

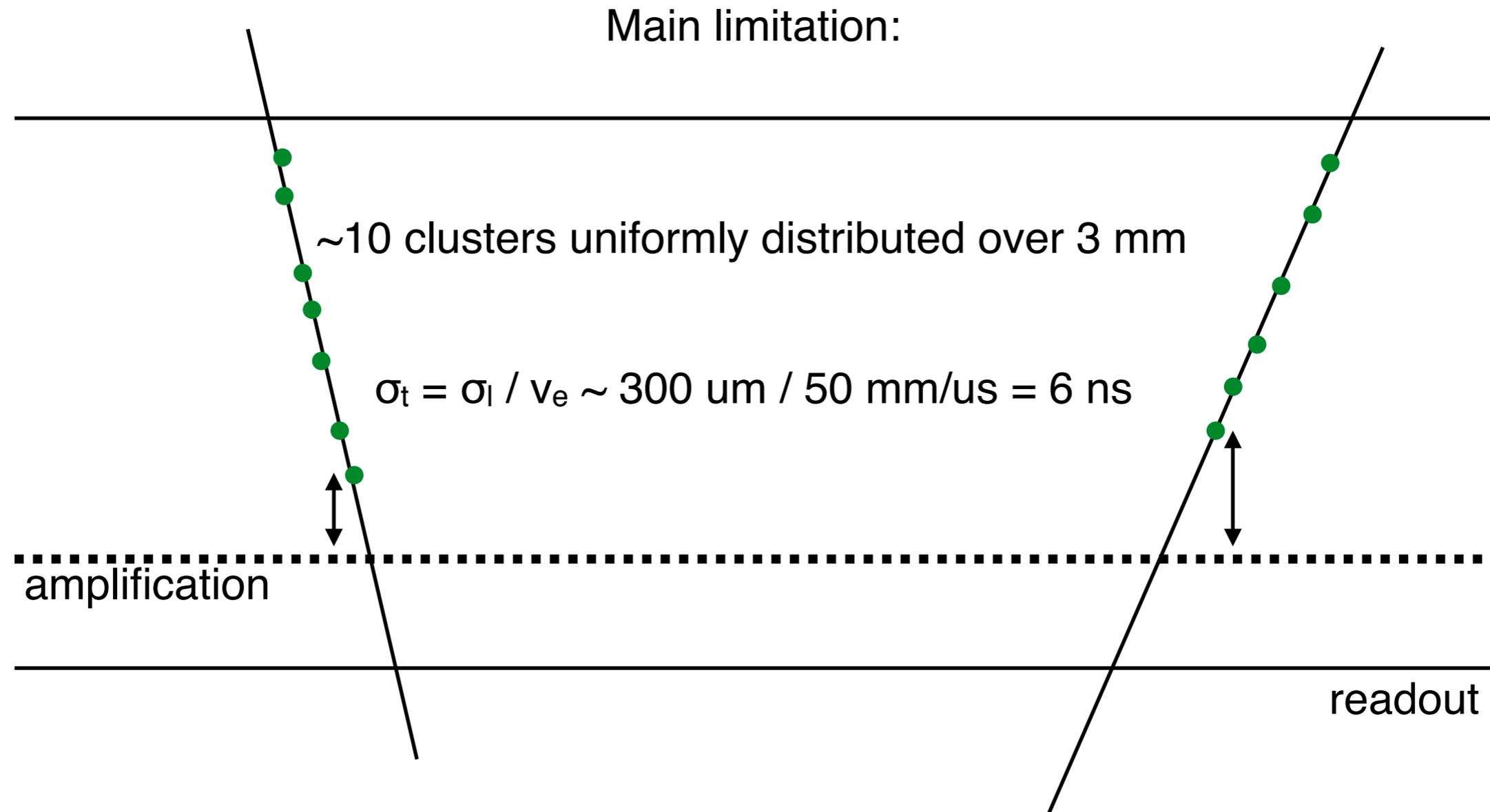
Picosec: test beam summary and outlook

CEA (Saclay), CERN (GDD), NSRC “Demokritos”,
Princeton University, Thessaloniki University, USTC (Hefei)

