

| Production run list, problems, and accesses |  |            |          |          |                                                                                                                                                    |                      |        |         |                  |                                |                   |                                 |
|---------------------------------------------|--|------------|----------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------|---------|------------------|--------------------------------|-------------------|---------------------------------|
| Date                                        |  | HAPPEX run | RHRS run | LHRS run | Comments on HAPPEX run                                                                                                                             | Other major progress | Halog# | Current | Left arm # pairs | Left arm # pairs scaled by I*d | Right arm # pairs | Right arm # pairs scaled by I*d |
|                                             |  |            |          |          |                                                                                                                                                    |                      |        |         |                  |                                |                   |                                 |
| 11/04/09                                    |  |            |          |          | Moller measurement                                                                                                                                 | Moller               | 294359 |         |                  |                                |                   |                                 |
| 11/06/09                                    |  |            |          |          | Moller measurement                                                                                                                                 | Moller               | 297889 |         |                  |                                |                   |                                 |
| 11/07/09                                    |  |            |          |          | 11pm, various long delay cables added to left arm to make timing works, left arm threshold adjusted. Threshold left: 65, 25, 20; right: 90, 20, 20 |                      | 298188 |         |                  |                                |                   |                                 |
| 11/08/09                                    |  | 13814      | 4866-7   | NA       | right arm only, with right arm helicity problem (transition time not eclused from integration)                                                     |                      |        | 80      | 0                | 0                              | 36043             | 27138.26                        |
|                                             |  | 13815      | 4868     | NA       |                                                                                                                                                    |                      |        | 80      | 0                | 0                              | 27262             | 20526.68                        |
|                                             |  | 13816      | 4869     | NA       |                                                                                                                                                    |                      |        | 80      | 0                | 0                              | 38935             | 29315.76                        |
|                                             |  | 13817      | 4869     | NA       |                                                                                                                                                    |                      |        | 80      | 0                | 0                              | 12109             | 9117.36                         |
|                                             |  |            |          |          | fixed right arm helicity and possibly pion veto                                                                                                    |                      |        |         |                  |                                |                   |                                 |
|                                             |  | 13826      | 4872     | NA       | right arm only. Right gr5-8 no trigger                                                                                                             |                      |        | 100     | 0                | 0                              | 25256             | 23770.35                        |
|                                             |  | 13827      | 4873     | NA       |                                                                                                                                                    |                      |        | 100     | 0                | 0                              | 32640             | 30720                           |
|                                             |  |            |          |          | fixed right arm gr5-8                                                                                                                              |                      |        |         |                  |                                |                   |                                 |
| 11/09/09                                    |  | 13844      | 4884     | 25345    | right arm only                                                                                                                                     |                      |        | 100     | 0                | 0                              | 33535             | 31562.35                        |
|                                             |  | 13845      | 4885     | 25346    | right arm only                                                                                                                                     |                      |        | 100     | 0                | 0                              | 17601             | 16565.65                        |
|                                             |  | 13846      | 4886     | 25347    | junk                                                                                                                                               |                      |        |         |                  |                                |                   |                                 |
|                                             |  | 13847      | 4887     | 25348    | right arm only                                                                                                                                     |                      |        | 100     | 0                | 0                              | 22020             | 20724.71                        |
|                                             |  | 13848      | same     | same     | right arm only                                                                                                                                     |                      |        | 100     | 0                | 0                              | 11701             | 11012.71                        |
|                                             |  | 13849      | 4888     | 25349    | right arm only                                                                                                                                     |                      |        | 100     | 0                | 0                              | 28983             | 27278.12                        |
|                                             |  | 13850      | 4889     | 25350    | right arm only                                                                                                                                     |                      |        | 100     | 0                | 0                              | 42296             | 39808                           |
|                                             |  | 13851      | NA       | NA       | right arm only                                                                                                                                     |                      |        | 100     | 0                | 0                              | 4430              | 4169.41                         |
| 11/09/09                                    |  |            |          |          | a few 16ns delay cables added to left arm                                                                                                          |                      | 298604 |         |                  |                                |                   |                                 |

## Major

|          |  |       |      |       |                                                                                                                                         |                                  |                   |     |       |          |       |          |
|----------|--|-------|------|-------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-------------------|-----|-------|----------|-------|----------|
|          |  |       |      |       | found right arm pion veto not working<br>(as if GC cut is not there)                                                                    |                                  | 298612            |     |       |          |       |          |
|          |  |       |      |       | d3 is missing in fbTDC                                                                                                                  |                                  | 298611            |     |       |          |       |          |
| 11/09/09 |  |       |      |       | right arm GC threshold doubled from<br>30 to 60. Later found this was not<br>effective.                                                 |                                  | 298609            |     |       |          |       |          |
|          |  |       |      |       | Access fix various things                                                                                                               |                                  | ??????            |     |       |          |       |          |
|          |  |       |      |       | first time right arm pion veto working                                                                                                  |                                  |                   |     |       |          |       |          |
| 11/10/09 |  | 13860 |      |       | right arm only                                                                                                                          |                                  |                   | 90  | 0     | 0        | 14203 | 12030.78 |
| 11/10/09 |  | 13861 |      |       | right arm only                                                                                                                          |                                  |                   | 90  | 0     | 0        | 11266 | 9542.96  |
| 11/10/09 |  | 13862 |      |       | right arm only                                                                                                                          |                                  |                   | 90  | 0     | 0        | 30161 | 25548.14 |
| 11/10/09 |  | 13863 |      |       | right arm only                                                                                                                          |                                  |                   | 90  | 0     | 0        | 45019 | 38133.74 |
| 11/10/09 |  | 13864 |      |       | right arm only                                                                                                                          |                                  |                   | 90  | 0     | 0        | 35569 | 30129.04 |
| 11/10/09 |  | 13865 |      |       | right arm only                                                                                                                          |                                  |                   | 90  | 0     | 0        | 9774  | 8279.15  |
| 11/10/09 |  | 13866 |      |       | right arm only                                                                                                                          |                                  |                   | 90  | 0     | 0        | 30084 | 25482.92 |
| 11/10/09 |  | 13867 |      |       | right arm only, junk?                                                                                                                   |                                  |                   | 90  | 0     | 0        | 0     | 0        |
|          |  |       |      |       | Right arm VETO width checked and<br>adjusted during an access (extra delay<br>also added mistakenly to T1 in VETO)                      |                                  | 298815            |     |       |          |       |          |
| 11/10/09 |  | 13868 | 4917 | 25366 | First time both arms. Right arm has<br>veto EN veto problem due to an extra<br>delay added to T1 earlier this day, EN<br>low efficiency |                                  | 298829            | 100 | 8920  | 8395.29  | 8920  | 8395.29  |
|          |  |       |      |       | Right arm EN veto timing fixed                                                                                                          |                                  | 298839,2<br>98857 |     |       |          |       |          |
| 11/10/09 |  | 13870 | 4925 | 25373 | Right arm offset drifted, low efficiency<br>in all groups, both narrow and wide                                                         |                                  | 298885,2<br>98886 | 100 | 13589 | 12789.65 | 13589 | 7673.79  |
| 11/10/09 |  | 13871 | 4926 | 25374 | Right arm low efficiency                                                                                                                |                                  |                   | 100 | 37963 | 35729.88 | 37963 | 21437.93 |
| 11/10/09 |  |       |      |       | beam vertical polarization nulled                                                                                                       | beam<br>vertical<br>polarization | POLOG<br>1497734  |     |       |          |       |          |
| 11/11/09 |  | 13873 | 4928 | 25376 | Right arm low efficiency                                                                                                                |                                  |                   | 100 | 39334 | 37020.24 | 39334 | 22212.14 |
| 11/11/09 |  | 13874 | 4929 | 25377 | Right arm low efficiency                                                                                                                |                                  |                   | 100 | 34401 | 32377.41 | 34401 | 19426.45 |

## Major

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|----------|--|--------------------------------------|------|-------|-------------------------------------------------------|--------|------------------------------|-----|-------|----------|-------|----------|
| 11/11/09 |  | 13875                                | 4930 | 25378 | Right arm low efficiency                              |        |                              | 100 | 40479 | 38097.88 | 40479 | 22858.73 |
| 11/11/09 |  | 13876                                | 4933 | 25380 | Right arm low efficiency                              |        |                              | 100 | 41325 | 38894.12 | 41325 | 23336.47 |
| 11/11/09 |  | 13877                                | 4934 | 25381 | Right arm low efficiency                              |        |                              | 100 | 47436 | 44645.65 | 47436 | 26787.39 |
| 11/11/09 |  | 13878                                | 4935 | 25382 | Right arm low efficiency                              |        |                              | 100 | 19158 | 18031.06 | 19158 | 10818.64 |
| 11/11/09 |  | 13879                                | 4936 | 25383 | Right arm low efficiency                              |        |                              | 100 | 32161 | 30269.18 | 32161 | 18161.51 |
| 11/11/09 |  | 13880                                | 4937 | 25384 | Right arm low efficiency                              |        |                              | 100 | 39312 | 36999.53 | 39312 | 22199.72 |
|          |  |                                      |      |       |                                                       |        |                              |     |       |          |       |          |
|          |  | right arm 740<br>replaced by<br>428F |      |       | Offset drift should stop now                          |        | 299029                       |     |       |          |       |          |
|          |  |                                      |      |       | Attenuator added to GC sum                            |        | 299020                       |     |       |          |       |          |
| 11/11/09 |  | 13883                                | 4942 | 25393 | Right arm gr6 TS missing                              |        | 299055                       | 100 | 19574 | 18422.59 | 19574 | 18422.59 |
| 11/11/09 |  | 13884                                | 4943 | 25394 | Right arm gr6 TS missing                              |        |                              | 100 | 30072 | 28303.06 | 30072 | 28303.06 |
| 11/12/09 |  | Rgr6TS fixed                         |      |       |                                                       |        | 299072                       |     |       |          |       |          |
| 11/12/09 |  | 13885                                | 4945 | 25395 |                                                       |        |                              | 100 | 39277 | 36966.59 | 39277 | 36966.59 |
| 11/12/09 |  | 13886                                | 4946 | 25396 |                                                       |        |                              | 100 | 37994 | 35759.06 | 37994 | 35759.06 |
| 11/12/09 |  | 13887                                | 4947 | 25397 |                                                       |        |                              | 100 | 33126 | 31177.41 | 33126 | 31177.41 |
| 11/12/09 |  | 13888                                | 4950 | 25398 | mostly no beam                                        |        |                              |     |       |          |       |          |
| 11/12/09 |  | 13889                                | 4951 | 25399 |                                                       |        |                              | 100 | 39734 | 37396.71 | 39734 | 37396.71 |
| 11/12/09 |  | 13890                                | 4952 | 25400 |                                                       |        |                              | 100 | 33806 | 31817.41 | 33806 | 31817.41 |
| 11/12/09 |  | 13891                                | 4953 | 25401 |                                                       |        |                              | 100 | 32283 | 30384    | 32283 | 30384    |
| 11/12/09 |  | 13892                                | 4955 | 25403 | 2uA, 2 minute run.                                    |        |                              |     |       |          |       |          |
| 11/12/09 |  | 13893                                | 4956 | 25404 | ??? short                                             |        |                              |     |       |          |       |          |
| 11/12/09 |  | 13894                                |      | 25405 | short                                                 |        |                              |     |       |          |       |          |
|          |  |                                      |      |       | Moller measurement                                    | Moller | 299208                       |     |       |          |       |          |
|          |  | Cerenkov<br>threshold<br>change      |      |       | A series of GC threshold study done<br>and understood |        | 299209,2<br>99225,29<br>9320 |     |       |          |       |          |
| 11/12/09 |  |                                      |      |       | slug 2 started here                                   |        | 299321,<br>299339            |     |       |          |       |          |

