



Nemko Test Report: 10211699RUS3 Line 37 Rev 1

Applicant: Texas Instruments, Inc.
12500 TI Blvd.
Dallas, TX 75243
USA


**Equipment Under Test:
(E.U.T.)** TRF7960ATB

FCC ID: Z64TRF7960ATB

In Accordance With: **FCC Part 15, Subpart C, Paragraph 15.225**
Operation within the band 13.110-14.010 MHz

Tested By: Nemko USA Inc.
802 N. Kealy
Lewisville, TX 75057

TESTED BY:  **DATE:** 17-Aug-2011
David Light, Senior Wireless Engineer Date

APPROVED BY:  **DATE:** 22-Feb-2013
Mike Cantwell, Reviewer Date

Total Number of Pages: 17

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Section 1. Summary Of Test Results

Manufacturer: Texas Instruments, Inc.

Model No.: TRF7960ATB

Serial No.: None

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 15, Subpart C, Paragraph 15.225 for operation in the band 13.110-14.010 MHz. All tests were conducted using measurement procedure ANSI C63.4-2003.

- | | | | |
|-------------------------------------|----------------------------|-------------------------------------|---------------------|
| <input checked="" type="checkbox"/> | New Submission | <input checked="" type="checkbox"/> | Production Unit |
| <input type="checkbox"/> | Class II Permissive Change | <input type="checkbox"/> | Pre-Production Unit |

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.
See " Summary of Test Data".



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Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
Powerline Conducted Emissions	15.207	Complies
Field Strength	15.225(a)	Complies
Radiated Emissions	15.225(d)/15.209	Complies
Frequency Stability	15.225(e)	Complies

Footnotes:

Engineering Judgment:

This report was reviewed and found to still be in compliance with the stated rules. A letter of attestation from the manufacturer also states that the TRF7960ATB is electrically identical to the TRF7960TB, the unit originally tested; and the report has been re-issued with only a change in the model number.



Michael Cantwell, PE, NCE

Section 2. General Equipment Specification

Frequency Range: 13.56 MHz Fixed

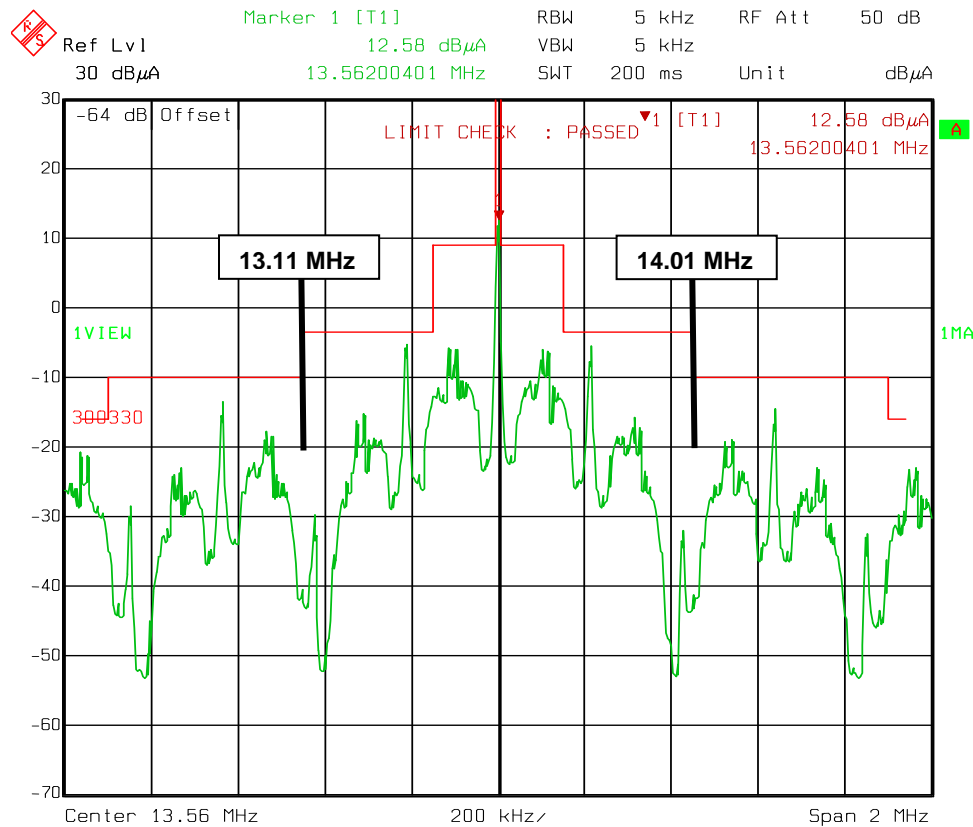
Operating Frequency(ies) of Sample: 13.56 MHz Fixed

Supply Power: 3.3 Vdc via USB

Integral Antenna: Yes No

Description of EUT

13.56 MHz RFID evaluation module. The unit was tested with both the Texas Instruments MSP-EXP430F5438 and the Stellaris DK-LM3S9B96 development boards.



