



# FCC PART 15.249

# MEASUREMENT AND TEST REPORT

For

# **Eastern Times Technology Co., Ltd.**

Building 5, Penghua Industry Park, Heping Rodd (w), Shenzhen, Guangdong, China

> FCC ID: TUV3702-C Model: ET-JP-3702

Report Type: **Product Type:** 2.4GHz Wireless Mini Keyboard Original Report 7 in slang **Test Engineer:** Tim Zhang **Report Number:** RSZ10011205 **Report Date:** 2010-02-09 Merry Zhao merry, Thuo **Reviewed By:** EMC Engineer Bay Area Compliance Laboratories Corp. (Shenzhen) **Prepared By:** 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008

**Note**: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Shenzhen). This report **must not** be used by the customer to claim product certification, approval, or endorsement by NVLAP\*, NIST, or any agency of the Federal Government.

\* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "\*" (Rev.2)

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# **GENERAL INFORMATION**

# **Product Description for Equipment under Test (EUT)**

The Eastern Times Technology Co., Ltd. 's product, model ET-JP-3702 (FCC ID: TUV3702-C), or the "EUT" as referred to in this report is a 2.4 GHz Wireless Mini Keyboard which measures approximately 13.1 cm L x 8.1 cm W x 1.7 cm H, rated input voltage: 2\*PCS AAA battery=3V DC

#### Product information:

Parameters	Specifications		
Modulation	FSK		
Frequency Range	2408-2474 MHz		
Transmission Power	≤0 dBm		

Transmission Channel (54 CH)

2408, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2471, 2472, 2473, 2474.

# **Objective**

This Type approval report is prepared on behalf of *Eastern Times Technology Co., Ltd.* in accordance with Part 2, Subpart J, and Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209, 15.109 and 15.249 rules.

#### **Related Submittal(s)/Grant(s)**

No Related Submittals.

# **Test Methodology**

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

<sup>\*</sup> All measurement and test data in this report was gathered from production sample serial number: 1001023 (Assigned by BACL, Shenzhen). The EUT was received on 2010-01-12.

# **Test Facility**

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located in the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on November 21, 2007. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200707-0).



The current scope of accreditations can be found at <a href="http://ts.nist.gov/Standards/scopes/2007070.htm">http://ts.nist.gov/Standards/scopes/2007070.htm</a>

# **SYSTEM TEST CONFIGURATION**

## **Justification**

The system was configured for testing in a typical fashion (as normally used by a typical user).

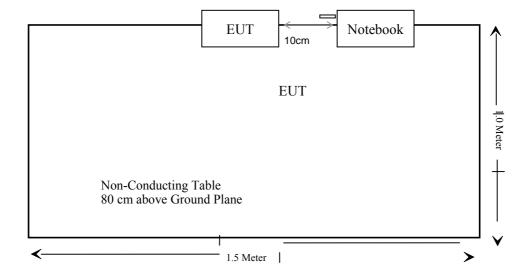
# **Equipment Modifications**

No modifications were made to the unit tested.

# **Configuration of Test Setup**



# **Block Diagram of Test Setup**



# SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207(a)	Conduction Emissions	N/A
\$15.205(a), \$15.209(a), 15.249(a), \$15.249(c), \$15.35	Radiated Emissions	Compliant
§15.249(d)	Out of Band Emissions	Compliant

# FCC §15.203 - ANTENNA REQUIREMENT

# **Applicable Standard**

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used.

## **Antenna Connector Construction**

The EUT has an printed antenna on PCB, which in accordance to section 15.203, is considered sufficient to comply with the provisions of this section. The antenna gain is 0 dBi.

Result: Compliant.

Please refer to the EUT internal photos.

# FCC §15.205(a) §15.209(a) & §15.249 - RADIATED EMISSIONS

# **Applicable Standard**

As per §15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Field strength of fundamental (millivolts/meter)		Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

As per §15.249 (c), Field strength limits are specified at a distance of 3 meters.

(d) 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.

# **Measurement Uncertainty**

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is ±4.0 dB.

