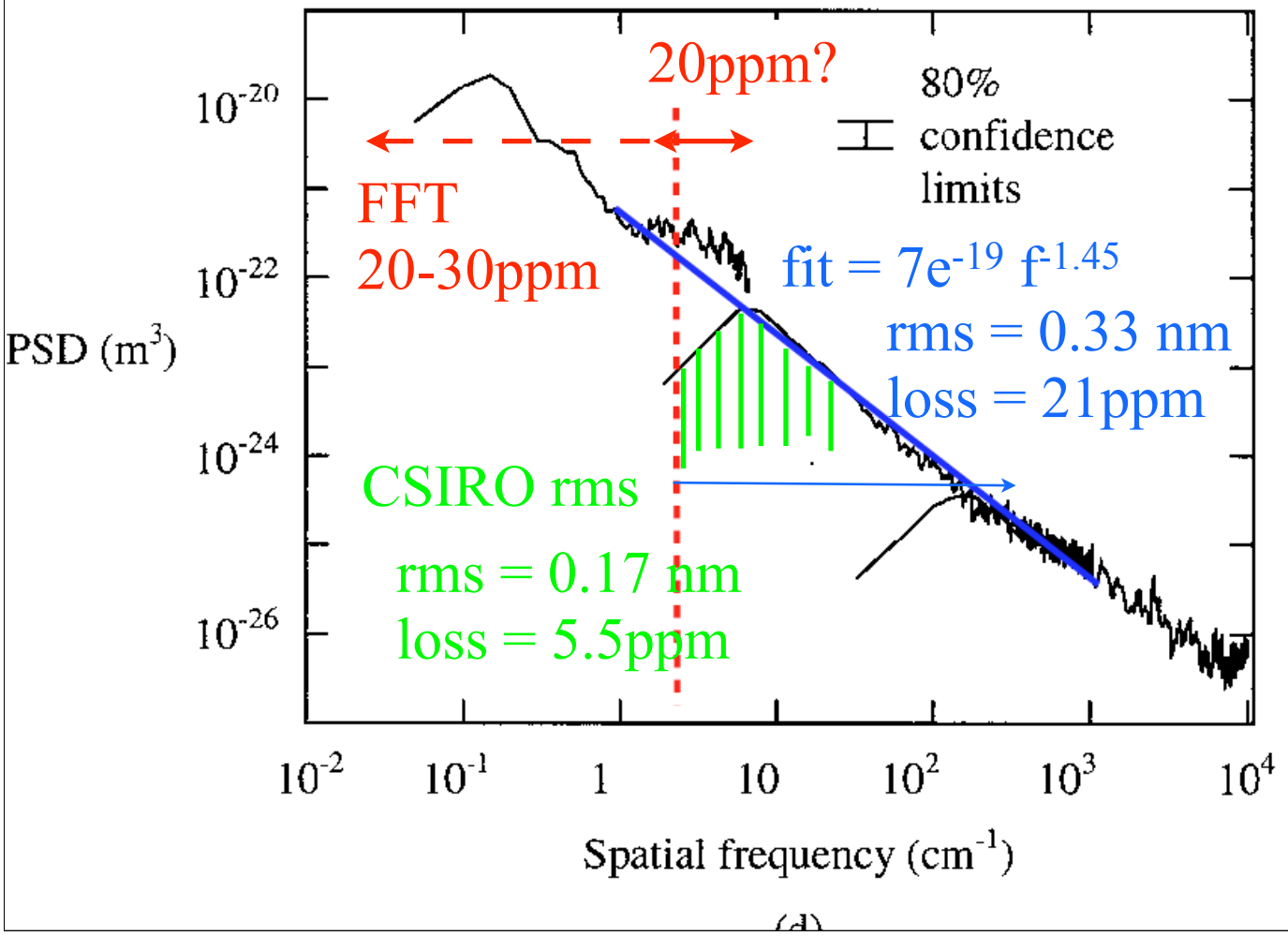
LIGO

$$loss = C(\frac{4\pi\sigma_{1D}}{\lambda})^2$$

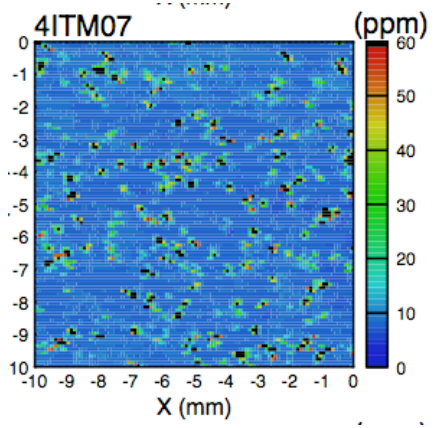
1D PSD

($C_{1D->2D}$=1.2)

