

* US Patent 5,463,291
** US Patent 5,608,224
*** US Patent 5,345,477

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Order No. A91MI-10047-1C-7600
Printed in USA
PA 1206/1

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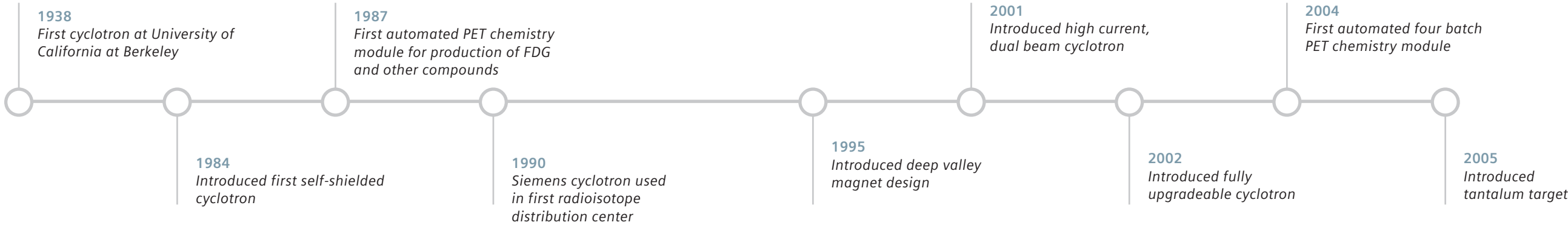


Raising the Bar in Radioisotope Production

Molecular imaging using PET technology is one of the fastest growing areas of imaging for both research and clinical applications. As the demand grows for more advanced radiopharmaceutical development programs, the leading facilities turn to Siemens for answers. With Siemens Eclipse™ cyclotrons and Explora® chemistry modules, we raise the bar in radioisotope delivery systems, providing high yields and unparalleled reliability.

Eclipse cyclotrons are powerful enough to provide Curie levels of radioisotopes for the most demanding clinical, research, and distribution centers, yet offer flexible design and easy workflow.

Building Upon the Standard of Proven Success



“The Siemens Eclipse cyclotron is the backbone of the PETNET distribution network. The revolutionary deep valley design allows for a highly efficient production platform on a compact footprint. This world class cyclotron routinely and reliably delivers the product that PETNET requires to distribute two thousand patient doses every day. Our customers rely on us to meet their daily FDG needs and we rely on the Siemens Eclipse to provide us with unparalleled performance.”

—Marc D. Weichelt, Senior Director of Field Production Support, PETNET Solutions



Straight-forward Design for Powerful Production



Powerful Production

Siemens Eclipse cyclotron, an 11MeV negative ion single particle accelerator, produces Curie levels of positron emitting radioisotopes — ¹⁸F, ¹¹C, ¹³N and ¹⁵O. Its self-shielded, automated design offers you fast, easy, and efficient production of PET radioisotopes. Eclipse cyclotrons meet a variety of needs: from the fast paced demands of the clinical environment, to flexible requirements for research settings, to powerful performance for commercial distribution centers.

Patented Magnet Design*

The accelerator magnet's coil is made from a continuous sheet of copper, which provides a significant reduction in power consumption, lower operating expenses, and enhanced reliability.

Deep Valley Technology

A large valley-to-hill gap ratio provides improved axial beam focusing with higher beam transmission and reduced internal activation. As a result, radiation exposure is reduced and shielding requirements are simplified.

Return Yoke

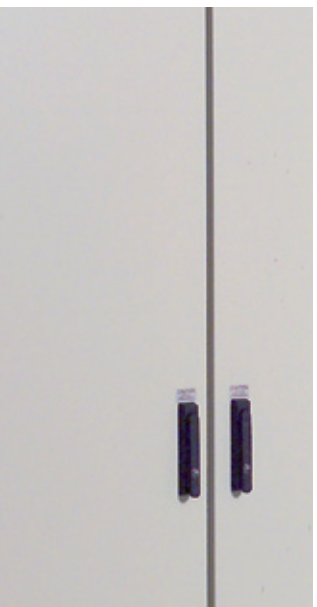
The accelerator chamber is surrounded by the magnet return yoke, reducing stray magnetic fields and helping to simplify installation and site planning.

Top-Mounted Components

All major components are vertically mounted on the accelerator, providing improved alignment and easier service. It is not necessary to lift the upper magnet yoke while conducting preventive maintenance on these components. This minimizes exposure of internal surfaces to moisture, making for more rapid pump-down, more stable performance, and higher beam production.

