

15, rue de la Claie
Z.I. Angers-Beaucouzé
49070 BEAUCOUZÉ
Tél. 02 41 73 26 27
Fax 02 41 73 26 40
e-mail : atlantique@emitech.fr
R.C.S. ANGERS 95 B 543
SIRET 344 545 645 00055

RA-03-24471/A/ST

FCC CERTIFICATION E.M.C. Measurement Technical Report

**standard to apply:
FCC Part 15**

**Equipment under test:
POINT OF SALE HAND HELD TERMINAL +
BASE STATION**

FCC ID: 034-I7770

**Company:
INGENICO**

TRANSMIT TO: Mr SCHANG

Company: INGENICO

Number of pages: 22 + 7 annexes

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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: POINT OF SALE HAND HELD TERMINAL +
BASE STATION

Reference / model: I 7770

Serial number: I7770BHT001A v01 (hand held terminal)
I7770BAS001A v2.1 (base station)

MANUFACTURER: INGENICO

COMPANY SUBMITTING THE PRODUCT:

Company: INGENICO

Address: 9, quai de Dion Bouton
92816 PUTEAUX CEDEX
FRANCE

Responsible: Mr SCHANG

DATE(S) OF TEST: 16, 17 and 18 June 2003
03 December 2003

TESTING LOCATION: EMITECH ATLANTIQUE laboratory at ANGERS (49) FRANCE
EMITECH ATLANTIQUE open area test site in LA POUEZE (49)
FRANCE
EMITECH laboratory at MONTIGNY LE BRETONNEUX (78)
FRANCE

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TESTED BY: P. BONNENFANT

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1.INTRODUCTION

This document presents the result of E.M.C. test carried out on the following equipment: POINT OF SALE HAND HELD TERMINAL + BASE STATION in accordance with normative reference.

2.PRODUCT DESCRIPTION

ITU Emission code: 1M00F7D

Classe: A (commercial, industrial or business environment)

Utilization: banking terminal of payment connected to the telephone network through a modem.

Antenna type: incorporated antenna

Antenna gain: 0 dBi (base and terminal)

Operating frequency range: from 2400 MHz to 2483.5 MHz

No of channels: 79

Channel spacing: 1 MHz

Frequency generation: ☒ SAW Resonator ☒ Crystal ☒ Synthetiser

Modulation: Frequency Hopping Spread Spectrum
☒ Amplitude ☒ Digital ☒ Frequency ☒ Phase

Power source: mains power adaptator for base station
Batteries Ni mH ($5 \times 1.2V$) for hand held terminal

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

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

3.NORMATIVE REFERENCE

FCC Part 15 (03) 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) Methods of measurement of Radio-Noise
Emissions 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 33: frequency range of radiated measurements
Paragraph 35: measurement detector functions and bandwidths
Paragraph 207: conducted limits
Paragraph 205: restricted bands of operation
Paragraph 209: radiated emission limits; general requirements
Paragraph 247: operation within the band 2400 – 2483.5 MHz

5.RELATED SUBMITTAL GRANT

Not related submittal grant.

6.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 “

7.TESTS AND CONCLUSIONS HAND HELD TERMINAL

Test procedure	Description of test	Criteria respected ?				Comment
		Yes	No	NAP	NAs	
FCC Part 15.205	RESTRICTED BANDS OF OPERATION	X				
FCC Part 15.207	CONDUCTED LIMITS			X		Note 4
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements			X		Note 5
FCC Part 15.247	OPERATION WITHIN THE BAND 2400-2483.5 MHz					
FCC Part 15.247	(a) (1) <i>hopping mode</i>	X				Note 1
FCC Part 15.247	(a) (1) (iii) <i>hopping timing</i>	X				Note 2
FCC Part 15.247	(b) (1) <i>max output power</i>	X				
FCC Part 15.247	(b) (1) <i>RF exposure compliance</i>			X		Note 3
FCC Part 15.247	(c) <i>intentional radiator</i>	X				
FCC Part 15.247	(d) <i>peak power spectral density</i>	X				Note 6

NAP: Not Applicable

NAs: Not Asked

Note 1: see appendix 2, the frequency hopping system have hopping channel carrier frequencies separated by 1 MHz (> 25 kHz). The system hop to channel frequencies from a pseudo randomly ordered list of hopping frequencies. Each frequency is used equally on the average by the transmitter.

Note 2: the frequency hopping system use more than 15 non-overlapping channels. The transmitter transmits every 98.3 ms (see appendix 4), during 425.7 μ s, with 79 channels $\times 0.4$ s (part 15) = 31.6 s. The transmitter for 31.6 s transmits 322 times, then $322 \times 438.6 \mu$ s = 137 ms, thus the average time of occupancy on any channel is less than 400ms within a period of 0.4 s multiplied by the number of hopping channels employed.

Note 3: This type of equipment use less than 0.5 W of output power with a high signal transmitting duty factor (see OET Bulletin 65c section 3).

Note 4: Battery source power.

Note 5: see FCC part 15.247 (c).

Note 6: Not asked in the standard (hopping system), realized at the request of the requerant. Conducted measurement is not possible (integral antenna), so we used the substitution method in open field.

Conclusion:

The sample of HAND HELD TERMINAL 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.

8.TESTS AND CONCLUSIONS BASE STATION

Test procedure	Description of test	Criteria respected ?				Comment
		Yes	No	NAP	NAs	
FCC Part 15.205	RESTRICTED BANDS OF OPERATION	X				
FCC Part 15.207	CONDUCTED LIMITS	X				
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements			X		Note 4
FCC Part 15.247	OPERATION WITHIN THE BAND 2400-2483.5 MHz					
FCC Part 15.247	(a) (1) <i>hopping mode</i>	X				Note 1
FCC Part 15.247	(a) (1) (iii) <i>hopping timing</i>	X				Note 2
FCC Part 15.247	(b) (1) <i>max output power</i>	X				
FCC Part 15.247	(b) (1) <i>RF exposure compliance</i>			X		Note 3
FCC Part 15.247	(c) <i>intentional radiator</i>	X				
FCC Part 15.247	(d) <i>peak power spectral density</i>	X				Note 5

NAP: Not Applicable

NAs: Not Asked

Note 1: see appendix 1, the frequency hopping system have hopping channel carrier frequencies separated by 1 MHz (> 25 kHz). The system hop to channel frequencies from a pseudo randomly ordered list of hopping frequencies. Each frequency is used equally on the average by the transmitter.

