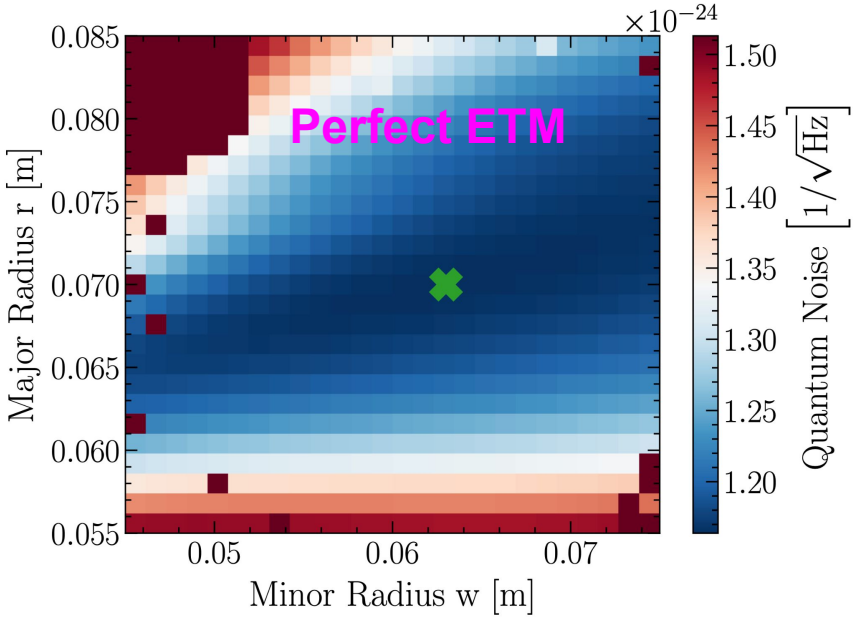
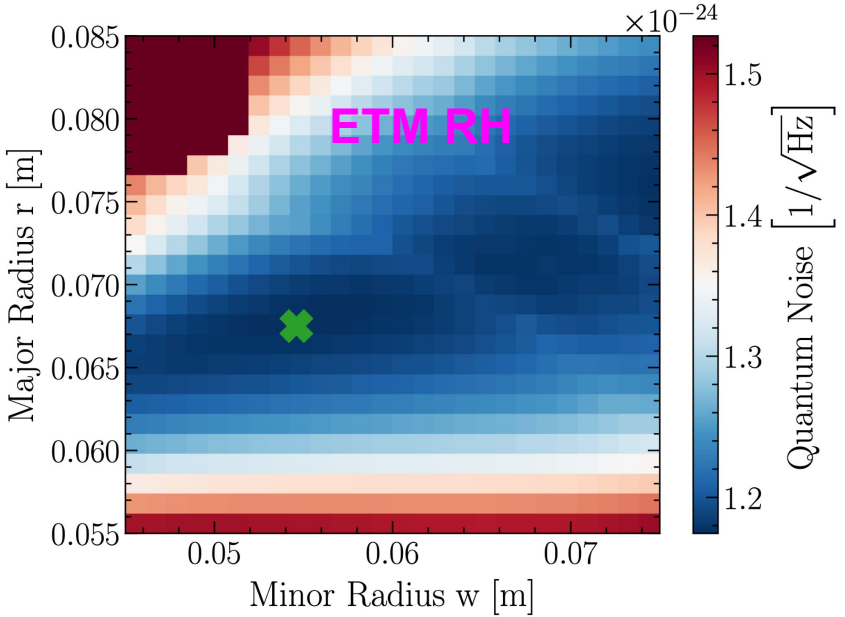
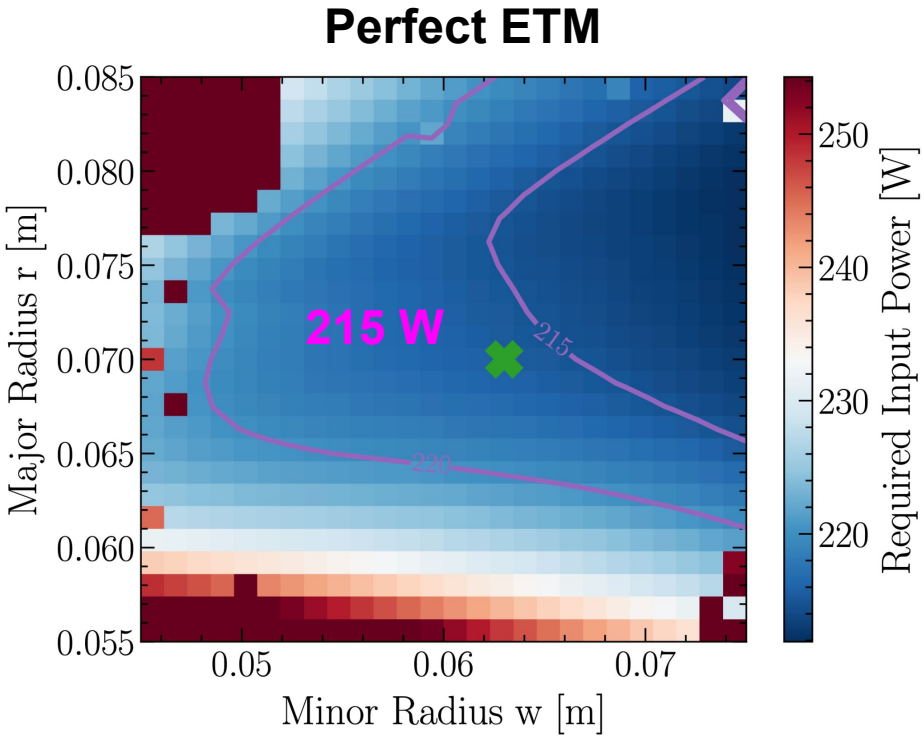
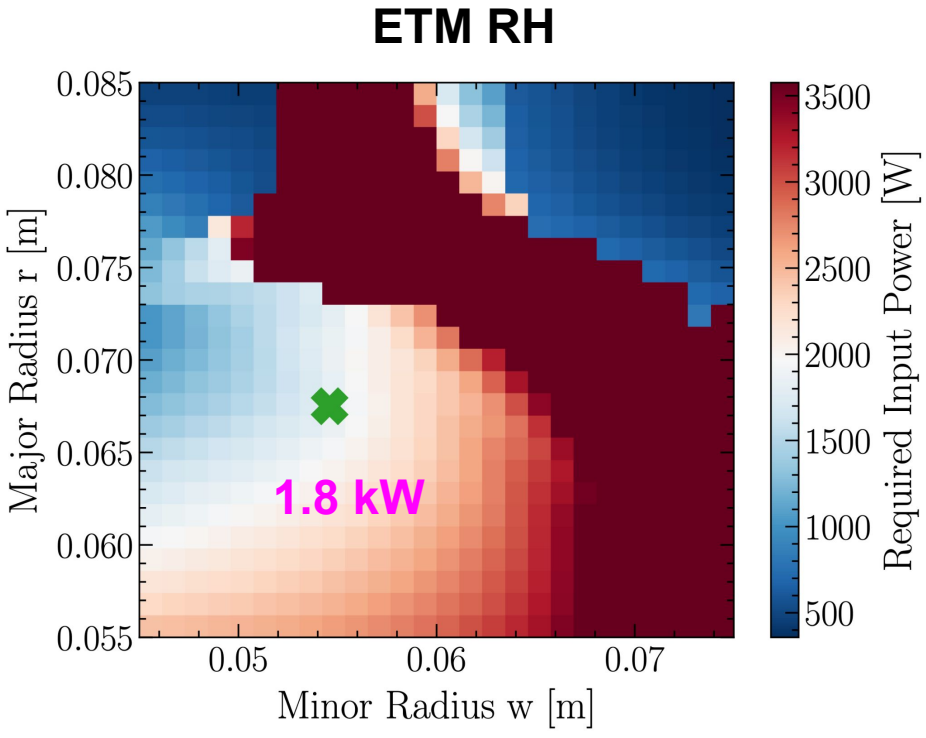
Grid-Search Study for FROSTI A#
Sing-Ring FROSTI ITM
Perfect ETM vs. ETM RH



