Mantis 1.9M Antenna Evaluation

Side Lobe Conformance to FCC Part 25.209(a)

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1/3/2017

Mantis 1.9M Antenna Side Lobe Evaluation

Below are the technical details explaining why the Vislink Advent Mantis 1.9M Flyaway antenna is worthy of an FCC waiver for Part 25.209--*Antenna Performance Standards*. At issue are two side lobes with low level RF radiation in directions that do not intersect the geostationary arc. The information contained in this document illustrates that when deployed in situations restricted to operation on the SES-3 satellite located in the 103.0° orbital slot, these side-lobes pose no risk of causing adjacent satellite interference in the geostationary arc because they point in a direction that's either above or away from the Geostationary Orbital arc and the gain of the sidelobes is more than -50 dBc below the main beam thereby diminishing any risk of causing adjacent satellite interference beyond all practical concerns. In addition the amount of side-lobe radiation according to the manufacturer's documentation is below the Eutelsat ESS-502 side-lobe specification.

1) Using test data provided by the manufacturer, the X-Y plot below shows the magnitude and position of the side lobes located in a horizontal plane ±178.5° from the direction of maximum radiation (main beam).

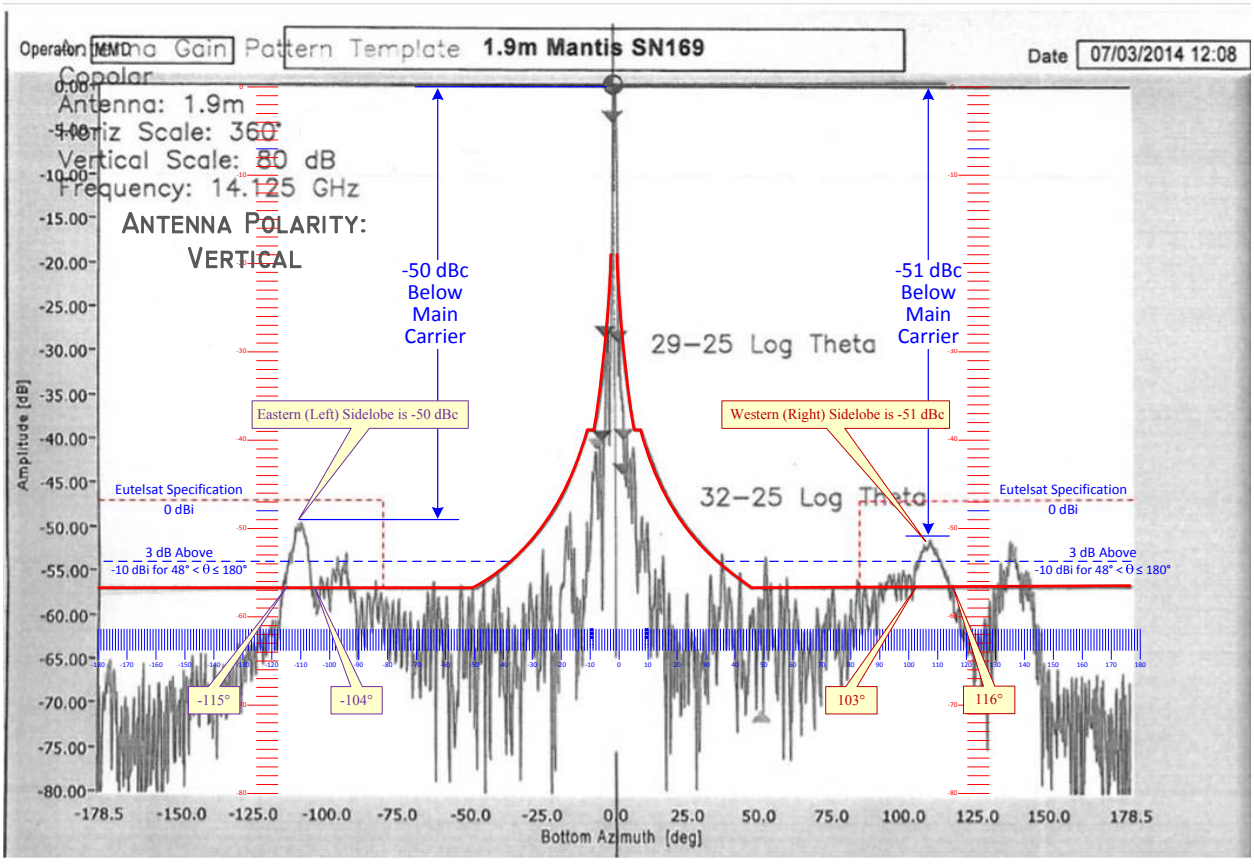
   a. The mask shown outline in red on the graph below is the side-lobe specification FCC Part 25.209 *Antenna Performance Standards*:

      29-25 log10 (Theta) dBi for $1° \leq \theta \leq 7°$
      +8 dBi for $7° < \theta \leq 9.2°$
      32.25 log10 (Theta) dBi for $9.2° < \theta \leq 48°$
      -10 dBi for $48° < \theta \leq 180°$

   b. The red vertical scale measures dBc magnitude of each side-lobe. The blue horizontal scale marks the degrees to the right and left of the direction of the main beam. The blue dotted line just above the horizontal portions of the mask are the 3 dB points above the -10 dBi for $48° < \theta \leq 180°$ specification.

   c. The red dotted rectangles on the left and right of the plot show the Eutelsat side-lobe specification of: 0 dBi for $85° < \theta \leq 180°$

   d. The two side-lobes of concern are labeled Eastern (Left) centered at -109° and Western (Right) centered at +108°. It can be seen that although they protrude beyond the limit, these side-lobes are ≥ -50dBc.



2) Transposing the above antenna azimuth pattern from an X-Y plot to a polar representation better illustrates the relationship between the direction of the main beam and the directions of the Left and Right side-lobes normalized in Figure-2 to 0° for purposes of visualization.
    a. It can be seen that both side-lobes radiate in obtuse angles away from the main lobe off the sides of the antenna.

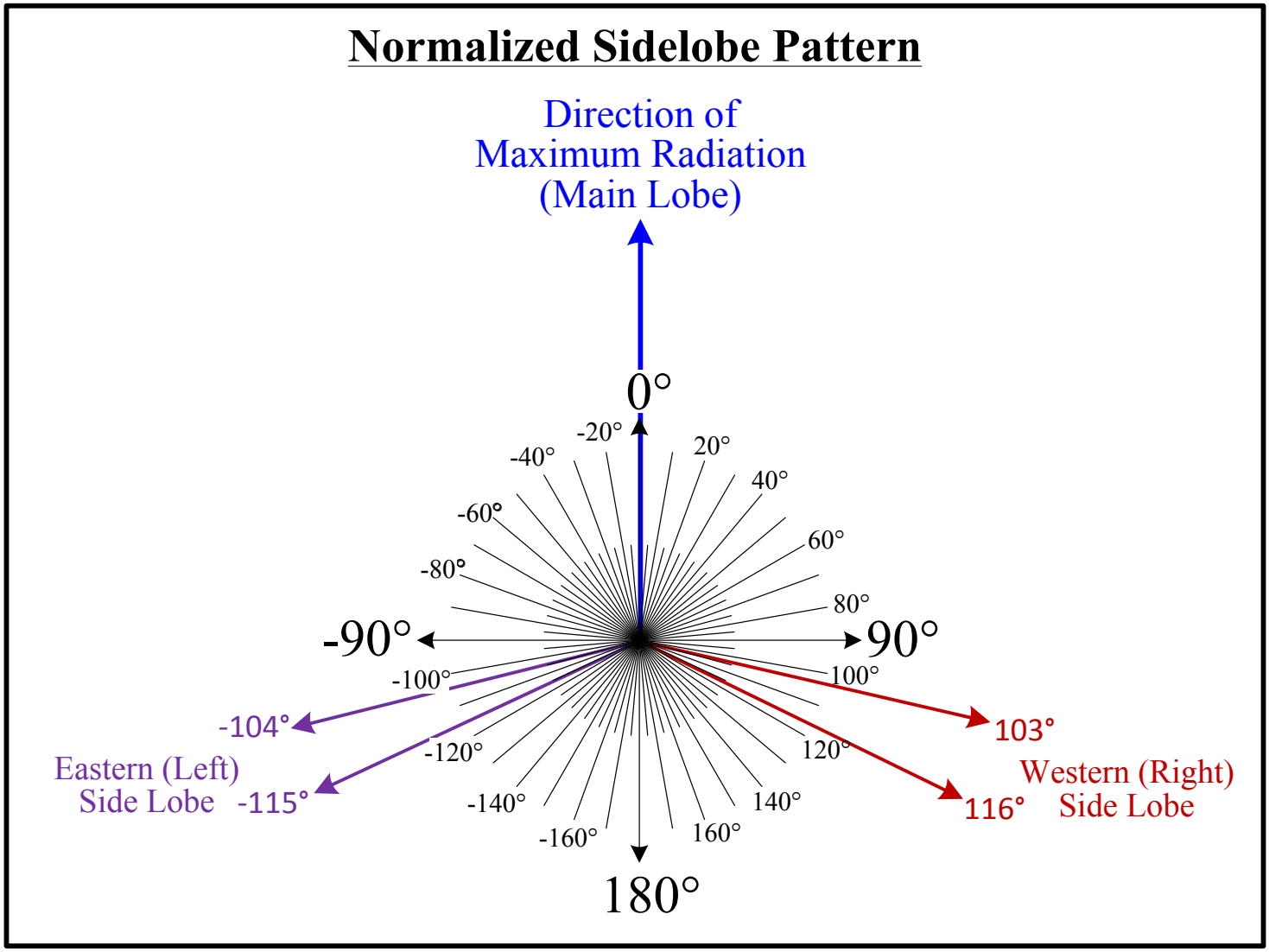


Figure-2

(Continued Next Page)

