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EMC TEST REPORT

Nr 3695-FCC

This test report applies only on equipment described hereafter.
Proposal number: 200512-2880

Date .....:	March 21st, 2006
Date of test.....:	January 17th to 20th, 2006 ; March 1st & 15th, 2006
Location.....:	**LCIE** ZI des Blanchisseries 38500 VOIRON - France
Performed by.....:	Laurent CHAPUS
Customer**.....:**	**TAGSYS S.A.** 180, Chemin de Saint Lambert 13821 La PENNE SUR HUVEAUNE FRANCE

Product.....:	**MEDIO P101 WIFI with L-W1 and TR-HA1 antennas** **FCC ID: QHKMEDIOP101WIFI**
Type of test .....:	**Radiated and Conducted Emission Test**

Applied standards.....:	ANSI C63-4 (2003) 47 CFR Part 15 Subpart C CISPR 22 (2003)

Result of tests.....:	**Radiated Emission : Comply** **Conducted Emission : Comply**

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Written by.....:	Laurent CHAPUS	Approved by :	Jacques LORQUIN

1. System test configuration

1.1. Justification

The system was configured for testing in a typical fashion (as a customer would normally use it).
WIFI and USB modes are evaluated with L-W1 and TR-HA1 antennas.

1.2. HARDWARE IDENTIFICATION:

*** Equipment Under Test (EUT):**

MEDIO P101 WIFI **sn:RD050105-1**
FCC ID: QHKMEDIOP101WIFI

*** Configuration:**

- **Antenna L-W1:**
  - Dimensions : 58x12x3cm
  - E/S : Coaxial cable with BNC connector: 2.8m (with 6 ferrites)

- **Antenna TR-HA1:**
  - Dimensions : 45x12x4cm
  - E/S : Coaxial cable with BNC connector: 2.0m (with 6 ferrites)

- **RF transmitter :**
  - Dimensions : 155x80x35mm
  - E/S :
    * Antenna connector SMA (13.56MHz signal)
    * USB port
    * power supply 12Vdc
    * I/O DIN5 connector
    * WIFI antenna (SMA reverse)

1.3. Auxiliaries

The FCC IDs for all equipment, more description of all cables used in the tested system are :

Trade Mark – Model Number (Serial number)	FCC ID	Description	Cable description
MEDIO P101 WIFI (sn: RD050105-1) L-W1 antenna TR-HA1 antenna	QHKMEDIOP101WIFI	RFID reader	Power cord unshielded, USB cable shielded, Coaxial cable with 6 ferrites (antennas) I/O cable unshielded
XP model:MPP6US12-2 (sn: none)	none	AC/DC Power supply Out 12vdc/450mA	Power cord unshielded.
Hewlett Packard VECTRA VL420 DT pn: P5755-60201 (sn: FR14122957)	DOC	Personal computer	Power cord unshielded. All other cable shielded.
Hewlett Packard pn:D2846 (sn: JP74001000)	DOC	Monitor	Power cord unshielded. Video cable shielded
Hewlett Packard pn:C4736A (sn: LZA4000061)	DZL211092	MOUSE	PS2 cable
Hewlett Packard pn:C4774 (sn: M990814763)	GYUR73SK	Keyboard	PS2 cable
NETGEAR WG-602 v3 (sn: WG17151DB036258)	PY3WG602V3	54Mbps WIFI wireless access point	Power cord unshielded Ethernet cable shielded
US ROBOTICS NR15.0010.01 (sn: none)	none	Power adapter for NETGEAR WG-602 v3 (Out: 7.5Vdc/1A)	Power cord unshielded
TAGSYS	none	TAG ISO 15693	

*** : Equipment under test.**

1.4. Equipment modifications

None.

1.5. EUT Exercise software

The EUT exercise program used during radiated and conducted testing was designed to exercise the equipment under test in a manner similar to a typical use. (Continually reading of tag ID)
PX Explorer.exe is running under windows XP.

1.6. I/O cables

- 2x Standard power cords, length:1.8m (power supply of the PC and monitor)
- Coaxial cable with 6 ferrites on BNC connector side, length: 2m or 2.8m (13.56MHz antennas)
- 1x USB cable, shielded, length: 2m
- 1x I/O cable, unshielded, length:1m
- 1x Ethernet cable, shielded length: 4m
- 1x DC power cable, unshielded, attached on EUT's power adapter: 2m

2. Radiated emission data

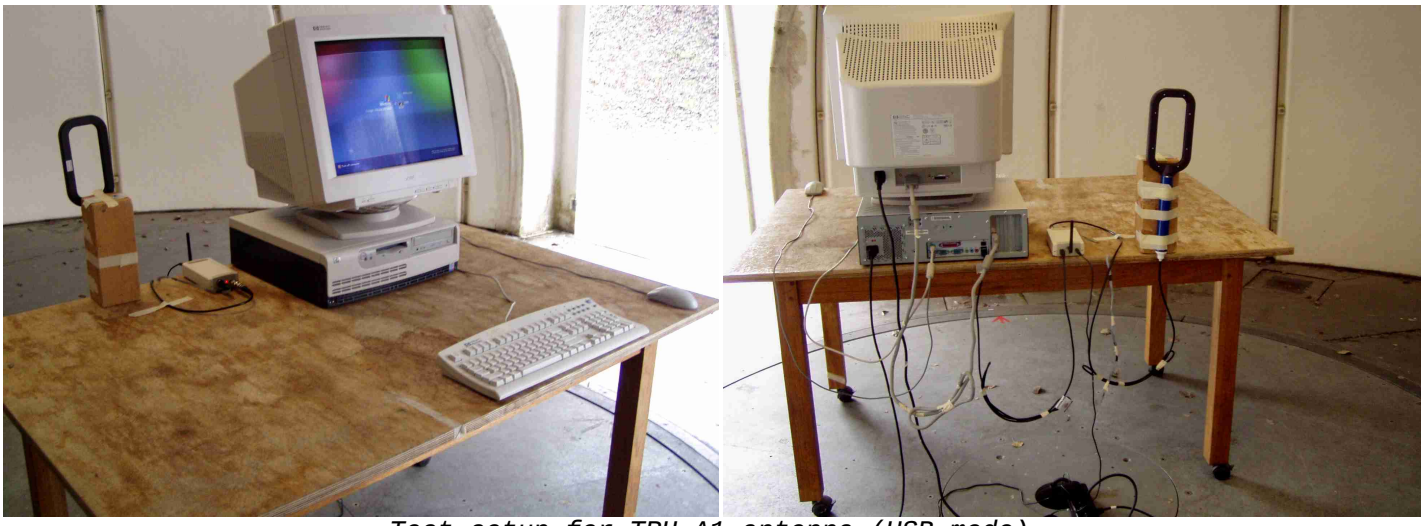
2.1. SET-UP

The installation of EUT is identical for pre-characterization measurement in a 3 meters full anechoic chamber and for measures on a 10 meters Open site.

The EUT is placed on a non-conducting table of 80cm height. A Tag is set on the antenna.

Equipment configuration and running mode:

- EUT is ON;
- The tag ID is being read continually;
- USB mode: the EUT is connected to the PC with the USB cable. The PC is set on the table.
- WIFI mode: data transfer between EUT and PC is processed by WIFI. The PC with its WIFI access point is set outside of the measuring area.



Test setup for TRH-A1 antenna (USB mode)

Test setup for TR-HA1 antenna (WIFI mode)

Test setup for L-W1 antenna (WIFI mode)

2.2. TEST EQUIPMENT

Test Equipment up to 1GHz on 10 meters open site:

Equipment	Company	Model	Serial
Spectrum Analyzer	HP	8568B	2732A04155
Quasi-Peak adapter	HP	85650A	2811A01134
RF Pre-selector	HP	85685A	2833A00784
Biconical Antenna	EMCO	3104C	9401-4636
Log Periodic Antenna	EMCO	3146	2178
Spectrum Analyzer	HP	8593E	3409u00537
Loop antenna	Electro-metrics	EM-6879	690234
Amplifier	HP	8447F H64	3113A06394

EMCO-1050, 6 meters height antenna mast & EMCO-1060, 3 meters diameter Turntable.
A 3 meters Open site located in **LCIE** - Voiron (FRANCE).

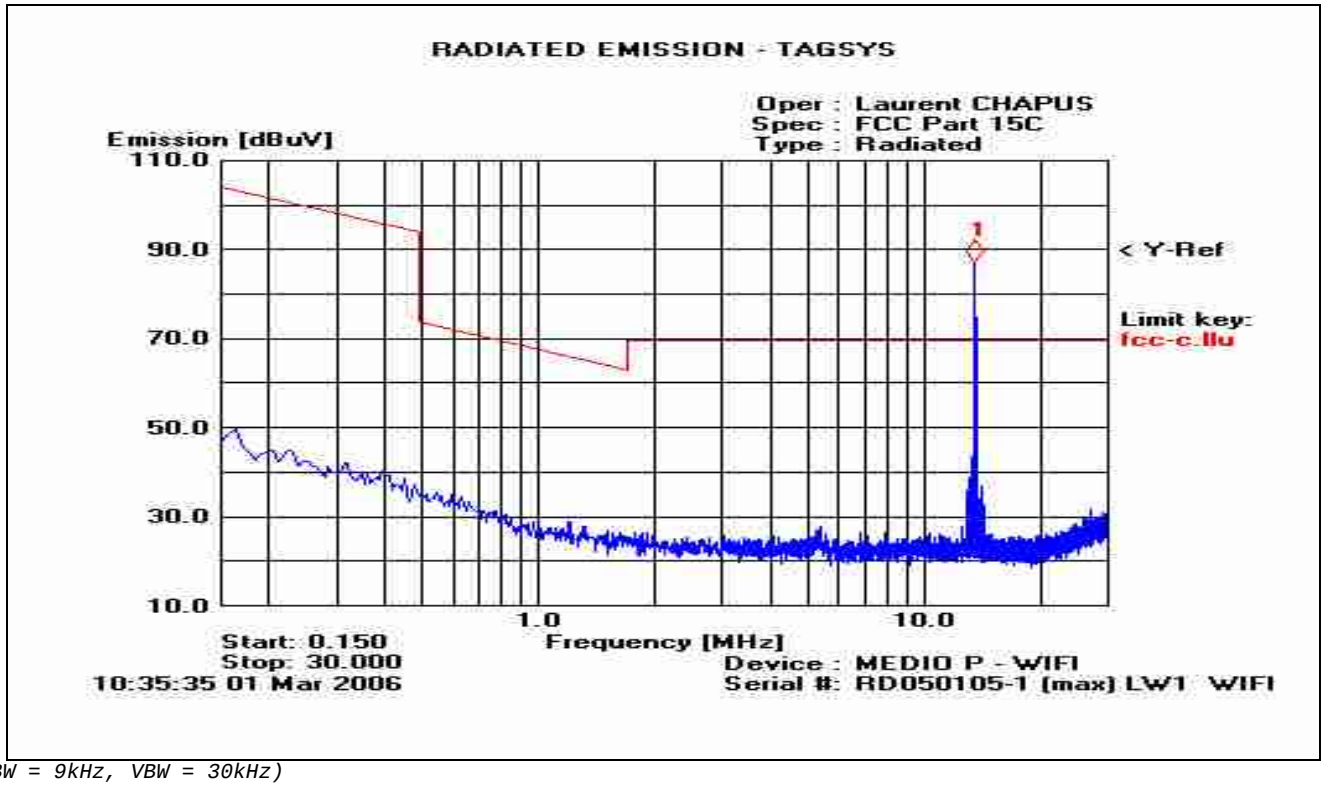
Pre-scan, test Equipment up to 1GHz:

Equipment	Company	Model	Serial
EMC Analyzer	HP	8591EM	3536A00384
Amplifier	HP	8447F H64	3113A06394
Antenna (30MHz-1GHz)	CHASE	CBL6111A	1628
Loop antenna	Electro-metrics	EM-6879	690234

2.3. TEST SEQUENCE AND RESULTS

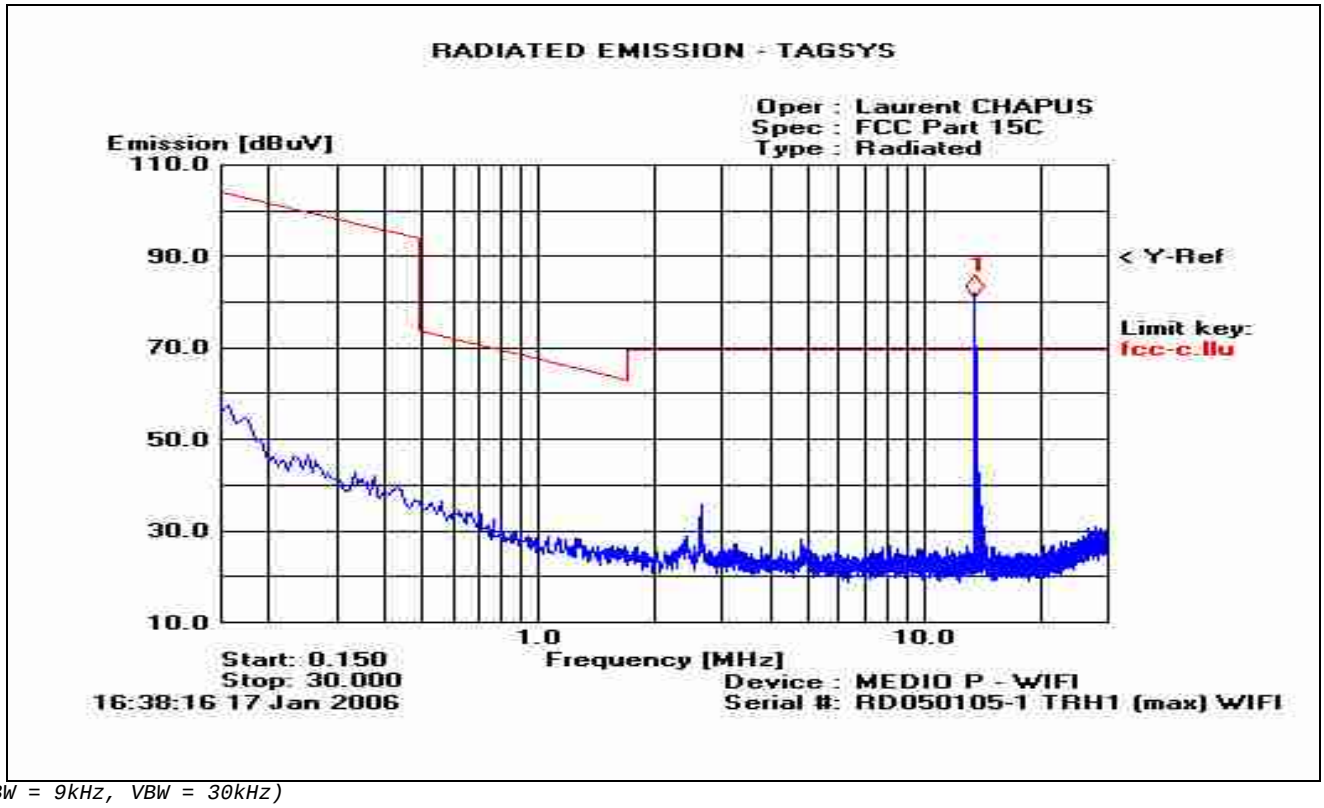
2.3.1.Pre-characterization at 3 meters [9kHz-30MHz]

A pre-scan of all the setup has been performed in a 3 meters full anechoic chamber.
The distance between EUT and antenna is 3 meters. Pre-characterization is performed in vertical (V) polarization and the loop antenna position was rotated during the test for maximized the emission measurement.
Frequency band investigated is 9kHz to 30MHz.
See below graph examples between 150MHz to 30MHz:
(No frequency observed between 9kHz to 150KHz)



(RBW = 9kHz, VBW = 30kHz)

Result for 150MHz to 30MHz, L-W1 antenna
(Marker n°1 is 13.56MHz)



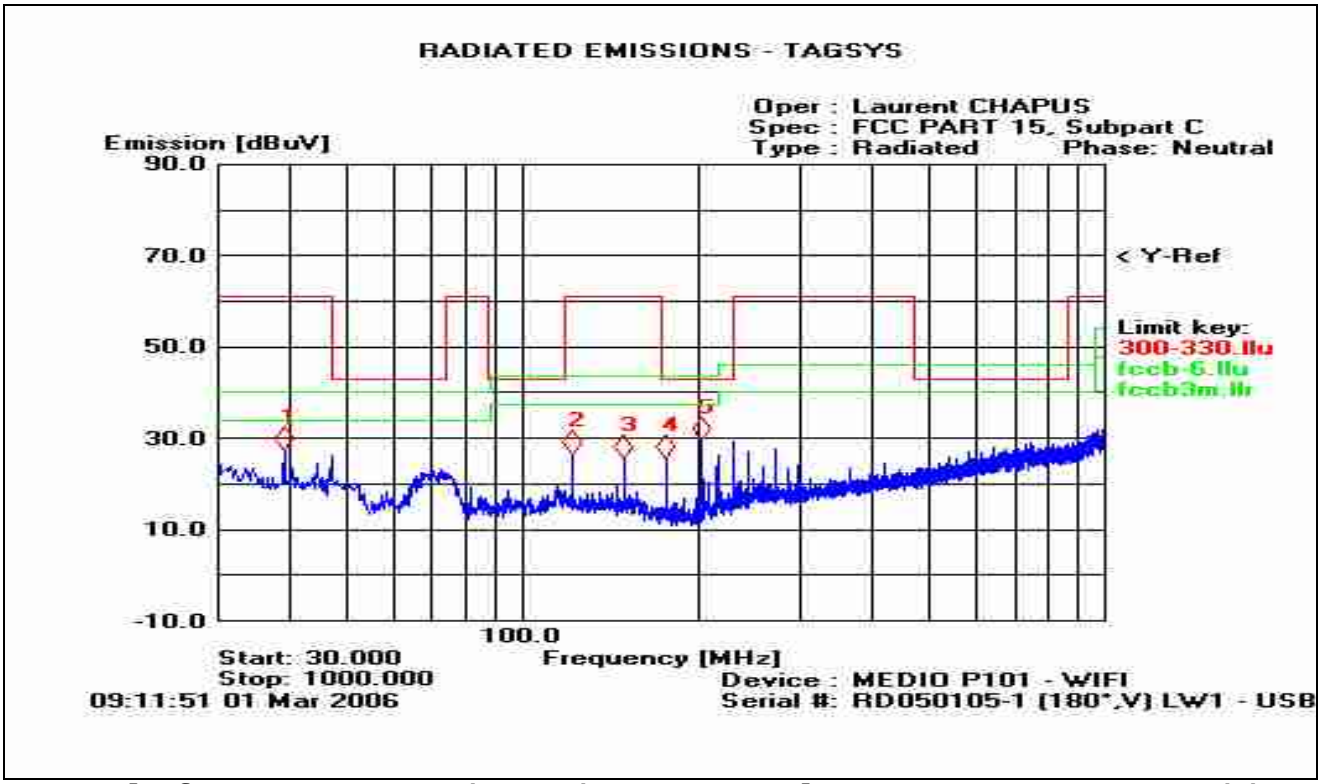
(RBW = 9kHz, VBW = 30kHz)

Result for 150MHz to 30MHz, TR-HA1 antenna
(Marker n°1 is 13.56MHz)

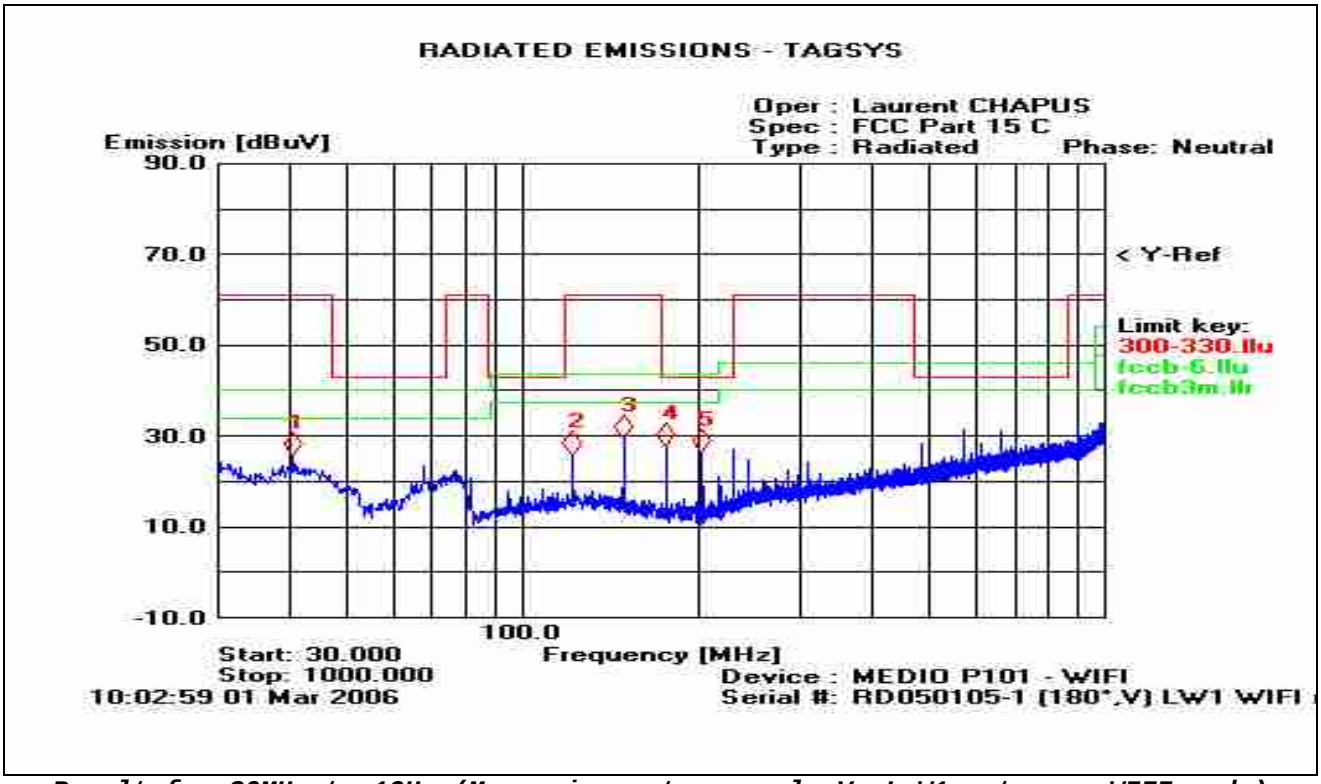
2.3.2.Pre-characterization at 3 meters [30MHz-1GHz]

