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EMC TEST REPORT

Nr 3626-A1-FCC

This test report applies only on equipment described hereafter.

Proposal number: 200511-2861

Date: January 5th , 2006

Location.....: **LCIE** Laboratory
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Customer.....: **PROMILES / DECATHLON** (Mr. LEGRAS Bruno)
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Product.....: **WIRELESS CYCLE COMPUTER**
DC7r and DC10r

Type of test: **Radio Noise Emissions Test.**

Applied standards: ANSI C63-4 (1992+2000)
47 CFR Part 15 Subpart C

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

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FCCID : SB9DCR04

DC7R AND DC10R WIRELESS CYCLING COMPUTER

1. System test configuration

1.1. Justification

The system was configured for testing in a typical fashion (as a customer would normally use it).

The wireless cycle computer is a system consisting of:

- Receiver: computer with LCD display, indicating instantaneous speed, trip distance, speed average and others many functions. The receiver is fixed on the handlebar.
- Transmitter: it sends to the computer wheel angular speed. It is fixed on the fork.
- Wheel magnet sensor: fixed on the wheel

DC10r and DC7r products are identical, excepted that the DC10r has added functions as described on the following page. PCB used for both computers are identical, with added components on the DC10r.

Transmitters supplied with the DC10r and DC7r products are identical.

1.2. HARDWARE IDENTIFICATION:

* Equipment under test (EUT): DC7r and DC10r wireless cycle computer
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➤ DC7r sn: none

➤ DC10r sn: none

- Input/output on receiver: none
- Input/output on transmitter: none
- Receiver size: 65x52x31mm
- Transmitter size: 49x30x20mm
- Frequencies: Crystal 32.768 kHz

1.3. Auxiliaries

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

Trade Mark - Model Number (Serial number)	FCC ID	Description	Cable description
DC7r	SB9DCR04	Wireless	No wire
DC10r (sn: none)		cycle computer	
Electric 12Vdc motor for wheel simulator (electric fan)	None	Wheel simulator	

1.4. Equipment modifications

No equipment modification has been necessary during testing to achieve compliance to FCC part 15 Subpart C requirements. The unit tested was representative to a production unit.



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1.5. EUT exercise software

No exercise software was used during the test.

1.6. Special accessories

No special accessory was used during the test.

1.7. I/O cables

No I/O cable dedicated to the wireless cycle computer.

2. Radiated emission data

2.1. SET-UP

The wireless computer with the wheel simulator is placed on a non-conducting table of 80cm height. The receiver is set 10cm in the area of the transmitter.



Radiated test setup

Equipment configuration and running mode:

- The computer is ON;
- The magnet sensor is passing in front of the detection area of the transmitter (wheel frequency rotation is set approx. to 11.1Hz)
- Computer displays a speed of approx. 88km/h
- The electric fan (wheel rotation simulation) is powered with a 12Vdc battery.

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



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2.2. TEST EQUIPMENT

Test Equipment up to 1GHz on 10m/3m open site:

Equipment	Company	Model	Serial
Spectrum Analyzer	HP	8568B	2732A04155
Quasi-Peak adapter	HP	85650A	2811A01134
RF Pre-selector	HP	85685A	2837A00784
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
OATS			

EMCO-1050, 6 meters height antenna mast

EMCO-1060, 3 meters diameter Turntable.

A 10 meters Open site located in LCIE - Voiron (FRANCE).

