

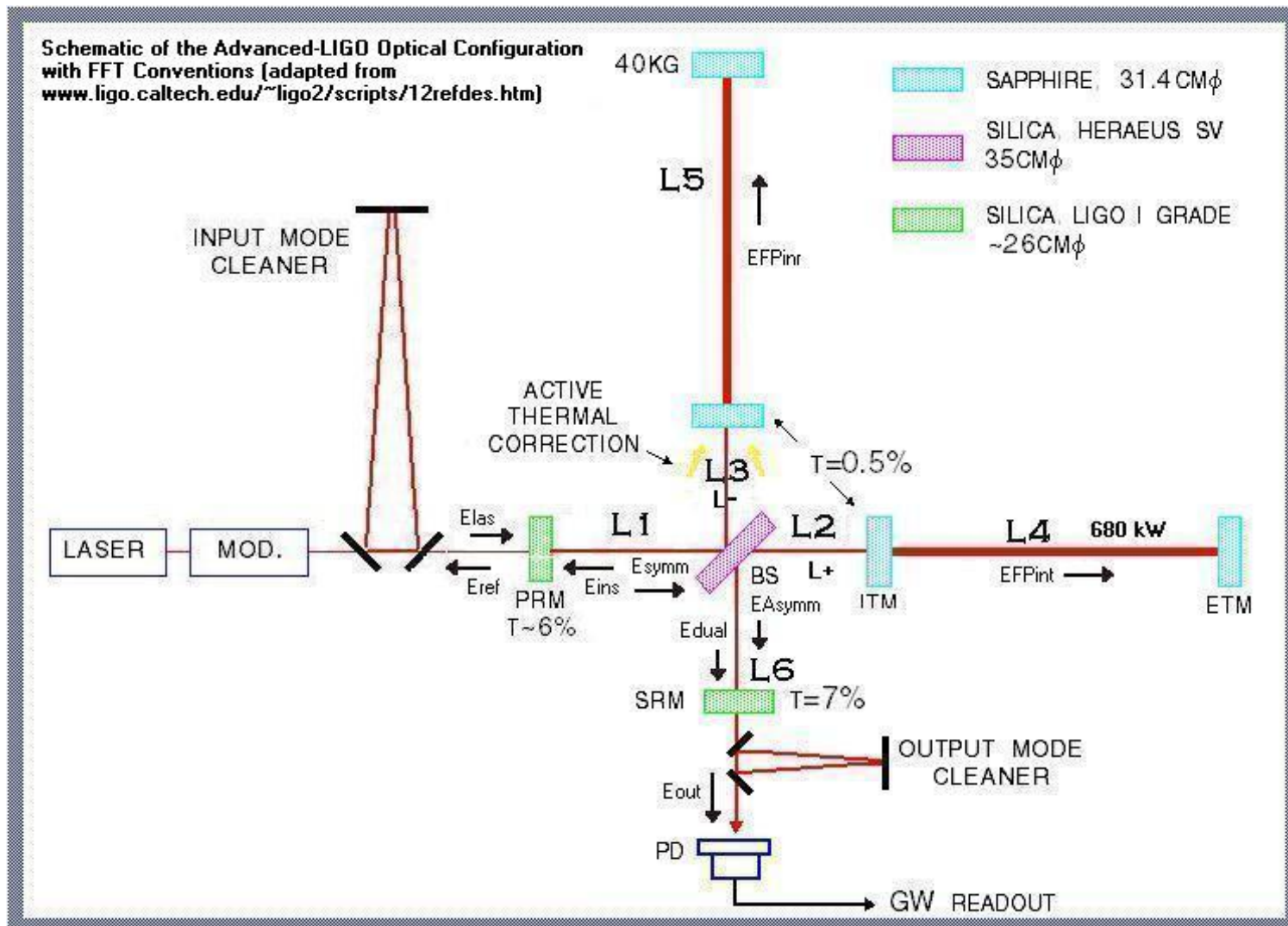


**New FFT Simulations for Advanced LIGO and the 40m  
With Real-Imperfect Optics Including GW Sidebands  
By Kenneth Ganezer, George Jennings, and Sam Wiley,  
CSUDH**

**Elementary Particles and Relativity Group  
Talk by K. Ganezer**

**Lasers and Optics  
Working Group  
LIGO Scientific Collaboration Meeting  
Hanford LIGO Observatory (HLO)  
August 20, 2002**