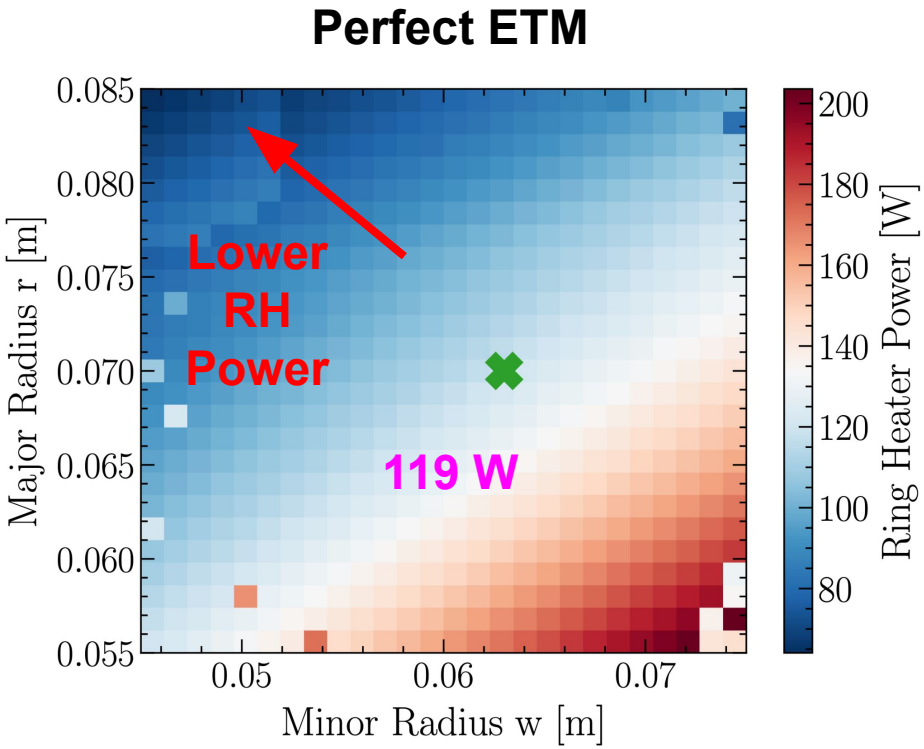


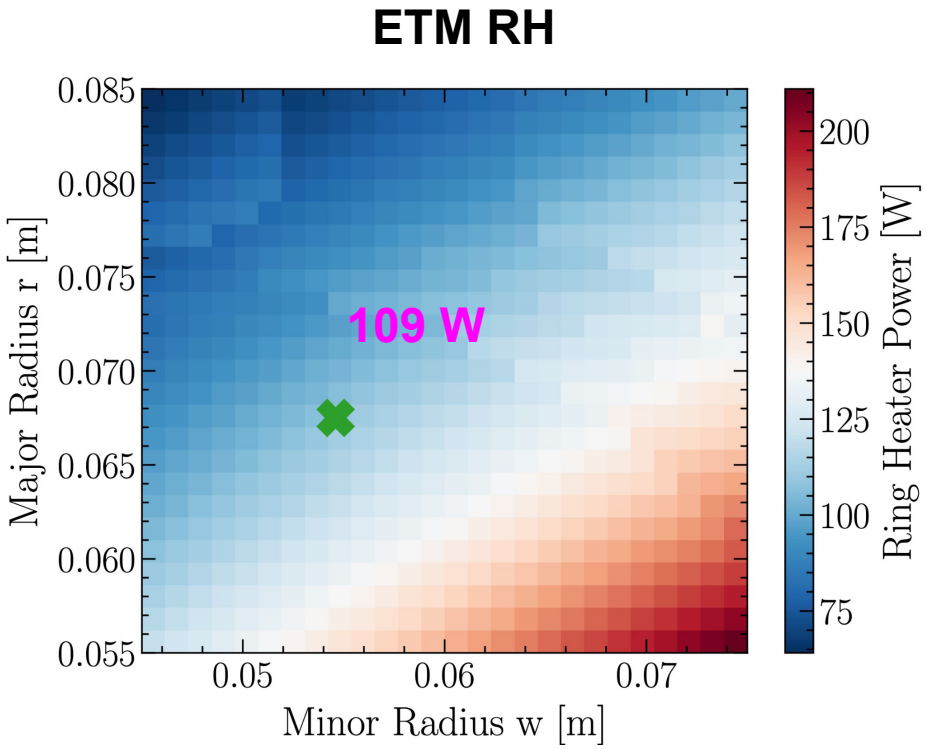
	Perfect ETM	ETM RH	Cold State
QN [1/rt(Hz)]	1.164e-24	1.175e-24	1.152e-24
Required Pin [W]	215	1830	—
FROSTI [r, w, P]	7.0 cm, 6.3 cm, 17.3 W	6.8 cm, 5.5 cm, 12.6 W	—
RH Power [W]	119	109	—





