



OML Millimeter Wave VNA Modules Configured for Keysight (Agilent/HP) 8510/85105A VNA Systems

OML has recently installed an Keysight 8510 VNA system to be used for testing and optimization of OML Millimeter Wave VNA Modules (modules) for delivery to customers. It is equivalent to the Keysight 85106D millimeter system and is capable of operating with either the Keysight x85104A series of millimeter wave (MMW) modules or the OML VxxVNA-T/R, VxxVNA-S and VxxVNA-T series of MMW modules. The OML modules allow 8510 coverage of the waveguide bands from 33 to 325 GHz.

OML's new test system includes: an 8510C VNA, two 83621B Synthesizers and an OML modified 85105A Millimeter Wave Controller. The 85105A is modified as described in the OML [Application Note HP85105A Modifications](#) posted on the OML web site. With this system OML can emulate 8510 systems equipped with the new 85105A-H01, the 85105A-K10 or user modified 85105A Millimeter Wave Controllers. The "H01" is a Keysight revised standard 85105A, applying the OML Application Note above, and has the same LO and RF levels as the standard 85105A. It does not require compensation of the LO and RF output levels. The "K10" is a special Keysight adaptation of their standard 85105A designed specifically to interface with all of the OML MMW modules 33 to 325 GHz and has RF drive capability up to 50 GHz. The "K10" LO output level is also the same as that of the standard 85105A and does not require compensation. The "K10" RF output is lower than that of the standard 85105A. Proper emulation of the "K10" RF level requires that attenuation be added to the RF output of OML's modified 85105A to achieve the "K10" emulation for testing and optimization OML modules through 110 GHz.

To emulate the "K10" higher frequency RF capability (up through 29 GHz) a frequency doubler is added to the RF output of OML's modified 85105A for testing and optimization of OML modules covering 90 to 325 GHz. This adaptation is possible because the standard 85105A has sufficient output power to drive a frequency doubler. **An end-user cannot use a "K10" with the OML "x2" Option because the "K10" has insufficient output power to drive the "x2" Option frequency doubler.** All versions of the 85105A have the same IF gain and no compensation is needed for that part of the emulation. These emulations allow the OML modules to be set up so that they can be connected to the customer's specific 8510 system with minimum, if any, adjustment.

Using the proper emulation for the customer's specific version of the 85105A the OML MMW modules are set up to interface with the customer's system. For optimum 8510/85105A MMW performance OML modules have internal attenuation applied to the LO and RF input ports as needed to match the drive level available with the customer system configuration. Stock OML 33 to 110 GHz modules require +5 dBm minimum RF drive (+7 to +10 dBm recommended). The 90 to 325 GHz modules require 0 dBm minimum (0 to +5 dBm recommended) RF drive unless equipped with the "x2" Option. The "x2" option equipped modules require +14 dBm minimum RF drive. All OML modules require +5 dBm minimum LO drive (+7 to +10 dBm recommended). The OML module internal IF gains are reduced by 25 to 35 dB to accommodate the built-in 85105A IF gain and avoid IF overload of the 8510.

OML also has available to use in its 8510 system the Keysight 08510-60105 IF Interface Cable. Keysight developed this Cable for use in the old 85104A millimeter wave system which some customers are still using (85104A system was composed of discrete components). This cable was used to interface the 85104A millimeter wave assembly to the 8510 without use of a controller. A system configured in this manner could perform only one path two port measurements ("S11" and "S21"). It is the least expensive (and least useful) system that can be configured for use with the OML MMW modules. This system relies on the synthesizers to provide the necessary RF and LO drive levels (as listed above) and on the OML modules to supply all of the required IF gain. The stock OML modules, without further optimization, interface easily to the IF Interface Cable based system with properly programmed synthesizers.

With this new 8510 test capability, OML Millimeter Wave VNA Modules are delivered from the factory internally adjusted to operate with the specific 8510 system configuration the customer is using. The IF levels are adjusted to yield the maximum possible dynamic range on the 8510. The LO and RF levels are adjusted for optimum 8510/85105 system frequency response. The customer is no longer required to measure each of the signal levels and apply the necessary outboard attenuation. Consult the other sections of the OML Millimeter Wave VNA Module manual or see the other papers posted in the Vector Analysis section of the OML web site for further insight.