

# Optics Status Update

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# Optics Status

- LHRS Optics Status:

Beam Energy (GeV)	Field (T)	Field Angle (deg)	Septum	Backup
2.253	0.0	90	484816	Straight through
2.253	0.0	6	484816	Straight through
2.253	5.0	0	400016	Straight through
2.253	2.5	90	484816	
2.253	2.5	90	483216	
1.706	2.5	90	400016	
1.158	2.5	90	400016	
2.253	5.0	90	400016	No full dp scan

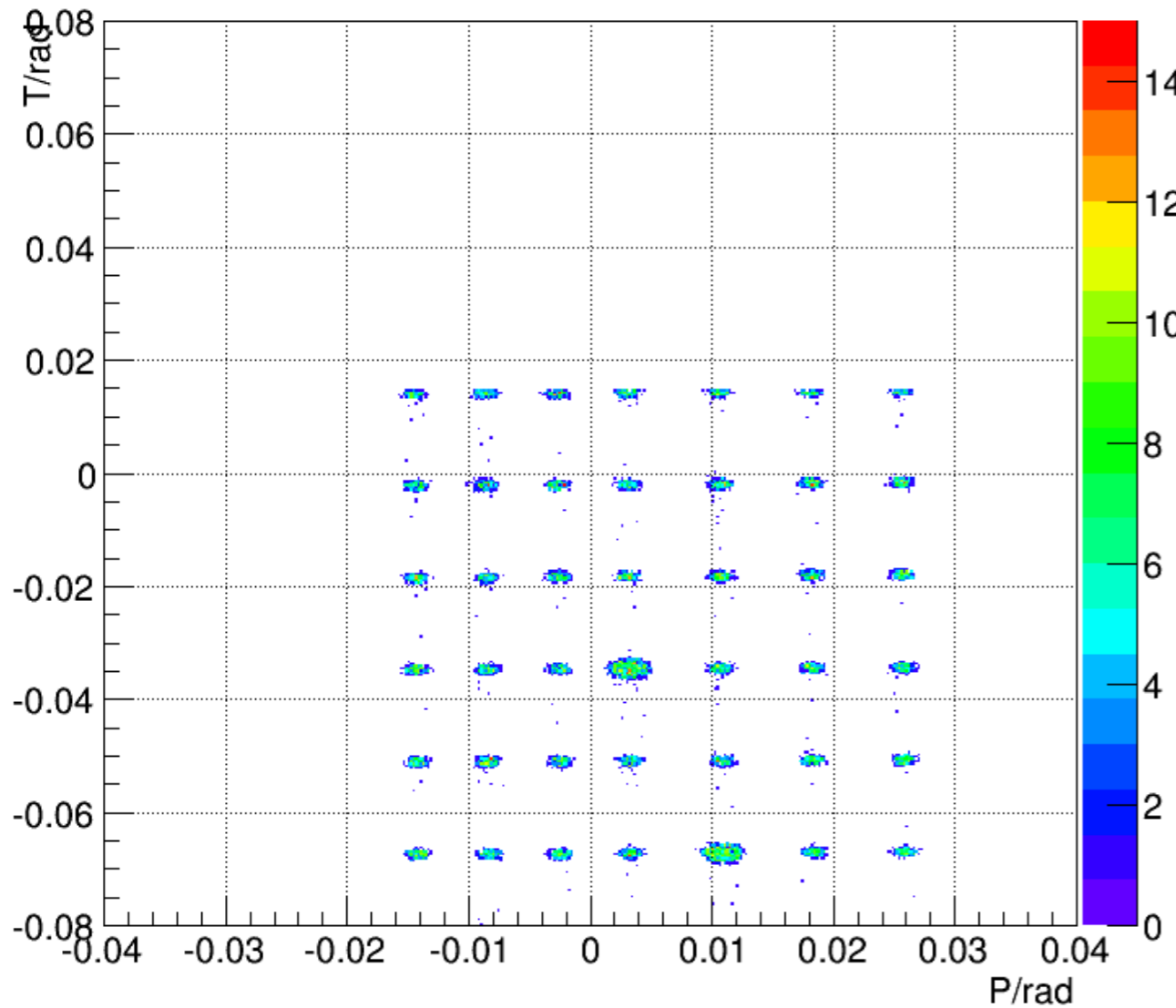
# Calibration

- Settings:
  - Beam energy 2.253GeV
  - 2.5T Target Field at 90deg
  - Septum coil turns is 40-32-16
- Optics settings:
  - Full delta scan on left arm (-3%, 2%, 0%, 2%, 3%)

