Technical Note

Striplines and TEM-cells: relation between cut-off frequency and height under the plate

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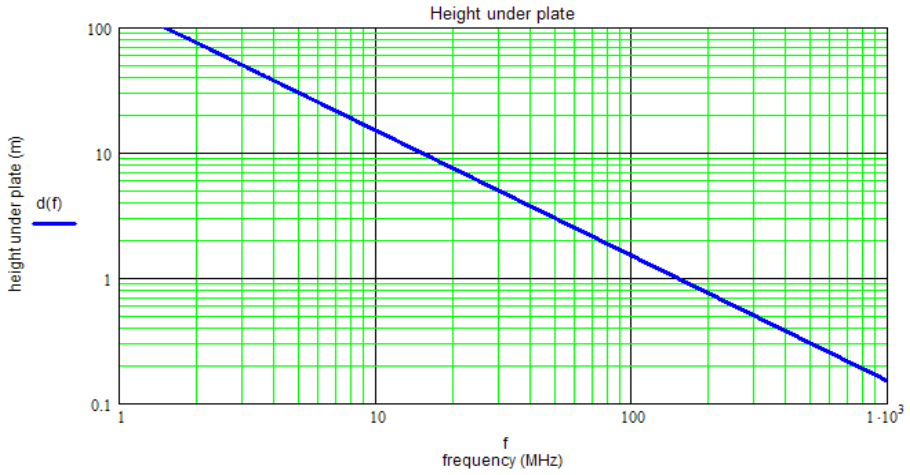
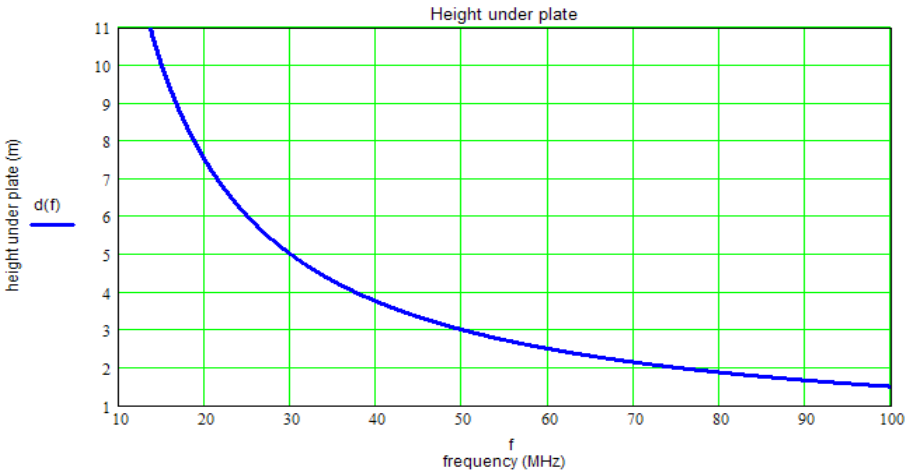
The propagation of the wave inside a TEM cell or a stripline is a TEM (Transverse ElectroMagnetic) mode. This means that the field is similar to that one produced far away from an antenna (far field conditions). The electric field is vertical and the magnetic field is horizontal. The ratio between the electric and magnetic components is the impedance of the wave: 377 Ω. Both components are perpendicular to the wave propagation direction.

The wave is travelling up to the transition placed between the slope (triangular part) and the flat part. In this region other modes than TEM are produced that induce reflections and field distortions, especially if the slope is steep. The process is repeated at the end of the flat part. Finally the load influences also the reflection. So the frequency range is limited by the height under the plate. This means that if the distance under the plate is high, the frequency limit is low. Above this limit, other modes appear and the field distribution is no more homogeneous. The diagrams give below the relation between the cut-off frequency and the height under the plate (centre plate for the TEM cell).





Remark: the devices under test placed inside the cell can produce field distortions and other modes than TEM. Therefore its dimensions have to be limited. Depending on the standard used, the height of the EUT must not
exceed ½ or ⅓ of the height under plate. The EUT must not be too large in order to stay in the homogeneous zone inside the TEM cell or the stripline.