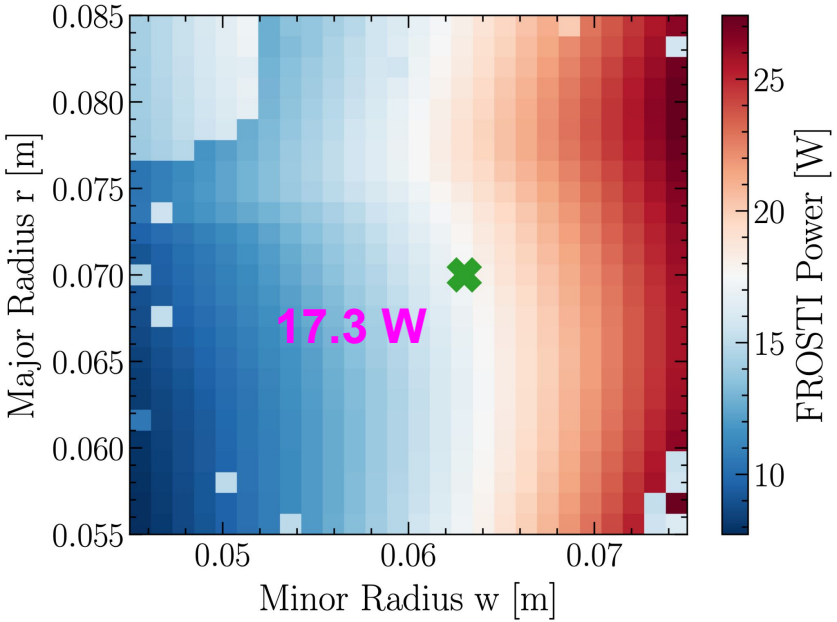
Required input power to reach 1.5 MW arm power
We need finer compensation at ETM as well



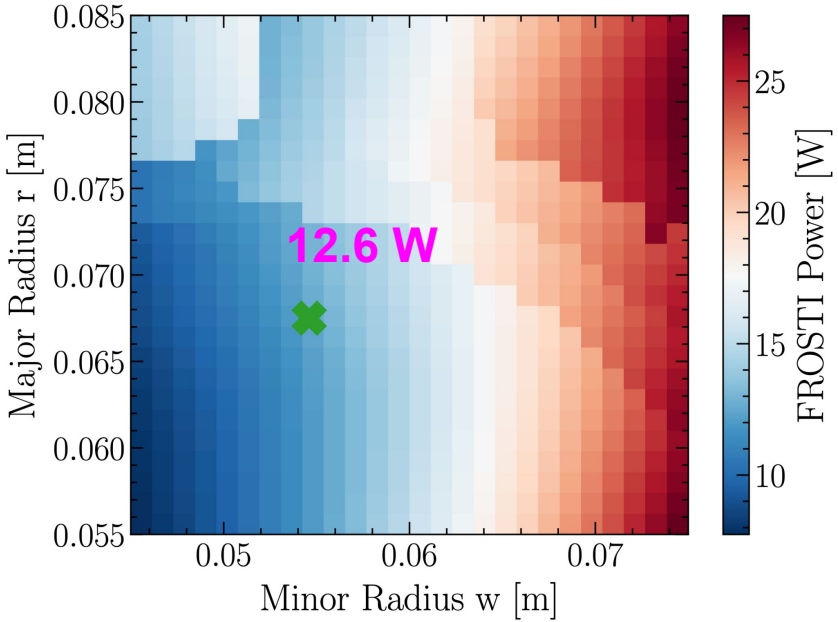


The required ring heater power is over 100 W. Can sacrifice the QN sensitivity by going to the upper left corner.

