



Monitoring Broadband Services from Space

An innovative set of solutions

Presented to:

ITU Workshop

Tuesday, September 6, 2016

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What's brewing ...

GSO HTS and multiband satellites

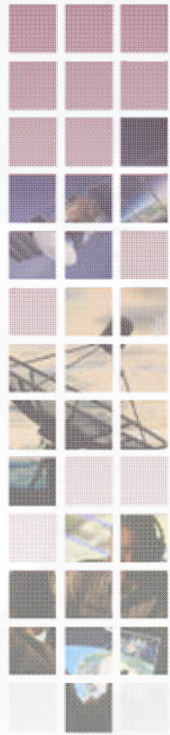
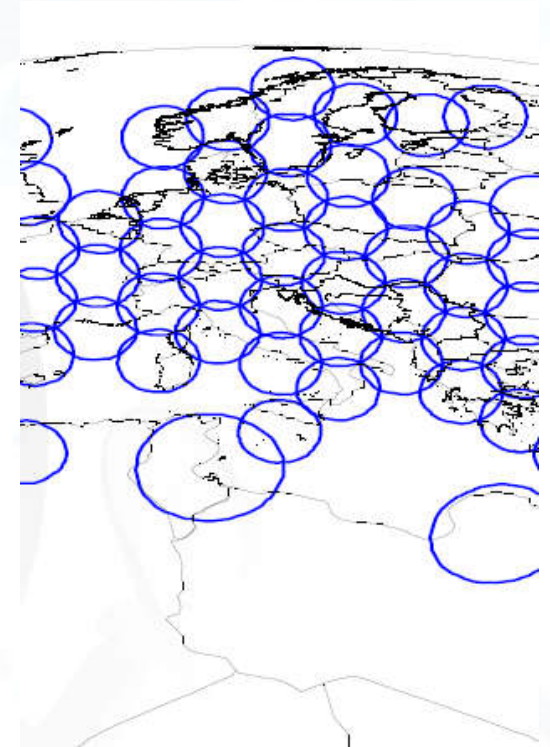
- Viasat-3
- Epic NG
- Global Xpress

Non-GSO Ku and Ka-Band

- LEO and MEO constellations

Thetered Ballons

- Project Loon

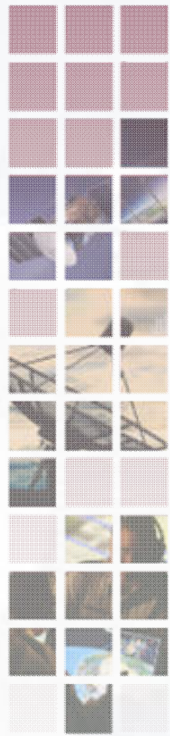


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Interferences to and from

- GSO vs non-GSO interference
- Ground interferences

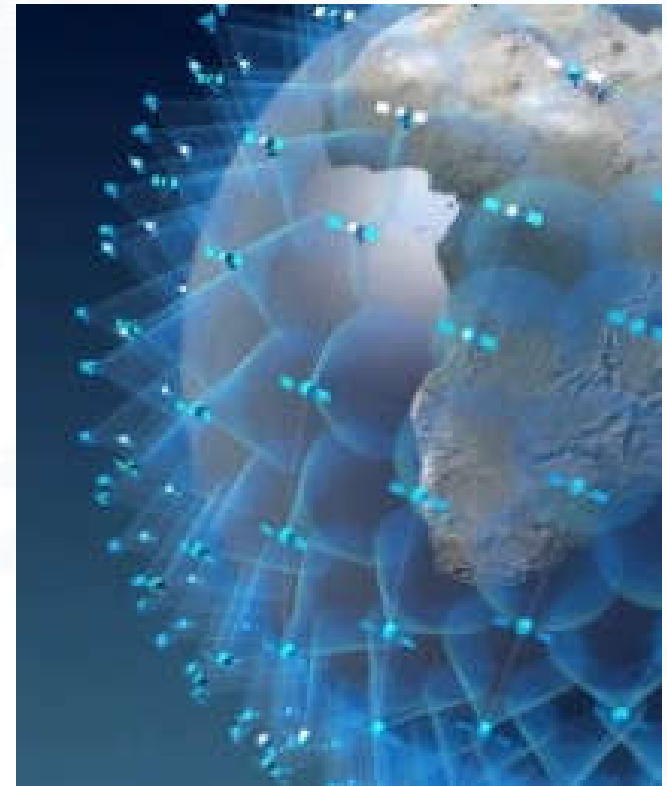
LEO/MEO End of Life Disposal

- How to manage additional debris?

