

Magnetic field in decay pipe (simulation vs data)

Yiding Yu

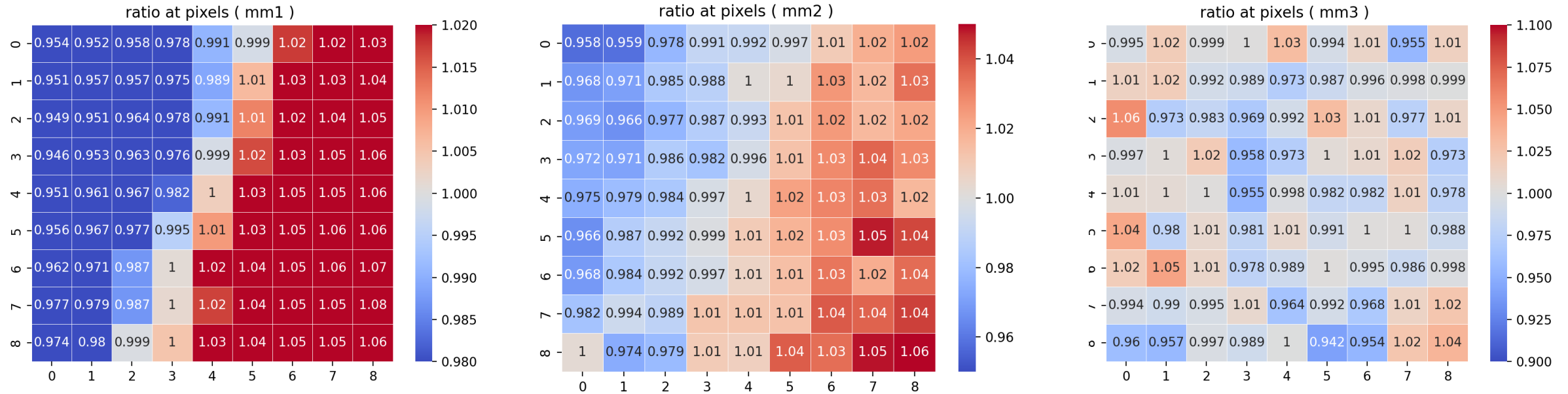
ILLINOIS INSTITUTE
OF TECHNOLOGY 

Beam sim meeting

Oct 05, 2022



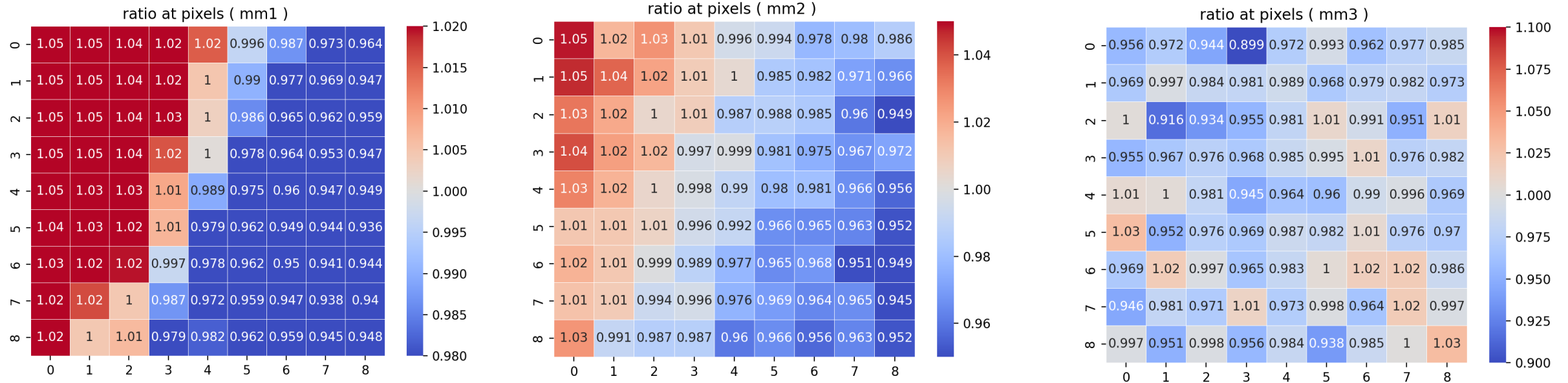
MM events change for no magnetic field in decay pipe



The MM1 is most sensitive to the change of magnetic fields in decay pipe (low energy muons)

Nominal: Magnetic field in decay pipe: $B_x = 0.1$ Gauss, $B_y = -0.3$ Gauss, $B_z = -0.07$ Gauss

MM events change for twice magnetic field in decay pipe



The pattern change at MM1 is opposite to no field

Nominal: Magnetic field in decay pipe: $B_x = 0.1$ Gauss, $B_y = -0.3$ Gauss, $B_z = -0.07$ Gauss

Twice the field in x and y:

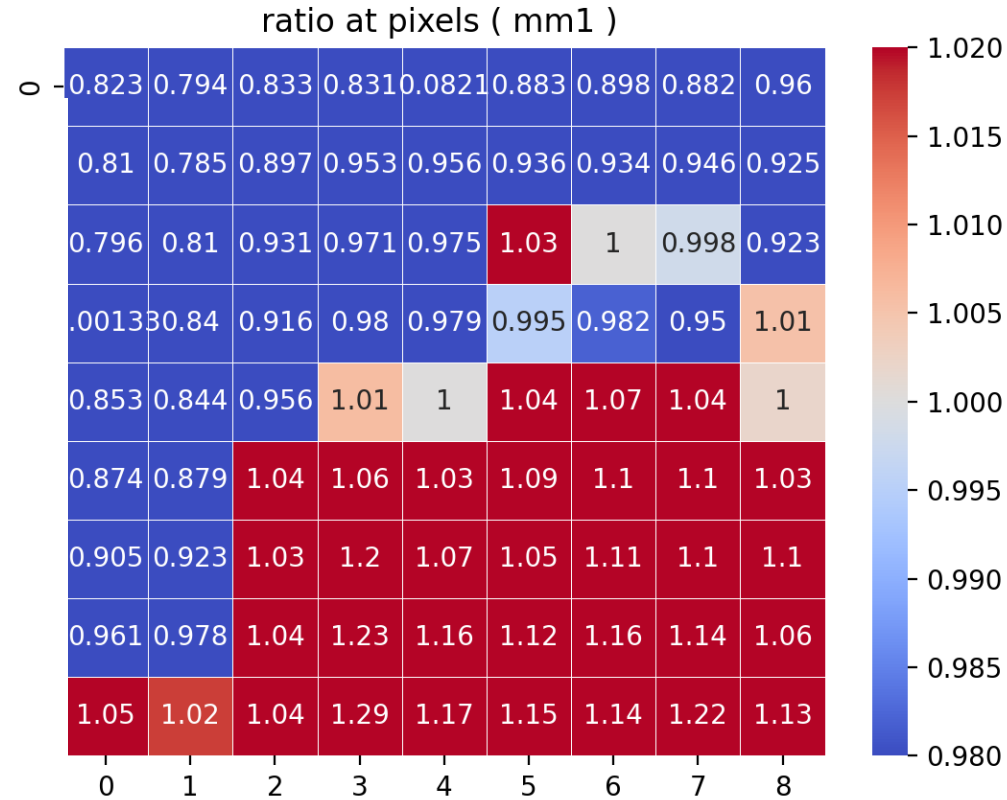
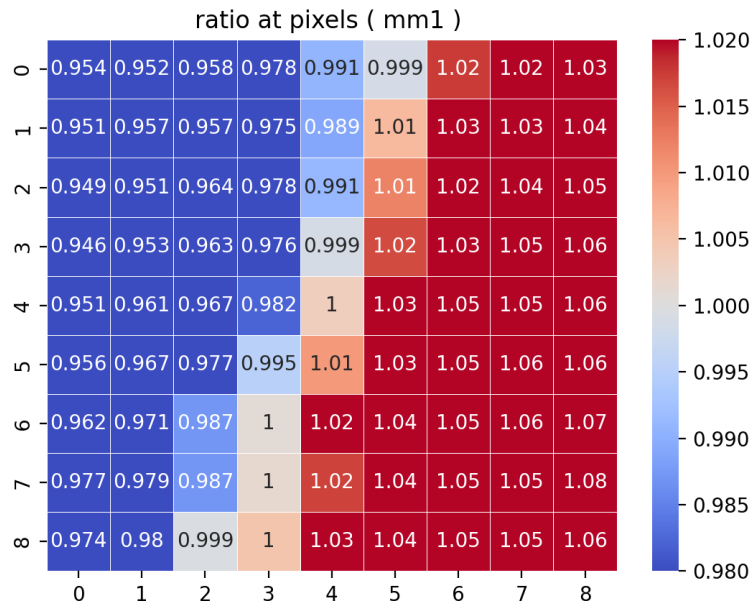
$B_x = 0.2$ Gauss, $B_y = -0.6$ Gauss, $B_z = -0.07$ Gauss

