FCC Part 15 Subpart B EMI TEST REPORT

of

E.U.T. : DIGITAL SATELLITE RECEIVER

MODEL : IRD-2102S (PROSAT-2102S)

FCC ID. : JJ6IRD2102S

for

APPLICANT : EFA CO.

ADDRESS : NO. 3, TZU-CHIANG 4TH ROAD, CHUNGLI INDUSTRIAL ZONE, TAOYUAN HSIEN, TAIWAN, R.O.C.

Test Performed by

ELECTRONICS TESTING CENTER, TAIWAN
NO. 8 LANE 29, WENMIMG ROAD,
LOSHAN TSUN, KWEISHAN HSIANG,
TAOYUAN, TAIWAN, R.O.C.

Tel:(03)3280026-32
Fax:(03)3280034

Report Number : ET87R-01-068

TEST REPORT NOTIFICATION

Applicant : EFA CO.
NO. 3, TZU-CHIANG 4TH ROAD, CHUNGLI INDUSTRIAL ZONE, TAOYUAN HSIEN, TAIWAN, R.O.C.

Manufacturer : EFA CO.
NO. 3, TZU-CHIANG 4TH ROAD, CHUNGLI INDUSTRIAL ZONE, TAOYUAN HSIEN, TAIWAN, R.O.C

Description of EUT :

a) Type of EUT : DIGITAL SATELLITE RECEIVER
b) Trade Name : PROSAT
c) Model No. : IRD-2102S (PROSAT-2102S)
d) Power Supply : 120VAC, 60Hz, 300W MAX
e) Frequency Range : 950MHz-2150MHz

Regulation Applied : FCC Rules and Regulations Part 15 Subpart B (1996)

I HEREBY CERTIFY THAT: The data shown in this report were made in accordance with the procedures given in ANSI C63.4, and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

Note: 1. The result of the testing report relate only to the item tested.
2. The testing report shall not be reproduced expect in full, without the written approval of ETC.

Issued Date : JUN. 05, 1998

Test Engineer : Tien Lu Liau
(Tien Lu Liau)

Approve & Authorized Signer : Will Yauo
Will Yauo, Supervisor
EMI Test Site of ELECTRONICS TESTING CENTER, TAIWAN

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1 GENERAL INFORMATION

1.1 Product Description

a) Type of EUT : DIGITAL SATELLITE RECEIVER

b) Trade Name : PROSAT

c) Model No. : IRD-2102S (PROSAT-2102S)

d) Power Supply : 120VAC, 60Hz, 300W MAX

e) Frequency Range : 950MHz-2150MHz

1.2 Characteristics of Device

The DIGITAL SATELLITE RECEIVER only DVB compatible. There are audio and video output for TV connection. It's easy controlled with front panel keys or remote controller.

1.3 Test Methodology

For DIGITAL SATELLITE RECEIVER, both conducted, radiated, conducted RF output signal and spurious level and transfer switch isolation testing were performed according to the procedures in section 12.2 of ANSI C63.4(1992).

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the roof top of Building at No.34, 5 Lirn, Din Fu Tsun, Lin Kou, Taipei, Taiwan, R.O.C.

This site has been fully described in a report submitted to your office, and accepted in a letter dated Feb. 10 , 1997.

2 LIMITATIONS AND LABELING REQUIREMENT

2.1 Definition

Unintentional radiator:
A device that intentionally generates and radio frequency energy for use within the device, or that sends radio frequency signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction.

Class A Digital Device:
A digital device which is marketed for use in commercial or business environment; exclusive of a device which is market for use by the general public, or which is intended to be used in the home.

Class B Digital Device :
A digital device which is marketed for use in a residential environment notwithstanding use in a commercial, business of industrial environment. Example of such devices that are marketed for the general public.

Note : A manufacturer may also qualify a device intended to be marketed in a commercial, business, or industrial environment as a Class B digital device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B Digital Device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B Digital Device, Regardless of its intended use.

2.2 Limitation

(1) Conducted Emission Limits :

Class A Line Conducted Emission Limits :

Frequency MHz	Emissions μV	Emissions dBμV
0.45 - 1.705	1000	60.0
1.705 - 30.0	3000	69.5

Class B Line Conducted Emission Limits :

Frequency MHz	Emissions μV	Emissions dBμV
0.45 - 30.0	250	48.0

(2) Radiated Emission Limits :

According to 15.109 ,Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Class A Radiated Emission Limits :

Frequency MHz	Distance Meters	Radiated dBμV/m	Radiated μV/m
30 - 88	10	39.0	90
88 - 216	10	43.5	150
216 - 960	10	46.4	210
above 960	10	49.5	300

Class B Radiated Emission Limits :

Frequency MHz	Distance Meters	Radiated dBμV/m	Radiated μV/m
30 - 88	3	40.0	100
88 - 216	3	43.5	150
216 - 960	3	46.0	200
above 960	3	54.0	500

2.3 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device :

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions : (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2.4 User Information

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual.

The Federal Communications Commission Radio Frequency Interference Statement includes the following paragraph.

This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio / TV technician for help.

3. SYSTEM TEST CONFIGURATION

3.1 Justification

The system was configured for testing in EUT is working.

The EUT was rotated to obtain the maximum level of radiated emissions .The antenna was varied in height above ground to obtain the maximum signal strength. The antenna height was varied from 1 to 4 meters.

It was operated with a appropriate standard RF signal applied to the RF input terminal. During emission test.

3.2 Device for Tested System

Device	Manufacture	Model / FCC ID.	Description
DIGITAL SATELLITE RECEIVER*	EFA CO.	IRD-2102S (PROSAT-2102S) / JJ6IRD2102S	1.5m Unshielded AC Power Cord 1.5m Unshielded AC Cable × 2 1.5m Unshielded AV Cable 5.0m Unshielded RG-6U 75 Ω Coaxial Cable 2.0m Unshielded S Type Cable 1.5m Unshielded TV Cable × 3 1.75m Unshielded 9pin Cable 1.5m Unshielded 25pin Cable
TV	Panasonic	TC-14L1R	1.2m Unshielded AC Power Cord 1.0m Unshielded AV Cable × 1
TV Test Transmitter	R & S	SFQ	1.8m Unshielded AC Power Cord
MPEG2 Measurement Generator	R & S	DVG	1.8m Unshielded AC Power Cord

Remark "*" means equipment under test.

4 RADIATED EMISSION MEASUREMENT

4.1 Description for Radiated Emission Measured

According to § 15.33 (b), radiated emission frequency was measured from 30 MHz to 5GHz.

The field strength measurements of the receiver under test which was placed on an wooden turntable 0.8 meter in height. The receiving antenna polarized horizontally was varied from 1 to 4 meters and the wooden turntable was rotated through 360 degrees to obtain the highest reading on the field strength meter or on the display of the spectrum analyzer. And also, each emission was to be maximized by changing the orientation of the equipment under test. These measurements were repeated with the receiving antenna polarized vertically.

For DIGITAL SATELLITE RECEIVER, it was operated with a appropriate standard RF signal applied to the RF input terminal during emission test.

According to FCC rule, for device submitted for notification in this report, the limit below 1 GHz is quasi peak and above 1 GHz is both peak and average applied. It is considered that the emission level is also in compliance with average limit when the measurement with peak function meets average limit.

And per FCC § 15.31 (m), measurements on intentional radiators or receiver shall be performed for each band as following :

Frequency range over which device operate	Number of Frequencies	Location in the range of operation
1 MHz or less	1	Middle
1 to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom

Here, we measured on the DIGITAL SATELLITE RECEIVER for 3 frequencies which covered the all operation range with this converter.

The following data lists the significant emission frequencies, measured levels, correction factor (includes cable and antenna corrections),the corrected reading, the limit , and margin. Explanation of the Correction Factor is given in paragraph 4.3.

4.2 Radiated Emission Data

4.2.1 Receiver Local Oscillator Emissions

Operation Mode : A RF test signal applied to input terminal
Test Date : JUN. 02, 1998 Temperature : 25 ℃ Humidity: 68%

a. Local Oscillator Frequency 1429.379MHz

Frequency (MHz)	Ant Pol H/V	Reading (dBuV) Peak	Ave.	Factor (dB)	Result @3m (dBuV/m) Peak	Ave.	Limit @3m (dBuV/m) Peak	Ave.	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
1429.379	V	48.8	--	-7.8	41.0	--	74.0	54.0	-33.0	0	1.20
2858.964	V	53.8	--	-1.6	52.2	--	74.0	54.0	-21.8	180	1.50
4288.429	H	47.2	--	2.0	49.2	--	74.0	54.0	-24.8	0	1.50
5717.943	V	46.9	--	4.4	51.3	--	74.0	54.0	-22.7	135	1.50
7147.379	H	44.5	--	5.6	50.1	--	74.0	54.0	-23.9	225	1.50
8576.893	H/V	--	--	6.8	--	--	74.0	54.0	--	--	--
10006.407	H	45.9	38.1	7.4	53.3	45.5	74.0	54.0	-8.5	135	1.50

b. Local Oscillator Frequency 2029.486MHz

Frequency (MHz)	Ant Pol H/V	Reading (dBuV) Peak	Ave.	Factor (dB)	Result @3m (dBuV/m) Peak	Ave.	Limit @3m (dBuV/m) Peak	Ave.	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
2029.486	V	51.1	--	-4.5	46.6	--	74.0	54.0	-27.4	0	1.40
4058.971	H	49.1	--	2.0	51.1	--	74.0	54.0	-22.9	90	1.50
6088.457	H	42.1	--	4.5	46.6	--	74.0	54.0	-27.4	225	1.40
8117.943	H	41.4	--	6.5	47.9	--	74.0	54.0	-26.1	350	1.30
10147.429	H/V	--	--	7.5	--	--	74.0	54.0	--	--	--

c. Local Oscillator Frequency 2629.600MHz

Frequency (MHz)	Ant Pol H/V	Reading (dBuV) Peak	Ave.	Factor (dB)	Result @3m (dBuV/m) Peak	Ave.	Limit @3m (dBuV/m) Peak	Ave.	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
2629.600	V	52.4	51.3	-2.3	50.1	49.0	74.0	54.0	-5.0	0	1.40
5259.179	V	47.7	44.0	3.7	51.4	47.7	74.0	54.0	-6.3	45	1.30
7888.393	V	43.9	--	6.4	50.3	--	74.0	54.0	-23.7	31	1.30
10517.757	H	47.5	39	7.9	55.4	46.9	74.0	54.0	-7.1	25	1.30
13147.407	H	43.7	--	10.5	54.2	--	74.0	54.0	-19.8	25	1.30
15777.007	H/V	--	--	8.3	--	--	74.0	54.0	--	--	--

Remark "--" means that the emission level is too low to be measured or attenuated more than 20 dB from limit.

