ORION

REAL-TIME
LOCATION SYSTEM

Mirion Technologies has developed the Orion RTLS™ System, which combines decades of radiological telemetry with the benefits of real-time location tracking.

The ability to track critical assets, support critical path time reduction and ALARA efficiencies and improve overall radiological safety are key drivers behind this technology application.

Orion.Client.OrionStudio v1.1.13 - Connected on localhost

Settings | Display

Telemetry

Clear | REC | 182 telemetry equipment(s) | Reset quality factors | Reset layout | - | +

Device nu...	MAC address	Last update	Prot...	Primary d...	Primary r...	TLD	RWP	Task	Q...
01A16FC7	0B:00:0160	05s	WRM3	0.0 mrem	0.0 mrem/h	LA000874(	20-1000	1234	90%
01A16FFC	*0B:00:018B*	*01min 35s*	*WRM3*	*0.0 mrem*	*0.0 mrem/h*				*4%*
01A17236	0B:00:011A	09s	WRM3	0.0 mrem	0.0 mrem/h				26%
01A1758C	0B:00:0172	00s	WRM3	1.4 mrem	0.1 mrem/h	LA000874(	20-1000	1234	52%

[Protocol] = 'WRM3'

Events

Max events number: 100

Refresh | Clear

Show informations | Show normal | Show warnings | Show alarms | Show faults | Show debug

Font size: - +

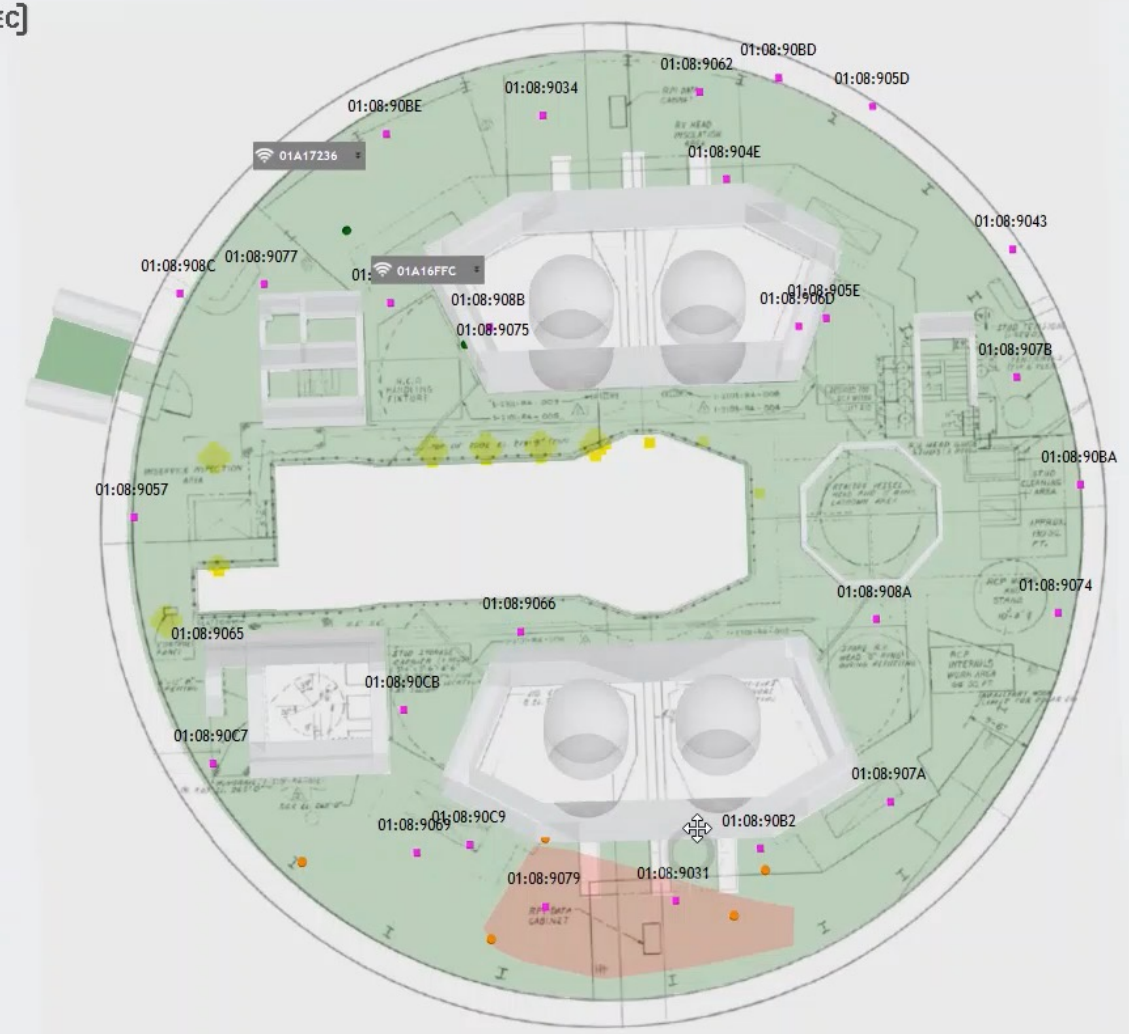
Identifier	Date	Type	Origin	Description
408912	2020/03/13 14:39:26	Alarm	0B:00:0160	Geo-fencing alarm fo...
408913	2020/03/13 14:39:31	Normal	0B:00:0160	End of geo-fencing al...
408914	2020/03/13 14:39:31	Alarm	0B:00:0160	Geo-fencing alarm fo...
408915	2020/03/13 14:39:32	Normal	0B:00:0160	End of geo-fencing al...
408916	2020/03/13 14:39:32	Alarm	0B:00:0160	Geo-fencing alarm fo...
408917	2020/03/13 14:39:35	Normal	0B:00:0160	End of geo-fencing al...
408918	2020/03/13 14:39:35	Alarm	0B:00:0160	Geo-fencing alarm fo...
408919	2020/03/13 14:39:36	Normal	0B:00:0160	End of geo-fencing al...
408920	2020/03/13 14:39:37	Normal	01A1758C	The LTx device is sen...
408921	2020/03/13 14:39:42	Alarm	0B:00:0160	Geo-fencing alarm fo...
408922	2020/03/13 14:39:44	Normal	0B:00:0160	End of geo-fencing al...
408923	2020/03/13 14:39:46	Alarm	0B:00:0160	Geo-fencing alarm fo...
408924	2020/03/13 14:39:46	Normal	0B:00:0160	End of geo-fencing al...
408925	2020/03/13 14:39:47	Alarm	0B:00:0160	Geo-fencing alarm fo...

