

BNL-101680-2014-TECH RHIC/AP/24;BNL-101680-2013-IR

Power Supply Accuracy in RHIC

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December 1985

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U.S. Department of Energy

USDOE Office of Science (SC)

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RHIC-AP-24

POWER SUPPLY ACCURACY IN RHIC

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G. Parzen

December 18, 1985

Power Supply Accuracy in RHIC G. Parzen, 12/18/85 Criterion ISR CBA - no DU(t) DV ≤)×10-3 RHIC - SV(t) present due to Synchrotron Oscillations No crossing of 10th order allowed (SPS) to 180 833 VX 4 516 Box is 33 × 10-3 w- 1. d.e. As_ = 19mm ->) = 28,827 28,822 6 × 10-3 from 6th order Vesabance Beam-Beam interaction gives DV 2 20×10-3 V(A) ~ 19×10-3 V(A) depends on SPIP + additional SV=6×103 Box is fairly full Criterion QV ≤ 1×10-3 Seems reasonable.

Najor Surces of SVervors QFGD tuning Q14243 bypass Q 2 Q3 tuning Chromaticity Control B2H, B2V Q7, Q6 tuning Accuracy Definition B-swing of 15 x=7 -> x=100 $Current \ accuracy = \frac{\Delta T}{T}$ Power Supply Accuracy = SI Imax Curvent Accuracy = 15 × Power Supply Accuracy

Quads in Series with Dipoles OF By pass, QD By pass

3

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| $\begin{array}{c c c c c c c c c c c c c c c c c c c $ | • • | | 7. | amps | cm" | AV2 | 1 DVy | Supply | |
| BIA QF 10 450 .013 .59 .10 1.2 17 BIV QQ 10 450 .013 .10 .59 1.2 18 Q123 Q1Q103 60 1750 .100 .57 .57 1.0 .12 18 Q133 Q1Q103 60 1750 .100 .57 .57 1.0 .15 Q71 10 400 .020 .07 .57 .57 1.0 .15 Q51 7 200 .012 .20 .07 57 .57 Q10 7 200 .012 .22 .23 57 .57 Q10 7 200 .012 .23 .22 .23 57 Q10 7 200 .012 .23 .25 .75 .57 Q20 7 200 .012 .23 .25 .75 .75 Q10 7 200 .012 .23 .25 .75 .75 Q20 .11< | | | | | Checken State State State State State State | | | Aceuvary | Accuracy |
| BIV QP 10 450 013 10 .59 1.2 13 Q123 Q16063 60 1750 .100 .57 .57 1.00 .15 Q123 Q16063 60 1750 .100 .57 .57 1.00 .15 Q7I 10 400 .620 .05 .26 10 .150 Q85 .71 200 .020 .07 .26 .10 .150 Q35 .71 200 .012 .23 .57 .75 Q14 .7 200 .012 .23 .57 .75 Q15 .7 .012 .23 .22 .75 .75 Q20 .012 .23 .15 .75 .75 Q20 .012 .23 .12 .75 .75 Q20 .012 .23 .12 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 .15 </td <td></td> <td></td> <td></td> <td> </td> <td></td> <td>[<i>l</i>.</td> <td>-3</td> <td>10-5</td> <td>10-5</td> | | | | | | [<i>l</i> . | -3 | 10-5 | 10-5 |
| B ± V QQ 10 450 ,013 .10 .59 1,2 18 Q 123 Q 16069 60 1750 .100 ,57 .57 1.00 15 Q 7I 10 400 .020 .05 .26 10 150 Q 85 10 400 .020 .05 .26 10 150 Q 85 7 200 .012 .20 .07 57 .75 Q 12 .20 .012 .23 57 .75 Q 15 7 200 .012 .23 57 .75 Q 16 7 200 .012 .23 .15 5 .75 Q 20 7 200 .012 .25 .15 5 .75 Q 20 .012 .25 .11 .17 10 .50 Q 20 .012 .25 .15 5 .75 .15 .15 Q 20 .021 .021 .021 .025 .10 .150 .150 | B1 H | QF | 10 | 450 | . 013 | .59 | 10 | 12 | 1-18 |
| $ \begin{array}{c c c c c c c c c c c c c c c c c c c $ | | | 18 | | | .10 | .59 | 11,2 | |
| $ \begin{array}{c c c c c c c c c c c c c c c c c c c $ | 1132 | 6.10202 | 60 | 1 | | | | 1 | 16 |
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| Q F 7 200 $0 2$ 22 23 5 75 Q 0 7 200 $0 2$ 23 5 75 Q 20 7 200 $0 2$ 23 15 5 75 Q 20 7 200 $0 2$ 235 15 5 75 Q 20 7 200 $0 2$ 235 15 5 75 Q 20 7 200 $0 2$ 235 15 5 75 Q 30 70 10 400 020 212 020 11 17 10 150 Q 70 10 400 020 226 10 150 150 Q 87 5 200 020 200 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 12 12 10 10 10 10 | Qbr | | | | . 020 | | | | |
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| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | Q d do | | | 200 | ,012 | .15 | .35 | 15 | -25 |
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Ripple Question Quad Ripple -> DVQ Dipole Ripple - D DD BVQ+ BVD=0 if Chromoticity=0 and ripples are equal. If ripples uncorvelated, and natural chromaticty ~ 60 △V = 2 × 60 × Ripple ≤ . 2 × 10-3 Ripple = 2 × 10-

(4)