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Mission Systems

Introduction to SBES

January 2016

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Snapshot of Current Equipment and Operations at Electronic Proving Ground (EPG), Ft. Huachuca

- Emitter equipment contained in “camping” shelters and cargo vans
- Each system requires a minimum of 2 personnel to operate
- Test Vignettes are run and scored manually
- Shelter and van systems have no range network connectivity

Manual
Scripted Voice
Scenarios

Legacy Emitter

Signal Generators

Range
Communications

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Current System Limitation and Constraints

Current and future multiservice emitter programs require a dense open-air RF environment using a robust signal set to represent current and projected RF signatures. The existing systems struggle to keep up with the rapid technology changes in the RF spectrum.

Constraint Examples

- Labor intensive
- Maintenance intensive
- Difficult and expensive to implement new capabilities
- Limited real time monitoring & feedback
- Difficult to ensure signal quality

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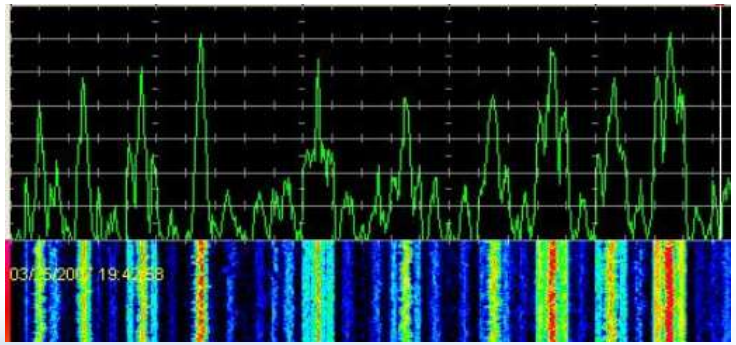
Synthetic Battlefield Emitter System (SBES)
Key Benefits

SBES provides a realistic RF environment to simulate modern battlefield conditions using minimal manpower resources.

- Using digital I&Q record and playback technology gives the test community access to unlimited emitter types without maintaining actual emitter equipment
- Digital I&Q high fidelity recordings insures that the RF emitter signatures are accurately represented
- The SBES Libraries provide storage and management for thousands of I&Q recordings and test event files
- Unmanned Remote Nodes significantly lower the number personnel required to execute a test event plan



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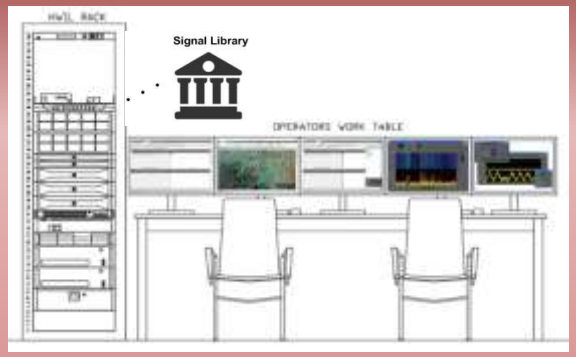
SBES – Main Components

- HWIL – Test Plan creation, Signal Library management
- Central Node – Manned control, monitor and emitter system
- Remote Nodes – Unmanned emitter trailer systems

Key Features

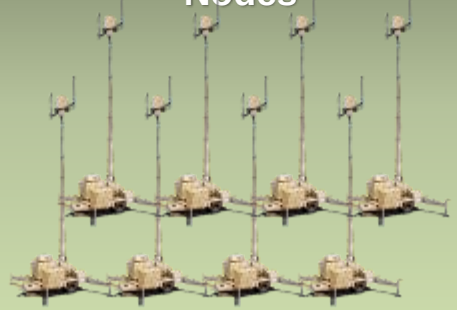
- **Frequency Range – 2MHz to 6GHz, up to 40MHz IBW**
- **Power – Up to 250W at the Central Node, 25W at Remote Nodes**
- **18 independent emitter paths**

