



Dynamics aperture study for HL-LHC

Flat optics for HL-LHC at collapse (addendum)

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Supervisor: Guido Sterbini

Configuration

New scans done with flat and standard filling scheme

Collapse process

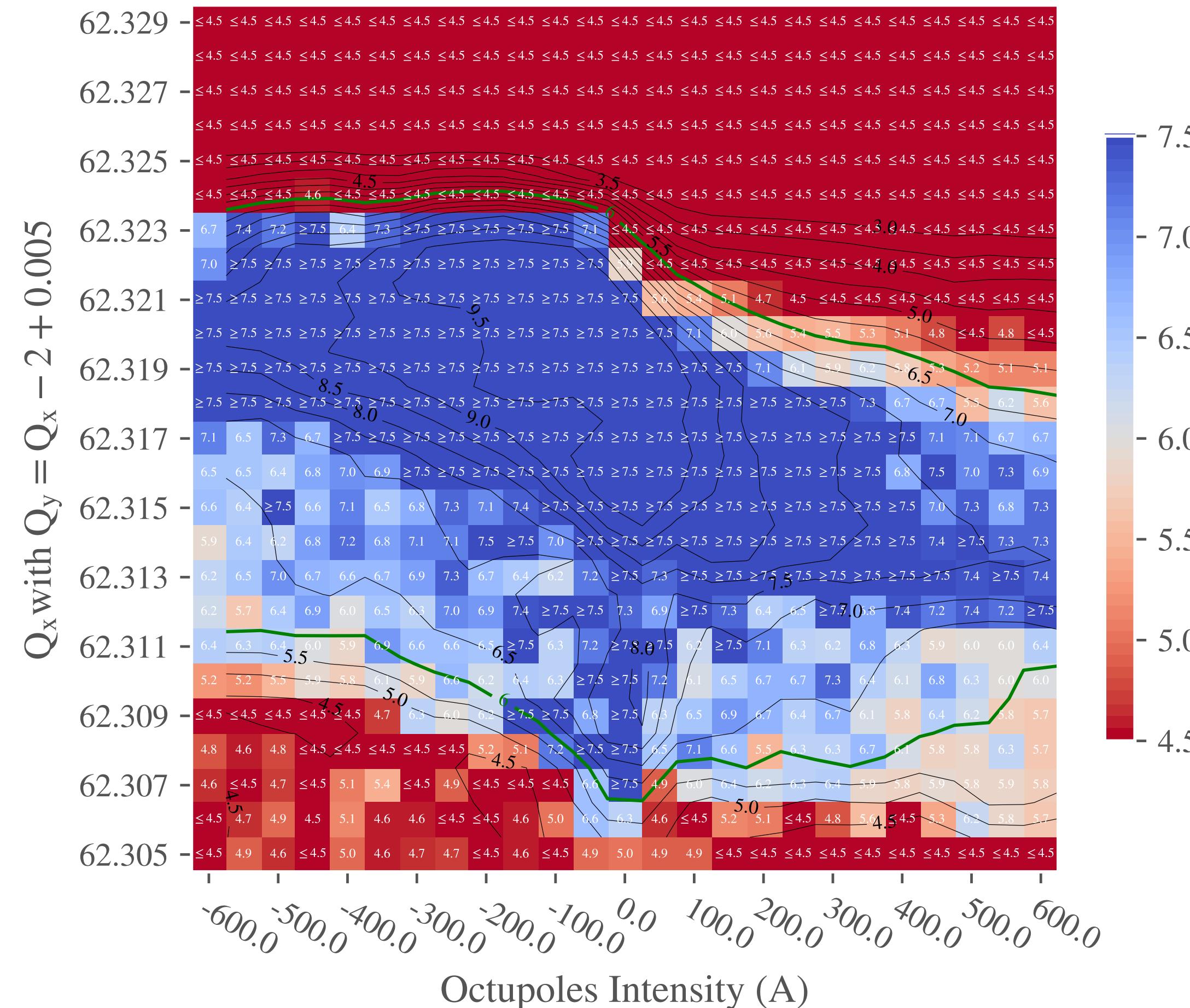
Collapse process is defined by the target lumi in the range of 1-2.5e34

L-Nb [10^34]	Energy	beta sep	beta cross	MO	Emit [um]	ppb	Crab	sep	crossing	Q'	LHCb - 1.5m / Alice 10m [10^34]	Optics
2.5 - 2200	7	0.7	0.7	450	2.3	2.3	0	0	250	15	0.2/0.014	Opt_collapse_700_1500 , opt_collapse_700_1500_thin
2.5 - 2200	7	0.6	1.2	450	2.3	2.3	0	0	250	15	0.2/0.014	
2.5 - 2200	7	0.45	1.8	450	2.3	2.3	0	0	250	15	0.2/0.014	Opt_flathv_450_1800_1500 , opt_flathv_450_1800_1500_thin
2.3 - 2200 or 2.0 - 1960	7	0.5	2	450	2.3	2.3	0	0	250	15	0.2/0.014	opt_flathv_500_2000_thin.madx
2.5 - 2748 or 1.8 - 1960	7	1.1	1.1	450	2.3	2.3	0	0	250	15	0.2/0.014	Opt_collapse_1100_1500.madx
2.5 - 2748 or 1.8 - 1960	7	0.9	1.8	450	2.3	2.3	0	0	250	15	0.2/0.014	opt_collapse_flathv_900_1800_1 500.madx
2.5 - 2748 or 1.8 - 1960	7	0.7	2.8	450	2.3	2.3	0	0	250	15	0.2/0.014	opt_collapse_flathv_700_2800.m adx
	7	1.0	1.0	450	2.3	2.3	0	0	250	15	0.2/0.014	opt_collapse_1000_1500.madx

