BPM summary

Pengjia Zhu
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Uncertainty for each run please check sql database
backup
New BPM Receiver

\[
\sin \theta \sin \phi = \frac{1}{2} \cos (\theta - \phi) - \frac{1}{2} \cos (\theta + \phi)
\]

\[
|R| = \sqrt{I^2 + Q^2}
\]

\[
\phi = \tan^{-1} \left(\frac{Q}{I}\right)
\]

Harmonic sampling
Sample Rate: 36MSPS

Cascaded integrator-comb filter

Infinite impulse response filter

\(BW = 175\text{Hz}\)

\(\int a \frac{d}{dt} \)

Epics

DAQ

0~10V

DAC

We can not see fast raster signal

Last week
**BPM calibration**

1. raw signal received in antenna VS recorded ADC data (linear region):

\[ \phi = f(A_+ - A_0 + ) = a(A_+ - A_0 + b) \]

2. rewrited diff/sum value (temp value):

\[ x_b = \frac{(A_+ - A_0 + b_+)}{(A_+ - A_0 + b)} \cdot g_x(A_- - A_0 - b_-) + g_x(A_- - A_0 - b_-) \]

3. nonlinearity correction for diff/sum (temp value):

\[ x = r x_b \left( \frac{1}{x_b^2 + y_b^2} - \frac{1}{\sqrt{x_b^2 + y_b^2}} \frac{1}{\sqrt{x_b^2 + y_b^2}} - 1 \right) \]

4. Calibrate with harp data

\[ x_{harp} = c_0 + c_1 x + c_2 y \]

\[ y_{harp} = c_0' + c_1' y + c_2' x \]

Position from harp, already transferred to BPM local coordinate (use survey data)
Constants

\[ \phi = f(A_+ - A_0 + ) = a(A_+ - A_+ 0 + b) \]

b: got from linear fit for current VS recorded ADC data

- Some bpm calibrations did the calibration for several currents
- Each harp scan position (one point) corresponding to several runs with different current (100nA, 75nA, 50nA)
- Assumption: those runs with different current have same beam position
- Influence: key parameter to eliminate the current effect, let calculated position immune to fluctuating current (50~100nA), especially for the difference of \( b_+ - b_- \)
Calibration constant for optics runs near 3185 (div=2)
Difficulties: no straight through calibrations for div=2

The most closed result for div=2 calibration is 3/6 div=3
Calibration for 3/6-3/28 (autogain): without subtracting pedestal
3185 run position calculated by using 3/6 div=3 calibration const
-0.84mm(x) 2.39mm (y) at target

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<tr>
<th>Fitted $X_{beam}$</th>
<th>-3.5mm</th>
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Compared with the fitted result x from optics