

5th CLIC-ILC BDS+MDI

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Contribution from

**The Cockcroft Institute and
The University of Manchester**

CRAB Cavity issue

- We notice a discrepancy between a simulation in which we have a crossing angle and the crab cavities switched on as compared to a perfectly straight linac calculation
- Both simulations should give the same result – however there is a discrepancy in the luminosity of ~10% between the results
- We think this may be an effect of the sextupoles near the IP

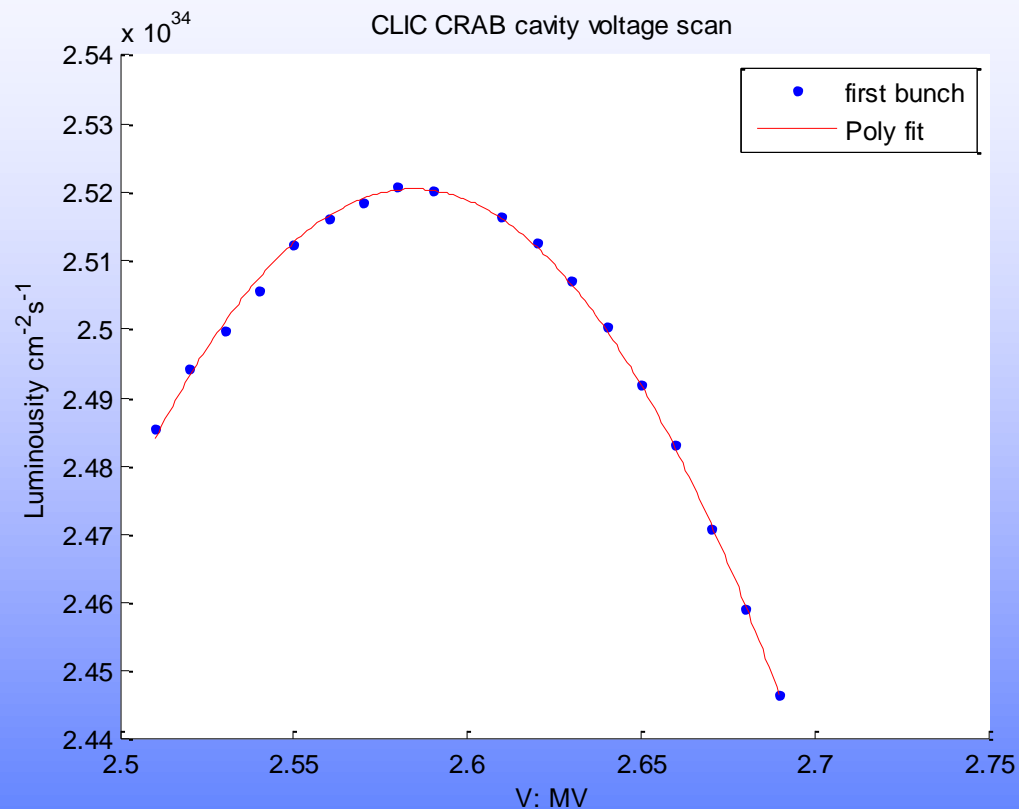
Things to resolve issue as previously suggested

- Swap the drift tubes and crab cavities around
- Use the dump beam command
- Calculate long range wakes

Comparison of CLIC-CRAB calculated from PLACET for:
Swapping D020 drift space and CLIC-CRAB cavity around
To check for the dependency of the sextupoles...

