new spectrum satellite

September 21, 2018

Mr. Jose P. Albuquerque
Chief, Satellite Division
International Bureau
Federal Communications Commission
Washington, DC 20554

Re: New Spectrum Satellite, Ltd.
IBFS File No. SAT-LOI-20170726-00111 (Call Sign S3019)
(Letter from the Federal Communications Commission dated August 8, 2018)

Dear Mr. Albuquerque,

New Spectrum Satellite, Ltd. ("NSS") hereby responds to the Commission's letter of August 8, 2018 seeking clarification on certain points arising out of its Petition for Declaratory Ruling filed July 26, 2017. As requested by the Commission, this supplements and expands on the information provided in the response to the Commission's earlier request of June 14, 2018 and which NSS submitted on July 16, 2018.

In response to item 1 in the above referenced letter, NSS supplies the following information:

> Pursuant to 47 C.F.R. § 25.114(c)(4)(vii)(C), 2nd sentence, we are including in the attached Appendix contour diagrams for a nadir user link transmit or receive beam, and diagrams of the beam array of identical beams formed by the satellite's multi-beam antenna. By way of further elaboration, we show the contour diagrams for beginning or end of arc, at apogee within the arc, and at the time-averaged operational altitude of 23,700 kilometers. This is all shown for the Western North America active arc. The Eastern active arc is similar since all satellites use the same antenna designs. The illustrations include contours for 2, 4, 6, 8, 10, 15, and 20 dB down from beam peak.

We also likewise include a diagram (Figure 4) of our active arcs shown on a Mercator global map, showing the East North America (ENA) active arc and the West North America (WNA) active arcs. For information purposes the figure also shows active arcs in other parts of the world. Active arcs of the same color, green or blue, are transited in turn by a given satellite.

Following this diagram, we show examples of the user beam array for the satellites as filed for the cases of start-of-arc, mid-arc and end-of-arc. The beam array diagrams include a contour for those places seeing a 20-degree elevation angle to the satellite. Areas in the United States are always served by beams operating above 20 degrees. Nonetheless for illustrative purposes the beams are drawn to terminate at the 10-degree elevation contour in the diagrams.

Note that another beam array from the East North America active arc covers the Eastern United States, so that the beam array from the West North America active arc only serves areas West of roughly 94 degrees West Longitude, as shown in Figure 5 (which shows the worst case elevation angles). West North America beams shown in this figure that are entirely within the service area of the East North America active arc will not be energized; rather beams from the satellite in the East North America active arc will serve those areas. Figure 8 shows the corresponding worst case illumination from the East North America active arc. Beams that are wholly to the West of the vertical line shown will not be energized; instead the area West of the line will be served by the beams in the West North America active arc.

When one array is at the beginning or end of an arc the other arc serving the area will be at apogee. Users will be given a fixed arc assignment corresponding to the arc providing the best service (highest elevation angles). Figure 9 and Figure 10 in the appendix illustrate this overlap. These figures show all beams from both satellites, even though only beams from each satellite serving its respective service area (East or West corresponding to the East or West North America active arc respectively) will be active and radiating, as already described above.

Figure 11 through Figure 16 in the Appendix show contour diagrams for feeder link receive and transmit beams pointed at nadir at the average operational altitude of 23,700 kilometers. All feeder link beams operating at the same frequency will be identical and will have the same contour diagram. There could be as many as 10 feeder link ground station sites serving each active arc upon complete terrestrial buildout and full satellite loading. Each steerable feeder link beam can be pointed anywhere in North America within the zone served by the respective active arc in which the host satellite is flying (the location shown in the illustrations is merely exemplary). The West North

America active arc serves points in North America west of longitude 94 degrees West. The East North America active arc serves points in North America East of this longitude. The Pacific active arc serves points West of 154 West longitude notably in Alaska and Hawaii.

Satellites will not operate to user or gateway ground stations in North America where at any time in an orbital pass the elevation angle from the ground station to the satellite is less than 20 degrees.

Again, the figures described above (figures 11 through 16) represent illustrative examples and similar and equivalent contour diagrams can be drawn for any gateway located within the United States and in fact the entire service area.

In response to item 2 in the FCC's letter of August 8, 2018, NSS offers the following clarification:

We note that Figure 5 and Figure 8 represent the worst case elevation angles from the two active arcs, East North America and West North America, that serve the continental United States. These beams represent the moment upon satellite activation on handoff from the active arc's departing satellite in the case of the WNA active arc, and immediately before satellite deactivation upon handover to the next satellite in the case of the ENA active arc. For all other times during either of the active-arc transits, the elevation angles to the satellite are better than shown in these respective figures.

Observing the two cited figures, no transmissions will ever arrive in the United States at elevation angles below 15 degrees in either worst case, even if beams serving out-of-area were illuminated (which is not planned as described in our reply to item 1 above). However, given that beams that lie wholly within the longitudes served by a different active arc are not energized, NSS can safely claim that no transmissions will ever arrive in the United States at elevation angles below 20 degrees within any active beam footprint.

Consequently, we do not use elevation angles below 20 degrees to serve our customers.

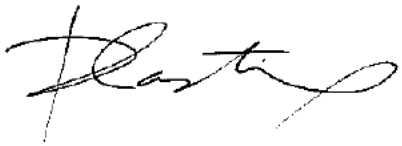
Furthermore, beams 292L/R to 327L/R represent the outer ring of beams in the 127-beam hexagonal transmit arrays. As can be seen in Figures 5 and 8, beams in the outer ring having any coverage in areas below 20 degrees elevation angle are well out of the active arc's service area and/or entirely out of country. Out of area beams (beams wholly out of the active arc's service area) are simply not energized. Beams out of country are wholly within Mexico, the lower elevation angles of service occurring in

Southern Mexico, and subject to any coordination there in the event landing rights there were to be sought. Absent service in Mexico, these beams are also unilluminated.

Hence, any energy arriving below 5 degrees elevation angle within the band 12.2 to 12.7 GHz in the United States would originate not from the cited beams, but from the well-suppressed far sidelobes of inner beams not in the outer ring.

As permitted through the extension granted on September 2, 2018 and as requested, this response is submitted on this 21st day of September 2018. NSS respectfully requests it be given the opportunity to supplement this submission should the Commission determine that any issue was not fully addressed.

Respectfully submitted



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Appendix

Antenna Contour and Array Diagrams

The following three figures are contours for the user link transmit and receive beams from the Virtual Geo satellites for the cases of start or end of active arc service, apogee, and average active altitude. Transmit and receive beams are congruent to facilitate beam and user traffic management.

Following these are a figure showing the active arcs, beam arrays under various circumstances, and feeder link beam contours.

