

# TEST RESULT SUMMARY

## FCC Part 15 Subpart C Section 15.231 Industry Canada RSS-210 Issue 7

MANUFACTURER	Liberty Hardware Manufacturing Corp 7500 Holland Road Taylor MI 48180
EUT DESCRIPTION	315 MHz transmitter module
EUT NAME	PTM240C
MODEL NUMBER(S) TESTED	PTM240C
SERIAL NUMBER(S) TESTED	n/a
TEST REPORT NUMBER	WC1002659
TEST DATE(S)	13 April 2010

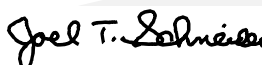
TÜV SÜD America Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the applicable requirements of FCC Part 15, Subpart C, Section 15.231 *"Periodic operation in the band 40.66 - 40.70 MHz and above 70 MHz"* and Industry Canada RSS-210 Issue 7 *"Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category 1 Equipment"* Annex 1 *"Momentarily Operated Devices"*

It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications necessary for compliance made during testing on the above mentioned date(s) must be implemented in all production units for compliance to be maintained.

Date: 27 April 2010

Tested by:

Approved by:



Location: Taylors Falls MN  
USA

Joel T Schneider  
Senior EMC Engineer

Greg S Jakubowski  
Senior EMC Technician

Not Transferable

# EMC TEST REPORT

Test Report File No. : **WC1002659** Date of issue: 27 April 2010

Manufacturer Liberty Hardware Manufacturing Corp

Address 7500 Holland Road

Taylor MI 48180

Description of Equipment 315 MHz transmitter module

Name of Equipment PTM240C

Model No(s) Tested PTM240C

Serial No(s) Tested n/a

Test Result ☒ **Positive** ☐ **Negative**

*TÜV SÜD America Inc reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. TÜV SÜD America Inc shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD America Inc issued reports.*

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*TÜV SÜD America Inc and its professional staff hold government and professional organization certifications and are members of AAMI, ACIL, AEA, ANSI, IEEE, NARTE, and VCCI.*

## REVISION RECORD

REVISION	TOTAL NUMBER OF PAGES	DATE	DESCRIPTION
	29	27 April 2010	Initial Release



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**EMC TEST REGULATIONS:**

**The tests were performed according to the following regulations:**

- FCC Part 15 Subpart C Section 15.231
- Industry Canada RSS-210 Issue 7 Annex 1



## ENVIRONMENTAL CONDITIONS IN THE LAB

### Actual

Temperature: : 21°C  
Relative Humidity : 30 %  
Atmospheric pressure : 99 kPa

## POWER SUPPLY UTILIZED

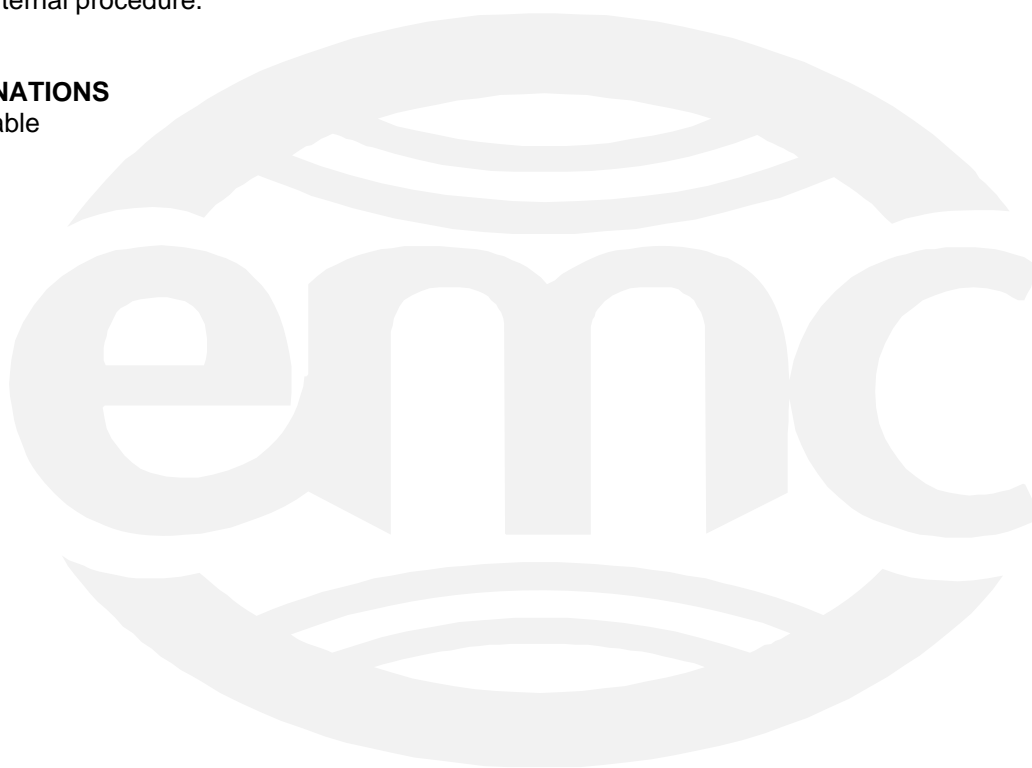
Power supply system : 3.3 VDC

## TEST EQUIPMENT

All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated according to internal procedure.

