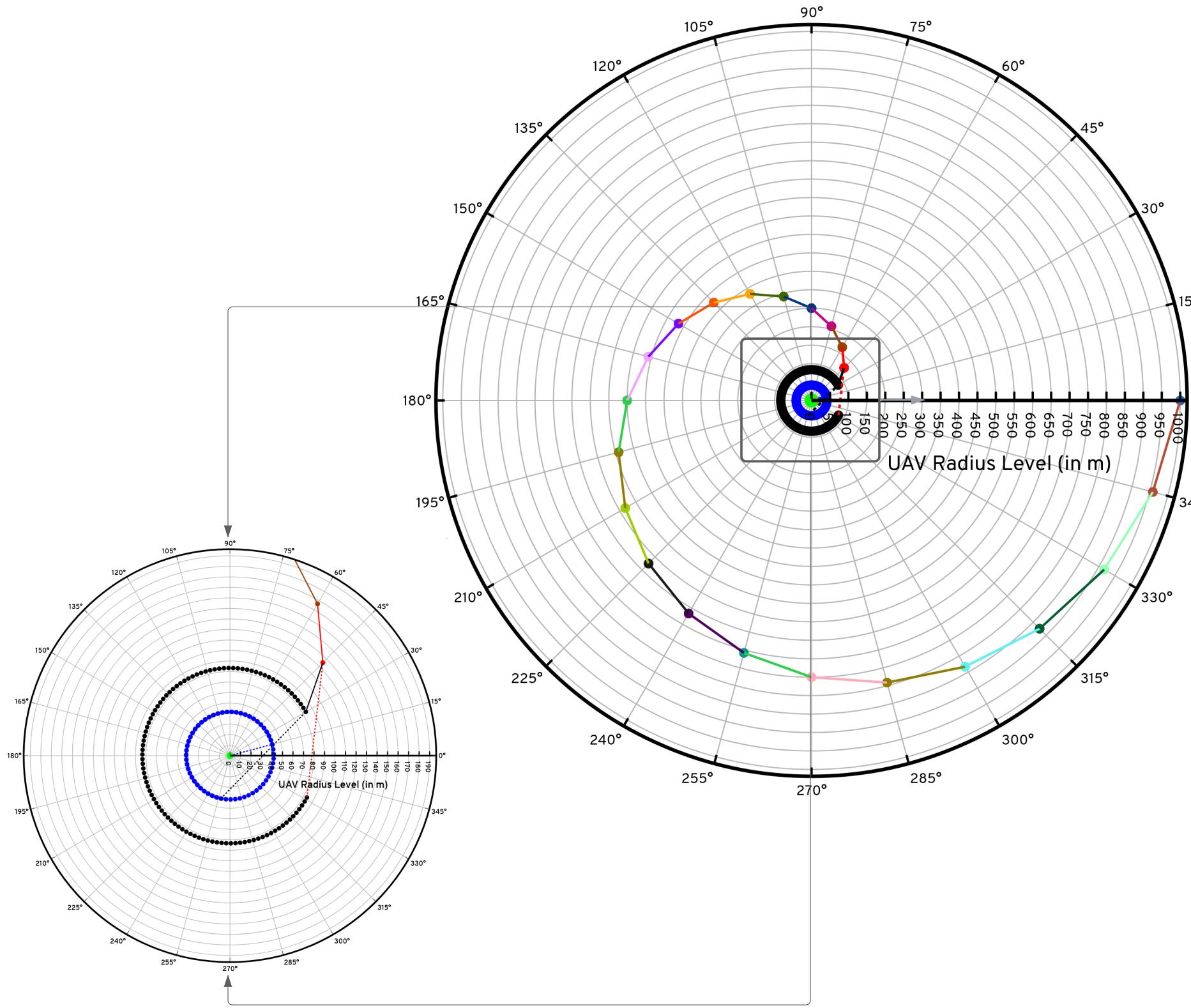
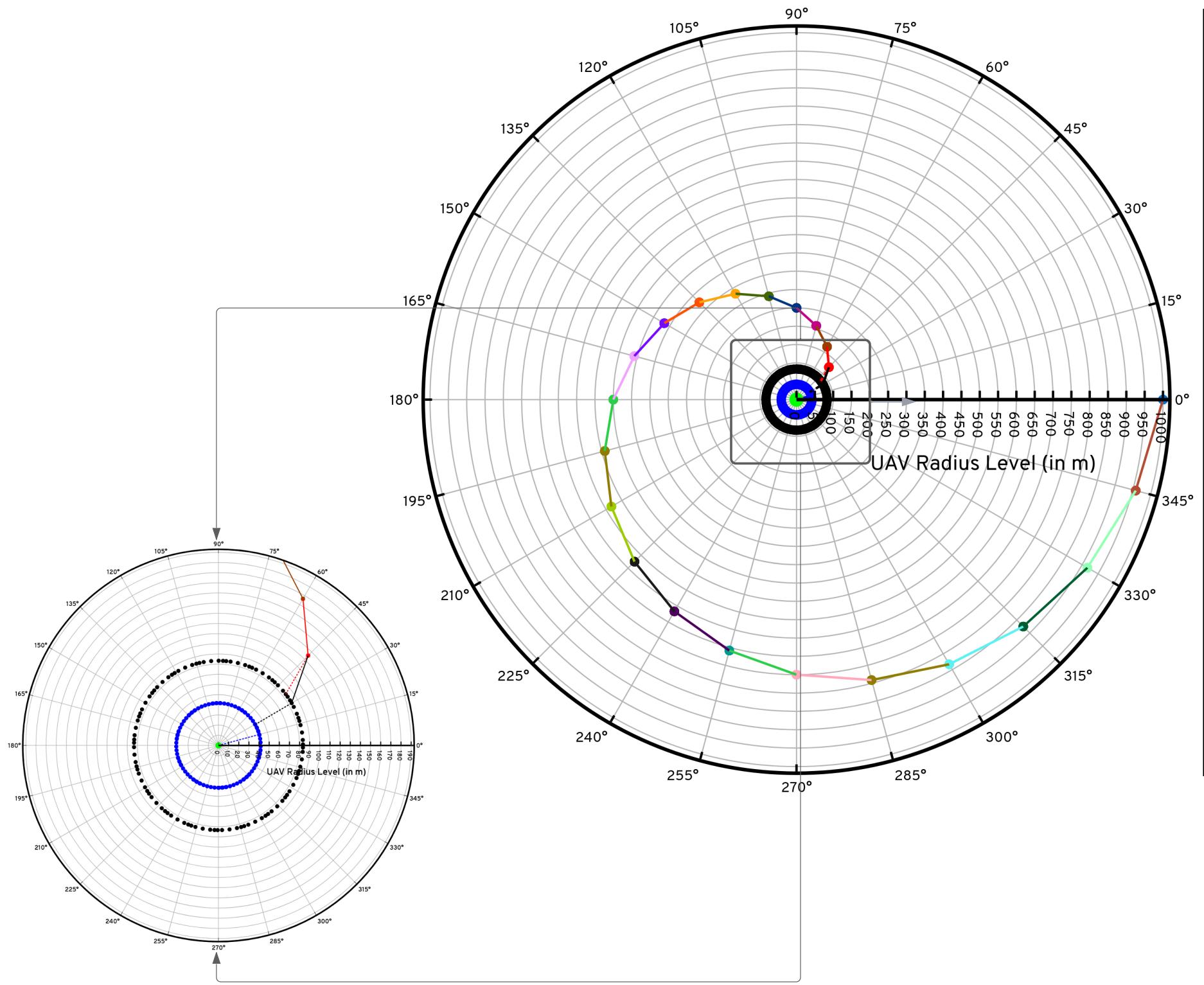



