Feedbacks from 8th HK Proto-Collaboration Meeting

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SCIENCES SORBONNE UNIVERSITÉ

LPNHE PARIS

cnrs dépasser les frontières IN2P3 Les deux infinis

Schedule

- Sat/Sun: Near/Intermediate Detector workshop
- Mon-Wed: Parallel session
  - Monday: Presented Memphyno during mPMT session
- Wed-Fri: Plenary session

- Additional Conveners+/International Board Representatives/ International Steering Board meetings
  - Mon evening: Conveners+
  - Tues evening: iSC/IBR
  - Wed lunch: iSC/IBR
  - Thur evening: iSC/IBR

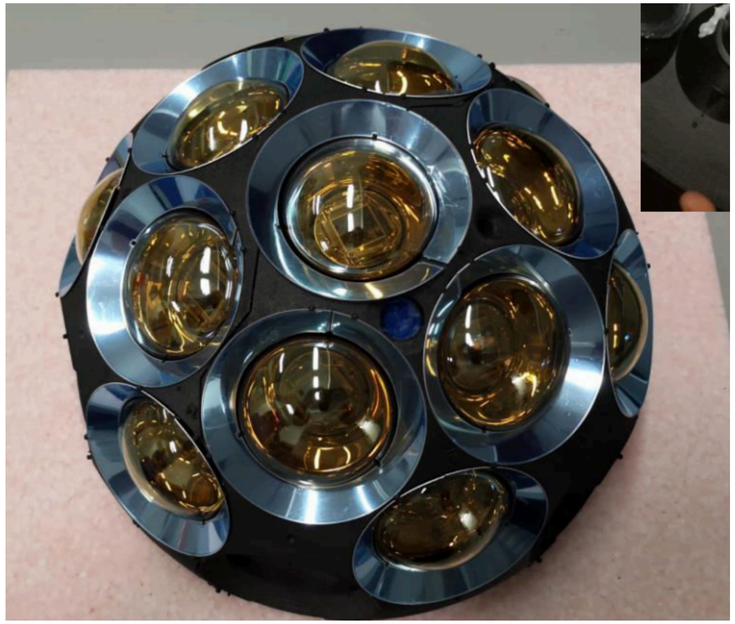
Feedbacks from Memphyno

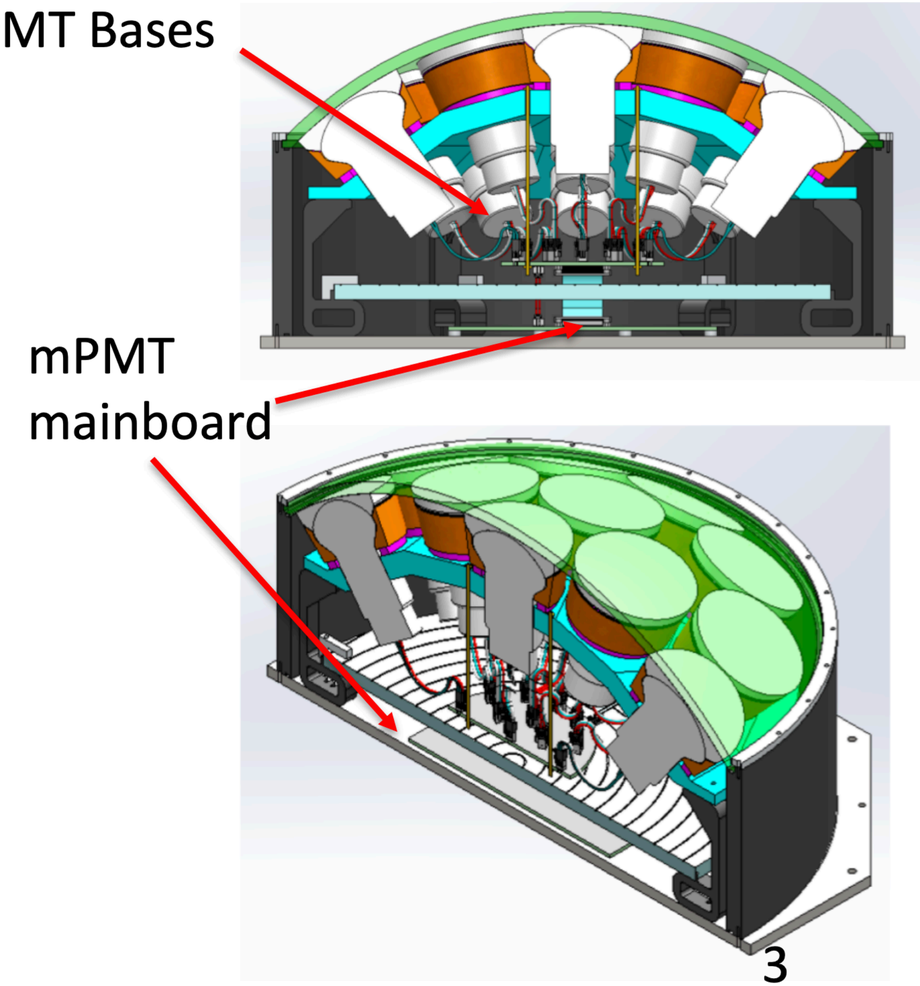
- Very positive during and after the session
- Questions mostly about the calibration systems and detection of stopping muons
- Mentioned several times by Canadian (Thomas Lindner), Italian (Gianfranca) and Japanese (Benjamin) colleagues as the place where first in-water tests will be made

