

# FKPPL Project application (2012)

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<b>ID: Title</b>	<b>ILC/CALICE</b>					
<b>List of participants</b>	<b>French Group</b>			<b>Korean Group</b>		
	<b>Name</b>	<b>Title</b>	<b>Affiliation</b>	<b>Name</b>	<b>Title</b>	<b>Affiliation</b>
	<u>Leader:</u> Roman Poeschl	DR2	LAL	<u>Leader:</u> Jong-Seo Chai	Pr.	SKKU
	Thibault Frisson	CDD	LAL	Hong-seung Song	Thes.	SKKU
	Stephane Callier	IR	LAL	Hyo-jeong choi	Thes.	SKKU
	Jeremy Rouene	Thes.	LAL	Seung Hyun Lee	Thes.	SKKU
<b>Requested LIA specific funding from France</b>						
<b>Description</b>		<b>Euro/unit</b>	<b>Nb of units</b>	<b>Total (euros)</b>	<b>Requested to: *</b>	
Visit to Korea (Electronics workshop)		150/day	16	2400	IN2P3	
Travel to Korea France-Korea		1000	4	4000	IN2P3	
Total				6400		
<b>Requested funding from Kprea</b>						
<b>Description</b>		<b>Won/Unit</b>	<b>Nb of units</b>	<b>Total (Won)</b>	<b>Requested to: **</b>	
Total						
<b>Additional funding</b>	<b>Additional funding from France</b>			<b>Additional funding from Korea</b>		
	<b>Provided by or requested to ***</b>	<b>Type</b>	<b>Euro</b>	<b>Provided by or requested to</b>	<b>Type</b>	<b>Won</b>
	Egide Porgram Star (Requested)	Beam test preparatio n and analysis meeting	13440	NRF (requested through program Star)	Beam tests in Europe with 'Korean PCB'	15000000

For example: IN2P3, CEA. \*\* Korean University or Institute. \*\*\* French Embassy, CNRS Egide,.....

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The next generation of detectors for particle physics experiments as for example at the future International Linear Collider, ILC, will have stringent requirements on the available space of the detection elements. Therefore the front-end electronics will be embedded in the detection volume of a calorimeter. At the same time an utmost reliability of the signal quality must be assured. This challenge is addressed in the proposed R&D program. The detection unit under study will be composed of silicon wafers, ASICs (short for Application Specific Circuits) and an interface card (Printed Circuit Board or PCB). Such an entity is also called Active Signal Unit or ASU. For prototypes of highly granular calorimeters as developed within the international CALICE collaboration (<https://twiki.cern.ch/twiki/bin/view/CALICE/WebHome>), the entire ASU must not exceed 1.1 mm in height for an 18x18cm<sup>2</sup> detection surface. The French and Korean partners are developing the front-end electronics of ASUs for the CALICE prototypes. The launching of the research partnership has been partially funded by the French-Korean virtual laboratory FKPPL.

One readout circuit, dubbed SKIROC, will read out 64 silicon pads and will realize the pre-amplification, shaping and digitization of the signal. The circuit is designed in AMS SiGe 0.35  $\mu$ m technology. The signals created in the P-I-N diodes of the silicon wafers by minimal ionizing particles will be as small as a few femto Coulomb, which requires low-noise architecture of the circuit. The validation of the circuit, which has an excellent signal-over-noise ratio of ten, will be pursued in the frame of the proposed project.

Korean groups brought into operation test boards and circuits dispatched from LAL Orsay in 2011 during a workshop sponsored largely via FKPPL. To validate the setup, a number of test series already performed at LAL will now have to be repeated. These tests include the study of the noise level and of the detail behavior of the different stages of the circuit (pre-amplification, signal shaping, sampling and digitisation). The ongoing of the test will be monitored in regular phone meetings but a dedicated workshop is indispensable for the success of the studies. This face-to-face meeting would naturally allow for hands-on support by the experts from LAL and will therefore accelerate the progress.

Students of SKKU have been trained in 2009 on the microelectronics for the CALICE prototypes. This training has been to a significant part sponsored by FKPPL. In particular they have been formed to design the challenging PCB of the detection ASU. This training resulted in an extended design of the PCB, which will now be manufactured in Korea, for example by the EOS company, and included in the beam test program of CALICE.

Once produced, the Korean boards are to be equipped with read-out circuits and silicon wafers to allow for a validation of PCBs from different manufacturers (i.e. from Korea and Europe). These 'Korean' made boards will then be added to the beam test setup in DESY. It is however indispensable that the setup including the data acquisition system will be brought into operation well before a test beam which is planned for July 2012 at DESY. For this a visit of the LAL team to SKKU in the first half of 2012 is again indispensable. This visit will include the setup of the data acquisition system at SKKU.

In summary the plans for 2012 comprise the pursue of the development of the front end electronics for high granular calorimeters which has been successfully started in the previous years with the help of the FKPPL funding. In 2012 we ask for funding the four french members of the proposal for one working meeting at SKKU.

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<b>Summary of Project</b>	<p><u>Abstract</u></p> <p>The next generation of detectors in particle physics requires highly compact low noise electronics. The proposed project comprises the development of microelectronic circuits, ASICs, and interface boards, PCBs. The power consumption and signal integrity of the ASICs will be validated and optimized. The PCBs will have to be ultrathin. In the year 2012 it planned to conduct intensive tests of the front-end electronics at the SKKU as well as to bring into operation a detection unit with employs an interface card, PCB, conceived by the Korean partner and which is the result of earlier training of SKKU students at LAL.</p>
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