

Appendix

This Appendix is made available for the paper titled "A Train Once Location Estimation Approach - Directional Propagation Model (DPM)" submitted to *IEEE Transactions on Mobile Computing*.

ψ - Azimuth angle (for horizontal plane) or
Elevation angle (for vertical plane)

$$0^\circ \leq \psi \leq 180^\circ$$

G_M - Maximum gain in the major lobe in *dBi*

ψ_b - $\frac{1}{2}$ HPBW

L_N - Near-in-sidelobe level in *dB*

L_F - Far-sidelobe level in *dBi*

$$X = G_M + L_N + 25 \log(b\psi_b) \quad (1)$$

$$Y = b\psi_b 10^{0.04(G_M + L_N - L_F)} \quad (2)$$

Table 1: Recommendation in radiation pattern of ITU-R Rec. S.672-4

Pattern Envelope (dBi)	Region
$G(\psi) = G_M - 3 \left(\frac{\psi}{\psi_b}\right)^\alpha$	$\psi \leq a\psi_b$
$G(\psi) = G_M + L_N$	$a\psi_b < \psi \leq b\psi_b$
$G(\psi) = X - 25 \log(\psi)$	$b\psi_b < \psi \leq Y$
$G(\psi) = L_F$	$Y < \psi \leq 180$

Table 2: Relationships between L_N , a , b and α

L_N (dB)	a	b	α
-20	2.58	6.32	2
-25	2.88	6.32	2