# ADVANCED LIGO SCHEMATIC WITH FFT FIELDS AND LENGTHS



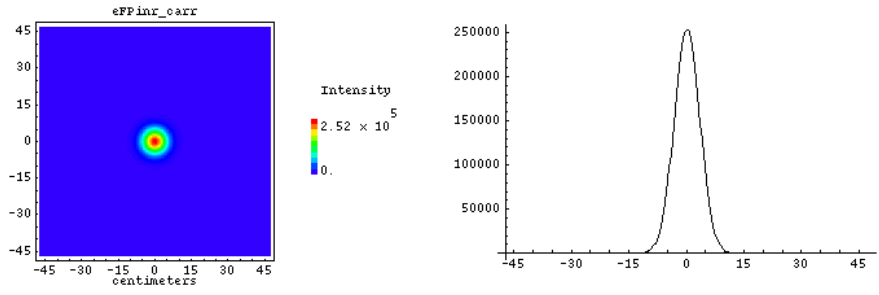
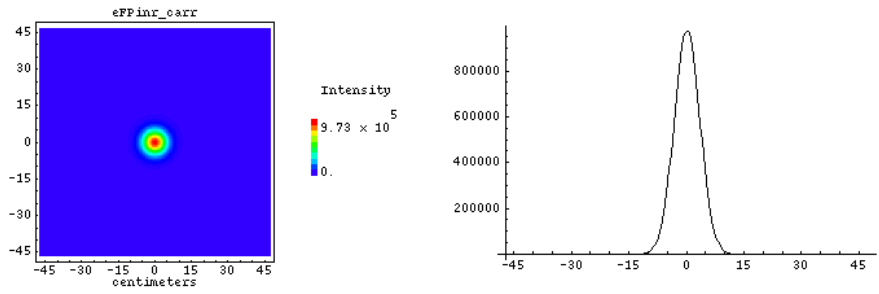


Figure-1a. Electric Field Intensity Map and Profile for the carrier in the FP arm on the reflective side of the BS. Perfect on top D= 2.66 nm on Bottom

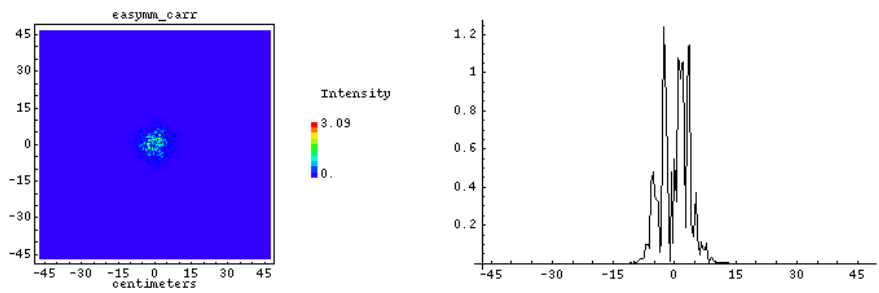
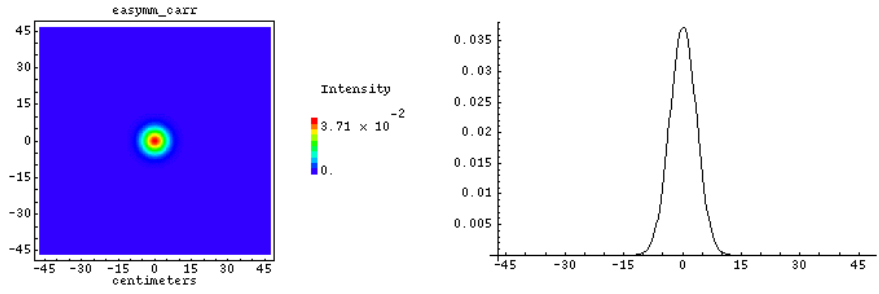
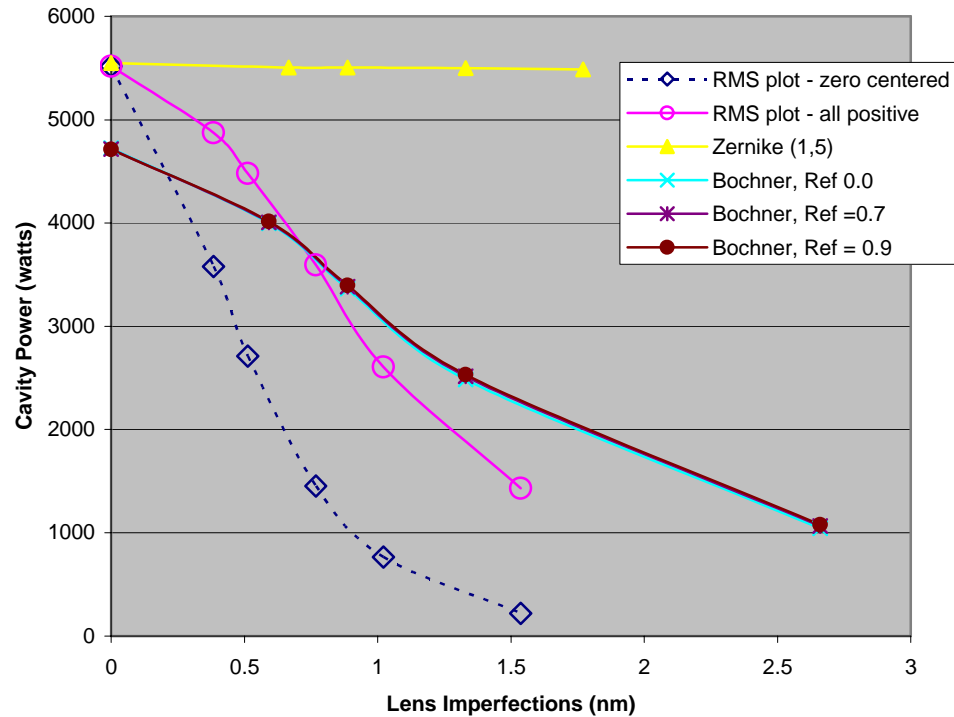


