Updates on Cosmic Ray detectors for outreach purposes

Charles Timmermans
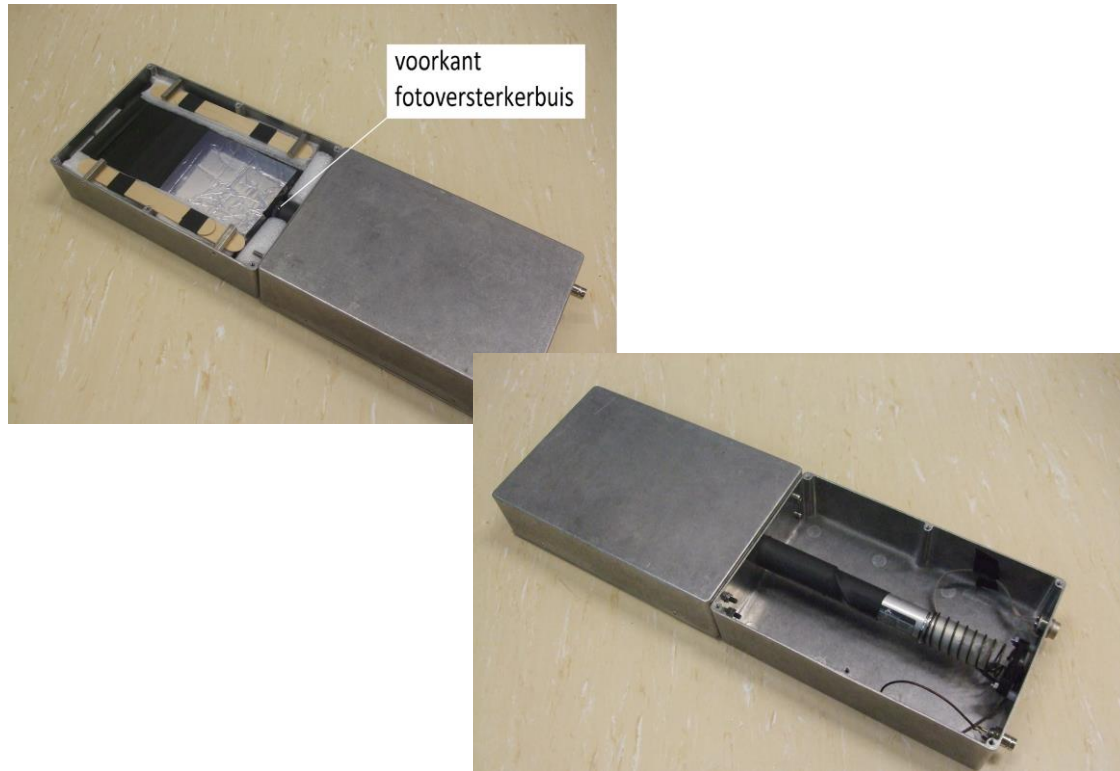
The NLT (Nature, Life, Technology) detectors

voorkant
fotoversterkerbuis

Nature, Life and Technology is part of the standard high school curriculum. High schools have to select several modules to teach, one off which is Cosmic Rays. We developed small robust scintillator modules in the past, which are used for several experiments/demonstrations (taking them to a high rise, on vacation into the mountains etc)

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The Thermos flask (Kamiokanne)

Our original version consisted of a modification of the lid so that the PMT could see the water, through a piece of glass. All properly sealed and light-tight. Standard PVC tubing to protect the PMT. Rather labor intensive to make…

