



***PROTECTION OF PRIMARY FIXED-SATELLITE SERVICE FROM
PROPOSED SECONDARY AIR-GROUND MOBILE SERVICES
IN 14.0-14.5 GHz***

December 3, 2013

Satellite Uplinks in 14.0-14.5 GHz are Sensitive to Interference

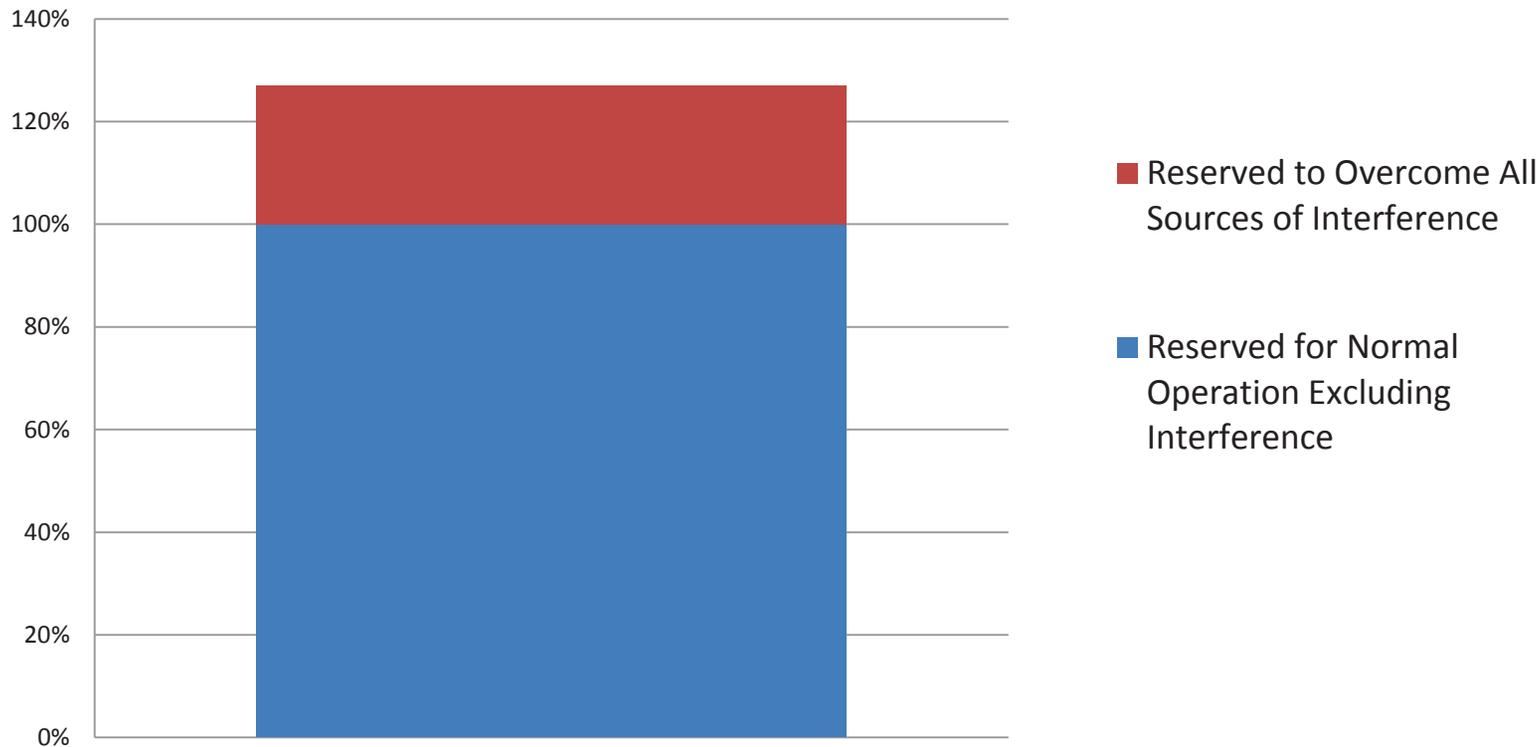


- 14.0-14.5 GHz band is the primary VSAT uplink band used in the USA and most other countries of the world.
- VSATs provide critical infrastructure.
- Transmitting VSAT uplinks typically connect back to large receiving earth stations (hubs) so the VSAT-to-satellite link is the critical link with the lowest C/N value.
- VSATs transmit the minimum power to close the link effectively for cost, safety and ASI (2° spacing) interference reasons.
- VSAT uplinks are therefore very sensitive to interference such as would be caused by the proposed AMS service.

