
Charge diffusion model (again)

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Diffusion model

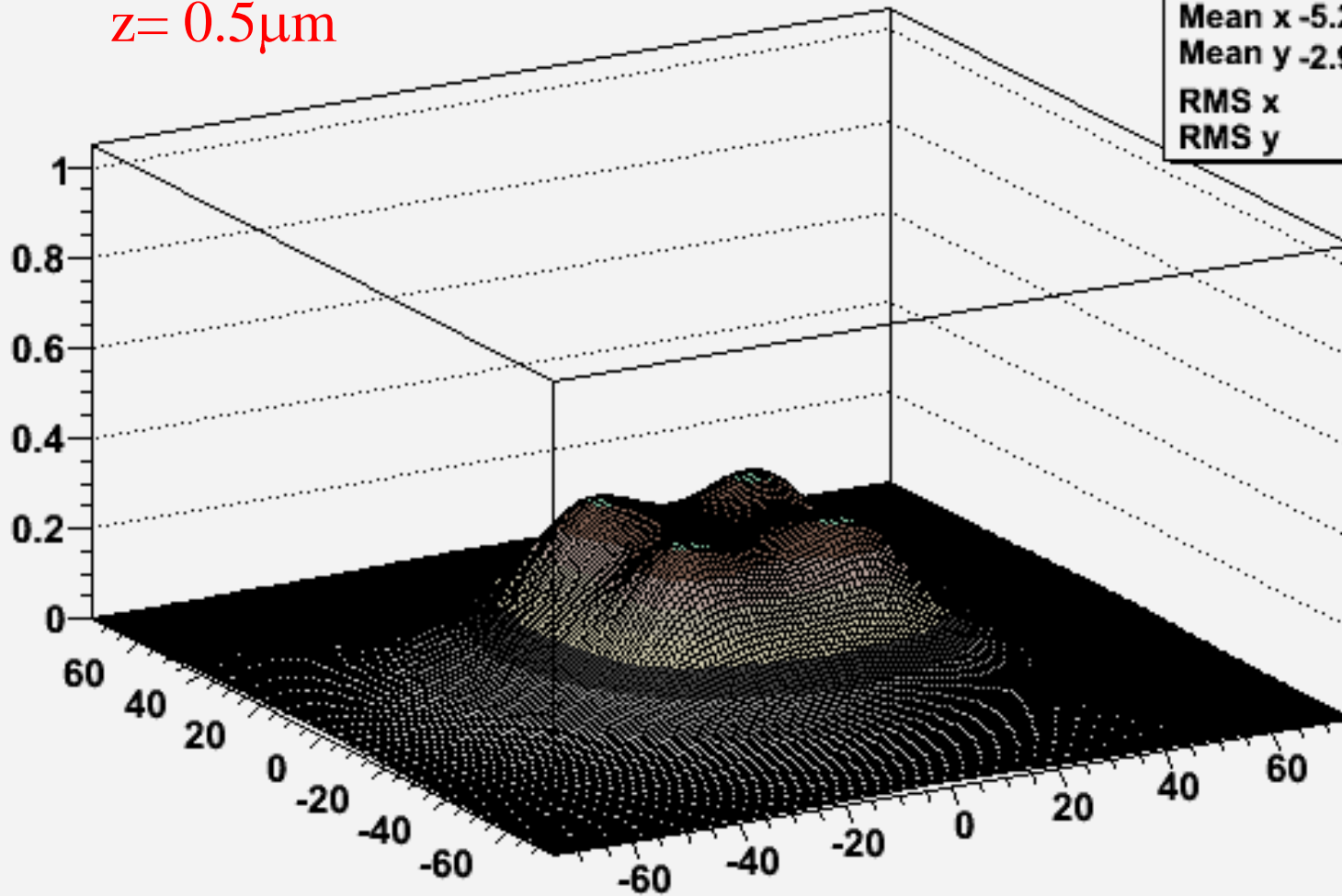
- Same model as described in last meeting (27/02/09)
 - Simple diffusion of charge to get spread between pixels
 - Tuned to agree with Giulio's GDS results at centre of pixel
- Previously, had generated two sets of data points for deep p-well
 - MIP-like, i.e. charge spread evenly throughout the epitaxial layer depth; this was done on a fine grid of $1 \times 1 \mu\text{m}^2$ steps in x and y
 - ^{55}Fe -like, i.e. Charge deposited at a single point in depth; this was done for steps of $1 \mu\text{m}$ in depth but coarser steps of $5 \times 5 \mu\text{m}^2$ steps in x and y
- Since then, did the mega-run; $1 \times 1 \times 1 \mu\text{m}^3$ steps in x, y and z
 - 3900 separate diffusion runs
 - Use translation and reflection symmetry to give full 30000 points
 - Gives detailed response to ^{55}Fe and can be averaged in z to give original MIP-like response

