

THRU Lab & Engineering.

477-6, Hager-Ri, Yoju-Up, Yoju-Gun

Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net



Test Report

Product Name: WIRELESS TRANSMITTER

FCC ID: RNII610488030RT

Applicant:

**ESEL INTERNATIONAL CO., LTD.
RM 15-17, 5/F, CARDINAL IND. BLDG. NO. 17
ON LOK MUN ST.,
FANLING N.T.
HONG KONG**

Date Receipt: 17/03/2006

Date Tested: 20/03/2006

APPLICANT: ESEL INTERNATIONAL CO., LTD.
FCC ID: RNII610488030RT
REPORT #: THRU-603002

COVER SHEET

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EXHIBIT INCLUDING:

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INSTRUCTION MANUAL
LABEL SAMPLE
LABEL LOCATION
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Test Equipment List

No	Description	Manufacturer	Model No.	Serial No.	Due Cal.
1	Test Receiver	Rohde & Schwarz	ESVS10	830489/001	2006.04.23
2	Test Receiver	Rohde & Schwarz	ESHS 10	825832/014	2006.08.25
3	Test Receiver	Rohde & Schwarz	ESVS 10	826008/014	2006.05.24
4	Spectrum Analyzer	Hewlett Packard	8566B	2311A02394	2006.04.23
5	Spectrum Display	Hewlett Packard	85662A	2542A12429	2006.04.23
6	Quasi-peak Adapter	Hewlett Packard	85650A	2521A00887	2006.04.23
7	RF Preselector	Hewlett Packard	85685A	2648A00504	2006.04.23
8	Preamplifier	Hewlett Packard	8449B	3008A00375	2006.04.23
9	Preamplifier	Hewlett Packard	8447F	3113A05367	2006.04.23
10	Preamplifier	Hewlett Packard	8447F	2805A02570	2006.12.12
	Preamplifier	A.H. Systems	PAM-0118	164	2007.01.17
11	Biconical Antenna	Eaton Corp.	94455-1	0977	2006.04.01
12	Biconical Antenna	EMCO	3104C	9111-2468	2006.06.07
13	Log Periodic Antenna	EMCO	3146	2051	2006.04.01
14	Log Periodic Antenna	EMCO	3146	8901-2320	2006.03.28
15	Horn Antenna	A.H. Systems	SAS-571	414	2006.03.17
	Horn Antenna	A.H. Systems	SAS-571	781	2007.01.07
16	Loop Antenna	Rohde & Schwarz	HFH2-Z2.335.4711.52	826532/006	2006.01.31
17	Dipole Antenna	Rohde & Schwarz	VHAP	574	2006.12.12
18	Dipole Antenna	Rohde & Schwarz	VHAP	575	2006.12.12
19	Dipole Antenna	Rohde & Schwarz	UHAP	546	2006.12.12
20	Dipole Antenna	Rohde & Schwarz	UHAP	547	2006.12.12
21	Signal Generator	Rohde & Schwarz	SMS	872165/100	2006.04.23
22	Signal Generator	Rohde & Schwarz	SMX	825459/030	2006.05.20
23	Spectrum Monitor	Rohde & Schwarz	EZM	862304/007	None
24	Panorama Monitor	Rohde & Schwarz	EPN	883707/207	None
25	Spectrum Analyzer	Advantest Corp.	R3261C	61720208	2006.04.23
26	Spectrum Analyzer	Hewlett Packard	8591A	3205A02641	2007.01.27
27	LISN	EMCO	3825/2	9111-1912	2006.12.12
28	LISN	Solar	8012-50-R-24	8379121	2006.04.25

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29	LISN	Kyoritsu	KNW-242	8-923-2	2006.04.25
30	Plotter	Hewlett Packard	7475A	2210A02802	None
31	Modulation Analyzer	Hewlett Packard	8901B	3438A05094	2006.04.23
32	Frequency Counter	Tektronic	CMC251	TW52489	2006.04.23
33	Temperature & Humidity Chamber	TABAI EZPEC CORP.	MC711P	112000492	2006.0827
34	Antenna Mast	EMCO	1070-3	9109-1617	None
35	Turn Table	EMCO	1080-1,2	9203-1762	None
36	Positioning Controller	EMCO	1090	9111-1054	
37	Antenna Power Supply	Rohde & Schwarz	HZ-9	920127	None
38	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	881052	None
39	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 ThruLab & 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 100 kHz and the video bandwidth was 300 kHz. The ambient temperature of the UUT was 12.6°C with a humidity of 56%.

