<u>Exhibit A</u>

Technical Annex for Chimera-1

I. Scope and Purpose

This Technical Annex provides supplemental engineering and operational information in support of Oligo Space's ("Oligo") application for authority to launch and operate the Chimera-1 non-geostationary orbit ("NGSO") satellite.

The annex describes Chimera-1's proposed orbital parameters, communications architecture, spectrum use, power flux-density analyses, antenna characteristics, and orbital debris mitigation measures relevant to the requested authorizations and associated waiver requests.

Chimera-1 is a hosted-payload spacecraft designed to support technology demonstration, scientific research, communications validation, propulsion evaluation, and radiation mitigation testing for commercial and academic payload customers.

II. General Description

A. Radiofrequency and Earth Station Overview

The following tables provide an overview of Chimera-1's frequency use and the characteristics of its earth station network. Final carrier assignments will be determined through applicable coordination processes and reflected in the final operational configuration. Chimera-1 will only transmit at any given time on a single channel while receiving on a single channel.

Table 1 – Chimera-1 Frequency Plan

Beam ID	SRx	STx	XTx	ISL
Description	S-Band Uplink (Earth-to-space)	S-Band Downlink (space-to-Earth)	X-Band (space-to-Earth)	L-Band (space-to-space)
Frequency Band	2025-2110 MHz	2200-2290 MHz	8025-8400 MHz	1618.725-1626.5 MHz

Bandwidth	103 kHz	103 kHz	15 MHz	35 kHz
Carrier Frequencies	2070 MHz 2035 MHz (backup)	2245 MHz	8200 MHz	**1618.725-1626.5 MHz**
Transmit Power	25.1 W	0.16 W	0.5 W	1.5 W
Transmit Antenna Gain	34 dBi	3 dBi	12 dBi	3 dBi (maximum)
EIRP	44 dBW	-5 dBW	9 dBW	**4.76 dBW**

B. Orbital Information

Chimera-1 will operate in low-Earth orbit with the expected deployment parameters delineated in the table below.

Orbital Parameter	Value
Inclination Angle (degrees)	97.4
Apogee (km)	510 km +/- 10 km
Perigee (km)	510 km +/- 10 km

C. Control of Chimera-1

Oligo will monitor and control all aspects of the Chimera-1 Mission through the Oligo Mission Operations Center (MOC) located at 3457 W El Segundo Blvd, Suite C, Hawthorne, CA 90250.

II. Frequency Use

A. Frequency Tolerance

The frequency tolerance requirements of section 25.202(e) will be met.

B. Out-Of-Band-Emissions

The out-of-band emission limits of section 25.202(f)(1), (2), and (3) will be met.

C. Frequency Reuse

Chimera-1 does not operate in any frequency bands where section 25.210(f) frequency reuse requirements apply.

III. Cessation of Emissions

Chimera-1 will be capable of ceasing transmissions consistent with the requirements of section 25.207 of the Commission's rules.

IV. Spectrum Sharing Analysis

Chimera-1's mission profile makes it well-suited to share spectrum with other systems. Chimera-1's Space Operations Service and TT&C transmissions will be on low duty cycles. Potential interference events are limited to periods during which Chimera-1 and another co-frequency system simultaneously maintain geometric alignment with a common earth station. In such circumstances, Oligo will coordinate operational scheduling as necessary to avoid simultaneous conflicting transmissions in the time, frequency, and geographic dimensions. Coordination of ground station access and scheduling will be managed through KSAT's established operational framework, further minimizing the risk of harmful interference.

Further, Chimera-1 is a single satellite that will only be communicating with 26 Earth stations spread throughout the world, with 6 located in the United States. Chimera-1 will also use small bandwidth channels that should facilitate coordinating spectrum use with other operators.

V. PFD Analysis

Oligo demonstrates below that its operations in the S-band downlink and X-band will comply with the applicable Commission and ITU rules.

a. 2200-2290 MHz

1. PFD at the Earth's Surface

The Commission's rules do not specify a PFD limit in the 2200-2290 MHz band; however, there are PFD limits specified in rule No. 21.16 of the International Telecommunication Union ("ITU") Radio Regulations ("ITU RR"). The maximum PFD levels for the Chimera-1 transmissions were calculated for the 2200-2290 MHz band and the results, which are provided in Schedule S, demonstrate that the downlink PFD levels of the Chimera-1 carriers do not exceed the limits specified in rule No. 21.16 of the ITU RR.

The figures below illustrate the S-band downlink PFD values in comparison with the ITU PFD limits in No. 21.16. When operating at orbital altitudes above 510 km, the EIRP of -5 dBW can be used for an emission bandwidth of 103 kHz as shown in Figure 1. For narrower emission bandwidths, the EIRP is reduced to keep the EIRP density constant. As the orbit altitude drops below 510 km, the RF power is backed off to assure PFD limits are always observed. The PFD at the Earth's surface produced by Chimera-1 satisfies the PFD limits for all angles of arrival calculated at the 450 km orbital altitude, which is the lowest operating orbital altitude for Chimera-1.

To the extent possible and helpful for de-orbiting, Oligo will continue to conduct S-band TT&C communications during the period up until when the perigee of Chimera-1 is above 450 km as Chimera-1 is de-orbiting. In that event, Chimera-1 will further reduce the power levels of its transmissions to maintain compliance with the PFD limits or payload transmissions will be limited to times when the instantaneous orbital altitude is above 450 km. The mission will be completed before reaching a perigee of 450 km.

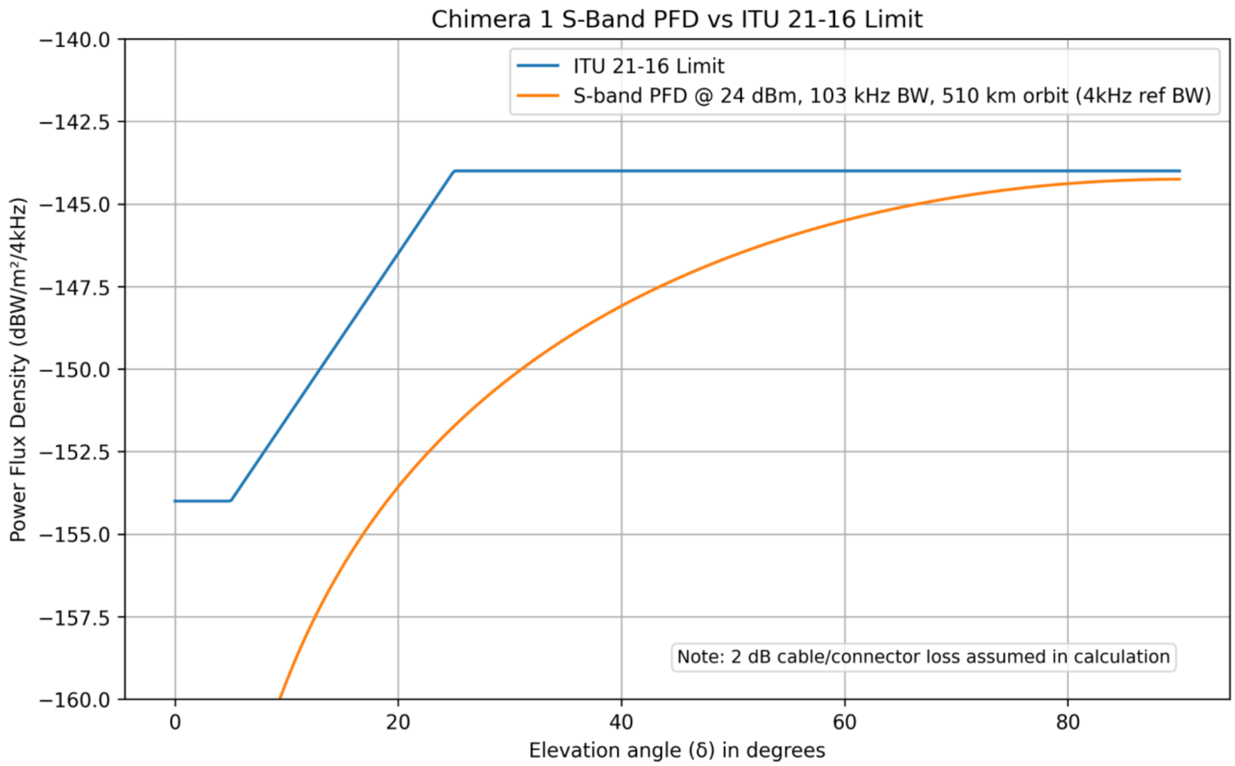

Figure 1 S-band PFD from 510 km Orbital Altitude

b. 8025-8400 MHz

1. PFD at the Earth's Surface

Chimera-1 meets the ITU-established PFD limits in the X-band on the Earth's surface and at the geostationary arc and adequately limits emissions in the adjacent band frequencies, as discussed below. Because the L-band communications subsystem employs a type-approved Iridium terminal operating on an existing licensed commercial MSS network, no separate power flux density (PFD) analysis at the Earth's surface is applicable. Likewise, no additional interference analysis is required beyond the certified operating characteristics of the Iridium terminal. The certified equipment complies with applicable FCC requirements for occupied bandwidth, transmit power, spurious emissions, and out-of-band emissions, and its operation is not expected to cause harmful interference to other authorized in-band or adjacent-band services.

The Commission's rules do not contain limits on PFD at the Earth's surface produced by emissions from space stations operating in the 8025-8500 MHz band.[1] However, Table 21-4 of the ITU RR specifies that the PFD at the Earth's surface produced by emissions from a space station in the 8025-8400 MHz band, including emissions from a reflecting satellite, must not exceed the following values:

- -150 dB(W/m²) in any 4 kHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;
- -150 + 0.5(δ – 5) dB(W/m²) in any 4 kHz band for angles of arrival δ (in degrees) between 5 and 25 degrees above the horizontal plane; and
- -140 dB(W/m²) in any 4 kHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

The PFD at the Earth's surface produced by Chimera-1 satisfies the PFD limits for all angles of arrival calculated at the 450 km orbital altitude, which is the lowest nominal operating orbital altitude for Chimera-1. In that event, Oligo will reduce the power levels of its transmissions to maintain compliance with the PFD limits or payload transmissions will be limited to times when the instantaneous orbital altitude is above 450 km.

Reduced emission bandwidths will typically be employed either early in the operational lifetime or in cases where additional link margin is necessary. Typically, the X-band band transmitter will operate at the maximum EIRP level of 9 dBW. Because Chimera-1 operates over a range of orbital altitudes, the minimum emission bandwidth that can be employed at maximum EIRP will change as a function of orbital altitude to ensure the PFD limits are met. For orbital altitudes with perigee above 500 km, the minimum emission bandwidth that can

[1] 47 C.F.R. § 25.208.

support the maximum EIRP is 15 MHz. The PFD for a 9 dBW EIRP within 15 MHz at 510 km orbital altitude is shown in the figure below.

The minimum orbital altitude at which the payload will transmit in the X-band is 450 km. At orbital altitudes from 500 km down to 450 km, the maximum EIRP and bandwidth size will be adjusted to ensure compliance with the PFD limits as Chimera-1 descends. The PFD for a 9 dBW EIRP within 15 MHz at 510 km and 450 km orbital altitude is shown in the figure below.

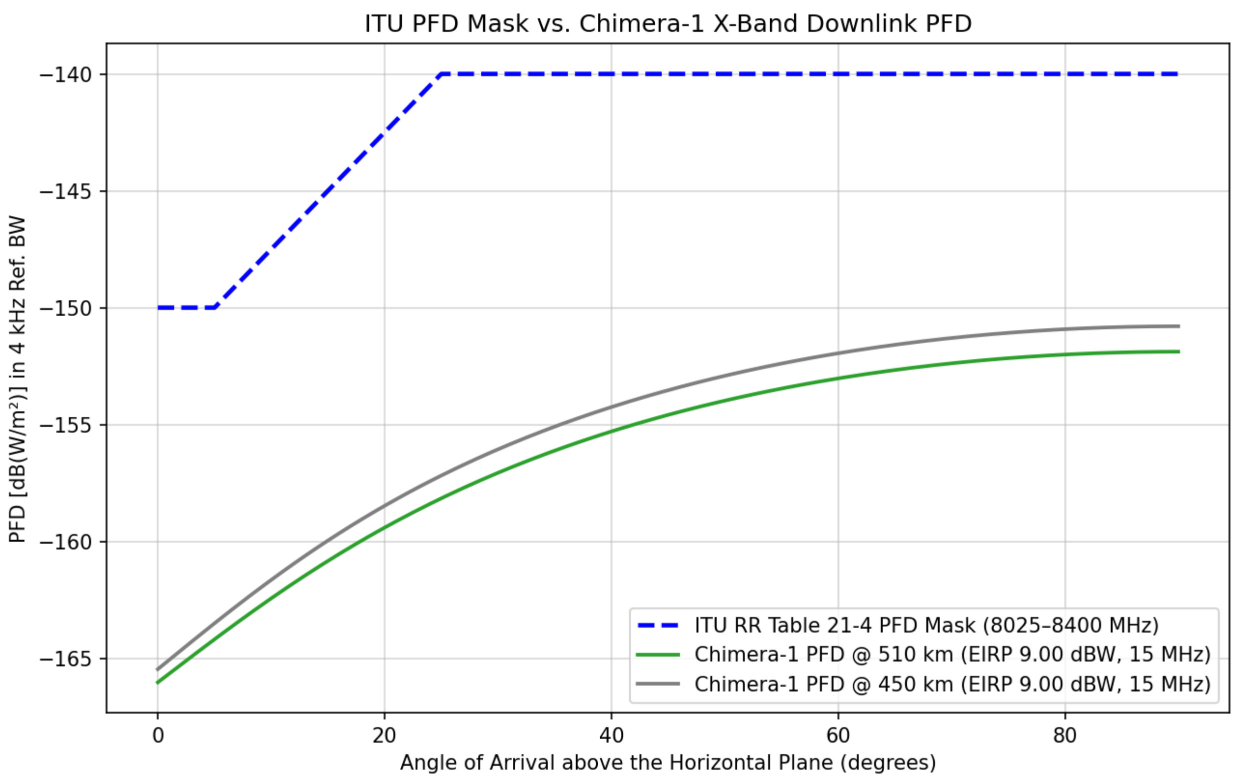

Figure 2 X-band PFD from 510 km and 450 km Orbital Altitude

2. **PFD at the Geostationary Satellite Orbit**

ITU RR 22.5 states that in 8025-8400 MHz band "the maximum power flux-density produced at the geostationary-satellite orbit by any Earth exploration-satellite service ("EESS") space station shall not exceed −174 dB(W/m^2) in any 4 kHz band." At the maximum 510 km altitude for Chimera-1, assuming the spacecraft is pointed directly at geostationary orbit, the PFD would be approximately -188.7 dBW/m^2 dBW/m^2, which complies with the limit.

PFD Calculation

$$
\begin{aligned}
\text{Range} &= 35786\ \text{km} - 510\ \text{km} = 35276\ \text{km} \\
\text{Transmitted Power (watts)} &= 10^{\left(\frac{27\ \text{dBm} - 30\ \text{dBm/dBW}}{10}\right)} \\
\text{Linear Gain} &= 10^{\left(\frac{12\ \text{dBi}}{10}\right)} \\
\text{PFD}\ (\text{W/m}^2) &= \frac{\text{Transmitted Power (watts)} \times \text{Linear Gain}}{4\pi \times \text{Range}^2} \\
\text{PFD per 4 kHz reference bandwidth} &= \frac{\text{PFD}}{15\,\text{MHz}/4\,\text{kHz}} \approx -188.7\ \text{dBW/m}^2
\end{aligned}
$$

3. Protection of Authorized X-band satellite operators

The Oligo Chimera-1 mission plans to use a 15-megahertz channel (15 MHz) in the X-band (space-to-Earth), to the extent necessary, on an unprotected and non-interference basis for space operations services. The attached report, included as Exhibit 6, demonstrates that the Chimera-1 spacecraft operations will not cause unacceptable levels of interference to authorized satellite systems in these X-band frequencies.[2]

4. Out-of-band Emissions in the 8025-8400 MHz band

ITU-R Recommendation SA-1157-1 specifies a maximum allowable interference power spectral flux density level ("PSFD") at the Earth's surface to protect ground receivers in the deep-space research band operating in the 8400-8450 MHz frequencies.[3] Oligo complies with

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[2] *See* Exhibit 6.
[3] *See* Recommendation ITU-R SA.1157-1 (Protection criteria for deep-space research) (2006).

this requirement. Moreover, Oligo's highest band edge is approximately 200 megahertz below the lowest band edge for the 8400–8450 MHz band, which would result in further attenuation.

Oligo calculates a maximum PSFD at the Earth's surface of -256.82 dB(W/m^2 / Hz), which is below the maximum allowable interference power spectral flux-density level at the Earth's surface of -255.1 dB(W/m^2/Hz) at 8.4 GHz.[4] Chimera-1's nominal operating altitude is 510 ± 10 km. The PSFD analysis below evaluates the worst-case altitude of 450 km, which is reached only during end-of-life atmospheric descent. At all nominal altitudes Chimera-1 operates with additional margin beyond the values shown. Chimera-1 will cease X-band transmissions once its instantaneous altitude falls below 450 km. This schedule is implemented via the transmitter's in-flight reconfigurable output power setting (27-33 dBm in 1 dB steps). The maximum interference PSFD was calculated as follows:

Chimera-1 maximum PFD (at 450 km altitude EOL, 15 MHz of bandwidth) = -150.8 dB(W/m^2*4 kHz)
Total Attenuation at 8.4 GHz relative to 8.2 GHz (filtering and guard band) = at least 70 dB

PSFD = PFD - 10*log(4000) – Attenuation
PSFD = -150.8 - 36.02 – 70
PSFD = -256.82 dB(W/m^2/Hz)

VI. Satellite Antennas

The following figures provide the antenna gain contour plots for the Chimera-1 mission transmit and receive antenna beams.

The submitted contours correspond to the spacecraft's S-band receive beam, S-band transmit beam, and X-band transmit beam associated with the proposed mission operations and identified Earth station locations. The contour plots depict the projected antenna gain patterns on the

[4] *Id.*

surface of the Earth and illustrate the operational footprint and gain characteristics of the proposed communications links for each relevant beam configuration.

The following figures contain the corresponding antenna gain contour plots and associated ground station mappings.

Table of Antenna Gain Contours

Map Number	**Location**	**Band**
1	Prudhoe Bay, Alaska	X-Band Transmit
2	Prudhoe Bay, Alaska	S-Band Receive
3	Andoya	S-Band Transmit
4	Andoya	S-Band Receive
5	Athens	S-Band Transmit
6	Athens	S-Band Receive
7	Awarua	S-Band Transmit
8	Awarua	S-Band Receive
9	Bahrain	S-Band Transmit
10	Bahrain	S-Band Receive
11	Cape Town	S-Band Transmit
12	Cape Town	S-Band Receive
13	Dubbo	S-Band Transmit
14	Dubbo	S-Band Receive
15	Dublin	S-Band Transmit

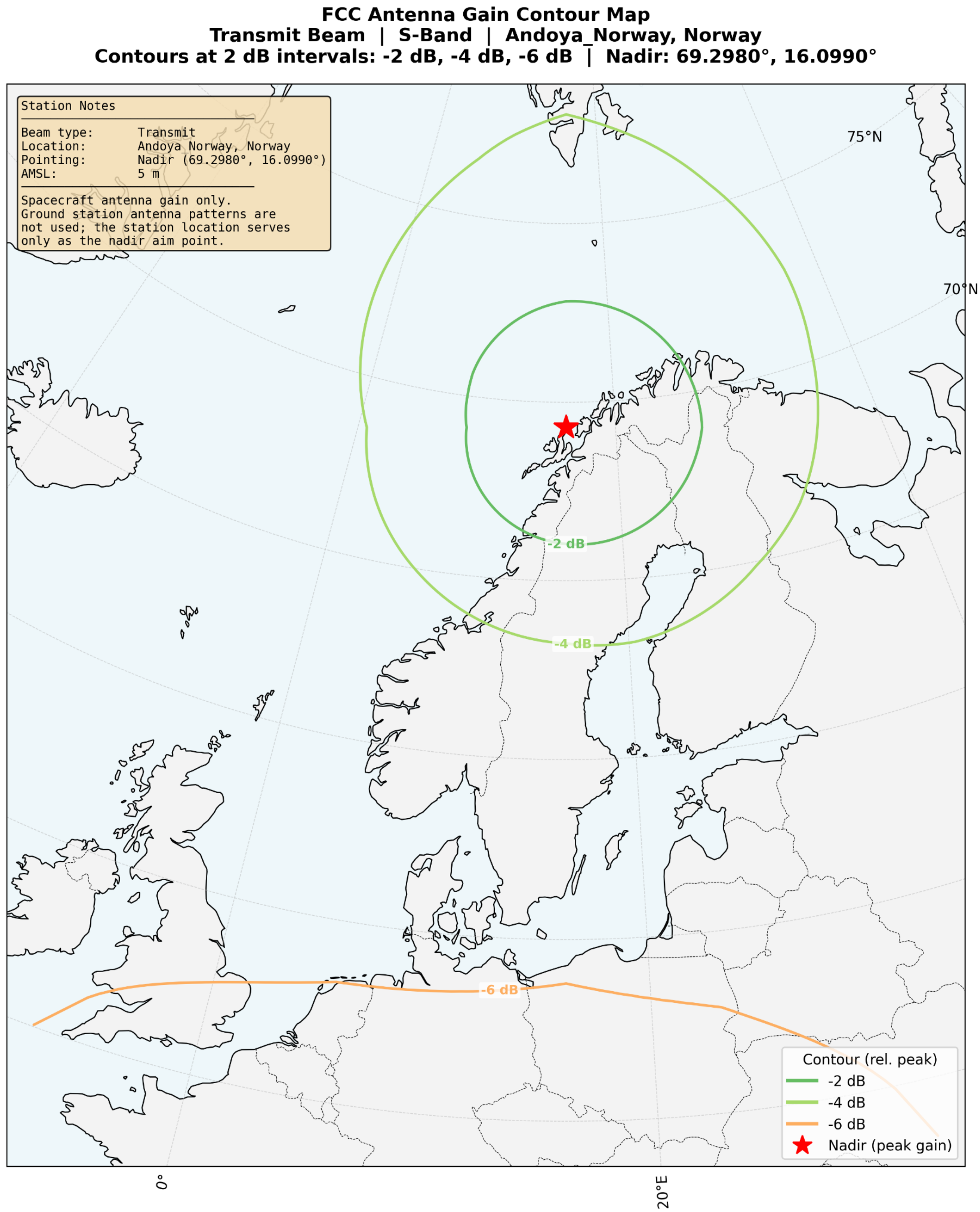
16	Dublin	S-Band Receive
17	Fairbanks, Alaska	X-Band Transmit
18	Fairbanks	S-Band Receive
19	Hartebeesthoek	S-Band Transmit
20	Hartebeesthoek	S-Band Receive
21	Hawaii	X-Band Transmit
22	Hawaii	S-Band Receive
23	Inuvik	S-Band Transmit
24	Inuvik	S-Band Receive
25	Jeju	S-Band Transmit
26	Jeju	S-Band Receive
27	Longovilo	S-Band Transmit
28	Longovilo	S-Band Receive
29	Mauritius	S-Band Transmit
30	Mauritius	S-Band Receive
31	Mingenew	S-Band Transmit
32	Mingenew	S-Band Receive
33	New Mexico	X-Band Transmit
34	New Mexico	S-Band Receive
35	Ohio	X-Band Transmit
36	Ohio	S-Band Receive
37	Oregon	X-Band Transmit
38	Oregon	S-Band Receive
39	Puertollano	S-Band Transmit
40	Puertollano	S-Band Receive
41	Punta Arenas	S-Band Transmit

42	Punta Arenas	S-Band Receive
43	Singapore	S-Band Transmit
44	Singapore	S-Band Receive
45	Stockholm	S-Band Transmit
46	Stockholm	S-Band Receive
47	Svalbard	S-Band Transmit
48	Svalbard	S-Band Receive
49	Troll	S-Band Transmit
50	Troll	S-Band Receive
51	Tromso	S-Band Transmit
52	Tromso	S-Band Receive

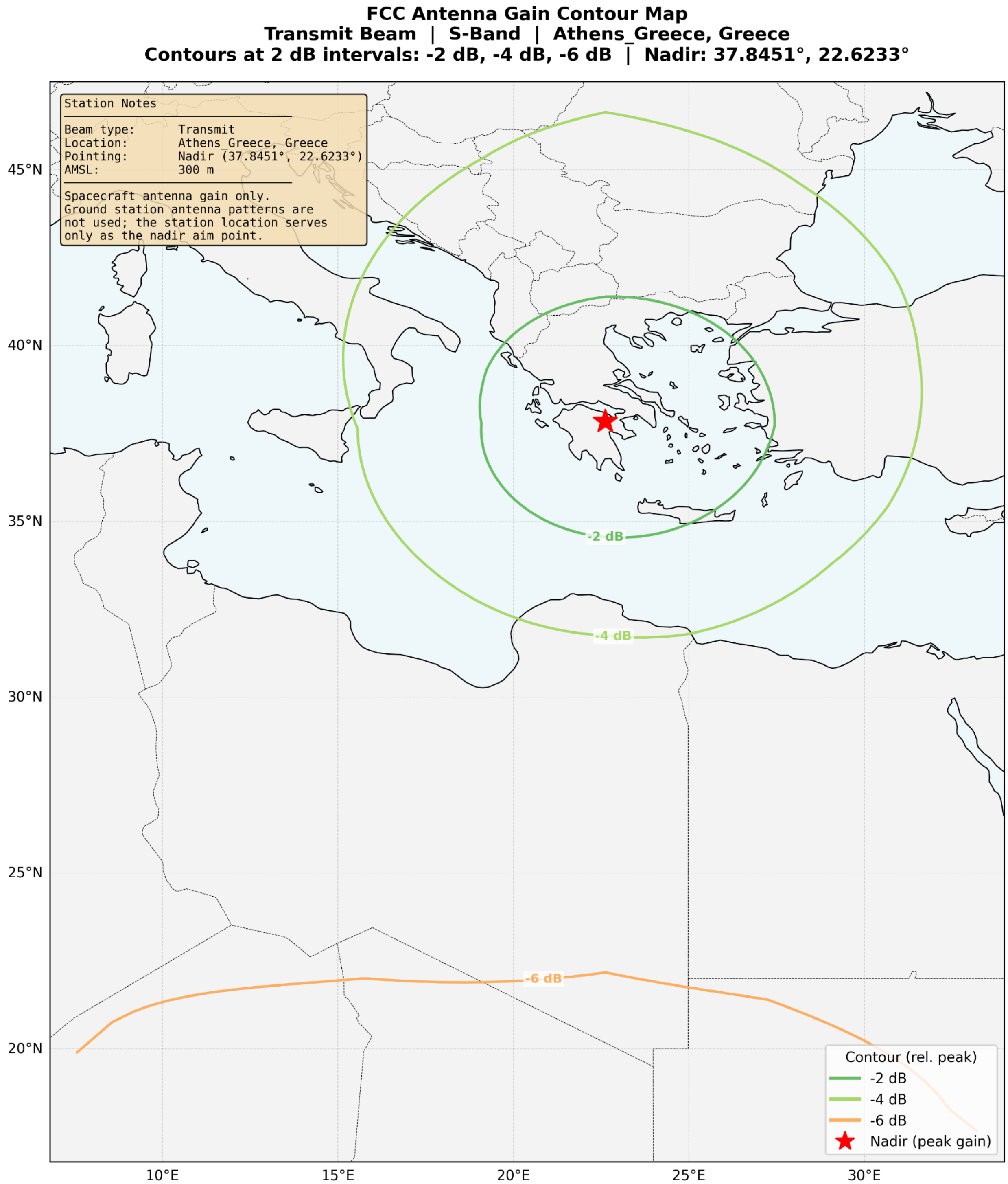
Note on Band Notation Convention:

The Transmit/Receive labels in the map titles above and map labels are defined from the spacecraft's perspective, not the earth station's. This means:

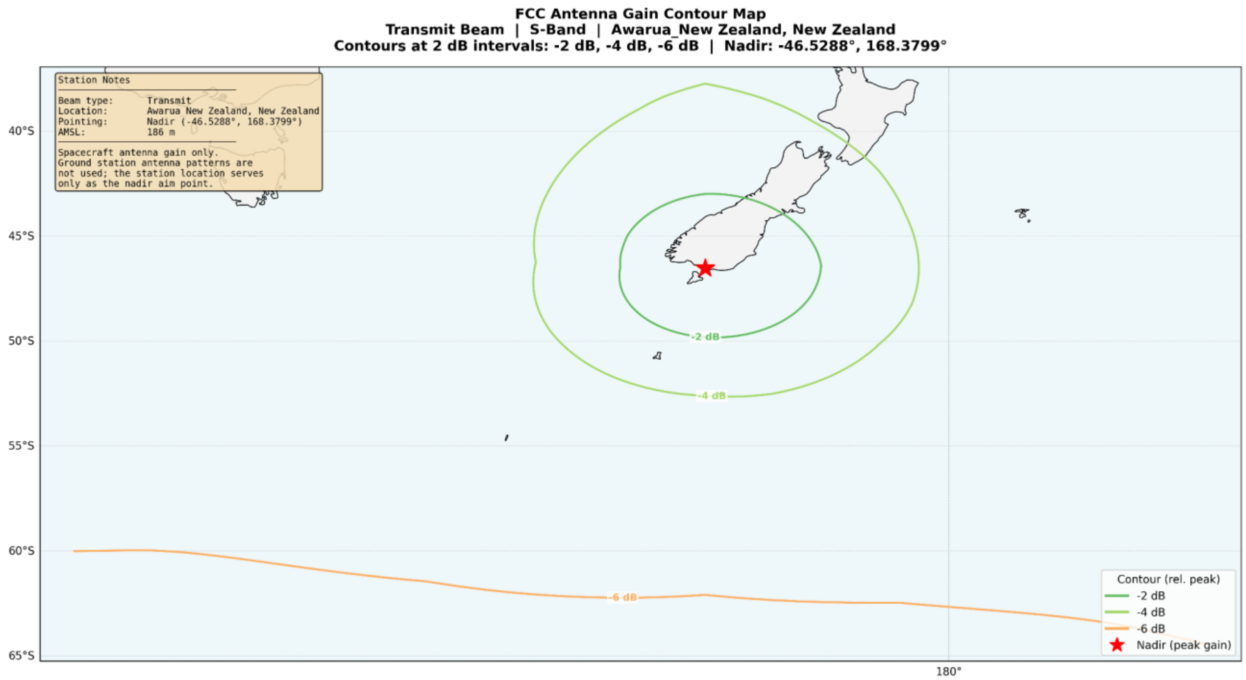
- Receive Earth Station = the earth station is receiving a signal that the spacecraft is transmitting (i.e., this corresponds to the spacecraft's Transmit Beam)
- Transmit Earth Station = the earth station is transmitting a signal that the spacecraft is receiving (i.e., this corresponds to the spacecraft's Receive Beam)