Pre-scan, test Equipment up to 1GHz:

Equipment	Company	Model	Serial
EMC Analyzer	HP	8593E	3409u00537
Amplifier	HP	8447F H64	3113A06394
Antenna (30MHz-1GHz)	CHASE	CBL6111A	1628
Loop antenna	Electro-metrics	EM-6879	690234



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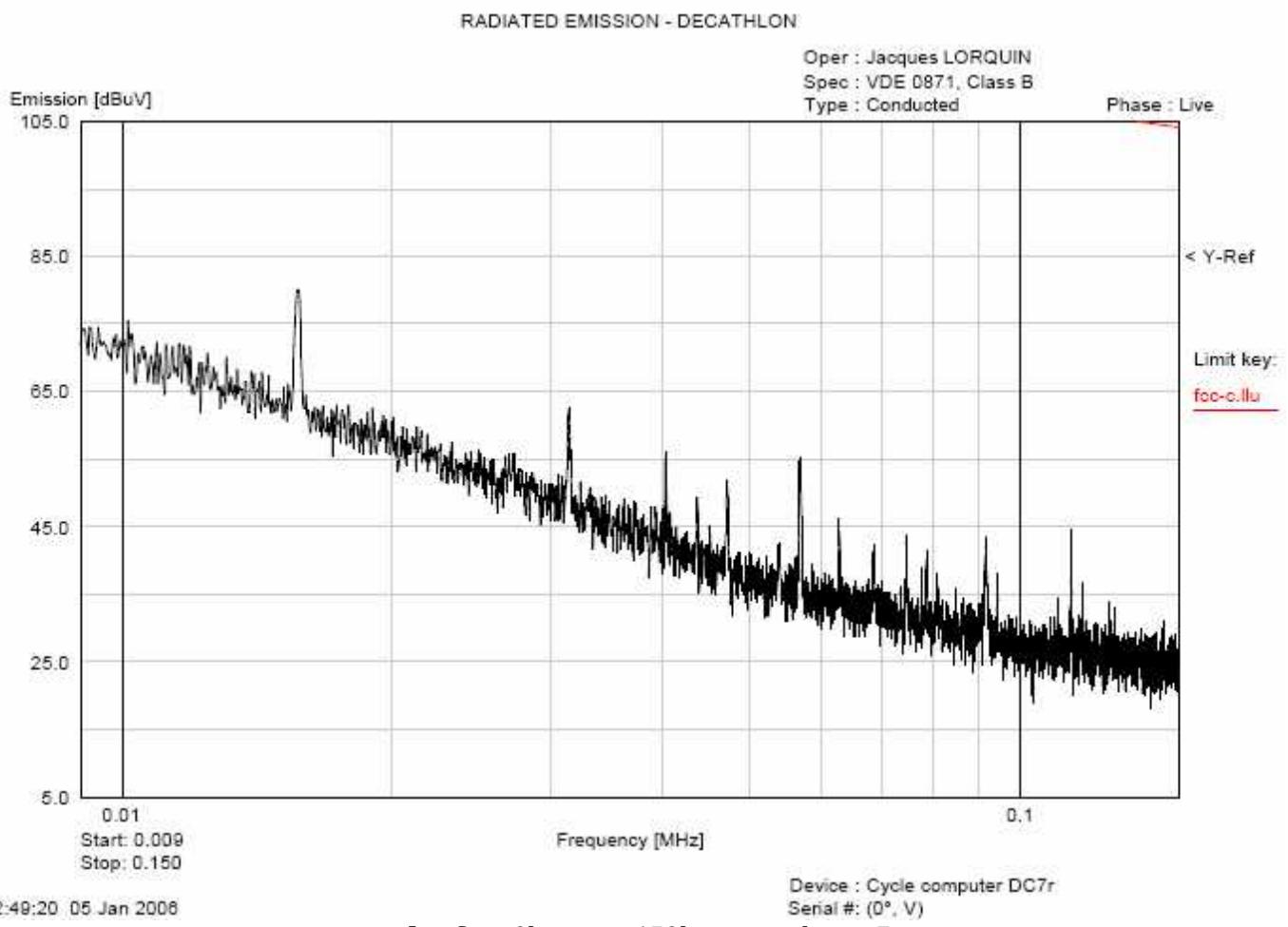
2.3. TEST SEQUENCE AND RESULTS

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.

