

# TIMCO ENGINEERING INC.

849 NW State Road 45  
Newberry, Florida 32669  
<http://www.timcoengr.com>  
888.472.2424 F 352.472.2030 email: [tei@timcoengr.com](mailto:tei@timcoengr.com)



## Test Report

Product Name: DONGLE

FCC ID: AZ489FT7020

Applicant:

**MOTOROLA, INC.**  
**8000 WEST SUNRISE BLVD, MD: 1309**  
**FT. LAUDERDALE FL 33322-9947 USA**

APPLICANT: MOTOROLA, INC.  
FCC ID: AZ489FT7020  
REPORT #: U:\M\MOTOROLA\_Florida\2523AUT5\2523AUT5TestReport.doc

COVER SHEET

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### EXHIBIT INCLUDED:

CONFIDENTIALITY REQUEST LETTER  
BLOCK DIAGRAM  
SCHEMATIC  
USERS MANUAL  
LABEL SAMPLE  
LABEL LOCATION  
EXTERNAL PHOTOGRAPHS  
INTERNAL PHOTOGRAPHS  
OPERATIONAL DESCRIPTION  
TEST SET UP PHOTOGRAPH

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## EMC Equipment List

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3-Meter OATS	TEI	N/A	N/A	Listed 1/13/03	1/12/06
Biconnical Antenna	Eaton	94455-1	1057	CAL 12/12/05	12/12/07
Biconnical Antenna	Eaton	94455-1	1096	CAL 8/17/04	8/17/06
Biconnical Antenna	Electro- Metrics	BIA-25	1171	CAL 4/29/05	4/29/07
Double- Ridged Horn Antenna	Electro- Metrics	RGA-180	2319	CAL 12/29/04	12/29/06
LISN	Electro- Metrics	ANS-25/2	2604	CAL 8/27/04	8/27/06
LISN	Electro- Metrics	EM-7820	2682	CAL 4/28/05	4/28/07
Log- Periodic Antenna	Eaton	96005	1243	CAL 12/14/05	12/14/07

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## TEST PROCEDURE

**GENERAL:** This report shall NOT be reproduced except in full without the written approval of TIMCO ENGINEERING, INC. The UUT was transmitting a test signal during the testing.

**RADIATION INTERFERENCE:** The test procedure used was ANSI STANDARD C63.4-2003 using a HEWLETT PACKARD spectrum analyzer with a pre-selector. 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 up to 1.0GHz and 1.0MHz with a video BW of 3.0MHz above 1.0GHz. The ambient temperature of the UUT was 74.3°F with a humidity of 69%.

**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 Pre-selector 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 (1.5m side). 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:** MOTOROLA, INC.  
**FCC ID:** AZ489FT7020  
**NAME OF TEST:** RADIATION INTERFERENCE  
**RULES PART NUMBER:** 15.249, 15.209

**REQUIREMENTS:**

Field Strength of Fundamental: 902-928 MHz 2.4-2.4835 GHz 94 dBuV/m @3m	Field Strength of Harmonics:  54 dBuV/m @3m	S15.209: 30 - 88 MHz 40 dBuV/m @3M 88 - 216 MHz 43.5 216 - 960 MHz 46 ABOVE 960 MHz 54dBuV/m
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EMISSIONS RADIATED OUTSIDE OF THE SPECIFIED FREQUENCY BANDS, EXCEPT FOR HARMONICS, SHALL BE ATTENUATED BY AT LEAST 50 dB BELOW THE LEVEL OF THE FUNDAMENTAL OR TO THE GENERAL RADIATED EMISSION LIMITS IN 15.209, WHICHEVER IS THE LESSER ATTENUATION.

**TEST DATA:**

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Pol.	Coax Loss dB	Correction Factor dB	Duty Cycle Factor dB	Field Strength dBuV/m	Margin dB
2,405.0	2,405.00	49.2	V	3.18	32.33	20	64.71	29.29
2,405.0	2,405.00	53.7	H	3.18	32.33	20	69.21	24.79
2,405.0	4,810.00	18.6	V	4.91	34.35	20	37.86	16.14
2,405.0	4,810.00	20.0	H	4.91	34.35	20	39.36	14.64
2,405.0	7,215.00	18.8	V	5.73	36.16	20	40.69	13.31
2,405.0	7,215.00	27.4	H	5.73	36.16	20	49.29	4.71
2,445.0	2,445.00	52.5	V	3.21	32.45	20	68.16	25.84
2,445.0	2,445.00	56.1	H	3.21	32.45	20	71.76	22.24
2,445.0	4,890.00	17.7	V	4.95	34.41	20	37.06	16.94
2,445.0	4,890.00	19.6	H	4.95	34.41	20	38.96	15.04
2,445.0	7,335.00	24.3	V	5.80	36.30	20	46.40	7.60
2,445.0	7,335.00	25.3	H	5.80	36.30	20	47.40	6.60
2,480.0	2,480.00	54.6	V	3.24	32.54	20	70.38	23.62
2,480.0	2,480.00	60.2	H	3.24	32.54	20	75.98	18.02
2,480.0	4,960.00	14.1	H	4.98	34.47	20	33.55	20.45
2,480.0	4,960.00	14.4	V	4.98	34.47	20	33.85	20.15
2,480.0	7,440.00	26.2	V	5.86	36.43	20	48.49	5.51
2,480.0	7,440.00	30.3	H	5.86	36.43	20	52.59	1.41

