Application Note

Microlab Signal Tappers – An Emerging Choice for In-Building DAS Design and Applications

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Introduction

Microlab Signal Tappers, also known as Signal Sampler, are very similar to directional couplers. The signal sampler extracts all signals regardless of the direction of flow. These include direct-coupled resistive samplers as well as electrostatic and electromagnetic probe samplers. Tappers are frequently used in Distributed Antenna Systems (DAS) and are available with either N or 7-16 mm DIN connectors.

Challenges in DAS Design and Deployment

Distributed Antenna Systems (DAS) are a big part of the wireless infrastructure growth. With the increase of the system architecture, there are more frequency expansion challenges in DAS. In order to cover these frequency extremes in a single system, economic factors compromise the performance. The performance trade-off during the design stages is the biggest challenge in DAS applications.

Usually unequal splitters and directional couplers used to divide or combine wireless signals. In practice, the smaller more conveniently sized directional coupler is usually selected. The unequal splitters with multiple coupling sections offer a flatter response at a lower price and a DC connection to the branch line. The best choice, however, is the signal tapper (sampler) which has a very flat response with a modest price.

Comparison between Signal Tappers and Directional Couplers

Directional couplers sample signals flowing in one direction only. These directional couplers include parallel line couplers and loop couplers. Directional couplers provide flat coupling, high directivity and low VSWR. Directivity is approximately 20 dB for printed couplers, 25 dB or more for air dielectric couplers. Units can be supplied with coupling ranging from 3 dB to 50 dB.

Tappers split high power cellular signals unevenly in fixed ratios from 1000:1 to 2:1 with minimal reflections or loss over the wireless bands in the range of 350 MHz to 2700 MHz. Tappers work independently of the signal direction. These include direct-coupled resistive samplers as well as electrostatic and electromagnetic probe samplers.

Directional couplers are commonly used as power combiners, both to divide and combine signals. Signal samplers, on the other hand, are used only occasionally to combine signals, but often to add a test signal. Directional couplers have some limitation on bandwidth and technical challenges which makes the overall system design cost more expensive.

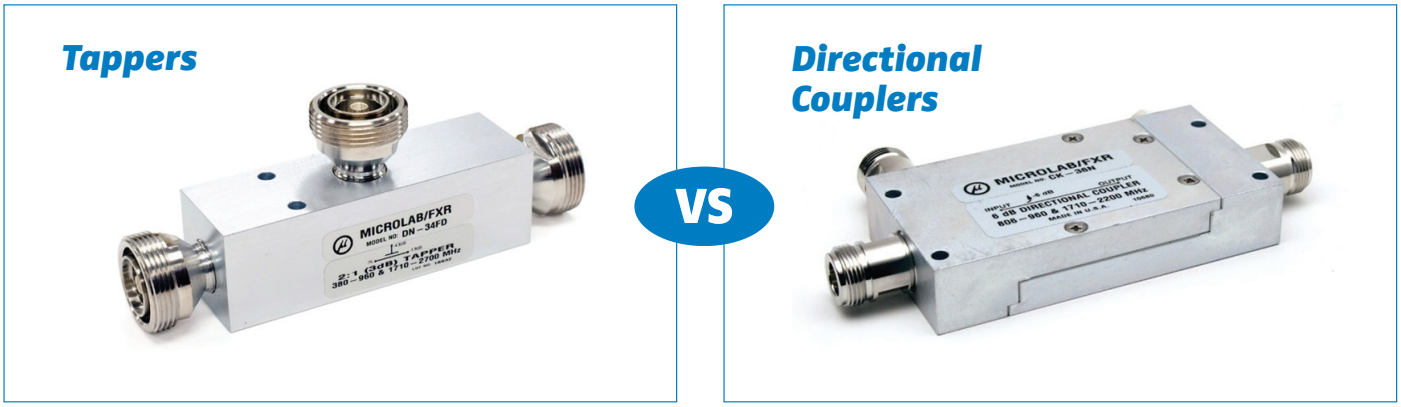

Fig 1: Tappers versus Directional Couplers

Signal Tappers	Directional Couplers
Ultra Broad-band: 350-2700 MHz	Ultra Broad-band: 380-2700 MHz
Lowest PIM (< -150 dBc)	Low PIM (< -140 dBc)
Highest Power (500 W avg.)	High Power (200 W avg.)
Improved system performance.	Moderate system performance
Very flat coupling values	Flat coupling values
Low priced without impacting system performance	Higher price for similar frequency coverage
No directivity	High directivity
Lower isolation	High isolation

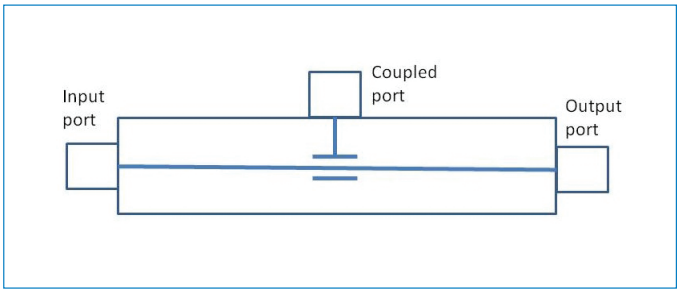

Fig 2: Block Diagram of Signal Tappers

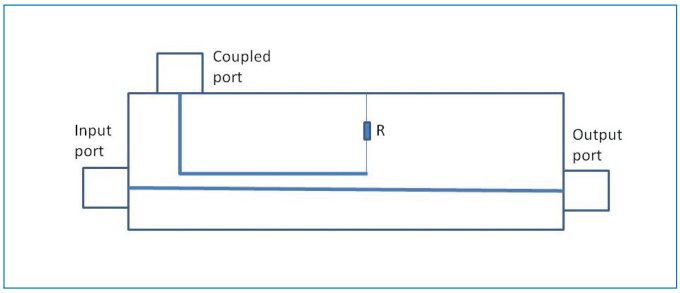

Fig 3: Block Diagram of Directional Couplers

Conclusion

Microlab Signal Tappers unevenly split high power cellular signals in fixed ratios with minimal reflections or loss over the wireless cellular bands. The innovative asymmetric design ensures an excellent input VSWR and coupling flatness across the band, even down to a 2:1 split. The lightweight design allows easy attachment to a wall using the supplied bracket. Designed with only a few solder joints and an air dielectric, loss is minimized and reliability enhanced. Tappers provide much less isolation than a directional coupler on a return path. Signal tappers have the benefit of easily realizable broad bandwidths. Major applications include LTE, WiMax, WiFi, PMR and Cellular Bands.

References:

[1] Microlab Signal Tappers.
(http://fxr.com/products/directional-couplers-and-tappers/tappersunequalssamplers)

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