<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Seely</td>
<td>ARTEP</td>
<td>High Res Hard Xray Spectroscopy at Titan</td>
</tr>
<tr>
<td>Jim Weaver (for Yefim Aglitsky)</td>
<td>NRL</td>
<td>High Resolution Spectra of He-like Fe for ICF</td>
</tr>
<tr>
<td>Patrick Ross</td>
<td>NSTec</td>
<td>Opacity Spectrometer</td>
</tr>
<tr>
<td>Ken Hill</td>
<td>PPPL</td>
<td>Stark broadening of Kr He-(\beta) lines for electron-density measurement on NIF</td>
</tr>
<tr>
<td>Taisuke Nagayama</td>
<td>SNL</td>
<td>Numerical scrutiny of SNL iron opacity experiments</td>
</tr>
</tbody>
</table>
Taisuke Nagayama (SNL) “Numerical scrutiny of SNL iron opacity experiments”

- Plasma (Fe/Mg) Self Emission
- Tamper Transmission Difference
- Time and space integration effects

Systematic uncertainties associated with the concerns are numerically investigated
Patrick Ross (NSTec) Opacity Spectrometer (for NIF Opacity platform designed to replicate “Z” experiments)

NIF Opacity Platform uses a capsule backlighter and a time-integrated spectrometer

**Description of the NIF Opacity X-Ray Spectrometer (OpSpec)**

The OpSpec is a crystal spectrometer snout designed to be fielded on a DIM in NIF. (Self-contained snout)

Time-integrated X-ray spectroscopy will be performed on NIF with OpSpec. (Time-resolved opacity measurements using a pulsed backlighter X-ray flash of ~500 ps)

<table>
<thead>
<tr>
<th>OpSpec Design Specifications/Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dispersion Element</td>
</tr>
<tr>
<td>Spectral Coverage</td>
</tr>
<tr>
<td>Resolving Power</td>
</tr>
<tr>
<td>Data Collection</td>
</tr>
<tr>
<td>NIF Usage</td>
</tr>
</tbody>
</table>

**OpSpec Design Parameters**

- **Film Length**: 173 mm
- **Resolving Power**: >800
- **Crystal**: KAP
- **Crystal Radius**: 75 mm

NEW
John Seely (ARTEP) High Res Hard Xray Spectroscopy at Titan

- New type of high-resolution transmission crystal spectrometer

- Diffraction from quartz (301) planes
  - Crystal cut so (101) planes are perpendicular to crystal surface
  - The (301) planes are 23.51° to the (101) planes
  - Diffracted x-rays emerge almost perpendicular to back surface of crystal
    - excellent focusing
    - minimal aberrations from bending crystal

From measured linewidth, and taking all contributors into account, deduce that
The intrinsic Lorentzian broadening of the (301) planes is 0.4 eV FWHM.

Compact: 0.5 m Crystal to Detector

2014 – concept presented
Jim Weaver for Yefim Aglitsky (NRL) “High Resolution Spectra of He-like Fe for ICF”

The measured spectra will serve as a benchmark to the 9th Non-LTE Code Comparison Workshop, Dec 2015, Paris, France

This work is new

0.6 keV to 24.8 keV
Ken Hill (PPPL) High Resolution spectrometer to measure Stark broadening of Kr He-β lines for electron-density measurement on NIF

Optical lay out:
• Fit in Stay out zone of DIM
• Do not block 7o ports

Determine pattern of rays hitting photocathode as function of where they hit crystal

Graphing the x-ray paths in our IDL program allows study of the crystal clearance for different values of L

• Examine different crystals ex: Ge (220), Ge <111>
• Examine different bending cylindrical (von Hamos) conical

THIS is new
2014
K Hill presented Hi Res (but not in DIM)
J Koch presented Johann design

X-ray intensities from equal areas of crystal are concentrated toward center of detector in the conical crystal geometry

• Match crystal height to photocathode
• affects thru put

• Kr Heβ, 15.43 keV, ΔE=400 eV or 1.4 keV, Ge (220), θβ=11.6°, ΔθRC~ 41 μrad, ΔE_{RC}=3 eV

• Cylindrical
  — Rays from 2-cm high crystal (Ω ~ 1.3 x 10^6 sr ) fit within a 400-μm slit
  — Energy spread over 100-μm detector "pixel": 5.5 eV (-> 6.25 eV total)
  — High quality concave cylindrical lenses are available as substrates

• Conical
  — Rays from 2-cm high crystal fit within a 200-μm slit
  — Narrow spatial peak will provide better time resolution with DISC
  — Energy spread over 100-μm detector “pixel”: 7.5-9 eV for 100-μm or 500-μm slit
  — Substrate requires special fabrication

• Cone length 23.5 mm, angle: 23.545°, r_{min}: 95.447 mm, r_{max}:100.14 mm
• We plan to obtain both a cylindrical and a conical crystal for evaluation
-Identify areas of potential deeper collaboration. What and What impact?
  - NIF Opacity is already a collaboration of 5 labs (LANL, LLNL, SNL, LLE, NSTec)
  - NIF Stagnation (Kr He beta) collaboration needs atomic modelers (U Nevada, Reno?)

Existing collaboration:
  - NRL built VIRGIL
  - ARTEP built NSS

? Work together on calibrations ???

-identify areas where an effort could use help from the national community. What are the questions? What impact?
-identify efforts that should be classified as either Transformational or Broad and would benefit from specific attention from the National Diagnostic Plan

For high resolution:
  - Rectangular, time integrated detector with high dynamic range and good spatial resolution that can take place of film
  - Rectangular, gated detector with high dynamic range and good spatial resolution that can take place of film