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**NAME OF TEST:** RADIATION INTERFERENCE

**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 spectrum was searched to at least the tenth (10) harmonic of the fundamental.

PERFORMED BY: RICHARD BLOCK                      DATE: 12/30/05

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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 more 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 was 1 long pulse 1.5 ms long for a total of 1.5 ms ON TIME within a 100 ms pulse train. The average field strength is determined by multiplying the peak field strength by the percent on time correction factor.

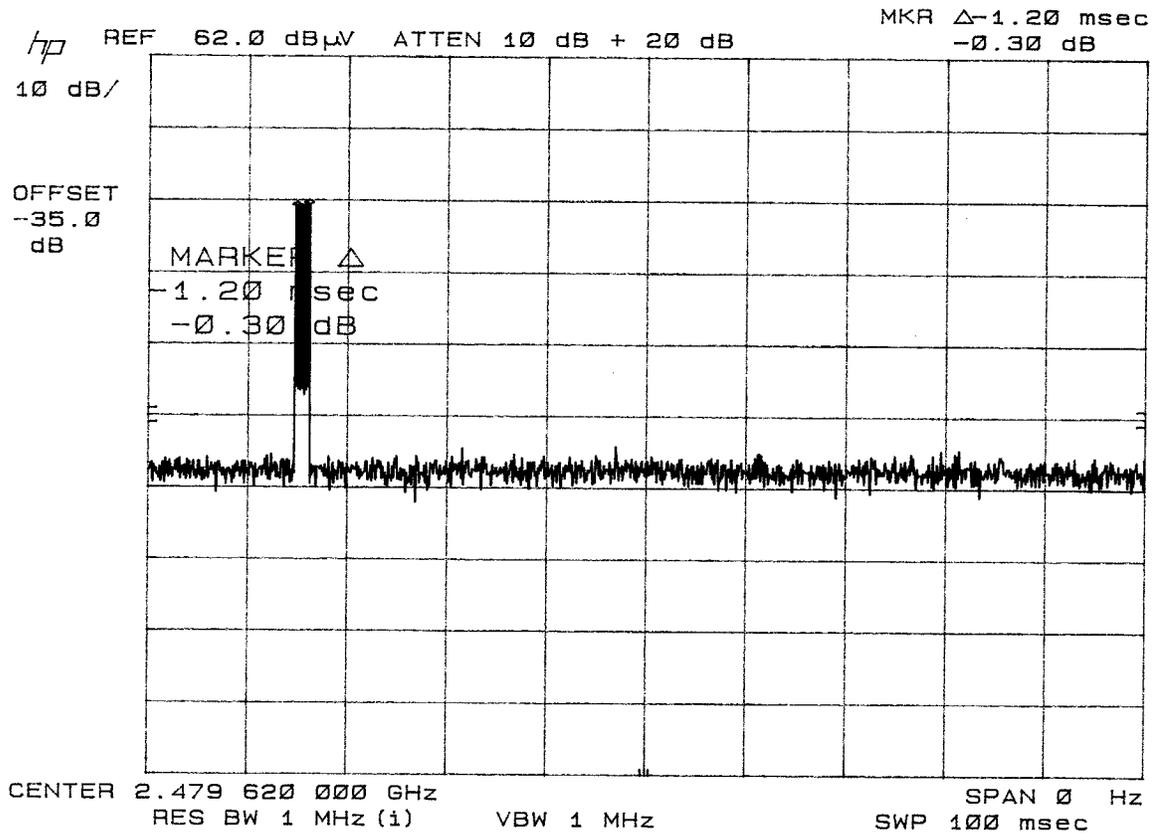
$dB = 20 \cdot \log(\text{ON TIME}) / \text{PERIOD}$   
 $dB = 20 \cdot \log(1.5/100)$   
 $dB = 20 \cdot \log(0.015)$   
 $dB = -36$

