Received

NOV 14 REC'D

Satellite Engineering Branch
International Bureau

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

RECEIVED

NOV -6 2003

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In the Matter of	)	
	)	
SWE-DISH SATELLITE COMMUNICATIONS, INC.	)	File No. SES-LIC-20030910-01236
	)	
Application for Earth Station Authority in the Fixed-Satellite Service	)	

Int'l Bureau

NOV 07 2003

Front Office

OPPOSITION AND RESPONSE OF SWE-DISH SATELLITE COMMUNICATIONS, INC.

SWE-DISH Satellite Communications, Inc. ("SWE-DISH")[1], by its attorneys, hereby responds to the Petition to Deny filed by PanAmSat Corporation ("PanAmSat") and the comments filed by AvL Technologies ("AvL") and Tripoint Global, Inc. ("Tripoint") in regard to SWE-DISH's application for licensing of a fixed-temporary earth station accessing satellites in the U.S. domestic arc. The SWE-DISH application was filed with the Federal Communications Commission ("Commission") on September 10, 2003, and placed on public notice on September 24, 2003.

The PanAmSat Petition to Deny is primarily intended to ensure that SWE-DISH provides adequate assurance that necessary coordination among all affected U.S. satellite operators will have occurred prior to licensing of the proposed earth station, including coordination with PanAmSat by the operator of any adjacent satellite on which the proposed earth station would be

[1] SWE-DISH Satellite Communications, Inc. (through its parent company, SWE-DISH Satellite Systems, Inc.) is a subsidiary of SWE-DISH Satellite Systems AB, which is also the manufacturer of the transportable earth station that is the subject of the pending application. For purposes of this pleading, both companies (applicant and manufacturer) are referred to as "SWE-DISH".

licensed to operate. The AvL and Tripoint Comments seek to raise various concerns about the technical characteristics and operation of the SWE-DISH antenna.

As demonstrated below, SWE-DISH fully intends to undertake the necessary coordination activity desired by PanAmSat as part of the licensing process. Moreover, the technical concerns raised by AvL and Tripoint are completely without merit and appear intended mainly to impede the deployment of state-of-the-art transportable earth station technology in the United States. For these reasons, SWE-DISH submits that the grant of its application would be fully consistent with the public interest.

BACKGROUND

SWE-DISH is a world-renown supplier of mobile satellite communications equipment and related services for broadband applications. It is extremely proud of its heritage as a leading innovator in transportable earth station technology, having designed and manufactured a variety of products which its customers today use to access virtually every major satellite system around the world. The company supplies major broadcasters, armed forces and disaster relief organizations, among others, with compact and rapidly deployable terminals for live transmission of video, data, Internet and voice content from anywhere in the world. SWE-DISH is committed to advancing the state of the art in transportable earth station technology so as to enhance the provision of satellite services on a global basis.

One of the newest products developed by SWE-DISH is the IPT SUITCASE, the world's most compact and quickest-to-air transportable satellite terminal. As deployed, the elliptically-shaped antenna measures 90 x 66 cm. When disassembled and packed for transport, the carbon-cased system measures a mere 66x47x29 cm, virtually the size of airplane cabin luggage. With a design that combines the benefits of simple, one-person operation with exceptional technical performance, it will allow live, 2Mbps broadband transmission complete with inbuilt encoding from virtually anywhere in the world.

Not surprisingly, the IPT SUITCASE has the potential to revolutionize the transportable satellite terminal marketplace. Although introduced by SWE-DISH just two years ago (September 2001), it has already been battle-tested in the connection with the recent hostilities in the Gulf Region, successfully enabling military and civilian customers, including most major broadcasters, to operate critical satellite telecommunications links under the most challenging of circumstances.

On September 10, 2003, SWE-DISH filed an application with the Commission seeking the licensing of a single IPT terminal. Given uncertainty about which U.S. domestic satellites the earth station would access, SWE-DISH believed that the most practical approach to licensing would be to seek authority for the antenna to be used on all U.S. domestic satellites licensed by the Commission ("ALSAT status"). In filing its application, however, SWE-DISH was fully cognizant that its application would be subject to "non-routine processing" review, given that Ku-band antennas smaller in diameter than 1.2 meters are not eligible for processing on a routine basis under the Commission's present rules.[2] More importantly, SWE-DISH was also fully aware of the stringent intersystem coordination requirements associated with such non-routine processing, including the need to satisfy any concerns regarding potential interference to adjacent satellite operators that could be caused by the use of the IPT SUITCASE on any particular satellite in the U.S. domestic arc.

