UNIVERSITÉ DE GENÈVE

FACULTÉ DES SCIENCES

HPTPC: status

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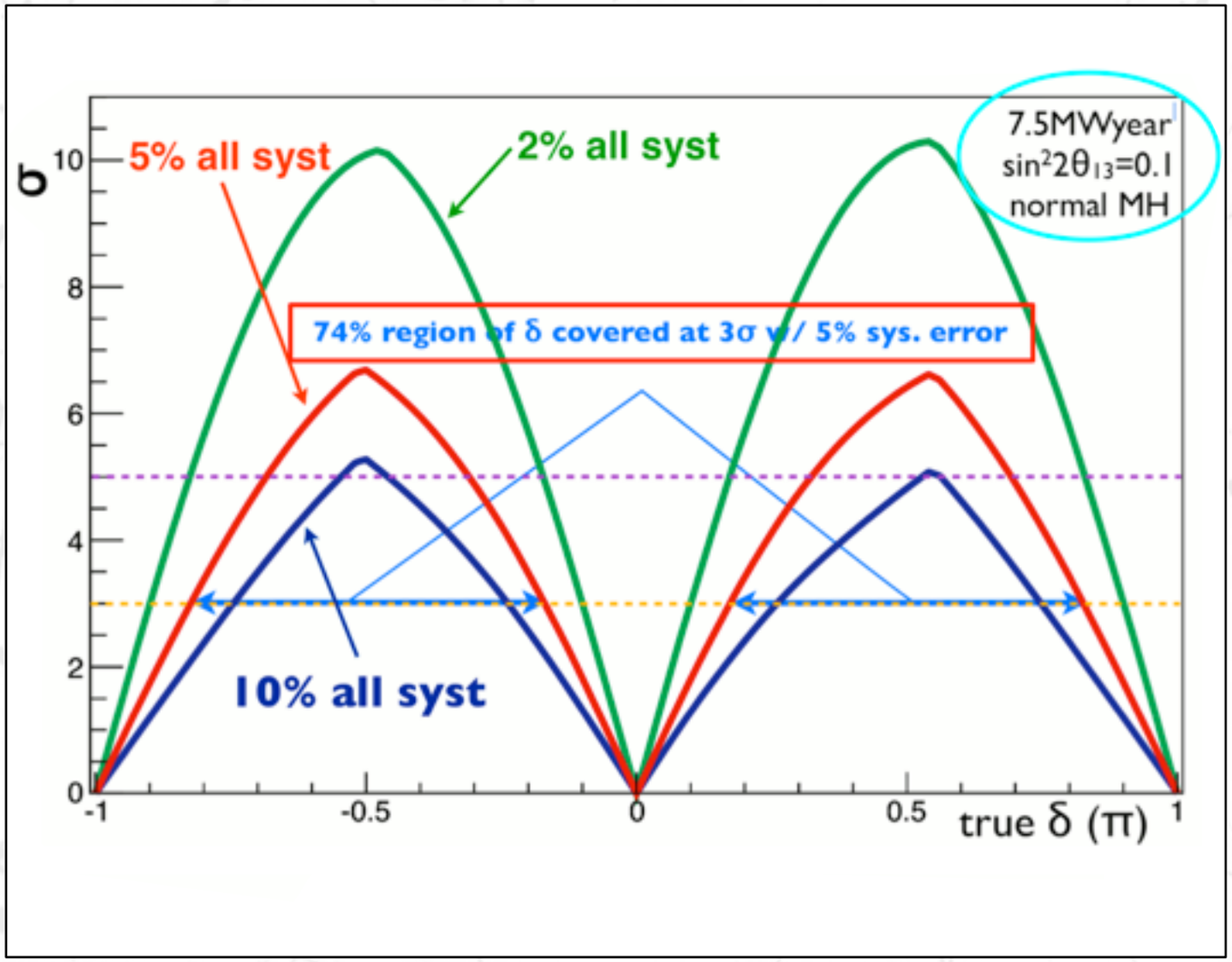
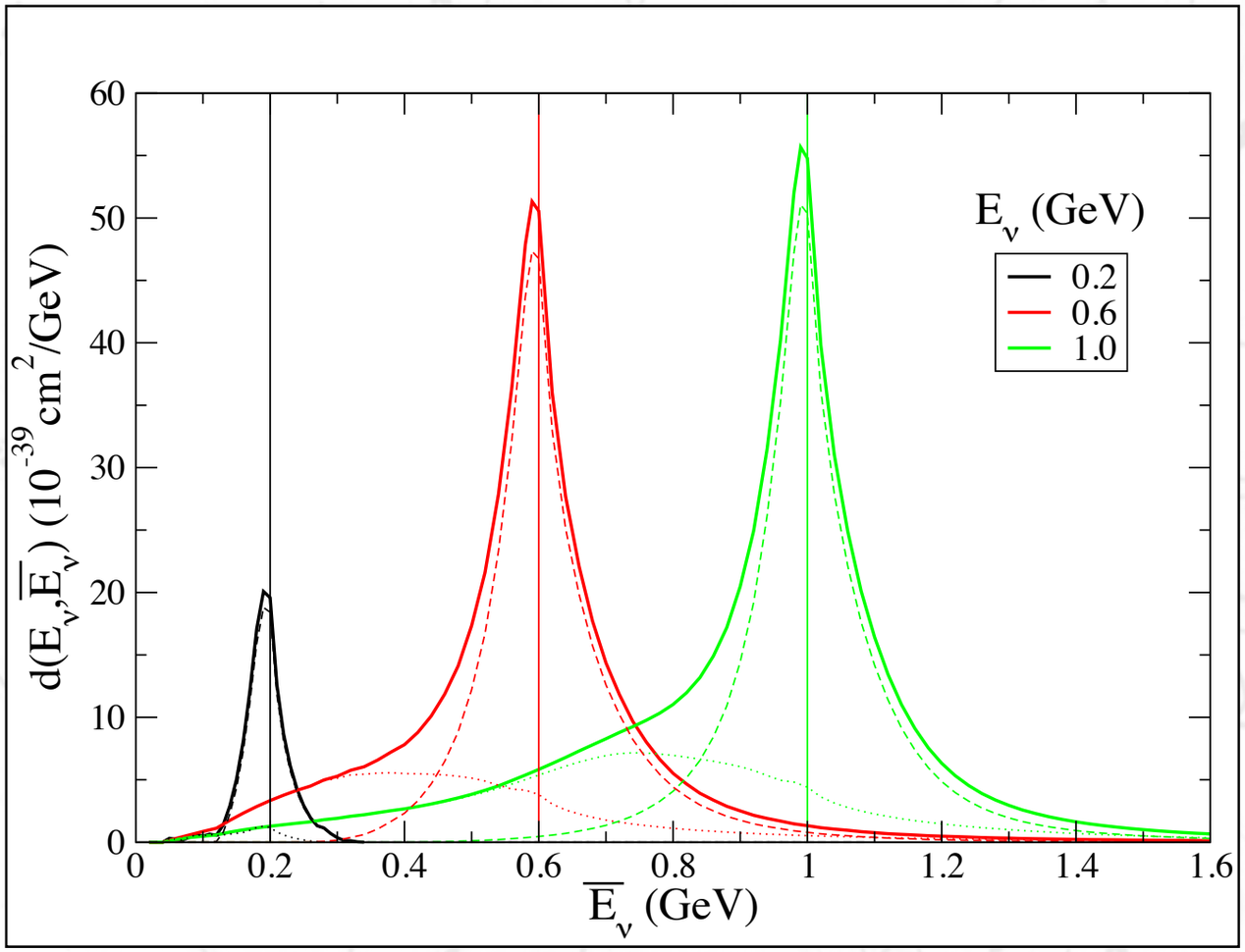
Université de Genève

