المجلس الأعلى للإتصالات و تكنولوجيا المعلومات
Supreme Council of Information & Communication Technology

ictQATAR

Guidelines for Communications Towers and Mast Radio Antenna Emissions

Telecommunications Regulatory Authority

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1 Introduction

1.1 Background

The Supreme Council of Information Communication and Technology ("ictQATAR"), in monitoring the development of Qatar's telecommunications sector, is issuing these guidelines to mobile operators in the management and provision of data pertaining to radio emissions from tower and mast-based antenna.

ictQATAR is mindful that increased awareness of electromagnetic fields from wireless devices and base stations has resulted in public concern with regard to possible adverse health effects. Such concern is not unique to Qatar and has been prevalent in a number of countries. ictQATAR understands that numerous studies have been undertaken to assess possible effects of electromagnetic fields emitted from radiocommunications equipment. However, ictQATAR is not qualified to express a scientific opinion about this matter, but understands that, to date, international consensus among leading experts concludes there is no convincing evidence that supports health-related concerns.

The guidelines herein regarding communications tower and mast radio emissions are in the interest of monitoring the use of radiocommunications-based facilities. The purpose is to collect information for the monitoring of the location, use and potential effect of such facilities. It is also intended to ensure the use of radio equipment attached to towers and masts is, and remains, consistent with international standards and practices. ictQATAR hopes that, by collecting data, it helps to allay some concerns about level of emissions from such facilities. While we understand that ultimately the full range of radio frequencies and its applications should be covered under health and safety guidelines, the scope of these guidelines is purposely limited to radio frequencies used by mobile operators in the State of Qatar. For the avoidance of doubt, the scope of these guidelines is therefore limited to the radio frequency range 900-2100 MHz.

1.2 Status of the Guidelines

ictQATAR is issuing these Guidelines under Chapter Two, Article 2 of Decree Law No. (34) of 2006 on the promulgation of the Telecommunications Law and as part of its responsibility in safeguarding customers' interests[1], in ensuring that all telecommunications equipment used is consistent with the equipment standards and international rules[2] and through the

[1] Chapter Two, Article 2(a)

[2] Chapter 12, Article 55

powers of requiring the required information for the exercise of its powers and responsibilities[3]. All mobile operators in the State of Qatar shall comply with the requirements set out in these Guidelines.

1.3 Objective of the Guidelines

The primary objective of these Guidelines is to establish a framework within which the emissions of radiocommunications transmitting equipment are monitored and reported.

1.4 Application of the Guidelines

The Guidelines shall be applied on a non-discriminatory basis to operators of radiocommunications transmission.

These Guidelines should apply from 10 October 2010 (**Effective Date**) and should not be applied retroactively. However, mobile operators are expected to ensure their equipment complies with the standards set out in these guidelines, taking the necessary steps to immediately correct or upgrade equipment that does not meet these standards.

1.5 Definitions

The definitions of the terms used in this document shall be consistent with those as set out Decree Law No. (34) of 2006 on the promulgation of the Telecommunications Law, its Executive By-Law of 2009 and their amendments or substitution.

Any terms that are not defined in the Telecommunications Law or Executive By-Law shall be defined in accordance with the definitions applied by the International Telecommunications Union (ITU) or in the absence of same, international best practice.

2 Radiocommunications Emissions Management Criteria

2.1 Standards

The international standard body International Commission on Non-Ionizing Radiation Protection (ICNIRP) has established guidelines for limiting Electromagnetic Field (EMF) exposure in order to protect individuals against known adverse health effects. ICNIRP has defined restrictions on exposure to time-varying electric, magnetic, and electromagnetic fields. The relevant parameters used to specify these restrictions are *Specific energy Absorption Rate (SAR)* and Power Density:

[3] Chapter 15, Article 62

- **Specific energy absorption rate** (SAR) is the rate at which energy is absorbed in body tissues, in watt per kilogram (W /kg).
- **Power density,** in radio wave propagation, is the power crossing a unit area normal to the direction of wave propagation; expressed in watt per square meter (W/m2).

ICNIRP has defined reference thresholds for the above mentioned parameters.

The main requirements for Radio Frequency EMF exposure that mobile operators are expected to be compliant with are the following:

- Power density of the electromagnetic radiation issued by the antennas of any towers should not be more than **10 W/m^2** for **general public** exposure and should not be more than **50 W/m^2** for the **workers** exposure.
- Towers installed on the buildings' rooftops, the power density of the electromagnetic radiation, measured at 6 meters higher than the rooftop of the building, should not be more than the **10 W/m^2** [4]

In keeping with international recognition of common public perception concerns, ictQATAR encourages operators to avoid installing transmission devices, telecommunications stations and outside receivers for wireless devices in "public-sensitive areas" – i.e. children's parks, schools and hospitals (public and private) where possible. Should a mobile operator find its network configuration cannot avoid locating transmitting antenna near such a public-sensitive area, a written consent must be obtained from the relevant competent authority(ies) depending on the exact location.

