

MI8 line Emittance Monitor

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Emittance monitor

Normalized emittance (1 σ):

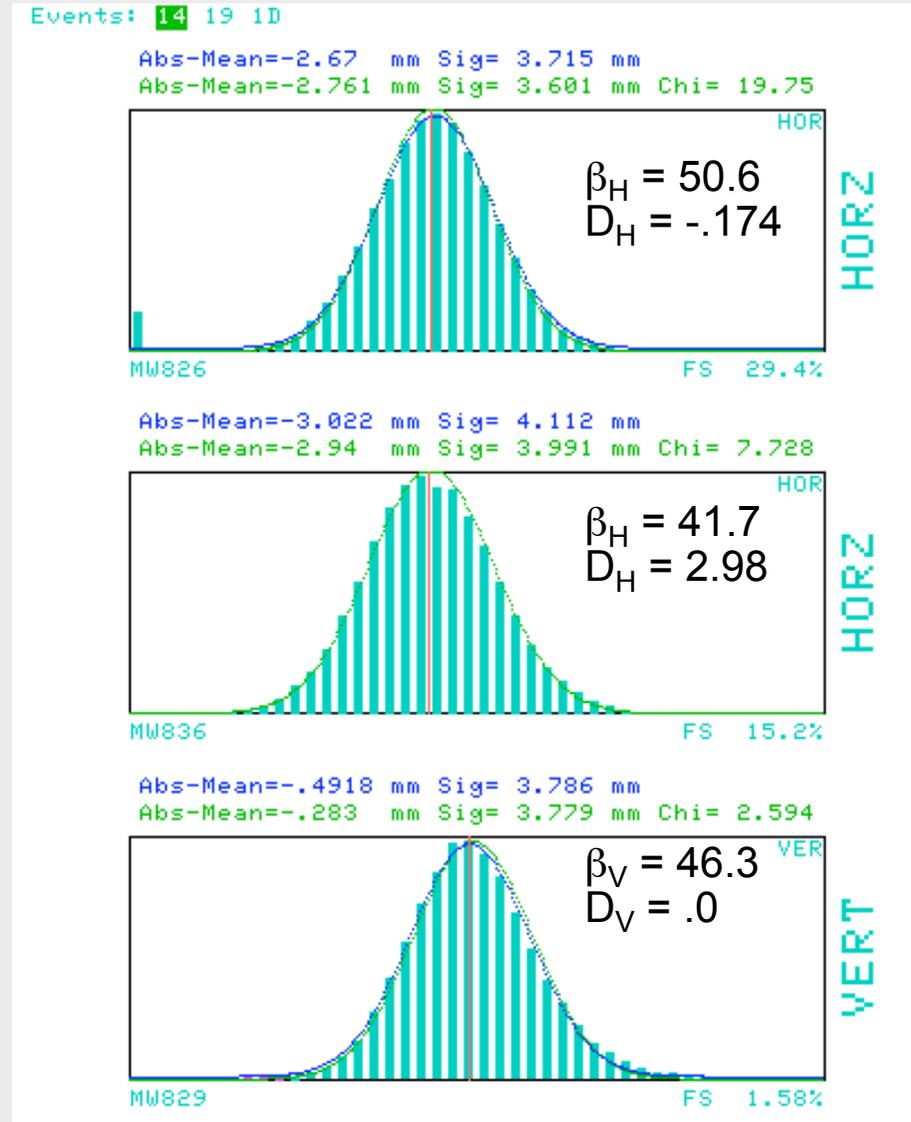
$$\sigma_i^2 = \frac{\varepsilon \beta_i}{(\beta\gamma)_{rel}} + (D_i \delta)^2$$

$$\text{with } \delta = \frac{\sigma_P}{P}$$

σ_i : measured profile at i-location
 σ_p : computed momentum width
 β_i : beta function at i-location
 D_i : dispersion function at i-location
 ε : emittance, in π -mm-mRad
 $(\beta\gamma)_{rel}$: relativistic beta-gamma

β_H and δ^2 : calculated by solving a set of 2x2 simultaneous equations.

β_V is calculated by inserting the known δ^2 into formula.

