



2nd National Conference on Radiation Physics

NCRP 2022

December 15th -16th, 2022

Brief Report on 2nd National Conference on Radiation Physics (NCRP-2022)

The 2nd National Conference on Radiation Physics (**NCRP - 2022**) was organised by Department of Physics, Bangalore University, Bengaluru during **15-16 December 2022** sponsored by Board of Research in Nuclear Sciences (BRNS) Department of Atomic Energy, Govt. Of India and supported by Electronic Enterprises, Indosaw & Parsram Pvt. Ltd with the focal theme “**Radiations for sustainable living**”. The major scientific thematic areas covered were Radiation detection and measurements, Biological effects of radiation, Applications of Radiation & Radioisotopes in medical, agriculture and Industries, Radioecology-processes, factors – transfer of radionuclides, Role of stable & radioisotopes in groundwater studies, Radiation protection & dosimetry, Reactor Physics & Shielding, Nuclear Energy & materials, Nuclear waste management, Emergency preparedness-radiation exposure, Artificial intelligence & Machine learning in nuclear data analysis, Radiation in the atmosphere and space, Materials processing with ion beams, electrons, gamma & neutrons, Effects of Radiation on materials and Radiation awareness.

Day 1 (15.12.2022)

The conference started with registration procedure at Prof. K Venkatagiri Gowda Auditorium. All the delegates and the participants registered between 9- 10am on 15-12-2022. Inaugural session started at 10 am led by **Dr. Ambika M R**, the Master of Ceremony (MC) for the conference. The function started with the invocation by **Prof. Meera B N** followed by **Mrs. Nandini**. The Convener of the conference, **Prof. N Nagaiah**, Department of Physics, Bangalore University, Bengaluru, briefly presented the preamble of the conference wherein he emphasised the fact that the conference stands as a platform to bring together the researchers in the field of radiation for the benefit of the public. He welcomed all the dignitaries present for the inaugural function. The dignitaries present for the inaugural function were, Chief Guest **Dr. D K Aswal**, OS & GD, HS&EG, BARC, Mumbai, **Prof. Dr. Jayakara S M**, **Hon’ble Vice Chancellor** of Bangalore University, Guests of honour-**Dr. K Shivanna** (Ex - BARC, Mumbai), **Dr. M A R Iyengar (Ex-IGCAR, Kalpakkam)**, **Dr. N Kumar** (AR & ESS, Ex- BARC, Mumbai) and special invitees – **Prof. K. Siddappa**, Former Vice Chancellor, Bangalore University, Bengaluru, **Prof. P Venkataramaiah**, Ex- VC, Kuvempu University, Shivamogga, **Prof. A R Ushadevi**, Chairperson, Department of Physics, Bangalore University, Bengaluru. The convener appreciated the researchers who contributed papers, their research work for the conference. He expressed his gratitude to the sponsors of the conference.



Invocation by Dr. B N Meera



Preamble of the event-Welcome address by Dr. N Nagaiah

Following the welcome speech, the **lighting of the lamp** was done by the dignitaries to spread the knowledge. The research work contributed for NCRP 2022 was brought in the form of Book of Abstracts and was released by the Chief Guest **Dr. D K Aswal**. He delivered the inaugural address and appreciated the organisers of NCRP -2022 for their sincere efforts. **Prof. Siddappa**, Former VC, Bangalore University expressed his happiness towards the organisers and remembered Dr. C Ganguly for his contribution to the field Radiation Physics that is increasingly effective and the importance of innovative research in the said field of research.



Lighting of Lamp – Chief Guests



Release of Book of Abstracts – Chief Guests



Inaugural Address by Dr. D. K Aswal



Address by Prof. K Siddappa

Prof. P Venkataramaiah congratulated **Prof. N Nagaiah** for organising the event and emphasised the fact that radiation is ubiquitous and there is no fear of radiation if the radiation level is within the safe limit. He recollected the apprehensions about radiation that prevailed in the minds of public of city

of Mysore prior to the research work conducted by **Prof. N Nagaiah** in the field of environmental radiations.

In order to appreciate and respect the contributions in the field of Radiation Physics, **Dr. MAR Iyengar, Dr. K Shivanna and Dr. N Kumar** were honoured by our **Hon'ble Vice Chancellor Dr. Jayakara S M, Dr. D K Aswal, Dr. P Venkataramaiah & Prof. K. Siddappa**.



