



A STRENGTHENED CNEN



**ACHIEVEMENTS
2019**

**DELIVERIES
2020**



CNEN
Comissão Nacional
de Energia Nuclear



Where CNEN is present



National Nuclear Energy Commission

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Message from the President

A strengthened CNEN

This milestone - a strengthened CNEN - reflects the sentiment of our career employees, as well as those outsources, fellows, students and volunteer employees. We ended 2019 with important achievements, and we started a very promising 2020.

And how to talk about the 2019-2020 biennium, without mentioning the research, development, innovation, production, teaching, regulation and inspection workforce? Yes, CNEN is all of that!

More than sixteen hundred servers, in different Units. More than one hundred masters and doctors graduated each year.

Talking about CNEN is talking about research that produces high-impact scientific knowledge, also with direct benefits to society, such as those described herein. This is also talking about more than two dozen types of radiopharmaceuticals produced in our facilities, which serve the entire national territory, in addition to the countless activities present in our laboratories, research reactors and accelerators, which bring social welfare and wealth.

Integration was present in our speech and in practice in 2019. Proved by development activities of the Brazilian Nuclear Program, in which CNEN coordinated several technical groups and participated effectively in many others.

Also the nuclear applications, which benefit areas of health, food, industry, mining, environment, defense and the technological development of various sectors.

There are two historic marks to celebrate: 60 years of radiopharmaceutical production in 2019; besides, 60 years of nuclear fuel cycle research in 2020 - an activity that brought together CNEN, IPEN and the Brazilian Navy, in São Paulo, since the beginning.

In 2019, 3,491 technical advices were prepared by our Directorate of Radioprotection and Nuclear Safety. The same area carried out, during the period, 412 regulatory inspections, both in radioactive installations (such as hospitals and medical clinics), as well as in mining, fuel cycle, transport, reactors, physical security and disposals.

Presently, Brazil is one of the few countries that have mining fields that make it autonomous in supplying nuclear ore and with export possibilities. This, coupled with the domain of uranium enrichment, in addition to the operation of power and research reactors. In such primacy, CNEN is an important vector of these conquests.

The "young lady" CNEN, who turns 64 in 2020, is attentive to social demands, while providing, to the government structure, compliance with the principles of Public Administration and the dictates of external and internal control bodies.

This material aims to bring the country a sample of the activities from a CNEN that gets things done.

These achievements, in 2019, were supported by the Ministry of Science, Technology, Innovations and Communications (MCTIC). With the same support, we will carry out what is described here - and other activities - in 2020.

Good reading!

Paulo Roberto Pertusi
President



ACHIEVEMENTS

2019

CNEN AT SCHOOL PROJECT HAS BEEN RESUMED



CNEN resumed the "CNEN at School" project. The initiative, from Research and Development Directorate (DPD), Social Communication Coordination (COCOM) and Radioprotection and Nuclear Safety Directorate (DRS), consists of taking CNEN specialists to schools, disseminating the applications of nuclear technology.

IRD/CNEN HELD RADIOACTIVES MATERIALS TRAINING FOR THE FEDERAL HIGHWAY POLICE IN BRASILIA

The IRD, a CNEN unit in Rio de Janeiro, provided training in Brasília for Federal Highway Police officers from the Special Resources Group, the Mobilizable Shock Group and the Fast-Response Group. The objective was to qualify police in protocols for escorting radioactive or nuclear material.

STORIES AND PERCEPTIONS OF WOMEN IN BRAZILIAN SCIENCE ARE PRESENTED IN OSA EVENT AT IPEN

Event marked the International Day of Women and Girls in Science, and featured contribution from the Optical Society of America (OSA).

CNEN STARTS OPERATING "SEI", DYNAMIZING PROCESSES AND DOCUMENT MANAGEMENT

Since January 2019, the Electronic Information System (SEI) has been in operation at CNEN. The system is used for the production and delivery of documents and processes throughout the Institution as well. The production of hard copy documents became exceptional.