---

[2] This may change in the future, depending on what actions are ultimately taken in *In Re* 2000 Biennial Regulatory Review – Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage by, Satellite Network Earth Stations and Space Stations, *Further Notice of Proposed Rulemaking,* IB Docket No. 00-248, FCC 02-257 (Sept. 26, 2002) (" Earth Station Licensing FNPRM").

To deal with these requirements, SWE-DISH undertook to obtain letters from each of the four U.S. licensed satellite operators generally setting forth the circumstances under which the IPT SUITCASE could be operated on each of their respective satellite systems without causing harmful adjacent satellite interference and identifying any other parameters that might affect operation of the antenna on a particular satellite or satellite system.[3] It was always clear, however, that SWE-DISH's ability to operate the earth station on any particular satellite – even after licensing – would entail additional interaction with the satellite operator in question, including, among other things, submission of a transmission plan, satellite link-budget optimization, and related activities.

Indeed, these additional requirements typically imposed by the satellite operators actually serve to further diminish the possibility of harmful interference occurring – an outcome which SWE-DISH fully supports. SWE-DISH also understood the important role of adjacent satellite coordination in this process, expecting that this would generally be conducted under the framework of the existing intersystem coordination agreements already in place among the four U.S. licensed satellite operators.

At the time SWE-DISH filed its application, and in light of some of the complexities inherent in this coordination process, SWE-DISH believed it would be feasible to conclude certain of these coordination activities on a more dynamic basis after licensing had occurred, but prior to commencement of actual operations on any given satellite (and it was largely on this basis that ALSAT status was requested). However, in light of the concerns raised by PanAmSat,

[3] At the time the application was filed, SWE-DISH had obtained such letters from two of the four major U.S. satellite operators, Intelsat and PanAmSat, and copies of those letters were attached to the application as exhibits. Subsequent thereto, SWE-DISH secured similar letters from the other two U.S. operators, SES Americom and Loral. SWE-DISH intends subsequently to amend its application to formally attach those letters as exhibits to the application itself.

SWE-DISH now recognizes that a more open-ended ALSAT designation simply may not be practical at this time. To that end, SWE-DISH intends to re-initiate discussions with each of the licensed U.S. domestic satellite operators to identify specific satellites for which IPT SUITCASE access would be most suitable and for which concurrence could most readily be obtained from adjacent satellite operators that no adjacent satellite interference would be experienced. Following the conclusion of such efforts, SWE-DISH would then amend its pending application to identify the specific satellites so identified, accompanied by necessary confirmation from affected adjacent satellite operators that harmful adjacent satellite interference would not be experienced.[4]

1. **ISSUES RAISED BY PANAMSAT**

The primary issue raised by PanAmSat is that the SWE-DISH application should not be granted unless any adjacent satellite operator serving as a point of communication for SWE-DISH will have coordinated with PanAmSat, in order to ensure that unacceptable levels of interference will not be caused to PanAmSat's satellites under conditions of uniform 2° orbital spacing. Consistent with the undertakings described above, we believe that this issue has been fully addressed and that the record has been clarified to confirm that the type and manner of frequency coordination desired by PanAmSat will in fact occur. To that end, we look forward to working cooperatively with PanAmSat as well as with the other U.S.-licensed operators to identify which satellites are best suited for use by the IPT SUITCASE and to confirm that such usage would not result in harmful adjacent satellite interference. Once this information has been

[4] Of course, in the event that the regulatory environment for the licensing of Ku-band antennas smaller than 1.2M is liberalized in the future, *see* Earth Station Licensing FNPRM, *supra*, such that an ALSAT designation would be more readily available for smaller dishes, SWE-DISH reserves its right to again seek ALSAT status in the case of this or any future application.

submitted to the Commission, we believe that our application can be expeditiously granted in a manner fully consistent with the approach suggested by PanAmSat in its pleading.

