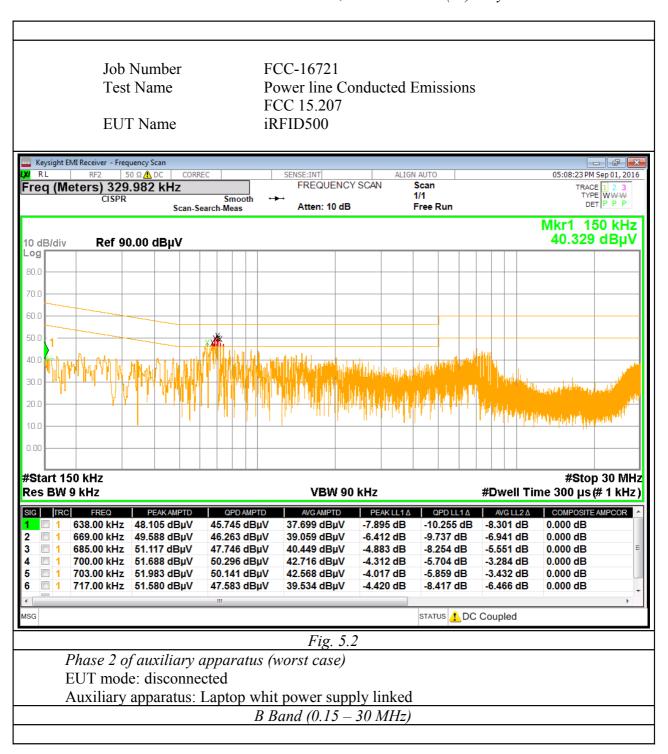
EUT modes of operations were tested in order to achieve the maximum level of emission.

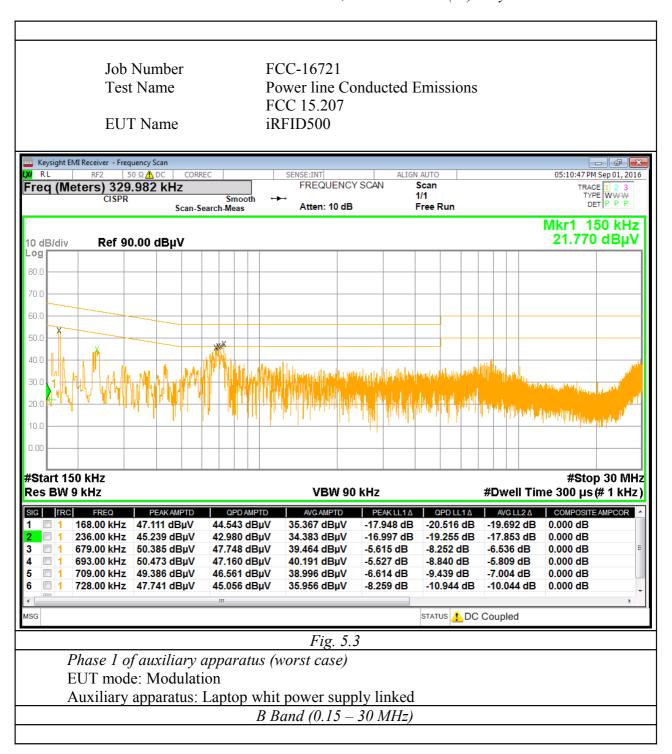
Results

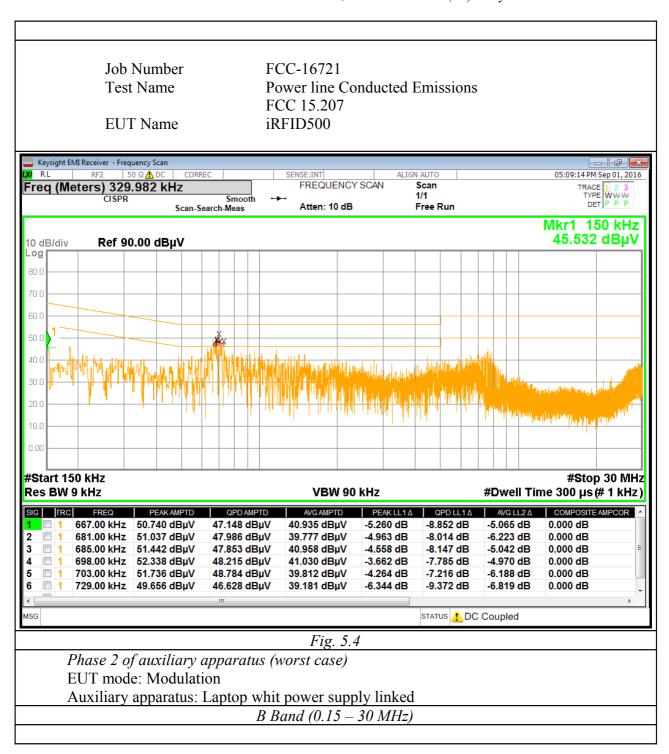
Equipment complied with the test specification limits.

Graphics in following figures show some registrations of the frequency spectrum of the conducted emissions.









6. OPERATION WITHIN THE BAND 902 - 928 MHz

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

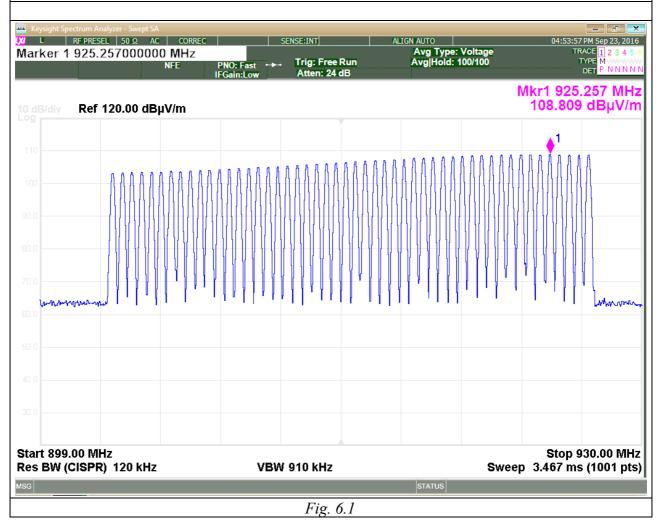
6.1. Number of Hopping Channel

For frequency hopping systems operating in the 902 – 928 MHz band:

- if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies;
- if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies.

