Eveluation of silicon pad sensors and preamp electronics

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FOCAL(FOrward CALorimeter)
 Compact sampling electromagnetic calorimeter

 FOCAL(FOrward CALorimeter)
 Compact sampling electromagnetic calorimeter Compact : deals with large particle flux at forward

 FOCAL(FOrward CALorimeter)
 Compact sampling electromagnetic calorimeter Sampling : observes part of the energy deposited by particle for the optimized shower

 FOCAL(FOrward CALorimeter)
 Compact sampling electromagnetic calorimeter Electromagentic : measures key particles (e, γ and π<sup>o</sup>) within small space

FOCAL(FOrward CALorimeter)
 Compact sampling electromagnetic calorimeter
 Calorimeter : measures energy.

# **Scope of efforts (I)**



Most electrons passing a given sensor layer are so called "MIP". In other words they deposit minimum ionization energy just like cosmic muons. Therefore we want to test sensors with cosmic muons.

## **Scope of efforts (II)**

Cosmic test requires setup of test electronics including preamps which Korean groups consider mass production of. We plan to test preamp models utilizing the test setup.

## Evaluation

Cosmic muon test

 Sensors are currently in production and we will show prepared test electronics.





## Evaluation

#### Preamp

 Evaluation setup are under development. We will describe model study by LTSpice an analog circuit simulator.

# **Preamp Card**



## **Preamp Card**



-	Alkrow			
i pamp	J_4K, raw		l(ldet)	
220mV-	(bubble)		(idei)	55µA
200mV-				
180mV-				-45µA
400 V				
160mv-				
140mV-	·/····/∖·····			
120mV-	· / / \ \			
100mV-	\\			
80mV-				-2004
001117				
6UmV-				
40m∨-				
20mV-				5µА
0mV−				
On	is 30ns 60ns 9	10 ne 120 ne 150 ne	100 210 24	
			180hs 210hs 24	uns 270ns 500hs
- Pamp	58_40k,raw		Touns 210ns 24	
<b>∼</b> pamp 1.2V-	o8_40k, raw V(bufout)		Iduns 210ns 24	uns 270ms 300ms
<b>I</b> .2V− 1.1V−	o8_40k, ra₩ V(bufout)		160ns 210ns 24	-60μA
<pre></pre>	o8_40k, ra₩ V(bufout)		Iouns 210ns 24	оля 270hs зооля × 60µА 55µА
2 pamp 1.2V 1.1V 1.1V 1.0V 0.9V 	26.40k, raw V(bufout)		Iouns 21uns 24	
2010	26.40k, raw V(bufout)		Iouns 210ns 24	
2 pamp 1.2V 1.1V 1.0V 0.9V 0.9V 0.8V 0.8V 0.7V 0.7V 0.7V	2010 2010 2010 2010 2010 2010 2010 2010		Touns 210ns 24	-55μΑ -55μΑ -55μΑ -55μΑ -50μΑ -55μΑ -50μΑ -50μΑ -50μΑ -45μΑ -45μΑ -40μΑ
Pressure	A Concernation of the conc		Iouns 210ns 24	
Pressure	No. Concernation of the second		Iouns 210ns 24	лля 2/018 300ля □ × 60µА -55µА -55µА -50µА -45µА -40µА -35µА -30µА
Pressure	A Concernation of the second o		Iouns 210ns 24	лля 2/01я зооля □ × 60µА 55µА 50µА 45µА 40µА 35µА 30µА 30µА
Pamp 1.2V 1.1V 1.0V 0.9V 0.9V 0.8V 0.7V 0.7V 0.6V 0.5V 0.5V 0.4V 0.4V	26.00 26.00		Tours         210ns         24           I((det))         II((det))         III((det))         IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	лля 2/018 зооля □ × 60µА -55µА -55µА -45µА -45µА -30µА -30µА -25µА -20µА
Pressure	26.40k, raw V(bufout)		Touris 210ns 24	
Pamp 1.2V 1.1V 1.1V 0.9V 0.9V 0.8V 0.7V 0.6V 0.6V 0.5V 0.5V 0.4V 0.3V 0.2V 0.2V 0.2V 0.2V	N CONC CON CON CON CON CONC CON CONC CON CON		Touns         210ns         24           I((det))         II((det))         III((det))         IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	лля 2/018 300ля □ × 60µА 55µА 55µА 45µА 45µА 36µА 36µА 30µА 25µА 20µА 15µА 10µА
Pamp 1.2V 1.1V 1.0V 0.9V 0.9V 0.8V 0.7V 0.6V 0.6V 0.6V 0.5V 0.4V 0.3V 0.3V 0.2V 0.1V 0.1V 0.1V 0.1V	NB_40k, raw V(bufout)		Touns 210ns 24	лля 2/018 зооля □ × 60µА -55µА -50µА -45µА -40µА -35µА -30µА -25µА -15µА -15µА -15µА -15µА
Pamp 1.2V 1.1V 1.0V  0.9V  0.9V  0.8V  0.7V  0.6V  0.5V  0.5V  0.4V  0.3V  0.2V  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	25.00 25.00		Tours     210ns     24	лля 2/018 зооля □ × 60µА -55µА -55µА -45µА -45µА -40µА -35µА -30µА -25µА -20µА -15µА -20µА -5µА -20µА -5µА -30µА -50µА -30µА

### **Summary and Outlook**

Cosmic test setup is ready.
 Preamp models are under study.