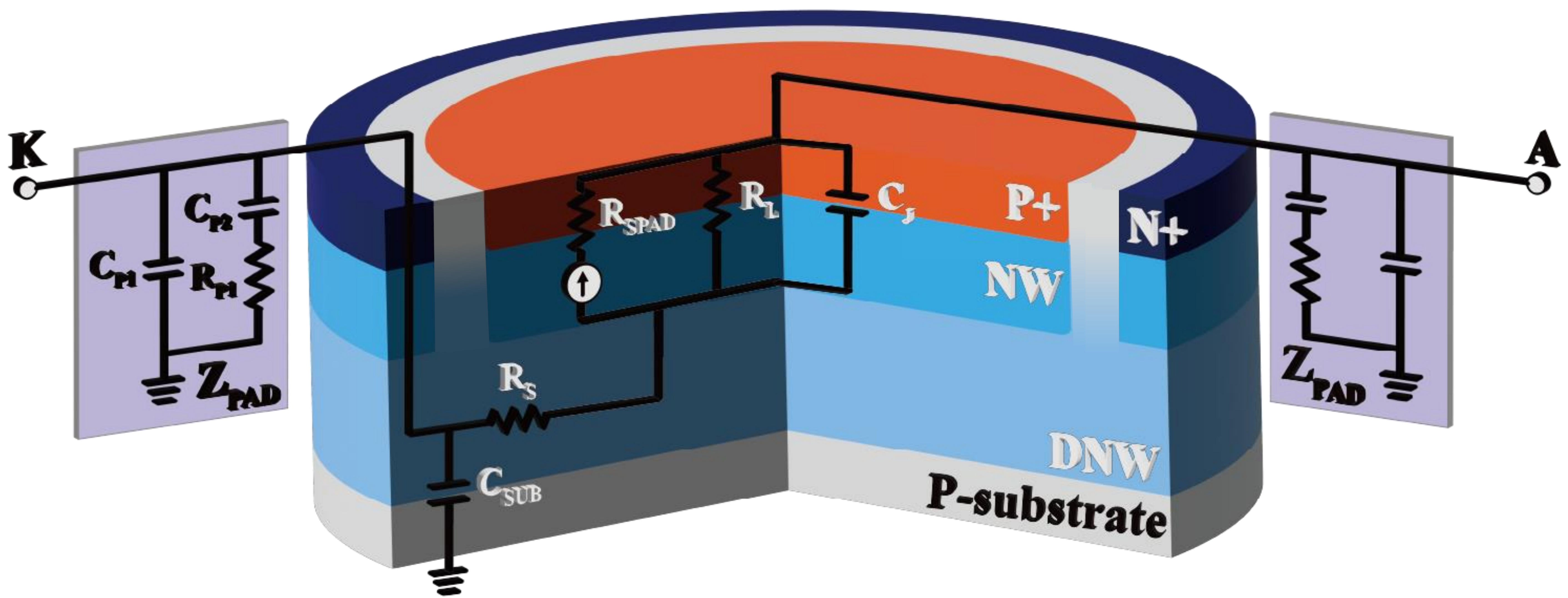
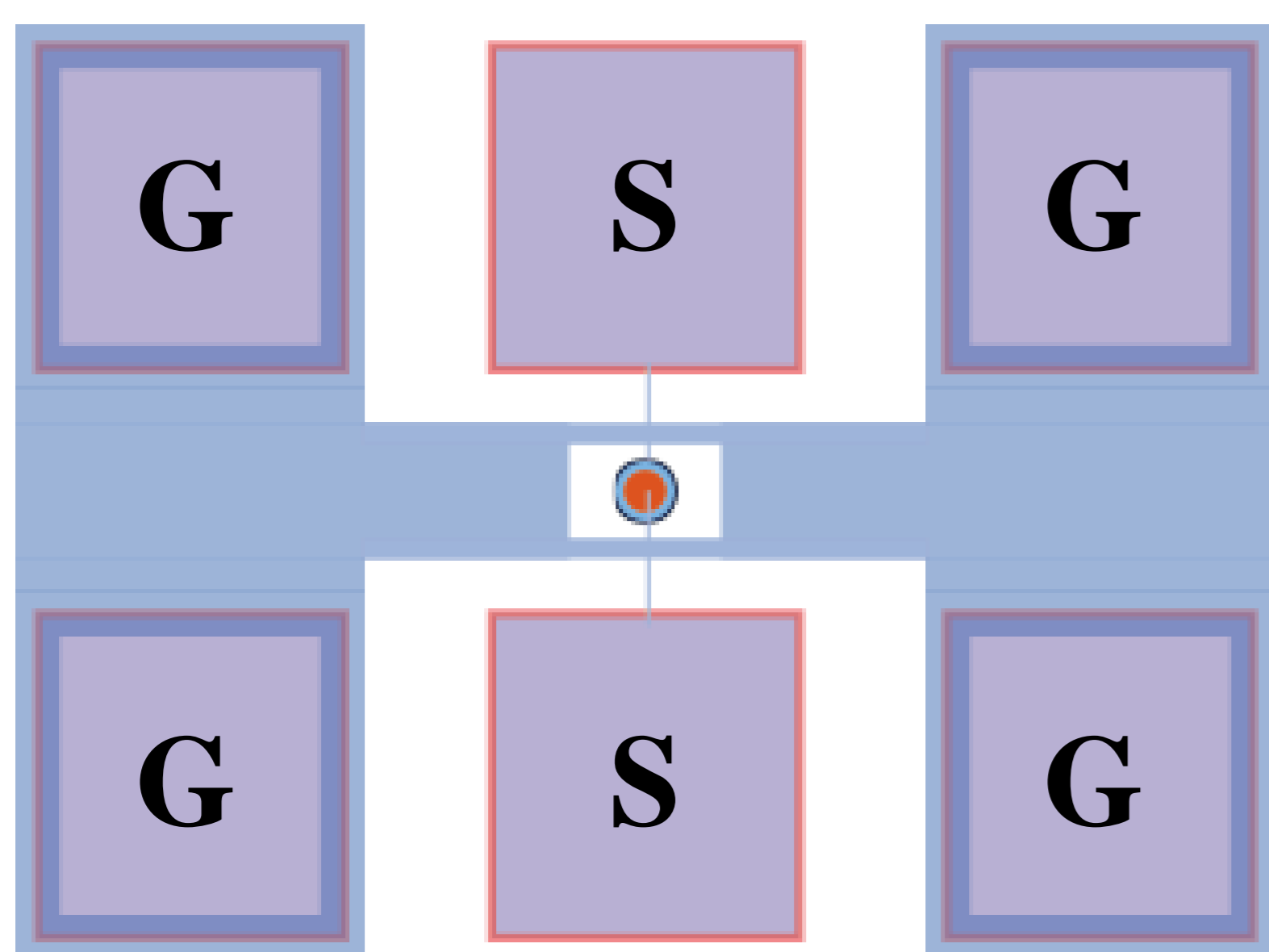


