



LSRESEARCH, LLC

Wireless Product Development

W66 N220 Commerce Court • Cedarburg, WI 53012 USA • Phone: 262.375.4400 • Fax: 262.375.4248 • www.lsr.com

ENGINEERING TEST REPORT # 312032

LSR Job #: C-1406

Compliance Testing of:

Thermostat THX9001R5003

Test Date(s):

March 9, 13, 14, and 28 2012

Prepared For:

Honeywell

1985 Douglas Drive North

Golden Valley, MN 55422

In accordance with:

Federal Communications Commission (FCC)

Part 15, Subpart C, Section 15.247

Industry Canada (IC) RSS-210 Annex 8

Frequency Hopping Spread Spectrum (FHSS) Operating

In the Frequency Band 902-928MHz

Intentional Radiators

This Test Report is issued under the Authority of:

Signature:

Date: 4-4-12

Test Report Reviewed by:

Signature

Date: 4-4-12

Report by:

Adam Alger

Signature:

Date: 3-28-12

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Prepared For: Honeywell

Report: TR 312032 A FCCICTX V1a

LSR: C-1406

Name: Thermostat THX9001R5003

Model: THX9001R5003

Serial: none (engineering sample)

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LS Research, LLC in Review

As an EMC Testing Laboratory, our Accreditation and Assessments are recognized through the following:



TESTING CERT #1255.01

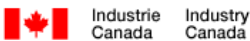
A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025: 2005 with Electrical (EMC) Scope of Accreditation
A2LA Certificate Number: 1255.01



Federal Communications Commission (FCC) – USA

Listing of 3 Meter Semi-Anechoic Chamber based on Title 47 CFR – Part 2.948
FCC Registration Number: 90756



Canada

Industry Canada

On file, 3 Meter Semi-Anechoic Chamber based on RSS-212 – Issue 1
File Number: IC 3088-A
On file, 3 and 10 Meter OATS based on RSS-212 – Issue 1
File Number: IC 3088



U. S. Conformity Assessment Body (CAB) Validation

Validated by the European Commission as a U. S. Competent Body operating under the U. S./EU, Mutual Recognition Agreement (MRA) operating under the European Union Electromagnetic Compatibility – Council Directive 2004/108/EC (formerly 89/336/EEC, Article 10.2).
Date of Validation: January 16, 2001

Validated by the European Commission as a U.S. Notified Body operating under the U.S. /EU, Mutual Recognition Agreement (MRA) operating under the European Union Telecommunication Equipment – Council Directive 99/5/EC, Annex V.
Date of Validation: November 20, 2002
Notified Body Identification Number: 1243

Prepared For: Honeywell	Name: Thermostat THX9001R5003
Report: TR 312032 A FCCICTX V1a	Model: THX9001R5003
LSR: C-1406	Serial: none (engineering sample)

1.0 Summary of Test Report

In March 2012 the Honeywell THX9001R5003 was tested and MEETS the following requirements.

Rule	Description	Procedure	Compliant	Note
FCC: 15.247(a)(1) IC: RSS-210 A8.1(a)	Emission Bandwidth 20dB & 99%	ANSI C63.4-2003	Yes	2
FCC: 15.247(b) IC: RSS-210 A8.4	Maximum Output Power	ANSI C63.4-2003	Yes	2
FCC: 15.247(a)(1)(i) IC: RSS-210 A8.1(c)	Hopping Requirements	ANSI C63.4-2003	Yes	2
FCC: 15.247(d) IC: RSS-210 A8.5	Band-edge	ANSI C63.4-2003	Yes	2
FCC: 15.247(d) IC: RSS-210 A8.5	Spurious Emissions	ANSI C63.4-2003	Yes	2
FCC: 15.247(d) IC: RSS-210 A8.5	Radiated Maximum Output Power	ANSI C63.4-2003	Yes	1
FCC: 15.247(d) IC: RSS-210 A8.5	Radiated Emissions at Band-edge	ANSI C63.4-2003	Yes	1
FCC: 15.247(d) IC: RSS-210 A8.5	Radiated Harmonics	ANSI C63.4-2003	Yes	1
FCC: 15.247(d) IC: RSS-210 A8.5	Radiated Emissions	ANSI C63.4-2003	Yes	1
FCC: 15.207 IC: RSS-GEN 7.2.2	Power Line Conducted Emissions	ANSI C63.4-2003	Yes	3
FCC: 2.1091 IC: RSS-102 2.5.1	MPE Calculations	OET 65	Yes	None
FCC: 15.109 IC: RSS-GEN	Receiver radiated Emissions	ANSI C63.4-2003	Yes	1

Note 1: Tested as a wall mount device in its intended orientation.

Note 2: RF Conducted measurement at antenna terminal.

Note 3: Device operates at 24VAC 60Hz.

2.0 Test Facilities

All testing was performed at:

LS Research, LLC
W66 N220 Commerce Court
Cedarburg, Wisconsin, 53012 USA

LS Research, LLC is accredited by A2LA (American Association for Laboratory Accreditation) to the requirements of ISO/IEC 17025, 2005 “General Requirements for the Competence of Calibration and Testing Laboratories”.

LS Research, LLC’s scope of accreditation includes all test methods listed herein, unless otherwise noted. Accreditation status can be verified at A2LA’s web site: www.a2la.net.

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3.0 Client Information

Manufacturer Name:	Honeywell
Address:	1985 Douglas Dr Golden Valley, MN 55422
Contact Person:	Dave Mulhouse

3.1 Equipment Under Test (EUT) Information

The following information has been supplied by the applicant.

Product Name:	THX9001R5003
Model Number:	THX9001R5003
Serial Number:	None (engineering sample)
FCC ID	HS9-THX9001R01
IC Number	573R-THX9001R01

3.2 Product Description

The device is a line powered thermostat with an integrated graphic color user interface; it provides temperature and humidity information.

Frequency Range (MHz)	903.0 – 926.4
RF Power In Watts (conducted)	0.01135
Max Conducted Output Power (dBm)	10.55
Field Strength at 3 meters (dB μ V/m)	110.7
Occupied Bandwidth 99%	63.2 kHz
Type of Modulation	FSK
Emission Designator	63K2FXD
Transmitter Spurious (worst case) at 3 meters	39.6 dB μ V/m (average) 1829.2 MHz
Stepped (Y/N)	No
Step Value	N/A
Frequency Tolerance %,Hz, ppm	Better than 100 ppm
Microprocessor Model #	CC1101
Antenna: Detachable / Non-detachable	Non-Detachable
Antenna: Type	PCB trace with bar element
Antenna Gain (Measured over ground plane)	4.9 dBi
FCC Rule Part	Title 47 Part 15.247
Industry Canada Rule Part	RSS-210 Issue 8 2010
Modular Filing	No
RF Exposure Type	Mobile
Receiver Spurious (worst case) at 3 meters	44.42 dB μ V/m (peak noise floor) at 2.969 GHz

Prepared For: Honeywell	Name: Thermostat THX9001R5003
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3.3 Modifications Incorporated In the EUT for Compliance Purposes

None noted at time of test.

3.4 Deviations & Exclusions from Test Specifications

Tested in continuous and normal operation in the intended orientation (wall mount)

4.0 Conditions of Test

Environmental:

Temperature: 20-25° C
Relative Humidity: 30-60%
Atmospheric Pressure: 86-106 kPa

Mains Voltage:

24VAC 60Hz from a transformer supplied with 120VAC 60Hz

5.0 Additional Information

None

6.0 Test Equipment

All test equipment is calibrated by a calibration laboratory accredited by A2LA to the requirements of ISO 17025. For a complete list of test equipment and calibration dates, see Appendix A. Unless otherwise noted, resolution bandwidth of measuring instrument used during testing for given frequency range:

Frequency Range	Resolution Bandwidth
9 kHz – 150 kHz	200 Hz
150 kHz – 30 MHz	9 kHz
30 MHz – 1000 MHz	120 kHz
Above 1000 MHz	1 MHz

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7.0 Declaration of Conformity

The EUT was found to MEET the requirements as described within the specification of FCC Title 47, CFR Part 15.247 (2011) and Industry Canada RSS-210, Issue 8 (2010)

If some emissions are seen to be within 3 dB of their respective limits:

As these levels are within the tolerances of the test equipment and site employed, there is a possibility that this unit, or a similar unit selected out of production may not meet the required limit specification if tested by another agency.

LS Research, LLC certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specifications. The results in this Test Report apply only to the item(s) tested on the above-specified dates. Any modifications made to the EUT subsequent to the indicated test date(s) will invalidate the data herein, and void this certification.

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Appendix A – Test Equipment



Date: 9-Mar-2012 Type Test: RF Conducted Job #: C-1406
Prepared By: Peter Customer: Honeywell Quote #: 312032

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	CC 000221C	Spectrum Analyzer	HP	E4407B	US39160256	5/4/2011	5/4/2012	Active Calibration
2	AA 960143	Phaseflex	Gore	EKD01D01048.0	5546519	6/1/2011	6/1/2012	Active Calibration

Project Engineer: Adam Olyer Quality Assurance: [Signature]



Date: 9-Mar-2012 Type Test: Radiated Emissions (109) Job #: C-1406
Prepared By: Adam A Customer: Honeywell Quote #: 312032

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960005	Biconical Antenna	EMCO	9310B	9601-2280	6/10/2011	6/10/2012	Active Calibration
2	AA 960078	Log Periodic Antenna	EMCO	93146	9701-4855	11/15/2011	11/15/2012	Active Calibration
3	EE 960158	RF Preselector	Agilent	N9039A	MY46520110	6/11/2011	6/11/2012	Active Calibration
4	EE 960157	3Hz-13.2GHz Spectrum Analyzer	Agilent	E4445A	MY48250225	6/6/2011	6/6/2012	Active Calibration
5	AA 960155	900MHz High Pass Filter	KVM	HPF-L-14185	7272-03	3/5/2012	3/5/2013	Active Calibration
6	EE 960160	0.8-21GHz LNA	Mini-Circuits	ZVA-213X-S+	977711030	4/27/2011	4/27/2012	Active Calibration
7	AA 960007	Double Ridge Horn Antenna	EMCO	3115	9311-4138	4/27/2011	4/27/2012	Active Calibration

Project Engineer: Adam Olyer Quality Assurance: [Signature]



Date: 28-Mar-2012 Type Test: Conducted Emissions Job #: C-1406
Prepared By: Adam Customer: Honeywell Quote #: 312032

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960013	EMI Receiver	HP	8546A System	3617A00320;3448A	11/22/2011	11/22/2012	Active Calibration
2	EE 960014	EMI Receiver-filter section	HP	85460A	3448A00296	11/22/2011	11/22/2012	Active Calibration
3	AA 960072	Transient Limiter	HP	11947A	3107A02515	11/2/2011	11/2/2012	Active Calibration
4	AA 960075	LISN	EMCO	3810/2NIM	9612-1710	9/19/2011	9/19/2012	Active Calibration

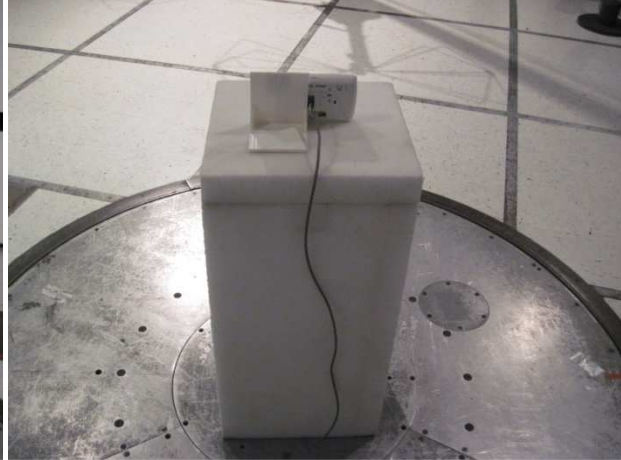
Project Engineer: Adam Olyer Quality Assurance: [Signature]

Prepared For: Honeywell
Report: TR 312032 A FCCICTX V1a
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Name: Thermostat THX9001R5003
Model: THX9001R5003
Serial: none (engineering sample)

Appendix B – Setup Photos

Radiated Emissions



AC Line Conducted Emissions



RF Conducted



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Model: THX9001R5003
Serial: none (engineering sample)

Appendix C – Test Data

C.1 – RF Conducted Emissions

A direct measurement of the transmitted signal was performed at the antenna port of the EUT via a cable connection to a spectrum analyzer. An attenuator was placed in series with the cable to protect the spectrum analyzer. The loss from the cable and the attenuator were added on the analyzer as gain offset settings there by allowing direct measurements, without the need for any further corrections. The EUT was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source.

