

ATTACHMENT 4



Meeting with FCC International Bureau June 6, 2007



Meeting Agenda

- ☐ RaySat Background
- ☐ Regulatory Milestones
- ☐ Protection of Adjacent Satellites
- ☐ Comments on the Application
- ☐ Request for Waivers
- ☐ Effect of VMES Rulemaking
- ☐ Other Issues
- ☐ Conclusion

RaySat Background

- RaySat has developed an affordable low-profile, vehicle-mounted, mobile broadband earth station
 - Transmit operations in Ku-band LMSS spectrum (14.0-14.5 GHz) on a secondary basis
 - Receive operations in 11.7-12.2 GHz band on an unprotected, non-interference basis
- Main users are military and government entities
 - U.S. Military / National Guard
 - FBI, DOE and other agencies
- Other applications
 - Trains
 - News organizations

RaySat Background (cont'd)

- ❑ Deployment of RaySat's low-profile antenna (height < 6") is critical
- ❑ Significant benefits of a low-profile antenna
 - Force protection (low RCS, inconspicuous, etc.)
 - Vehicle accessibility (minimizes vehicle height)
 - Ease of installation and operation
 - Light weight, low power
 - Transportable/deployable in the field
 - Affordable

RaySat Background (cont'd)



RaySat's low-profile StealthRay antenna and larger, parabolic antennas

Regulatory Milestones

□ Experimental Licensing

- Experimental STA - March 2005 (WC9XCU)
- Experimental STA - June 2005 (same)
- Experimental License - August 2005 (WD2XTB, expires August 1, 2007)
- Experimental modification to add Limited Market Study authority - January 2006 (same)

□ International Bureau

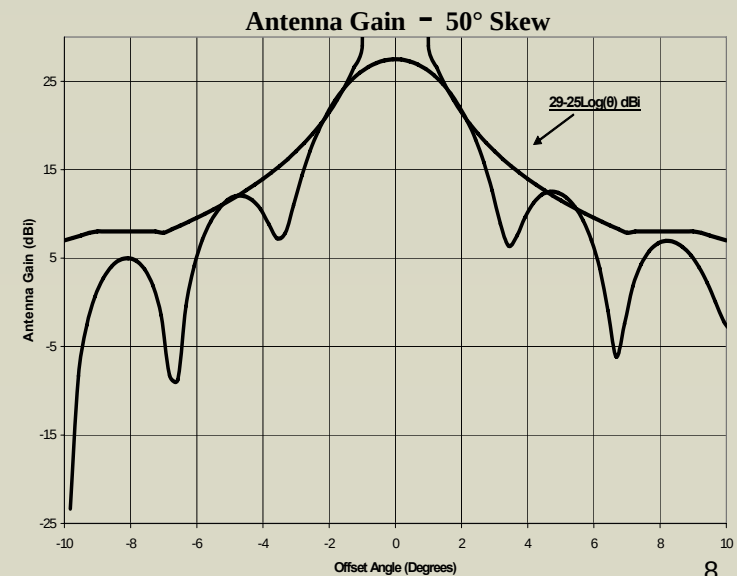
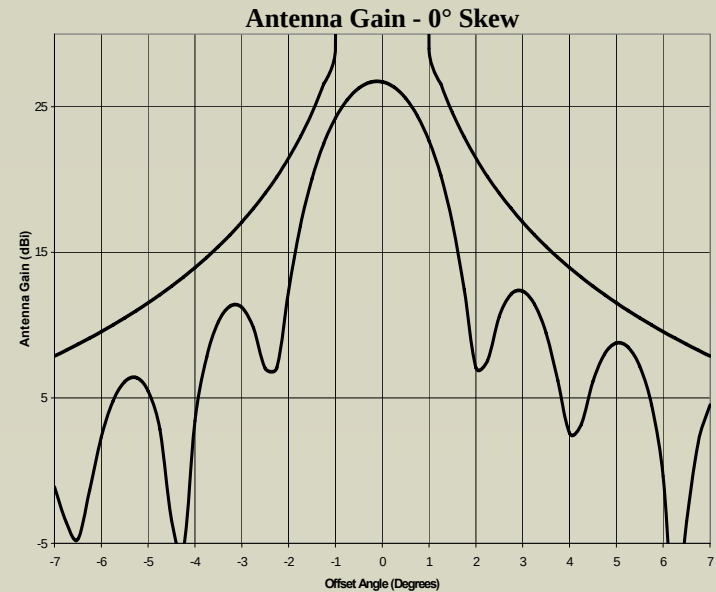
- LMSS blanket license application - filed March 2006 (pending)

