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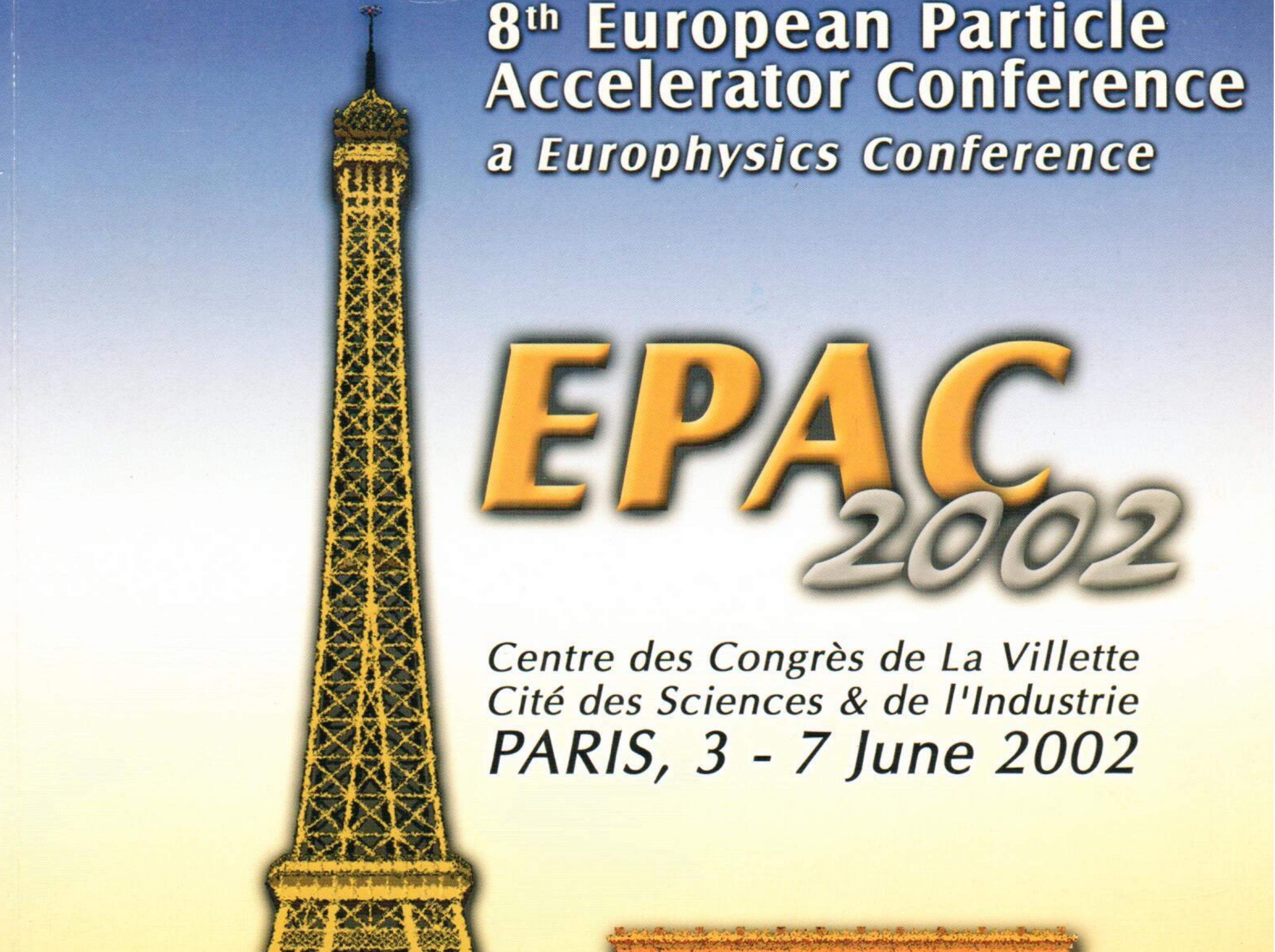

Abstracts Brochure

Accelerator Centre, NAC, South Africa). In addition to the existing two vaults for proton therapy three further vaults will be provided. Four of these vaults will be equipped, respectively, with an iso-centric spot-scanning system, a fixed horizontal line for spot-scanning and two fixed lines for scattering systems enabling treatment from two angles each. Proton beams from the new cyclotron will be switched between the different vaults. It is estimated that about 1000 patients will be treated annually with the new facilities, which will be operated on a commercial basis. The existing 200 MeV cyclotron will be retained for nuclear physics research, production of radioisotopes, neutron therapy and will in future also be used for eye treatment with protons in one of the existing vaults for proton therapy. The rationale for and the layout of the facilities will be presented.

