Cert. No. 1152.01
Electrical (EMC)

DATE: 19 July 2005

I.T.L. (PRODUCT TESTING) LTD.

FCC EMC/Radio Test Report

for

Sensus Metering Systems

Equipment under test:

American Meter Residential Gas Meter Transmitter

GS0007

Written by: _____
D. Shidlowsky, Documentation

Approved by: _____
E. Pitt, Test Engineer

Approved by: _____
I. Raz, EMC Laboratory Manager

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This report relates only to items tested.

Cert. No. 1152.01
Electrical (EMC)

Measurement/Technical Report for

Sensus Metering Systems

American Meter Residential Gas Meter Transmitter

GS0007

FCC ID: KCHGS0001

19 July 2005

This report concerns: Original Grant: Class II change: X

Equipment type: Radio Telemetry Transmitter
Request Issue of Grant:
__x__ Immediately upon completion of review

Limits used:
CISPR 22 _____ Part 15 __x__

Measurement procedure used is ANSI C63.4-2003.

Application for Certification prepared by:
Ishaishou Raz
ITL (Product Testing) Ltd.
Kfar Bin Nun
D.N. Shimshon 99780
Israel
e-mail Sraz@itl.co.il

Applicant for this device: (different from "prepared by")
Anup Nandwana
Sensus Metering Systems
450 North Gallatin Ave.
Uniontown PA 15401
USA
Tel: 805-562-5363
Fax: 805-562-9134
e-mail: anup.nandwana@sensus.com

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1. General Information

1.1 Administrative Information

Manufacturer:	Sensus Metering Systems
Manufacturer's Address:	450 North Gallatin Ave., Uniontown PA 15401 USA Tel: 805-562-5363 Fax: 805-562-9134
Manufacturer's Representative:	Shimon Zigdon
Equipment Under Test (E.U.T):	American Meter Residential Gas Meter Transmitter
Equipment Model No.:	GS0007
Equipment Serial No.:	Not designated
Date of Receipt of E.U.T:	13.07.05
Start of Test:	13.07.05
End of Test:	14.07.05
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	See Section 2

1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), File No. IC 4025.
6. TUV Product Services, England, ASLLAS No. 97201.
7. Nemko (Norway), Authorization No. ELA 207.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 Product Description

See details in ITL test report no. E57420.01.

Description of change:
The transmitter KCHGS0001 for 'wall mount' installation (instead of 'on meter' installation) was adapted as follows:

A rear, external, metallic bracket was added.
The magnetic interface to the meter is extended by a 3 wires cable.

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

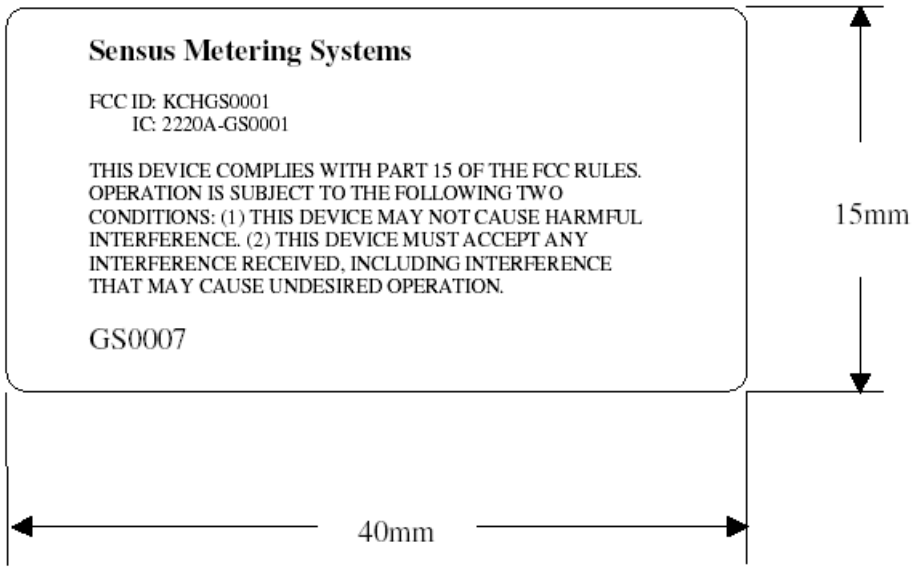
The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing December 12, 2003).
I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

Radiated Emission

The Open Site complies with the ±4 dB Normalized Site Attenuation requirements of ANSI C63.4-2003. In accordance with Paragraph 5.4.6.1 of this standard, this tolerance includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies.

2. Product Labeling



3. System Test Configuration

3.1 Justification

See ITL test report no. E57420.01.
Spurious radiated emissions were re-testing was performed according to correspondence with Timco dated 15 June 2005. See Appendix B Correspondence.

3.2 EUT Exercise Software

See ITL test report no. E57420.01.

3.3 Special Accessories

See ITL test report no. E57420.01.

3.4 Equipment Modifications

See ITL test report no. E57420.01.

