RA-24-08102900-1/A Ed. 1

"This report cancels and replaces the test report n° RA-24-08102900-1/A Edition 0"

FCC CERTIFICATION
RADIO Measurement
Technical Report

standard to apply:
FCC Part 15.247
PERMISSIVE CHANGE

Equipment under test:
3M WIRELESS SYSTEM / BASE STATION
EXTERNAL ANTENNA SOLUTION

FCC ID :
VJV-9008251

Company:
TES ELECTRONIC SOLUTIONS

DISTRIBUTION: Mr LECORRE **Company: TES ELECTRONIC SOLUTIONS**

1 **Number of pages: 17 including 3 annexes**

Ed.	Date	Modified pages	Written by Name	Visa	Technical Verification Quality Approval Name	Visa
1	6-Mar-09	1, 3-4, 6-8, 11 and 17	P. BONNENFANT	PB	Y. JUDÉAUX	

Duplication of this test report is only permitted for an integral photographic facsimile. It includes the number of pages referenced here above.

This document is the result of testing a specimen or a sample of the product submitted. It does not imply an assessment of the conformity of the whole manufactured products of the tested sample.

PRODUCT:	**3M WIRELESS SYSTEM / BASE STATION EXTERNAL ANTENNA SOLUTION**
Reference / model:	9008251
Serial number:	not communicated
MANUFACTURER:	TES ELECTRONIC SOLUTIONS

COMPANY SUBMITTING THE PRODUCT:

Company:	TES ELECTRONIC SOLUTIONS
Address:	50 rue du president Sadate 29337 QUIMPER Cedex FRANCE
Responsible:	M. LECORRE
DATE(S) OF TEST:	23 and 24 July 2008
TESTING LOCATION:	EMITECH ATLANTIQUE laboratory at ANGERS (49) FRANCE EMITECH ATLANTIQUE open area test site in LA POUEZE (49) FRANCE Registration Number by FCC: 101696/FRN: 0006 6490 08
TESTED BY:	L. BERTHAUD

CONTENTS

TITLE **PAGE**

EMITECH

1. INTRODUCTION

This document presents the result of RADIO test carried out on the following equipment:
3M WIRELESS SYSTEM / BASE STATION EXTERNAL ANTENNA SOLUTION in accordance with normative reference.

2. PRODUCT DESCRIPTION

Class: B (residential environment)

1 Antenna type: 8 dBi Round Patch

Operating frequency range: from 2401.92 MHz to 2479.68 MHz

Number of channels: 75

Channel spacing: 900 kHz

Modulation: Frequency Hopping Spread Spectrum (FHSS)

O Amplitude O Digital ⊙ Frequency O Phase

Power source: 115 Va.c (mains)

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

The standards and testing methods related throughout this report are those listed below.
They are applied on the whole test report even though the extensions (version, date and amendment) are not repeated.

FCC Part 15 (2007)	Code of Federal Regulations Title 47 - Telecommunication Chapter 1 - Federal Communications Commission Part 15 - Radio frequency devices Subpart C - Intentional Radiators
ANSI C63.4 (2003)	Methods of Measurement of Radio-Noise Emissions from Low-voltage Electrical and Electronics Equipment in the range of 9 kHz to 40 GHz.
Public Notice DA 00-705	Filing and Measurement Guideline for Frequency Hopping Spread Spectrum Systems.

4. TEST METHODOLOGY

Radio performance tests procedures given in part 15:

Paragraph 33: frequency range of radiated measurements
Paragraph 35: measurement detector functions and bandwidths
Paragraph 203: antenna requirement
Paragraph 205: restricted bands of operation
Paragraph 207: conducted limits
Paragraph 209: radiated emission limits; general requirements
Paragraph 247: operation within the bands 902-928 MHZ, 2400-2483.5 MHz and 5725-5850 MHz

