

Heavy ion Effects in Optocouplers

Final Presentation of ESTEC Contract

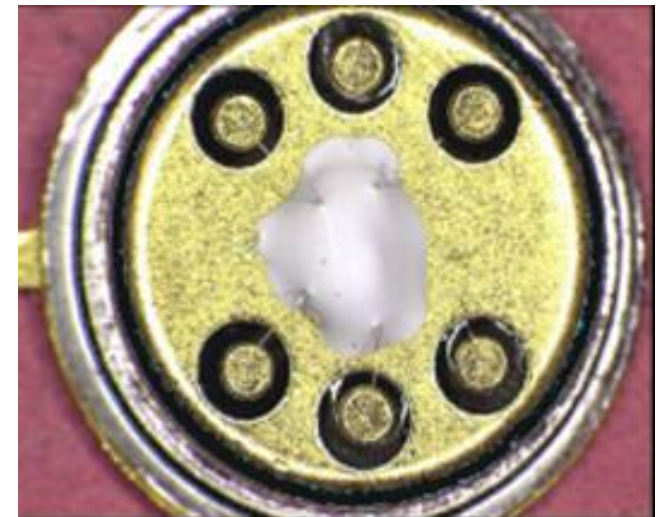
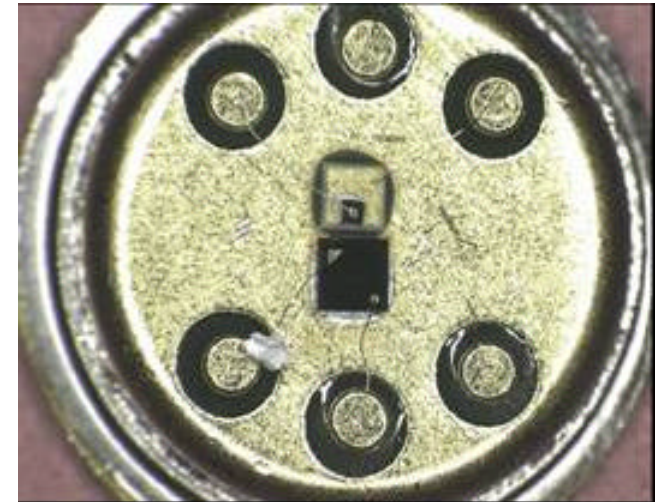
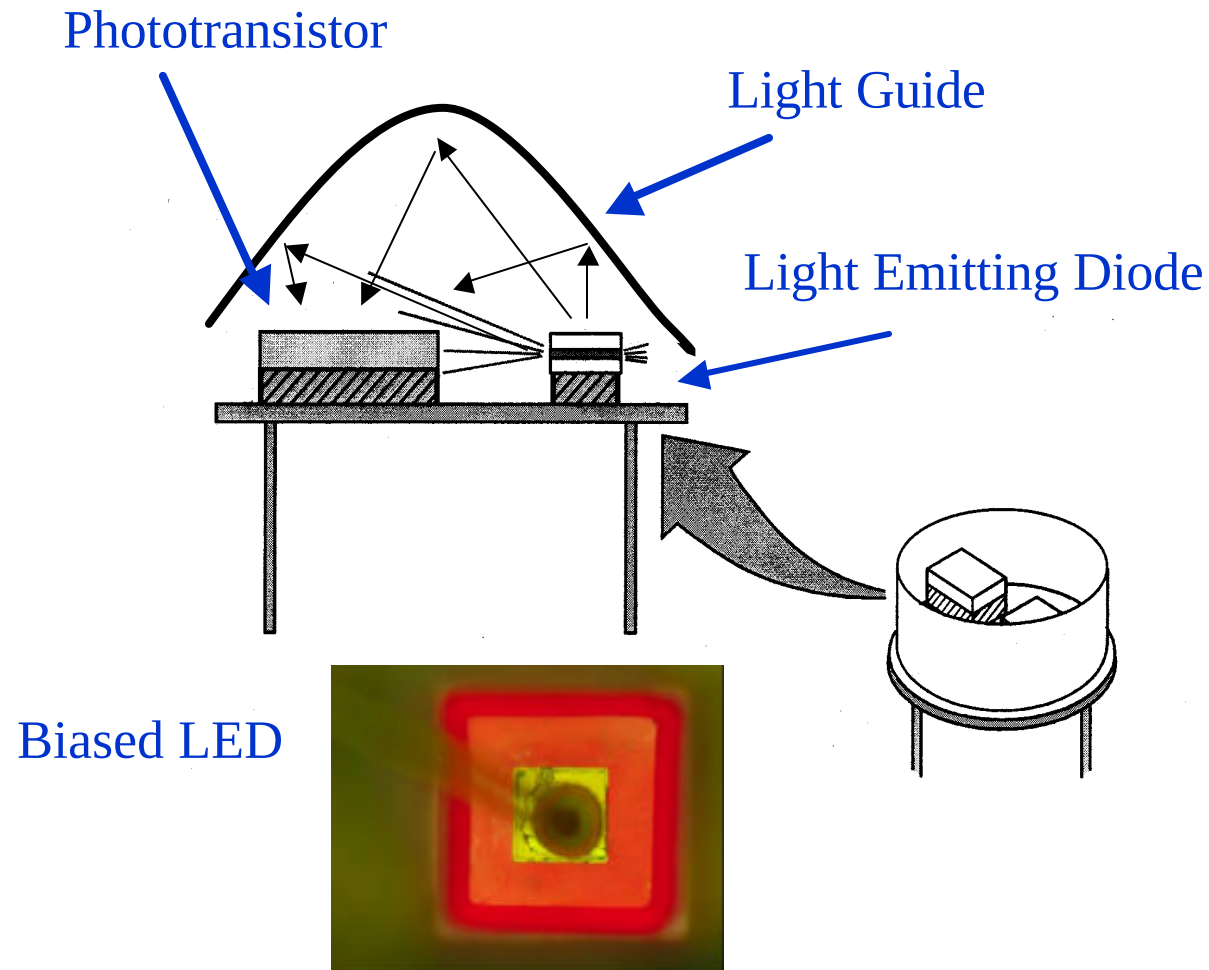
No. 11407/95/NL/MV, CCN-5, COO-5/III.