RBW = 200Hz and VBW = 3kHz



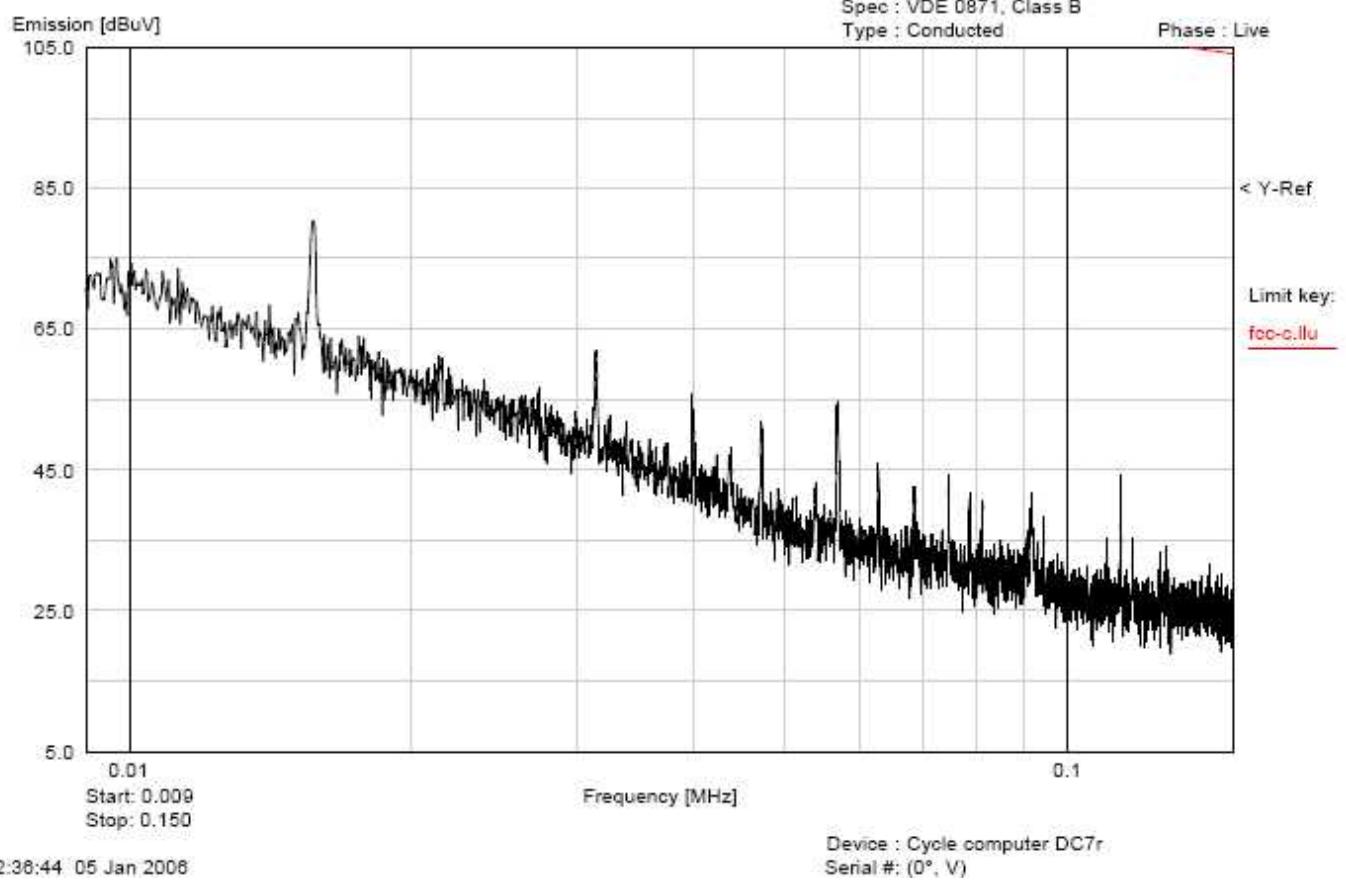
Marker V	Frequency [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0.040	55.30	44.35	38.60	93.80