Driving reason

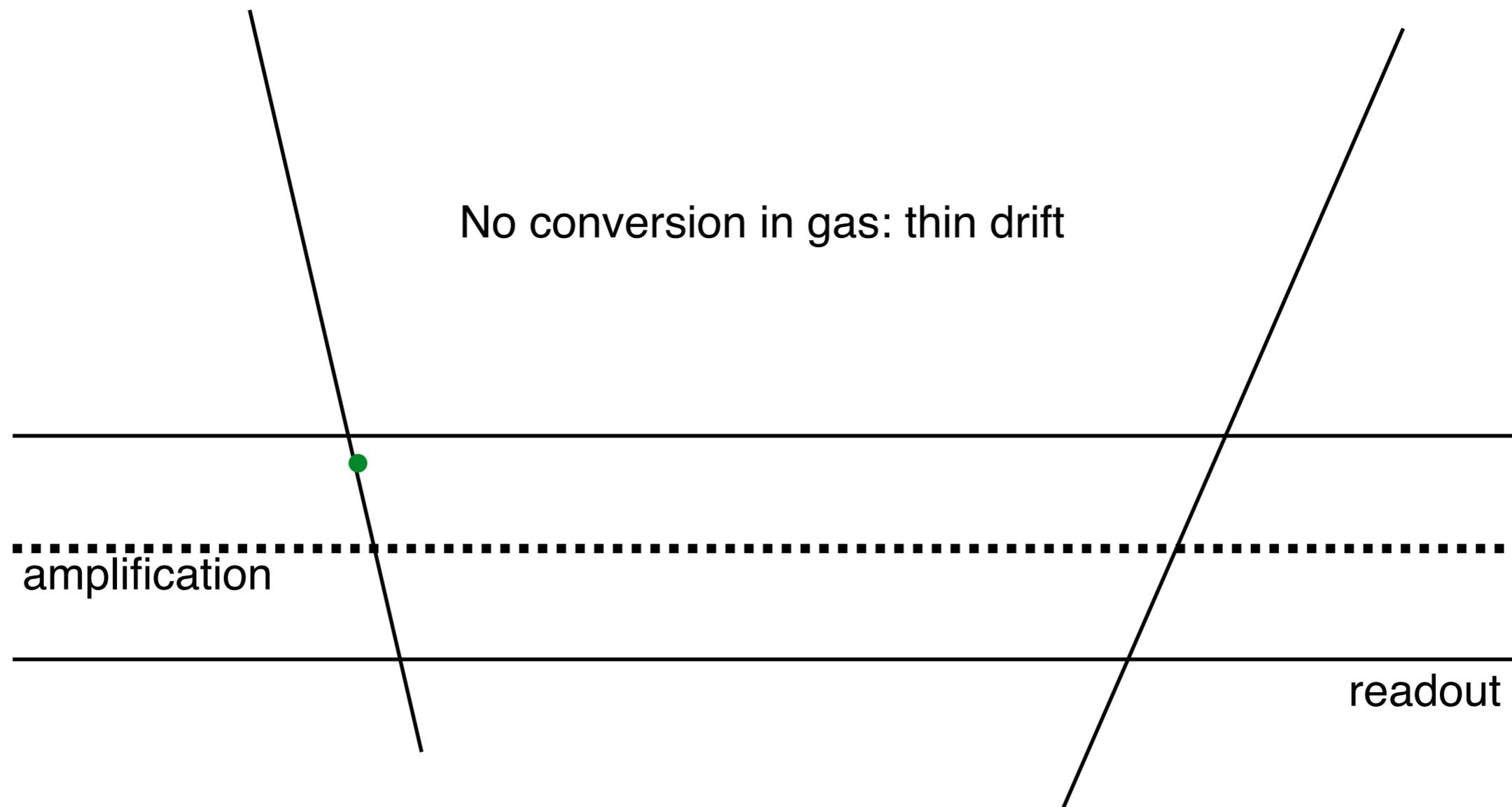
Large area detectors for pile-up mitigation
with timing cuts at HL-LHC experiments

