

Tevatron abort kicker prefire simulations.

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Abstract

The possible accidental beam losses in the Tevatron are studied via realistic Monte Carlo simulations. Such a beam losses could be the consequence of an accidental prefire of one of the abort kicker modules.

According to the statistics at Tevatron Run-I (between 12/93 and 2/96), the abort kicker prefire had happened 7 times during 496 stores (20 months). A probability of two and more kickers prefire is much low. Recently, during Run-II the A \emptyset proton kickers prefired three times, causing the SC magnet quench and a 200 Rad instantaneous dose at the CDF detector. This damaged some of the Si ladders.

A two-turn particle tracking through the Tevatron lattice [1] in a presence of proton and antiproton orbit separation designed for Run II [2] with beam deflection by the proton and antiproton abort kickers is done with the STRUCT code [3]. The kicker waveform after kicker module prefire and accelerator aperture restrictions, including collimation system, was realistically simulated. It was shown that movable collimators located at the Tevatron A11 and A48 straight section in 7 and 4.4 mm down from the beam pipe center can protect the Tevatron magnets against the quench and eliminate losses in the B \emptyset and D \emptyset detectors.

In the Tevatron the abort gap is equal to $2.617\mu s$. Each of the proton and antiproton kickers consists of five identical modules. At one of the kicker module prefire the rest four ones of this kicker and five modules of another one are fired with a $2\mu s$ delay after prefire. The resulting kick is shown in Figure 1. If particles are bent by the kicker to a 60% of the total strength, the beam is clearly aborted to the dump. If angle is smaller, the bunch passes through the dump aperture without interaction, and is bended by the antiproton kicker before going downstream to the collider aperture.

1 Results of Simulations

A 396 ns (21 buckets) bunch spacing for 36X36 bunches is assumed. The abort gap is $2.617\mu s$ (139 buckets) long. Full kick from all 5 kickers is 1.38 mrad down. The

AO absorbers are at $Y = -16\text{ mm}$ from the beam pipe center (Figure 2). Tevatron aperture is shown in Tables 1. The circulating beam normalized emittance (95%) is $20\pi\text{ mm}\cdot\text{mrad}$. The accelerator intensity is $2.8 \cdot 10^{11}$ protons and $5.6 \cdot 10^{10}$ antiprotons per bunch. Every bunch is simulated by 1000 particles with Gaussian distributions. Each particle lost at the simulations corresponds to $2.8 \cdot 10^8$ protons or $5.6 \cdot 10^7$ antiprotons lost in the real machine.

The kicker waveform shown in Figure 3 is an approximation of the measured kicker waveform. Thirty two bunches are taken in the simulations with the first one located at 396 ns after the moment of kicker module prefire.

The beam trajectories for bunches number 7-16 at the proton kicker prefire are shown in Figures 4 and 5. Bunch number 8 is lost at the vertical separator behind the $B\emptyset$ IP, bunches number 9 and 10 are lost at the vertical separator upstream of the $B\emptyset$ IP and bunches number 11 and 12 - at the aperture of dipoles downstream of the $A\emptyset$ (Figure 5). Bunches 1-7 and 15-36 are lost in the abort dump, and bunches number 13 and 14 - at the aperture of antiproton kicker.

The beam trajectories at antiproton kicker prefire for bunches number 7,8 and 9 are shown in Figures 6 and 7. Bunches number 8 and 9 are lost at the vertical separator and low- β quad upstream of the $B\emptyset$ IP and bunches number 10-13 - at the aperture of dipoles downstream of the $A\emptyset$ (Figure 7). Bunches 1-7 and 16-36 are lost in the abort dump, and bunches number 14 and 15 - at the aperture of antiproton kicker.

Proton bunches loss location and beam loss distribution along the accelerator at the proton and antiproton kicker prefire without collimators are shown in Figures 8, 9 and Table 2.

As shown in Figure 4, 10, 11 and Table 3, a movable collimator located at the Tevatron A11 straight section in 7 mm ($20\sigma_y$) down from the beam pipe center perfectly protects SC dipoles behind the $A\emptyset$ against quench and decreases losses in the $B\emptyset$ detector but can not eliminate them at the antiproton kicker prefire. Bunch number 8 is intercepted by the A11 collimator only partially in this case. Figure 12 and Table 4 and 5 shows that collimator A48 located upstream of the CDF Roman Pots in 4.4 mm ($20\sigma_y$) down from the beam pipe center can eliminate losses in the $B\emptyset$ but can not protect dipoles behind the $A\emptyset$ from the antiproton kicker prefire. Only combination of both A11 and A48 collimators can protect the Tevatron magnets against the quench and eliminate losses in the $B\emptyset$ detector.

