



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

Christopher Snowdon



RELIABLE • CRITICAL • LIFELINES

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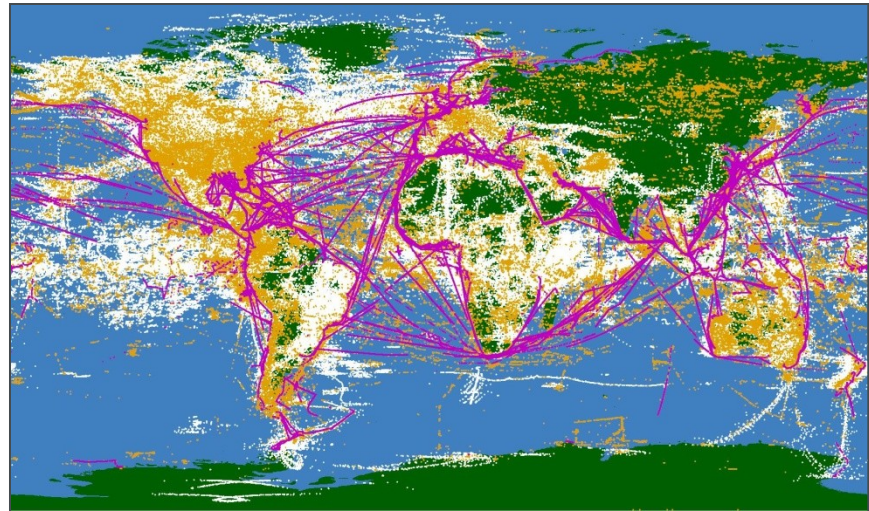


History of Iridium

- 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

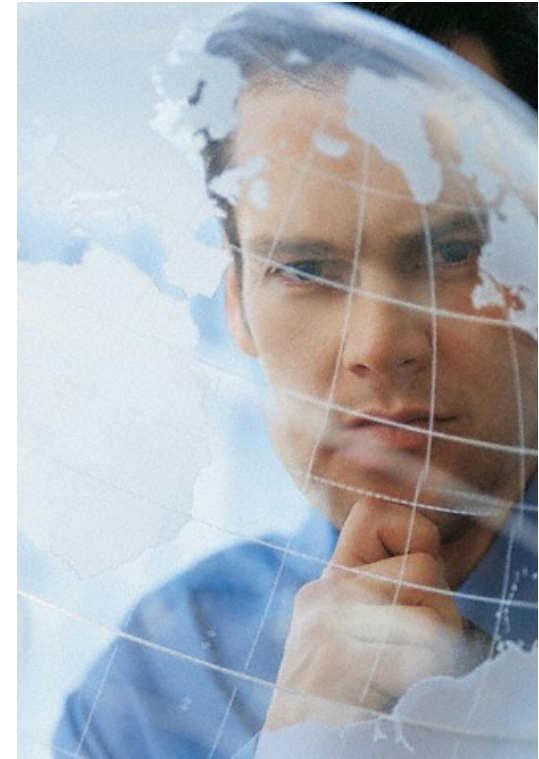
- Iridium system has operated continuously for more than 15 years
- More than 12 gateways have been constructed, and more to follow
- Feeder links have been shown to be resilient and reliable
 - Single point outages are rare
 - Availability exceeds 99.99%
 - To date, negligible interference events have 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