Previous Result with D020 then Crab

Operating voltage for the CLIC-CRAB calculated from PLACET



SET: ELECTRON LINE PHASE = POSITRON LINE
PHASE=0

N_slice=101

N=101

Total particles=10201

Voltage

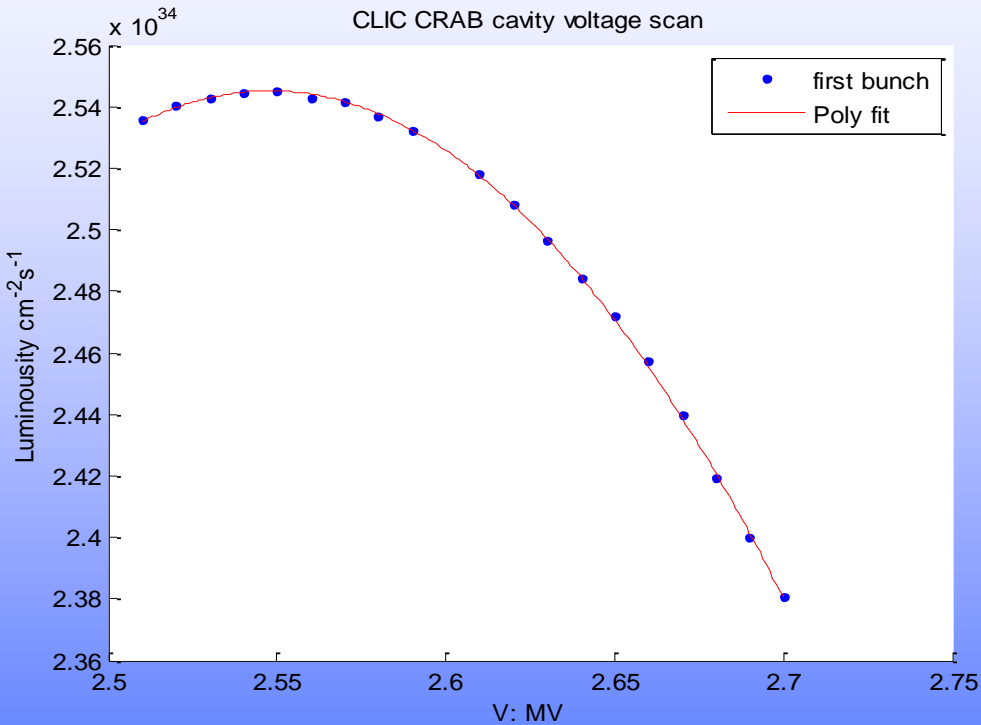
MaxV=2.584MV

Lum=2.5205e34

98% Lum

2.4930<V<2.6710

GARCIA – swap D020 drift space and Crab voltage scan i.e. Crab then D020



**SET: ELECTRON LINE PHASE = POSITRON LINE
PHASE=0**

N_slice=101

N=101

Total particles=10201

Voltage

MaxV=2.548MV

Lum=2.5451e34

```
#Drift -name "D2OD" -length 11.28893905 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008
Drift -name "D2OD" -length 11.12893905 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008
CrabCavity -name CRABCAV -length 0.16 -frequency 11.9942 -voltage $VOLTAGE -phase $PHASE -wakelong wakelong
Girder
Drift -name "OCTDRIFT" -length 2 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008
Girder
Multipole -name "SF1" -synrad $mult_synrad -type 3 -length 0.496824 -strength [expr -6.053493698*$e0] -aperture_shape elliptic -aperture_x 0.00483 -aperture_y 0.00483
#Drift -name "M21" -length 0 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008
Girder
Drift -name "LX0" -length 0.248412 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008
Girder
Quadrupole -name "QF1" -synrad $quad_synrad -length 3.25668132 -strength [expr 0.13177400282*$e0] -aperture_shape elliptic -aperture_x 0.00469 -aperture_y 0.00469
Bpm -name "BPMFFS" -length 0 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008
Girder
Drift -name "D1OD" -length 0.48412 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008
Girder
Drift -name "OCTDRIFT" -length 2 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008
Girder
Multipole -name "DEC0" -synrad $mult_synrad -type 4 -length 0.496824 -strength [expr -1.0*-135.6855204*$e0] -aperture_shape elliptic -aperture_x 0.00359 -aperture_y 0.00359
Girder
Drift -name "LX0" -length 0.248412 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008
Girder
Multipole -name "SD0" -synrad $mult_synrad -type 3 -length 0.496824 -strength [expr 21.78589514*$e0] -aperture_shape elliptic -aperture_x 0.00376 -aperture_y 0.00376
Girder
Drift -name "LX0" -length 0.248412 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008
Multipole -name "DD0" -synrad $mult_synrad -type 5 -length 0 -strength [expr 38023298.32*$e0] -aperture_shape elliptic -aperture_x 0.00382 -aperture_y 0.00382
Girder
Quadrupole -name "QD0" -synrad $quad_synrad -length 2.732532 -strength [expr -0.3175473258*$e0] -type 4 -Kn [expr -1.0*1000*$e0] -aperture_shape elliptic -aperture_x 0.00383 -
aperture_y 0.00383
Bpm -name "BPMFFS" -length 0 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008
Girder
Drift -name "D0" -length 3.5026092 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008
#Drift -name "IP" -length 0 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008
#Drift -name "ENDEFF1" -length 0 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008
#Drift -name "NEWBDS$END" -length 0 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008
Marker -name END_CLICBDS1
```

