

**500 pC emittance**

**(Gaussian cathode laser pulses)**

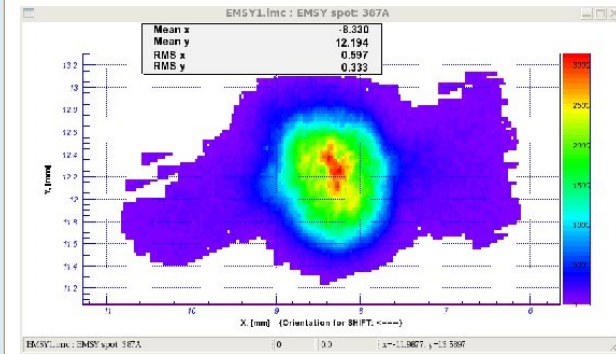
# 500pC Emittance (20.07.2016M): 60MV/m, BSA=1.2mm, 387A

| I_main (A) | Xrms, mm | Yrms, mm | EmitX_2D, mm mrad | EmitX_2D, nonscaled | XYrms, mm | EMSY1 NoP | EMSY1 Gain | MOI NoP | MOI, Gain | XBL NoP | XBL gain | EmitY_2D, mm mrad | EmitY_2D, nonscaled | YBL NoP | YBL gain | EmitXY_2D, mm.mrad | EmitXY_2D, nonscaled |
|------------|----------|----------|-------------------|---------------------|-----------|-----------|------------|---------|-----------|---------|----------|-------------------|---------------------|---------|----------|--------------------|----------------------|
| 380        | 0.402    | 0.226    | 1.738             | 0.856               | 0.301     | 1         | 5          | 2       | 17        | 4       | 21       | 1.664             | 0.902               | 25      | 21       | 1.701              | 0.879                |
| 382        | 0.437    | 0.232    | 1.548             | 0.720               | 0.318     | 1         | 5          | 2       | 17        | 3       | 21       | 1.380             | 0.823               | 25      | 21       | 1.462              | 0.77                 |
| 384        | 0.486    | 0.241    | 1.362             | 0.529               | 0.342     | 1         | 8          | 2       | 18        | 2       | 19       | 1.123             | 0.684               | 17      | 21       | 1.237              | 0.602                |
| 386        | 0.535    | 0.277    | 1.177             | 0.520               | 0.385     | 1         | 12         | 2       | 20        | 2       | 20       | 0.705             | 0.509               | 14      | 21       | 0.911              | 0.514                |
| 387        | 0.597    | 0.333    | 1.144             | 0.518               | 0.446     | 1         | 16         | 2       | 21        | 2       | 21       | 0.569             | 0.438               | 17      | 21       | 0.807              | 0.476                |
| 388        | 0.713    | 0.422    | 1.337             | 0.702               | 0.549     | 1         | 20         | 3       | 21        | 4       | 21       | 0.662             | 0.492               | 18      | 21       | 0.941              | 0.588                |
| 390        | 1.127    | 0.594    | 2.100             | 1.166               | 0.818     | 3         | 19         | 6       | 21        | 8       | 21       | 0.873             | 0.736               | 30      | 21       | 1.354              | 0.926                |

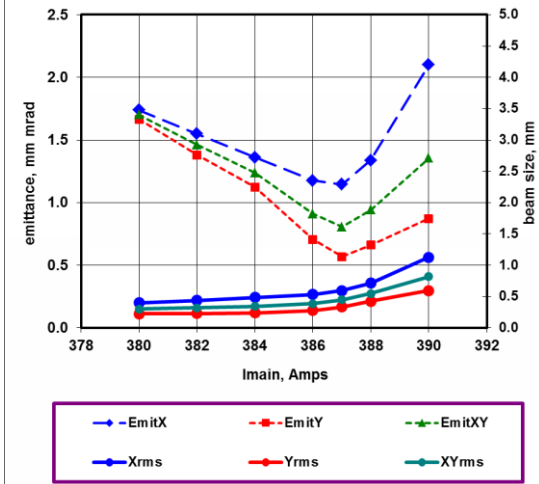
**FastScan Program report**

Gun Mean, [MeV/c] = 6.570000  
 Gun RMS, [keV/c] = 29.000000  
 Gun Phase - MMMG, [deg] = 0.000000  
 Booster Mean, [MeV/c] = 23.594000  
 Booster RMS, [keV/c] = 140.000000  
 Booster Phase - MMMG, [deg] = 0.000000  
 Laser beam, Xrms, [mm] = 0.294000  
 Laser beam, Yrms, [mm] = 0.301000  
 Laser beam, Rise Time, [ps] = 0.000000  
 Laser beam, Fall Time, [ps] = 0.000000  
 Laser beam, FWHM, [ps] = 11.000000  
 Actuator speed, [mm/s] = 0.100000  
 Drift Length, [m] = 3.133000

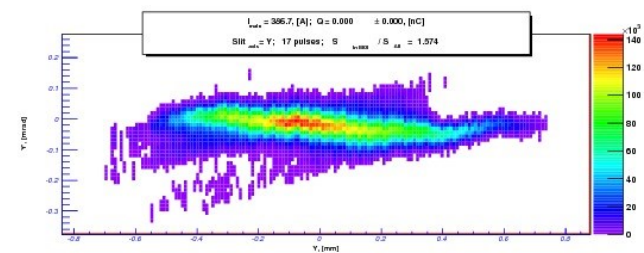
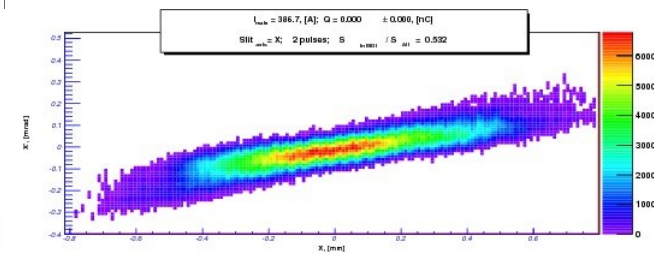
OK



Beam size and emittance for BSA 1.2mm  
0.5nC, 6.5MW gun MMMG, 3.5MW booster MMMG



Laser RMS~0.3mm



| Results Plot system ver: Apr 20 2016 17:54:24 |                   |           |                 |
|---|-------------------|-----------|-----------------|
| Laser:  | rim size          | ~0.294000 | ~0.301000 [mm]  |
| Electron beam:                                | Microstrucgap     | 0.57080   | ~1.0000 [MeV/c] |
|   | Microstrucbarrier | 23.59400  | ~1.9400 [MeV/c] |
|   | r_gun             | 0.58787   | ~0.5000 [mm]    |
|   | r_booster         | 0.27580   | ~0.2500 [mm]    |
|   | divergence        | 0.07750   | [mrad]          |
|   | coherence         | 0.00775   | [mrad]          |
|   | sheared div       | 0.01482   | [mrad]          |
|   | drift             | 3.13300   | [m]             |
|   | f                 | 0.01000   | [mm]            |
|   | l                 | 0.02000   | [mm]            |
|   | h                 | 1.00000   | [mm]            |
|   | lens              | 1.00000   | [mm]            |
|   | lens2             | 1.0598    | [mm mrad]       |
|   | lens3             | 0.518     | [mm mrad]       |
|   | lens4             | 1.144     | [mm mrad]       |