The measurements were made using FCC Public Notice DA00-705 March, 2000.

Summary of Results

Frequency (MHz)	EBW 20 dB (kHz)	EBW 99 % (kHz)	Power (dBm)	Hopping Requirements	Band-Edge	Spurious Emissions	Stability
903	66.25	63.19	10.55	Pass	Pass	Pass	Pass
914.6	67.50	62.98	10.41	Pass	Pass	Pass	Pass
926.4	67.50	62.93	10.39	Pass	Pass	Pass	Pass

Emission bandwidth, output power, band-edge, spurious emissions, and stability tests performed with transmitter in continuous transmit mode on low, mid, and high channel.

Hopping Tests tested with transmitter in normal operating mode.

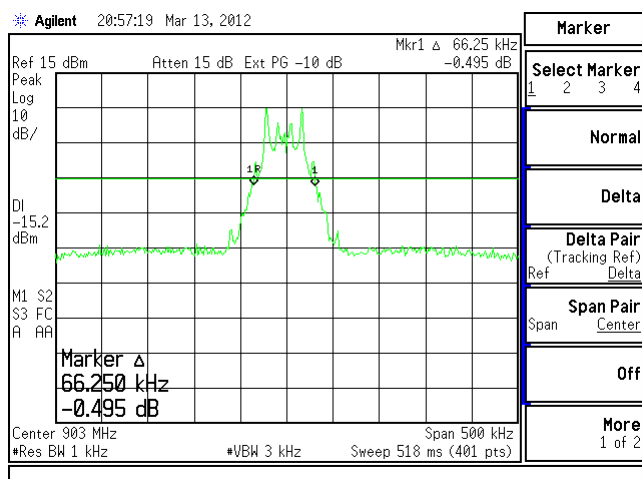
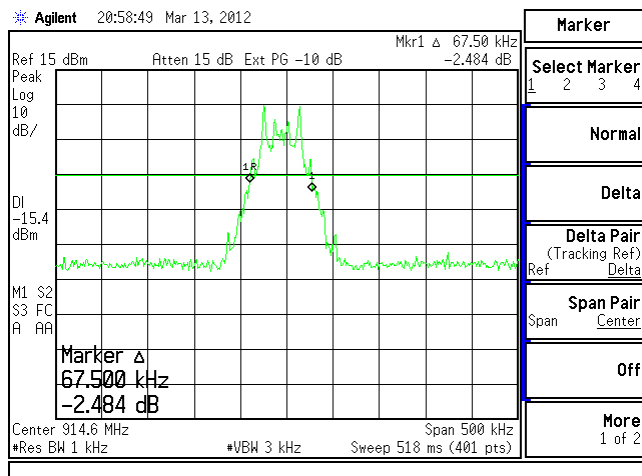
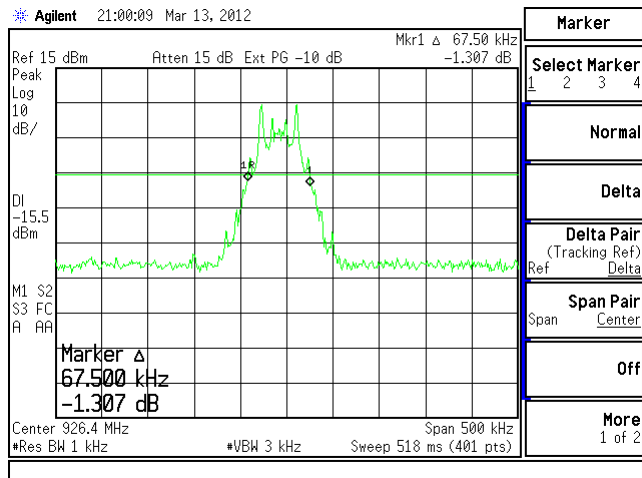
Number of Channels: 50

Minimum Separation: 400 kHz

Dwell Time: One pulse of 145ms in 20 second period.

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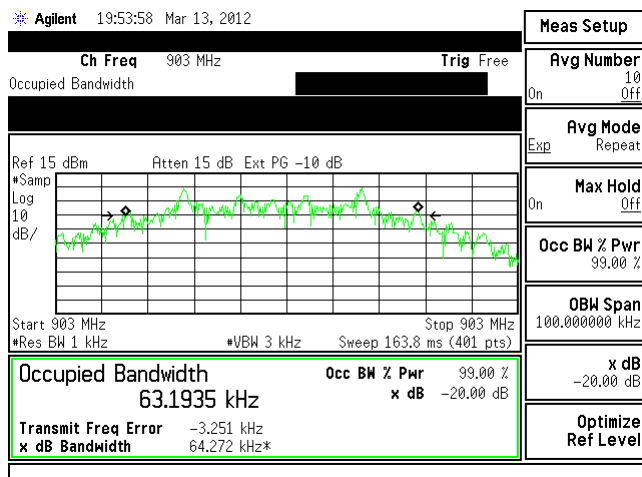
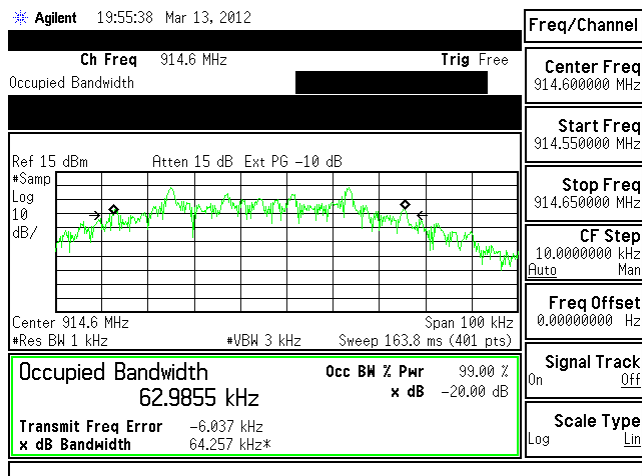
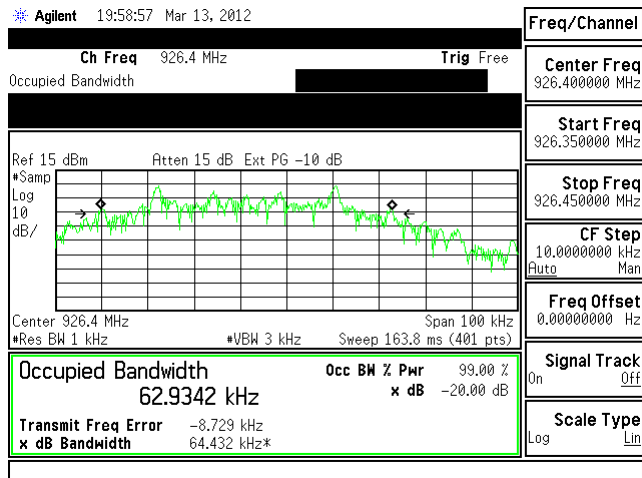
Emission Bandwidth – 20dB



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Name: Thermostat THX9001R5003
Model: THX9001R5003
Serial: none (engineering sample)

Emission Bandwidth – 99%



Prepared For: Honeywell

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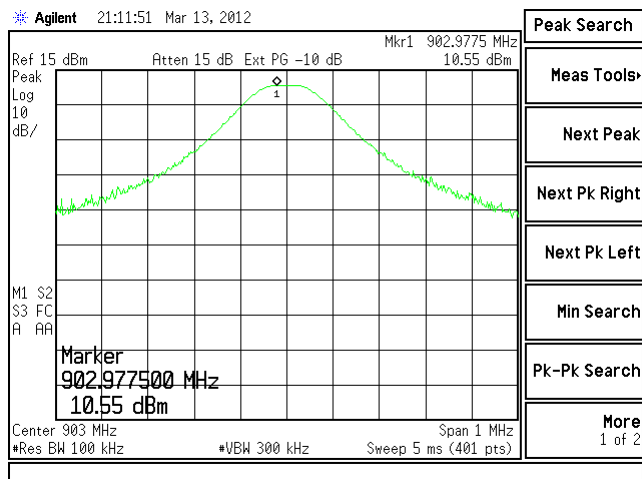
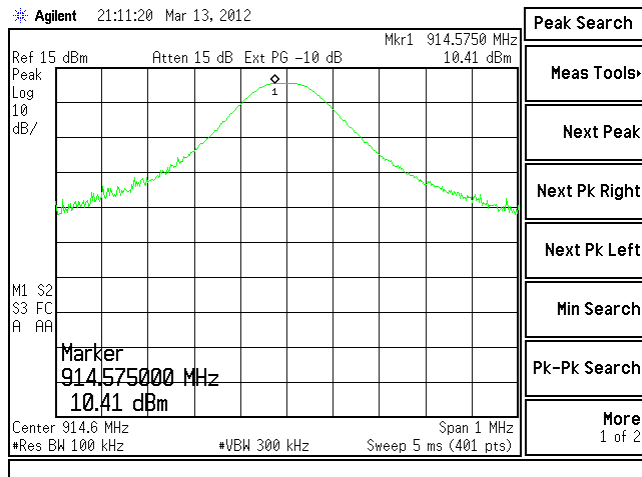
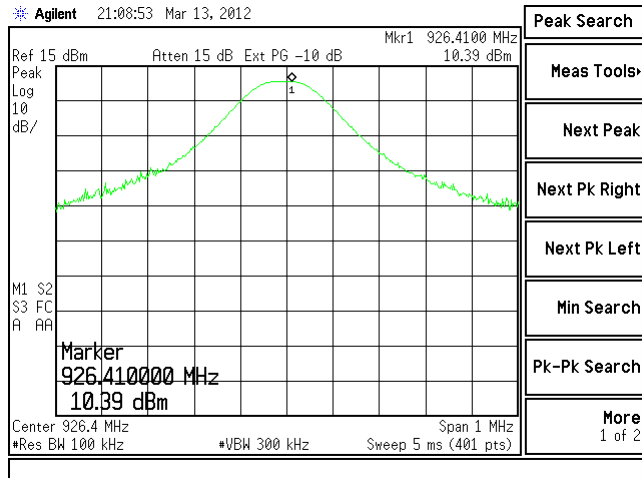
LSR: C-1406

