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Striplines BPMs Status of striplines BPMs





Striplines BPMs

Status of striplines BPMs

Optics modeling

- Transfer matrices check
- Injection parameter and dispersion fit + correction
- Orbit steering
- Conclusion and prospect
 Conclusion and prospect



Striplines BPMs Status of striplines BPMs

What has been done

- Electronics has been retuned.
- Polarity has been changed on backwards BPMs.
- High pass filter has been changed.
- Comparison of the calibration with and without kicker is on going.



Striplines BPMs

Status of striplines BPMs

Stripline BPM

| BPM name | length | diameter | remarks |
|----------|--------|----------|------------------------|
| MQF1X | | small | |
| MQD2X | | | |
| MQF3X | | | |
| MQF4X | short | big | very bad |
| MQD5X | 1 | | |
| MQF6X | | small | |
| MQF7X | | big | |
| MQD8X | 1 | | |
| MQF9X | | | |
| MQF13X | long | small | good (ring electronic) |
| MQD14X | | | good (ring electronic) |
| MQF15X | | | good (ring electronic) |



Striplines BPMs

Status of striplines BPMs

Tuning of the electronics

- All head on circuit checked (MQF4X fixed).
- All clipping circuit checked, offsets and clipping levels retuned.
- No real improvement observed.



Striplines BPMs Status of striplines BPMs

Polarity changed

- Electronics is tuned and calibrated for a pulse negative and then positive.
- BPMs with electrodes upstream of the electrodes must invert the signal before clipping circuit.
- Made with the switch at the entrance of the clipping circuit.



Striplines BPMs Status of striplines BPMs

High pass filter and kicker noise

- Kicker noise inducted signal has been measured.
- Cut by the 15*MHz* high pass filter, most efficient just before the clipping circuit.
- However it distorts the signal badly when used with the electronics.
- Has not been installed (can be tested with future one).



Striplines BPMs Status of striplines BPMs



- Calibration measurement has been made for MQF1X, MQF4X and MQF9X.
- Done with and without the kicker.
- On going study :
 - Stability/reproducibility of the amplification.
 - Noise level function of the intensity.
 - Influence of the kicker on the calibration.



Optics modeling Transfer matrices check

Outline



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Optics modeling

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Optics modeling Transfer matrices check



- Change corrector strength or displace quadrupole.
- Fit the slope of the position in all BPM function of that change.
- Compare with the expected one from magnet current settings.
- If no agreement, possibility to apply fudge factor to 1 quad to reproduce measurement.



Optics modeling

Transfer matrices check



- Lots of sign problems due to different conventions for various instrumentations.
- Identify non-calibrated BPMs.
- Now really good agreement from mid-EXT line.
- Sometimes problems at the begining of EXT line.



Optics modeling

Transfer matrices check

ZH2X R₁₂ measurement





Optics modeling

Transfer matrices check

ZV6X R_{12} measurement





Optics modeling Transfer matrices check



- Easy to use interface.
- Quick determination of modeling problems (1 corrector scan = few min).
- Quick determination of problematic BPMs.
- Possibility to test hypothesis (quad fudge factor).
- Already well tested in beam.



Optics modeling Injection parameter and dispersion fit + correction





Striplines BPMs

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Optics modeling Injection parameter and dispersion fit + correction

Principle and status

- $X X' Y Y' \frac{dE}{E}$ reconstruction at selected point with selected BPMs.
- Fit the dispersion from correlation in all BPMs with reconstructed energy (can be parasitic with other measurements).
- Fit the dispersion at the selected point using dispersion in selected BPMs.
- Compute correction (untested).



Optics modeling

Injection parameter and dispersion fit + correction

Experimental test

- Data taken in May and last week.
- parameters reconstruction seems good (steps in energy when Δ*f* ramp used are well reconstructed).
- Dispersion measurement reconstructed fits very well with dispersion measured in all goods BPMs.
- Dispersion measurement with beam fluctuation !
- Dispersion correction still untested.