3.5 Configuration of Tested System

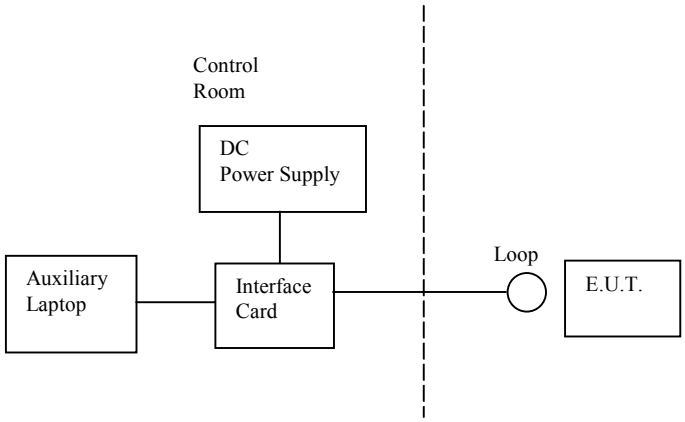


Figure 1. Configuration of Tested System

4. Block Diagram

4.1 Schematic Block/Connection Diagram

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4.2 Theory of Operation

See ITL test report no. E57420.01.

5. Spurious Radiated Measurement Photo

Figure 2. Spurious Radiated Emission Test Front

6. Spurious Radiated Emission in the Restricted Bands Below 1 GHz

6.1 Test Specification

9 kHz-1000 MHz, FCC Part 15, Subpart B, CLASS B

6.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in *Figure 1*.

The frequency range 9 kHz-1000 MHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 9 kHz-30MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter.
In the frequency range 30-1000MHz, the readings were maximized by adjusting the antenna height between 1-4 meters. The turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods:

Turning the E.U.T on and off.
Using a frequency span less than 10 MHz.
Observation of the signal level during turntable rotation. Background noise is not affected by the rotation of the E.U.T.

The E.U.T. was operated in the frequencies of 904.6, 915.0, and 925.4 MHz.

6.3 Test Results

The E.U.T met the requirements of the FCC Part 15, Subpart B ,Class B specification.

The signals in the band 9 kHz – 30 MHz were 20dB below the specification limit.

The margin between the emission level and the specification limit is 6.3 dB in the worst case at the frequency of 180.00 MHz, horizontal polarization.

The test results were the same for all 3 operating frequencies.

The details of the highest emissions are given in *Figure 3* to *Figure 6*.

TEST PERSONNEL:

Tester Signature: _____ Date: 24.07.05

Typed/Printed Name: E. Pitt

Radiated Emission

E.U.T Description	American Meter Residential Gas Meter Transmitter
Type	GS0007
Serial Number:	Not designated

Specification: FCC Part 15, Subpart B, Class B

Antenna Polarization: Horizontal
Antenna: 3 meters distance
Frequency range: 30 MHz to 1000 MHz
Detectors: Peak, Quasi-peak

Frequency (MHz)	Peak Amp (dBμV/m)	QP Amp (dBμV/m)	Correction (dB)	Specification (dBμV/m)	Margin (dB)
150.00	33.3	29.6	14.6	43.5	-13.9
155.00	30.0	28.0	14.7	43.5	-15.5
165.00	41.9	36.2	15.0	43.5	-7.3
180.00	39.7	37.2	15.7	43.5	-6.3
300.00	28.4	25.8	15.6	46.0	-20.2
360.00	37.8	34.7	17.7	46.0	-11.3
390.00	24.1	24.0	18.8	46.0	-22.0

Figure 3. Radiated Emission. Antenna Polarization: HORIZONTAL. Detectors: Peak, Quasi-peak

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Radiated Emission

E.U.T Description	American Meter Residential Gas Meter Transmitter
Type	GS0007
Serial Number:	Not designated

