

THRU Lab & Engineering.

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THRU

Test Report

Product Name: GMRS/FRS Combination

MODEL NO: GMRS7015RC

FCC ID: U32GMRS7015

Applicant:

TTI International Limited
Unit 1106-1110, 11/F., Star House, 3 Salisbury Road,
Tsimshatsui, Kowloon, HongKong

Date Receipt: 02/27/2007

Date Tested: 03/08/2007

APPLICANT: TTI International Limited
FCC ID: U32GMRS7015
REPORT : THRU-703006

cover

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APPLICANT: TTI INTERNATIONAL LIMITED

FCC ID: U32GMRS7015

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SCHEMATICS
INSTRUCTION MANUAL
SAMPLE OF FCC ID LABEL AND SKETCH OF LOCATION
TEST SETUP PHOTOS
EXTERNAL PHOTOS
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CIRCUIT DESCRIPTION

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TEST Equipment List

No	Description	Manufacturer	Model No.	Serial No.	Due Cal.
1	Test Receiver	Rohde & Schwarz	ESVS10	830489/001	2007.04.23
2	Test Receiver	Rohde & Schwarz	ESHS 10	825832/014	2007.08.25
3	Test Receiver	Rohde & Schwarz	ESVS 10	826008/014	2006.05.24
4	Spectrum Analyzer	Hewlett Packard	8566B	2311A02394	2007.06.17
5	Spectrum Display	Hewlett Packard	85662A	2542A12429	2007.06.17
6	Quasi-peak Adapter	Hewlett Packard	85650A	2521A00887	2007.06.17
7	RF Preselector	Hewlett Packard	85685A	2648A00504	2007.06.17
8	Preamplifier	Hewlett Packard	8449B	3008A00375	2007.04.23
9	Preamplifier	Hewlett Packard	8447F	3113A05367	2007.05.09
10	Preamplifier	Hewlett Packard	8447F	2805A02570	2005.12.12
11	Preamplifier	A.H. Systems	PAM-0118	164	2007.04.01
12	Biconical Antenna	Eaton Corp.	94455-1	0977	2007.04.01
13	Biconical Antenna	EMCO	3104C	9111-2468	2006.06.07
14	Log Periodic Antenna	EMCO	3146	2051	2007.05.11
15	Log Periodic Antenna	EMCO	3146	8901-2320	2006.03.28
16	Horn Antenna	A.H. Systems	SAS-571	414	2007.03.17
17	Horn Antenna	A.H. Systems	SAS-571	781	2006.01.07
18	Loop Antenna	Rohde & Schwarz	HFH2-Z2.335.4711.52	826532/006	2007.01.31
19	Dipole Antenna	Rohde & Schwarz	VHAP	574	2007.12.12
20	Dipole Antenna	Rohde & Schwarz	VHAP	575	2007.12.12
21	Dipole Antenna	Rohde & Schwarz	UHAP	546	2007.12.12
22	Dipole Antenna	Rohde & Schwarz	UHAP	547	2007.12.12

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23	Signal Generator	Rohde & Schwarz	SMS	872165/100	2006.04.23
24	Signal Generator	Rohde & Schwarz	SMX	825459/030	2007.06.15
25	Spectrum Monitor	Rohde & Schwarz	EZM	862304/007	None
26	Panorama Monitor	Rohde & Schwarz	EPN	883707/207	None
27	Spectrum Analyzer	Advantest Corp.	R3261C	61720208	2007.06.05
28	Spectrum Analyzer	Hewlett Packard	8591A	3205A02641	2007.12.12
29	LISN	EMCO	3825/2	9111-1912	2007.12.12
30	LISN	Solar	8012-50-R-24	8379121	2007.04.25
31	LISN	Kyoritsu	KNW-242	8-923-2	2007.05.28
32	Plotter	Hewlett Packard	7475A	2210A02802	None
33	Modulation Analyzer	Hewlett Packard	8901B	3438A05094	2007.05.19
34	Waveform Generator	Hewlett Packard	33120A	US34001190	2007.05.23
35	Audio analyzer	Hewlett Packard	8903B	3011A12915	2007.05.23
36	Universal counter	Hewlett Packard	5343A	3020A02978	2007.05.23
37	Frequency Counter	Tektronic	CMC251	TW52489	2007.04.23
38	Temperature & Humidity Chamber	TABAI EZPEC CORP.	MC711P	112000492	2006.08.27
39	Antenna Mast	EMCO	1070-3	9109-1617	None
40	Turn Table	EMCO	1080-1,2	9203-1762	None
41	Positioning Controller	EMCO	1090	9111-1054	
42	Antenna Power Supply	Rohde & Schwarz	HZ-9	920127	None
43	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	881052	None
44	Coaxial Take-up Reel	EMCO	100817	9109-1684	None