The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Measurement



6.2. Carrier Frequency Separation

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Measurement

The following figures show the acquired graphics.

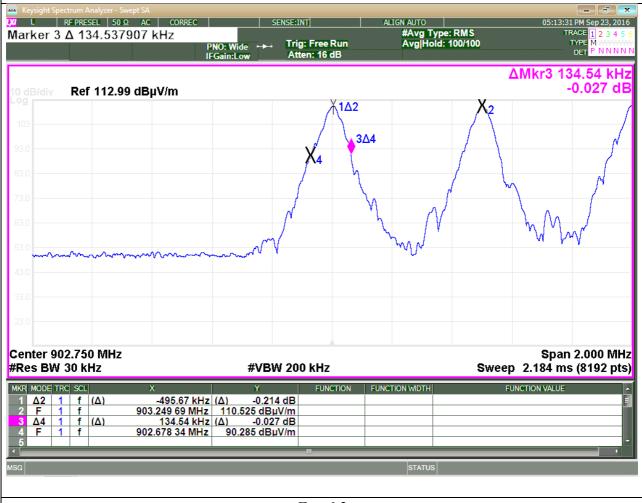
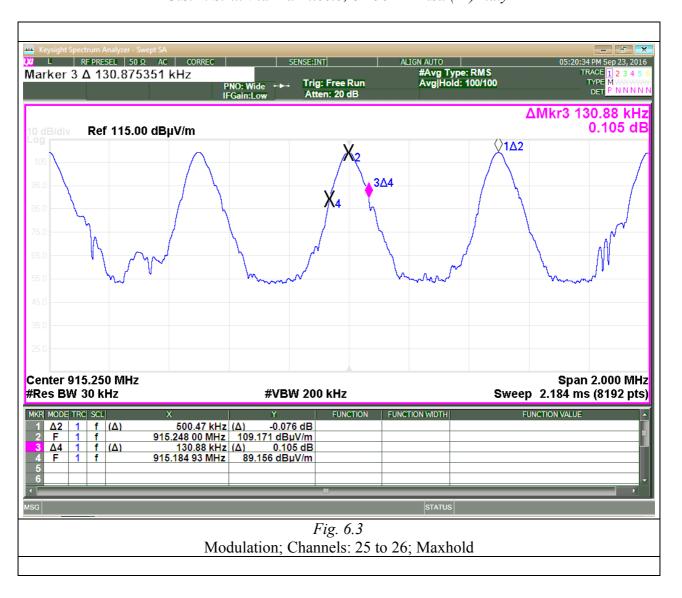
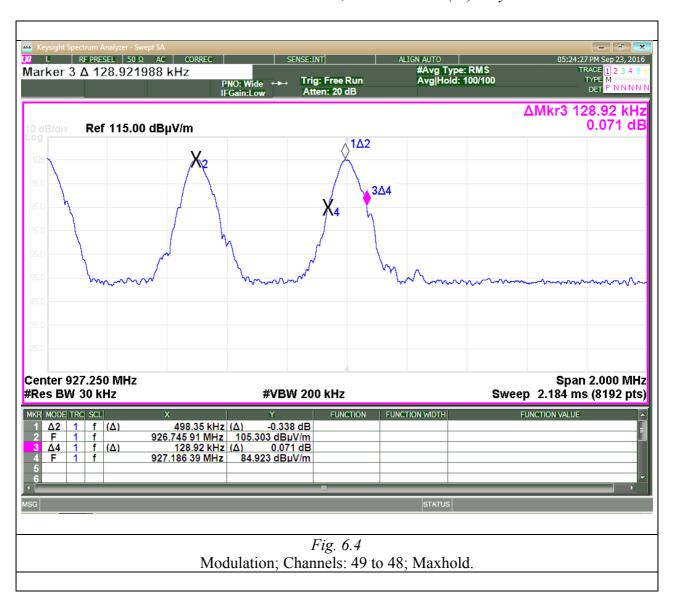


Fig. 6.2 Modulation; Channels: 0 to 1; Maxhold





6.3. Time of Occupancy

Limits

For frequency hopping systems operating in the 902928

MHz band: if the 20 dB bandwidth of the hopping channel

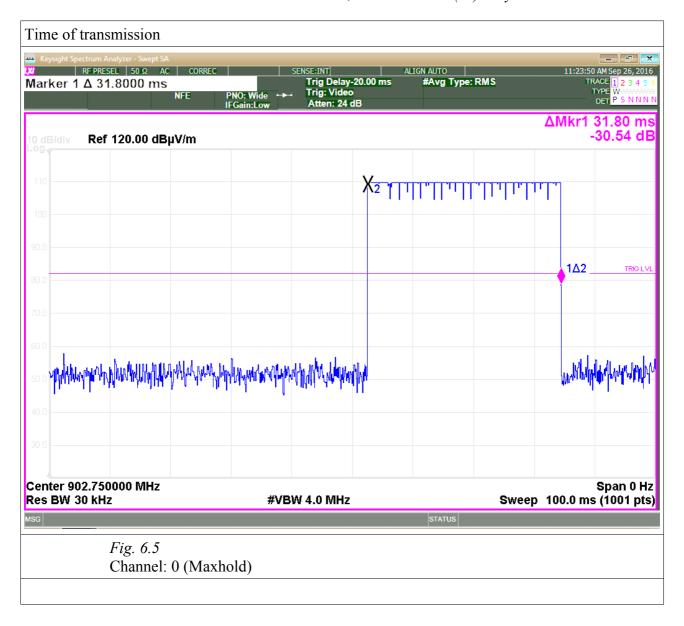
is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any

