NATIONAL INSTITUTE FOR RESEARCH AND DEVELOPMENT
IN ELECTRICAL ENGINEERING ICPE-CA

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BRIEF PRESENTATION of INCDIE ICPE-CA

INCDIE ICPE-CA is a national institute with a long tradition on Romanian market, set up in 1950 and reorganized in 2004 under Romanian Government Decision no. 1282/24.08.2004 in *National Institute for Research and Development in Electrical Engineering ICPE-CA*, being coordinated by the National Ministry of Education.

Vision INCDIE ICPE-CA

INCDIE ICPE-CA will become the promoter of progress based on knowledge in the field of electrical engineering.

Mission INCDIE ICPE-CA

INCDIE ICPE-CA promotes and carries out applied research in national and international background in electrical engineering field (materials, electrotechnologies, new energy sources, micro- and nano-electrotechnologies, electromagnetic compatibility, a.o.) for private and public companies, in the benefit of the whole society.

Developing technological innovation for customers, ICPE-CA increases their competitiveness both in Romania and in Europe. Research activities promote the economic development of society and lead to social welfare, closely connected with the environment.

For institute employees, ICPE-CA offers personal development professional qualification which will enable them to occupy positions of responsibility at the level of the institute, industry and other scientific fields.

The mission is defined, achievable (due ICPE-CA skills and creativity of employees), informative, accurate, reflects reality of ICPE-CA (values and culture), and is oriented towards customers.

INCDIE ICPE-CA has as main activity, according to NACE 7219, ***research and development on natural sciences and engineering***, and as secondary activities ***research and development in biotechnology*** (NACE 7211) and ***research and development on*** in social sciences and humanities (NACE 7220).

Short presentation of research activity in period 2012-2013

Main activities include: basic and applied research in the field of electrical engineering, technical assistance and consultancy in the field of electrical engineering, information, documentation and training personnel in electrical engineering.

The research activity of the Institute is involved in three main research areas, organized in three great departments: Department for Advanced Materials (functional / multifunctional, crystalline and nanostructured materials and composites), Department for Efficiency in Conversion and Consumption of Energy (wind, solar, fuel cells, hydrogen storage, energy conversion, energy saving and energy recovery), Department for Micro-Nano-Electro-Technologies and five R&D laboratories which are RENAR (Romanian Accreditation Association) accredited: Laboratory for Electrical Materials and Products Characterization (RENAR accreditation certificate *LI 845 / 26.01.2010*), Laboratory for Electromagnetic Compatibility (RENAR accreditation certificate *LI 881 / 14.06.2010*), Laboratory for Determination of Thermal Analysis (RENAR accreditation certificate *LI 685 / 25.07.2013)*, Laboratory for Micro and Nano-Electro-Mechanics (RENAR accreditation certificate *LI 967 / 27.11.2012*) and Laboratory for β-TCP Biomaterials (ODTM accreditation certificate 25 SM 1 / 2012, 25 DM 2.3 / 2012 and 25 DM 2.4 / 2012).

To achieve the strategic objectives required by the **Institute mission**, namely **research and development in electrical engineering for the benefit of society**, the Institute carries out multidisciplinary research and partnerships in various national and international projects. The financing of its activities is done mainly by the PN II National Research-Development-Innovation Programmes, Core Programme, as well as research grants and projects financed from EU Programmes, including structural funds.

During 2012-2013 ICPE-CA carries out basic and applied research as follows:

- 10 projects in coordination and 11 projects as partner in PN II National Research-Development-Innovation Programmes –Partnership;

