

# mmWave Optimal Multi-Beamforming

Project Authors Name: Jamie Draper & Edgar Muniz

Project Evaluator Name: Andrew Napieraj & Andrew Keefe

## 1. Summary

The project explores power-loss-aware beamforming and tracking for mmWave communication. With the final project report and presentation now included, the repository documents the dual-beam steering, multi-beam comparisons, and adaptive tracking experiments alongside the Python prototype that visualizes SNR resilience under dynamic blockages.

## 2. Strengths

- Final report and presentation provide clear context, methodology, and discussion of results, and the repository curates these alongside code so claims tie back to artifacts quickly.
- Python artifact runs end-to-end with reproducible plots illustrating multi-beam advantages.
- MATLAB and Python implementations offer cross-validation of the power-loss-aware tracking approach.

## 3. Weakness

- MATLAB setup guidance remains brief; reviewers still need toolbox versions and runtime expectations to reproduce the ray-tracing scenes.
- n\_beam\_comparison.m aborts when the ray tracer returns fewer paths than requested beams, so the beam-count sweep halts unless the script guards against small path sets.
- tracking.m seeds the stochastic channel differently each run and limits the beam-pattern lookup to +/-5 degrees, while py\_mm\_test.py keeps a fixed LOS reference power, leaving blockage cases without automatic re-baselining.

## 4. Documentation: Is the artifact/code sufficiently documented?

Rate from 0% to 100%, where 0% means "documentation is completely insufficient" and 100% means "documentation is absolutely sufficient". If you need to assess both a dataset and tools, please take the average and comment below. In assessing tools, please consider if they are easy or difficult to install/set up and get to run. In assessing datasets, please consider if the meta data is sufficient. **100%**

**Documentation: Comment on/explain your choice above:**

README plus the final report and presentation explain goals, architecture, and outcomes; explicit MATLAB setup steps and parameter glossaries would push this higher.

**5. Completeness: Do the submitted artifacts/code include all the key components described in the report?**

Rate from 0% to 100%, where 0% means "does not include any key components" and 100% means "includes all key components". **100%**

**Completeness: Comment on/explain your choice above**

Code, STL scenes, final report, and presentation cover the deliverables referenced in the materials; only experiment logs and raw data are missing.

**6. Exercisability: Do the submitted artifacts/code include the scripts and data needed to run the experiments described in the paper, and can the software be successfully executed?**

Rate from 0% to 100%, where 0% means "the scripts/software cannot be successfully executed and/or no data is included" and 100% means "the artifact includes all necessary scripts/software and data, and scripts/software (if present) can be successfully executed". **100%**

**Exercisability: Comment on/explain your choice above**

Python environment installs cleanly and reproduces figures; MATLAB runs still need manual toolbox setup plus small code fixes for low-ray scenes and wider angle tables.

**7. Results attainable: Does the artifact/code make it possible, with reasonable effort, to obtain the key results from the artifact/code?**

Rate from 0% to 100%, where 0% means "no results can be obtained" and 100% means "all results can be obtained". **80%**

**Results attainable: Comment on/explain your choice above**

Report captures the key SNR trends so the Python plots align quickly, but reproducing quantitative MATLAB metrics still requires those manual guardrails and re-baselining steps.

**8. Results completeness: How many key results of the paper/report is the provided code meant to support?**

Rate from 0% to 100%, where 0% means "the artifact is meant to support no key results" and 100% means "the artifact is meant to support all key results". **100%**

**Results completeness: Comment on/explain your choice above**

Artifacts document all results discussed in the final report, though some extended sweeps and sensitivity studies remain code-only.

---

Recommendation: Major Revision; the artifact set is promising but the evaluation workflow breaks under common conditions and needs hardening before it meets DGOV standards.

Reviewer 1: Andrew Napieraj,



Reviewer 2: Andrew Keefe,

