Microstrip & Coaxial Transistor Test Fixtures

For Load Pull Applications
Transistor Fixture Families

- Focus manufactures standard and customized Test Fixtures for packaged small, medium and high power transistors

- Two types of Fixtures are available:
  - Microstrip Fixtures, model PTJ-x-y
  - Coaxial Fixtures, model MLTF-x-y

Suffix “x-y” indicates
- Type of connector
- Frequency range
- Custom type
Fixtures for Load Pull

- Load Pull (and Noise) measurements use electro-mechanical Impedance Tuners
- The RF path between DUT and Tuner must be kept as short as possible, as to reduce insertion loss and maximize VSWR@DUT
- Therefore fixtures where the base extends beyond the RF connectors of the fixture are not suitable.
- Many, otherwise good, available fixtures suffer this handicap.
- Fixtures must be easily calibrated as two-ports and S-parameters of the input and output section must be available.
Fixtures not good for Load Pull

Example of fixture not suitable for load pull measurements
Fixtures suitable for Load Pull

Example of fixture suitable for load pull measurements

- Input Tuner
- DUT
- Output Tuner

Base shorter than Fixture + RF connectors

Maximum VSWR
Focus Test Fixtures to 18GHz

Microstrip Fixtures

• One fixed block, one adjustable block
• Mstrip transformers and bias networks on fixture
• Available with 7/16, N, 7 and 3.5
• DUT fixed using a clamp
• TRL Calibration Standards

Coaxial Fixtures

• Minimum Loss; No dielectric
• Only 50Ω
• DUT leads clamped into coax
• APC-7, N, 7/16
• TRL Calibration Standards
Overview Test Fixtures

- **Microstrip – Standard and Custom**
  - PTJ-S DC-4GHz SMA, N, 3.5, 7, 7/16
  - PTJ-C DC-6GHz SMA, N, 3.5, 7, 7/16
  - PTJ-X DC-12GHz SMA, N, 3.5, 7
  - PTJ-Ku DC-18GHz SMA, N, 3.5, 7

- **Coaxial – Low Loss**
  - MLTF-C DC-6GHz N, 7, 7/16
  - MLTF-X DC-12GHz N, 7
  - MLTF-Ku DC-18GHz N, 7
Microstrip Test Fixtures

PTJ-0 with APC-7 and N connectors

PTJ-0/N with water cooling
Microstrip Fixtures PTJ-Ku-7 (Operating to 18 GHz)

- APC-7 Connector
- Movable Block
- In situ fastening wheel
- Delay Insert
Overall S-Parameters

PTJ-Ku-7

Insertion Loss of Input and Output sections:

\[ IL = 0.06 \cdot f \text{ [GHz]} \text{ dB} \]
Overall S-Parameters

PTJ-X-7

Insertion Loss of Input and Output sections:

\[ IL = 0.06 \cdot f \ [\text{GHz}] \ \text{dB} \]

Total Reflection

-21 dB
Overall S-Parameters

PTJ-C-SMA

Insertion Loss of Input and Output sections:

\[ IL = 0.05 \cdot f [\text{GHz}] \text{ dB} \]

Total Reflection
Microstrip Fixtures PTJ-C in 7/16 with Transistor Clamps & Water Cooled Insert
Microstrip Fixtures PTJ-C with Adjustable Transistor Clamp
High Power Test Fixture PTJ-C with Water Cooled Inserts (>250 Watts)
Microstrip Fixtures with Water Cooled Transistor Inserts
Microstrip Fixtures PTJ-X-N in Load Pull Operation
Focus calibration
Software allows accurate characterization of input and output section of this fixture
Use Adapter Removal to measure S-parameters of fixture half, since TRL fails when harmonic traps are included on the matching networks.

Measure Input section

Measure Output section
Coaxial Fixtures, MLTF*-X-N

*MLTF = Minimum Loss Test Fixture
MLTF-X-N with Accessories*

*TRL Calibration Standards and Transistor Insert
Insertion Loss per Half: 0.02dB @ 2GHz

*US patent 6,414,563*
MLTF-Ku-7 Ready to Ship

S-parameters of input and output sections

MLTF with Insert

TRL Calibration Standards
S2P of Total Fixture

Insertion Loss of Input and Output sections:

IL = 0.0033 \cdot f \text{ [GHz]} \text{ dB}
Using MLTF and PMT allows us to generate extremely high $\Gamma$ ($\sim0.98$) @DUT ref. plane