Transceiver Test Report

FCC ID: A94402455

Certificate # 1514.1

Report number:	EMC.402455.67.10.1B
Prepared for:	Bose Corporation DCE - EMC 1 New York Ave, Framingham MA 01701
Type of Product:	Digital home entertainment audio/video control console.
Model:	Bose 402455
Marketing Name:	AV35 Control Console
Standards:	FCC part 15 subpart B,C ANSI C63.10(2009) RSS310 issue 2 ICES-003 issue 4
Report prepared by:	Peter Boers
Signature:	
Report reviewed by:	Brent DeWitt
Signature:	
Report issue date:	April 7, 2010 Revision B, added conducted test data Clarification of model and marketing name designation

Bose Corporation, 1 New York Ave, Framingham, MA 01701, USA
Tel: (508) 766-6000 Fax: (508) 766-1145

Table of Contents:

1. Report Summary 3
1.1 Product 3
1.2 Client 3
1.3 Applicable Standards 3
1.4 Test Laboratory 3
2. Product description 4
3. Applicable standards, requirements and tests 5
4. Environmental Conditions 5
5. Detailed Test Results. 6
5.1 Conducted emissions 6
5.2 Radiated emissions 8
5.3 Output Field Strength 10
5.4 Harmonics 13

Bose Corporation, 1 New York Ave, Framingham, MA 01701, USA
Tel: (508) 766-6000 Fax: (508) 766-1145

1. Report Summary

1.1 Product

Manufacturer: Bose Corporation

Type: Digital home entertainment audio/video control console (multi-media equipment)

Model: 402455

Marketing name: AV35 Control Console

1.2 Client Bose Corporation
1 New York Ave, Framingham MA 01701

1.3 Applicable Standards FCC part 15.B and C
ANSI C63.10 (2009)
RSS 310 issue 2
ICES-003 Issue 4, CAN/CSA/CISPR22

Test Results: Pass ☒ Fail ☐

1.4 Test Laboratory Bose DCE laboratories
1 New York Ave
Framingham, MA 01701.
IC registration : 3232A
FCC site registration under A2LA cert. #1514

This report relates only to the items tested.

Bose Corporation, 1 New York Ave, Framingham, MA 01701, USA
Tel: (508) 766-6000 Fax: (508) 766-1145

2. Product description

General	The Bose Corporation model 402445 is an Audio/Video home entertainment console featuring HDMI switching and up-conversion from conventional video sources as well as the basic AM/FM tuner functions. The AV35 version of this series contains a 27 MHz transceiver for remote control of the console's second zone functions. The 27 MHz transceiver connects to an external wire antenna (provided with the product), connectable via a unique connector located in the back of the console.
Power source	AC, 100 – 240V ac nominal, 50/60 Hz external power supply
Frequency band	26.96 – 27.28 MHz
Carrier frequency	27.145 MHz
Modulation method(s)	Pulse modulation
Antenna	External, unique connector, provided by manufacturer, Bose part number 277892-003

Bose Corporation, 1 New York Ave, Framingham, MA 01701, USA
Tel: (508) 766-6000 Fax: (508) 766-1145