- Desired tests include:
  - Dark rate measurements
  - TTS
  - Calibration
  - Long-term stability of the design (leakage, response)
  - Integration (electronics, DAQ)

mPMTs to be tested

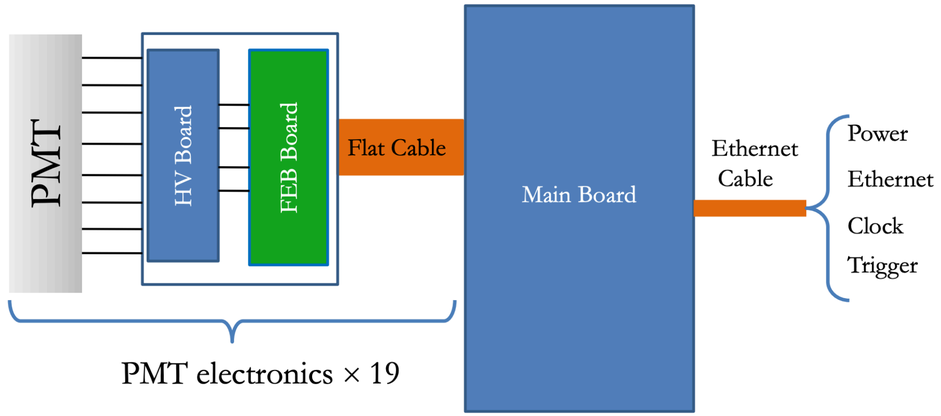
- Italian: adapted KM3Net DOM
- Canadian: new design
- Japanese: same as Canadian design

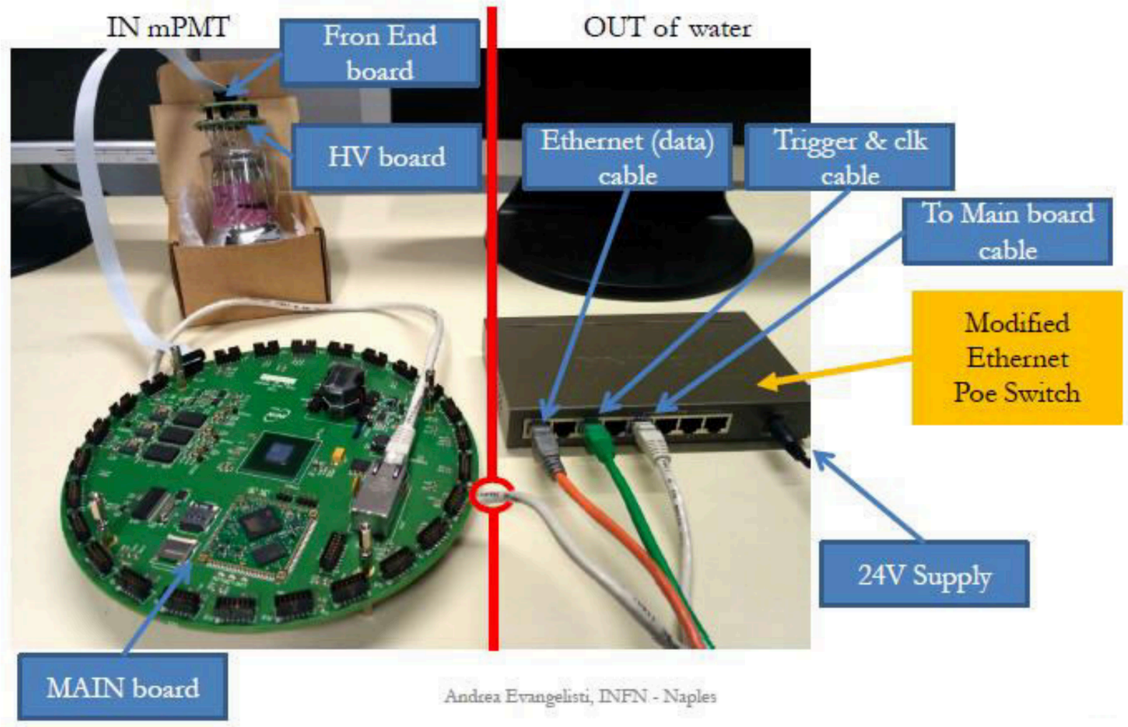




Italian electronics

- Italian: based on KM3Net
- Connected to Etherned
  (HV, Trigger, clock, data)
- Modified Ethernet switch (provided)
- FEB
  - Amplifier
  - Discriminator
  - Integrator
  - ADC (2MSPS 12 Bit)

