POSINTS Simulations of e-cloud induced coherent tuneshifts for Cesr-TA Regular Bends (exact input parameters as in Gerry runs). Positron beam

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Content/Comments

- The following results repeat the POSINST calculations for the regular dipoles presented at the *Jan-8-09 tele-meeting* and Jan-20 addendum but this time using the **exact choice** of input parameters as in Gerry's runs except for max no. macro-photo-electrons produced per each bunch passages which is limited here to 200k. Gerry uses 500k.
- My previous previous runs had, among others, slightly different settings for beam sizes.

- Positron beam. Machine setting as of April 07 measurements (11 bunch trains)
- Conversion field-to-tuneshift presupposes L=377.99 total length occupied by regular dipoles.
- Convention for E-field sign: Ex or Ey are positive if pointing toward the direction of positive x and y.

- The simulations summarized here give slightly larger estimates of the tuneshifts than my previous calculations – now they are more consistent with Gerry's calculations. E.g.
  - For the 11th bunch Gerry gives $|\langle E_y \rangle|$=13.77 V/m at dy=5mm and $|\langle E_y \rangle|$ =13.89 V/m at dy = -5mm
  - Now I find $|\langle E_y \rangle|$=13.71 V/m at dy=5mm and $|\langle E_y \rangle|$=13.98 V/m at dy = -5mm (*vs.* $|\langle E_y \rangle|$*=11.52 V/m at dy=5mm that I was finding before*)

Regular DIPOLE:: selected input parameters in POSINST runs

- E=1.885 Gev
- sigmax =2.2 mm; sigmay=0.14mm; sigmaz =12.6mm
- N=1.2E10 part/bunch
- photpbppm = 0.5316 [=Photons/m per part]; queffp=12% [QE]
- B=0.0715 T
- blensig =6
- refl=0.15

- betax=15.9 m; betay=18.94m; $L_{regular\text{-}dip}$ =377.99m [not POSINTS parameters; used for field-to-tune conversion]

Regular DIPOLE:: POSINST input file (portion)

```
CESR-TA dipole at 1.885 GeV: SEY=2.0, Epk=310, r=15%,QE=12%, 51 nicks, pa=1,500000 macro, spch 5,5,10 stps
1  modepos
3586737 random no. seed
3  1.2e10  1.885e9 ibptype,xnpnom,beamen      ! witness bunch studies parameter
1 iden_xy   (transv. gaussian)
2.2e-3    0.14e-3  sigx,sigy  ! average beam sigma in the ring
1 iden_z    (longit. gaussian)
51 nkicks                                !* 51 good 101 better
12.6e-3 sigz [m]                        ! standard CESR bunch length
4   blensig                               ! blensig*sigmaz total bunch length
cesr_ta_fill                          ! filefillpatt
768.43   1281   circ, nharm             ! 14 ns bunch spacing
 2       1.0  nobjtype,slength        ! cesr main dipole
 0.0715  bfield   ! CHICANE max field is By = 0.146 Tesla
 0.045  0.025  0  1  ach,bch,hch,ichsh
 5  5  1e-3  1   0.15      ek0phel,eksigphel,sigyphel,pangphel,refleff ! ATTENTION to reflectivity!
 0.5316  0.12   1      photpbppm,queffp,dilution      !* photon per beam particle per meter, quantum efficiency
 294    100      50  2e6  1e-8  temperature,ek0ionel,esigionel,crossect,pressure ! standard vacuum/ionization
 5 5 1   1    ek0plel,eksigplel,idisplel,pangplel     ! proton losses (mainly for PSR/SNS)
 0  100     plossratepbppm,plelyield        ! proton losses OFF
 200000 , 0,  0  macrophel, macroionel, macroplel       !* macroelectrons per bunch passage
 1 matsurf: MODEL No. 2: SPS data and Hilleret recommendation, Frank Zimmermann model
   310    1.8   1.54033  E0tspk,dtspk,powts
   0.660   0.8   0.700   1.00   0.000   0.000 tpar1-tpar6
   1.5  1.75  1  3.75  8.5 11.5  2.5  3  2.5  3      enpar
   2.5  3.3  2.5  2.5  2.8  1.3  1.5  1.5  1.5  1.5  pnpar
   0.01902  0.5  0   15.   1.000   0.260   2.000   2.000 P1einf,P1epk,E0epk,E0w,powe,epar1,epar2,sige
   0.0409225   0.1902  0.104045  0.260  2.000  0.500 Ecr,P1rinf,qr,rpar1,rpar2,pr
2.0  1  dtotpk,pangsec
0     0.010    0.005 strvolt,strwidth,strgap
1  dek
5e-9    1    1000     dtres, dek0, ek0top
-2.4384e-2, 2.4384e-2, -1.0, 1.0  winx1,winx2,winy1,winy2
4.5e-3  .45e-3   ctrx,ctry
1 ibbk
3 ispch
7, 7 ngrexpx, ngrexpy
10  nsteps
5e-9 dtchk
5    !  3 inst
-1   2  0.005 0  21  6 ! inst=5:=> nbdisp, iwxy, disp, iwitness, nrunbktshots,maxnskip_witness
 0 idis
 0 ibbb
 0 ihisxy
 0 idumpphsp
```