Depth dependence

AMM plot Z 0

$z = 0.5 \mu\text{m}$

zAmm0	
Entries	22500
Mean x	-5.262e-16
Mean y	-2.988e-16
RMS x	26.6
RMS y	26.6

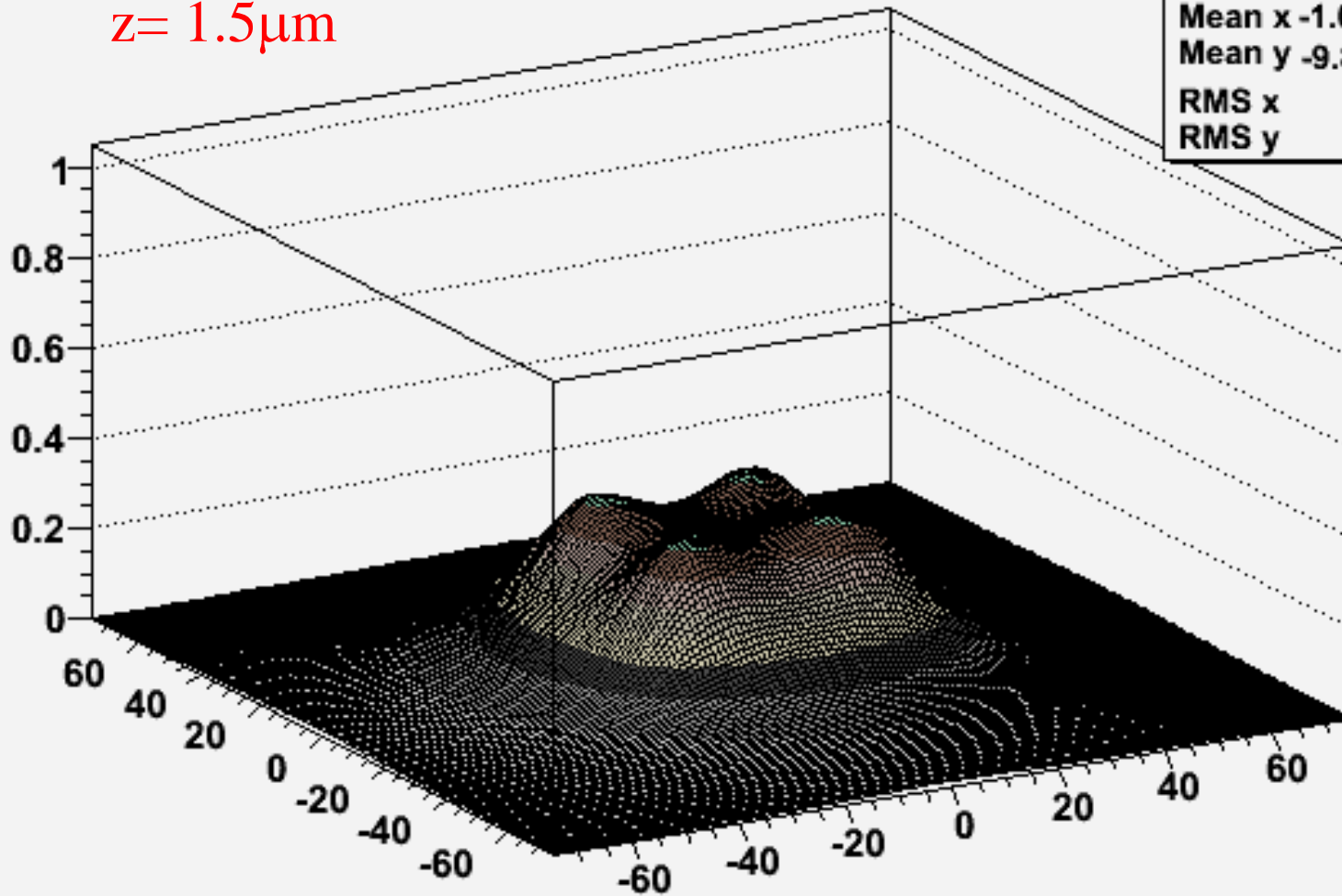


Depth dependence

AMM plot Z 1

$z = 1.5\mu\text{m}$

zAmm1	
Entries	22500
Mean x	-1.067e-15
Mean y	-9.816e-17
RMS x	26.57
RMS y	26.57

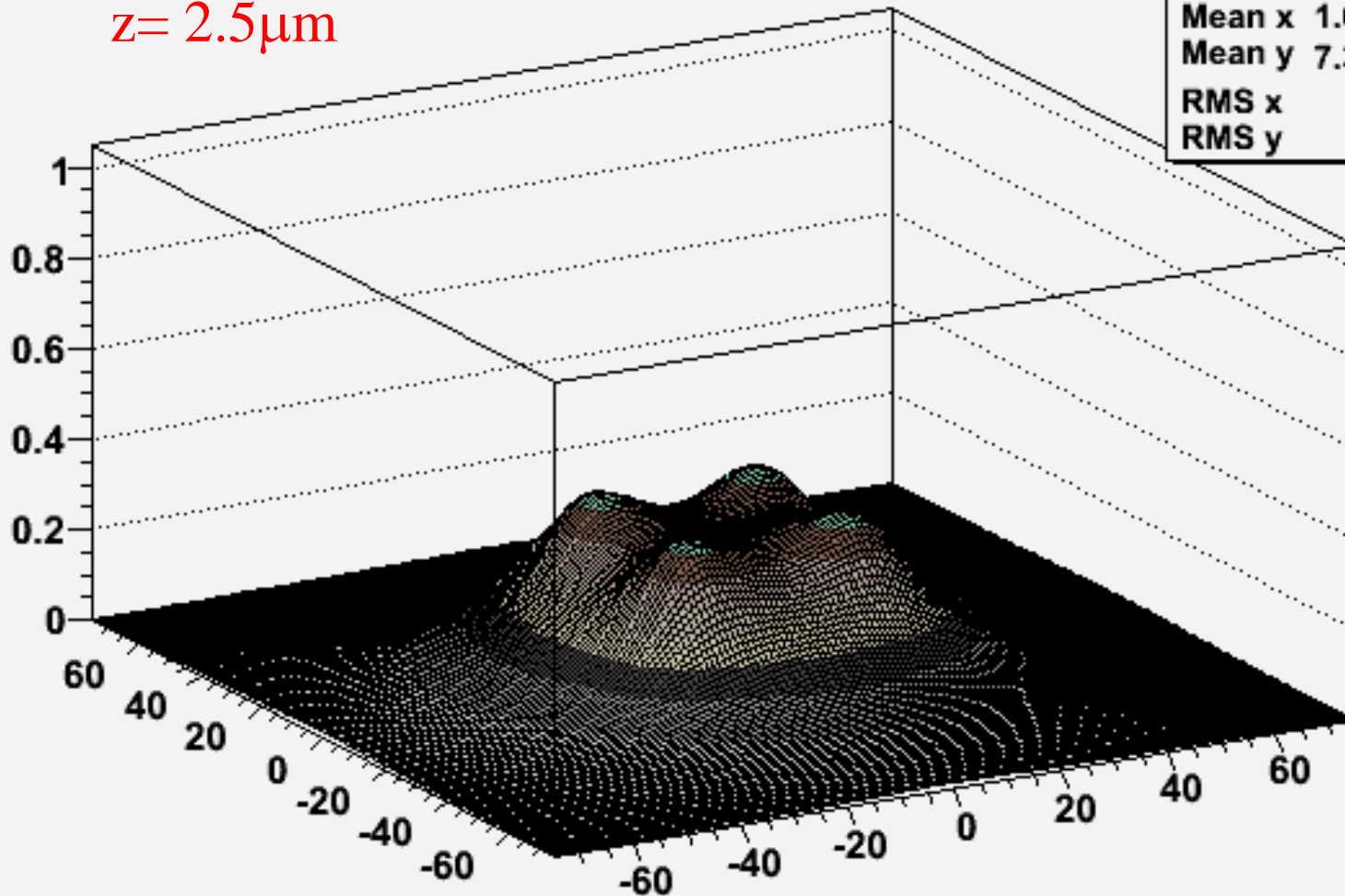


Depth dependence

AMM plot Z 2

$z = 2.5\mu\text{m}$