Location Tracking

Map models display | Floor models display | Layers display | Floors | Bounding boxes | Exclusion zones | Cross countings | Blocks | Loaded models | Drawing tools

Hot spots | Radiation shields | Locating equipments | Locating equipments in alarm | Models to load | Heat map and hot spots tools

Tracking



Debug

MIRION TECHNOLOGIES Health Physics Division | OrionStudio | Server | factory (Factory)

Location Tracking

Enter Full Screen

Map models display

- Objects
- GEORGIA_200221
- Floor171
- Floor220
- Primary171
- Primary220
- Reactor
- Steamgenerator
- swimmingpool
- wall171
- wall220
- test

Floor models display

- FLOOR 220
- 220
- 171
- 200real

Layers display

- Floors
- Bounding boxes

Blocks

Cross countings | Blocks | Loaded models

Radiation shields

Name	Floor	Attenuation

Hot spots | Radiation shields

Bounding bo...

N	F	Type
Bio	Flo	Norma
Ves	Flo	Exclus
Bio	Flo	Norma
Bio	Flo	Norma
Bio	Flo	Norma
Bio	Flo	Norma

Exclusion zo...

N	F	Ty	Tri
Ala	Flo	Alar	Botl

Acknowledge

Locating eq...

N	MAC Addre

Floors

N	Z level (m)
Flo	-14.6
Flo	-7.3
Flo	0.0
Flo	9.1

Tracking

45 FPS

703 ft

618 ft to 703 ft

618 ft

Drawing tools

Floors

Bounding boxes

Free exclusion zones

Cross counting

Blocks

Hot spots and radiation shield

Tools

Heat map and hot spots tools | Models to load

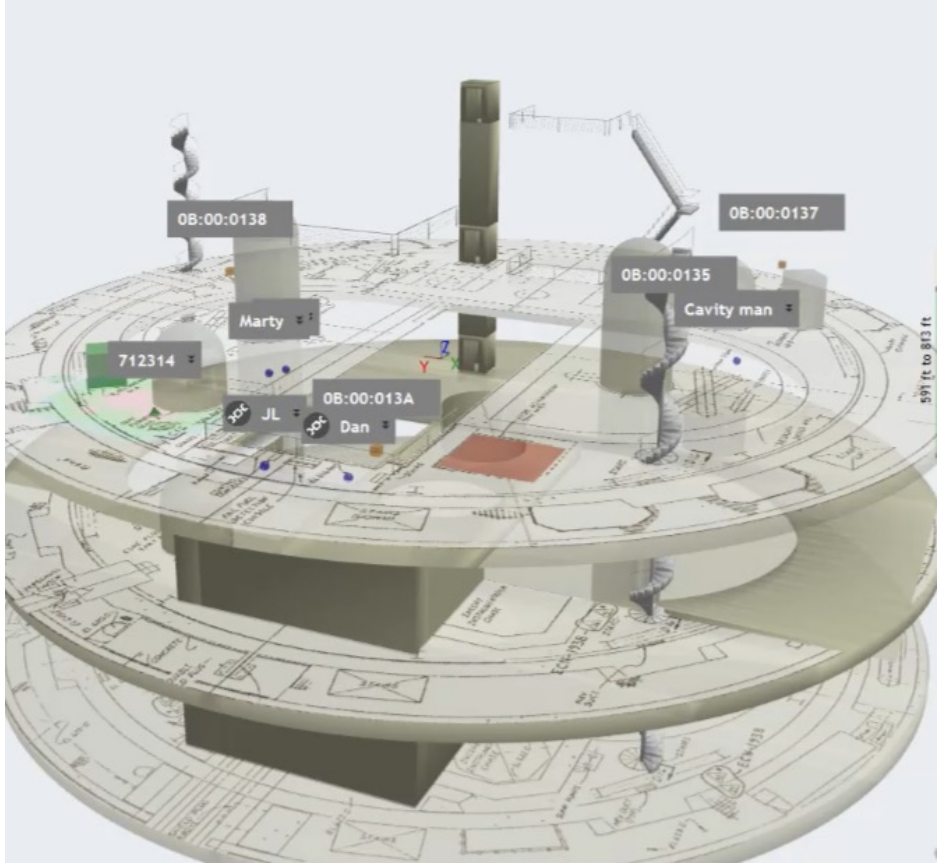
Unmute | Start Video | Invite | Participants 5 | Share | Chat | Record | Leave Meeting

Value Proposition

Orion RTLS helps nuclear operators:

- limit **critical path time loss**,
- simplify **dose rate management**, and
- reduce **man hours** needed to complete jobs

These gains are realized through critical path time hours saved by eliminating the risks of missing people, equipment and tools, drastically reducing dose rate alarms, as well as reducing man hours spent on completion of RWP tasks and time spent surveying to construct or update area dose rate maps.



