Name: APSREC409V01

Type: Space station, Receiving and Transmitting

Region(s): 123

Required Input Parameters:
gain

Validation Warnings/Errors: None

Pattern Information:
Ln = -15 dB
z = 1

Co-Polar Component:

$G_1 = G_{max} - 3\,(\varphi/\psi_b)^{1.5}$ for $0° \le \varphi \le a\,\psi_b$

$G_2 = G_{max} - 15$ for $a\,\psi_b < \varphi \le b\,\psi_b$

$G_3 = G_{max} - 15 - 25 \log(\varphi/b/\psi_b)$ for $b\,\psi_b < \varphi \le Y$

$G_4 = 0$ for $Y < \varphi \le 90°$

$G_5 = 0.25\,G_{max}$ for $90° < \varphi \le 180°$

$G = MAX(G_1, G_2, G_3, G_4, G_5)$

where:

$\psi_b = \sqrt{1200}\,/(D/\lambda)$

$D/\lambda = 10^{\left(\frac{G_{max} - 7.7}{20}\right)}$

$a = 2.58$

$b = 6.32$

$Y = b\,\psi_b\,10^{0.04\,(Gmax\ -\ 15)}$

Description:
Recommendation ITU-R S.1528-0 space station antenna pattern for non-GSO satellites operating in FSS below 30 GHz. Recommends 1.2.

Name: APSREC410V01

Type: Space station, Receiving and Transmitting

Region(s): 123

Required Input Parameters:
gain

Validation Warnings/Errors: None

Pattern Information:
Ls = -12 dB

Description:
Recommendation ITU-R S.1528-0 space station antenna pattern for non-GSO satellites operating in FSS below 30 GHz. Recommends 1.3 for MEO.

Co-Polar Component:

$G_1 = G_{max} - 3\,(\varphi/\psi b)^{1.5}$ for $0° \le \varphi \le \psi b$

$G_2 = G_{max} - 3\,(\varphi/\psi b)^{2}$ for $\psi b < \varphi \le Y$

$G_3 = G_{max} + L_S - 25 \log (\varphi/Y)$ for $Y < \varphi \le Z$

$G_4 = 0$ for $Z < \varphi \le 180°$

$G = MAX(G_1, G_2, G_3, G_4)$

where:

$\psi b = \sqrt{1200}\,/(D/\lambda)$

$D/\lambda = 10^{\left(\frac{G_{max} - 7.7}{20}\right)}$

$L_S = -12$

$Y = 2\,\psi b$

$Z = Y\,10^{0.04\,(G_{max} + L_S)}$

Name: APSREC411V01

Type: Space station, Receiving and Transmitting

Region(s): 123

Required Input Parameters:
gain

Validation Warnings/Errors: None

Pattern Information:
Ls = -6.75 dB

Co-Polar Component:

Description:
Recommendation ITU-R S.1528-0 space station antenna pattern for non-GSO satellites operating in FSS below 30 GHz. Recommends 1.3 for LEO.

$$G_1 = G_{max} - 3\,(\varphi/\psi b)^{1.5} \quad \text{for} \quad 0° \le \varphi \le \psi b$$

$$G_2 = G_{max} - 3\,(\varphi/\psi b)^{2} \quad \text{for} \quad \psi b < \varphi \le Y$$

$$G_3 = G_{max} + L_S - 25 \log (\varphi/Y) \quad \text{for} \quad Y < \varphi \le Z$$

$$G_4 = 0 \quad \text{for} \quad Z < \varphi \le 180°$$

$$G = MAX(G_1, G_2, G_3, G_4)$$

where:

$$\psi b = \sqrt{1200}\,/(D/\lambda)$$

$$D/\lambda = 10^{\left(\frac{G_{max} - 7.7}{20}\right)}$$

$$L_S = -6.75$$

$$Y = 1.5\,\psi b$$

$$Z = Y\,10^{0.04\,(G_{max} + L_S)}$$

Name: APSREC414V01

Type: Space station, Receiving and Transmitting

Region(s): 123

Required Input Parameters:
gain

Validation Warnings/Errors: None

Pattern Information:
Ls = -20 dB

Description:
Recommendation ITU-R S.1528-0 space station antenna pattern for non-GSO satellites operating in FSS below 30 GHz. Recommends 1.3 adapted for HEO.

Co-Polar Component:

$G_1 = G_{max} - 3\,(\varphi/\psi b)^{1.5}$ for $0° \le \varphi \le \psi b$

$G_2 = G_{max} - 3\,(\varphi/\psi b)^{2}$ for $\psi b < \varphi \le Y$

$G_3 = G_{max} + L_S - 25 \log (\varphi/Y)$ for $Y < \varphi \le Z$

$G_4 = 0$ for $Z < \varphi \le 180°$

$G = MAX(G_1, G_2, G_3, G_4)$

where:

$\psi b = \sqrt{1200}\,/(D/\lambda)$

$D/\lambda = 10^{\left(\frac{G_{max} - 7.7}{20}\right)}$

$L_S = -20$

$Y = \psi b\,(-L_S/3)^{1/2}$

$Z = Y\,10^{0.04\,(G_{max} + L_S)}$

Notes on the implementation of Recommendation ITU-R S.1528

The Bureau has implemented four specific antenna patterns using Recommendation ITU-R S.1528 as shown in Table 1 below.

TABLE 1

APL implementations of Recommendation ITU-R S.1528

APL Name	Description	Comment
APSREC409V01	Implements *recommends 1.2*	For $D/\lambda \geq 35$, does not require orbit categorization
APSREC410V01	Implements *recommends 1.3* for MEO	For $D/\lambda < 35$
APSREC411V01	Implements *recommends 1.3* for LEO	For $D/\lambda < 35$
APSREC4XXV01	Implements *recommends 1.3* for HEO	For $D/\lambda < 35$

For the implementation of Recommendation ITU-R S.1528, the following classification of satellite orbits is used as shown in Table 2 below.

TABLE 2

Orbit altitudes for LEO, MEO and other for implementation of Recommendation ITU-R S.1528

Abbreviation	Description	Criterion
LEO	Low-Earth orbit	Orbit altitude < 2 000 km
MEO	Medium-Earth orbit	Orbit altitude between 2 000 km and 27 000 km
Other (GEO, HEO)	Quasi-geostationary, highly elliptical orbit	Orbit altitude above 27 000 km

The selection of corresponding APL is done in the Bureau's GIBC PFD NGSO software when calculating pfd values for non-GSO satellite systems.

There is no need to capture specific APL number in satellite network submission. The general reference to REC-1528 should be used in antenna pattern type.