3.8cm^{-1}

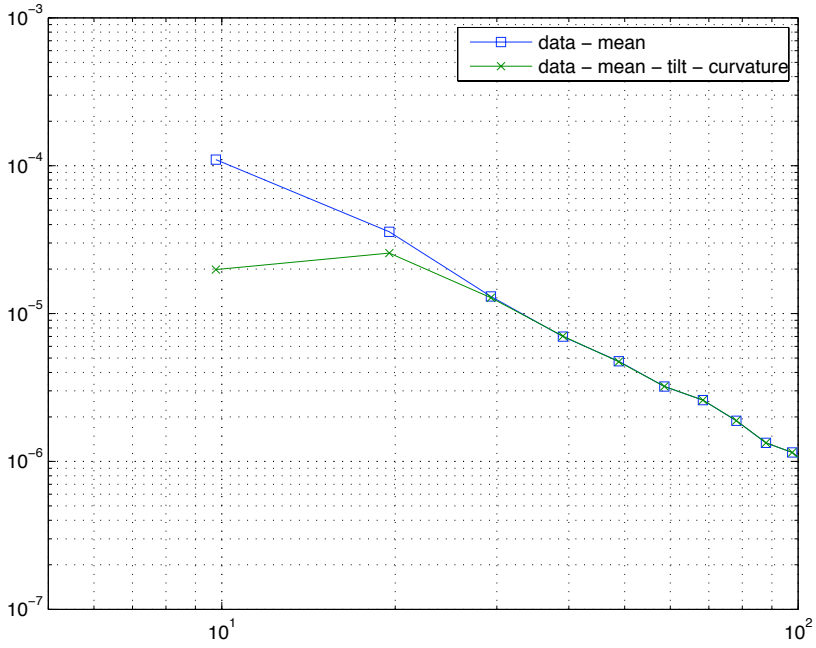


+ 10 ppm
non smooth
scattering



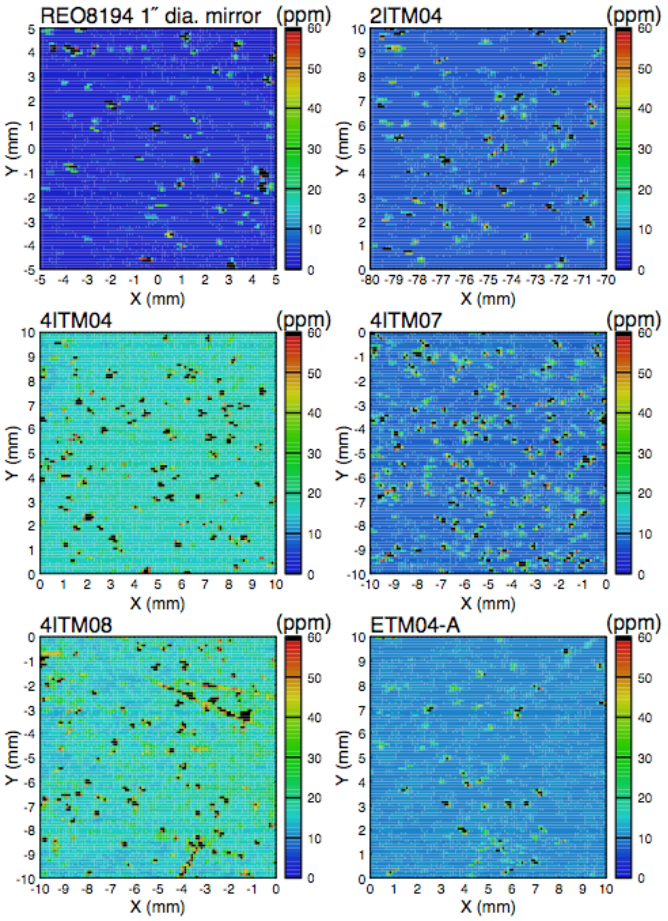
CSIRO RMS

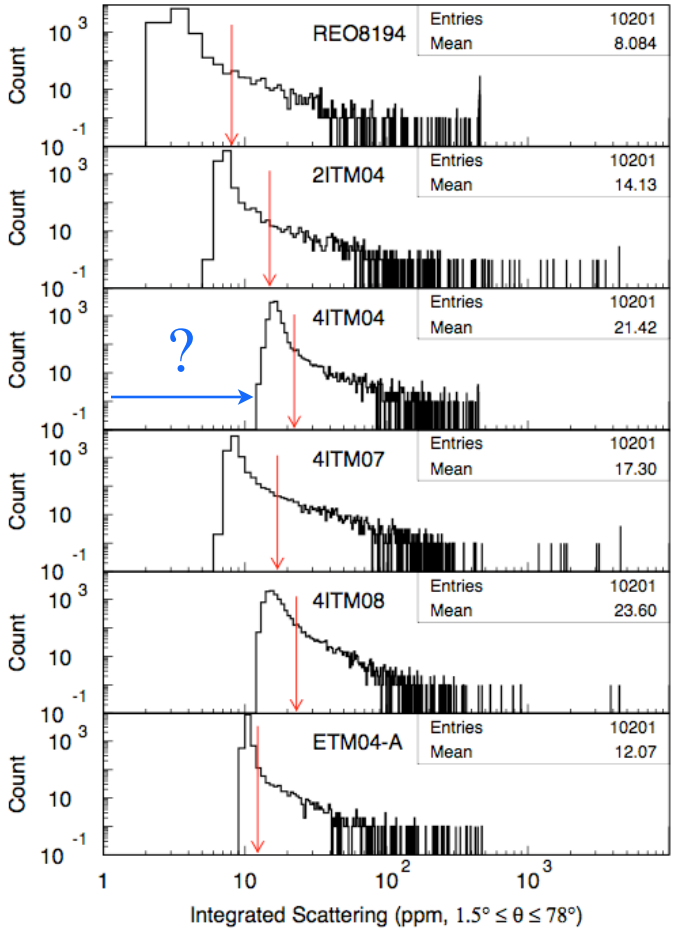
- 1d topo data - tilt - curvature using 1024 data points
  - » rms = 0.17nm
- generate data using spectrum f^{-2}
  - » rms = 0.12 using raw data
  - » rms = 0.064 using data with tilt and curvature subtracted
- loss ~ rms^2



