



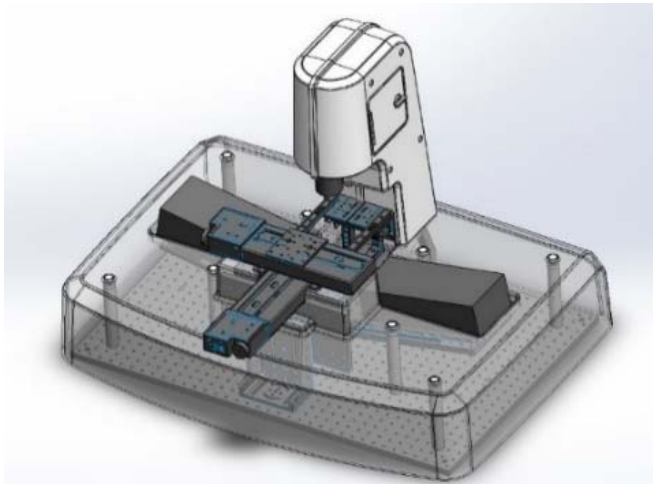
**Automated Performance of On-wafer Calibration and
Characterization Using Non-Contact Probes**

 **TERAPROBES** INC

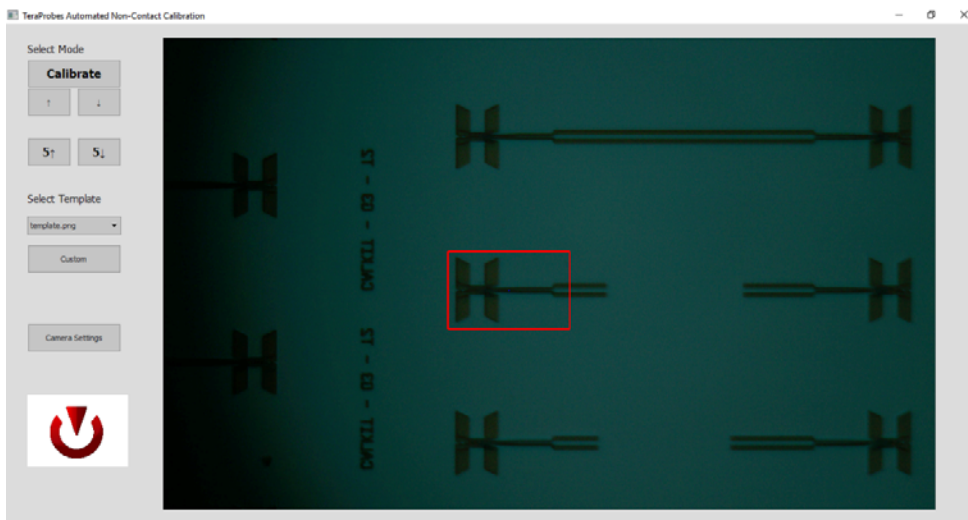
Fully-automated On-wafer Non-contact Characterization



From concept...



