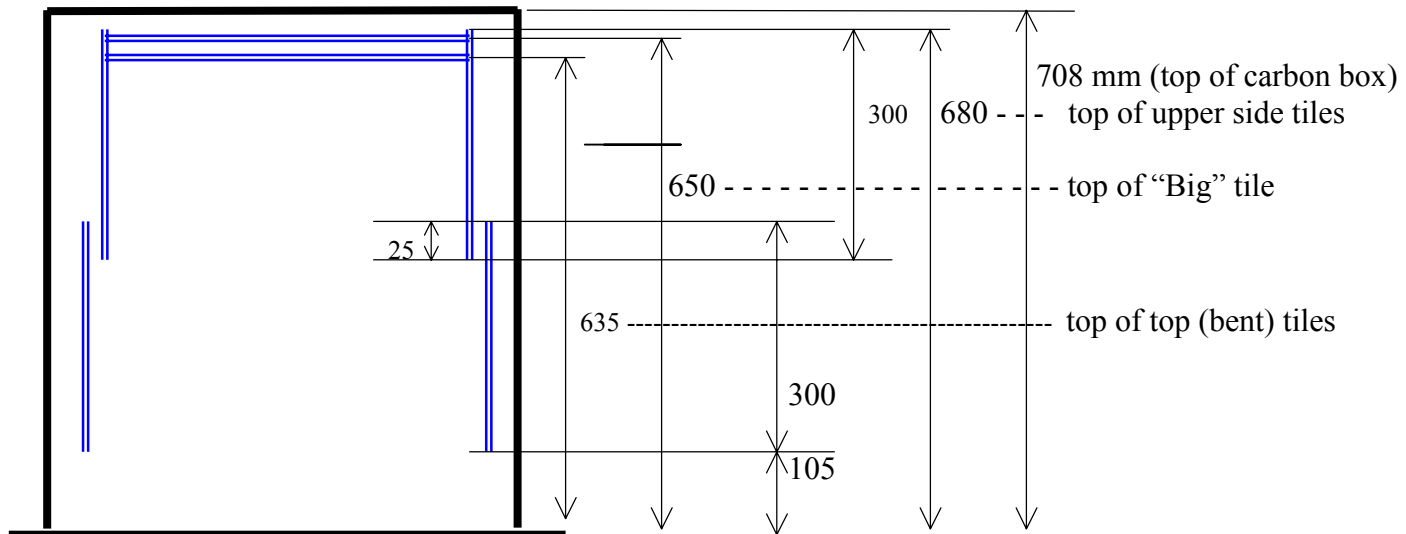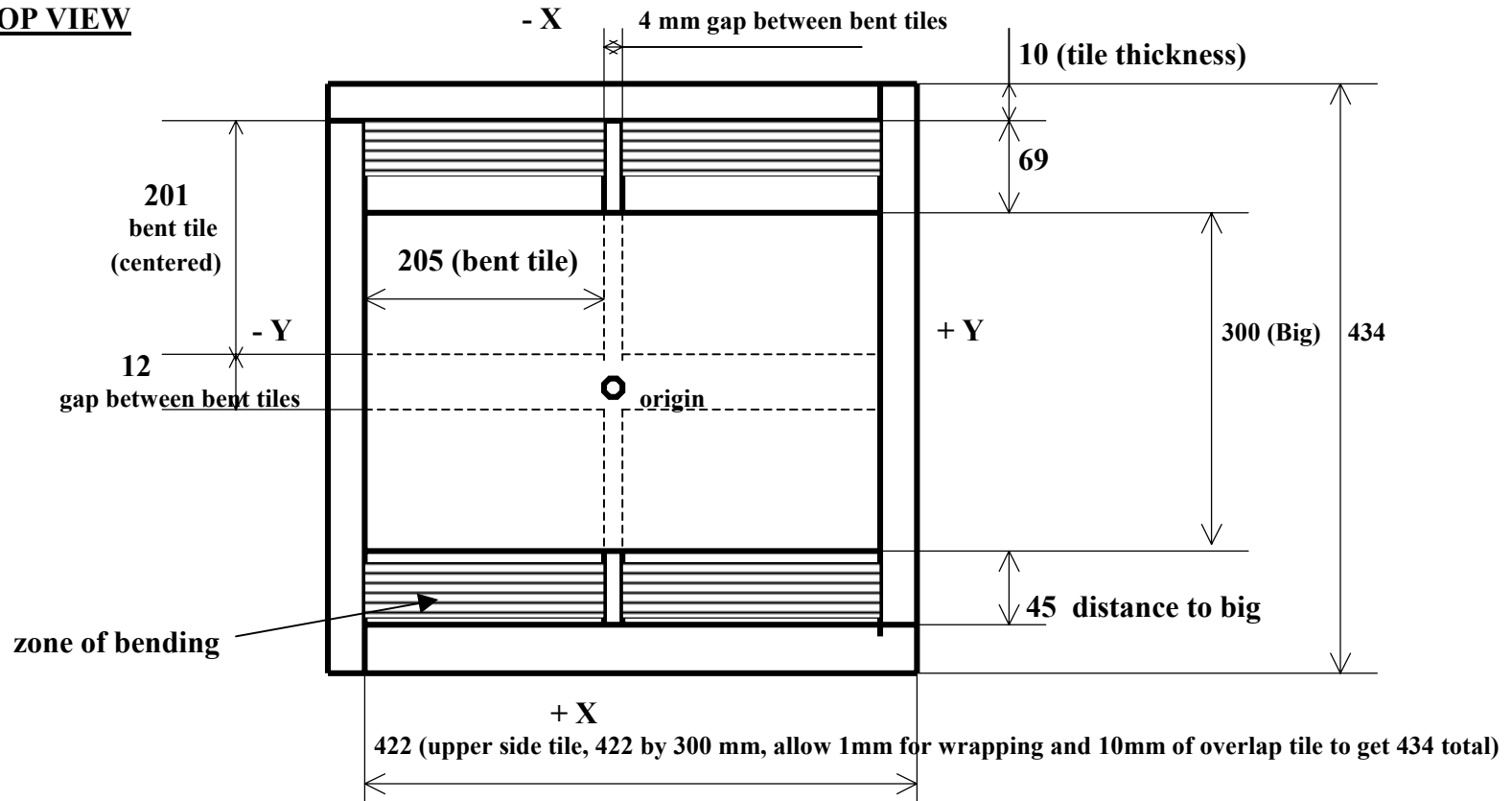Alex Moiseev, Bob Schaefer, 11/08/01

