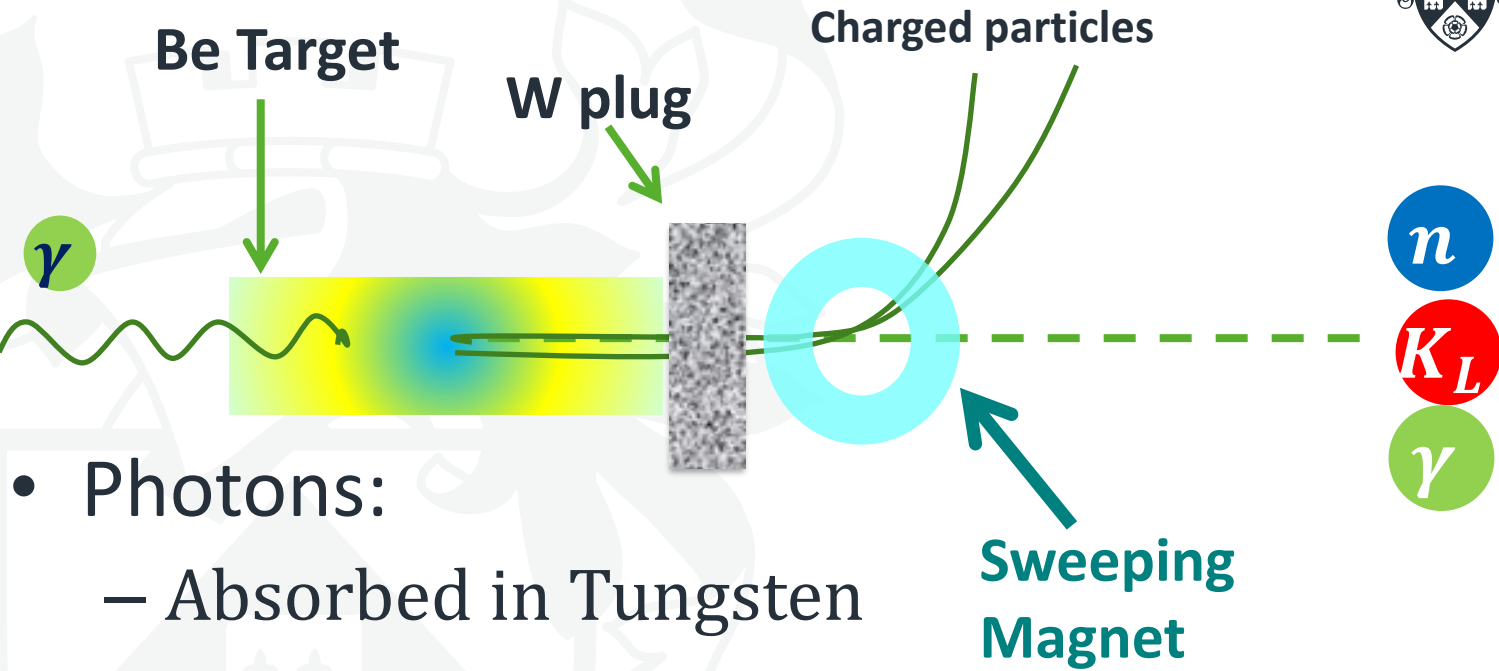




# Backgrounds at KLF

**Mikhail Bashkanov**

# Possible Backgrounds



- Photons:
  - Absorbed in Tungsten
  - $v = c$
  - Small x-section
- Neutrons:
  - $v_n \ll v_{K_L}$
  - Different kinematics