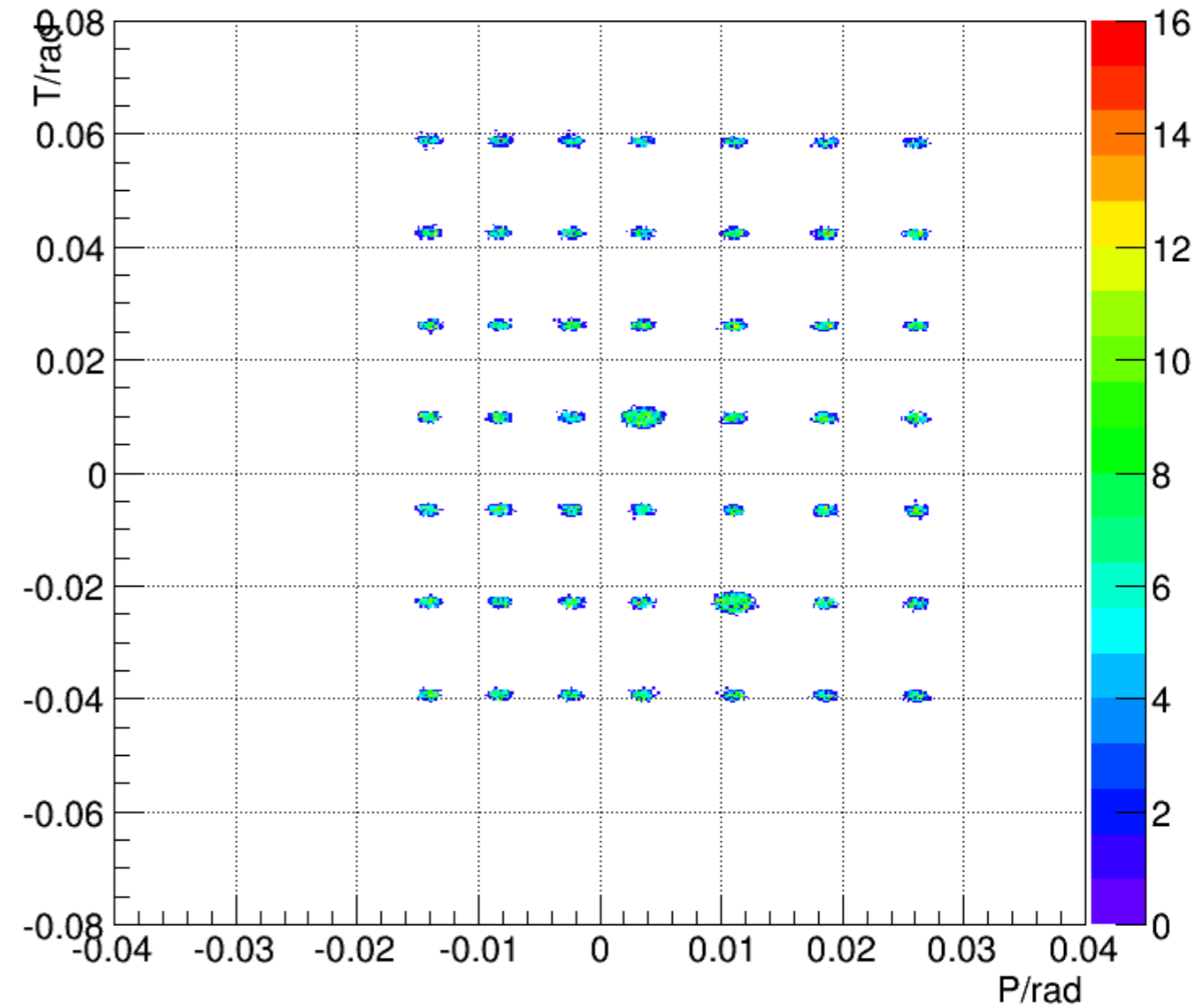
# Calibration

- Simulation result to show the effect of the field
  - Assuming point beam, set to the average value of BPM readout