# An Optimized SPAD Equivalent-Circuit Model

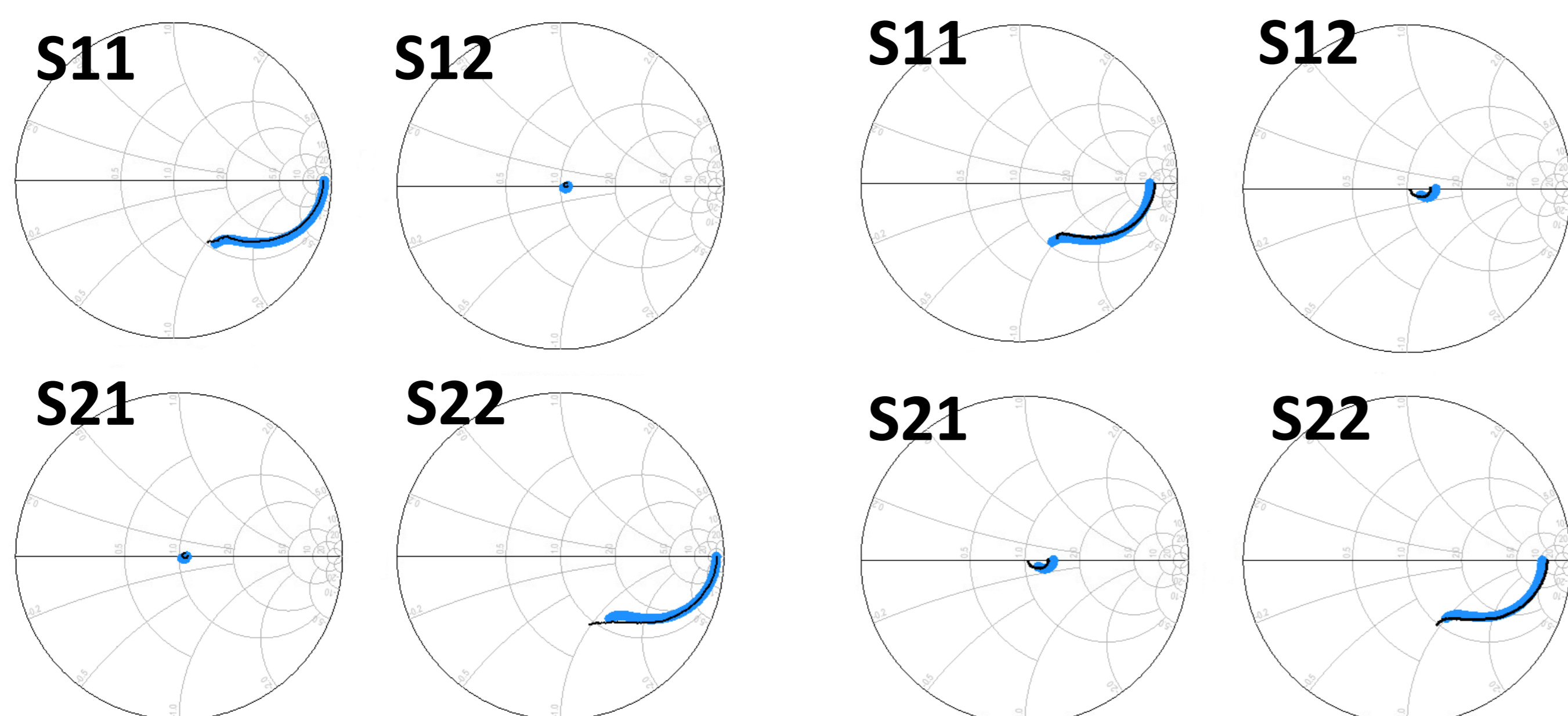


✓ An equivalent-circuit model for SPADs



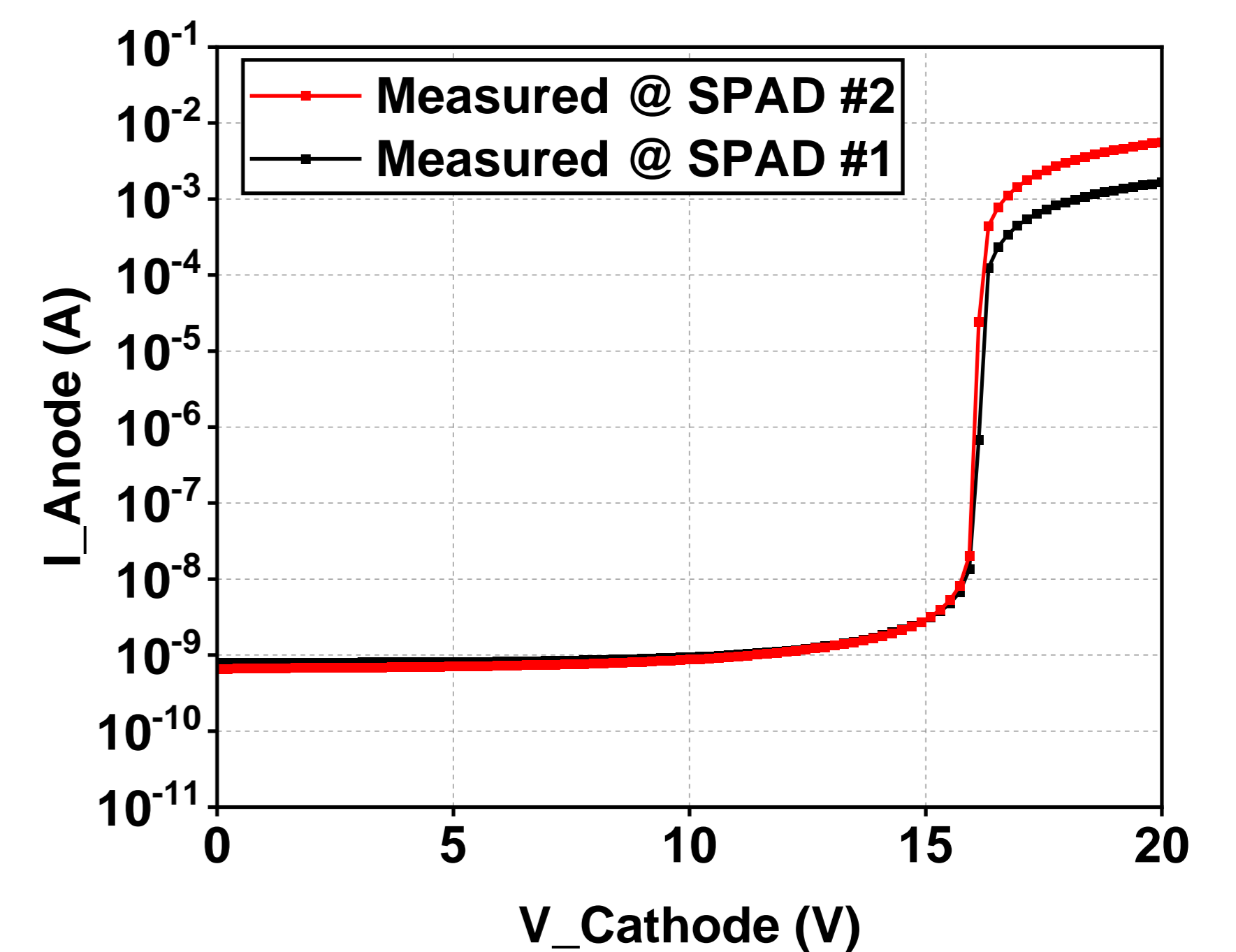
1. **Calibration** : To correct systematic errors and probe effects to establish an accurate reference plane using SOLT
  2. **De-embedding** : Removes pad effects to reveal the device's intrinsic properties
- Measure and model pad S-parameters, then subtract from the DUT model to isolate intrinsic properties