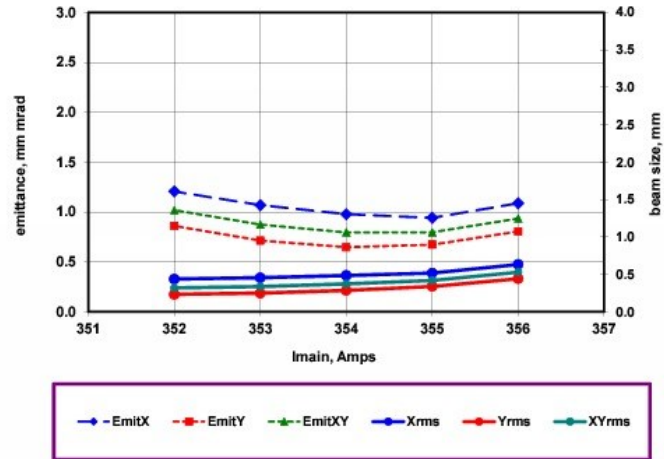
| Results Plot system ver: Apr 20 2016 17:54:24 |                   |           |                 |
|---|-------------------|-----------|-----------------|
| Laser:  | rim size          | ~0.294000 | ~0.301000 [mm]  |
| Electron beam:                                | Microstrucgap     | 0.57080   | ~1.0000 [MeV/c] |
|   | Microstrucbarrier | 23.59400  | ~1.9400 [MeV/c] |
|   | r_gun             | 0.58787   | ~0.5000 [mm]    |
|   | r_booster         | 0.27580   | ~0.2500 [mm]    |
|   | divergence        | 0.07750   | [mrad]          |
|   | coherence         | 0.00775   | [mrad]          |
|   | sheared div       | 0.00840   | [mrad]          |
|   | drift             | 3.13300   | [m]             |
|   | f                 | 0.01000   | [mm]            |
|   | l                 | 0.02000   | [mm]            |
|   | h                 | 1.00000   | [mm]            |
|   | lens              | 1.00000   | [mm]            |
|   | lens2             | 0.534     | [mm mrad]       |
|   | lens3             | 0.438     | [mm mrad]       |
|   | lens4             | 0.569     | [mm mrad]       |

(Stat: 1x3 for X 3+2 for Y)  
 $X_{emit} = (1.124 \pm 0.015)$  mm mrad  
 $Y_{emit} = (0.576 \pm 0.041)$  mm mrad  
 $XY_{emit} = (0.805 \pm 0.029)$  mm mrad

# 500pC Emittance (21.05.2015M): 53MV/m, BSA=1.2mm, 354A

| I <sub>main</sub> (A) | Xrms, mm | Yrms, mm | XYrms, mm | EMSY1 NoP | EMSY1 Gain | MOI NoP | MOI, Gain | EmitX <sub>2D</sub> , mm.mrad | EmitX <sub>2D</sub> , noncalcd | XBL NoP | XBL gain | EmitY <sub>2D</sub> , mm.mrad | EmitY <sub>2D</sub> , noncalcd | YBL NoP | YBL gain | EmitXY <sub>2D</sub> , mm.mrad | EmitXY <sub>2D</sub> , noncalcd | BetaX | AlphaX | BetaY | AlphaY |
|-----------------------|----------|----------|-----------|-----------|------------|---------|-----------|-------------------------------|--------------------------------|---------|----------|-------------------------------|--------------------------------|---------|----------|--------------------------------|---------------------------------|-------|--------|-------|--------|
| 356                   | 0.634    | 0.443    | 0.53      | 1         | 22         | 2       | 19        | 1.088                         | 0.670                          | 9       | 22       | 0.806                         | 0.673                          | 12      | 22       | 0.936                          | 0.871                           |       |        |       |        |
| 355                   | 0.519    | 0.340    | 0.42      | 1         | 19         | 1       | 22        | 0.943                         | 0.533                          | 6       | 21       | 0.674                         | 0.593                          | 10      | 21       | 0.797                          | 0.598                           |       |        |       |        |
| 354                   | 0.488    | 0.288    | 0.373     | 1         | 18         | 1       | 19        | 0.979                         | 0.428                          | 4       | 21       | 0.648                         | 0.498                          | 8       | 21       | 0.798                          | 0.448                           |       |        |       |        |
| 353                   | 0.456    | 0.249    | 0.337     | 1         | 12         | 1       | 17        | 1.070                         | 0.391                          | 3       | 21       | 0.715                         | 0.486                          | 8       | 20       | 0.675                          | 0.436                           |       |        |       |        |
| 352                   | 0.437    | 0.233    | 0.319     | 1         | 9          | 1       | 16        | 1.207                         | 0.377                          | 3       | 21       | 0.861                         | 0.505                          | 8       | 20       | 1.019                          | 0.436                           |       |        |       |        |

Beam size and emittance for BSA1.2 mm  
500 pC, gun MMMG, Booster MMMG

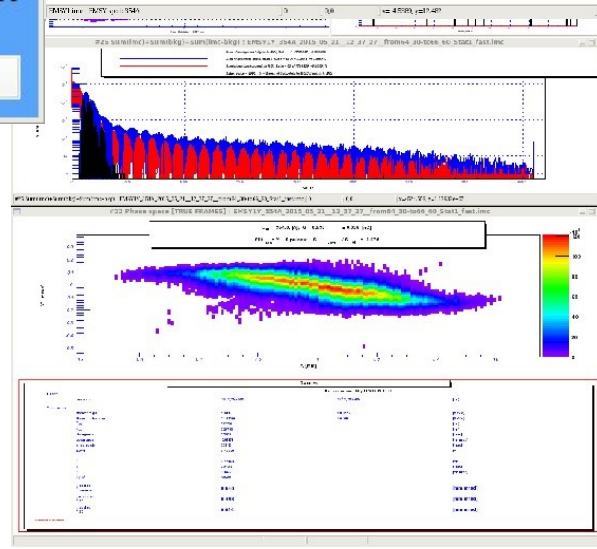
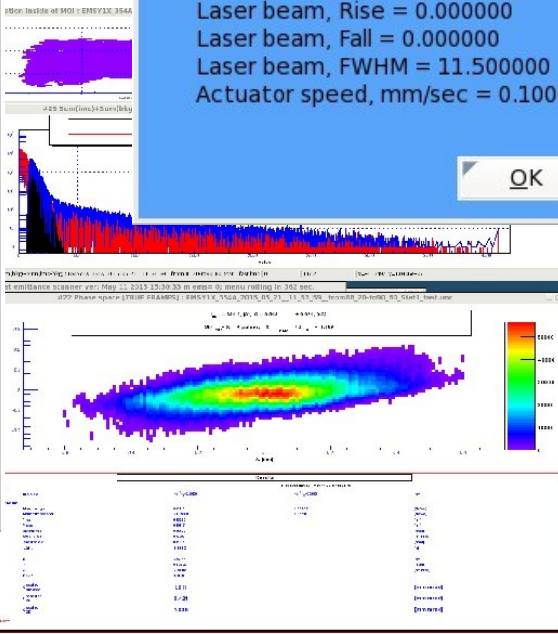
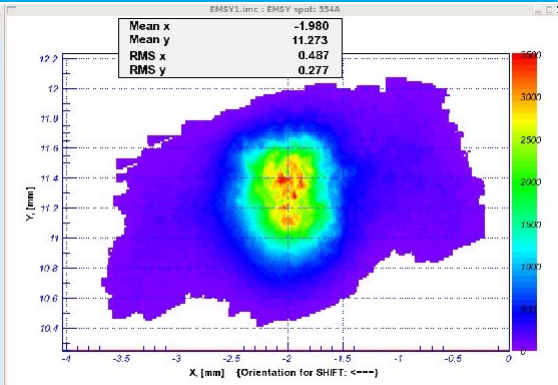


Laser FWHM ~ 12 ps, gaussian shape

**Program report**

Gun Mean, [MeV/c] = 6.061100  
 Gun RMS, [KeV/c] = 25.200000  
 Gun Pref, [deg] = 0.000000  
 Booster Mean, [MeV/c] = 21.393000  
 Booster RMS, [KeV/c] = 168.000000  
 Booster Pref, [deg] = 0.000000  
 Laser beam, Xrms = 0.299000  
 Laser beam, Yrms = 0.306000  
 Laser beam, Rise = 0.000000  
 Laser beam, Fall = 0.000000  
 Laser beam, FWHM = 11.500000  
 Actuator speed, mm/sec = 0.100000

