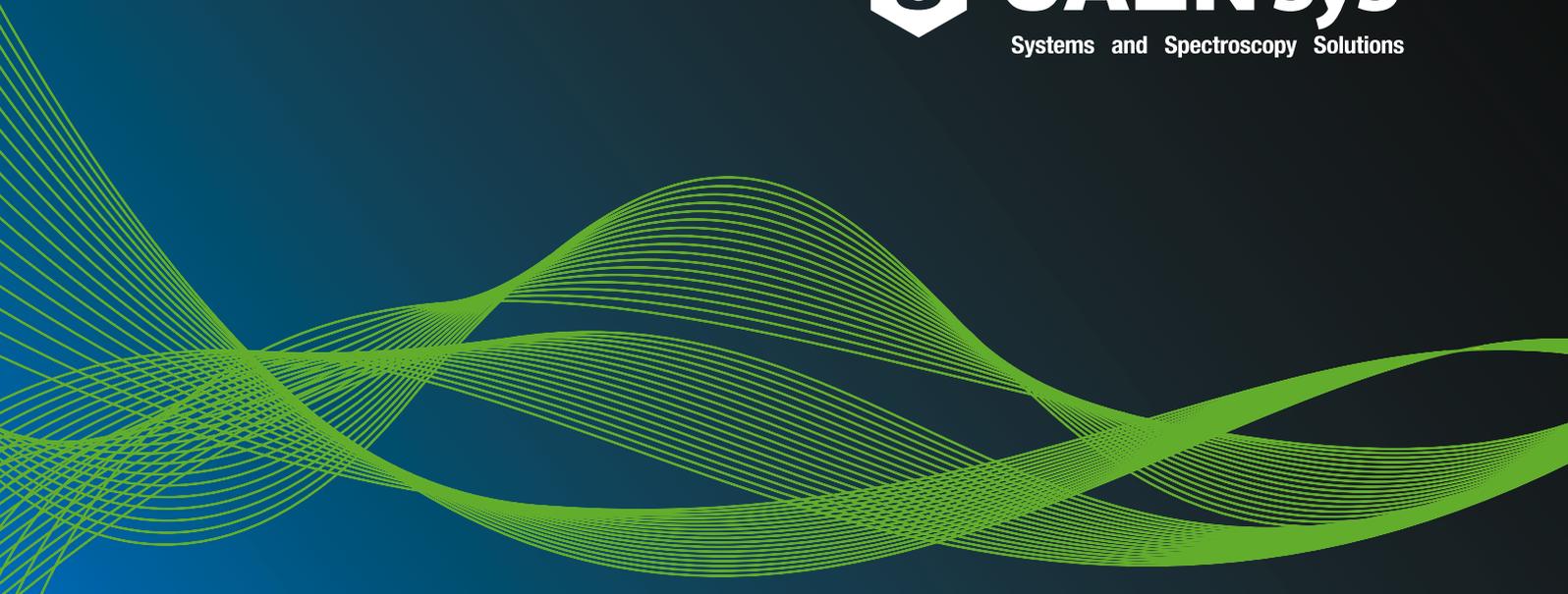
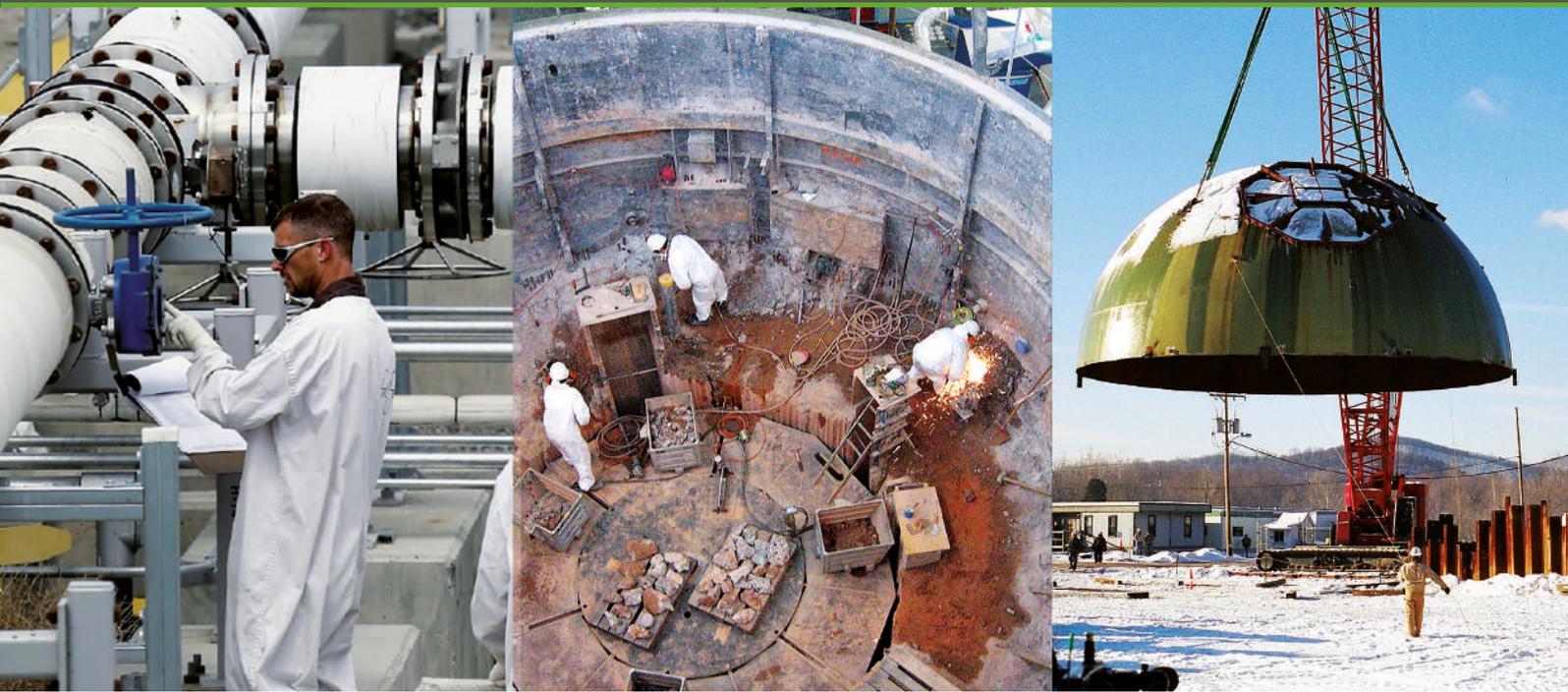