3. Applicable standards, requirements and tests

RSS 310	ICES-003 CAN-CSA-CIS-22	FCC part 15	Test references:
		15.31	Measurement standard: ANSI C63.10 (2009) is used as a measurement standard for the intentional emissions of the device under test. There are no user adjustable controls that affect the level of emissions.
		15.33(b)1	The highest frequency generated or used in the device (intentional radiator) is 27.145 MHz. For an unintentional radiator, the conducted measurement range is from 150 kHz to 30 MHz, and the radiated frequency range is from 30 MHz to 1 GHz.
	3	15.35	Measurement detector and bandwidth: Conducted measurements are made with a CISPR-16 compliant receiver with both an average and quasi-peak detector and 9 kHz bandwidth to the appropriate limits. Radiated measurements are made with a quasi-peak or peak detector below 1 GHz and with an average and a peak detector above 1 GHz with a bandwidth of 1 MHz.
	5.3	15.107	Conducted emissions: The device meets the conducted emission requirements with a margin of more than 20 dB. Detail measurements are contained in section 5.1 of this report.
	5.5	15.109	Radiated emissions: The device meets the radiated emission requirements with a margin of more than 15 dB. Detail measurements are contained in section 5.2 of this report.
2.3			The User Manual (OG) contains the words in both English and French "*This category II radiocommunication device complies with Industry Canada Standard RSS310*" "*Ce dispositif de radiocommunication de catégorie II respecte la norme CNR-310 d'Industrie Canada*"
		15.203	The antenna is connected via a special, unique connector: 2 mm diameter audio plug. This plug has been previous accepted (see FCC id A94-AVYYB) as a non-standard antenna connector.
3.12 Table 1		15.205	The device does not operate in the restricted bands as defined in RSS310 Table 1 or FCC part 15 section 205
3.8		15.227(a)	The maximum emission in the band from 26.96 to 27.28 MHz does not exceed 10,000 microvolts per meter (80dBuV//m, average). Peak emissions meet the requirements of FCC section 15.35 (not more than 20dB above the average). Detail measurement results are in section 5.3 of this report.
Table 2, 3		15.227(b)	Emissions outside the band from 26.96 to 27.28 MHz meet the requirements for FCC part 15.209 and RSS 310 Tables 2 and 3. Detail measurement results are in section 5.2 of this report.

4. Environmental Conditions

All testing is performed under the following conditions, unless otherwise defined in the detail test report section.

Temperature: 22 ± 4 °C

Humidity: 30 – 60 % RH

Bose Corporation, 1 New York Ave, Framingham, MA 01701, USA
Tel: (508) 766-6000 Fax: (508) 766-1145

5. Detailed Test Results.

5.1 Conducted emissions

5.1.1. Requirements

FCC rules part 15.107(a), CAN-CSA-CISPR22 class B

Frequency	Limit in dBµV	
MHz	Quasi-peak	Average
0.15 – 0.5	66-56*	56-46*
0.5 - 5	56	46
5 – 30	60	50

*The limit decreases with the logarithm of the frequency

5.1.2. Test Setup

Reference ANSI C63.10 figure 6.
The EUT is placed on 80 cm high non-conductive table. The distance to the nearest vertical ground reference plane is 40cm. The distance to all other conductive surfaces is more than or equal to 80cm. Measurements are made on all current carrying AC mains conductors.

The AV35 system is only configured to operate the 27 MHz transceiver. The carrier frequency of the transmitter falls in the frequency band in which the conducted emissions are measured; two conditions are measured:

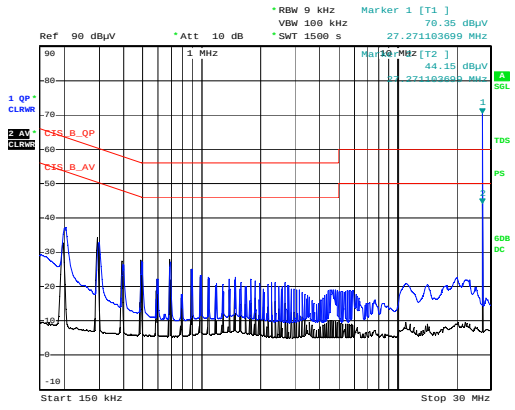
(1) With the transmitter operating, antenna connected – the carrier will show in the spectrum

(2) With the transmitter operating into a 50 Ohm shielded load.

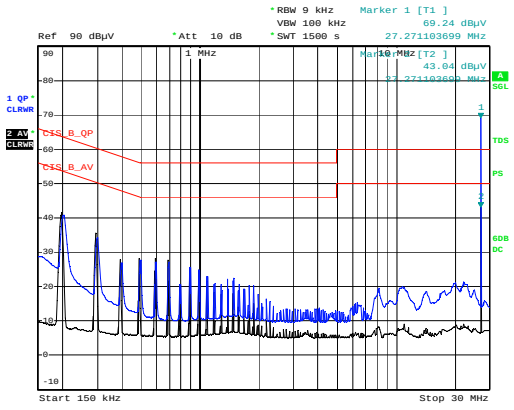
5.1.3. Test data

TX operating, connected to antenna (bundled)

