ISAT US Inc.
FCC Form 312 Exhibit A

Application to Modify License E140029

I. DESCRIPTION OF MODIFICATION

ISAT US Inc. ("ISAT US") hereby seeks to modify its Global Xpress blanket license for Ka-band maritime Earth Stations in Motion ("ESIM"), Call Sign E140029 ("License"), File No. SES-LIC-20140224-00098 ("GX Maritime Application") (as modified by File Nos. SES-MOD-20151106-00818, SES-MOD20161130-00917, and SES-MOD-20170817-00928) to add a three new GX Earth station terminal types ("MicroSat", "MilliSat-W", "MilliSat-H") that will communicate with the Inmarsat-5 F2 ("I5F2") and Inmarsat- 5 F3 ("I5F3") satellites. Section II addresses the proposed new Earth station terminals. No other changes are requested by this modification application. ISAT US incorporates by reference Exhibits E (response to Question E17 regarding the remote control point) and (24-hour point of contact) of the GX Maritime Application, as well as certain other portions of the GX Maritime Application referenced below.

II. NEW EARTH STATION IN MOTION TERMINALS

This modification application seeks to add three terminal models that are manufactured by GetSat. The terminals will provide mobile communications services over Inmarsat's Ka-band Global Xpress satellite system in the 29.5-30.0 GHz (Earth-to-space) and 19.7-20.2 GHz (space-to-Earth) frequency bands. ISAT US already holds a blanket license for ESIMs that provide broadband communications in maritime applications[1] with the Inmarsat 5F2 and Inmarsat 5F3 satellite networks. This license covers operations in the 29.5-30.0 GHz (Earth-to-space) and 19.7-20.2 GHz (space-to-Earth) frequency bands. This application seeks authority to operate in these same frequencies for maritime applications. As pictured below, the GetSat terminals

[1] *See* Call Sign E140029.

utilize small flat panel antennas to achieve a compact terminal size that is especially useful in mobile applications. These terminals will add to the option of terminals available to meet the needs of maritime users. In the future, Inmarsat plans to file an additional application seeking authorization for these same terminals in land-mobile deployments.

A. Maritime ESIM Terminal Description

This application seeks to license the MicroSat, MilliSat-W, and MilliSat-H terminals manufactured by GetSat ("GetSat Terminals"). The terminals will operate on the same frequencies as the GX Terminals in the current license: 19.7-20.2 GHz (space-to-Earth) and 29.5-30.0 GHz (Earth-to-space). As illustrated in the off-axis EIRP spectral density plots in Exhibit B, the MicroSat, MilliSat-W, and MilliSat-H terminals meet the performance requirements in Section 25.138 (a) under clear sky conditions. Additionally, each of these ESIM terminal types will be operated within the -118 dBW/m^2/MHz power flux-density at the earth's surface of the I5F2 and I5F3 satellite. Thus, the proposed terminals are able to operate without causing unacceptable interference, consistent with the requirements of Section 25.209(f).[2]

The Commission has deleted the requirement to provide receive earth station patterns in the 19.7-20.2 GHz frequency band (see Sections 25.132 and 25.115). To the extent that the proposed terminal may have minor exceedance at certain off-axis angles Inmarsat understands and agrees to accept interference from adjacent FSS satellite networks to the extent the relevant receiving antenna performance requirements of Section 25.209 are exceeded.

Radiation hazard analyses for the MicroSat, MilliSat-W, and MilliSat-H terminals and a discussion of the results are provided in Exhibit C.

[2] *See* Section 25.209(f).

The proposed GetSat Terminals will be subject to the same national security requirements described in Section 4 of Exhibit A of the GX Maritime Application. That discussion is incorporated by reference herein. Inmarsat has completed US334 coordination with the applicable Federal users.

The following sections provide a description of each of the terminal types.

B. MICROSAT Terminal

The required technical data for the proposed MicroSat earth station is provided in the Form 312. This terminal type employs a 0.248 x 0.135 meter flat panel antenna and the half-power beamwidth required in Section 25.130(f) is 2.4 degrees. In addition, for blanket licensing of transmitting Earth stations in the 29.5-30.0 GHz band, the Commission adopted off-axis EIRP spectral density levels contained in Section 25.138(a). As illustrated in the off-axis EIRP spectral density plots in Exhibit B, the proposed terminal type meets the performance requirements in Section 25.138 (a) under clear sky conditions.

Below are images of the MicroSat terminal both inside and outside of its radome:

C. MILLISAT-W Terminal

The required technical data for the proposed MILLISAT-W earth station is provided in the Form 312. This terminal type utilizes a variation on the MicroSat design, that employs a 0.5 x 0.135 meter flat panel antenna; and the half-power beamwidth required in Section 25.130(f) is 1.2 degrees. In addition, for blanket licensing of transmitting Earth stations in the 29.5-30.0 GHz band, the Commission adopted off-axis EIRP spectral density levels contained in Section 25.138(a). As illustrated in the off-axis EIRP spectral density plots in Exhibit B, the proposed terminal type meets the performance requirements in Section 25.138 (a) under clear sky conditions.

Below are images of the MilliSat-W terminal, both inside and outside of its radome:

D. <u>MILLISAT-H Terminal</u>

The required technical data for the proposed MILLISAT-H earth station is provided in the Form 312. This terminal type utilizes a variation on the MicroSat design, that employs a 0.248 x 0.27 meter flat panel antenna; and the half-power beamwidth required in Section 25.130(f) is 2.2 degrees. In addition, for blanket licensing of transmitting Earth stations in the 29.5-30.0 GHz band, the Commission adopted off-axis EIRP spectral density levels contained in Section 25.138(a). As illustrated in the off-axis EIRP spectral density plots in Exhibit B, the proposed terminal type meets the performance requirements in Section 25.138 (a) under clear sky conditions.

Below is an image of the MilliSat-H terminal both inside and outside of its radome:

III. REQUEST FOR WAIVER

ISAT US hereby respectfully requests a partial waiver of Sections 25.115(g) and 25.132(b)(1) of the FCC's rules to the extent the antenna plots in Exhibit B of this application do not cover the entire range of off-axis angles called for in those rule sections. The relevant portions of Sections 25.115 and 25.132 call for plots of maximum co-polarized EIRP density in the plane tangent to the GSO arc at off-axis angles from minus 180° to plus 180°. Exhibit

B of this application includes plots covering off-axis angles from minus 90° to plus 90°. These are the plots that were provided by the terminal manufacturer, and ISAT US was unable to receive plots covering the rest of the range called for in Sections 25.115 and 25.132 of the FCC's rules.[3] The plots provided for each antenna show a sharp drop off in EIRP density at angles moving away from the GSO arc, and in each case show that by minus 50° or plus 50°, the EIRP densities are well below the envelope specified in Section 25.209 of the FCC's rules. This strong performance against the Section 25.209 envelope is in part a result of the small rectangular panel and tight beam-forming of the GetSat terminal antennas. As a result of the terminal design, there is no reason to expect that that the EIRP density levels would dramatically increase beyond minus 90° or plus 90°. Grant of this partial waiver will help accelerate the approval process of these terminals by not requiring unnecessary and duplicative measurements to be taken by the manufacturer, and thus would serve the public interest.

IV. RESPONSE TO QUESTION 36

ISAT US submits this response to Question 36 of the FCC Form 312 out of an abundance of caution. In 2005, the Commission dismissed a Petition for Declaratory Ruling (the "Petition") filed by Inmarsat Mobile Networks, Inc.'s affiliate, Inmarsat Global Limited ("Inmarsat Global"), seeking United States market access to provide MSS in the 2 GHz band. Subsequent to Inmarsat Global's filing, the Commission assigned all 2 GHz spectrum currently allocated for

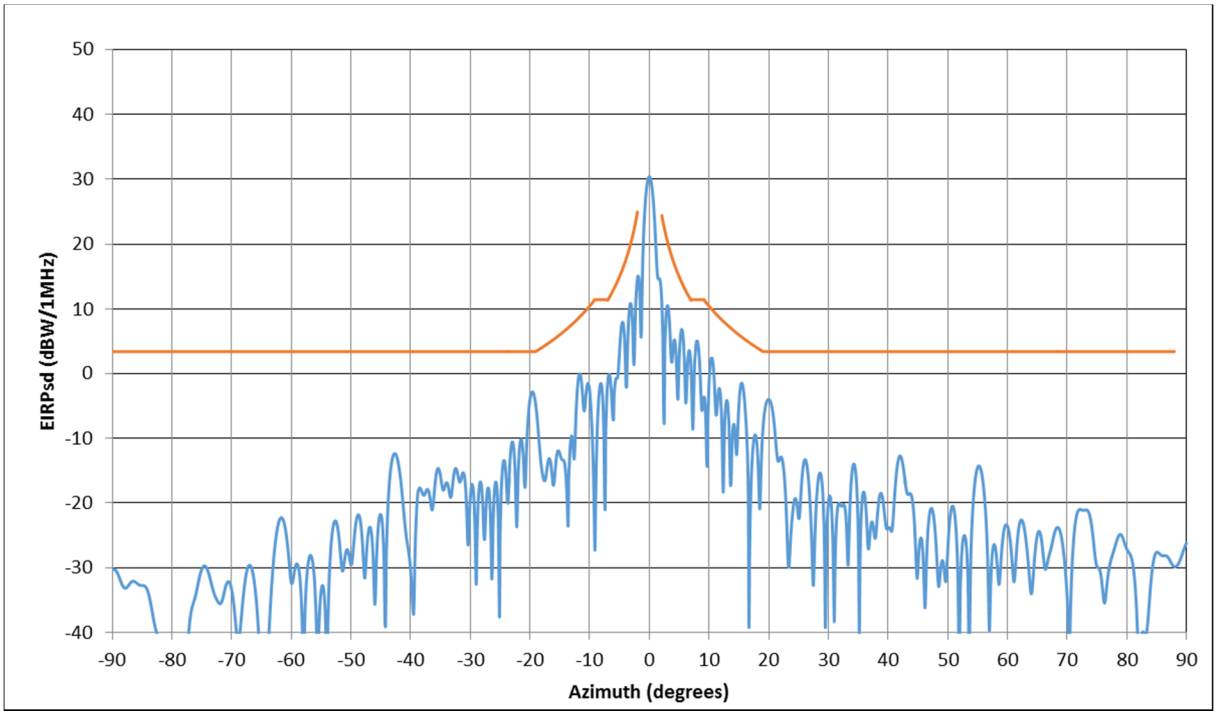
[3] In other instances, the plots provided by the manufacturer show greater ranges than those required under the FCC rules. Those greater ranges are included in this application for completeness and only reinforce the favorable performance of the GetSat terminals.

MSS in the United States to two other satellite operators, and thus dismissed Inmarsat Global's Petition.