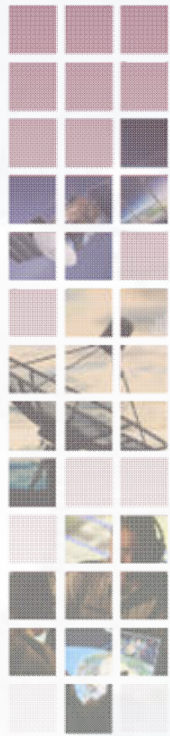
User Terminals Accuracy

- Accuracy, Reliability, Consistency

... headaches?



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Radio Space Monitoring, but what exactly?

GSO HTS spacecrafts

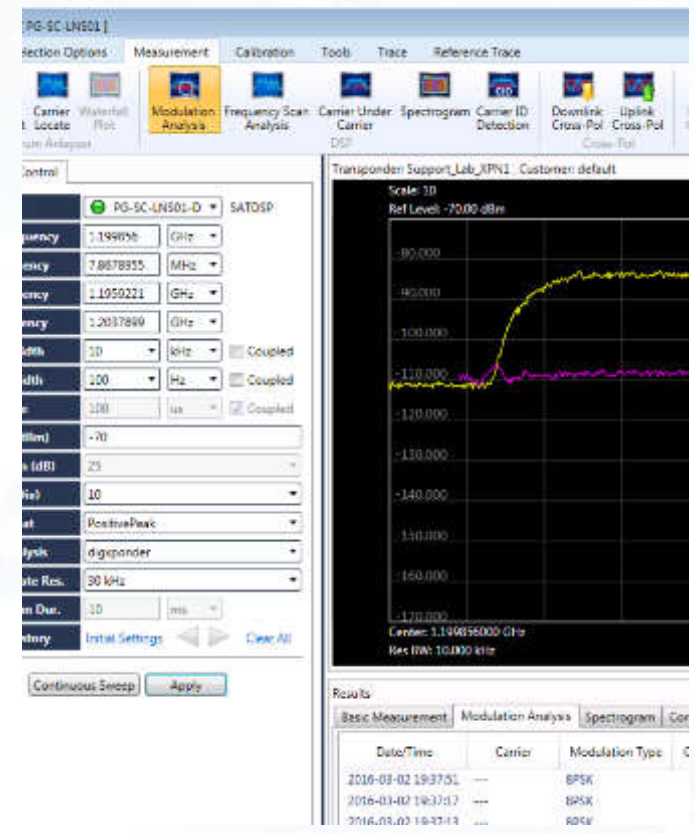
- Multiple bands
- Spot Beams

Non-GSO spacecrafts

- Full motion tracking

User Terminals

- Type approved
- Earth-to-Space Monitoring



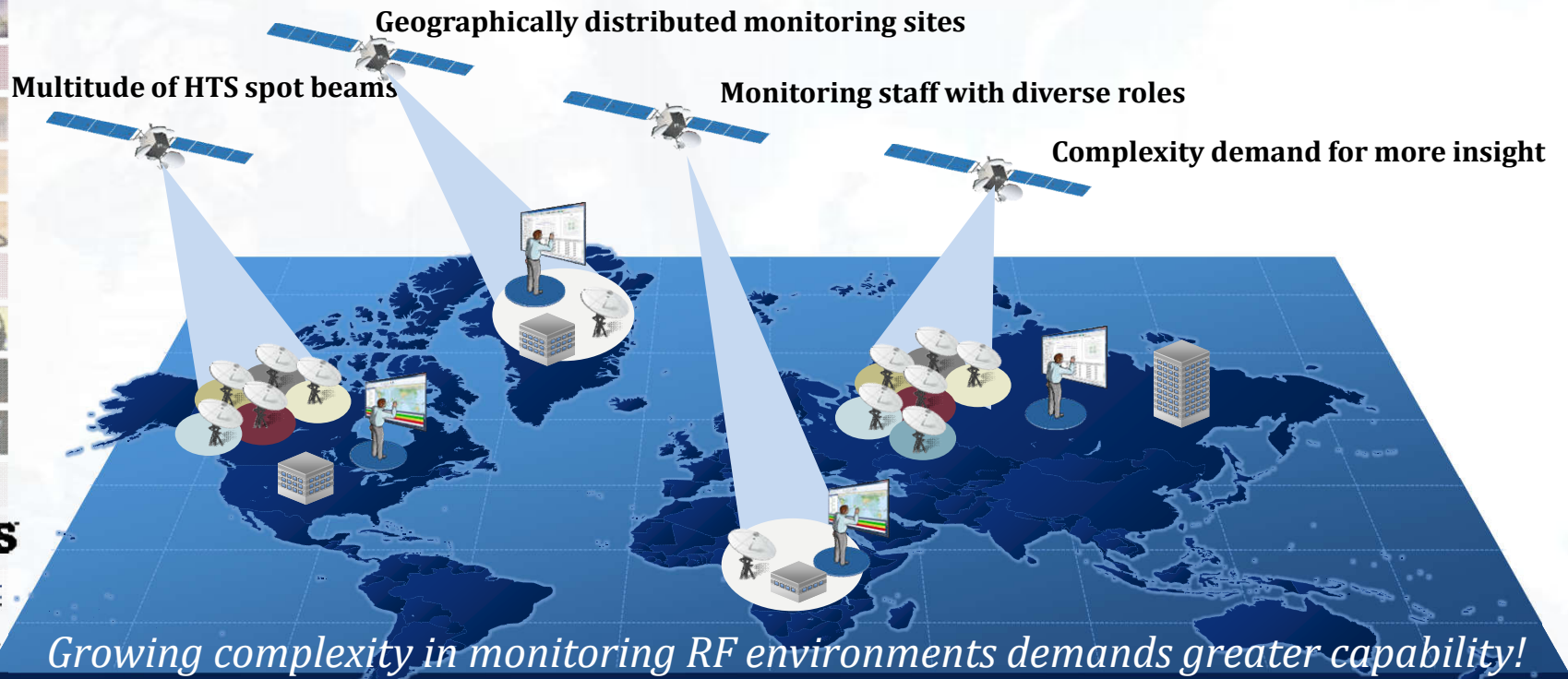
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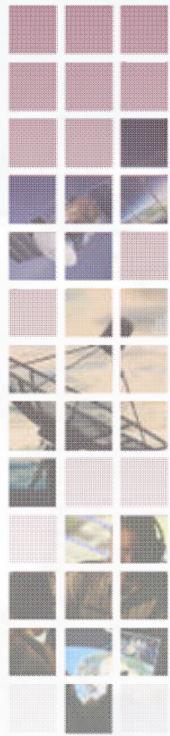
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RF Monitoring an Enterprise Capability



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Global Awareness

Fixed and Mobile Solutions

Airborne Capabilities

Pre-deployment Testing

Signal Cancellation

Innovative Technologies

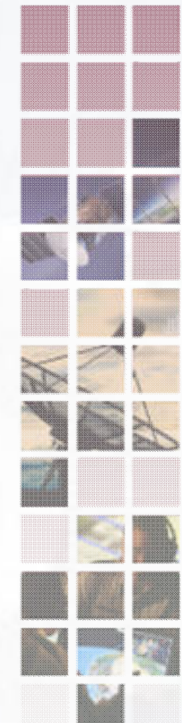


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Centralized Situational Awareness

Allows for a truly Global RF Monitoring effort

- **Multi-layer map view**
 - Situational awareness of monitored satellites, beams and related collateral signals with status of monitoring sites
 - Graphical approach brings immediate value because very little learning is required by the user, and the effected context is readily understood
- **Rapidly go from event to signal analysis**
- **Rapidly declutter alarms and graphical elements**
- **Monitor HTS spot beams**