Saab Ericsson Space, Sweden - Stanley Mattsson



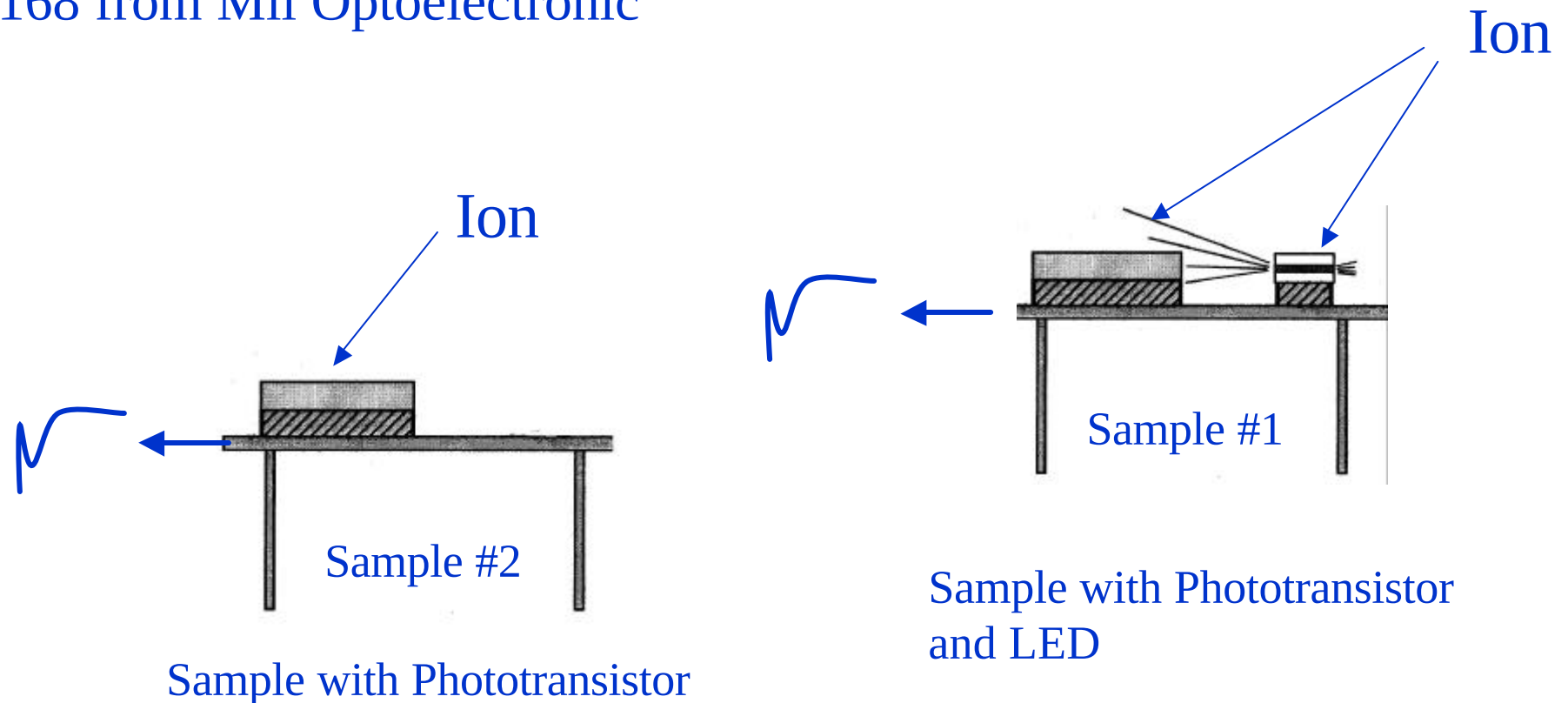
SET in Optocoupler with Un-Biased LED

66168 Mii Optoelectronic



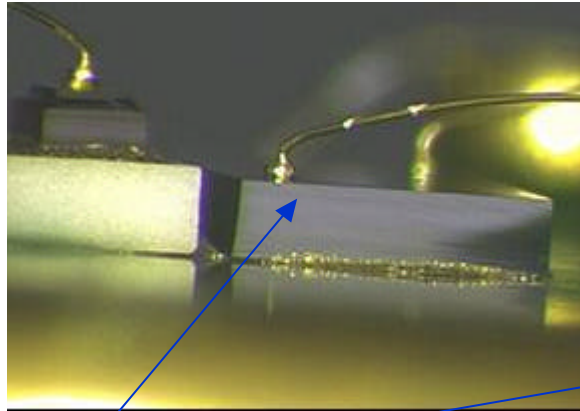
Sample Preparation