DigiWaste Platform

The World's First Fully Digital Platform for
Nuclear Waste Management



Digitizing Nuclear Waste



The Challenge

The process of dismantling and decommissioning nuclear infrastructure increasingly demands methods for a full traceability of waste material to improve quality management and operational safety. Precise waste management and minimization procedures provide twofold benefits; the optimization of costs associated with D&D and the minimization of dose exposure to operators and personnel.

The absence of a consistent, straightforward solution for digitizing the enormous amount of data produced during D&D operational activities is a critical issue, one which challenges the Operator's ability to maintain high operational quality assurance and measurement precision.

The utilization of tools and instrumentation from disparate sources, sources which are often unable to share information with one another, have forced Operators to devise ad hoc management systems. These management systems are often based on complex and sometimes even incomplete or inaccurate logbook notations. The result is a complex procedure burdened by poor QA/QC and an increased likelihood of errors.

Dr. Massimo Morichi

International Qualified Radioprotection and
Nuclear Measurements Expert

DigiWaste Platform



The Solution

The CAEN Sys DigiWaste Platform is the first fully comprehensive solution which provides seamless digitization of D&D activities. The system offers easy tracking of any type of radioactive material or object produced via D&D operations thanks to the use of specialized, radiation tolerant UHF RFID tags. The data included in these RFID tags is integrated into a central database, where all relevant information associated with the D&D cycle is securely stored and easily accessed by authorized personnel.

The DigiWaste Platform relies on an innovative and unprecedented handheld instrument, the RadHAND. This pioneering technology combines state-of-the-art radiation measurement capabilities with read/write UHF RFID tagging, all while integrating a color camera, audio recorder, and GPS and UWB localization for both outdoor and indoor positioning. Taking advantage of this system, D&D operators can easily identify radioactive sources and initiate the waste tracking process at the earliest possible phase of the D&D cycle.