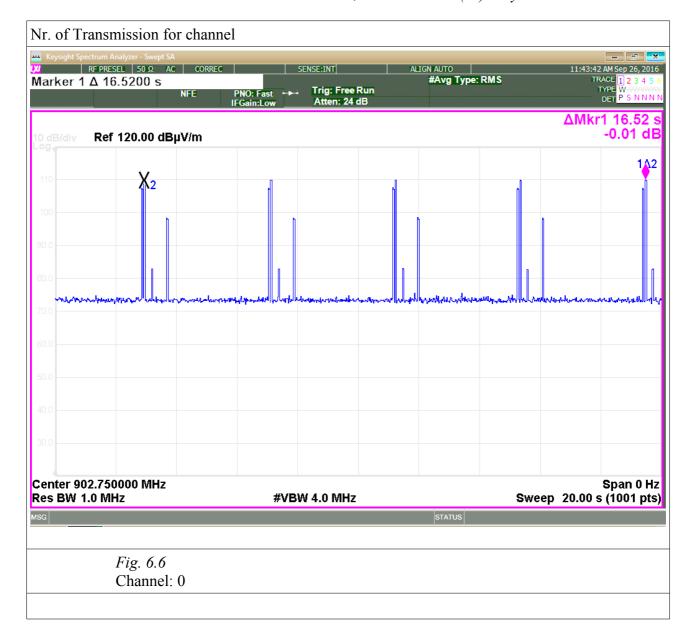
frequency shall not be greater than 0.4 seconds within a 20 second period

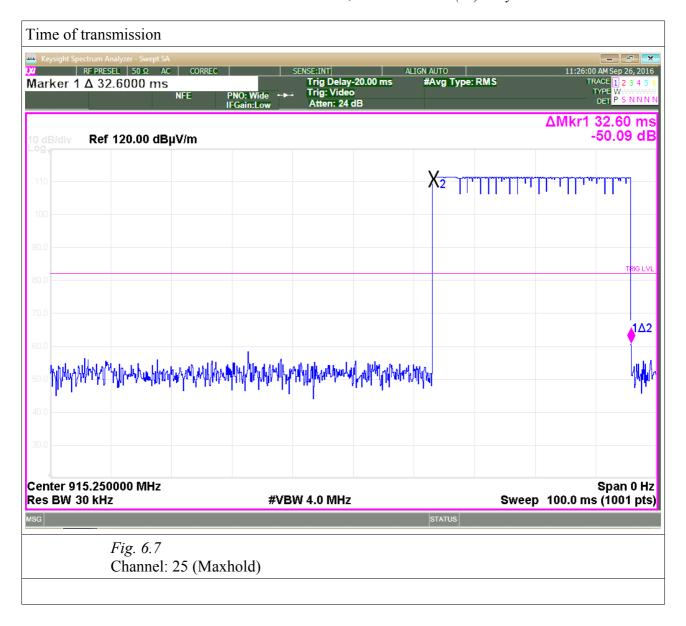
Measurements

Channel	Dwell Time (ms)	Nr. of Transmission for channel (in 20 s)	Pol.	Time of Occupancy in 20 s (ms)
0	31.8	5		159
25	32.6	5		163
49	31.9	5		160

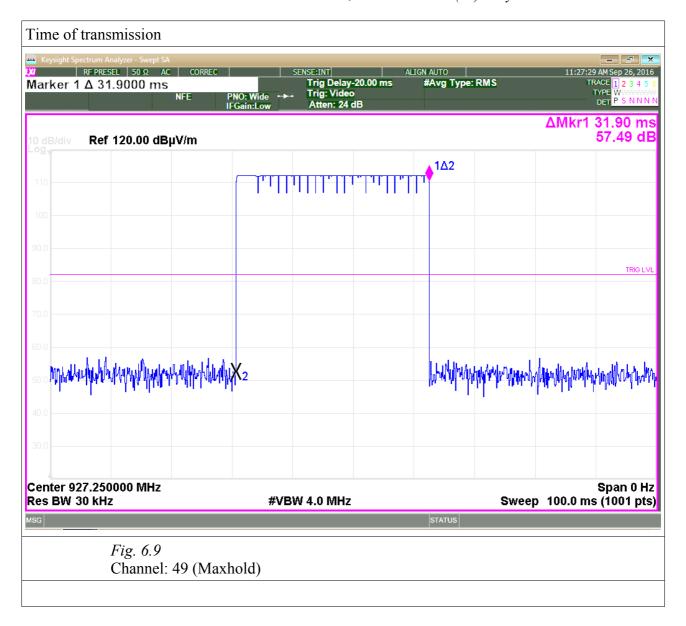
The following figures show the acquired graphics.

