

**SY3-East Dump Line
Beam Study
2025. 06. 12, 13 report**

2025. 6. 16

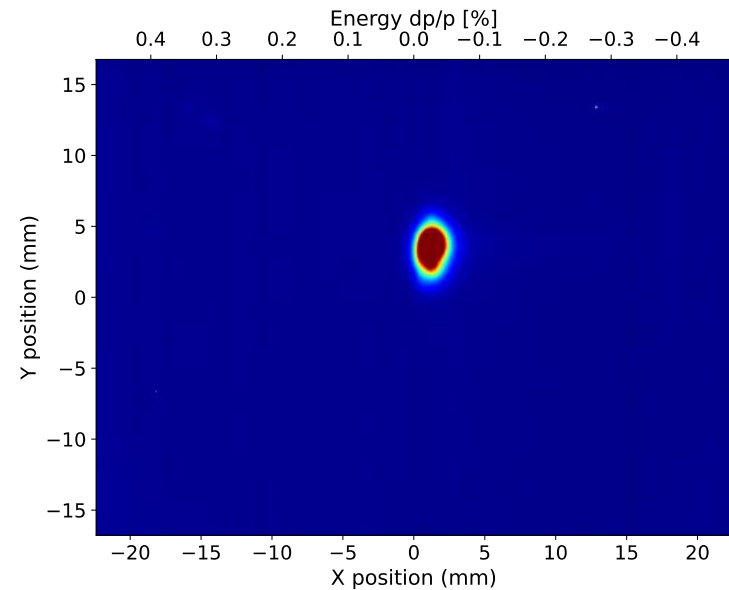
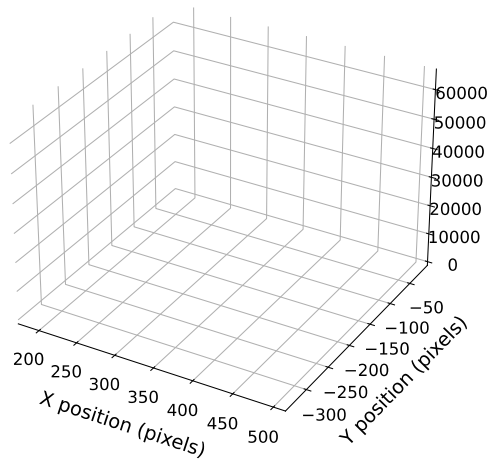
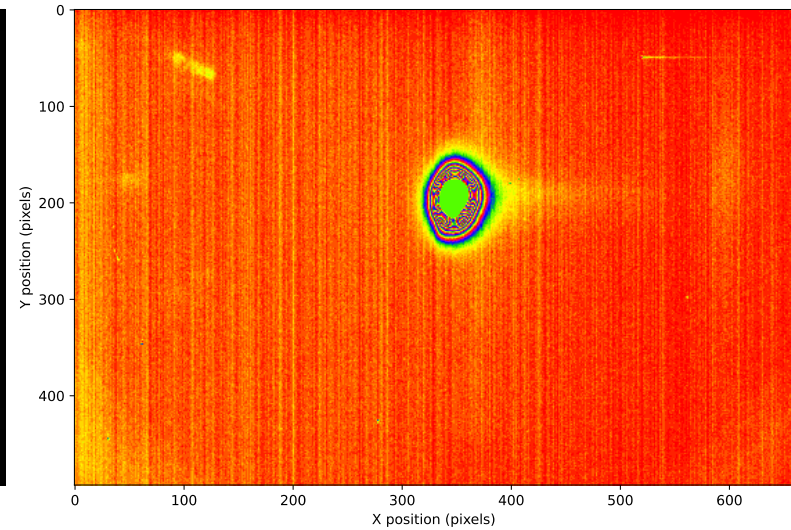
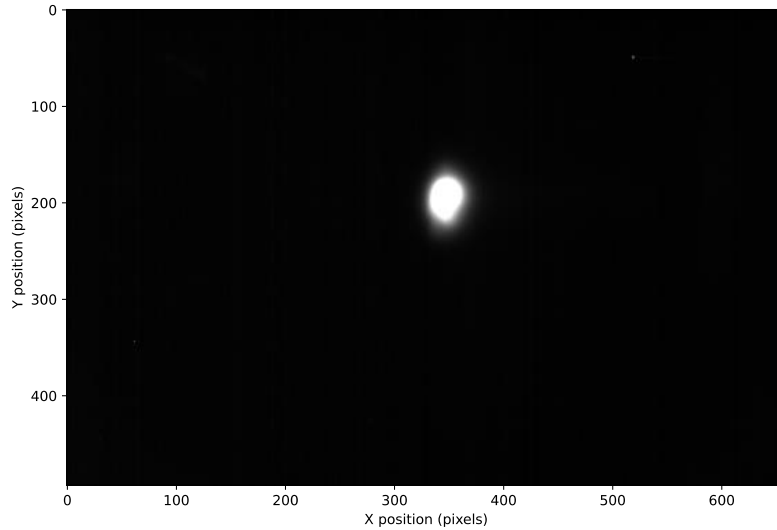
紙谷 琢哉

SC_61_A3での観測

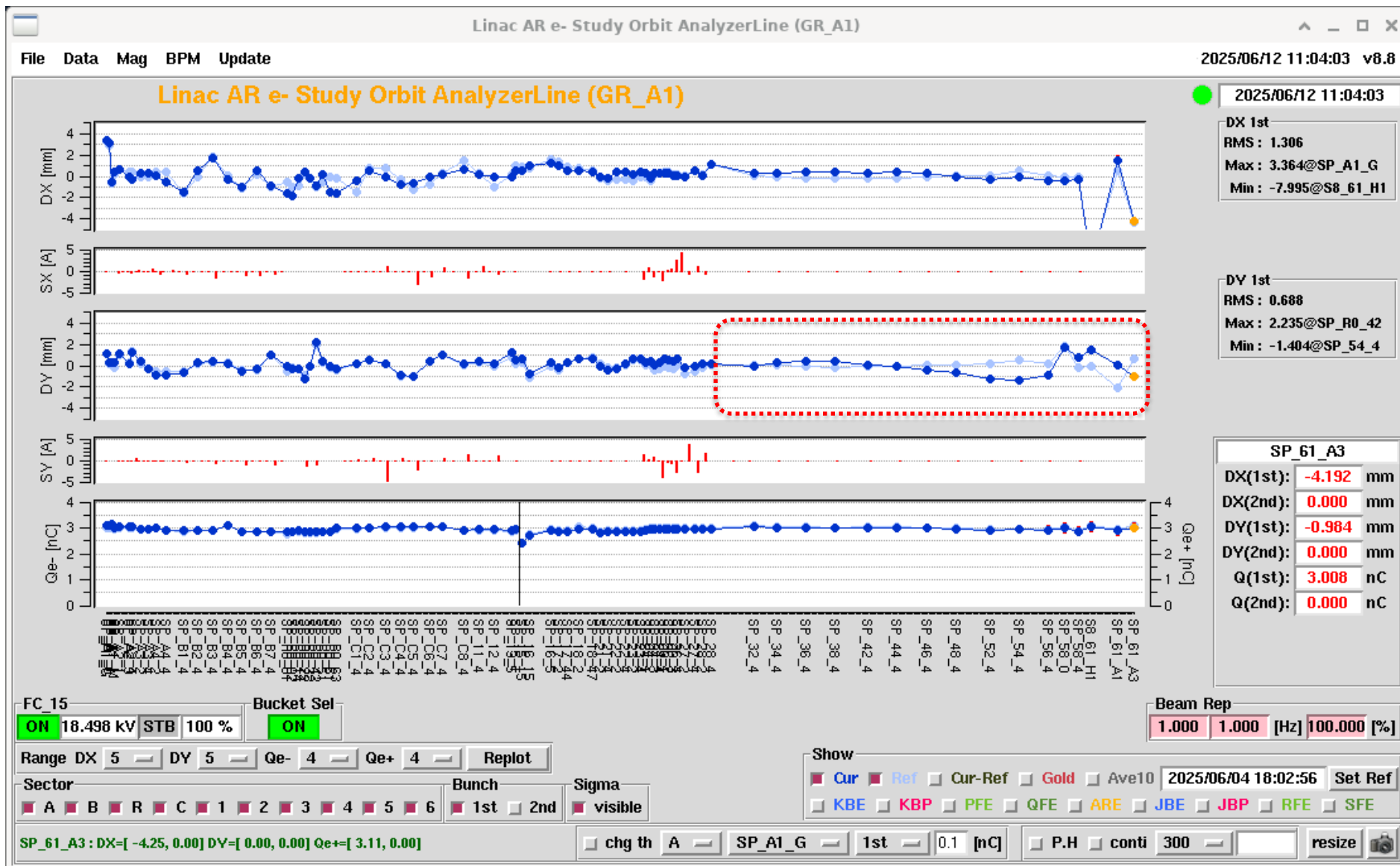
- KBEビームを SC_61_A3 で観測しながら、3-secの始めの PY_DC_4 により vertical 方向にわざと軌道を立てて、wake により vertical 方向に beam spot が広がる様子を観測した。
- SB_5 の位相をずらして energy spread を広げて、horizontal 方向に energy distribution を vertical 方向に bunch の longitudinal 情報を見えるようにすることを試みた。

vertical orbit 無し & dispersion zeroの状態

dphiSB5_00deg_QDF61A1_ON_OrbitDistOFF/170559_611192_GC_61_A3.png

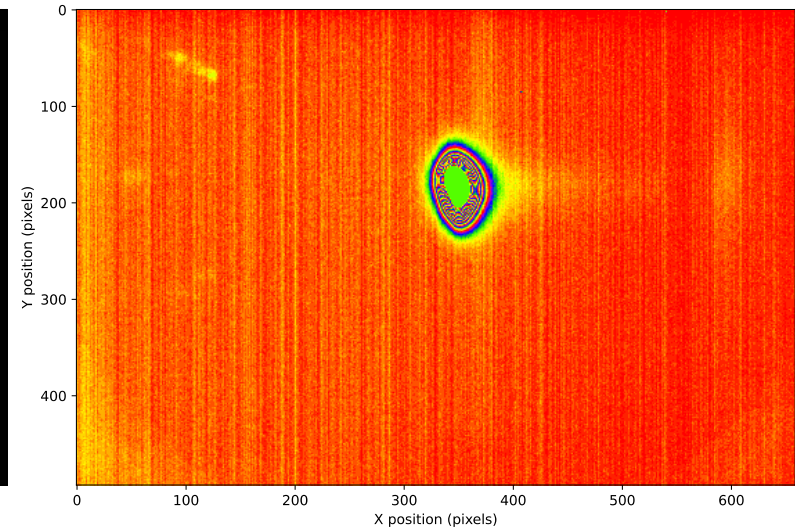
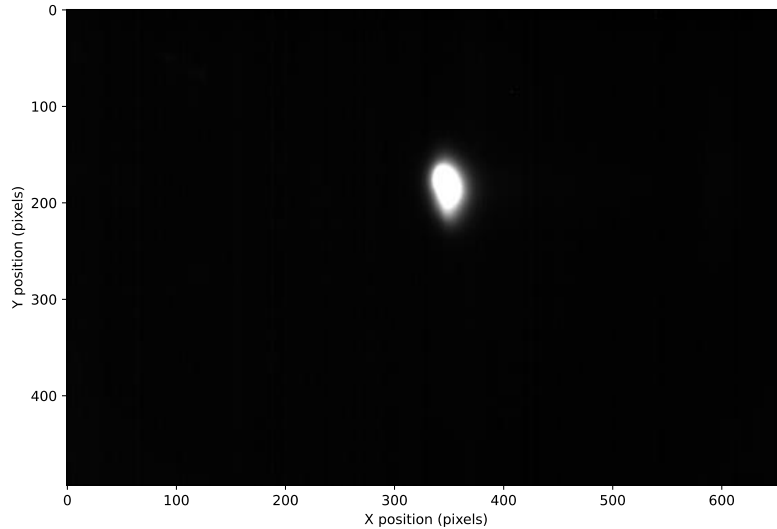


vertical orbit by PY_DC_4

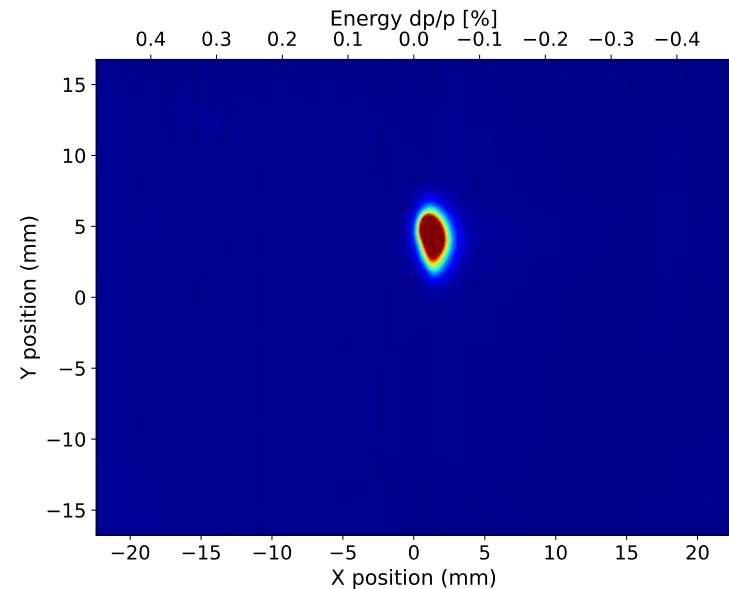
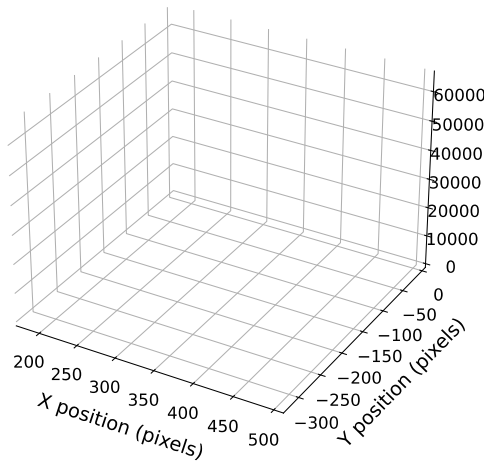


vertical orbit 有り & dispersion zeroの状態

dphiSB5_00deg_QDF61A1_ON/170137_008936_GC_61_A3.png



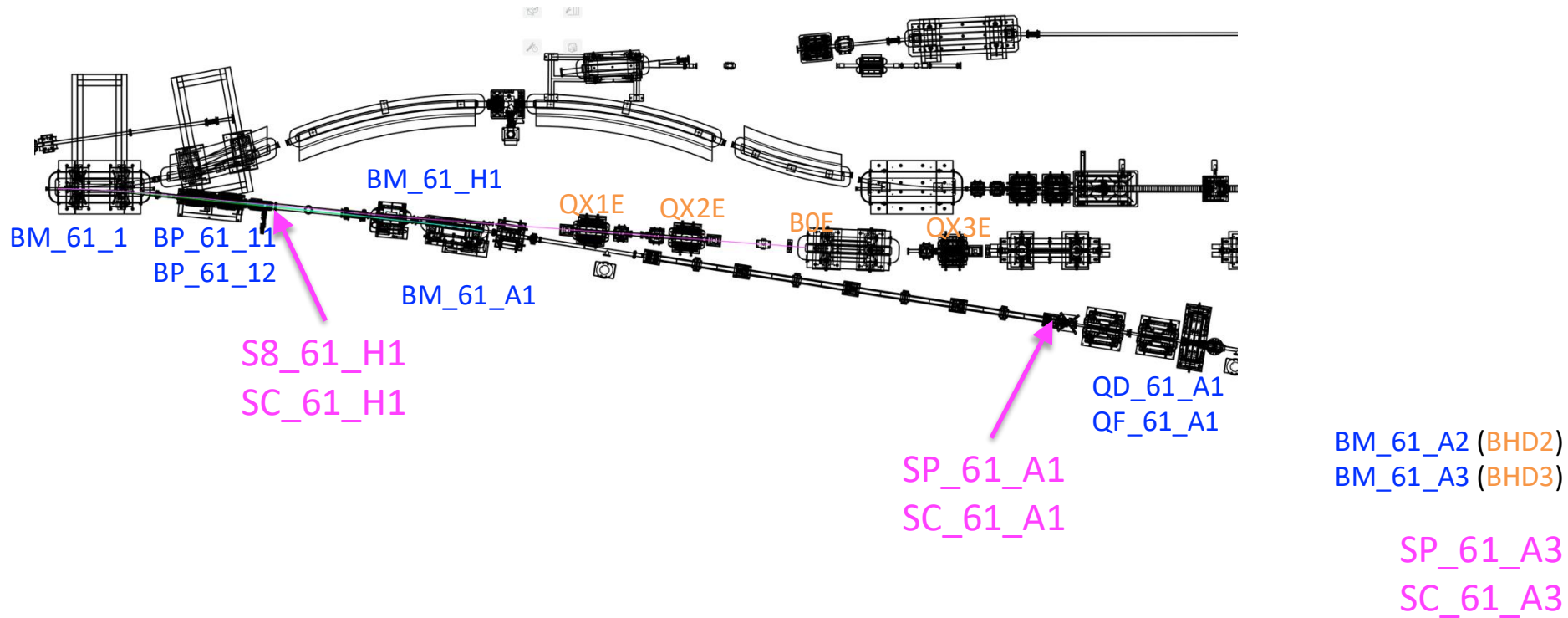
vertical orbit を
立てると
SC_61_A3 での
profile が
vertical に少し
伸びる



