Software-defined microwave photonic filter with high reconfigurable resolution

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Abstract: Microwave photonic filters (MPFs) are of great interest in radio frequency systems since they provide prominent flexibility on microwave signal processing. Although filter reconfigurability and tunability have been demonstrated repeatedly, it is still difficult to control the filter shape with very high precision. Thus the MPF application is basically limited to signal selection. Here we present a polarization-insensitive single-passband arbitrary-shaped MPF with ~GHz bandwidth based on stimulated Brillouin scattering (SBS) in optical fibre. For the first time the filter shape, bandwidth and central frequency can all be precisely defined by software with ~MHz resolution. The unprecedented multi-dimensional filter flexibility offers new possibilities to process microwave signals directly in optical domain with high precision thus enhancing the MPF functionality. Nanosecond pulse shaping by implementing precisely defined filters is demonstrated to prove the filter superiority and practicability.

Key words: Microwave photonic filter, stimulated Brillouin scattering, high resolution