

# *Shintake Monitor*

*- Detector & BG study -*

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Thanks to T. Suehara

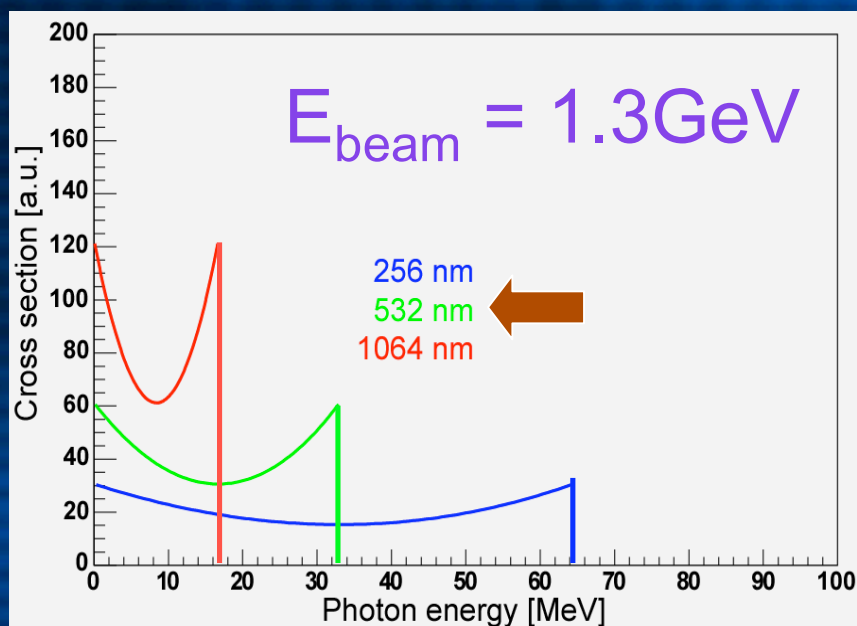
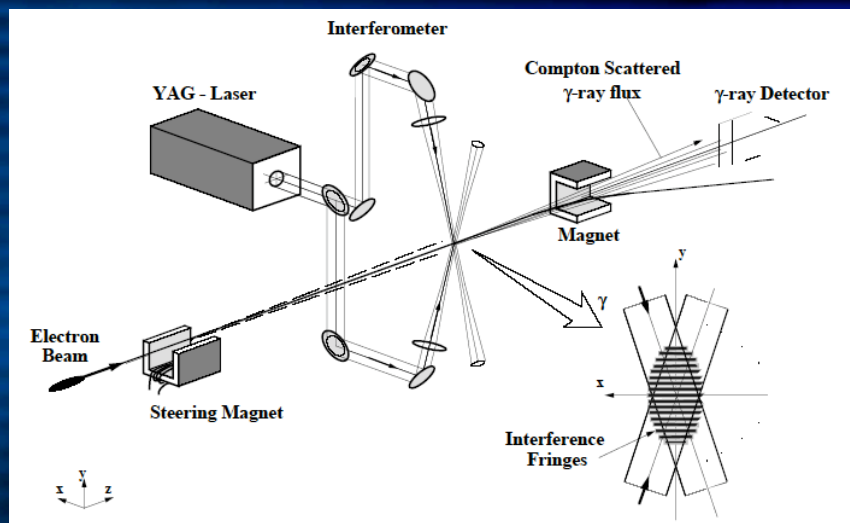
# *Contents*

- Signal
- Background
- Photon Detector
- ATF2 Layout

# *Signal*



# Signal at ATF2



- #photon  $\sim 4400$ 
  - 200mJ, 532nm, 10ns pulse laser
  - 30um laser spot @IP
  - c.f. #photon  $\sim 5000$  (FFTB)
  - $O(10^{3\sim 4})$  less than wire scanner
- $E_{\text{photon}} < 30 \text{ MeV}$ 
  - Much less energetic
  - c.f.  $E_{\text{photon}} < 13 \text{ GeV}$  (FFTB),  
 $< E_{\text{beam}}$  (wire scanner)

→ Background may be severe.