# **Test Equipment Setup**

The spectrum analyzer or receiver is set as:

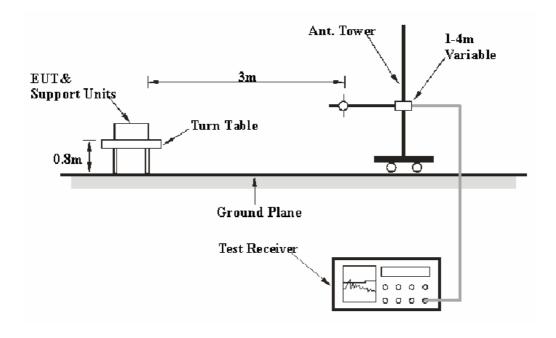
Below 1000 MHz:

Quasi-Peak: RBW = 100 kHz/VBW = 300 kHz/Sweep = Auto

Above 1000 MHz:

(1) Peak: RBW = 1MHz VBW = 1MHz / Sweep = Auto
 (2) Average: RBW = 1MHz/VBW = 10Hz/Sweep = Auto

# **EUT Setup**



The radiated emission and out of band emission tests were performed in the 3 meters chamber B, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15.209, FCC 15.109 and FCC 15.249 limits.

# **Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
НР	Amplifier	8447E	1937A01046	2009-11-15	2010-11-15
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2009-11-24	2010-11-24
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2009-04-12	2010-04-12
НР	Amplifier	8449B	3008A00277	2009-09-29	2010-09-29
Sunol Sciences	Horn Antenna	DRH-118	A052604	2009-09-25	2010-09-25
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2009-08-28	2010-08-27

<sup>\*</sup> Statement of Traceability: Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

#### **Test Procedure**

For the radiated emissions test, the EUT, and all support equipment power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 mete, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

# **Corrected Amplitude & Margin Calculation**

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

# **Test Results Summary**

According to the data in the following table, the EUT complied with the <u>FCC Part 15.209, 15.109 & 15.249</u>, with the worst margin reading of:

Transmitting: 9.24 dB at 7224 MHz in the Vertical polarization, low channel Transmitting: 9.28 dB at 7320 MHz in the Vertical polarization, middle channel Transmitting: 11.67 dB at 7432 MHz in the Horizontal polarization, high channel

#### **Test Data**

#### **Environmental Conditions**

Temperature:	25 ° C		
Relative Humidity:	56%		
ATM Pressure:	100.0 kPa		

The testing was performed by Tim Zhang on 2010-02-09.

Test Mode: Transmitting

# Peak Measurement:

				Tes	t Ante	nna	Cable	Pre-Amp.	Cord.	FC	CC 15.249	/15.209
Frequency (MHz)	Reading (dBµV/m)	Detector (PK/AV)	Direction Degree	Height (m)	Polar (H/V)		Loss Gain (dB)	Amp. (dBμV/m)	Limit (dBµV /m)	Margin (dB)	Comment	
	Low Channel (2408 MHz)											
2408	87.32	PK	140	1.6	Н	30.9	7.9	33.9	92.22	114	21.78	Fund.
4816	54.35	PK	46	1.2	Н	36.3	7.56	33.7	64.51	74	9.49	harmonic
7224	50.62	PK	336	1.0	Н	39.2	9.12	33.6	65.34	74	8.66	harmonic
9632	45.15	PK	211	1.2	Н	41.4	10.79	34	63.34	74	10.66	harmonic
2408	92.14	PK	80	1.0	V	30.3	7.9	33.9	96.44	114	17.56	Fund.
4816	55.65	PK	139	1.0	V	35	7.56	33.7	64.51	74	9.49	harmonic
7224	52.1	PK	38	1.0	V	38	9.12	33.6	65.62	74	8.38	harmonic
9632	47.71	PK	156	1.2	V	40.1	10.79	34	64.6	74	9.40	harmonic
				Midd	le Cha	nnel (24	40 ME	(z)				
2440	85.59	PK	226	1.4	Н	30.9	7.9	33.9	90.49	114	23.51	Fund.
4880	53.05	PK	250	1.4	Н	36.3	7.56	33.7	63.21	74	10.79	harmonic
7320	49.82	PK	318	1.7	Н	39.2	9.12	33.6	64.54	74	9.46	harmonic
2440	90.64	PK	145	1.7	V	30.3	7.9	33.9	94.94	114	19.06	Fund.
4880	53.89	PK	258	1.37	V	35	7.56	33.7	62.75	74	11.25	harmonic
7320	51.2	PK	57	1.7	V	38	9.12	33.6	64.72	74	9.28	harmonic
				High	n Chan	nel (247	74 MHz	z)				
2474	84.59	PK	150	1.6	Н	30.9	7.9	33.9	89.49	114	24.51	Fund.
4948	51.32	PK	132	1.7	Н	36.3	7.56	33.7	61.48	74	12.52	harmonic
7432	47.61	PK	74	2.0	Н	39.2	9.12	33.6	62.33	74	11.67	harmonic
2474	89.3	PK	225	1.9	V	30.3	7.9	33.9	93.6	114	20.4	Fund.
4948	51.79	PK	298	1.6	V	35	7.56	33.7	60.65	74	13.35	harmonic
7432	48.73	PK	23	1.5	V	38	9.12	33.6	62.25	74	11.75	harmonic