Why HPTPC ?

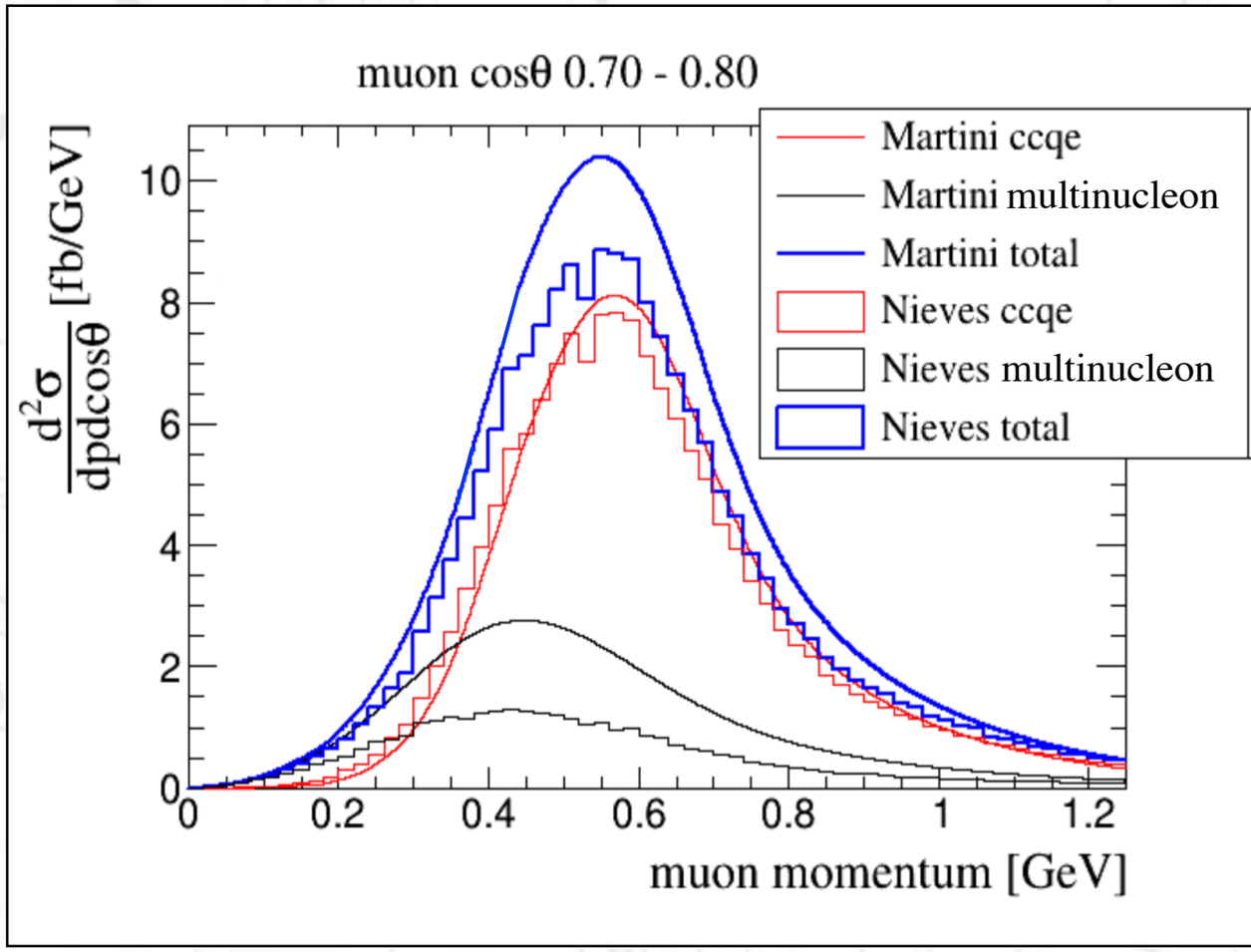
- Effect of systematic errors on the HyperKamiokande results.



Why HPTPC ?