- 14 projects in Core Programme;
- 9 projects of bilateral cooperation with JINR (Joint Institute for Nuclear Research) - Dubna, Russia;
- partner in international project - FAIR (*Facility for Antiproton and Ion Research*) - Germany;
- 1 project UE/COST Action D43 (2006-2013): Colloid and Interface Science for Nanotechnology;
- 1 project UE/COST Action CM1101 (2011-2016): Colloidal Aspects of Nanoscience for Innovative Processes and Materials;
- 1 project FP7 REGPOT-2008-1 "*Developing RTD Potential of INCDIE ICPE-CA in the Field of Hydrogen and Fuel Cell Technologies (ICPE-HyFC)*", grant agreement no. 229 906;
- 1 project with the North-West Regional Development Agency within Competitiveness & Innovation Framework Programme, ENT/CIP/07/0001a "*Business Innovation Support Network Transylvania* " EEN 225 559 BISNet Transylvania-1;
- 2 projects FP7-MNT ERA NET: code 7-053/2012 "*Technology for development of mini-supercapacitors based on electroactive networks polymer - CNT/CNF*" and code 7-041/2011 "*Research and development of new functionalities for sports and health garments*";
- 1 project in Sectoral Operational Programme "Increasing of Economic Competitiveness" (SOP IEC Programme), priority axis II - Research, Technological Development and Innovation for competitiveness, the area of intervention 2.2, Operation 2.2.1, "*Modernization of the infrastructure for promotion of research potential in electrical engineering for applications in priority economic thematic areas of Romania as EU member state – acronym PROMIT";*
- 1 project in Sectoral Operational Programme "Increasing of Economic Competitiveness" (SOP IEC Programme), priority axis II - Research, Technological Development and Innovation for competitiveness, the area of intervention 2.2, Operation 2.1.1, "*Advanced research for achieving carbon materials with thermal resistance subjected to irradiation, with high life time, for sealing rings – acronym CARBOTIR"*;
- 4 projects in Romania-Bulgaria Cross-Border Cooperation Programme 2007-2014: REACT "*Integrated system for dynamic monitoring and warning for Technological Risks in Romania-Bulgaria Cross-border area*" - MIS-ETC CODE 144, RES-OP-DEV "*Romanian - Bulgarian Joint Cooperation for the long-term and Sustainable Development of the young human resources in the field of the Renewable Energy Technologies in order to overcome the socio-cultural barrier to open common and Opportunities for getting a job and Their Employment Along the cross - border area*" - MIS-ETC CODE 222, "*Joint study regarding the promotion of renewable energy for the environmental protection, within the natural protected areas from the Lower Danube, the Danube Delta and the Black Sea Region"* - MIS-ETC CODE 128, „*Clean access in Calarasi Silistra cross-border area*" MIS-ETC CODE 118*;*
- 4 bilateral cooperation projects within Capacities Programme - Module III – Joint Scientific Programme with China, Bulgaria and Moldova;
- 1 project within Black Sea Basin Joint Operational Programme 2007-2013, "*Integrated hotspots management and saving the living Black Sea ecosystem – HOT BLACK SEA*", MIS-ETC 2303;
- 1 project within RDI Programme – STAR (Space Technology and Advanced Research) – „*Advanced composite structures for space applications"*;
- 2 projects within PN II National Research-Development-Innovation Programmes – Innovation, Sub-programme – Innovation support services „Checks for innovation" – *„Technical study concerning electricity generation system – photovoltaic panels mounted on the roof, without energy storage*", „*Pilot installation for wind energy conversion with the power of 1,5 kW*".

The institute was involved in another 36 non-budgetary applied research contracts in areas such as: new energy sources, materials for electrical engineering, environmental protection, electromagnetic compatibility, micro and nano electrotechnologies, as well as in another 47 small-scale manufacturing contracts (small-scale manufacturing of materials processed in different shapes and sizes; small-scale manufacturing of some complex applications: sensors, actuators, magnetic couplings, transducers, protection equipment to control against electrochemical corrosion, stand/systems for monitoring, verification and control of electrical and environmental parameters; techniques application of vacuum thin layers deposition; characterization and testing of various types of materials; CEM measurements; evaluation of thermal behaviour of products and materials; MEMS processing; MEMS and NEMS measurements; consulting in the field of intellectual property).

According to its mission mentioned above, from 2013 ICPE-CA is Romanian partner of a project within South-East Europe Transnational Cooperation Programme (*Promotion of Financing Innovation in South-East Europe - PROFIS*) which aims to provide a guide to services necessary to obtain financing for early stages innovative businesses: for technology transfer, possibly prototyping, marketing – market launch to the stage where production costs are lower than incomes and to identify barriers to innovation financing.