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:

Freq (MHz) METER READING + ACF = FS

33 20 dBuV + 10.36 dB = 30.36 dBuV/m @ 3m

ANSI STANDARD C63.4-2003 10.1.7 MEASUREMENT PROCEDURES: The UUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The UUT was placed in the center of the table. The table used for radiated measurements is capable of continuous rotation. The spectrum was scanned from 30 MHz to 10th harmonic of the fundamental.

Peak readings were taken in three (3) orthogonal planes and the highest readings were converted to average readings based on the duration of "ON" time.

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.

Measurements were made by ThruLab & ENGINEERING at the registered open field test site located at 477-6, Hager-Ri, Yoju-Up, Yoju-Gun, Kyunggi-Do, 469-803, Korea

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APPLICANT: ESEL INTERNATIONAL CO., LTD.

FCC ID: RNII610488030RT

NAME OF TEST: RADIATION INTERFERENCE

RULES PART NO.: 15.231

REQUIREMENTS:

Fundamental Frequency MHz	Field Strength of Fundamental dBuV	Field Strength of Harmonics and Spurious Emissions (dBuV/m @ 3m)
40.66 to 40.70	67.04	47.04
70 to 130	61.94	41.94
130 to 174	61.94 to 71.48	41.94 to 51.48
174 to 260	71.48	51.48
260 to 470	71.48 to 81.94	51.48 to 61.94
470 and above	81.94	61.94

THE LIMIT FOR AVERAGE FIELD STRENGTH dBuV/m FOR THE FUNDAMENTAL FREQUENCY = 80.82 dBuV/m. NO FUNDAMENTAL IS ALLOWED IN THE RESTRICTED BANDS.

THE LIMIT FOR AVERAGE FIELD STRENGTH dBuV/m FOR THE HARMONICS AND SPURIOUS FREQUENCIES = 60.82 dBuV/m. SPURIOUS IN THE RESTRICTED BANDS MUST BE LESS THAN 54 dBuV/m OR 15.209.

TEST DATA:

Tuned Frequency MHz	Emission Frequency (MHz)	Meter Reading dBuV	Ant. Polarity	Correction Factor dB	Coax Loss dB	Duty cycle Factor	Field Strength (dBuV/m)	Margin (dB)	Limit (dBuV/m)
434.08	434.08	43.80	H	16.00	4.45	6.94	57.31	23.51	80.82
434.08	434.08	48.80	V	16.00	4.45	6.94	62.31	18.51	80.82
434.08	868.16	23.80	H	23.50	7.13	6.94	47.49	13.33	60.82
434.08	868.16	30.60	V	23.50	7.13	6.94	54.29	6.53	60.82
434.08	1302.33	26.10	H	23.78	2.42	6.94	45.36	8.64	54.00
434.08	1302.33	33.50	V	23.78	2.42	6.94	52.76	1.24	54.00
434.08	1736.45	29.80	H	25.14	2.69	6.94	50.69	10.13	60.82
434.08	1736.45	38.40	V	25.14	2.69	6.94	59.29	1.53	60.82
434.08	2170.56	23.30	H	27.64	3.20	6.94	47.20	13.62	60.82
434.08	2170.56	33.40	V	27.64	3.20	6.94	57.30	3.52	60.82
434.08	2604.39	7.30	H	28.30	3.48	6.94	32.14	28.68	60.82
434.08	2604.39	10.70	V	28.30	3.48	6.94	35.54	25.28	60.82
434.08	3038.47	7.90	H	29.82	3.72	6.94	34.50	26.32	60.82
434.08	3038.47	7.60	V	29.82	3.72	6.94	34.20	26.62	60.82
434.08	3472.56	6.90	H	30.08	3.92	6.94	33.97	26.85	60.82
434.08	3472.56	8.60	V	30.08	3.92	6.94	35.67	25.15	60.82
434.08	3906.64	7.70	H	31.81	3.28	6.94	35.85	18.15	54.00
434.08	3906.64	7.20	V	31.81	3.28	6.94	35.35	18.65	54.00
434.08	4340.72	7.80	H	32.54	4.25	6.94	37.65	16.35	54.00
434.08	4340.72	6.60	V	32.54	4.25	6.94	36.45	17.55	54.00

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Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows:

1) for the band 130-174 MHz, uV/m at 3 meters = $56.81818(F) - 6136.3636$;

2) for the band 260-470 MHz, uV/m at 3 meters = $41.6667(F) - 7083.3333$.