Regular DIPOLE: Summary of results for the 11th bunch

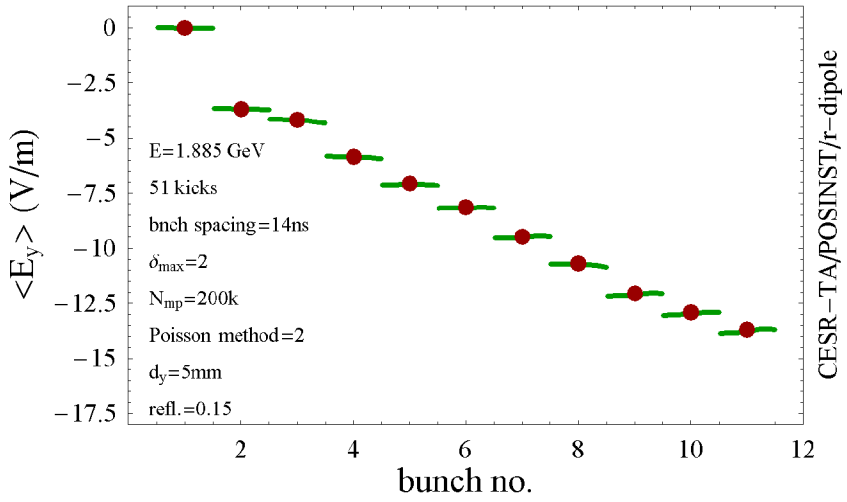
	All bunches offset
<Ex> at dx= 5mm	-1.81 V/m
<Ex> at dx= -5mm	2.07 V/m
ΔQ_x	0.038
<Ex> at dx= 0.5mm	
<Ex> at dx= -0.5mm	
ΔQ_x	
<Ey> at dy= 5mm	-13.71 V/m
ΔQ_y	0.32 kHz
<Ey> at dy= -5mm	13.98 V/m
ΔQ_y	0.33 kHz
<Ey> at dy= 0.5mm	-1.90 V/m
ΔQ_y	0.45 kHz
<Ey> at dy= -0.5mm	2.14 V/m
ΔQ_y	0.50 kHz

Estimate of x-tuneshifts based on
-0.5* [<Ex(dx)>/dx + <Ex(-dx)>/(-dx)]

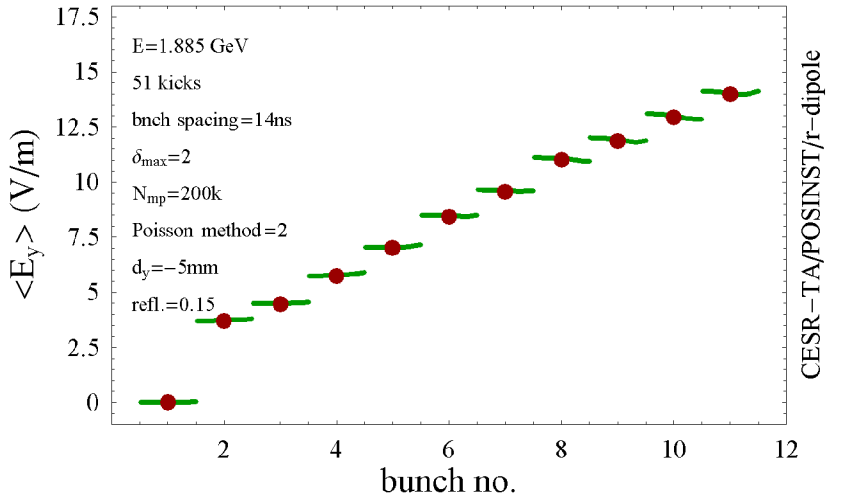
Estimate of y-tuneshifts based on
-<Ey(dy)>/dy

