NEBULA

(Neutron-detection system for Breakup of Unstable-Nuclei with Large Acceptance)

- 240 Neutron counters (60 modules x 4 stacks)
- 48 VETO counters
NEBULA

(Neutron-detection system for Breakup of Unstable-Nuclei with Large Acceptance)

• **Neutron counter**
  – scintillator
    • BC408
    • 12cm x 12cm x 180cm
  – PMT
    • R7724ASSY (both ends)
    • vertical position is determined by time difference

• **VETO counter**
  – 1cm-thick scintillator
  – used to identify the charged particles
NEBULA

(Neutron-detection system for Breakup of Unstable-Nuclei with Large Acceptance)

- 240 Neutron counters (60 modules x 4 stacks)
- 48 VETO counters

- High efficiency
  - ~70% for 1n detection

- Large acceptance
  - effective area : 3.6m (H) x 1.8m (V)
    \(-10^\circ<\theta_H<10^\circ, -5^\circ<\theta_V<5^\circ\)

- Multi-neutron detection
  - aiming at 4n detection
Multi-neutron detection
(example: 2n case)

- Crosstalk ... more than 2 hits caused by 1n
  - Should be eliminated for multi-neutron detection
  → Kinematical condition is used to reject the crosstalk

- Same wall event → position information
  - 2 hits are clustered and are regarded as 1 hit if positions are close
  - Lose efficiency for small $E_{\text{rel}}$

- Different wall event → velocity information
  - The event is true if $\beta_{12} > \beta_1$
    - Because crosstalk neutron must be slow
  - Can measure up to $E_{\text{rel}} \sim 0$
neutron counter

before mounting the VETO counters

Photo

VETO counter (1cm thickness)

after mounting the VETO counters

before mounting the VETO counters