

BEAM TECHNOLOGIES in BARC

Dr. Pitamber Singh

The book elucidates different aspects of electron accelerators and their development work in BARC. Accelerators and their applications have now become an integral part of everyday life. They are deployed not only in basic research but also for reaping wider societal benefits. Electrons being fundamental particles, they are highly preferred for basic research. Electron accelerators are extensively deployed in diversified areas, including food irradiation, industry, environment, national security, synchrotron radiation sources, healthcare to mention but a few. Electron beams are being extensively used in testing of electronics systems for ascertaining potential radiation damage in the environs of outer space during outer space missions.

Beam Technology Development Group, BARC made immense contributions towards building both DC and RF electron accelerators, particularly for industrial applications. This book poignantly presents the development journey of electron linacs at BARC. It has a total of 36 chapters written mostly by subject experts. Specifically, chapter 24 of the book discusses the basic theory of electron linear accelerators and important parameters associated with them. It not only covered the details of different systems (electron gun, power supplies, vacuum systems, accelerating structures, RF and cooling systems, etc.) but also their applications in diversified fields. Chapter 36 presents a detailed account of neutron production using electron beams generated directly through (e^- , n) and indirectly using (γ , n) reactions. It is encouraging to note that a few hundred MeV electron accelerator had been used as to demonstrate the working of Accelerator Driven System (ADS) for Thorium utilization.

In the book, a full chapter has been devoted to human and machine safety related issues. Shielding is one of the very important aspects of accelerators. Electron linacs deliver large current/power beams and therefore, special attention needs to be given to the cooling of different systems, particularly for accelerating cavities, magnets and titanium foil through which beam emanate and strike the objects to be irradiated sufficiently. For this purpose, scanning magnets are used. The resonating frequency of the accelerating RF cavity is a strong function of temperature of the cavity. The book presents details on thermal analysis of these systems.

In a nutshell, the book is a compendium of articles with information on the evolution and transformation of beam technologies development in BARC. I am confident that it will surely enlighten and excite the community of young researchers.



Dr. Pitamber Singh, an outstanding scientist, joined BARC in 1976 after graduating from the 19th batch of BARC Training School. Dr. Singh made important contributions towards indigenous development of accelerators. Besides, he also made several important contributions in the field of nuclear physics. He has more than 400 publications to his credit, which includes 84 in internationally reputed journals. Dr. Singh had been a recipient of DAE's Technical Excellence Award for the year 2000. He worked at Max Planck Institute for Kernphysik, Heidelberg, as post doc Fellow during 1985-86, and has visited several accelerator laboratories. Presently, he is the Chairman of DAE's Design and Safety Review Committee-Accelerator Projects (DSRC-AP).

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