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TEST PROCEDURE

GENERAL: This report shall NOT be reproduced except in full without the written approval of THRU LAB & ENGINEERING.

RADIATION INTERFERENCE: The test procedure used was ANSI STANDARD C63.4-2003 using a HEWLETT PACKARD spectrum analyzer with a preselector. The bandwidth of the spectrum analyzer was 100 kHz with an appropriate sweep speed. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100kHz and the video bandwidth was 300kHz. The ambient temperature of the UUT was 9.4 with a humidity of 82%.

FORMULA OF CONVERSION FACTORS: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer.

The antenna correction factors are stated in terms of dB. The gain of the Preselector was accounted for in the Spectrum Analyzer Meter Reading.

Example:

$$\text{Freq (MHz) METER READING} + \text{ACF} = \text{FS}$$
$$33.20 \text{ dBuV} + 10.36 \text{ dB} = 30.36 \text{ dBuV/m} @ 3m$$

ANSI STANDARD C63.4-2003 10.1.7 MEASUREMENT PROCEDURES: The unit under test was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The table used for radiated measurements is capable of continuous rotation.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

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APPLICANT: TTI INTERNATIONAL LIMITED

FCC ID: U32GMRS7015

NAME OF TEST: RADIATION INTERFERENCE

RULES PART NUMBER: 15.109

REQUIREMENTS: 30 to 80 MHz: 40.0 dBuV/m @ 3m

88 to 216 MHz: 43.5 dBuV/m @ 3m

216 to 960 MHz: 46.0 dBuV/m @ 3m

ABOVE 960 MHz: 54.0 dBuV/m @ 3m

TEST RESULTS: A search was made of the spectrum from 30 to 1000 MHz and the measurements indicate that the unit DOES meet the FCC requirements.

TEST DATA: 451.1000 MHz

No	Emission Frequency (MHz)	Meter Reading dBuV/m	Ant. Polarity	Correction Factor dB	Cable Loss dB	Field Strength (dBuV/m)	Margin (dBuV/m)	Limit (dBuV/m)
1	52.00	10.4	V	10.2	1.0	21.7	-18.3	40.0
2	61.20	12.9	H	7.2	1.1	21.2	-18.8	40.0
3	70.65	11.2	V	5.7	1.2	18.1	-21.9	40.0
4	115.20	8.3	H	10.9	1.8	21.0	-22.5	43.5
5	132.90	5.7	V	13.4	2.0	21.0	-22.5	43.5
6	153.60	5.9	V	16.9	2.1	24.9	-18.6	43.5
7	432.50	6.2	H	16.0	4.4	26.6	-19.4	46.0
8	501.30	4.5	V	18.1	4.9	27.6	-18.4	46.0

TEST PROCEDURE: ANSI STANDARD C63.4-2003. The bandwidth of spectrum analyzer was 100 kHz with an appropriate sweep speed. When an emission was found, the table was rotated to produce the maximum signal strength. The antenna was placed in both the horizontal and vertical planes and the worse case emissions were reported. The receiver was put into the coherent mode by placing an antenna driven by a signal generator off site. The UUT was tested in 3 orthogonal planes.

PERFORMED BY: TAI-YEON KIM

DATE: 3/ 29 /2007

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APPLICANT: TTI INTERNATIONAL LIMITED

FCC ID: U32GMRS7015

NAME OF TEST: RADIATION INTERFERENCE

RULES PART NUMBER: 15.109

REQUIREMENTS: 30 to 80 MHz: 40.0 dBuV/m @ 3m

88 to 216 MHz: 43.5 dBuV/m @ 3m

216 to 960 MHz: 46.0 dBuV/m @ 3m

ABOVE 960 MHz: 54.0 dBuV/m @ 3m

TEST RESULTS: A search was made of the spectrum from 30 to 1000 MHz and the measurements indicate that the unit DOES meet the FCC requirements.