Value Proposition

Solutions for key challenge areas

Lost Critical Path Time

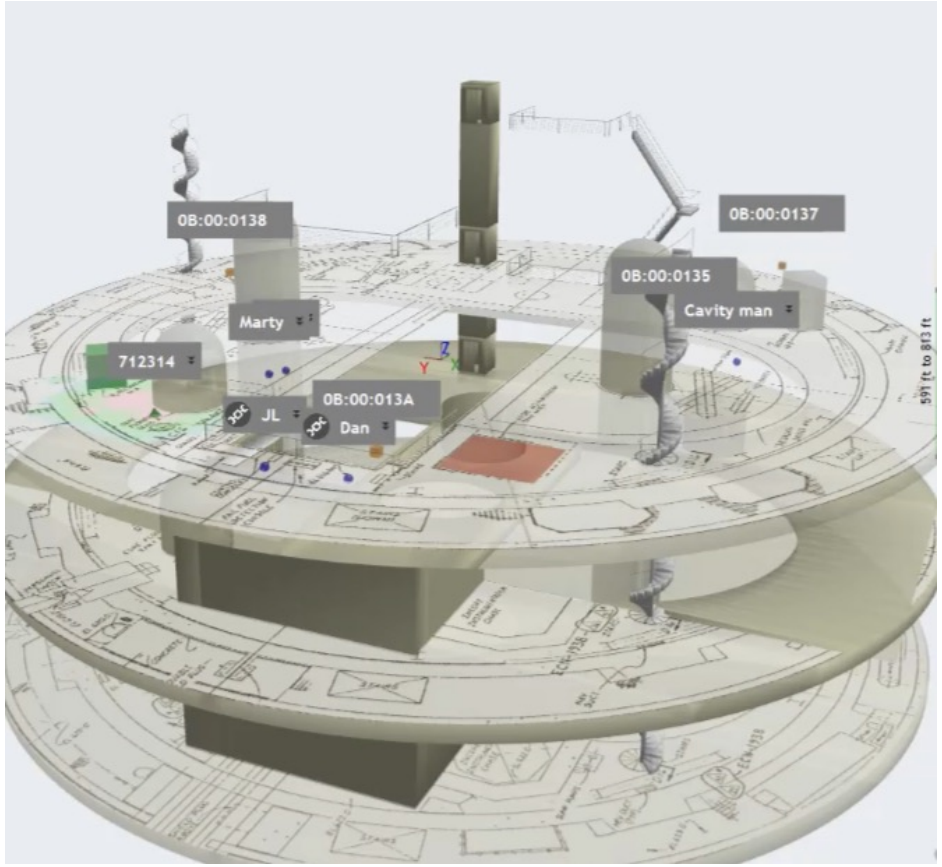
- ALARA planning
- Outage/refurb CPT
- Tools missing
- Personnel location
- Equipment missing
- Contractor management

High Dose Rate Alarms

- High dose rate alarms are an administrative nightmare
- Dose rate environments change
- Updating mapping requires intensive survey hours
- Dose rate zone visualization

