THE UNIVERSITY OF WARWICK

LEBT beam data

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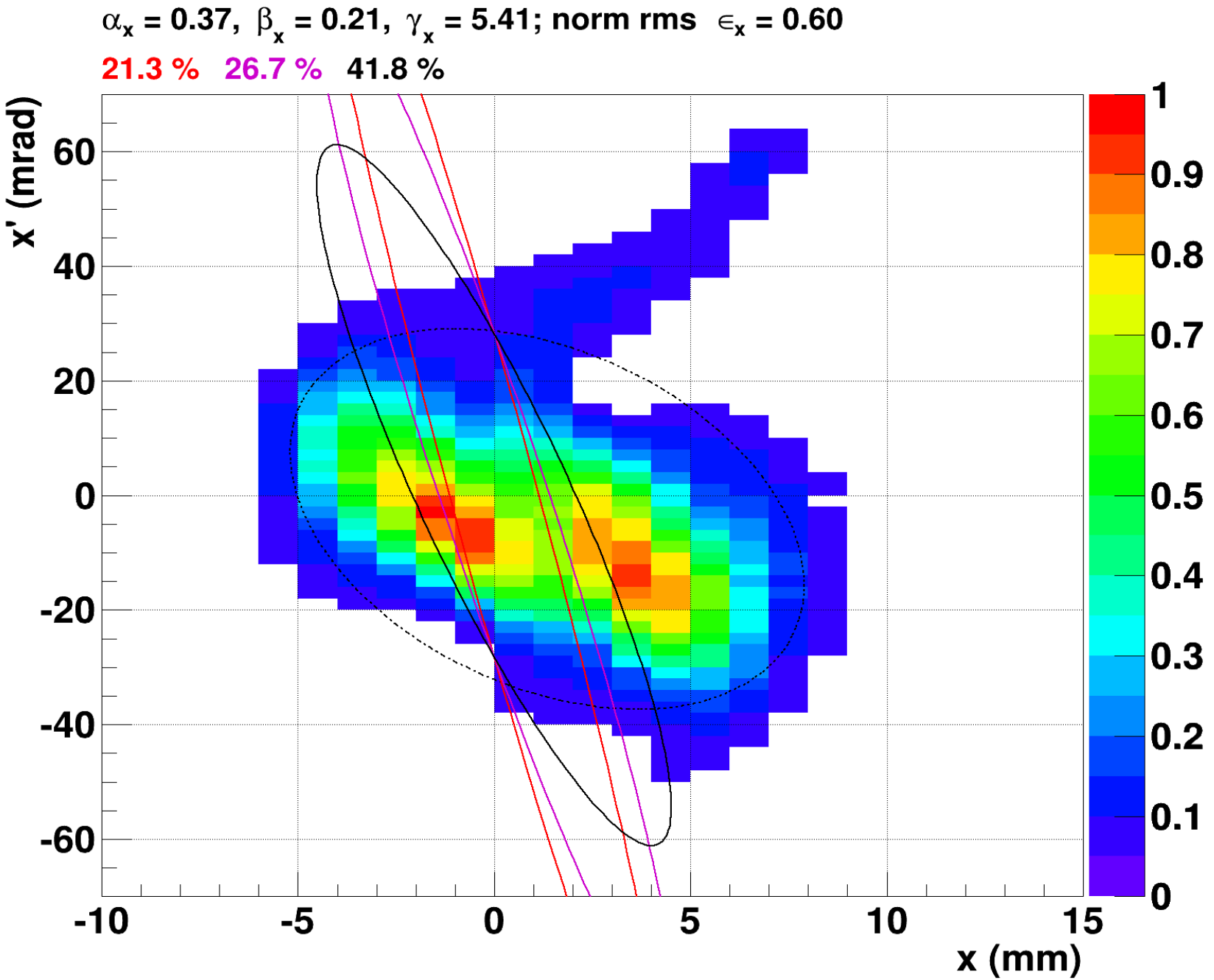
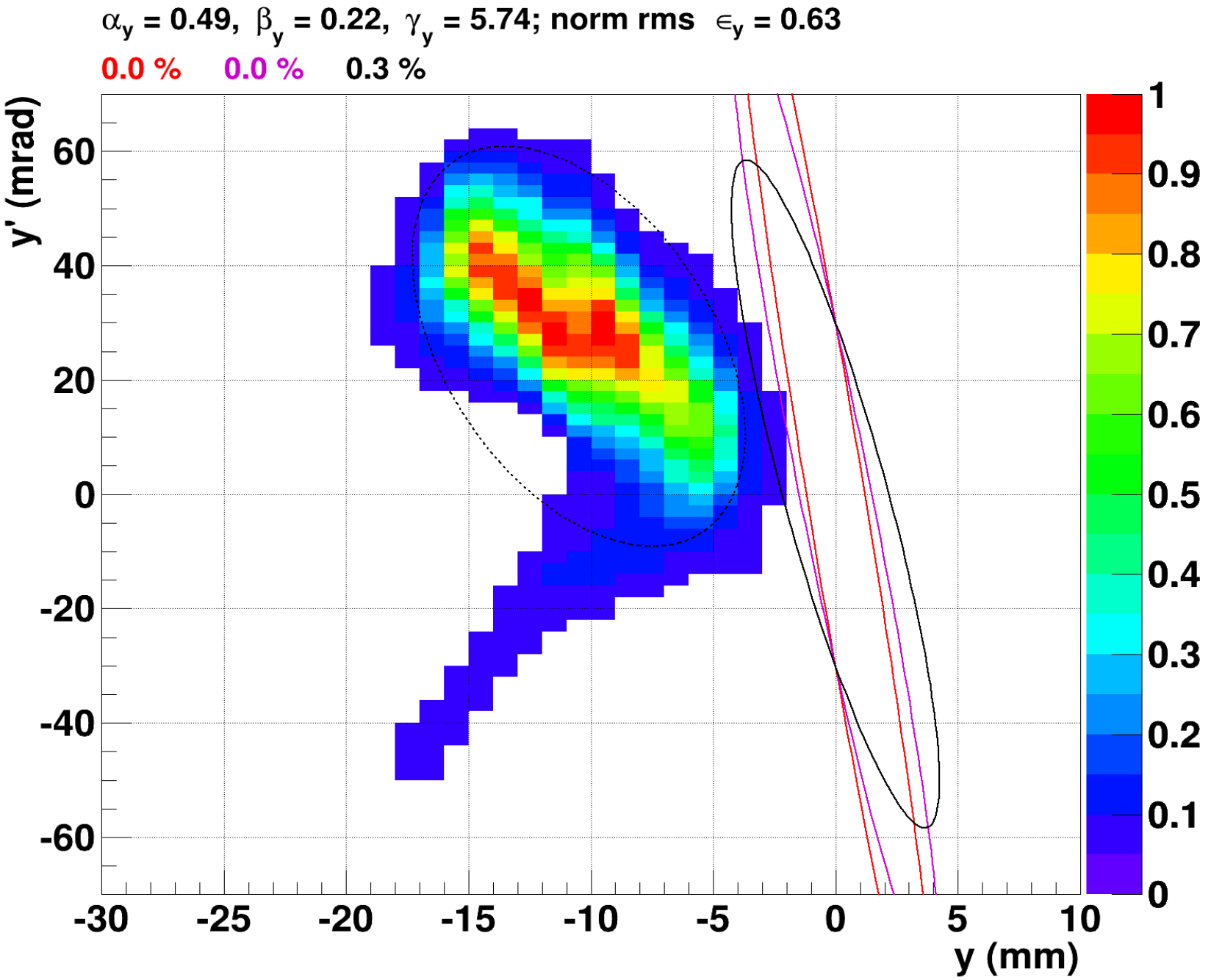
Introduction

- Plots of LEBT emittance scanner data for 65 keV beam
  - Data taking campaign over past few weeks by Christoph, Scott, Dan
- x-x' and y-y' profile scans at end of LEBT
  - Plot headings correspond to
    - Run number, Horiz then Vert scan, 3 solenoid currents (S1-S2-S3), PA settings
    - Data runs have fixed solenoid currents S1 = 130 A, S2 = 80 A
    - S3 (reversed current polarity) varied about -220 A: -140 to -245 A
  - Removed spurious “noise”; intensity threshold = 5% maximum intensity
  - Intensity weighted <xx>, <x x'>, <x' x'> $\Longrightarrow$ data Twiss 100% (dotted) ellipse
  - Measured rms emittance = 100% ellipse area/4
- Emittance scans compared to RFQ acceptance
  - Ideal, matched case (red ellipse)
  - Transmission ~90% case for $\gamma = 0.65\ \gamma_0$ (purple ellipse)
  - Transmission ~75% case for $\gamma = 0.30\ \gamma_0$ (black ellipse)
- Intensity fractions quoted within the RFQ acceptance (for the 3 cases)