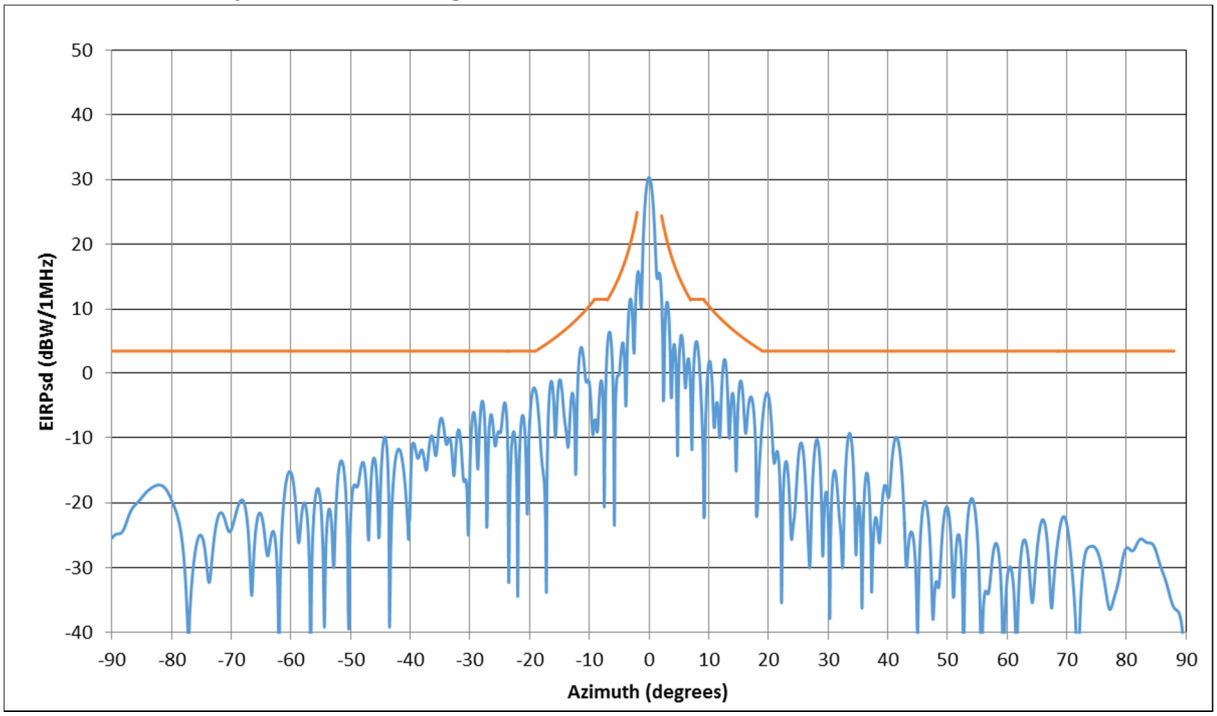
EXHIBIT B

1.0 MilliSat-W Off-Axis EIRP Masks

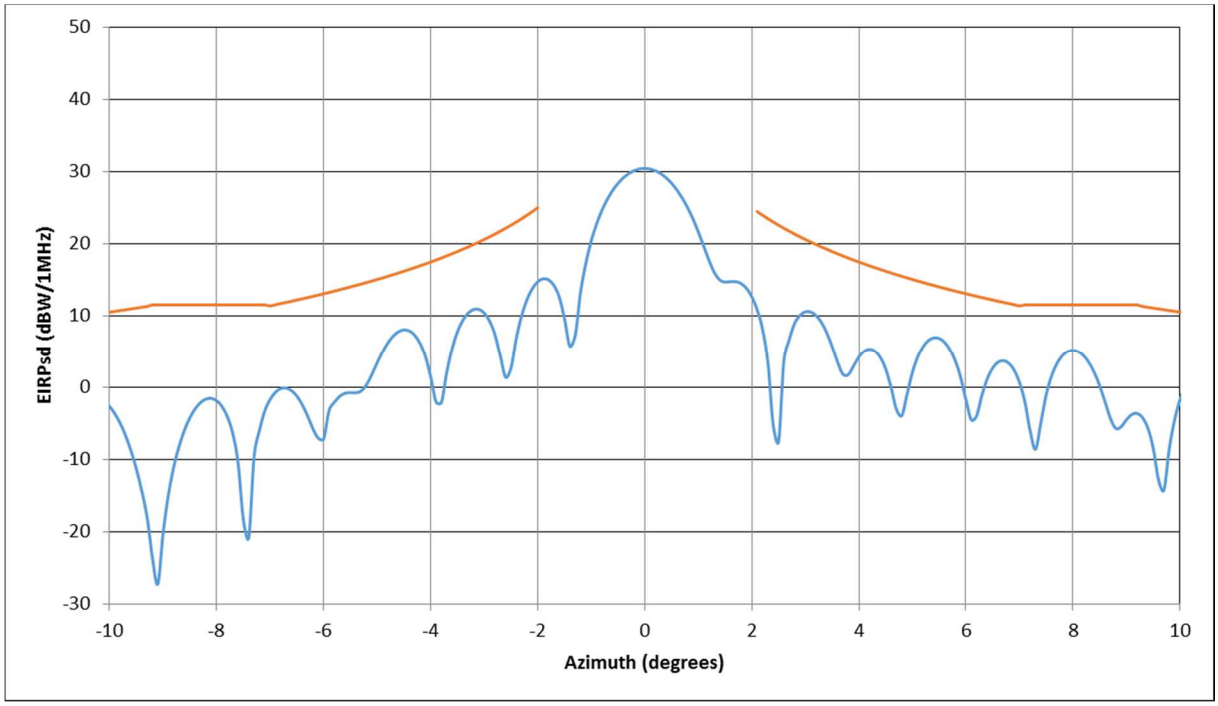
Co-Pol EIRP density in the Plane Tangent to the GSO Arc 29.5 GHz



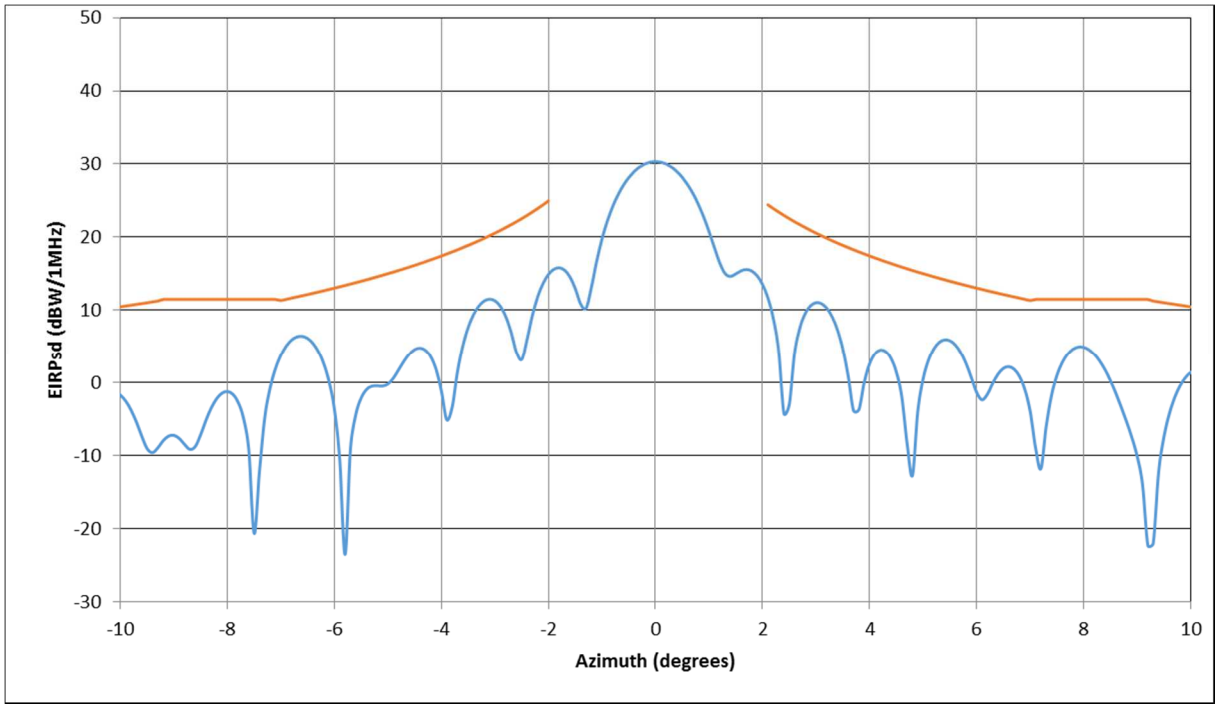
Co-Pol EIRP density in the Plane Tangent to the GSO Arc 30.0 GHz



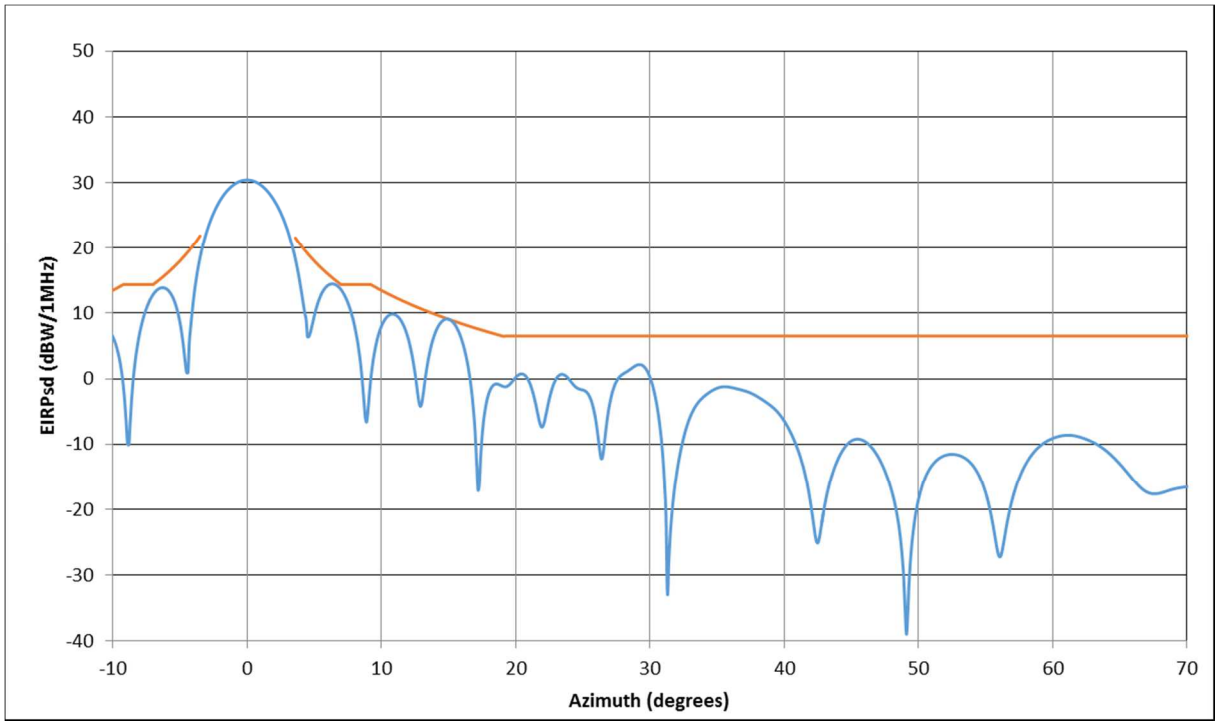
Co-Pol EIRP density in the Plane Tangent to the GSO Arc 29.5 GHz (-10 to +10 degrees)



