Standards Council of Canada
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Laboratoire accrédité
Portée d'accréditation 75

TM

Test Report:	5W39806
Applicant:	Hortau Inc. 840 Sainte-Therese, Suite 300 Quebec, Quebec G1N 1S7
Apparatus:	Hortimetre-P (M/N: HOR04183-P) and Hortimetre-M (M/N: HOR04183-M)
FCC ID:	S4THOR04183
In Accordance With:	FCC Part 15 Subpart C, 15.231 Periodic operation in the band 40.66-40.70MHz and above 70 MHz.
Tested By:	Nemko Canada Inc. 303 River Road Ottawa, Ontario K1V 1H2
Authorized By:	Sim Jagpal, Resource Manager
Date:	8 April 2005
Total Number of Pages:	25

Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C. Radiated tests were conducted is accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

The assessment summary is as follows:

Apparatus Assessed:	Hortimetre-P (M/N: HOR04183-P) and Hortimetre-M (M/N: HOR04183-M)
Specification:	FCC Part 15 Subpart C, 15.231
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Original Release

Author: Jason Nixon, Telecom Specialist

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

TABLE OF CONTENTS

Section 1 : Equipment Under Test

1.1 Product Identification

The Equipment Under Test was identified as follows:

Hortimetre-P (M/N: HOR04183-P) and
Hortimetre-M (M/N: HOR04183-M)

1.2 Samples Submitted for Assessment

The following samples of the apparatus have been submitted for type assessment:

Sample No.	Description	Serial No.
9	Hortimetre-M	03041020
10	Horitmetre-P	——
4	OMEGA HHM93 OMEGAETTE DMM	——
5	LZR ELECTRONICS SWITCHING POWER SUPPLY M/N LZUSD02001	——

The first samples were received on: February 22, 2005

1.3 Theory of Operation

The Hortimetre-M and P use identical RF circuits, the difference between the models is the chassis. The hortimetres periodically transmit a measurement, to a receiver, randomly between 2 and 7 minutes. The data contained in the transmission is the serial number and the measurements. The hortimetres can also be hardwired for reporting, with an external power supply. In this case the transmitter is disabled.

1.4 Technical Specifications of the EUT

Manufacturer:	Hortau Inc.
Operating Frequency:	418Mhz (fixed)
Emission Designator:	M1D
Radiated Power:	69.3dBuV/m @ 3m
Modulation:	Pulse Position Modulation
Antenna Data:	Antenna Factor, ANT-418-CW-QW
Antenna Connector:	Reverse Polarity SMA

Section 2 : Test Conditions

2.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.231

Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

2.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

2.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	15 – 30 ^{o}C
Humidity range	:	20 - 75 %
Pressure range	:	86 - 106 kPa
Power supply range	:	+/- 5% of rated voltages

2.4 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer	Hewlett-Packard	8564E	FA001367	June 28/04	June 28/05
Dipole Antenna Set	EMCO #1	3121C	FA000814	April 21/04	April 21/05
Spectrum Analyzer	Rohde & Schwarz	FSU	FA001877	May 26/04	May 26/05
Horn Antenna #1	EMCO	3115	FA000649	Dec. 22/04	Dec. 22/05
Log Periodic Antenna #1	EMCO	LPA-25	FA000477	Aug. 26/04	Aug. 26/05
1.0 – 2.0 GHz Amplifier	JCA	12-400	FA001498	June 18/04	June 18/05
2.0 – 4.0 GHz Amplifier	JCA	24-600	FA001496	June 18/04	June 18/05
4.0 – 8.0 GHz Amplifier	JCA	48-600	FA001497	June 18/04	June 18/05

Section 3 : Observations

3.1 Modifications Performed During Assessment

The following modification was performed during this assessment:

3.1.1 Modification 1

As originally submitted the EUT was found to be non-compliant with 15.231(e). The duty cycle of each bit was changed to 0.4msec on and 900msec total bit time. Also a 430ohm resistor was added between pin 3 and 4 and removing pin 4 from ground of the RF IC. Following this modification the apparatus was found to be fully compliant.

3.2 Record Of Technical Judgements

The following technical judgements were made during this assessment:

3.2.1 Technical Judgement 1

The Hortimetre-P and Hortimetre-M use the same software and RF circuits. However the enclosures are different between the two models, therefore testing for conducted and radiated emissions was performed on each model.

3.2.2 Technical Judgement 2

The conducted emissions were performed for both units, however the transmitter is disabled whenever the external power supply is detected.

3.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

3.4 Test Deleted

No Tests were deleted from this assessment.

Section 4 : Results Summary

This section contains the following:

FCC Part 15 Subpart C : Test Results

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N	No : not applicable / not relevant.
Y	Yes : Mandatory i.e. the apparatus shall conform to these tests.
N/T	Not Tested, mandatory but not assessed. (See section 3.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus in their final modified state.

4.1 FCC Part 15 Subpart C : Test Results

Part 15	Test Description	Required	Result
15.207(a)	Powerline Conducted Emissions	Y	PASS
15.209(a)	Radiated Emissions within Restricted Bands	Y	PASS*
15.231(a)(1)	Manually operated transmitter	N	
15.231(a)(2)	Automatically activated transmitter	N	
15.231(a)(3)	Periodic transmissions at regular predetermined intervals	N	
15.231(a)(4)	Radiators used in cases of emergency	N	
15.231(a)(5)	Set-up information for security systems	N	
15.231(b)	Radiated Emissions	N	
15.231(c)	20dB Bandwidth	Y	PASS
15.231(d)	Devices operating within the frequency band 40.66-40.70 MHz	N	
15.231(e)	Radiated emissions for Periodic radiators	Y	PASS

Notes:

1) The EUT can be powered by a DC power supply and transmit a DC reading, but during this type of operation the Transmitter would be turned off. Otherwise the Transmitter is 3VDC battery powered.
2) The EUT periodically transmits, therefore the requirements of 15.231(a) do not apply.

* No emissions were detected in the restricted bands.

Appendix A : Test Results

Criteria: Clause 15.207(a) Powerline Conducted Emissions

Frequency of Conducted limit (dBmV)

Emission (MHz)	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

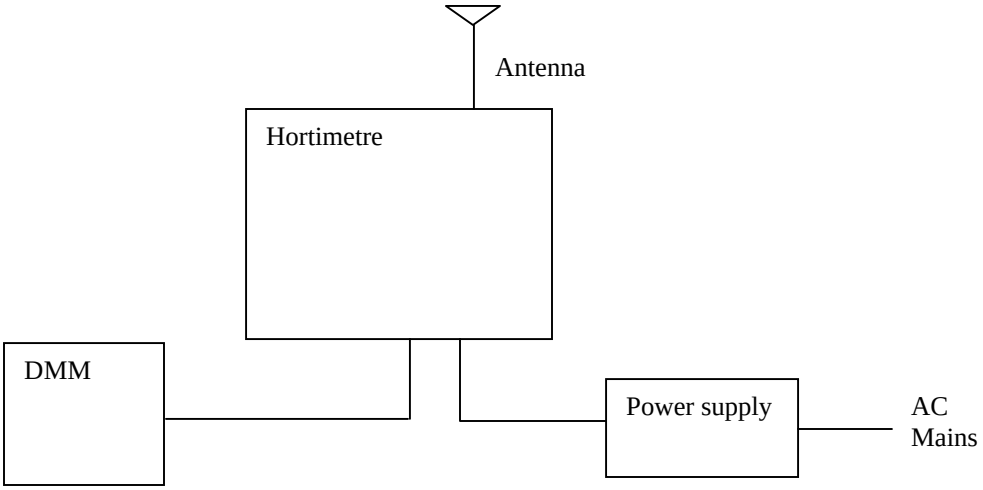
* Decreases with the logarithm of the frequency.