## SIGN EXPLANATIONS

- ☐ - not applicable
- ☒ - applicable



## Activation time

### FCC 15.231(a)(1) - IC RSS 210 A1.1.1(1)

#### Test limit

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

#### Test summary

The requirements are: ☐ - MET ☐ - NOT MET ☒ - NOT APPLICABLE

The transmitter is not manually operated.

### FCC 15.231(a)(2), IC RSS 210 A1.1.1(2)

#### Test limit

A transmitter activated automatically shall cease transmission within 5 seconds after activation

#### Test summary

The requirements are: ☒ - MET ☐ - NOT MET

The transmitter activates automatically and does cease transmission within 5 seconds after activation

#### Test location

☒ - Oakwood Lab

☐ - Wild River Lab Small Test Site (Open Area Test Site)

#### Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE10435	E4440A	Agilent	Spectrum Analyzer	MY44304483	28-Jul-10

#### Test data

See plot on next page

Agilent 16:03:21 Apr 13, 2010

Ref 107 dB $\mu$ V Atten 10 dB

Norm  
Log  
10  
dB/

LgAv

Center 315.000 0 MHz

Res BW 9.1 kHz

VBW 27 kHz

Sweep 5 s (1001 pts)

Span 0 Hz

Marker	Trace	Type	X Axis	Amplitude

Marker

Select Marker


1 2 3 4

Normal

Delta

Delta Pair

(Tracking Ref)

Ref 

Span Pair

Span Center

Off

More

1 of 2

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## Periodic transmissions

FCC 15.231(a)(3), IC RSS-210 A1.1.1(3)

### Test limit

Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

### Test summary

The requirements are: ■ - MET □ - NOT MET

1. The PTM240C would be used in our products to transmit up to 3 different sets of data (Linking, Motion, heartbeat.)
2. The **Linking telegram** is a data packet that is only used once (usually) in the life of the product. When the product which includes the radio is installed in its application, a button is pressed on the product which will transmit a Linking Telegram to a receiver which will identify itself as a part of a larger system. This is the only time this telegram is ever necessary.
3. The **Motion Telegram** is a data packet that is transmitted when a motion signal is received by the product from the output of a motion-sensing element such as a PIR sensor. This radio is unique in that it will always be used by us inside Motion Sensor-type products. Our products utilize energy harvesting power sources (such as solar cells), so we will typically shut down the sensing element for up to a minute or two after a motion was detected to conserve energy. The maximum number of Motion Telegrams that could be transmitted by our products is 60/hour assuming there is constant motion being detected by our product.
4. The **Heartbeat Telegram** is a data packet that is transmitted when there is no motion being detected by the product and is sent, typically, at random intervals depending on the amount of energy that is being harvested by our power source. For example, one of our products uses solar cells to power the sensor. The solar cells have a varying voltage output. It depends on how much energy is being consumed by the product, and by how much light is available in the room. We use this voltage as a factor in an RC timer which will transmit a "heartbeat" when no motion is present. The fastest we allow this heartbeat to occur is once every 70 seconds, typically. Although, because the voltage applied to the RC timer is variable and random, the range could be between 70 seconds and 180 seconds. Therefore, assuming no motion occurs over the course of 1 hour, the most heartbeats that could be transmitted is 51. In addition, because our product is dependent on light to power it and since we have no batteries or long-term storage devices, we also use our end products in "Manual ON, auto OFF" applications. What this means is that a user will enter a room, turn on the lights, and our product will have power to operate. After a predetermined amount of time, the system will turn OFF the lights in the room when no motion is detected by our sensor. When the lights are OFF, we have no power to transmit anything.

So, the total transmission time for the Heartbeat over 1 hour would be 51 X 3.675 msec, or 187.425 msec.

## Transmission of set-up information

### FCC 15.231(a)(5)

#### Test limit

Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

#### Test summary

The requirements are: ☐ - MET ☐ - NOT MET ☒ - NOT APPLICABLE



## Field strength of fundamental FCC 15.231(b) - IC RSS 210 A1.1.2

### Test limit

The limits are specified at a distance of 3 meters.

Frequency (MHz)	Field Strength of Fundamental (μV/m)
315	6041 μV/m - (75.6 dBμV/m) average limit
	60416 μV/m – (95.6 dBμV/m) peak limit

### Test summary

The requirements are: ■ - MET □ - NOT MET

The fundamental was measured to be 52481 μV/m (94.4 dBμV/m) in peak detector mode at 3 meters - (1.2 dB below limit)

The fundamental was calculated to be 1950 μV/m (65.8 dBμV/m) in average mode – (9.8 dB below limit)

The average level was obtained by subtracting the duty cycle from the measured peak level. The duty cycle of the transmitted signal was measured to be the worst case on time over 100 msec. In this time frame there are 3 pulses of 1.225 msec width. The duty cycle is thus measured to be  $1.225 \text{ msec} \times 3 / 100 \text{ msec} = 3.7 \%$ , which allows for a 28.6 dB reduction.

Below 1 GHz, rbw and vbw = 120 kHz for peak readings.