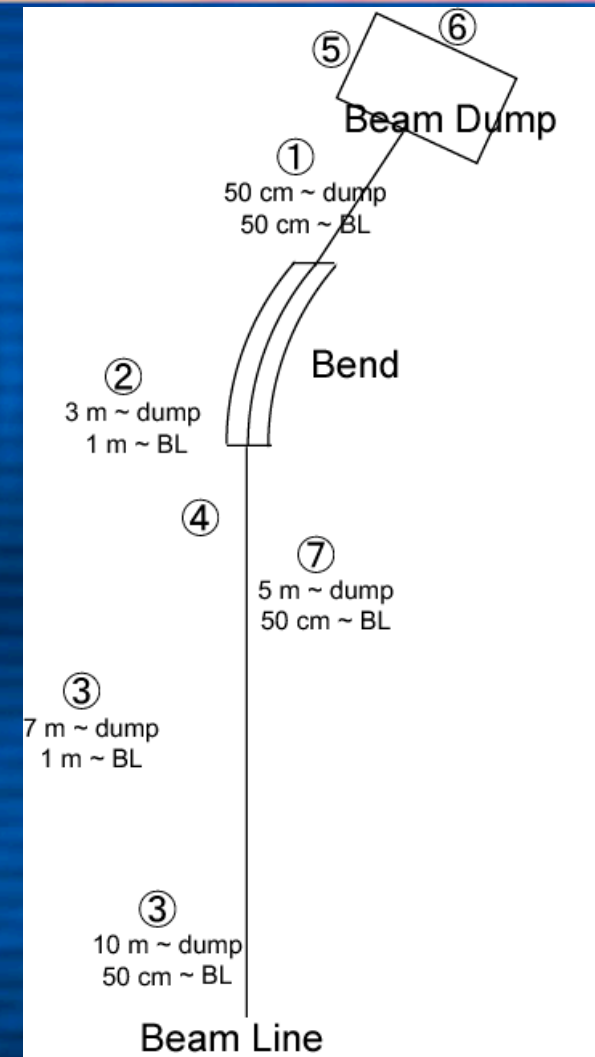
# *Background*

# *Expected background sources*

1. Synchrotron radiation
  - Can be eliminated by low energy cut ( $E_c \sim 1\text{keV}$ )
2. Brems. from beam-gas scattering
  - Negligibly small
3. Radiation from beam dump
4. Interaction of beam-halo with beam-pipe