OK



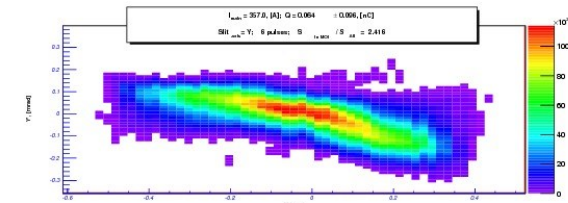
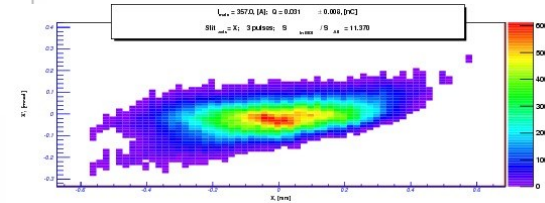
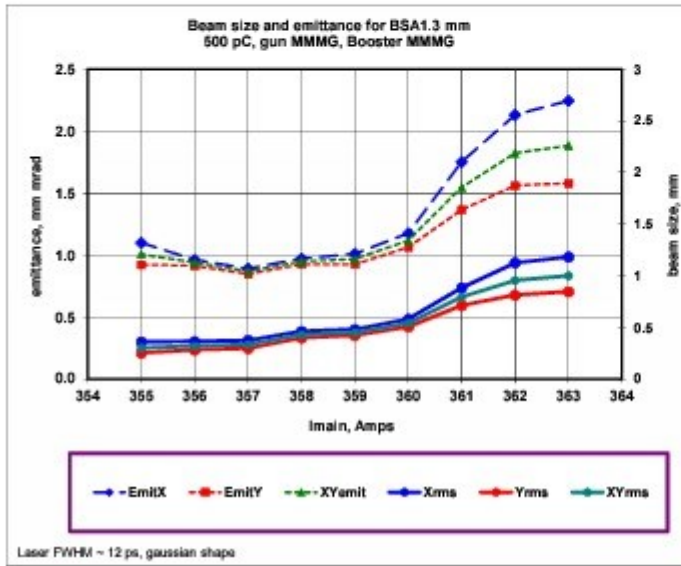
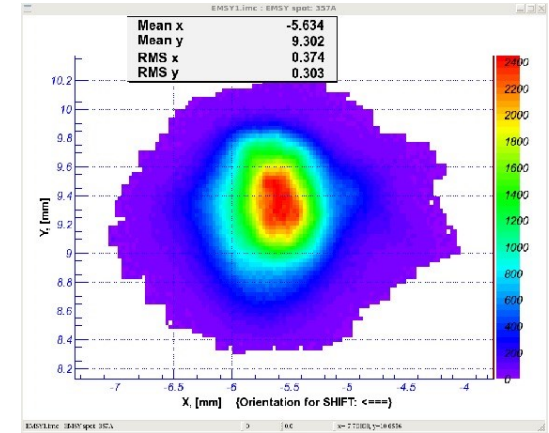
Xemit = 0.990 +/- 0.030 mm.mrad  
 Yemit = 0.649 +/- 0.017 mm.mrad  
 XYemit = 0.801 +/- 0.014 mm.mrad

# 500pC Emittance (02.10.2015A-N): 53MV/m, BSA=1.3mm; 357A

| I <sub>main</sub> (A) | Xrms, mm | Yrms, mm | XYrms, mm | EMSY Nup | EMSY Gain | MOY Nup | MOY Gain | EmRK_2D, mm mrad | EmRY_2D, mm mrad | EmXY_2D, mm mrad | BeamX | AlphaX | BeamY | AlphaY |    |       |       |
|-----------------------|----------|----------|-----------|----------|-----------|---------|----------|------------------|------------------|------------------|-------|--------|-------|--------|----|-------|-------|
| 355                   | 1.183    | 0.844    | 0.990     | 2        | 18        | 5       | 22       | 2.246            | 1.870            | 45               | 22    | 1.580  | 1.680 | 50     | 22 | 1.884 | 1.772 |
| 362                   | 1.125    | 0.811    | 0.955     | 2        | 17        | 3       | 22       | 2.132            | 1.702            | 41               | 22    | 1.561  | 1.404 | 40     | 22 | 1.824 | 1.546 |
| 361                   | 0.883    | 0.711    | 0.792     | 1        | 19        | 3       | 19       | 1.752            | 1.138            | 22               | 22    | 1.365  | 1.149 | 20     | 22 | 1.546 | 1.143 |
| 360                   | 0.579    | 0.505    | 0.541     | 1        | 15        | 2       | 19       | 1.176            | 0.956            | 16               | 22    | 1.062  | 1.003 | 10     | 22 | 1.118 | 1.022 |
| 359                   | 0.478    | 0.420    | 0.448     | 1        | 11        | 1       | 22       | 1.050            | 0.876            | 9                | 22    | 0.926  | 0.795 | 10     | 20 | 0.967 | 0.733 |
| 358                   | 0.460    | 0.396    | 0.428     | 1        | 7         | 1       | 18       | 0.972            | 0.510            | 4                | 22    | 0.926  | 0.622 | 8      | 21 | 0.949 | 0.563 |
| 357                   | 0.373    | 0.295    | 0.332     | 1        | 5         | 1       | 17       | 0.890            | 0.463            | 3                | 21    | 0.848  | 0.504 | 6      | 20 | 0.869 | 0.478 |
| 356                   | 0.362    | 0.280    | 0.318     | 1        | 3         | 1       | 15       | 0.952            | 0.422            | 3                | 20    | 0.914  | 0.437 | 5      | 21 | 0.908 | 0.429 |
| 355                   | 0.358    | 0.250    | 0.290     | 1        | 1         | 1       | 14       | 1.099            | 0.460            | 3                | 20    | 0.923  | 0.448 | 6      | 21 | 1.007 | 0.454 |

**Program report**

Gun Mean, [MeV/c] = 6.098000  
 Gun RMS, [KeV/c] = 21.100000  
 Gun Fref, [deg] = 0.000000  
 Booster Mean, [MeV/c] = 21.179000  
 Booster RMS, [KeV/c] = 66.000000  
 Booster Fref, [deg] = 0.000000  
 Laser beam, Xrms = 0.328000  
 Laser beam, Yrms = 0.336000  
 Laser beam, Rise = 0.000000  
 Laser beam, Fall = 0.000000  
 Laser beam, FWHM = 11.500000  
 Actuator speed, mm/sec = 0.200000



| Label   | Value     | Unit      |
|---------|-----------|-----------|
| MeanX   | 6.098000  | [MeV/c]   |
| RMSX    | 21.100000 | [KeV/c]   |
| FrefX   | 0.000000  | [deg]     |
| MeanY   | 21.179000 | [MeV/c]   |
| RMSY    | 66.000000 | [KeV/c]   |
| FrefY   | 0.000000  | [deg]     |
| Xrms    | 0.328000  | [mm]      |
| Yrms    | 0.336000  | [mm]      |
| XYrms   | 0.336000  | [mm]      |
| EmittX  | 0.857     | [mm mrad] |
| EmittY  | 0.750     | [mm mrad] |
| XYemitt | 0.801     | [mm mrad] |
| BeamX   | 0.328     | [mm]      |
| AlphaX  | 0.000     | [deg]     |
| BeamY   | 0.336     | [mm]      |
| AlphaY  | 0.000     | [deg]     |
| EmittX  | 0.846     | [mm mrad] |
| EmittY  | 0.426     | [mm mrad] |
| XYemitt | 0.874     | [mm mrad] |

| Label   | Value     | Unit      |
|---------|-----------|-----------|
| MeanX   | 6.098000  | [MeV/c]   |
| RMSX    | 21.100000 | [KeV/c]   |
| FrefX   | 0.000000  | [deg]     |
| MeanY   | 21.179000 | [MeV/c]   |
| RMSY    | 66.000000 | [KeV/c]   |
| FrefY   | 0.000000  | [deg]     |
| Xrms    | 0.328000  | [mm]      |
| Yrms    | 0.336000  | [mm]      |
| XYrms   | 0.336000  | [mm]      |
| EmittX  | 0.857     | [mm mrad] |
| EmittY  | 0.750     | [mm mrad] |
| XYemitt | 0.801     | [mm mrad] |
| BeamX   | 0.328     | [mm]      |
| AlphaX  | 0.000     | [deg]     |
| BeamY   | 0.336     | [mm]      |
| AlphaY  | 0.000     | [deg]     |
| EmittX  | 0.732     | [mm mrad] |
| EmittY  | 0.591     | [mm mrad] |
| XYemitt | 0.771     | [mm mrad] |

