

Results of the DISC DIRC test beam campaign at CERN

# PANDA collaboration meeting

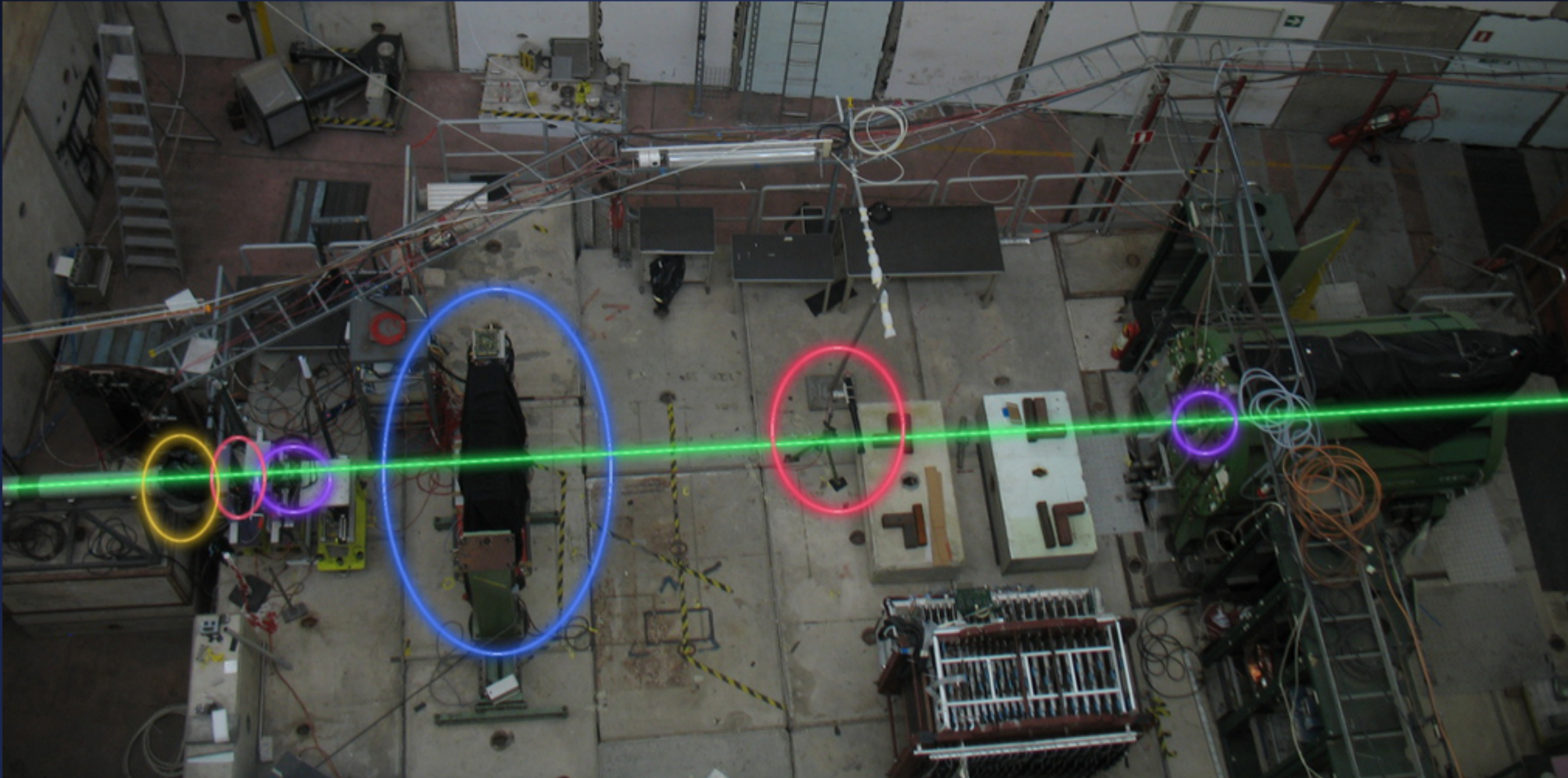
## December 2012

*Benno Kröck, Avetik Hayrapetyan, Daniel Mühlheim, Julian Rieke,  
Klaus Föhl, Michael Düren, Oliver Merle*  
JLU Gießen



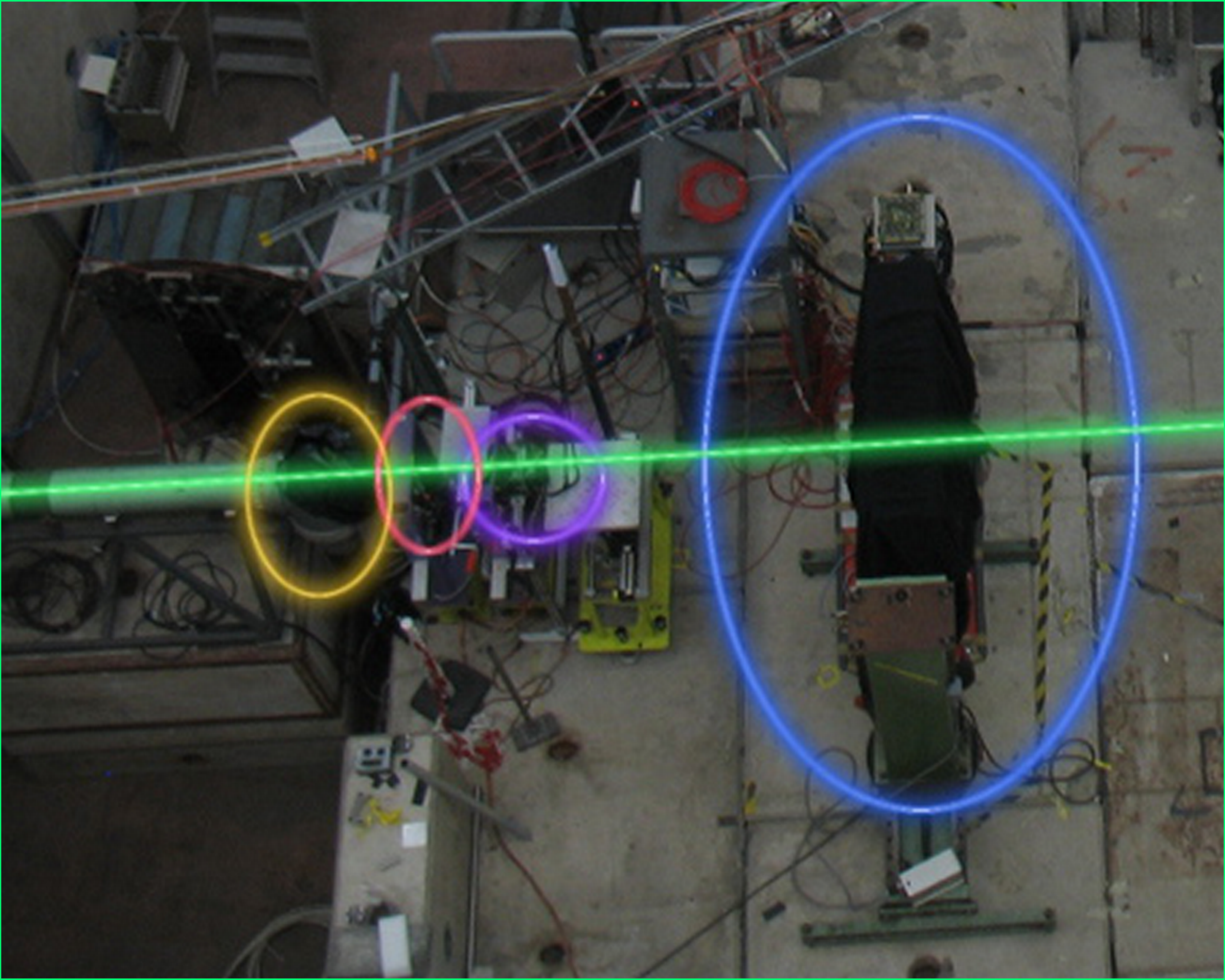


## CERN testbeam

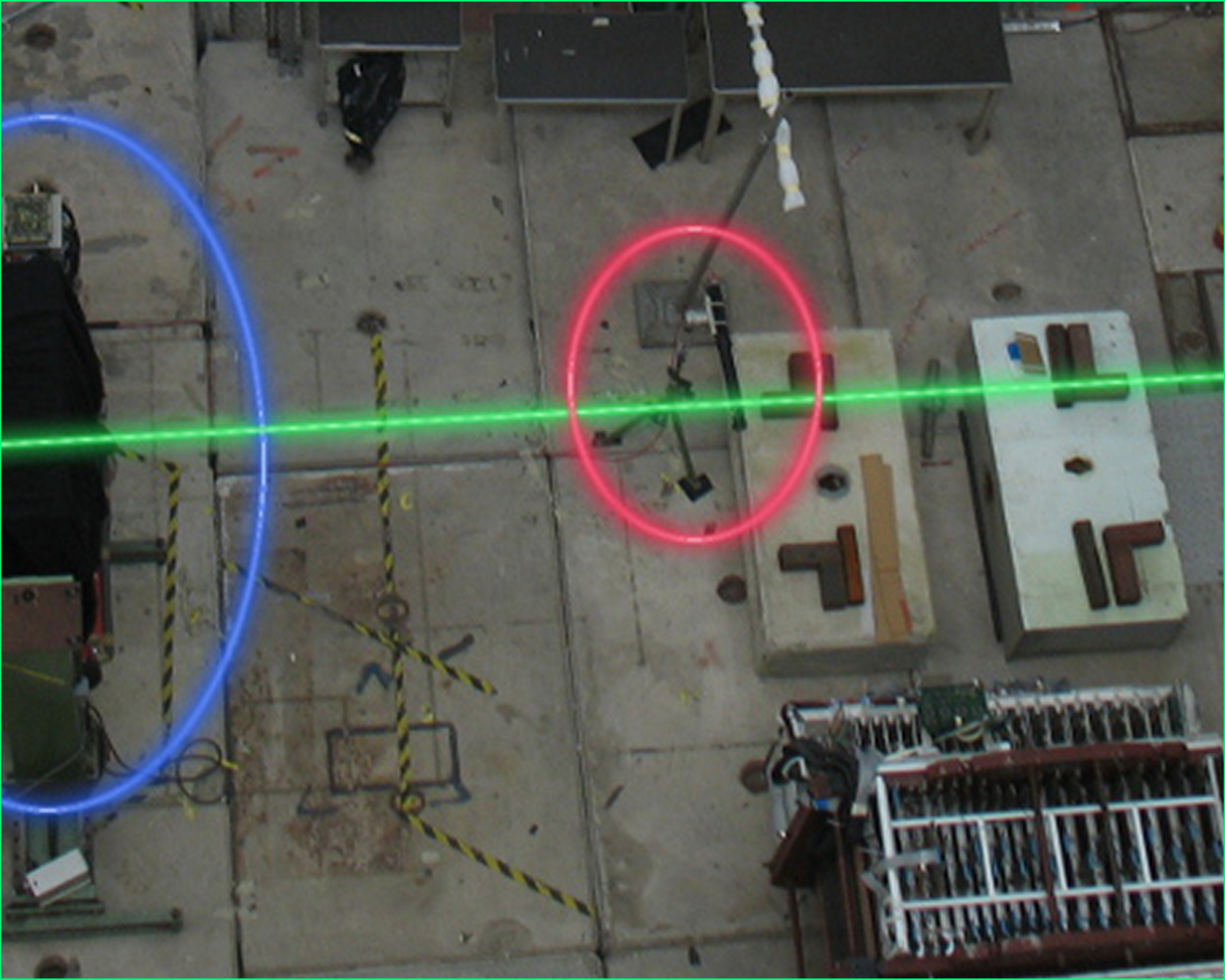


- ▷ first try from 16th of September to 2nd of October: almost no beam, magnets broken
- ▷ second try from 15th to 25th of October: beam for few days
- ▷ 3.5 GeV/c
- ▷ protons, light mesons, . . .