... to Product



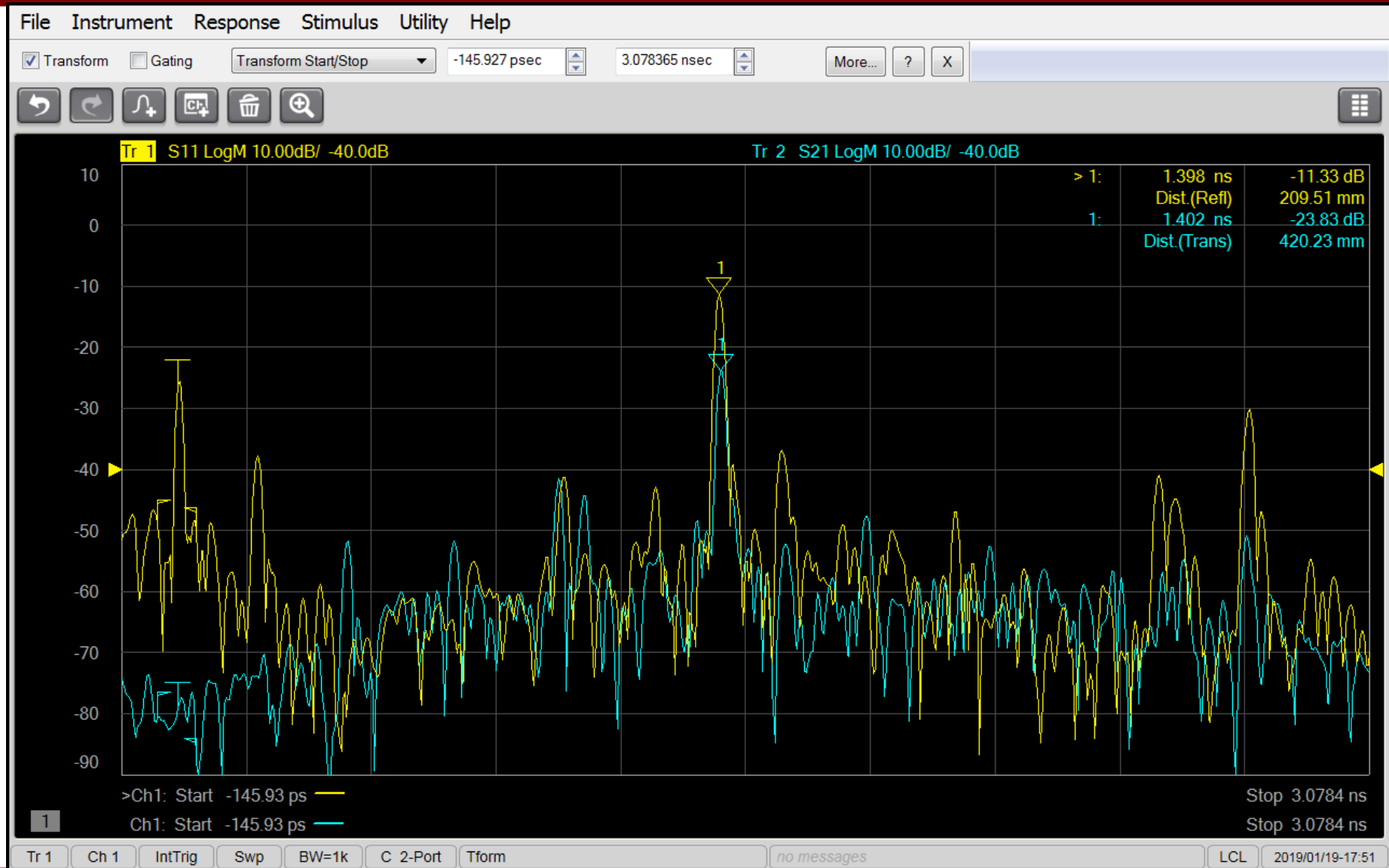
- Fully-automated
- Non-contact
- On-wafer / Wafer-scale Device and IC Probing Systems
- 55GHz-1.1THz
- Single-ended or Pure Differential

