

# Microwave & RF Device Characterization Solutions

## MT1000 – Mixed-Signal Active Load Pull System (30.0 MHz to 40.0 GHz) And MT2001 System Software

From



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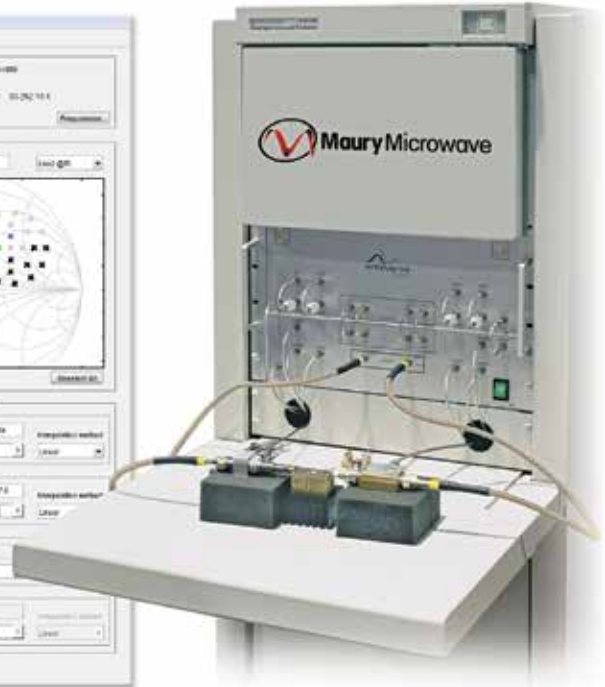
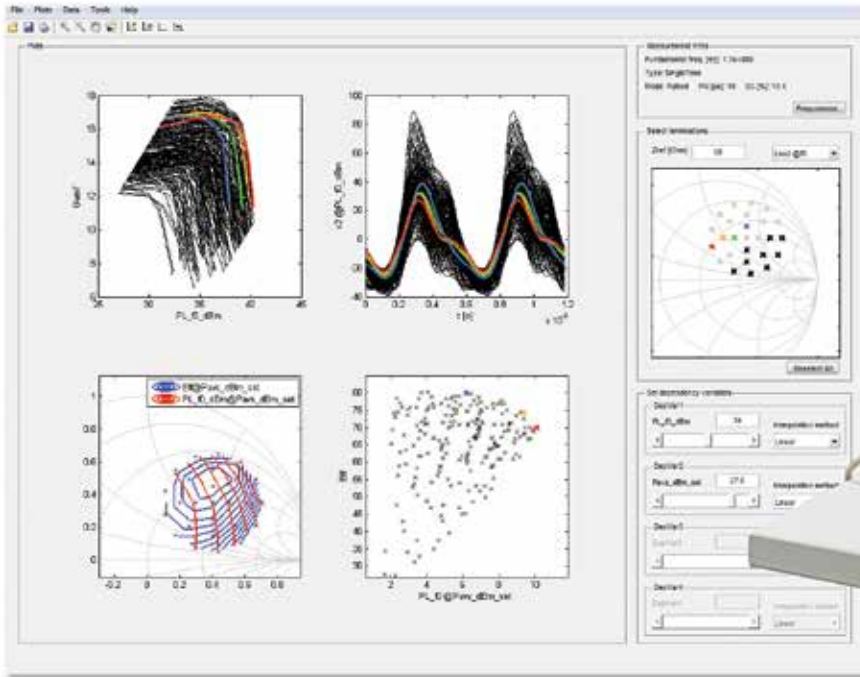
- **RF Device Characterization Methods**
- **Pitfalls To Avoid When Purchasing A Device Characterization System**
- **Device Characterization Software**
  - IVCAD Advanced Measurement & Modeling Software (MT930 Series)
  - ATSV5 Automated Tuner System Software (MT993 Series)
  - AMTSv3 Automated Mobile Test System Software (MT910 Series)
- **Maury Automated Tuners**
  - LXI™-Certified High-Gamma Tuners™
  - LXI™-Certified High-Power Tuners
  - LXI™-Certified 7mm Tuners
  - LXI™-Certified 3.5mm Tuners
  - LXI™-Certified 2.4mm Tuners
  - LXI™-Certified 1.85mm Tuners
  - Millimeter-Wave Tuners
  - LXI™-Certified Multi-Harmonic Tuners
  - LXI™-Certified 7mm Sensor Tuners
- **Automated Sliding Loads**
- **Pre-Matching Probe Mounts**
- **Noise Receiver Modules**