Simulations result: round 1m/1m ($\epsilon_n = 2.3\mu m$)

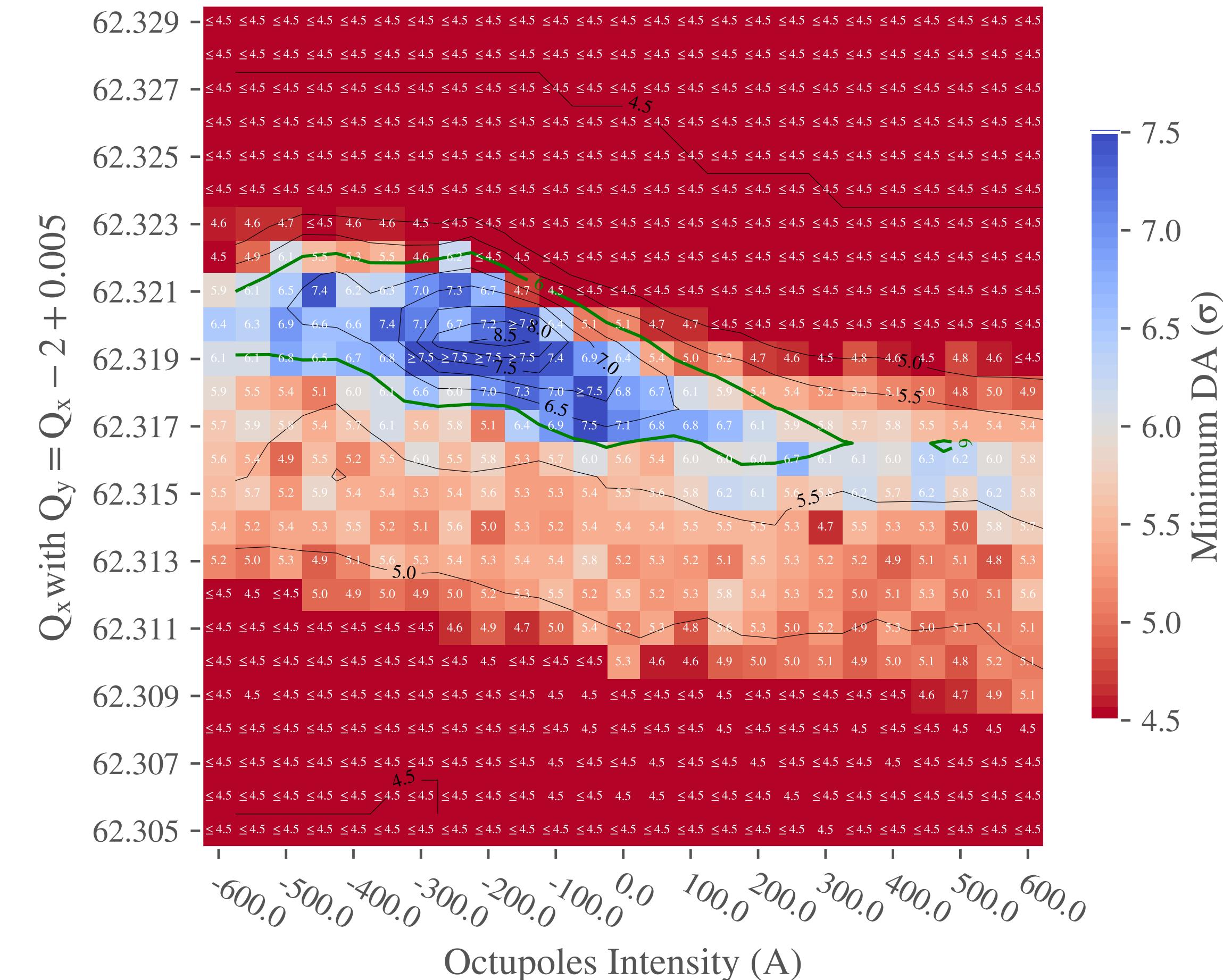
8b4e

HL-LHC v1.6. E = 7.0 TeV. $N_b \simeq 2.3 \times 10^{11}$ ppb,
 $L_{1/5} = 2.04 \times 10^{34} \text{cm}^{-2}\text{s}^{-1}$, $L_2 = 3.46 \times 10^{30} \text{cm}^{-2}\text{s}^{-1}$, $L_8 = 2 \times 10^{33} \text{cm}^{-2}\text{s}^{-1}$
 $\beta_{x,1}^* = 1 \text{ m}$, $\beta_{y,1}^* = 1 \text{ m}$, polarity IP_{2/8} = 1/1
 $\Phi/2_{1(H)} = 250 \mu\text{rad}$, $\Phi/2_{5(V)} = 250 \mu\text{rad}$, $\Phi/2_{2,V} = -170 \mu\text{rad}$, $\Phi/2_{8,V} = 170 \mu\text{rad}$
 $\sigma_z = 7.61 \text{ cm}$, $\epsilon_n = 2.3 \mu\text{m}$, $Q' = 15$, $C^- = 0.001$
8b4e_1972b_1960_1178_1886_224bpi_12inj. Bunch 89.