From the beginning until now, the Institute has continued its programme to build a comprehensive framework of cooperation and partnership with entities that working in the field of electrical engineering and not only; the results being more visible and beneficial to Institute evolution. Thus, we can mention a large number of scientific papers published in specialized ISI quoted journals (33 scientific papers in 2012 and 25 in 2013), scientific papers published in other specialized journals non-quoted ISI (36 scientific papers in 2012 and 30 in 2013), scientific papers presented at international conferences (105 scientific papers in 2012 and 98 in 2013), new products (12 new products in 2012 and 6 in 2013), new technologies (1 new tech in 2012 and 4 in 2013), procedures (2 procedures in 2012 and 5 in 2013) and services resulting from research, technology transfers (4 technological transfers made in 2011, 2 in 2012 and one in 2013), all of which means a scientific and technological, economic and social progress.

Also, the Institute is well represented in the field of intellectual property through patents granted by State Office for Inventions and Trademarks OSIM (8 patents granted up to September 2013 and 12 patents granted in 2012), patents submitted at OSIM (20 submitted patents in 2012 and 7 submitted patents between 01 - 09.01.2013) and continuous participation in major International Exhibitions of Inventions, being awarded with many national and international medals and awards (17 awards obtained in 2012 and 6 awards obtained up to September 2013.

To promote the results of its research activities, must be highlighted both the different institute attending of national and international fairs (International Exhibition of Inventions, Geneva – Switzerland, International Salon Brussels – EUREKA – Belgium, International Exhibition for Ideas – New Inventions – Products – IENA – Nuremberg, Germany, International Industrial Fair "HANNOVER MESSE" – Hanover, Germany, International Exhibition of Inventions, Scientific Research and New Technologies – INVENTIKA, Exhibition of Romanian Research Results RESEARCH SHOW, Regional Research Show in the cities: Alexandria, Brasov, Bacau, Slobozia, Calimanesti-Caciulata, Arad, POLIFEST Exhibition, Research Exhibition within National Conference of Research and Innovation from Romania CNCI, ATEE Exhibition) with the most important achievements for technology transfer in economy, and organizing the scientific events with national and international participation (5 scientific events as organizer and co-organizer in 2012 and 3 scientific events as organizer in 2013) which have led to the increasing the scientific visibility of the Institute.


ASOCIAȚIA GENERALĂ A INGINERILOR DIN ROMÂNIA

PREMIUL AGIR
2012

În domeniul "Ingineria materialelor"

Se acordă realizatorului:
INCDIE ICPE - CA - Institutul Național de Cercetare - Dezvoltare pentru Inginerie Electrică

pentru lucrarea: ***Produs granular sintetic pentru aplicații în chirurgia oralo-maxilofacială (PG β-TCP, 500-1000μm).***

06.09.2013

Președinte,
Mihai MIHAIȚĂ

In the same context we mention awarding in 2008 by National Authority of Scientific Research NASR the *Excellence Award for the most efficiently promotion of research results*, awarding by General Association of the Engineers in Romania AGIR for technology transfer of the following prizes: in 2010, three prizes for *Award for assimilation in industrial manufacturing of synchronous generators for wind micro-turbines*, the prize for "*Household biogas unit for rural areas*", the prize for "*High stability polymeric materials to manufacture sealing products used in nuclear electrical power*"; in 2011 *Award in the "electrical engineering" field* for "*Bipolar carbon plates for polymer electrolyte fuel cells*", as well as in 2012 *Award in the "engineering materials" field* for "*Synthetic granular product for applications in oral surgery and implantology (PG β-TCP, 500-1000μm)*".

