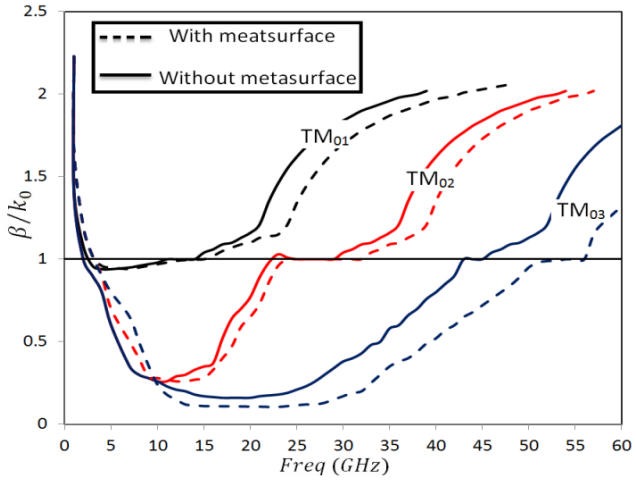
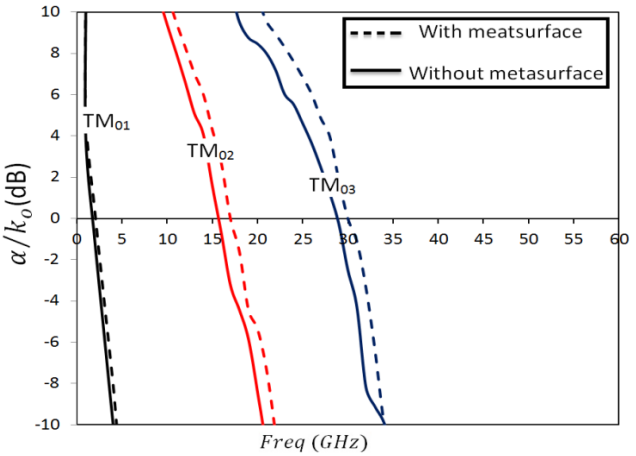
dielectric rod with the metasurface has leaky wave propagation modes of $\beta/k_0 < 1$ and $\alpha/k_0 \ll 1$ at wider frequency ranges compared with the dielectric rod without metasurface. This property is found to be common in all TM_{0n} modes. This result shows that by controlling the shapes and the dimensions of the loading metasurface it would be possible to control the wave propagation on dielectric waveguides.



(a) Normalized propagation wave number



(b) Normalized attenuation coefficient

Fig. 3. Normalized complex wave number of a cylindrical dielectric waveguide; with and without a metasurface.

4 Conclusion

Modified Generalized Sheet Transition Condition (GSTC) for cylindrical configuration is introduced. This modified GSTC is used to develop the characteristic equation of a cylindrical dielectric rod loaded by a metasurface. This configuration is found to be suitable as a leaky wave antenna. The advantage of using metasurface is that it can be used to control the operating modes of the dielectric rod. The obtained results show that the loading metasurface can control the center frequency and the operating bandwidth of the leaky wave modes of this structure.

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