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**Spherical harmonic analysis applied to the reconstruction of the
sound field radiated by a loudspeaker**

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The three dimensional acoustic radiation patterns generated by different models of loudspeaker have been measured in an anechoic environment using an array of 40 omnidirectional microphones, arranged on a hemispherical surface. The acquired data have been numerically processed in order to obtain the complete three dimensional reconstruction of the analysed sound field. The theory of the applied method is based on the spherical harmonic decomposition of the sound field defined over the surface of a sphere containing the sound source and sampled at a finite number of positions. The reconstruction of the sound field in the region of the space inside and outside the measurement surface has been obtained by multiplying each coefficient of the spherical harmonic series by the corresponding spherical propagator, defined as the ratio of two spherical Hankel functions. The conditioning of the inverse problem related to the reconstruction of the sound field in the interior of the measurement surface has been analysed and put in relation to the behaviour of the spherical propagators of different orders.