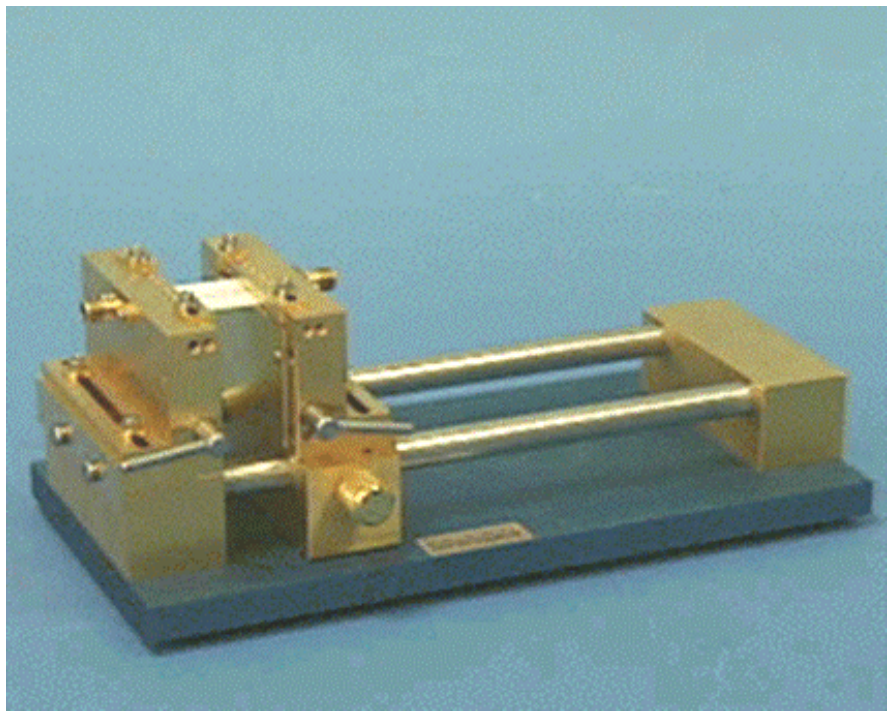
X2Y®

Technology In Balance

Comparative Device-Only Measurements of X2Y®, Arrays and Ordinary Capacitors

Microwave Fixture, Raw Component

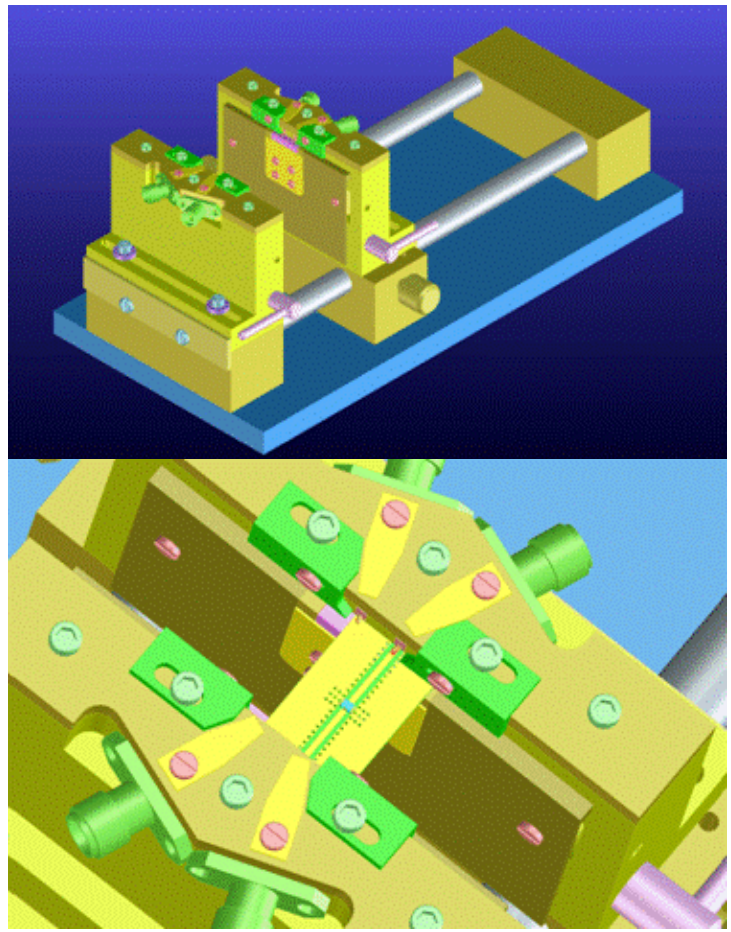
- Universal Substrate Test Fixture
  - Designed by Inter-Continental Microwave
  - WK-3000 Series
    - http://www.icmicrowave.com/Univ_Substr_TF_WK_3000/WK_3000_Series_page1.htm