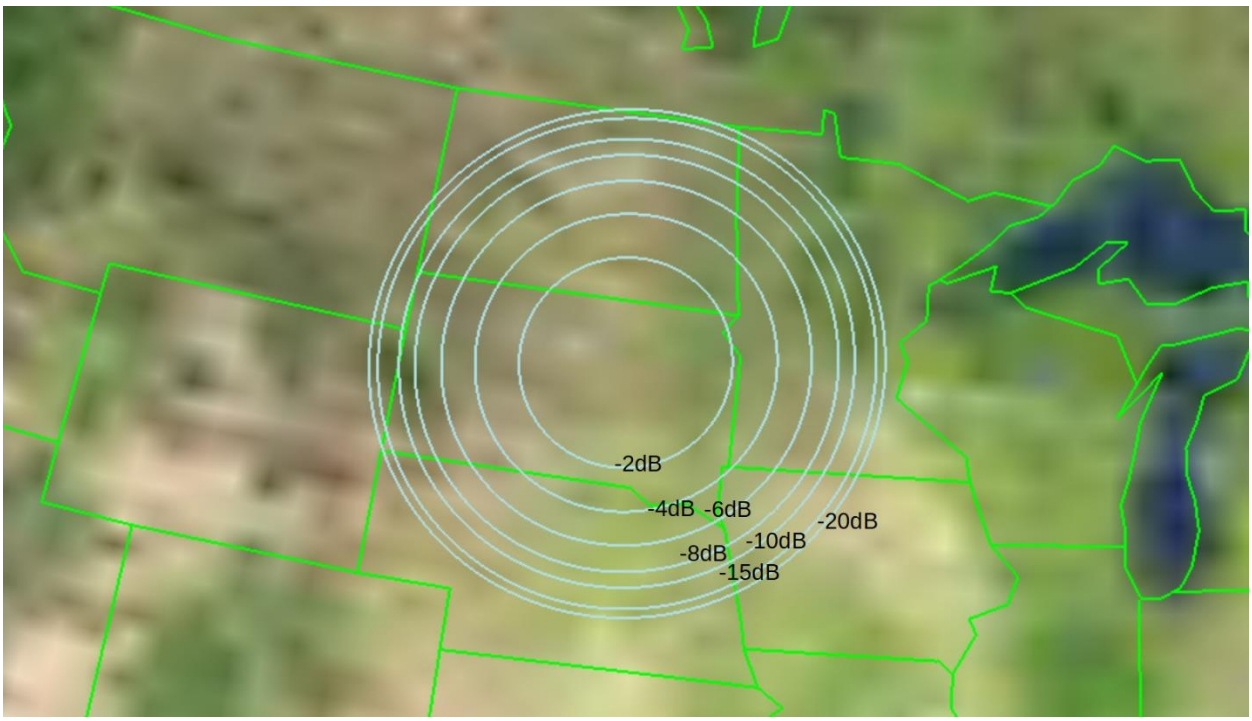

Figure 1 Nadir beam contours for end of West North America active arc, start of arc similar. Applies to Schedule S receive beams 1-14 and transmit beams 1-8

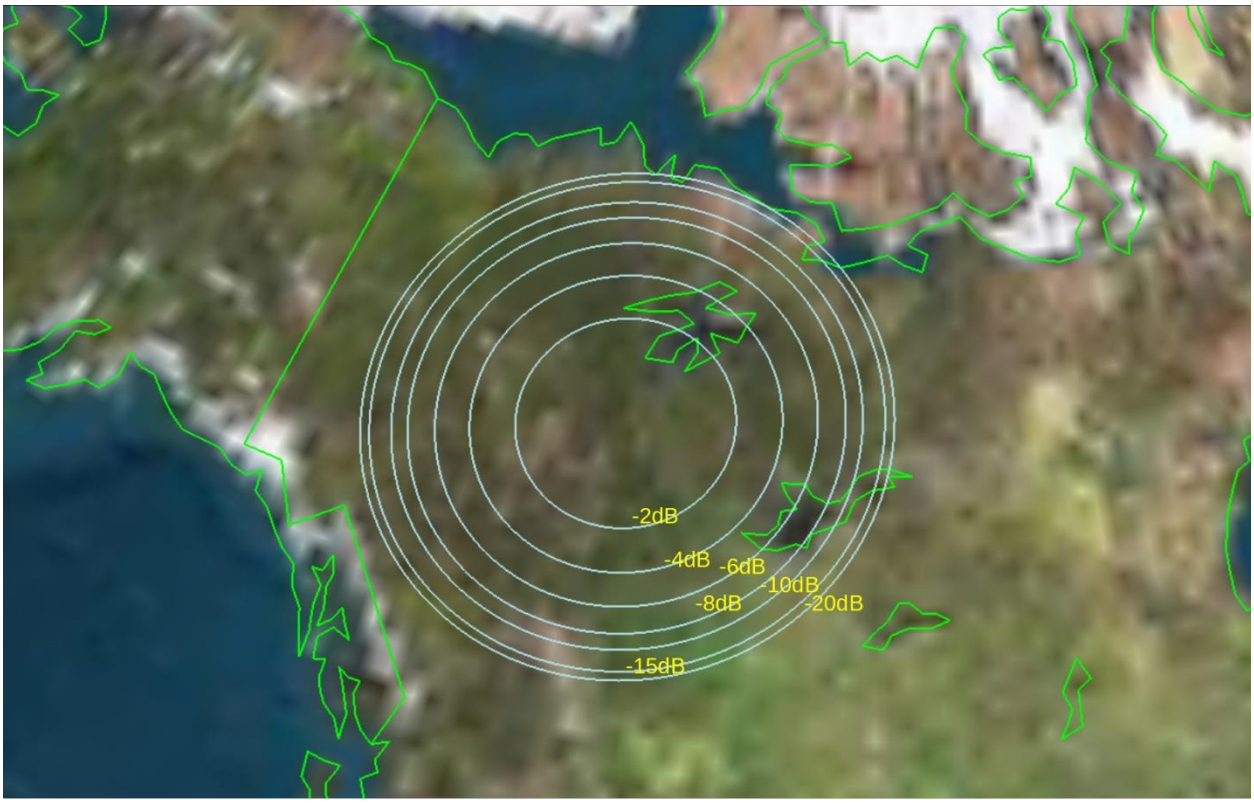

Figure 2, Nadir beam contours when at apogee in the West North America active arc. Applies to receive beams 1-14 and transmit beams 1-8

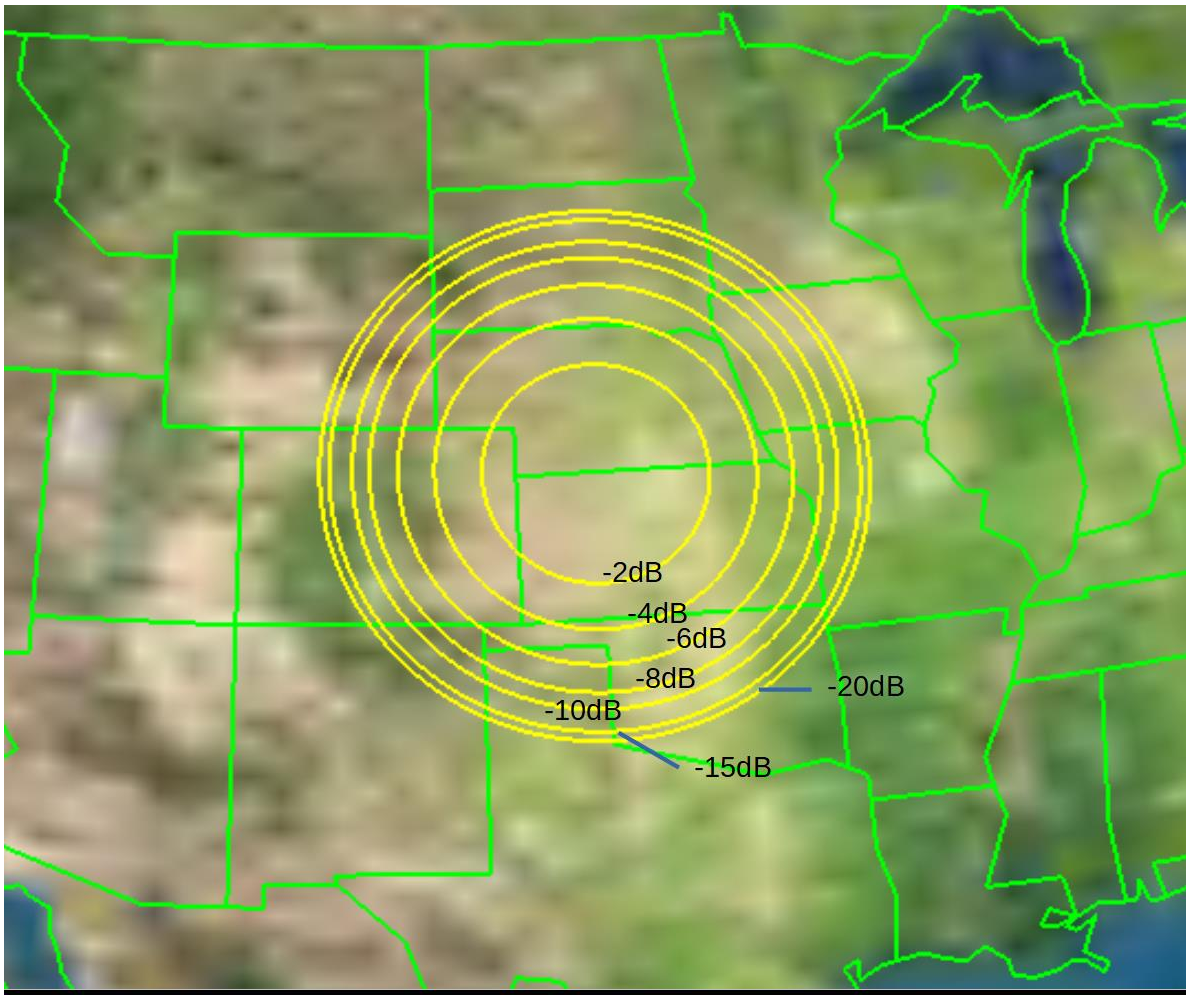

Figure 3, User link nadir beam at average altitude = 23,700km. Applies to receive beams 1-14 and transmit beams 1-8

