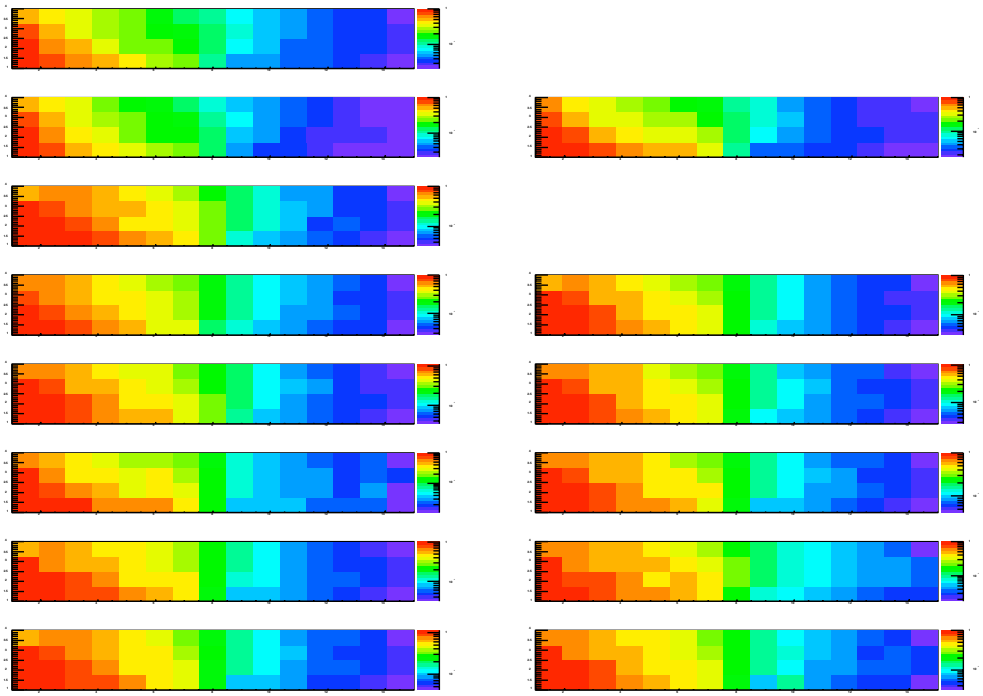
Veto Wall Fitting, new approach

JG

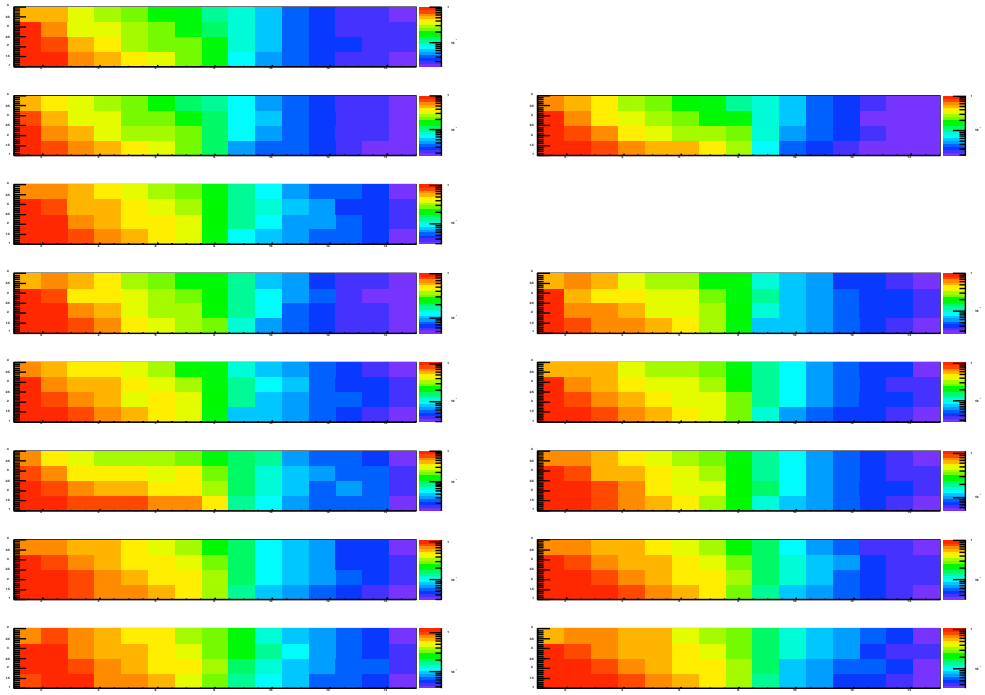
4/5/10



Log scale, ratio plots

<- Left PMTs, all paddles

Right PMTs, all paddles ->



You can see on the “cold side”
(= right side with this orientation)
of the paddle, the exponential
decay dependence in the vertical
direction is pretty much gone, but
the horizontal dependence still
seems to be around.

… so I propose to fit an x- and y- exponential decay on the “hot side”, but on the “cold side” only fit an x- exponential decay.

Functionally, this looks like…

“on” for hot side, xbins 1-7

$$FCN = \theta(7,i)\{\exp(-\alpha_x(i-1) + \exp(-\alpha_y(j-1)) - 1\}$$
$$+ \beta * \theta(i,8)\exp(-\alpha_x(i-1))$$

“on” for cold side, xbins 8-15

“xbins” here count from hot side to cold side, not necessarily corresponding to the grid written on the paddles.

i is xbin,
j is ybin

β the barrier term to simulate the scintillator discontinuity in middle of paddle (we expect it to be < 1)

α_x α_y strengths of the exponential decay in x, y directions

$$\theta(\arg 1, \arg 2) = 1 \text{ for } \arg 1 \geq \arg 2$$
$$= 0 \text{ for } \arg 1 < \arg 2$$

On the theta-function,
I chose to make the 7th bin in x the cutoff bin between the “hot” and “cold” side. The actual bin position of the paddle center varies from paddle to paddle as the bin grids written on the marvelguard paper of course are not uniform.
Putting the barrier at the 7th bin instead of the 8th bin, if anything, underestimates (in x) the position of the barrier and minimizes any “cold side” contamination of the “hot side”.

L PMT Results

PMT	α_x	α_y	β
1L	0.217	0.090	0.456
3L	0.251	0.072	0.517
4L	0.157	0.136	0.191
5L	0.119	0.074	0.275
7L	0.159	0.067	0.370
8L	0.141	0.072	0.317
9L	0.121	0.057	0.292
10L	0.146	0.053	0.316
11L	0.138	0.143	0.144
12L	0.118	0.071	0.321
13L	0.110	0.090	0.230
14L	0.138	0.083	0.266
15L	0.106	0.057	0.283
16L	0.143	0.063	0.359

