Suggestions to 2006 LAT prototype beam test plan

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Science Tasks

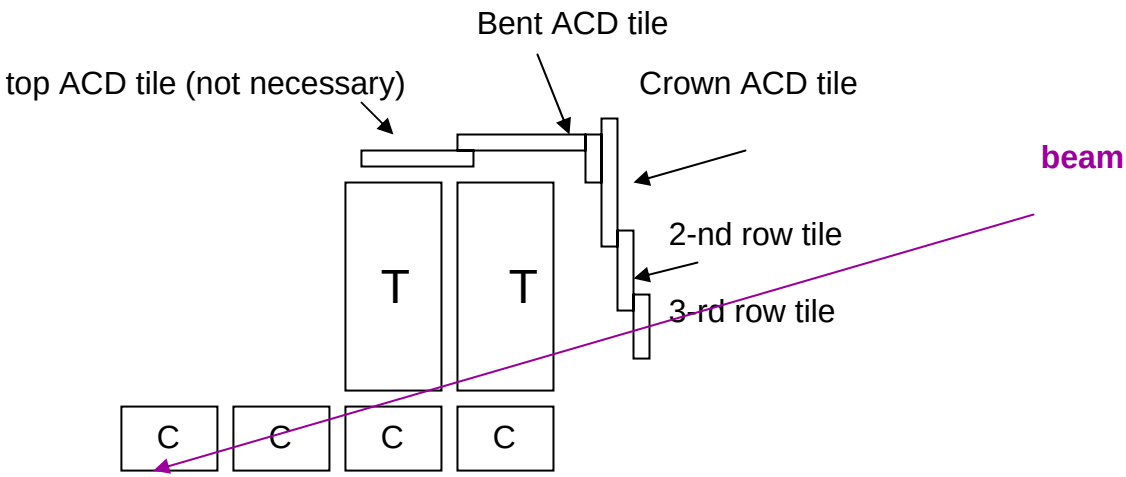
Topic	Problem	Way to solve	What is needed
High Energy Electrons (above 100 GeV)	1. Increase Geometric Factor 2. Improve dE/E for High Energy	Use off-angle events	Beam test, simulations
	Hadron/electron separation at level 10^{-4}	Use calorimeter imaging capability	Beam test, simulations
	Gamma-ray contamination to electron flux	Use ACD	Beam test for backsplash with real instrument
Dark Matter – gamma-ray flux features above 100 GeV	Hadrons and electrons removal	Use off-angle events to improve dE/E; Use ACD – the only tool to remove electrons	Beam test for backsplash with real instrument

What can be done during LAT Beam test at CERN to support this work?

Two main things:

1. Include ACD to confirm backsplash measurements with real LAT detectors and materials.
2. Study the power of the calorimeter to separate hadron from electromagnetic events

Scheme of beam setup to cover both these issues:



ACD Hardware availability

Item	Description	Status
Bent Tile	Tile exists (at GSFC) with old rectangular connector; needs wrapping Clear Fiber Cable (same old design to match tile) – available, needs PMT bushing and nut to be bonded, end polished. Parts are avalable	Some work at GSFC is needed OK – means no serious problems
Crown Tile	Use tile sent to SLAC with EM Double check at SLAC and refurbish if needed	Little work OK
2-nd and 3-rd row tiles	Use tiles sent to SLAC with ACD. Both of these tiles are 3-rd row; to compensate difference in heights between 2-nd and 3-rd row (4cm) set crown tile lower - not to create a “crown” Ready	OK
Top Flat Tile	Use tile sent to SLAC with EM; refurbish. Not necessary item	Not necessary item OK
FREE board	Need 1 FREE board. There are 2 FREE sent to SLAC; any of them is usable - check	OK
PMT	FREE boards at SLAC have PMT’s; sufficient amount is available at GSFC	OK
Tile Mounting Frame	Needs to be designed and built; include tile flexures. Can be simple	Work is needed. OK

Beam Setup and Requirements

Electron Beam (backsplash experiment)

- 3 energies from 50 GeV to max available

- 2 -3 angles at each energy

- 50K events in each run (~ 5 hours with 500 electrons per spill)

- down-stream plastic scintillating detector to remove hadrons (provided by GSFC)

Proton Beam (electron – hadron separation)

- one energy (another energy would be a bonus), 200 GeV or so

- 2 angles

- 100K – 200K events in each run

- "electron removing" detector (~2X of lead + plastic scintillating detector behind that, provided by GSFC) in front of "LAT"

Results to be used to validate follow-up detailed Monte Carlo Simulations