Note 2: the frequency hopping system use more than 15 non-overlapping channels. The transmitter transmits every 98.16 ms (see appendix 3), during 438.6 μ s, with 79 channels $\times 0.4$ s (part 15) = 31.6 s. The transmitter for 31.6 s transmits 322 times, then $322 \times 438.6 \mu$ s = 141.2 ms, thus the average time of occupancy on any channel is less than 400ms within a period of 0.4 s multiplied by the number of hopping channels employed.

Note 3: This type of equipment use less than 0.5 W of output power with a high signal transmitting duty factor (see OET Bulletin 65c section 3).

Note 4: see FCC part 15.247 (c).

Note 5: Not asked in the standard (hopping system), realized at the request of the requerant. Conducted measurement is not possible (integral antenna), so we used the substitution method in open field.

Conclusion:

The sample BASE STATION 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.

9.CONDUCTED EMISSION ON AC MAINS PORTS BASE STATION

Standard: FCC Part 15 (02)

Test procedure: paragraph 15.207

Test equipment:

TYPE	BRAND	EMITECH NUMBER
Spectrum analyzer	Hewlett Packard	20
T-Network	Secré	340
Transient limiter	Hewlett Packard	758
LISN	PMM	813
Software	Emitech	1694
Test enclosure	Emitech	1804
AC power source	Schaffner	2134
AC power source	Schaffner	2149
AC power source	Schaffner	2151
Harmonics/Flicker analyser	Schaffner	2152

Test set up:

Frequency range: 150 kHz - 30 MHz.

Detection mode: Peak / Quasi-peak / Average

Resolution bandwidth:

Frequency range	Resolution bandwidth	Video bandwidth
150 kHz - 30 MHz	10 kHz	30 kHz

Operating mode during the test: In communication

Equipment under test operating condition:

Category of equipment: Table-top equipment

The equipment under test *(EUT) is operating on a non conductive test table at 0.8 m above the horizontal metal ground plane and at 0.4 m beside the vertical metal ground plane.

* The EUT is supplied through LISN (Line Impedance Stabilization Network) bonded to the ground reference plane.

Results:
Sample N° 1

Power source: 110 V.a.c.

Curve reference	Comments
Curve 1	Measurement of peak detection on wire 1
Curve 2	Measurement of peak detection on wire 2
Curve 3	Measurement of average detection on wire 1
Curve 4	Measurement of average detection on wire 2

Appendix 5 = curves 1 to 4

Limit: The EUT must satisfy requirements of the standard shown in table below.

Frequency range (MHz)	Limit (dBµV)	
	Quasi-peak	Average
0.15 to 0.5	66 - 56	56 - 46
0.5 to 5	56	46
5 to 30	60	50

Test conclusion:

RESPECTED STANDARD

10. PEAK OUTPUT POWER HAND HELD TERMINAL

Standard: FCC Part 15 (03)

Test procedure: paragraph 15.247

Test equipment:

TYPE	BRAND	EMITECH NUMBER
Spectrum analyzer FSEM 30	Rohde & Schwarz	1244
Source power EX354D	TTI	2148
Diode detector OD20004A	Omniyig	2469
Oscilloscop THS 720	Tektronix	0940
Antenna RGA60	Electrometrics	1938
Antenna RGA60	Electrometrics	1204
Open site	EMITECH	1274
Radio frequency generator SME06	Rohde & Schwarz	1669
Micro Wattmeter 4200 RF	Boonton	2559
Probe Micro Wattmeter 4200 4E	Boonton	2560
Low-noise amplifier 1 to 18 GHz	ALC	2648
High pass filter HPM 11630	Micro-Tronics	1673

FIRST METHOD

Test set up:

The carrier power is the peak power delivered to the artificial antenna.

The artificial antenna is a 50 Ω load connected directly at the power meter or the spectrum analyzer.

Equipment under test operating condition:

The equipment is in continuous transmission mode at the highest power level which the transmitter is intended to operate.

We used for the source power a variac adjusted at the nominal main power.

SECOND METHOD

Test set up:

We use for this measure outdoor test site, by substitution method. The measuring distance between the equipment and the test antenna is 3 m. The antenna have been oriented in the two polarizations, we have recorded only highest level. Height support of the equipment: 0.8 m.

The spectrum analyser is replaced by a diode detector which is connected to the vertical channel of an oscilloscope.

The maximum deviation Y-trace of the oscilloscope is recorded as "B" and the duty cycle of the transmitter "X".

The equipment under test is substituted by a signal generator with a calibrated double ridged guide antenna, and its level adjusted such that the deviation of the Y-trace of the oscilloscope reaches level "B".

The output power level of the signal generator is measured with a calibrated RF power meter.

Test operating condition of the equipment:

Antenna gain (relative to an isotropic antenna): not communicated, integral antenna.
The transceiver is blocking in transmit mode hopping.

Results:

Ambient temperature (°C): 20
Relative humidity (%): 53

FIRST METHOD

Antenna gain: 0 dBi

RBw: 1 MHz

VBw: 1 MHz

Sample N° 1

		Peak Output Power (W) at frequencies:			Limits (W)
		Channel 1 2401.93 MHz	Channel 40 2440.92 MHz	Channel 79 2479.92 MHz	
Normal test conditions	Nominal power source (V): 6	73.79×10^{-3}	60.81×10^{-3}	27.67×10^{-3}	1*

* the frequency hopping systems use at least 75 hopping channel.

Polarization of test antenna: horizontal (height: 136 cm)

Position of equipment: use position, to put flat (azimuth: 69 degrees)

SECOND METHOD

Step 1: duty cycle: Tx on/(Tx on + Tx off) $0 < x \leq 1$

Step 2: average output power: A (dBm)

$$P(\text{eirp}) = A + G + 10 \log(1/x) \text{ with } G: \text{antenna gain}$$

Step 3: maximum peak deviation: B (V)

Step 4: substitution level radiated: C (mW)

Sample N° 1

			Step 1 x	Step 2		Step 3 B (V)	Step 4 C (mW)	Limit (W)
				A + G (dBm)	P (dBm)			
Normal test conditions	Temperature (°C): 21 Humidity (%): 60	Nominal power source (V): 6	0.34	+ 13.01	+ 17.7	- 28	58.88	1*

* the frequency hopping systems use at least 75 hopping channel.