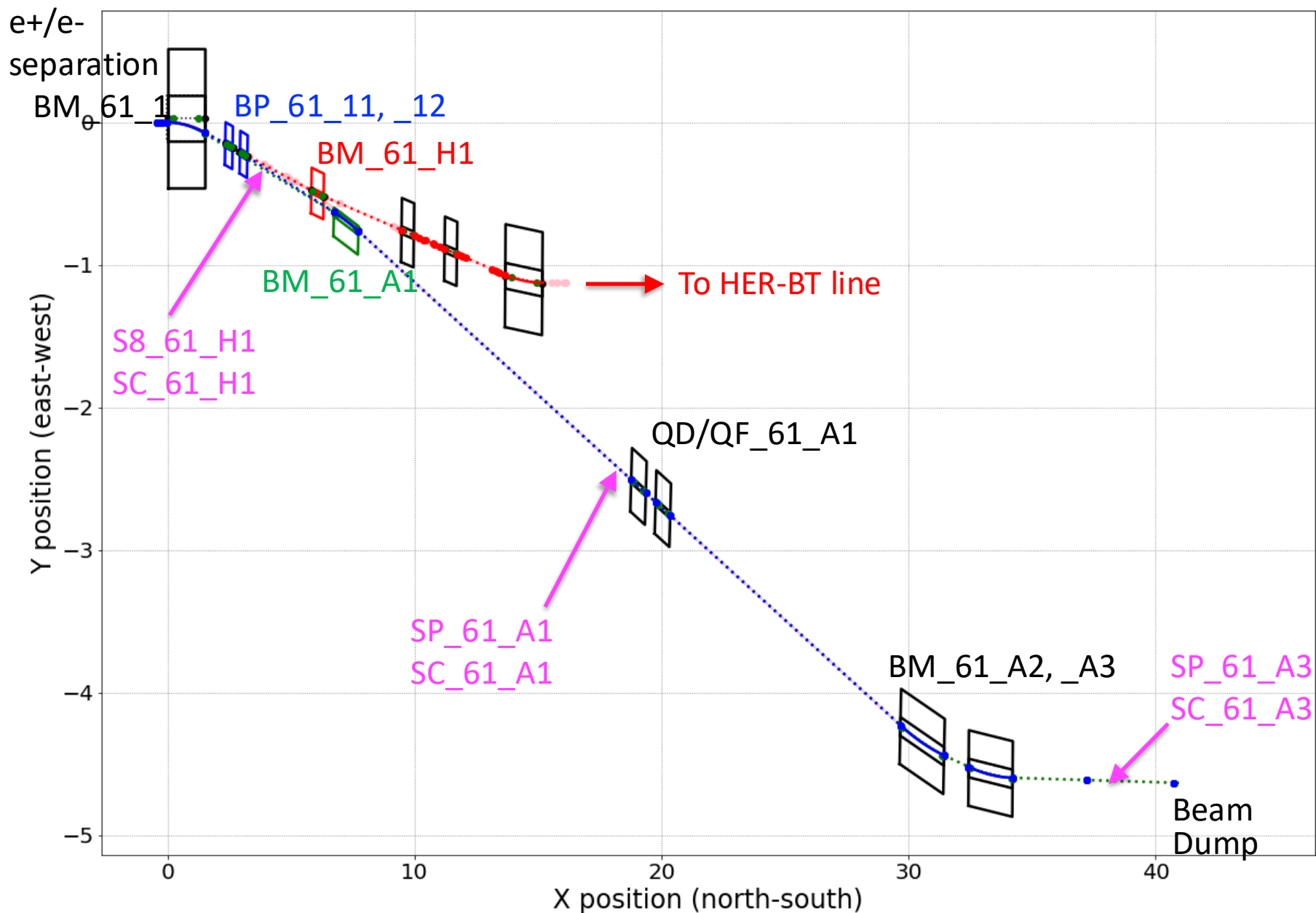
SY3 East Dumpline & Beam Monitors

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● SY3 Beam-Dumpline

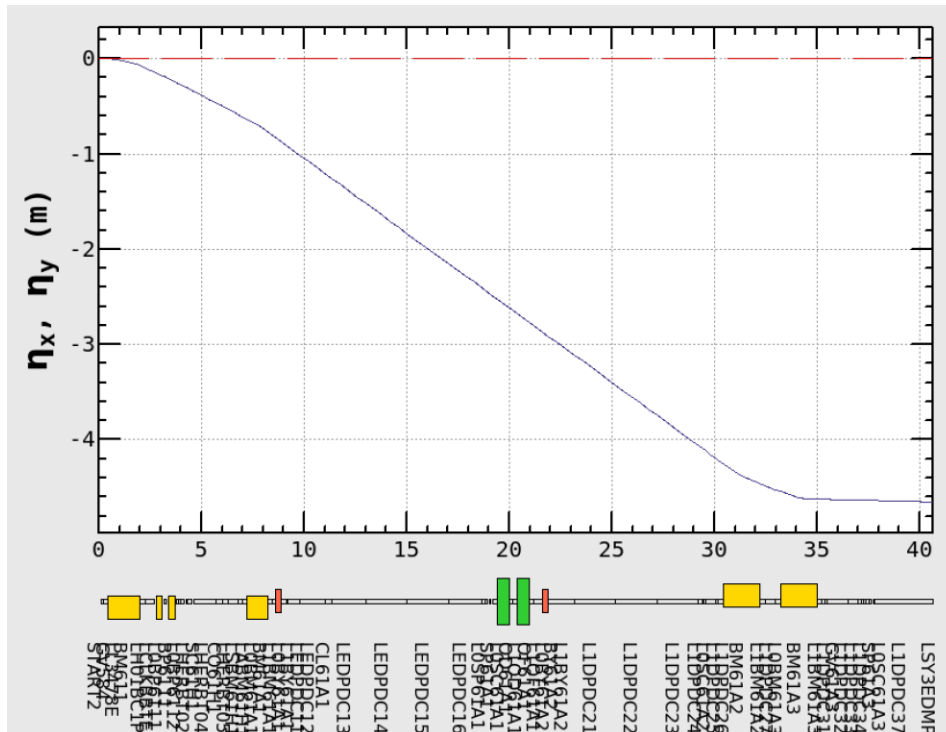


SY3 East Dumpline & Beam Monitors



Dispersion function along SY3 dump line

- Dispersion function in the Pulse Bend switched orbit is evaluated with SAD for the case QD/QF_61_A1 are OFF.

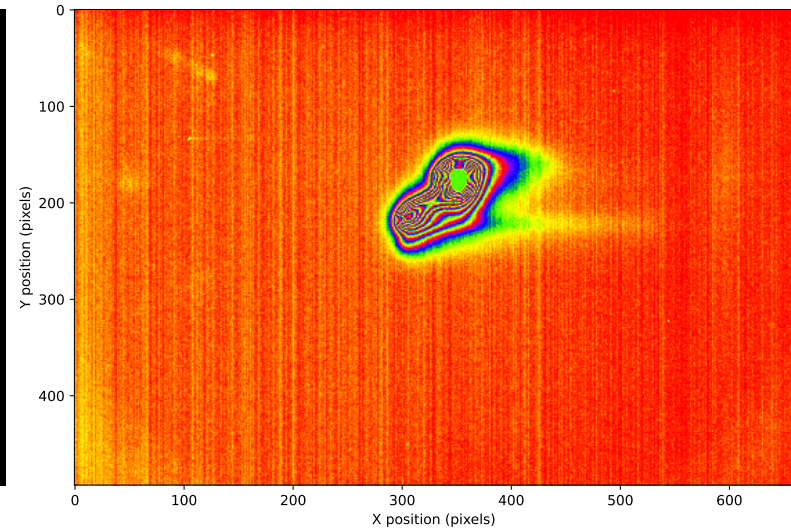
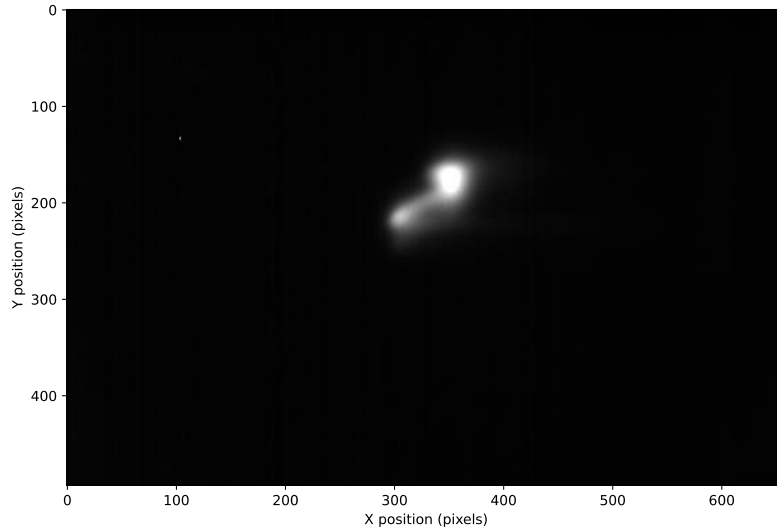


Position	Dispersion [m]
S8_61_H1	0.275
SC_61_H1	0.301
duct beside BM_61_H1	0.608
BM_61_A1 (exit)	0.767
SP_61_A1	2.427
SC_61_A1	2.474
QF_61_A1 (entrance)	2.677
SC_61_A2	4.102
SP_61_A3	4.634
SC_61_A3	4.637

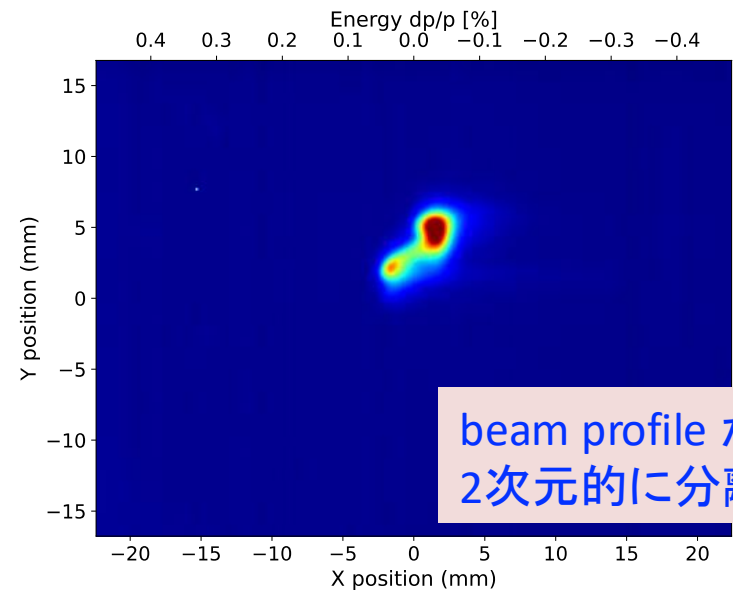
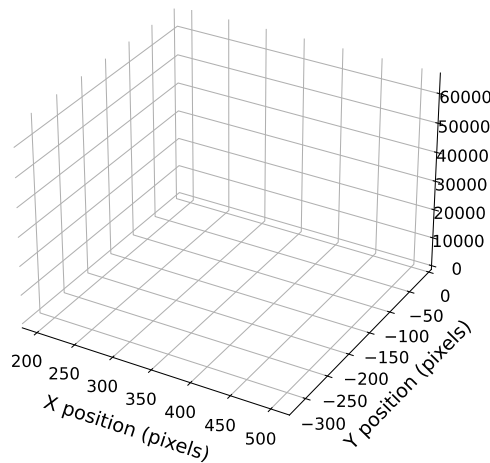
These are tentative values and need fine adjustment in the SAD deck.

vertical orbit 有り & dispersion = 4.673 m

dphiSB5_00deg/165735_166407_GC_61_A3.png



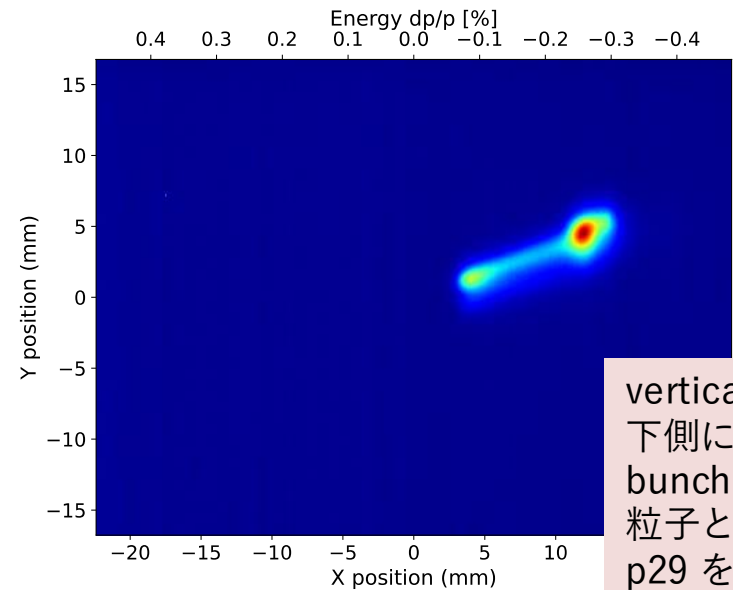
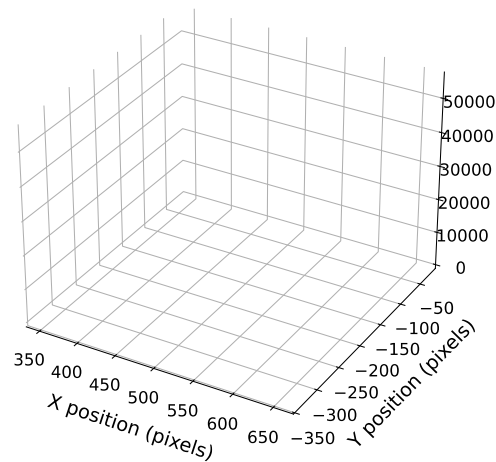
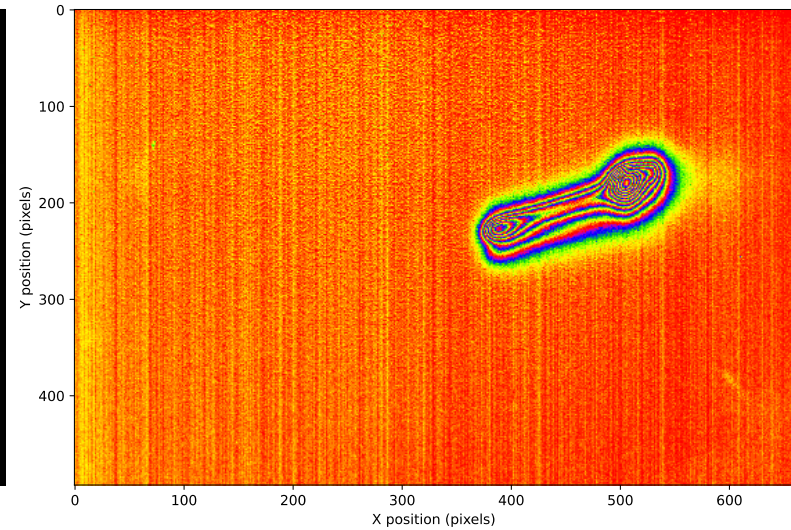
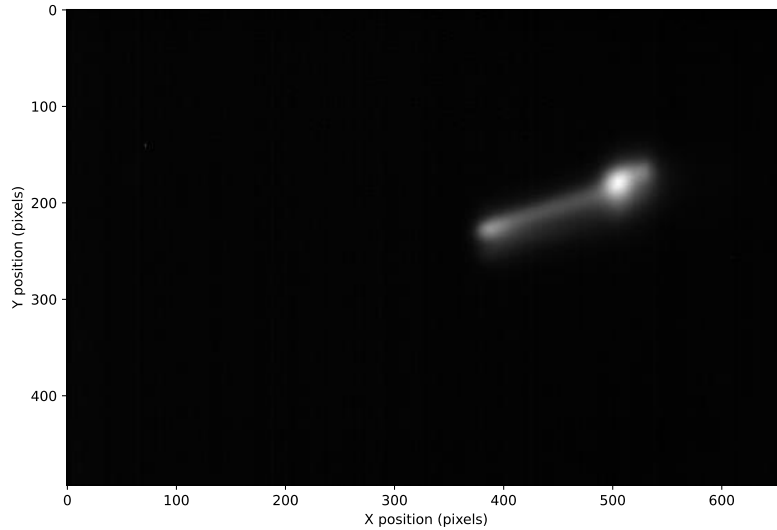
QD/QF_61_A1
の電流値を
zero にすると
SC_61_A3 での
Dispersion が
4.763 m に
増大する



