High Granularity Time Detector (HGTD) Module Hybridization and TestBench Measurement @ IHEP

EXPERIMENT Xuan YANG, Institute of High Energy Physics (CAS) 7th CLHCP Workshop, 25-28 November 2021, Nanjing, China

Introduction

> Module is the basic element of HGTD

> It consists of two parts:

Low gain avalanche diode (LGAD) sensor for charge collecting

Dedicated ASIC (Altiroc) for digital readout

> They are bump-bonded together (hybridization)
to provide full functionality

> It is wire-bonded to module flex to exchange



data with other detector components



TestBench Setup

> A key point to understand the performance of the module/ASIC

> Experimental setup: > Use FPGA as interface



> Slow control and data-taking by laptop

Preliminary Result

- Least Significant Bit (LSB) estimate of TOA and TOT as expected
- Compared two types of preamplifier (TZ and VPA) for time walk correction:
 - \succ TZ has a better performance against high voltage
 - VPA is sensitive to number of high voltage wires



Vertical Horiz/Acq	Trigger	Display	Cursors	Measure	Math	Masks	Save	Recall	Analyze	-	DP073	Tel	< 📃 🗾
							‡ ' '						
							- - -						
							- -						
							- · ·						
.						· · · · · · ·	-						
						<u>.</u>							
	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	**************************************				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~!!**********************************	Semperation of the second s
				A		_,,,	money						
and the second sec	. hand the second	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	ᡔ᠊ᠾ᠆᠆᠆ᡃᡦᡧᡌᡃᡵᡰᡃᡪᠾᡔᢪ	******	Marke we are the	-	n st	M. man	and the state of the second	anna an Alan Saar	- Martine Martin	an de ale de artes	WW THE FLOW W
· · · · · · · · · · · · · · · · · · ·	<u></u>					· · hy	Į Č	<u> </u>	· ·				
						_	+						
							+ · · + +						
- - 	n. 	Marine	-handerly here	ant when the state	- Martin march	What was in	+   + + · ·	1 Millinger	when when a property	yunio di Allane	<b>~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~</b>	-vitero-boos-to	age www.
							Ī						
- · · · ·							+ · ·						
		1 1			i i i		ŧ.,					i i	
C1 1.0V/div	50Ω	B _W :3.5G						A'	1 240.0mV		10.0ns/div 10	0.0GS/s IT	2.5ps/pt
C2 30.0mV/div	50Ω ν 50Ω	² ^B W:2.5G									Run 34 026 acqs	Sample	RL:40.0k
											Cons Septe	mber 25, 2	020 16:17:00



80

60

TOTc [dac]

40

20

0

100

120