#OLD VALUE BEFORE GARCIA SUGGESTION

#CrabCavity -name CRABCAV -length 0.16 -frequency 11.9942 -voltage \$VOLTAGE -phase \$PHASE -wakelong wakelong

#Girder

#Drift -name "OCTDRIFT" -length 2 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008

#GARCIA suggestion - flip Drift and Crab around

Girder

Drift -name "OCTDRIFT" -length 2 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008

CrabCavity -name CRABCAV -length 0.16 -frequency 11.9942 -voltage \$VOLTAGE -phase \$PHASE -wakelong wakelong

Girder

Multipole -name "SF1" -synrad \$mult_synrad -type 3 -length 0.496824 -strength [expr -6.053493698*\$e0] -aperture_shape elliptic -aperture_x 0.00483 -aperture_y 0.00483

#Drift -name "M21" -length 0 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008

Girder

Drift -name "LX0" -length 0.248412 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008

Girder

Quadrupole -name "QF1" -synrad \$quad_synrad -length 3.25668132 -strength [expr 0.13177400282*\$e0] -aperture_shape elliptic -aperture_x 0.00469 -aperture_y 0.00469

Bpm -name "BPMFFS" -length 0 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008

Girder

Drift -name "D1OD" -length 0.48412 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008

Girder

Drift -name "OCTDRIFT" -length 2 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008

Girder

Multipole -name "DEC0" -synrad \$mult_synrad -type 4 -length 0.496824 -strength [expr -1.0*-135.6855204*\$e0] -aperture_shape elliptic -aperture_x 0.00359 -aperture_y 0.00359

Girder

Drift -name "LX0" -length 0.248412 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008

Girder

Multipole -name "SD0" -synrad \$mult_synrad -type 3 -length 0.496824 -strength [expr 21.78589514*\$e0] -aperture_shape elliptic -aperture_x 0.00376 -aperture_y 0.00376

Girder

Drift -name "LX0" -length 0.248412 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008

Multipole -name "DD0" -synrad \$mult_synrad -type 5 -length 0 -strength [expr 38023298.32*\$e0] -aperture_shape elliptic -aperture_x 0.00382 -aperture_y 0.00382

Girder

Quadrupole -name "QD0" -synrad \$quad_synrad -length 2.732532 -strength [expr -0.3175473258*\$e0] -type 4 -Kn [expr -1.0*1000*\$e0] -aperture_shape elliptic -aperture_x 0.00383 -aperture_y 0.00383

Bpm -name "BPMFFS" -length 0 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008

Girder

Drift -name "D0" -length 3.5026092 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008