zAmm2	
Entries	22500
Mean x	1.666e-16
Mean y	7.305e-17
RMS x	26.51
RMS y	26.51

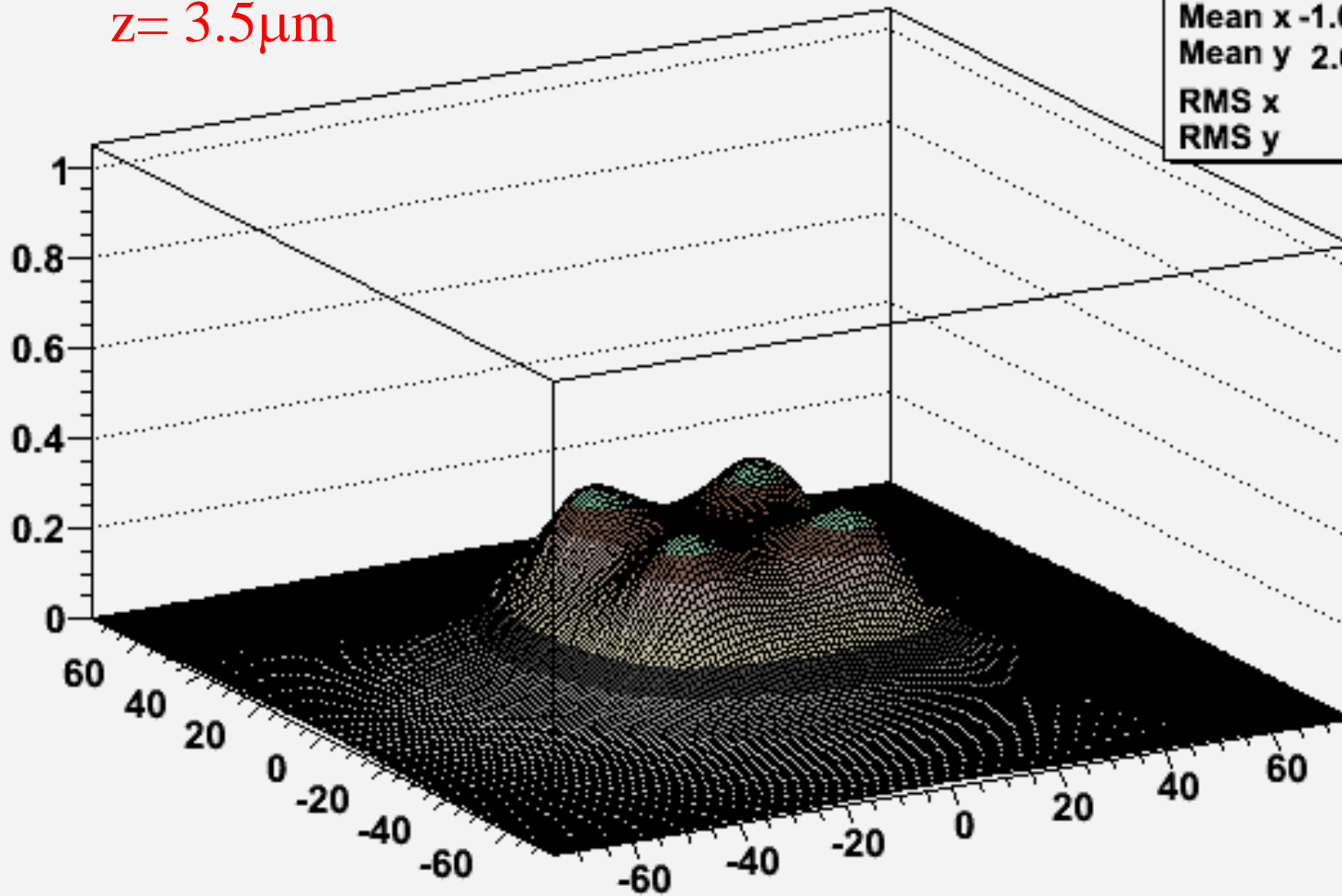


Depth dependence

AMM plot Z 3

$z = 3.5\mu\text{m}$

zAmm3	
Entries	22500
Mean x	-1.054e-15
Mean y	2.006e-17
RMS x	26.43
RMS y	26.43

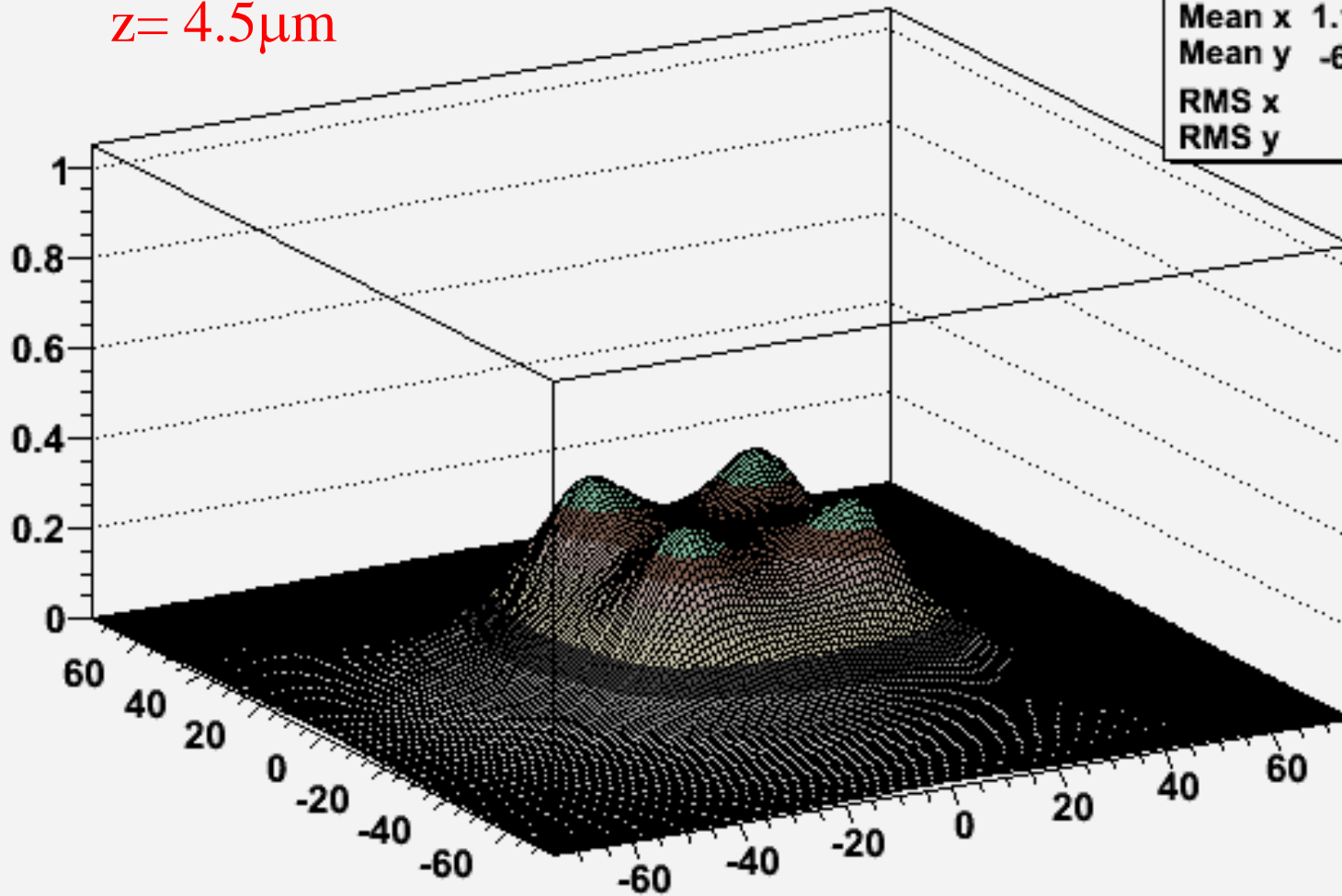


Depth dependence

AMM plot Z 4

$z = 4.5\mu\text{m}$

zAmm4	
Entries	22500
Mean x	1.166e-15
Mean y	-6.87e-17