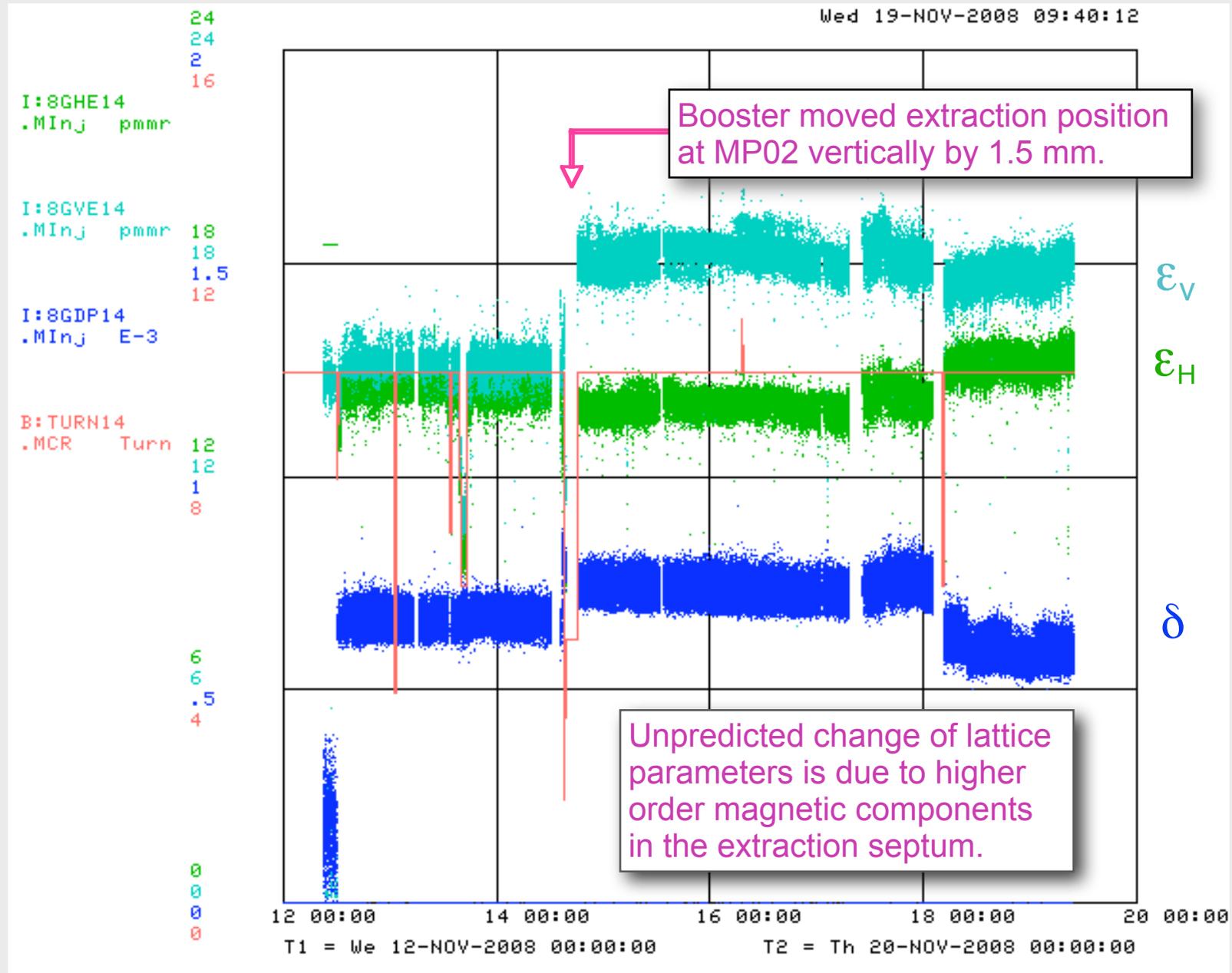


Emittance monitor setup

```
-I:8GIDX1      MI8L emit: hor MW 1st   5           5           node
-I:8GIDX2      MI8L emit: hor MW 2nd   2           2           node
-I:8GIDY       MI8L emit: ver MW           6           6           node
-I:8GX1N       MI8L emit: sigma x1 m  1000        1000        (M)
-I:8GX1X       MI8L emit: sigma x1 m   0           0           (M)
! LATTICE FUNCTION AT THE SCANNERS USED
-I:8GBEX1      MI8L emit: hor beta 1  38.806      38.806      (M)
-I:8GBEX2      MI8L emit: hor beta 2  54.986      54.986      (M)
-I:8GBEY       MI8L emit: ver beta   44.084999   44.084999   (M)
-I:8GETX1      MI8L emit: hor eta 1s -.17377     -.17377     (M)
-I:8GETX2      MI8L emit: hor eta 2n  2.9793501   2.9793501   (M)
-I:8GETY       MI8L emit: ver eta   -.23703     -.23703     (M)

! EMITTANCES