Antenna Height: ■ - 1 to 4 meters  
Antenna Polarization: ■ - Horizontal ■ - Vertical  
: ■ - EUT rotated 360 degrees

### Test location

■ - Oakwood Lab (Open Area Test Site)

### Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE10435	E4440A	Agilent	Spectrum Analyzer	MY44304483	28-Jul-10
Cal Code B = Calibration verification performed internally.			Cal Code Y = Calibration not required when used with other calibrated equipment.		

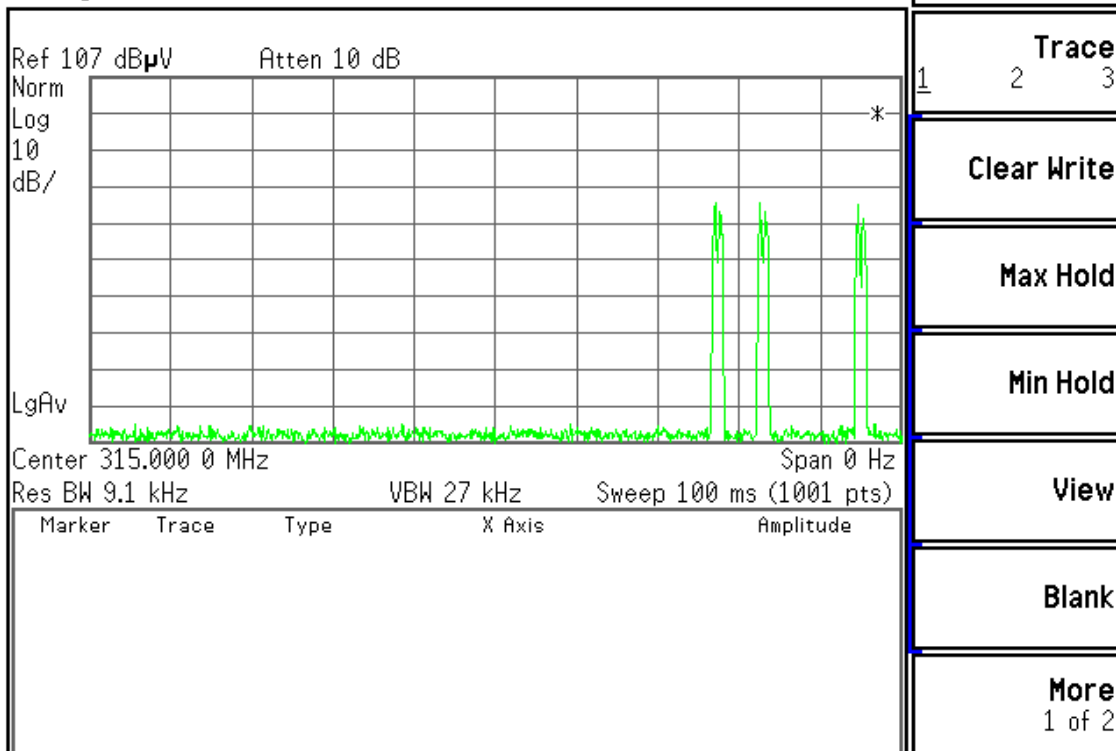
### Test data

#### List of measurements for run #: 4

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC-15.231 3m pk or qp	DELTA2 FCC 15.231 3m av
module - antenna horizontal, board vertical – 100 kHz RBW						
switched to a different transmitter - labeled TUV						
314.987 MHz	79.0 Pk	1.74 / 13.66 / 0.0 / 0.0	94.4	H / 1.00 / 0	-1.2	n/a
314.983 MHz	63.1 Pk	1.74 / 13.66 / 0.0 / 0.0	78.5	V / 1.80 / 75		n/a
module - antenna and board horizontal						
314.981 MHz	63.1 Pk	1.74 / 13.66 / 0.0 / 0.0	78.5	V / 1.10 / 305		n/a
314.988 MHz	78.4 Pk	1.74 / 13.66 / 0.0 / 0.0	93.8	H / 1.00 / 0		n/a
module - antenna straight up in air						
314.988 MHz	65.4 Pk	1.74 / 13.66 / 0.0 / 0.0	80.8	H / 1.10 / 210		n/a
314.978 MHz	76.2 Pk	1.74 / 13.66 / 0.0 / 0.0	91.6	V / 1.70 / 330		n/a

