Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of Row 44, Inc. Application For Authority To Operate Up To 1,000 Technically-Identical Aeronautical-Mobile Satellite Service Transmit/Receive Earth Stations Aboard Commercial And Private Aircraft	)	FCC File No. SES-LIC-20080508-00570 Call Sign: E080100

PETITION TO DENY OF VIASAT, INC.

ViaSat, Inc. ("ViaSat"), pursuant to Section 309(d) of the Communications Act, as amended, and Section 25.154 of the Commission's rules,[1] petitions the Commission to deny the application of Row 44, Inc. ("Row 44") for authority to provide aeronautical-mobile satellite service ("AMSS") in the Ku-band ("Application"). Row 44 seeks to deploy this service through aeronautical earth stations ("AESs") located on commercial airplanes that would travel to, from and within the 48 contiguous states, Alaska, and Hawaii. ViaSat has substantial business interests in the operations of "traditional" VSAT networks, as well as the developing Ku-band AMSS industry. In fact, ViaSat itself holds a Commission license to provide AMSS services in the Ku-band.[2] As such, ViaSat has a distinct interest in ensuring that no authorized AMSS system poses an interference risk to existing Ku-band satellite operations.[3]

---

1 47 U.S.C. § 309(d); 47 C.F.R. § 25.154.

2 *See ViaSat, Inc. Application for Blanket Authority for Operation of 1,000 Technically Identical Ku-Band Aircraft Earth Stations in the United States and Over Territorial Waters*, 22 FCC Rcd 19964 (2007) ("*ViaSat AMSS Authorization Order*").

3 Accordingly, ViaSat has standing to file this Petition to Deny. *See FCC v. Sanders Brothers Radio Station*, 309 U.S. 470 (1940).

As explained below, Row 44's Application is materially incomplete. Moreover, Row 44 fails to demonstrate that its proposed AMSS system would be two-degree compatible. Accordingly, ViaSat respectfully requests that the Commission deny the Application.

I. INTRODUCTION AND BACKGROUND

In 2003, the Commission created a secondary allocation for mobile-satellite services, including AMSS, in the 14.0-14.5 GHz uplink band.[4] At present, there are no specific Commission service rules governing the licensing or operation of AMSS in the 14.0-14.5 GHz band, and there is no domestic allocation for AMSS in the 11.7-12.2 GHz downlink band. During the pendency of a rulemaking proceeding that seeks to address those issues, the Commission has applied its rules for very small aperture terminals ("VSATs") in the fixed-satellite service ("FSS") in evaluating applications for authority to provide AMSS, paying particular attention to the off-axis power density and antenna pointing concerns presented by the use of mobile AESs in the Ku-band.[5]

Row 44's Application seeks authority to provide AMSS in the Ku-band using the Horizons-1, AMC-2, and AMC-9 geostationary satellites. Included in the Application is a lengthy exhibit entitled "System Description and Technical Information" ("Row 44 System Description"). Significantly, that exhibit omits forward link budgets and elevation patterns for the proposed AES antenna.

---

4 *Amendment of Parts 2, 25, and 87 of the Commission's Rules to Implement Decisions from World Radiocommunication Conferences Concerning Frequency Bands Between 28 MHz and 36 GHz and to Otherwise Update the Rules in this Frequency Range*, 18 FCC Rcd 23426, at ¶ 76 (2003).

5 *See, e.g., ViaSat AMSS Authorization Order* at ¶ 11 ("Although not directly applicable to AESs, the Commission's rules for Fixed-Satellite Service (FSS) earth stations provide guidance as to the technical criteria for evaluating AESs' off-axis e.i.r.p. density.").

