Excellence in Compliance Testing

Certification Exhibit

FCC ID: SDBR100NA

FCC Rule Part: 47 CFR Part 2.1091

ACS Project Number: 16-3084

Manufacturer: Sensus Metering Systems, Inc.
Model: R100NA

RF Exposure
Multiple Transmitters

General Information:

Applicant: Sensus Metering Systems, Inc.
Device Category: Fixed
Environment: General Population/Uncontrolled Exposure

The R100NA can be installed into the 53963437000XX host with 2 additional wireless transceivers. Transceiver 1 is a WIFI device and a second is a single cellular modem. Simultaneous transmission is possible with the WIFI (FCC ID: Z64-WL18DBMOD), and cellular radio modem (FCC ID: RI7LE910NA or RI7LE910SV) and the native R100NA Flexnet transmitter.

Technical Information:

Using RI7LE910SV cellular modem

Table 1: Technical Information

	Telit Communications LE910SV	**SDBR100NA**	**Texas Instruments WL18DBMOD**
Frequency Bands (MHz)	Band 13:777MHz-787MHz	901 to 960 MHz	2412 to 2462 MHz
	Band 4:1710.7MHz-1754.3MHz		
	Band 2:1850.7MHz-1909.3MHz		
Antenna Type(s)	Band 13: Vertical	J Pole	Vertical Dipole
	Band 4: Vertical		
	Band 2: Vertical		
Antenna Gain (dBi)	Band 13: 0.97	5.15 dBi	2.0 dBi
	Band 4: 0.68		
	Band 2: 0.68		
Conducted Power (dBm)	Band 13: 24	35.8	23.86
	Band 4: 24		
	Band2: 24		

The LE910SV cellular modem has several modulation formats the worst case was selected for each frequency band.

MPE Calculation:

The Power Density (mW/cm^2) is calculated as follows:

$$S = \frac{PG}{4\pi R^2}$$

Where:
S = power density (in appropriate units, e.g. mW/cm2)
P = power input to the antenna (in appropriate units, e.g., mW)
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 (appropriate units, e.g., cm)

Table 2: MPE Calculation (Including Collocated Devices)

Transmit Frequency (MHz)	Radio Power (dBm)	Power Density Limit (mW/cm^2)	Radio Power (mW)	Antenna Gain (dBi)	Antenna Gain (mW eq.)	Distance (cm)	Power Density (mW/cm^2)	Radio
777	24	0.52	251.19	0.96	1.247	47	0.011	A
1710.7	24	1.00	251.19	0.68	1.169	47	0.011	B
1850.7	25	1.00	316.23	0.68	1.169	47	0.013	C
2412	23.86	1.00	243.22	2	1.585	47	0.014	D
901	35.8	0.60	3801.89	5.15	3.273	47	0.448	E

Summation of MPE ratios – Simultaneous Transmissions

This device contains multiple transmitters which can operate simultaneously; therefore the maximum RF exposure is determined by the summation of MPE ratios. The limit is such that the summation of MPE ratios is ≤ 1.0.

Table 3: Summation of MPE Ratios

	Scenario 1	Scenario 2	Scenario 3
Radio A (Telit Band 13)	x		
Radio B (Telit Band 4)		x	
Radio C (Telit Band 2)			x
Radio D (WIFI)	x	x	x
Radio E(R100NA)	x	x	x
Radio A MPE Ratio	0.021790373		
Radio B MPE Ratio		0.01058265	
Radio C MPE Ratio			0.013322767
Radio D MPE Ratio	0.013886552	0.013886552	0.013886552
Radio E MPE Ratio	0.746381538	0.746381538	0.746381538
MPE Ratio Summation:	0.782058462	0.770850739	0.773590856

Using RI7LE910NA cellular modem

Table 4: Technical Information

	Telit Communications, S.p.A. LTE modem Model LE910-NA FCC ID: RI7LE910NA	**SDBR100NA**	**Texas Instruments WL18DBMOD**
Frequency Bands (MHz) & Conducted Power (dBm)	LTE Band 17: 706.5 MHz - 713.5 MHz Conducted Power = 25.00 dBm	901 to 960 MHz Conducted Power = 35.8 dBm	2412 to 2462 MHz Conducted Power = 23.86 dBm
	UMTS/HSPA: 826.4 MHz – 846.6 MHZ Conducted Power = 25.00 dBm		
	LTE Band 5: 826.5 MHz – 846.5 MHz Conducted Power = 25.00 dBm		
	GSM 850: 824.2MHz-848.2MHz Conducted Power = 33.5dBm		
	LTE Band 4: 1712.5 MHz – 1752.5 MHz Conducted Power = 25.00 dBm		
	UMTS/HSPA: 1852.4 MHz – 1907.6 MHz Conducted Power = 25.00 dBm		
	LTE Band 2: 1852.5 MHz – 1907.5 MHz Conducted Power = 25.00 dBm		
	GSM 1900: 1850.2 MHz – 1909.8 MHz Conducted Power = 30.50 dBm		
Antenna Type(s)	SanteFe SFT-LTE-002	J Pole	Vertical Dipole
Antenna Gain (dBi)	700MHz Band = 0.97	5.15 dBi	2. dBi
	800MHz Band = 0.97		
	1700MHz Band = 0.68		
	1900MHz Band = 0.68		

MPE Calculation:

The Power Density (mW/cm^2) is calculated as follows:

$$S = \frac{PG}{4\pi R^2}$$

Where:
S = power density (in appropriate units, e.g. mW/cm2)
P = power input to the antenna (in appropriate units, e.g., mW)
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 (appropriate units, e.g., cm)

Table 5: MPE Calculation (Including Collocated Devices)

Transmit Frequency (MHz)	Radio Power (dBm)	Power Density Limit (mW/cm^2)	Radio Power (mW)	Antenna Gain (dBi)	Antenna Gain (mW eq.)	Distance (cm)	Power Density (mW/cm^2)	Radio
706.5*	25	0.47	316.23	0.96	1.247	47	0.014	A
824.2*	33.5	0.55	559.68**	0.96	1.247	47	0.025	B
1712.5*	25	1.00	316.23	0.68	1.169	47	0.013	C
1850.2*	25	1.00	316.23	0.68	1.169	47	0.013	D
2412	23.86	1.00	243.22	2	1.585	47	0.014	E
901	35.8	0.60	3801.89	5.15	3.273	47	0.448	F

*The Telit RF Exposure report filed with FCC ID RI7LE910NA was used to determine the worst case for each frequency band.
**Peak output power for GSM850 is 33.5 dBm with a 25% duty cycle. 559.68 mW is the source-based time-averaging power.

Summation of MPE ratios – Simultaneous Transmissions

This device contains multiple transmitters which can operate simultaneously; therefore the maximum RF exposure is determined by the summation of MPE ratios. The limit is such that the summation of MPE ratios is ≤ 1.0.

Table 6: Summation of MPE Ratios

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Radio A (Telit LTE Band 17)	x			
Radio B (Telit GSM850)		x		
Radio C (Telit LTE Band 4)			x	
Radio D (Telit LTE Band 2)				x
Radio E (WIFI)	x	x	x	x
Radio F (R100NA)	x	x	x	x
Radio A MPE Ratio	0.030169875			
Radio B MPE Ratio		0.045771259		
Radio C MPE Ratio			0.013322767	
Radio D MPE Ratio				0.013322767
Radio E MPE Ratio	0.013886552	0.013886552	0.013886552	0.013886552
Radio F MPE Ratio	0.746381538	0.746381538	0.746381538	0.746381538
MPE Ratio Summation:	0.790437965	0.806039348	0.773590856	0.773590856