- 50 GHz Noise Receiver Modules
- 50 GHz PNA-X Noise Receiver Modules
- Millimeter-Wave Noise Receiver Modules
- **Precision Low-Loss Coaxial Triplexers & Diplexers**
- **Low-Loss Couplers**
- **Low-Loss Load Pull Test Fixtures**
- **Wide Matching Range Coaxial Slide Screw Tuners**
- **RF Device Characterization System Integration**
- **Turnkey Measurement Systems**
- **Integrated Load Pull and Noise Measurement Systems**
- **Mixed-Signal Active Load Pull Systems**
- **AMCAD Engineering's PIV/PLP Family of Pulsed IV Systems**

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# MT1000 – Mixed-Signal Active Load Pull System (30.0 MHz to 40.0 GHz) And MT2001 System Software



U.S. Patent No. 8,456,175

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## Key Features (Typical Performance)

- Broadband system concept (e.g. 0.7-40.0 GHz)
- Re-configurable hardware; single-ended number of controlled harmonics
- High speed and dynamic range
- Embedded measurement of (Pulsed/Isothermal) DC parameters

## Single tone

- "Real-time" measurement speed >1,000 power and load states per minute
- Multi-dimensional parameter sweeps
- (Pulsed/Isothermal) High Power testing
- Measurement of calibrated Voltage and Current waveforms
- Device protection included
- Waveform reconstruction

### "Real-Time" Load Pull

Synchronization between signal generation and detection facilitates ultra-fast measurements.

- Independently fully controlled multidimensional Load Pull parameters sweep
- 5,760 measurement points in less than 5 minutes: 90 fundamental load states, swept load and source harmonic termination, 16 power levels

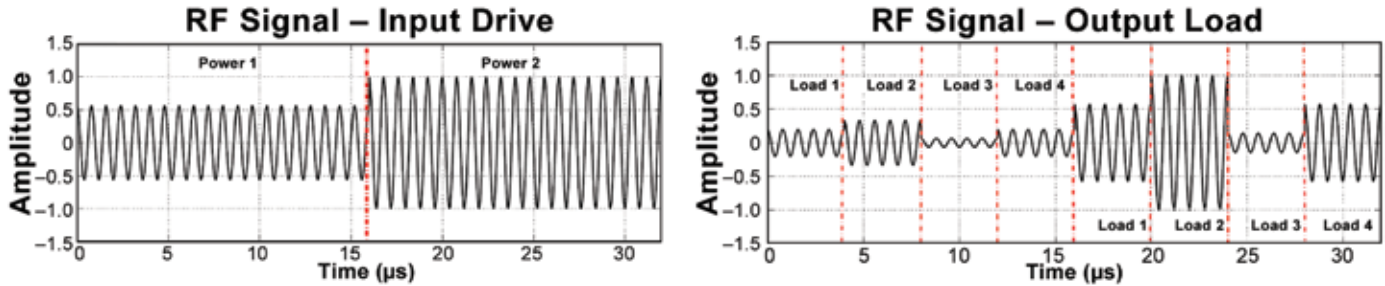
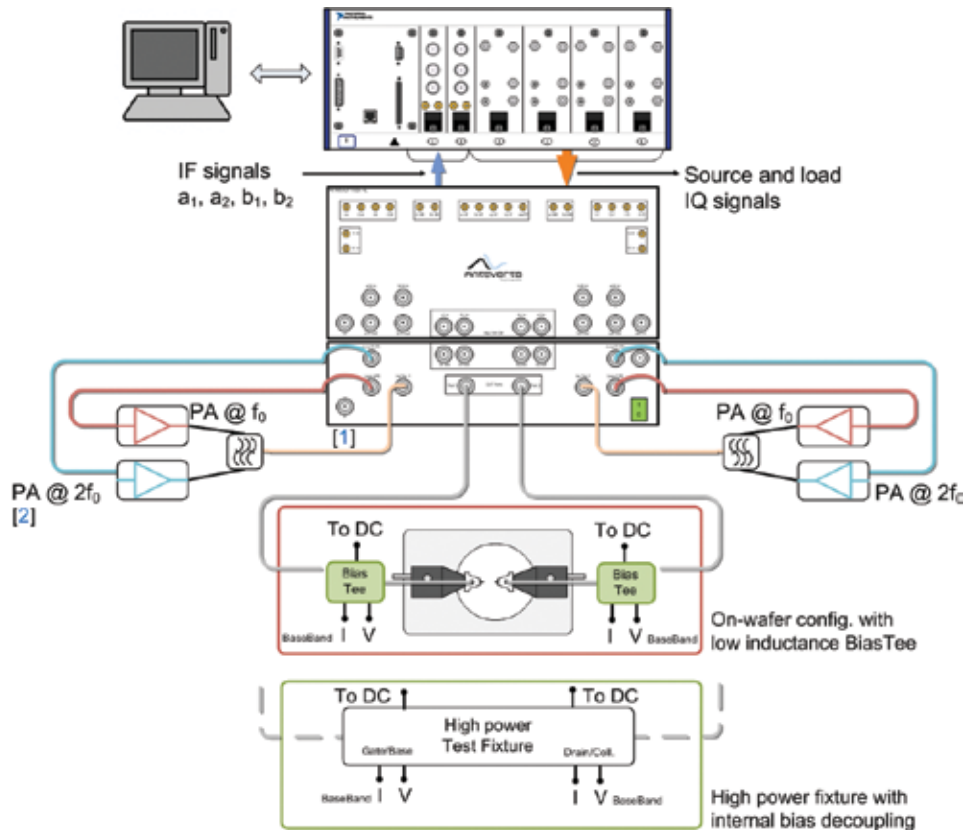


