HGTD Sensor Status and Plan

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Outline

- Introduction
- Probe station tests
- Laser and beta source tests
- Irradiation tests

Introduction

- IHEP ATLAS HGTD Testing Tasks
  - Leading tasks:
    - IV, CV: ”single” probes: singes, 2x2 arrays (cold)
    - IV: Probe card: 5x5 arrays
  - Contributing tasks:
    - TCT with Laser: 2x2 arrays
    - I-V: probe card 15x15 arrays
    - IV: Breaking (X-rays)
    - ASIC Read-out
  - Test beam participation

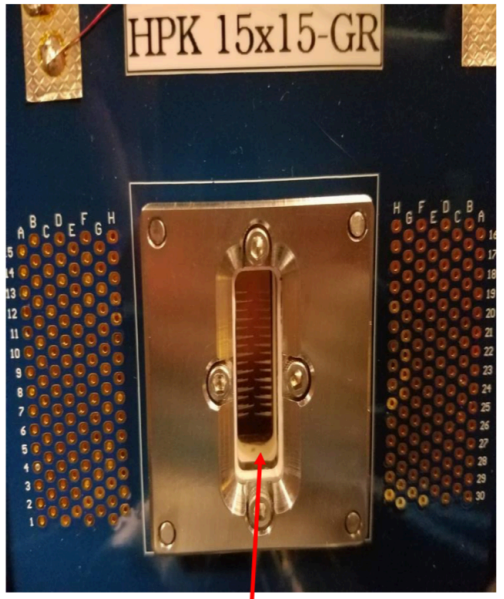
Probe Station Tests

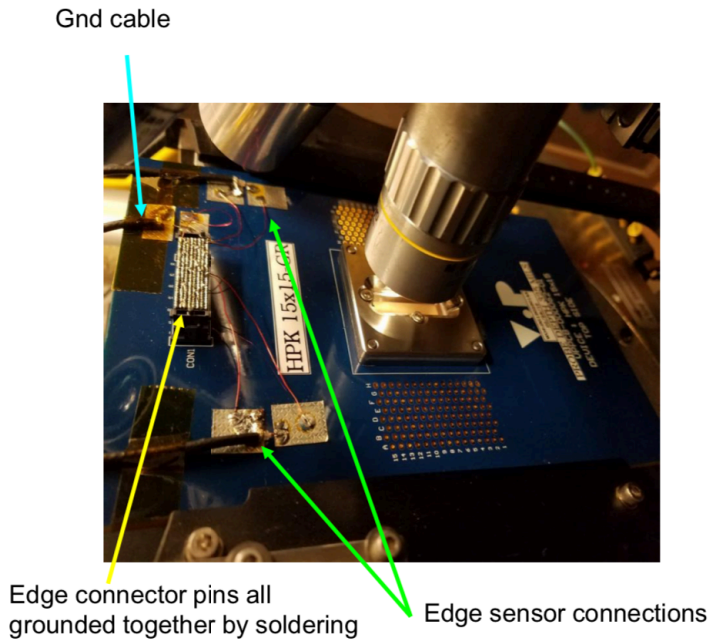
- Measure I-V, C-V, probe card, cold
- Develop automatic probe card (5x5) test scheme
  (or other intelligent and reliable test methods)
- Ongoing: Upgrade to -30/-40C cold facility
- Goal: Identify the key measurements and priotize the test tasks

Probe Card Status (by Ryuta)

Carolyn Gee

- 5x5 Probe Card
  - Manual switcher
  - At this moment, the probe card can not fit to the cold chuck
- 15x15 Probe Card
  - It is announced that the probe card for 15x15 is ready
  - Need to develop the readout system for each individual channel.





Laser and Beta source tests

- Laser for timing measurement
- TCT scan to study internal structure
- Beta source to evaluate the MIP interaction with LGAD
- Goal: What's the new detector physics we can learn?

Irradiation tests

- X-Ray tests
- Proton irradiation tests
- Goal: what's the radiation hardness for the sensors we can learn and how to improve?

Sensors for test

- For September TDR
  - NDL, HPK, CNM.
- For future study
  - To be submitted (Mei, Kewei)

Distribution of Sensors according to Tasks

Result of call for measurement campaign of irradiated HPK sensors:
Restrict to HPK 3.1, 3.2

Hartmut **22 July 2019**

						INSTITUTES					
Sensors	**HPK 50um**	**Type 3.1, 3.2,**	**Method**	**Sensor**	**UCSC**	**CERN**	**BNL**	**IHEP**	**JSI**	**Göttingen**
	Charge collection after irradiation		Cold beta source	SE5, 2x2, 3x3	x	single pads	single pads (from Aug-Sep)		x	
	Power		Cold I-V	SE5, 2x2, 3x3, 5x5	x	single pads	single pads (from Aug-Sep)	from ~ mid July		single+2x2
	Gain Mechanism	Doping profile	Cold C-V	SE5, 2x2, 3x3	x	single pads	single pads (from Aug-Sep)	from ~ mid July		
	Gain difference between SEn									
		gain vs. Bias	Cold beta source	SE5, SE3, SE2 and 3x3	x		single pads (from Aug-Sep)			
		Doping profile	Cold C-V				single pads (from Aug-Sep)			
	Interpad gap & Slim edge		Laser TCT	2x2, 3x3, 5x5						x (until Aug)
Sensors	**HPK 35um**	**Type 1.1, 1.2, 2**								
	Charge collection after irradiation		Cold beta source	SE5, 2x2, 3x3	x	single pads	single pads (from Aug-Sep)		x	
	Power		Cold I-V	SE5, 2x2, 3x3, 5x5	x	single pads	single pads (from Aug-Sep)	from ~ mid July		single+2x2
	Gain Mechanism	Doping profile	Cold C-V	SE5, 2x2, 3x3	x	single pads	single pads (from Aug-Sep)	from ~ mid July		
	Interpad gap & Slim edge		Laser TCT	2x2, 3x3, 5x5						x (until Aug)
Sensors	**"All"**									
	Breaking									
		ramping Bias	Cold I-V	Single,2x2, 3x3, 5x5			single pads (from Aug-Sep)			
		ramping bias	cold I-V + laser	Single,2x2, 3x3, 5x5						
		ramping bias	x-rays	Single,2x2, 3x3, 5x5			single pads (from Aug-Sep)			
	Long-term operation									
		constant bias	Cold I-V	Single,2x2, 3x3, 5x5						x
		constant bias	Cold beta source	Single,2x2, 3x3, 5x5					x	
		constant bias	Cold Laser	Single,2x2, 3x3, 5x5						x
	UBM									
		ramping Bias	Cold I-V	2x2, 3x3, 5x5			single pads (from Aug-Sep)			
	Annealing								x	