SAMPLE CALCULATION OF LIMIT @ 434 MHz:

$$41.6667 (434) - 7083.3333 = 11000.01 \text{ uV/m}$$

$$20\log(11000.01) = 80.82\text{dBuV/m limit @ 434 MHz}$$

TEST RESULTS: The unit DOES meet the FCC requirements.

PERFORMED BY: S.W.Ahn **DATE TESTED:** 20/03/06

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CALCULATION OF DUTY CYCLE:

The period of the pulse train is determined by observing it on an oscilloscope or a spectrum analyzer with zero (0) frequency span. A plot is then made of the pulse train with a sweep time of 100 milliseconds. This sweep determines the duration of the pulse train, which in this case is millisecond. This sweep allows the determination of the number of and type of pulses, i.e. long & short. Plots are then made showing the duration of each type of pulse and its duration. From the 100 millisecond Plot, the number of a given type of pulse is then multiplied by the duration of that type pulse. This allows the calculation of the amount of time the UUT is on within 100 ms. If the pulse train is longer than 100 ms then this number is multiplied by 100 to determine the percentage ON TIME. If the pulse train is less than 100 ms the total on time is divided by the length of the pulse train and then multiplied by 100 to determine the percentage ON TIME. In this case there were 25 short pulses 375 usec long and 6 long pulses 787.5 usec long for a total of 14.1 ms ON TIME within a 31.3 msec pulse train. The average field strength is determined by multiplying the peak field strength by the percent on time.

$dB = 20 \cdot \log(ON\ TIME) / PERIOD$

$ON\ TIME / msec = (Long\ Pules * EA + Short\ Pules * EA) = (0.7875 / msec * 6 + 0.375 / msec * 25)$

