

2014.06.24 LEPS II detector meeting @RCNP

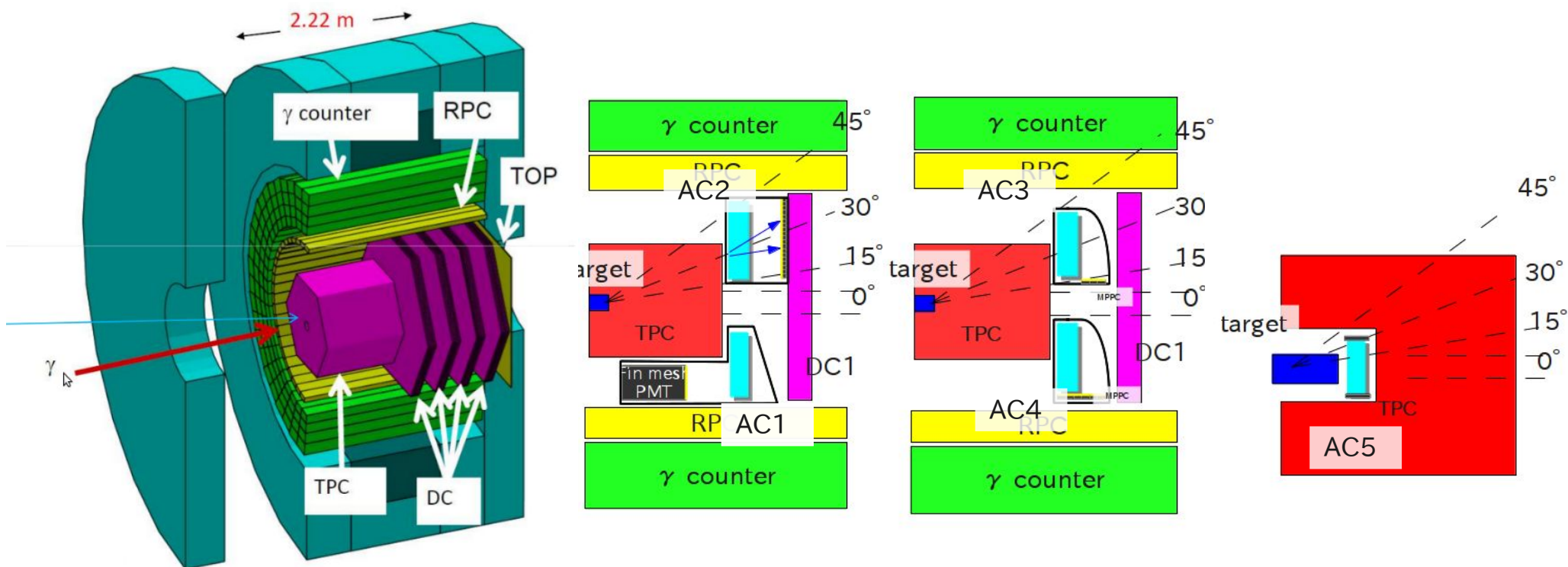
Proposal of LEPS II AC design

H. ITO, Chiba Univ.

outline

- (1) overview
- (2) mechanism & detail
- (3) cost
- (4) summary

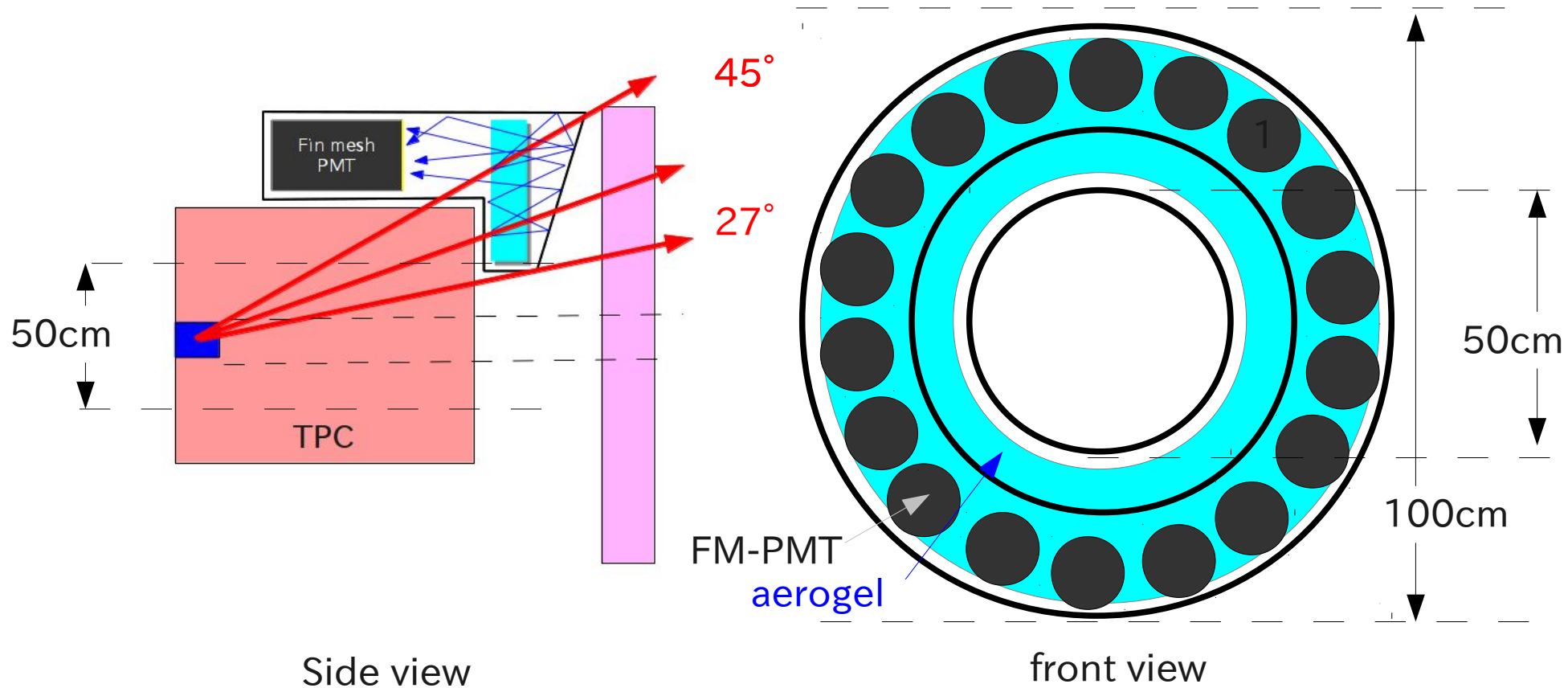
Overview for proposal of LEPS II AC



AC is installed between each MWDC.

	AC1	AC2	AC3	AC4	AC5
thickness	10-15 cm	10-15 cm	10-15 cm	10-15 cm	2-4 cm
aerogel index	1.03	1.03	1.03	1.03	1.03
type	threshold	RICH	threshold	threshold	threshold
install position	TPC - DC1	TPC - DC1	TPC - DC1	TPC - DC1	Target - TPC
focusing	normal	-	ellipsoid mirror focus	outside collection	normal
Photo-device	FM-PMT (2 inch) 18	MPPC (6 x 6 mm ²) 7.27 x 10 ³	MPPC (6 x 6 mm ²) 300	MPPC (6 x 6 mm ²) 3000	MPPC (6 x 6 mm ²) 160
acceptance [deg.]	27-45	15-45	15-25.7	15-30	0-23.8