II. THE APPLICATION IS INCOMPLETE AND SHOULD BE DISMISSED AS DEFECTIVE

As an initial matter, the Application is incomplete, and as such should be dismissed as defective. Among other things, Row 44 fails to provide representative link budgets for both segments of the proposed communications link, which are essential to permit the Commission and the public to assess whether the proposed system would comply with the Commission's rules and operate as described. Row 44 includes only two link budgets in its Application, both of which are return link budgets that assume a remote AES located over the vicinity of Fairbanks, Alaska using the Horizons-1 satellite. While Row 44 claims that these links budgets are "examples,"[6] it makes no attempt to show that these examples are *representative* of the operations of the proposed system. In fact, they are not.

First, Row 44 fails to include any forward link budgets (the communications link from the hub to the remote terminals on the airplanes). Second, Row 44 does not include any link budgets for communications over two of the proposed satellites – AMC-2 and AMC-9 – and does not claim that the operational parameters of these satellites are identical to those of Horizons-1. Third, Row 44 does not include link budgets that represent the differences in the coverage pattern of Horizons-1 over North America, even though, as explained in the attached Technical Annex, the operational parameters of the proposed system over Horizons-1 would change markedly across the proposed service area. Simply put, the link budgets included in the Application are insufficient to allow the Commission to conclude that the proposed system would be compatible with a two-degree spacing environment.

---

6 Row 44 System Description at 11.

In addition, Row 44 fails to supply any transmit elevation patterns, despite the requirement in Section 25.132(b) of the Commission's rules to submit such patterns.[7] Understanding the performance of the proposed antenna in the elevation plane is critical in the case of an AES because of the way that an airplane banks, turns, and otherwise changes direction during flight. While such an omission would give cause for concern under any circumstances, the omission of these transmit elevation patterns is particularly troubling here because Row 44, unlike other AMSS applicants, has not demonstrated that it has conducted extensive transmit/receive flight testing of its proposed antenna to establish that its AMSS system can operate on a moving platform with significant pitch, yaw, and roll without causing harmful interference into adjacent satellite operations.[8]

III. ROW 44 FAILS TO DEMONSTRATE THAT ITS PROPOSED AMSS SYSTEM WOULD BE TWO-DEGREE SPACING COMPATIBLE

Row 44 fails to demonstrate that its proposed AMSS system would be two-degree spacing compatible; in fact, the Application suggests the opposite. First, it appears that the proposed system would not comply with Section 25.134(g)(1) of the Commission's rules, which limits the maximum transmitter power density of routinely-processed VSATs.[9] Row 44 claims compliance, assuming a carrier bandwidth of 1600 kHz – including both the spectrum occupied by the signal (256 kHz or 512 kHz) and large guard bands that are approximately three to six

---

7 *See* 47 C.F.R. § 25.132(b).

8 Row 44 asserts that its user terminal would constantly monitor the "skew angle" between the terminal and the satellite to which it is transmitting, and cease transmissions if this angle exceeds +/- 25 degrees. Row 44 System Description at 9. However, it is unclear whether Row 44's calculation of this angle would be based on the aircraft's location alone, or whether it would account for pitch, yaw, and roll as a result of aircraft maneuvers. Notably, for commercial jets a bank angle in the range of 25 to 30 degrees is not uncommon.

9 47 C.F.R. § 25.134(g)(1).

times the size of the bandwidth of the specified signal.[10] This approach is simply incorrect and yields an artificially low power density. The Commission is clear that compliance (or non-compliance) with Section 25.134(g)(1) must be measured across the "bandwidth occupied by the symbol rate."[11] As explained in the attached Technical Annex, if compliance with Section 25.134(g)(1) is evaluated over the bandwidth of the signal, it is clear that Row 44's system would be more than 2.2 dB over that power density limit.