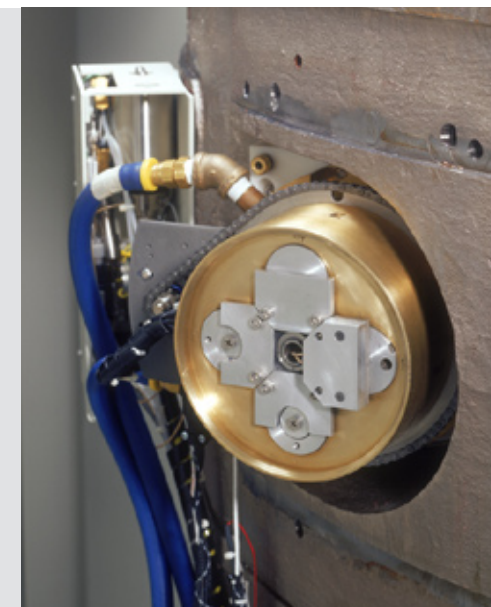
Compact and Self-shielded

The Eclipse safety shielding's interlocking mechanism eliminates the need for a complex and expensive vault to house the cyclotron. Retracting the safety shields requires a simple push of a button. Decommissioning costs are significantly less when compared to a vault-based machine.



“Our research demands are high. We are cutting edge and we expect our partnership with Siemens to help take us to the next level. We have never been disappointed...”

— Dr. N. Satyamurthy, Ph.D., Professor Biomedical Cyclotrons,
University of California at Los Angeles School of Medicine.



Flexible Design

Modular Targets

Eclipse target design enables Curie level yields of PET radioisotopes using minimal amounts of enriched target materials. Targets are easily installed and removed, minimizing radiation exposure. Changing targets does not require breaking the accelerator vacuum, contributing to the system's unbeatable uptime. Because the Eclipse can be configured to accommodate one or two target ports, any combination of targets can be used, offering you a flexible approach to generate multiple isotopes simultaneously.

Target Changer**

The Eclipse features innovative target changers with four and eight positions per carousel, respectively, for built-in expansion and backup slots. This requires at most two beam ports which minimize the possibility of leaks and simplify beam alignment and extraction. The dual extraction option allows two target changers to be mounted, offering a maximum of sixteen target positions and the capability to simultaneously produce two different isotopes or to double the quantity of one.

Targets

All targets are available on both the 4 and 8 position target systems except for the tantalum target, which is only available in the 4 position, high current target changer.

¹⁸F Fluoride Ion

Fluoride ion is commonly produced with a standard, silver body target. The new, optional tantalum target body for fluoride ion production offers unparalleled uptime, and is the backbone of today's major FDG production facilities.

¹¹C Carbon Dioxide Gas

The minimal surface area carbon dioxide target produces ultra-high specific activity ¹¹C carbon dioxide at high yields.

¹⁵O Oxygen Gas

The compact and high yield oxygen target can produce a dose of ¹⁵O water for under four dollars in target materials with just a fraction of a target load.

¹³N Ammonium Ion***

The ¹³N target produces ¹³N ammonia in the target with no need for additional synthesis and minimal in-line purification.

¹⁸F Fluorine Gas

The fluorine target produces ¹⁸F fluorine gas using the two shoot method, enabling high yield and efficient recovery (>99%) of the ¹⁸O enriched oxygen gas.



Explora FDG₄

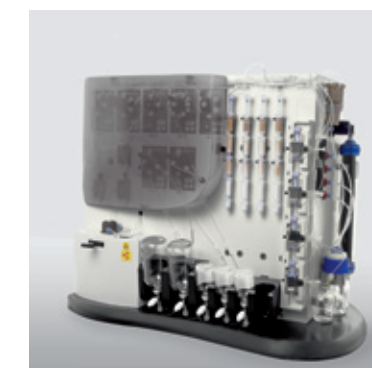
You can synthesize up to four production runs with one set up — and extend your production to other nucleophilic substitutions. The FDG₄ is a flexible platform for your tracer development that will serve as the backbone for future chemistry efforts.

Through the Explora product portfolio, Siemens offers an expansive line of automated synthesis for PET imaging and research, as well as a team of technical experts to help you optimize your facility. Build your program for today and tomorrow with the Explora product portfolio.

Quality FDG Production

- 4 runs without intervention
- Novel recipe building software for customized chemistry
- Remote diagnostic capability
- Automatic self-cleaning
- Rich user feedback (radiation, temperature, pressure sensors)
- Low cost of operation
- Minimal custom parts (uses conventional disposable glassware)
- Supports recovery of ¹⁸O water

A Broad Offering



Explora CN

Cyanide synthesis, includes conversion of ¹¹C carbon dioxide to methane. The Explora CN uses simple, effective flow chemistry for robust production.

