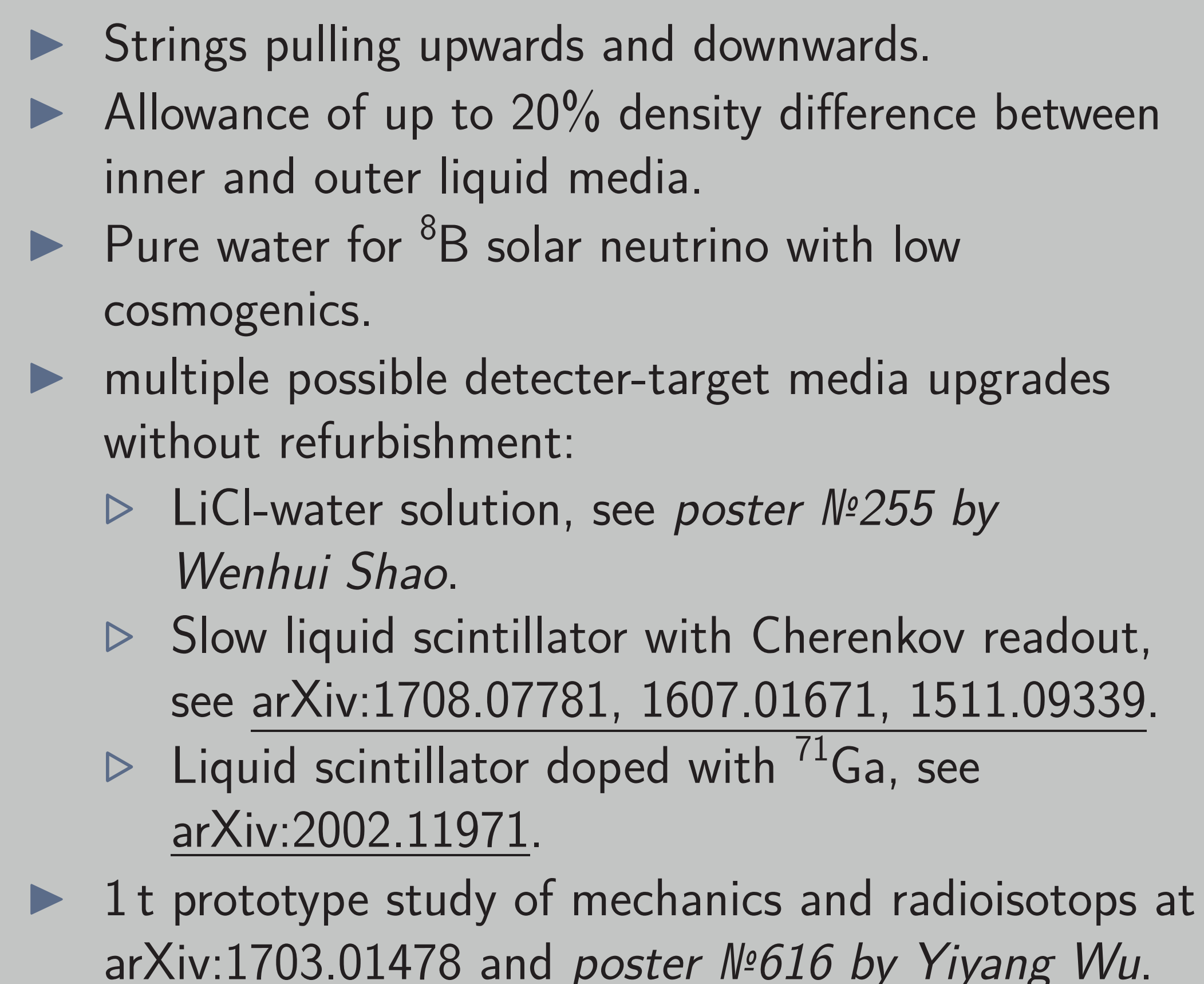




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- ## 1 Gravity-buoyancy tolerant acrylic vessel