[009] Low and Intermediate Energy Proton and Ion Accelerators and Sources

[A04] Low- and Intermediate-Energy Circular Accelerators

MOPRI086

Design and Construction Progress on the IUCF Mid-West Proton Radiation Institute., *D. Friesel, V. Anferov, J. Collins, W. Jones, J. Katuin, S. Klein, N. Schreuder, IUCF, Bloomington* - Construction of the IUCF Proton Therapy Cancer Treatment facility, the Midwest Proton Radiation Institute (MPRI), has been underway for two years. Upgrades to the IUCF seperated sector cyclotrons, including a 750 keV proton RFQ pre-injector system, are nearly complete. Installation of the medical beam transport system, consisting of a 205 MeV proton "Trunk" beam line and three energy selection beam lines (ES lines) to the treatment rooms, is complete and beam commissioning is underway. The MPRI beam delivery system is unique in that 205 MeV protons can be rapidly switched (3 ms switch time) from the "Trunk" into each of the three planned ES lines, where the proton energy delivered to each treatment room can be independently degraded to as low as 65 MeV. Installation of the beam delivery (Nozzles, diagnostics, Wobbler, etc) and patient positioning hardware (based on industrial robot technology) in the first treatment room is in progress and beam commissioning will begin during the last quarter of 2002. Installation of a 360 degree rotating gantry system in the second treatment room will be completed by the end of 2004. This contribution will present the most unique beam delivery features of this new proton therapy facility and address the present status of this project.

MOPRI087

Compact Proton and Carbon Ion Synchrotrons for Radiation Therapy, *K. Endo, Z. Fang, KEK, Ibaraki-ken; G. Silvestrov, BINP, Novosibirsk; S. Fukumoto, M. Mizobata, A. Teramoto, I. Uetomi, Mitsubishi Electric Corporation, Kobe-Shi* - A compact proton and carbon ion synchrotron development program is approved in 2001 to promote the radiation therapy at the reasonable cost. They depend on the high magnetic field to make the ring as small as possible. The maximum proton (carbon ion) energy is 200 MeV (300 MeV/u) with the circumference of 11 m (16 m) at the maximum dipole field of 3 T (4 T). Main concerns are the development of a high field magnet with a uniform field distribution and a short high voltage wide-range RF cavity. Three dimensional transient field calculations are carried out under the pulse excitation with the rise time of 5 ms and the beam behaviors are also simulated under the sextupole error field in the dipoles. Beam optics and transverse beam stability studies for the construction will be presented including the lattice design.

MOPRI088

High Power Neutron Producing Target with Liquid Metal Cooling, *G. Silvestrov, B. Bayanov, V. Belov, S. Danilov, V. Karasyuk, T. Sokolova, S. Taskaev, G. Villevald, BINP, Novosibirsk; V. Kononov, IPPE, Obninsk* - The target is an iron plate for the absorption of incident proton or deyton beam. This plate has a system of cooling channels, covered by thin molibdenic foil and liquid gallium will be pumped through them. The neutron producing target itself is a thin (about 10 microns) layer of matter with high neutron production cross-section placed on the surface of molibdenic foil. It can be lithium (or lithium hydride), beryllium, titanium saturated by tritium or porous titanium oxide saturated by Carbon-13. Two designs of the target are described: 1. Stationary target like disk 50 mm in diameter with power removal capability of several tens of kW. 2. Rotating target with power removal more than 100 kW. It includes pump for pumping of liquid metal coolant and heat exchanger with secondary cooling contour.

MOPRI089

Progress of RF-knockout Extraction for Ion Therapy, *T. Furukawa, M. Kanazawa, M. Muramatsu, K. Noda, S. Shibuya, E. Takada, S. Yamada, NIRS, Chiba City* - Scanning methods for ion therapy have strongly required a lower ripple of the beam spill and a faster response to beam-on/off in slow extraction from a synchrotron ring. At HIMAC, RF-knockout extraction method has been improved through frequency and amplitude modulation of a transverse RF field. In this method, particles near the resonance can be spilled out from the separatrices by synchrotron oscillation as well as by a transverse RF field, because the method has utilized bunced beam to reduce the spill-ripple. From this point of view, chromaticity dependence of the ripple was investigated, and a fast beam-stopping method that can stop extracting the beam within 70 microseconds was verified. In order to reduce the ripple, furthermore, an advanced RF-knockout method has been proposed and verified by both simulations and experiments.

MOPRI090

Present Status of the RI Beam Project in HIMAC, *M. Kanazawa, NIRS, Chiba City* - Heavy ion radiotherapy has an advantage in its dose concentration on a tumor, and accurate range is essential in the charged particle radiotherapy. In the treatment, X-ray CT number is used to calculate the ion range, where empirical conversion table between CT number and electron density in the human body is used. A positron emitter beam provides the possibility of the range verification in the patient's body accurately. To utilize this beam, the fragment separator was constructed in HIMAC (Heavy Ion Medical Accelerator in Chiba) facility. The irradiation and the positioning systems with treatment chair were constructed successively. In an irradiation system, the spot scanning