



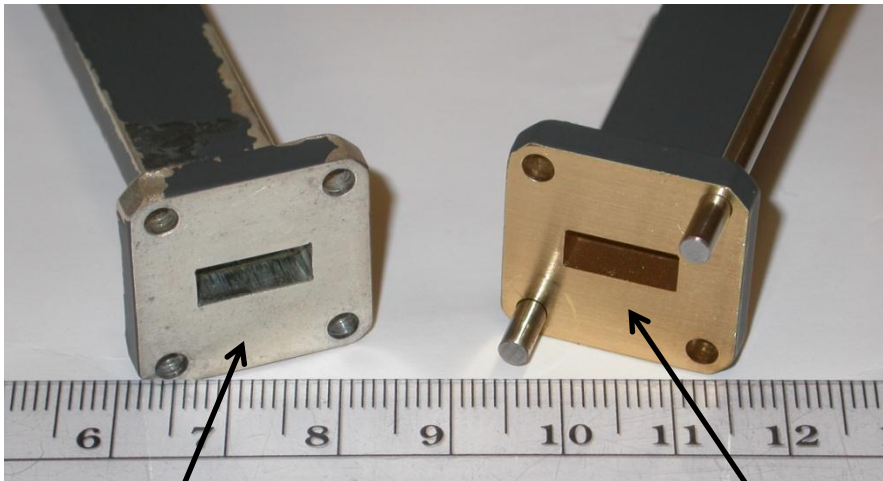
RF Absorber Material Measurements *brief notes*