Sensitivity of LED and Phototransistor was measured by comparing two different prepared samples of Optocoupler 66168 from Mii Optoelectronic



66168 Mii Optoelectronic

LED and Phototransistor from Side

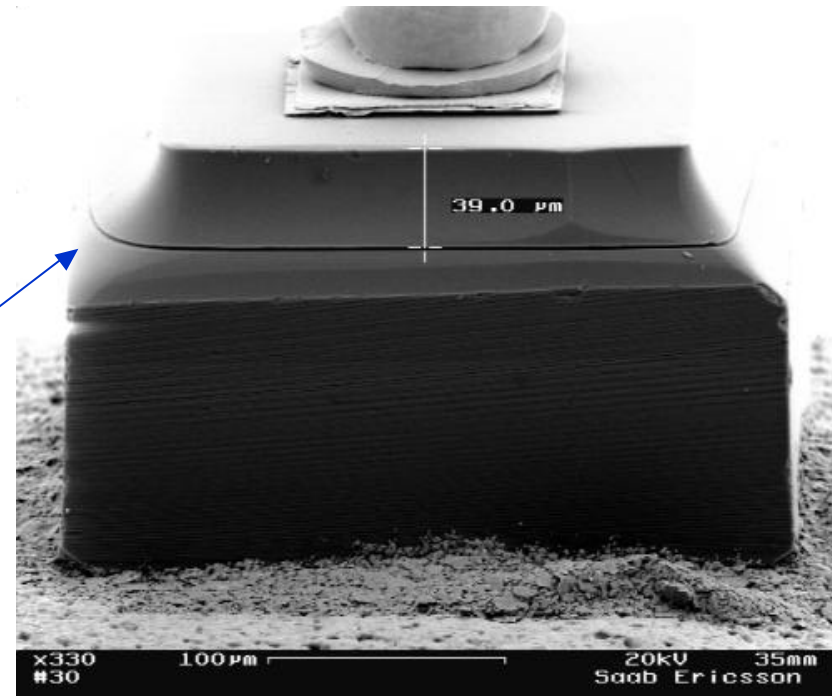
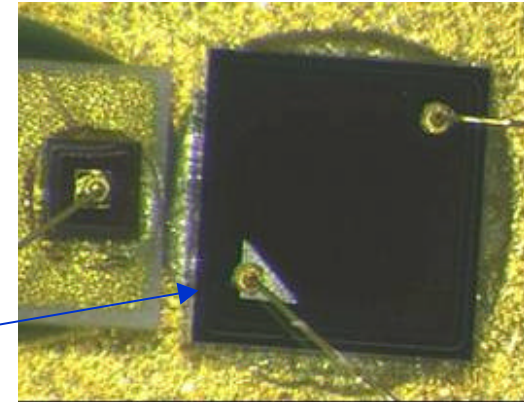