$dB = 20 \cdot \log(14.1 / 31.3)$

$dB = 20 \cdot \log(0.45)$

$dB = -6.94$

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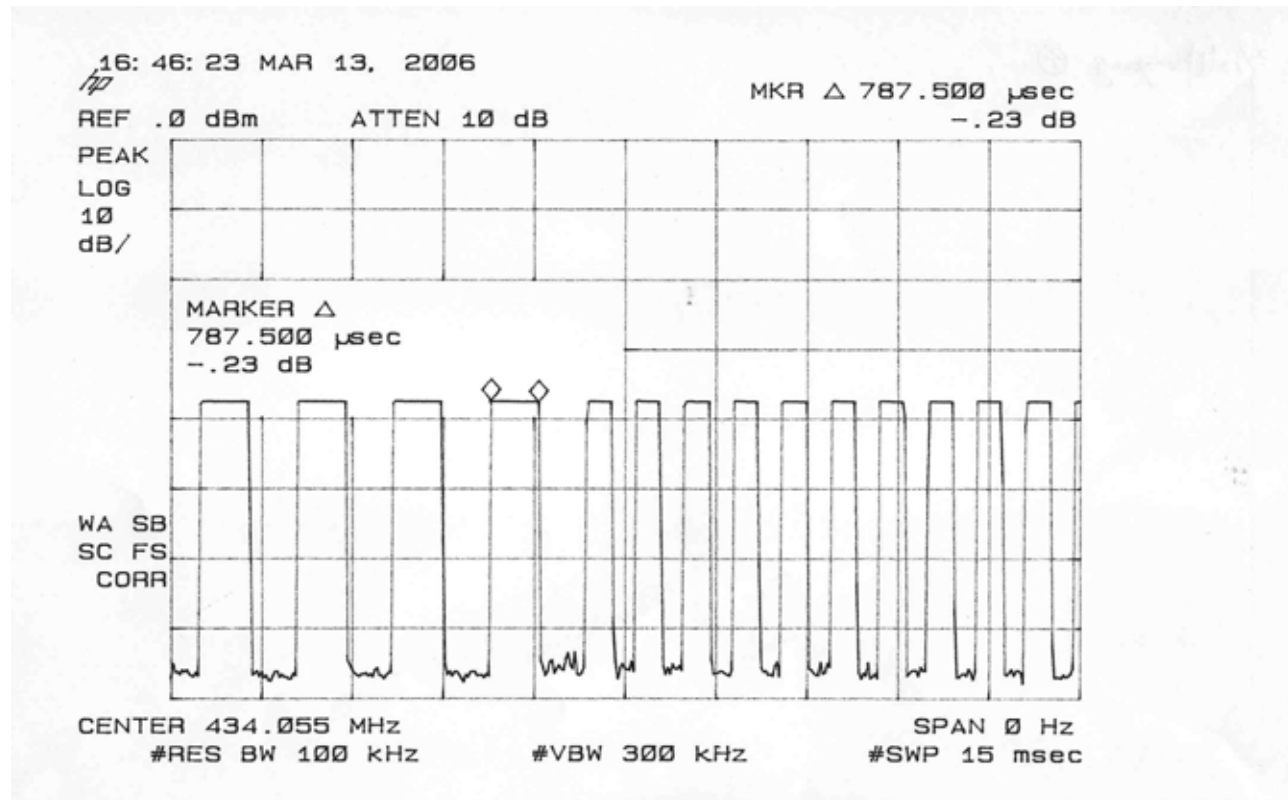
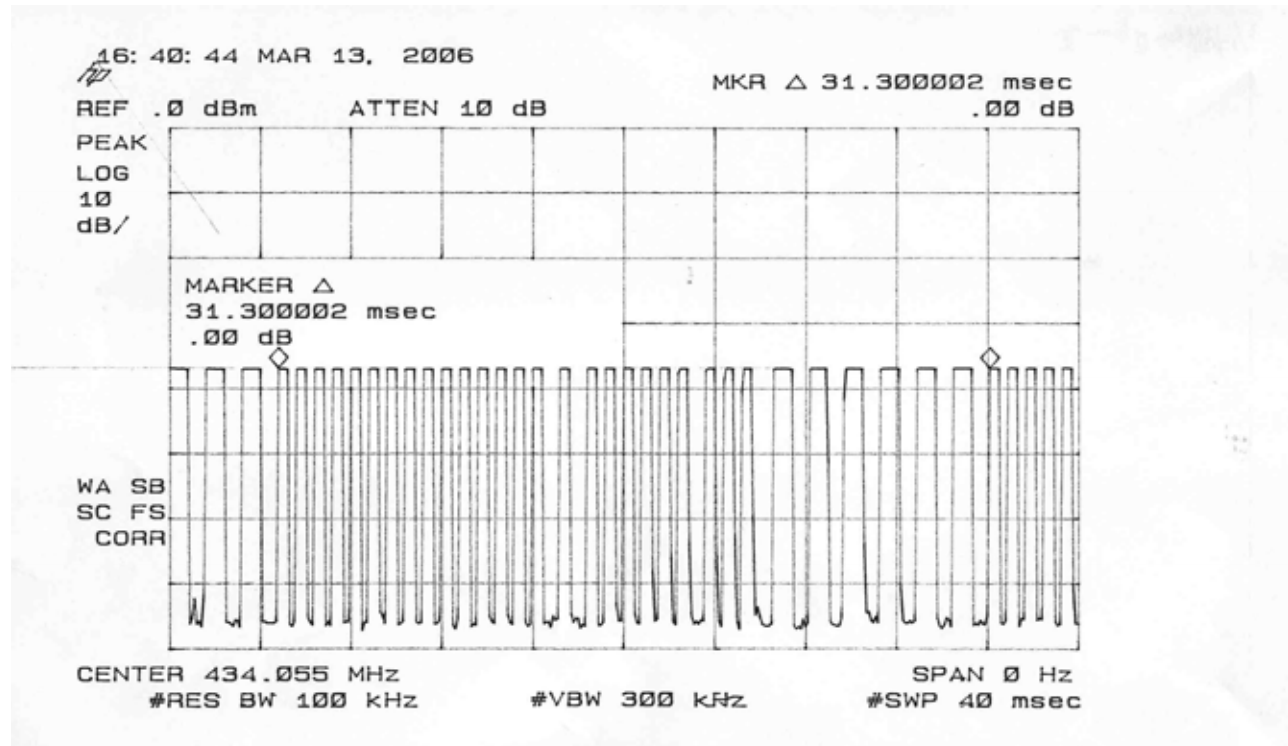