3) The polar antenna plot below shows the relationship of the sidelobes to the main beam when the antenna is pointed towards the SES-3 satellite in the 103° orbital slot from the eastern most point on the mainland United States at Quoddy Head, Maine.

   a. The Black arc represents the eastern and western limits and orientation of the geosynchronous arc.

   b. The Blue vector shows the orientation and width of the main beam when the antenna is pointing towards SES-3 in the 103° orbital slot and crossing through the geosynchronous arc.

   c. The Red vectors show the direction and width of RF radiation as the side lobes either pass over or away from the geosynchronous arc.

   d. Clearly, it can be seen the heading of the Right Side Lobe points > 67° away from the GSO making interference to adjacent satellites from this side lobe impossible (see Figure-3).

   e. Although the Left Side Lobe appears to point in the direction of the GSO, there are two important factors to consider:

      i. The elevation of both sidelobes when the antenna is looking at SES-3 from the most eastern point on Mainland USA is 27.29° above the horizon. The geosynchronous arc at 122.42°N, the azimuth of the Western (Left) Side Lobe is at Elevation of 20.2°. Consequently, the Western (Left) Side Lobe passes 7.1° above the geosynchronous arc and with a beam width of only ± 1.0°, the risk of interference to satellites in that portion of the arc is negligible (see Figure-4).

      ii. The magnitude of the both side-lobes is more than 50dB below the main carrier significantly reducing further the risk of interference.