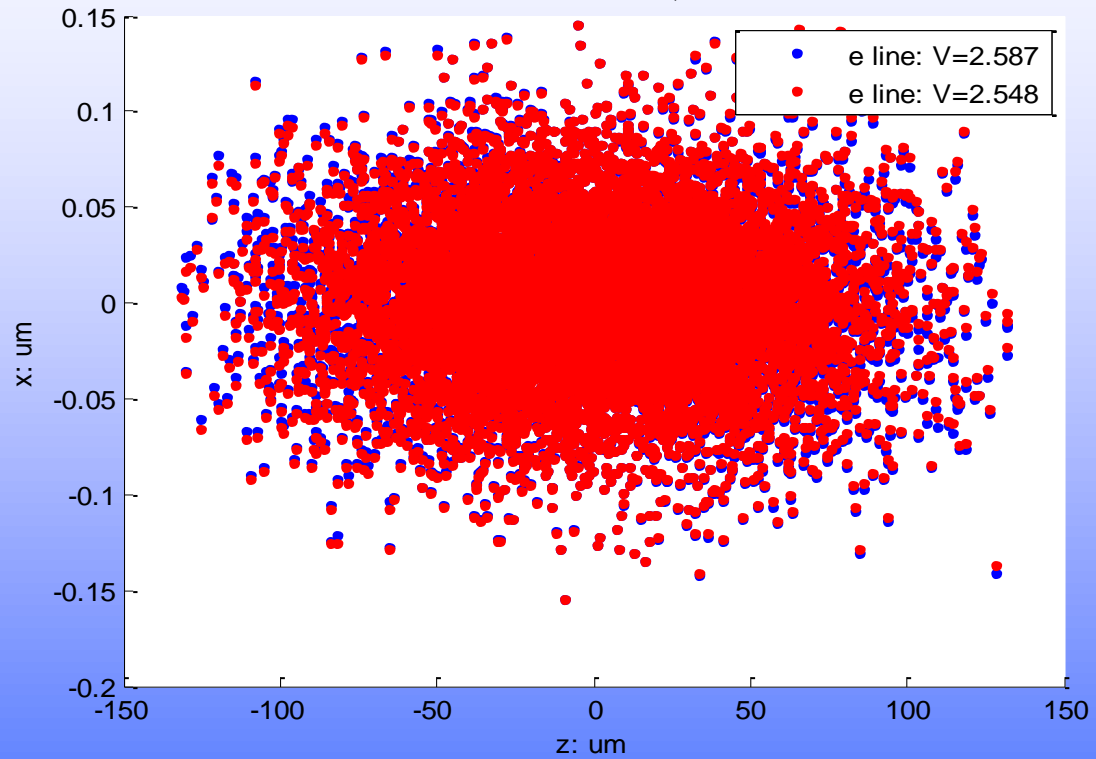
#Drift -name "IP" -length 0 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008

#Drift -name "ENDEFF1" -length 0 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008

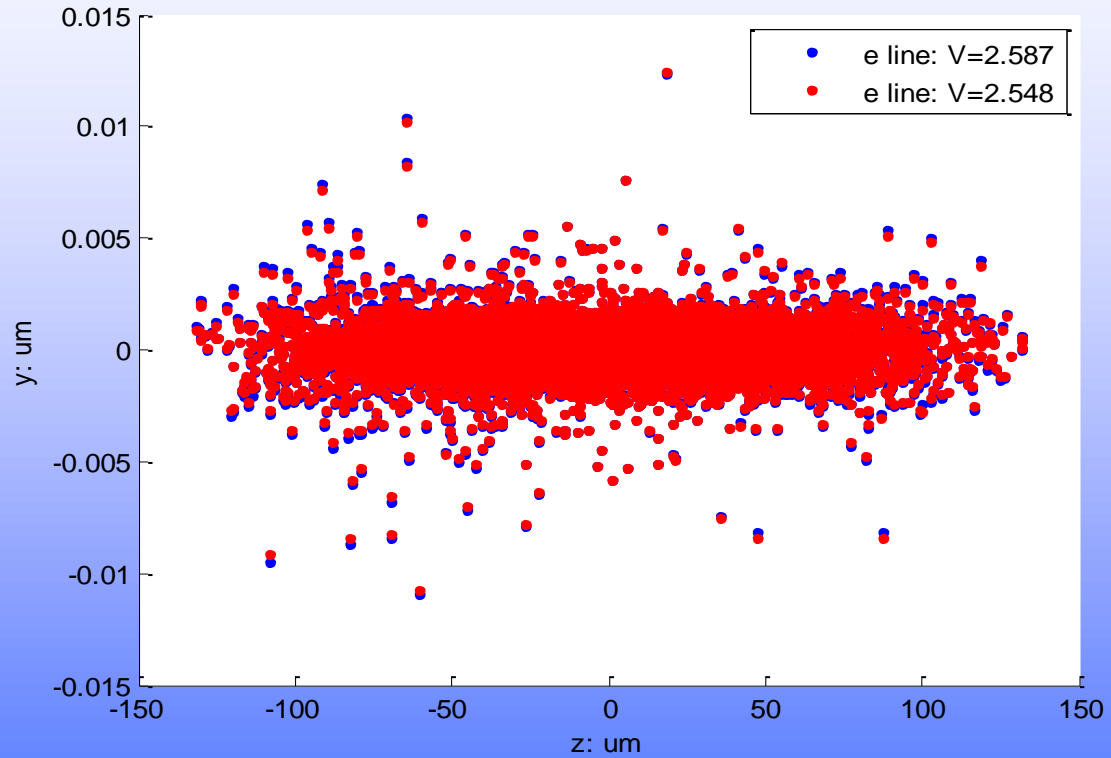
#Drift -name "NEWBDS\$END" -length 0 -aperture_shape elliptic -aperture_x 0.008 -aperture_y 0.008

