

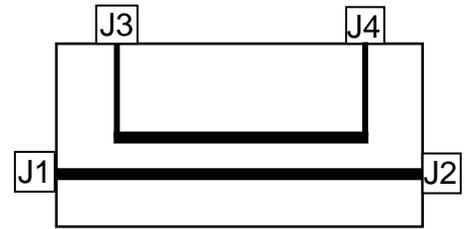
Economic Multi-Signal Combining with Directional Couplers

Combining different wireless carriers does not always mean using complex filters or acceptance of the 3 dB loss of hybrid combiners. The choice usually starts with considerations of the guard band between the signals and the acceptable limitations of passive intermodulation (PIM).

If the signals are in the same frequency band then very often no amount of filtering will provide sufficient isolation between the sources, in which case the use of a 3 dB Hybrid Combiner is most appropriate. If the signals are widely spaced then a cross band coupler can be an effective answer of combining the two signals onto a single path with minimal loss (< 0.5 dB) and high isolation (> 50 dB). However, such crossband couplers are very specific in frequency bands and can be expensive.

A very basic crossband coupler, albeit with a loss penalty can be realized with an air-line directional coupler from Microlab/FXR. What is frequently forgotten is the fact that the frequency range of a coupler, usually an octave band, refers only to the coupled port, the through or main line being essentially broad band.

So, if you need to combine say a 420 MHz carrier to a cellular or PCS band signal path, a directional coupler with a bandwidth of just 380 to 520 MHz may be all that is necessary. The penalty of course is a 6 dB loss on the 420 MHz signal path, plus an isolation of around 25 dB, but the benefits are minimal loss on the main line and an off-the-shelf component at a reasonable price. Such a component for the 380 – 520 MHz band is available from Microlab as the CK-26N. Alternatively, a Cellular/PCS signal could be added to a 420 MHz signal using an 800 – 2200 MHz Directional Coupler such as the CK-36N, but this time the 6 dB loss would be borne by the Cellular/PCS signal.



Path J1 to J2 is wide band
Coupled path J3/J4 to J1/J2 is limited band



6 dB Directional Coupler



3 dB Hybrid Coupler

Yet another way is to use a 3 dB Hybrid Coupler as a 3 dB Directional Coupler in the same manner as a 6dB, except this time the loss to the coupling path is only 3 dB, at the cost of some of the isolation between the two sources. Microlab/FXR has prepared a specification sheet for such Hybrids used as Directional Couplers, CK-64/74/84/94N.

Microlab/FXR also offers a growing number of low cost Diplexers, sometimes referred to as Crossband Couplers in the BK series. Most common is the Diplexer BK-20 which splits and divides the cellular/GSM band (700 – 960 MHz) from the PCS/DCS/UMTS bands (1710 – 2170 MHz). A second series, BK-21, splits all cell phone bands (80 – 2170 MHz) from the Wireless LAN band (2400 – 2500 MHz).

To discuss which solution is best for your application, call or e-mail the passive component experts at Microlab/FXR. (5/04)



High/Low Band Diplexer