Conducted emissions; Line



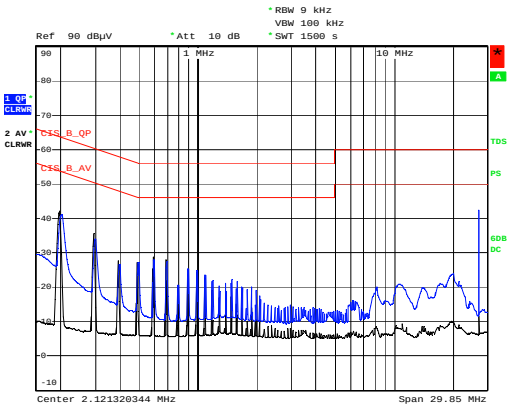
Conducted emissions; Neutral



Bose Corporation, 1 New York Ave, Framingham, MA 01701, USA
Tel: (508) 766-6000 Fax: (508) 766-1145

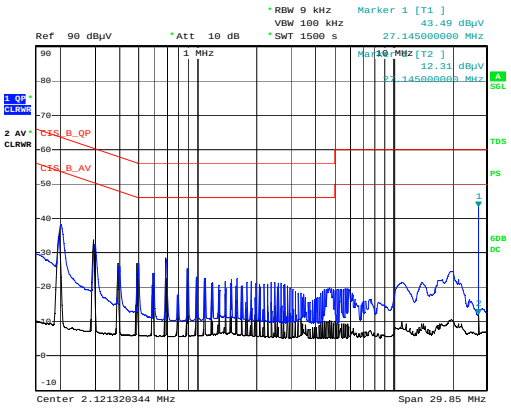
TX operating and terminated into 50 Ohms

Conducted emissions; Line



Date: 17.MAR.2010 17:18:47

Conducted emissions; Neutral



Date: 17.MAR.2010 21:39:31

All unintentional emissions are more than 20 dB below the limit.

At the carrier frequency, with the antenna port terminated into 50 Ohms, the conducted emissions are

Detector	Measured Value dBµV	Limit dBµV	Margin
QP	47.1	60	-12.9
Average	34.8	50	-15.2

5.1.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service	
				Last	due date
LISN	EMCO	3810/2	TN600	3/11/2010	3/11/2011
Receiver	Rohde & Schwarz	ESCI	TN1420	6/2/2009	6/2/2010
Transient Limiter	HP	11947A	TN57	11/24/2009	11/24/2011

5.1.5. Test information

Date of test: March 17,2010
April 6, 2010

EUT serial: 051115F00410023AE

Test Location: Henry room

Test result: Pass

Tested by: Peter Boers

Bose Corporation, 1 New York Ave, Framingham, MA 01701, USA
Tel: (508) 766-6000 Fax: (508) 766-1145