While this fact alone is cause for concern, there is reason to suspect that those user terminals would need to operate at higher power levels than those specified to achieve the throughput described in the Application, yielding even higher, non-compliant power densities. Row 44 proposes to use Time Division Multiple Access (TDMA) to permit multiple users to access the same spectrum.[12] In a TDMA system, each user is assigned only a portion of each time frame on the system, and consequently the effective data rate *per user* is only a portion of the data rate *for the system*. Thus, in order for the proposed system to achieve a throughput of 256 kbit/s – the minimum throughput that Row 44 suggests would support its service – the system would need to provide a much higher burst rate *per link*, which would require each user terminal to operate at power levels higher than those reflected in the link budgets included in the Application.[13]

---

10 Row 44 System Description at 11. Row 44 provides no explanation as to why it has used a spacing factor of 6.25 to specify a carrier bandwidth of 1600 kHz.

11 *See Routine Licensing of Large Networks of Small Antenna Earth Stations Operating in the 12/14 GHz Frequency Bands*, Notice of Proposed Rulemaking, 5 FCC Rcd 2778, at ¶ 5 n.12 (1990) (noting that power density is calculated based on the "bandwidth occupied by the symbol rate[.]").

12 Row 44 System Description at 3.

13 Other portions of the Application suggest that the proposed system may not operate in accordance with the parameters specified therein. For example, the Application specifies antenna gains of 31.8 dBi in the 11.7 GHz receive band, but only 28.6 dBi in the 14.47

Nor does the proposed system comply with Section 25.222(a)(6) of the Commission's rules, which require VSATs to maintain a pointing error of less than 0.2 degrees.[14] Row 44 concedes that Section 25.222(a)(6) "may reasonably be extended to cover all Earth stations in motion operating on the Ku-band FSS frequencies" and claims that its proposed user terminals would meet this requirement.[15] Although the Commission's rules require Row 44 to demonstrate that its system would meet a tracking accuracy of 0.2 degrees *peak*,[16] Row 44 claims only that its system would meet a tracking accuracy of 0.2 degrees *root mean square* (RMS).[17] As the Technical Annex details, "peak" and "RMS" tracking accuracy are two very different standards, and Row 44's use of RMS would allow for some measure of significant mispointing in the direction of other geostationary spacecraft.

Although Row 44 claims that the proposed user terminals would cease transmissions within 100 milliseconds if the user terminal antenna were mispointed by more than 0.5 degrees,[18] it is unclear how Row 44 would achieve that level of performance when sampling would not occur quickly enough to facilitate that level of performance. Row 44 proposes to use closed loop

---

GHz transmit band, which is highly unusual because antenna gain typically increases with frequency. If there is a valid technical explanation for why Row 44's antenna defies expectations in this respect, the Application does not provide it. If there are errors in how Row 44 calculated transmit antenna gain, that may affect whether the antenna pattern in fact complies with Section 25.209 of the Commission's rules. 47 C.F.R. § 25.209.

14 47 C.F.R. § 25.222(a)(6).

15 Row 44 System Description at 10-11 n.7.

16 In promulgating Section 25.222(a)(6), the Commission made clear its intent to make the rule "consistent with the technical parameters contained in Resolution 902," which requires a tracking accuracy within 0.2 degrees peak. *See Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/3700-4200 MHz Bands and 14.0-14.5 GHz/ 11.7-12.2 GHz Bands*, 20 FCC Rcd 674, at ¶ 104 n.271 (2005).

17 *Id.* at 10.

18 Row 44 System Description at 10.

tracking as a means to ensure that its user terminal antennas are properly pointed toward the target satellite.[19] As explained in the attached Technical Annex, an antenna utilizing closed loop tracking must acquire several samples around its offset tracking loop in order to determine its orientation, whether it is mispointed, and in what direction. Practically speaking, because of the minute changes in antenna gain that would occur as a result of 0.2° to 0.5° of angular mispointing, it would be extremely difficult – if not impossible – for the antenna to detect mispointing of such magnitude at all. At a minimum, however, effective tracking would require the antenna to collect many E_s/N_o samples. Row 44 has indicated that such samples would be output by the user terminal's modem every 100 milliseconds. Considering that the antenna would need to gather multiple samples before determining whether it is in fact mispointed, it would not be possible for the antenna to determine that it is mispointed, and then inhibit transmissions, within a single 100 millisecond period as claimed by Row 44.