2 High-quantum-efficiency low-background PMT

- PMT glass bulbs



MCP-PMT after potting

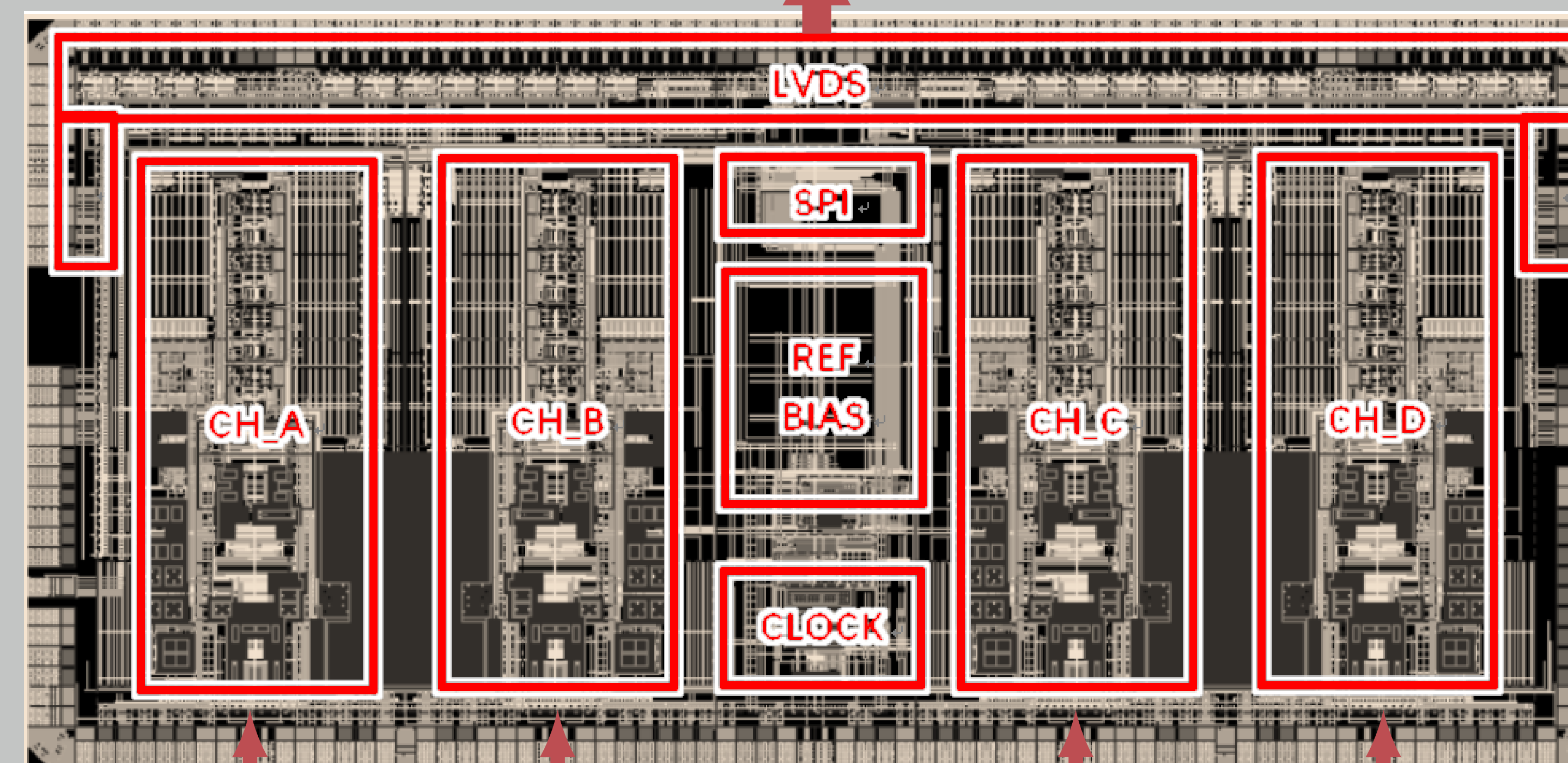


- ▶ Waveform analysis algorithm suitable to the characteristics of new PMT, see *poster №413 by Aiqiang Zhang*.
- ▶ GPU acceleration in *poster №381 by Yuyi Wang*.

3 Low-power-consumption 12-bit 1Gbps waveform digitizer

- ▶ Analog-to-digital converter chip from JUNO for full PMT waveform readout, revised with much lower chip power consumption of 0.35 W/channel.
- ▶ 4 channels integrated on one chip, 8-channel model under development.
- ▶ Scheduled to tapeout with 65nm MOSFET node.
- ▶ Frontend electronic board prototype ready.