Operators are required to maintain for each site a set of documents detailing an "exclusion zone" with full and detailed radiation pattern. The exclusion zone is defined as the zones in the vicinity of base stations outside which safety levels of exposure are not exceeded.

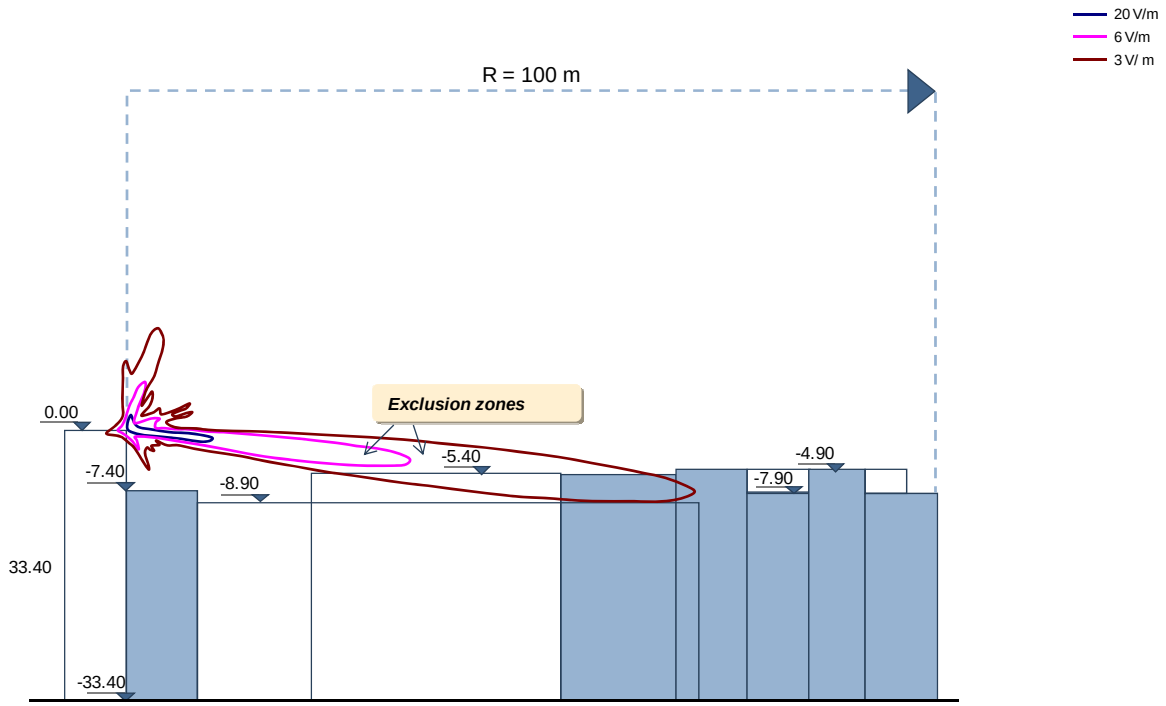
Specifically the mobile operators need to provide the following documents to ictQATAR whenever it is required:

- A local analysis of the site location and a simulation of the actual antenna radiation pattern for the different power density thresholds.
- If relevant, buildings or portions of buildings that falls within the exclusion zone.

[4] This case is a rare occurrence to protect the general public in a very specific case where the mobile tower is placed on a rooftop accessible to (and used by) the general public

In case of buildings or portion of buildings falling within the exclusion zone, a decision will be taken by the relevant authority(ies) as to whether such situation within the exclusion zone is presenting or not a concern for health and safety (it may affect an area not open to general public).

Exhibit 1: Example of Radiation Pattern as a function of different power density (expressed in V/m)



2.2 Emissions Guidelines

In order to minimize undue and onerous constraints on the mobile operators in Qatar regarding their network planning in terms of sites deployment, emissions guidelines are set to ensure that a quick check can be performed by the authorities on the operators' Effective Radiated Power (ERP)[5] levels and minimum distance between sites and populated areas. These guidelines may be used to readily identify sites that could raise concern regarding compliance with the radio frequency exposure limits.

[5] ERP is defined as the product of the power supplied to the antenna and its gain relative to a half-wave dipole in a given direction (or in the direction of maximum gain if not otherwise specified).