Mechanism of AC1



Side view

front view

- AC1 -

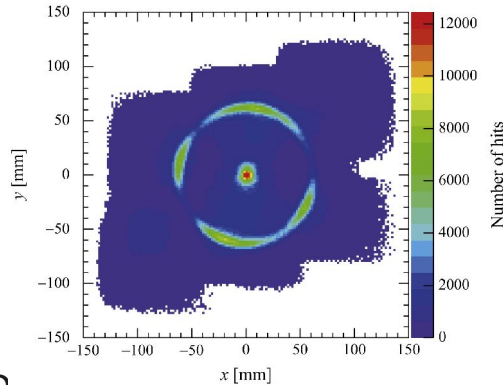
- Photo-device: FM-PMT(2 inch) ... 18
- Aerogel: index 1.03, ϕ (100-50) x 4 cm³, 23.6 L
- Threshold type
- Aim to Np.e. > 4

Mechanism of AC2 and AC3

- AC2 -

A-RICH

- Photo-device: HAPD
- Aerogel 1.04-1.05
- Pion/kaon
- $N_{p.e.} \sim 6.6$
- Separation $4.1-4.5 \sigma$

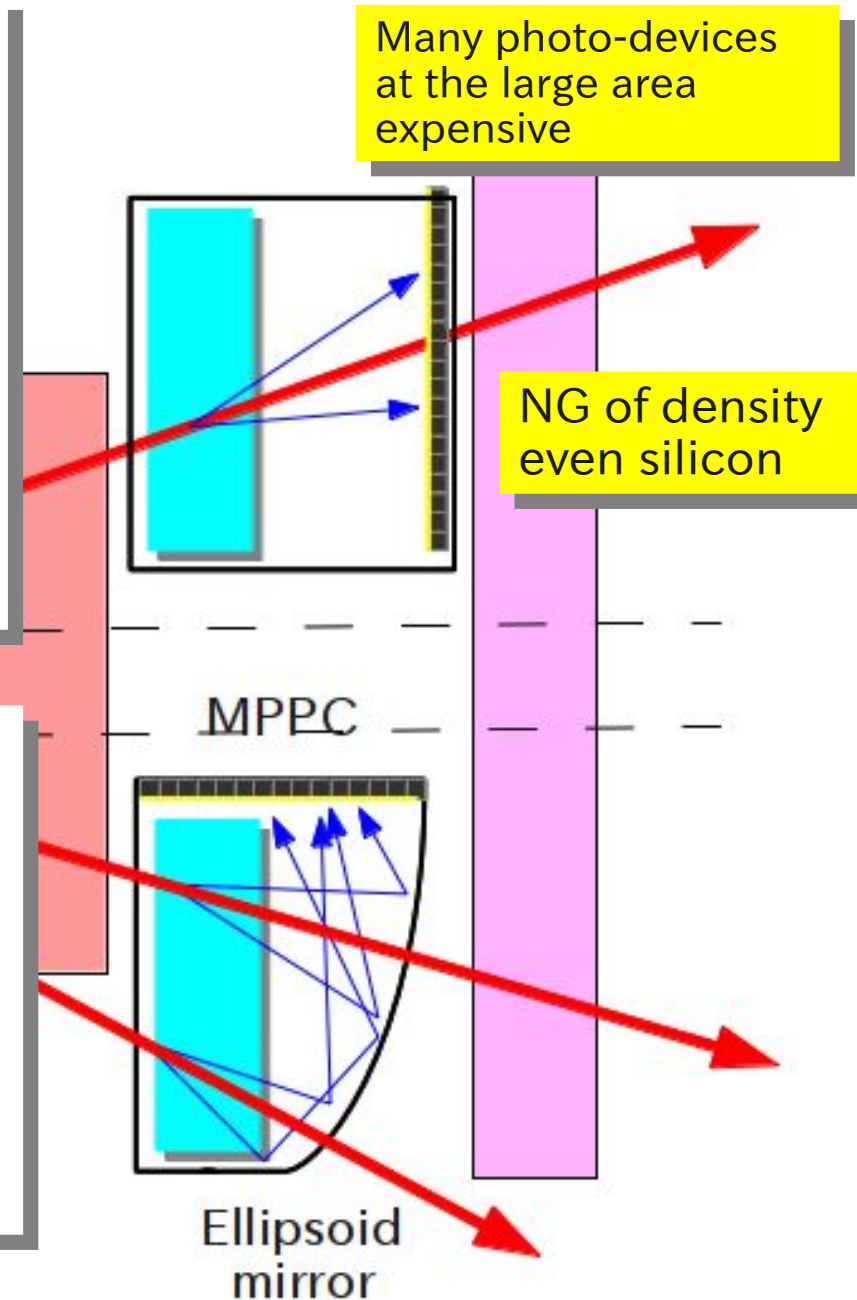


I. Adachi, M. Tabata, et al.

- Aim to using MPPC to 4 p.e.
- MPPC : 7.57×10^3
- Aerogel: index 1.03, $\phi (100-50) \times 4 \text{ cm}^3$, 23.6 L