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|----------|--|-------|--|-----------------------------------------------------------------------------------------------------------------|--------|-----------------------------|--|--|--|--|--|
| 11/12/09 |  |       |  | Right arm GC threshold set to 150, this affects PVDIS run starting 13902 (left arm was 150 from the beginning). |        | 299357                      |  |  |  |  |  |
| 11/14/09 |  | 13940 |  | noticed HRS synch problem but PVDIS synchs are still good, during run 13940                                     |        | 299716,299723               |  |  |  |  |  |
|          |  |       |  | CH synch fixed 2 hours later                                                                                    |        | 299736                      |  |  |  |  |  |
| 11/14/09 |  | 13948 |  | slug 3 started here                                                                                             |        | 299784                      |  |  |  |  |  |
| 11/14/09 |  |       |  | quick tagger check between runs, left tagger missing                                                            |        | 299888                      |  |  |  |  |  |
| 11/14/09 |  |       |  | Pockel cell setting problem?                                                                                    |        | 299935                      |  |  |  |  |  |
| 11/15/09 |  |       |  | RHRS HV slot13 problem. Run 13981 is the first good run after HV card is replaced                               |        | 300085,300114,300131        |  |  |  |  |  |
| 11/15/09 |  |       |  | slug 4 started here                                                                                             |        |                             |  |  |  |  |  |
| 11/16/09 |  |       |  | Qsq vs. current scan                                                                                            |        | 300286,300294               |  |  |  |  |  |
| 11/16/09 |  |       |  | access work: increased Left HRS ADC gate from 300 to 400ns; fixed BCM d3; fixed one pileup                      |        | 300367,300526               |  |  |  |  |  |
| 11/17/09 |  |       |  | Moller measurement                                                                                              | Moller | 300591                      |  |  |  |  |  |
| 11/17/09 |  |       |  | multiple left Q1 trip during late evening-owl of next day                                                       |        |                             |  |  |  |  |  |
| 11/18/09 |  |       |  | Access: Right HRS T2 fixed (missing since 11/16)                                                                |        | 300760,300778               |  |  |  |  |  |
| 11/18/09 |  |       |  | slug 5 started here                                                                                             |        | 300772                      |  |  |  |  |  |
| 11/18/09 |  |       |  | Left Q1 polarity readback problem noticed (readback only)                                                       |        | 300841,300840               |  |  |  |  |  |
| 11/19/09 |  |       |  | Found right arm gr4w missing since beginning of slug 5, slug4 was all fine                                      |        | 300965                      |  |  |  |  |  |
| 11/19/09 |  |       |  | 2 accesses to fix right gr4w, no halog for the 2 <sup>nd</sup> access but various halog to show working results |        | 300990,301026,301036,301044 |  |  |  |  |  |
| 11/19/09 |  |       |  |                                                                                                                 |        |                             |  |  |  |  |  |
| 11/19/09 |  |       |  | slug 6 started here                                                                                             |        | 311152                      |  |  |  |  |  |

## Major

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|----------|--|-----------------------------------------|---------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|
| 11/20/09 |  | 14074-14080                             |               |                 | 1 <sup>st</sup> Al dummy runs, 5 hours                                                                                                                           |           | 301247                                                                                                                  |  |  |  |  |  |
| 11/20/09 |  | 14087, 14088,<br>14089, 14091,<br>14092 | 5186-<br>5190 | 25631-<br>25635 | 1 <sup>st</sup> deadtime study                                                                                                                                   |           | 301359,a<br>Iso<br>301376<br>301621,<br>301643,<br>301660,<br>301661,<br>results<br>see<br>301710-<br>301712,<br>301807 |  |  |  |  |  |
| 11/21/09 |  |                                         |               |                 | During opportunistic beam down time,<br>long access to 1) replace right arm<br>pion scaler (first time gr1-3 PIN are<br>fixed) 2) fine tune left arm pion timing |           |                                                                                                                         |  |  |  |  |  |
| 11/22/09 |  |                                         |               |                 | slug 7 started here                                                                                                                                              |           | 301760                                                                                                                  |  |  |  |  |  |
| 11/22/09 |  |                                         |               |                 | noticed small timing mismatch in left<br>gr5 EN                                                                                                                  |           | 301824,3<br>01850                                                                                                       |  |  |  |  |  |
| 11/22/09 |  | 14152-14156                             |               |                 | 2 <sup>nd</sup> Al dummy runs, 4hours                                                                                                                            |           | 301882,3<br>01937                                                                                                       |  |  |  |  |  |
| 11/23/09 |  | 14175                                   |               |                 | 1 <sup>st</sup> bcm calibration                                                                                                                                  | BCM       | 302148                                                                                                                  |  |  |  |  |  |
| 11/23/09 |  |                                         |               |                 | during polarity change, changed GC<br>width in VETO from 55-55ns to 40ns                                                                                         |           | 302098                                                                                                                  |  |  |  |  |  |
|          |  |                                         |               |                 | left gr5 cable adjusted                                                                                                                                          |           | 302111                                                                                                                  |  |  |  |  |  |
| 11/23/09 |  |                                         |               |                 | positron runs, all had GC in VETO width<br>set to 40ns (not 50 or 55ns), on both<br>arms                                                                         |           |                                                                                                                         |  |  |  |  |  |
|          |  | 14175                                   | 5262          | 25711           | BCM calibration                                                                                                                                                  |           | 302083                                                                                                                  |  |  |  |  |  |
|          |  | 14176                                   |               |                 | boiling test in the shift summary but<br>it's not!!                                                                                                              |           | 302100                                                                                                                  |  |  |  |  |  |
| 11/23/09 |  |                                         |               |                 | 2 <sup>nd</sup> deadtime study done on 11/23                                                                                                                     |           | 302226                                                                                                                  |  |  |  |  |  |
| 11/24/09 |  |                                         |               |                 | spot move (1 <sup>st</sup> ) 2pm                                                                                                                                 | spot move | elog<br>1499858                                                                                                         |  |  |  |  |  |
| 11/24/09 |  |                                         |               |                 | Moller measurement                                                                                                                                               | Moller    | 302364                                                                                                                  |  |  |  |  |  |

## Major

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| 11/25/09 |  |             |      |       | After switching polarity back to negative on 11/24, found left pion VETO not working (GC width too narrow). During an access at 4am, restored both arm GC to 50-55ns.                                         | 302402                                  |     |  |  |  |  |
| 11/25/09 |  |             |      |       | Before restoring GC width, run 14201 and 14202 had tagger on, GC 40ns, for the 3 <sup>rd</sup> deadtime study.                                                                                                | 302411                                  |     |  |  |  |  |
| 11/25/09 |  |             |      |       | Restored GC width                                                                                                                                                                                             | 302418,<br>302420,<br>302428,<br>302444 |     |  |  |  |  |
| 11/25/09 |  |             |      |       | slug 8 started here                                                                                                                                                                                           | 302438                                  |     |  |  |  |  |
| 11/25/09 |  | 14218-14222 |      |       | 3 <sup>rd</sup> AI dummy runs, 4 hours                                                                                                                                                                        | 302639                                  |     |  |  |  |  |
| 11/26/09 |  |             |      |       | changed T1 input width to VETO circuit from 100ns to 30ns by using an extra 706, without introducing extra delays. This happened between run 14236 and 14237; Also adjusted right arm FADC signal arrangement | 302802,3<br>02830                       |     |  |  |  |  |
|          |  | 14237       | 5343 | 25785 | 20min run to check deadtime                                                                                                                                                                                   |                                         | 50  |  |  |  |  |
|          |  | 14238       | 5344 | 25786 | 20min run to check deadtime                                                                                                                                                                                   | 302843                                  | 100 |  |  |  |  |
|          |  | 14239       |      |       | it's a good production run but tagger was on (100Hz)                                                                                                                                                          |                                         | 100 |  |  |  |  |
| 11/26/09 |  |             |      |       | slug 9 started here                                                                                                                                                                                           | 302888                                  |     |  |  |  |  |
|          |  |             |      |       | <b>left arm PID drop in gr 2 and 6 between now and 11/30</b>                                                                                                                                                  |                                         |     |  |  |  |  |
| 11/27/09 |  |             |      |       | slug 10 started here                                                                                                                                                                                          | 303159,<br>303173                       |     |  |  |  |  |
| 11/28/09 |  | 14292       | 5395 | 25838 | deadtime study, tagger 1kHz, FADC mistakenly on                                                                                                                                                               | 303269                                  | 110 |  |  |  |  |
|          |  | 14293       | 5396 | 25839 | deadtime study, tagger 1kHz                                                                                                                                                                                   |                                         | 110 |  |  |  |  |
|          |  | 14294       | 5397 | 25840 | deadtime study, tagger 10kHz                                                                                                                                                                                  | 303283                                  | 110 |  |  |  |  |
|          |  |             |      |       | productions runs in between                                                                                                                                                                                   |                                         |     |  |  |  |  |
|          |  | 14297       | 5399 | 25842 | deadtime study, tagger 10kHz                                                                                                                                                                                  |                                         | 80  |  |  |  |  |