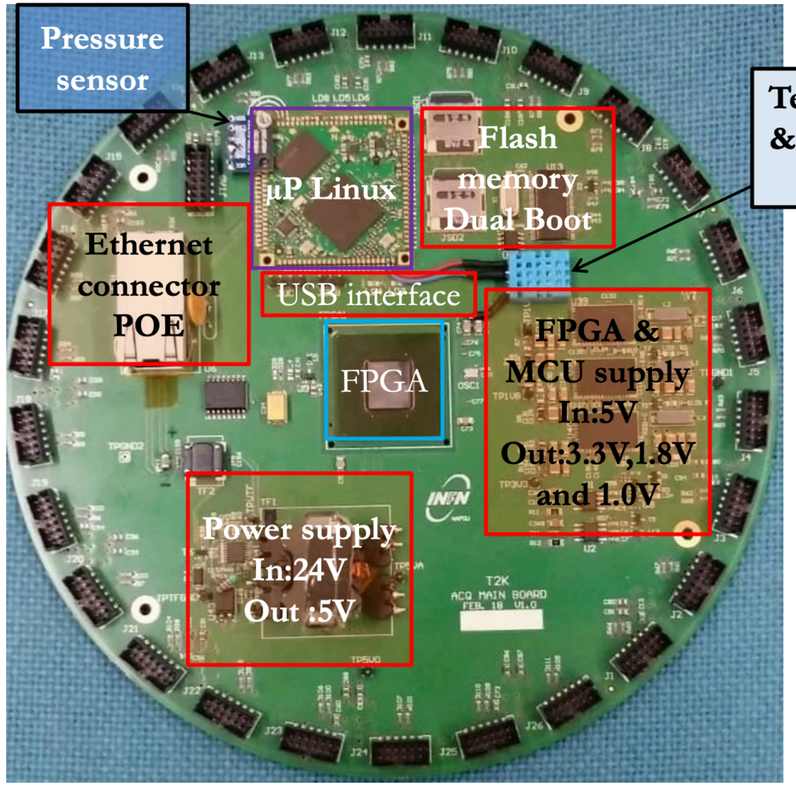


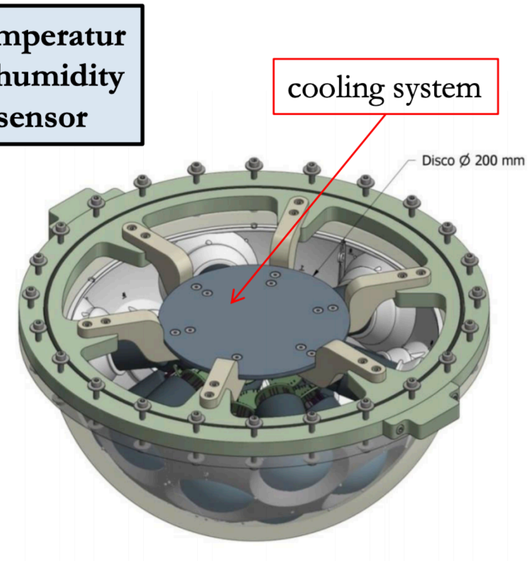


Italian electronics

- Italian: based on KM3Net
- FPGA
  - ADC control
  - Timestamp
  - Trigger logic
- mu-Linux
  - Channels slow control
  - Data acquisition/transmission
  - FPGA programming
  - FPGA slow control
  - Temp. monitoring