LIGO

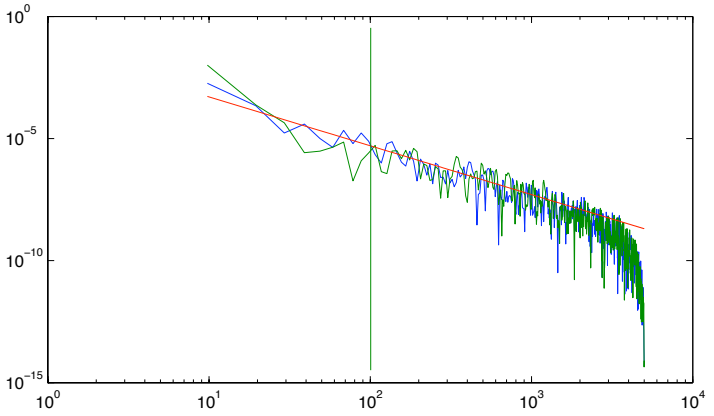
Integrating sphere data

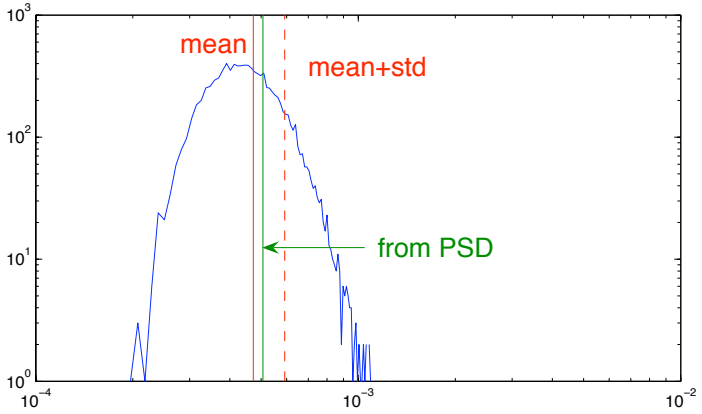


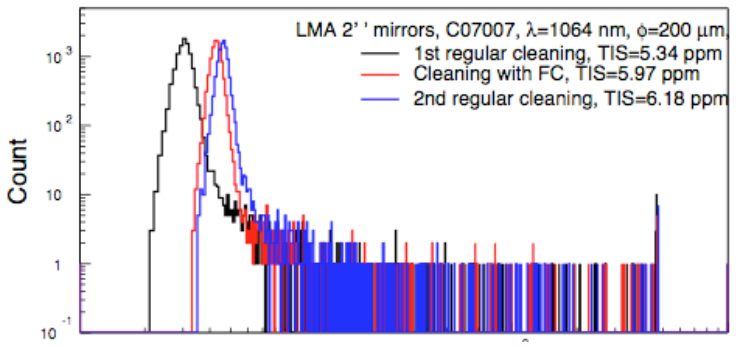


Integrating sphere data

- Statistical variation explains threshold behavior
  - » 2 examples in Fig.1
- energy sum with k>100
  - » mean = 4.7e-4
  - » rms = 1.2e-4
  - » $\int PSD = 5.1e{-}4$

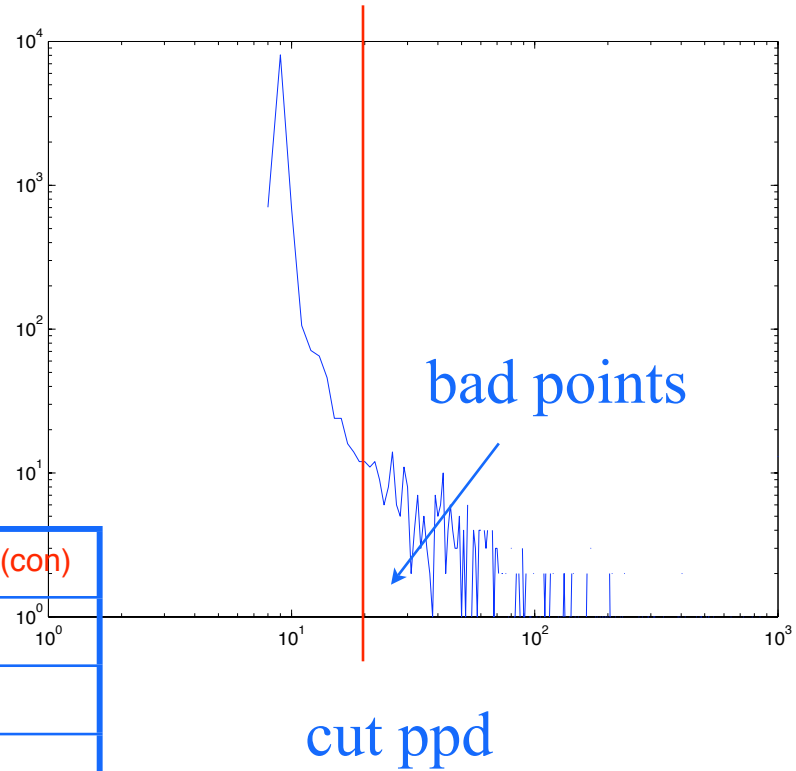






Anomalous loss

- 2ITM04
  - total of 10201 data
  - mean(all)=16, std(all)=109
  - bad points 362 with loss>20ppm
  - mean(bad)=193, std(bad)=556
  - mean(con)=193 * 362/10201=7 ppm