4.2.2 Other Spurious Emissions

Operation Mode : A RF test signal applied to input terminal
Test Date : JUN. 05, 1998 Temperature : 25 ℃ Humidity: 73%

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
57.999	H	53.0	-15.8	37.2	40.0	-2.8	90	4.00
161.966	H	43.8	-9.4	34.4	43.5	-9.1	270	4.00
175.489	H	49.2	-9.1	40.1	43.5	-3.4	270	4.00
199.770	H	45.1	-7.1	38.0	43.5	-5.5	90	4.00
479.472	H	48.7	-4.5	44.2	46.0	-1.8	0	2.00
759.207	H	39.3	-0.3	39.0	46.0	-7.0	270	1.80

4.3 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

RESULT = READING + CORR. FACTOR

where CORR. FACTOR = Antenna FACTOR + Cable FACTOR

4.4 Equipment for Radiation Measurement

The following test equipment are used during the radiated test .

Equipment	Manufacturer	Model No.	Next Cal. Date
EMI Receiver	Hewlett-Packard	8546A	02/11/1999
Spectrum Analyzer	Hewlett-Packard	8568B	10/16/1998
Quasi Peak Adapter	Hewlett-Packard	85650A	10/07/1998
Pre-selector	Hewlett-Packard	85685A	10/16/1998
Pre-Amplifier	Hewlett-Packard	8447D	12/23/1998
Pre-Amplifier	Hewlett-Packard	8449B	05/08/1999
Horn Antenna	EMCO	3115	08/05/1998
Log Periodic Antenna	EMCO	3146	12/10/1999
Biconical Antenna	EMCO	3108	08/05/1998

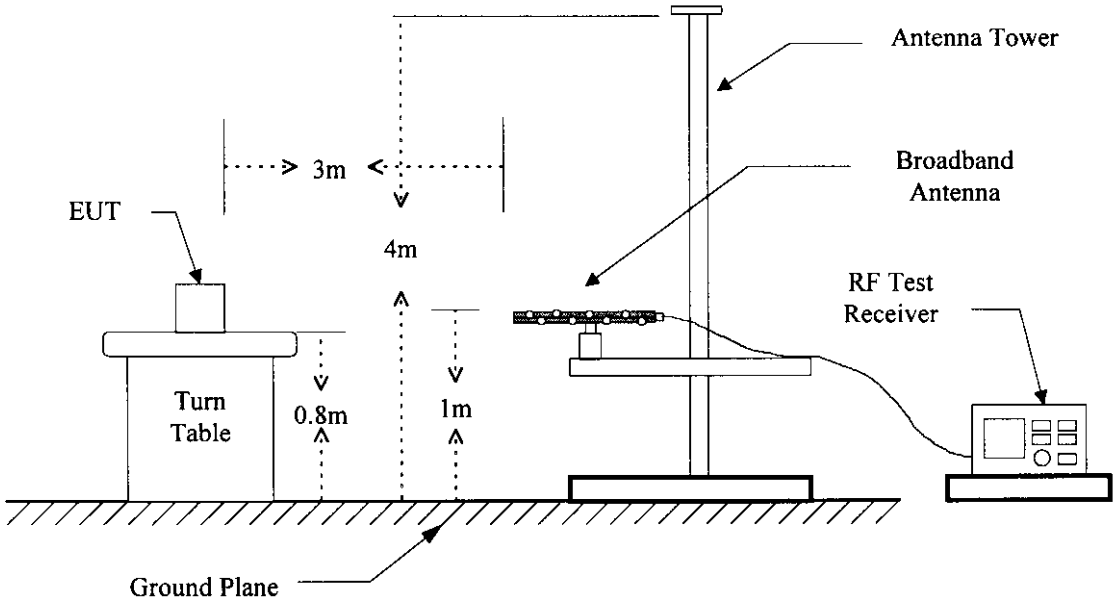
4.5 Measuring Instrument Setup

Explanation of measuring instrument setup when respective function is used in any frequency band is as following :

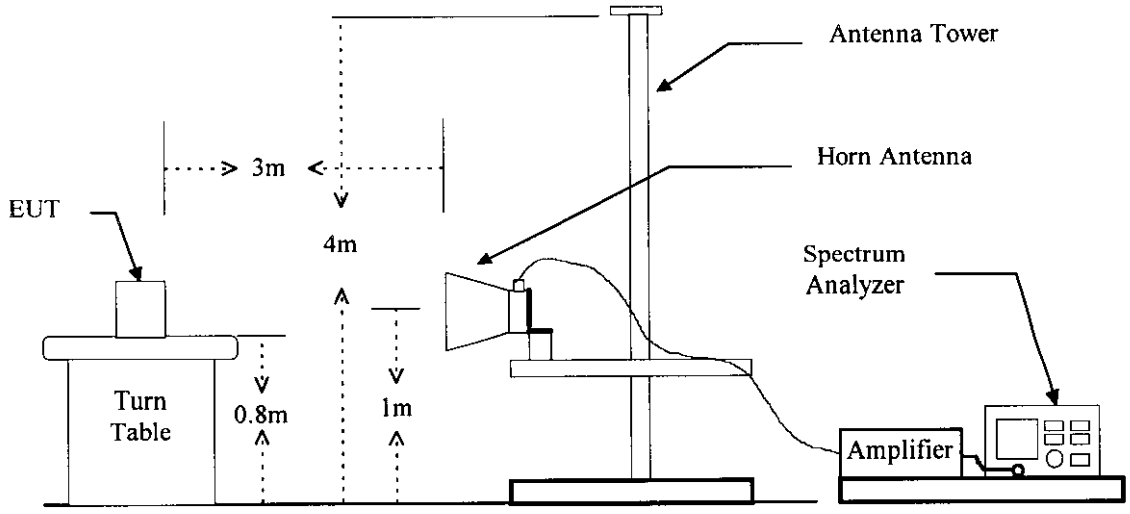
Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	RF Test Receiver	Quasi Peak	120 kHz	N/A
	Spectrum Analyzer	Peak	100 kHz	100 kHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz
	Spectrum Analyzer	Average	1 MHz	300Hz

4.7 Open Field Test Site Setup Diagram

Radiated Emission's Frequency Below 1 GHz



Radiated Emission's Frequency Above 1 GHz



5 CONDUCTED EMISSION MEASUREMENT

5.1 Description

The initial setup in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on following data pages, and these signals are the quasi-peaked.

For DIGITAL SATELLITE RECEIVER, it was operated with a RF signal applied to the RF input terminal. There is no significant change in radiated emissions when a 0 dBmV input signal is applied.

This conducted emission data is only reported with three input channels, for there is no significant change in other input channels during the preliminary tests.

5.2 Conducted Emission Data

A.

Test Date : JUN. 02, 1998 Temperature : 22 ℃ Humidity: 85%

Receiver Frequency : 950MHz Output Channel : CH3

Frequency	Reading (dBuV)		Factor	Result (dBuV)		Limit	Margin
(MHz)	Va	Vb	(dB)	Va	Vb	(dBuV)	(dB)
0.450	38.8	39.4	0.2	39.0	39.6	48.0	-8.4
0.469	34.9	38.3	0.2	35.1	38.5	48.0	-9.5
0.510	33.0	36.5	0.2	33.2	36.7	48.0	-11.3
0.579	29.9	33.5	0.2	30.1	33.7	48.0	-14.3
1.047	30.7	31.5	0.3	31.0	31.8	48.0	-16.2
1.373	29.1	31.4	0.3	29.4	31.7	48.0	-16.3

B.

Test Date : JAN. 02, 1998 Temperature : 22 ℃ Humidity: 85%

Receiver Frequency : 1550MHz Output Channel : CH3

Frequency	Reading (dBuV)		Factor	Result (dBuV)		Limit	Margin
(MHz)	Va	Vb	(dB)	Va	Vb	(dBuV)	(dB)
0.450	39.0	39.6	0.2	39.2	39.8	48.0	-8.2
0.469	35.2	38.5	0.2	35.4	38.7	48.0	-9.3
0.510	33.2	36.7	0.2	33.4	36.9	48.0	-11.1
0.579	30.1	33.7	0.2	30.3	33.9	48.0	-14.1
1.047	30.9	31.7	0.3	31.2	32.0	48.0	-16.0
1.373	29.3	31.6	0.3	29.6	31.9	48.0	-16.1

C.

Test Date : JAN. 02, 1998 Temperature : 22 ℃ Humidity: 85%

Receiver Frequency : 2150MHz Output Channel : CH3

Frequency	Reading (dBuV)		Factor	Result (dBuV)		Limit	Margin
(MHz)	Va	Vb	(dB)	Va	Vb	(dBuV)	(dB)
0.450	38.9	39.5	0.2	39.1	39.7	48.0	-8.3
0.469	35.0	38.4	0.2	35.2	38.6	48.0	-9.4
0.510	33.1	36.6	0.2	33.3	36.8	48.0	-11.2
0.579	30.0	33.6	0.2	30.2	33.8	48.0	-14.2
1.047	30.8	31.6	0.3	31.1	31.9	48.0	-16.1
1.373	29.2	31.5	0.3	29.5	31.8	48.0	-16.2

D.

Test Date : JUN. 05, 1998 Temperature : 22 ℃ Humidity: 85%

Receiver Frequency : 950MHz Output Channel : CH4

Frequency	Reading (dBuV)		Factor	Result (dBuV)		Limit	Margin
(MHz)	Va	Vb	(dB)	Va	Vb	(dBuV)	(dB)
0.450	38.7	39.3	0.2	38.9	39.5	48.0	-8.5
0.469	34.8	38.2	0.2	35.0	38.4	48.0	-9.6
0.510	32.9	36.4	0.2	33.1	36.6	48.0	-11.4
1.047	30.6	31.4	0.3	30.9	31.7	48.0	-16.3
1.373	29.0	31.3	0.3	29.3	31.6	48.0	-16.4
1.825	26.8	30.1	0.3	27.1	30.4	48.0	-17.6

E.

Test Date : JUN. 05, 1998 Temperature : 22 ℃ Humidity: 85%

Receiver Frequency : 1550MHz Output Channel : CH4

Frequency	Reading (dBuV)		Factor	Result (dBuV)		Limit	Margin
(MHz)	Va	Vb	(dB)	Va	Vb	(dBuV)	(dB)
0.450	38.6	39.1	0.2	38.8	39.3	48.0	-8.7
0.469	34.6	38.3	0.2	34.8	38.5	48.0	-9.5
0.510	33.1	36.7	0.2	33.3	36.9	48.0	-11.1
1.047	30.8	31.6	0.3	31.1	31.9	48.0	-16.1
1.373	29.1	31.5	0.3	29.4	31.8	48.0	-16.2
1.825	27.1	30.4	0.3	27.4	30.7	48.0	-17.3

F.