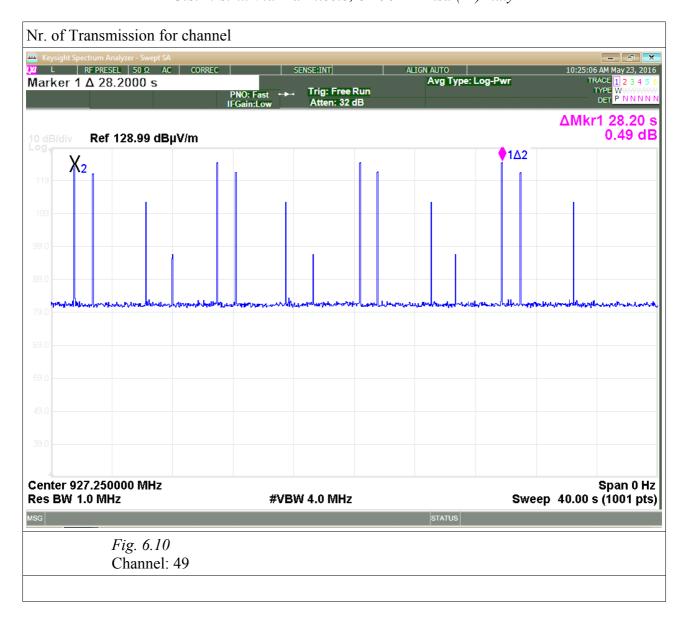




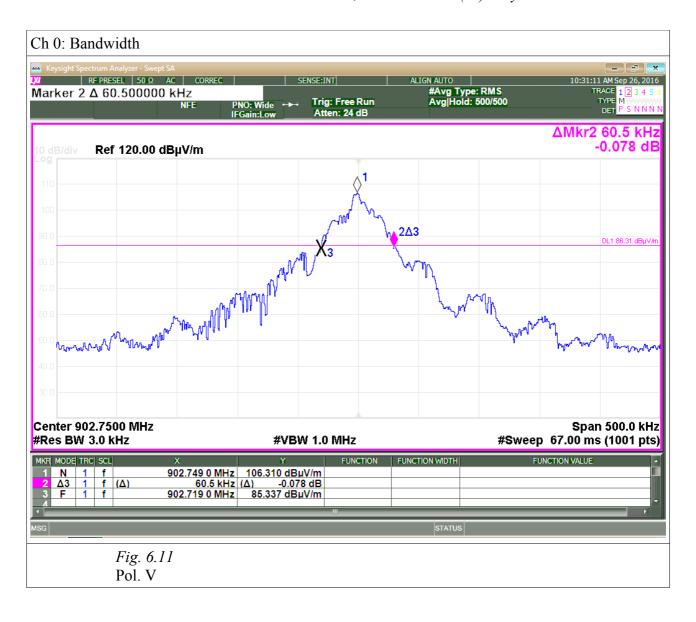




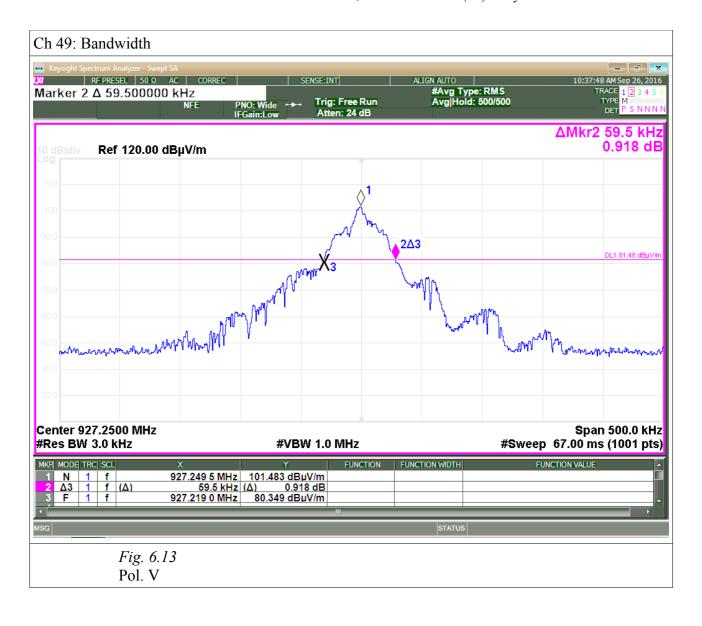


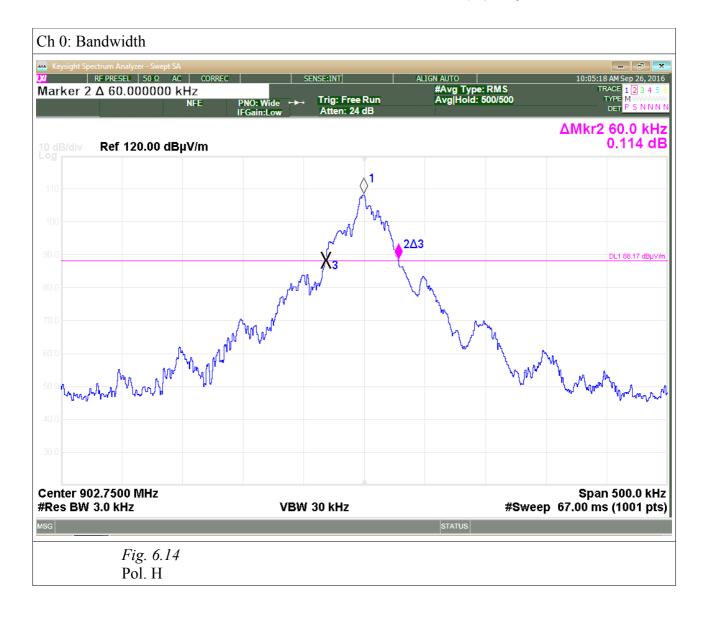


6.4.	20 dB Bandwidth		
Measureme	<u>ents</u>		
	Channel	Frequency (Pol. V / Pol. H)	Bandwidth (Pol. V / Pol. H)
		[MHz]	[kHz]
	0	902.7485 / 902.7495	60.5 / 60.5
	25	915.2505 / 915.2500	75.5 / 72.5
	49	927.2505 / 927.2495	59.5 / 59.5
The follow	ring figures show the	acquired graphics.	













6.5. Peak Output Power

Equipment shall meet the limits below.

Frequency range [MHz]	Number of Channel [#]	RF power output Limit [dBm]
902 – 928	50	30.0 (1 W)
902 – 928	< 50	24.0 (0.25 W)

Measurement

Eirp and Erp measurement were measured accordingly to ANSI C63.10: 2013 and 412172 D01 Determining ERP and EIRP v01r01.