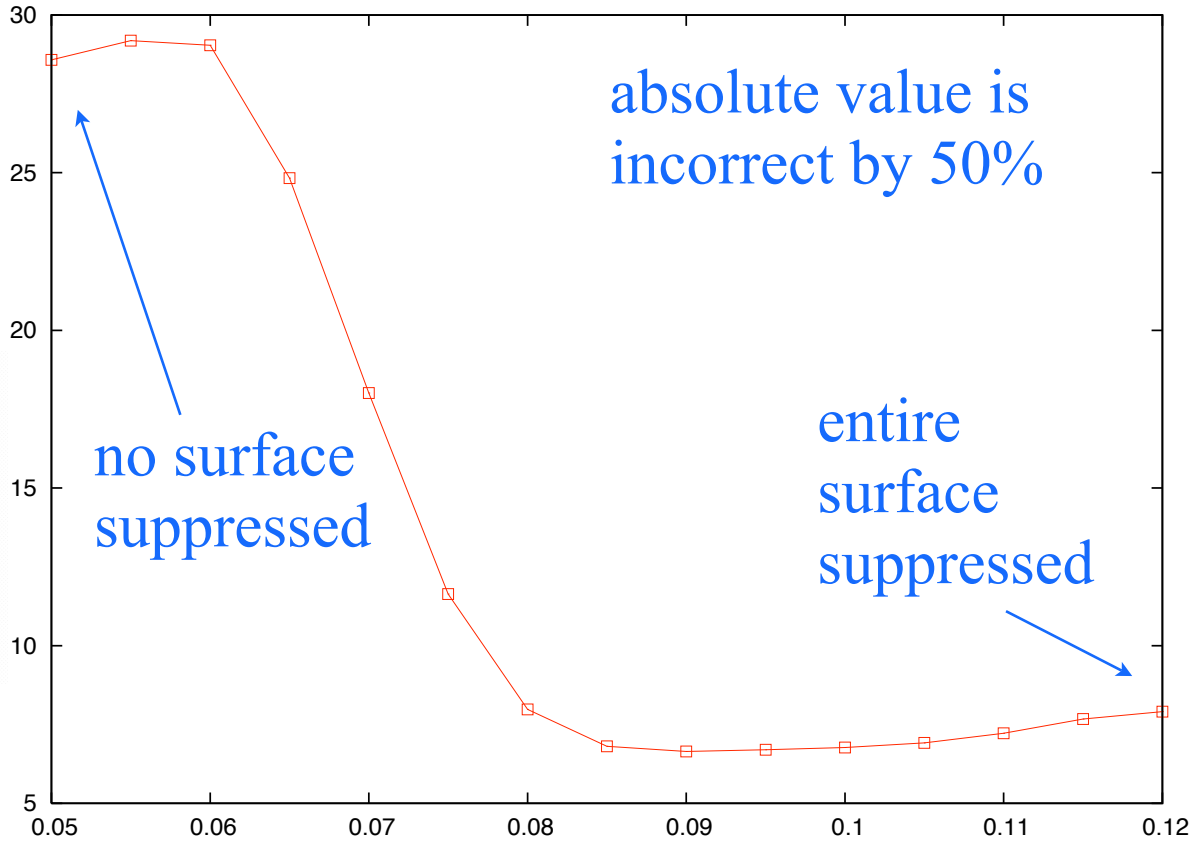


	cut ppd	bad points	mean(all)	mean(bad)	mean(con)
2ITM04	20	362	16	193	7
4ITM04	30	613	23	95	5.7
4ITM07	20	882	18	105	9.1
4ITM08	30	936	25	91	8.3
ETM04A	15	356	12	53	2

