Financial Aid

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Applicant Information

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9. Expiration date of **passport**: Agafonov Mikhail, passport 51 No 1529899,
   Data of issue: March 05, 2003;
   Data if expiry: March 05, 2008.

Requested Financial Aid

Hotel: yes
Registration Fee: yes
Air Fare: very desirable from Moscow to Strasbourg, two-side flight (because my possibility to apply in 2003 in the Russian Foundation of Fundamental Research is already used).

Vita

Born: October 8, 1954 (Nizhny Novgorod, Russia).

Education:

1977 - graduation from State University in Nizhny Novgorod, Department of Radio Physics.
1989 - Ph.D. in physics and mathematics. Thesis: The structure of the Crab Nebula from images by Lunar occultations observations and it's radio emission at meter wavelengths.

Employment record:

1977-1983 engineer,
1983-1989 junior scientific worker,
1989-1991 scientific worker,
1991-1994 senior research scientist (department of astrophysics and remote sensing at N.Novgorod Radiophysical Research Institute (NIRFI));
1994-2001 scientific secretary of N.Novgorod Radiophysical Research Institute (NIRFI);
2001 Deputy Director in Science of Nizhny Novgorod Radiophysical Research Institute (NIRFI).

Research: image reconstruction, processing, recognition by remote sensing (in Astronomy and tomography), supernovae.

1994-1996 correspondent of URSI (International Union of Radio Science); The Card No 300778.
Since 1995 COSPAR Associates (Scientific Commission A,C,E) (see COSPAR Directory, april 1997).
Since 1996 member of European Astronomical Society.
1992-1995 pluralistically lecturer on the Applied Mathematics Chair State University in Nizhny Novgorod, Department of Computational Mathematics and Cybernetics.
2003 pluralistically lecturer (Course: Processing Methods of Biomedical Signals and Data) on the Atomic and Thermo Power Stations and Medical Engineering Chair State Technical University in Nizhny Novgorod, Physics and Techniques Department.

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2. Agafonov M.I. Cassiopeia A flux density secular decrease slowdown at metre wavelengths. Pis'ma v Astronomicheskii zhurnal. 1994, v.20, p.18.
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11. Agafonov M.I., Stankevich. Crab Nebula mapping by the Lunar occultations observations: structure and the envelopes. In the Book: Radioemission from the star and the sun. ASP Conference Series, San Francisco, Vol. 93, 1996, p.147-149. Ed. by A.R.Taylor and J.M.Paredes.
12. Agafonov M.I. Image reconstruction with few strip-integrated projections: enhancements by application of versions of the CLEAN algorithm. In the Book: **Astronomical Data Analysis Software and Systems YI**. ASP Conference Series, San Francisco, Vol. 125, 1997, p.202-205. Ed. by G. Hunt and H.E. Payne.
13. Agafonov M.I. Determination of the permissible solutions area by image reconstruction from a few projections: method 2-CLEAN DSA. In the Book: **Astronomical Data Analysis Software and Systems YII**. ASP Conference Series, San Francisco, Vol. 145, 1998, p.58-62. Ed. by R. Albrecht, R.N. Hook and H.A. Bushouse.
14. Agafonov M.I.The foreshortened reconstructive tomography (method 2-CLEAN DSA) for the 2-D high angular resolution reconstruction in astronomy. Abstracts of the 9-th European and 5-th Euro-Asian Astronomical conference (Joint European and National Astronomical Meeting – JENAM), 2000, Moscow, MGU, Russia, p.170
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17. Agafonov M.I. Few Projections Tomography.II. Information Telecommunication Technology 2-CLEAN DSA. Izvestiya VUZ – Radiofizika (in press); and Reprint NIRFI No.477, Nizhny Novgorod, 2003.
18. Agafonov M.I., Sharova O.I. Few Projections Tomography.III. Radioastronomical Approach and 2-CLEAN DSA Method in the 3-Dimentional Applications. Izvestiya VUZ – Radiofizika (in press); and Reprint NIRFI No. 478, Nizhny Novgorod, 2003.
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Appendix 1

The following Papers of Radio Astronomers have made valuable contribution to the Solution of the Few Projection Tomographical Problem and to the Creation of the 2-CLEAN DSA Method of Reconstruction in a wide space frequency band.