2. <u>ISSUES RAISED BY AVL AND TRIPOINT</u>

While PanAmSat's interest in this matter arises from its status as a potentially affected satellite operator, the other two commenting parties –AvL and Tripoint – have each entered the fray under the guise of being an interested "industry member", which translated means that they are competitors of SWE-DISH. The AvL comments rely on a smokescreen of technical jargon and mischaracterization to put forward a series of purported technical deficiencies in an attempt to foster the impression of serious design problems with the IPT SUITCASE. The Tripoint comments are even less substantive, merely asserting that the SWE-DISH antenna "*may* cause potential harmful interference" and that this interference "*may* cause irreparable harm to the satellite antenna industry and the future development and growth of efficient and effective terminals . . ." (emphasis added).

None of these concerns is valid. Indeed, the IPT SUITCASE is fully capable of providing technically superior performance without generating unacceptable levels of interference, whether operating from locations in the U.S. or from any other location around the world, and whether accessing U.S. licensed or non-U.S. licensed satellites. In addressing each of AvL's concerns below, we demonstrate that the AvL comments provide no justification whatsoever for denying or delaying approval of the SWE-DISH antenna.

The first issue raised by AvL concerns alignment of the major axis with the satellite orbital arc when operating on satellites far to the east or west of the longitudinal location of the IPT SUITCASE. SWE-DISH acknowledges that because the antenna is elliptical, when the orbital arc deviates away from the major axis and towards the minor axis, the main beam width will increase and therefore the risk of interference to an adjacent satellite at 2° spacing increases. Attachment A shows that there is a zone of ±28.5° offset from the antenna major axis in which the main beam width and the sidelobes do not cause interference. In those instances in which the orbital arc falls outside this zone, SWE-DISH has developed a simple and easy to use mechanism for tilting the IPT SUITCASE so that the orbital arc aligns within the allowable zone. This mechanism allows the antenna to be tilted in 10° increments up to maximum tilt of 40°. When coupled with the ±28.5° offset zone in which no interference would be experienced, as noted above, this is sufficient to ensure that no interference to any satellite covering operations within CONUS would occur. The design simplicity and ease of use of the tilt mechanism further enhance its reliability in this regard.

AvL's second point concerns the pointing accuracy of the IPT SUITCASE. SWE-DISH is confident that no other small portable terminal can offer as high a level of pointing accuracy as the IPT SUITCASE. The high precision motor drive system allows the operator to adjust the antenna pointing in 0.1° steps from the Graphical User Interface ("GUI"). The integrated receive signal power detector provides relative power levels to such a high accuracy that a movement of only 0.1° will show in the GUI an increase or reduction of level depending on whether movement is occurring towards or away from the main beam peak. Furthermore, SWE-DISH has had extensive wind tunnel tests conducted showing that, even at the operating wind speed of 10m/s, the deflection of the antenna in the azimuth plane will not exceed 0.1° for all wind directions (see Attachment A). These two factors, taken together, mean that the IPT SUITCASE will achieve a total pointing accuracy of ±0.2° under an operational wind speed of 10m/s.[5]

---

[5] In taking account of the effect of wind loading, SWE-DISH may be applying an even more stringent pointing error than that contemplated by the Commission in the Earth Station Licensing FNPRM, *supra* (see Sections III.D.3 and D.4).

Further, AvL's assertion that interference at 2° spacing can only be avoided when operating on satellites on the same longitude as the site location is simply incorrect, for the reasons stated above and as shown in Attachment A.

Third, AvL makes the general point that EIRP limits are dependent on various data rates and FECs, in an apparent attempt to suggest that the IPT SUITCASE may exceed authorized EIRP levels. This observation, however, is by no means unique to the IPT SUITCASE, but in fact is true for <u>all</u> earth station terminals irrespective of antenna size and shape and whether they are routine or non-routine applications. Ultimately, what matters most is whatever the Commission specifies as the power limit at the input to the antenna. In this regard, unlike most terminals, which are comprised of many separate non-integrated parts (antenna, amplifier, converter, modem, etc.) with no overall control system, the IPT SUITCASE is fully integrated with a complete management system controlled by the GUI, which allows the operator to accurately control and monitor the transmit power level. It should also be noted that, unlike systems with separate amplifiers, the IPT SUITCASE has a fully integrated 25W SSPA which cannot be swapped for a higher power amplifier, further ensuring that the operator will not be able to increase the maximum EIRP after a license has been granted.

