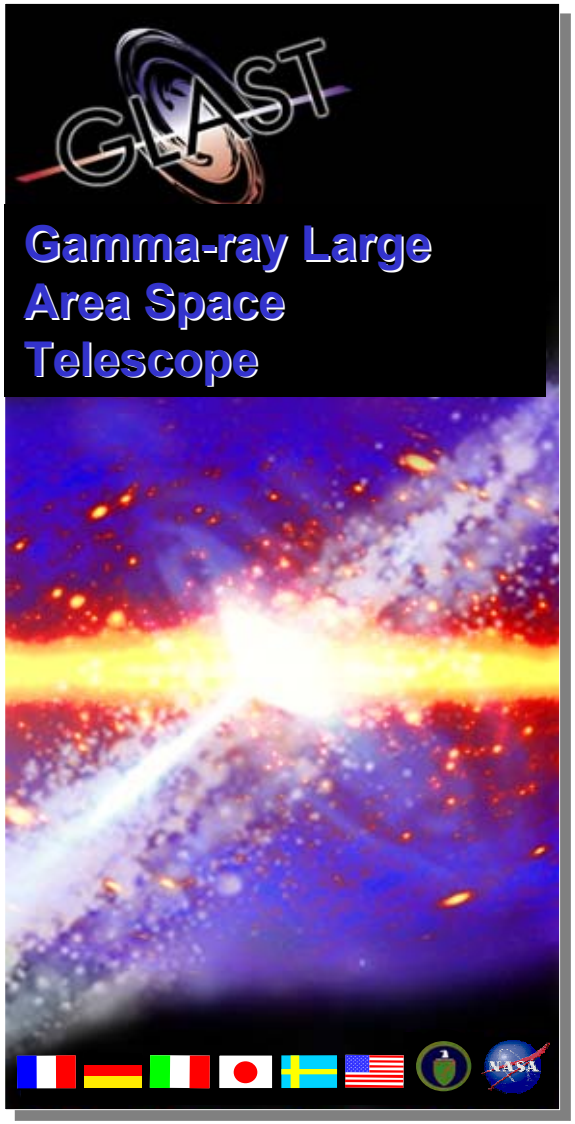

GLAST Calorimeter geometry implementation in GLEAM

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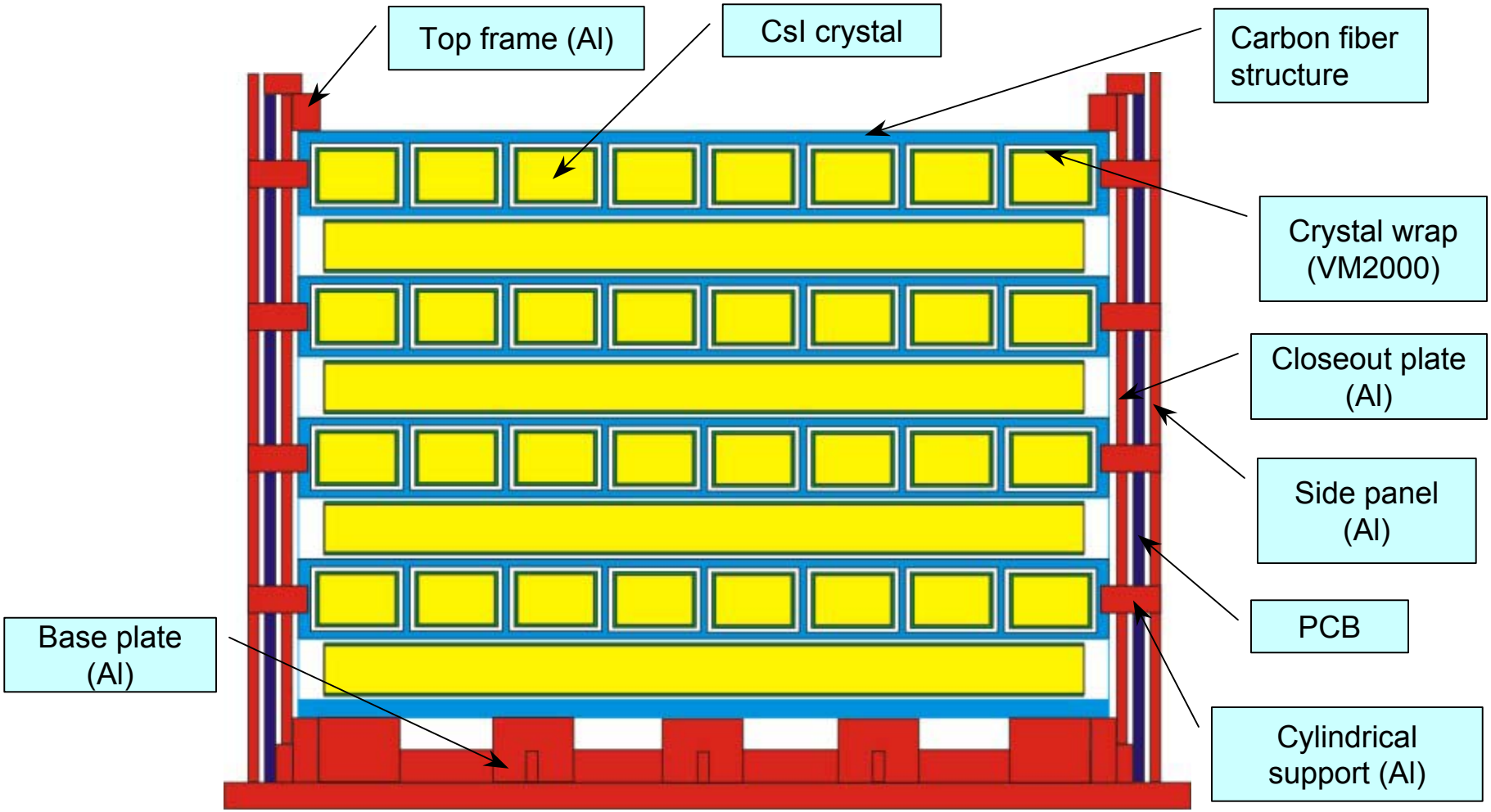
Outline

- Calorimeter geometry overview
  - Active part (crystals +diodes+supporting structure)
  - Dead material :
    - top frame
    - electronics compartment
    - base plate
- Calorimeter geometry in GLEAM
  - What is implemented
  - What is not implemented
  - Geometry constants
- To be done
  - Model modification
  - Implement geometry in gaps between towers