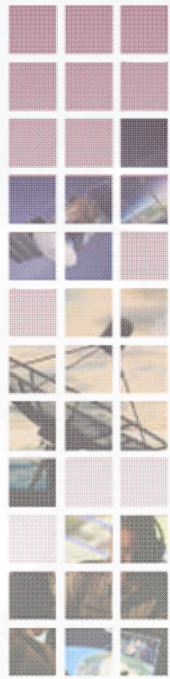


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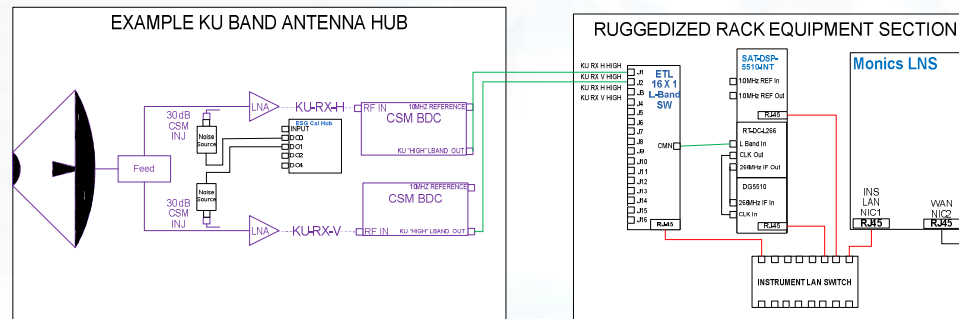
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Transportable Solutions

- Mounted on a ruggedized transportable rack to be deployed within the coverage of the remote/steerable beam to be monitored
- Antenna can be ruggedized too
- Can include frequency conversion
- Connected to central system by either satellite or terrestrial links
- Support from RF over IP technologies



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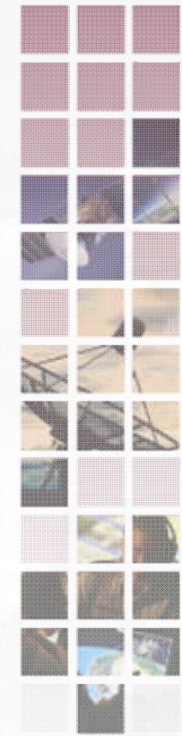
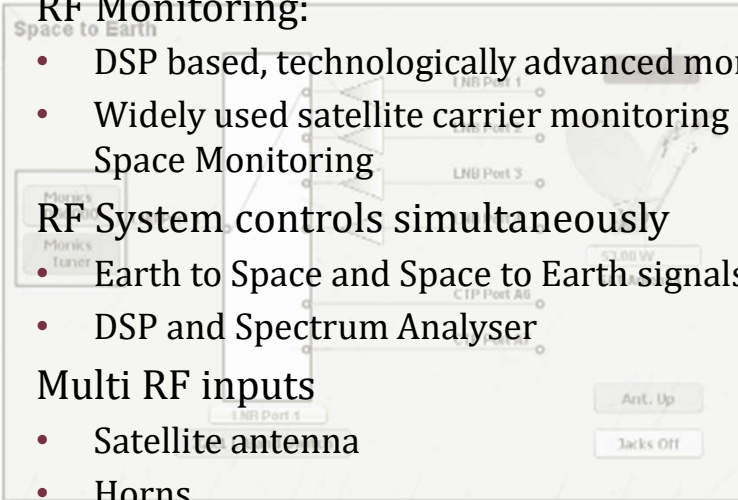
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Mobile Solutions

- **RF Monitoring:**
 - DSP based, technologically advanced monitoring system
 - Widely used satellite carrier monitoring system in Radio Space Monitoring
- **RF System controls simultaneously**
 - Earth to Space and Space to Earth signals
 - DSP and Spectrum Analyser
- **Multi RF inputs**
 - Satellite antenna
 - Horns
 - Omnidirectional antenna
 - External source
- **Networked**
 - System remotely operated
 - Automated data transfer to headquarters (Optional)



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Airborne RF Monitoring Solutions

- Airborne automated RF Spectrum surveillance
- Detect and geotag Radio Frequency (RF) signals transmitted to Earth-to-Space
- Based on a user-defined simple flight plan, the sensor is flown automatically over the target zone and records the power received at the user-defined frequency
- Three phase approach: Planning, Execution, Results and Reporting