beam profile が
2次的に分離する

$$\phi \text{ SB}_5 = -6 \text{ deg}$$

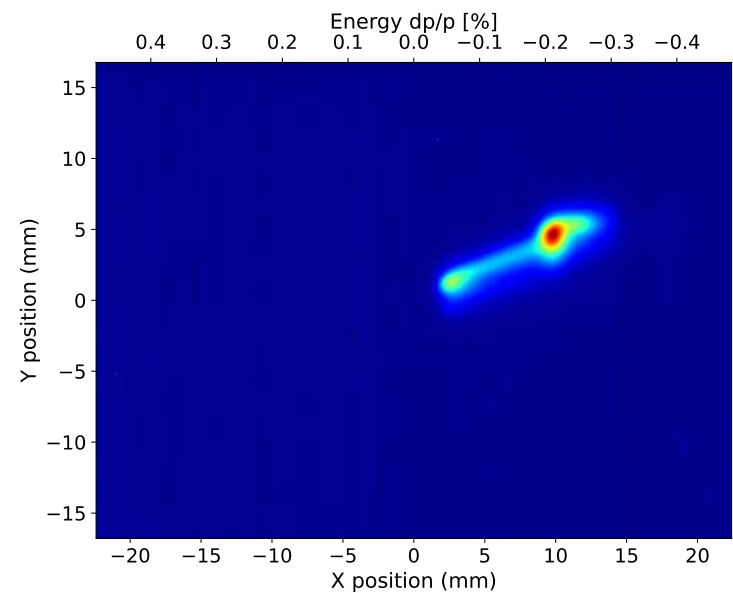
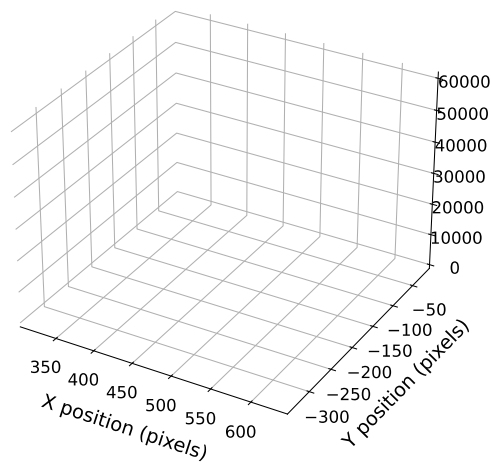
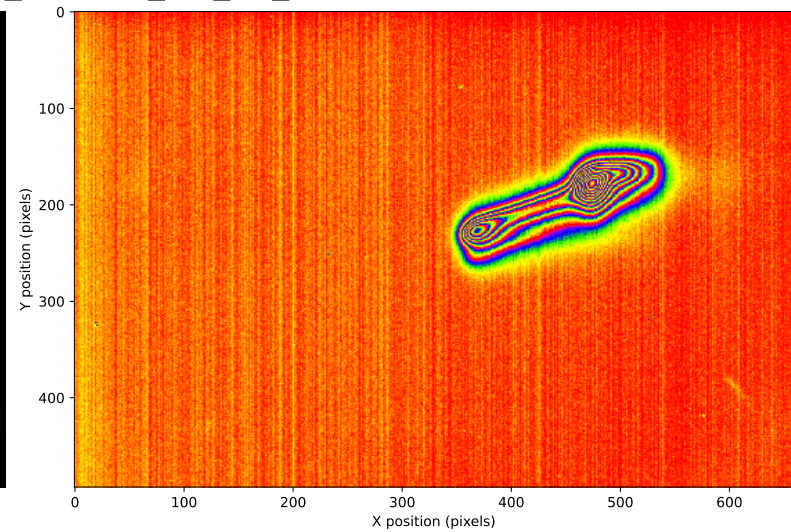
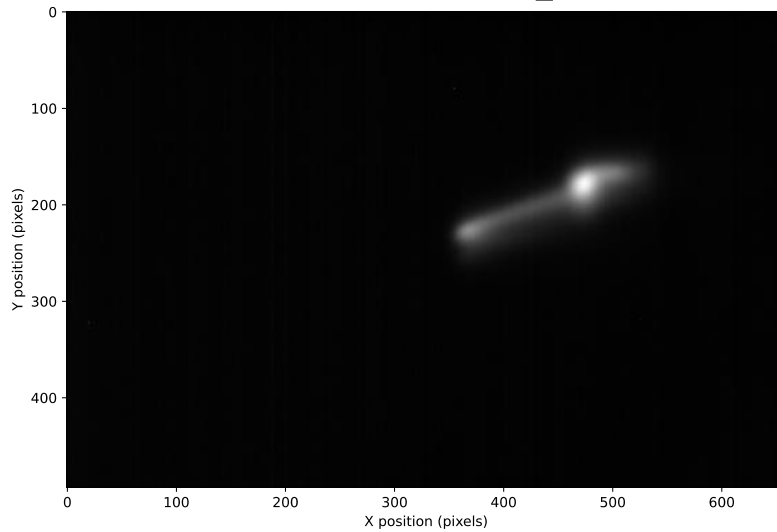
dphiSB5_-6deg/164504_014116_GC_61_A3.png



vertical方向の
下側に居るのが
bunch tail の
粒子と思われる
p29 を参照

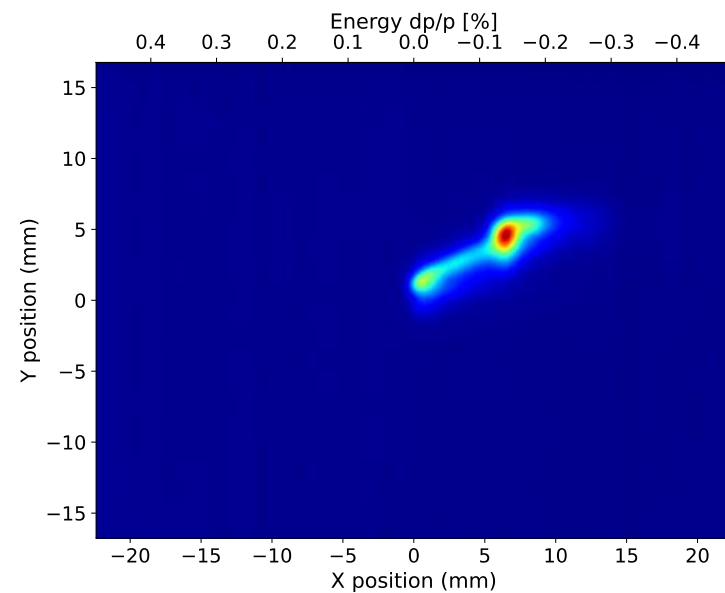
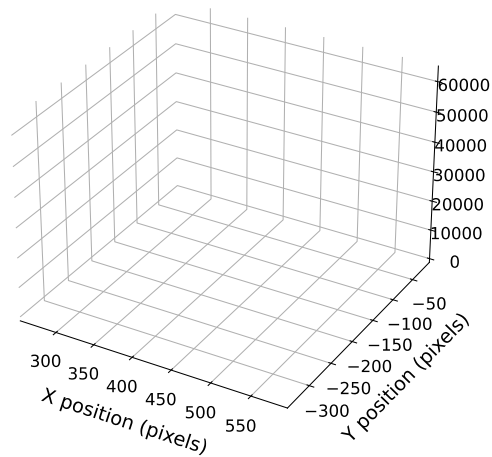
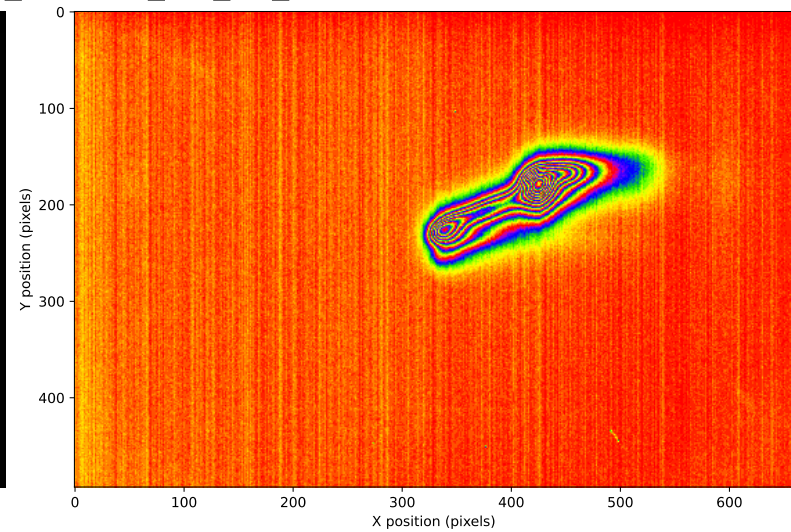
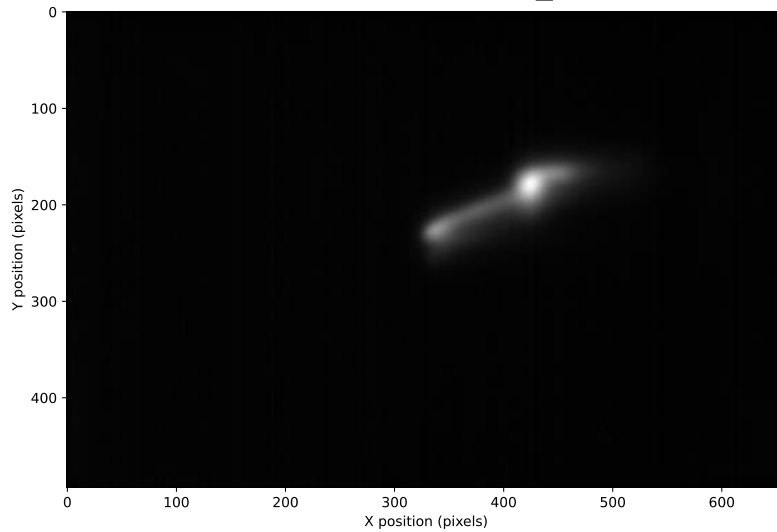
$$\phi \text{ SB}_5 = -5 \text{ deg}$$

dphiSB5_-5deg/165334_149351_GC_61_A3.png



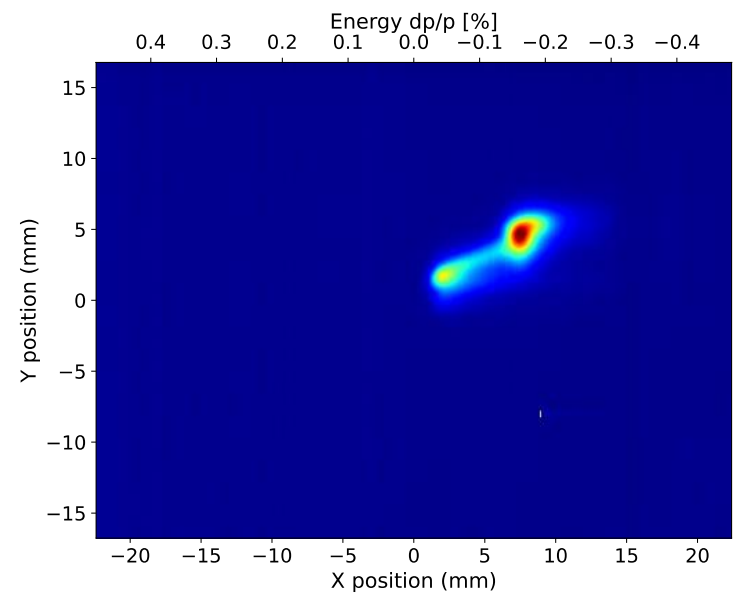
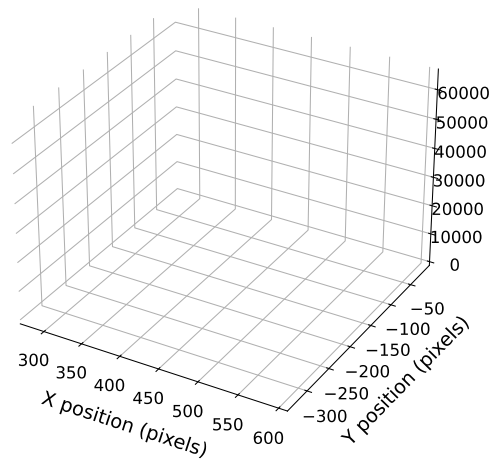
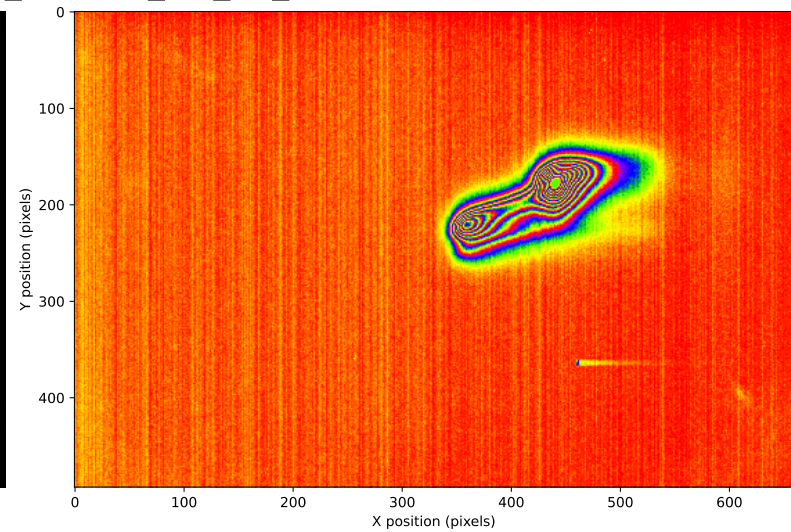
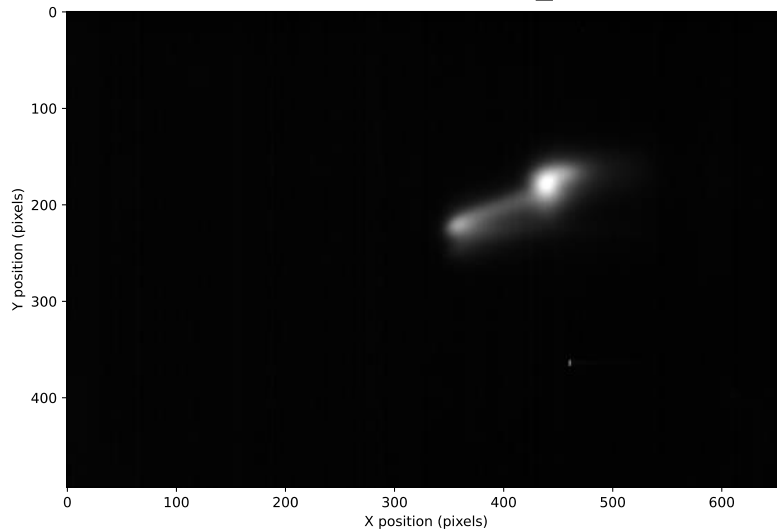
$$\phi \text{ SB}_5 = -4 \text{ deg}$$