Base-Emitter Junction

Most Sensitive Area for Ions

Transistion Region

LED and Phototransistor from Top

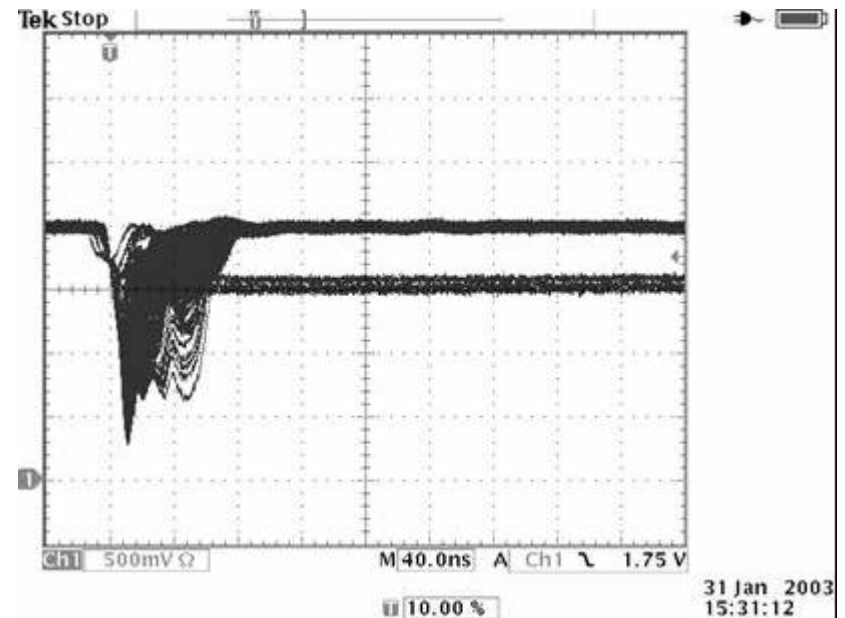


Saab Ericsson Space

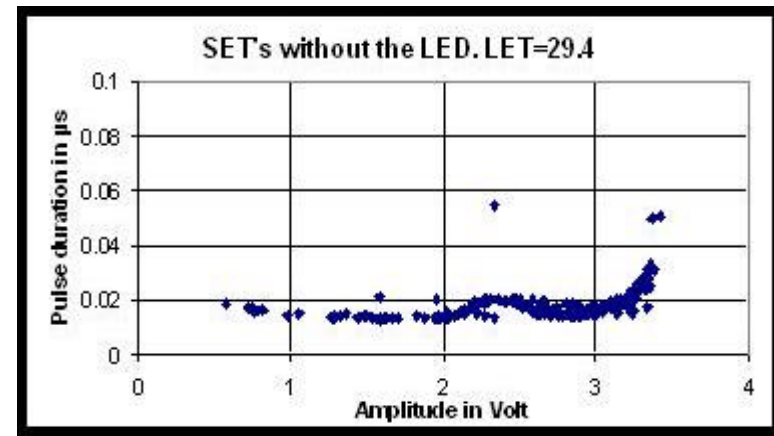
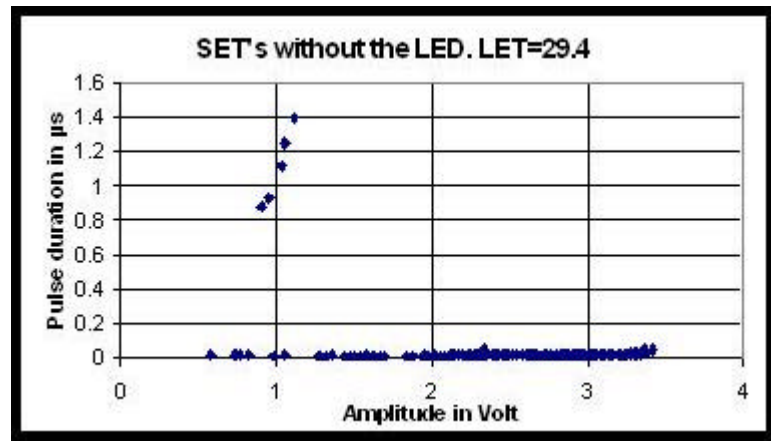
SET Results