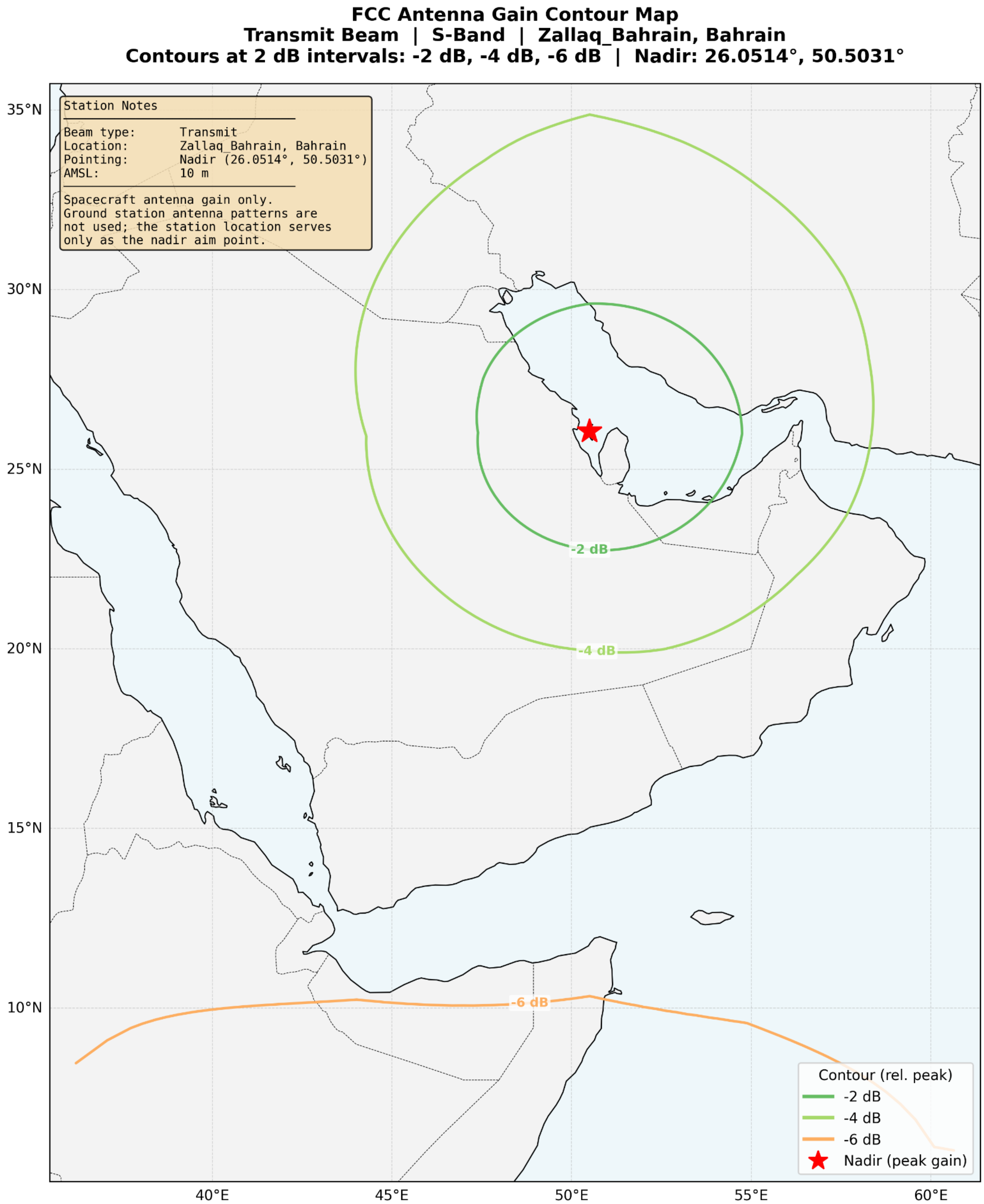
Map 1 - Andoya S-Band Transmit



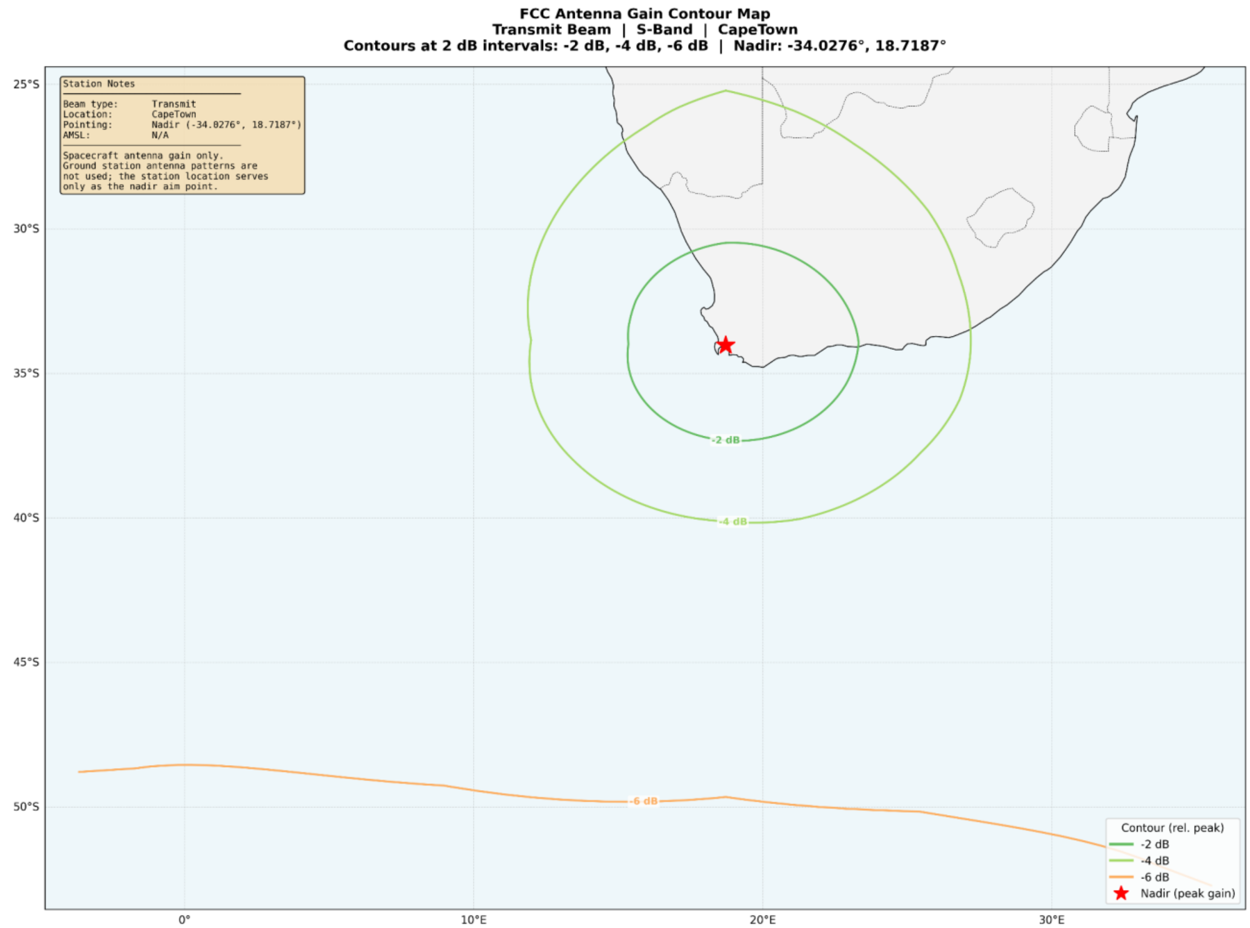
Map 2 - Athens S-Band Transmit



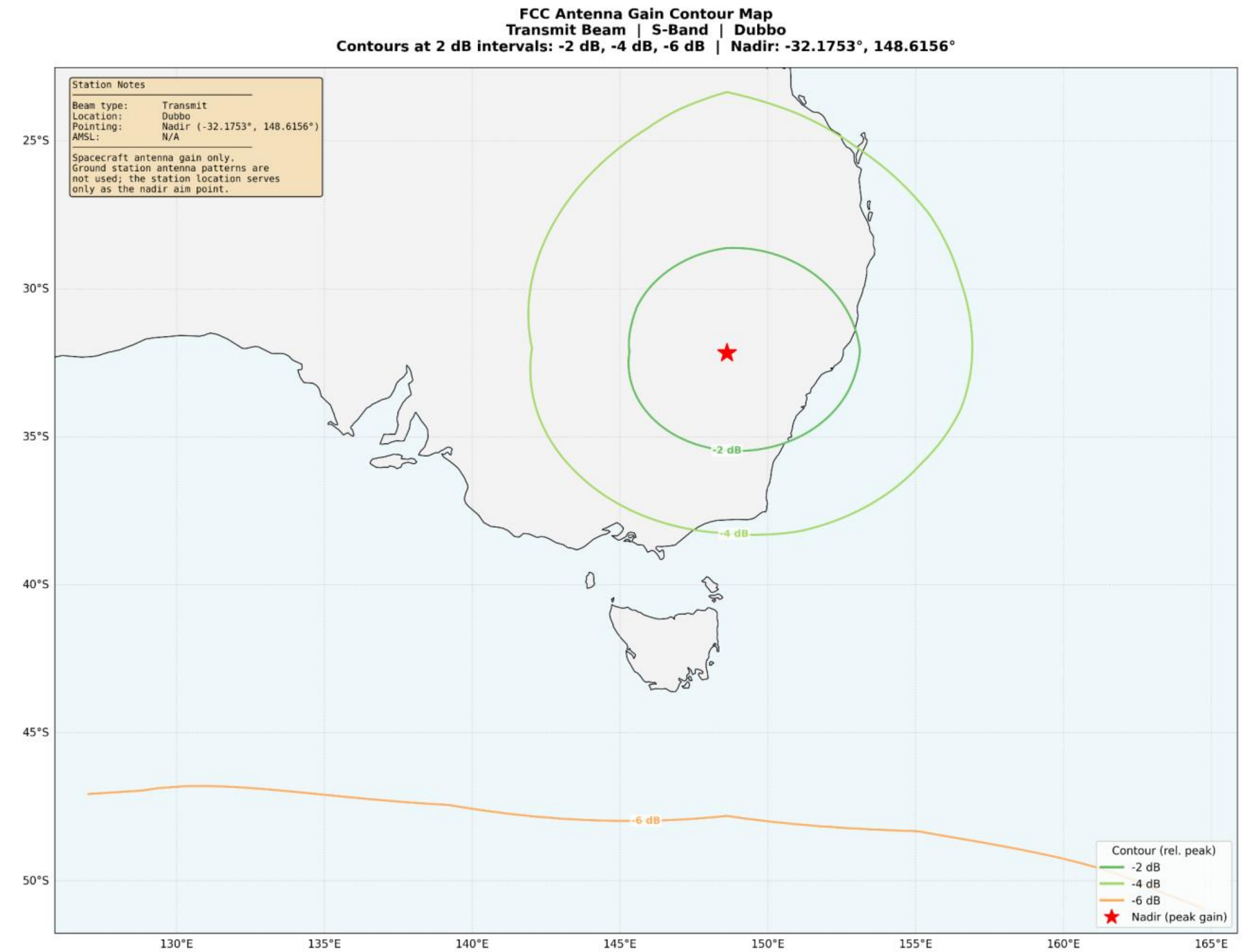
Map 3 - Awarua S-Band Transmit



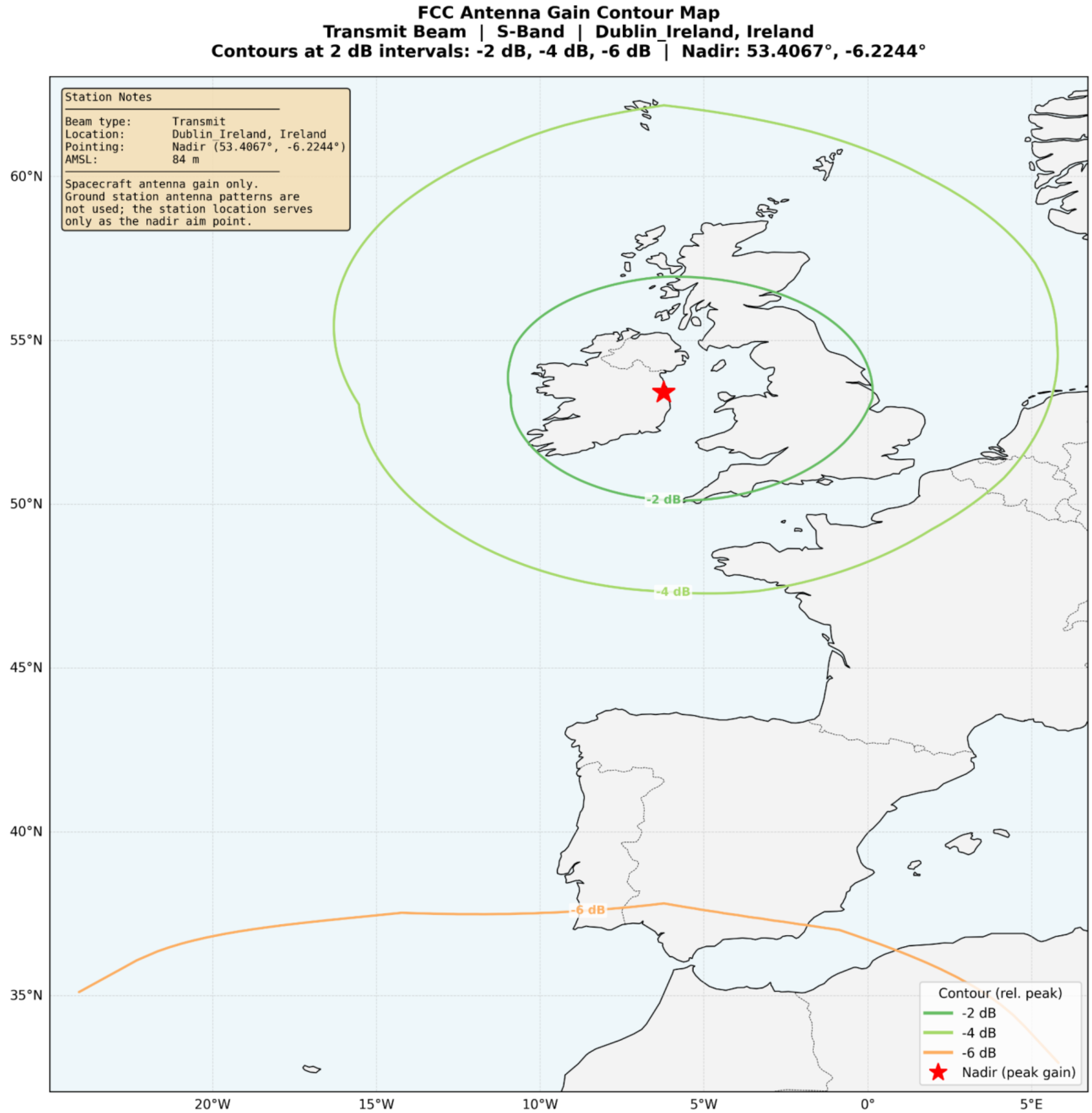
Map 4 - Bahrain S-Band Transmit



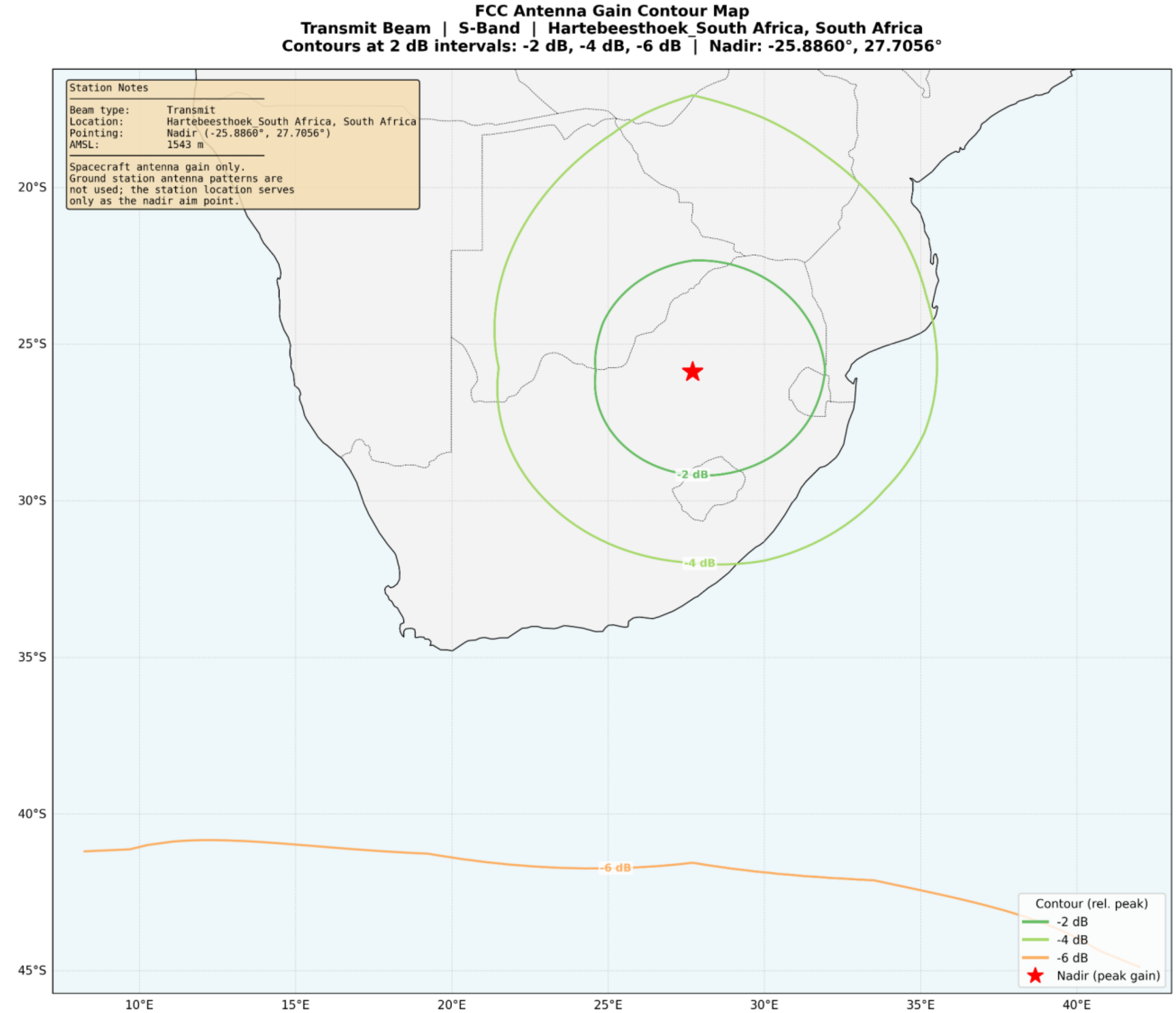
Map 5 - Cape Town S-Band Transmit



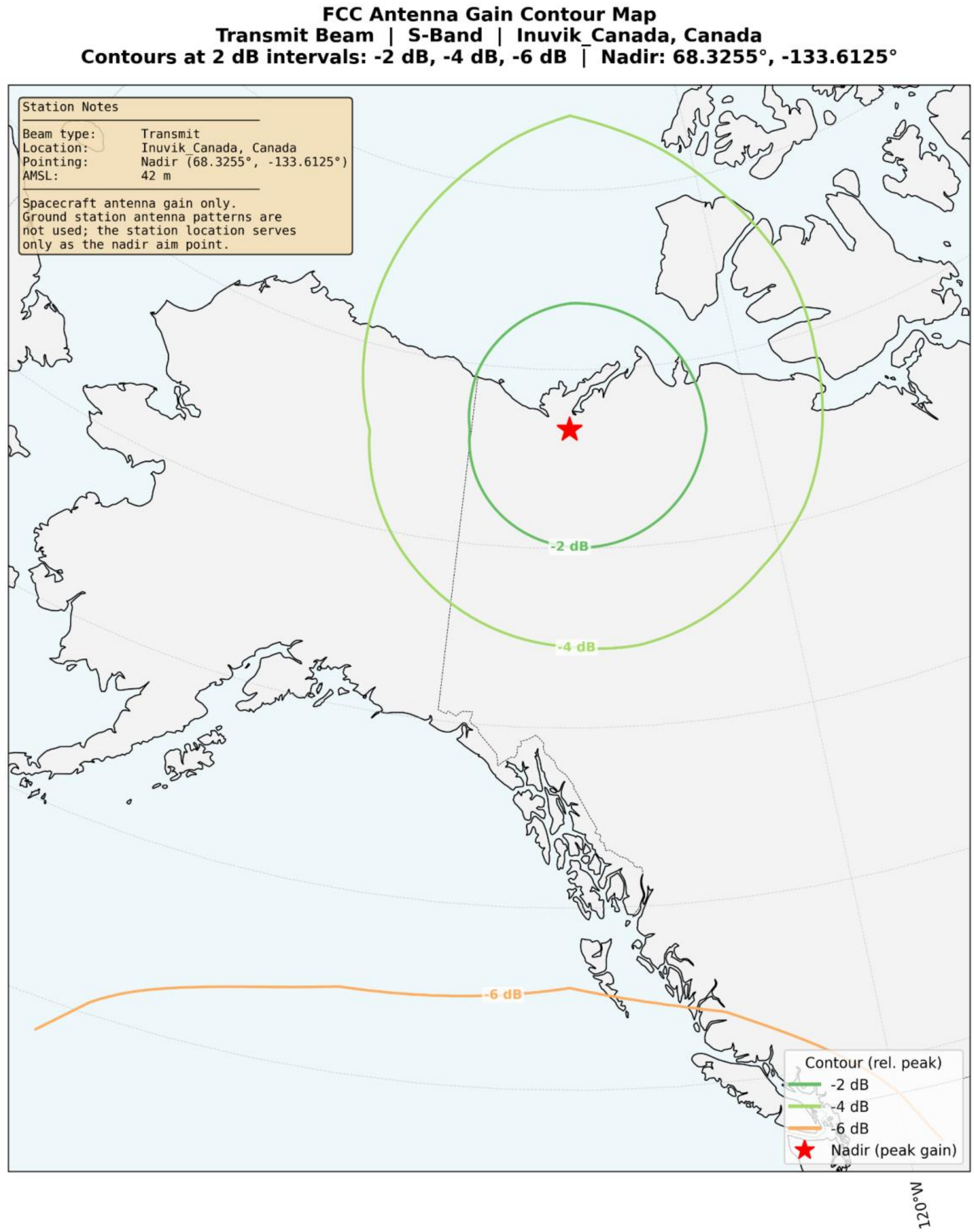
Map 6 - Dubbo S-Band Transmit



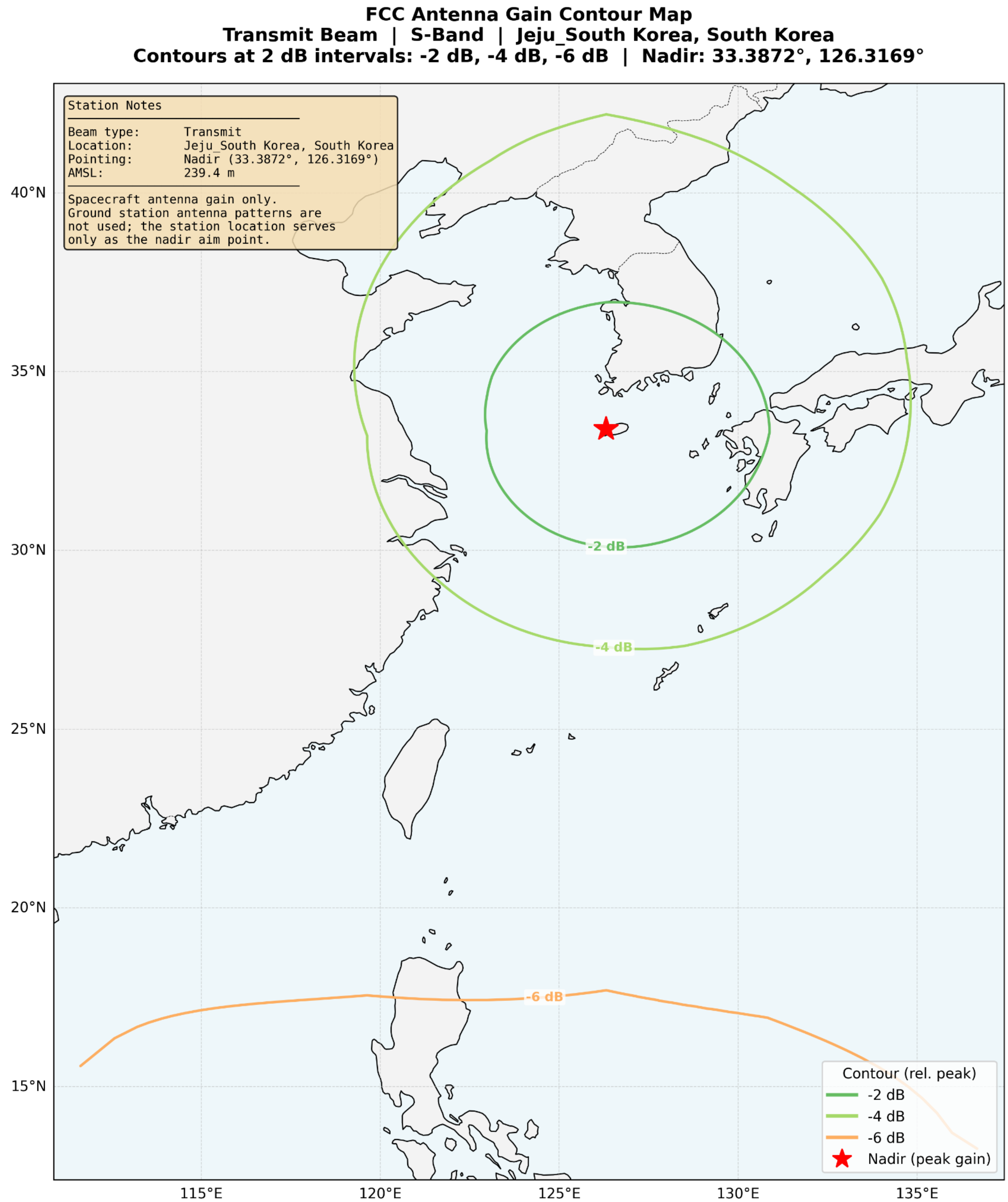
Map 7 - Dublin S-Band Transmit



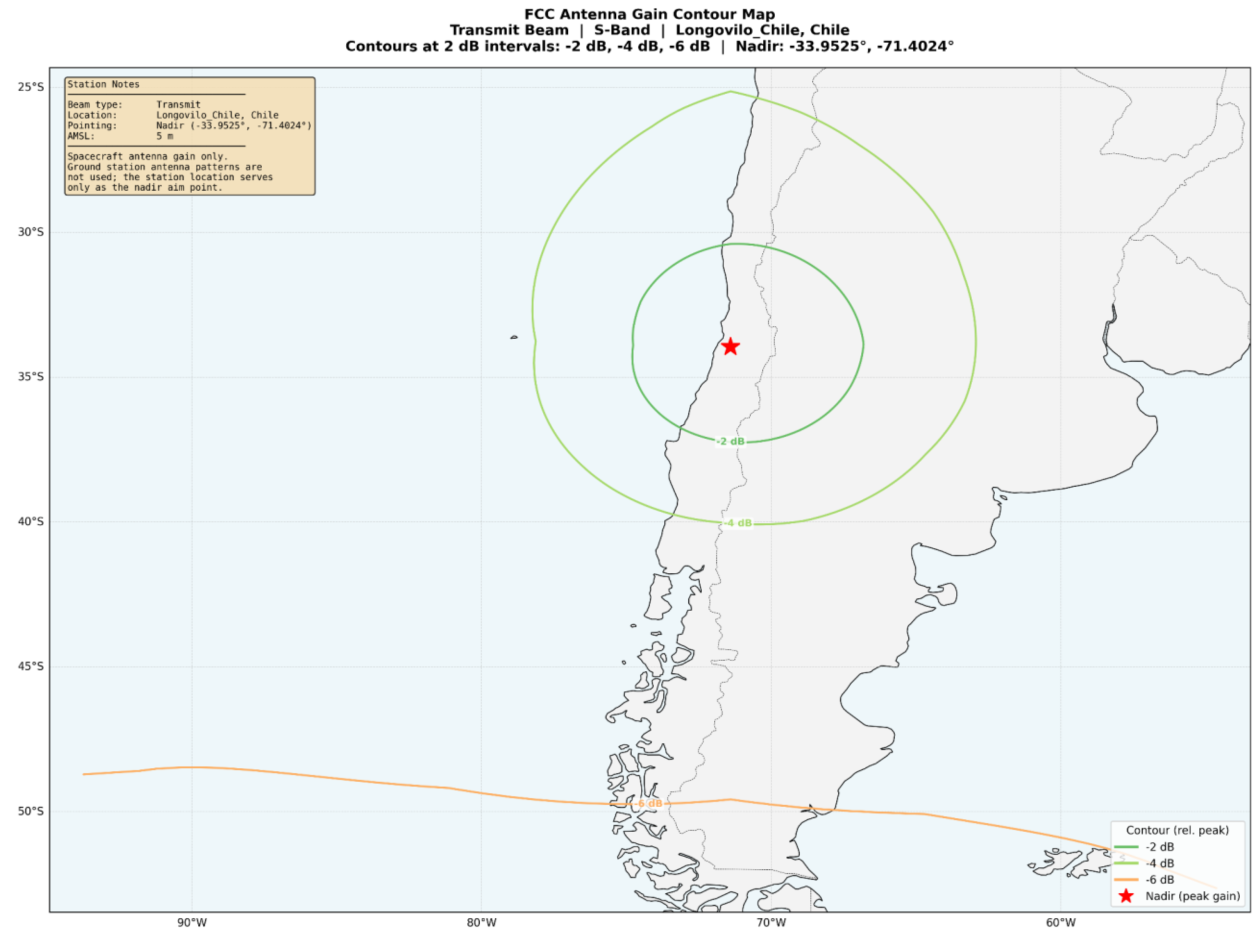
Map 8 - Hartebeesthoek S-Band Transmit



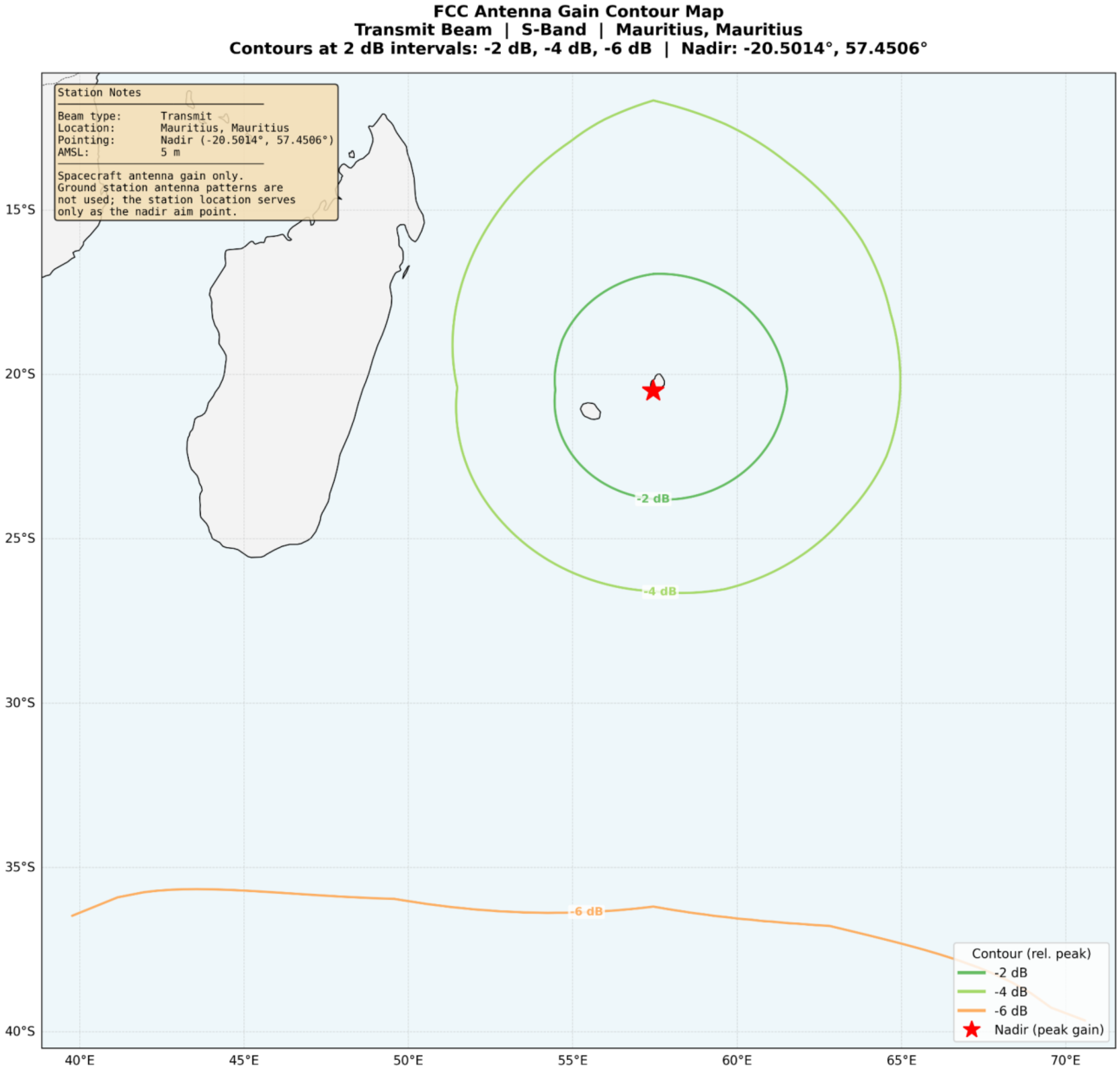
Map 9 - Inuvik S-Band Transmit



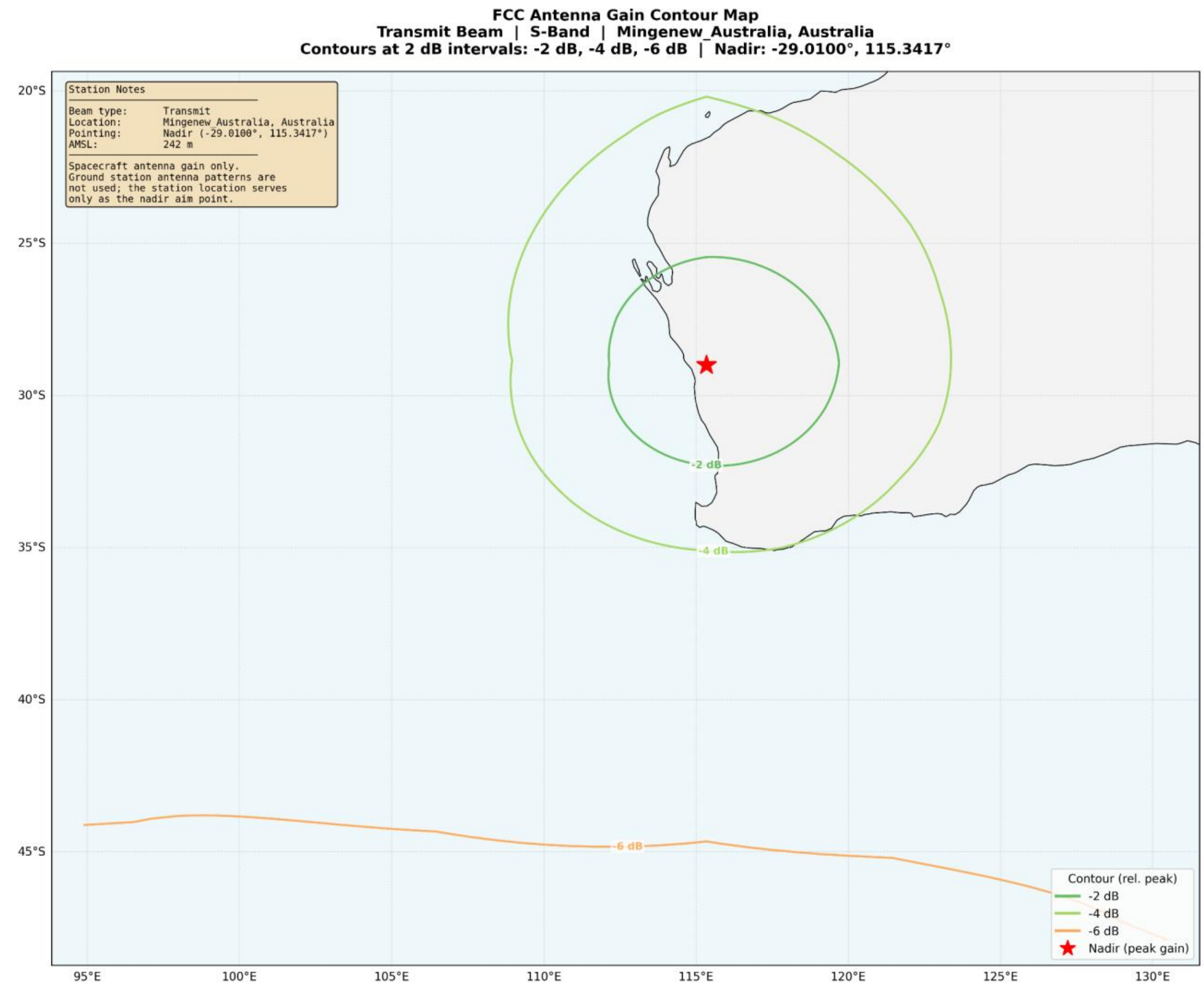
Map 10 - Jeju S-Band Transmit



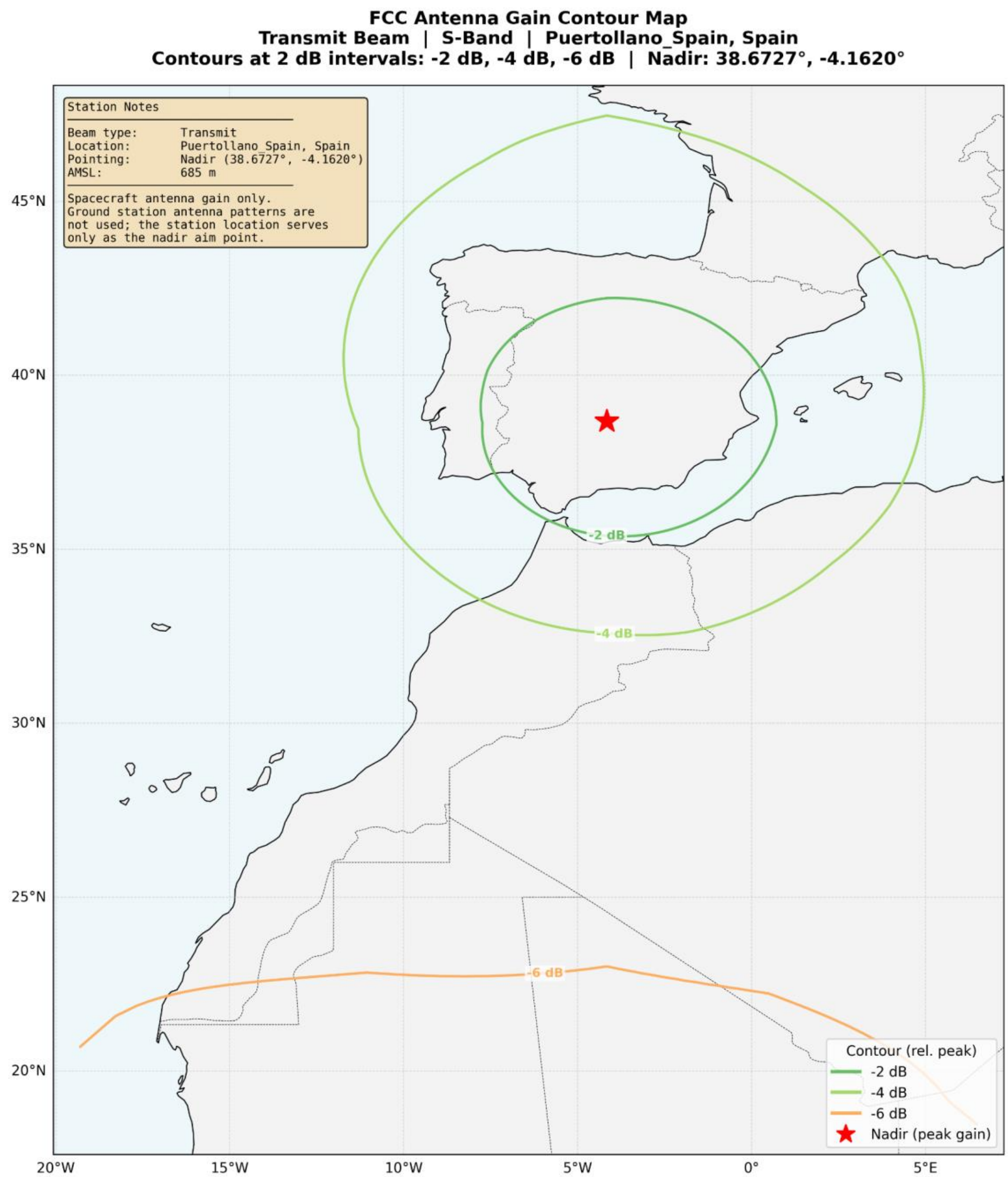