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## DUTY CYCLE PLOT

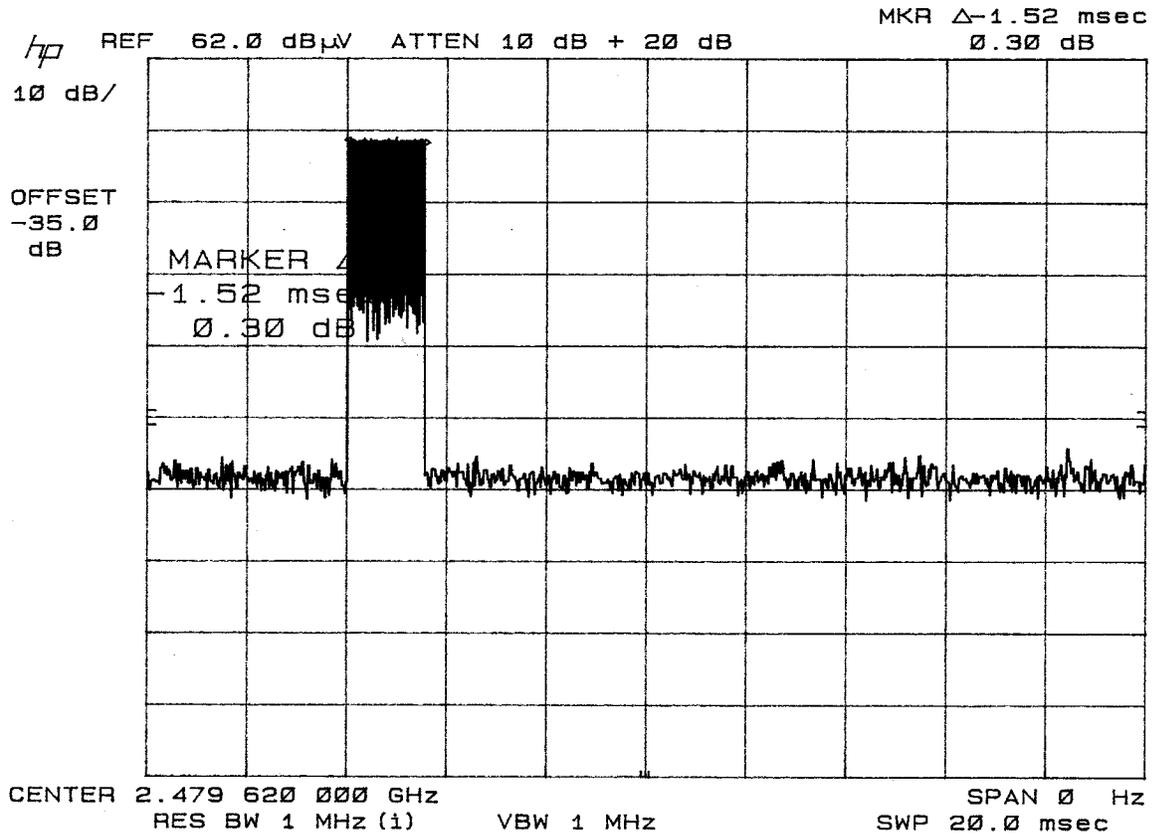


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## DUTY CYCLE PLOT



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**APPLICANT:** MOTOROLA, INC.

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**NAME OF TEST:** Occupied Bandwidth

**RULES PART NO.:** 15.249

**REQUIREMENTS:** The field strength of any emissions appearing outside the band edge above and below the band edges shall be attenuated at least 50 dB below the level of the carrier or to the general limits of 15.209.

THE FOLLOWING PLOT REPRESENTS THE EMISSIONS TAKEN FOR THIS DEVICE.

**METHOD OF MEASUREMENT:** A small sample of the transmitter output was fed into the spectrum analyzer and the attached plot was printed. The vertical scale is set to -10 dBm per division.

**PERFORMED BY:** RICAHRD BLOCK

**DATE:** 12/30/05

APPLICANT: MOTOROLA, INC.