* * * * *

As explained above, the Application is incomplete and fails to demonstrate that the proposed system is two-degree compatible. Accordingly, ViaSat respectfully requests that the Commission deny the Application.

---

19 *Id.* at 9-10.

Respectfully submitted,

John P. Janka
Elizabeth R. Park
Jarrett S. Taubman
LATHAM & WATKINS LLP
555 Eleventh Street, N.W.
Suite 1000
Washington, D.C. 20004
Telephone: (202) 637-2200

Counsel for ViaSat, Inc.

June 27, 2008

TECHNICAL ANNEX

This Technical Annex provides technical support for arguments presented in the foregoing ViaSat Petition to Deny the Application of Row 44, Inc. ("Row 44") for authority to provide aeronautical-mobile satellite service ("AMSS") in the Ku-band. Specifically, this Annex details Row 44's failure to (i) supply representative link budgets reflecting the differences in coverage pattern of the Horizons-1 satellite across North America; (ii) supply transmit elevation patterns; (iii) provide a consistent and correct statement of its proposed carrier bandwidth; (iv) properly calculate EIRP spectral density; (v) properly account for the proposed use of TDMA architecture; (vi) demonstrate compliance with the Commission's antenna pointing accuracy requirements; (vii) demonstrate the ability to cease transmissions within 100 milliseconds of a mispointing event; and (viii) explain the facial inconsistency in Row 44's stated antenna gain performance.

1. ROW 44'S FAILURE TO SUPPLY REPRESENTATIVE LINK BUDGETS

Row 44 includes only two link budgets in its Application, both of which are return link budgets assuming a remote AES located at Fairbanks, Alaska and served by the Horizons-1 satellite. Among other things, these link budgets fail to reflect the diverse geographic locations from which Row 44 user terminals may operate. In particular, in at least a portion of the proposed service area, Row 44's AESs would need to operate at higher power in order to facilitate effective communications.

The Application specifies a remote G/T contour for the satellite of 2.9 dB/K for Fairbanks, Alaska. However, during the flight path from Fairbanks to CONUS, the spacecraft G/T would fall to below 2 dB/K and likely to 0 dB/K or less for some flight paths.

The Application specifies a clear sky RF head back off of 2.6 dB when operating at Fairbanks with a 512 kbit/s data rate. Using that additional available power to compensate for a lower spacecraft G/T, the Row 44 AES could support, at best, 512 kbit/s operations down to a 0.3 dB/K G/T contour. However, as discussed in Section 4 below, an AES operating from Fairbanks would already operate at an antenna input power density level approximately 2.2 dB above the Section 25.134 limit. Additional increases in power used to compensate for lower G/T would exacerbate the degree to which the Row 44 system already fails to comply with Section 25.134(g)(1) of the Commission's rules.

At the 256 kbit/s data rate, Row 44 indicates that the clear sky RF head back off is 5.6 dB for the Fairbanks, AK location. Increasing power further to support operation in areas where the satellite G/T falls below the given 2.9 dB/K value would again only increase the amount by which Row 44 is non compliant with Section 25.134. For example, if the G/T were to fall to -2.7 dB/K, the user terminal would need to operate at maximum power to close the link, resulting in an antenna input power density of 7.8 dB above the Section 25.134 limit (2.2 dB + 5.6 dB).