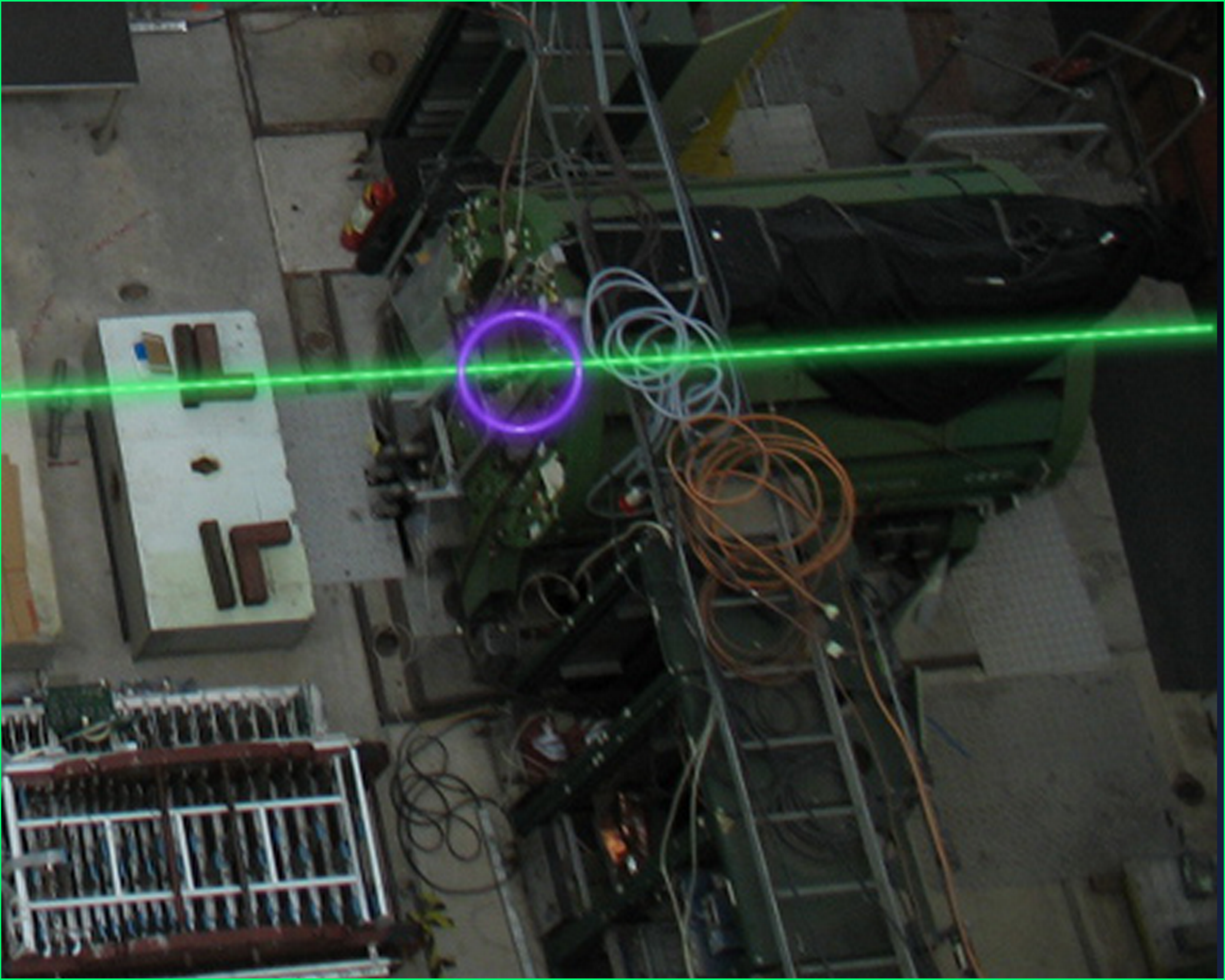






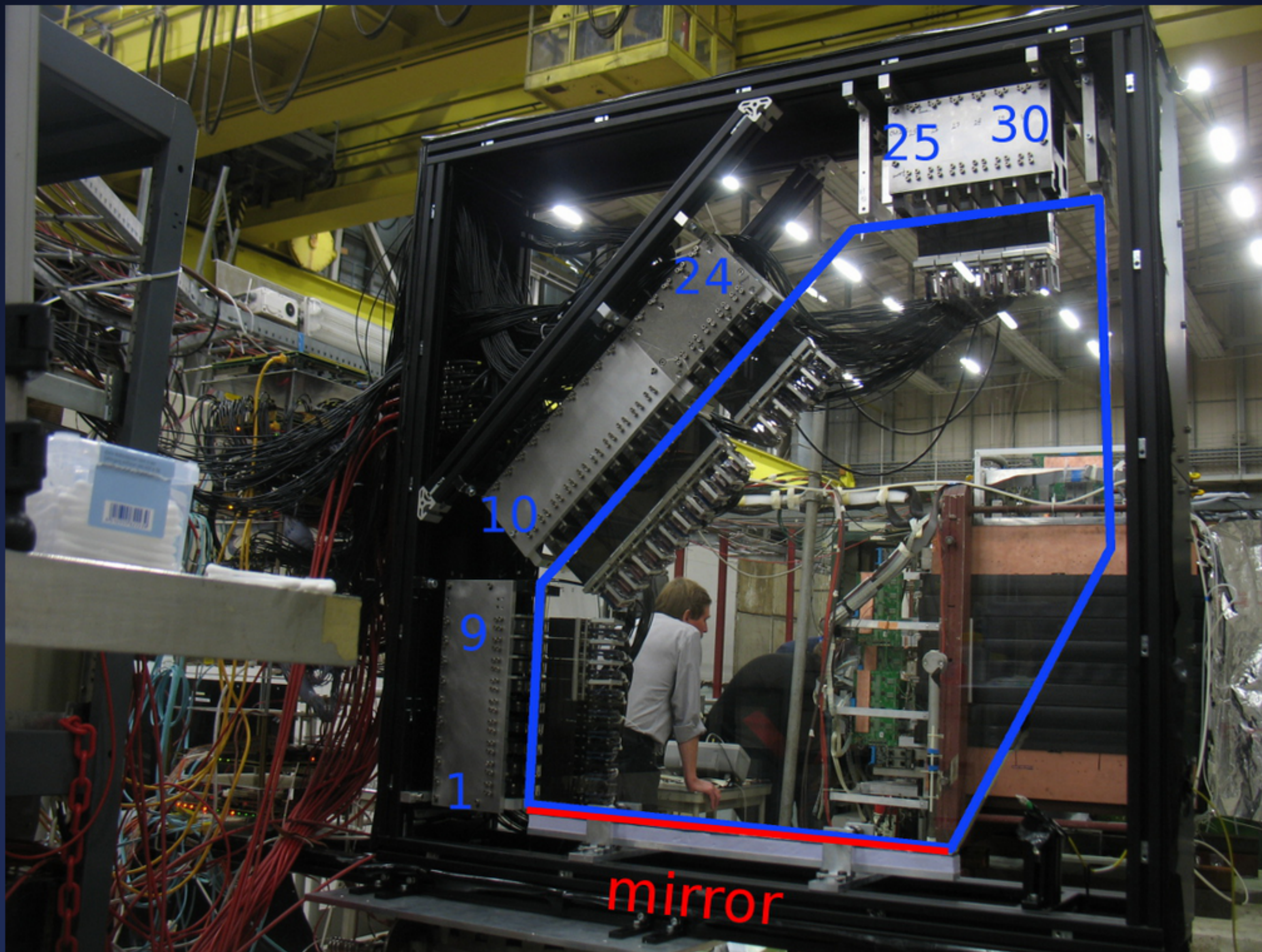






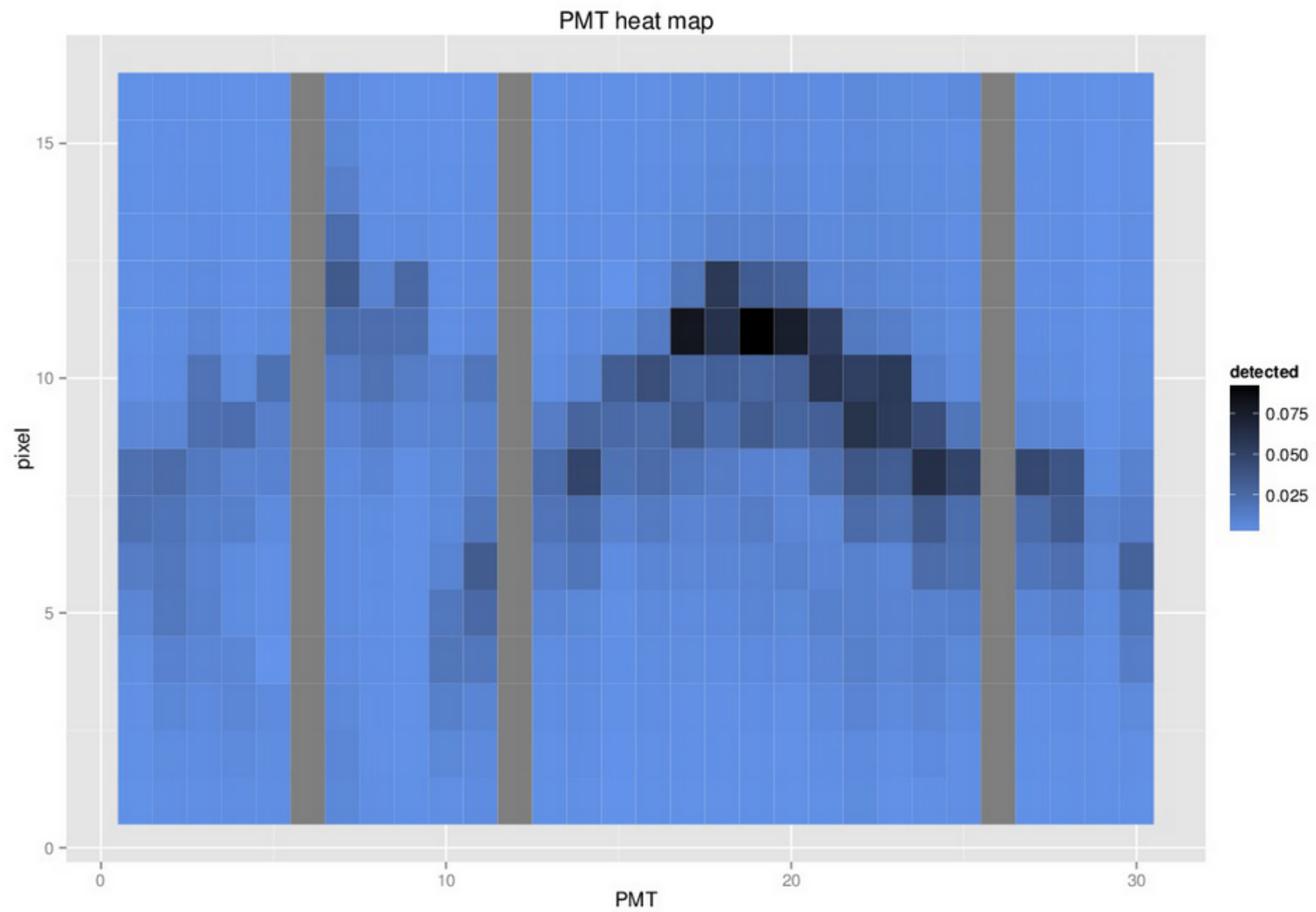


# Disc DIRC prototype



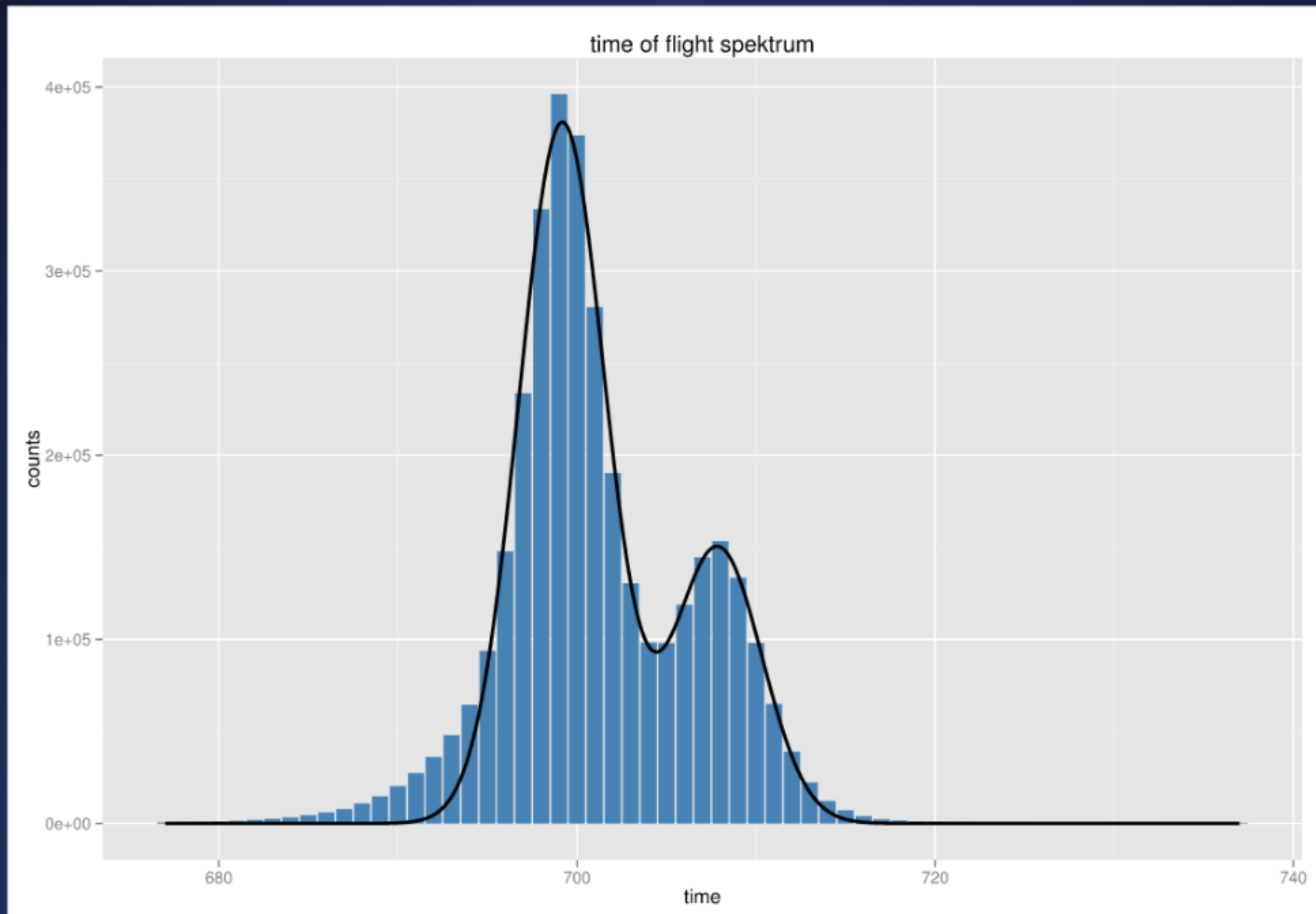


# Cherenkov smiles in Disc DIRC



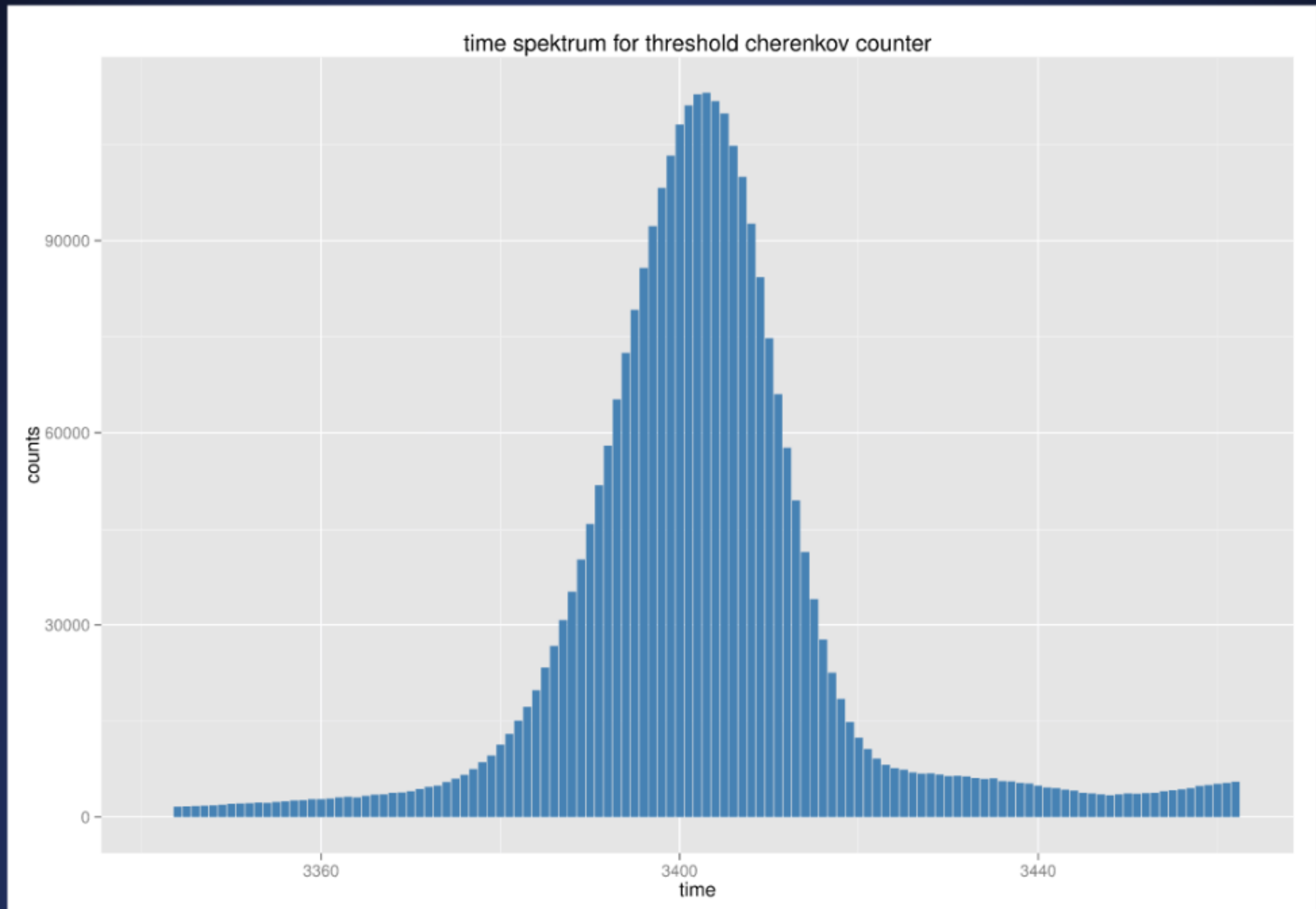


# Offline calibration: separate protons and light particles with time of flight counters



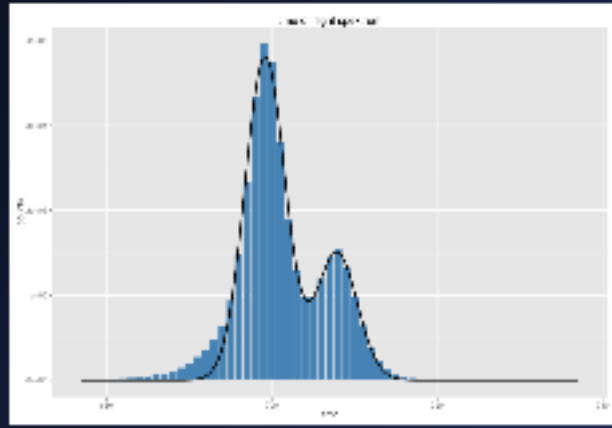