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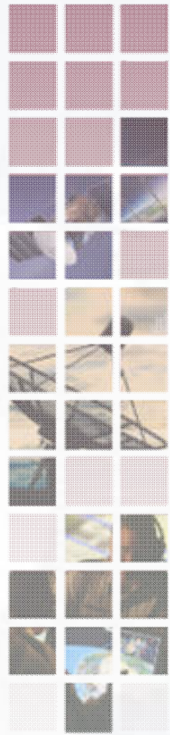
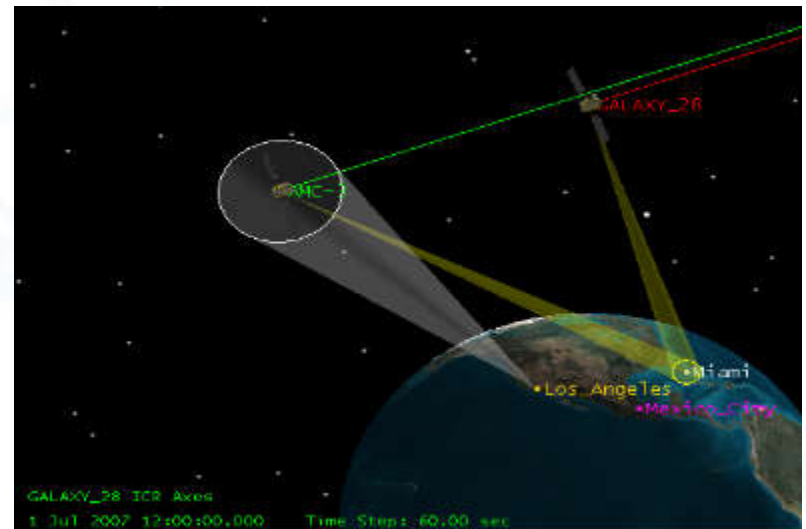
Ecosystem Simulation

Re-creating signals that precisely reflect those encountered in nature:

- Only realistic tests have value
- Physics compliant
- Phase continuous
- Operational environment in the lab
- Accurate and repeatable

Creates scenarios that are otherwise:

- **Expensive** – satellites constellation or different orbits
- **Impossible** – satellite is not launched yet, equipment does not exist yet
- **Disruptive** – cannot jam active satellites
- **Difficult** – worst-case situations are very difficult to create: locations, routes, weather, etc



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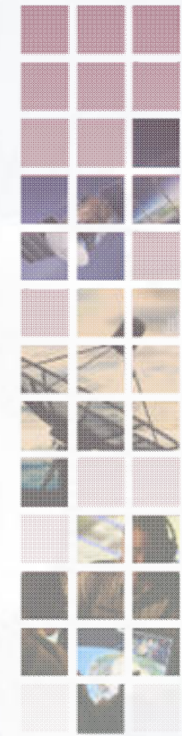
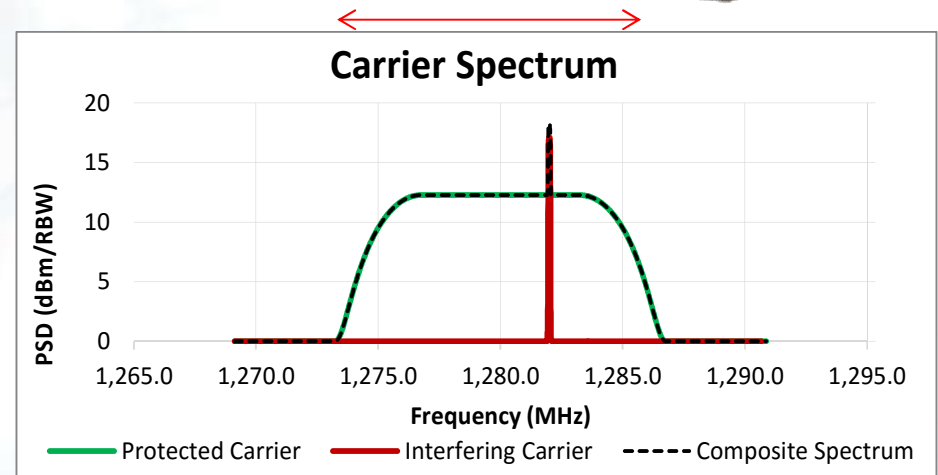
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Signal Cancellation

- L band (900MHz to 2150MHz) Rx input
- IBW:54MHz
- Rx input Return Loss > 15dB (closer to 20dB)
- Integrated phase noise: < 1°
- In band flatness: < 0.5dB over 54MHz
- Input power :-60 dBm to -25 dBm
- Max Operating input: -15 dBm typical (+5 dBm max with no damage)
- CW sweep rate - 5MHz/Sec




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