Software-controlled Automation of Calibration and Measurements

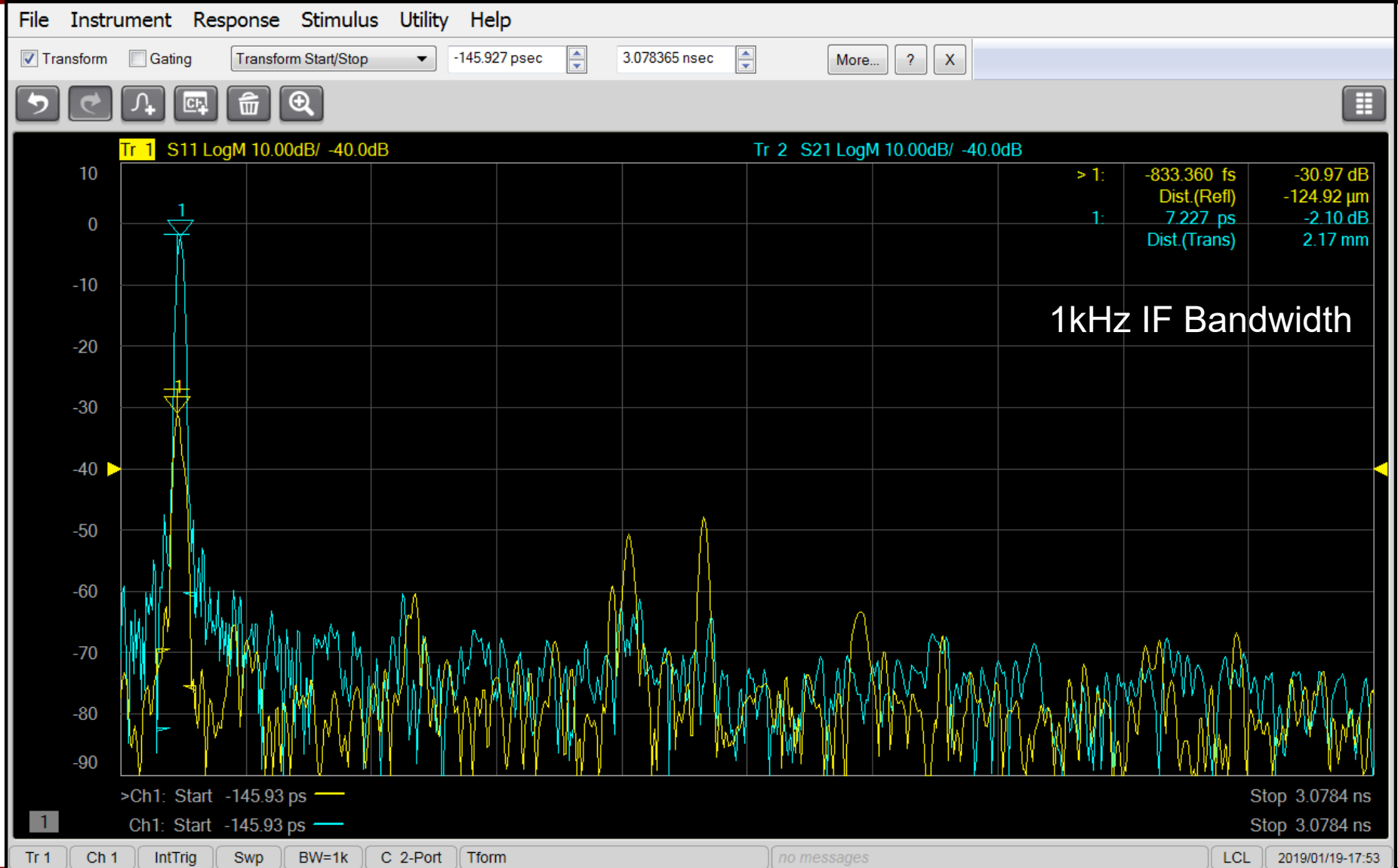


A screenshot of a software interface for calibration and measurements. The interface is divided into a control panel on the left and a main display area on the right. The control panel includes a 'Select Mode' section with a 'Calibrate' button and navigation buttons (up/down arrows, '3' with up/down arrows, '5' with up/down arrows), a 'Lock' button, and a list of 'ReMeasure' buttons (ReMeasure-14, ReMeasure-7, ReMeasure-6, ReMeasure-Cal, ReMeasure). Below this is a 'Select Template' dropdown menu set to 'template.png', a 'Custom' button, and a 'Camera Settings' button. At the bottom left of the control panel is a red circular logo with a white downward-pointing triangle. The main display area shows a dark background with several horizontal red laser lines. A central target symbol, consisting of a cross with four rectangular wings, is highlighted with a red square. On the right side of the display, there is vertical text: 'CALKIL - BS - 13' and 'CALKIL'.