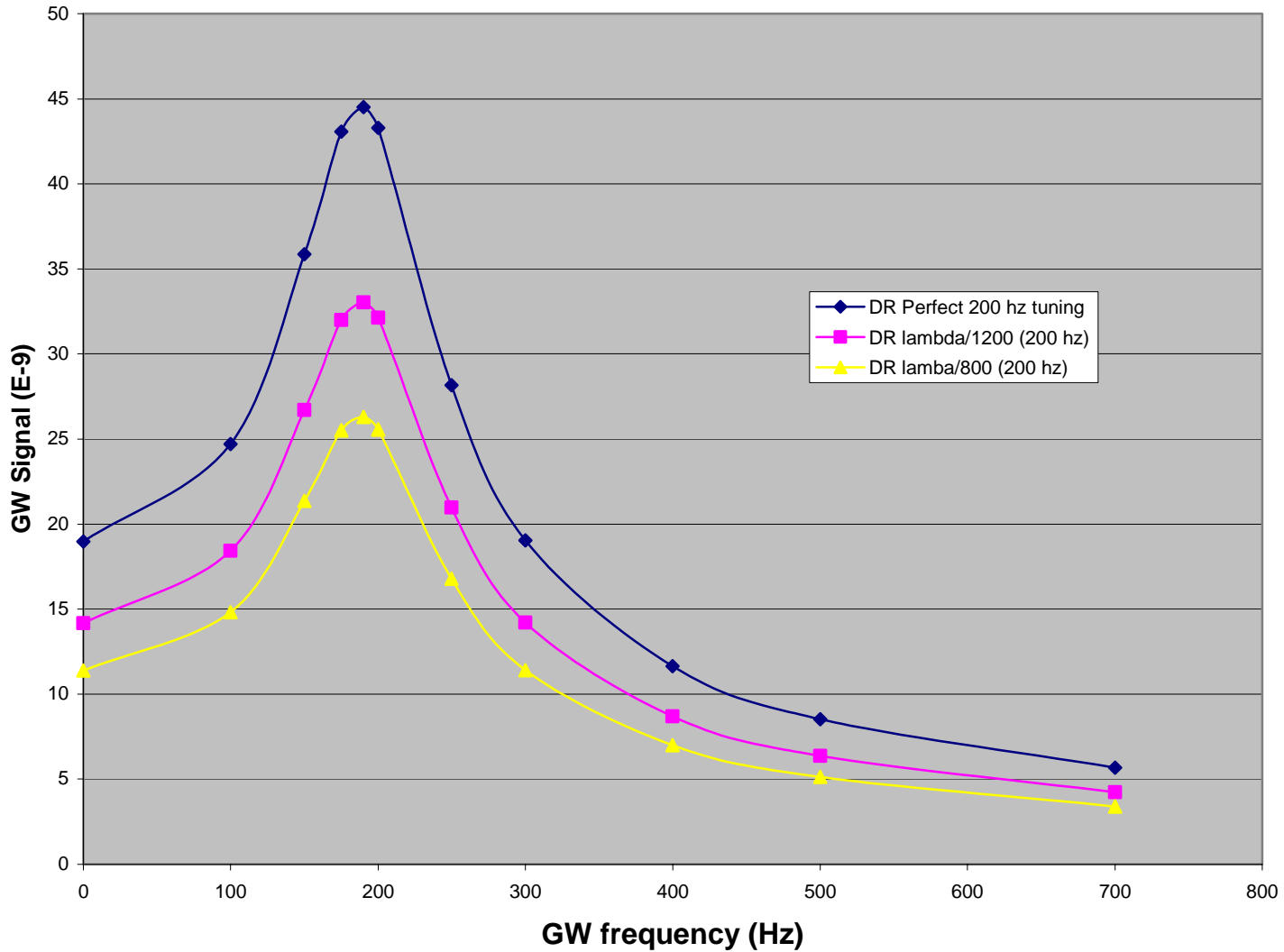
Figure-1b. Intensity at the asymmetric port of the BS, Top is Perfect case bottom is D=2.66 nm