Test Conditions:

Sample Number:	9 and 10	**Temperature:**	22
Date:	February 24, 2005	**Humidity:**	30
Modification State:	0	**Tester:**	Jason Nixon
		Laboratory:	Shield Room

Test Results: See Attached Plots and Tables.

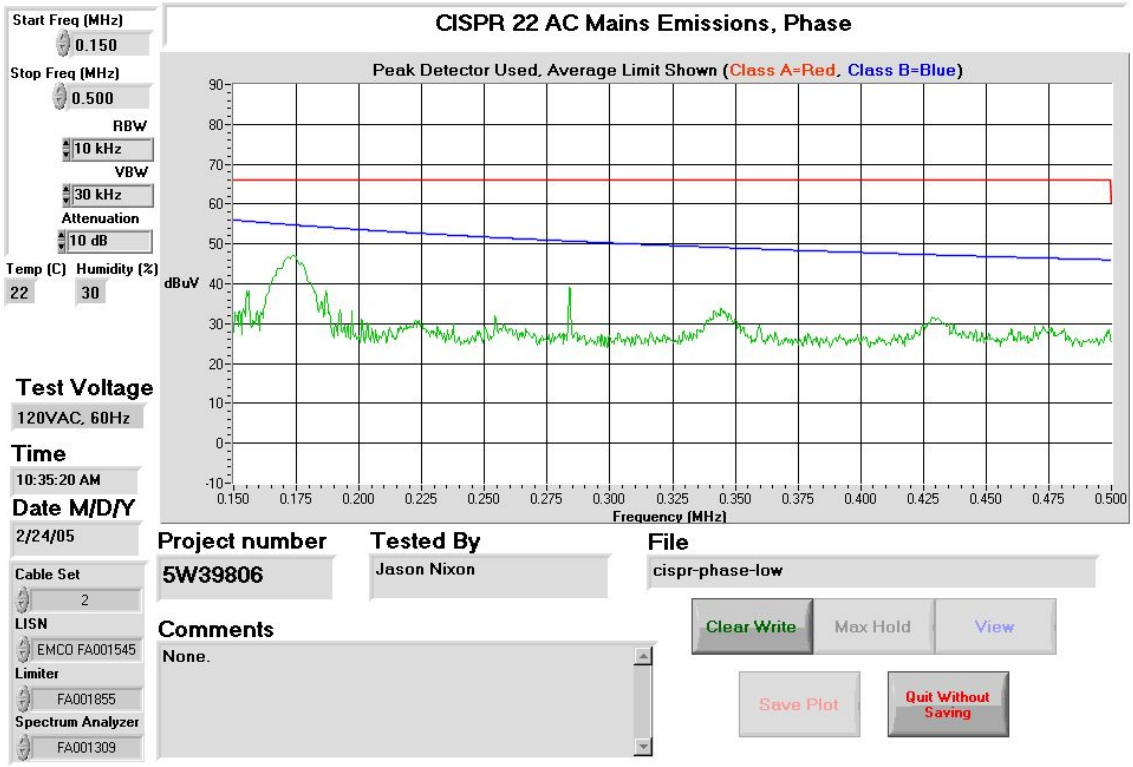
Block Diagram of Test Setup:

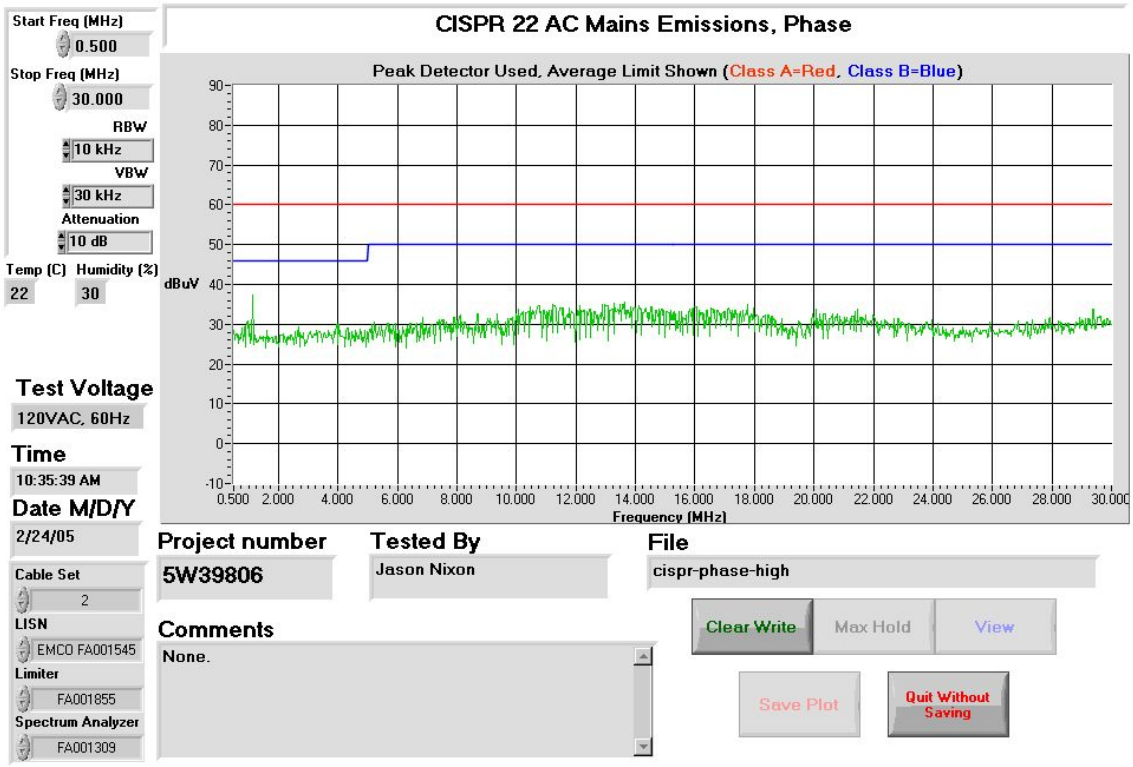


Additional Observations:

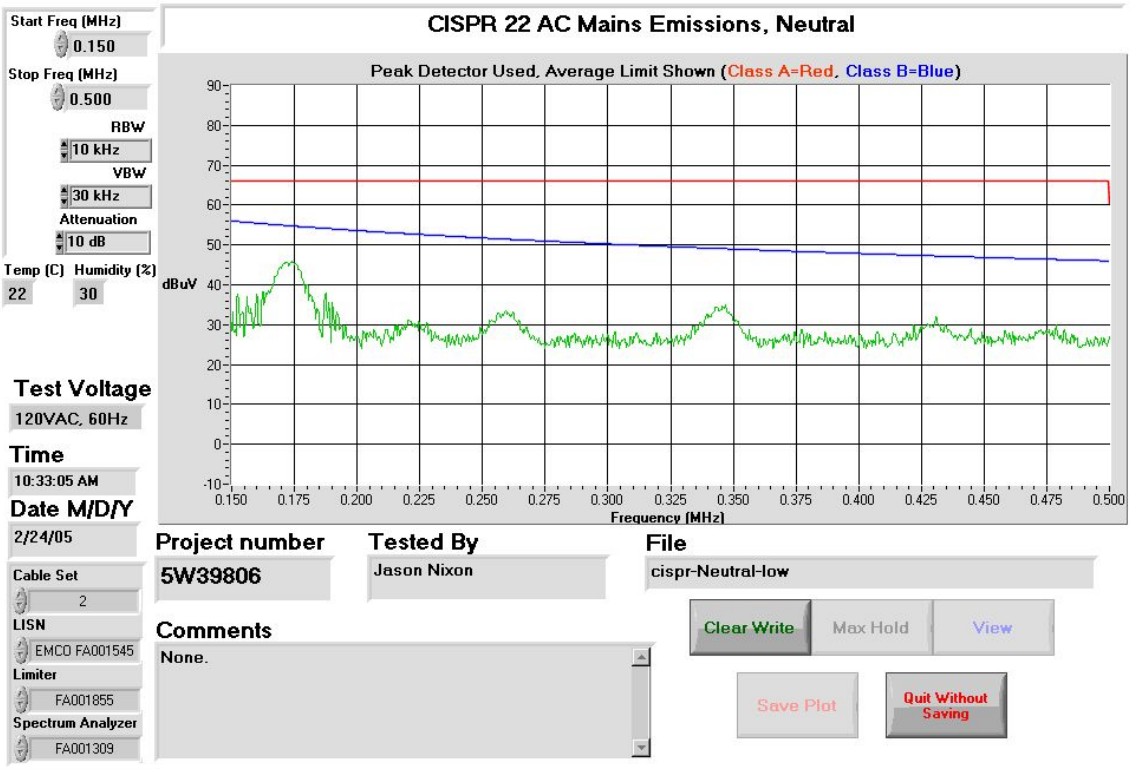
Plots are taken using a peak detector and compared to the Quasi-peak and average limits. At points over the limit the values in the Tables are measured using Quasi-peak and average detectors to show compliance.