I:8GHE14      MI8L hor emit on $14  16.156322   pmmr
I:8GVE14      MI8L ver emit on $14  16.830429   pmmr
I:8GDP14      MI8L dp/p on $14     .43613434   E-3
I:8GHE19      MI8L hor emit on $19  13.843661   pmmr
I:8GVE19      MI8L ver emit on $19  14.625114   pmmr
I:8GDP19      MI8L dp/p on $19     .35953659   E-3
I:8GHE1D      MI8L hor emit on $1D  15.888483   pmmr
I:8GVE1D      MI8L ver emit on $1D  16.514671   pmmr
I:8GDP1D      MI8L dp/p on $1D     .68418252   E-3
```

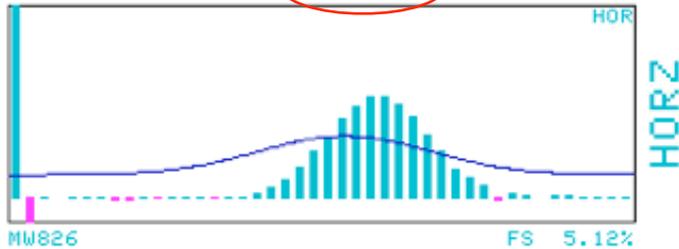
Data logging the emittance results



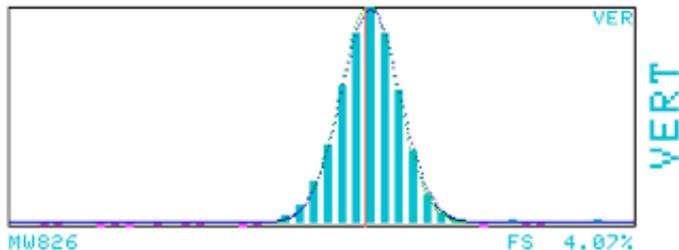
Proton load beam profile on \$15

Events: 15

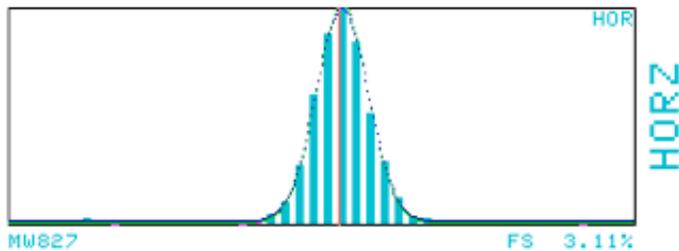
Abs-Mean= 1.607 mm Sig= 6.029 mm
 Abs-Mean=-24.5 mm Sig= 0 mm Chi= 0



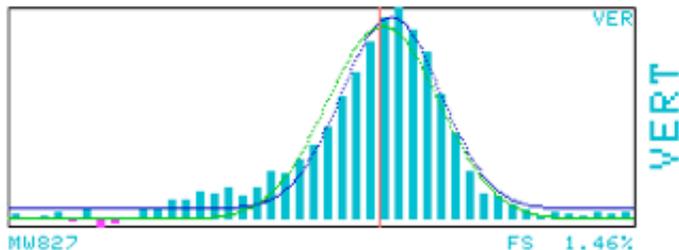
Abs-Mean= 3.443 mm Sig= 2.081 mm
 Abs-Mean= 3.314 mm Sig= 2.026 mm Chi= 4.843