# Measurement at current ATF

1. Csl
2. Plastic scintillator

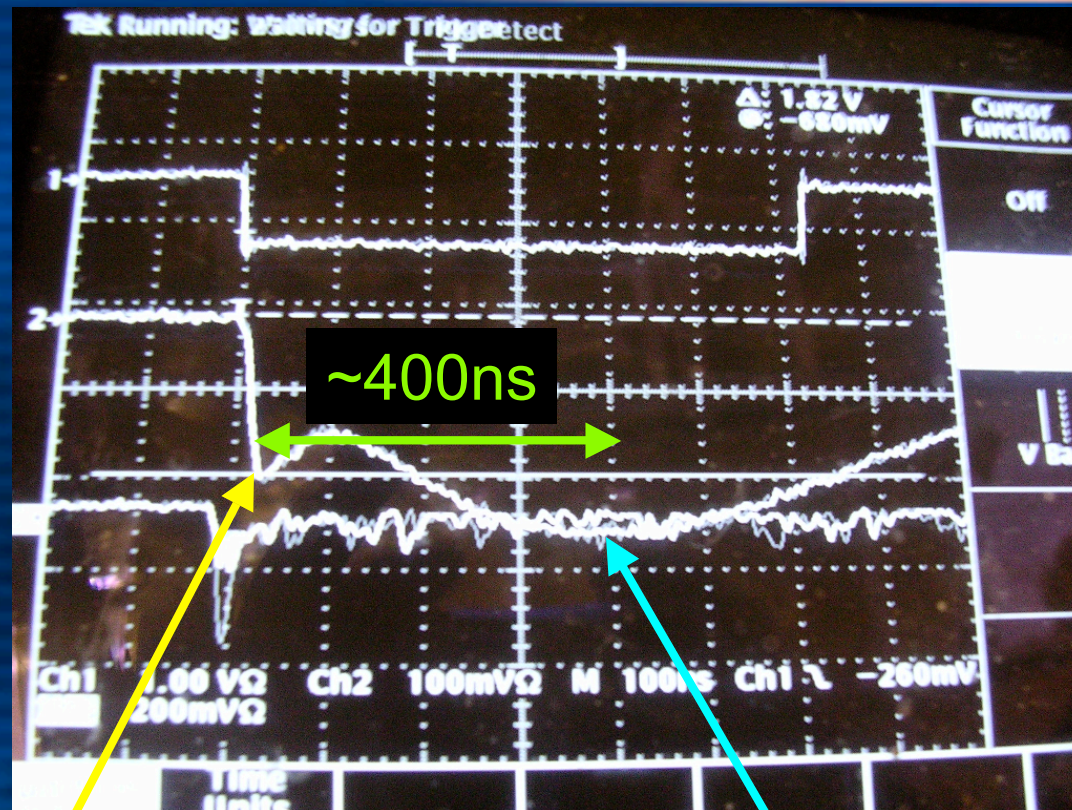




# CsI Signal

Beam timing

CsI signal



100ns/div

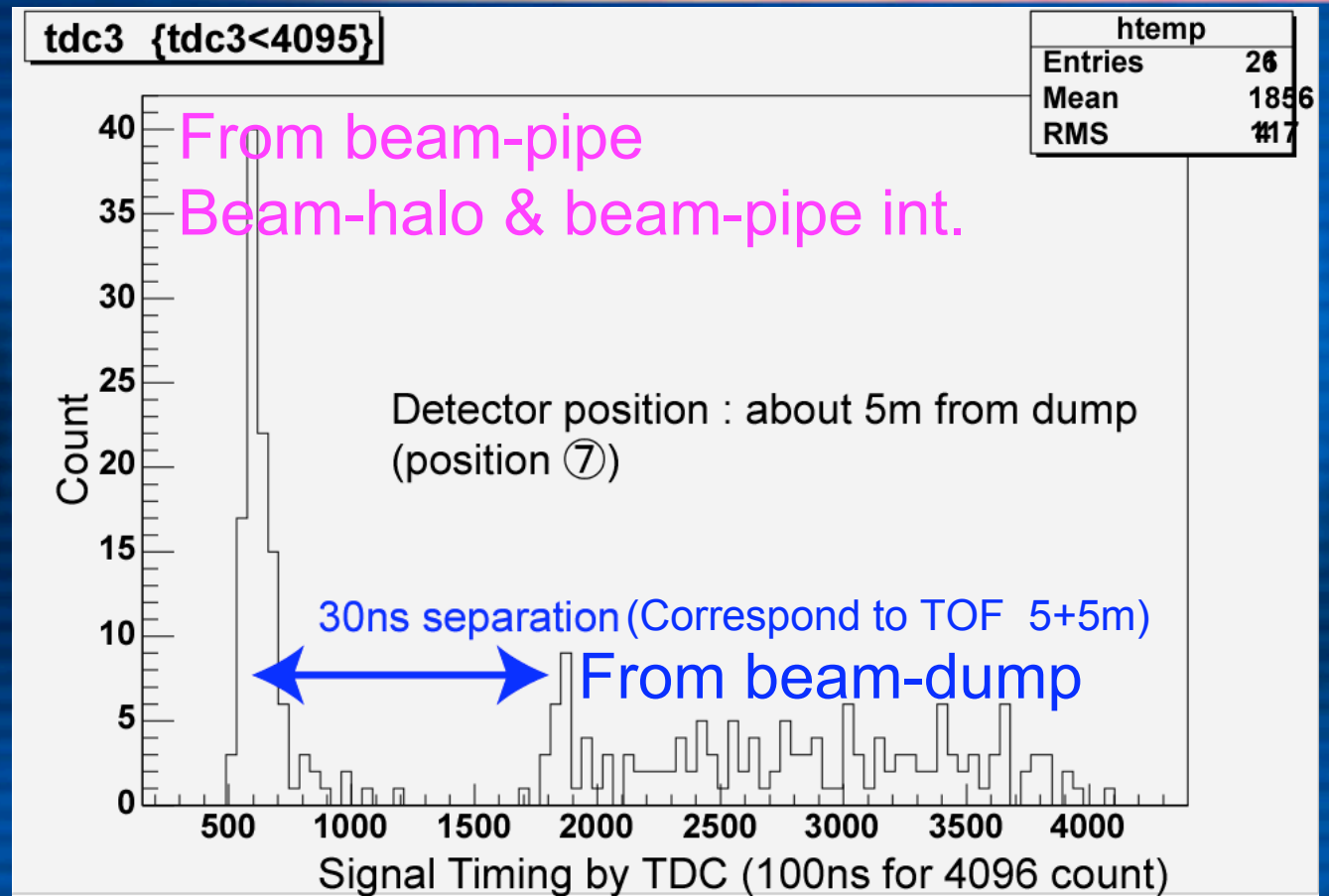
Prompt Peak  
(halo-pipe int. & from BD?)

Delayed Peak  
(Neutron?)

# Timing spectrum of Prompt signal

Plastic scintillator

5m from beam dump  
0.5m from beam pipe



Need good timing resolution



