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RA-04-24011/1/A/ST

FCC CERTIFICATION
RADIO Measurement
Technical Report

standard to apply:
FCC Part 15

Equipment under test:
NBC REMOTE CONTROL + USB/RF RECEIVER

FCC ID: B4S40005927

Company:
X-10 France

DISTRIBUTION: Mr ROSSI **Company: X-10 France**

Number of pages: 11 + 4 appendixes

Ed.	Date	Modified pages	Editing Name	Editing Visa	Verification Approval Name	Verification Approval Visa
0	24-Feb-04	Creation	L. BERTHAUD	LB	P. BONNENFANT	

PRODUCT:	**NBC REMOTE CONTROL + USB/RF RECEIVER**
Reference / model:	remote control: 40005927 receiver: 40005928
Serial number:	not communicated
MANUFACTURER:	X-10 X-10 Building, Labour Industrial District Xixiang Town, Baoan County, Shenzen CHINA

COMPANY SUBMITTING THE PRODUCT:

Company:	X-10 France
Address:	3, rue de Penthièvre 75008 PARIS FRANCE
Responsible:	Mr ROSSI
DATE(S) OF TEST:	26 and 27 January 2004 06 and 17 February 2004
TESTING LOCATION:	EMITECH ATLANTIQUE open area test site in LA POUEZE (49) FRANCE Registration Number by FCC: 101696/FRN: 0006 6490 08
TESTED BY:	L. BERTHAUD

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1.INTRODUCTION

This document presents the result of RADIO test carried out on the following equipment: NBC REMOTE CONTROL + USB/RF RECEIVER in accordance with normative reference.

2.PRODUCT DESCRIPTION

ITU Emission code: 200KL1D

Class: B (residential environment)

Utilization: remote control and USB receiver for Personal Computer applications

Antenna type: internal antenna

Operating frequency: 433.92 MHz

No of channels: 1

Channel spacing: not concerned

Frequency generation: ⊙ SAW Resonator O Crystal O Synthetiser

Modulation: ⊙ Amplitude (pulsed modulated device) O Digital O Frequency O Phase

Power source: alkaline batteries LR03 (2 x 1.5 V) for remote control
Directly supplied by the USB port for receiver.

Power level, frequency range and channels characteristics are not user adjustable.

The details pictures of the product and the circuit boards are joined with this file.

3.NORMATIVE REFERENCE

FCC Part 15 (2003)	Code of Federal Regulations Title 47 - Telecommunication Chapter 1 - Federal Communications Commission Part 15 - Radio frequency devices Subpart C - Intentional Radiators
ANSI C63.4 (01)	American National Standard for Methods of measurement of Radio-Noise from low-voltage. Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

4.TEST METHODOLOGY

Radio performance tests procedures given in part 15:

Paragraph 109: radiated emission limits (Subpart B Unintentional Radiators)
Paragraph 111: antenna power conducted limits for receivers (Subpart B unintentional Radiators)
Paragraph 203: antenna requirement (Subpart C intentional Radiators)
Paragraph 205: restricted bands of operation (Subpart C intentional Radiators)
Paragraph 209: radiated emission limits; general requirements (Subpart C intentional Radiators)
Paragraph 231: periodic operation in the band 40.66 – 40.7 MHz and above 70 MHz (Subpart C intentional Radiators)
Paragraph 33: frequency range of radiated measurements
Paragraph 35: measurement detector functions and bandwidths

5.TEST UNIT CONFIGURATION

JOINED DOCUMENTATIONS

"Synoptic"
"Block diagram"
"External photos and Product labeling"
"Assembly of components"
"Internal photos"
"Layout pcb"
"Bil of materials"
"Schematics"
"Product description"
"User guide"

6.TESTS AND CONCLUSIONS

Test procedure	Description of test	Criteria respected ?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.109	RADIATED EMISSION LIMITS	X				Receiver
FCC Part 15.111	ANTENNA POWER CONDUCTION FOR RECEIVERS			X		*Note 1*
FCC Part 15.203	ANTENNA REQUIREMENT	X				*Note 1*
FCC Part 15.205	RESTRICTED BANDS OF OPERATION	X				Transmitter
FCC Part 15.231	PERIODIC OPERATION IN THE BAND 40.66 – 40.7 MHz and above 70 MHz					Transmitter
a)	Operation mode	X				*Note 2*
b)	Radiated emissions	X				*Notes 3 et 5*
c)	Bandwidth of the emission	X				*Note 4*
d)				X		
e)				X		

NAp: Not Applicable NAs: Not Asked

Note 1: internal antenna without connector.