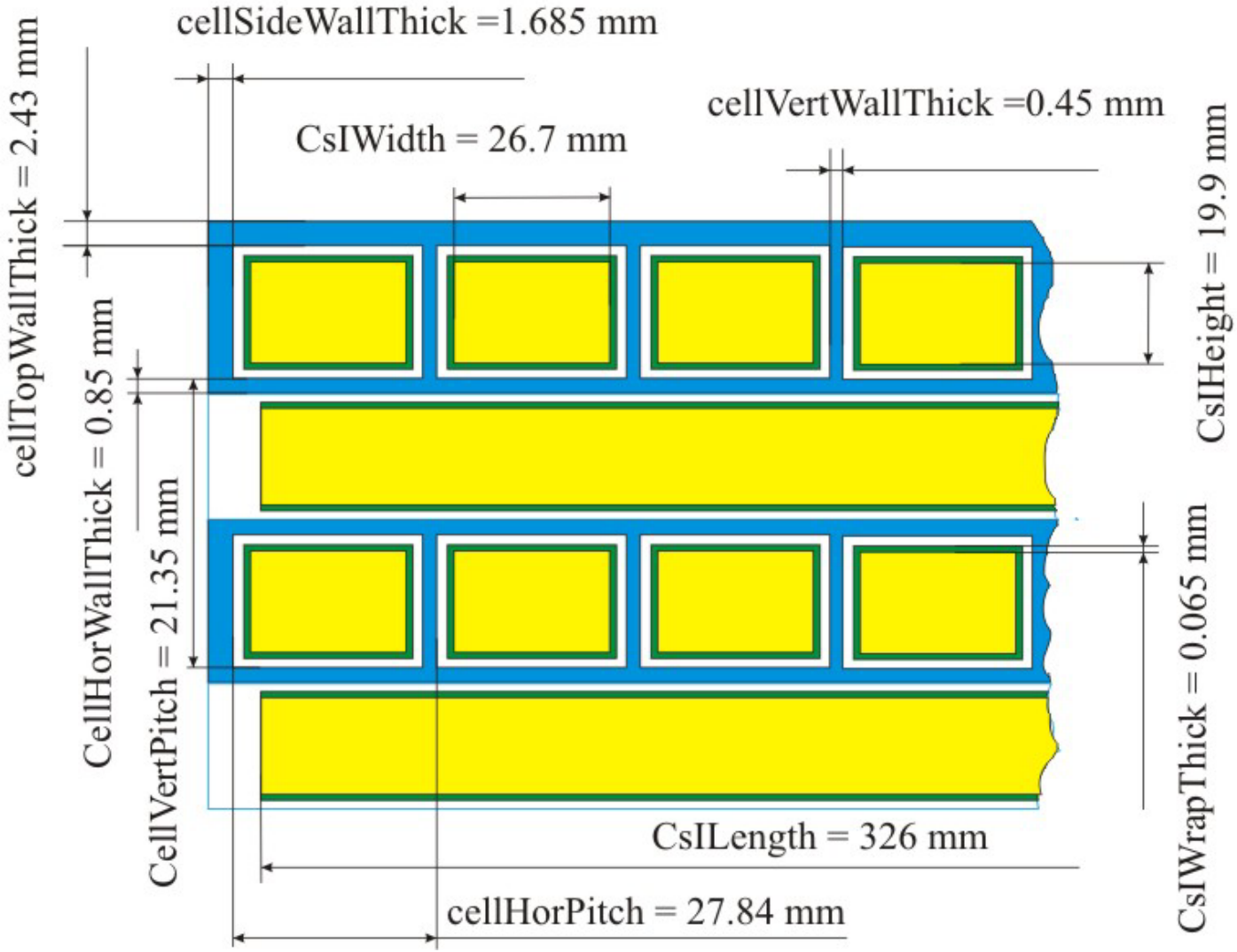
Sources of information on CAL geometry

- Paul Dizon (NRL)
- Engineering drawings from LLR (France) (available also on web site http://www-glast.slac.stanfor.edu/software/CAL/meetings/)
  - LAT-DS-00917
    - GLT-LLR-00-01 D_Top frame.pdf
  - LAT-DS-00918
    - GLT-LLR-00-02-B _structure composite.pdf
  - LAT-DS-00923
    - GLT-LLR-00-15 D_Side panel X.pdf
  - LAT-DS-00920
    - GLT-LLR-00-09 F_Close out plate X.pdf
  - LAT-DS-00919 (Base plate)