Explora GPU

The general purpose gas processing unit in the Explora line provides for conversion of ¹⁵O-O₂ to ¹⁵O-CO and ¹⁵O-CO₂ and converts ¹¹C-CO₂ to ¹¹C-CO as well.

Explora AC

The Explora Acetate module is a flexible platform for Grignard-based syntheses.

Explora H₂O

The ¹⁵O water module allows for inexpensive production of ¹⁵O water and offers a unique disposable cassette.

“Our Eclipse cyclotron and Explora synthesis box have performed reliably with a down time of less than 1%. The cyclotron and box are easy to use and the training provided by Siemens is excellent. Its versatility allows facilities with limited staff to operate the unit quite efficiently.”

— George N. Chacko, M.D., President, Midwest Medical Isotopes LLC.



Easy Workflow

Automation — Bringing It All Together

The Eclipse control system allows you to initiate production remotely and within minutes the system is ready to irradiate a target. You can easily control all functions of the cyclotron which allows you to optimize performance.

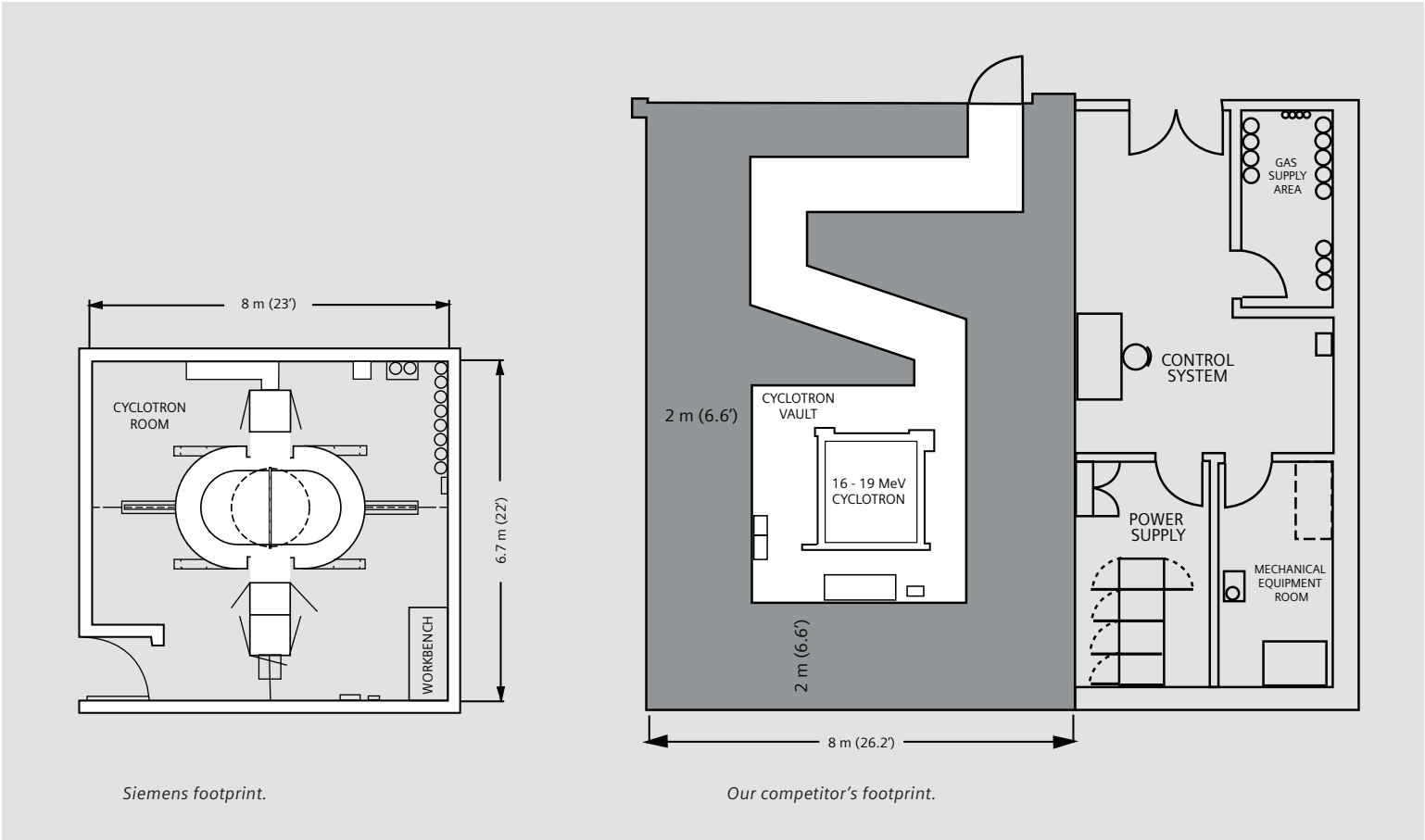
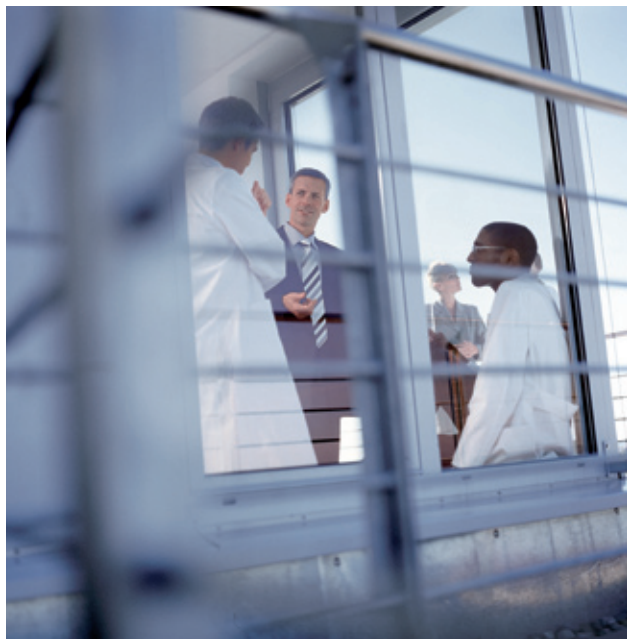
- Remote operation and test capability for Eclipse cyclotrons and Explora chemistry modules provides unparalleled service support.