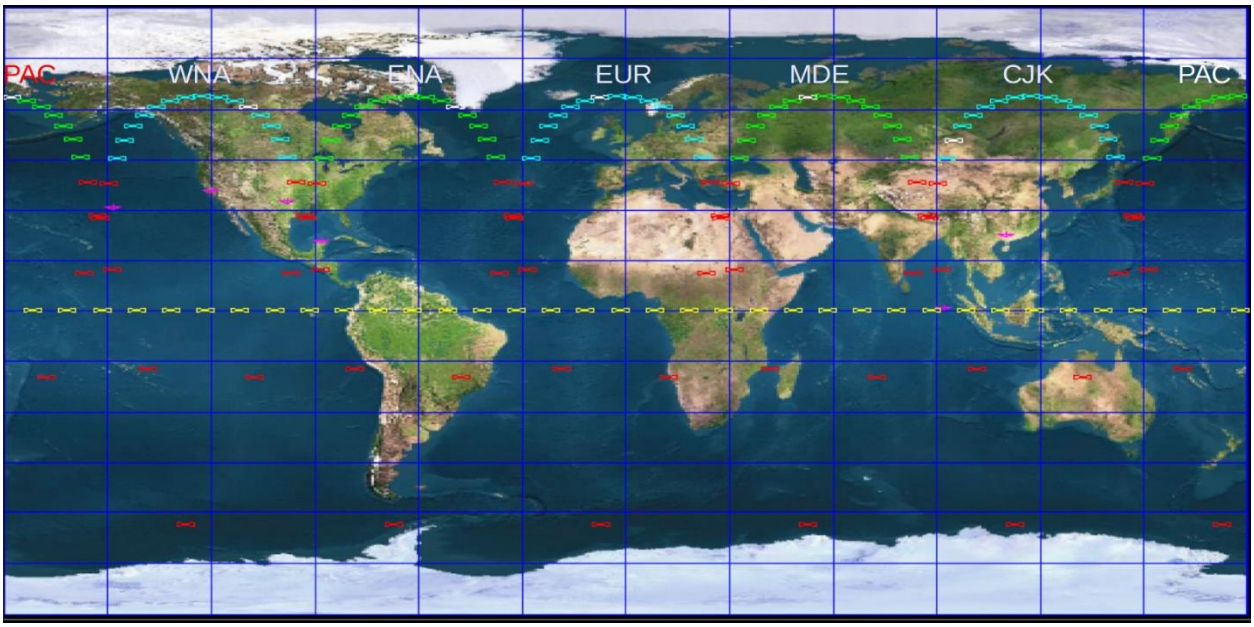

Figure 4, Virtual Geo Active Arcs. The East and West North America active arcs (ENA and WNA respectively) can be seen over North America, divided at approximately 94 degrees West longitude. The blue and green satellites are active, red satellites are quiescent. The Pacific (PAC) active arc serves Alaska and Hawaii. Yellow satellites are satellites in the geostationary orbit.

Figure 5 Satellite transmit and receive user link beam array at the start (most Westward end) of the West North America active arc. The large circle is the 20-degree elevation angle contour to the satellite. The beams terminate in this illustration at 10 degrees elevation angle rather than at 0 degrees. Only those beams serving the Western United States West of the vertical line at approximately 94 degrees West are active on this satellite. The East North America active arc serves the United States East of the vertical line.

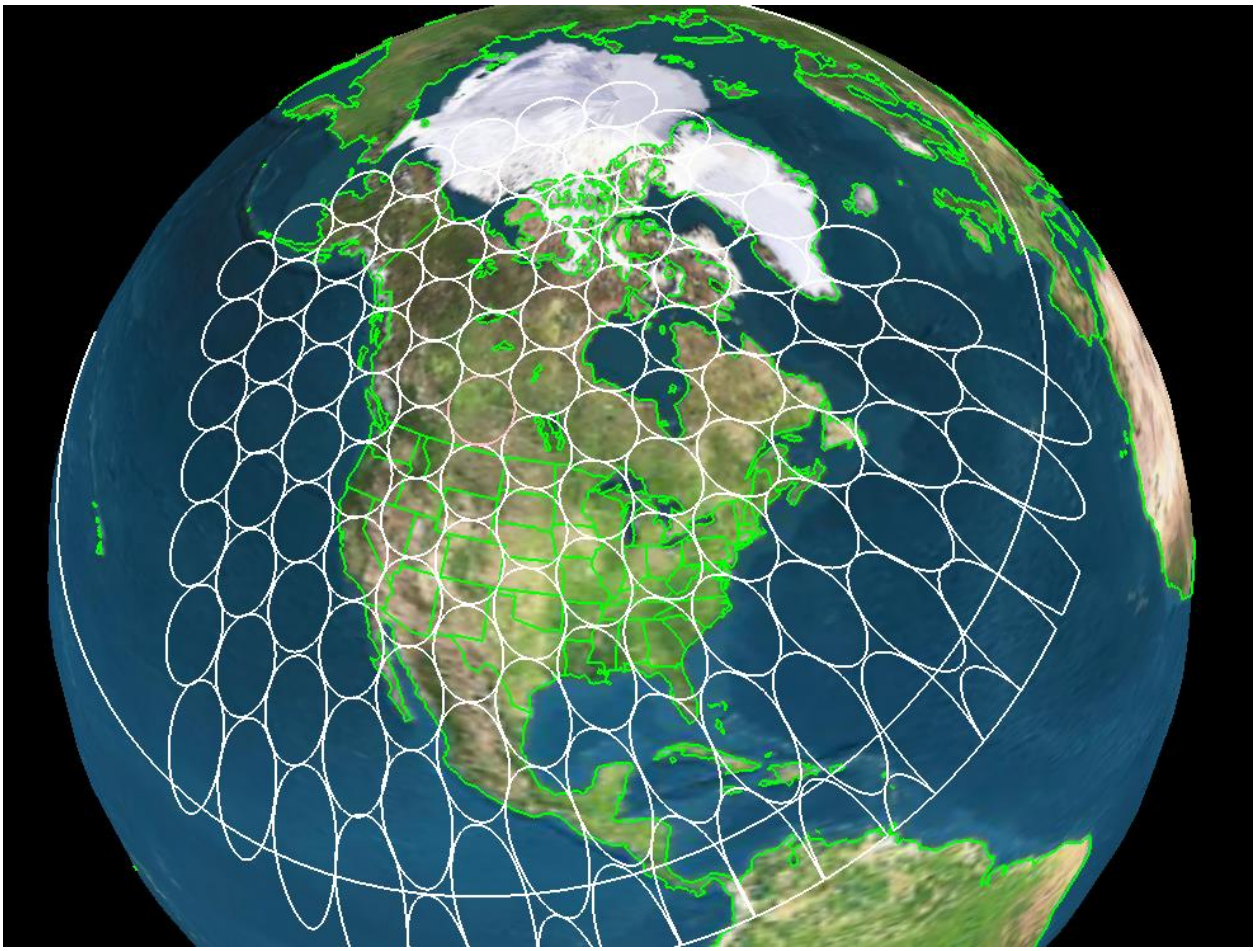

Figure 6 Satellite transmit and receive user link beam array West North American active arc, satellite at apogee. As before, the large circle shows the 20-degree elevation angle contour.