Test conclusion:

RESPECTED STANDARD

11. PEAK OUTPUT POWER BASE STATION

Standard: FCC Part 15 (03)

Test procedure: paragraph 15.247

Test equipment:

TYPE	BRAND	EMITECH NUMBER
Spectrum analyzer FSEM 30	Rohde & Schwarz	1244
Diode detector OD20004A	Omniyig	2469
Oscilloscop THS 720	Tektronix	0940
Antenna RGA60	Electrometrics	1938
Antenna RGA60	Electrometrics	1204
Open site	EMITECH	1274
Radio frequency generator SME06	Rohde & Schwarz	1669
Micro Wattmeter 4200 RF	Boonton	2559
Probe Micro Wattmeter 4200 4E	Boonton	2560
Low-noise amplifier 1 to 18 GHz	ALC	2648
High pass filter HPM 11630	Micro-Tronics	1673
Variac R213	Dereix	1419

FIRST METHOD

Test set up:

The carrier power is the peak power delivered to the artificial antenna.

The artificial antenna is a 50 Ω load connected directly at the power meter or the spectrum analyzer.

Equipment under test operating condition:

The equipment is in continuous transmission mode at the highest power level which the transmitter is intended to operate.

We used for the source power a variac adjusted at the nominal main power.

SECOND METHOD

Test set up:

We use for this measure outdoor test site, by substitution method. The measuring distance between the equipment and the test antenna is 3 m. The antenna have been oriented in the two polarizations, we have recorded only highest level. Height support of the equipment: 0.8 m.

The spectrum analyser is replaced by a diode detector which is connected to the vertical channel of an oscilloscope.

The maximum deviation Y-trace of the oscilloscope is recorded as "B" and the duty cycle of the transmitter "X".

The equipment under test is substituted by a signal generator with a calibrated double ridged guide antenna, and its level adjusted such that the deviation of the Y-trace of the oscilloscope reaches level "B".

The output power level of the signal generator is measured with a calibrated RF power meter.

Test operating condition of the equipment:

Antenna gain (relative to an isotropic antenna): not communicated, integral antenna.
The transceiver is blocking in transmit mode hopping.

Results:

Ambient temperature (°C): 21
Relative humidity (%): 60

FIRST METHOD

Antenna gain: 0 dBi

RBw: 1 MHz

VBw: 1 MHz

Sample N° 1

		Peak Output Power (W) at frequencies:			Limits (W)
		Channel 1 2401.93 MHz	Channel 40 2440.92 MHz	Channel 79 2479.92 MHz	
Normal test conditions	Nominal power source (V.a.c.): 110	38.73×10^{-3}	42.46×10^{-3}	25.53×10^{-3}	1*

* the frequency hopping systems use at least 75 hopping channel.

Polarization of test antenna: horizontal (height: 116 cm)

Position of equipment: use position, to put flat (azimuth: 0 degree)

SECOND METHOD

Step 1: duty cycle: Tx on/(Tx on + Tx off) $0 < x \leq 1$

Step 2: average output power: A (dBm)

$$P(\text{eirp}) = A + G + 10 \log(1/x) \text{ with } G: \text{antenna gain}$$

Step 3: maximum peak deviation: B (V)

Step 4: substitution level radiated: C (mW)

Sample N° 1

			Step 1 x	Step 2		Step 3 B (V)	Step 4 C (mW)	Limit (W)
				A + G (dBm)	P (dBm)			
Normal test conditions	Temperature (°C): 21 Humidity (%): 60	Nominal power source (V): 6	0.34	+ 10.31	+ 15	- 24	31.62	1*

* the frequency hopping systems use at least 75 hopping channel.

Test conclusion:

RESPECTED STANDARD

12.RADIATED EMISSION HAND HELD TERMINAL

Standard: FCC Part 15 (03)

Test procedure: paragraph 15.247

Test equipment:

TYPE	MANUFACTURER	EMITECH NUMBER
Spectrum analyzer E4407B	Agilent	3020
Open site	Emitech	1274
Radiofrequency generator SME06	Rohde & Schwarz	1669
Antenna RGA-60	Electrometrics	1938
Antenna RGA-60	Electrometrics	1204

Measured condition:

We used the same method of the peak output power (FIRST METHOD), but the oscilloscope and the diode is replaced by a spectrum analyser used in combination with an RF power meter.

Resolution bandwidth: 3 kHz

Video bandwidth: 3 kHz

Test operating condition of the equipment:

Antenna gain (relative to an isotropic antenna): not communicated, integral antenna.

The transceiver is blocking in transmit mode hopping.

Results:

Ambient temperature (°C): 19

Relative humidity (%): 59

Power source (V): 6

Sample n° 1 Channel 1

	Peak power density at frequency: 2402 MHz
Normal test conditions	+ 3.38 dBm
Limits	+ 8dBm

Sample n° 1 Channel 40

	Peak power density at frequency: 2441 MHz
Normal test conditions	+ 3.13 dBm
Limits	+ 8 dBm

Sample n° 1 Channel 79

	Peak power density at frequency: 2480 MHz
Normal test conditions	+ 0.51 dBm
Limits	+ 8 dBm

Test conclusion:

RESPECTED STANDARD

13.RADIATED EMISSION BASE STATION

Standard: FCC Part 15 (03)

Test procedure: paragraph 15.247

Test equipment:

TYPE	MANUFACTURER	EMITECH NUMBER
Spectrum analyzer E4407B	Agilent	3020
Open site	Emitech	1274
Radiofrequency generator SME06	Rohde & Schwarz	1669
Antenna RGA-60	Electrometrics	1938
Antenna RGA-60	Electrometrics	1204
Variac R213	Dereix	1419

Measured condition:

We used the same method of the peak output power (FIRST METHOD), but the oscilloscope and the diode is replaced by a spectrum analyser used in combination with an RF power meter.

Resolution bandwidth: 3 kHz

Video bandwidth: 3 kHz

Test operating condition of the equipment:

Antenna gain (relative to an isotropic antenna): not communicated, integral antenna.

The transceiver is blocking in transmit mode hopping.

Results:

Ambient temperature (°C): 19
Relative humidity (%): 59

Power source: 110 Va.c.