Summary of ITU Recommendation S. 1432-1 (1)



Satellite System Power Planning

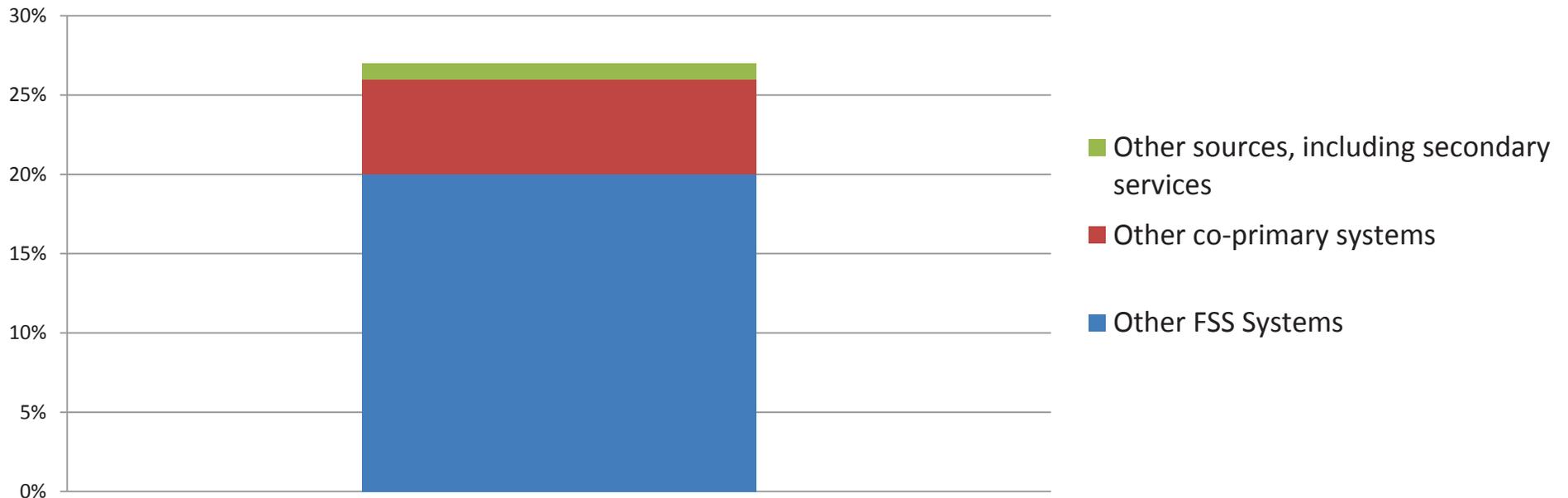


In order to limit signal degradation due to interference, the ITU recommends that FSS satellite systems (including those in the 14.0-14.5 GHz band) account for a **maximum allowable aggregate interference of 27% of clear-sky satellite system noise.**

Summary of ITU Recommendation S. 1432-1 (2)



Allotted Portion of Aggregate Interference Budget by Emission Source



- Of the 27% aggregate interference that existing and future FSS satellite systems are supposed to withstand under S.1 432-1, **only 1% is allocated to all non-primary sources of interference**
- In the WRC-15 prep process, the U.S. position is that when there are multiple secondary services in a single frequency band, this 1% increase in interference should be apportioned between the secondary services
- If non-primary services collectively cause more than the 1% of aggregate interference they are allotted by the ITU, FSS operators' ability to manage interference from other co-primary systems such as other FSS systems will be degraded

Summary of ITU Recommendation S. 1432-1 (3)



Recommendation Annex 1, paragraph 4: “Error performance and availability degradations due to frequency sharing on a non-primary basis”

“There are no Recommendations pertaining to the amount of interference that a digital satellite circuit will receive from systems that share frequencies on a non-primary basis. Since, according to the RR, non-primary allocated services and all other emissions must operate on a non-interference basis, allotting 1% of the satellite system noise to these non-primary sources of interference should adequately accommodate these interferers.”

SIA Conclusion – Allowing aggregate interference to FSS from AMS licensees and other non-primary users to exceed 1% would be inconsistent with ITU Recommendation S. 1432-1 and with the stated U.S. government position at the ITU

Protection of GSO FSS (1)