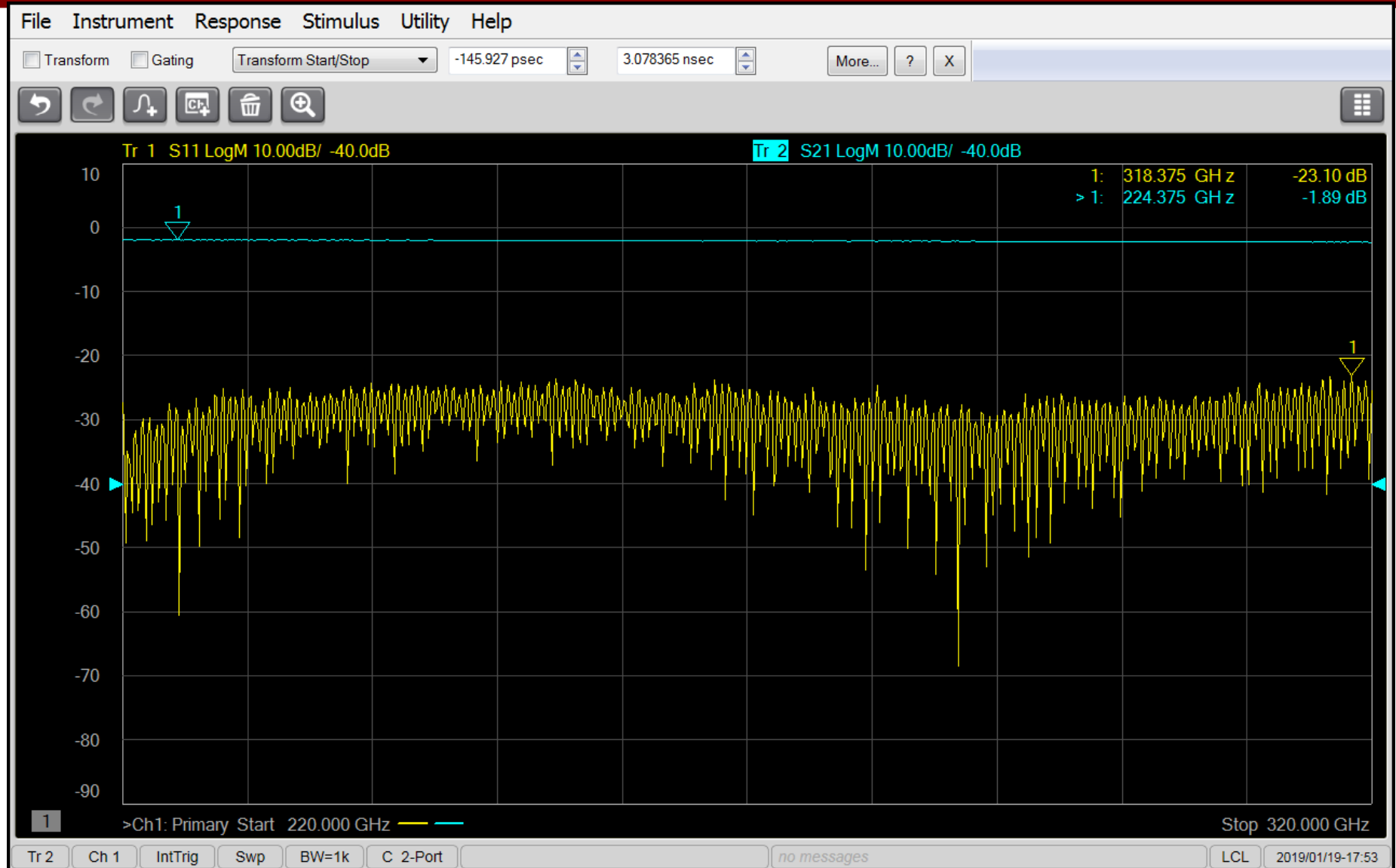
Typical Response Before On-wafer Calibration: THRU (VNA first-tier calibrated to extender ports)



