distinguished from possible calibration inaccuracies. Over this $3\frac{1}{2}$ years maximum calibration deviations of 1.6 K and rms variations of 0.7 K have been observed. However, it must be pointed out that conditions during some calibrations were not ideal, and inaccuracies may have occurred which, in turn, caused a fictitious instability of the radiometer. Therefore, it is advantageous to recalibrate the instrument only when the climatic effects are small and sufficient time is available for a thorough and careful calibration procedure.

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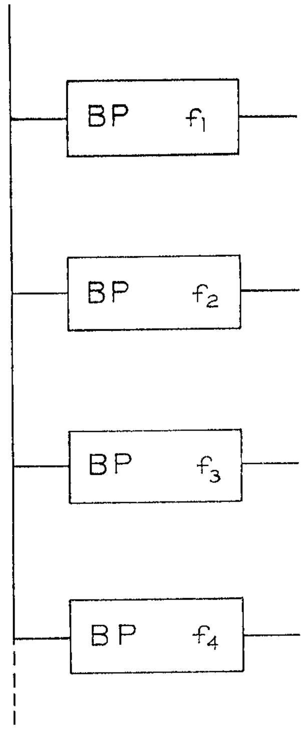

Fig 1. Multicoupler block diagram.

Resonant Cavities Used as Frequency Selective Phase Shifters

N. A. McDONALD

Abstract—**An application of resonant cavities as frequency selective phase shifters in a multicoupler configuration is described.**

When several bandpass filters are to be sequentially branched off a transmission line to form a multicoupler as in Fig. 1, some method has to be used to obtain, at the pass frequency of each bandpass filter, the correct impedance (usually an open circuit) immediately below the junction of that bandpass filter and the main transmission line.

Two common ways to achieve this are:

a) to insert below each bandpass filter a bandstop filter tuned to the same frequency;
b) to insert below each bandpass filter an adjustable phase shifter, and to terminate the main transmission line beyond the last bandpass filter in a short circuit or reactance.

This letter relates to an alternative configuration in which resonant cavities are used as frequency selective phase shifters beyond the last bandpass filter.

Consider the network of Fig. 2, in which all of the series resonant circuits are of high Q and independently tunable, and in which each series circuit presents a high impedance at the junction T except in the vicinity of the resonant frequency of that circuit. If a signal at fixed frequency f_1 is applied to the transmission line above T and one of the series circuits is tuned through resonance at f_1, the admittance that the series circuit presents at the junction T, in principle, passes through all reactive values. Accordingly the standing wave pattern at f_1 on the transmission line above T moves a distance of one-half wavelength and is therefore capable of presenting any reactive impedance at any point on the line above T.

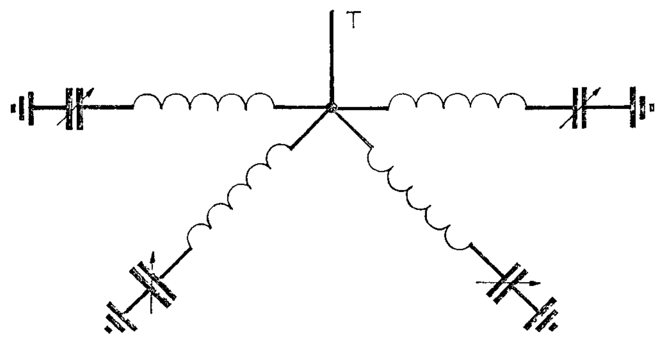

Fig. 2. Parallel combination of resonators

Such a combination of resonant circuits acts as a frequency selective phase shifter having as many independently adjustable phase/frequency combinations as there are resonant circuits. If such a network is placed below the lowest filter in Fig. 1, the necessary impedance requirements can be met at the junctions between bandpass filters and the main transmission line. Although in principle the stopband impedances of the bandpass filters at the main transmission line are infinite, any residual reactances can be absorbed in the phase shift adjustment.

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This technique has been successfully applied to the design and construction of a 12-channel multicoupler in which each narrow band channel is independently tunable from 225–400 MHz [1]. The 12 tunable bandpass filters are connected to the main transmission line at physically convenient intervals. The frequency selective phase shift network, connected below the last filter, is obtained from the parallel connection of 12 tunable cavity resonators, each of which is associated with one of the bandpass filters. Residual effects of bandstop filters in the main transmission line are avoided, and the required phase shift is independently adjustable for each bandpass channel.

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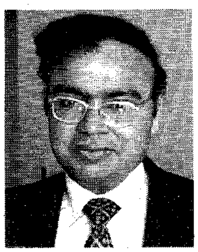

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