



**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT
INTENTIONAL RADIATOR CERTIFICATION TO
FCC PART 15 SUBPART C REQUIREMENT**

OF

FCC ID:NO9O10004

ORBIT TRANSMITTER (902 – 918 MHz)

MODEL NO:ORBIT

SERIAL NO: 707-14233/1

REPORT NO: 98E7214

SEPTEMBER 8,1998

Prepared for
**HBC ELECTRONIC FUNKTECHNIK GMBH
HALLER STRASSE 49-53
CRAILSHEIM 74564, GERMANY**

Prepared by
**COMPLIANCE CERTIFICATION SERVICES, INC.
1366 BORDEAUX DRIVE
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NVLAQ[®]
LAB CODE:200065-0

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1. VERIFICATION OF COMPLIANCE

COMPANY NAME : HBC ELECTRONIC FUNKTECHNIK GMBH
HALLER STRASSE 49-53
CRAILSHEIM 74564 GERMANY

CONTACT PERSON : WOLFGANG BRENDEL / PRESIDENT

TELEPHONE NO : (01149)7951-393-855


EUT DESCRIPTION : ORBIT TRANSMITTER

MODEM NAME : ORBIT

DATE TESTED : SEPTEMBER 8, 1998

LIMITS APPLY TO: FCC PART 15 SECTION 15.249	
TECHNICAL LIMITS	TEST RESULT
Radiated Emission of fundamental Frequency	PASSED
Radiated Emission of Harmonic Frequency	PASSED
Radiated Emission Outside the Band	PASSED

The above equipment was tested by Compliance Certification Services Inc. for compliance with the requirements set forth in CFR 47 PART 15 SUBPART C. This said equipment in the configuration described in this report shows the maximum emission levels emanating from equipment are within the compliance requirements.



MIKE C.I. KUO / VICE PRESIDENT
COMPLIANCE CERTIFICATION SERVICES, INC.

2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

CHASSIS TYPE	PLASTIC
Frequency Range	902 - 918 MHz
Synthesizer	FUS 680 Transmitter with high integrated synthesizer MB1511 (IC1)
Type of Transmitter	Frequency Modulated
Antenna Requirement	Permanently Attached (Internal)
DC voltage	6V DC
Emission Designator	F2D

3. TEST LOCATION

All emissions tests were performed at:

Compliance Consulting Services
561F Monterey Road
Morgan Hill, CA 95087

CCS has site descriptions on file with the FCC for 10 and 3 meter site configurations.
CCS is a NVLAP accredited facility.

4. TEST RESULT SUMMARY

Radiated Emissions

Test Requirement: 15.249

Field Strength of Fundamental Frequency and Harmonics

Measurement Equipment Used:

HP 8563EM Spectrum Analyzer

HP 8449B Preamplifier, 1 - 26 GHz

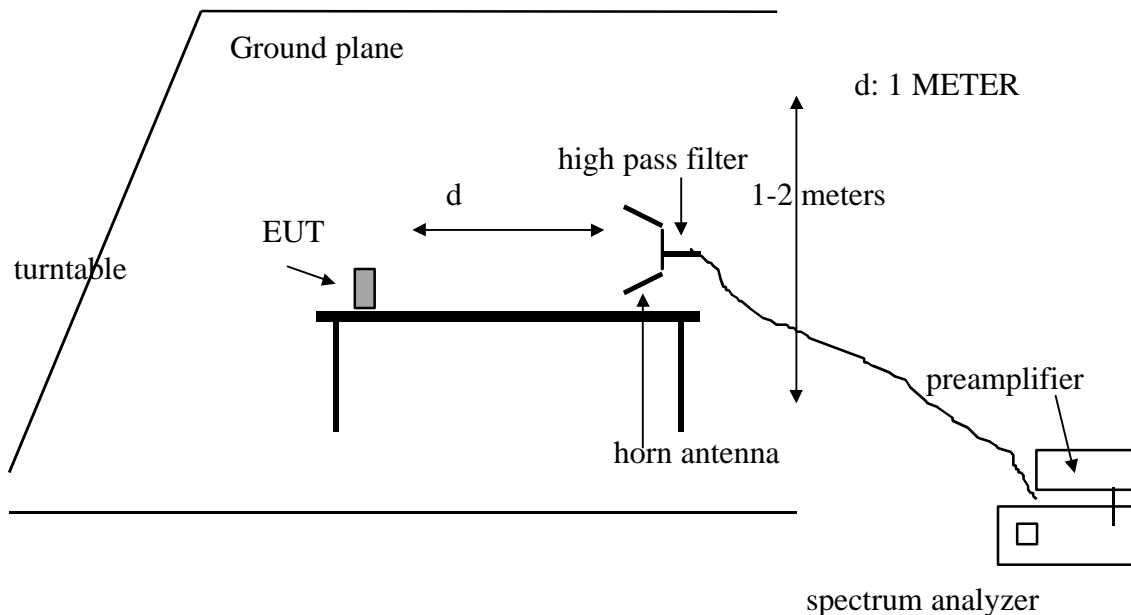
EMCO 3146 Antenna, 200 - 1000MHz

ARA DRG-118/A Double Ridged Horn antenna, 1 - 18 GHz

QIM "The Workhorse" low loss cable, 9ft (loss: 0.85 dB/ft@ 26 GHz)