## Major

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|----------|--|-------------|------|-------|----------------------------------------------------------------------------------|-----------------|----------------|--------|-------|--|-------|--|
|          |  | 14298       | 5400 | 25843 | deadtime study, tagger 10kHz                                                     |                 |                | 60     |       |  |       |  |
|          |  | 14299       | 5401 | 25844 | deadtime study, tagger 10kHz                                                     |                 |                | 40     |       |  |       |  |
|          |  | 14300       | 5402 | 25845 | deadtime study, tagger 10kHz                                                     |                 |                | 20     |       |  |       |  |
|          |  | 14301       | 5403 | 25846 | deadtime study, tagger OFF, rate scan                                            |                 |                | 20-110 |       |  |       |  |
| 11/29/09 |  | 14308       |      |       | right Q1 tripped and did not recover during this run                             |                 |                |        |       |  |       |  |
|          |  | 14309-14336 |      |       | left arm only                                                                    |                 |                |        |       |  |       |  |
|          |  | 14326       |      |       | slug 11 started here                                                             |                 | 303595         |        |       |  |       |  |
|          |  | 14332-14334 |      |       | 4th AI dummy, 3 hours                                                            |                 | 303662         |        |       |  |       |  |
| 11/30/09 |  | 14335-14336 |      |       | production LD2, left arm only                                                    |                 |                |        |       |  |       |  |
| 11/30/09 |  | 14342       | 5435 | 25883 | deadtime study, tagger 10kHz, cosmics                                            |                 | 303731         | 0      |       |  |       |  |
|          |  |             |      |       | Moller measurement                                                               | Moller          | 303792         |        |       |  |       |  |
| 12/01/09 |  | 14357       | 5445 | 25900 | this was the last run before transverse running                                  |                 | 303904         |        |       |  |       |  |
| 12/01/09 |  |             |      |       | whole day was to set up the vertical polarization and to fix the beamline vacuum |                 |                |        |       |  |       |  |
| 12/01/09 |  |             |      |       | slug 12 (transverse run) started here                                            |                 | 303966-303968  |        |       |  |       |  |
| 12/02/09 |  | 14364       | 5453 | 25916 | transverse run both arms                                                         | transverse runs |                |        | 32638 |  | 32638 |  |
|          |  | 14365       | 5454 | 25917 | transverse run both arms                                                         |                 |                |        | 40968 |  | 40968 |  |
|          |  | 14366       | 5455 | 25918 | transverse run both arms                                                         |                 |                |        | 23147 |  | 23147 |  |
|          |  | 14367       | 5456 | 25919 | transverse run both arms                                                         |                 |                |        | 35652 |  | 35652 |  |
|          |  | 14368       | 5457 | 25920 | DAQ crash, no event                                                              |                 |                |        |       |  |       |  |
|          |  | 14369       | 5458 | 25921 | transverse run both arms                                                         |                 |                |        | 19035 |  | 19035 |  |
|          |  | 14370       | 5459 | 25922 | transverse run both arms                                                         |                 | 304081         |        | 35916 |  | 35916 |  |
|          |  |             |      |       |                                                                                  |                 |                |        |       |  |       |  |
|          |  | 14371       | 5460 | 25923 | slug 13 (transverse run) started here                                            |                 | 304088, 304089 |        | 35001 |  | 35001 |  |
|          |  | 14372       | 5461 | 25924 | transverse run both arms                                                         |                 |                |        | 11992 |  | 11992 |  |
|          |  | 14373       | 5462 | 25925 | transverse run both arms                                                         |                 |                |        | 43242 |  | 43242 |  |

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|----------|--|----------|-----------|-------------|--------------------------------------------------------------------------------------|---------|----------------|-----|-------|--|-------|--|
|          |  | 14374    | 5463      | 25926       | transverse run both arms                                                             |         |                |     | 25590 |  | 25590 |  |
|          |  |          |           |             | 200ns delay added to left arm GC input of VETO circuit for random coin measurement   |         | 304130, 304173 |     |       |  |       |  |
|          |  | 14375    | 5464      | 25927       | left arm random coincidence, right arm transverse running                            |         |                | low | 0     |  |       |  |
|          |  | 14376    | 5465-5468 | 25928-25932 | left arm random coincidence, right arm transverse running                            |         |                | 90  | 0     |  | 35086 |  |
|          |  | 14377    |           |             |                                                                                      |         |                |     | 0     |  |       |  |
| 12/02/09 |  |          |           |             | 200ns delay removed from GC                                                          |         |                |     |       |  |       |  |
|          |  |          |           |             | Mini-spin dance                                                                      | Moller  | 304208         |     |       |  |       |  |
|          |  |          |           |             | Left arm moved to 14 deg, 3.66 GeV/c                                                 |         | 304175,304196  |     |       |  |       |  |
|          |  | 14378    |           |             | slug 14 started here                                                                 |         | 304185         |     |       |  |       |  |
|          |  |          |           |             | left arm 14 deg, 3.66 GeV/c, right arm kine#2 as usual                               |         |                |     |       |  |       |  |
|          |  | 14384    |           |             | slug 15 started here                                                                 |         | 304302         |     |       |  |       |  |
|          |  |          |           |             | left arm 14 deg, 3.66 GeV/c, right arm kine#2 as usual                               |         |                |     |       |  |       |  |
| 12/03/09 |  |          |           |             | left arm moved to 15 deg, 3.66 GeV/c, RES #7                                         |         | 304350         |     |       |  |       |  |
|          |  | 14389    |           |             | slug 16 started here, no IHWP flip                                                   |         | 304353         |     |       |  |       |  |
|          |  |          |           |             | left arm RES #7, right arm DIS #2                                                    |         |                |     |       |  |       |  |
|          |  |          |           |             | Compton photon FADC starts working                                                   | Compton |                |     |       |  |       |  |
|          |  | 14400    |           |             | slug 17 started here                                                                 |         | 304488         |     |       |  |       |  |
|          |  |          |           |             | left arm RES #7, right arm DIS #2                                                    |         |                |     |       |  |       |  |
| 12/04/09 |  | to 14411 |           |             | left arm RES #7, right arm DIS #2                                                    |         |                |     |       |  |       |  |
|          |  |          |           |             | left arm moved to 20 deg, 2.63 GeV/c                                                 |         | 304605,304609  |     |       |  |       |  |
|          |  |          |           |             | left arm threshold changed, some blocks lead glass signal checked but no change made |         | 304620         |     |       |  |       |  |
|          |  |          |           |             | slug 18 started here                                                                 |         | 304618         |     |       |  |       |  |

## Major

|          |  |       |      |       |                                                                                                                                                                                   |  |                                                    |        |  |  |  |  |
|----------|--|-------|------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------------------------------------------|--------|--|--|--|--|
|          |  |       |      |       | PID checked with run 25980, bad efficiency almost everywhere. TS threshold too high for all groups. Other problems also exist, see next two accesses                              |  |                                                    |        |  |  |  |  |
|          |  |       |      |       | 7pm left arm TS threshold changed again, removed gr5 TS 12ns delay cable, added cables to 2 blocks in gr5 and gr6                                                                 |  | 304678,3<br>04679,<br>304850                       |        |  |  |  |  |
|          |  |       |      |       | both arms at DIS kine#2                                                                                                                                                           |  |                                                    |        |  |  |  |  |
|          |  |       |      |       | PID checked with run 25986. Gr2 and gr5 low efficiency seems to due to PS threshold and timing (gr5 only). Gr6 low efficiency seems to due to missing PRL2[31] in gr6 TS trigger. |  | 304721,3<br>04729,30<br>4840,304<br>843,3049<br>05 |        |  |  |  |  |
| 12/05/09 |  |       |      |       | both arms at DIS kine#2                                                                                                                                                           |  |                                                    |        |  |  |  |  |
|          |  |       |      |       | 4pm access to adjust left PS threshold and check offsets. This seem to have fixed the left arm problem                                                                            |  | 304898,<br>304905,<br>304908                       |        |  |  |  |  |
| 12/06/09 |  | 14443 |      |       | slug 19 started here                                                                                                                                                              |  | 304978                                             |        |  |  |  |  |
|          |  |       |      |       | both arms at DIS kine#2                                                                                                                                                           |  |                                                    |        |  |  |  |  |
| 12/07/09 |  | 14475 |      |       | slug 20 started here                                                                                                                                                              |  | 305260,3<br>05265                                  |        |  |  |  |  |
|          |  |       |      |       |                                                                                                                                                                                   |  |                                                    |        |  |  |  |  |
| 12/07/09 |  | 14488 |      |       | tagger ON from 14488 to 14495                                                                                                                                                     |  |                                                    |        |  |  |  |  |
| 12/07/09 |  | 14490 | 5583 | 26059 | deadtime study, tagger 10kHz                                                                                                                                                      |  |                                                    | 110    |  |  |  |  |
|          |  | 14491 | 5584 | 26060 | deadtime study, tagger 10kHz                                                                                                                                                      |  |                                                    | 80     |  |  |  |  |
|          |  | 14492 | 5585 | 26061 | deadtime study, tagger 10kHz                                                                                                                                                      |  |                                                    | 60     |  |  |  |  |
|          |  | 14493 | 5586 | 26062 | deadtime study, tagger 10kHz                                                                                                                                                      |  |                                                    | 40     |  |  |  |  |
|          |  | 14494 | 5587 | 26063 | deadtime study, tagger 10kHz                                                                                                                                                      |  |                                                    | 20     |  |  |  |  |
|          |  | 14495 | 5588 | 26064 | deadtime study, tagger OFF, rate scan                                                                                                                                             |  | 305435                                             | 20-110 |  |  |  |  |
|          |  |       |      |       |                                                                                                                                                                                   |  |                                                    |        |  |  |  |  |
|          |  |       |      |       |                                                                                                                                                                                   |  |                                                    |        |  |  |  |  |

## Major

|          |  |                    |      |       |                                                                                                                           |                            |                       |  |  |  |  |  |  |
|----------|--|--------------------|------|-------|---------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------------|--|--|--|--|--|--|
| 12/08/09 |  |                    |      |       | Compton electron detector tune                                                                                            |                            |                       |  |  |  |  |  |  |
|          |  |                    |      |       | Moller failed                                                                                                             | Moller                     |                       |  |  |  |  |  |  |
| 12/09/09 |  |                    |      |       | slug 21 started here                                                                                                      |                            |                       |  |  |  |  |  |  |
| 12/09/09 |  |                    |      |       | spot move (2 <sup>nd</sup> )                                                                                              |                            |                       |  |  |  |  |  |  |
|          |  |                    |      |       | Mott measurement for vertical polarization, consistent with zero                                                          | beam vertical polarization | 305822, POLOG 1502095 |  |  |  |  |  |  |
| 12/09/09 |  |                    | 5619 | 26102 | right arm Q3 off                                                                                                          | Q3 test                    |                       |  |  |  |  |  |  |
|          |  | 14530              | 5620 | 26103 | right arm Q3 off                                                                                                          | only 1000 pairs            |                       |  |  |  |  |  |  |
|          |  | 14531              | 5621 | 26104 | right arm Q3 off                                                                                                          | junk                       |                       |  |  |  |  |  |  |
|          |  | 14539              | 5625 | 26111 | right arm Q3 off, some Q2 runs before 14530 and also before 14539                                                         |                            |                       |  |  |  |  |  |  |
|          |  |                    |      |       | starting 14540 are regular slug 21 production runs                                                                        |                            |                       |  |  |  |  |  |  |
| 12/10/09 |  |                    |      |       | Moller measurement                                                                                                        | Moller                     |                       |  |  |  |  |  |  |
|          |  |                    |      |       | optics data                                                                                                               | optics                     |                       |  |  |  |  |  |  |
|          |  |                    |      |       | AI dummy (2 hours)                                                                                                        |                            |                       |  |  |  |  |  |  |
| 12/12/09 |  |                    |      |       | slug 22 started here                                                                                                      |                            |                       |  |  |  |  |  |  |
| 12/13/09 |  |                    |      |       | slug 23 started here                                                                                                      |                            |                       |  |  |  |  |  |  |
| 12/14/09 |  | 14642-14643        |      |       | 2 <sup>nd</sup> bcm calibration                                                                                           | BCM                        | 306876                |  |  |  |  |  |  |
|          |  | 14644              |      | 26225 | shows low efficiency in left arm EW gr5, 26117 was okay. Problem seems to have appeared gradually between 14628 and 14644 |                            | 306916, 306962        |  |  |  |  |  |  |
|          |  |                    |      |       | boiling test                                                                                                              |                            | 307011                |  |  |  |  |  |  |
|          |  | 14663, 14667-14668 |      |       | tagger test with beam off to check left gr5-6                                                                             |                            |                       |  |  |  |  |  |  |
|          |  | 14669              |      |       | ANDing 758 for gr5-6 on left replaced, 14669 is the first good run                                                        |                            | 307043                |  |  |  |  |  |  |
| 12/15/09 |  |                    |      |       | slug 24 started here                                                                                                      |                            | 307184                |  |  |  |  |  |  |
| 12/16/09 |  |                    |      |       | Moller measurement                                                                                                        | Moller                     | 307464                |  |  |  |  |  |  |

