**Coincidence Measurements**

Show:
1) Angular Correlations
2) Temporal Correlations

**Lasers**

<table>
<thead>
<tr>
<th>Type</th>
<th>Power (mW)</th>
<th>Wavelength (nm)</th>
<th>Price</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diode-Pumped, Frequency Doubled</td>
<td>20</td>
<td>409</td>
<td>$5k</td>
<td>(40mW, $6k)</td>
</tr>
<tr>
<td>Laser Diode</td>
<td>50</td>
<td>405</td>
<td>$7.6k</td>
<td>Circularized Beam</td>
</tr>
<tr>
<td>Laser Diode</td>
<td>185</td>
<td>407</td>
<td>$9.1k</td>
<td>Multi-Spatial Mode</td>
</tr>
</tbody>
</table>

Prices will come down in next few years
New DVD technology (HD-DVD, Blu-Ray) uses 405 nm lasers
Lasers
These are full systems
- Power supply, TEC’s, Collimation Optics...
Can get individual Laser Diodes
- 405nm, 35mW, $2.6k (Thorlabs)
50mW System
- Works great!
185mW System
- Way more counts!
- Works great for non-entangled states
- Jury out on polarization entangled states
  - Entanglement not as good as 50mW source

Protecting the Crystal
Desiccant at night
Collection Optics

Photon Count with the Lights on

Filters block green -- pass NIR
Single Photon Counting Module

~$9.5k with box

About 1/2 the cost of 4 individual counters

Coincidence Electronics

~$10k for 4 modules and crate
New Coincidence Electronics

In collaboration with Dave Branning and Dave Ahlgren at Trinity College

~$100

New Coincidence Electronics

Advantages
- Cheaper
- No dead time
  - Higher count rates

Disadvantages
- Lower time resolution
  - Higher accidental rates
Observing Temporal Correlations

Cheap MCA

- Use trigger circuit, A/D converter, and LabView

Tweaking
Taking Data

Observing Angular Correlations

Slide detector along ruler
Aligning Other Detectors

Align laser backwards through pinholes

Insert PBS and B’ detector

Align laser backwards through pinholes
Aligning Other Detectors

Polarization Interferometer
Local-Realism Experiments

Photon Pairs

Electronics

Detectors

Bob

Alice

Local-Realism Experiments

Bob

Alice
Tweaking

Taking Data