The emissions guidelines are defined in terms of minimum safety distance between the antenna and the nearest building in the direction of propagation of the antenna[6].

Exhibit 2 represents the safety distance for the general public from the antenna, given various Effected Radiated Power (ERP) levels emitted by the antenna. The safety distances indicated are calculated in order to respect the threshold of power density as specified in 2.1.

Exhibit 2: Safety distance and Peak ERP variation for Power Density equal to 10 W/m² (Public)

ERP (dBm)	Min distance (m)
40	0.4
43	0.5
46	0.7
49	1.0
52	1.4
55	2.0
58	2.8
61	4.0

Exhibit 3 represents the safety distance for workers from the antenna, given various Effected Radiated Power (ERP) possible levels emitted by the antenna. The safety distances indicated are calculated in order to respect the threshold of power density as specified in 2.1. In the case of workers, it will be up to the mobile operator to ensure the adequate reduction of power output during installation/ maintenance work at different locations (e.g., fence, bottom of mast etc).

[6] This distance is not the distance from the mast or bottom of the mast. Typically, this would exclude the building where the antenna is located in case the antenna is on a rooftop. In other words, this is the straight line distance from the antenna and the point/ area considered

Exhibit 3: **Safety distance and Peak ERP variation for Power Density equal to 50 W/m² (Workers)**

ERP (dBm)	Min distance (m)
40	0.2
43	0.2
46	0.3
49	0.5
52	0.6
55	0.9
58	1.3
61	1.8

3 Audit of Wireless Communications Base Station procedures

3.1 Wideband and narrowband tests

In order for ictQATAR to verify the compliance of the mobile operator's deployed network with the RF emission standards, the measurements of radiofrequency (RF) electromagnetic fields levels will be executed in two main stages by the mobile operators to check the compliance level of power density from major sites. This will take the form of audits by the mobile operators and monitoring by ictQATAR. The two main audit and monitoring stages are wideband tests and narrowband tests as detailed in the following two sections.

3.1.1 Wideband tests

Wideband tests are initially performed during any site audit by the operators:

- Wideband tests measure the total electric field values, directly comparable with safety thresholds.
- Wideband tests measure the large frequency range to catch all possible radiation.
- Wideband tests require specific instrumentation using wideband isotropic probes.
- Wideband tests may trigger a corrective action such as power reduction on installation and also switch-off of the equipment.

3.1.2 Narrowband tests

Should the site fail the wideband tests, a narrowband test will then be performed by the mobile operator with the following characteristics:

- Narrowband tests are used for monitoring the EM emission levels due to an already known source (e.g., one specific operator);
- Narrowband tests require highly specialized, frequency selective equipment (spectrum analysers, isotropic or directional probes, Demodulators of WCDMA/GSM/DVB-T/DVB-H/FM signals);
- Based on these measurement results, a corrective action can be determined by the mobile operator in order to bring the total EM emission's level below the limits.

Both wideband and narrowband tests are executed in urban and rural environment with different testing by the operators.

3.2 Overall process of sites audit

The following guidelines set forth the regularity of audits and number of sites to be audited:

- When requested by ictQATAR, wireless towers and masts shall be audited by the mobile operators within a period of three (3) months from the date that will be specified by ictQATAR in its request;
- All new sites in Qatar need to be audited by the mobile operator within 5 working days after their installation. This first audit will be a detailed tests (20 to 30 test locations around the site);
- On-going audits of sites will be done by the operator as detailed below, and will include high-level tests (5 to 10 test locations around the site);
- For all tests, first wideband tests will be performed, followed by narrowband tests if a breach of standards has been identified;
- The results of such audits will be recorded by the operator and provided to ictQATAR.

An operator may be instructed by ictQATAR, at its discretion, to undertake one or more audits from time to time in a given area based on:

- citizens' requests
- areas of high concern (e.g., near schools and hospitals)
- areas with dense concentration of sites (from multiple operators)

- a selected sample of sites, up to 20% of the total number of sites in Qatar (on a rotation basis from quarter to quarter and at the discretion of the ictQATAR).