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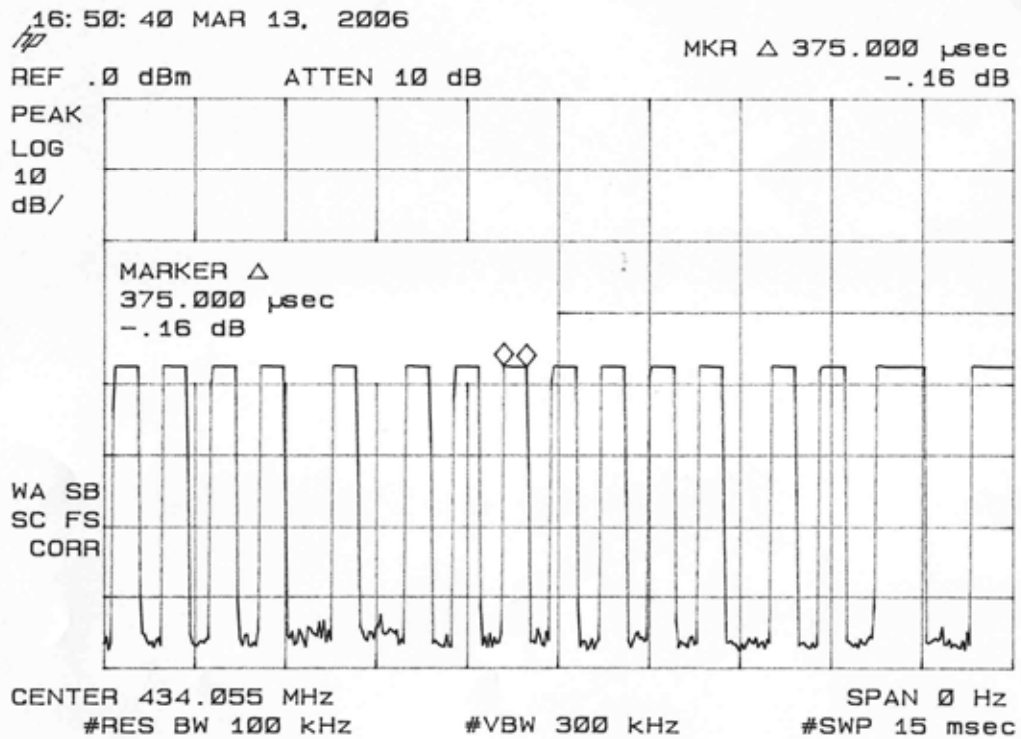
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NAME OF TEST: Occupied Bandwidth