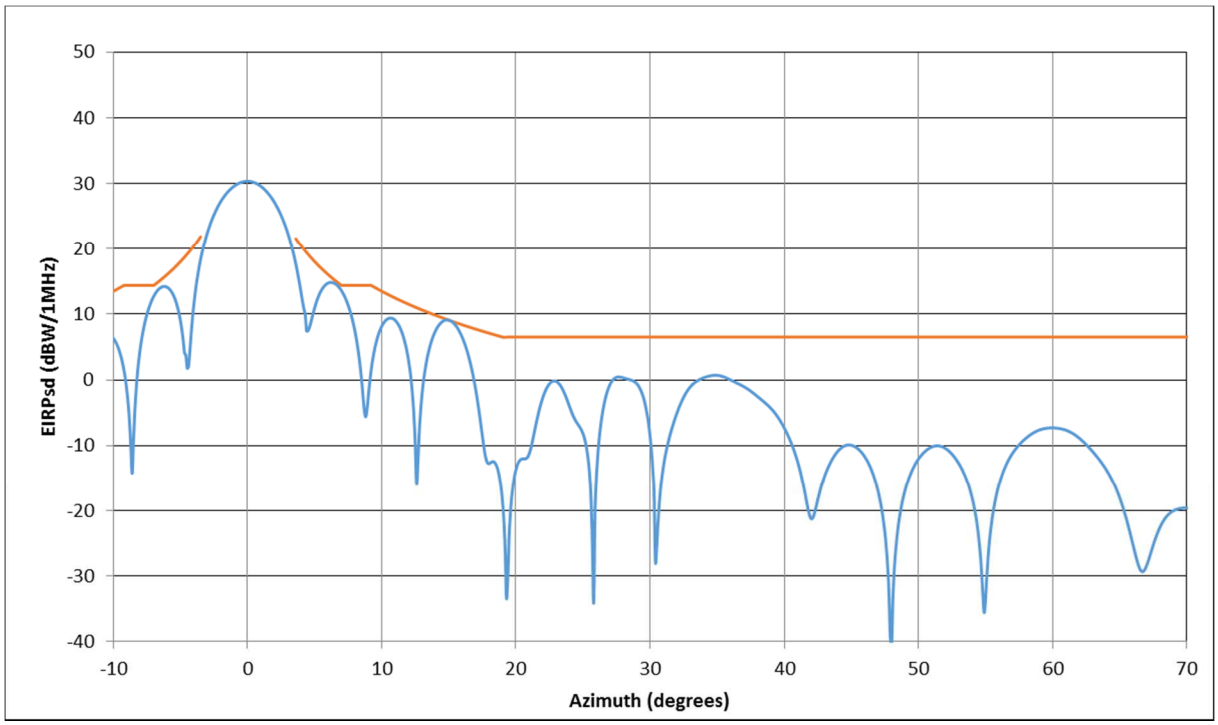
Co-Pol EIRP density in the Plane Tangent to the GSO Arc 30.0 GHZ (-10 to +10 degrees)



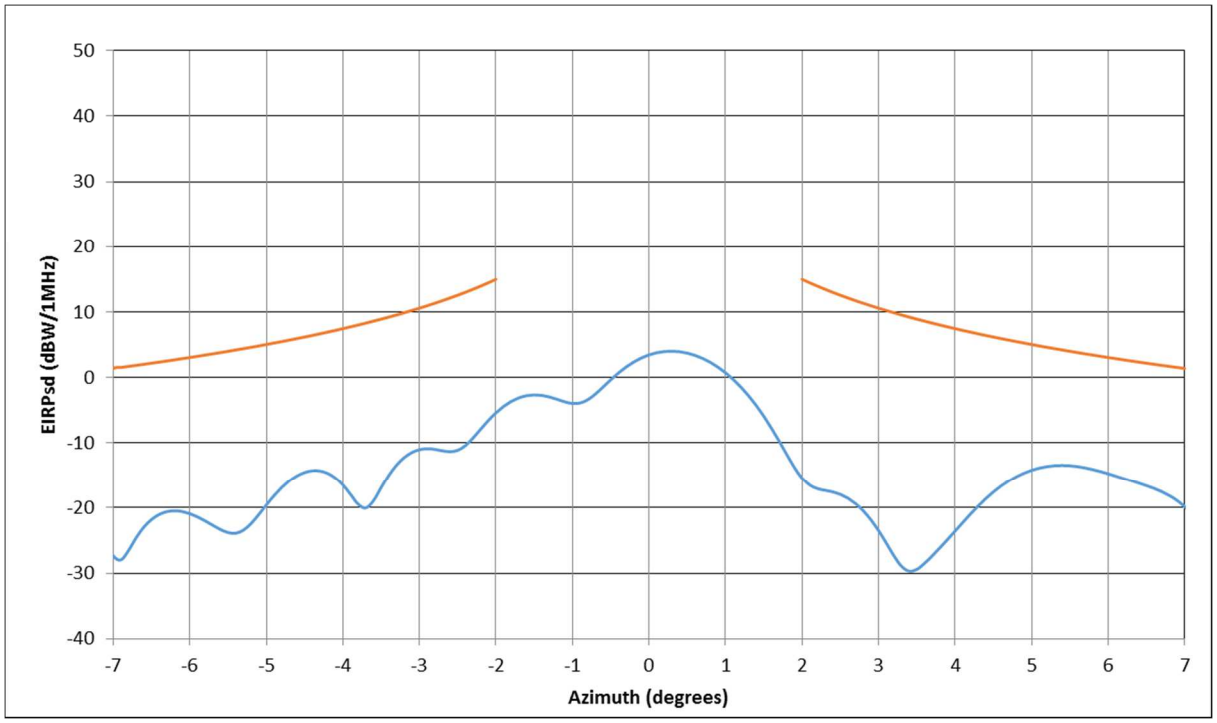
Co-Pol EIRP density in the Perpendicular to the GSO Arc 29.5 GHz (0 to +30 degrees)



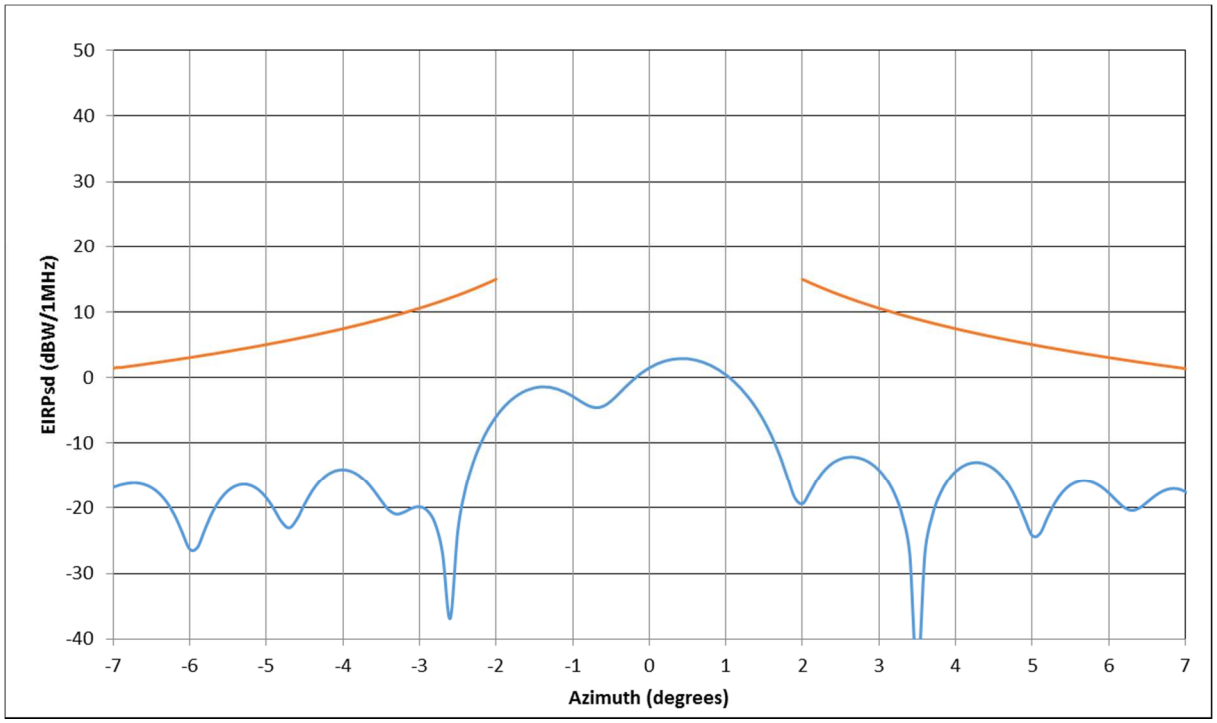
Co-Pol EIRP density in the Perpendicular to the GSO Arc 30.0 GHz (0 to +30 degrees)



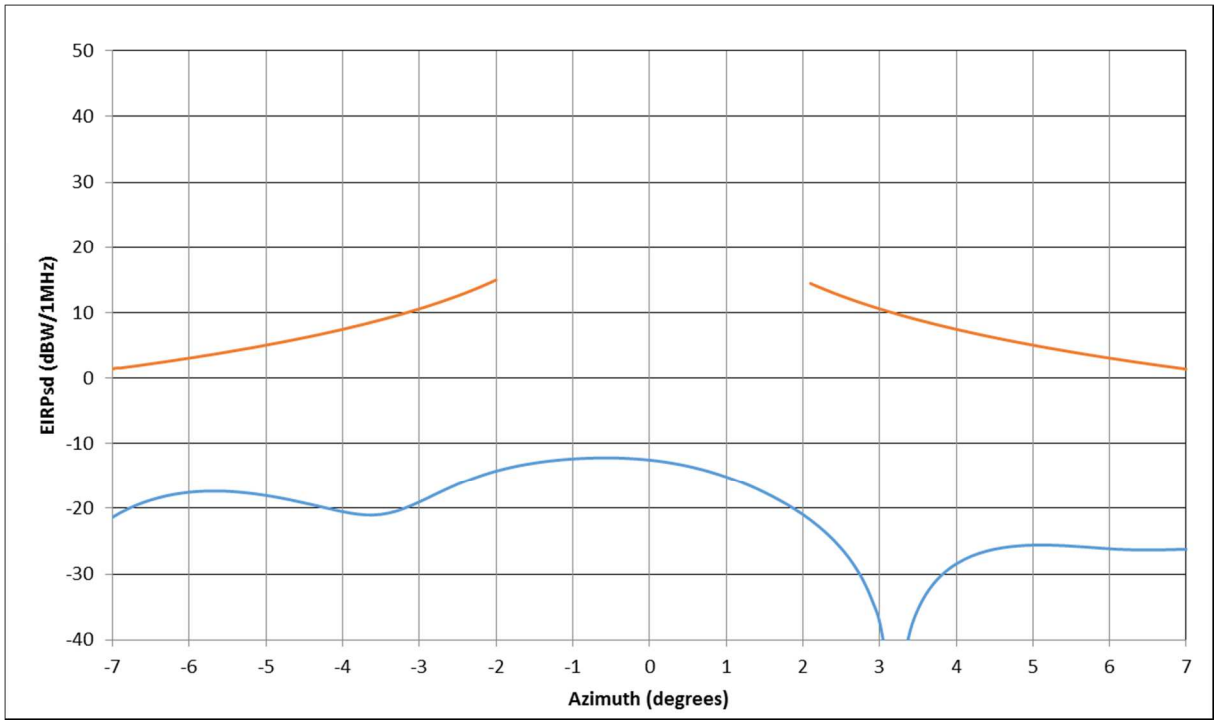
X-Pol EIRP density in the plane tangent to the GSO Arc 29.5 GHZ (-7 to +7 degrees)