Test Date : JUN. 05, 1998 Temperature : 22 ℃ Humidity: 65%

Receiver Frequency : 2150MHz Output Channel : CH4

Frequency	Reading (dBuV)		Factor	Result (dBuV)		Limit	Margin
(MHz)	Va	Vb	(dB)	Va	Vb	(dBuV)	(dB)
0.450	38.9	39.5	0.2	39.1	39.7	48.0	-8.3
0.469	35.0	38.4	0.2	35.2	38.6	48.0	-9.4
0.510	33.2	36.6	0.2	33.4	36.8	48.0	-11.2
1.047	30.7	31.5	0.3	31.0	31.8	48.0	-16.2
1.373	29.3	31.6	0.3	29.6	31.9	48.0	-16.1
1.825	27.0	30.4	0.3	27.3	30.7	48.0	-17.3

5.3 Result Data Calculation

The result data is calculated by adding the LISN Factor to the measured reading. The basic equation with a sample calculation is as follows:

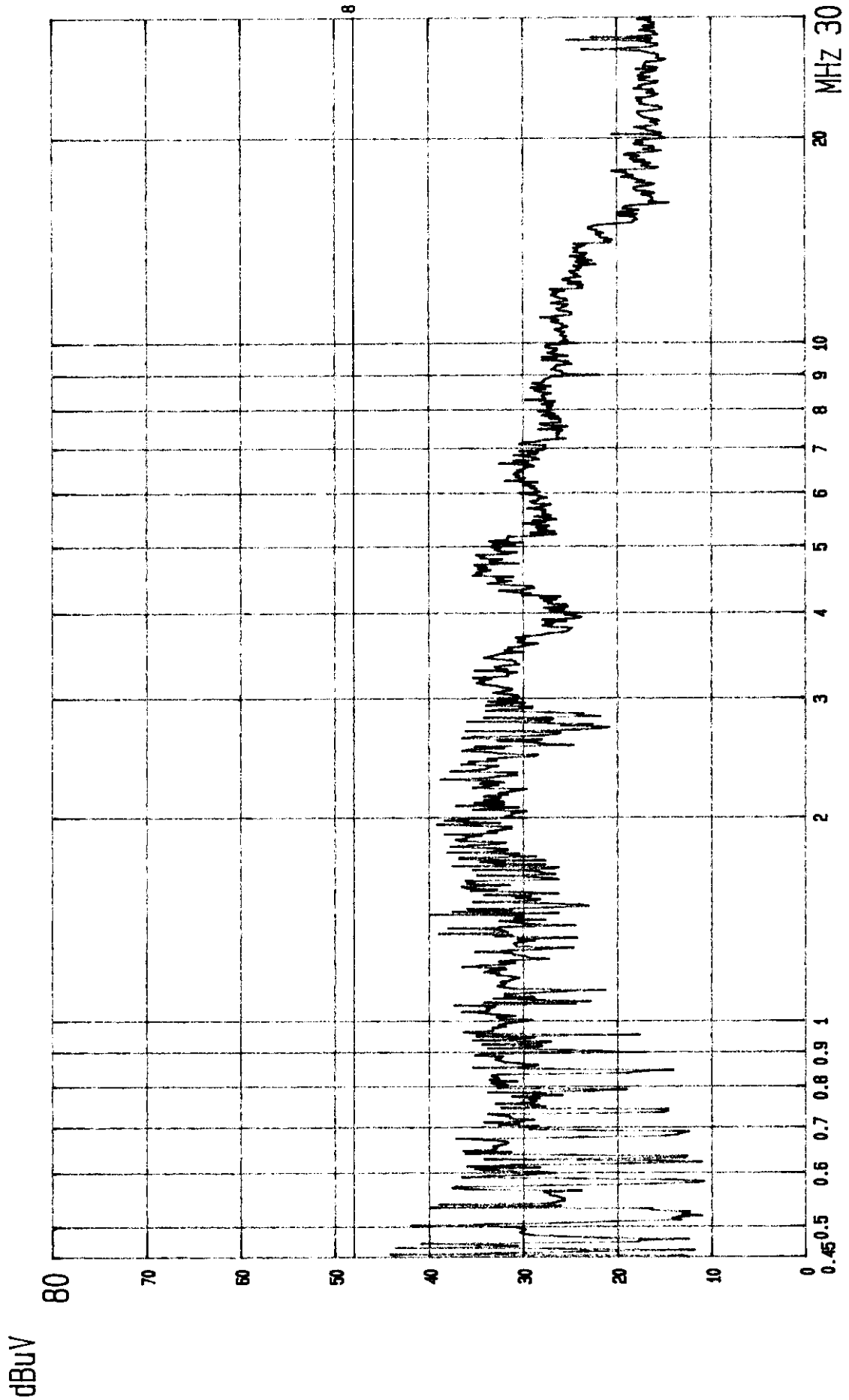
RESULT = READING + LISN FACTOR

Assume a receiver reading of 22.5 dB μ V is obtained, and LISN Factor is 0.1 dB, then the total of field strength is 22.6 dB μ V.

RESULT = 22.5 + 0.1 = 22.6 dB μ V

Level in μ V = Common Antilogarithm[(22.6 dB μ V)/20]