Map 11 - Longovilo S-Band Transmit



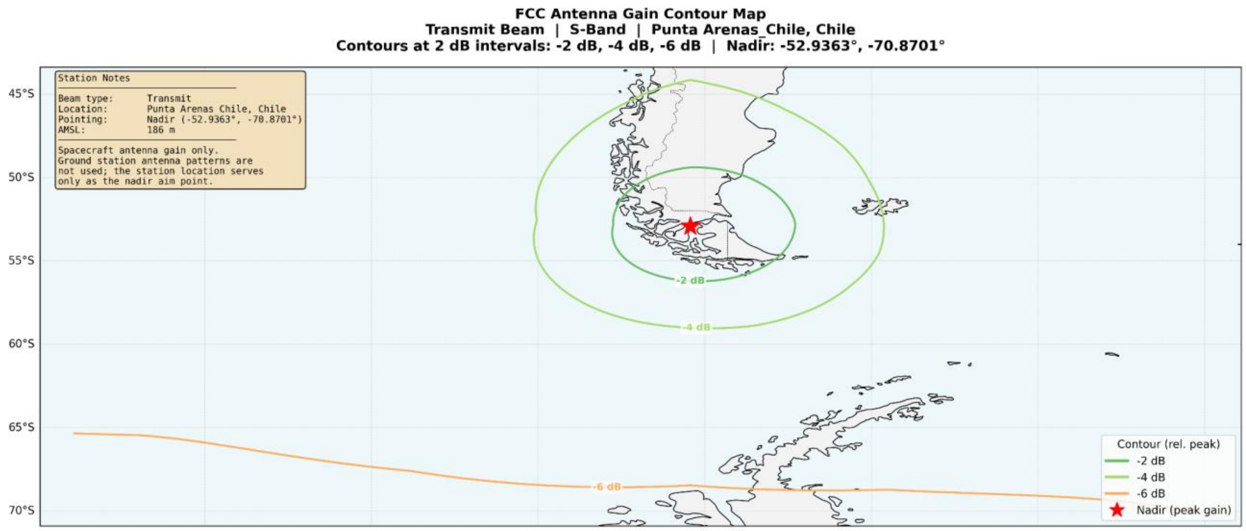
Map 12 - Mauritius S-Band Transmit



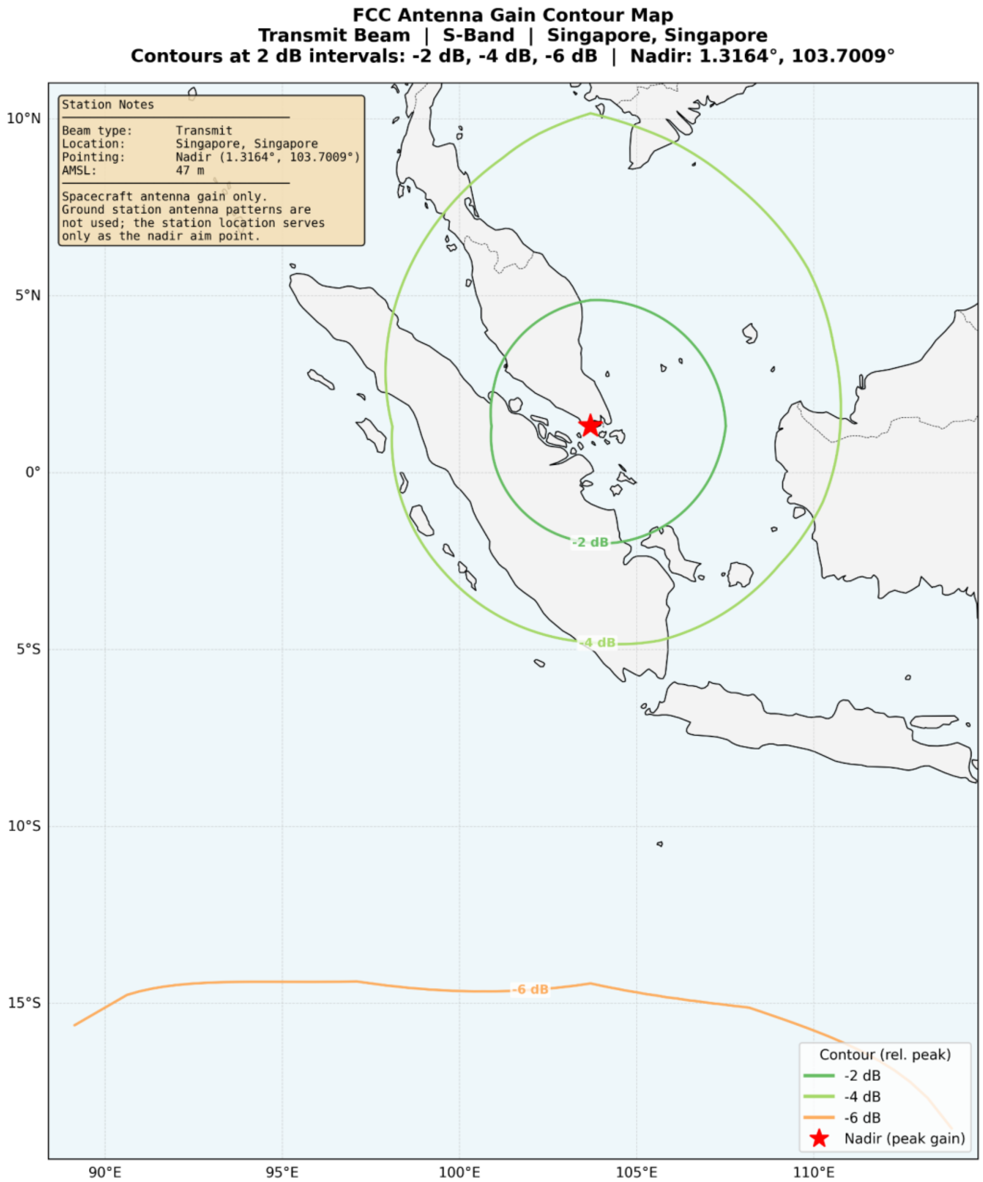
Map 13 - Mingenew S-Band Transmit



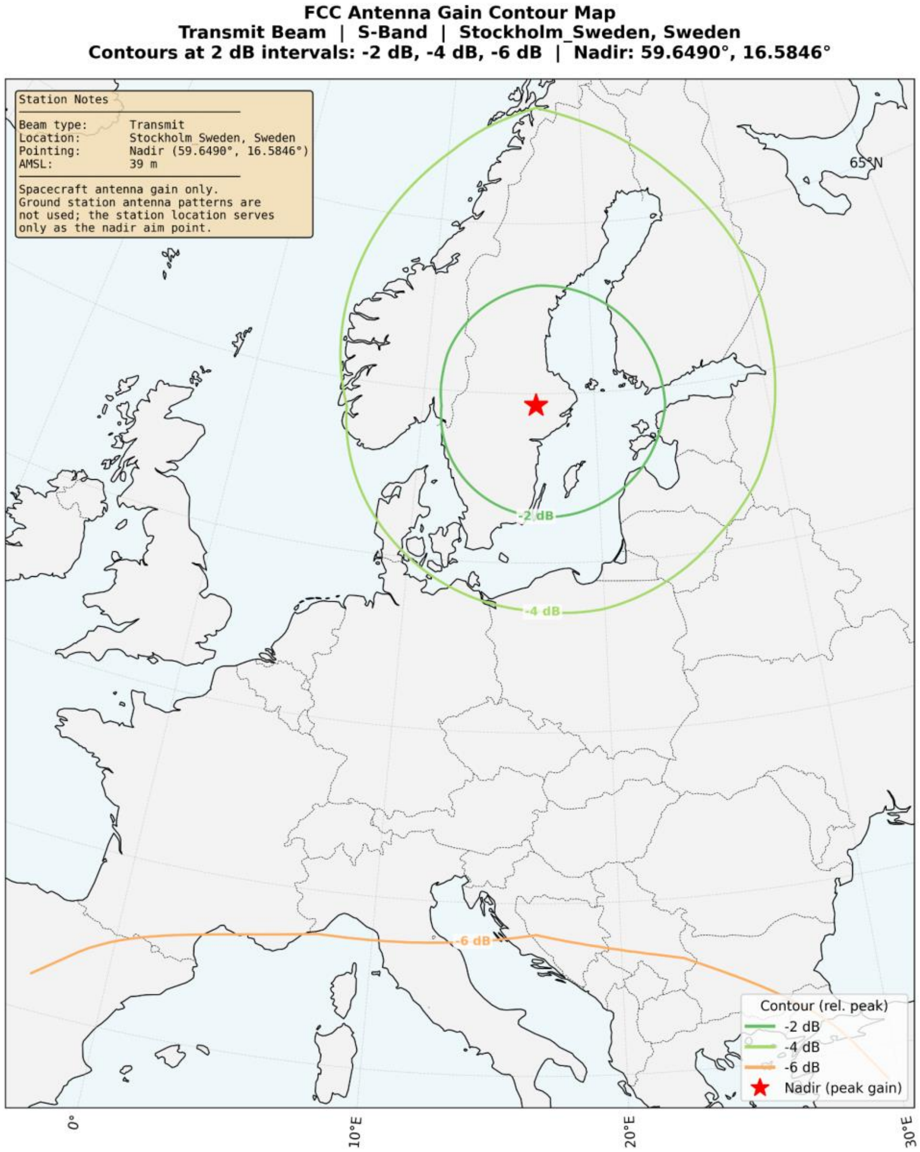
Map 14 - Puertollano S-Band Transmit



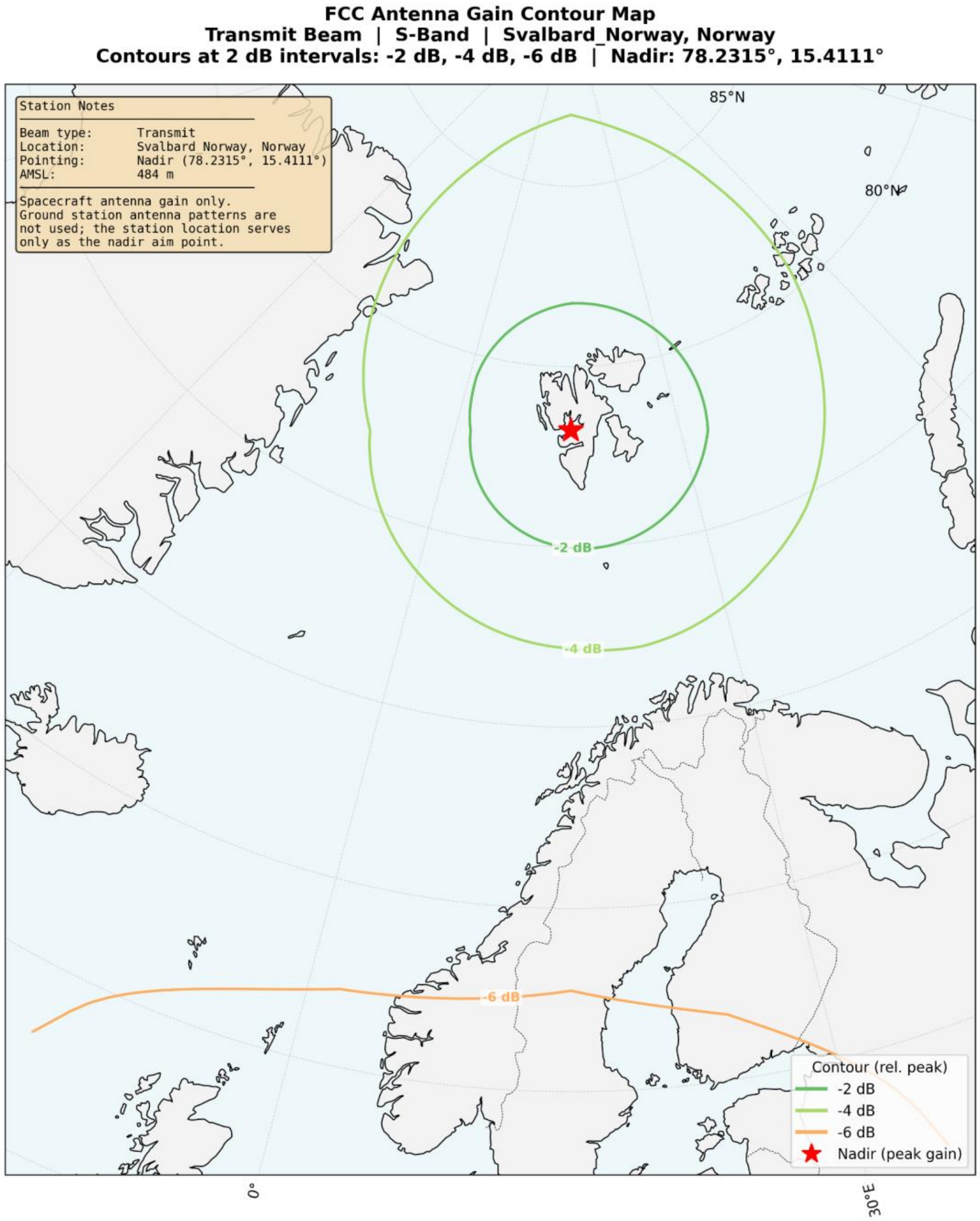
Map 15 - Punta Arenas S-Band Transmit



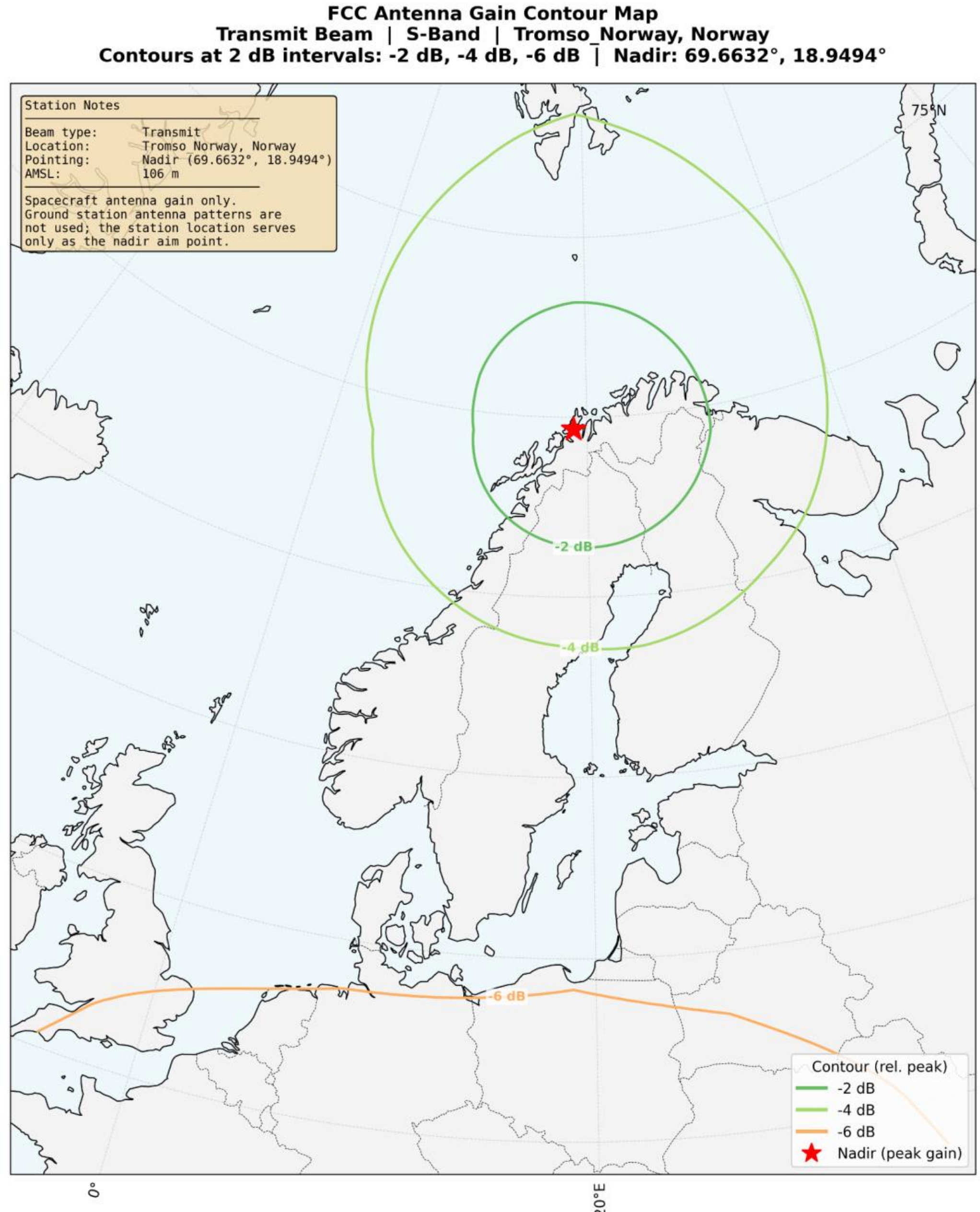
Map 16 - Singapore S-Band Transmit



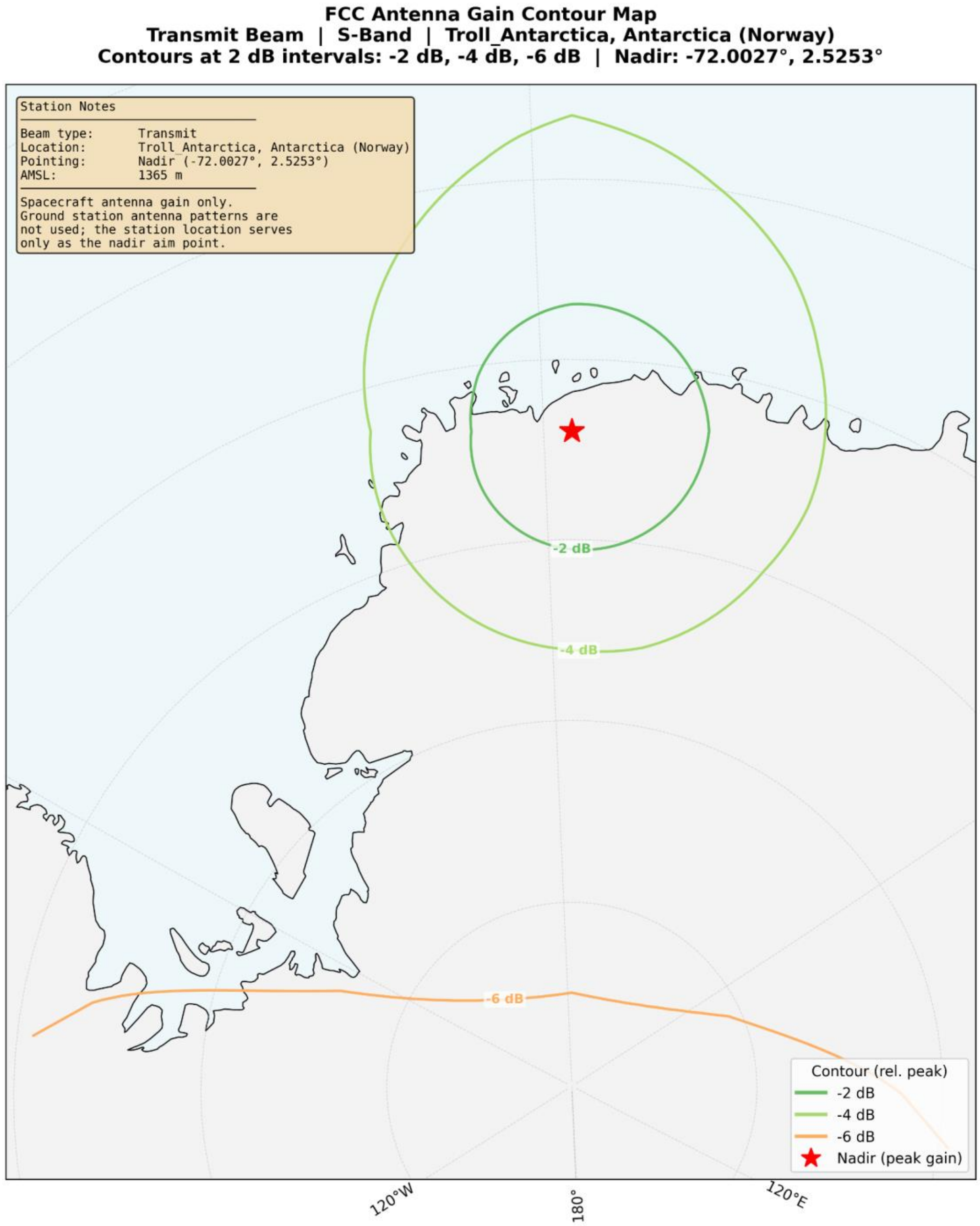
Map 17 - Stockholm S-Band Transmit



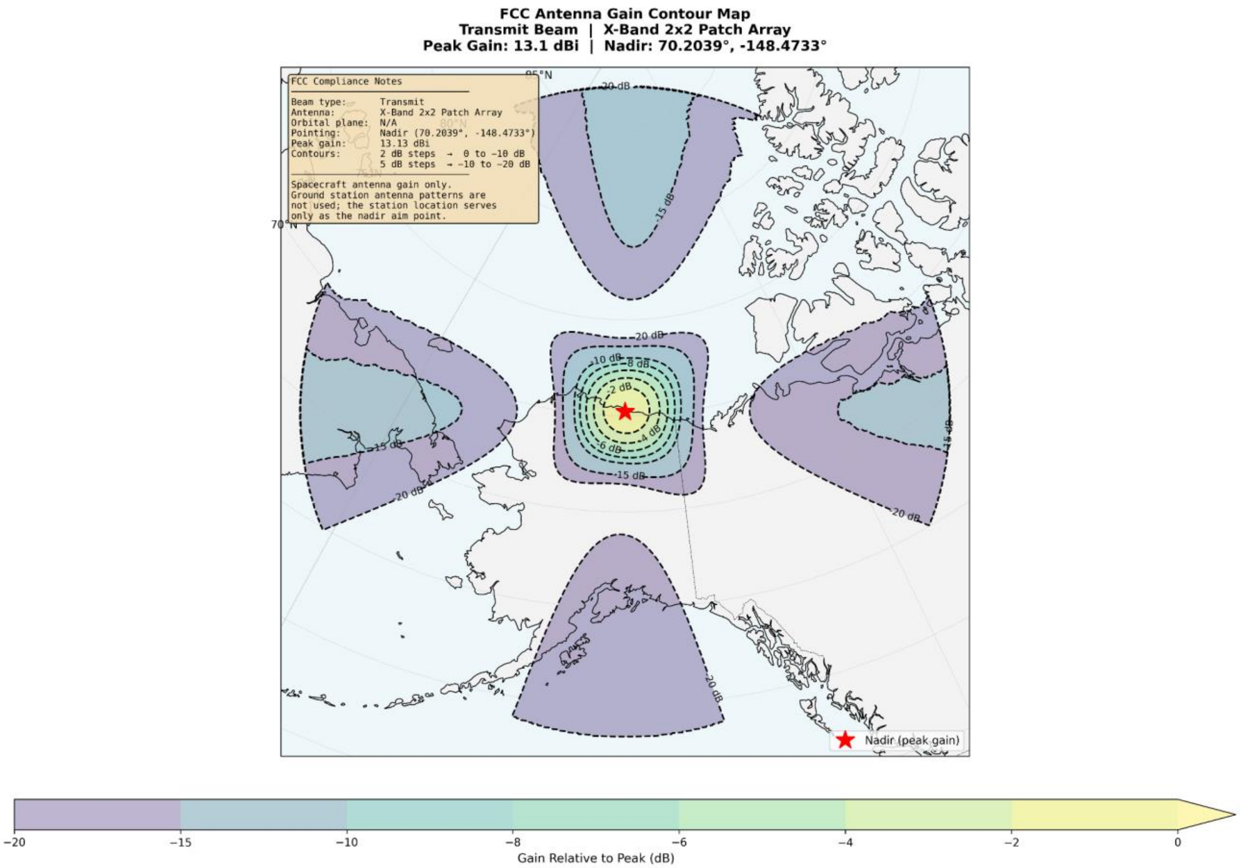
Map 18 - Svalbard S-Band Transmit



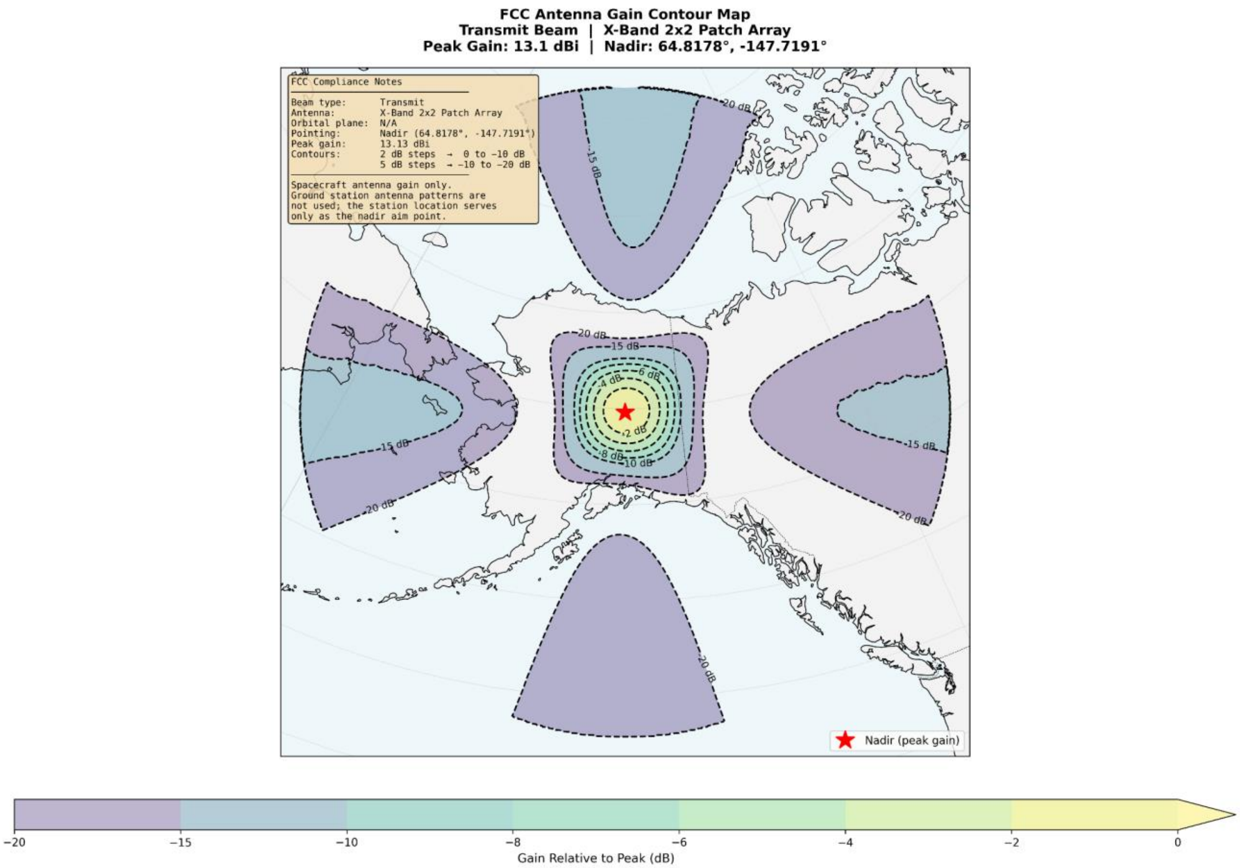
Map 19 - Tromso S-Band Transmit



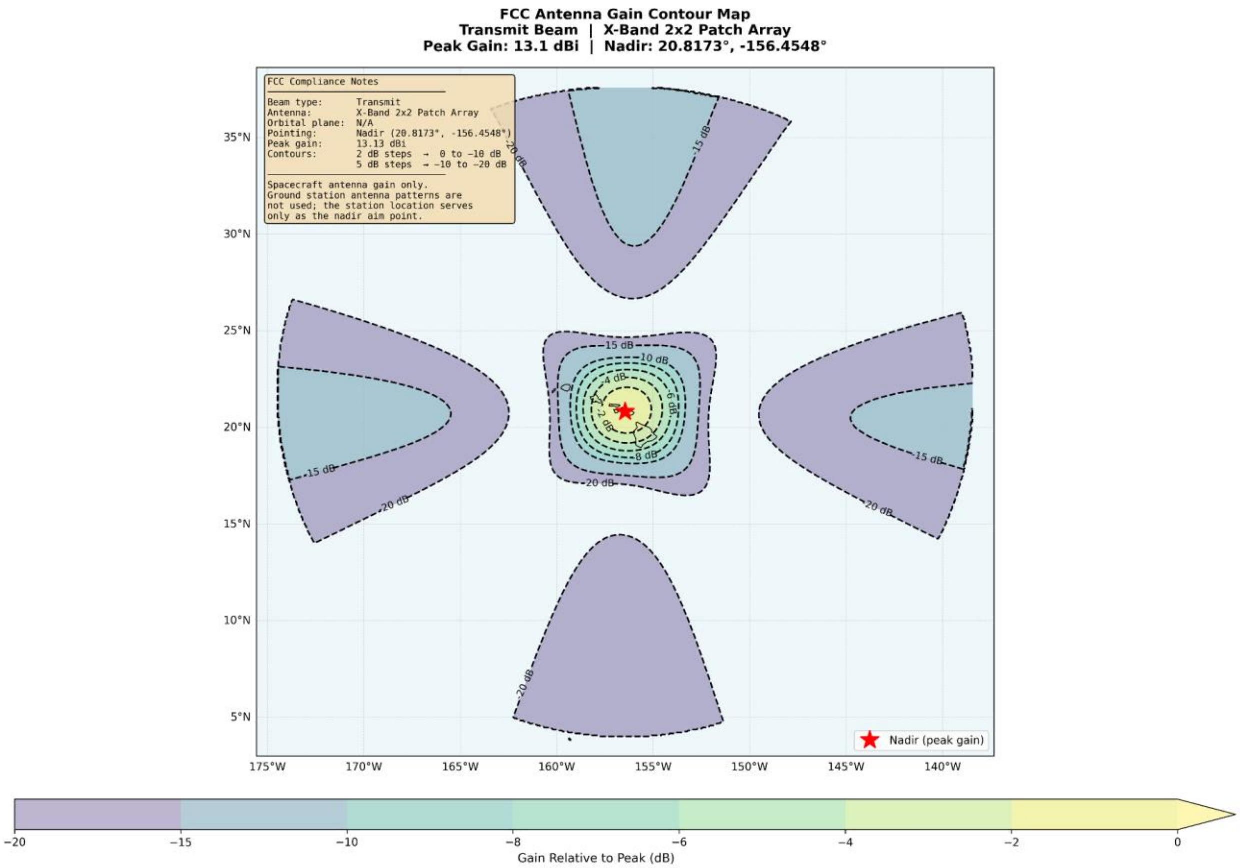
Map 20 - Troll S-Band Transmit



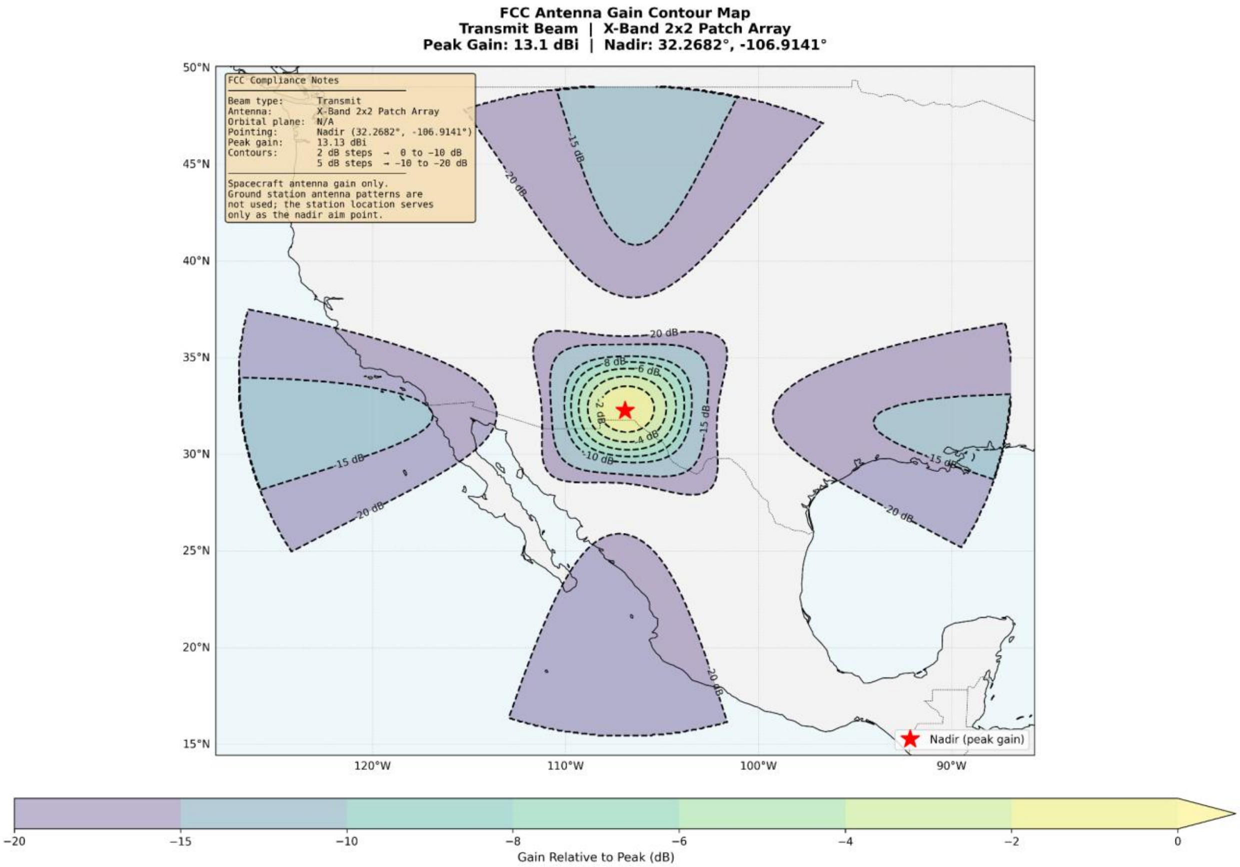
Map 21 - Prudhoe Bay, Alaska X-Band Transmit