Bx= 0.1 gaus

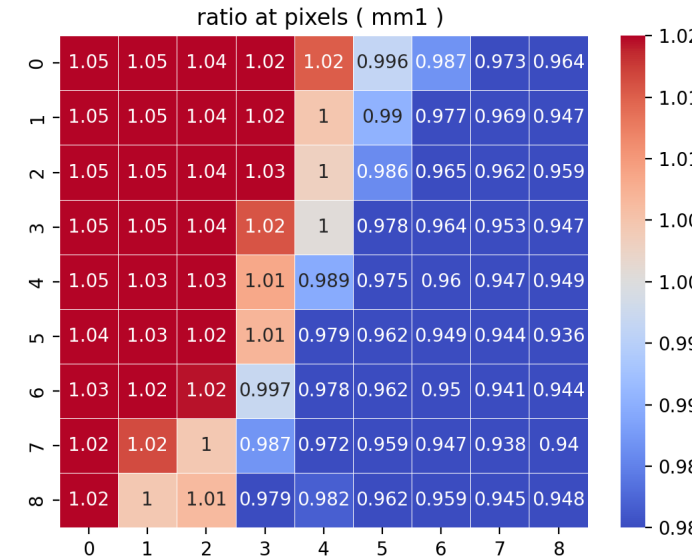
By= -0.3 gaus

Data / nominal

No field

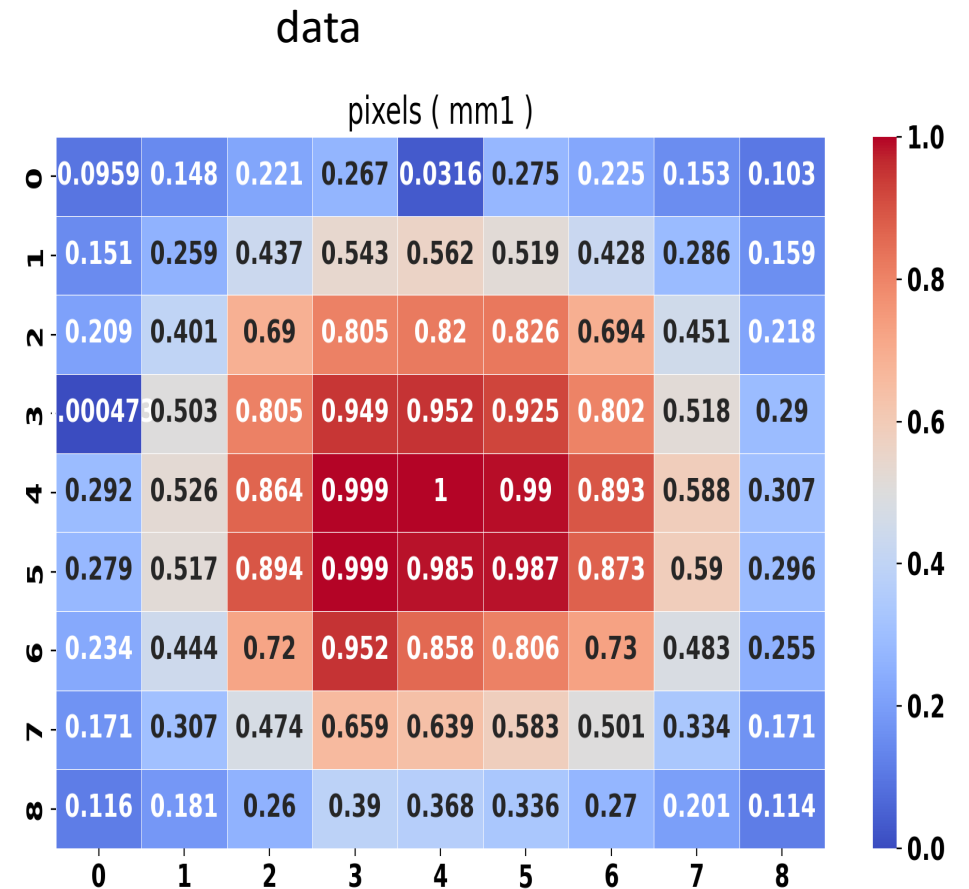
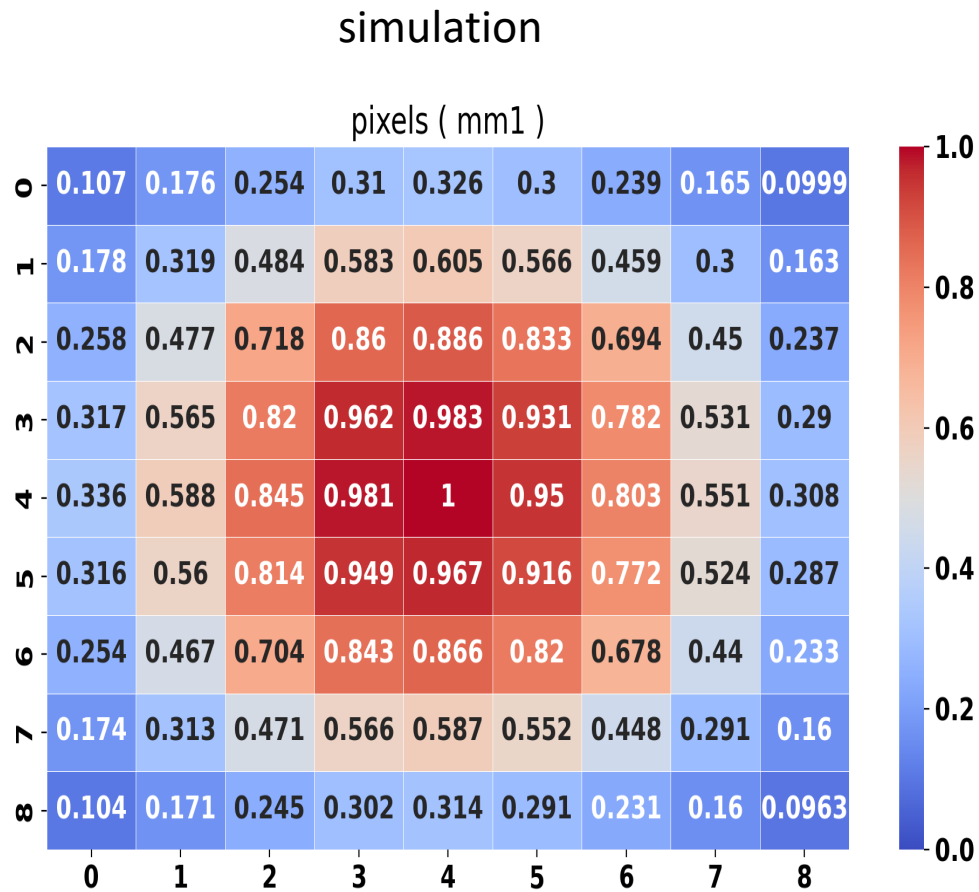


2 *field



More simulation with different magnetic field

Data vs simulation



Simulation with different Magnetic field in decay pipe

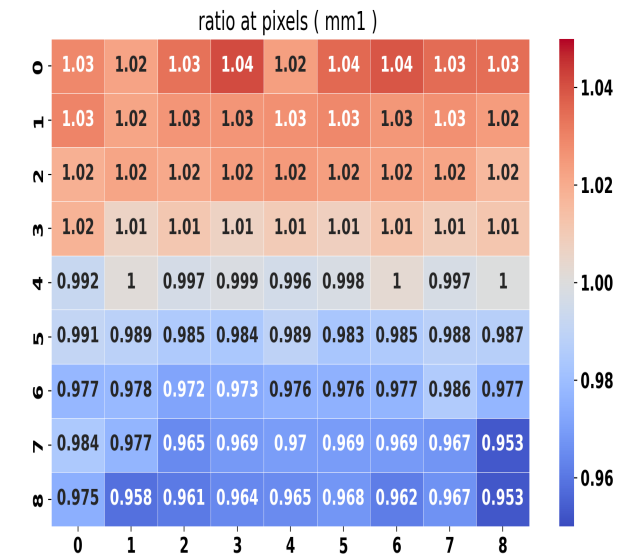
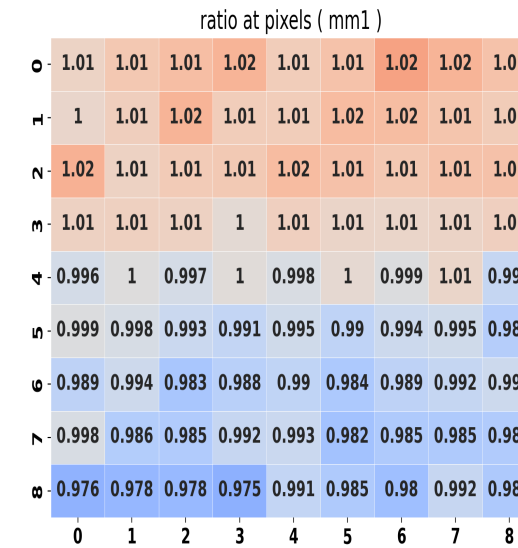
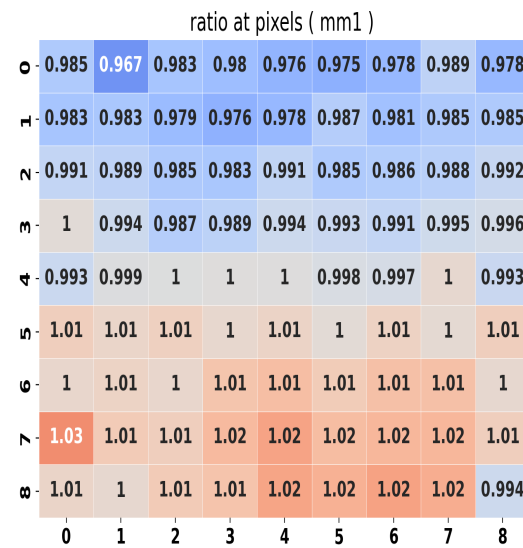
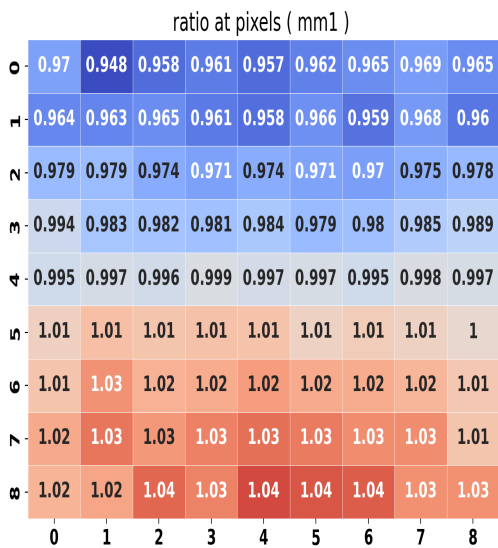
simulations