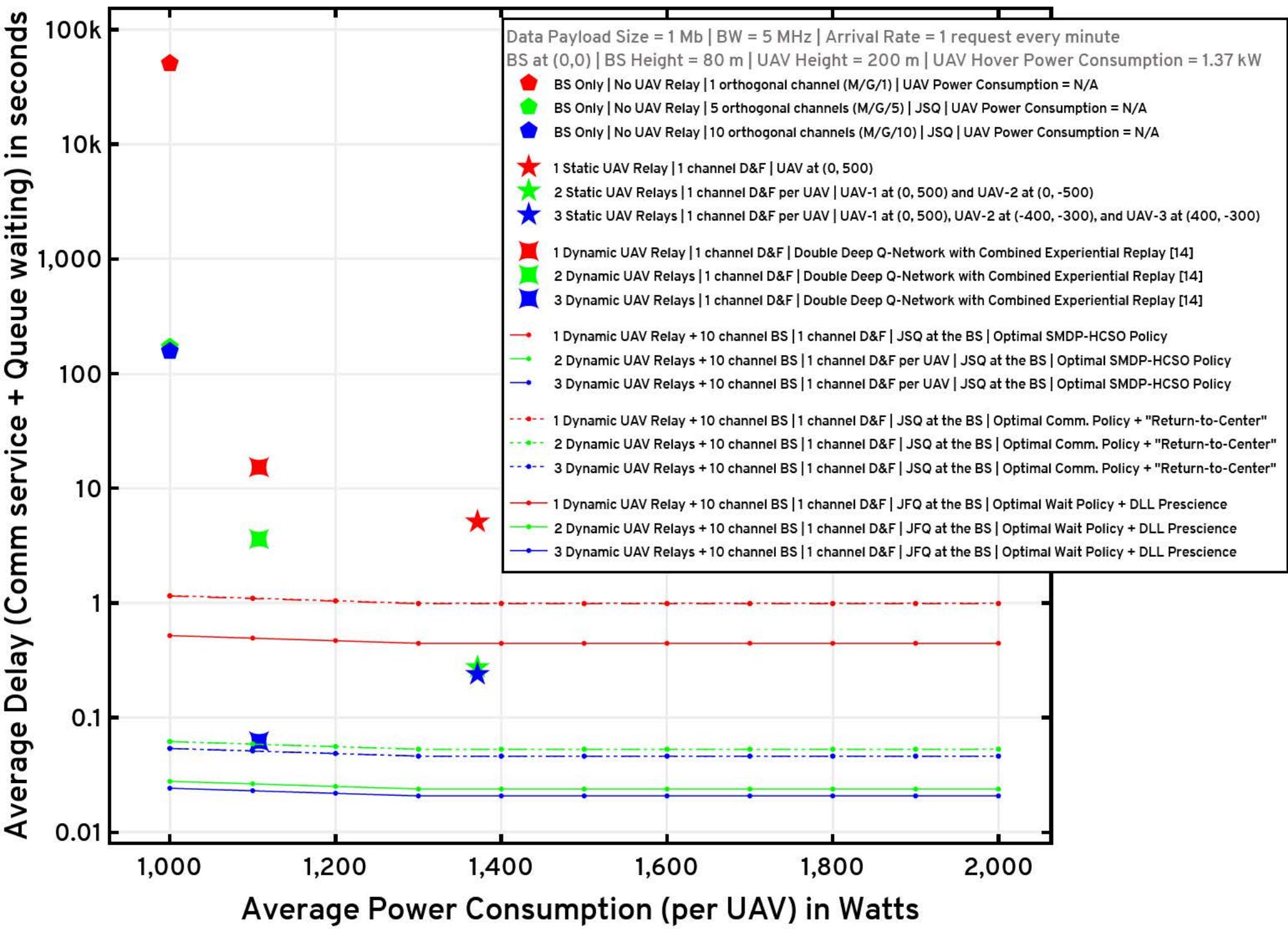
Cell Radius = 1 km
 Max UAV Velocity = 55 m/s
 Data Payload Size = 1 Mb
 Average Power Constraint = 1.2 kW
 25 Waiting States (UAV Radius Levels)
 Arrival Rate (Λ) = 1 request every minute

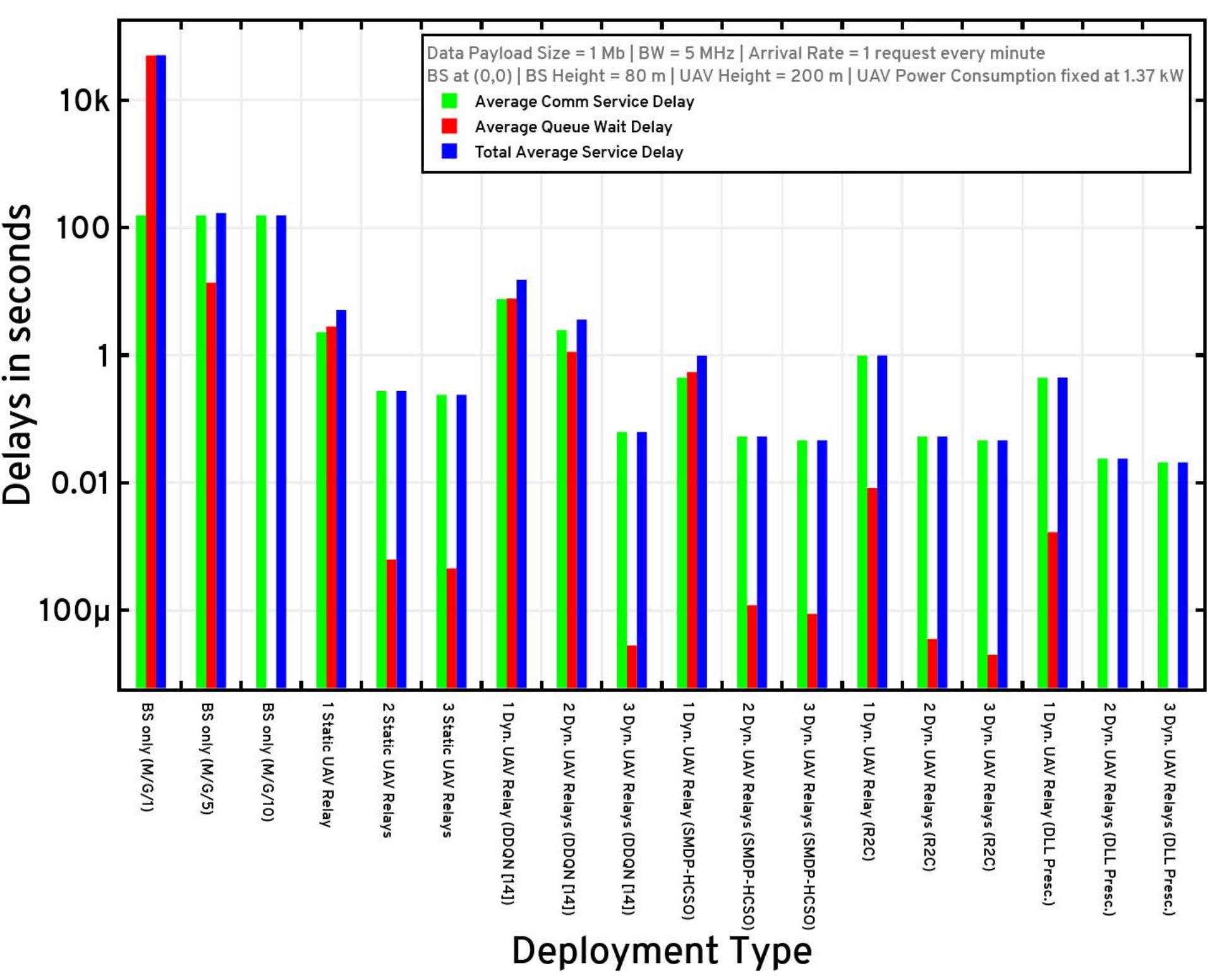
- Cell Center | BS at (0, 0) | UAV Initially at (0, 0)
- v = 7.50 m/s | No Waiting, Move to next level
- v = 21.47 m/s | $v_r^* = 7.50$ m/s | Waiting | $\theta_c^* = 27.67$ deg/s
- v = 7.50 m/s | After Waiting, Move to next level
- v = 21.47 m/s | $v_r^* = 7.50$ m/s | Waiting | $\theta_c^* = 13.84$ deg/s
- v = 7.50 m/s | After Waiting, Move to next level
- v = 22.50 m/s | No Waiting, Move to prev level
- v = 22.50 m/s | No Waiting, Move to prev level
- v = 22.50 m/s | No Waiting, Move to prev level
- v = 22.50 m/s | No Waiting, Move to prev level
- v = 22.50 m/s | No Waiting, Move to prev level
- v = 22.50 m/s | No Waiting, Move to prev level
- v = 22.50 m/s | No Waiting, Move to prev level
- v = 27.50 m/s | No Waiting, Move to prev level
- v = 27.50 m/s | No Waiting, Move to prev level
- v = 27.50 m/s | No Waiting, Move to prev level
- v = 27.50 m/s | No Waiting, Move to prev level
- v = 27.50 m/s | No Waiting, Move to prev level
- v = 27.50 m/s | No Waiting, Move to prev level
- v = 33.30 m/s | No Waiting, Move to prev level
- v = 33.30 m/s | No Waiting, Move to prev level
- v = 33.30 m/s | No Waiting, Move to prev level
- v = 33.30 m/s | No Waiting, Move to prev level
- v = 33.30 m/s | No Waiting, Move to prev level
- v = 38.00 m/s | No Waiting, Move to prev level
- v = 38.00 m/s | No Waiting, Move to prev level
- v = 38.00 m/s | No Waiting, Move to prev level
- v = 38.00 m/s | No Waiting, Move to prev level