= 13.48 μ V


dBuV
80
70
60
50
40
30
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10
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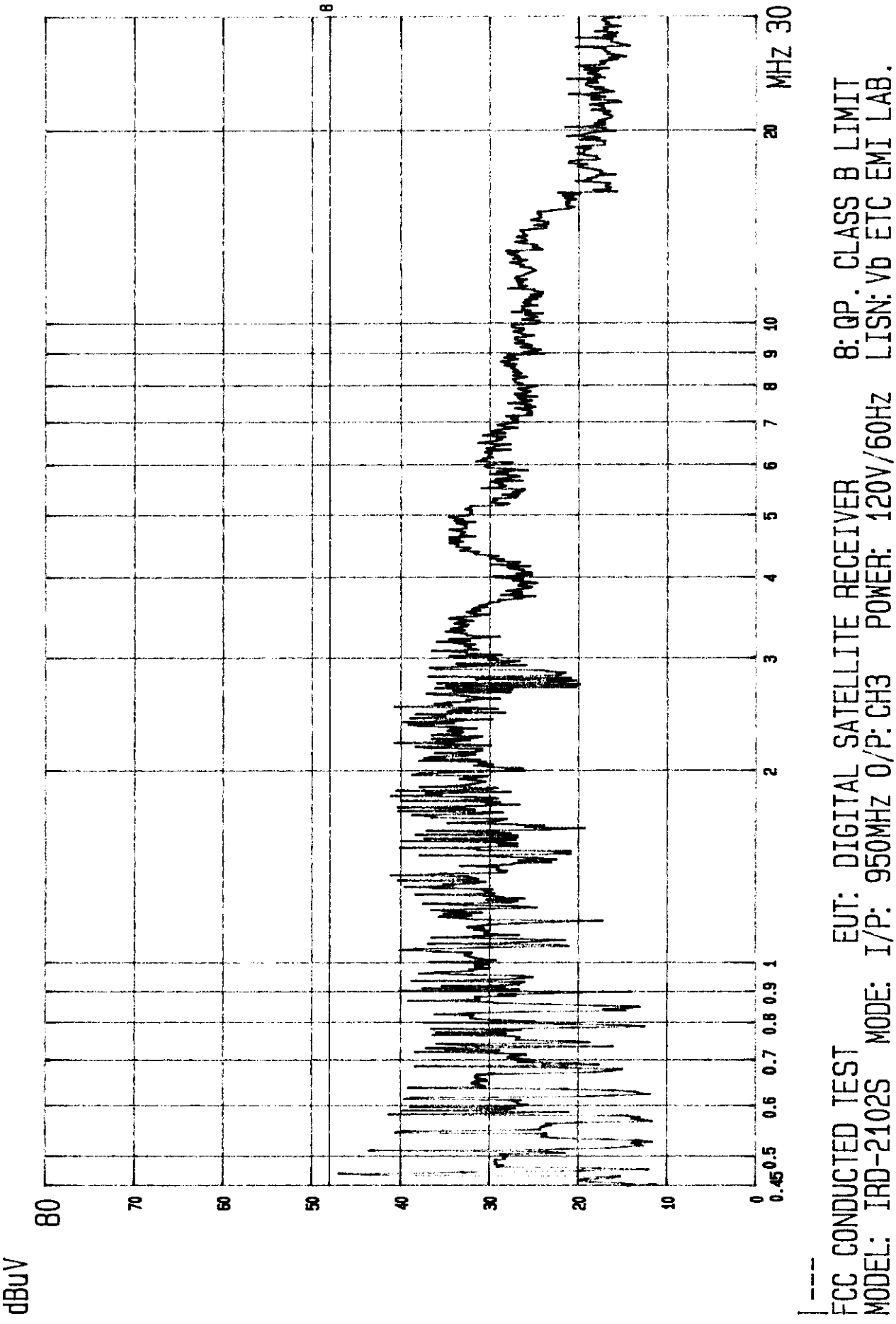
0.9
1
2
3
4
5
6
7
8
9
10
20
30
MHz
8
FCC CONDUCTED TEST
MODEL: IRD-2102S MODE: I/P: 950MHz O/P: CH3 POWER: 120V/60Hz
EUT: DIGITAL SATELLITE RECEIVER
8: QP. CLASS B LIMIT
LISN: Va ETC EMI LAB.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EUT: DIGITAL SATELLITE RECEIVER
8: QP. CLASS B LIMIT
dBuV
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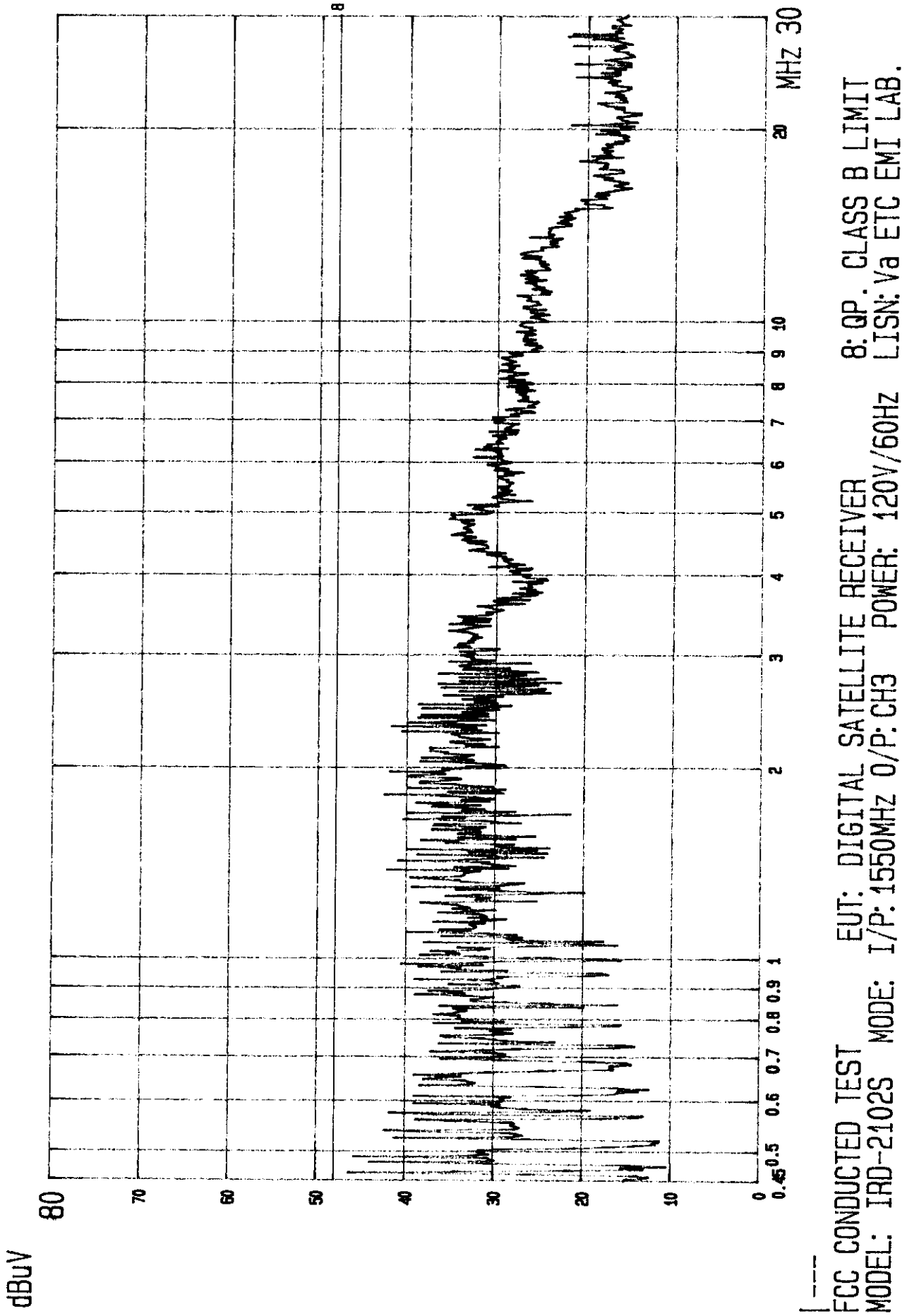
FCC CONDUCTED TEST
MODEL: IRD-2102S MODE: I/P: 1550MHz O/P: CH3 POWER: 120V/60Hz
EUT: DIGITAL SATELLITE RECEIVER
8: QP. CLASS B LIMIT
LISN: Va ETC EMI LAB.
dBuV
80
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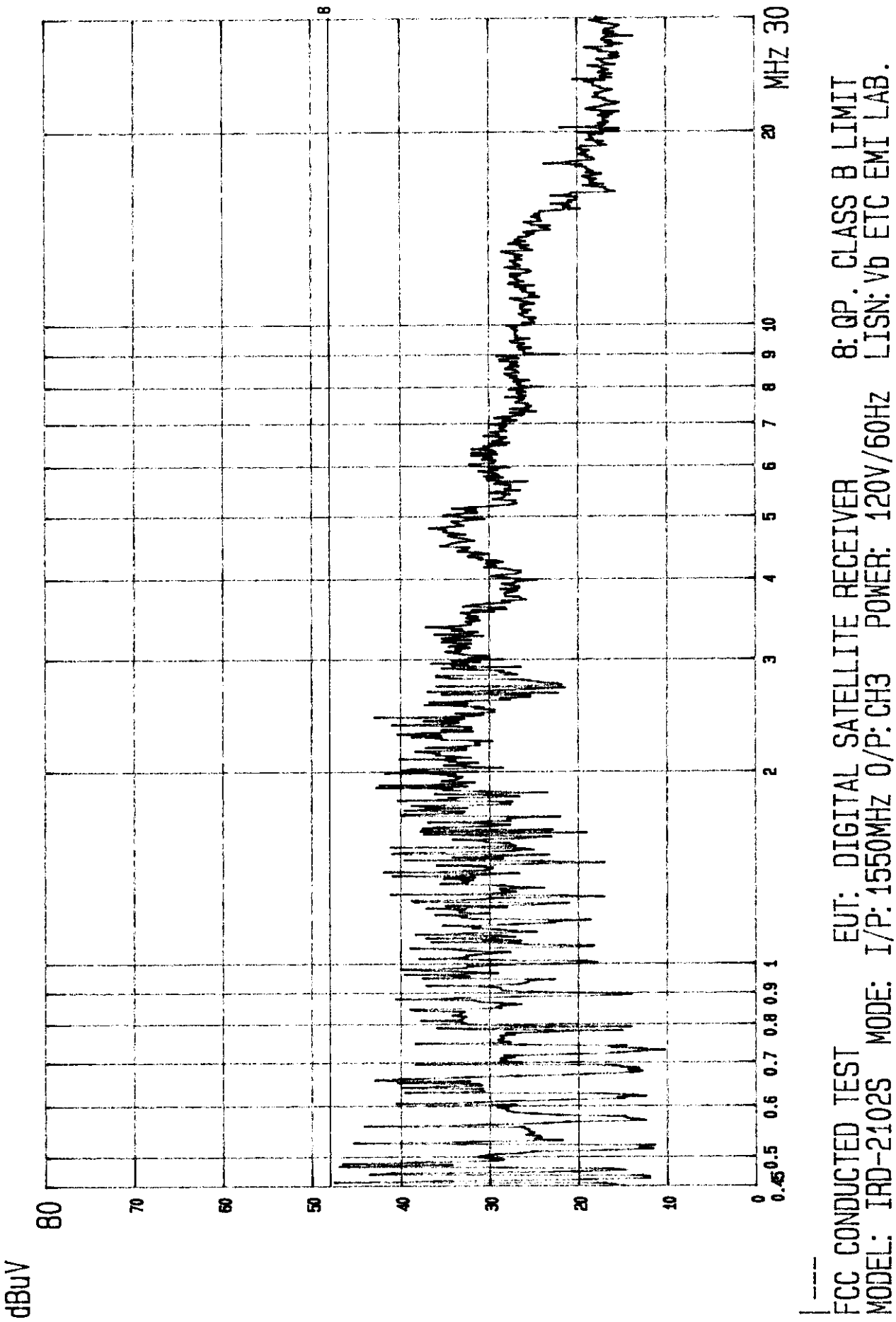
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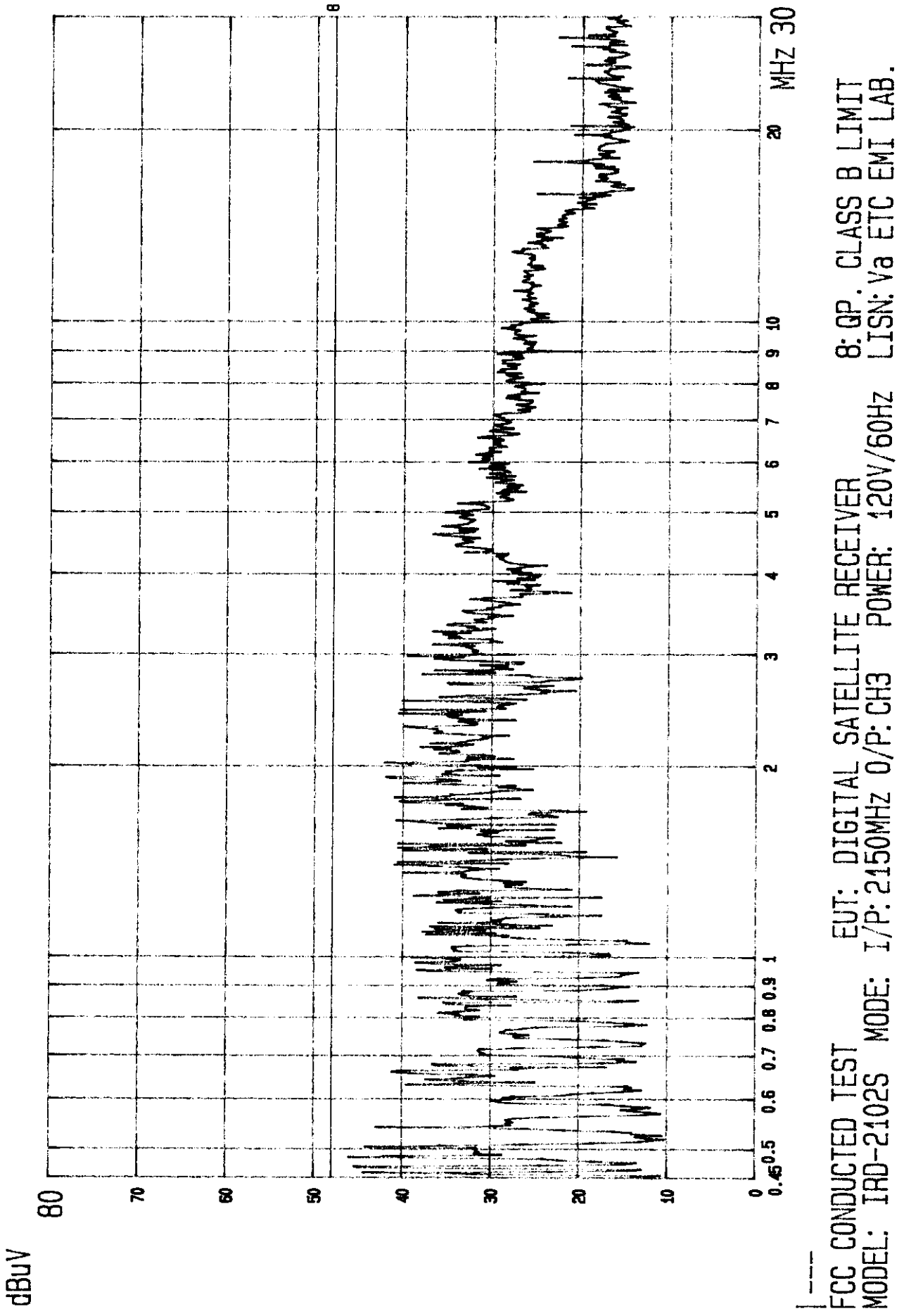
MHz
8
FCC CONDUCTED TEST
MODEL: IRD-2102S MODE: I/P: 1550MHz O/P: CH3 POWER: 120V/60Hz
EUT: DIGITAL SATELLITE RECEIVER
8: QP. CLASS B LIMIT
LISN: Vb ETC EMI LAB.


