Introduction

This document is meant to give the reader information about the question: "How to measure the impact of the HST-program?". The question must always be related to the goals of the HST and due to reasons of limited resources we've only focused on the starting part of a few of all the goals.

We've taken a lot of inspiration from how the FCI looks like. If you don't know what it's about, you should check it out.

Goals declared by the CERN for HST:

- To promote the teaching of physics and, in particular of particle physics, in high schools
- To promote the exchange of knowledge and experience among teachers of different nationalities
- To expose teachers to the world of research
- To stimulate activities related to the popularization of physics within and beyond the classroom
- To help CERN establish closer links with European schools
- To encourage the cooperation between CERN and existing programs sponsored by the European Union in the area of scientific education

Specific aims we've chosen which are related to these goals are:

- Understanding how the HST-program impacts both the teachers approach and confidence when helping students learn physics.
- To improve the HST program according to the goals.

Justification

We strongly believe that if teachers gain knowledge and confidence of what we're experiencing and learning here, there is a great possibility that this'll shine through to the students. On the other hand, if we won't have the confidence in talking about quantum mechanics nor particle physics we will either have boring answers or unable to fascinate the students in a positive manner. Knowledge and confidence are probably the key to give a good impression and to make students feel like this is something that is important.

Today it's possible to find a lot of information on the internet about things such as dark matter, antimatter and so on, so forth. But that doesn't mean it's easy for a student to understand what it is, let alone how to put it into perspective with all their other knowledge. This means that they will either start to search for the answers to their questions by looking it up themselves, or by starting discussions with somebody they know can handle physics well. Who is better than the physics

teacher here? Teachers also got the possibility to induce these feelings in the students, to ask more questions and to learn more about the universe.

If teachers are unable to at least have confidence in saying “I know this, but not that, and you could find more information here”. Students got a really good potential to learn more about particle physics and understand why CERN is so important.

Information about the questions

Questions are always asked from the perspective of a student. When these questions are answered by the teachers, it’s important to realize that the questions are supposed to simulate a student in action. This implies that the questions could show students lack of knowledge which means the teacher and the student got a great opportunity for learning.

Another question that could be useful to include once testing the questionnaire on a teacher is this: “If you have a better idea how to ask other questions or rephrase the ones that are already there, feel free to do so. All inputs have the potential to be helpful.”

The questionnaire

A. PARTICLE PHYSICS.

1. **Can you in a short way explain to me what the standard model looks like?**
2. **What's the difference between normal- and antimatter?**
3. **What's the consequence of the Higgs field in our universe?**

B. COSMOLOGY

4. **I want you to convince me why you think dark matter exists, or why you think it doesn't.**
5. **I've got a hard time understanding what the inflation is. Can you explain to me what you know about it and why it's important to explain the evolution of the universe?**

C. STRUCTURE OF CERN

6. **What is the difference between CERN and LHC?**
7. **Why do we need two detectors that do the same thing? To me it seems like a waste of money that CERN's built both ATLAS and CMS.**

D. QUANTUM PHYSICS

8. **When do you think will we find the technology to be able to measure with a greater precision than the current limit of the uncertainty principle?**
9. **I've seen in a video that a physicist said: "Everything that can happen, will happen, with a probability between 0 and 100%.". Was it just a lie or how can I interpret what he said?**

How to use this afterwards

The questions can and must be changed in order to receive higher quality. It'll be a process of evolution that will require many pilots in order to evolve in a positive direction. Our tip is to let the questions evolve by both letting teachers come up with new questions that their students might ask, but also to refine the ones already existing. The national program could be of a great assistance here, but also the next international program.

The questions could also be used on the national program, so they could work as a pilot. The answers you'll get back will and could provide with information how to shape the questions in order to measure the impact even better.

We've found that both surveymonkey.de and socrative.com works pretty well. In order to really make use of these programs, money might be an issue, i.e. premium accounts might be needed.

Once the questions have evolved enough to be considered good to measure the impact then the science can begin.