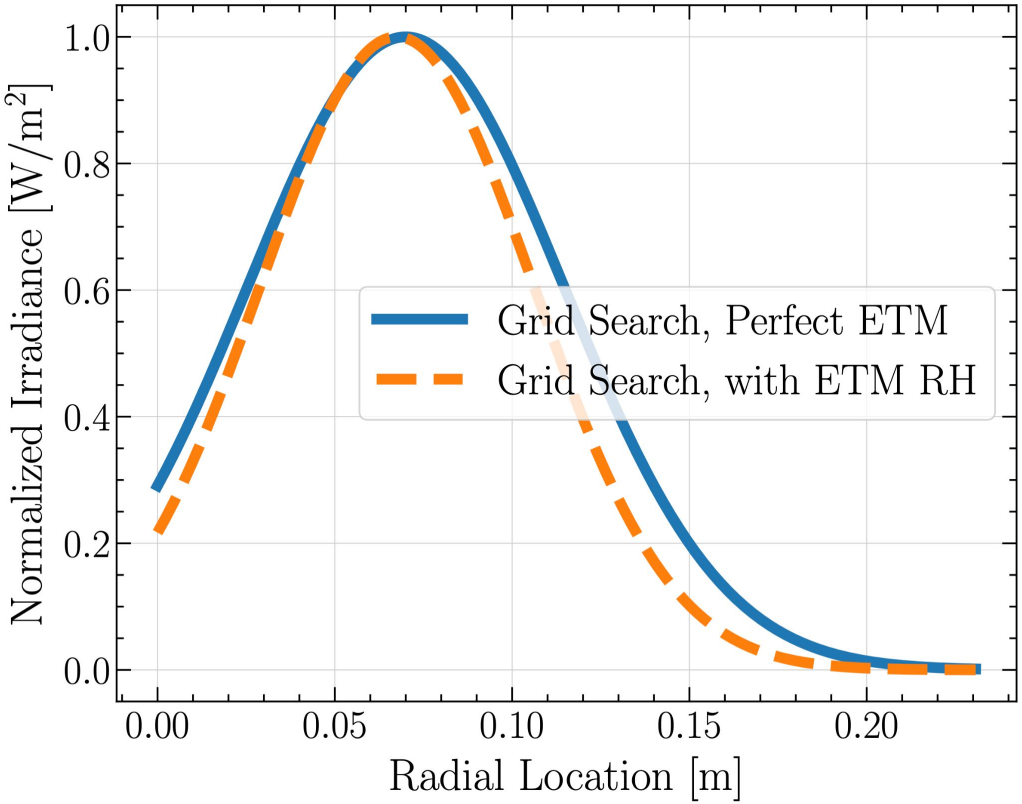
Perfect ETM



ETM RH

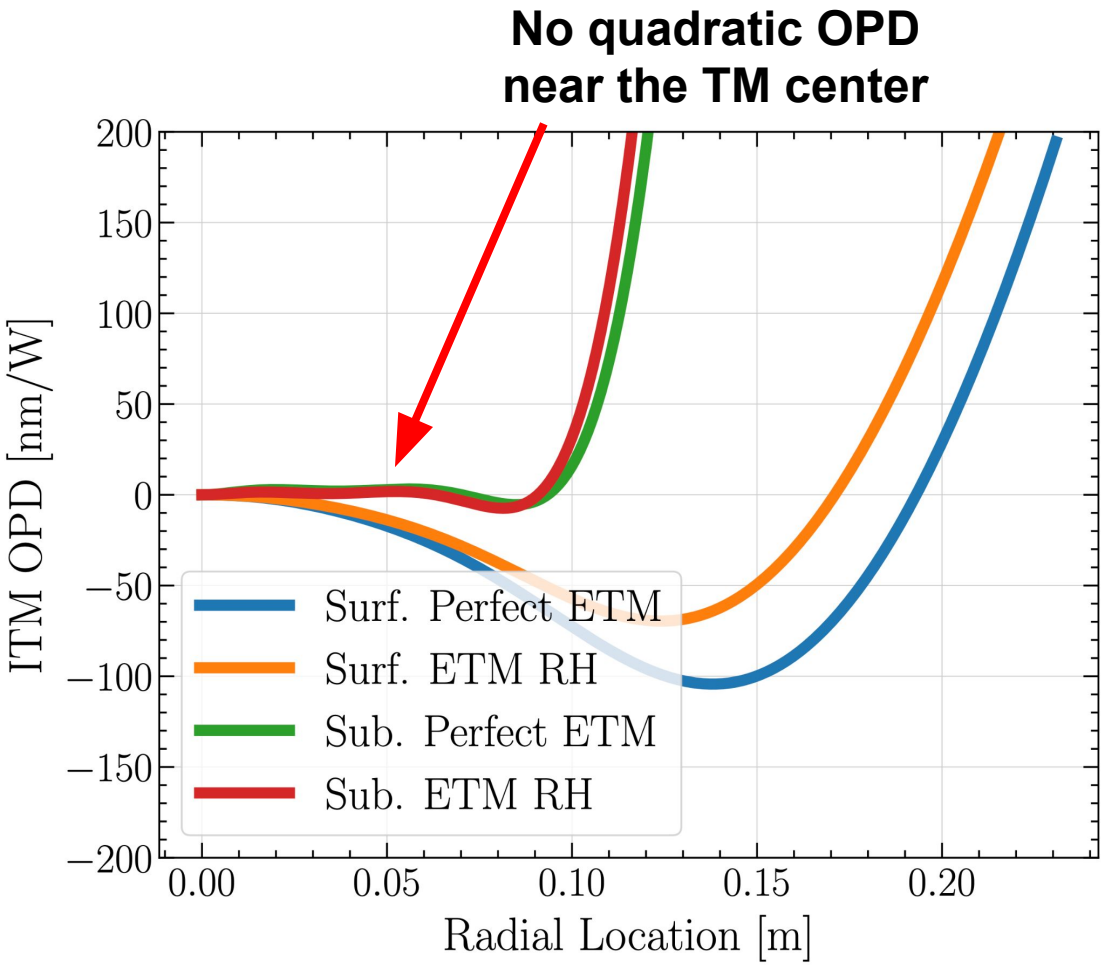


The required FROSTI power is manageable (FROSTI O5 prototype showed 12.5 W delivered power at 300 C)



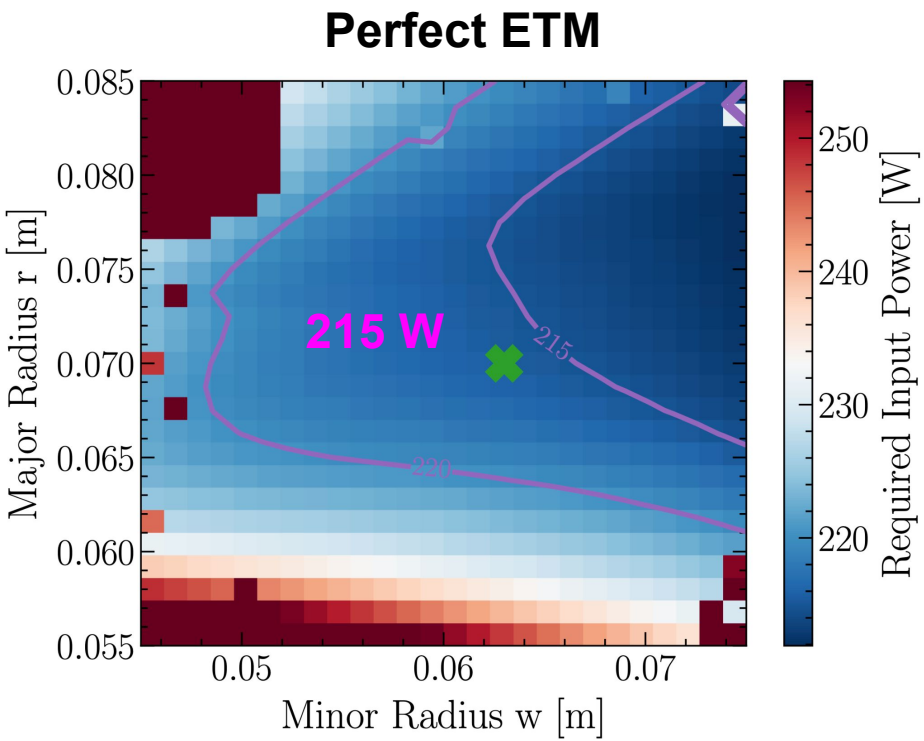