BX= -0.1
BY= -0.3

BX= 0.0
BY= -0.3

BX= 0.2
BY= -0.3

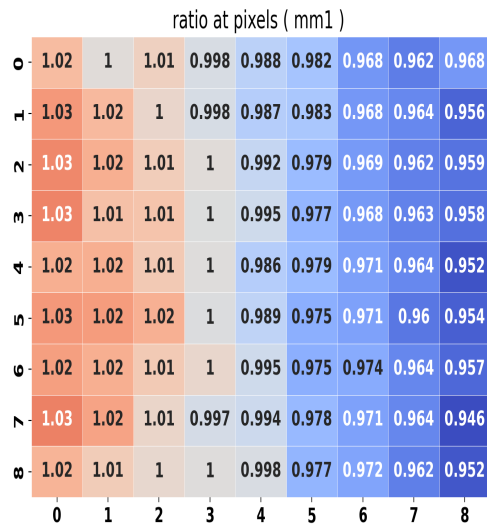
BX= 0.3
BY= -0.3



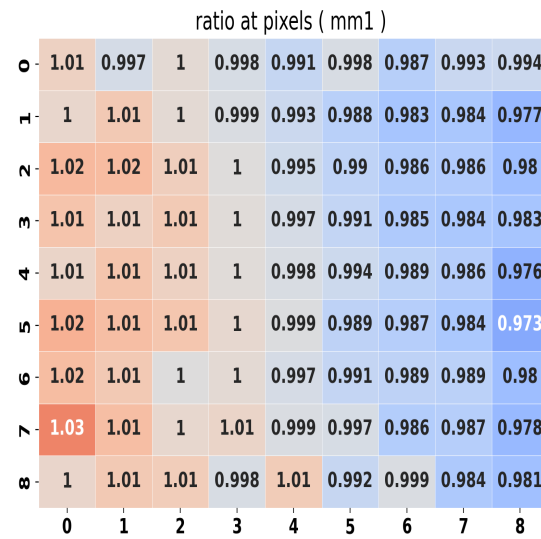
Simulation with different Magnetic field in decay pipe

simulations

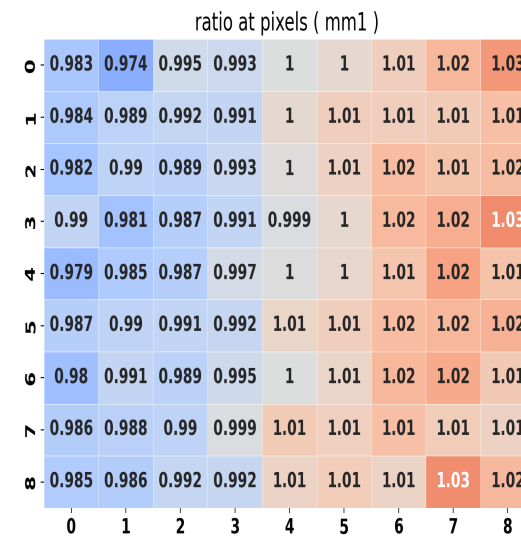
BX= 0.1
BY= -0.5



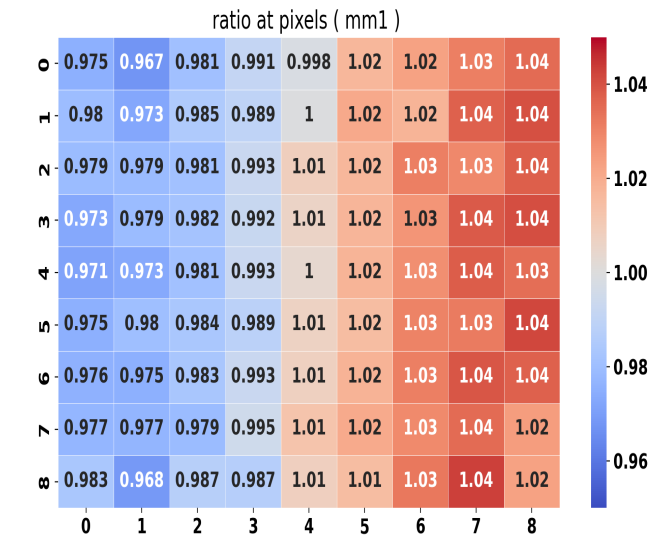
BX= 0.1
BY= -0.4



BX= 0.1
BY= -0.2



BX= 0.1
BY= -0.1



Change B_y with fixed B_x

Simulation vs data

Compare sim with data

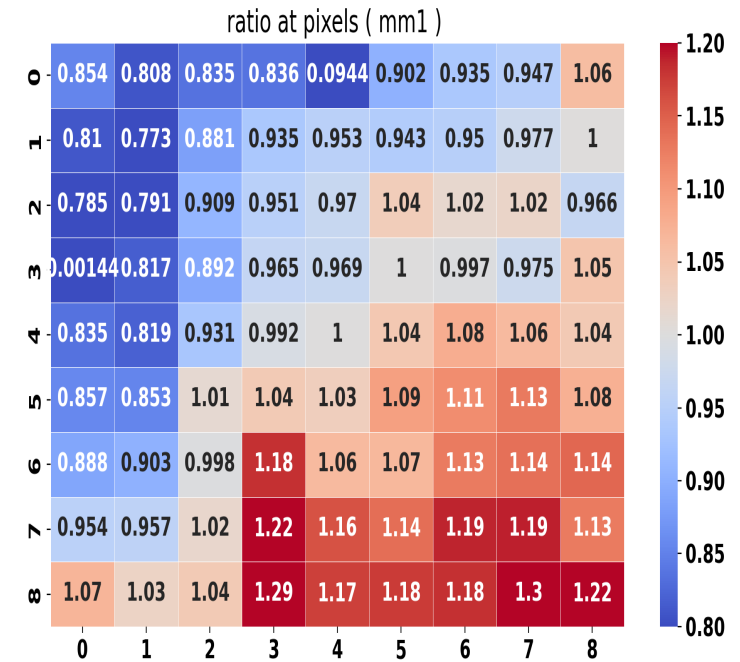
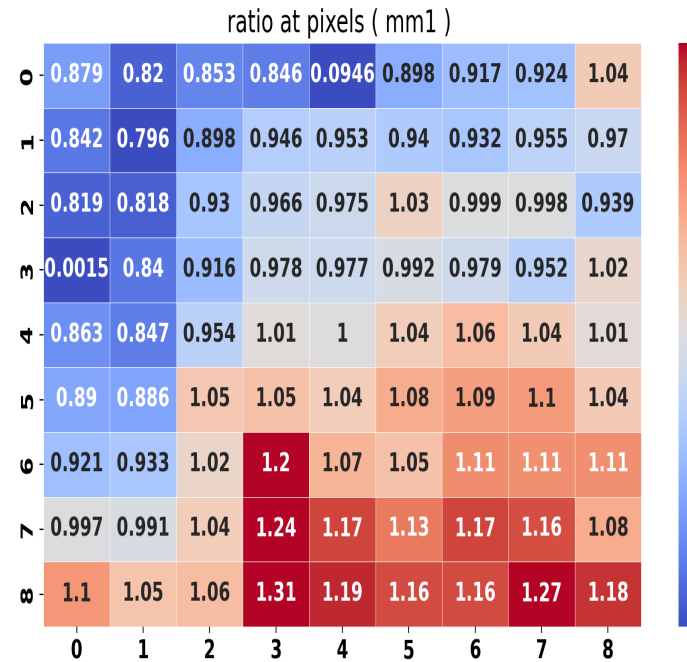
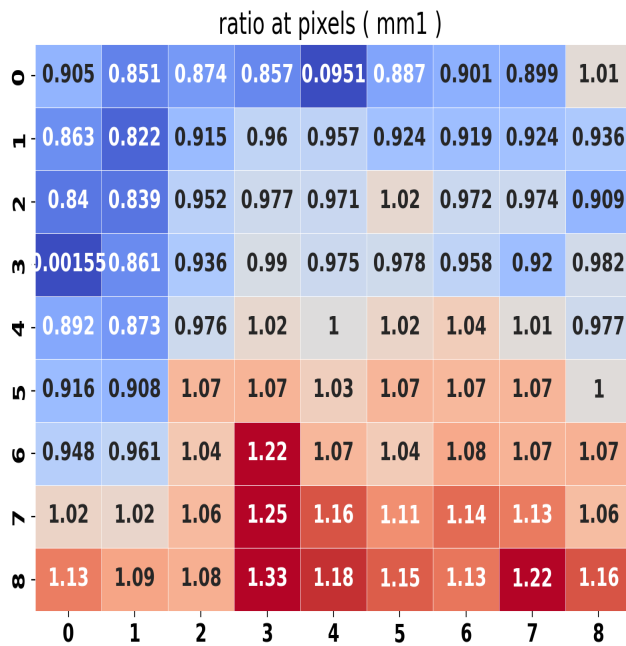
Ratios = data / sim