Sample n° 1 Channel 1

	Peak power density at frequency: 2402 MHz
Normal test conditions	+ 1.66 dBm
Limits	+ 8dBm

Sample n° 1 Channel 40

	Peak power density at frequency: 2441 MHz
Normal test conditions	+ 3.23 dBm
Limits	+ 8 dBm

Sample n° 1 Channel 79

	Peak power density at frequency: 2480 MHz
Normal test conditions	+ 1.53 dBm
Limits	+ 8 dBm

Test conclusion:

RESPECTED STANDARD

14.RADIATED EMISSION HAND HELD TERMINAL

Standard: FCC Part 15 (03)

Test procedure: paragraph 15.205
paragraph 15.209
paragraph 15.247

Test equipment:

TYPE	BRAND	EMITECH NUMBER
Test receiver ESVS 10	Rohde & Schwarz	1219
Spectrum analyzer FSEM 30	Rohde & Schwarz	1244
Biconical antenna HP 11966C	Hewlett Packard	728
Log periodic antenna HL 223	Rohde & Schwarz	1999
Open site	Emitech	1274
Multimeter 8840A	Fluke	1018
Antenna RGA-60	Electrometrics	1204
Low-noise amplifier	Microwave DB	1922
High pass filter HP12/3200-5AA	Filtek	
Antenna WR42	IMC	1939

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 above a ground plane. Zero degree azimuth corresponds to the front of the equipment under test.

Frequency range: from 9 kHz to harmonic 10 ($F_{\text{carrier}} \leq 10 \text{ GHz}$)

Detection mode: Quasi-peak ($F < 1 \text{ GHz}$)
Average ($F > 1 \text{ GHz}$)

Bandwidth: 120 kHz ($F < 1 \text{ GHz}$) or 100 kHz, following 15.205 or 15.247
1 MHz ($F > 1 \text{ GHz}$) or 100 kHz, following 15.205 or 15.247

Distance of antenna: 3 meters

Antenna height: 1 to 4 meters

Antenna polarization: vertical and horizontal

Equipment under test operating condition:

The equipment is in continuous transmission mode.

Results:

Ambient temperature (°C): 20

Relative humidity (%): 53

Power source (V): 6

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

Lowest Channel Emission

FREQUENCIES (MHz)	RBW (kHz)	Detector Q: Quasi-peak A: Average	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
353.92	100	Q	H	43.4	92*	48.6
398.148	100	Q	H	34	92*	58
412.886	100	Q	H	41	92*	51
442.36	100	Q	H	37.3	92*	54.7
471.85	100	Q	H	38.7	92*	53.3
530.83	100	Q	H	38.7	92*	53.3
552.96	100	Q	H	37.5	92*	54.5
589.805	100	Q	H	35.5	92*	56.5
648.83	100	Q	H	40.4	92*	51.6
707.808	100	Q	H	41.6	92*	50.4
4803.83	1000	A	V	49.45	54**	4.55
7205.7	100	A	V	57.53	92*	34.47
9607.76	100	A	V	59.65	92*	32.35
12009.59	1000	A	V	48.83	54**	5.17

Highest Channel Emission

FREQUENCIES (MHz)	RBW (kHz)	Detector Q: Quasi-peak A: Average	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
353.92	100	Q	H	43.4	92*	48.6
398.148	100	Q	H	34	92*	58
412.886	100	Q	H	41	92*	51
442.36	100	Q	H	37.3	92*	54.7
471.85	100	Q	H	38.7	92*	53.3
530.83	100	Q	H	38.7	92*	53.3
552.96	100	Q	H	37.5	92*	54.5
589.805	100	Q	H	35.5	92*	56.5
648.83	100	Q	H	40.4	92*	51.6
707.808	100	Q	H	41.6	92*	50.4
4959.83	1000	A	V	51.13	54**	2.87
7439.76	1000	A	V	53.79	54**	0.21
9919.66	100	A	V	48.01	92*	43.99

* limit corresponding at 20 dB below the highest level produced by the intentional radiator.

** restricted bands of operation in 15.205, this limit corresponding at the 15.209 section.

Test conclusion:

RESPECTED STANDARD

15.RADIATED EMISSION BASE STATION

Standard: FCC Part 15 (03)

Test procedure: paragraph 15.205
paragraph 15.209
paragraph 15.247

Test equipment:

TYPE	BRAND	EMITECH NUMBER
Test receiver ESVS 10	Rohde & Schwarz	1219
Spectrum analyzer FSEM 30	Rohde & Schwarz	1244
Biconical antenna HP 11966C	Hewlett Packard	728
Log periodic antenna HL 223	Rohde & Schwarz	1999
Open site	Emitech	1274
Multimeter 8840A	Fluke	1018
Antenna RGA-60	Electrometrics	1204
Low-noise amplifier	Microwave DB	1922
High pass filter HP12/3200-5AA	Filtek	
Antenna WR42	IMC	1939
Variac R213	Dereix	1419

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 ($F_{\text{carrier}} \leq 10 \text{ GHz}$)

Bandwidth: Quasi-peak ($F < 1 \text{ GHz}$) or 100 kHz, following 15.205 or 15.247
Average ($F > 1 \text{ GHz}$) or 100 kHz, following 15.205 or 15.247

Bandwidth: 120 kHz ($F < 1 \text{ GHz}$)
1 MHz ($F > 1 \text{ GHz}$)

Distance of antenna: 3 meters

Antenna height: 1 to 4 meters

Antenna polarization: vertical and horizontal

Equipment under test operating condition:

The equipment is in continuous transmission mode.

Results:

Ambient temperature (°C): 20

Relative humidity (%): 53

Power source (V): 110

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

Lowest Channel Emission

FREQUENCIES (MHz)	RBW (kHz)	Detector Q: Quasi-peak A: Average	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
353.92	100	Q	H	34.7	90*	55.3
403.072	120	Q	H	37.5	46**	8.5
452.21	100	Q	H	41.2	90*	48.8
486.62	100	Q	H	40.1	90*	49.9
614.42	100	Q	H	35.3	90*	54.7
4803.81	1000	A	V	52.95	54**	1.05
7205.71	100	A	V	55.35	90*	34.65
9607.62	100	A	V	57.36	90*	32.64

Highest Channel Emission

FREQUENCIES (MHz)	RBW (kHz)	Detector Q: Quasi-peak A: Average	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
353.92	100	Q	H	34.7	90*	55.3
403.072	120	Q	H	37.5	46**	8.5
452.21	100	Q	H	41.2	90*	48.8
486.62	100	Q	H	40.1	90*	49.9
614.42	100	Q	H	35.3	90*	54.7
4959.8	1000	A	V	53.51	54**	0.49
7439.72	1000	A	V	53.88	54**	0.12
9919.61	100	A	V	58.81	90*	31.19

* limit corresponding at 20 dB below the highest level produced by the intentional radiator.