Microwave Fixture, Raw Component

Test Fixture Characteristics

- Measurements can be made on various MLCC designs, DC-26.5 GHz
  - Conventional two-terminal caps
  - Multi-terminal arrays
  - X2Y® capacitors
- The fixture is designed for accurate and repeatable measurements by de-embedding with TRL/LRM or TOSL Standards
- The test fixture has two measurement options:
  - Two-port, to determine bypass performance (shown)
  - Four-port, to determine dual line filter performance

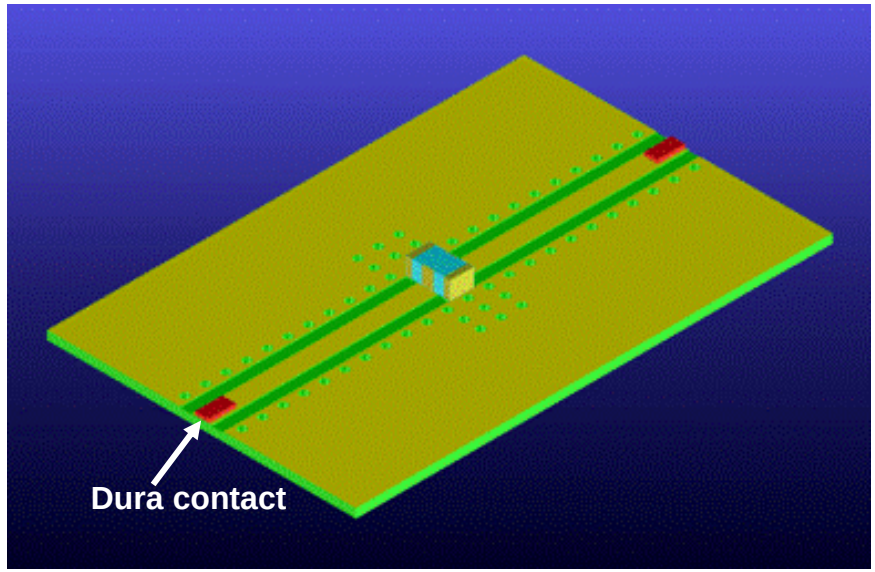


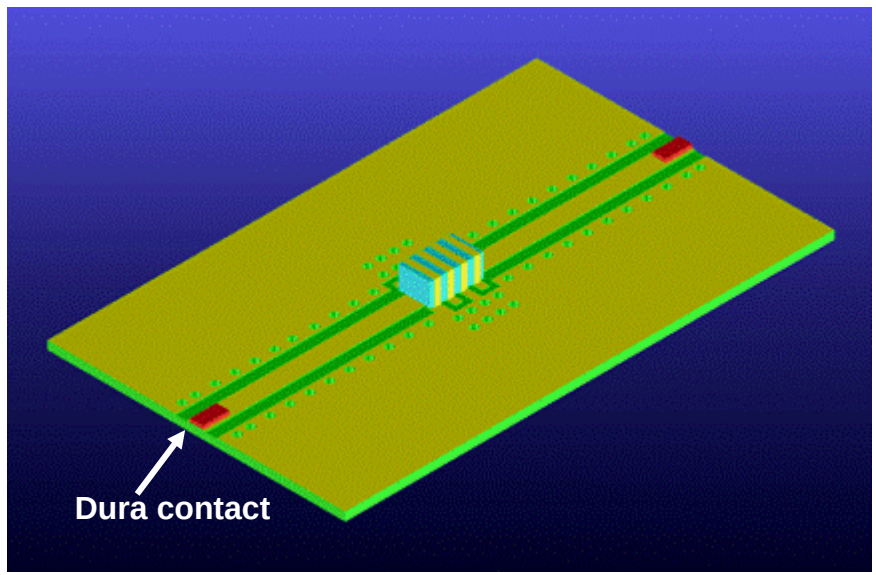
Fixture shown using two-port measurement option

Microwave Fixture, Raw Component

Test Board Characteristics

- PCBs material, Rogers RT5880.
  - 10 mil thick material
  - 20 mil thick material (depending on DUT size, to maintain 50 Ohms)
- All use 1 oz copper on both sides. The via holes are 12 mils plated thru.
- The DURA contacts at the input and output of the boards make sure the microstrip does not get damaged with use.
- Since the calibration standards have the same DURA contacts, there is no influence resulting from the DURA contacts.