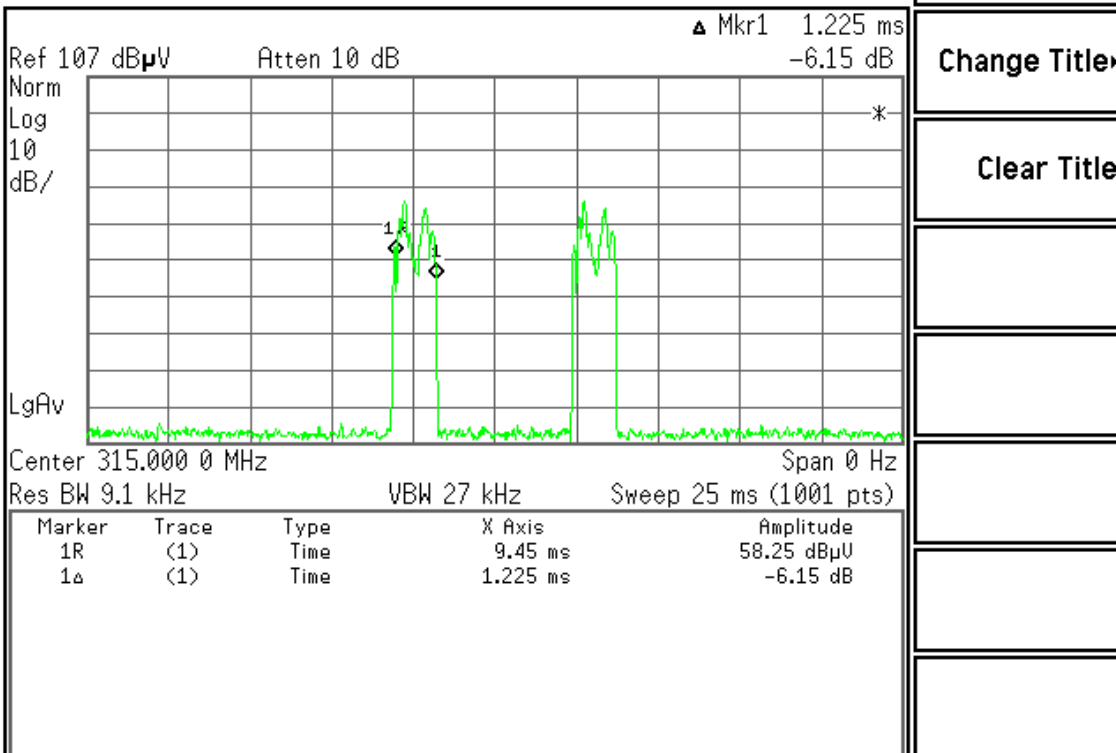
### Worst case 100 msec on time

\* Agilent 16:13:57 Apr 13, 2010



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\* Agilent 16:16:40 Apr 13, 2010



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## Field strength of spurious emissions

### FCC 15.231(b) - IC RSS 210 A1.1.2

#### Test limit

The limits are specified at a distance of 3 meters – for fundamental frequency of 319.5 MHz.

Frequency (MHz)	Field Strength of Spurious Emissions (uV/m)		
30-3150	604.1 uV/m	(55.6 dBuV/m)	average limit
	6041 uV/m	(75.6 dBuV/m)	peak limit
Except for 15.205 bands			
30-88	100	(40 dBuV/m)	quasi-peak
88-216	150	(43.5 dBuV/m)	quasi-peak
216-960	200	(46 dBuV/m)	quasi-peak
960-1000	500	(54 dBuV/m)	quasi-peak
1000-3150	500	(54 dBuV/m)	average
	5000	(74 dBuV/m)	peak

#### Test summary

The requirements are: ☒ - MET ☐ - NOT MET

Below 1 GHz, rbw and vbw = 120 kHz for peak readings.

Above 1 GHz, rbw and vbw = 1 MHz for peak readings, rbw = 1 MHz and vbw = 10 Hz for average readings.

Antenna Height: ☒ - 1 to 4 meters

Antenna Polarization: ☒ - Horizontal ☒ - Vertical

: ☒ - EUT rotated 360 degrees

#### Test location

☒ - Oakwood Lab (Open Area Test Site)

#### Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
OWLE03202	EM-6917B	Electro-Metrics	Biconicalog Periodic	101	19-May-10
OWLE02671	8447D	Hewlett-Packard	Preamplifier	2648A04942	Code B 13-Jan-11
WRLE03958	SL18B4020	Phase One Microwave	Preamplifier 1 – 18 GHz	0002	Code B 13-Jan-11
WRLE02075	3115	EMCO	RidgeGuide Ant. 1-18 GHz	9001-3275	18-Jan-11
WRLE03295	85662A	Hewlett-Packard	Analyzer Display	2349A06144	03-Mar-11
WRLE02689	8566B	Hewlett-Packard	Spectrum Analyzer	2416A00321	03-Mar-11
WRLE02684	85650A	Hewlett-Packard	Quasi-Peak Adapter	2521A01006	07-May-10
WRLE03895	NHP-600	Mini-Circuits	30-600MHz Stopband filter 3		Code B 11-Dec-10

Cal Code B = Calibration verification performed internally.

Cal Code Y = Calibration not required when used with other calibrated equipment.

#### Test data

See data on next page.