- AC3 -

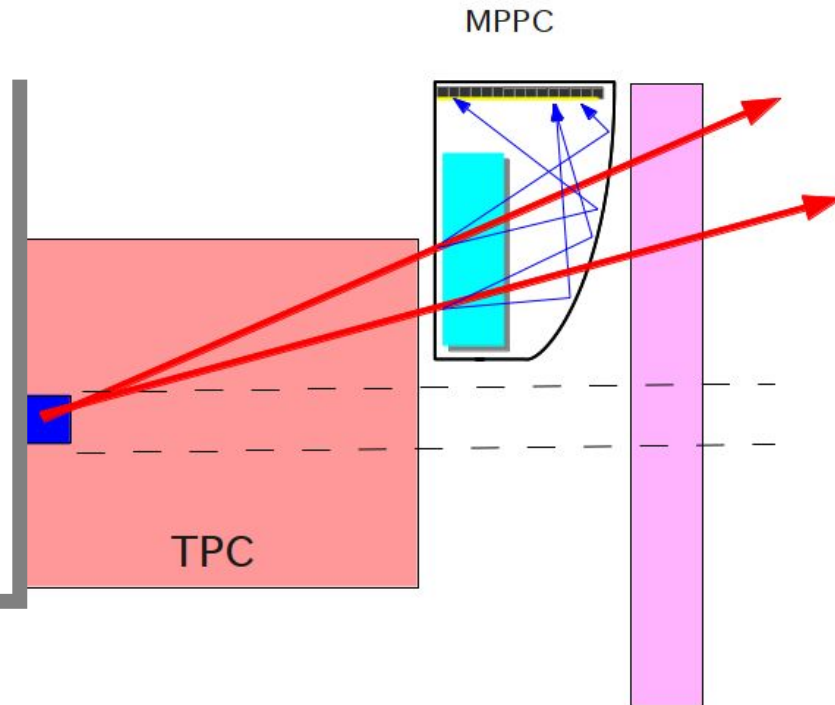
- Photo-device: MPPC
... 300
- Aerogel: 1.03;
- ellipsoid mirror focusing
- Threshold type
- Aim to $N_{p.e.} > 4$
- Aerogel: index 1.03, $\phi (100-50) \times 4 \text{ cm}^3$, 23.6 L



Mechanism of AC4 and AC5

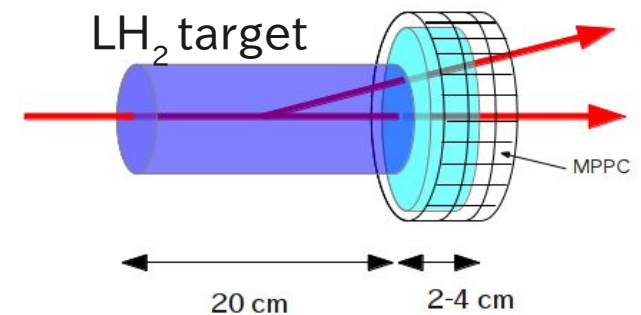
- AC4 -

- Photo-device: MPPC
... 3000
- Aerogel: 1.03;
- Winston cone mirror focusing
- Threshold type
- Aim to Np.e. > 4
- Aerogel: index 1.03, $\phi (100-50) \times 4 \text{ cm}^3$, 23.6 L

