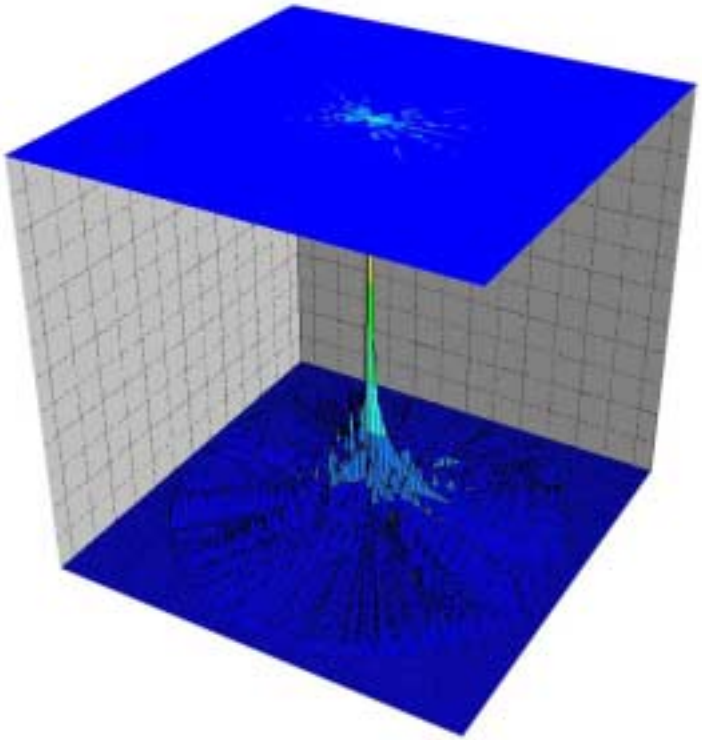
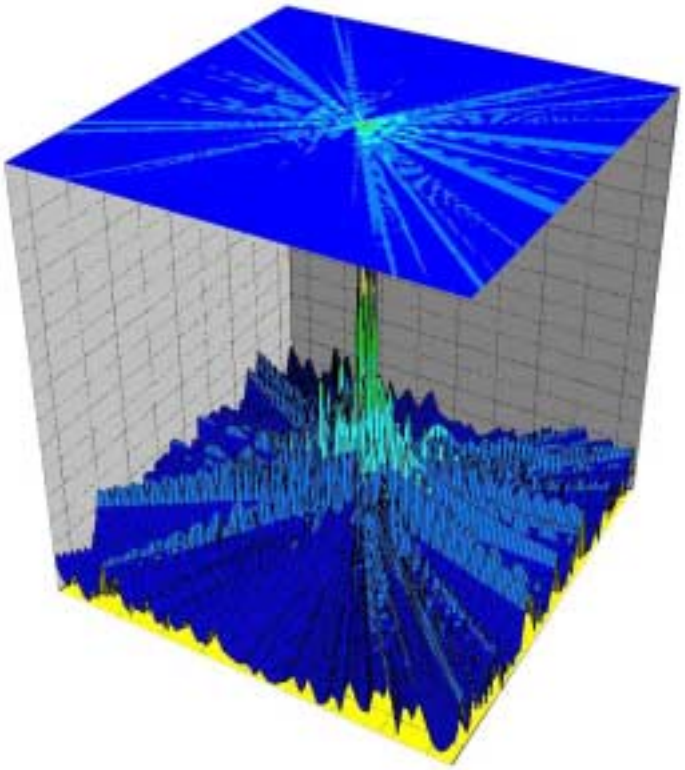
Experimental Measurement with Conducting Cylinder

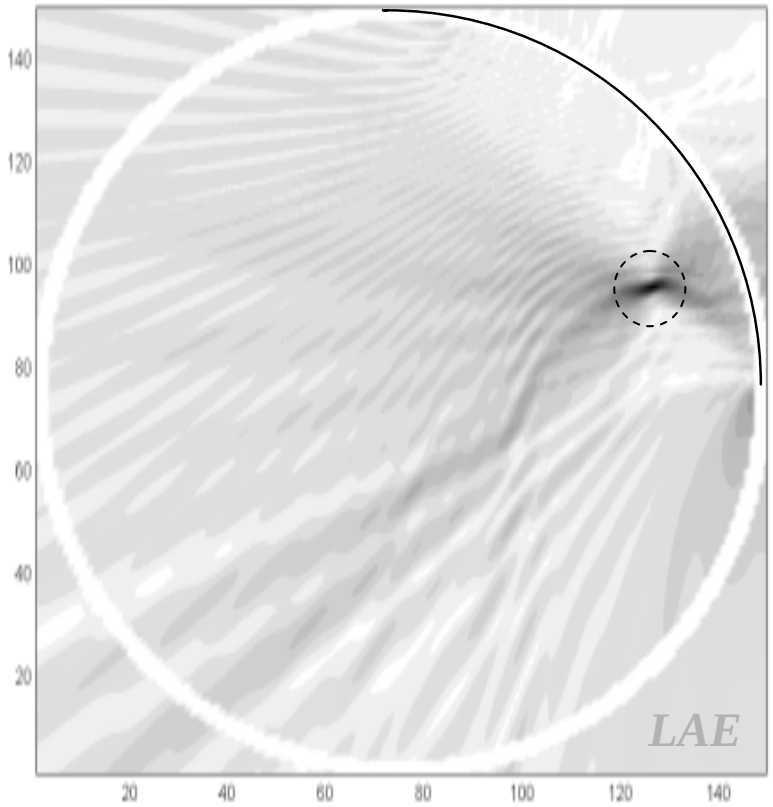
In order to verify this concept an experiment was carried out to reconstruct the SF from the, conducting cylinder of 2cm radius which was illuminated at a frequency of 30GHz by a horn antenna at approximately distance of 30cm. The SF was recorded in far zone at distance of 30cm from cylinder by a dipole sensor of 0.8mm connected to the HP8510C Vector Network Analyzer. Complex values of the scattered field were measured on a half circle in the backward direction. The measured data was processed to reconstruct the analytical continuation of the wave field by the method described above. The AA were place on a half circle of 30.5cm radius next to the one used for measurements as shown in left picture. In this figure a minimum leveling of the presented reconstructed field is applied to localize all possible SFS. In right picture a zoom in left one without leveling is also shown. In both Figures the dashed line presents the position in the 2-D space of the cylinder. It is evident that the method enables to localize the auxiliary sources inside the scatterer and thus provides an efficient and highly simple target imaging technique.





Experimental Measurement with Dielectric Cylinder

The same reconstruction algorithm is also valid for imaging purposes using ultrasound waves. Experimental measurements were carried out using ultrasound waves of 50kHz. A dielectric cylinder (plastic container) of 3.5cm radius filled with oil was placed in a water tank. Then the cylinder was illuminated by an ultrasound source at 50 kHz frequency and the scattered field was measured in the points on the black arc shown on the figure. The scatterer was shifted out of the center of the arc which aperture is 90^0. Then applying the above described algorithm the measured data were used in reconstructing the field. In figure the amplitude distribution of the reconstructed field is shown. The darker the area the higher the amplitude of the reconstructed field and the maximum value corresponds exactly inside the non-physical area of the scatterer were the SFS should be. The above described experiment demonstrates the applicability of the proposed reconstruction in case of penetrating objects.



The uniqueness property of the described field reconstruction method states that the computed visualization pattern does not change if additional sources are placed outside the region between the scatterer and the visualization area. This is true as in any holographic methods where neighboring sources does not disturb obtained picture.