

**bmcoforum Input on the
Radio Spectrum Policy Group Report on
“Cognitive Technologies”
doc. RSPG09-299**

The “Broadcast Mobile Convergence Forum” (**bmcoforum**) thanks the Radio Spectrum Policy Group for providing the opportunity to respond to the consultation on the RSPG Report on “Cognitive Technologies”.

The **bmcoforum** is an international non-profit organisation designed to shape open markets for media delivery. **bmcoforum** addresses the use of personal mobile devices in delivering relevant audiovisual content and services wherever, whenever by the best delivery channel. For that reason **bmcoforum** brings together players from all parts of the media delivery value chain.

I. General remarks

The **bmcoforum** shares the general expectation that cognitive radio technologies may offer additional flexibility and improved efficiency to overall spectrum use in the future. As the use of the spectrum is further intensifying, it is important to find alternative ways to make the available spectrum more efficiently utilized.

The **bmcoforum** is aware of the US Federal Communications Committee (FCC) having recently agreed to allow the use of the interleaved broadcast spectrum in the UHF band for license exempt wireless broadband services under certain conditions, by using cognitive radio techniques. The **bmcoforum** also knows about other administrations worldwide which are making assessments for similar usages.

Cognitive capabilities like sensing, access to database and use of geo-location, use of cognitive pilot channel (CPC), transmission power control, etc. can form a toolbox and could facilitate the coexistence of cognitive radio systems with existing radio systems. In most of the cases, a suitable combination of such capabilities will be necessary to achieve the goal.

The capabilities need to be studied and defined in order to evaluate the possibility and degree of coexistence with existing systems and with other radiocommunication services. Cognitive radio technologies may enable coexistence in bands where it was previously determined not to be feasible, but those might not be able to be deployed in all bands.

As cognitive radio technology is new, it is essential to study the means to observe the interference that they may generate and which type of performance indicators are needed to describe whether sufficient protection of other users is achieved. This monitoring aspect – peculiar to any innovation in radio environment – may also be extended to different/adjacent frequency bands in order to evaluate or adjust technical parameters for the coexistence between cognitive radio systems and existing services in those bands.

II. Detailed comments

In the following, the **bmco**forum takes the opportunity to provide detailed comments on a few sections of the RSPG Report on "Cognitive technologies".

On section 3 "Basic concepts and terminology"

The **bmco**forum supports the suggestion to use the same definitions in the European debate as developed by the ITU-R study group 1, but this should not be a limiting factor to think about applicability, e.g. for mobile use.

In some cases, the word "autonomously" in the definition of a Cognitive Radio System (CRS) might be questioned, e.g. for TV White space devices (WSD). All current studies – e.g. by Ofcom and in SE43 – come to the conclusion that sensing alone will not provide adequate protection of existing services within the band under consideration. In addition, a combination of cognitive capabilities might be needed. In this context, the use of a database, together with geo-location, will require some kind of an "authorisation process". Indeed, there is nothing in the ITU definition which requires CRS to protect a non-CRS service operating in accordance with the Radio Regulations. The requirement is simply 'to achieve predefined objectives'. The implicit assumption is that protection will be ensured by the fact that CRS will itself operate 'in accordance with the Radio Regulations'. However, this is ultimately limited to the protection of services in neighbouring states. Protection of existing services within an administration will need to be defined by the national regulator and is not inherent in the definition of CRS.

On section 4.2.1 "Sensing"

It is correctly stated that a cognitive radio must be more sensitive than the other spectrum user's receivers. However, the final conclusion is based on the consideration that the introduction of cognitive radio technologies might be useful in a frequency band where the number of technologies of existing users is limited only. For example, the text mentions the UHF broadcasting bands, and the **bmco**forum would like to refer to its comments on section 9 of the report below.

Furthermore, the last sentence of the 4th paragraph on page 11 is highlighted:

"In order to develop adequate sensing technologies, the receiver parameters of the existing users should be known, too."

As a direct consequence, any CRD must be able to adapt its sensing technologies to any new technology – e.g. from DVB-H to NGH – of a primary or secondary existing service (the "incumbent") in order to guarantee the unhampered development of these services.

On section 4.2.2 "Cognitive pilot channel (CPC)"

The **bmco**forum agrees that a CPC might be used to overcome potentially time-consuming scanning processes that would be required to obtain similar knowledge.

It is noted that any in-band CPC would require the reservation of a specific channel, i.e. in the case of the UHF band one channel which typically is in use

for broadcasting services, acts as a guard between different services, or is protected on a national basis, e.g. for the Radioastronomy Service.

The CPC could be used to inform CR devices on the evolution of regulation, as pointed out in section 5.4.3 of the Report. However, it still needs to be ensured that any such change will lead to subsequent reactions for/in the CR device. This is especially true if a primary or secondary existing service (the “incumbent”) uses a new technology, or if more stringent regulatory procedures need to be applied.

On sections 4.2.3 and 5.4.1 “Databases”

In section 4.2.3, the text lists some of the information which such a database could contain, e.g. table of users, their regulatory status and interference protection parameters.

This section should clearly state that the database will be centralized, i.e. located on network side and not inside the terminal. Further on, the sentence “An alternative to ... the CPC is ... to have a database ...” is misleading: The CPC needs some kind of database on network side to derive the data to be distributed via the CPC. Thus, the **bmco**forum propose to rewrite the first sentence into:

“An alternative to sensing is for a CR to have a centralized, nationwide database available of the frequencies which can be used at certain locations as well as the applicable rules. The terminal needs a mechanism to access the database, e.g. using an existing access technology to access the database or using the CPC to provide the terminal with the essential information contained in the data base.”