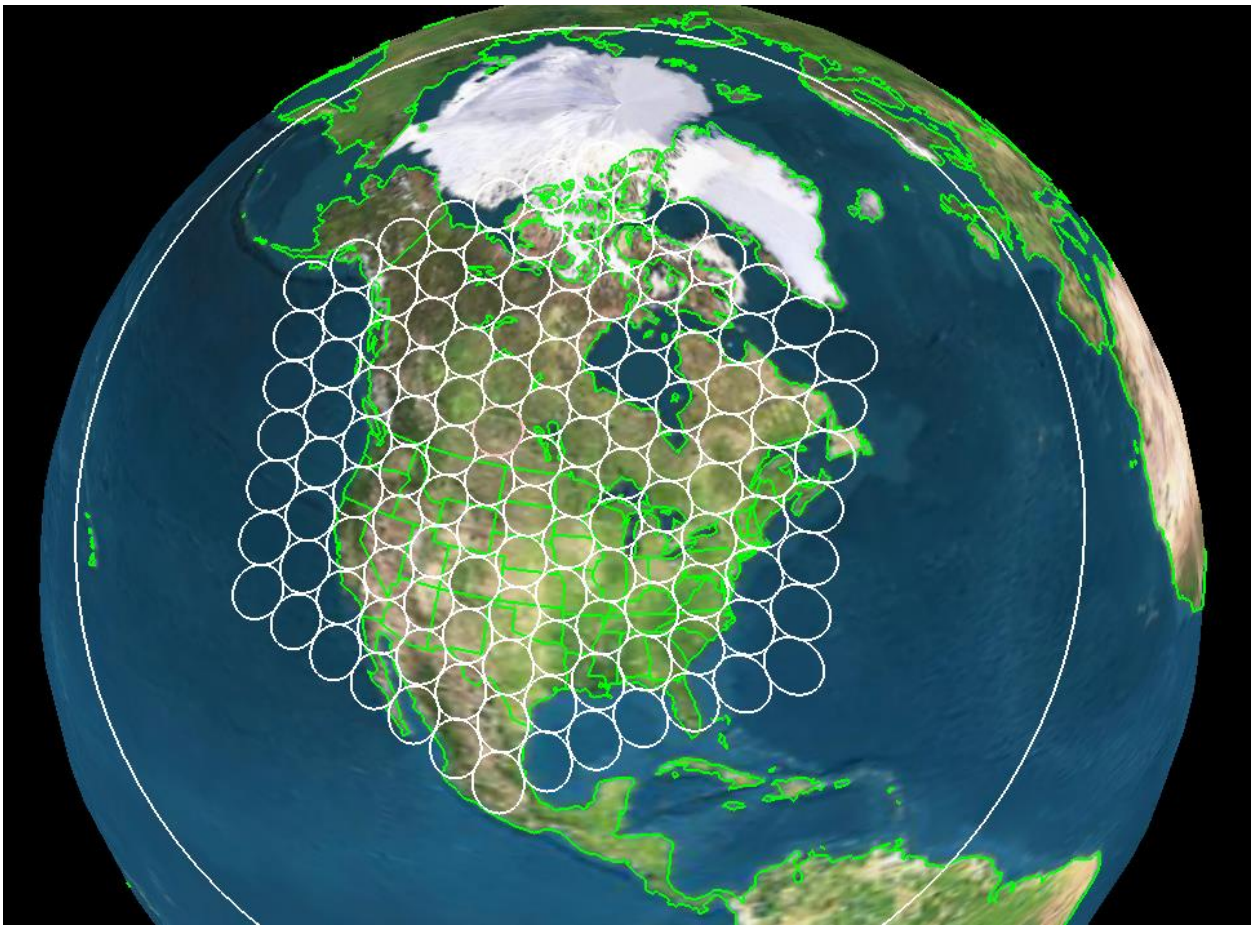

Figure 7 Satellite transmit and receive user link beam array from a satellite at the end of the West North American active arc at the point of handover to the next satellite entering the arc. The large circle shows the 20-degree elevation angle contour to the satellite.

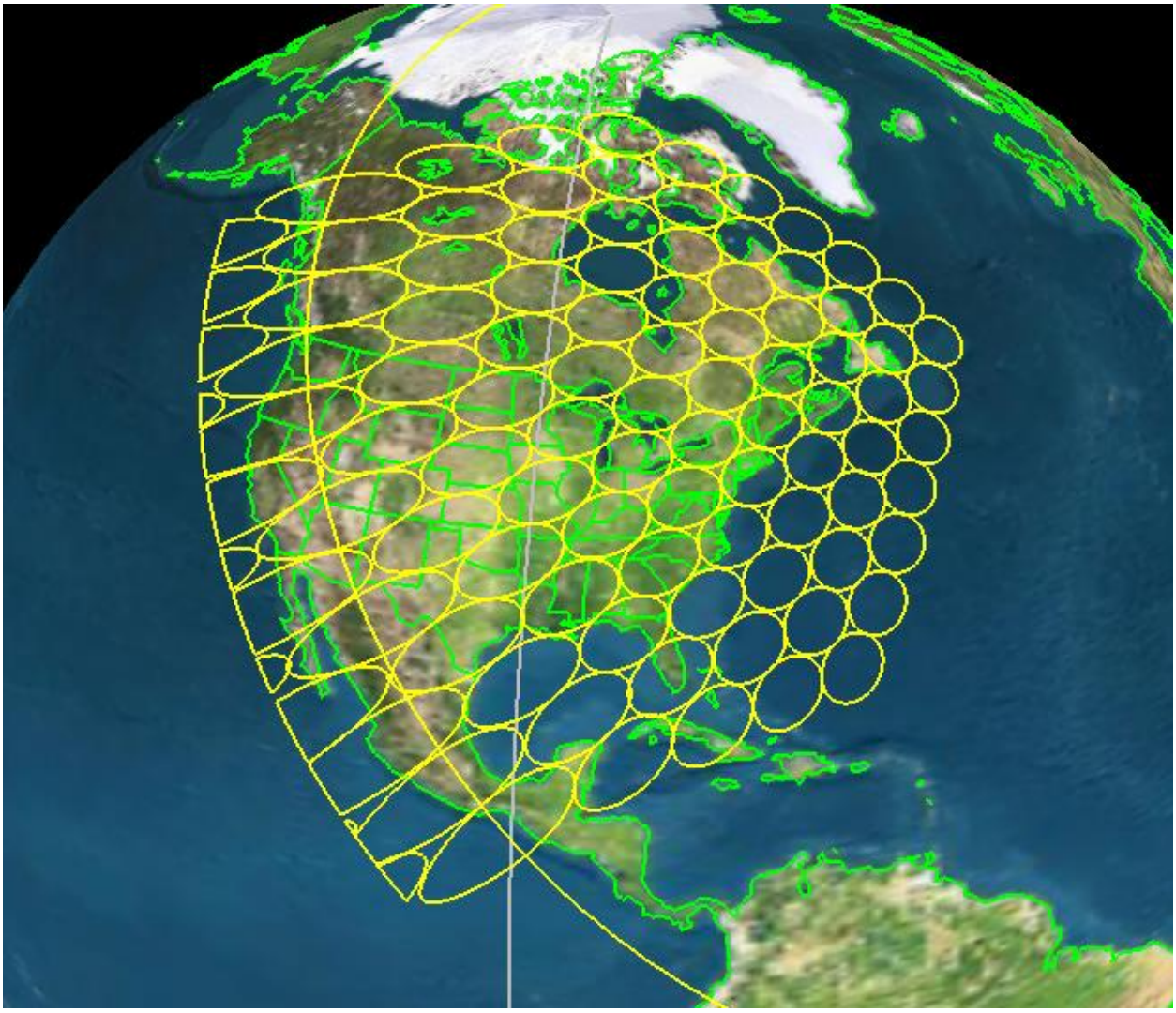

Figure 8, Satellite transmit and receive user link beam array at the end (most Eastward end) of the East North America active arc. The large circle is the 20-degree elevation angle contour to the satellite. The beams terminate in this illustration at 10 degrees elevation angle rather than at 0 degrees. Only those beams serving the Eastern United States East of the vertical line are active on this satellite. The West North America active arc serves the United States West of the vertical line.

