Beam size at foil position rev.2

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Note on 25 Feb 2014 (1)

Mori&Okabe's note on 01/12/2011 specifies

rms unnorm emittance is e_x,y=8 pi mm mrad

rms energy spread is +/- 1%

Therefore rms beam size without dispersion is
x=4.8 mm and y=4.6 mm

This is consistent with observed half beam size of
~10 mm.

rms momentum spread of $dp/p=(1/2)dT/T=0.5x10^{-2}$ is also consistent with observed momentum spread of $1.3x10^{-2}$.

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Only my naive remaining question is why the specification of linac beam parameters changes from Okabe@FFAG11 (Sep 11) to Mori&Okabe note (Dec 11)

H emit (unnor.): 4.4 (90%) -> 8 (rms) or 32 (90%)

V emit (unnor.): 4.1 (90%) -> 8 (rms) or 32 (90%)

\Delta T　　　: 45 keV (90%) -> 110 keV (rms)

or 220 keV (90%)

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The rest is the original version.

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According to Ishi-san's presentation at FFAG13 beta_x = 2.9 m and beta_y = 2.6 m at foil.

According to Okabe-san's presentation at FFAG11 90% norm emittance is e_x=0.68 pi mm mrad and e_y=0.63 pi mm mrad.

Therefore 90% beam size without dispersion is x=3.5 mm and y=3.2 mm

If observed half beam size is ~10 mm, there is a factor of 3 in beam size difference and the linac emittance is about 10 times larger than specification.

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According to Okabe-san's presentation at FFAG11 90% delta T=45 keV.

Therefore $dp/p = 2 \times 10^{-3}$.

If observed $dp/p = 1.3 \times 10^{-2}$, there is a factor of 6 difference.

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I just wonder

1. Linac beam is simply worse than expected.
2. Linac beam is not well tuned.
3. Beam transport line introduces large aberration.
4. Measurement at foil does not give you accurate
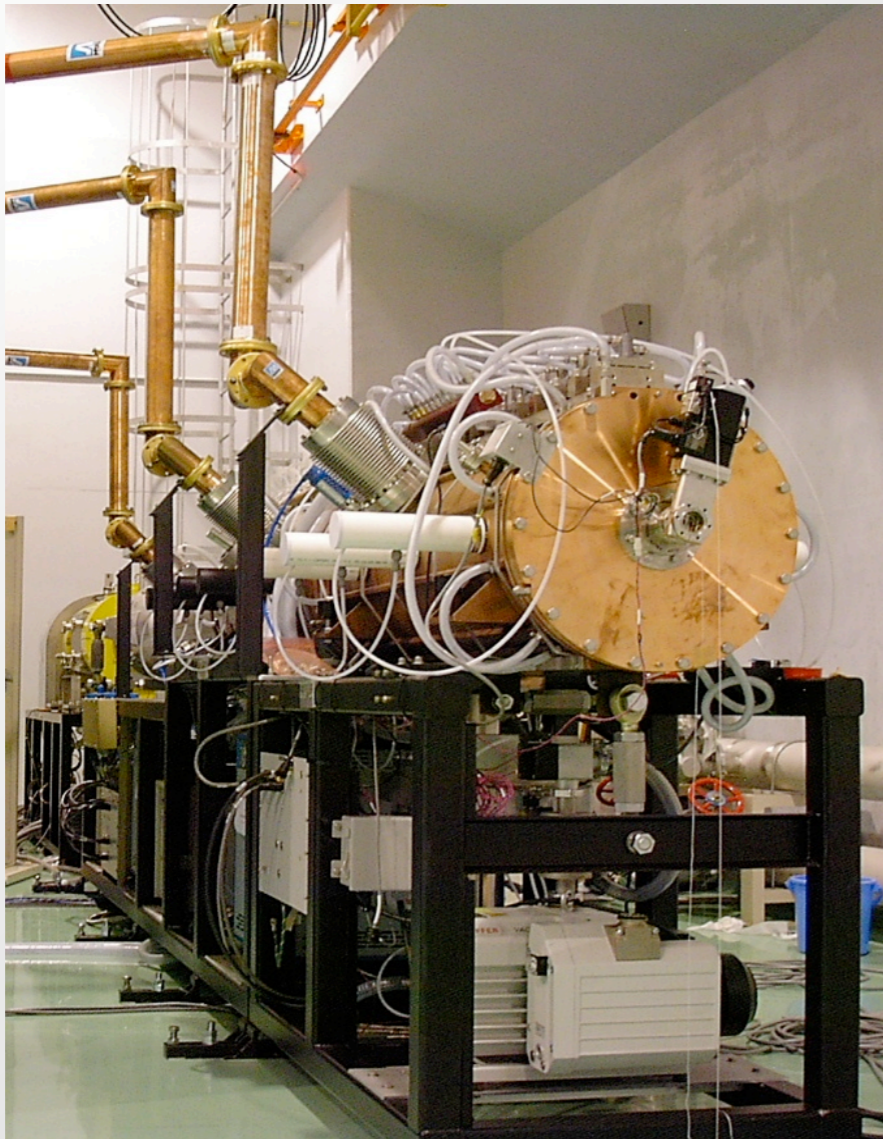   size.