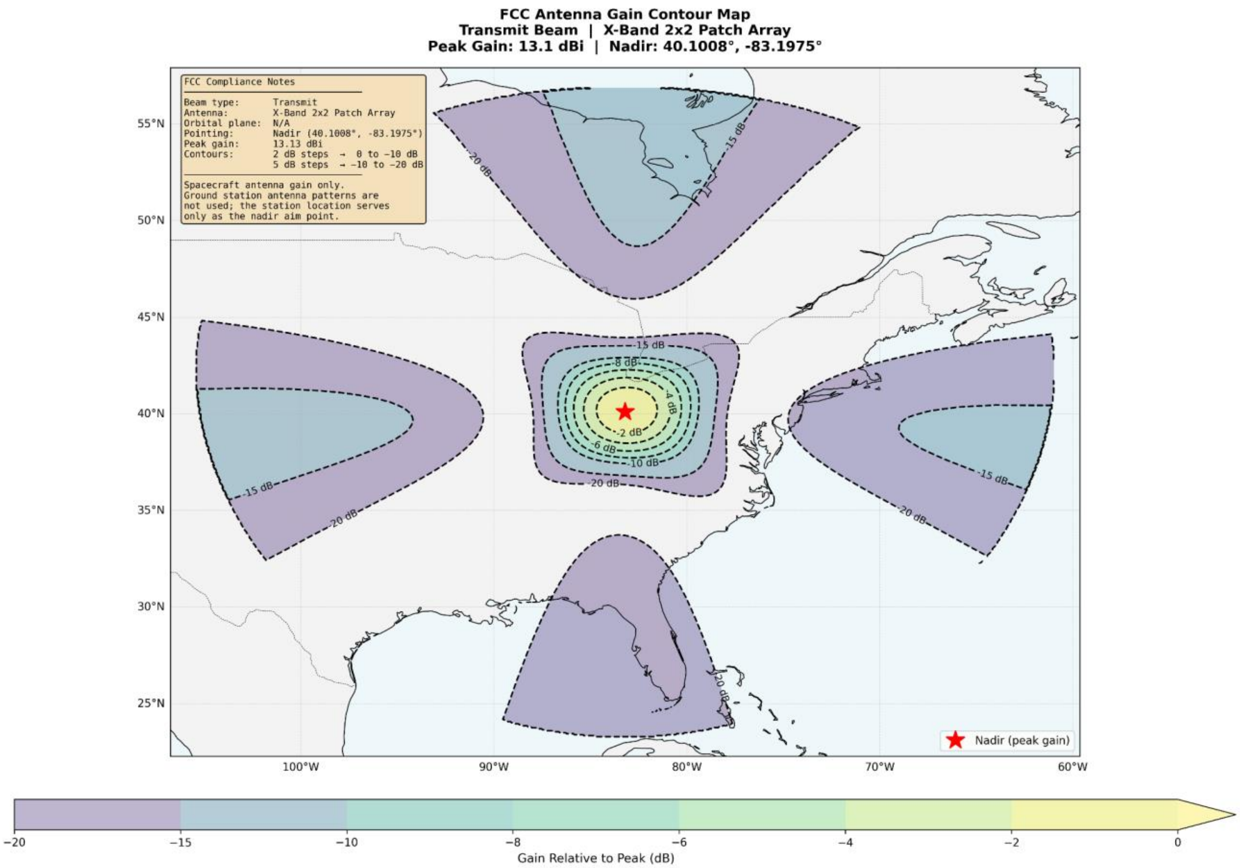
Map 22 - Fairbanks, Alaska X-Band Transmit



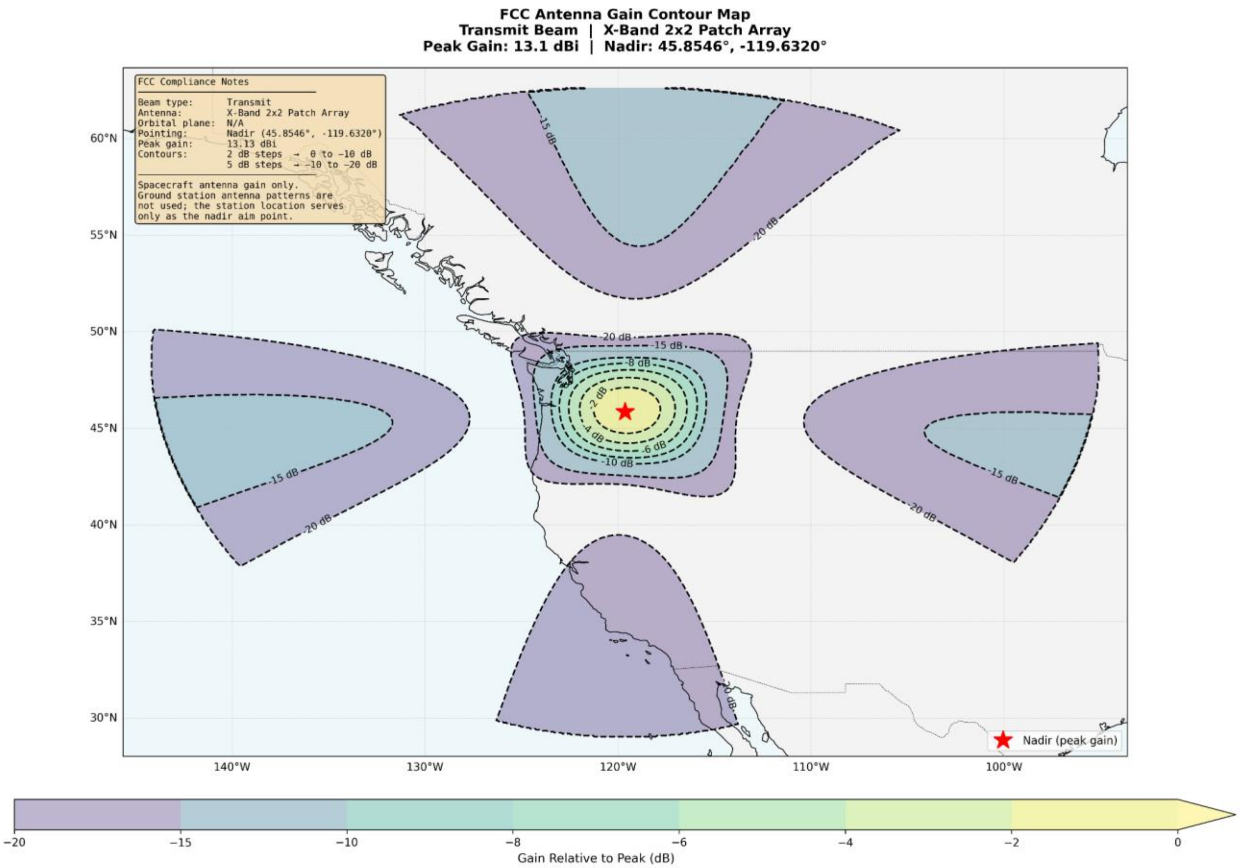
Map 23 - Hawaii X-Band Transmit



Map 24 - New Mexico X-Band Transmit

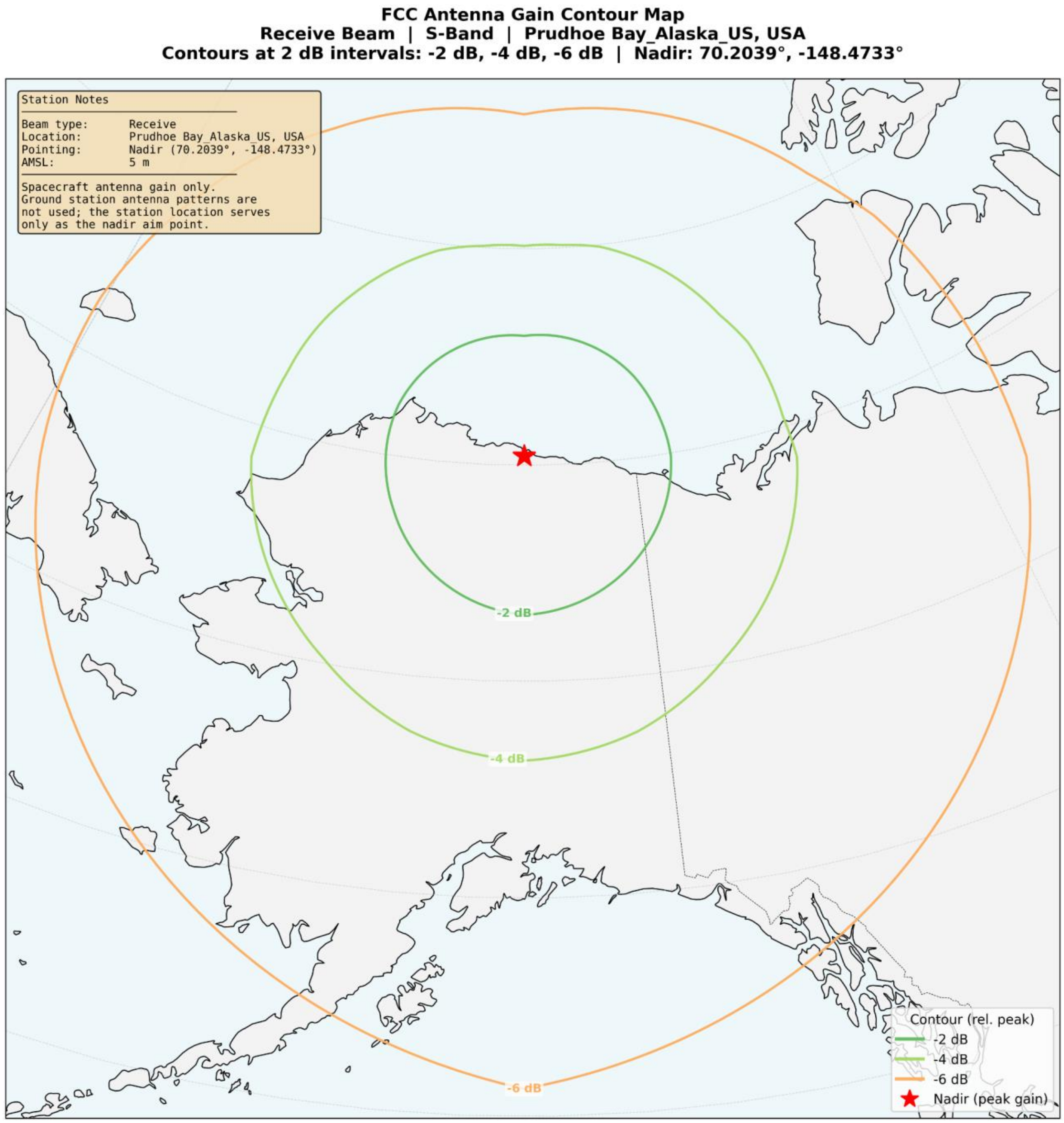


Map 25 - Ohio X-Band Transmit

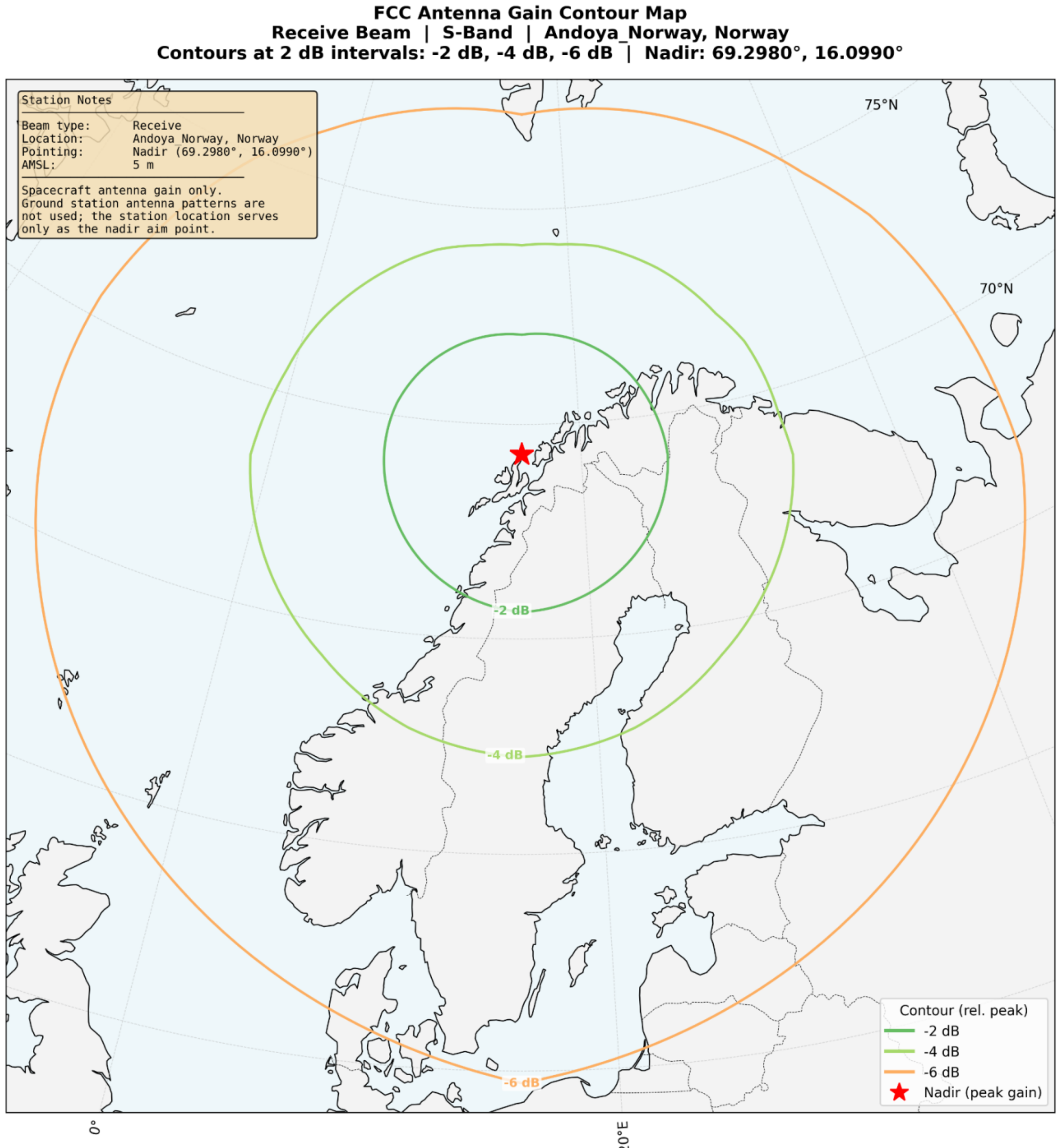


FCC Antenna Gain Contour Map
Transmit Beam | X-Band 2x2 Patch Array
Peak Gain: 13.1 dBi | Nadir: 45.8546°, -119.6320°
FCC Compliance Notes
Beam type: Transmit
Antenna: X-Band 2x2 Patch Array
Orbital plane: N/A
Pointing: Nadir (45.8546°, -119.6320°)
Peak gain: 13.13 dBi
Contours: 2 dB steps → 0 to −10 dB
5 dB steps → −10 to −20 dB
Spacecraft antenna gain only.
Ground station antenna patterns are
not used; the station location serves
only as the nadir aim point.
60°N
55°N
50°N
45°N
40°N
35°N
30°N
140°W
130°W
120°W
110°W
100°W
-20 dB
-15 dB
-10 dB
-8 dB
-6 dB
-4 dB
-2 dB
Nadir (peak gain)
−20
−15
−10
−8
−6
−4
−2
0
Gain Relative to Peak (dB)

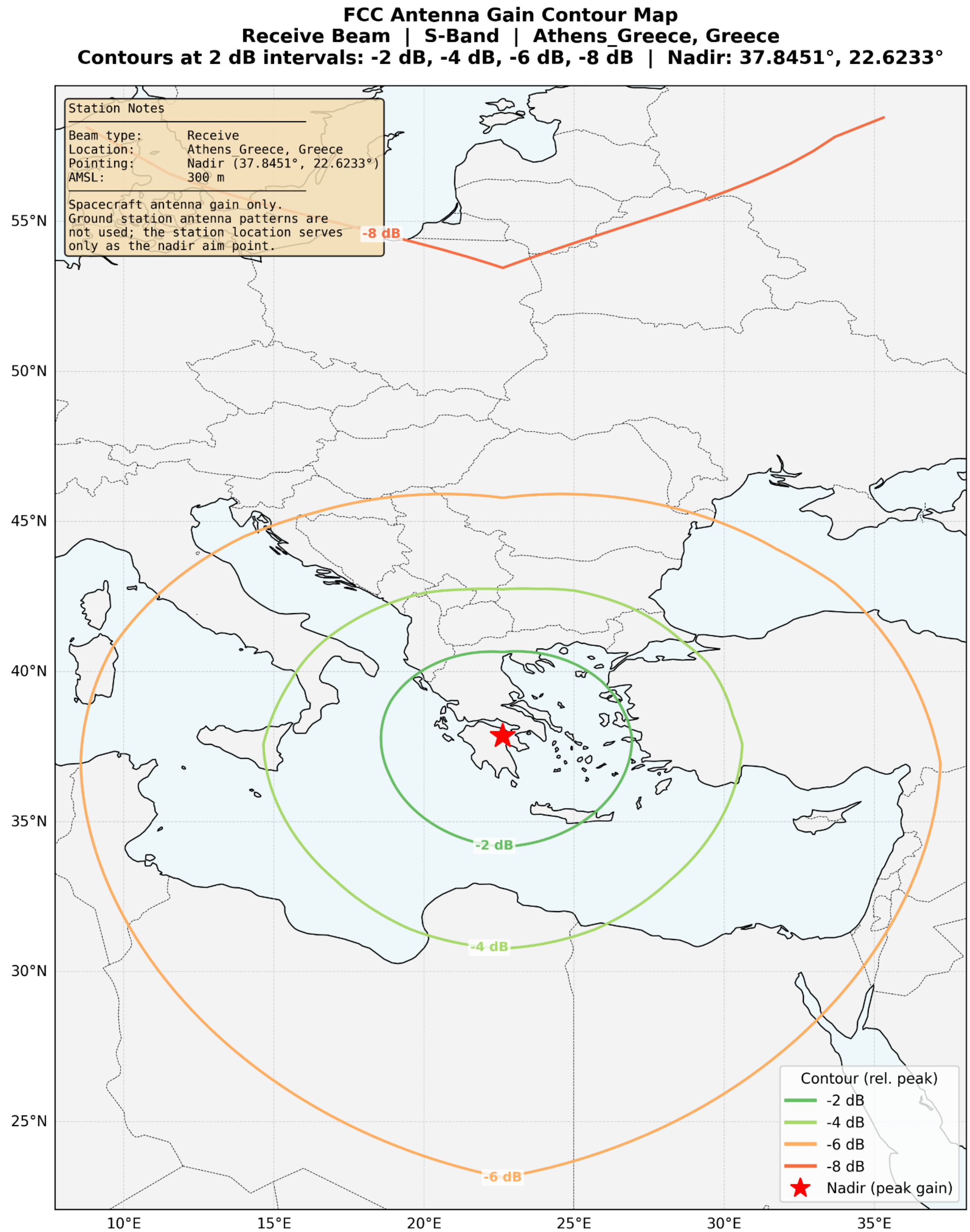
Map 26 - Oregon X-Band Transmit



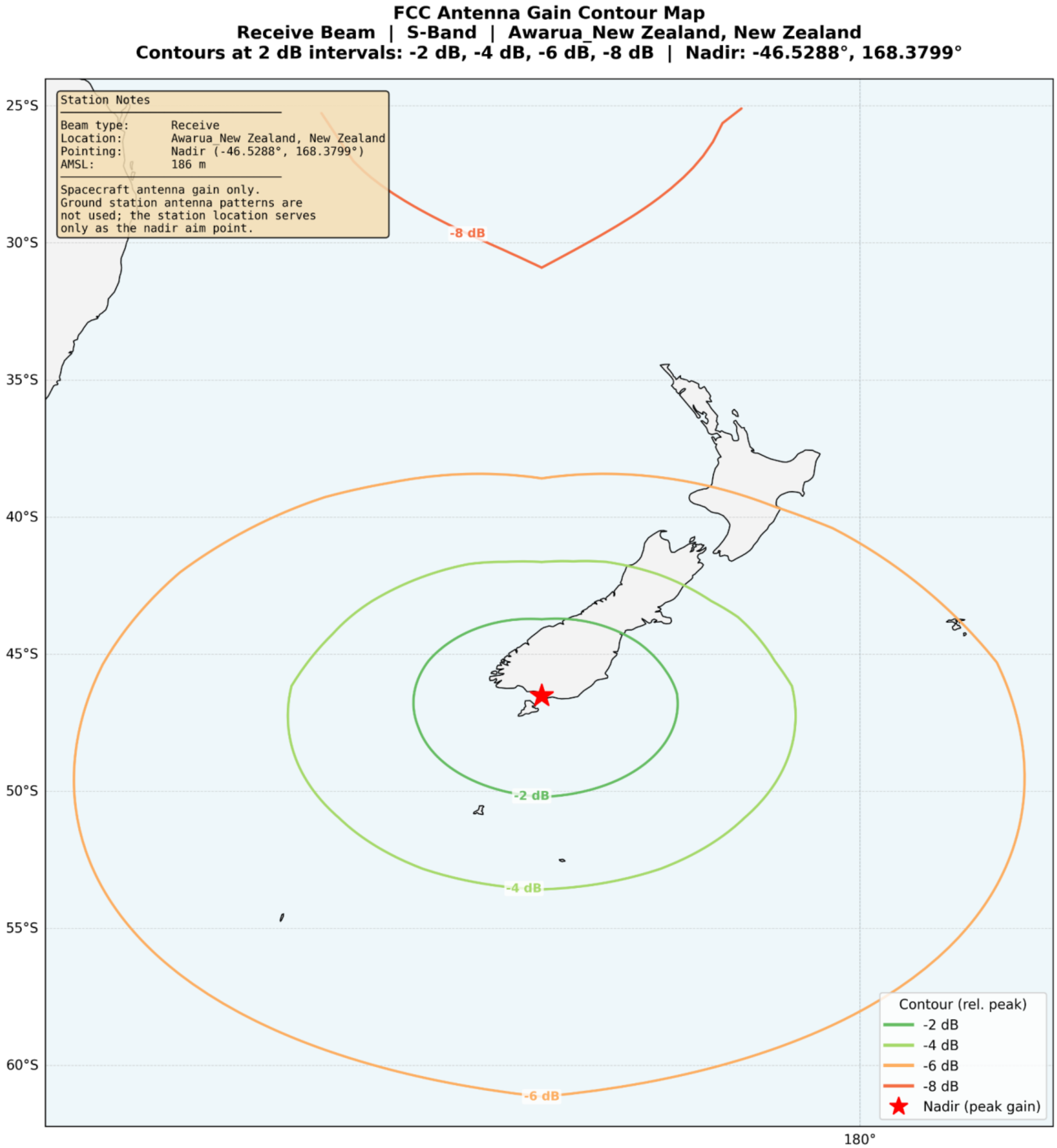
Map 27 - Prudhoe Bay, Alaska S-Band Receive