Name: Thermostat THX9001R5003

Model: THX9001R5003

Serial: none (engineering sample)

Output Power



Prepared For: Honeywell

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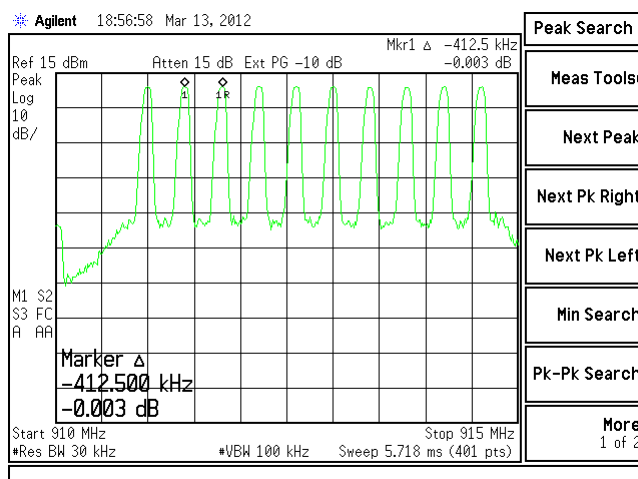
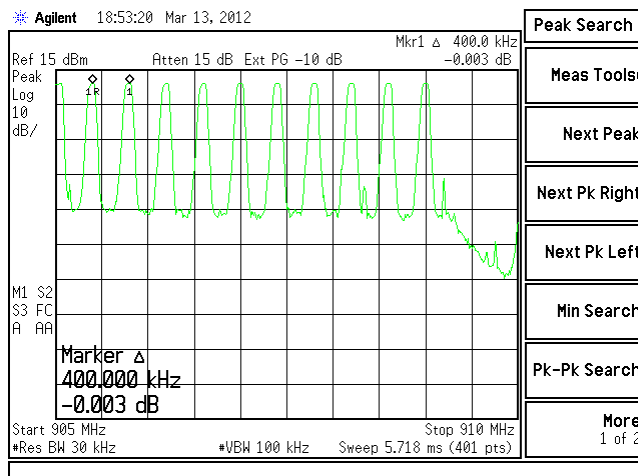
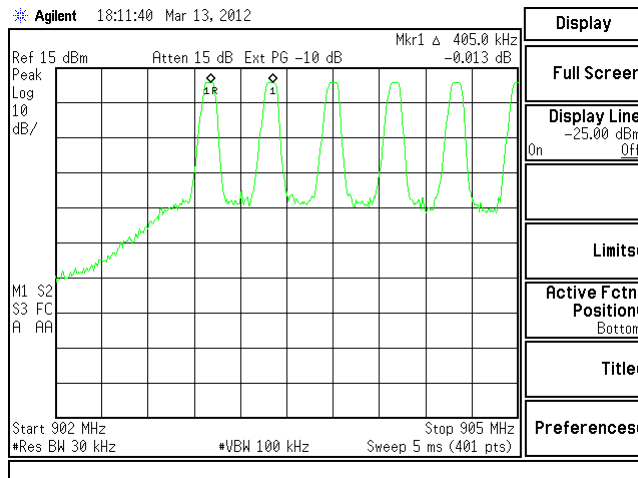
LSR: C-1406

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Model: THX9001R5003

Serial: none (engineering sample)

Hopping Requirement – Channel Separation and Number of Channels (Normal Operating Mode)



Prepared For: Honeywell

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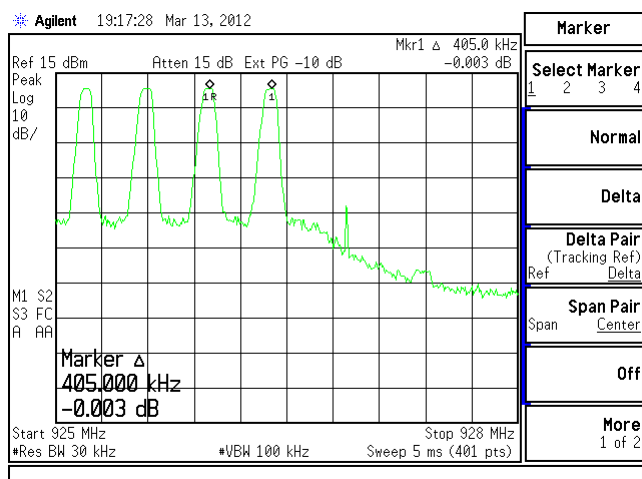
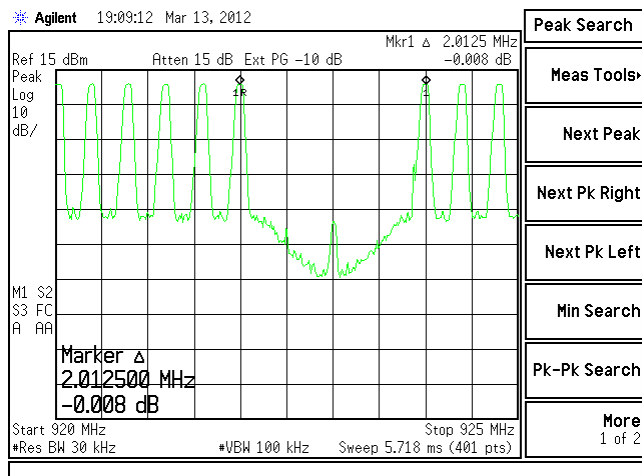
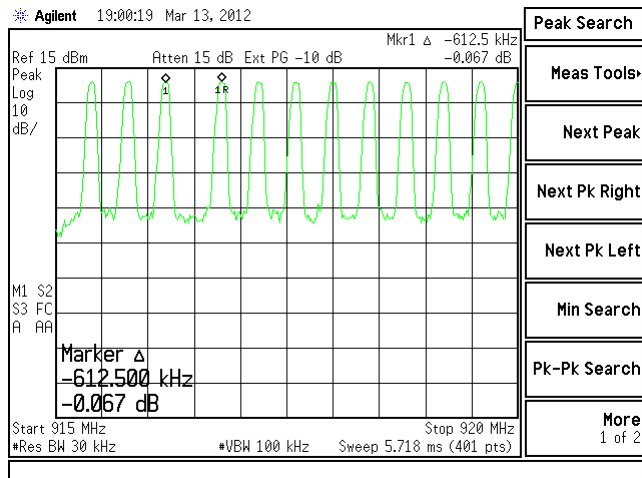
LSR: C-1406

Name: Thermostat THX9001R5003

Model: THX9001R5003

Serial: none (engineering sample)

Hopping Requirement – Channel Separation and Number of Channels



Prepared For: Honeywell

Report: TR 312032 A FCCICTX V1a

LSR: C-1406

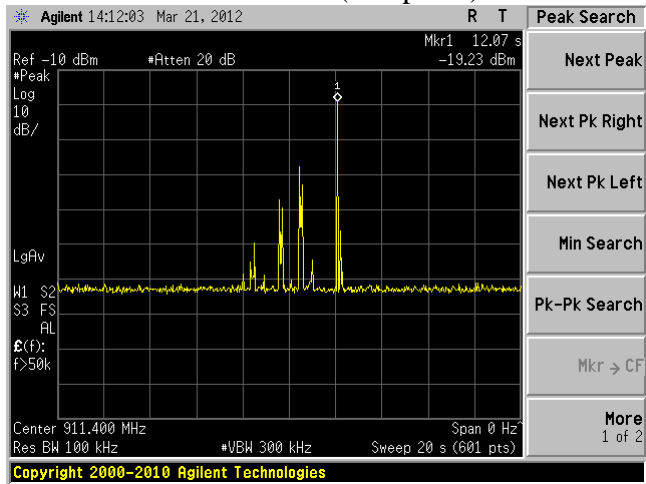
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Model: THX9001R5003

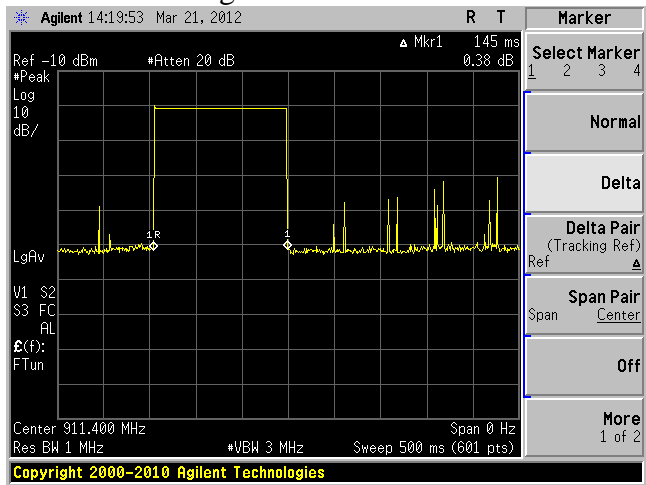
Serial: none (engineering sample)

Hopping Requirement – Dwell Time / Time of Occupancy
Tested in normal frequency hopping mode.