Standard

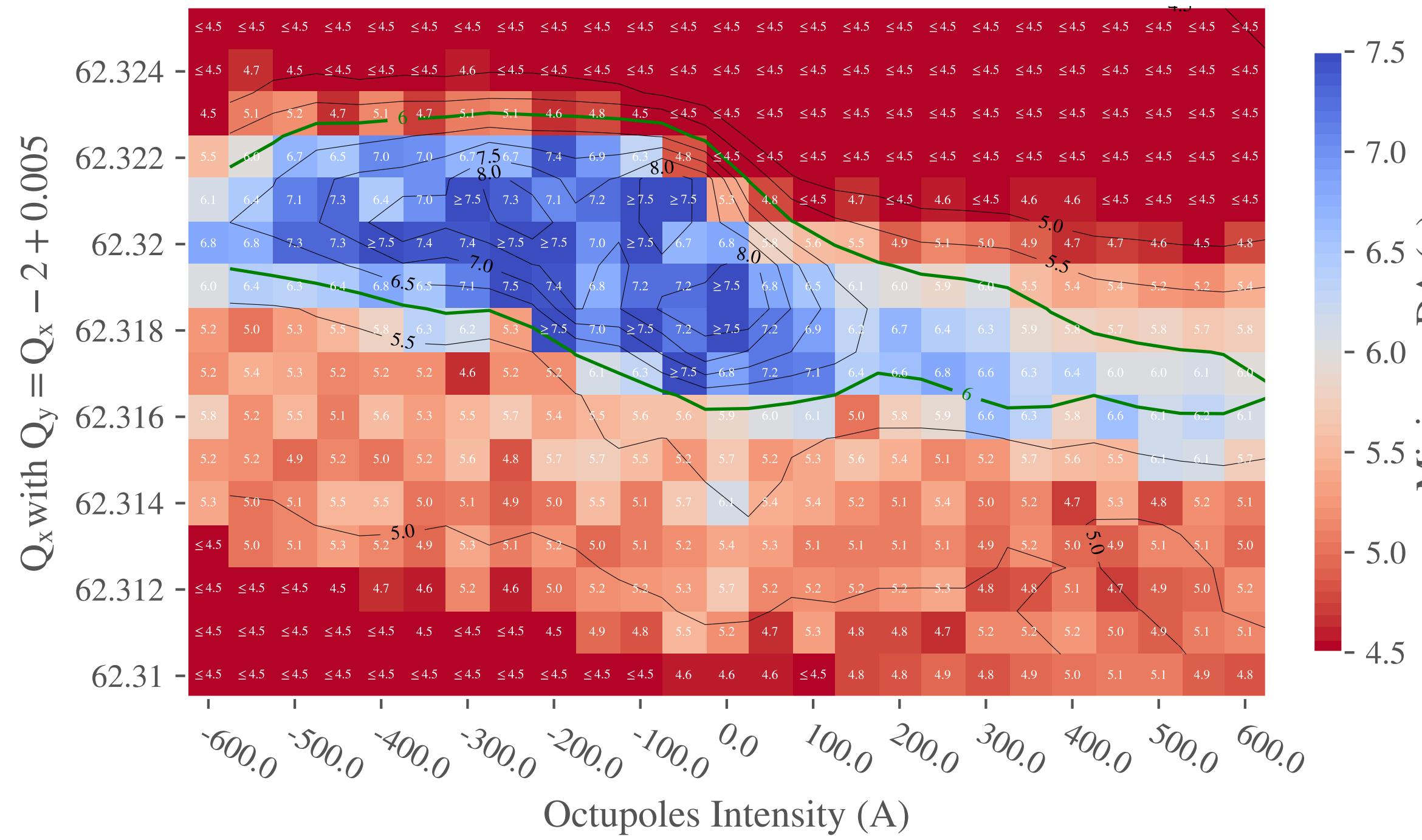
HL-LHC v1.6. E = 7.0 TeV. $N_b \simeq 2.3 \times 10^{11}$ ppb,
 $L_{1/5} = 3.14 \times 10^{34} \text{cm}^{-2}\text{s}^{-1}$, $L_2 = 4.78 \times 10^{30} \text{cm}^{-2}\text{s}^{-1}$, $L_8 = 1.71 \times 10^{33} \text{cm}^{-2}\text{s}^{-1}$
 $\beta_{x,1}^* = 1 \text{ m}$, $\beta_{y,1}^* = 1 \text{ m}$, polarity IP_{2/8} = 1/1
 $\Phi/2_{1(H)} = 250 \mu\text{rad}$, $\Phi/2_{5(V)} = 250 \mu\text{rad}$, $\Phi/2_{2,V} = -170 \mu\text{rad}$, $\Phi/2_{8,V} = 170 \mu\text{rad}$
 $\sigma_z = 7.61 \text{ cm}$, $\epsilon_n = 2.3 \mu\text{m}$, $Q' = 15$, $C^- = 0.001$
25ns_2760b_2748_2492_2574_288bpi_13inj_800ns_bs200nsConverted.json. Bunch 150.