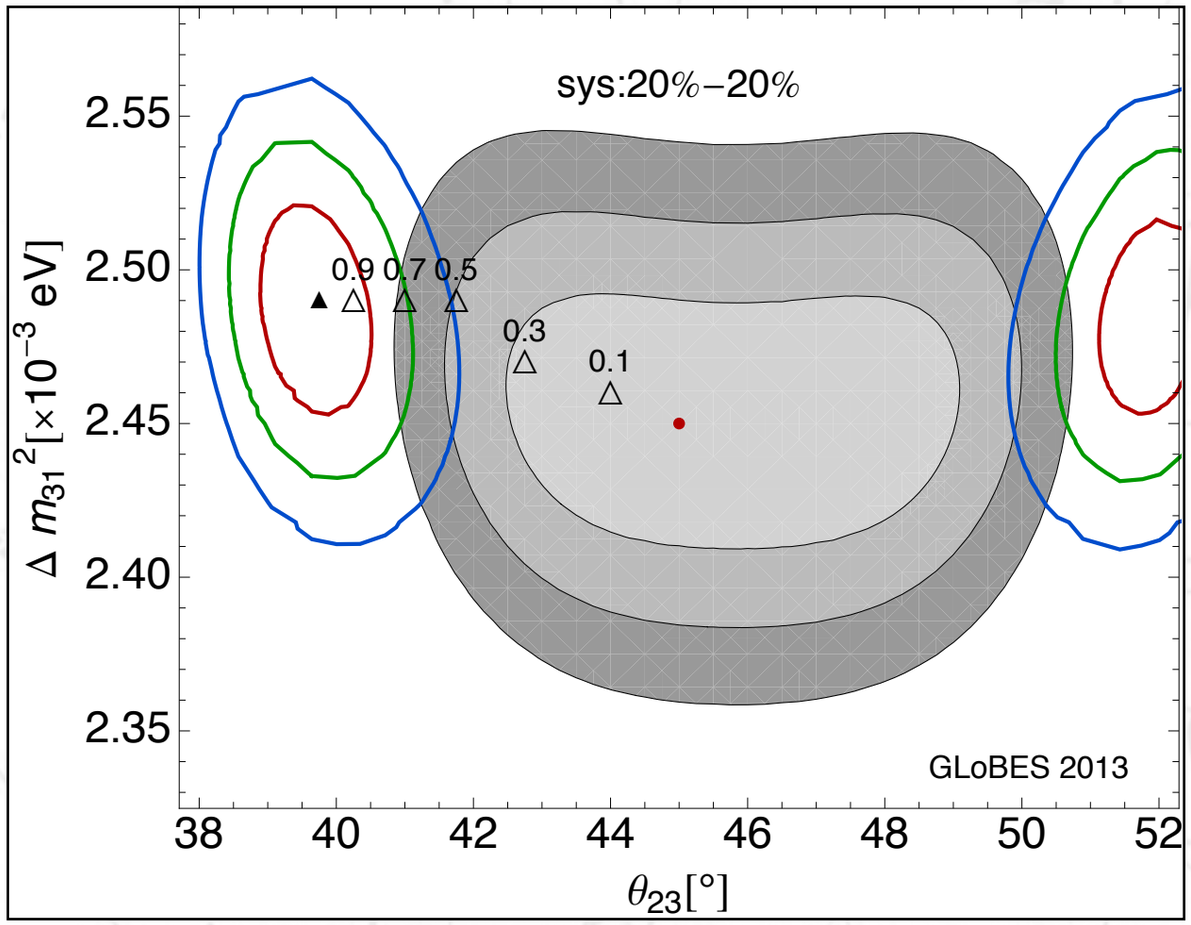


Effect of two body currents in SK/HK energy reconstruction.

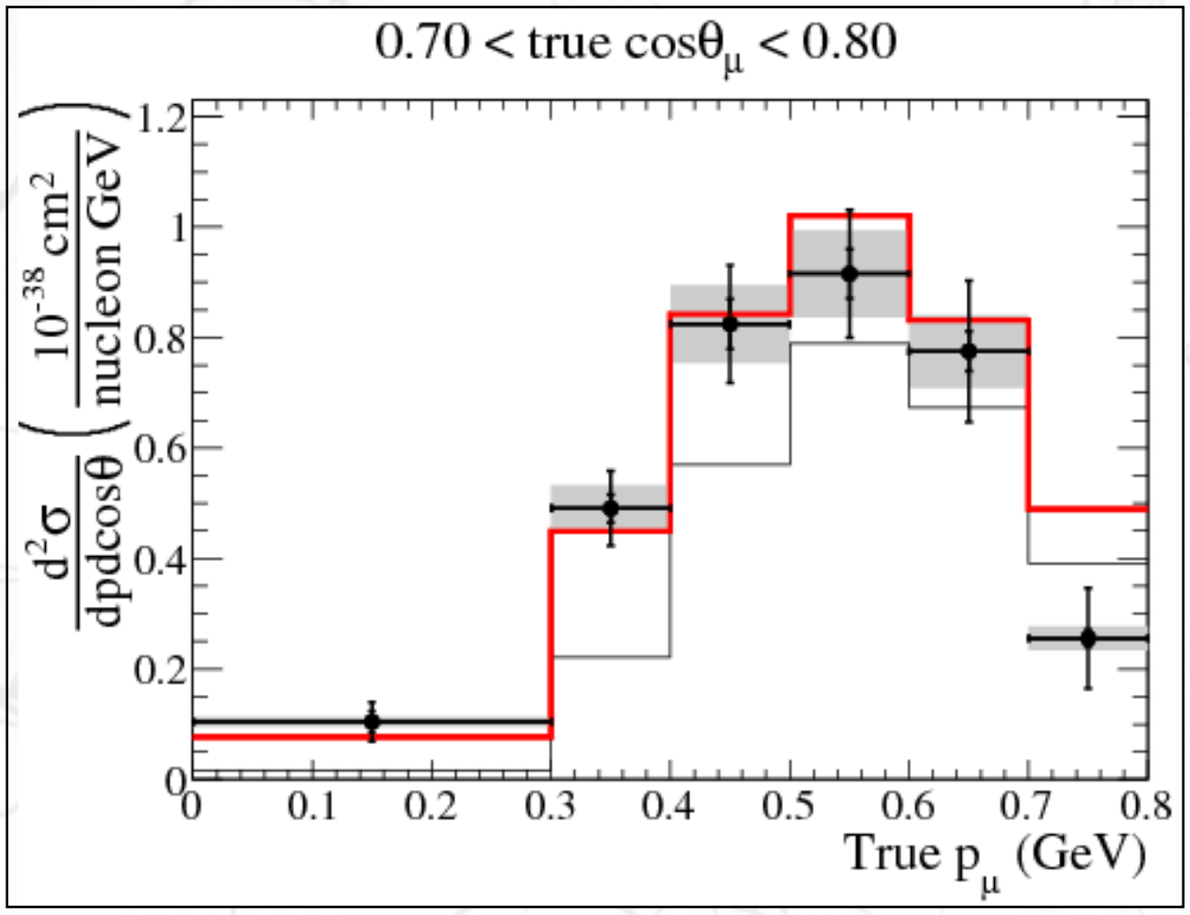


Similar models provide different predictions

Why HPTPC ?