# Offline calibration: gas Cherenkov detector as veto for protons

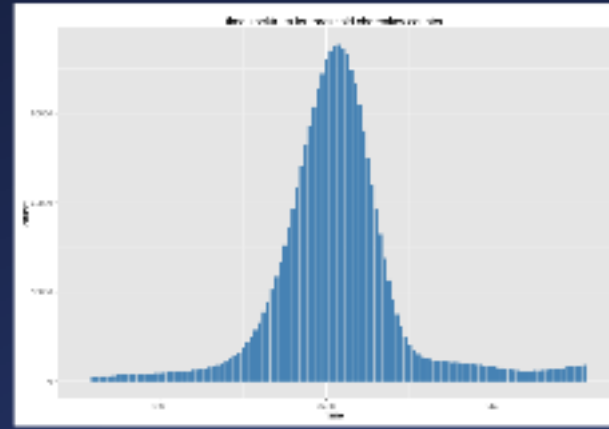




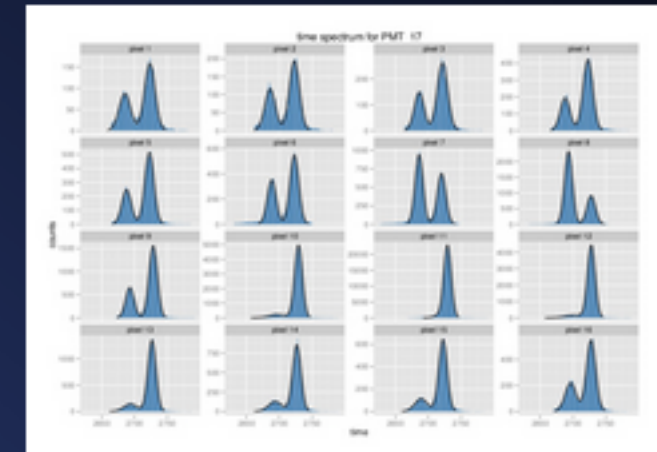
Offline calibration: separate protons and light particles with time of flight counters



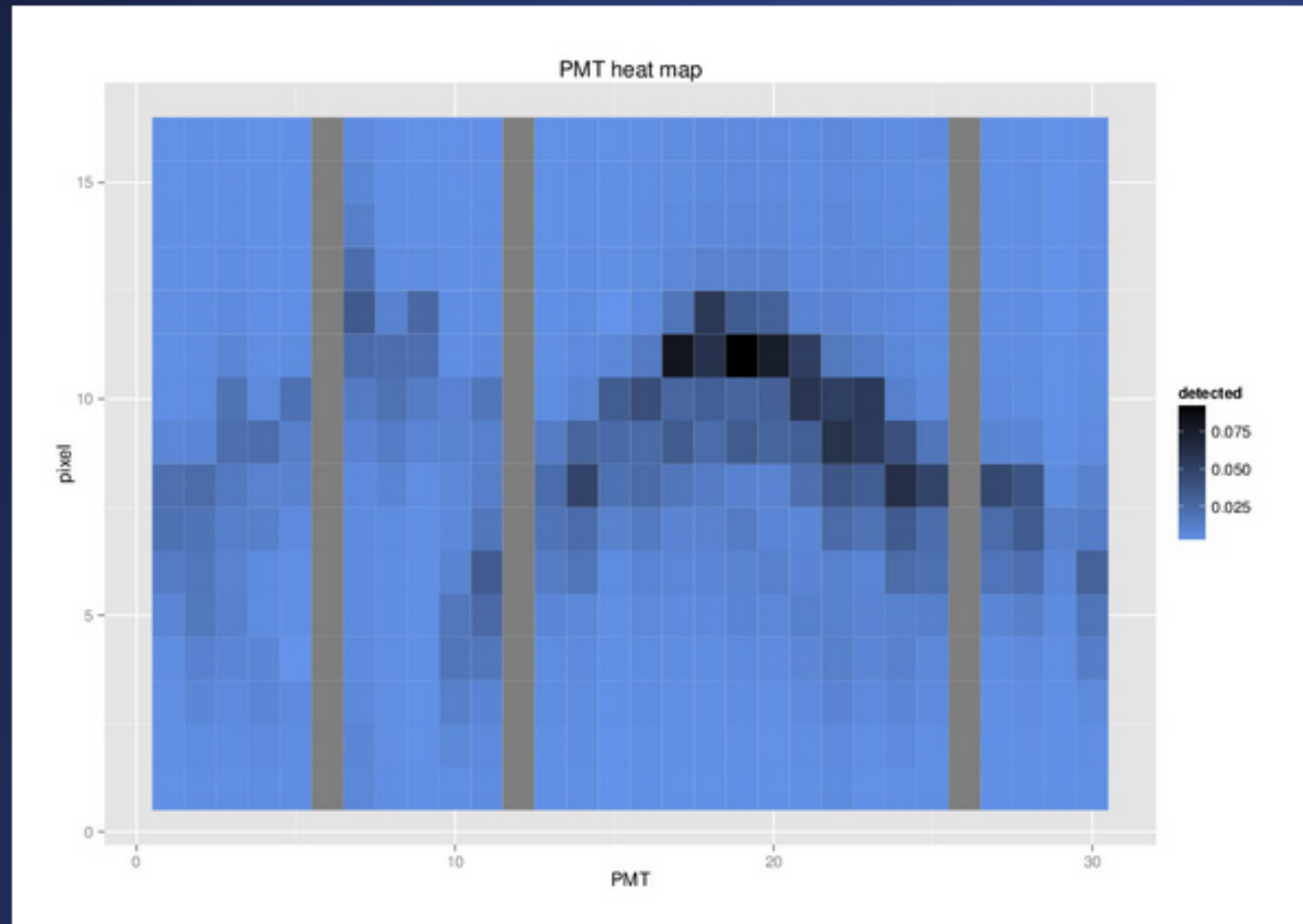
Offline calibration: gas Cherenkov detector as veto for protons