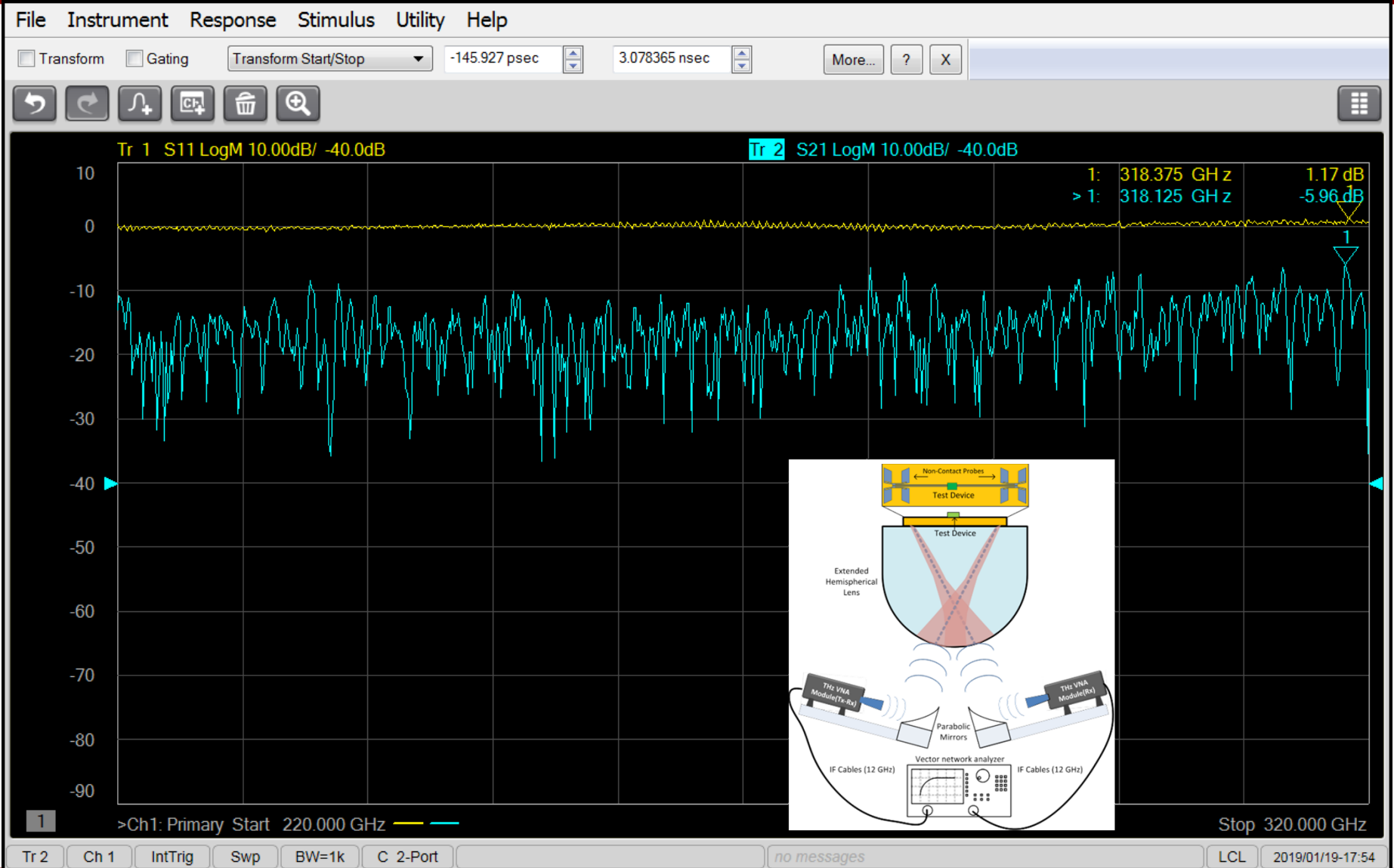
Typical Response After On-wafer Calibration: THRU



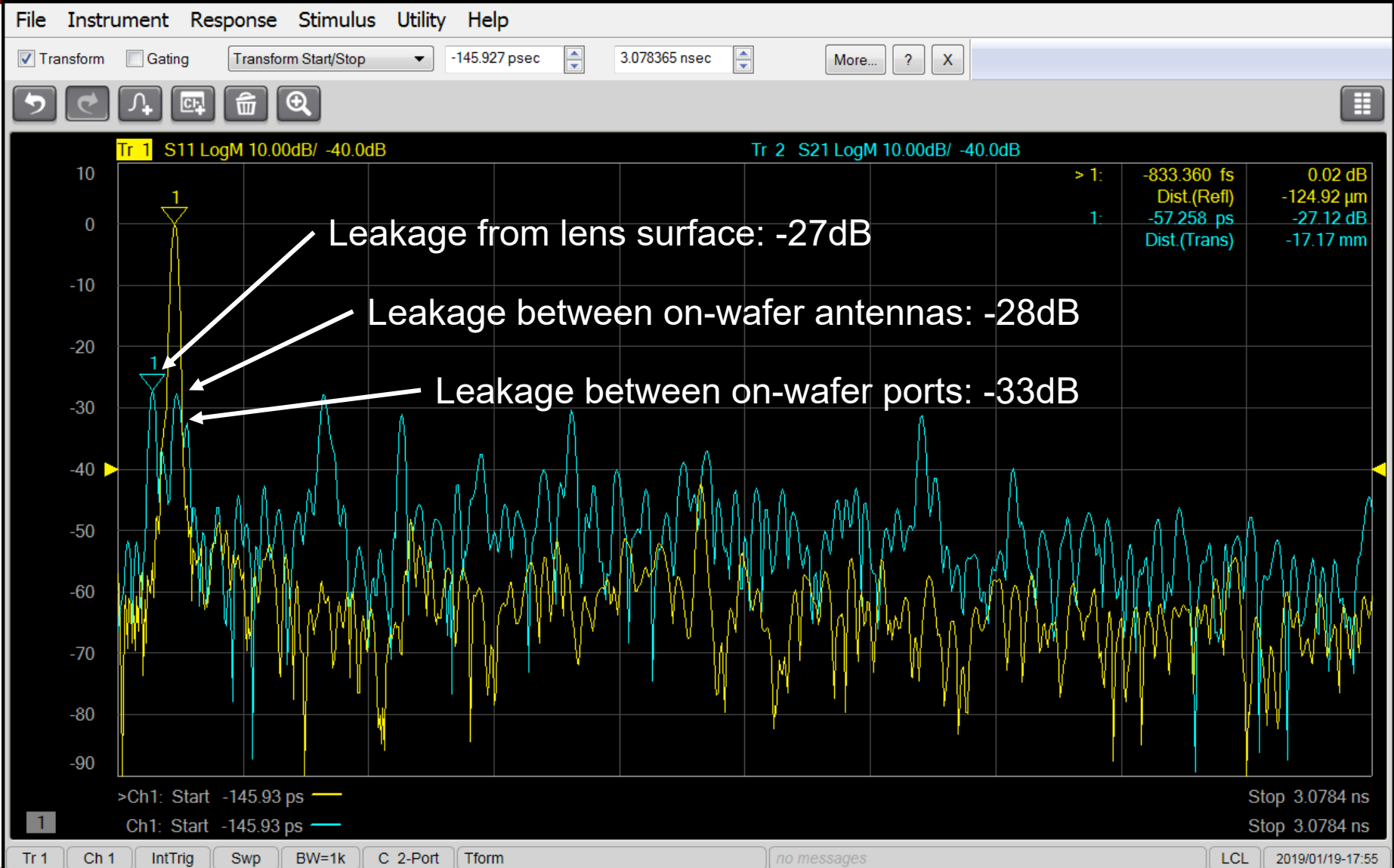
On-wafer Calibrated THRU Response: Frequency Domain