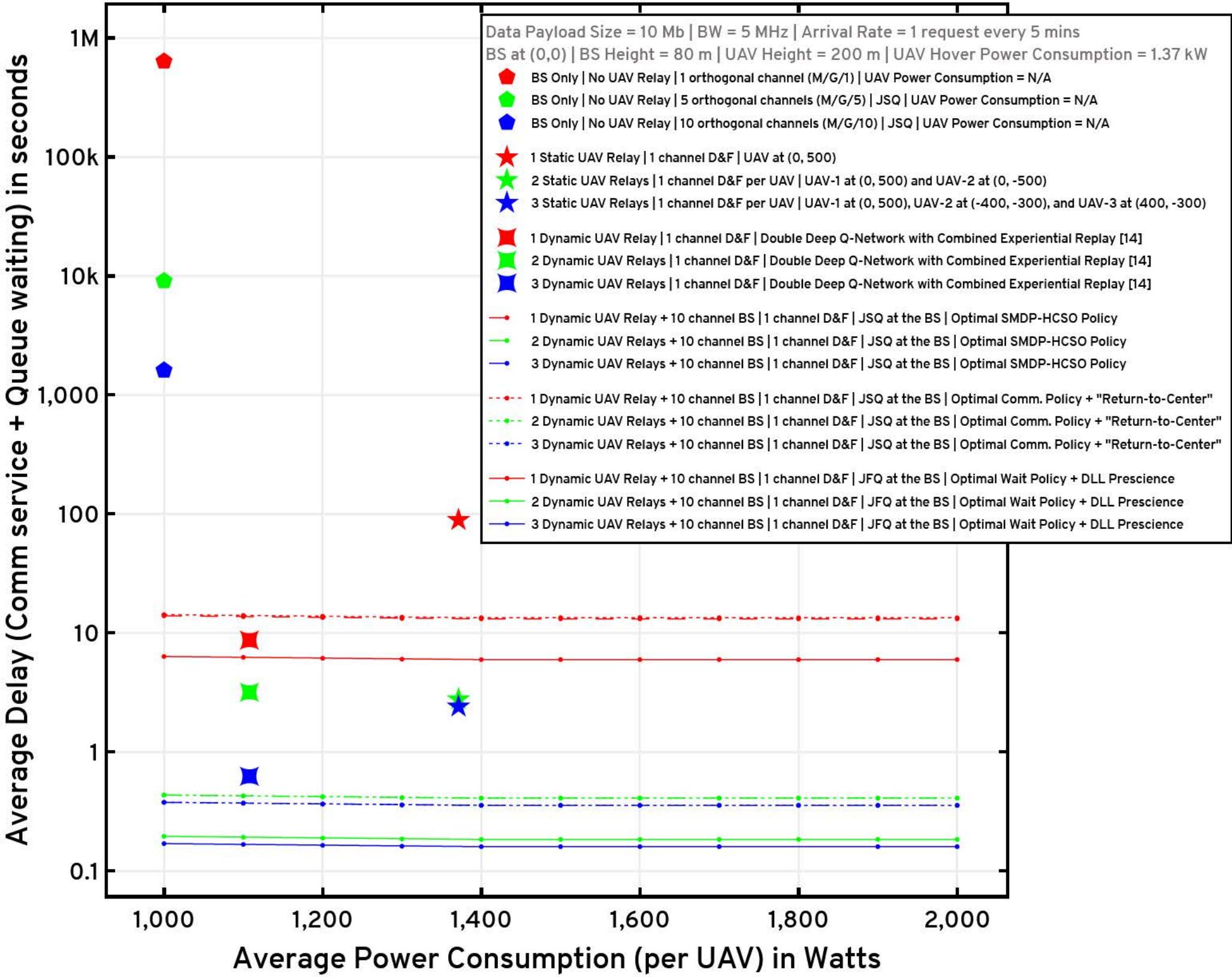




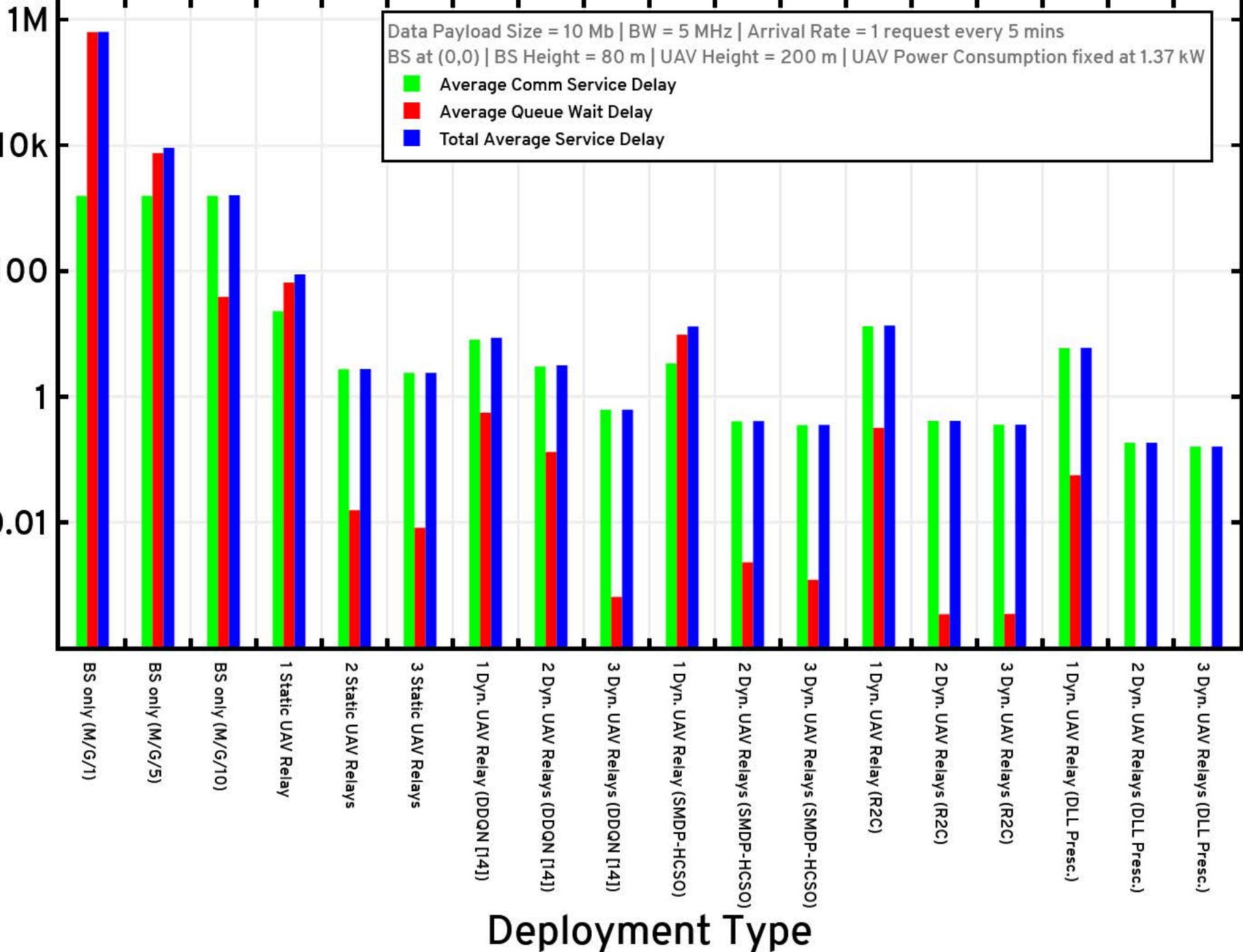


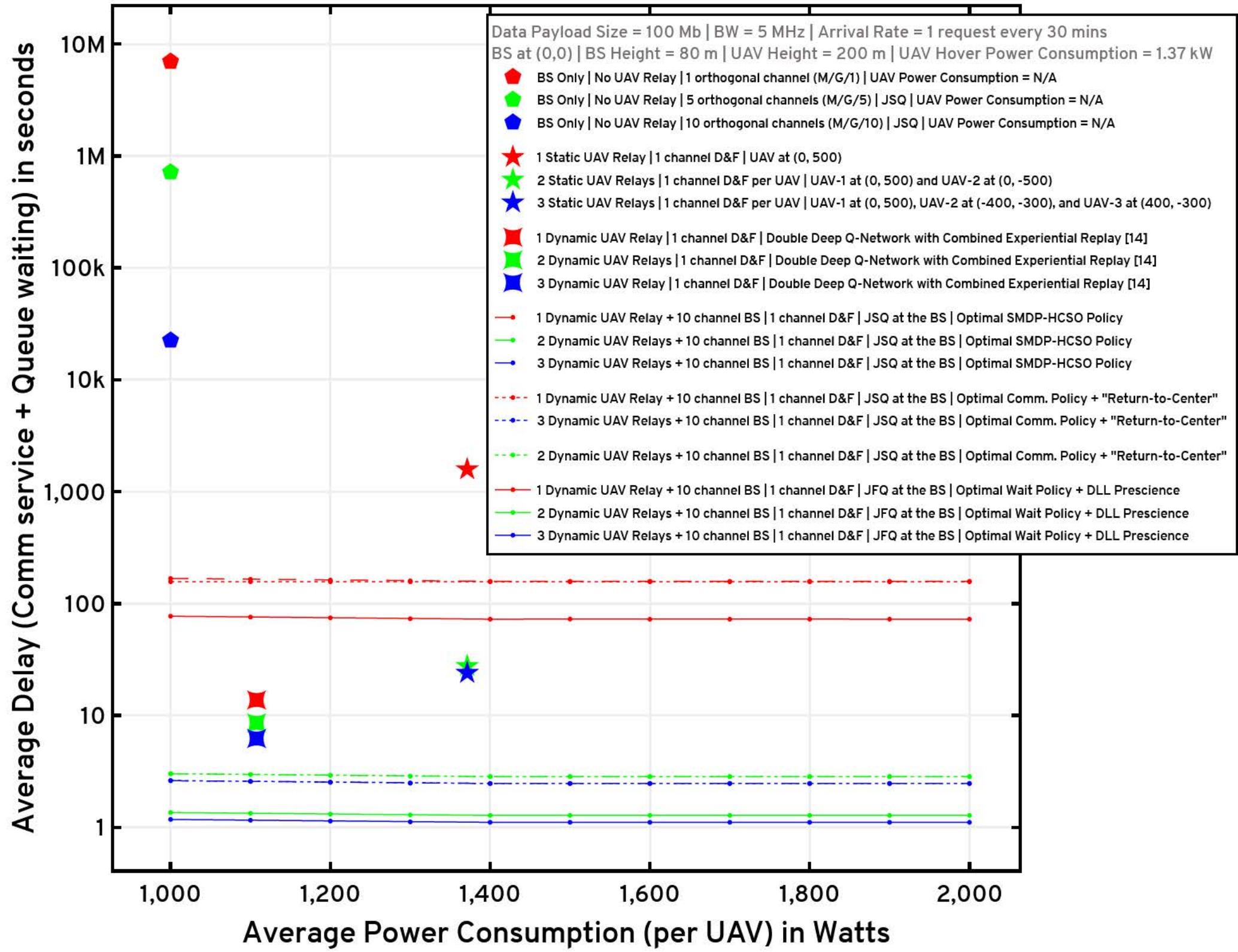


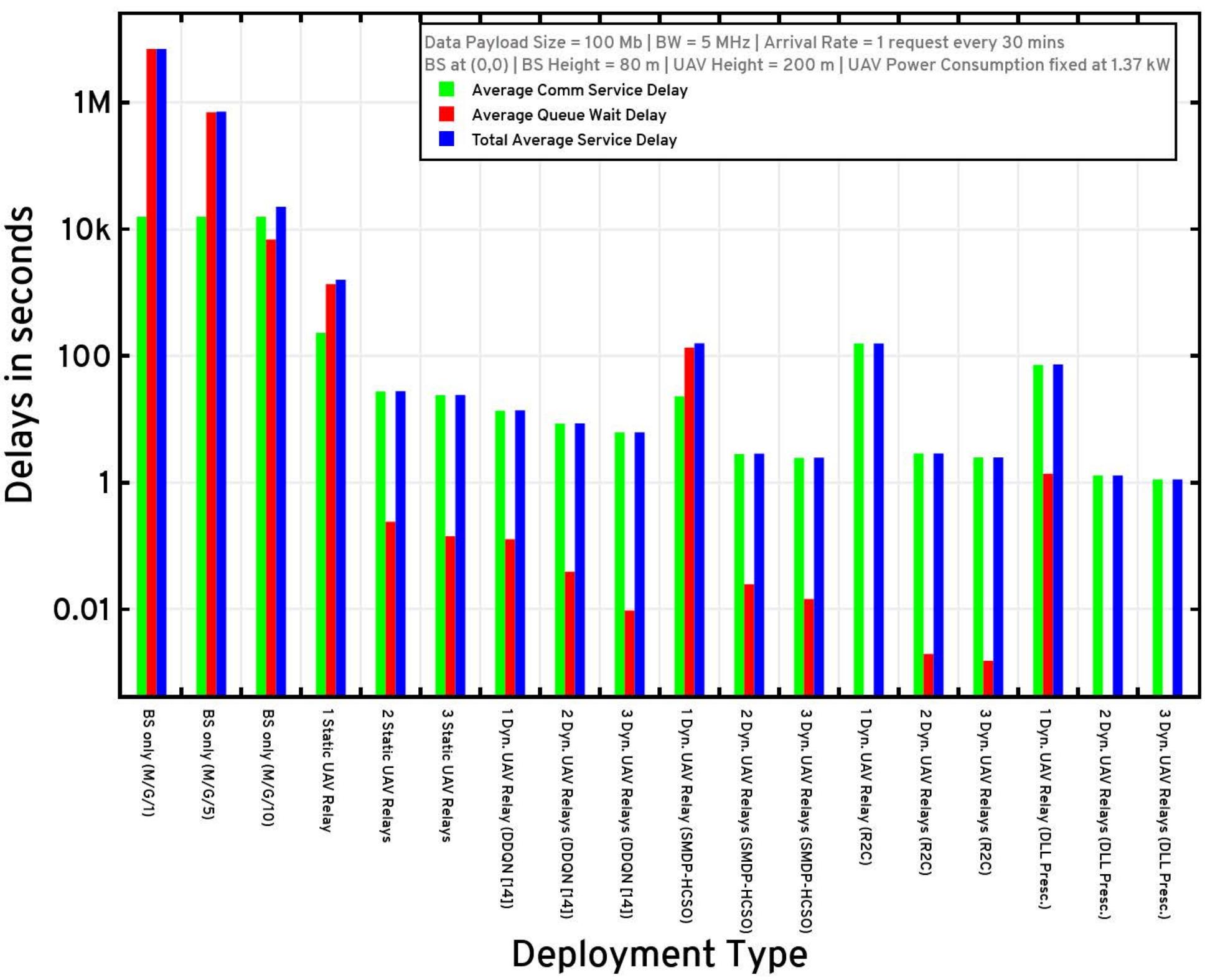





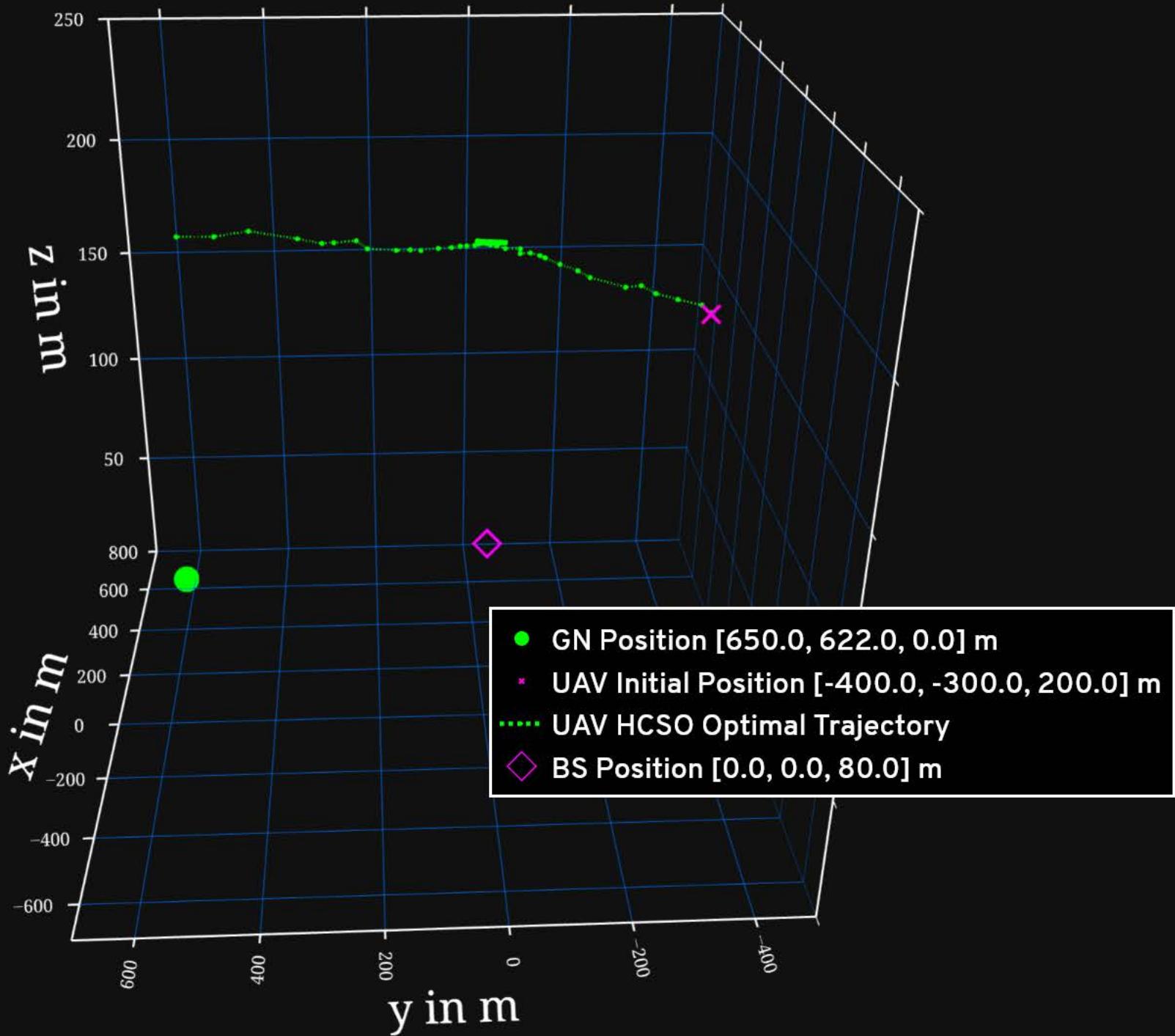
Delays in seconds

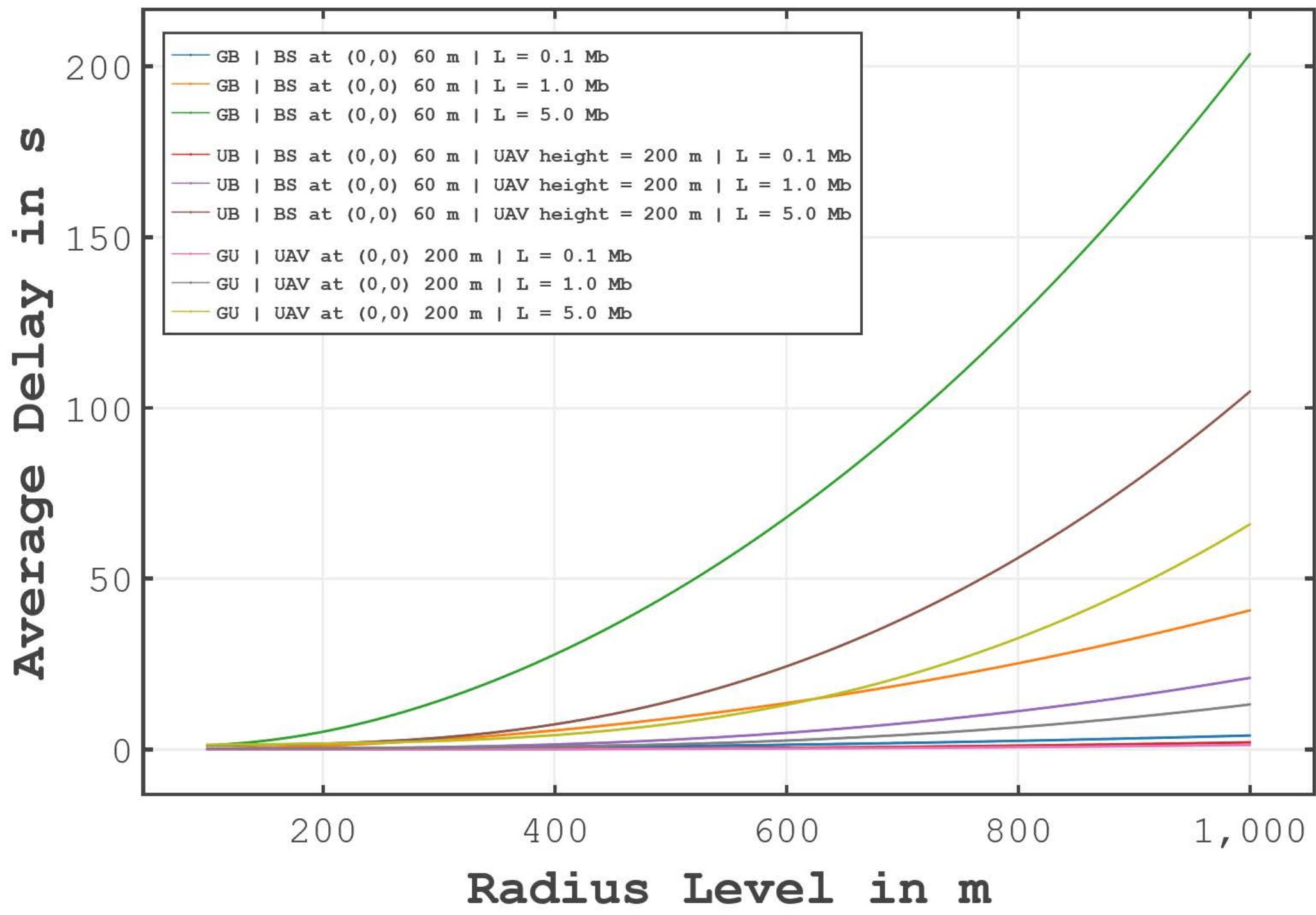