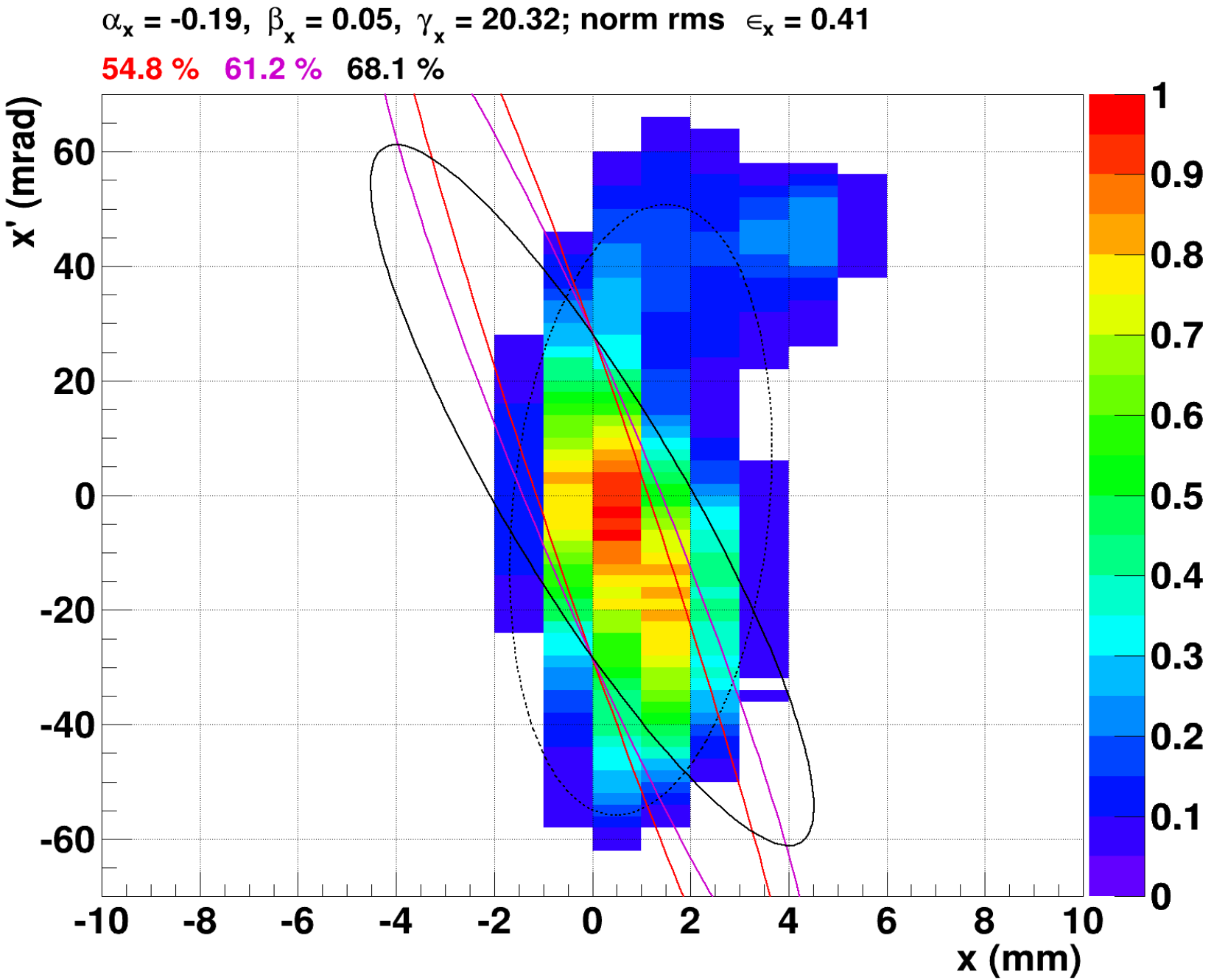
Run 638 H 130-080-220A; 13A, 21kV



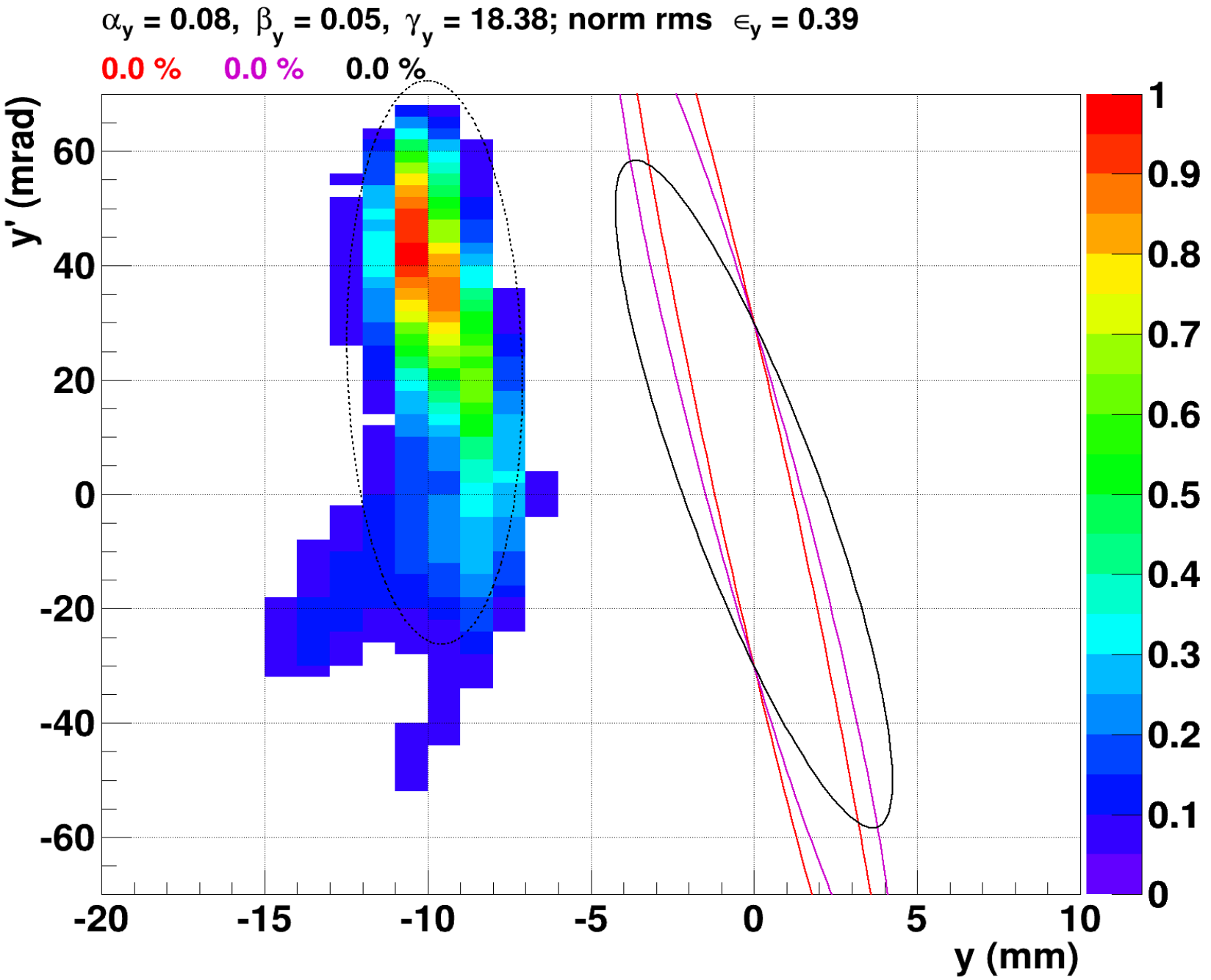
Run 639 V 130-080-220A; 13A, 21kV



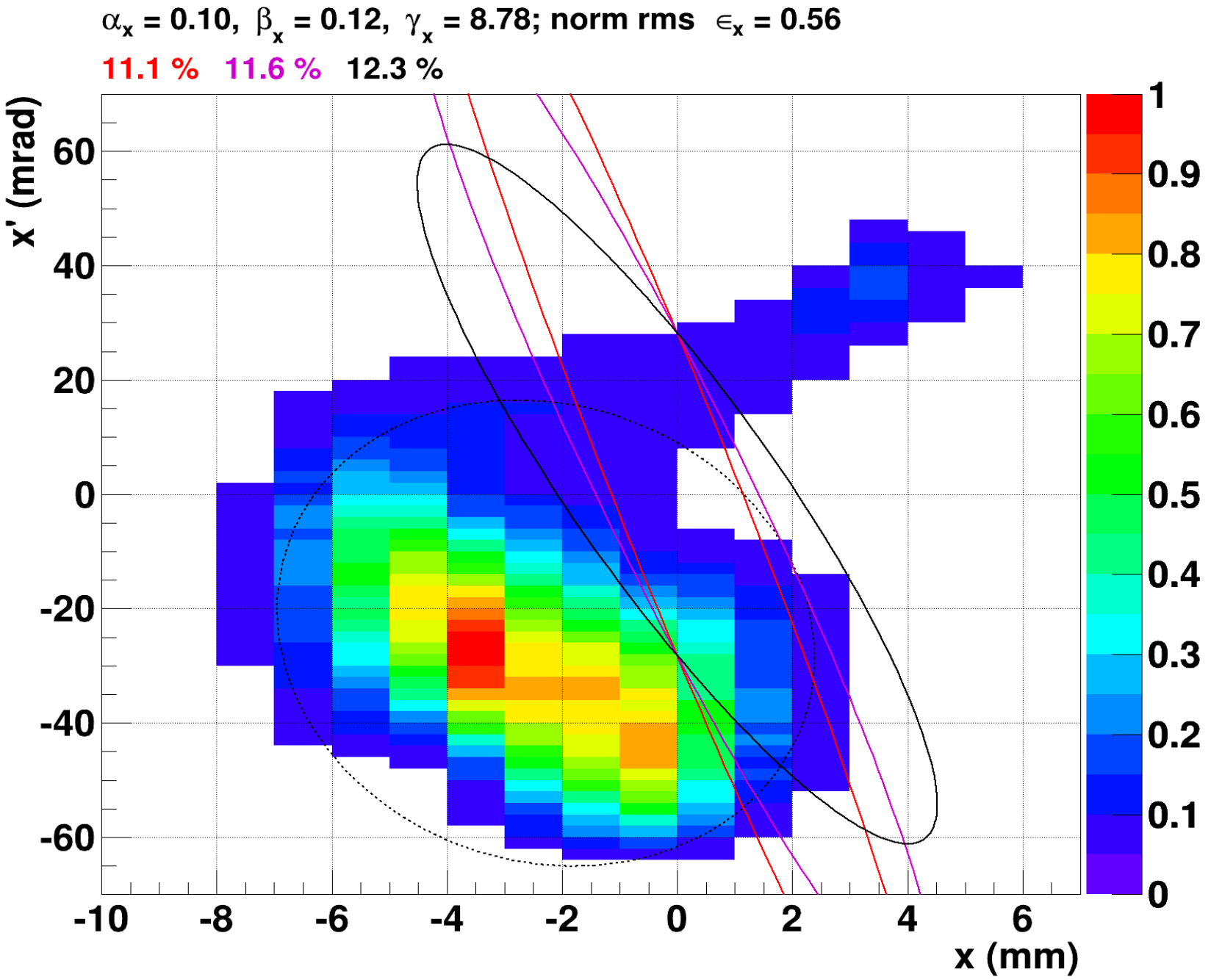
Run 641 H 130-080-220A; 11A, 18kV



