ADVANCES IN ACCELERATOR TECHNOLOGY

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3RD WORKSHOP ON TARGETRY AND TARGET CHEMISTRY

A ROUND-TABLE DISCUSSION ON ADVANCES IN ACCELERATOR TECHNOLOGY

A new dimension was added to this workshop by devoting a session to advances in accelerator technology arising in the commercial world. Eight companies contributed to this session, which was in fact conveniently divided into two parts. In the first, attention focused on cyclotrons in the 8-30 MeV category intended chiefly for general radioisotope production, and in the second the potential of "RFQs" and other devices intended chiefly for ^{15}O production were discussed. Each company submitted papers to the workshop and these are included in these proceedings; what follows is a very brief guide to their contents and to some additional points which emerged through discussion.

PART 1: CYCLOTRONS IN THE 8-30 MEV CATEGORY (Chairman: D J Silvester)

1.1 Ebco Industries Ltd, Richmond BC, Canada

Karl Erdman described the 30 MeV H^- cyclotron which is being constructed in collaboration with TRIUMF engineers to expand the Nordion radioisotope production capability at TRIUMF. Consideration is now also being given to modifying this machine to accelerate D^- as well as H^-, and to building a scaled-down (13/8 MeV) version for the PET market.

1.2 Scanditronix AB, Uppsala, Sweden.

Rolf Kjellström outlined the status of the MC32 cyclotron, which is to be installed at the German Cancer Research Centre in Heidelberg. Structurally similar to the well-established MC40 positive-ion cyclotrons, this is planned to accelerate H^- to 32 MeV and D^- to 15 MeV. One feature of this machine will be the facility to change its beam extraction foils without breaking the machine vacuum.

1.3 Orbit Inc, Oak Ridge TN, USA.

Bob Highfill described the 8 MeV H^+ cyclotron constructed for the Medical Sciences Division of the Oak Ridge Associated Universities. This machine is noteworthy for having vertical dees (in the time honoured Oak Ridge tradition) for its very small dimensions (3ft x 4ft x 5ft) and for not requiring chilled water for its cooling system.

1.4 CTI Cyclotron Systems Inc, Berkeley CA, USA

George Hendry reviewed the collective experience of the three Radionuclide Delivery Systems (RDSs) that had so far been installed in hospitals in N America and Europe. He stressed the reliability of performance of all components of the RDS, i.e. the cyclotron (11.4 MeV H^-), the targets and the chemical processing systems.

1.5 Ion Beam Applications s.a., Louvain-la-neuve, Belgium.

Yves Jongen reported on the performance of the Cyclone 30 (30 MeV H^-) cyclotron, and on the current development of a smaller version, the Cyclone 10/5, designed to accelerate H^- (to 10 MeV) and D^- (to 5 MeV) and aimed at the burgeoning PET centre market.

PART 2: RFQS AND OXYGEN-15 GENERATORS (Chairman: S McQuarrie)

2.1 Science Applications International Corporation, San Diego CA, USA

Bill Hagan opened this session by briefly outlining the physical principle of charged particle acceleration by means of Radio-Frequency Quadrupole (RFQ) devices, stressing their overall simplicity in design and operation. He went on to discuss the 8 MeV ^{3}He-accelerator which is being developed, with the collaboration of Ken Krohn (University of Washington in target design) for the production of radioisotopes for PET. Particular advantages perceived for this novel approach are first that enriched target materials are not required, second that low neutron production should minimise shielding problems, and third that the cost should be lower than that of a cyclotron with similar output.

2.2 AccSys Technology Inc, Pleasanton CA, USA

Bob Hamm continued to champion RFQ acceleration in his presentation. His company is developing several radionuclide production linacs capable of accelerating H^+ up to 66 MeV, but attention focused on the 11 MeV device (5 m long) and on the 3 MeV D^+ accelerator (2.8 m long).

2.3 Science Research Laboratory Inc, Somerville MA, USA

Ruth Shefer reported on the status of her company's work on the development of a Tandem Cascade Accelerator 3-4 MeV (H^-/H^+) intended to produce radioisotopes for PET. Mike Welch and Jim Brodack (Washington University, St Louis) are collaborating in the development of solid-phase targets to yield ^{11}C, ^{13}N, ^{15}O or ^{18}F. The machine under construction is some 11 ft long, but only the (small) external target region requires shielding. Extremely high beam currents (up to 1 mA) are said to be accessible in this machine!

2.4 Ion Beam Applications s.a., Louvain-la-neuve, Belgium

Yves Jongen returned to describe plans for a very small accelerator designed specifically to make just ^{15}O-labelled gases. This will be a 3 MeV D^+ classical cyclotron with vertical dees inside a magnet that opens on hinges and occupies a space of about 1 m^3. Originally conceived as an alternative to ^{82}Rb-generators for use in PET centres with no in-house cyclotron, it could also serve to free bigger, more costly, machines from the necessity to make ^{15}O, sometimes for several hours a day.

A principle point of interest in discussing this, and the other low-energy accelerators, was what target window materials would be found to be sufficiently thin yet robust enough to give long service. Undoubtedly, we shall be hoping to find the answer to this question at the next Targetry workshop.