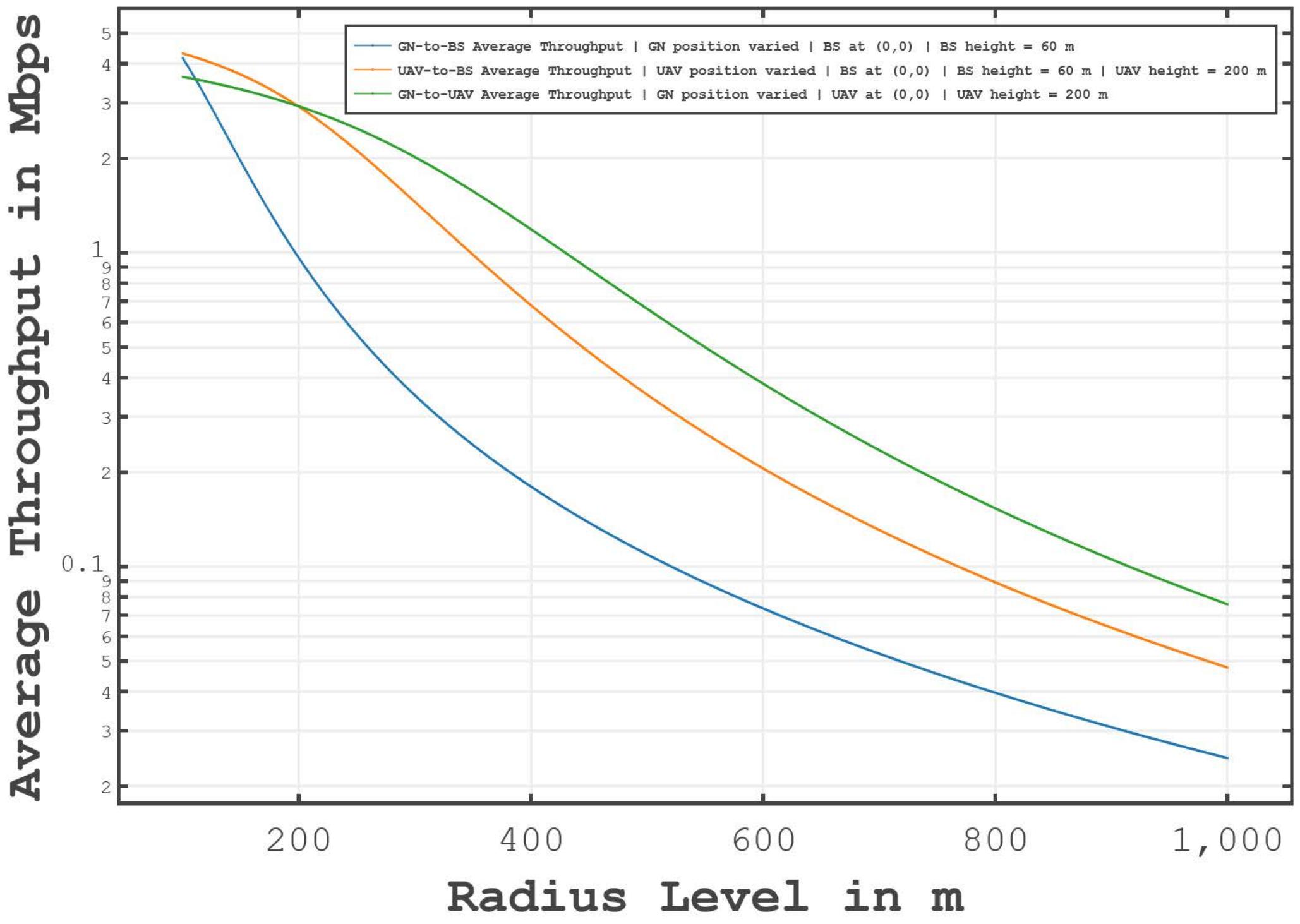


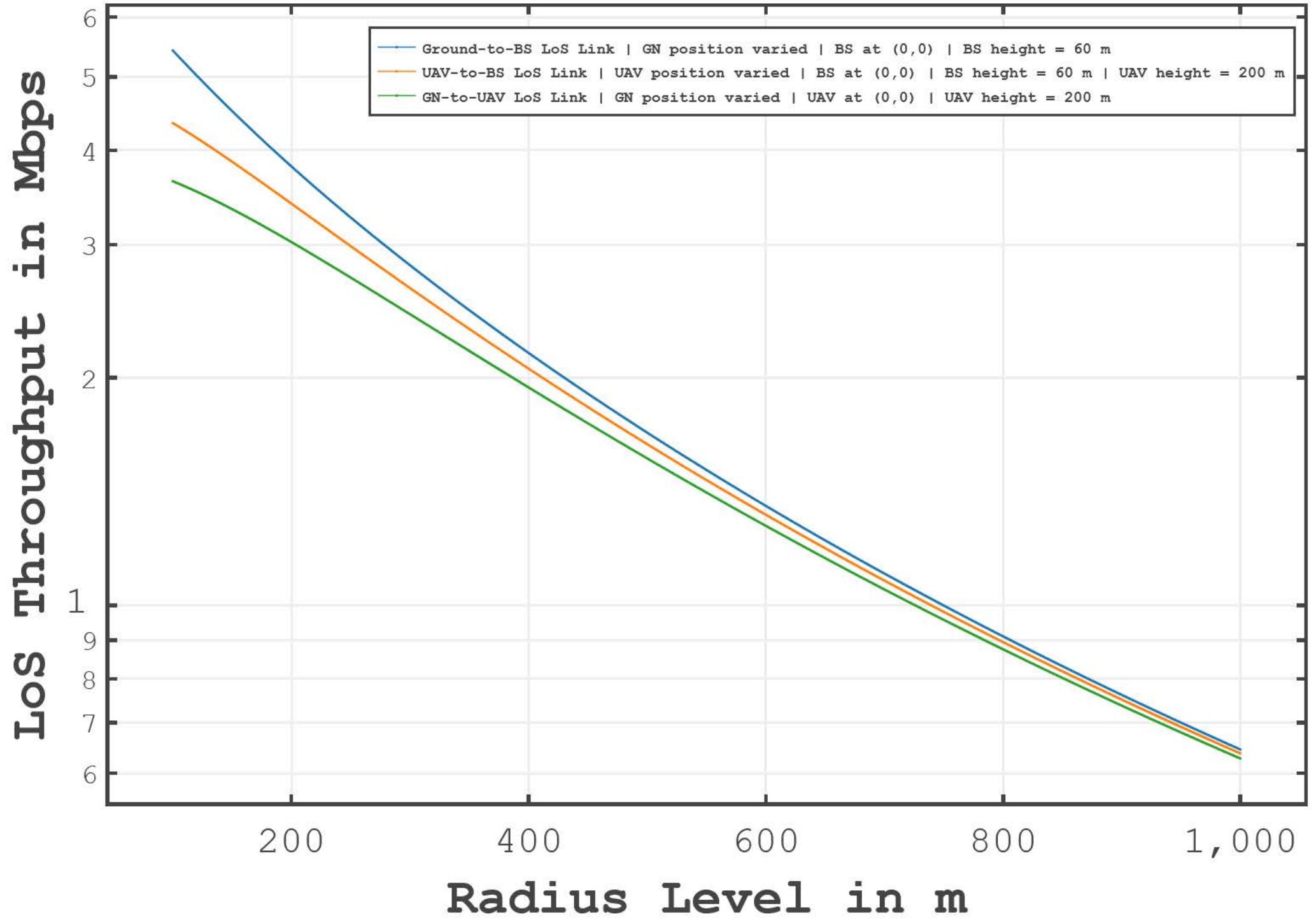


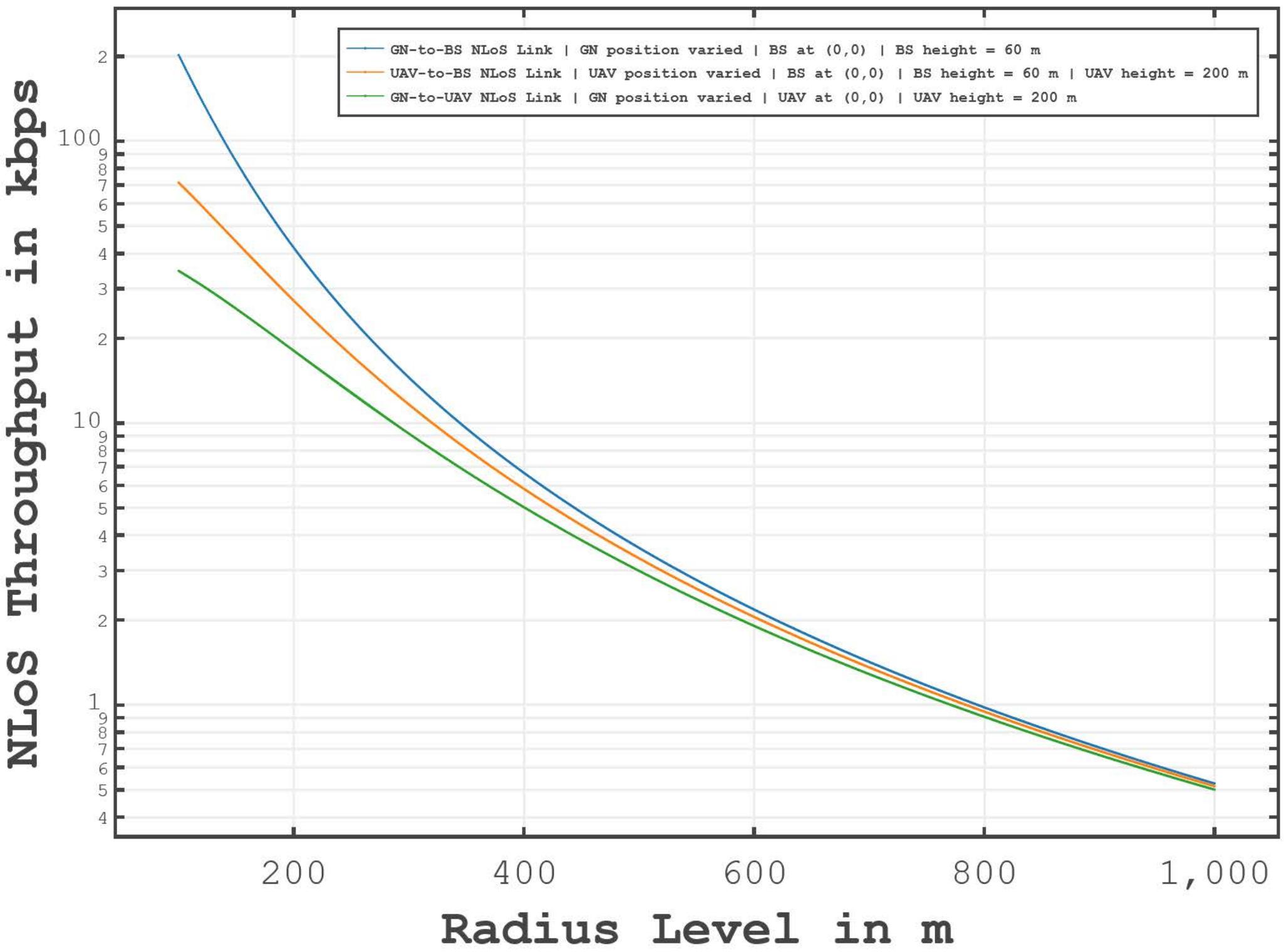


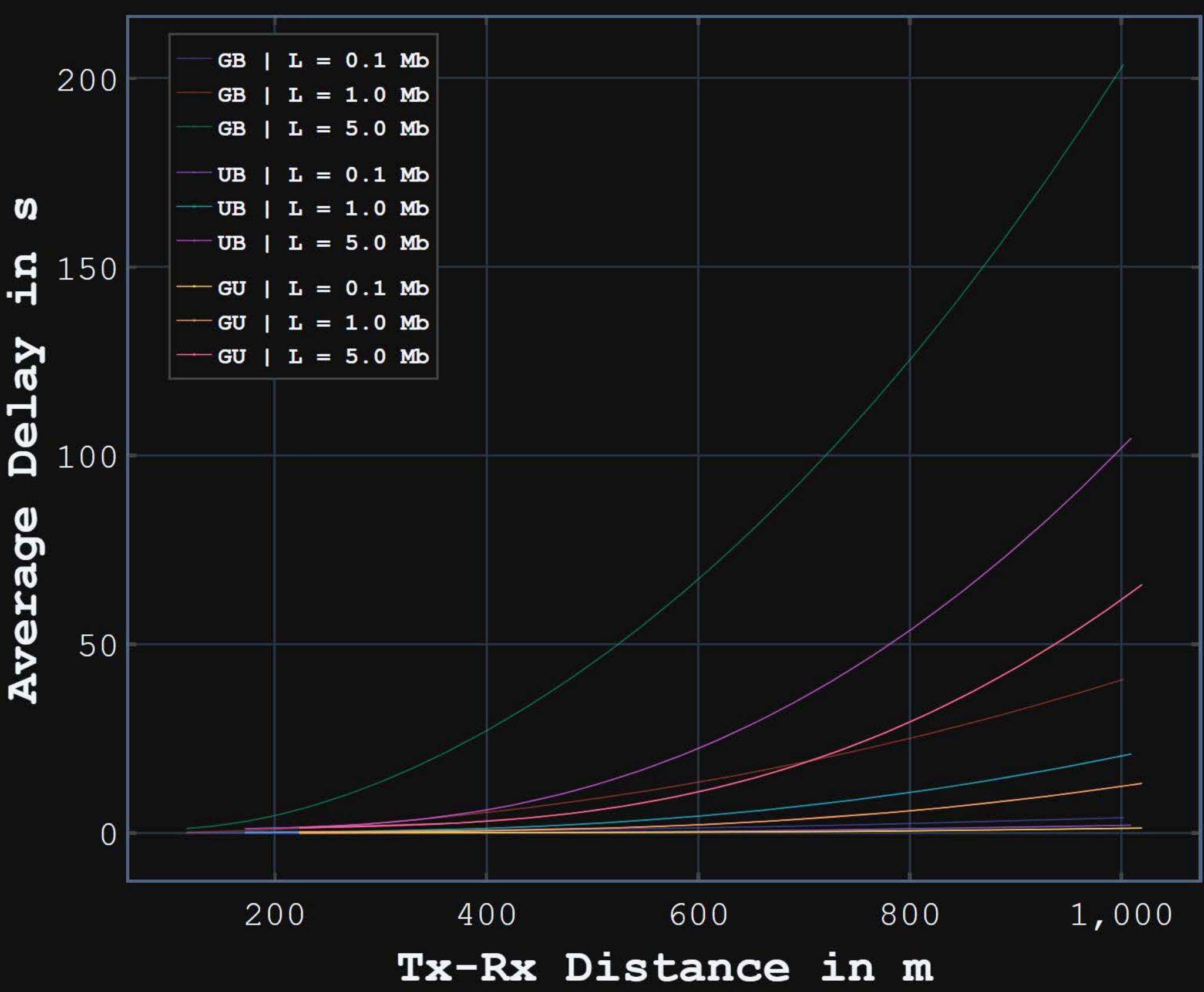


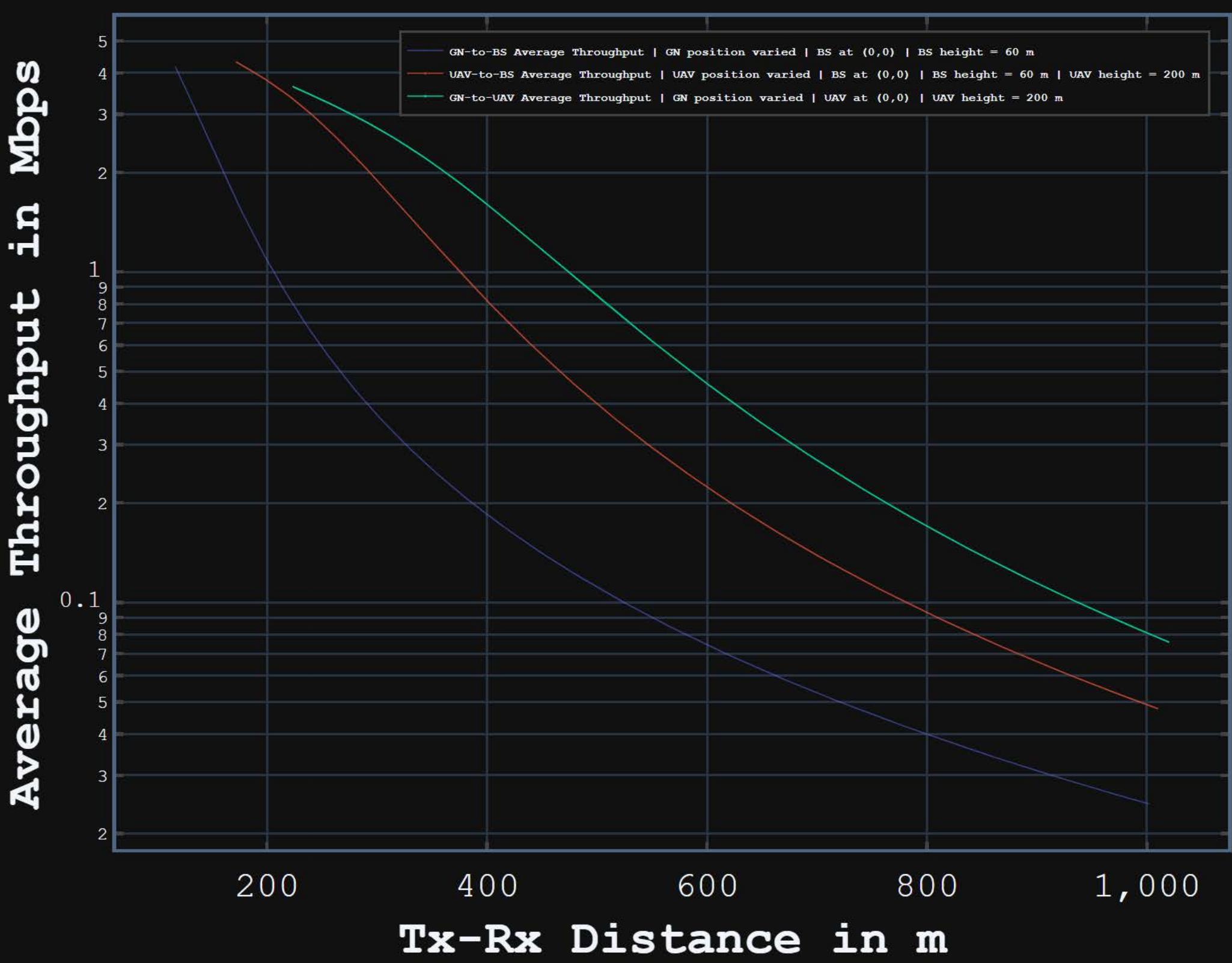


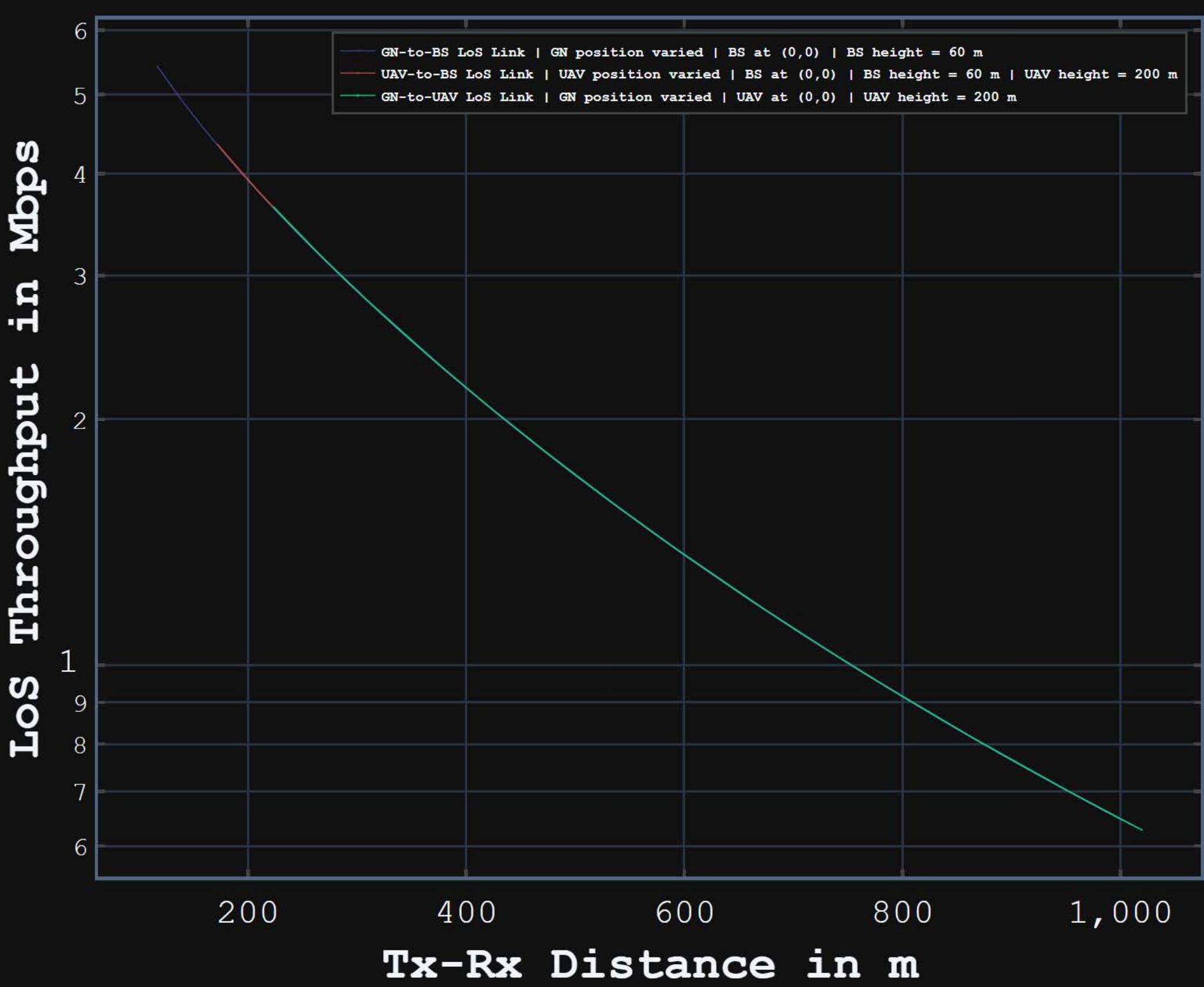


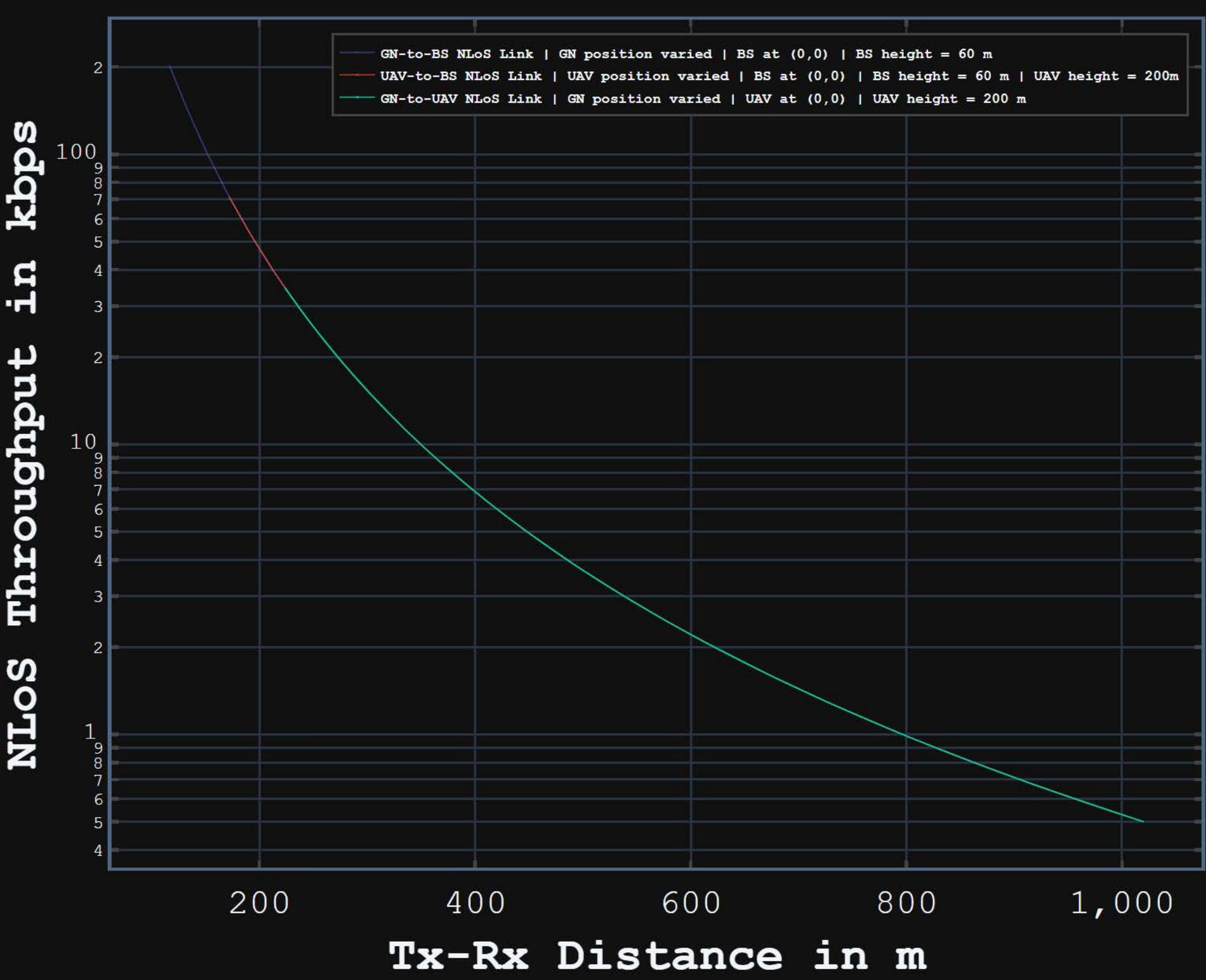


