

**Radio Astronomical Approach and 2-CLEAN DSA Reconstruction for the
2D and 3D Few Projections Astrotomography and Remote Sensing (Oral).**

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In the presentation made by R.Gordon, 1978 (see Proceedings of IAU colloquium no.49 on the Image Formation From Spatial Coherence Function in Astronomy, August 1978, Groningen, the Netherlands) a few basic principles and problems of reconstruction with projections in tomography were formulated. As it seems to us that since that time radio astronomy has made a great contribution to the solution of the important problem - the problem of reconstruction from a few strip-integrated projections, which is the same for tomography and astronomy. The contributions of radio astronomers are described in the abstract of GA IAU00450 (Agafonov, JD9, Sydney, 2003).

The radioastronomical approach to this problem, the main elements of which were described and published in 1989-1990 [1,2], is being summarized. The basis of it makes the solution to the deconvolution problem for a 2D plane with the use of Synthesized Beam (SB). To remove the distortion of the tomogram occurring because of the SB sidelobes influence realizations of the iterations algorithms with non-linear constraints well-known in radioastronomy as CLEAN are used. The reconstruction takes place when the components of the solution are drawn into the area of permissible constraints. The results received earlier, and namely the research of the solution convergence, the use of two variants of CLEAN algorithm (ST-CLEAN [3] and TC-CLEAN [4]) to determine the permissible area of solutions, are being summarized. Worked out finally, the reconstruction method 2-CLEAN DSA [5,6] allows to carry out 2D recognition in a wide space frequency band $\{0, \omega_b\}$, constrained only by the upper frequency ω_b when the number of projections contains only ~ 0.1 of the number needed for the usual tomography approach. The method easily adapts to the wide range of additional constraints.

In this presentation is new, that the radioastronomical approach and 2-CLEAN DSA method are examined in the application to the two variants of 3D reconstruction [7]. The first variant assumes the use of 1D projections, received by scanning the object with plane knife beams, the second variant assumes reconstruction on the basis of 2D projections. The process of construction and visualization of the synthesized beams is presented. The connection of the level of its sidelobes with the necessary for the reconstruction number of projections is shown in comparison with the situation of 2D reconstruction. The possibilities of graphical depiction of the process are illustrated by the example of the 3D model of an optically thin emitting object. The recommended applications to the method: the problems of astrotomography and remote sensing of the objects. This technique can help also to simulate and create new systems.

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