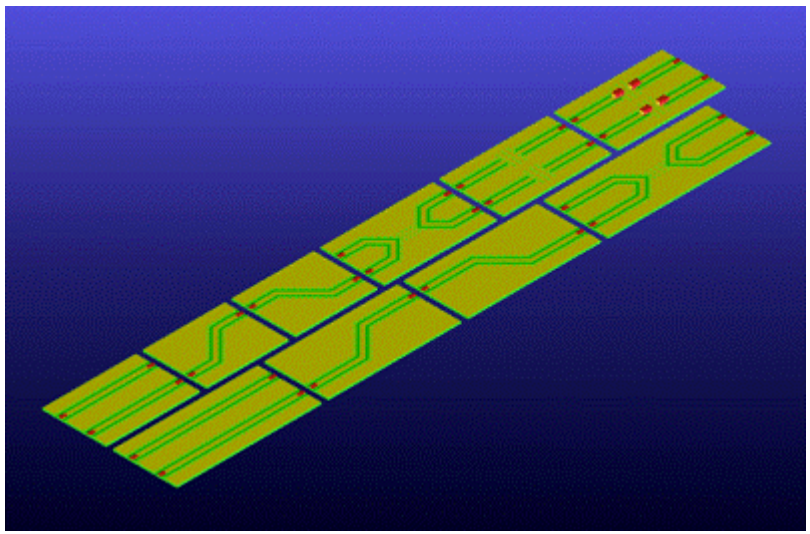




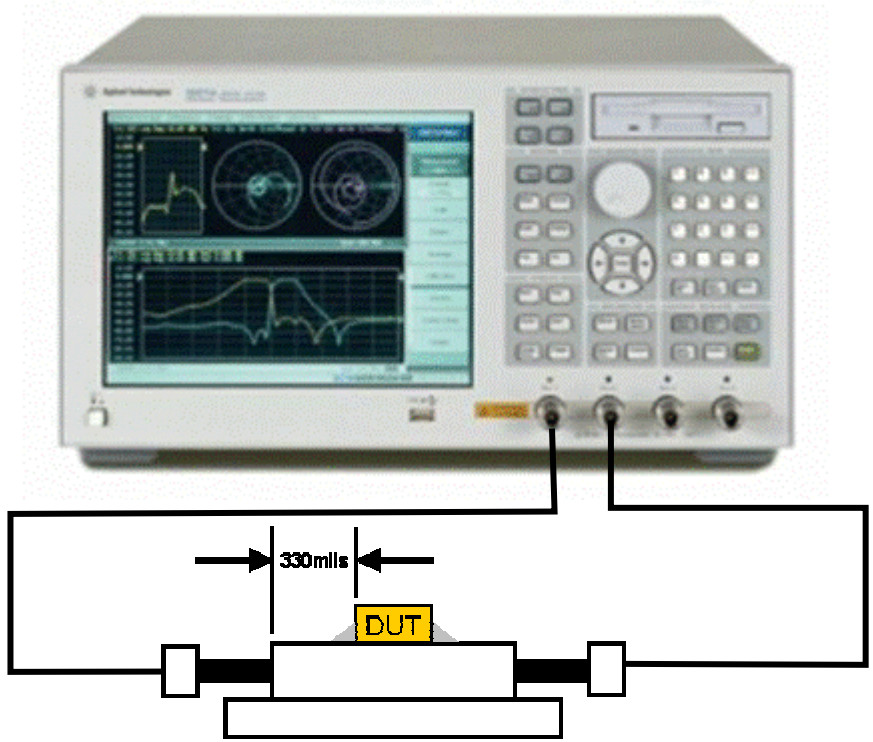
Microwave Fixture, Raw Component

Measurement System

- Agilent 5071A (300kHz – 8.5GHz)
- TRL calibration
  - Standard definitions describe the electrical characteristics (delay, attenuation, and impedance of each calibration standard).
  - Standard class assignments allow for multiple calibration standards
  - De-embeds fixture to achieve “device only” final result

