



Report ITU-R SM.2154
(09/2009)

**Short-range radiocommunication
devices spectrum occupancy
measurement techniques**

SM Series
Spectrum management



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Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

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***Note:** This ITU-R Report was approved in English by the Study Group under the procedure detailed in Resolution ITU-R 1.*

Electronic Publication
Geneva, 2009

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1 Introduction

Industry request more licence exempt frequency space under the argument that the available frequency bands are not sufficient and sometimes even congested. A balanced opinion from a frequency management point of view can only be obtained when this is based on objective information, including spectrum monitoring information. Also many non ISM bands used by different services are nowadays occupied by short-range radiocommunication devices (SRDs) sharing these frequencies under no interference no protected basis. This Report does not describe UWB or UWB related measurements.

Typical values given in the Report are based on the example of a 863-870 MHz monitoring campaign. For other frequency bands and SRDs in those bands, other values may be more appropriate without changing the basic measurement methodology.

1.1 Why SRD monitoring?

Since SRDs are entering a market which does not confine the use to a single country also ITU needs to consider developing or adapting SRD monitoring methods. Examples are wireless LAN's on board aircraft, SRDs for monitoring the technical condition of parts in airplanes, cell phones with integrated SRDs such as inductive readers and micro FM transmitters and medical implants asking for global harmonised SRD frequency space.

1.2 How does the monitoring of SRDs differ from normal monitoring?

The monitoring of SRDs has some differences with conventional spectrum monitoring. Not only the occupancy is of interest but also the effectiveness of the politeness protocols needs to be investigated. The latter is something to be obtained by processing the monitoring data. In most cases only occupancy information is required since standardisation takes care of the proper implementation of the politeness protocols. Testing against a standard is therefore sufficient in many cases.

1.3 Relation between SRD monitoring and other monitoring operations

Monitoring organisations may carry out noise monitoring, SRD monitoring and traditional monitoring. All of these methods have their specific features but are specially in the case of SRD monitoring closely related.

Monitoring task	Expected result	Geography	Method
Noise <30 MHz	Noise effects of PLT, EMC and inductive SRD applications	Local at a few number of specific sites Global at a quiet receiving site to assess the cumulative effects received by ionospheric propagation	According Recommendation ITU-R SM.1753 After that correlation between local and global sites
Noise >30 MHz	Noise effects of UWB, cumulative SRD emissions, spurious radiation of both SRD and non SRD applications (services)	Local at a large number of different types of sites	According Recommendation ITU-R SM.1753
SRD monitoring	Occupancy of allocated/shared SRD bands	Local at a large number of different types of hotspots. For each specific frequency band multiple measurement points for each hotspot	According the guidelines in this Report
Traditional monitoring	Occupancy/coverage of frequencies and frequency bands allocated to services Spurious and other unwanted effects and technical properties of individual systems/transmitters Also suitable for relative stationary SRD systems like RFID interrogators	Fixed Mobile On route	Fixed (remote) monitoring/measurements Mobile monitoring/measurements Signal analysis On route monitoring/measurements

2 Technical description of the main issues to consider when monitoring SRDs

SRDs are in most cases, but not always, low power transmitters for indoor use with a low duty cycle and a low probability of intercept with common monitoring setups. Based on experiences it is therefore suggested not to use fixed or remote controlled fixed monitoring stations since they are almost always too far from the so called “hot spots” of SRDs. A mobile or semi mobile setup at the locations where the interception of these devices is most likely is recommended. Common definitions of locations and their descriptions such as rural, semi rural, industrial etc are not suitable in this case.

2.1 Locations

Locations could be based on the devices expected in the frequency bands as found in applicable frequency plans. The following list is an example and is not exhaustive. It needs to be modified depending on the national situation.

Type	SRD hotspot or warm area location
RFID	Distribution centres, shopping malls, airports
Social alarms	Hospitals, homes for elderly people
Alarms	Industrial areas with offices
Metering & monitoring	(E.g. remote controlled traffic lights and parking lots) in city centres
Non specific SRDs	Densely populated areas
Radio microphones	Theatres, football stadiums
Wireless audio	Densely populated areas
Medical implants	Anywhere but dominant in hospitals and medical centres

UHF RFIDs are used as an example for the following considerations. The scope, however, can be extended to monitoring of other SRDs.

2.2 Monitoring period and choice of location

A monitoring campaign should include time periods based on the expected frequency use, for example one 24 h period on a working day and a 24 h period on a weekend day for RFID's. Monitoring results could vary within a locations area so moving the setup each hour, or another time period, is necessary to give reliable results. For example at an airport most luggage handling is done underground so measuring at the terminal gives different results than in the cellar. A few different locations in a city centre could give different results due to shielding of buildings so moving the setup periodically is an advantage. The results of a typical locations area should be combined. Synchronisation of the mutual monitoring periods between administrations if a coordinated monitoring campaign is performed is not necessary since there is no schedule or day to day synchronisation between the use in different nations. During the development of methods and guidelines it seemed to be an advantage to harmonise some terminology. Note that these defined terms are only related to SRD monitoring and valid for this report. The locations with activity are for example called hot spots and warm areas, not to be confused with WIFI hotspots.

Warm area: A large area with distributed activity like a car parking place.

Hotspot: A confined area with activity. A hotspot can be situated within a warm area.

Monitoring location: A location with one or more hotspots and/or warm areas.