# Background

- BG from beam-dump can be separated by timing information if dump is far enough
- Photons produced by beam-halo and beam-pipe interaction will be severe BG
  - Can not be separated by timing information
  - May be reduced by beam collimator / mask
  - Intensity : to be studied with MC



# *Photon detector*

# Possible detector

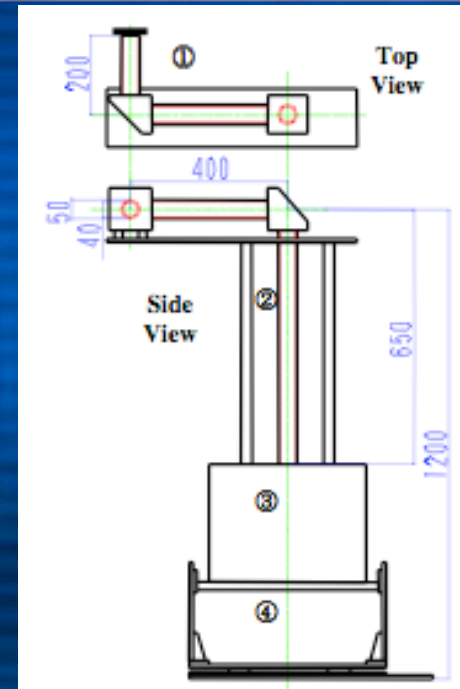


collimator + pure CsI  
(laser wire ;  $E_{ph} < 30\text{MeV}$ )