AvL next points to a discrepancy between specifications in the application and on the SWE-DISH web page. The specifications in the application take precedence and are accurate. In particular, in the case of any normal product development evolution, refinements to certain specifications continuously occur, with the result that web-site information might not necessarily reflect the latest release or version. SWE-DISH acknowledges that the website information was incorrect.

Lastly, AvL's cavalier dismissal of the supporting letters provided by SWE-DISH is unwarranted. What the letters in fact clearly show, and indeed what they were intended to show, were the conditions under which interference-free operation could occur. Similarly, it is totally irrelevant whether for other purposes Intelsat has certified the IPT SUITCASE as an Intelsat Standard G antenna. The key issue is whether operation of the IPT terminal on an Intelsat satellite would cause unacceptable interference into the operation of adjacent satellites and on that subject the record is clear (and will be made even clearer in the future) that no such interference will be experienced.

In summary, none of the specific concerns raised by AvL or Tripoint in their comments withstands scrutiny, nor do they provide any credible basis for challenging the SWE-DISH application.

CONCLUSION

For the foregoing reasons, following the submission by SWE-DISH of the additional information it has committed herein to provide, the Commission should expeditiously grant the SWE-DISH application.

Respectfully submitted,

SWE-DISH SATELLITE COMMUNICATIONS, INC.

By: *[signature]*

Maury J. Mechanick
WHITE & CASE, LLP
601 13th Street, N.W.
Washington, D.C. 20005
Tel: (202) 626-3635
Fax: (202) 639-9355
Email: mmechanick@whitecase.com
Its Attorney

November 6, 2003

DECLARATION

I, Håkan Karlsson, Chief Technical Officer of SWE-DISH Satellite Systems AB, hereby declare under penalty of perjury under the laws of the United States, that:

(1) SWE-DISH Satellite Systems, AB, is the manufacturer of the earth station that is the subject of the licensing application filed by SWE-DISH Satellite Communications, Inc., with the Federal Communications Commission on September 10, 2003.

(2) I have read the foregoing "Opposition and Response of SWE-DISH Satellite Communications, Inc." concerning its pending application.

(3) The facts and technical information set forth therein are true and correct to the best of my knowledge, information and belief.

Executed this 6th day of November, 2003.

Håkan Karlsson
Chief Technical Officer
SWE-DISH Satellite Systems, AB

Table 1: *Adjacent Satellite Angles at Representative CONUS Sites*

	Site Location	Seattle	San Diego	Chicago	Bangor	Miami
	Latitude	47.4	32.4	41.5	44.8	25.8
	Longitude	122.2	117.1	87.4	68.8	80.2
Satellite Location (W.L.)	Adjacent Satellite (W.L.)	Off-Axis Angle (deg.)				
45	43	---	---	2,15	2,20	2,22
74	72	2,11	2,17	2,23	2,22	2,31
87	85	2,16	2,22	2,24	2,21	2,31
89	87	2,16	2,23	2,24	2,21	2,30
91	89	2,17	2,24	2,24	2,20	2,30
93	91	2,17	2,24	2,24	2,20	2,30
95	93	2,18	2,25	2,24	2,19	2,30
97	95	2,18	2,25	2,24	2,19	2,29
99	97	2,18	2,26	2,24	2,18	2,29
101	99	2,19	2,26	2,23	2,18	2,28
103	101	2,19	2,27	2,23	2,17	2,28
119	117	2,21	2,28	2,19	2,12	2,22

Conclusion

We have demonstrated that the emission levels in the direction of the 2° neighbouring satellite from the SWE-DISH IPT Suitcase antenna show compliance with Section 25.209 of the Commission's Rules as long as the satellite orbital arc cuts the antenna at azimuth offset angles less than 28.5°. Furthermore, we have shown that the separation angle of the 2° satellites is in excess of 2.1° when viewed from the surface of CONUS, so we have an extra margin of at least 0.1°.

