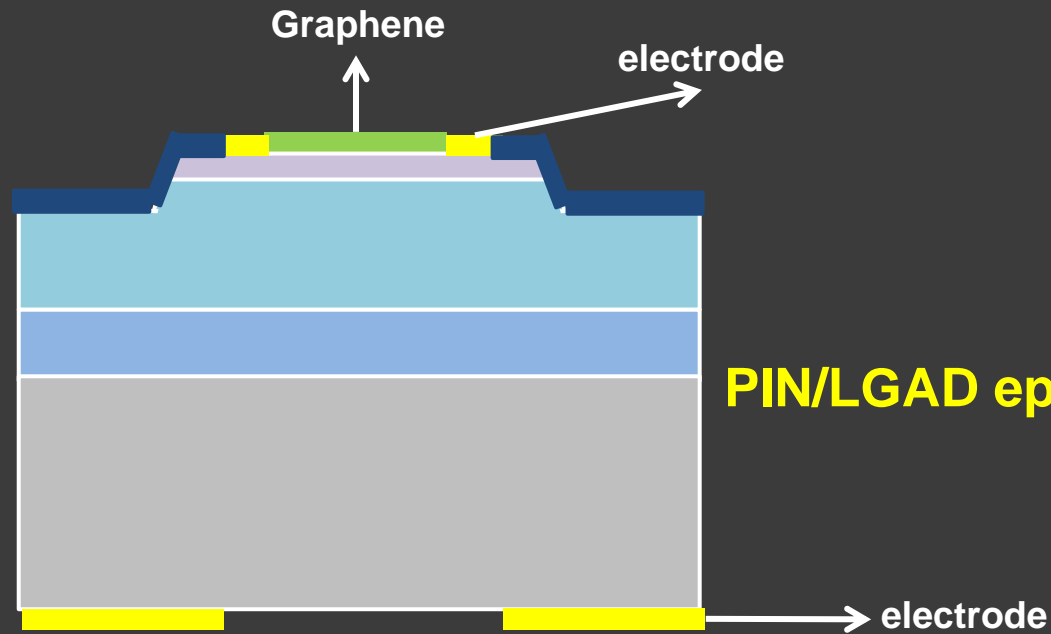


# Graphene-optimized Silicon Carbide Detector (GSCD) Plan

**WG6 subproject with RG 6.4**

# Motivation and Goals

## Prototype —GSCD1

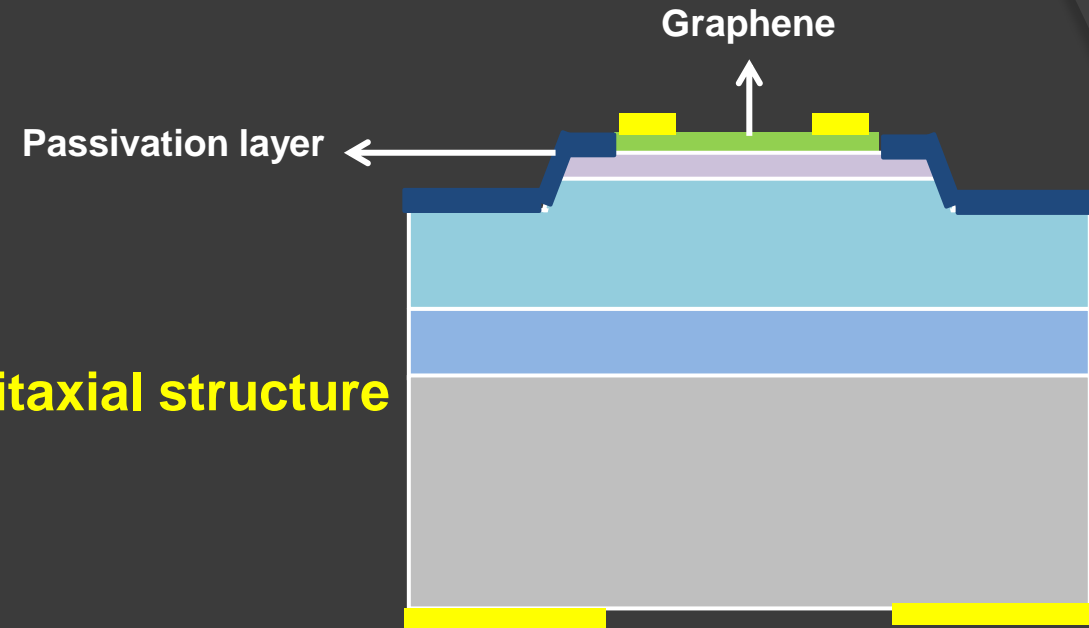


Graphene is used as an electrode

Goals:

- ◆ Reduce the contact barrier and improve the P-ohmic contact performance—— **GSCD2**