Dwell Time in 20seconds (one pulse)

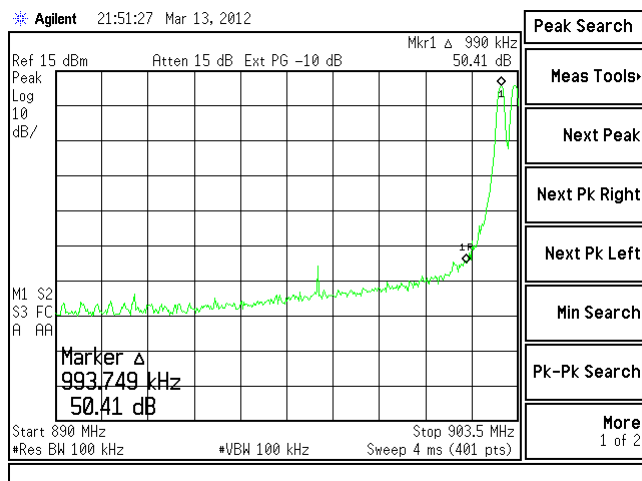
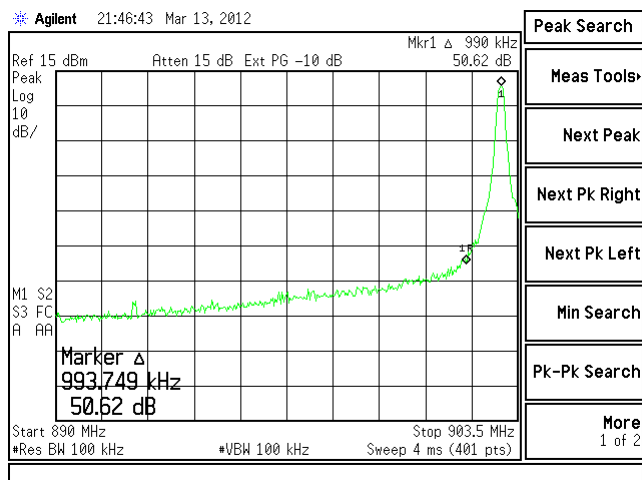
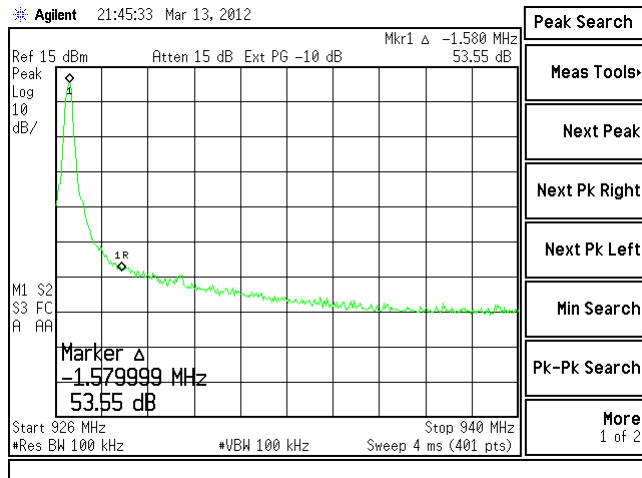


Dwell Time of signal



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Band Edge



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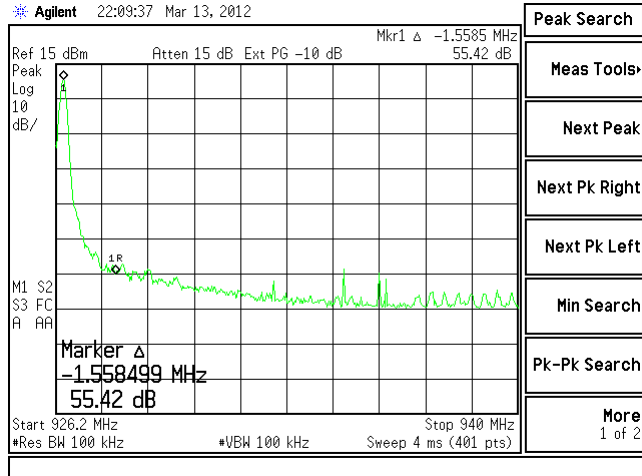
LSR: C-1406

Name: Thermostat THX9001R5003

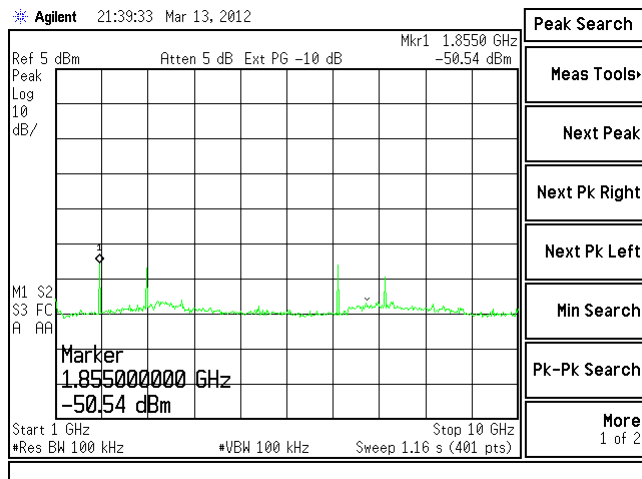
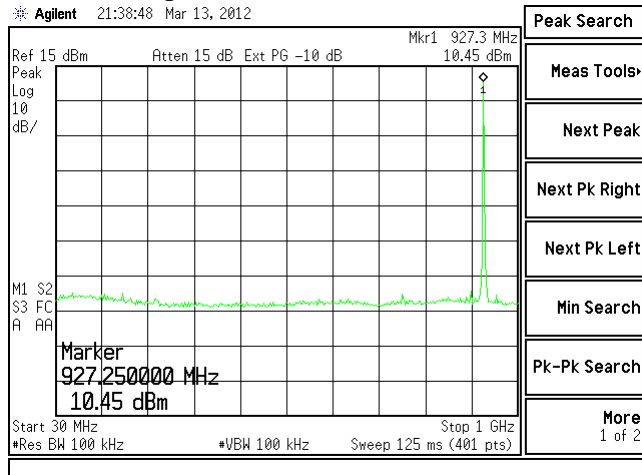
Model: THX9001R5003

Serial: none (engineering sample)

Band Edge with hopping



Conducted Spurious



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Model: THX9001R5003

Serial: none (engineering sample)

Frequency and Power Stability over Voltage Variations

20.4 VAC		24.0 VAC		27.6 VAC	
Power (dBm)	Frequency (Hz)	Power (dBm)	Frequency (Hz)	Power (dBm)	Frequency (Hz)
10.6	902965100	10.6	902977500	10.6	902954000
10.4	914563100	10.4	914575000	10.4	914578900
10.4	926415100	10.4	926409800	10.4	926414200

Channel	Max	Min	Freq drift (Hz)
Low	902977500	902954000	23500
Middle	914578900	914563100	15800
High	926415100	926409800	5300

The power and frequency stability of the device was examined as a function of the input voltage available to the EUT. A Spectrum Analyzer was used to measure the power and frequency at the appropriate frequency markers. Power was supplied by a variable AC power supply and was varied $\pm 15\%$ from the nominal.

The power was then cycled On/Off to observe system response. No unusual response was observed, the emission characteristics were well behaved, and the system returned to the same state of operation as before the power cycle.

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C.2 – Radiated Emissions

The test setup was assembled in accordance with Title 47, CFR FCC Part 15, RSS GEN and ANSI C63.4-2003. The EUT was placed on an 80cm high non-conductive pedestal, centered on a flush mounted 2-meter diameter turntable inside a 3 meter Semi-Anechoic, FCC listed Chamber.

The applicable limits apply at a 3 meter distance. Measurements above 6 GHz were performed at a 1.0 meter separation distance. The calculations to determine these limits are detailed in the following pages.

For both fundamental and spurious emissions measurement, the data reported includes all necessary correction factors. These correction factors are loaded onto the EMI receiver when measurements are performed.

Reported Measurement data = Raw receiver measurement (dB μ V/m) + Antenna correction Factor + Cable factor (dB) + Miscellaneous factors when applicable (dB) – amplification factor when applicable (dB).

Generic example of reported data at 200 MHz:

Reported Measurement data = 18.2 (raw receiver measurement) + 15.8 (antenna factor) + 1.45 (cable factor) = 35.45 (dB μ V/m).

As specified in 15.247 (d) and RSS 210 A8.2 (b), radiated emissions that fall within the restricted band described in 15.205(c) for FCC and section 2.2, 2.6 and 2.7 of RSS 210 for IC, must comply with the general emissions limit.

The following table depicts the general radiated emission limits above 30 MHz. These limits are obtained from Title 47 CFR, Part 15.209, for radiated emissions measurements. These limits were applied to any signals found in the 15.205 restricted bands. The mentioned limits correspond to those limits listed in RSS 210 section 2.7.

Frequency (MHz)	3 m Limit (μ V/m)	3 m Limit (dB μ V/m)
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
960-10,000	500	54.0

Note: Limits are rounded to the nearest tenth of a dB.

For average measurements above 1000MHz, resolution bandwidth set at 1 MHz and video bandwidth reduced to 10 Hz.

Additional Notes:

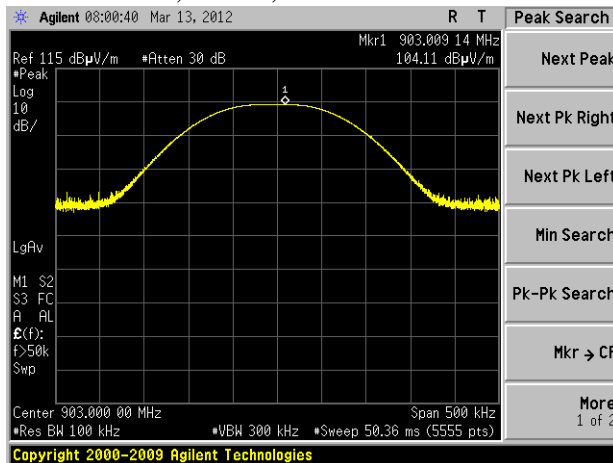
EUT was tested in continuous transmit mode on low, mid, and high channels for radiated emissions tests.

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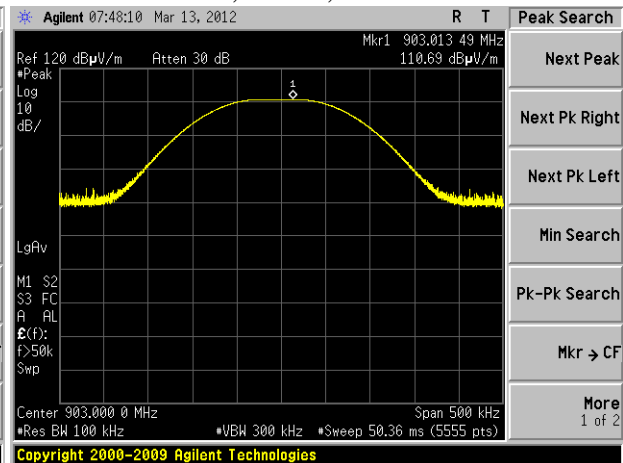
Fundamental

Frequency (MHz)	Antenna	Height (m)	Azimuth (degree)	Peak (dBμV/m)	Limit (dBμV/m)	Margin	EUT
903	H	1.0	340	110.7	130	19.3	Ant A
903	V	1.9	88	104.1	130	25.9	Ant A
903	H	1.0	168	106.7	130	23.3	Ant B
903	V	1.3	274	106.1	130	23.9	Ant B
914.6	H	1.0	340	110.2	130	19.8	Ant A
914.6	V	1.2	87	104.8	130	25.2	Ant A
914.6	H	1.0	168	104	130	26	Ant B
914.6	V	1.2	274	104.8	130	25.2	Ant B
926.4	H	1.0	327	109.7	130	20.3	Ant A
926.4	V	1.2	104	104.9	130	25.1	Ant A
926.4	H	1.6	157	103.6	130	26.4	Ant B
926.4	V	1.1	271	103.8	130	26.2	Ant B