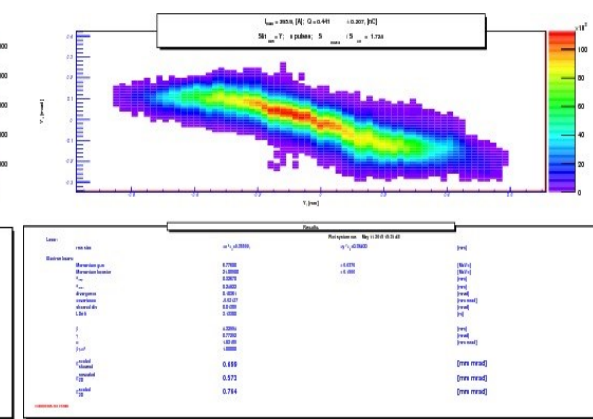
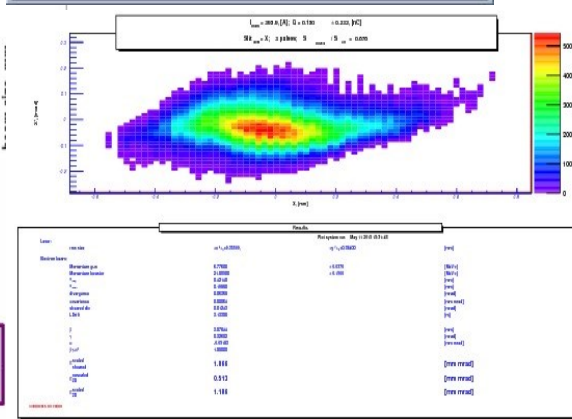
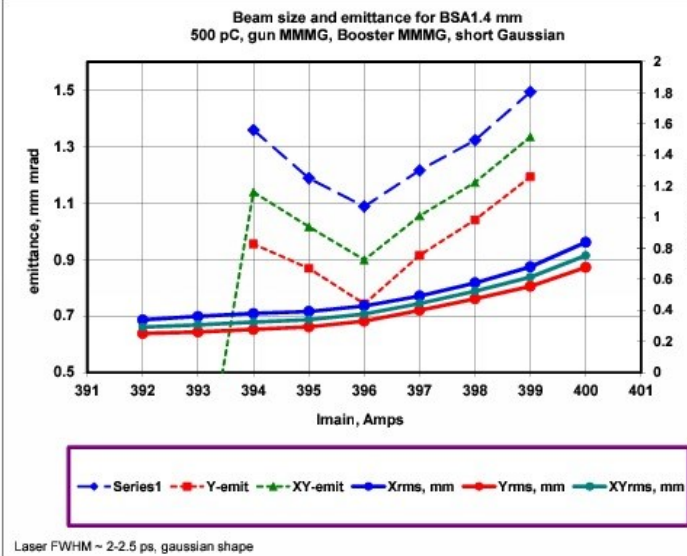
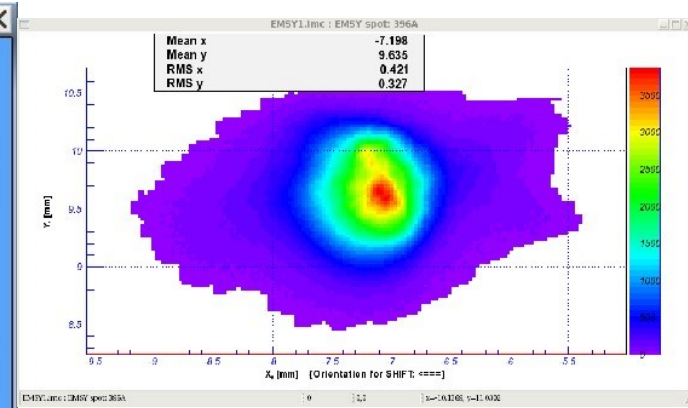
Xemitt = 0.857 +/- 0.023 mm mrad  
 Yemitt = 0.750 +/- 0.042 mm mrad  
 XYemitt = 0.801 +/- 0.025 mm mrad

# 500pC Emittance (31.10.2015M-A): 60MV/m, BSA=1.4mm, 396A, shortG

| I <sub>main</sub> (A) | Xrms, mm | Yrms, mm | XYrms, mm | EMSY1 NoP | EMSY1 Gain | MOI NoP | MOI Gain | EmiX_2D, mm mrad | EmiX_2D, noncalcd | XBL NoP | XBL gain | EmiY_2D, mm mrad | EmiY_2D, noncalcd | YBL NoP | YBL gain | EmiXY_2D, mm mrad | EmiXY_2D, noncalcd | BetaX | AlphaX |
|-----------------------|----------|----------|-----------|-----------|------------|---------|----------|------------------|-------------------|---------|----------|------------------|-------------------|---------|----------|-------------------|--------------------|-------|--------|
| 400                   | 0.639    | 0.677    | 0.754     | 1         | 19         | 3       | 22       |                  |                   |         |          |                  |                   |         |          |                   |                    |       |        |
| 399                   | 0.681    | 0.555    | 0.615     | 1         | 15         | 2       | 22       | 1.494            | 1.071             | 23      | 17       | 1.193            | 1.040             | 22      | 17       | 1.335             | 1.055              |       |        |
| 398                   | 0.577    | 0.475    | 0.524     | 1         | 13         | 2       | 19       | 1.323            | 0.780             | 13      | 17       | 1.041            | 0.841             | 15      | 17       | 1.174             | 0.810              |       |        |
| 397                   | 0.493    | 0.401    | 0.445     | 1         | 9          | 1       | 22       | 1.216            | 0.672             | 7       | 17       | 0.915            | 0.767             | 12      | 17       | 1.055             | 0.718              |       |        |
| 396                   | 0.425    | 0.331    | 0.377     | 1         | 6          | 1       | 22       | 1.088            | 0.578             | 5       | 17       | 0.743            | 0.685             | 11      | 17       | 0.899             | 0.629              |       |        |
| 395                   | 0.393    | 0.294    | 0.340     | 1         | 4          | 1       | 20       | 1.188            | 0.609             | 5       | 17       | 0.869            | 0.653             | 10      | 17       | 1.016             | 0.631              |       |        |
| 394                   | 0.380    | 0.277    | 0.324     | 1         | 3          | 1       | 19       | 1.359            | 0.634             | 5       | 17       | 0.955            | 0.611             | 10      | 17       | 1.139             | 0.622              |       |        |
| 393                   | 0.361    | 0.261    | 0.307     | 1         | 2          | 1       | 18       |                  |                   |         |          |                  |                   |         |          | 0.000             | 0.000              |       |        |
| 392                   | 0.339    | 0.251    | 0.292     | 1         | 1          | 1       | 17       |                  |                   |         |          |                  |                   |         |          | 0.000             | 0.000              |       |        |

**Program report**

Gun Mean, [MeV/c] = 6.776000  
 Gun RMS, [KeV/c] = 37.000000  
 Gun Fref, [deg] = 0.000000  
 Booster Mean, [MeV/c] = 21.089000  
 Booster RMS, [KeV/c] = 150.000000  
 Booster Fref, [deg] = 0.000000  
 Laser beam, Xrms = 0.355000  
 Laser beam, Yrms = 0.354000  
 Laser beam, Rise = 0.000000  
 Laser beam, Fall = 0.000000  
 Laser beam, FWHM = 2.500000  
 Actuator speed, mm/sec = 0.200000



| Unit      | Value | Unit    | Value | Unit      |
|-----------|-------|---------|-------|-----------|
| Beam size | 1.700 | Xrms    | 0.355 | [mm]      |
| Beam size | 1.000 | Yrms    | 0.354 | [mm]      |
| Beam size | 0.908 | XY-emit | 0.908 | [mm mrad] |
| Beam size | 0.754 | Y-emit  | 0.754 | [mm mrad] |
| Beam size | 0.639 | X-emit  | 0.639 | [mm mrad] |
| Beam size | 0.331 | XBL     | 0.331 | [mm]      |
| Beam size | 0.251 | YBL     | 0.251 | [mm]      |
| Beam size | 0.292 | XYrms   | 0.292 | [mm mrad] |
| Beam size | 0.277 | Yrms    | 0.277 | [mm mrad] |
| Beam size | 0.261 | Xrms    | 0.261 | [mm mrad] |
| Beam size | 0.339 | YBL     | 0.339 | [mm mrad] |

| Unit      | Value | Unit    | Value | Unit      |
|-----------|-------|---------|-------|-----------|
| Beam size | 1.700 | Xrms    | 0.355 | [mm]      |
| Beam size | 1.000 | Yrms    | 0.354 | [mm]      |
| Beam size | 0.908 | XY-emit | 0.908 | [mm mrad] |
| Beam size | 0.754 | Y-emit  | 0.754 | [mm mrad] |
| Beam size | 0.639 | X-emit  | 0.639 | [mm mrad] |
| Beam size | 0.331 | XBL     | 0.331 | [mm]      |
| Beam size | 0.251 | YBL     | 0.251 | [mm]      |
| Beam size | 0.292 | XYrms   | 0.292 | [mm mrad] |
| Beam size | 0.277 | Yrms    | 0.277 | [mm mrad] |
| Beam size | 0.261 | Xrms    | 0.261 | [mm mrad] |
| Beam size | 0.339 | YBL     | 0.339 | [mm mrad] |