Simulations result: round 1m/1m ($\epsilon_n = 2\mu m$)

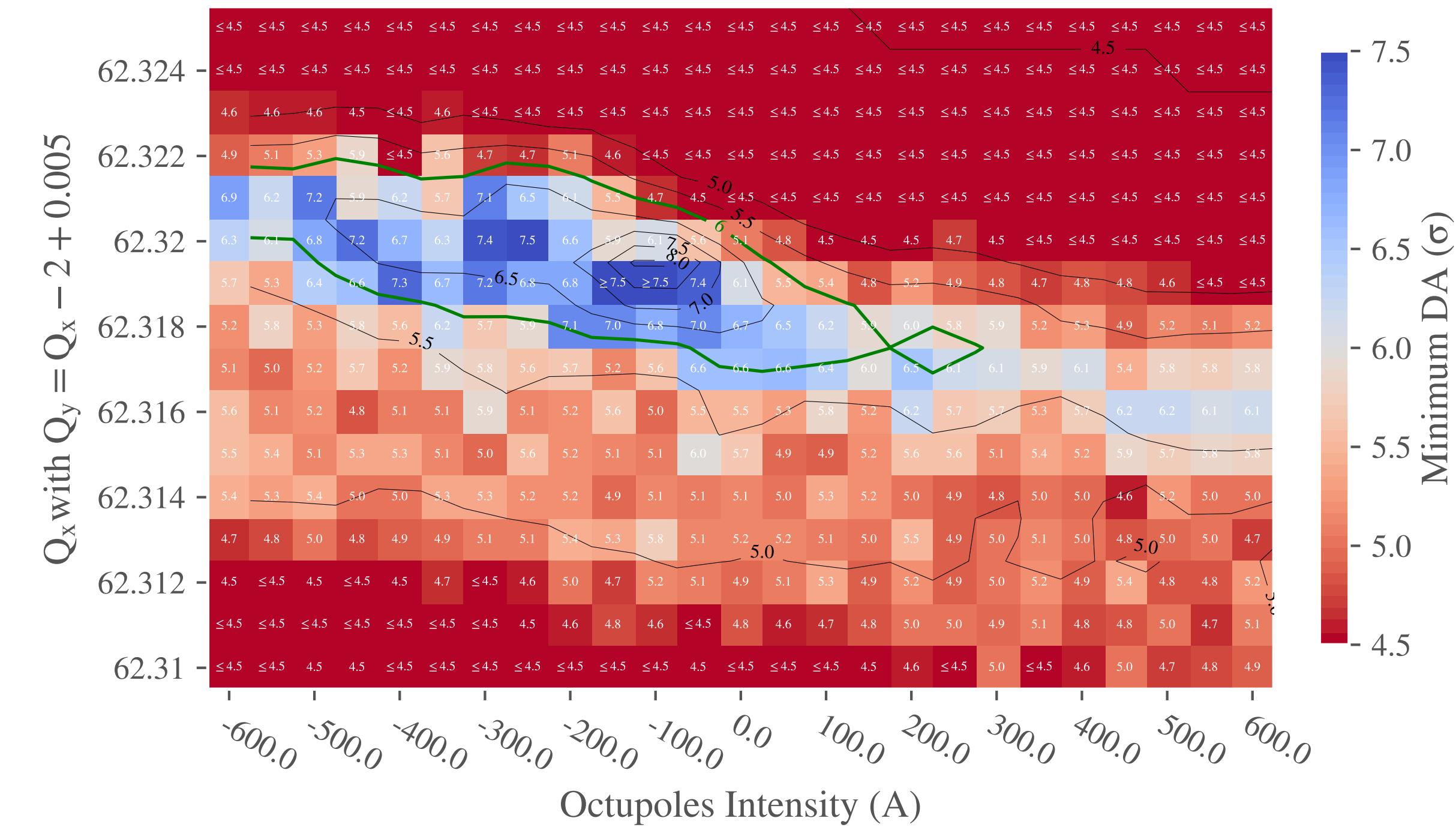
8b4e

HL-LHC v1.6. E = 7.0 TeV. $N_b \simeq 2.3 \times 10^{11}$ ppb,
 $L_{1/5} = 2.63 \times 10^{34} \text{ cm}^{-2} \text{s}^{-1}$, $L_2 = 1.56 \times 10^{30} \text{ cm}^{-2} \text{s}^{-1}$, $L_8 = 1.51 \times 10^{33} \text{ cm}^{-2} \text{s}^{-1}$
 $\beta_{x,1}^* = 1 \text{ m}$, $\beta_{y,1}^* = 1 \text{ m}$, polarity IP_{2/8} = 1/1
 $\Phi/2_{1(H)} = 250 \mu\text{rad}$, $\Phi/2_{5(V)} = 250 \mu\text{rad}$, $\Phi/2_{2,V} = -170 \mu\text{rad}$, $\Phi/2_{8,V} = 170 \mu\text{rad}$
 $\sigma_z = 7.61 \text{ cm}$, $\epsilon_n = 2.0 \mu\text{m}$, $Q' = 15$, $C^- = 0.001$
8b4e_1972b_1960_1178_1886_224bpi_12inj. Bunch 89.