RMS x	26.32
RMS y	26.32

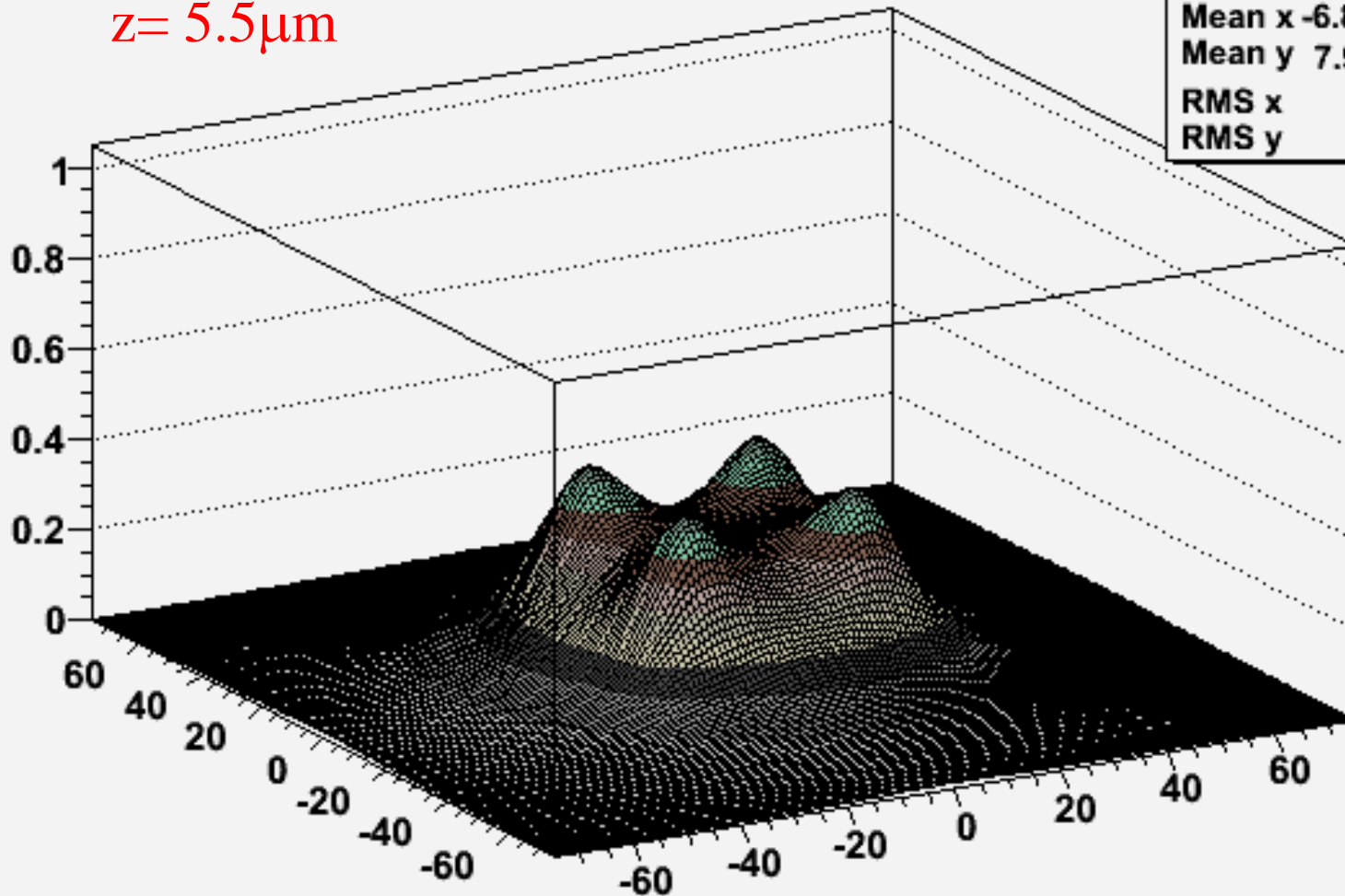


Depth dependence

AMM plot Z 5

$z = 5.5\mu\text{m}$

zAmm5	
Entries	22500
Mean x	-6.898e-16
Mean y	7.945e-17
RMS x	26.17
RMS y	26.17

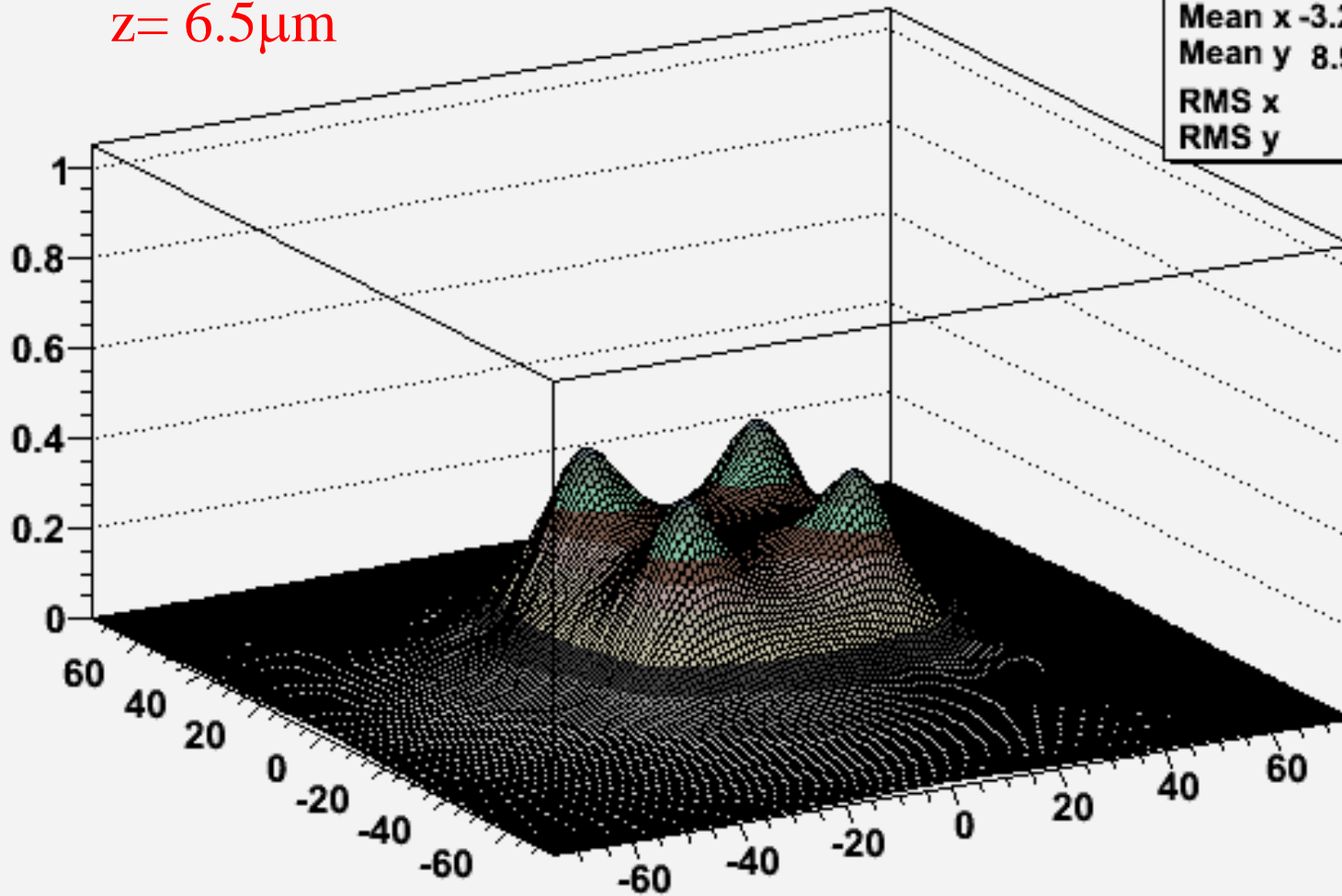


Depth dependence

AMM plot Z 6

$z = 6.5\mu\text{m}$

zAmm6	
Entries	22500
Mean x	-3.245e-16
Mean y	8.922e-17
RMS x	26
RMS y	26

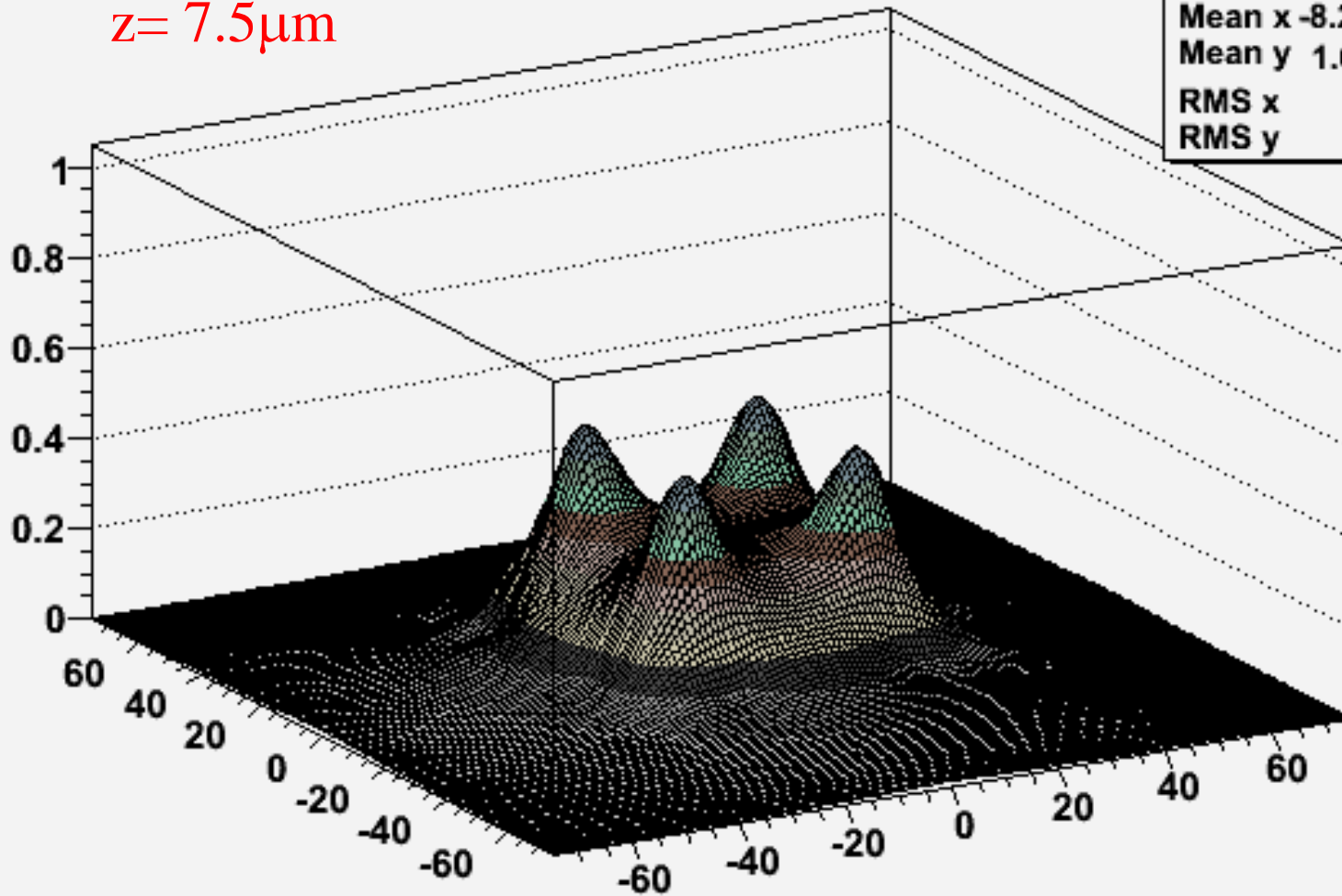