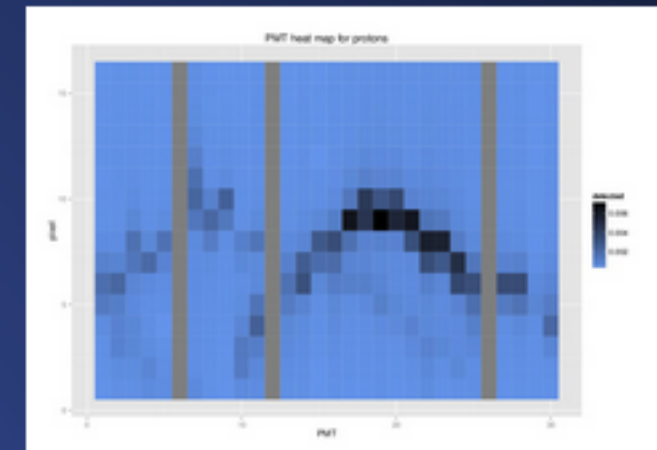
Offline calibration: time of propagation to separate direct and reflected light



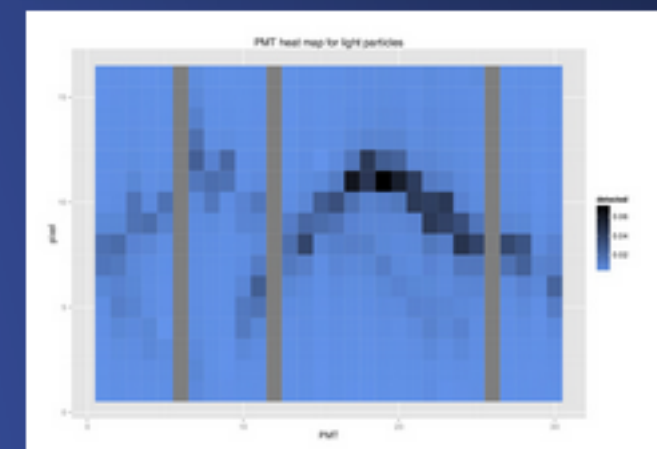
## Cherenkov smiles in Disc DIRC



Offline calibration: Cherenkov smiles from protons



Offline calibration: Cherenkov smiles from light particles





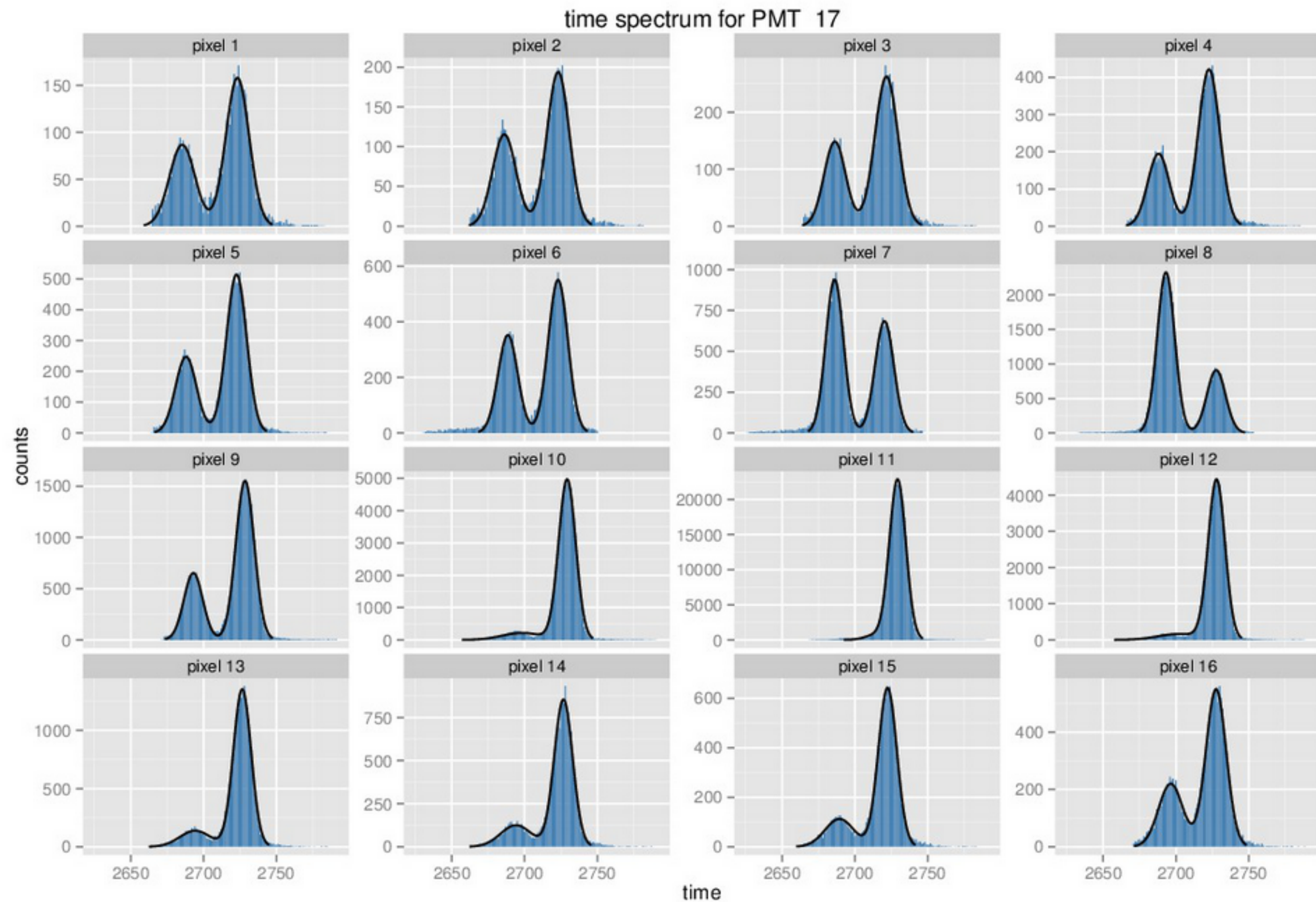






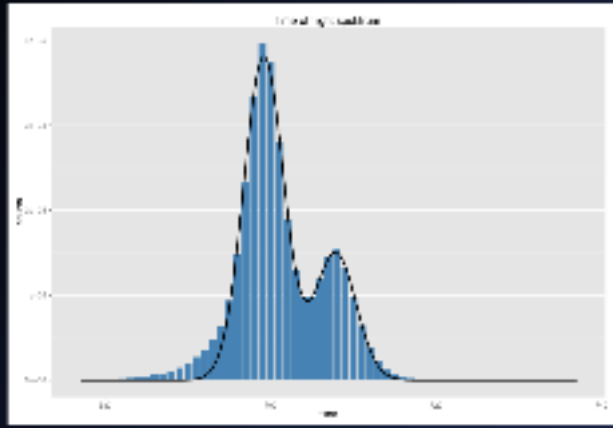


# Offline calibration: time of propagation to separate direct and reflected light

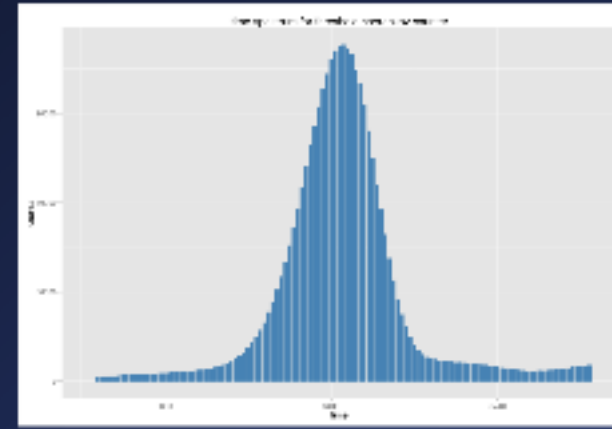




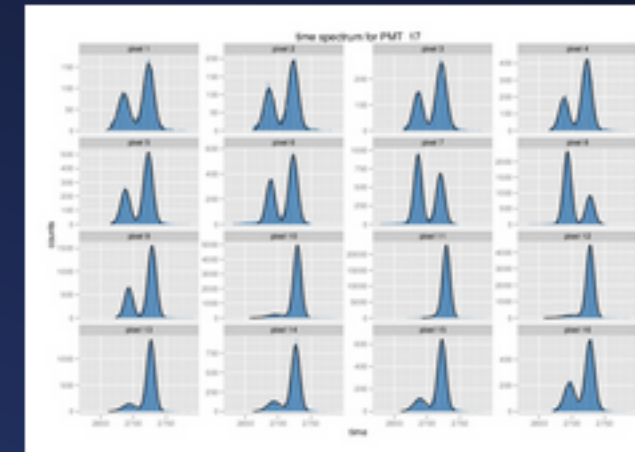
Offline calibration: separate protons and light particles with time of flight counters