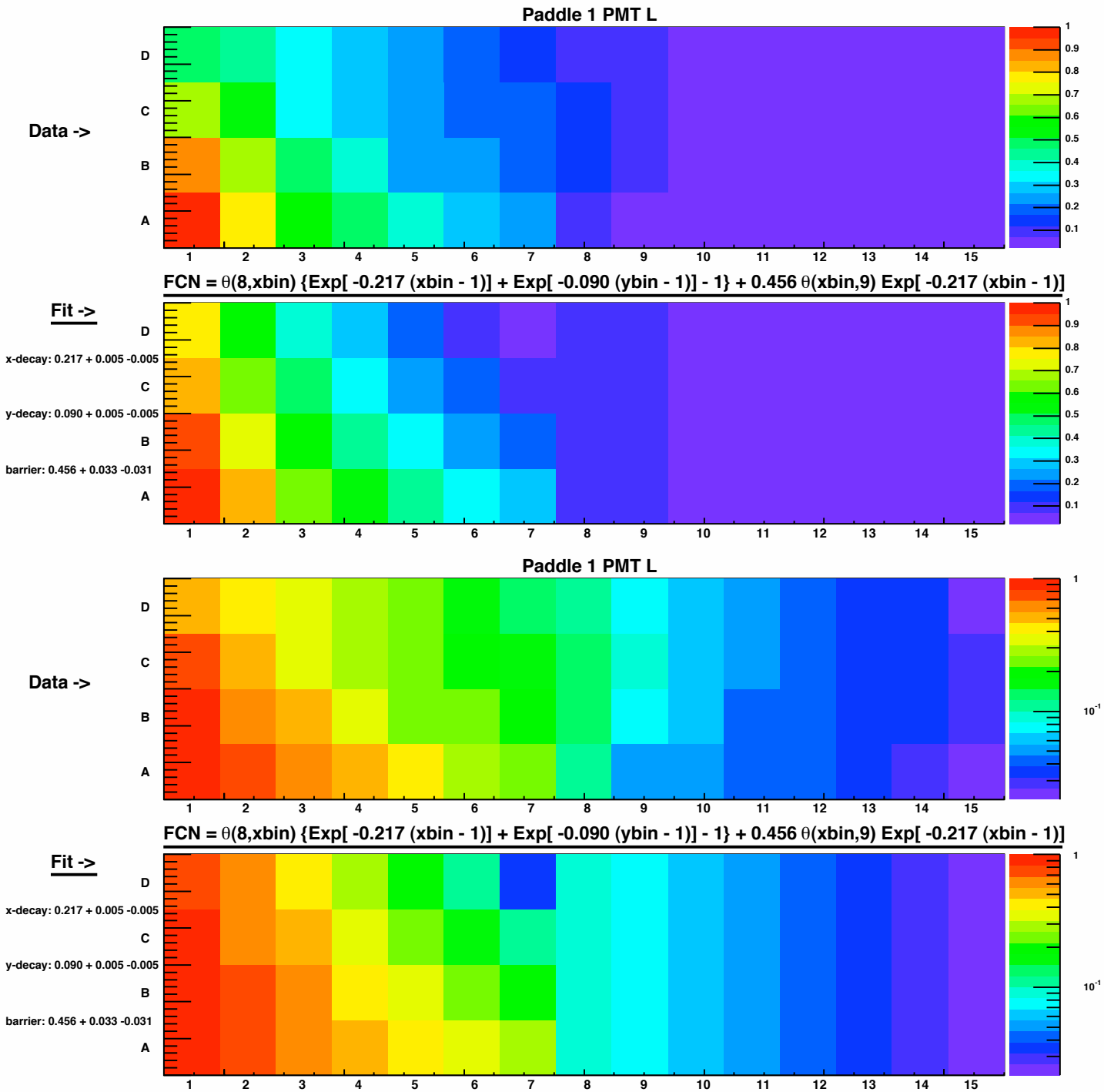
R PMT Results

PMT	α_x	α_y	β
1R	0.199	0.094	0.378
3R	0.221	0.102	0.332
4R	0.159	0.119	0.218
5R	0.143	0.058	0.336
7R	0.150	0.061	0.439
8R	0.163	0.082	0.338
9R	0.135	0.081	0.284
10R	0.136	0.086	0.279
11R	0.098	0.202	0.108
12R	0.123	0.036	0.392
13R	0.111	0.059	0.249
14R	0.105	0.071	0.226
15R	0.104	0.010	0.296
16R	0.100	0.070	0.223

Linear scale →

EXAMPLE

Log scale →



All other fit plots found in
http://home.fnal.gov/~grange/MINERvAmisc/2DFitPaddleMaps/

/(Log)PaddleFit_i_j.eps (Log) scale results, i = paddle number, j=0 if PMT L, j=1 if PMT R

On errors…

I do pure stat errors and build the error in by hand - error in each ratio bin:

if R = a/b

delta R = R * sqrt((sqrt(a)/a)^2 + (sqrt(b)/b)^2)

This is correct for stat error, but I'm getting strange chisq values out of the fits, chisq / dof = 500/60 or so, even though by eye the results look pretty good compared to data. Not sure what's going on here, I suspect the chisq blows up when the error is very small (less than one for these ratios measurements), and of course chisq gets divided by the square of the error…