Which part of the mirror contribute

loss per mirror in ppm when the central region is suppressed by 0.5

scale by 0.5



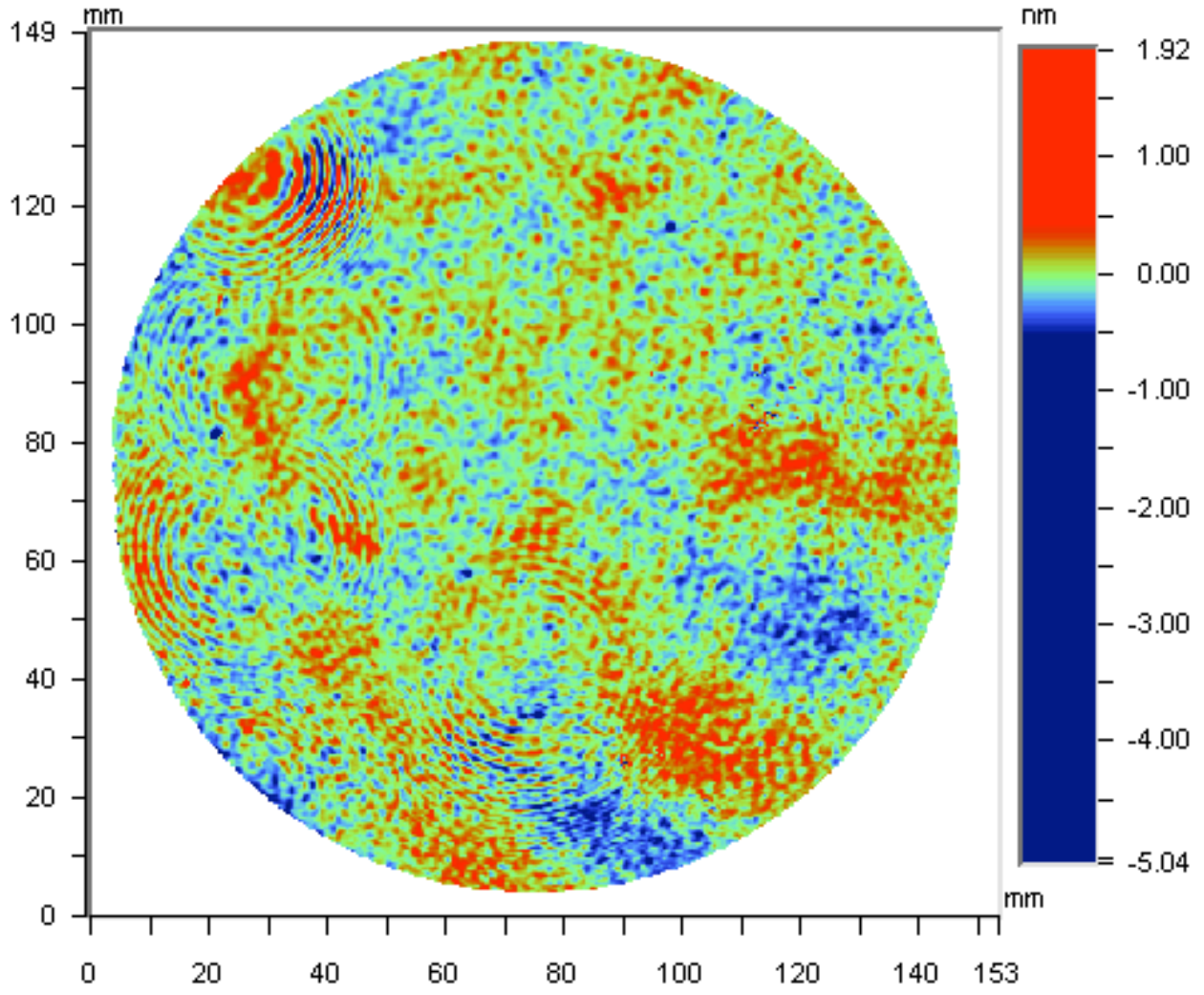
Orange peel
- psd shows bumps at ~0.3 cm -

loss ~ 2.4 ppm

new FFT grid size
= 0.14 ~ 0.28cm

loss ~ 1.3 ppm x 2

old FFT :
loss(35cm/256) -
loss(35cm/128)



