FCC Part 15.247 Certification
Test Report

FCC ID: R7PIWRS3

FCC Rule Part: 15.247

ACS Report Number: 04-0264-15C

Manufacturer: Cellnet Technology, Inc.
Equipment Type: Utility Meter Usage Data Transceiver
Model: IWR with Utilinet DC Radio

Theory of Operation

Operational Description

FCC ID: R7PIWRS3
ORGANIZATION: CellNet Technology, Inc.

The EUT is a data radio used in the Utility industry for controls and automatic meter reading.

1.1 Section 15.203

This device must be professionally installed.

a.) It is sold to utility companies for the purpose of automating the control of remote devices (relays, capacitor banks, etc.) and for collecting data from remote devices such as meters.
b.) The installation must be done by professionals adhering to the guidelines established in the device manual.
c.) This device is marketed through advertising in Utility industry literature, company presence at Utility trade shows, and through partnerships with distributors and other companies who do business in the Utility and related industries.

1.2 Section 15.204

The Antennas to be used with this device are specified in the Manual.

1.3 Section 15.247(a)

This device operates within the 902 to 928 MHz band. In order to comply with band-edge requirements, channel center-frequencies are spaced 100 KHz apart from 902.1 to 927.9[MHz]. The radio firmware is written such that 259 channels can be used. Certain channels can be blocked by way of radio configuration, but the firmware requires at least 50 channels be used. The 20 dB bandwidth is nominally 50 kHz. Independent of configuration, each transmitter uses each frequency and equal amount of time on average.

The firmware uses a pseudo-random hopping sequence among the channels that are selected. Many such sequences are used so that adjacent networks can exist without interfering with one another. Cellnet assigns sequence numbers with a unique number provided to each customer.

1.4 Time of Occupancy

The UtiliNet radio firmware prohibits transmission on any one frequency from exceeding 0.4 Sec within a 20 second period. In the absence of any transmission, receivers hop frequencies every 700 mS.

1.5 Pseudorandom Frequency Hopping Sequence

The UtiliNet radio firmware computes a number of pseudo-random hopping sequences. For a given network of radios, the hopping sequence is the same for every radio. Other networks of radios (which might be operating nearby) can use a different hopping sequence. The firmware determines which sequence to use based on a fixed configuration parameter. CellNet assigns these parameters, with a unique number given to each customer.

The following table lists the hopping sequence for channels between 905 and 925 MHz using the factory-default fixed-configuration parameter of 670[H]. The frequencies are used in order from lowest “slot” number to highest “slot” number.

