Coatings: what's possible

R. Bassiri, E. Gustafson, G. Cagnoli, and many others...

GWADW 2016 - Elba

Coatings: what's possible

- Now:
  - Change in e.g. titania doping to increase refractive index:
    - Possible some other dopant to same affect
    - LMA have coating with ~ 6% TN reduction

  - Multi-material a-Si for ETMs:
    - a-Si buried in the lower layers of the HR stack
    - @1064 ~ 20% TN reduction

Coatings: what's possible

- What's possible in 1 – 3 years:
  - Elevated temperature deposition
    - Makes lower loss on a-Si coatings
    - Postulate lower loss in traditional oxides
  - Higher temperature annealing before crystallization reduces loss
    - Nano-layer Titania-Tantala coating
    - Zr:Ta_2O_5 (does not crystallize at 700C – loss under investigation), other dopants/oxides?
- What's possible in 3 - 5+ years (if the right MBE and 2 people are available)
  - AlGaAs
    - Low loss, low absorption, low scatter loss in small cavity
    - Need to scale to large area – study absorption, scatter, uniformity, **figure error**
  - AlGaP – proven low loss – other parameters need further study

Coatings: what's possible

- By Dec 2016, we will likely know whether loss can be reduced by elevated temperature deposition on IBS tantala

- We will have a better idea on whether loss can be reduced by:
  - changes in deposition rate
  - ion-assisted deposition

- Structure to thermal noise understanding converging
  - Mechanical loss modelling will work with experimental characterization
  - Predictive capability possible