This means in practice that for operation in CONUS on the majority of satellites providing CONUS coverage, the IPT Suitcase is compliant with the FCC ruling without tilting, however, on those rare occasions where the tilting is required to ensure compliance a simple and easy to operate function is provided.

Interference Analysis Within 2° Spacing

Introduction

In this Section we discuss the possible adjacent satellite interference in a 2° spacing environment and show under what conditions the interference levels from the SWE-DISH IPT Suitcase antenna system will not cause off-axis interference.
Interference is avoided:

- if the off-axis energy density emission does not exceed 15-25 log θ dBW/4KHz along the orbital arc [25.209, 25.212]
- if the width (w) of the main-lobe where it starts to cross over the 15-25 log θ dBW/4KHz envelope (an example is given in figure 1) is smaller than the difference between the adjacent satellite spacing and the antenna pointing error (p), i.e. $w < (2° - p)$.

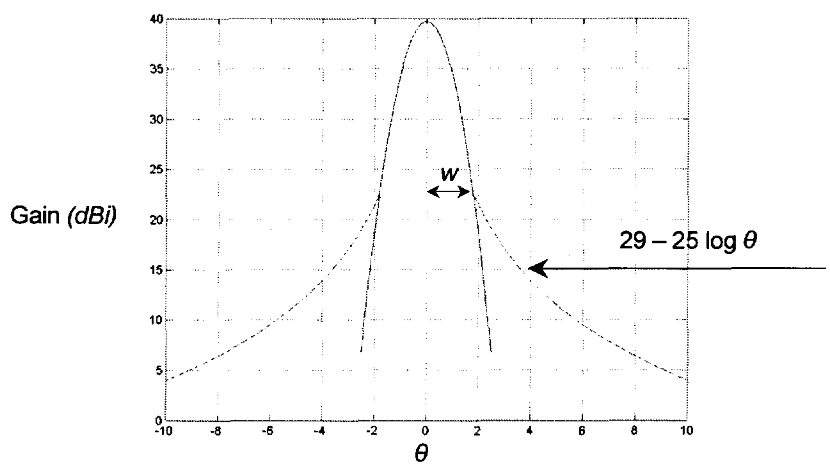


Figure 1: *This figure illustrates the definition of the parameter w used in the text, here we have assumed that the energy density input to the antenna system is below –14 dBW/4KHz.*

Emission calculation for different off-axis angles

At the antenna test range we measure the azimuth cut, the elevation cut and some cuts in between but to measure all cuts is not practical and therefore we need a model to be able to extrapolate the measured data for all values of α between these measured values. The model is described here as well as a calculation of the angle α when the interference level towards the neighbouring 2° satellite starts to increase above the acceptable levels. The calculation is based on a known antenna pointing accuracy, *p*, of 0.2° (discussed later in this attachment).

Using an analytic expression to describe the width of the antenna main lobe as a function of the offset angle from the azimuth cut, α. See figure 2 for an illustration of the antenna parameters.

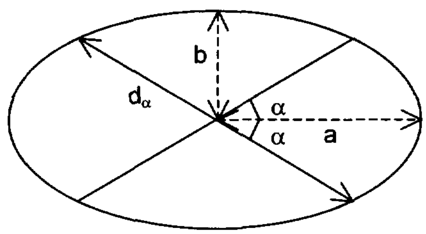


Figure 2: *Angle α as defined in the text, as well as the parameters determining the ellipse.*

The parameters a and b are the antenna major and minor axis, d_α is the antenna diameter as a function of the offset angle α and is therefore determined from the ellipse equation. To calculate the width of the main lobe, *w*, as a function of the angle α we use a formula for the main lobe gain as a function of θ according to CCIR/ITU.

Following this procedure and calculating the main beam for different α we check when the condition $w \leq (2° - p)$ is satisfied and conclude that the angle on the main reflector, α, where the main lobe starts to increase above the 29-25 log θ envelope at θ=1.8° is α = 28.5°. The conclusion from this calculation is that the off-axis interference levels on neighbouring satellites will be acceptable as long as α < 28.5° and the energy density input to the system is below –14 dBW/4kHz. To be able to operate the terminal under conditions when the satellite arc cuts the reflector at larger offset angles than 28.5° without reducing the power SWE-DISH have designed a mechanical device that allows the user to tilt the terminal to ensure that the satellite orbital arc falls within the zone of ±28.5° offset from the antenna major axis.