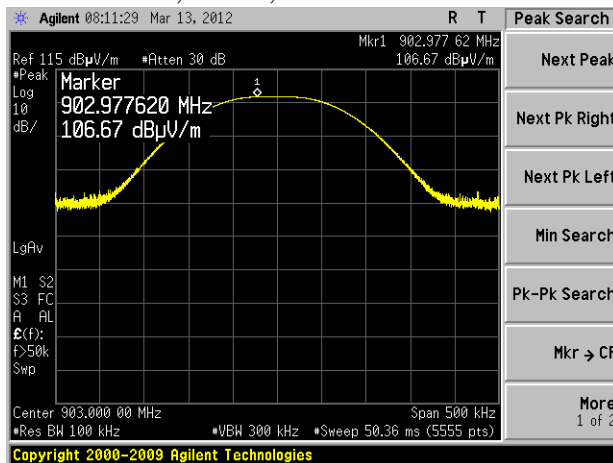
Low Channel, Ant A, Vertical



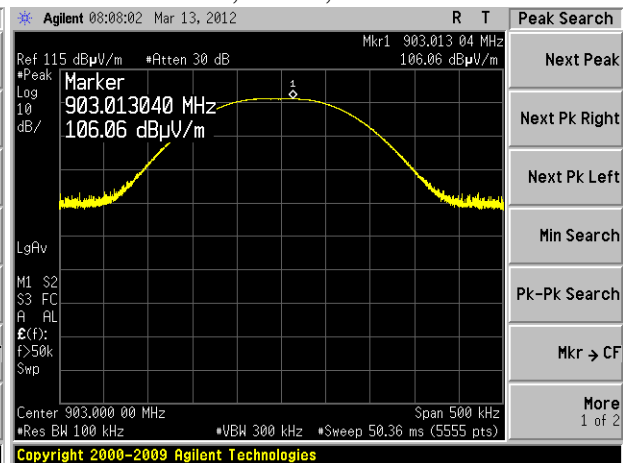
Low Channel, Ant A, Horizontal



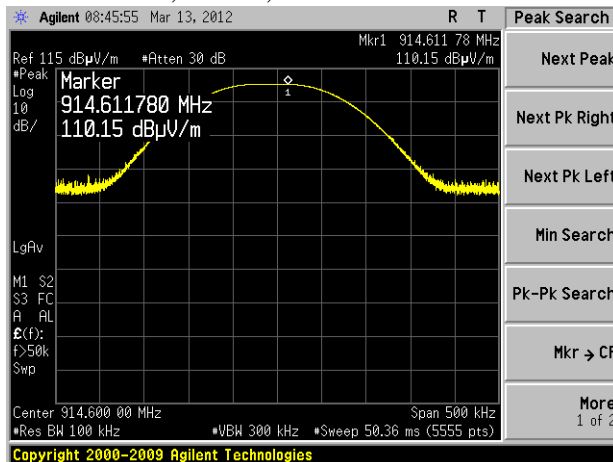
Low Channel, Ant B, Horizontal



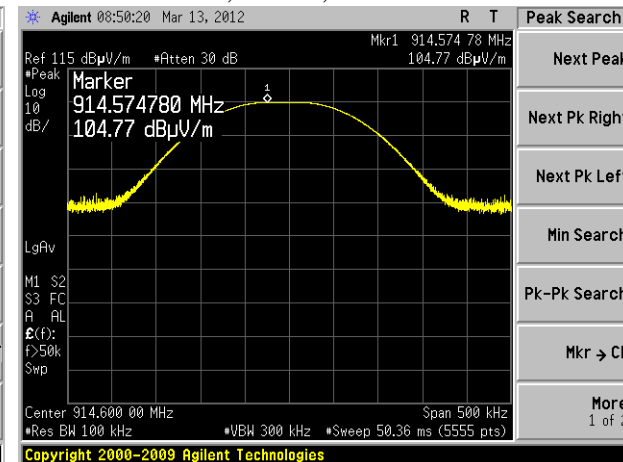
Low Channel, Ant B, Vertical



Mid Channel, Ant A, Horizontal



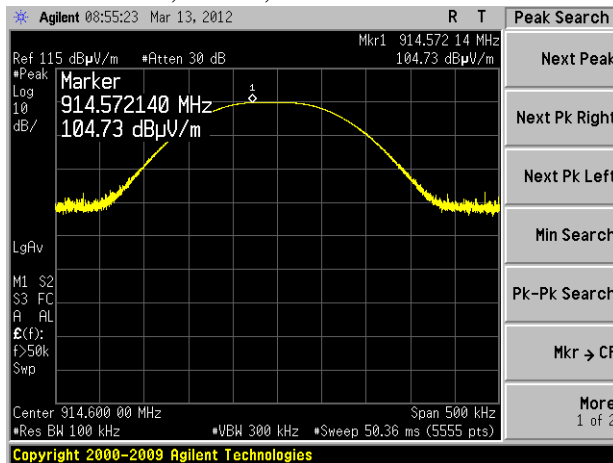
Mid Channel, Ant A, Vertical



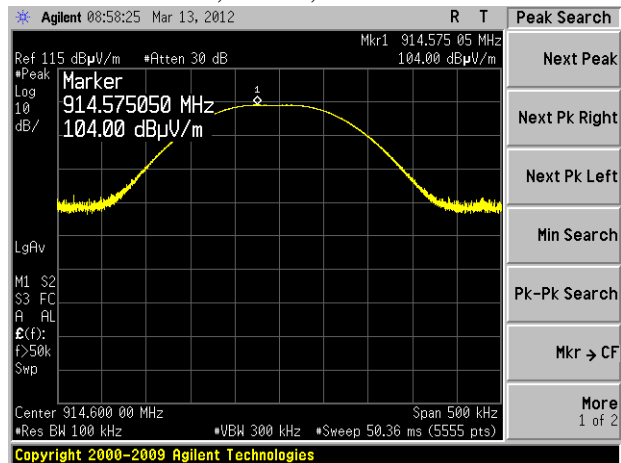
Prepared For: Honeywell
Report: TR 312032 A FCCICTX V1a
LSR: C-1406

Name: Thermostat THX9001R5003
Model: THX9001R5003
Serial: none (engineering sample)