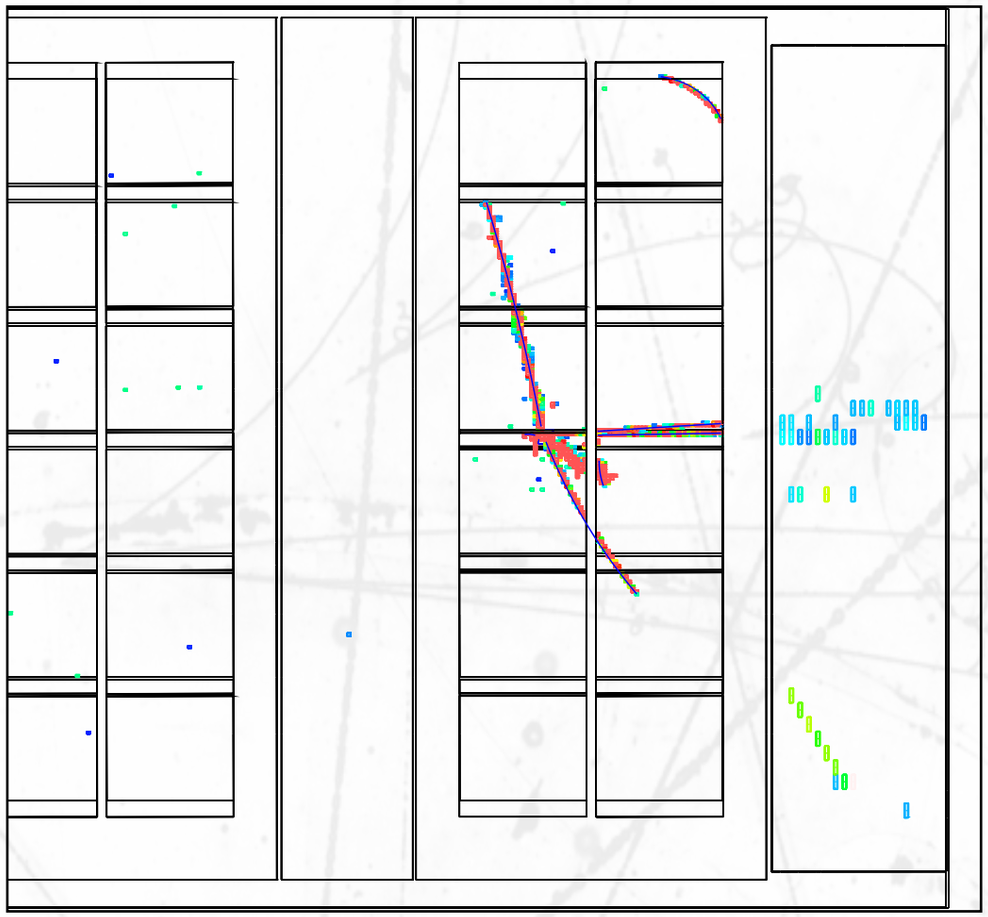
Bias in the measurement of oscillation parameters for different levels of background mis-estimates in the case of $\theta_{23}=45°$



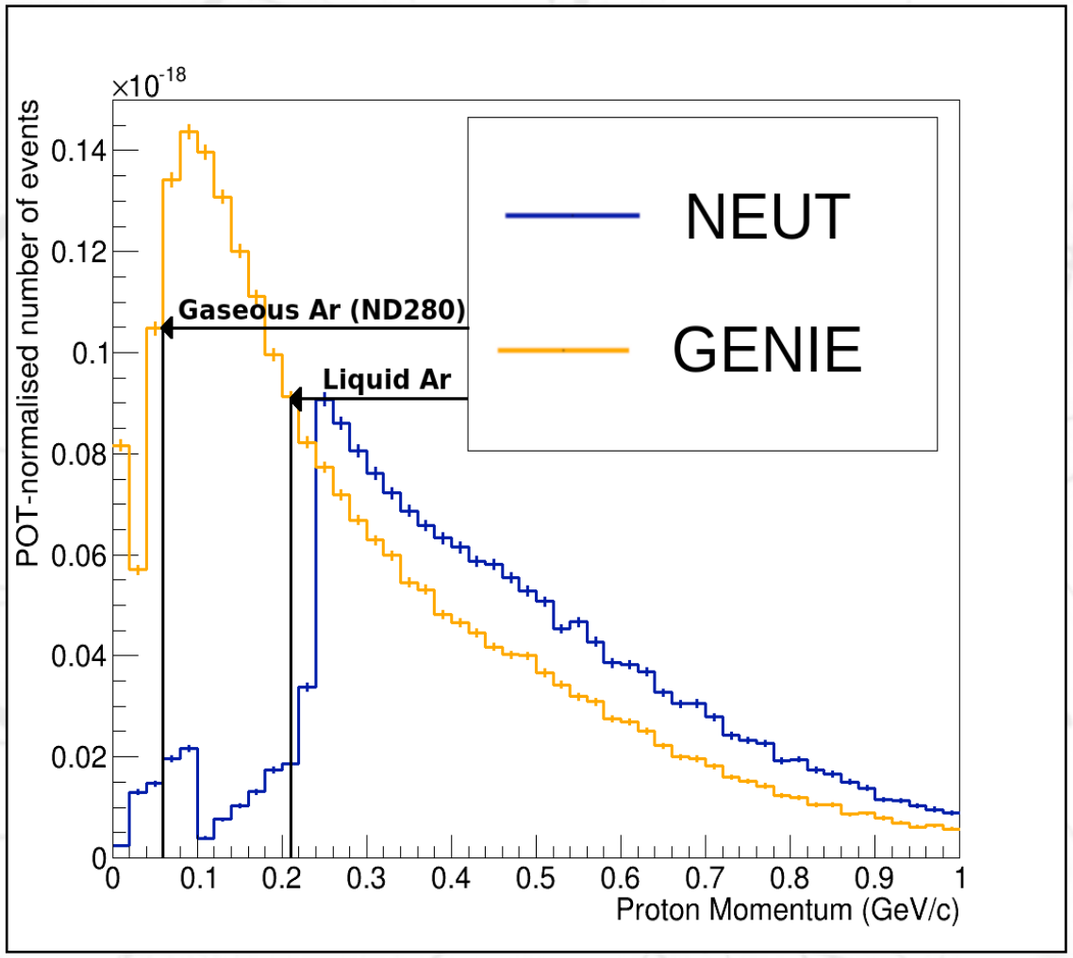
T2K CC0pi oscillation event sample data (black points, with grey systematic error bars) compared with a Monte Carlo prediction including the Martini multi-nucleon interaction process (red line), and a Monte Carlo prediction without multi-nucleon interactions (grey line)