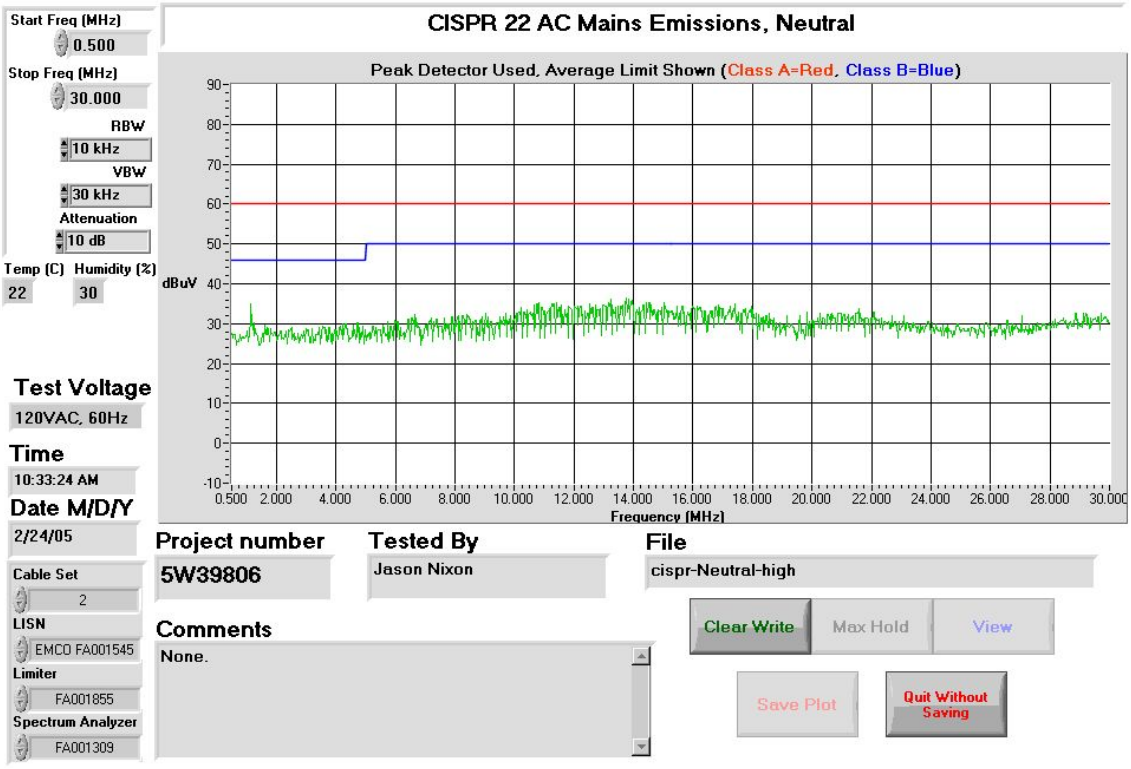
Hortimetre-P
Phase



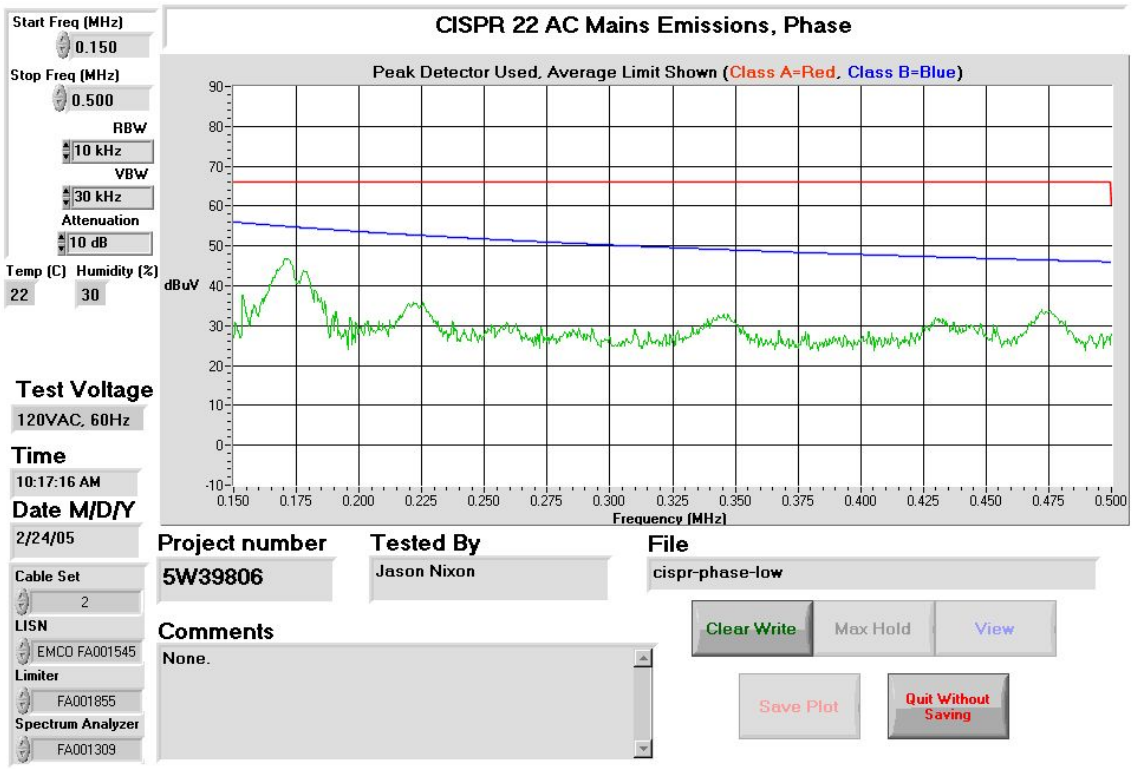


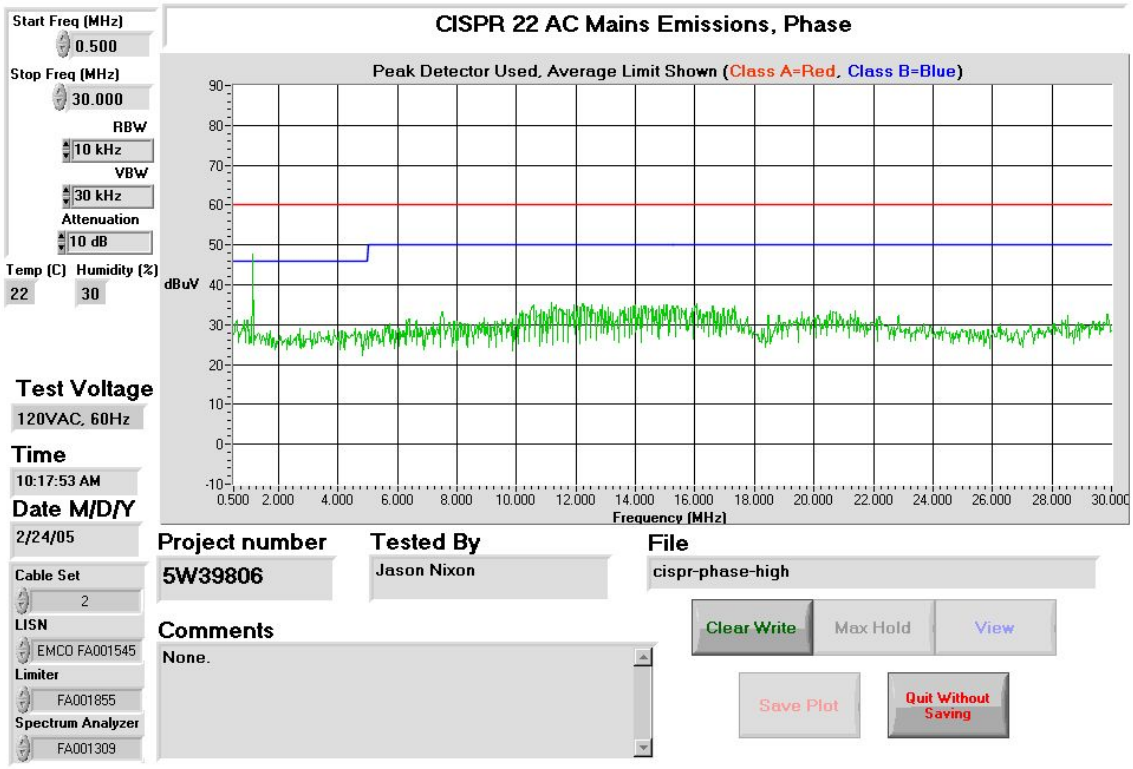
Neutral


CISPR 22 AC Mains Emissions, Neutral
Peak Detector Used, Average Limit Shown (Class A=Red, Class B=Blue)
Start Freq (MHz) 0.150
Stop Freq (MHz) 0.500
RBW 10 kHz
VBW 30 kHz
Attenuation 10 dB
Temp (C) 22
Humidity (%) 30
Test Voltage 120VAC, 60Hz
Time 10:33:05 AM
Date M/D/Y 2/24/05
Cable Set 2
LISN EMCO FA001545
Limiter FA001855
Spectrum Analyzer FA001309
dBuV
Frequency (MHz)
Project number 5W39806
Tested By Jason Nixon
File cispr-Neutral-low
Comments None.
Clear Write
Max Hold
View
Save Plot
Quit Without Saving

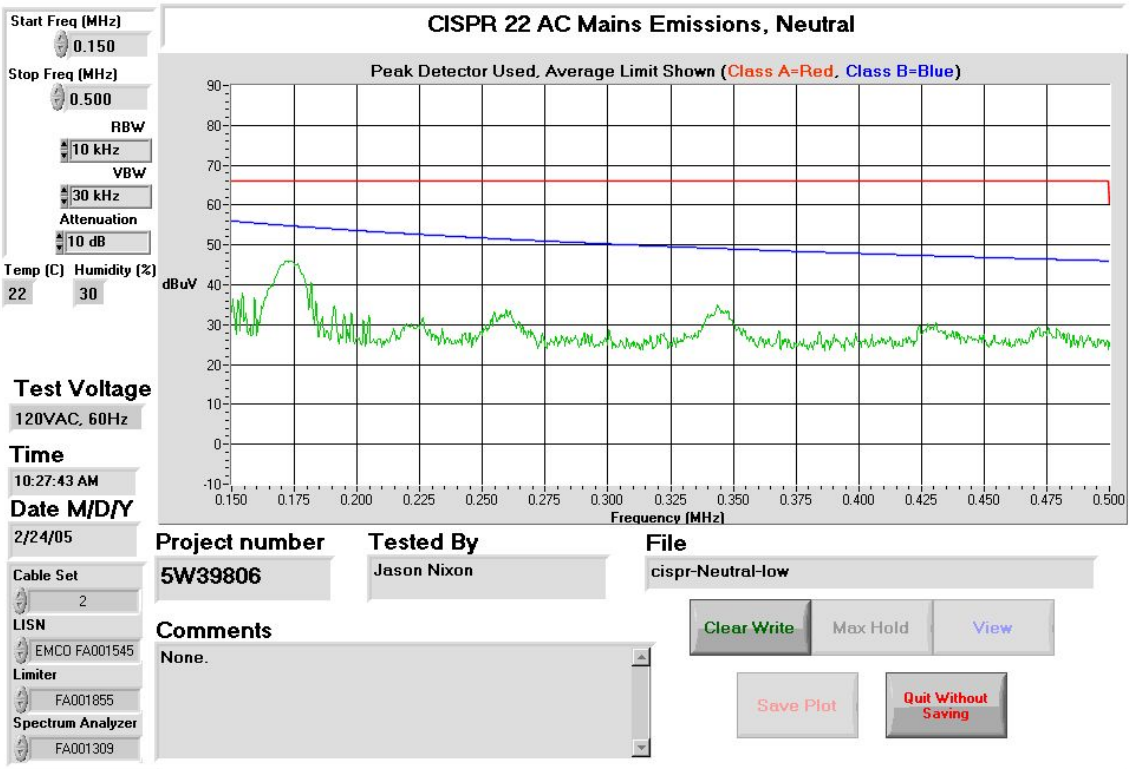

CISPR 22 AC Mains Emissions, Neutral
Peak Detector Used, Average Limit Shown (Class A=Red, Class B=Blue)
Start Freq (MHz) 0.500
Stop Freq (MHz) 30.000
RBW 10 kHz
VBW 30 kHz
Attenuation 10 dB
Temp (C) 22
Humidity (%) 30
Test Voltage 120VAC, 60Hz
Time 10:33:24 AM
Date M/D/Y 2/24/05
Cable Set 2
LISN EMCO FA001545
Limiter FA001855
Spectrum Analyzer FA001309
dBuV
Frequency (MHz)
Project number 5W39806
Tested By Jason Nixon
File cispr-Neutral-high
Comments None.
Clear Write
Max Hold
View
Save Plot
Quit Without Saving