INFN mPMT electronics: main board





Total Power consumption:
- ID: 19 ch → ~ 4 W

Canadian electronics

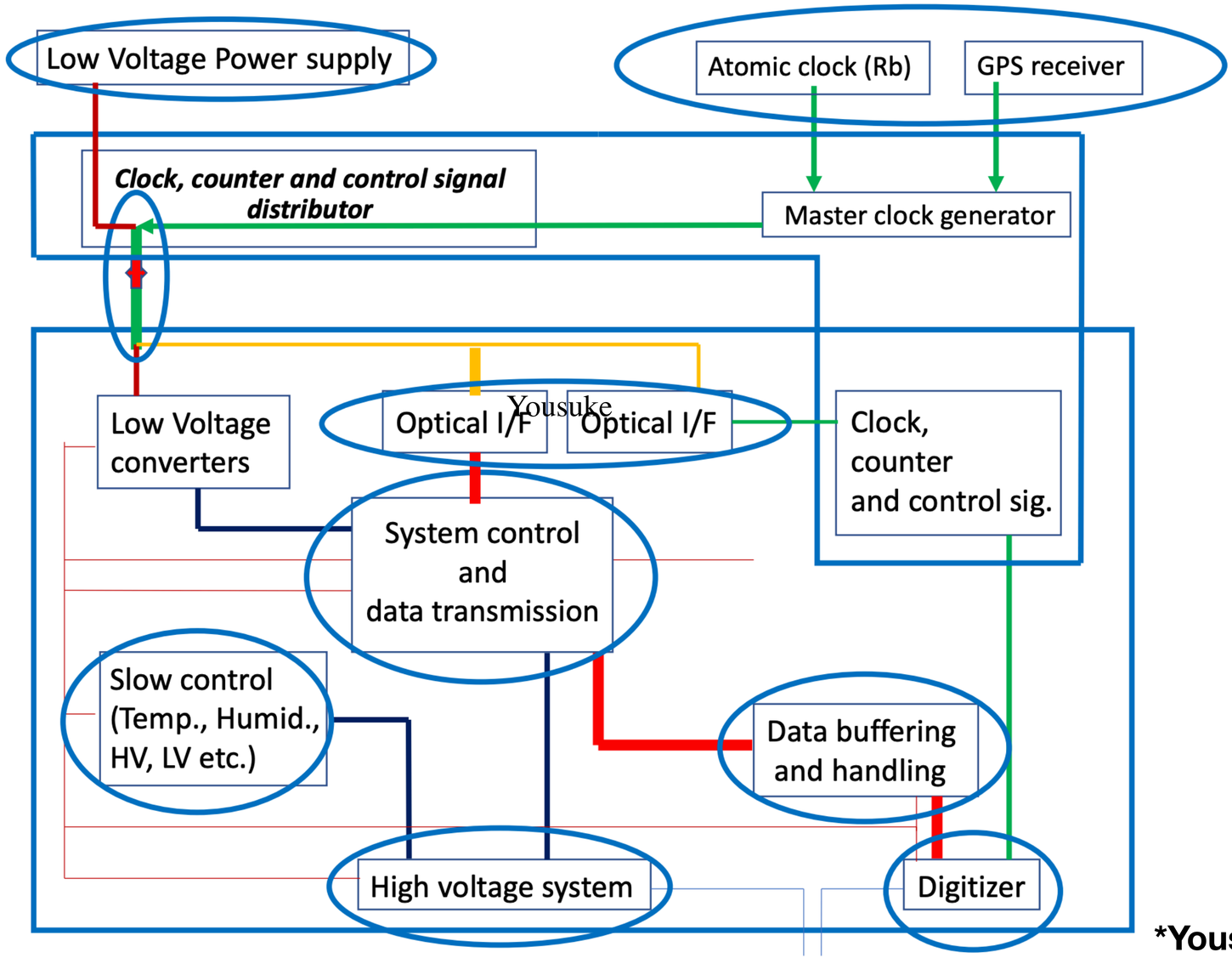
"Develop new digitization: KM3NET single time-over-threshold does not give sufficient information for large pulses."

Uses Flash ADC, read continuously by FPGA
Depending on the shape of the signal

- Pulse charge + time
- ADC samples

This electronics might be the one used for HK
But a couple of challenges to overcome (related to FPGA and cost…)

