

ORKA - Towards a cavity enhanced optical dipole trap for a Rb^{87} BEC in microgravity

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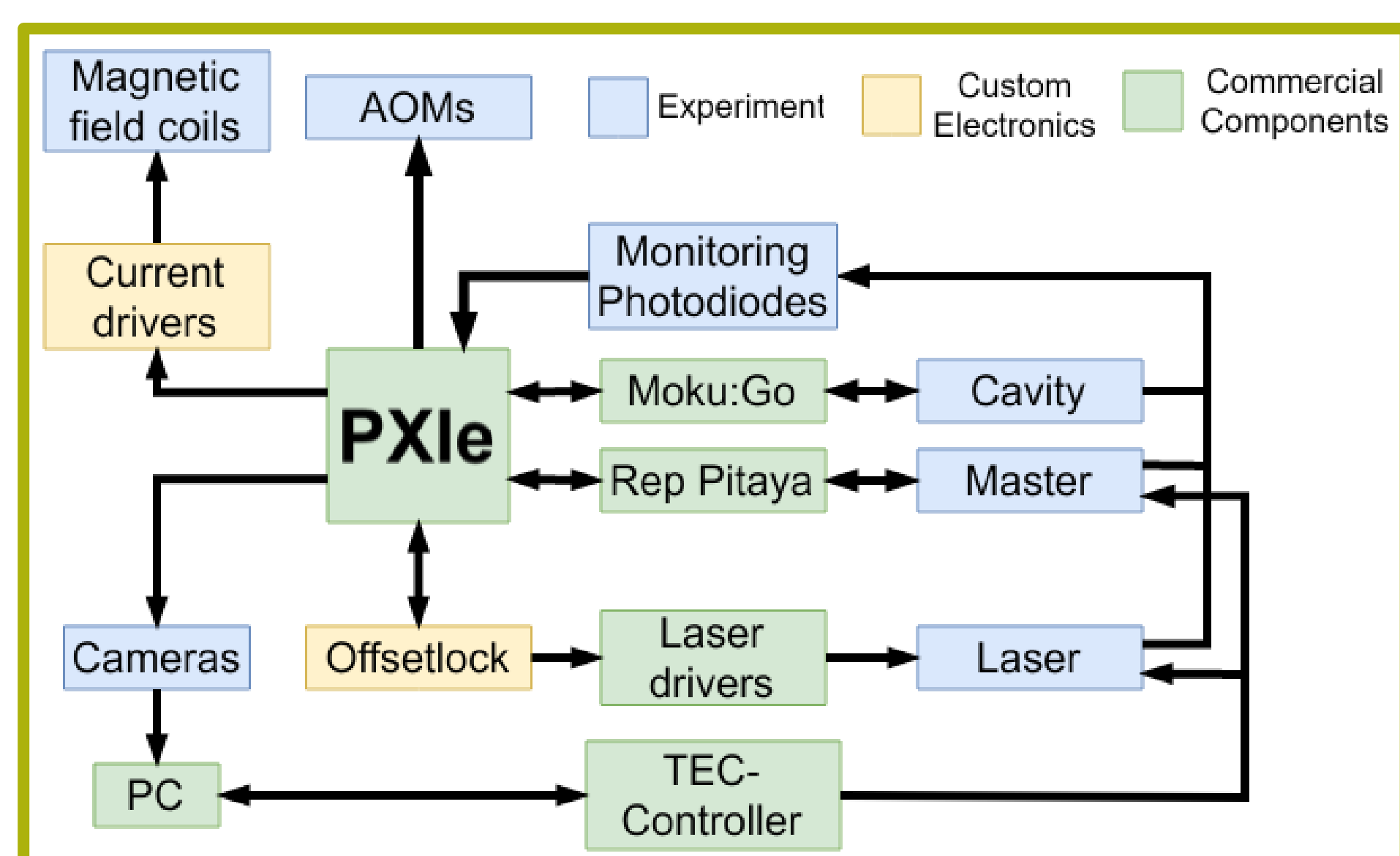
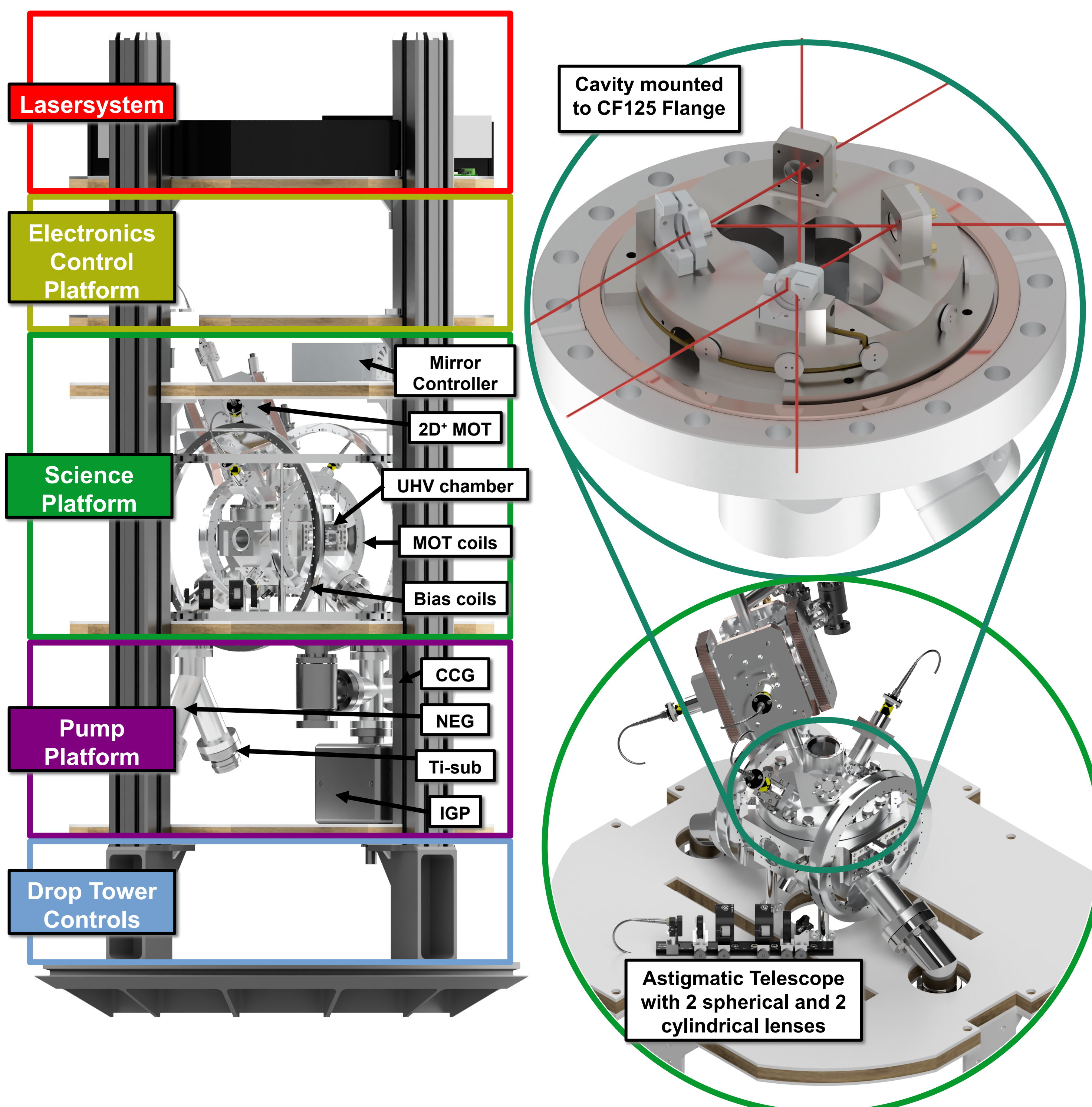
Motivation