Similar to  
Shintake-mon. @ATF2

22 June 2005

T.Sanuki, ILC-BDIR, RHUL






Pb converter + Gas Cherenkov  
(wire scanner;  $E_{ph} < 1.3\text{GeV}$ )

worked at FFTB  
 $E_{ph} < 15\text{GeV}$

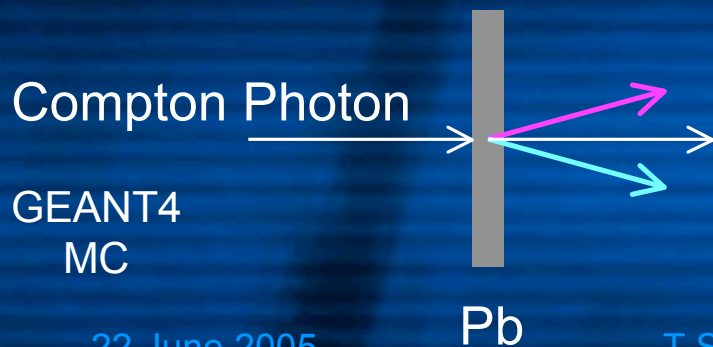
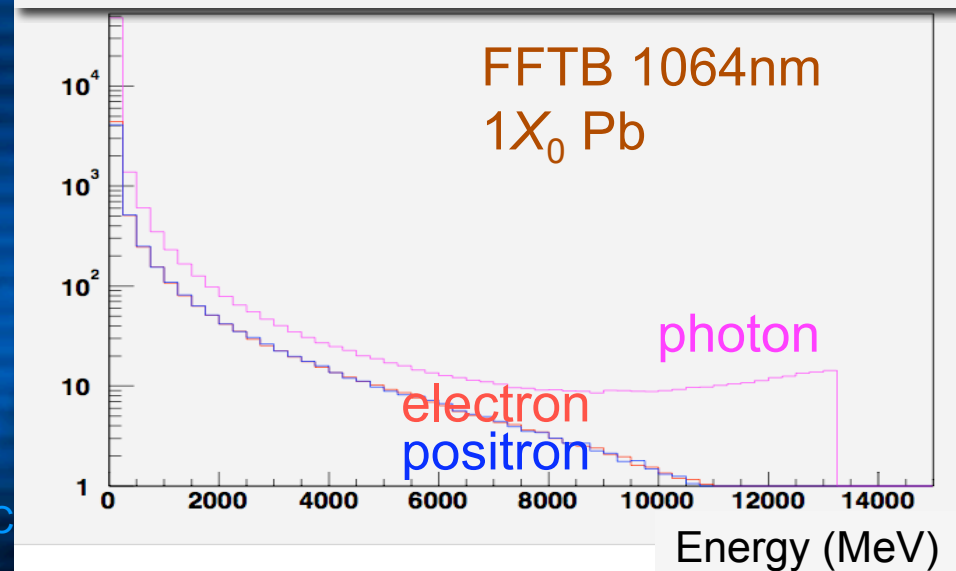
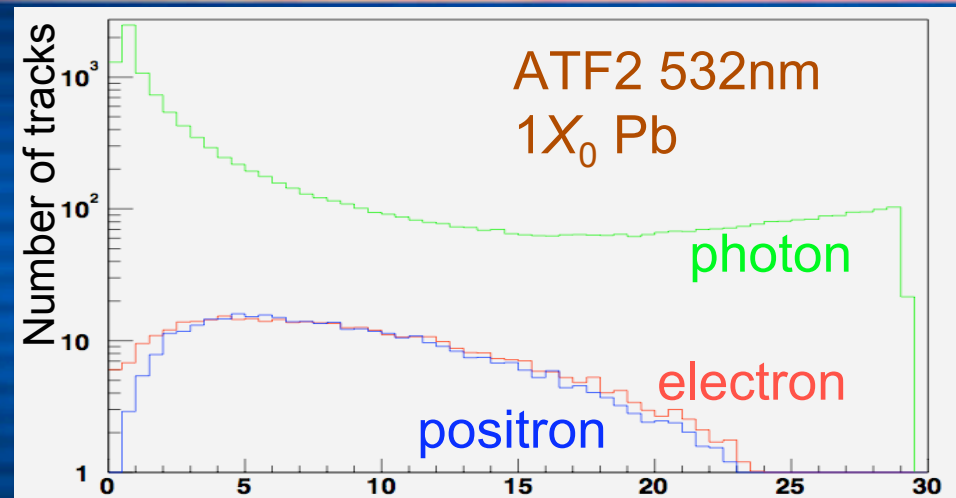
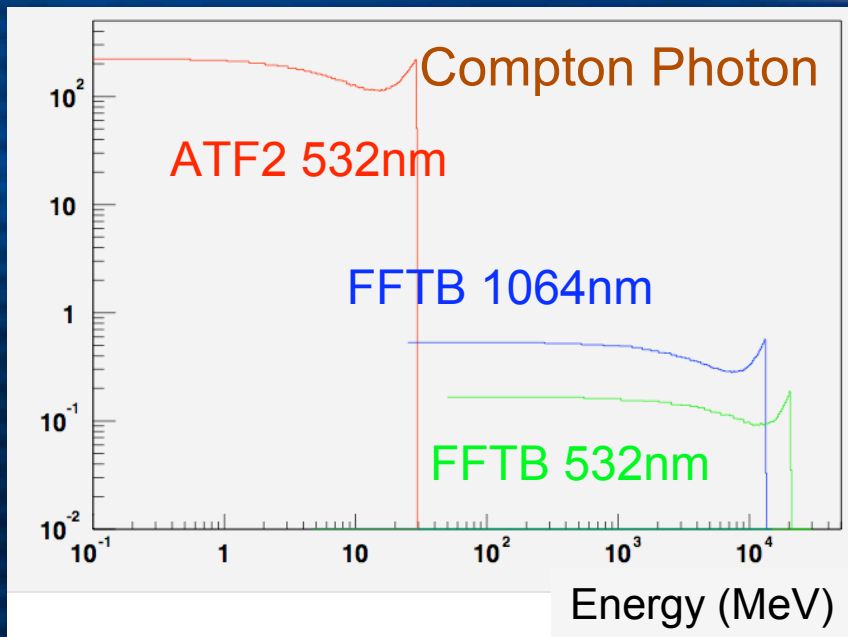
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# Csl / Gas Cherenkov

	Signal Speed	Signal Amplitude
Csl	 c.f. BG study	
Gas Cherenkov		?