Specification: FCC Part 15, Subpart B, Class B

Antenna Polarization: Horizontal
Antenna: 3 meters distance

Frequency range: 30 MHz to 1000 MHz
Detectors: Peak, Quasi-peak

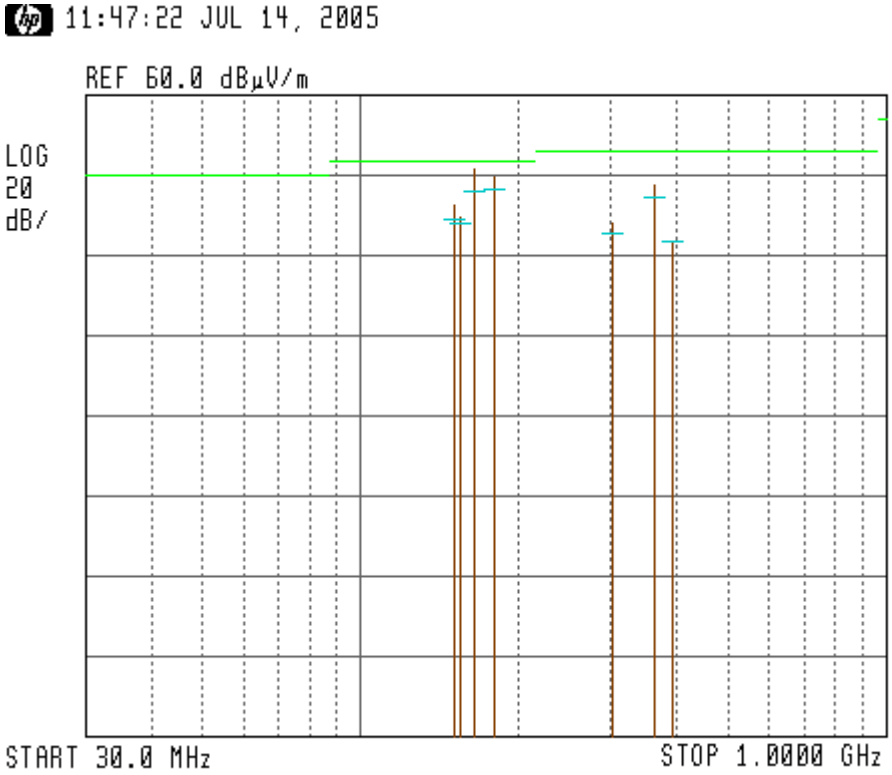

Figure 4. Radiated Emission. Antenna Polarization: HORIZONTAL Detectors: Peak, Quasi-peak

Note:

1. *Horizontal axis shows logarithmic frequency scale.*
2. *The vertical axis shows amplitude (in dB µV/m).*
3. *Peak detection is designated by the top of each vertical line.*
4. *Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.*

Radiated Emission

E.U.T Description: American Meter Residential Gas Meter Transmitter
Type: GS0007
Serial Number: Not designated

Specification: FCC Part 15, Subpart B, Class B

Antenna Polarization: Vertical
Antenna: 3 meters distance
Frequency range: 30 MHz to 1000 MHz
Detectors: Peak, Quasi-peak

Frequency (MHz)	Peak Amp (dBμV/m)	QP Amp (dBμV/m)	Correction (dB)	Specification (dBμV/m)	Margin (dB)
33.36	36.0	32.9	14.7	40.0	-7.1
70.00	30.6	24.0	9.8	40.0	-16.0
160.00	35.2	34.3	14.9	43.5	-9.2
165.00	33.6	30.3	15.0	43.5	-13.2
170.00	37.5	32.7	15.1	43.5	-10.8
175.00	30.9	29.4	15.4	43.5	-14.1
360.00	33.6	29.3	17.7	46.0	-16.7

Figure 5. Radiated Emission. Antenna Polarization: VERTICAL. Detectors: Peak, Quasi-peak

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Radiated Emission

E.U.T Description	American Meter Residential Gas Meter Transmitter
Type	GS0007
Serial Number:	Not designated

Specification: FCC Part 15, Subpart B, Class B

Antenna Polarization: Vertical
Antenna: 3 meters distance

Frequency range: 30 MHz to 1000 MHz
Detectors: Peak, Quasi-peak

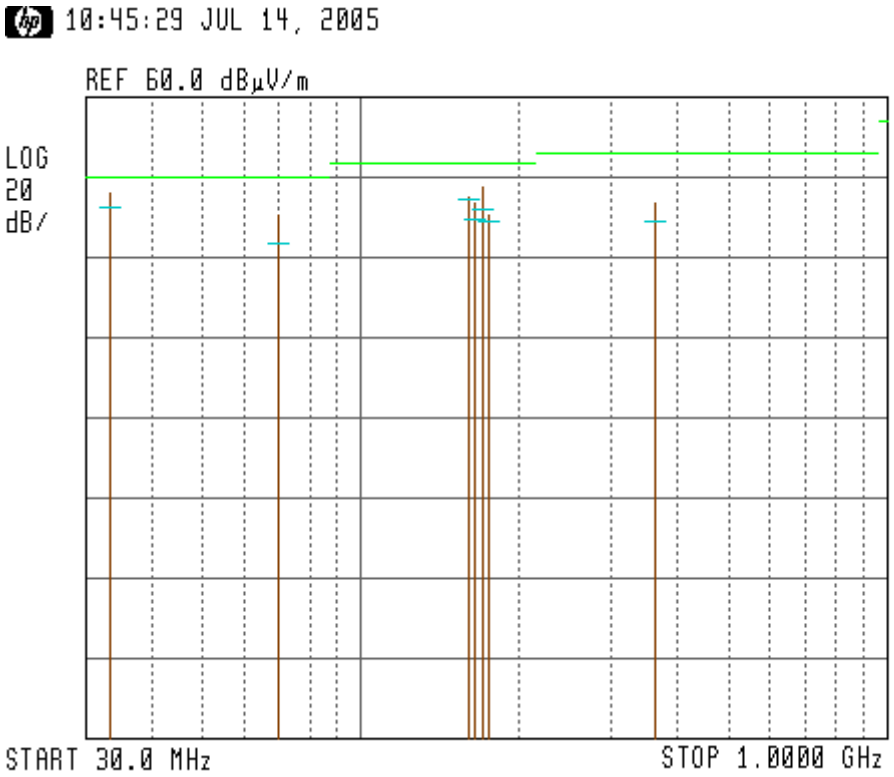

Figure 6. Radiated Emission. Antenna Polarization: VERTICAL. Detectors: Peak, Quasi-peak

Note:

1. *Horizontal axis shows logarithmic frequency scale.*
2. *The vertical axis shows amplitude (in dB µV/m).*
3. *Peak detection is designated by the top of each vertical line.*
4. *Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.*

6.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3411A00102	February 26, 2005	1 year
RF Section	HP	85420E	3427A00103	February 26, 2005	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	March 14, 2005	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	October 20, 2004	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 17, 2004	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	ThinkJet 2225	2738508357.0	N/A	N/A

6.5 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$[dB\mu v/m]\ FS = RA + AF + CF$$

FS: Field Strength [dBµv/m]
RA: Receiver Amplitude [dBµv]
AF: Receiving Antenna Correction Factor [dB/m]
CF: Cable Attenuation Factor [dB]

No external pre-amplifiers are used.