Honoring of Guests—Dr. MAR Iyengar, Dr. K Shivanna and Dr. N Kumar

Dr. MAR Iyengar expressed his gratitude for being honoured and remembered **Dr. C. Ganguly**, the father of radiation Physics and Chemistry as a multidisciplinary personality in the field of research. A brief mention of radioelements in water was made by **Dr. Iyengar**. Later, **Dr. K Shivanna**, after congratulating the organisers of NCRP -2022, appreciated the conference topics covering all areas of radiation isotope viz radiological applications of nuclear radiation, hydrological problems and ground water recharge, identification of pollutants, sedimentation problems using radiation technique, radiation in agriculture etc. He mentioned that many eminent and well experienced resource persons are invited for the conference to share their experience. **Dr. N Kumar** also appreciated the organisers and remembered the fact that after COVID -19, bringing many researchers from all over the country on one platform is praiseworthy.

The Hon'ble Vice Chancellor of Bangalore University, **Prof. Dr. Jayakara SM** delivered the Presidential remarks. He appreciated the Department of Physics, the convener and the entire team for their efforts in organising NCRP – 2022. He mentioned about the application of radiation in medical sciences i.e. curing of cancer, hyperthyroid etc. and wished that the two day conference may give a greater insight for the researchers working in this field.



Presidential Address by Dr. Jayakara S M

At the end, **Dr. A R Ushadevi, Chairperson**, Department of Physics, Bangalore University proposed the vote of thanks expressing heartfelt gratitude to all the dignitaries and participants of the conference on behalf of the organisers. The sponsors of the conference were acknowledged for their generous contributions and made a remark that the NCRP-22 is a place where the grandparents, parents, and the young researchers in the field of radiation meet. The inaugural session was concluded with the **National Anthem**.



Group photo – NCRP 2022 Delegates

After High tea and photosession, the post inaugural session started with the Keynote address by **Dr. D K Aswal** on “**Radiation, nuclear energy and environment: All good for human development index of a nation**”. He put forward an interesting question to the audience – Are you scared of radiation? The speaker made it clear that radiation is everywhere and is essential for life and emphasised that nuclear energy is important for improving human development in India (HDI). In order to come out of the fear of nuclear radiation, it was mentioned that coal is more dangerous compared to nuclear radiation. Moderate dose of radiation is beneficial rather than being a health risk. So far no evidence of genetic effect has been observed in Nagasaki incident. In atomic bomb survivor data, low radiation doses reduced cancers and the biggest cause of cancers is tobacco, alcohol and diet related issues. His talk was very inspiring and created awareness among the public in eradicating the fear of radiation. His presentation made the audience to recall Madam Marie Curie – Nothing in life is to be feared.

For the first session, Prof. B N Meera introduced the resource person **Dr. Meera Venkatesh** - Ex-Director, Division of Physical and Chemical Sciences, Department of Nuclear Applications, International Atomic Energy Agency (IAEA), Vienna to the audience. The **title** of the talk was **Health care application of radio isotopes**. As an introduction, the speaker mentioned about the characteristics of nuclear radiation – energetic, cause changes, loses energy on passing through matter which makes it for a variety of applications. Few to be mentioned are diagnosis therapy, healthcare radiotracers, nuclear medicine and radiopharmaceuticals, diagnostic radiopharma-static imaging, dynamic imaging, tomographic imaging, SPECT, PET, molecular imaging, external beam radiation therapy, Brachytherapy(in contact with body). The speaker pointed out that India is among the well developed nations in the radiation therapy.



Keynote Address by Dr. D K Aswal



Invited talk by Dr. Meera Venkatesh

Post lunch, the next invited talk was by **Dr. J. Souframanien**, Nuclear Agriculture & Biotechnology Division, BARC, Mumbai who was introduced **to the august gathering by Dr. M K Kokila**. He delivered a talk on **Applications of Radioisotopes and Radiations in Agriculture**. The speaker elaborated the use of radiations and radioisotopes in agriculture to develop improved varieties to manage insect pests, genetic improvement of crops, to study fertiliser use efficacy, to preserve agricultural products etc. The use of radiation and radioisotopes in agriculture is considered as the peaceful application of nuclear energy for the benefit of the public. The use of radioisotopes in soil sciences and plant nutrition, Insect pest management using Sterile Insect Techniques (SIT) were discussed and concluded that the nuclear technologies will continue to play a significant role in addressing food and nutritional security and will benefit farmers, traders and consumers.