Note that both Intelsat and Loral indicate that they would restrict the input power density to –16 dBW/4kHz, repeating the calculation above we find that the interference levels will be below the 15-25 log θ dBW/4kHz envelope for angles α up to 52°.

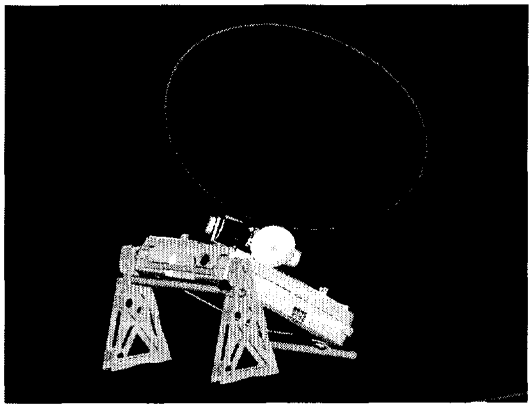
The antenna gain pattern in the direction of the neighbouring 2° satellite show that the emission in that direction is far below the 29-25 log θ envelope under the conditions discussed above, and therefore in reality the interference level will be much lower than the interference level accepted by FCC.

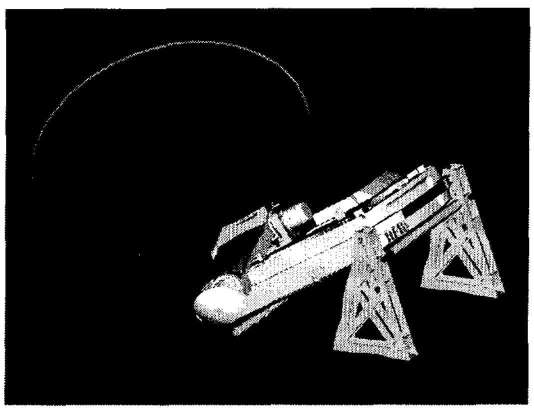
SWE-DISH Tilt Function

The main reflector can be tilted in four steps in order to align the reflector main axis with the satellite orbital arc according to the specification below.

- Tilt angles provided: 0°, +/-10°, +/-20°, +/-30°, +/-40°.
- Mechanical tilt components: 2 metal tubes and 2 tilt blocks.

Please see the picture below to illustrate the tilt function in use.





The metal tubes are fixed to the underside of the IPT Suitcase and the tilt blocks are mounted onto one of the tubes using the hole corresponding to the tilt angle required. The choice of which tube the blocks are mounted on depends on which direction the tilt is required, when looking east or west of your location. The in-built high precision orthogonal tilt sensors provide the accurate tilt angles to the IPT Suitcase control system. The GUI provides guidance for the operator to control the tilt angle which makes operation of the terminal with the tilt function is as simple as operation without, since all calculations are corrected for the current tilt angle.

Pointing Accuracy

The overall summation of the pointing error is ± 0.2 degree which comprises 0.1 degree for aiming error and 0.1 degree for the operational wind load, as verified in our wind tunnel tests. By following the operational procedure described in our FCC application (IPT suitcase System description exhibit B), will ensure accurate pointing towards the satellite and no adjacent satellite interference.