Depth dependence

AMM plot Z 7

$z = 7.5\mu\text{m}$

zAmm7	
Entries	22500
Mean x	-8.298e-16
Mean y	1.606e-16
RMS x	25.8
RMS y	25.8

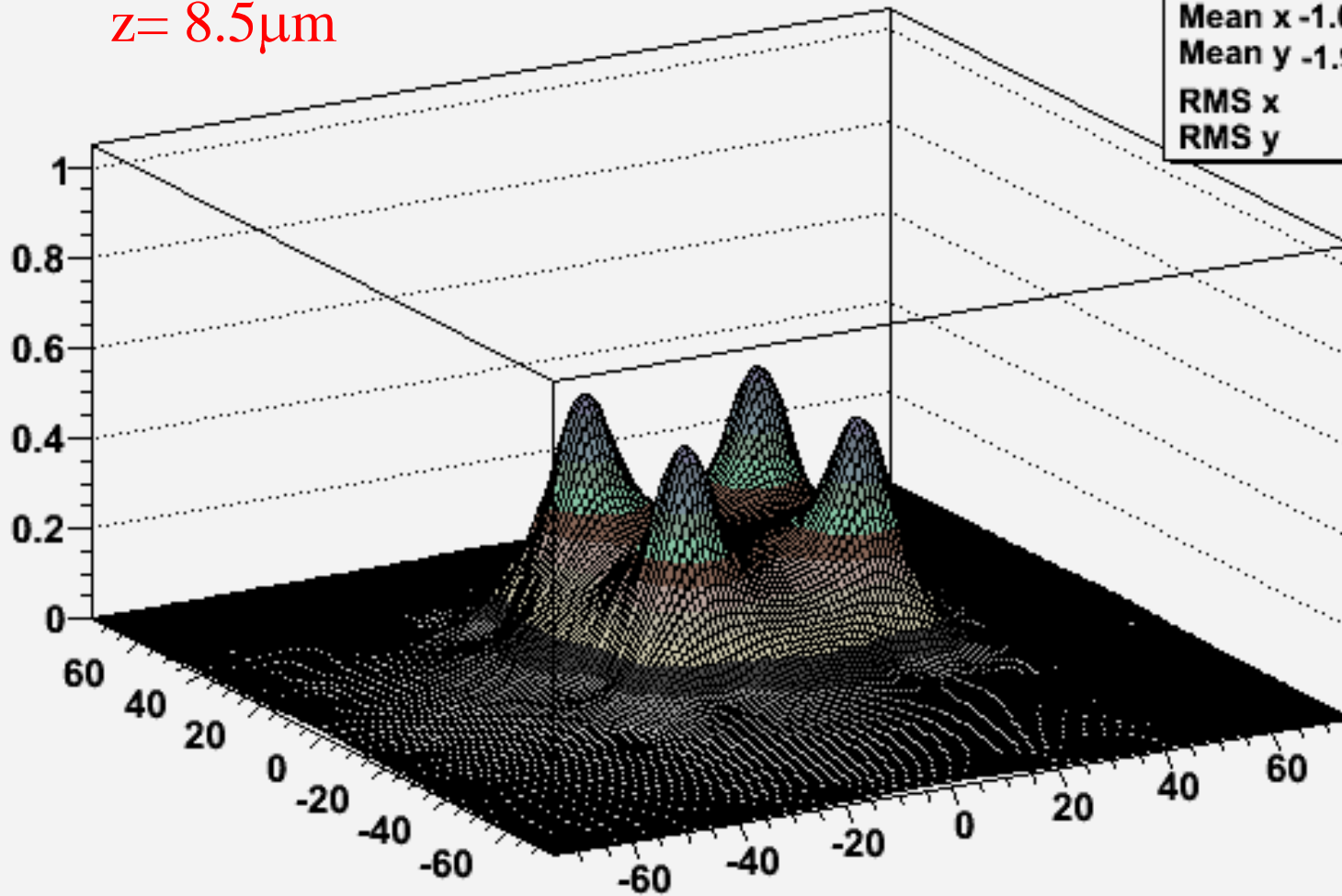


Depth dependence

AMM plot Z 8

$z = 8.5\mu\text{m}$

zAmm8	
Entries	22500
Mean x	-1.027e-15
Mean y	-1.965e-17
RMS x	25.57
RMS y	25.57

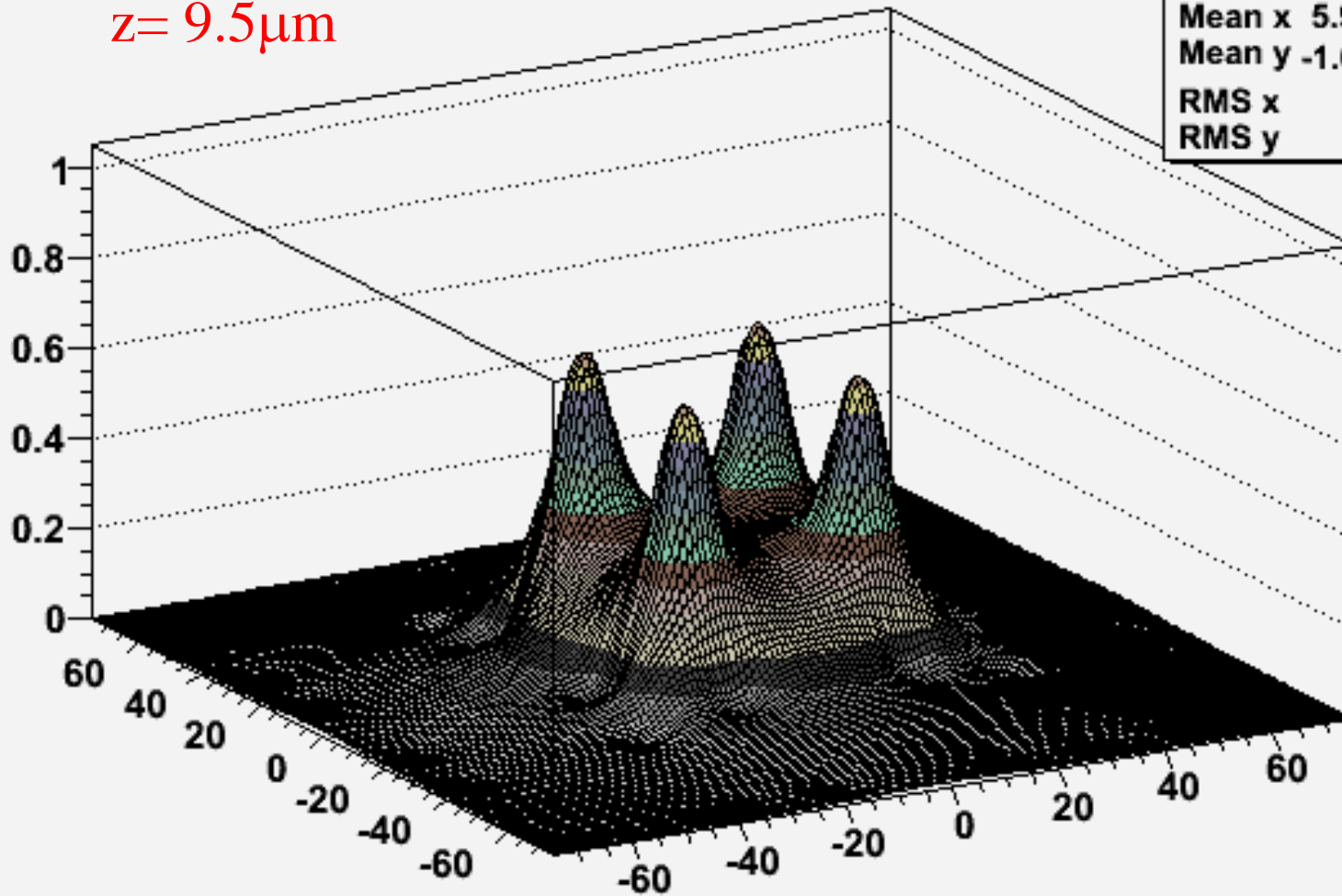


Depth dependence

AMM plot Z 9

$z = 9.5\mu\text{m}$