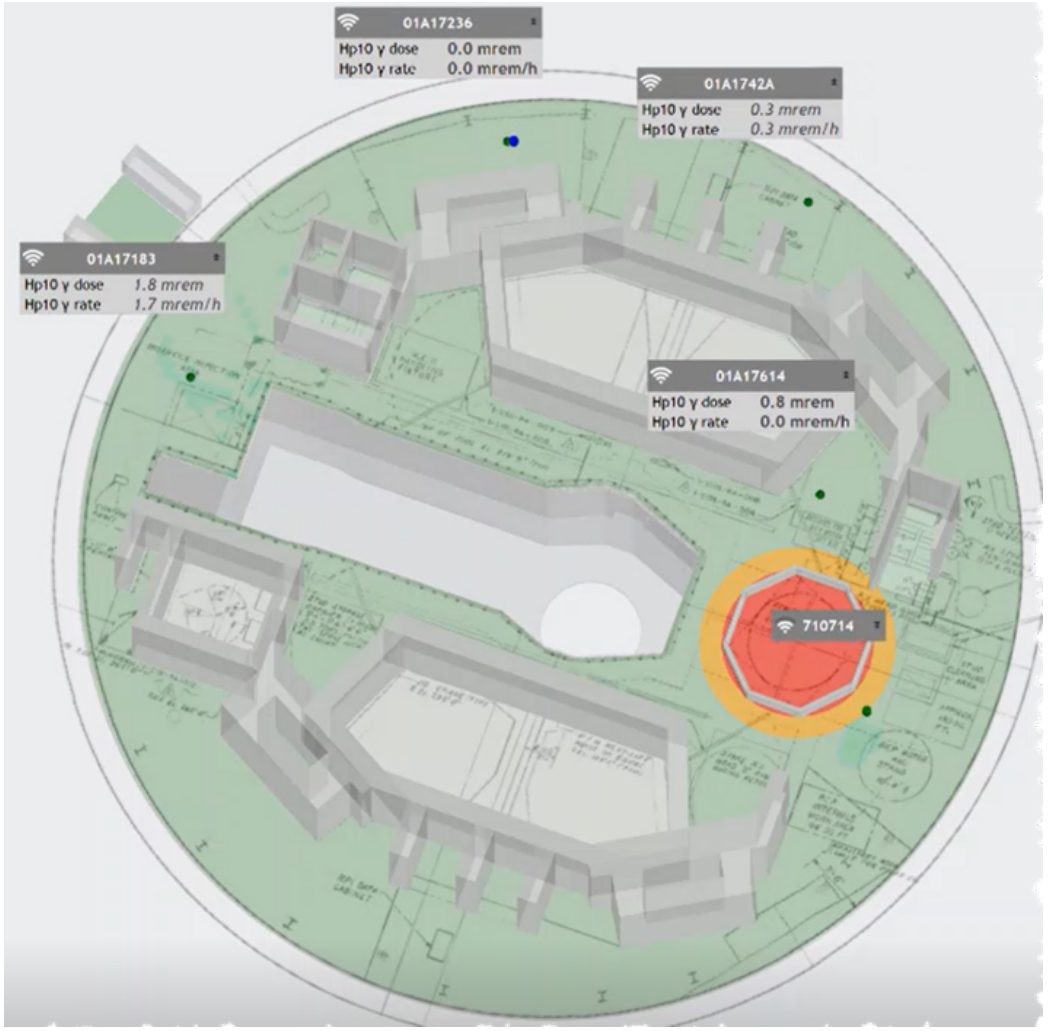
Safety

- Accountability for high rad evolutions and muster points
- Two-way communication
- “Man down” monitoring
- Geofencing locked high rad areas
- Training and simulation



Location Tracking

- **Track location of assets and workers**
- 1m location accuracy with WRM radiological data
- Site 2D/3D maps can be imported into Orion™ Studio software
- Distinct views of elevations or areas (e.g. drywell, platforms, vaults) can be created
- WRM capable survey instruments can be tracked with asset tags for dose rate locations
- Asset tags can be viewed with workers or hidden/separately monitored



MIRION TECHNOLOGIES

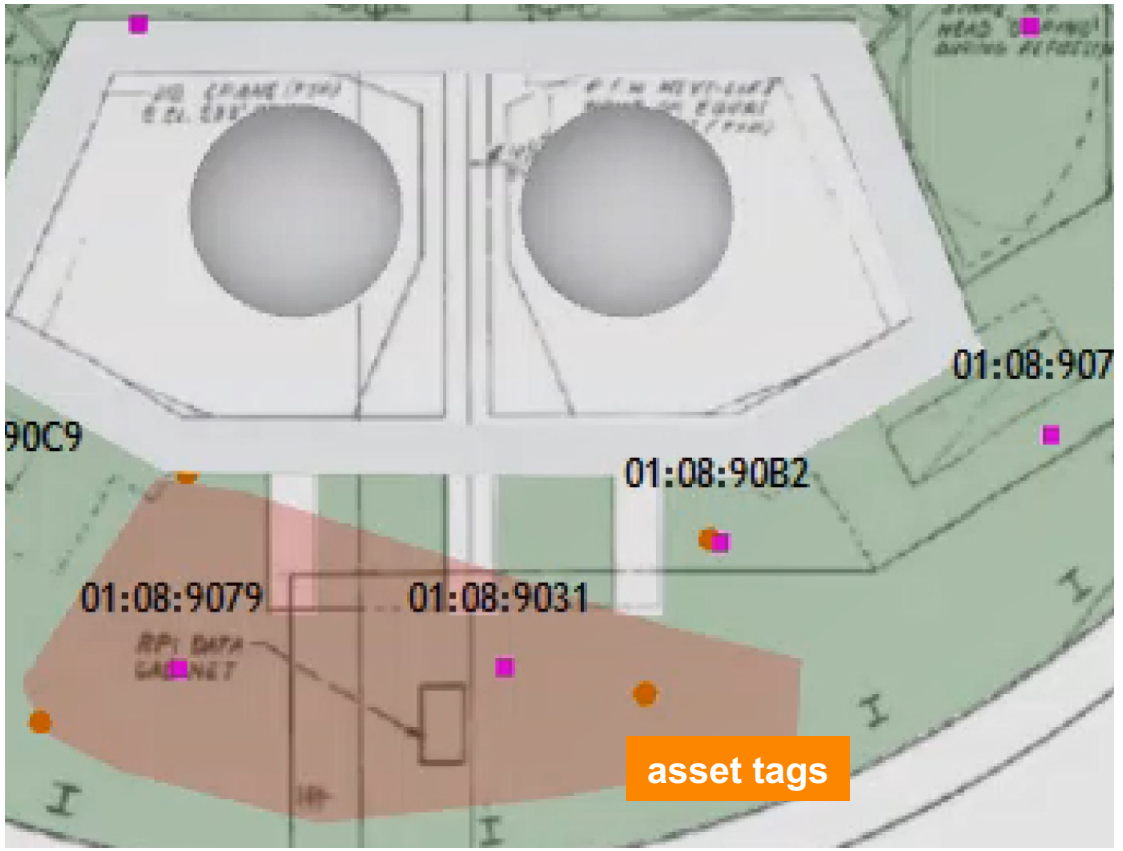
Asset Tracking

During outage/refurbishment :

- Asset tags can be attached to critical items
    - Replacement Components
    - Tools
    - Filters
    - Lead Blankets