TEST DATA: 462.7125MHz

No	Emission Frequency (MHz)	Meter Reading dBuV/m	Ant. Polaritry	Correction Factor dB	Cable Loss dB	Field Strength (dBuV/m)	Margin (dBuV/m)	Limit (dBuV/m)
1	52.20	12.5	H	10.1	1.0	23.7	-16.3	40.0
2	61.50	11.6	H	7.1	1.1	19.8	-20.2	40.0
3	70.10	9.3	V	5.5	1.2	16.0	-24.0	40.0
4	215.30	7.2	V	10.7	2.7	20.6	-22.9	43.5
5	252.10	6.5	H	12.1	3.1	21.7	-24.3	46.0
6	333.70	5.2	H	16.3	3.7	25.2	-20.8	46.0
7	432.40	5.9	V	16.0	4.4	26.3	-19.7	46.0
8	701.60	3.8	V	21.4	6.2	31.4	-14.6	46.0

TEST PROCEDURE: ANSI STANDARD C63.4-2003. The bandwidth of spectrum analyzer was 100 kHz with an appropriate sweep speed. When an emission was found, the table was rotated to produce the maximum signal strength. The antenna was placed in both the horizontal and vertical planes and the worse case emissions were reported. The receiver was put into the coherent mode by placing an antenna driven by a signal generator off site. The UUT was tested in 3 orthogonal planes.

PERFORMED BY: TAI-YEON KIM

DATE: 3/ 29 /2007

APPLICANT : TTI International Limited
FCC ID : U32GMRS7015
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APPLICANT: TTI INTERNATIONAL LIMITED

FCC ID: U32GMRS7015

NAME OF TEST: RADIATION INTERFERENCE

RULES PART NUMBER: 15.109

REQUIREMENTS: 30 to 80 MHz: 40.0 dBuV/m @ 3m

88 to 216 MHz: 43.5 dBuV/m @ 3m

216 to 960 MHz: 46.0 dBuV/m @ 3m

ABOVE 960 MHz: 54.0 dBuV/m @ 3m

TEST RESULTS: A search was made of the spectrum from 30 to 1000 MHz and the measurements indicate that the unit DOES meet the FCC requirements.

TEST DATA: 469.9125MHz

No	Emission Frequency (MHz)	Meter Reading dBuV/m	Ant. Polaritry	Correction Factor dB	Cable Loss dB	Field Strength (dBuV/m)	Margin (dBuV/m)	Limit (dBuV/m)
1	48.00	10.4	V	11.3	1.0	22.7	-17.3	40.0
2	59.50	12.9	V	7.6	1.1	21.6	-18.4	40.0
3	60.70	11.2	H	7.2	1.1	19.6	-20.4	40.0
4	147.90	8.3	H	16.4	2.1	26.8	-16.7	43.5
5	172.60	5.7	V	15.7	2.3	23.7	-19.8	43.5
6	265.40	5.9	V	13.6	3.2	22.7	-23.3	46.0
7	508.30	6.2	H	18.0	5.0	29.2	-16.8	46.0
8	834.40	4.5	H	22.6	7.0	34.1	-11.9	46.0

TEST PROCEDURE: ANSI STANDARD C63.4-2003. The bandwidth of spectrum analyzer was 100 kHz with an appropriate sweep speed. When an emission was found, the table was rotated to produce the maximum signal strength. The antenna was placed in both the horizontal and vertical planes and the worse case emissions were reported. The receiver was put into the coherent mode by placing an antenna driven by a signal generator off site. The UUT was tested in 3 orthogonal planes.

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APPLICANT: TTI INTERNATIONAL LIMITED

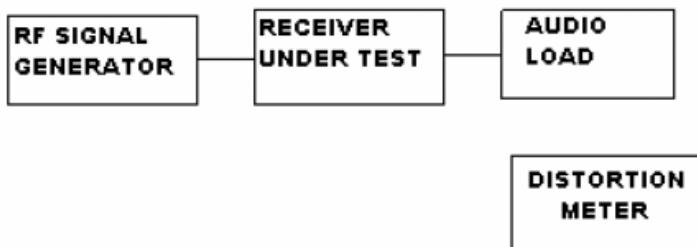
FCC ID: U32GMRS7015

NAME OF TEST: 38dB REJECTION RATIO

RULES PART NUMBER: 15.121(b)

REQUIREMENTS: 38dB REJECTION RATIO TO SENSITIVITY OF THE RECEIVER.