Note 2: the transmitter operate manually and employ a switch that deactivates automatically the transmitter and ceases transmission within 5 seconds after deactivation.
The transmitter does not perform periodic transmissions.

Note 3: field strength limit of fundamental (F = 433.92 MHz)
41.6667 (F) - 7083.3333 = 10997 µV/m at 3 m = 80.8 dBµV/m at 3 m.
The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

Note 4: the bandwidth of the emission at 20 dB is 531.9 kHz (see appendix 3), less than 0.25 % of the centre frequency (1.0848 MHz).

Note 5: pulsed modulated device.
A duty cycle correction factor has been applied to measures above 1 GHz.
We used the formulas:

$* ON\ TIME = N_1.L_1 + N_2.L_2 + \ldots + N_{n-1}.L_{n-1} + N_n.L_n$

(where N_1 is number of type 1 pulse, L_1 is length of type 1 pulse…).

and $* DUTY\ CYCLE = ON\ TIME / 100\ ms$ *or T (whichever is less, where T is the period of the pulse train).*

We have found (see appendix 4) $N_1 = 1$ $L_1 = 4\ ms$; $N_2 = 21$ $L_2 = 601\ \mu s$; $T = 39.1\ ms$

so $* DUTY\ CYCLE = \frac{4\ ms + (21 \times 601\ \mu s)}{39.1\ ms}$ *= 42.5 % which gives a correction factor of -3.72 dB.*

Conclusion:

The sample of NBC REMOTE CONTROL + USB/RF RECEIVER submitted to the tests complies with the regulations of the standard FCC Part 15 in accordance with the limits or criteria defined in this report.

7.RADIATED EMISSION LIMITS (RECEIVER)

Standard: FCC Part 15 (2003)

Test procedure: paragraph 109

Class: B

Test equipment:

TYPE	BRAND	EMITECH NUMBER
Test receiver	Rohde & Schwarz ESVS 10	1219
Biconical antenna	Hewlet Packard 11966 C	728
Log periodic antenna	Rohde & Schwarz HL 223	1999
Double ridged guide antenna	Electrometrics EM 6961	1204
Spectrum analyser	Rohde & Schwarz FSEM30	1244
Open area test site	EMITECH	1274
Preamplifier	DBS Microwave DB97-1852	2648
High pass filter	Micro-tronics HPM11630	1673
Power source	TTI	2148

Test set up:

The system is tested in an open area test site (OATS).
The test unit is placed on a rotating table, 0.8 m from a ground plane. Zero degree azimuth corresponds to the front of the equipment under test.

Frequency range: 30 MHz - 5 GHz (F < or = 1 GHz).

Detection mode: Quasi-peak (F < 1 GHz)
Average (F > 1 GHz)

Bandwidth: 120 kHz (F < 1 GHz)
1 MHz (F > 1 GHz)

Distance of antenna: 3 meters

Antenna height: 1 to 4 meters

Antenna polarization: vertical and horizontal (only the highest level is recorded)

Equipment under test operating condition:

The receiver is tested with an USB port simulator (provided by the applicant).
The equipment is in continuous reception mode.

Results:

Ambient temperature (°C): 19
Relative humidity (%): 54

Power source: directly supplied by the USB port.

Not any spurious has been detected, the equipment under test have a minimum margin of 20 dB below the limit.