Init TP T vs P



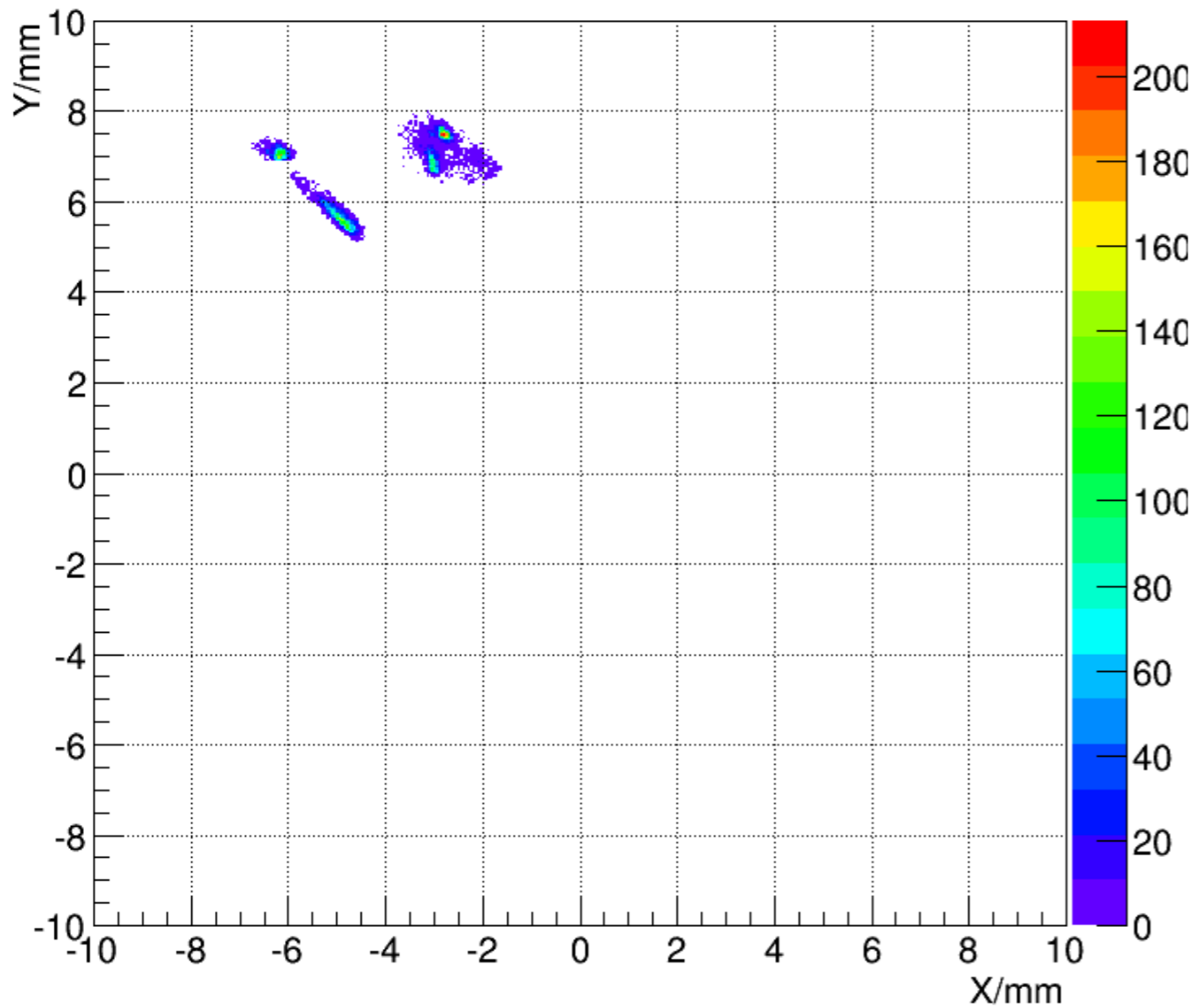
Effective Angle



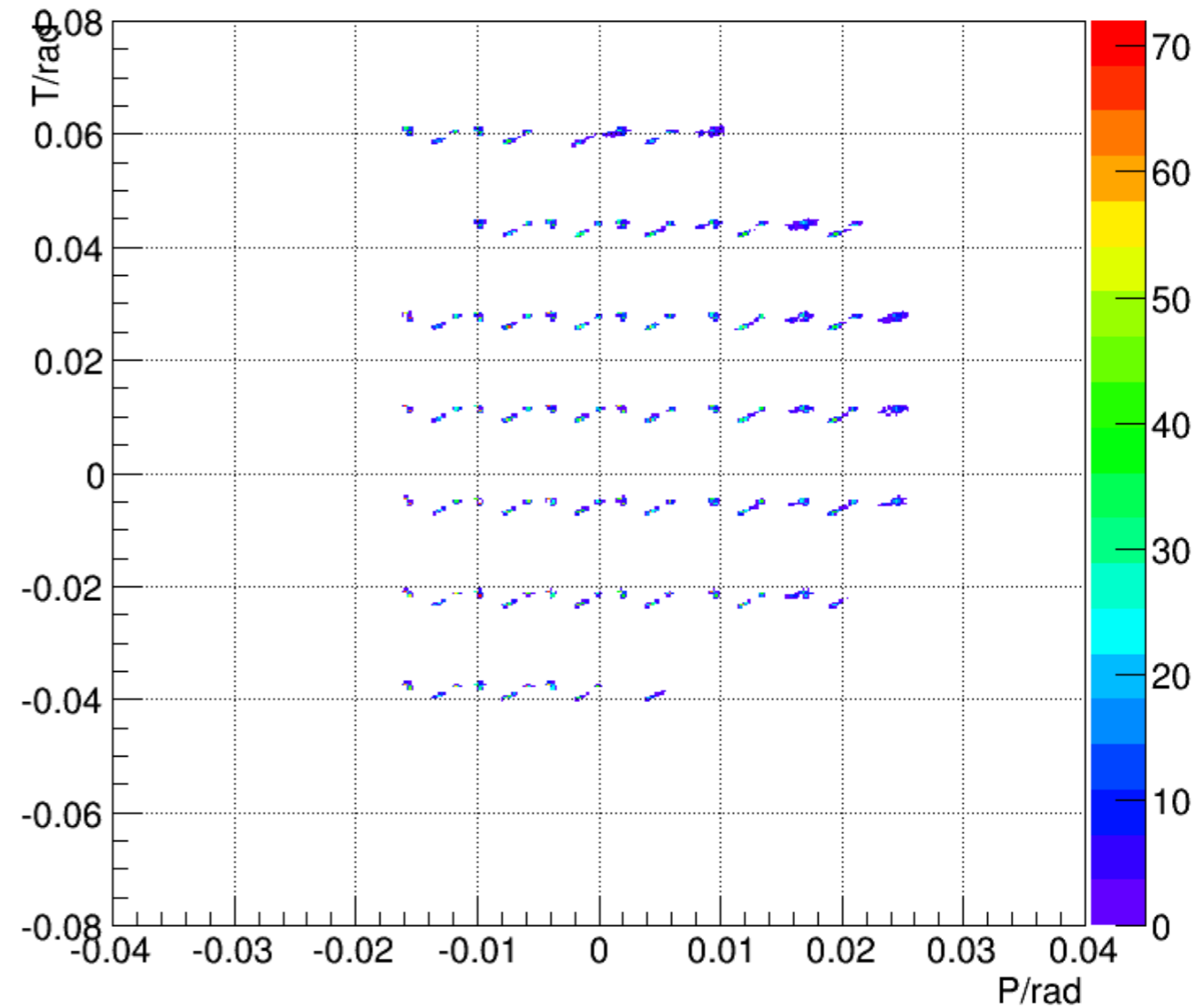
# Calibration

- Use an event by event simulation to calculate the effective theta and phi angle
- Central hole has a small offset of the phi angle