7. Spurious Radiated Emission in the Restricted Bands, Above 1 GHz

7.1 Radiated Emission Above 1 GHz

The E.U.T operation mode and test set-up are as described in Section 3.

See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in *Figure 1*.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.
In the frequency range 1-2.9 GHz, a computerized EMI receiver complying to CISPR 16 requirements was used.
In the frequency range 2.9-9.5 GHz, a spectrum analyzer including a low noise amplifier was used. During average measurements, the IF bandwidth was 1 MHz and the video bandwidth was 100Hz. During peak measurements, the IF bandwidth was 1 MHz and the video bandwidth was 3 MHz.
The test distance was 3 meters.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.
Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

7.2 Test Data

JUDGEMENT: Passed by 5.0 dB

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification. The worst cases were:

for 904.6 MHz, 5.6 dB margin at 9046.00 MHz frequency, vertical polarization.

for 915.0 MHz, 5.0 dB margin at 9150.00 MHz frequency, vertical polarization

for 925.4 MHz, 5.7 dB margin at 7403.20 MHz frequency, horizontal polarization

The details of the highest emissions are given in Figure 7 to Figure 18.

TEST PERSONNEL:

Tester Signature: _____ Date: 24.07.05

Typed/Printed Name: E. Pitt

Radiated Emission Above 1 GHz

E.U.T Description	American Meter Residential Gas Meter Transmitter
Type	GS0007
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal
Test Distance: 3 meters
Operating Frequency: 904.6 MHz

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Peak

Freq. (MHz)	Peak Amp (dBμV/m)	Peak. Specification (dB μV/m)	Peak. Margin (dB)
2713.80	53.0**	74.0	-21.0
3618.40	40.6*	74.0	-33.4
4523.00	43.2*	74.0	-30.8
5427.60	45.1*	74.0	-28.9
8141.40	52.9*	74.0	-21.1
9046.00	53.5*	74.0	-20.5

Figure 7. Radiated Emission. Antenna Polarization: HORIZONTAL. Detector: Peak

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Peak Amp" includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Preamplifier Gain

** "Correction Factor" = Antenna Factor + Cable Loss

Radiated Emission Above 1 GHz

E.U.T Description	American Meter Residential Gas Meter Transmitter
Type	GS0007
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal
Test Distance: 3 meters
Operating Frequency: 904.6 MHz

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Average

Freq. (MHz)	Average Amp (dBμV/m)	Average Specification (dB μV/m)	Peak. Margin (dB)
2713.80	44.0**	54.0	-10.0
3618.40	30.8*	54.0	-23.2
4523.00	35.0*	54.0	-19.0
5427.60	38.2*	54.0	-15.8
8141.40	44.7*	54.0	-9.3
9046.00	47.8*	54.0	-6.2

Figure 8. Radiated Emission. Antenna Polarization: HORIZONTAL. Detector: Average

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Average Amp" includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Preamplifier Gain

** Correction Factor = Antenna Factor + Cable Loss

Radiated Emission Above 1 GHz

E.U.T Description	American Meter Residential Gas Meter Transmitter
Type	GS0007
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical
Test Distance: 3 meters
Operating Frequency: 904.6 MHz

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Peak

Freq. (MHz)	Peak Amp (dBμV/m)	Peak. Specification (dB μV/m)	Peak. Margin (dB)
2713.80	52.6**	74.0	-21.4
3618.40	39.9*	74.0	-34.1
4523.00	46.8*	74.0	-27.2
5427.60	49.3*	74.0	-24.7
8141.40	55.3*	74.0	-18.7
9046.00	56.7*	74.0	-17.3

Figure 9. Radiated Emission. Antenna Polarization: VERTICAL. Detector: Peak

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Peak Amp" includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Preamplifier Gain

** "Correction Factor" = Antenna Factor + Cable Loss

Radiated Emission Above 1 GHz

E.U.T Description	American Meter Residential Gas Meter Transmitter
Type	GS0007
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical
Test Distance: 3 meters
Operating Frequency: 904.6 MHz

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Average

Freq. (MHz)	Average Amp (dBμV/m)	Average Specification (dB μV/m)	Peak. Margin (dB)
2713.80	43.8**	54.0	-10.2
3618.40	32.3*	54.0	-21.7
4523.00	40.1*	54.0	-13.9
5427.60	43.0*	54.0	-11.0
8141.40	46.7*	54.0	-7.3
9046.00	48.4*	54.0	-5.6