94% of neutrons associated with  $T < 300\text{MeV}$

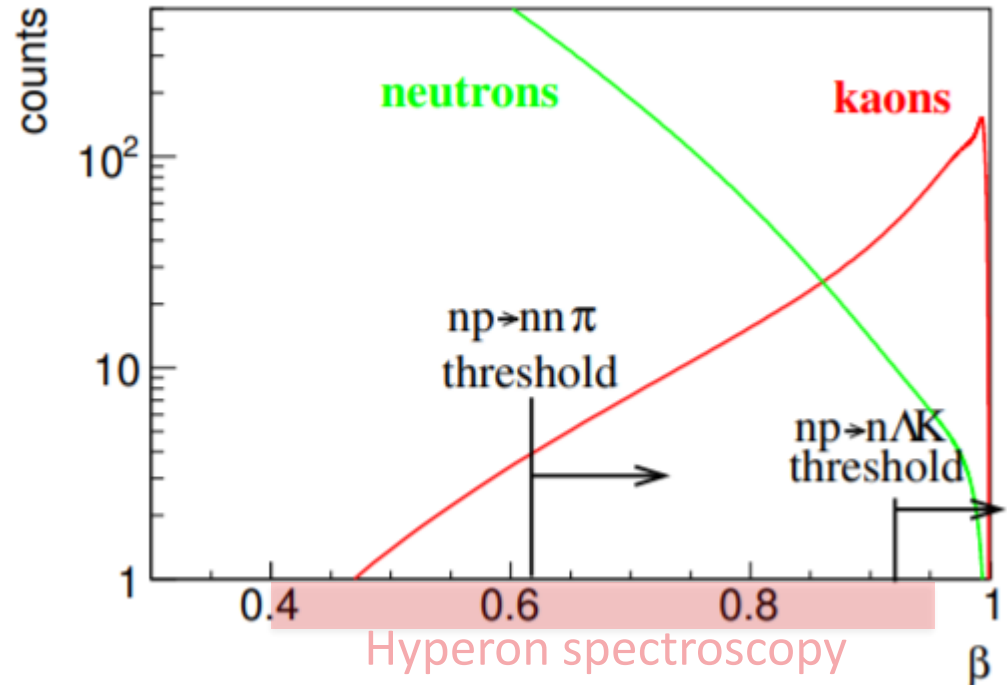
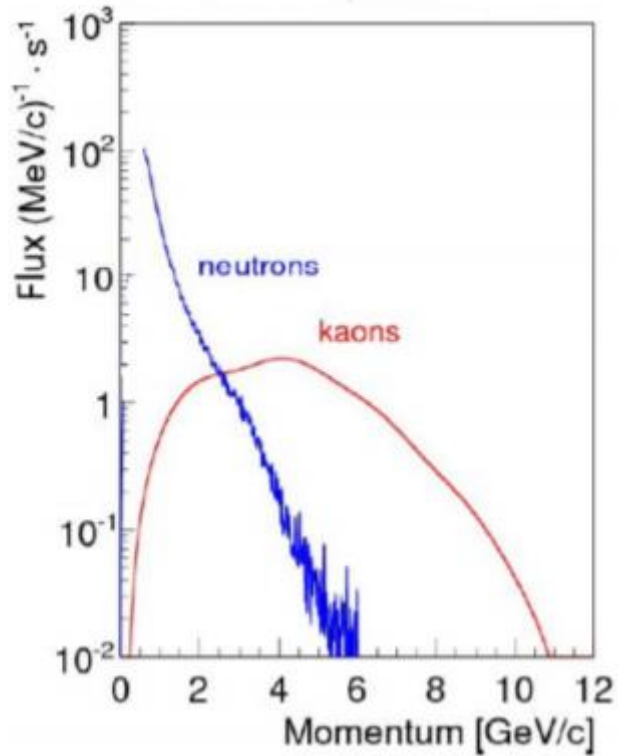