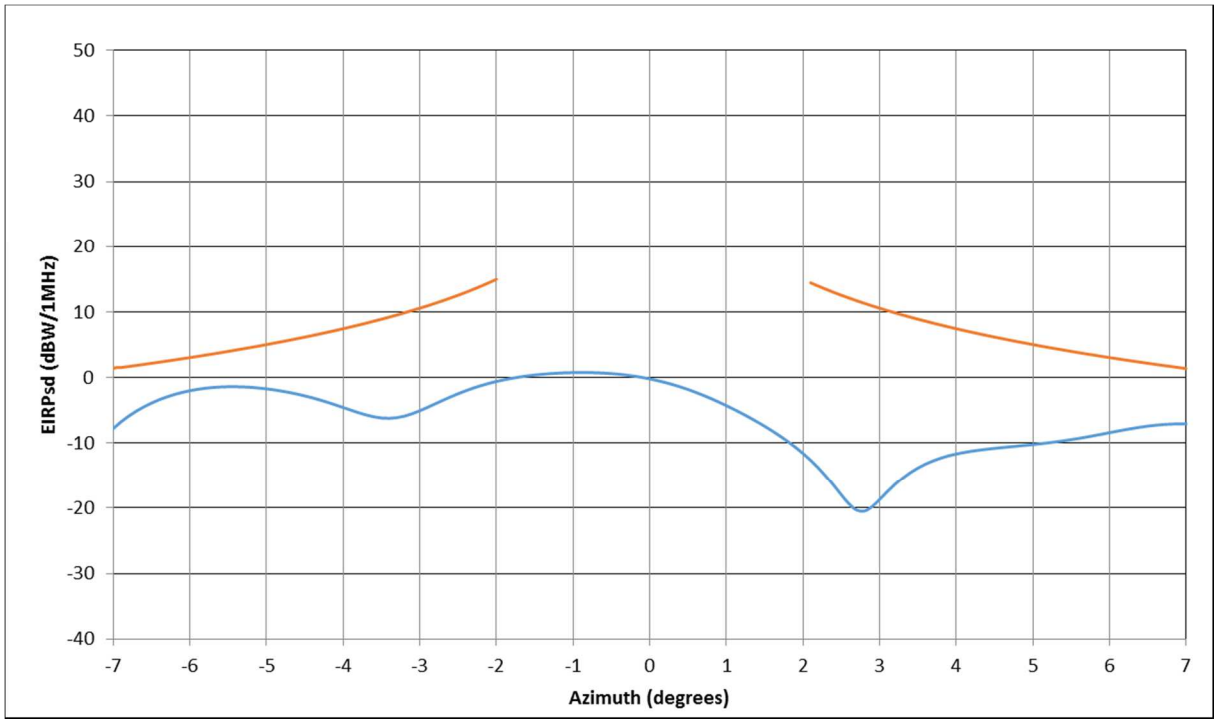
X-Pol EIRP density in the plane tangent to the GSO Arc 30 GHZ (-7 to +7 degrees)



X-Pol EIRP density in the plane perpendicular to the GSO Arc 29.5 GHZ (-7 to +7 degrees)

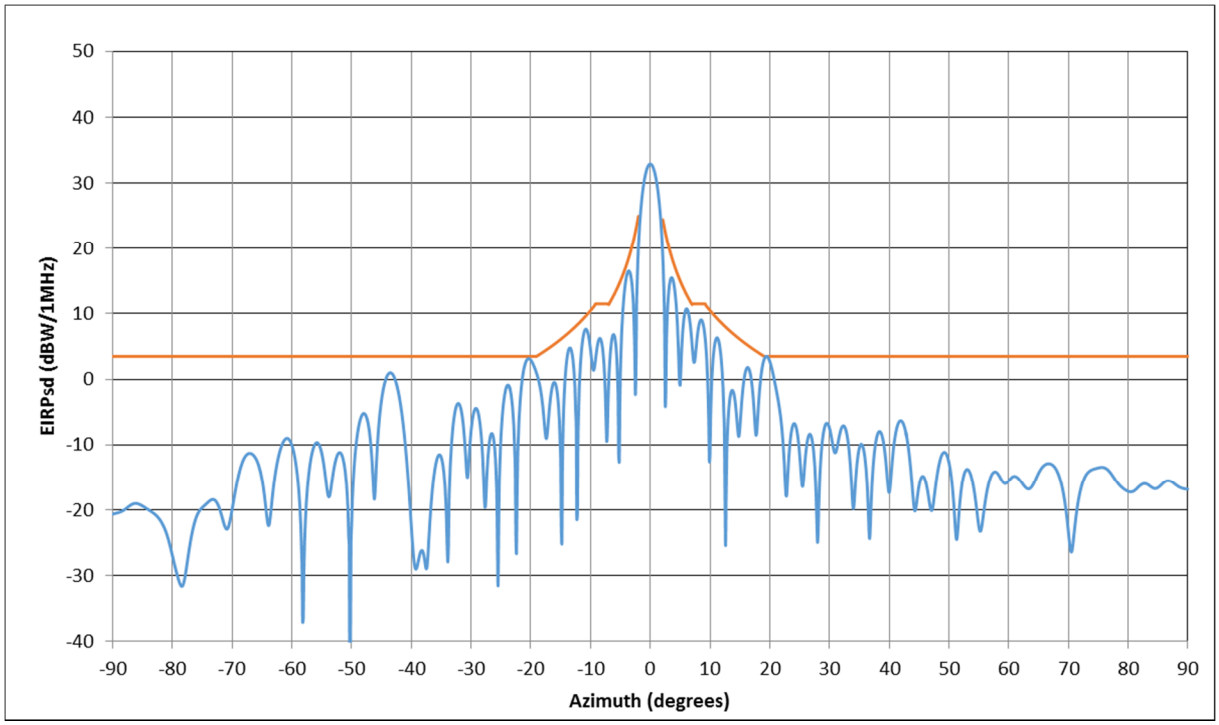


X-Pol EIRP density in the plane perpendicular to the GSO Arc 30 GHZ (-7 to +7 degrees)

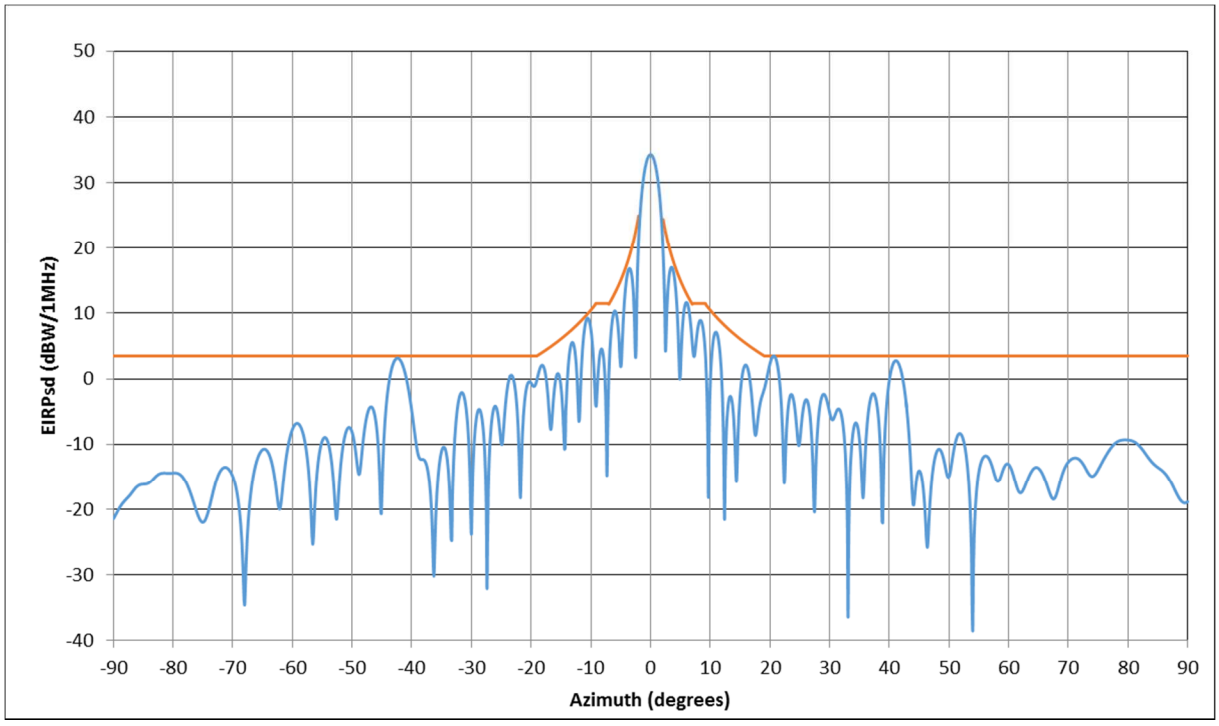


2.0 MilliSat-H Off-Axis EIRP Masks

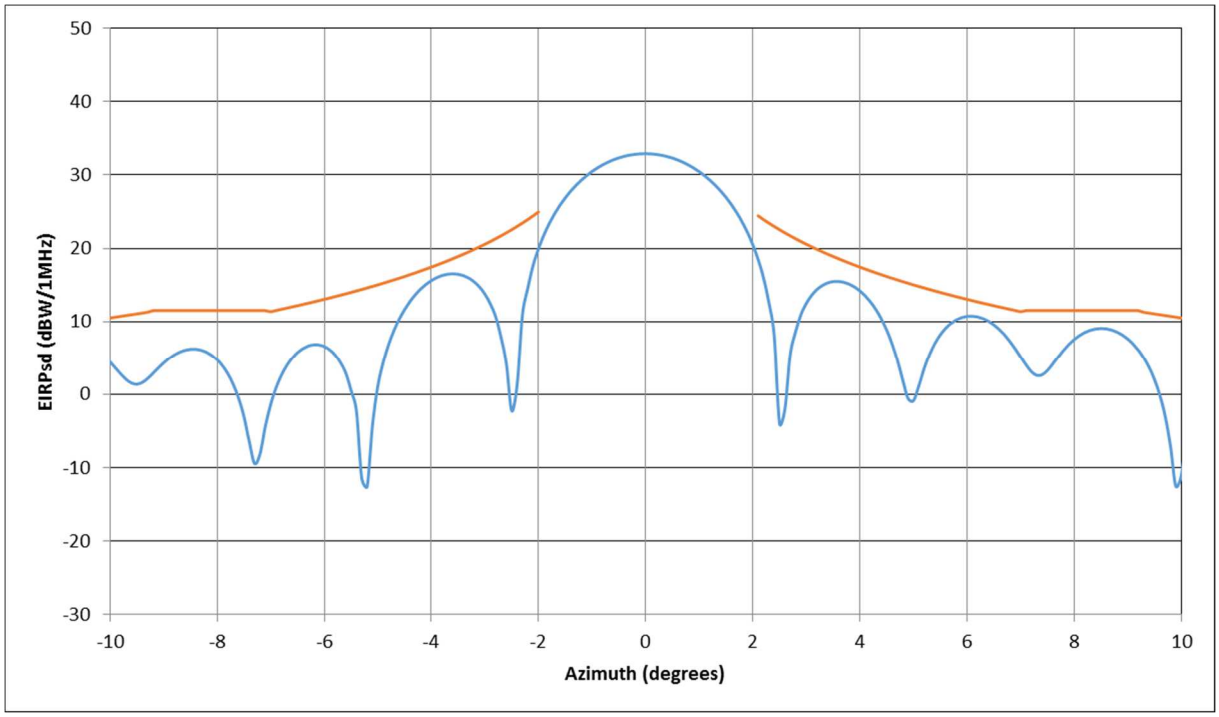
Co-Pol EIRP density in the Plane Tangent to the GSO Arc 29.5 GHz