Figure 10. Radiated Emission. Antenna Polarization: VERTICAL. Detector: Average

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Average Amp" includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Preamplifier Gain

** Correction Factor = Antenna Factor + Cable Loss

Radiated Emission Above 1 GHz

E.U.T Description	American Meter Residential Gas Meter Transmitter
Type	GS0007
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal
Test Distance: 3 meters
Operating Frequency: 915.0 MHz

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Peak

Freq. (MHz)	Peak Amp (dBμV/m)	Peak. Specification (dB μV/m)	Peak. Margin (dB)
2745.00	54.2**	74.0	-19.8
3660.00	41.6*	74.0	-32.4
4575.00	44.1*	74.0	-29.9
7320.00	49.3*	74.0	-24.7
8235.00	53.8*	74.0	-20.2
9150.00	53.5*	74.0	-20.5

Figure 11. Radiated Emission. Antenna Polarization: HORIZONTAL. Detector: Peak

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Peak Amp" includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Preamplifier Gain

** "Correction Factor" = Antenna Factor + Cable Loss

Radiated Emission Above 1 GHz

E.U.T Description	American Meter Residential Gas Meter Transmitter
Type	GS0007
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal
Frequency range: 1.0 GHz to 9.5 GHz
Test Distance: 3 meters
Detector: Average
Operating Frequency: 915.0 MHz

Freq. (MHz)	Average Amp (dBμV/m)	Average Specification (dB μV/m)	Peak. Margin (dB)
2745.00	43.7**	54.0	-10.3
3660.00	31.2*	54.0	-22.8
4575.00	35.0*	54.0	-19.0
7320.00	41.9*	54.0	-12.1
8235.00	44.1*	54.0	-9.9
9150.00	46.3*	54.0	-7.7

Figure 12. Radiated Emission. Antenna Polarization: HORIZONTAL. Detector: Average

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Average Amp" includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Preamplifier Gain

** Correction Factor = Antenna Factor + Cable Loss

Radiated Emission Above 1 GHz

E.U.T Description	American Meter Residential Gas Meter Transmitter
Type	GS0007
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical
Test Distance: 3 meters
Operating Frequency: 915.0 MHz

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Peak

Freq. (MHz)	Peak Amp (dBμV/m)	Peak. Specification (dB μV/m)	Peak. Margin (dB)
2745.00	54.3**	74.0	-19.7
3660.00	39.4*	74.0	-34.6
4575.00	45.7*	74.0	-28.3
7320.00	48.9*	74.0	-25.1
8235.00	55.5*	74.0	-18.5
9150.00	56.9*	74.0	-17.1

Figure 13. Radiated Emission. Antenna Polarization: VERTICAL. Detector: Peak

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Peak Amp" includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Preamplifier Gain

** "Correction Factor" = Antenna Factor + Cable Loss

Radiated Emission Above 1 GHz

E.U.T Description	American Meter Residential Gas Meter Transmitter
Type	GS0007
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical
Test Distance: 3 meters
Operating Frequency: 915.0 MHz

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Average

Freq. (MHz)	Average Amp (dBμV/m)	Average Specification (dB μV/m)	Peak. Margin (dB)
2745.00	46.3**	54.0	-7.7
3660.00	33.1*	54.0	-20.9
4575.00	40.1*	54.0	-13.9
7320.00	44.2*	54.0	-9.8
8235.00	47.3*	54.0	-6.7
9150.00	49.0*	54.0	-5.0

Figure 14. Radiated Emission. Antenna Polarization: VERTICAL. Detector: Average

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Average Amp" includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Preamplifier Gain

** Correction Factor = Antenna Factor + Cable Loss

Radiated Emission Above 1 GHz

E.U.T Description	American Meter Residential Gas Meter Transmitter
Type	GS0007
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal
Test Distance: 3 meters
Operating Frequency: 925.4 MHz

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Peak

Freq. (MHz)	Peak Amp (dBμV/m)	Peak. Specification (dB μV/m)	Peak. Margin (dB)
2776.20	52.7**	74.0	-21.3
3701.60	39.2*	74.0	-34.8
4627.00	44.5*	74.0	-29.5
7403.20	53.2*	74.0	-20.8
8328.60	54.8*	74.0	-19.2

Figure 15. Radiated Emission. Antenna Polarization: HORIZONTAL. Detector: Peak

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Peak Amp" includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Preamplifier Gain

** "Correction Factor" = Antenna Factor + Cable Loss

Radiated Emission Above 1 GHz

E.U.T Description	American Meter Residential Gas Meter Transmitter
Type	GS0007
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal
Test Distance: 3 meters
Operating Frequency: 925.4 MHz

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Average

Freq. (MHz)	Average Amp (dBμV/m)	Average Specification (dB μV/m)	Peak. Margin (dB)
2776.20	45.3**	54.0	-8.7
3701.60	31.8*	54.0	-22.2
4627.00	35.2*	54.0	-18.8
7403.20	48.3*	54.0	-5.7
8328.60	47.2*	54.0	-6.8

Figure 16. Radiated Emission. Antenna Polarization: HORIZONTAL. Detector: Average

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Average Amp" includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Preamplifier Gain