Abs-Mean= 1.431 mm Sig= 1.836 mm
 Abs-Mean= 1.438 mm Sig= 1.812 mm Chi= 2.153

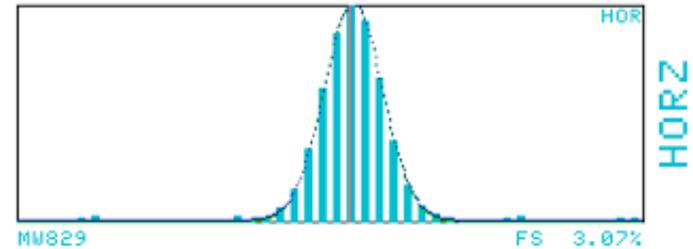


Abs-Mean= 4.89 mm Sig= 3.474 mm
 Abs-Mean= 4.317 mm Sig= 3.946 mm Chi= 11.22

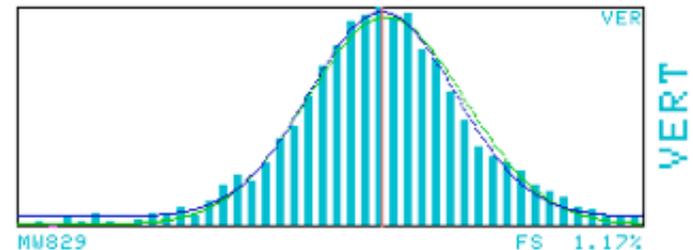


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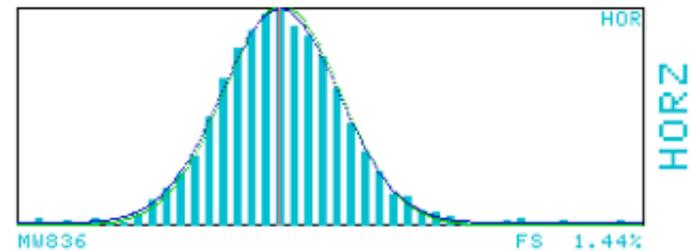
Abs-Mean= 1.585 mm Sig= 2.059 mm
 Abs-Mean= 1.55 mm Sig= 2.056 mm Chi= .7804



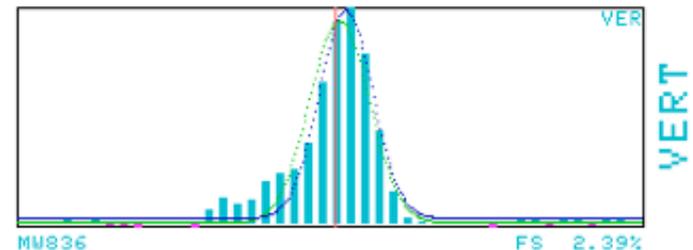
Abs-Mean= 3.608 mm Sig= 5.121 mm
 Abs-Mean= 3.87 mm Sig= 5.538 mm Chi= 3.654