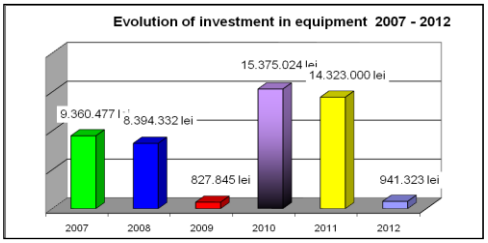
In order to develop the technological innovation for its customers, ICPE-CA provides consulting activities, know-how transfer and development of partnerships in the electrical engineering field by the Incubation Office - ITA ECOMAT ICPE-CA – having the headquarter in Sf.Gheorghe and Avrig – Marsa cities and by the Technological Transfer Centre CTT ICPE-CA Bucharest.

Among the results of R&D activities of the Institute we can mention:

- materials and components for energy area, materials and components for electrical engineering area, biomaterials and bio-based products, materials with special application;
- electrical generators operated from renewable sources; special electric machines;
- cryogenics applications for efficiency of conversion and consumption of energy;
- CAD/CAM/CAE design;

- microelectromechanical systems; MEMS by LIGA technology;
- obtaining of fuel cells and integrated systems for energy production;
- development of biogas unit and monitoring the anaerobic digestion processes in biogas unit;
- studies regarding materials degradation by corrosion, corrosion control in different natural and industrial environment, electromagnetic pollution of environment;
- complex electrosecurity systems and active protection against corrosion for underground metallic conductors systems to increase their durability and safety in operation;
- piezoceramic, electrostrictive, magnetostrictive, electromagnetic, electrodynamic, electrothermal microactuators;
- electromagnetic and electrostatic micromotors and microgenerators;
- electromechanic or piezoelectric microharvesting systems;
- electromagnetic, linear and angular position microsensors with application in monitoring the landslides and slide position; gas electrochemical microsensors; microsensors for the study of mobility and medical re-education;
- capacitive water desalination modules;
- biology and electromechanical applications of carbon-graphite materials;
- micro and nanobionic / the study of magnetic bacteria with applications in MEMS and NEMS;
- electromechanical systems: testing systems of railway running path; microsystems for motion and motility monitoring; soft for systems which monitoring the motion; identify the motion parameters with help of micro and macrophotogrammetry systems; micro drives and active control systems in 2D and 3D.

These results were made possible by the Institute research staff, composed of high-class specialists who have a high potential for assimilation of the latest technologies in the field and always adapting to the market requirements. Thus, in proportion of 72% of those 176 employees with higher education, 55 are doctors, 29 are PhD students having quite different specializations (physics, chemistry, electrotechnics, metallurgy, mechanics, and biology) and 2 are master students.



Increasing the equipment investment, both from its own and budgetary funding sources, as it is presented in the near figure, allowed the Institute and the research staff to increase the quality of research and to approach the new research areas.

ICPE-CA has implemented and certified Integrated Management System Quality-Environment in accordance with the EU requirements of ISO 9001 and ISO 14001.

Scientific objectives and directions

For the next year we intend to:

1. Higher participation in national and international research efforts (through participation in FP8 and HORIZON 2020) to replace materials with a high content of strategic elements (like Co, rare earth in permanent magnets, Li in electrical power sources, Al and Cu in electrical conductors) with other having a smaller amount of that elements in order to promote a sustainable policy through economy of resources (materials together with energy);
2. Introduction of an Energy Management System, promotion of it national wide and to assist electrical energy consume with high companies in order to save energy;
3. To develop products and technologies, using the skill of our Institute in advanced materials and microelectromechanical system, which save energy, which convert with high efficiency renewable energy sources in usable energy (electrical, thermal);
4. Contribution to the development of big national and international (research and economic units) projects for high level devices having an increased energy efficiency;
5. Development of new MEMS/NEMS, using advanced materials and techniques and technologies proper to our institute, in order to contribute together with our other departments – special with that for ECCE – to our main goal of our applicative research, namely to assist the commercial companies of the electrical engineering field to enhance the level of the sold products, finally in the benefice of the whole society;
6. An adequate HR policy in order to enhance the quality of the research personnel and offering in the same time to all staff members of a career in research; increasing the number of full-time researcher only for a given project (time limited hiring);
7. Development of the infrastructure of our institute in order to be able to participate in big national and international programmes;