** Correction Factor = Antenna Factor + Cable Loss

Radiated Emission Above 1 GHz

E.U.T Description	American Meter Residential Gas Meter Transmitter
Type	GS0007
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical
Test Distance: 3 meters
Operating Frequency: 925.4 MHz

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Peak

Freq. (MHz)	Peak Amp (dBμV/m)	Peak. Specification (dB μV/m)	Peak. Margin (dB)
2776.20	52.8**	74.0	-21.2
3701.60	41.7*	74.0	-32.3
4627.00	46.1*	74.0	-27.9
7403.20	47.5*	74.0	-26.5
8328.60	49.3*	74.0	-24.7

Figure 17. Radiated Emission. Antenna Polarization: VERTICAL. Detector: Peak

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Peak Amp" includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Preamplifier Gain

** "Correction Factor" = Antenna Factor + Cable Loss

Radiated Emission Above 1 GHz

E.U.T Description	American Meter Residential Gas Meter Transmitter
Type	GS0007
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical
Test Distance: 3 meters
Operating Frequency: 925.4 MHz

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Average

Freq. (MHz)	Average Amp (dBμV/m)	Average Specification (dB μV/m)	Peak. Margin (dB)
2776.20	44.2**	54.0	-9.8
3701.60	32.7*	54.0	-21.3
4627.00	38.8*	54.0	-15.2
7403.20	40.0*	54.0	-14.0
8328.60	46.7*	54.0	-7.3

Figure 18. Radiated Emission. Antenna Polarization: VERTICAL. Detector: Average

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Average Amp" includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Preamplifier Gain

** Correction Factor = Antenna Factor + Cable Loss

7.3 Test Instrumentation Used, Radiated Measurements Above 1 GHz

Receiver	HP	85422E	3411A00102	February 26, 2005	1 year
RF Section	HP	85420E	3427A00103	February 26, 2005	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	ThinkJet2225	2738508357	N/A	N/A
Antenna-Log Periodic	A.H.System	SAS-200/511	253	January 24,2005	2 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	October 17, 2004	1 year
Spectrum Analyzer	HP	8592L	3926A01204	February 2, 2005	1 year

8. APPENDIX A - CORRECTION FACTORS

8.1 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3
20.0	0.6
30.0	0.8
40.0	0.9
50.0	1.1
60.0	1.2
70.0	1.3
80.0	1.4
90.0	1.6
100.0	1.7
150.0	2.0
200.0	2.3
250.0	2.7
300.0	3.1
350.0	3.4
400.0	3.7
450.0	4.0
500.0	4.3
600.0	4.7
700.0	5.3
800.0	5.9
900.0	6.3
1000.0	6.7

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
1200.0	7.3
1400.0	7.8
1600.0	8.4
1800.0	9.1
2000.0	9.9
2300.0	11.2
2600.0	12.2
2900.0	13.0

NOTES:

1. *The cable type is RG-214.*
2. *The overall length of the cable is 27 meters.*
3. *The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".*

8.2 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.2
2.0	1.6
3.0	2.0
4.0	2.4
5.0	3.0
6.0	3.4
7.0	3.8
8.0	4.2
9.0	4.6
10.0	5.0
12.0	5.8

NOTES:

1. The cable type is RG-8.

2. The overall length of the cable is 10 meters.

8.3 Correction factors for CABLE

from EMI receiver to test antenna

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.2
20.0	0.2
30.0	0.2
40.0	0.2
50.0	0.3
60.0	0.4
70.0	0.4
80.0	0.4
90.0	0.5
100.0	0.5
150.0	0.6
200.0	0.6
250.0	0.7
300.0	0.8
350.0	0.9
400.0	1.0
450.0	1.1
500.0	1.2
600.0	1.3
700.0	1.4
800.0	1.4
900.0	1.5
1000.0	1.5

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
1200.0	1.6
1400.0	1.8
1600.0	2.1
1800.0	2.2
2000.0	2.3
2300.0	2.8
2600.0	2.7
2900.0	3.1

NOTES:

1. The cable type is RG-214.

2. The overall length of the cable is 5.5 meters.

8.4 Correction factors for CABLE

from spectrum analyzer to test antenna above 2.9 GHz

FREQUENCY (GHz)	CORRECTION FACTOR (dB)	FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.9	14.0	9.1
2.0	2.7	15.0	9.5
3.0	3.5	16.0	9.9
4.0	4.2	17.0	10.2
5.0	4.9	18.0	10.4
6.0	5.5	19.0	10.7
7.0	6.0	20.0	10.9
8.0	6.5	21.0	11.2
9.0	7.0	22.0	11.6
10.0	7.5	23.0	11.9
11.0	7.9	24.0	12.3
12.0	8.3	25.0	12.6
13.0	8.7	26.0	13.0

NOTES:

1. The cable type is SUCOFLEX 104 E manufactured by SUHNER.

2. The cable is used for measurements above 2.9 GHz.

3. The overall length of the cable is 10 meters.

8.5 Correction factors for CABLE

from EMI receiver to test antenna at 10 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3
20.0	0.8
30.0	0.9
40.0	1.2
50.0	1.4
60.0	1.6
70.0	1.8
80.0	1.9
90.0	2.0
100.0	2.1
150.0	2.6
200.0	3.2
250.0	3.8
300.0	4.2
350.0	4.6
400.0	5.1
450.0	5.3
500.0	5.6
600.0	6.3
700.0	7.0
800.0	7.6
900.0	8.0
1000.0	8.7