Abs-Mean=-3.583 mm Sig= 4.121 mm
 Abs-Mean=-3.457 mm Sig= 4.08 mm Chi= 1.887



Abs-Mean= 1.058 mm Sig= 1.889 mm
 Abs-Mean= .599 mm Sig= 2.11 mm Chi= 51.96

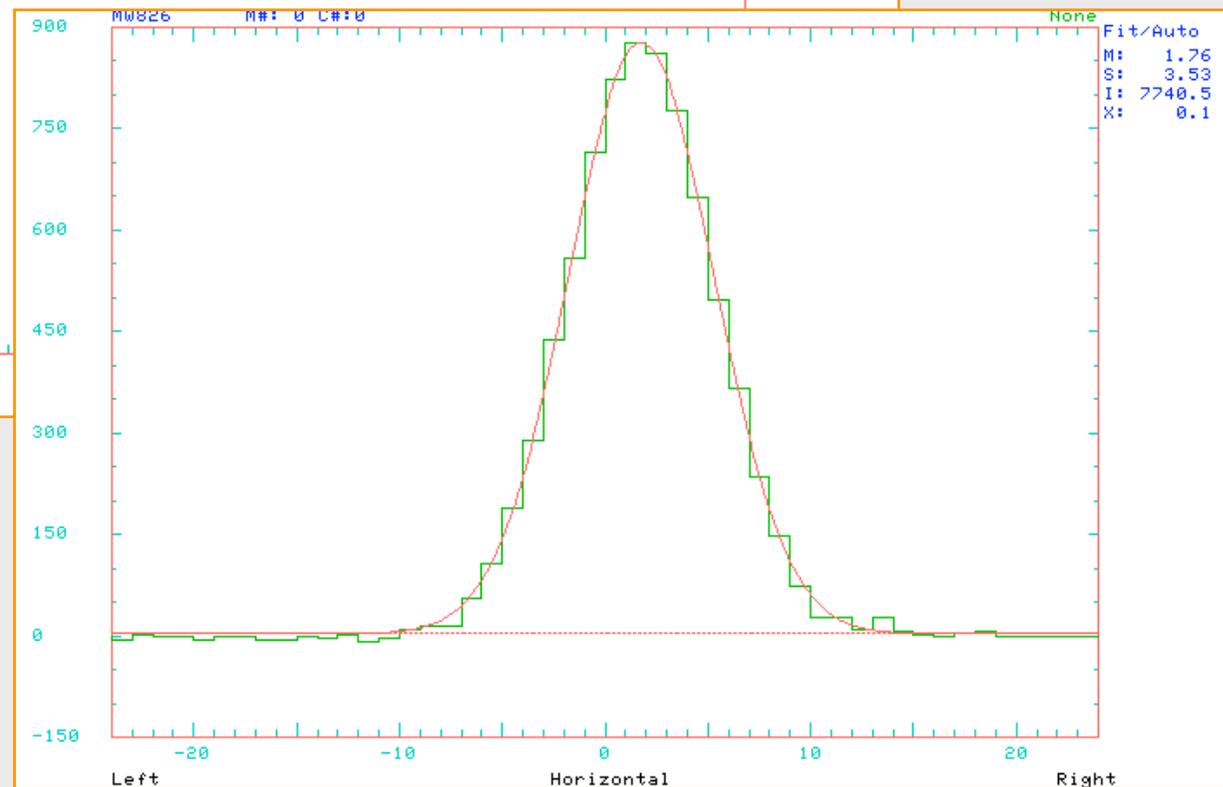
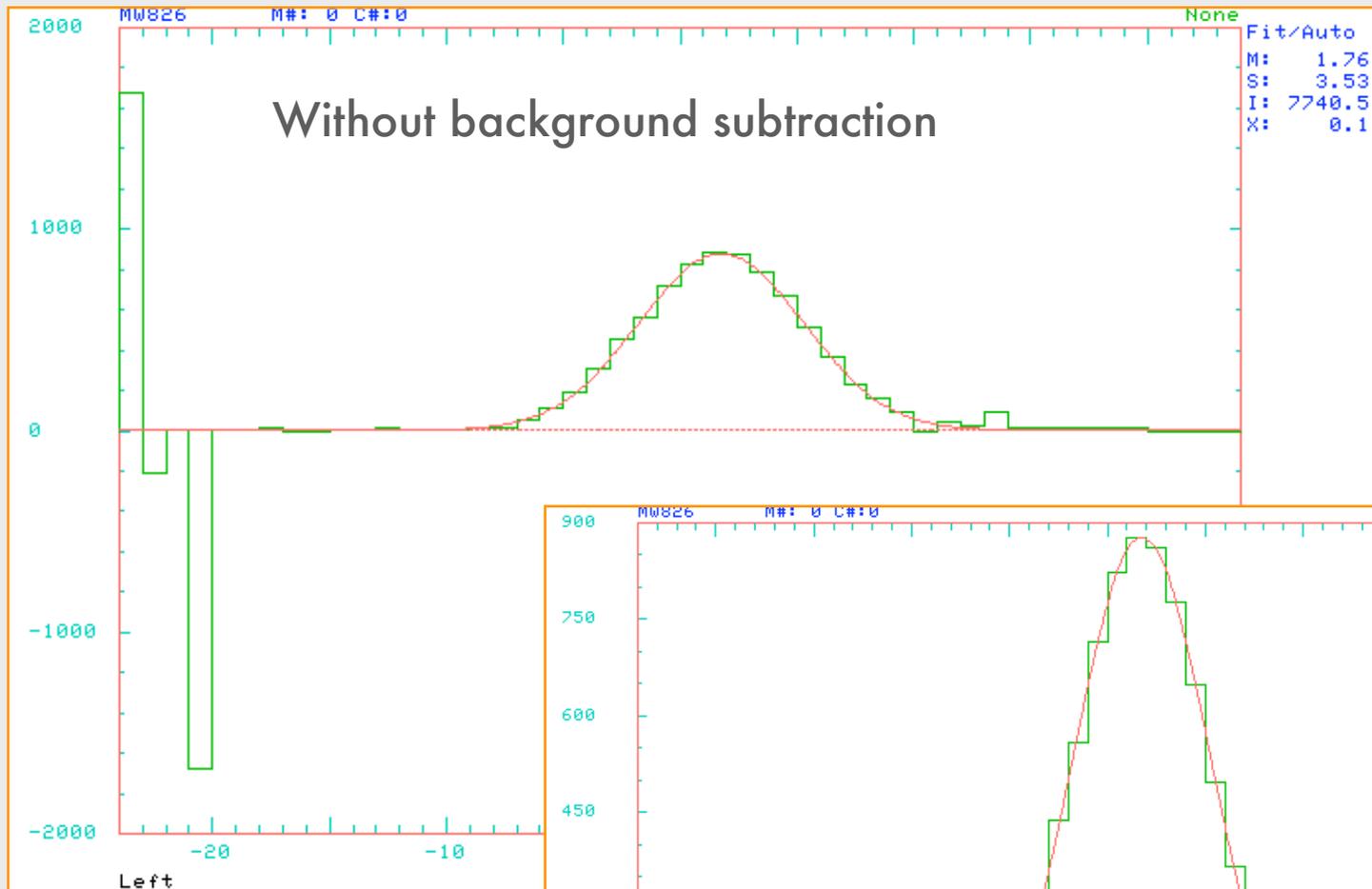