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Water: The thermosflask (Kamiokanne)
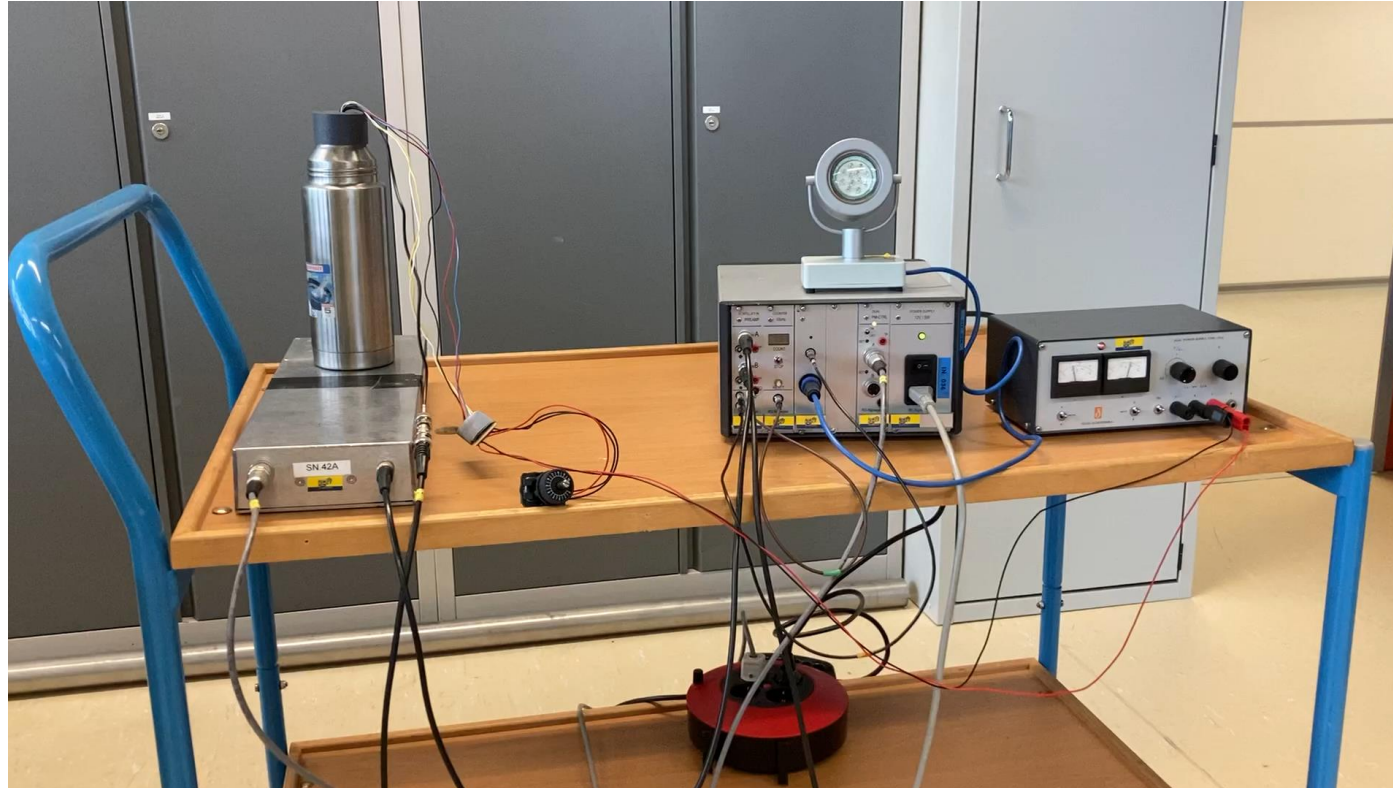
3D printing makes life a lot easier. We now print a replacement for the cap and in principle the inside can be adjusted for different photosensors. The PM is not directly in the water but there is a small glass between water and PM which enables all of this. Lots of new experiments are possible. In addition: Contrary to the scintillator-plate this is a 3-D detector thus suddenly inclined incoming muons can be seen as well.