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RADIATED EMISSION - DECATHLON



Result for 9kHz to 150kHz on the DC10r

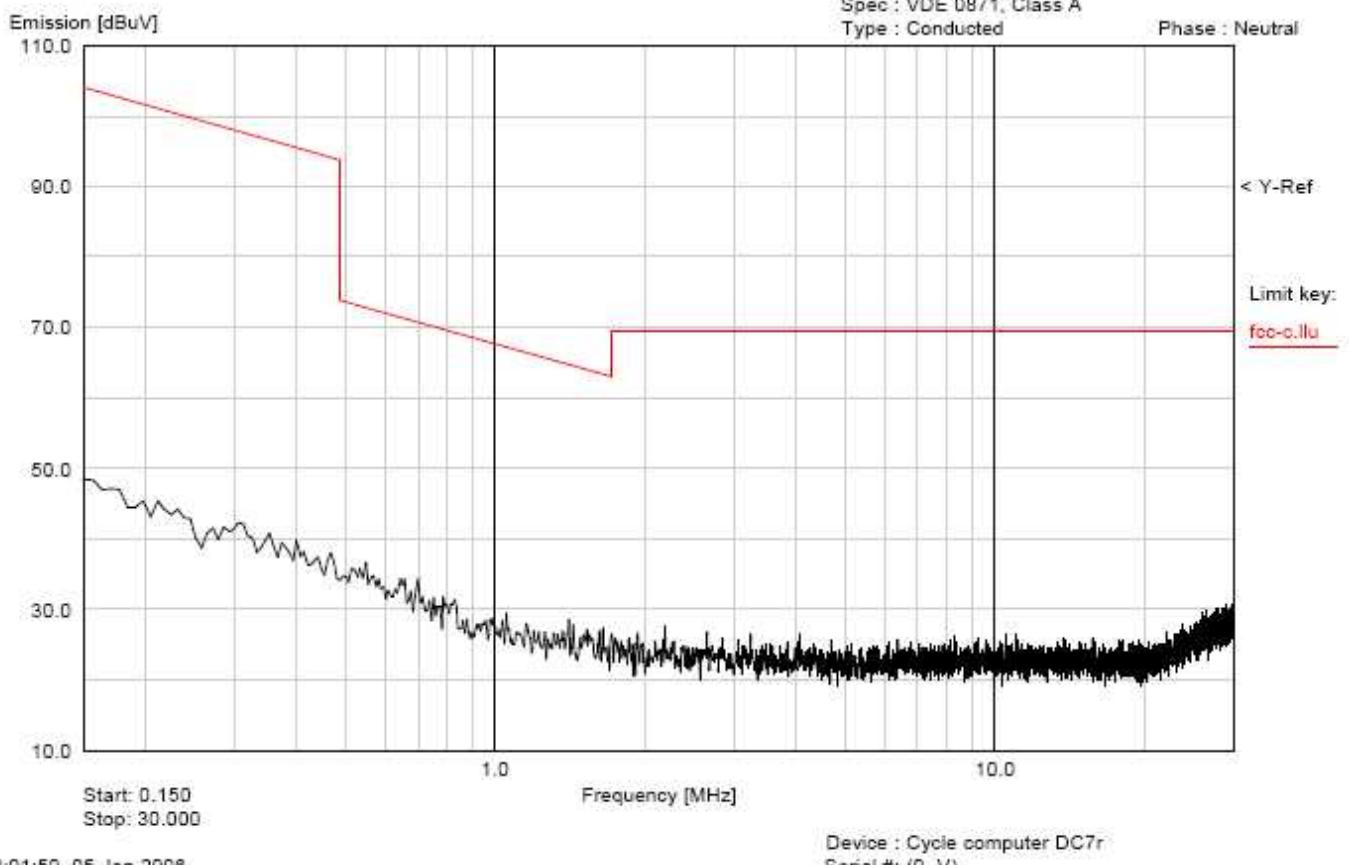
Marker V	Frequency [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0.040	56.56	45.51	39.42	93.80