** restricted bands of operation in 15.205, this limit corresponding at the 15.209 section.

Test conclusion:

RESPECTED STANDARD

16.APPENDIXES**Appendix 1: "CHANNEL SEPARATION BASE STATION"**

This appendix contains 2 pages.

Appendix 2: "CHANNEL SEPARATION HAND HELD TERMINAL"

This appendix contains 2 pages.

Appendix 3: "TIMING HOPPING AND TIMING CHANNEL BASE STATION"

This appendix contains 3 pages.

Appendix 4: "TIMING HOPPING AND TIMING CHANNEL HAND HELD TERMINAL"

This appendix contains 3 pages.

Appendix 5: "CONDUCTED EMISSIONS ON POWER SUPPLY"

This appendix contains 5 pages.

Appendix 6: "PHOTOGRAPHIES OF THE EQUIPMENT UNDER TEST"

This appendix contains 9 pages.

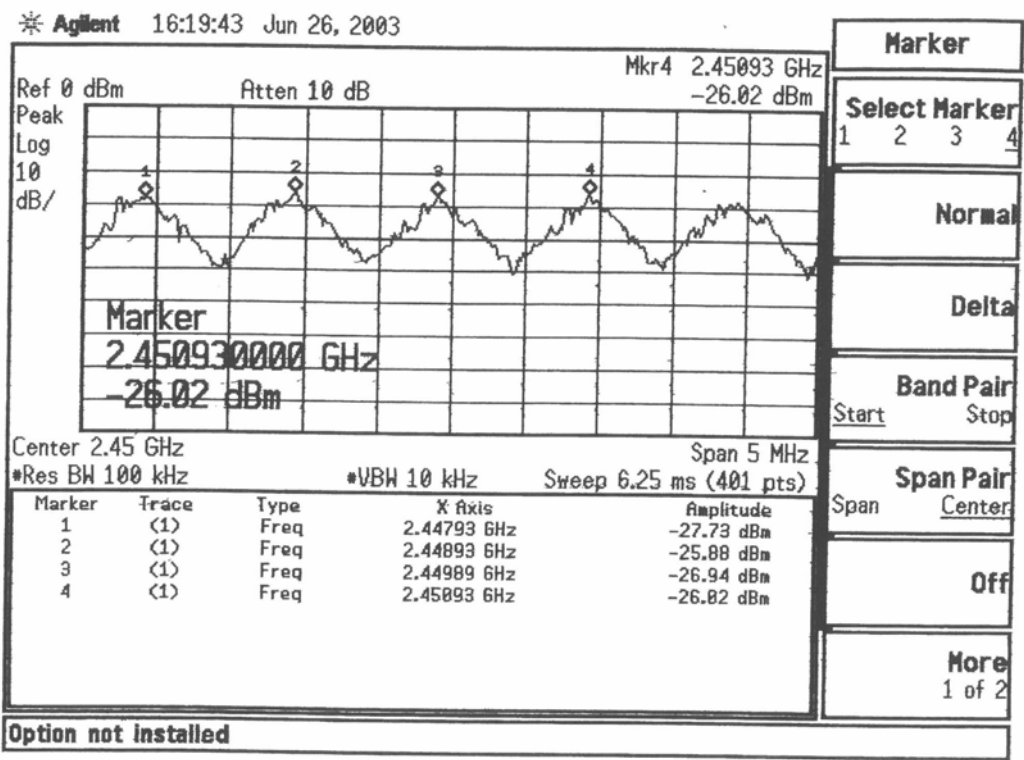
Appendix 7: "PHOTOGRAPHIES OPEN AREA AND SET UP"

This appendix contains 3 pages.