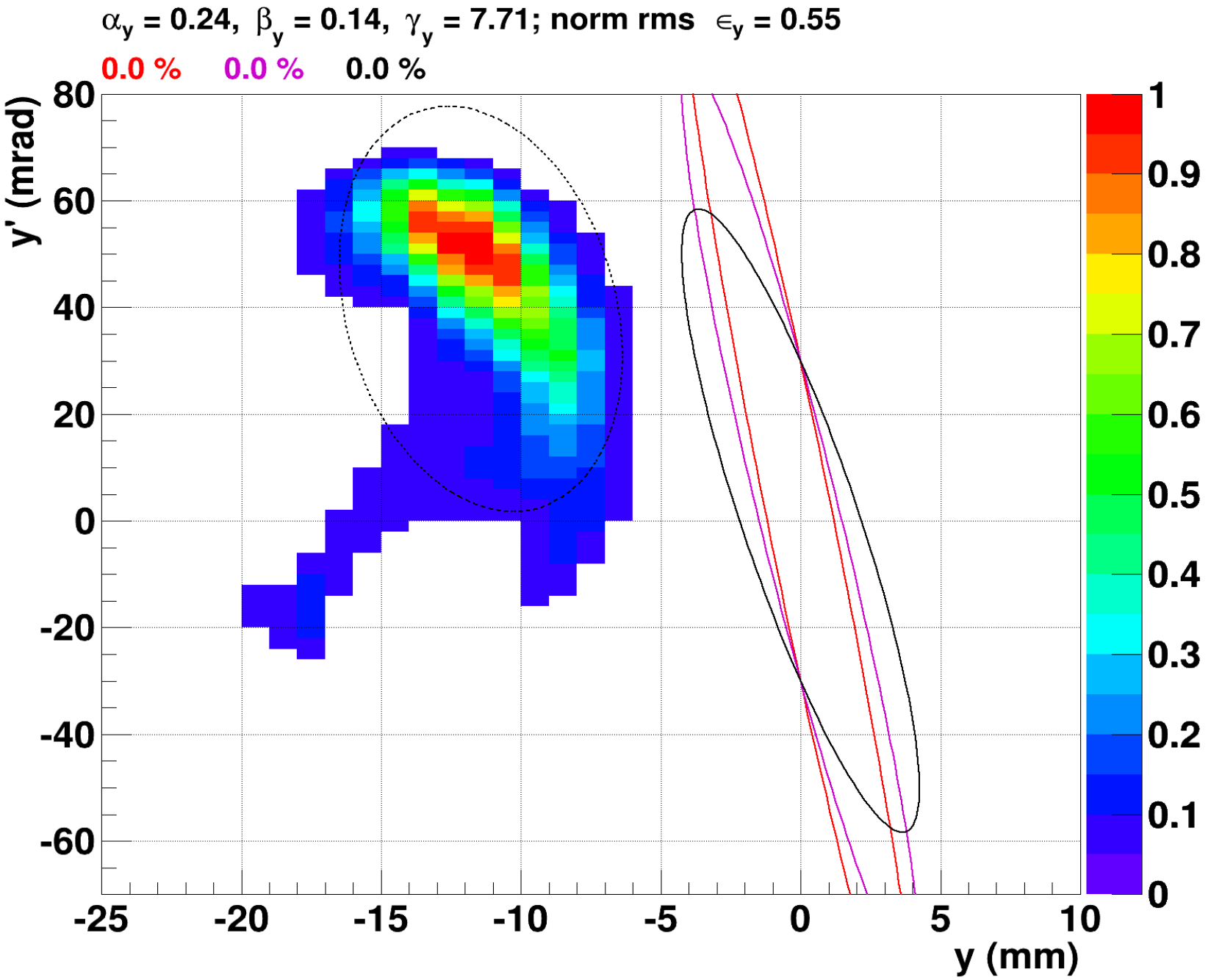
Run 640 V 130-080-220A; 11A, 18kV



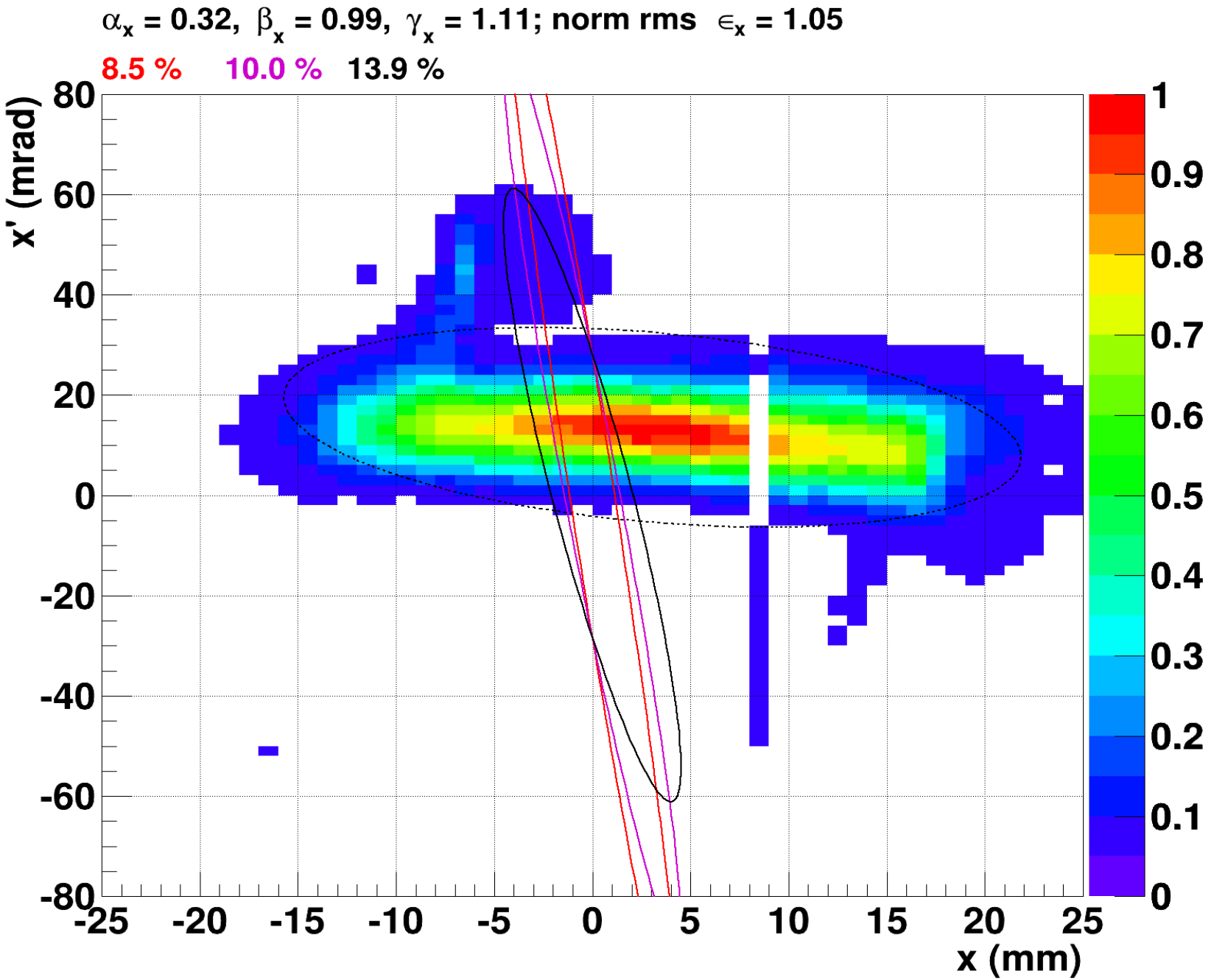
Run 642 H 130-080-220A; 15A, 22kV



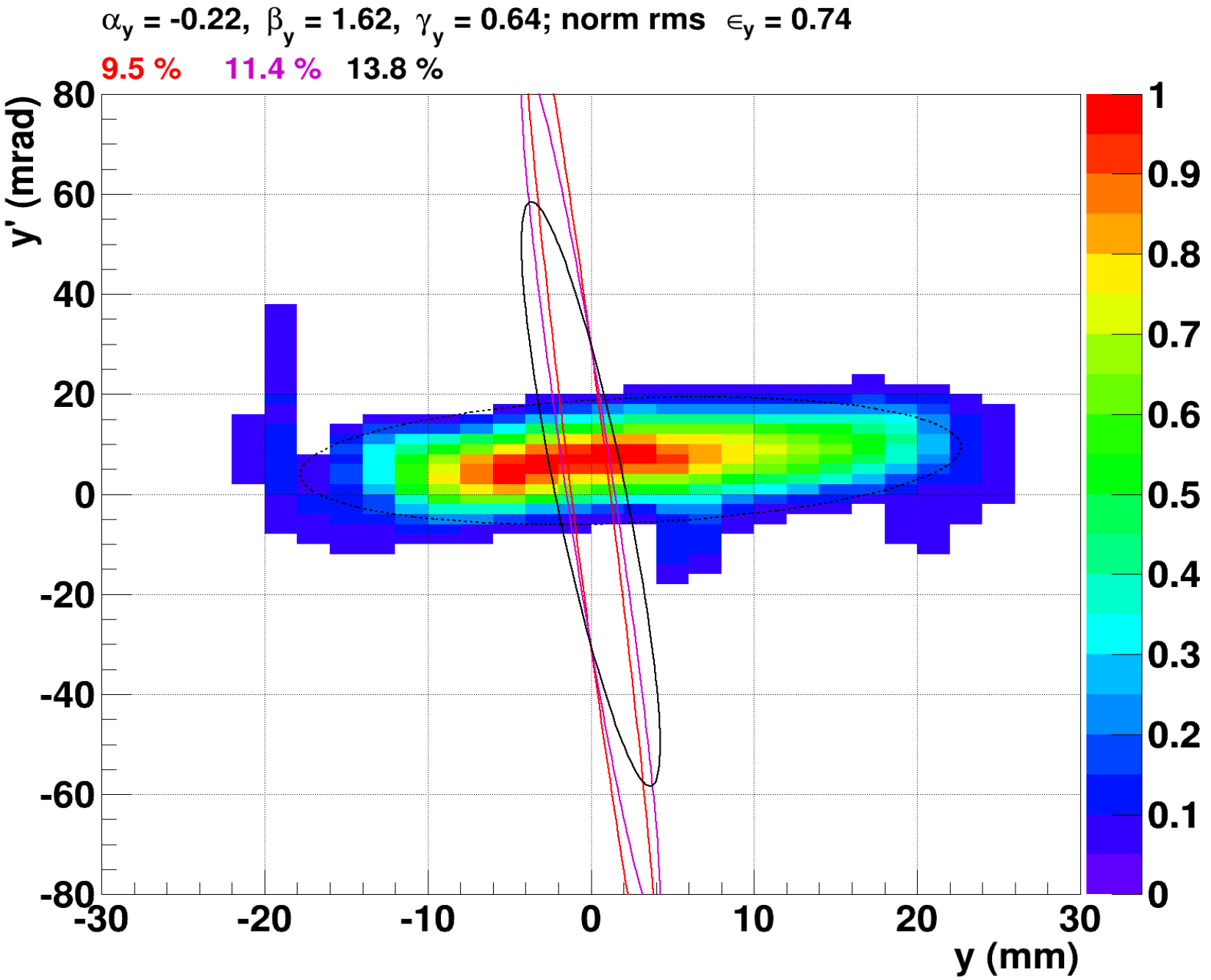
Run 643 V 130-080-220A; 15A, 22kV