99% Occupied Bandwidth = 425 kHz

Section 3. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207
TESTED BY: Brian BoyeaTom Tidwell / Debbie Jensen	DATE: 17 August 2011

Test Results: Complies. The worst case emission was 54.4 dB μ V at 656 kHz. This is 1.6 dB below the quasi-peak specification limit of 56.0 dB μ V.

Test Data: Refer to attached plots

Equipment Used: 674-704-1258-1663-1988-1548

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 35 %

Test Data – Powerline Conducted Emissions

Frequency MHz	FCCB QP LIMIT	FCCB AVG LIMIT	AVG Meas	AVG Margin	QP Meas	QP Margin
0.328	60.9	50.9	42.6	-8.4	54.8	-6.1
0.343	60.5	50.5	40.7	-9.8	54.2	-6.3
0.356	60.1	50.1	39.2	-10.9	55.7	-4.5
0.369	59.7	49.7	40.8	-9.0	55.9	-3.9
0.376	59.5	49.5	42.5	-7.1	56.4	-3.1
0.379	59.5	49.5	42.8	-6.6	56.8	-2.6
0.383	59.3	49.3	43.1	-6.2	57.3	-2.1
0.395	59.0	49.0	42.2	-6.8	56.1	-2.9
0.656	56.0	46.0	41.3	-4.7	54.4	-1.6
0.685	56.0	46.0	39.5	-6.5	53.0	-3.0
0.83	56.0	46.0	36.0	-10.0	44.8	-11.2
0.91	56.0	46.0	38.5	-7.5	52.7	-3.3
0.94	56.0	46.0	38.8	-7.2	52.8	-3.2
1.21	56.0	46.0	39.4	-6.7	50.6	-5.4
1.92	56.0	46.0	38.8	-7.2	47.4	-8.6
2.1	56.0	46.0	38.3	-7.7	46.6	-9.4
2.1	56.0	46.0	38.2	-7.9	46.4	-9.6
2.1	56.0	46.0	38.2	-7.8	46.5	-9.5
2.11	56.0	46.0	38.1	-7.9	46.7	-9.3
2.12	56.0	46.0	35.9	-10.2	44.4	-11.6
2.13	56.0	46.0	38.1	-7.9	46.4	-9.6
2.15	56.0	46.0	37.2	-8.8	43.8	-12.3
2.16	56.0	46.0	37.9	-8.1	45.6	-10.4
2.29	56.0	46.0	37.9	-8.1	46.9	-9.1
2.31	56.0	46.0	37.3	-8.7	46.5	-9.5

Section 4. Field Strength

NAME OF TEST: Field Strength	PARA. NO.: 15.225(a)
TESTED BY: David LightTom Tidwell / Debbie Jensen	DATE: 09 August 2011

Test Results: Complies.

Measurement Data:

Freq. (MHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)		Corrected Reading (dBuV/m)	Spec. Limit (dBuV/m)	Pol.	Comments:
								TI MSP-EXP430F5438
13.56	43.9	17.4	0.1		61.4	124	Loop	
								Stellaris DK-LM3S9B96
13.56	46.6	17.4	0.1		64.1	124	Loop	

Measurement Distance: 3 meters

Detector Bandwidth: 10 kHz/10 kHz

Detector Function: Peak

The specification limit was adjusted at 40 dB per decade from 30 meter limit.

Notes:

- For handheld devices, the EUT was tested on three orthogonal axis'
- The device was tested from 30 MHz to the tenth harmonic of the highest fundamental frequency per 15.33
- The device was tested on three channels per 15.31(l).

Test Equipment Used: 1733-1767-1783

Measurement Uncertainty: +/-3.6 dB

Temperature: 22 °C

Relative Humidity: 45 %

Section 5. Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.225(d)/15.209
TESTED BY: David LightTom Tidwell / Debbie Jensen	DATE: 03 August 2011

Test Results: Complies

Test Equipment Used: 1767-1733-1763-1783-791

Measurement Uncertainty: +/-3.6 dB

Temperature: 22 °C

Relative Humidity: 45 %

Measurement Data: Refer to data on following page.

