Coaxial Stub Tuners

DATASHEET / 2G-008



Coaxial Stub Tuners

Description

Maury stub tuners are basic laboratory tools used for matching load impedances to provide for maximum power transfer between a generator and a load, and for introducing a mismatch into an otherwise matched system. Typical applications include power and attenuation measurements, tuned reflectometer systems and providing a DC return for single-ended mixers and detectors. Maury stub tuners are available in double- and triple-stub configurations with frequency ranges extending from 0.2 to 18.0 GHz.

Stub tuners work as impedance transformers to introduce a variable shunt susceptance into a coaxial transmission line. They consist of one or more short-circuited, variable length lines (stubs) connected at right angles to the primary transmission line. To provide all possible shunt susceptances, each stub must be movable over 1/2 wavelength at the lowest frequency of operation; therefore, the lower frequency limit of a tuner is determined by the frequency at which the maximum stub travel equals 1/2 wavelength. The upper frequency limit for a stub tuner is established by its connectors.

The inter-stub spacing of multiple-stub tuners determines the range of impedances that can be matched and the ease of tuning. Compared with single- and double-stub tuners, triple-stub tuners are more convenient to use since tuning sensitivity is relatively independent of stub spacing.

How a stub tuner works.

A stub tuner is a matching network used in RF and microwave systems to match the impedance of a transmission line to a load. It consists of a main transmission line and a short-circuited or open-circuited stub placed at a specific distance from the load.

How It Works:

1. The stub is a short segment of transmission line, typically open or short-circuited.
2. The location of the stub along the main transmission line is chosen to create the desired impedance transformation.
3. The stub acts as a reactive element (inductor or capacitor) that cancels out the unwanted reactance of the load, ensuring a perfect impedance match.
4. By adjusting the stub length, the reflected signal is minimized, maximizing power transfer.

Maury offers triple stub tuners consisting of three tuning stubs positioned at fixed intervals along the transmission line.

How It Works:

1. Three short-circuited or open-circuited stubs are placed at fixed distances.
2. Each stub contributes to modifying the impedance, providing three degrees of freedom.
3. The three adjustable stub lengths allow for impedance matching over a very broad range.
4. The tuning process involves iterative adjustment of each stub until the reflection coefficient is minimized.

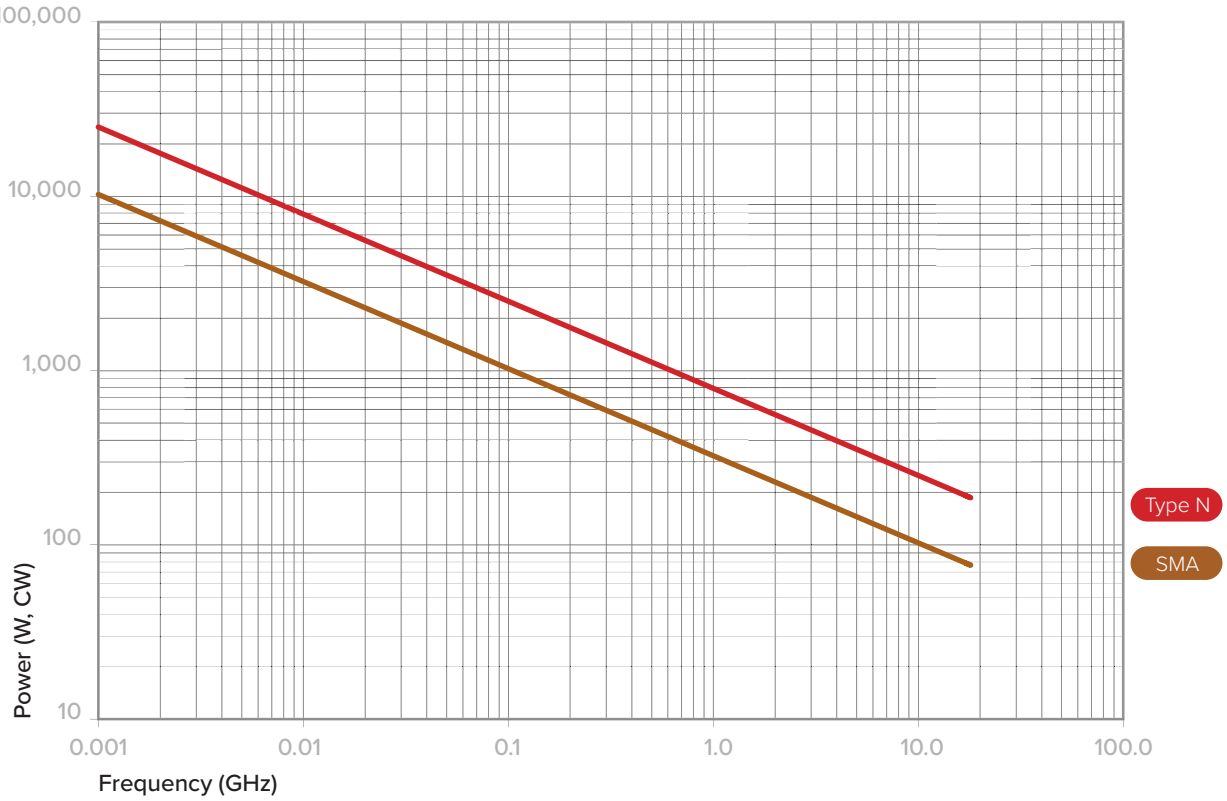
Since each stub must be individually adjusted to reach a desired target impedance, it is impractical for constant VSWR measurements.

