



The T-Junction Coupler

Say we desire a **matched** and **lossless** 3-port coupler.

Q: *Wait a minute! I already told you that a matched, lossless, reciprocal 3-port device of any kind is a physical impossibility!*

A: Absolutely true! Our desire in this case will be **unfulfilled**. There are, however, a few designs that come **close**.

- 1. The Lossless Divider** - As the name states, this coupler is lossless. It is likewise reciprocal, and thus is **not matched**.
- 2. The Resistive Divider** - As the name implies, this coupler is **lossy**. However, it is both matched and reciprocal.
- 3. The Circulator** - This three-port coupler is both matched and (ideally) lossy. This of course means that it is **not reciprocal!**
- 4. The Wilkinson Divider** - Like the resistive divider, it is matched and reciprocal, and thus is **lossy**. However, it is lossy in a way that is not apparent when power is **divided** (i.e., power can be divided **without loss**).

As a result, the Wilkinson Power Divider is in most ways as **ideal** a T-junction as there is. Accordingly, it has its very **own section** in your textbook!