BPM Y vs X

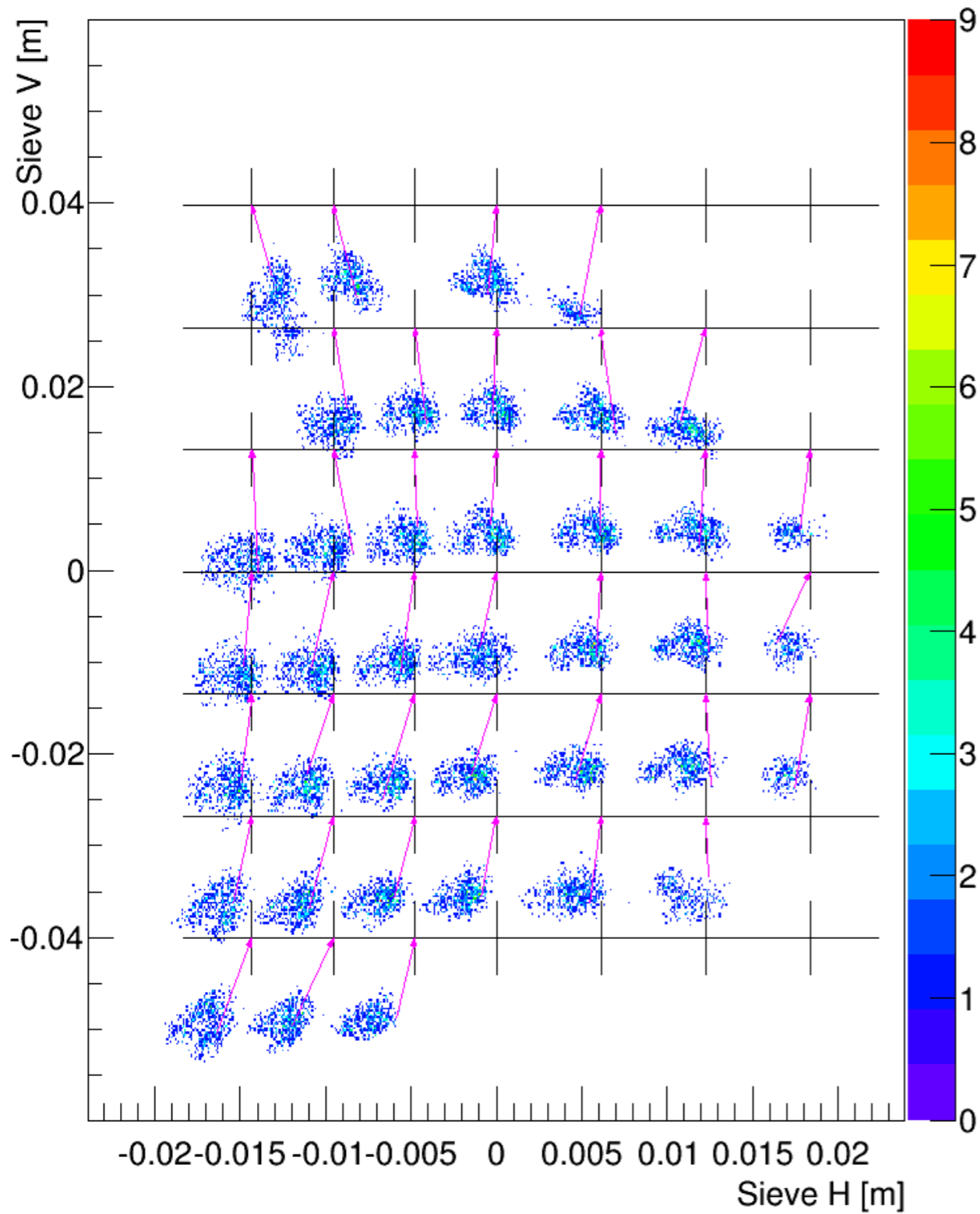


Effective Angle

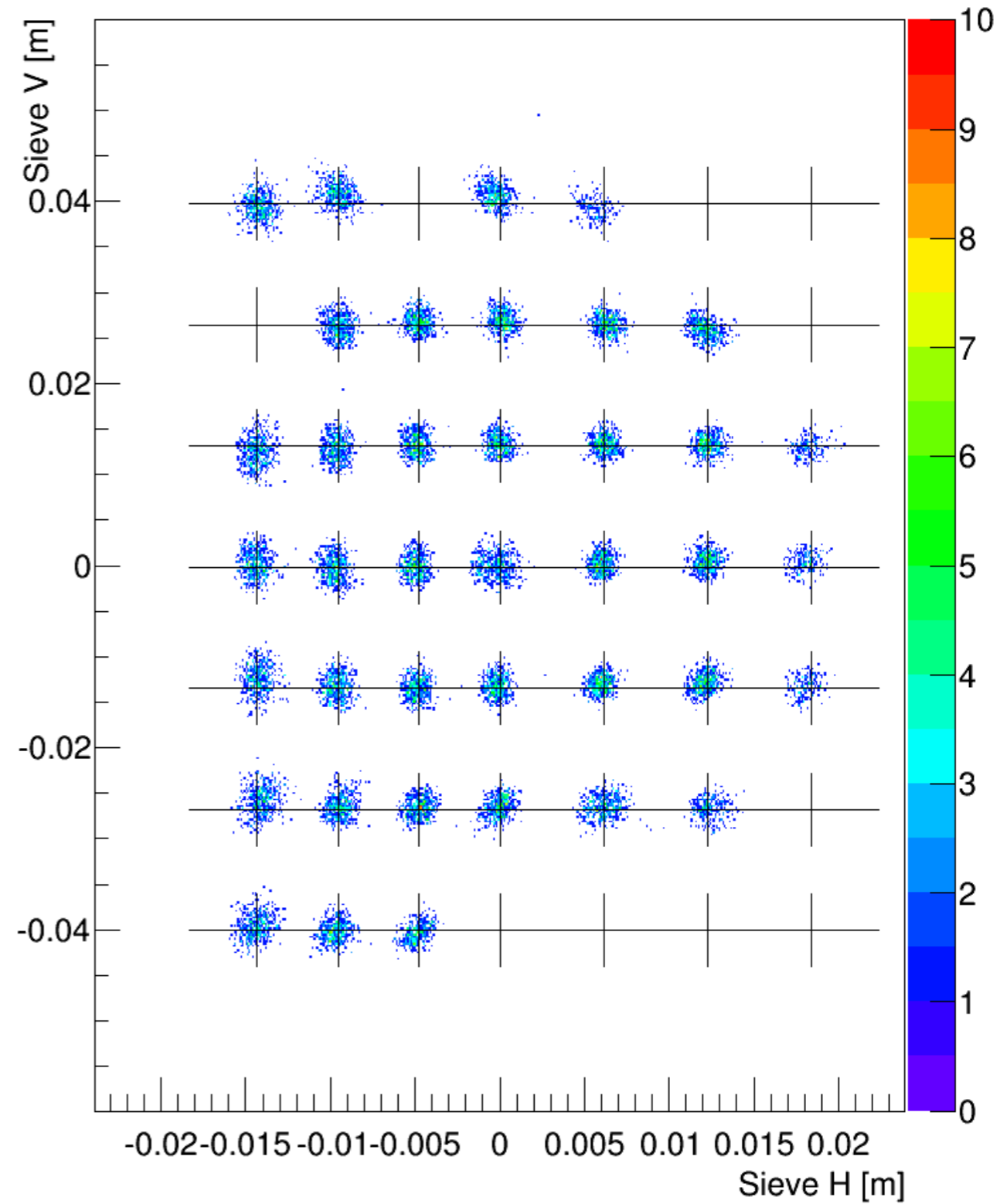


# Calibration

Before Calibration

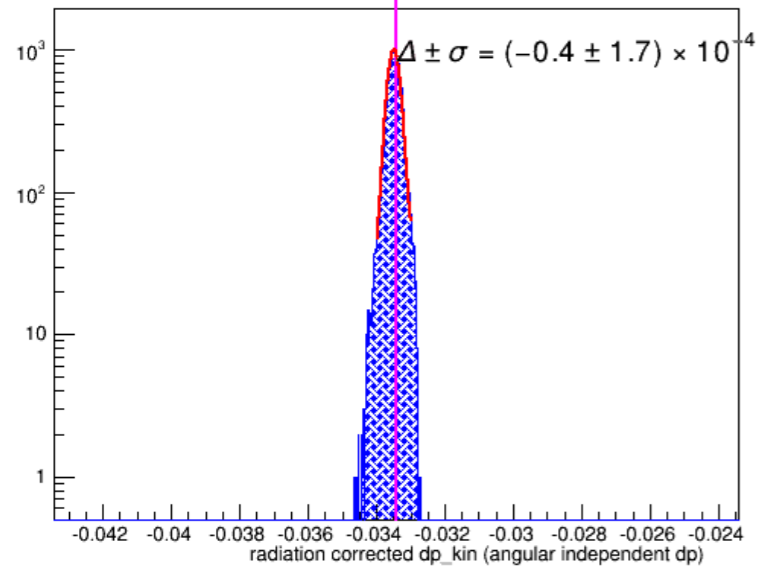


After Calibration

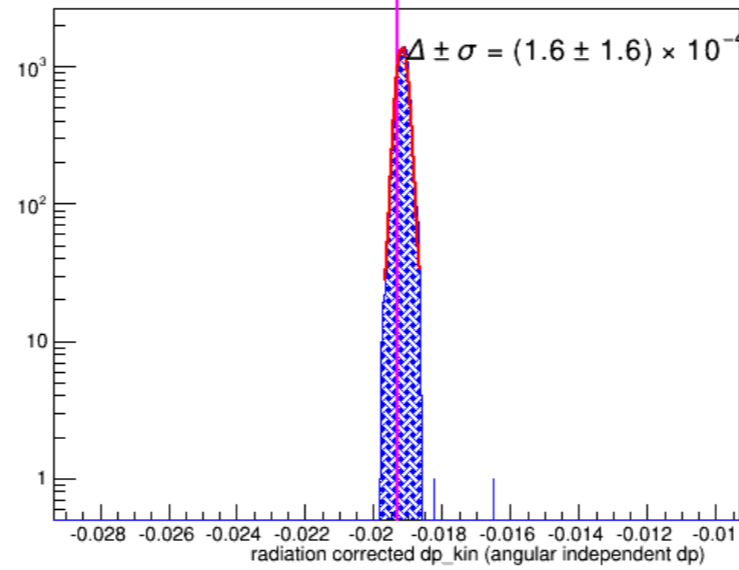


# Calibration

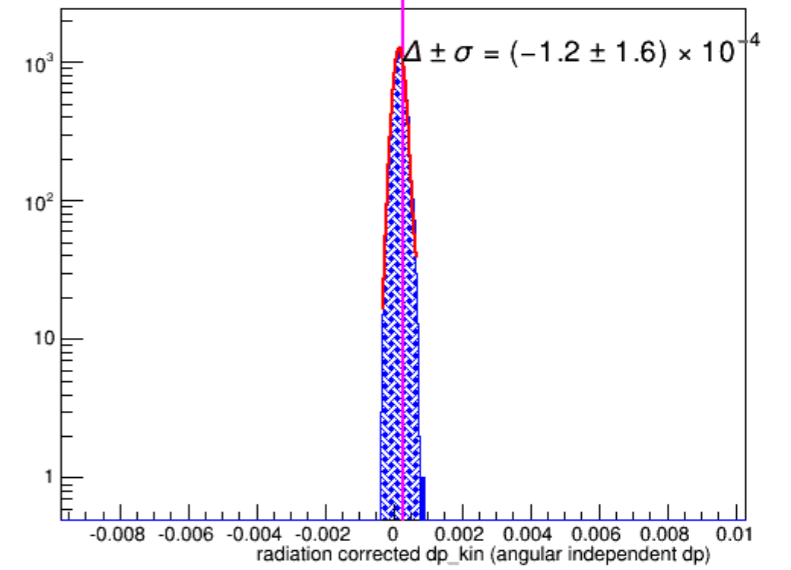
-3%



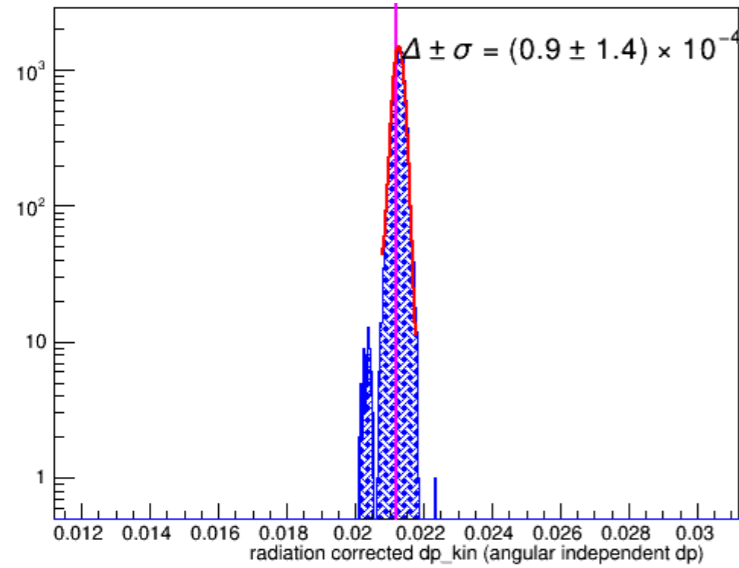
-2%



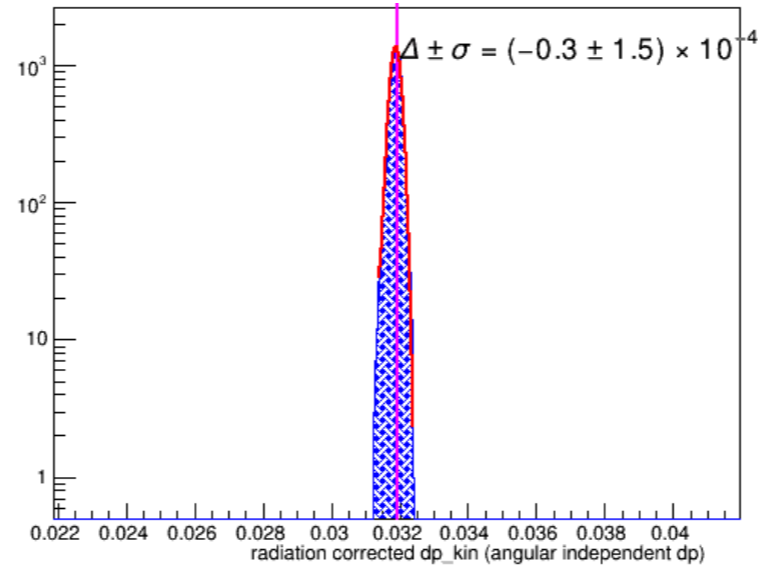
0%



2%



3%



