Summary

FEASIBILITY STUDY
DEPLOYMENT OF THE WHITE SPACE DEVICES IN THE UHF BAND (470-790MHz)

The development of telecommunication systems that we would work on as secondary spectrum users for the broadcasting of a TV signal (470MHz - 790MHz) can be considered as in researching and developing stage in the field of cognitive telecommunications systems. These devices use a free frequency spectrum in a particular region for a certain period of time to broadcast their signal. The main prerequisite for the operation of these systems is not to interfere with the primary spectrum users.

The current state of the market of TVWS devices is typical for the early stages of development of new technologies and systems. There is not a unique standard according to which the equipment is developed, resulting in the incompatibility of equipment made by different manufacturers. Currently, the most common systems are based on the IEEE 802.11 series of standards as well as on the basis of LTE. It can be expected that LTE will have somewhat better prospects in the future, because LTE-based systems can be used as a part of the LTE systems in the unlicensed range and have better spectral efficiency.

There is no unique and influential association of producers dealing with issues of compatibility of equipment and quality control of its production. Existing associations do not have sufficient authority to organize interoperability tests. Similarly, they do not have sufficient authority to establish the basic guidelines for the development and application of the TVWS system that the equipment manufacturers would all accept and apply. The existing recommendations and instructions are general and do not provide the conditions for creating interoperability of the equipment made by different manufacturers.

Currently, there are no significant commercial networks based on TVWS equipment and technologies, there are only trial networks. The reason for this is the fact that the spectrum is used on a secondary basis. Regulatory agencies cannot guarantee to users that there is a required frequency range at any time of the system's operation. This hinders more serious investments in TVWS systems, as it may happen that installed systems remain without the required range for signal emission, the ability to use an additional range to provide greater bandwidth to users or to expand the network further due to an increase in the number of users.

On the other hand, there is no serious interest in the implementation of the TVWS system in Europe. At present there is an interest only in the United Kingdom. The regulator in the UK, OFCOM, has made a series of documents analyzing the impact of the TVWS system on primary users and equipment used in various outdoor events (microphones and similar studio and field equipment). The other countries in Europe do not have published policies for the operation of TVWS devices. Relugations on a European level are relatively scarce and they leave the freedom to national regulators to independently define the rules of the TVWS system in accordance with their plans. Recommendation EN 301 598 defines important elements of TVWS equipment while ECC reports 185 and 186 show the results of research

related to the operation of the TVWS device and the potential interference that it can create to primary spectrum users. RATEL must insist on ETSI certification based on EN 301 598 for any license to operate TVWS equipment in Serbia. In addition to the above mentioned documents, ECC Reports 148, 159 and 236 are included in the set of documents on which RATEL can rely on when creating domestic policies for the operation of the TVWS system.

Costs of the regulatory agency when introducing TVWS devices into operation on the territory of the Republic of Serbia, would be significant because of the need to project and create the base of the white space on the territory of the Republic of Serbia (WSDB). RATEL's costs for creating WSDB are estimated to ca 25 million dinars in addition to later maintenance costs which on the annual level can be up to 18 million dinars. Currently, this investment cannot be justified neither with market interest nor with wider social interest considering that there are no domestic producers of TVWS equipment and good development of telecommunication services on the territory of the Republic of Serbia and RATEL's existing activities which have provided satisfactory quality of services to the end users, with favorable prices of services. Consequently, the cost-effectiveness of the TVWS system can be questionable. Also, coordination with neighboring countries at this time would be extremely complicated due to the lack of clear rules and bilateral agreements in order to coordinate and there is no known interest in neighboring countries to engage in the resolution of this issue. Also, RATEL would have to carry out a number of laboratory tests to determine the impact of specific TVWS devices on digital TV signal receivers used and sold on the market in the Republic of Serbia, as well as on the most popular PMSE equipment. In order to enable further work of the PMSE equipment, it would be necessary for RATEL to register and geographically locate the PMSE equipment, and there are indications that TVWS systems could endanger the use of PMSE equipment in large gatherings when large frequency ranges are required for operation of the PMSE devices.

The current degree of development and presence on the market indicate that the success of the TVWS system cannot be foreseen with certainty. However, it is necessary to monitor the further development of these systems for several reasons. The first reason is the interest of large international companies that could invest in TVWS systems and make them much more present on the market. The second reason for monitoring the development of the TVWS system is because it's basically a sort of cognitive systems. Regardless of the technology that will ultimately be applied, and whether in the final outcome systems will be called TVWS systems or not, it can be expected that the idea of applying cognitive systems will become more and more present and that new techniques of multiple spectrum exploitation will be defined (through the existence of multiple users of the same frequency range). Bearing in mind the activities of RATEL, the agency should continue to monitor the development of cognitive systems, to study inventive ways of using spectrum and to develop new technologies, in order to be ready for the introduction of new, inventive and efficient methods of spectrum exploitation.

Observed in the short-term period, it is necessary to undertake activities to promote the capabilities of the TVWS system, through a description of possible applications and experiences from existing systems (e.g. fixed broadband wireless access, application in an industrial environment, etc.). The purpose of the presentation would be to bring new technologies and technology solutions closer to potential providers of telecommunication services who would see their interest in the application of such networks. The Ministry of

European Integration, as an institution responsible for the coordination of international development assistance, is starting the process of drafting a new several-year plan for development assistance for the period 2019-2025. Therefore, in 2018, RATEL can apply for funding from IPA funds for projects that would promote TVWS technologies, cognitive radio research, creation and development of WSDB, and laboratory testing of the interference that TVWS systems can cause to primary users of spectrum, as well as possible construction of test TVWS networks.

Also, it is necessary that RATEL contacts ETSI as the authoritative institution for contact with manufacturers of TVWS equipment, in order to declare RATEL as a contact institution in the case of the Republic of Serbia in the relevant ETSI documents.