Protection of Adjacent Satellites

- RaySat fully protects primary FSS operations
 - Antenna characteristics and transmit power levels carefully designed to prevent harmful interference to adjacent satellites
 - Automated satellite acquisition and closed-loop tracking ensure off-axis EIRP along the GSO remains within prescribed levels
 - Cessation of emissions within 100ms if tracking error exceeds 0.5° precludes any possibility of harmful interference
- RaySat's operations have been fully coordinated by satellite operators
 - Seven proposed satellite points of communication coordinated with twenty satellites within $\pm 6^\circ$ of their orbital locations
- No instances of interference in more than two years of demonstrations and testing

Protection of Adjacent Satellites (cont'd)

- ❑ Antenna Tx panel is asymmetrical:
23" in the horizontal plane
3.25" in the vertical plane
- ❑ "Skew angle" is the offset between the longest axis of the antenna and the GSO arc
- ❑ Larger skew angles cause a larger contribution from the vertical component, thus broadening the antenna pattern
- ❑ 50° skew angle is the worst case expected for CONUS coverage

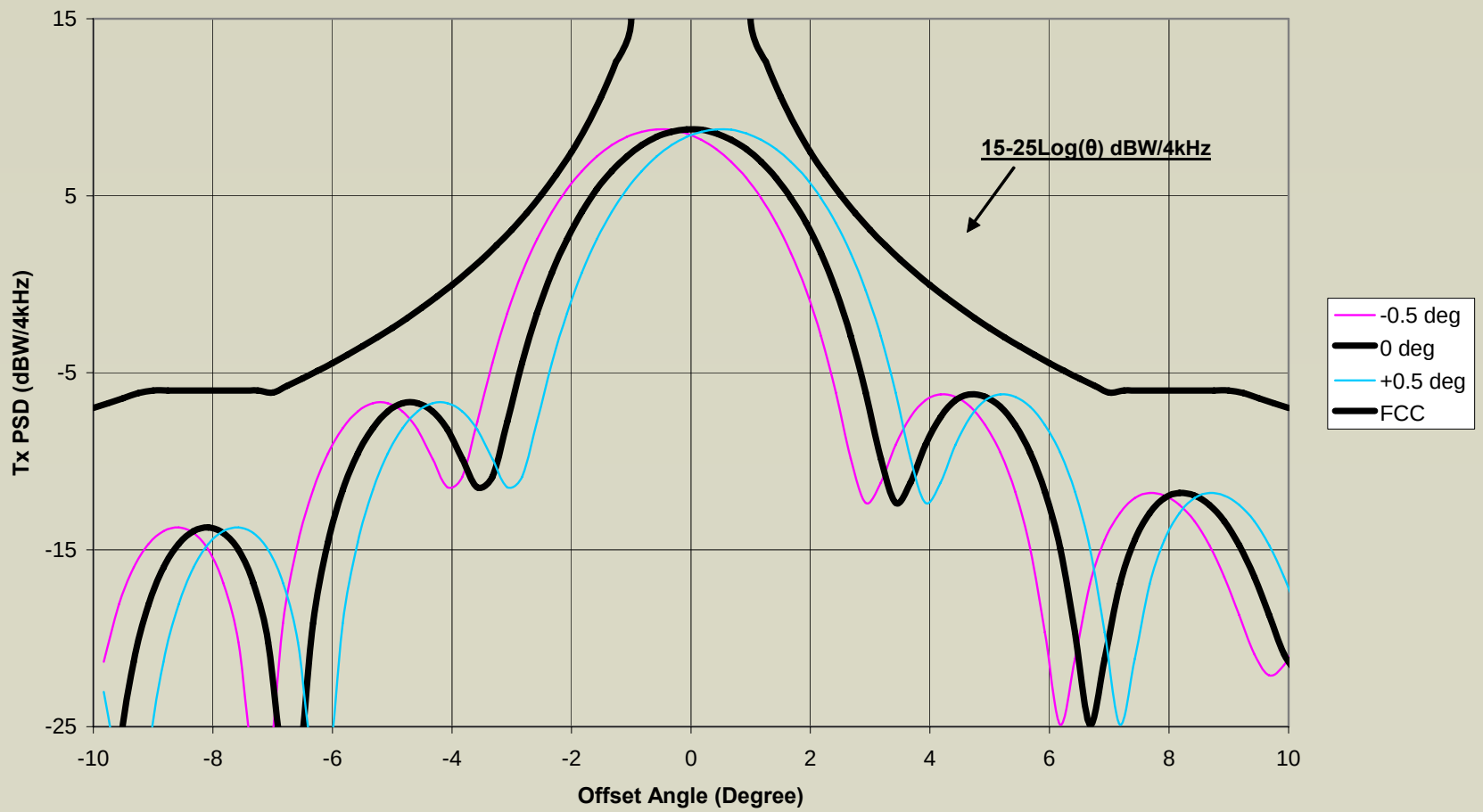


Protection of Adjacent Satellites (cont'd)

