**MBT Replication Kit: Minimal Instructions**

**Purpose**

Enable anyone with basic optics/lab access to replicate the MBT beam-bending experiment and observe the predicted effect.

**Bill of Materials (Per Replication Kit)**

* Laser pointer (Class 1/2, 532nm green or 650nm red preferred)
* Optical breadboard/mounts (or DIY clamp fixtures)
* Glass or metal vacuum chamber with optical ports (mini bell jar or desiccator with window)
* Vacuum pump (rotary vane or hand-pump, down to ~1 mbar)
* Motorised rotation stage (manual turntable or low-RPM DC gear-motor and speed controller)
* Position-sensitive detector (PSD) or basic USB webcam for beam position tracking
* Standard computer (laptop/desktop) with Python and numpy, matplotlib, OpenCV (for analysis)
* Laser safety goggles (match laser wavelength)
* Acrylic shield (optional but recommended)

**Assembly & Operation Steps**

1. Mount laser securely outside vacuum chamber; aim through optical port at detector.
2. Align detector (webcam/PSD) opposite laser port.
3. Install chamber on rotation stage, ensure balanced and level.
4. Seal chamber, evacuate to lowest safe pressure.
5. Power on laser, verify beam spot is clearly visible on detector.
6. Record beam position with chamber stationary (control baseline).
7. Begin rotating chamber (start at 1 RPM, increase as safe).
8. Record beam position at each RPM step.
9. Return to stationary, re-check baseline.
10. Repeat all steps at normal atmospheric pressure for control comparison.

**Data Collection**

* Use provided Python script to log beam centroid on each frame.
* Output position vs. RPM in spreadsheet (CSV) for later analysis.
* Blind analysis is recommended: let software assign “random” labels to runs so users cannot bias results.

**Replication Success Criteria**

* Success: Any statistically significant shift in the laser’s position correlated to chamber rotation under vacuum only, NOT present at atmospheric pressure, supports MBT effect.
* Null: No RPM-correlated shift beyond noise/error = null result (MBT not supported under current conditions).