Hardware Integration Lab



Central Node

Unmanned Remote Nodes



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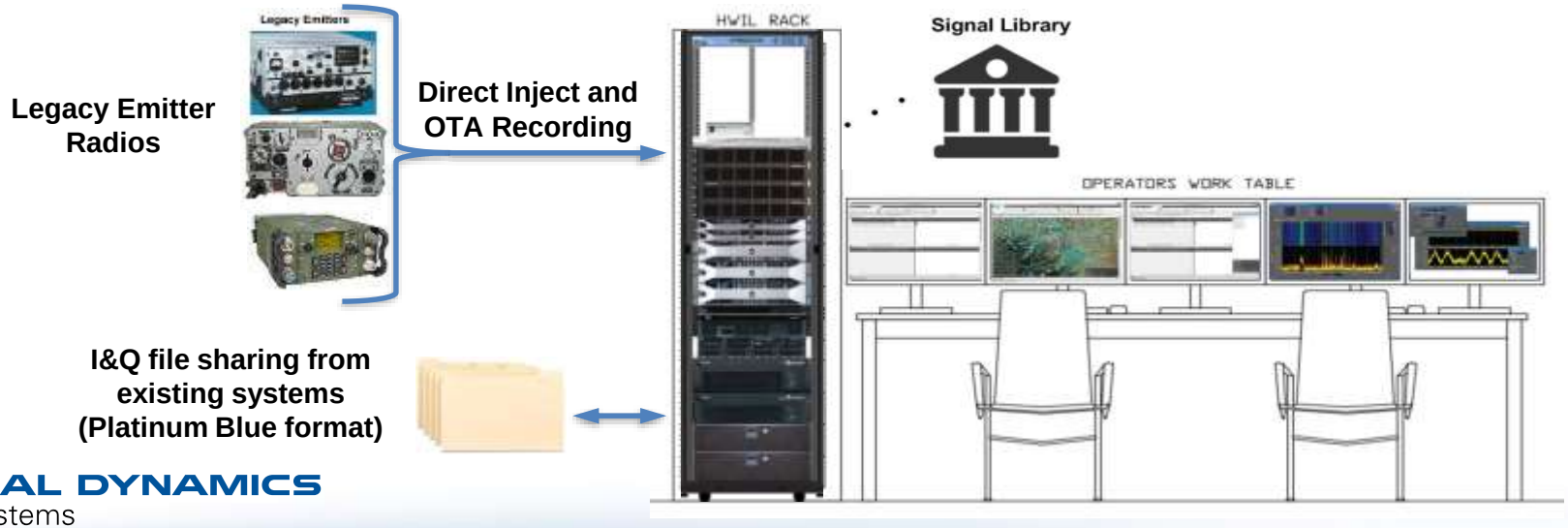
SBES – HWIL Key Components

- I&Q Recording Device – Captures high fidelity I&Q emitter recordings that are then stored in the Signal Library
  - AeroFlex BSAG, 70MHz IBW, Synthetic Signal Generation, Advanced Signal Analysis
- Signal Library – Made up of high fidelity I&Q reusable recordings
  - Winchester FlashNAS ZX2000, 110TB - scalable up to 720TB
- Map Library – Range Maps used for planning asset placement and analysis
  - Dell PowerVault MD1200, 36TB
- SBES Application – Custom software used to plan and manage equipment and test events.