A pre-scan of all the setup has been performed in a 3 meters full anechoic chamber. The distance between EUT and antenna is 3 meters. Test is performed in horizontal (H) and vertical (V) polarization with a log-periodic antenna Chase CBL6111A and on 4 faces of the EUT.
See below graph examples between 30MHz to 1GHz.

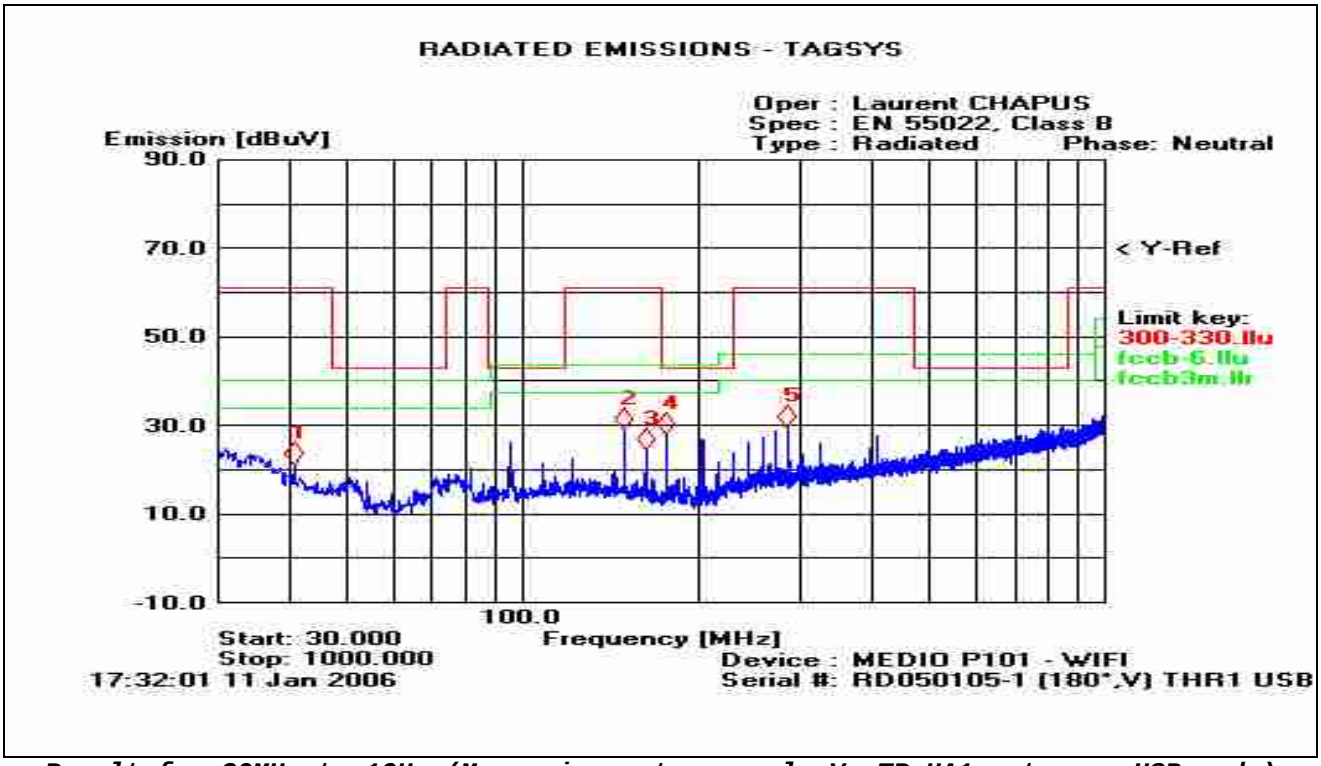
(RBW = 120kHz, VBW = 300kHz)



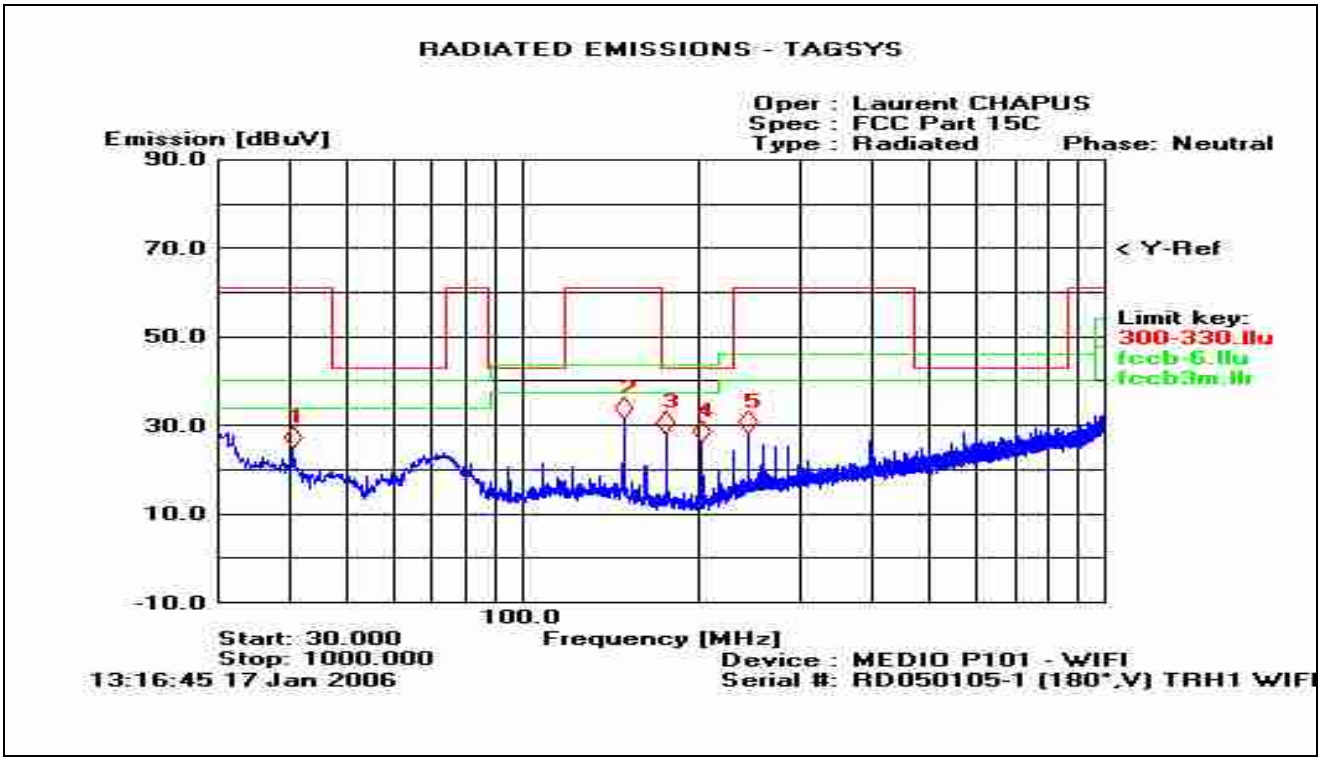
Result for 30MHz to 1GHz (Measuring antenna pol. V, L-W1 antenna, USB mode)



Result for 30MHz to 1GHz (Measuring antenna pol. V, L-W1 antenna, WIFI mode)



Result for 30MHz to 1GHz (Measuring antenna pol. V, TR-HA1 antenna, USB mode)



Result for 30MHz to 1GHz (Measuring antenna pol. V, TR-HA1 antenna, WIFI mode)

2.3.3.Characterization on 10 meters open site below 30 MHz

The product has been tested according to ANSI C63.4(2003), FCC part 15 subpart C. Radiated Emission were measured on an open area test site. A description of the facility is on file with the FCC.

The product has been tested at a distance of **10 meters** from the antenna and compared to the FCC part 15 subpart C §15.225 limits in the frequency range 13.553MHz 13.567MHz. Measurement bandwidth was 9kHz.
Antenna height was 1m for both horizontal and vertical polarization.
Antenna was rotated around its vertical axis.
Continuous linear turntable azimuth search was performed with 360 degrees range.
No other frequency than the carrier at 13.56MHz was found and measured on the 10 meters open site.
Equipment was moved to position that maximized emission. The Equipment was tested in vertical and horizontal position, rotated from 0° to 360°.
(3 axis measurement)
A summary of the worst case emissions found in all test configurations and modes is shown on clauses 2.3.1.

L-W1 antenna:

Frequency (MHz)	QPeak Lmt (dBµV/m) @ 30m	QPeak (dBµV/m)	QPeak-Lmt (dB)	Turntable Angle (deg)	Ant. Pol./ Angle (deg)	Tot Corr (dB)
13.56*1	84.0	58.0*2	-26.0	120°	V / 90°	35.3

*1: Fundamental – 15.225 limits. Measure have been done at 10m distance and corrected according to requirements of 15.209.e) (M@30m = M@10m-19.1dB)
*2: Worst case for USB or WIFI mode.

TR-HA1 antenna:

Frequency (MHz)	QPeak Lmt (dBµV/m) @ 30m	QPeak (dBµV/m)	QPeak-Lmt (dB)	Turntable Angle (deg)	Ant. Pol./ Angle (deg)	Tot Corr (dB)
13.56*1	84.0	63.1*2	-20.9	270°	V / 90°	35.3

*1: Fundamental – 15.225 limits. Measure have been done at 10m distance and corrected according to requirements of 15.209.e) (M@30m = M@10m-19.1dB)
*2: Worst case for USB or WIFI mode.