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# Neutrons

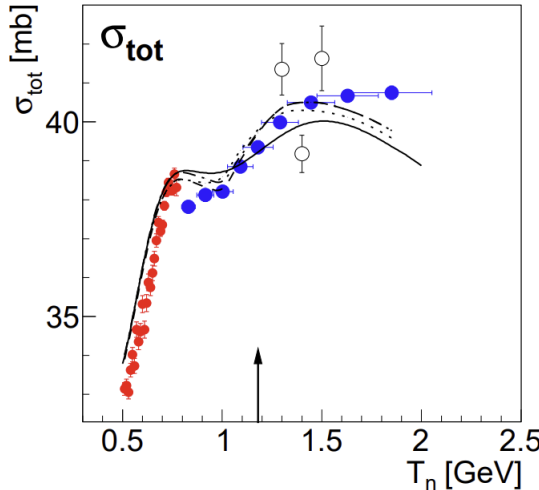
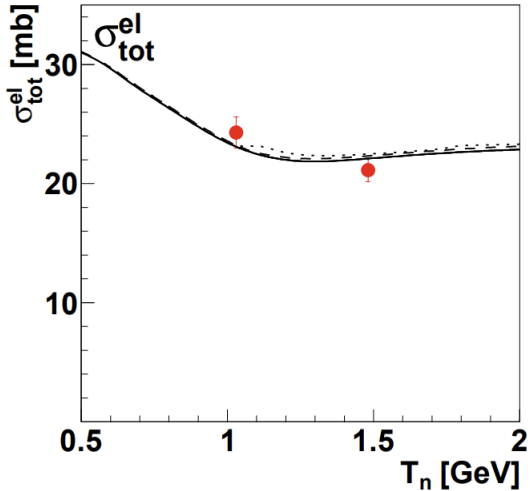


# Neutron Background



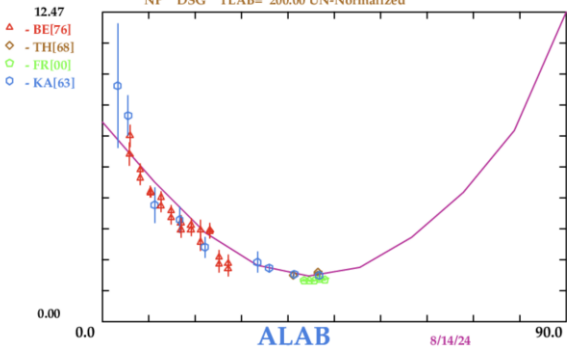
- $E_n > 1.6 \text{ GeV}$  (strangeness threshold) ~ 1% of neutron flux
- $0.3 < E_n < 1.6 \text{ GeV}$  (above pion threshold) ~ 5% of neutron flux
- $E_n < 0.3 \text{ GeV}$  ~ 94% of neutron flux – do not contribute

# Neutron Cross-Sections



$E_n = 0.2 \text{ GeV}$

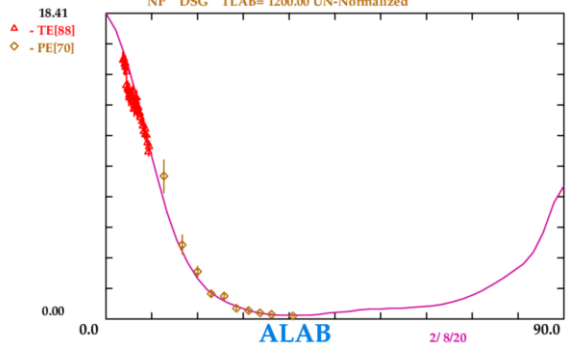
Plotted data is for TLAB=194.00 to TLAB=210.00  
NP DSG TLAB= 200.00 UN-Normalized



SM16 0-3.0 GEV PP=50276/25348 NP=22832/12938 RAA [147] 5/  
NN091 Nucleon-Nucleon 05/09 Amdt[NIJM] 11/07/21