Timing of gaseous detector



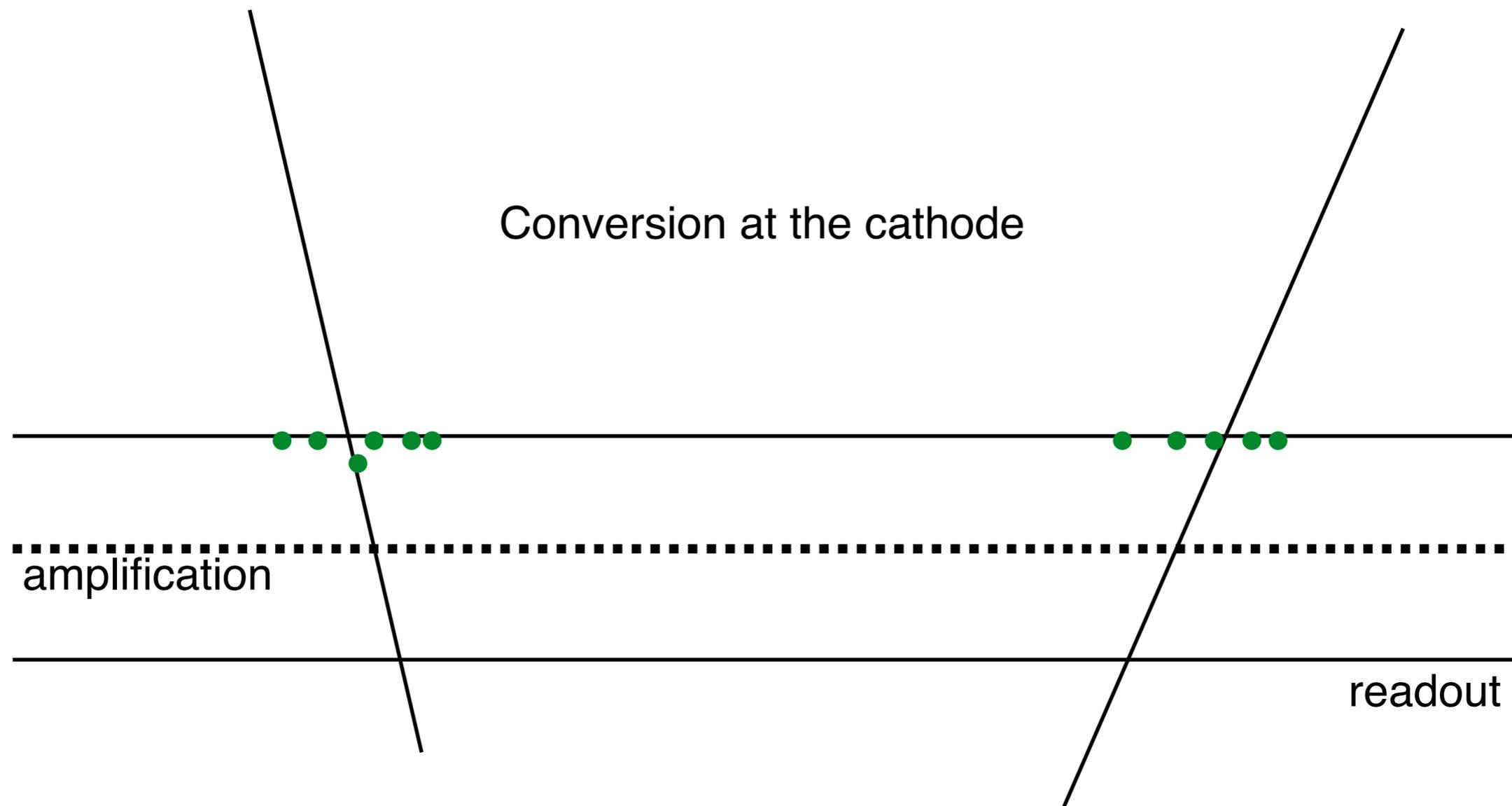
Statistics of the number of clusters helps, but contributions also from diffusion, electron velocity, signal to noise...