By = -0.5

Bx = 0.1

By = -0.3

By = -0.1



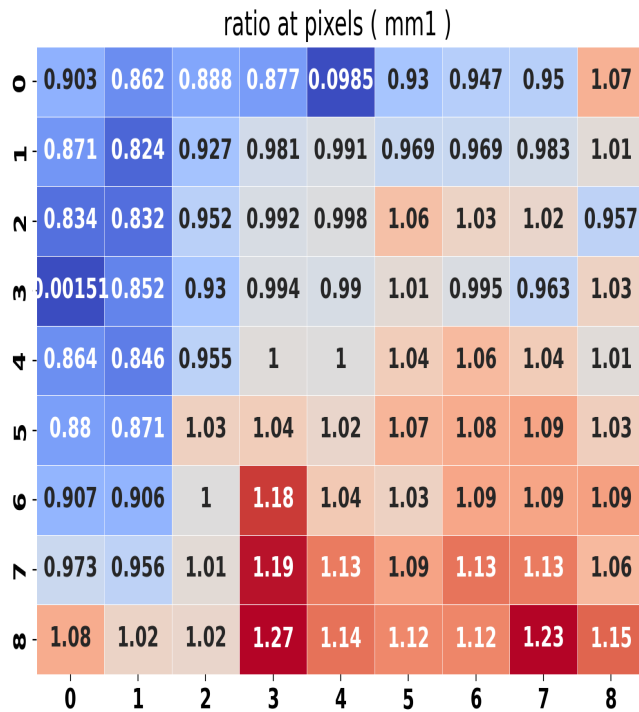
Change B_x with fixed B_y

Simulation vs data

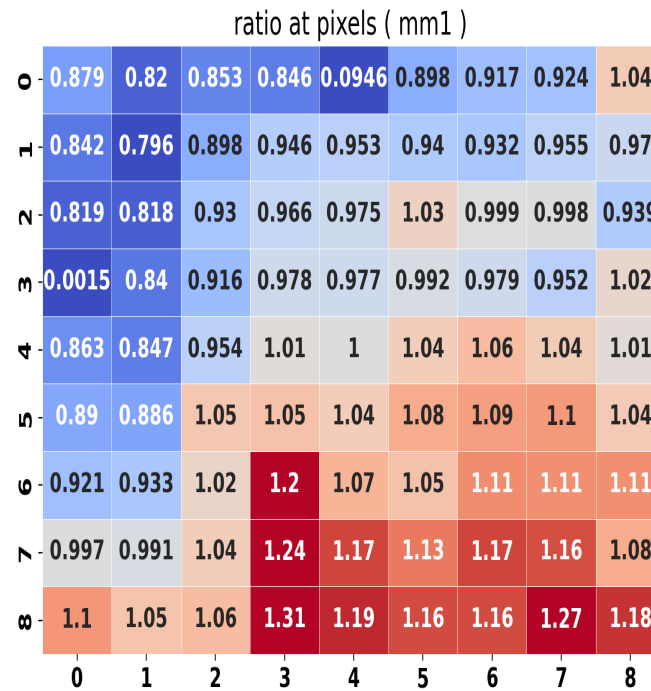
Compare sim with data

By = -0.3

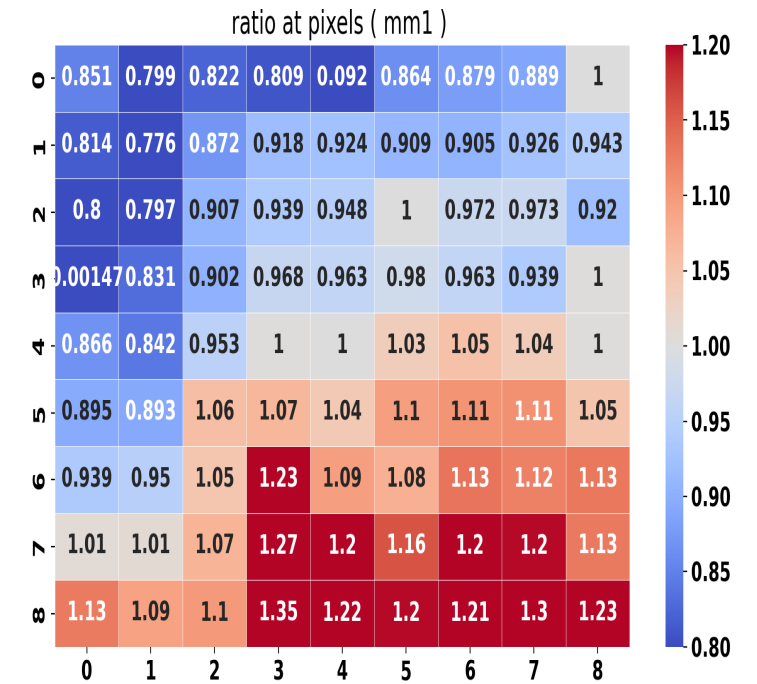
Bx = -0.1



Bx = 0.1



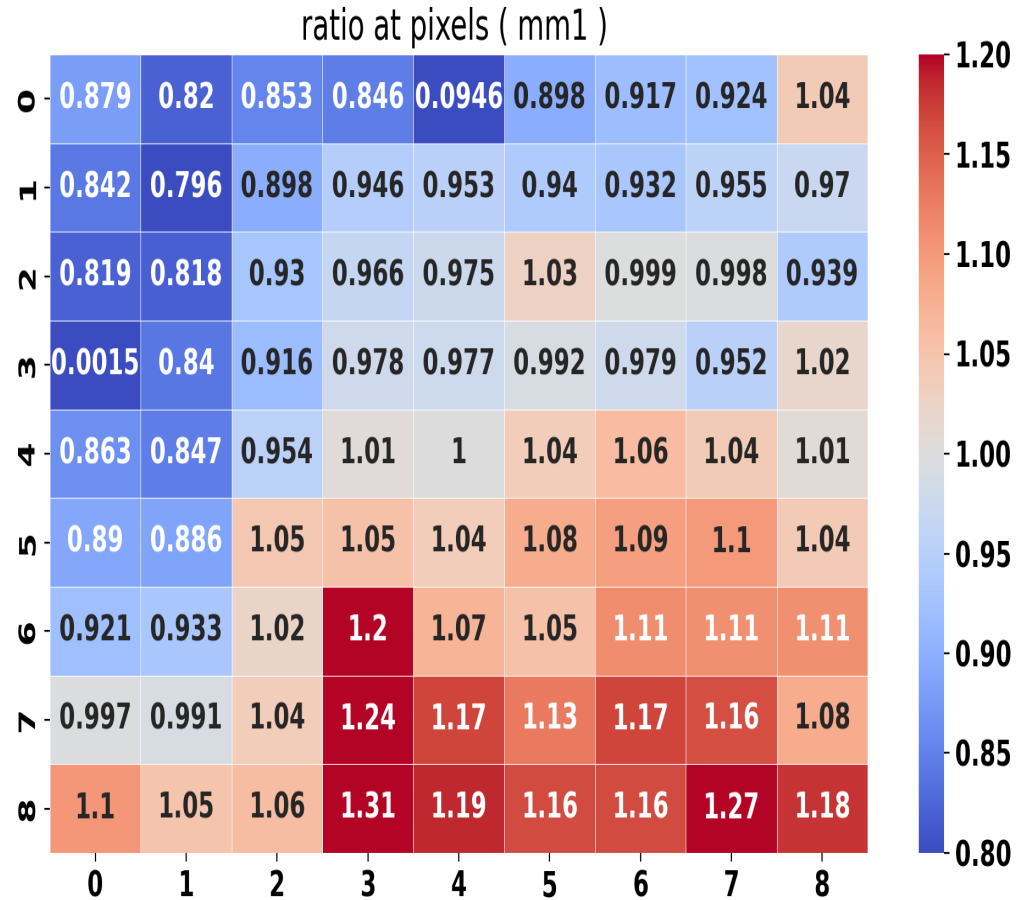
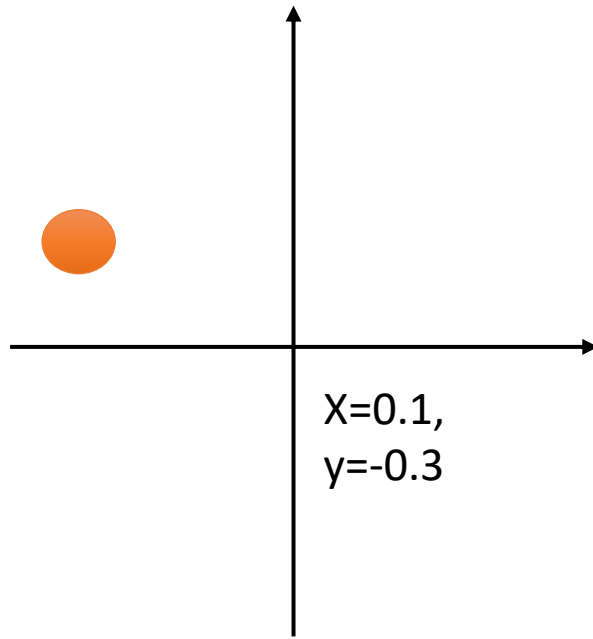
Bx = 0.3