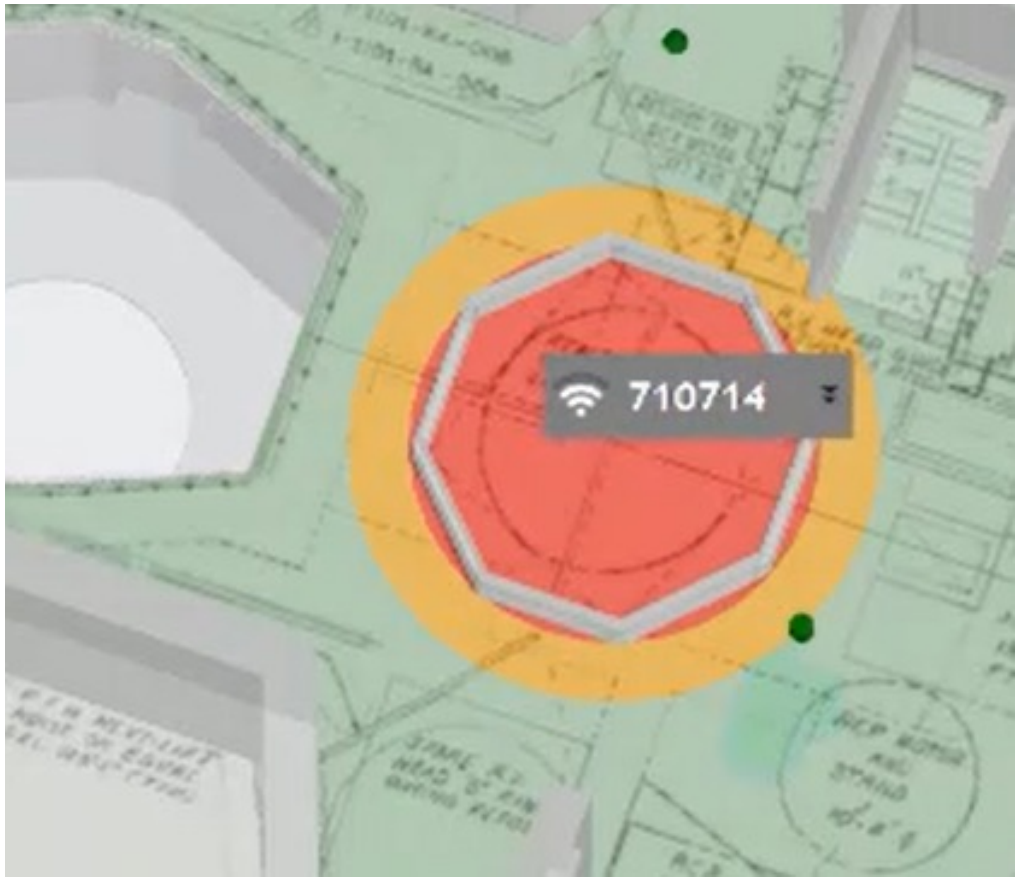
For large scale installations:

- Asset Tags can be used to cover warehouse items for storage of high value / critical inventory.