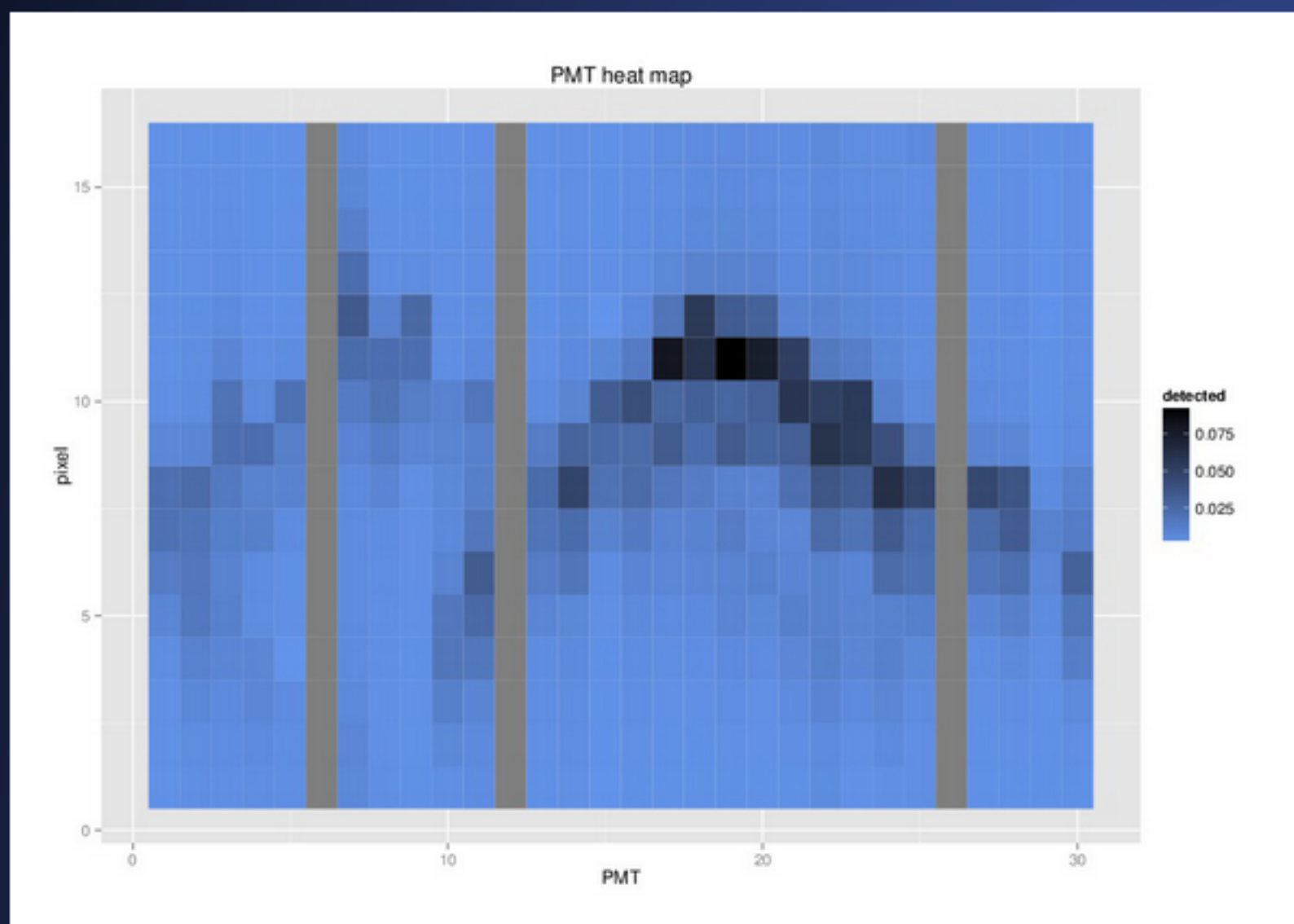
Offline calibration: gas Cherenkov detector as veto for protons



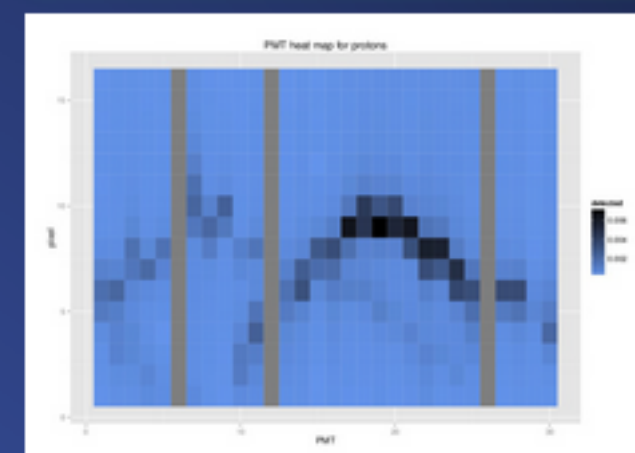
Offline calibration: time of propagation to separate direct and reflected light



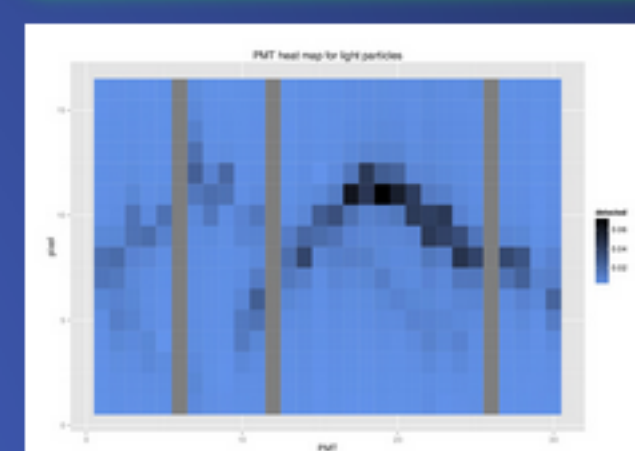
# Cherenkov smiles in Disc DIRC



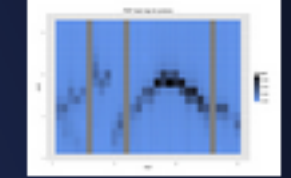
Offline calibration: Cherenkov smiles from protons



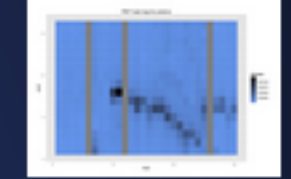
Offline calibration: Cherenkov smiles from light particles



Offline calibration: Cherenkov smiles from protons



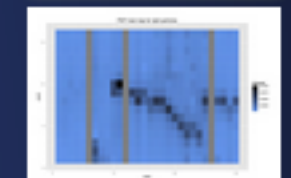
Offline calibration: Cherenkov smiles from light particles