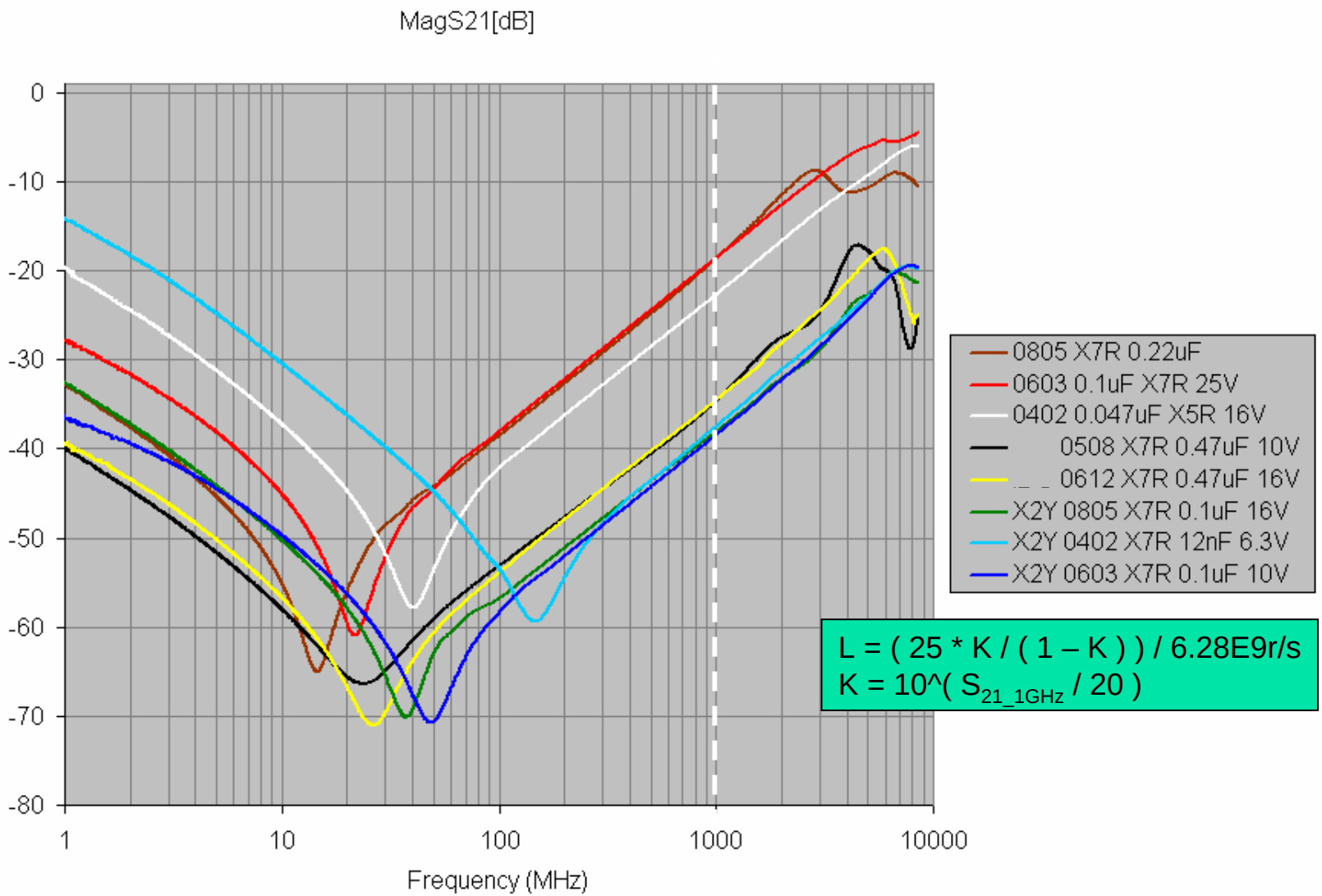


Vector Network Analyzer



The launch length (length from the input edge to the part) is 330 mils. Calibration standards establish the reference planes at the point where the DUT starts (for both the cal standards and DUT)