Microlab 150HX High Pass Filter (fo = 2100 MHz), 400Hz (fo=4000 Mhz)

Test Set-Up



Test Procedures

1. The EUT was placed on a wooden table on the outdoor ground plane. The search antenna was placed 1 METER from the EUT. The EUT was placed in X,Y, and Z positions to simulate actual usage.
2. The turntable was slowly rotated to locate the direction of maximum emission at each emission falling in the restricted bands of 15.205.
3. Once maximum direction was determined, the search antenna was raised and lowered in both vertical and horizontal polarization. The maximum readings so obtained are recorded in the data listed below.
4. High Pass Filter is used for measurement above 1000mhz. No Pre-Amp is used for fundamental Frequency measurement.

5. Since EUT actual tuning range is over 10 Mhz, three fundamental frequencies are selected : 902, 909 and 917 MHz.

Test Results: Refer to attached tabular data sheets.

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Compliance Engineering Services Inc.

Project No. : 98E7214
 Report No. : 980623C1
 Date : 06/23/1998
 Time : 08:57
 Test Engr : JUAN MARTINEZ

>> 3 M RADIATED EMISSION DATA <<

Company : HBC-ELECTRONICS FUNKTECHNIK GMBH
 Equipment Under Test : ORBIT TRANSMITTER (902-918MHz)
 Test Configuration : EUT ONLY
 Type of Test : FCC 15.249 (A) (C)
 Mode of Operation : TX

Freq.	dBuV	PreAmp	Ant	Cable	dBuV/m	Limit	Margin	Pol	Hgt (m)	Az
LOW CHANNEL 902.5MHz:										
X-AXIS:										
LP 9107-3163 ; No Pre-pamp :										
902.50	59.40	0.00	21.87	3.94	85.21	94.00	-8.79	V	1.0	315
902.50	63.90	0.00	22.90	3.94	90.74	94.00	-3.26	H	1.0	270
Y-AXIS:										
902.50	65.00	0.00	22.90	3.94	91.84	94.00	-2.16	H	1.0	120
902.50	59.10	0.00	21.87	3.94	84.91	94.00	-9.09	V	1.6	150
Z-AXIS:										
902.50	62.60	0.00	21.87	3.94	88.41	94.00	-5.59	V	1.2	320
902.50	55.80	0.00	22.90	3.94	82.64	94.00	-11.36	H	1.3	180
MIDDLE CHANNEL 909.9MHz:										
Z-AXIS:										
909.90	55.50	0.00	23.01	3.96	82.47	94.00	-11.53	H	1.3	180
909.90	62.80	0.00	22.00	3.96	88.76	94.00	-5.24	V	1.3	180
X-AXIS:										
909.90	57.40	0.00	22.00	3.96	83.36	94.00	-10.64	V	1.7	320
909.90	63.30	0.00	23.01	3.96	90.27	94.00	-3.73	H	1.0	315
Y-AXIS:										
909.90	64.00	0.00	23.01	3.96	90.97	94.00	-3.03	H	1.0	135
909.90	57.90	0.00	22.00	3.96	83.86	94.00	-10.14	V	1.6	140
HIGH CHANNEL 917.8MHz:										
Y-AXIS:										
917.80	60.90	0.00	22.14	3.98	87.02	94.00	-6.98	V	1.5	180
917.80	65.30	0.00	23.13	3.98	92.40	94.00	-1.60	H	1.0	270
X-AXIS:										
917.80	64.90	0.00	23.13	3.98	92.00	94.00	-2.00	H	1.0	270

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917.80	64.90	0.00	23.13	3.98	92.00	94.00	-2.00	H	1.0	270
917.80	60.60	0.00	22.14	3.98	86.72	94.00	-7.28	V	1.0	150
Z-AXIS:										
917.80	65.00	0.00	22.14	3.98	91.12	94.00	-2.88	V	1.2	225
917.80	57.80	0.00	23.13	3.98	84.90	94.00	-9.10	H	1.2	180

ALSO, COMPLETED SCAN FOR ALL CHANNELS FROM 30 TO 1GHz, TO CHECK FOR ANY OTHER EMISSIONS RADIATING OUTSIDE OF THE SPECIFIED BAND.

