FOCUS MICROWAVES

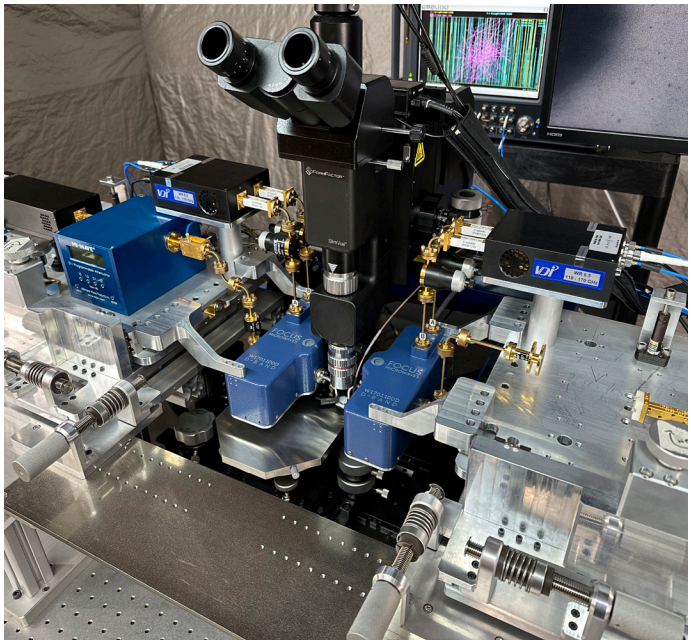
Waveguide Tuners

50-330GHz Waveguide Tuners

Introduction | Waveguide Tuners

Focus Microwaves pushes the boundaries of tuner technology once again. While 6G frequencies and applications are still being defined, Focus took the initiative and developed a new family of waveguide tuners designed for frequencies greater than 110GHz. Leveraging the success and technology of the DELTA tuners (industry standard for direct connect on wafer applications) and combined it with the micro-metric accuracy and repeatability of the small footprint OMEGA tuners. These new waveguide tuners revolutionize the Sub-THz bands.

Starting with models from 26 to 40 GHz and now up to 330 GHz using standard WR-3, WR-5, WR-6, WR-10, WR-12, WR-15, WR-22 and WR-28 waveguide sections. The extreme high horizontal (2.5µm) and vertical (1.5µm) probe movement resolution allows dense impedance coverage up to the highest frequency. Focus' series of waveguide tuners provide high tuning range in a small footprint, making them ideal for on-wafer applications. Multiple models are available for Ka, V, E, W and D bands.



The extreme low-loss RF probes used in the waveguide tuners are meticulously engineered to achieve optimal tuning accuracy and repeatability. These probes are designed to be free of spurious resonances, ensuring that the signal integrity is maintained throughout the tuning process. This high level of precision is crucial for applications that demand exceptional performance and reliability.

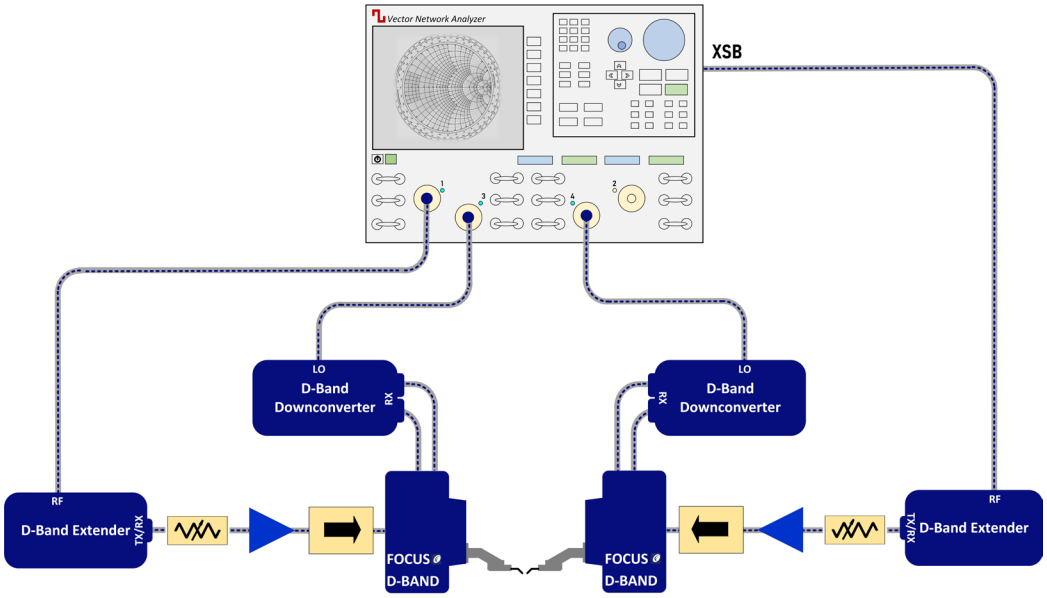
Moreover, all Focus tuners are equipped with LAN control capabilities, allowing for seamless integration into networked environments. This feature enables remote operation and monitoring, which is particularly advantageous in complex testing and measurement setups. Additionally, the tuners come with on-board impedance synthesis firmware known as iTuner. This sophisticated software is based on prior calibration data, ensuring that the tuners can accurately replicate the desired impedance conditions without the need for repeated manual adjustments.