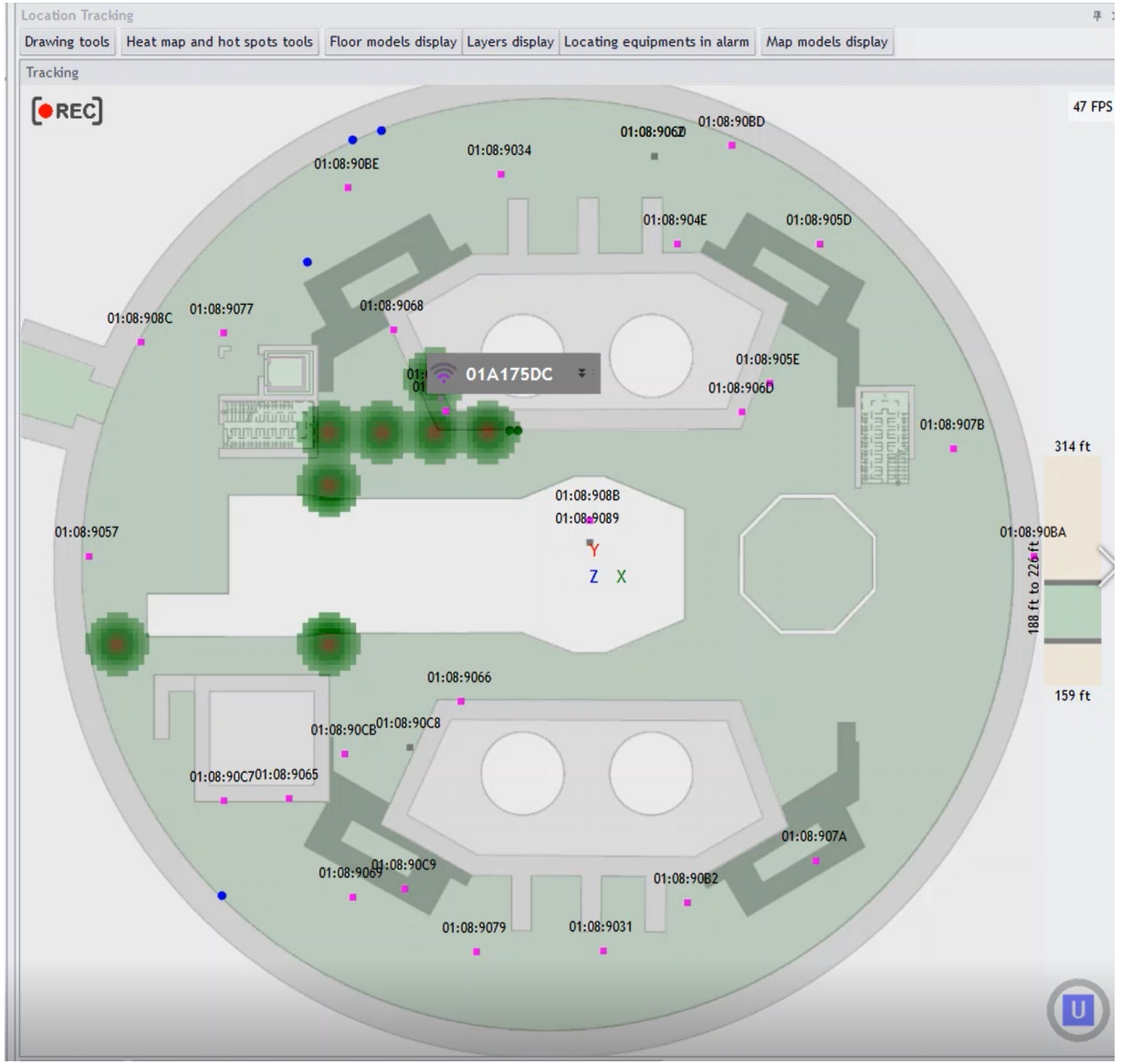
Geofencing

- **Create virtual boundaries in Orion™ Studio to trigger warnings and alarms locally (dosimeter) and/or at central monitoring**
- LHRA/high dose rate areas
- Restrict areas to certain personnel
- Control RWPs / Tasks based on specific hazard location



Dose Rate Mapping

- **Dose rate and location data are combined graphically to create a composite “heat” map**
- Parameters for dose rate gradients, refresh rates and peak and average data are customizable in Orion™ Studio



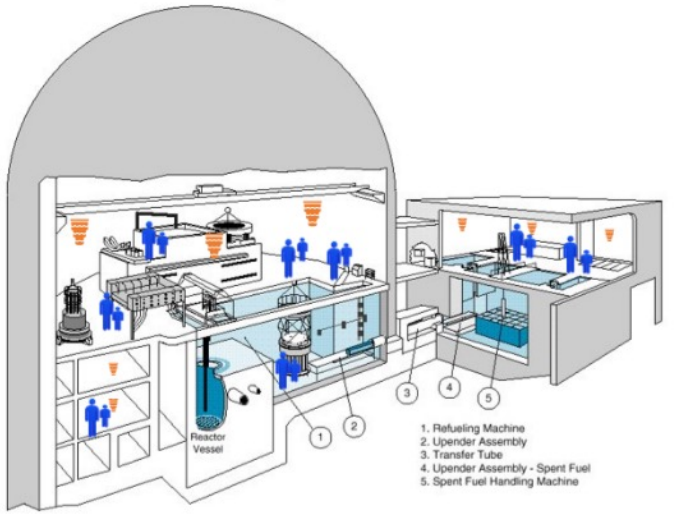
ORION™ RTLS: Technology Application

Orion utilizes “Anchors” which function as UWB “nodes” in the system. Anchors send and receive packets of location and time data from Mirion tracking devices (example: DMC 3000 Dosimeter with LTx Module or Asset Tag) and facilitate the network between a central server where a proprietary algorithm, displays current locations.

Anchors triangulate, using ToF and AoA, to track precise locations of devices that are networked with them.

ToF – Time of Flight is defined by the time it takes for a signal to travel from an Anchor to an incorporated tracking device

AoA – The Angle of Arrival is a metric used by interpreting the direction that the UWB wave is both sent from and retrieved at to calculate a position



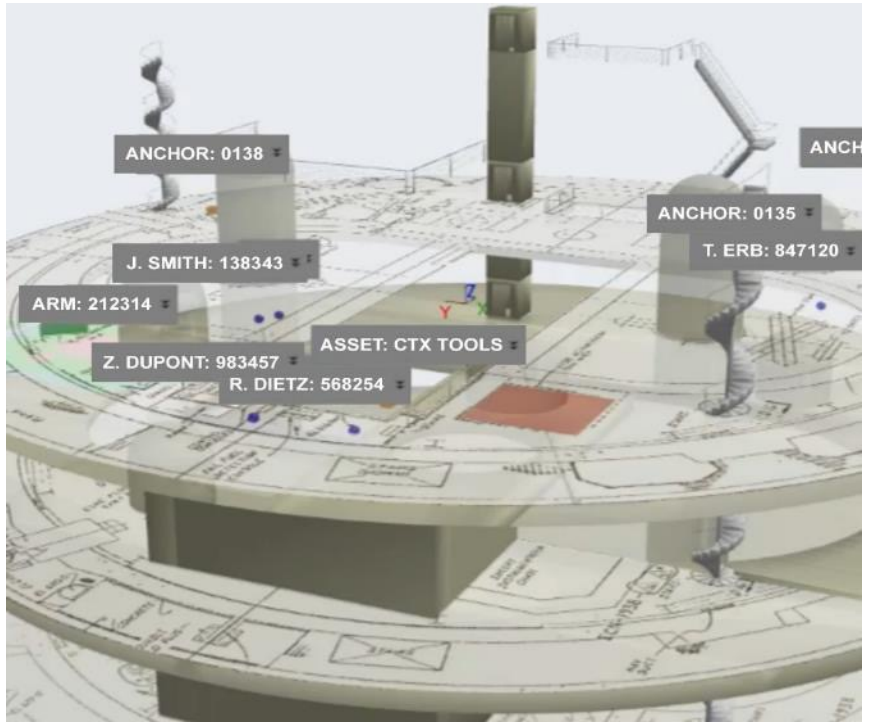
MIRION TECHNOLOGIES

01

System Components

ORION™ RTLS

Orion™ Studio Software



Orion Studio software, running at central monitoring, provides real-time location visualization of:

- WRM telemetry data (Dosimeters, Area Monitors, CAMs, etc.)
- Workers and contractor locations
- Asset Tag locations
- Geofences with alerts
- Dose rates (with mapping)

Applications:

- Instantly create exclusion zones based on real-time conditions (dose rate, airborne, air quality)
- Schedule jobs to limit lost time due to real-time congestion in work areas
- Dose-rate "heat" maps provide up-to-date conditions for pre-job briefings
- Track the number of workers in / out of an area
- Identify specific components by their location

Anchors

Anchors are placed throughout the monitored area to capture and relay location data to the central monitoring station

- Inexpensive (Cat 5) cables utilizing Power over Ethernet (PoE)
- IP-43 Rated for spray water hazards
- Simple “Daisy Chain” installation

Application:

- Placed throughout the monitored area to provide location data for Orion™ Studio
- For temporary installations, each anchor has strong magnetic mounts for easy and rapid deployment and removal
- 4 to 5 Anchors spaced ~ 20m apart (within RF Line of Sight) will provide sufficient location resolution

Dosimeter with LTx Module

- Orion RTLS utilizes the established technology of the DMC 3000 dosimeter, fitted with an exchangeable LTx module
- The LTx module supports the transmission of radiological information and location coordinates which facilitate real-time visualization on the Orion Studio Software
- LTx module features:
  - Ultra Wide Band for transmission of positioning coordinates
  - WRM2 900 MHz or 2.4 GHz WRM for the transmission of radiological information
  - Communicates with existing WRM3 compatible telemetry systems for radiological only functionality
  - Powered independently from the dosimeter (module failure will not impact worker dosimeter or alarms)

Asset Tag

An asset tag can be fixed to critical spare parts, large tools and equipment to track their location throughout a monitored facility. Asset tags transmit location data, eliminating challenges caused by lost equipment

- Rugged and watertight (P65)
- 2+ year battery life
- Various secure mounting provisions

Application:

- Save crucial time in locating critical path items/tools related to the outage and normal operations support
- Warehouse items identified for quick and controlled locations
- Vendor equipment location for outage support, containers, pelican case, tools, etc.
- Foreign Material Exclusion tags – What's IN/OUT, tools, etc.
- Geo-Fencing when an asset egresses from a defined storage location
- Determine if important access doors / swing gates are open or closed