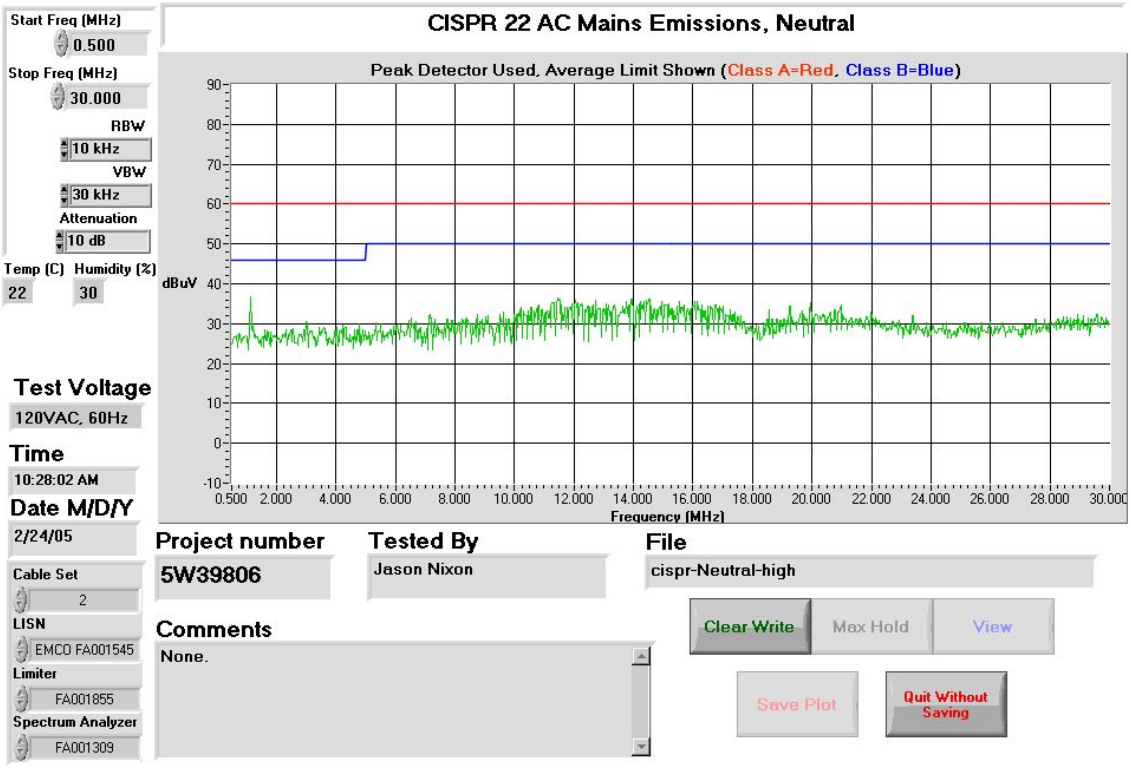
Hortimtre-M
Phase





Neutral


Start Freq (MHz)
0.150
Stop Freq (MHz)
0.500
RBW
10 kHz
VBW
30 kHz
Attenuation
10 dB
Temp (C)
22
Humidity (%)
30
Test Voltage
120VAC, 60Hz
Time
10:27:43 AM
Date M/D/Y
2/24/05
Cable Set
2
LISN
EMCO FA001545
Limiter
FA001855
Spectrum Analyzer
FA001309
CISPR 22 AC Mains Emissions, Neutral
Peak Detector Used, Average Limit Shown (Class A=Red, Class B=Blue)
dBuV
Frequency (MHz)
Project number
5W39806
Tested By
Jason Nixon
File
cispr-Neutral-low
Comments
None.
Clear Write
Max Hold
View
Save Plot
Quit Without Saving


Start Freq (MHz)
0.500
Stop Freq (MHz)
30.000
RBW
10 kHz
VBW
30 kHz
Attenuation
10 dB
Temp (C)
22
Humidity (%)
30
Test Voltage
120VAC, 60Hz
Time
10:28:02 AM
Date M/D/Y
2/24/05
Cable Set
2
LISN
EMCO FA001545
Limiter
FA001855
Spectrum Analyzer
FA001309
CISPR 22 AC Mains Emissions, Neutral
Peak Detector Used, Average Limit Shown (Class A=Red, Class B=Blue)
dBuV
Frequency (MHz)
Project number
5W39806
Tested By
Jason Nixon
File
cispr-Neutral-high
Comments
None.
Clear Write
Max Hold
View
Save Plot
Quit Without Saving

Hortimetre-M

	Conductor	Frequency (MHz)	Detector	Emission Level (dBuV)	LISN Loss (dB)	Cable Loss (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	Phase	1.1170	Quasi Peak	20.9	0.00	0.00	20.90	56.0	35.1
			Average	19.5	0.00	0.00	19.50	46.0	26.5
2	Phase	14.2600	Quasi Peak	31.0	0.20	0.00	31.20	60.0	28.8
			Average	28.2	0.20	0.00	28.40	50.0	21.6
3	Phase	0.1719	Quasi Peak	44.2	0.00	0.00	44.20	64.9	20.7
			Average	26.2	0.00	0.00	26.20	54.9	28.7
4	Phase	0.3441	Quasi Peak	26.6	0.00	0.00	26.60	59.1	32.5
			Average	25.7	0.00	0.00	25.70	49.1	23.4

Criteria: Clause 15.231(c) 20dB Bandwidth

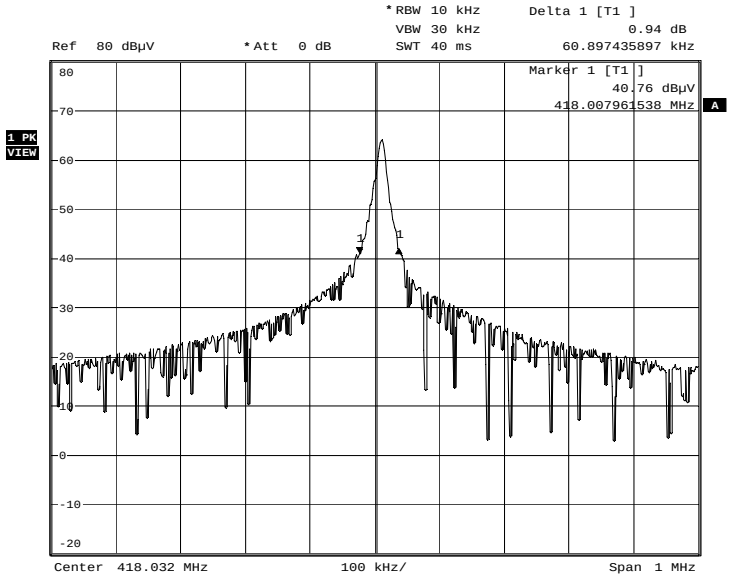
The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Conditions:

Sample Number:	9 and 10	**Temperature:**	24
Date:	March 10, 2005	**Humidity:**	12
Modification State:	1	**Tester:**	Jason Nixon
		Laboratory:	Wireless

Test Results:

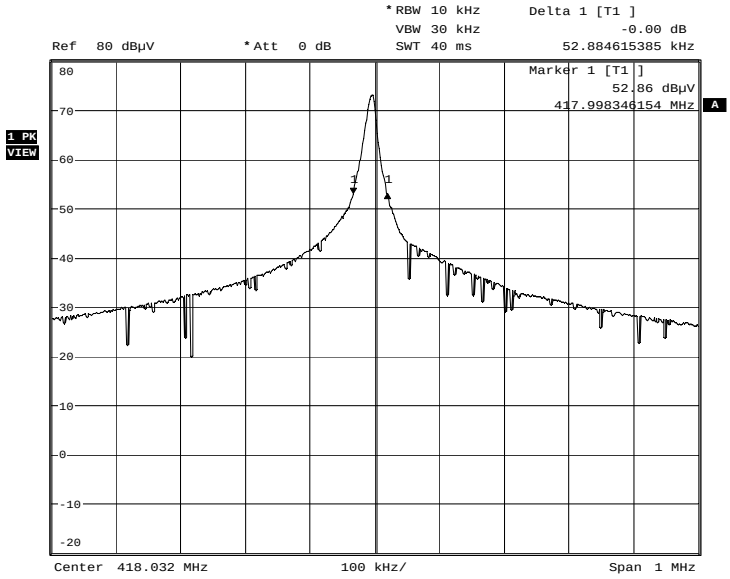
20dB Bandwidth of Hortometer-m:



20dB Bandwidth

Date: 10.MAR.2005 08:23:16

20dB Bandwidth of Hortometer-p:



20dB Bandwidth

Date: 10.MAR.2005 08:18:58

Criteria: Clause 15.231(e) Radiated emissions for Periodic radiators

Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1,500	50 to 150
174-260	1,500	150
260-470	1,500 to 5,000	150 to 500
Above 470	5,000	500

In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

Test Conditions:

Sample Number:	9 and 10	**Temperature:**	10
Date:	March 9, 2004	**Humidity:**	43
Modification State:	1	**Tester:**	Jason Nixon
		Laboratory:	OATS

Test Results:

See Attached Table for Results

Additional Observations:

The Spectrum was searched from 30MHz to the 10th Harmonic.

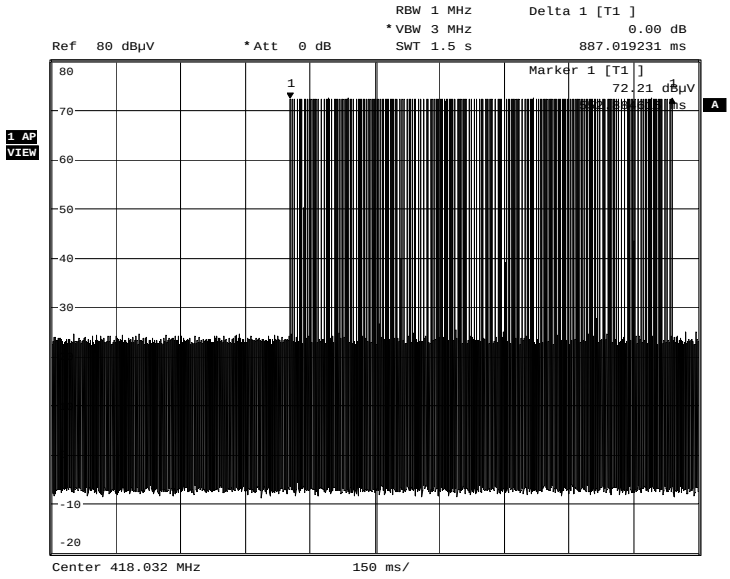
The EUT was measured on three orthogonal axis.

The EUT was tested with a fresh set of batteries.

Results found to be 20dB or greater under the limit have not been included.

Measurement equipment was set up to use 100kHz RBW/VBW when measuring below 1GHz and 1MHz RBW/VBW when measuring above 1GHz.

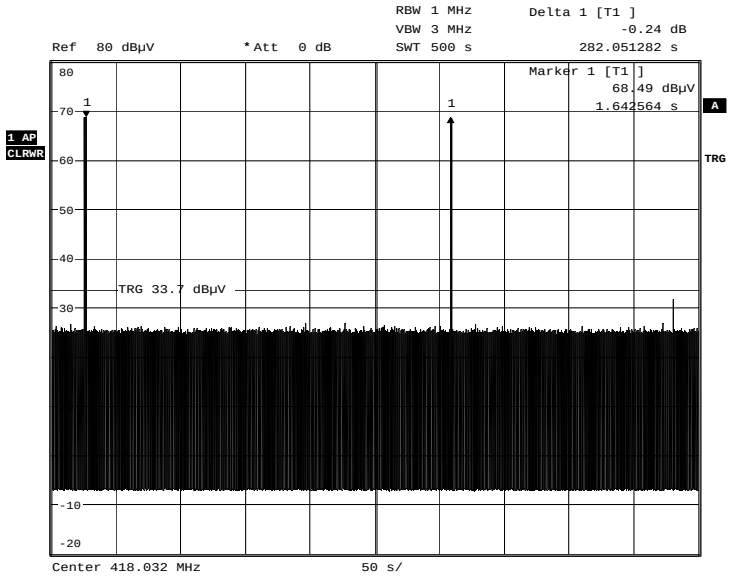
Data burst On-Time:



Time of One Data Burst

Date: 10.MAR.2005 08:05:27

Time between Data bursts:



Time between bursts

Date: 10.MAR.2005 08:42:41

The EUT transmits periodically between 2 minutes and 7 minutes. At the lowest time of 2 minutes or 120sec is greater than 26.6sec (30 x Data Burst time).

Freq. (MHz)	Ant	Pol. V/H	RCVD Signal (dBμV)	Ant. Factor (dB)	Amp. Gain (dB)	Duty Cycle Corr. (dB)	Cable Loss (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)
Hortimetre-P										
418.032	ED4	V	65.3	21.0	-	-19.6	2.6	69.3	72.3	3.0
418.032	ED4	H	50.0	21.0	-	-19.6	2.6	54.0	72.3	18.3
Hortimetre-M										
418.032	ED4	V	61.5	21.0	-	-19.6	2.6	65.5	72.3	6.8
418.032	ED4	H	50.3	21.0	-	-19.6	2.6	54.3	72.3	18.0

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole
Note 2: Positive Peak detector used

Duty Cycle:

Duty cycle = 20 log (on-time/100msec) = -19.6dB

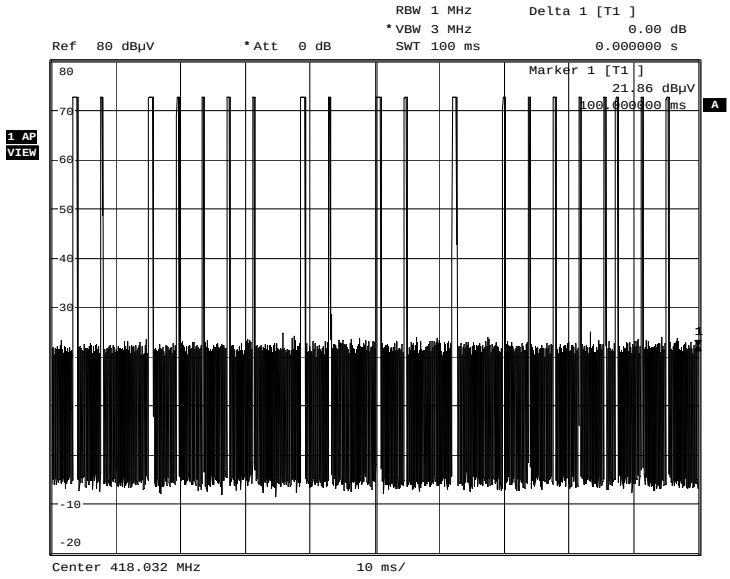
On-time = 25.5 pulses in 100msec.(25.5 = 100msec/3.926msec time for each bit of data)

Worst case pulse stream = 1 sync pulse + 24.5 one's or zero's, the EUT used pulse position modulation, therefore, on-time for a one or a zero is the same.