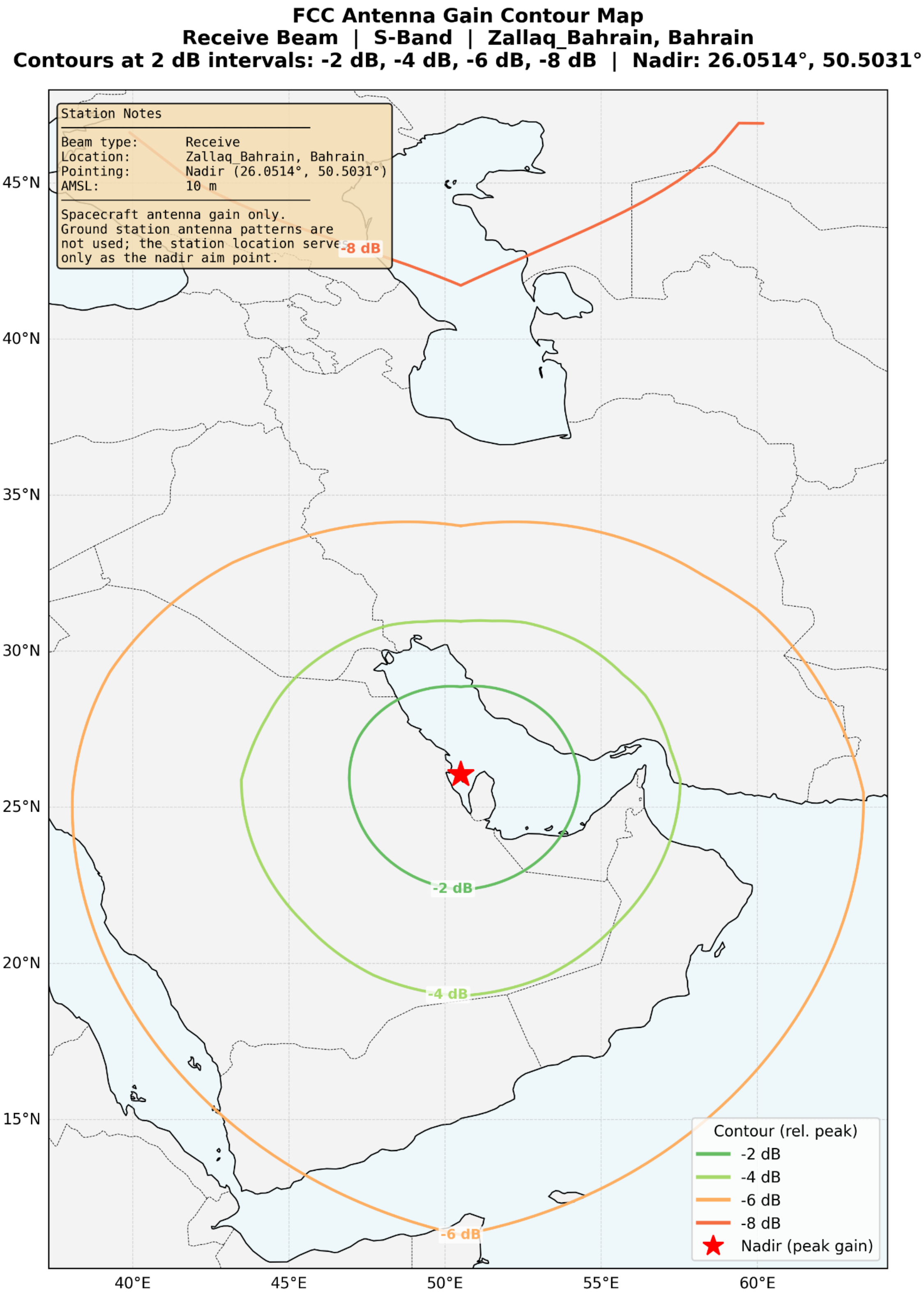
Map 28 - Andoya S-Band Receive



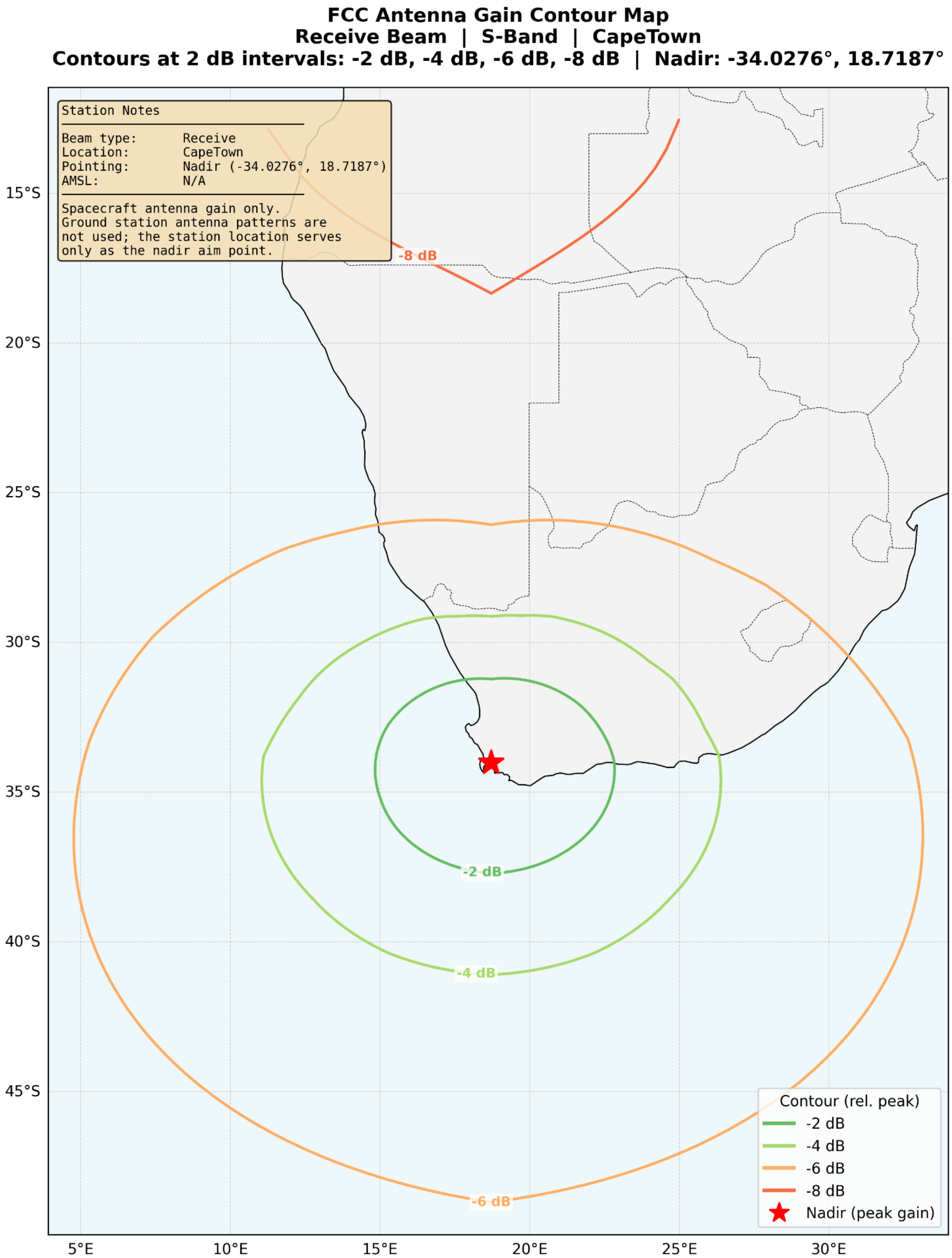
Map 29 - Athens S-Band Receive



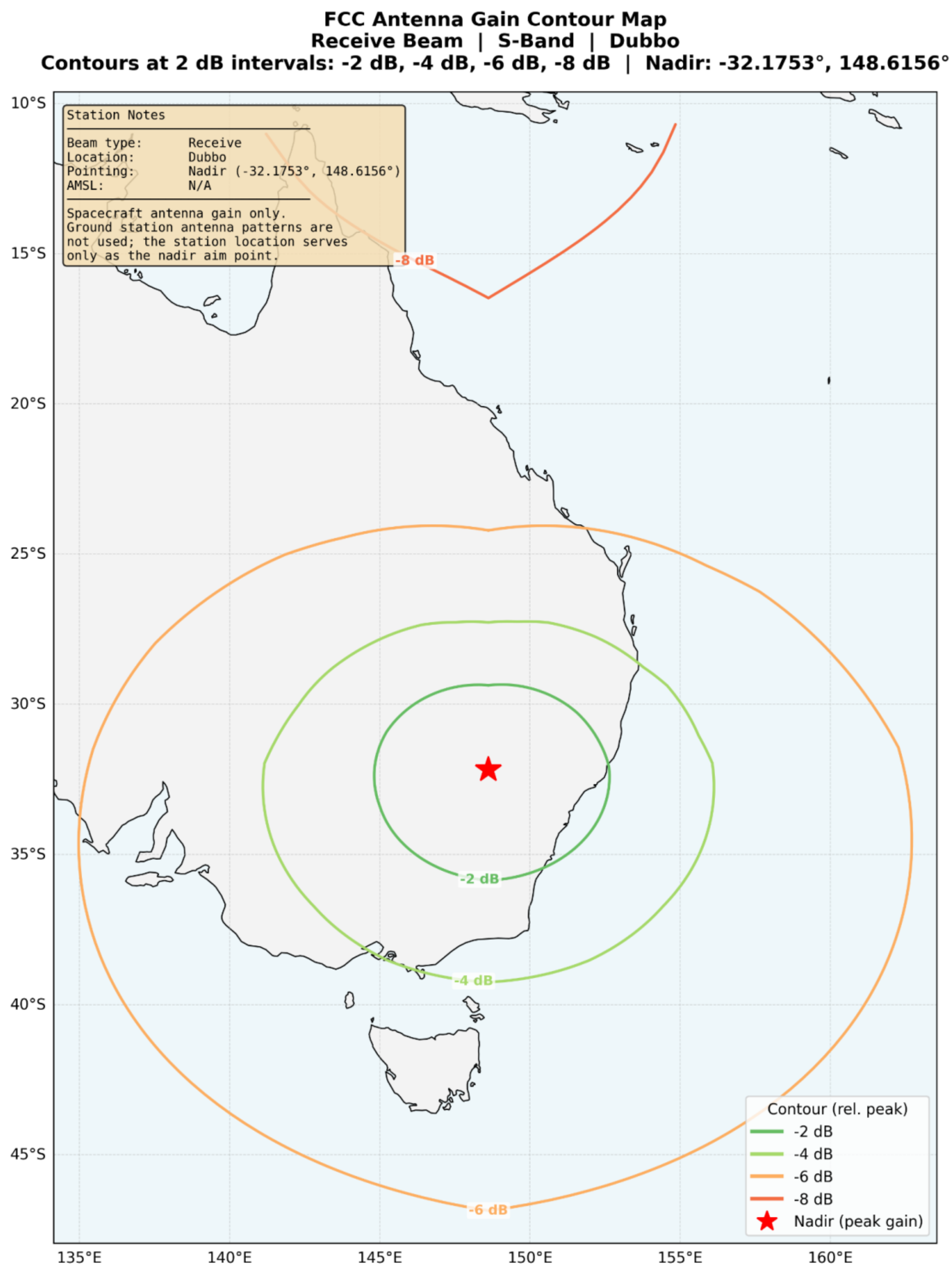
Map 30 - Awarua S-Band Receive



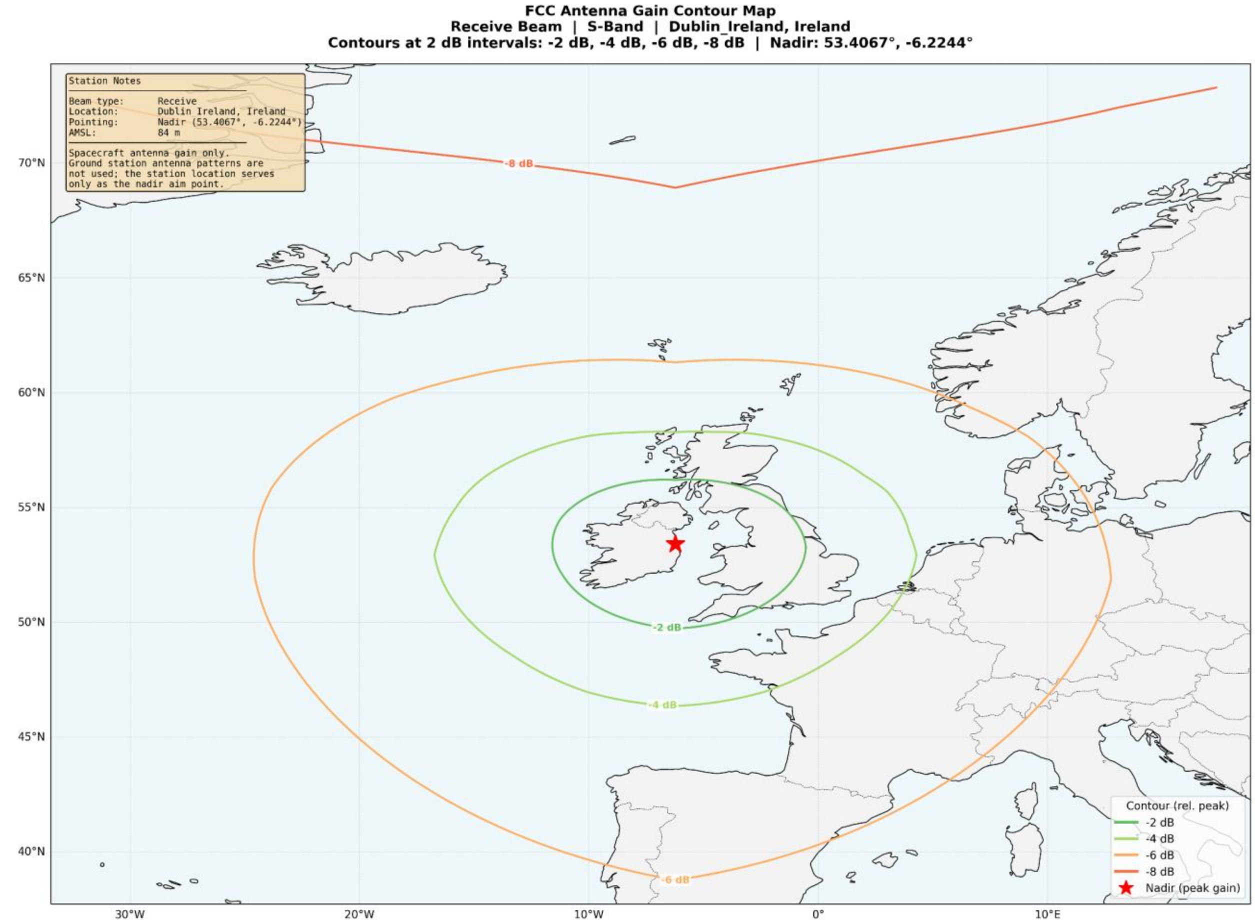
Map 31 - Bahrain S-Band Receive



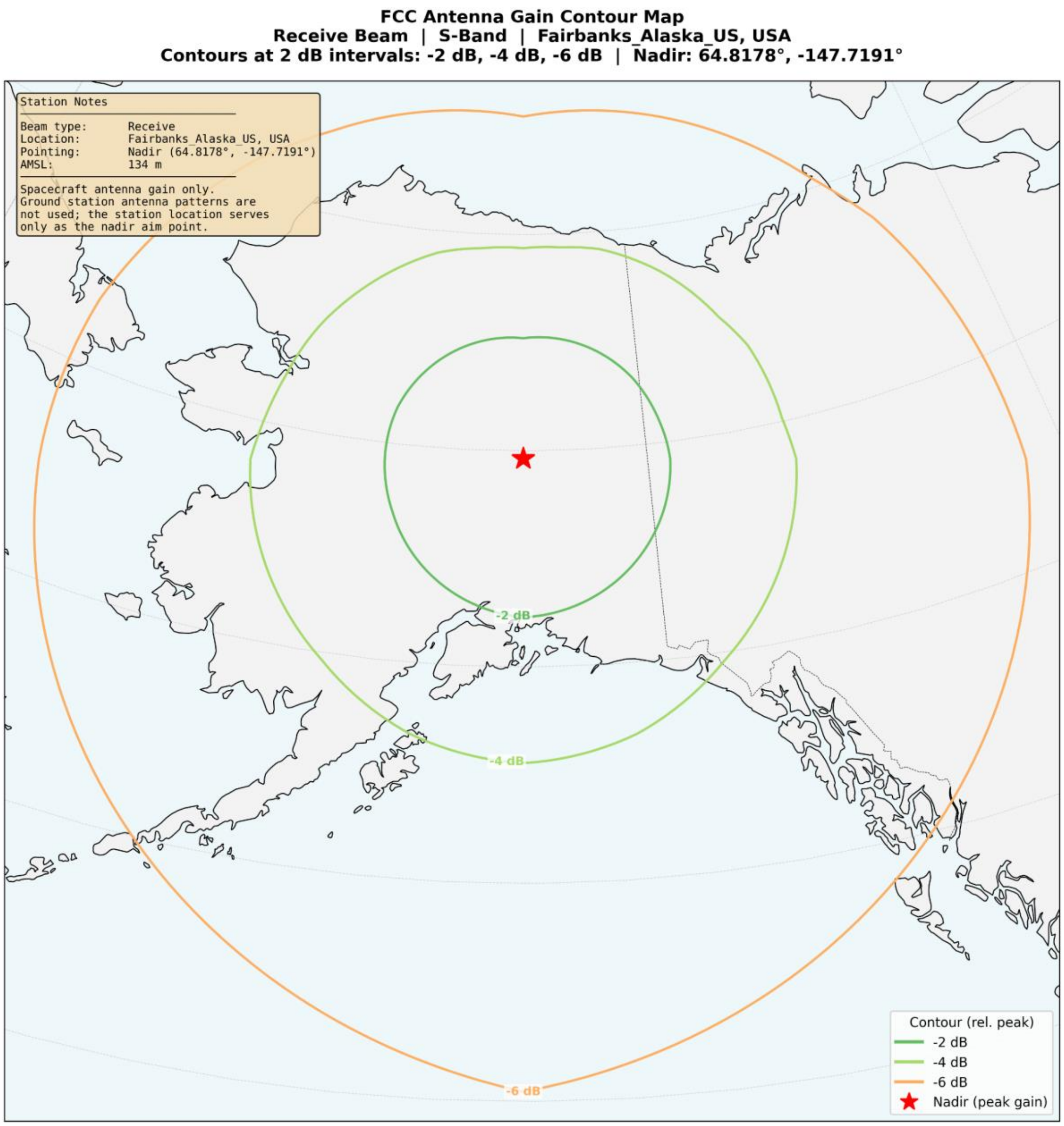
Map 32 - Cape Town S-Band Receive



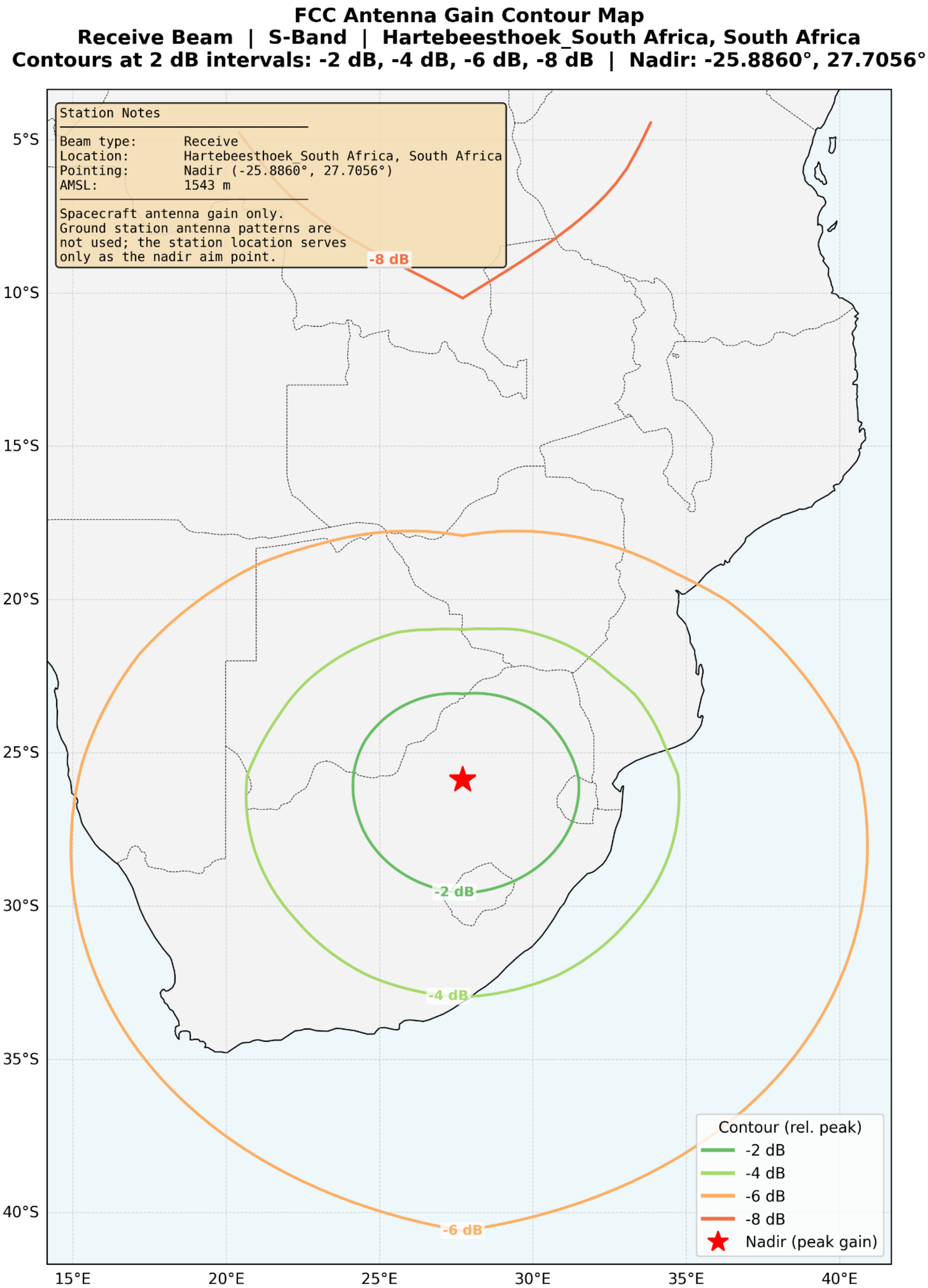
Map 33 - Dubbo S-Band Receive



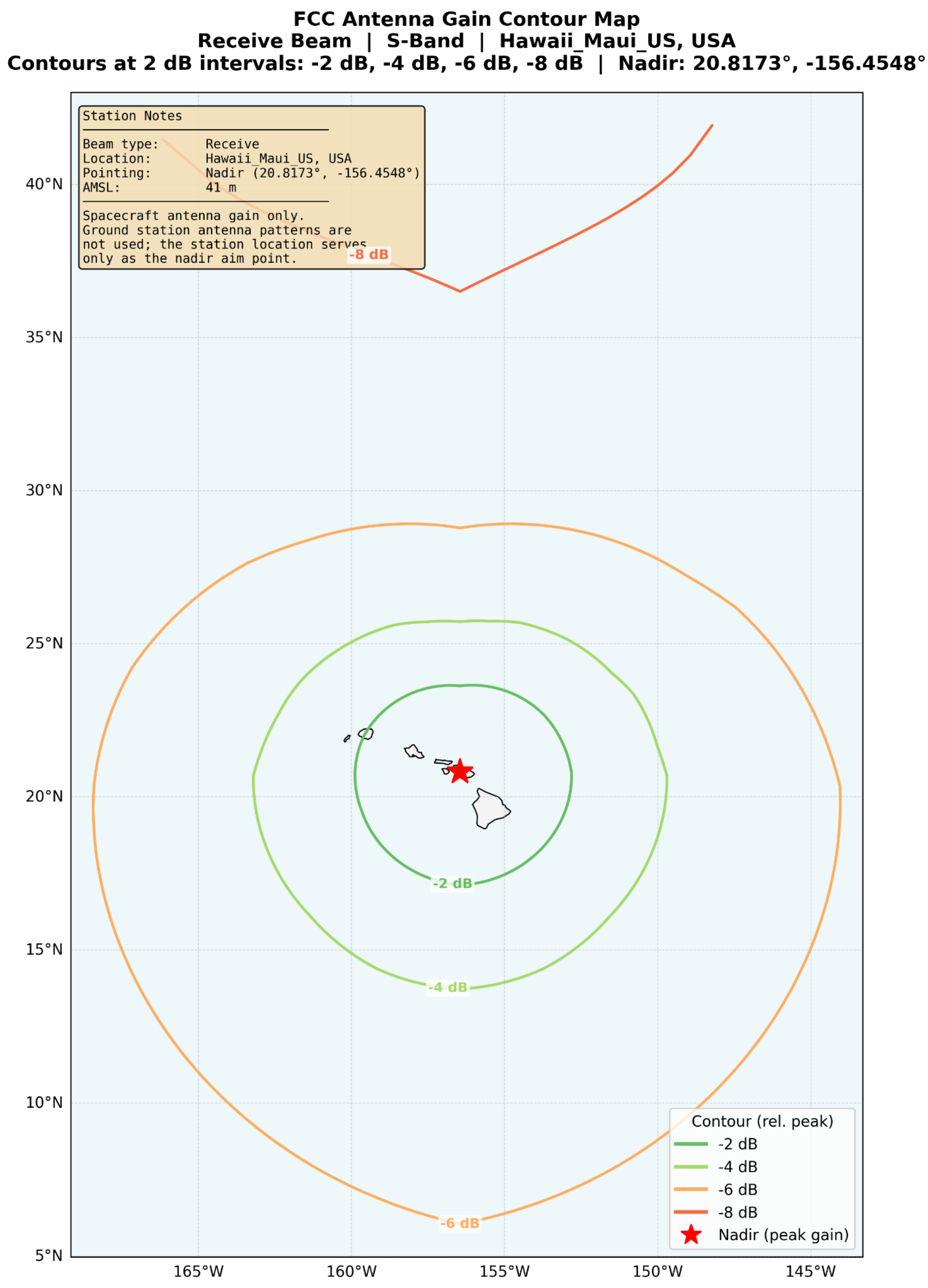
Map 34 - Dublin S-Band Receive



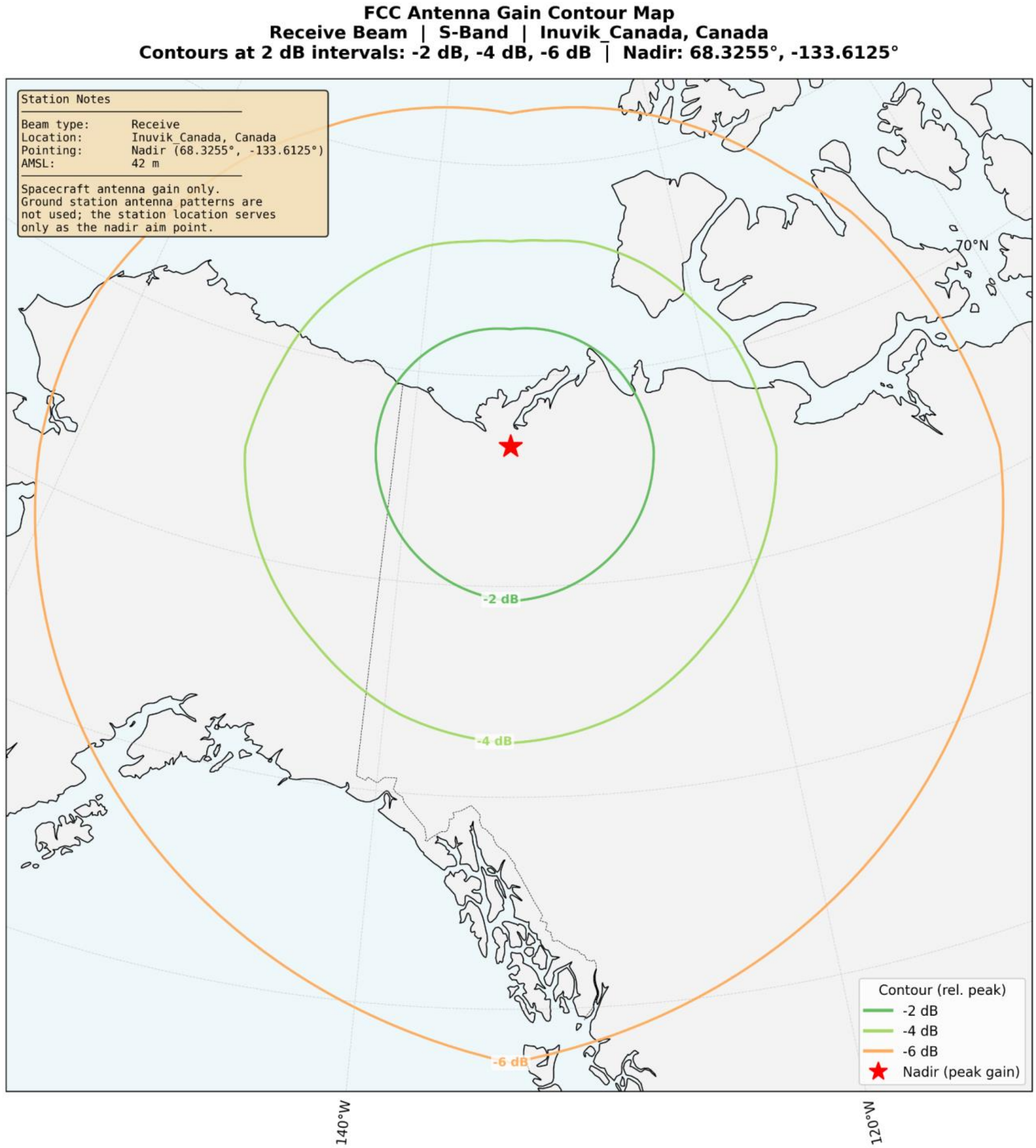
Map 35 - Fairbanks S-Band Receive



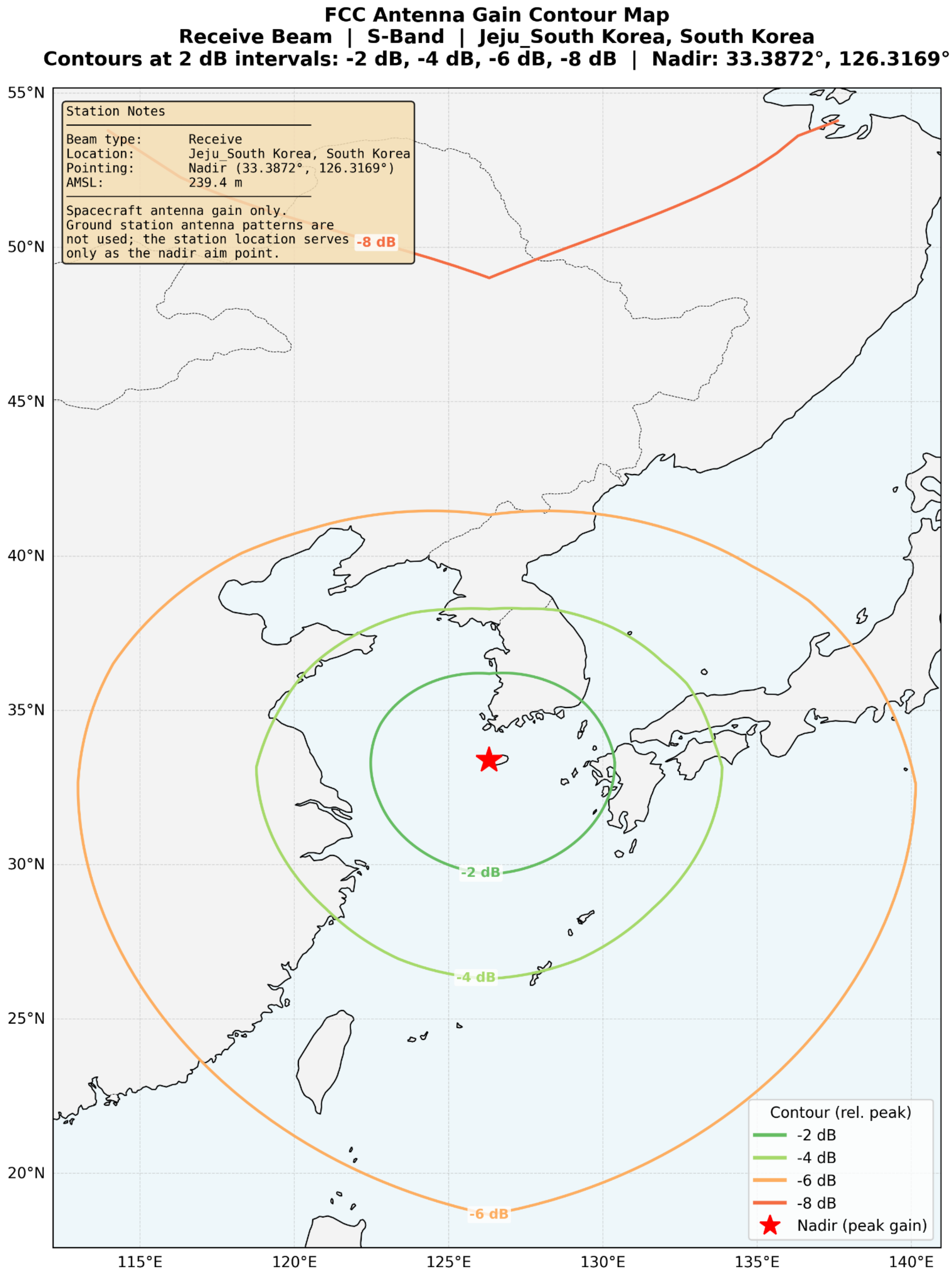
Map 36 - Hartebeesthoek S-Band Receive



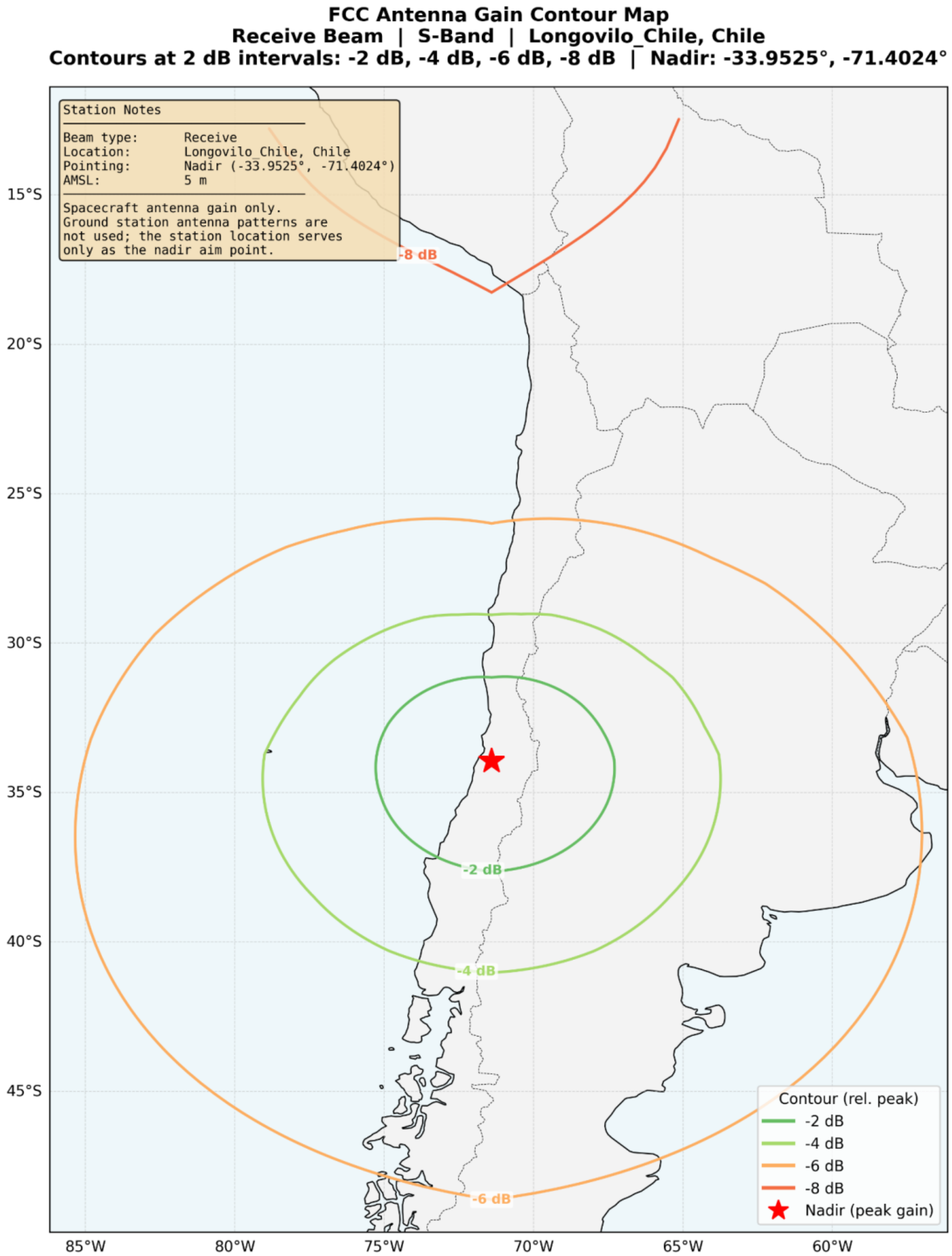
Map 37 - Hawaii S-Band Receive



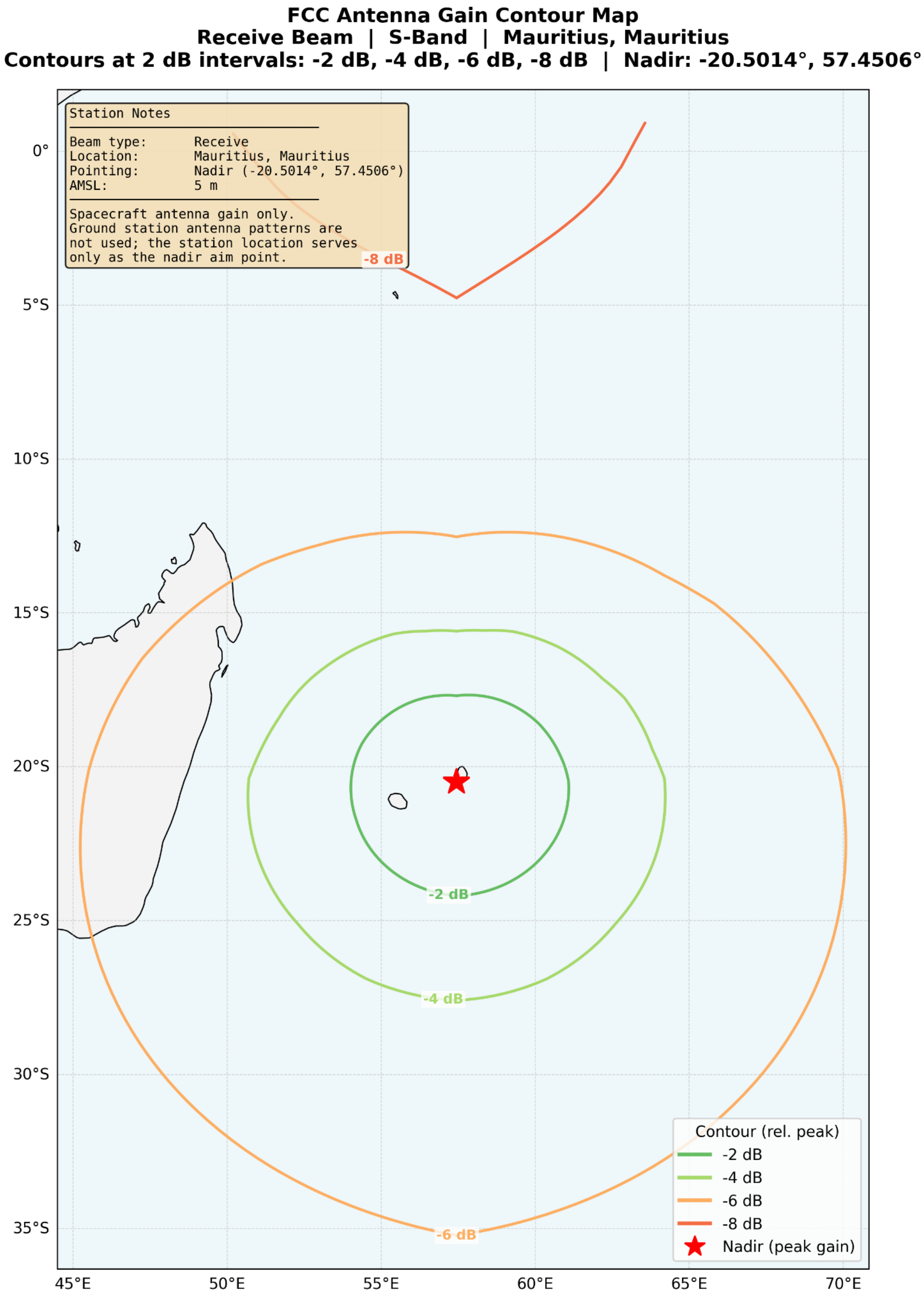
Map 38 - Inuvik S-Band Receive



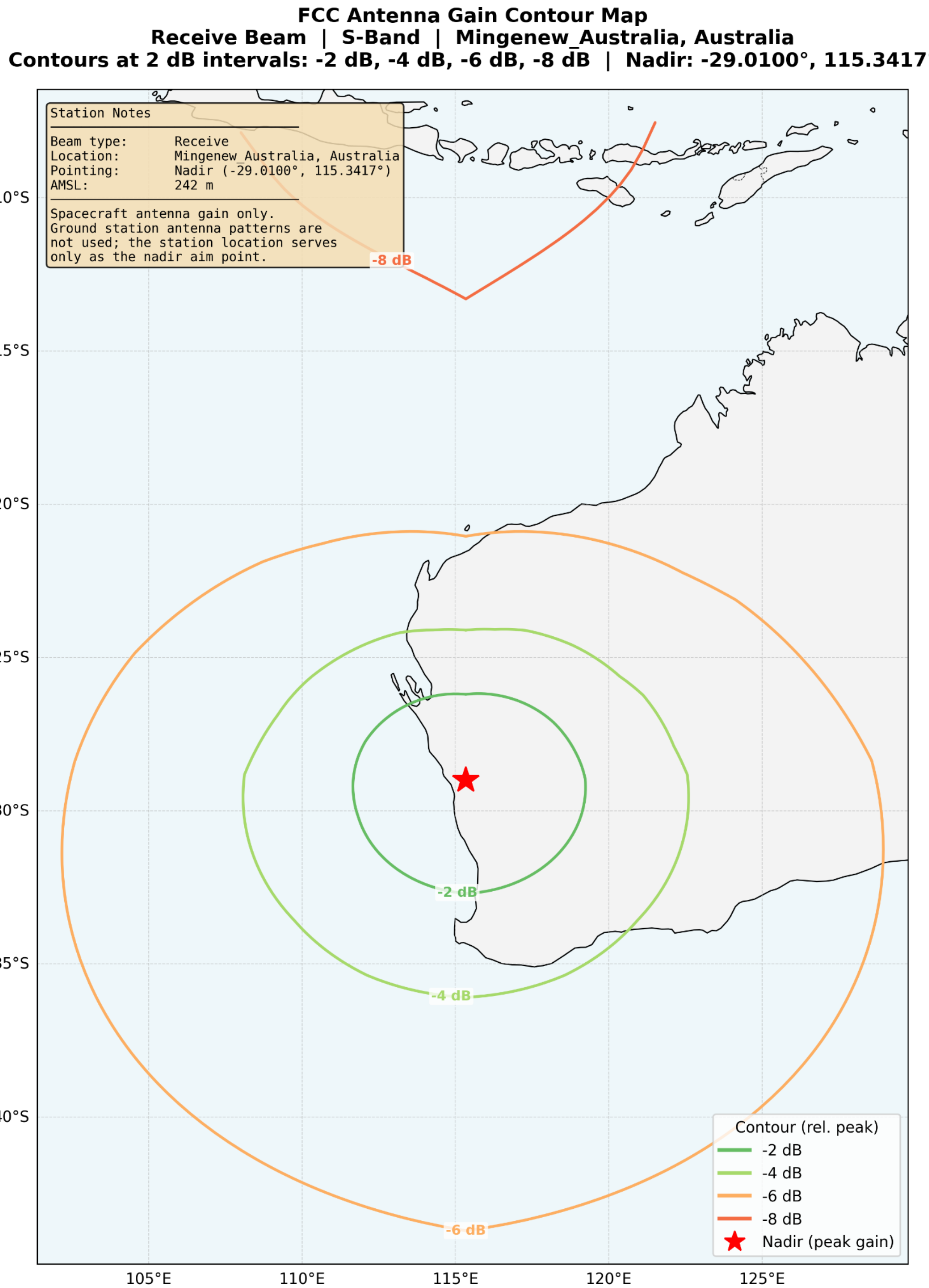
Map 39 - Jeju S-Band Receive



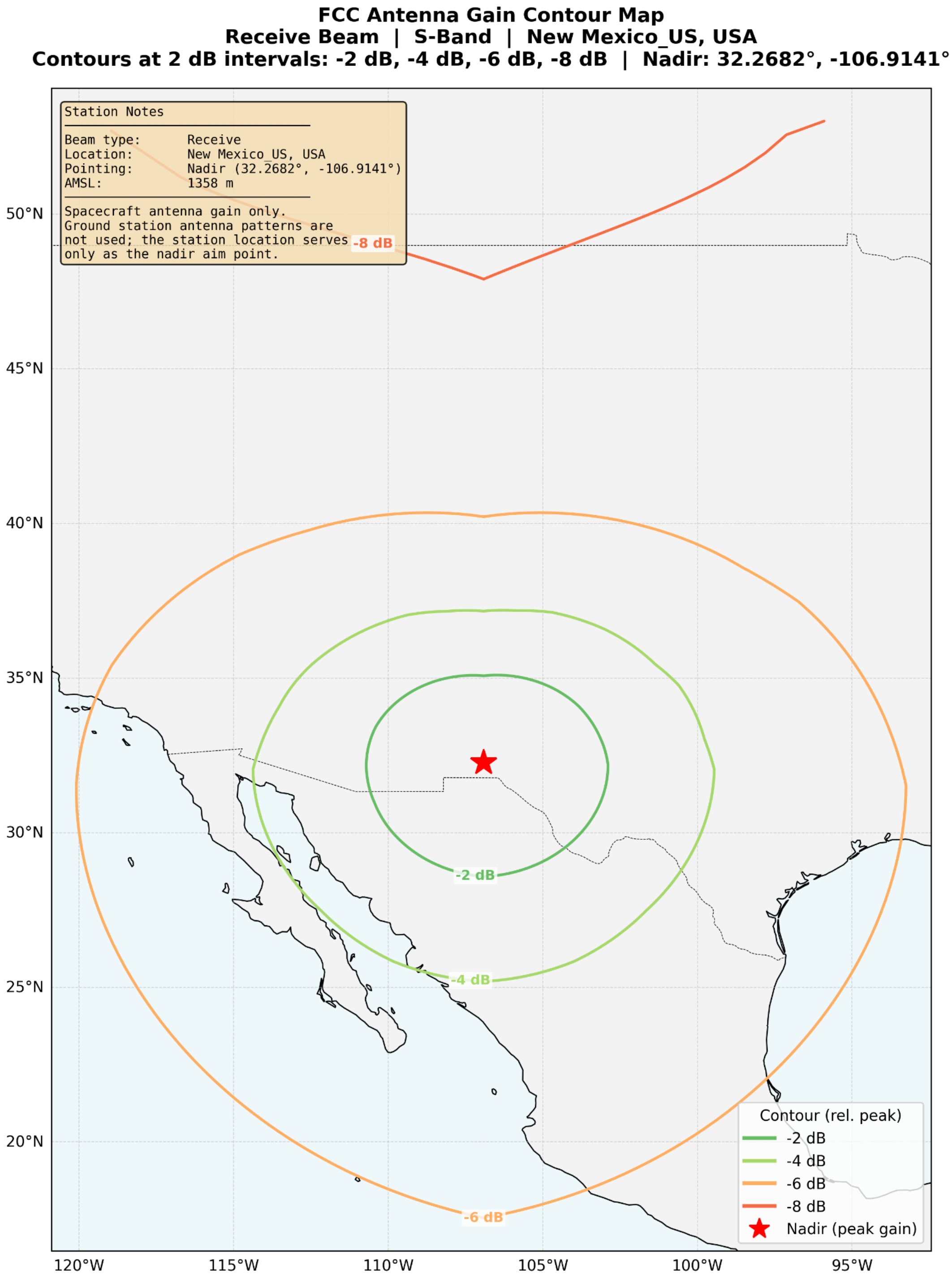
Map 40 - Longovilo S-Band Receive



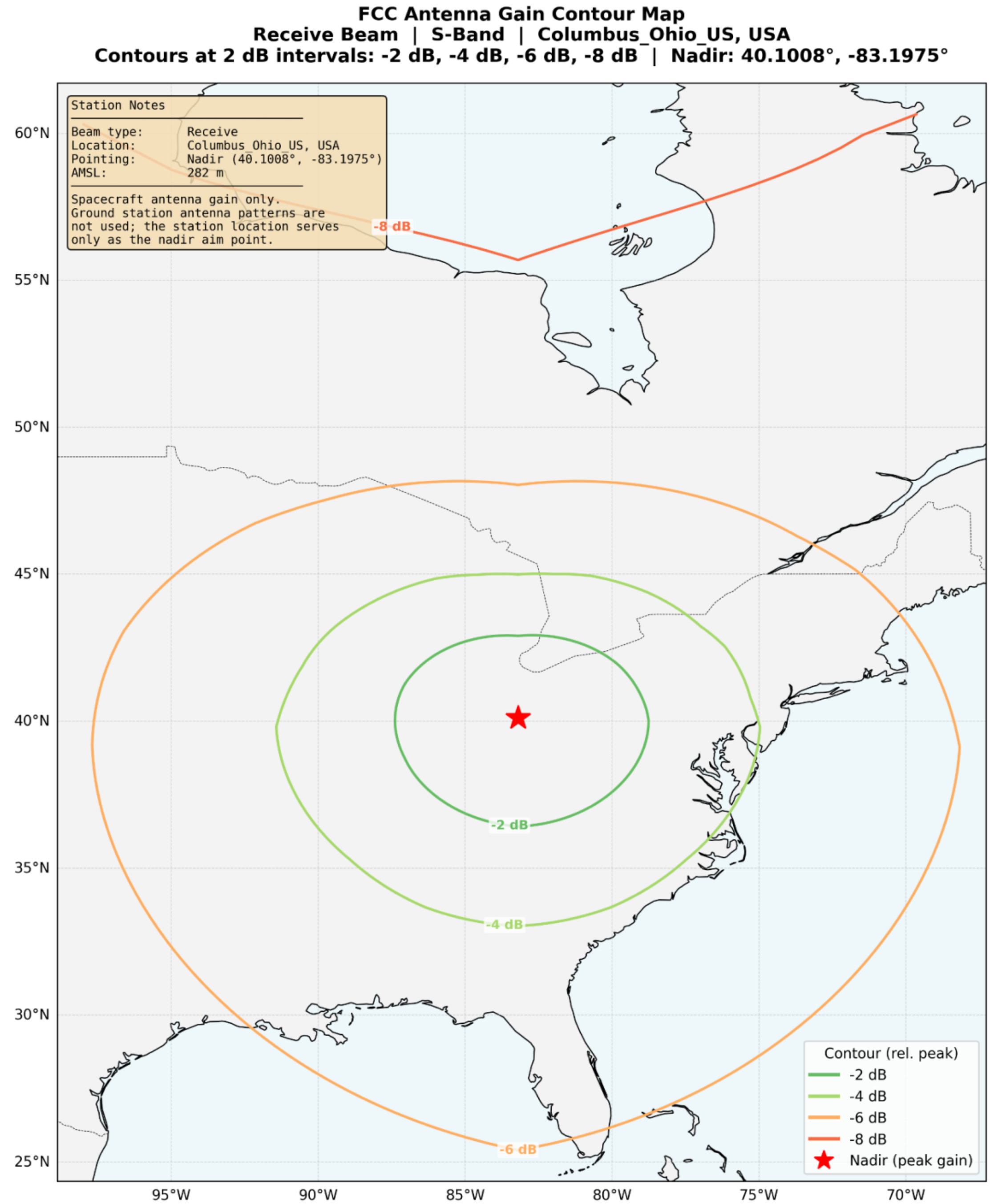
Map 41- Mauritius S-Band Receive



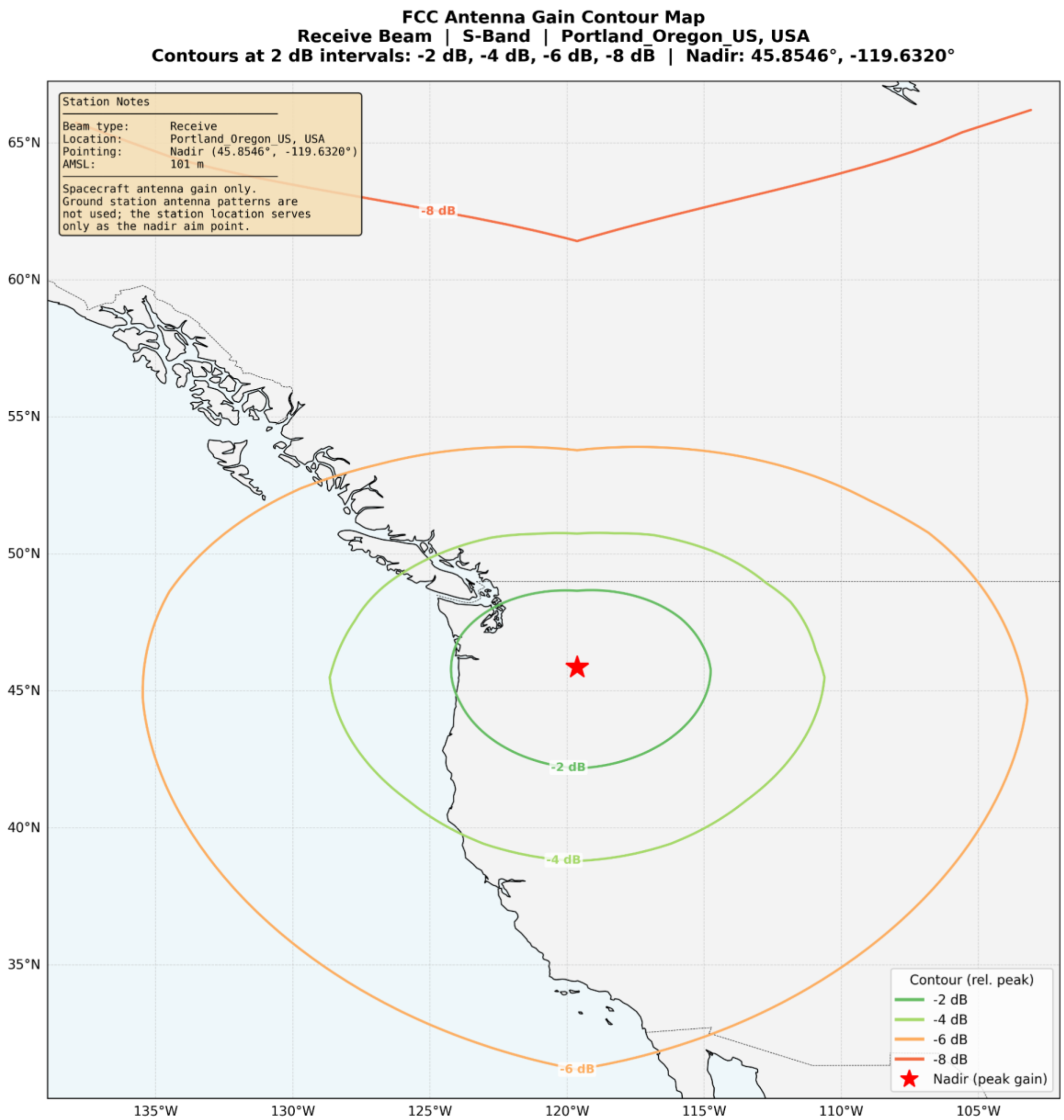
Map 42 - Mingenew S-Band Receive



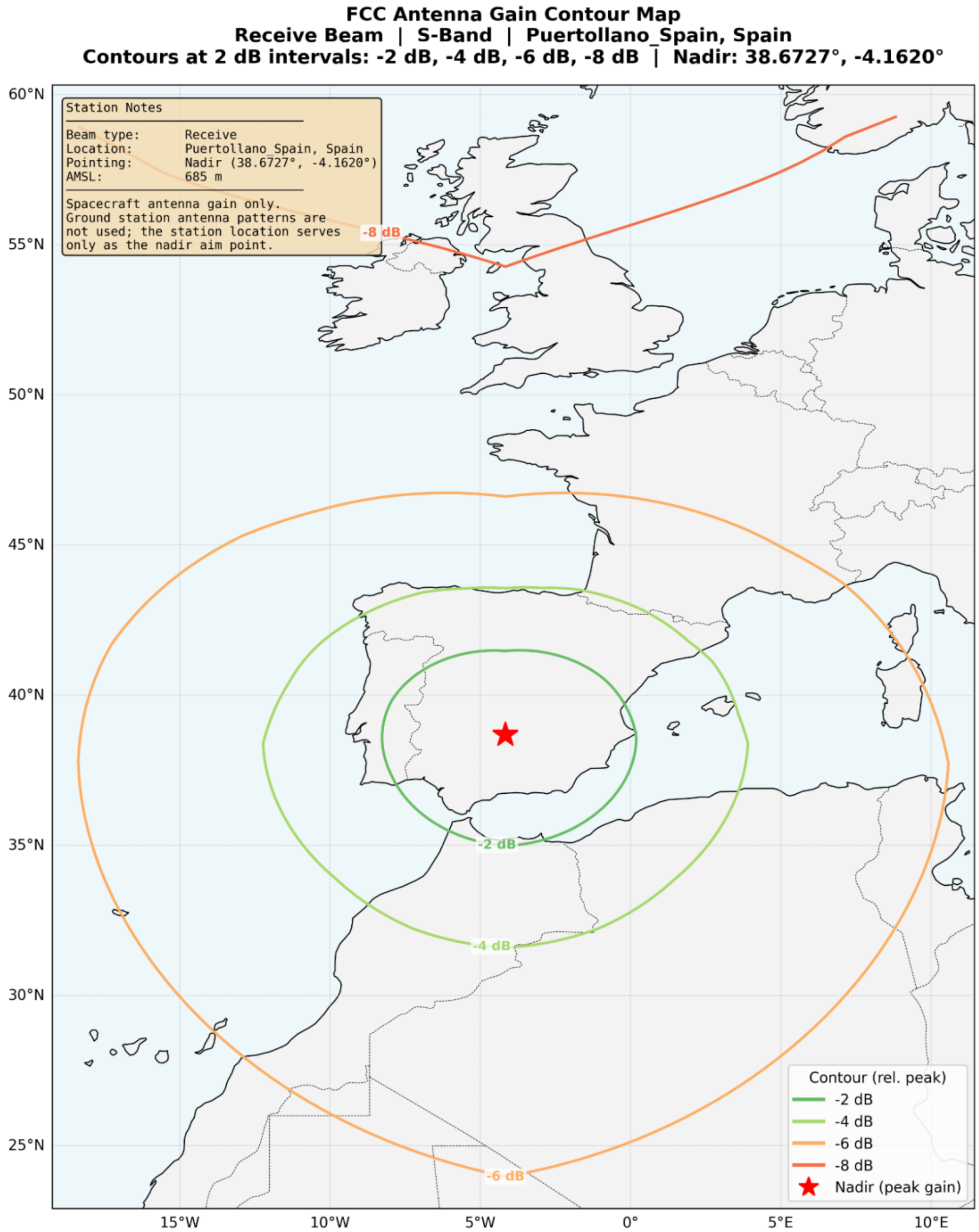
Map 43 - New Mexico S-Band Receive



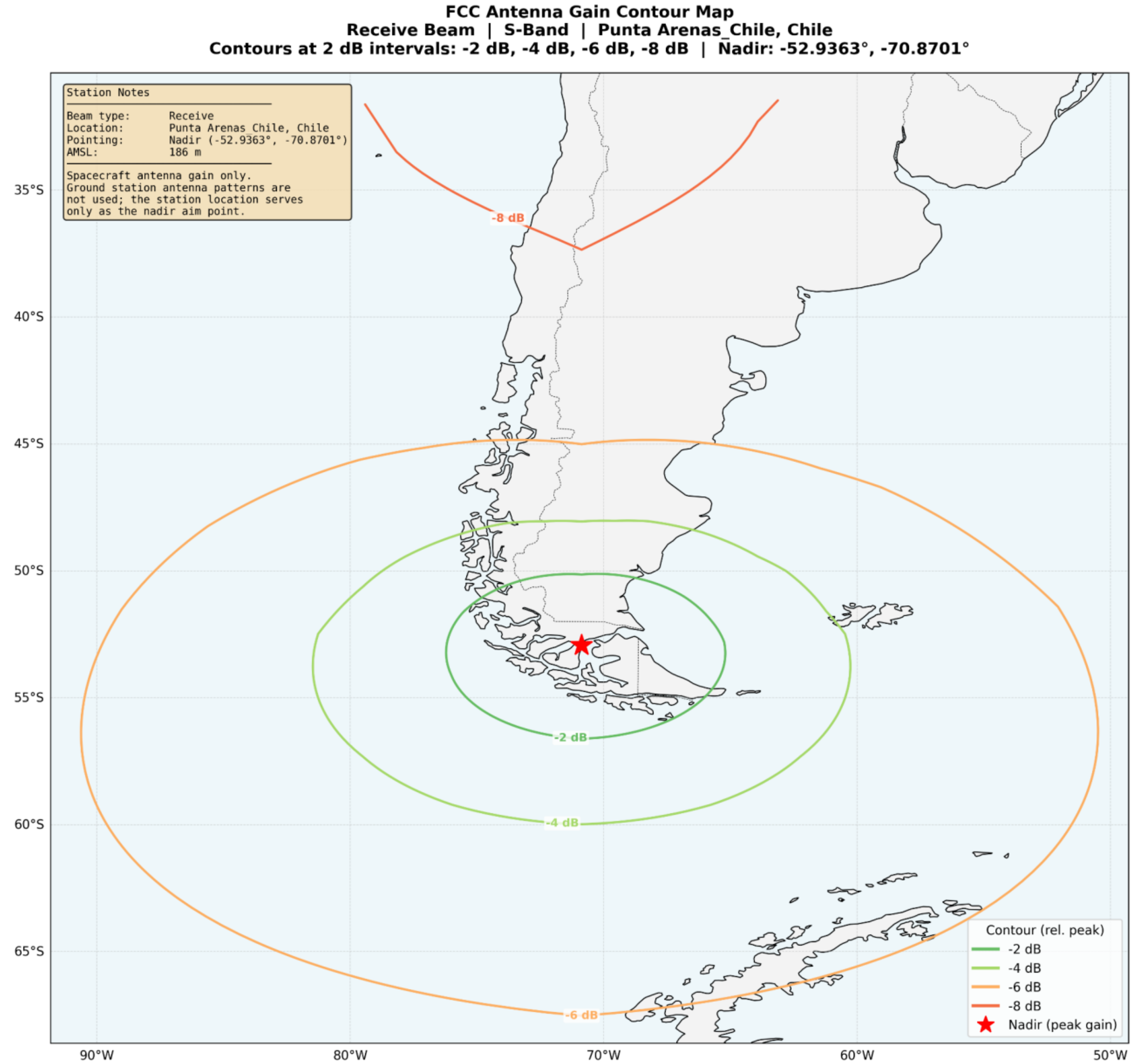
Map 44 - Ohio S-Band Receive



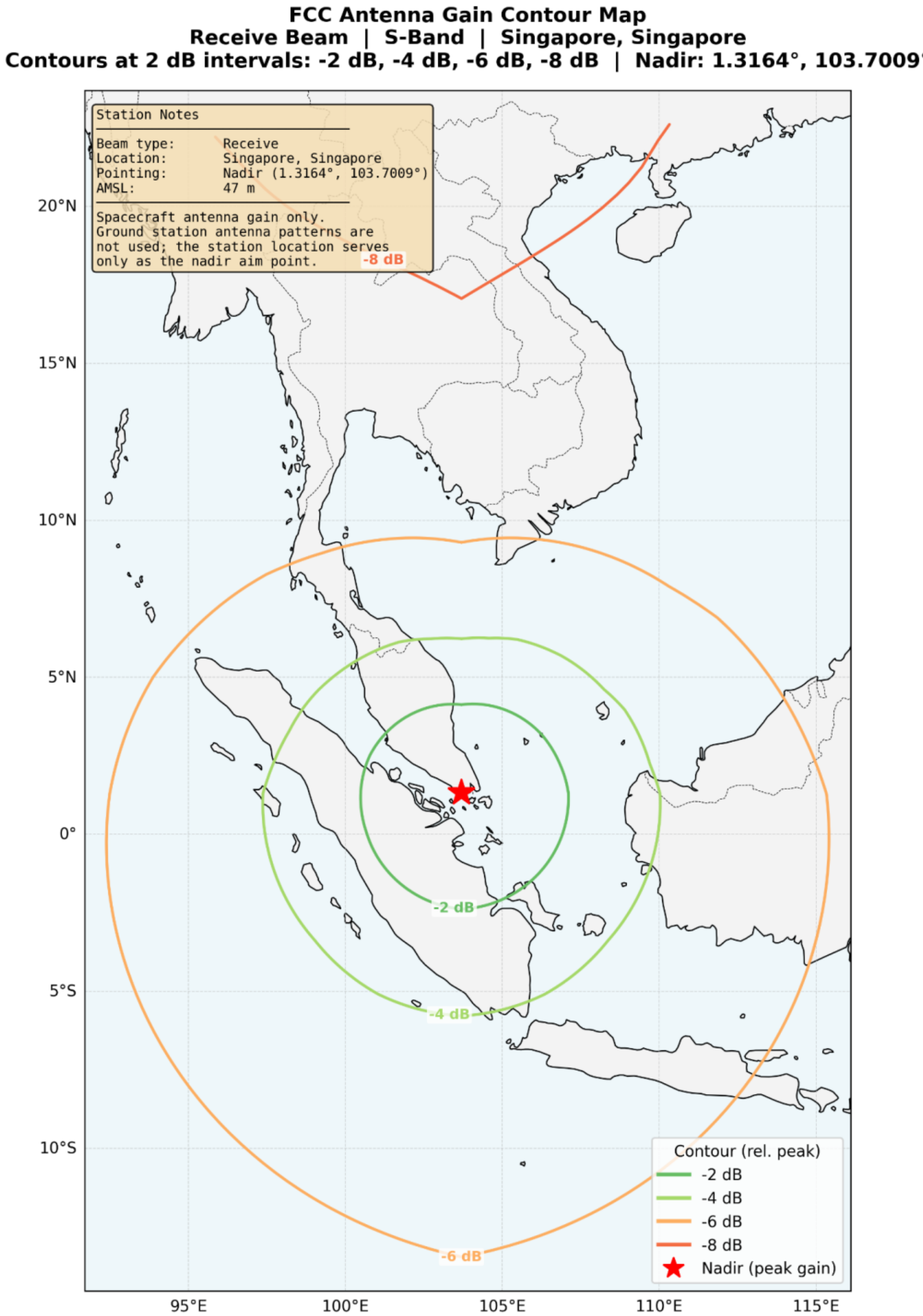
Map 45 - Oregon S-Band Receive



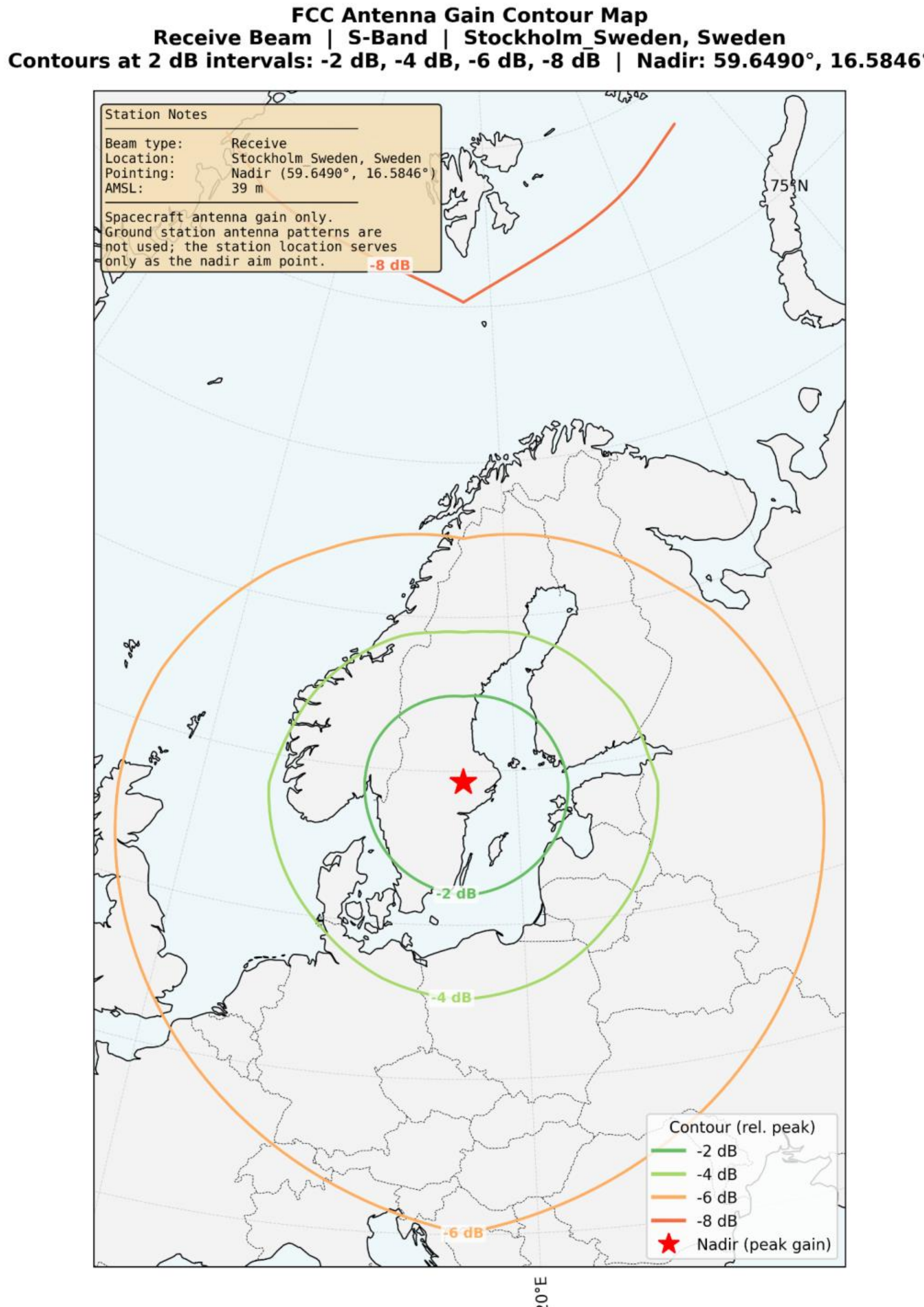
Map 46 - Puertollano S-Band Receive



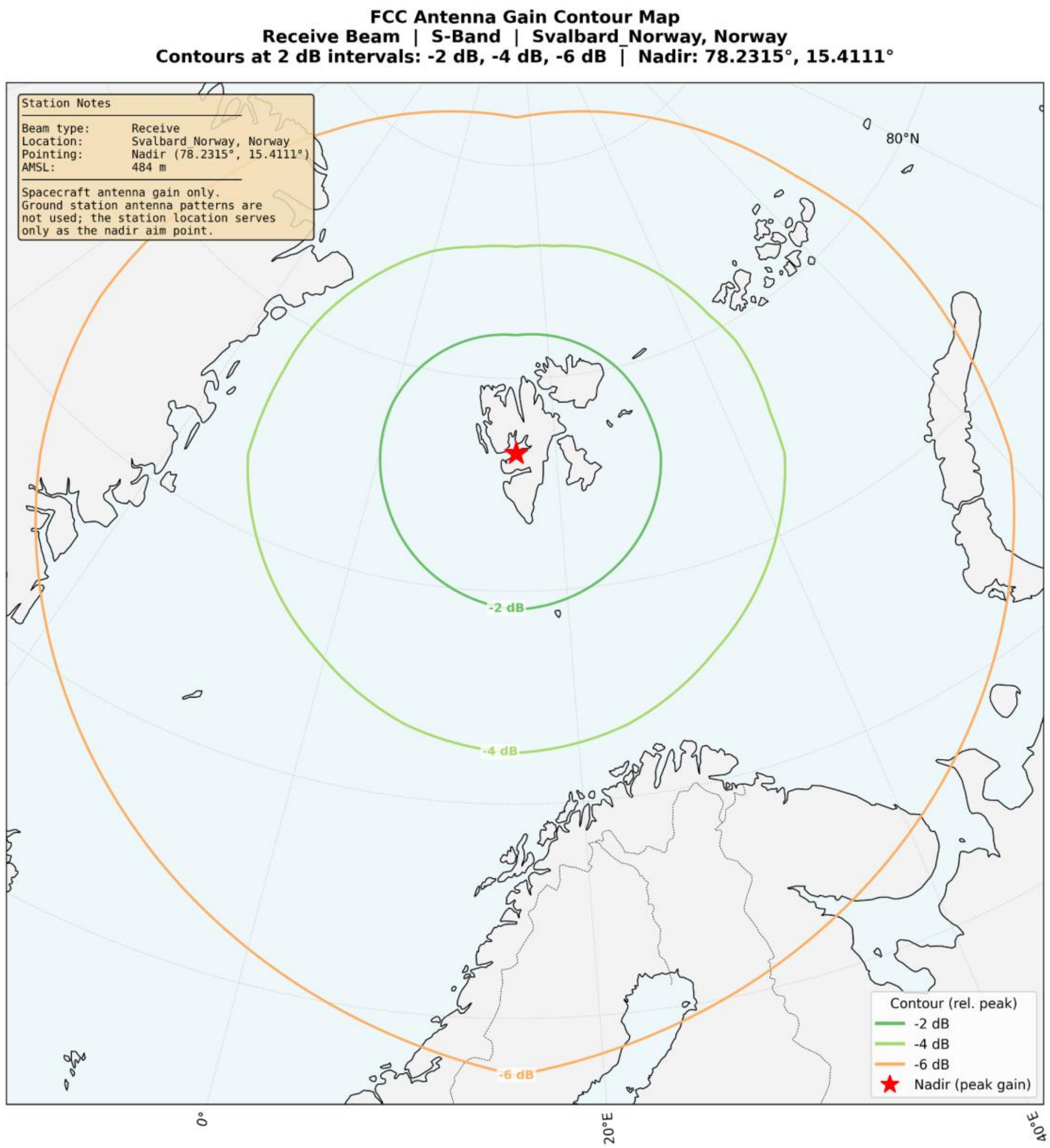
Map 47 - Punta Arenas S-Band Receive



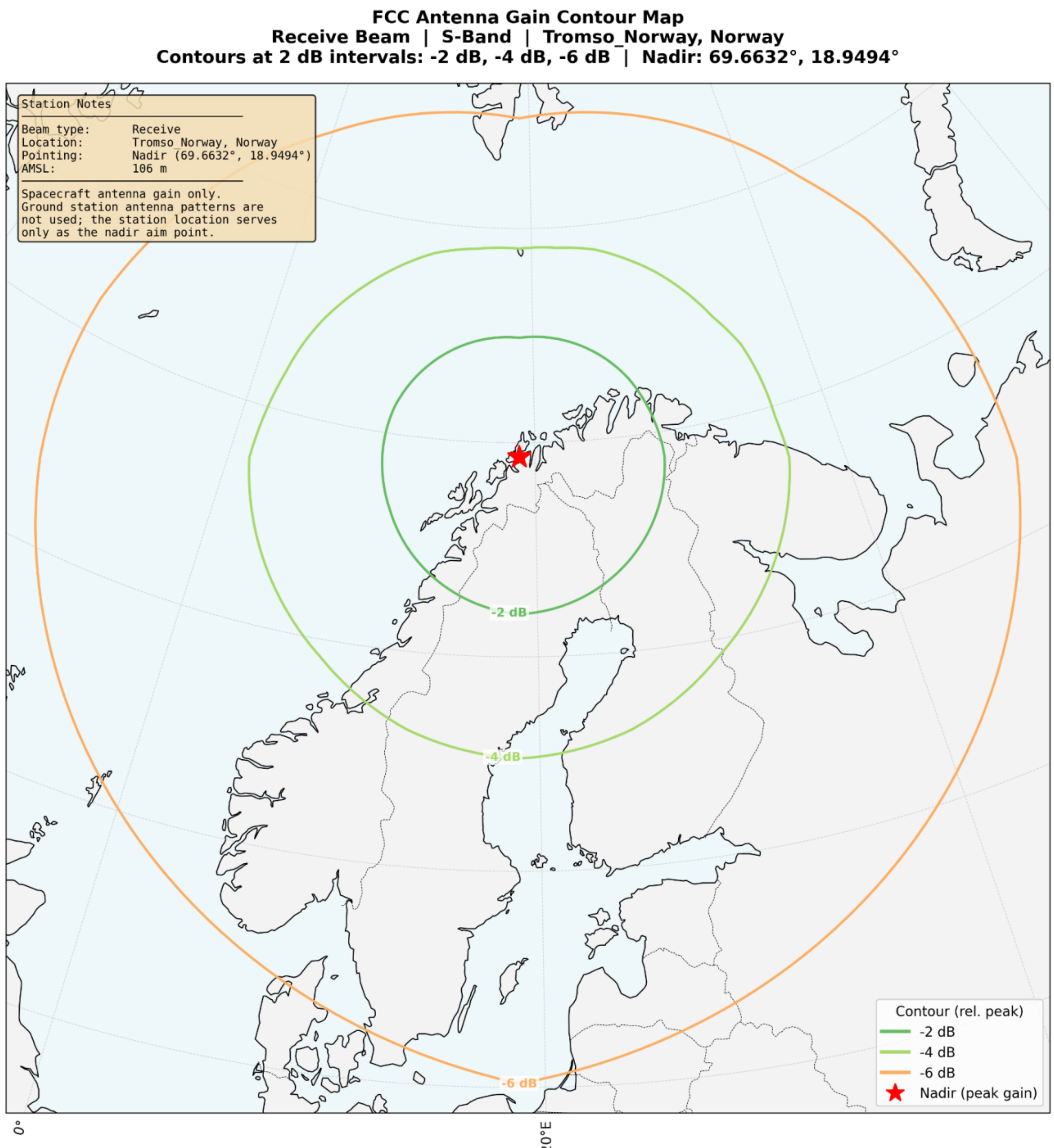
Map 48 - Singapore S-Band Receive



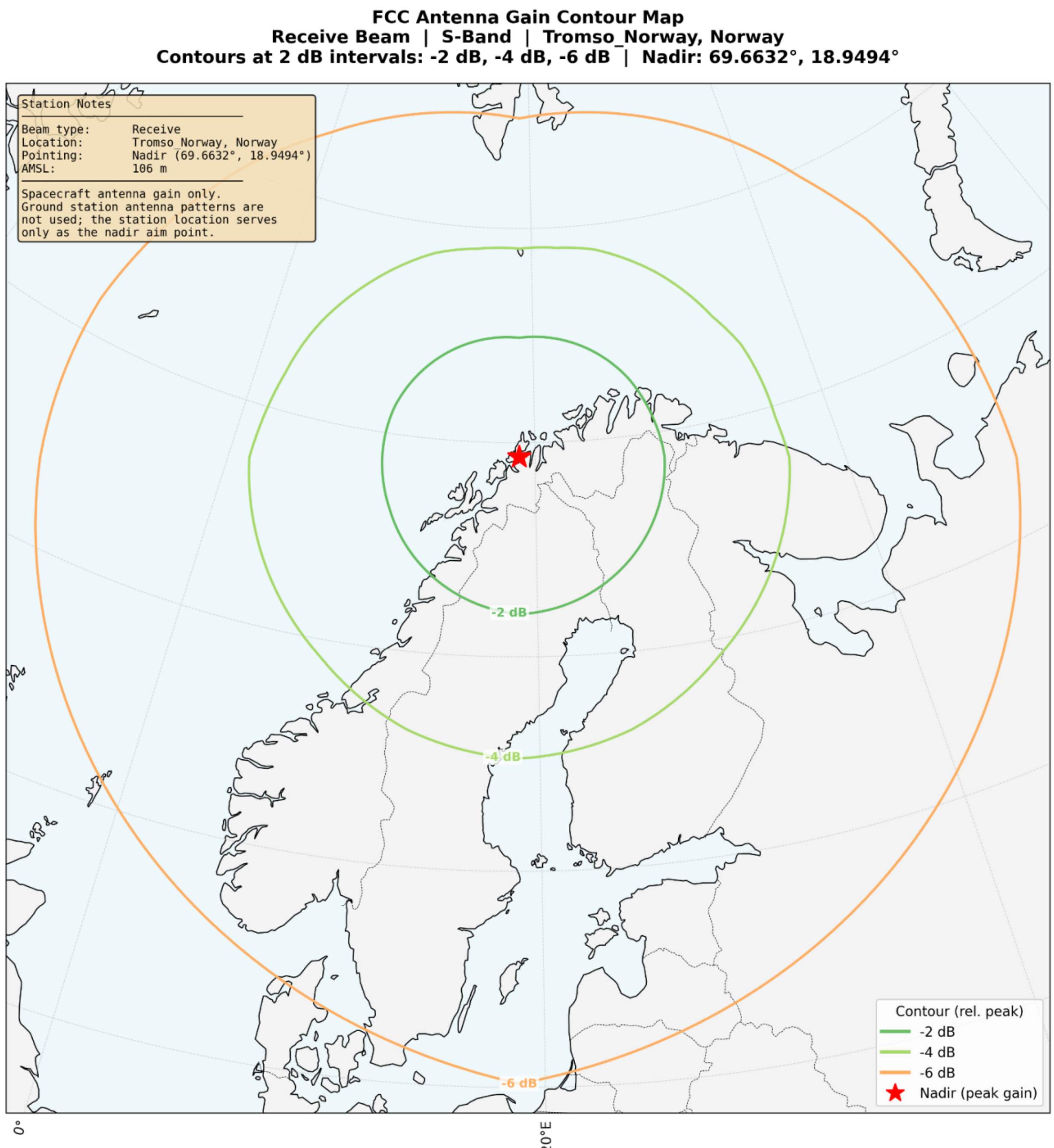
Map 49 - Stockholm S-Band Receive



Map 50 - Svalbard S-Band Receive



Map 51 - Tromso S-Band Receive



Map 52 - Tromso S-Band Receive

VII. Orbital Debris Risk Mitigation Plan

Oligo has completed an orbital debris assessment report ("ODAR") using the National Aeronautics and Space Administration ("NASA") Debris Assessment Software ("DAS") and provided it with this application.