5. ADD ATTACHMENTS FILES

"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 15.203	ANTENNA REQUIREMENT				X	*Note 1*
FCC Part 15.205	RESTRICTED BANDS OF OPERATION	X				
FCC Part 15.207	CONDUCTED LIMITS				X	*Note 3*
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements	X				*Note 2*
FCC Part 15.247	OPERATION WITHIN THE BAND 902-928 MHZ, 2400-2483.5 MHz and 5725-5850 MHz					
	(a) (1) *hopping systems*				X	*Note 3*
	(a) (1) (i) 902 – 928 MHz			X		
	(a) (1) (ii) 5725 – 5850 MHz			X		
	(a) (1) (iii) 2400 – 2483.5 MHz				X	*Note 3*
	(a) (2) *digital modulation techniques*			X		
	(b) *max output power*	X				
1	(c) *operation with directional antenna gains > 6 dBi*	X				*Note 4*
	(d) *intentional radiator*	X				
	(e) *peak power spectral density*			X		
	(f) *hybrid system*			X		
	(g)				X	
	(h)				X	
	(i) *RF exposure compliance*				X	*Note 3*
DA 00-705	BAND EDGE COMPLIANCE				X	*Note 3*

NAp: Not Applicable NAs: Not Asked

Note 1: dedicated cable and antenna,(see photos in annex 1) with an antenna connector.

Note 2: see FCC part 15.247 (d).

Note 3: test already realized (see Emitech Radio measurement technical report RA-24-07103070-1).

1 *Note 4: see annex 3.*
The antenna is not an omni-directional antenna.

Conclusion:

The sample of 3M WIRELESS SYSTEM / BASE STATION EXTERNAL ANTENNA SOLUTION 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. PEAK OUTPUT POWER

Standard: FCC Part 15

Test procedure: paragraph 15.247

Test equipment:

TYPE	BRAND	EMITECH NUMBER
Spectrum analyzer FSP 40	Rohde & Schwarz	4088
Variac R213	Dereix	1419

Test set up:

The conducted output power level of the equipment is measured with a calibrated spectrum analyzer.

RBW: 1 MHz (peak detector)
VBW: 3 MHz

Equipment under test operating condition:

The equipment under test is blocked in continuous transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate.
The measurement has been realized with his dedicated cable.

1 Antenna gain: 8 dBi.

Results:

Ambient temperature (°C): 28
Relative humidity (%): 33

Power source: 115 Va.c through a variac

Sample n° 1 Channel 1

		Level (dBw)	P (W)	Limit (w)
Normal test conditions	Nominal power source (V): 115	-9.67	107.89 x 10^{-3}	0.794*

Power change compared to previous version: -0.65 dB.

Sample n° 1 Channel 47

		Level (dBw)	P (W)	Limit (w)
Normal test conditions	Nominal power source (V): 115	-10.61	86.89 x 10^{-3}	0.794*

Power change compared to previous version: -2.64 dB.

Sample n° 1 Channel 91

		Level (dBw)	P (W)	Limit (w)
Normal test conditions	Nominal power source (V):	-11.11	77.45 x 10^{-3}	0.794*

Power change compared to previous version: -2.36 dB.

* the maximum conducted power is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Test conclusion:

RESPECTED STANDARD

8. RADIATED EMISSION OF TRANSMITTER

Standard: FCC Part 15

Test procedure: paragraph 15.205
paragraph 15.209
paragraph 15.247

Test equipment:

TYPE	BRAND	EMITECH NUMBER
Test receiver ESH3	Rohde & Schwarz	1058
Test receiver ESVS 10	Rohde & Schwarz	1219
Spectrum analyzer FSP 40	Rohde & Schwarz	4088
Loop antenna	EMCO	1406
Biconical antenna HP 11966C	Hewlett Packard	728
Log periodic antenna HL 223	Rohde & Schwarz	1999
Open site	Emitech	1274
Antenna RGA-60	Electrometrics	1204
Low-noise amplifier 2 to 18 GHz	Microwave DB	1922
High pass filter HP12/3200-5AA	Filtek	
Antenna WR42	IMC	1939
Variac R213	Dereix	1419
Low-noise amplifier 18 to 26 GHz	ALC	3036

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 9 kHz to harmonic 10 ($F_{carrier} \leq 10$ GHz)

Bandwidth: 120 kHz (F < 1 GHz) or 100 kHz, following 15.205 or 15.247
1 MHz (F > 1 GHz) or 100 kHz, following 15.205 or 15.247

Distance of antenna: between 30 m and 3 m according the frequencies and the limits.

Antenna height: 1 to 4 meters

Antenna polarization: vertical and horizontal, only the highest level is recorded.

Equipment under test operating condition:

The equipment under test is blocked in continuous transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate.
The measurement has been realized with his dedicated cable and antenna.