✓ GSG samples for precise parameter extraction

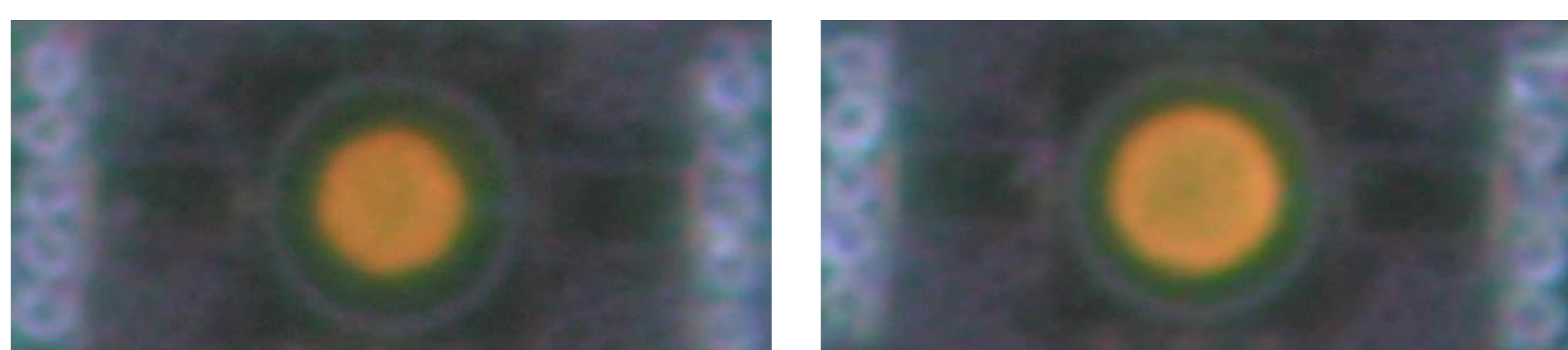


✓ S-parameter fitting results (left : SPAD #1, Right : SPAD #2)  
(Measured / Simulation @  $V_{EX} = 3V$ )

*S-parameters vary by device and accurately reflect device performance characteristics !*



✓ I/V curve measurement results under illuminated conditions



✓ LET measurement results

< SPAD #1 >      < SPAD #2 >

- ❖ This enables analysis and anticipation of component characteristics
- ❖ By integrating device parameters, circuit simulations achieve higher precision

✓ Significance of an equivalent-circuit model for SPADs