

Adjacent Satellite Interference Protection in the Ka-band: Proposed Revisions to 47 CFR, Part 25

**Proposals of:
QUALCOMM Incorporated**

**Presented to FCC
Office of Engineering and Technology (OET)
Mr. Ed Thomas**

December 9, 2003

QUALCOMM'S FOCUS TODAY

- **QUALCOMM's proposal within Part 25 rulemaking for a new rule governing adjacent satellite interference in the Ka-band which utilizes statistical methods to control adjacent satellite interference:**
 - **Ka-Band Terminals Routinely Processed:**
 - **Part 25.138(a) – Blanket Licensing Provisions**
 - **Our business interest and focus is Ka-band**
 - **Current rule has an absolute limit for 100% of the time**
 - **To accommodate new technologies and recognize actual system and user behavior, statistical methods are needed.**
 - **A new rule would be technologically neutral and permit high-capacity Ka-band broadband satellite systems**
 - **Ku-band Terminals Routinely Processed:**
 - **Part 25.134 – Blanket Licensing Provisions**
 - **Prior proceedings addressing statistics were in the Ku-band**

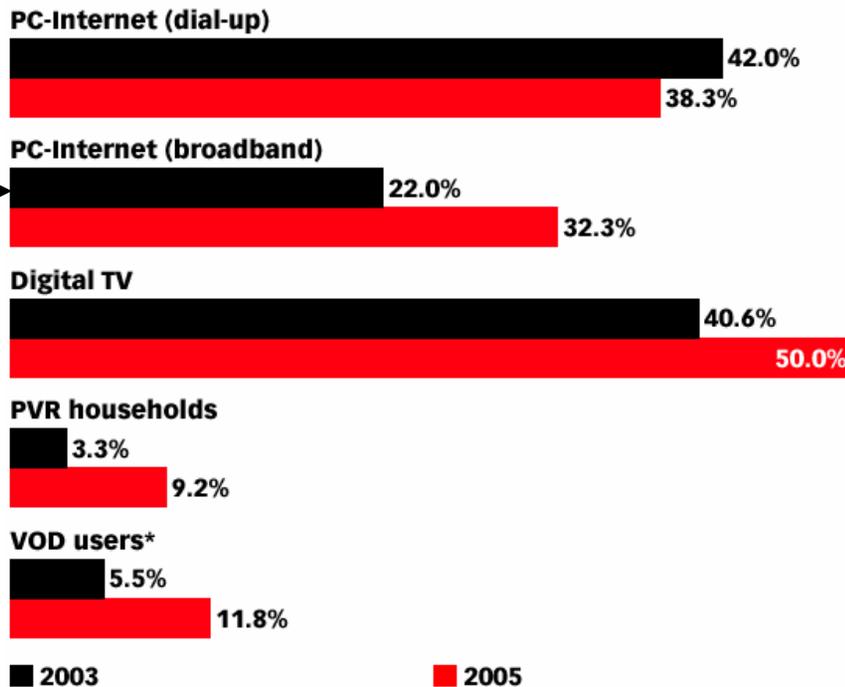
- The Public Interest -

What's Happening in the Broadband Market Place?

- **Broadband service growth rate in urban homes is progressing rapidly.**
 - **22%** of U.S. homes now have high speed cable or DSL Internet access service (source: eMarketeer).
 - New installation growth rate is currently greater than **25%** per year.
- **Cable companies have established a service expectation which bundle DTH video with high speed Internet access.**
- **A strong public mandate exists to eliminate the “digital divide.”**
 - FCC is required by Congress to periodically report on U.S. industry progress in providing “*advanced telecommunications capability*” to **all** Americans.

Broadband Internet Penetration (DSL + Cable Modem)

US Household Penetration of Digital TV, Dial-Up & Broadband Internet, Personal Video Recorders (PVRs) and Video-on-Demand (VOD), 2003 & 2005 (as a % of total households)



Market Surveys →
For 2003 Range
From 16% to 28%

Note: *Households purchasing at least one VOD or SVOD program per month

Source: eMarketer, August 2003

What's Happening in the Broadband Market Place? (2)

- **Satellite systems are a highly efficient and economic means of providing affordable services to areas of low population density in the foreseeable future.**
- **QUALCOMM is developing advanced broadband technologies and has an interest in this proceeding.**

Why Will Statistical Methods in Future Telecom Systems Have to be Considered?

- **In order to adapt to these dynamic requirements, telecommunications systems have been developed which:**
 - **Adjust channel conditions according to user demand**
 - **Account for natural variations in traffic level and link signal conditions (e.g., propagation / environmental changes)**
 - **Adapt to the variable delays encountered when connecting to the Internet**
- **THUS . . .**

Why Statistical Methods In Future Telecom Systems are Inevitable?