2. ROW 44'S FAILURE TO SUPPLY TRANSMIT ELEVATION PATTERNS

Row 44 fails to include any transmit elevation patterns in the Application. Section 25.132(b) of the Commission's rules requires earth station applicants to submit co-polarized patterns for each of the two orthogonal senses of polarization from 0 to 45 degrees in elevation. While Row 44's failure to comply with the rule this would give cause for concern under any circumstances, the omission of these patterns is particularly troubling because there is no indication that Row 44 has conducted extensive testing of its proposed antenna under an experimental license like other AMSS applicants (including ViaSat). Such testing is critical to demonstrate the actual performance of the antenna in a dynamic environment. Row 44's aeronautical system, which does not conform to the U.S. Table of Frequency Allocations, when operating on a moving platform with significant pitch, yaw, and roll, has the potential to direct radiation intended for the elevation plane instead into the direction of adjacent spacecraft in the geostationary orbital arc. Thus, an understanding on Row 44's transmit parameters in the elevation plane, as well as the real-world performance of its antenna technology, is essential to assessing the potential for harmful interference into adjacent satellite operations.

3. ROW 44'S ARTIFICIAL INFLATION OF STATED CARRIER BANDWIDTH

The Application claims a carrier bandwidth of 1600 kHz, even though the link budgets included in the Application report noise bandwidths of 256 kHz and 512 kHz, respectively. It therefore appears that Row 44's claimed carrier bandwidth is not accurate.

The Application lists emission designator 1M60G7D. Emission designators are intended to designate the *necessary* or *occupied* bandwidth of an emission, as opposed the bandwidth *assigned* or *allocated* by the system. Thus, Row 44's choice of emission designator implies that the system would actually use 1600 kHz of bandwidth when transmitting from its user terminals.

Notably, the Application specifies the user terminal modulation type as offset-QPSK, with a transmitted signaling rate of either 256 or 512 kbit/s, and a forward error correction of rate 1/2, 2/3, or 4/5 turbo code. With respect to the 256 kbit/s case, the necessary and occupied bandwidth for such a transmission can be calculated by: (i) multiplying the user data rate of 256 kbit/s by 2, because the Rate 1/2 FEC encoder outputs two encoded bits per inputted user data bit; and (ii) multiplying this result by 1/2, because QPSK modulation transmits two bits per symbol. The result, 256 kHz, is usually considered *necessary* bandwidth, or noise bandwidth, of the signal.

To determine *occupied* bandwidth, necessary bandwidth is normally multiplied by a bandwidth expansion factor of approximately 1.2 to 1.4 in order to account for the square root raised cosine (SRRC) filtering typically applied to modem PSK modulators. These calculations would result in an occupied bandwidth of between 307.2 kHz and 358.4 kHz.

The link budgets included in the Application specify a noise bandwidth of 256 kHz for the 256 kbit/s case, which is consistent with the calculation above. However, Row 44 proceeds to multiply the signal by a carrier spacing factor of 6.25 to specify a final carrier spacing value of 1600 kHz. No explanation is given for the carrier spacing factor, or why a signal with at most 358.4 kHz of occupied bandwidth would need 1600 kHz of satellite bandwidth allocated to it.

4. ROW 44'S INCORRECT CALCULATION OF EIRP SPECTRAL DENSITY

The Application incorrectly calculates EIRP spectral density for purposes of assessing compliance with Section 25.134(g)(1), which provides that applications to provide VSAT service in the Ku-band will be routinely processed only if "[t]he maximum transmitter power spectral density of a digital modulated carrier into any GSO FSS earth station antenna shall not exceed -14.0 - 10log(N) dB(W/4 kHz)," where N=1 for TDMA systems. Row 44 claims compliance with Section 25.134(g)(1) based on use of 1600 kHz of bandwidth. However, the link budgets prepared by Row 44 are based on noise bandwidths of 256 kHz and 512 kHz, respectively. In other words, Row 44 only plans to use, at most, 512 kHz of spectrum per carrier. Pursuant to Commission precedent, compliance with Section 25.134(g)(1) must be measured across this used spectrum; Row 44 cannot artificially deflate its power spectral density by including guard band spectrum in its calculations.