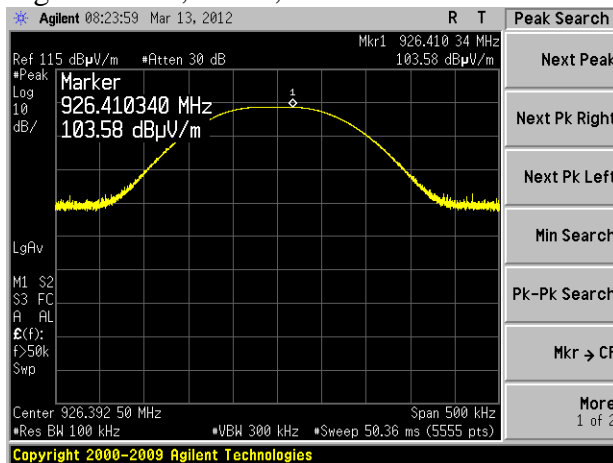
Mid Channel, Ant B, Vertical



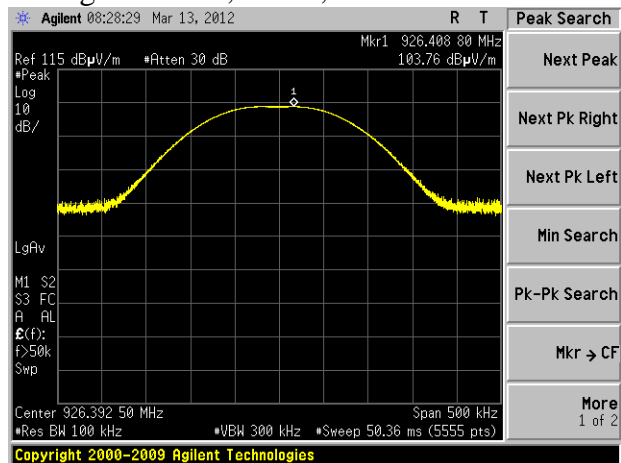
Mid Channel, Ant B, Horizontal



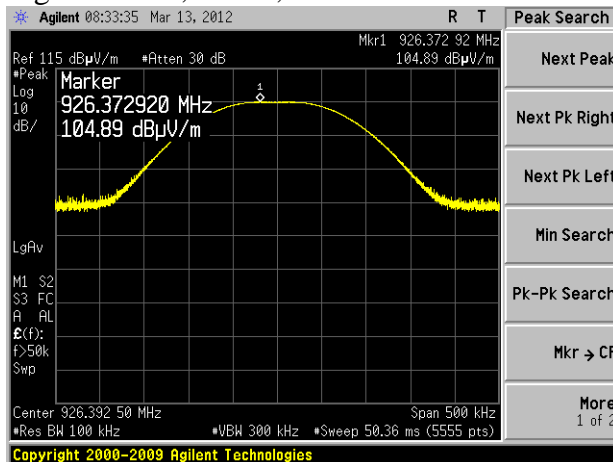
High Channel, Ant B, Horizontal



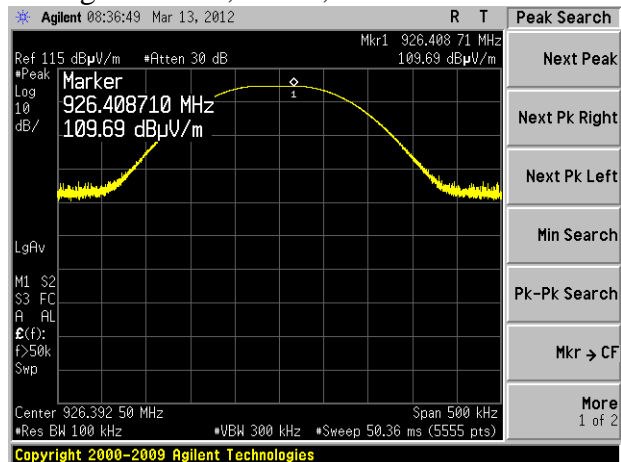
High Channel, Ant B, Vertical



High Channel, Ant A, Vertical



High Channel, Ant A, Horizontal

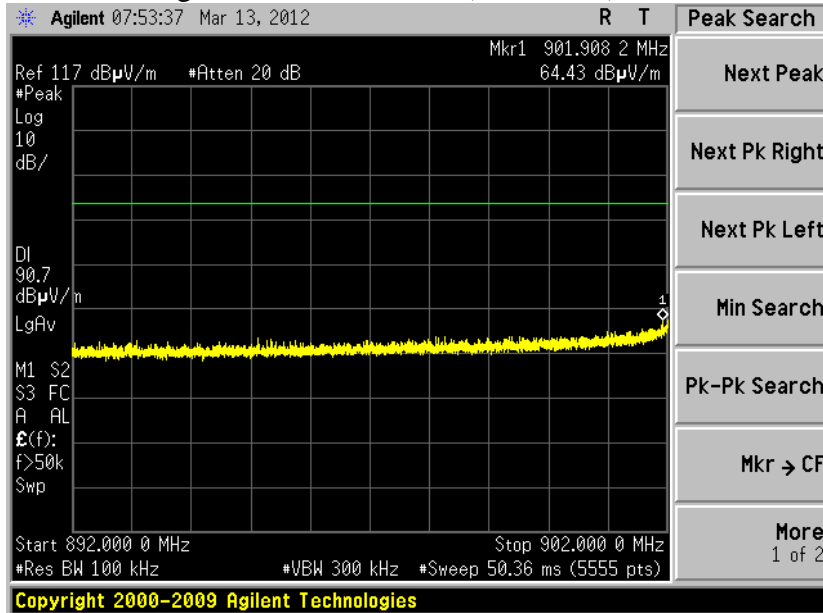


Prepared For: Honeywell
Report: TR 312032 A FCCICTX V1a
LSR: C-1406

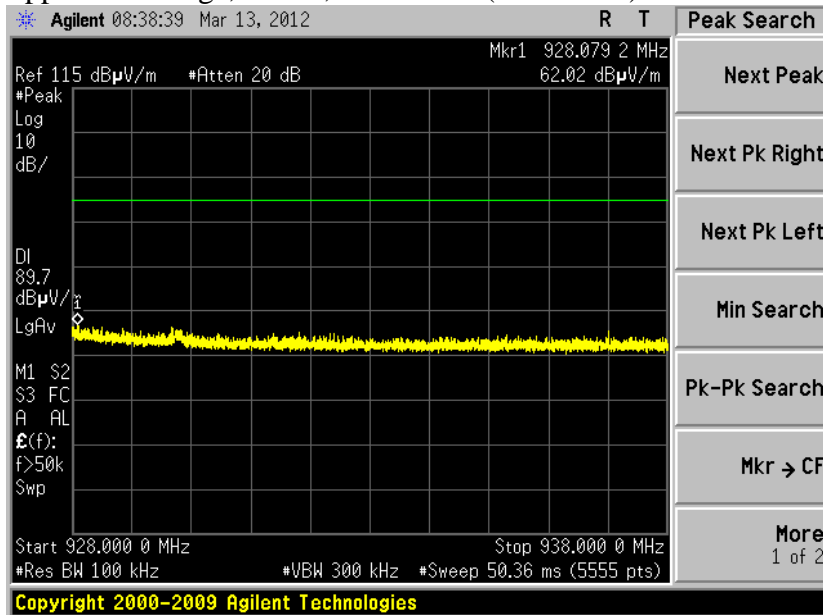
Name: Thermostat THX9001R5003
Model: THX9001R5003
Serial: none (engineering sample)

Radiated Band-Edge

Low Band-edge, Ant A, Horizontal (worst case)



Upper Band-edge, Ant A, Horizontal (worst case)



Prepared For: Honeywell

Report: TR 312032 A FCCICTX V1a

LSR: C-1406

Name: Thermostat THX9001R5003

Model: THX9001R5003

Serial: none (engineering sample)

Radiated Harmonics

1-6GHz 3 meters; 6-10GHz 1 meter

Low
Channel

Frequency (MHz)	Height (m)	Azimuth (degree)	Peak Reading (dBμV/m)	Avg Reading (dBμV/m)	Avg Limit (dBμV/m)	Margin (dB)	Antenna Polarity	EUT Antenna	Note
1806	1.11	317	40.7	31.0	54.0	23.0	Horizontal	A	None
1806	1.30	143	41.4	34.5	54.0	19.5	Vertical	A	None
1806	1.05	184	42.8	37.4	54.0	16.6	Horizontal	B	None
1806	1.00	144	40.5	32.7	54.0	21.3	Vertical	B	None
2709			41.9		54.0		Horz and Vert	A and B	Noise Floor
3612			45.5		54.0		Horz and Vert	A and B	Noise Floor
4515			46.2		54.0		Horz and Vert	A and B	Noise Floor
5418			49.3		54.0		Horz and Vert	A and B	Noise Floor
6321	1.00	171	50.9	44.3	63.5	19.2	Horizontal	A	None
7224			40.7		63.5		Horz and Vert	A and B	Noise Floor
8127	1	105	49.5	37.3	63.5	26.2	Horizontal	B	None
8127	1.23	287	50.2	37.7	63.5	25.8	Vertical	B	None
9030	1.03	174	53.7	44.9	63.5	18.7	Vertical	A	None
9030	1	241	52.2	41.6	63.5	21.9	Horizontal	B	None
9030	1	196	53.4	45.9	63.5	17.6	Vertical	B	None

Prepared For: Honeywell	Name: Thermostat THX9001R5003
Report: TR 312032 A FCCICTX V1a	Model: THX9001R5003
LSR: C-1406	Serial: none (engineering sample)

Radiated Harmonics

1-6GHz 3 meters; 6-10GHz 1 meter

Mid

Channel

Frequency (MHz)	Height (m)	Azimuth (degree)	Peak Reading (dBμV/m)	Avg Reading (dBμV/m)	Avg Limit (dBμV/m)	Margin (dB)	Antenna Polarity	EUT Antenna	Note
1829.2	1.04	160	40.7	30.5	54.0	23.5	Horizontal	A	None
1829.2	1.23	98	41.4	34.3	54.0	19.7	Vertical	A	None
1829.2	1.04	187	43.5	39.6	54.0	14.4	Horizontal	B	None
1829.2	1.28	147	41.1	33.9	54.0	20.1	Vertical	B	None
2743.8			42.4		54.0		Horz and Vert	A and B	Noise Floor
3658.4			45.6		54.0		Horz and Vert	A and B	Noise Floor
4573			48.3		54.0		Horz and Vert	A and B	Noise Floor
5487.6			50.1		54.0		Horz and Vert	A and B	Noise Floor
6402.2			39.8		63.5		Horz and Vert	A and B	Noise Floor
7316.8	1.00	118	51.5	40.7	63.5	22.8	Horizontal	A	None
7316.8	1.3	103	51.0	42.1	63.5	21.4	Vertical	A	None
7316.8	1.06	351	53.4	46.1	63.5	17.4	Horizontal	B	None
7316.8	1.25	96	54.9	50.7	63.5	12.9	Vertical	B	None
8231.4	1	112	50.5	39.7	63.5	23.8	Horizontal	B	None
8231.4	1	201	50.4	39.3	63.5	24.2	Vertical	B	None
9146	1	126	51.07	38.84	63.5	24.66	Horizontal	A	None
9146	1	174	51	42.73	63.5	20.77	Vertical	A	None
9146	1	242	50.4	39.61	63.5	23.89	Horizontal	B	None
9146	1	174	51.32	43.52	63.5	19.98	Vertical	B	None

Prepared For: Honeywell	Name: Thermostat THX9001R5003
Report: TR 312032 A FCCICTX V1a	Model: THX9001R5003
LSR: C-1406	Serial: none (engineering sample)

Radiated Harmonics

1-6GHz 3 meters; 6-10GHz 1 meter

High Channel

Frequency (MHz)	Height (m)	Azimuth (degree)	Peak Reading (dBμV/m)	Avg Reading (dBμV/m)	Avg Limit (dBμV/m)	Margin (dB)	Antenna Polarity	EUT Antenna	Note
1852.8	1.02	168	38.9	29.8	54.0	24.2	Horizontal	A	None
1852.8	1.26	240	39.9	29.9	54.0	24.1	Vertical	A	None
1852.8	1.00	184	44.2	39.5	54.0	14.5	Horizontal	B	None
1852.8	1.23	143	41.1	34.5	54.0	19.5	Vertical	B	None
2779.2			42.1		54.0		Horz and Vert	A and B	Noise Floor
3705.6			46.3		54.0		Horz and Vert	A and B	Noise Floor
4632			48.2		54.0		Horz and Vert	A and B	Noise Floor
5558.4			50.8		63.5		Horz and Vert	A and B	Noise Floor
6484.8			40.3		63.5		Horz and Vert	A and B	Noise Floor
7411.2	1.06	123	51.0	39.7	63.5	23.8	Horizontal	A	None
7411.2	1.22	97	50.9	40.0	63.5	23.5	Vertical	A	None
7411.2	1.07	350	53.2	47.9	63.5	15.6	Horizontal	B	None
7411.2	1.22	93	56.0	51.6	63.6	12.0	Vertical	B	None
8337.6	1	36	52.0	39.1	63.5	24.4	Vertical	A	None
8337.6	1.06	95	50.1	38.7	63.5	24.8	Horizontal	B	None
8337.6	1.11	305	50.07	39.12	63.5	24.38	Vertical	B	None
9264					63.5		Horz and Vert	A and B	Noise Floor

Prepared For: Honeywell	Name: Thermostat THX9001R5003
Report: TR 312032 A FCCICTX V1a	Model: THX9001R5003
LSR: C-1406	Serial: none (engineering sample)

Radiated Emissions 30-1000MHz

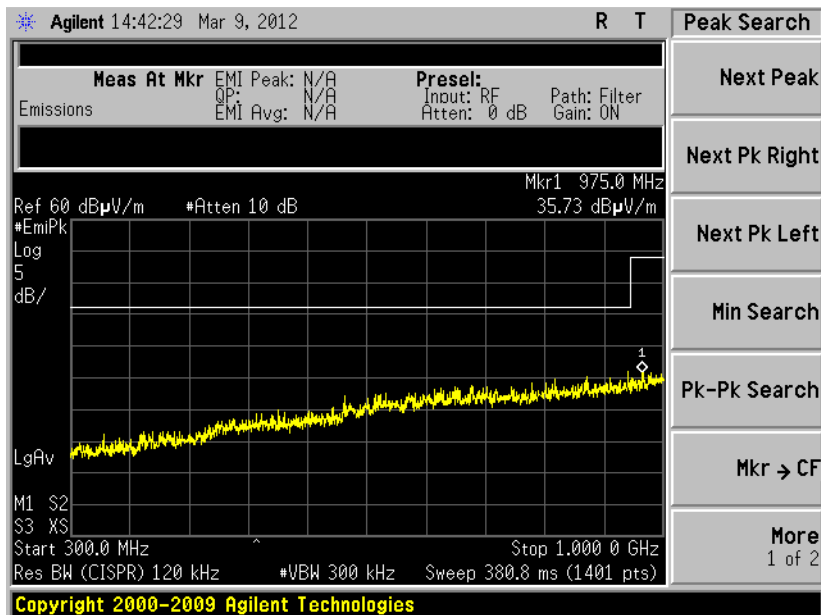
Manufacturer	Honeywell
Date	3-13-2012
Operator	Adam A
Temperature	20 - 25° C
Humidity	30 – 60%
Test Voltage	24VAC 60Hz
Test Location	LS Research, LLC - FCC Listed 3 meter Semi-Anechoic Chamber
Test Distance	3 meter
EUT Placement	80 cm height non-conductive table
Measurements	Final
Detectors	Quasi-Peak
Additional Notes	Emissions found not associated with transmit or receive mode. Tested with Antenna A and B, low, mid, high channel

Frequency (MHz)	Height (m)	Azimuth (degree)	Peak Reading (dBµV/m)	Quasi Peak Limit (dBµV/m)	Margin (dB)	Antenna Polarity	Comment
975.0	1.00	0	35.73	54.0	18.3	Horizontal	Noise Floor
985.5	1.00	0	36.28	54.0	17.7	Vertical	Noise Floor
178.0	1.00	0	34.78	43.5	8.7	Vertical	Infrequent emission
98.0	1.00	122	23.64	43.5	19.9	Vertical	none
86.7	1.00	197	20.96	40.0	19.0	Vertical	none
58.1	1.00	57	28.01	40.0	12.0	Vertical	none
184.3	1.00	0	31.3	43.5	12.2	Horizontal	Infrequent emission