Test Data – Radiated Emissions

Texas Instruments MSP-EXP430F5438

Frequency MHz	FCC B Limits	Peaks H_Peaks	Peaks Margin
32.4	40.0	32.2	-7.8
40.0	40.0	27.8	-12.2
103.8	43.5	20.8	-22.8
162.7	43.5	29.6	-13.9
199.9	43.5	26.6	-16.9
247.0	46.0	32.5	-13.5
332.9	46.0	33.7	-12.3
393.1	46.0	31.8	-14.3
420.3	46.0	36.8	-9.2
900.2	46.0	32.5	-13.5

Frequency MHz	FCC B Limits	Peaks V_Peaks	Peaks Margin
96.9	43.5	29.0	-14.5
162.7	43.5	26.6	-16.9
271.1	46.0	35.3	-10.8
420.3	46.0	36.4	-9.6
705.3	46.0	35.3	-10.7
732.5	46.0	36.8	-9.2
772.7	46.0	35.9	-10.1

Stellaris DK-LM3S9B96

Frequency MHz	FCC B Limits	Peaks H_Peaks	Peaks Margin
100.1	43.5	25.5	-18.0
119.8	43.5	27.6	-15.9
150.0	43.5	41.8	-1.8
168.3	43.5	32.8	-10.7
199.9	43.5	29.2	-14.3
327.2	46.0	35.1	-11.0
487.7	46.0	34.3	-11.7
515.0	46.0	34.0	-12.0
720.2	46.0	36.2	-9.8

Frequency MHz	FCC B Limits	Peaks V_Peaks	Peaks Margin
96.1	43.5	28.3	-15.2
150.2	43.5	34.7	-8.9
345.7	46.0	37.9	-8.2
596.7	46.0	34.8	-11.2
599.8	46.0	37.5	-8.5
624.0	46.0	36.1	-10.0

Section 6. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 15.225(e)
TESTED BY: David LightTom Tidwell / Debbie Jensen	DATE: 09 August 2011

Test Results: Complies

Test Equipment Used: 1767-1733-1763

Measurement Uncertainty: +/-3.6 dB

Temperature: 22 °C

Relative Humidity: 45 %

Measurement Data:

Temp (°C)	Measured Frequency (MHz)		Test Voltage	Frequency Error (Hz)	Limit (+/-Hz)	Error (ppm)	Comment
20	13.560230		3.3	230	1356.0	16.961652	
20	13.560211		2.8	211	1356.0	15.6	
20	13.560205		3.8	205	1356.0	15.1	
-20	13.560199		3.3	199	1356.0	15.1	
50	13.560241		3.3	241	1356.0	17.8	

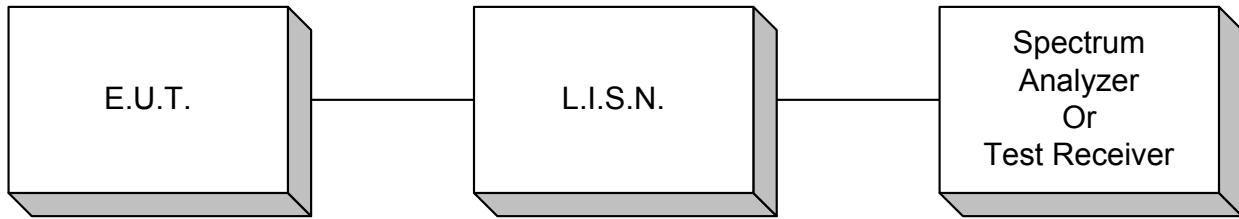
Section 7. Test Equipment List

Asset Tag	Description	Manufacturer	Model	Serial #	Last Cal	Next Cal
674	Limiter	Hewlett Packard	11947A	3107A02200	26-Oct-2010	26-Oct-2011
704	Filter, High Pass, 5KHz	Solar Electronics	7930-5.0	933126	29-Sep-2010	29-Sep-2011
1258	LISN .15mhz-30mhz	EMCO	3825/2	1305	25-Oct-2010	25-Oct-2011
1663	Spectrum Analyzer	Rohde & Schwartz	FSP3	100073	23-Aug-2010	23-Aug-2011
1733	Antenna, Active Loop	EMCO	6507	45939	27-Apr-2011	27-Apr-2012
1763	Antenna, Bilog	Schaffner	CBL 6111D	22926	11-Feb-2011	11-Feb-2012
1767	Receiver	Rohde & Schwartz	ESIB26	837491/0002	01-Dec-2010	01-Dec-2011
1783	Cable Assy, 3m Chamber	Nemko	Chamber		04-Oct-2010	04-Oct-2011
1988	Cable, Coaxial	Nemko USA, Inc.			03-Nov-2010	03-Nov-2011
791	Pre Amplifier	Nemko, USA	CRA69 321003 9605	119	19-May-2011	19-May-2012
1548	0.5m Cable Assy	Nemko USA	RG213		01-Oct-2010	01-Oct-2011