Limits Subclause §15.225(a)

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
13.56	15 848 84dBµV/m	30

2.3.4.Characterization on 3 meters open site from 30MHz to 1GHz

The product has been tested according to ANSI C63.4(2003), FCC part 15 subpart C. Radiated Emission were measured on an open area test site. A description of the facility is on file with the FCC.

The product has been tested at a distance of **10 meters** from the antenna and compared to the FCC part 15 subpart C §15.209 limits. Measurement bandwidth was 120kHz from 30 MHz to 1GHz.

Above 1GHz, the RBW and VBW are 1MHz. A peak and average measurement were performed. Antenna height search was performed from 1m to 4m for both horizontal and vertical polarization. Continuous linear turntable azimuth search was performed with 360 degrees range.
Equipment was moved to position that maximized emission. Equipment was moved to position that maximized emission. The Equipment was tested in vertical and horizontal position, rotated from 0° to 360°.(3 axis measurement)
A summary of the worst case emissions found in all test configurations and modes is shown on clause 2.3.2.

Results: 30MHz to 1GHz

L-W1 antenna (USB mode):

No	Frequency (MHz)	QPeak Lmt (dBµV/m)	QPeak (dBµV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)	Comments
1	40.692	40.0	35.2	**-4.8**	170	H	100	11.0	
2	67.779	40.0	35.7	**-4.3**	340	V	190	9.5	Worst margin
3	122.029	43.5	32.2	**-11.3**	175	V	100	15.6	
4	149.161	43.5	32.6	**-10.9**	90	H	330	14.4	
5	176.277	43.5	36.2	**-7.3**	185	V	100	17.5	
6	203.418	43.5	37.8	**-5.7**	150	V	120	15.3	
7	230.510	46.0	40.6	**-5.4**	145	V	100	15.0	
8	244.071	46.0	37.2	**-8.8**	310	V	120	14.8	

Measure have been done at 10m distance and corrected according to requirements of 15.209.e) (M@3m = M@10m+10.5dB)

L-W1 antenna (WIFI mode):

No	Frequency (MHz)	QPeak Lmt (dBµV/m)	QPeak (dBµV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)	Comments
1	39.152	40.0	32.6	**-7.4**	345	V	310	11.0	
2	40.654	40.0	36.0	**-4.0**	165	H	400	11.0	Worst margin
3	43.000	40.0	30.5	**-9.5**	205	V	360	11.2	
4	122.028	43.5	36.5	**-7.0**	305	V	120	15.6	
5	149.150	43.5	32.7	**-10.8**	150	V	100	14.4	
6	176.277	43.5	37.4	**-6.1**	330	V	100	17.5	
7	203.417	43.5	31.4	**-12.1**	315	V	120	15.3	
8	230.523	46.0	38.6	**-7.4**	110	V	100	15.0	
9	244.093	46.0	33.9	**-12.1**	185	V	100	14.8	

Measure have been done at 10m distance and corrected according to requirements of 15.209.e) (M@3m = M@10m+10.5dB)

TR-HA1 antenna (USB mode):

No	Frequency (MHz)	QPeak Lmt (dBµV/m)	QPeak (dBµV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)	Comments
1	149.156	43.5	36.3	**-7.2**	145	V	120	14.4	
2	176.287	43.5	37.7	**-5.8**	320	V	100	17.5	
3	203.396	43.5	33.6	**-9.9**	125	V	120	15.3	
4	230.516	46.0	43.2	**-2.8**	265	H	350	15.0	
5	244.095	46.0	44.6	**-1.4**	270	H	350	14.8	Worst margin
6	257.656	46.0	42.7	**-3.3**	265	H	280	15.2	
7	271.200	46.0	38.8	**-7.2**	265	H	290	15.8	
8	284.768	46.0	37.5	**-8.5**	175	V	100	16.5	

Measure have been done at 10m distance and corrected according to requirements of 15.209.e) (M@3m = M@10m+10.5dB)

TR-HA1 antenna (WIFI mode):

No	Frequency (MHz)	QPeak Lmt (dBµV/m)	QPeak (dBµV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)	Comments
1	40.691	40.0	31.8	**-8.2**					
2	81.351	40.0	35.6	**-4.4**					
3	122.062	43.5	39.1	**-4.4**					
4	149.153	43.5	41.0	**-4.2**					Worst margin
5	176.286	43.5	36.6	**-6.9**					
6	203.391	43.5	35.4	**-8.1**					
7	230.530	46.0	36.8	**-9.2**					
8	244.074	46.0	38.6	**-7.4**					
9	257.629	46.0	37.3	**-8.7**					
10	271.188	46.0	37.5	**-8.5**					
12	284.766	46.0	34.9	**-11.1**					

Measure have been done at 10m distance and corrected according to requirements of 15.209.e) (M@3m = M@10m+10.5dB)

2.4. Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follow :

FS = RA + AF + CF – AG

Where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Factor
AG = Amplifier Gain

Assume a receiver reading of 52.5dBµV is obtained. The antenna factor of 7.4 and a cable factor of 1.1 is added. The amplifier gain of 29dB is subtracted, giving a field strength of 32 dBµV/m.
FS = 52.5 + 7.4 + 1.1 – 29 = 32 dBµV/m
The 32 dBµV/m value can be mathematically converted to its corresponding level in µV/m.
Level in µV/m = Common Antilogarithm [(32dBµV/m)/20] = 39.8 µV/m.

3. Conducted emission data

The product has been tested according to ANSI C63.4-(2003) and FCC Part 15 subpart C.

The product has been tested with 110V/60Hz power line voltage and compared to the FCC Part 15 subpart C §15.207 limits. Measurement bandwidth was 9kHz from 150 kHz to 30 MHz.

Measurement was initially made with an HP-8591EM Spectrum Analyzer in peak mode. This was followed by a Quasi-Peak, i.e. CISPR measurement with the Rohde & Schwarz ESH3 receiver for any strong signal. If the average limit is met when using a Quasi-Peak detector, the EUT shall be deemed to meet both limits and measurement with the average detector is unnecessary.

The Peak data are shown on the following plots. Quasi-Peak and Average measurements are detailed in a table with frequencies and levels measured.

Interconnecting cables and equipment's were moved to position that maximized emission. A summary of the worst case emissions found in all test configurations and modes is shown on the following page.

3.1. SET-UP

The EUT is placed on a table at 0.8m height. The cable of the power adapter has been shorted to 1meter length. The EUT is powered trough the LISN (measure). The peripheral equipment (PC) is connected to a separate LISN.

- EUT is ON;
- The tag ID is being read continually;
- USB mode: the EUT is connected to the PC with the USB cable. The PC is set on the table.
- WIFI mode: data transfer between EUT and PC is processed by WIFI.

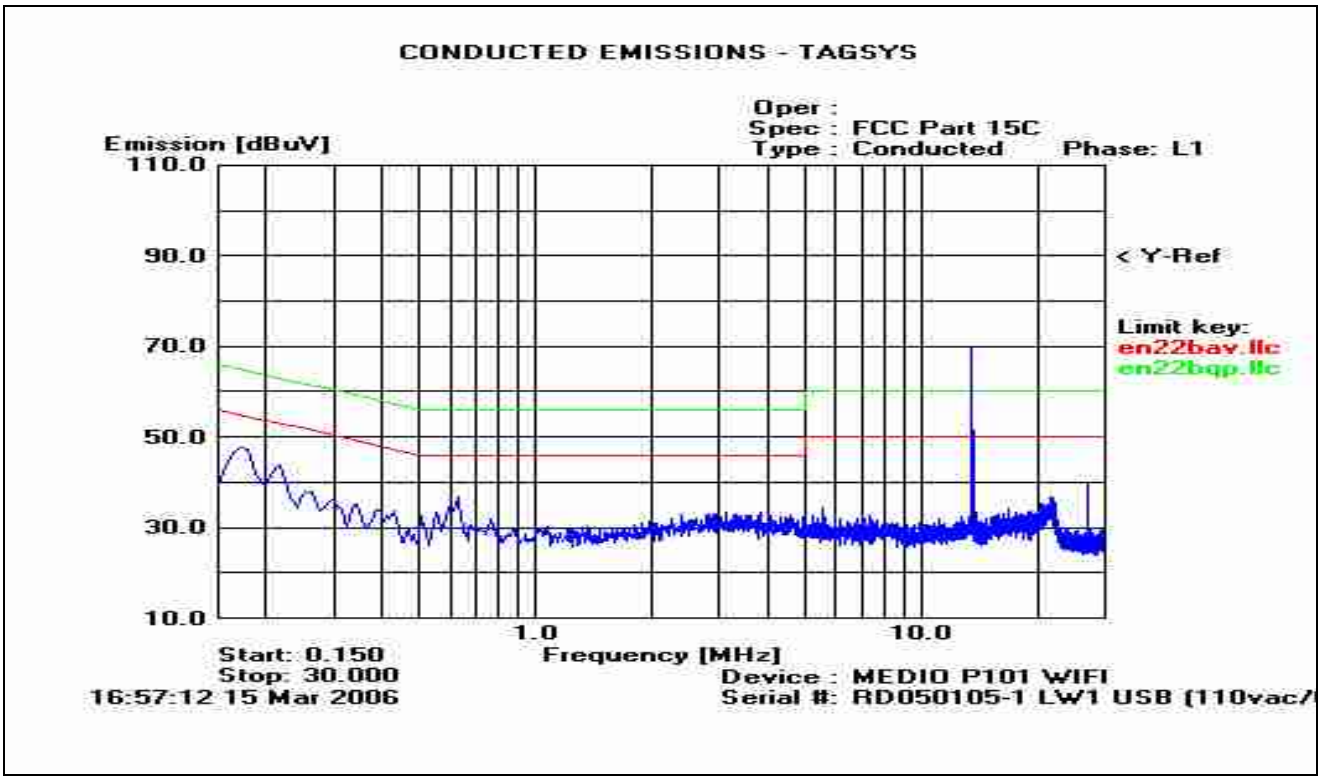
3.2. TEST EQUIPMENT

Equipment	Company	Model	Serial
EMC Analyzer	HP	8591EM	3536A00384
test receiver	Rohde&Schwarz	ESH3	872079/117
Transient Limiter	HP	11947A	3107A01596
LISN(auxiliary)	EMCO	3810/2SH	9511-11821628
LISN(measure) 50Ω / 50µH	Telemeter Electronis	TGmbH NNB 2/16	0001300
Faraday room	Rayproof		4854

3.3. TEST SEQUENCE AND RESULTS

Measures are performed on Line 1 and on the Neutral of the power supply.