FCC CONDUCTED TEST
MODEL: IRD-2102S MODE: I/P: 2150MHz O/P: CH3 POWER: 120V/60Hz
EUT: DIGITAL SATELLITE RECEIVER
8: QP. CLASS B LIMIT
LISN: Va ETC EMI LAB.
dBuV
80
70
60
50
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30
20
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0
0.45
0.5
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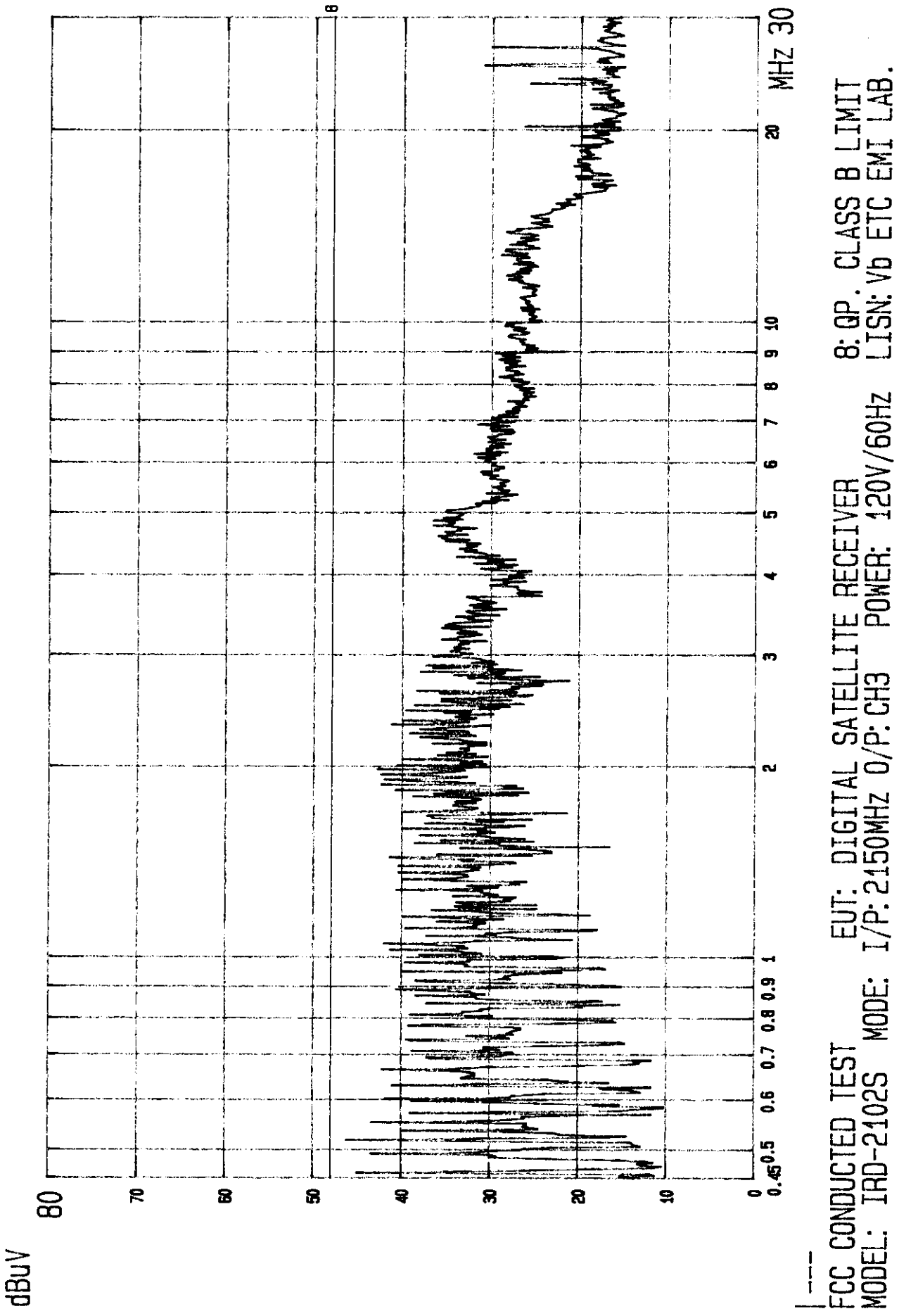
MHz
8


FCC CONDUCTED TEST
MODEL: IRD-2102S MODE: I/P: 2150MHz O/P: CH3 POWER: 120V/60Hz
EUT: DIGITAL SATELLITE RECEIVER
8: QP. CLASS B LIMIT
LISN: Vb ETC EMI LAB.
dBuV
80
70
60
50
40
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20
10
0
0.45
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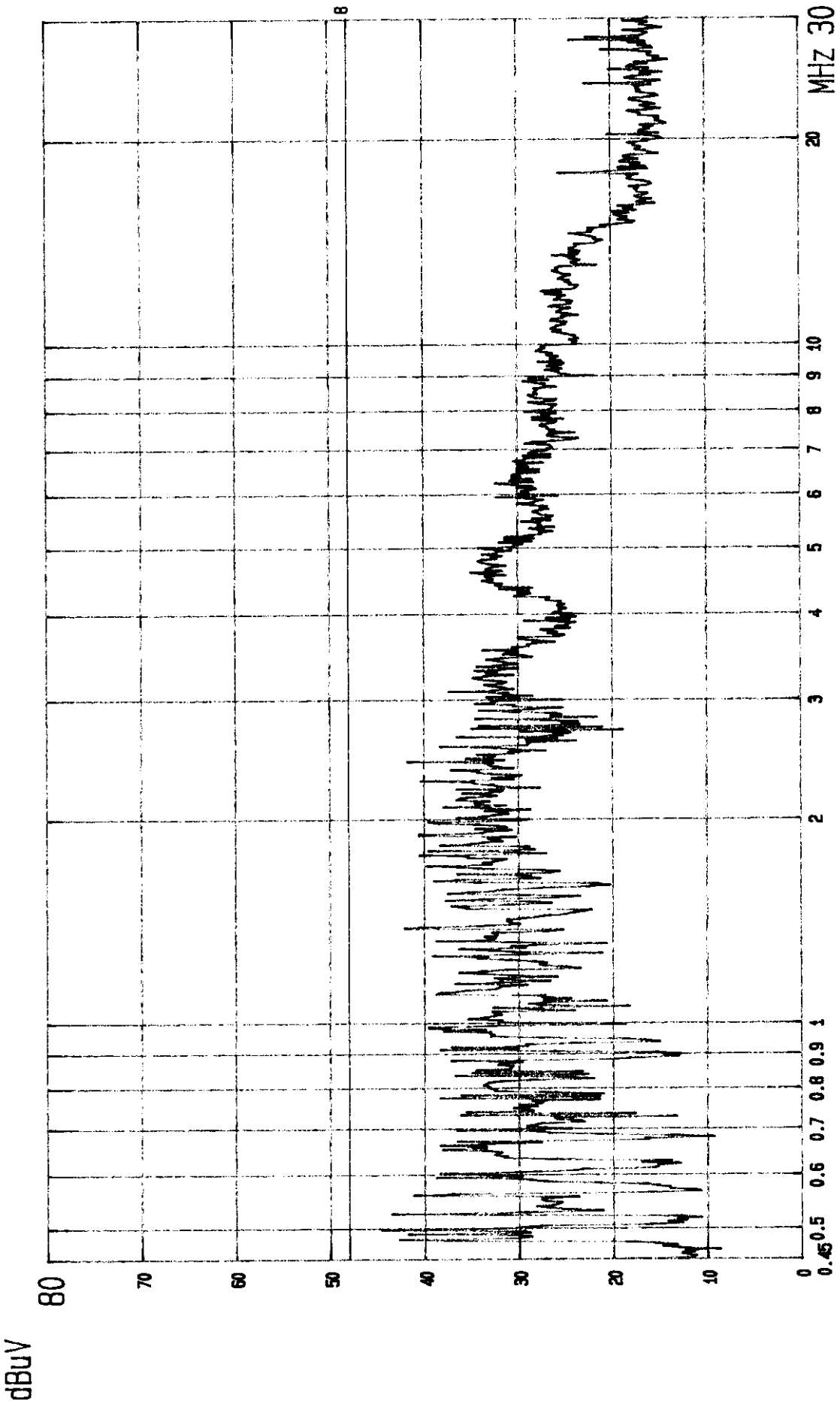
MHz 30
8


FCC CONDUCTED TEST
MODEL: IRD-2102S MODE: I/P: 950MHz O/P: CH4 POWER: 120V/60Hz
EUT: DIGITAL SATELLITE RECEIVER
8: QP. CLASS B LIMIT
LISN: Va ETC EMI LAB.
dBuV
80
70
60
50
40
30
20
10
0
0.45
0.5
0.6
0.7
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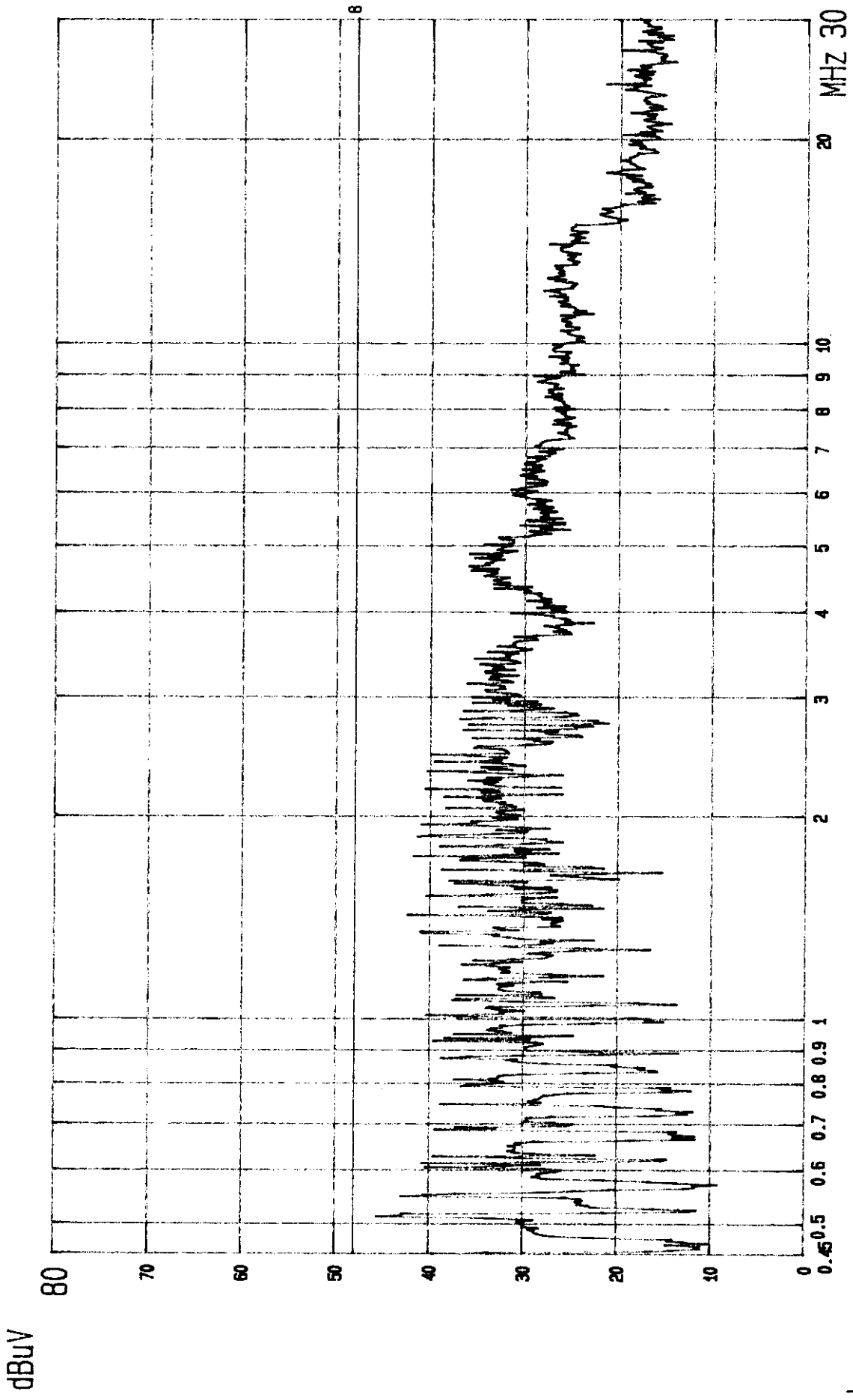
MHz 30
8