zAmm9	
Entries	22500
Mean x	5.996e-16
Mean y	-1.077e-17
RMS x	25.3
RMS y	25.3

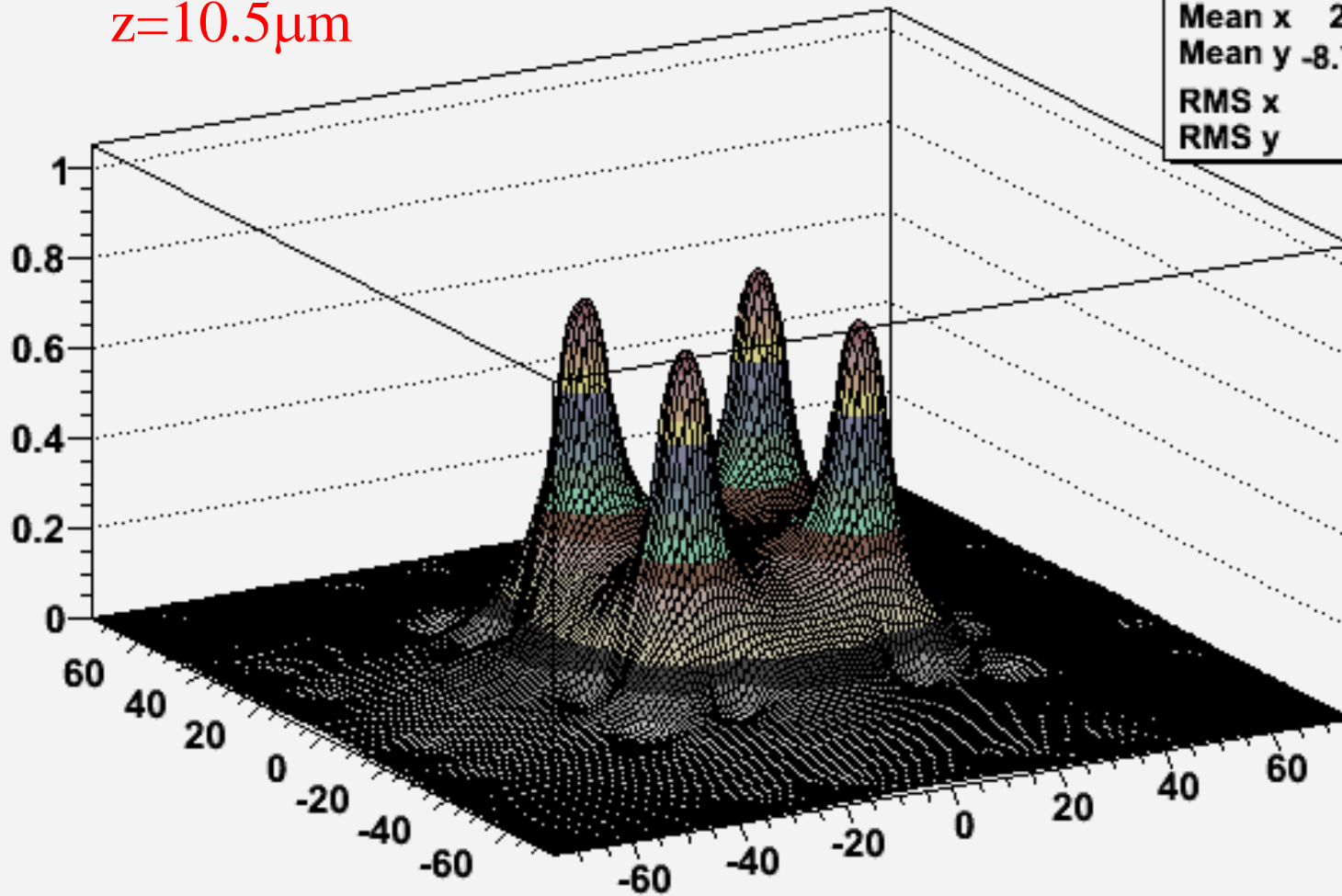


Depth dependence

AMM plot Z 10

$z=10.5\mu\text{m}$

zAmm10	
Entries	22500
Mean x	2.29e-16
Mean y	-8.775e-17
RMS x	25
RMS y	25

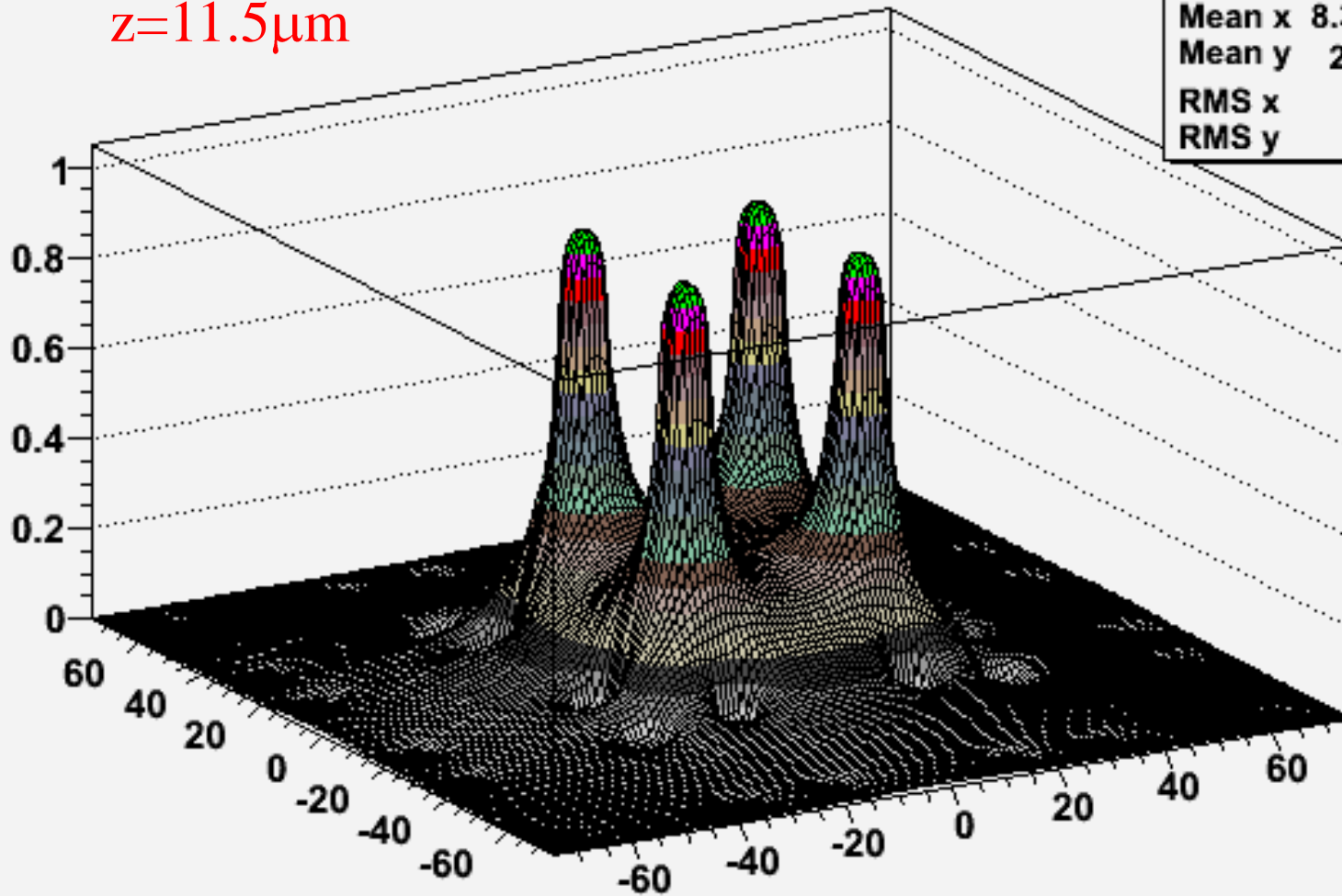


Depth dependence

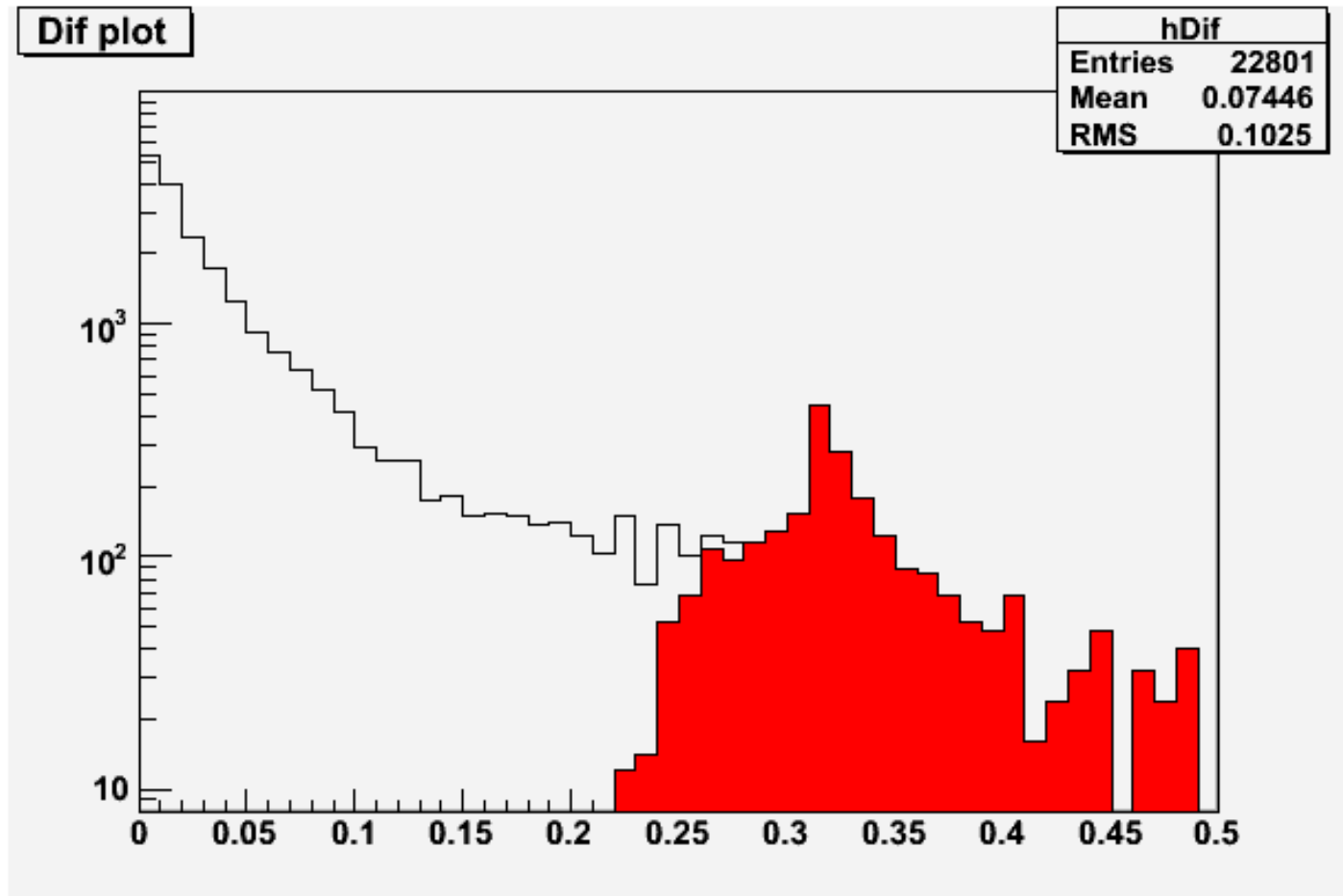
AMM plot Z 11

$z=11.5\mu\text{m}$

zAmm11	
Entries	22500
