



INSTITUTE OF APPLIED PROBLEMS OF PHYSICS

NATIONAL ACADEMY OF SCIENCES OF
REPUBLIC OF ARMENIA



The Institute was formed in 1980 in Yerevan by academician of NAS of RA, honored scientist, professor *Alpic Rafael Mkrtychyan*.

Institute have three branches located in Armenia in Meghri, Kapan and Byurakan.

In 2011 our institute with the Tomsk Polytechnic University founded the first Russian-Armenian joint laboratory in Tomsk and Yerevan.

In May 2014 we form the first research joint laboratory with Artsakh State University named prof. *Alpic Rafael Mkrtychyan*.

And during this visit I hope that we shall form another joint laboratory with our Italian colleagues.

The main aim of formation of this laboratories is:

- supporting of fundamental and applied investigations in Armenia, Artsakh, Russian Federation and Italy;
- utilization of our developed unique equipment in science and technics, as well as in medicine and civil areas;
- exchange of highly qualified scientific-technical stuff, as well as students and post graduate students;
- further integration scientist and engineers into international asso-ciation of scientists;
- assistance in solving of international and national economic and technical problems.

Main directions of scientific-technical research

Condensed matter physics, Acoustics, Plasma physics, Acoustophysics, Material sciences, Scientific engineering, Information technologies.

Possible areas of developed applications

Nuclear physics, solid state physics, biology, chemistry, geology, ecology and etc.

The Most Important Fundamental Results Obtained during last year

- Being the first time, the effect of the coherent bremsstrahlung of the electrons with 20 MeV energies in the targets was experimentally shown in the presence and absence of an external acoustic field and the spectral distribution change was recorded. Simultaneously, making use of the effects of X-ray full transmission in space according to time and nullifying of the absorption coefficient (transparency effect), it is possible to create short-wave X-ray sources with controllable parameters (**academician A. R. Mkrtchyan, Dr. V. R. Kocharyan, Sc. D. A. A. Saharyan, Dr. E. A. Mkrtchyan**).
- Being the first time, the phenomena of acceleration of heavy ions and radicals in modified by external acoustic fields medias was find out. An acceleration factor more than 3 orders of magnitude was registered. The theoretical explanations of the experimental results are under development (**Prof. A.H. Mkrtchyan, Dr. V. V. Nalbandyan, Dr. H. R. Muradyan**).
- Acousto-plasma magnetic diodes of different types were developed and feasibility study of their utilization for special purposes was carried out (**academician A.R. Mkrtchyan, Dr. A. Abrahamyan**).
- The phenomena of accumulation and intensification of supper weak acoustic vibration in resonance systems with specific geometric form was observed and corresponding explanation is given (**Prof. A. H. Mkrtchyan, academician A.R. Mkrtchyan, & et.all**).

The Developed Applications in the last year period

- Development and creation of 10-50 MeV electron beam line with controllable parameters (**academician A. R. Mkrtyan, Dr. A.S. Ghalumyan, etl.**)
- A software package was developed for calculating a coherent scattering of X-radiation with arbitrary intensity distribution in the presence of super lattice (**Dr. V.R. Kocharyan**).
- In the presence of an acoustic wave, based on coherent bremsstrahlung, taking into account the effects of full transmission in space and converging to zero transparency, a short-wave monochromatic X-radiation source is developed, which characteristics is controllable in space and time (**academician A. R. Mkrtyan**).
- A new generation X-ray diffractometer with high aperture ratio based on a acousto-monochromator was developed and created. The new diffractometers provides high level monochromatic and high aperture ratio diffraction of X-Rays without any harmonicas and background radiation (**academician A.R. Mkrtyan**).
- New generation of supper sensitive low frequency acoustic sensors were developed for registration of natural and artificial acoustic vibrations (**Prof. A. H. Mkrtyan, academician A.R. Mkrtyan, & et.all**).



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- A generator of sinusoidal signals of 1kHz to 10MHz ranges with 1Hz precision was developed to control with high stability the parameters of a X-ray-acoustic monochromator. (**Dr. V.R. Kocharyan**).
- A computerized diffraction spectrograph for visible light was developed and made. (**Dr. A.S. Abrahamyan**).
- New evaporation method by utilization of acousto-plasma was developed. (**academician A.R. Mkrтчyan**).
- New crystallizing dishes were made for the growth of lithium iodate single crystals in presence of the mixtures of various amino acids (**Dr. A.K. Atanesyan**).
- High efficiency supper speed detector-convertor systems of neutron, electron, alpha and gamma particle, X-ray radiations were developed on the basis of new synthesized high ordered composite materials (**Prof. A. H. Mkrтчyan, Dr. V. V. Nalbandyan, Dr. H. R. Muradyan**).
- New types of bactericide emitter, highly efficient spotlights have been developed. The experimental specimens were made and a series of their technical parameters behavior were studied. A bactericide emitter was developed (**V. Yeghoyan**).

**The main results obtained during collaborations with
*Russian Federation***

- A various types of acousto-plasma magnetic diodes were developed and their advantage studies were made for the implementation under special conditions and for special purposes. (**academician A.R. Mkrтчhyan**)
- New global radiofrequency identification system on the basis of acoustoelectric systems was developed. (**Prof. A.S. Bagdasaryan, Prof. A. H. Mkrтчhyan**)
- Monitoring and controlling system to forecast the extreme situations was developed. (**Prof. V.K.Saryan, Prof. A. H. Mkrтчhyan**)
- New composite piezoceramic elements (**Prof. S.S. Nersesov, Prof. A. H. Mkrтчhyan**)
- Controllable elements of X-Ray and gamma optics.

Belarus

New generation of power supplies for acousto-plasma discharge balbs were developed. The acousto-plasma states dependence on acoustic field parameters were studied.
(**head academician A.R. Mkrтчhyan**)



Thank You For Attention