Short Pulses, max 80 ns

Few Pulses μ -sec long (unexplained)



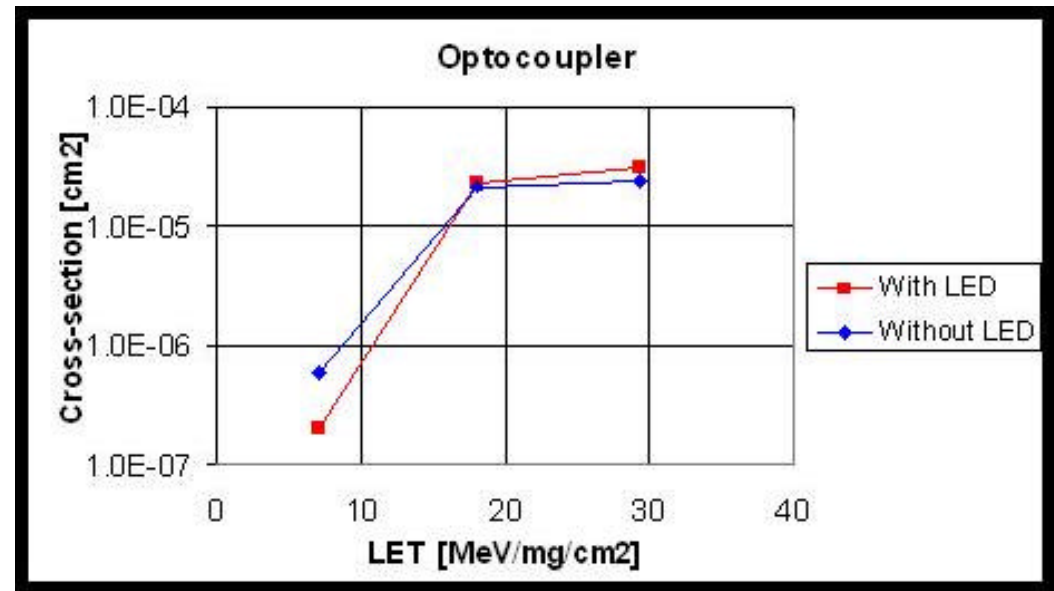
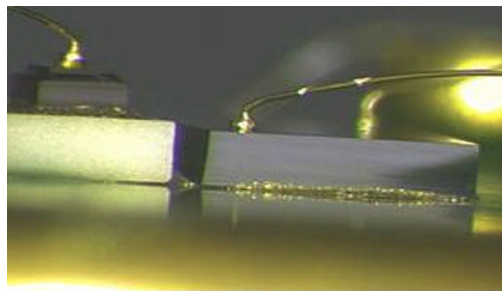
Scatter Plot of Pulse Duration vs Amplitude