1. **Bracewell, Riddle, 1967** [1] – This Paper is classical in tomography and radio astronomy. It is shown that by the number of projections $N \geq \pi D / \varphi$, where D is the diameter of the object, φ is the desired angular resolution, the reconstruction of the brightness distribution may be reached by summarizing the projections (this case corresponds to the filling of the summary point spread function of all UV-plane up to boundary radius ω_b).

2. **Application of Synthesised Beam SB** (or Summary Point Spread Function) **and the removal of sidelobes of SB** in the form of dispersed knife beam [2, 11, 9]. First it was used by **Maloney, Gottesman, 1979** [2]. This paper was truthfully the pioneer contribution, though it was accomplished without the necessary substantiated of the solution.

3. **CLEAN Algorithms: ST-CLEAN (Hogbom, 1974)** [3] and **TC-CLEAN (Steer, Dewdney, Ito, 1984)** [4] **–** which are radio astronomical realizations of iteration algorithms with non-linear constraints.

4. **Solution Convergence Research by ST-CLEAN and TC-CLEAN applications for this problem (Agafonov, Podvojskaya, 1989)** [5], and the **computerized simulation** experiments for the elucidation of the reconstruction possibilities by the few projections tomography problem in a wide space frequency band $\{0,\omega_b\}$.

5. **2-CLEAN DSA Method** of the Determination of the permissible Solution Area from smooth (TC-CLEAN) to sharp (ST-CLEAN) variants satisfying imposed constraints **(Agafonov, Podvojskaya, 1990)** [6, 10].

6. **2-CLEAN DSA Method (Agafonov, 1996, 1997)** [7, 8] –The Method for the Solution of the Few Projections Tomography Problem in a wide space frequency band.

7. **Reconstruction with real Observational Projections (Agafonov, Ivanov, Podvojskaya, 1990)** [9] from Lunar Occultation of the Crab Nebula brightness distribution by the determination of the sharpest and smoothest variant of the solution, satisfying imposed constraints.

8. **2-CLEAN DSA Method in the 3D Applications (Agafonov, Sharova, 2003)** [12]**.**

It is obviously, that this Technology of Reconstruction may be one of the basic component of the Astrotomography, which deals with the investigation of stars and the Sun by the reconstruction of their inside structure or using special tomographical methods. Besides that this technique is also useful for Remote Sensing in a wide field of applications.

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2. Maloney, F.P., Gottesman, S.T. Lunar occultation observation of the Crab Nebula. Astrophys.J., 1979, v.234, p.485-492.
3. Hogbom, J.A. Aperture synthesis with a non-regular distribution of interferometer baselines. Astron.Astroph, Suppl.Ser., 1974, v.15, N3, p.417-426.
4. Steer, D.G., Dewdney, P.E., Ito, M.R. Enhancements to the deconvolution algorithm "CLEAN". Astron.Astrophys., 1984, v.137, N2, p.159-165.
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6. Agafonov M.I., Podvojskaya O.A. Reconstruction of two-dimensional brightness distribution using two versions of the CLEAN algorithm for a limited number of projections in radio astronomy and tomography. Izv. VUZ – RADIOFIZIKA, 1990, v.33, N10, p.1185-1187, in russian. (R & QE, Radio physics and Quantum Electronic, 1990, v.33, p.1185A, copyright Plenum Publishing Corporation, in english).
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12. Agafonov M.I., Sharova O.I. Few Projections Tomography.III. Radioastronomical Approach and 2-CLEAN DSA Method in the 3-Dimentional Applications. Izvestiya VUZ – Radiofizika (in press); and Reprint NIRFI No. 478, Nizhny Novgorod, 2003.