## Major

|                   |  |             |      |       |                                                                                                                                 |                     |        |  |  |  |  |  |
|-------------------|--|-------------|------|-------|---------------------------------------------------------------------------------------------------------------------------------|---------------------|--------|--|--|--|--|--|
| 12/17/09          |  | until 14725 |      |       | change to 4-pass, prepare for resonance running                                                                                 | pass change         |        |  |  |  |  |  |
| 12/17/09          |  |             |      |       | access work in preparation for resonance running                                                                                |                     | 307675 |  |  |  |  |  |
| 12/17/09          |  | 14735-14764 |      |       | slug 25 started here, changed slug number at Dec 17 4pm.                                                                        |                     |        |  |  |  |  |  |
| 12/17/09          |  |             |      |       | Left arm at kine#3 with dipole and Q1 at the proper setting, Q2 and Q3 set at 3.66 GeV/c, right arm at kine #5.                 |                     |        |  |  |  |  |  |
| 12/18/09          |  | 14744       | 5841 | 26337 | AI dummy runs                                                                                                                   |                     |        |  |  |  |  |  |
| 12/19/09          |  | 14765-14779 |      |       | slug 26 started here, started from same kinematics as slug 25                                                                   |                     | 308066 |  |  |  |  |  |
|                   |  |             |      |       | Left arm set to 3.66 GeV/c, Right arm at 3.10 GeV/c                                                                             | calibration /optics | 308207 |  |  |  |  |  |
|                   |  |             |      |       | optics data taken on 12/18 and 12/19, see below for summary                                                                     |                     |        |  |  |  |  |  |
|                   |  |             |      |       |                                                                                                                                 |                     |        |  |  |  |  |  |
|                   |  |             |      |       |                                                                                                                                 |                     |        |  |  |  |  |  |
|                   |  |             |      |       |                                                                                                                                 |                     |        |  |  |  |  |  |
|                   |  | 14780       |      |       | rate comparison with 14781/2 to study the effect of LQ2, LQ3 and RQ1 at wrong settings                                          | calibration /optics |        |  |  |  |  |  |
|                   |  |             |      |       | Left arm dipole and Q1 set to 3.66, Q2 and Q3 set to 3.349; Right arm Q1 set to 3.136, all other 3 magnets to 3.100 (unchanged) |                     | 308254 |  |  |  |  |  |
|                   |  | 14781-14782 |      |       | rate comparison with 14780 to study the effect of LQ2, LQ3 and RQ1 at wrong settings                                            |                     |        |  |  |  |  |  |
|                   |  |             | 5884 | 26395 |                                                                                                                                 |                     |        |  |  |  |  |  |
|                   |  |             |      |       | Left arm at kine #4, Right arm continues at kine #5.                                                                            |                     | 308289 |  |  |  |  |  |
| 12/19/09-12/20/09 |  |             | 5890 | 26401 | AI dummy runs, Q2 only                                                                                                          |                     |        |  |  |  |  |  |
| 12/19/09          |  |             |      |       | Long down time due to target/magnets/cryo                                                                                       |                     |        |  |  |  |  |  |
| 12/19/09          |  |             |      |       | slug 27 started here                                                                                                            |                     | 308309 |  |  |  |  |  |

Major

|                 |         |             |          |                                                                                                         |                                       |        |           |       |             |         |      |
|-----------------|---------|-------------|----------|---------------------------------------------------------------------------------------------------------|---------------------------------------|--------|-----------|-------|-------------|---------|------|
| 12/20/09        |         |             | 26407    | resume production, started from Q2 measurements, sieve in optics, and AI dummy runs                     |                                       |        |           |       |             |         |      |
| 12/21/09        |         | 14803       |          | AI dummy run, production with left at kine #4 and right at kine #5                                      |                                       | 308646 |           |       |             |         |      |
| 12/21/09        |         | 14804-14807 |          | production with left at kine #4 and right at kine #5                                                    |                                       | 308646 |           |       |             |         |      |
| 12/21/09        |         |             |          | another down time (short) due to target/cryo                                                            |                                       |        |           |       |             |         |      |
| 12/21/09        |         | 14808-      |          | continue production                                                                                     |                                       |        |           |       |             |         |      |
|                 |         |             |          | slug 28 started here                                                                                    |                                       | 308728 |           |       |             |         |      |
|                 |         |             |          | production with left at kine #4 and right at kine #5                                                    |                                       |        |           |       |             |         |      |
|                 |         |             |          |                                                                                                         |                                       |        |           |       |             |         |      |
|                 |         |             |          | random coincidence measurement?                                                                         |                                       |        |           |       |             |         |      |
|                 |         |             |          |                                                                                                         |                                       |        |           |       |             |         |      |
|                 |         |             |          |                                                                                                         |                                       |        |           |       |             |         |      |
|                 |         |             |          |                                                                                                         |                                       |        |           |       | Total#pairs | 1128831 |      |
|                 |         |             |          |                                                                                                         |                                       |        | time (hr) | 16.92 | 10.7        | 26.9    | 16.4 |
|                 |         |             |          |                                                                                                         |                                       |        |           |       | 4.13        |         | 1.81 |
| Moller Raw      | Results |             |          | <a href="http://www.jlab.org/~moller/raw_results.html">http://www.jlab.org/~moller/raw_results.html</a> |                                       |        |           |       |             |         |      |
|                 |         |             |          |                                                                                                         |                                       |        |           |       |             | 2.12    |      |
| optics run list |         |             | RHRS run | LHRS run                                                                                                |                                       |        |           |       |             |         |      |
| 11/08/09        |         |             | 20 deg   | 12.9 deg                                                                                                | Left at -3.66 GeV, Right at -2.63 GeV |        |           |       |             |         |      |
|                 |         |             | 4833     | 25304                                                                                                   | multifoil carbon raster off           |        |           |       |             |         |      |
|                 |         |             | 4859     | 25334                                                                                                   | same                                  |        |           |       |             |         |      |
|                 |         |             | 4832     | 25303                                                                                                   | multifoil carbon raster on            |        |           |       |             |         |      |
|                 |         |             | 4856     | 25311                                                                                                   | same                                  |        |           |       |             |         |      |
|                 |         |             | 4858     | 25333                                                                                                   | single carbon raster off              |        |           |       |             |         |      |
|                 |         |             | 5159     | 25605                                                                                                   | single carbon raster on               |        |           |       |             |         |      |

## Major

|          |  |  |          |          |                                                                                                                  |  |  |  |  |  |  |  |
|----------|--|--|----------|----------|------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|
|          |  |  |          |          | the above (earlier) optics runs had different beam position from most of production                              |  |  |  |  |  |  |  |
|          |  |  |          |          |                                                                                                                  |  |  |  |  |  |  |  |
| 12/10/09 |  |  | 20 deg   | 20 deg   | Left and Right at -2.63 GeV/c                                                                                    |  |  |  |  |  |  |  |
|          |  |  | 5640     | 26128    | multifoil carbon raster off                                                                                      |  |  |  |  |  |  |  |
|          |  |  | 5641     | 26129    | multifoil carbon raster on                                                                                       |  |  |  |  |  |  |  |
|          |  |  | 5642     | 26130    | single carbon raster off                                                                                         |  |  |  |  |  |  |  |
|          |  |  | 5643     | 26131    | single carbon raster on                                                                                          |  |  |  |  |  |  |  |
|          |  |  |          |          |                                                                                                                  |  |  |  |  |  |  |  |
| 12/18/09 |  |  | 12.9 deg | 12.9 deg | LQ1 and LDipole at -4.0 GeV, LQ2 and LQ3 at -3.66 GeV; Right at -3.10 GeV.                                       |  |  |  |  |  |  |  |
|          |  |  | 5836     | 26332    | raster off, sieve out                                                                                            |  |  |  |  |  |  |  |
|          |  |  | 5837     | 26333    | raster on, sieve out                                                                                             |  |  |  |  |  |  |  |
|          |  |  | 5838     | 26334    | raster on, left sieve in                                                                                         |  |  |  |  |  |  |  |
|          |  |  | 5839     | 26335    | raster off, left sieve in                                                                                        |  |  |  |  |  |  |  |
|          |  |  |          |          |                                                                                                                  |  |  |  |  |  |  |  |
| 12/19/09 |  |  | 12.9 deg | 12.9 deg | Left at -3.66 GeV, Right at -3.10 GeV                                                                            |  |  |  |  |  |  |  |
|          |  |  | 5876     | 26386    | optics data, raster off                                                                                          |  |  |  |  |  |  |  |
|          |  |  | 5877     | 26387    | optics data, raster on                                                                                           |  |  |  |  |  |  |  |
|          |  |  | 5878     | 26389    | optics data, raster on, left sieve in                                                                            |  |  |  |  |  |  |  |
|          |  |  | 5879     | 26390    | optics data, raster off, left sieve in                                                                           |  |  |  |  |  |  |  |
|          |  |  |          |          |                                                                                                                  |  |  |  |  |  |  |  |
|          |  |  | 12.9 deg | 12.9 deg | LQ1 and LDipole at -3.660 GeV, LQ2 and LQ3 at -3.349 GeV; RQ1 at -3.136 GeV/c, RDipole, RQ2 and RQ3 at -3.1 GeV. |  |  |  |  |  |  |  |
|          |  |  | 5884     | 26395    | raster on, sieve-out, 19:34-                                                                                     |  |  |  |  |  |  |  |
|          |  |  | 5885     | 26396    | raster off, sieve-out, 19:40-                                                                                    |  |  |  |  |  |  |  |
|          |  |  | 5886     | 26397    | raster off, left sieve in, 19:52-                                                                                |  |  |  |  |  |  |  |

Major

|  |  |  |      |       |                                       |  |  |  |  |  |  |  |
|--|--|--|------|-------|---------------------------------------|--|--|--|--|--|--|--|
|  |  |  | 5887 | 26398 | raster on, left sieve in, 20:25-      |  |  |  |  |  |  |  |
|  |  |  |      |       | Left at -3.55 GeV, Right at -3.10 GeV |  |  |  |  |  |  |  |
|  |  |  | 5891 | 26402 | raster off, sieve-out                 |  |  |  |  |  |  |  |