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Water: The thermosflask (Kamiokanne)
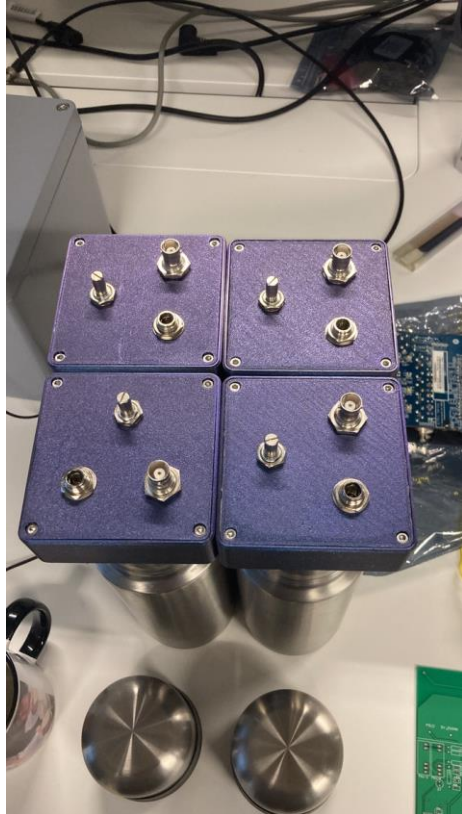
Latest version:
A square cap includes all required electronics (plenty of space)

PM HV controlled with a pot meter

Signal out through a BNC cable

Requires only a standard ~12V DC supply

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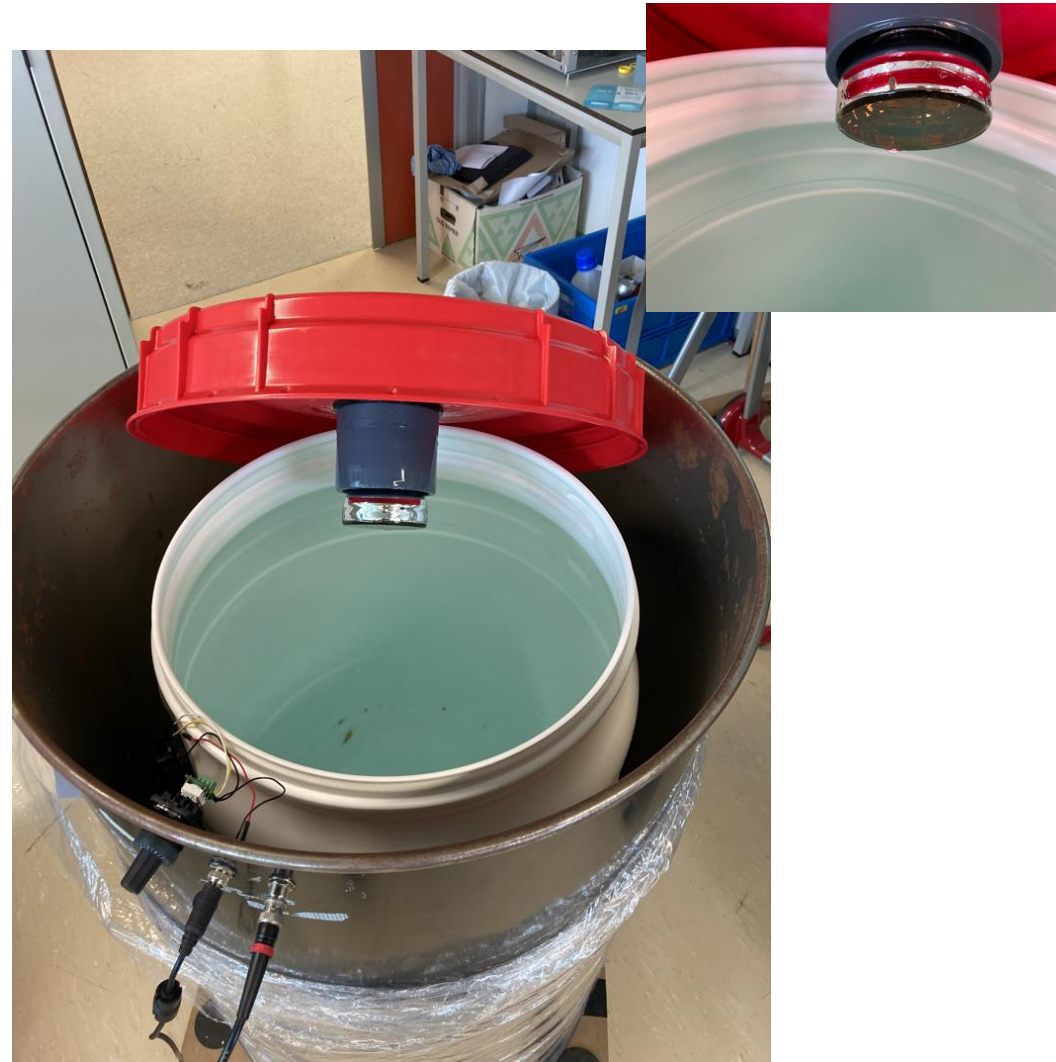
Larger: The oilbarrel

