

## Low Frequency Noise Measurement System

### Introduction

Primarius 9812DX is an enhanced version of the industry's de-facto standard flicker noise (1/f noise) measurement systems 9812D and 9812B. 9812DX sets new records in measurement speed, system resolution and coverage of different types of measurement requirements for flicker noise and random telegraph noise or signaling (RTN or RTS). Flicker noise is the dominant noise for deep sub-micron and nanometer CMOS, bipolar junction transistor (BJT), field effect transistor (FET) and heterojunction bipolar transistor (HBT) devices.

9812DX includes an order of magnitude improvement in measurement resolution compared with the legacy systems. It provides all device types with wide operating conditions, including high voltage up to 200V and extreme low current down to 10pA. It is also the only system in the market that accommodates a complete range of measurement conditions for both high and low impedance devices, ranging from 10Ω to 10MΩ.

To meet the challenge of explosive growth requirements for low frequency noise test in advanced technology nodes, especially FinFET technology, 9812DX delivers a significant and innovative improvement in hardware and software design. With a typical noise measurement speed of 20 sec/bias, 9812DX sets a new high-speed record. The 9812DX can be used in conjunction with the Primarius semiconductor parameter testing system FS-Pro, providing a parallel testing framework solution that significantly improves testing efficiency and throughput.

The 9812DX has been adopted by many foundries following 9812B/D and has become the new golden tool for low frequency noise testing. It is widely used for development of the most advanced semiconductor process technology nodes, from 14nm and 10nm to 7nm, 5nm and 3nm.

### Applications

- Process quality evaluation and monitoring for advanced technology (FinFET/FD-SOI/GaN) development
- Noise characterization for SPICE model extraction
- Process/device evaluation for advanced circuit designs



### Key Advantages

- **Proven gold standard**  
Indispensable tool for many leading foundries & top fabless companies
- **Ultimate resolution**  
Multiple built-in LNAs provide the widest impedance matching range
- **Full device type coverage**  
All conditions including high voltage and extreme low current
- **Highest speed**  
Fast noise measurement speed and efficient statistical noise analysis
- **Broad technology supports**  
Proven in all technology nodes including 14/10/7/5nm

### Hardware Specifications

- **Wide range**  
Maximum input SMU voltage and currents: 200V and 200mA
- **High accuracy**  
Minimum DC accuracy: 10pA  
System noise current resolution:  $<10^{-27} \text{A}^2/\text{Hz}$
- **High speed**  
20 sec/bias for typical device 1/f noise
- **Wide impedance range**  
DUT impedance ranging from 10Ω to 10MΩ
- **Input/Load resistors**
  - 16 Gate/Base options, 15 Drain/Collection options
  - Voltage LNA: 0.03-10MHz, 0.65nV/ $\sqrt{\text{Hz}}$  (@5kHz)
  - Current LNA: 0.03-1MHz, 0.7pA/ $\sqrt{\text{Hz}}$  (@5kHz)
  - Wideband current LNA: 0.03-10MHz, 5pA/ $\sqrt{\text{Hz}}$  (@5kHz)
  - High precision current LNA: 0.03-20kHz, 60fA/ $\sqrt{\text{Hz}}$  (@5kHz)
  - Built-in ADC and DSA, ESD DUT Protections

