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Product Note 24

Setup Configurations for Very Low Impedance Tuning

Standard CCMT and MTS tuners can tune accurately to reflection factors between 0.82 and 0.85. This corresponds to VSWR of 10:1 to 12.5:1 and permits to measure safely transistors with internal resistances Zin of 4 to 5 Ω. Tuners with option -HR (High Reflection [1]) can tune to VSWR of 20:1 (Γ=0.904, Zin=2.5 Ω). To measure transistors with lower internal resistance we recommend to use transforming networks [2]. The main reasons for this are the accuracy and reproducibility of the tuners as well as the accuracy of calibration and measurement of the network analyzers [2].

Setup Recommendations

DUT Resistance	Required VSWR	Corresponding Γ	Recommended Solution
5 Ω	>10:1	0.818	Standard CCMT/MTS
2.5 Ω	>20:1	0.906	CCMT/MTS -HR option
1 Ω	>50:1	0.961	CCMT/MTS + one 20Ω λ /4 Transformer
0.5 Ω	>100:1	0.980	" " "
0.2 Ω	>250:1	0.992	CCMT/MTS -HR + one 10Ω λ /4 Transformer
0.1 Ω	>500:1	0.996	" " "

Single section transformers reduce instantaneous band-width to about 15%. At medium and high frequencies (f>4GHz) multi-sectional transformers can be designed and manufactured covering bandwidth such as 6 to 18 GHz or 10 to 40 GHz.

[1] "RF tuner with Very High VSWR, model MTS-308-HR", Product Note 17, Focus Microwaves, August 1994.
[2] "Load Pull Measurements on Very Low Impedance Transistors", Appl. Note 6, Focus Microwaves, November 1993.