BFEM ACD geometrical configuration

This document describes the physical dimensions of the ACD tiles and the carbon box that was used on the GLAST BFEM. Units for all numbers are in millimeters.

SIDE VIEW : ACD tiles in Blue

708 mm (top of carbon box)
300 680 - - - top of upper side tiles
650 - - - - - - - - - - - - - - - - top of "Big" tile
25
635 -- top of top (bent) tiles
300
105

TOP VIEW

- X

4 mm gap between bent tiles

10 (tile thickness)

69

201
bent tile
(centered)

205 (bent tile)

- Y

300 (Big) 434

+ Y

12
gap between bent tiles

origin

zone of bending

45 distance to big

+ X

422 (upper side tile, 422 by 300 mm, allow 1mm for wrapping and 10mm of overlap tile to get 434 total)

From this figure: "Big" tile center (x,y) is (+12, 0). It has dimensions 422 by 300 mm
"Bent" top tile centers are (-106.5, -104.5); (-106.5, 104.5); (106.5, -104.5); and (106.5, 104.5)
Upper side tiles centers (they are 422 by 300 mm) are (-216.5, -5.), (-5., 216.5), (216.5, 5.), (5., -216.5).
Perimeter of upper part of ACD is 4 x 434 = 1736

NOTES ON DIMENSIONS:

Lower side tiles

  Lower side tiles have dimensions 444mm by 300mm, and similarly overlapped on the corners, with tile centers at (x, y) = (-226., -5.), (-5., 226.), (226., 5.), (5., -226.). . These overlaps are NOT perfect due to thick wrapping, but I think they can be assumed perfect as a good approximation.

Apparent discrepancy of the "Big" top tile dimensions

  The careful reader will notice that the "Big" tile will not fit between the two Y upper side tiles as drawn. The size of the "Big" tile is indeed correct (422 mm by 300 mm). The perimeter of the enclosure in the TOP VIEW shown above (as 434 mm by 434 mm square) is accurate ONLY for the bottom of the upper side tiles, where they are surrounded by the lower side tiles. The resolution of this apparent discrepancy is that the two upper side Y tiles were tilted by about 1 degree (about the bottom edge). At the top of the ACD therefore, the –Y and +Y tiles have been displaced by -6 mm and +6 mm to accommodate the "Big" tile. The top of the upper side tiles is then a 434 mm by 444 mm rectangle (444 = 422 + 1 + 10 + 1 + 10). The overlap at the top of the +Y and –Y upper side tiles with the neighboring X tiles is somewhat less than is in the figure.
  One possible way to approximate this is to ignore the slant in the –Y and +Y tiles making them vertical and just shorten the top tile dimensions (e.g. "Big" would be 414mm by 300mm, a less than 2% change in size). This would simplify the geometry greatly while making only a very small change to the tile sizes. Another way could be to keep the "Big" tile its correct size, but to make the side tiles slightly bigger to allow for the corner overlaps. Either approximation should not much affect the performance.

Top "bent" tiles

  The top tiles have a circular, or rather we should say, cylindrical bend in them near the ±X side tiles. The inside radius of this bend is 50mm and the arc length of the bent region is $\pi /2$ x 50 mm.
  Lastly the astute reader will note that the width of these top tiles is 205 mm and that there is a 4 mm gap between them. This makes a total of 414 mm (= 205 + 4 + 205), while the length of "big" is 422 mm. The answer is that there are gaps (about 4 mm) between the top tiles and the ±Y walls.