F-P Cavity Power



Advanced LIGO FP-Arm Power versus RMS for Various Types Phase Deformations of Surfaces and Substrates including 1. Zernicke Polynomials (ROC, Astigmatism, Coma) 2. Random (Uniformly Distributed) Pixel by Pixel ( 3 mm x 3mm pixels; rough surface). 3. Real Phase Maps of Bochner.  
LIGO-G020353-00-Z

# GW Signal vs Frequency

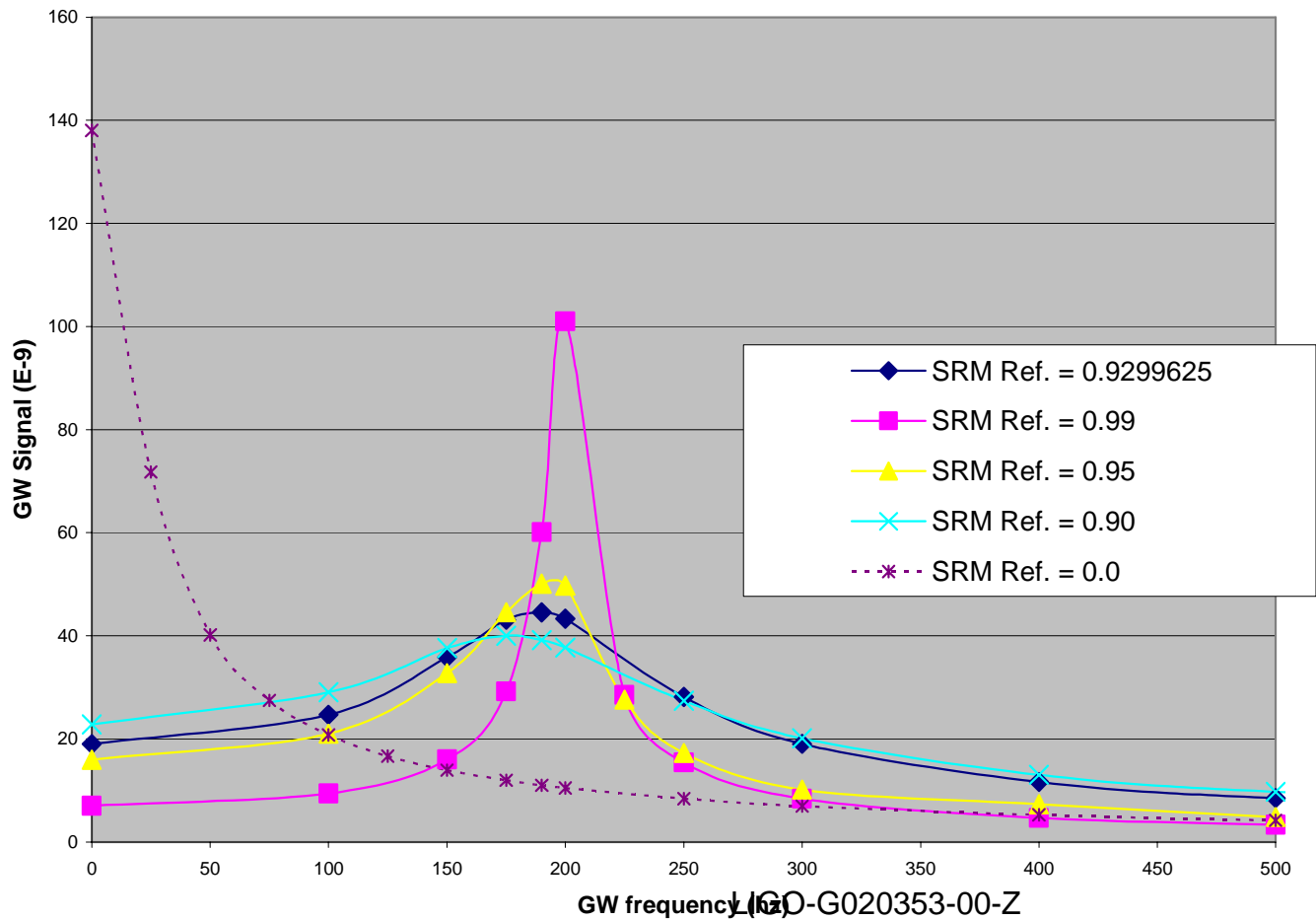