FCC CONDUCTED TEST
MODEL: IRD-2102S MODE: I/P: 950MHz O/P: CH4 POWER: 120V/60Hz
EUT: DIGITAL SATELLITE RECEIVER
8: QP. CLASS B LIMIT
LISN: Vb ETC EMI LAB.
dBuV
80
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30
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10
0
0.45
0.5
0.6
0.7
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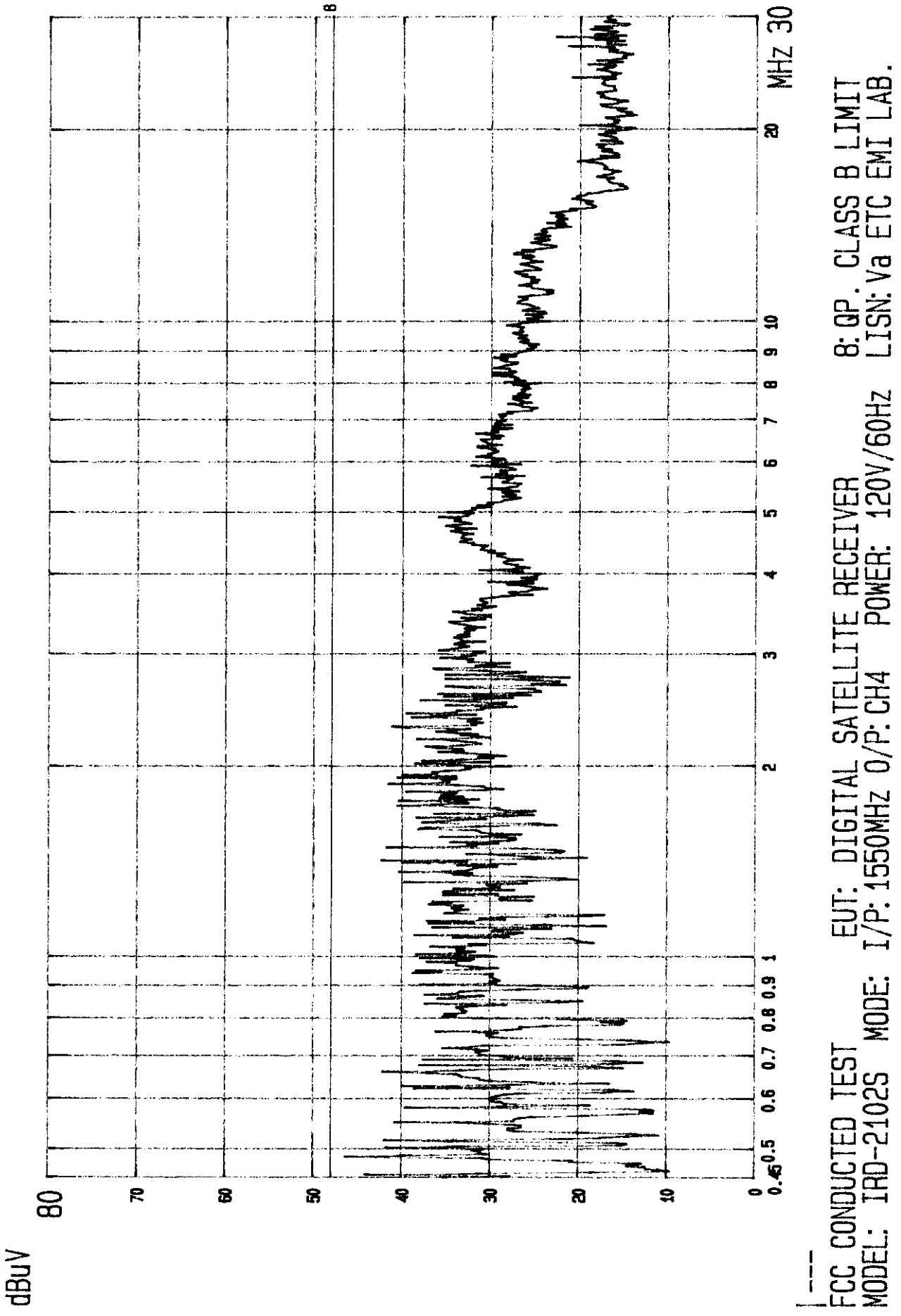
10
20
MHz 30
8


FCC CONDUCTED TEST EUT: DIGITAL SATELLITE RECEIVER 8: QP. CLASS B LIMIT
MODEL: IRD-2102S MODE: I/P: 1550MHz O/P: CH4 POWER: 120V/60Hz LISN: Va ETC EMI LAB.
dBuV
80
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60
50
40
30
20
10
0
0.45
0.5
0.6
0.7
0.8
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7
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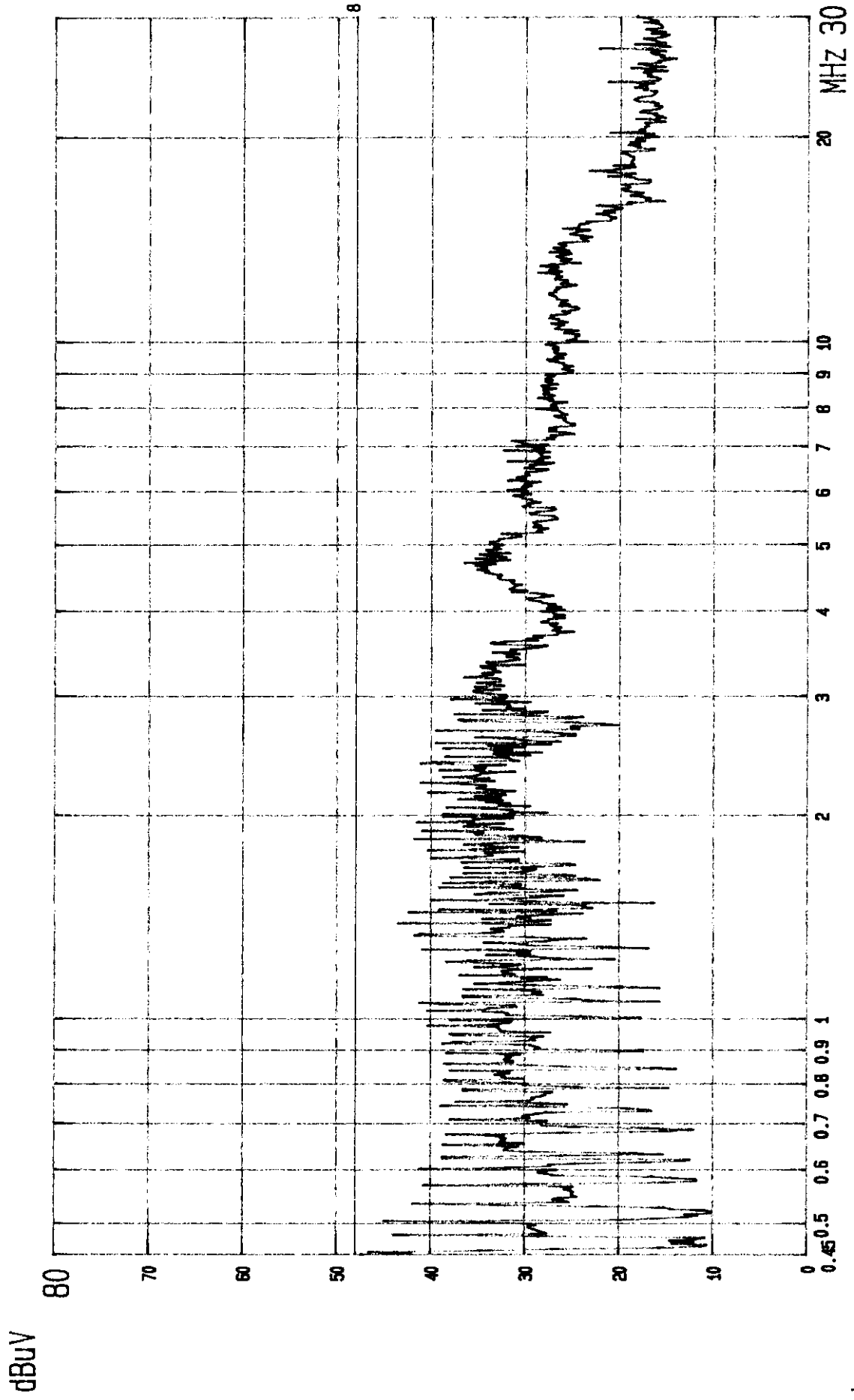
20
MHz 30
B


