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The Development and Application of CIAE's Cyclotrons for the medical isotopes production

Since the establishment of the first cyclotron in China in 1958, the China Institute of Atomic Energy (CIAE) has developed a series of high-current cyclotron devices, which are playing a crucial role in the development of nuclear science disciplines and applications of nuclear technology in China. In 1996, CIAE had developed the first proton cyclotron of 30 MeV/350 μ A in China for medical isotope production and ^{57}Co , ^{67}Ga , ^{111}In , ^{201}Tl and other radioisotopes were produced successfully by this cyclotron. The 14 MeV PET cyclotron was built in 2012 and lots of isotopes for the PET such as ^{18}F , ^{11}C , ^{13}N , ^{89}Zr were produced by this machine. The 100 MeV cyclotron of CIAE-100 was developed in 2014 in CIAE, which is the largest compact cyclotron in the world. The maximum of beam current is 520 μ A and the beam power is 52kW for CIAE-100. ^{68}Ge was produced successfully and several experiments for the isotope production of ^{225}Ac were finished by CYCIAE-100. The first 14MeV/18MeV cyclotron with mA level was developed independently by CIAE in 2021 and it was used for the treatment of boron neutron capture therapy (BNCT). In order to produce the isotope such as ^{68}Ge , ^{225}Ac , ^{223}Ra , etc, a 75MeV cyclotron with the beam current of 800 μ A will be built by CIAE in China. The proton energy range of 30 ~ 75MeV will be extracted and the beam power will be got 60kW for 75MeV cyclotron. Many kinds of the medical radioisotopes such as $^{68}\text{Ge}/^{68}\text{Ga}$, ^{223}Ra , ^{225}Ac , ^{213}Bi , $^{82}\text{Sr}/^{82}\text{Rb}$, ^{67}Cu , $^{44}/^{47}\text{Sc}$ will be produced by 75 MeV cyclotron.

Notes

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