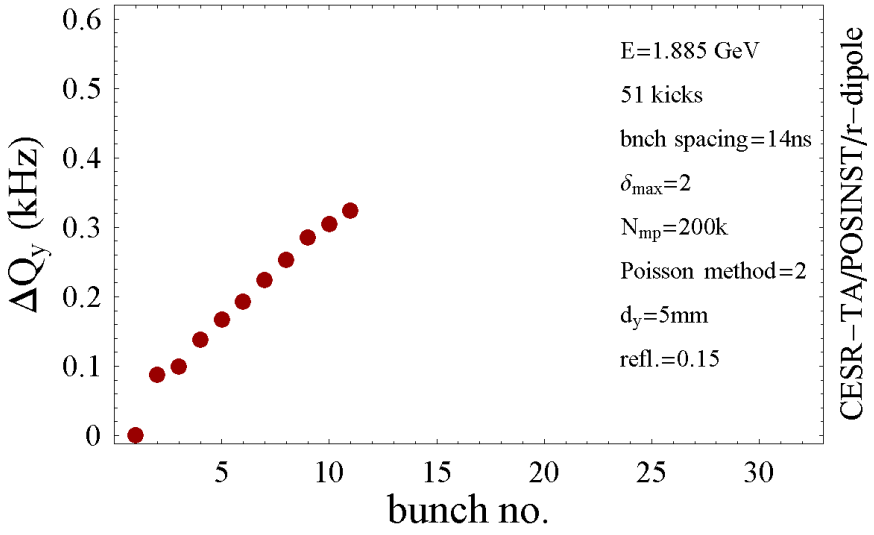
Regular DIPOLE:: Vertical motion (dy=+/-5mm)