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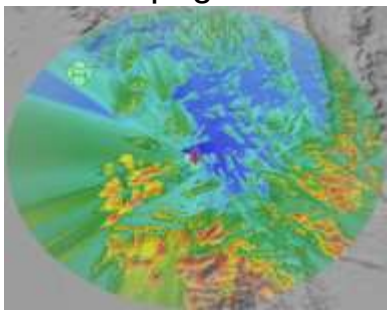
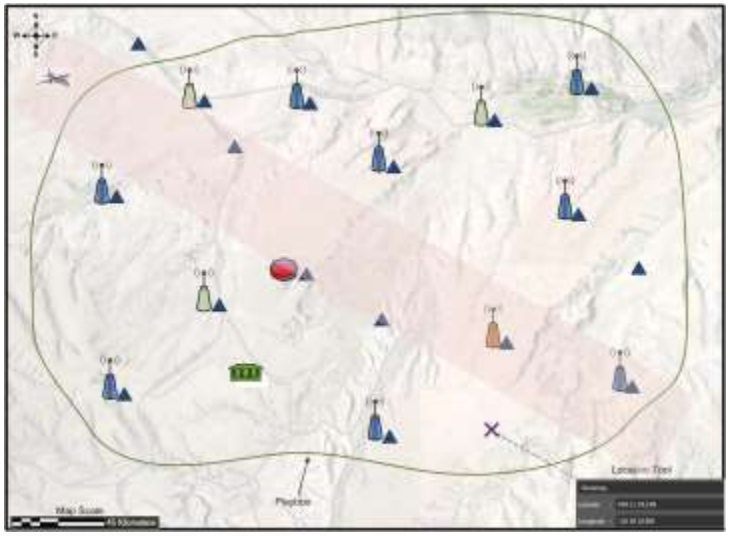
HWIL Major Software Interface Components

- Map Window – Optimizes test asset location placements
  - Analysis Tools – LOS, Propagation loss, Distance measurements
- Vignette Planner – Assign signals events to Test Assets over time
- Explorer Window – Used to build and navigate libraries
- Signal Editor – Used to inspect and edit I&Q signal attributes
- Record Signal Importer – Used to manage captured signals

Propagation Loss



Vignette Planner



Map Window

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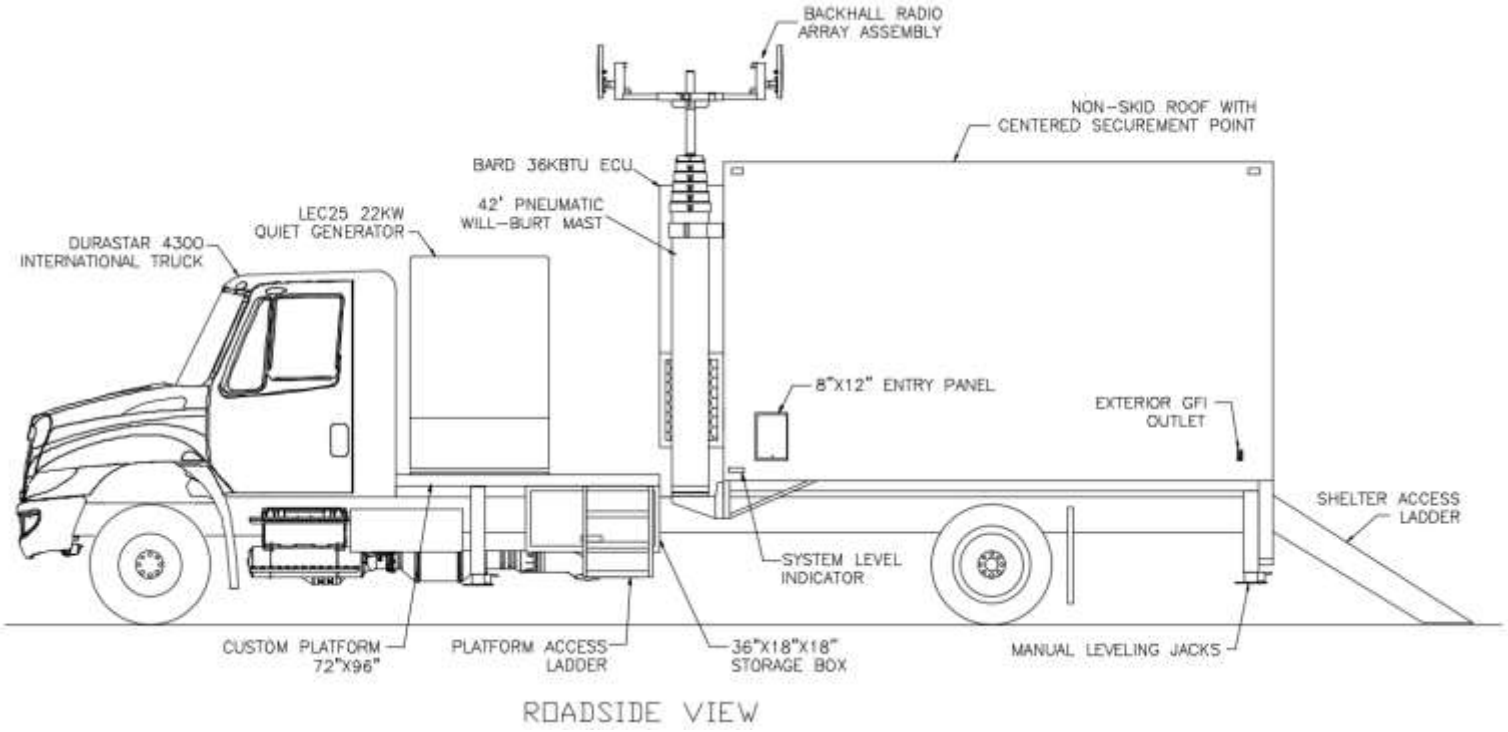
Central Node System

