

# Light detection systems

M. Weber

With slides from T. Wongjirad, M.  
Toups, R Van de Water, F. Cavanna

# Light System

- PMT
- Light guides, SiPMT
- New ideas

Time for R&D ?

Do we have time for R&D ?  
Is this the time for R&D/tests ?

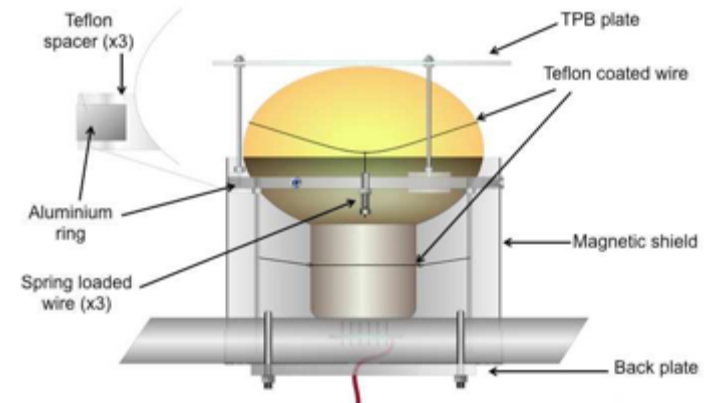
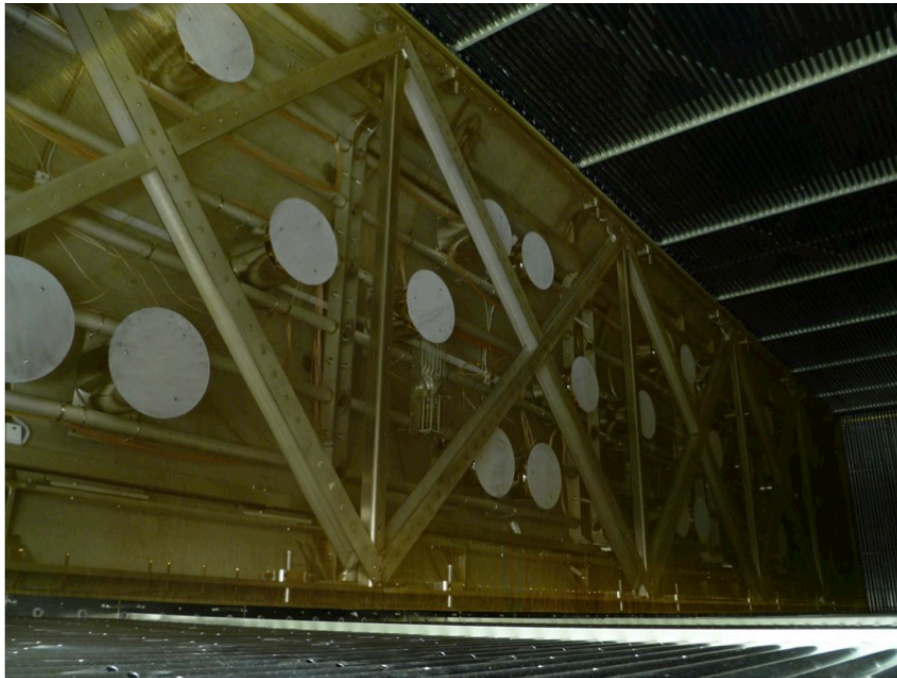
- > Timing requirements ( $T_0$ , cosmics, new physics ?)
- > Position resolution requirements (pixelization/granularity)
- > Coverage requirement
- > Transparent cathode ? Hybrid systems ?
- > Use also for calorimetry / PID ?
- > Enhanced physics case ? (DM ToF, NCES, ...)

Transparency  
of CPA ? Field cage ?

Systematics with different light detection systems in the detectors ?