\*denotes peak reading compared to average limit

\*\*denotes quasi-peak reading compared to quasi-peak limit

### List of measurements for run #: 4

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC-15.231 3m pk or qp	DELTA2 FCC 15.231 3m av
209.994 MHz	62.2 Pk	1.37 / 10.67 / 24.9 / 0.0	49.33	H / 1.00 / 0	-26.27	-6.27*
244.1 MHz	30.1 Qp	1.6 / 11.82 / 24.98 / 0.0	18.55	H / 1.00 / 0	-27.45**	n/a
734.966 MHz	47.4 Pk	2.93 / 21.08 / 24.91 / 0.55	47.06	H / 1.00 / 0	-28.54	-8.54*
629.973 MHz	52.2 Pk	2.68 / 19.5 / 24.72 / 0.66	50.33	H / 1.20 / 0	-25.27	-5.27*
63.288 MHz	34.8 Pk	0.79 / 10.51 / 25.05 / 0.0	21.05	H / 1.00 / 90	-54.55	-34.55*
79.084 MHz	33.5 Pk	0.94 / 7.99 / 25.02 / 0.0	17.41	H / 1.00 / 90	-58.19	-38.19*
294.88 MHz	33.1 Pk	1.7 / 13.02 / 24.7 / 0.0	23.13	H / 1.00 / 180	-52.47	-32.47*
353.192 MHz	32.2 Pk	1.84 / 14.59 / 24.76 / 0.0	23.87	H / 1.00 / 180	-51.73	-31.73*
419.956 MHz	57.8 Pk	2.09 / 16.37 / 24.73 / 0.0	51.52	H / 1.00 / 180	-24.08	-4.08*
36.884 MHz	32.5 Pk	0.64 / 17.68 / 25.09 / 0.0	25.74	H / 1.00 / 270	-49.86	-29.86*
1.26 GHz	59.0 Pk	4.31 / 25.68 / 51.01 / 0.0	37.98	H / 1.00 / 0	-37.62	-17.62*
1.89 GHz	53.6 Pk	5.24 / 27.27 / 50.66 / 0.0	35.46	H / 1.00 / 0	-40.14	-20.14*
1.575 GHz	60.2 Pk	4.91 / 25.76 / 50.79 / 0.0	40.08	H / 1.00 / 180	-33.92	-13.92*
2.835 GHz	59.6 Pk	6.13 / 29.56 / 49.61 / 0.0	45.68	H / 1.00 / 180	-28.32	n/a
2.835 GHz	44.22 Av	6.13 / 29.56 / 49.61 / 0.0	30.29	H / 1.00 / 180	n/a	-23.71
3.15 GHz	67.9 Pk	6.4 / 30.6 / 49.48 / 0.0	55.42	H / 1.90 / 160	-20.18	n/a
3.15 GHz	42.74 Av	6.4 / 30.6 / 49.48 / 0.0	30.26	H / 1.90 / 160	n/a	-25.34
2.205 GHz	60.7 Pk	5.58 / 27.32 / 50.15 / 0.0	43.44	V / 1.00 / 270	-30.56	-10.56*

## Bandwidth of emission

FCC 15.231(c) - IC RSS 210 A1.1.3

### Test limit

The bandwidth of the emission shall be no wider than 0.25% of the center frequency, as determined at the points 20 dB down from the modulated carrier. The emission shall be no wider than 787.5 kHz.

### Test summary

The requirements are: ☒ - MET ☐ - NOT MET

The bandwidth of the emission is measured to be 288 kHz.

### Test location

☒ - Oakwood Lab (Open Area Test Site)

☐ - Wild River Lab Small Test Site (Open Area Test Site)

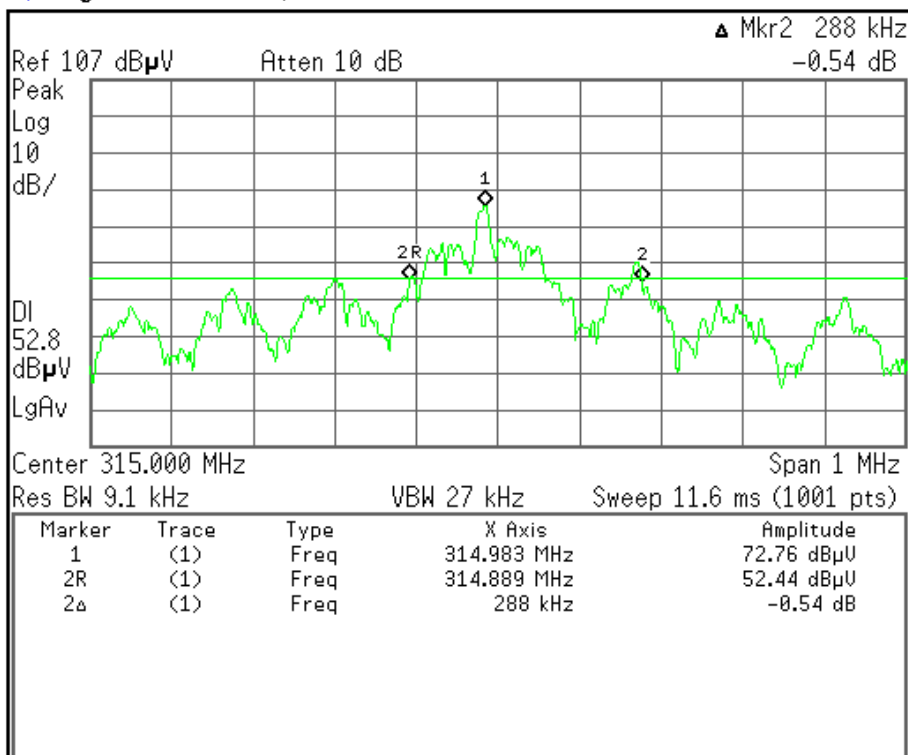
### Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE10435	E4440A	Agilent	Spectrum Analyzer	MY44304483	28-Jul-10

### Test data

See plot on next page

Agilent 15:45:39 Apr 13, 2010



Title
Change Title
Clear Title

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## Conducted emissions – AC power lines

### FCC 15.207, IC RSS-Gen 7.2.2

#### Test summary

The requirements are: ■ - NOT APPLICABLE □ - NOT MET

Test was performed in accordance with the test procedures of ANSI C63.4 2003, clause 7.2

The module was tested powered by battery, no plans on using in products that connect to AC power line.