Field Strength approach (linear terms):

$$erp = (E*d)^2/(30*1.64)$$
 (1)

E = Electric field strength in V/m

d = measure distance in m

Note: for f< 1GHz the radiated power is in ERP

The measured values are:

CHANNEL	Electric Field [dBµV/m] / Output Power [dBm]				
	Pol. V	Pol. H			
0	101.296 / 3.89	122,402/ 24.99			
25	98.661 / 1.25	122,851 / 25.44			
49	101.676 / 4.27	122,189 / 24.78			

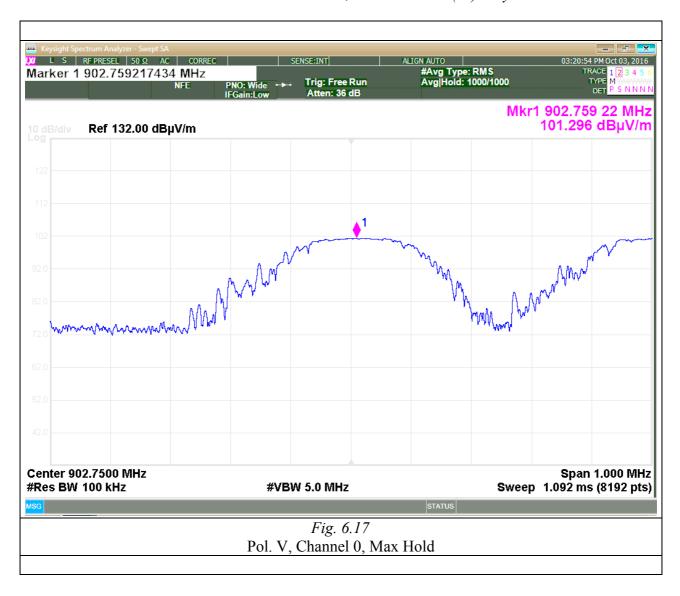
Maximum Electric Field 122,851 dBuV/m = 1,4V/m

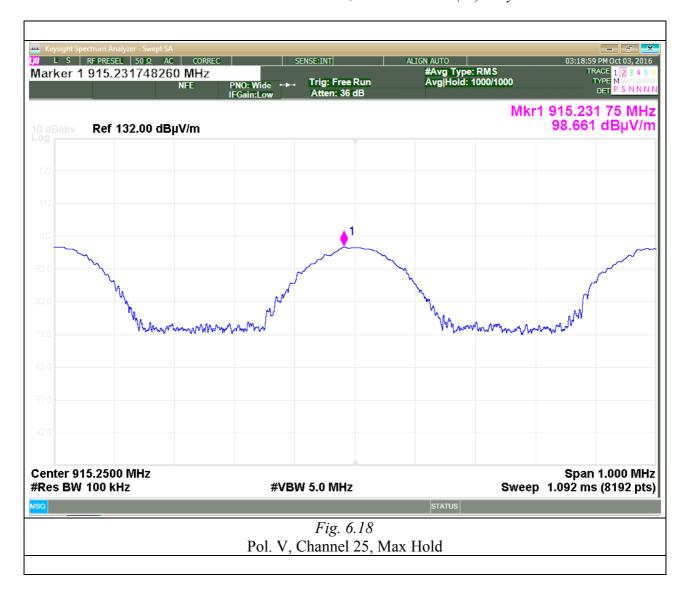
d = 3m

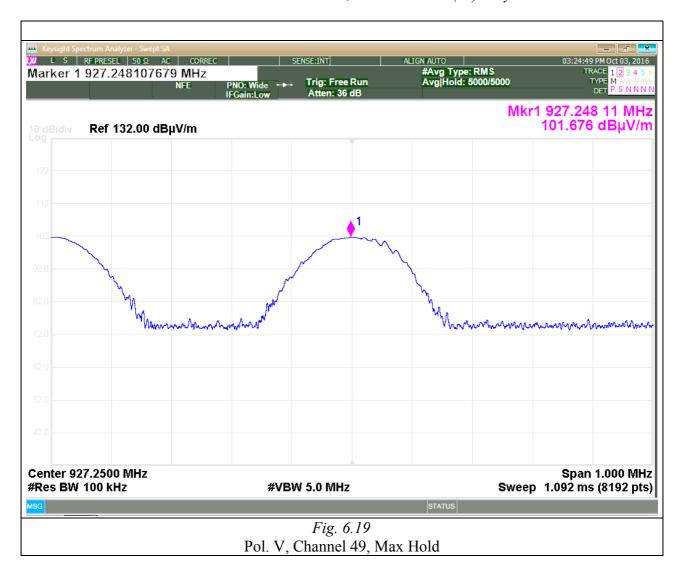
Accordingly to (1) erp is calculated:

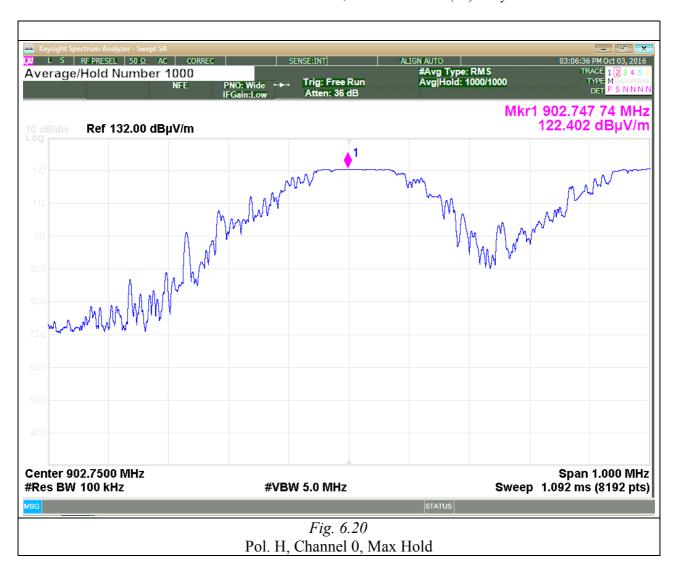
$$erp = 0.35 W$$

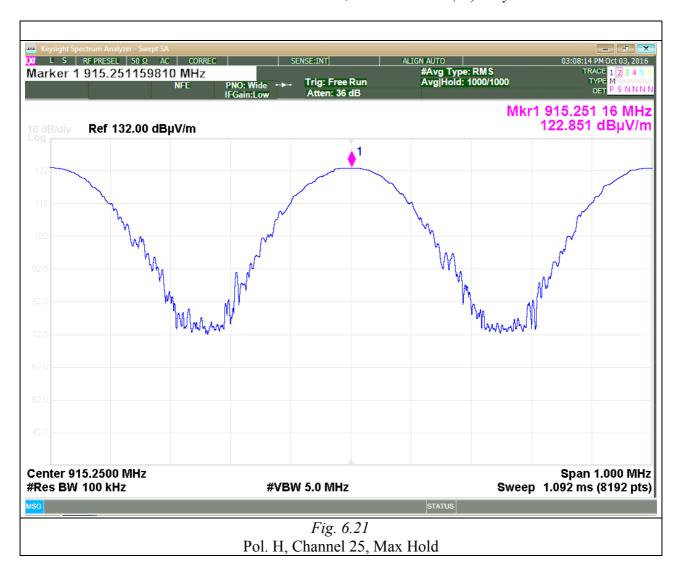
The following figures show the acquired graphics.

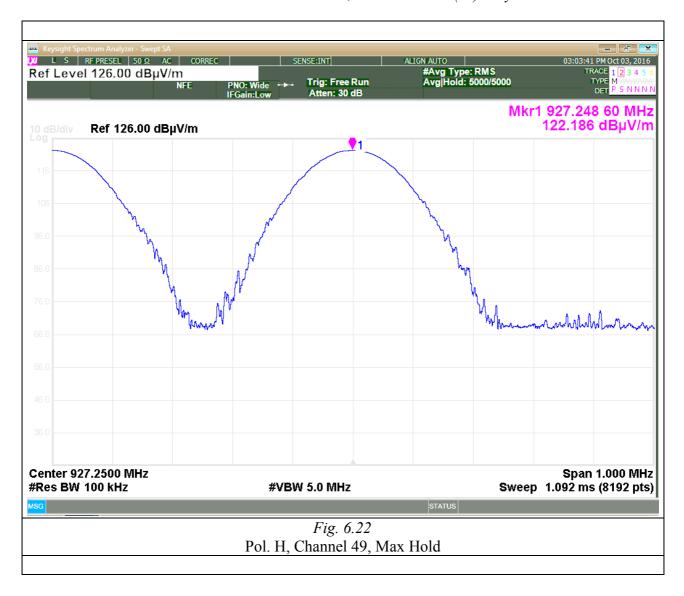












6.6. B_{AND} E_{DGE}

Emissions must be within the band 902-928 MHz.

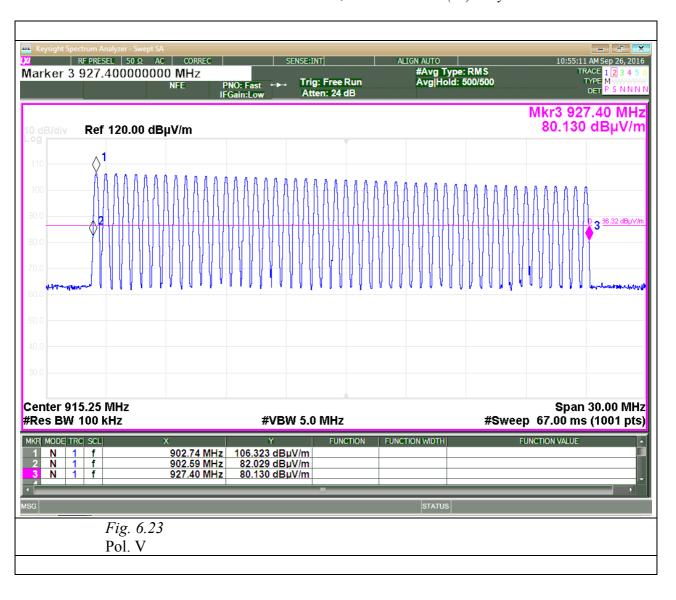
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

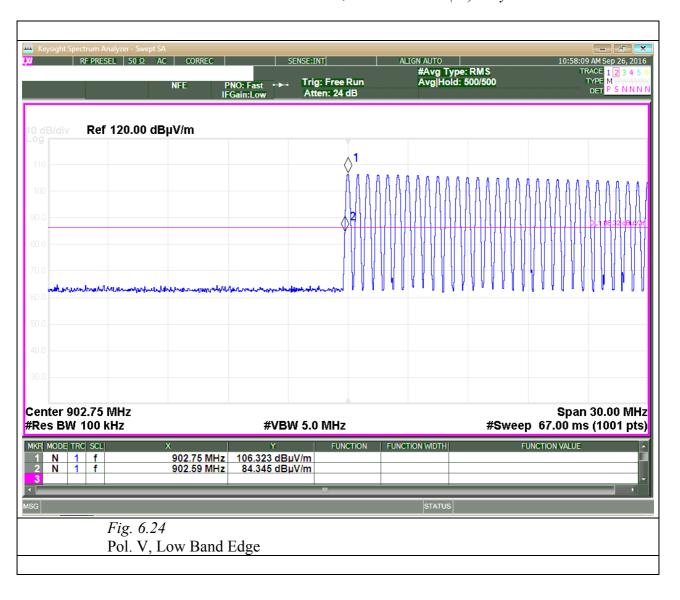
If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