The collimator A48 located at $13\sigma_x$ and $20\sigma_y$ upstream of the last three dipoles in front of the IP can be used both for the Tevatron protection from the abort kicker prefire and for the main CDF and $D\emptyset$ detectors protection from nuclear elastic beam-gas scattering in the ring [4]. This collimator can be placed at $X = 9.2\text{ mm}$ and $Y = 4.4\text{ mm}$ upstream or at $X = 11.1\text{ mm}$ and $Y = 6.3\text{ mm}$ downstream of the CDF Roman Pots. Unfortunately collimator located downstream of the Roman Pots drastically decreases their horizontal acceptance. There are two possible solutions: put this collimator upstream of the Roman Pots or downstream of them but only from

three sides of the circulating beams (Figure 13).

In the first case one should expect increased background in the Roman Pots originated by the halo particles in the collimator. This background may be removed from statistic by timing (different time for proton halo particles and antiprotons scattered in the IP).

In the second case the efficiency of protection from nuclear elastic beam-gas scattering decreases by approximately a factor of 5. Additional concern is the background from secondaries originated in this collimator by the antiproton beam halo and antiprotons scattered in the IP to large angle. This background can not be removed from the statistics as it has the same time as the registered particles. The results of calculations presented in the paper are related to the first case of collimator location upstream of the CDF and DØ Roman Pots.

Proton beam loss distribution depends on the moment of prefire with respect to the bunches position. Proton beam loss at the proton and antiproton abort kicker prefire with collimators A11 and A48 in a working position are shown in Table 6 for the first bunch located in 0.198 μ sec after the kicker prefire. About 30% of the bunch intensity is lost in the vertical separator behind the IP at the antiproton kicker prefire.

Variation of the delay from the moment of prefire and the rest modules fire effects the similar way. Proton beam loss at the abort kicker prefire with collimators A11 and A48 in a working position are shown in Table 7 and 8 for the delay of 1.2 μ sec and 1.0 μ sec. About 30% of the bunch intensity is lost in the vertical separator behind the IP. This can be improved by collimators positioning by $1 \sigma_y$ closer to the beam.

Antiproton beam loss distributions at the proton and antiproton abort kicker prefire are shown in Figures 8, 9 and Table 9. Three antiproton bunches are lost in the three dipoles upstream of the AØ, five bunches are lost in the collimator F17, one - at the aperture of the proton kicker and the rest are lost in the abort dump.

References

- [1] J.A. Johnstone, Tevatron optics with magnet moves for Roman pots at CDF, FERMILAB-TM-2157, Aug 2001.
- [2] P. Bagley, Beam Separation for the Tevatron Run-II. Private communication, December 1997.
- [3] I. Baishev, A. Drozhdin, and N. Mokhov, ‘STRUCT Program User’s Reference Manual’, SSCL-MAN-0034 (1994), <http://www-ap.fnal.gov/~drozhdin/>
- [4] A.I. Drozhdin, V.A. Lebedev, N.V. Mokhov, L. Nicolas, S.I. Striganov, A. Tollestrup, Backgrounds in the Tevatron Collider Detectors due to Nuclear Elastic Beam-Gas Scattering, presented to PAC-03.

| element | aperture |
|-------------------------------------|----------------|
| Proton and antiproton kickers | D44 mm |
| AØabsorbers | D56 mm |
| Beam pipe up/downstream of absorber | D68.6 mm |
| Beam pipe in the quads and drifts | D68.6 mm |
| Beam pipe in the dipoles | 63 X 63 mm |
| Beam pipe in the separators | 50.8 X 50.8 mm |

Table 1: Tevatron aperture used in the calculations.

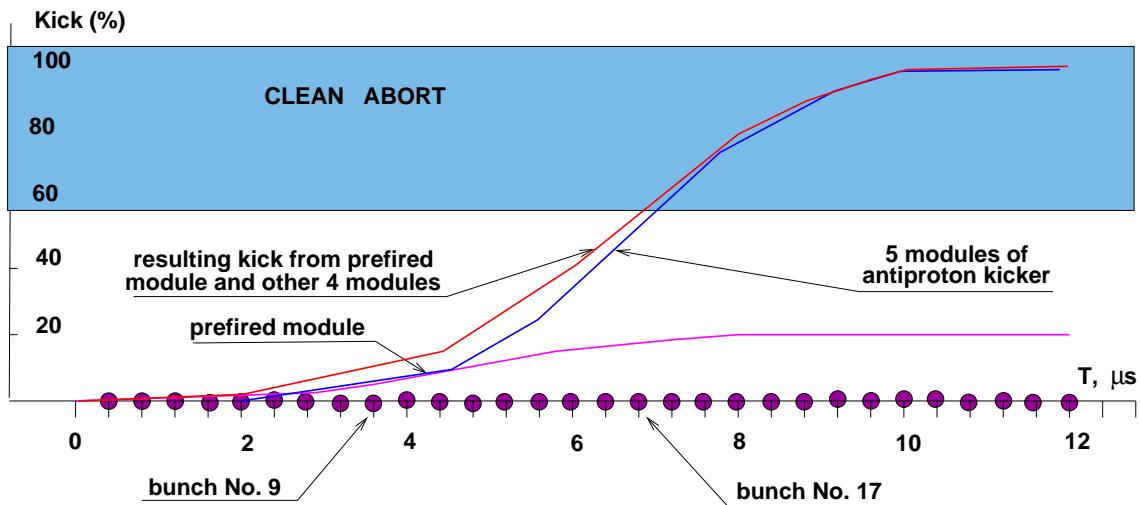


Figure 1: Tevatron abort kicker wave form at the proton kicker prefire.