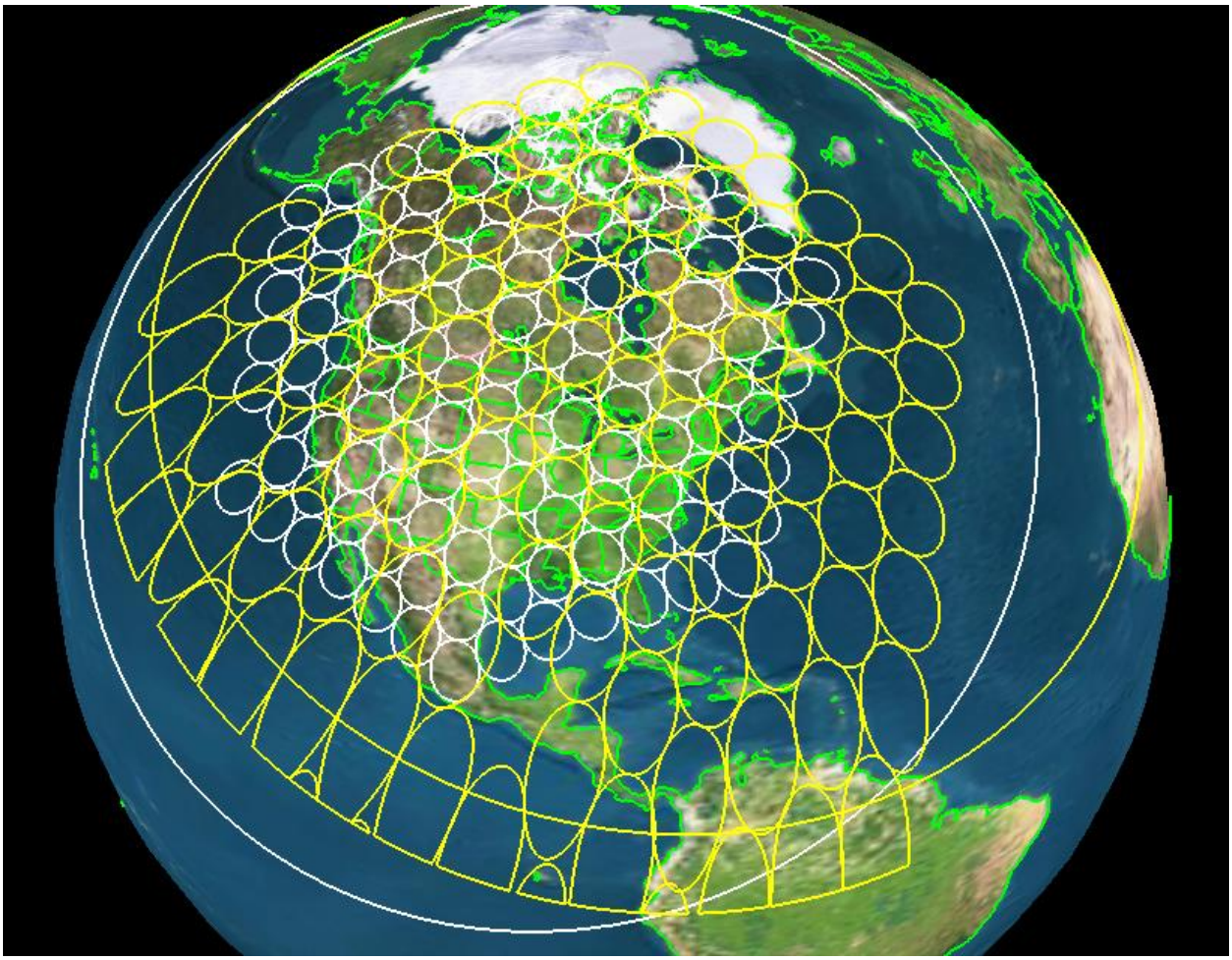

Figure 9 transmit and receive user link beam arrays from two satellites. The satellite showing white beam footprint is exiting the West North America active arc while another satellite showing yellow beam footprints is at apogee in the East North America active arc. The large circle shows the 20-degree elevation angle contour for each respective satellite.

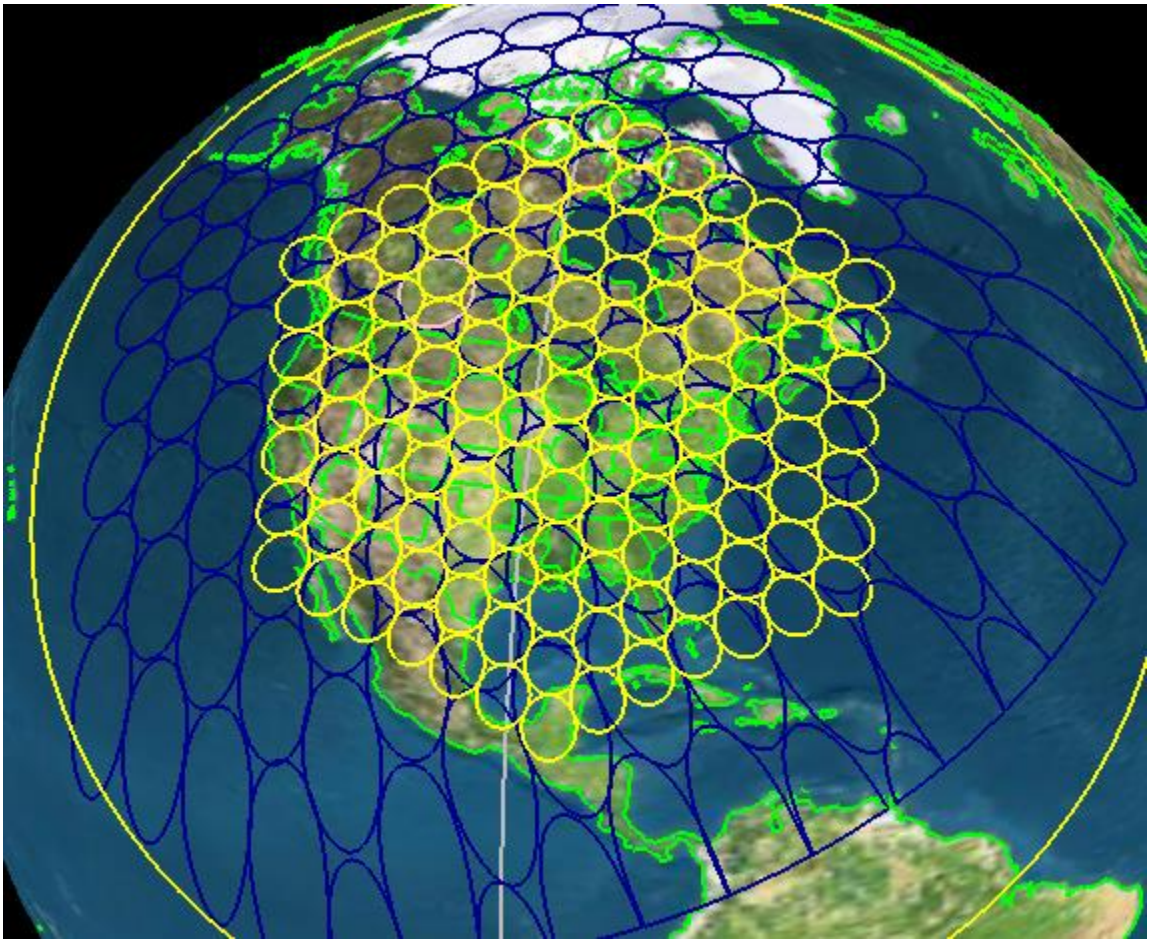

Figure 10, The ENA active arc satellite beam array at start of the ENA active arc, shown in yellow. The WNA beam array from the neighboring satellite in the WNA is shown in dark blue. The large yellow circle is the 20-degree elevation angle contour to the ENA satellite. All ENA beams operate at high elevation angles.