# 1st Order Matrix

- Compare the 1st order matrix between 2 situations: with and without target field:

$$\theta_{tg} = T_{0000} + T_{1000} x + T_{0100} \theta + T_{0010} y + T_{0001} \varphi$$

$$\varphi_{tg} = P_{0000} + P_{1000} x + P_{0100} \theta + P_{0010} y + P_{0001} \varphi$$

Septum	Field	T0000	T1000	T0100	T0010	T0001
484816	0T	1.868E-03	2.007E-02	-2.756E+00	-2.443E-01	4.421E-01
484816	2.5T	6.507E-03	2.697E-02	-2.759E+00	-3.013E-01	5.954E-01
400016	L	7.322E-03	2.198E-02	-2.747E+00	-4.091E-01	3.172E-01
400016	2.5T	8.343E-03	3.970E-02	-2.694E+00	9.870E-02	8.813E-02
		P0000	P1000	P0100	P0010	P0001
484816	0T	-6.095E-04	5.408E-03	-2.096E-03	-6.777E-01	3.508E-01
484816	2.5T	9.791E-04	2.412E-03	4.762E-02	-6.882E-01	3.463E-01
400016	L	-4.322E-03	1.389E-02	1.861E-01	-7.073E-01	3.832E-01
400016	2.5T	-7.575E-03	1.985E-02	2.284E-01	-7.075E-01	3.869E-01



# Calibration

- The x beam position (vertical) difference may cause the offset of theta angle
  - x is not reconstructed, and is assumed to be 0 during the reconstruction
  - Need a correction (extended target correction)
- The 1st order matrix of phi angle is different because of the septum changed
- TODO:
  - Right calibration
  - Use beam position scan data to calculate the extended target correction