Total # of data 18
V. c2.2

msg

Compliance Certification Services
Fcc Part 15.249(A)

9/8/1998
Juan Martinez
Site C(1Meter)

HBC-ELECTRONICS FUNKTECHNIK GMBH
ORBIT TRANSMITTER (902 - 918 MHz)
S/N: 707-L4233/1

f0=902.5MHz

F(MHz)	PK dBuv	AV dBuv	AF (dB)	CL (dB)	AMP (dB)	DIST (dB)	OTHER (dB)	TOTAL		LIMIT		MARGIN	
								(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)
Y-AXIS													
1085	56.4	54.2	26	2.59	-35	-10.5	1	40	38	74	54	-34	-16
2707	58.4	56.7	30	4.07	-35	-10.5	1	48	46	74	54	-26	-7.7
3614	53.3	50.2	32.9	4.63	-35	-10.5	1	46	43	74	54	-28	-11
4512	49.6	45	32.4	5.18	-35	-10.5	1	43	38	74	54	-31	-16
5415	52.78	49.41	34.9	5.74	-35	-10.5	1	49	46	74	54	-25	-8.5
6.317	43.09	31.07	35.3	6.08	-35	-10.5	1	40	28	74	54	-34	-26
7220	47.95	36.08	36.5	6.65	-35	-10.5	1	47	35	74	54	-27	-19
8122	49.82	38.71	37.1	7.6	-35	-10.5	1	50	39	74	54	-24	-15
9025	46.92	37.02	38.3	7.98	-35	-10.5	1	49	39	74	54	-25	-15
X-AXIS													
1085	57.2	55.2	26	2.59	-35	-10.5	1	41	39	74	54	-33	-15
2707	54.1	51.1	30	4.07	-35	-10.5	1	44	41	74	54	-30	-13
3614	50.7	46.8	32.9	4.63	-35	-10.5	1	44	40	74	54	-30	-14
4512	54.8	49.8	32.4	5.18	-35	-10.5	1	48	43	74	54	-26	-11
5415	55.04	52.57	34.9	5.74	-35	-10.5	1	51	49	74	54	-23	-5.3
6.317	44.83	36.81	35.3	6.08	-35	-10.5	1	42	34	74	54	-32	-20
7220	47.56	38.9	36.5	6.65	-35	-10.5	1	46	38	74	54	-28	-16
8122	48.75	37.12	37.1	7.6	-35	-10.5	1	49	37	74	54	-25	-17
9025	47.26	38.58	38.3	7.98	-35	-10.5	1	49	40	74	54	-25	-14
Z-AXIS													
1085	55	52.3	26	2.59	-35	-10.5	1	39	36	74	54	-35	-18

1(A)

ms.

2707	54.7	52	30	4.07	-35	-10.5	1	44	42	74	54	-30	-12
3614	53.1	50.3	32.9	4.63	-35	-10.5	1	46	43	74	54	-28	-11
4512	49.8	47.2	32.4	5.18	-35	-10.5	1	43	40	74	54	-31	-14
5415	55.44	52.59	34.9	5.74	-35	-10.5	1	52	49	74	54	-22	-5.3
6317	45.77	36.54	35.3	6.08	-35	-10.5	1	43	33	74	54	-31	-21
7220	48.95	39.78	36.5	6.65	-35	-10.5	1	48	38	74	54	-26	-16
8122	48.75	36.89	37.1	7.6	-35	-10.5	1	49	37	74	54	-25	-17
9025	47.89	37.02	38.3	7.98	-35	-10.5	1	50	39	74	54	-24	-15

NOTE: ALL MEASUREMENTS ARE HORIZONTAL MEASUREMENTS.

N: Noise Floor
 AF: Antenna Factor
 AMP: Pre-amp gain
 CL: Cable loss

RES VBW

PK: 1MHz 1MHz PK: Peak
 AV: 1MHz 10Hz AV: Average

Fig.

Compliance Certification Services
Fcc Part 15.249(A)

6/24/1998
 Juan Martinez
 Site C(1Meter)

HBC-ELECTRONICS FUNKTECHNIK GMBH
 ORBIT TRANSMITTER (902 - 918 MHz)
 S/N: 707-L4233/1

fo=909.9MHz

F(MHz)	PK dBuv	AV dBuv	AF (dB)	CL (dB)	AMP (dB)	DIST (dB)	OTHER (dB)	TOTAL (dBuV/m)	LIMIT (dBuV/m)			MARGIN (dBuV/m)		
									PK	AV	PK	AV	PK	AV
Y-AXIS														
1819	54.89	52.03	26	2.66	-35	-10.5	1	39	36	74	54	54	-35	-18
2729	55.31	52.82	30	3.8	-35	-10.5	1	45	42	74	54	54	-29	-12
3639	52.55	49.07	33	4.75	-35	-10.5	1	46	42	74	54	54	-28	-12
4549	47.68	41.66	32.4	5.32	-35	-10.5	1	41	35	74	54	54	-33	-19
5459	43.78	31.82	35	5.89	-35	-10.5	1	40	28	74	54	54	-34	-26
6369	42.1	30.95	35.3	6.46	-35	-10.5	1	39	28	74	54	54	-35	-26
7279	47.78	35.12	36.5	6.65	-35	-10.5	1	46	34	74	54	54	-28	-20
8189	48.42	36.29	37.2	7.41	-35	-10.5	1	49	36	74	54	54	-25	-18
9099	48.99	36.06	38.3	7.79	-35	-10.5	1	51	38	74	54	54	-23	-16

