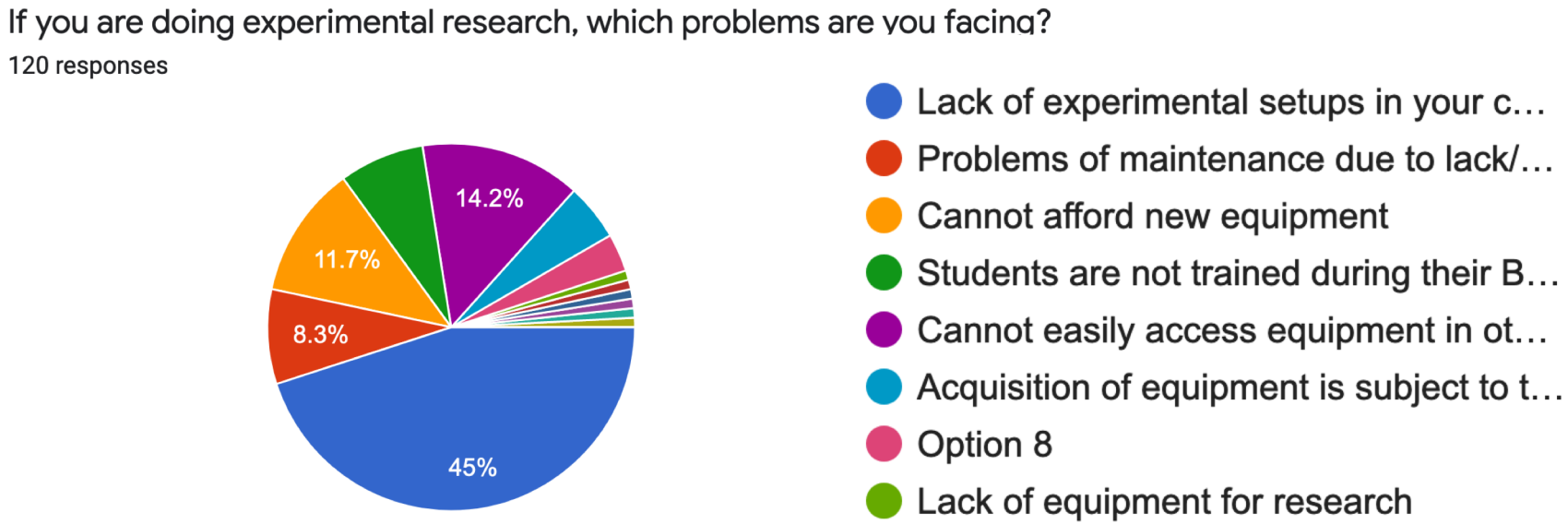
Proposal for an LOI for ASFAP: "International Centre for Experimental Physics in Africa (ICEPA)"

- The need for experimental facilities and educational training centre in instrumentation for basic and applied experimental physics

Extracted from the survey of the Materiel and Condensed Matter WG:



Proposal for an LOI for ASFAP: "International Centre for Experimental Physics in Africa (ICEPA)"

- Common LOI of Instrumentation and physics-education WG ?
- Much inspired by African Institute for Mathematical Sciences (AIMS) and other educational centres like Southern African Institute for Nuclear Technology and Sciences (SAINT) or Sèmè City in Cotonou, Bénin or ICTP-EAIFR in Kigali, Rwanda.
- Master like curriculum typically one and a half year, including a 6 month research project
- Educational training centre in instrumentation for basic and applied experimental physics
- High level lectures (<50%) and hands on experiences (>50%)
- Experimental installations and/or facilities installed at such a centre
- Similar to AIMS but for experimental physics, strongly oriented towards instrumentation.
- With final examine and recognised diploma (association to university ?)

Curriculum and skills:

Lectures and hands-on experiences over 12 month followed by 6 month research project, written report and defence (jury)

- Mechanics, design, technical drawings, some practical experience in a workshop
- Basics in electricity and electronics
- All steps of an experiment in physics from conception, planning to execution and analysis
- Learn to understand and if possible carry out some of the key experiments in modern physics including their respective physics
- Data acquisition systems and data analysis.
- Programming (in C++ for example)
- Statistical treatment of data and error analysis
- Transversal skills like collaborative working, communication skills, language skills, presentation
- Writing of scientific papers
- …..

The curriculum would be concluded by a final exam and a diploma.

Possible Curriculum

1. Semester

- 50% lectures and 50% “simple” experiments which can be carried out in one or at most 2 afternoons and can be analysed within two further afternoons.
- The goal is to consolidate the basic level of understanding of physics, electronics and DAQ, the basics of statistical treatment of measurements for analysis.
- This semester should also level out different pre-knowledge of the students.

2. Semester

- 20% lectures and 80% advanced experiments. The advanced experiments will take typically 2 full days to carry out and 2-3 further days to analyse. The Students should chose around 10 experiments out of a pool of up to 15-20 existing ones.
- The level and complexity of these experiments should correspond to the advanced laboratory courses for Master students at well-known universities of international reputation. The experiments should represent all major fields of physics, at least this should be the guideline for choosing a new set-up.

3. Semester

- Internship in an experimental institute or facility concluded by a final written report:
- The third semester is dedicated to the participation in an scientific activity in the form of a 4-5 months internship in a research centre in Africa or abroad. The work during this internship will be summarised in a master-like thesis and defended before a jury in order to obtain the diploma.

How to construct and finance these experiments ?

- The idea is to establish partnerships between ICEPA and international institutes, laboratories, physics faculties for each individual experiment.
  - Provide the experiment in kind
  - Responsibility, help and advice for installing and training of local staff
  - Insure reliability of the experiments and build academic and international relation
  - Essential way to finance the scientific equipment
- However important investments coming from the host state and from international funds for the overall structure and the infrastructure are mandatory.

Structure and necessary facilities of the centre

- **Lectures will be delivered by renown teachers from Africa and the international community.**
- **Accommodation for students and teachers during the terms**
- **Student Grants for 12-18 months**
- **Building and class rooms for teaching and learning**
- **Buildings well equipped with all technicalities to be able to install and develop instrumentational facilities, (electricity, water, internet, mechanical and electronics workshop…)**
- **Computing facilities**
- **Local technical and scientific staff for maintenance and development**
- **Administrative complex to run the centre**
- **Administrative staff, security**
- **Scientific directorate**
- **…..**

- Needs very strong and important investments for the hardware, for buildings, infrastructure, etc….
- The centre would live of international partnerships with universities and research laboratories in the world to seek support and funding and investments in kind
- Time-line: associate to existing centre or physics faculty, build from there….