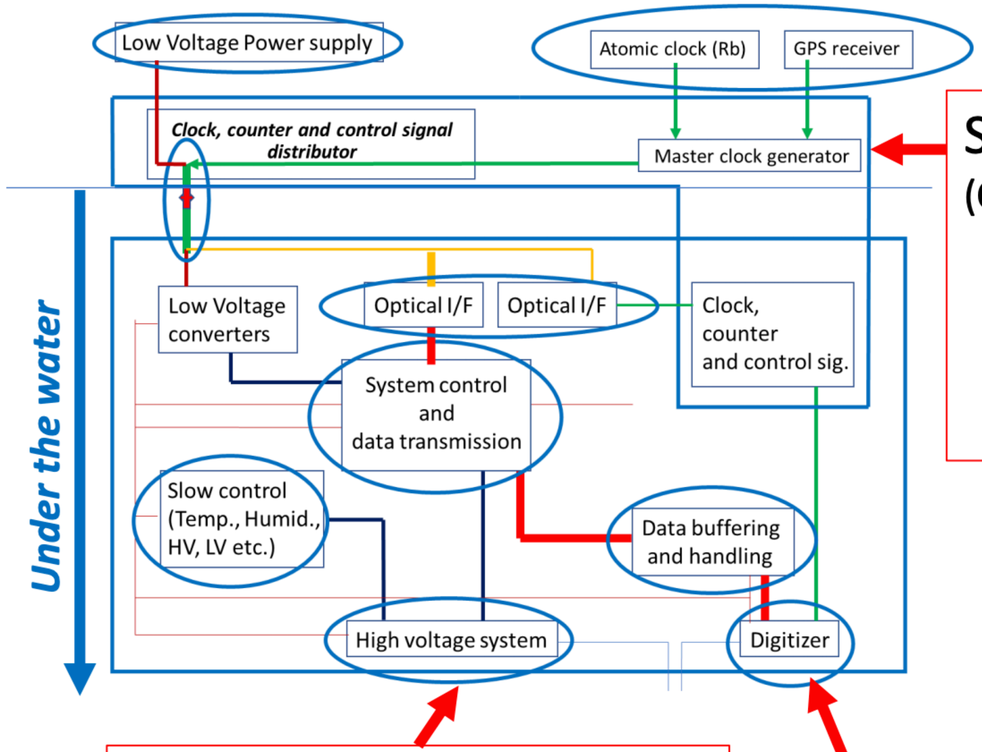
20” PMT electronics



Yousuke

*Yousuke KATAOKA

Possible contributions (1)



Synchronization

(Clock, Counter & Status monitor)

Candidates

- Custom (based on the SK and Belle2)
- Customized White Rabbit? Prohibitive price…

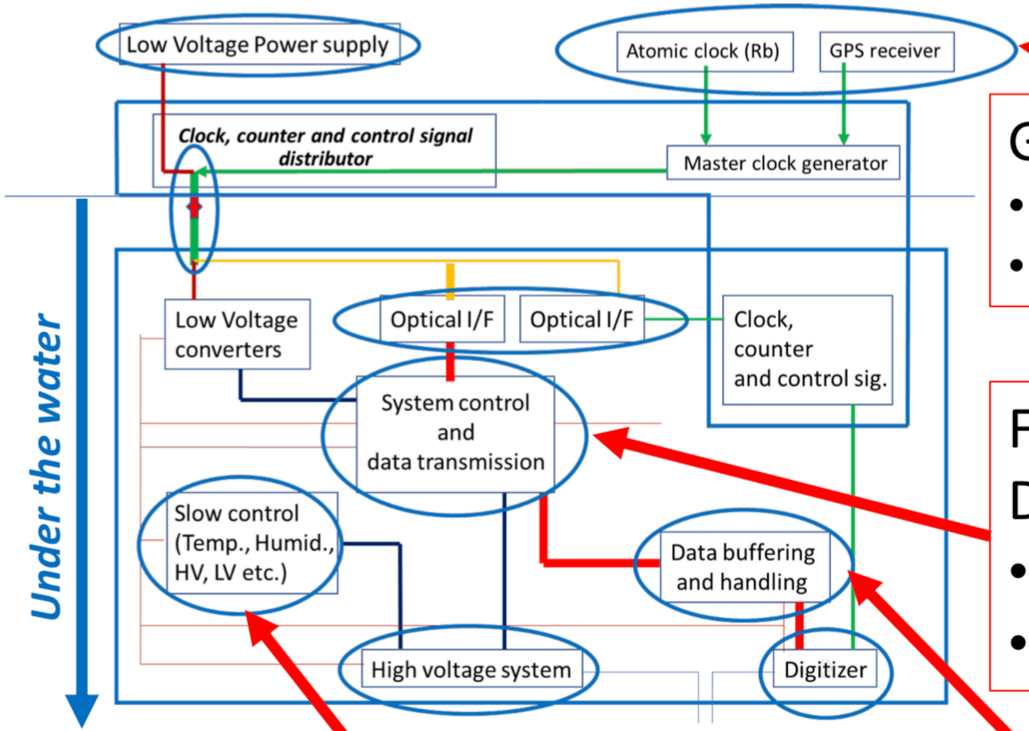
High Voltage PS

- CAEN (Italy)
- iSEG (Germany)
- Bellnix (JPN)
- Kaizu Works (JPN)

Photosensor digitization

- Candidates (= ongoing R&D)
  - QTC + TDC (FPGA)
  - Waveform sampling

Possible contributions (2)



GPS + Reference clock
- Commercial products?
- Common view GPS receiver?