prediction

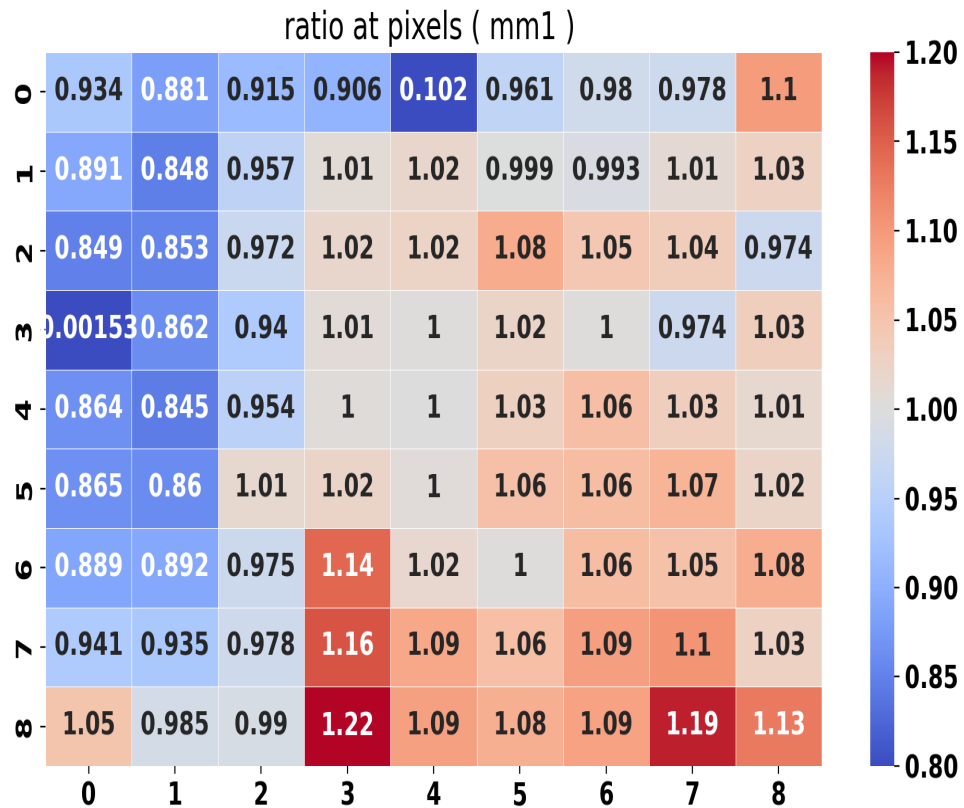
$B_x = 0.1$

$B_y = -0.3$



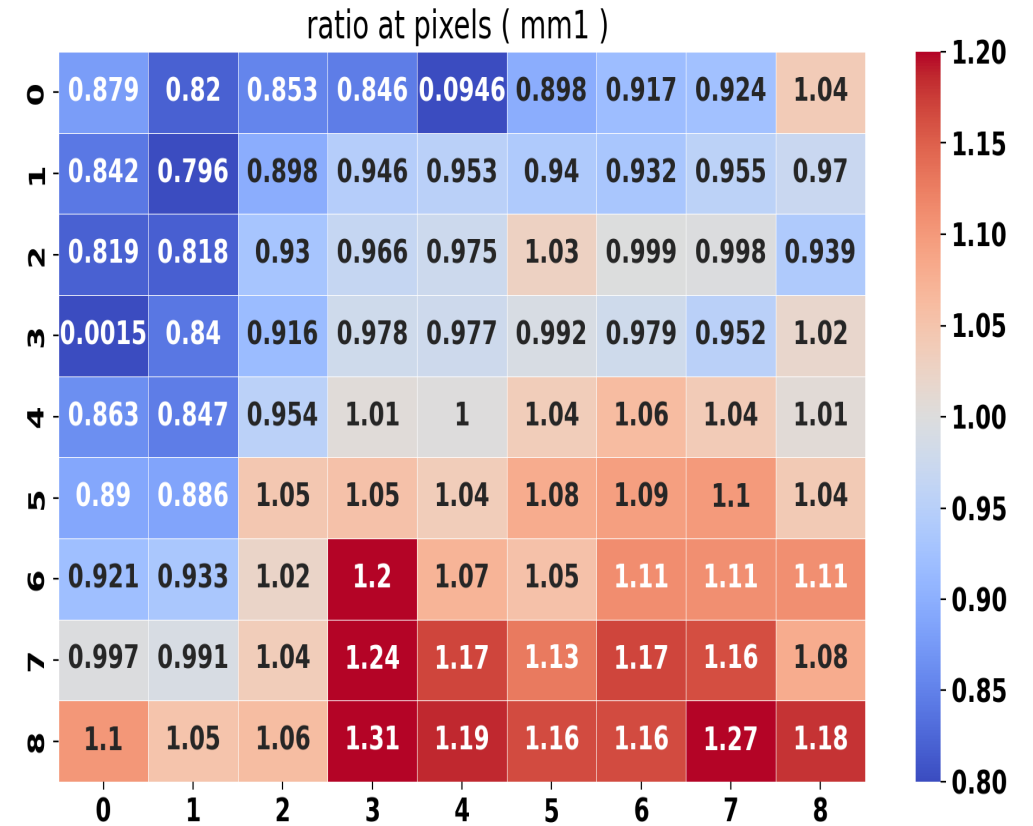
prediction

Bx = -0.3
By = -0.3