X-AXIS														
1819	54.67	51.79	26	2.66	-35	-10.5	1	39	36	74	54	54	-35	-18
2729	58.89	57.87	30	3.8	-35	-10.5	1	48	47	74	54	54	-26	-6.8
3639	51.89	48.72	33	4.75	-35	-10.5	1	45	42	74	54	54	-29	-12
4549	50.07	46.4	32.4	5.32	-35	-10.5	1	43	40	74	54	54	-31	-14
5459	44.89	33.54	35	5.89	-35	-10.5	1	41	30	74	54	54	-33	-24
6369	43.87	31.75	35.3	6.46	-35	-10.5	1	41	29	74	54	54	-33	-25
7279	47.58	36.47	36.5	6.65	-35	-10.5	1	46	35	74	54	54	-28	-19
8189	48.24	36.78	37.2	7.41	-35	-10.5	1	48	37	74	54	54	-26	-17
9099	48.12	36.75	38.3	7.79	-35	-10.5	1	50	38	74	54	54	-24	-16

off

Z-AXIS	59.45	57.87	26	2.66	-35	-10.5	1	44	42	74	54	-30	-12
1819	59.45	57.87	26	2.66	-35	-10.5	1	44	42	74	54	-30	-12
2729	60.4	59.35	30	3.8	-35	-10.5	1	50	49	74	54	-24	-5.4
3639	54.7	51.58	33	4.75	-35	-10.5	1	48	45	74	54	-26	-9.2
4549	50.53	45.77	32.4	5.32	-35	-10.5	1	44	39	74	54	-30	-15
5459	44.58	33.45	35	5.89	-35	-10.5	1	41	30	74	54	-33	-24
6369	43.58	38.74	35.3	6.46	-35	-10.5	1	41	36	74	54	-33	-18
7279	46.89	36.48	36.5	6.65	-35	-10.5	1	46	35	74	54	-28	-19
8189	47.52	35.18	37.2	7.41	-35	-10.5	1	48	35	74	54	-26	-19
9099	48.25	36.62	38.3	7.79	-35	-10.5	1	50	38	74	54	-24	-16

NOTE: ALL MEASUREMENTS ARE HORIZONTAL MEASUREMENTS.

N: Noise Floor
 AF: Antenna Factor
 AMP: Pre-amp gain
 CL: Cable loss

RES VBW

PK: 1MHz 1MHz
 AV: 1MHz 10Hz
 PK: Peak
 AV: Average

mf

Compliance Certification Services
Fcc Part 15.249(A)

6/24/1998
Juan Martinez
Site C(1Meter)

HBC-ELECTRONICS FUNKTECHNIK GMBH
ORBIT TRANSMITTER (902 - 918 MHz)
S/N: 707-L4233/1

f₀=917.8MHz

F(MHz)	PK dBuv	AV dBuv	AF (dB)	CL (dB)	AMP (dB)	DIST (dB)	OTHER (dB)	TOTAL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dBuV/m)
Y-AXIS										
1835	56.66	54.04	26	2.66	-35	-10.5	1	41 38 74	54	-33 -16
2753	59.81	58.07	30	3.8	-35	-10.5	1	49 47 74	54	-25 -6.8
3671	53.67	51.37	33	4.75	-35	-10.5	1	47 45 74	54	-27 -9.4
4588	49.71	45.42	32.4	5.32	-35	-10.5	1	43 39 74	54	-31 -15
5506	43.24	31.9	35	5.89	-35	-10.5	1	40 28 74	54	-34 -26
6424	42.46	31.31	35.3	6.46	-35	-10.5	1	40 29 74	54	-34 -25
7342	47.34	35.26	36.5	6.65	-35	-10.5	1	46 34 74	54	-28 -20
8260	48.15	36.33	37.2	7.41	-35	-10.5	1	48 36 74	54	-26 -18
9178	47.32	36.01	38.3	7.79	-35	-10.5	1	49 38 74	54	-25 -16
X-AXIS										
1835	56.88	55.27	26	2.66	-35	-10.5	1	41 39 74	54	-33 -15
2753	62.5	60.97	30	3.8	-35	-10.5	1	52 50 74	54	-22 -3.7
3671	54.29	51.84	33	4.75	-35	-10.5	1	48 45 74	54	-26 -8.9
4588	51.77	47.92	32.4	5.32	-35	-10.5	1	45 41 74	54	-29 -13
5506	44.51	32.78	35	5.89	-35	-10.5	1	41 29 74	54	-33 -25
6424	43.45	31.01	35.3	6.46	-35	-10.5	1	41 28 74	54	-33 -26
7342	47.58	36.78	36.5	6.65	-35	-10.5	1	46 35 74	54	-28 -19
8260	48.75	36.64	37.2	7.41	-35	-10.5	1	49 37 74	54	-25 -17
9178	49.56	37.74	38.3	7.79	-35	-10.5	1	51 39 74	54	-23 -15