Timing of gaseous detector

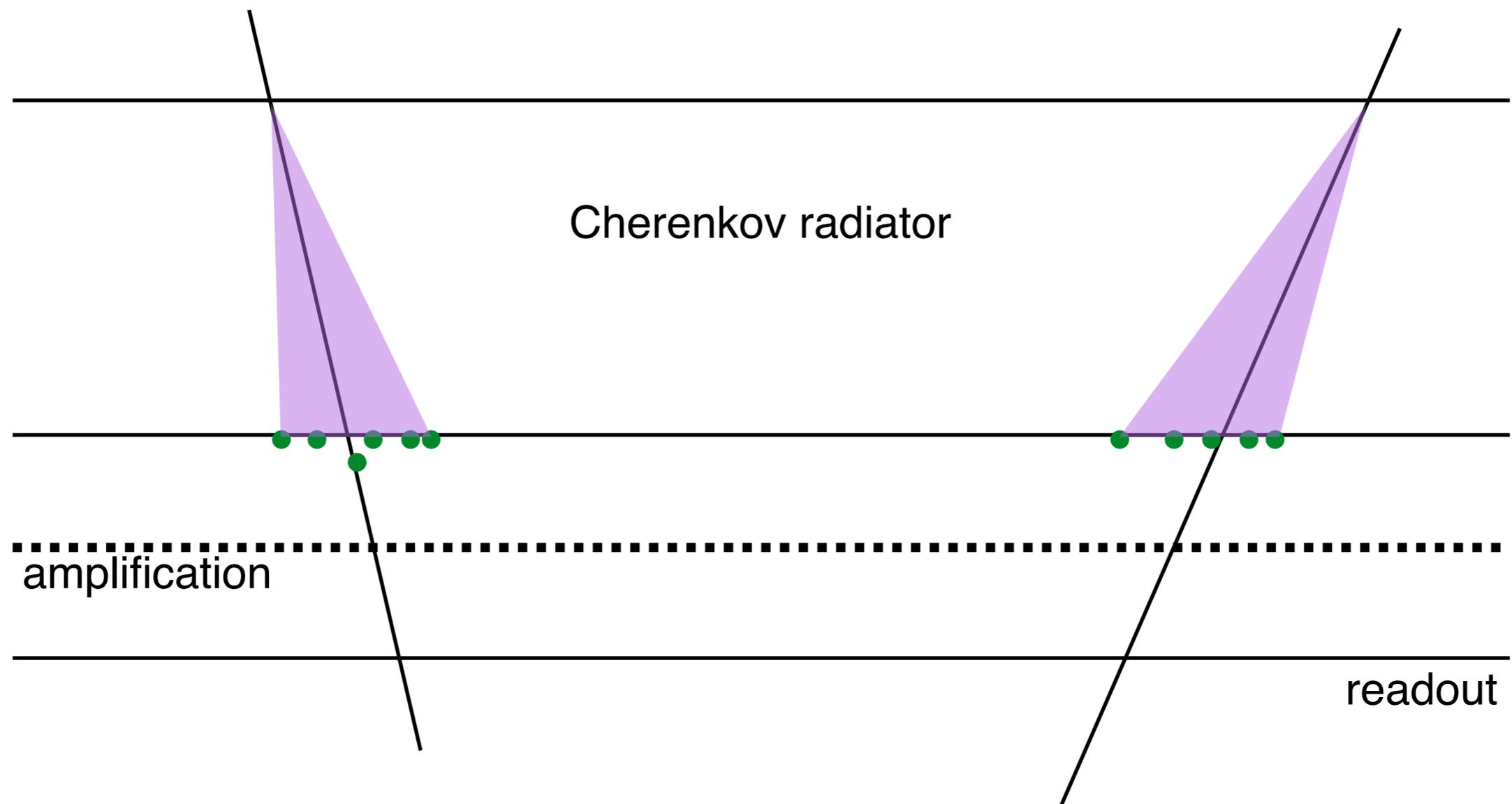


Thin drift can be used as pre amplification

Timing of gaseous detector



Timing of gaseous detector



Actual R&D on

Radiator (length): Cherenkov photons

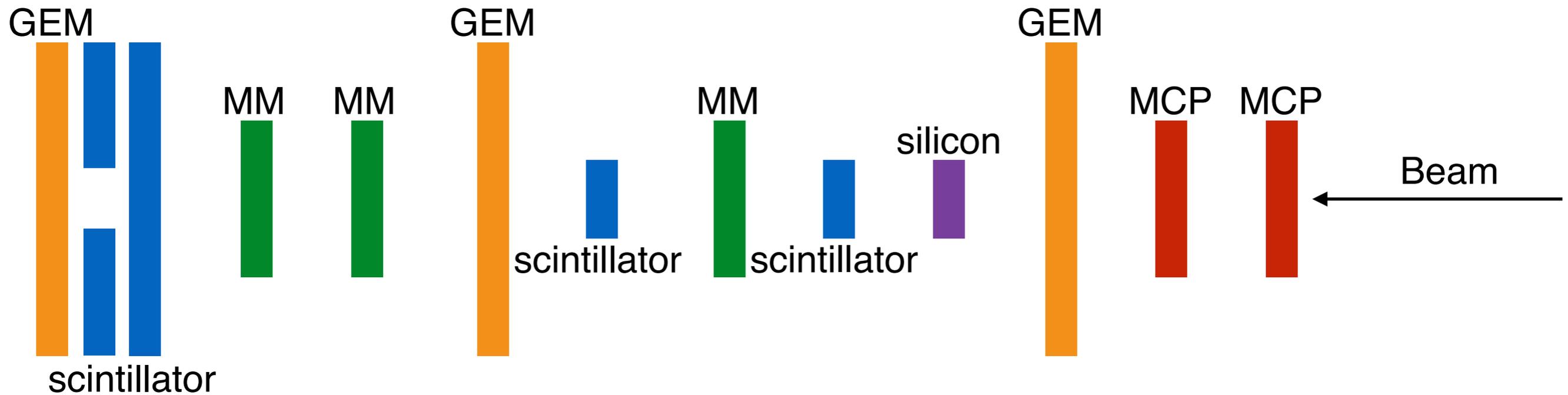
Photocathode and substrate: p.e.

Gas: diffusion, p.e., and amplification

Drift length: diffusion and amplification

MM structure: amplification and timing

Recent test beam



Trigger: coincidence of two $5 \times 5 \text{ mm}^2$ scintillators and a veto downstream (avoid showers)
Tracker: three GEMs to measure where the triggered particle passed (reject showers too)
Time reference: two Hamamatsu MCP-PMTs (160 ps rise time)
MM detectors: flushing and sealed mode operation
Silicon: 3x APDs (Hyper-fast Si)
Tracking acquisition: APV25 + SRS
Timing acquisition: CIVIDEC C2 preamp + 2x 2.5 GHz LeCroy scopes (synchronised with the tracker) and SAMPIC