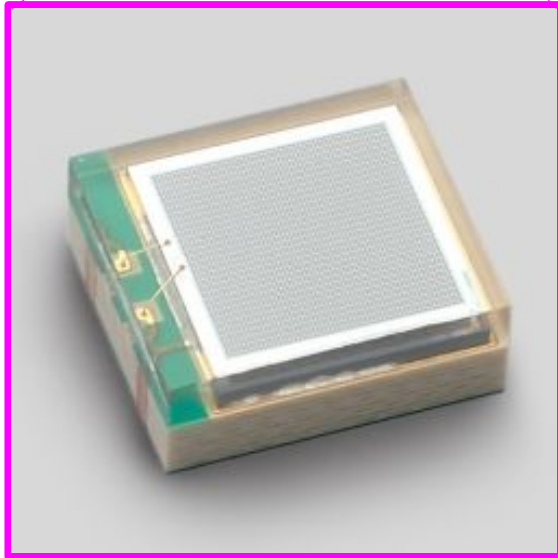
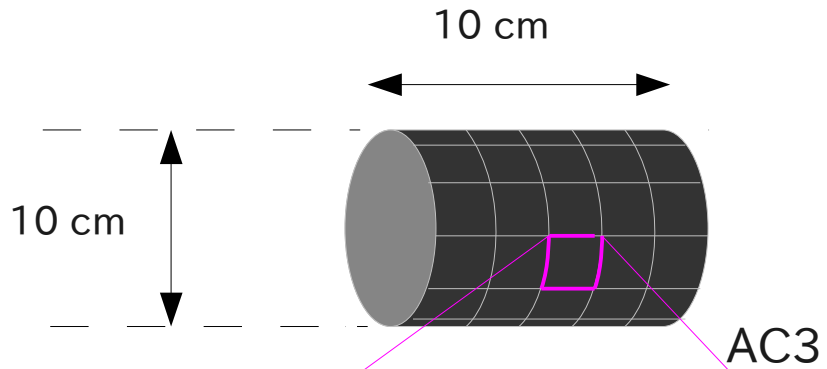


- AC5 -

- Photo-device: MPPC
... 160
- Aerogel: 1.03;
- Threshold type
- Aim to Np.e. > 4
- Aerogel: index 1.03, $\phi 10 \times 4 \text{ cm}^3$, 0.4 L



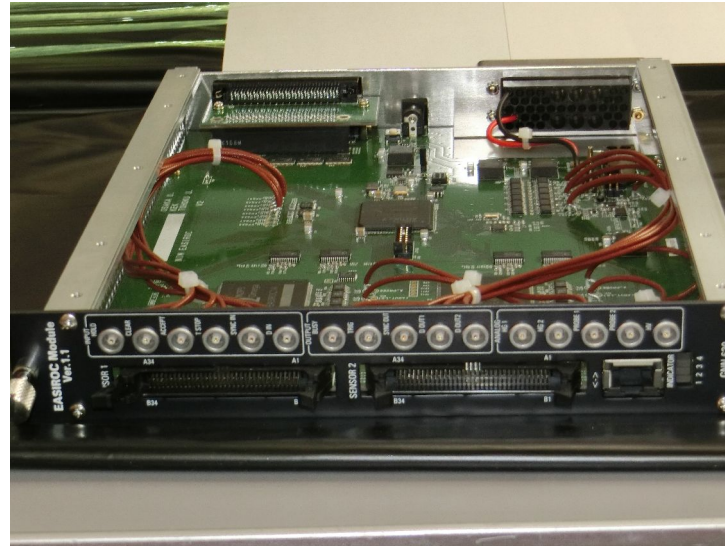
MPPC + EASIROC module



MPPC: $6 \times 6 \text{ mm}^2$
16k¥/piece

EASIROC module

64 ch: power supply, ADC, TDC;
Trigger: multi logic (or, and, external...)
Control: Ethernet