Xemit = 1.093 +/- 0.015 mm mrad  
 Yemit = 0.754 +/- 0.021 mm mrad  
 XYemit = 0.908 +/- 0.014 mm mrad

# 500pC Emittance: 2016 vs 2015

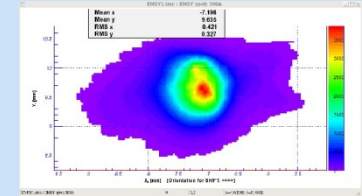
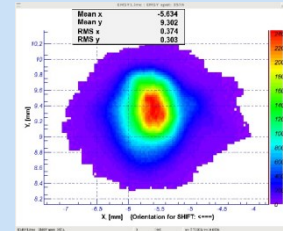
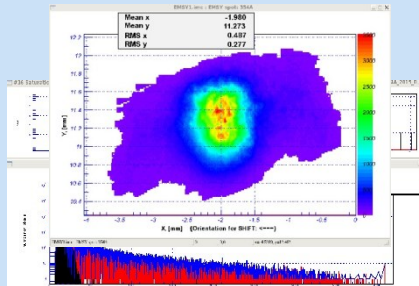
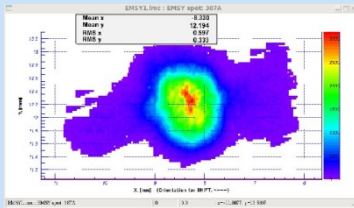
(20.07.2016M): **60MV/m**,  
BSA=1.2mm, 387A  
**6.57MeV/c**  
**23.6MeV/c**

(21.05.2015M): **53MV/m**,  
BSA=1.2mm, 354A  
**6.06MeV/c**  
**21.4MeV/c**

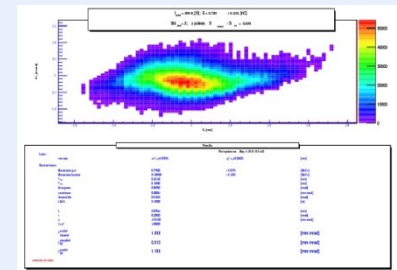
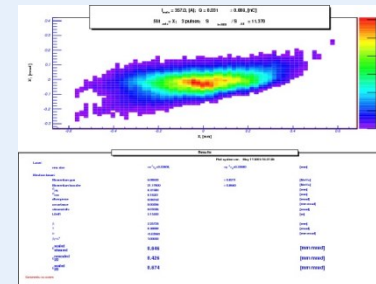
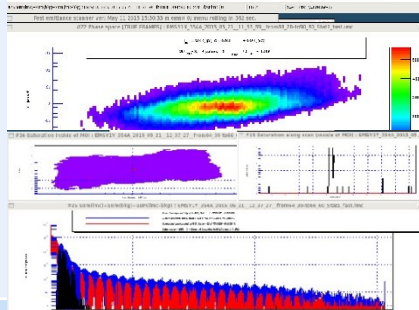
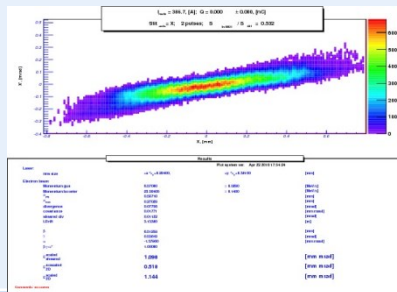
(02.10.2015A-N): **53MV/m**,  
BSA=1.3mm; 357A  
**6.10MeV/c**  
**21.2MeV/c**

(31.10.2015M-A): **60MV/m**,  
BSA=1.4mm, 396A  
**6.78MeV/c**  
**21.1MeV/c**

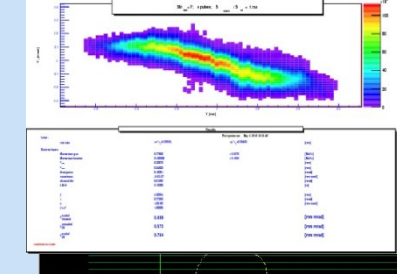
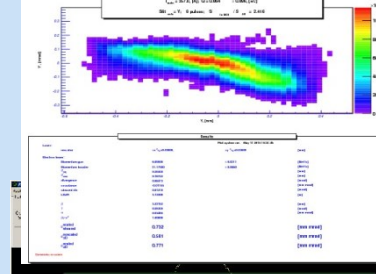
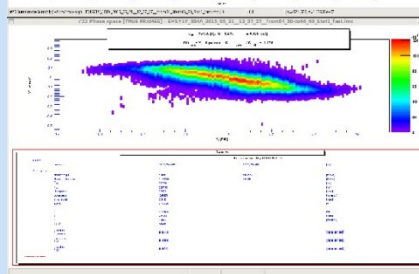
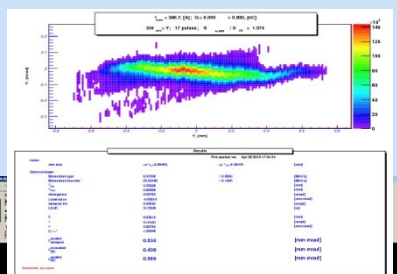
EMSY



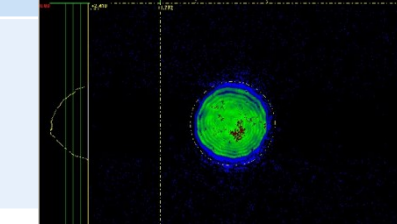
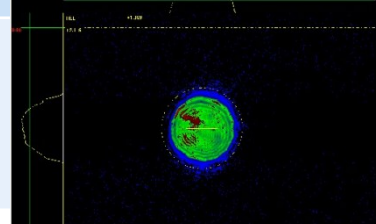
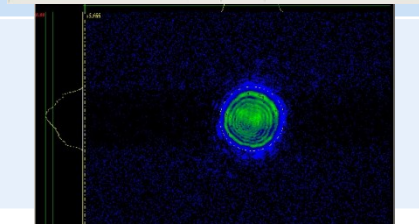
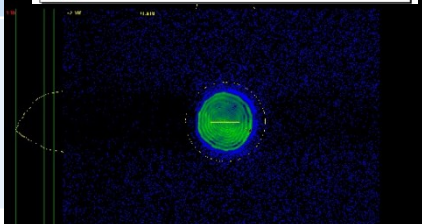
XPX