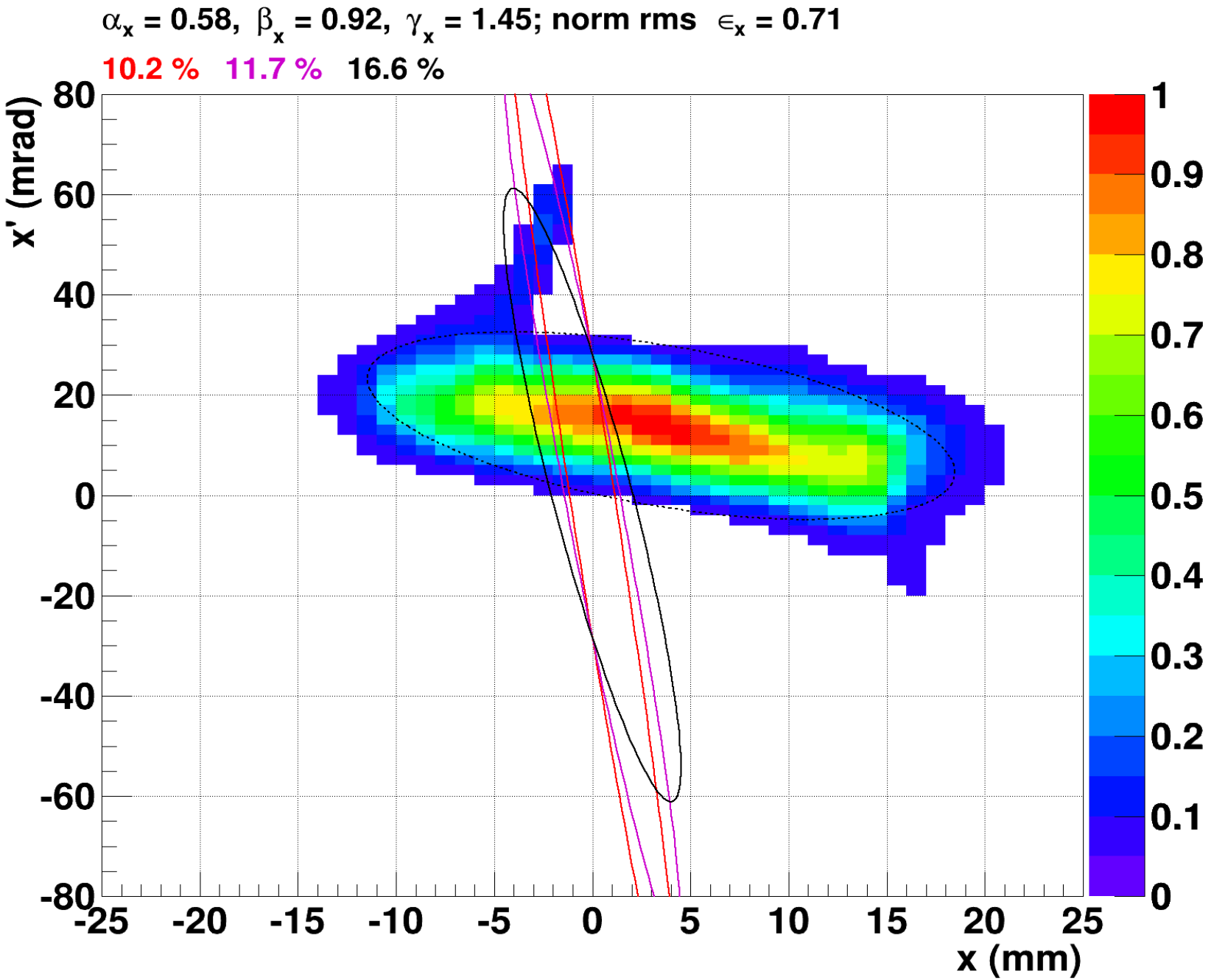
Run 687 H 130-080-140A; 11.5A, 21kV



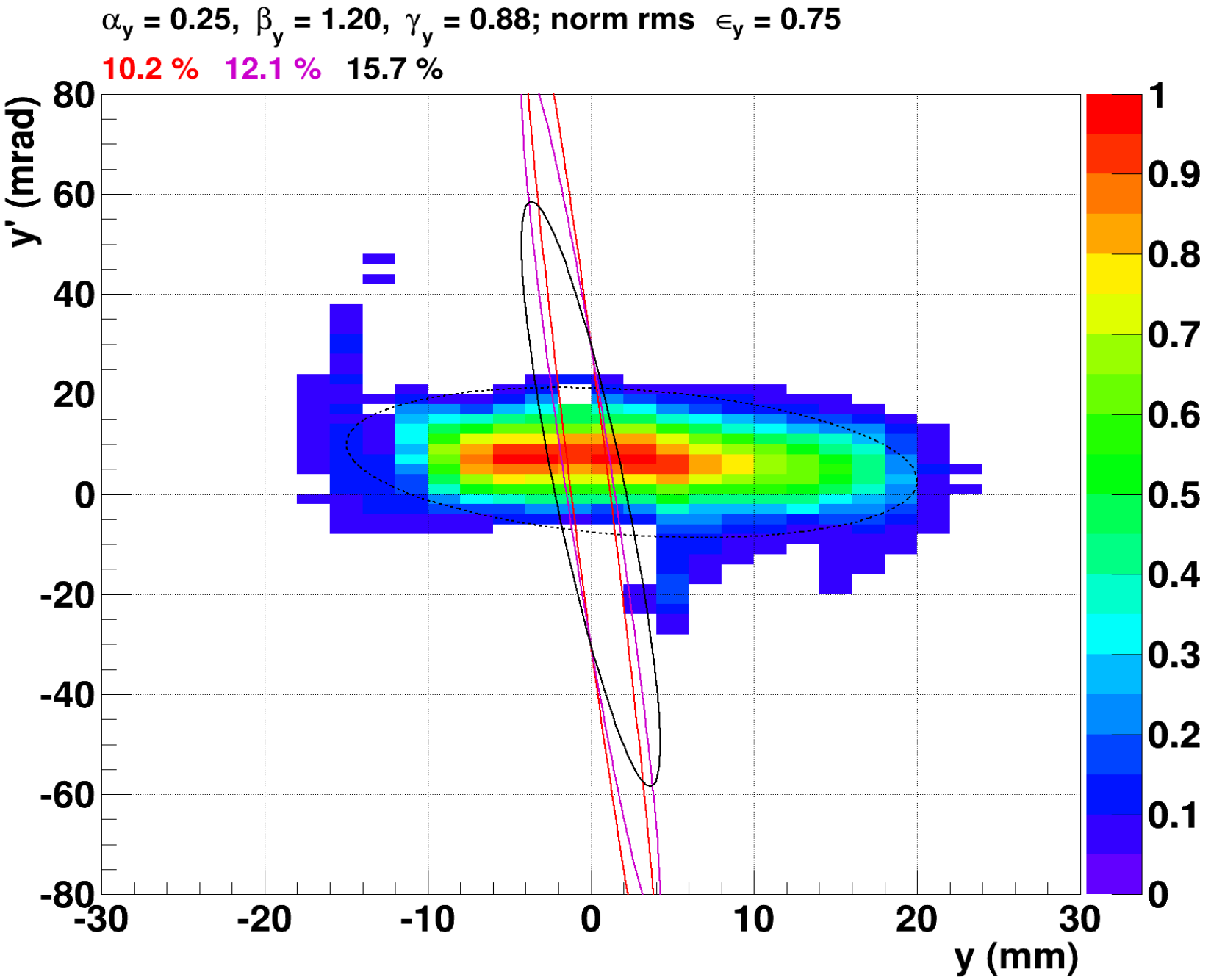
Run 664 V 130-080-140A; 11.5A, 21kV



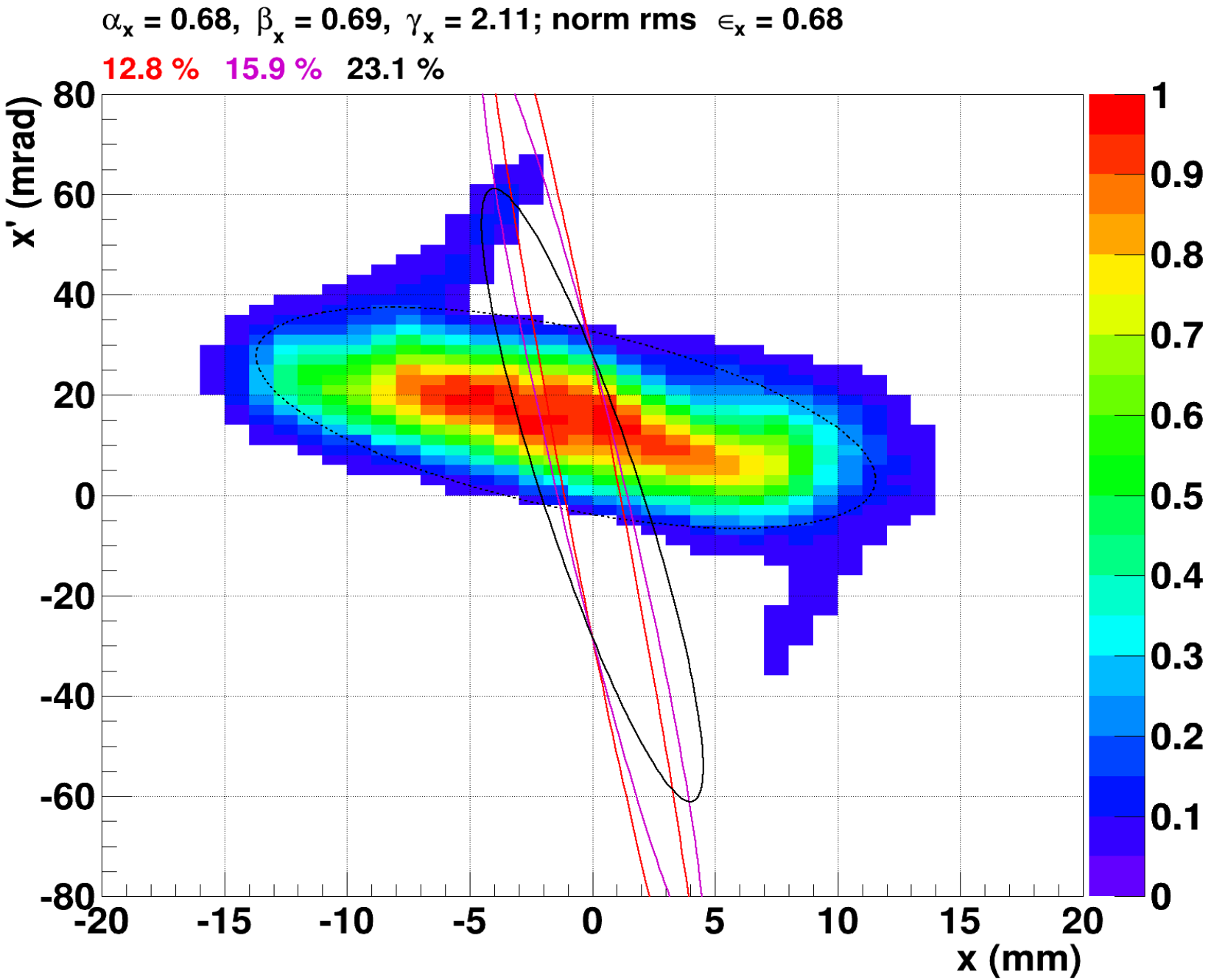
Run 686 H 130-080-160A; 11.5A, 21kV



