

Using a Balun Transformer Combiner for High Power Microwave Experiments*

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A novel coaxial power combiner[1] design has been duplicated that has distinct advantages over other combiner geometries that can handle high power. This design is being applied to combine four 3 kW power supplies to obtain a 12 kW, 5 MHz system for an ICRF antenna on HSX. In the past, Wilkinson type combiners have had limited application to high power systems because of the lack of non-inductive, high power, 100Ω balance loads. With this new design, standard 50Ω dummy loads can be used instead for the balance load. The cost is considerably lower than lumped element combiner designs which are dominated by capacitor costs. At such a relatively low frequency, a 3-dB quarter-wave coupled-line coupler becomes impractically long, and a conventional branch-line hybrid requires 35Ω -line, which is commercially unavailable. The balun combiner uses less transmission line than a ring hybrid and has good bandwidth characteristics even away from its best line impedance. Theoretical calculations and modeling were performed for line impedances from 50Ω to 75Ω in 5Ω increments. Measurements from a low-power test device show excellent agreement with theory, and construction of the high power system is underway.

[1] Q. Guo, Y. Ma, J. Ju, APM2005 Proceedings (2005).

*Work supported by USDOE.