□□□ End of report, 7 appendixes to be forwarded □□□

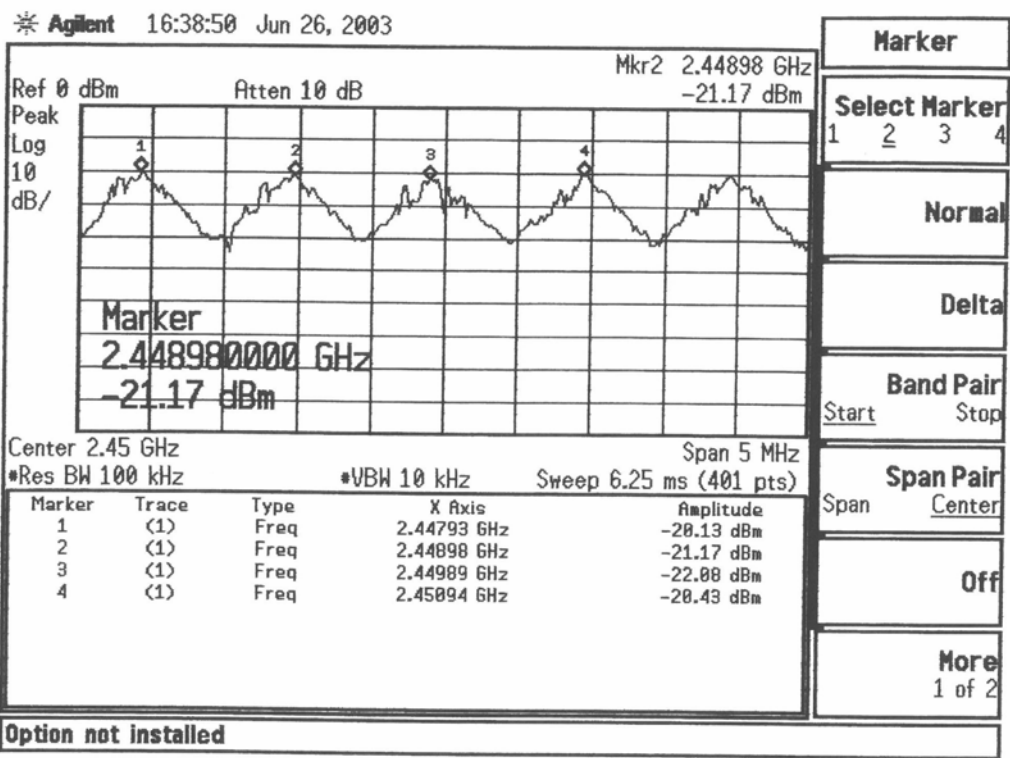
APPENDIX 1

CHANNEL SEPARATION BASE STATION



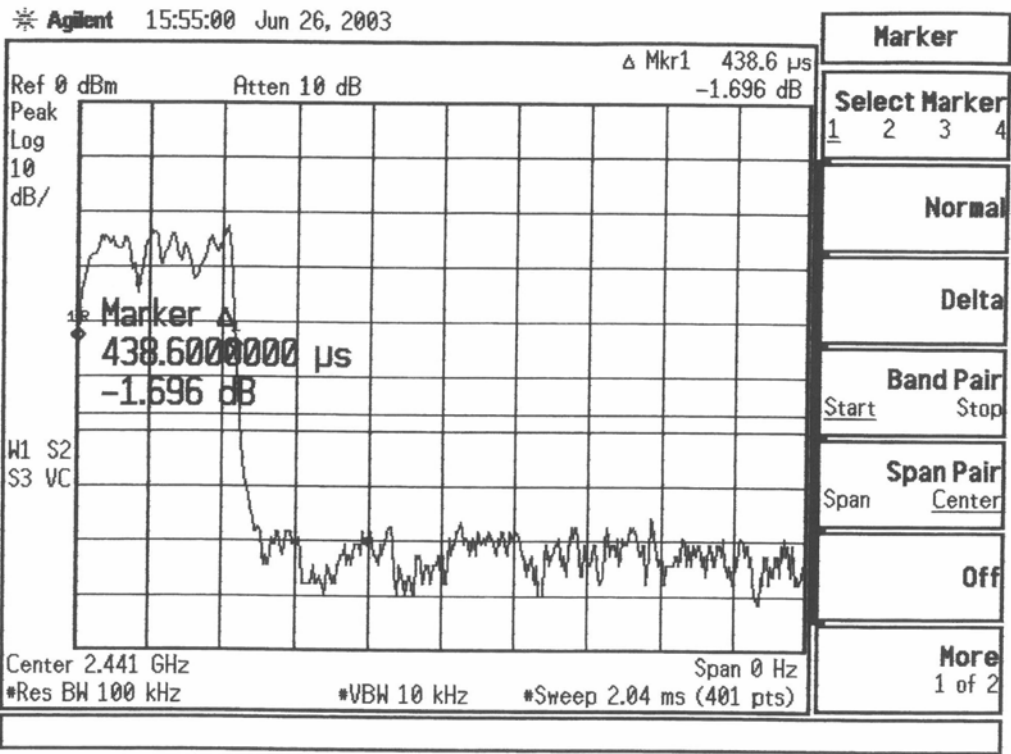
APPENDIX 2

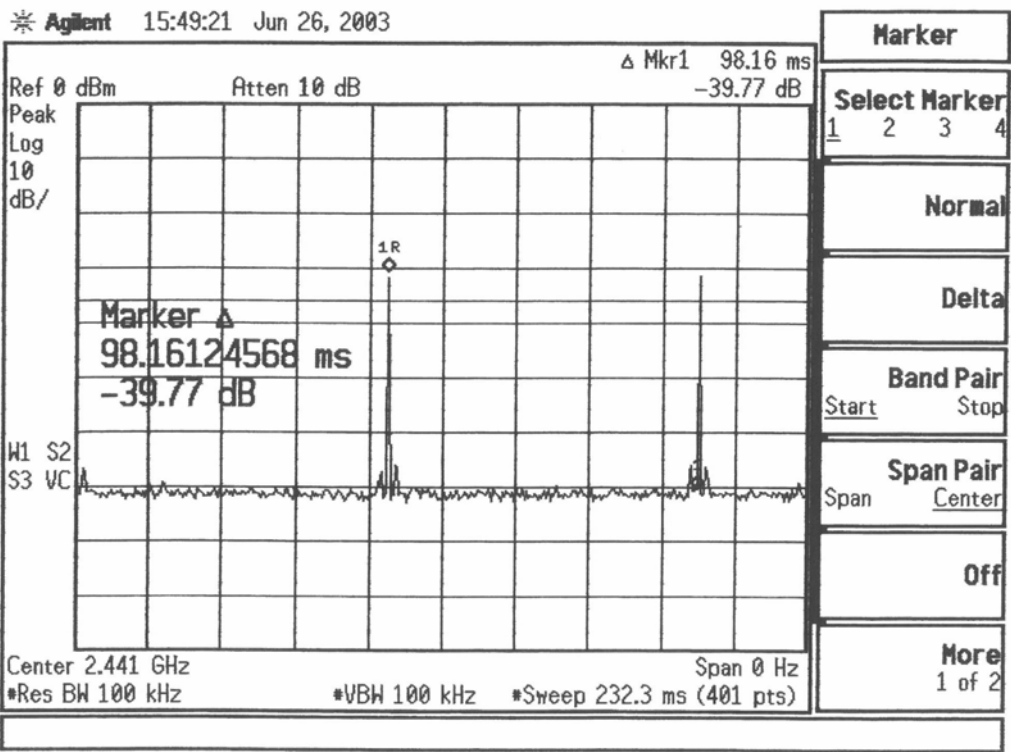
CHANNEL SEPARATION HAND HELD TERMINAL



APPENDIX 3

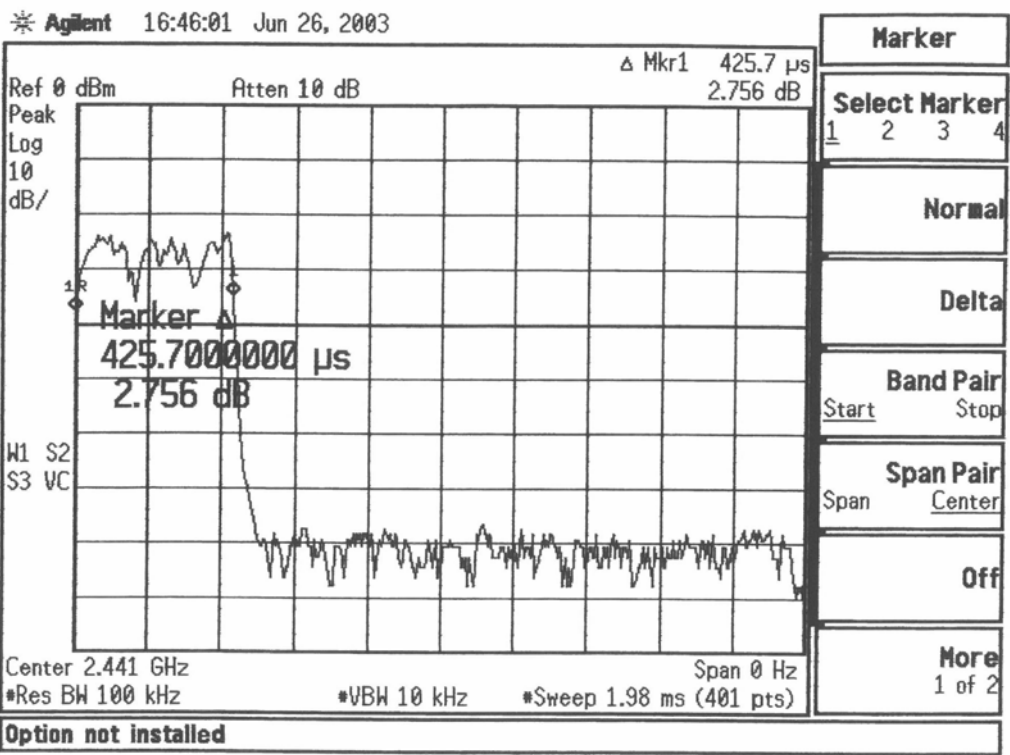
TIMING HOPPING AND TIMING CHANNEL BASE STATION

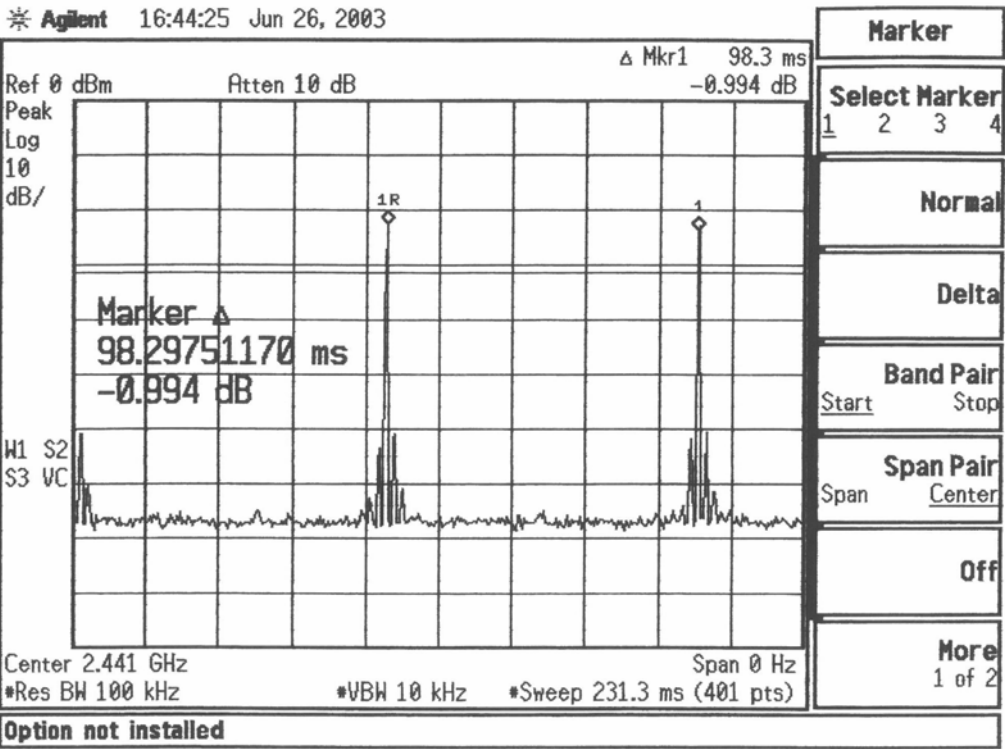




APPENDIX 4

TIMING HOPPING AND TIMING CHANNEL HAND HELD TERMINAL