Front-end module control & Data transmission
- Command handling
- Data handling

Slow control
- HV monitor
- LV monitor
- Environment monitor

Data handling
- Data buffering
- Data compression

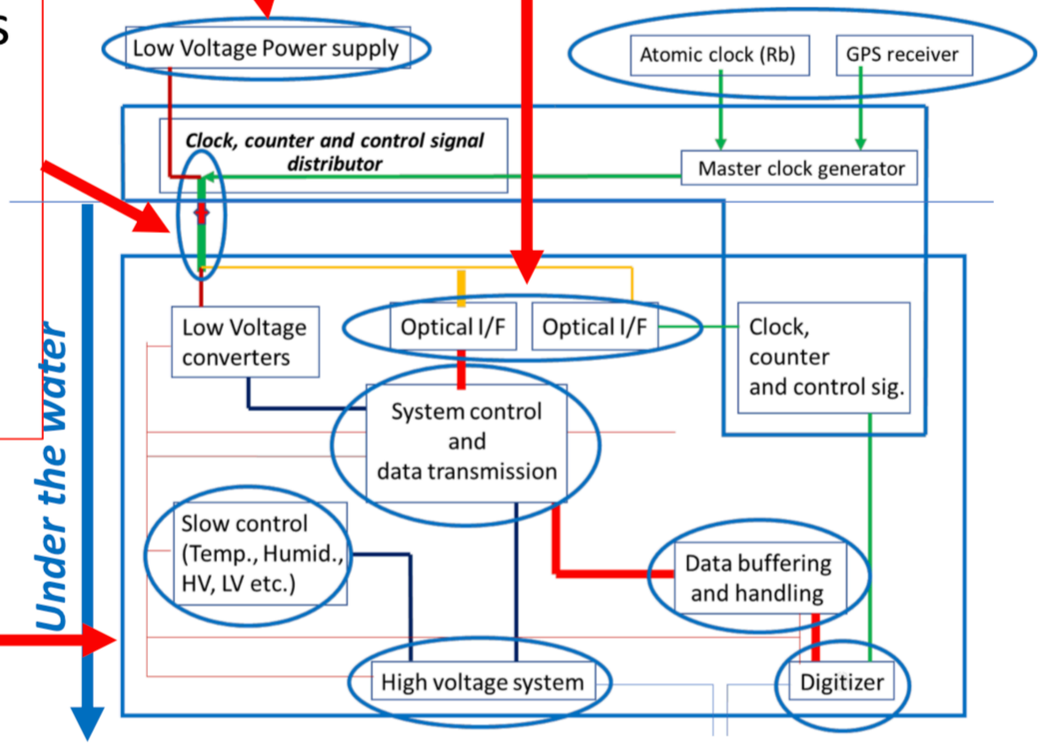
Possible contributions (3)

Low voltage power supply
- iSEG (Germany)
- Custom (commercial)

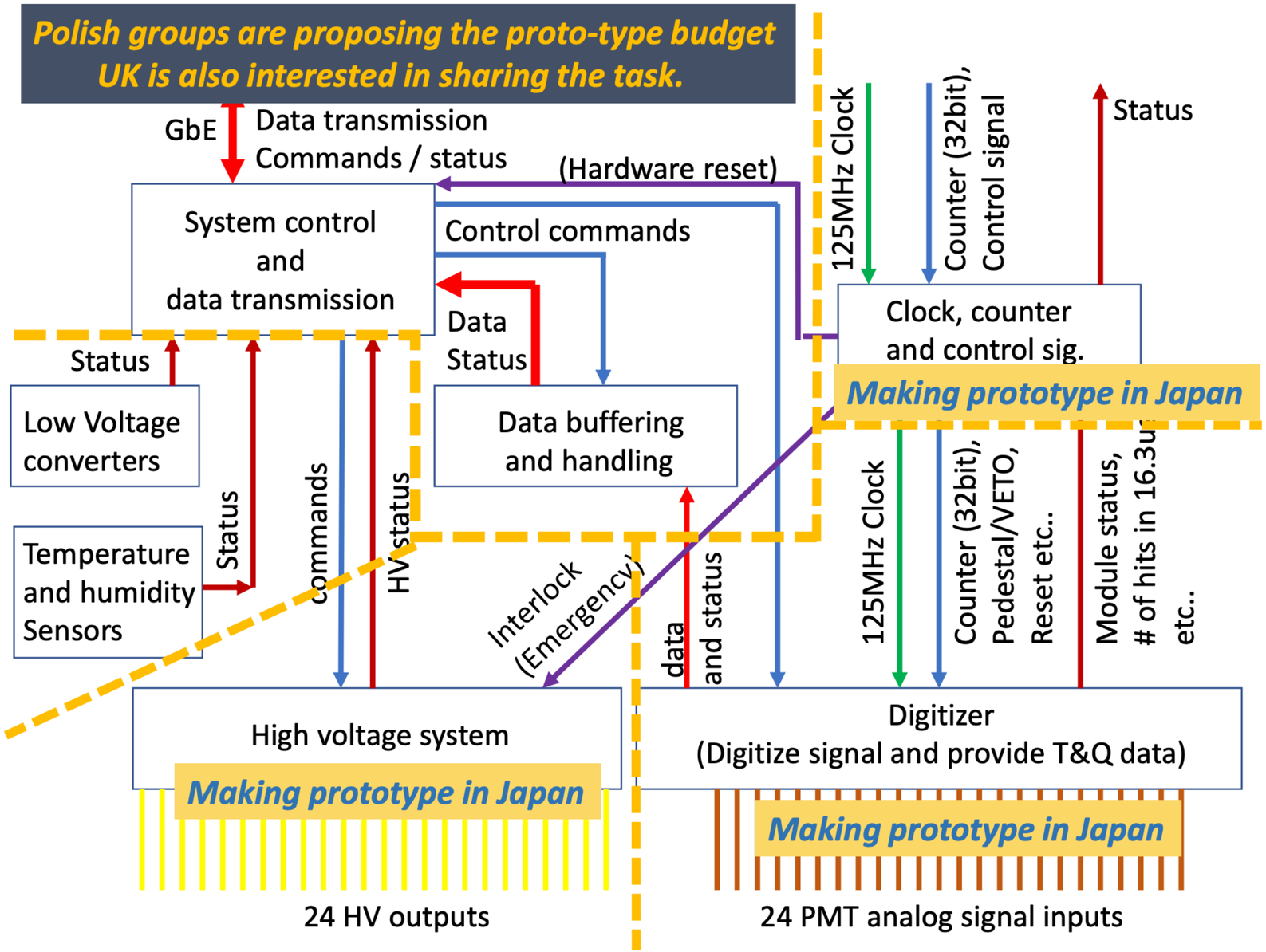
Durable optical I/F
- Appointech (Taiwan)
- Versatile Link (CERN)?

