MIRION Connect 21

Annual Users' Conference

Radiological Emergency Planning

Automating the Process

Perry White

Product Line Manager / Application Support

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MIRION TECHNOLOGIES

What Task? What Requirements?

- Besides multiple scenarios (Dirty Bomb, Nuclear Plant Accident, Radioactive Spill, etc.) customer must deal with different aspects (Monitor Release, Clear Area and People, Search for Radioactive Material, etc).
- This means customers will have different requirements they are trying to meet. Even for the same scenario and task, different organization, will have different requirement!

- This means there is No Single Solution for this type of monitoring!

Justifying Automation!

- For those organization that are looking at this, they normally have to justify the expenditure. Here are a few:
- *Regulatory Requirement – Post Fukushima requirements were added to Nuclear Plants. Canadian Nuclear Safety Commission added a requirement for Perimeter Monitors in Reg Doc 2.10.1.*
- *Reduce Staff - Or at least the amount of personnel required to respond to an accident.*
- *ALARA – Reduce the requirement to enter the Plume, reduce the amount of people required in Field Monitoring Teams.*
- *Better Data – More points monitored, Data is more frequent, and possibly more data from each point.*

Justifying Automation Continued!

- *Reduces Human Performance Errors by Not having data verbally called in to a Controller, who writes it down and takes to another person entering data into the Midas or other plume program!*
- *While this is focused on a Radiological Accident, it helps in drills as well which helps prevent Comments or Findings that have to be Answered and Dispositioned which can be hundreds of man-hours.*
- *Liability – If an accident did occur, having as much data as possible to justify the actions taken will help in the aftermath of litigation. There will be a lot of claims of exposures from various sources. There is even an APP for that that uses the solid state camera chip as a Radiation Detector.*

How do I help thee, let me count the ways!

1. Perimeter Monitors – Easy to do. For NPPs it can utilize your existing WRM2 capability to provide the reach back. Multiple solutions for different applications.
2. Drop Boxes to Drop Trailers – Basically something that can be left in the Plume direction to monitor when it goes over that has Reach Back for the data. Multiple variations also up to an including with air sampling capability.
3. Continuous Air Sampling – Can monitor particulate or Iodine.
4. Instrument Kits – With the RDS-32 we have a variety of probes that can be utilized again with an without reach back.
5. Spectroscopic Data – with and without reach back. This includes quantification by sending a file that can be analyzed by our Genie software. Send file with reach back or analyze in Vehicle.
6. Reach Back – Automatically send data to Rad Responder or other Supervisory Software.
7. Applications – How can I use this equipment to help my Site?

Perimeter Monitors

- **We go back to a bunch of What questions for this!**

- *What do you need to monitor – Gamma, Gamma and Beta, Gamma Spec.*
- *What Locations – Inside plant area,1 mile perimeter, up to 10 mile EPZ.*
- *What is your infrastructure – WRM2 Telemetry, Power to Sites, Network to sites, mounting locations.*

Perimeter Monitors

- **What do you want to monitor**?
- *Gamma is the most common and the easiest to do at any location and with any infrastructure.*
- *Gamma and Beta means you have two detectors and have two measurements. Note you don't need the beta dose rate, you just need to know if it is different from the gamma reading to determine Elevated or Ground Plume*
- *Gamma Spec would be unusual for a perimeter monitor but after a recent discussion with a utility I find the idea does have merit and also has reach back from almost any location!*
- *I'll mention Air Sampling here as well. There are generally some airborne monitors for environmental sampling but they are not normally setup as perimeter monitors.*

Perimeter Monitors

- **What Locations do you need to monitor**?
- *Site Boundary (1 mile perimeter):*
  - *WRM2 – this is fairly easily done with the WRM2 Telmetry system but there are site with a lot of hills and trees that would be a challenge.*
  - *Network – Obviously this is easily done with almost any instrument.*
  - *Cellular / Satellite – This is the most difficult to do and has limitations and a recurring expense associated with it.*
- *Past the 1 mile Site Boundary:*
  - *There are some possibilities with the WRM2 Telemetry but the further out the more Repeaters / Monitors need to be added.*
  - *Network is normally Not a possibility.*
  - *Cellular / Satellite is the main solution for these locations,* ***First Net Cellular would be required if no Satellite option included****.*