CONVERSION OF THE IPEN/MB-01 REACTOR CORE RODS

After 30 years of operation, IPEN/MB-01 Nuclear Research Reactor received a new core. The 680 fuel rods were replaced by elements plate-type fuels. CNEN also issued the permanent operation grant for the reactor.

CNEN HAS WORKED IN NUCLEAR AND RADIOLOGICAL SECURITY IN GREAT EVENTS



CNEN acted in the nuclear and radiological safety of major events held in Brazil, in 2019, such as the presidential inauguration ceremony, the FIFA U-17 Cup, the America Cup and the 11th BRICS Summit. CNEN work took place in conjunction with the police and military troops, aiming to ensure safety from radioactive materials.

CDTN/CNEN STUDENTS ARE NAMED NUCLEARS AMBASSADORS AT INAC 2019

Six students from the CDTN, CNEN unit in Belo Horizonte, were nominated Nuclear Ambassadors of the Brazilian Association of Nuclear Energy (ABEN), during the "International Nuclear Atlantic Conference" - INAC 2019. The ambassadors are Bárbara Braga, Laura Takahashi and Natália Taveira, who form the Nucleotiza team - Nuclear Awareness - and Patrícia Caetano, Joice Idehara and Daniele Fagundes, from the team ProTecnu - Pro Nuclear Technology.

IAEA DEPUTY DIRECTOR GENERAL VISITS CNEN HEADQUARTERS

CNEN received a visit from the Deputy Director General (DDG) of the International Atomic Energy Agency (IAEA), Mikhail Chudakov, at its headquarters in Rio de Janeiro. The meeting hold steered the presentation of CNEN activities and its Units, as well.

TWO NEW CNEN STANDARDS ISSUED, REGARDING THE NUCLEAR PHYSICAL SAFETY

Two new standards regarding nuclear physical safety were approved at a meeting of the CNEN Deliberative Commission. Both are already active: CNEN NN 2.01, which deals with "Physical Protection of Nuclear Materials and Facilities" and NN 2.06, which regulates the "Physical Protection of Radioactive Sources and Radioactive Installations Associates".

CRCN-NE/CNEN ACHIEVES FDG-18 RADIOPHARMACEUTICAL REGISTRATION

Since the start of production of the FDG-18, efforts have been made to obtaining the registration of this radiopharmaceutical with the National Sanitary Surveillance Agency (ANVISA), that resulted in this registration.

CRCN-NE/CNEN RECEIVES VISIT FROM BRICS SCIENTISTS

BRICS scientists visited the facilities of the Regional Center for Nuclear Sciences of Northeast (CRCN-NE), due to participation in BRICS-UFPE Scientific Workshop.

REPOSITORY OF LOW AND MEDIUM RADIATION LEVELS (RBMN) ESTABLISHES ITS MATRIX OF RESPONSIBILITIES

The RBMN project established, in 2019, its Accountability Matrix, with definition of attributions in various instances. The initiative, essential for dynamics of radioactive waste disposal, will add scientific and technological value to the region where the repository will be established.

SOFTWARE DEVELOPED AT IPEN/CNEN MAKES SUCCESS AT THE BRAZILIAN CONGRESS OF CERAMICS

At the event, a blank poster was presented, with only the title and name of the authors. With the software and the use of augmented reality glasses, easily crystalline structures were created and seen, in a virtual and interactive three-dimensional environment.

CNEN HOSTS IAEA WORKSHOP ON EXTENSION OF NUCLEAR REACTORS SERVICE LIFE

CNEN hosted a regional workshop of the International Atomic Energy Agency (IAEA), tailored to train professionals in the nuclear field for procedures and regulations in nuclear reactor life extension processes.

INMETRO KEEPS ISO 17025 ACCREDITATION FROM LAPOC/CNEN

The National Institute of Metrology, Quality and Technology (INMETRO) renewed its ISO 17025 accreditation for the Poços de Caldas Laboratory (LAPOC), a CNEN unit located in the State of Minas Gerais.