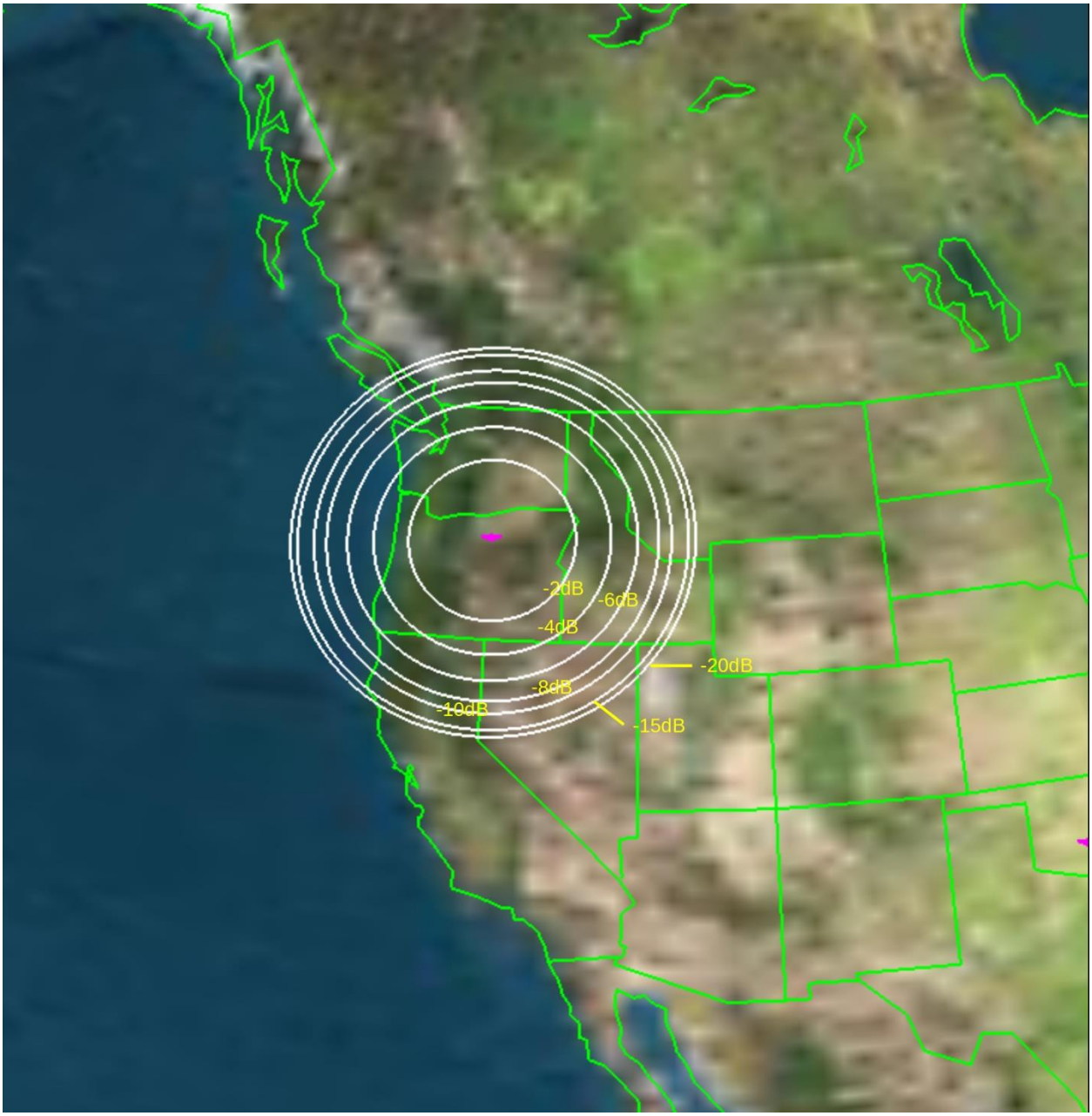

Figure 11, Beam footprint for Schedule S feeder link transmitting beam 10

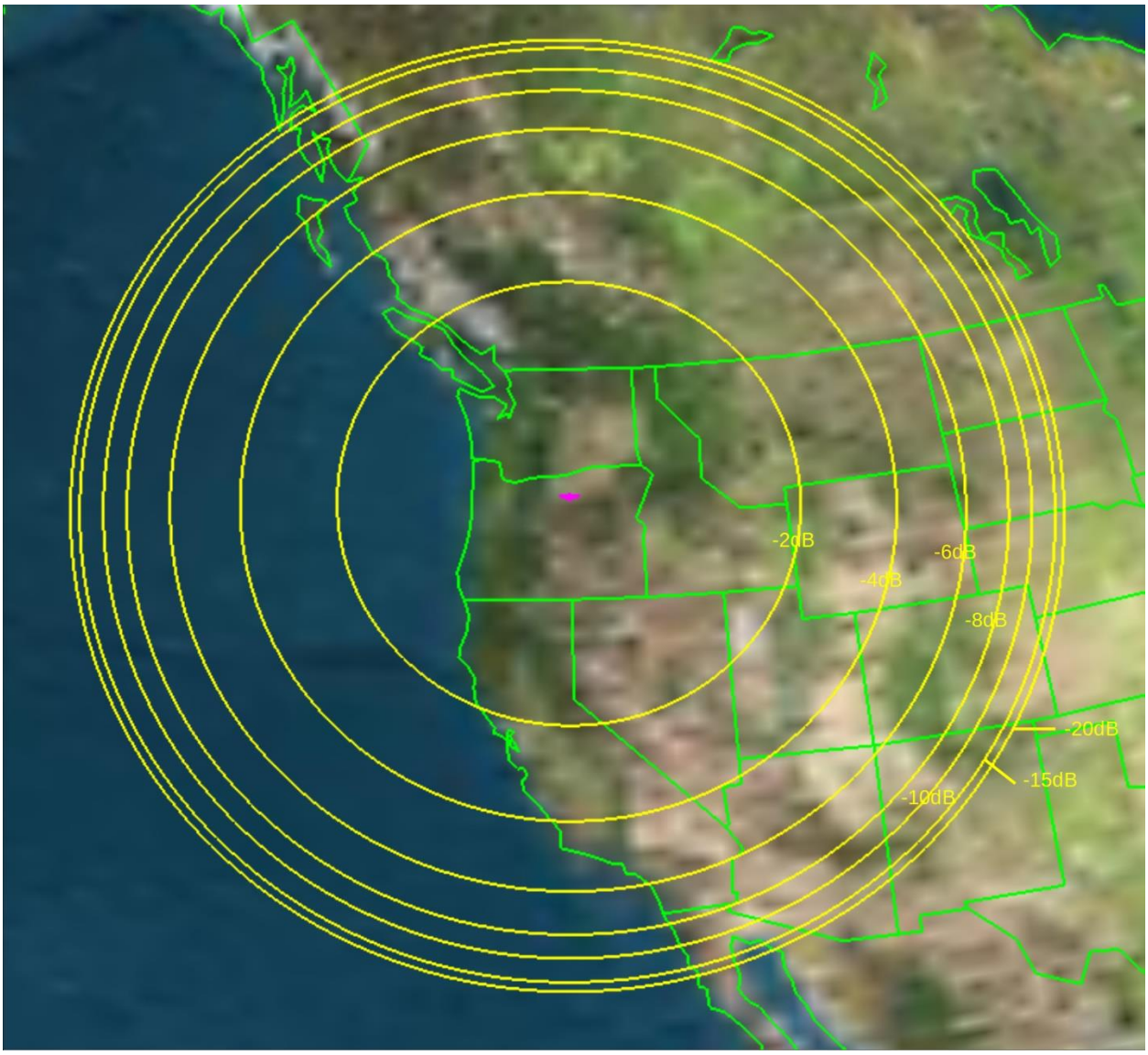

Figure 12, Contours for Schedule S feeder link transmitting beam 9