When these carrier widths of 256 kHz and 512 kHz are considered, it is clear that Row 44's system would not comply with Section 25.134(g)(l). With respect to the 256 kbit/s case, the Application specifies an uplink EIRP of 34.9 dBW, with a transmit antenna gain of 28.6 dBi. Therefore, the input power density into the antenna would be 6.3 dBW/256 kHz, or -11.76 dBW/4 kHz. This value is 2.238 dB above the FCC 25.134 limit of -14 dBW/4 kHz. Similar calculations show the same 2.2 dB exceedance in the 512 kbit/s case.

5. ROW 44'S FAILURE TO ACCOUNT FOR ITS USE OF TDMA ARCHITECTURE

The link budgets included in the Application fail to account for the TDMA architecture of the proposed system. Row 44 proposes to use the Hughes HX system, which employs Time Division Multiple Access (TDMA) to permit multiple users to access the same spectrum. In the Hughes HX TDMA system, a 45 millisecond (ms) frame length is defined, with individual users assigned to some number of time slots of each frame in which they may transmit. The greater the number of users assigned to share a particular inbound frequency channel, the less time per frame each user is granted access the channel. For example, assuming that a frame is to be shared equally by 4 users, each user may then transmit for 1/4th of the frame, or 11.25 ms.

Because each user transmits only for a portion of the frame, the effective data rate *per user* is only a portion of the data rate *for the system.* For example, if each user is transmitting at 256 kbit/s, but for only 11.25 ms per frame, the effective data rate at which each user transmits is 64 kbit/s (256 kbit/s x 11.25 ms/frame x 22.222 frame/s). If a user desires to transmit more data per second (i.e., per each frame), that user must either use a greater portion of the frame or transmit at a higher signaling rate during the allocation portion.

In practice, the actual data rate would be somewhat lower because a portion of the 45 ms frame is set aside for slotted Aloha contention access. These slots are used by terminals in the Hughes HX system to request bandwidth from the system.

Row 44's link budgets suggest that user terminals would operate with a throughput of 256 kbit/s or 512 kbit/s, making the effective throughput for each user of Row 44's TDMA system substantially lower. However, a lower throughput is unlikely to support the proposed AMSS operations. Accordingly, each AES would need to either transmit for a longer portion of the frame, or at a higher signaling rate. Since Row 44 proposes to operate on a TDMA basis, it is simply not feasible for each AES to use a larger portion of the frame. Therefore, transmissions at a higher data rate seem to be the most plausible option. This is consistent with the choice of emission designator.

As noted above, Row 44 has specified an emission designator of 1M60G7D, or a 1600 kHz wide carrier. Based on Row 44's proposed use of OQPSK modulation, and rate 1/2 FEC, this bandwidth could support a throughput of 1600 kbit/s, which would in turn support an effective throughput per user of at least 256 kbit/s (assuming each user transmitted for at least 7.2 ms per 45 ms frame). This would allow Row 44 to actually operate the system with aircraft transmitting at 1600 kbit/s, as opposed to 256 kbit/s or 512 kbit/s as stated in Row 44's link budgets. However, in order for the desired E_b/N_o or C/N to remain constant as the data rate increases, the transmitted power must increase by the same ratio. For the 256 kbit/s case where the burst data rate increases to 1600 kbit/s, the transmit power must increase by a ratio of 6.25:1 or 7.96 dB. This higher transmit power is not reflected in the Application, and could significantly increase the risk of harmful interference into adjacent satellite operations.

Finally, in addition to the power increases above, Row 44 makes no mention of the increased power density due to collisions in the slotted Aloha contention access time slots when multiple aircraft request bandwidth from the system at the same time. In conventional VSAT systems with compliant antennas, the momentary off-axis power increase due to collisions in contention access channels is of some concern, but in a mobile network with non-compliant antennas operating at higher than allowable input power densities, the increased off-axis power density due to contention access is particularly troublesome.