- ❑ Off-axis EIRP density levels may not exceed the following mask (resulting from maximum VSAT input power density of Section 25.134(a) into a Section 25.209(a) compliant antenna):
 - $15 - 25\log(\theta)\text{dBW/4kHz}$ for $1.25^\circ \leq \theta \leq 7.0^\circ$
 - -6dBW/4kHz for $7.0^\circ < \theta \leq 9.2^\circ$
 - $18 - 25\log(\theta)\text{dBW/4kHz}$ for $9.2^\circ < \theta \leq 48^\circ$
 - -24dBW/4kHz for $48^\circ < \theta \leq 180^\circ$
- ❑ RaySat antenna uses a maximum flange power density of -18.1 dBW/4kHz
- ❑ Off-axis EIRP density levels at 50° skew angle confirm no possibility of harmful interference

Protection of Adjacent Satellites (cont'd)

Off-Axis EIRP Spectral Density at 50° Skew - 14.25 GHz (+/- 0.5° Pointing Error Shown)



Protection of Adjacent Satellites (cont'd)

- ❑ Fully automatic satellite acquisition and tracking -- no user action required
- ❑ Tracking Methodology
 - Closed-loop system tracks on downlink carrier
 - In the elevation plane, two tracking beams are generated
 - In the azimuth plane, dithering used to determine peak signal strength
 - Gyros determine satellite position and the antenna's angular position

	<u>Azimuth Axis</u>	<u>Elevation Axis</u>
Maximum Velocity	60 deg/s	72 deg/s
Maximum Acceleration	400 deg/s ²	>1,000 deg/s ²
Travel Range	360° continuous	20° – 70°

Comments on the RaySat Application

- Viasat filed comments raising three main issues:
 - Unspread signal without centralized NOC may cause interference
 - Pointing accuracy of the unspread signal may cause interference
 - Link budgets are not viable
- RaySat has fully responded to these issues:
 - Centralized network control is unnecessary
 - Unspread signal's off-axis EIRP density complies with FCC rules
 - RaySat's network, similar to VSAT networks, does not require a centralized NOC to ensure interference-free operation
 - All terminals controlled through sophisticated hub earth stations
 - Unlike other networks, RaySat takes pointing error into account and is always compliant with 2° spacing requirements (even when mispointed at 0.5°)
 - Supplemental link information and more than two years of operational experience confirm the service is robust

Request for Waivers

- ❑ RaySat requested waivers of 47 C.F.R. §25.209(a)(1) and (a)(2); also requested “catch all” waiver of other rules necessary for grant
- ❑ Waivers would strongly serve the public interest and would not undermine the purpose of the rules
 - Permits introduction and use of advanced LMSS antennas with no adverse interference consequences
 - Section 25.209(a)(1) waiver requested out of an abundance of caution
 - ❑ Non-conforming antennas permitted under Section 25.220(c)
 - ❑ Off-axis EIRP levels confirm no possibility of interference
 - ❑ RaySat’s operations have been fully coordinated
 - ❑ Antenna gain and PSD patterns
 - Section 25.209(a)(2)
 - ❑ RaySat will coordinate with any future Ku-band NGSO service provider to ensure that there will be no harmful interference

Effect of VMES Rulemaking

- Secondary LMSS $\neq$ Primary VMES
 - LMSS must not cause harmful interference to and must accept interference from primary FSS operations
 - Constraints imposed through satellite operator coordination will ensure no harmful interference
- Consideration of the VMES NPRM should not delay or otherwise affect RaySat's application
- If RaySat seeks co-primary VMES status in the future, it will comply with rules adopted in the VMES proceeding or request appropriate waiver

Other Issues

- ❑ NASA and NSF Coordination
 - Coordination agreements completed and signed
 - Antennas will automatically mute transmission when located within exclusion zones
- ❑ Application Amendment
 - Change in applicant
 - Reduction in number of antennas
 - Additional technical information (as required)
- ❑ International Bureau Questions

Conclusion

- ❑ RaySat's proposed LMSS operations have been fully coordinated, will not cause harmful interference and should be authorized promptly
- ❑ The pending VMES proceeding should have no impact on FCC consideration of RaySat's LMSS application
- ❑ RaySat will provide any additional information necessary to facilitate expeditious grant of its application