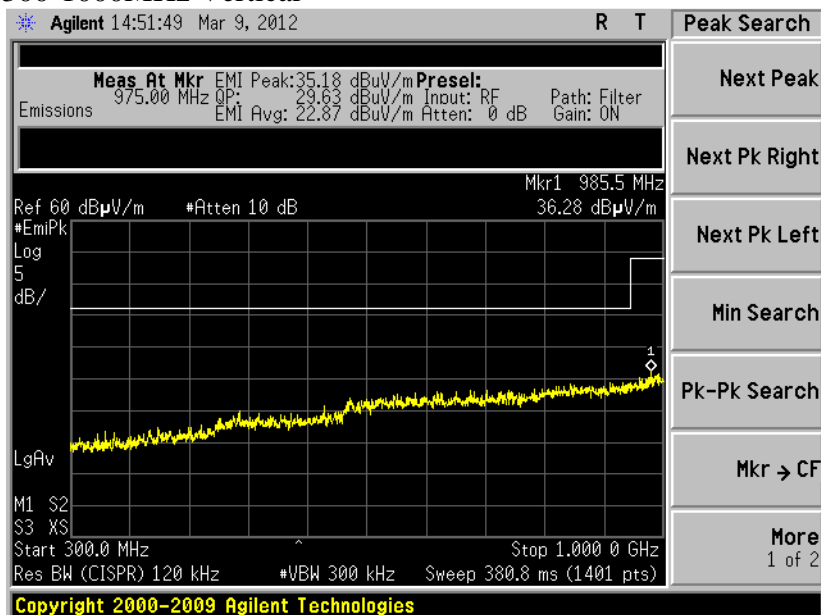
Prepared For: Honeywell	Name: Thermostat THX9001R5003
Report: TR 312032 A FCCICTX V1a	Model: THX9001R5003
LSR: C-1406	Serial: none (engineering sample)

C.1 Radiated Emissions 30-1000MHz

300-1000MHz Horizontal



300-1000MHz Vertical



Prepared For: Honeywell

Report: TR 312032 A FCCICTX V1a

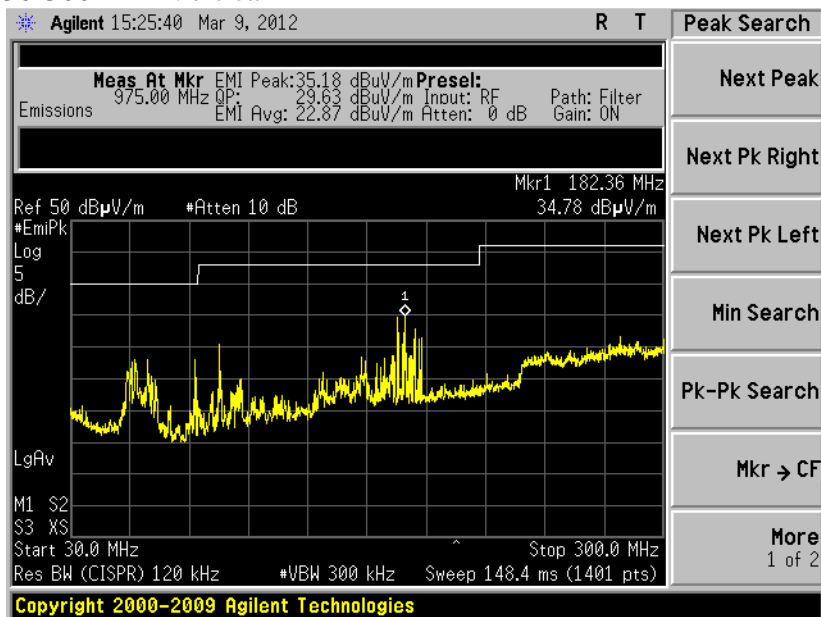
LSR: C-1406

Name: Thermostat THX9001R5003

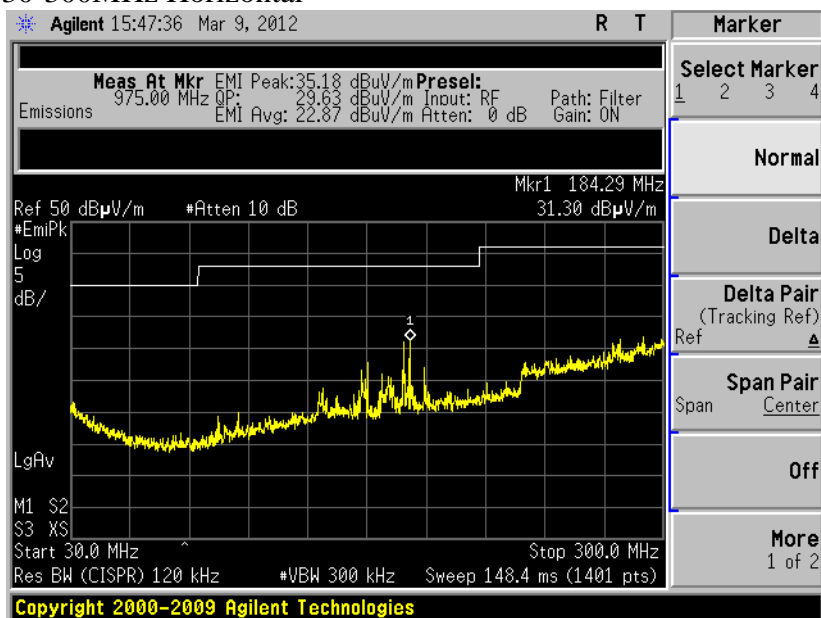
Model: THX9001R5003

Serial: none (engineering sample)

30-300MHz Vertical



30-300MHz Horizontal



Prepared For: Honeywell

Report: TR 312032 A FCCICTX V1a

LSR: C-1406

Name: Thermostat THX9001R5003

Model: THX9001R5003

Serial: none (engineering sample)

C.3 – Power line Conducted Emissions

The test area and setup are in accordance with ANSI C63.4 per the requirements of Title 47 CFR, FCC Part 15, and RSS-GEN. The EUT was placed on a non-conductive wooden table, with a height of 80 cm above the reference ground plane. The EUT's power cable was plugged into a 50 Ω (ohm), 50/250 μ H Line Impedance Stabilization Network (LISN). The AC power supply of 110V was provided via an appropriate broadband EMI Filter, and then to the LISN line input. Final readings were then taken and recorded. After the EUT was setup and connected to the LISN, the RF Sampling Port of the LISN was connected to a 10 dB Attenuator-Limiter, and then to the EMI System.

A list of the test equipment and accessories utilized for the Conducted Emissions test, including calibration information and equipment descriptions, is provided in Appendix A. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All cables are calibrated and verified periodically for conformance. The emissions are measured on an EMI System, which has automatic correction for all factors stored in memory and allows direct readings to be taken.

Limits of Conducted Emissions at the AC Mains Ports
FCC Part 15.207 / RSS-GEN

Frequency Range (MHz)	Class B Limits (dB μ V)		Measuring Bandwidth
	Quasi-Peak	Average	
0.150 -0.50 *	66-56	56-46	RBW = 9 kHz VBW \geq 9 kHz for QP VBW = 1 Hz for Average
0.5 – 5.0	56	46	
5.0 – 30	60	50	
* The limit decreases linearly with the logarithm of the frequency in this range.			

Prepared For: Honeywell	Name: Thermostat THX9001R5003
Report: TR 312032 A FCCICTX V1a	Model: THX9001R5003
LSR: C-1406	Serial: none (engineering sample)

C.3 – Conducted Emissions

Manufacturer	Honeywell
Date	3-21-2012
Operator	Adam A
Temperature	20 - 25° C
Humidity	30 – 60%
Test Voltage	24VAC 60Hz
Test Location	LS Research, LLC – Conducted Emissions Area
Test Distance	40 cm from vertical conductive wall
EUT Placement	80 cm height non-conductive table
Measurements	Final
Detectors	Quasi-Peak, Average
Additional Notes	Continuous transmit determined worst case over receive mode. Peak emission shown on screen capture over average limit.

Frequency (MHz)	Line	Quasi-Peak			Average		
		Q-Peak Reading (dBμV)	Q-Peak Limit (dBμV)	Quasi- Peak Margin (dB)	Average Reading (dBμV)	Average Limit (dBμV)	Average Margin (dB)
0.152	L1	52.1	65.90642	13.806421	39.3	55.906421	16.6064
0.169	L1	51.4	64.99494	13.594944	28.8	54.994944	26.1949
0.185	L1	50.5	64.25854	13.758541	30.2	54.258541	24.0585
0.219	L1	48.1	62.84621	14.746206	27.9	52.846206	24.9462
0.237	L1	47.2	62.20869	15.008687	29.8	52.208687	22.4087
0.305	L1	47.1	60.10705	13.007052	33	50.107052	17.1071
0.152	L2	52.1	65.89548	13.79548	39.2	55.89548	16.6955
0.186	L2	50.3	64.22271	13.922711	30.5	54.222711	23.7227
0.202	L2	49.1	63.53677	14.436772	28.4	53.536772	25.1368
0.227	L2	45.9	62.55599	16.655993	31.4	52.555993	21.156
0.245	L2	45.1	61.92601	16.826009	26.4	51.926009	25.526
0.285	L2	45.3	60.66441	15.364406	25	50.664406	25.6644

Prepared For: Honeywell	Name: Thermostat THX9001R5003
Report: TR 312032 A FCCICTX V1a	Model: THX9001R5003
LSR: C-1406	Serial: none (engineering sample)

L2 150k-30MHz Tx Cont

08:26:43 MAR 20, 2012

START
150 kHz

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 160 kHz
56.11 dBμV

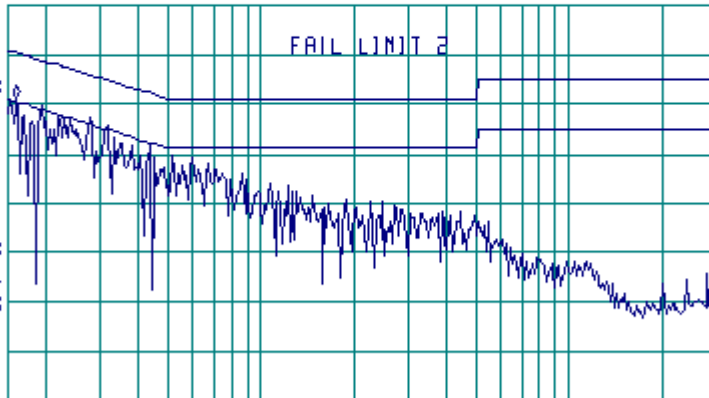
Last Hrd
Key Menu

SPAN

LOG REF 75 0 dBμV

10
dB/
ATN
10 dB

VA SB
SC FC
ACORR



START 150 kHz STOP 30.00 MHz
RL #1F BW 9.0 kHz AVG BW 30 kHz SWP 2.49 sec

MARKER
↓ CF

MARKER
△

NEXT
PEAK

NEXT PK
RIGHT

NEXT PK
LEFT

More
1 of 2

L1 150k-30MHz Tx Cont

08:28:58 MAR 20, 2012

START
150 kHz

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 160 kHz
55.11 dBμV

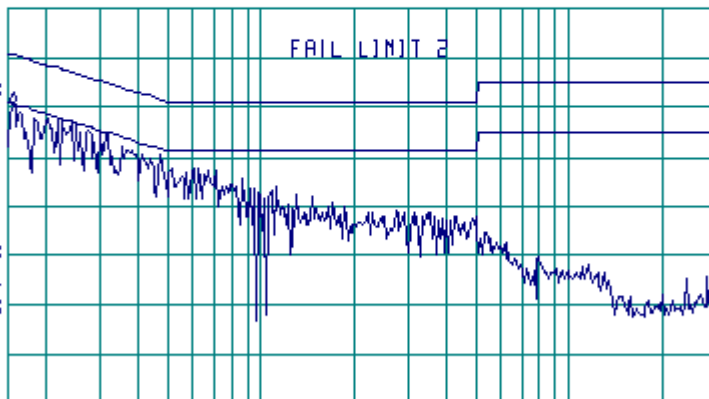
Last Hrd
Key Menu

SPAN

LOG REF 75 0 dBμV

10
dB/
ATN
10 dB

VA SB
SC FC
ACORR



START 150 kHz STOP 30.00 MHz
RL #1F BW 9.0 kHz AVG BW 30 kHz SWP 2.49 sec

MARKER
↓ CF

MARKER
△

NEXT
PEAK

NEXT PK
RIGHT

NEXT PK
LEFT

More
1 of 2

Prepared For: Honeywell

Report: TR 312032 A FCCICTX V1a

LSR: C-1406

Name: Thermostat THX9001R5003

Model: THX9001R5003

Serial: none (engineering sample)