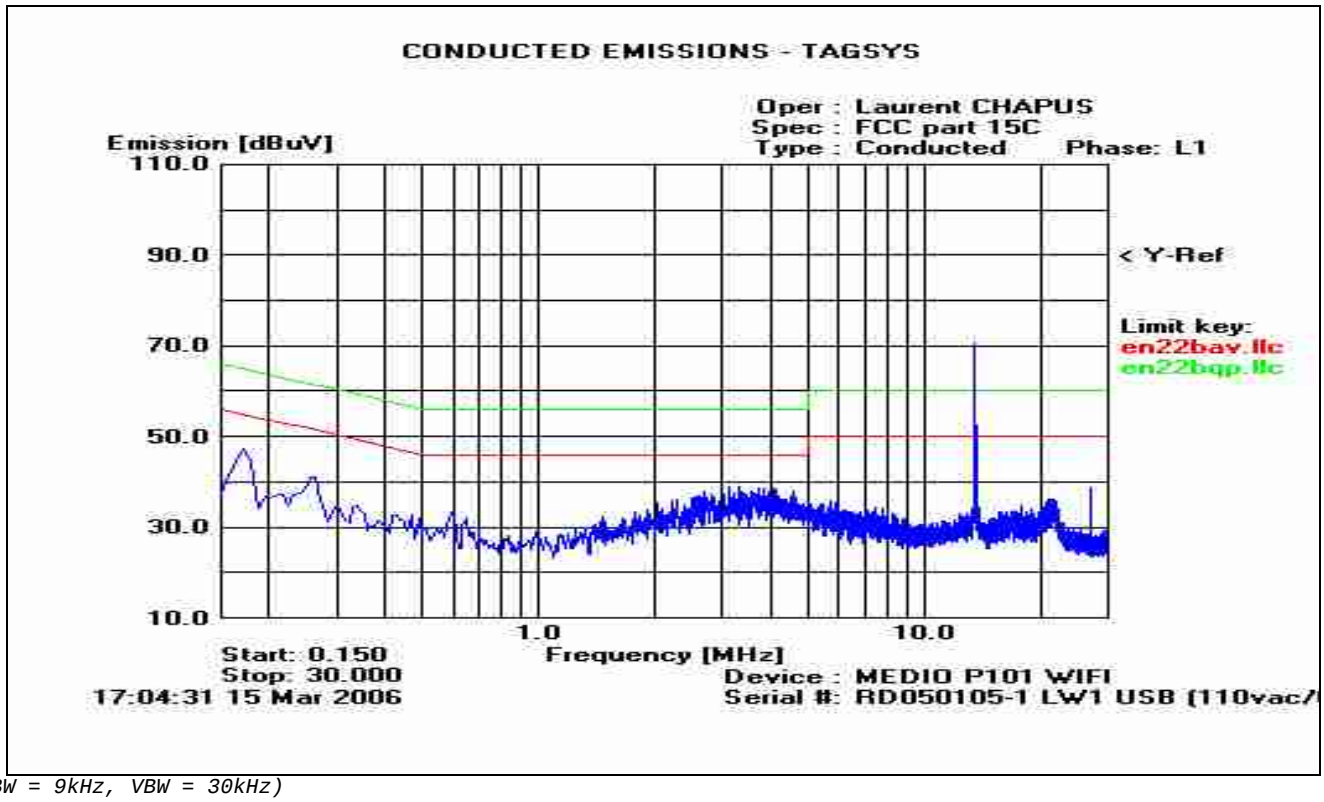
3.3.1.Line (L1) conducted emission data, Antenna L-W1, USB mode



(RBW = 9kHz, VBW = 30kHz)

Marker	Freq. [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0.180	48.06	45.69	31.30	54.00
2	0.250	39.52	36.23	23.69	50.00
3	0.430	34.27	29.98	19.97	46.00
4	0.630	35.45	30.87	23.92	46.00
5	13.57	70.19 *	69.36 *	68.59 *	50.00
6	27.13	39.58	36.69	29.26	50.00

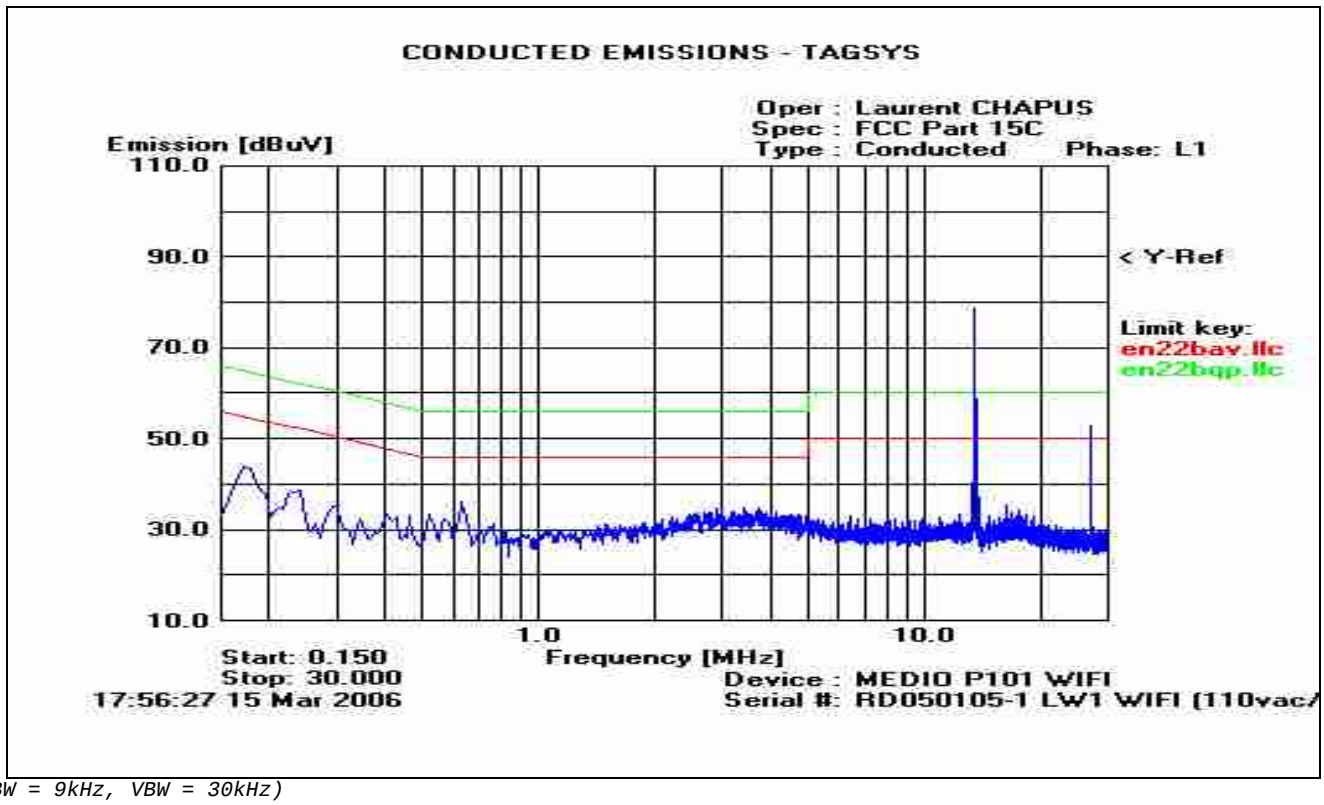
3.3.2.Neutral conducted emission data, Antenna L-W1, USB mode



(RBW = 9kHz, VBW = 30kHz)

Marker	Freq. [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0.180	47.57	45.23	34.26	54.00
2	0.250	41.23	38.12	30.57	50.00
3	0.430	33.17	28.55	21.80	46.00
4	0.610	34.87	30.22	21.96	46.00
5	13.57	72.53	70.97	67.08	50.00
6	27.13	38.79	35.77	27.90	50.00

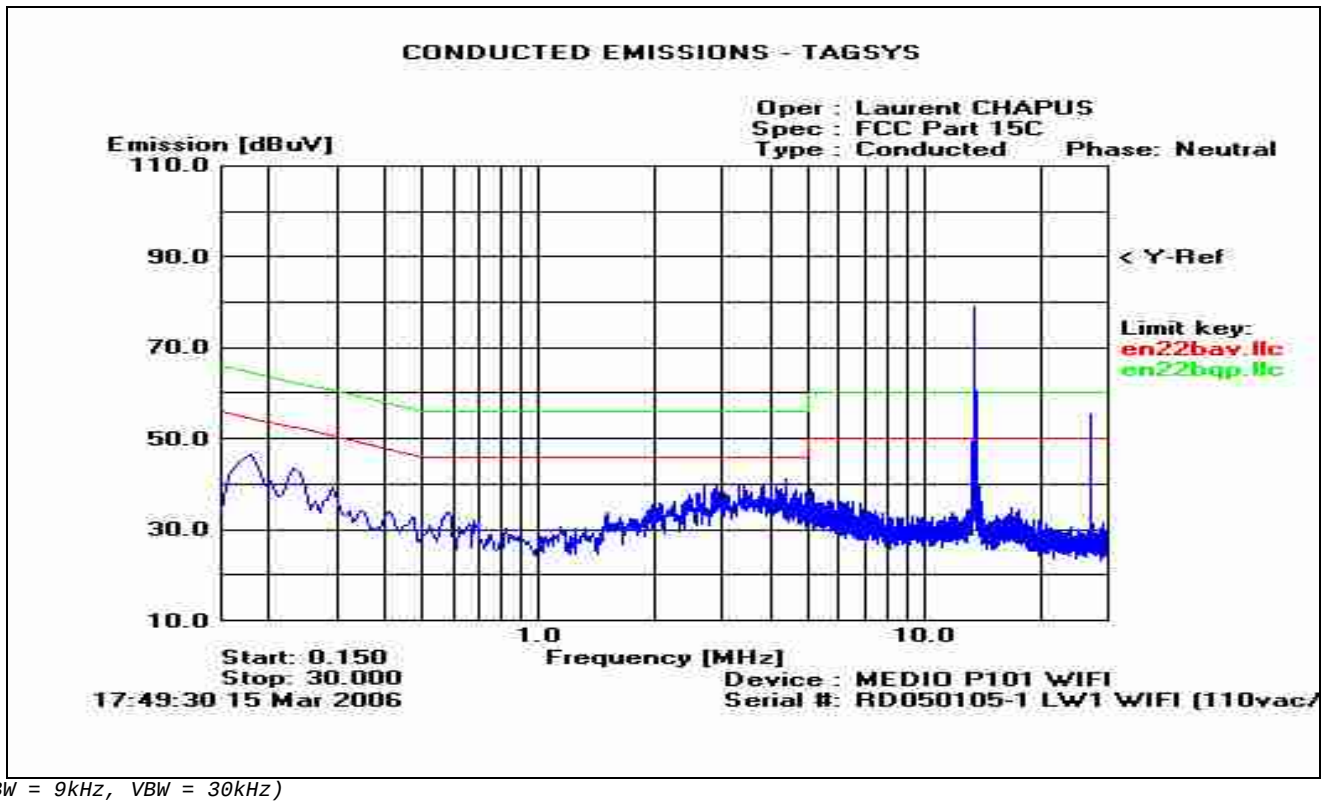
3.3.3.Line 1 conducted emission data, Antenna L-W1, WIFI mode