The optimal sing-ring FROSTI have similar profiles for with perfect ETM vs ETM with RH correction.

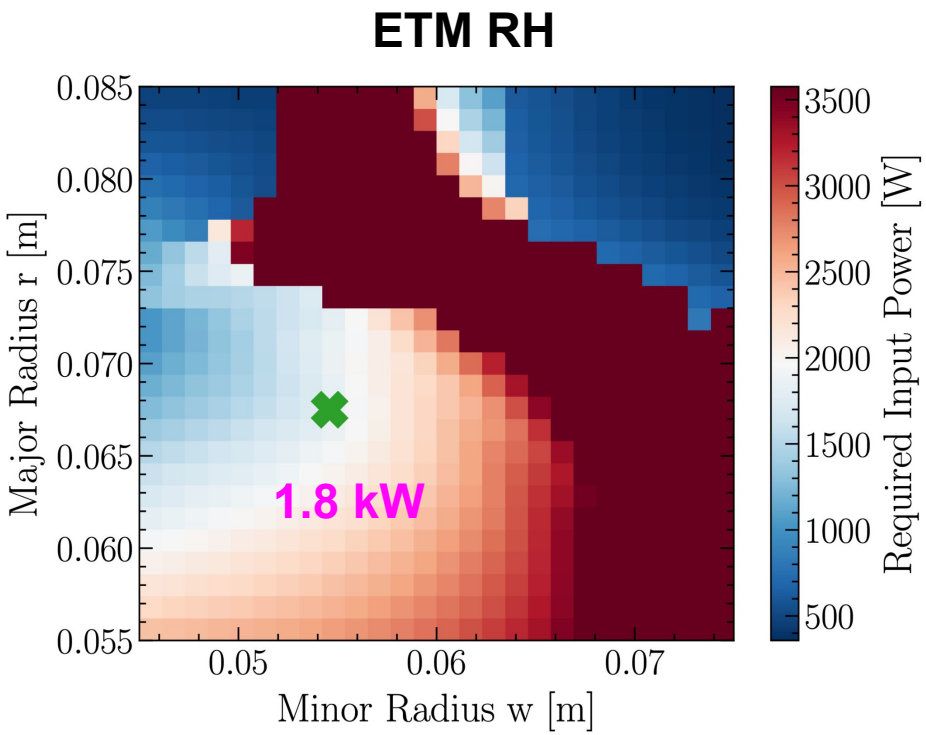
1. Perfect ETM: r=7.0 cm, w=6.3 cm
2. With ETM RH: r=6.8 cm, w=5.5 cm