Standard

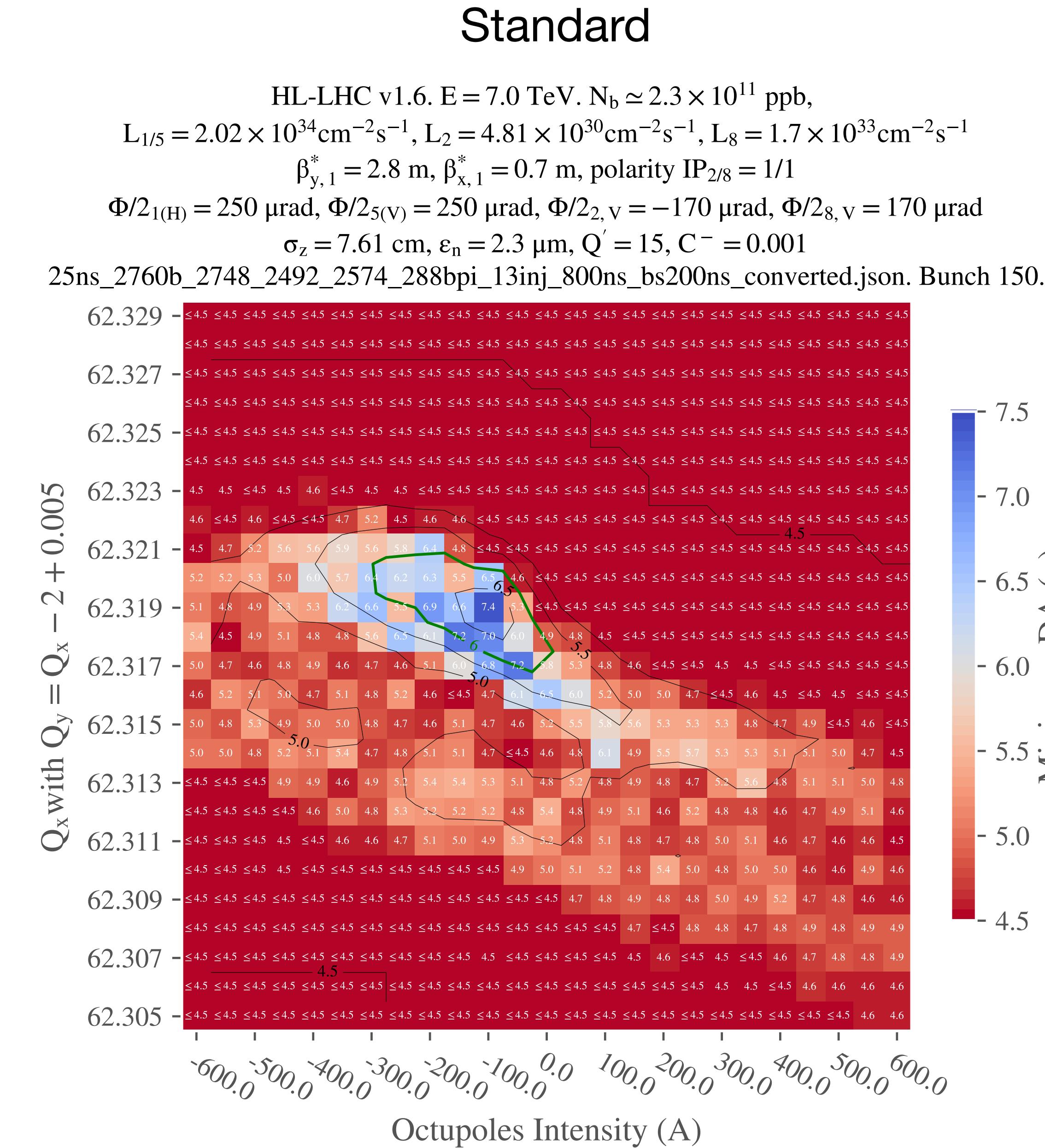
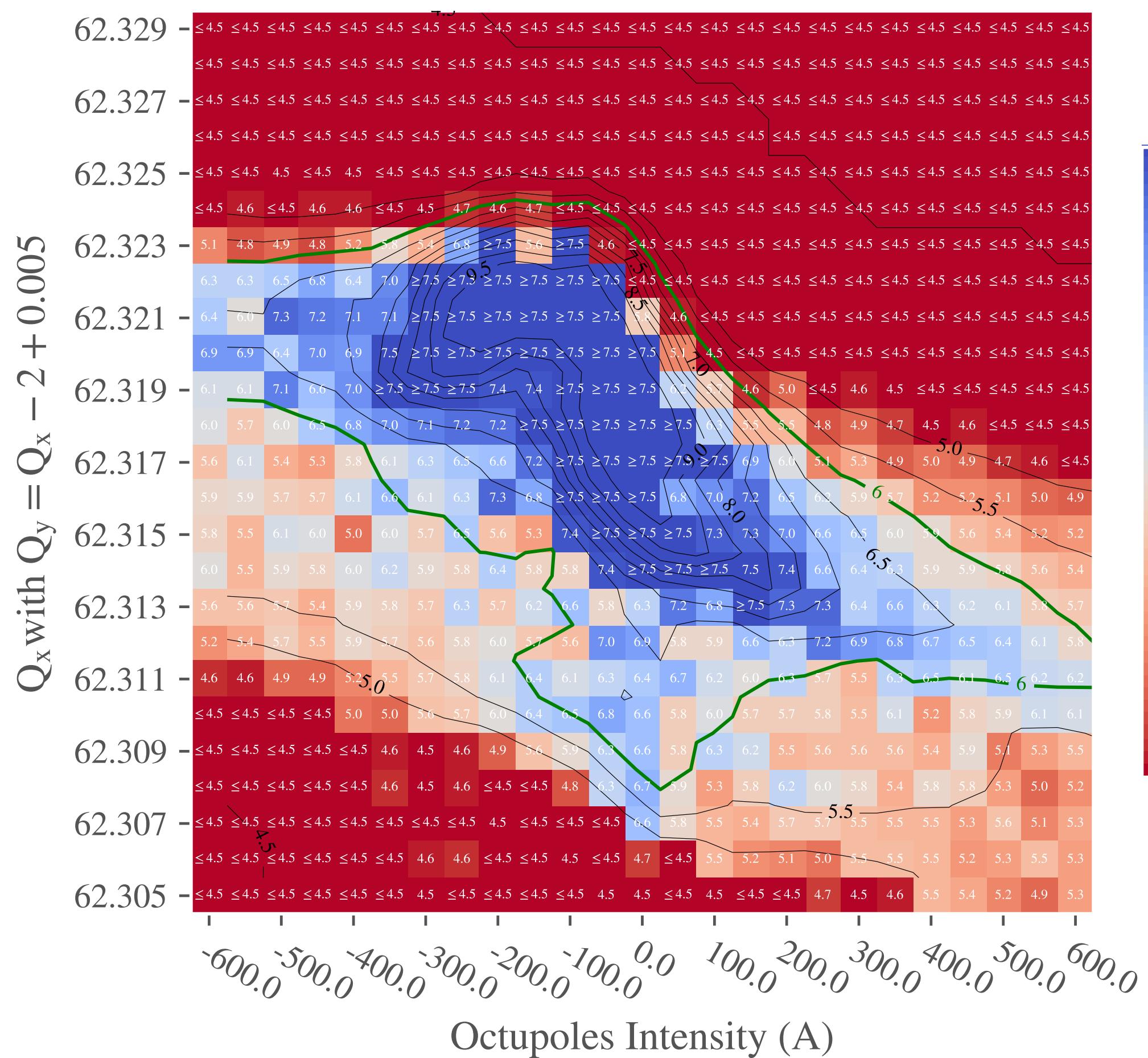
HL-LHC v1.6. E = 7.0 TeV. $N_b \simeq 2.3 \times 10^{11}$ ppb,
 $L_{1/5} = 3.53 \times 10^{34} \text{ cm}^{-2} \text{s}^{-1}$, $L_2 = 4.86 \times 10^{30} \text{ cm}^{-2} \text{s}^{-1}$, $L_8 = 1.62 \times 10^{33} \text{ cm}^{-2} \text{s}^{-1}$
 $\beta_{x,1}^* = 1 \text{ m}$, $\beta_{y,1}^* = 1 \text{ m}$, polarity IP_{2/8} = 1/1
 $\Phi/2_{1(H)} = 250 \mu\text{rad}$, $\Phi/2_{5(V)} = 250 \mu\text{rad}$, $\Phi/2_{2,V} = -170 \mu\text{rad}$, $\Phi/2_{8,V} = 170 \mu\text{rad}$
 $\sigma_z = 7.61 \text{ cm}$, $\epsilon_n = 2.0 \mu\text{m}$, $Q' = 15$, $C^- = 0.001$
25ns_2760b_2748_2492_2574_288bpi_13inj_800ns_bs200nsConverted.json. Bunch 150.