All the information produced in subsequent D&D activities can be uploaded, collected and processed by the customizable database framework, RadBASE. This information, together with operational instructions, may be accessed by on-field operators equipped with dedicated, ruggedized, and highly portable RFID readers from the RadREAD family.



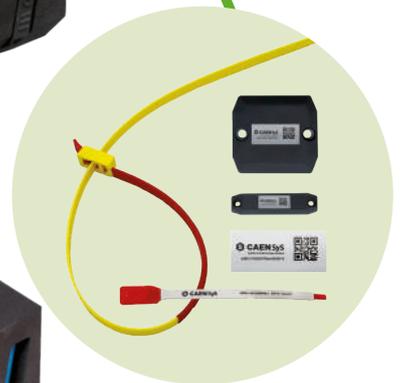
RadBASE

Database framework for data storage and integrated customized processes



RadHAND 600 PRO

Spectroscopic Radiation Measurement and UHF RFID Tagging Handheld



RadRFID

Rad-tolerant UHF RFID tag family



RadREAD

Stand-alone, ruggedized portable UHF RFID reader family



Benefits Of DigiWaste Platform

DigiWaste Platform offers several major advantages in terms of optimization, safety, security, and compliance. These advantages are realized thanks to easy, fast, and reliable access to all the information collected at any point of the D&D cycle.



Data Access

Quick access to all information produced during the D&D activity cycle

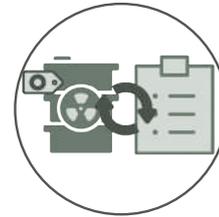
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Tagging

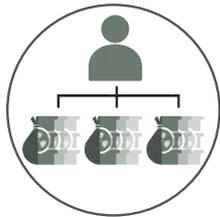
Easy identification and tracking of all RFID-tagged items

+



Automation

Automatic inventory of tagged waste containers and report generation



Categorization

Waste bagging, categorization and grouped-waste monitoring

+



Task Assignment

Assign Operator-specific tasks and instructions

+



Sorting

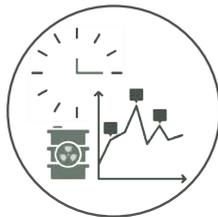
Waste sorting according to user defined criteria



Synchronization

Continous monitoring and update of waste data

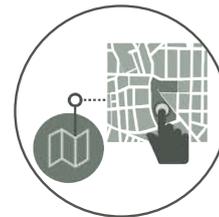
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Traceability

Historical data traceability of the waste

+



Mapping

New-site characterization with interactive mapping of sources

TOTAL BENEFITS

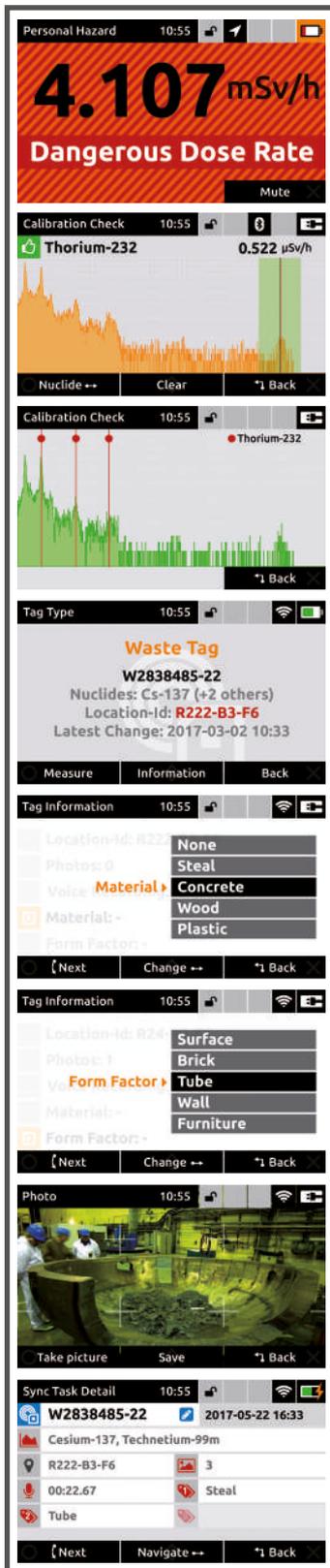
Cost Savings
Reduced Operational Time
Improve Quality Assurance
Enhanced ALARA

DigiWaste Platform

A VIEW INSIDE

RadHAND 600 PRO

Spectroscopic Radiation Measurement and UHF RFID Tagging Handheld



RadHAND is the world's first hand-held instrument designed to perform both spectroscopic radiation measurement and UHF RFID tagging of nuclear waste material and objects.