Main Components

- Prime Mover (International DuraStar 4300)
- 8'W x 12'L x 7.2'H Environmentally Controlled Shelter
- 36,000 BTU Bard AC/Heater Unit
- 22KW Quiet Series Generator
- Two 41' Will-Burt Pneumatic Mast (150lbs Payload each)



ROADSIDE VIEW

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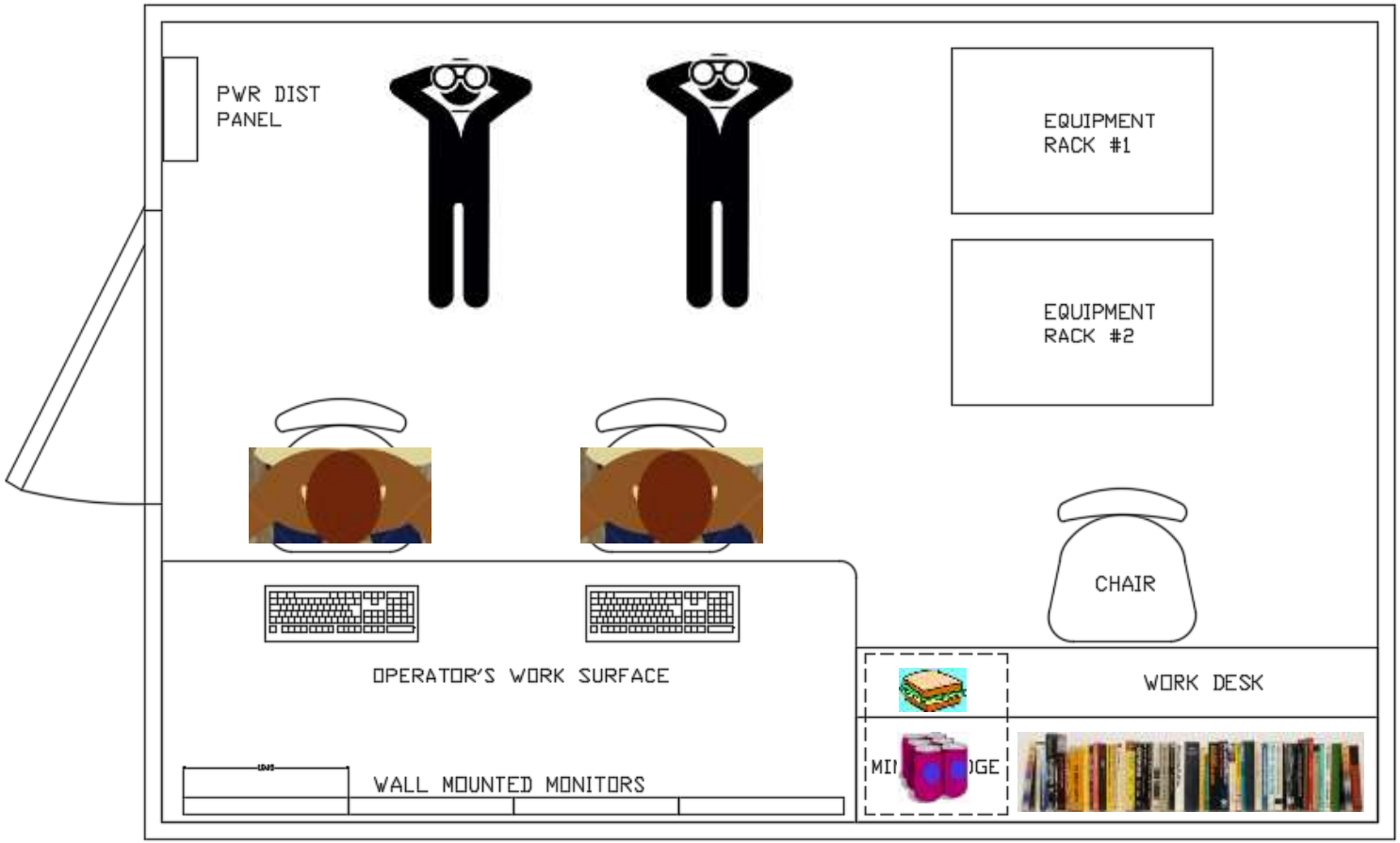
Central Node Shelter Interior Layout

