An RO3010 Rogers Corporation PCB datasheet gives that the relative permittivity is 11.2 and dissipation factor is 0.022 at 10 GHz at 23°C. Determine ε', ε'', and the effective conductivity σ of this RO3010 PCB.

- Per notes, $\varepsilon' = \varepsilon_r \varepsilon_0 = 11.2\,(8.8541878\times10^{-12}$ F/m)

  $\Rightarrow$ **$\varepsilon' = 9.9167\times10^{-11}$ F/m**.

- 'dissipation factor' is another word for loss tangent $\Rightarrow$ $\tan\delta = 0.022$.

- Per notes, $\varepsilon'' = \varepsilon' \tan\delta = 9.9167\times10^{-11}\,(0.022)$

  $\Rightarrow$ **$\varepsilon'' = 2.1817\times10^{-12}$ F/m**.

- Per notes, $\varepsilon'' = \sigma/\omega$. So, the effective conductivity is $\sigma = \omega\varepsilon''$.

  $\sigma = 2\pi\,(10\times10^{9})\,2.1867\times10^{-12}$ $\Rightarrow$ **$\sigma = 0.13708$ S/m**.