#### Test location

- ☐ - Wild River Lab Large Test Site (Open Area Test Site)
- ☐ - Wild River Lab Small Test Site (Open Area Test Site)
- ☐ - Wild River Lab Tech Area, conducted measurement

#### Test limit

Frequency (MHz)	Quasi-peak (dB $\mu$ V)	Average (dB $\mu$ V)
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

#### Test data

n/a

**Test Setup Photo - Field strength of emissions**  
FCC 15.231(b) - IC RSS 210 A1.1.2





**Test Setup Photo - Field strength of emissions**  
FCC 15.231(b) - IC RSS 210 A1.1.2



**Equipment Under Test (EUT) Test Operation Mode:**

**The device under test was operated under the following conditions during emissions testing:**

- ☐ - Standby
  - ☐ - Test program (H - Pattern)
  - ☐ - Test program (color bar)
  - ☐ - Test program (customer specific)
  - ☐ - Practice operation
  - ☐ - Normal Operating Mode
  - - See Software and/or Operating Modes in Appendix A
- 

**Configuration of the device under test:**

- - See Constructional Data Form and Block Diagram in Appendix A
- ☐ - See Product Information Form in Appendix B

## GENERAL REMARKS:

None

### Modifications required to pass:

- ☒ None
- ☐ As indicated on the data sheet(s)

### Test Specification Deviations: Additions to or Exclusions from:

- ☒ None
- ☐ As indicated in the Test Plan
- ☐

## SUMMARY:

The requirements according to the technical regulations are

- ☒ - met and the equipment under test does fulfill the general approval requirements.
- ☐ - **not** met and the equipment under test does **not** fulfill the general approval requirements.

EUT Received Date: 13 April 2010  
Condition of EUT: Normal  
Testing Start Date: 13 April 2010  
Testing End Date: 13 April 2010

## TÜV SÜD AMERICA INC

Tested by:

*Joel T. Schneider*

Joel T Schneider  
Senior EMC Engineer

Approved by:

*G. Jakubowski*

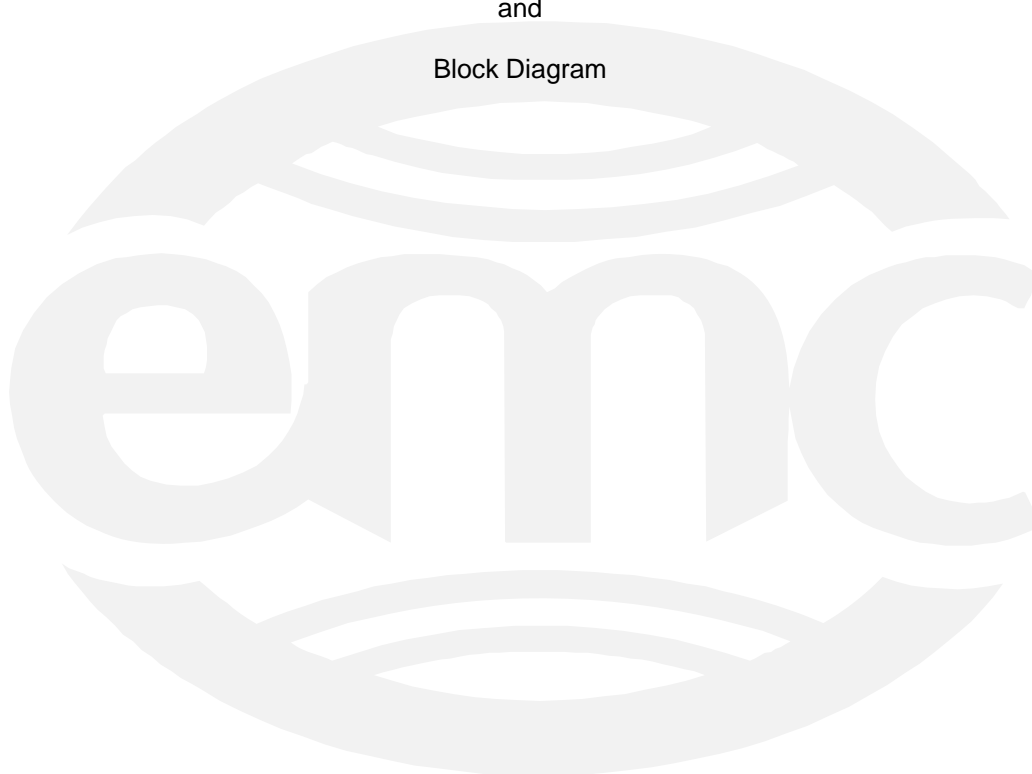
Greg S Jakubowski  
Senior EMC Technician