$E_n = 1.25 \text{ GeV}$

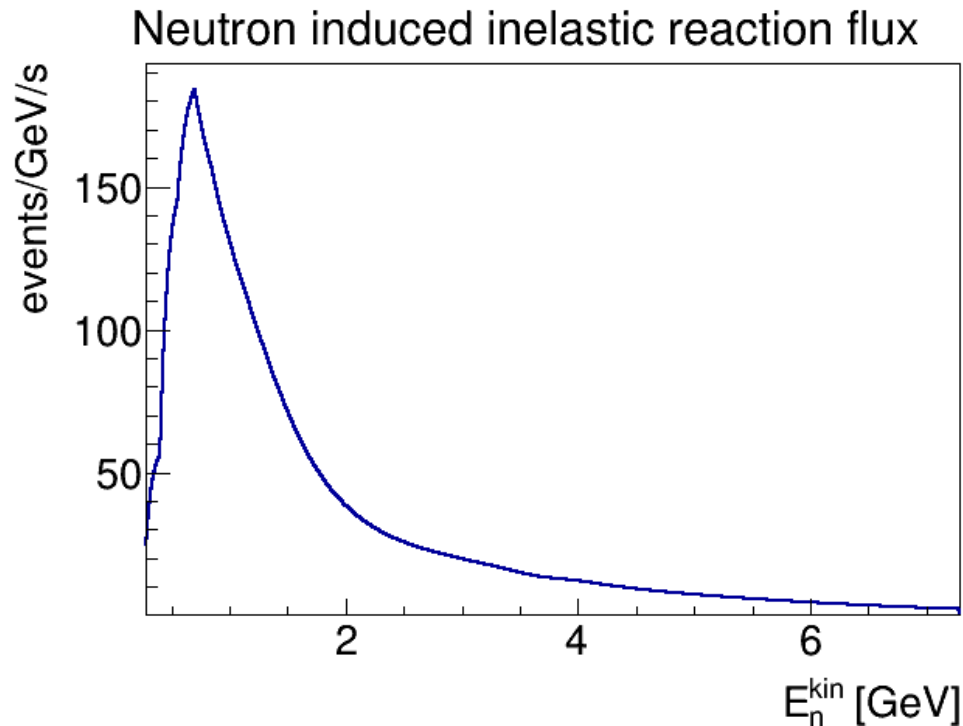
Plotted data is for TLAB=1118.20 to TLAB=1243.00  
NP DSG TLAB= 1200.00 UN-Normalized



SM16 0-3.0 GEV PP=50276/25348 NP=22832/12938 RAA [147] 5/  
NN091 Nucleon-Nucleon 05/09 Amdt[NIJM] 01/03/19

- Elastic cross-section forward-backward peaked
- Either beampipe or at 90 deg with  $E \sim 0$