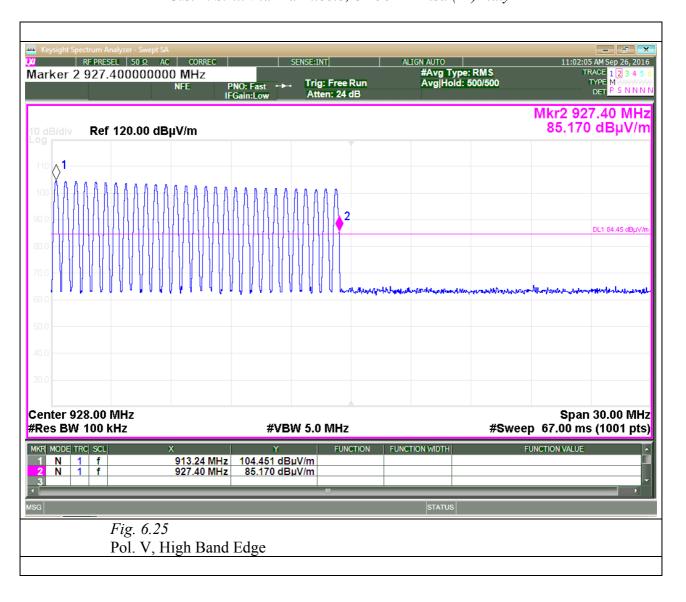
Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

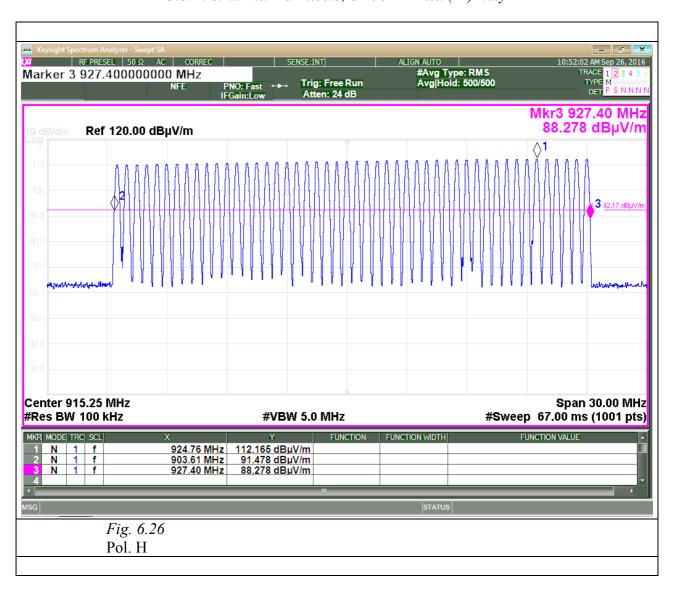
Measurements

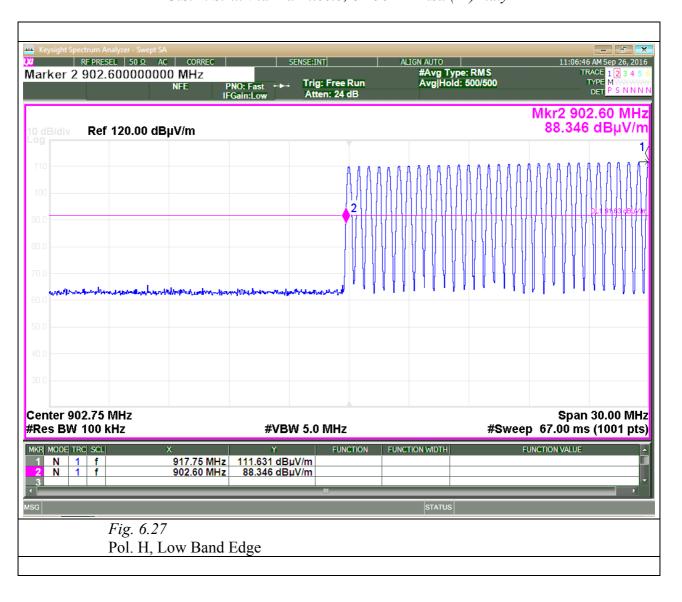
The following figures show the acquired graphics.

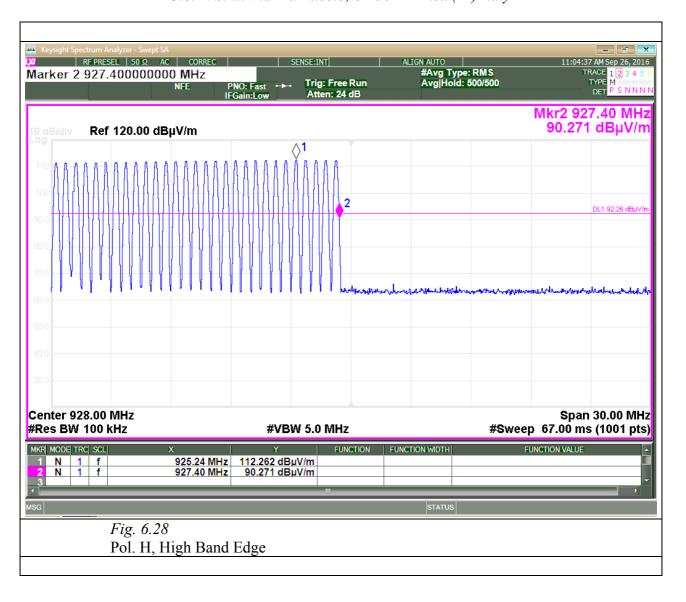












7. RADIATED OPERATION WITHIN THE BAND 902 - 928 MHz

7.1. Spurious Radiated Emissions

Nr	AVG Level (dBμV/m)					AVG	Remark	
Harmonics	(Ch 0	Ch	25	Ch	49	Limits	
	F (MHz)	(dBµV/m)	F (MHz)	(dBµV/m)	F (MHz)	(dBµV/m)	$(dB\mu V/m)$	
2			-		-		54.0	
3			-		-		54.0	
4	-		-				54.0	
5	-		-				54.0	
6			-				54.0	
7							54.0	
8							54.0	
9			-		-		54.0	
10	-		-				54.0	

Note: Levels below 20 dB of limits are indicated with (--).

