Different users can sometimes share a given spectrum frequency band. This means more spectrum resources available, and lower access barriers for new users. But it needs regulators to grant shared spectrum access rights. Common examples are Wi-Fi networks, baby monitors, garage door openers, and radio frequency identification device (RFID) systems.

From a regulatory point of view, band sharing can be achieved in two ways: either by the Collective Use of Spectrum (CUS), allowing spectrum to be used by more than one user simultaneously without a licence; or using Licensed Shared Access (LSA), under which users have individual rights to access a shared spectrum band.

## Broader context

The EU's Radio Spectrum Policy Programme (RSPP) sets out the framework, based on the principle that spectrum should be used efficiently use and managed effectively. To enhance efficiency and flexibility, it requires Member States, in cooperation with the Commission, to foster the collective use and shared use of spectrum where appropriate. To meet the growing demand for wireless connectivity, and given advances in the technologies for sharing spectrum , the Commission has proposed a common approach [1] to identify beneficial opportunities to share spectrum (BSO).

## Current Developments

In September 2012, the European Commission published its views on "**Promoting the shared use of radio spectrum resources in the EU** [1]". This document highlights the importance of technologies to share radio frequencies; as well as the need to create incentives and legal certainty for innovators. It proposes ways to promote wireless innovations to share spectrum more efficiently, in particular:

- Developing a common approach to identify beneficial opportunities to share spectrum (BSO) in the internal market;
- Providing economic incentives and legal certainty for users to develop and deploy spectrum-sharing technologies, for example based on sharing contracts;
- Authorising shared spectrum access with "guaranteed rights of use", as a tool for regulators to leverage economies of scale for wireless innovation;
- Monitoring and extending the harmonised licence-exempt internal market bands.

With the support of EU legislators, national regulators, stakeholders and researchers, we can together create a regulatory environment that both incentivises investment in research and deployment of wireless innovation; and enables regulators to allow more shared spectrum access.

In this context, an **independent study sets out some "Perspectives on the value of shared spectrum access"** [2]; while the Radio Spectrum Policy Group has also reported on "**collective use of spectrum and other sharing approaches** [3]". In addition, the Commission is currently working on a study on the "Impact of traffic offloading and technological trends on the demand for wireless broadband spectrum" (SMART 2012/0015) [4], and on the spectrum inventory.

## Two different approaches

Sharing radio frequency in the EU can be done in two ways: the CUS model (also called licence-exempt approach); or a variety of different implementations of the LSA model, in which different users need a licence to access a shared band. Even though many applications still depend on exclusive access to spectrum, shared bands are increasingly recognised as the breeding ground for wireless innovation that stimulates the development and deployment of more resilient wireless technologies.

The main difference between the two pillars relates to the regulatory guarantees for accessing shared bands. The CUS model provides all users with shared or "collective" usage rights to access a particular band. To manage interference, CUS users rely on technical usage parameters that are specified in spectrum regulations (in combination with a degree of self-regulation for the sharing rules). These parameters can, for example, be specified in harmonised equipment standards. Legally based on the concept of a **general authorisation** [5], [6]the CUS model allows lower regulatory constraints, but means more responsibility for spectrum users to share spectrum efficiently and manage interference effectively.

The LSA concept, in contrast, gives users shared spectrum access rights that are guaranteed by a regulator, making it possible to ensure a predictable quality of service. Each user needs an individual (but not exclusive) licence to access a particular frequency band. Such authorisations depend on the specific sharing conditions in a band, which need to be sufficiently attractive and predictable for new investment in equipment and networks. Under such a licensed regime, interference management is the responsibility of the spectrum management authority, which sets the access parameters through regulation and licence conditions. A user that receives such a usage right, for example by acquiring a licence through a spectrum auction, is often also entitled to be protected against harmful interference.

## CUS model in practice

Important advantages of the CUS model are the low entry barriers, the certainty of access (which in turn can encourage wireless innovations), and lower administrative burdens for both user and regulator.  Under the model, an undetermined number of independent users and/or devices is allowed to access spectrum in the same range of frequencies simultaneously and in a particular geographic area under a well-defined set of conditions. This is particularly the case if shared spectrum bands are "licence-exempt", i.e. if users do not have to acquire a licence to access the spectrum.