# Neutron Reaction yield

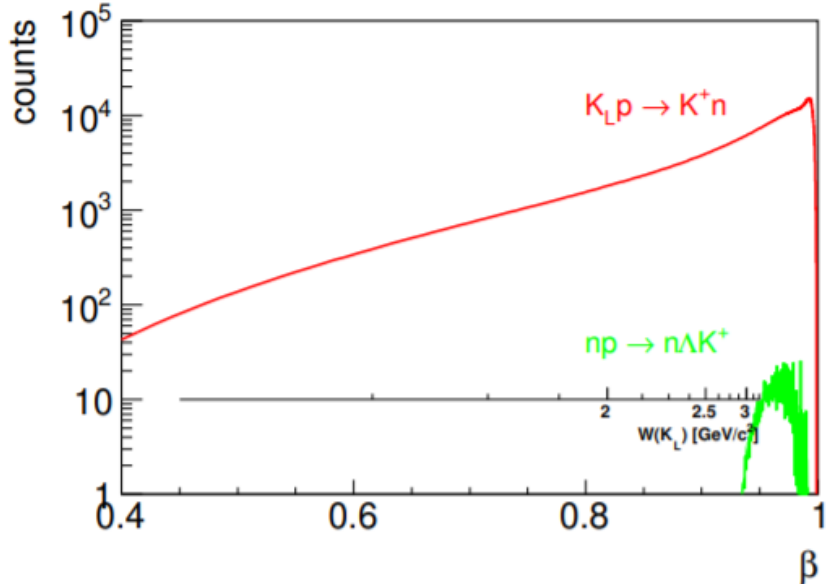


- Neutron-induced reaction rate: **233 ev/s**

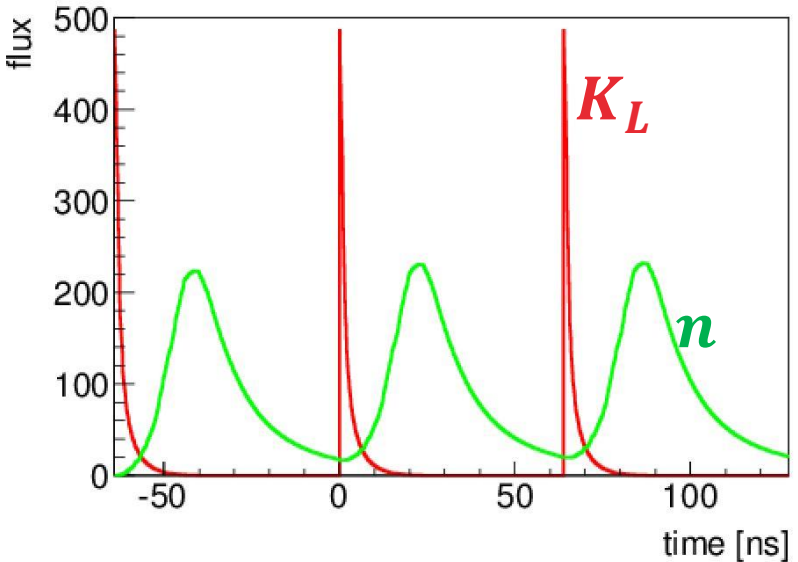
# Neutron Background



### Reaction yield

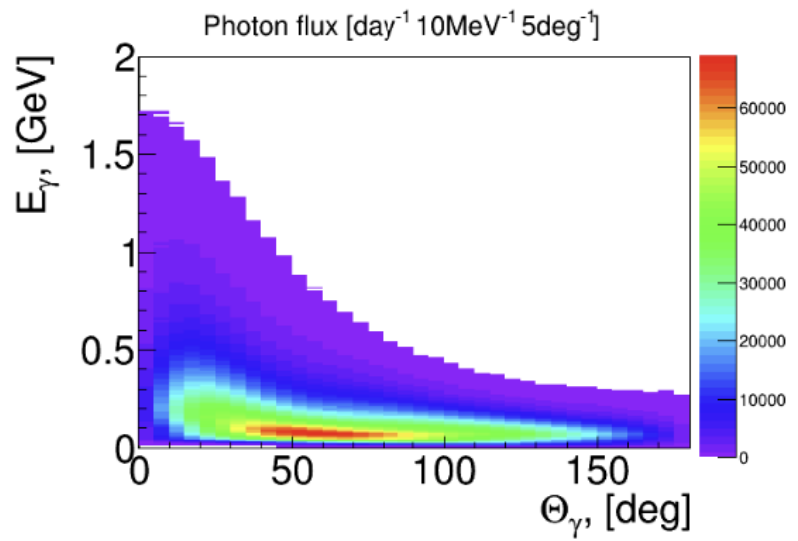
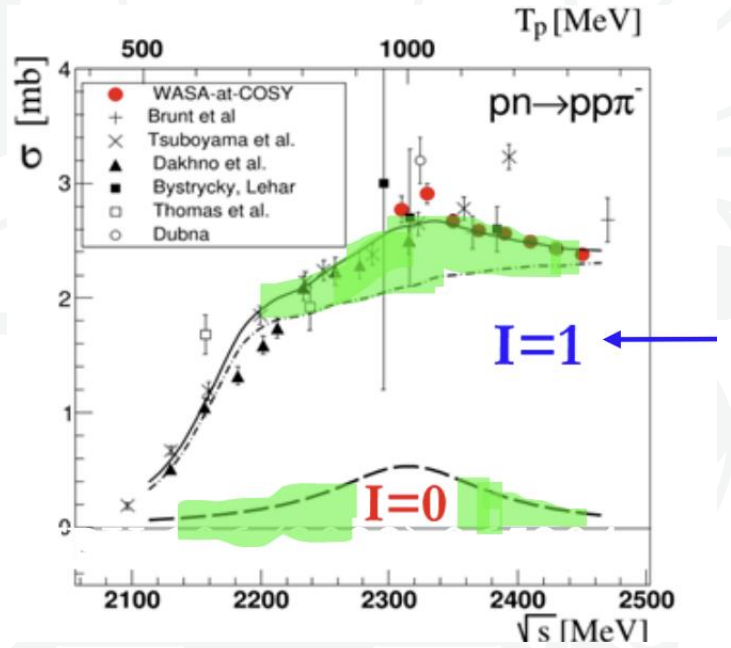


### Bunch time structure



- Neutron-induced reactions are not an issue for the main program

# Useful Neutrons: Calibration



- Neutron-induced reactions are isospin  $I=1$  dominated
- Can be used for calibration  $np \rightarrow np\pi^0$
- $\sim 24M$   $\gamma$ 's from neutron-induced  $\pi^0$  production per day
- Neutron-induced reactions have high scientific interest!