- Accommodates 2 operators comfortably with room for observers
- Includes mini frig, work desk and cabinet storage
- Rear rack access for maintenance and equipment changes



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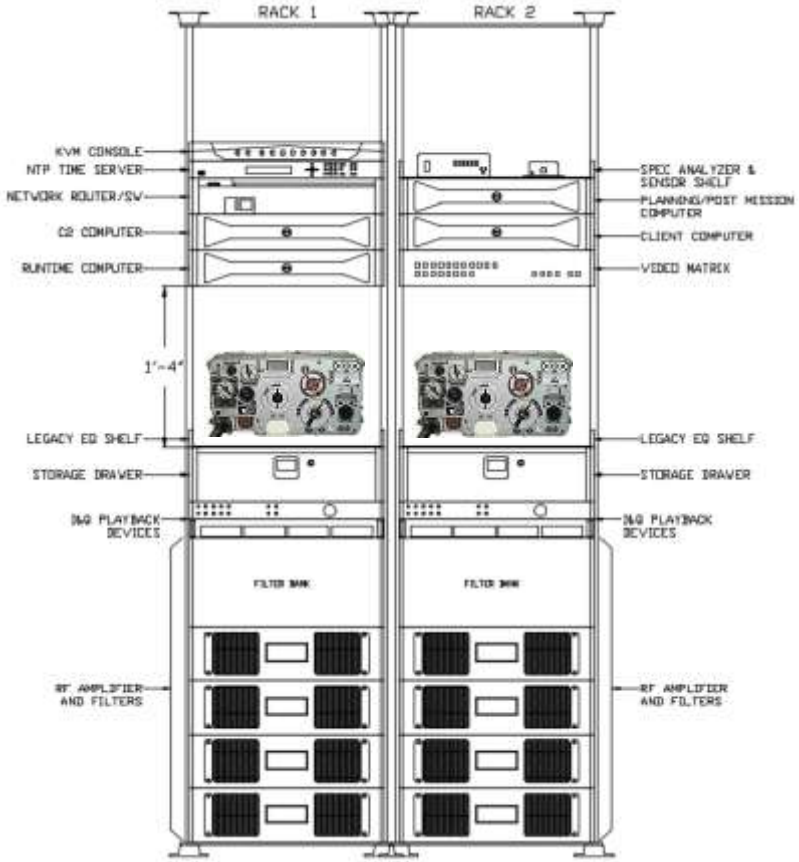
Central Node Shelter Interior Layout Continued

- 2X8 Operators Monitor Wall controlled by a video matrix switch
- 2 independent RF emitter paths capable of up to 250 Watts
- Rack space to accommodate legacy emitter equipment
- Open Air Spectrum Analyzer (Survey the RF environment)