02

Technology Demonstration at an operational Nuclear Plant During a Refuel Outage

ORION™ RTLS

Solutions for key challenge areas

Lost Critical Path Time

Enhanced Radiological Control

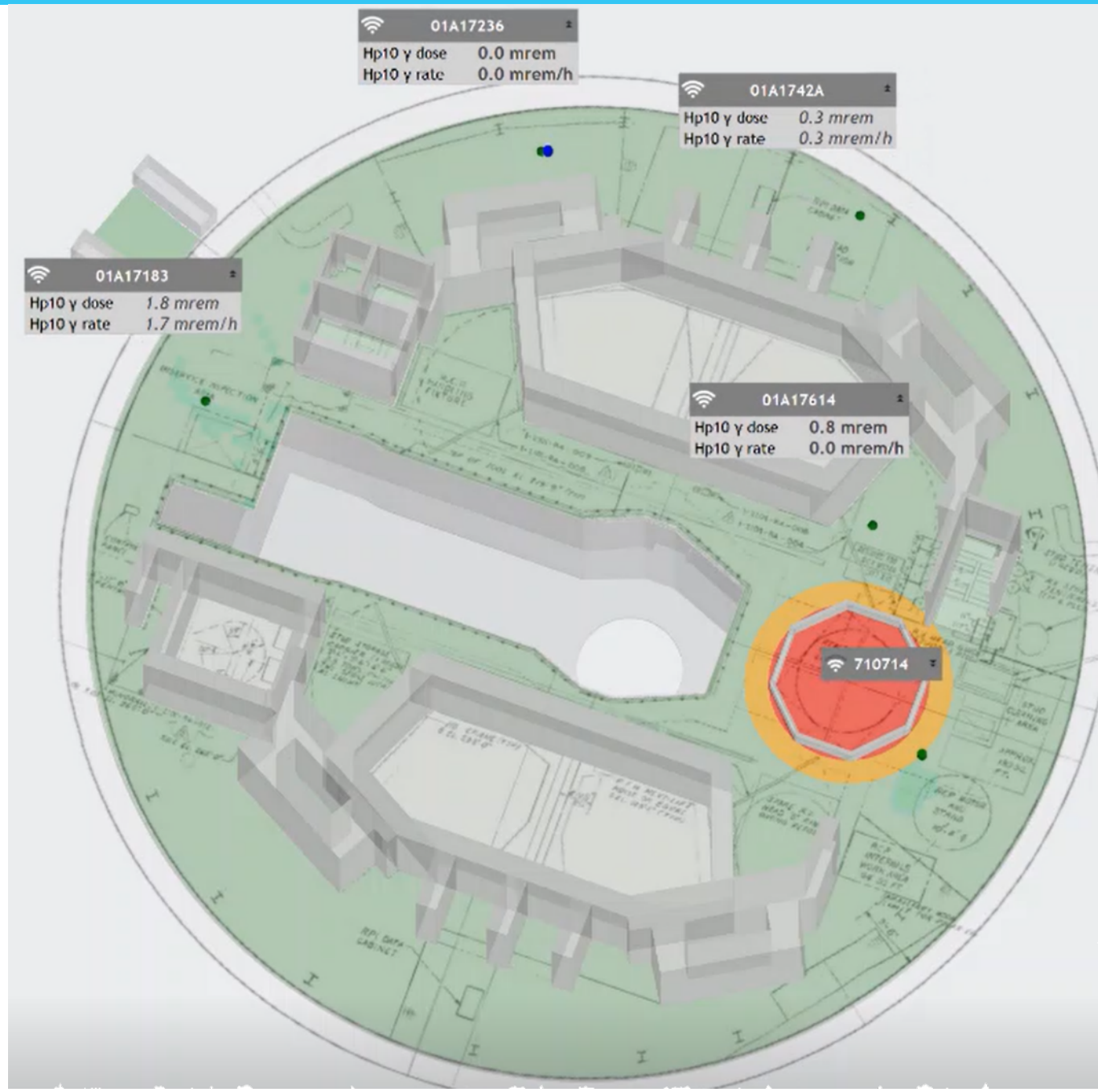
Safety

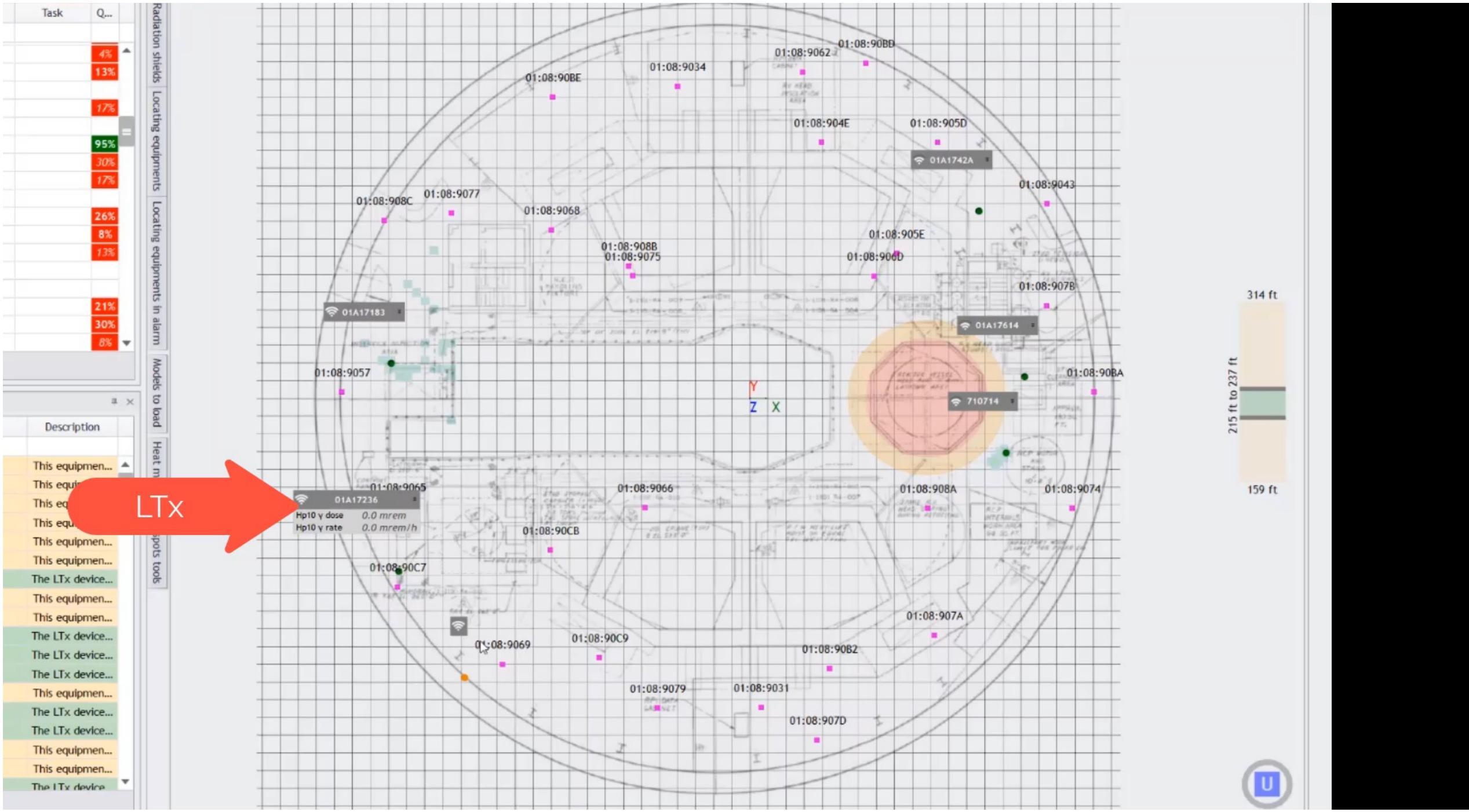
CENTRAL MONITORING STATION

ORION™ RTLS STATION

Technology Demonstration at US NPP During Refuel Outage

- Accuracy tests
- Dynamic/movement tests
- Geofence “restricted” areas
- Dose rate mapping (heat map)




Task
Q...
4%
13%
17%
95%
30%
17%
26%
8%
13%
21%
30%
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Description
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The LTx device...
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This equipmen...
Radiation shields
Locating equipments
Locating equipments in alarm
Models to load
Heat m
spots tools
LTx
01:08:90BD
01:08:9062
01:08:9034
01:08:90BE
01:08:904E
01:08:905D
01A1742A
01:08:9043
01:08:908C
01:08:9077
01:08:9068
01:08:905E
01:08:908B
01:08:9075
01:08:906D
01:08:907B
01A17183
01A17614
01:08:9057
01:08:90BA
710714
01A17236
Hp10 γ dose 0.0 mrem
Hp10 γ rate 0.0 mrem/h
01:08:9065
01:08:9066
01:08:908A
01:08:9074
01:08:90CB
01:08:90C7
01:08:907A
01:08:9069
01:08:90C9
01:08:90B2
01:08:9079
01:08:9031
01:08:907D
314 ft
215 ft to 237 ft
159 ft

03

Live Demonstration:

ORION™ RTLS