E. Chojnacki
HOM - 2010



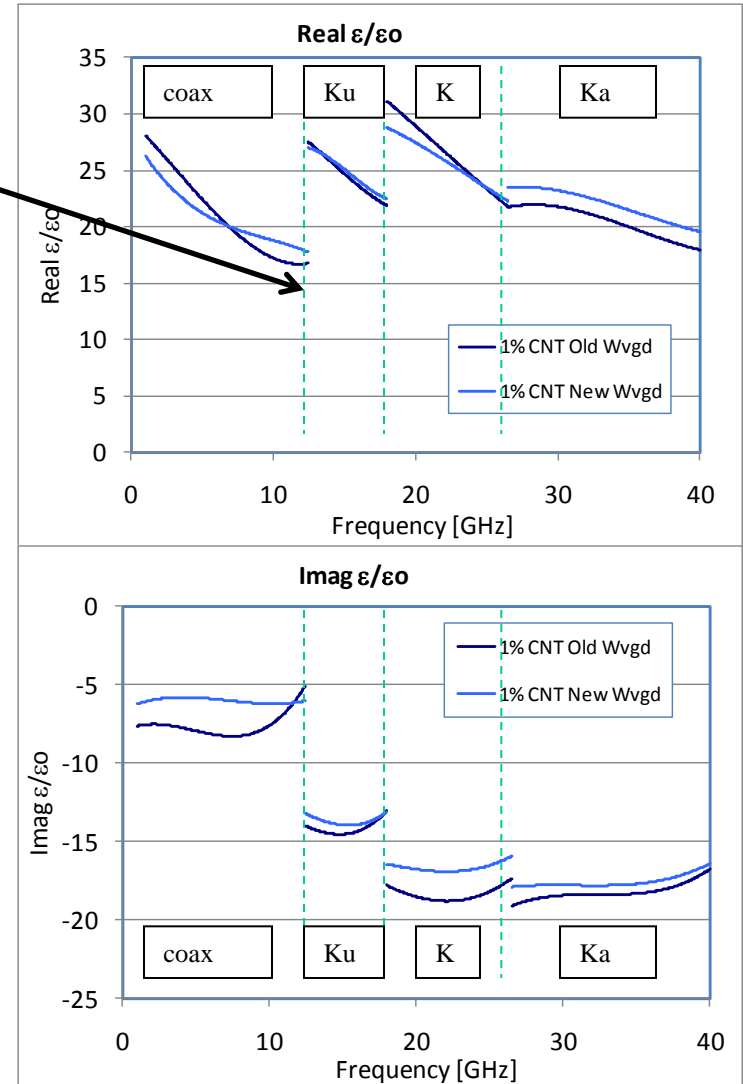
Typical Measurement Error

Significant discontinuity between bands and trend within bands



Old waveguide

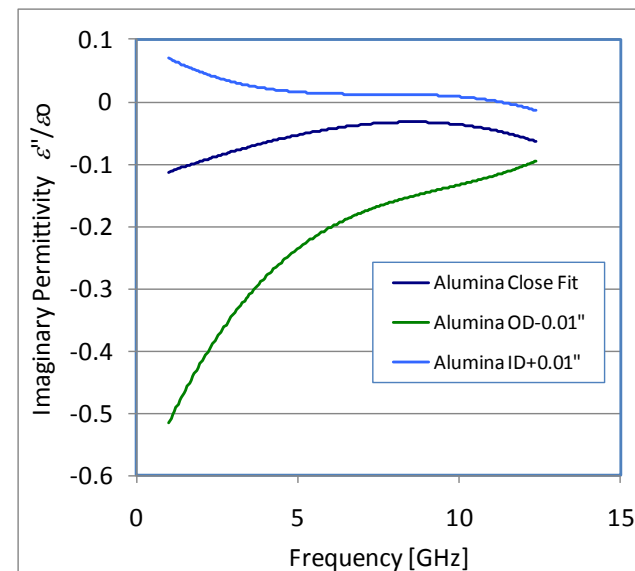
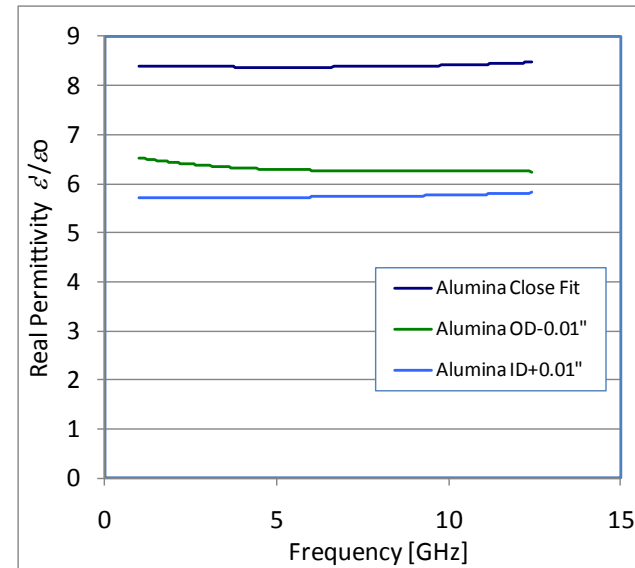
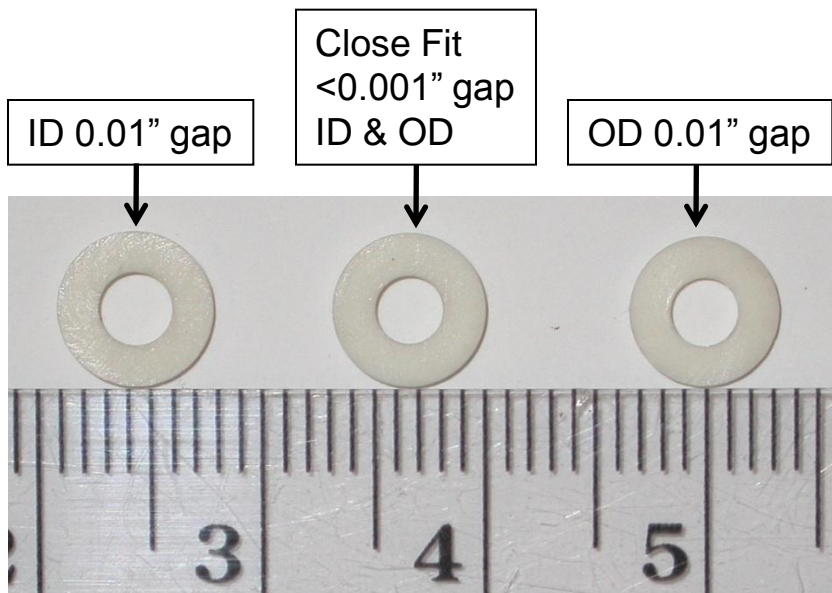
New waveguide and pins for alignment





Typical Measurement Error

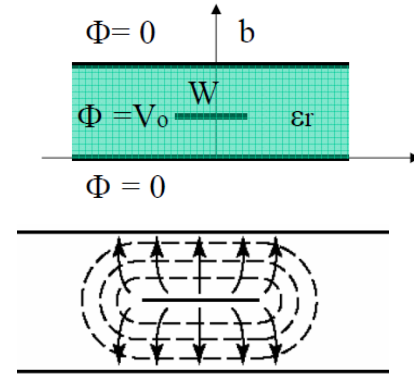
Three alumina coax samples, ~99% pure.



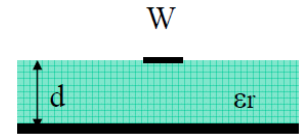


Stripline Methods?

- Stripline/Microstrip can provide broadband measurements using a single fixture
- Is there a configuration that is
 - easy to assemble
 - insensitive to dimensional error (clamped plates)
 - easy to calibrate and immerse in LN₂
 - analytic extraction of ϵ and μ



Quasi-TEM for $d \ll \lambda$



$$Z_0 = \frac{30\pi}{\sqrt{\epsilon_r}} \frac{b/W_e}{1 + 0.441 b/W_e}$$

where W_e is a value describing the **effective width** of the center conductor:

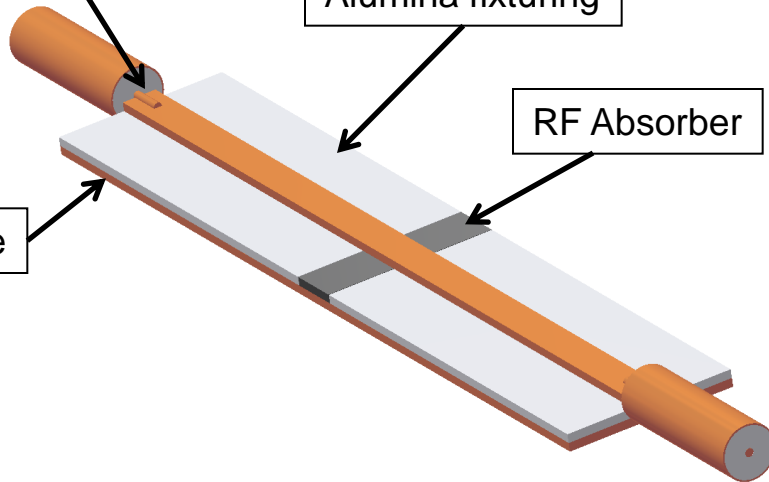
$$\frac{W_e}{b} = \frac{W}{b} - \begin{cases} 0 & \text{for } W/b > 0.35 \\ ((0.35 - W/b)^2) & \text{for } W/b < 0.35 \end{cases}$$

Matched transition to coax & PNA

Alumina fixturing

RF Absorber

Ground plane



Line-Line Dielectrometric Method

A Wideband Line-Line Dielectrometric Method for Liquids, Soils, and Planar Substrates. Isabelle Huynen, Catherine Steukers, and Fabienne Duhamel,

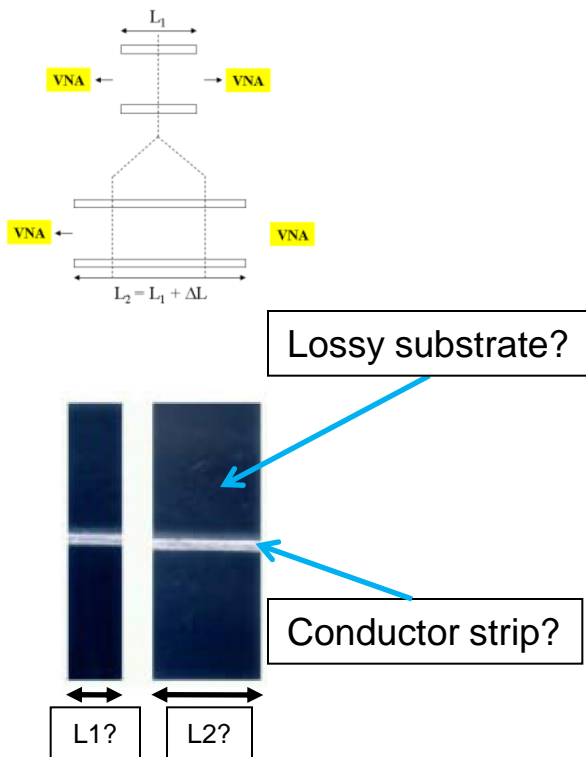
IEEE TRANSACTIONS ON INSTRUMENTATION AND MEASUREMENT, VOL. 50, NO. 5, OCTOBER 2001,

<http://ieeexplore.ieee.org/ielx5/19/20793/00963208.pdf?tp=&arnumber=963208&isnumber=20793&tag=1>

Carbon Nanotube Composites for Broadband Microwave Absorbing Materials,

A. Saib, et al., 2005 European Microwave Conference,

<http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=1608849>



Details of the apparatus and accuracy of the tests are opaque in both publications.

This method needs validation...

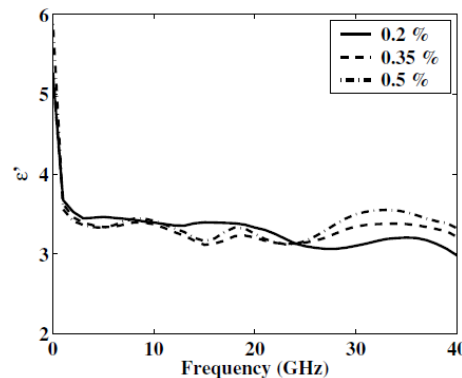


Fig. 5. Real part of the effective permittivity of CNT-poly(ϵ -caprolactone) (PCL) composite with 0.2 (solid line), 0.35 (dashed line), and 0.5 (dash-dotted line) weight percent of CNTs.

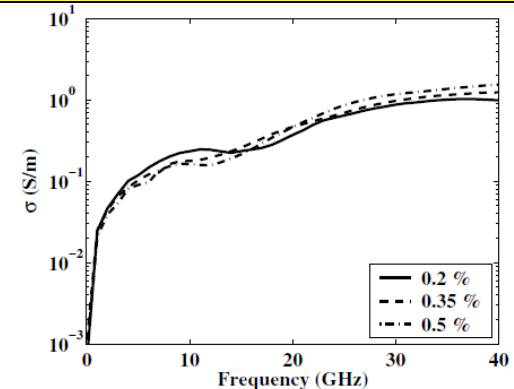


Fig. 6. RF conductivity of CNT-poly(ϵ -caprolactone) (PCL) composite with 0.2 (solid line), 0.35 (dashed line), and 0.5 (dash-dotted line) weight percent of CNTs.