TEST SET-UP



TEST PROCEDURE: The reference sensitivity was measured in accordance with TIA/EIA-603;

- a. Equipment connected as illustrated
- b. A standard signal was applied to the receiver input terminals.
- c. Receiver output audio output was adjusted for rated output.
- d. The RF Signal generator was adjusted to the lowest level to produce a 12dB SINAD without the audio output dropping more than 3dB. Make note of sensitivity level.
- e. This was done across the different bands to establish a reference level. The reference taken was the worse case sensitivity.
- f. The output of the signal generator was then adjusted to a level of 60dB above the reference level at a frequency of 824.1MHz.
- g. With the level set 60dB above the level measured in step e.
- h. Set squelch on receiver to threshold, the signal level required to open the squelch must be lower than the level measured in step d.
- i. Cause the receiver to scan or step-it through its complete range of frequencies.
- j. If receiver stops or unsquelches on any frequency, record the frequency and then adjust the level until a 12dB SINAD is produced. This level must be greater than 38dB above the level in step e.
- k. Repeat steps f through j for frequencies 835.0, 847.9, 870.0, 880.5, 892.9 MHz.

TEST RESULTS: The UUT meets the 38dB REJECTION RATIO.

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1. 38 dB Rejection Test Data for Base Band (869.040-893.970 MHz)

Table 1-1: 38 dB Rejection {Frequency Injected: 870.000 MHz} (Cellular Band)

Frequency Injected: 870.000 MHz				
Frequency Detected (MHz)	Level 12 dB SINAD at 870.000 MHz	Level 12 dB at Frequency Detected	Rejection	Margin
No Frequencies Detected	N/A	N/A	N/A	N/A

Table 1-2: 38 dB Rejection {Frequency Injected: 880.500 MHz} (Cellular Band)

Frequency Injected: 880.500 MHz				
Frequency Detected (MHz)	Level 12 dB SINAD at 869.040 MHz	Level 12 dB at Frequency Detected	Rejection	Margin
No Frequencies Detected	N/A	N/A	N/A	N/A

Table 1-3: 38 dB Rejection {Frequency Injected: 892.900 MHz} (Cellular Band)

Frequency Injected: 892.900 MHz				
Frequency Detected (MHz)	Level 12 dB SINAD at 892.900 MHz	Level 12 dB at Frequency Detected	Rejection	Margin
No Frequencies Detected	N/A	N/A	N/A	N/A

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2. 38 dB Rejection Test Data for Mobile Band (824.040-848.970 MHz)

Table 2-1: 38 dB Rejection {Frequency Injected: 824.100 MHz} (Mobile Band)

Frequency Injected: 824.100 MHz				
Frequency Detected (MHz)	Level 12 dB SINAD at 824.100 MHz	Level 12 dB at Frequency Detected	Rejection	Margin
No Frequencies Detected	N/A	N/A	N/A	N/A

Table 2-2: 38 dB Rejection {Frequency Injected: 835.000 MHz} (Mobile Band)

Frequency Injected: 824.040 MHz				
Frequency Detected (MHz)	Level 12 dB SINAD at 835.000 MHz	Level 12 dB at Frequency Detected	Rejection	Margin
No Frequencies Detected	N/A	N/A	N/A	N/A

Table 2-3: 38 dB Rejection {Frequency Injected: 847.900 MHz} (Mobile Band)

Frequency Injected: 824.040 MHz				
Frequency Detected (MHz)	Level 12 dB SINAD at 847.900 MHz	Level 12 dB at Frequency Detected	Rejection	Margin
No Frequencies Detected	N/A	N/A	N/A	N/A

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APPLICANT: TTI INTERNATIONAL LIMITED

FCC ID: U32GMRS7015

NAME OF TEST: POWER LINE CONDUCTED INTERFERENCE

RULES PART NO.: 15.207

REQUIREMENTS:	QUASI-PEAK	AVERAGE
.15 – 0.5 MHz	66-56 dBuV	56-46 dBuV
0.5 – 5.0	56	46
5.0 – 30.	60	50

TEST PROCEDURE: ANSI STANDARD C63.4-2003. The spectrum was scanned from .15 to 30 MHz.
THE ATTACHED GRAPHS REPRESENT THE EMISSIONS READ FOR POWERLINE
CONDUCTED FOR THIS DEVICE.