1. Residual wavefront OPD for surface and substrate with perfect ETM vs with ETM RH
2. The quadratic substrate OPD is removed by the choice of RH power to preserve the squeezing benefit

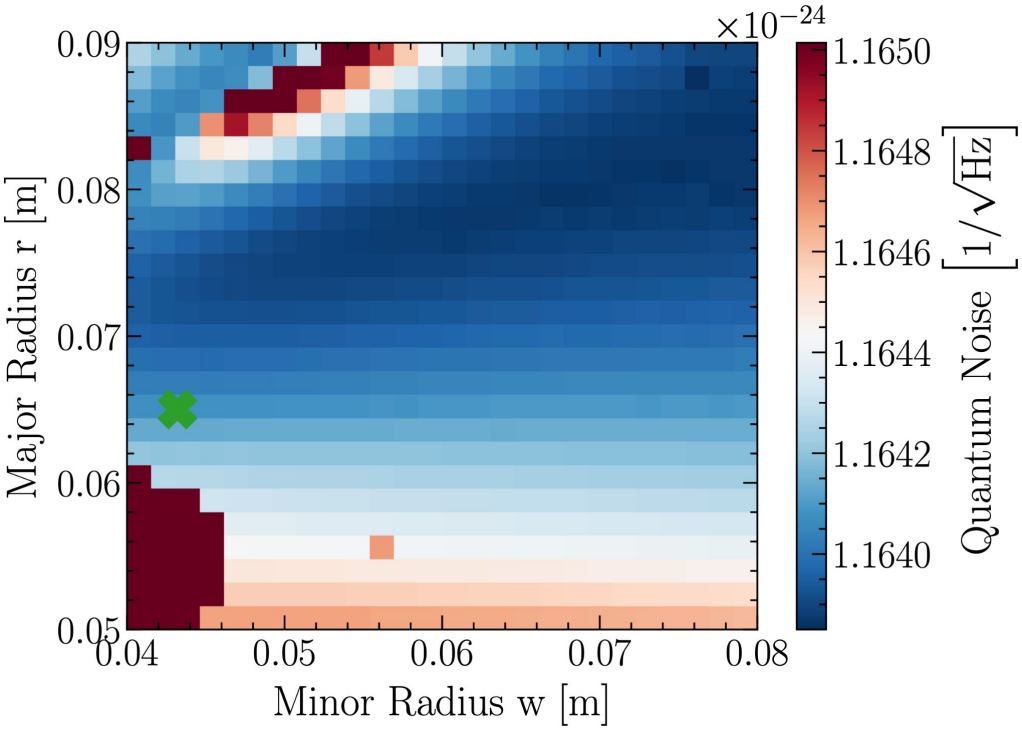
Grid-Search Study for A# with Sing-Ring Dual FROSTI (ITM and ETM)