Optics modeling

Injection parameter and dispersion fit + correction

Horizontal dispersion measurement ramp on

| | | | | | | _ × |
|--------------------|-------------------------|--------------------------|---|------------------|--|-----|
| Measurement option | ons | | | | output | |
| Freq. range : | | save filename : 2 | 20091210T235006 | | resizing plot resizing plot done | |
| SPM read per step | | 🖌 plot after mei | asurement | Measure | dPS(QF1X)=0.056+-0.007 dPS(QF6X)=0.030+-0.009 | |
| tot BPM read : | 200 | Wait to fill buffer | | | resizing plot done | - |
| oad/Display optic | ns | | Fitting and Correction | | Plots | |
| oad filename : | dispersion_10_dec_ram | Load | BPM reconstruction | BPM dispersion | Dispersion : X | |
| X range : | [0 89.3] | BPM reading range : | Fit point : | MQD10X | param (histo): X • | |
| Y range : | [-1.5.6] | [1:206] | Fit | Apply correction | Parameters evolution | |
| Dx=0.06 | 43 +-0.204 mm D×'=-68 | .8 +-0.483 mrad Dy=-1.75 | +-0.609 mm Dy'=-0.561 +-0 | 0.666 mrad | | |
| Dx=0.06 | | .8 +-0.483 mrad Dy=-1.75 | 0.14 +3.1 mill by -0.22. +-0.609 mm Dy'=-0.561 +-(| 0.666 mrad | | |
| 0.5 | | | | | | |
| Dx=0.06 | 43 + -0.204 mm Dx + -63 | 38 +-0.483 mind Dy1.75 | | | | |
| Dx=0.06 | 43 +- 0.204 mm Dx -= 68 | .8 +-0.483 mid Dyr-1.75 | | | | |

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Optics modeling

Injection parameter and dispersion fit + correction

Vertical dispersion measurement ramp off

| Aeasurement optio | ons | | | | output | |
|-------------------|-----------------------|--------------------------|-----------------------------|------------------|---|---------------------------------|
| Freq. range : | | save filename : | 20091210T235006 | | resizing plot | |
| 3PM read per step | | 🗹 plot after m | easurement | Measure | dPS(QF1X)=0.027+-0.004 dPS(QF6X)=-0.002+-0.005 | |
| tot BPM read : | 200 | Wait to fill buffer | | | resizing plot resizing plot | |
| oad/Display optic | ns | | Fitting and Correction | | Plots | |
| oad filename : | dispersion_10_dec_ram | Load | BPM reconstruction | BPM dispersion | Dispersion : X http://www.mail.com/ | |
| X range : | [0 89.3] | BPM reading range : | Fit point : | MQD10X | param (histo): X - | |
| Y range : | [-1.5.6] | [1:201] | Fit | Apply correction | Parameters evolution | |
| D×=-6 | .59 +-0.753 mm Dx'=-6 | 6.5 +–1.03 mrad Dy=–18.1 | . +-2.28 mm Dy'=17.4 +-2.58 | mrad | | |
| Dx=-6 | | 6.5 +-1.03 mrad Dy=-18.1 | +-2.28 mm Dy'=17.4 +-2.58 | | | surem |
| Dx=-6 | | 6.5 +-1.03 mrad Dy=-18.1 | +-2.28 mm Dy =17.4 +-2.58 | | | surem nstruc corre |
| Dx=-6 | | 6.5 +-1.03 mrad Dy=-18.1 | +-2.28 mm Dy=17.4 +-2.58 | | | surem nstruc corre ign |
| Dx==6 | | 5.5 +-1.03 mrad Dy=-18.1 | +-228 mm Dy-17.4 +-258 | | | surem nstruc corre ign |
| Dx==6 | | 6.5 +-1.03 mrad Dy18.1 | +-2.28 mm Dy-17.4 +-2.58 | | | surem nstruc corre |