Offline calibration: Cherenkov smiles from protons



Offline calibration: Cherenkov smiles from light particles

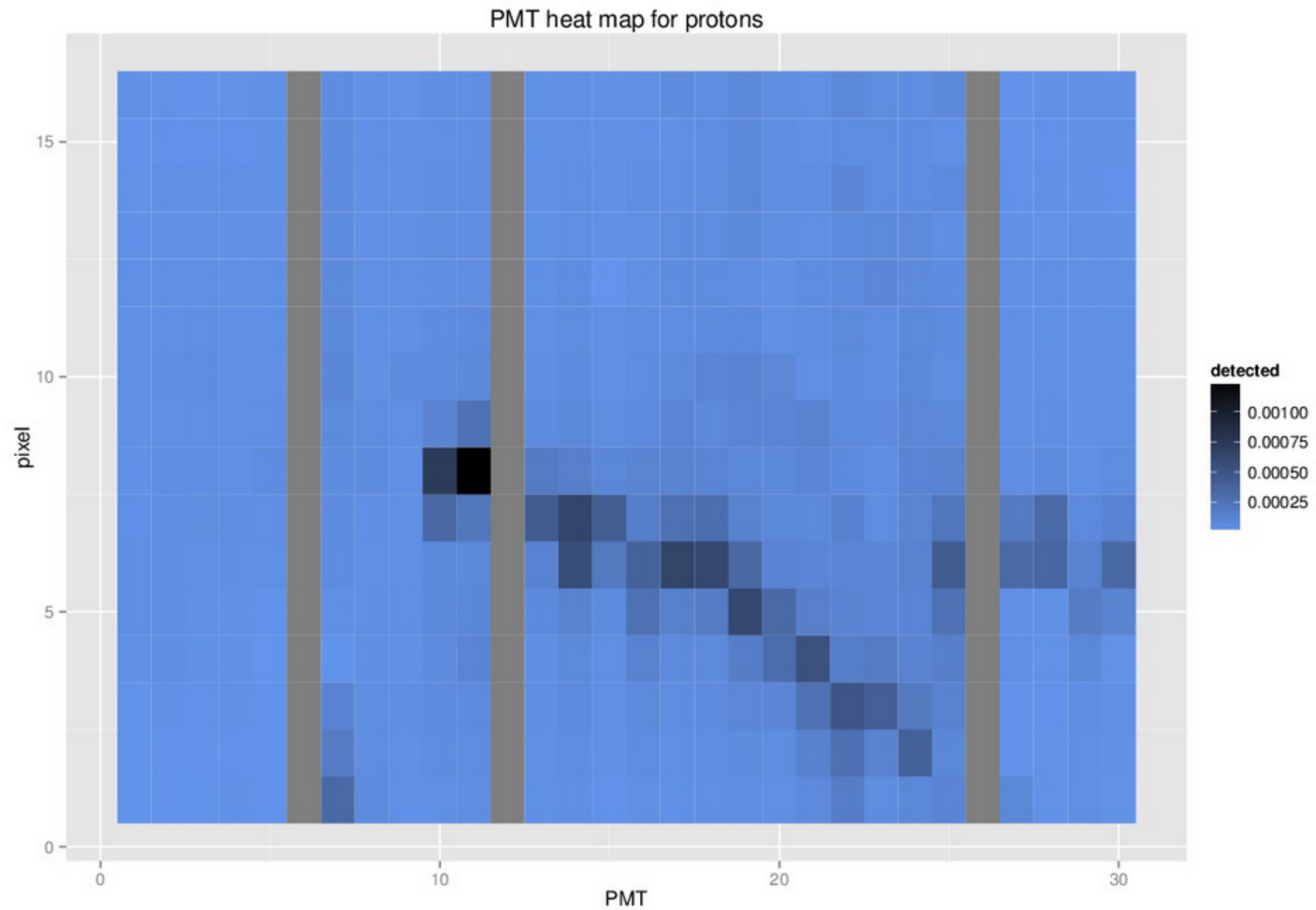








# Offline calibration: reflected light from protons

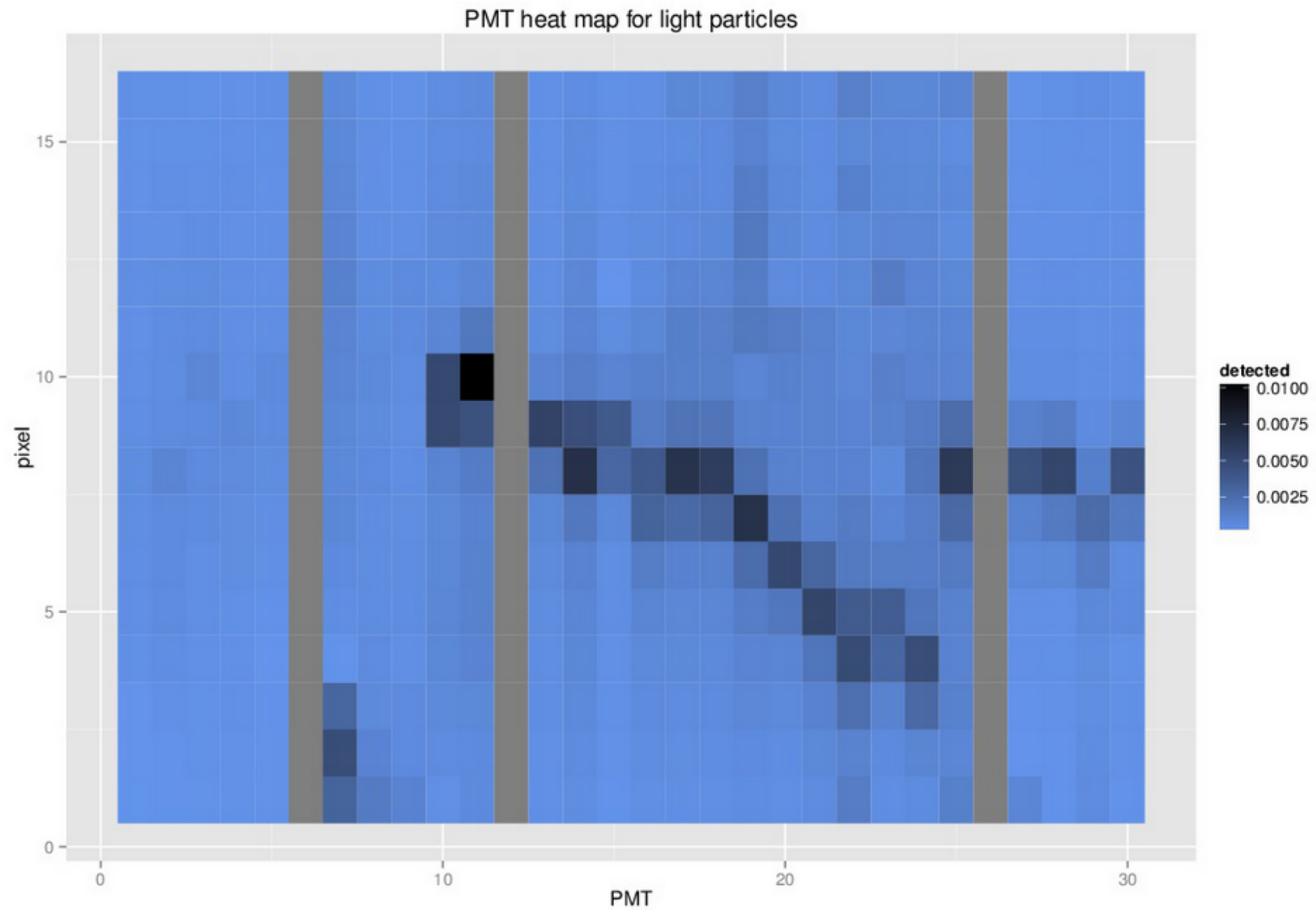






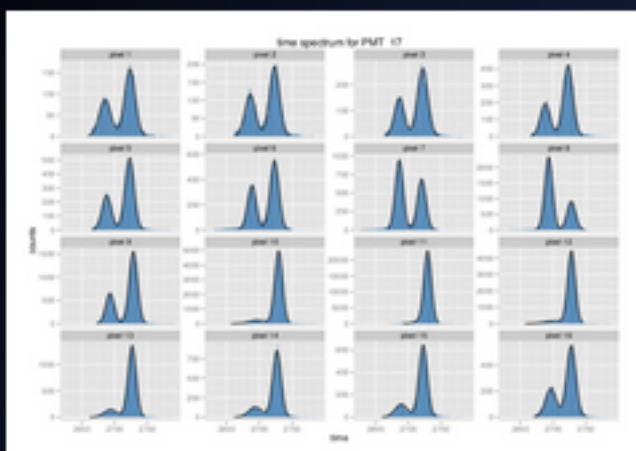


# Offline calibration: reflected light from light particles

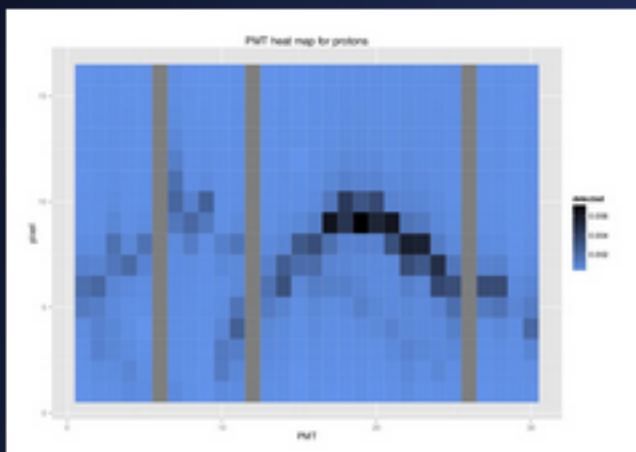




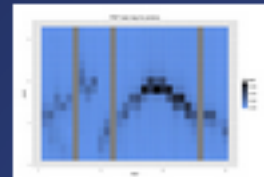
Offline calibration: time of propagation to separate direct and reflected light



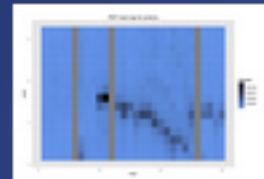
Offline calibration: Cherenkov signal from protons



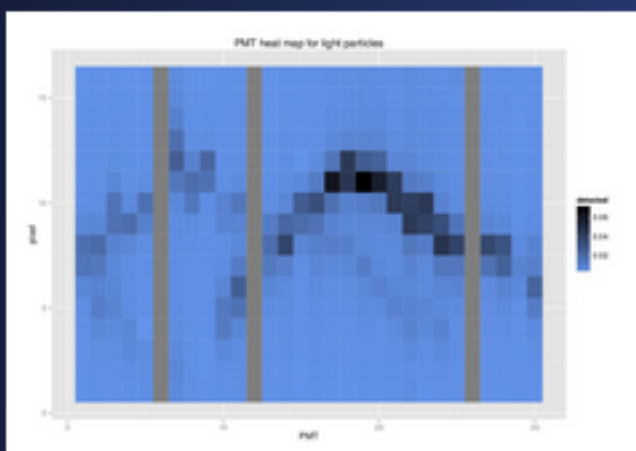
Offline calibration: time of propagation



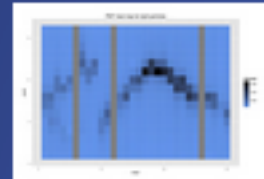
Offline calibration: color separation of protons



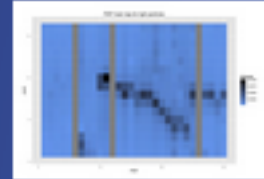
Offline calibration: Cherenkov signal from light particles



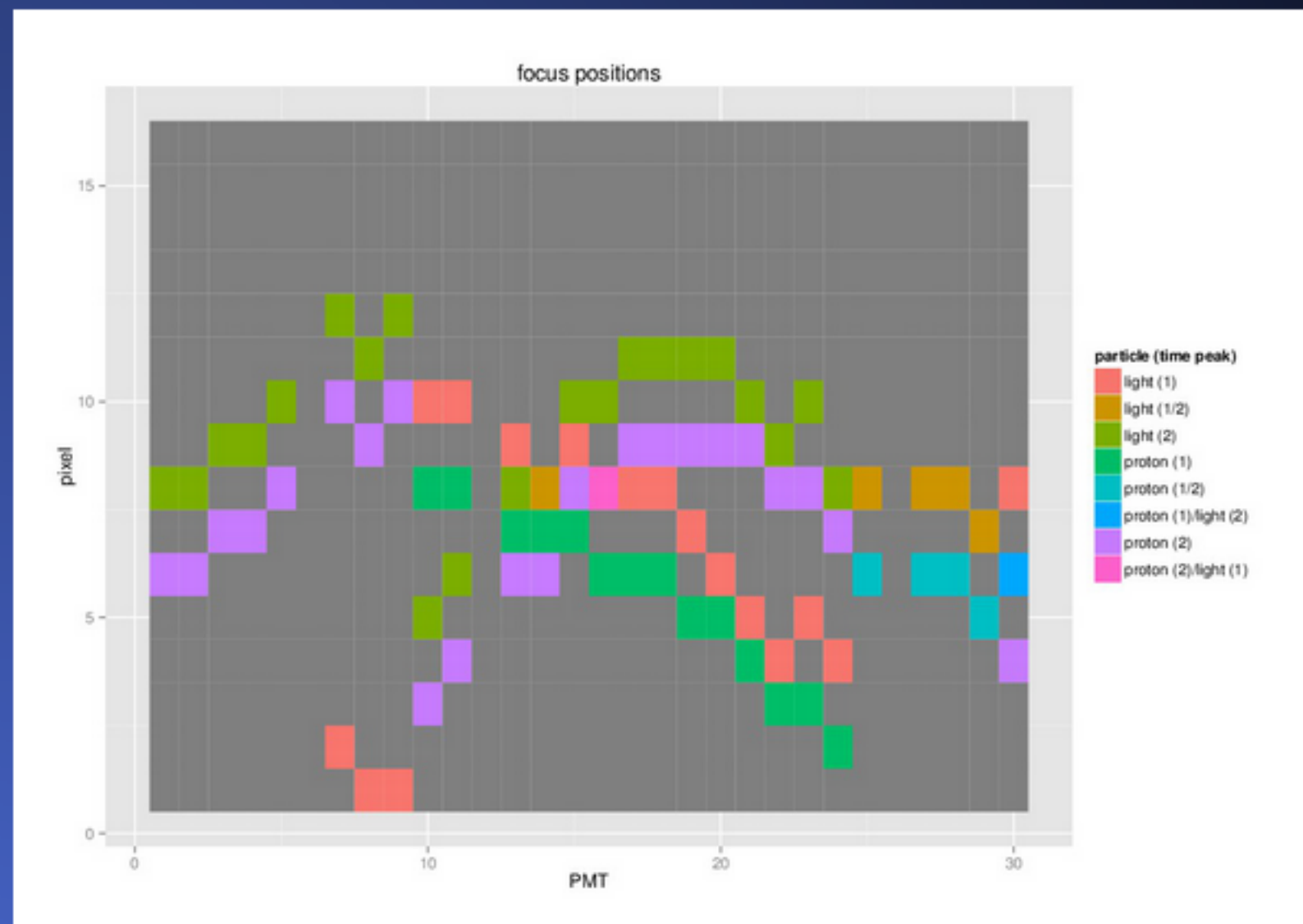
Offline calibration: time of propagation



