

| <u>APPLICANT</u>   | <u>Manufacturer</u>  |
|--|--|
| Knogo North America<br>350 Wireless Boulevard<br>Hauppauge, NY 11788 | North American Technical Services<br>30 Northport Road<br>Sound Beach, NY 11789-1734 |

TEST SPECIFICATION: FCC Rules and Regulations Part 15, Subpart C

TEST SAMPLE DESCRIPTION

BRANDNAME: Knogo

MODEL: 8MWDD FCC ID:

TYPE: Swept RF Transmitter

FREQUENCY RANGE: 7.9 - 8.9 MHz

POWER REQUIREMENTS: 18VAC derived from 115VAC, 60 Hz AC Adapter

TESTS PERFORMED

- 15.207(a) Conducted Emissions
- 15.223(a) Radiated Emissions, Fundamental
- 15.223(a) Occupied Bandwidth
- 15.223(b) Radiated Emissions, Spurious

## REPORT OF MEASUREMENTS

Applicant: Knogo North America

Device: Swept RF Transmitter

FCC ID:

Power Requirements: 18VAC derived from 115VAC, 60Hz AC Adapter

Applicable Rule Section: Part 15, Subpart C, Section 15.223

## TEST RESULTS

15.207(a): The radio frequency voltage that was conducted back on to the AC power line on any frequency/frequencies within the bandwidth of 450kHz to 30MHz did not exceed 250 microvolts.

15.223(a): Field strength of emissions from the intentional radiator operating in the 1.705 - 10 MHz frequency band did not exceed 100 uV/m average for the fundamental. The 6dB bandwidth of the emission was greater than 10% of the center frequency.

15.223(b): Field strength of emissions outside of the band 1.705 - 10 MHz did not exceed the general radiated emissions limits of 15.209.

## GENERAL NOTES

1. All user accessible controls were adjusted to produce maximum emissions.
2. Measurements of conducted emissions were performed utilizing a 50 ohm/50 $\mu$ henry Line Impedance Stabilization Network (LISN).
3. The unit sweeps between 7.9 - 8.9 MHz.
4. The frequency range was scanned from 1.705 MHz to 1 GHz. All emissions not reported were more than 20dB below the specified limit.

## MODIFICATIONS

Customer added Fair Rite brand Ferrite to the EUT, Model Number 0431164281, between the transmitter and the antenna, closest to transmitter.

## DETERMINATION OF DUTY CYCLE

The unit's RF output was directly coupled to the input of the spectrum analyzer. The analyzer was set for a frequency span of 0Hz. The sweep time was then adjusted in order to display one full pulse train. The transmitter on time was then summed and compared to the time for one full cycle in order to obtain the duty cycle. ( See plots for additional information)

|                        |   |   |
|------------------------|---|---|
| Transmitter On Time    | = | 56 microseconds (maximum- worst case in 100 ms) |
| Transmitter Cycle Time | = | 16.67 milliseconds                              |
| Transmitter Duty Cycle | = | 0.336 %   |

## SPECTRUM ANALYZER DESENSITIZATION CONSIDERATIONS

Due to the nature of the emissions being measured, care was taken to ensure that the resolution bandwidth of the spectrum analyzer was adequate to provide accurate measurements. The following formula was utilized:

Setting pulse desensitization equal to zero and utilizing the minimum observed pulse width of 7.0 $\mu$ s yields a minimum required bandwidth of 104,657 Hz. FCC specified bandwidths of 10 kHz below 30 MHz and 100kHz and 1MHz were utilized below and above 1GHz, respectively. For measurements below 30 MHz a pulsedwidth desensitization factor of -19.6 dB was applied, derived from the following formula:

$$P[\text{dB}] = 20 \log (\text{pulse width} \times \text{bandwidth} \times 1.5)$$

Where pulse width = 7.0 microseconds and bandwidth = 10 kHz

$$P[\text{dB}] = -19.6 \text{ dB}$$

EXHIBIT 4

Radiated Emissions

Para. 15.223(a)

Para. 15.223(b)

(Please see separate e-file attachment named ReFund.pdf and RESpur.pdf)

EXHIBIT 4

Occupied Bandwidth

Para. 15.223(b)