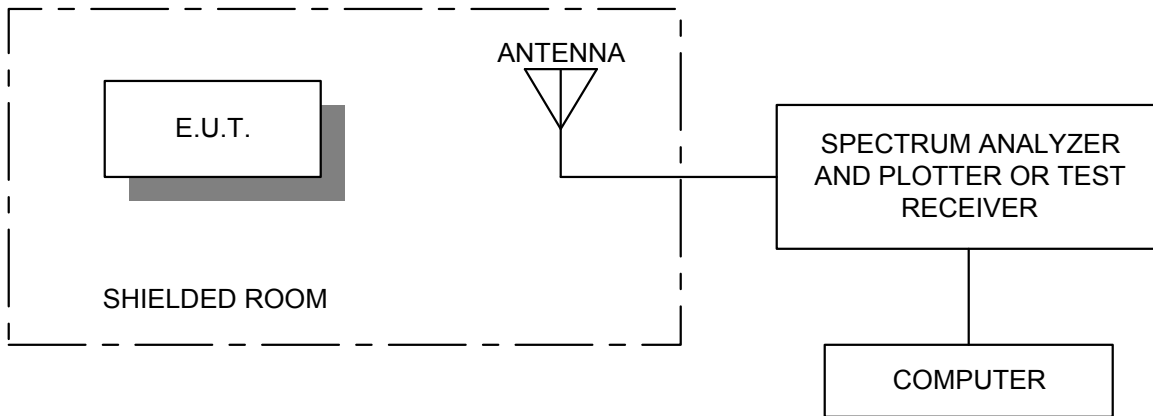
ANNEX A

TEST DIAGRAMS

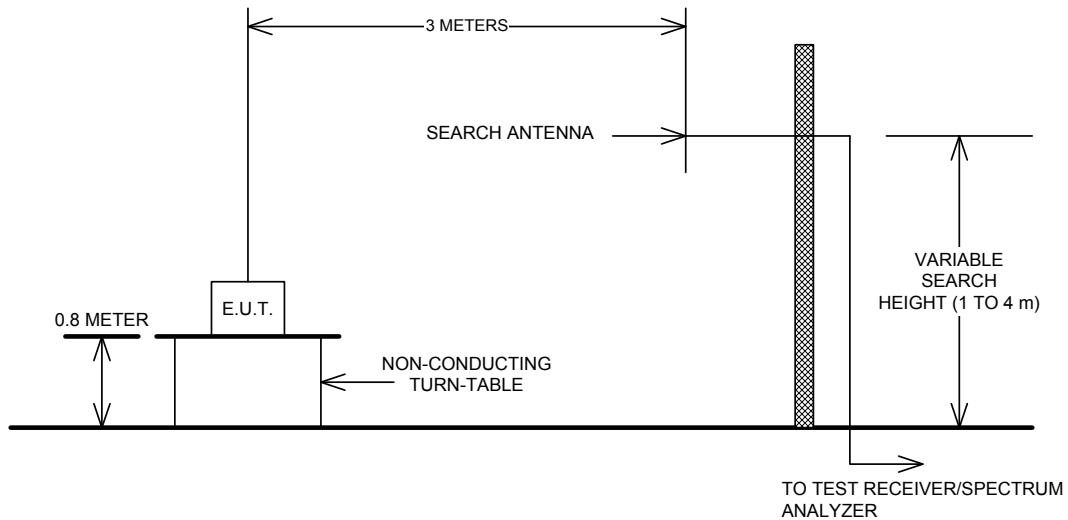
Conducted Emissions



Radiated Prescan



Test Site For Radiated Emissions



ANNEX B

TEST DETAILS

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
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Minimum Standard: §15.207 Conducted limits.

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 mH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of Conducted Emission (MHz)	Limit (dBmV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

(b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

(1) For carrier current systems containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000 mV within the frequency band 535-1705 kHz, as measured using a 50 mH/50 ohms LISN.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits as provided in §15.205 and §§15.209, 15.221, 15.223, 15.225 or 15.227, as appropriate.

(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

NAME OF TEST: Operation in the band 13.110-14.010 MHz	PARA. NO.: 15.225
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(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

(e) The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to $+50$ degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

(f) In the case of radio frequency powered tags designed to operate with a device authorized under this section, the tag may be approved with the device or be considered as a separate device subject to its own authorization. Powered tags approved with a device under a single application shall be labeled with the same identification number as the device.