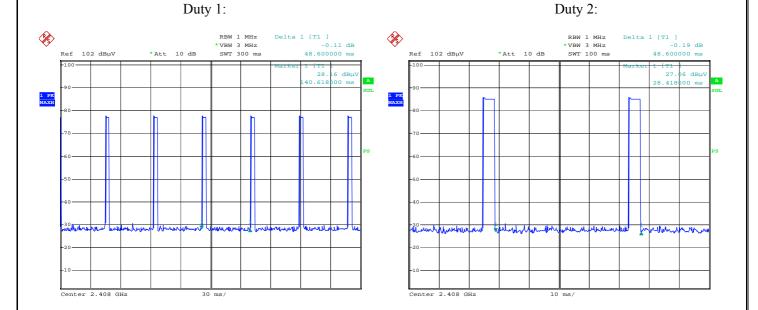
# Average Results:

Engguener	Peak Measured	Antenna	<b>Duty Cycle</b>	Average	FCC 15.	249/209					
Frequency (MHz)	@ 3m (dBμV/m)	Polar (H/V)	Factor (dB)	Amp. (dBμV/m)	Limit (dBµV/m)	Margin (dB)	Comment				
	Low Channel (2408 MHz)										
2408	92.22	Н	20.86	71.36	94	22.64	Fund.				
2408	96.44	V	20.86	75.58	94	18.42	Fund.				
4816	64.51	Н	20.86	43.65	54	10.35	harmonic				
4816	64.51	V	20.86	43.65	54	10.35	harmonic				
7224	65.34	Н	20.86	44.48	54	9.52	harmonic				
7224	65.62	V	20.86	44.76	54	9.24	harmonic				
9632	63.34	Н	20.86	42.48	54	11.52	harmonic				
9632	64.60	V	20.86	43.74	54	10.26	harmonic				
		Mid	dle Channel (2	2440 MHz)							
2440	90.49	Н	20.86	69.63	94	24.37	Fund.				
2440	94.94	V	20.86	74.08	94	19.92	Fund.				
4880	63.21	Н	20.86	42.35	54	11.65	harmonic				
4880	62.75	V	20.86	41.89	54	12.11	harmonic				
7320	64.54	Н	20.86	43.68	54	10.32	harmonic				
7320	64.72	V	20.86	43.86	54	10.14	harmonic				
		Hiş	gh Channel (24	474 MHz)							
2474	89.49	Н	20.86	68.63	94	25.37	Fund.				
2474	93.60	V	20.86	72.74	94	21.26	Fund.				
4948	61.48	Н	20.86	40.62	54	13.38	harmonic				
4948	60.65	V	20.86	39.79	54	14.21	harmonic				
7432	62.33	Н	20.86	41.47	54	12.53	harmonic				
7432	62.25	V	20.86	41.39	54	12.61	harmonic				

# **Duty Cycle Factor**

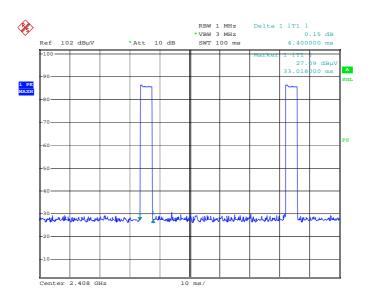
Duty Cycle=4.4 ms/48.6 ms \*100% = 9.05% Duty Cycle Factor = 20 log (0.0905) = -20.86 dB

Average = Peak + Duty Cycle Factor



Date: 4.FEB.2010 02:30:33 Date: 4.FEB.2010 02:14:10

# Duty 3:



Date: 4.FEB.2010 02:17:17

# FCC §15.249(d) – OUT OF BAND EMISSIONS

### **Applicable Standard**

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.

# **Measurement Uncertainty**

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is +4.0 dB.

### **Test Equipment Setup**

The spectrum analyzer or receiver is set as:

Above 1000 MHz:

(1) Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto
 (2) Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

### **Test Procedure**

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 mete, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission at the band edge. The receiving antenna should be changed the polarization both of horizontal and vertical.

