

Novel concept for pulse compression via structured spatial energy distribution

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Abstract: We present a novel concept for pulse compression scheme applicable at RF, microwave and possibly to optical frequencies based on structured energy distribution in cavities supporting degenerate band-edge (DBE) modes. For such modes a significant fraction of energy resides in a small fraction of the cavity length. Such energy concentration provides a basis for superior performance for applications in microwave pulse compression devices (MPC) when compared to conventional cavities. The novel design features: far larger loaded quality factor of the cavity and stored energy compared to conventional designs, energy feeding and extraction at the cavity center, substantial reduction of the cavity size by use of equivalent lumped circuits for low energy sections of the cavity, controlled pulse shaping via engineered extraction techniques. The presented concepts are general, in terms of equivalent transmission lines, and can be applied to a variety of realistic guiding structures.

Keywords: Microwave, Pulse compression, Cavity, Degenerate band-edge modes, Quality factor.

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