Run 663 V 130-080-160A; 11.5A, 21kV



Run 685 H 130-080-180A; 11.5A, 21kV



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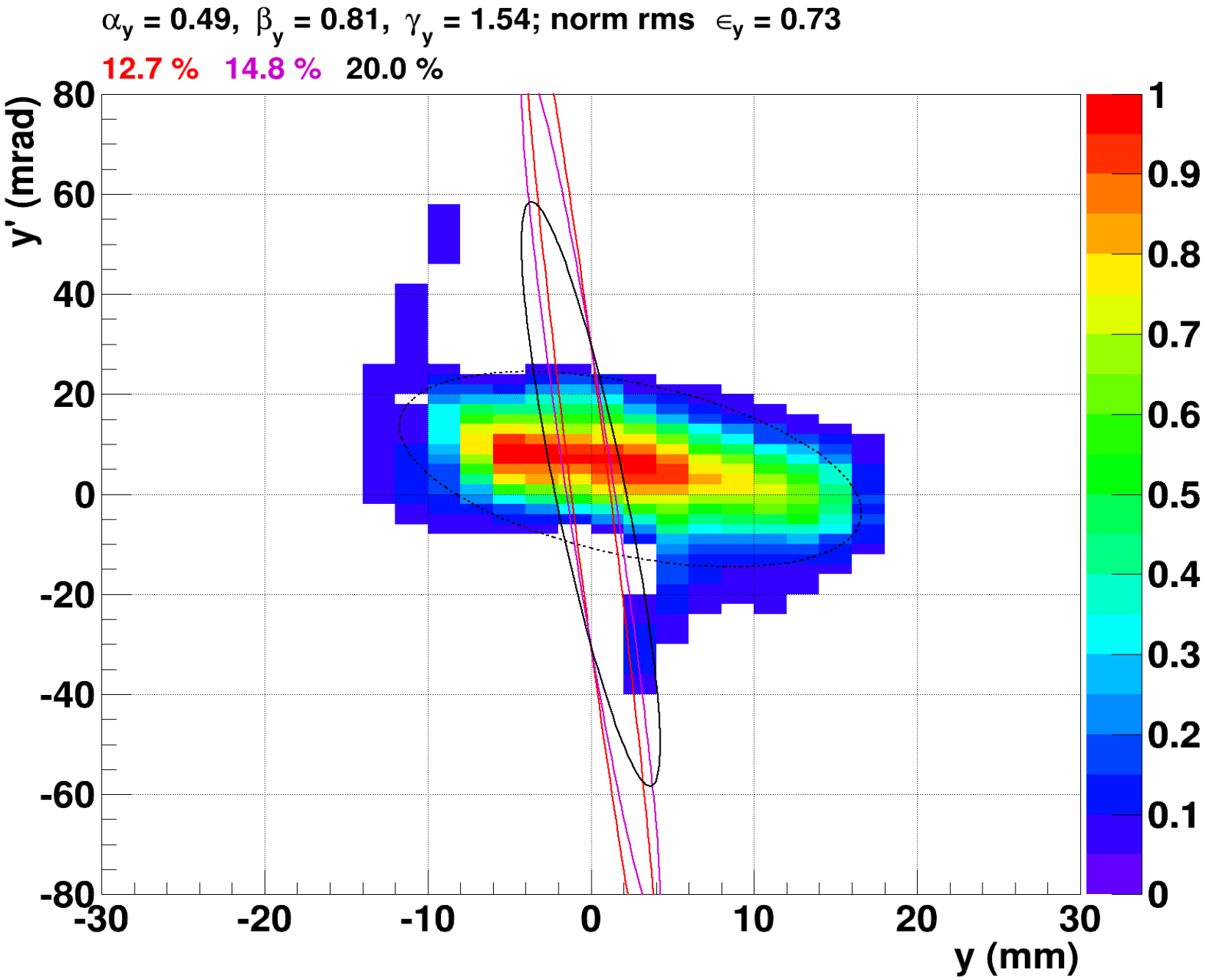
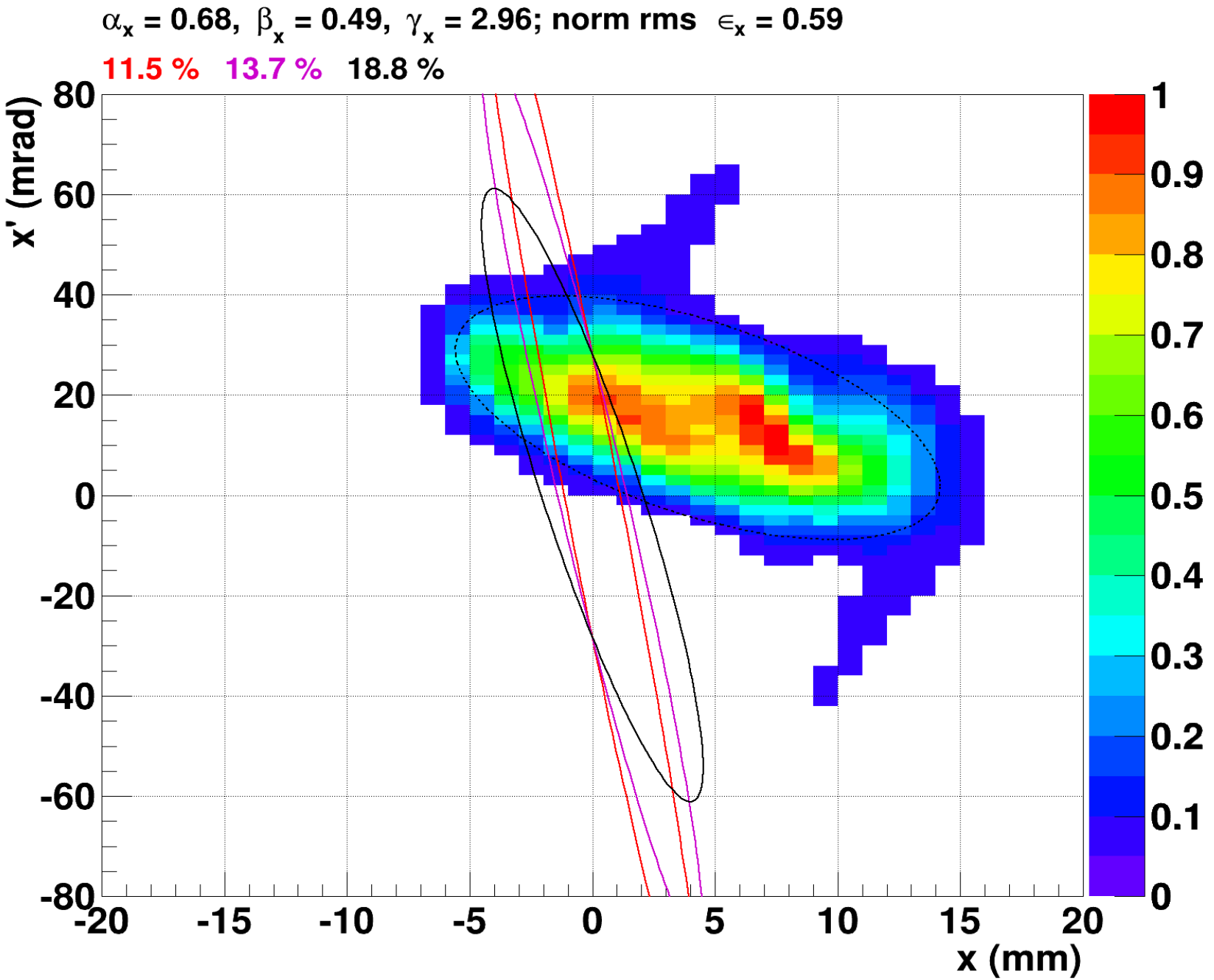
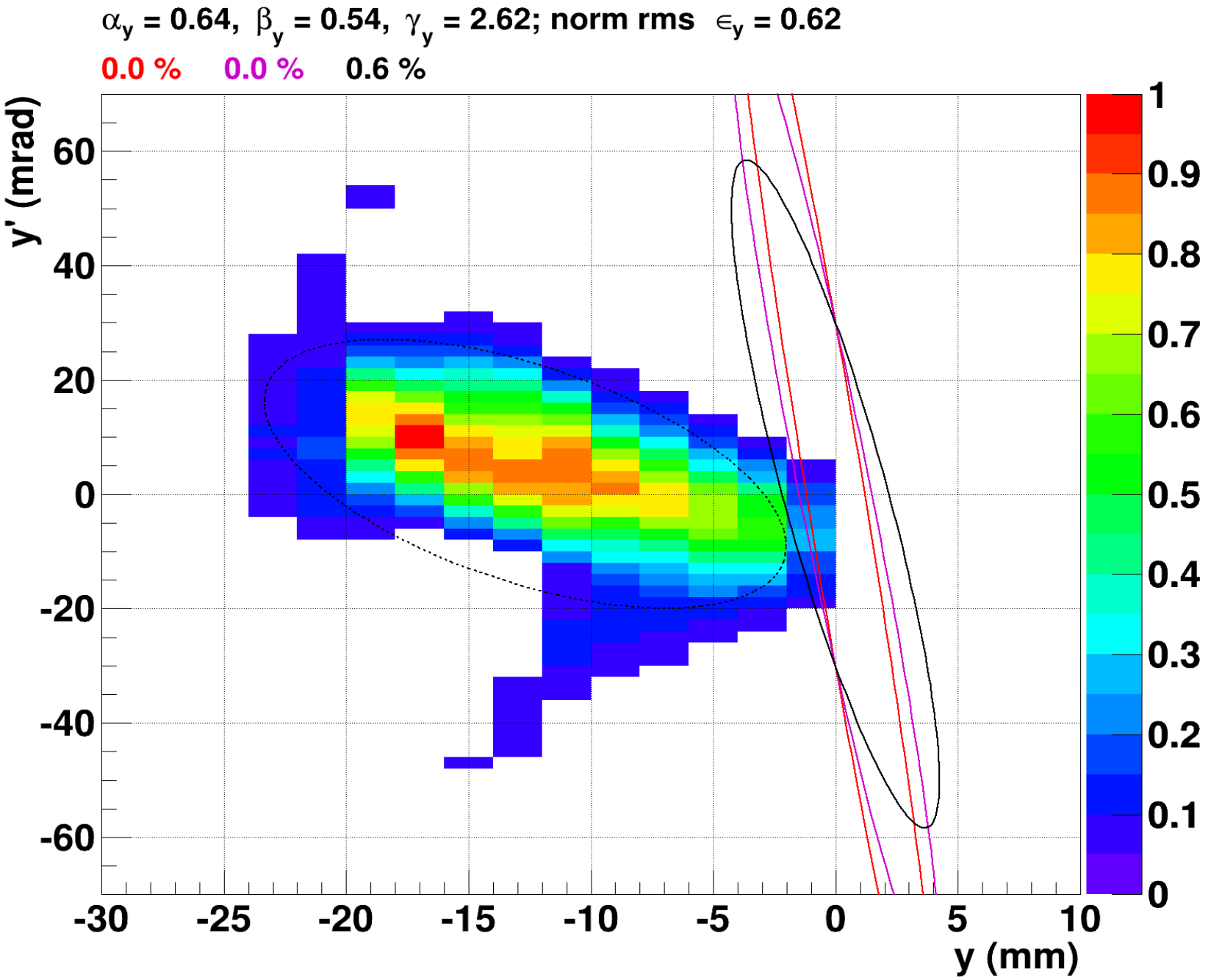


