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| Proposals relating to STUDY on improvement of efficiency in the use of radio spectrum while sharing the infrastructure by mobile service networks |

1. **Introduction**

Surveys, conducted by the ITU, show that sharing of infrastructure has become one of the current trends in mobile networks and broadband wireless access. This trend can significantly reduce costs of operators, improve quality of service and coverage of users without any sacrificing the availability of service or raising of efficiency in use of the limited radio frequency resource. In the current economic environment it is relevant not only for emerging countries but also for the countries with highly developed economies. The survey conducted by the ITU in 2013 shows that 61% of correspondents responded positively to the question of whether the sharing of infrastructure is mandated. Also 62% of countries have confirmed that co-location/site sharing is mandated [1].

However, a positive regulatory decision on sharing of infrastructure (SoI) at the national level per se is not sufficient for the maximum effect expected from this regulatory decision. In particular, the obligation of operators to allow other operators’ antennas to be installed on their own masts in most cases has business justification and is not associated with any solution of technical problems or raising of efficiency in use of spectrum either for their own or for mast-lessee operators’ networks.

In the meanwhile, regulatory decisions on SoI with due account for the functioning of modern communication technologies and methods for planning of spectrum use, would greatly improve the efficiency of spectrum use. This positive effect is also confirmed by studies, in particular by the GSMA, which shows that the SoI enables optimization of the scarce national resources: for example, the land and the spectrum can be used more efficiently, and it can also have a positive impact on economic growth [2].

In addition, active infrastructure sharing can actually include spectrum sharing. At the same time, in some countries it has been reported that sharing, both active and passive, is hampered by strict local regulation on EM fields emission limits. For example, actually a wide divergence exists amongst the values set by different countries in Europe [3].

It is quite difficult to get regulatory decisions at the national level, as it requires theoretical and practical studies. The solution can be found in the development of internationally harmonized recommendations on the SoI.

1. **Technical aspects of infrastructure sharing in the broadband wireless access networks**

One of the directions in the development of radio communications is to provide full access to the frequency spectrum use. This trend is reflected in the following modern principles and methods of spectrum use:

• Digital dividend and the associated principles of technological neutrality and cognitive radio;

• Use of spectrum on the basis of shared licenses (LSA - License Shared Access) and secondary licenses market («spectrum trading»);

• Use of technologies which mitigate the effect of interference (TPC - Transmit Power Control, DFS - Dynamic Frequency Selection).

These principles and methods of the spectrum use have created a new approach in addressing the issues of the SoI to achieve maximum effect in the use of available spectrum. For example, technological neutrality makes possible to use all spots in the frequency bands, allocated for mobile broadband (fixed) access technologies of the IMT family, with certain restrictions on the parameters of emission and reception in the adjacent frequency bands. These limits could be significantly weakened, if antennas of base stations of mobile and fixed access were placed on a common mast with a antennas diversity (vertical). A problem of interference mitigation in blocking and intermodulation for the cases, when common sites are used by several operators, can be solved in the similar way. When operators use special constructions of distributed antennas on a common mast, the maximum indicators of the quality of service can be obtained in the networks of operators who use a common frequency resource, owing to the localization of coverage areas.

The use of the SoI deserves a separate study in the tasks for frequency-territorial planning of networks of various communications standards in closely spaced or adjacent frequency bands. In particular, use by operators of the common masts - with known coordinates of installation sites, recommended heights and directions of sectors - would greatly facilitate the planning process itself due to low levels of interference of both inter-network and intra-net based.

1. **The ITU activities**

On the Regulators 8th Global Symposium on 11-March 13, 2008 a document "What do we mean by 6 levels of sharing?" was presented for discussion and practical recommendations on innovative strategies for sharing the infrastructure were developed to promote the access acceptable for everyone. During the period form 2008 till 2014 there were several regional workshops on this issue.

The sixth World Telecommunication Development Conference (Dubai, 30 March – 10 April 2014) charged the ITU-D Study Group 1 with a task to study infrastructure sharing issue under Rev. Question 12-3/1 “Economic policies and methods of determining the costs of services related to national telecommunication/ICT networks, including next-generation networks” [4]. In particular, this study will cover “different models for infrastructure sharing, including through commercially negotiated terms:

2.1) Infrastructure sharing and access to networks/infrastructure for new entrants including national roaming aspects;

2.2) Incentives for network development;

2.3) The impact of infrastructure sharing on investment cost, provision of telecommunication/ICT services, competition and prices to consumers: case studies with quantitative analysis.

A development of best practices for promoting appropriate infrastructure sharing is expected as an output of this ITU-D study.

The possible study on increasing the efficiency of spectrum use due to infrastructure sharing is in compliance with ITU-R Strategic Goal “to seek ways and means to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum” and may be considered under realization of Objective 5 of the ITU-R Draft four-year Rolling Operational Plan for the 2015 to 2018 “to provide support and assistance to the membership, mainly to developing countries, in relation to radiocommunication matters, information and communication infrastructure and application …”.

**3 Propositions**

**3.1 Topics for studies proposed for the ITU-R**

Given the typical models of infrastructure sharing in the mobile networks, it is proposed to consider the following:

* Development of recommendations, containing requirements to the EMC and methods to ensure it under the condition of sharing of platforms and antenna tower, as well as a procedure for measurements to ensure EMC.
* Study and implementation of new methods, technologies, spectrum access and sharing techniques.
* Compatibility study of technologically neutral communications systems using common antenna towers.
* Study of the effectiveness of shared antenna towers for frequency-territorial planning of networks of different standards.
* Study of the possibility and efficiency of use by operators of the common distributed antennas for broadband access systems.

**3.2 Cooperation with ITU-D**

The WTDC-14 by its Resolution 59 (Rev. Dubai, 2014) “Strengthening coordination and cooperation among ITU-R, ITU-T and ITU-D on matters of mutual interest” invited TDAG, among others, in collaboration with RAG to assist in identifying subjects common to ITU-D and ITU-R and in identifying joint activity on issues of mutual interest.

The infrastructure sharing may be identified among possible issues of joint interest between ITU-D and ITU-R, in particular, in respect of study on increasing the efficiency of spectrum use due to infrastructure sharing in mobile networks.

**References:**

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