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Analysis of the Implementation Methods of the Left and Right Hand Transmission Lines in the Filter

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Abstract

The filter is an important component in the microwave circuit by providing signal transmission in the passband and providing attenuation in the stopband to control the frequency response somewhere in the microwave system. Here, the application of the left and right hand transmission lines in the dual frequency filter, the band pass filter and the ultra wide band filter are summarized.

Keywords: Left and right handed transmission line, filter;

1. Introduction

The filter is an important component in the microwave circuit by providing signal transmission in the passband and providing attenuation in the stopband to control the frequency response somewhere in the microwave system. Here, the application of the left and right hand transmission lines in the dual frequency filter, the band pass filter and

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the ultra wide band filter are summarized.

2. Filter Implementation Analysis

In the aspect of dual-frequency filter: the literature [1] adopts the combination of loading the left and right hand short-circuiting branches and the coplanar waveguide open-circuit branches, and designs a dual-frequency filter. The bandwidth of the two passbands is independently adjustable, compact and high-frequency. Harmonics also has a good suppression effect; the literature [2] designed a dual-band filter with microstrip structure according to the unique advantages of the left and right hand transmission lines in the field of dual-frequency microwave devices, as shown in Figure 1; A dual-frequency filter is designed based on the left and right hand transmission lines of the inverse open resonant single loop.

In terms of band-pass filters: [4] proposed a zero-order resonator unit based on the left and right hand transmission lines operating in the X-band, and designed a new band-pass filter operating at 9.2 GHz to 9.5 GHz using two units. This filter maintains less in-band ripple and good cut-off characteristics compared to conventional filters based on the form of coupled microstrip lines, and is reduced in size by 80%; the literature [5] is based on ground defects and microstrip gaps. The left and right hand transmission line units are designed, and the two-stage units are cascaded to design a band pass filter, as shown in Fig. 2.

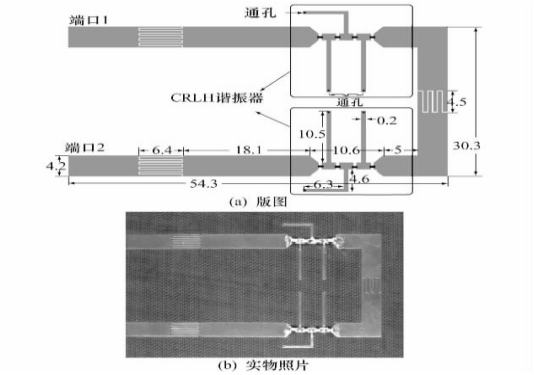

Fig. 1 Dual-frequency filter reported in [2]

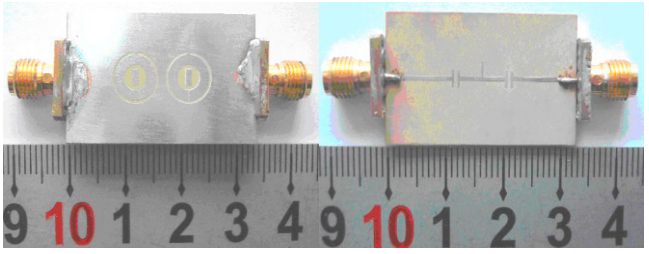

Fig. 2 Bandpass filter reported in [5]

In the ultra-wideband filter: since there is no stop band between the left-hand passband and the right-hand passband of the balance left and right hand transmission lines, the two are combined into one passband, and the UWB filter can be realized in this way. In [6], a new type of UWB filter based on the 10-unit hand structure is proposed, as shown in Fig. 3. The literature [7] proposes an improved left-right hand transmission line period unit formed by surface coupling, and based on the unit design. The ultra-wideband filter, as shown in Fig. 4, has the advantages of small size and low insertion loss; the literature [8] proposes a combined structure of a reverse open-loop resonator and a parallel branch and a small ultra-wideband filter based on the combined structure. The device is shown in Figure 5; the literature [9] uses the equilibrium state of the left and right hand transmission lines based on

the reverse open-loop resonator to design a broadband band-pass filter, and introduces a parallel grounding branch in the original structure to achieve the second harmonic. The control combines the left-hand passband, the right-hand passband and the second harmonic passband to design a high-performance, miniaturized ultra-wideband bandpass filter, corresponding broadband bandpass filter and ultra-wideband bandpass filter structure. Figure 6 shows.

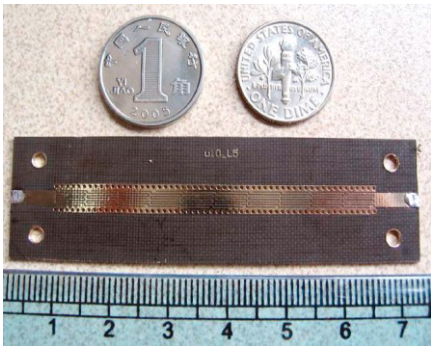

Fig. 3 Ultra-wideband filter reported in [6]

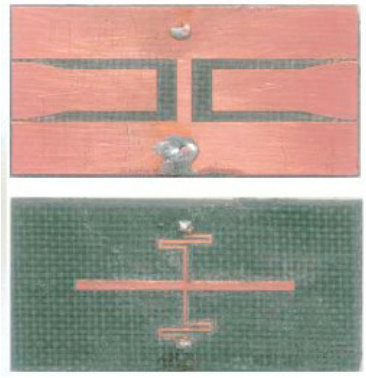

Fig. 4 Ultra-wideband filter reported in [7]

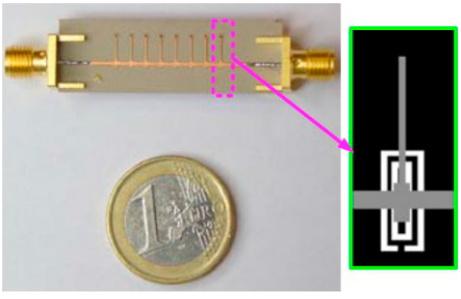

Fig. 5 Ultra-wideband filter reported in [8]

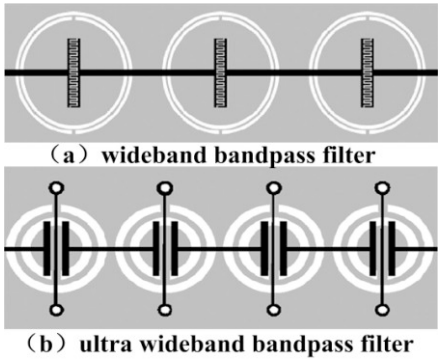

Fig. 6 Ultra-wideband filter reported in [9]

3. Conclusion

The function of the feeder system is to ensure that the amplitude and phase of each antenna unit in the antenna array are distributed as needed. Therefore, the merits of the feeder system are the key factors affecting the overall performance of the antenna array. The filter is an important part of the antenna's feeder system. This paper summarizes the application of the left and right hand transmission lines in the filter, and analyzes the advantages and disadvantages of different implementations.

4. Acknowledgement

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