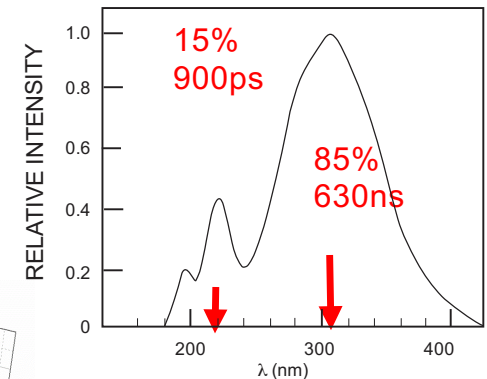
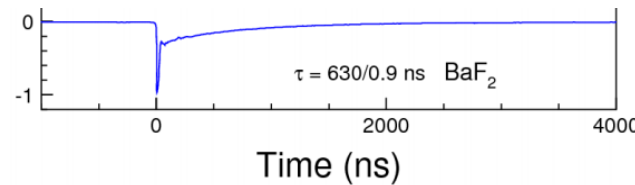


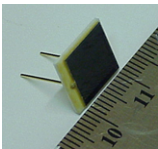
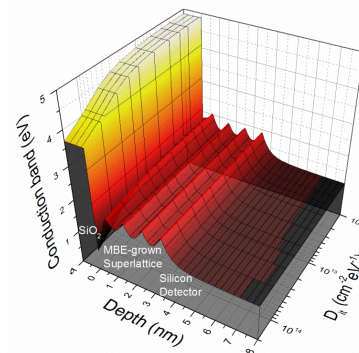
An APD for the detection of the fast scintillation component of BaF₂

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- The baseline design for the Mu2e electromagnetic calorimeter employs BaF₂ crystals
 - The requirement is the detection of 105 MeV/c electrons, a signal of μ to e conversion, in a high rate environment in the presence of substantial low energy neutron-induced background
 - BaF₂ has the fastest decay time of any inorganic scintillator: $\tau \sim 900$ ps at 220nm
 - This is accompanied by a much larger slow component: $\tau \sim 630$ ns at 300nm

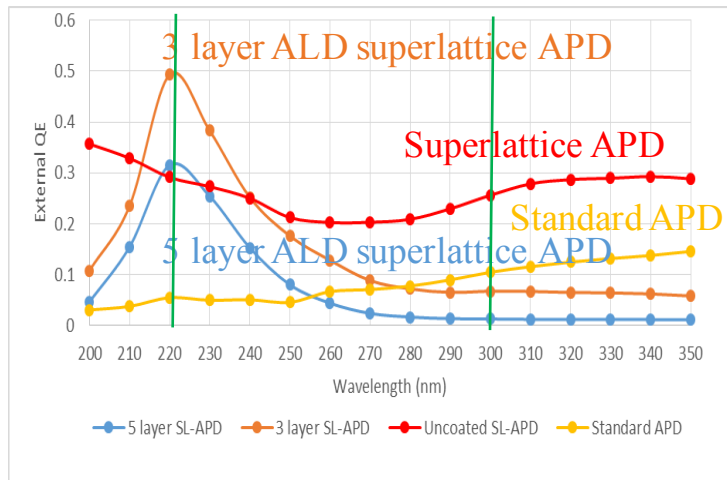


- We have developed a 9x9mm APD suitable for BaF₂ readout
 - Employs superlattice doping to improve QE in the UV and improve timing
 - Uses an atomic layer deposition interference filter to detect 220 nm and reject 300 nm light

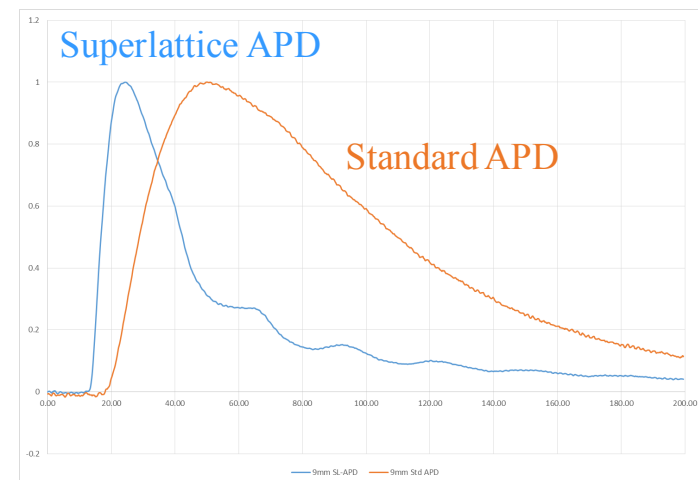


An APD for the detection of the fast scintillation component of BaF₂

- Composite Al/Al₂O₃ ALD filter provides high QE at 220nm and extinction at 300nm
 - Filter can be tuned to trade 220nm efficiency for 300nm extinction
- Superlattice improves APD time response



ALD+superlattice filter performance



Superlattice APD rise/decay time

- Current devices have higher dark current and thus more noise than standard APDs
 - Cooling to 0° C reduces noise to that of standard APD at room temperature