



Commissioning Minimum Bias Trigger Scintillator (MBTS)

Proposal for discussion

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MBTS



- ✓ **Why:** we need to be able in the first weeks of ATLAS to have an effective mean to trigger on physics and veto halo events.
- ✓ **What :** scintillator counters with some segmentation in eta and phi, able to detect 1 minimum ionizing particle
- ✓ **Where :** on the front face of the LAr endcap cryostat, covering the radial dimension of the Inner Detector
- ✓ **When :** needed in 2007 for the first beam, 3-4 months at low luminosity ($5 \cdot 10^{32}$), it will be dismantled during the first shut down

MBTS readout



- ✓ It will be too difficult to bring inside ATLAS new PMTs, cables,...
- ✓ The idea is to use the same light connectors used for the existing crack scintillators. This means that during this period some crack scintillators can not be used
- ✓ Each PMT in the tile drawers, used for this purpose, will then be linked to the LVL1 trigger processor or equivalent

MBTS Geometry



- ✓ On each side a disk of scintillator $R_{\min}=138$ mm, $R_{\max}=1200$ mm
 R_{\max} can still be optimized.
- ✓ Each disk will take the place of the JM moderator disk (see
ATLJM___0003)
- ✓ Maximum thickness of the disk, including supports and eventual
readout system $\Delta Z= 30 \pm 1$ mm
- ✓ Supported direct to the cryostat warm wall via a set of screws (M12).
12 screws at a radius of 900 mm, 8 screws at a radius of 420 mm
(see drawing ATLJM___0003)

MBTS Segmentation



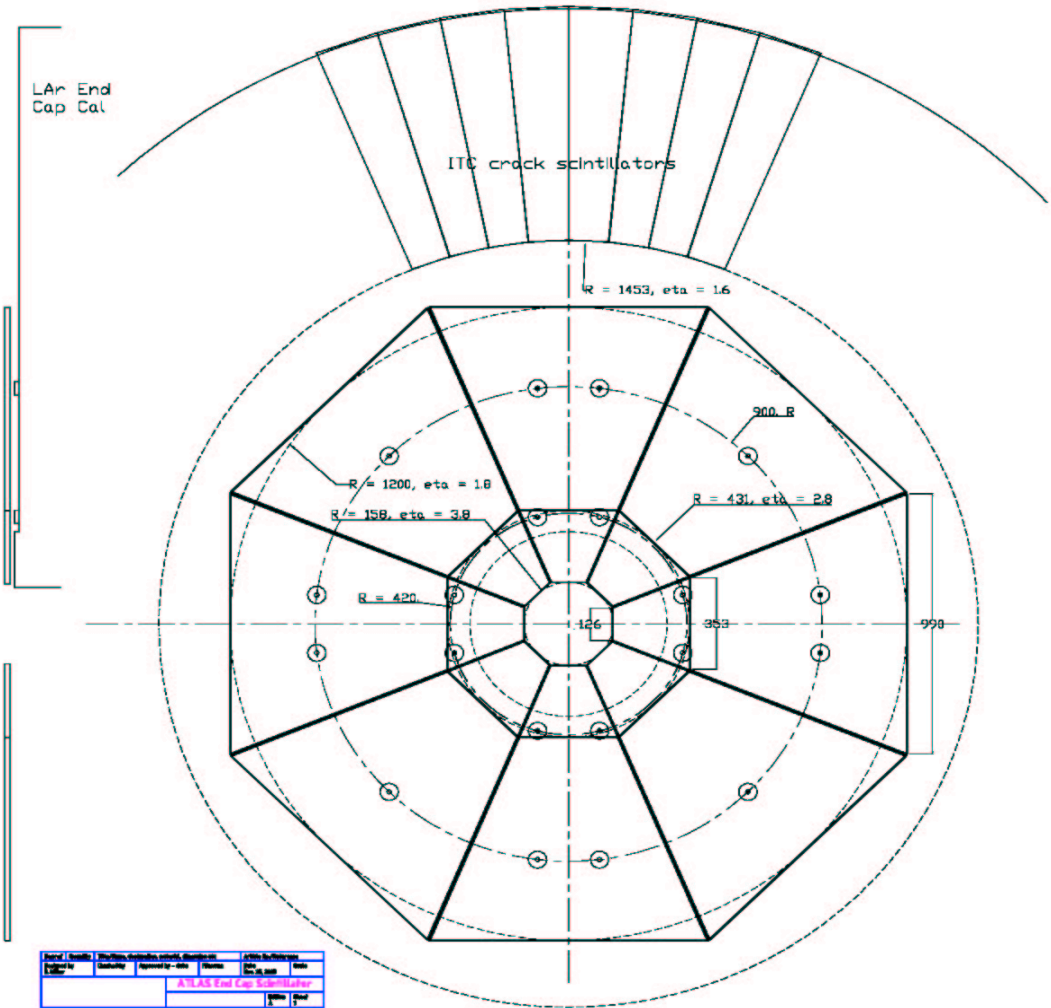
- ✓ PHI segmentation of 8 should be enough. This still need to be confirmed by simulation.
- ✓ Eta segmentation of 2 would be nice. Radius or eta of segmentation to be defined. Limit of Pixel detector?
- ✓ Today only existing geometrical proposal is the one of B.Miller (see next slice).