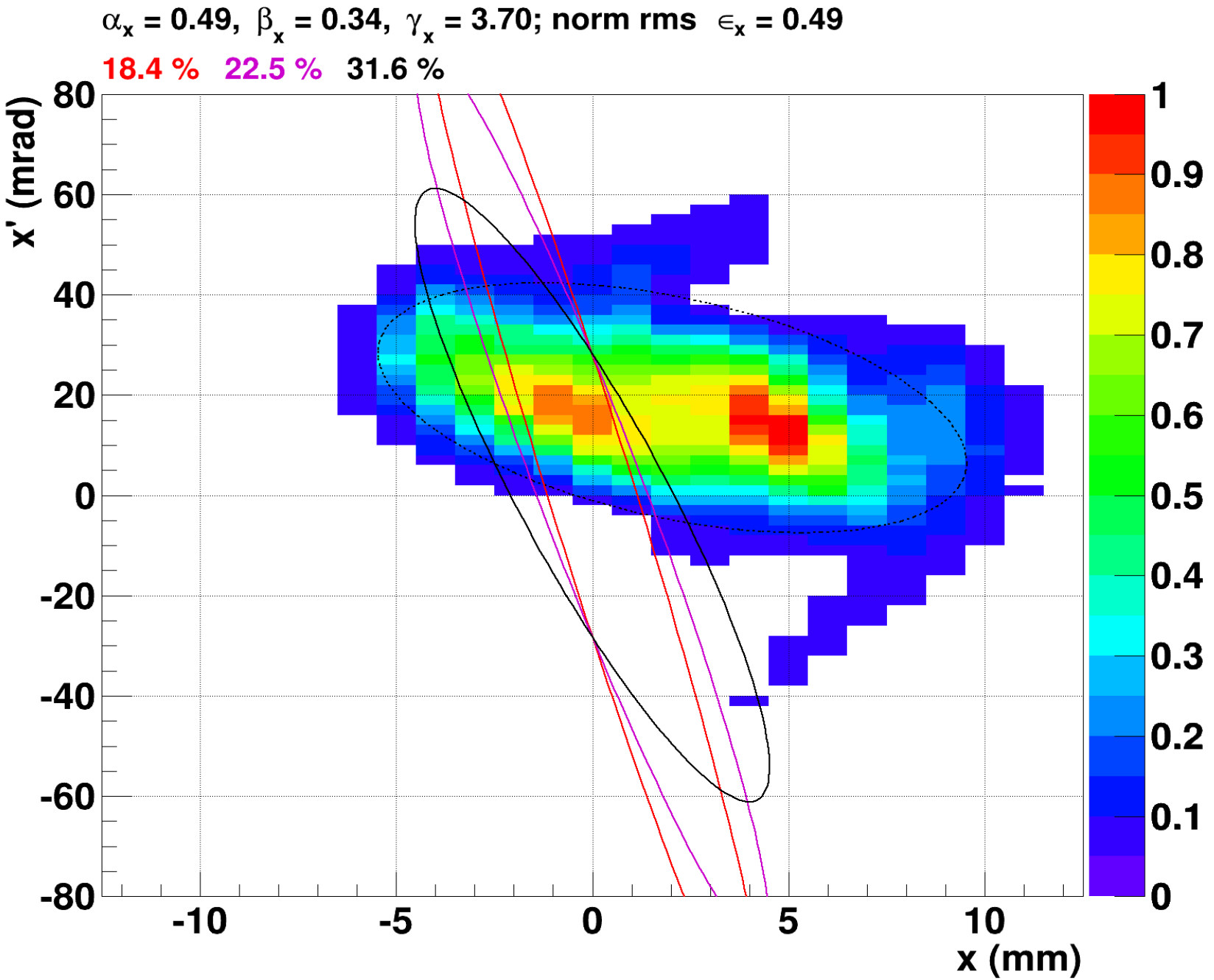
Run 683 H 130-080-200A; 11.5A, 21kV



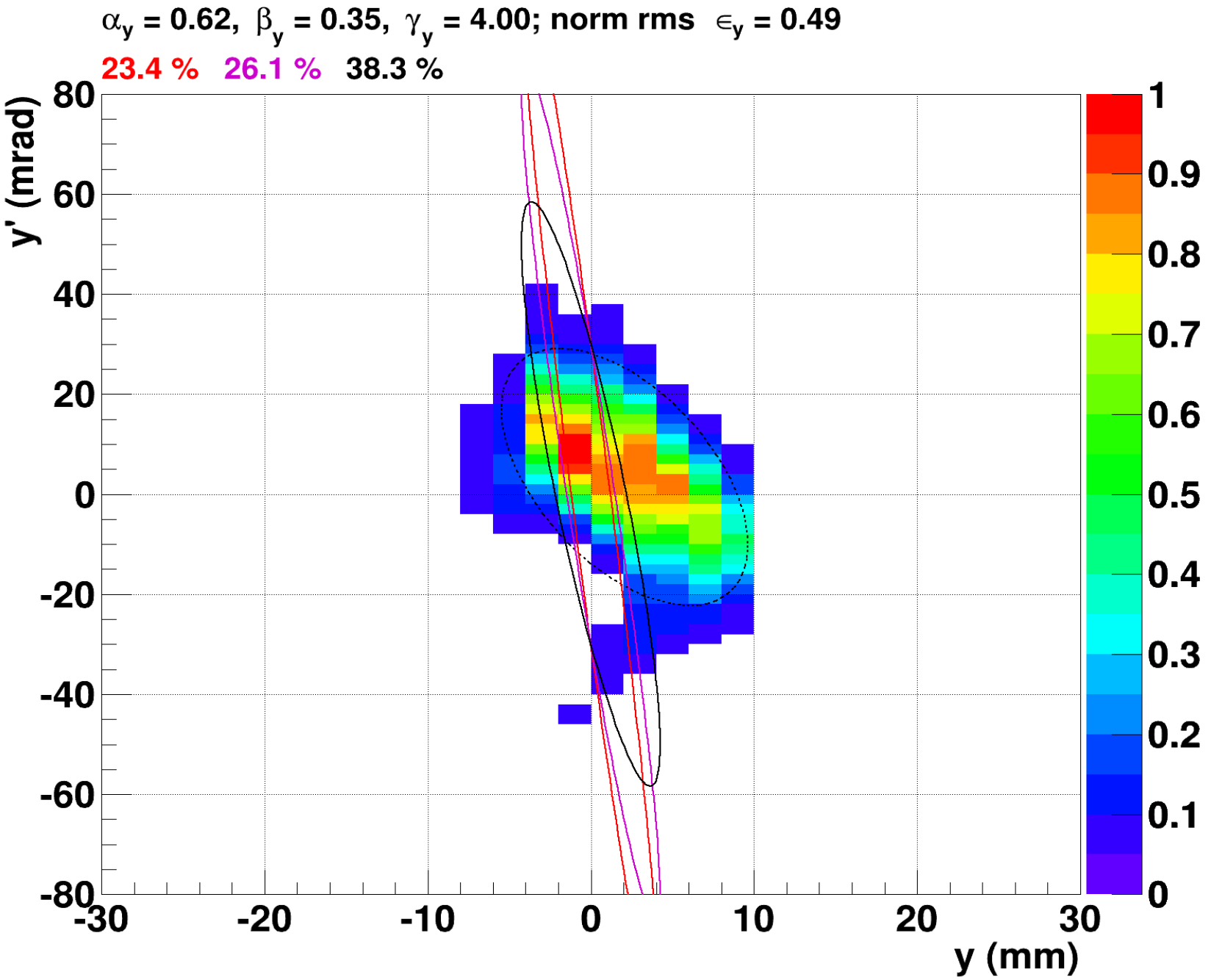
Run 655 V 130-080-200A; 11.5A, 21kV



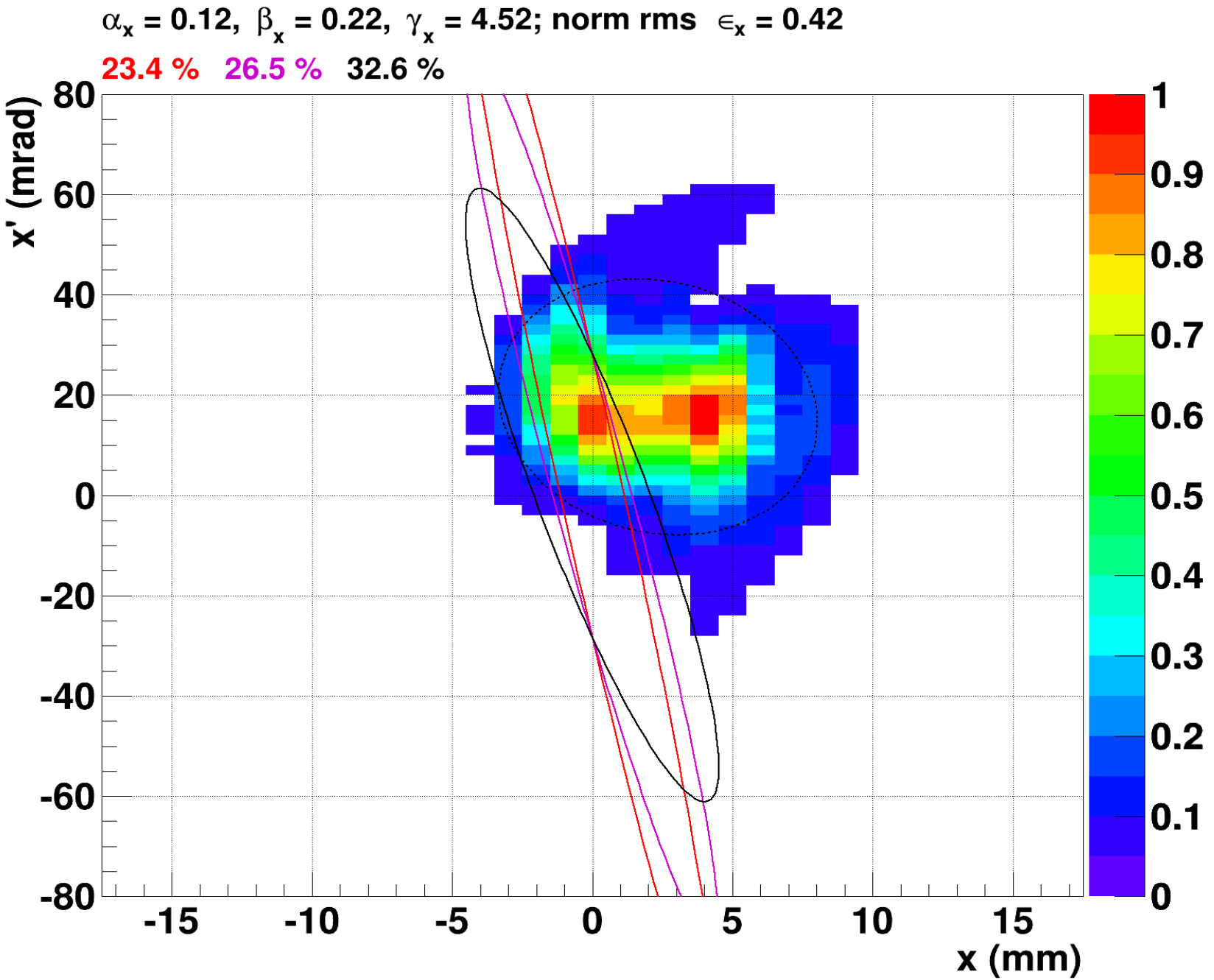
Run 681 H 130-080-220A; 11.5A, 21kV



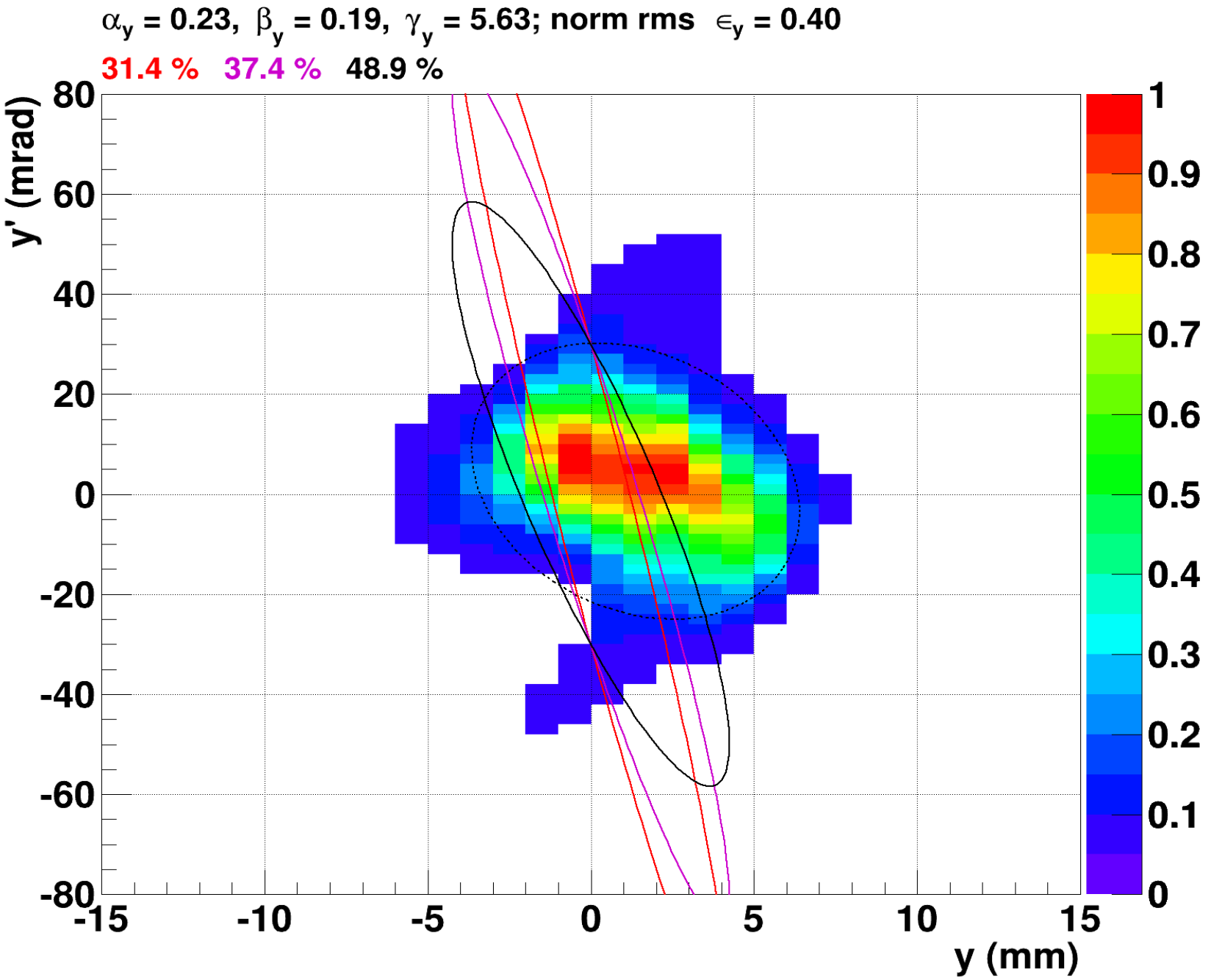
Run 658 V 130-080-220A; 11.5A, 21kV



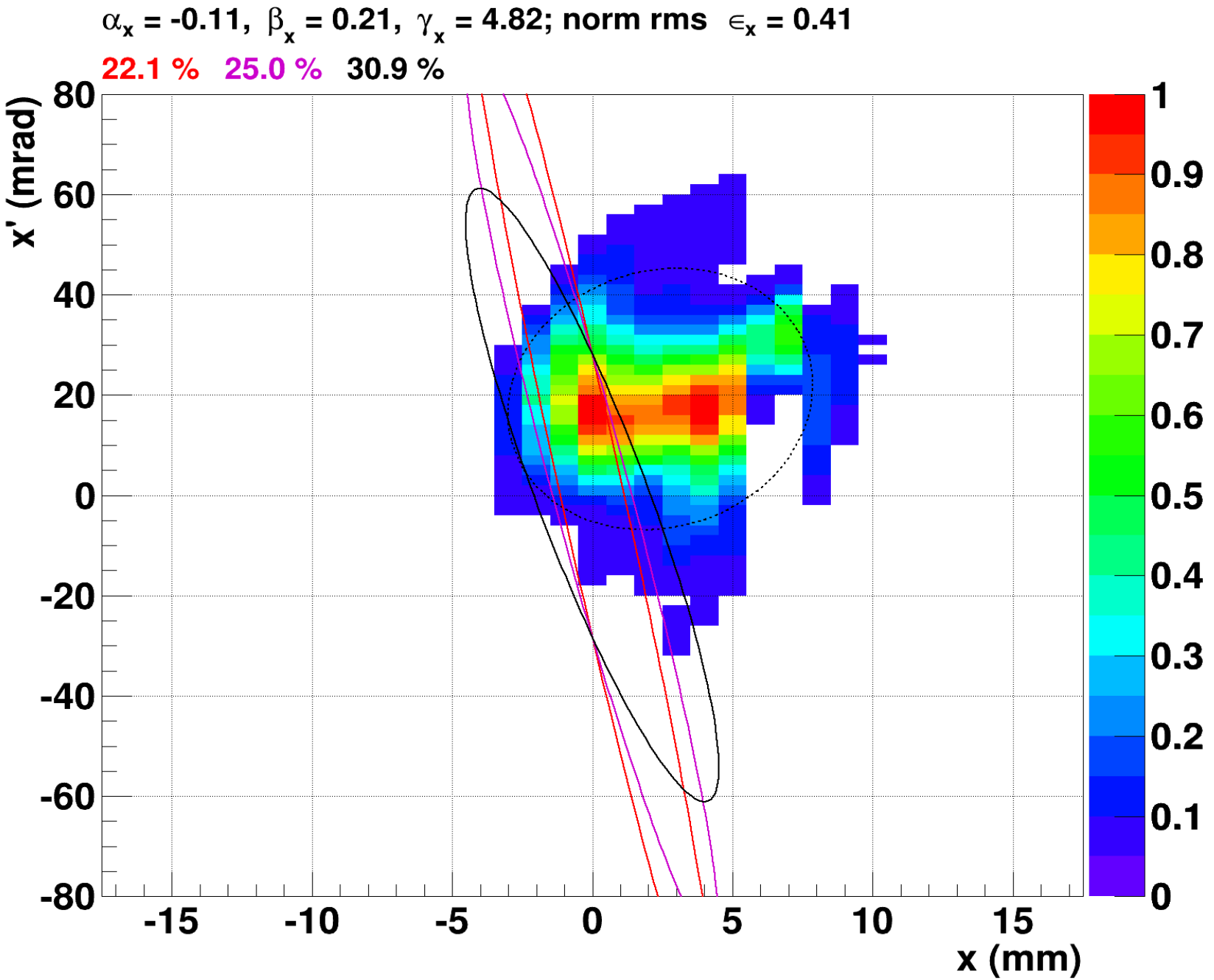
Run 676 H 130-080-240A; 11.5A, 21kV



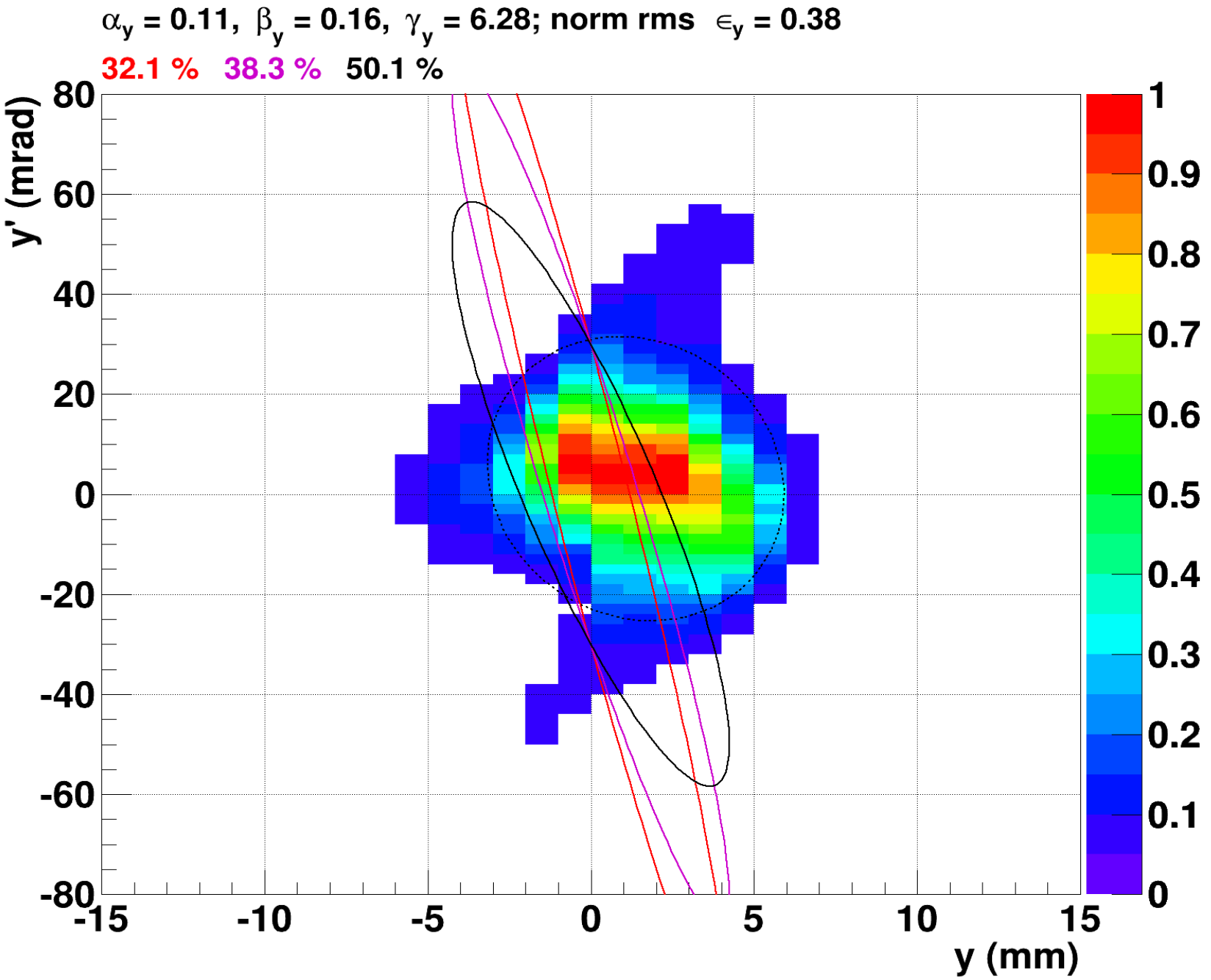