First version: Painted rainbarrel; was no good at all.

Second version: Oil barrel with white food container for reflections.

This version required 2 low voltage supplies and quite some loose cables

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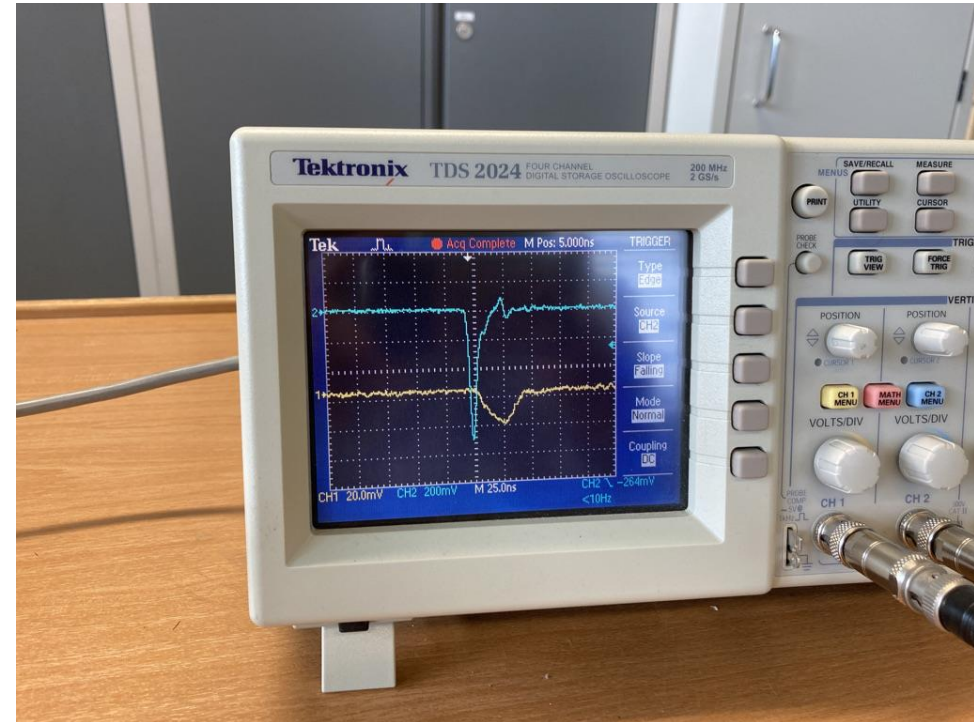
Larger: The oilbarrel

Recent improvements, all power from 1 standard charger. HV regulation through potentiometer, no holes in the tank. New activity triggered by a high school student that wanted to work with it in school.

A better solution for mounting the PM still needs to be found

Water: The oilbarrel

Water: The Oilbarrel

More improvements are being made, including a logical output. This will be used to connect several tanks on 1 microcontroller allowing to measure the time differences with a precision of about 4 ns. A bachelor student is working on a project characterizing these detectors and to develop a directional reconstruction including uncertainties

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