Ka-band for Non-GSO Satellite Systems - Iridium’s Experience

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History of Iridium

• Concept of an independent global communications network originated at Motorola around 1990
• Plan to build 77 satellites (hence “Iridium”, element with 77 electrons) - later rationalised to 66 satellites
• L-band allocation for user links made at WARC-1992
• Ka-band feeder link allocations made at WRC-1995
• Satellites launched during 1997/98, and service began in late 1998
• Initial service heavily focused on handheld terminals
• Iridium entered Chapter 11 in 1999, emerging again in 2001
• Since 2001, Iridium refocused on industrial applications - now supports a much larger array of users
The Iridium Satellite Network

• 66 cross-linked Low-Earth-Orbit (LEO) satellites provide...
  • High-quality, low-latency voice & data communications
  • Fully global coverage including polar regions
• Fully redundant gateway infrastructure
  • > 99.99% availability
• Single subscriber device works worldwide
Choice of Ka-Band Feeder Links

- Iridium designed as an independent network (intersatellite links)
- Feeder links require very high availability, but existing C-band and Ku-band were heavily congested
- Problem of coordinating LEO satellites with existing satellite links
- Bands had to support:
  - Small spacecraft antenna
  - LEO operations
  - High availability
  - High bandwidth (2 x 200 MHz)
- New Ka-band allocations chosen at WRC-95: 19.3-19.7 GHz (downlink) and 29.1-29.5 GHz (uplink)
  - Ka-band unused at that time
  - Protection of GSO was not applied to these allocations
  - Capacity for multiple NGSO systems
Iridium’s Experience

- Iridium system has operated continuously for more than 15 years
- More than 12 gateways have been constructed, and more to follow
- Feeder links have been shown to be resilient and reliable
  - Single point outages are rare
  - Availability exceeds 99.99%
  - To date, negligible interference events have been experienced
- But increasing numbers of GSO networks seeking coordination
  - GSO networks must fully protect Iridium’s operations
  - In-line interference events cause total loss of link
  - Frequency avoidance is the only workable method identified
Focusing on the Future

Iridium NEXT

Constantly innovating and expanding possibilities

• NEXT program on schedule to begin launching satellites in 2015

• Will maintain current 66 cross-linked LEO satellite architecture
  • Unmatched global coverage
  • Backwards compatibility for all current Iridium services and customers

• Iridium NEXT will enable
  • Enhanced voice and high-speed data services
  • Enhanced IP-based performance and subscriber technology
  • Powerful new services and devices
Conclusions

- Ka-band is a practical and effective satellite band
- Increasing interest in GSO applications
- Coordination is becoming more difficult (like other satellite bands!)
- Frequency avoidance is the only practical way to ensure protection of Non-GSO networks like Iridium