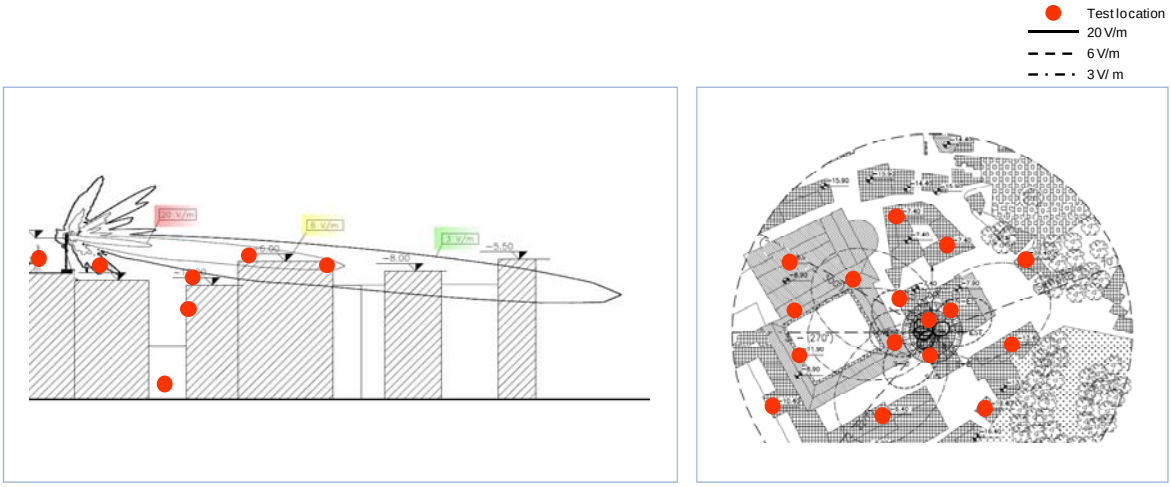
3.2.1 Wideband Testing

For wideband tests, ictQATAR will measure the total EMF level at a number of spots to check the level of power density around the selected site. In case of breach, narrowband measurements will be performed. Wideband tests are executed in both rural and residential environment using tools such as portable field tester and isotropic probe (antenna) mounted on wooden tripod.

The Wideband measurement procedure is the following:

- All measurements are static, without drive tests to be carried out;
- Between 20 and up to 30 locations to be tested (or 5 to 10 for high level tests), depending on surrounding environment (fewer points in rural) as per illustrative Exhibit 4 below;
- Measured values must be averaged over a minimum of 5 minutes (typically 10 minutes is considered as measurement interval);
- Locations selected amongst those where people spend at least 4 hours.

Exhibit 4: Spot highlights in a selected site



3.2.2 Narrowband Testing

The narrowband power density test is only performed by the relevant competent authority(ies) to determine the cause of a breach in the EMF exposure limits and determine the corrective action. It requires different tools and the knowledge of the frequencies used in the given area by all operators.

The major procedures on executing narrowband tests are the following:

- Measurement activities are to be carried out during traffic busy hour (as GSM/UMTS sites are radiating maximum power);
- Measurements are to be executed on the highest power channel and on all channels with power levels within 6dB range from the highest.

3.2.3 Reassessment of compliance site

Assessed compliance site shall be reassessed if its design or operational procedures have been modified in such a way that the modification could invalidate the compliance assessment already performed. Examples of such situations include, but are not limited to:

- Increase in transmitter power or of its duty cycle; and
- Alternation of the antenna type of field pattern, antenna bearing, height or location.

3.3 Reporting obligations

Mobile operators have to maintain an up-to-date sites database, which contains at least the following entries per site:

- Site location: Address (area, street, etc.)
- Site location: GPS coordinates
- Is the site location close to a school, kindergarten, hospital or mosque? (Yes / No)
- Is the site location within a three (3) kilometre radius of an airport? (Yes / No)
- Has the Qatar Civil Aviation Authority been notified? (Yes / No)
- Authorization reference of approval by the relevant authorities (e.g., Ministry of Municipality and Urban Planning)
    - Date
    - Authorizing Authority
    - Authorization Reference
- Type of structure
- Height of structure (in meters)

- Equipment housing
    - Length (in meters)
    - Width (in meters)
    - Height (in meters)
- Tower/Mast: Materials and colour
- Description of Environmental Impact Management (i.e., efforts to minimize visual and audio – as applicable - impact on the surrounding environment)
- Site complies with ICNIRP (Yes / No) (ICNIRP public compliance is determined by mathematical calculation and implemented by careful location of antennas, access restrictions and/or barriers and signage as necessary).
- Confirmation that members of the public cannot/will not unknowingly enter areas close to the antennas (Yea/No)
- Frequency
- Modulation characteristics
- Power output (EIRP in dBW per carrier)
- Confirmation that the power output will not interfere with other users of the site, including radio network operators
- Number of antennas
- Height of antenna (meters) from ground level
- Antenna manufacturer
- Antenna manufacturer's model number

This database must be operational within five (5) months from the Effective Date of these Guidelines and will be accessed by ictQATAR whenever required.

Mobile Operators are expected to nominate a Compliance Site Manager, whose name and contact details (such as telephone, email and mail) must be provided to ictQATAR.

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