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Activities from Cyclotrons at German Cancer Research Center (DKFZ), Heidelberg –A Status Report

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The onset of cyclotron history at DKFZ dates back since 1971, when the first compact cyclotron (protons and α-particles: 22MeV; deuterons: 11MeV; 3He: 28MeV) was purchased from Allgemeine Elektrizitäts-Gesellschaft (AEG)-Telefunken, Germany. After its installation at DKFZ, it was employed to produce short lived radionuclides (15O, 18F, 13N, 11C, 81Rb) for the radiochemistry and nuclear medicine. In parallel, an active research program in the field of radiobiology and dosimetry using fast neutrons and light ions was also established. After ca. 17 years of successful operation (1973 - 1990), it was clear that the existing AEG compact cyclotron would not be able to keep up the increasing future demands. Supplies and parts were obsolete, spare parts were nonexistent and operational reliability faded away. Moreover, the applications necessitate higher energies and currents and an application for a higher energy cyclotron was submitted.

A second compact cyclotron, and subsequently one of the first available negative ion cyclotrons MC32NI (M = Mini; C = Cyclotron; 32 = 32 MeV proton energy, NI = Negative Ion) from Scanditronix, Uppsala, Sweden, with relatively higher energies (proton: 32MeV; deuterons: 16MeV) was purchased and installed in 1991. Since 1991, the MC32NI cyclotron has had been employed for multiple projects e.g. radionuclides production for clinical (15O, 18F, 13N, 11C, 81Rb) and preclinical (64Cu) applications, nuclear physics experiments, dosimetry, wear measurements of industrial machine parts followed by labeling with 57Co (for ZAG Karlsruhe, Germany) and educational studies. In July 2017 the management board of the DKFZ has decided to shut down the existing cyclotron and replace it with the similar energy cyclotron in another building. The next cyclotron will be employed for clinical applications as well as producing more and more radiometals used in both diagnostic and therapeutic techniques, thereby heading more closely towards appropriate matched-pair combinations – theranostic approach.

The existing DKFZ cyclotron facility (≈ 800m2) and its decommissioning, performance and status of the MC32NI cyclotron, different target and beam lines systems, some technical problems occurred in recent times, ongoing radionuclides development, future planned projects, installation of a new cyclotron and bunker systems will be presented in brief.

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