5.2 Radiated emissions

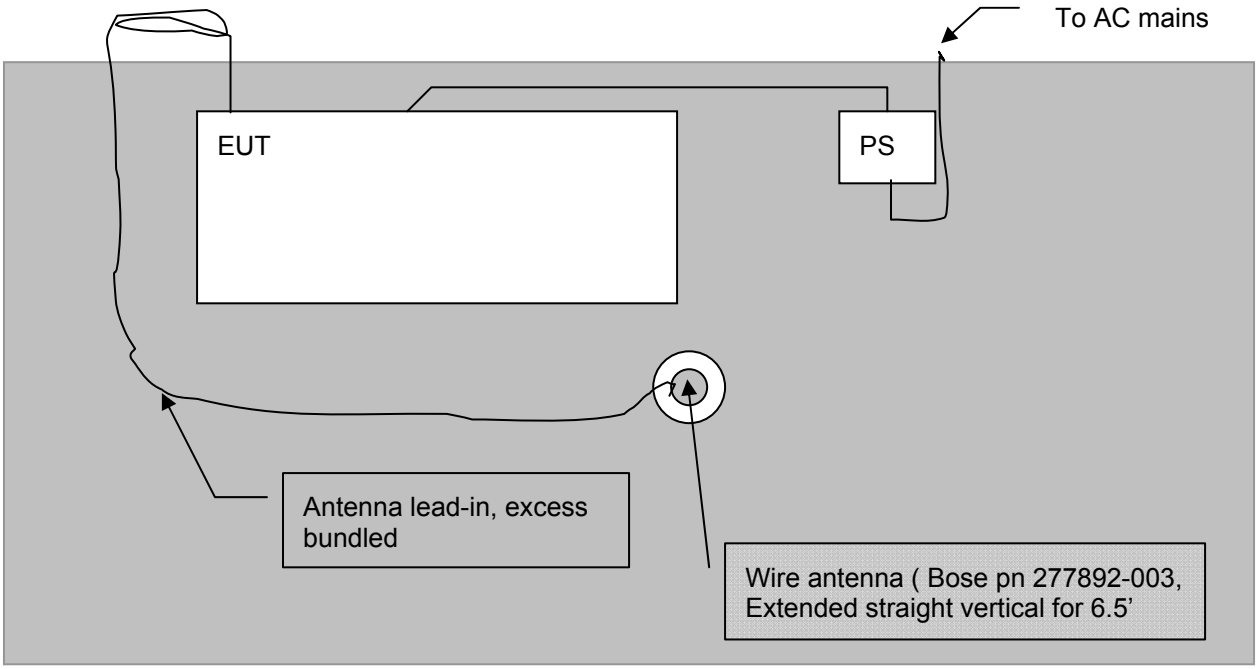
5.2.1. Requirements

FCC rules part 15.109 (a) and 15.209, CAN-CSA-CISPR22 class B and RSS-310 table

Frequency	Distance		Limit in dBµV/m	
MHz	meters	Quasi-peak	Average	Peak
0.009 – 0.09	300		240/F(kHz)	
0.90 – 0.11	300	240/F(kHz)		
0.11– 0.49	300		240/F(kHz)	
0.49 – 1.705	30	2400/F(kHz)		
1.705 – 30	30	30		
30 – 230	3	40		
230-960	3	46		
960-1000	3	47		
> 1000	3		54	74

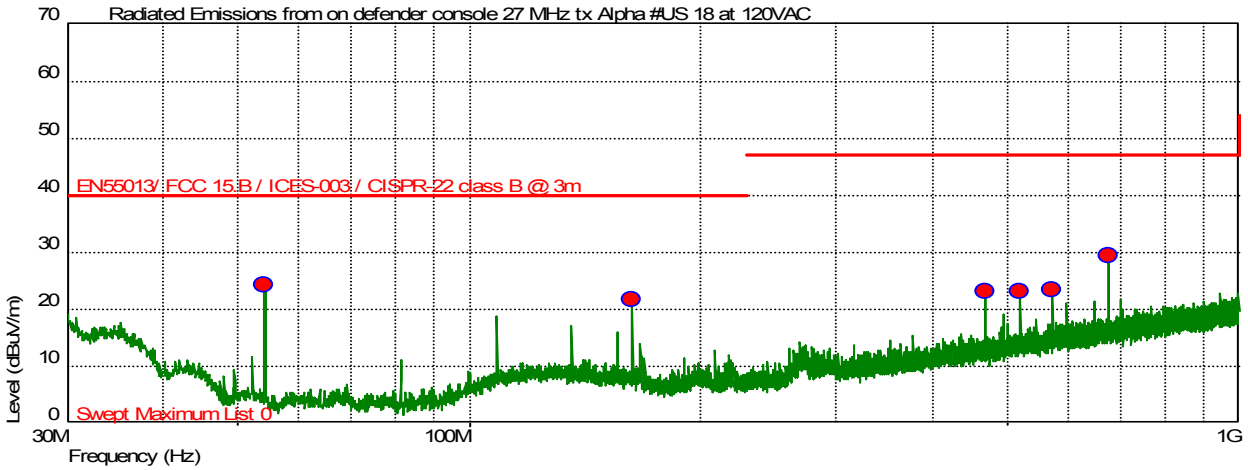
5.2.2. Test Setup

Numerous antenna positions were investigated. The worst case condition is with the antenna extended vertical in a straight line.