- Data rates within a channel vary with time.
- Data rates of users sharing “channels” (FDMA, TDMA or CDMA) and system resources are different even at the same instant.
- Transmission times and delays vary within a channel.
- EACH OF THESE FACTORS INTRODUCE ONE TO MANY RANDOM VARIABLES INTO THE DATA SYSTEM PROVIDING CONNECTIVITY.
- If satellites are to play a significant role in *broadband services* they must adapt to and support this reality.

- Other Regulatory Proceedings –
(We Were Not the First to Notice)

A Key Commission Rulemaking:

RM-9864; Adopted December 6, 2000

- **This Report & Order was made after considering a petition for declaratory ruling filed by Spacenet, Inc.**
- **Spacenet argued that it's VSAT Ku-band terminals, operating in "slotted Aloha" access mode, do not violate the spirit of Part 25.134 of the Commission's rules.**
- **Aloha relies on statistical probability calculations to limit the number and duration of simultaneous transmissions.**
- **Spacenet further argued that in an Aloha system when two or more users simultaneous transmit, the adjacent satellite ESD limits are exceeded but, "for no more than tens of milliseconds."**

A Key Commission Rulemaking (2):

RM-9864

- **The request for rulemaking was put on Public Notice.**
- **Other satellite operators (incl. Hughes and PanAmSat) filed comments, generally supporting the use of random multiple access techniques, and the use of statistical methods to govern adjacent satellite interference conditions.**
- **Aloha Networks also filed comments regarding their particular approach to using Aloha methods of communications and statistical means of treating adjacent satellite interference.**
- **Exact agreement among satellite operators was not reached at the time, however, general consensus was achieved that Aloha technology, as practiced by satellite operators, does NOT cause harmful interference to adjacent satellites.**

A Key Commission Rulemaking (3): RM-9864

- **The Commission declined to adopt any declaratory ruling at that time, stating that:**
 - **Slotted Aloha cannot be construed to comply with the letter of Section 25.134 if each terminal transmits at maximum power density.**
 - **The Commission would address these issues in a forthcoming rulemaking.**
- **However, the Commission adopted a waiver allowing VSAT operators in the Ku-band to continue using the Aloha and slotted Aloha random access techniques.**

The Importance of the RM-9864 Rulemaking

- **Aloha Network Systems, in proposing an alternative random access method, is an excellent “example case” of the need for addressing a statistically based rule for adjacent satellite interference.**
- **We maintain that Aloha Networks technology is one of many the FCC will be seeing in a plethora of future applications. Many of these new technologies, by necessity, will use channel multiplexing where the power in the channel will vary randomly with time.**
- **Since this issue was not addressed head-on in Dec. 2000 by the Commission, it now becomes more important to do so, as technology has moved on in a direction that makes a statistical rulemaking governing ASI even more important.**

The Importance of the RM-9864 Rulemaking (2)

- **At the time of this ruling, perhaps the Commission had no option but to grant waivers to the existing satellite operators using Aloha random access technology. Such a waiver however, has the effect of blocking new technology entrants into the marketplace while it “grandfathers” existing operators and blocks new technology that could improve spectral efficiency and increase system capacity.**
- **This all points to the need for a broader rule that is statistically based and that will “level the playing field.”**
- **The Continuation of this debate brings us to the instant modifications to Part 25 as contemplated by IB docket No. 00-248.**

Related Rulemakings Involving Systems Behaving in a Statistical Manner

- **The Skybridge NGSO/FSS system initiative resulted in modifications to Part 25.208(g)-(h).**
- **The power flux densities given there represent a cumulative distribution function of PFD values.**
 - **But, the PFDs are “capped” at the high end**
- **These values are applicable to the Ku-Band FSS allocation.**
- **The adopted rules did not fully embrace a statistical approach.**

There is Related International Interest in Addressing Statistically Based Methods of Interference Evaluation

- **The ITU-R Study Group 4A, has adopted a study question 208/4 which deals specifically with statistical and stochastic methods of dealing with interference between satellites:**
 - **“Use of statistical and stochastic methods in evaluation of interference between satellite networks in the fixed-satellite service.”**
 - **This recognizes the need to utilize such approaches in the development of interference rules.**

Conclusions

- **Contemporary satellite communication systems require statistical regulatory treatment:**
 - **As QUALCOMM has attempted to demonstrate, the requirements for a statistically base rule is broader than has been previously contemplated by showings in the public record.**
 - **An innovative approach to statistical methods is required.**
 - **It is possible to draft broad rules that are technology-neutral yet address the statistical nature of contemporary satellite communications systems.**
 - **Such rules can (and must) apply to routinely licensed small satellite terminals.**
 - **Technology which have statistically variable characteristics make very efficient use of spectrum resources and result in higher capacity systems.**

- Supplementary Slides -

Specific Proposed Rule Change:

- Part 25.138 (a)(1):

The total number of simultaneously transmitting co-frequency GSO FSS earth stations operating in one uplink beam may generate an off-axis EIRP spectral density for co-polarized signals (when directing their power within $\pm 3^\circ$ of the GSO arc and under clear sky conditions) in accordance with Figure 25-XXX.

