OBSERVING OPTICAL TRANSITION RADIATION FROM 10keV ELECTRONS

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Observing Optical Transition
Radiation from 10keV Electrons
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Characteristics of OTR

• Fast timescale (ns- same as beam timescale)
• Linearly Dependent on Electron Beam Current
• Highly Polarized- Sin$^2\alpha$ Dependent ($\alpha$= Angle of Polarization)
• Linearly Dependent on Wavelength Term ($\frac{d\lambda}{\lambda^2}$)
• Dependent on $\psi$ ($\psi$=screen angle)
Observing Optical Transition Radiation from 10keV Electrons

- PMT Voltage [mV] detection of Optical Transition Radiation versus UMER Beam Current [mA]
- Polarization of Optical Transition Radiation: Phototube Voltage [mV] as a function Polarization Angle [deg]
- Wavelength Dependence of OTR: PMT Output Voltage [mV] versus dλ/λ² [nm⁻¹]
- Angular Distribution of Horizontally Polarized OTR: Normalized Intensity vs. Psi [deg]
Conclusions

Observed OTR from 10keV electrons with high degree of certainty

Future Considerations

Need further investigation with angular distribution to reconcile theory with data
1) **Beam Current Time Response**

**and Rise Time**

- **Output Voltage (mV)** from Burgoz Coil (Current Monitor)
- **74.4mA, 100ns Beam Pulse**
- $\Delta t = 100\text{ns at FWHM}$

2) **OTR Time Response**

**and Rise Time**

- **Output Voltage (mV) of Phototube** for 74.4mA, 100ns Beam Pulse
- $\Delta t = 100\text{ns at FWHM}$

- **Rise Time of Burgoz Coil (mV)**
  - **74.4mA 100ns Electron Beam Pulse**
  - $90\% V_{MAX}$
  - Rise $= 6\text{ns}$

- **Rise Time of PMT Voltage (mV) Detection of OTR from 74.4mA 100ns Electron Beam Pulse**
  - $90\% V_{MAX}$
  - Rise $= 15\text{ns}$