On each side 4.46 m^2 , if 20 mm thick = 0.08925 m^3 of scintillator

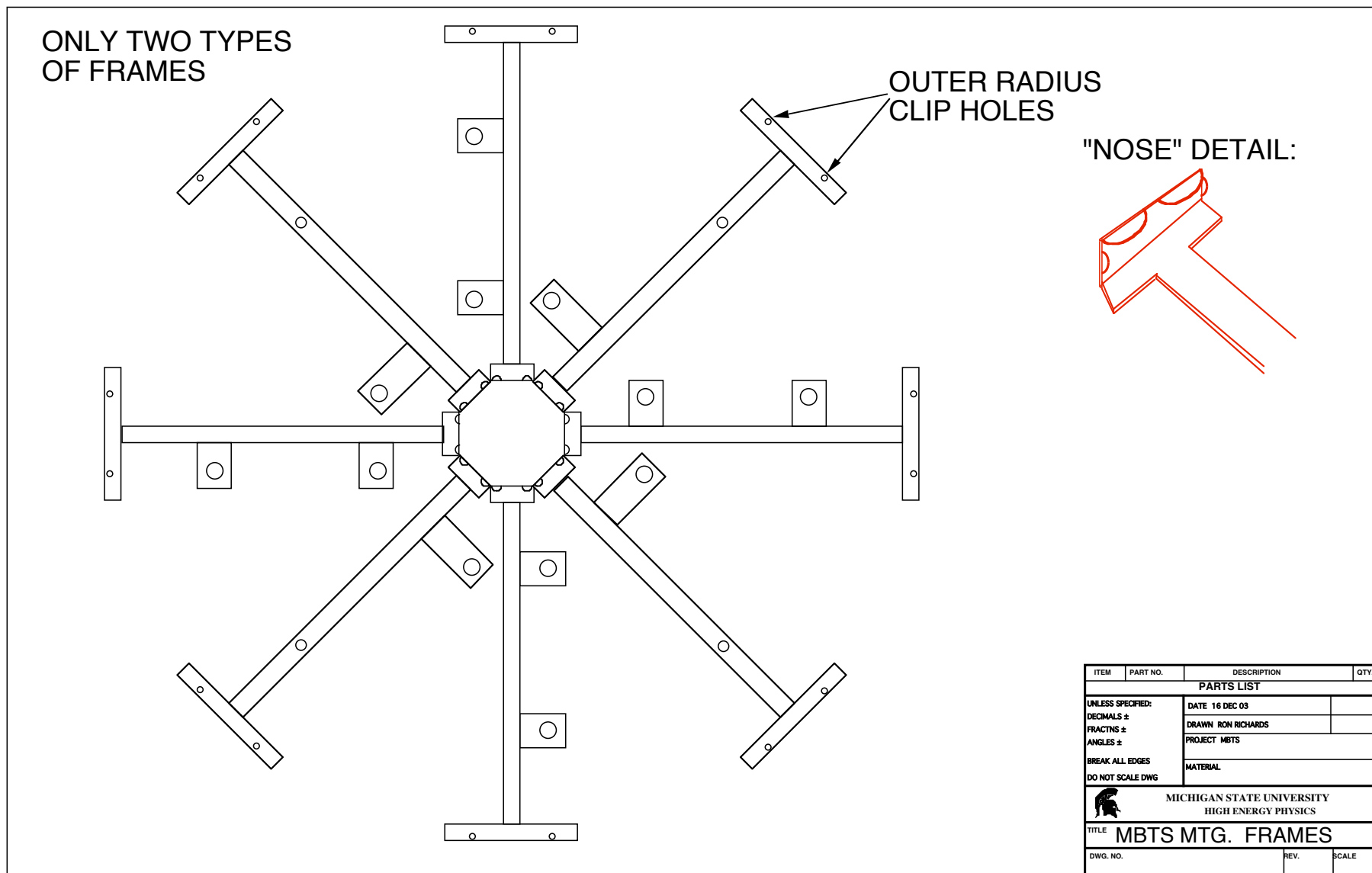
8 large trapezoidal scintillators $L1=990, L2=353, H=769$ Area= 0.5164 m^2

8 small trapezoidal scintillators $L1=352, L2=126, H=172$ Area= 0.0414 m^2

MBTS Segmentation



Mounting scheme



Some other questions



- ✓ Type of fiber readout
 - along side of scintillator or with groove?
- ✓ Optical cable will take signals from scintillator to crack connector
 - should we try for step up in fiber diameter?
- ✓ How important is uniformity
 - within one segment
 - should we divide the outer eta scintillator into 2 pieces?
 - segment to segment
- ✓ How important is timing?

- ✓ Start with prototype scintillator(s)
 - test light yield/uniformity with fibers along side
 - try groove/cutting outer eta segment in middle

MBTS Optical readout



- ✓ This is probably the most complex part of the project
- ✓ The requirement is to have enough light in the PMTs to detect minimum ionizing particles with enough photo statistics. Can we define a number ?
- ✓ The light budget should allow a degradation of the light output by a factor 2 because of radiation damage
- ✓ We have to discuss first how we organize such R&D !!

Next steps and milestones



- ✓ From now to March '04 define layout and readout geometry
- ✓ Up to May '04 procure 1 small and 1 big trapezoid + readout
- ✓ July-August '04 test such prototypes in the beam at CERN (H8)
- ✓ October '04 define the final geometry and write a technical proposal
- ✓ 2005 go for procurement
- ✓ March '06 install it on the cryostats
- ✓ April '06 commissioning, with the LVL1 trigger electronics

MBTS Procurement



- ✓ This project will be centrally funded with ATLAS Common Fund resources
- ✓ To be procured $\sim 9 \text{ m}^2$ or 0.1785 m^3 or $\sim 180 \text{ kg}$ of ready scintillator
- ✓ In addition we have to procure all support material, wrapping and optical readout components
- ✓ My budget estimation is of about 30KCHF of base material + assembly and R&D work...is that reasonable?
- ✓ Who will participate in this project? We will need a project leader!