The highest emission read for Line 1 was 0.151MHz @ 43.1 dBuV/m

The highest emission read for Line 2 was 0.152MHz @ 41.0 dBuV/m

TEST RESULTS: Both lines were observed. The measurements indicate that the unit DOES appear to meet the FCC requirements for this class of equipment.

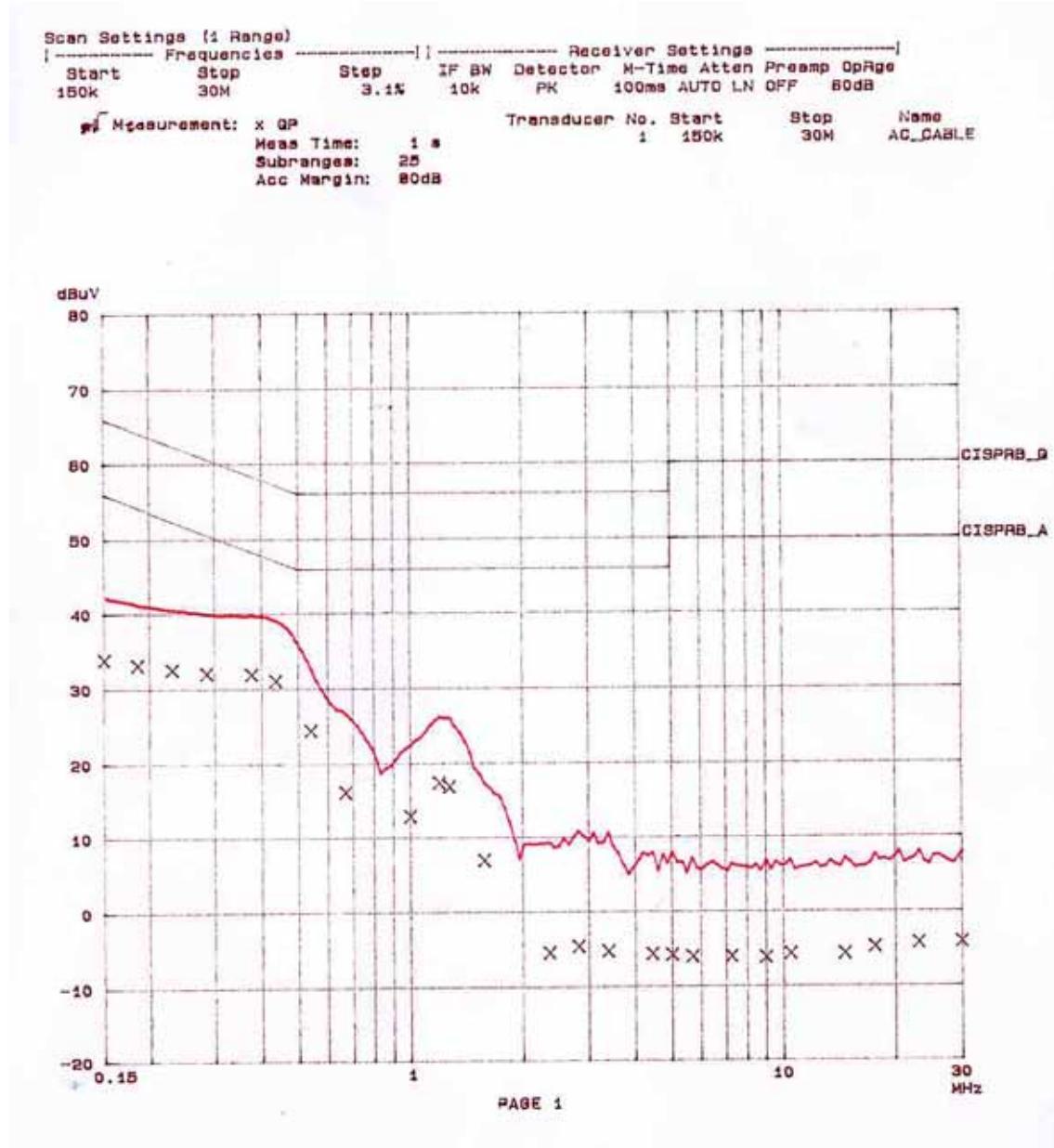
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LINE 1(H)