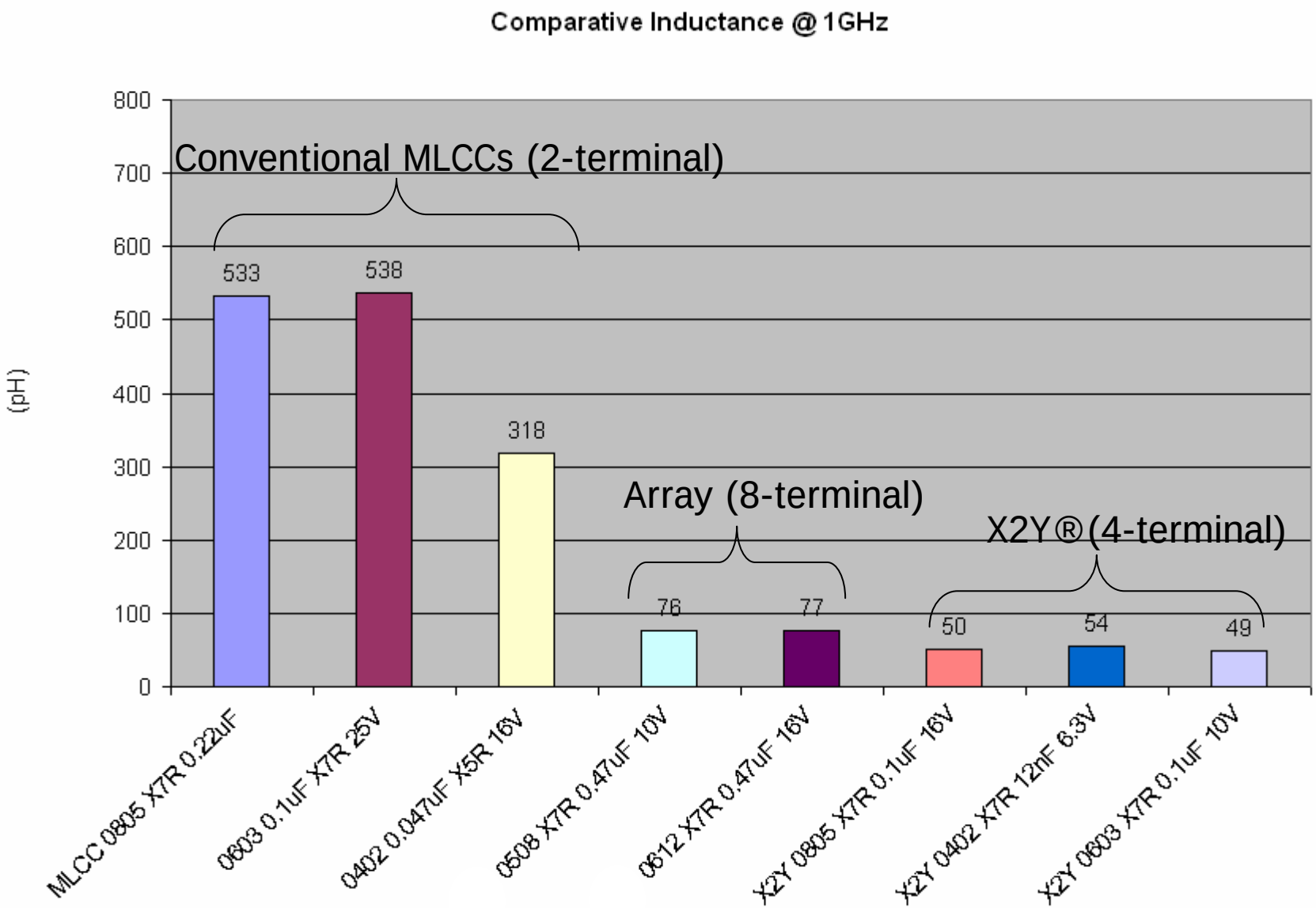
S21 Data



Extracted ESL

- DUTs have varied capacitances.
  - With fixture effects accurately de-embedded, comparative inductance for all DUTs can be calculated along the flat portion of the L_slope well above the varied SRF's and well below the capacitor / fixture parallel resonance
- The frequency point used in this data is 1GHz:
  - L = (25 * K / (1 – K)) / 6.28E9r/s
  - K = 10^(S_{21_1GHz} / 20)

Raw Device Inductance Summary



Available X2Y® Product Sizes

Even large sizes exhibit less than 60pH inductance.