Figure 1. Injection signals as used in the "real-time" multi-dimensional parameter sweeps.

### High Power/On-Wafer Configuration

The active loops are fully re-configurable (e.g., the same hardware would also support source pull at  $f_0$  and load pull at  $f_0$ ,  $2f_0$  and  $3f_0$ , or true differential source and load pull at  $f_0$ ). See [1] in the diagram below.

The proprietary algorithm (patent pending) results in low requirements on the loop amplifiers, so linearity is no longer a problem in this regard, while their  $P_{sat}$  should be just slightly larger than the power generated by the device under test (DUT). See [2] in the diagram at below.



**Available Models**

Model	System RF Bandwidth (GHz)	Number of Active Tuning Loops <sup>2</sup>	Power <sup>1</sup> Handling: CW/Pulsed (W)	Typical Detection Dynamic Range (dB)	Typical Active Load Dynamic Range (dB)	Minimum Pulse Width (nS)
MT1000HF2	0.03 – 2.0	2	50/500	80	60	2000
MT1000HF4	0.03 – 2.0	4				
MT1000A2	0.3 – 6.0	2	100/1000			
MT1000A4	0.3 – 6.0	4				
MT1000B2	0.4 – 18.0	2				
MT1000B4	0.4 – 18.0	4				
MT1000D2	0.5 – 26.0	2	20/200			
MT1000D4	0.5 – 26.0	4				
MT1000E2	0.7 – 40.0	2				
MT1000E4	0.7 – 40.0	4				

<sup>1</sup> Higher power options are available.

<sup>2</sup> 5-loop and 6-loop add-ons available.

**MT2001 Software Modules**

Module	Description
MT2001A	MT2000 POWER MEASUREMENTS <i>(required)</i>
MT2001D	MT2000 NVNA (TIME DOMAIN ANALYSIS)
MT2001E	EXTERNAL CONTROL
MT2001F	VISUALIZATION



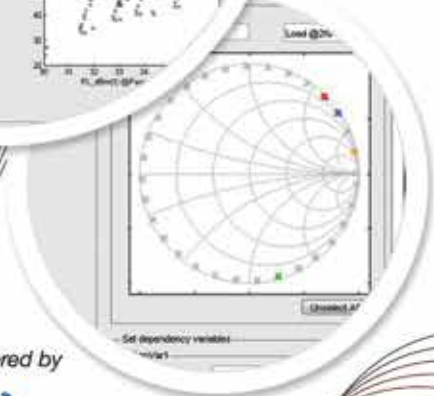
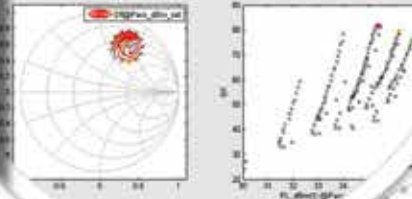
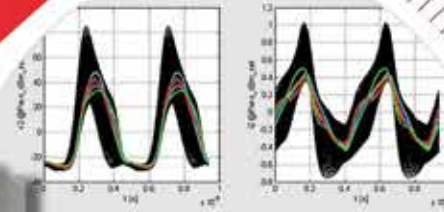


### **Suggested Reading**

- 5A-044 – *Active Harmonic Load Pull with Realistic Wideband Communications Signals.*
- 5A-045 – *Active Harmonic Load Pull for On-Wafer Out-of-Band Device Linearity Optimization.*
- 5A-046 – *A Mixed-Signal Approach for High-Speed Fully Controlled Multidimensional Load Pull Parameters Sweep.*
- 5A-047 – *Base-Band Impedance Control and Calibration for On-Wafer Linearity measurements*
- 5A-048 – *A Mixed-Signal Load Pull System for Base-Station Applications*
- 5C-087 – *Active Load Pull Surpasses 500 Watts!*

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***Contact Us:***

Web: [maurymw.com](http://maurymw.com)

Email: [maury@maurymw.com](mailto:maury@maurymw.com)

Voice: +1-909-987-4715

Fax: +1-909-987-1112