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RADIATED EMISSION - DECATHLON



Result for 150MHz to 30MHz on the DC7r



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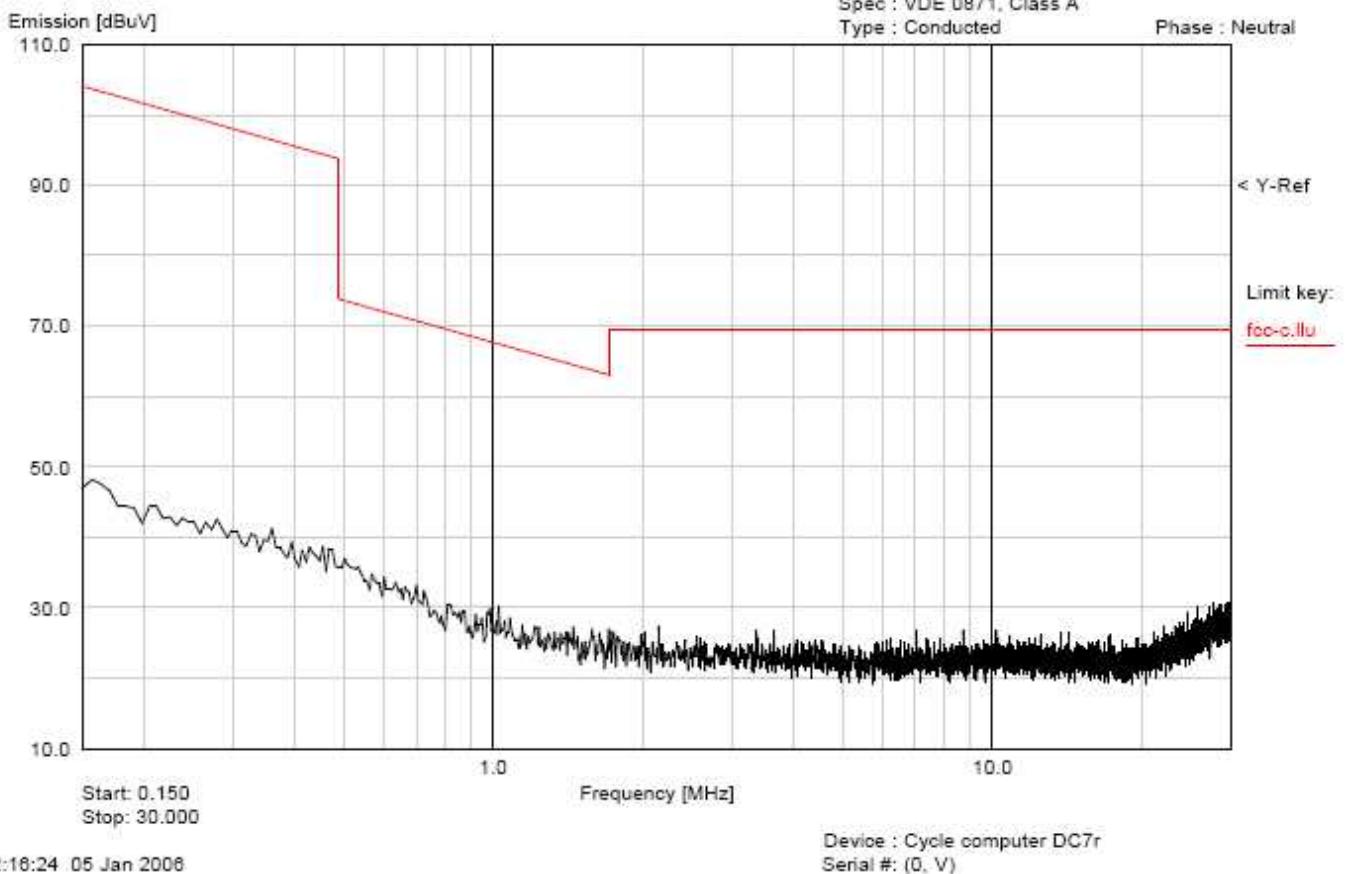
RADIATED EMISSION - DECATHLON