# MicroBooNE

- 32 8" PMT
- Behind the readout wires
- TPB coated plate



# Acrylic Guides

M. Toups  
T. Wongjirad

- Basic design concept:
  - Scintillation light from LAr, 128 nm — convert to optical and collect onto photo detector
  - Conversion by TPB coating (shifts to 430 nm) at surface
  - Acrylic bar uses total internal reflection to guide light to SiPMs for counting

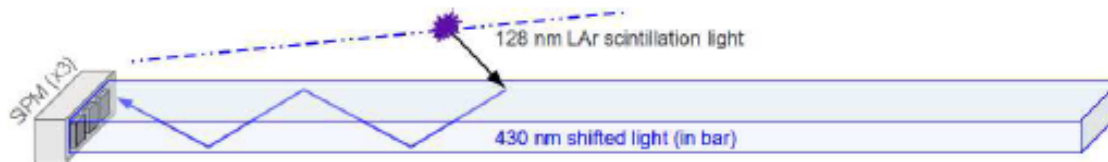
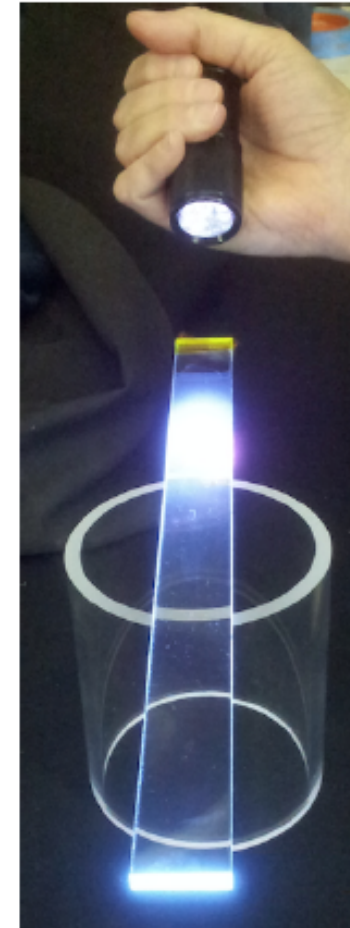
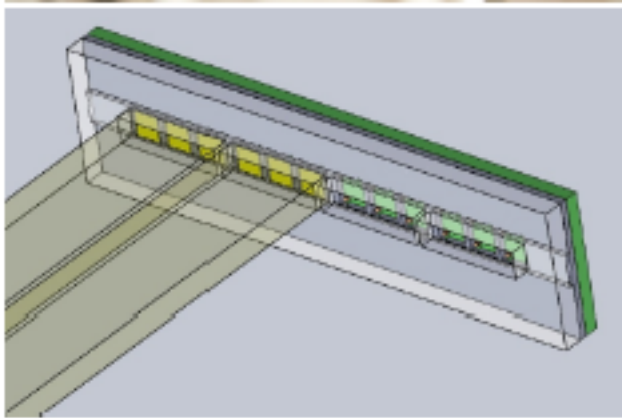


figure from arXiv:1408.1763v1 [physics.ins-det]