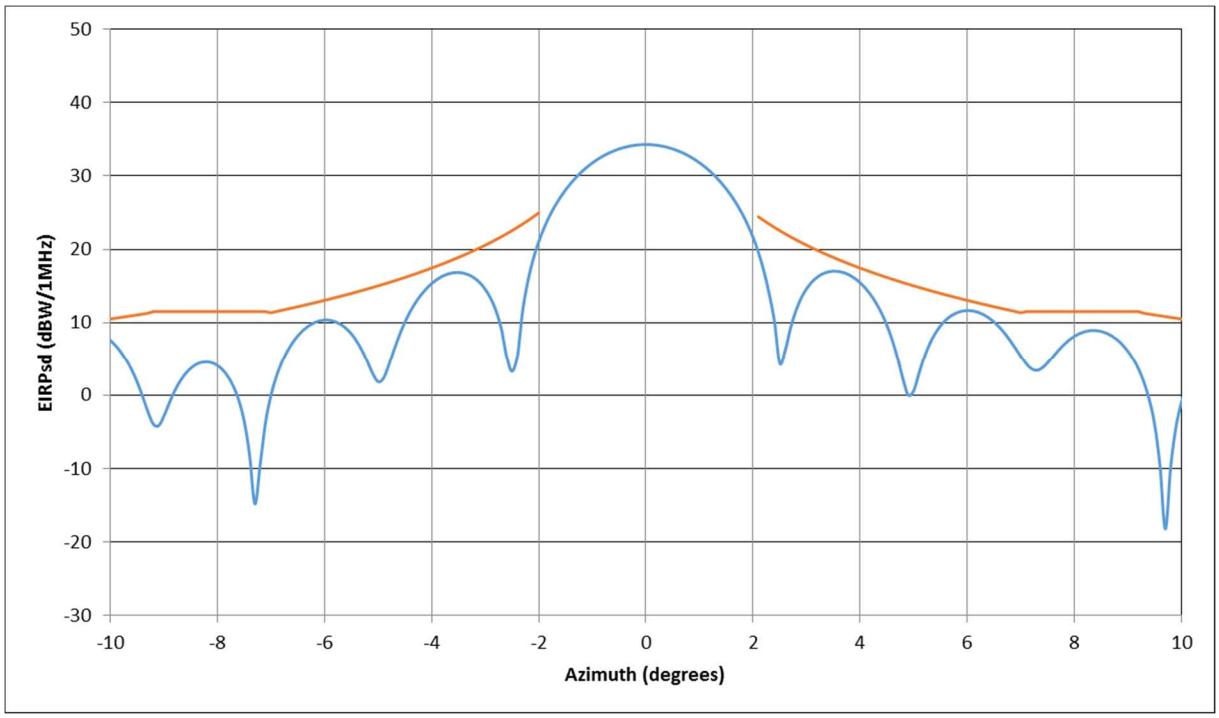
Co-Pol EIRP density in the Plane Tangent to the GSO Arc 30 GHZ



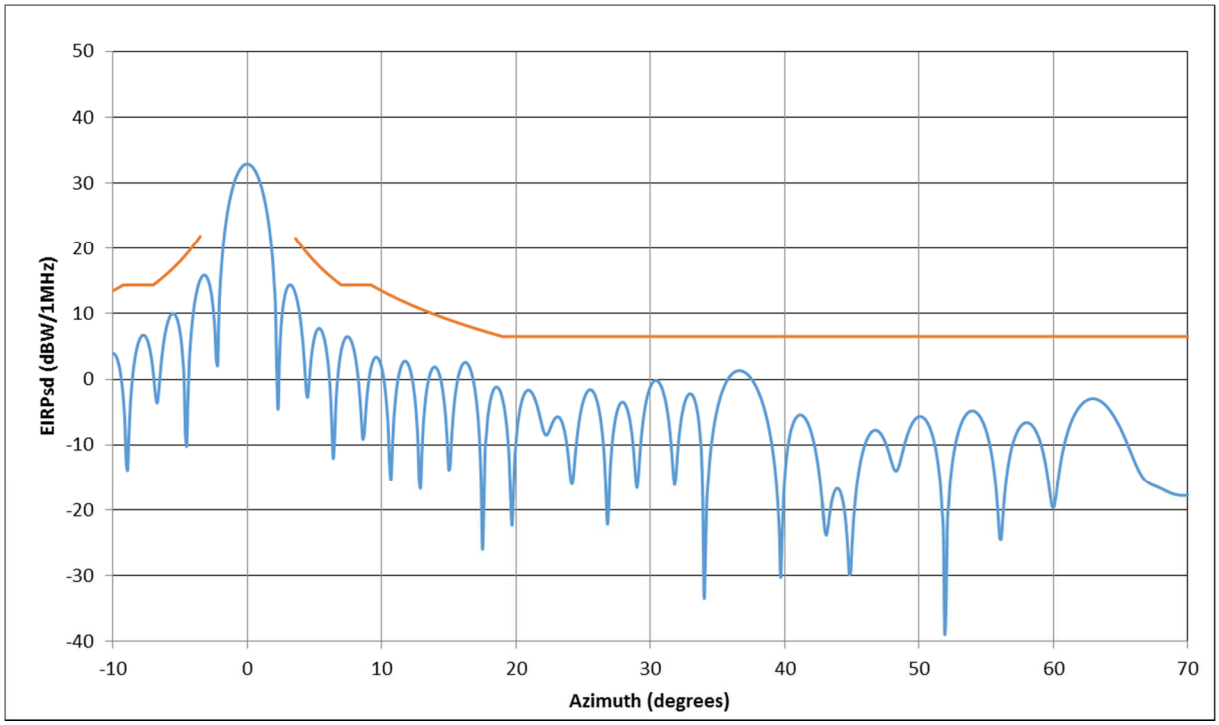
Co-Pol EIRP density in the Plane Tangent to the GSO Arc 29.5 GHz (-10 to +10 degrees)



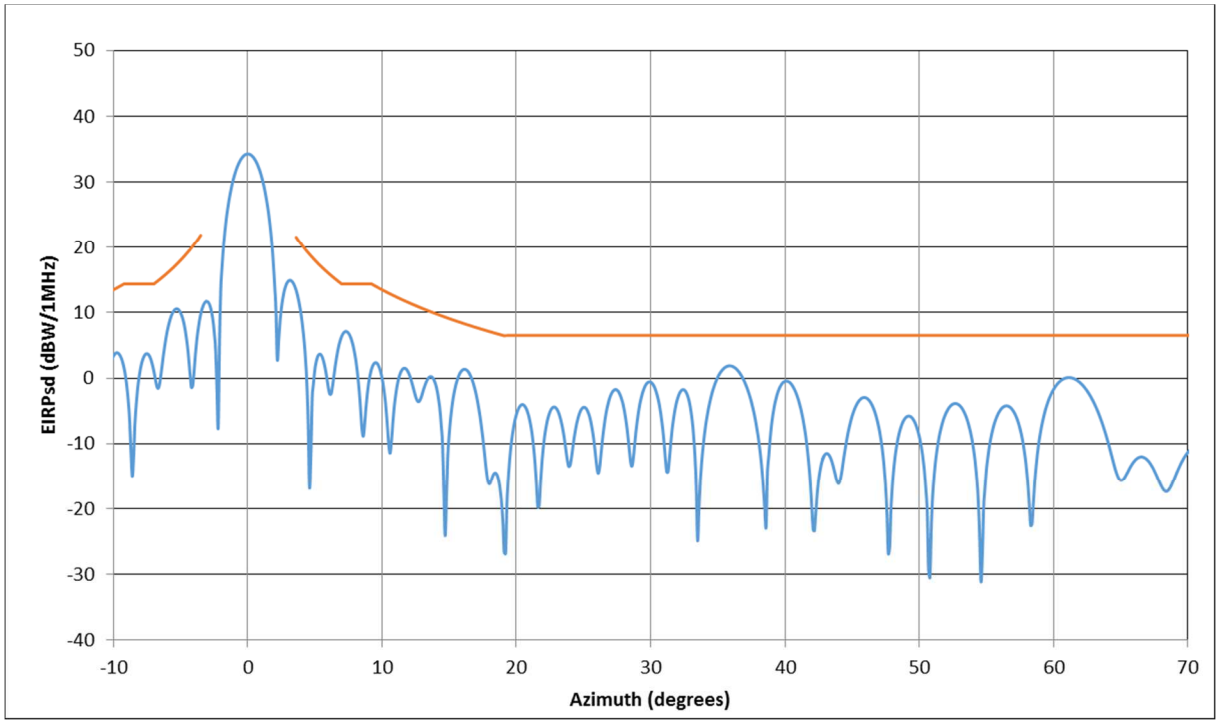
Co-Pol EIRP density in the Plane Tangent to the GSO Arc 30 GHz (-10 to +10 degrees)



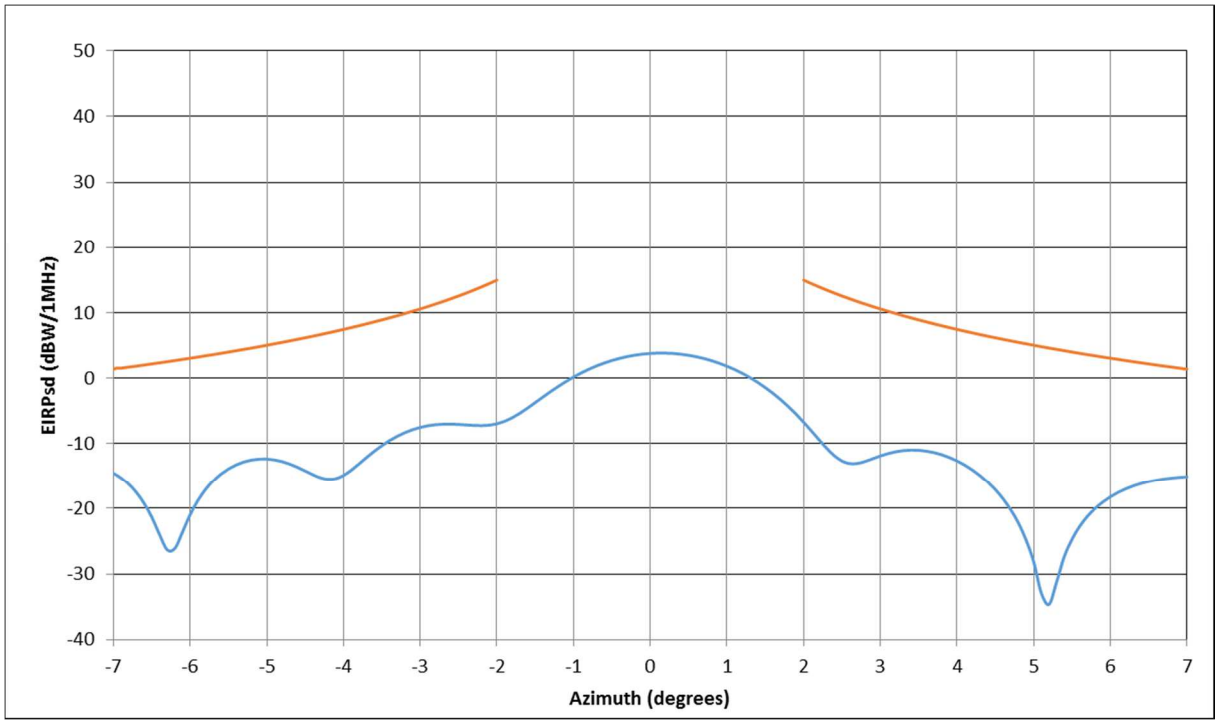
Co-Pol EIRP density in the Perpendicular to the GSO Arc 29.5 GHz (0 to +30 degrees)