Perimeter Monitors

- **What Infrastructure do you have?**
- *Most NPP's have our WRM2 Wireless already. While helpful adding a system without it may only require software and an extra AWM Base station with a remote antenna. We have quite a number on Non-NPPs with perimeter monitoring systems!*
- *No Power at the location determines if the monitor needs add Solar or battery as the power option.*
- *Network capability allows the easiest Perimeter Monitor addition of all especially if POE capable!*
- *Other infrastructure like having Siren Towers can also help, but a lot of site are removing these!*

Perimeter Monitor Benefits

- Reduce Required Field Monitoring Team(s)
- Reduce Personnel Entering Radiological Hazardous Areas
- Live Time Monitoring
- Radiological Information via Web Based Application for Multiple Viewing Locations (Site / Offsite)
- Safety – Remote Monitoring allows getting data from areas that are difficult to traverse
- 1 Mile EPZ monitoring
- Utilizing WRM2 Data has high reliability. In case of a loss of cellular event or power event, as long as the base station and a computer has power – the data will be received and processed. TV3000 can operate stand-alone on a single computer.
- Functionality will be added to TV3000 to send data to RadResponder

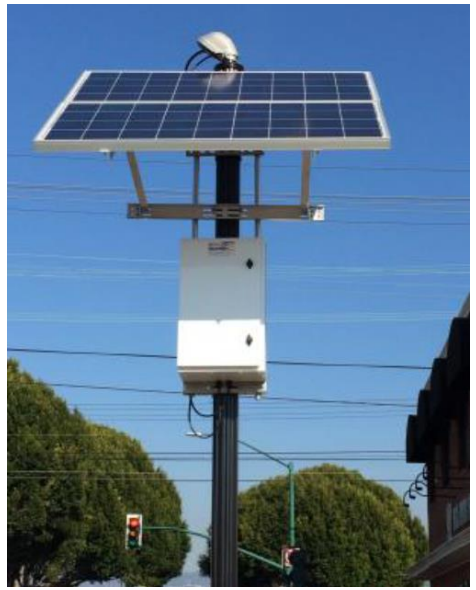
WRM2 Perimeter Monitor

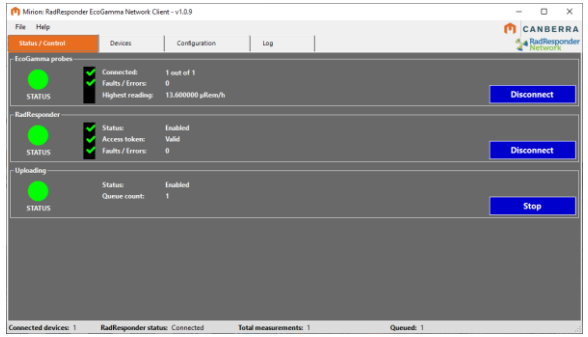
- Typical Solar WRM2 Monitor:
  - Self Contained
  - NEMA Rating
  - Battery Backup – 7 – 14 days
  - Solar Powered
  - Repeater Capability

- What is needed:
  - Teleview 3000 Software
  - Base Stations Central Location (MET Tower / Turbine Building)
  - Perimeter Monitors
  - Repeaters (areas where line of site maybe obstructed)

EcoGamma Perimeter Monitor

- If you have POE Network capability, this is the easiest way to add a perimeter monitor. Just mount and connect the EcoGamma to your network!
- Teleview has added the EcoGamma for the next release.
- The EcoGamma has a very sensitive low range detector and a high range to go from 1 uR/hr to 1000 R/hr.
- It stores 3 months of data in case of a loss of network connection
- It has Rad Responder interface program to automatically send data to Rad Responder





Drop Boxes / Trailers

- Lets start at the simplest Drop Box for On-Site areas that have WRM2 coverage outside (like for their Perimeter Monitors).
- The RDS drop box is for areas such as Security DP's other outside areas that still need to be manned in an emergency.
- You can also add to fill in gaps between perimeter monitors or simply use where you can if you Don't have a perimeter monitor system.
- Runs 45 days in a waterproof case with a carabiner for easy mounting.