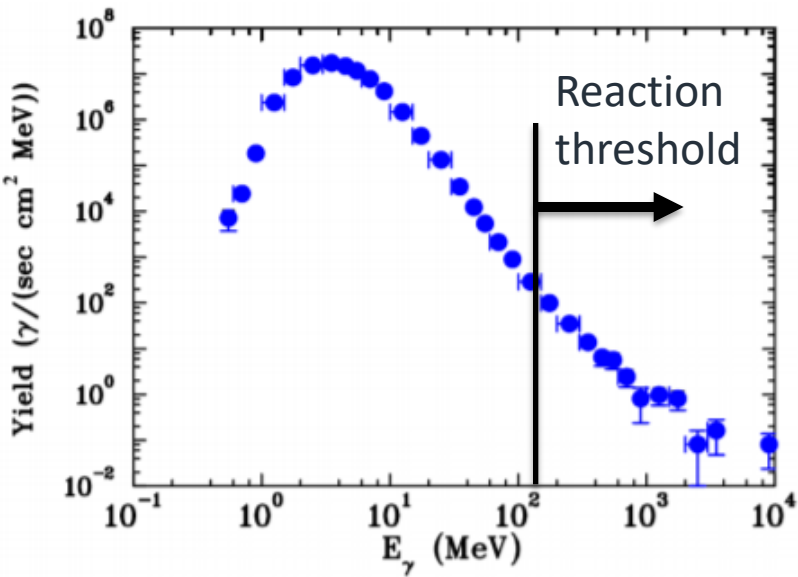


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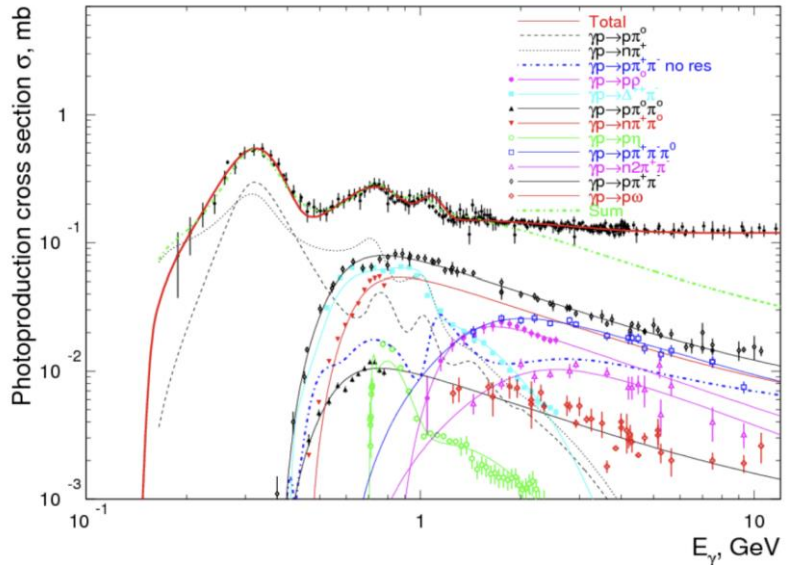
# Photons