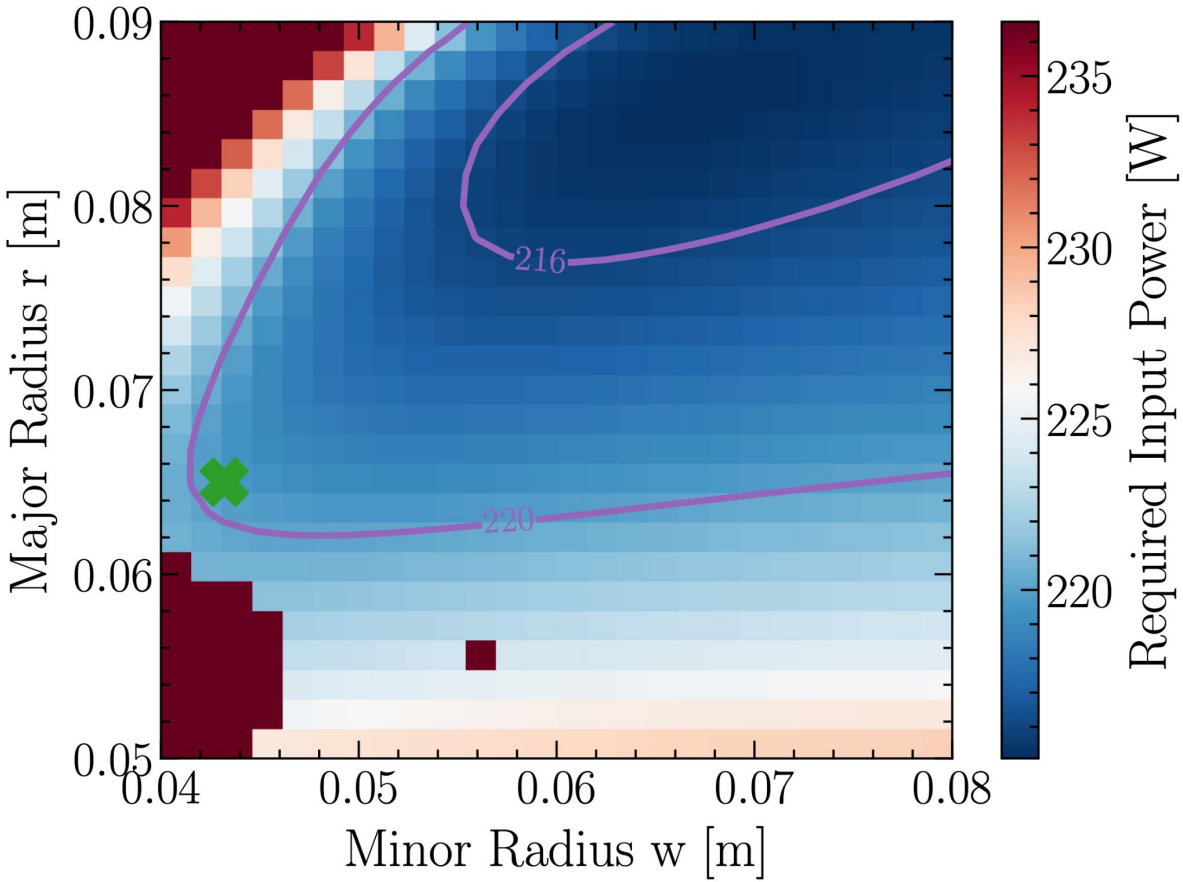
Motivation for FROSTI ETM: required input power to reach 1.5 MW is too large even with ETM RH

1. Assume the optimal FROSTI ITM parameters as identified when assuming perfect ETM (7.0 cm, 6.3 cm, 17.3 W)
2. Grid search FROSTI ETM location and width. The FROSTI power is set to optimize the QN and the required input power: QN*1e24 + Pin/250
3. The RH power is set to remove the curvature deformation in ETM surface.



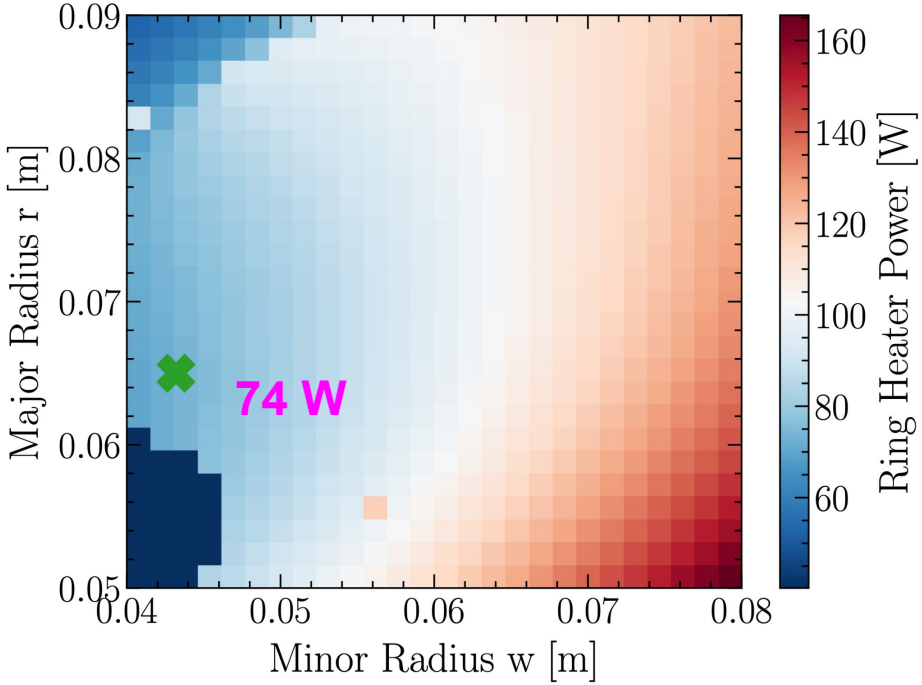
	Perfect ETM	ETM RH	FROSTI ETM
QN [1/rt(Hz)]	1.164e-24	1.175e-24	1.164e-24