APPENDIX 5

CONDUCTED EMISSION ON POWER SUPPLY

Curve 1

I7770 POINT OF SALE TERMINAL

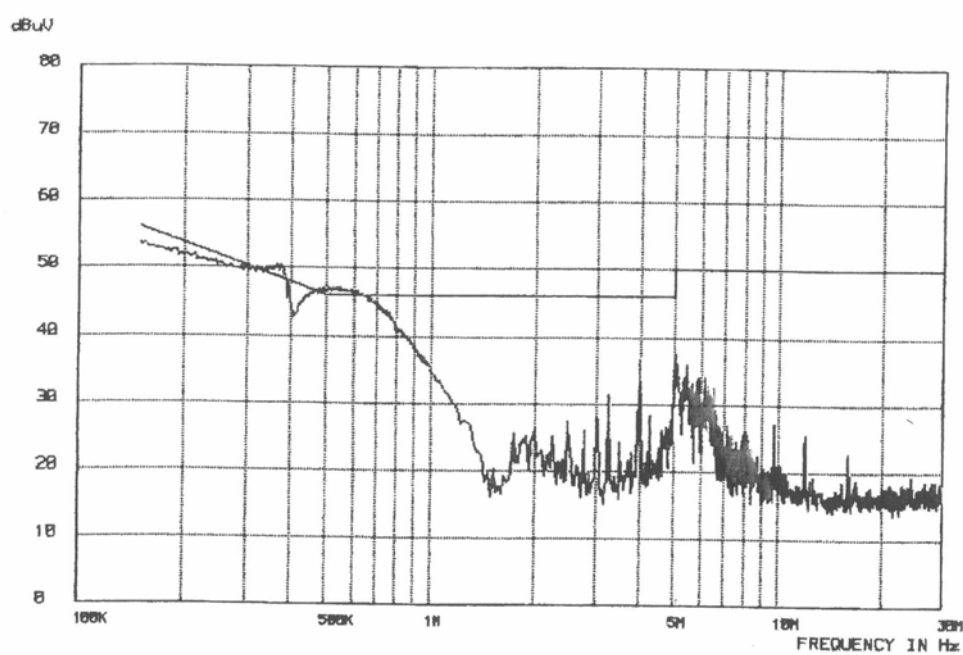
CONDUCTED EMISSIONS ON POWER SUPPLY

WIRE 1

PEAK DETECTION

IN COMMUNICATION

10/06/2003

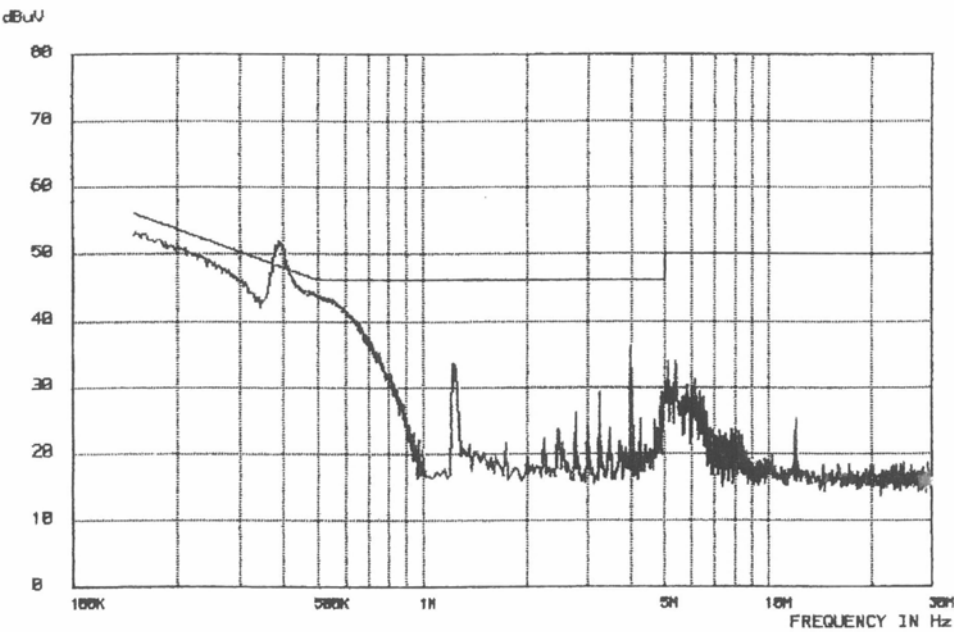


Fmin (MHz)	Fmax (MHz)	RBW (kHz)
.15	1	10
1	10	10
10	30	10

Curve 2

I7770 POINT OF SALE TERMINAL
CONDUCTED EMISSIONS ON POWER SUPPLY
WIRE 2
PEAK DETECTION
IN COMMUNICATION

10/06/2003