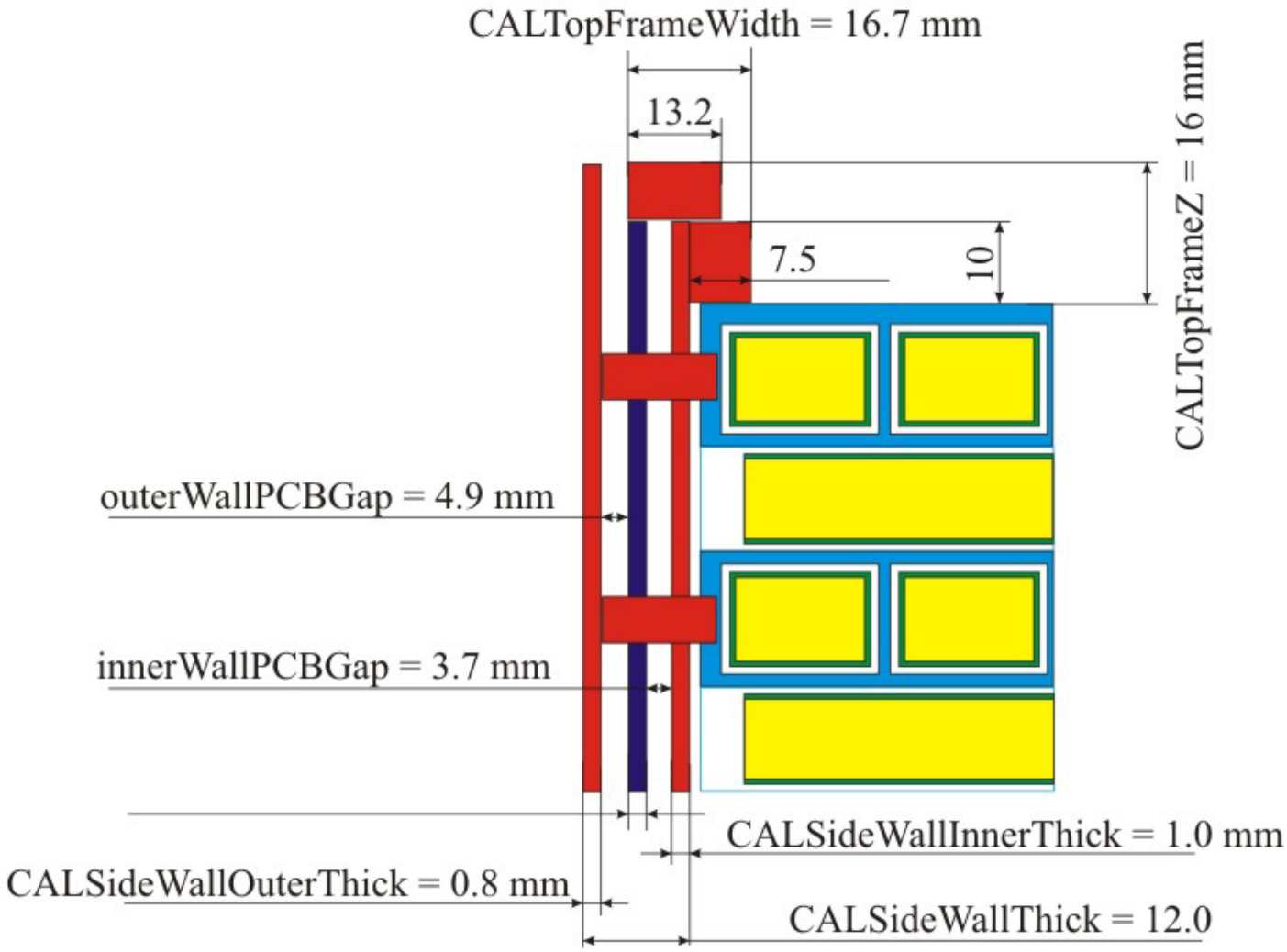
CAL geometry overview (not to scale – only 8 crystals per layer shown)



