

The currently observed dynamic progress in the development of wireless communication systems requires more efficient utilization of the available resources to satisfy the demand for systems' throughput and range. To meet these demands, it is necessary in many cases to increase the number of transceivers and to introduce appropriate multiplexing circuits and/or to increase the transmitting power while reducing the power loss within the transmitter, and keeping the same or comparable physical volume of the devices. Therefore, extensive research efforts are directed towards the development of novel solutions and technologies allowing for the realization of compact and lightweight systems with a high level of components' integration and increased power efficiency. The goal of the project is to investigate and develop new design methodologies, circuits' topologies and manufacturing techniques and schemes of mm-wave components and sub-systems realized with the use or support of additive manufacturing technologies to feature minimized total power losses, high electrical performance, lightweight as well as low-cost realization, dedicated for the automotive sensors and next generation of radio communication systems. Within the project two different approaches for realization of low-loss and high-performance mm-wave front-end components will be investigated, namely the realization of quasi-planar structures, where high-resolution manufacturing technique and dielectric materials properties are the main concerns; and the realization of light-weight 3-D waveguide structures where surface finish and metallization quality are of major concern. The intended final results of the project include novel techniques of realization of high-performance wave-guiding structures as well as filters, power-dividers, antenna feeding networks and antenna arrays operating at mm-wave frequency range. The project realization will accelerate the miniaturization of mobile electronic wireless and sensing devices, and currently developed communication standard. To achieve the goal of the project it is required to bring together the profound knowledge not only in the field of microwave circuits and antenna arrays, but also from the development of new materials and manufacturing technologies.