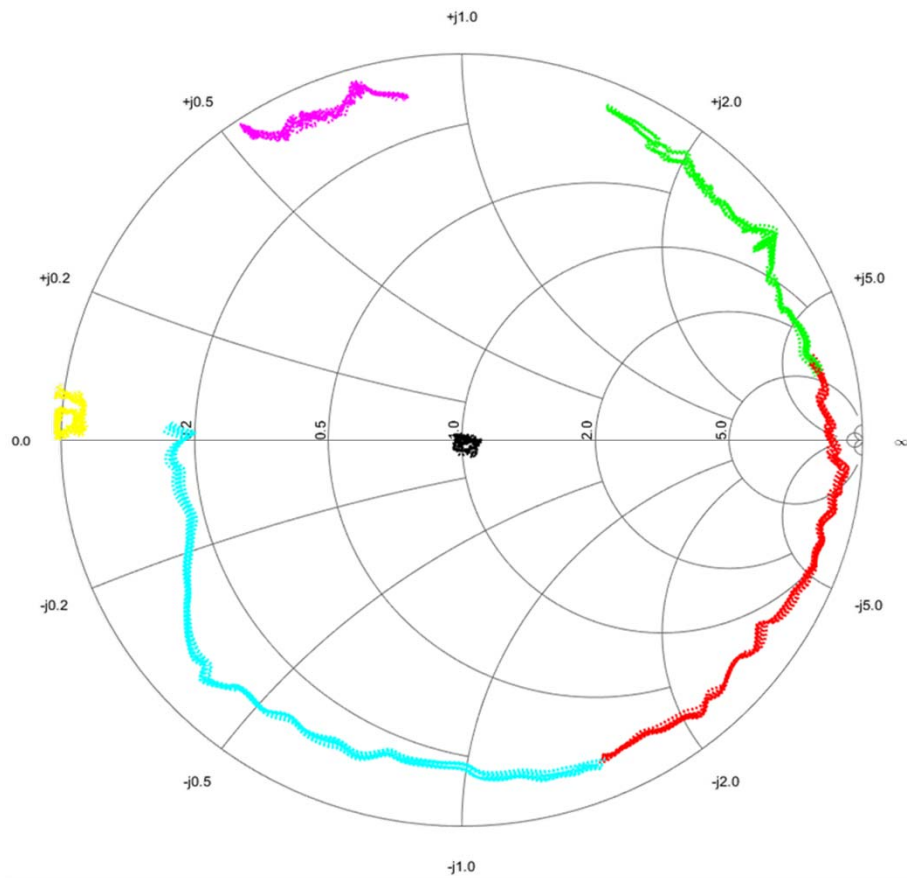
On-wafer Calibrated SHORT Response: Frequency Domain