Oper : Jacques LORQUIN

Spec : VDE 0871, Class A

Type : Conducted

Phase : Neutral





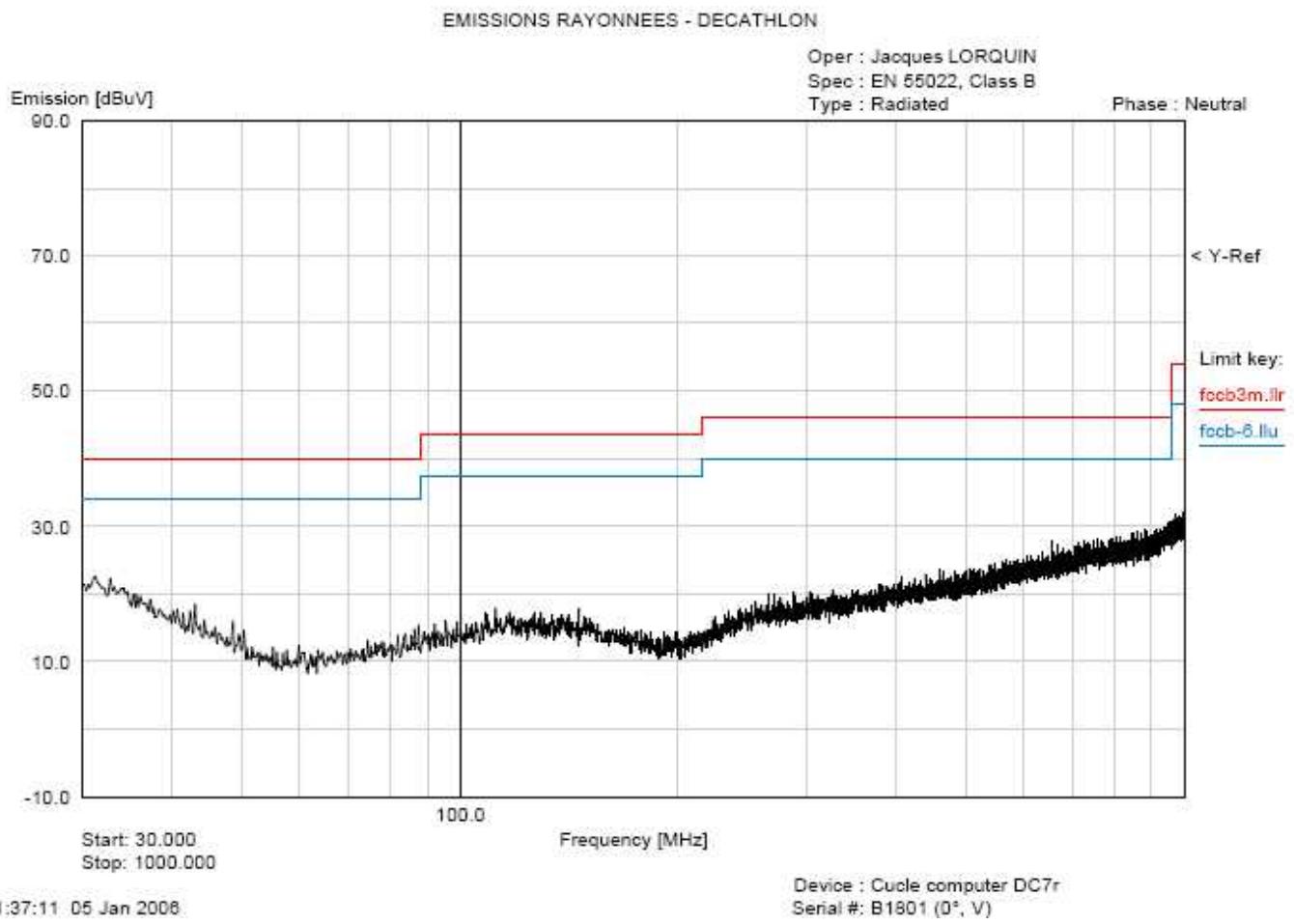
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2.3.2.Pre-characterization at 3 meters [30MHz-1GHz]