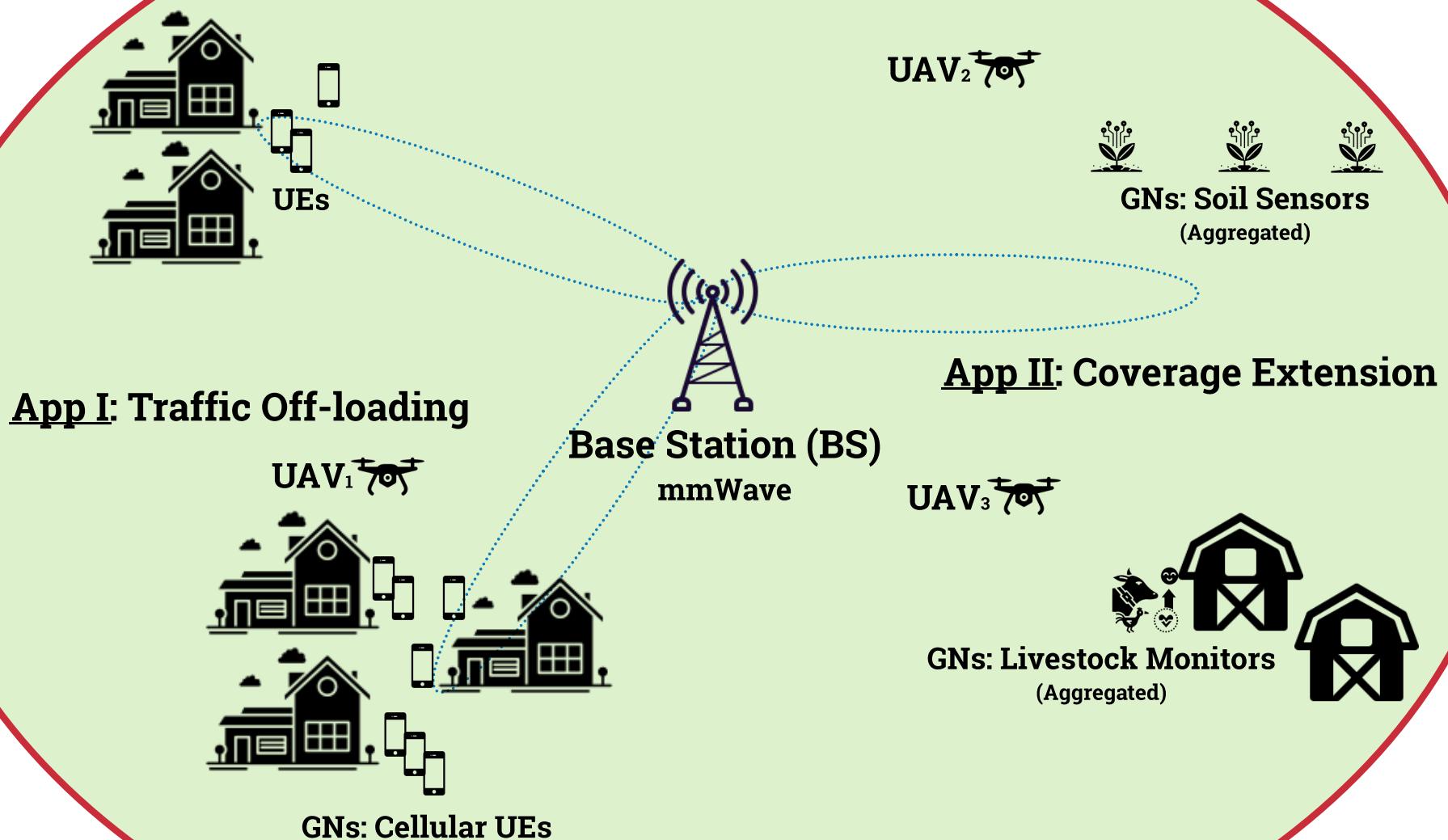












Until Convergence (k)

$$|g_k - g_{k-1}| < \epsilon_{DI}; |\bar{E}_k - P_{\text{avg}} \bar{T}_k| < \epsilon_{PF}; \nu_k |\bar{E}_k - P_{\text{avg}} \bar{T}_k| < \epsilon_{CS}$$

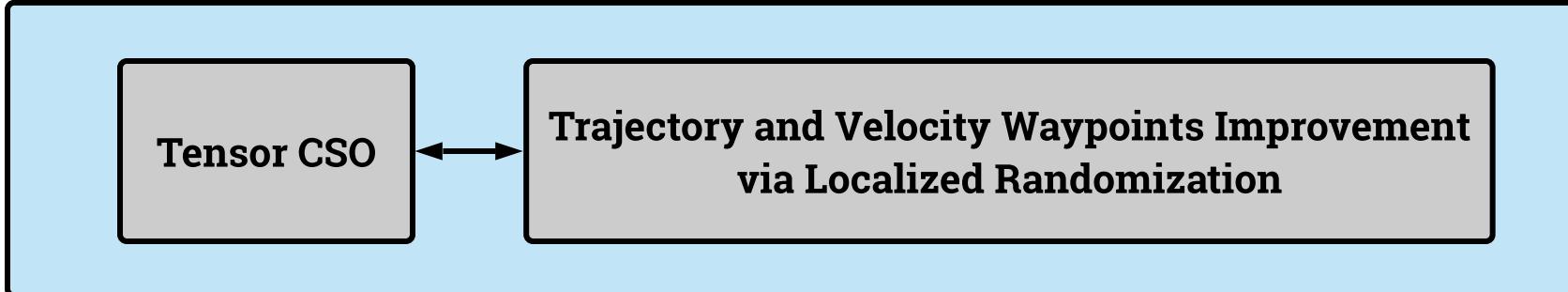