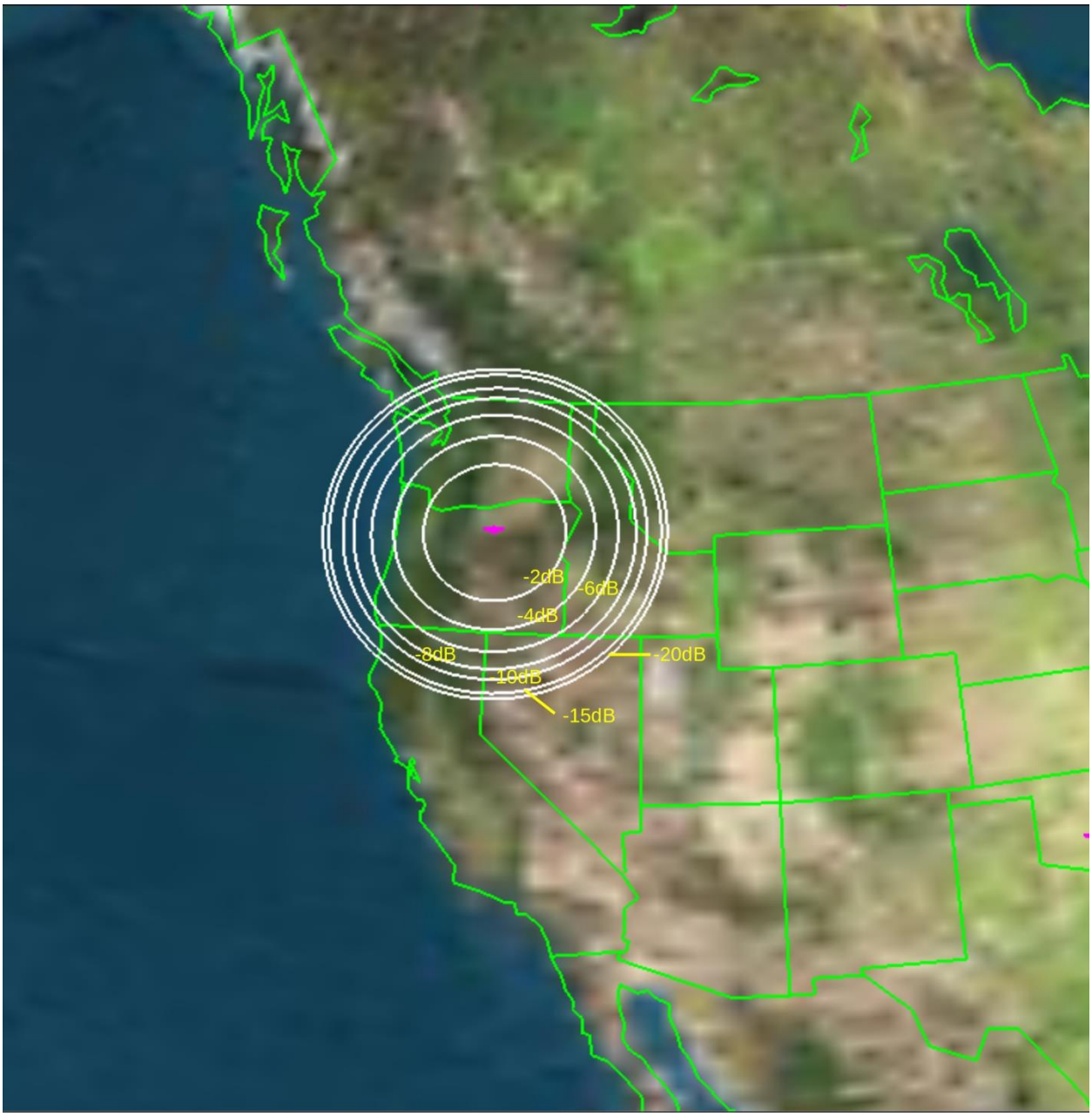

Figure 13, Contours for Schedule S feeder link receiving beam 15 and 16.

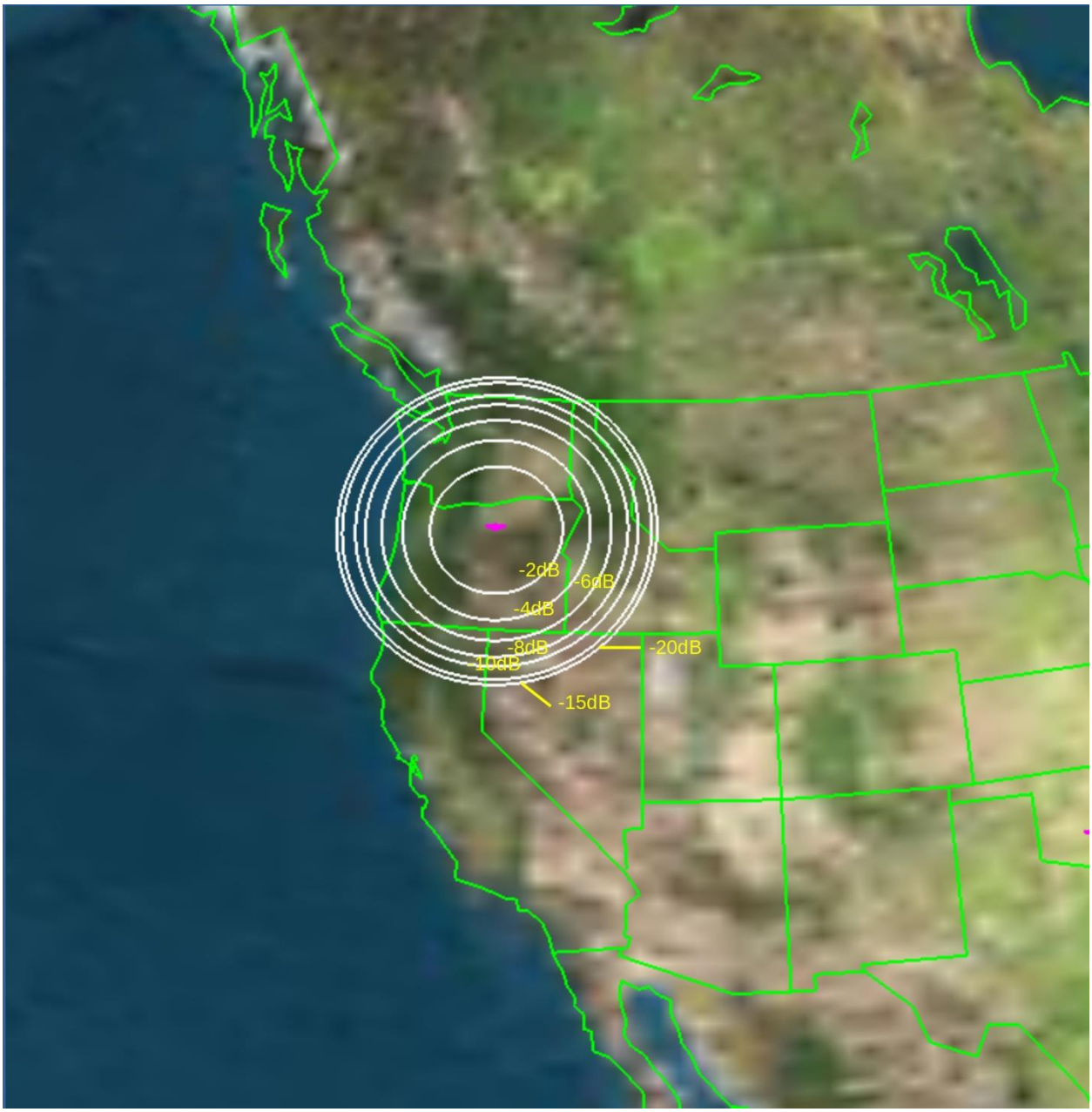

Figure 14, Contours for Schedule S receiving feeder link beams17 and 18.