Offline calibration: color separation of light particles

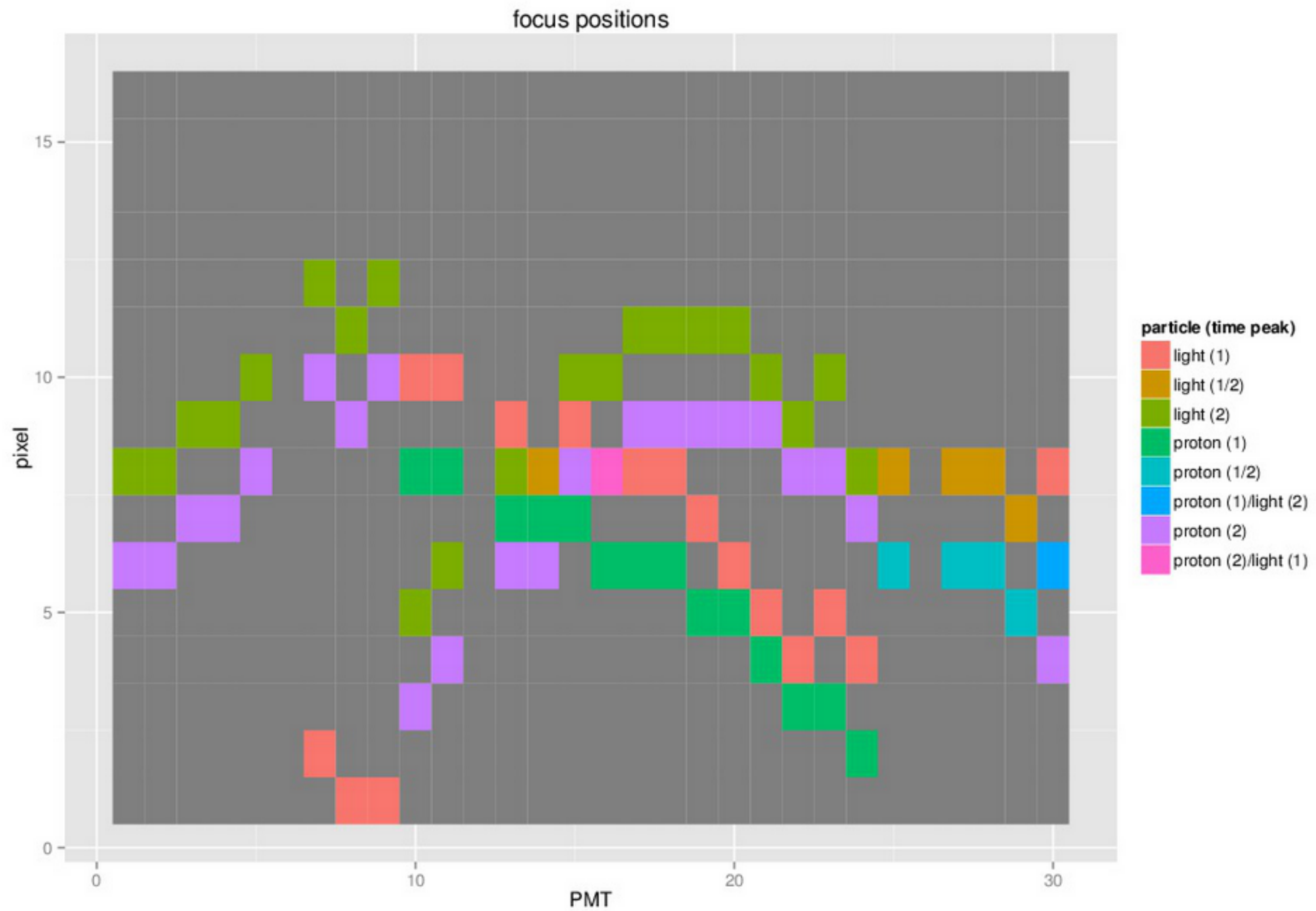


Offline calibration: focal positions after separations

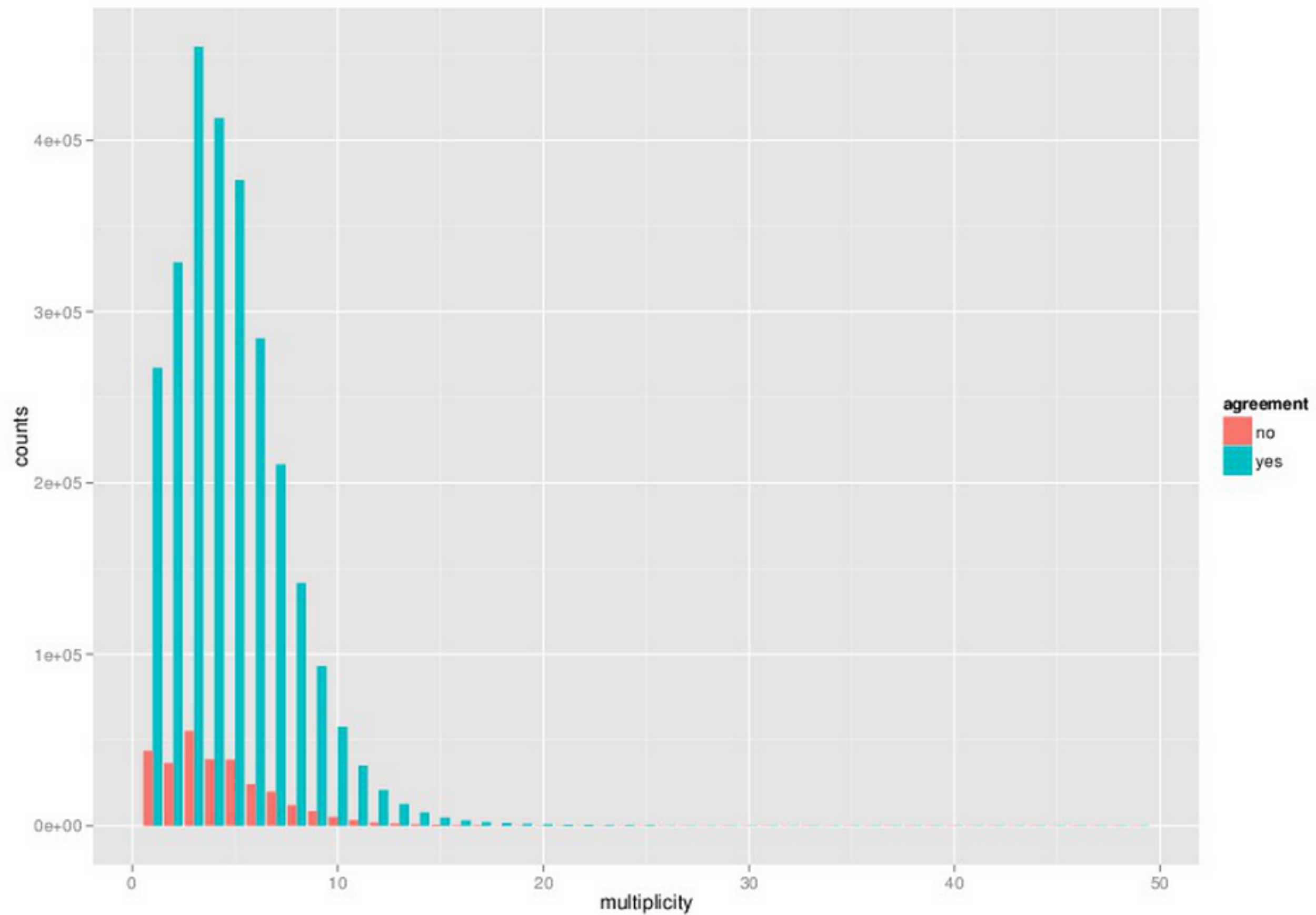




# Offline calibration: focal positions after separations

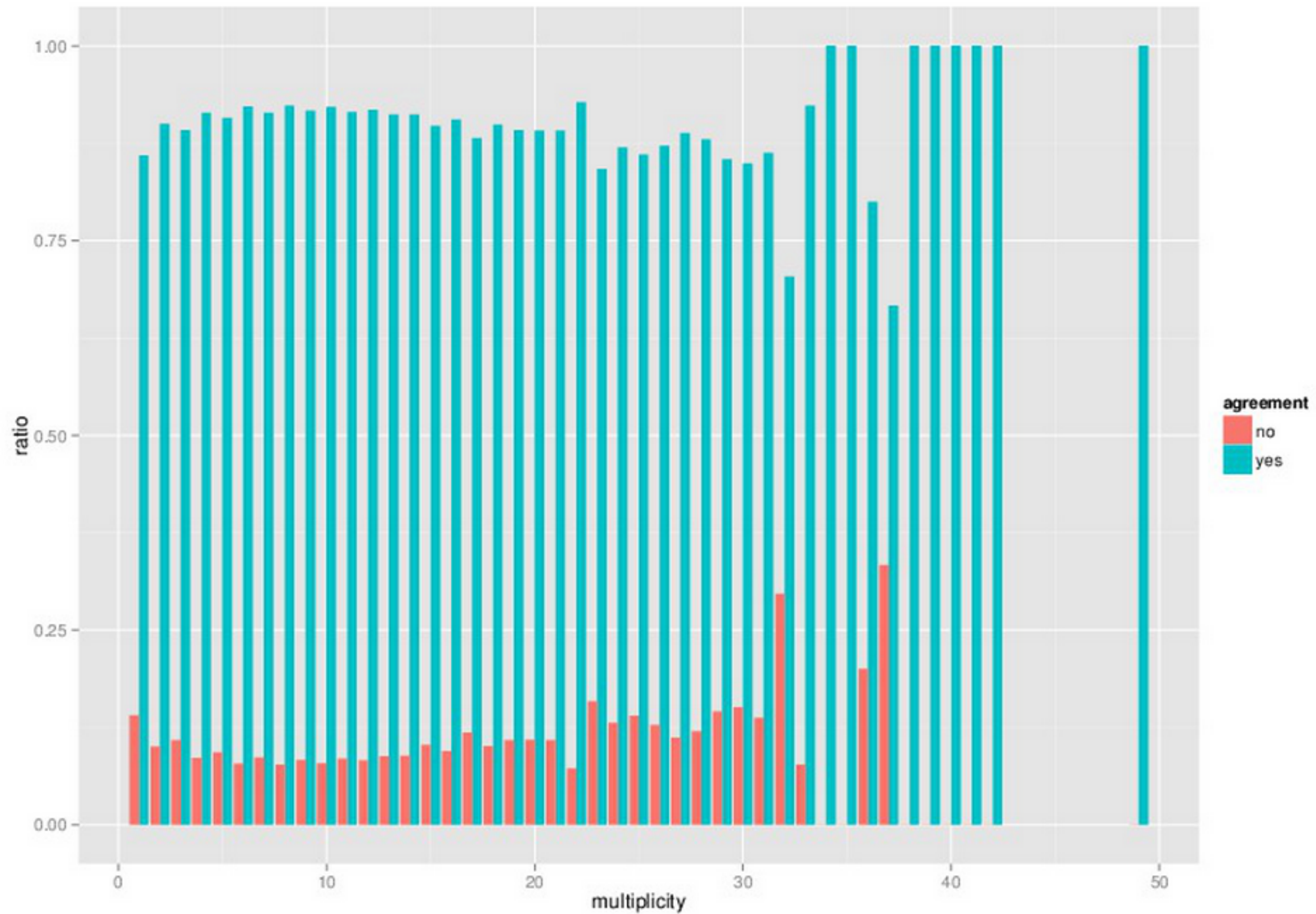


# PID for single events: comparison of results with TOF and veto counters

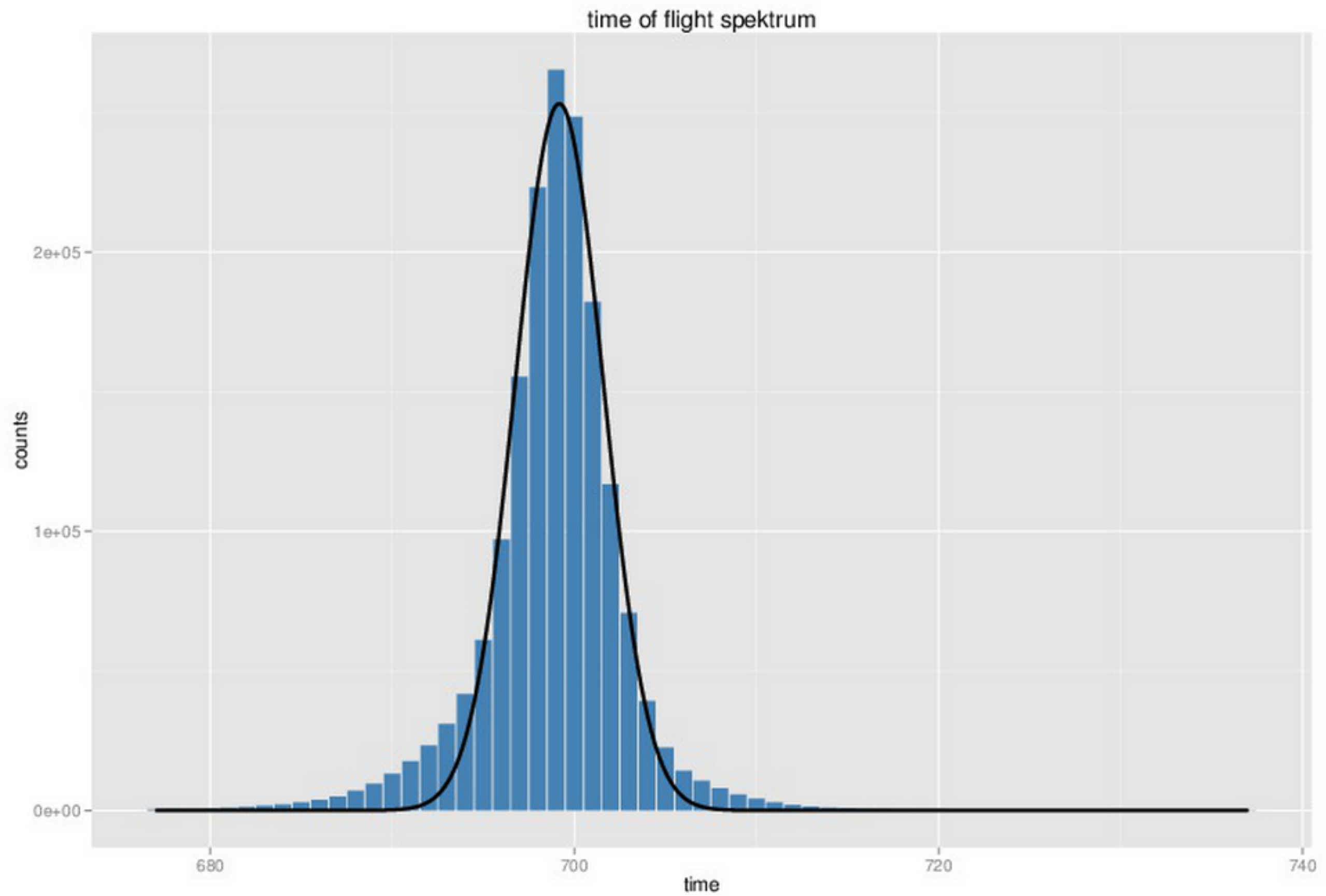




Same plot as previous one, but normalized

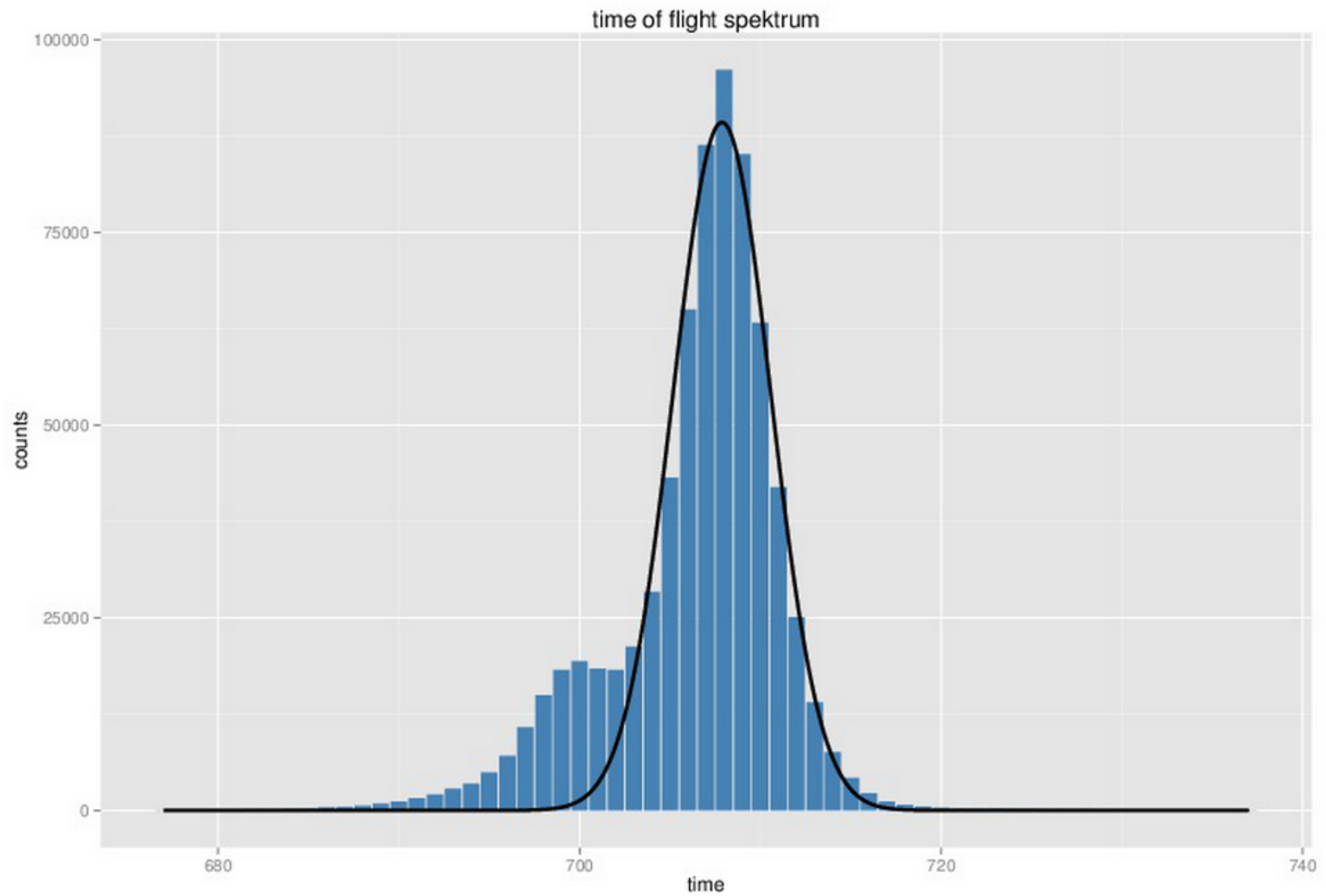


# TOF spektrum for events identified as light particle





# TOF spektrum for events identified as protons



## Summary

- ▷ Disc DIRC prototype separated protons and light particles successfully.
- ▷ Time of propagation was used to separate direct and reflected photons.

## Outlook

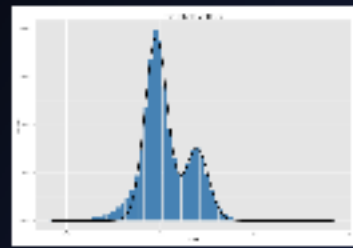
- ▷ Further investigations are needed to understand rates.
- ▷ Optimizations should improve PID quality.
- ▷ Monte Carlo and tracking information could improve PID.

## Thanks to

- ▷ Michael Traxler, Marek Palka, Cahit Ugur, Grzegorz Korcyl
- ▷ Barrel DIRC group
- ▷ Erlangen group
- ▷ Lau Gatignon, Horst Breuker, Michael Jeckel



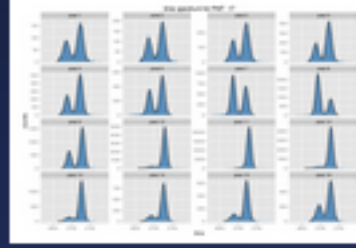
DIRC for a fixed size pipe radius  $r$  and light particles with a size of light  $\lambda$  is given:



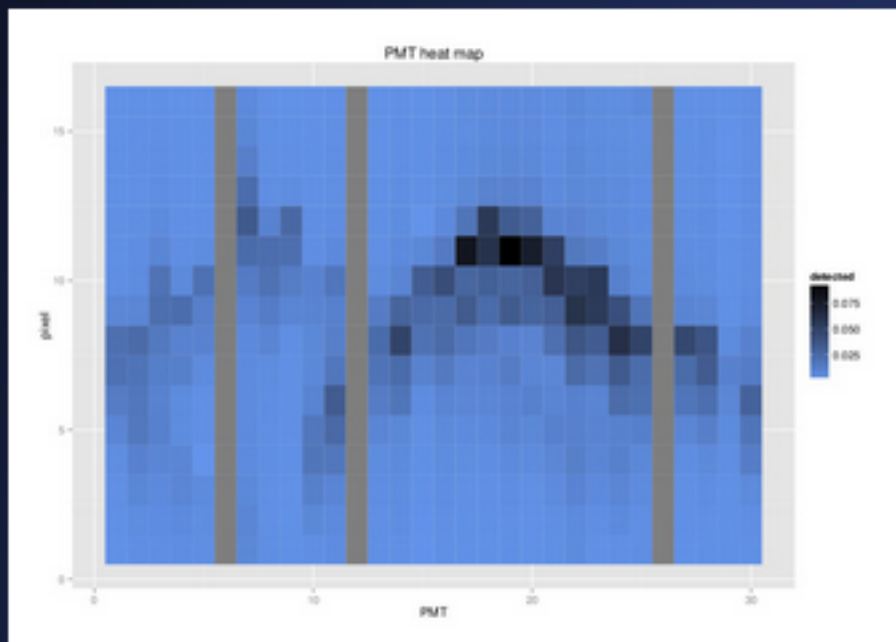
DIRC fiber calibration gas: Cherenkov emission from  $\pi^0$  mesons.



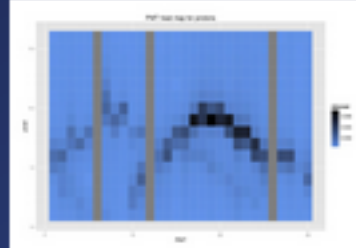
DIRC fiber calibration gas: propagation to separate direct and reflected light



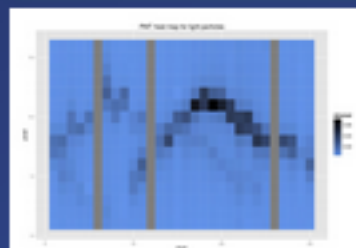