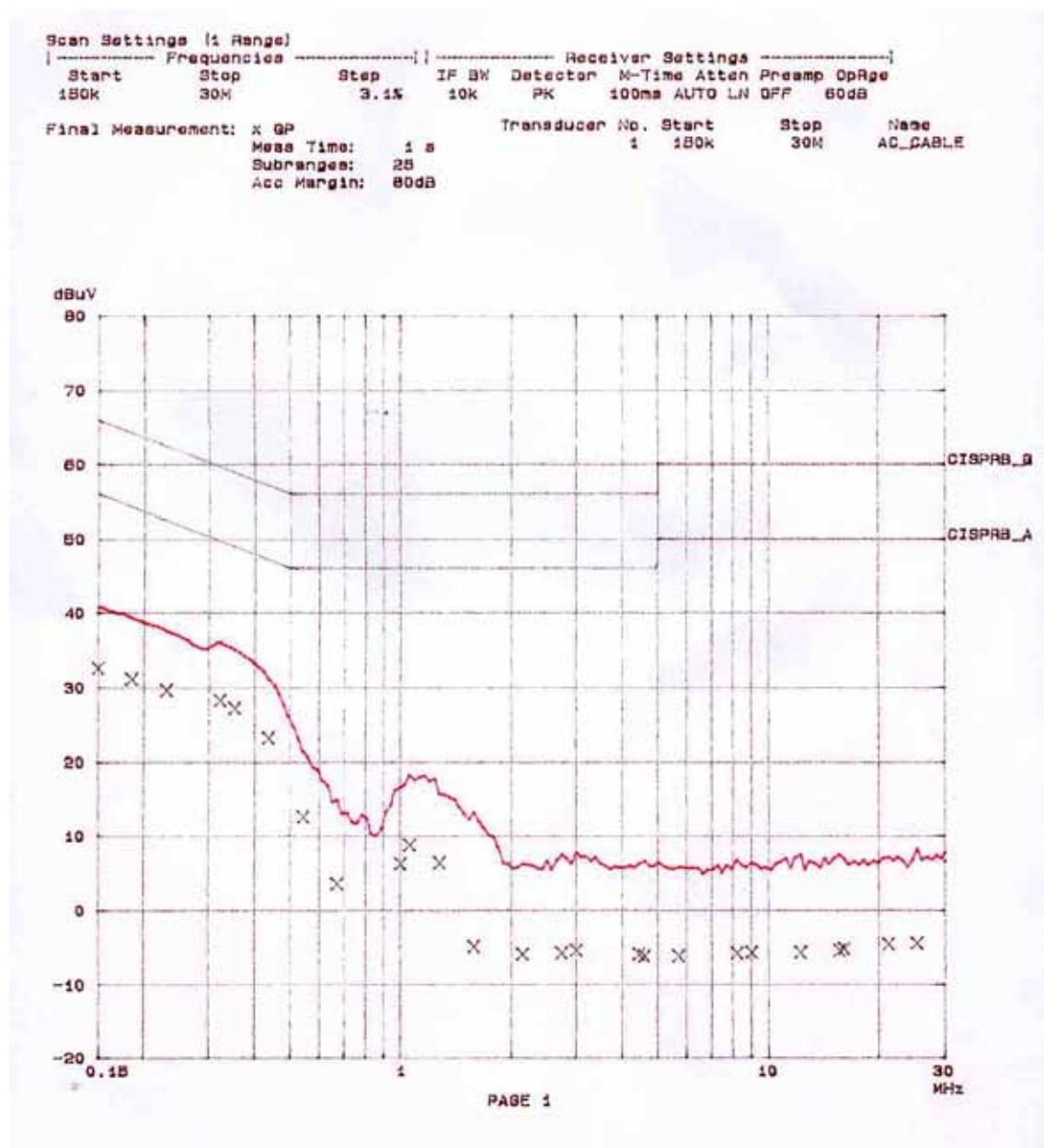
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LINE 2(N)



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