Major

| Right<br>Electron<br>global rate |        | Right<br>ENglobal |          |        |          |          | Right<br>EWglobal<br>raw |          |        |          |          | Right<br>PiNglobal<br>rate |        |
|----------------------------------|--------|-------------------|----------|--------|----------|----------|--------------------------|----------|--------|----------|----------|----------------------------|--------|
| narrow                           | wide   | Asym              | RMS      | dA     | A/(dA)^2 | 1/(dA)^2 | Asym                     | RMS      | dA     | A/(dA)^2 | 1/(dA)^2 | narrow                     | wide   |
|                                  |        |                   |          |        |          |          |                          |          |        |          |          |                            |        |
|                                  |        |                   |          |        |          |          |                          |          |        |          |          |                            |        |
|                                  |        |                   |          |        |          |          |                          |          |        |          |          |                            |        |
| 13.64k                           | 13.64k | 277.2             | 3.195E+4 | 168.29 | 9.79E-3  | 3.53E-5  | 273.7                    | 3.195E+4 | 168.29 | 9.66E-3  | 3.53E-5  | 22.03k                     | 26.28k |
| 13.95k                           | 13.95k | -42.32            | 3.204E+4 | 194.05 | -1.12E-3 | 2.66E-5  | -36.67                   | 3.203E+4 | 193.99 | -9.74E-4 | 2.66E-5  | 22.08k                     | 26.51k |
| 13.83k                           | 13.83k | 319.1             | 3.222E+4 | 163.29 | 1.20E-2  | 3.75E-5  | 320.3                    | 3.222E+4 | 163.29 | 1.20E-2  | 3.75E-5  | 22.07k                     | 26.42k |
| 13.46k                           | 13.46k | 88.52             | 3.222E+4 | 292.80 | 1.03E-3  | 1.17E-5  | 89.86                    | 3.222E+4 | 292.80 | 1.05E-3  | 1.17E-5  | 21.74k                     | 25.91k |
|                                  |        |                   |          |        |          |          |                          |          |        |          |          |                            |        |
| 9.70k                            | 9.70k  | -161.6            | 3.865E+4 | 243.20 | -2.73E-3 | 1.69E-5  | -159.8                   | 3.865E+4 | 243.20 | -2.70E-3 | 1.69E-5  | 63.47k                     | 75.79k |
| 9.54k                            | 9.54k  | 482.3             | 3.872E+4 | 214.32 | 1.05E-2  | 2.18E-5  | 483.6                    | 3.871E+4 | 214.26 | 1.05E-2  | 2.18E-5  | 54.86k                     | 65.25k |
|                                  |        |                   |          |        |          |          |                          |          |        |          |          |                            |        |
| 18.0k                            | 18.0k  | 288.6             | 2.785E+4 | 152.08 | 1.25E-2  | 4.32E-5  | 295.1                    | 2.785E+4 | 152.08 | 1.28E-2  | 4.32E-5  | 56.73k                     | 65.22k |
| 18.2k                            | 18.2k  | 147.2             | 2.794E+4 | 210.60 | 3.32E-3  | 2.25E-5  | 140.2                    | 2.794E+4 | 210.60 | 3.16E-3  | 2.25E-5  | 57.1k                      | 65.63k |
|                                  |        |                   |          |        |          |          |                          |          |        |          |          |                            |        |
| 17.9k                            | 17.9k  | 274.9             | 2.808E+4 | 189.23 | 7.68E-3  | 2.79E-5  | 281.4                    | 2.807E+4 | 189.16 | 7.86E-3  | 2.79E-5  | 48.17k                     | 56.08k |
| 16.6k                            | 16.6k  | 85.35             | 2.777E+4 | 256.72 | 1.30E-3  | 1.52E-5  | 88.92                    | 2.777E+4 | 256.72 | 1.35E-3  | 1.52E-5  | 50.29k                     | 57.96k |
| 17.6k                            | 17.6k  | 95.26             | 2.774E+4 | 162.94 | 3.59E-3  | 3.77E-5  | 93.8                     | 2.774E+4 | 162.94 | 3.53E-3  | 3.77E-5  | 53.59k                     | 61.76k |
| 18.7k                            | 18.7k  | 362.7             | 2.795E+4 | 135.90 | 1.96E-2  | 5.41E-5  | 360.9                    | 2.795E+4 | 135.90 | 1.95E-2  | 5.41E-5  | 56.98k                     | 65.66k |
| 17.75k                           | 17.75k | 368.7             | 2.785E+4 | 418.43 | 2.11E-3  | 5.71E-6  | 394.5                    | 2.784E+4 | 418.28 | 2.25E-3  | 5.72E-6  | 48.84k                     | 56.77k |
|                                  |        |                   |          |        |          |          |                          |          |        |          |          |                            |        |

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|        |        |        |          |        |          |         |        |          |        |          |         |        |        |
| 16.18k | 16.18k | 91.16  | 3.030E+4 | 254.25 | 1.41E-3  | 1.55E-5 | 81.88  | 3.030E+4 | 254.25 | 1.27E-3  | 1.55E-5 | 44.23k | 51.48k |
| 17.58k | 17.58k | 285    | 2.907E+4 | 273.88 | 3.80E-3  | 1.33E-5 | 265    | 2.906E+4 | 273.79 | 3.54E-3  | 1.33E-5 | 50.05k | 58.04k |
| 17.39k | 17.39k | 84.62  | 2.919E+4 | 168.08 | 3.00E-3  | 3.54E-5 | 86.68  | 2.919E+4 | 168.08 | 3.07E-3  | 3.54E-5 | 49.34k | 47.28k |
| 17.44k | 17.44k | 278.1  | 2.925E+4 | 137.86 | 1.46E-2  | 5.26E-5 | 278.7  | 2.925E+4 | 137.86 | 1.47E-2  | 5.26E-5 | 46.06k | 54.44k |
| 17.23k | 17.23k | 222.9  | 2.959E+4 | 156.90 | 9.06E-3  | 4.06E-5 | 222    | 2.959E+4 | 156.90 | 9.02E-3  | 4.06E-5 | 42.86k | 50.36k |
| 17.19k | 17.18k | 107.7  | 2.900E+4 | 293.33 | 1.25E-3  | 1.16E-5 | 111.4  | 2.900E+4 | 293.33 | 1.29E-3  | 1.16E-5 | 41.94k | 49.44k |
| 17.66k | 17.66k | 198.1  | 2.902E+4 | 167.31 | 7.08E-3  | 3.57E-5 | 194.6  | 2.902E+4 | 167.31 | 6.95E-3  | 3.57E-5 | 62.33k | 71.8k  |
|        |        |        |          |        |          |         |        |          |        |          |         |        |        |
|        |        |        |          |        |          |         |        |          |        |          |         |        |        |
| 8.6k   | 18.02k | 252.7  | 4.192E+4 | 443.85 | 1.28E-3  | 5.08E-6 | 90.91  | 2.875E+4 | 304.41 | 9.81E-4  | 1.08E-5 | 23.9k  | 28.1k  |
|        |        |        |          |        |          |         |        |          |        |          |         |        |        |
| 16.9k  | 16.9k  | 499.6  | 3.070E+4 | 263.36 | 7.20E-3  | 1.44E-5 | 507.8  | 3.069E+4 | 263.27 | 7.33E-3  | 1.44E-5 | 25.11k | 12.18k |
| 12.15k | 12.15k | 112.2  | 3.524E+4 | 180.87 | 3.43E-3  | 3.06E-5 | 114.6  | 3.523E+4 | 180.81 | 3.51E-3  | 3.06E-5 | 5.88k  | 5.89k  |
|        |        |        |          |        |          |         |        |          |        |          |         |        |        |
| 13.62k | 13.61k | -168.3 | 3.324E+4 | 167.60 | -5.99E-3 | 3.56E-5 | -169.7 | 3.324E+4 | 167.60 | -6.04E-3 | 3.56E-5 | 7.05k  | 7.06k  |
| 14.29k | 14.28k | 165.1  | 3.225E+4 | 173.88 | 5.46E-3  | 3.31E-5 | 165.1  | 3.225E+4 | 173.88 | 5.46E-3  | 3.31E-5 | 7.72k  | 7.73k  |