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

# **Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2009-11-24	2010-11-24
НР	Amplifier	8447E	1937A01046	2009-08-02	2010-08-02
A.H. System	Horn Antenna	SAS-200/571	135	2009-05-17	2010-05-17

<sup>\*</sup> Statement of Traceability: Bay Area Compliance Laboratories Corp. (Shenzhen) Corp. attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

# **Test Data**

## **Environmental Conditions**

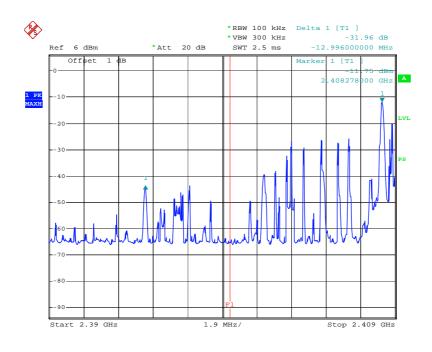
Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.2 kPa

<sup>\*</sup>The testing was performed by Tim Zhang on 2010-02-09.

**Test Result:** Compliant, please refer to the following plots.

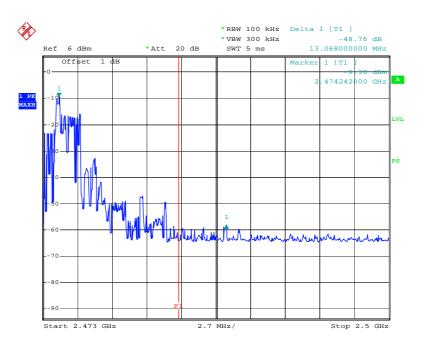
Frequency (MHz)	Delta Peak to Band Emission (dBc)
2395.282	31.96
2487.310	48.76

## Band-left:



Date: 9.FEB.2010 03:24:01

# Band-Right:



Date: 9.FEB.2010 03:27:40

# **FCC §15.215(c) – 20 dB BANDWIDTH**

### **Applicable Standard**

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

# **Test Equipment List and Details**

Manufacturer	Description	Model Serial Number		Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2009-11-24	2010-11-24
HP	Amplifier	8449B	3008A00277	2009-09-12	2010-09-11
Sunol Sciences	Horn Antenna	DRH-118	A052604	2009-09-25	2010-09-25

<sup>\*</sup> Statement of Traceability: Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

#### **Test Procedure**

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- 3. Measure the frequency difference of two frequencies that indicated 20dB bandwidth.
- 4. Repeat above procedures until all frequencies measured were complete.

#### **Test Data**

### **Environmental Conditions**

Temperature:	25 ° C
<b>Relative Humidity:</b>	56%
ATM Pressure:	100.0kPa

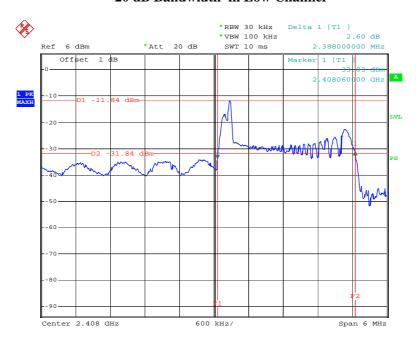
The testing was performed by Tim Zhang on 2010-02-05.

Test Mode: Transmitting

Pleas refer to the plot and tabular data sheet attached.

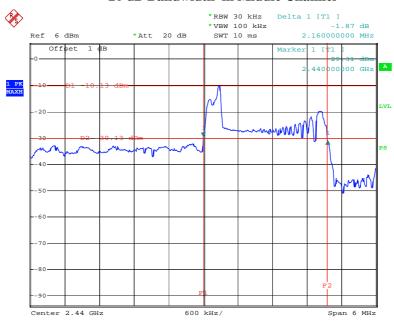
Channel	Channel Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2408	2.388
Mid	2440	2.160
High	2474	2.184

## 20 dB Bandwidth in Low Channel



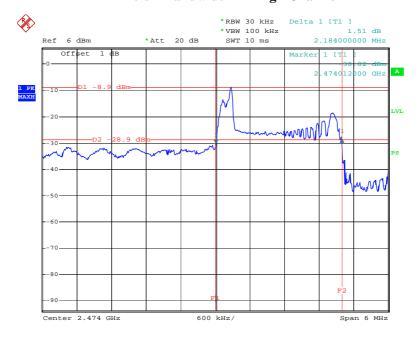
Date: 5.FEB.2010 02:36:56

## 20 dB Bandwidth in Middle Channel



Date: 5.FEB.2010 02:41:58

## 20 dB Bandwidth in High Channel



Date: 5.FEB.2010 02:47:16

## \*\*\*\*\* END OF REPORT \*\*\*\*\*