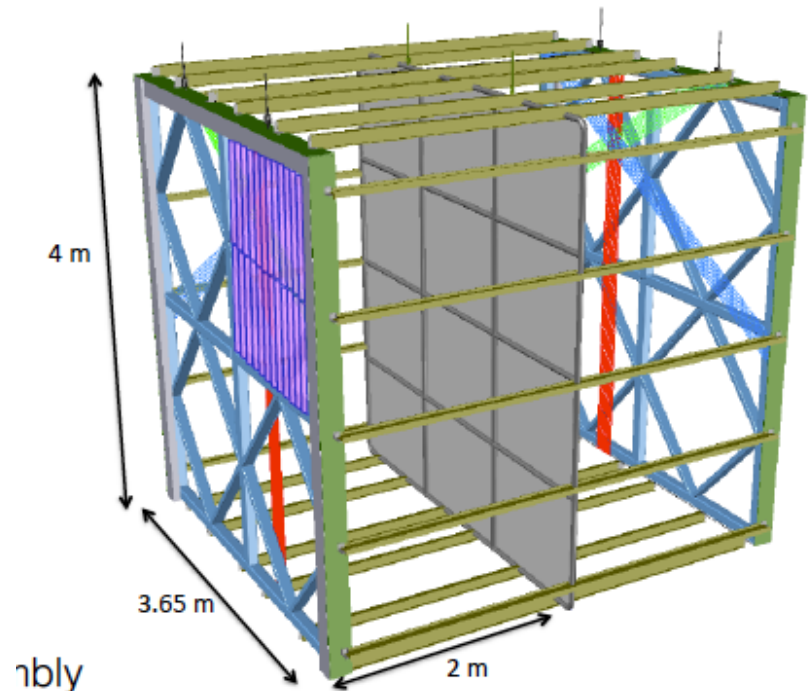
# LAr1ND base

M. Toups  
T. Wongjirad



LBNE design

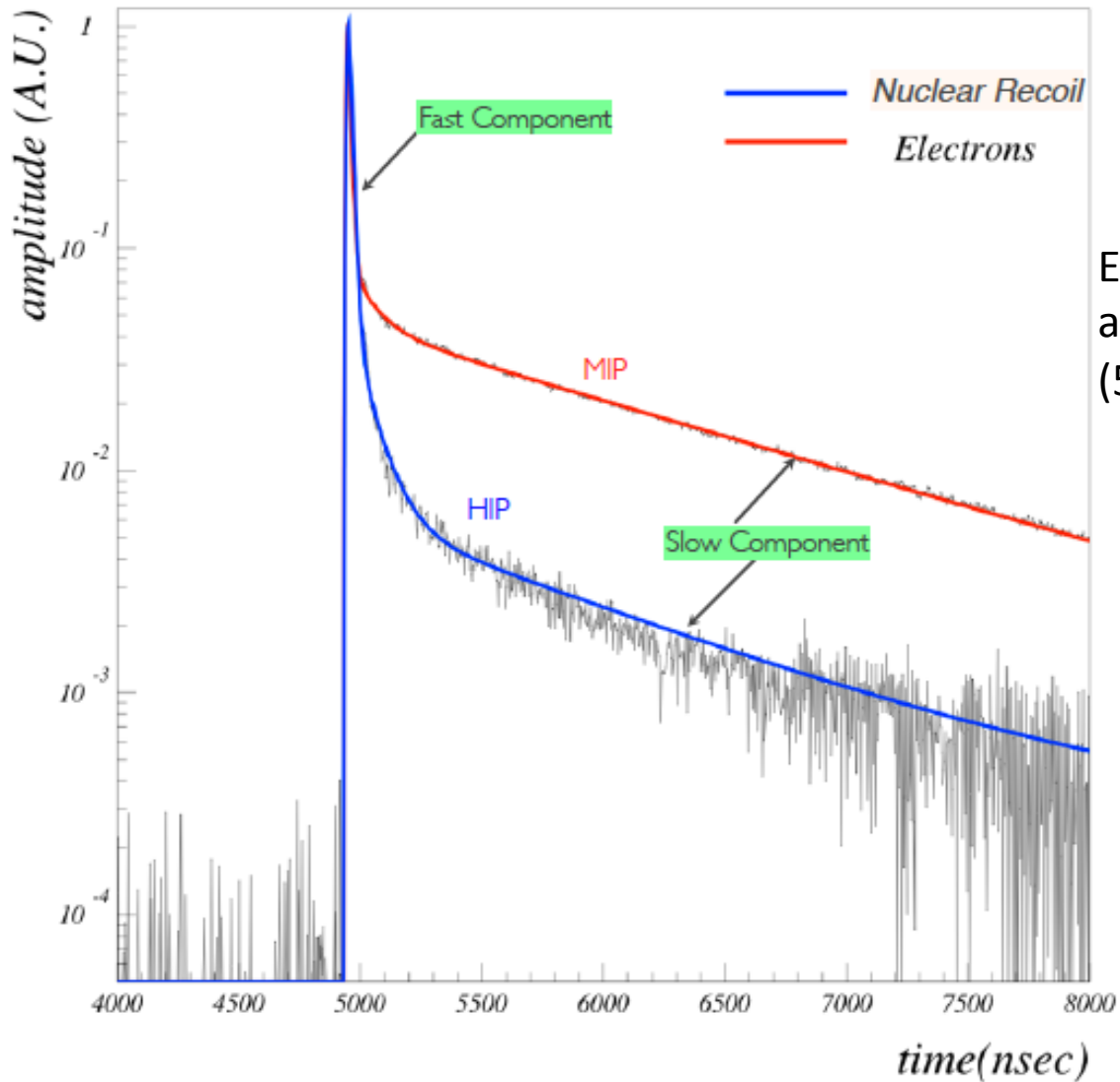
- Groups of bars mounted on paddles
- 3 SiPMT each bar side
- Single or double ended readout depending on efficiency / bar length
- Light yield OK, 1inch/1m bars (units ?)