Drop Boxes / Trailers

- The next is more for off site use, the EcoGamma Drop Box. This can be dropped at any distance from the accident!
- It comes in a Waterproof case with over 4 days of run time on battery power.
- This uses Dual Carrier Cell modem with FirstNet capability. This means you will get data even when the normal Cell towers are flooded!
- It also has a Satellite option for those who cannot get FirstNet access.
- It has built in VPN and Wifi for additional connectivity.

Drop Boxes / Trailers

- When you have the need for more information than just gamma dose rates, especially air sampling you will likely need a trailer, even if a small one.
- The more elaborate the monitoring the more elaborate the trailer or vehicle.
- We had a request to be able to monitor Gamma and Beta as well as sample for Iodine in a small Drop Trailer.
- The issue, after discussing it, is dropping it where the plume will be on the ground so you can get a sample, AND before the dose rates get too high.

Air Sampling

- Air Sampling whether particulate or iodine has a number of challenges, the first being it needs Power.
- You can put them in an environmental enclosure but some location will require the ability to control the climate.
- We have dual detector for background subtraction, but increased dose rates will still reduce the MDA, eventually to a point you can't see the level you need.
- We do have data for the iCAM that shows you can see 1 DAC of I-131 at 15 mr/hr and 10 DAC (2e-7 uCi/cc – Seems to be a required limit) at 100 mr/hr for 5 minute sampling.
- We have a charcoal filter for measuring Iodines but it only comes in the Fixed filter, which means you have to manually change it when it gets too high.
- Bottom line is it is hard to automate the determination of airborne levels. But we will touch on that more later.

Kits

- We started making Kits with our RDS-31/32 meters and accessories a number of years ago because of the many probe options and it has a Cradle to allow power and mounting in a vehicle.
- The Grab and Go brief case size kits can hold everything you may need to respond to your specific radiological situation.
  - Briefcase size cases to hold multiple meters and detectors
  - Meters may be powered by USB for long term deployment (this means you will never have to worry about the batteries going dead on drill day)!
  - Accessories for easy mounting (e.g. windshield mounts)
  - Kits tend to be individualized so normally “pluck” foam is used but for orders of 10 or more we can have nice custom cut inserts made.

Gamma Spectroscopy (SPIR Mobile Systems)

- Drone / UGV Ready
- Dual Detector – 0.1 uR/hr to 1000 R/hr
- NaI or LaBr detector
- Simple Use and Installation
- IP 65
- Rad Responder Connectivity Expected 2022

- 80 nuclides/7 Libraries
- Active Energy Stabilized Nai or LaBr Detector.
- Up to 10 R/hr
- Rad Responder Connectivity
- Connected device (email, supervision, reach back)
- Simple GUI
- ISOCS / Genie Compatible

Gamma Spectroscopy (SPIR Mobile Systems)