On-time of 1 sync pulse = 1.755msec

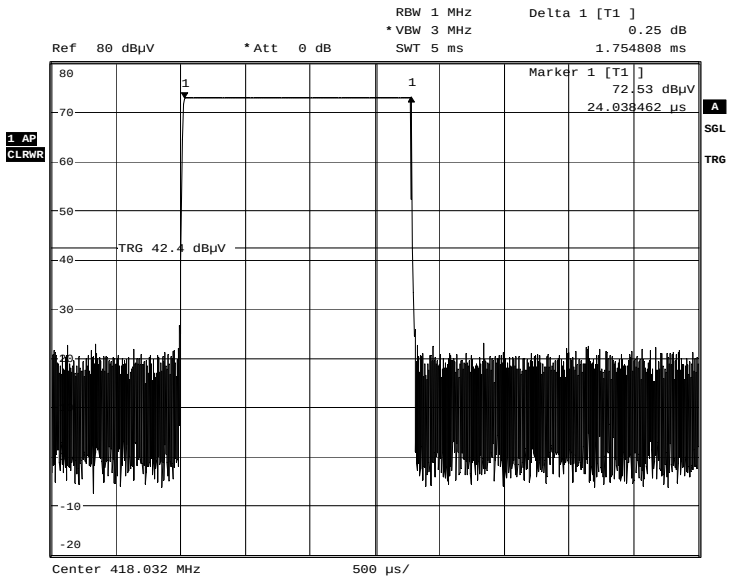
On-time of one's and zero's = 0.353msec

Therefore, worst case on-time = 10.404msec



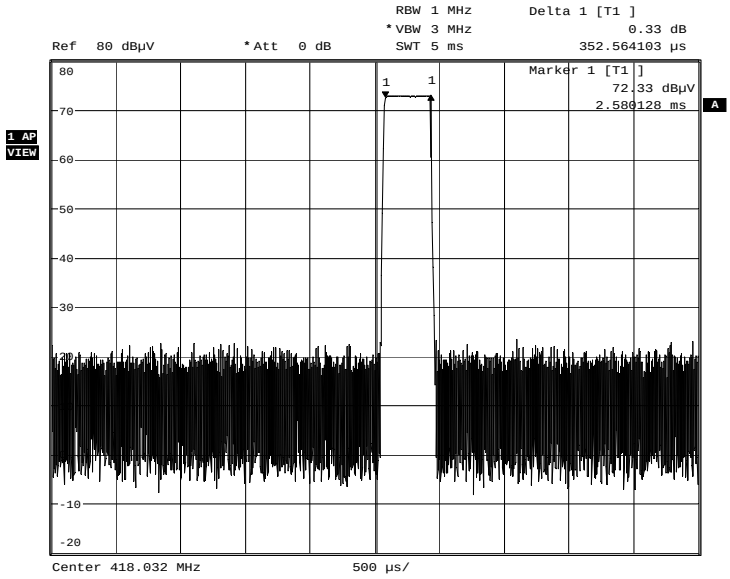
Number of Bits per 100msec

Date: 10.MAR.2005 08:07:40



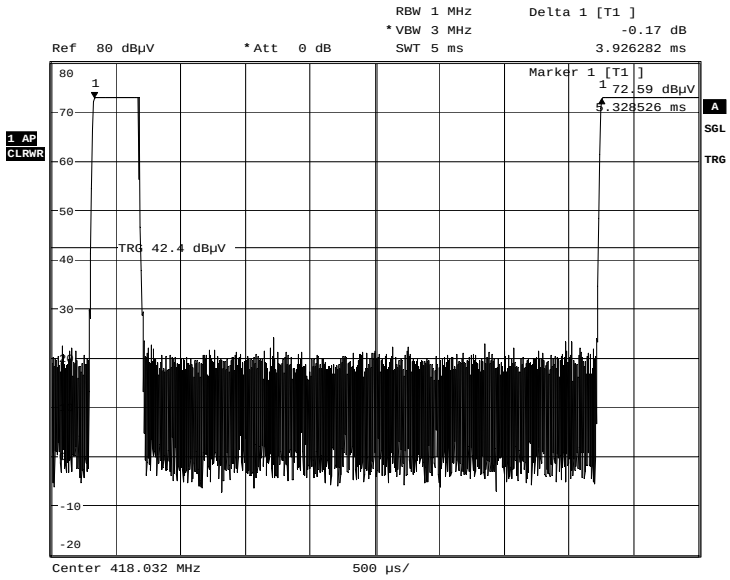
On-time of sync pulse

Date: 10.MAR.2005 08:13:19



On-time per bit

Date: 10.MAR.2005 08:09:44



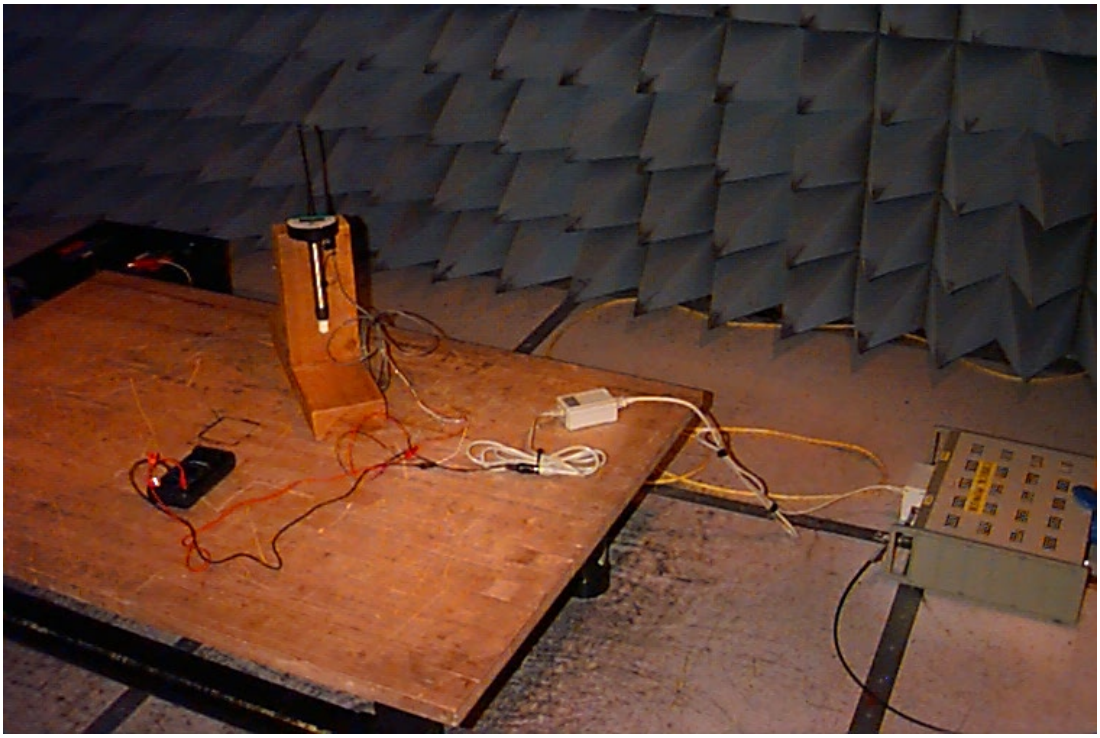