By incorporating these advanced technologies, Focus tuners provide users with a robust and highly reliable solution for RF testing and tuning, capable of meeting the stringent demands of modern electronic and communication systems.

D-Band Vector Load Pull | 110-170GHz

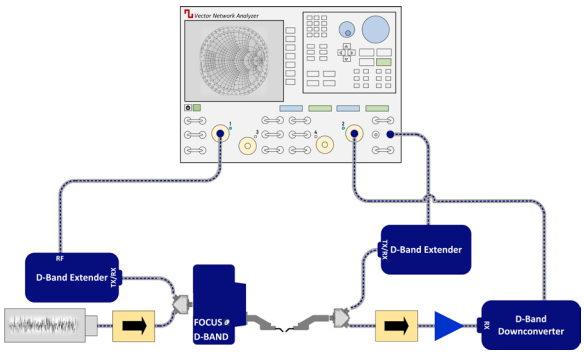
Considering 6G requirements in terms of Radio performance, with all the limitations of signal propagation, a higher throughput in terms of power and efficiency is desired from millimeter-wave (mmW) or THz circuits. The performance of these RF circuits is constrained by the performance of transistors and other active devices. Due to the transistor's physical limitations at these frequencies, the maximum available output power degrades drastically. This constraint brings in more value to perform load pull characterization of these active devices in this sub Tera Hertz frequency range.

The traditional vector load pull system requires measurements of forward and reverse travelling waves using the standard coaxial receivers in a vector network analyzer (VNA). For sub-THz bands when using external WG frequency extenders a direct receiver access is not available. Also, the losses at these frequencies have to be minimized to extract the maximum VSWR from the passive tuners. To address this limitation and based on the legacy of Delta on-wafer tuners, Focus Microwaves has designed small footprint waveguide tuners that can be connected directly to the RF probes and are available with options for vector load pull measurements. Custom 4-channel downconverter receivers are used to downconvert the input/output a1,2/b1,2 mmWave high frequency waveforms to an intermediate frequency (IF) which is low enough to be fed to the standard VNA receivers.



D-Band Noise Characterization | 110-170GHz

Achieving a reasonable tuning range is as critical for noise parameter extraction as for load pull measurements. Having a good tuning range allows for better impedance spread when measuring minimum noise figure at the optimum gamma for full band waveguide measurements. Direct probe connection is a key as losses at D-Band will significantly collapse the constellation of impedance the user can tune. Illustrated here is a sample setup of a D-Band Noise Parameter extraction system. A dedicated down convertor receiver together with input and output noise modules is designed to translate the high frequency signals to an acceptable frequency range of the Noise Figure analyzer.



Focus | Waveguide Tuners | Models & Specifications

Model	Frequency	VSWR	Connector type
W1280	8.0 - 12 GHz	≥ 20:1	WR-90
W18120	12 - 18 GHz	≥ 20:1	WR-62
W26180	18 - 26.5 GHz	≥ 20:1	WR-42
W40260	26.5 - 40 GHz	≥ 20:1	WR-28
W50330	33 - 50 GHz	≥ 20:1	WR-22
W75500B*	50 - 75 GHz	≥ 20:1 (typ. 35:1)	WR-15
W90600B*	60 - 90 GHz	≥ 20:1 (typ. 35:1)	WR-12
W110750B*	75 - 110 GHz	≥ 20:1 (typ. 35:1)	WR-10
W140900B*	90 - 140 GHz	≥ 20:1	WR-8
W1701100B*	110 - 170 GHz	≥ 15:1	WR-6
W2201400B*	140 - 220 GHz	≥ 10:1	WR-5
W3302200B*	220 - 330 GHz	≥ 6:1 (typ. 10:1)	WR-3
W75500BV**	50 - 75 GHz	≥ 20:1 (typ. 35:1)	WR-15
W90600BV**	60 - 90 GHz	≥ 20:1 (typ. 35:1)	WR-12
W110750BV**	75 - 110 GHz	≥ 20:1 (typ. 35:1)	WR-10
W140900BV**	90 - 140 GHz	≥ 20:1	WR-8
W1701100BV**	110 - 170 GHz	≥ 15:1	WR-6
W2201400BV**	140 - 220 GHz	≥ 10:1	WR-5
W3302200BV**	220 - 330 GHz	≥ 6:1 (typ. 10:1)	WR-3

* Tuner type for On-Wafer Applications
** Tuner Type for On-Wafer Vector Load Pull