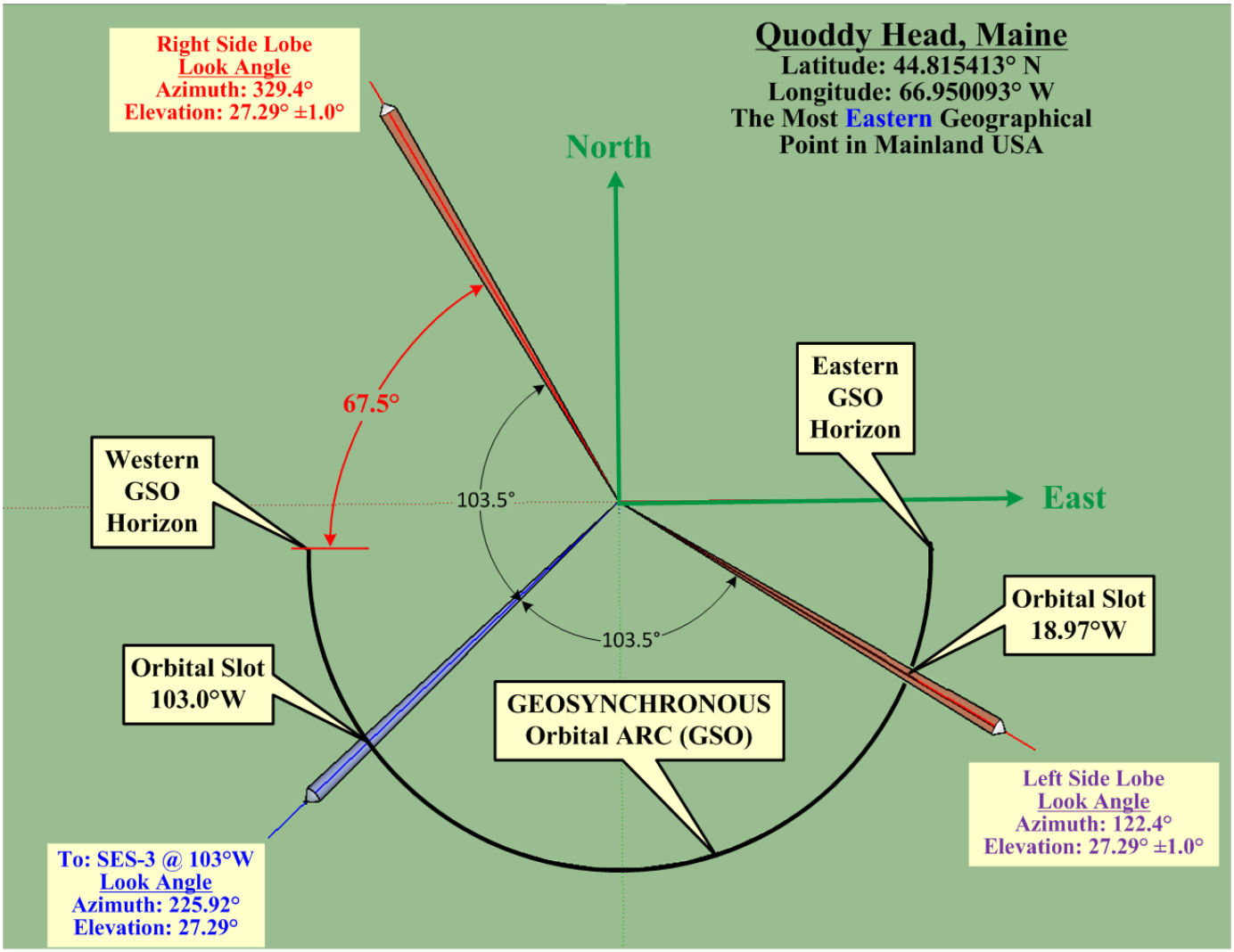


Figure-3

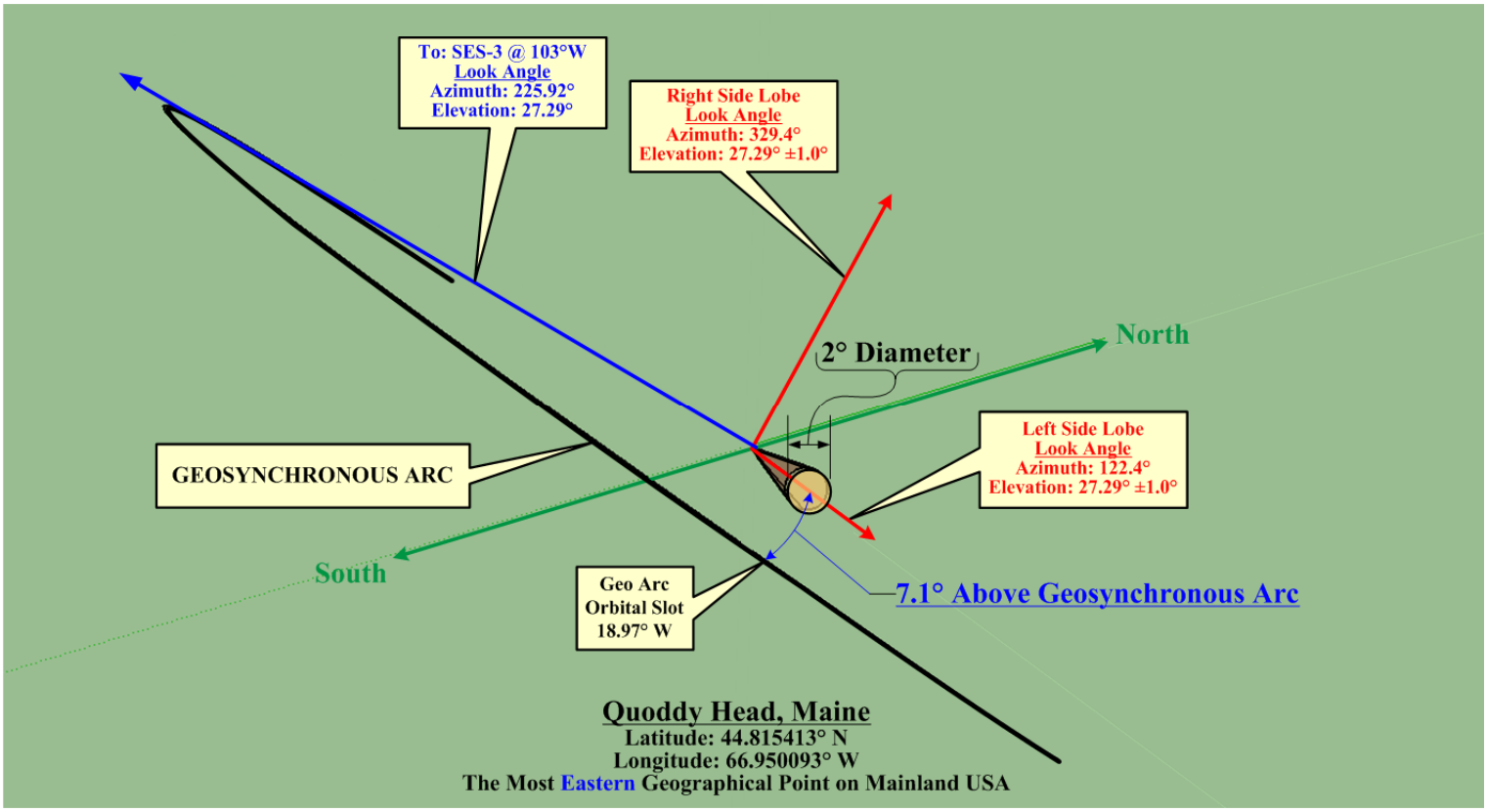


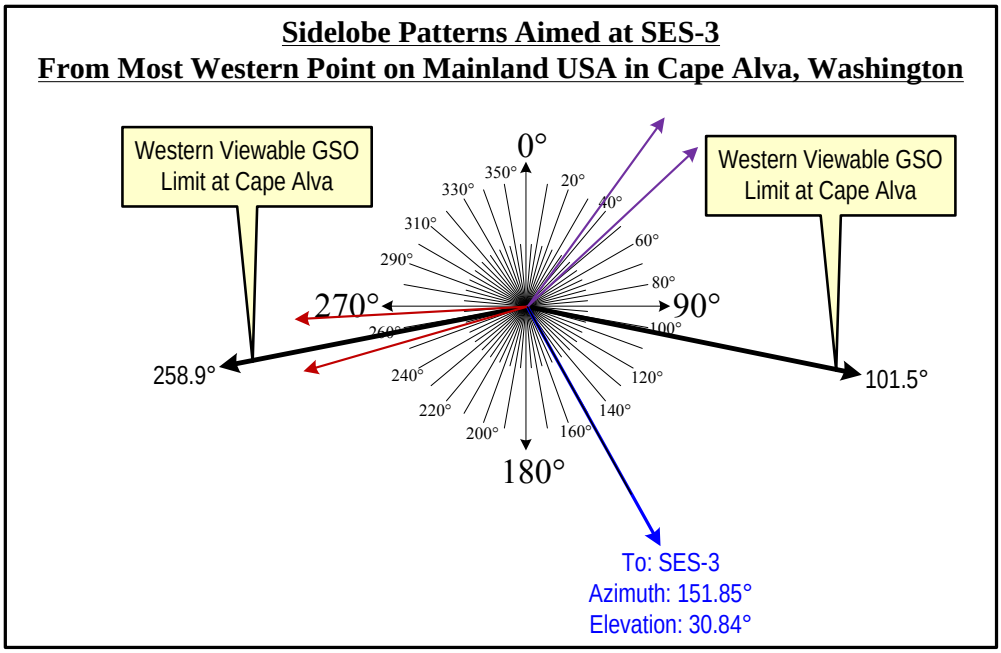
Figure-4

4) The polar plot of the antenna below in Figure-5 shows the relationship of the side-lobes to the main beam when the antenna is pointed towards the SES-3 satellite from the Western most point on the Mainland United States at Cape Alva, Washington.