Simulations result: flat 0.7m/2.8m ($\epsilon_n = 2.3\mu m$)

8b4e

HL-LHC v1.6. E = 7.0 TeV. $N_b \simeq 2.3 \times 10^{11}$ ppb,
 $L_{1/5} = 1.32 \times 10^{34} \text{ cm}^{-2} \text{s}^{-1}$, $L_2 = 3.46 \times 10^{30} \text{ cm}^{-2} \text{s}^{-1}$, $L_8 = 2 \times 10^{33} \text{ cm}^{-2} \text{s}^{-1}$
 $\beta_{y,1}^* = 2.8 \text{ m}$, $\beta_{x,1}^* = 0.7 \text{ m}$, polarity IP_{2/8} = 1/1
 $\Phi/2_{1(H)} = 250 \mu\text{rad}$, $\Phi/2_{5(V)} = 250 \mu\text{rad}$, $\Phi/2_{2,V} = -170 \mu\text{rad}$, $\Phi/2_{8,V} = 170 \mu\text{rad}$
 $\sigma_z = 7.61 \text{ cm}$, $\epsilon_n = 2.3 \mu\text{m}$, $Q' = 15$, $C^- = 0.001$
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HL-LHC v1.6. E = 7.0 TeV. $N_b \simeq 2.3 \times 10^{11}$ ppb,