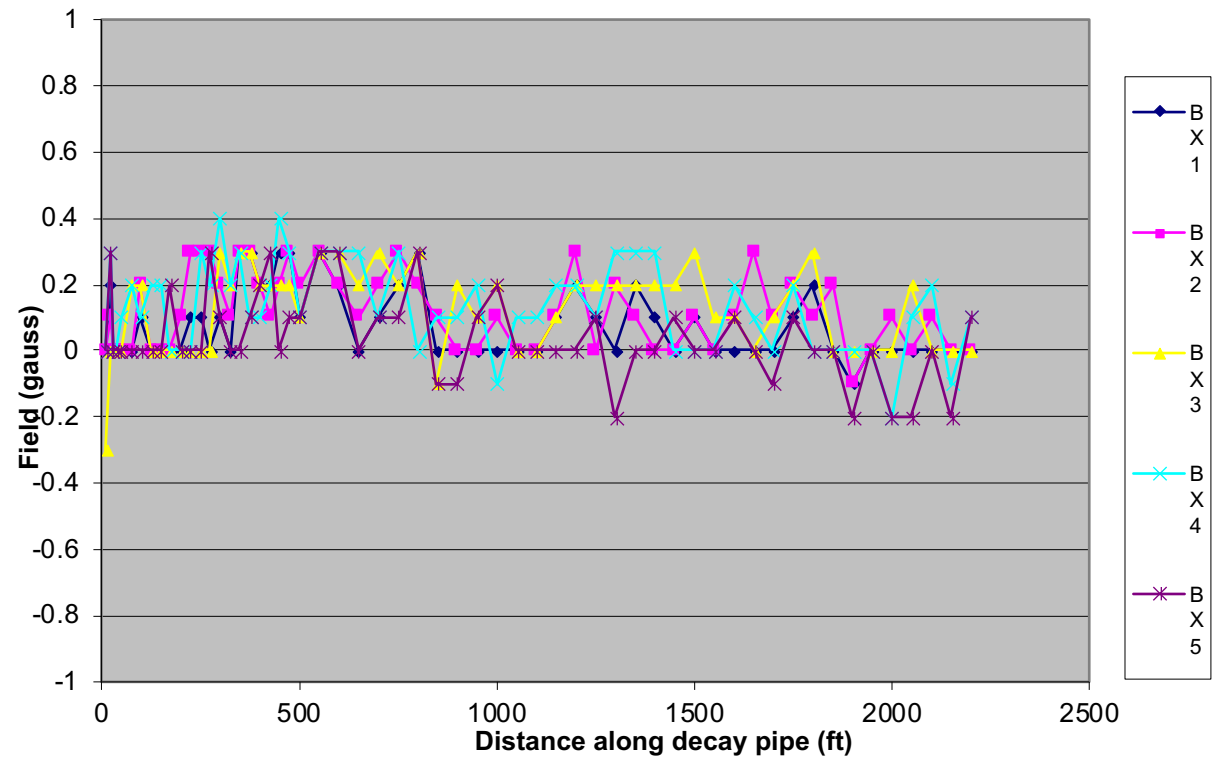
05/20/22

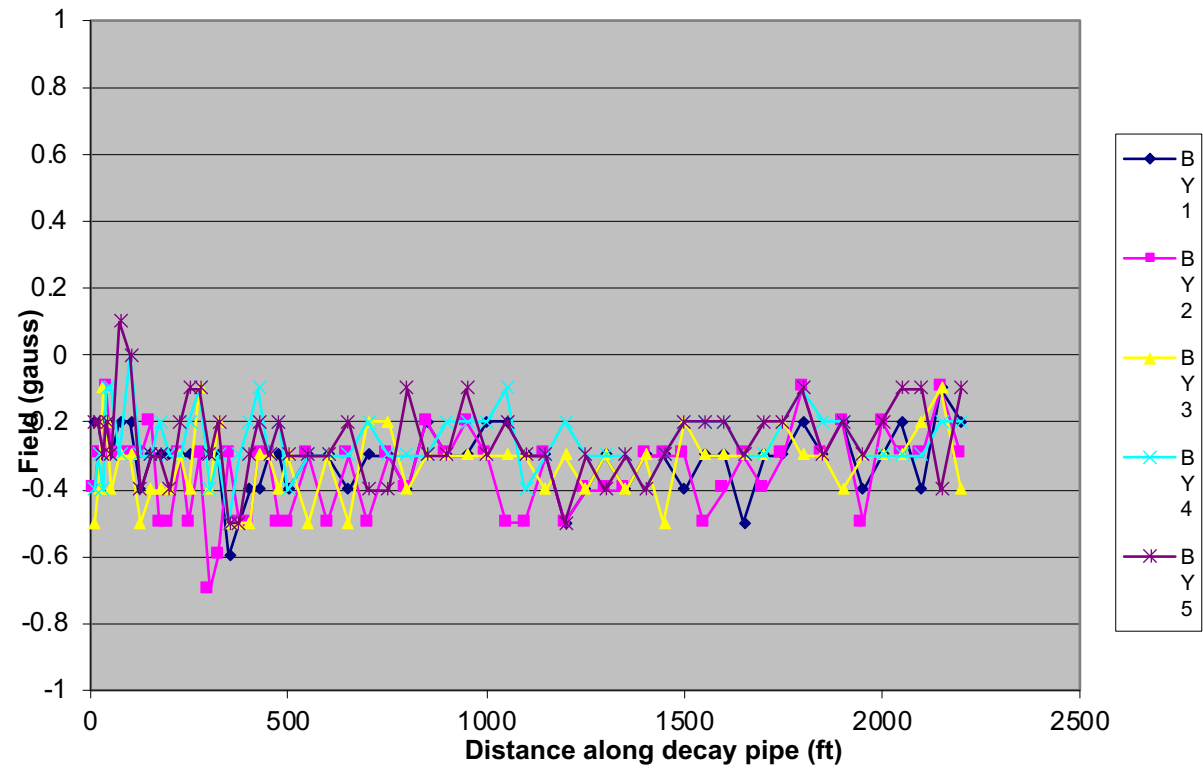
Bx = 0.1
By = -0.3



training run 14

Back up



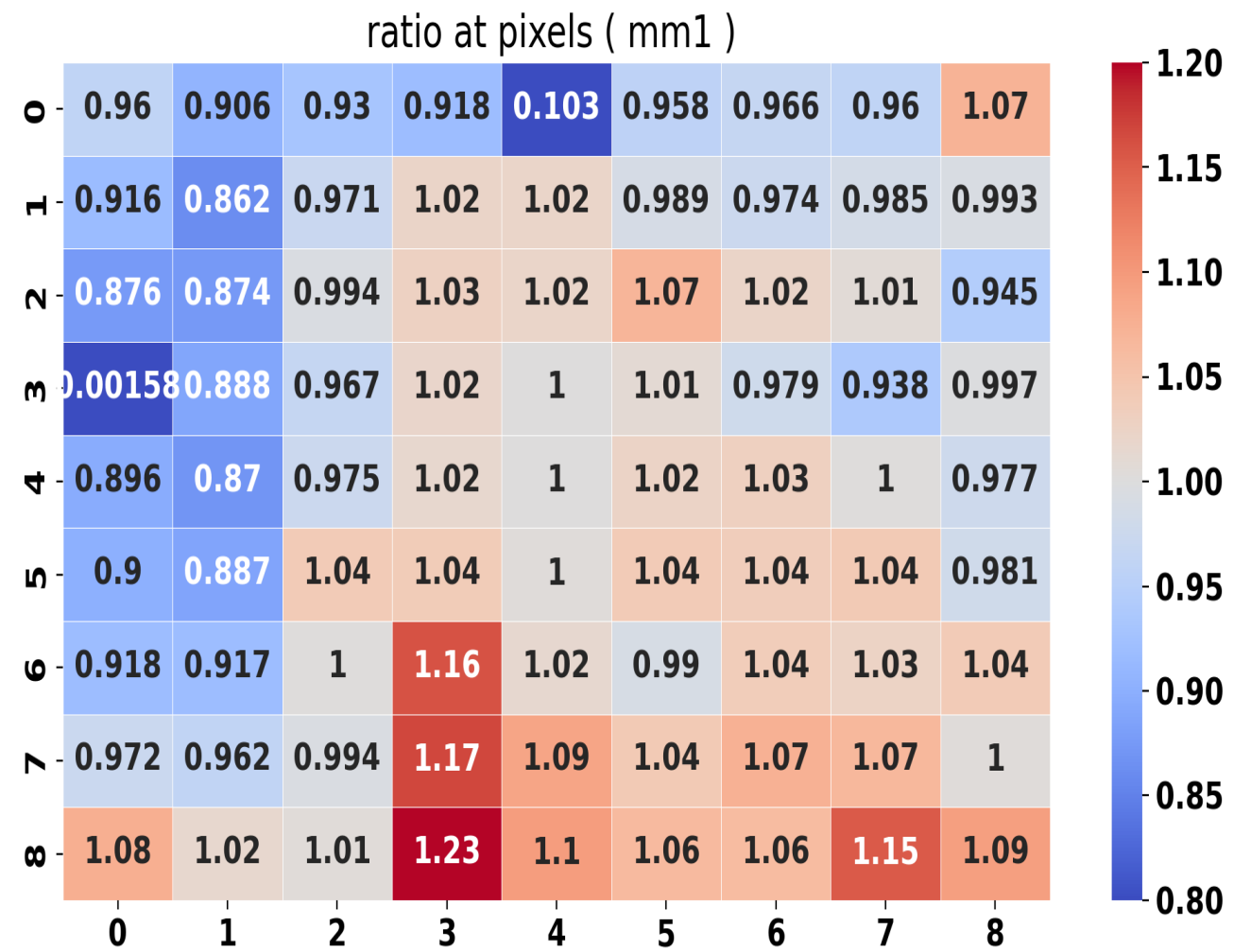