Total bit time

Date: 10.MAR.2005 08:14:56

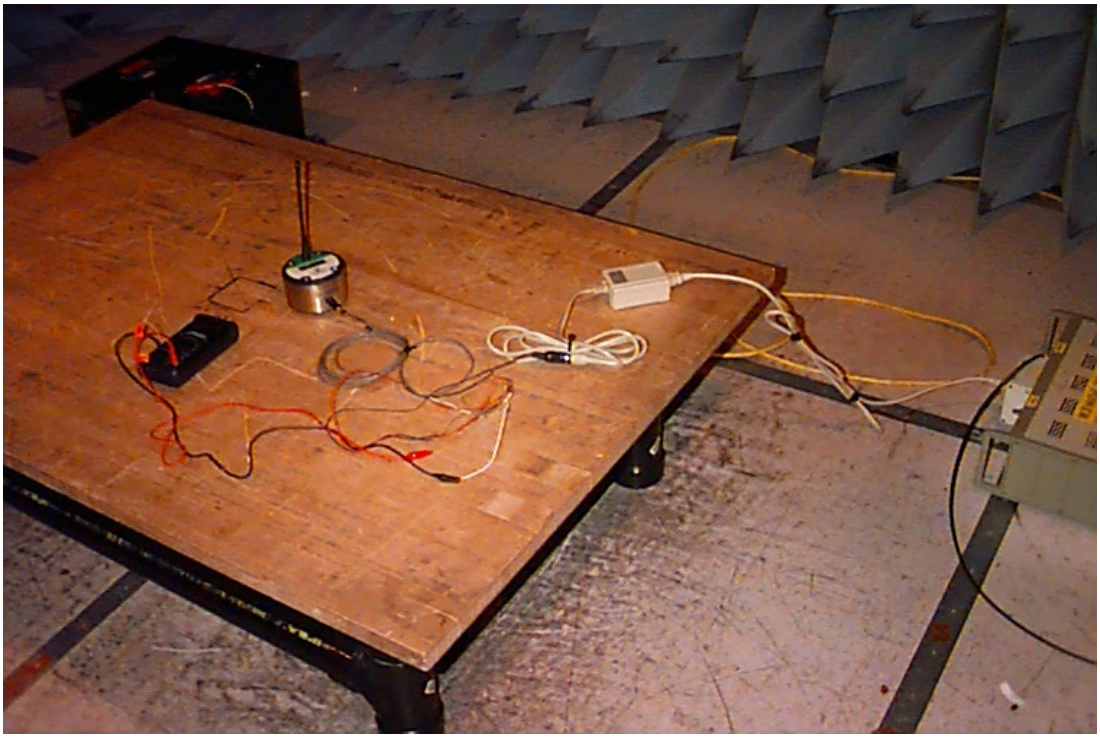
Appendix B : Setup Photographs

Conducted Emissions Setup:

Hortimetre-P

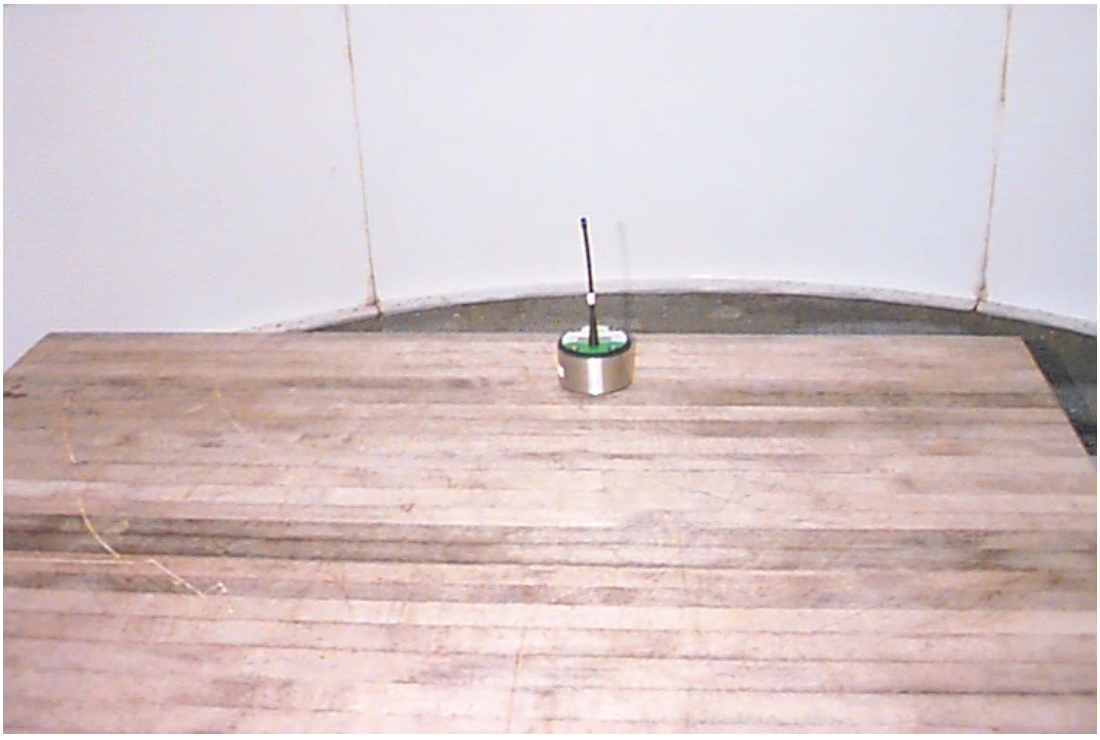


Hortimetre-M



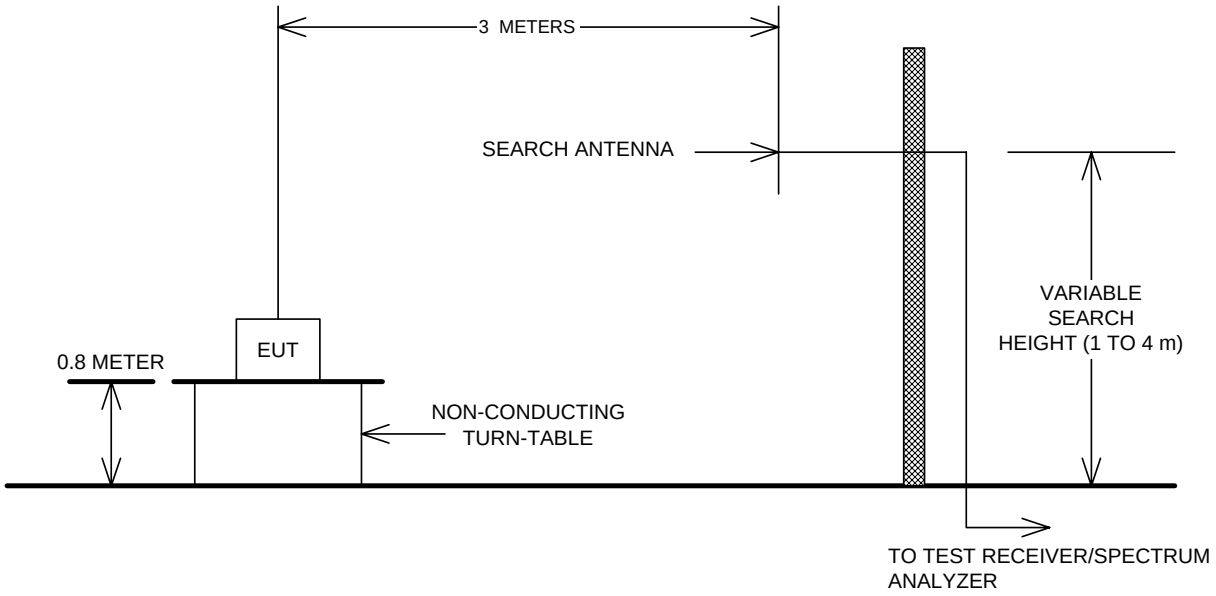
Spurious Emissions Setup:
Hortimetre-P

Horitmetre-M



Appendix C : Block Diagram of Test Setups

Test Site For Radiated Emissions



Conducted Emissions