Slot	Frequency	Slot	Frequency	Slot	Frequency	Slot	Frequency	Slot	Frequency
211	905.000	178	910.000	56	915.000	60	920.000	231	925.000
15	905.100	212	910.100	237	915.100	150	920.100		
230	905.200	21	910.200	91	915.200	57	920.200		
133	905.300	109	910.300	159	915.300	135	920.300		
124	905.400	61	910.400	187	915.400	215	920.400		
192	905.500	11	910.500	16	915.500	203	920.500		
185	905.600	90	910.600	123	915.600	74	920.600		
80	905.700	193	910.700	50	915.700	29	920.700		
32	905.800	216	910.800	179	915.800	134	920.800		
201	905.900	93	910.900	117	915.900	52	920.900		
238	906.000	105	911.000	229	916.000	236	921.000		
43	906.100	204	911.100	14	916.100	139	921.100		
49	906.200	152	911.200	40	916.200	221	921.200		
189	906.300	197	911.300	165	916.300	45	921.300		
118	906.400	176	911.400	5	916.400	129	921.400		
169	906.500	145	911.500	213	916.500	227	921.500		
188	906.600	54	911.600	30	916.600	75	921.600		
13	906.700	194	911.700	132	916.700	184	921.700		
199	906.800	7	911.800	114	916.800	81	921.800		
110	906.900	85	911.900	82	916.900	154	921.900		
92	907.000	73	912.000	67	917.000	115	922.000		
44	907.100	218	912.100	31	917.100	162	922.100		
157	907.200	8	912.200	175	917.200	17	922.200		
84	907.300	51	912.300	191	917.300	147	922.300		
71	907.400	70	912.400	225	917.400	232	922.400		
98	907.500	146	912.500	100	917.500	10	922.500		
72	907.600	63	912.600	234	917.600	182	922.600		
151	907.700	209	912.700	94	917.700	200	922.700		
27	907.800	62	912.800	86	917.800	69	922.800		
77	907.900	173	912.900	35	917.900	33	922.900		
214	908.000	87	913.000	206	918.000	103	923.000		
0	908.100	208	913.100	25	918.100	102	923.100		
116	908.200	205	913.200	24	918.200	96	923.200		
79	908.300	41	913.300	38	918.300	183	923.300		
48	908.400	2	913.400	76	918.400	195	923.400		
64	908.500	220	913.500	177	918.500	233	923.500		
104	908.600	226	913.600	78	918.600	155	923.600		
99	908.700	108	913.700	106	918.700	163	923.700		
58	908.800	131	913.800	46	918.800	6	923.800		
111	908.900	224	913.900	138	918.900	141	923.900		
65	909.000	3	914.000	136	919.000	140	924.000		
39	909.100	167	914.100	217	919.100	120	924.100		
23	909.200	153	914.200	164	919.200	158	924.200		
130	909.300	168	914.300	22	919.300	228	924.300		
37	909.400	42	914.400	137	919.400	20	924.400		
207	909.500	235	914.500	55	919.500	170	924.500		
174	909.600	59	914.600	18	919.600	186	924.600		
88	909.700	47	914.700	181	919.700	222	924.700		
53	909.800	113	914.800	112	919.800	143	924.800		
180	909.900	144	914.900	127	919.900	4	924.900		

1.6 Equal Hopping Frequency Use

With 50 channels minimum, and a receiver hopping rate of 700 mS, it takes more than 20 seconds to cycle through the hopping sequence. Channel hopping is continuous – not just triggered by transmissions. Data is transmitted in short packets – each limited to 400 mS of transmit time. Data transmissions do not occur continuously, but as needed by network data traffic and are thus asynchronous to the hopping process. By this method it is guaranteed that:

1. Time spent on each channel is equal
2. Transmissions cannot exceed 400 mS
3. Every channel is used an equal amount of time.

1.7 System Receiver Input Bandwidth

The receiver input bandwidth is limited by a SAW filter inside the TAU RF hybrid. It is labeled as FL4 on the block diagram and has a bandwidth of 40 KHz.

1.8 De Facto EIRP Limit

The max conducted power is +30 dBm. Customers can choose to field-configure the conducted power to levels less that 30[dBm]. Factory calibration of each unit guarantees that max conducted power cannot exceed +30[dBm] under any conditions. An industry-standard antenna connection is used on this product allowing customers to use many different antennas. The manual serves as a guide for the professional installers and instructs that the configured conducted power level, in conjunction with the antenna gain, cannot produce an EIRP in excess of +36[dBm].

1.9 Point-to-Point Operation

This relaxation is not used.

1.10 RF Exposure Compliance Requirements

See the manuals.

1.11 Installation / Operation Manual Requirements

See the manuals.

1.12 Section 15.247(g)

The radio's firmware is written such that frequency-hopping occurs even in the absence of transmissions. When a transmitter is presented with a continuous stream of data, that data is broken into multiple packets which are transmitted in succession while hopping occurs. The transmitter moves through the hopping sequence following it's receiver. At each frequency, the transmitter will not transmit for more than 400[mS]. Every channel is used, and every channel is used an equal amount of time on average.

1.13 Section 15.247(h)

This device does <u>not</u> have the ability to alter the hopping sequence in order to avoid simultaneous occupancy of a channel by multiple transmitters. In such cases, interference occurs and communication is potentially lost.