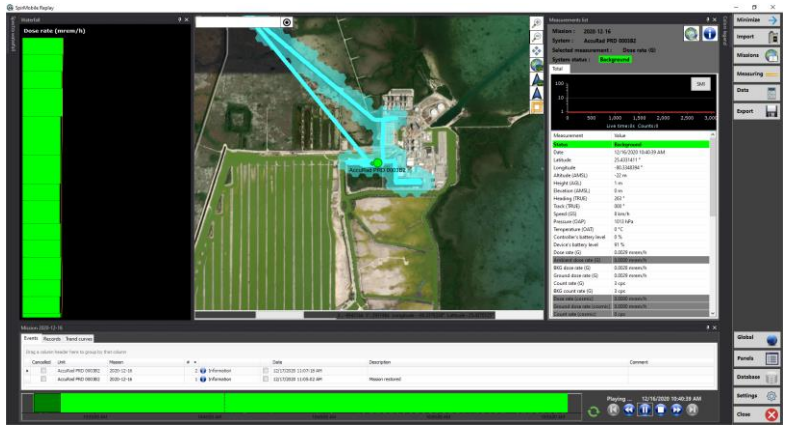
SpirVIEW Mobile

Main supervision
Computer (agency, local headquarters)
Or Cloud based server

Other displays:
(agency, local headquarters)

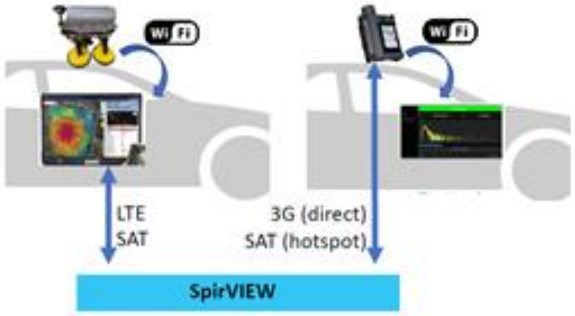
Internet or Private TCP/IP network (typically cellular 4G/LTE)

Field supervision



Configurations

- SPIR-Explorer
- SPIR-Ace



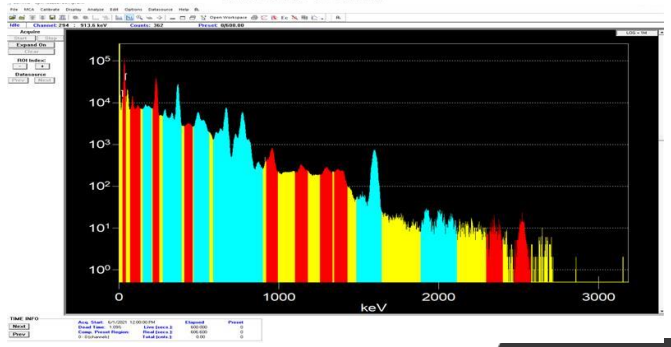
Gamma Spectroscopy (Genie Export)

- The Genie Xport package for the SPIR Ace included Generic ISOCS characterization and preloaded efficiency calibrations.
- ISOCS Can be used to create unique geometries (such as a half filled 100 liter Marinelli).
- You simply perform an analysis (Can be remotely) which can provide isotope identification.
- Then select the analysis, chose the geometry and then Export the CNF file (USB or email).
- Load the CNF file in Genie 2000 software and perform your analysis which will no include not only Identification but Quantification of the sample.

GENIE XPORT

Remote Display and Start

Connect to the SPIR-Ace device with a hotpot or WIFI connection and enable acquisition from a safe or more accessible location.