Why HPTPC ?

Low momentum particles contains information about models.



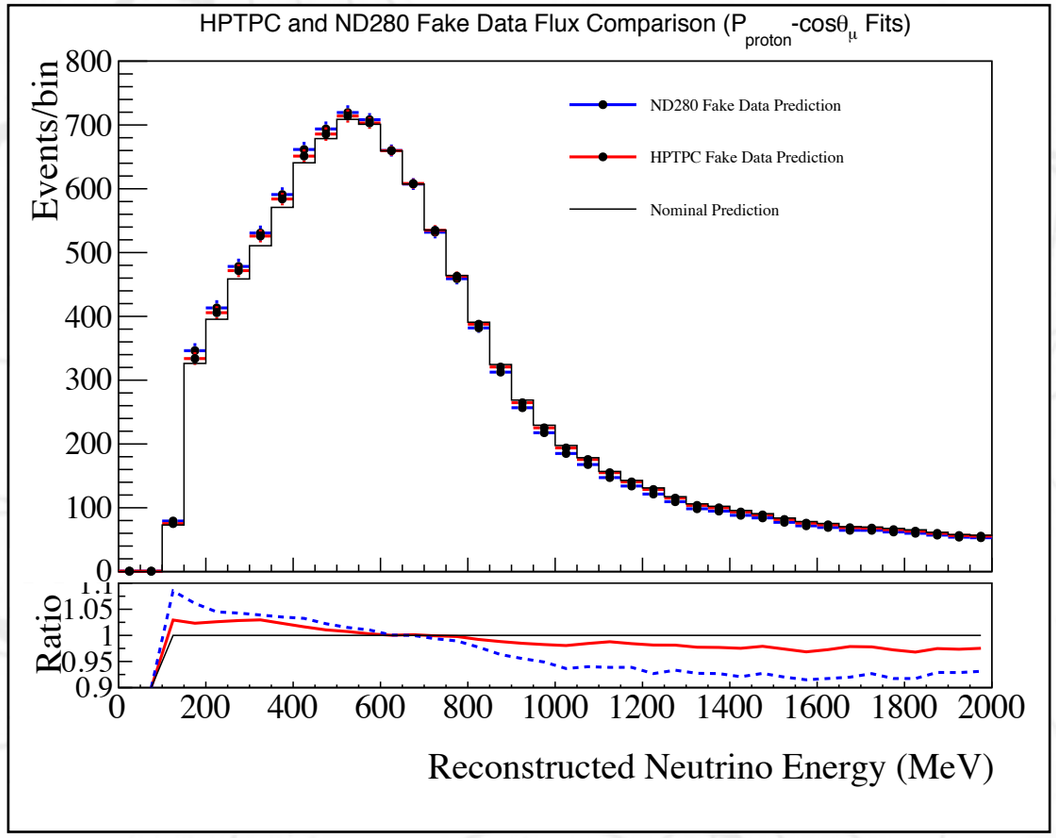
Interaction of neutrino in the ND280 TPC gas



Proton momentum distribution as predicted by two interaction models.

HPTPC performance

Selection	ND280 purity	HPTPC purity
CC-0π-0p	14 %	78 %
CC-0π-1p	71 %	86 %
CC-0π-Np	80 %	88 %
CC-1π-0p	42 %	79 %
CC-1π-1p	45 %	80 %
CC-1π-Np	77 %	83 %