Advanced LIGO GW-AMPLITUDE IN  $\sqrt{W}$  per W of CARRIER AT EXITING SRC for  $h_{amp} = 10^{-21}$  AND SRC Tuned to 200Hz For Random Pixel Phase Deformed Mirrors

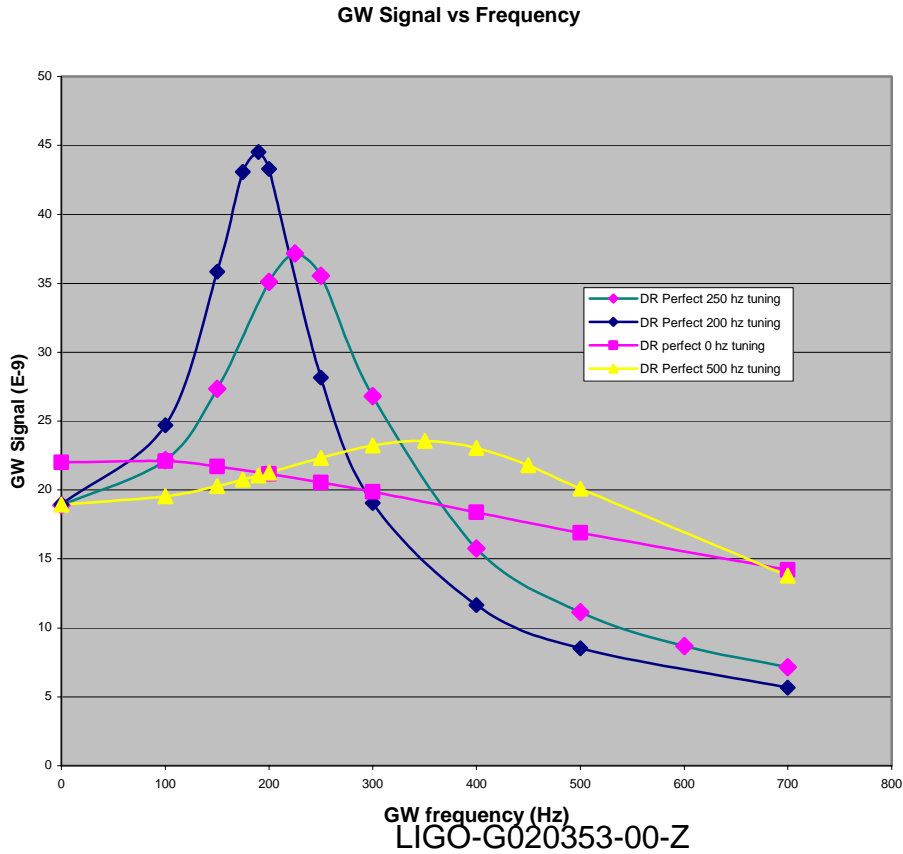
LIGO-G020353-00-Z

# GW Signal in Advanced LIGO with Various SRM Reflectivities For Perfect Mirrors

GW Signal vs. frequency



# GW Signal for Various Tuning Frequencies of the Signal Recycling Cavity



**GW-Amplitude for Upgraded Caltech 40m IFO with SRC tuned to 200 Hz and h=strain amplitude=10<sup>-21</sup>**