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
1200.0	9.8
1400.0	10.0
1600.0	11.3
1800.0	12.2
2000.0	13.1
2300.0	14.5
2600.0	15.9
2900.0	16.4

NOTES:

1. The cable type is RG-214.

2. The overall length of the cable is 34 meters.

3. The above data is located in file 34M10MO.CBL on the disk marked "Radiated Emissions Tests EMI Receiver".

8.6 Correction factors for LOG PERIODIC ANTENNA

Type LPD 2010/A
at 3 and 10 meter ranges.

Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	12.5
400.0	15.4
500.0	16.1
600.0	19.2
700.0	19.4
800.0	19.9
900.0	21.2
1000.0	23.5

Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.8
400.0	15.3
500.0	15.6
600.0	18.7
700.0	19.1
800.0	20.2
900.0	21.1
1000.0	23.2

NOTES:

1. *Antenna serial number is 1038.*
2. *The above lists are located in file number 38M3O.ANT for a 3 meter range, and file number 38M100.ANT for a 10 meter range.*
3. *The files mentioned above are located on the disk marked "Radiated Emission Test EMI Receiver".*

8.7 Correction factors for LOG PERIODIC ANTENNA

Type SAS-200/511
at 3 meter range.

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
1.0	24.9
1.5	27.8
2.0	29.9
2.5	31.2
3.0	32.8
3.5	33.6
4.0	34.3
4.5	35.2
5.0	36.2
5.5	36.7
6.0	37.2
6.5	38.1

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
7.0	38.6
7.5	39.2
8.0	39.9
8.5	40.4
9.0	40.8
9.5	41.1
10.0	41.7
10.5	42.4
11.0	42.5
11.5	43.1
12.0	43.4
12.5	44.4
13.0	44.6

NOTES:

1. *Antenna serial number is 253.*
2. *The above lists are located in file number SAS3M0.ANT for a 3 meter range.*
3. *The files mentioned above are located on the disk marked "Antenna Factors".*

8.8 Correction factors for BICONICAL ANTENNA

Type BCD-235/B, at 3 meter range

FREQUENCY (MHz)	AFE (dB/m)
20.0	19.4
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11.0
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13.0
180.0	13.5
190.0	14.0
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9
310	20.7
320	21.9
330	23.4
340	25.1
350	27.0

NOTES:

1. Antenna serial number is 1041.

2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

8.9 Correction factors for BICONICAL ANTENNA

Type BCD-235/B, 10 meter range

FREQUENCY (MHz)	AFE (dB/m)
30.0	12.1
40.0	10.6
50.0	10.6
60.0	8.9
70.0	8.5
80.0	9.6
90.0	9.4
100.0	9.6
110.0	10.3
120.0	10.7
130.0	12.6
140.0	12.7
150.0	12.7
160.0	13.8
170.0	13.7
180.0	14.9
190.0	13.4
200.0	13.1
210.0	14.0
220.0	14.5
230.0	15.8
240.0	16.0
250.0	16.6
260.0	16.7
270.0	18.3
280.0	18.5
290.0	19.3
300.0	20.9

NOTES:

1. *Antenna serial number is 1041.*
2. *The above list is located in file 41BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".*

8.10 Correction factors for ACTIVE LOOP ANTENNA

Model 6502
S/N 9506-2950

FREQUENCY	Magnetic Antenna Factor	Electric Antenna Factor
(MHz)	(dB)	(dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2

8.11 Correction factors for BICONICAL ANTENNA

Type 3109,
1.0 meter range

FREQUENCY (MHz)	AFE (dB/m)
20.0	11.1
30.0	12.0
40.0	12.0
50.0	11.4
60.0	10.3
70.0	10.7
80.0	8.3
90.0	9.0
100.0	10.0
110.0	11.6
120.0	13.6
130.0	14.2
140.0	13.5
150.0	12.7
160.0	12.7
170.0	13.6
180.0	15.3
190.0	14.6
200.0	14.7
210.0	15.3
220.0	15.8
230.0	17.0
240.0	18.0
250.0	18.1
260.0	18.0
270.0	17.5
280.0	18.2
290.0	19.7
300.0	21.8

NOTES:

1. Antenna serial number is 3244.

2. The above list is located in file 44BIC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver"

8.12 Correction factors for BICONICAL ANTENNA

Type 3109,
3 meter range

FREQUENCY (MHz)	AFE (dB/m)
20.0	18.4
30.0	14.0
40.0	12.3
50.0	10.6
60.0	8.3
70.0	8.7
80.0	7.2
90.0	8.6
100.0	10.1
110.0	11.2
120.0	11.8
130.0	12.3
140.0	12.7
150.0	12.5
160.0	12.4
170.0	12.1
180.0	12.2
190.0	12.8
200.0	13.7
210.0	14.5
220.0	15.4
230.0	15.9
240.0	16.3
250.0	16.7
260.0	17.1
270.0	17.2
280.0	17.5
290.0	18.1
300.0	18.9