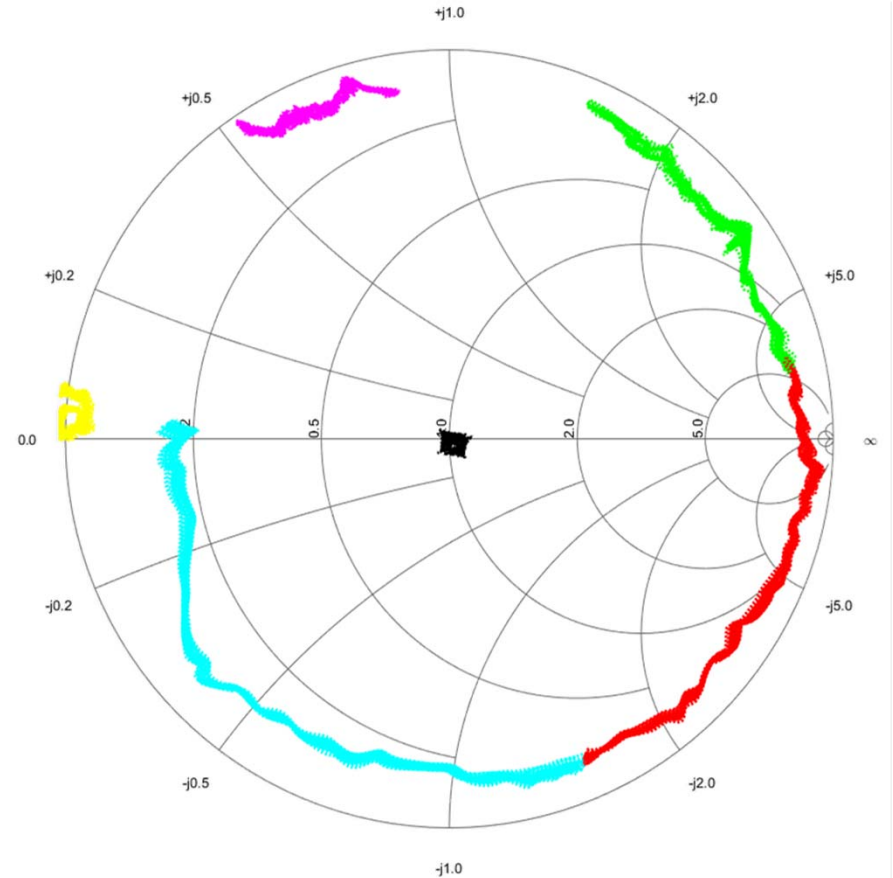
On-wafer Calibrated SHORT Response: Time Domain



Automated Repeatability – Calibration (WR3.4)



10 successive measurements conducted in the 220-330GHz band



40 successive measurements

Automated Repeatability



Cal. Standards	10 Measurements		20 Measurements		30 Measurements		40 Measurements	
Stan. Dev. (σ)	Mag (%)	Phase ($^{\circ}$)	Mag (%)	Phase ($^{\circ}$)	Mag (%)	Phase ($^{\circ}$)	Mag (%)	Phase ($^{\circ}$)
Ref. Short	0.80	0.37	0.68	0.35	0.68	0.38	0.70	0.37
Ref.+d	0.76	0.43	0.72	0.59	0.74	0.58	0.71	0.60
Ref.+2d	0.92	0.67	0.87	0.62	0.99	0.62	1.12	0.62
Ref.+3d	0.98	0.10	0.82	0.12	0.85	0.15	0.96	0.17
Ref.+4d	0.34	0.70	0.35	0.61	0.35	0.63	0.31	0.64
Overall Mean	0.76	0.45	0.69	0.46	0.72	0.47	0.76	0.48
Overall σ	0.25	0.25	0.20	0.22	0.24	0.21	0.31	0.21

Repeatability at instrument drift levels:

- After an initial 20-min. warmup using VDI WR3.4 SOLT calibration kit
- VDI WR3.4 Extenders: 0.6% in amplitude and 0.42 degrees in phase over 20 min.