dphiSB5_-4deg/162945_449625_GC_61_A3.png



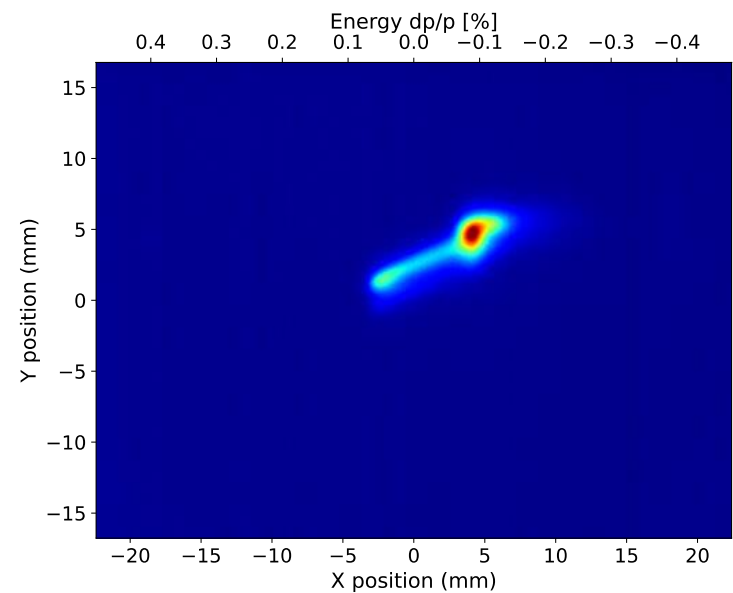
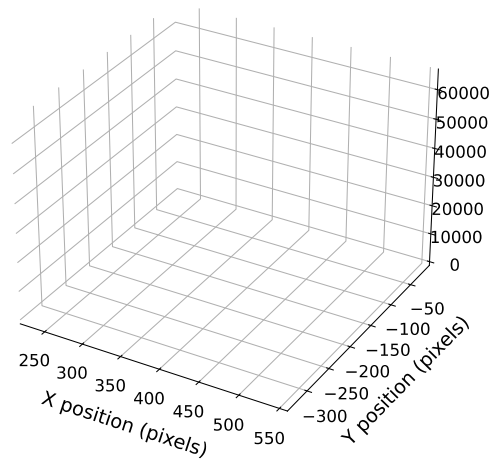
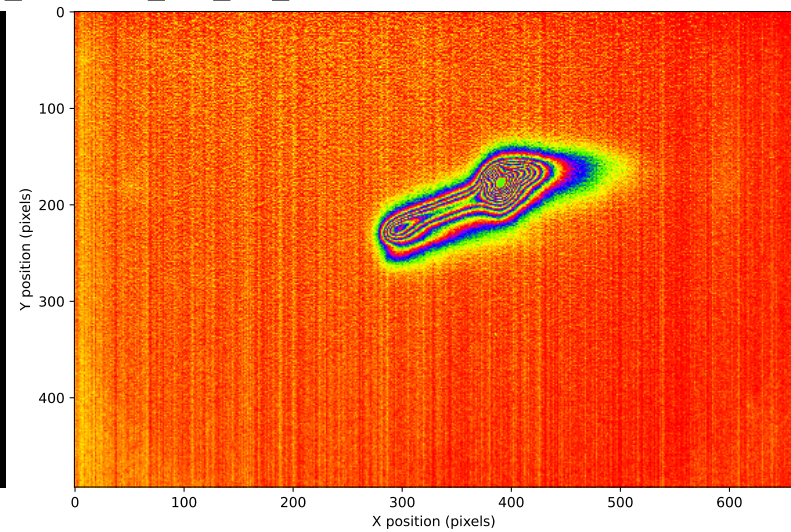
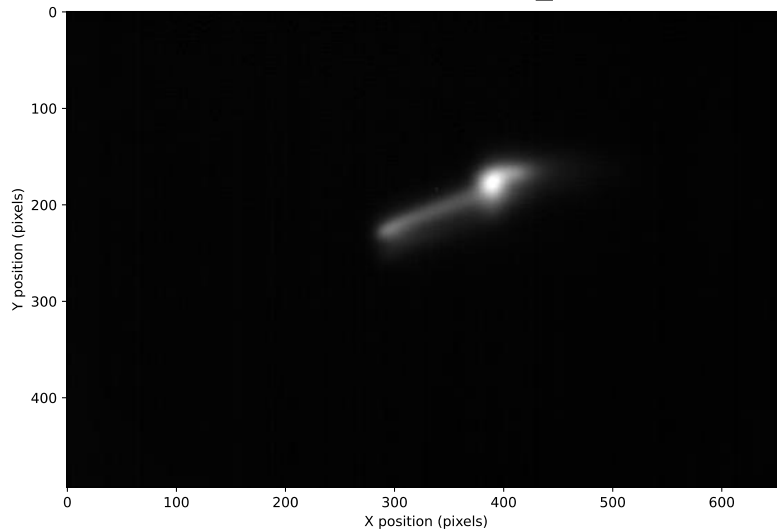
$$\phi \text{ SB}_5 = -3 \text{ deg}$$

dphiSB5_-3deg/162600_247949_GC_61_A3.png



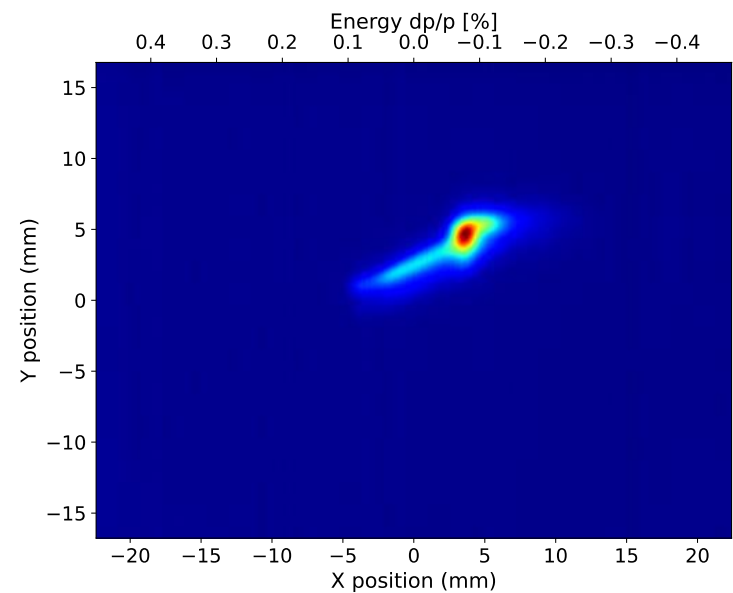
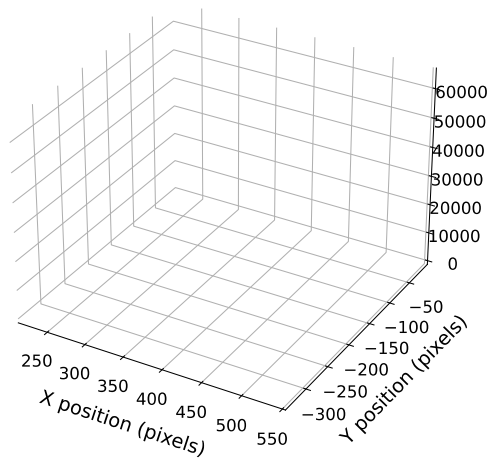
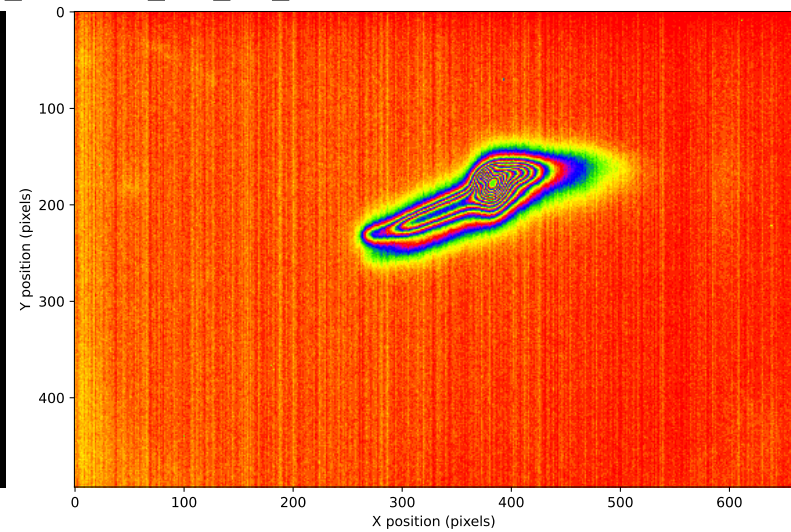
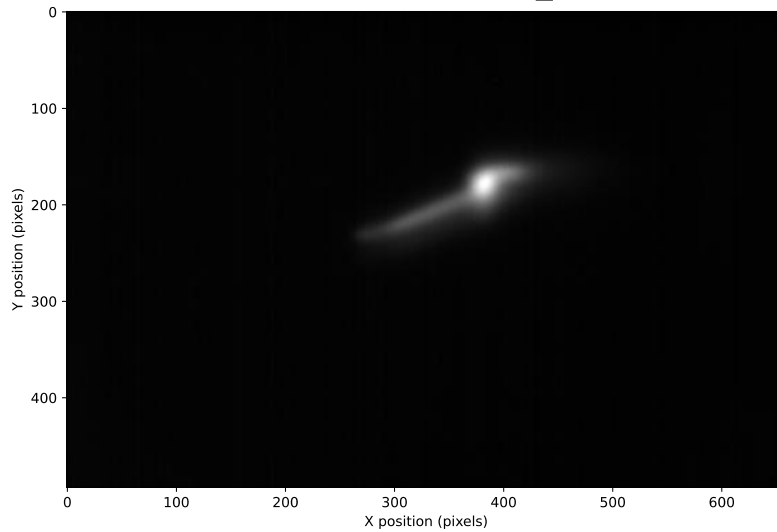
$$\phi \text{ SB}_5 = -2 \text{ deg}$$

dphiSB5_-2deg/162234_247831_GC_61_A3.png



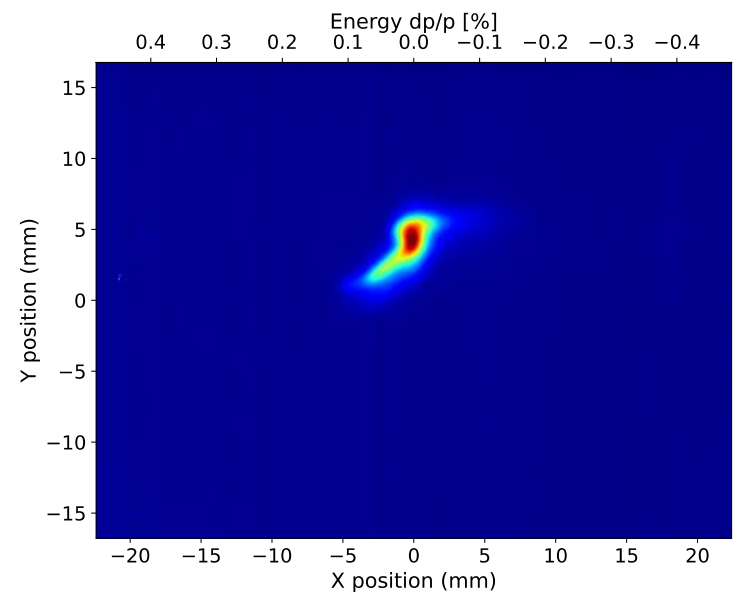
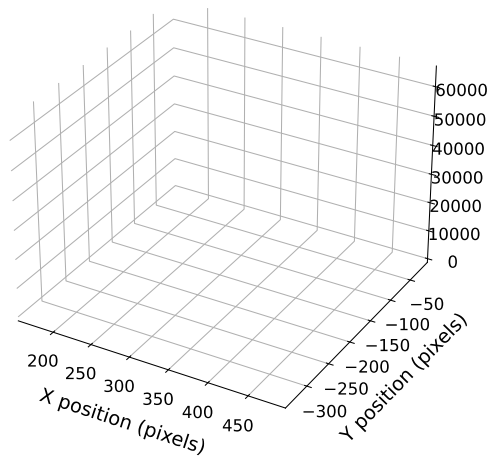
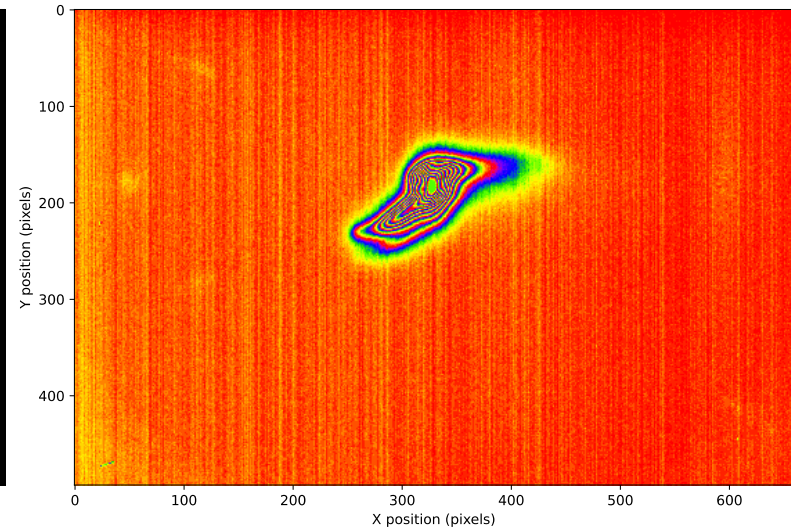
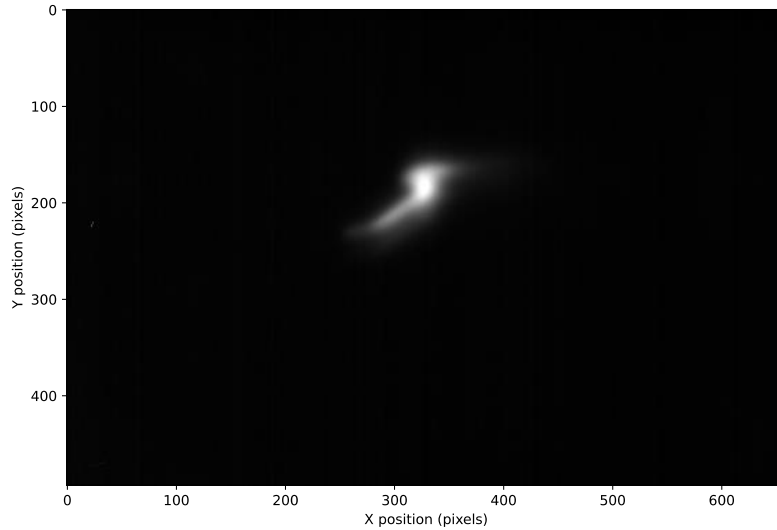
$$\phi \text{ SB}_5 = -1 \text{ deg}$$