All optical dipole trapping employs spatially large high-power laser
 Microgravity experiments often have a strict power and size budget
 ORKA aims to reduce the required Laser power by multiple orders of magnitude by exploiting the high-power light field in a high finesse cavity

Bremen Drop Tower facilities

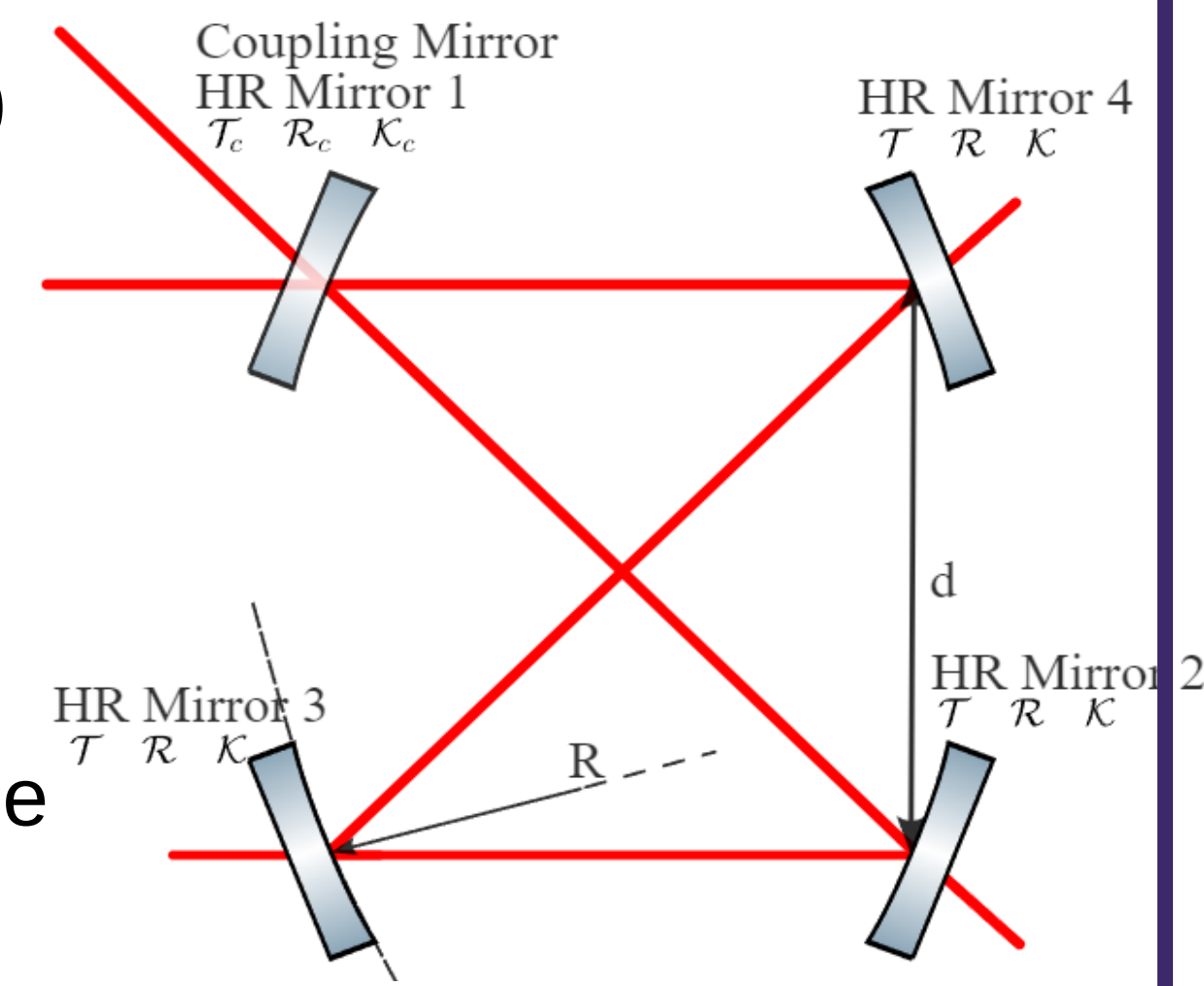
Drop Tower: 4.7s μ g (9.3s with catapult), 3 drops/d, 10^{-6} μ g quality, up to 50 g deceleration
 Gravi Tower: up to 2.5s μ g, 20 drops/h, 10^{-4} μ g quality, up to 5 g deceleration
 Payload dimension: 0.6 m x 1.78m (Drop Tower)/ x 1.017 m (Gravi/Catapult)
 Previous success of PRIMUS (dipole trap) and QUANTUS (chiptrap) for BEC generation, with PRIMUS being the heritage project to ORKA