(Please see separate e-file attachment named OccBw.pdf)

EXHIBIT 4

Conducted Emissions

Para. 15.107(a)

(Please see separate e-file attachment named CeData.pdf)

## EQUIPMENT LISTS

### FCC 15.207(a) Conducted Emissions, 450kHz-30MHz

| <b>EN</b> | <b>Type</b>       | <b>Manufacturer</b> | <b>Description</b> | <b>Model No.</b> | <b>Cal Date</b> | <b>Due Date</b> |
|-----------|-------------------|---------------------|--------------------|------------------|-----------------|-----------------|
| 078       | LISN              | Solar Electronics   | 10 kHz - 30 MHz    | 8028-50-TS24BNC  | 04/27/2000      | 04/27/2001      |
| 202       | Transient Limiter | Hewlett Packard     | .009 MHz - 200 MHz | 11947A           | 07/24/2000      | 07/24/2001      |
| 231A      | Graphics Plotter  | Hewlett Packard     | N/A                | 7440A            | 08/03/2000      | 08/03/2001      |
| 513       | LISN              | Solar Electronics   | 10 kHz - 30 MHz    | 8028-50-TS24BNC  | 04/27/2000      | 04/27/2001      |
| 544       | EMC Analyzer      | Hewlett Packard     | 9.0 kHz - 1.8 GHz  | 8591EM           | 08/25/1999      | 09/25/2000      |

### FCC 15.223(a) Fundamental Frequency, 1.705-10MHz

| <b>EN</b> | <b>Type</b>          | <b>Manufacturer</b> | <b>Description</b> | <b>Model No.</b> | <b>Cal Date</b> | <b>Due Date</b> |
|-----------|----------------------|---------------------|--------------------|------------------|-----------------|-----------------|
| 012       | Loop Antenna, Active | EMCO                | 9 kHz - 30 MHz     | 6502             | 10/04/1999      | 10/04/2000      |
| 067       | Open Area Test Site  | Retlif              | 3 Meter            | RNY              | 10/15/1997      | 10/15/2000      |
| 141       | Spectrum Analyzer    | Hewlett Packard     | 100 Hz - 40 GHz    | 8566B            | 08/03/2000      | 02/03/2001      |
| 141A      | Graphics Plotter     | Hewlett Packard     | N/A                | 7470A            | 03/08/2000      | 03/08/2001      |
| 141B      | Quasi-Peak Adaptor   | Hewlett Packard     | 100 Hz - 1 GHz     | 85650A           | 08/02/2000      | 02/02/2001      |

### FCC15.209(a) Spurious Radiated Emissions, 1.705-1000MHz

| <b>EN</b> | <b>Type</b>             | <b>Manufacturer</b> | <b>Description</b>   | <b>Model No.</b> | <b>Cal Date</b> | <b>Due Date</b> |
|-----------|-------------------------|---------------------|----------------------|------------------|-----------------|-----------------|
| 012       | Loop Antenna, Active    | EMCO                | 9 kHz - 30 MHz       | 6502             | 10/04/1999      | 10/04/2000      |
| 067       | Open Area Test Site     | Retlif              | 3 Meter              | RNY              | 10/15/1997      | 10/15/2000      |
| 133       | Broadband Pre-Amplifier | Electro-Metrics     | 10 kHz - 1 GHz, 26dB | BPA-1000         | 06/13/2000      | 06/13/2001      |
| 141A      | Graphics Plotter        | Hewlett Packard     | N/A                  | 7470A            | 03/08/2000      | 03/08/2001      |
| 206B      | 6.0 dB Attenuator       | Texscan             | 0 - 1.0 GHz          | FP-50 - 6 dB     | 06/13/2000      | 06/13/2001      |
| 523       | Biconilog               | Electro-Mechanics   | 26 - 2000 MHz        | 3142B            | 06/08/2000      | 06/08/2001      |
| 544       | EMC Analyzer            | Hewlett Packard     | 9.0 kHz - 1.8 GHz    | 8591EM           | 08/25/1999      | 09/25/2000      |
| 617       | Interference Analyzer   | Electro-Metrics     | 10 kHz - 1 GHz       | EMC-30           | 01/17/2000      | 01/17/2001      |