



## INTERNSHIP PROGRAM FOR INTERNATIONAL STUDENTS

### INTERNSHIP SUBJECT FORM

Name of the Host Laboratory	Laboratoire Leprince-Ringuet (LLR)
Website of the Host Laboratory	<a href="http://llr.in2p3.fr">llr.in2p3.fr</a>
Research Group	CALICE / ILD
Internship Supervisor	Vincent Boudry
Internship Subject	5D Minkovsky model of particle showers
Student's level	<input checked="" type="checkbox"/> Advanced Undergraduate Students (3 <sup>rd</sup> or 4 <sup>th</sup> year) <input checked="" type="checkbox"/> Master's students (1 <sup>st</sup> or 2 <sup>nd</sup> year) <input type="checkbox"/> PhD students
Proposed Duration	<input checked="" type="checkbox"/> 3 months <input checked="" type="checkbox"/> 4 months <input checked="" type="checkbox"/> 5 months <input checked="" type="checkbox"/> 6 months
Prerequisites	Basic knowledge of particle interactions.
Internship description (max. 15 lines)	<p>The next generation of detectors for particle colliders beyond the LHC (so-called "Higgs factories": ILC, CEPC, CLIC, FCC-ee) will be imaging devices: they will have 100 to 1000 more voxels (3D pixels) than existing apparatus. They will record the deposits of energy from the particles created in the collisions showering entering the calorimeters, with unprecedented precision, together with the time of the deposits.</p> <p>By rebuilding the "history" of the showers, we improve dramatically the precision of the measurement of the jets generated in the collision.</p> <p>With a precision in time similar to the cell size over the speed of light <math>d/c \sim 1 \text{ cm}/c = 30 \text{ ps}</math>, a full 5D picture of the showers is possible (4D of space-time + energy). Yet they yet have to be properly modelled in order to extract at best the information on the original particle, taking into account the propagation of sub-particles.</p> <p>The student will work on the extension of existing models, including the fluctuations, and compare them with simulations (GEANT4) and beam test data from a prototype. Depending on the exact dates of the internship, a participation to the data taking at CERN could be possible.</p>

The boxes marked with cross implies eligible