Experiment capsule



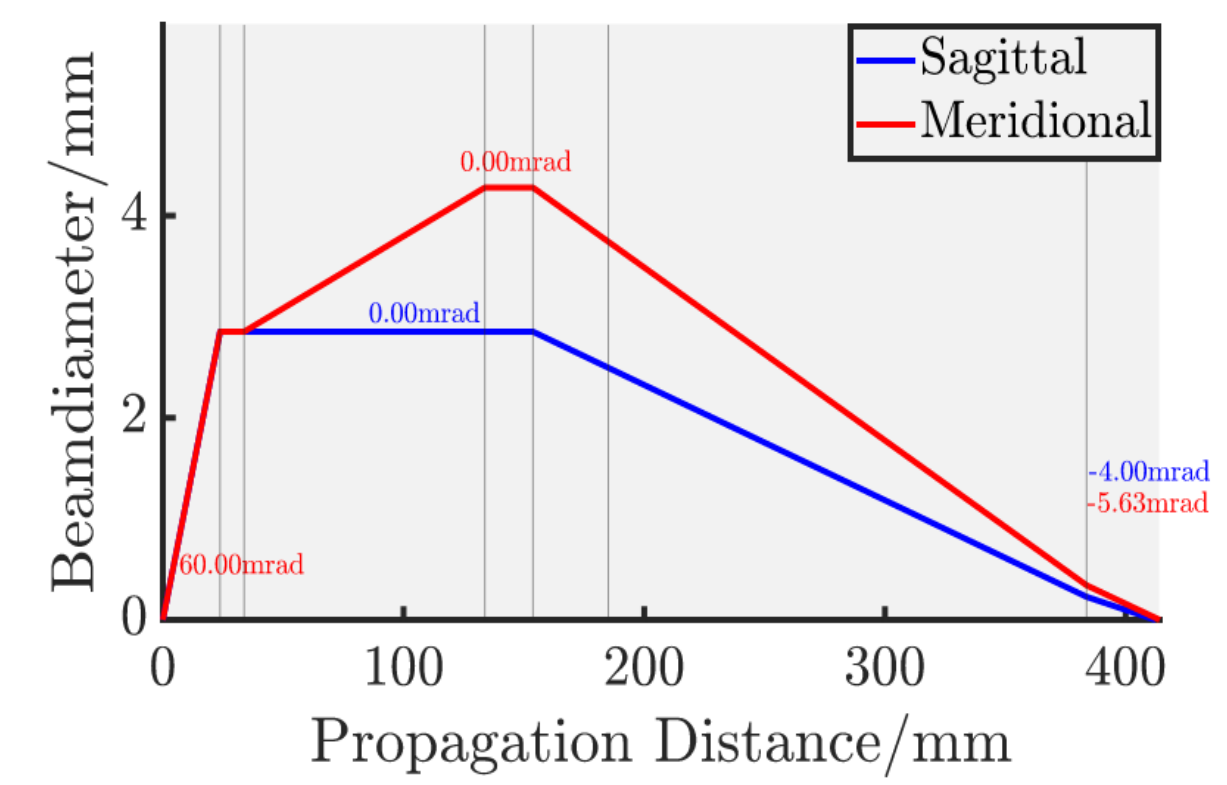
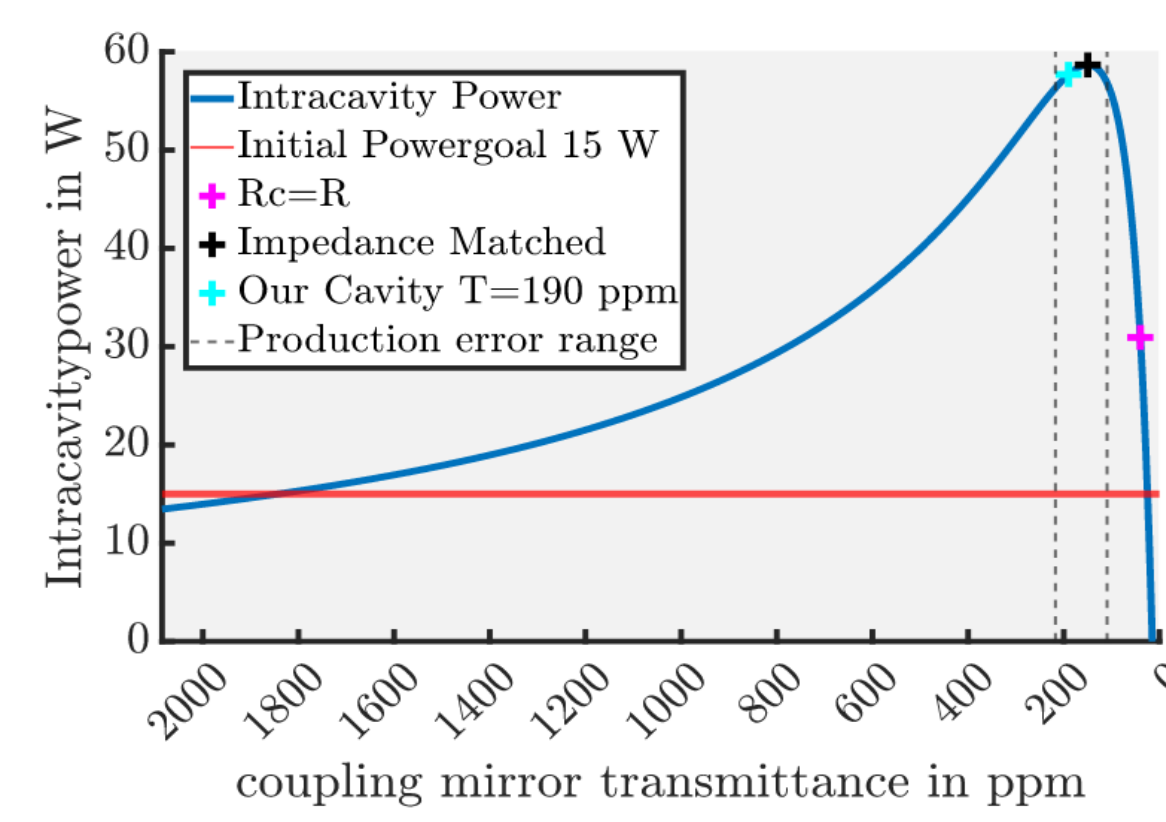
The bow tie cavity

