The Growing Specter of LEO/GEO Interference
The Growing Interference Challenge

RF interference issues:
- More complex
- More price sensitive
- Increasing impact on SLAs

- Millions of VSATS
- Thousands of Small Sats
- Hundreds of GEO satellites
- 100+ New HTS
- Closer Proximity
- Thousands of Small Sats
Significant Small Sat Growth…Along With LEO/GEO Interference

Small Sat Market Growth
• $ 2.28 billion in 2016 to $ 7.66 billion by 2023
• CAGR of 18.8%
• Growth driven by:
  – Rising demand for imaging services
  – Increased Demand for Low Latency Satellite Communications
  – Lower costs
  – Continuing technological advances

*LEO constellation deployments will significantly escalate interference issues with GEO networks.*
History of LEO/GEO Satellite Interference

• Caused when a LEO satellite crosses the path between a GEO earth station and a GEO satellite
• First recognized during an earlier wave of proposed LEO constellations some 20 years ago
• Per the ITU, NGSOs responsible to:
  – Manage power to EPFD limits
  – Repoint beams so as not to interfere with GEO beam footprint
  – Change frequency bands to avoid interfering with GEO transmissions
• Significant increase in the sensitivity of GEO satellites:
  – Enables GEO satellite operators to utilize smaller antennas
  – As LEO satellites also use smaller antennas
  – Smaller antennas have much upside—smaller footprint and reduced costs
  – But, higher side-lobe gain, increases possibility of interference of operational power requirements
Frequency Sharing

• GEO and LEO operators may share Ku/Ka band to optimize frequency
• LEO satellites crossing equator change bands to avoid interfering with GEO sats
Beam Pointing

• In Northern hemisphere, GEO antennas point to their satellite in a mostly southerly direction.
• If the LEO antenna pointing angle intersect the GEO belt, it will create interferences.
• As LEO satellites cross the equator their payload is switched off.
• Once clear of the footprint, the LEO satellite is switched back on.
Power Management

• LEO power management by is another means to avoid LEO/GEO interference
• As satellites become more sensitive, the GEO antennas are getting smaller
  – Which means lower Equivalent Isotropically Radiated Power (EIRP) to the satellite,
  – Less gain on the receive side
  – Side lobe gain of the antenna becomes relatively more susceptible to interference
  – The question is: will EPFD limits for LEO satellites need to be reduced...and, will that power reduction have any negative effect on their ability to adequately perform their mission?
Monitor & Mitigate LEO/GEO Interference

Monics - Monitor LEO/GEO Satellites & Beams
Compass - Monitor & Control all Hybrid Network Devices
Skyminer - Predict Analysis for Performance Issues and Trends

Carrier Monitoring
Device Monitoring & Control
Trend Analysis
Monitoring Makes Good Neighbors

- Comply with EPFD requirements
- Adjust to Doppler effects
- Accurate time stamping
- No degradation to primary spectrum user
- Interference characterization, determine local (terrestrial) interference affecting gateway
Optimize Satellite Operations with Big Data Analytics

• Correlate diverse data sets across the ground station to improve operations

• Analyze data to detect and anticipate failures to minimize service impact to customers

• Evaluate and optimize system design and performance over time for both the space and ground
Thank you
Comprehensive Carrier Monitoring Products

Carrier Monitoring - Monics Net
- Advanced interference identification
- Highly scalable monitoring

Visualization & UAC - Monics Enterprise
- Global map based displays
- Enterprise level user access control

HTS Monitoring - Monics 200
- Cost-effective spot beam monitoring
- Fully featured RF analytics
Compass – Real-Time Monitor & Control

- Reduce time consuming and labor intensive management tasks
- Manage entire hybrid environment
- Grow and scale operations
- Resolve remote site issues faster and decrease costly visits