   a. The Black vectors represent the limits of the eastern and western GSO horizons.

   b. The Blue vector shows the orientation of the main beam when the antenna is pointing towards SES-3.

   c. The Red and Violet vectors show the direction of radiation for the Eastern (Left) and Western (Right) Side Lobes.



   d. Even in this location, the Eastern (Left) Side-Lobe points in a direction more than 50° away from the GSO (Figure-6) and the Western (Right) Side Lobe passes more than 26° above the GSO (Figure-7), once again, reducing the risk of adjacent satellite interference to a negligible level.

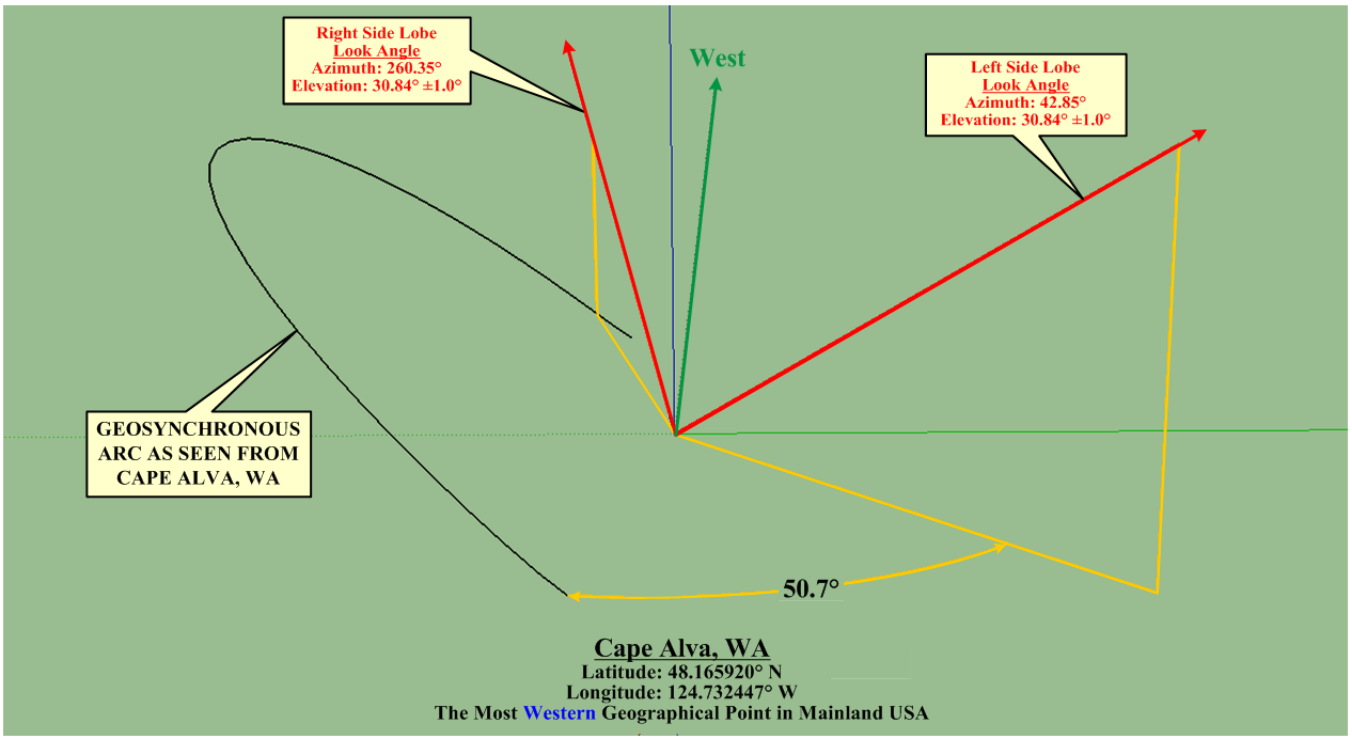


Figure-6

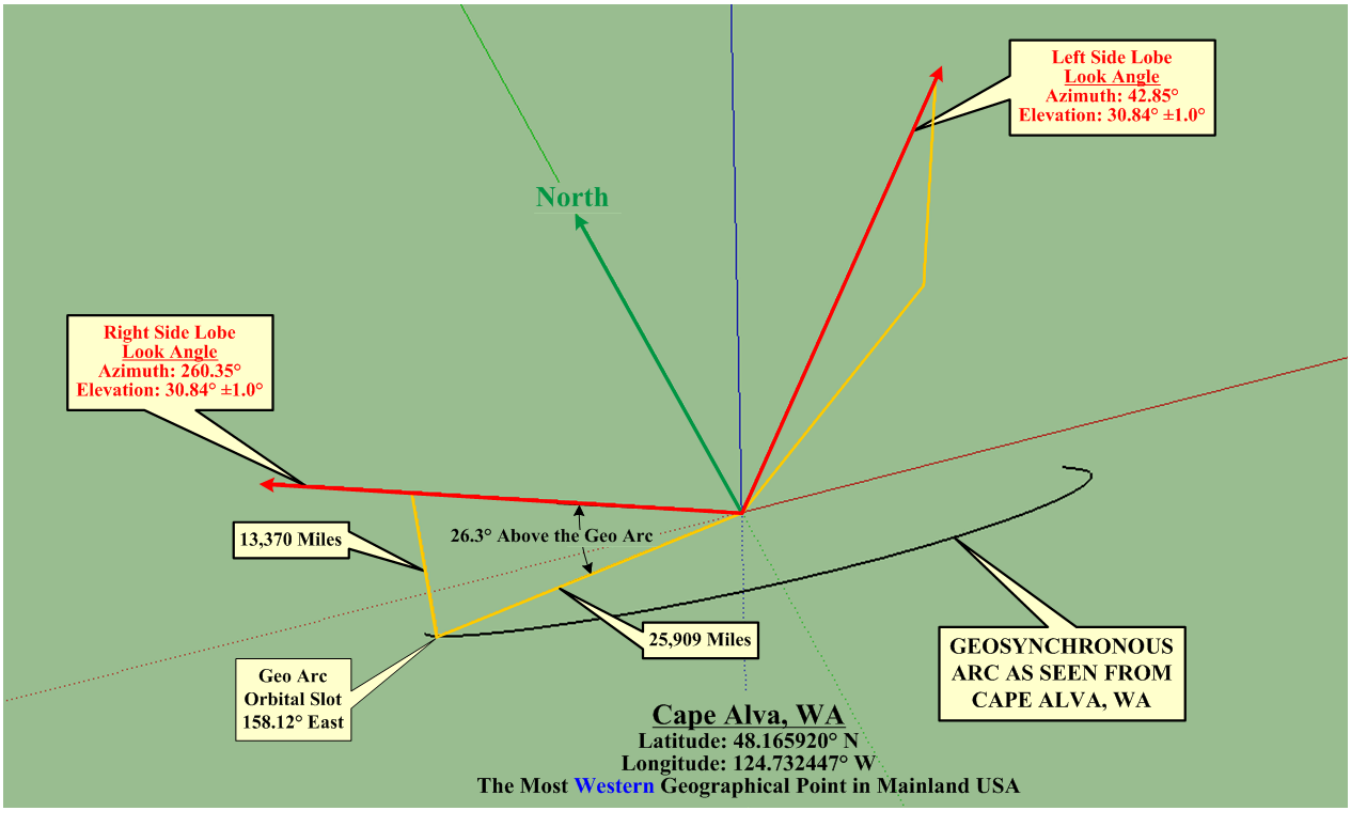


Figure-7

5) In conclusion and based on the direction, magnitude and elevation of the side-lobes from the Vislink Mantis 1.9M Ku-band uplink terminal and in addition to being compliant to the Eutelsat side-lobe specification, the likelihood of adjacent satellite interference resulting from Ku-band transmissions from within the Mainland USA toward the SES-3 satellite is nonexistent. For that reason, NBC News Field Operations would like to petition the Federal Communications Commission for a waiver of the -10 dBi for $48° < \theta \leq 180°$ side-lobe specification and grant authorization to operate Mantis 1.9M flyaway uplink terminals within the continental US for the purposes of temporary Newsgathering.