dphiSB5_-1deg/161846_619980_GC_61_A3.png



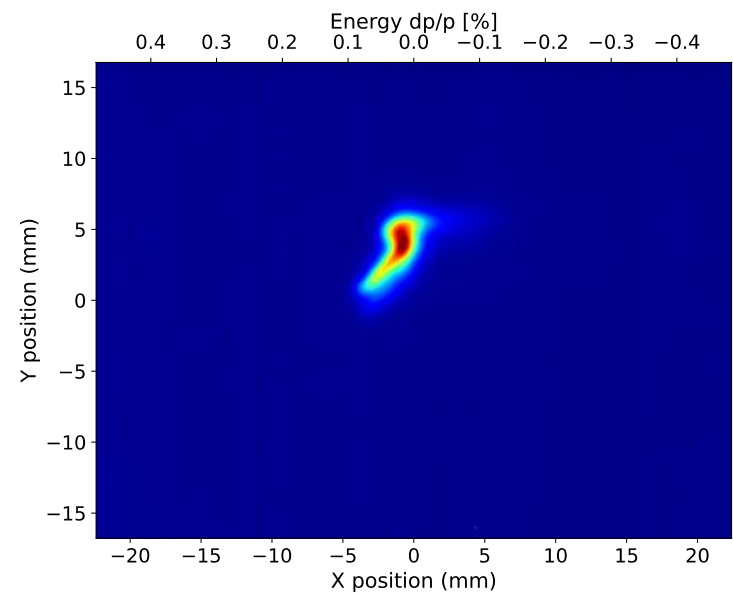
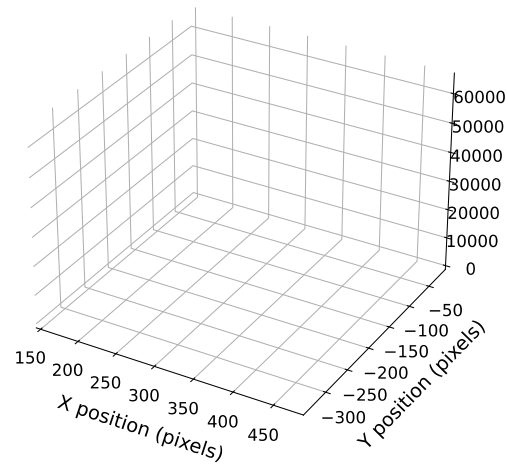
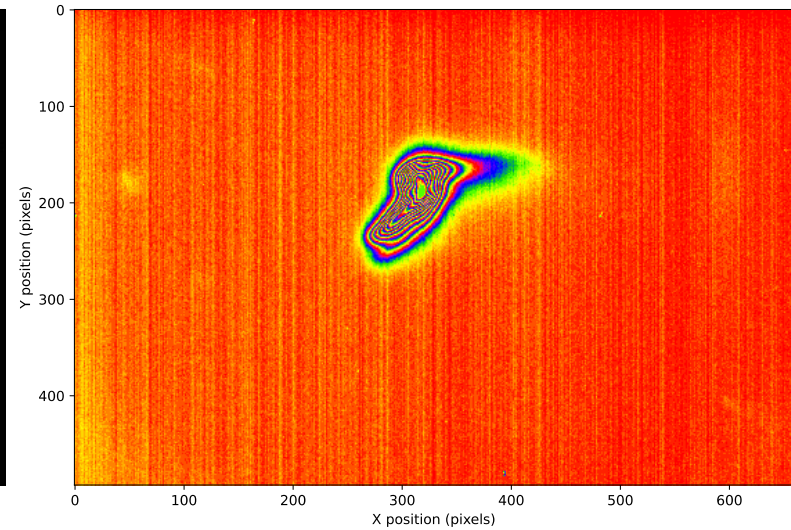
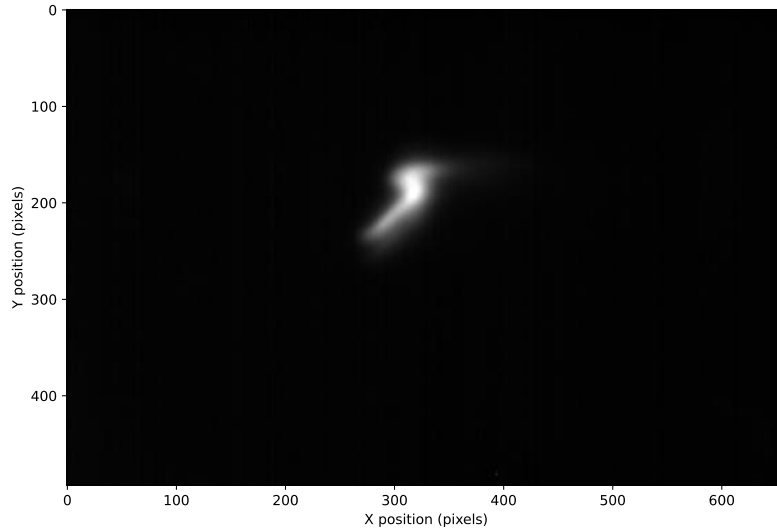
$$\phi_{SB_5} = 0 \text{ deg}$$

dphiSB5_00deg/161456_530037_GC_61_A3.png



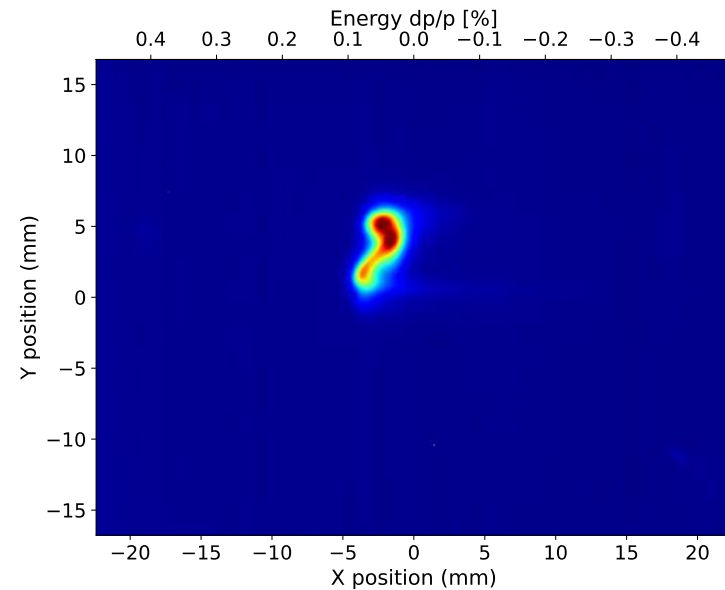
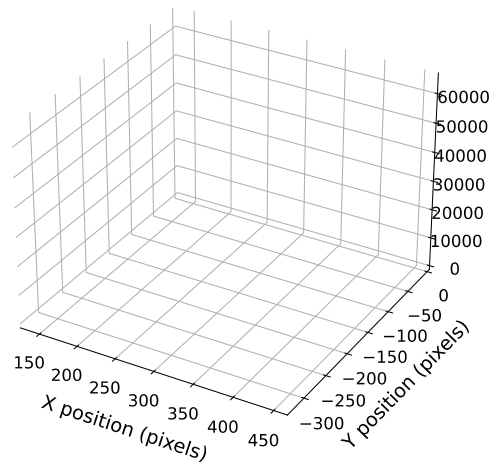
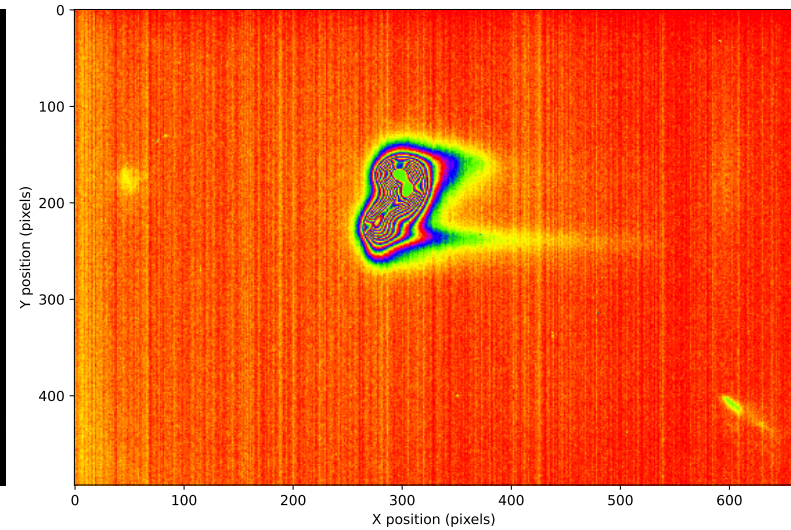
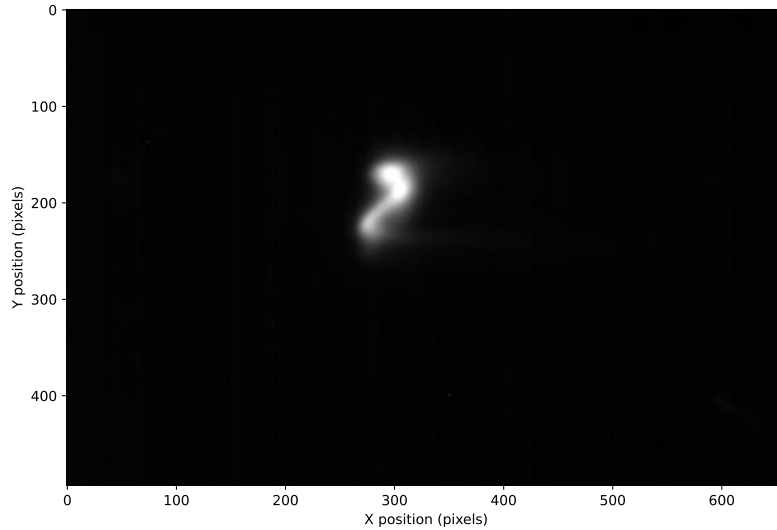
$$\phi \text{ SB_5} = 1 \text{ deg}$$

dphiSB5_01deg/161306_632185_GC_61_A3.png



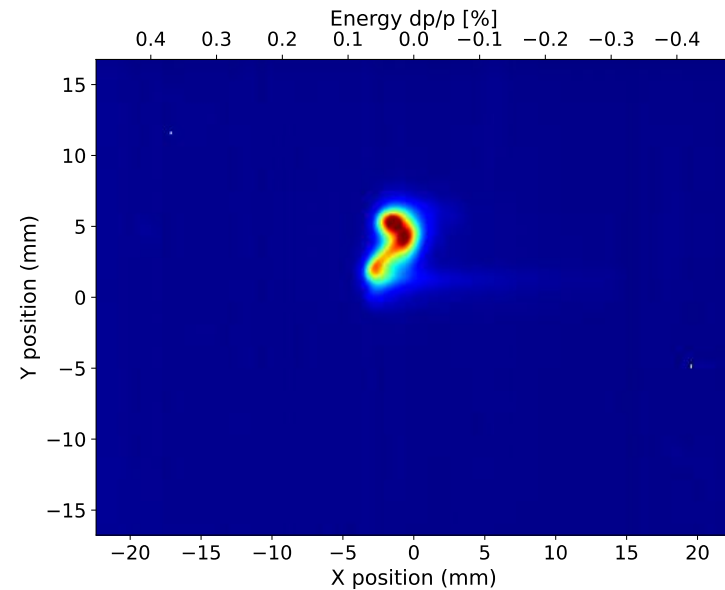
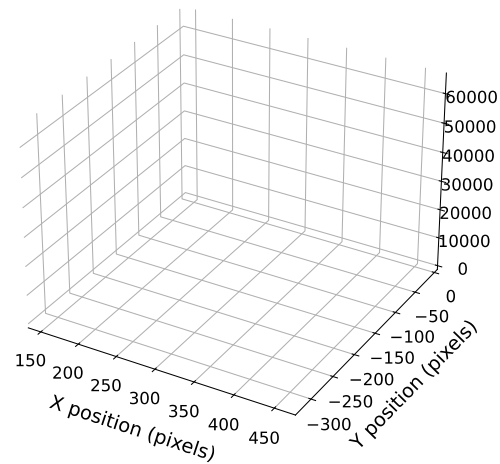
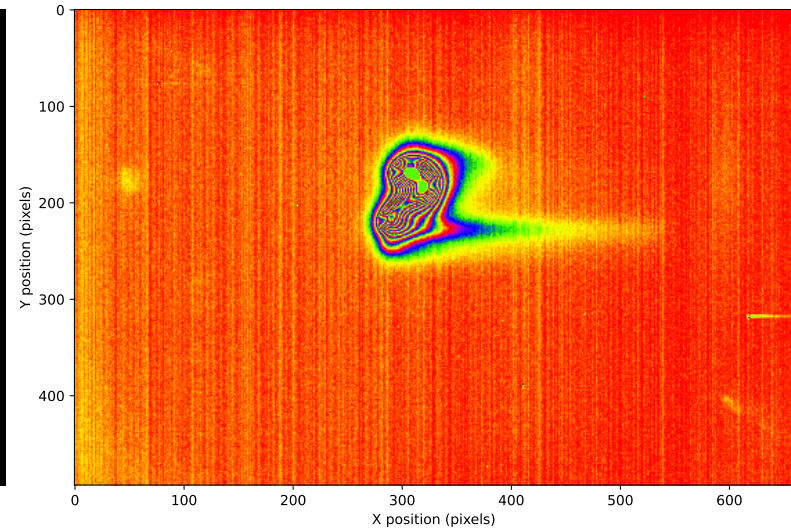
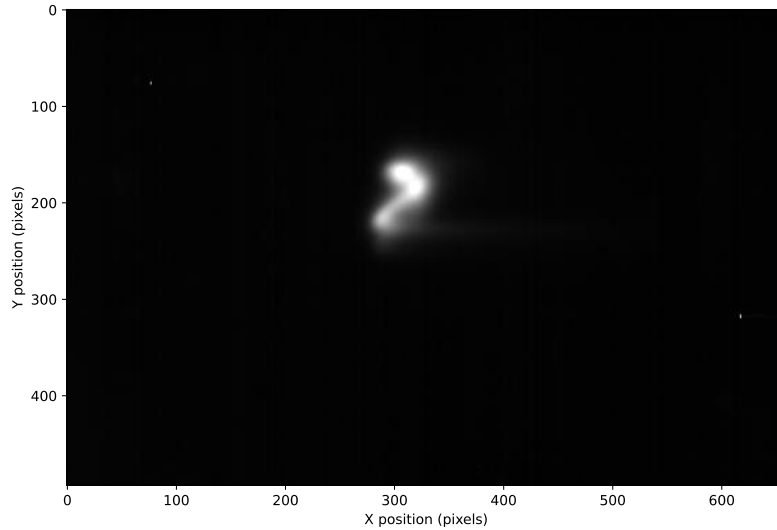
$$\phi \text{ SB_5} = 2 \text{ deg}$$