mg

Z-AXIS	59.77	58.18	26	2.66	-35	-10.5	1	44	42	74	54	-30	-12
1835	64.93	63.78	30	3.8	-35	-10.5	1	54	53	74	54	-20	-0.9
2753	55.82	53.13	33	4.75	-35	-10.5	1	49	46	74	54	-25	-7.6
3671	51.33	47.76	32.4	5.32	-35	-10.5	1	45	41	74	54	-29	-13
4588	43.15	31.78	35	5.89	-35	-10.5	1	40	28	74	54	-34	-26
5506	43.74	31.65	35.3	6.46	-35	-10.5	1	41	29	74	54	-33	-25
6424	47.32	36.12	36.5	6.65	-35	-10.5	1	46	35	74	54	-28	-19
7342	48.52	36.79	37.2	7.41	-35	-10.5	1	49	37	74	54	-25	-17
8260	47.56	36.12	38.3	7.79	-35	-10.5	1	49	38	74	54	-25	-16
9178													

NOTE: ALL MEASUREMENTS ARE HORIZONTAL MEASUREMENTS.

N: Noise Floor
 AF: Antenna Factor
 AMP: Pre-amp gain
 CL: Cable loss

RES VBW

PK: 1MHz 1MHz PK: Peak
 AV: 1MHz 10Hz AV: Average

Occupied Bandwidth

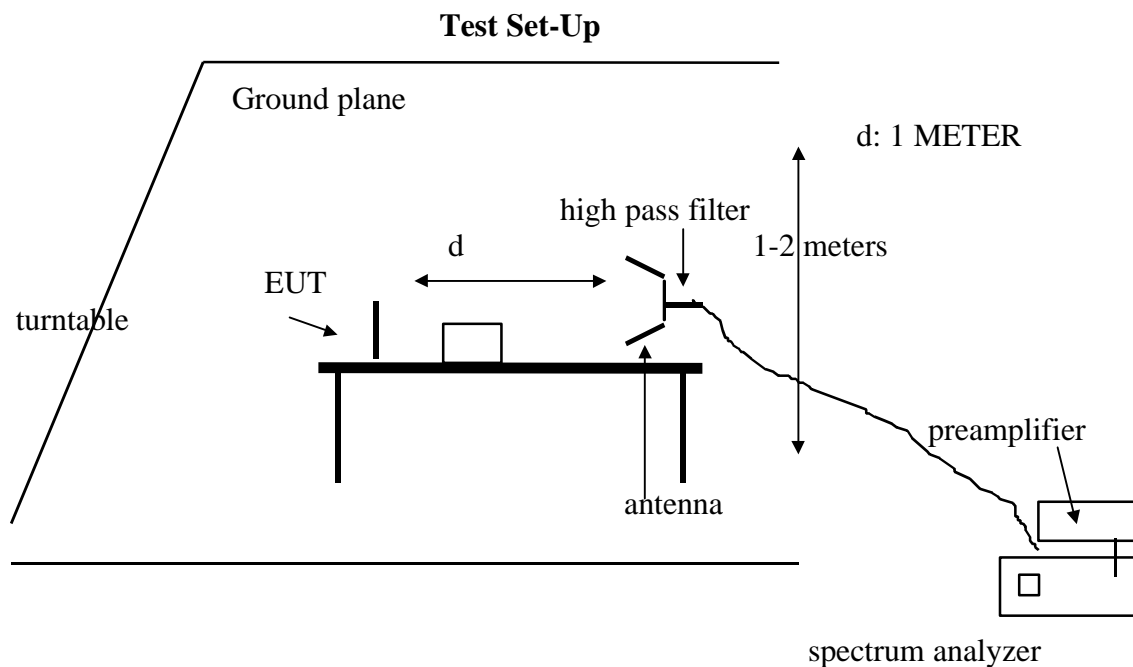
Test Requirement: 15.249 (C)

Measurement Equipment Used:

HP 8563EM Spectrum Analyzer

EMCO 3146 Antenna, 200 - 1000MHz

QIM "The Workhorse" low loss cable, 9ft (loss: 0.85 dB/ft@ 26 GHz)



Test Procedures

1. The EUT transmit frequency was set to 902MHz, the lowest operating frequency of the EUT.
2. The MAX HOLD and MARKER features of the analyzer were used to determine the occupied bandwidth of the signal.

Test Results

All signals outside 902MHz were at least 50 dB below the fundamental. Refer to attached spectrum analyzer chart.

