Table S1: Simulation Parameters: Microtubule Assembly

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| Parameter | Description | Value | Reference |
| [GTP-tub] | Free GTP-Tubulin concentration | 3-15 μM  | Matched to experiments  |
| *kon, PF* | Tubulin on-rate constant  | 0.65 µM-1 s-1 pf-1 | (Margolin et al., 2012), lowered to match experimental growth rates (Roth et al., 2019) |
| *koff, GTP* | Tubulin off-rate when GTP dimer below | 0.2 s-1 | (Margolin et al., 2012) |
| *koff, GDP* | Tubulin off-rate when GDP dimer below | 200 s-1 | (Margolin et al., 2012) |
| *khyd, GTP* | Hydrolysis rate constant  | 0.55 s-1  | (Margolin et al., 2012)  |
| *klateral Bond Formation* | Formation rate for a lateral bond between protofilaments  | 100 s-1 | (Margolin et al., 2012) |
| *klateral bond break TT* | Breakage Rate for lateral bond between two GTP dimers | 70 s-1 | (Margolin et al., 2012) |
| *klateral bond break TD* | Breakage rate for lateral bond between a GTP and GDP dimer | 90 s-1 | (Margolin et al., 2012) |
| *klateral bond break DD* | Breakage rate for lateral bond between two GDP dimers | 600 s-1 | (Margolin et al., 2012)  |
| *klateral bond break TT Seam* | Breakage Rate for lateral bond two GTP dimers at the seam | 140 s-1 | (Margolin et al., 2012) |
| *klateral bond break TD Seam* | Breakage Rate for lateral bond between a GTP and GDP dimer at the seam | 180 s-1 | (Margolin et al., 2012) |
| *klateral bond break DD Seam* | Breakage Rate for lateral bond between two GDP dimers at the seam | 1200 s-1 | (Margolin et al., 2012)  |
| *πbreak* | Correction factor for the lateral bond breakage rate if the neighboring PFs all have lateral bonds  | 10 | (Margolin et al., 2012)  |
| *T­dimer* | Max taper length in dimers before increase in klateral bond break and koff | 75 layers (600 nm) | Based on (Ogren et al., 2022) |
| *π­taperOff* | Factor to increase off rates when taper greater than Tdimer | 100 | this study |
| *π­taperLateralBreak* | Factor to increase lateral bond breaking rates when taper greater than Tdimer | 1000 | this study |