6. ROW 44'S FAILURE TO DEMONSTRATE COMPLIANCE WITH POINTING ACCURACY REQUIREMENTS

The Application fails to demonstrate that the proposed system would comply with Section 25.222(a)(6) of the Commission's rules, which has been applied to require blanket licensed AESs to maintain a pointing error of less than 0.2 degrees between the orbital location of the target satellite and the axis of the main lobe of the earth station antenna. Row 44 claims to meet this requirement. More specifically, though, Row 44 claims to meet a tracking accuracy of 0.2 degrees root mean square, and the ability to cease transmissions within 100 ms if the antenna is mispointed beyond 0.5 degrees.

Even assuming that the user terminal antenna would be capable of providing tracking accuracy within 0.2 degrees root mean square, though, Row 44 makes no claim that it is able to provide a tracking accuracy of within 0.2 deg peak, in a manner consistent with Annex 2 to ITU RES 902-4. In promulgating Section 25.222(a)(6), the Commission made clear its intent to make that rule " consistent w ith the technical parameters contained in Resolution 902." Thus, the Application does not demonstrate Row 44's compliance with Section 25.222(a)(6).

Row 44's calculations, which utilize a root mean square approach, provide insight only into the "average"[1] value of the signal under the peak. As such, a signal with a huge momentary excursion from the base to peak could have the same root mean square value as a signal with a smaller excursion from the base with a longer duration. Thus, the root mean square value would not indicate the degree by which the antenna is truly mispointed at any given time, and thus would not adequately protect adjacent satellite operations from harmful interference during a large excursion.

7. ROW 44'S FAILURE TO DEMONSTRATE THE ABILITY TO CEASE TRANSMISSIONS WITHIN 100 MS OF MISPOINTING EVENT

The Application fails to demonstrate that the AES antenna would cease transmissions within 100 milliseconds of a mispointing event. Row 44 proposes to use closed loop tracking to

---

1 The average and root mean square values of a signal differ slightly, and average as used in this context is intended to be a descriptive approximation.

ensure that its user terminal antennas are properly pointed at the target satellite. Row 44 also claims that "[a]ll emissions shall automatically cease within 100 milliseconds if the angle between the orbital location of the target satellite and the axis of the main lobe of the antenna exceeds 0.5°." Closed loop tracking typically requires some form of offset scanning, where the antenna is pointed away from boresight to develop an error signal upon which to track. An antenna utilizing closed loop tracking must acquire several samples around its offset tracking loop in order to determine its orientation, how far mispointed it is, and in what direction.

Row 44 has indicated that E_s/N_0 information would be output by the user terminal's modem every 100 milliseconds. A number of these E_s/N_0 data points would be required for each offset scanning cycle, and a number of scanning cycles would be required before the tracking loop could converge. Further, multiple E_s/N_0 samples indicating a departure from the current average value would be required for the antenna control unit to determine that pointing accuracy is outside the allowed 0.5 degree limit. Thus, it is simply not possible for the antenna to determine through a single 100 millisecond sample that it is mispointed by more than 0.5 degrees, and then inhibit transmissions, all within the same 100 millisecond period.

Row 44 also fails to distinguish between pointing accuracy in the azimuth and elevation planes. While Row 44 has not furnished elevation antenna patterns, it has specified the height and width of the AES antenna aperture. The beamwidth of the antenna in the elevation and azimuth planes may be inferred from this information using established antenna theory formulas. Based on this beamwidth, it is possible to determine that a 0.2 deg offset in elevation pointing would yield a change in gain of roughly 0.01 dB, while a 0.5 deg offset in elevation pointing would yield a change in gain of roughly 0.06 dB. In the azimuth plane, a 0.2 degree offset from boresight would yield a change in gain of roughly 0.15 dB, whereas a 0.5 degree offset from boresight would yield a change in gain of roughly 0.9 dB.