CDTN/CNEN STUDENTS WIN 2019 NUCLEAR OLYMPICS – WNU



Students from CDTN, CNEN unit in Belo Horizonte, won the Olympics Nuclear 2019, organized by World Nuclear University (WNU) in Vienna, Austria. The group, led by Vitor de Almeida, was also formed by Anna Peluso, Edilaine da Silva, Luciana Ribeiro, Nathalia Medeiros and was supervised by professor Amir Zacarias Mesquita. They addressed the unfamiliarity of the population about themes of nuclear technology and use of radiation.

UPDATING OF STANDARD ENABLES CNEN TO APPLY SANCTIONS AND PRECAUTIONARY MEASURES, TO FACILITIES THAT DO NOT OBSERVE LICENSING AND CONTROL REQUIREMENTS FOR THE USE OF RADIOACTIVE SOURCES

With the update of the CNEN NN 6.02 standard, Brazilian facilities that deal with radioactive sources in the medical, industrial and research areas are now subject to sanctions and precautionary measures, in case of non-compliance with the licensing and control parameters from CNEN.

IPEN/CNEN APPROVES PROJECT FOR USAGE OF HIGH LASERS INTENSITY AS COMPLEMENTARY CANCER FIGHTING THERAPY

Project will be carried out in partnership with the University of Nebraska-Lincoln (USA), within the scope of FAPESP SPRINT Program, and will enable Brazilian scientists and students in touch with global scientific and technological leaders in this field.

THREE RADIOPHARMACEUTICALS FOR DIAGNOSTIC PURPOSES, PRODUCED IN IPEN/CNEN, GET ANVISA REGISTRATION

Three radiopharmaceuticals produced at IPEN, a CNEN unit in São Paulo, obtained ANVISA registration: DISI-TEC (Dysophenin), PIRO-TEC (Tetrasodium Pyrophosphate) and DEX-500-TEC (Dextran).

CRCN-NE/CNEN FELLOWSHIP AWARDED BY FACEPE

A fellow at the Regional Center for Nuclear Sciences of the Northeast (CRCN-NE), Iasmim Marcela Siqueira da Silva, received an honourable mention at the Scientific Initiation Journey – Foundation of Support to Science and Technology of Pernambuco (FACEPE), with the research entitled "Methodologies for quality control of the ¹⁸FPSMA radiotracer".

FIRST TECHNICAL VISIT OF THE IEN/CNEN-UFRJ-UFPE AGREEMENT

Researcher at the Materials and Chemistry Technology Service (SETMQ) at IEN, CNEN unit in Rio de Janeiro, was at the Nuclear Energy Department of the Federal University of Pernambuco (DEN/UFPE). It was the first technical visit provided for the Recife-Rio Cooperation Agreement (CORERJ), in which IEN participates, together with Federal Universities from Rio de Janeiro and Pernambuco States. This research by SETMQ aims to characterize the gas system of the cold pilot unit (UPF), for catalytic cracking of oil, in development at UFPE.

CNEN DELIVERS TO MCTIC STUDIES ABOUT THE CREATION OF THE NUCLEAR REGULATORY AUTHORITY

Through work that brought together the Directorates of Radioprotection and Nuclear Safety, Institutional Management, Research and Development, along with the Federal Prosecutor Office, Internal Audit, Staff Office and Advisory to the Presidency, studies were developed on the creation of the National Authority for Nuclear Safety.

COLLECTION OF THE USP CHEMISTRY INSTITUTE'S LIBRARY WAS IRRADIATED IN IPEN/CNEN FOR DECONTAMINATION

Part of the library collection at University of São Paulo Institute of Chemistry (IQ) underwent disinfestation in the Cobalt-60 Multi-Purpose Radiator, from the Technology Center of Radiations of IPEN, CNEN unit in São Paulo. Materials treated were contaminated by insects and fungi.

CCTM/IPEN/CNEN MASTER RESEARCH WINS "BRAZILIAN MATERIALS ASSOCIATION AWARD" IN THE METALLIC PRODUCTS CATEGORY

Winning work, entitled "Characterization of sintered valve seat inserts obtained with AISI M2 high-speed after air quenching", is the result of the master's research of Maurílio Pereira Gomes, from Materials Science and Technology Center, one of the IPEN Research Centers, that stand out the most in scientific congresses.

