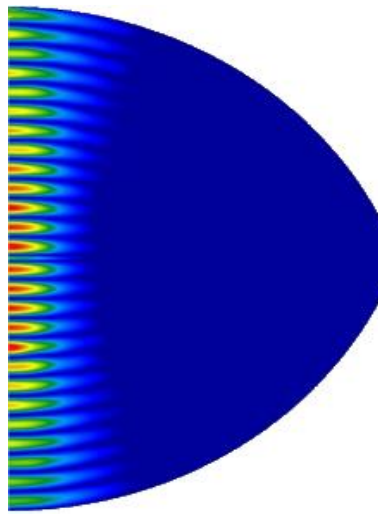
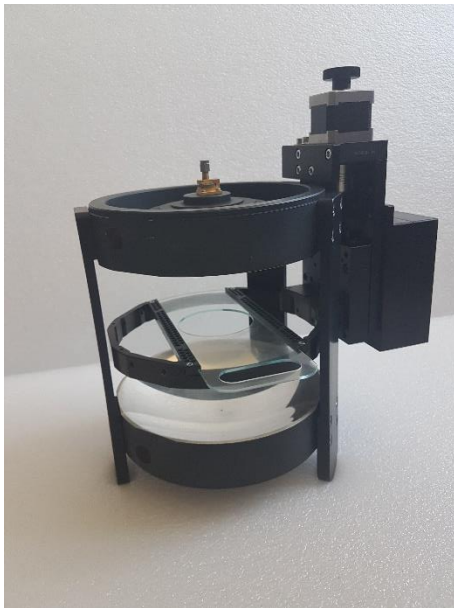


Fabry-Perot Open Resonator for precise measurements of electromagnetic properties of low-loss materials at 20-50 GHz range

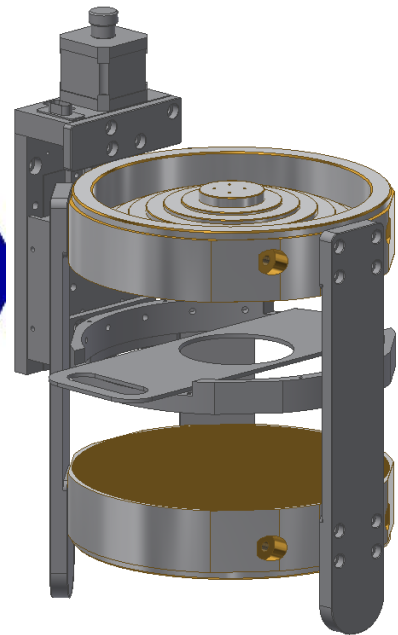


FABRY PEROT OPEN RESONATOR

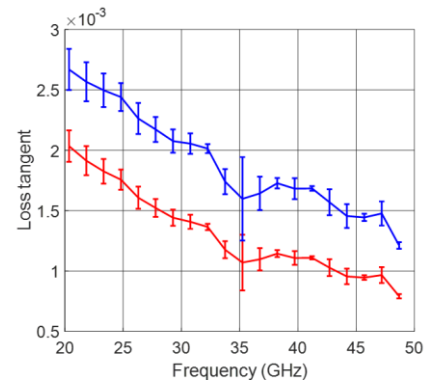
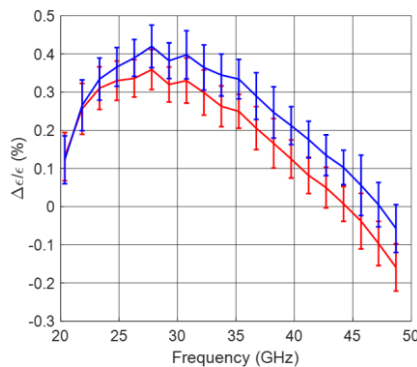
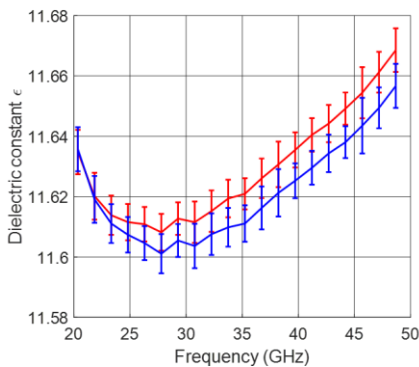
Fabry Perot Open Resonators (FPORs) are dedicated to broadband (multi-mode) measurements of the complex permittivity of laminar dielectric materials with the loss tangent that can be as low as $\tan\delta = 10^{-5}$, which is possible due to the Q-factor reaching 200,000. The current version of the FPOR setup operates in the 20 – 50 GHz range with a 2 GHz frequency step imposed by spectral distance between consecutive odd $TEM_{0,0,p}$ cavity Gaussian modes. Unlike state-of-the-art in this field, the setup uses Gaussian mirrors instead of spherical ones to better fit to the Gaussian modes in a broad frequency spectrum. In addition, a novel permittivity extraction algorithm relying on coordinate transformation is applied, which results in the measurement accuracy of dielectric constant and loss tangent at the level of $\Delta\epsilon/\epsilon < 0.5\%$ and $\Delta\tan\delta/\tan\delta < 2\%$, respectively. Once the sample under test with a diameter of about 3 inches is placed on a sample holder, the measurement is performed automatically without the need of user's intervention.



TEM_{0,0,27} mode
(QuickWave V2D simulator)



Silicon ($h = 389 \mu\text{m}$)



PET foil ($h = 99 \mu\text{m}$)