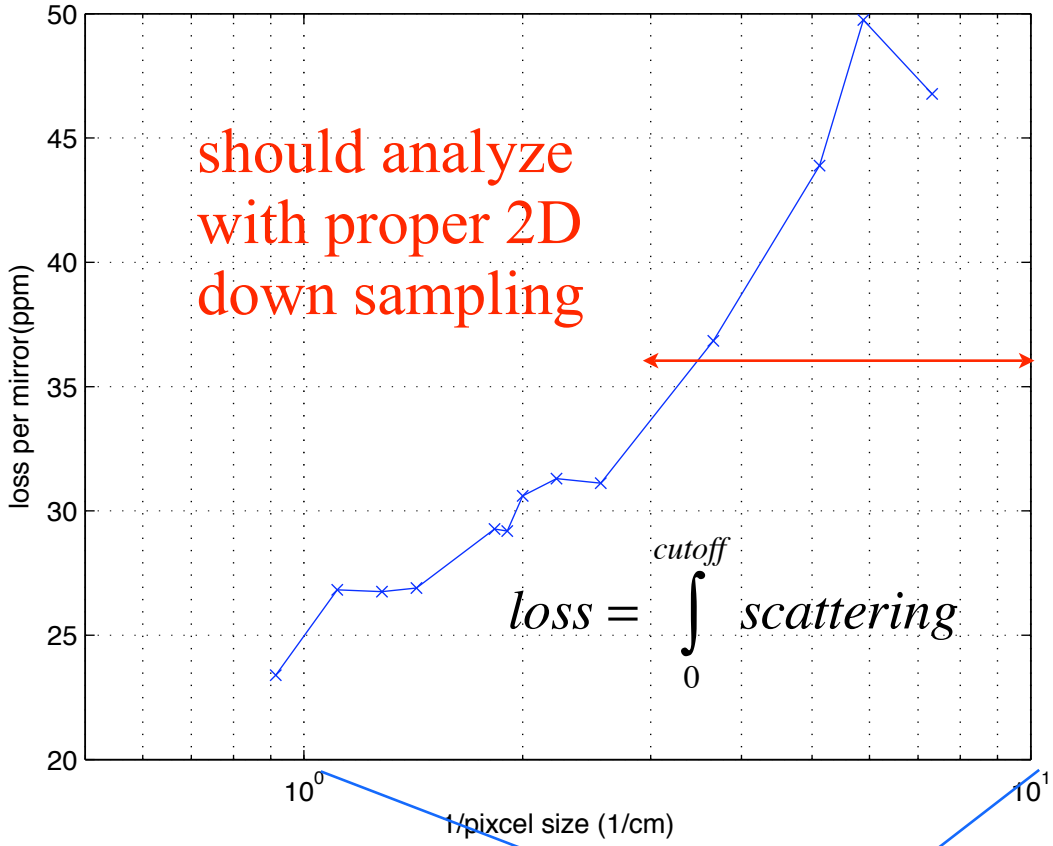
G060572

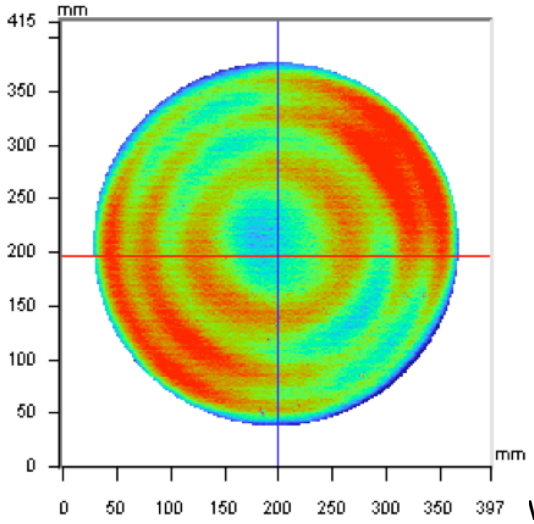
LIGO

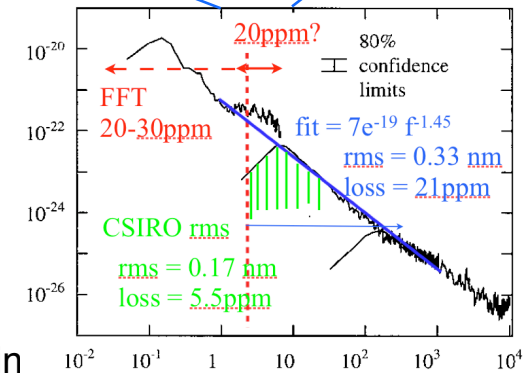
loss pe size or

Loss calculated using a bin size : assume no loss with spatial frequency longer than 1/bin size

loss(1/bin2) - loss(1/bin1)
= loss coming spatial freq between 1/bin2 - 1/bin1







Loss per mirror

rms = 1nm vs 0.5nm