CNEN AND US DEPARTMENT OF ENERGY PROMOTE COURSE ON PHYSICAL PROTECTION OF NUCLEAR FACILITIES

CNEN and the National Nuclear Security Administration (NNSA) of the United States Department of Energy (US-DoE) took the Fundamentals of Protection in Nuclear Installations course.

IPEN/CNEN DONATES SUPPLY TO TREAT CONTAMINATED PUMPS IN THE RESCUE WORK IN BRUMADINHO

2,500 grams of dimercaptosuccinic acid (DSMA), a chemical agent, were donated for usage to treat heavy metal poisoning, such as lead, arsenic, mercury and cadmium.

CDTN/CNEN PERFORMS OPERATION WITH RADIOACTIVE SOURCES IN PANAMA

A team of CNEN specialists, coordinated by CDTN, CNEN unit in Belo Horizonte, carried out, in Panama, a recovery operation and conditioning of radioactive sources at risk.

IPEN/CNEN PARTICIPATES IN THE GLOBAL IAEA PROJECT FOR ASSESSMENT OF THE IMPACT OF ACIDIFICATION OF OCEANS ON FISH

The project will last four years and will seek to deepen the knowledge about the acidification of oceans and their impacts on marine life, through laboratory and field experiments.

SECURITY FORCES WERE TRAINED BY CDTN/CNEN TO ACT IN AMERICA CUP 2019



The CDTN, a CNEN unit in Belo Horizonte, carried out training in nuclear and radiological security issues, for 30 Military Police professionals, Civil Police, Firefighters, Federal Police and Federal Highway Police who acted in the America Soccer Cup 2019.

IPEN/CNEN POST-DOC WINS INTERNATIONAL AWARD WITH RESEARCH ON GOLD NANOPARTICLES WITHOUT TOXIC COMPOUNDS

Lucas Freitas, postdoctoral fellow at the Chemistry and Environment Center (CQMA) of IPEN, was awarded the "IIA Scientific Award" for best work in poster at the "International Meeting on Radiation Processing" (IMRP19).

FIRST CLASS OF PROFESSIONAL TECHNOLOGY MASTER DEGREE IN RADIATIONS - HEALTH SCIENCES

The program aims to train health professionals in the use of ionizing and non-ionizing radiation for diagnosis, therapy and other applications in health. It is the only *stricto sensu* program in Brazil in this area.

IPEN/CNEN PERFORMANCE RECEIVES RECOGNITION BY COPOM

The State of São Paulo Military Police Operations Center (COPOM) honored IPEN for its activities, carried out in order to clarify and steer the military police corps on radioactivity, radioprotection and response to radiological emergencies.

CNEN CREATES RADIOACTIVE WASTE DAMS REGISTRATION, RESULTING FROM THE MINING OPERATION AND PROCESSING OF NUCLEAR ORES

Through resolution 257, of December 19, 2019, CNEN created the Registry of Radioactive Waste Dams, Resulting from the Mining Operation and Processing of Nuclear Ore. The resolution also established a system safety management, the qualification of technical managers, minimum content and detailing security plans.

IPEN/CNEN RESEARCHER IS LAURED WITH THE TITLE OF "EMERITUS" BY INTERNATIONAL IRRADIATION ASSOCIATION

Researcher Maria Helena de Oliveira Sampa is part of the RMB project team and had her work recognized in the "International Meeting on Radiation Processing" (IMRP19).

IPEN/CNEN WINS TWO AWARDS IN INTERNATIONAL CONGRESS, HELD AT THE UNIVERSITY OF PARMA, ITALY

Award-winning research addresses the uses of nuclear radiation in dental area and were developed by the Biophotonics Group at the Lasers and Applications Center of IPEN.

IRD/CNEN HELD TRAINING ON COLLECTION AND PREPARATION OF ENVIRONMENTAL SAMPLES



Collection and preparation of environmental matrixes in nuclear accidents was the theme of training conducted at IRD, CNEN unit in Rio de Janeiro, for members of emergency response groups, Fire Department, Armed Forces, government agencies health professionals, among others, who deal with ionizing radiation in everyday life.

