

GSA views on spectrum sharing

UK SPF Cluster 3: Spectrum Sharing Workshop

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Foreword

- ❑ The following provides the latest **views** of the GSA on the **co-channel sharing** of spectrum from the perspective of mobile communication networks based on **IMT technologies** specified by 3GPP, including 4G and 5G NR (referred to as “IMT networks” in this document).
- ❑ We note that the issues of **inter-service** and **intra-service** spectrum sharing often get **conflated**, and result in misunderstandings. For this reason, we treat these separately in what follows.

Spectrum sharing

Inter-service

Intra-service

Inter-service sharing

Introduction

- ❑ This refers to the **co-channel** sharing of spectrum between **IMT** networks and **existing** users of **other services** in a given band.
- ❑ The growing **demand** for terrestrial mobile broadband connectivity, and the fact that frequency **re-planning** or **clearance** of incumbents to allow IMT deployments may **not** be **possible** in all cases, mean that **increasing** levels of spectrum **sharing** between IMT networks and other services may be **inevitable** going forward.

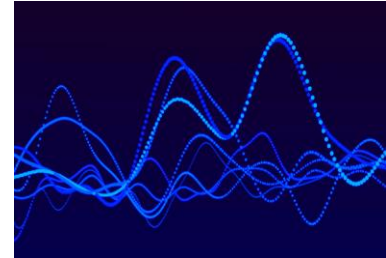
As such, the mobile industry has been very **active** in recent years in establishing **efficient inter-service** spectrum sharing frameworks at a **global level** in order to allow more extensive use of the scarce spectrum resource.



Recommendations (1)

GSA considers that

- a) where possible, bands considered for use by **IMT** networks should be **cleared** of existing users of spectrum, particularly in the geographical areas where IMT networks are to be deployed, in order to **avoid uncertainties** within the interference environment, and to deliver the challenging **IMT-2020** QoS requirements specified by the **ITU-R**;
- b) where cost-benefit (or other) analysis indicates that **clearance** of existing users might **not** be a **viable** option to make room for introduction of IMT networks, sharing of spectrum between **IMT** networks and **existing users** of the band could be considered, always subject to **least restrictive** technical conditions¹;



¹ Least restrictive technical conditions mean the imposition of minimal regulatory technical requirements (e.g., emission limits) which would result in an acceptably low probability of harmful interference between radio systems.

Recommendations (2)

GSA considers that

- c) where sharing of spectrum between **IMT** networks and existing users is the **only option** available, careful consideration should be given to the sharing objectives and requirements, and their **impact** on the operation of all parties, and should **not deter** the substantial **long term investments** needed for the roll out of IMT networks;
- d) in order to **minimise** costs and complexity, spectrum sharing between **IMT** networks and existing users should be preferably considered **first** in bands where the geographic **locations** of existing **incumbent** users are **known**, are **not ubiquitous**, and do not vary with **time** in relation to the IMT networks;



Recommendations (3)

GSA considers that

- e) where appropriate, various **co-ordination** approaches may be applied to facilitate spectrum sharing between **IMT** networks and **existing users**.



Intra-service sharing

Introduction (1)

- ❑ This refers to the **co-channel** sharing of spectrum between **different IMT** networks in a given band.
- ❑ We note that **IMT** networks are themselves highly **sophisticated** spectrum **sharing systems**: through technologies such as cellular frequency **re-use** and network **slicing**, IMT networks allow **billions** of users and devices to share the same frequencies in the pursuit of a wide variety of use cases and with a predictable/managed QoS¹.

¹ Note that 3GPP has also specified Dynamic Spectrum Sharing (DSS) which allows an MNO to dynamically share the resources available in a radio carrier between LTE and NR, thereby providing a useful migration path. This can be categorised as intra-operator/inter-technology spectrum sharing, and should not be confused with intra-service spectrum sharing.



Introduction (2)

- ❑ We also note that **individual licensing**, in all its various **flavours**, is essential for the delivery of a **predictable QoS** by allowing IMT networks to **control** the number of spectrum users, and to efficiently **distribute** the radio resource among them in a **deterministic** manner.