(RBW = 9kHz, VBW = 30kHz)

Marker	Freq. [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0.160	44.12	41.30	28.28	54.00
2	0.250	40.71	36.85	25.12	50.00
3	0.420	34.05	29.83	22.48	46.00
4	0.590	33.49	30.28	23.27	46.00
5	13.57	78.74 *	78.01 *	77.25 *	50.00
6	27.13	53.77	50.94	32.36	50.00

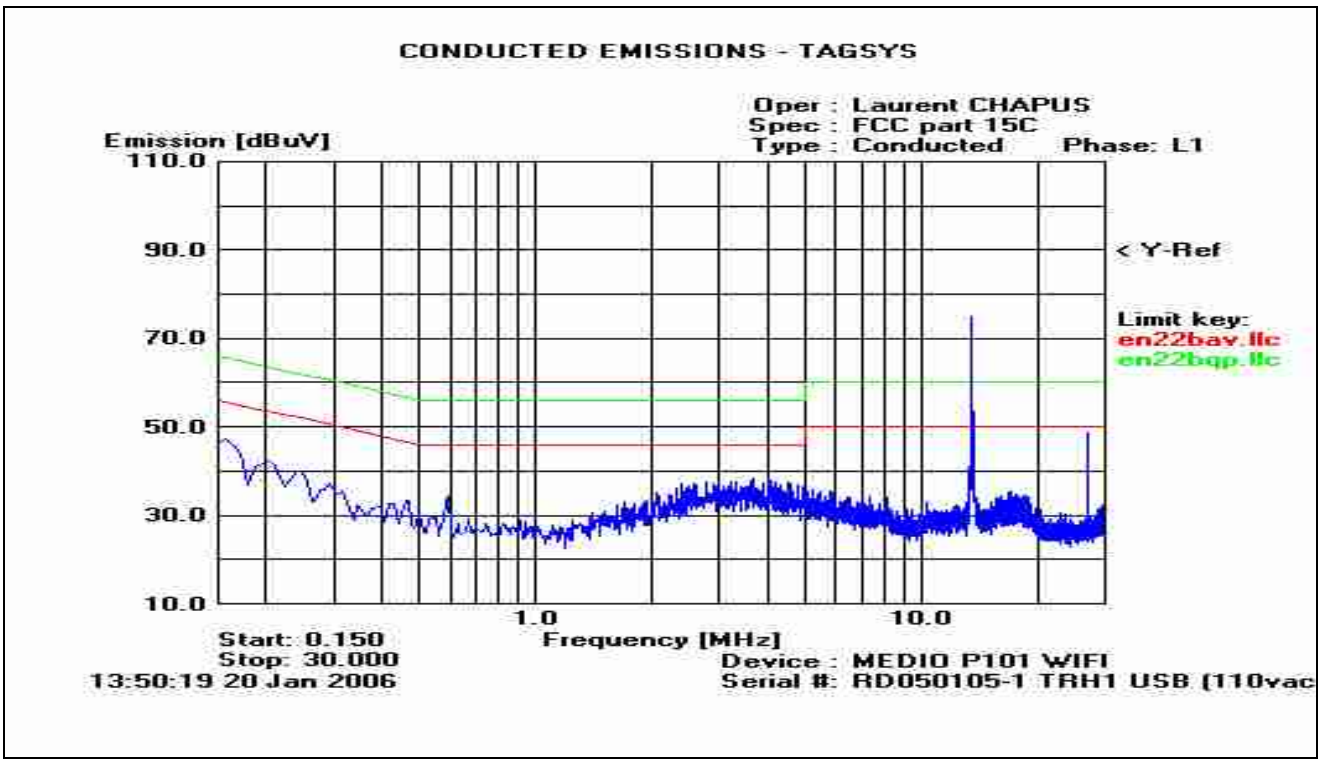
3.3.4.Neutral conducted emission data, Antenna L-W1, WIFI mode



(RBW = 9kHz, VBW = 30kHz)

Marker	Freq. [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0.160	46.79	44.19	34.87	54.00
2	0.250	42.93	38.43	30.86	50.00
3	0.420	34.78	31.39	25.51	46.00
4	0.590	35.07	30.25	21.40	46.00
5	13.57	80.80 *	79.32 *	75.96 *	50.00
6	27.13	58.36	56.46	34.37	50.00

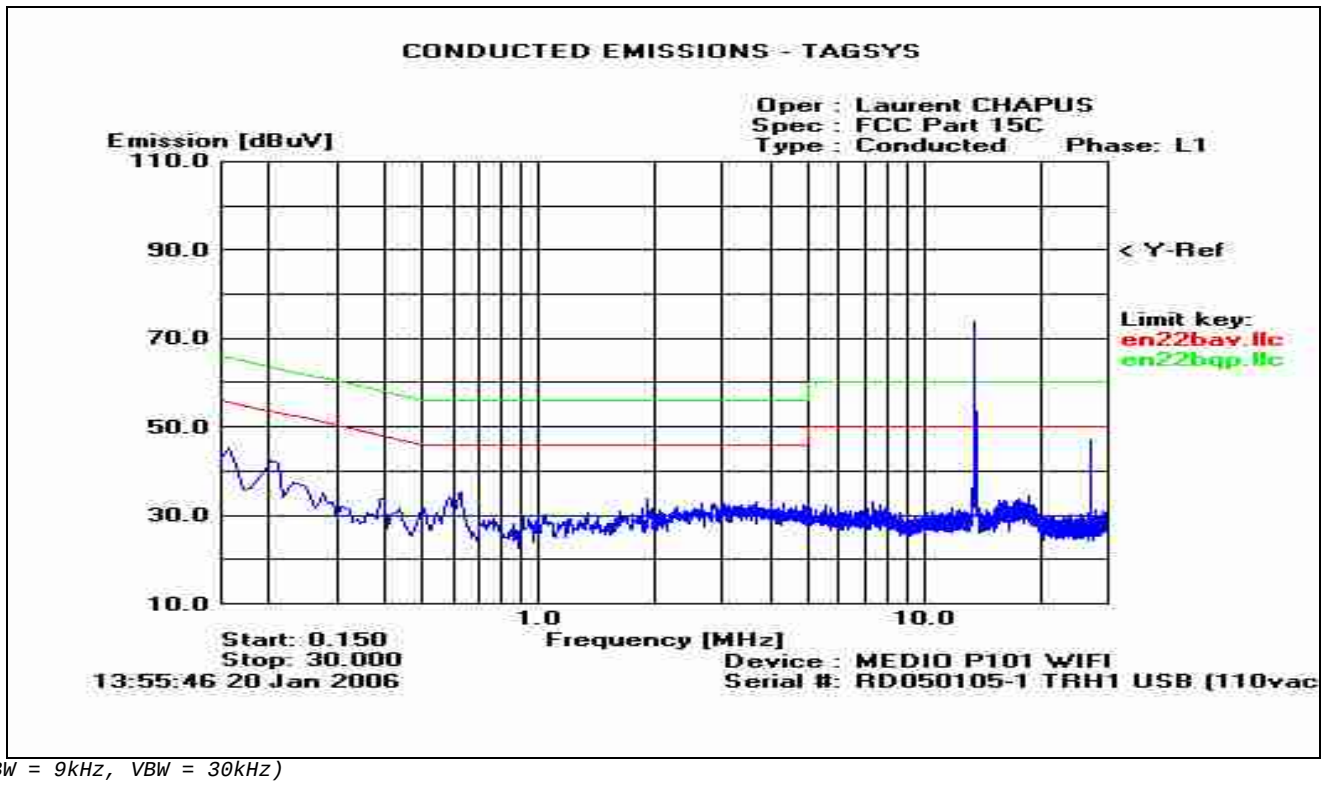
3.3.5.Line (L1) conducted emission data, Antenna TR-HA1, USB mode



(RBW = 9kHz, VBW = 30kHz)

Marker	Freq. [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0.160	47.99	43.97	31.72	54.00
2	0.200	45.06	41.60	30.60	52.00
3	0.240	41.66	37.50	29.51	52.00
4	0.590	34.40	30.03	20.07	46.00
5	13.57	76.36 *	74.84 *	70.99 *	50.00
6	27.12	49.66	47.32	40.40	50.00

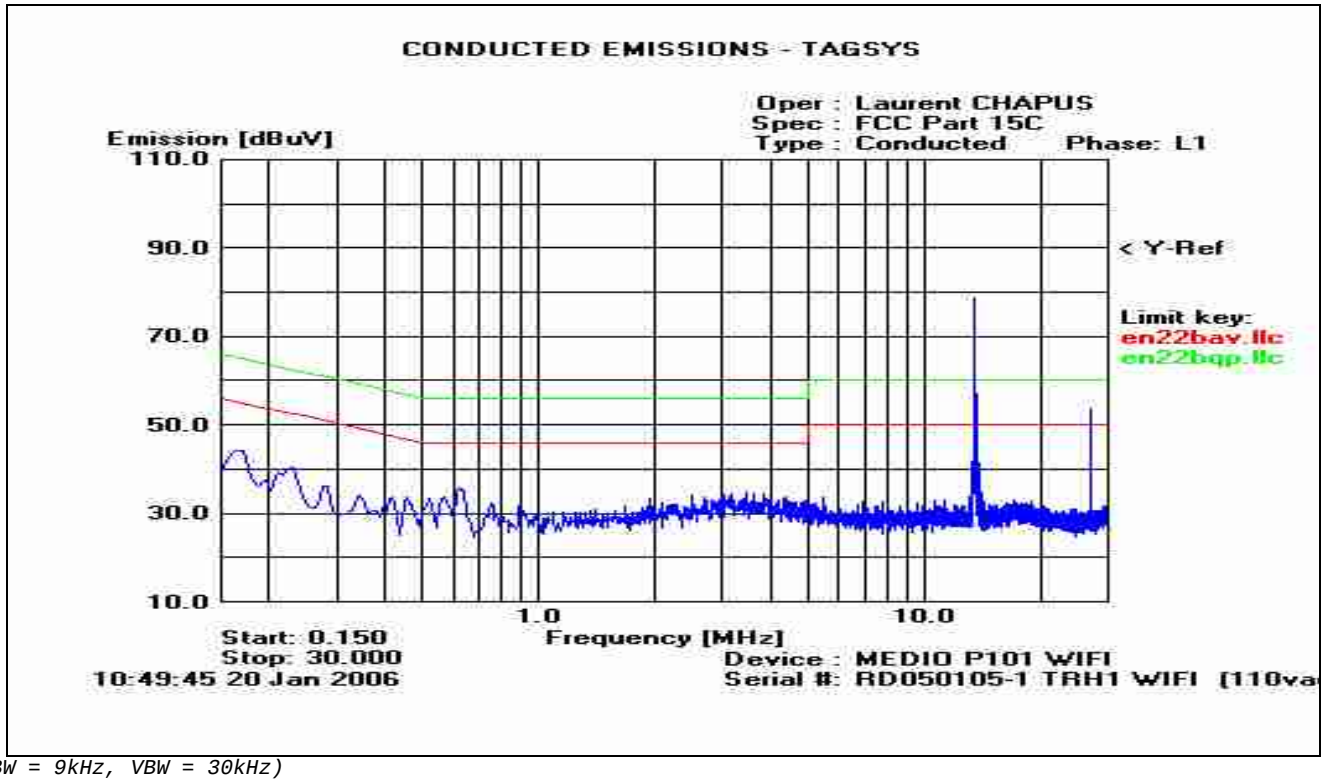
3.3.6.Neutral conducted emission data, Antenna TR-HA1, USB mode



