MR 2178

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DATE: 1976

TITLE: Microwave leakage indication.

SOURCE: J Micwv Powr 11(2):156-57

MAIN SUBJECT HEADING:

(AN)	HU	AT	IH	M
ANALYTICS	HUMAN EFFECTS	ANIMAL TOXICITY	WORKPLACE PRACTICES-ENGINEERING CONTROLS	MISCELLANEOUS

SECONDARY SUBJECT HEADINGS: AN HU AT IH M

Physical/Chemical Properties

Review

Animal Toxicology

Non-occupational Human Exposure

Occupational Exposure

Epidemiology

Standards

Manufacturing

Uses

Reactions

Sampling/Analytical Methods

Reported Ambient Levels

Measured Methods

Work Practices

Engineering Controls

Biological Monitoring

Methods of Analysis

Treatment

Transportation/Handling/Storage/Labelling probe consists of three mutually perpendicular coils. Each coil, having a diameter of 9 cm and consisting of two turns. The natural resonance of each turn is well above the frequency range of interest and each coil is resonated slightly below the frequency range of interest with a small lumped capacitance. The coils are each terminated in a thin film thermocouple element having a resistance between thirty and fifty ohms. Very high resistance monolithic leads connect the outputs of the elements to a well shielded preamp. Connections are then made to the metering instrument. The RF induced currents dissipate power and heat the resistive thermocouple hot junctions thereby providing a d.c. output voltage proportional to the square of the RF induced current. The probe makes use of a high resistance film to provide a shield of static changes, and a preamp in the handle which eliminates cable modulation from degrading the performance.

Calibration of the probe is accomplished using TEM cells developed at NBS. These cells are also used to confirm that the response of the probes is to the magnetic field, through use of short circuit termination on the cells producing high VSWR's where intense E or H fields can be predicted.

A complementry probe functions with the same metering instrumentation to monitor electromagnetic fields from 300 MHZ to 18 GHz. This probe responds to the E field, is isotropic and has a frequency sensitivity of ±0.5 dB from 1 to 12 GHz and +0.5 to 3 dB over the total range.

(Narda Microwave Corporation, Plainview, N.Y. 11803.)

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4A.4

MICROWAVE LEAKAGE INDICATION

S. C. Kashyap, J. Y. Wong and J. G. Dunn (Canada)

This paper describes two systems for automatic indication of maximum microwave leakage level along any point on a radiating slot. Efforts are concentrated on the indication of leakage beyond 1 mW/cm^2. Results of experiments on a recent model of a microwave oven and a waveguide radiating slot are presented.

Microwave ovens are finding greater acceptance for cooking and re-heating foods in homes as well as hospitals, restaurants, etc. Better door seals and introduction of additional features like defrosting have been helpful in increasing their popularity. However, the microwave ovens still lack an important feature—that of being able to automatically indicate if the microwave leakage at any point around the oven door exceeds permissible levels.

Radiation monitors of various kinds are presently available in the market to check leakage levels around microwave oven doors as well as industrial equipment. Most of these are quite expensive and use one or a number of RF detectors and a meter. Some microwave power density meters using liquid crystals have also been developed recently. However, all the present microwave power density meters give the leakage level at a point and require the monitor probe to be moved all around the oven door for an indication of maximum leakage. This paper describes two simple microwave leakage indicator systems which overcome these problems and automatically provide a clear indication if the leakage at any point along the length of a radiating slot exceeds some preset permissible level.

First System

Basic configuration of the first system will be shown. A strip of encapsulated liquid crystal (ELC) film backed by a microwave absorbing material is used. Its operation is based upon the change in colour exhibited by the ELC film in a certain temperature range. When the strip is exposed to microwaves, the microwave absorbing material generates heat and the change in colour of the strip from black to blue (warmest) indicates the presence of microwaves. The microwave power density at which this change of colour occurs is decided by the operating temperature of the ELC film and the properties of the microwave absorbing material. Various experiments have been conducted to evaluate the performance of the strip for indication of leakage from a recent model of a microwave oven and a waveguide radiating slot. Efforts have been concentrated on the indication of leakage beyond 1 mW/cm^2, the permissible level for microwave ovens use in Canada. Results of the leakage tests as well as the effect of the surrounding temperature on the performance of the strip is discussed. It is shown that normal changes in room temperature have negligible effect and that the effect of hot vapours from the food being cooked can be minimized by a thin backing of thermal insulation on the strip.

Second System

Basic configuration of a second leakage indicating system will be shown. It consists of a number of RF detector diodes distributed periodically on a transmission line which is connected to a voltmeter. The transmission line can assume various configurations, e.g., strip line, microstrip line, slot line, etc. In the present case, the slot line was found to be the most convenient. when the leakage indicator is exposed to radiation from a slot, various diodes are exposed to different RF fields. However, a d.c. voltage corresponding to only the maximum RF field along the slot is indicated on the voltmeter since the rectified voltage on a particular diode tends to reverse bias the remaining diodes. Larger the number of diodes, higher the chances of getting a consistent relationship between d.c. voltage indicated and the maximum power density on the slot. In the present case, diodes at an interval of 2″ are used. A typical response obtained with a 1.0″ wide, 12″ long slot line will be shown. The position as well as level of maximum power density on the radiating slot was varied for obtaining the data. Effect of the distance from the radiating slot is discussed and it is demonstrated that this device when affixed to the door of a microwave oven or located near an industrial microwave equipment will indicate when the microwave leakage at any point along its length exceeds a permissible level.

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4A.5

POWER DENSITY MEASUREMENTS IN THE NEAR FIELDS

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The paper describes measuring systems which record separately intensity of the electric and magnetic field components. Putting the obtained results through an appropriate summing network we obtain: electric, magnetic or total energy density.

Determination of power density in simple wave fields is generally obtained by measuring the intensity of one of the electromagnetic field components. In the frequency range above 300 MHz power density measurements are made using