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MEASUREMENT REPORT
OF THE
M90 TWO WAY PAGER
FOR

Occupied Bandwidth:
FCC Part 2.1033(c)(14)/2.1049(h)/24.133

Frequency Stability vs. Temperature:
FCC Part 2.1033(c)(14)/2.1055/24.135

Frequency Stability vs. Supply Voltage:
FCC Part 2.1033(c)(14)/2.1055/24.135

Results: Passed

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Occupied Bandwidth:
FCC Part 2.1033(c)(14)/2.1049(i)/24.133

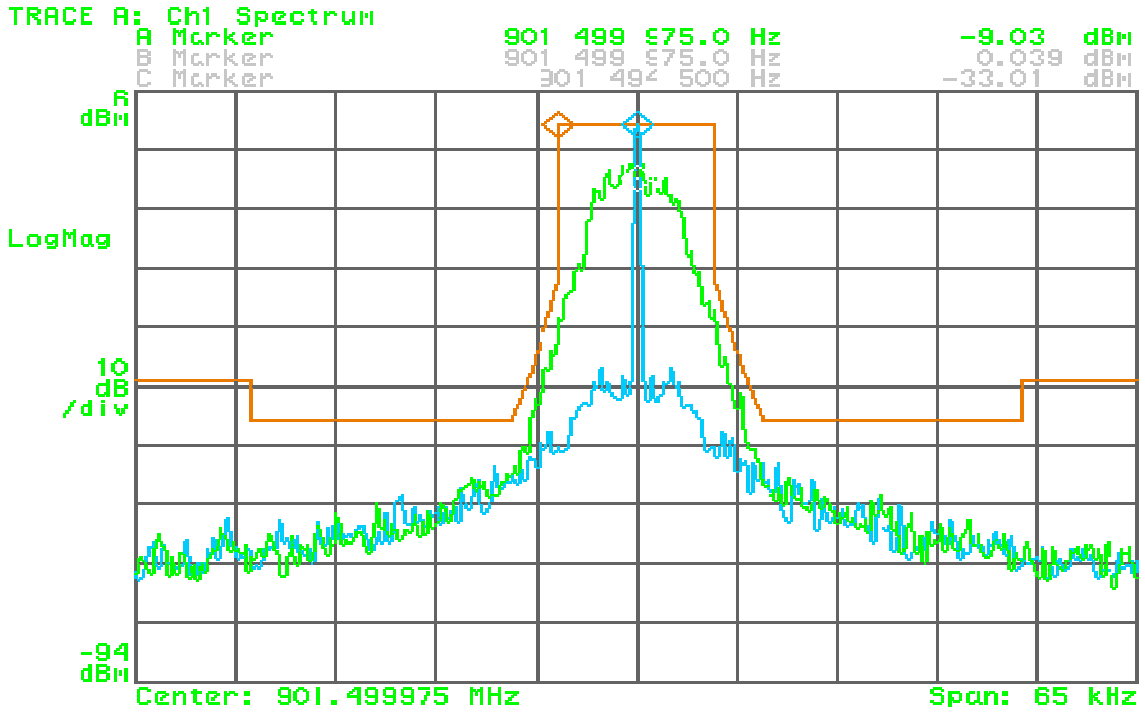
Test Conditions

The M90 device was placed inside the TEM cell and the TEM cell's port was connected to the vector signal analyzer (VSA) via an attenuator. The M90 device was communicating with a PC via its serial port. The VSA was configured as a spectrum analyzer with a resolution bandwidth of 300 Hz and a span of 65 kHz. All spectrum analyzer measurements were made using the continuous peak detector function. The spectrum analyzer reference level (and top of FCC mask) was set to the un-modulated (carrier only) peak power level. The carrier only tone at 901.5MHz was generated by a special test routine on the device. This reference trace was stored in the memory of the spectrum analyzer. Next, internal test code was started in the device that continuously modulates the transmitter with 9600 bps pseudo-random data which was found to be the worse cause data rate for occupied BW. An overlay of the carrier-only spectrum (blue), the modulated spectrum (green), and the FCC mask (brown) are plotted from the spectrum analyzer and shown below.