A broad range of applications and technologies currently benefit from the CUS model of spectrum regulation. Among those are most **short-range devices** [7] (SRD) with applications such as Radio Frequency Identification Devices (RFID) that support supply chain automation and machine-to-machine (M2M) applications. Emerging **intelligent transport systems** [8] and **automotive short-range radars** [9] (SRR) also depend on CUS bands; as do Wi-Fi routers.

**Ultra wide-band** (UWB) wireless technologies also depend on the CUS model. UWB transmits low-power radio signals across a wide range of frequencies, supporting short-range applications like high-data communications, location tracking and ground-penetration radar. UWB is a type of ‘underlay’ spectrum usage – in that it shares frequencies with other applications but without causing harmful interference to these existing user applications.

## Promoting the shared use of radio spectrum resources

Radio spectrum is an extremely valuable natural resource. The exponential increase in demand for technologies like Wi-Fi or smart electricity grids means we must use this finite resource efficiently. But meeting that growing demand for wireless connectivity is harder in the absence of vacant spectrum. In addition, making existing bands available is often expensive, involves delays and runs the occasional risk of having to "switch off" existing users.

Traditional spectrum regulation separates technologies into different frequency bands to avoid inference, and to more easily guarantee quality of service. (For example, bands for TV and Radio broadcasts are kept separate form those used for mobile internet connections). But advances in technologies increasingly make it possible for different types of technology to operate in the same frequency band.

To share spectrum more efficiently, the EU needs to support new technologies, and make it easier

for different users to use a given frequency band; in effect making additional spectrum available without having to remove existing users. One example is "cognitive radio" technology to provide wireless broadband services in the "white spaces" between TV frequencies.

## What action does the EU have to take?

The EU needs a common approach to spectrum sharing to achieve economies of scale in the internal market. If undertaken solely at national level, spectrum sharing would instead fragment the market, and would mean wireless innovations miss out on considerable benefits.

The Commission therefore proposes to unlock additional spectrum resources, based on a common methodology, to identify beneficial sharing opportunities (BSO) across the radio spectrum; and to enable regulators to authorise users with shared spectrum access rights (SSAR).

## Benefits of shared spectrum access for citizens and industry

Citizens will get affordable wireless broadband services over shared frequencies (e.g. via Wi-Fi hotspots); and can enjoy using ever more wireless gadgets.

Innovators developing wireless technologies can get more chances to access more parts of the spectrum. In particular, the licence-exempt bands which are the breeding ground for wireless innovation.

And existing spectrum users can get a regulatory environment which encourages investment in research and deployment of wireless innovation: which will have numerous benefits in the medium and long term. For example, shared spectrum bands for wireless broadband can be used at the same time by internet providers to offer affordable wireless connectivity services and by mobile networks operators to save costs. In addition, more possibilities to share licensed spectrum may open new possibilities to share infrastructure.

## More information

- Commission Communication on "Promoting the shared use of radio spectrum resources in the EU" COM(2012) 478 [10].
- Consultants study on [2]**Perspectives on the value of shared spectrum access** [2], March 2012
- **Final RSPG Report** [3] on Collective Use of Spectrum and Other Sharing Approaches, November 2011
- **Final RSPG Opinion** [11] on Cognitive Technologies, February 2011
- **Final RSPG Report** [12] on Cognitive Technologies, February 2010
- **Final RSPG Opinion** [13] on Aspects of a European Approach to ‘Collective Use of Spectrum’ November 2008
- Consultants **Study on Legal, Economic & Technical Aspects** [14] of ‘Collective Use’ of Spectrum in the European Community, November 2006.

- **Get involved** [15]

## Tags:

- radio spectrum policy [16]
- shared use [17]
- spectrum sharing [18]
- CUS [19]
- LSA [20]
- BSO [21]
- SSAR [22]

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