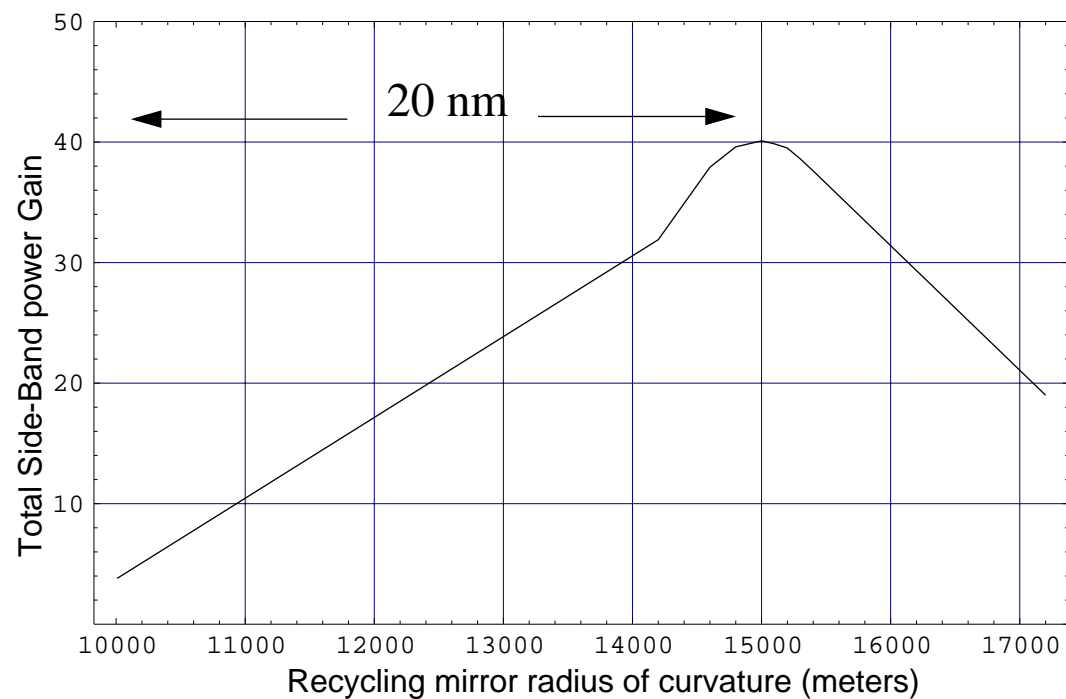


LIGO I
thermal
compensation



	Optic	Absorption		BS Power	h (200 Hz) (Hz ^{-1/2})	Δ ITM sag
		Substrate	Coating			
LIGO I	Fused Silica	5 ppm/cm	0.5 ppm	200 W	3 x 10 ⁻²³	20 nm
LIGO II	Fused Silica	1 ppm/cm	0.5 ppm	2 kW	4 x 10 ⁻²⁴	100 nm
LIGO II	Sapphire	40 ppm/cm	0.5 ppm	10 kW	10 ⁻²⁴	500 nm

Can we manage > 100 nm thermal distortion?

- Thermal Compensation: CO₂ laser or ring heaters
 1. Noise coupling
 - Feedthrough of heating noise to cavity length noise
 2. Is control loop necessary for large distortion?
 - For 80 ppm/cm sapphire, 2% power variation may throw IFO out of lock

- Alternate sensing schemes less sensitive to distortion
(Melody: will work for 100W power, 20 ppm/cm absorption)
 1. No sidebands for gw signal (offset locking)
 - 1st order sensitive to AM on light
 - other dof's?
 - test on LIGO I
 2. Arm cavity resonant sidebands
 - increased complexity of sensing matrix
 - alignment sensing?
 - test at ACIGA high power facility?