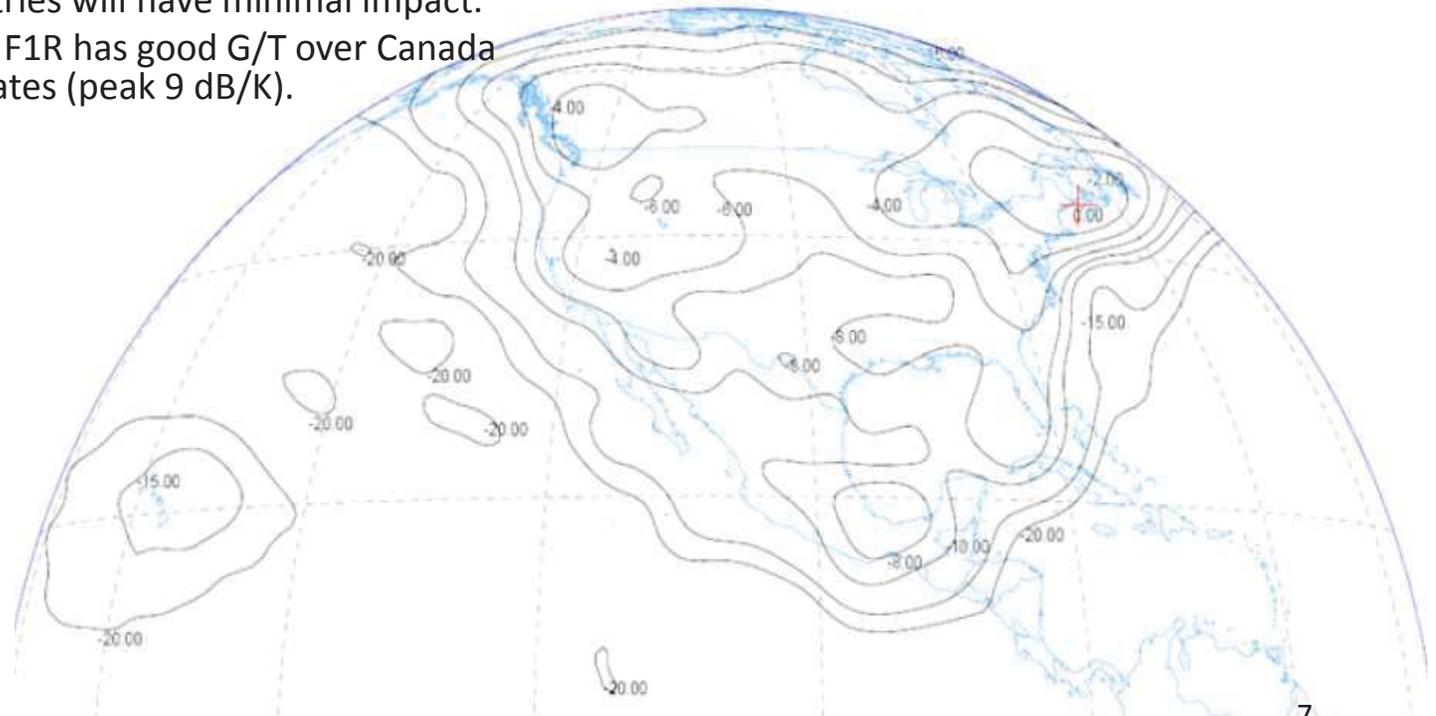


- No more than 1% $\Delta T/T$ should be caused by all non-primary sources of interference into the primary FSS. (ITU-R Rec. S.1432)
- Not appropriate to allocate the entire 1% allowance to the proposed secondary AMS when:
 - AMS will not be the only non-primary source of interference in various parts of 14.0-14.5 GHz.
 - Possibility of future non-primary services in 14.0-14.5 GHz in the U.S. or in neighboring countries (including expansion of secondary AMS into Canada or Mexico).
 - Apportionment of the 1% is consistent with U.S. international positions.
- Any rules for the proposed secondary AMS must establish:
 - Enforceable aggregate interference limit of no more than 0.33% $\Delta T/T$ for GSO FSS.
 - Enforceable single-entry interference limits for AMS ground stations and aircraft terminals based on this aggregate interference limit.

Protection of GSO FSS (2)



- Other non-primary services in 14.0-14.5 GHz:
 - Federal Space Research Service in 14.0-14.2 GHz.
 - Federal Fixed and Mobile in 14.4-14.5 GHz.
- Possibility of future non-primary services, e.g. secondary AMS in Canada or Mexico
 - Qualcomm incorrect that secondary AMS in neighboring countries will have minimal impact.
 - For instance, Anik F1R has good G/T over Canada and the United States (peak 9 dB/K).



Contours show relative gain below peak in dB.

Protection of NGSO FSS



- The 1% $\Delta T/T$ criteria for protection of GSO FSS from all non-primary sources of interference applies equally to the protection of NGSO FSS systems
- The 6% $\Delta T/T$ criteria proposed by Qualcomm into NGSO FSS is wholly inappropriate
 - 6% $\Delta T/T$ is typically the threshold level of interference allowed from co-primary FSS operations without triggering coordination
- Just because an NGSO FSS system is not in operation today in the 14.0-14.5 GHz band does not justify a reduction in the protection criteria for primary FSS from non-primary services
 - Secondary services must protect both existing and future primary FSS deployments, including future primary NGSO FSS systems