dphiSB5_02deg/160729_060201_GC_61_A3.png



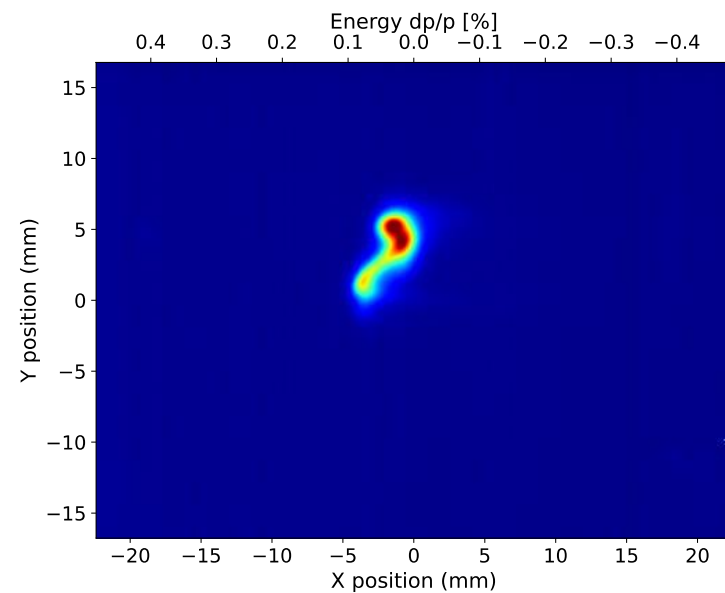
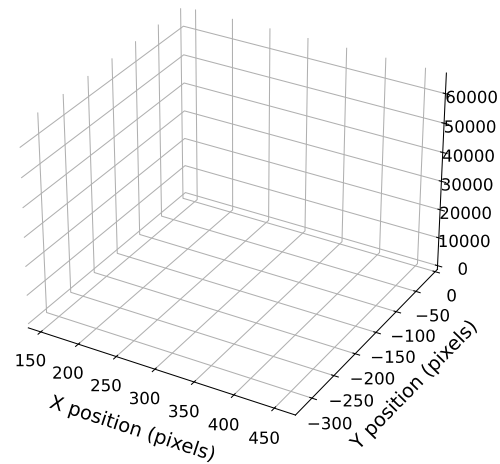
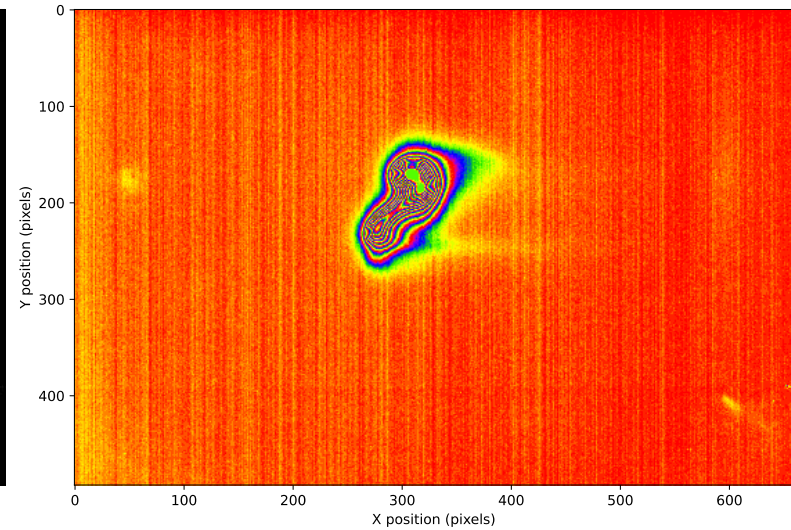
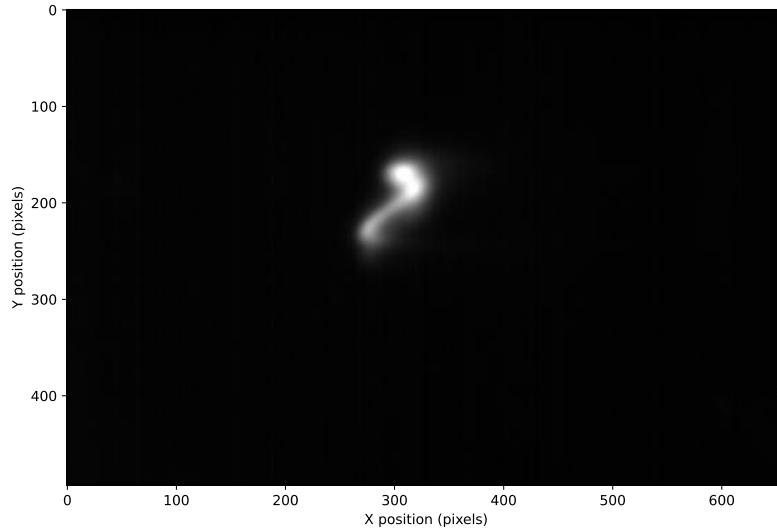
$$\phi \text{ SB_5} = 3 \text{ deg}$$

dphiSB5_03deg/160551_519140_GC_61_A3.png



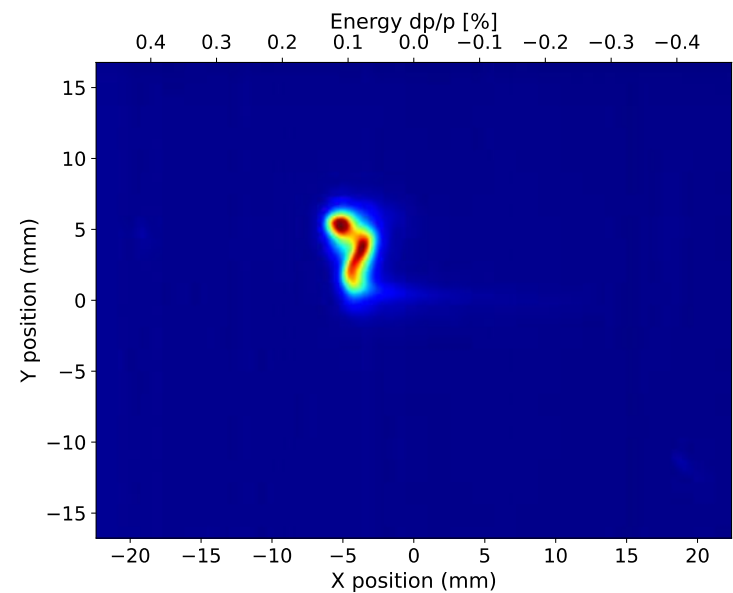
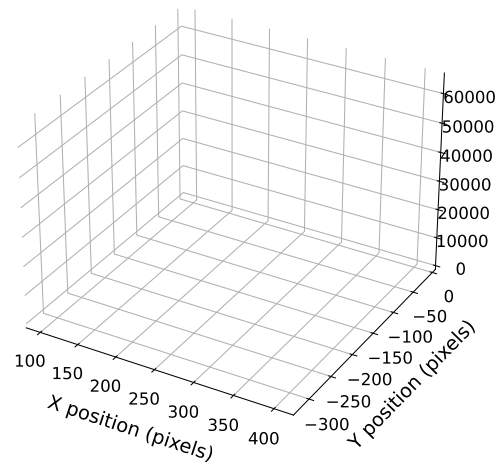
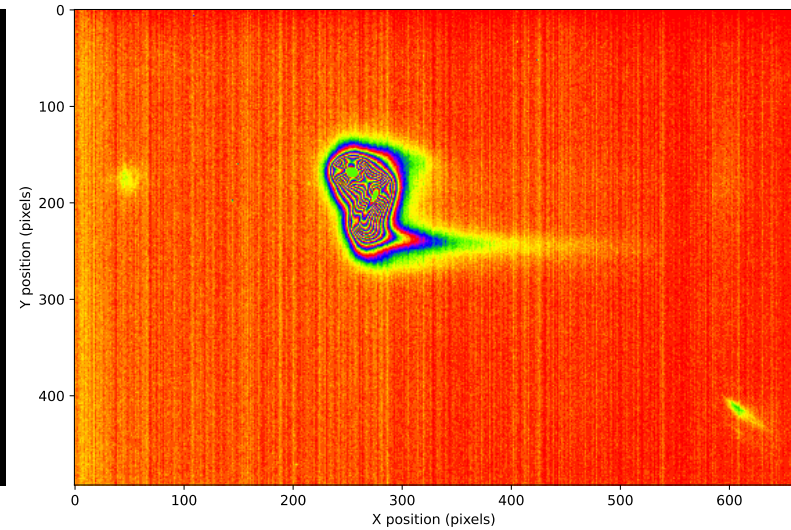
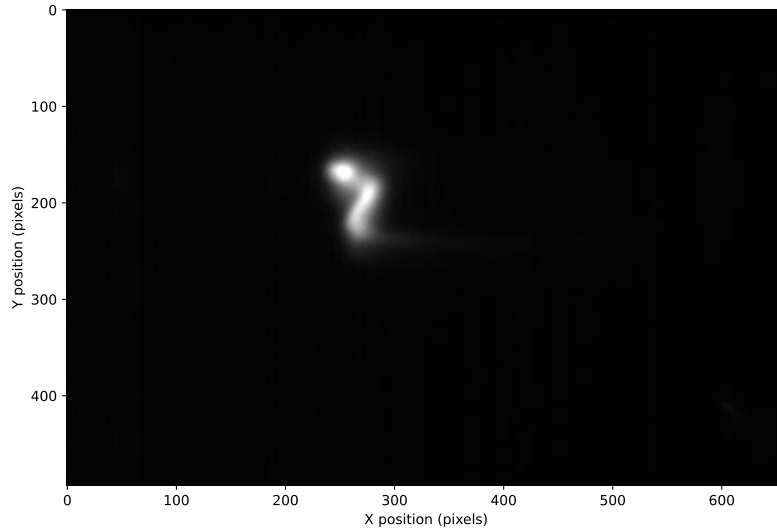
$$\phi \text{ SB_5} = 4 \text{ deg}$$

dphiSB5_04deg/160152_500185_GC_61_A3.png



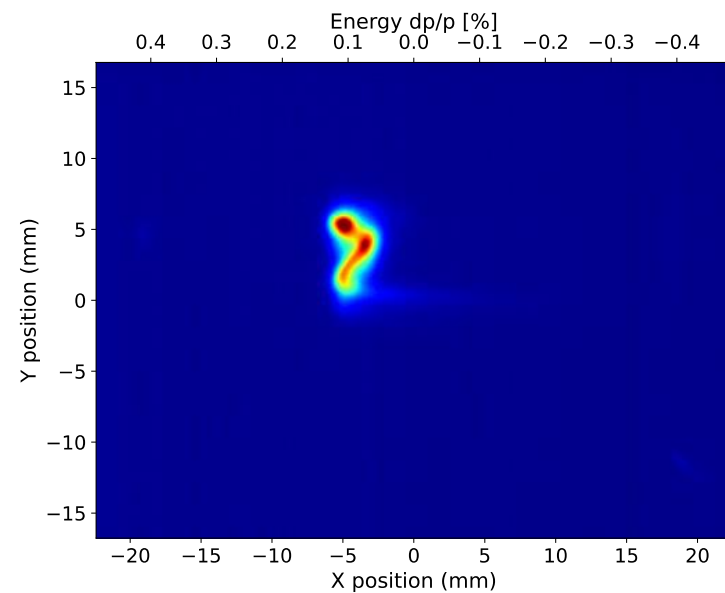
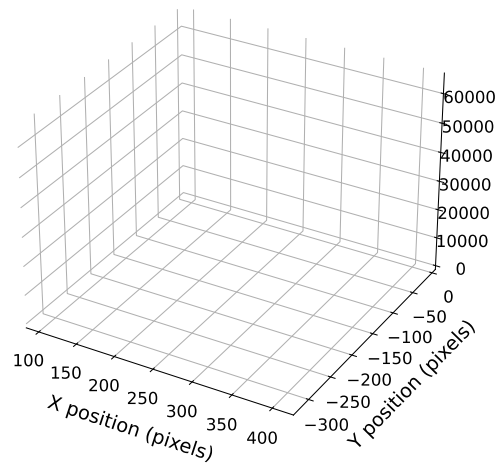
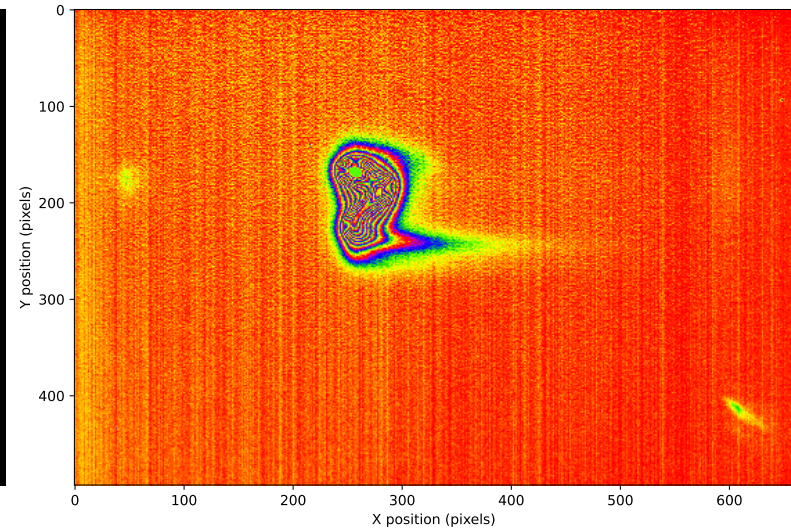
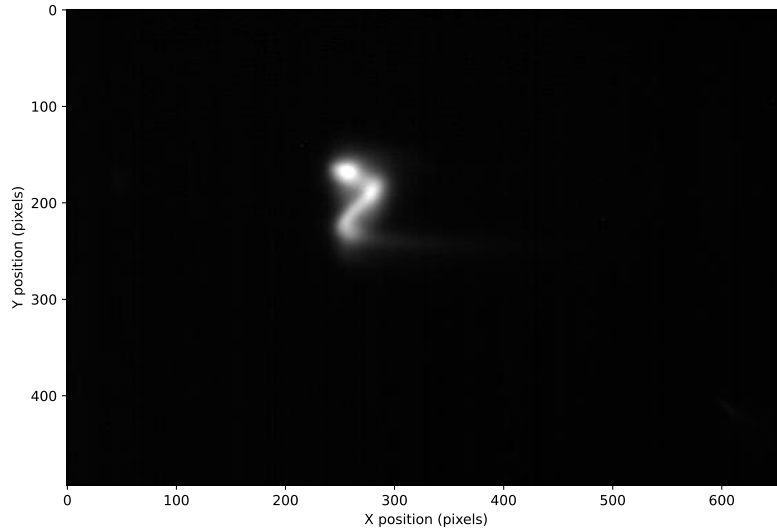
$$\phi \text{ SB_5} = 5 \text{ deg}$$