Super polished SiO_2 ($R_q < 0.2$ nm)
 Finesse: 18k
 Power factor: 7.25k
 Free spectral range: 1.44 GHz



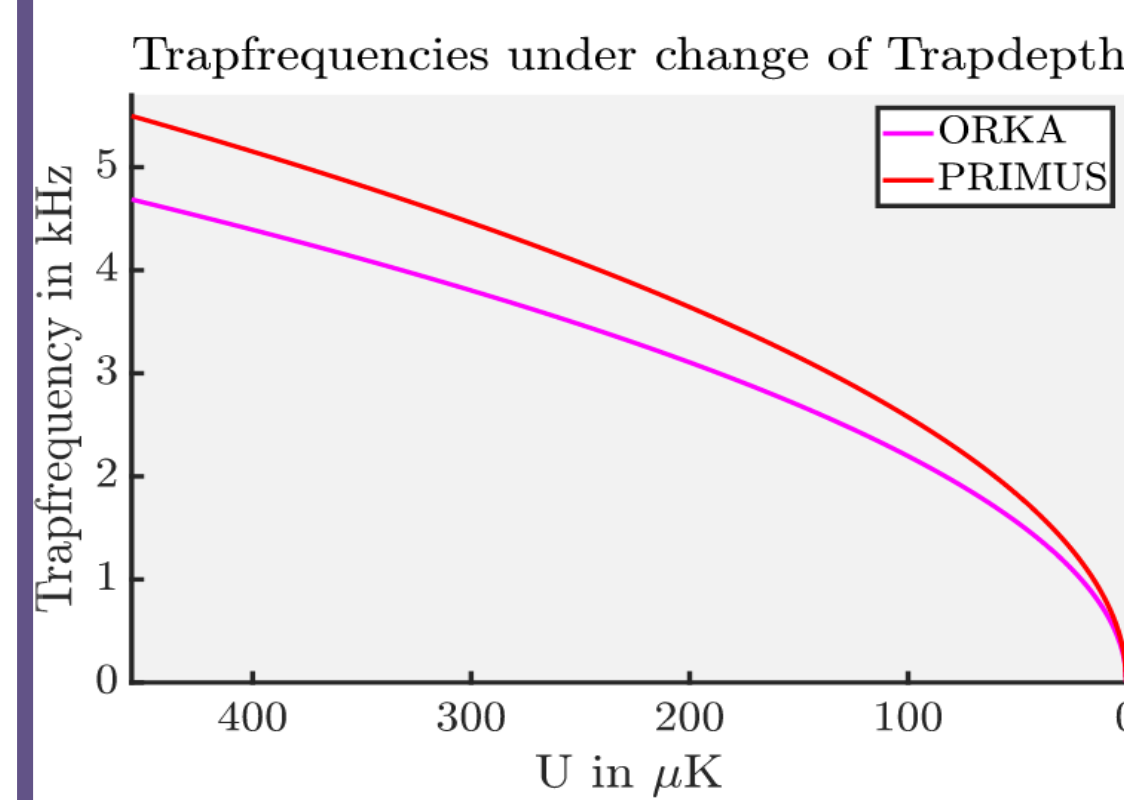
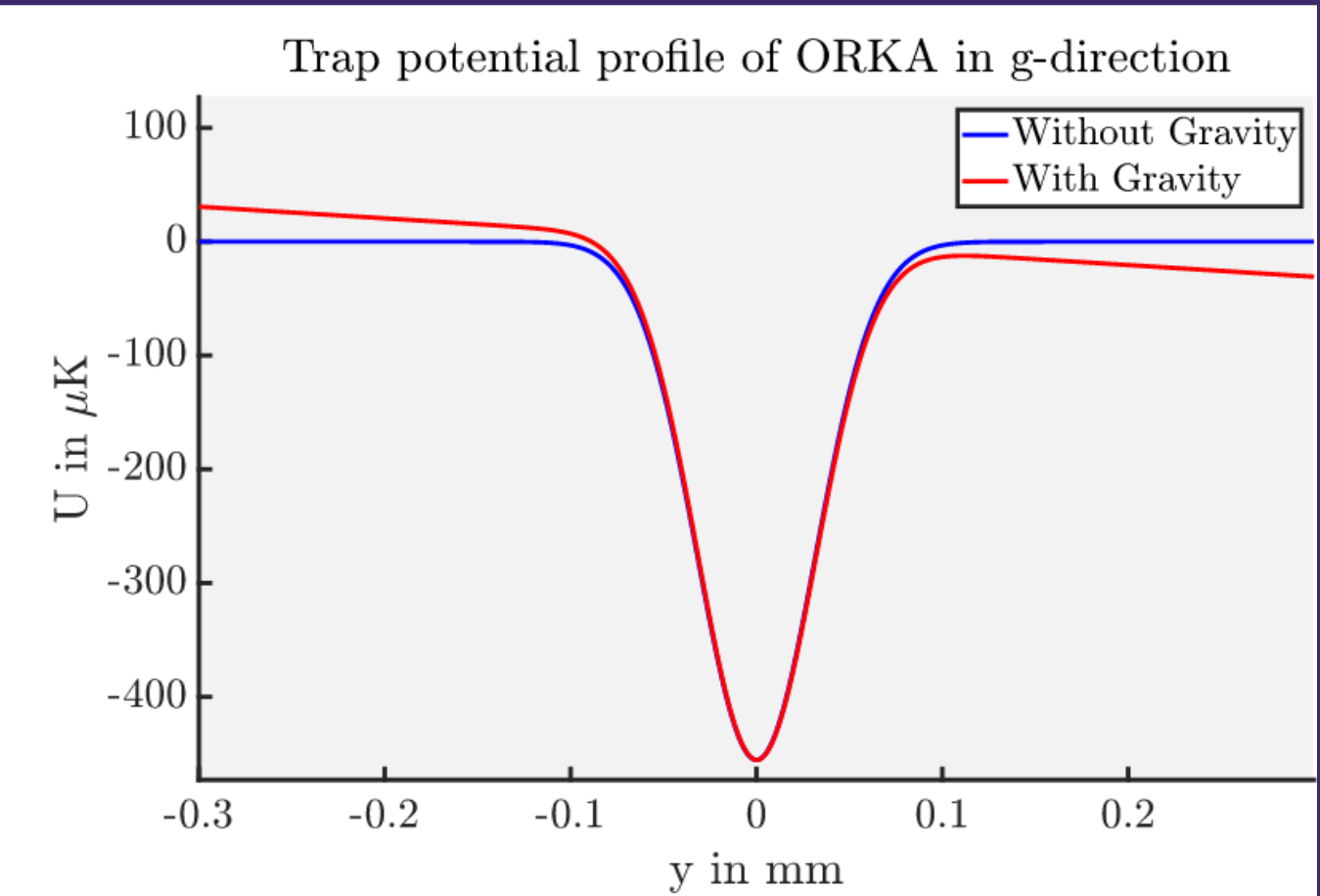
Impedance matched
 Mode matching with 2D telescope

Coated for 1064 & 780 nm



Dipole Trap

Input Laserpower: 2 mW
 Resulting Trapdepth: 455 μ K
 Trapfrequency: 4.68 kHz
 Trapdiameter: 63/87 μ m



Similar ramping behaviour to PRIMUS for evaporative cooling

Great potential for BEC preparation

After BEC preparation: Near resonant experiments with 780 nm

Laserpower can be increased for ultra-deep traps

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