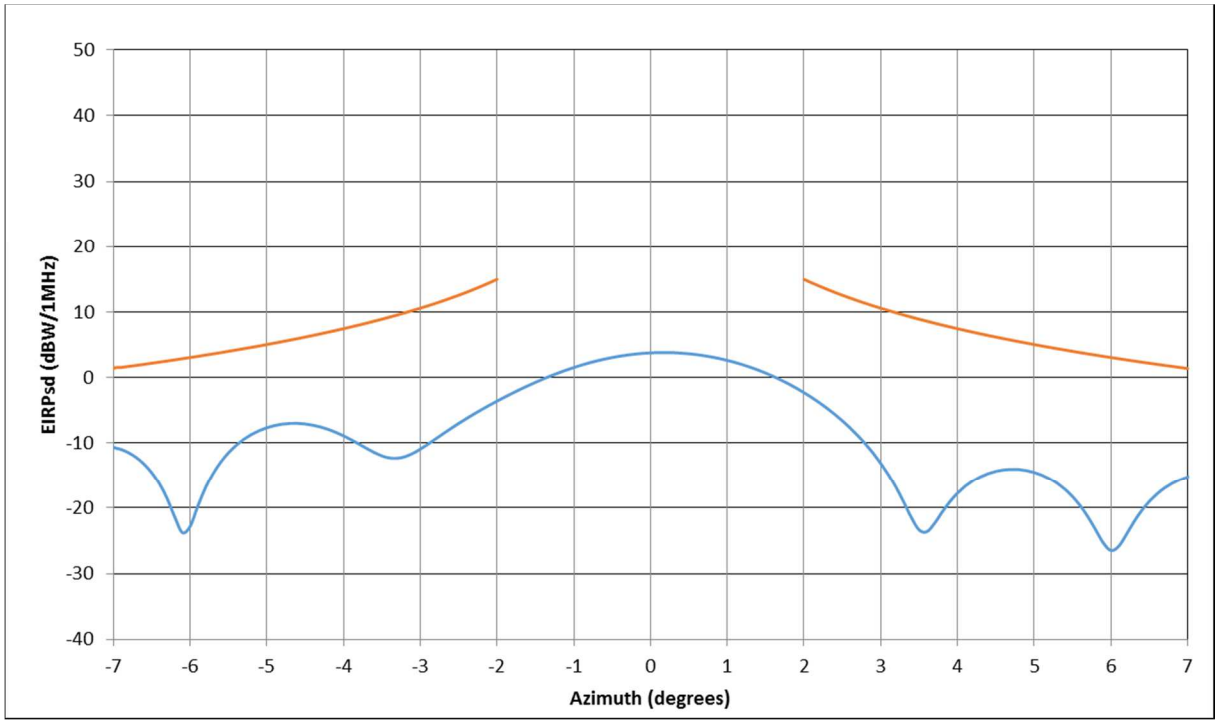
Co-Pol EIRP density in the Perpendicular to the GSO Arc 30.0 GHz (0 to +30 degrees)



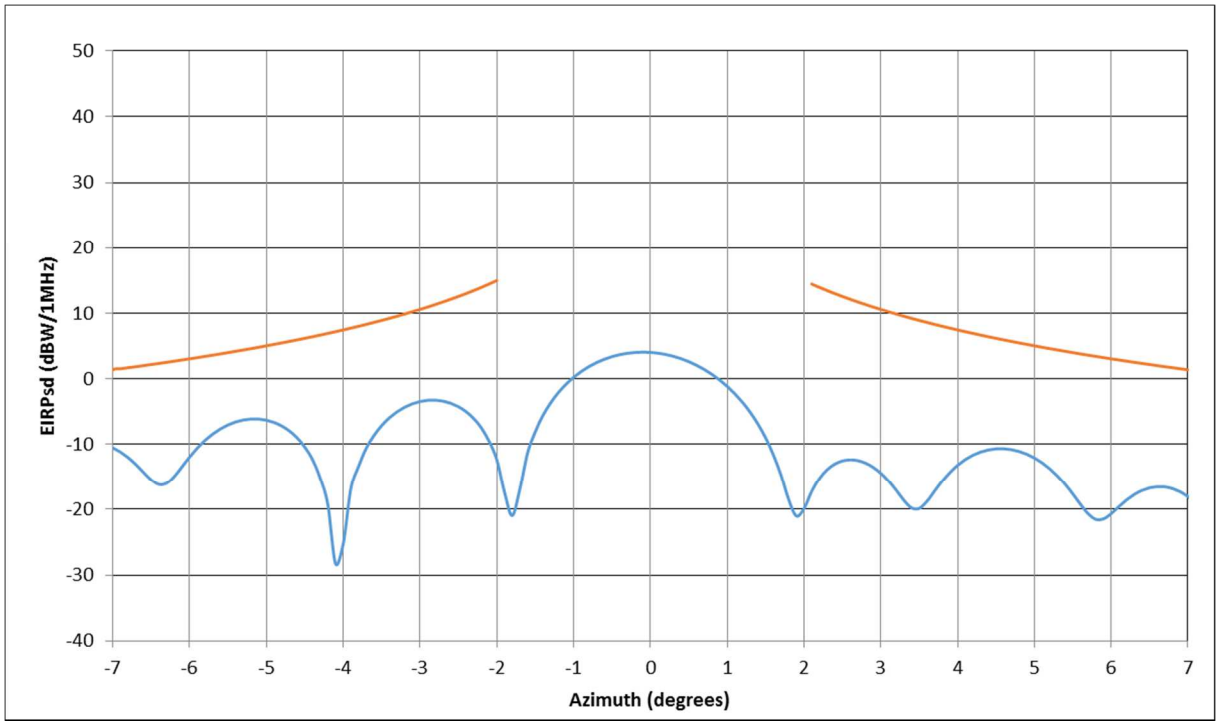
X-Pol EIRP density in the plane tangent to the GSO Arc 29.5 GHZ (-7 to +7 degrees)



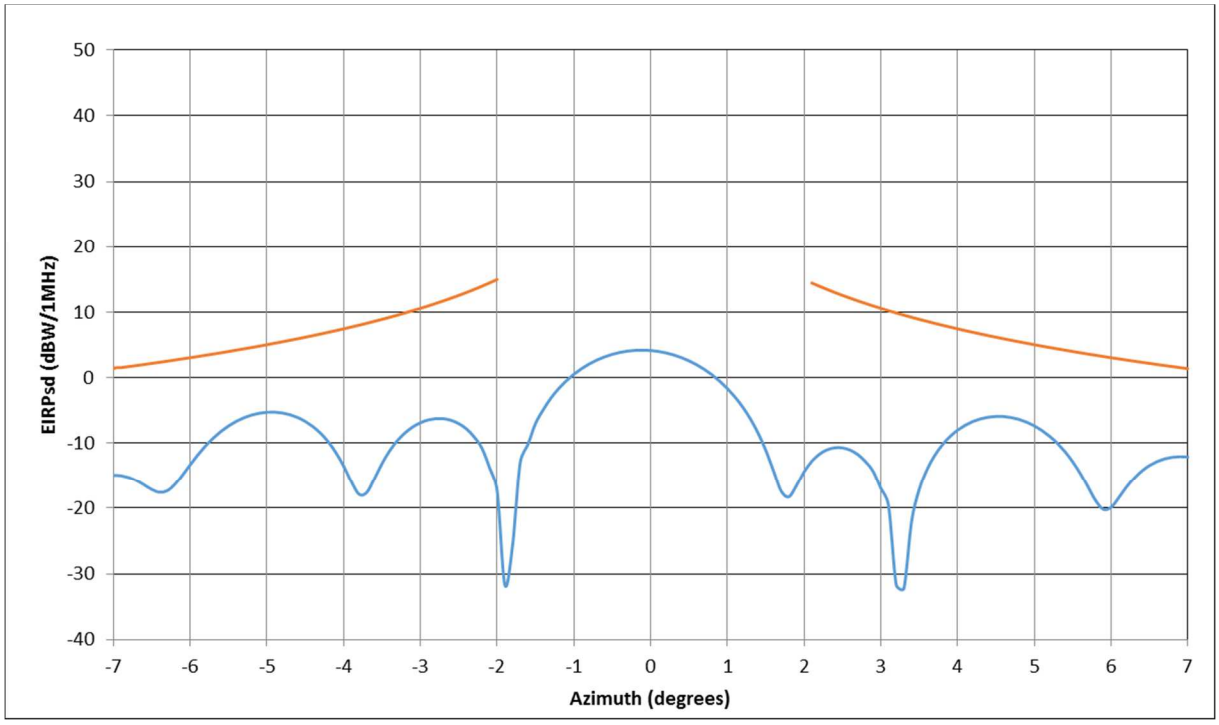
X-Pol EIRP density in the plane tangent to the GSO Arc 30.0 GHz (-7 to +7 degrees)



X-Pol EIRP density in the plane perpendicular to the GSO Arc 29.5 GHZ (-7 to +7 degrees)

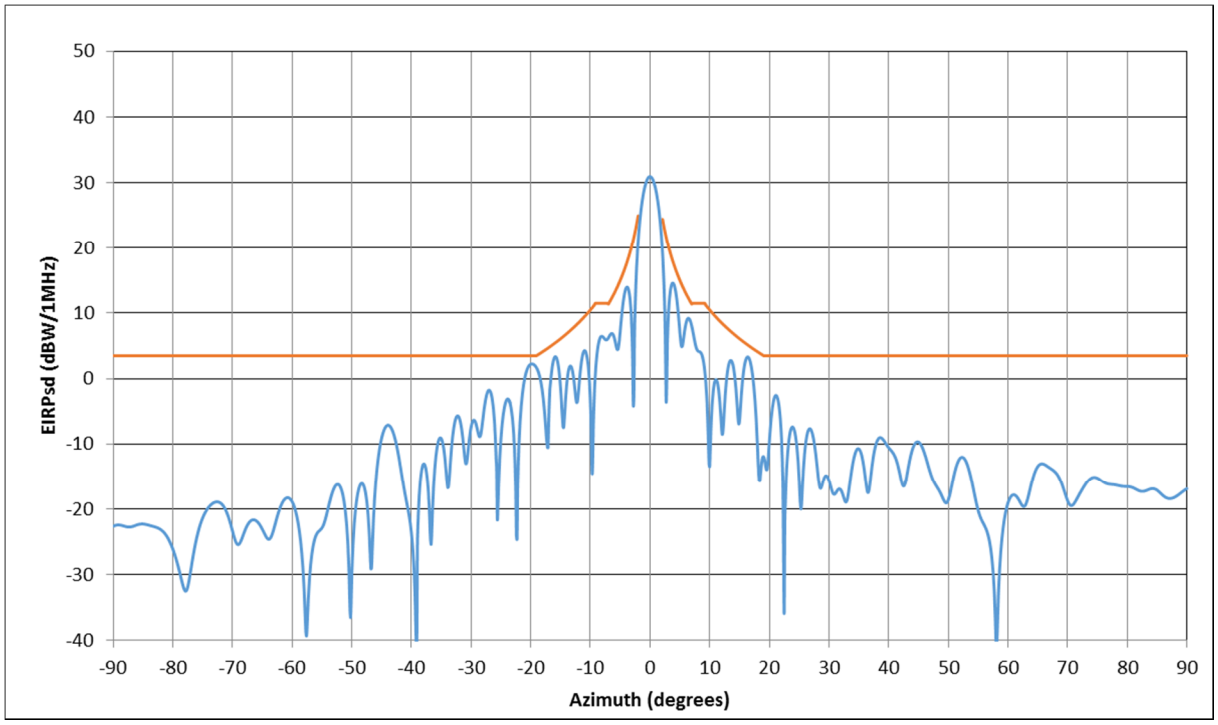


X-Pol EIRP density in the plane perpendicular to the GSO Arc 30.0 GHZ (-7 to +7 degrees)