The next invited speaker was **Dr. R P Singh, Scientist – H, Inter University Accelerator Centre (IUAC) New Delhi** who was introduced to the audience by **Dr. Basavaraj Angadi**. The title of the talk was **Nuclear Physics Research using Particle accelerators at IUAC**. The speaker briefly introduced IUAC which caters wide variety of particle beams with large energy range of few keV to 100MeV and particle accelerators that can be used for nuclear physics experiments. The National Array of Neutron Detectors (NAND), a General Purpose Scattering Chamber (GPSC) and mass spectrometers HIRA and HYRA which are excellent electromagnetic devices to select out residual nuclei formed in nuclear reactions were briefly explained to the participants. Few of the recent research results with a brief introduction to the experimental setups and particle accelerators at IUAC were highlighted.

Following this, **Dr. Murali Seshadri**, Scientific Officer- H, Head, Emergency Preparedness and Response Section, RSSD, BARC, Mumbai who was introduced by **Dr. Harish** delivered a talk **on radiation safety, Detection, Indian Nuclear Energy programme and Beneficial Uses of Radiation Technology**. In his address, the use of Ionizing Radiation and radioisotopes for medical diagnostics, nuclear medicines for therapy, radiation technology in the fields of agriculture, food processing, industrial radiography, tracers, hydrology, power generation were discussed. A mention of international agencies like UNSCEAR, ICRP which report international guideline documents for safety was made. The beneficial applications of radiation technology and radioactive waste management were discussed and concluded that radiation is beneficial to the humankind.

This was followed by Poster session where in abstracts of different categories RSP, **NRD, PNR, RDM & RPD** were presented by the researchers and were evaluated by the judges. The last technical session of the day was by **Dr. Karunakara. N.** Co-ordinator, Centre for Advanced Research in Environmental Radioactivity (CARER) and Head, Medical Physics Division Mangalore University, Mangaluru, India, who was introduced by Dr. Gladys Mathews. The title of the talk was **Standardisation of methods for Carbon-14 measurements and quantification of excess activity in the vicinity of PHWR nuclear power plant at Kaiga, India**. A brief introduction of carbon – 14, its existence, specific activity, half life etc were

mentioned. The speaker elaborated the need for ^{14}C measurement, the different methods of its measurement – Accelerated Mass Spectrometer (AMS), Liquid scintillation based method, Benzene synthesis and LSC. The BRNS coordinated projects at CAREER and the important aspects were presented. After the talk, **Dr. Karunakara. N** was honored by **Prof. A R Ushadevi**, Chairperson, Department of Physics, Bangalore University, Bengaluru for his contribution to the field of radiation physics and for his continuous support and co-operation for the researchers working in the field of Environmental radioactivity throughout the country.

Following this, the **oral presentation** by the participants (OP-1) was conducted and the session was chaired by Dr. N Kumar, Ex-BARC, where in 5 researchers presented their work in the field of Physics of nuclear reactors (PNR)

After a short break, an entertainment programme for the participants was arranged to showcase/present the culture of Karnataka. **Prof. Meera B N** led the programme and the cultural programme was presented by the **Department of Dance, Drama and Music, Bangalore University, Bengaluru**. All the participants enjoyed the cultural programmes.



Cultural programme

The day's programme concluded at 8.30pm followed by the banquet dinner hosted by **Prof. Dr. Jayakara SM**, the Hon'ble Vice Chancellor of Bangalore University, Bengaluru.