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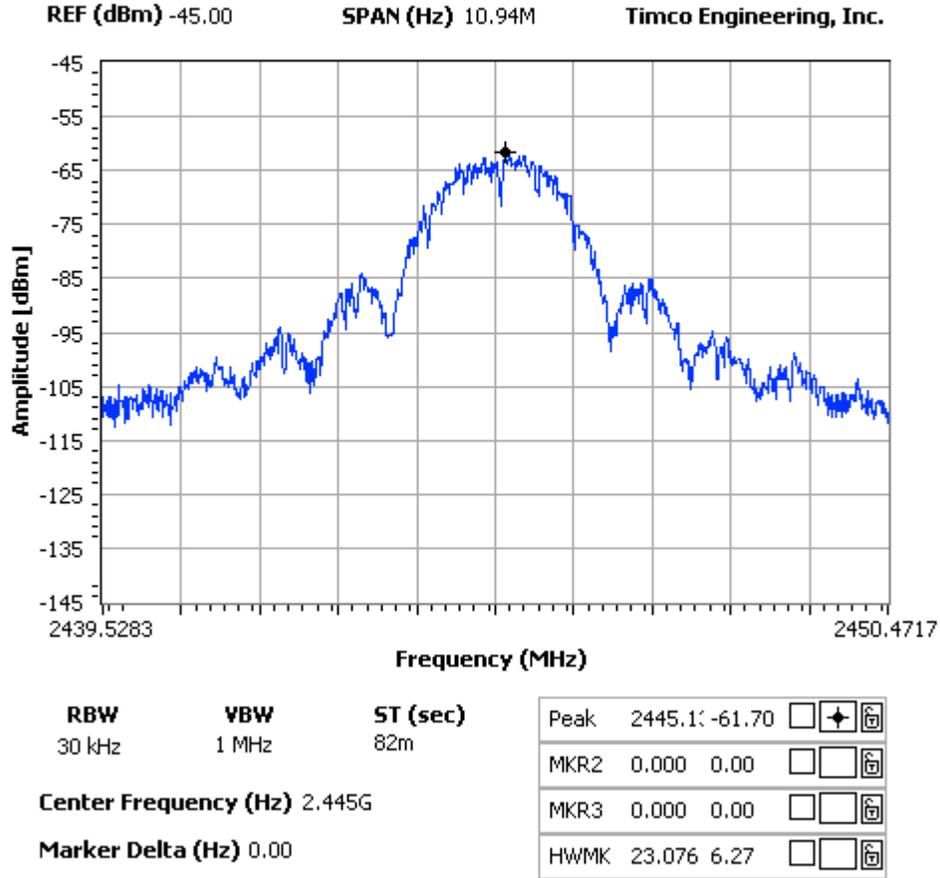
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**NOTES:**

Occupied Bandwidth  
 Job: 2509AUT5



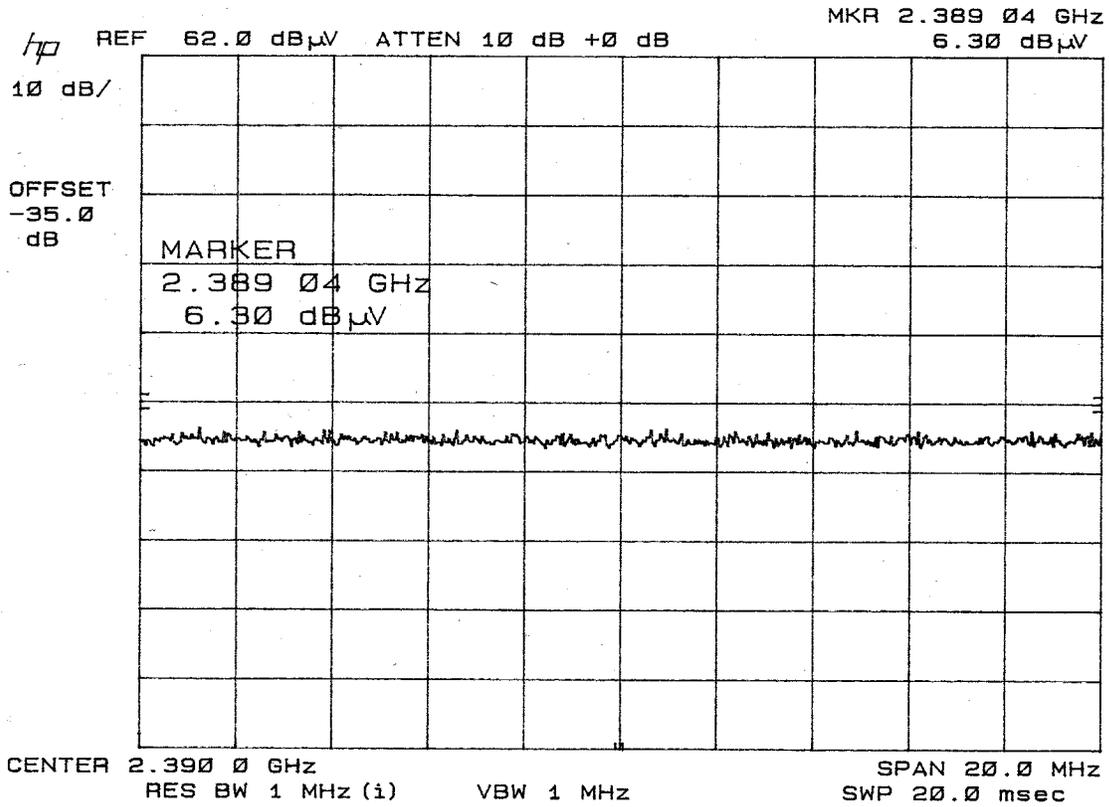
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## LOWER RESTRICTED BAND PLOT