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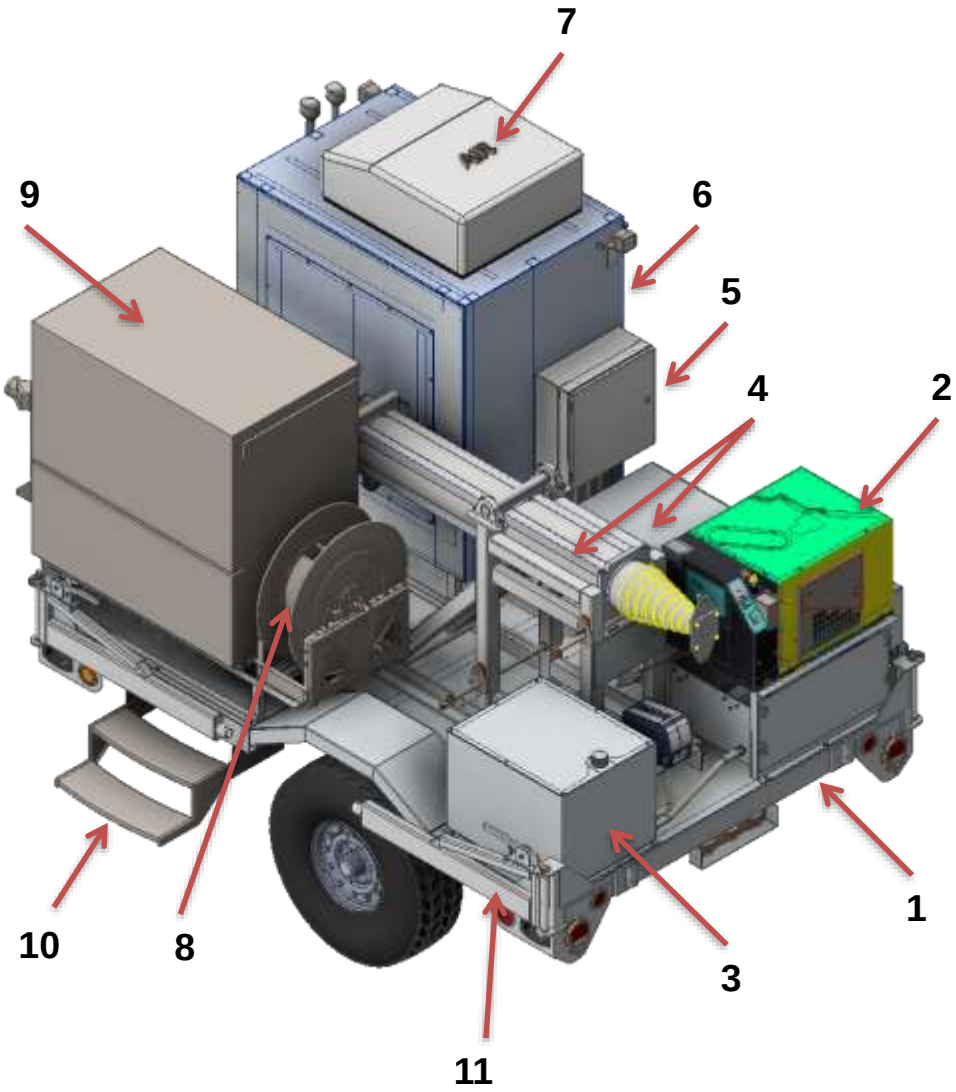
Remote Node Trailer System

Main Components

1. Military Style Trailer (Aluminum)
2. 6KW Diesel Generator
3. Fuel Tank
4. Mast and air compressor
5. Power distribution panel
6. Electronics (Equipment) Cabinet
7. ECU
8. Mast Cable Reel
9. Storage Box
10. Pull out steps (Mirrored on opposite side)
11. Swing out stabilizer legs (4X)



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SBES – Unmanned Remote Node Features