Marker -name END_CLICBDS1

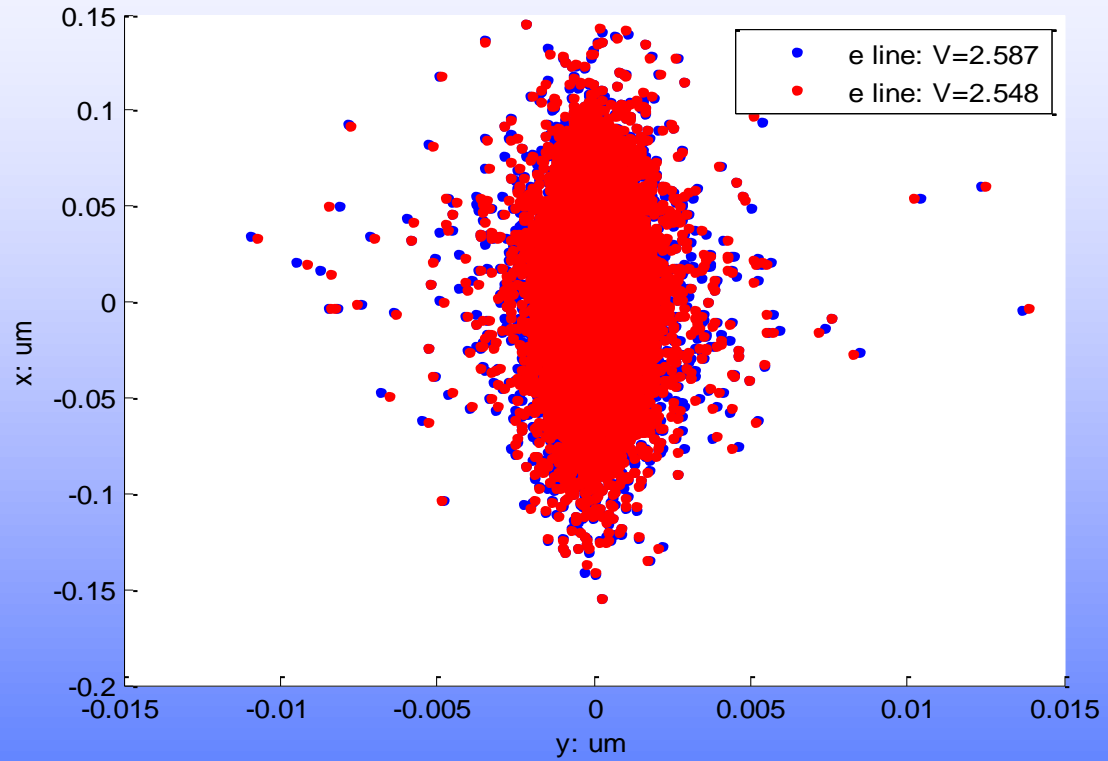
Plot of first bunch electron lines with interchanging of Crab at IP xz after coordinate transform
- Common: Phase=0, Roll=0