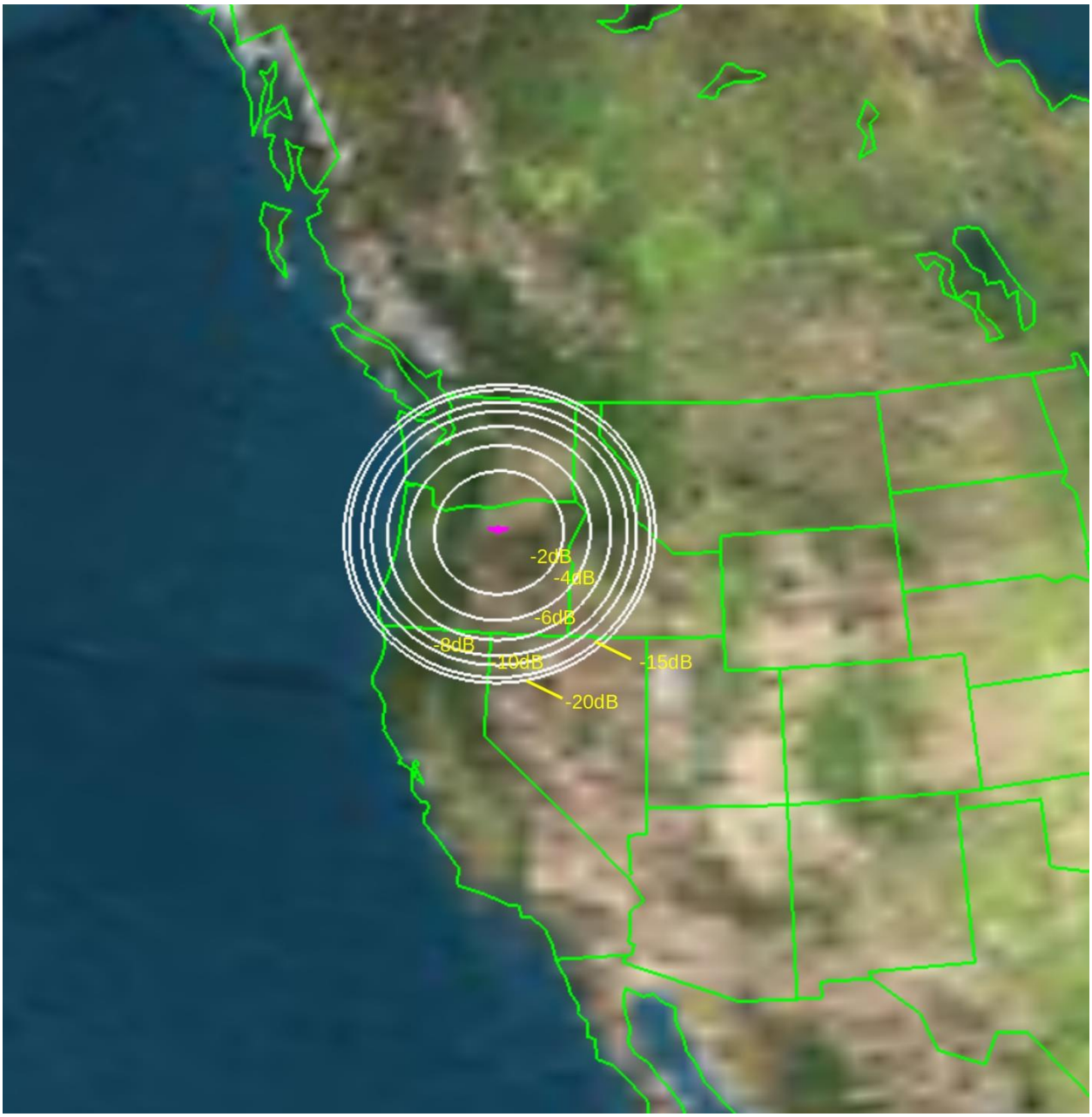

Figure 15, Contours for Schedule S receiving feeder link beams 19 and 20.

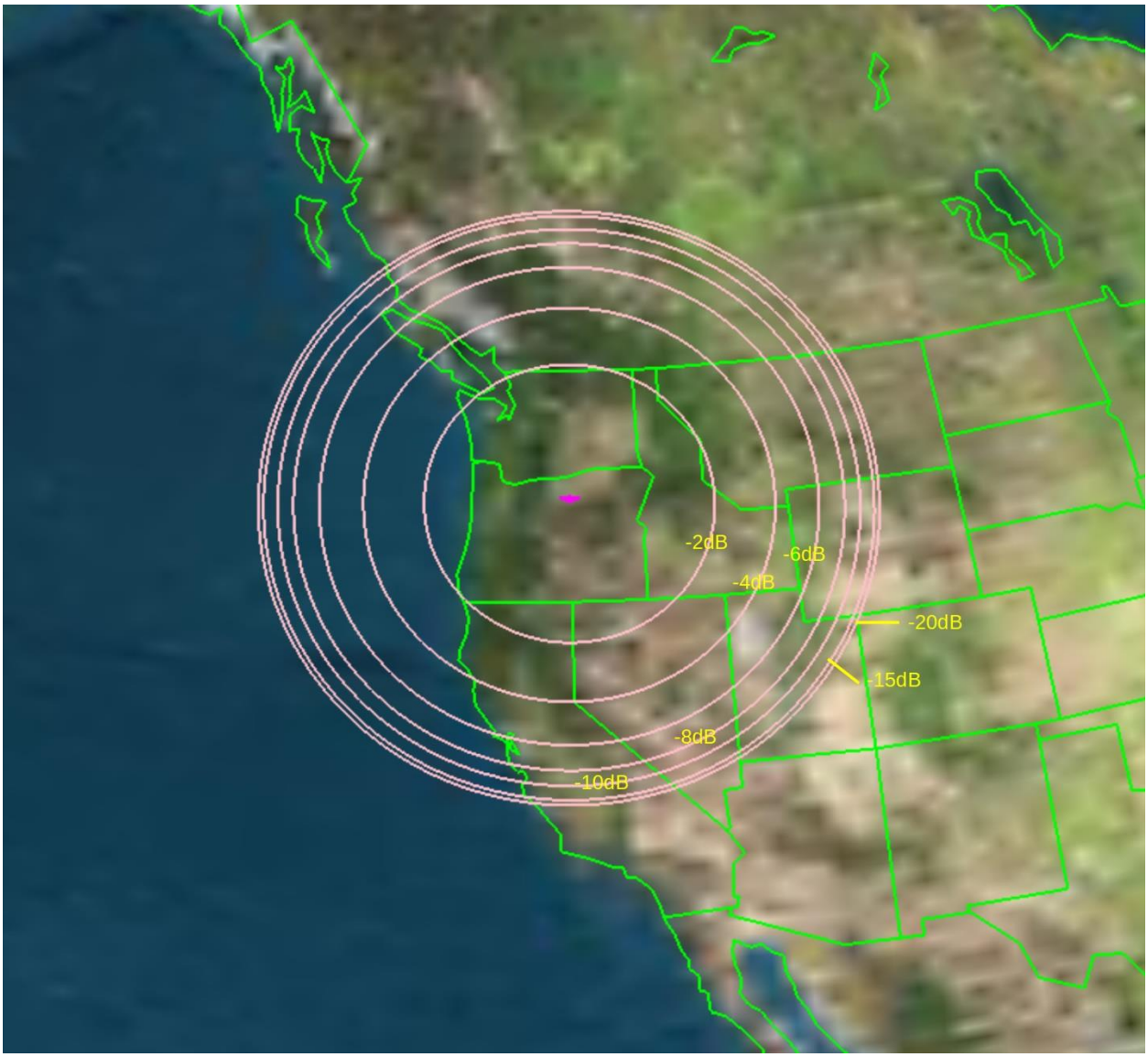

Figure 16, Contours for Schedule S receiving feeder link beams 21 and 22.