Improvements on event purities by HPTPC

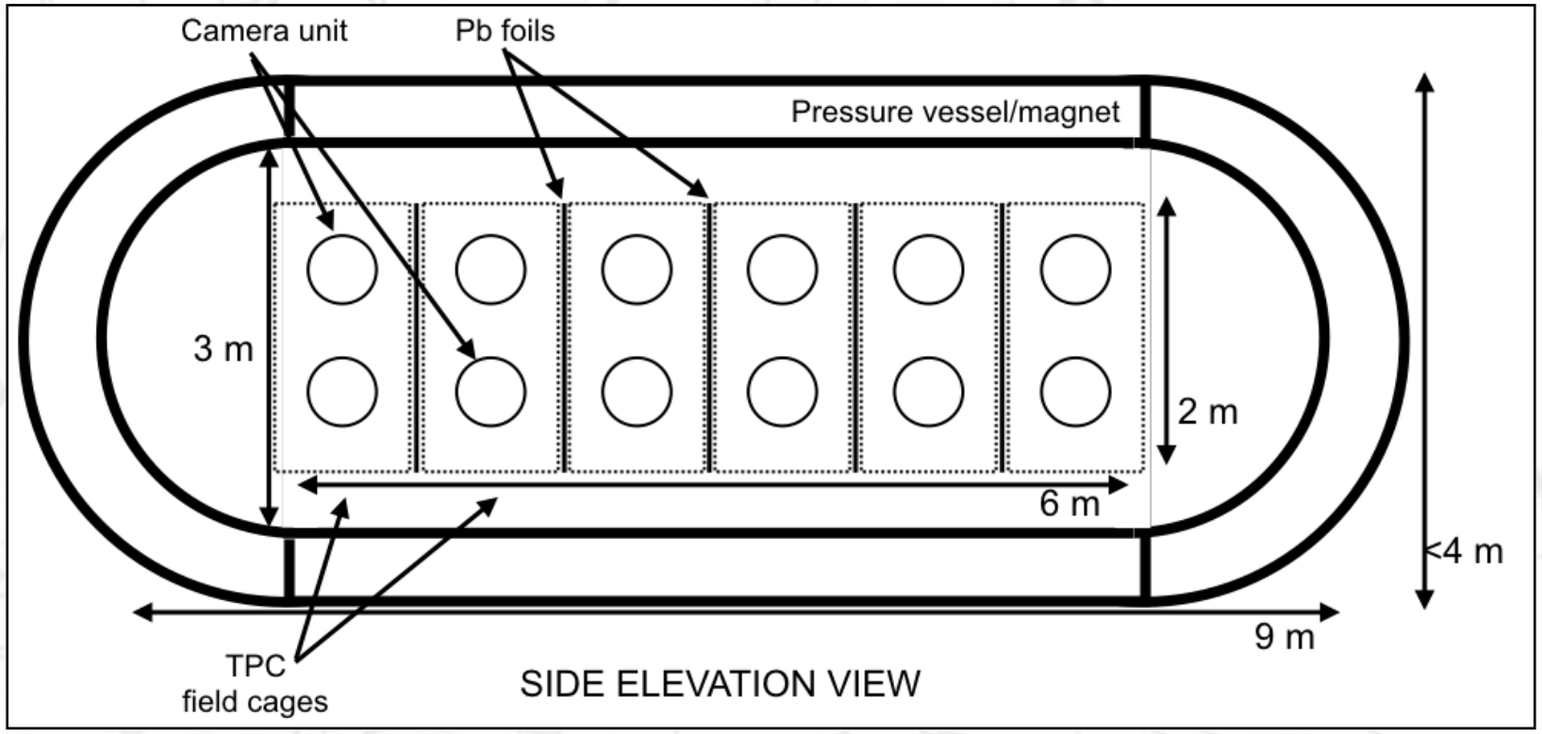
Effect on the neutrino energy reconstruction

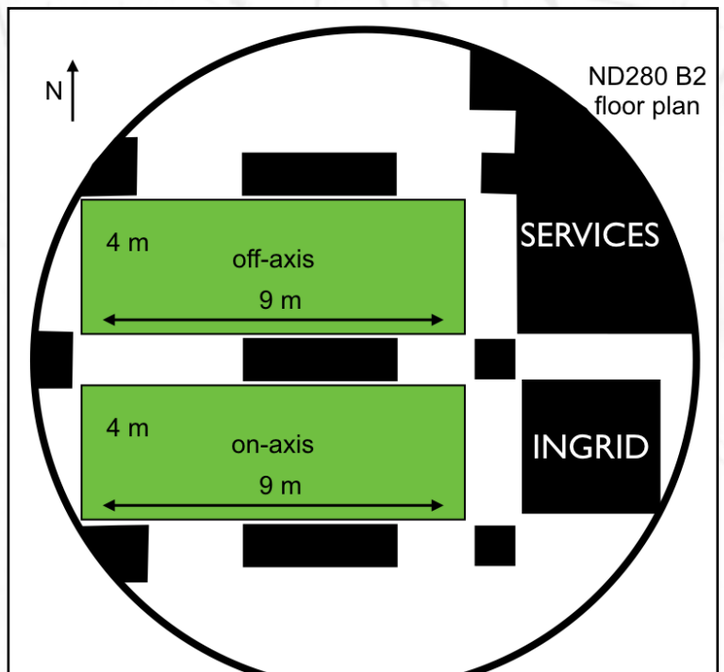
of interactions

10 bar pressure in the 21 m^3 fiducial volume.

GAS	m (kg)	ν_μ CC	ν_μ NC	ν_e CC
He	33	9,42E+03	3,768E+03	1,69E+02
CH_4	133	3,77E+04	1,508E+04	6,77E+02
Ar	333	9,47E+04	3,788E+04	1,693E+03
CF_4	734	2,07E+05	8,28E+04	3,726E+03