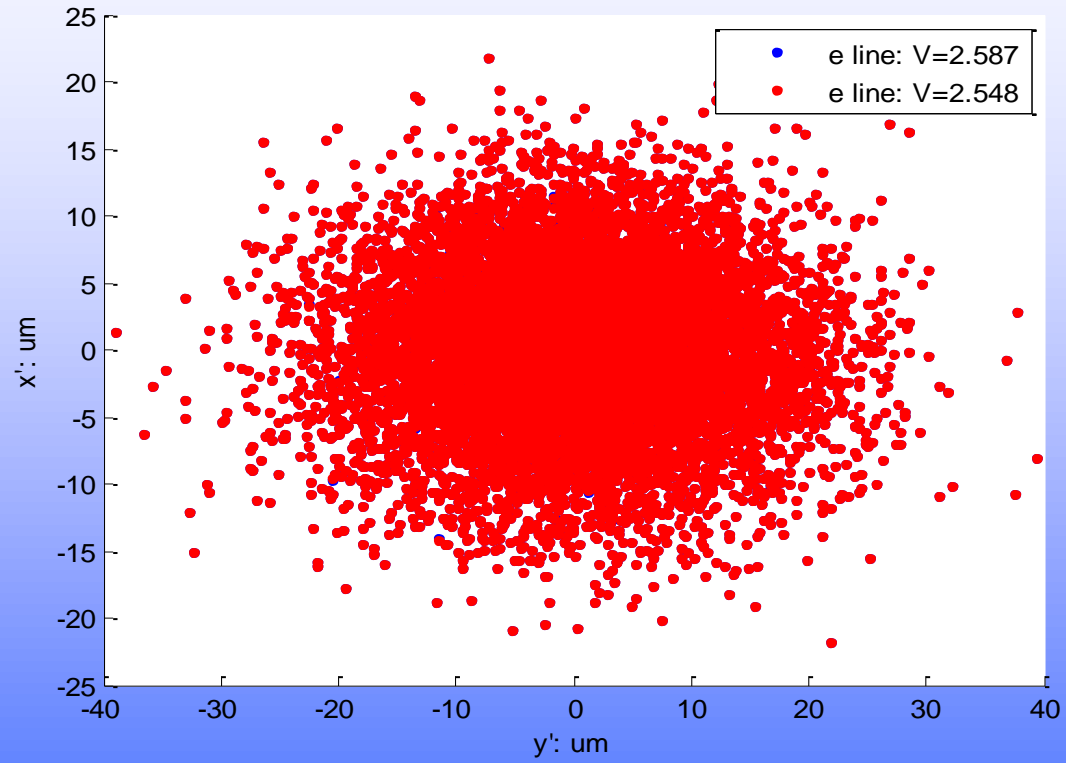
Plot of first bunch electron lines with interchanging of Crab at IP yz after coordinate transform
- Common: Phase=0, Roll=0