Applicable limits:	30 – 88 MHz	100 µV/m at 3 m
	88 – 216 MHz	150 µV/m at 3 m
	216 – 960 MHz	200 µV/m at 3 m
	Above 960 MHz	500 µV/m at 3 m

8.RADIATED EMISSION LIMITS; GENERAL REQUIREMENTS (TRANSMITTER)

Standard: FCC Part 15 (2003)

Test procedure: paragraph 205 / 209
paragraph 231

Test equipment:

TYPE	BRAND	EMITECH NUMBER
Test receiver	Rohde & Schwarz ESVS 10	1219
Biconical antenna	Hewlet Packard 11966 C	728
Log periodic antenna	Rohde & Schwarz HL 223	1999
Double ridged guide antenna	Electrometrics EM 6961	1204
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Open area test site	EMITECH	1274
Preamplifier	DBS Microwave DB97-1852	2648
High pass filter	Micro-tronics HPM11630	1673

Test set up:

The system is tested in an open area test site (OATS).
The test unit is placed on a rotating table, 0.8 m from a ground plane. Zero degree azimuth corresponds to the front of the equipment under test.

Frequency range: from 30 MHz to harmonic 10 ($F_{carrier} \leq 1$ GHz)

Detection mode: Quasi-peak or average (F < 1 GHz)
Average (F > 1 GHz)

Bandwidth: 120 kHz (F < 1 GHz)
1 MHz (F > 1 GHz)

Distance of antenna: 3 meters

Antenna height: 1 to 4 meters

Antenna polarization: vertical and horizontal (only the highest level is recorded)

Equipment under test operating condition:

The equipment is in continuous transmission mode, modulated.

Results:

Ambient temperature (°C): 18.5
Relative humidity (%): 39

Power source: we used for power source the internal batteries (15.31e) of the equipment and we noted:

Voltage at the beginning of test (V): 3.13
Voltage at the end of test (V): 3.06
Percentage of the voltage drop during the test (%): 2.24

The polarity column refers to the antenna polarity at which the maximum emissions level is measured.

Channel Emission

FREQUENCIES (MHz)	Detector	E.U.T. orientation	Antenna height (cm)	Polarization of antenna H: Horizontal V: Vertical	Azimuth (degrees)	Field strength (dBµV/m)	Limits (dBµV/m)
417.726	A	X	100	H	114	31.9	60.8
425.803	A	X	100	H	96	39.2	60.8
(1) 433.8787	A	X	100	H	269	80.6	(1) 80.8
445.299	A	Z	381	V	43	30.1	60.8
855.634	A	Z	126	V	158	38.8	60.8
877.766	A	Z	124	V	161	60.1	60.8
879.886	A	Z	119	V	178	40.2	60.8
* 1301.629	P	Z	135	V	210	53.7	* 54.0
1735.449	P	Z	131	V	198	47.9	60.8
2169.209	P	Z	164	V	237	59.1	60.8
2602.569	P	Z	187	V	252	59.0	60.8
3037.111	P	Z	105	V	331	48.5	60.8
3470.168	P	X	183	H	341	54.2	60.8
* 3904.709	P	X	257	H	202	51.8	* 54.0

(1) fundamental.
E.U.T.: Equipment Under Test
* restricted band of operation § 15.205.

E.U.T. orientation
X: to put flat
Y: on the edge
Z: up right

A: average
Q: quasi peak
P: peak

Note: 10997 µV/m at 3 m = 80.8 dBµV/m at 3 m *1099 µV/m at 3 m = 60.8 dBµV/m at 3 m*
500 µV/m at 3 m = 54.0 dBµV/m at 3 m

The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.
All readings above 1 GHz were taken using a peak detector function at a distance of 3 meters and the duty cycle correction factor in order to determinate the average value of the emission (see § 15.35 of standard FCC; pulsed modulated devices).

9.APPENDIXES

***Appendix 1*: "PHOTOGRAPHIES OF THE EQUIPEMENT UNDER TEST"**

This appendix contains 8 pages.

***Appendix 2*: "OPEN AREA TEST SITE, TEST SET UP"**

This appendix contains 3 pages.

***Appendix 3*: "BANDWIDTH OF EMISSION"**

This appendix contains 2 pages.

***Appendix 4*: "DUTY CYCLE DETERMINATION"**

This appendix contains 4 pages.

□□□ End of report, 4 appendixes to be forwarded □□□