NOTES:

1. Antenna serial number is 3244.

2. The above list is located in file 44BIC3M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver"

9. APPENDIX A - CORRESPONDENCE

From: Sid Sanders [mailto:sid@timco.cc]
Sent: Wednesday, June 15, 2005 8:00 PM
To: Emc
Subject: RE: GS0007-Urgent

TIMCO ENGINEERING INC. TCB & FCB

849 NW State Road 45 *FCC Approvals*
Newberry, Florida 32669 *Industry Canada Approvals*
http://www.timcoengr.com *Notified Body for Europe*
888.472.2424 F 352.472.2030 email: tei@timcoengr.com

15 June 2005
Mr. David Shidlowsky
EMC Laboratory
ITL Ltd.
Kfar Bin Nun
Israel
Email: sraz@itl.co.il
SUBJECT: Sensus Metering Systems New EUT
Reference: Your email of 22 May to 15 June 2005
David,
Our opinion is that since the physical shape & we assume that the PCB layout is different & that the antenna is different that you must do the radiated emissions test on the EUT & provide internal & external photographs, label & label location and then you can add this EUT to the FCCID/Certificate by doing a Class II change with test data.
Regards,
Sid Sanders
-----Original Message-----
From: Emc [mailto:emc@itl.co.il]
Sent: Wednesday, June 15, 2005 6:13 AM
To: Sid Sanders (E-mail)
Subject: FW: GS0007-Urgent
Importance: High
Hi Sid,
1. Attached are the schematics and photos as requested. Schematics are the same for both units.
2. We need an answer A.S.A.P. as our customer needs an answer.
Thank you for your assistance.
Regards

David Shidlowsky
Technical Writer
EMC Laboratory
ITL (Product Testing) Ltd.
Kfar Bin Nun
Israel
Tel: +972-8-9797799
Fax: +972-8-9797702
Email: davids@itl.co.il/emc@itl.co.il
http://www.itl.co.il
http://www.i-spec.com

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-----Original Message-----
From: Emc
Sent: Tuesday, June 07, 2005 8:05 AM
To: 'Sid Sanders'
Cc: Shimon Zigdon (E-mail); Shmuel Hazon (E-mail)
Subject: RE: GS0007
Hi Sid;
1) Attached are photos of the GS0001 FCC certified model + GS0007, the modified, new model.
2) Please regard both products as having the same schematics.
3) Shimon, I consider your description: "same electronics" in your 31/5/05 email, as "same schematics", please verify.
Best Regards;
Shaike Raz
EMC Laboratory Manager
EMC Laboratory
ITL (Product Testing) Ltd.
Kfar Bin Nun
Israel
Tel: +972-8-979-7799
Fax: +972-8-979-7702
Email: sraz@itl.co.il/emc@itl.co.il
http://www.itl.co.il
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-----Original Message-----
From: Sid Sanders [mailto:sid@timco.cc]
Sent: Tuesday, May 31, 2005 2:04 PM
To: Emc
Subject: RE: GS0007
David,
I need more information, photos, schematics in order to answer this questions.
Regards,
Sid

-----Original Message-----
From: Emc [mailto:emc@itl.co.il]
Sent: Sunday, May 29, 2005 3:46 AM
To: Sid Sanders (E-mail)
Subject: FW: GS0007
Importance: High

Hi Sid,
Following is a request from Sensus Metering Systems for whom Timco approved several meters in the past year.
In our opinion a Permissive Change Class II is required.
Please comment/verify.
We need a reply A.S.A.P.
Regards

David Shidlowsky
Technical Writer
EMC Laboratory
ITL (Product Testing) Ltd.
Kfar Bin Nun
Israel
Tel: +972-8-9797799
Fax: +972-8-9797702
Email: davids@itl.co.il/emc@itl.co.il
http://www.itl.co.il
http://www.i-spec.com

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-----Original Message-----
From: Zigdon, Shimon [mailto:shimon.zigdon@sensus.com]
Sent: Sunday, May 22, 2005 2:50 PM
To: Emc
Subject: GS0007

Shaike Shalom,
Sensus Metering Systems certified in the last 6 months 5 transmitters for gas Automatic Meter Reading (AMR) application. Their FCC ID numbers are KCHGS0001, KCHGS0002, KCHGS0003, KCHGS0005 and KCHGS0006. These 5 transmitters have mechanical structure (plastic enclosure) that customized them to specifics gas meter models. These 5 models cover the majority of gas meters (residential and commercial) in use in the US. Nevertheless, there are number meter models that are not popular but used commercially, that are not covered by these 5 models.
To address these meters, Sensus Metering Systems adapted the transmitter KCHGS0001 for 'wall mount' installation (instead of 'on meter' installation). This 'wall mount' transmitter has the same PCB, same electronic and same plastic enclosure as the product KCHGS0001. The adaptations are as follows:

- To adapt it for 'wall mount' installation a rear, external, metallic bracket is added.
- The magnetic interface to the meter is extended by 3 wires cable.

We would like to check if these adaptations require a complete certification process, partial or none.
Regards,
Shimon