This analysis shows that Chimera-1 is compliant with every NASA standard and relevant Commission rule.

A. Spacecraft Hardware Design

Oligo confirms that Chimera-1 will not undergo any planned release of debris during its normal operations. In addition, all separation and deployment mechanisms, and any other potential source of debris, will be retained by the spacecraft. Oligo has also assessed the probability of Chimera-1 becoming a source of debris by collision with small debris or meteoroids of less than one centimeter in diameter that could cause loss of control and prevent post-mission disposal.

B. Minimizing Accidental Explosions

Oligo is designing its spacecraft in a manner that limits the probability of accidental explosion. Oligo has assessed the possibility of accidental explosions during and after completion of mission operations through failure mode verification analysis. As part of the satellite manufacturing process, Oligo has taken steps to ensure that debris generation will not result from the conversion of energy sources onboard Chimera-1 into energy that fragments the satellite.

All sources of stored energy onboard the spacecraft will have been depleted or safely contained when no longer required for mission operations or post-mission disposal.

C. Safe Flight Profile

Oligo will identify Chimera-1 upon deployment through active beaconing. Oligo has assessed and limited the probability of Chimera-1 becoming a source of debris by collisions with large debris or other operational spacecraft. Oligo will work closely with its launch provider to ensure that the satellite is deployed in such a way to minimize the potential for in-plane collision. DAS shows that collision with a large object at the worst-case altitude of 600 km is 9.22E-4, well below the threshold in the Commission rules in section 25.114.