FCC 15.249(CC)

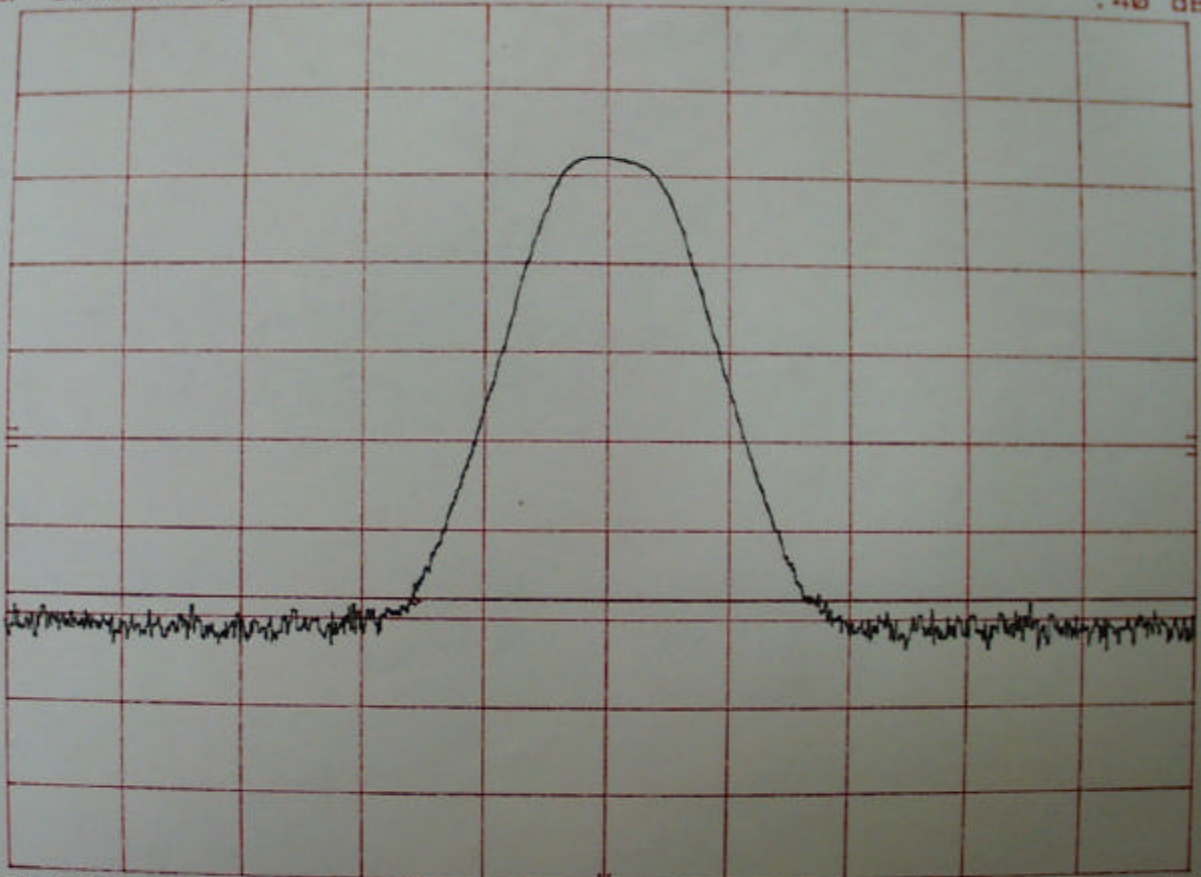
REF 107.0 dB μ V ATTEN 0 dB

g.m.
MKR Δ 322 kHz
.40 dB

10 dB/

OFFSET
10.0
dB

DL
39.2
dB μ V



START 902.000 MHz

RES BW 100 kHz

VBW 100 kHz

STOP 903.000 MHz

SWP 20 msec

g.7

FCC 15.249 (c)