### Cherenkov's miles in Disc DIRC



DIRC fiber calibration gas: Cherenkov emission from  $\pi^0$  mesons



DIRC fiber calibration gas: Cherenkov emission from light particles



DIRC fiber calibration gas: Cherenkov emission from  $\pi^0$  mesons



DIRC fiber calibration gas: Cherenkov emission from  $\pi^0$  mesons



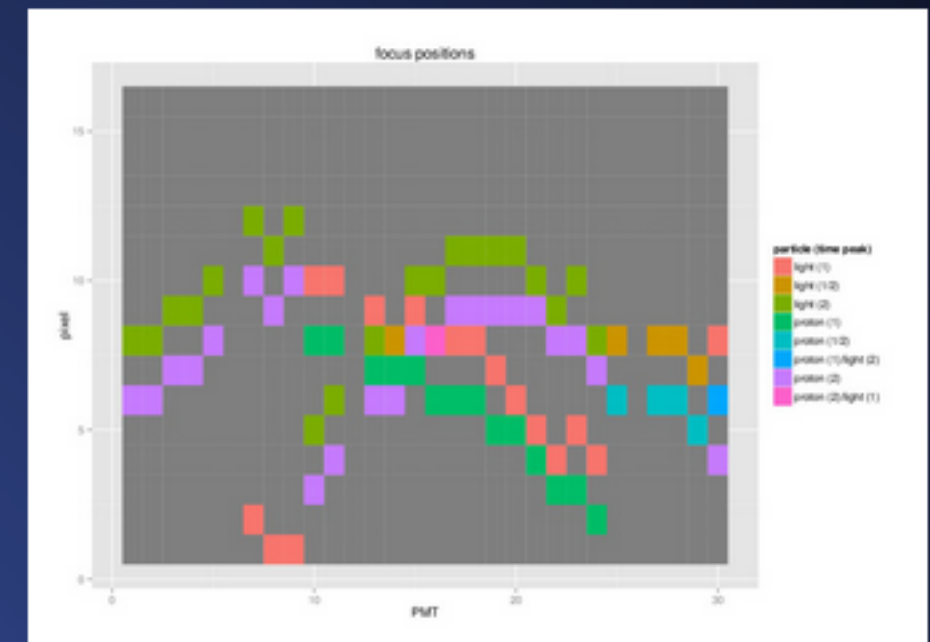
DIRC fiber calibration gas: Cherenkov emission from light particles



DIRC fiber calibration gas: Cherenkov emission from light particles



### Offline calibration: focal positions after separations



DIRC installation



Disc DIRC gas setup



Results of the DIRC DIRC wire beam campaign at CERN



**no issues**

Disc DIRC: gas setup or setup of all gas cells and light particle beam made by:

Time of propagation was used to separate direct and reflected light.

**no bugs**

Fiber beam investigation was not needed to see detection rates.

Clipping detection rates at large angle (PI) quality.

Most of gas cells and working calibration was M setup over PI.

**Thank to:**

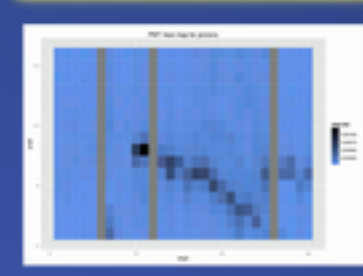
Michael Tander, Marko Puhar, Fabio Ugo, Georges Kourtellos

Final DIRC group

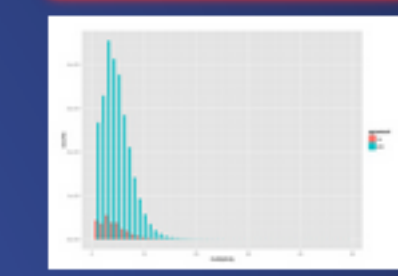
Fiber gas: gms p

Laszlo Gulyas, Elvira Wenzler, Michael Frank

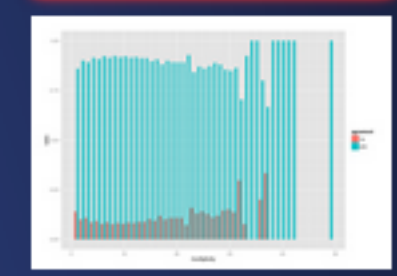
DIRC fiber calibration: separation of  $\pi^0$  meson signal



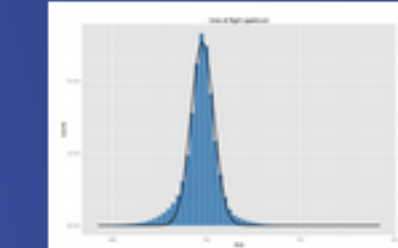
PI1 for single events: time position of arrival with 'WF' and time constant



Same plot as previous one, but no reduced



'WF' spectra used for direct and reflected light particles



'WF' spectra used for direct and reflected light particles