Highlights

- Measure nuclear waste
- Securely store all Waste Data (incl. Audio/Video)
- Write Waste data into RFID tags
- Sync with DataBase (Web-interfaced)



RadHAND 600 PRO Tripod-Mount:
Ideal for remote access and
monitoring via web interface of
fixed measurement locations

USB Connection

Battery Pack

UHF RFID Reader

Camera - Bar Code Scanner

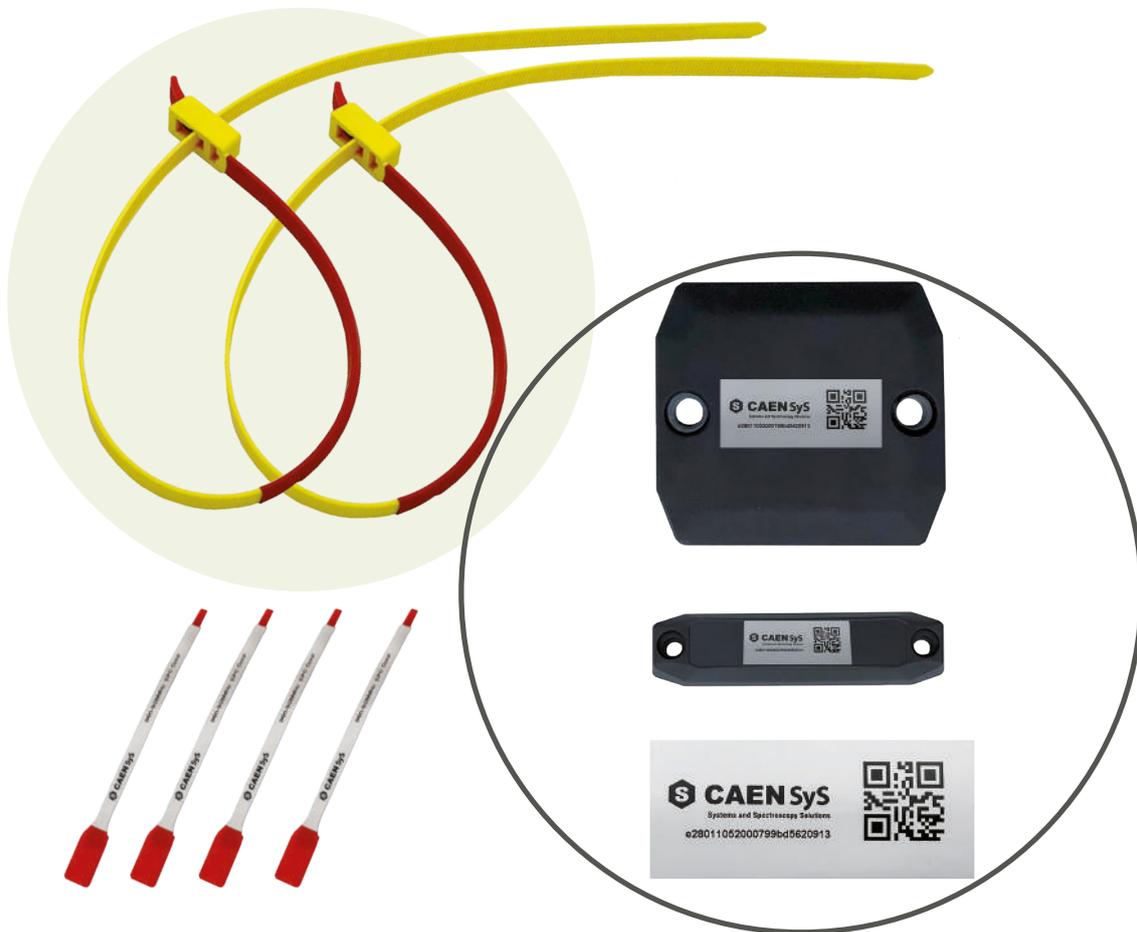
Detector



Main Features

- State of the art algorithms allow top performance on nuclide identification and dose-rate measurements
- Fully wireless connectivity for hands-free operation
- 8hr operation on battery
- Multiple Units may be linked to develop a network of sensors
- Integrated GPS for geolocalization and timing information (customizable in-door applications)
- Locally encrypted data may be saved on-board or transmitted to a secure remote database
- Supports integration of external application-specific probes such as alpha/beta contaminameters, neutron detectors, and high resolution CdZnTe gamma spectrometers