$$O^*(s), \forall s \in S_{\text{wait}} | U^*(s), \forall s \in S_{\text{comm}}$$

$$\begin{aligned} \forall s \in S_{\text{wait}} \\ \ell_v^*(s; v_r) \\ E^*(s; v_r, \theta_c^*) \\ T^*(s; v_r, \theta_c^*) \end{aligned}$$

TensorFlow Constrained
Angular Velocity Optimization

$$\theta_c^*$$

Waiting State Cost Evaluations



Comm State Cost Evaluations

$$\begin{aligned} \forall s \in S_{\text{comm}} \\ \ell_v^*(s; \xi^*, (\hat{r}_U, \hat{\theta}_U)) \\ \xi^* E(s; (\hat{r}_U, \hat{\theta}_U), \mathbf{q}_U^*) \\ \xi^* T(s; (\hat{r}_U, \hat{\theta}_U), \mathbf{q}_U^*) \end{aligned}$$

Concurrent Threads

Until Convergence (i)

$$H(s) = V_{i+1}(s) - V_i(s); \max_{s \in S} H(s) - \min_{s \in S} H(s) < \delta$$

Projected Subgradient Ascent

$$\nu_k$$

Cost Evaluation
(Lagrangian | Energy | Delay)

Concurrent Threads

SMDP Value Iteration