Optical fibers + copper cables
underwater connector
with special combined cable
- ODU (Germany)
- LEMO (Switzerland)
- Meisei (Cable, JPN)

Water tight case
- Conceptual design by MSR (JPN)



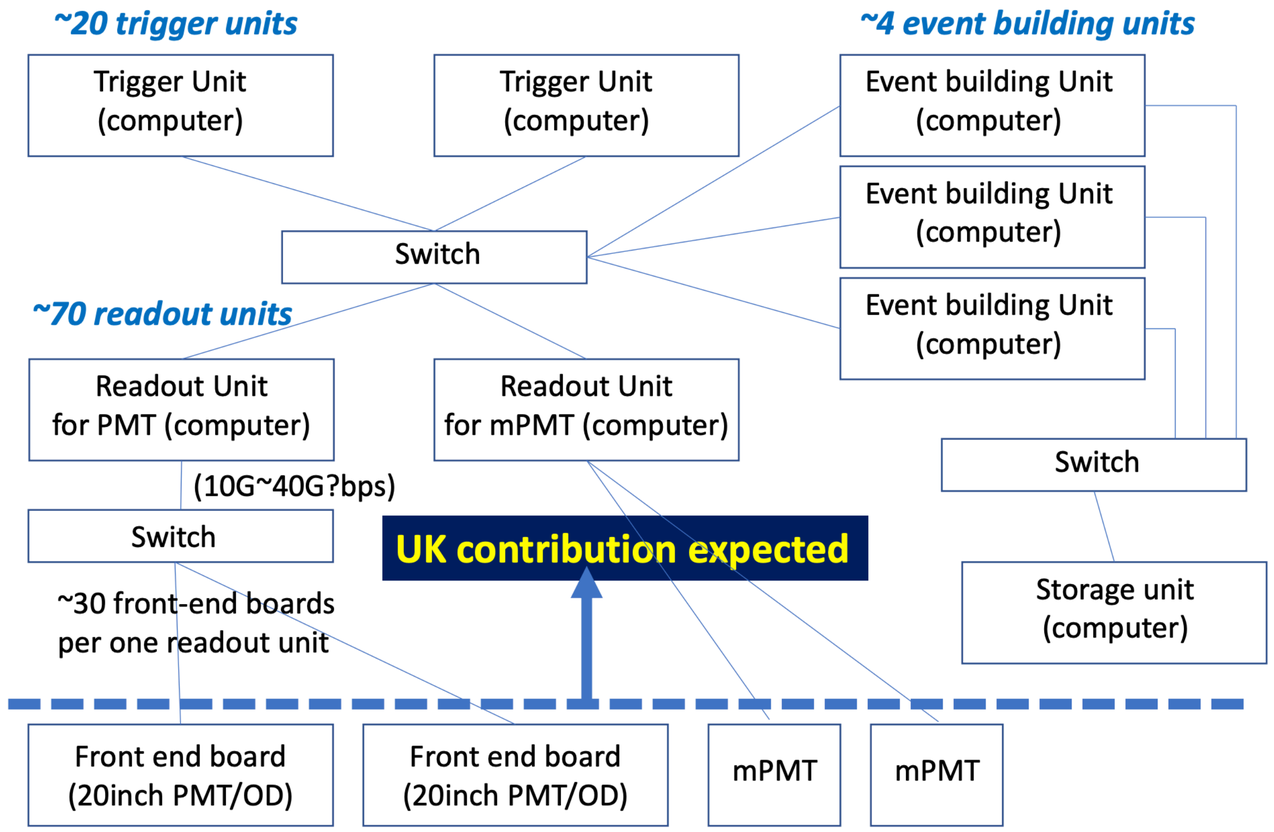
Who does what now?