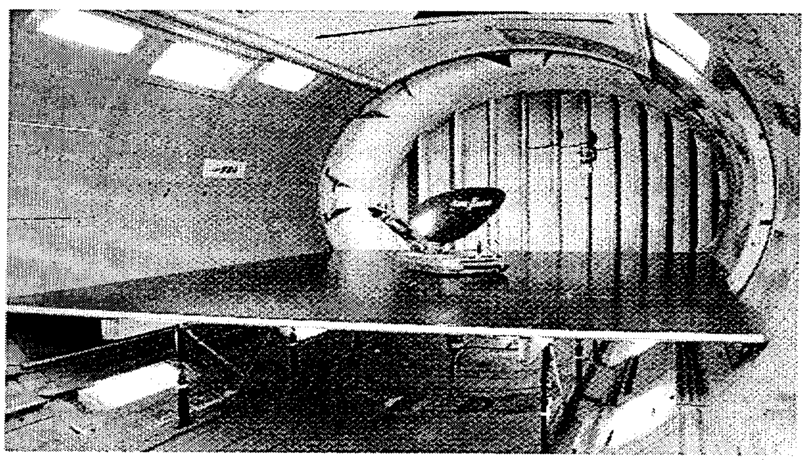
The IPT Suitcase pointing error under wind loading has been measured through wind tunnel testing carried out at Swedish Military Aeronautic division (FOI) in December 2002.

FOI-Memo 81-0024
D.nr.: 02-2136
December 2002
Technical report

FOI
TOTALFÖRSVARETS
FORSKNINGSINSTITUT
Aeronautics Division, FFA

Per-Åke Torlund

Wind Tunnel Test of the SWE-DISH® IPT Suitcase Satellite Terminal in the FOI Wind Tunnel FFA/LT1



The IPT Suitcase was tested at several wind speeds up to a maximum of 30 m/s and the deflections on the complete unit were measured. The conclusion was that the IPT Suitcase pointing error in azimuth at operational wind speed of 10 m/s will not exceed 0.1 degree.

Adjacent satellite geometry

The specific off-axis adjacent satellite angles from earth stations located at five representative, geographically distributed cities along the boundary of CONUS were calculated. The results are shown in Table 1 below.

As shown in the Figure 3, the off-axis angle ψ is given by

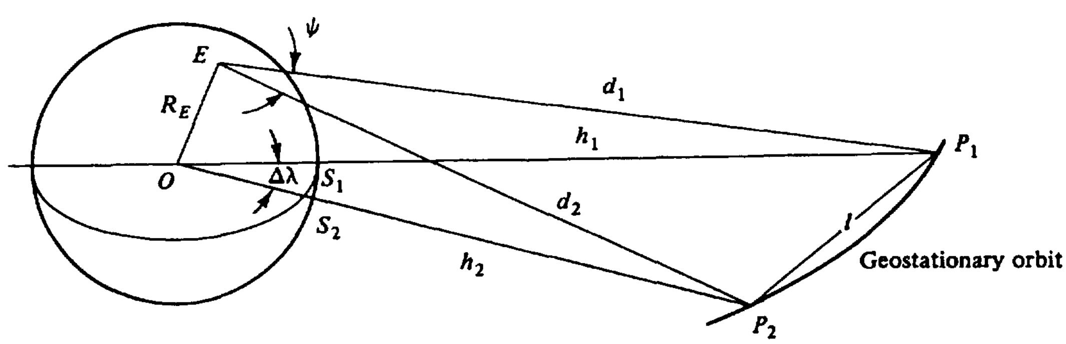
$$\cos\psi = \frac{d_1^2 + d_2^2 - l^2}{2 d_1 d_2}$$

where d_1 and d_2 are the slant ranges to each satellite and l is the linear separation of the satellites. From triangle $P_1\,O\,P_2$

$$l = 2 r \sin\frac{\Delta\lambda}{2}$$

where r is the radius of the geostationary orbit (42,164 km) and $\Delta\lambda$ is the difference in longitude between the satellites. As can be seen from Table 1 for a geocentric separation angle of 2°, for all 2° Ku-band satellites with CONUS coverage located between 15° and 143° west longitude, the topocentric separation angle within CONUS is between 2.11° and 2.31°.

Figure 3: *Adjacent satellite geometry*



CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing was sent by first-class mail, postage prepaid, this 6th day of November, 2003, to the following:

William Coulter
Coudert Brothers, LLP
1627 Eye Street, N.W.
Washington, D.C. 20006

Joseph A. Godles
Goldberg, Godles, Wiener & Wright
1229 Nineteenth Street, N.W.
Washington, D.C. 20036

Marvin Shoemake
Executive Vice President
Tripoint Global, Inc.
4825 River Green Parkway
Duluth, GA 30096

Maury J. Mechanick
Maury J. Mechanick