## Appendix A

Constructional Data Form

and

Block Diagram





## EMC Test Plan and Constructional Data Form

PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE. IF TESTING RESULTS IN MODIFICATIONS TO THE EQUIPMENT, PLEASE SUBMIT A REVISED TP/CDF INDICATING THOSE MODIFICATIONS.  
**NOTE: This information will be input into your test report as shown below. Press the F1 key at any time to get HELP for the current field selected.**

Company: Liberty Hardware Manufacturing Corporation  
 Address: 7500 Holland Road  
Taylor, MI 48180  
 Contact: David M Burke Position: Associate Principal Engineer  
 Phone: 313.510.8249 Fax: 313.792.4325  
 E-mail Address: dburke@masco-rd.com

### General Equipment Description -- NOTE: This information will be input into your test report as shown below.

EUT Description Transmitter Module 315MHz  
 EUT Name PTM240C  
 Model No.: PTM240C Serial No.: NA  
 Product Options: NA  
 Configurations to be tested: Stock Unit

### Equipment Modification (If applicable, indicate modifications since EUT was last tested. If modifications are made during this testing, submit revised TP/CDF after testing is complete.)

Modifications since last test: NA  
 Modifications made during test: Original testing with 6' power cable, changed to shorter leads more representative of actual product installation

### Test Objective(s): Please indicate the tests to be performed, entering the applicable standard(s) where noted.

- |   |  |
|---|--|
| <input type="checkbox"/> EMC Directive 2004/108/EC (EMC)  | <input checked="" type="checkbox"/> FCC: Class <input type="checkbox"/> A <input checked="" type="checkbox"/> B Part <u>15</u> |
| Std: _____  | <input type="checkbox"/> VCCI: Class <input type="checkbox"/> A <input type="checkbox"/> B                                     |
| <input type="checkbox"/> Machinery Directive 89/392/EEC (EMC)   | <input type="checkbox"/> BSMI: Class <input type="checkbox"/> A <input type="checkbox"/> B (Separate Report)                   |
| Std: _____  | <input checked="" type="checkbox"/> Canada: Class <input type="checkbox"/> A <input checked="" type="checkbox"/> B             |
| <input type="checkbox"/> Medical Device Directive 93/42/EEC (EMC)   | <input type="checkbox"/> Australia: Class <input type="checkbox"/> A <input type="checkbox"/> B                                |
| Std: _____  | <input type="checkbox"/> Other: _____  |
| <input type="checkbox"/> Vehicle Directive: <input type="checkbox"/> 2001/3/EC (EMC) <input type="checkbox"/> 2004/104/EC (EMC) |  |
| <input type="checkbox"/> Other Vehicle Std: _____   |  |
| <input type="checkbox"/> FDA Reviewers Guidance for Premarket Notification Submissions (EMC)                                    |  |

### Third Party Certification, if applicable (\*Signature on Page 6 Required)

- |   |   |
|---|---|
| <input type="checkbox"/> Attestation of Conformity (AoC)*                             | <input type="checkbox"/> EMC Certification (used with Octagon Mark)*                                  |
| <input type="checkbox"/> Certificate of Conformity (CoC)*                             | <input type="checkbox"/> Compliance Document*   |
| Protection Class (N/A for vehicles)   | <input type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III |
| (Press F1 when field is selected to show additional information on Protection Class.) |   |
| <input checked="" type="checkbox"/> FCC / TCB Certification                           | <input checked="" type="checkbox"/> Industry Canada / FCB Certification                               |
| <input type="checkbox"/> E-Mark Certification   | <input type="checkbox"/> Taiwan Certification   |

**EMC Test Plan and Constructional Data Form****Attendance**Test will be: ☒ Attended by the customer ☐ Unattended by the customer**Failure - Complete this section if testing will not be attended by the customer.**

If a failure occurs, TÜV SÜD America should:

- ☐ Call contact listed above, if not available then stop testing. (After hrs phone): \_\_\_\_\_
- ☐ Continue testing to complete test series.
- ☐ Continue testing to define corrective action.
- ☒ Stop testing.

**EUT Specifications and Requirements**Length: 35mm Width: 29.2mm Height: \_\_\_\_\_ Weight: \_\_\_\_\_**Power Requirements***Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)*Voltage: 2.5V-5.5V DC (If battery powered, make sure battery life is sufficient to complete testing.)# of Phases: NA

Current (Amps/phase(max)): \_\_\_\_\_ Current (Amps/phase(nominal)): \_\_\_\_\_

Other Requires > 0.25mWsec Energy Pulse (see PTM240C User Manual)**Other Special Requirements****Typical Installation and/or Operating Environment**(ie. Hospital, Small Business, Industrial/Factory, etc.)  
Residential and Light Commercial Applications (indoors)**EUT Power Cable**

☒ Permanent OR ☐ Removable Length (in meters): 1.5cm MAX

☐ Shielded OR ☐ Unshielded

☐ Not Applicable



# EMC Test Plan and Constructional Data Form

EUT Interface Ports and Cables														
Type	Analog	Digital	During Test		Qty	Shielding		Termination	Connector Type	Port Termination	Length tested (in meters)	Removable	Permanent	
			Active	Passive		Yes	No							Type
<b>EXAMPLE:</b>														
RS232	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Foil over braid	Coaxial	Metallized 9-pin D-Sub	Characteristic Impedance	6	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Power and IO Connector	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>			Header			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>



# EMC Test Plan and Constructional Data Form

**EUT Software.**

Revision Level: DA

Description: Current Production revision from EnOcean of the PTM240C as tested is at REV DA

**Equipment Under Test (EUT) Operating Modes to be Tested** -- list the operating modes to be used during test.

It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing. Consult with your TÜV Product Service Representative if additional assistance is required.