EASIROC module
300 k¥/module

Aerogel

AC1-4 ... $\phi (100-50) \times 4 \text{ cm}^3 \sim 23.6 \text{ L}$

AC5 ... $\phi 10 \times 4 \text{ cm}^3 \sim 0.4 \text{ L}$

1batch /2L ... 200 k¥
→ 100 k¥/L



Summary

We presented proposal LEPS II AC design.

	AC1	AC2	AC3	AC4	AC5
thickness	10-15 cm	10-15 cm	10-15 cm	10-15 cm	2-4 cm
aerogel index	1.03	1.03	1.03	1.03	1.03
type	threshold	RICH	threshold	threshold	threshold
install position	TPC - DC1	TPC - DC1	TPC - DC1	TPC - DC1	Target - TPC
focusing	normal	-	ellipsoid mirror focus	outside collection	normal
Photo-device	FM-PMT (2 inch)	MPPC (6 x 6 mm ²)	MPPC (6 x 6 mm ²)	MPPC (6 x 6 mm ²)	MPPC (6 x 6 mm ²)
	18	7.27×10^3	300	3000	160
acceptance [deg.]	27-45	15-45	15-25.7	15-30	0-23.8
cost [k¥]					
aerogel	2,360	2,360	2,360	2,360	40
Photo-device	3,600	116,320	4,800	48,000	5,600
EASIROC module	0	34,200	1,500	14,100	900
total	5,960	152,880	8,660	64,460	6,540

Backup

Cherenkov light info.

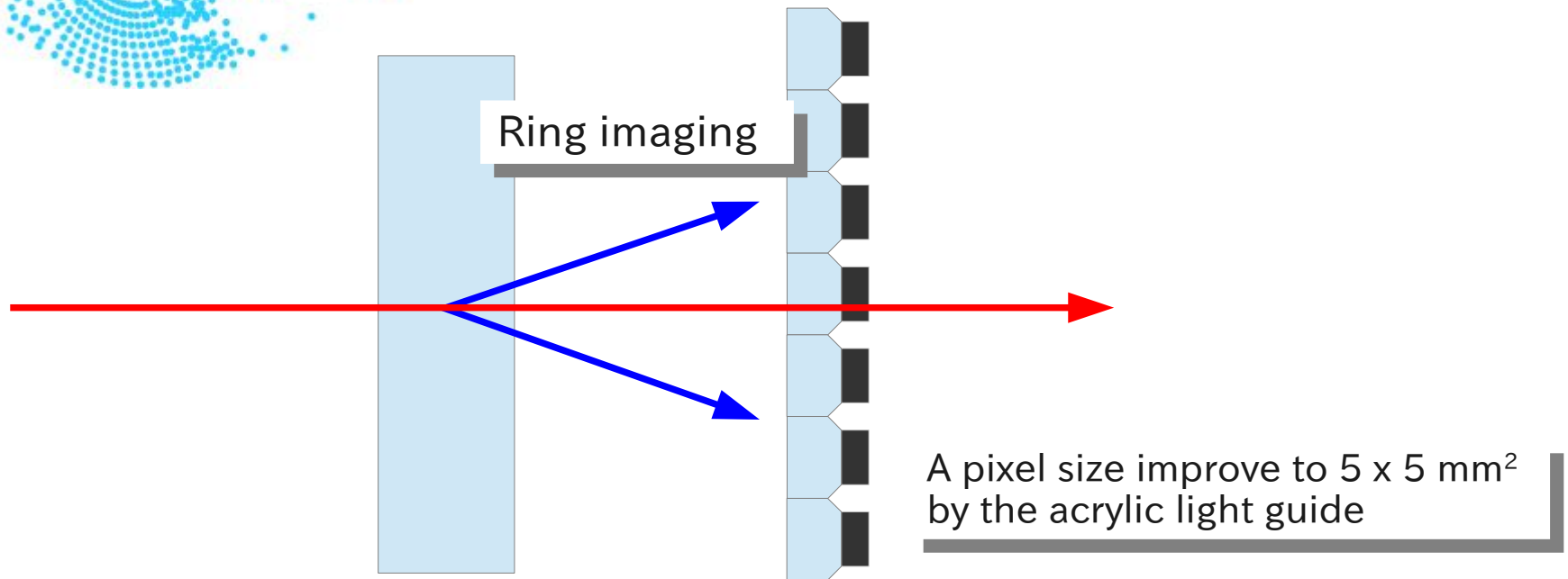
index	Cherenkov angle [deg.]	number of photons rate of 1.05	number of photons
1.03	13.9	0.62	30.9
1.04	16.0	0.81	40.6
1.05	17.8	1.00	50.0
1.06	19.4	1.18	59.2
1.07	20.9	1.36	68.1
1.08	22.2	1.53	76.7
1.09	23.5	1.70	85.1
1.10	24.6	1.87	93.3
1.11	25.7	2.03	101.3
1.12	26.8	2.18	109.1
1.13	27.8	2.33	116.6
1.14	28.7	2.48	124.0
1.15	29.6	2.62	131.1
1.16	30.5	2.76	138.1
1.17	31.3	2.90	144.9
1.18	32.1	3.03	151.6