Crystals + carbon fiber structure



Electronics compartment + top frame



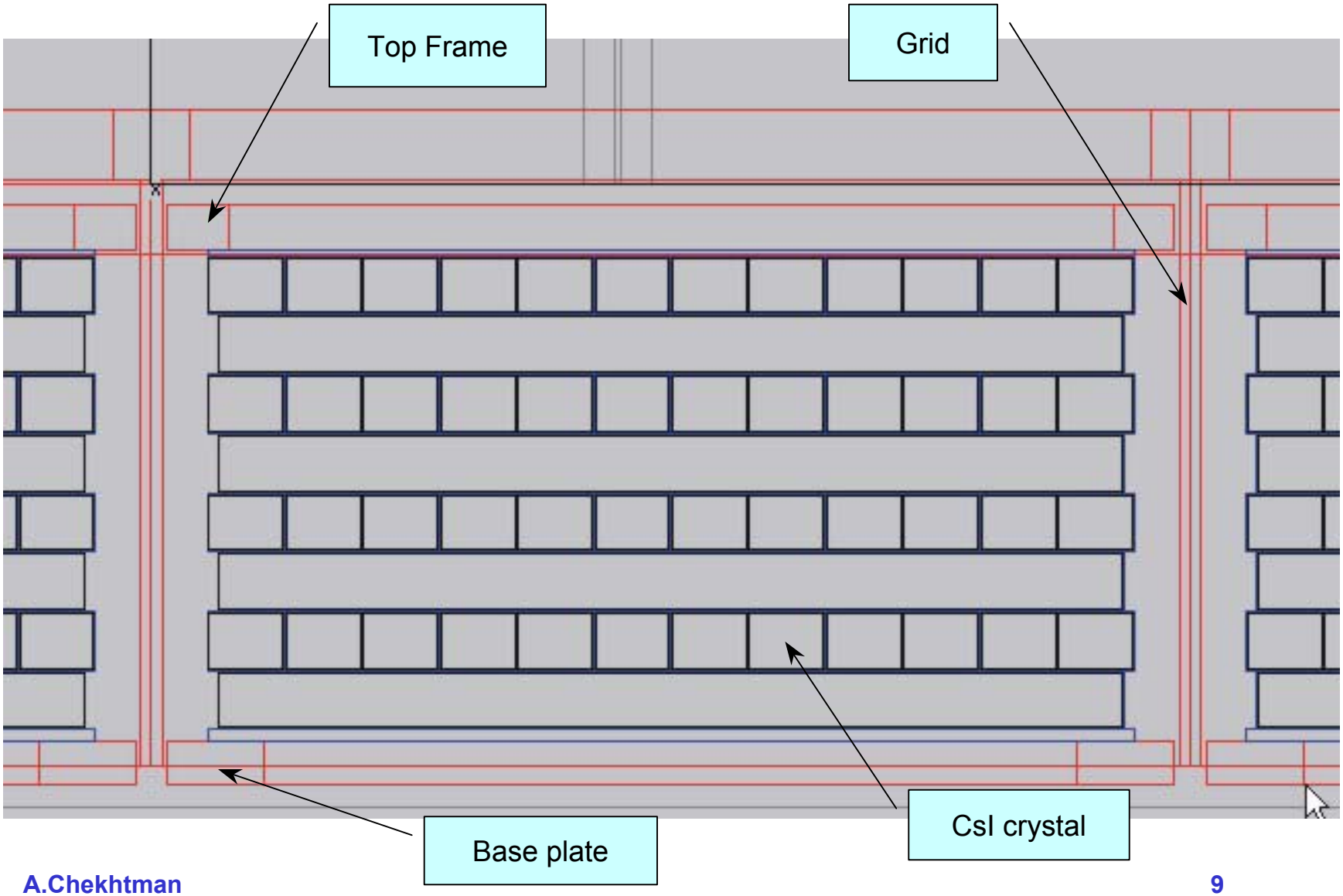
Calorimeter geometry in GLEAM

- Only active part and top frame are implemented now
- Calorimeter geometry model hasn't been modified since 2001, while design has significantly changed
  - Crystal wrap didn't exist, the reflector was a part of carbon fiber structure and its thickness was added to the thicknesses of all structure walls
    - This modification is small, but very misleading – it is much easier to describe the wrap explicitly
  - The model of carbon fiber structure was "technological":
    - Structure was represented as the set of "cells" (with wall thickness = $\frac{1}{2}$ of internal wall thickness), glued together
    - The thickness of external carbon fiber walls was represented as regular thickness (= $\frac{1}{2}$ of internal walls) + additional "reinforsment" layer
    - This model corresponds to the way the structure was glued, but makes the comparison with engineering drawings difficult.