It is precisely for this reason that **IMT** technologies are **designed** to operate subject to individual licensing in order to deliver the **challenging** technical requirements set out by the ITU-R.



Recommendations (1)

GSA considers that

- f) individual **wide-area/national** licensing is the **preferred authorisation** regime for **IMT** networks for the delivery of services with a predictable/managed QoS, including for eMBB, URLLC and mMTC;
- g) any desired **sharing** of spectrum among wide-area/national IMT network **licensees** should ideally be **market-led**, and can already be **implemented** through MOCN¹ technologies specified in 3GPP;

National
Licensing



¹ For radio access network (RAN) sharing, the two most commonly used solutions are known as MOCN (Multi Operator Core Network) and MORAN (Multi Operator RAN). With MORAN everything in the RAN (antenna, tower, site, power) except the radio carriers is shared between two or more operators. With MOCN, two or more core networks share the same RAN meaning the carriers are shared. The existing core networks could be kept separate. MOCN is the most resource efficient solution as it gives the mobile operators the opportunity to pool their respective spectrum allocations, resulting in improved trunking efficiency. MOCN has been supported since 3GPP Release-6 for UMTS, since Release-8 for LTE, and since Release-15 for 5G.

Recommendations (2)

GSA considers that

- h) where there is a justified demand from parties to deploy **private IMT** networks within limited geographic areas, **market-led** intra-service spectrum sharing should be preferably achieved through **leasing** of spectrum from the individual wide-area/national IMT network licensees;
- i) where there is a justified demand from parties to deploy **private IMT** networks within limited geographic areas, intra-service spectrum sharing could be also achieved through **local licensing** of frequencies which are **not co-channel** with those used by **wide-area/national** IMT networks. Any local licences should be available **to all** interested parties, and should **not** in any way **compromise** the **availability** of nationwide licensed spectrum – with large contiguous blocks – for wide-area/national IMT networks;



Recommendations (3)

GSA considers that

- j) **predictable access** to spectrum, uninflated and predictable **costs** of spectrum, and a **stable** interference environment (both co-channel and adjacent channel) are all **essential** to exploit the reliability, low latency and spectrum efficiency of **IMT** networks and to **incentivize investments** in capacity and coverage. This is key both for public and private networks.
- k) where certain parties are contented with deploying communications networks with **dynamic/opportunistic** access to spectrum, the use of bands that are subject to **general authorisation** (licence exemption) are recommended for this purpose. Such opportunistic access is, for example, offered by 5G NR-U (New Radio – Unlicensed) which is being developed in 3GPP to be used in licence-exempt spectrum;



Recommendations (4)

GSA considers that

- m) in case of dynamic spectrum access, **adjacent** channel interference should also be addressed by regulators;
- n) **IMT** network deployments take place over time and are based on **evolving** traffic **demands** and uptake of use cases. Therefore, spectrum in specific geographic **remote/rural** areas may not be used by MNOs in the **early days** of network deployment. MNOs' strategies and long-term plans should be considered before concluding on the efficiency of MNO spectrum use.



Summary

Summary (1)

- ❑ Broadly speaking, spectrum sharing should only be considered where there is a **clear demand** for additional spectrum which otherwise cannot be made available, and where the benefits **outweigh** the costs.

In other words, spectrum sharing – and **complex** proposals for **intra-service** spectrum sharing in particular – should not be considered as goals in themselves but must bring tangible **net benefits** to users of spectrum.



Summary (2)

- ❑ The GSA considers that **existing** spectrum authorisation frameworks based on individual **licensing** and licence **exemption** in **distinct frequencies** respectively, as available today, are **sufficient** to cater for all foreseen intra-service spectrum sharing scenarios for innovative use cases.

Where there might be demand for **dynamic/opportunistic** intra-service spectrum sharing, these can already be catered for using **licence exempt** bands. Therefore, GSA does **not see a need** for additional spectrum **sharing frameworks** to cater for such dynamic/opportunistic use.



Licensing +
Licence exemption

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