YPY



VC2



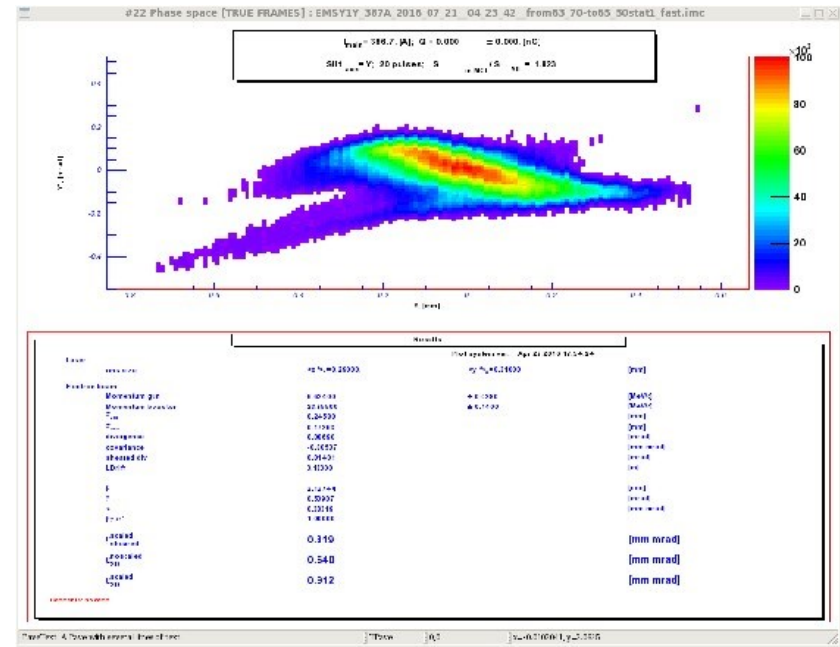
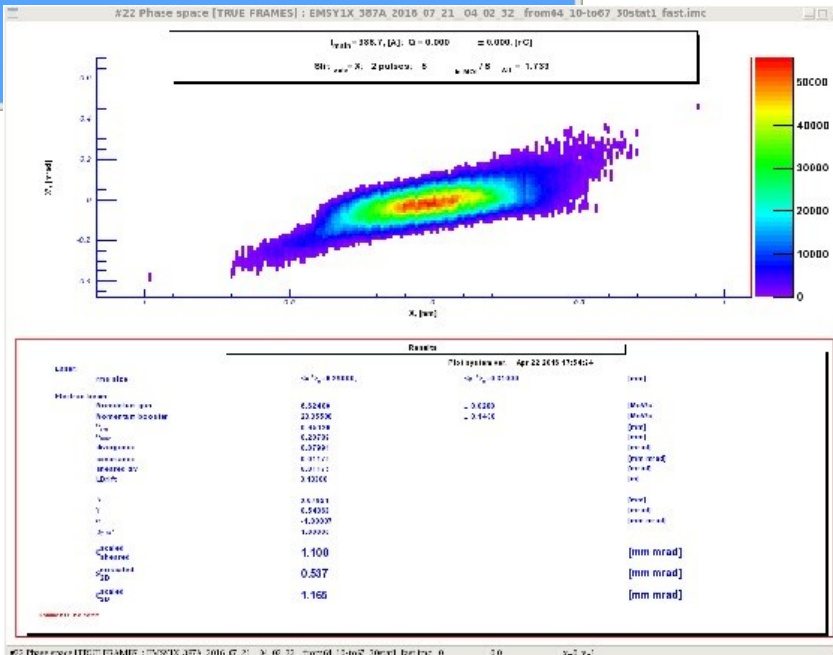
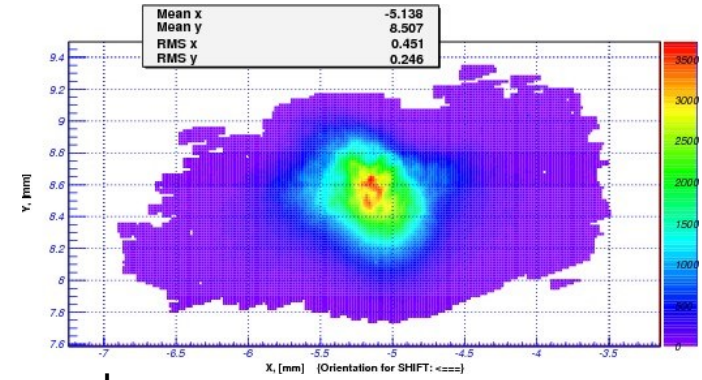
# 500pC Emittance (20.07.2016N): 60MV/m, BSA=1.2mm, 387A

**FastScan Program report**

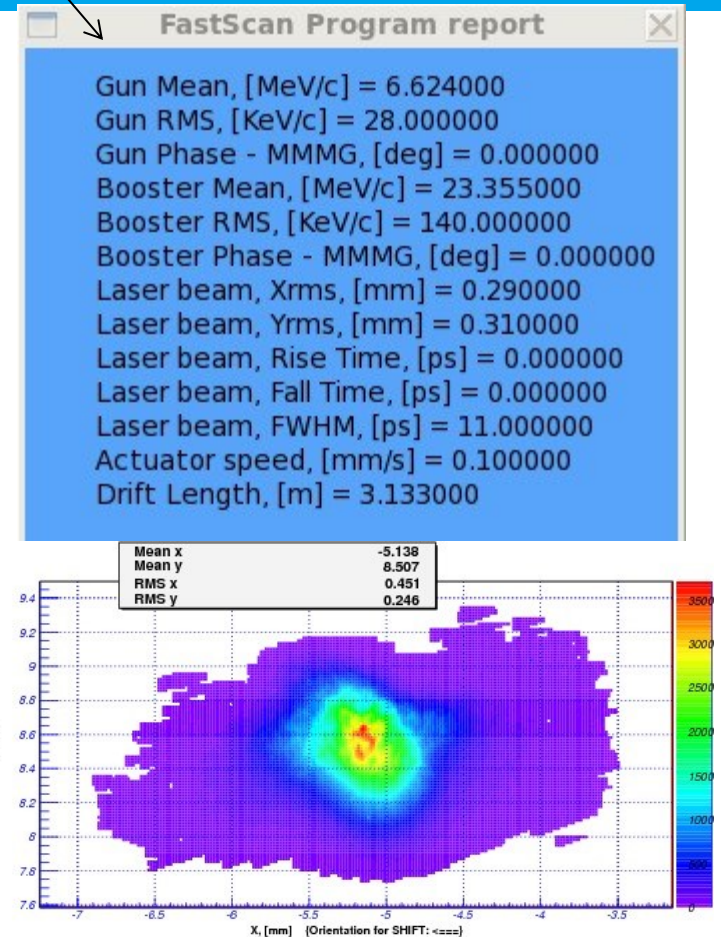
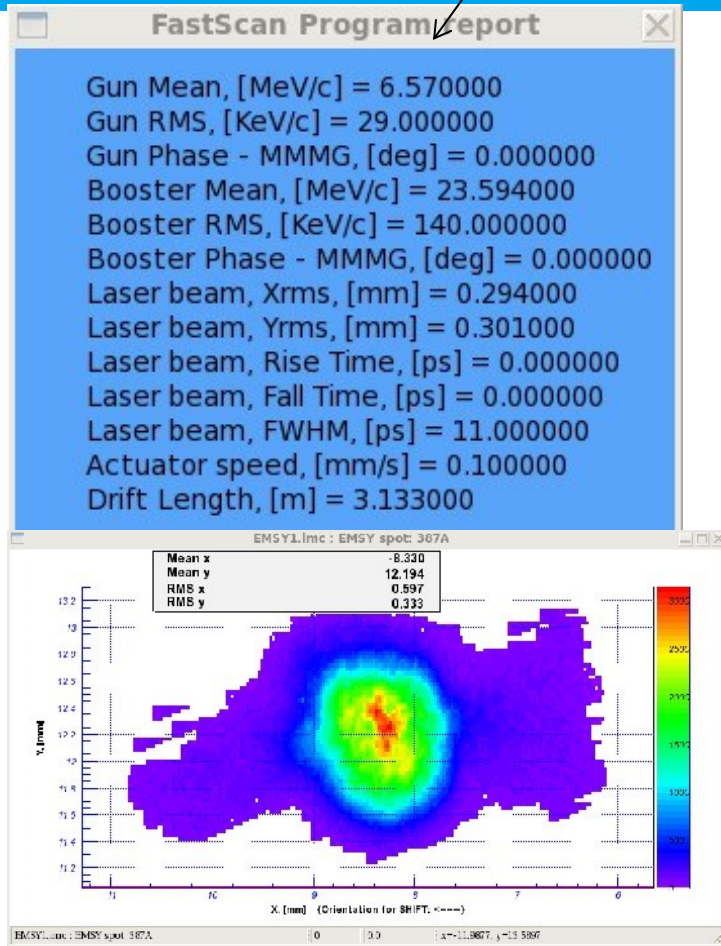
Gun Mean, [MeV/c] = 6.624000  
 Gun RMS, [KeV/c] = 28.000000  
 Gun Phase - MMMG, [deg] = 0.000000  
 Booster Mean, [MeV/c] = 23.355000  
 Booster RMS, [KeV/c] = 140.000000  
 Booster Phase - MMMG, [deg] = 0.000000  
 Laser beam, Xrms, [mm] = 0.290000  
 Laser beam, Yrms, [mm] = 0.310000  
 Laser beam, Rise Time, [ps] = 0.000000  
 Laser beam, Fall Time, [ps] = 0.000000  
 Laser beam, FWHM, [ps] = 11.000000  
 Actuator speed, [mm/s] = 0.100000  
 Drift Length, [m] = 3.133000