I am still hoping coherent oscillations could be
measured in both horizontal and vertical directions.

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Beta functions calculated from backward tracking in the main ring

Sunday, September 22, 13

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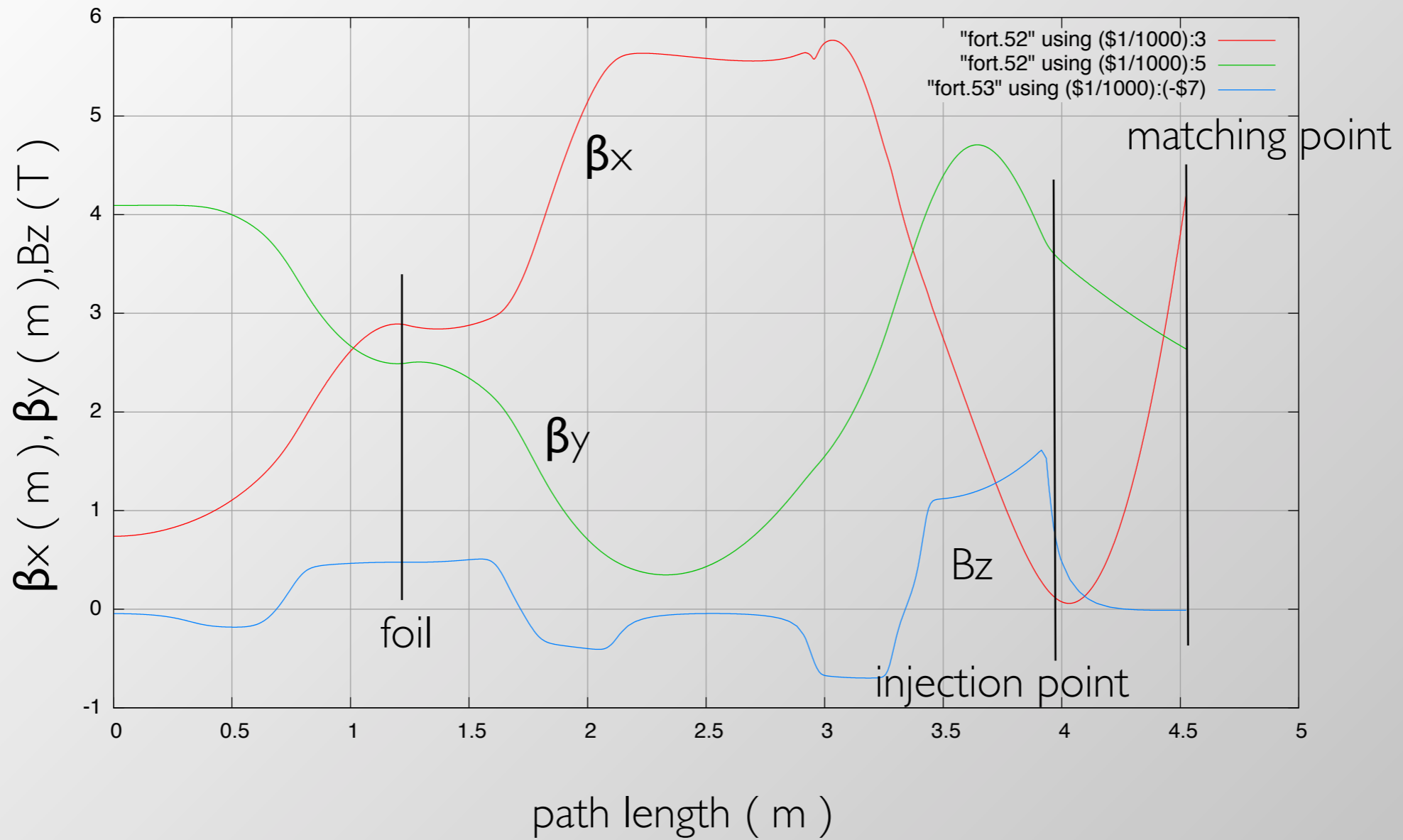
Spec of Linac + H⁻ Ion Source

Linac beam parameter

Ion ：H⁻

E_{ext} ：11MeV

Beam Pulse width(MAX) ：100 μsec

Peak Curr.(MAX) :~5 mA

:~$3.12*10^{12}$[ppp]

(Present injector) :~$6.00*10^{8}$[ppp]

rep. rate :1Hz~200Hz

Horizontal
norm. emittance (90%)：0.680 mm•mrad

Vertical
norm. emittance (90%)：0.630 mm mrad

Ene. 90% ： ΔE ~ 45KeV

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Mori&Okabe note
01/12/2011

Emittance growth caused by multiple scattering with carbon foil at beam injection

Thickness of C-foil : 20 micro-gram/m^2

Energy : 11MeV

Emittance : 8 mm.mrad (unnormalized rms)

Energy spread : +- 1% (rms)

Bunching factor : ~0.3

f rf = 20MHz (h=5)

Horizontal emittance

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