



Certification Exhibit

FCC ID: SDBR100NA

FCC Rule Part: 47 CFR Part 2.1091

TÜV SÜD Project Number: 72159520

Manufacturer: Sensus USA, Inc.
Model: **R100NA (with Amphenol antenna)**

RF Exposure Multiple Transmitters

General Information:

Applicant: Sensus USA, 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. This document covers the present model combined with the Amphenol antenna.

The high-gain antenna for the R100NA is only applicable with the unit operated in the base station / fixed frequency bands of operation (930-931 MHz, 940-941 MHz, 941-941.5 MHz, 952-953 MHz and 959.85-960 MHz).

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	Panel Antenna	Vertical Dipole
	Band 4: Vertical		
	Band 2: Vertical		
Antenna Gain (dBi)	Band 13: 0.97	20.1	2.0
	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/cm²) 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	228	0.000	A
1710.7	24	1.00	251.19	0.68	1.169	228	0.000	B
1850.7	24	1.00	251.19	0.68	1.169	228	0.000	C
2412	23.86	1.00	243.22	2	1.585	228	0.001	D
901	35.8	0.60	3801.89	20.1	102.329	228	0.596	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	0.000925957		
Radio B MPE Ratio		0.000449697	
Radio C MPE Ratio			0.000449697
Radio D MPE Ratio	0.000590093	0.000590093	0.000590093
Radio E MPE Ratio	0.991486739	0.991486739	0.991486739
MPE Ratio Summation:	0.993002789	0.99252653	0.99252653

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		
	SanteFe SFT-LTE-002		
Antenna Gain (dBi)	700MHz Band = 0.97	20.1	2.0
	800MHz Band = 0.97		
	1700MHz Band = 0.68		
	1900MHz Band = 0.68		

MPE Calculation:

The Power Density (mW/cm²) 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	228	0.001	A
824.2	33.5	0.55	559.68	0.96	1.247	228	0.001	B
1712.5	25	1.00	316.23	0.68	1.169	228	0.001	C
1850.2	25	1.00	316.23	0.68	1.169	228	0.001	D
2412	23.86	1.00	243.22	2	1.585	228	0.001	E
901	35.8	0.60	3801.89	20.1	102.329	228	0.596	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	0.001282034			
Radio B MPE Ratio		0.001944997		
Radio C MPE Ratio			0.000566136	
Radio D MPE Ratio				0.000566136
Radio E MPE Ratio	0.000590093	0.000590093	0.000590093	0.000590093
Radio F MPE Ratio	0.991486739	0.991486739	0.991486739	0.991486739
MPE Ratio Summation:	0.993358866	0.994021829	0.992642968	0.992642968