Results:

Ambient temperature (°C): 21.5
Relative humidity (%): 52

Power source: 115 Va.c. through a variac

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

Channel 1

FREQUENCIES (MHz)	Detector	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Power change (dB) compared to previous version
228.1	QP	164	158	120	V	23.1	95.56	72.46	-0.3
250	QP	100	34	120	H	34.6	46.02 *	11.42	+2.8
300	QP	157	103	120	V	45.8	95.56	49.76	+2.4
400	QP	129	128	120	V	33.6	46.02 *	12.42	+2.6
500	QP	150	163	120	V	44.6	95.56	50.96	-1.3
560	QP	250	38	120	H	36.8	95.56	58.76	-0.9
600	QP	114	45	120	H	43.8	95.56	51.76	+2
665	QP	198	328	120	H	32.6	95.56	62.96	-2.9
675	QP	100	70	120	H	41.8	95.56	53.76	+2.8
700	QP	100	215	120	H	45.4	95.56	50.16	+2.4
775	QP	250	204	120	H	40.3	95.56	55.26	-0.5
791.99	QP	125	0	120	V	45.4	95.56	50.16	+0.4
4803.85	Avg	100	59	100	V	27.7	53.98 *	26.28	-8.4
4803.85	Peak	100	59	100	V	49.4	73.98 *	24.58	-10
7205.73	Peak	107	0	1000	V	56.4	95.56	39.16	-5.2
12009.75	Avg	192	10	100	V	39.9	53.98 *	14.08	-9.1
12009.75	Peak	192	10	100	V	64.1	73.98 *	9.88	-3.9

Channel 40

FREQUENCIES (MHz)	Detector	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Power change (dB) compared to previous version
228.1	QP	164	158	120	V	23.1	95.56	72.46	-0.3
250	QP	100	34	120	H	34.6	46.02*	11.42	+2.8
300	QP	157	103	120	V	45.8	95.56	49.76	+2.4
400	QP	129	128	120	V	33.6	46.02	12.42	+2.6
500	QP	150	163	120	V	44.6	95.56	50.96	-1.3
560	QP	250	38	120	H	36.8	95.56	58.76	-0.9
600	QP	114	45	120	H	43.8	95.56	51.76	+2
665	QP	198	328	120	H	32.6	95.56	62.96	-2.9
675	QP	100	70	120	H	41.8	95.56	53.76	+2.8
700	QP	100	215	120	H	45.4	95.56	50.16	+2.4
775	QP	250	204	120	H	40.3	95.56	55.26	-0.5
791.99	QP	125	0	120	V	45.4	95.56	50.16	+0.4
4883.18	Avg	100	76	100	V	27.6	53.98*	26.38	-9.2
4883.18	Peak	100	76	100	V	48.4	73.98*	25.58	-9.8
7325.28	Avg	112	0	100	V	35.2	53.98*	18.78	-8
7325.28	Peak	112	0	100	V	62.9	73.98*	11.08	-5.4
12208.19	Avg	187	14	100	V	40.3	53.98*	13.68	-8.1
12208.19	Peak	187	14	100	V	60.7	73.98*	13.28	-3.8

Channel 91

FREQUENCIES (MHz)	detector	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Power change (dB) compared to previous version
228.1	QP	164	158	120	V	23.1	95.56	72.46	-0.3
250	QP	100	34	120	H	34.6	46.02*	11.42	+2.8
300	QP	157	103	120	V	45.8	95.56	49.76	+2.4
400	QP	129	128	120	V	33.6	46.02*	12.42	+2.6
500	QP	150	163	120	H	44.6	95.56	50.96	-1.3
560	QP	250	38	120	H	36.8	95.56	58.76	-0.9
600	QP	114	45	120	H	43.8	95.56	51.76	+2
665	QP	198	328	120	H	32.6	95.56	62.96	-2.9
675	QP	100	70	120	H	41.8	95.56	53.76	+2.8
700	QP	100	215	120	H	45.4	95.56	50.16	+2.4
775	QP	250	204	120	H	40.3	95.56	55.26	-0.5
791.99	QP	125	0	120	V	45.4	95.56	50.16	+0.4
4961.1	Avg	107	84	100	V	28.7	53.98*	25.28	-9.3
4961.1	Peak	107	84	100	V	50.2	73.98*	23.78	-10.7
7441.73	Avg	114	0	100	V	34.7	53.98*	19.28	-8.8
7441.73	Peak	114	0	100	V	61.6	73.98*	12.38	-5.4
12402.77	Avg	193	17	100	V	40.7	53.98*	13.28	-7.9
12402.77	Peak	193	17	100	V	62.6	73.98*	11.38	-3.7

* restricted bands of operation.