RULES PART NO.: 15.231(C)

REQUIREMENTS: The bandwidth of the emission shall be no wider than .25% of the center frequency for devices operating between 70 and 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

THE FOLLOWING PLOT REPRESENTS THE EMISSIONS TAKEN FOR THE DEVICE.

METHOD OF MEASUREMENT: A small sample of the transmitter output was fed into the spectrum analyzer and the following plot was generated. The vertical scale is set to 10 dB per division: the horizontal scale is set to 10kHz per division.

TEST RESULTS: The unit meets the FCC requirements.

PERFORMED BY: S.W.Ahn

DATE: 20/03/06

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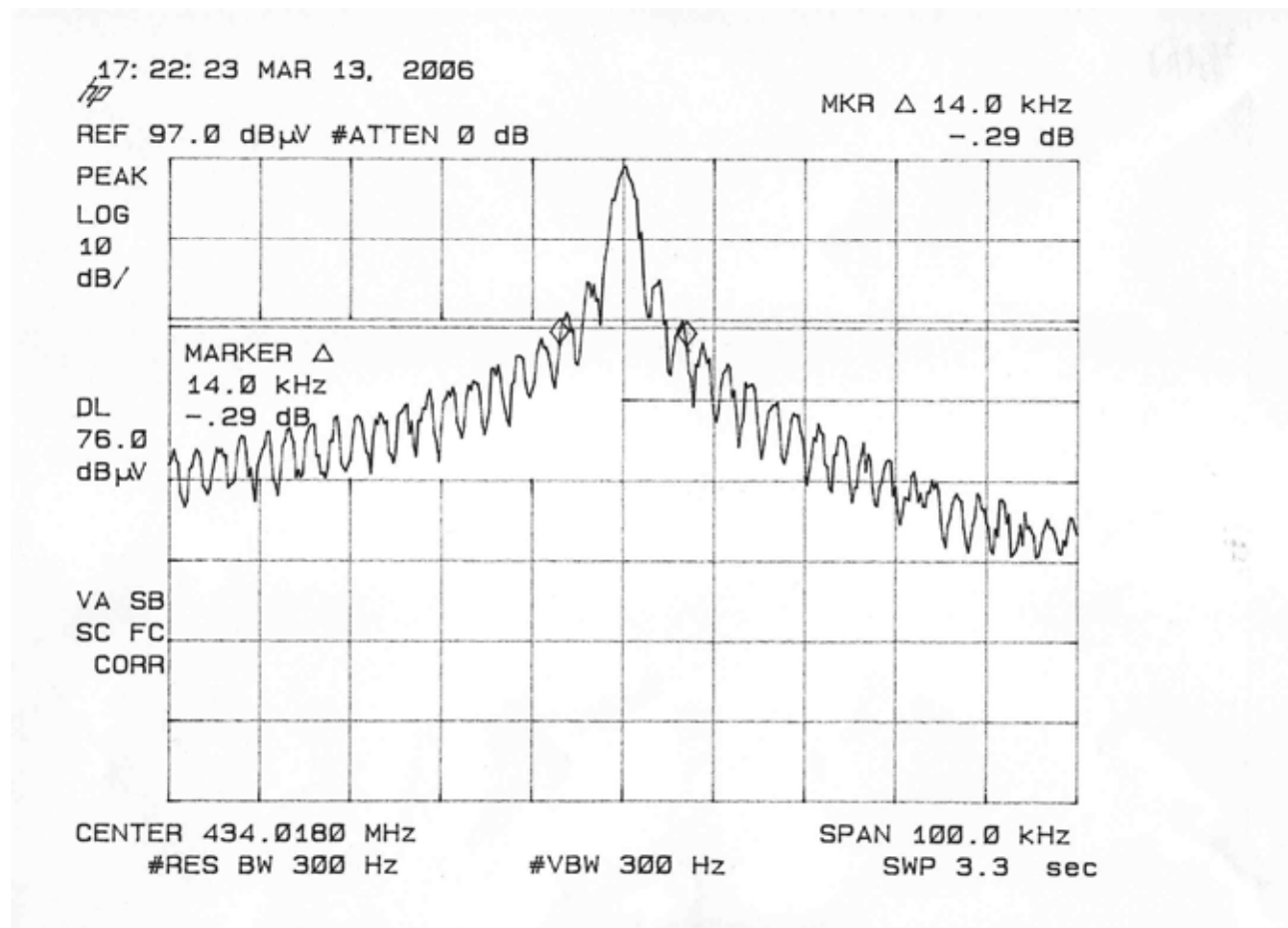
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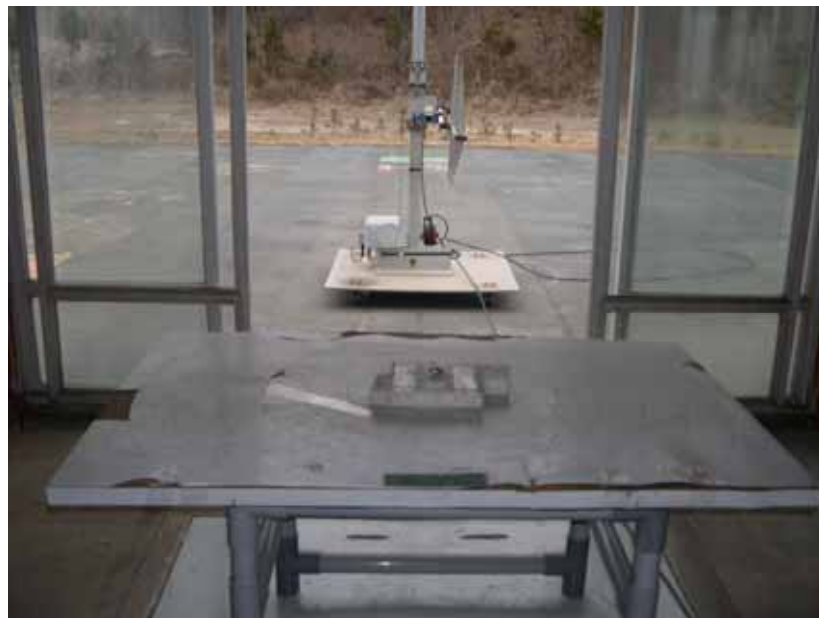
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