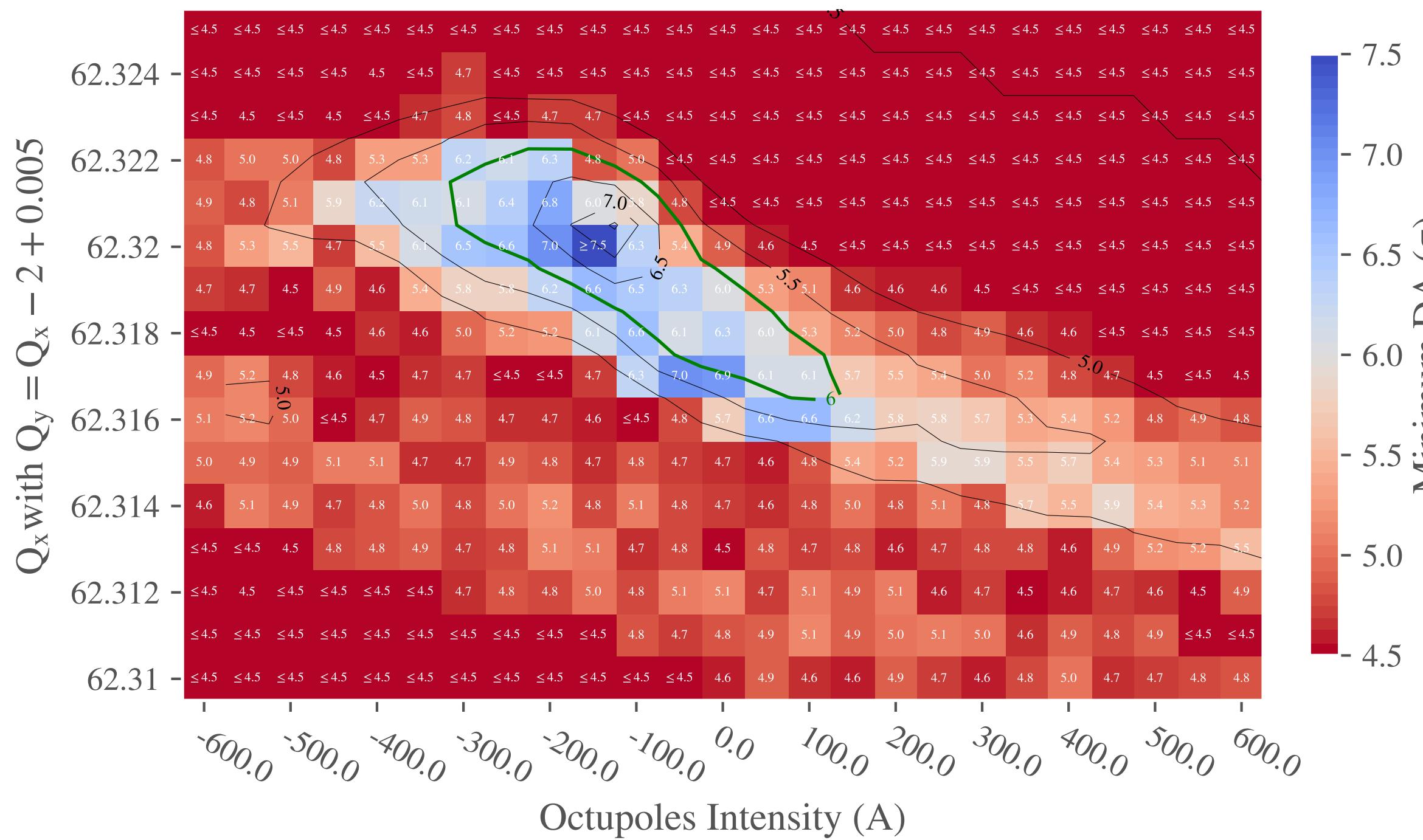
$L_{1/5} = 1.67 \times 10^{34} \text{ cm}^{-2} \text{s}^{-1}$, $L_2 = 1.59 \times 10^{30} \text{ cm}^{-2} \text{s}^{-1}$, $L_8 = 1.5 \times 10^{33} \text{ cm}^{-2} \text{s}^{-1}$

$\beta_{y,1}^* = 2.8 \text{ m}$, $\beta_{x,1}^* = 0.7 \text{ m}$, polarity IP_{2/8} = 1/1

$\Phi/2_{1(H)} = 250 \mu\text{rad}$, $\Phi/2_{5(V)} = 250 \mu\text{rad}$, $\Phi/2_{2,V} = -170 \mu\text{rad}$, $\Phi/2_{8,V} = 170 \mu\text{rad}$