hp

REF 106.0 dB μ V ATTEN 0 dB

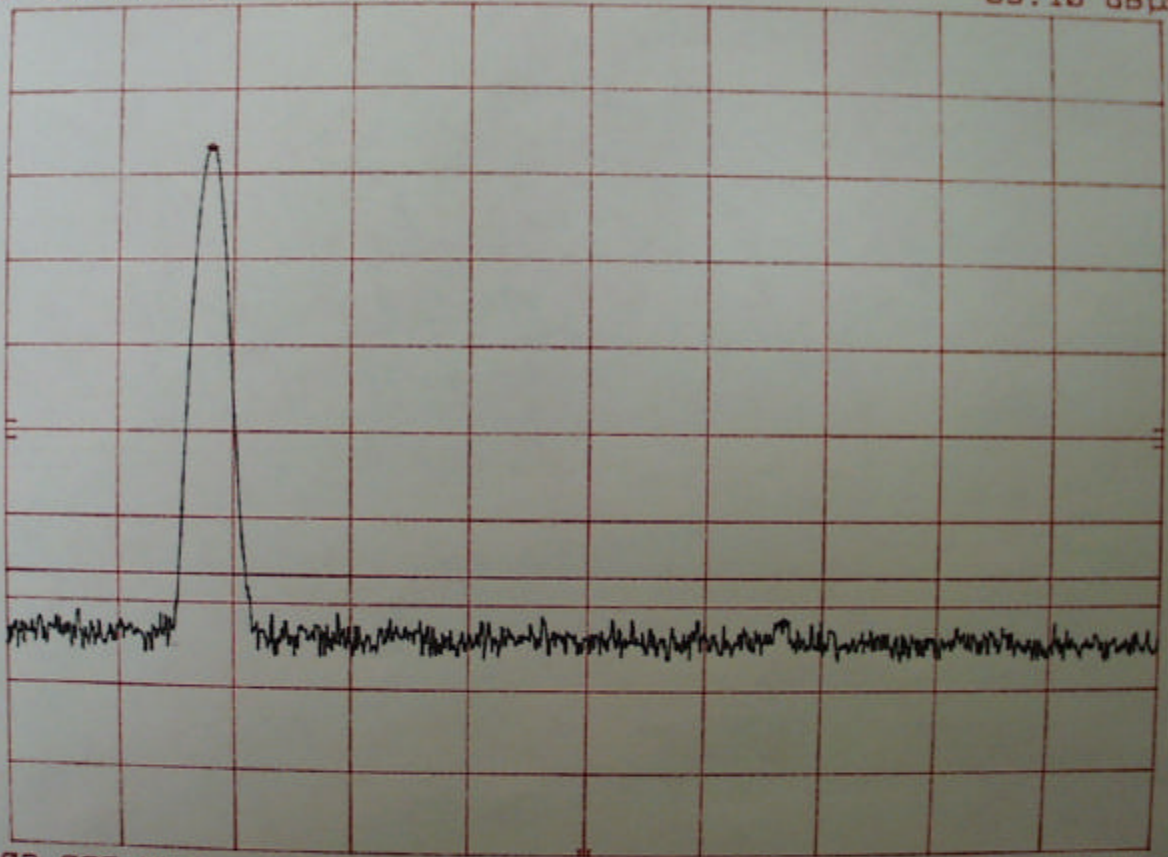
MKR 902.537 MHz

89.10 dB μ V

10 dB/

OFFSET
10.0
dB

DL
39.1
dB μ V



START 902.000 MHz

RES BW 30 kHz

VBW 100 kHz

STOP 905.000 MHz

SWP 20 msec

gm

FCC 15.249 (c)