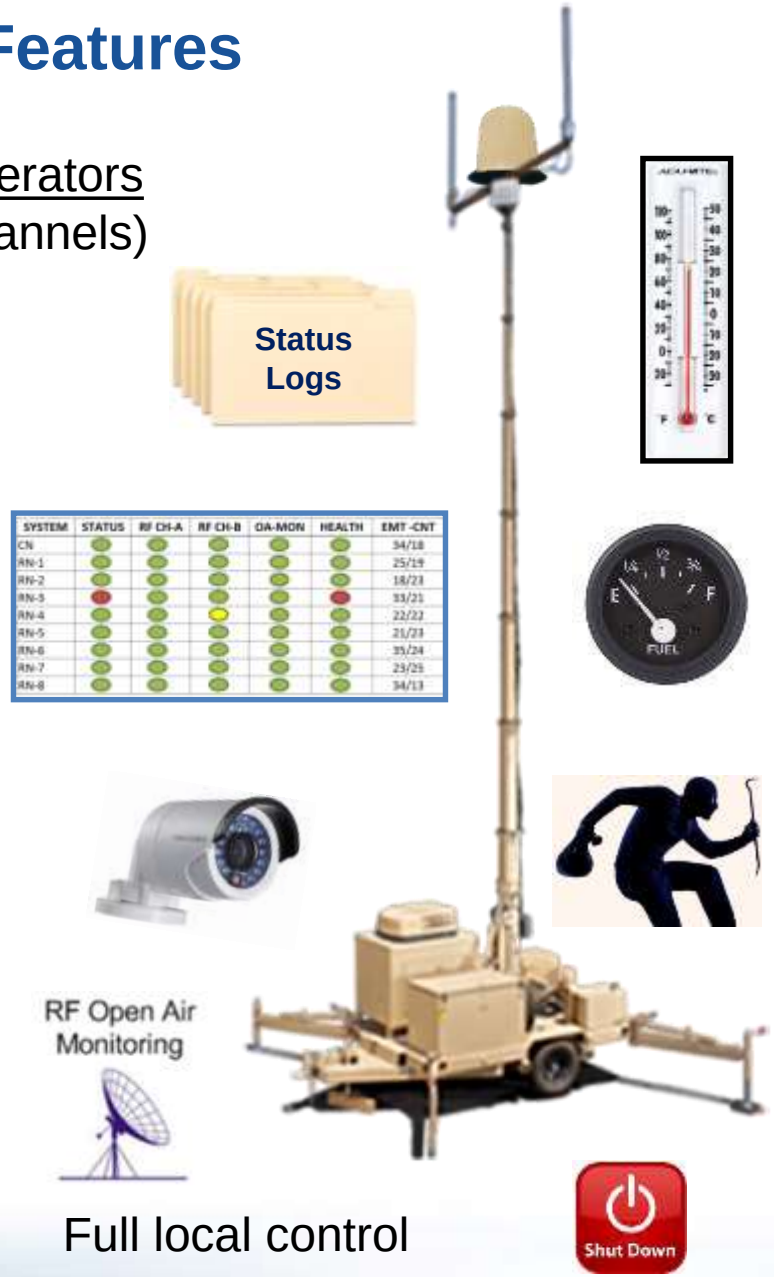
Real-time data feedback to the Central Node Operators

- Forward & reverse power monitoring (both channels)
- Open air RF monitoring verification
- Enclosure temperature status
- Fuel level status
- Generator power status
- Surveillance video and motion detection
- Status logs

Central Node remote control features

- Remote system shutdown
- Equipment diagnostics and troubleshooting
- Execute manual emitting events

