

<u>Name</u>	<u>Organisation</u>	<u>Project title</u>	<u>Decision No.</u>	<u>Decision date</u>	<u>Funding period</u>	<u>Funding</u>
Mämmelä, Aarne	VTT	Spectrum Management for Future Wireless Systems (SMAS)	134624	29.09.2009	01.01.2010 - 31.12.2012	279 000

Project description

The fundamental problem for future wireless communication systems is to find suitable carrier frequencies and bandwidths to meet the demand of increasing end-user requirements. The radio spectrum, globally administered by the International Telecommunication Union (ITU), is fully allocated to different services but measurements on the current spectrum use show that large portions of the allocated frequency bands are only partially occupied. Utilizing the available spectrum efficiently is of great concern due to its scarcity and ever growing number of wireless devices and services. As a result, the spectrum regulatory framework is shifting from strict regulation and licensing towards liberalization of spectrum access which calls for the development of new novel and more flexible spectrum management schemes. Much research work is currently on-going to find technical solutions to improve spectrum utilization but the spectrum management techniques and underlying theory for the more liberalized spectrum access are far from complete. Part of the work is focusing on cognitive radios and networks but the studies are typically conducted without considering the theoretical limits, genuine operating environment and the regulatory framework. Hence, the basic knowledge behind the different spectrum usage approaches is not solid. Most of the research has concentrated either on evolution of practical systems or on implementation proposals for new systems. It is an important task to further strengthen the knowledge of spectrum sharing. Basic research should give guidance in the form of fundamental structures and mechanisms that are needed in efficient spectrum sharing. The project objective is threefold. First aim is to produce solid world class results to serve as a fundament of a theory of spectrum sharing. In particular, theoretical limits for the efficiency of spectrum utilization are studied. Discrete network topologies serve as the framework for this study. Second objective is to design general rules for spectrum sharing based on incentives of individual systems and to develop intelligent decision making methods for spectrum sharing. Policies arising from the regulatory framework are also taken into account, which is a relatively unexplored area. The third objective is to numerically determine the capacity of a network utilizing spectrum sharing. For this purpose, properties of the communication channel are modelled on the network level. The consortium consists of three groups. The first group is lead by Prof. Hämäläinen (TKK) and Prof. Tirkkonen (TKK), the second group is lead by Research Prof. Mämmelä (VTT), and the third by Prof. Ipatov (UTU) and doctor Poikonen (UTU). Team members have complementary academic and industrial background and expertise from physical layer to network level research and spectrum related topics.