**!NB: RF2 and RF1 were re-configured by HH-experts (uTCA-timing)**

Xemit=1.212 +/- 0.03 mm.mrad  
 Yemit=0.971 +/- 0.046 mm.mrad  
 XYemit=1.085 +/- 0.029 mm.mrad



# 500pC Emittance: 20.07.2016M vs 20.07.2016N

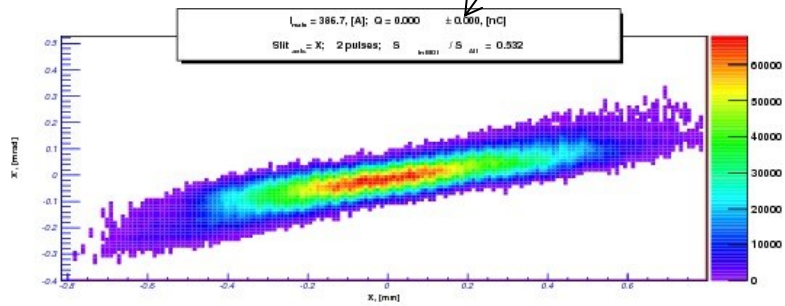


(Stat: 1x3 for X 3+2 for Y)  
Xemit=( 1.124 +/- 0.015 ) mm mrad  
Yemit=( 0.576 +/- 0.041 ) mm mrad  
XYemit=(0.805 +/- 0.029 ) mm mrad

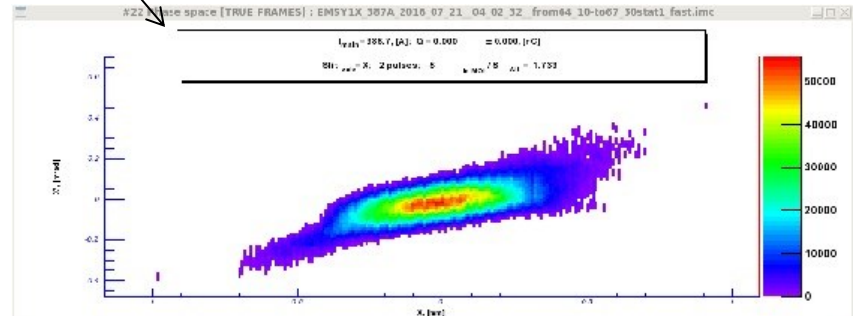
Xemit=1.212 +/- 0.03 mm.mrad  
Yemit=0.971 +/- 0.046 mm.mrad  
XYemit=1.085 +/- 0.029 mm.mrad



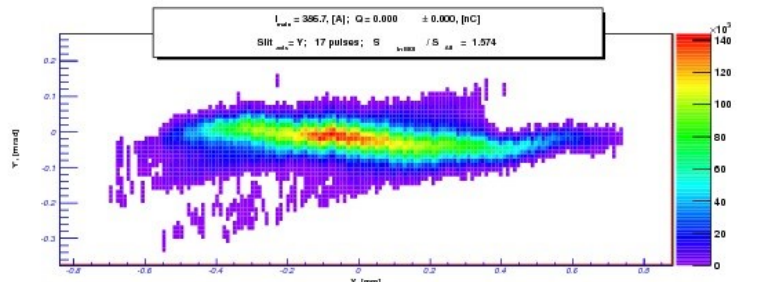
# 500pC Emittance: 20.07.2016M vs 20.07.2016N



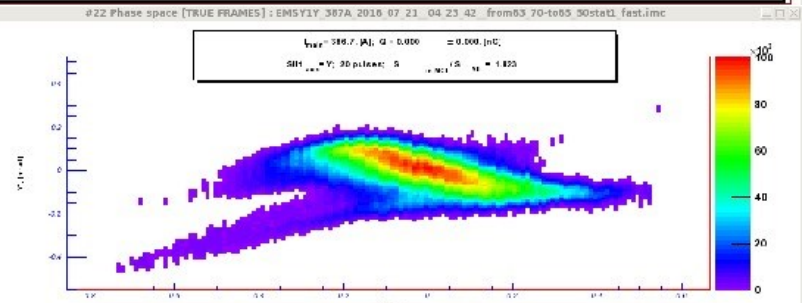
| Results         |                         | Plot options: Apr 22 2016 17:54:24 |           |
|-----------------|-------------------------|------------------------------------|-----------|
| Beam: rms size  | $\sigma_{x'} = 8.28400$ | $\sigma_x = 4.38100$               | [mm]      |
| Electron beam:  |                         |                                    |           |
| Momentary pos   | 0.57008                 | ± 0.0000                           | [mm(s)]   |
| Momentary veloc | 23.28400                | ± 0.1400                           | [km/s]    |
| $\beta_{rel}$   | 0.58740                 |                                    | [mm]      |
| $\beta_{rel}^2$ | 0.27008                 |                                    | [mm]      |
| divergence      | 0.07750                 |                                    | [mmrad]   |
| coastance       | 0.01771                 |                                    | [mmrad]   |
| abund ch        | 0.01102                 |                                    | [mm]      |
| LDH             | 3.15300                 |                                    | [mm]      |
| $\beta$         | 0.51200                 |                                    | [mm]      |
| $\gamma$        | 0.55400                 |                                    | [mmrad]   |
| $\alpha$        | -1.02900                |                                    | [mmrad]   |
| $\beta_{rel}^2$ | 1.00000                 |                                    | [mmrad]   |
| scaled          | 1.098                   |                                    | [mm mrad] |
| abund           |                         |                                    | [mm mrad] |
| scaled          | 0.518                   |                                    | [mm mrad] |
| LD              |                         |                                    | [mm mrad] |
| scaled          | 1.144                   |                                    | [mm mrad] |
| LD              |                         |                                    | [mm mrad] |



| Results         |                         | Plot options: Apr 22 2016 17:54:24 |           |
|-----------------|-------------------------|------------------------------------|-----------|
| Beam: rms size  | $\sigma_{x'} = 8.28400$ | $\sigma_x = 9.27000$               | [mm]      |
| Electron beam:  |                         |                                    |           |
| Momentary pos   | 0.52400                 | ± 0.0000                           | [mm(s)]   |
| Momentary veloc | 23.25500                | ± 0.1400                           | [km/s]    |
| $\beta_{rel}$   | 0.46100                 |                                    | [mm]      |
| $\beta_{rel}^2$ | 0.21200                 |                                    | [mm]      |
| divergence      | 0.22200                 |                                    | [mmrad]   |
| coastance       | 0.01700                 |                                    | [mmrad]   |
| abund ch        | 0.01100                 |                                    | [mm]      |
| LDH             | 3.00000                 |                                    | [mm]      |
| $\beta$         | 0.47000                 |                                    | [mm]      |
| $\gamma$        | 0.48000                 |                                    | [mmrad]   |
| $\alpha$        | -1.33300                |                                    | [mmrad]   |
| $\beta_{rel}^2$ | 1.00000                 |                                    | [mmrad]   |
| scaled          | 1.100                   |                                    | [mm mrad] |
| abund           |                         |                                    | [mm mrad] |
| scaled          | 0.537                   |                                    | [mm mrad] |
| LD              |                         |                                    | [mm mrad] |
| scaled          | 1.160                   |                                    | [mm mrad] |
| LD              |                         |                                    | [mm mrad] |



| Results         |                         | Plot options: Apr 22 2016 17:54:24 |           |
|-----------------|-------------------------|------------------------------------|-----------|
| Beam: rms size  | $\sigma_{y'} = 8.28400$ | $\sigma_y = 4.21600$               | [mm]      |
| Electron beam:  |                         |                                    |           |
| Momentary pos   | 0.57008                 | ± 0.0000                           | [mm(s)]   |
| Momentary veloc | 23.28400                | ± 0.1400                           | [km/s]    |
| $\beta_{rel}$   | 0.58208                 |                                    | [mm]      |
| $\beta_{rel}^2$ | 0.26008                 |                                    | [mm]      |
| divergence      | 0.07750                 |                                    | [mmrad]   |
| coastance       | 0.02016                 |                                    | [mmrad]   |
| abund ch        | 0.00600                 |                                    | [mm]      |
| LDH             | 3.15300                 |                                    | [mm]      |
| $\beta$         | 0.52812                 |                                    | [mm]      |
| $\gamma$        | 0.51501                 |                                    | [mmrad]   |
| $\alpha$        | 0.20716                 |                                    | [mmrad]   |
| $\beta_{rel}^2$ | 1.00000                 |                                    | [mmrad]   |
| scaled          | 0.534                   |                                    | [mm mrad] |
| abund           |                         |                                    | [mm mrad] |
| scaled          | 0.438                   |                                    | [mm mrad] |
| LD              |                         |                                    | [mm mrad] |
| scaled          | 0.569                   |                                    | [mm mrad] |
| LD              |                         |                                    | [mm mrad] |