Available Models

STUB CONFIGURATION	FREQUENCY RANGE (GHz)	MODEL (BY CONNECTOR TYPE) TYPE N	MODEL (BY CONNECTOR TYPE) SMA	STUB TRAVEL INCHES	STUB TRAVEL (cm)	STUB SPACING INCHES	STUB SPACING (cm)	Power Handling
TRIPLE-STUB	0.2 — 0.5	1878G	—	30.0	(76.2)	4.6 (11.7) / 2.0	(5.1)	See Table on Page 2 for Power Handling vs Frequency, assuming 10:1 VSWR
	0.4 — 1.0	1878A	1819A	15.0	(38.1)	4.6 (11.7) / 2.0	(5.1)	
	0.8 — 4.0	1878B	1819B	7.5	(19.1)	1.0 (2.5) / 0.75	(1.9)	
	2.0 — 18.0	1878C	1819C	3.0	(7.6)	0.75 (1.9) / 0.5	(1.3)	

Power Handling Capability of Stub Tuners

POWER (W, CW) VS. FREQUENCY (GHZ) AT 10:1 VSWR, 25 C, SEA LEVEL





1819C
Triple-Stub
Tuner

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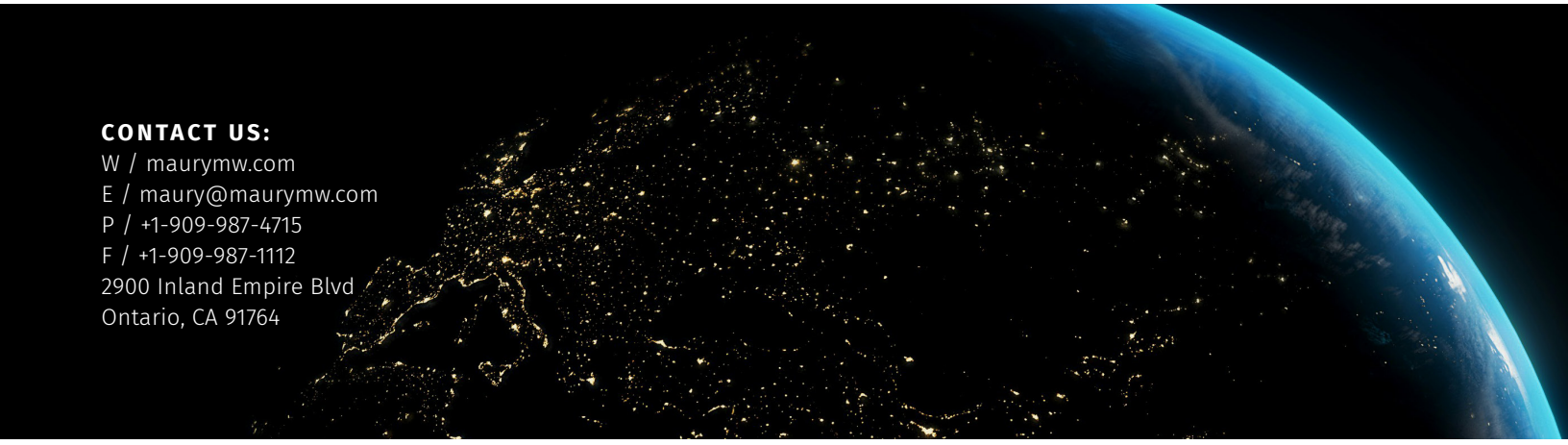

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