- ◆ Reduces the rising time and improves the time sensitivity of the device.——**GSCD1/GSCD2**

## Prototype —GSCD2

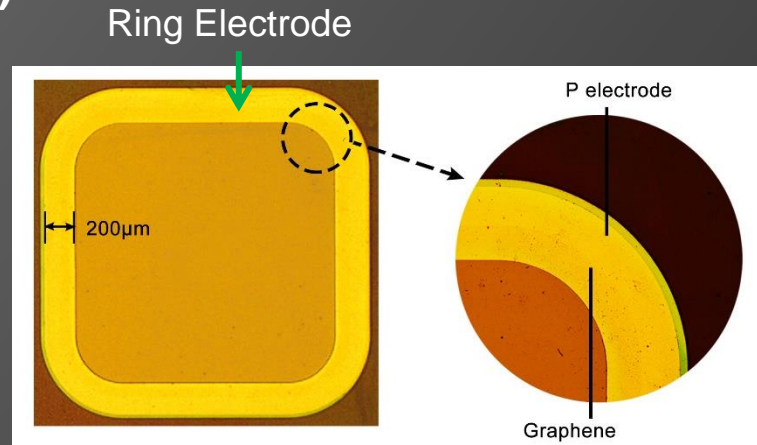
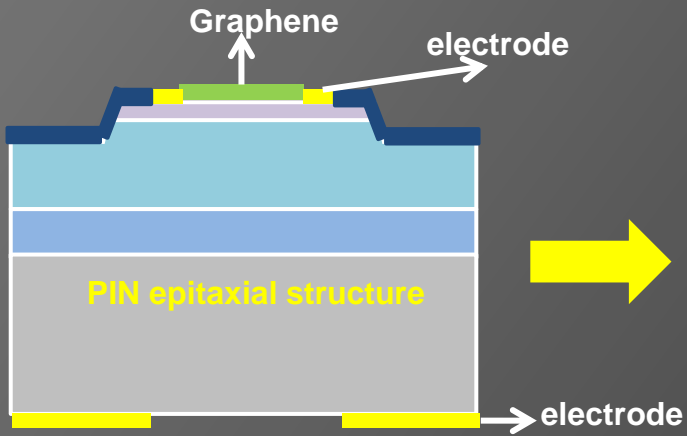


Used as an electrode

Reduces the contact barrier

# Research Progress—GSCD1(G/RE PIN)

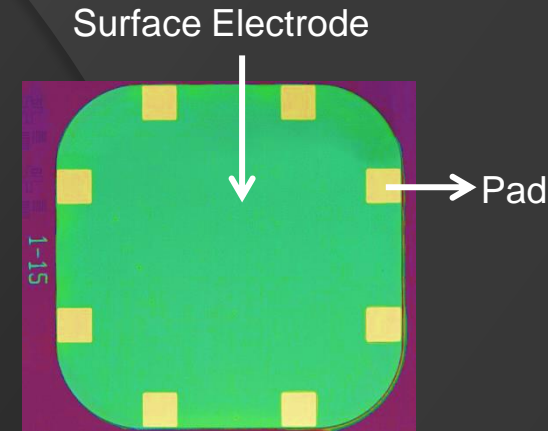
## Prototype —GSCD1(G/RE PIN)