Bose Corporation, 1 New York Ave, Framingham, MA 01701, USA
Tel: (508) 766-6000 Fax: (508) 766-1145

5.2.3. Test data



Peak detector values:

Frequency (MHz)	Level (dBuV/m)	Height (m)	Polar	Table (Deg)	Limit (dBuV/m)	Margin(dBuV/m)	Comment
54.25	24.4	3.00	--	59	40	-15.6	2nd harmonic
162.85	21.8	2.50	--	270	40	-18.2	6th harmonic
467.95	23.2	1.50	|	89	46	-22.8	
519.95	23.1	2.00	--	359	46	-22.9	
571.95	23.3	1.50	--	300	46	-22.7	
675.95	29.3	1.50	--	270	46	-16.7	

5.2.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
Antenna	Sunol Sciences	JB6	TN1541	8/6/2009	8/6/2010
Pre-Amp	Rohde & Schwarz	TS-PR8	TN1669	3/5/2009	3/5/2010
Receiver	Rohde & Schwarz	ESU40	TN1663	7/29/2009	7/29/2010
8 GHz cable set	-	-	TN1445	5/19/2009	5/19/2010

5.2.5. Test information

Date of test: 2/15/2010 **EUT serial:** 0016AE

Test Location: Maxwell House **Test result:** Pass

Tested by: Peter Boers

Bose Corporation, 1 New York Ave, Framingham, MA 01701, USA
Tel: (508) 766-6000 Fax: (508) 766-1145

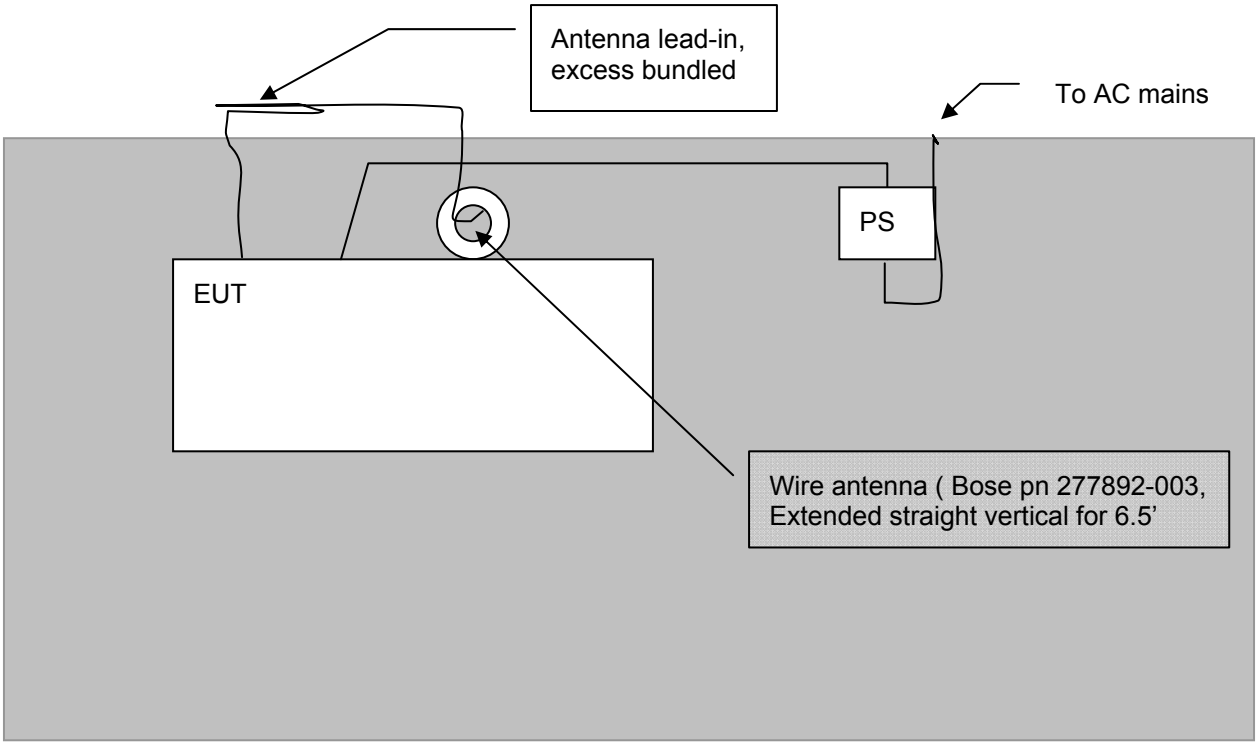
5.3 Output Field Strength

5.3.1. Requirements

FCC part 15.227, RSS 310 section 3.8

Frequency MHz	Level dBuV/m average	Level dBuV/m peak
26.96 - 27.28	80	100

5.3.2. Test Setup



Bose Corporation, 1 New York Ave, Framingham, MA 01701, USA
Tel: (508) 766-6000 Fax: (508) 766-1145