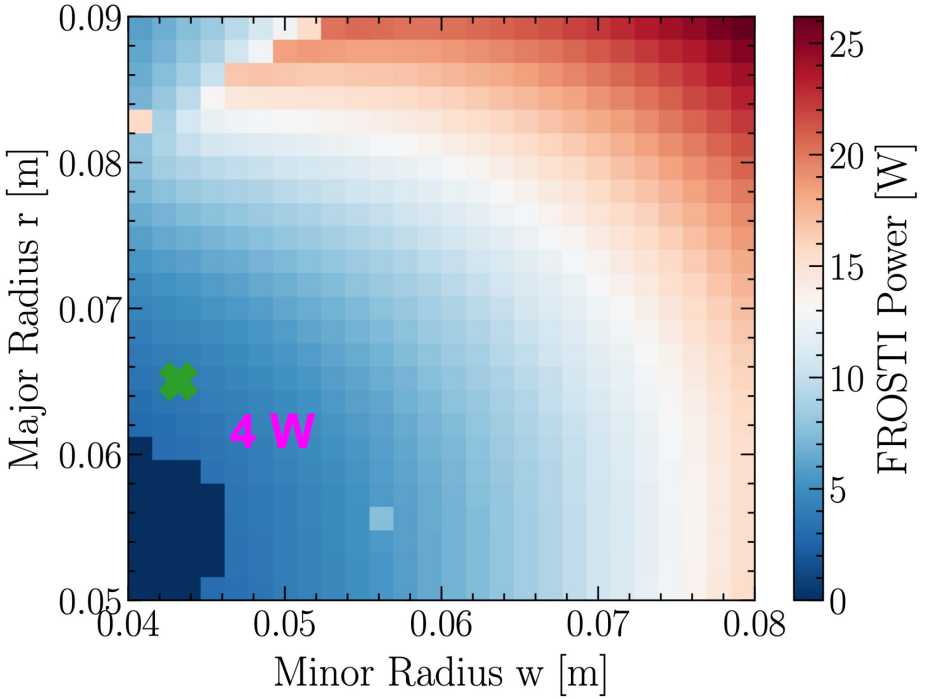
Reach the same QN sensitivity as the perfect ETM case



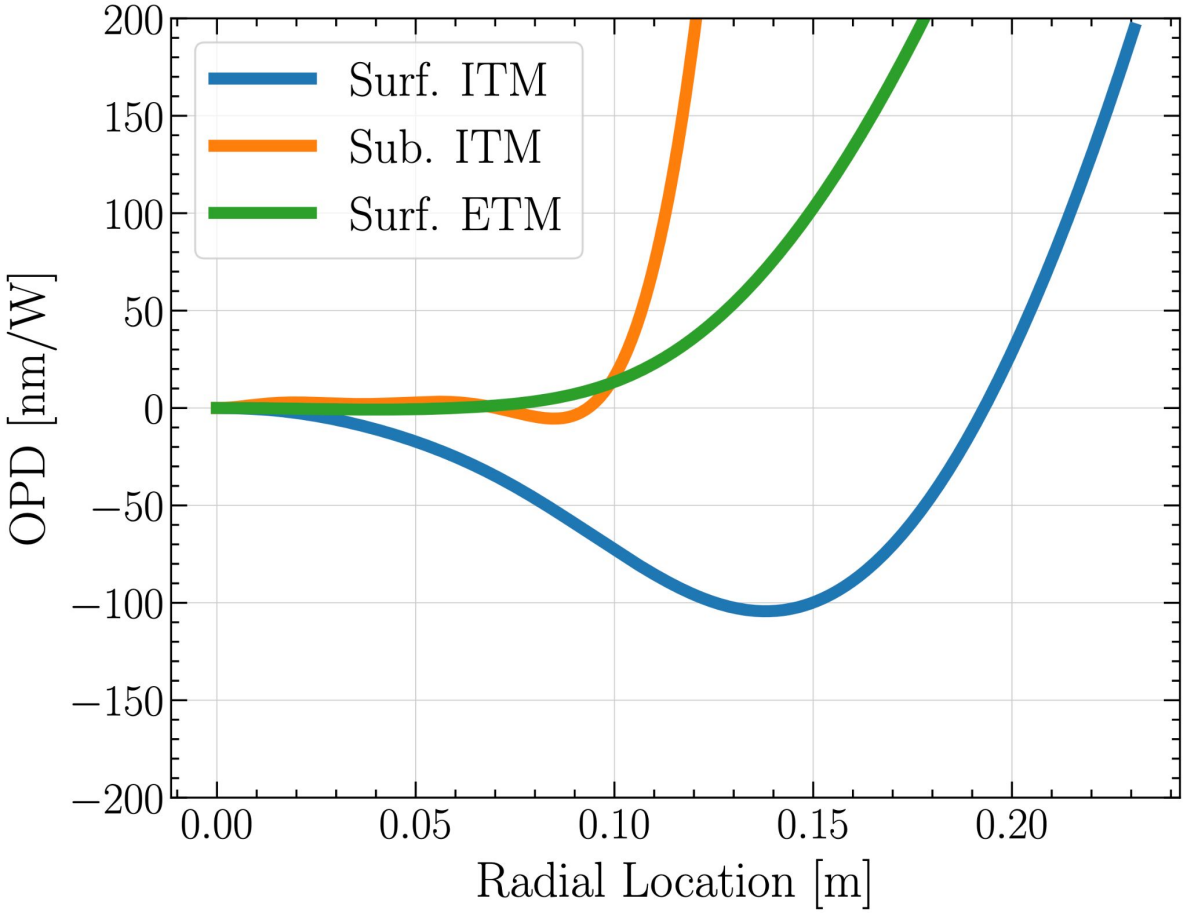
1. With FROSTI ETM, the required input power can be lowered to ~ 200 W to reach 1.5 MW.
2. For comparison, with perfect ETM, the input power is 215 W. With ETM RH, the input power is 1.8 kW.
3. The optimal FROST ETM (green cross) is chosen to be consistent with lower RH and FROSTI power requirement (next slide)

Required ring heater power





Required FROSTI ETM power favors smaller major and minor radius design



Surface and substrate residual wavefront error for both FROSTI ITM and ETM.

1. FROSTI ITM: r=7.0 cm, w=6.3 cm, P=17.3 W
2. FROSTI ETM: r=6.5 cm, w=4.3 cm, P=4.0 W