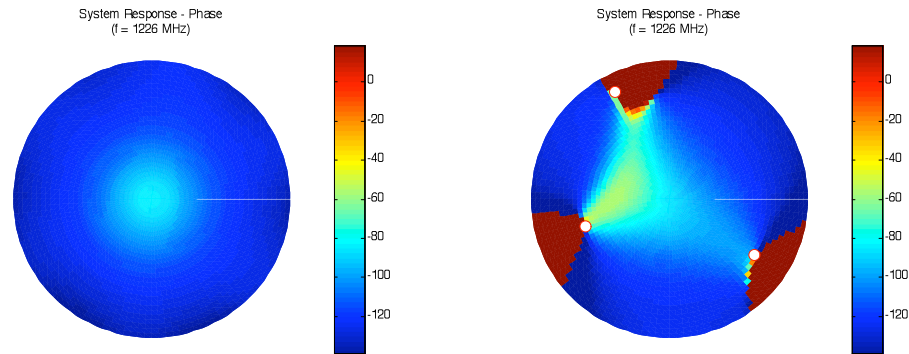


Phase Center Characterization of Multi-Element AJ Antennas for GPS Receivers

PI: Inder J. Gupta, The Ohio State University

Sponsor: Air Force Office of Scientific Research (AFOSR)



Transfer function phase of a 7-element antenna at carrier frequency. Left – no jammers; right – three jammers.

A military GPS receiver is required to provide accurate PVT information in hostile RF environments. In these GPS receivers, multi-element antenna arrays are used to mitigate jammers. In a typical GPS receiver, the position and velocity solutions are calculated at the phase center of the antenna. The phase center of any practical antenna varies with aspect angle as well as with frequency, and needs to be characterized to obtain the desired accuracy in position and velocity. For fixed reception pattern antennas (FRPA) and controlled reception pattern antennas (CRPA) operating in interference-free environments, many approaches are available to characterize the antenna phase center. However, when a CRPA is exposed to jamming, the weighting of its individual antenna elements is adjusted to mitigate jammers. The resulting overall antenna pattern can be significantly different from the no-jammer pattern and one has to re-characterize the antenna phase center to maintain the desired position and velocity accuracies. This is a very challenging task. We have investigated a new approach for characterizing the antenna phase center movement for GPS CRPAs operating in the presence of jammers. In the proposed approach, **antenna transfer function** is used for the phase center characterization. Since the antenna transfer function is based on the response of individual elements which does not change with jamming environment, no real time measurements are needed to characterize the antenna phase center. We have also developed simple methods to mitigate antenna induced biases in GNSS receivers.

Further Reading:

I.J. Gupta, C. church, A. O'Brien and C. Slick, "Prediction of antenna and antenna electronics induced biases in GNSS receivers," *Proceedings of the Institute of Navigation's 2007 National Technical Meeting*, San Diego, CA, January 2007.

A. O'Brien and I.J. Gupta, "Mitigation of adaptive antenna induced biases in GNSS receivers," *Proceedings of the Institute of Navigation's 2008 National Technical Meeting*, San Diego, CA, January 2008.