Mean x	8.399e-16
Mean y	2.95e-16
RMS x	24.67
RMS y	24.67

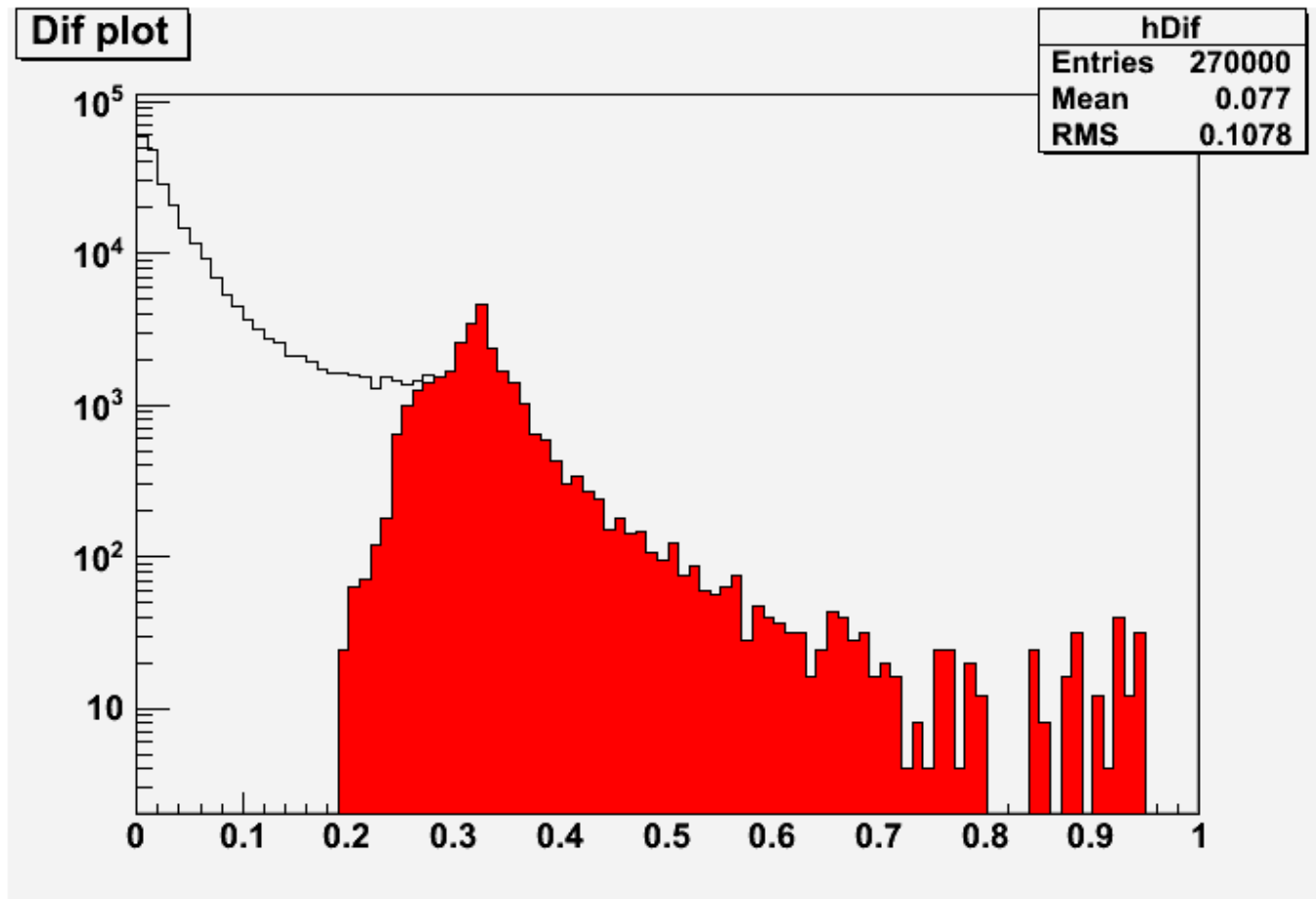


Fractional spectrum $1\mu\text{m}$ with MIP-like z



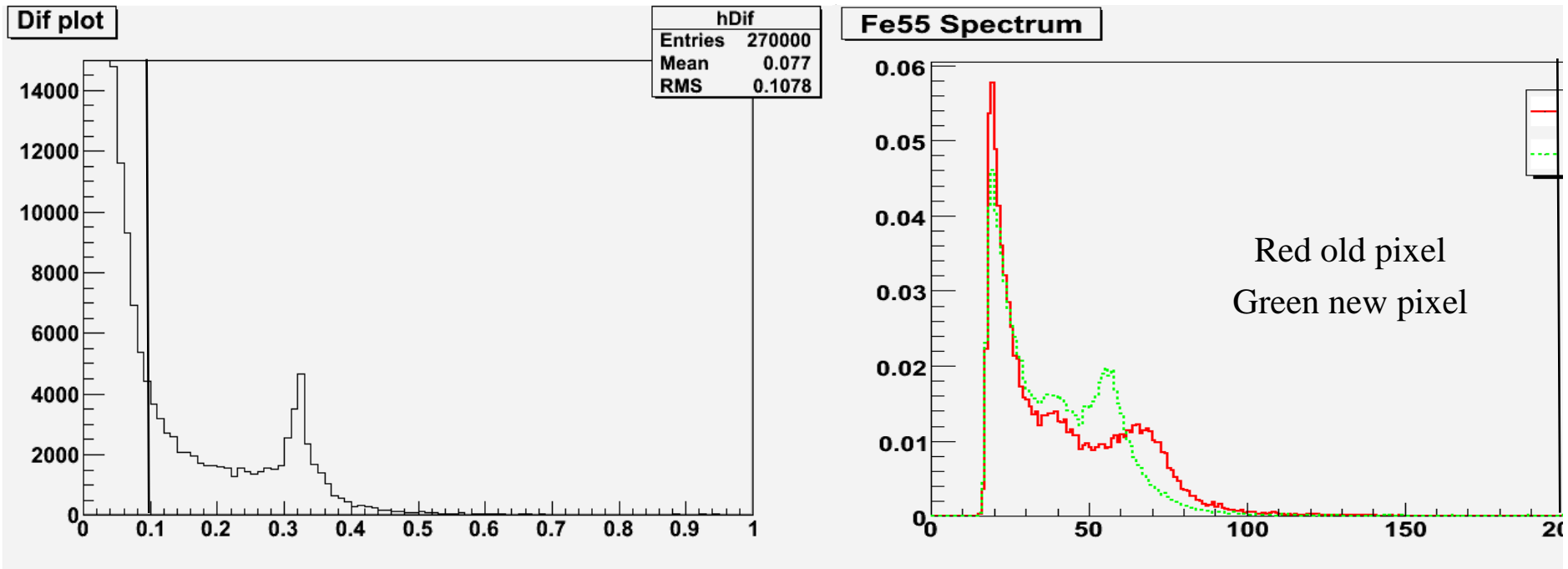
- White are all values in 3×3 pixel array
- Red are values in central pixel

Fractional spectrum $1\mu\text{m}$ with ^{55}Fe -like z



- Spectrum extends much higher now due to hits just below diodes
- Low peak still clearly visible; value of 31% fixed by matching Giulio's results
- Is there a high peak? If so, maybe at 95%? Model not accurate here...

Fractional spectrum ^{55}Fe -like z vs Marcel



- Line shows “guess” at 10% simulation threshold equivalent for comparison
- Stretch Marcel’s plot to only go to high peak position $\sim 200\text{mV}$
- Agreement in not good in detail but general shape is similar