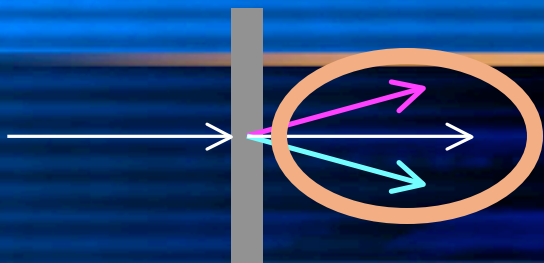
# EM shower (MC)



GEANT4  
MC

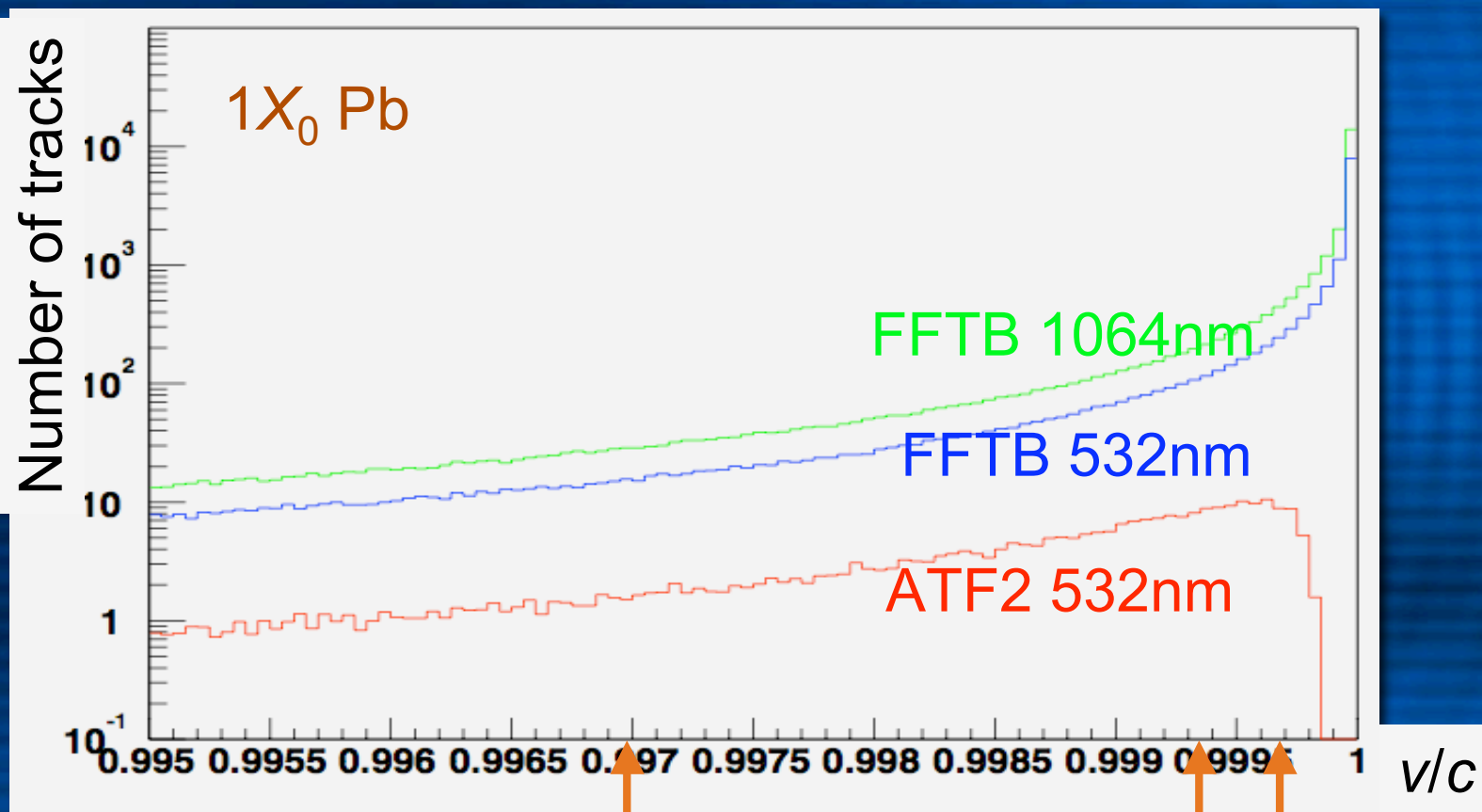
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# Velocity distribution