4-channel chip design

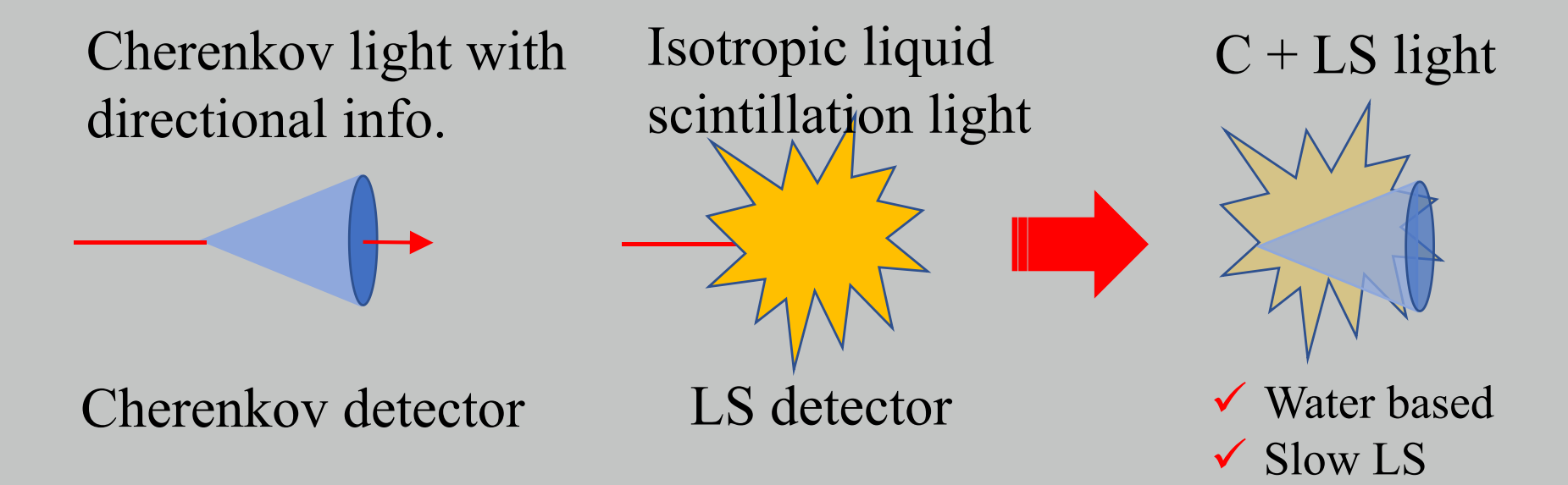


analog input from PMTs

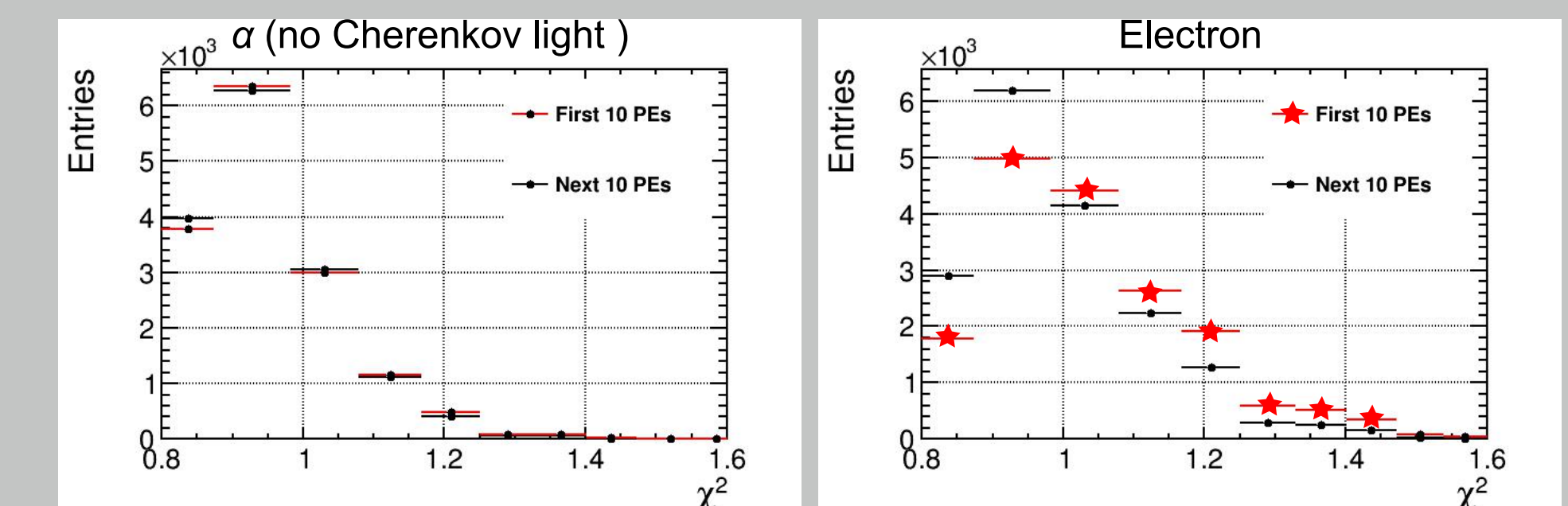
FPGA: Field Programmable Gate Array. SoC: System-on-chip. SPI: Serial Peripheral Interface.

MOSFET: metal-oxide-semiconductor field-effect transistor. LVDS: Low-Voltage Differential Signaling.

4 Cherenkov and scintillation light dual readout



- ▶ Separate atmospheric ν events from supernova ν .
- ▶ Direction of solar ν and ^{40}K Geo- ν .
- ▶ Slow liquid scintillator with 1-t prototype detector.
- ▶ ^{214}Bi - ^{214}Po decay demonstrates dual readout:
 - ▷ Prompt 2 MeV β emits Cherenkov light;
 - ▷ Delayed 7.7 MeV α has no Cherenkov light.



Civil construction

- ▶ CJPL D2 experimental hall is under construction.
 - ▷ Realtime monitoring and indoor positioning.
 - ▷ Heavy machinery deployed.
- ▶ Further digging down to maximize the detector size.

Inward view of D2 hall



Summary and Outlook

- ▶ CJPL is ideal for MeV neutrino physics, for which JNE collaboration constructs hundred-ton neutrino detector by 2026.
- ▶ Key innovations are being realized at JNE:
 1. Gravity-buoyancy tolerant acrylic vessel.
 2. Much improved $\varnothing 20$ cm MCP-PMT.
 3. New 12-bit 1Gbps waveform digitizer.
 4. Slow liquid scintillator with Cherenkov readout.