(RBW = 9kHz, VBW = 30kHz)

Marker	Freq. [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0.160	45.87	43.53	28.98	54.00
2	0.200	43.12	38.66	24.74	52.00
3	0.240	39.26	35.03	23.02	52.00
4	0.630	36.57	33.62	28.77	46.00
5	13.57	73.97 *	73.07 *	72.33 *	50.00
6	27.12	47.58	45.05	40.95	50.00

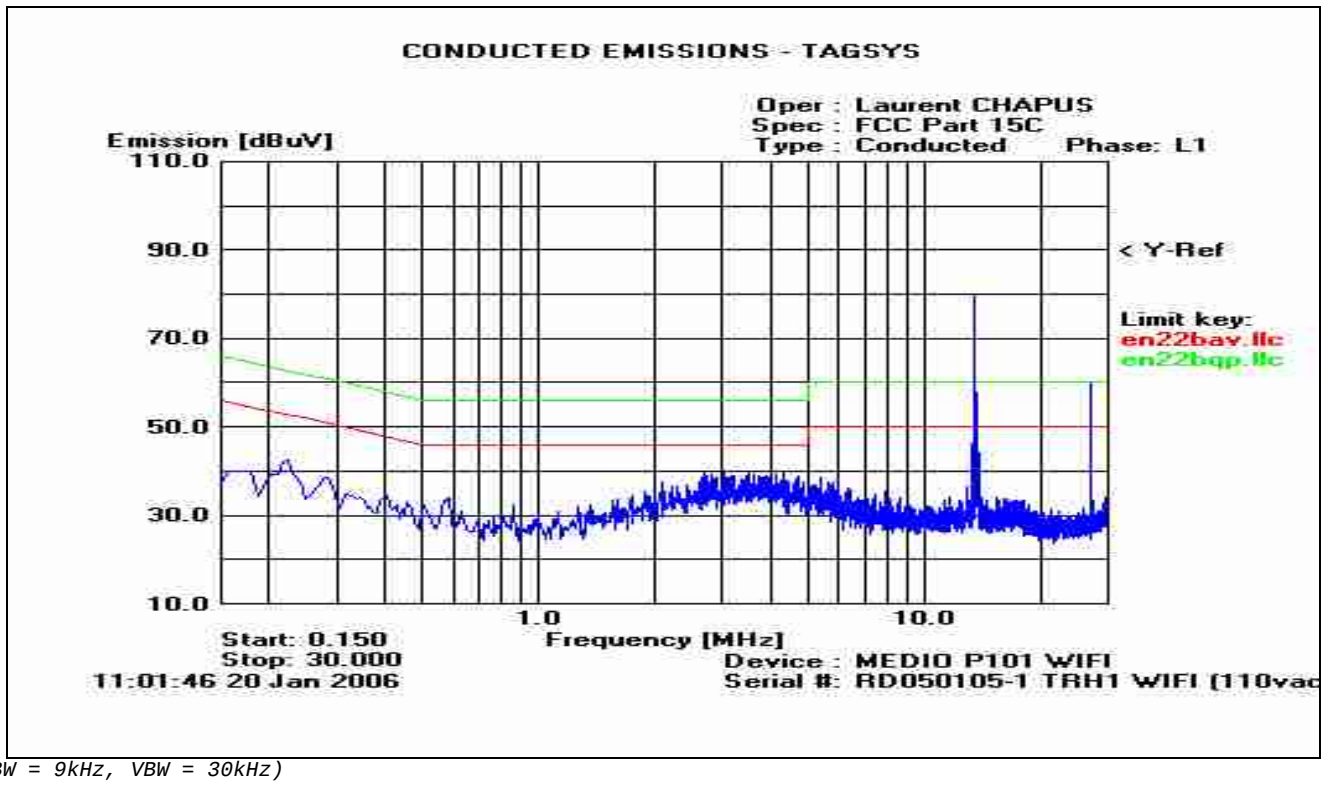
3.3.7.Line 1 conducted emission data, Antenna TR-HA1, WIFI mode



(RBW = 9kHz, VBW = 30kHz)

Marker	Freq. [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0.170	44.49	41.69	28.33	54.00
2	0.230	40.65	37.09	24.63	52.00
3	0.280	35.83	30.93	19.57	50.00
4	0.640	35.46	32.65	26.08	46.00
5	13.57	79.18 *	78.44 *	77.77 *	50.00
6	27.13	54.81	51.85	39.55	50.00

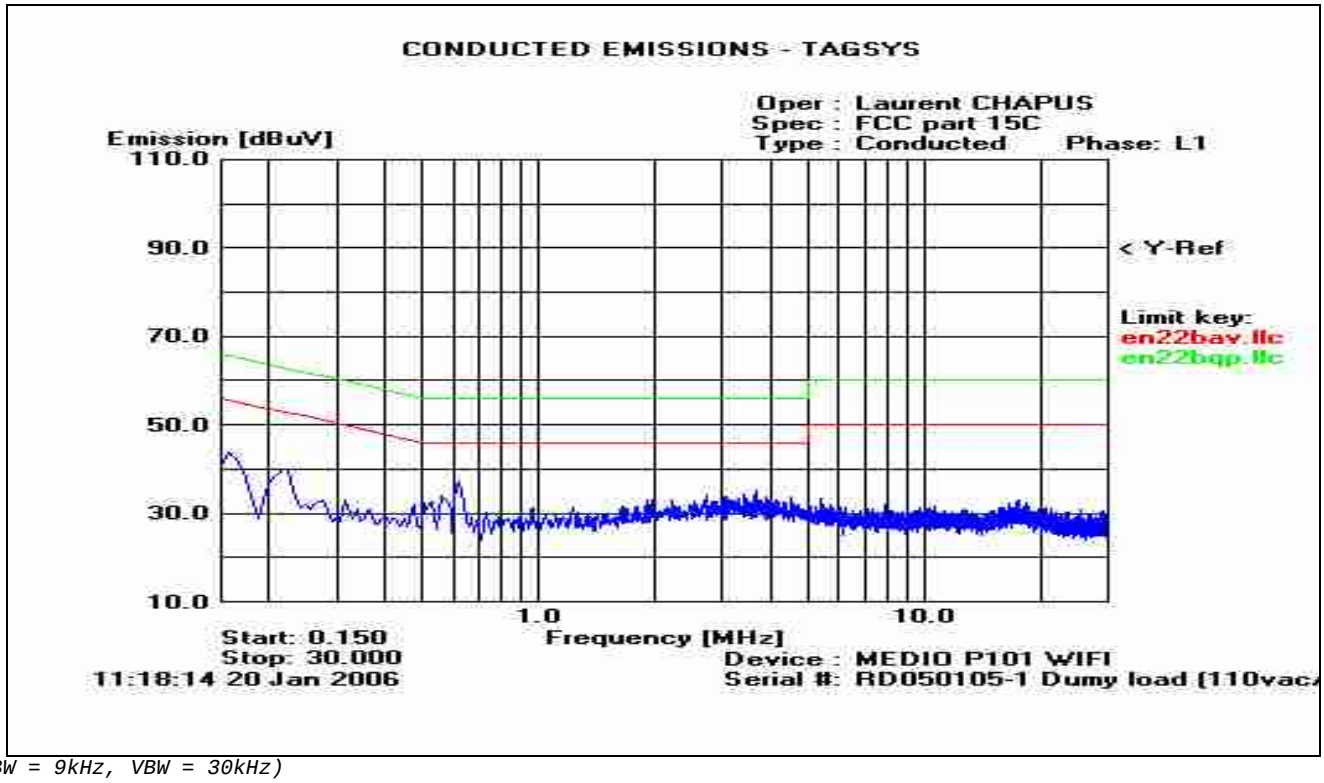
3.3.8.Neutral conducted emission data, Antenna TR-HA1, WIFI mode



(RBW = 9kHz, VBW = 30kHz)

Marker	Freq. [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0.170	46.49	43.45	34.88	54.00
2	0.230	43.36	38.73	30.85	52.00
3	0.280	39.00	34.14	27.70	50.00
4	13.57	81.14 *	79.91 *	76.51 *	50.00
5	27.13	59.92	58.06	40.59	50.00
6	0.580	35.16	31.82	22.32	46.00