Other idea

2-6 June 2014 Beurs van Berlage

Hamamatsu MPPC S11834 as a detector of Cherenkov photons

Rok PESTOTNIK
Jozef Stefan Institute



aerogel

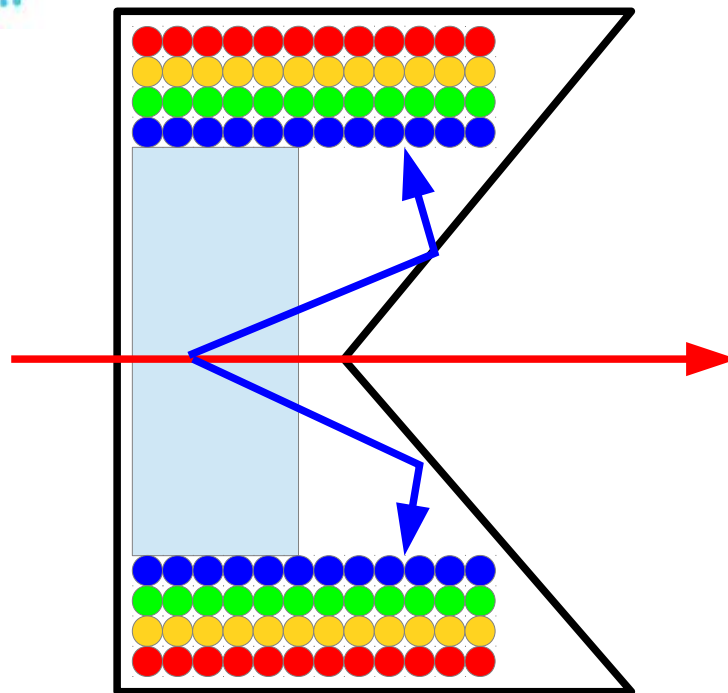
MPPC: 3 x 3 mm²
+
Acrylic light guide

Other idea

2-6 June 2014 Beurs van Berlage

Development of Multipurpose Aerogel Cherenkov Counter

Hiroshi ITO
Chiba univ.



WLS fiber light guide
Fiber: 0.2 mm in diameter
Possible of arbitrary shape
Less photoelectrons