DAY – 2 (16 - 12 - 2022)

The morning session of the second day of NCRP – 22 was conducted at **Department of Physics, Bangalore University, Bengaluru**. The first session was the virtual session which was co-ordinated by **Prof. Ramakrishna Damle** and the resource person was Dr. **Shrinivasrao R. Kulkarni**, Scientific Staff, Leibniz-Institut für Astrophysik Potsdam (AIP), Germany. The title of his talk was **Detection of cosmic ray and solar energetic particles in space using space based instruments**. The speaker briefly explained about the discovery of cosmic particles, its detection and identification. The solar Orbiter Mission was discussed along with Solar Orbiters Electron Proton Telescope (EPT) & High Energy Telescope (HET) which are capable of detecting solar and cosmic charged particles in the energy range few KeV to GeV. The Ionising Radiation Sensor (IRAS), Lunar Lander Neutron and Dosimetry (LND), Thermal neutron detectors, Neutral Particle detectors (Gamma and fast neutron) were also discussed.

Following the technical session, **two** parallel sessions of Oral presentation (ERM+RSP & NRD+MAR) by the participants were conducted in the Department of Physics. Dr. N. Karunakara, Dr. Gudennavar, Dr. Shivalingaswamy T and Dr. Nagesh N Bhat chaired the sessions respectively.



The second technical session of the day was conducted at Venkatagiri Auditorium, Bangalore University, Bengaluru. The resource person was **Dr. K Shivanna, Former Head, Isotope Hydrology BARC, Mumbai** who delivered a talk on **Sustainable Water Resource Management and the Role of Isotope Techniques**. The speaker pointed out that **sustainability** of water resource and vulnerability of groundwater to contamination are the important environmental issues in many countries. The role of Isotope techniques, which is an independent and powerful tool, and which has become an integral part of many hydrological investigations in groundwater studies were discussed. An over view of the groundwater sustainability problems in India, applications of isotope techniques for water resources development and management with a few case studies were presented.

In the next technical session, the resource person was **Dr. H. C. Manjunatha, (Alumni of the Department)** Associate Professor of Physics, Government College for women, Kolar, Karnataka was introduced by Dr. Susheela K L. **The title of the talk was Indian strive on superheavy elements**. The speaker described in detail, the characteristics of superheavy elements, the tremendous efforts to discover elements with $Z= 119, 120$ using hot fusion reactions etc. All the superheavy elements are radioactive and most of them decay through alpha decay. Hence an accurate empirical formula for alpha decay half-lives need to be established and the uncertainties associated with these half-lives also needs to be estimated. The reason behind the failure to synthesize super heavy elements $Z>118$ was explored and was found to be due to the improper choice of the beam energies.



Invited talk by Dr. Manjunath HC

The next invited talk was by **Dr. H. J. Pant**, Head, Isotope and Radiation Application Division, Bhabha Atomic Research Centre, Trombay, Mumbai on the topic “**Applications of Radioisotopes in Industry**”. The speaker was introduced by **Dr. A R Ushadevi**, Chairperson, Department of Physics, Bangalore University, Bengaluru. The speaker explained the use of radioisotopes in industry for identification of flow malfunctions, measurement of flow parameters etc. The radiotracers applications in industry which include leak detection in buried pipelines and heat exchangers, blockage location in buried pipelines, measurement of mixing/blending time, residence time distribution analysis, estimation of flow rates in pipelines and canals, wear and corrosion rate monitoring of industrial components, sediment transport investigation in ports, effluent dispersion in water bodies, ground water velocity measurement, seepage location in dams and flow mapping in oil fields were discussed briefly. The Industrial radiography technique using Iridium-192 and Cobalt-60 radioisotopes based devices which is an important non-destructive testing technique for visualization of defects in welding/casting, in-service inspection, monitoring health of industrial specimen and life extension of plant were mentioned.