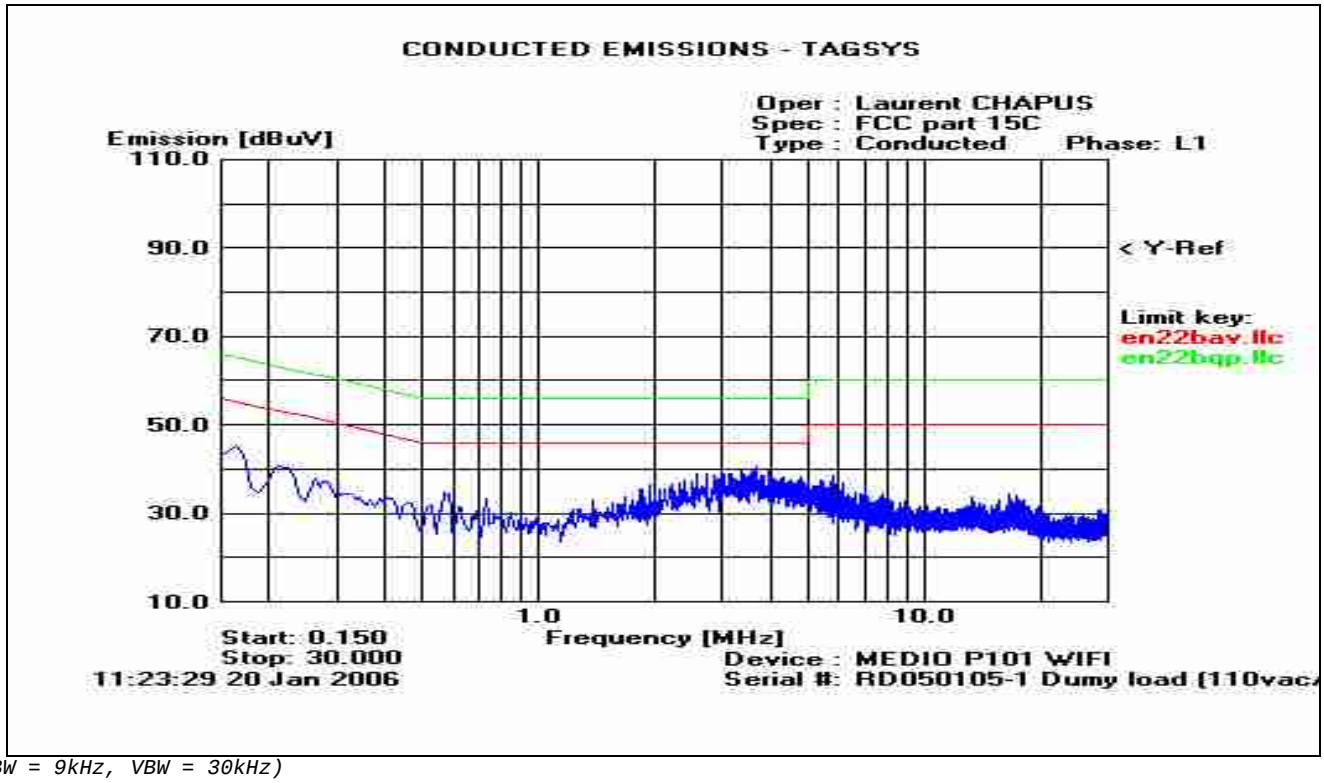
3.3.9.Line 1 conducted emission data, dummy load (replaces the antenna)



(RBW = 9kHz, VBW = 30kHz)

Marker	Freq. [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0.160	43.03	40.07	27.32	54.00
2	0.220	42.70	37.52	23.36	52.00
3	0.270	34.59	28.88	18.57	50.00
4	0.620	37.13	33.18	24.90	46.00

3.3.10.Neutral conducted emission data, dummy load (replaces the antenna)



(RBW = 9kHz, VBW = 30kHz)

Marker	Freq. [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0.160	44.24	-	-	54.00
2	0.220	40.37	-	-	52.00
3	0.270	37.06	-	-	50.00
4	0.620	31.62	-	-	46.00
5	3.660	38.57	32.44	24.08	46.00

4. Fundamental frequency tolerance (15.225.c)

The frequency tolerance of the carrier signal shall be maintained within +/-0.01% of the operating frequency when the temperature is varied from -20°C to +50°C

4.1. TEST EQUIPMENT

Equipment	Company	Model	Serial
Spectrum Analyzer	HP	8593E	3409u00537
Loop antenna	Electro-metrics	EM-6879	690234
Climatic chamber	BIA		
Programmable AC power supply	HP	HP 6842A	3531A00109
Multimeter	FLUKE 87 IV		

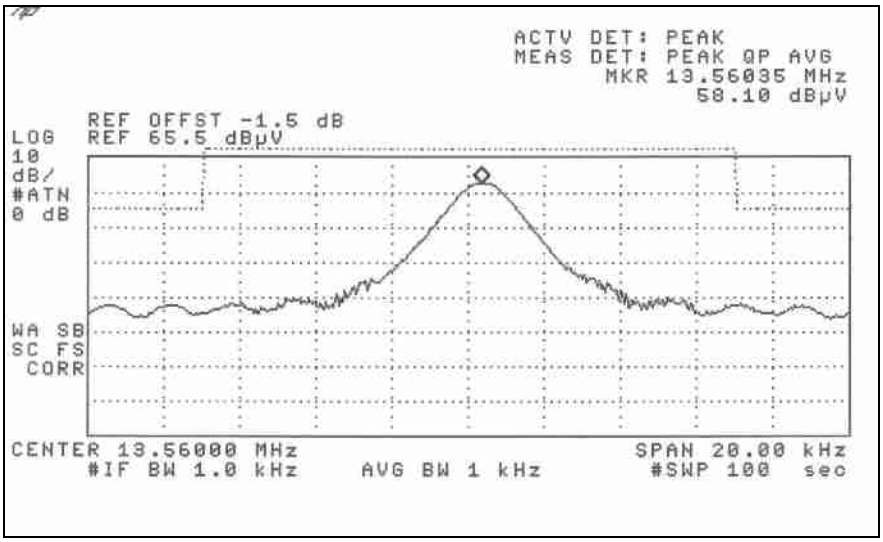
4.2. Temperature fluctuation

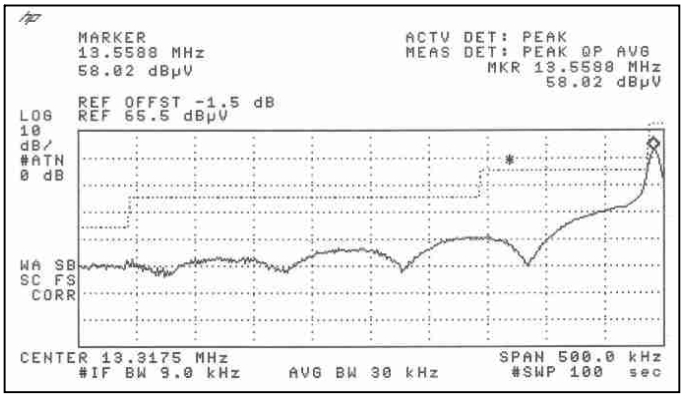
Temperature has been set at +25°C, –20°C and +50°C.
Mains voltage is 110V/60Hz, 93.5V or 126.5V
Frequency of carrier: 13.56 MHz
Upper limit: 13.561356 MHz
Lower limit: 13.558644 MHz

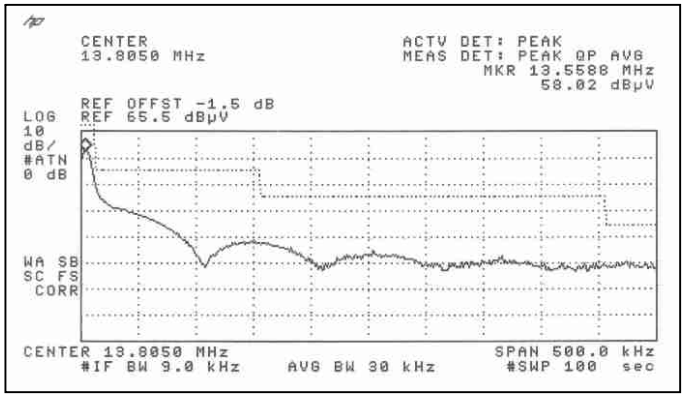
Temperature	-20°C	25°C	+50°C
Power voltage: 110V Frequency (MHz) Carrier level	13.561045 -0.7dBc	13.560745 REF	13.560745 +0.7dBc
Power voltage: 93.5V Frequency (MHz) Carrier level	13.561045 -0.7dBc	13.560745 0.0dBc	13.560745 +0.7dBc
Power voltage: 126.5V Frequency (MHz) Carrier level	13.561045 -0.7dBc	13.560745 0.0dBc	13.560745 +0.7dBc
Result	Pass	-	Pass

5. Band-edge compliance §15.209

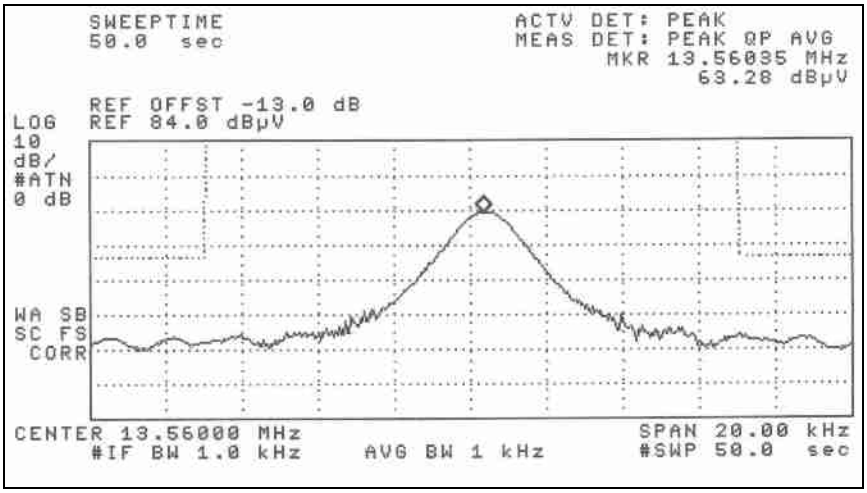
5.1. L-W1 antenna

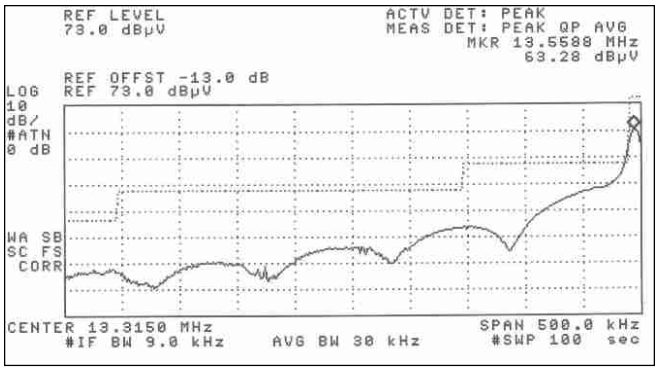


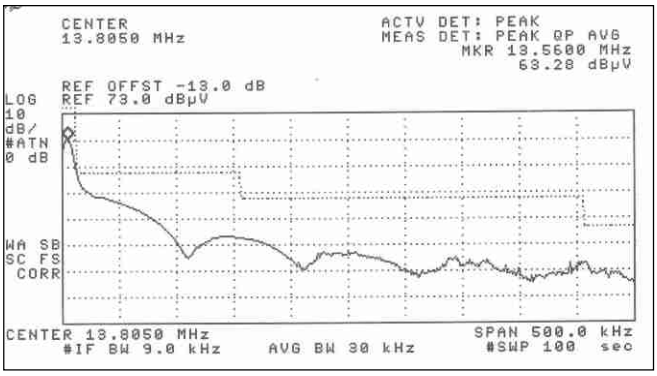




5.2. TR-HA1 antenna







End of Tests