dphiSB5_05deg/155621_745460_GC_61_A3.png



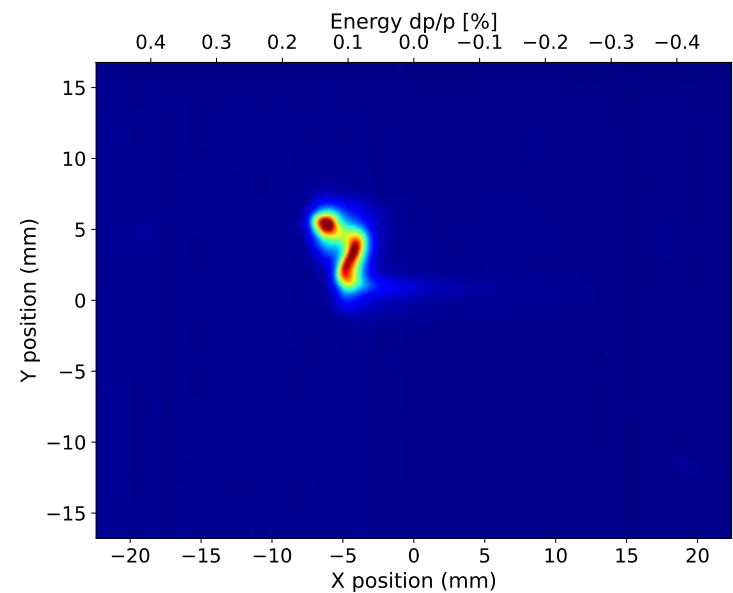
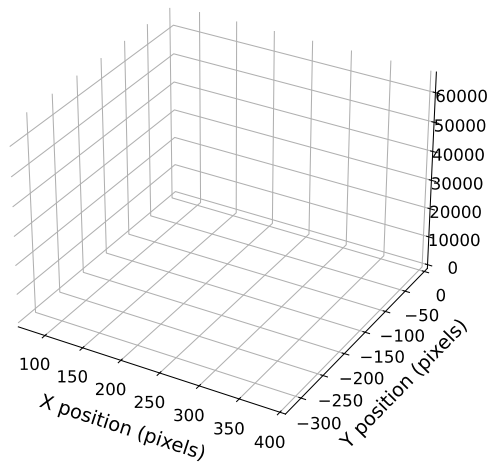
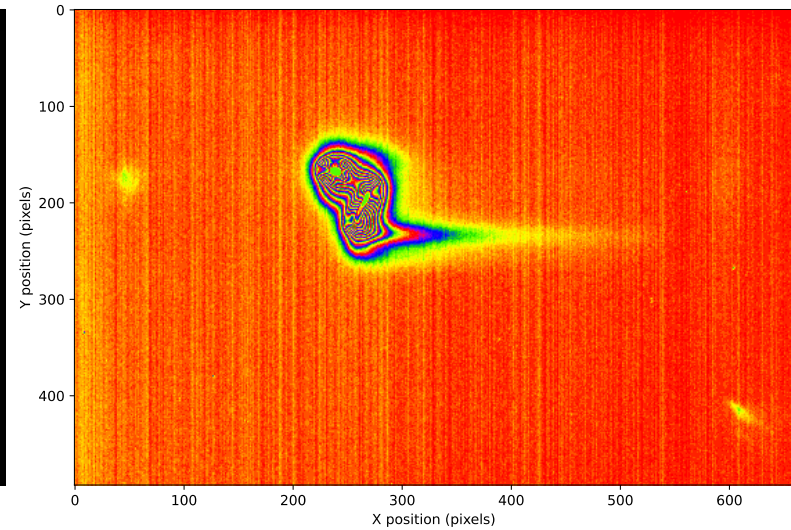
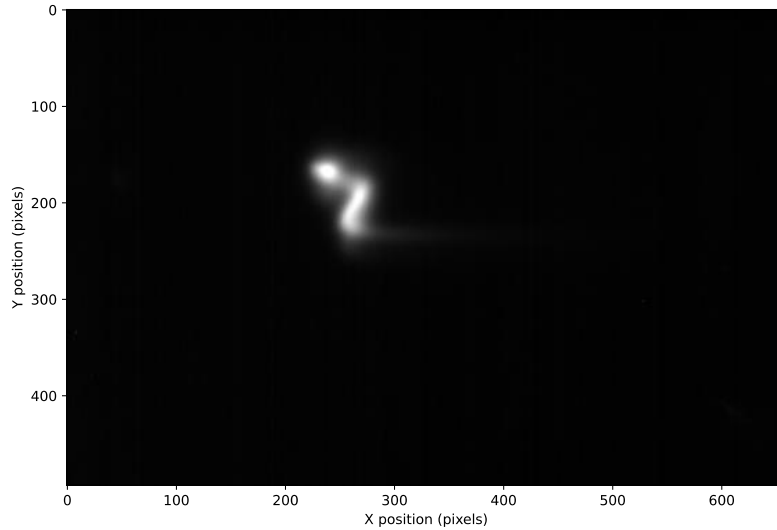
$$\phi \text{SB}_5 = 6 \text{ deg}$$

dphiSB5_06deg/155223_600176_GC_61_A3.png



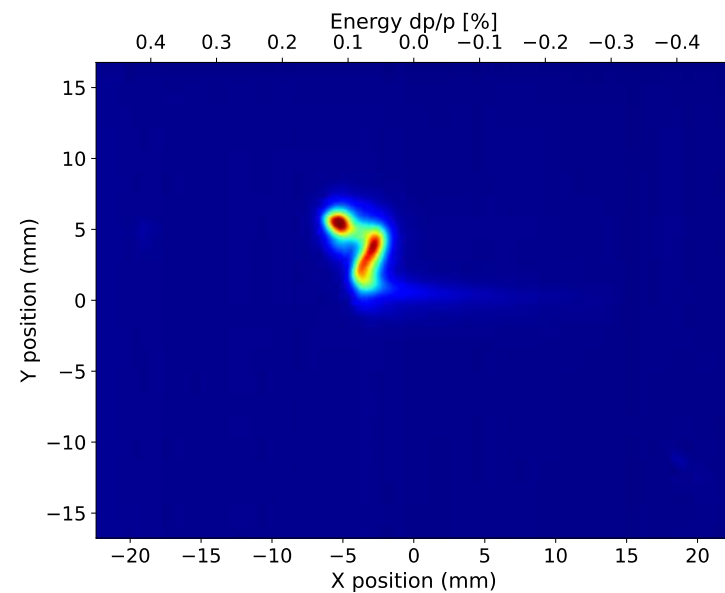
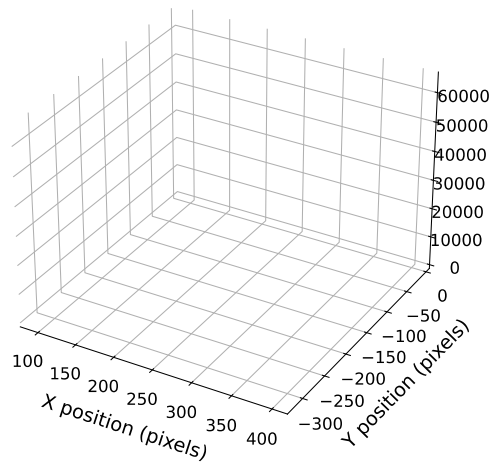
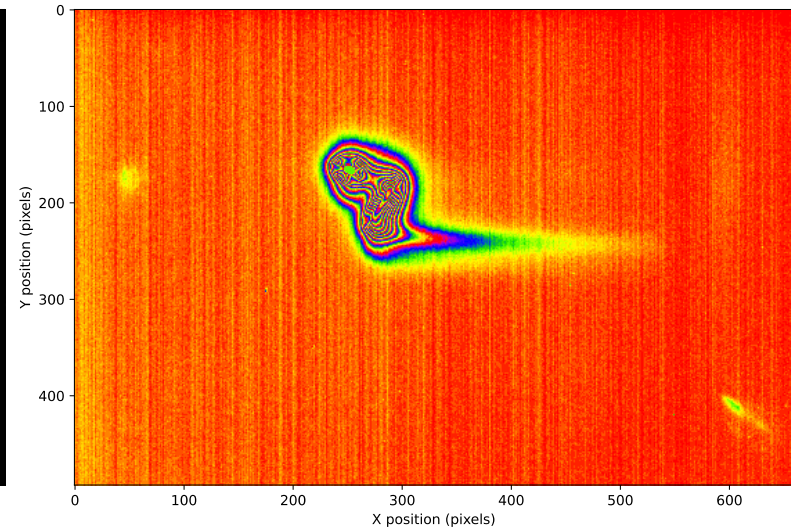
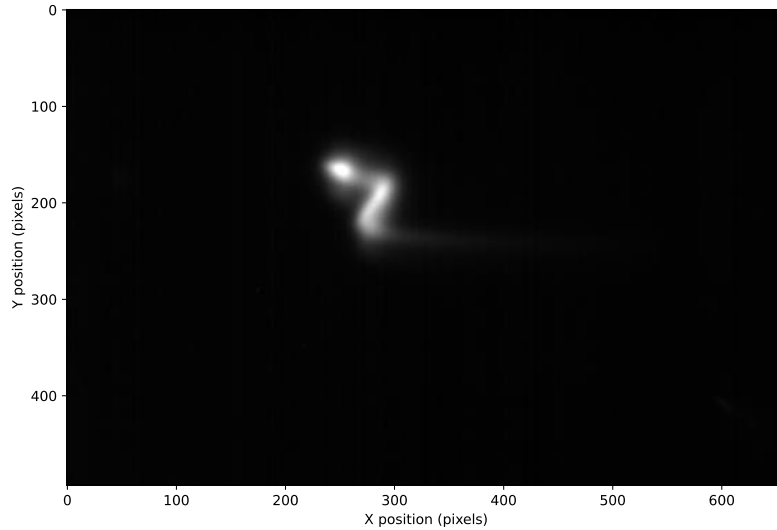
$$\phi \text{ SB_5} = 7 \text{ deg}$$

dphiSB5_07deg/154648_913661_GC_61_A3.png



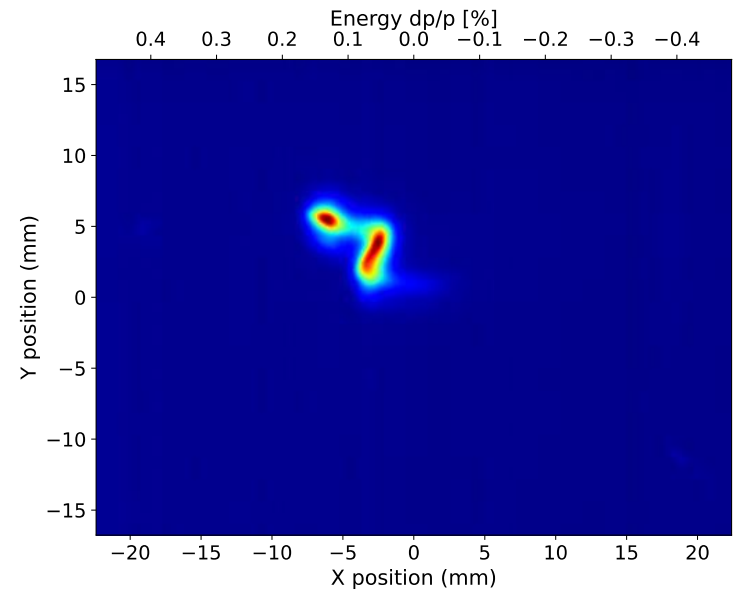
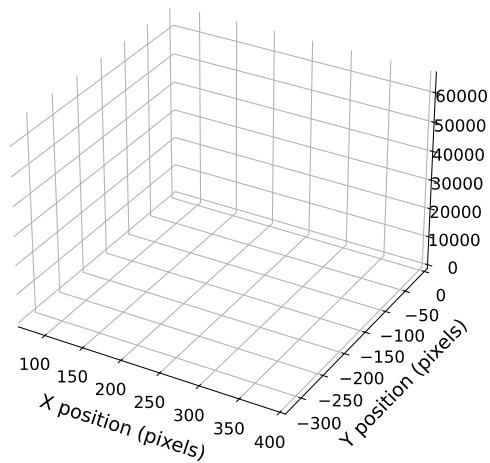
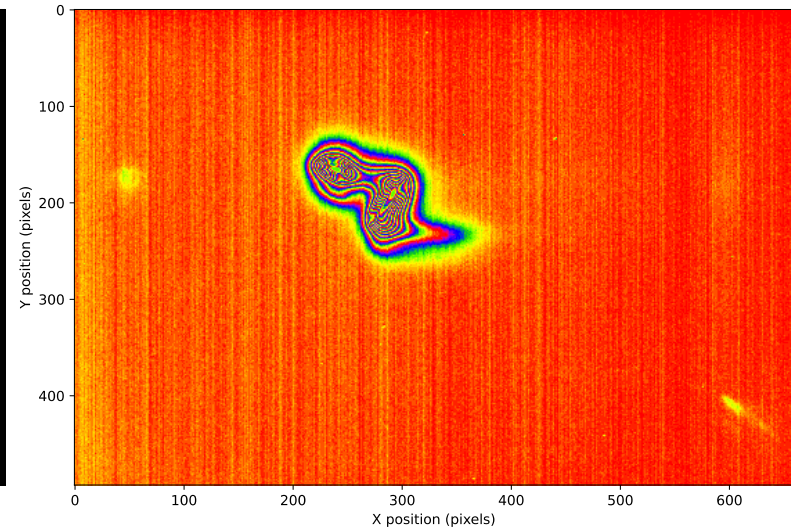
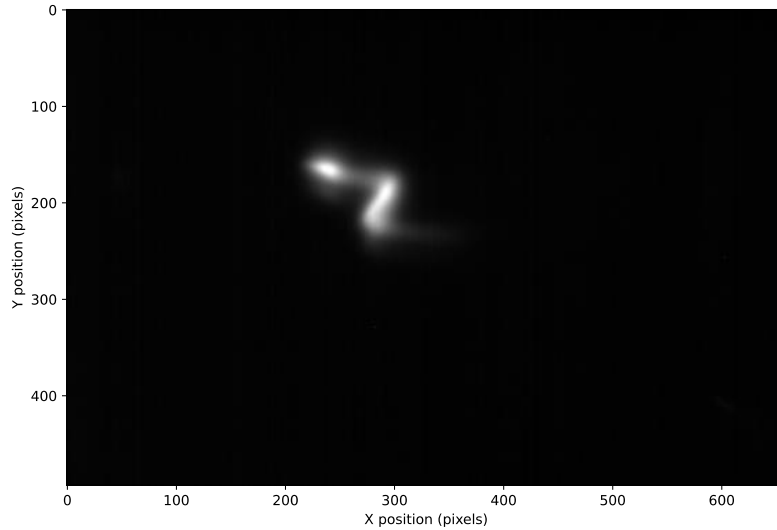
$$\phi \text{ SB_5} = 8 \text{ deg}$$

dphiSB5_08deg/153835_184836_GC_61_A3.png



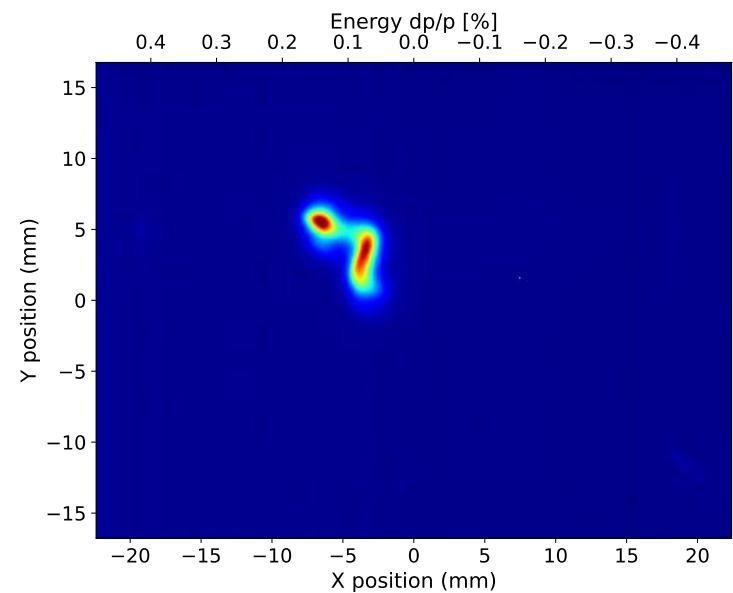
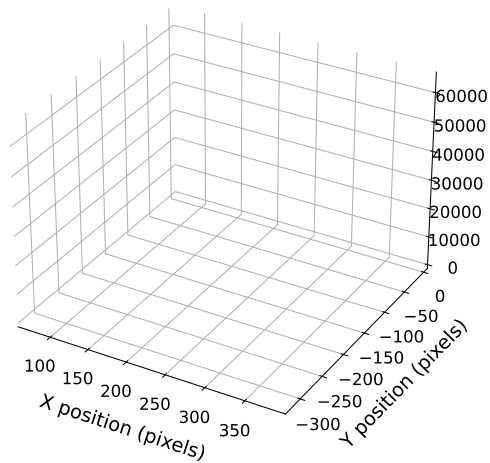
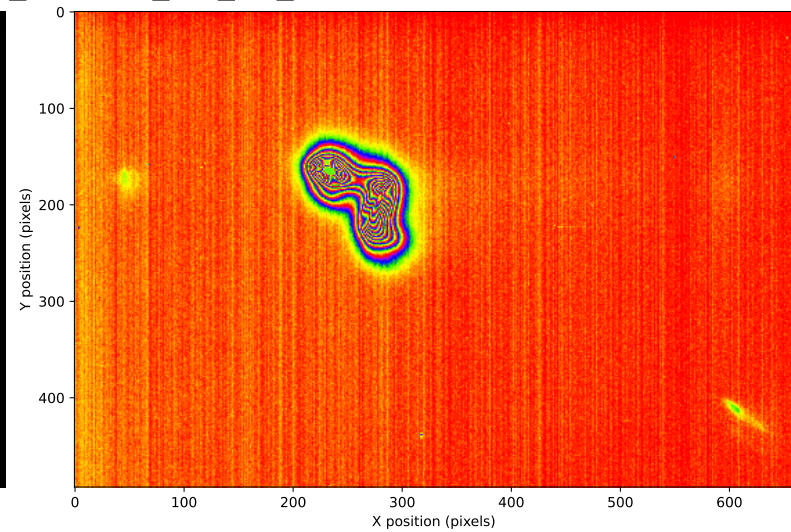
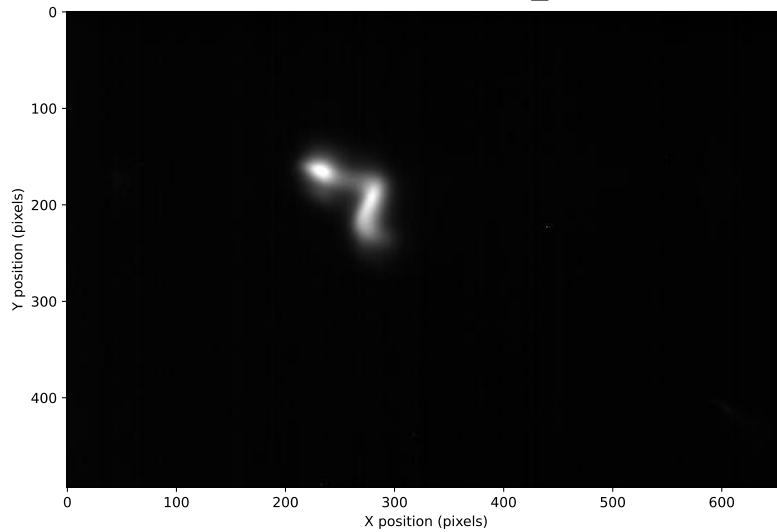
$$\phi \text{ SB_5} = 9 \text{ deg}$$