Oligo certifies that it will register with the 18th Space Defense Squadron and take all possible and necessary action in the event that the 18th alerts Oligo regarding a potential conjunction event. Oligo will likewise take all practical steps to ensure that its spacecraft transits its orbit safely by pre-screening maneuvers and affirms that Chimera-1 will be trackable on-orbit.

While Chimera-1 will passively de-orbit, its propulsive capabilities will allow it to take emergency maneuvers in the event that it is necessary to do so in order to protect the International Space Station or other inhabited spacecraft. Oligo has not identified any unique orbital safety risks associated with the proposed mission profile.

Oligo will engage with any operators of nearby constellations and other space stations to ensure safe and coordinated space operations as needed. Oligo will also provide all relevant agencies with any information they need to assess risks and ensure safe flight profiles, as well as contact information for Oligo personnel at its MOC.

D. Post-Mission Disposal

Oligo will conduct payload operations for up to five years and dispose of Chimera-1 less than six years after launch through atmospheric re-entry.

As demonstrated in its ODAR, Chimera-1 will burn up during uncontrolled re-entry with no material surviving to reach the Earth's surface. Accordingly, the risk of human casualty on the ground from Chimera-1 re-entering the atmosphere is 0, below the 1:10,000 threshold in NASA-STD-8719.14C and the Commission rules in section 25.114.

Certification of Person Responsible for Preparing Engineering Information

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this application, 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 application, and that it is complete and accurate to the best of my knowledge and belief.

Corey Mack
/s/
Corey Mack
Head of Operations
Oligo Space