More details are provided in section 5.4.1, especially a certain separation between elements which are more relevant for national responses and those issues where a European harmonised approach will be desirable.

The **bmco**forum generally agrees, but would like to highlight a few points which may have a European aspect as well:

- The position accuracy should be specified, which could be done by the national regulator. However, there is a more fundamental point if it comes to the question of which database should be contacted, especially in bordering areas. In this case, any misinterpretation and answer from the “wrong” side of the border clearly should be avoided.
- This leads to a more fundamental question of how to deal with this topic in bordering areas in general – to plan for some overlapping between countries.

The usage of databases is strongly related to geo-location. In this context, reliability of geo-location is a significant aspect: will geo-location always work – indoors and outdoors –, with the same resolution and accuracy? What is the future of the system to be used?

The RSPG took this into consideration later, in section 9:

“The information transmitted through the databases and the cognitive pilot channel (CPC) on the frequency usage and on the regulatory environment needs to be reliable. The issue for regulation would be how to ensure the reliability and accuracy of this information.”

The **bmco**forum is of the opinion that this should be stated earlier in the text, taking into account the above mentioned aspects and their importance beyond national border lines.

On section 5.4.2 “Cognitive Pilot Channel”

bmcoforum proposes to cancel the last sentence in paragraph 2.

Furthermore, **bmco**forum proposes that RSPG should refer to the last version of the CPG-Draft Brief on WRC-2012 Agenda Item 1.19 stating that no modifications in the Radio Regulations are necessary.

“CEPT is of the view that frequencies or frequency bands (tuning range) for specific applications could be harmonized, as necessary, on world wide basis in ITU-R Recommendations or regionally. CEPT is also of the view that no regulatory actions would be required for SDR.”

On sections 5.4.3 “Software defined radio”

The **bmco**forum agrees with the conclusion that the situation becomes much more complex in case of a horizontal market. Therefore, the **bmco**forum would like to highlight the fact that any software which alters the RF parameters of the hardware platform will raise responsibility issues.

Beside that, there are other important topics like “monitoring” and “future developments of incumbent services”.

On sections 6.1 “ECC correspondence group on Cognitive Radio”

The **bmco**forum would like to highlight that the protection of Mobile TV should be taken into account by all initiatives named, e.g. in SE43 and in WG FM.

White space devices are under consideration in CEPT SE43. It already turned out that the spectrum sensing approach alone is not a reliable one, to ensure that white space devices will not interfere with existing services operating in the same band, especially with broadcasting and PMSE. Other techniques to receive information about the radio environment seem to be very expensive (e.g. beacon approach) and/or would require a reliable location method (e.g. usage of geo-location database). Based on these elements, it can be concluded that CRS will present a high potential to cause interferences with existing services (e.g. in Mobile TV) unless a reliable interference-avoiding technique is implemented in CRS.

This high potential to cause interference will be the case for other potential candidate bands as well. An overview of those bands, which are of importance for Mobile TV, is provided in the **bmco**forum spectrum position.

On section 6.3 “Activities in the ITU”

The **bmco**forum has considered in detail the possible regulatory implications of the use of cognitive radio systems and does not believe that changes to the Radio Regulations are required to facilitate cognitive radios under a particular service. No spectrum needs to be identified for Cognitive Radio technologies or any of its radio elements such as the Cognitive Pilot Channel (CPC). When the

cognitive system uses a particular spectrum opportunistically it should ensure that it does not cause any harmful interference to systems that have a primary allocation to that spectrum. However, **bmcoforum** considers that there is still a need for the so called "Static Spectrum Management" and to identify spectrum for defined usages and that the development of the CR technologies should not hinder this well-established process.

On section 9 "Conclusions", especially with respect to the UHF band

The **bmcoforum** wishes to point out that any use of TV White Spaces by license exempt wireless broadband devices must not endanger the operation and development of Mobile TV services, for a number of reasons:

- Unlicensed TV White Space devices could considerably interfere with Mobile TV devices, both in co-channel and in adjacent channels, in particular due to causing receiver front-end overloading.
- It may be extremely difficult to ensure avoidance of Mobile TV receiver overloading due to the interference from unlicensed nomadic TV white space devices, since they may be located in close proximity and would be using interleaved spectrum. Any Mobile TV receiver blocking would significantly impact the quality of the established services and the user acceptance for these services as a whole.
- The deployment of license exempt TV White Space devices could considerably endanger the availability of the UHF spectrum for the introduction as well as the long term development of a sustainable and commercially successful Mobile TV service.

Two potential technological approaches are under consideration in SE43, sensing and geo-location. It seems that both techniques are not in a position to provide a solution at present. Sensing remains unsatisfactory; the FCC did not retain it. The geo-location combined with a database will need an update of the data with every change of the UHF Plan – e.g. DVB-H gap-fillers, repeaters and temporary usages, e.g. for events and trial purposes, are unknown in many cases.

While admitting that the adequate and successful use of TV White Spaces may contribute to a more intensive overall spectrum usage and encouraging the ongoing work in SE43 for defining the technical and operational requirements for the operation of CRS in the "White spaces", the **bmcoforum** invites administrations to carefully evaluate all different aspects and their respective consequences – e.g. considerable interference risk for Mobile TV – prior to allowing any use of TV White Spaces in the broadcast spectrum for license exempt wireless services and/or devices.

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