C.4 – Receiver Radiated Emissions

1-6 GHz measured at 3meter

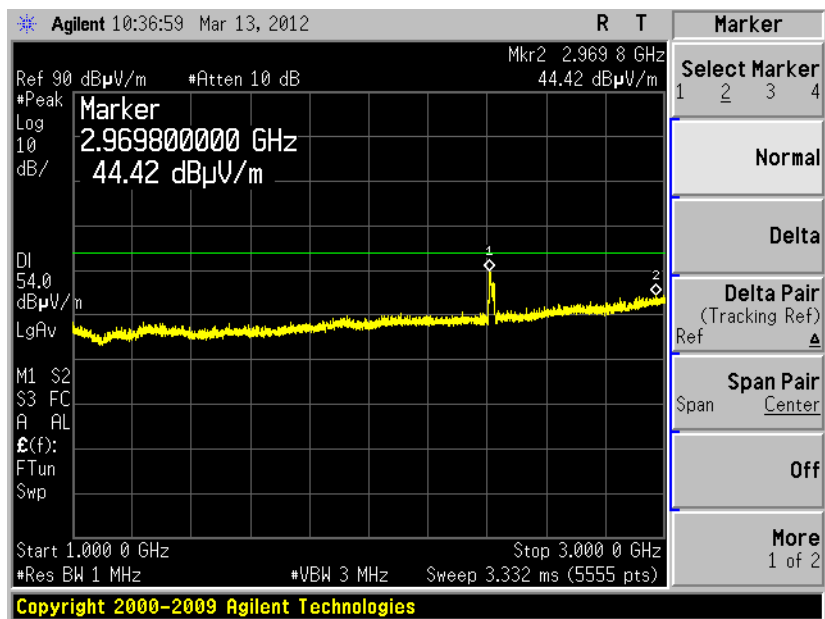
Marker 1 (1-3GHz) at emission not associated with EUT

Peak emissions compared to average limit (no emissions found)

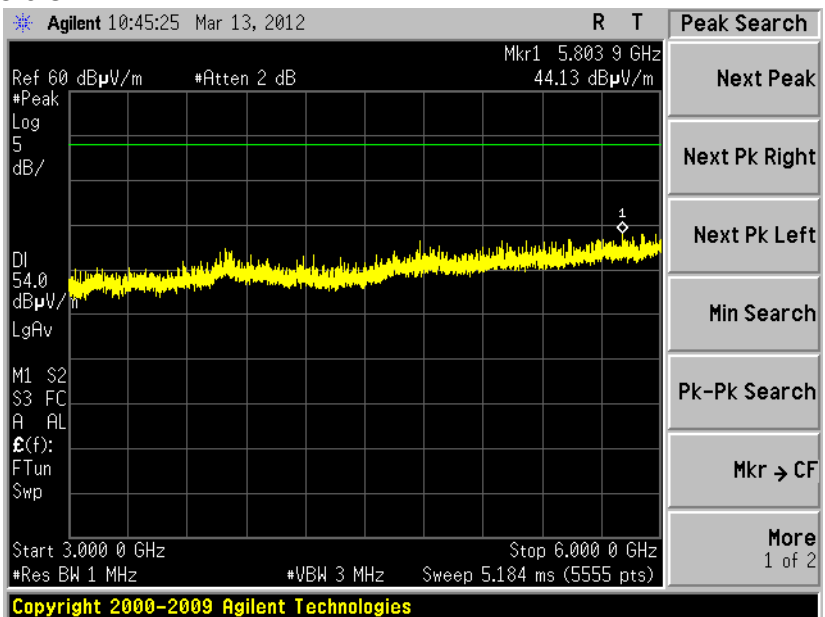
Vertical and Horizontal

EUT Antenna A&B Low, Mid, High Channels

1-3GHz



3-6 GHz



Prepared For: Honeywell

Report: TR 312032 A FCCICTX V1a

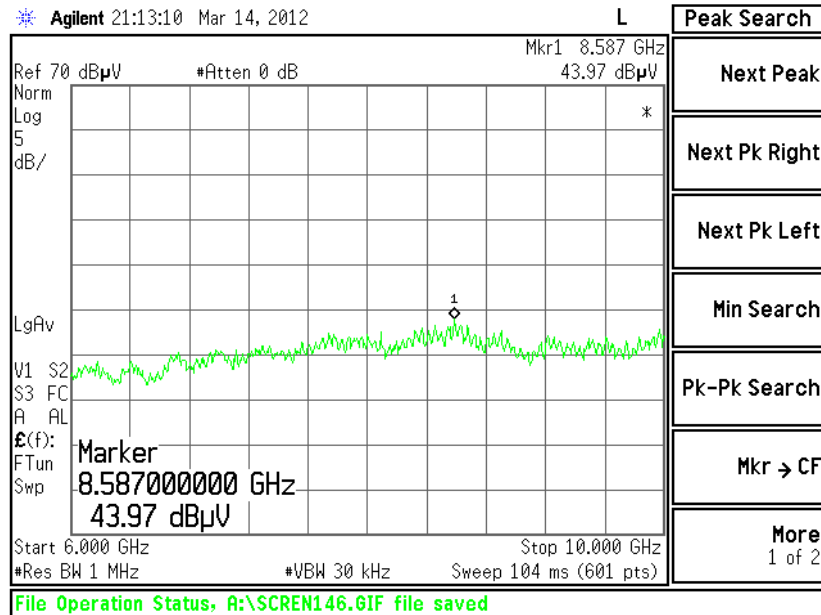
LSR: C-1406

Name: Thermostat THX9001R5003

Model: THX9001R5003

Serial: none (engineering sample)

Receive mode 6-10GHz measured at 1 meter
 Vertical and Horizontal
 Antenna A and B
 No emissions found



Note: For 30-1000MHz emissions see C.2 of this report. All emissions found not to be associated with receiver mode.

Prepared For: Honeywell	Name: Thermostat THX9001R5003
Report: TR 312032 A FCCICTX V1a	Model: THX9001R5003
LSR: C-1406	Serial: none (engineering sample)

Appendix D - Uncertainty Summary

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of $k=2$.

Table of Expanded Uncertainty Values, (K=2) for Specified Measurements

Measurement Type	Particular Configuration	Uncertainty Values
Radiated Emissions	3 – Meter chamber, Biconical Antenna	4.82 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.88 dB
Radiated Emissions	3-Meter Chamber, Horn Antenna	4.85 dB
Radiated Emissions	10-Meter OATS, Biconical Antenna	4.32 dB
Radiated Emissions	10-Meter OATS, Log Periodic Antenna	3.63 dB
Absolute Conducted Emissions	Agilent PSA/ESA Series	1.38 dB
AC Line Conducted Emissions	Shielded Room/EMCO LISN	3.20 dB
Radiated Immunity	3 Volts/Meter in 3-Meter Chamber	2.05 Volts/Meter
Conducted Immunity	3 Volts level	2.33 V
EFT Burst, Surge, VDI	230 VAC	54.4 V
ESD Immunity	Discharge at 15kV	3200 V
Temperature/Humidity	Thermo-hygrometer	0.64°/ 2.88 %RH

Appendix E - References

Publication	Year	Title
FCC CFR Parts 0-15	2011	Code of Federal Regulations – Telecommunications
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.
RSS-210 Annex 8	2010	Low-power License-exempt Radio communication Devices (All Frequency Bands): Category I Equipment
RSS-GEN Issue 3	2010	General Requirements and Information for the Certification of Radio Apparatus
ANSI C63.10	2009	American National Standard for Testing Unlicensed Wireless Devices
FCC Public Notice DA 00-705	2000	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

Prepared For: Honeywell	Name: Thermostat THX9001R5003
Report: TR 312032 A FCCICTX V1a	Model: THX9001R5003
LSR: C-1406	Serial: none (engineering sample)

Appendix F – MPE Calculations

The following MPE calculations are based on a measured ERP of 110.7 dBμV/m at 3m and conducted RF power of +10.6 dBm as presented to the antenna. The calculated gain of this antenna, based on the ERP measurements (over a conducting ground plane) is 4.9 dBi.

The output power is less than 200mW and exempt from evaluation as stated in Industry Canada RSS-102 section 2.5.1.

<u>Prediction of MPE limit at a given distance</u>			
Equation from page 18 of OET Bulletin 65, Edition 97-01			
$S = \frac{PG}{4\pi R^2}$			
where: S = power density			
P = power input to the antenna			
G = power gain of the antenna in the direction of interest relative to an isotropic radiator			
R = distance to the center of radiation of the antenna			
Maximum peak output power at antenna input terminal:	10.60	(dBm)	
Maximum peak output power at antenna input terminal:	11.482	(mW)	
Antenna gain(typical):	4.9	(dBi)	
Maximum antenna gain:	3.090	(numeric)	
Prediction distance:	20	(cm)	
Prediction frequency:	903	(MHz)	
PE limit for uncontrolled exposure at prediction frequency:	0.6	(mW/cm^2)	
Power density at prediction frequency:	0.007059	(mW/cm^2)	
Maximum allowable antenna gain:	24.2	(dBi)	
Margin of Compliance at	20	cm =	19.3 dB

Prepared For: Honeywell	Name: Thermostat THX9001R5003
Report: TR 312032 A FCCICTX V1a	Model: THX9001R5003
LSR: C-1406	Serial: none (engineering sample)

END OF REPORT

Date	Version	Comments	Person
3-29-12	V0	Initial Draft Release	Adam A
4-4-12	V1	Added Product Description and revised model number	Adam A
4-5-12	V1a	Fix Emission Designator, clarify average measurement, clarify transmit mode	Adam A

Prepared For: Honeywell	Name: Thermostat THX9001R5003
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