IRD / CNEN HELD EMERGENCY TRAINING IN RADIOLOGY AND RADIOPROTECTION FOR POLICE IN RIO DE JANEIRO



Professionals from the Federal, Federal Highway, Port, Military and Civil Police, as well as the Brazilian Navy, participate in training in radiation protection and emergency, conducted by IRD, a CNEN unit in Rio de Janeiro.

CRCN-NE/CNEN FELLOWSHIP AWARDED IN NATIONAL EVENT OF SCIENTIFIC RESEARCH

CRCN-NE scientific initiation student, Natália Ayumi Albuquerque Kitaoka, had his award-winning presentation as the best of the session in which she participated in the "Annual Seminar in Program for Scientific and Technological Initiation", promoted by the National Commission of Nuclear Energy.

IPEN / CNEN RESEARCHER RECEIVES 2019 EXCELLENCY AWARD IN THE "BEST ASSOCIATED RESEARCHER" CATEGORY OF THE RCGI

Chemist Thiago Lopes, from the Fuel and Hydrogen Cell Center (CECCO) of IPEN, a CNEN unit in São Paulo, received the 2019 "Excellency Award" for its performance as associate researcher at the Research Center for Gas Innovation (RCGI).

JOINT PROJECT OF CRCN-NE, CDTN, IPEN, PUC-RS AND HCFMUSP GETS IAEA APPROVAL

The project "Strengthening Capabilities for Preclinical and Clinical Trials of New Radiopharmaceuticals for Medical Use" was approved by the International Atomic Energy Agency and will be carried out in 2020-2021.

ANVISA APPROVES FIRST RADIOPHARMACEUTICAL MEDICINE READY FOR USE MANUFACTURED BY CDTN/CNEN

ANVISA registered Radioglic® (18F), manufactured by CDTN, a CNEN unit in Belo Horizonte.

CDTN/CNEN PERFORMS SAFETY RADIOLOGICAL TRAINING FOR THE BRAZILIAN ARMY

The Nuclear and Radiological Safety Division (DISEN) of CDTN, a CNEN unit in Belo Horizonte, held a radiological safety course for students at the Brazilian Army School of Specialized Instruction (EsIE).

IPEN/CDTN PERFORMS WORKSHOP ON FOOD IRRADIATION FOR ELEMENTARY AND HIGH SCHOOL TEACHERS

The purpose of the event was providing elementary and high school teachers and undergraduate or Pedagogy students a reflection on the applications of nuclear energy, in food, through lectures, workshops and technical visits to facilities of the IPEN radiator.

CNEN COORDINATED THE COUNTRY PROGRAMME FRAMEWORK (CPF) FOR 2020-2024 – THE PROGRAM OF TECHNICAL COOPERATION BETWEEN BRAZIL AND THE IAEA



CNEN, as the liaison body of Brazil state with the International Atomic Energy Agency (IAEA), coordinated the elaboration of the Country Programme Framework (CPF) for the period 2020-2024. The document is the reference for the medium-term planning of technical cooperation between a member state and the IAEA.

IEN/CNEN, INB and IQ-UFRJ START PARTNERSHIP IN PROJECT

The project aims to select, implement and validate a methodologic analytical tool capable of reliably quantifying the presence of carbonate ions and fluoride, using the ion chromatography technique. It is a partnership of IEN, a CNEN unit in Rio de Janeiro, the Brazilian Nuclear Industries (INB) and the Institute of Chemistry, Federal University of Rio de Janeiro (IQ-UFRJ).

IPEN/CNEN PRESENTS THE PUBLIC ITS PIONEER WORK IN 60 YEARS OF PRODUCTION OF RADIOPHARMACEUTICALS IN BRAZIL

Researchers presented research and projects that made history, placing the Institute on the edge of Nuclear Medicine in the country, as well as highlighted the social and economic benefits of nuclear technology.