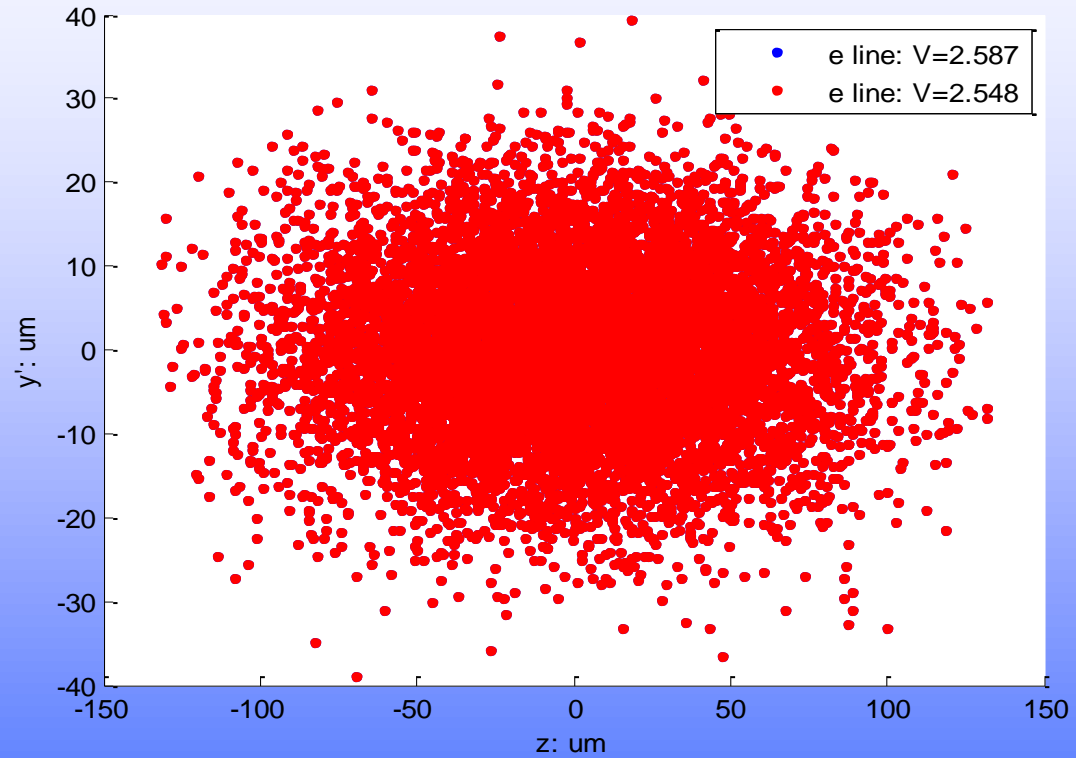
Plot of first bunch electron lines with interchanging of Crab at IP xy after coordinate transform
- Common: Phase=0, Roll=0



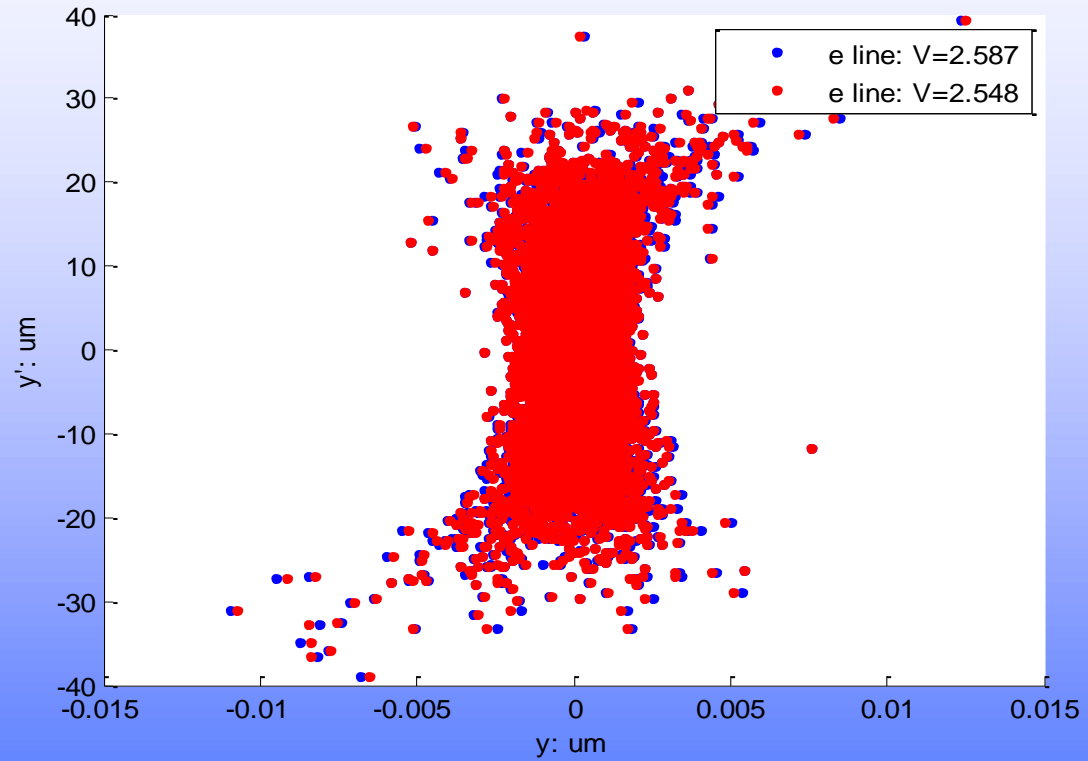
Plot of first bunch electron lines with interchanging of Crab at IP x'y' after coordinate transform
- Common: Phase=0, Roll=0