77065



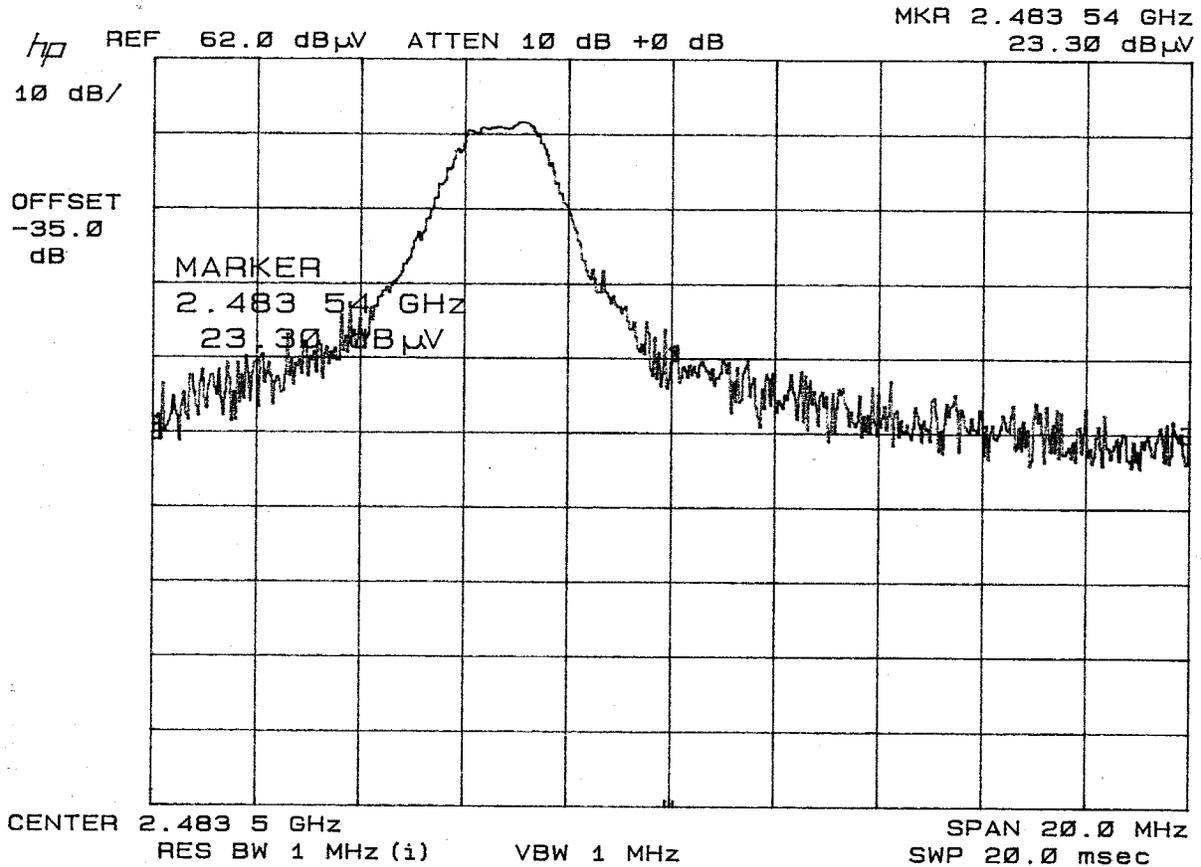
6.3 dBuV/m from plot  
3.18 dB coax loss  
32.32 dB ACF  
41.8 dBuV/m Total

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## UPPER RESTRICTED BAND PLOT



23.3 dBuV/m from plot  
 3.24 dB coax loss  
32.54 dB ACF  
 57.67 dBuV/m Peak Total  
-20 dB duty cycle CF  
 37.67 dBuV/m Average

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