

RECOMMENDATION ITU-R SM.1056-1

**Limitation of radiation from industrial, scientific
and medical (ISM) equipment**

(Question ITU-R 70/1)

(1994-2007)

Scope

This Recommendation provides limits of radiation from various ISM devices and gives advice on how to use the limits in Publication 11 of International Special Committee on Radio Interference (CISPR).

The ITU Radiocommunication Assembly,

considering

- a) that No. 1.15 of the Radio Regulations (RR) defines ISM applications (of radio-frequency energy) as operation of equipment or appliances designed to generate and use locally radio-frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunications;
- b) that ISM equipment has the potential to cause harmful interference to radiocommunication services and applications throughout the spectrum;
- c) that for the optimum use of the frequency spectrum, it is necessary to lay down limits of radiation from ISM equipment outside the bands designated for their use;
- d) that due to the different operating environments and characteristics of ISM equipment several categories of limits are necessary;
- e) that radio services operating in the bands designated for use by ISM equipment prior to WARC-79 are required to accept harmful interference and that radiation limits are necessary in all other bands to protect radio services;
- f) that radiation from ISM equipment may be costly and technically difficult to suppress and thus development of suppression requirements must take into consideration physical, technological, economic, operational and safety aspects of ISM usage to avoid unnecessarily severe measures;
- g) that equipment meeting the radiation limits, which are compromise values, may in some circumstances cause harmful interference; and, there needs to be provisions for measures to be taken to eliminate or reduce interference in individual cases;
- h) that the legal and administrative provisions differ in different countries and thus administrations have different methods of applying and enforcing limits;
- j) that the International Electrotechnical Commission/International Special Committee on Radio Interference (IEC/CISPR) has developed limits and taken into account the principles outlined in e) and f) and the requirements to harmonize the procedures for the control of interference in order to eliminate technical barriers to trade;

- k) that the interference potential depends on the location of ISM equipment within the user's premises and that the measuring distance and the point of reference for *in situ* measurements have to be taken into account;
- l) that severe difficulties could arise if different limits were to be recommended by different international bodies for the same class of equipment,

noting

- a) that, for ISM applications, the frequencies typically used by ISM equipment and some current and future ISM applications are shown in Annex 1;
- b) that, although the ITU has designated specific frequency bands for ISM applications, other operating frequencies are also being used where practical constraints do not permit the usage of the designated bands;
- c) that CISPR Publication 23 “Determination of limits for industrial, scientific and medical equipment” provides details of the derivation of limits;
- d) that information technology equipment (ITE) which use RF energy have not been considered by the CISPR as ISM equipment and CISPR Publication 22, contain a guide for the application of limits and methods of measurements for ITE;
- e) that RF lighting device operating in the ISM frequency bands 2.45 and 5.8 GHz (and 915 MHz band for Region 2 as defined by the RR) have been considered as ISM equipment in CISPR Publication 11, and other type lighting devices are covered in CISPR Publication 15,

recognizing

- a) that Resolution 63 (Rev.WRC-03) resolves that to ensure that radiocommunication services are adequately protected, studies are required on the limits to be imposed on the radiation from ISM equipment within the frequency bands designated in the Radio Regulations for this use and outside of those bands, in close collaboration with CISPR;
- b) that Resolution 952 (WRC-03) resolves to invite CISPR to use the definition of ISM application as show in No. 1.15 of RR, until a new definition is developed in ITU-R in collaboration with CISPR,

recommends

- 1 that administrations may use the latest edition of CISPR Publication 11, including amendments, as a guide for the application of limits and methods of measurements for ISM devices, in order to protect radiocommunications;
- 2 that continued cooperation with the CISPR should be initiated to ensure that radiocommunication needs are fully taken into consideration.

Annex 1

Industrial, scientific and medical (ISM) applications

1 Introduction

This Annex includes the ITU definition of ISM applications, a list of frequencies typically used by ISM equipment and describes some current and future ISM applications.

2 ISM applications

According to RR No. 1.15, ISM application is the operation of equipment or appliances designed to generate and use locally radio-frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunications.

A partial list of ISM applications and equipment include:

Induction heating equipment (below 1 MHz)

- domestic induction cookers
- metal melting
- billet heating
- tube welding
- soldering and brazing
- component heating
- spot welding
- selective surface heat treating of metal parts
- semiconductor crystal growing and refining
- seam bonding of autobody surfaces
- package sealing
- heating strip steel for galvanizing, annealing and paint drying

RF dielectric heating equipment (1-100 MHz)

- veneer and lumber drying
- textile drying
- fibreglass drying
- paper and paper coating drying
- plastic pre-heating
- plastic welding and moulding
- food post baking and drying
- meat and fish thawing
- foundry core drying
- glue drying
- film drying
- adhesive curing
- material preheating

Medical equipment

- short-wave and microwave diathermy and hyperthermia equipment
- electrical surgical units (ESU)
- magnetic resonance imaging (MRI)
- ultrasonic diagnostic imaging

Microwave equipment (above 900 MHz)

- domestic and commercial microwave ovens
- food tempering, thawing and cooking
- UV paint and coating curing
- rubber vulcanization
- pharmaceutical processing

Miscellaneous equipment

- RF excited arc welders
- spark erosion equipment

Laboratory and scientific equipment

- signal generators
- measuring receivers
- frequency counters
- flow meters
- spectrum analysers
- weighing machines
- chemical analysis machines
- electronic microscopes
- switched mode power supplies (not incorporated in an equipment)