Appendix 2

Below is Introduction of one of my last Paper (in press now); on the fig. is 3 variants of considered cases of reconstruction :

Introduction

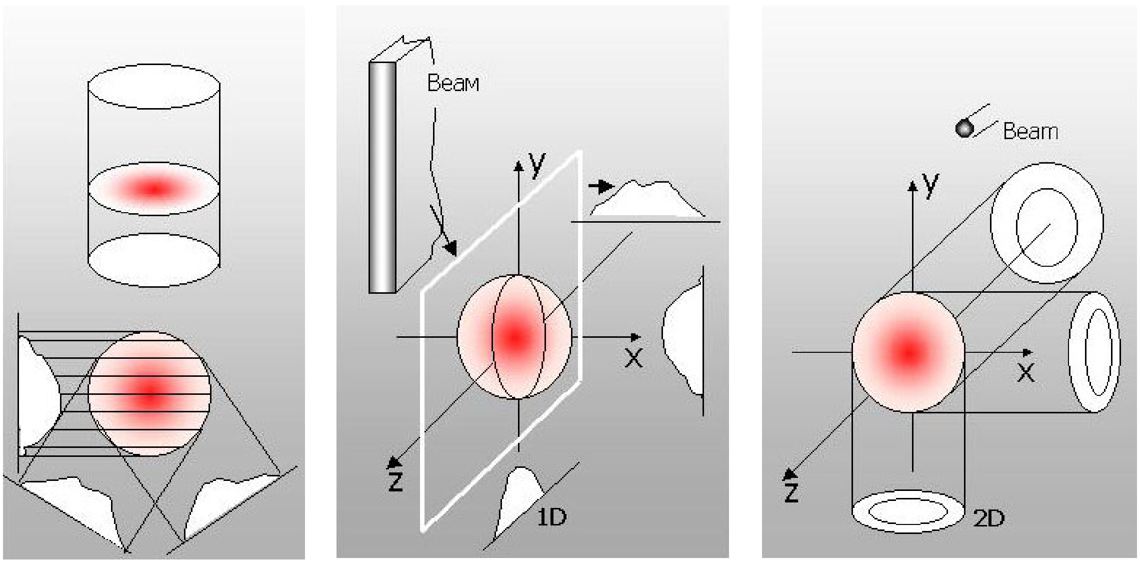
The problem of successful reconstruction of the inside structure of the objects, which includes not only compact elements but also extended areas of various spatial sizes, is found in different fields of science: in plasma research, medicine, MGD engines, tokamaks, the brightness distribution reconstruction by lunar occultations, contactless monitoring of different objects, research by knife beam of observational instruments, slits of optical systems.

In 1978, at the symposium “Image Formation From Coherence Function in Astronomy”, in R. Gordon’s presentation the basic problems and principals of tomography were formulated, the main of which are: the theorem of indetermination [2], the necessity to take into account the physical character of the problem being resolved, the demand to start the equipment construction only after the algorithm has been created and examined. The latter, unfortunately, was not used in medicine earlier and because of a great number of projections the dose of radiation was sufficient.

In 1977 the theorem of indetermination was mathematically proved – a fundamental constraint, an anomalous case of projection reconstruction, which shows, however, not the expediency to increase their number but the necessity to use different a-priori information for the limitation of the solution area to the definite problem of reconstruction.

Since the time of Gordon’s presentation radioastronomy has made a considerable contribution to the solution of some important problems that are the same for radioastronomy and tomography [4], which, as it seems to us, it can be proud of. In this paper the radioastronomical approach to the problem on the base of the most important publications is presented. Besides, we have tried to draw the researchers’ attention to a number of very important aspects, because the reconstruction from a few projections cannot be successful without taking them into consideration.

We suppose that it will be useful if the specialists of different fields know the physical sense of the radioastronomical approach to the problem as soon as possible. In the article we have tried to summarize and illustrate the main aspects of the problem solution and given examples of their practical realization. We hope, the accompanying pictures will help to understand the problem and, besides, it is useful to consider the reconstruction of the problem having illustrations. The understanding of the problem will help to avoid the case of medical equipment described above.



a) b) c)

Fig.