CPRC
CANADIAN POLICE RESEARCH CENTRE

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CENTRE CANADIEN DE RECHERCHES POLICIERES

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Radiation Measurements on Police Traffic Radar Speed Detectors

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TECHNICAL MEMORANDUM

Submitted by
MPB Technologies Inc.

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NOTE: Further information about this report can be obtained by calling the CPRC information number (613) 998-6343

Executive Summary

The safe use of police traffic radar units has raised a number of questions in the community. As a result, the Ottawa Police approached the Canadian company MPB Technologies to do a study on “Radiation Measurements on the Police Traffic Radar Speed Detectors”. All submitted units were well within Canada’s National Health and Welfare, “Safety Code-6” designation.

Note 1 Actual measurement data sheets are not included in this report but will be supplied on request.

Note 2 : The following sections are not included, Section 3 - Calibration Certificates, Appendix A - Power Density Table, Appendix B - Radiation Patterns, Appendix C - Test Equipment Report.

Note 3 : Appendix D - Bibliography is included.

Customer No.: 70670 MPBT No.: 1126

Test Report for Radiation Measurements on the Police Traffic Radar Speed Detectors

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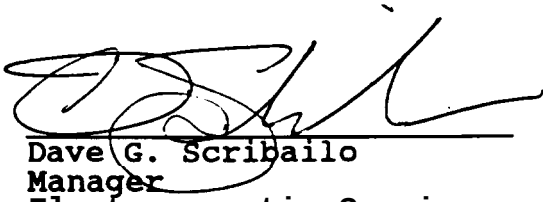

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1.0 SUMMARY OF RADAR MEASUREMENTS

SUMMARY

The Safety Code - 6 of National Health and Welfare states that the "General Public (those individuals that are not microwave radiation workers) shall not be exposed to power density levels greater than one (1) mW/cm^2 averaged over a one-minute period in the range of frequencies between 10 MHz and 300 GHz.

Units #30 (13299) and #28 (13301) operate on CW (continuous wave) and are well below the one (1) mW/cm^2.

The remaining units operate on a 40% duty cycle. The radiated power would be 40% of the measured value with a possible error of +20% -17%.

All units passed, with #12 (6659) being borderline at two (2) inches.

ie: 2.14 mW/cm^2 . 40% . 120% = 1.0 mW

2.0 RADAR MEASUREMENTS

OTTAWA POLICE RADAR SPEED DETECTORS

The radiation levels at 10.524 GHz were checked at two (2) and six (6) inches from the horn cover.

A small linear horn (2.5 cm x 2.25 cm mouth) was used to receive the radiated energy. The Horn was first calibrated, using an HP8510 Network Analyzer. With the three-antenna system, the gain of the Horn measured 9 dB. The expected power from the Horn in a 1-mW/cm^2 field was determined by the formula:

$$Pr = \frac{F \cdot G \cdot \lambda^2}{4\pi}$$

Pr = Power Received

F = Field mW/cm^2 at the Horn focus

G = Gain of Horn

λ = Wavelength at 10.524 GHz

ie: $$Pr = \frac{1\ mW/cm^2 \times 9 \times (2.849cm)^2}{4\pi} = 5.8\ mW$$

A calibrated source of 10.524 GHz was set to 5.8 mW and fed into a receiver. The Receiver signal was noted and compared to the signals from the Horn when the Horn was placed two (2) and six (6) inches from the radars. Since the radars transmit circular polarized signals, the vertical and horizontal signal from the Horn were added. The results and shown in Table 1.

Note 1:

For measurements, all radars were set to CW operation. If the radars are modulated OFF and ON, the average radiation power will be reduced in the same ratio as of the ON and OFF time.

Note 2:

The overall -accuracy of the measurement was + 0.8 dB or +20% -17%.

Note 3:

Some radiation patterns have been included for general information.

BIBLIOGRAPHY

NBS: **Technical Note 1319, "Generation of Standard Electromagnetic Fields in a TEM Cell". Ref: Kank+, M.; Orr, R. David**

NRCC: **"Measurement of Antenna Factors with a TEM cell", Ref: Kashyap, S.C.**

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IEEE 3024969 **"The Institute of Electrical & Electronic Engineers", sect. 2.2.2.3**

NBS: **Technical Note 1309, 1987 "Calibration Procedures for Horizontal Dipole Antennas (25 to loo0 MHZ)", Ref: CamelI, D.G.;Larsen, E.B.; Cruz, J E.**

ANSI C63.5: **"American National Standards for Electromagnetic Compatibility, . Radiated Emission Measurement in EMI, Calibration of Antennas", 1988**

SAE-ARP 958: **"Broadband Electromagnetic Interference Measurement Antennas; Standard Calibration Requirements & Methods**

SAFETY CODE - 6 **"Reccommended Safety Procedures for the Installation and Use of Radiofrequency & Microwave Devices in the Frequency Range 100 MHz - 300 GHz", Environmental Health Directorate, Health Protection Branch, 1979**