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 2 faces of the EUT.

See below a graph example between 30MHz to 1GHz:

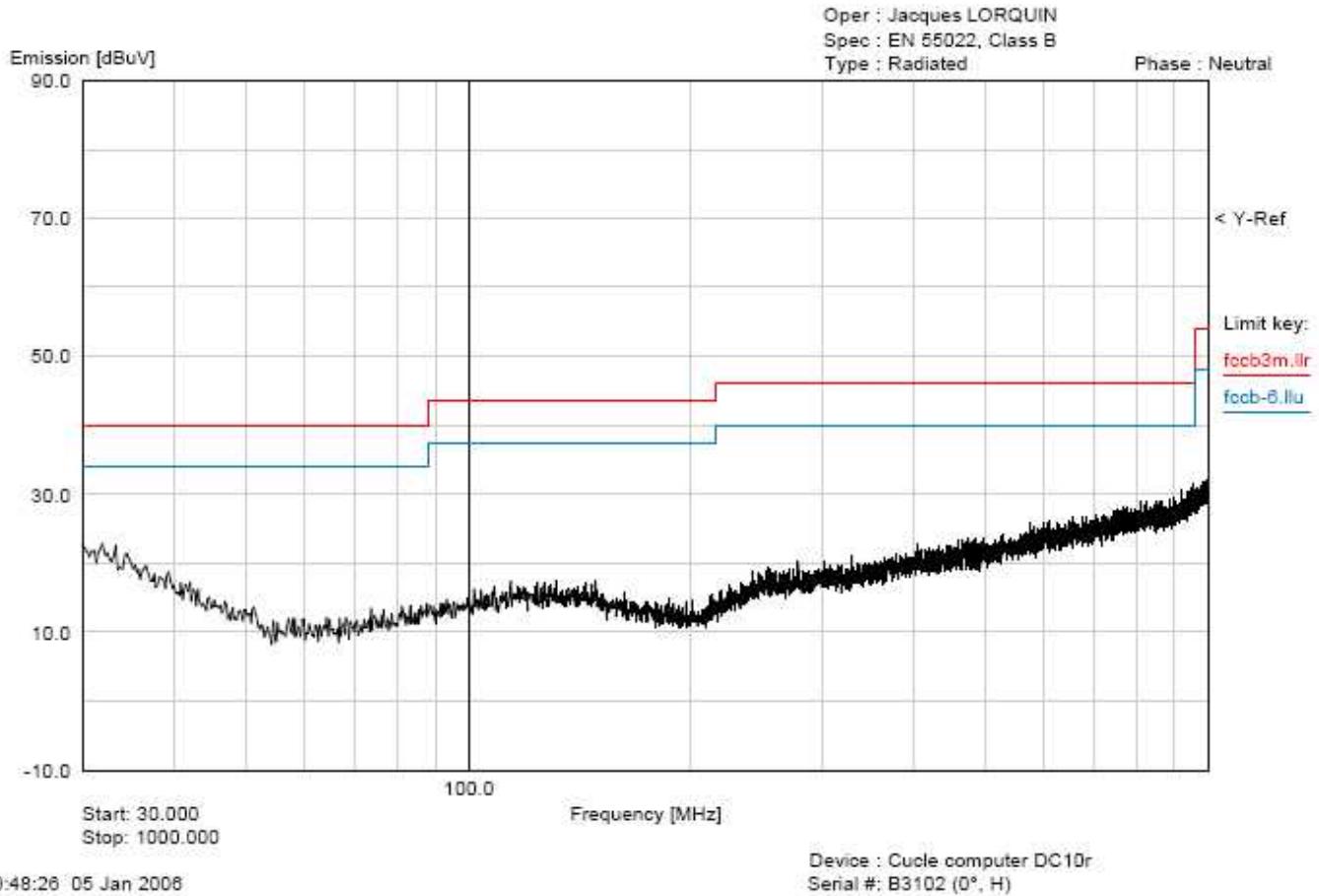




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30MHz-1GHz pre-scan result on DC10r



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2.3.3.Characterization on 10 or 3 meters open site below 30 MHz

The product has been tested with a new battery, at a distance of 3 meters from the antenna and compared to the FCC part 15 subpart C §15.209& §15.225 limits. Measurement bandwidth was 9 kHz from 150 kHz to 30 MHz and 200 Hz from 9 kHz to 150 kHz.

The loop antenna position was rotated to locate the orientation that maximized emission reception during testing. Antenna search was performed for both horizontal and vertical polarization. Continuous linear turntable azimuth search was performed with 360 degrees range.

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 2.1. Test performed with new battery.

DC7r

Frequency (MHz)	AV Limit (dB μ V/m) @ 300m	AV (dB μ V/m)	AV-Limit (margin, dB)	Peak (measure dB μ V/m)	Peak - Limit (margin, dB)	Angle Ant. (deg)	Tot (dB)
0.04* ¹	35.7	-	-	-12.2	-47.9	0	32.3

*¹: Fundamental - 15.209 limits. Measure have been done at 3m distance and corrected following requirements of 15.209.e) (M@300m = M@3m-80dB)

DC10r

Frequency (MHz)	AV Limit (dB μ V/m) @ 300m	AV (dB μ V/m)	AV-Limit (margin, dB)	Peak (measure dB μ V/m)	Peak - Limit (margin, dB)	Angle Ant. (deg)	Tot (dB)
0.04* ¹	35.7	-	-	-11.9	-47.6	0	32.3

*¹: Fundamental - 15.209 limits. Measure have been done at 3m distance and corrected following requirements of 15.209.e) (M@300m = M@3m-80dB)