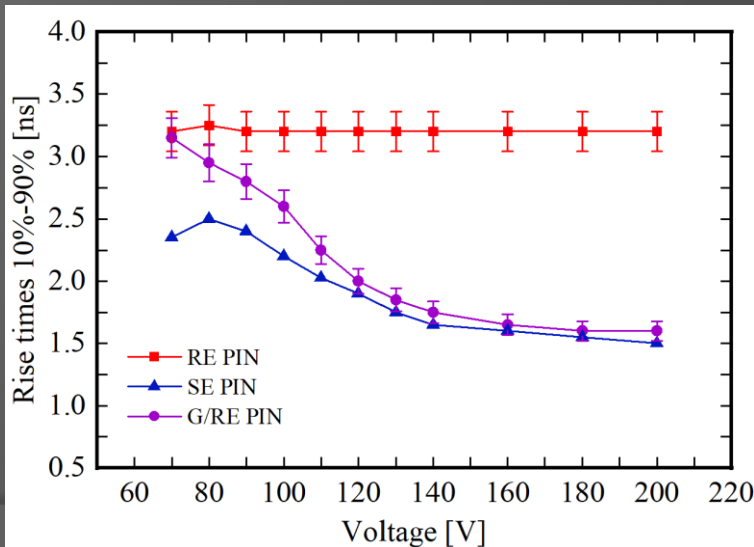
Graphene/Ring Electrode PIN: **G/RE PIN**



Ring Electrode PIN: **RE PIN**



Surface Electrode PIN: **SE PIN**



Rise time ( > 120V ) : RE PIN > **G/RE PIN** ≈ SE PIN

**A small signal rise time of a device means that the device is more sensitive to time response. The graphene optimizes the RE PIN signal response time and can replace metal for particle detector electrode materials.**

# Scientific problems to be solved

- **How to effectively improve charge collection rate and time resolution?**

1. Using graphene to reduce the contact barrier and improve the P-ohmic contact performance
2. Graphene is used as an electrode

- **How to reduce graphene defects?**

1. Transfer graphene to direct growth graphene on SiC

- **Readout electrical board and readout ASICs?**

1. Improve signal-to-noise ratio
2. impedance mismatch

- **Effect of irradiation on the performance**

1. Effects of different irradiation types on 4H-SiC devices
2. Understanding of temperature dependence

# Deliverables & time scales & contributing institutions

No.	Title	Description	Start date	End date	Institutions
Di.1	Fabrication of Graphene/SiC PIN	Fabrication of Graphene/SiC PIN	1/2025	8/2025	IHEP
Di.2	Fabrication of Graphene/SiC LGAD	Fabrication of Graphene/SiC LGAD	8/2025	12/2025	IHEP
Di.3	Electronics Readout	Development of the readout single board and ASICs	6/2025	12/2025	IHEP, IAT
Di.4	Characterization	IV, CV, Charge collection, time resolution test	1/2026	12/2026	IHEP, JLU, IAT
Di.5	Irradiation	Irradiation Graphene/SiC devices	1/2027	6/2027	IHEP
Di.6	Study of Irradiation Defects	Analysis of device defects caused by different types of irradiation	1/2027	6/2027	IHEP, IAT

**JLU: Jilin University**

**IAT: Shandong Institute of Advanced Technology**

# Collaborative work

- WG2, 3, 5: characterization of irradiated and non-irradiated devices
- WG4: modelling of radiation damage
- WG8: dissemination and outreach
- **Converge on a WG6 subproject with RG 6.4 Two-dimensional material detector**

**Welcome to join us!**

**Contact Person**  
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