IPEN/CNEN PERFORMS WORKSHOP TO PRESENT AND DISCUSS RESULTS OF RESEARCH IN CORROSION

Event shared the results obtained by the thematic project "Study of corrosion localization and characterization of the corrosion resistance, associated with fatigue in the welding area, in high resistance aluminum alloys with friction welding (FSW)", theme of great interest in the aviation industry.

VEHICLE FUEL REFINING TECHNOLOGY USING MICRO-WAVES IS FINALIST OF THE ANP AWARD

Technology has been shown to be efficient in reducing pollutant content, mainly sulphur and nitrogen, and was initially tested with diesel oil. The award was granted by the National Petroleum, Natural Gas and Biofuels Agency (ANP).

CRCN-CO/CNEN STUDIES IMAGE OPTIMIZATION IN VACUUM-ASSISTED MAMMARY BIOPSY AND GUIDED BY MAMMOGRAPHY

Mammotomy is a breast biopsy done with the help of a mammogram. With the examination of image, it is possible to locate a tumor and remove a piece of its tissue. The study carried out by CRCN-CO, in partnership with Federal University of Goiás (UFG), assesses images quality of mammotomy and mammography equipment, conventional and digital, in addition to checking the doses received by patients in these exams.

IRD/CNEN PERFORMED QUALITY CONTROL COURSE AND DOSIMETRY IN MAMMOGRAPHY

In the course conducted by IRD, a CNEN unit in Rio de Janeiro, presentations and practical exercises, from Institute experts, were developed, applying concepts and techniques to technologists and technicians in radiology, who deal with mammography.

IEN/CNEN HOSTS IAEA WORKSHOP FOR PROJECTS OF TECHNICAL COOPERATION

The National Workshop on Logical Framework aims to guide teams to prepare organized projects, being offered to programs in Portuguese-speaking countries, that will integrate the initiative in the 2020/2021 biennium.

CNEN AND MCTIC PROCEED WITH DEVELOPMENT ACTIONS FOR BRAZILIAN MULTIPROPOSE REACTOR (RMB)

Preliminary and Installation Licenses, issued by IBAMA, were obtained for the project. A wide range of radioisotopes and radiopharmaceuticals, to be produced through RMB, may serve areas of health, industry, agriculture and the environment, with an emphasis on the production of Molybdenum-99, which will make the country self-sufficient in this material, crucial for more than 80% of Nuclear Medicine diagnoses.



DELIVERIES

2020

**DRAFT OF REGULATORY POSITION 3.01 - RESEARCH LEVELS AND
REFERENCE FOR DRINKING WATER RADIOACTIVITY**

**STRUCTURING THE NATIONAL TEACHING AND RESEARCH NETWORK
IN NUCLEAR AREA - RNPEN**

**UNDERGRADUATE COURSE IN NUCLEAR ENGINEERING POLI/USP-
IPEN/CNEN**

**RESEARCH IN NEW RADIOPHARMACEUTICALS: PRE-CLINICAL
DOSIMETRY AND TESTS NEEDED TO REGISTER NEW PRODUCTS**

**EVALUATION OF OCCUPATIONAL DOSES (END OF MEMBERS, CHEST
AND CRYSTALLINE) IN NEW RADIONUCLIDE THERAPIES**

**DEVELOPMENT AND IMPROVEMENT - TECHNIQUES OF CLINICAL
DOSIMETRY IN RADIOTHERAPY TREATMENTS**

**RISK ASSESSMENT ON EXAMS AND PROCEDURES FOR RADIOLOGY
AND NUCLEAR MEDICINE FOCUSING ON THE PEDIATRIC PATIENT**

**DOSIMETRY AND PREPARATION OF QUALITY ASSURANCE
PRACTICES, IN DENTAL RADIOLOGY**

**TRACEABILITY PROGRAM FOR RADIOPHARMACEUTICALS BASED IN
PROFICIENCY TESTS (DIRECTED TO PRODUCERS, RADIOPHARMACIES
AND REGIONAL LABORATORIES)**

