**Power loss reduction as a way for circuits` functionality improvement**

In this Chapter it is shown that power loss reduction allows to extend the functional range of a circuit on an example of low-cost impedance tuner for push-pull transistor measurement. The usable range of realizable impedances is increased by replacing larger and lossier rat-race coupler with 6 times smaller coupled-line coupler allowing for measurement of power transistors featuring very-low input/output impedance. Such measurements are in many cases crucial for the design of high-power microwave amplifiers as in the developed high-power transceiver front-end where the proposed tuner was used to find the maximum power terminating impedances at the transistor`s input and output. The results of the conducted research have been a subject of conference paper presented at *Radio and Wireless Symposium RWS`16* under auspice of *Institute of Electrical and Electronics Engineers* and technical report on the realization of *RF Pulsed Power Amplifier ,*which constitute the Chapter.

A low-cost impedance tuner, well suitable for load and source pull transistor measurements is presented. The proposed circuit consists of 3-dB quadrature coupled-line directional coupler with tuning components realized as shorted microstrip line sections with appropriate sliding shorting elements, which allow to provide any desired impedance. The theoretical analysis of the proposed circuit has been performed and the principle of circuit’s behavior has been explained. An exemplary impedance tuner has been designed, manufactured and measured. The obtained measurement results prove the usefulness and demonstrate the advantages of the presented approach.

For the product components “ADS-B vehicle transponder” and “MODE-S interrogator” a power amplifier is needed. Investigation has shown that it is not possible to buy a suitable amplifier from stock, which is fulfilling all the requirements. In this package research shall be done to select the best suitable components for a RF power amplifier. The amplifier shall be able to work in pulsed mode for efficient PPM amplification. It shall be designed to be used as part of an ADS-B vehicle transponder, so that small size and low power consumption are important. It may also later be used in a portable, battery powered aircraft transponder. It shall be possible to connect the amplifier to the same antenna that is used for reception, so a RX/TX switch solution needs to be integrated.