1. Stock unit from EnOcean with firmware modified to accept a constant DC input (instead of a pulse) which will continuously transmit a 315MHz Carrier Wave for power measurements.
2. Stock unit from EnOcean
- 3.

**Equipment Under Test (EUT) System Components** -- List and describe all components which are part of the EUT. For FCC & Taiwan testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc)

Description	Model #	Serial #	FCC ID #
315MHz Transmitter Module	PTM240C		X98-PTM240C



## EMC Test Plan and Constructional Data Form

**Support Equipment** -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc)  
This information is required for FCC & Taiwan testing.

<i>Description</i>	<i>Model #</i>	<i>Serial #</i>	<i>FCC ID #</i>
Battery Pack	NA	NA	NA

### Oscillator Frequencies

<i>Manufacturer</i>	<i>Frequency</i>	<i>Derived Frequency</i>	<i>Component # / Location</i>	<i>Description of Use</i>

### Power Supply

<i>Manufacturer</i>	<i>Model #</i>	<i>Serial #</i>	<i>Type</i>
			<input type="checkbox"/> Switched-mode: (Frequency) _____ <input type="checkbox"/> Linear <input type="checkbox"/> Other: _____
			<input type="checkbox"/> Switched-mode: (Frequency) _____ <input type="checkbox"/> Linear <input type="checkbox"/> Other: _____

### Power Line Filters

<i>Manufacturer</i>	<i>Model #</i>	<i>Location in EUT</i>

### Critical EMI Components (Capacitors, ferrites, etc.)

<i>Description</i>	<i>Manufacturer</i>	<i>Part # or Value</i>	<i>Qty</i>	<i>Component # / Location</i>



## EMC Test Plan and Constructional Data Form

**EMC Critical Detail** -- Describe other EMC Design details used to reduce high frequency noise.

PLEASE ENTER NAMES BELOW (INSERT ELECTRONIC SIGNATURE IF POSSIBLE)

**Authorization (Signature Required if a Third Party Certification is checked on pg 1)**

A handwritten signature in black ink, appearing to read 'David M Burke'.

04-01-2010

Customer authorization to perform tests  
according to this test plan.

Date

**David M Burke**

04-01-2010

Test Plan/CDF Prepared By (please print)

Date

## Appendix B

### Measurement Protocol



# MEASUREMENT PROTOCOL

## GENERAL INFORMATION

### Test Methodology

Emissions testing is performed according to the procedures in ANSI C63.4-2003, FCC KDB Publication 558074, the article "The Measurement of Occupied Bandwidth" by Industry Canada's certification bureau, & FCC Public Notice DA 02-2138.

### Measurement Uncertainty

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. The test system has a measurement uncertainty of  $\pm 1.8$  dB. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. The test system has a measurement uncertainty of  $\pm 4.8$  dB. The equipment comprising the test systems is calibrated on an annual basis.

### Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into its characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

### Conducted Emissions

Final measurement levels are determined by connecting the antenna port of the DUT to a spectrum analyzer input via coaxial adapters, high frequency coax, and attenuators as necessary. The loss created by the interconnect apparatus is offset by settings within the analyzer. Specific analyzer settings are determined by the procedures throughout this report.

### Radiated Emissions

Radiated emissions from the EUT are measured in the frequency range of 30 to 1000 MHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth, and peak and average detection. The antenna is positioned 3 meters horizontally from the EUT. The antenna height is positioned 1-4 meters above the ground plane. Measurement scans are made with both horizontal and vertical antenna polarizations. Average measurements above 1 GHz are achieved using a peak detector with 1 MHz RBW and 10 Hz VBW.

The final level, in dB $\mu$ V/m, equals the reading from the spectrum analyzer (Level dB $\mu$ V), adding the antenna correction factor and cable loss factor (Factor dB) to it, and subtracting the preamp gain (and duty cycle correction factor, if applicable). This result then has the limit subtracted from it to provide the Delta, which gives the tabular data as shown in the data. Intentional radiators are rotated through 3 orthogonal axes to determine the maximum emission test position.

Example:

FREQ (MHz)	LEVEL (dB $\mu$ V)	CABLE/ANT/PREAMP (dB) (dB/m) (dB)	FINAL (dB $\mu$ V/m)	POL/HGT/AZ (m) (deg)	DELTA1
60.80	42.5Qp +	1.2 + 10.9 - 25.5 =	29.1	V 1.0 0.0	-10.9

### Test Equipment

All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated according to internal procedure.