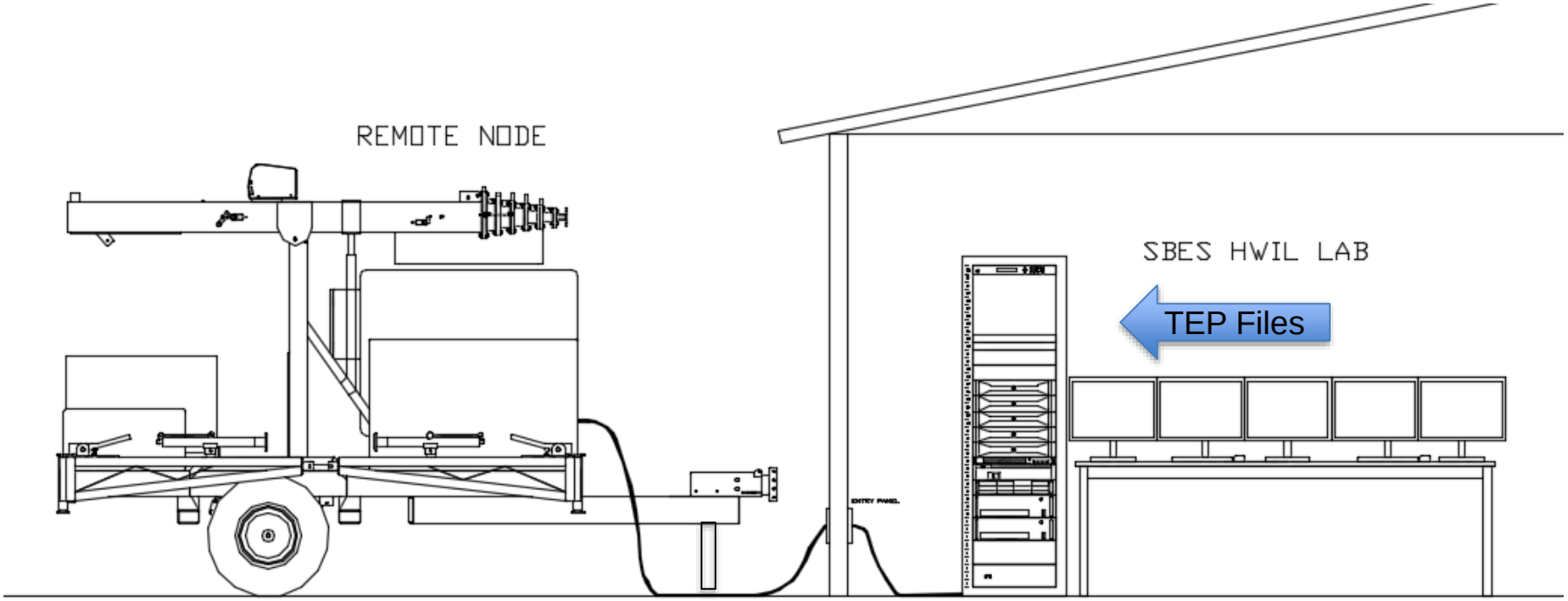
- **30 Minute deploy time**
- **72 Hour Mission Execution**
- **42’ Pneumatic Mast**



Full local control

SBES Operational Deployment Preparation

- Completed Test Event Plans (TEPs) files are transferred from the HWIL to the SBES Nodes
- In yard testing and checkout can be done via network hardline connections



SBES File Transfer Concept

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SBES Operational Execution – OV1

- 1 Central Node with 8 Unmanned Remote Nodes
- 18 independent emitters
- Support Personnel – 2 Test Operators, 1 Support Technician
- Wireless data control network with GPS synchronization
- Systems can be deployed over a 20KM X 20KM grid
- Test Event Plans are initiated and controlled through the Central Node
- Post mission results, analysis and reports processed at the Central Node

DENSE RF ENVIRONMENT

SUT

Wireless C2 /Status Data

Remote Node 1

Remote Node 2

Remote Node 3

Remote Node 4

Remote Node 5

Remote Node 6

Remote Node 7

Remote Node 8

Central Node

SUT

SBES Schedule

	2015				2016				2017			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Critical Design Review completed				▲								
HWIL & CN developed					△							
RN #1 developed						△						
AT & Demo completed								△				
RNs #2-8 developed											△	
Final AT completed; FOC delivered												△

SBES Benefits and Risk Reduction

- Using I&Q record and playback technology gives the test community unlimited emitter types without maintaining actual emitter equipment
- Test Events are executed using automated scripts thus reducing manual errors
- Real time feedback will help ensure quality testing is being executed
- Reuse of test event plans and I&Q recordings reduces planning time and labor cost
- Analysis tools help optimize equipment placement before asset deployment
- Minimal personnel needed to operate SBES – Major cost reduction to execute test events (Only 3 people are required to operate SBES versus 19 to operate same number of legacy emitter assists)

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Questions?

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