RadRFID



Rad-tolerant UHF RFID tag family

CAEN SyS utilizes UHF FRID technology which allows the Operator to read/write RFID tags at a distance and without the benefit of line-of-sight, as is required by competitive technologies.

CAEN SyS UHF RFID tags are able to sustain a total dose above 300 Gy. This guarantees longterm, reliable, and accurate data collection, updating, and storage for tagged objects.

Our RadRFID tags are available in a wide range of shapes, sizes, and materials to provide the best possible fit for the many objects, containers, and enclosures found throughout the D&D cycle.



Stand-alone, ruggedized portable UHF RFID reader family

Our RadREAD devices are specially designed to provide the Operator with quick and easy access to all relevant D&D information contained in the RadBASE database by simply scanning the RFID tag.

Operators equipped with the portable UHF RFID readers may be assigned tasks and specific operational instructions as well as up-to-date information in real time. This approach greatly increases efficiency; which translates into lower operational cost and enhanced conformity to the ALARA approach via lower potential exposure time.

- Wireless connectivity via Bluetooth and Wi-Fi
- Rugged, IP65 rated case supports operation in harsh environments and easy decontamination
- Raised buttons allow users to interface and control unit while wearing gloves
- Bar code reader included for a seamless transition from legacy tracking systems

RadBASE

Database framework for data storage and integrated customized processes



RadBASE is a data management framework designed to support the development, tracking and integration of information critical to D&D and waste management activities.

Our secure web service employs high level data encryption and a multi-layered user access strategy to ensure safe and secure network management. User-specific access levels determine the type of data an operator may retrieve.

Network administrators are afforded complete control and access management for all integrated devices. Each device transmits live, real time information on instrument status, location, measured radioactivity levels and alarm status, task progression, and RFID tag inventory.

The devices may also receive, in real time, operator-specific instructions from network administrators and managers.

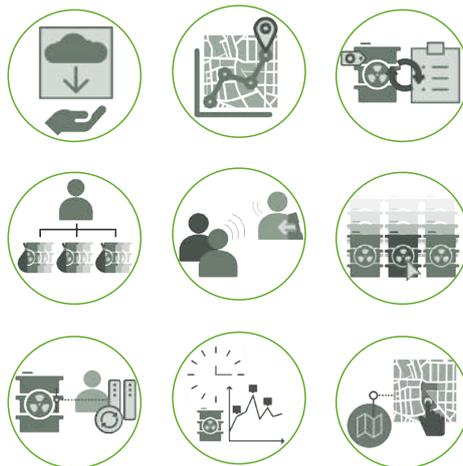
Waste Management Dataset

RadBASE is a very flexible framework for data storage and management. It can merge data produced by diverse sources and run user-defined analysis for the optimization of the operational processes:

- Operators ID
- Operators categories
- Item ID
- Item category
- Item descriptions and attributes (e.g. matrix, chemicals, etc)
- Locations
- GPS and Indoor positioning (UWB)
- Dose Rates
- Identified Nuclides
- Pictures
- Voice Notes
- Operational workflows and steps
- Tracking of items
- Item inventory
- Gamma Spectra
- Count Rates
- Hot Spot (Nuclide picture - position)

DATA FUSION

BENEFITS



Use Cases



Decommissioning & Dismantling

The DigiWaste Platform manages the digitization of all relevant information produced throughout the D&D cycle and supports integration of previous or legacy data.

