Global mobile Suppliers Association

GSA views on spectrum sharing

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GSA position on spectrum sharing

The following provides the latest views and position of 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.

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.

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 by using licence exempt bands. Therefore, GSA does not see a need for additional spectrum sharing frameworks to cater for such dynamic/opportunistic use.

Inter-service spectrum sharing

(i.e. between different services as defined by ITU: Mobile, FSS, MSS, etc.)

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.

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 conditions[1];

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;

[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.

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;

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

Intra-service spectrum sharing

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 QoS[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.

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 MOCN[3] technologies specified in 3GPP;

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;

[2] 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.

[3] 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 that the radio 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.

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;

l) in case of dynamic spectrum access, adjacent channel interference should also be addressed by regulators;

m) the combination of individual licensing of spectrum (with its various flavours) and licence exempt spectrum (general authorisation) in distinct frequencies respectively, as available today, is currently sufficient to cater for all foreseen intra-service spectrum sharing scenarios for innovative use cases;

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 MNO 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.