FCC CONDUCTED TEST
MODEL: IRD-2102S MODE: I/P: 1550MHz O/P: CH4 POWER: 120V/60Hz
EUT: DIGITAL SATELLITE RECEIVER
8: QP. CLASS B LIMIT
LISN: Vb ETC EMI LAB.
dBuV
80
70
60
50
40
30
20
10
0
0.45
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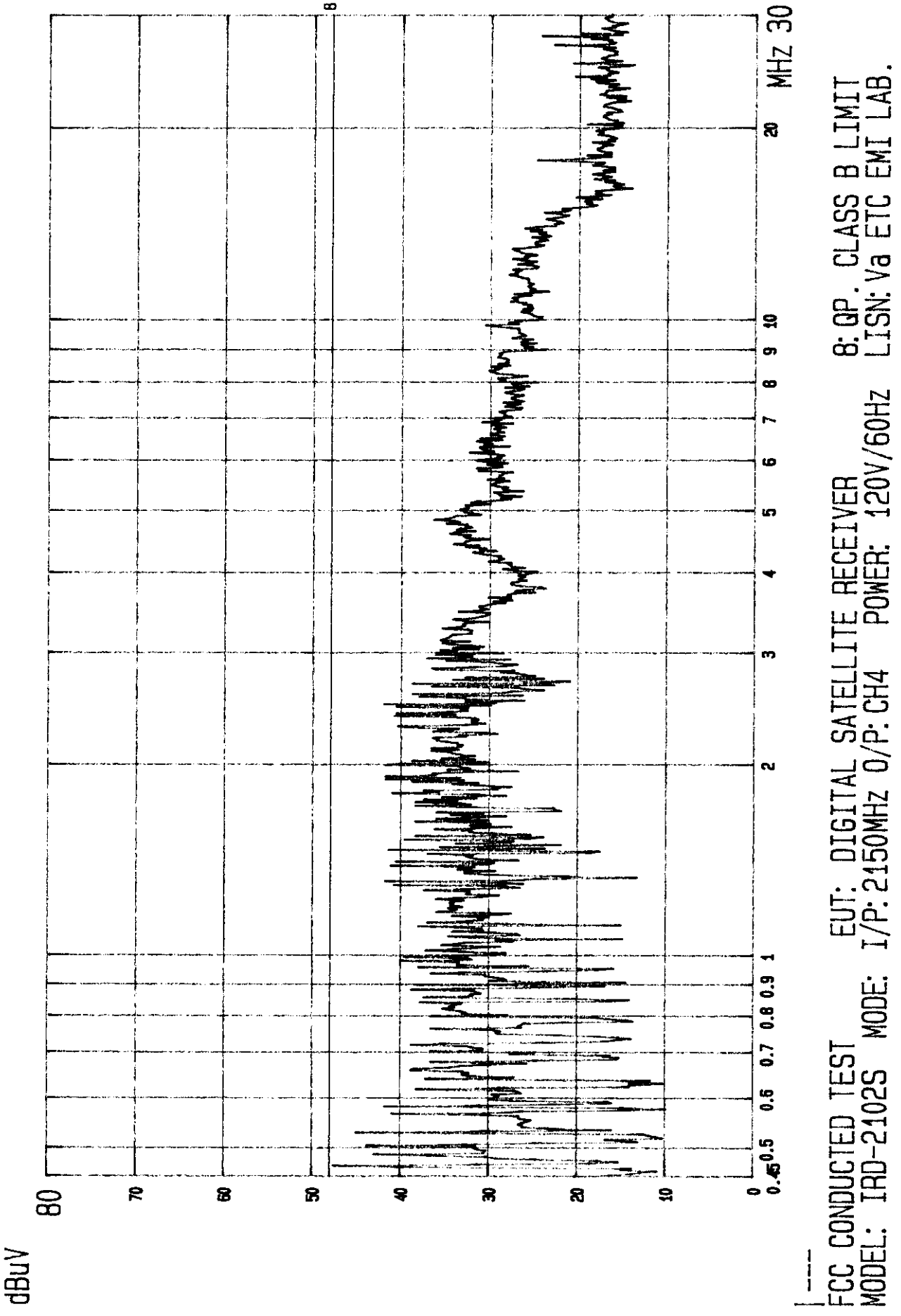
20
MHz 30
8


FCC CONDUCTED TEST
MODEL: IRD-2102S MODE: I/P: 2150MHz O/P: CH4 POWER: 120V/60Hz
EUT: DIGITAL SATELLITE RECEIVER
8: QP. CLASS B LIMIT
LISN: Va ETC EMI LAB.
dBuV
80
70
60
50
40
30
20
10
0
0.45
0.5
0.6
0.7
0.8
0.9
1
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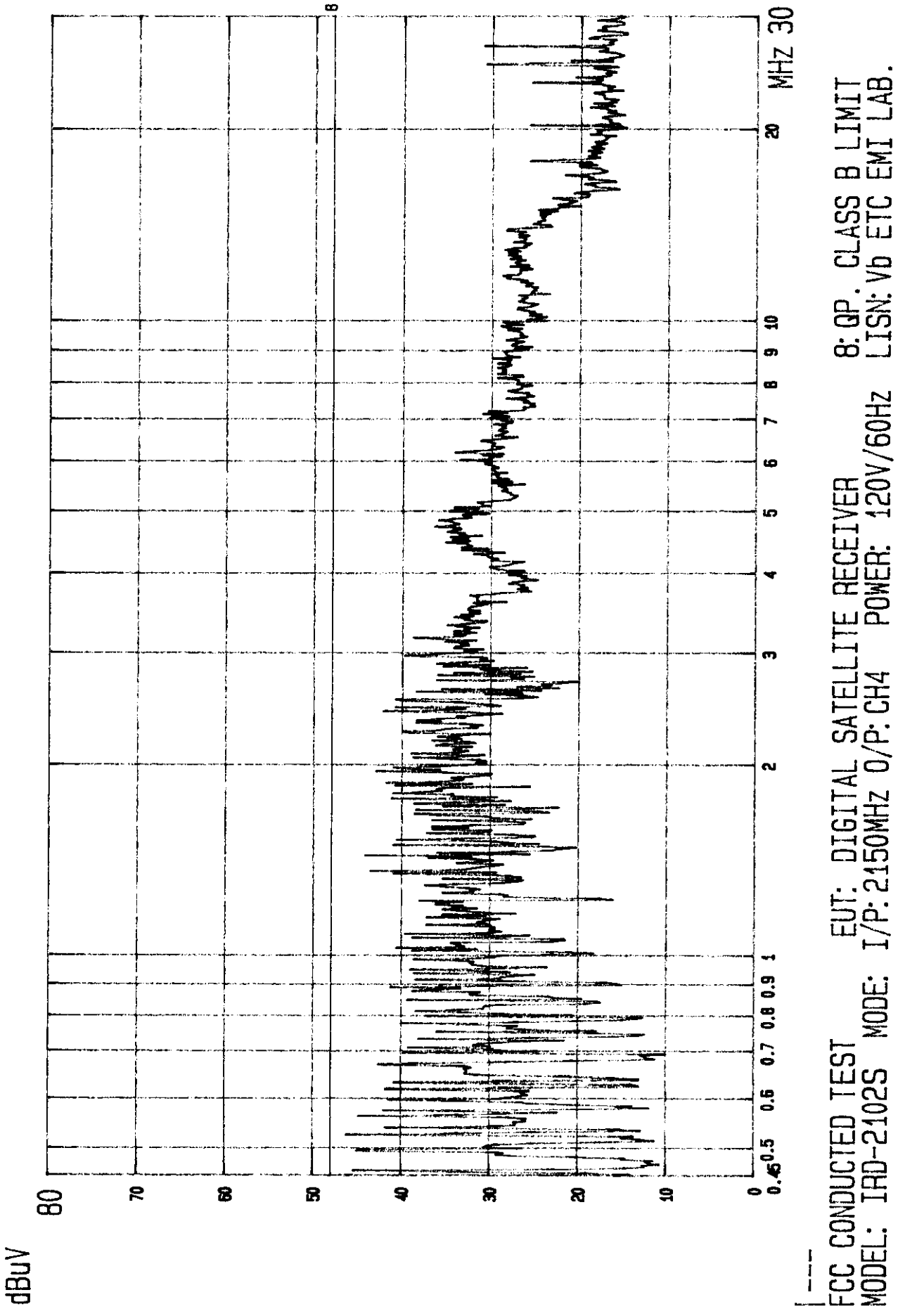
30
MHz
8


FCC CONDUCTED TEST
MODEL: IRD-2102S MODE: I/P: 2150MHz O/P: CH4 POWER: 120V/60Hz
EUT: DIGITAL SATELLITE RECEIVER
8: QP. CLASS B LIMIT
LISN: Vb ETC EMI LAB.
dBuV
MHz
80
70
60
50
40
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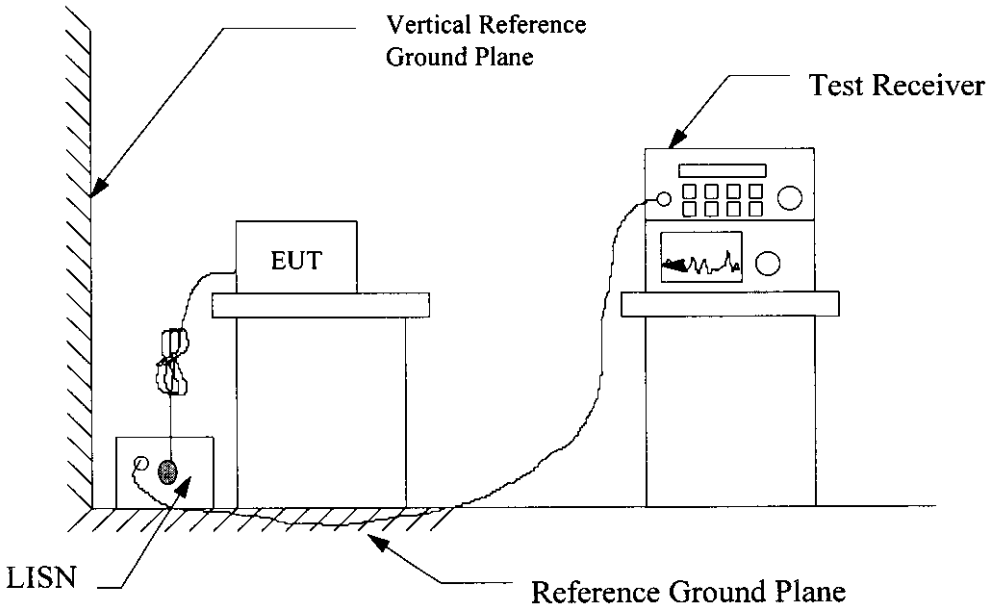
5.5 Conducted Measuring Setup Diagram



5.6 Conducted Measurement Equipment

The following test equipment are used during the conducted test .

Equipment	Manufacturer	Model No.	Next Cal. Date
RF Test Receiver	Rohde and Schwarz	ESH3	01/04/1999
Spectrum Monitor	Rohde and Schwarz	EZM	N.C.R.
Line Impedance Stabilization network	Kyoritsu	KNW-407	12/10/1998
Line Impedance Stabilization network	Rohde and Schwarz	ESH2-Z5	08/18/1998
Printer	Rohde and Schwarz	PUD-3	N.C.R.
Plotter	Hewlett-Packard	7440A	N/A
Shielded Room	Riken		N.C.R.

6 RF OUTPUT LEVEL MEASUREMENT

6.1 Measurement Description

According to section 12.2.5 of ANSI C63.4, the output signal level is the maximum voltage level present at the output terminal of a TV interface device on a particular frequency during normal use of the device.

A standard test RF signal is applied to SAT in terminal. Measure the signal level at the visual and aural carrier frequencies of the output channel.