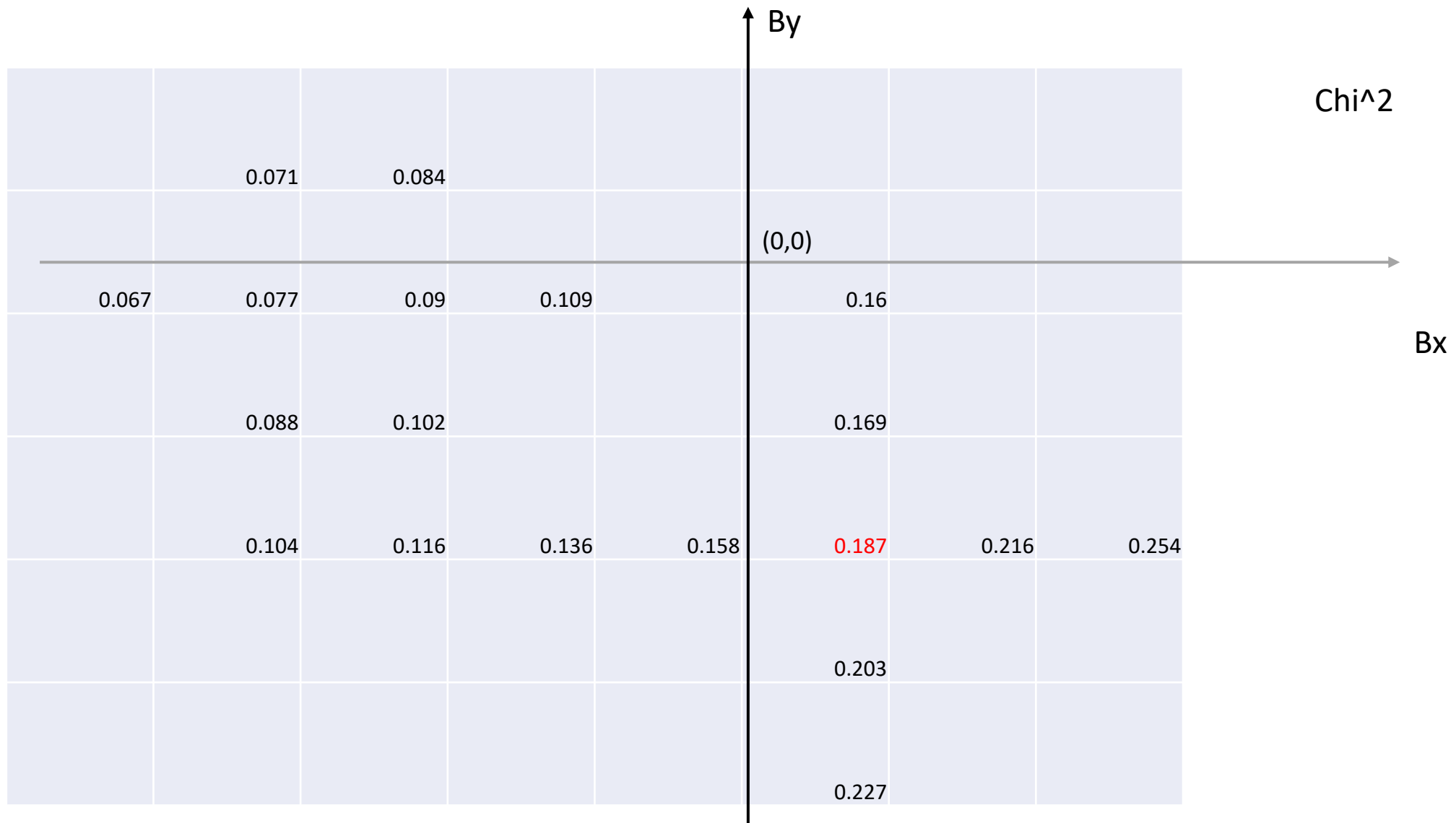
$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

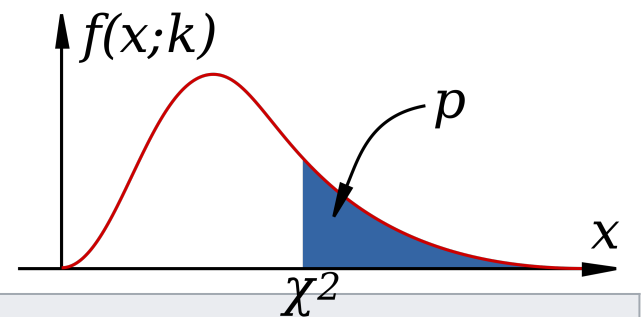
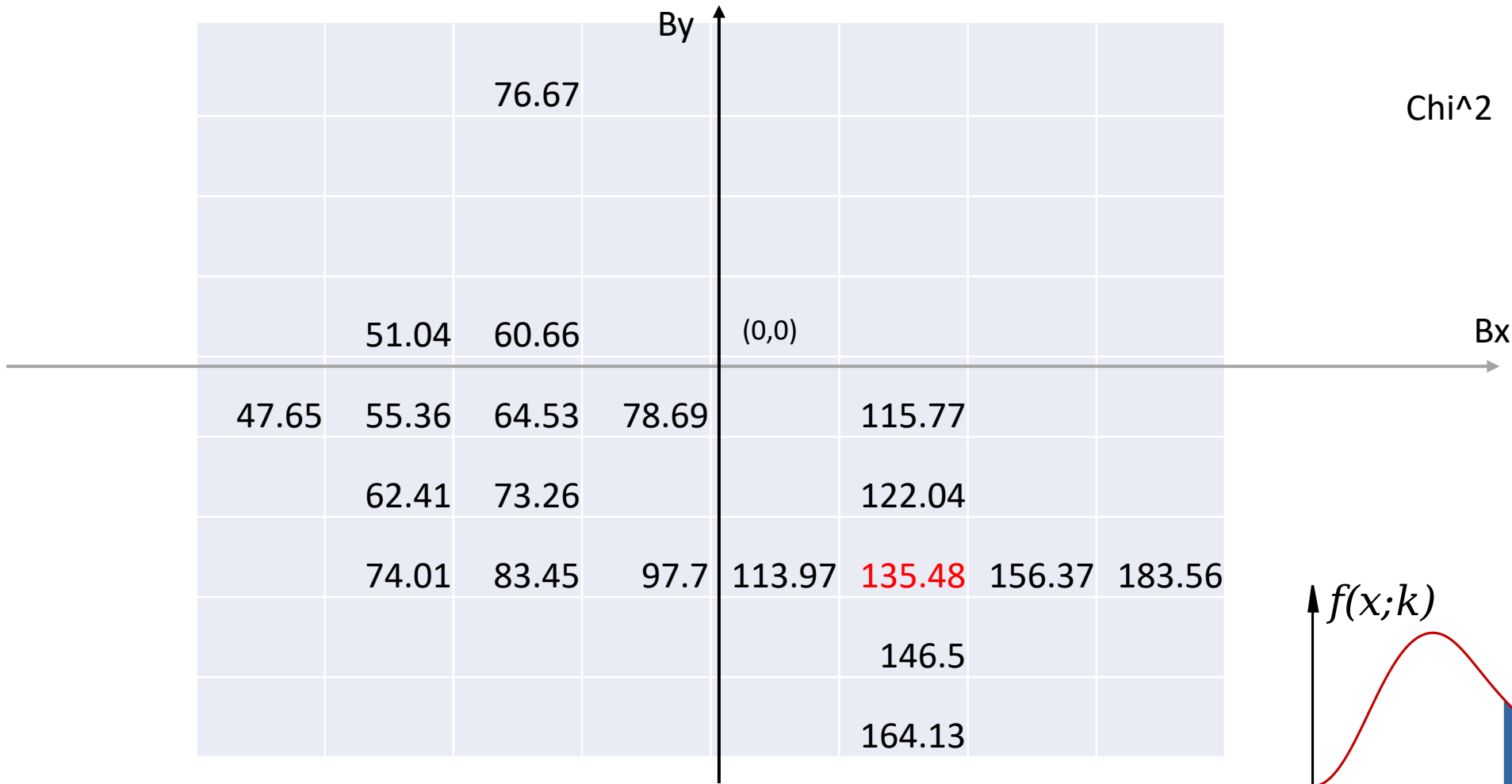
By = -0.1