Applicable limits: 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.

The highest level recorded in a 100 kHz bandwidth is 115.56 dBµV/m on channel 1.

So the applicable limit is 95.56 dBµV/m.

In addition, radiated emissions which fall in the restricted band, as defined in section 15.205 (a), must also comply with the radiated emission limits specified in section 15.209 (a) (see section 15.205 (c)).

Any spurious that has more than 20 dB of margin compared to the applicable limit is not necessarily reported.

TEST CONCLUSION:

RESPECTED STANDARD

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□□□ End of report, 3 annexes to be forwarded □□□

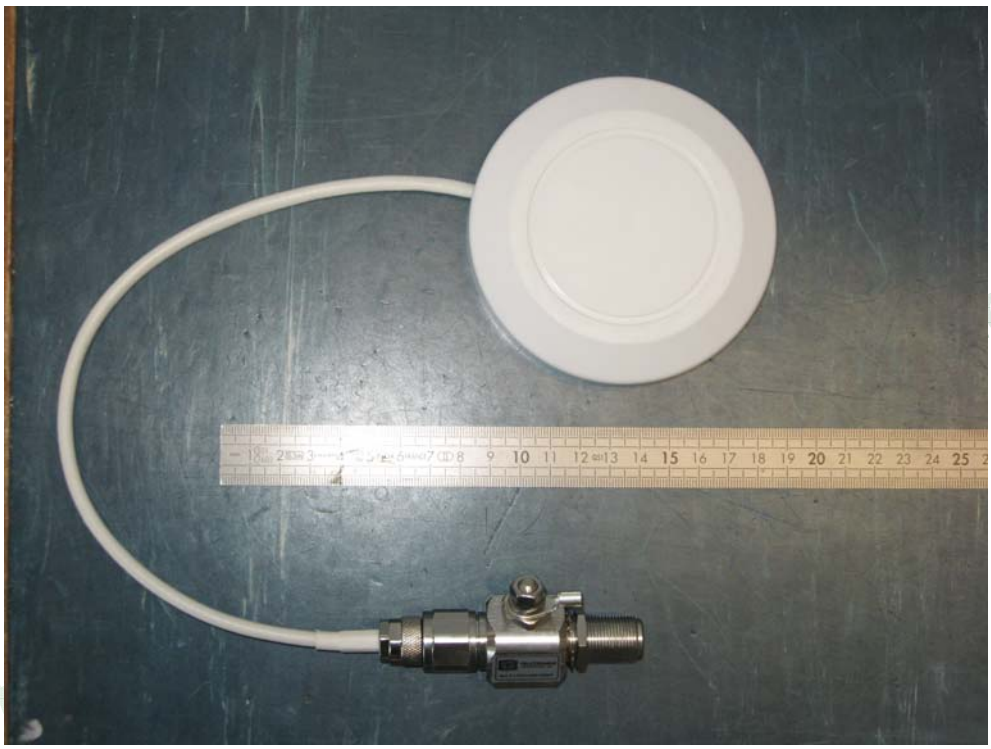
ANNEX 1: PHOTOS OF THE EQUIPMENT UNDER TEST