5.3.3. Test data

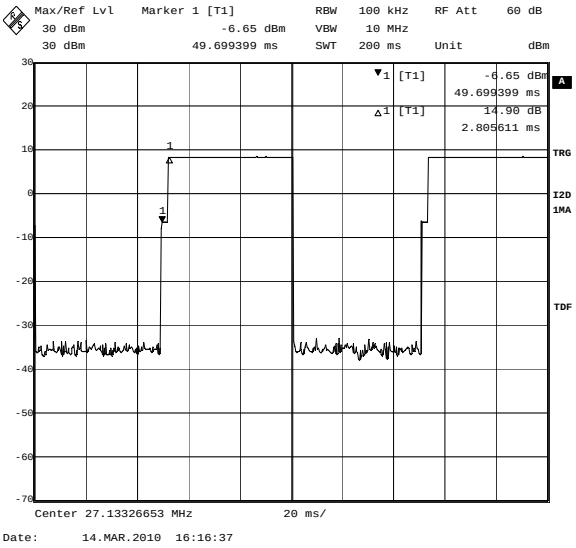
Duty cycle:

The 27.145 MHz TX in the console sends out a data packet with a duty cycle of 32.5% maximum.

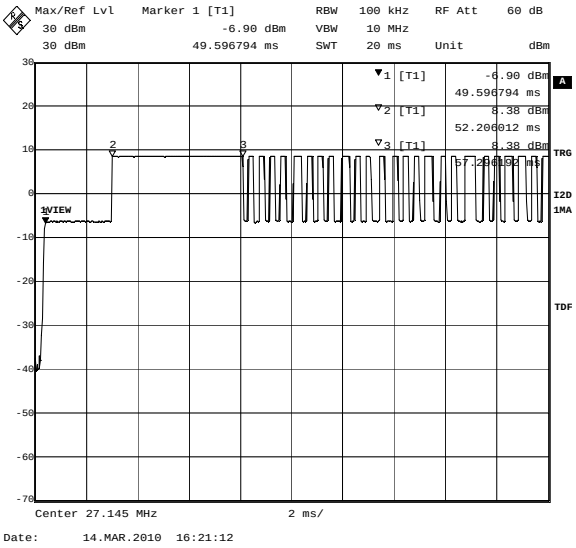
The transmit sequence has the following segments:

- 2.6 ms of low level carrier only (-16 dBc)
- 5.09 ms of full power carrier
- 31 characters of transmitted information – maximum length is 52 ms. Duty cycle is 50% during those 52 ms.

200 ms interval



20 ms detail



Duty cycle calculation:

5.09 ms pre-amble @ 100%	=	5.09
57.15 – 5.09 = 52.04 @ 50%	=	26.02
2.61 + 52.04 = 54.65 @ 2.5% (-16dBc)	=	1.37
		----------+
		32.48 %

Correction factor -9.8 dB

Bose Corporation, 1 New York Ave, Framingham, MA 01701, USA
Tel: (508) 766-6000 Fax: (508) 766-1145

Output level:

Antenna	Carrier Frequency [MHz]	Peak Measured level @ 3 m [dBµV/m]	Duty Cycle correction	Average level [dBµV/m]	Limit [dBµV/m]	Margin [dB]
277892-003	27.145	89.0	-9.8	79.2	80.0	- 0.8

5.3.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
Antenna	ETS	6512	TN1501	5/7/2008	5/7/2010
Receiver	Rohde & Schwarz	FSH6	TN1658	6/3/2009	6/3/2010

5.3.5. Test information

Date of test: 2/23/2010 **EUT serial:** 0014AE

Test Location: Bose PP parking lot **Test result:** Pass

Tested by: Kevin Thibodeau, Brent DeWitt

Bose Corporation, 1 New York Ave, Framingham, MA 01701, USA
Tel: (508) 766-6000 Fax: (508) 766-1145