The maximum duration for which the total co-channel adjacent satellite EIRP spectral density may exceed A shall not exceed 1.0 second.

θ : is the average value of the angle, in degrees, measured from the axis of the main lobe of the earth station antennas to the direction of the potential victim space station.

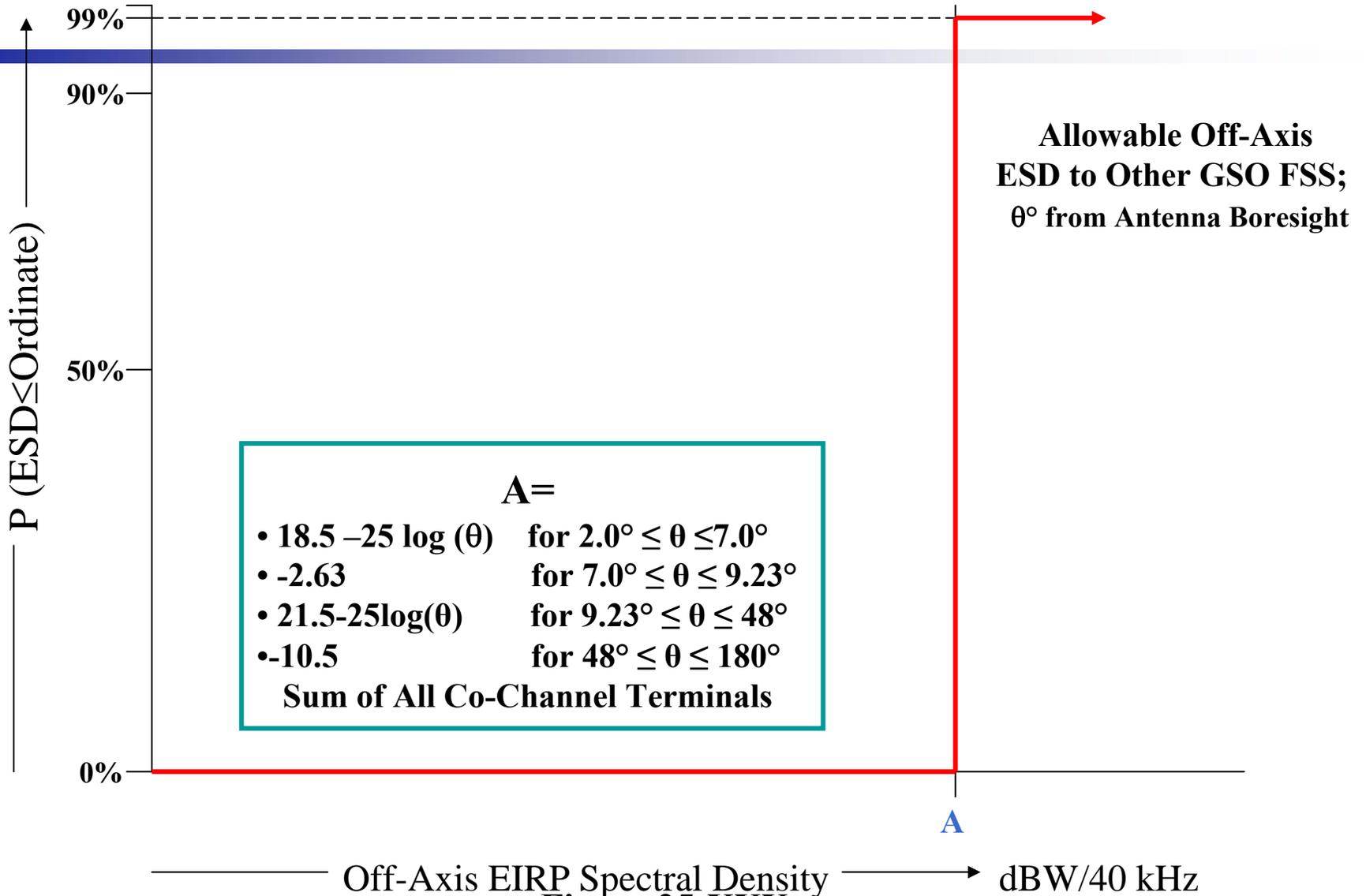


Figure 25-XXX