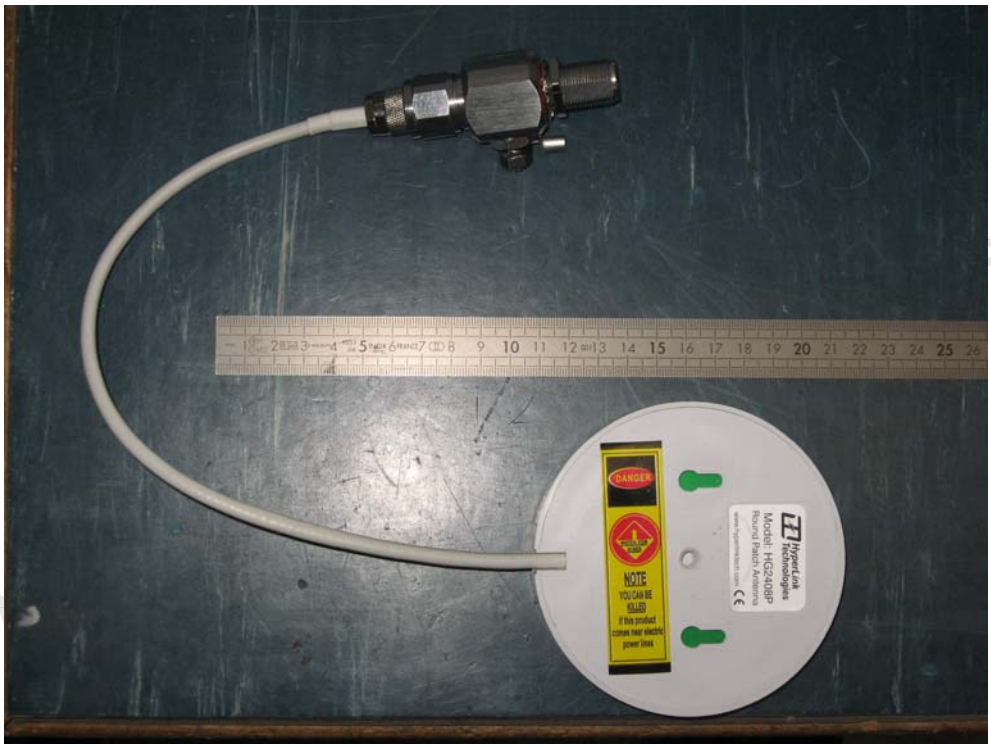
GENERAL VIEW

INTERNAL VIEW

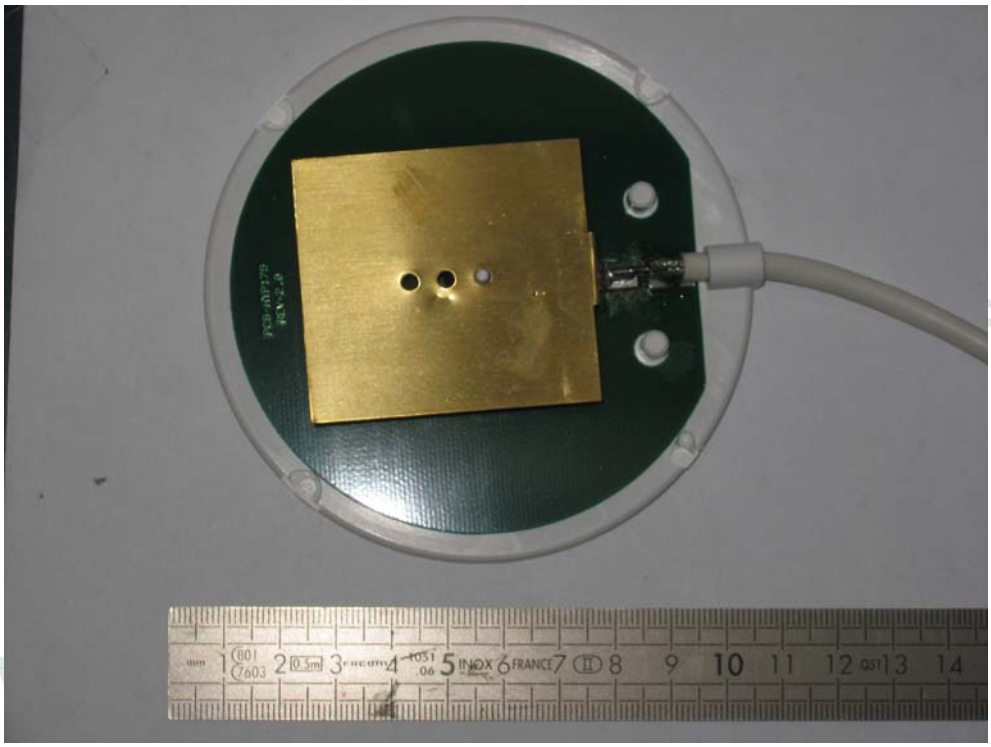
EMITECH
EMITECH
EMITECH

ANTENNA




DANGER
NOTE
YOU CAN BE KILLED
If this product comes near electric power lines
Model HG2408P
Round Patch Antenna


HyperLink Technologies
Model: HG2408P
Round Patch Antenna
www.hyperlinktech.com
DANGER
NOTE
YOU CAN BE KILLED
If this product comes near electric power lines



ANNEX 2: TEST SET UP

RADIATED MEASUREMENT

OPEN AREA TEST SITE

ANNEX 3: EXTERNAL ANTENNA SOLUTION