



# SNS COLLEGE OF TECHNOLOGY

(Autonomous Institution)

COIMBATORE-35

DEPARTMENT OF BIOMEDICAL ENGINEERING



## 19BME308 - Medical Radiation Safety

### UNIT I - INTRODUCTION TO RF AND MICROWAVE RADIATION

#### 1.6 RF Radiation Measuring Methods

##### **Introduction**

Surveys can be classified into three broad headings according to their nature and purpose. These are:

1 RF Leakage tests for unintended radiation from transmitter cabinets, antenna exchanges, loads and other items connected to RF transmitters; leakage from RF process machines, medical apparatus, microwave ovens and other sources of RF energy. With the present interest in radiation from such things as video display units, which might not be seen by most people as RF sources, leakage tests may extend to a wider range of sources than has been the case in the past.

2 X-ray Leakage tests for any transmitters, RF machines, VDUs and other RF sources which use voltages higher than 5 kV to operate electronic tubes.

3 RF Exposure tests to establish the potential exposure of people to fields from antennas or any other systems which are intended to radiate RF energy.

##### **RF exposure tests**

For RF exposure surveys there are two basic approaches to exposure testing, differing only in objective and not in technique. These are:

1 The characterisation of an antenna and transmitter as a portable entity which can be deposited at an unknown site and so located that clearly defined safety limits can be observed. It follows that this can only be fully achieved when there is no likelihood that the equipment will be deployed amongst buildings or other structures which could invalidate the original radiation safety data. In order to do such characterisations, it is necessary to use a flat site free of any



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structures and buildings which might seriously affect the results, so that the survey data is as 'site independent' as possible. This approach is probably a minority case.

2 Measurements made at a particular place and time to determine safety provisions applicable only to that place. This type of survey takes into account the real environment – buildings, other antennas, people and their work patterns and is the most common type of exposure survey.

- A modern electronic (ultrasonic) measuring 'tape' can be useful indoors where walls and cabinet structures can be used as reflection media when measuring equipment in order to make drawings for a survey report. Outside use is normally impractical and, in the author's experience, electronic measuring 'tapes' may not survive acquaintance with a high power radar even when just carried in the pocket! Plastic-cased digital watches may suffer the same fate. Conventional tape measures should not be metal ones!
- An optical range finder can be useful for outside work if of a robust type. A compass may also be useful on some types of survey to align moveable antennas, etc.
- A roll of aluminium cooking foil is indispensable for experimental shielding, wrapping round the RF probe when zeroing the instrument if this is proving difficult and for checking whether the RF electric field is interfering with X-ray instruments.
- Self adhesive aluminium strip/lead strip are widely available and useful for temporary shielding around waveguide flanges. The lead strip is useful for X-ray purposes.
- A roll of adhesive tape is essential to put leakage markers on equipment. The tape must be specified as a tape which will not damage paint finishes on equipment. Many commonly used domestic tapes are likely to remove the paint finishes, something which is not appreciated by the equipment owners!
- Wooden or other non-conducting material rods marked at suitable distance intervals can be useful when it is required to measure at a constant height.

**Reference:** Ronald Kitchen - *RF and Microwave radiation safety handbook*.