High-Performance RF Routing:

Exploring the Capabilities and Uses of EECL's SMX Switch Matrices

As modern RF, microwave, and wireless communications systems grow increasingly complex, the demand for precise, automated, and high-speed signal routing has never been higher. Whether in a multi-port automated test equipment (ATE) rack, a satellite communications ground station, or a dense semiconductor characterization lab, engineers require hardware that can direct signals without introducing unwanted insertion loss, skew, or crosstalk.

KEY FEATURES

- Ultra-low insertion loss (~12dB at 30GHz)
- Ultra-high isolation (>90dB)
- Broadband and flat – up to 12/30GHz
- Full crossbar topology
- Switch path length matched
- Any combination of input/output ports dual path
- Oven stabilised for zero drift
- Benchtop or Rackmount for professional ATE



APPLICATIONS

- RF Automated Testing
- VNA Multiport Measurements
- Antenna Characterization
- 5G & Phased Arrays
- Cross-correlation
- RF Multiplexing
- Satellite Base Station



Enter the **SMX Series Switch Matrices** from **European Engineering & Consultancy Ltd (EECL)**. Engineered to handle high-frequency signals up to **30 GHz** (with broader capabilities extending across various specialized setups), these solid-state matrices have become essential tools for advanced RF testing and signal distribution.

Key Engineering Features of the SMX Series

EECL's **SMX Series Switch Matrices** are considered superior in high-frequency RF and microwave testing due to several distinct engineering and performance advantages over standard switching hardware:

- **Full-Crossbar Topology:** Unlike traditional blocking matrices, the SMX series features a full crossbar architecture. This means any common port can be dynamically routed to any switch port simultaneously, offering unmatched routing flexibility.
- **Matched Path Lengths:** To maintain phase integrity and accurate timing across parallel measurement channels, the internal switch paths are meticulously matched in length, verified via Time-Domain Reflectometry (TDR).
- **High-Frequency Performance:** Supporting options up to 30 GHz with ultra-high isolation (often exceeding 90 dB) and low insertion loss, the matrices maintain signal fidelity across wide bandwidths.
- **Rapid Switching Speeds:** Leveraging advanced solid-state design, switching operations occur in roughly 20 microseconds, making them ideal for high-throughput production environments.
- **Flexible Control & Form Factors:** Units can be operated as compact benchtop instruments or integrated into professional rackmount ATE systems. They feature modern remote-control interfaces including USB and Ethernet (LAN) connectivity.

Primary Use Cases and Applications

Because of their broad frequency coverage, precision routing, and rapid transition times, EECL's SMX matrix units serve several critical sectors:

1. Automated Test Equipment (ATE) & Production Lines

In manufacturing environments testing multi-band radios, components, or modules, minimizing test time is vital. The SMX matrix allows an automated test system to cycle a single Vector Network Analyzer (VNA) or spectrum analyzer through dozens of device test ports rapidly, maximizing throughput without requiring manual cable reconnections.

2. Aerospace, Defense, & Satellite Communications

Testing modern phased-array antennas, radar subsystems, and satellite communication links requires routing multiple high-frequency signals seamlessly. The high isolation and low signal degradation of the SMX series ensure that cross-talk between sensitive channels is virtually eliminated.

3. Semiconductor & 5G/6G Component Characterization

As wireless tech pushes into higher millimeter-wave frequencies, testing multi-port chips (such as beamformers and MIMO transceivers) demands hardware that preserves signal integrity. The SMX matrices provide the stable, repeatable path environments necessary for accurate device profiling.

Conclusion

EECL's SMX switch matrices bridge the gap between high-frequency signal fidelity and automated testing efficiency. By combining a full-crossbar topology, ultra-low insertion loss, and robust software control, they provide the backbone for complex, multi-channel RF testing environments where precision cannot be compromised.

More at https://www.saelig.com/eecl/rf-switch.htm