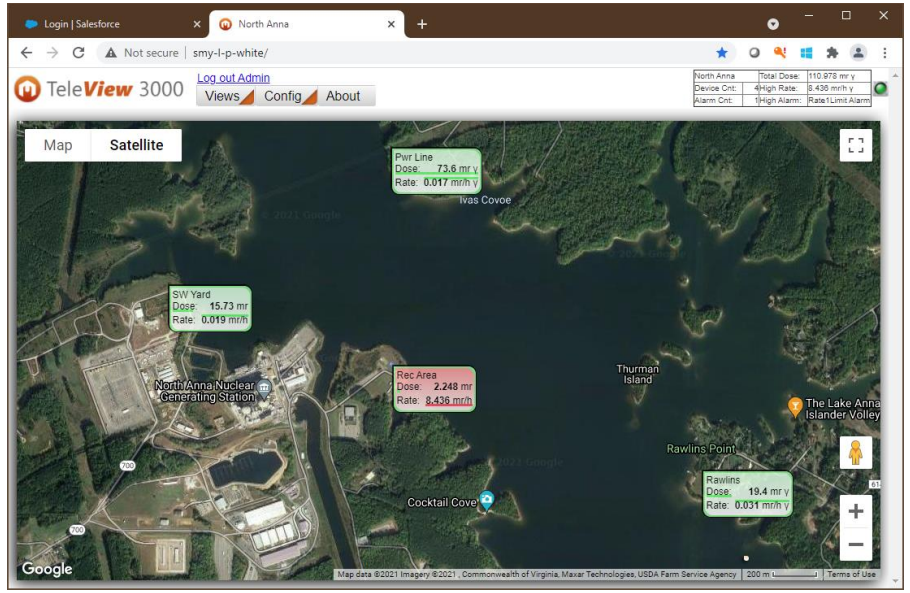


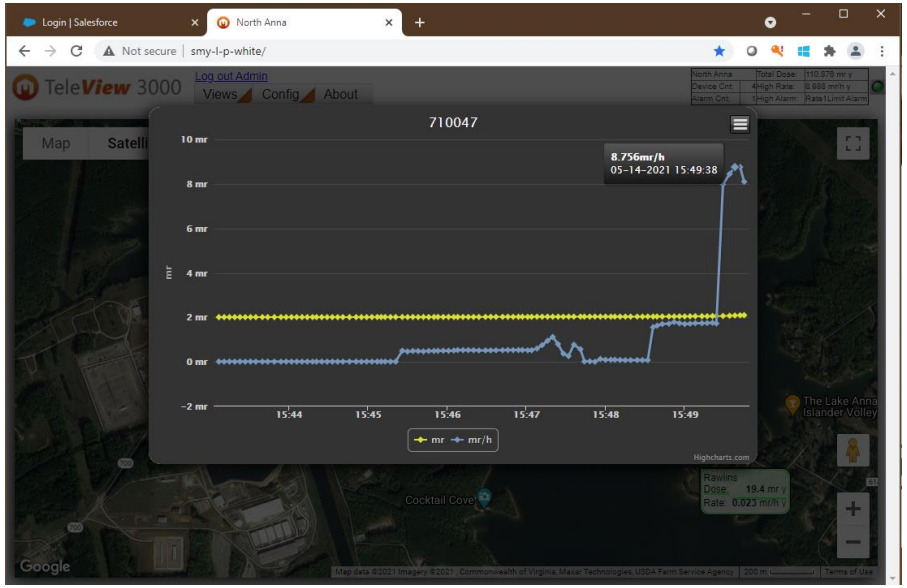
Spot and the SPIR Explorer

+

Reach Back (Teleview 3000)

- Teleview 3000 telemetry monitoring program is unique in that is the browser based and uses Google maps to plotting EP monitor locations.
- You can enter the GPS info for the monitor or just right Click and position it on the map. Zoom in to place more precisely.





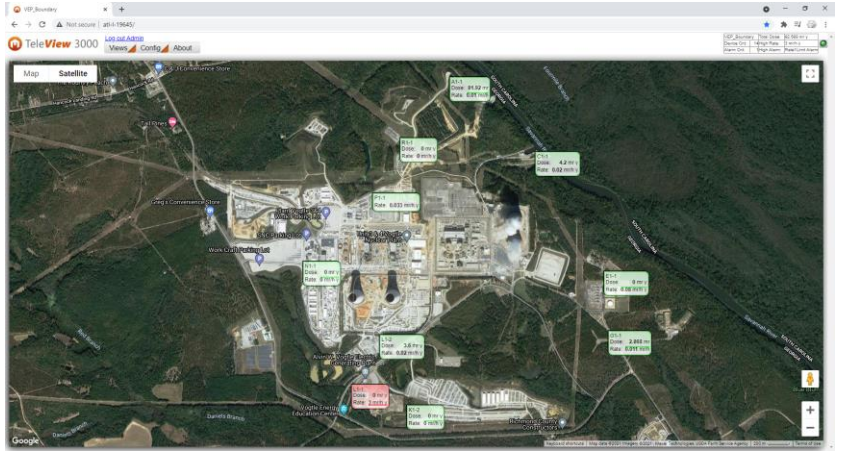
Reach Back (Teleview 3000)