We pioneered the fully automated and integrated cyclotron. Our systems offer high-yields with reliable uptime.

- Feedback of system irradiation parameters enables performance optimization.
- Ability to visualize performance in real time enhances safety and operational efficiencies.
- Cyclotron component lifetime tracking increases uptime and reliability.

When it comes to the production of radio-tracers, we see the ability to be automated yet flexible as key to producing consistent high yields. So we have simplified the production process and this in turn reduces the workload on your staff.

- Explora substep efficiency analysis: (trapping, labeling, hydrolysis) maximizes output.
- Recipe builder unit operations, with drag-and-drop capability, support extremely flexible synthesis creation and modification.



Site Planning and Installation

Siemens is dedicated to supporting you with a simple start-up program. Our experts can advise you on space utilization, system integration and system configuration. We installed and continue to service the largest comprehensive cyclotron-based radiopharmacy network. This makes us the experts in the field, that's why we can offer you system start-up in as little as two weeks.

- Installation and Training**
- Siemens site planning
 - System placement in one day**
 - Typical system start-up in 2 weeks
 - Remote diagnostics on all sub-systems
 - On-site operators training
 - Expert applications training
 - Turn key solutions including hot lab setup and regulatory assistance*
 - Off-site preceptorship programs*

*Available via third parties
**In most cases

Room Requirements

Compact and light, the Eclipse requires only a 14" thick concrete pad and a 22' x 23' (6.7 m x 7 m) room, including all power supplies. The Eclipse self-shield is an engineered containment system, including a negative pressure effluent containment, prompt radiation shielding, and interlocked access control. This eliminates the cost of vault design for the facility. The system is also available without the self-shield for installation in existing vault spaces. The design of the Eclipse cyclotron reduces decommissioning costs as well. Higher energy cyclotrons produce more neutrons of higher energy, which in turn increase activation of surrounding vault walls. This activation is minimized with the 11 MeV Eclipse. Moreover, the self-shield is easily removed without demolition at decommissioning, further reducing total cost of ownership.

- Lowest Power and Siting Costs**
- One-third of the power consumption*
 - Small footprint
 - Fewer regulatory constraints
 - No vault = no bond. Green and sustainable

* relative to competitor cyclotrons @ 100kw



Powerful, Flexible, Easy.

With the most comprehensive capabilities in the industry, Siemens Molecular Imaging can help you stay ahead in the race to personalized medicine. We lead the market in clinical, preclinical, and biomarker solutions. Enabling diagnosis and treatment to be more targeted. More cost-effective. And more successful than ever before. Because at Siemens Molecular Imaging, innovation is in our genes.

Future Growth and Support

With Siemens' radioisotope delivery systems, support begins before delivery and continues throughout the product life cycle. We offer a full range of service plans to ensure that your Eclipse system continues to meet factory specifications and maintains the highest level of reliability.

The need for PET radiopharmaceuticals is growing. Siemens offers solutions that include cyclotrons, chemistry, startup support, training, and a complete customer care program.