dphiSB5_09deg/153021_995427_GC_61_A3.png



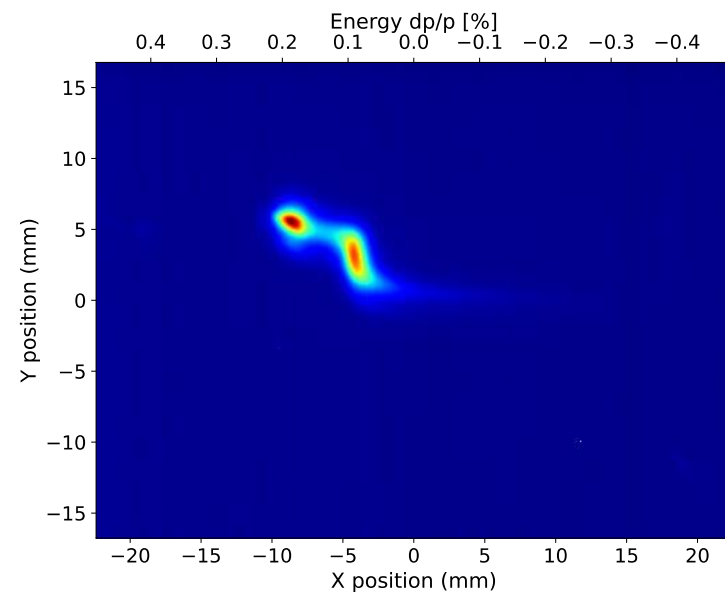
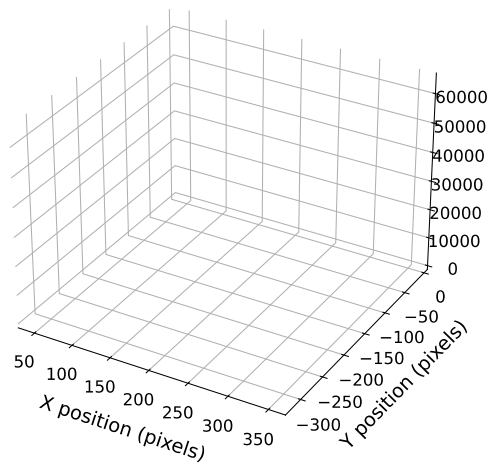
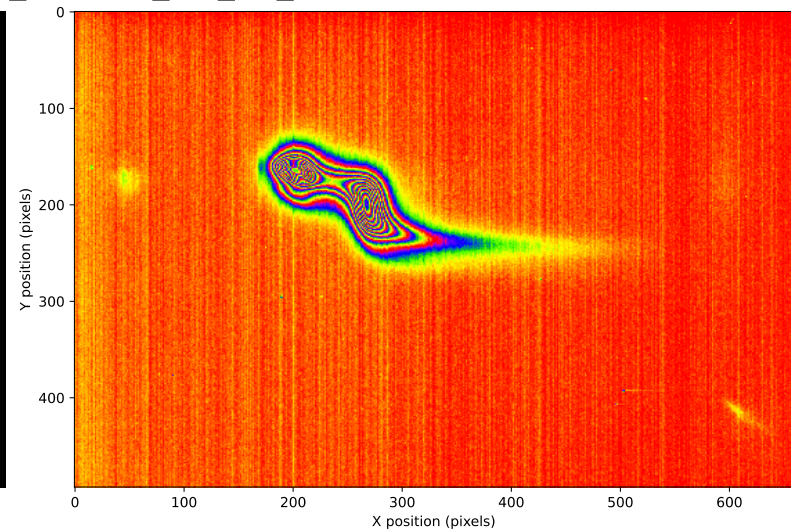
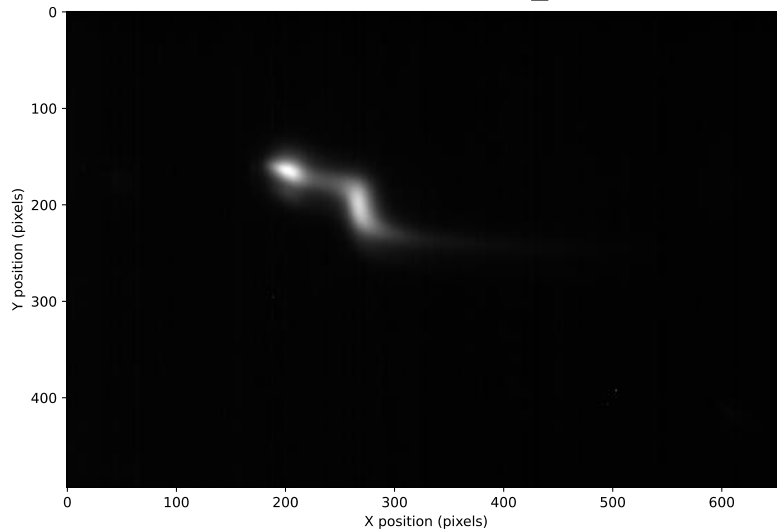
ϕ SB_5 = 10 deg

dphiSB5_10deg/152051_937966_GC_61_A3.png



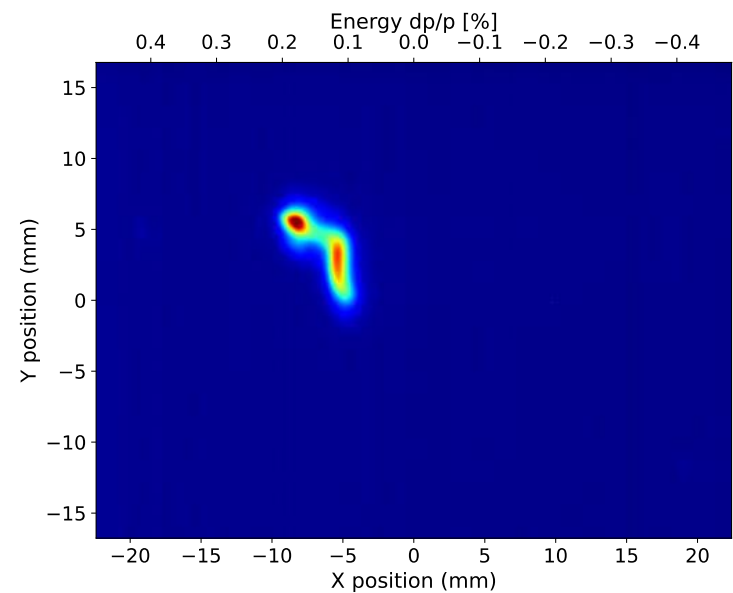
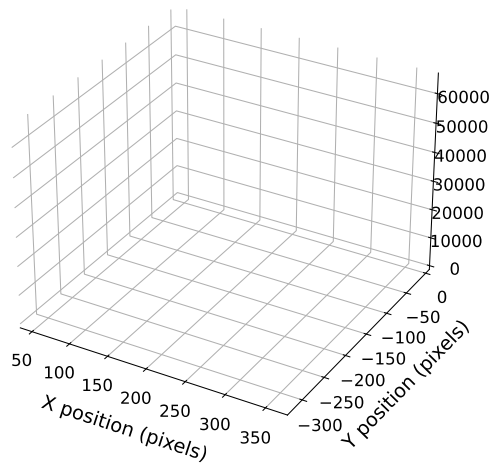
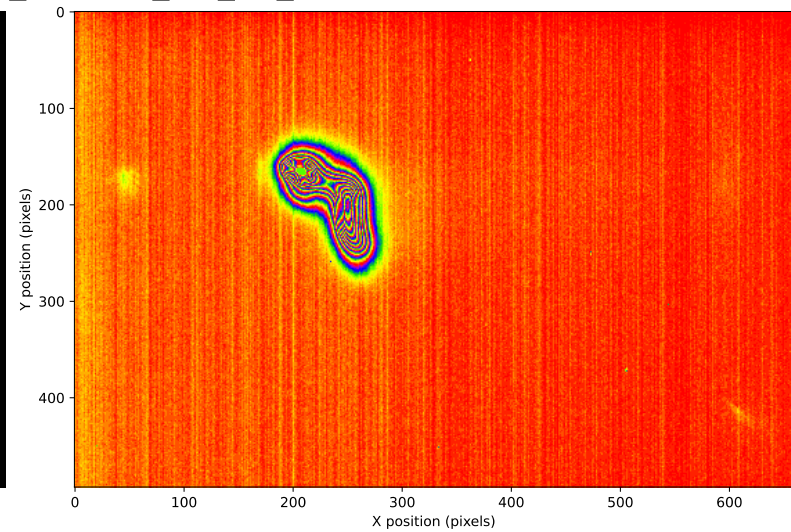
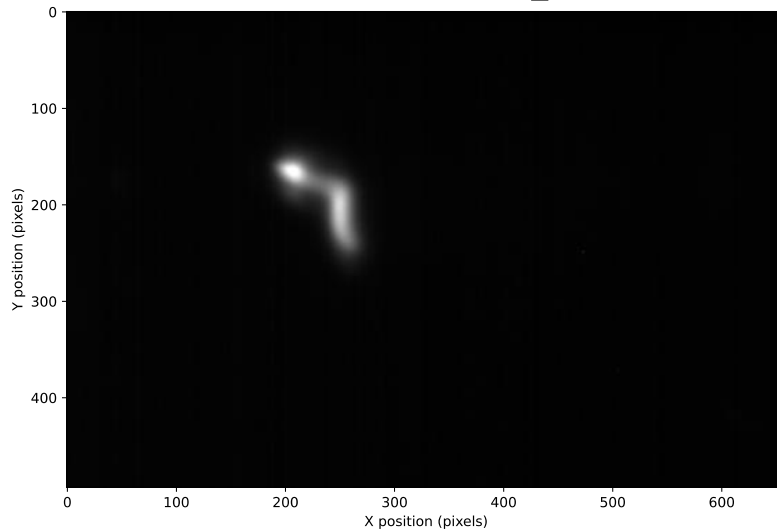
ϕ SB_5 = 11 deg

dphiSB5_11deg/151635_263922_GC_61_A3.png



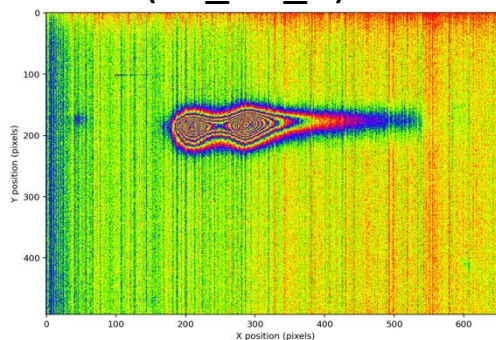
ϕ SB_5 = 12 deg

dphiSB5_12deg/151345_366450_GC_61_A3.png



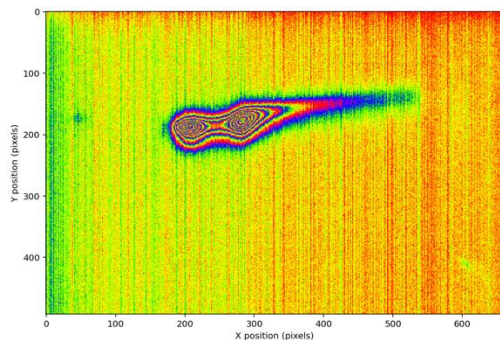
3-sec先頭のPulseST kick の向きによる変化

$$\Delta I(\text{PY_DC_4}) = 0.0 \text{ A}$$

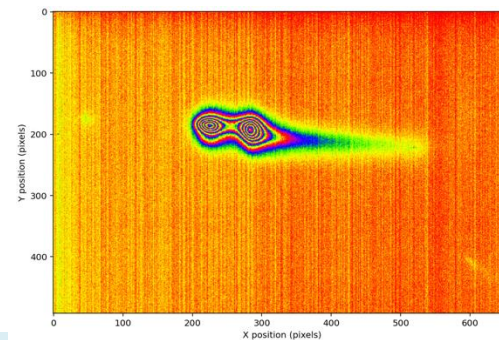


(dphi_SB_5 = +9 deg)

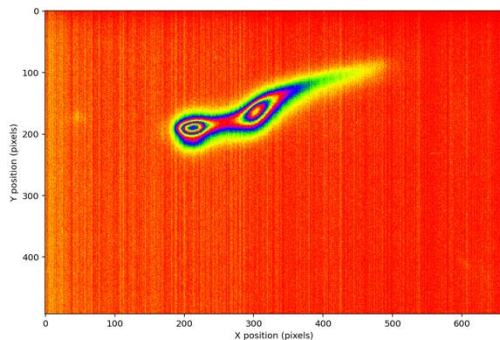
$$\Delta I(\text{PY_DC_4}) = -0.5 \text{ A}$$



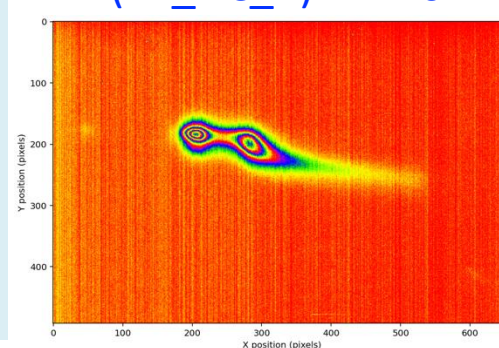
$$\Delta I(\text{PY_DC_4}) = +0.5 \text{ A}$$



$$\Delta I(\text{PY_DC_4}) = -1.0 \text{ A}$$



$$\Delta I(\text{PY_DC_4}) = +1.0 \text{ A}$$



orbitの立て方を変えると vertical 方向に振れるところから右側が bunch tail の粒子と思われる
SB_5 phase を振った測定時には
 $\Delta I(\text{PY_DC_4})$ は +0.7 A としたので tail の粒子は下側に居るとと思われる

まとめ

- Linac SY3 East Dump に KBE ビームを Pulse Bend BP_61_11, _12 で kick out してdump 手前のスクリーン SC_61_A3 (with triggered camera) において観測し、
QD/QF_61_A1 を OFF にして dispersion の大きな状態 [$D(s) = 4.637 \text{ m}$]で、3-sec より vertical orbit を立てて transverse wake の影響が vertical 方向に出る状態で SB_5 phase を変化させてbeam profile の変化を調べた。
- bunch の前後関係をおおよそつかんで energy distribution の multi-peak の位置を測ることができそうである。
- HER の入射調整に使える情報となると思われる。

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