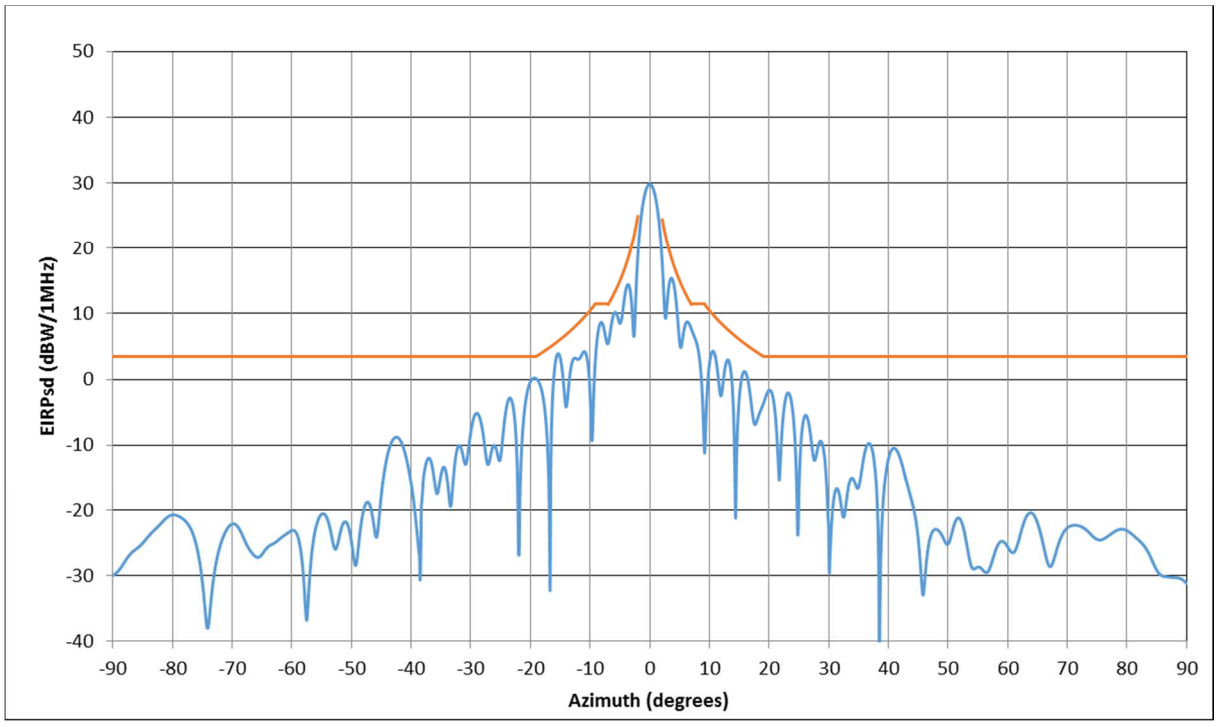


3.0 MicroSat Off-Axis EIRP Masks

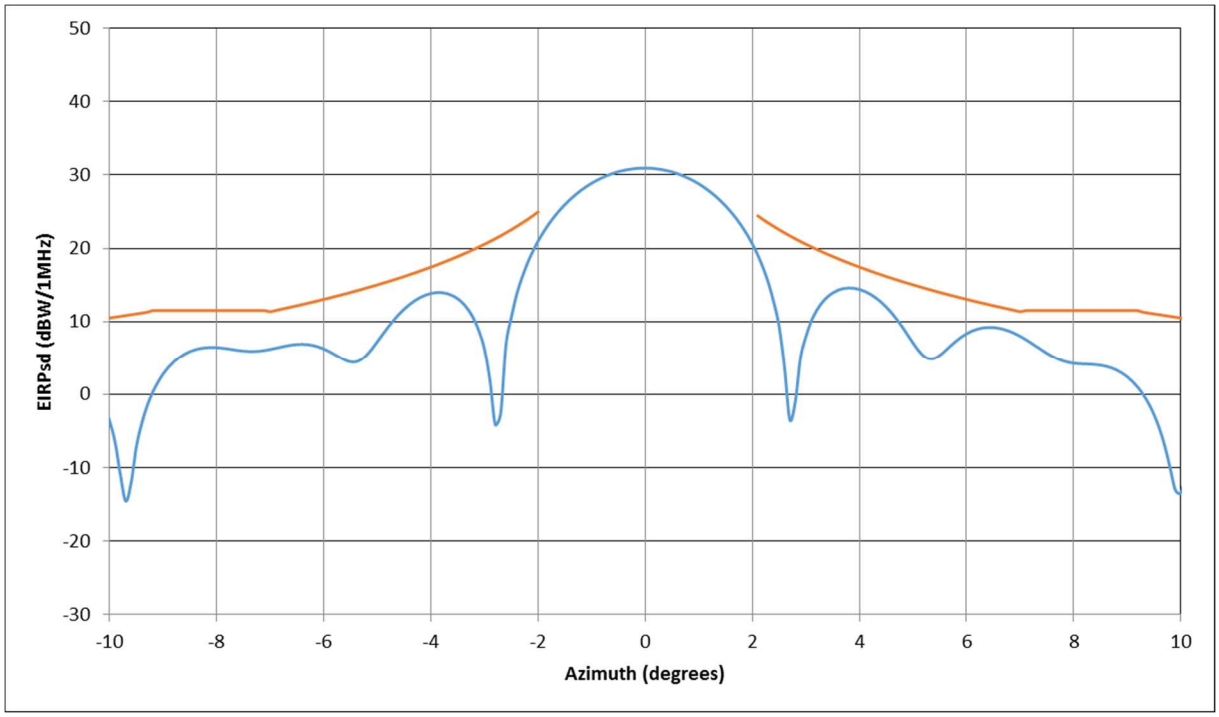
Co-Pol EIRP density in the Plane Tangent to the GSO Arc 29.5 GHz



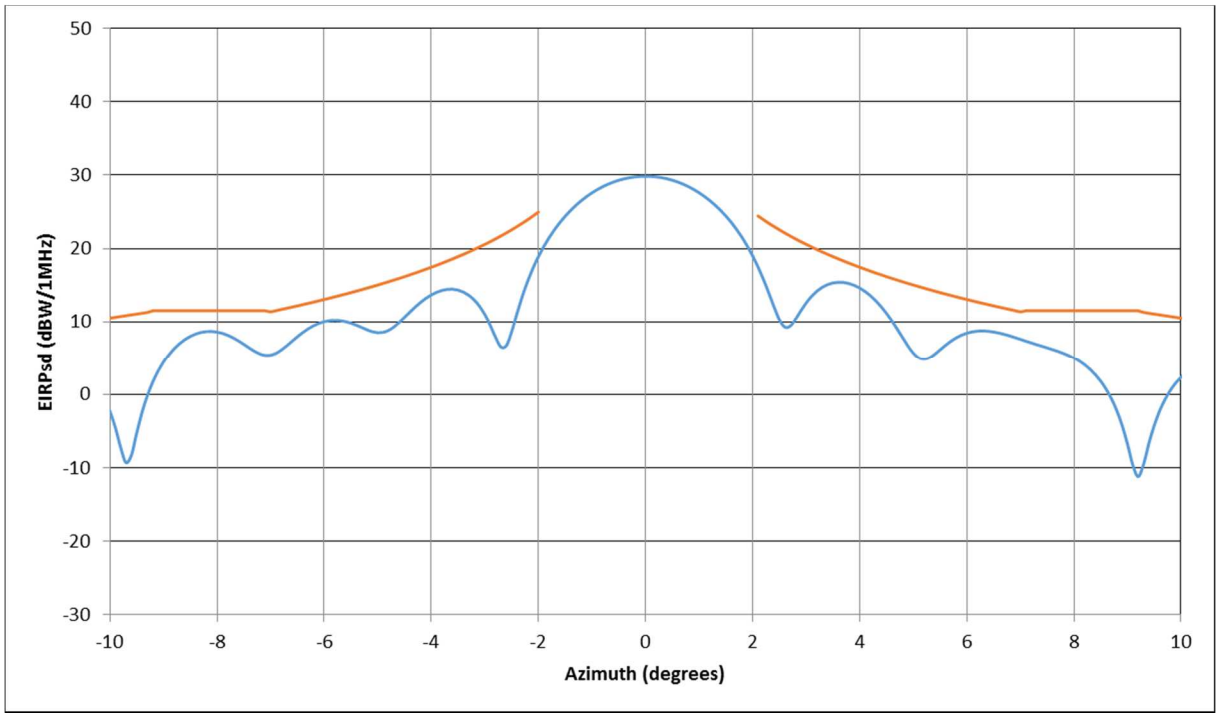
Co-Pol EIRP density in the Plane Tangent to the GSO Arc 30.0 GHz



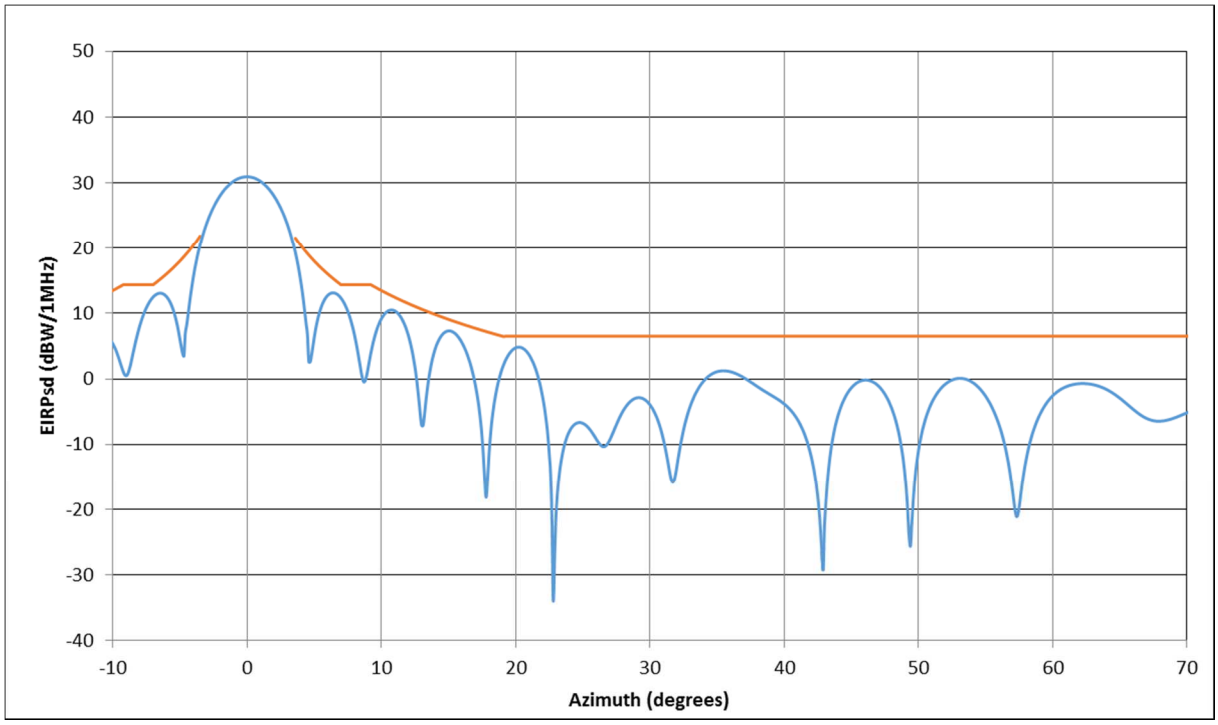
Co-Pol EIRP density in the Plane Tangent to the GSO Arc 29.5 GHz (-10 to +10 degrees)