- Teleview monitors through the WRM2 system a wide Varity of gamma probes and will also connect to the new IC3 Ion Chamber. The Ion Chamber is always a request for open and close window readings!
- The RDS-31/32 meters can provide alpha and beta contamination readings as well as Neutron reading when the SN-D-2 is used.
- The DRM-3000 can also provide multiple different readings based on the probes used.
- We can monitor a number of different airborne monitors, from particulate, to Iodine to Tritium and Noble gases.
- We even can monitor non radio active gas such as O2 levels as well as Temperature and Humidity.
- We have just added the EcoGamma to Teleview via Network connection only at this time.

Reach Back (Teleview 3000)

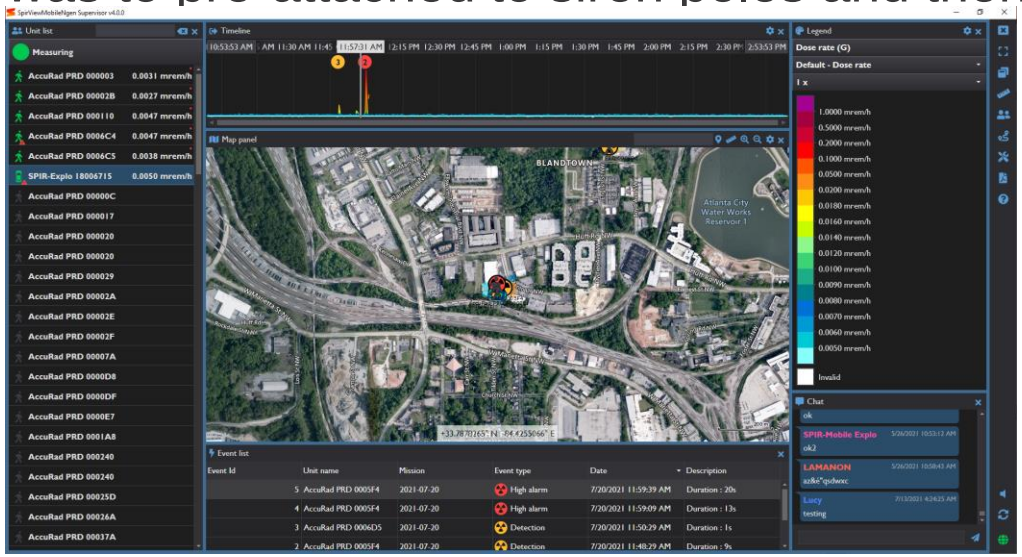
- When a site has WRM2 coverage outside the plant, Field Monitoring Teams can use an AWM in conjunction with their RDS or other telemetry meters and their DMC-3000s to add GPS data to the devices.
- This means the site can monitor the team's dose and rate information from their dosimeters, as well as data from any telemetry capable instrument being utilized in their VAN.
- This will actually display as a moving icon on the Google map. All data is stored with he GPS coordinates for later retrieval.
- Midas – We have been in discussions with the Midas team and the ability to pull the Teleview data direct from the data files and they believe they can do it. There is a customer already in talks to do something similar.

This means no interactions from anyone one to get data to Midas! Full Automation!



Reach Back (SPIRView)

- We discussed on a previous slide the connection to the SPIR software. SPIRView is a supervisory software that is cloud based so it can be viewed from anywhere.
- It provides live time readings including travel path and heat mapping.
- Currently the SPIR equipment and the Accurad are the only devices that can obtain that connection. We hope to add the RDS-32 as well.
- In our last discussions with a Corporate EP group, they liked both SPIRView and Teleview but preferred to only have One program to use. They proposed an interesting monitoring solution – Accurad / Phone drop box. Lockable Nema case to put an Accurad, Phone and Power bank. There idea was to pre-attached to siren poles and then put devices in it.