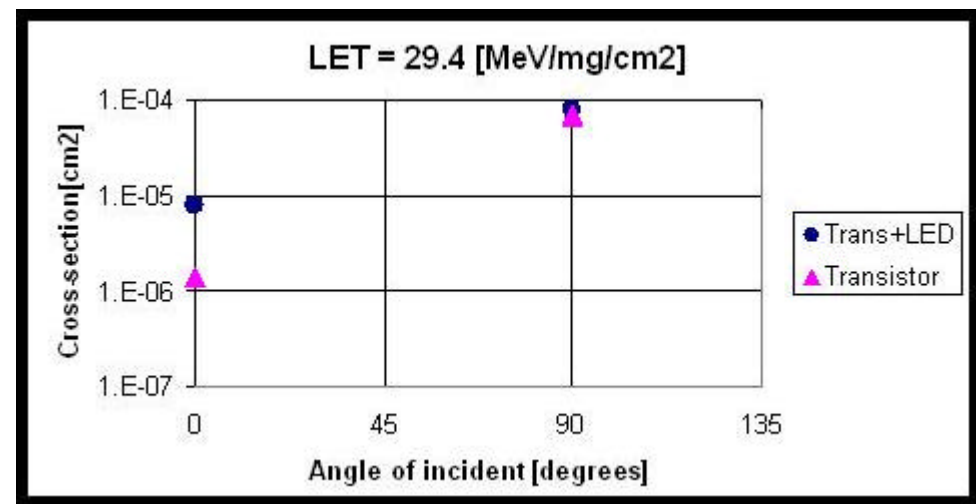
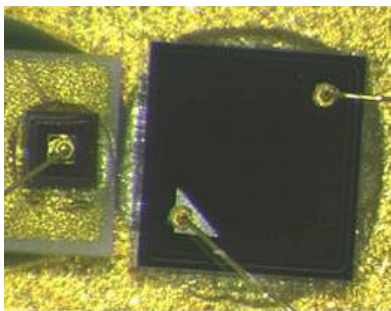
SET Cross Section