| Results         |                         | Plot options: Apr 22 2016 17:54:24 |           |
|-----------------|-------------------------|------------------------------------|-----------|
| Beam: rms size  | $\sigma_{y'} = 8.28400$ | $\sigma_y = 4.21600$               | [mm]      |
| Electron beam:  |                         |                                    |           |
| Momentary pos   | 0.48100                 | ± 0.0000                           | [mm(s)]   |
| Momentary veloc | 23.00000                | ± 0.1400                           | [km/s]    |
| $\beta_{rel}$   | 0.46500                 |                                    | [mm]      |
| $\beta_{rel}^2$ | 0.19600                 |                                    | [mm]      |
| divergence      | 0.20000                 |                                    | [mmrad]   |
| coastance       | 0.01500                 |                                    | [mmrad]   |
| abund ch        | 0.00600                 |                                    | [mm]      |
| LDH             | 3.15300                 |                                    | [mm]      |
| $\beta$         | 0.47000                 |                                    | [mm]      |
| $\gamma$        | 0.49000                 |                                    | [mmrad]   |
| $\alpha$        | 0.20100                 |                                    | [mmrad]   |
| $\beta_{rel}^2$ | 1.00000                 |                                    | [mmrad]   |
| scaled          | 0.310                   |                                    | [mm mrad] |
| abund           |                         |                                    | [mm mrad] |
| scaled          | 0.548                   |                                    | [mm mrad] |
| LD              |                         |                                    | [mm mrad] |
| scaled          | 0.312                   |                                    | [mm mrad] |
| LD              |                         |                                    | [mm mrad] |

# Week 29 plans: Further conditioning + Photoelectrons

1. Conditioning for 650us x 6.5MW (sharp resonancel!):
  1. 400us X 7.5MW → 650us
  2. Phase shifter re-adjustment (+RF group)→done?
2. Fast recovery tool → next steps?
3. Solenoid BBA → check
4. CDS booster: dark current and MP measurements
5. E-beam imaging studies?
6. TDS (re-) start (+RF experts):
  1. RF commissioning
  2. PST.Scr1 mapping for the homogeneity
7. Projected emittance check (?60MV/m, MMMG, 1.2mm, 500pC):
  1. E-beam transport → steerings 20.07 10:50?
  2. Imain scan + 3x3 stat
  3. Booster gradient scan: →2.5MW
  4. 3.5MWbooster and BSA=1.1mm → Imain scan + 3x3 stat
8. Bunch length with TDS
9. δE-program
10. Slice emittance (the best projected emittance setup as a start)

- Dark current monitoring
- Monitor the resonance temperature:
  - 4MW (10MWdc) x 400us eff x1% reflection
  - for 50,100, 200, 400us: 6MW x3%reflection

| to do:               | Measurements                               |                            |                     |                            |                         |                         |                         |
|----------------------|--|----------------------------|---------------------|----------------------------|-------------------------|-------------------------|-------------------------|
| Week 29              | Mon Jul-18                                 | Tue Jul-19                 | Wed Jul-20          | Thu Jul-21                 | Fri Jul-22              | Sat Jul-23              | Sun Jul-24              |
| Morn. 07:00 to 15:30 | Solenoid EBA<br>Krasilnikov<br>Kalantaryan | Krasilnikov<br>Kalantaryan | Emittance           | TDS                        |                         |                         |                         |
| Late 15:00 to 23:30  | Imaging<br>Rublack<br>Zhao                 | Cond tests                 |                     | Boonpompras<br>Kalantaryan | Boonpompras<br>Lishilin | Boonpompras<br>Lishilin | Boonpompras<br>Lishilin |
| Night 23:00 to 07:30 | Asymmetry<br>Renier<br>Isaev               | Emittance                  | Renier<br>Melkunyan | Renier<br>Melkunyan        | Renier<br>Zhao          | Emittance               | Renier<br>Zhao          |
| Resp. Phys           |  |                            |                     |                            |                         |                         |                         |
| Laser                |  |                            |                     |                            |                         |                         |                         |
| RF                   | Jachmann                                   | Jachmann                   | Jachmann            | Jachmann                   | Jachmann                | Jachmann                | Jachmann                |
| Vaku.                | Rueger                                     | Rueger                     | Rueger              | Rueger                     | Rueger                  | Rueger                  | Rueger                  |
| Contr.               | Petrosyan                                  | Petrosyan                  | Petrosyan           | Petrosyan                  | Petrosyan               | Petrosyan               | Petrosyan               |
| Electr.              | Schade                                     | Schade                     | Schade              | Schade                     | Schade                  | Schade                  | Schade                  |
| Infrast.             | Schulze                                    | Schulze                    | Schulze             | Schulze                    | Schulze                 | Schulze                 | Schulze                 |
| SSB                  | Krasilnikov                                | Krasilnikov                | Krasilnikov         | Huck                       | Huck                    | Huck                    | Huck                    |
| Schichtabsich        | Loisch                                     | Loisch                     | Loisch              | Saisa-Ard                  | Saisa-Ard               | Kalantaryan             | Kalantaryan             |

# Measurement program 2016

| #  | Task   | Coordinator  | Duration (shifts) | Meas. Program | Remark   |         |
|----|--|--------------|-------------------|---------------|--|---------|
| 1  | Dark current monitoring  |              | 30min-1h          | +             | 6.5MW, 200us, 1% + DCM?  | Ongoing |
| 2  | Resonance temperature monitoring   | YR           | 30min-1h          | +             | 4MW, 400us, 1%   | Ongoing |
| 3  | Laser BL alignment   | MG           | 2d?               | +             |  | Done    |
| 4  | Laser BBA  | YR           | 1-2 shifts        | +             | LBL aligned  | Done    |
| 5  | Solenoid BBA   | MK           | 3-4 shifts        | +             | u-mover works  | Done*   |
| 6  | Longitudinal momentum characterization (maxPz, MMMG vs. peak RF power gun)         | MK           | 5-6 shifts        | +             |  | Done    |
| 7  | Emission studies (+charge profile of pulse train → nose in the bunch charge train) | MK           | 4-5shift+         | ?             | Request from FLASH (S. Schreiber), ?Right after the cathode insertion? | Started |
| 8  | Dummy plasma cell (window foil) stress tests                                       | MG           | 5d+               | +             | 6MW, 100pulses, booster→nominal  | Done    |
| 9  | E-beam asymmetry studies   | Igl, MK      | ?                 | ?             |  | Done*   |
| 10 | δE: LPS, slice energy spread characterization                                      | MK, J. Zhu   |                   | +/-           | Request from HH (M. Dohlus, J. Zhu), TDS                               |         |
| 11 | BPM commissioning  | MK,FT        | 3-4+              | +/-           | E-beam, Q~0.5-1nC  | Ongoing |
| 12 | Projected emittance studies  |              |                   | ?             | (53MV/m vs. 60MV/m)x(FTvs.Gauss)+TDS                                   |         |
| 13 | Slice emittance studies  | HH           |                   | ?             | TDS  |         |
| 14 | Plasma experiment  | MG           |                   | ?             | TDS  |         |
| 15 | Plasma TR  | GL           |                   |               | TDS  |         |
| 16 | 3DElla commissioning   | TR, JG       |                   | ?             |  |         |
| 17 | TDS commissioning/characterization?  | HH           |                   | ?             |  |         |
| 18 | CDS booster studies (dark current)   | I.Rybn., Igl |                   | +             | no e-beam needed, CDS IL works   | Done?   |
| 19 | Commissioning of res. temp. tool   | YR           | 3 shifts          | +             |  | Done?   |
| 20 | THz related experiments: 4nC   | PB           | 8 shifts          | +             | EMSY1-3, all screens, TDS, HEDA1,2 (long laser – FT of Gauss)          |         |
| 21 | THz related experiments: short bunches   | PB           | 3 shifts          | +             | TDS available, BSA=3.0mm → homogeneity                                 |         |
|    |  |              |                   |               |  |         |