Reach Back (RadResponder)

- The RadResponder Network is the national standard and Whole Community solution for the management of radiological data. It is a product of collaboration between Federal Emergency Management Agency (FEMA), Department of Energy (DOE) / National Nuclear Security Administration (NNSA), the Environmental Protection Agency (EPA), and the Defense Threat Reduction Agency (DTRA) and is provided free of charge to all Federal, state, local, tribal, and territorial response organizations.
- Currently we have connection to Rad Responder through out Accurad App, so the Accurad Can be viewed in SPIRView and send data to Rad Responder!
- We are working on adapting the Accurad App to make a connection with our RDS-32 also
- The SPIR Ace has a connection to Rad Responder as well as SPIRView but does require a SIM card or WiFi for the reach back.
- Teleview is being modified to automatically send specific data at a specific frequency to Rad Responder. This may be very useful for some customer since it can send a wider variety of information including contamination and airborne levels.

Applications RDS-32

- You still need to send people out into the field. Whether for initial response, search or mitigation after an accident to clear personnel and equipment.
- We have a Kit for you! If you didn't see the RDS-32 presentations, take a look at what it is capable off.
- We are in the process of modifying our Accurad App to utilize the BLE connection to the RDS-32. This will provide RadResponder reach back and should provide connection to SPIRView.
- The next phase is to add the ability send data from the RDS-32 connected probes to RadResponder. This will include Alpha and Beta Contamination and Neutron dose rates possibly.
- One last note on this App is the plan to use WRM2 telemetry parsers which should make it possible for other devices that use WRM2 data can be added. The DMC-3000 and the IC3 Ion Chamber will likely be the first additional devices.

Applications
Perimeter Monitors

- One of the reason we base our perimeter monitor on the AWM is it allows us to increase the transmission power and utilize a high gain external antenna.
- Even though site perimeters are normally within a mile, it is seldom line of site. The higher power and gain can help push through trees that would stop the lower power. ***This means you can use Less monitors on the site***.
- An interesting idea we heard recently, to eliminate the need for the WRM2 coverage, was to create a SPIR Ace perimeter monitoring system. Since the SPIR Ace can use a Sim card, all you need is Cell phone coverage (preferably First Net). This allows you to get dose rates and upon an increase start an acquisition to get a spectrum. At a certain level (~10 mrem/hr) the scintillation detector will saturate and you will no longer be able to get a spectrum but will have spectral data up till that point.

Applications
AccuRad Drop/Mount Box

- We recently had a meeting with a corporate EP group to discuss options to automate their process. It was a great discussion and we took back several ideas. One was a simple and inexpensive solution for monitoring out past the site boundary.
- The idea was to pre-mount small lockable NEMA boxes where you can put an AccuRad with a Phone connected via the phone app in positions in the plumes path. Plus add a power bank to keep the phone powered depending on how long you want to leave it out there.
- This gives you SPIRView capability and you can send data to Rad Responder with them.
- I think you could also use them as drop boxes and secure them and lock them as you mount them in the plumes path.

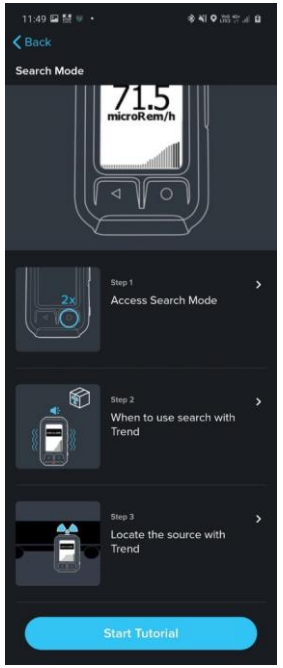
Applications
Assembly Areas

- Assembly Area Monitoring
  - The idea is to have the RDS-31/32 alarm box near the entrance to monitor dose rates in the area and alarm if increasing past a certain point.
  - A secondary function would be to add the GMP-25 probe to monitor person entering the area after Relocation. It has a separate alarm for contamination levels.
- Both of these reading can be sent to the sites telemetry software such as Teleview 3000 and notify the RP personnel of any alarm so they can be investigated.