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| 13.75k | 13.75k | -117   | 3.315E+4 | 164.77 | -4.31E-3 | 3.68E-5 | -116.6 | 3.317E+4 | 164.87 | -4.29E-3 | 3.68E-5 | 7.20k  | 7.21k  |
| 12.83k | 12.83k | 176    | 3.419E+4 | 168.19 | 6.22E-3  | 3.54E-5 | 178.1  | 3.419E+4 | 168.19 | 6.30E-3  | 3.54E-5 | 6.48k  | 6.49k  |
| 12.38k | 12.38k | 303.1  | 3.479E+4 | 159.74 | 1.19E-2  | 3.92E-5 | 299.6  | 3.479E+4 | 159.74 | 1.17E-2  | 3.92E-5 | 6.14k  | 6.15k  |
| 9.94k  | 9.94k  | 56.02  | 3.993E+4 | 288.49 | 6.73E-4  | 1.20E-5 | 56.63  | 3.993E+4 | 288.49 | 6.80E-4  | 1.20E-5 | 4.73k  | 4.74k  |
| 11.77k | 11.77k | 266.6  | 3.956E+4 | 220.59 | 5.48E-3  | 2.06E-5 | 270.3  | 3.956E+4 | 220.59 | 5.55E-3  | 2.06E-5 | 8.54k  | 8.55k  |
| 16.68k | 16.68k | 361.8  | 2.991E+4 | 150.85 | 1.59E-2  | 4.39E-5 | 361    | 2.991E+4 | 150.85 | 1.59E-2  | 4.39E-5 | 12.02k | 12.04k |
|        |        |        |          |        |          |         |        |          |        |          |         |        |        |
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|        |        |        |          |        |          |         |        |          |        |          |         |        |        |
| 16.25k | 16.25k | 495.1  | 3.026E+4 | 216.29 | 1.06E-2  | 2.14E-5 | 484.4  | 3.027E+4 | 216.36 | 1.03E-2  | 2.14E-5 | 48.37k | 48.38k |
| 16.42k | 16.42k | 296    | 3.012E+4 | 173.69 | 9.81E-3  | 3.31E-5 | 293.1  | 3.011E+4 | 173.63 | 9.72E-3  | 3.32E-5 | 48.95k | 48.95k |
|        |        |        |          |        |          |         |        |          |        |          |         |        |        |
| 19.2k  | 19.2k  | 311.7  | 2.789E+4 | 140.73 | 1.57E-2  | 5.05E-5 | 310.8  | 2.788E+4 | 140.68 | 1.57E-2  | 5.05E-5 | 48.52k | 48.53k |
| 19.23k | 19.22k | 125.9  | 2.794E+4 | 143.34 | 6.13E-3  | 4.87E-5 | 121.6  | 2.794E+4 | 143.34 | 5.92E-3  | 4.87E-5 | 48.48k | 48.58k |
| 19.09k | 19.08k | 152.9  | 2.796E+4 | 153.62 | 6.48E-3  | 4.24E-5 | 150.9  | 2.796E+4 | 153.62 | 6.39E-3  | 4.24E-5 | 48.21k | 48.22k |
|        |        |        |          |        |          |         |        |          |        |          |         |        |        |
| 19.35k | 19.34k | 49.89  | 2.775E+4 | 139.21 | 2.57E-3  | 5.16E-5 | 49.73  | 2.775E+4 | 139.21 | 2.57E-3  | 5.16E-5 | 48.84k | 48.84k |
| 19.2k  | 19.19k | 277.9  | 2.804E+4 | 152.50 | 1.19E-2  | 4.30E-5 | 279.4  | 2.804E+4 | 152.50 | 1.20E-2  | 4.30E-5 | 48.54k | 48.54k |
| 19.33k | 19.33k | -236.2 | 2.803E+4 | 156.00 | -9.71E-3 | 4.11E-5 | -236   | 2.803E+4 | 156.00 | -9.70E-3 | 4.11E-5 | 48.82k | 48.82k |
|        |        |        |          |        |          |         |        |          |        |          |         |        |        |
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|  |  | -21.27 | 2.964E+4 | 185.29 | -6.20E-4 | 2.91E-5 | -16.02 | 2.965E+4 | 185.35 | -4.66E-4 | 2.91E-5 |  |  |
|  |  |        |          |        |          |         |        |          |        |          |         |  |  |
|  |  |        |          |        |          |         |        |          |        |          |         |  |  |
|  |  | 195.2  | 2.946E+4 | 157.28 | 7.89E-3  | 4.04E-5 | 196.2  | 2.946E+4 | 157.28 | 7.93E-3  | 4.04E-5 |  |  |
|  |  |        |          |        |          |         |        |          |        |          |         |  |  |
|  |  |        |          |        | 50.12    | 74.54   |        |          |        | 52.19    | 74.68   |  |  |
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| Right<br>PiNglobal |          |        |            |            | Right<br>PiWglobal |          |        |            |            | Left<br>Electron<br>global rate |      | Left<br>ENglobal |
| Asym               | RMS      | dA     | $A/(dA)^2$ | $1/(dA)^2$ | Asym               | RMS      | dA     | $A/(dA)^2$ | $1/(dA)^2$ | narrow                          | wide | Asym             |
|                    |          |        |            |            |                    |          |        |            |            |                                 |      |                  |
|                    |          |        |            |            |                    |          |        |            |            |                                 |      |                  |
|                    |          |        |            |            |                    |          |        |            |            |                                 |      |                  |
| 351.5              | 2.529E+4 | 133.21 | 1.98E-2    | 5.64E-5    | 251.3              | 2.314E+4 | 121.89 | 1.69E-2    | 6.73E-5    |                                 |      |                  |
| 117.2              | 2.571E+4 | 155.71 | 4.83E-3    | 4.12E-5    | 149.0              | 2.339E+4 | 141.66 | 7.42E-3    | 4.98E-5    |                                 |      |                  |
| 291.5              | 2.557E+4 | 129.59 | 1.74E-2    | 5.95E-5    | 289.6              | 2.335E+4 | 118.34 | 2.07E-2    | 7.14E-5    |                                 |      |                  |
| 122.6              | 2.546E+4 | 231.37 | 2.29E-3    | 1.87E-5    | 117.4              | 2.339E+4 | 212.56 | 2.60E-3    | 2.21E-5    |                                 |      |                  |
|                    |          |        |            |            |                    |          |        |            |            |                                 |      |                  |
| 156.5              | 1.522E+4 | 95.77  | 1.71E-2    | 1.09E-4    | 120.5              | 1.391E+4 | 87.53  | 1.57E-2    | 1.31E-4    |                                 |      |                  |
| 147.7              | 1.596E+4 | 88.34  | 1.89E-2    | 1.28E-4    | 183.1              | 1.454E+4 | 80.48  | 2.83E-2    | 1.54E-4    |                                 |      |                  |
|                    |          |        |            |            |                    |          |        |            |            |                                 |      |                  |
| 185.3              | 1.571E+4 | 85.79  | 2.52E-2    | 1.36E-4    | 165.6              | 1.464E+4 | 79.95  | 2.59E-2    | 1.56E-4    |                                 |      |                  |
| 211.2              | 1.581E+4 | 119.17 | 1.49E-2    | 7.04E-5    | 193.6              | 1.477E+4 | 111.33 | 1.56E-2    | 8.07E-5    |                                 |      |                  |
|                    |          |        |            |            |                    |          |        |            |            |                                 |      |                  |
| 94.54              | 1.730E+4 | 116.58 | 6.96E-3    | 7.36E-5    | 99.0               | 1.602E+4 | 107.96 | 8.49E-3    | 8.58E-5    |                                 |      |                  |
| 101.7              | 1.621E+4 | 149.86 | 4.53E-3    | 4.45E-5    | 62.2               | 1.506E+4 | 139.22 | 3.21E-3    | 5.16E-5    |                                 |      |                  |
| 75.27              | 1.605E+4 | 94.28  | 8.47E-3    | 1.13E-4    | 95.7               | 1.496E+4 | 87.87  | 1.24E-2    | 1.30E-4    |                                 |      |                  |
| 140                | 1.608E+4 | 78.19  | 2.29E-2    | 1.64E-4    | 121.9              | 1.497E+4 | 72.79  | 2.30E-2    | 1.89E-4    |                                 |      |                  |
| 193                | 1.703E+4 | 255.87 | 2.95E-3    | 1.53E-5    | 146.8              | 1.568E+4 | 235.58 | 2.65E-3    | 1.80E-5    |                                 |      |                  |
|                    |          |        |            |            |                    |          |        |            |            |                                 |      |                  |

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|        |          |        |          |         |        |          |        |          |         |  |        |        |        |
| 102.1  | 1.857E+4 | 155.82 | 4.21E-3  | 4.12E-5 | 19.8   | 1.718E+4 | 144.16 | 9.52E-4  | 4.81E-5 |  |        |        |        |
| -113.2 | 1.754E+4 | 165.25 | -4.15E-3 | 3.66E-5 | 7.6    | 1.618E+4 | 152.44 | 3.29E-4  | 4.30E-5 |  |        |        |        |
| 76.07  | 1.761E+4 | 101.40 | 7.40E-3  | 9.73E-5 | 48.9   | 1.632E+4 | 93.97  | 5.53E-3  | 1.13E-4 |  |        |        |        |
| 74.89  | 1.826E+4 | 86.06  | 1.01E-2  | 1.35E-4 | 51.0   | 1.670E+4 | 78.71  | 8.23E-3  | 1.61E-4 |  |        |        |        |
| 13.83  | 1.882E+4 | 99.79  | 1.39E-3  | 1.00E-4 | -4.4   | 1.738E+4 | 92.15  | -5.18E-4 | 1.18E-4 |  |        |        |        |
| -93.56 | 1.895E+4 | 191.68 | -2.55E-3 | 2.72E-5 | -66.84 | 1.738E+4 | 175.80 | -2.16E-3 | 3.24E-5 |  |        |        |        |
| 23.49  | 1.573E+4 | 90.69  | 2.86E-3  | 1.22E-4 | 85.8   | 1.460E+4 | 84.18  | 1.21E-2  | 1.41E-4 |  |        |        |        |
|        |          |        |          |         |        |          |        |          |         |  |        |        |        |
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|        |          |        |          |         |        |          |        |          |         |  |        |        |        |
| -284.3 | 2.560E+4 | 271.06 | -3.87E-3 | 1.36E-5 | -219.1 | 2.356E+4 | 249.46 | -3.52E-3 | 1.61E-5 |  | 212.1k | 212.3k | -57.04 |
|        |          |        |          |         |        |          |        |          |         |  |        |        |        |
| 296.9  | 3.361E+4 | 288.32 | 3.57E-3  | 1.20E-5 | 308.7  | 3.366E+4 | 288.75 | 3.70E-3  | 1.20E-5 |  | 212.5k | 212.6k | 97.29  |
| 199.8  | 5.096E+4 | 261.55 | 2.92E-3  | 1.46E-5 | 149.6  | 5.092E+4 | 261.34 | 2.19E-3  | 1.46E-5 |  | 214k   | 214.2k | 141.7  |
|        |          |        |          |         |        |          |        |          |         |  |        |        |        |
| -61.89 | 4.645E+4 | 234.21 | -1.13E-3 | 1.82E-5 | -69.8  | 4.639E+4 | 233.91 | -1.28E-3 | 1.83E-5 |  | 214.5k | 214.7k | 122.5  |
| -57.26 | 4.448E+4 | 239.82 | -9.96E-4 | 1.74E-5 | -19.0  | 4.446E+4 | 239.71 | -3.30E-4 | 1.74E-5 |  | 215.2k | 215.3k | 116.9  |

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| 45.85  | 4.632E+4 | 230.23 | 8.65E-4  | 1.89E-5 | 46.9   | 4.629E+4 | 230.08 | 8.86E-4  | 1.89E-5 |  | 214.7k | 214.8k | 9.08   |
| -208.9 | 4.873E+4 | 239.71 | -3.64E-3 | 1.74E-5 | -194.3 | 4.868E+4 | 239.47 | -3.39E-3 | 1.74E-5 |  | 213.9k | 214.0k | -41.79 |
| 575.4  | 5.001E+4 | 229.62 | 1.09E-2  | 1.90E-5 | 562.9  | 5.000E+4 | 229.57 | 1.07E-2  | 1.90E-5 |  | 213.8k | 213.9k | 106.3  |
| 110    | 5.710E+4 | 412.54 | 6.46E-4  | 5.88E-6 | 56.2   | 5.708E+4 | 412.39 | 3.31E-4  | 5.88E-6 |  | 214.8k | 214.9k | 56.32  |
| -318.5 | 5.396E+4 | 300.89 | -3.52E-3 | 1.10E-5 | -357.9 | 5.391E+4 | 300.61 | -3.96E-3 | 1.11E-5 |  | 213.3k | 213.5k | 1.84   |
| -18.42 | 3.580E+4 | 180.56 | -5.65E-4 | 3.07E-5 | -16.1  | 3.577E+4 | 180.41 | -4.94E-4 | 3.07E-5 |  | 213.3k | 213.5k | 57.88  |
|        |          |        |          |         |        |          |        |          |         |  |        |        |        |
|        |          |        |          |         |        |          |        |          |         |  |        |        |        |
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| 63.5   | 1.769E+4 | 126.44 | 3.97E-3  | 6.25E-5 | 68.7   | 1.768E+4 | 126.37 | 4.30E-3  | 6.26E-5 |  | 211.1k | 211.2k | 102.2  |
| 79.92  | 1.765E+4 | 101.78 | 7.71E-3  | 9.65E-5 | 79.6   | 1.764E+4 | 101.72 | 7.69E-3  | 9.66E-5 |  | 213.7k | 213.8k | 25.11  |
|        |          |        |          |         |        |          |        |          |         |  |        |        |        |
| -10.09 | 1.776E+4 | 89.61  | -1.26E-3 | 1.25E-4 | -6.5   | 1.775E+4 | 89.56  | -8.05E-4 | 1.25E-4 |  | 212.3k | 212.4k | 66.47  |
| 15.18  | 1.761E+4 | 90.34  | 1.86E-3  | 1.23E-4 | 18.8   | 1.760E+4 | 90.29  | 2.30E-3  | 1.23E-4 |  | 212.8k | 212.9k | 13.1   |
| 100.9  | 1.787E+4 | 98.18  | 1.05E-2  | 1.04E-4 | 103.2  | 1.786E+4 | 98.13  | 1.07E-2  | 1.04E-4 |  | 211.2k | 211.3k | -53.79 |
|        |          |        |          |         |        |          |        |          |         |  |        |        |        |
| -185.2 | 1.764E+4 | 88.49  | -2.36E-2 | 1.28E-4 | -188.2 | 1.764E+4 | 88.49  | -2.40E-2 | 1.28E-4 |  | 213.9k | 214.0k | 57.29  |
| 283    | 1.774E+4 | 96.48  | 3.04E-2  | 1.07E-4 | 286.9  | 1.773E+4 | 96.43  | 3.09E-2  | 1.08E-4 |  | 212.3k | 212.4k | -2.83  |
| -117.7 | 1.768E+4 | 98.40  | -1.22E-2 | 1.03E-4 | -122.7 | 1.767E+4 | 98.34  | -1.27E-2 | 1.03E-4 |  | 213.7k | 213.8k | 101.4  |
|        |          |        |          |         |        |          |        |          |         |  |        |        |        |
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|        |          |        |          |         |       |          |        |          |         |  |  |        |
| -70.97 | 1.735E+4 | 96.04  | -7.69E-3 | 1.08E-4 | -77.6 | 1.733E+4 | 95.93  | -8.44E-3 | 1.09E-4 |  |  | 38.22  |
| -50.88 | 1.737E+4 | 85.82  | -6.91E-3 | 1.36E-4 | -50.9 | 1.736E+4 | 85.77  | -6.92E-3 | 1.36E-4 |  |  | 23.7   |
| 85.26  | 1.754E+4 | 115.29 | 6.41E-3  | 7.52E-5 | 83.6  | 1.750E+4 | 115.02 | 6.32E-3  | 7.56E-5 |  |  | -87.03 |
| 118.4  | 1.733E+4 | 91.78  | 1.41E-2  | 1.19E-4 | 125.6 | 1.731E+4 | 91.68  | 1.49E-2  | 1.19E-4 |  |  | 50.02  |
|        |          |        |          |         |       |          |        |          |         |  |  |        |
| 57.4   | 1.748E+4 | 126.70 | 3.58E-3  | 6.23E-5 | 47.1  | 1.746E+4 | 126.55 | 2.94E-3  | 6.24E-5 |  |  | 143.9  |
| -14.57 | 1.811E+4 | 95.56  | -1.60E-3 | 1.10E-4 | -12.3 | 1.809E+4 | 95.45  | -1.35E-3 | 1.10E-4 |  |  | 43.79  |
|        |          |        | 12.86    | 40.49   |       |          |        | 12.26    | 40.44   |  |  |        |
| -0.74  | 1.795E+4 | 95.95  | -7.99E-5 | 1.09E-4 | 0.1   | 1.794E+4 | 95.89  | 1.17E-5  | 1.09E-4 |  |  | -62.54 |
| 5.71   | 1.806E+4 | 164.92 | 2.10E-4  | 3.68E-5 | -0.2  | 1.805E+4 | 164.83 | -8.65E-6 | 3.68E-5 |  |  | 49.92  |
| -98.7  | 1.887E+4 | 90.74  | -1.20E-2 | 1.21E-4 | -97.6 | 1.885E+4 | 90.65  | -1.19E-2 | 1.22E-4 |  |  | -10.85 |