List of Test Equipment

1. Vector Signal Analyzer, Hewlett Packard, Model No. 89441A, S/N 3416A00985.
2. TEM cell, TESCOM, Model TC-5060B, S/N 5060B140094.
3. 50BR -017, Attenuator, S/N 1623749529.

Results: PASSED mask as shown below.



M90 Device MSN:UGBC5Z224J

Frequency Stability vs. Temperature: FCC Part 2.1033(c)(14)/2.1055/24.135

Test Conditions

As described in the theory of operation, the M90 transmitter is frequency locked to the highly accurate GPS reference located in the Base Station via the M90's receiver's automatic frequency control AFC. A universal pager tester TC-2000A was used to emulate the Base Station. The M90 device was placed inside a temperature test chamber with an external power supply. The M90 device was communicating wirelessly with the TC-2000A with the M90's transmit frequency at 901.5MHz. The TC-2000A would send messages to the M90 and an ACK (acknowledgement) message, which is a representative of all transmissions from the M90 device, was sent back in reply to the TC-2000A over the temperatures between –30 and +50°C in 10°C steps. The M90 carrier frequency offset was measured by the TC-2000A and is reported below. A programmable power supply was set to 3.8V and was turned on and off at each 10 degree increment to ensure a full reacquisition (worst case) in the AFC would occur. The M90 device has an internal temperature sensor and shuts off all transmission at below -5 degree C to save battery life. Ten frequency error readings were done at each temperature and the worst case error found is shown below.

List of Test Equipment

1. Temperature Test Chamber, Tenney Environmental, Model No. TUJR, S/N 27503-04.
2. Universal Pager Tester TC-2000A, TESCOM, S/N2000A080037.
3. Power Supply, Hewlett Packard, Model No. E3631A, S/N KR64306064.
4. 34401A Multimeter S/N US36125720
5. 80TK Fluke Thermocouple Module
6. HP8561E Spectrum Analyzer S/N 3738A02089

Results: PASSED the 1 ppm requirement as shown below.

Temperature (°C)	Carrier offset (Hz)	Carrier offset (ppm)
-30	No transmission	No transmission
-20	No transmission	No transmission
-10	No transmission	No transmission
0.0	39	0.043
10	37	0.041
20	-33	-0.037
30	39	0.043
40	31	0.034
50	27	0.030

M90 Device MSN: UGBC5Z2245

Frequency Stability vs. Supply Voltage: FCC Part 2.1033(c)(14)/2.1055/24.135

Test Conditions

As described in the theory of operation, the M90 transmitter is frequency locked to the highly accurate GPS reference located in the Base Station via the M90's receiver's automatic frequency control AFC. A universal pager tester TC-2000A was used to emulate the Base Station. The M90 device's battery was replaced with a variable power supply. The M90 device was communicating wirelessly with the TC-2000A with the M90's transmit frequency at 901.5MHz. The TC-2000A would send messages to the M90 and an ACK (acknowledgement) message, which is a representative of all transmissions from the M90 device, was sent back in reply to the TC-2000A . The M90 device was at room temperature (23 degree C). The M90 carrier frequency offset was measured by the TC-2000A for the maximum (4.2V) and minimum (3.5V) battery voltages and is reported below. Ten frequency error readings were done for each of the two battery voltages and the worst case error found for each case is shown below.

List of Test Equipment

1. Universal Pager Tester TC-2000A, TESCOM, S/N2000A080037.
2. Power Supply, Hewlett Packard, Model No. E3631A, S/N KR64306064.
3. 34401A Multimeter S/N US36125720
4. HP8561E Spectrum Analyzer S/N 3738A02089

Results: PASSED the 1 ppm requirement as shown below.

Battery Voltage (V)	Carrier offset (Hz)	Carrier offset (ppm)
Minimum, 3.5V	38	0.042
Maximum, 4.2V	39	0.043

M90 Device MSN: UGBC5Z2245