Bx = -0.3

χ^2 = chi squared
 O_i = observed value
 E_i = expected value





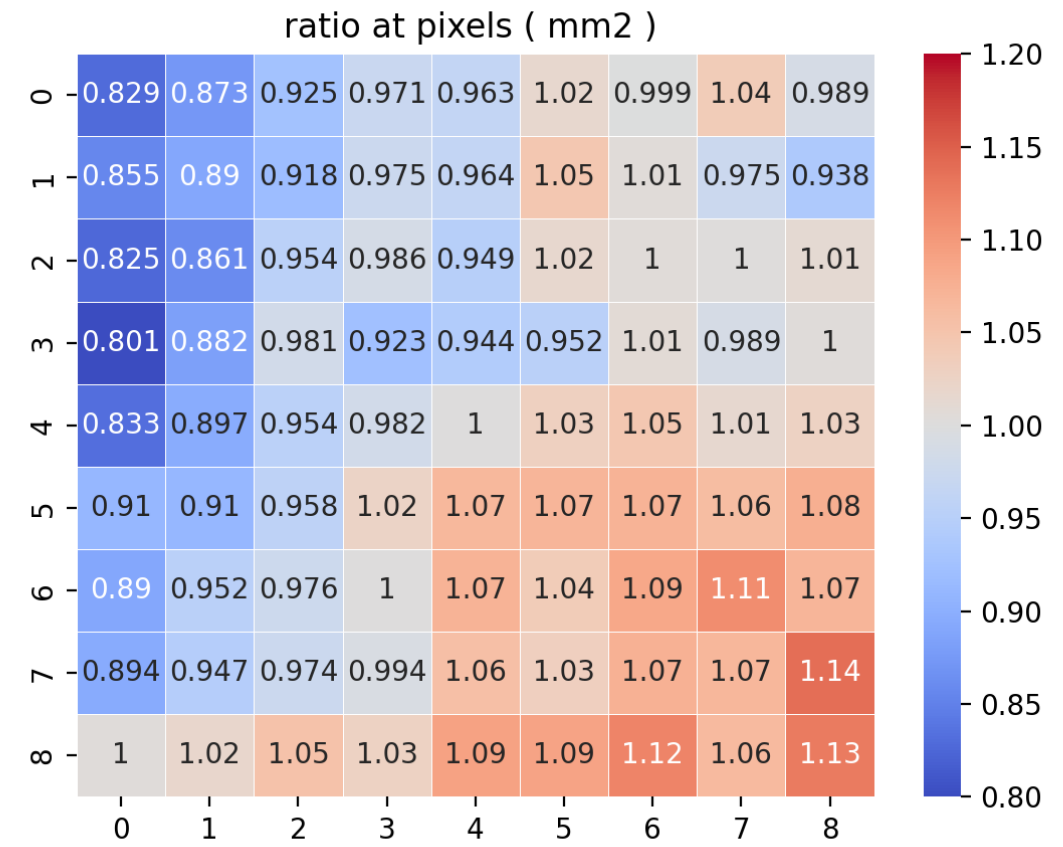
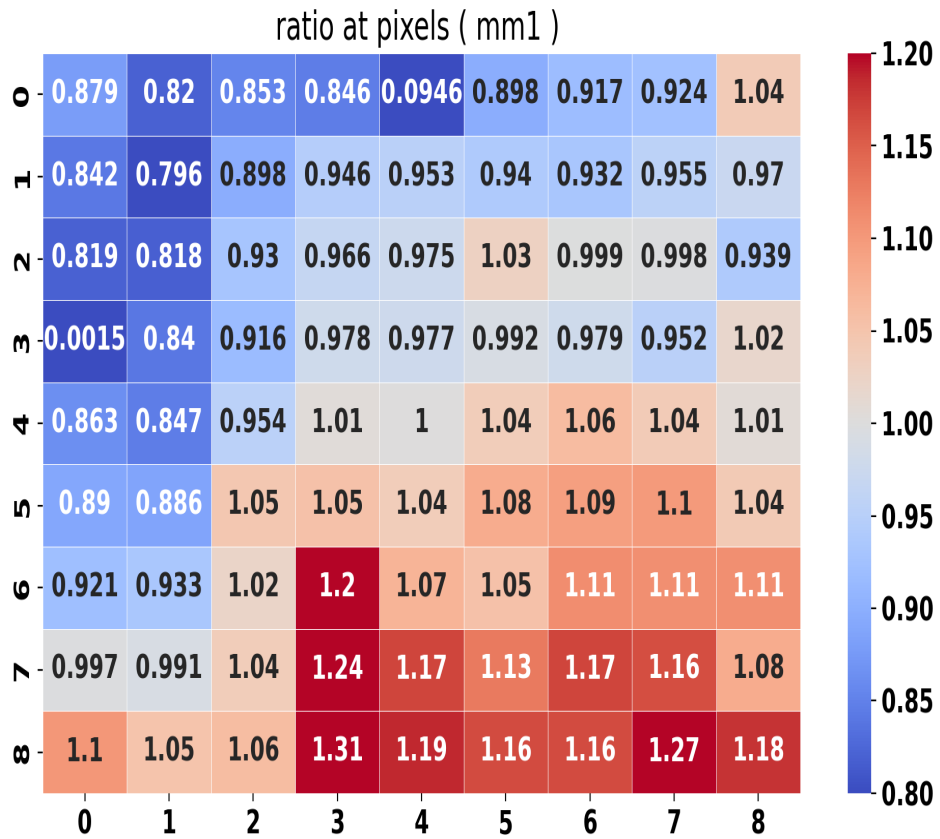


Probability Content, p , between χ^2 and $+\infty$															
0.99 5	0.99	0.97 5	0.95	0.9	0.75	0.5	0.25	0.1	0.05	0.02 5	0.01	0.00 5	0.00 2	0.00 1	
38.6	40.6	43.7	46.5	49.9	56.0	63.3	71.2	78.8	83.6	88.0	93.2	96.8	101. 4	104. 7	20

MM2 behavior

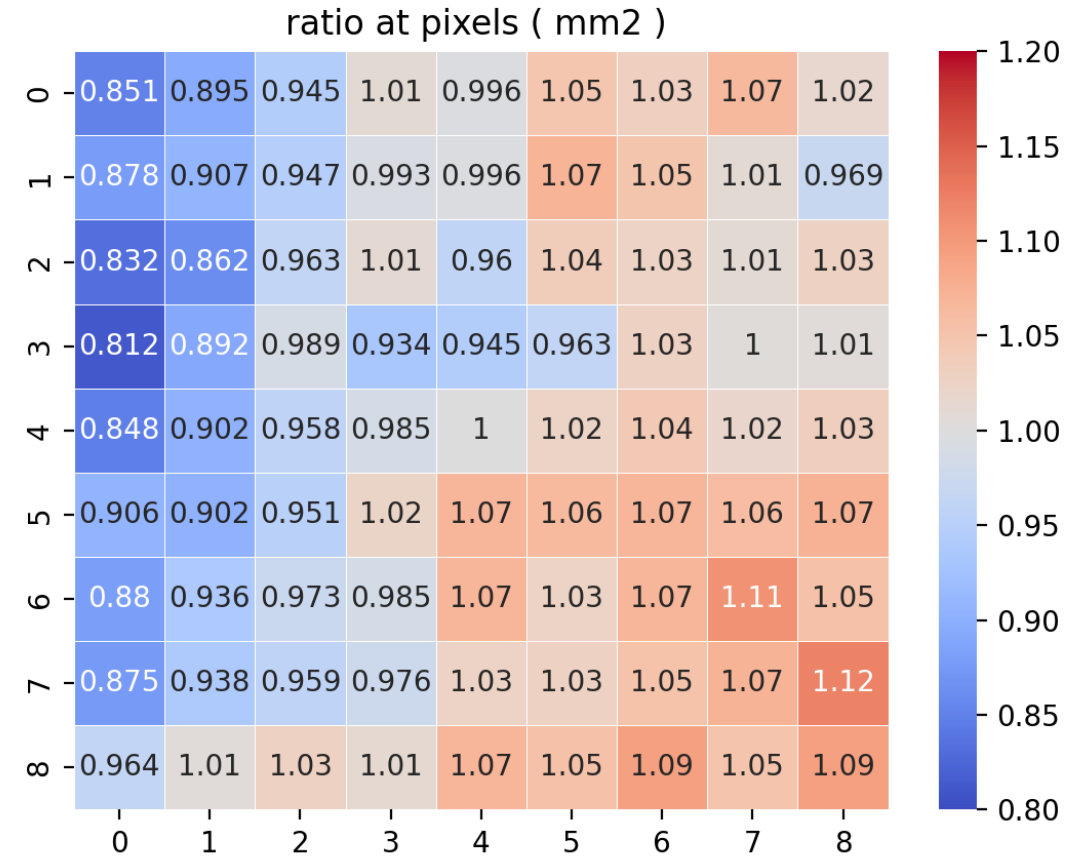
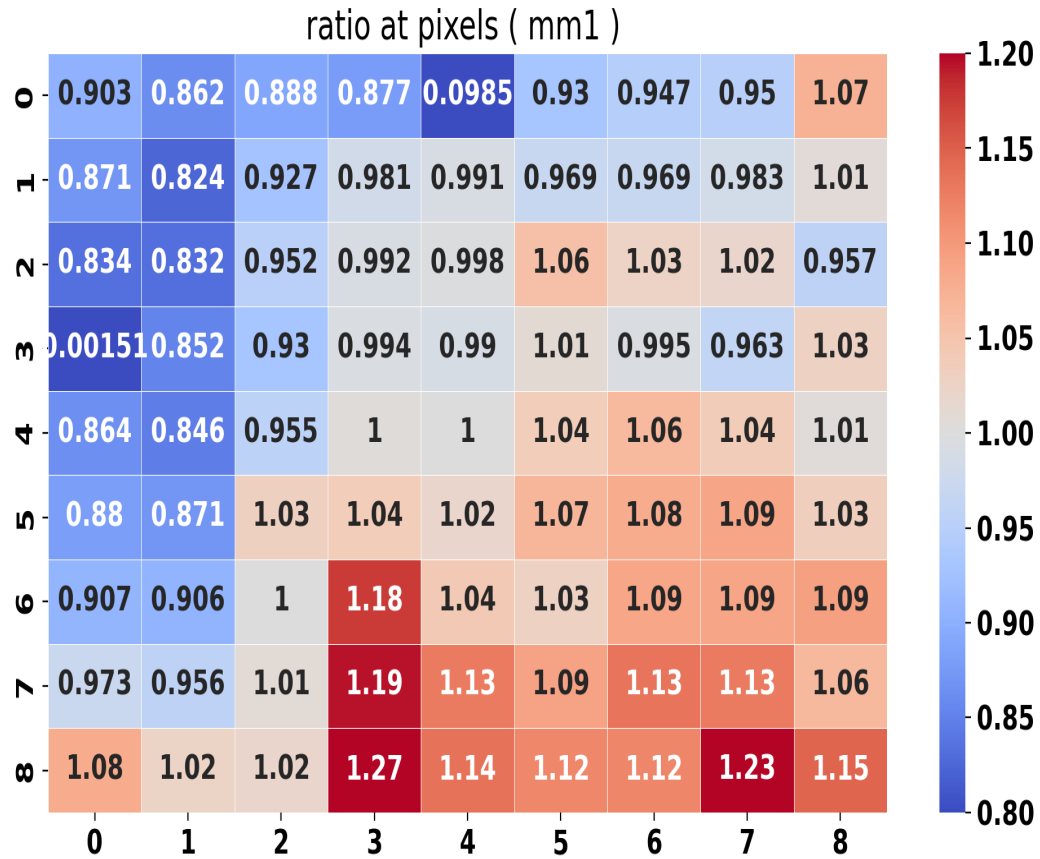
Bx = 0.1

By = -0.3



Bx = -0.1

By = -0.3



Bx = -0.3

By = -0.1