Set
Thresh
old

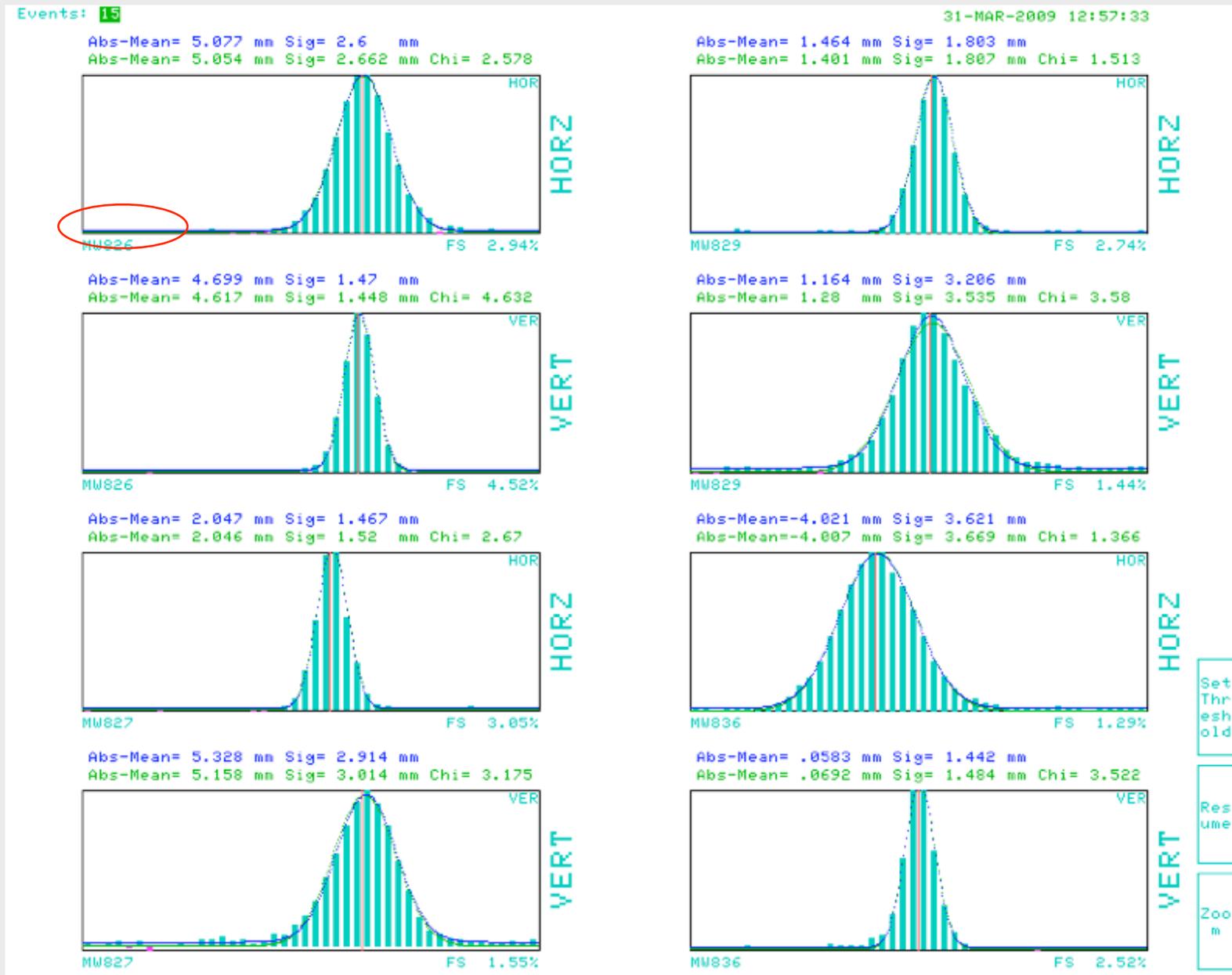
Res
ume

Zoo
m

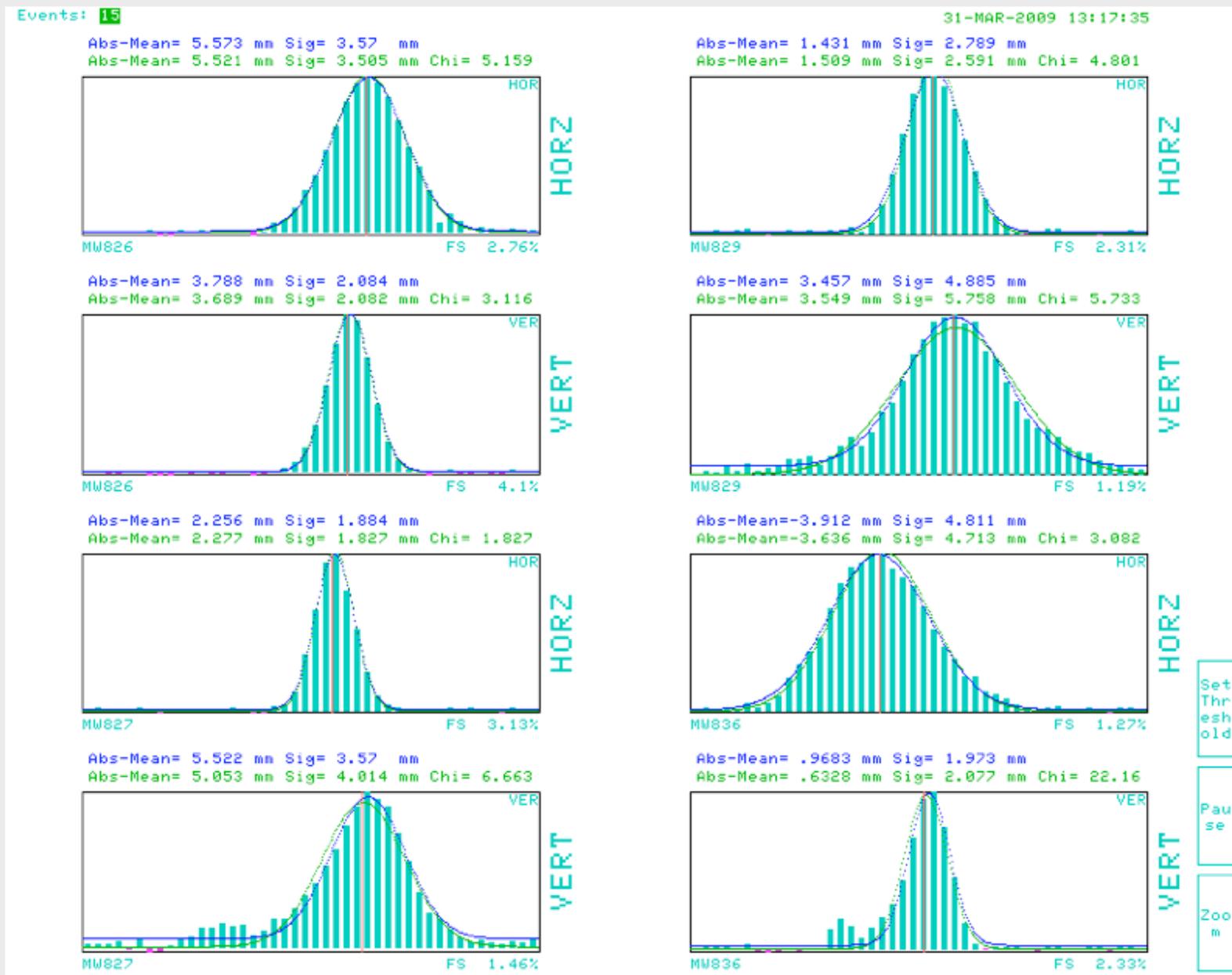
Horizontal profile at mw826



\$15, uncoalesced, 2 turns 30 bunches



\$15, coalesced, 10 turns 7 bunches



MI8 line emittance as logged