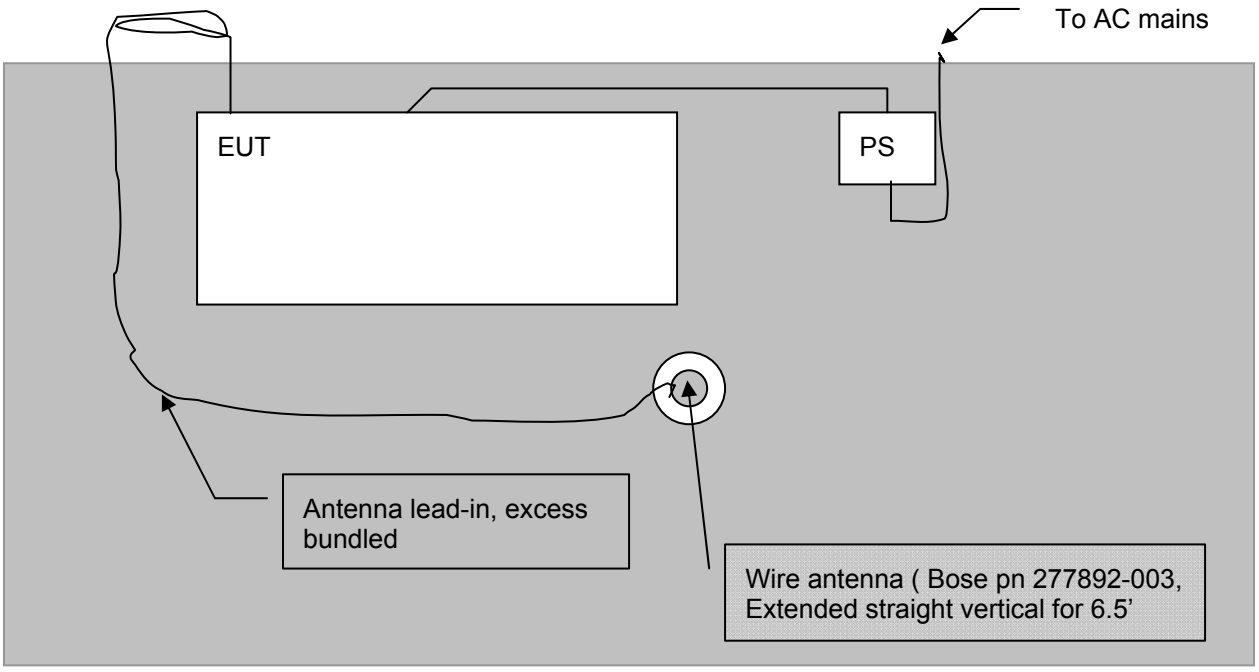
5.4 Harmonics

5.4.1. Requirements:

Harmonics shall be measured up to the 10th harmonic of the fundamental (271.5 MHz)

Frequency [MHz]	Limit @ 3m [dBµV/m]	Detector
30-88	40	QP
88-216	43.5	QP
216-960	46	QP

5.4.2. Test Setup



.

Bose Corporation, 1 New York Ave, Framingham, MA 01701, USA
Tel: (508) 766-6000 Fax: (508) 766-1145

5.4.3. Test data

Harmonic order	Frequency [MHz]	Measured level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	notes
Fundamental	27.145				
2	54.29	35.4	40	-4.6	pk
3	81.435	26.2	40	-13.8	pk
4	108.58	29.7	43.5	-14.2	pk
5	135.725	-	43.5	-	Not measurable
6	162.87	23.9	43.5	-19.6	pk
7	190.015	-	43.5	-	Not measurable
8	217.16	-	46.0	-	Not measurable
9	244.305	-	46.0	-	Not measurable
10	271.45	-	46.0	-	Not measurable

5.4.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
Antenna	Sunol Sciences	JB6	TN1541	8/6/2009	8/6/2010
Pre-Amp	Rohde & Schwarz	TS-PR8	TN1669	3/5/2009	3/5/2010
Receiver	Rohde & Schwarz	ESU40	TN1663	7/29/2009	7/29/2010
8 GHz cable set	-	-	TN1445	5/19/2009	5/19/2010

5.4.5. Test information

Date of test: 2/15/2010 **EUT serial:** 0016AE

Test Location: Maxwell House **Test result:** Pass

Tested by: Peter Boers

Bose Corporation, 1 New York Ave, Framingham, MA 01701, USA
Tel: (508) 766-6000 Fax: (508) 766-1145