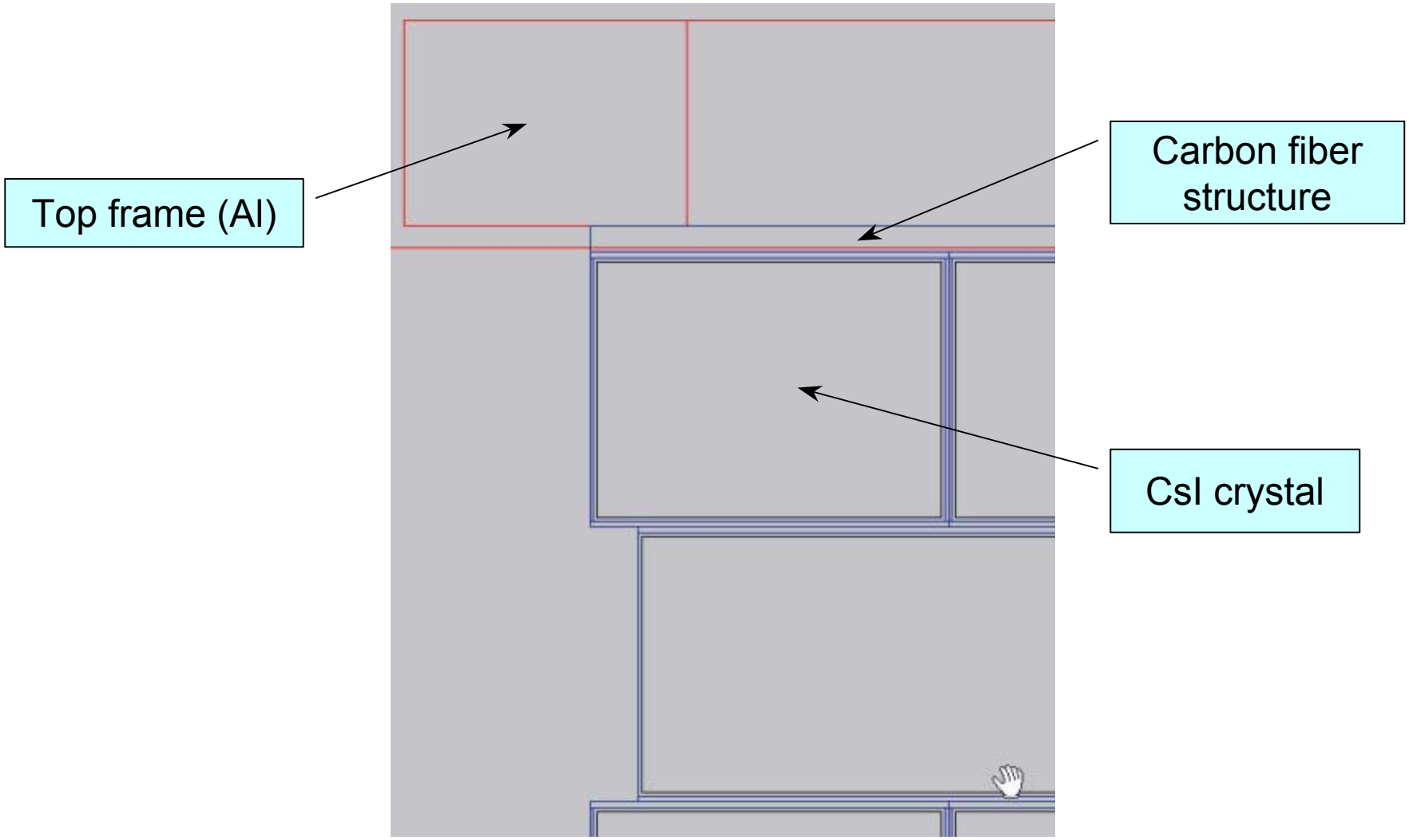
Calorimeter geometry in GLEAM (cont.)