Site assessment

- Smart handheld devices for spectroscopic characterization of the site
- Storage of data in a secure central database server and in-situ rad-tolerant RFID tags

Clean-up & material removal

- Operators can easily read back previous measurements and descriptions on RFID tags
- Optimization of the activities and ALARA approach

Waste Bagging

- Bags are measured and tagged with RFID tags of waste for easy and efficient waste tracking

Bag Characterization

- Bag characterization options include both fixed and mobile measurement stations

Barrel filling and stock

- Barrels are filled with waste, measured and tagged for long term storage or transportation to repository



Interim Storage of Nuclear Waste

The DigiWaste Platform may also be adopted as an interim waste storage solution for monitoring activities and verifying waste status. Variations in measured quantities can be automatically measured and updated in programmable time steps and updated in both the central database and in associated RFID tags.

This approach supports real-time data analysis and early recognition of any deviation from safe values for critical quantities such as dose rate. It also allows the user to closely monitor measured vs estimated values in specific isotope evolutionary scenarios.

- Monitoring activities and status of waste
- Trends automatically registered by the instruments and data updated in RadBASE and RadRFID tags
- Real-time data analysis and early recognition of any deviation from safe values
- Waste integrity and containment status control
- Fixed RFID readers for automatic inventory, tracking, and handling of waste

Use Cases



Legacy Waste

The DigiWaste Platform is a complete solution for the evaluation and management of legacy waste.

It allows for quick, preparatory assessment of waste by means of the RadHAND 600 Pro and associated probes and gamma cameras for hot spot detection.

Each item can be tagged with RadRFID tags and assigned to specific operational streams by on-field Operators equipped with the RadREAD devices. Operators may also receive instructions and specific tasks defined within the RadBASE database or as instructed by supervisors.

- Automated tagging and prescreening of legacy waste with high efficiency gamma spectroscopy
- High resolution Low-Energy gamma spectrometry
- Gamma imaging integration with Hot-Spot identification and positioning
- Real time data insertion on central database and RFID tags
- Selection of different operational streams for waste characterization and storage in repository



Radioprotection

The DigiWaste platform is an ideal solution for radioprotection applications at nuclear sites where periodic measurement patrols are required. The system allows for each measurement point to be associated with a specific UHF RFID tag, thus enhancing security and adherence to ALARA.

- RadBASE collects, secures and stores periodic measurement data. Data is also saved locally in the tag memory and refreshed upon new measurement.
- RadBASE can show trend plots of the measurements and automatically generate reports.
- The system supports automated warnings, addressed to Supervisors, should measurements deviate from accepted safe value range or demonstrate significant consecutive values. Operator response is recorded and is also available in real time to administrators.
- The RadHAND 600 Pro integrates embedded positioning systems. This feature allows Operators to quickly and easily produce radiological maps for indoor and open-field site characterization.

Safety, Transparency, and Respect for the ALARA Concept:

The DigiWaste Platform allows operators to easily share waste characterization datasets with Safety Authorities, allowing inspectors to quickly verify procedural compliance on-field by simply scanning tagged items and via the RadREAD unit and accessing the RadBASE database.

Other Scenarios

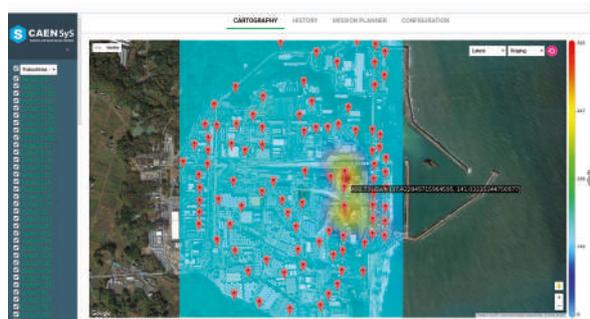
Augmented Reality

- On field operators can retrieve information and instructions from the platform and visualize them in mixed reality while working on specific tasks through Mixed Reality wearable devices
- Perfect for demonstration and training exercises in virtual scenarios



Radiological Mapping

Combination of radiometric measurements, GPS and UWB information for geo-referenced mapping



Nuclear transportation

Measurement and Tracking of medical and industrial radioactive items from production site to end user



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CAEN SyS s.r.l.

Via Vetraia 11

55049 - Viareggio

Italy

Phone +39.0584.388.398

Fax +39.0584.388.959

info@caensys.com

www.caensys.com

CAEN SyS  **Systems and Spectroscopy Solutions**

