OP1/IRMSWG Meeting Agenda DSS 2013 10:00-11:30 AM

- Introductory Remarks
  - Gary Wiese (Lockheed Martin/OEOSC)
  - Dave Aikens (Savvy Optics/OEOSC)
- NIST Update
  - John Burnett (NIST)
- **Sampling Protocols**
  - **Adam Phenis (SAIC)**
- Review of ISO 17328
  - Eric Stover (M3)
- Refractive Index Sample Fab Tolerances
  - Gary Wiese (Lockheed Martin/OEOSC)
- Material Survey Results
  - Gary Wiese (Lockheed Martin/OEOSC)
- Materials Metrology Instrumentation
  - Nathan Carlie (Schott)
- Prism Coupler Capabilities
  - Amy Qiao (PNNL)
- Group Discussion

IRSMWG Sampling Protocols

Adam Phenis

SAIC

Goal

The goal of the sampling protocol is to come up with a procedure/s to identify how to sample the various materials to determine the desired optical and mechanical properties.

- It is important to note that there can be differences between each material based on the material supplier and their various recipes/techniques
- The bottom line is that this protocol has to be flexible

Strawman Protocol

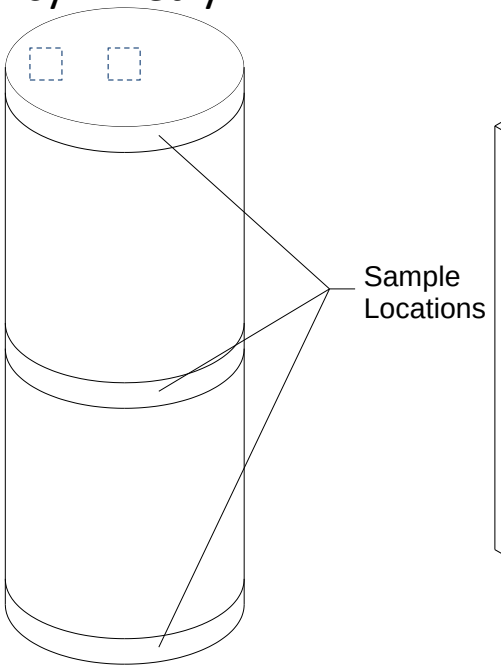
- Protocol for each different material category – Potentially
- The protocol will survey the material lot to be able to show uniformity
  - If after enough statistical samples, the uniformity is shown to be consistent, the survey set could be reduced to save on cost
- Example protocol
  - For CZ Si, single boule with 6 samples, 3 from the center with resistivity's of 5, 20 and 40 ohm-cm and then 3 that are some distance out, i.e. 3", from the center at each of those locations where the center samples came from
    - Repeat above for another boule from this manufacturer made the exact same way to determine repeatability. Ideally, the samples used would be much more, but, depending on funding, the second set could just come from center samples.
    - Then repeat for each manufacturer

Material Categories and Manufacturing Techniques

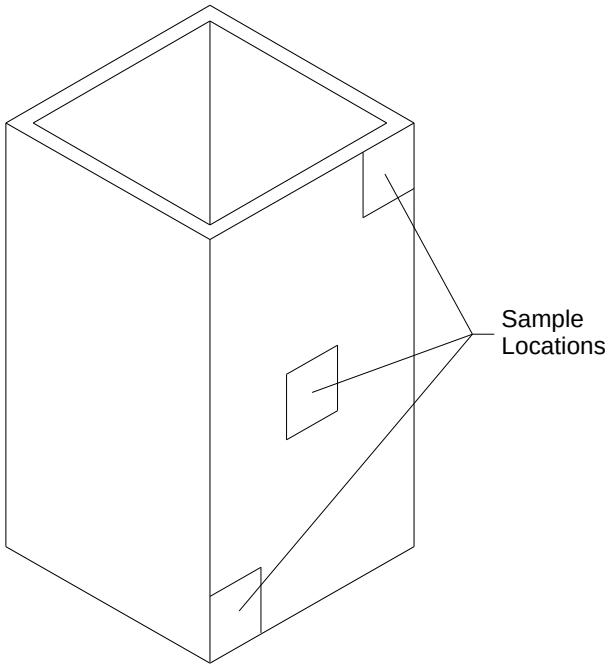
- Material Categories
  - Crystals
  - CVD
  - Chalcogenides
  - Hard (ALON, Spinel, etc)
- Manufacturing Techniques
  - Crystal Techniques
    - Czochralski
    - Floatzone
  - CVD techniques
    - Pressure variations
    - Assistance variations
  - Chalcogenides
    - Amorphous
    - CVD
  - Hard
    - Pressure baked???

Sample Locations

Assumes radial symmetry



Czochralski



CVD

Chalcogenide

????

Hard

????

Example Protocol

- For CZ Si, single boule with 6 samples, 3 from the center with resistivity's of 5, 20 and 40 ohm-cm and then 3 that are some distance out, i.e. 3", from the center at each of those locations where the center samples came from
  - Repeat above for another boule from this manufacturer made the exact same way to determine repeatability. Ideally, the samples used would be much more, but, depending on funding, the second set could just come from center samples.
  - Then repeat for each manufacturer

Material manufacturers – Please tell me what I am getting wrong?

Questions/Comments

- Material manufacturers – Please tell me what I am getting wrong?
- Material Manufacturers –
  - Where do you have your difficulties?
  - Does your process vary lot to lot?
- We want you feedback on this…