**RESPONSE ACTIONS TO RADIOLOGICAL AND NUCLEAR
EMERGENCIES (INTERNAL TRAINING)**

NEUTRON METROLOGY WORKSHOP FOR LATIN AMERICAN COUNTRIES

RESPONSE ACTIONS TO RADIOLOGICAL AND NUCLEAR EMERGENCIES (TRAINING FOR MEMBERS OF FIELD

ENVIRONMENTAL SAMPLES COLLECTION, DURING RADIOLOGICAL AND NUCLEAR EMERGENCIES (TRAINING FOR MEMBERS - ARMED FORCES FAST RESPONSE TEAMS)

RESPONSE ACTIONS TO RADIOLOGICAL AND NUCLEAR EMERGENCIES (TRAINING FOR GOVERNMENT MEMBERS)

PARTNERSHIP AGREEMENT WITH THE FEDERAL UNIVERSITY OF ITAJUBÁ (UNIFEI), FOR HYDROLOGY FIELD RESEARCH

EXTENSION COURSE OFFER IN "SAFETY ENGINEERING AND RISK ANALYSIS"

DEVELOPMENT AND CHARACTERIZATION OF NANOCOMPOSITES OF POLYMERIC BASE WITH GRAPHITIC MATERIALS AND OXIDES METALS FOR X-RAY AND SHIELDING APPLICATIONS AND HIGH DOSE DETECTION

DEVELOPMENT OF A SCALABLE PROCESS FOR INDUSTRIAL GRAPHEN PRODUCTION FROM CHEMICAL EXFOLIATION OF NATURAL GRAPHITE

DEVELOPMENT AND APPLICATION OF METHODOLOGIES AND SYSTEMS OF DOSIMETRY AND QUALITY OF IMAGES, CONTRIBUTING TO THE EXTENSION OF RADIOLOGICAL PROTECTION OF PATIENTS IN DIAGNOSTIC RADIOLOGY

PARTNERSHIP WITH UFMG TO SUPPORT THE DEVELOPMENT OF TECHNOLOGY BASED COMPANIES

PREPARING THE TRIGA REACTOR MODERNIZATION PROJECT

IMPLEMENTATION OF THE CALIBRATION AND TEST PROCEDURE PERFORMANCE OF DOSIMETERS USED IN DOSIMETRY OF X-RAY, BETA, GAMMA AND NEUTRON BEAMS, FOR RADIOLOGICAL PROTECTION OF WORKERS AND PATIENTS EXPOSED TO RADIATION

NECESSARY ACTIONS FOR THE SELECTION AND APPROVAL OF THE PLACE FOR IMPLEMENTATION - LOW AND MEDIUM RADIATION LEVELS REPOSITORY

IMPLEMENTATION OF PERMANENT PROPHYLAXIS DENTISTRY PROGRAM, COVERING ALL SERVERS IN CDTN/CNEN

RESEARCH PROJECT: ASSESSMENT OF POTENTIAL NEUROPROTECTOR OF ROSMARINIC ACID IN THE TREATMENT OF ISCHEMIA INJURIES AND CEREBRAL REPERFUSION BY MICROPET

RESEARCH PROJECT: ANALYSIS OF THE ANTITUMORAL POTENTIAL FOR SORGHUM BICOLOR L. MOENCH EXTRACT IN BREAST TUMORS, THROUGH PET IMAGES

TECHNICAL FEASIBILITY STUDIES FOR THE DEVELOPMENT OF MOLECULES MARKING TECHNIQUES WITH ^{18}F , FOR BREAST CANCER, AND FLUOR-PSMA FOR PROSTATE CANCER

RESEARCH PROJECT: ADVANCING IMAGINOLOGY TO THE PATIENT WITH PROSTATE CANCER (RESEARCH PROJECT SUPPORTED BY STATE OF PERNAMBUCO FUNDING AGENCY)

IMPLEMENTATION OF QUALITY MANAGEMENT SYSTEM (QMS) AND TRITIUM LABORATORY CERTIFICATION

PRODUCTION AND DEVELOPMENT OF FDG (^{18}F) WITH MORE STABILITY, WITH ASCORBIC ACID ADDITION, AIMING AT OFFERING POSSIBILITIES OF THIS RADIOPHARMACEUTICAL FOR DISTANT CUSTOMERS