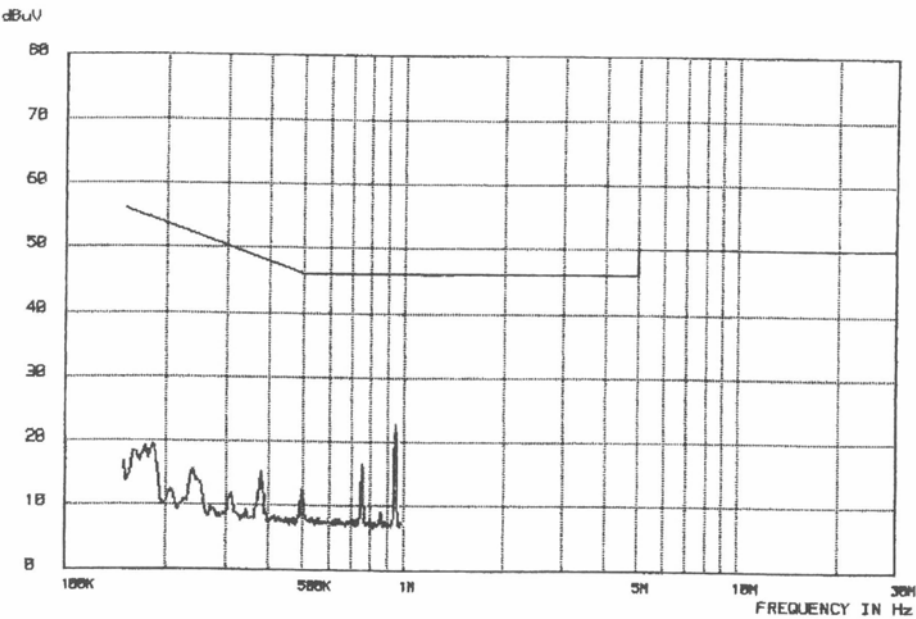


Fmin (MHz)	Fmax (MHz)	RBW (kHz)
.15	1	10
1	10	10
10	30	10

Curve 3

I7770 POINT OF SALE TERMINAL
CONDUCTED EMISSIONS ON POWER SUPPLY
WIRE 1
AVERAGE VALUE
IN COMMUNICATION

10/06/2003

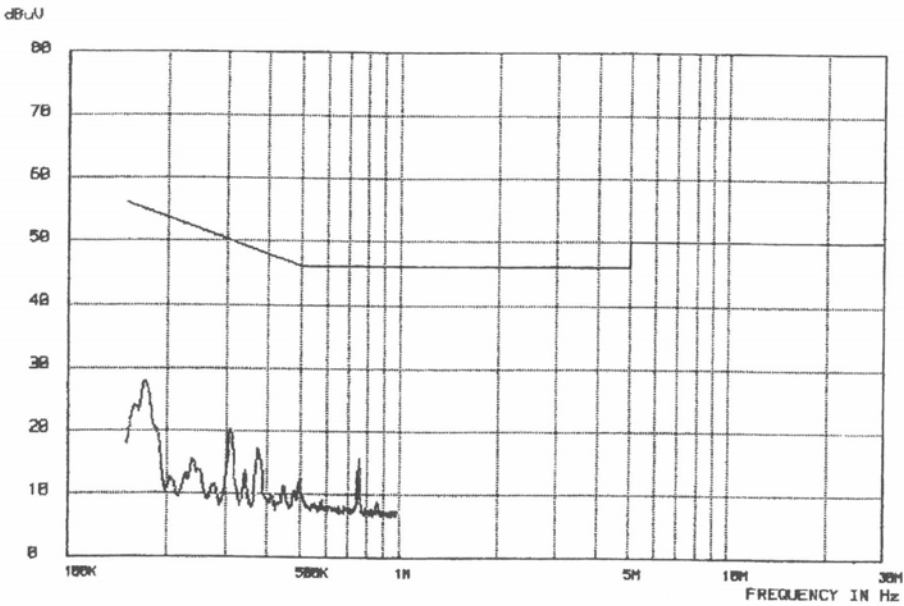


Fmin	Fmax	RBW
(MHz)	(MHz)	(kHz)
.15	1	10

Curve 4

I7770 POINT OF SALE TERMINAL
CONDUCTED EMISSIONS ON POWER SUPPLY
WIRE 2
AVERAGE VALUE
IN COMMUNICATION

10/06/2003



Fmin (MHz)	Fmax (MHz)	RBN (kHz)
.15	1	10