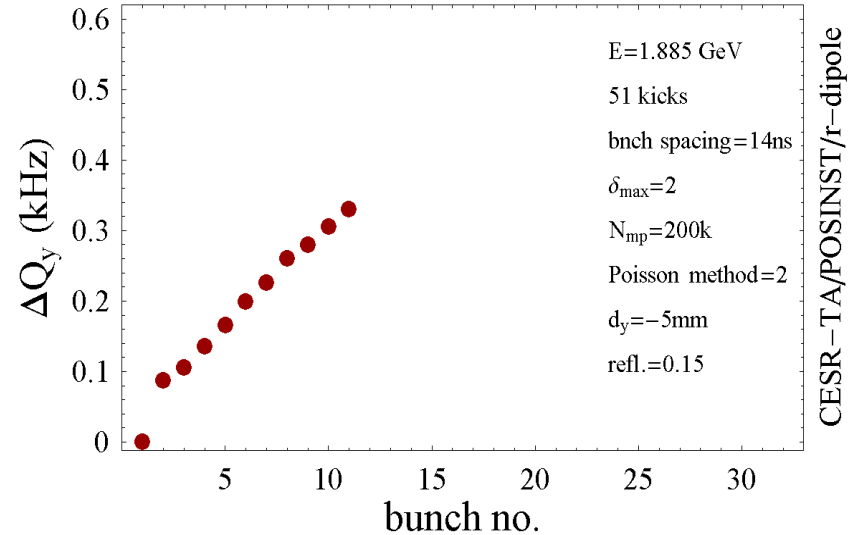
dy= + 5mm



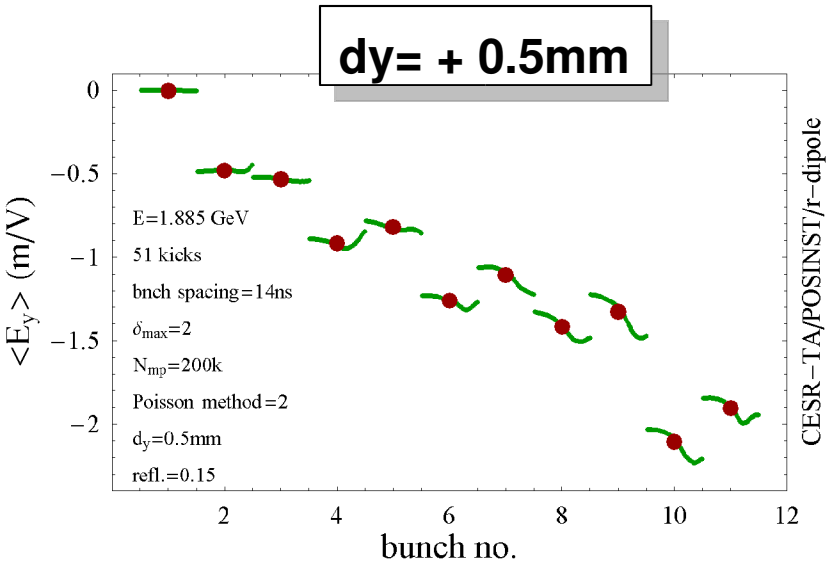
dy= - 5mm

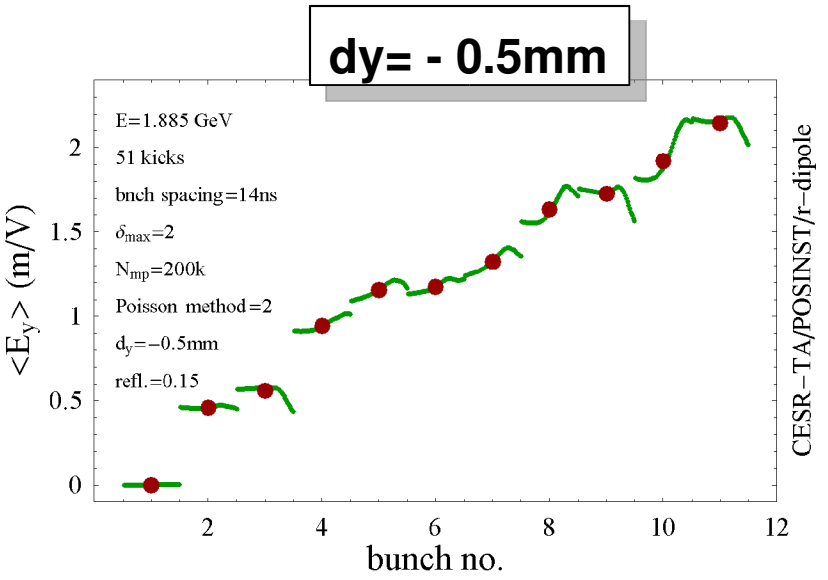


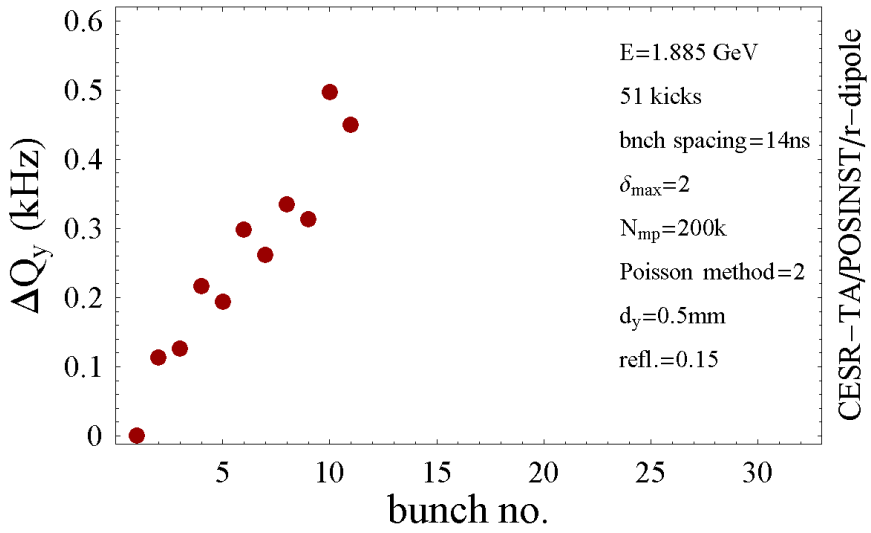


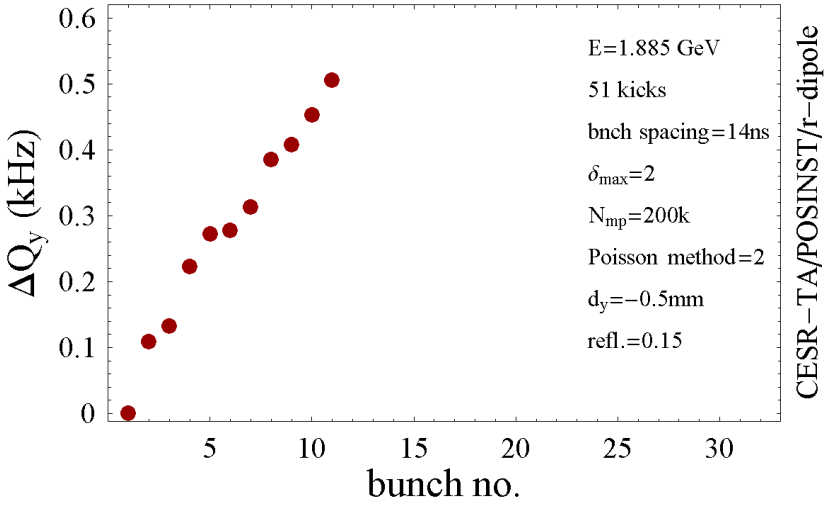


Regular DIPOLE:: Vertical motion (dy=+/-0.5mm)









Regular DIPOLE:: Horizontal motion (dx=+/-5mm)