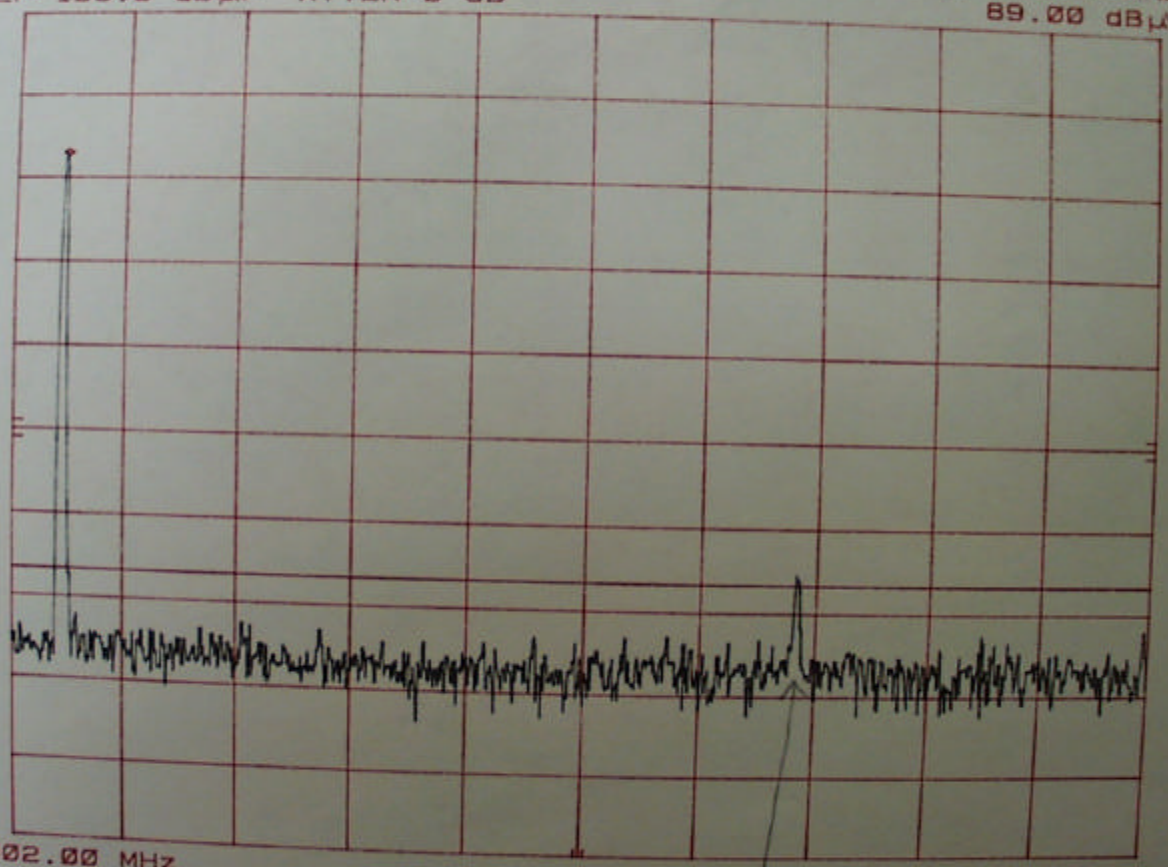
REF 106.0 dB μ V ATTN 0 dB

MKR 902.72 MHz
89.00 dB μ V

10 dB/

OFFSET
10.0
dB

DL
39.1
dB μ V



START 902.00 MHz

RES BW 30 kHz

VBW 100 kHz

STOP 918.00 MHz

SWP 50 msec

Signal
is an ambient refer
to next page

gm

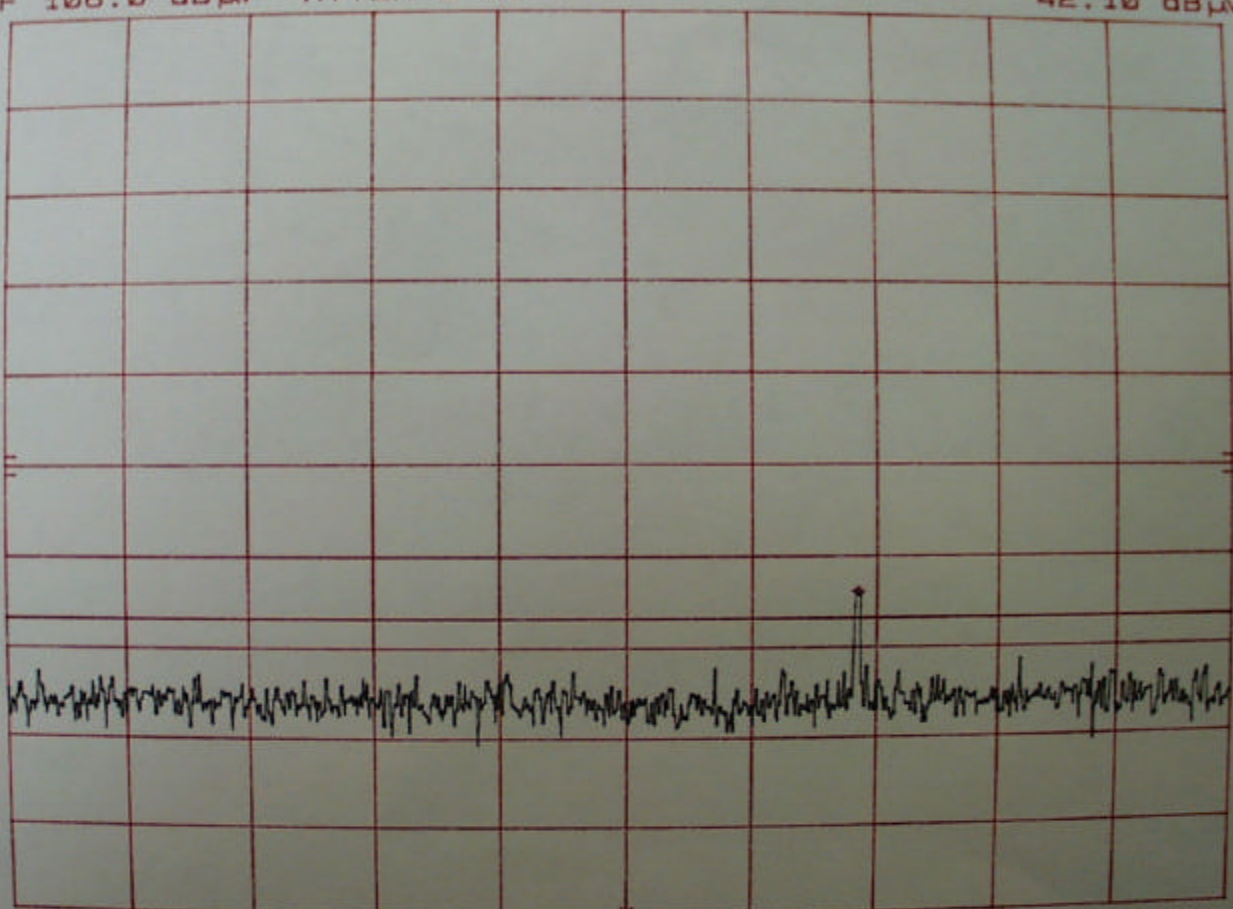
EUT OFF. SIGNAL IS AN AMBIENT
REF 106.0 dB μ V ATTN 0 dB

MKR 912.94 MHz
42.10 dB μ V

hp
10 dB/

OFFSET
10.0
dB

DL
39.1
dB μ V



START 902.00 MHz

RES BW 30 kHz

VBW 100 kHz

STOP 918.00 MHz

SWP 50 msec

5. EUT SETUP PHOTO