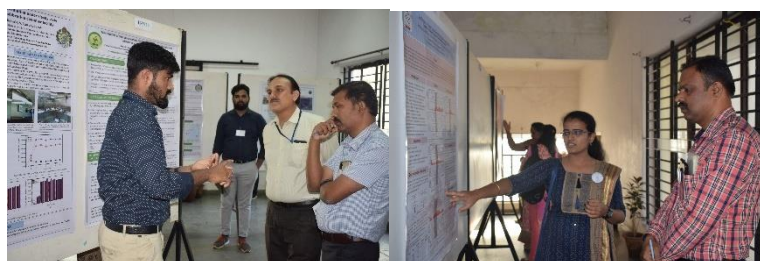
Invited talk by Dr. H J Pant



Invited talk by Dr. Nagesh N Bhat

Following this, **Dr. Nagesh N Bhat**, Scientific Officer, Radiological Physics and Advisory Division, Bhabha Atomic Research Centre, Trombay, Mumbai delivered a talk on **Advanced radiobiological indicators for detection and management of radiological incidents**. In his talk, he pointed out that with the increase in application of radiation, the number of radiation workers using radiation generating device also has increased. Though there are inbuilt safety features which prevent them from getting serious exposures, small scale incidents can give doses of hundreds of mSv and such doses pose no serious medical concern. However, to avoid higher exposures due to mishandling of personal dosimeters demand methods to ascertain genuineness of exposure and estimation of actual dose. In this connection biological dosimetry methods are useful. Biological dosimetry methods relying on biological signals in response to radiation exposure are helpful to address most of these challenges.

Following, the poster session -2 was conducted at the same venue. All the participants were very enthusiastic in presenting their work. All the delegates went around the posters to discuss about the work going on in the respective fields. Poster session was then followed by Tea Break.



Poster presentation by the participants

Dr. B. S. Sandhu President, Indian Society for Radiation Physics (ISRP), Ex-Dean - Academic Affairs & Ex-Head of Department of Physics, Punjabi University, Patiala, delivered his talk on **Societal and Medical Applications of Nuclear Radiations**. **Prof. B Eraiah** introduced and welcomed the resource person to the participants. In his talk, the use of Rayleigh and Compton scatterings for various societal and medical applications was described. The speaker pointed out that these non-destructive nuclear techniques help in detection of explosives (landmines) such as TNT ($C_7H_5N_3O_6$) and RDX ($C_3H_6N_6O_6$), hence is of great importance for defence personnel. In the fields of nuclear medicine and nuclear radiation physics, gamma radiation offer low patient dose as compared to X-ray. He made it clear that Nuclear radiations are also helpful in examining the credibility of gold ornaments and homogeneity of various solid, liquid and gaseous samples having Scientific, Industrial, Environmental, Agricultural, Geological, Biological and Medical interests. Dr. Sandhu's talk was like the concluding session as it covered the uses of radiation in several fields.



Invited talk by Dr. B S Sandhu

The valedictory session of **NCRP – 22** was held at the same venue. **Shri** Mayank Agarwal, Regional Director, AMD, Bengaluru was the chief guest for the session. Dr. V. V. Suresh Babu, Dean, Faculty of Science, **Dr. J. T. Devaraju, Registrar**, Bangalore University, Bengaluru were the guests. **Prof. B Eraiah** welcomed the Chief guest Shri Mayank Agarwal and other guests on & off the dias. Shri Mayank Agarwal delivered the valedictory address and was happy to be part of NCRP 2022. Following, **Prof. N Nagaiah** briefly presented an overview of the conference and made a very relevant quote by Madam Curie "Nothing in life to be feared but only to be faced". He summarised the events of the conference recollecting all the invited talks by eminent scientists in the field of radiation physics. Among the oral and poster presentations which were evaluated by the eminent scientists, 5 Best Oral and 4 Best poster presentations from each session were considered for award to motivate and encourage the young researchers, were distributed by the guests to the awardees. In addition, we would fail in duties, if we do not mention the contributions of one of the Invited speakers, **Dr. H J Pant who was** so kind and generous in **contributing ONE Best poster presentation** award. Further, participants were given an

opportunity to give their feedback, share their experiences during NCRP 2022. The participants appreciated the organising team for the wonderful technical sessions, refreshments and hospitality and expressed their willingness to be part of upcoming events in future. Prof. J T Devaraju addressed the gathering and appreciated the organisers specially the convener **Prof. N Nagaiah** for his tireless efforts in making NCRP-2022 a great success. The chairperson of the Physics Department, **Prof. A. R. Ushadevi and the Convener of NCRP 2022, Prof. N Nagaiah** was well appreciated for their sincere efforts in organising the conference and making it a memorable one to the participants. Prof. Suresh Babu, Dean, Faculty of Science, Bangalore University, Bengaluru made his presidential remarks. Prof. Vijaykumar Doddamani proposed the vote of thanks wherein he thanked each and every person involved directly and indirectly in organising NCRP 2022 and making this event a grand success.



Valedictory session



Valedictory address by Shri Mayank Agarwal