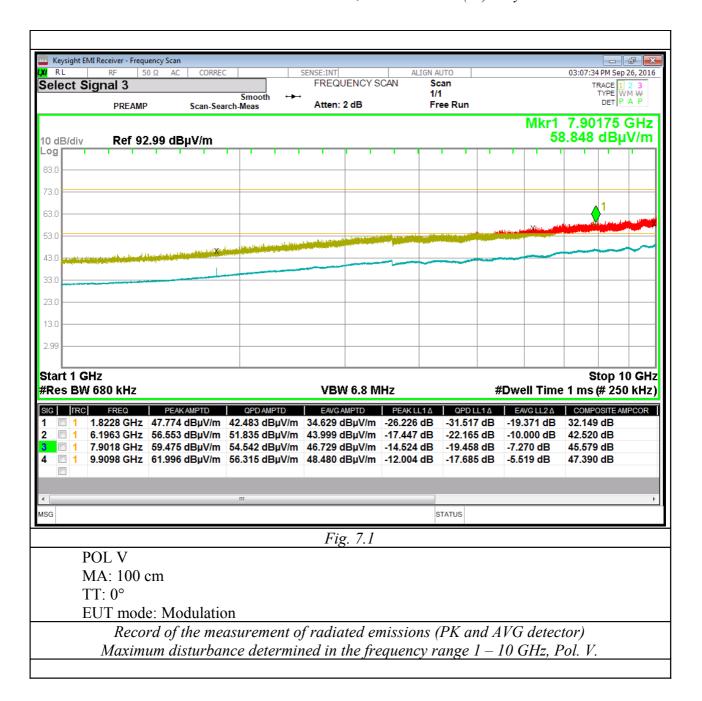
Nr	Peak Level (dBμV/m)					PK	Remark	
Harmonics Ch 0		Ch 0	Ch 25		Ch 49		Limits	
	F (MHz)	(dBµV/m)	F (MHz)	(dBµV/m)	F (MHz)	(dBµV/m)	(dBµV/m)	
2							74.0	
3							74.0	
4							74.0	
5							74.0	
6							74.0	
7							74.0	
8							74.0	
9							74.0	
10							74.0	

Note: Levels below 20 dB of limits are indicated with (--).

Test Equipment

Equipment	Manufacturer	Model	Cal. Due	
MXE EMI Receiver	Agilent/Keysight	N9038A	01/2017	
Anechoic Chamber	Comtest	CSA01	01/2017	
Bilog Antenna	Schaffner	CBL6112B	01/2017	
Horn Antenna	EMCO	3115	01/2017	
Controller	Deisel	HD100	01/2017	
Turn Table	Deisel	MA240	01/2017	
LISN	GSD	NTW06	01/2017	

Test procedure: CT15R01





8. Рното



Fig. 8.1
Conducted Emissions Test Set-up

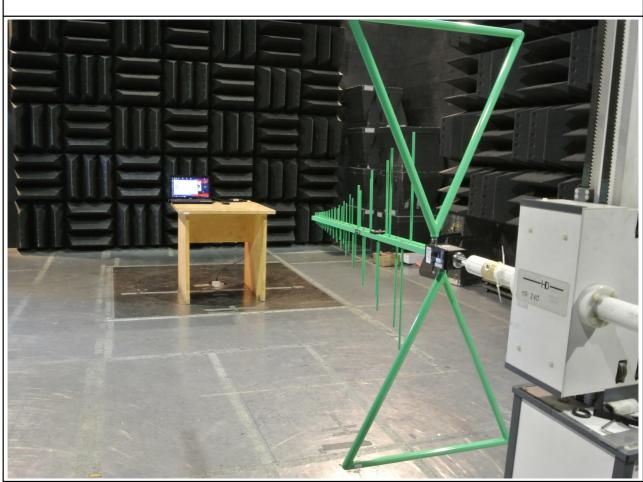


Fig. 8.2 Radiated Emissions Test Set-up Range: 30 – 1000 MHz



Fig. 8.3
Radiated Emissions Test Set-up
Range: 1 – 10 GHz

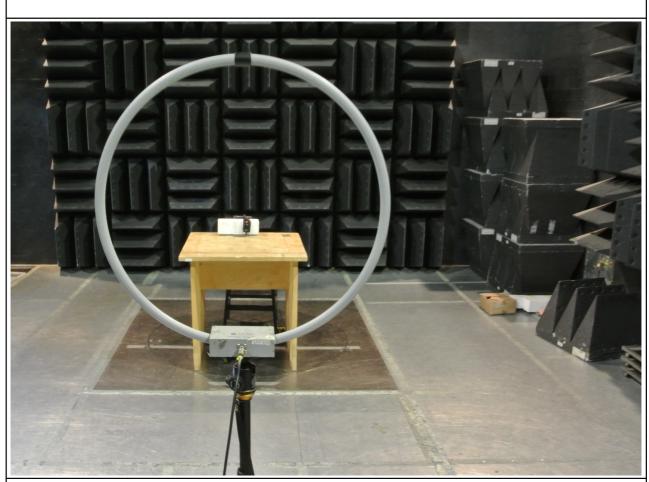


Fig. 8.4

Radiated Emissions Test Set-up
Range: 9 kHz – 30 MHz