Modelling of UWB Antenna Disrupted by Human Phantom in Spherical harmonics Space

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Abstract:

In order to have realistic and accurate results from a propagation channel simulator it imports to take into account the transmitting and receiving full vector antenna radiation patterns. A measured antenna represents an extremely large amount of data which difficult to manage especially in ray tracing simulator. Therefore, a full data compression is crucial. Moreover, the knowledge of the antenna radiation pattern is required only for a reduced number of directions. Adopting a spherical harmonics decomposition allows data compression and computationally efficient angular reconstruction. This aspect is one of the great advantages of the approach [1].

Besides of using spherical harmonics expansion to have compact representation of antenna pattern, we suggest a spherical harmonics coefficient model to describe the behaviour of antenna disrupted by a human phantom. A measurement campaign was performed, where a cylindric human phantom was set at different distances from antenna.

The elaborated model takes as inputs the spherical harmonics coefficients representing the antenna in free space and the antenna-phantom distance. The output is coefficients representing the antenna pattern disrupted by the human phantom.

The proposed model might have a huge advantage in a ray tracing simulator including Body Area Networks. In fact, in ray tracing simulators with several BANs, the most evident solutions is to apply ray searching for all antennas which makes this task computationnally expensive and it depends on the choice of the body model (cylindric...). Using the coefficients model might alleviate the task since we know already the new antenna pattern and we may[a1] abstract the body and the result of the model represents antenna in free space-body system.

[1] J. Rahola, F. Belloni, and A. Richter, “Modelling of radiation patterns using scalar spherical harmonics with vector coefficients,” in European Conference on Antennas and Propagation, 2009