

## An Automatic Near-field Characterization System with Multipolar Expansion Approach

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The importance of the radiated equivalent sources characterization and Electromagnetic Compatibility studies has been emphasized in the present literature. It mentions the methodology based on the multipolar expansion in spherical harmonics of the near-field sources. Details of this methodology and of the prototypes suitable for determining components of the multipolar expansion are shown, for instance, in (Vincent, Benjamin, et al. "Loop antennas for near-field multipolar-expansion identification: first experimental validations." *Instrumentation and Measurement, IEEE Transactions on* 59.12 (2010): 3086-3092.), and T. Q. V. Hoang, A. Bréard, and C. Voltaire, "Near Magnetic Field Coupling Prediction Using Equivalent Spherical Harmonic Sources," *IEEE Trans. on EMC*, Vol. 56, n°6, pp. 1457-1465, 2014.). Nevertheless, these prototypes requires that either the device under test or the loop sensors be constantly positioned between all the measurements, to get the proper components necessary to represent accurately complex radiated sources, thus resulting in a time-demanding approach.

In order to minimize the aforementioned constraints, an automatic system is proposed, in which the positioning feedback is done by computer vision and the movement is provided by stepper motors, and nonmagnetic pulleys, carefully located and operated in order to not interfere in the field measurements. To improve the mechanical precision, the main mechanical components or parts of this system were carried out using CNC equipment. The validation was based in previous results obtained by the authors.

Although, the spherical harmonics are used so far, the proposed system also allows implementing the equivalent cylindrical ones, being considered as part of future work. Thus, higher degrees of precision will be allowed, since higher order and degrees of the desired component of the multipolar expansion can be obtained by this system.

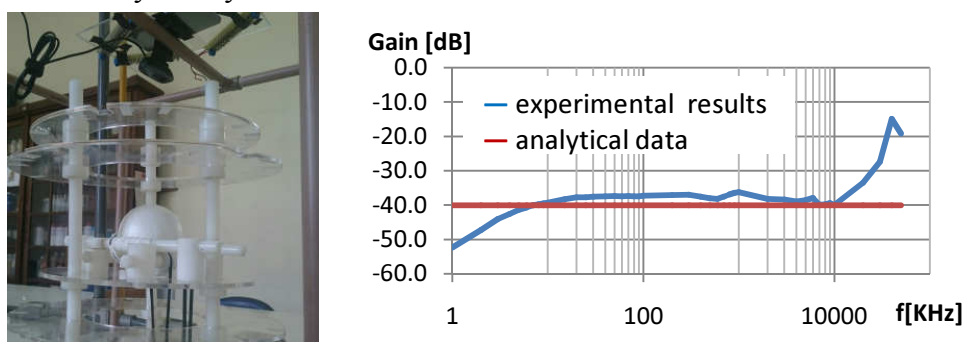


Figure 1 - Automatic antenna assembly (left) preliminary validation results (right)