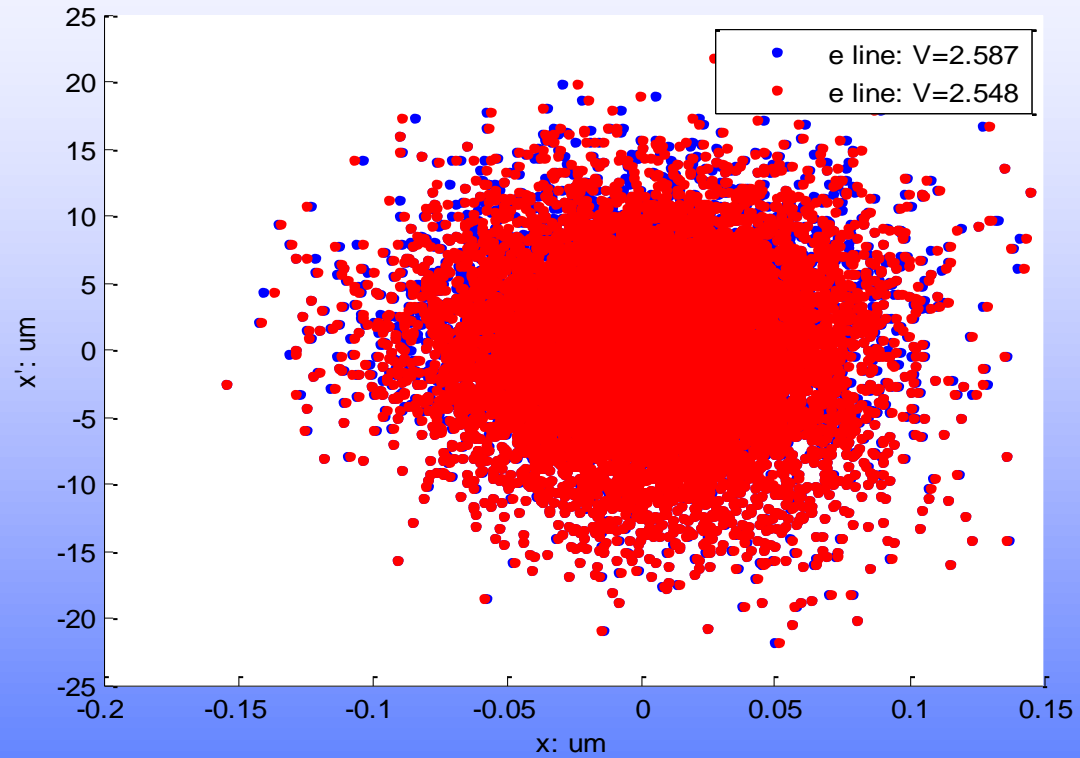
Plot of first bunch electron lines with interchanging of Crab at IP zy' after coordinate transform
- Common: Phase=0, Roll=0



Plot of first bunch electron lines with interchanging of Crab at IP yy' after coordinate transform
- Common: Phase=0, Roll=0



Plot of first bunch electron lines with interchanging of Crab at IP xx' after coordinate transform
- Common: Phase=0, Roll=0



Things to do for CLIC-CRAB beam dynamic simulations

- Swaping of the drift-tubes and Crab cavities makes no difference to the calculation...
- Problem possibly associated with the sextupoles

Things to do for CLIC-CRAB beam dynamic simulations

- Need to use the “Dump Beam command” after the sextupoles or to simply replace the sextupoles with drift tubes....
- I have still yet to do the Long range Wakefield calculations – which must be completed by next Thursday....