

This paper proposes a novel concept of an integrated duplex antenna for realizing a compact multifunction RF front end by integrating a duplexer and a dual-band patch antenna. First, an all-resonator-based duplexer is designed. It is composed of two sets of split-ring resonators as channel filters, which are joined by a dual-mode stub-loaded resonator as the junction resonator. Then, a novel dual-band patch antenna is achieved by coupling a patch with a hairpin resonator through a slot in the ground. Uniform radiation characteristics have been achieved across the two bands. Finally, the duplexer is integrated with the dual-band patch antenna to form a highly integrated duplex antenna by coupling the hairpin resonator to the junction resonator of the duplexer directly. In this process, the 50- Ω interface and matching network between them are removed, contributing to a compact footprint. The details of codesign approach have been discussed in this paper. Compared with the traditional cascaded duplexer and antennas, this paper is much more compact and integrated but with an improved frequency response. A prototype of an integrated duplex antenna at S-band is fabricated and measured, showing two operation channels of 2.52-2.65 GHz for transmitting and 2.82-2.94 GHz for receiving with an isolation of over 32 dB. The measured results agree well with the simulation results..