Northern Illinois University

SiPMs for Mu2eII

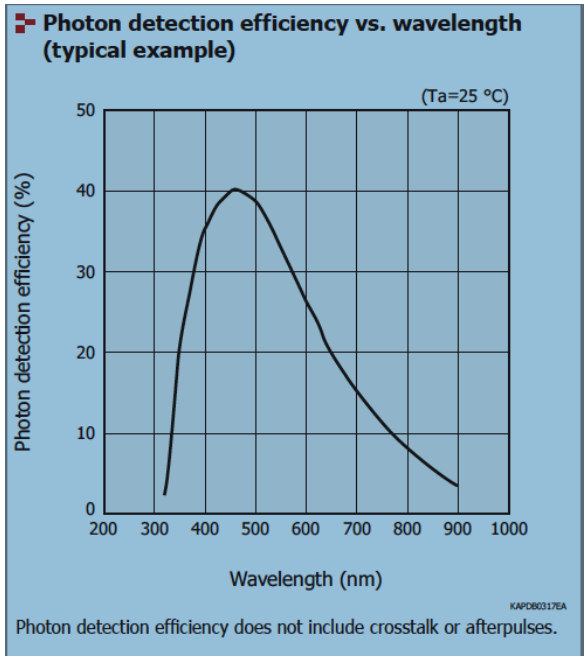
Mu2eII Workshop
August 29-30, 2018
Northwestern University

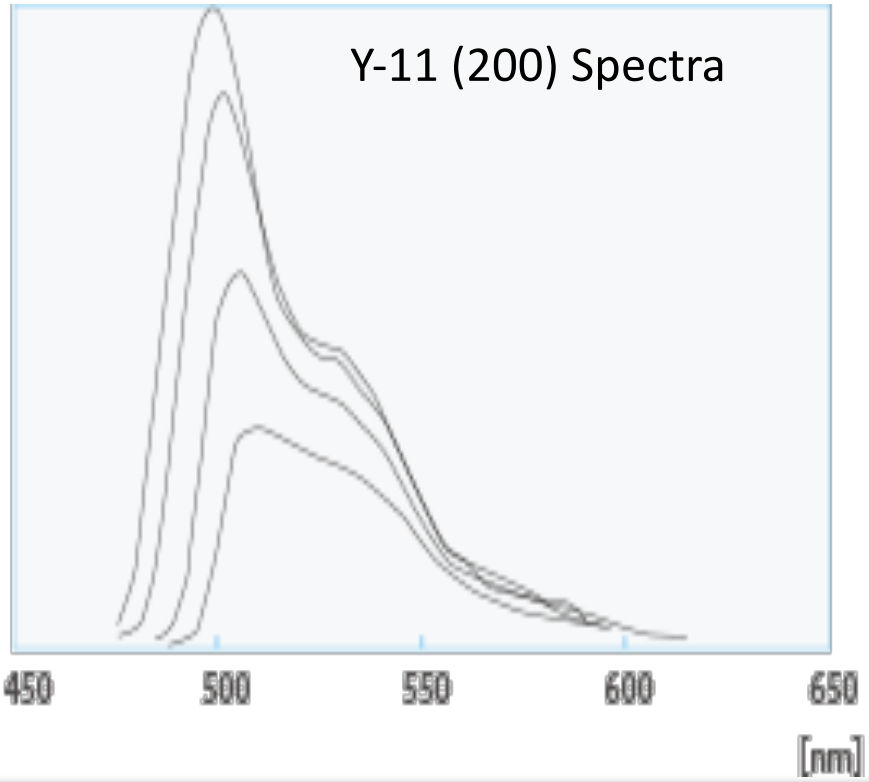
General Outlook

- **Even with threefold increase in integrated dose, no insurmountable problems with SiPMs.**
- **Will continue to lose single PE resolution but will have considerable experience at cross calibration and annealing.**
- **Main issue will be impacts of higher dark rate or noise which will require control with higher thresholds. Can respond by increasing the signal or reducing the rates.**

Mitigation

- **To increase the signal, a straightforward approach would be better matching of photon detection efficiency (PDE) to the WLS fiber (new devices).**





Mitigation

- **To reduce the rates,**
  - **Custom active area (new devices)**
  - **Junction electric field engineering (new devices)**
  - **Faster recovery time (new devices)**
  - ***In situ* annealing schemes.**

Considerations

- **Overall optimization required as positive and negative correlations between device characteristics.**
- **Need to address SiPM packaging because approaching currents where self-heating effects can become important and heat dissipation of packaging would become relevant**

➢ **Requires close collaboration with vendor for a more custom device. Should begin as soon as possible!**

- **There are other mitigation paths associated with the scintillator and electronics.**
  - **Increased photon yield**
  - **Faster/higher rate electronics**
  - **Sensor coincidence on same site or strip**