$|Q| > 0$

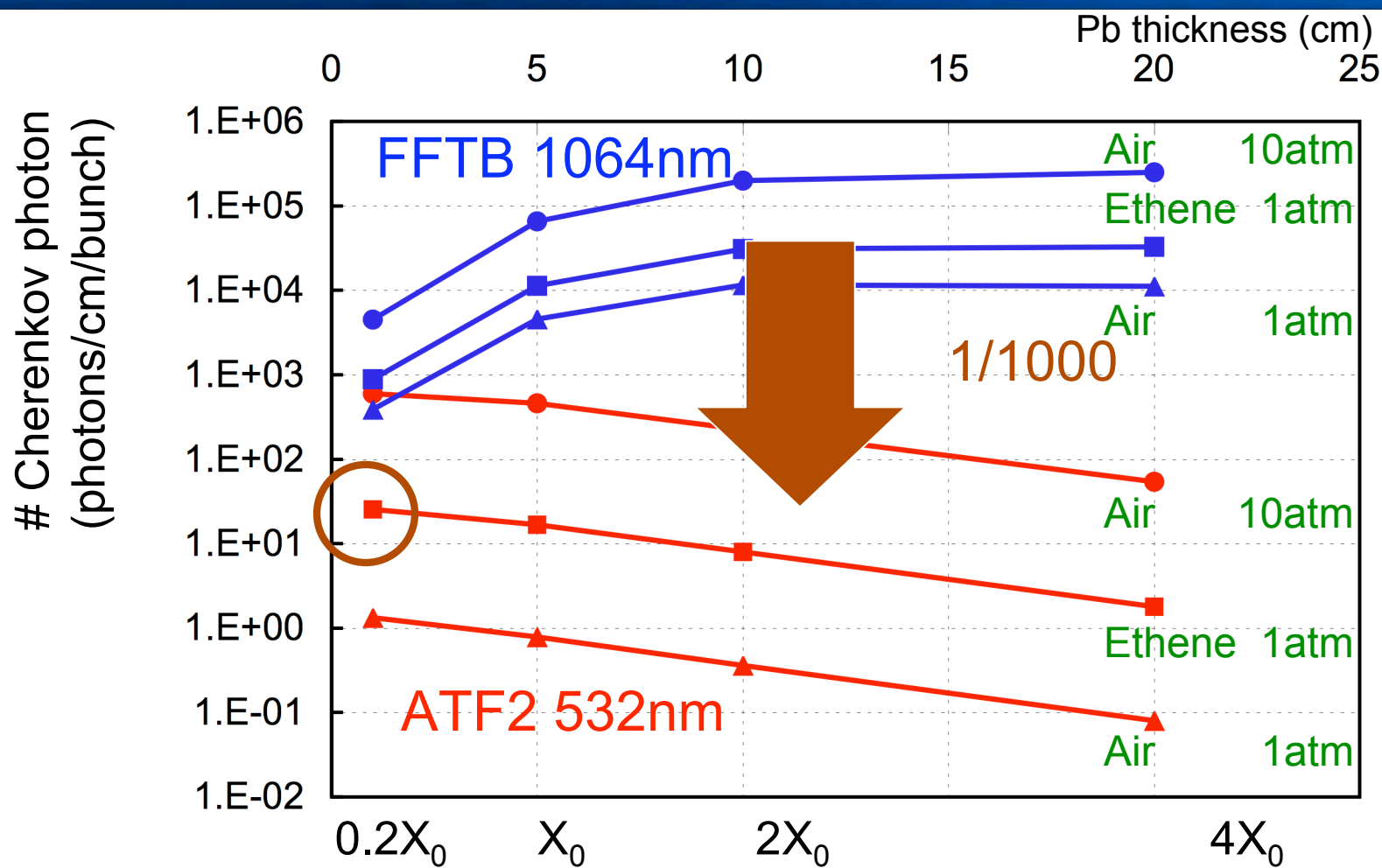


Threshold

Air 10atm

1atm. Ethene Air

# # Cherenkov photon /cm /bunch





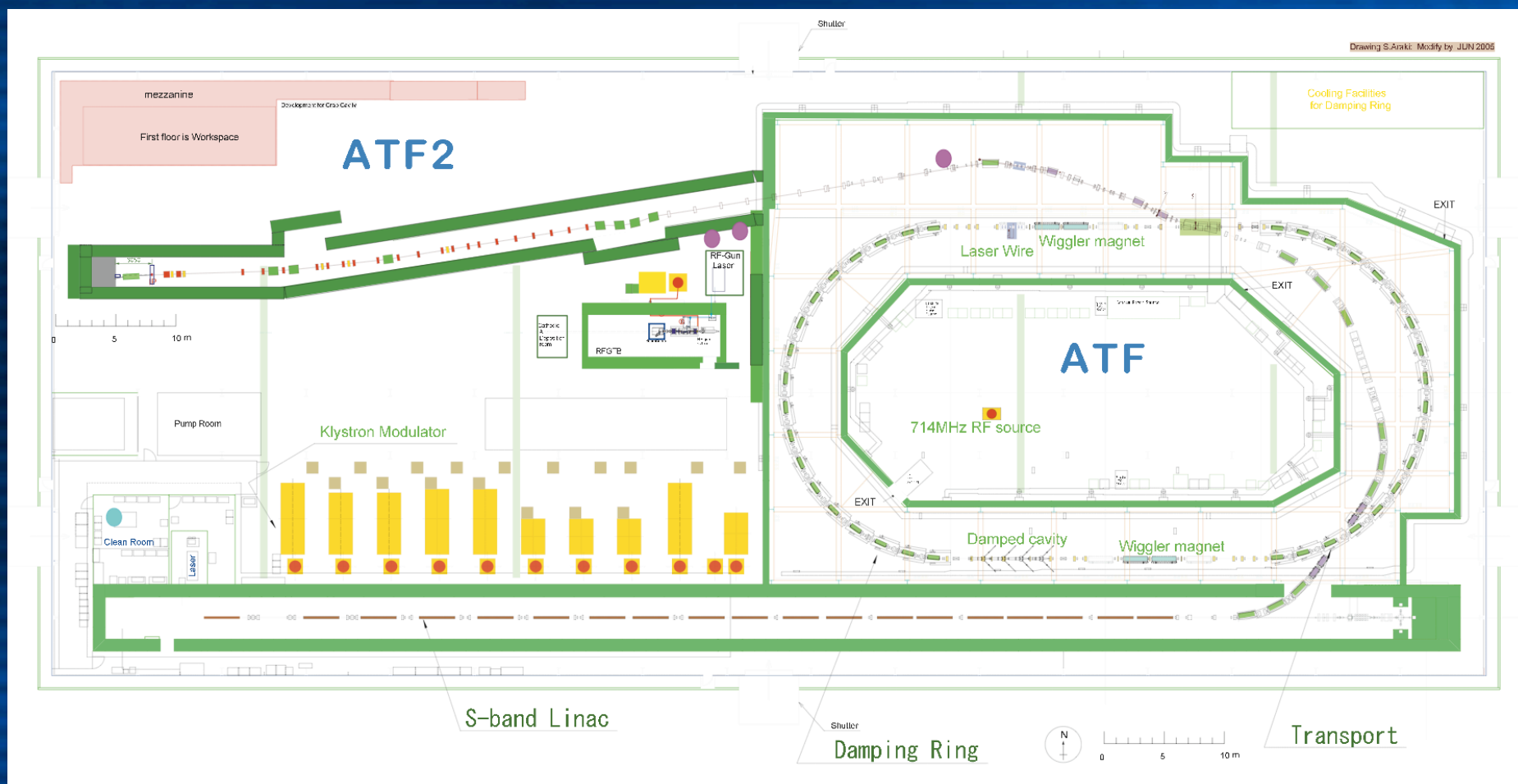
# *Photon detector*

- Faint Cherenkov signal
- Severe BG condition
- FFTB-type ethene Cherenkov detector can work ?
- Long gas Cherenkov counter ?
- Radiator with a higher refractive index ?