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| 175   | 1.899E+4 | 118.71 | 1.24E-2 | 7.10E-5 | 166.5 | 1.898E+4 | 118.65 | 1.18E-2 | 7.10E-5 |  |  |  | -54.09 |
|       |          |        |         |         |       |          |        |         |         |  |  |  |        |
|       |          |        |         |         |       |          |        |         |         |  |  |  |        |
| 106.6 | 1.894E+4 | 101.11 | 1.04E-2 | 9.78E-5 | 112.8 | 1.894E+4 | 101.11 | 1.10E-2 | 9.78E-5 |  |  |  |        |
|       |          |        |         |         |       |          |        |         |         |  |  |  |        |
|       |          |        | 25.23   | 47.91   |       |          |        | 25.19   | 47.89   |  |  |  |        |
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|          |       |          |         |        |          |       |          |         |        |        |        |          |
| 8.519E+3 | 90.20 | -7.01E-3 | 1.23E-4 | -54.88 | 8.515E+3 | 90.16 | -6.75E-3 | 1.23E-4 | 23.9k  | 28.13k | -294.3 | 2.560E+4 |
|          |       |          |         |        |          |       |          |         |        |        |        |          |
| 8.478E+3 | 72.73 | 1.84E-2  | 1.89E-4 | 98.41  | 8.475E+3 | 72.70 | 1.86E-2  | 1.89E-4 | 23.99k | 28.24k | -241.2 | 2.563E+4 |
| 8.421E+3 | 43.22 | 7.59E-2  | 5.35E-4 | 138.9  | 8.418E+3 | 43.20 | 7.44E-2  | 5.36E-4 | 24.29k | 28.59k | -138.2 | 2.541E+4 |
|          |       |          |         |        |          |       |          |         |        |        |        |          |
| 8.367E+3 | 42.19 | 6.88E-2  | 5.62E-4 | 126    | 8.364E+3 | 42.17 | 7.08E-2  | 5.62E-4 | 24.44k | 28.84k | 137.3  | 2.533E+4 |
| 8.309E+3 | 44.80 | 5.82E-2  | 4.98E-4 | 117.4  | 8.305E+3 | 44.78 | 5.86E-2  | 4.99E-4 | 24.5k  | 28.98k | 104.2  | 2.530E+4 |

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| 8.352E+3 | 41.51 | 5.27E-3  | 5.80E-4 | 9.47   | 8.351E+3 | 41.51 | 5.49E-3  | 5.80E-4 | 24.34k | 28.64k | 13.39  | 2.532E+4 |
| 8.396E+3 | 41.30 | -2.45E-2 | 5.86E-4 | -39.85 | 8.395E+3 | 41.30 | -2.34E-2 | 5.86E-4 | 24.19k | 28.5k  | 241.5  | 2.544E+4 |
| 8.376E+3 | 38.46 | 7.19E-2  | 6.76E-4 | 106.8  | 8.372E+3 | 38.44 | 7.23E-2  | 6.77E-4 | 24.2k  | 28.45k | 12.79  | 2.546E+4 |
| 8.382E+3 | 60.56 | 1.54E-2  | 2.73E-4 | 49.49  | 8.379E+3 | 60.54 | 1.35E-2  | 2.73E-4 | 24.33k | 28.59k | 80.62  | 2.535E+4 |
| 8.365E+3 | 46.64 | 8.43E-4  | 4.60E-4 | -1.04  | 8.362E+3 | 46.63 | -4.79E-4 | 4.60E-4 | 24.08k | 28.35k | 275.7  | 2.556E+4 |
| 8.428E+3 | 42.51 | 3.20E-2  | 5.53E-4 | 57.77  | 8.426E+3 | 42.50 | 3.20E-2  | 5.54E-4 | 24.17k | 28.49k | -91.6  | 2.547E+4 |
|          |       |          |         |        |          |       |          |         |        |        |        |          |
|          |       |          |         |        |          |       |          |         |        |        |        |          |
|          |       |          |         |        |          |       |          |         |        |        |        |          |
| 8.412E+3 | 60.13 | 2.83E-2  | 2.77E-4 | 107.3  | 8.406E+3 | 60.08 | 2.97E-2  | 2.77E-4 | 23.68k | 27.96k | 42.3   | 2.589E+4 |
| 8.364E+3 | 48.23 | 1.08E-2  | 4.30E-4 | 27.83  | 8.363E+3 | 48.23 | 1.20E-2  | 4.30E-4 | 24.16k | 28.47k | 79.61  | 2.546E+4 |
|          |       |          |         |        |          |       |          |         |        |        |        |          |
| 8.350E+3 | 42.13 | 3.74E-2  | 5.63E-4 | 64.46  | 8.348E+3 | 42.12 | 3.63E-2  | 5.64E-4 | 23.97k | 28.31k | -133   | 2.548E+4 |
| 8.390E+3 | 43.04 | 7.07E-3  | 5.40E-4 | 10.18  | 8.389E+3 | 43.04 | 5.50E-3  | 5.40E-4 | 23.98k | 28.21k | 126.4  | 2.562E+4 |
| 8.403E+3 | 46.17 | -2.52E-2 | 4.69E-4 | -55.94 | 8.400E+3 | 46.15 | -2.63E-2 | 4.69E-4 | 23.76k | 27.96k | -54.61 | 2.580E+4 |
|          |       |          |         |        |          |       |          |         |        |        |        |          |
| 8.366E+3 | 41.97 | 3.25E-2  | 5.68E-4 | 55.19  | 8.363E+3 | 41.95 | 3.14E-2  | 5.68E-4 | 24.07k | 28.33k | -48.72 | 2.566E+4 |
| 8.415E+3 | 45.77 | -1.35E-3 | 4.77E-4 | 1.63   | 8.416E+3 | 45.77 | 7.77E-4  | 4.77E-4 | 23.92k | 28.1k  | -66.66 | 2.549E+4 |
| 8.372E+3 | 46.60 | 4.67E-2  | 4.61E-4 | 99.78  | 8.369E+3 | 46.58 | 4.60E-2  | 4.61E-4 | 24.11k | 28.32k | 230.1  | 2.531E+4 |
|          |       |          |         |        |          |       |          |         |        |        |        |          |
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| 8.508E+3 | 47.09 | 1.72E-2  | 4.51E-4 | 46.65  | 8.476E+3 | 46.92 | 2.12E-2  | 4.54E-4 |  |  | -176.6 | 2.425E+4 |
| 8.445E+3 | 41.72 | 1.36E-2  | 5.74E-4 | 25.32  | 8.417E+3 | 41.58 | 1.46E-2  | 5.78E-4 |  |  | -131.7 | 2.417E+4 |
| 8.620E+3 | 56.66 | -2.71E-2 | 3.12E-4 | -93.89 | 8.603E+3 | 56.55 | -2.94E-2 | 3.13E-4 |  |  | -235.3 | 2.442E+4 |
| 8.545E+3 | 45.26 | 2.44E-2  | 4.88E-4 | 58.08  | 8.521E+3 | 45.13 | 2.85E-2  | 4.91E-4 |  |  | -15.07 | 2.430E+4 |
|          |       |          |         |        |          |       |          |         |  |  |        |          |
| 8.590E+3 | 62.26 | 3.71E-2  | 2.58E-4 | 141.1  | 8.571E+3 | 62.12 | 3.66E-2  | 2.59E-4 |  |  | -246   | 2.503E+4 |
| 8.809E+3 | 46.48 | 2.03E-2  | 4.63E-4 | 47.9   | 8.787E+3 | 46.37 | 2.23E-2  | 4.65E-4 |  |  | -56.81 | 2.532E+4 |
|          |       | 33.60    | 19.82   |        |          |       | 36.64    | 19.76   |  |  |        |          |
| 8.777E+3 | 46.91 | -2.84E-2 | 4.54E-4 | -65.15 | 8.759E+3 | 46.82 | -2.97E-2 | 4.56E-4 |  |  | 85.56  | 2.527E+4 |
| 8.816E+3 | 80.51 | 7.70E-3  | 1.54E-4 | 55.17  | 8.795E+3 | 80.31 | 8.55E-3  | 1.55E-4 |  |  | -18.86 | 2.544E+4 |
| 9.258E+3 | 44.52 | -5.47E-3 | 5.05E-4 | -7     | 9.233E+3 | 44.40 | -3.55E-3 | 5.07E-4 |  |  | 186.5  | 2.694E+4 |