# Plans ?

- Have a basic system concept ready now (CDR)
  - Just  $T_0$  ?
  - Resolve the Booster RF buckets with ns timing ?
  - Requirements on time/position match to TPC ?
- Work on the physics case for a much improved system (faster, more coverage)  
**See next slides for even more improvement ideas**
- Get the funds if needed to implement a more expensive system to enhance the physics reach (or other technology, \$\$ should not drive decision)

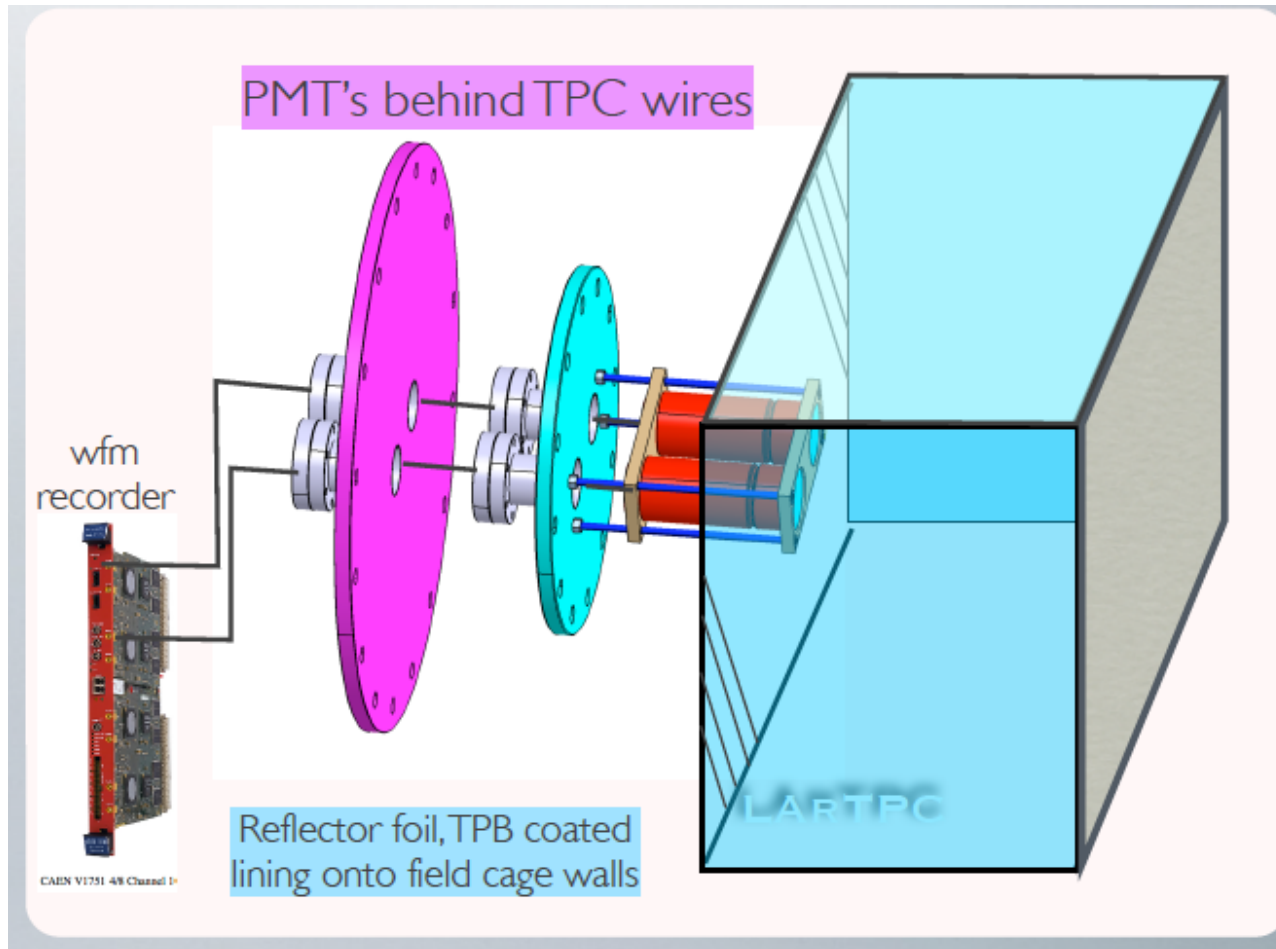
## LAr Scintillation Light: recorded (avg.) waveforms



Energy loss in ionization  
and scintillation  
(50/50 at 500 V/cm)

F. Cavanna

# LArIAT light system



Collect the most light possible and use also for calorimetry/PID.  
Has been previously used, implemented in LArIAT.

F. Cavanna