SUPPLYING OF RADIOPHARMACEUTICAL (FLUORCOLINE), AIMING DIAGNOSIS IN NUCLEAR MEDICINE

RESEARCH PROJECT: SPECIFIC STABLE ISOTOPES IN COMPOUNDS ("COMPOUND SPECIFIC STABLE ISOTOPE" - CSSI) FOR PLOT SOURCES OF SEDIMENTS IN LARGE RESERVOIRS

RESEARCH PROJECT: ICP-MS APPLIED TO THE DETERMINATION OF ANTIMONY IN NEW DRUGS FOR THE TREATMENT OF LEISHMANIOSIS

PARTNERSHIP BETWEEN IEN/CNEN AND STARTUP ATOMUM SERVICES FOR NEW RESEARCH PROJECTS FOR RADIOTRACERS USAGE, IN THE OIL AND GAS INDUSTRY

SIMULATORS IN VIRTUAL REALITY BUILDING, FOR PROFESSIONALS TRAINING IN NUCLEAR MEDICINE, RADIOLOGICAL PROTECTION AND PHYSICAL PROTECTION

TECHNOLOGICAL INNOVATION PROJECT: MECHATRONIC SYSTEM FOR NUCLEAR INSTRUMENTATION - TRANSISTOR BASED

IMPLEMENTATION OF THE IEN/CNEN INTERNSHIP PROGRAM

EVENT ORGANIZATION: XXV BRAZILIAN MEDICAL PHYSICS CONGRESS

EVENT ORGANIZATION: 5th INTERNATIONAL MEETING OF COMPLEX PHYSICAL PHENOMENA IN MATERIALS

PUBLICATION OF BOOK ON NANOTECHNOLOGY IN IPEN/CNEN

COMPLETION OF A MOBILE ELECTRON BEAM IRRADIATION UNIT

TRAINING UNDER THE LEADERSHIP DEVELOPMENT PROGRAM IN NUCLEAR

IMPLEMENTATION OF THE WORKFLOW TASKS MANAGER (GFT)

STRUCTURING DISCIPLINE TO BE OFFERED IN PARTNERSHIP WITH UFRJ PHARMACY SCHOOL, USING RADIOPHARMACY FACILITIES

INTERNATIONAL WORKSHOP "60 YEARS OF THE NUCLEAR FUEL CYCLE"

IMPLEMENTATION OF THE SPECIALIZATION COURSE FOR OPERATION AND MAINTENANCE OF CYCLOTRON ACCELERATORS, USING RDS111 AND ASSOCIATED FACILITIES

PRODUCTION OF RADIOISOTOPES CU-64 AND ZR-89 IN CYCLOTRON ACCELERATOR

CONSTRUCTION OF THE R&D LABORATORY INTO THE RADIOPHARMACY CENTER, AT IPEN/CNEN, WITH FAPESP FUNDING

STANDARDIZATION OF IMAGE QUALITY ANALYSIS AND RISK CONTROL IN VACUUM-ASSISTED BREAST BIOPSY (GUIDED BY MAMMOGRAPHY)

LU177-PSMA CLINICAL TESTS (PHASE1) IN COOPERATION WITH "HOSPITAL DO AMOR"

INSTALLATION OF DIGITAL CONTROL FOR THE NUCLEAR RESEARCH REACTOR IEA-R1

RADIOLOGICAL MONITORING PROGRAM FOR LANDFILLS IN THE METROPOLITAN REGION OF GOIÂNIA

TOTAL ALPHA AND BETA ANALYSIS BY LIQUID SCINTILLATION IN UNDERGROUND WATERS OF THE METROPOLITAN REGION OF GOIÂNIA

ANALYSIS OF URANIUM AND TORIUM OF WATER PUBLIC SUPPLY IN THE STATE OF GOIÁS



NUCLEAR TECHNOLOGY FOR A BETTER LIFE



Health



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Environment



Energy



Naval
Propulsion

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