Measurements

Radiator: MgF_2 2mm, 3mm, and 5mm

Photocathode: CsI, Cr, and polycrystalline diamond

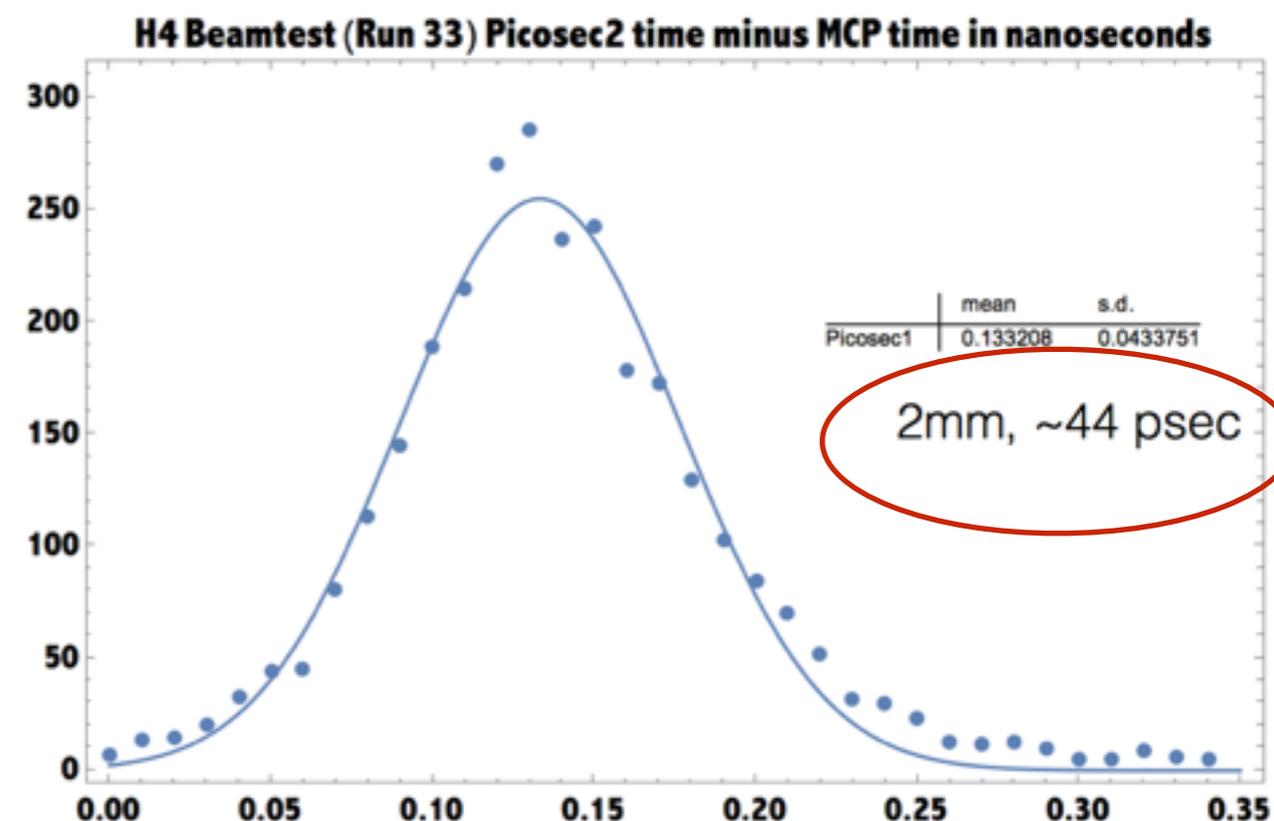
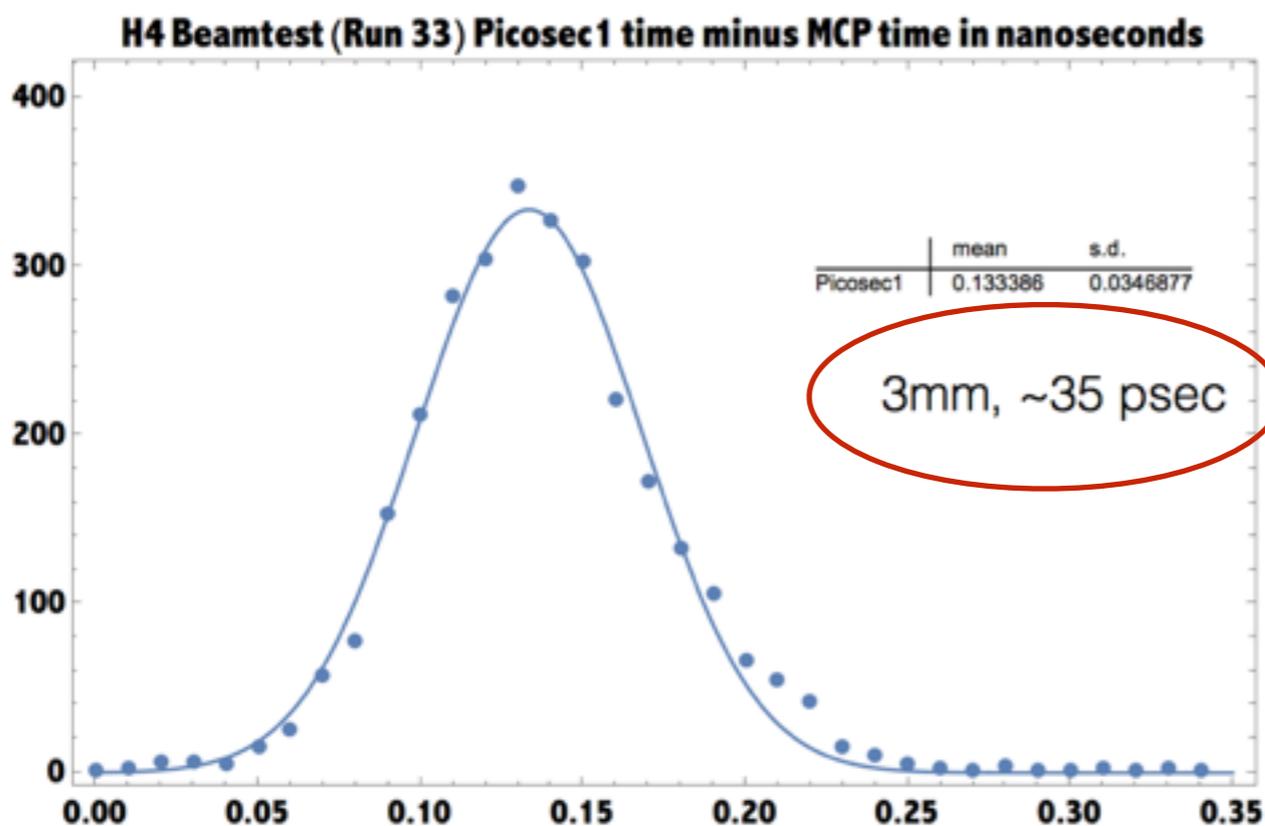
Photocathode substrate: Al and Cr

Gas: Ne/ CH_4 (sealed), Ne/ C_2H_6 (sealed), and Ne/ CF_4 / C_2H_6 (flushing)

MM structure: bulk and thin mesh

Preliminary results

Ne/CF₄/C₂H₆ and Csl



About two orders of magnitude better than standard MPGDs

from S. White talk on Tuesday

Still to be addressed

Photocathode stability (IBF, photon feedback, discharges)

Discharge resistance, maintaining the signal quality

Multiple-pad readout performance

In the next test beam

Trigger area (also) larger (border region)

Improve signal quality (mesh at ground, better connectors, ...)

Different drift gaps

More metallic photocathodes

Different and improved preamps