2.3.4.Characterization on 10 meters open site from 30MHz to 1GHz

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

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

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.

A summary of the worst case emissions found in all test configurations and modes is shown on clause 2.1.



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DC7r

No	Frequency	QPeak	Lmt	QPeak	QPeak-Lmt	Angle	Pol	Hgt	Tot	Corr	Comments
	(MHz)	(dB μ V/m)	(dB μ V/m)	(dB)	(dB)	(deg)		(cm)	(dB)		
@ 3m											
											No frequency measured at 10m No frequency observed during the pre-characterization stage

DC10r

No	Frequency	QPeak	Lmt	QPeak	QPeak-Lmt	Angle	Pol	Hgt	Tot	Corr	Comments
	(MHz)	(dB μ V/m)	(dB μ V/m)	(dB)	(dB)	(deg)		(cm)	(dB)		
@ 3m											
											No frequency measured at 10m No frequency observed during the pre-characterization stage

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 52.5dB μ V is obtained. The antenna factor of 7.4 and a cable factor of 1.1 are added. The amplifier gain of 29dB is subtracted, giving a field strength of 32 dB μ V/m.

$$FS = 52.5 + 7.4 + 1.1 - 29 = 32 \text{ dB}\mu\text{V/m}$$

The 32 dB μ V/m value can be mathematically converted to its corresponding level in μ V/m.

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm} [(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \text{ } \mu\text{V/m.}$$



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3. Conducted emission data

Not applicable (Equipment non connected to mains)

4. Band-edge compliance §15.209

Not applicable (Measured level below spurious limit)

End of Tests

End of report