# Photon background



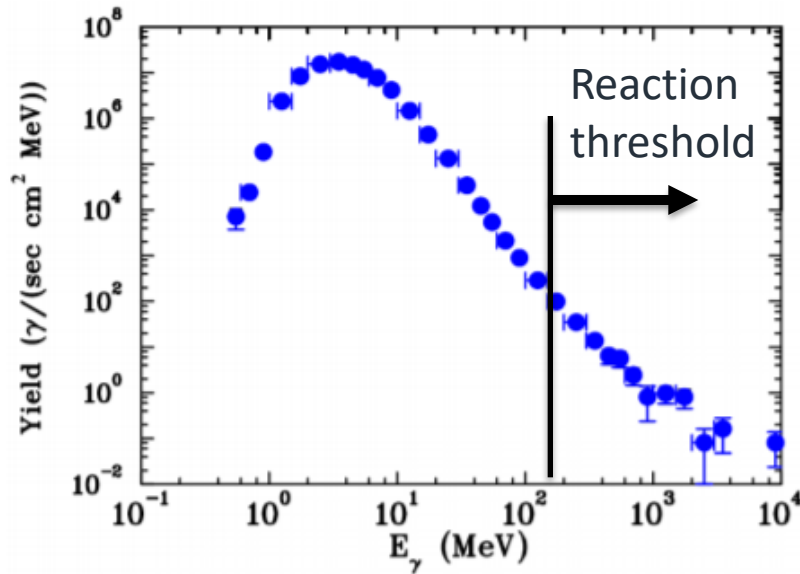
Photon flux at LH2/LD2



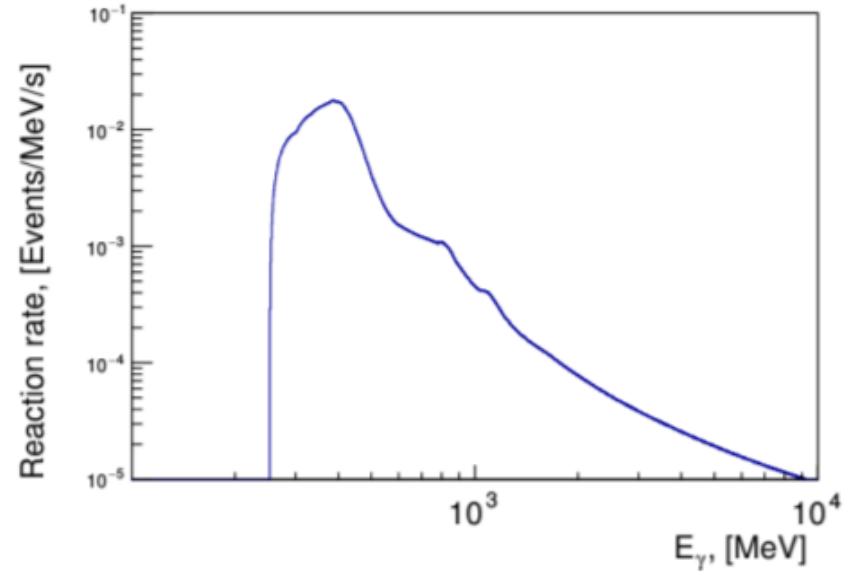
Photoinduced reaction rate

- Photoinduced reaction rate < 4Hz

# Photon background



Photon flux at LH2/LD2



Photoinduced reaction rate

- Photoinduced reaction rate  $< 4\text{Hz}$
- Photoproduction reactions are not an issue for the main program

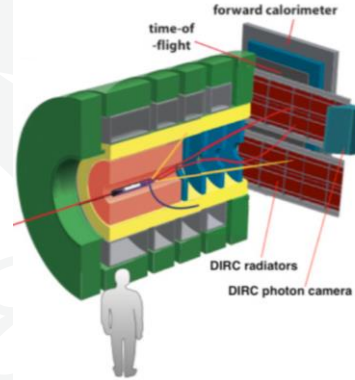


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# Cosmics



# Cosmic muon background



- Cosmic rate induced rate:  $\sim 500 \text{ ev/s}$
- Cosmic rays are not an issue for the main program

# Total budget



Reactions	Rate [kHz]
$K_L$ –induced	1.0
$n$ –induced	0.4
$\gamma$ –induced	0.004
cosmics	0.5
<b>Total</b>	<b>~2.0</b>

# Conclusion

- Background conditions at KLF are very mild
- No physical background problems at reconstruction level.