Phototransistor Sensistive Part

Data from Irradiation at 90°



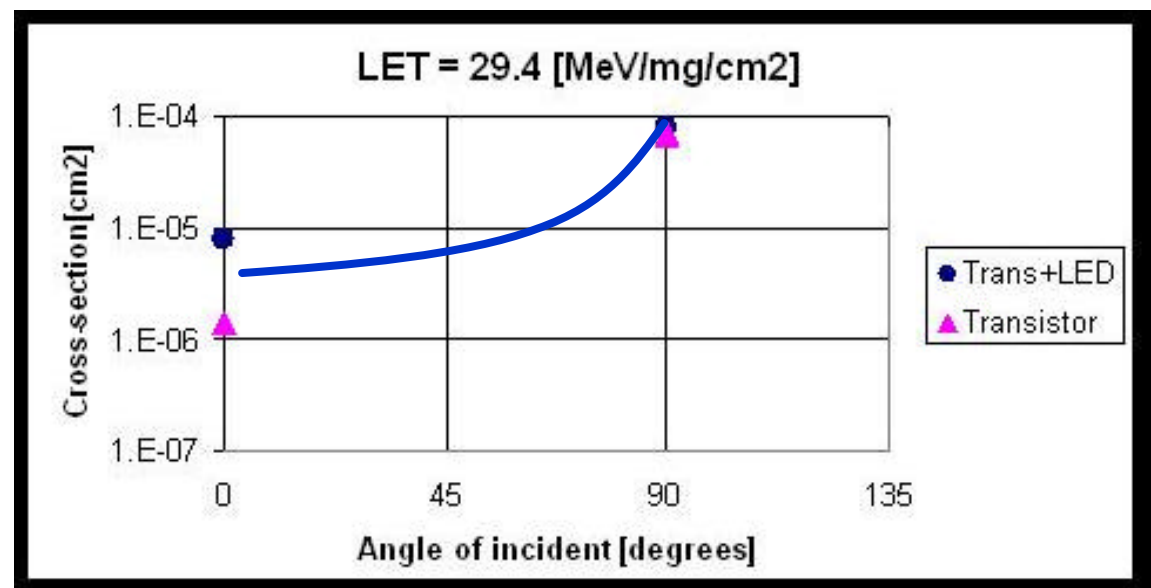
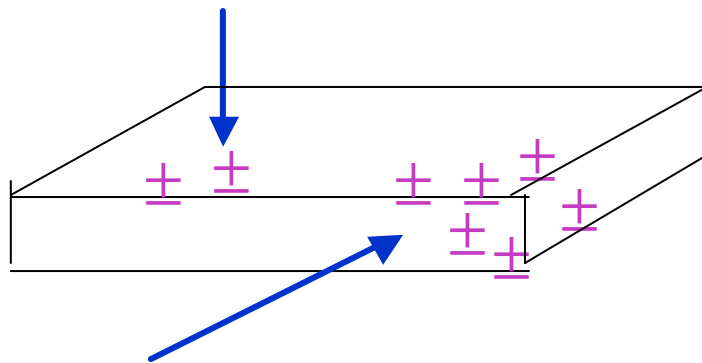
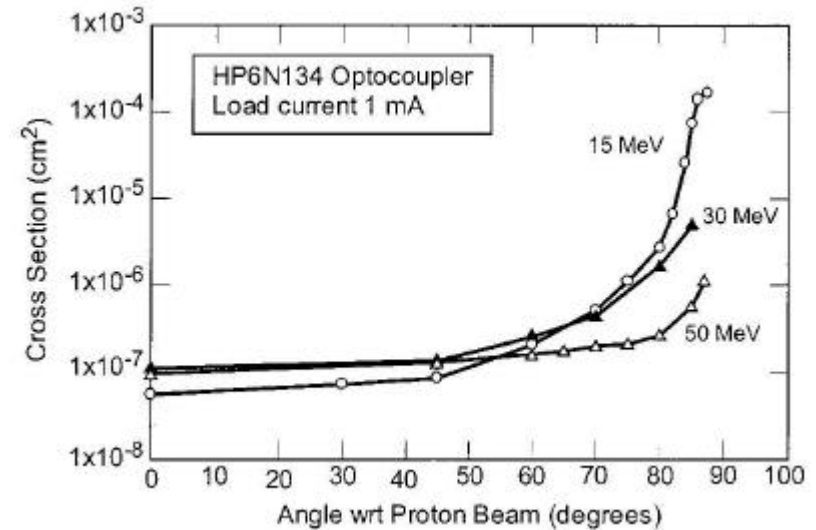
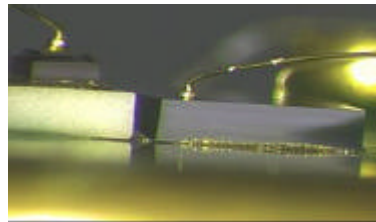
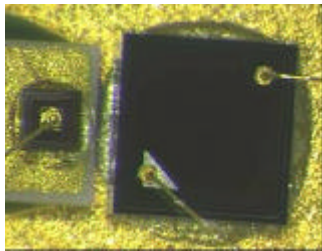
Angular Dependence



SET Cross Section JPL Proton Data

Johnston et al Trans Nucl Sci 46(6) (1999)

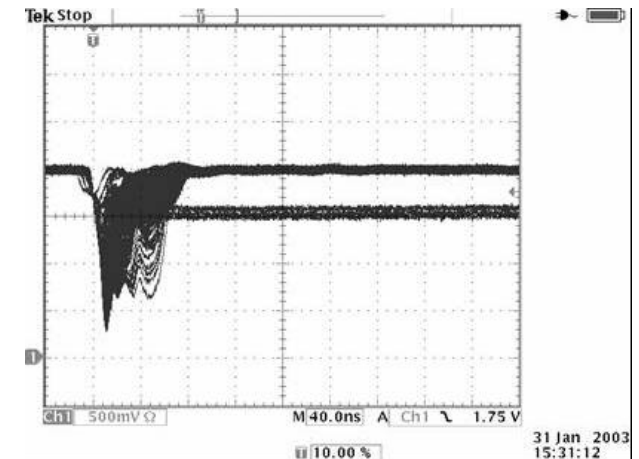
Angular Dependence



Conclusion

66168 Rad Hard Optocoupler from Mii Optoelectronics

- Phototransistor Most Sensitive
- Transients Less Than 100 ns
- Complex Pulse Shape
- Unidentified μ s long Pulses Observed



There are other types of Optocouplers with internal high-gain amplifier (6N134) or Optocouplers with more optical sensitivity which likely are more sensitive to Protons and Heavy Ions than 66168 in the present study