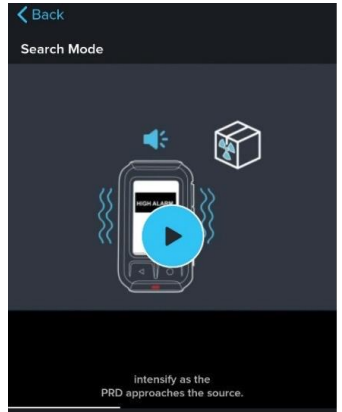
Training / Drill Applications
Sim-Teq

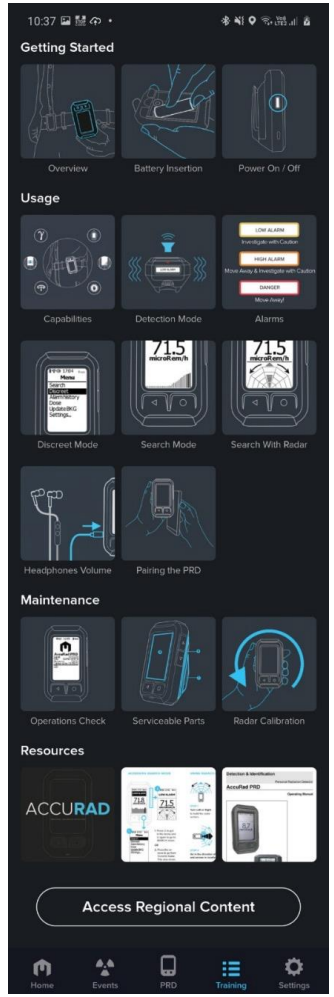
- You can't have an instrument program without Training personnel on the equipment! But, you don't want to have to deal with real sources or radioactive material while Training.
- Like the other Sim-Teq equipment we sell, this training equipment has all the functionality of a regular RDS and DMC-3000 including the built in WRM2 Radio and responds to the Sim-Teq dose rate sources.
- In addition, when you add the GMP-25TD (Training Device) you can add contamination sources to allow realistic response when frisking. This uses RFID and sources of specific strengths so they can be put in pockets, under dressings or under a smear.
- Because all readings can be manually adjusted as well using Sim sources, Controllers for the drill can update the participants Dose information, Rate information and Contamination results live time as the drill progress.
- Also if utilized with Telemetry reach back to Teleview, the site will also see the radiological information.

Training Applications
Accurad



- The Accurad has an actually Training APP that walks you through all aspects of its Use and Mantenance.
- The Tutorials are setup to acknowledge you have gone through them so you know what you have looked at.
- In addition when you go through all the tutorials there is an optional test built in so you can qualify your users with this equipment!





What do you need?

- Well you have seen what we have an what we can do. Not all is “Off the Shelf” ready, but mainly because no one has committed to purchase. Nothing adds incentive to finish a project as much as a Purchase Order!
- So this is your time to tell us what we are missing!
- We will start with the next slide of our guesses.

Will This Help?

- Many of us at Mirion were previous customers so we tend to look at what we are doing from that specific perspective. I was RP Supervision at a Farley Nuclear Plant with a background in Instrumentation and Technology.
- RDS-32 on SpirView as well as RadResponder?
- RDS-32 to include Probe data as well as the normal Gamma info in the APP and Rad Responder?
- The RDS-32 App to be able to see other instruments, like the new IC3 ion Chamber, DMC-3000s, Maybe even connect to the AWM?
- Allow remote sending of CNF files in SPIRView?
- What about a SPIRAce Perimeter Monitor System?
- What about the Accurad Drop Box?

Questions?