The "N_0" component of the "E_s/N_0" signal, which provides the information sampled by the antenna for tracking purposes, is composed of thermal noise, adjacent satellite downlink interference, cross-polarization interference, and other factors. These components are not static and vary considerably from instant to instant, often with swings of more than 0.5 dB. As such, in the elevation plane it would be difficult to distinguish a mispointing event from normal fluctuation of the signal. A large number of 100 ms E_s/N_0 samples would be required for the ACU to establish a meaningful value for E_s/N_0 and resolve signals in the 0.06 dB range.

Realistically, effective tracking likely would require at least a 0.5 dB of E_s/N_0 change, which would correspond to roughly 1.5 degrees of elevation offset and roughly a 0.4 degree of offset from antenna boresight in the azimuth plane.

Row 44 does not discuss how its E_s/N_0 based closed loop tracking system would avoid mispointing due to the presence of adjacent satellites. The tracking system has no way of distinguishing between thermal noise and other noise sources, and a tracking system which is reliant on N_0 as a component of its closed loop tracking would attempt to point the antenna to the best E_s/N_0. A higher power density satellite operating to the East side the target satellite would result in a higher N_0 component from the East due to the greater downlink interference on that side.

The tracking system would be biased towards the Western satellite because while the E_s component would be reduced somewhat when the antenna is pointed to the West, the N_0 component would fall off faster, and the resultant E_s/N_0 would be higher, even though the antenna would be mispointed to the West.

8. ROW 44'S FAILURE TO EXPLAIN INCONSISTENT ANTENNA GAIN PERFORMANCE

The Application specifies antenna gains of 28.6 dBi at 14.47 GHz and 31.8 dBi at 11.7 GHz. This is highly unusual, since antenna gain typically increases with frequency, as opposed to decreasing with frequency, as Row 44 suggests would be the case with respect to its antenna. Using an efficiency value of 65%, which is typical, and calculating backwards from the receive antenna gain of 31.8 dBi yields an antenna area of 0.122 m^2. Inputting this area back into the gain formula using the transmit frequency yields a gain of 33.64 dBi – or 5.05 dB over Row 44's claimed gain of 28.6 dBi.

It should be noted that Aerosat, the manufacturer of the antenna that Row 44 proposes to employ, has published antenna brochures specifying the transmit gain of its antenna as 33.3 dBi, which is within 0.34 dB of the 33.64 dBi calculated above.

If there is a valid technical explanation for why Row 44 is stating the transmit antenna gain as only 28.6 dBi, the Application includes no such explanation.

ENGINEERING INFORMATION CERTIFICATION

I hereby certify that I am the technically qualified person responsible for reviewing the engineering information contained in the foregoing submission, that I am familiar with Part 25 of the Commission's rules, that I have either prepared or reviewed the engineering information submitted in this pleading, and that it is complete and accurate to the best of my knowledge and belief.

REGISTERED PROFESSIONAL ENGINEER
DARYL T. HUNTER
E 16610
EXP 6/30/2010
ELECTRICAL
STATE OF CALIFORNIA

Daryl T. Hunter, P.E.
ViaSat, Inc.
6155 El Camino Real
Carlsbad, CA 92009-1699

Dated: June 27, 2008

DECLARATION

I, Daryl T. Hunter, hereby make the following declarations under penalty of perjury. I understand that this Declaration will be submitted to the Federal Communications Commission.

1. I am Director, Regulatory Affairs of ViaSat, Inc.

2. I have reviewed the foregoing Petition to Deny of ViaSat, Inc.

3. I certify that the facts set forth in the foregoing Petition to Deny of ViaSat, Inc. are true and correct to the best of my knowledge.

Daryl T. Hunter

Executed June 27, 2008

CERTIFICATE OF SERVICE

I, Jarrett S. Taubman, hereby certify that on this 27th day of June, 2008, I served a true copy of the foregoing Petition to Deny of ViaSat, Inc. by first class mail, postage pre-paid upon the following:

David S. Keir
Leventhal Senter & Lerman PLLC
2000 K Street, NW
Suite 600
Washington, DC 20006

Jarrett S. Taubman