

Two Arm Spiral Antenna

A two-arm self-complementary archimedean spiral antenna is modelled in FEKO to determine its wideband behaviour.

Introduction

Spiral antennas are traveling wave structures and are well-known for their wideband performance. A bandwidth of 5:1 or 10:1 is easily obtained and a stable input impedance is achieved through a self-complementary geometry. This wideband characteristic of the spiral antenna makes it an attractive choice where a single antenna is required to send/receive over multiple channels. In [1] the application of spiral antennas in mobile communication and navigation is investigated.

The antenna under consideration is a two-arm self-complementary archimedean spiral antenna and has a radius of 250mm. Figure 1 shows the simulation model and the current distribution on the structure at 250MHz. The antenna is fed in the centre where the two arms connect.

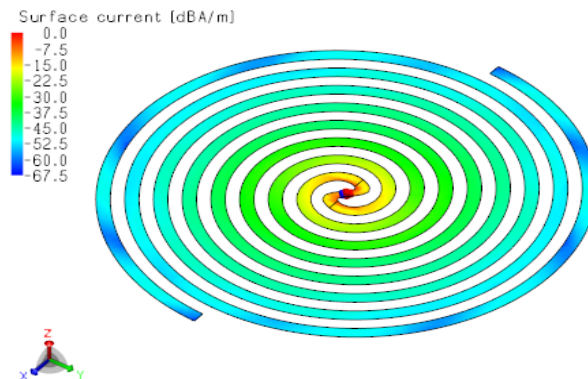


Figure 1: Current distribution on spiral antenna at 1.3 GHz

Figure 2(a) shows the input impedance of the antenna across a wide frequency band and Figure 2(b) the reflection coefficient of the antenna relative to a system impedance of 2000 Ω . The impedance bandwidth for the antenna is observed to be greater than 8:1.

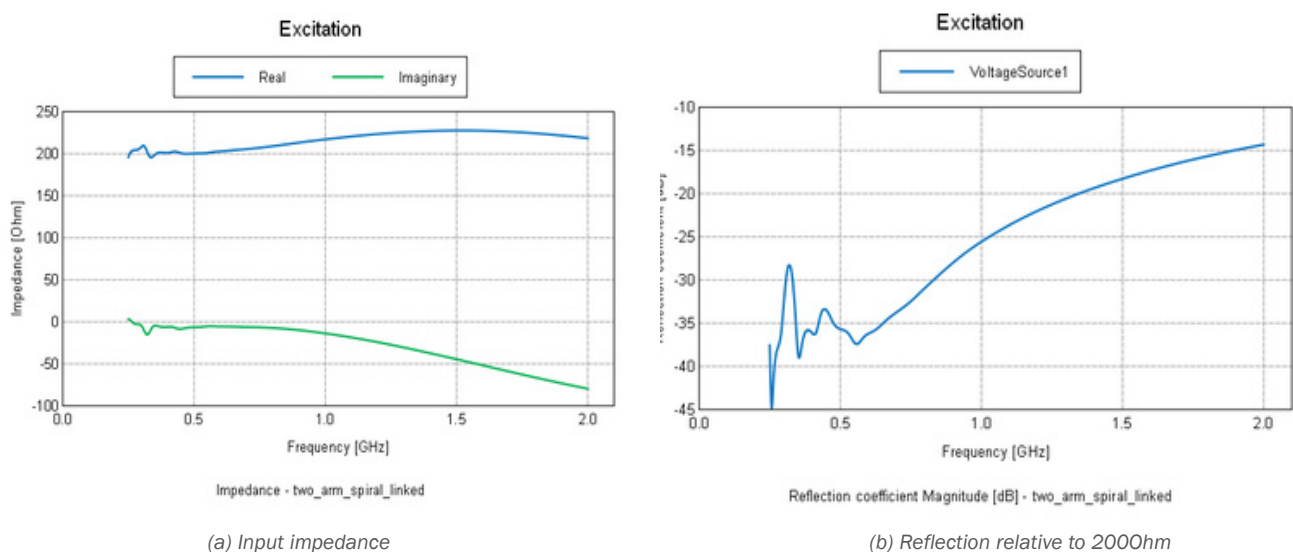
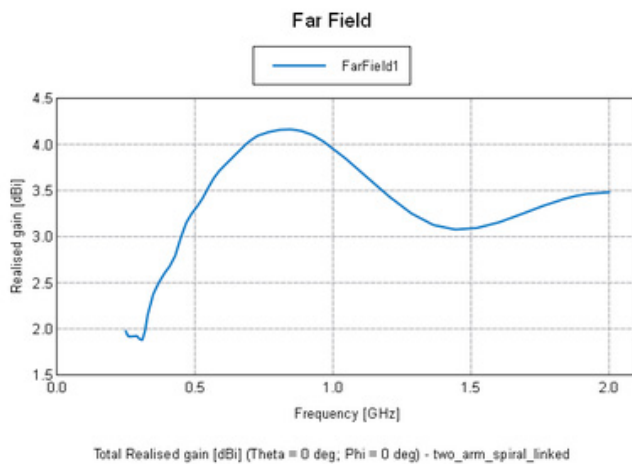
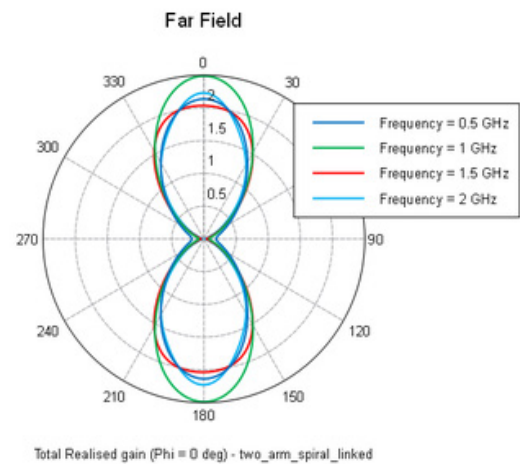


Figure 2: Impedance characteristics of spiral antenna

Another consideration is the wideband behaviour of the antenna gain and radiation pattern. Figure 3(a) shows the axial gain of the spiral antenna across a wide frequency band and Figure 3(b) shows the radiation pattern at a few selected frequency points within this band. Antenna gain and radiation patterns seem stable across a bandwidth of about 4:1.



(a) Axial gain (theta = 0)



(b) Radiation pattern

Figure 3: Radiation characteristics of spiral antenna

References

- [1] E. Gschwendtner, W. Wiesbeck, "Ultra-Broadband Car Antenna for Communications and Navigation Applications", IEEE Transactions on Antennas and Propagation, Vol. 51, No. 8, August 2003.