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Optics modeling

Injection parameter and dispersion fit + correction

Horizontal dispersion measurement ramp on

| Measurement ontic | \n c | | dispersion_measureme | iit. | output | |
|--|---------------------------|-------------------------|--|------------------|--|---|
| Freq. range : | | save filename : | 20091210T235006 | | resizing plot done dRVOSIX)==0.045+=0.006 | |
| BPM read per step : | | 🖌 plot after me | easurement | Measure | dPS(QS2X)=0.047+-0.004 plotting | |
| tot BPM read : | 200 | Wait to fill buffer | | | dPS(QF1X)=0.056+-0.007 dPS(QF6X)=0.030+-0.009 | - |
| Load/Display optio | ns | | Fitting and Correction | | Plots | |
| load filename : | dispersion_10_dec_ram | Load | BPM reconstruction | BPM dispersion | Dispersion : Y | |
| X range : | [0 89.3] | BPM reading range : | Fit point : | MQD10X | param (histo): X - | |
| Y range : | [-0.1 0.1] | [1:206] | Fit | Apply correction | Parameters evolution | |
| DX=0.06 | 43 +-0.204 mm Dx'=-68. | 8 +-0.483 mrad Dy=-1.75 | +-0.609 mm Dy'=-0.561 +- | 0.666 mrad | | |
| Dx=0.06 | 43 +-0.204 mm Dx'=-68. | 8 +-0.483 mrad Dy=-1.75 | +-0.609 mm Dy'=-0.561 +-1 | | ┇ ┎┺┰┸╀╫┲┺┱┰───╄┰ | |
| 0.1 | 43 +-0.204 mm Dx'=-68. | 8 +-0.483 mrad Dy=-1.75 | +-0.609 mm Dy0.561 +-1 | | | |
| | 43 +-0.204 mm Dx'+-68. | 8 +=0.483 mrad Dy=-1.75 | +-0.609 mm Dy =-0.561 +-1 | | Resulting | |
| | 43 +-0.204 mm Dx +-68. | 8 +-0.483 mad Dy1.75 | | | | |
| 0.05 <u>E</u> 0 -0.05 -0.05 -0.05 | 43 +-0.204 mm Dx'+-68. | 8 +-0.483 mad Dy1.75 | | | | |
| 0.1 0.1 0.5 0.0 | 43 + -0.204 mm Dx - = 68. | 8 +-0.483 mad Dy1.75 | + -0.000 mm Dy -0.501 +-1 + -0.500 mm Dy -0.5 | | | |

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Optics modeling

Injection parameter and dispersion fit + correction

Vertical dispersion measurement ramp off

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|----------------------|-----------------------|---------------------|------------------------|--|---|--|
| Measurement opti | ons | | unspersion_measureme | internet in the second se | output | |
| Freq. range : | | save filename : | 20091210T235006 | | resizing plot done dPS(OS1X)==0.037+=0.009 | |
| BPM read per step | | 🗹 plot after m | easurement | Measure | dPS(QS2X)=0.036+-0.006 plotting | |
| tot BPM read : | 200 | Wait to fill buffer | | | done dPS(QF1X)=0.024+-0.004 dPS(OF6X)=-0.006+-0.005 | |
| Load/Display option | ons | | Fitting and Correction | | Plots | |
| load filename : | dispersion_10_dec_ram | Load | BPM reconstruction | BPM dispersion | Dispersion : Y | |
| X range : | [0 89.3] | BPM reading range : | Fit point : | MQD10X | param (histo): X | |
| Y range : | [1 0.1] | [1:201] | Fit | Apply correction | Parameters evolution | |
| | | | | | | |
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Optics modeling Injection parameter and dispersion fit + correction



- Powerful reconstruction of parameters and incoming dispersion.
- Allows monitoring their evolution.
- Correction need to be tested.
- Kubo-san's dispersion bump need to be implemented.



Optics modeling

Orbit steering





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Optics modeling

Orbit steering



- Measure average beam orbit with cuts.
- chose the BPM, correctors, mover involved in correction.
- Compute EXT or FF line correction to a reference orbit.
- Display the estimated orbit after correction.
- Display the corrector strengths or mover change involved.
- Apply the correction and compare with the predictions.
- Allows to make the bump and display comparison between prediction and real effect.
- Allows to cancel the corrections.



Optics modeling

Orbit steering



- Tested yesterday and worked well (where modeling is good).
- Sometime fails due to incorrect setting of the correctors (need to cancel cancel correction and apply again).



Optics modeling

Orbit steering

Before EXT X correction





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Optics modeling

Orbit steering

After EXT X correction





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Optics modeling

Orbit steering

After 5 EXT X correction





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Optics modeling

Orbit steering

After FF Y correction





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Conclusion and prospect

Conclusion and prospect





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Conclusion and prospect

Conclusion and prospect



Conclusion and prospect

Conclusion and prospect

Conclusion

- EXT striplines are still bad despite retuning.
- Transfer matrix check tool available.
- Dispersion measurement possible even without Δ*f* ramp + injection parameter bunch/bunch.
- Orbit steering works, some iterations needed.



Conclusion and prospect

Conclusion and prospect

Prospects

- Calibration data of striplines is being analysed.
- Global fit and/or determination of the most probable fudge factor to apply for model and measurements consistency is considered.
- Improvement on vertical parameters determination has to be done.
- Need to improve orbit steering to gain robustness.



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