8. Generalization of modeling in all fields of applicative research in order to build and to test virtual prototypes, increasing the efficiency in research (saving of time and material costs);
9. Building of poles of excellence in the main areas and important research field of our institute: advanced materials, RES including more energy management, MEMS/NEMS, EMC, thermal analysis;
10. For EMC Laboratory: the extension of frequency range in the LF and ULF domain (ULF submarine communications); the extension of frequency range in the UHF up to 300MHz, the limit of allocated frequency; the development of tests and research in 0.3 – 4 THz (THz - Time Domain Spectroscopy) in order to become an important player at national and international level;
11. Development of new accredited services for electrical engineering;
12. Increasing the national and international visibility of our staff through high quality papers in good ranked international journals, and increased participation of our staff in high level international conferences, application for international patents, further organizing of conferences, workshops with international participation in field in which our institute has a solid position;
13. Improving the scientific documentation facility of our staff, using centralized access to international journals (like ANELIS), also our own IEEE membership documentation possibility in specific electrical engineering journals, a powerful and secure network of PC, connected to different facilities, development of our data management plan;
14. Further development of our system of the institute's memory;
15. Increased participation of our scientists in solving problems needed by the industry (economy) through participation of our researchers in specialized clusters;
16. Further development of strategic partnerships with prestigious Romanian and abroad universities, as well as with large traders or services providers in our country;
17. Increasing of number of applications in programmes like: Cross-border Programmes, Black Sea Cooperation Programme, European South – East Programme, etc.;
18. Strengthening of the external cooperation with CERN – Geneva. FAIR – Darmstadt, JINR – Dubna;
19. Increasing the cooperation with other Romanian institutes in the frame of the ELI-NP Programme and of The Advanced Studies Centre – Danube Delta – Black Sea;
20. Increasing the role of ICPE-CA in big national programmes and projects with national and international relevance (ELI, Hadronotherapy, Electrical Mobility, Energy Management System and others);
21. Organization of scientific workshops and conferences in order to increase our scientific and technological visibility;
22. Organization of seminars with industrial partners in order to increase visibility of our products and technologies, to enhance the knowledge of industrial needs;

Among the major projects of the institute developed in the previous period, we mention the following:

1. Project PN 09-35 0102 "*Achievement of dipole superferic magnets, superconducting coils, magnets, magnets and sources for particle accelerators FAIR*", financed by Core Programme.

2. Project 4942/2011 *"Advanced Research for achieving carbon materials with thermal resistance subjected to irradiation with high life time, for sealing rings*", financed from the Sectoral Operational Programme "Increasing of Economic Competitiveness", priority axis II - Research, Technological Development and Innovation for competitiveness, operation 2.1.1.

3. Project PN 7-041/2011 „*Research and development of new functionalities for sports and health garments*", financed by CROSS TEXNET Programme, INCDIE ICPE-CA partner.

4. Project PN-35/0301 „*Development of new materials and devices for controlled release of drugs with applications in biomedical engineering*", financed by Core Programme.

5. Project PN 09-35 0103 „*Composite materials with performant mechanical properties*", financed by Core Programme.

6. Project 81-059/2007 „*Security elements with ferromagnetic microwires and field sensor for application on electronic detection for validating*", financed by PNCDI II – Partenership, INCDIE ICPE-CA coordinator.

7. Project REACT „*Integrated system for dynamic monitoring and warning for technological risks in Romania-Bulgaria crossborder area*", MIS ETC CODE 144, financed by Crossborder Programme Romania-Bulgaria 2007-2014, INCDIE ICPE-CA coordinator.

8. Project 71-127/2007 "Smart processing of spin valve nano-devices with giant magnetoresistance ratio with applications in spintronics (SPIN-VALVE)", INCDIE ICPE-CA coordinator, financed by PNCDI II – Partnership.

9. Project 71-052 / 2007 „*Computerised system for measuring and analysis of railway profiles for improving the safety of guidance and quality of rolling in exploitation as well as the synthesis of new profiles at railway vehicles*", INCDIE ICPE-CA coordinator, financed by PNCDI II – Partnership.