Run 660 V 130-080-240A; 11.5A, 21kV



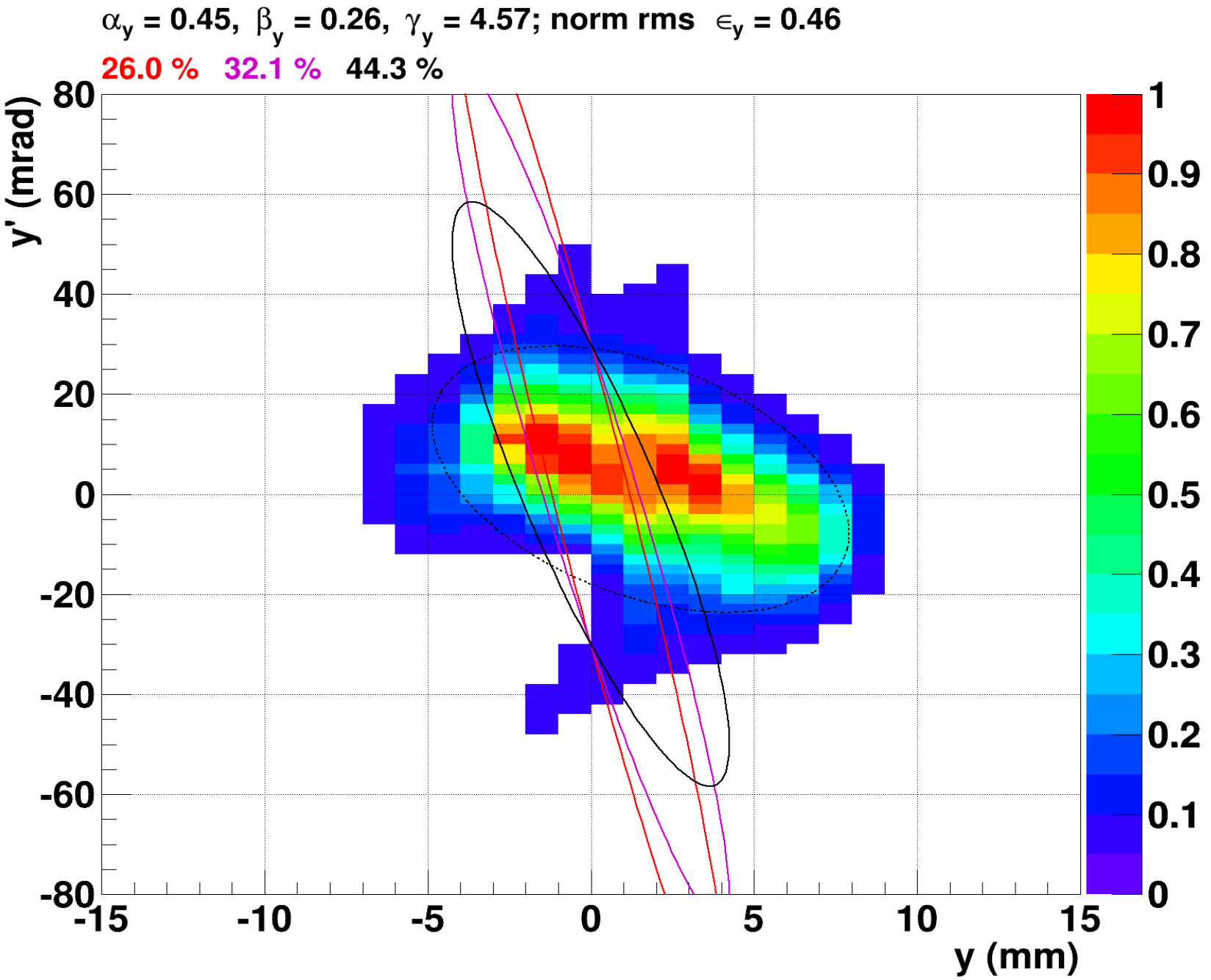
Run 677 H 130-080-245A; 11.5A, 21kV



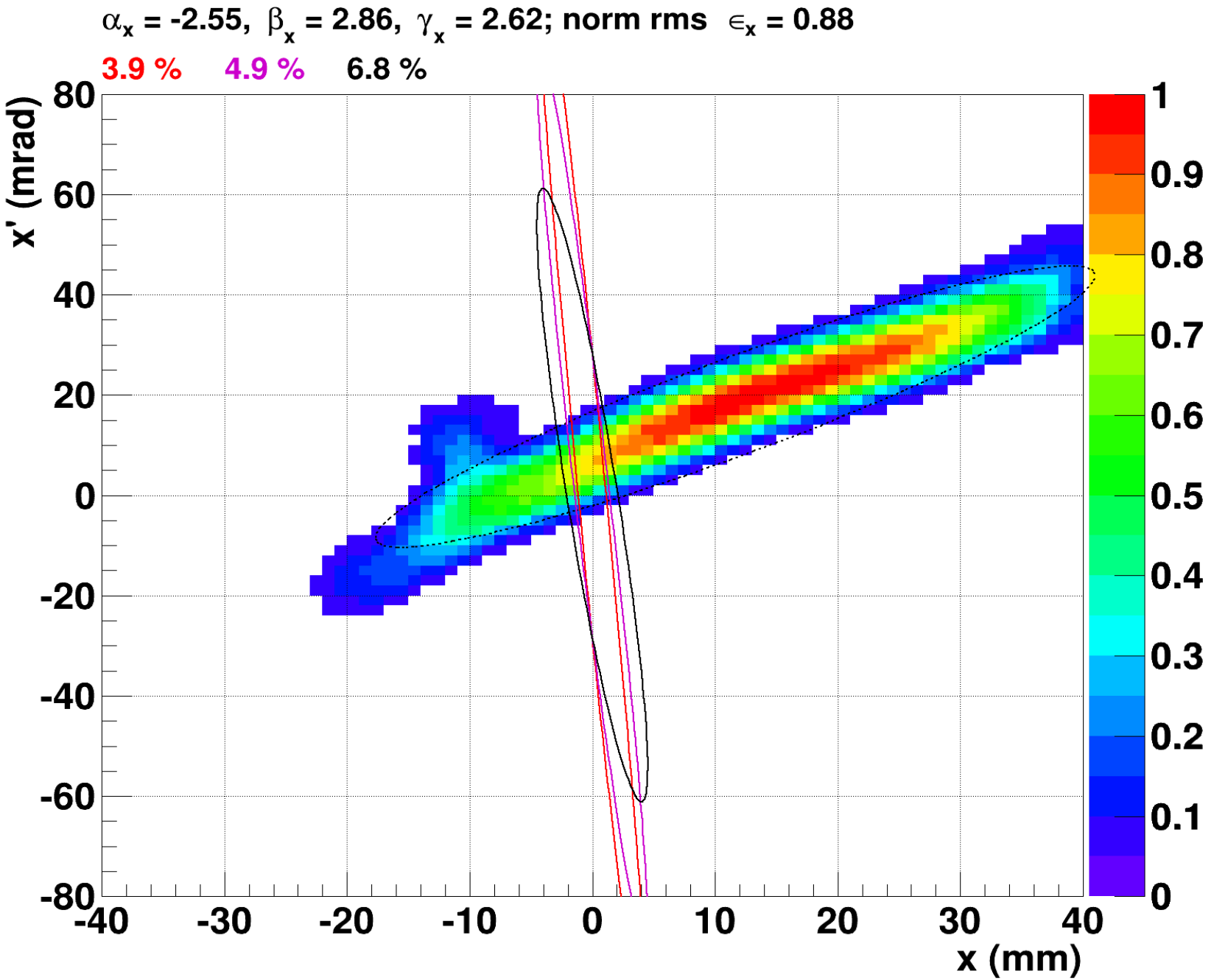
Run 661 V 130-080-245A; 11.5A, 21kV



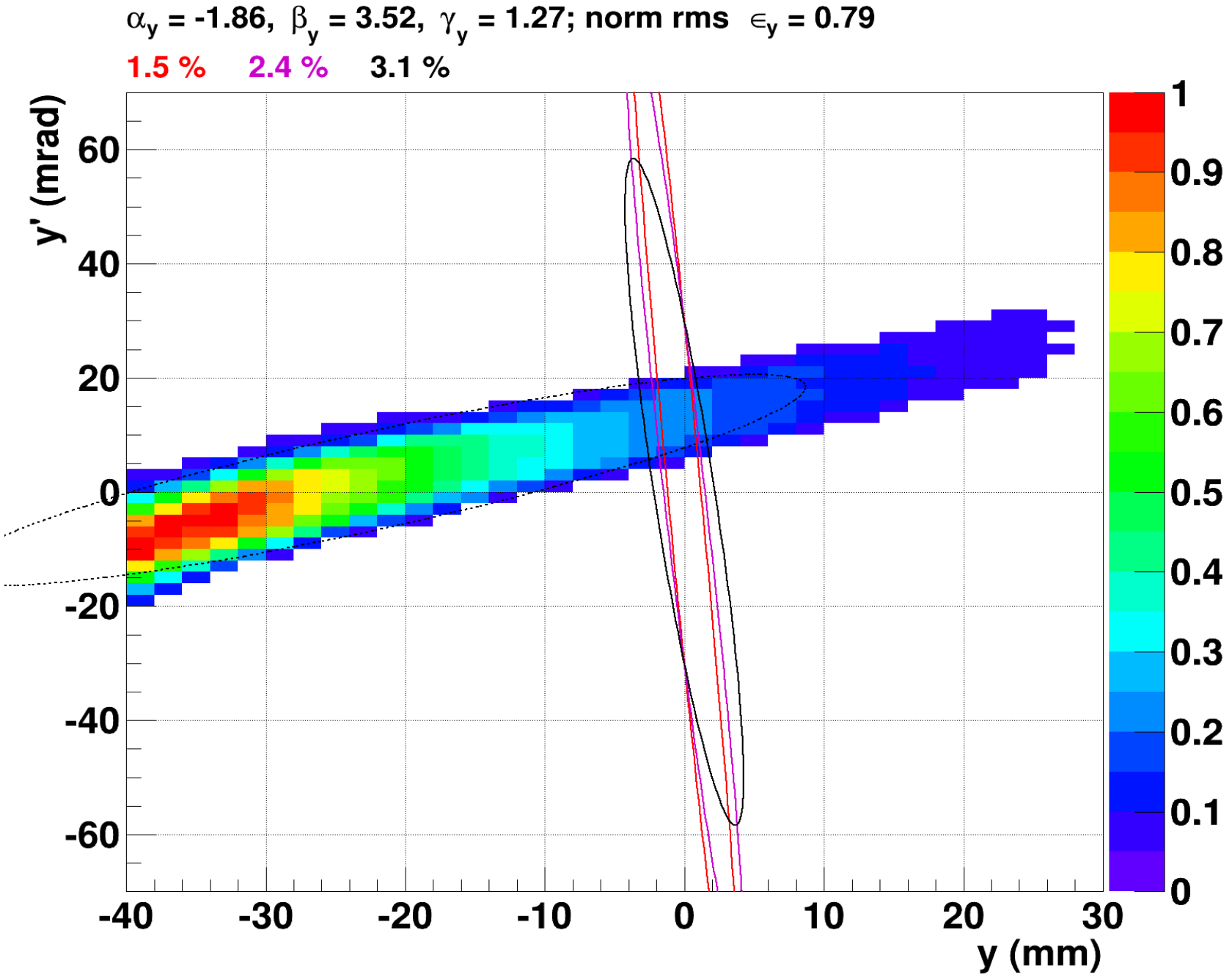
Run 662 V 130-080-230A; 11.5A, 21kV



Run 688 V 130-080-000A; 11.5A, 21kV



Run 654 V 000-000-000A; 11.5A, 21kV



GPT Sim: Solenoid currents range

I_1 (A)	I_2 (A)	I_3 (A)	RFQ eff (%)	Focus length (cm)
0	50 – 140	190 – 240	75 - 85	4 – >22
25	50 – 140	190 – 240	75 – 85	4 – >22
50	40 – 140	190 – 240	75 – 85	4 – >22
75	0 – 120	200 – 250	75 – 86	4 – 22
100	0 – 120	200 – 250	75 – 87	4 – 20
125	0 – 100	210 – 250	76 – 88	4 – 16
137	0 – 80	220 – 250	77 – 86	4 – 12
150	0 – 50	240 – 250	77 – 78	4 – 8
175	0 – 70	230 – 250	50 – 60	8 – 12
200	200 – 250	250	53 – 65	20 – >22

$I_1 \gtrsim$ 175 A gives over-focusing of the beam inside LEBT

$\Rightarrow$ high I_2 & I_3 needed to focus beam again