Need more study

# *ATF2 layout*

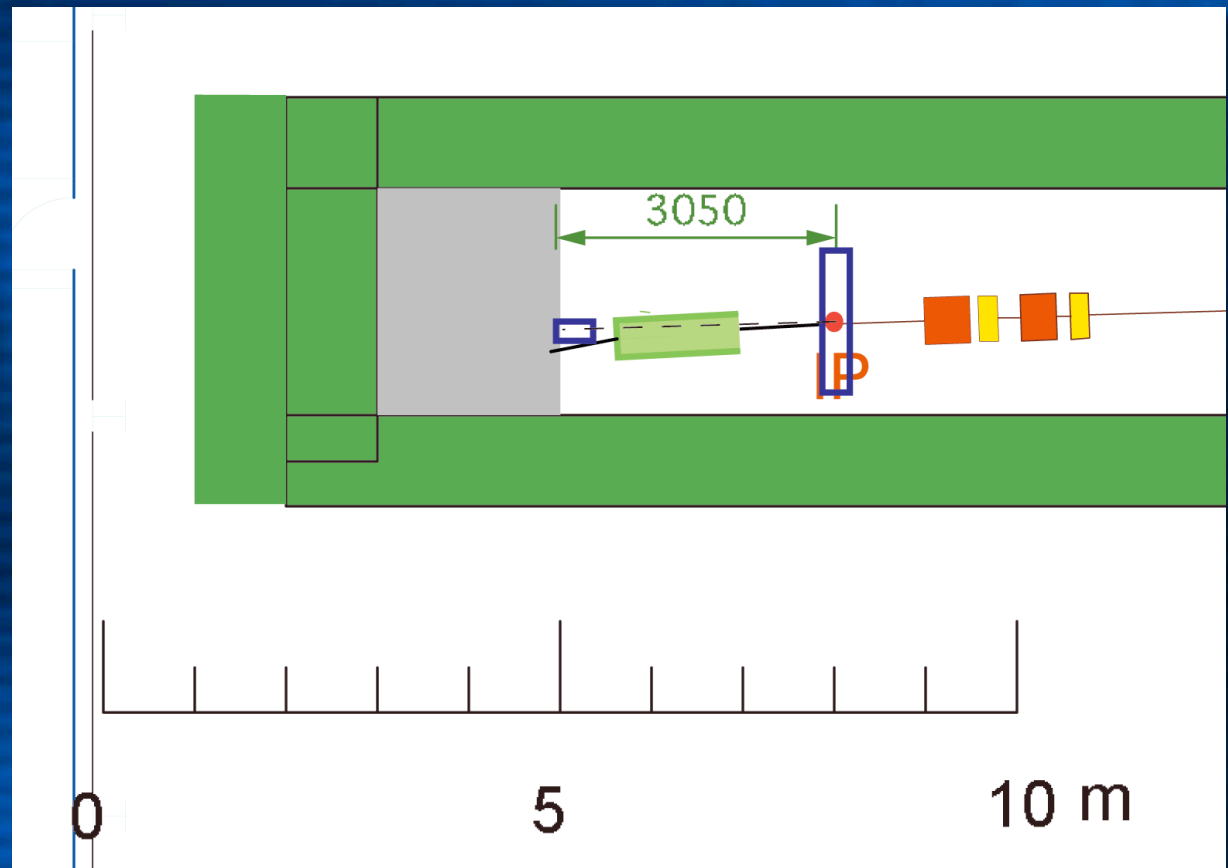
# Baseline optimal optics



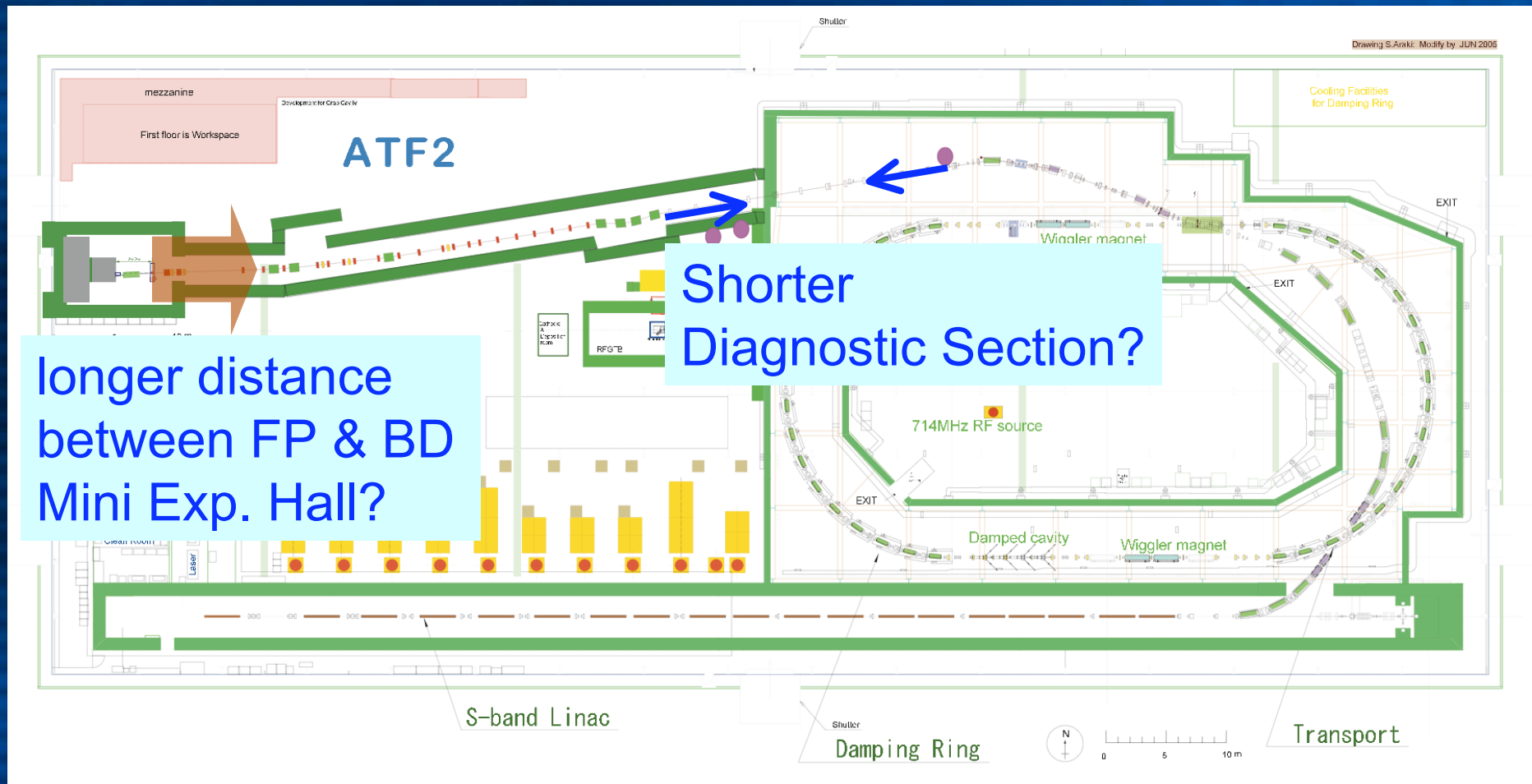


# *Around Shintake Monitor*

- No room for maintenance
- No room for long detector
- BG from beam dump



# Possible ATF2 layout



# *Summary*

- We measured BG at ATF
- BG from beam dump can be discriminated by timing information if dump is far enough, timing resolution is good enough
- Effect of beam halo should be studied
- Beam halo to be spoiled
- Need to develop a good photon detector
- ATF2 layout to be re-considered