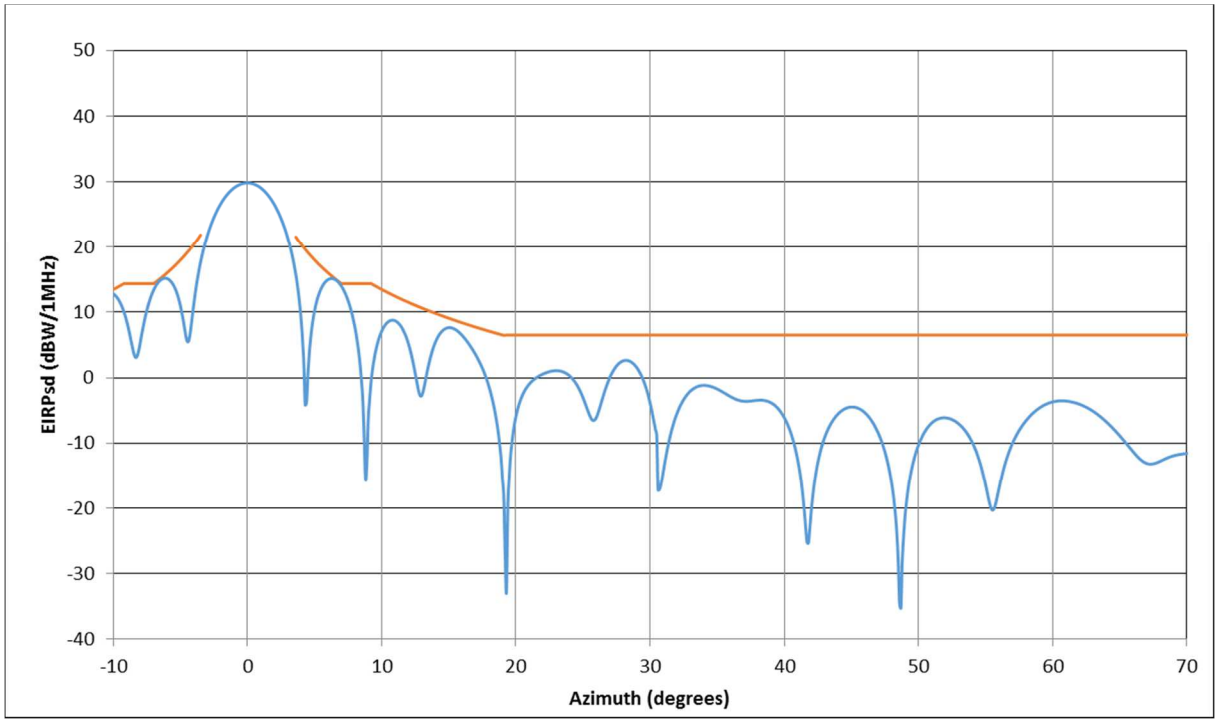
Co-Pol EIRP density in the Plane Tangent to the GSO Arc 30.0 GHz (-10 to +10 degrees)



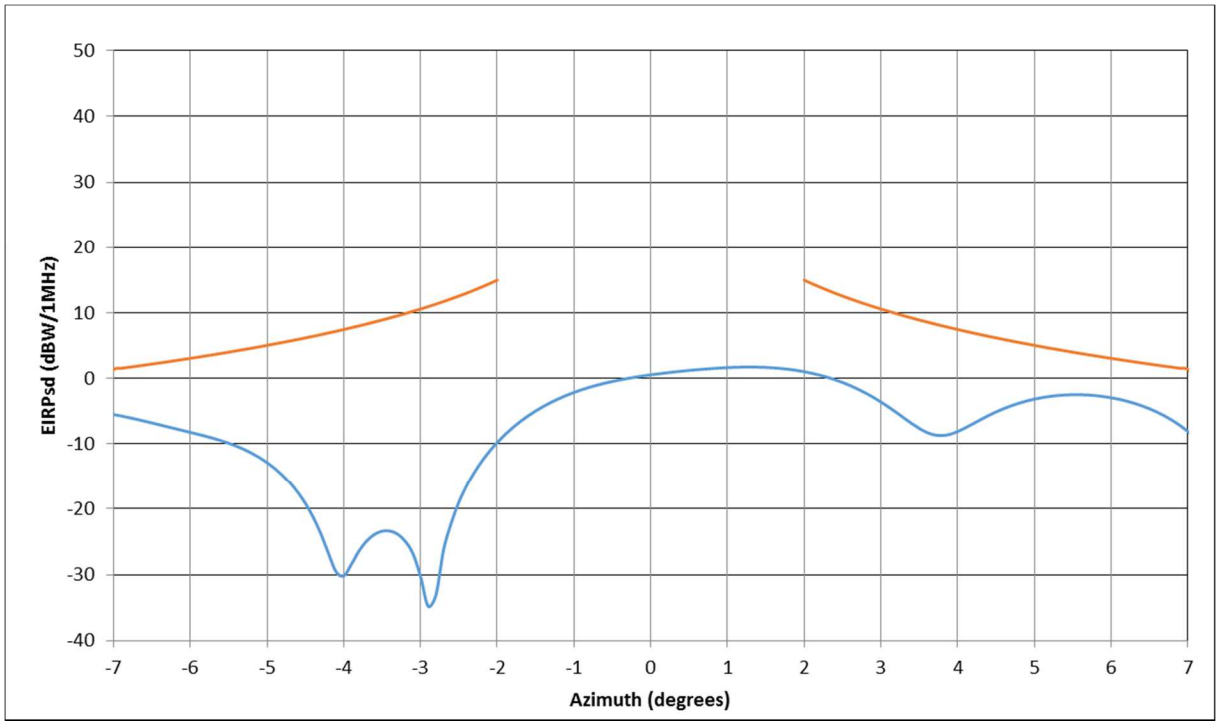
Co-Pol EIRP density in the Perpendicular to the GSO Arc 29.5 GHz (0 to +30 degrees)



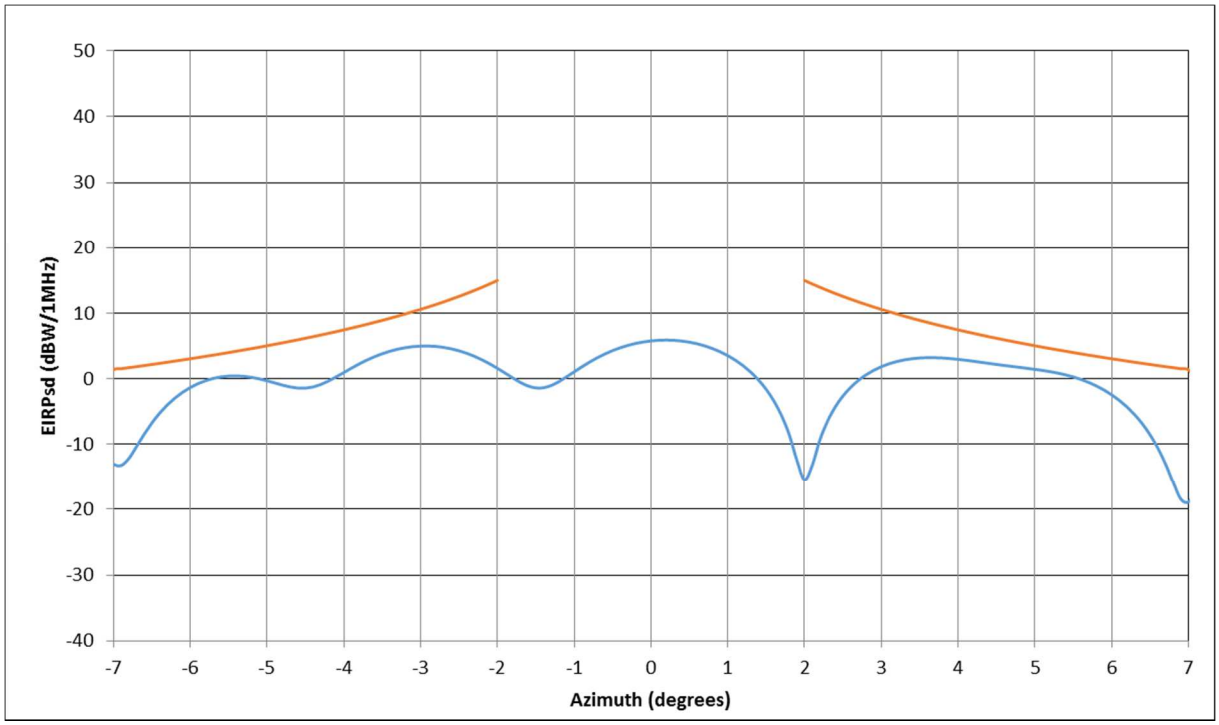
Co-Pol EIRP density in the Perpendicular to the GSO Arc 30.0 GHz (0 to +30 degrees)



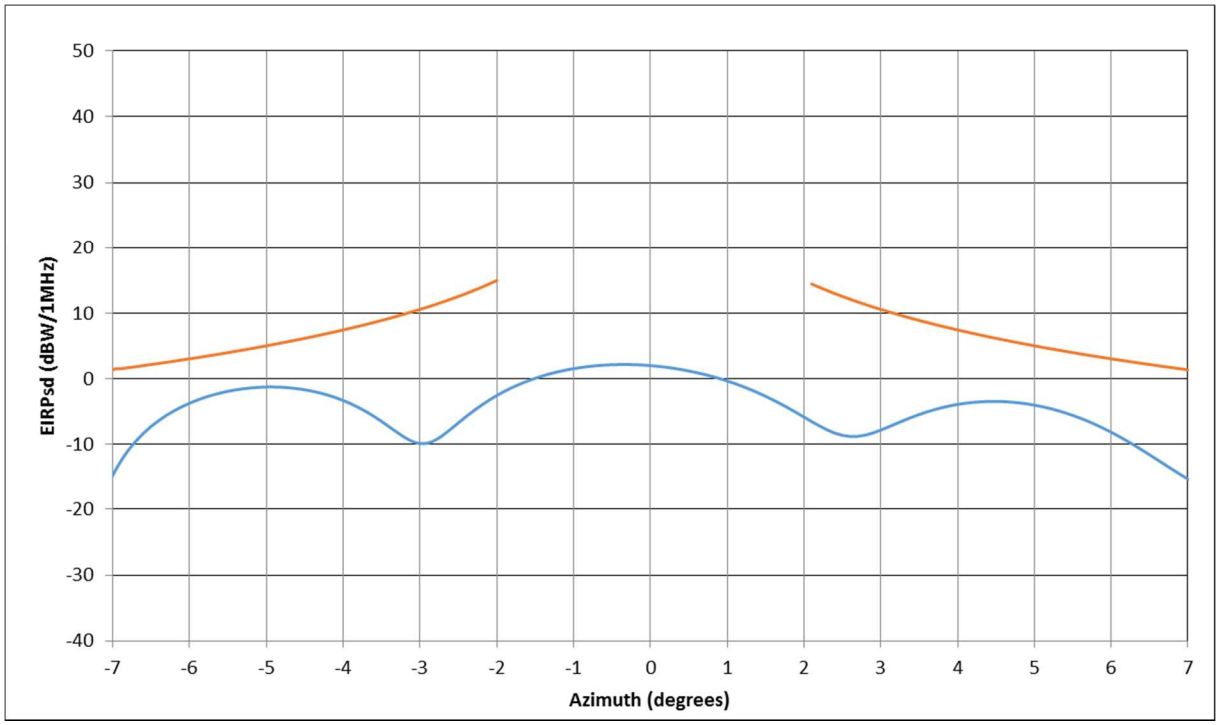
X-Pol EIRP density in the plane tangent to the GSO Arc 29.5 GHZ (-7 to +7 degrees)



X-Pol EIRP density in the plane tangent to the GSO Arc 30.0 GHz (-7 to +7 degrees)



X-Pol EIRP density in the plane perpendicular to the GSO Arc 29.5 GHZ (-7 to +7 degrees)



X-Pol EIRP density in the plane tangent to the GSO Arc 30.0 GHZ (-7 to +7 degrees)