DAQ (common to mPMT and PMT)

Mostly led by UK
Discussion with B. Richards for possible contributions

- Expected in software (for sure)
- Maybe hardware (but no R&D)



Possible contribution:

- Can develop a nice expertise on Memphyno
- Use it on CERN test beam and E61/HK

Computing

HK release made on a regular basis

Software installed on /cvmfs/hyperk.egi.eu

- Can be mounted on grid/clusters for software uniformisation
- Eventually move away from this system using Singularity (docker-based solution)

Share resources (storage and computing) using DIRAC

- QMUL GRID provided 20 TB for production + some CPUs
- Looking for European contributions (HK universities, JENNIFER) and T1 sites – possibilities: RAL (UK), TRIUMF (Canada), INFN (Italy), IN2P3 (France)
- 5 years: 15PB storage ~ 12 Oku yen + 3000 Xenon ~ 18 Oku yen

Easy contribution

- Consolidate synergies with Belle-II (Jennifer-II)
- Contacted Thomas for advices on how to proceed with CC-IN2P3 people

Let's talk about money…

Initial suggestions for budget request to MEXT
"Unacceptable" proposal for overseas countries (basically the first 2 IBR meetings…)

Numbers shown in the Japanese budget request for FY2019

item	Japan	Oversea
Cavern	263	
Tank (liner, structure)	127	
Photo-detection system	113	124*
Water & management	47	
Total	549 Oku-en	124 Oku-en

- PD system = sensors, covers, separation, electronics, DAQ, coils, calibration system…
- We need to fill "124 equivalent Okuen"
- International contributions to Japanese PD system could increase 50 cm PMTs.

New plan…

Basically switch Japanese expenses with overseas

- Japan pays for PMTs
- Overseas do the R&D and some other tasks

Better but still a lot of money to promise without the formal agreement from MEXT

Not shown here: Overseas handle the ND (30 Okuen)
Not sure if this includes the IWCD

Crude numbers

Okuen

item		Japan(diff.)	Oversea(diff.)
Cavern		**263**	
Tank (liner, structure)		**119(-8)**	**8*(+8*)**
Photo-detection system		**113(-)**	**117*(-8*)**
	50 cm PMT 20,000	73(-10)	
	50 cm PMT 10,000	37(+37)	
	50 cm PMT material		15*(+15*)
	50 cm PMT cover	0 (-21)	32*(+32*)
	50 cm PMT assemble	3(+1)	
	50 cm PMT electronics	0(-6)	9*(+9*)
	mPMT 7,000		49(-64*)
	OD and others		12*(-)
Water & management		**32(-15)**	**15*(+15*)**
Total		**542 (-7)**	**140* (+15*)**

140/(542+140)=20.5%

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Coming months planning

May: Dedicated Mtg on TR and EoI* (2-3days depending on the agenda).

- There are many constraints on the days in May. We narrowed down the options to either 5/8-10 or 5/18-20 (just before SK collaboration meet): **in-person meeting!**

June: HKAC meeting (sub-committee in ~May) (Early)
June: EoI released
June-July: 2nd HKFF meeting
September: Hyper-Kamiokande collaboration meeting

- Note: TAUP2019 in Toyama, Sept 9-13
- Any other constraints before we send out a Doodle poll?

Suggestion to Francesca: ask to have first drafts sent around March to a contact person for a first round of comments and checks
*: consensus that the EoI only give our expected contributions, with our projections in terms of manpower and resources — doesn't need to be "approved" by fundings agencies, but when discussed in May funding agencies and us need to say the same thing

Budget requests

Requesting money from SU's Emergence program:

- Less than 100k€ - avg: 57k€ (currently around 74k€)
- 1 year of postdoc salary
- Instrumentation for calibration on Memphyno (LED, magnetic field control…)
- Shipping mPMT/manpower to France
- Need to finish description texts and add interested people into the proposal (name and FTE)

FJPPL: travel money (a few k€?)

IN2P3?