- No dead material between towers (except grid)
  - this could affect the shower leakage through the cracks between towers
  - Even small amount of material could result in multiple scattering of soft particles and their returning to the active part of the calorimeter.
  - This could change the crack corrections obtained from simulation
- The material in the base plane doesn't affect the calorimeter performance, it could affect only background rates

Tower geometry in GLEAM



Calorimeter geometry in GLEAM (zoom)



Calorimeter geometry constants

Name	Value	New Value	Description
CALTransverseStayClear	364 mm	364 mm	Transverse dimension of CAL Stay Clear envelope from LAT-DS-00038-2
CALVertStayClear	224.3 mm	224.3 mm	Z-dimension of CAL Stay Clear envelope from LAT-DS-00038-2
diodeX	0.3 mm	0.3 mm	Depletion depth of diode Si
diodeLY	14.5 mm	14.5 mm	Width of large diode Si
diodeSY	2.4 mm	2.4 mm	Width of small diode Si
diodeZ	10.5 mm	10.5 mm	Height of diode Si
CsILength	326 mm	326 mm	Length of a CsI crystal as of 30May02
CsIWidth	26.714 mm	**26.7mm**	(Transverse) width of a CsI crytal
CsIHeight	19.9 mm	19.9 mm	Height of a CsI crystal
diodeZOffset	0.9 mm	**0.55 mm**	Z offset of diodes relative to crystal
diodeLYOffset	-2.55 mm	**-2.60 mm**	Y (transverse) offset of large diode relative to crystal
diodeSYOffset	8.6 mm	**8.025 mm**	Y offset of small diode relative to crystal

Cal geometry constants (2)

Name	Value	New Value	Description
cellVertPitch	21.35 mm	21.35 mm	Vertical pitch of CsI and cells
cellHorPitch	27.844 mm	**27.84 mm**	Horizontal pitch of CsI and cells
cellVertWallThick	0.49 mm	**0.45 mm**	Thickness of reflector and composite cell vertical walls (C) – **Now reflector not included**
cellHorWallThick	0.85 mm	0.85 mm	Thickness of reflector and composite cell horizontal walls (C) – **Now reflector not included**
CellSideReinfThick **Now – cellSideWallThick**	1.4 mm	**1.685 mm**	**not understood** Horizontal thickness of reinforcement on side of outermost cells (C) **Now – thickness of outside vertical wall (C)**
CALSideWallThick	11.6 mm	**12.0 mm**	Horizontal thickness of side compartment with electronics
CALSideWallInnerThick	1 mm	1 mm	Horizontal thickness of inner wall within (largely hollow) side wall
CALSideWallOuterThick	1 mm	**0.8 mm**	Horizontal thickness of outer wall within (largely hollow) side wall
CALSideWallPCBThick	1.6 mm	1.6 mm	Horizontal thickness of PCB within (largely hollow) side wall

Cal geometry constants (3)

Name	Value	New Value	Description
CALModuleWidth	363 mm	363 mm	Horizontal, face-to-face dimension of CAL module (presumably both X and Y)
CALModuleHeight	223.8 mm	**222.0 mm**	Vertical, top-to-bottom dimention of CAL module
CALCylSupportDiameter	10 mm	10 mm	Diameter of cylindrical supports (Al)
CALCylSupportCellDelta	4	4	Number of cells between adjacent (in the same layer) cylindrical supports
CALTopFrameZ	16 mm	16 mm	Thickness of top of CAL frame (Al)
CALTopFrameWidth	22 mm	**16.7 mm**	Width of top picture frame (Al)
CALTopPlateZ	2 mm	**2.43 mm**	Vertical thickness of CAL top plate composite
CsIWrapThick		**0.065 mm**	**Thickness of crystal wrap (reflector VM2000)**
CALBottomPlateZ	4 mm	**4.43 mm**	Vertical thickness of CAL bottom plate composite

Cal geometry modifications to be done (proposal)

- Add crystal VM2000 wrap explicitly
- Add dead material between towers: closeout plate, PCB, side pannel, cylindrical supports
- Modify top frame shape
- Use new values of geometry constants
- Clarify geometry of base plate and propose some reasonable model, add later (when base plate design will be finished)