$\sigma_z = 7.61 \text{ cm}$, $\epsilon_n = 2.0 \mu\text{m}$, $Q' = 15$, $C^- = 0.001$

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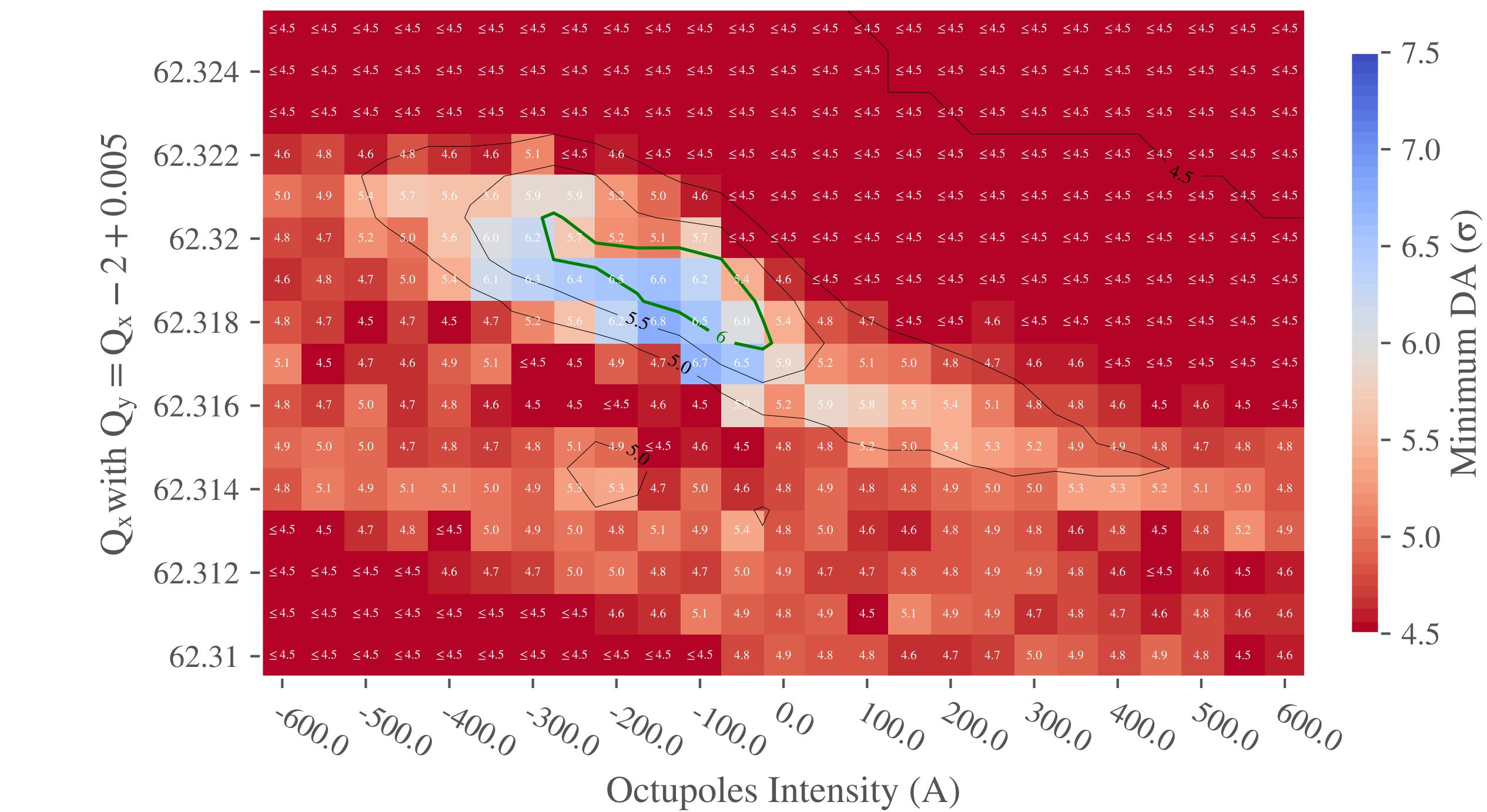
$L_{1/5} = 2.25 \times 10^{34} \text{ cm}^{-2} \text{s}^{-1}$, $L_2 = 4.92 \times 10^{30} \text{ cm}^{-2} \text{s}^{-1}$, $L_8 = 1.61 \times 10^{33} \text{ cm}^{-2} \text{s}^{-1}$

$\beta_{y,1}^* = 2.8 \text{ m}$, $\beta_{x,1}^* = 0.7 \text{ m}$, polarity IP_{2/8} = 1/1

$\Phi/2_{1(H)} = 250 \mu\text{rad}$, $\Phi/2_{5(V)} = 250 \mu\text{rad}$, $\Phi/2_{2,V} = -170 \mu\text{rad}$, $\Phi/2_{8,V} = 170 \mu\text{rad}$

$\sigma_z = 7.61 \text{ cm}$, $\epsilon_n = 2.0 \mu\text{m}$, $Q' = 15$, $C^- = 0.001$

25ns_2760b_2748_2492_2574_288bpi_13inj_800ns_bs200nsConverted.json. Bunch 150.





Thank you!