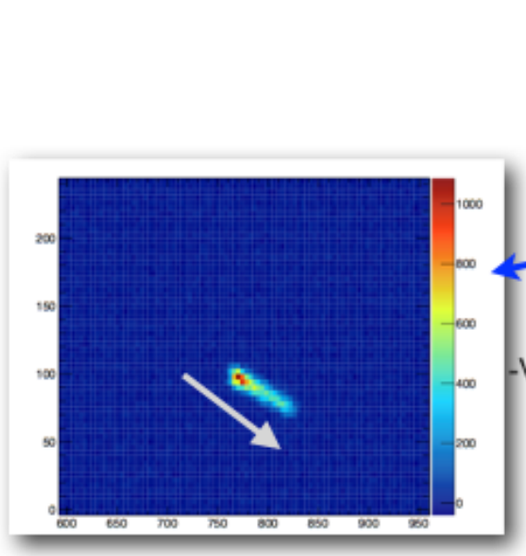
Possible layout



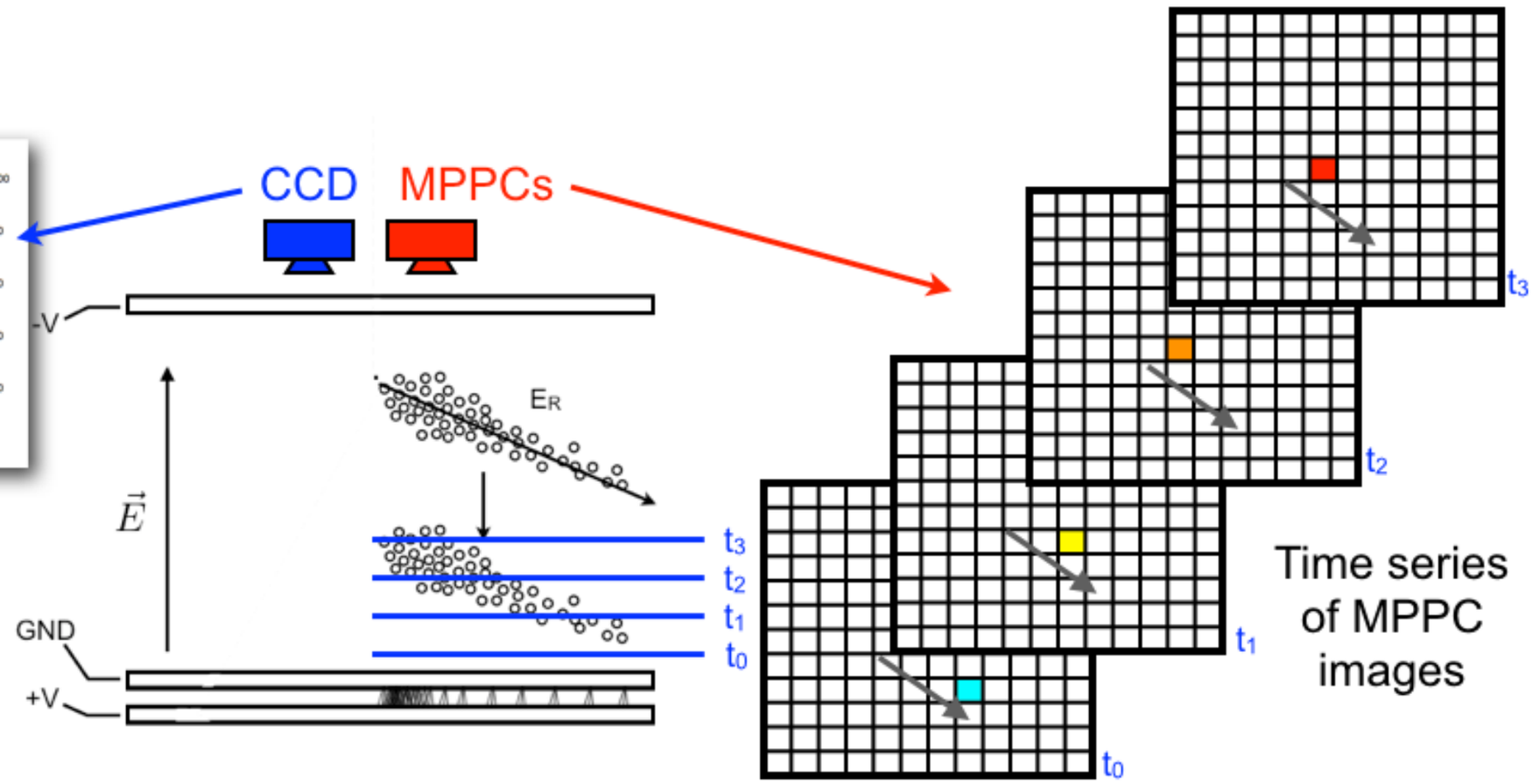


Possible location at the ND280 pit

Possible concept: optical readout

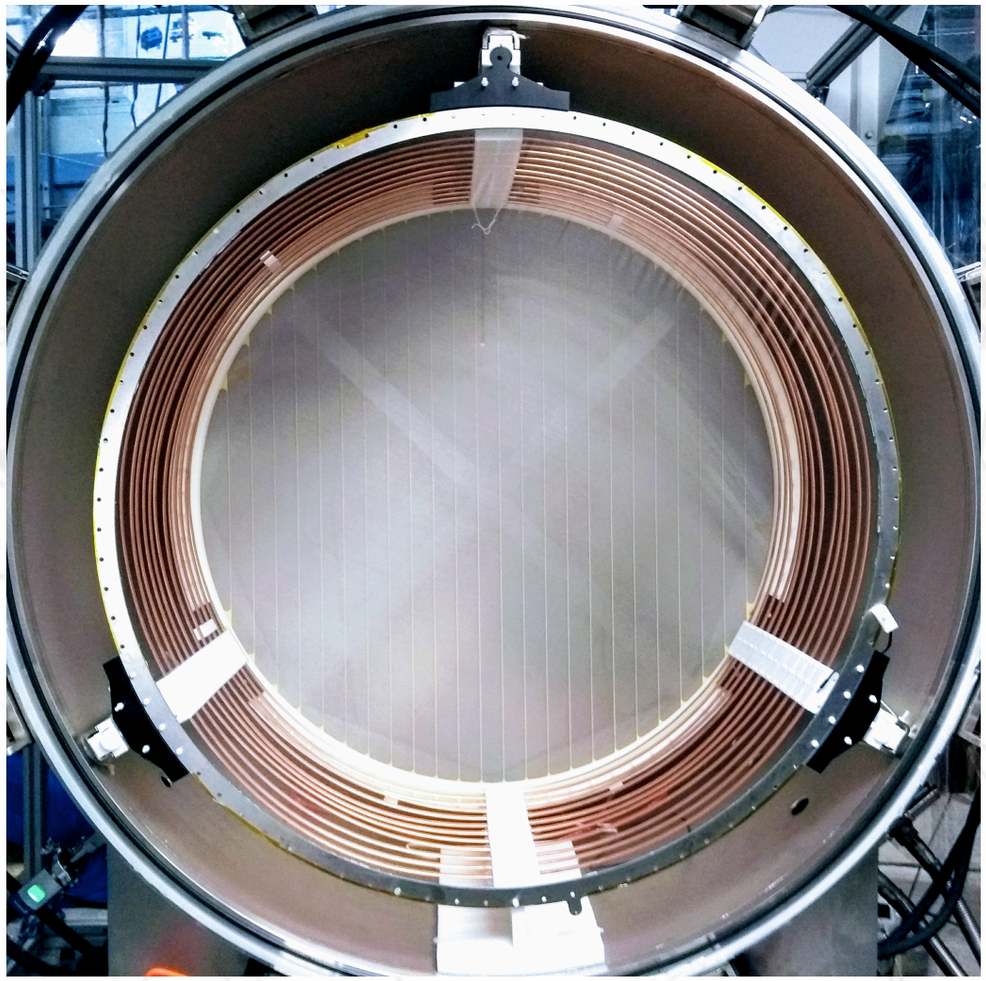


High resolution CCD image

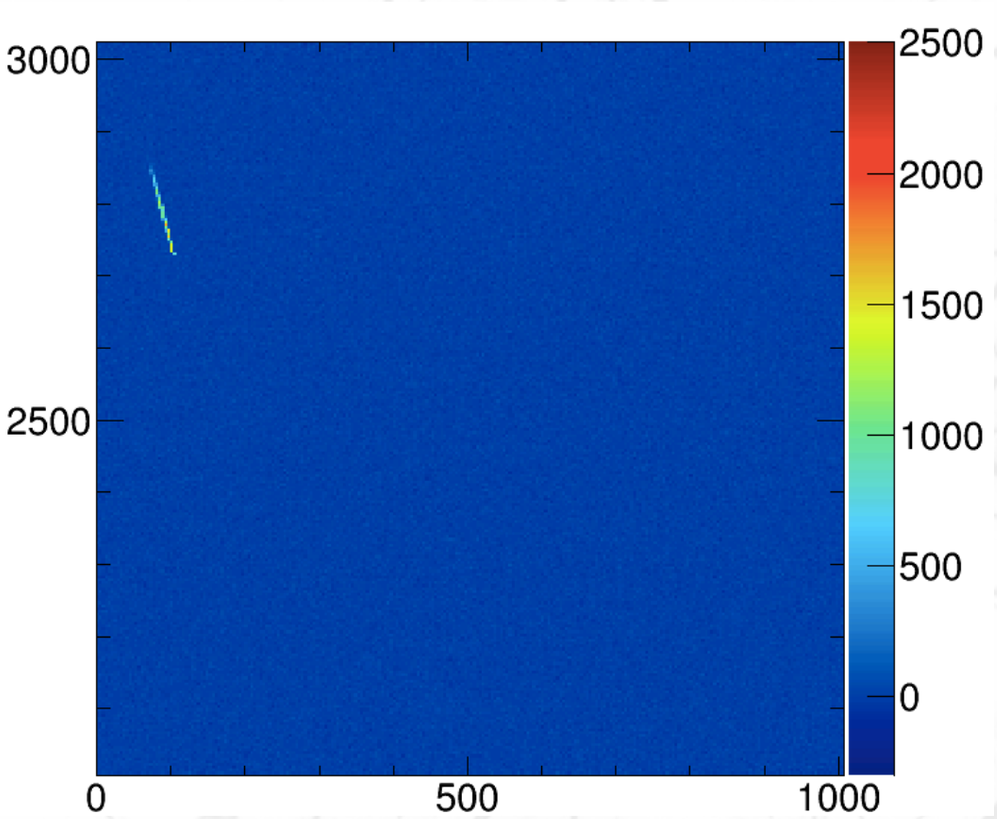


First prototype @ CERN

Imperial College / RHUL



Beam Tracks!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2000
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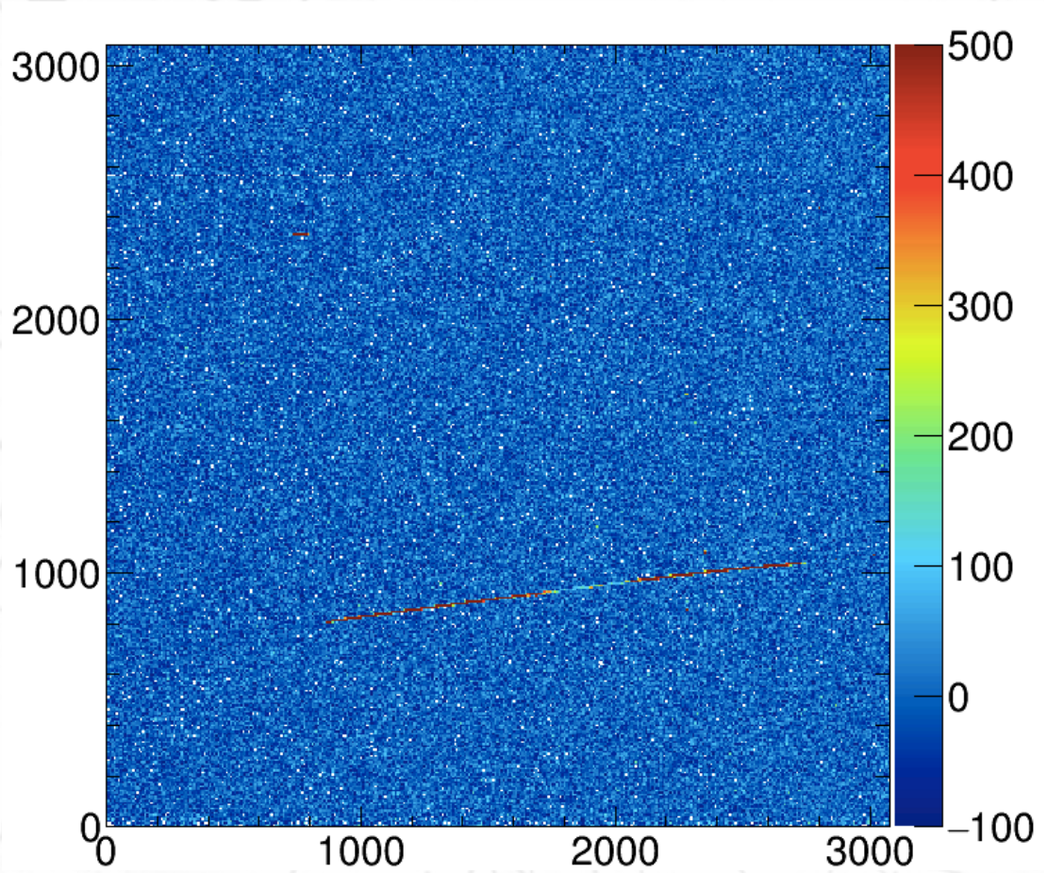
3000
2000
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400
300
200
100
0
−100

Status

- RHUL/IC/RAL/IFAE asked for a EU synergy grant to build the experiment. It was rejected in the second round but with excellent reviews.
  - misunderstanding of the financial situation of several proposals.
  - Try again? Under discussion.
- New: possible applications in electron scattering (e,e')A to be explored.
  - electron scattering can help neutrinos to reduce systematics in neutrino interactions. (neutrino-nuclear community synergies).
- A lot of data to analyse from the test-beam + large experience gained.
- Dune program at FNAL also interested in this technology.
- UniGe will join the program now, exploring fast and high granularity photosensors.
- HPTPC might be a critical component for the next generation of ND's.