LGAD Discussion session

WP 3.2. SENSORS WITH INTRINSIC GAIN

M1: Understand the effect of Carbon and Gallium on gain after irradiation (Q1/2019)

M2: Model the acceptor removal effect after irradiation (Q3/2019)

M3: Produce new LGAD design to increase the fill factor (Q2/2020)

M4: Design and simulate new LGAD geometries for operation at $1\times10^{17} n_{eq}/cm^2$ (Q4/2022)

LGADs – points for discussion

- SEB observed in particle beams
  - It driven by the average electric field in the device – safe <11 V/mm, danger >12 V/mm
  - Limits the operation voltage range and ability for compensation of radiation damage
  - Can we increase it by the device design?
- Improvement of radiation hardness
  - C enrichment mastered to the level that sensors can survive 2.5e15 cm-2 (HL-LHC) timing was mastered by FBK/IME (IHEP,USTC).
  - Can we invent some other impurity that would reduce the removal constant even further?
  - Replace boron with something else?
  - Compensated material using differences in removal constants
  - HT annealing procedures for C+B and B only LGADs
  - Understanding the acceptor removal on microscopic level (removal paths)
    - BiOi?
    - g_{Bi}-g_{BiOi}= ?
- Impact ionization – seems that “standard” models don’t work well for LGADs – modelling on the way
  - The way the measurements are done matters?
  - Radiation damage effects on impact ionization?
- Detection of non-mip particles?
  - Screening effects – even the simplest model (polarization of gain layer) works quite well
  - Angled tracks – important for our experiments (significant improvement already for small angles)
  - Beam monitors?

LGADs – points for discussion

- Improvement of inter-pad distance for high particle rate environments
  - TI-LGADs (C-GL?)
  - iLGADs
- Resistive-LGADs – lots of progress and room for optimization (position vs time resolution)
  - particle rate limitations?
  - radiation hardness?
- AC-LGAD :
  - Lots of activities – investigation for 4D in less busy environments
  - Test beam with BNL AC-LGAD