6.2 Data of Measurement

Test Date : JUN. 05, 1998 Temperature : 22 ℃ Humidity: 85%

A. Output Channel : 3

Receiver Local Oscillator Frequency : 1429.379MHz

Frequency		Loss	Reading in dBuV		Result in uV		Limit in uV	
Video	Audio	dB	Video	Audio	Video	Audio	Video	Audio
61.24	56.79	0.5	65.8	50.9	2065.4	371.5	3000	671

Receiver Local Oscillator Frequency : 2029.486MHz

Frequency		Loss	Reading in dBuV		Result in uV		Limit in uV	
Video	Audio	dB	Video	Audio	Video	Audio	Video	Audio
61.24	56.79	0.5	65.7	50.8	2041.7	367.3	3000	671

Receiver Local Oscillator Frequency : 2629.600MHz

Frequency		Loss	Reading in dBuV		Result in uV		Limit in uV	
Video	Audio	dB	Video	Audio	Video	Audio	Video	Audio
6124	56.79	0.5	65.7	51.0	2041.7	375.8	3000	671

Note : The audio channel showed above table is the one generating higher output level of tow audio channels.

B. Output Channel : 4

Receiver Local Oscillator Frequency : 1429.379MHz

Frequency		Loss	Reading in dBuV		Result in uV		Limit in uV	
Video	Audio	dB	Video	Audio	Video	Audio	Video	Audio
67.23	62.79	0.5	66.6	52.2	2264.6	431.5	3000	671

Receiver Local Oscillator Frequency : 2029.486MHz

Frequency		Loss	Reading in dBuV		Result in uV		Limit in uV	
Video	Audio	dB	Video	Audio	Video	Audio	Video	Audio
67.23	62.79	0.5	66.5	52.1	2238.7	426.6	3000	671

Receiver Local Oscillator Frequency : 2629.600MHz

Frequency		Loss	Reading in dBuV		Result in uV		Limit in uV	
Video	Audio	dB	Video	Audio	Video	Audio	Video	Audio
67.23	62.79	0.5	66.5	52.2	2238.7	431.5	3000	671

Note : The audio channel showed above table is the one generating higher output level of tow audio channels.

6.3 Calculation of Data Measured

The measuring data for output signal level is calculated as following formula :

$$\text{Result (uV)} = \left[10^{\frac{(\text{Reading+Pad Loss})}{20}} \right]$$

6.4 Equipment for RF Output Level Measurement

Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum analyzer	ADVANTEST	R3271	09/02/1998
Amplifier	Hewlett-Packard	8447D	12/23/1998

The parameters of Spectrum Analyzer is set as following while measurement is performed :

Resolution Bandwidth : 100 KHz
Video Bandwidth : 100 KHz
Frequency Span : 10 MHz
Sweep Time : 200 ms
Function : Peak
Input Impedance : 75Ω

7 RF CONDUCTED SPURIOUS EMISSION MEASUREMENT

7.1 Description of Measurement

According to section 12.2.5 of ANSI C63.4, the output signal level is the maximum voltage level present at the output terminal of a TV interface device on a particular frequency during normal use of the device.

A standard testRF signal is applied to SAT in terminal. Measure the signal level at the visual and aural carrier frequencies of the output channel.

7.2 Measurement Data

Test Date : JAN. 13, 1998 Temperature : 20 ℃ Humidity: 55%

A. Output Channel :3

Receiver Local Oscillator Frequency : 1429.379MHz

Frequency MHz	Meter Reading dBuV	ATT. dB	Amplifier Gain dB	Pad Loss dB	Result in dBuV	Result in uV	Limit in uV
54.001	53.7	3	-25	0.5	32.2	40.7	94.8
80.984	33.1	3	-25	0.5	11.6	3.8	94.8
134.514	30.4	3	-25	0.5	8.9	2.8	94.8
336.285	33.1	3	-25	0.5	11.6	3.8	94.8
479.486	38.0	3	-25	0.5	16.5	6.7	94.8
729.078	36.0	3	-25	0.5	14.5	5.3	94.8

Note : Measuring instrument input impedance is set to 75 Ohms when perform this item of measurement and a built in pre-amplifier is active.

Output Channel :3

Receiver Local Oscillator Frequency : 2029.486MHz

Frequency MHz	Meter Reading dBuV	ATT. dB	Amplifier Gain dB	Pad Loss dB	Result in dBuV	Result in uV	Limit in uV
54.001	53.8	3	-25	0.5	32.3	41.2	94.8
80.984	33.2	3	-25	0.5	11.7	3.8	94.8
134.514	30.5	3	-25	0.5	9.0	2.8	94.8
336.285	33.2	3	-25	0.5	11.7	3.8	94.8
479.486	38.1	3	-25	0.5	16.6	6.8	94.8
729.078	36.1	3	-25	0.5	14.6	5.4	94.8

Receiver Local Oscillator Frequency :2629.600MHz

Frequency MHz	Meter Reading dBuV	ATT. dB	Amplifier Gain dB	Pad Loss dB	Result in dBuV	Result in uV	Limit in uV
54.001	53.9	3	-25	0.5	32.4	41.7	94.8
80.984	33.3	3	-25	0.5	11.8	3.9	94.8
134.514	30.6	3	-25	0.5	9.1	2.9	94.8
336.285	33.3	3	-25	0.5	11.8	3.9	94.8
479.486	38.2	3	-25	0.5	16.7	6.8	94.8
729.078	36.2	3	-25	0.5	14.7	5.4	94.8

Note : Measuring instrument input impedance is set to 75 Ohms when perform this item of measurement and a built in pre-amplifier is active.

B. Output Channel :4

Receiver Local Oscillator Frequency : 1429.379MHz

Frequency MHz	Meter Reading dBuV	ATT. dB	Amplifier Gain dB	Pad Loss dB	Result in dBuV	Result in uV	Limit in uV
54.001	52.9	3	-25	0.5	31.4	37.2	94.8
80.981	36.9	3	-25	0.5	15.4	5.9	94.8
134.514	46.5	3	-25	0.5	25.0	17.8	94.8
336.285	37.6	3	-25	0.5	16.1	6.4	94.8
479.486	39.0	3	-25	0.5	17.5	7.5	94.8
729.078	36.8	3	-25	0.5	15.3	5.8	94.8

Receiver Local Oscillator Frequency : 2029.486MHz

Frequency MHz	Meter Reading dBuV	ATT. dB	Amplifier Gain dB	Pad Loss dB	Result in dBuV	Result in uV	Limit in uV
54.001	53.0	3	-25	0.5	31.5	37.6	94.8
80.984	37.0	3	-25	0.5	15.5	6.0	94.8
134.514	46.6	3	-25	0.5	25.1	18.0	94.8
336.285	37.7	3	-25	0.5	16.2	6.5	94.8
479.486	39.1	3	-25	0.5	17.6	7.6	94.8
729.078	36.9	3	-25	0.5	15.4	5.9	94.8

Receiver Local Oscillator Frequency : 2629.600MHz

Frequency MHz	Meter Reading dBuV	ATT. dB	Amplifier Gain dB	Pad Loss dB	Result in dBuV	Result in uV	Limit in uV
54.001	53.1	3	-25	0.5	31.6	38.0	94.8
80.984	37.1	3	-25	0.5	15.6	6.0	94.8
134.514	46.7	3	-25	0.5	25.2	18.2	94.8
336.285	37.8	3	-25	0.5	16.3	6.5	94.8
479.486	39.2	3	-25	0.5	17.7	7.7	94.8
729.078	37.0	3	-25	0.5	15.5	6.0	94.8

Note : Measuring instrument input impedance is selected with 75 Ohms when perform this item of measurement and a built in pre-amplifier is active.

7.3 Calculation of Data Measured

The measuring data for output signal level is calculated as following formula :

$$\text{Result (uV)} = \left[10^{\frac{(\text{Reading+Pad Loss-Amplifier Gain+Att.})}{20}} \right]$$

7.4 Equipment for Conducted Spurious Measurement

Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum analyzer	ADVANTEST	R3271	09/02/1998
Amplifier	Hewlett-Packard	8447D	12/23/1998

The parameters of Spectrum Analyzer is set as following while measurement is performed :

Resolution Bandwidth : 100 KHz
Video Bandwidth : 100 KHz
Frequency Span : 10 MHz
Sweep Time : 200 ms
Function : Peak
Input Impedance : 75Ω

8 ANTENNA TRANSFER SWITCH MEASUREMENT

8.1 Description for measurement

For TV interface devices, according to § 15.115(c)(ii), isolation of transfer switch shall not exceed 0.346 times the square root of R (same as the R in RF output signal).

A standard testRF signal is applied to SAT in terminal.

8.2 Data of Measurement

A. Output Channel :3

Receiver Local Oscillator Frequency : 1429.379MHz

Meter Reading (dBm)	Corrected Factor (dB)	Result (uV)	Limit (uV)	Margin (uV)
-81.5	-21.5	1.9	3.0	0.56

Receiver Local Oscillator Frequency : 2029.486MHz

Meter Reading (dBm)	Corrected Factor (dB)	Result (uV)	Limit (uV)	Margin (uV)
-81.4	-21.5	2.0	3.0	0.59

Receiver Local Oscillator Frequency : 2629.600MHz

Meter Reading (dBm)	Corrected Factor (dB)	Result (uV)	Limit (uV)	Margin (uV)
-81.3	-21.5	2.0	3.0	0.56

Note :

1. Measuring instrument input impedance is selected with 75 Ohms when perform this item of measurement and a built in pre-amplifier is active.
2. Corrected factor includes matching pad loss or attenuator attenuation (if any), cable loss and amplifier gain (if any), that is :

   = *pad loss + attenuation - amplifier gain*

B. Output Channel :4

Receiver Local Oscillator Frequency : 1429.379MHz

Meter Reading (dBm)	Corrected Factor (dB)	Result (uV)	Limit (uV)	Margin (uV)
-81.3	-21.5	2.0	3.0	0.10

Receiver Local Oscillator Frequency : 2029.486MHz

Meter Reading (dBm)	Corrected Factor (dB)	Result (uV)	Limit (uV)	Margin (uV)
-81.2	-21.5	2.0	3.0	0.59

Receiver Local Oscillator Frequency : 2629.600MHz

Meter Reading (dBm)	Corrected Factor (dB)	Result (uV)	Limit (uV)	Margin (uV)
-81.1	-21.5	2.0	3.0	0.61

Note :

1. Measuring instrument input impedance is selected with 75 Ohms when perform this item of measurement and a built in pre-amplifier is active.
2. Corrected factor includes matching pad loss or attenuator attenuation (if any), cable loss and amplifier gain (if any), that is :

   = *pad loss + attenuation - amplifier gain*

8.3 Result Calculation

$$\text{Result (uV)} = \left[10^{\frac{(\text{Reading+Corrected Factor})}{10}} \times 75 \times 10^{-3} \right]^{\frac{1}{2}} \times 10^{6}$$

8.4 Measuring Instrument

Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum Analyzer	ADVANTEST	R3271	09/02/1998
Amplifier	Hewlett-Packard	8447D	12/23/1998

The parameters of RF test receiver is set as following while measurement is performed :

Resolution Bandwidth : 100 KHz
Video Bandwidth : 100 KHz
Frequency Span : 1 MHz
Sweep Time : 200 ms
Function : Peak