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| 9.202E+3 | 57.52 | -1.63E-2 | 3.02E-4 | -53.37 | 9.182E+3 | 57.40 | -1.62E-2 | 3.04E-4 |  |  | -122.1 | 2.665E+4 |
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|          |       | -30.05   | 26.58   |        |          |       | -28.77   | 26.52   |  |  |        |          |
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|        |          |         |        |          |        |          |         |
| 271.06 | -4.01E-3 | 1.36E-5 | -219.1 | 2.356E+4 | 249.46 | -3.52E-3 | 1.61E-5 |
|        |          |         |        |          |        |          |         |
| 219.86 | -4.99E-3 | 2.07E-5 | -200.8 | 2.370E+4 | 203.31 | -4.86E-3 | 2.42E-5 |
| 130.41 | -8.13E-3 | 5.88E-5 | -198.3 | 2.340E+4 | 120.10 | -1.37E-2 | 6.93E-5 |
|        |          |         |        |          |        |          |         |
| 127.72 | 8.42E-3  | 6.13E-5 | 133.6  | 2.323E+4 | 117.13 | 9.74E-3  | 7.29E-5 |
| 136.41 | 5.60E-3  | 5.37E-5 | 141.5  | 2.321E+4 | 125.14 | 9.04E-3  | 6.39E-5 |

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| 125.85 | 8.45E-4  | 6.31E-5 | 39.34  | 2.321E+4 | 115.36 | 2.96E-3  | 7.51E-5 |
| 125.14 | 1.54E-2  | 6.39E-5 | 211.7  | 2.338E+4 | 115.01 | 1.60E-2  | 7.56E-5 |
| 116.90 | 9.36E-4  | 7.32E-5 | -24.94 | 2.349E+4 | 107.85 | -2.14E-3 | 8.60E-5 |
| 183.15 | 2.40E-3  | 2.98E-5 | 38.67  | 2.315E+4 | 167.25 | 1.38E-3  | 3.57E-5 |
| 142.53 | 1.36E-2  | 4.92E-5 | 229.4  | 2.351E+4 | 131.10 | 1.33E-2  | 5.82E-5 |
| 128.46 | -5.55E-3 | 6.06E-5 | -116   | 2.344E+4 | 118.22 | -8.30E-3 | 7.16E-5 |
|        |          |         |        |          |        |          |         |
|        |          |         |        |          |        |          |         |
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| 185.05 | 1.24E-3  | 2.92E-5 | 75.75  | 2.379E+4 | 170.04 | 2.62E-3  | 3.46E-5 |
| 146.82 | 3.69E-3  | 4.64E-5 | -10.18 | 2.351E+4 | 135.57 | -5.54E-4 | 5.44E-5 |
|        |          |         |        |          |        |          |         |
| 128.57 | -8.05E-3 | 6.05E-5 | -143.7 | 2.340E+4 | 118.07 | -1.03E-2 | 7.17E-5 |
| 131.44 | 7.32E-3  | 5.79E-5 | 106.7  | 2.351E+4 | 120.61 | 7.33E-3  | 6.87E-5 |
| 141.75 | -2.72E-3 | 4.98E-5 | 50.83  | 2.376E+4 | 130.55 | 2.98E-3  | 5.87E-5 |
|        |          |         |        |          |        |          |         |
| 128.73 | -2.94E-3 | 6.03E-5 | 29.59  | 2.370E+4 | 118.90 | 2.09E-3  | 7.07E-5 |
| 138.64 | -3.47E-3 | 5.20E-5 | -100.8 | 2.350E+4 | 127.81 | -6.17E-3 | 6.12E-5 |
| 140.87 | 1.16E-2  | 5.04E-5 | 265.5  | 2.335E+4 | 129.96 | 1.57E-2  | 5.92E-5 |
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|        |          |         |        |          |        |          |         |
| 134.23 | -9.80E-3 | 5.55E-5 | -191.6 | 2.420E+4 | 133.95 | -1.07E-2 | 5.57E-5 |
| 119.41 | -9.24E-3 | 7.01E-5 | -146.1 | 2.410E+4 | 119.07 | -1.03E-2 | 7.05E-5 |
| 160.51 | -9.13E-3 | 3.88E-5 | -192.3 | 2.439E+4 | 160.31 | -7.48E-3 | 3.89E-5 |
| 128.70 | -9.10E-4 | 6.04E-5 | -30.29 | 2.426E+4 | 128.48 | -1.83E-3 | 6.06E-5 |
|        |          |         |        |          |        |          |         |
| 181.42 | -7.47E-3 | 3.04E-5 | -258.3 | 2.492E+4 | 180.62 | -7.92E-3 | 3.07E-5 |
| 133.60 | -3.18E-3 | 5.60E-5 | -63.11 | 2.525E+4 | 133.23 | -3.56E-3 | 5.63E-5 |
|        | -127.68  | 56.68   |        |          |        | -133.57  | 56.55   |
| 135.07 | 4.69E-3  | 5.48E-5 | 67.81  | 2.522E+4 | 134.80 | 3.73E-3  | 5.50E-5 |
| 232.31 | -3.49E-4 | 1.85E-5 | -81.31 | 2.532E+4 | 231.22 | -1.52E-3 | 1.87E-5 |
| 129.55 | 1.11E-2  | 5.96E-5 | 160.8  | 2.688E+4 | 129.26 | 9.62E-3  | 5.98E-5 |

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| 166.60 | -4.40E-3 | 3.60E-5 | -102.5 | 2.660E+4 | 166.28 | -3.71E-3 | 3.62E-5 |
|        |          |         |        |          |        |          |         |
|        |          |         |        |          |        |          |         |
|        |          |         |        |          |        |          |         |
|        | 65.42    | 76.93   |        |          |        | 47.88    | 76.75   |
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**Production run list**

| Date     | HAPPEX run |
|----------|------------|
| 11/08/09 | 13814      |
|          | 13815      |
|          | 13816      |
|          | 13817      |
|          |            |
|          | 13826      |
|          | 13827      |
| 11/09/09 | 13844      |
|          | 13845      |
|          | 13846      |
|          | 13847      |
|          | 13848      |
|          | 13849      |
|          | 13850      |
|          | 13851      |
| 11/10/09 | 13860      |
| 11/10/09 | 13861      |
| 11/10/09 | 13862      |
| 11/10/09 | 13863      |
| 11/10/09 | 13864      |
| 11/10/09 | 13865      |
| 11/10/09 | 13866      |

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11/11/09 13880



Optics

|                          |          |                                                                             |                                                                                     |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
|--------------------------|----------|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>General comments:</b> |          | For PVDIS we did not have sieve data at the main DIS production kinematics. |                                                                                     |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
|                          |          |                                                                             |                                                                                     |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
| <b>optics run list</b>   | LHRS run | RHRS run                                                                    | Run conditions                                                                      |  | Comments for optics analysis, Left arm                                                                                                                                                                                                                                                            | Comments for optics analysis, Right arm                                                                                                                                                                                                      |
| 11/08/09                 | 12.9 deg | 20 deg                                                                      | Left at -3.66 GeV, Right at -2.63 GeV                                               |  | These runs should be used to determine Q2 of production runs, which were taken at the same HRS settings: Left at DIS kine #1.                                                                                                                                                                     | These runs should be used to determine Q2 of production runs, which were taken at the same HRS settings: right at DIS kine #2.                                                                                                               |
|                          | 25304    | 4833                                                                        | multifoil carbon raster off                                                         |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
|                          | 25334    | 4859                                                                        | same                                                                                |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
|                          | 25303    | 4832                                                                        | multifoil carbon raster on                                                          |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
|                          | 25311    | 4856                                                                        | same                                                                                |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
|                          | 25333    | 4858                                                                        | single carbon raster off                                                            |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
|                          | 25605    | 5159                                                                        | single carbon raster on                                                             |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
|                          |          |                                                                             | the above (earlier) optics runs had different beam position from most of production |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
|                          |          |                                                                             |                                                                                     |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
| 12/10/09                 | 20 deg   | 20 deg                                                                      | Left and Right at -2.63 GeV/c                                                       |  | These runs should be used to determine Q2 of production runs, which were taken at the same HRS settings: both arms at DIS kine #2.                                                                                                                                                                | These runs should be used to determine Q2 of production runs, which were taken at the same HRS settings: both arms at DIS kine #2. The right arm stayed the same as 11/08 runs but other conditions may have changed (such as beam position) |
|                          | 26128    | 5640                                                                        | multifoil carbon raster off                                                         |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
|                          | 26129    | 5641                                                                        | multifoil carbon raster on                                                          |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
|                          | 26130    | 5642                                                                        | single carbon raster off                                                            |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
|                          | 26131    | 5643                                                                        | single carbon raster on                                                             |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
|                          |          |                                                                             |                                                                                     |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
|                          |          |                                                                             |                                                                                     |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
| 12/18/09                 | 12.9 deg | 12.9 deg                                                                    | LQ1 and LDipole at -4.0 GeV, LQ2 and LQ3 at -3.66 GeV; Right at -3.10 GeV.          |  | These runs should be used to study the effect of mis-tuning of LQ2 and LQ3 (they could not go above -3.66 GeV/c, although production requires -4.0 GeV), and be used to determine Q2 of production runs. Production runs were taken at the same HRS settings: Left arm at RES kine #3 (mistuned). | These runs can be used to determine Q2 of production runs: Right arm at RES kine #5.                                                                                                                                                         |
|                          | 26332    | 5836                                                                        | raster off, sieve out                                                               |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
|                          | 26333    | 5837                                                                        | raster on, sieve out                                                                |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
|                          | 26334    | 5838                                                                        | raster on, left sieve in                                                            |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
|                          | 26335    | 5839                                                                        | raster off, left sieve in                                                           |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
|                          |          |                                                                             |                                                                                     |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |
|                          |          |                                                                             |                                                                                     |  |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                              |

Optics

|          |          |          |                                                                                                                  |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                   |
|----------|----------|----------|------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12/19/09 | 12.9 deg | 12.9 deg | Left at -3.66 GeV, Right at -3.10 GeV                                                                            | These runs should be used to compare with the next set of optics (5884-5887), in order to determine how mistuning LQ2 and LQ3 affect optics. This can help to study the systematics of RES kine #3 data (see above). | Right arm is the same as 12/18 runs but may warrant analysis for double-checking.                                                                                                                                                 |
|          | 26386    | 5876     | optics data, raster off                                                                                          |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                   |
|          | 26387    | 5877     | optics data, raster on                                                                                           |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                   |
|          | 26389    | 5878     | optics data, raster on, left sieve in                                                                            |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                   |
|          | 26390    | 5879     | optics data, raster off, left sieve in                                                                           |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                   |
|          |          |          |                                                                                                                  |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                   |
|          | 12.9 deg | 12.9 deg | LQ1 and LDipole at -3.660 GeV, LQ2 and LQ3 at -3.349 GeV; RQ1 at -3.136 GeV/c, RDipole, RQ2 and RQ3 at -3.1 GeV. | see above. Left arm data here is to study mis-tuning of LQ2 and LQ3.                                                                                                                                                 | Right arm is at a slightly mis-tuned setting from RES kine #5, comparison with 12/18 runs on the Right arm could tell us how this slight mistune affect data taking. (a few production runs were taken at this mistuned setting). |
|          | 26395    | 5884     | raster on, sieve-out, 19:34-                                                                                     |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                   |
|          | 26396    | 5885     | raster off, sieve-out, 19:40-                                                                                    |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                   |
|          | 26397    | 5886     | raster off, left sieve in, 19:52-                                                                                |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                   |
|          | 26398    | 5887     | raster on, left sieve in, 20:25-                                                                                 |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                   |
|          |          |          | Left at -3.55 GeV, Right at -3.10 GeV                                                                            |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                   |
|          | 26402    | 5891     | raster off, sieve-out                                                                                            |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                   |