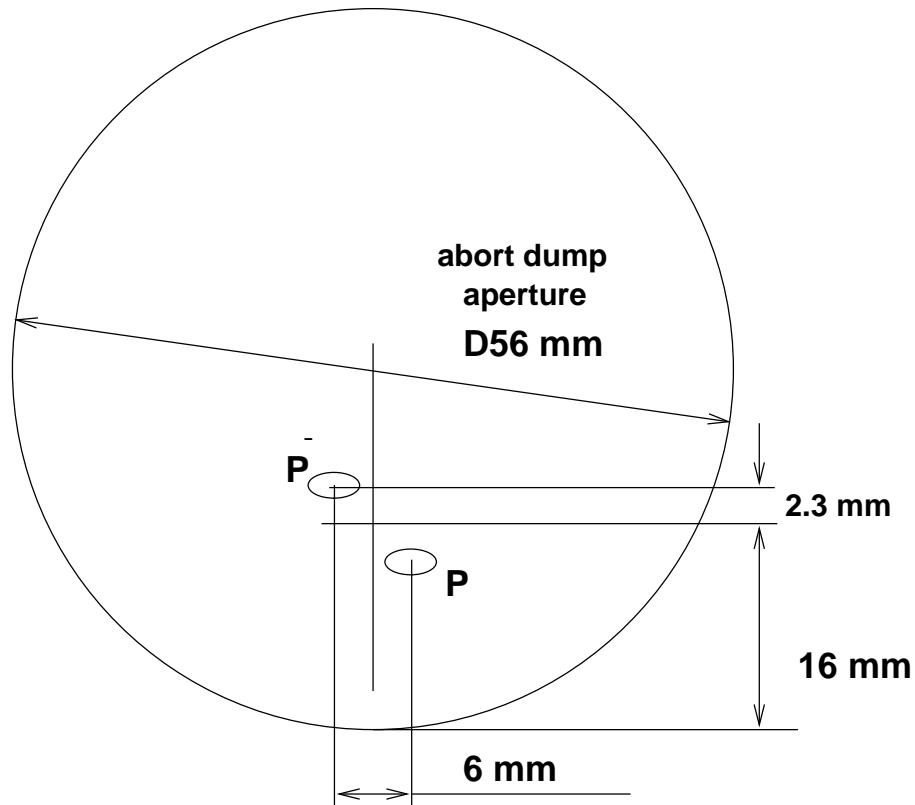


Figure 2: Proton and antiproton closed orbits in the middle of abort dump.

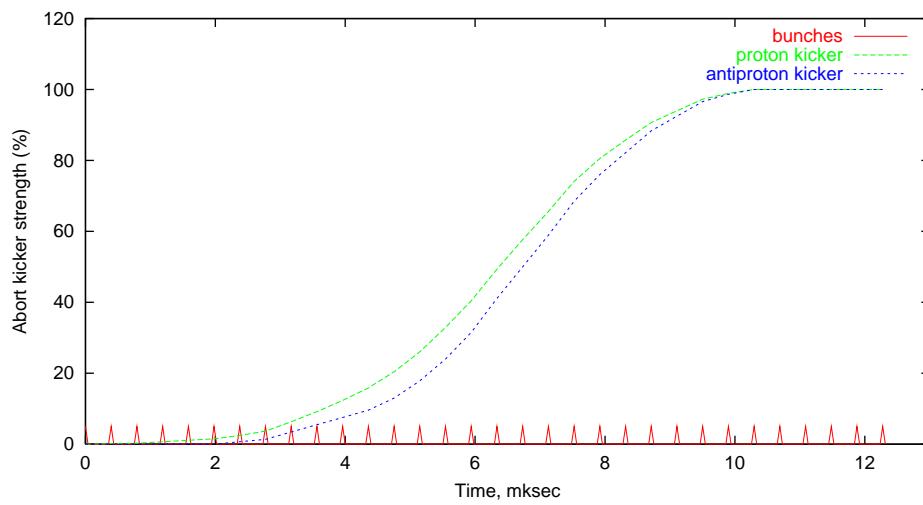


Figure 3: Tevatron proton and antiproton abort kick wave form at the proton kicker prefire.

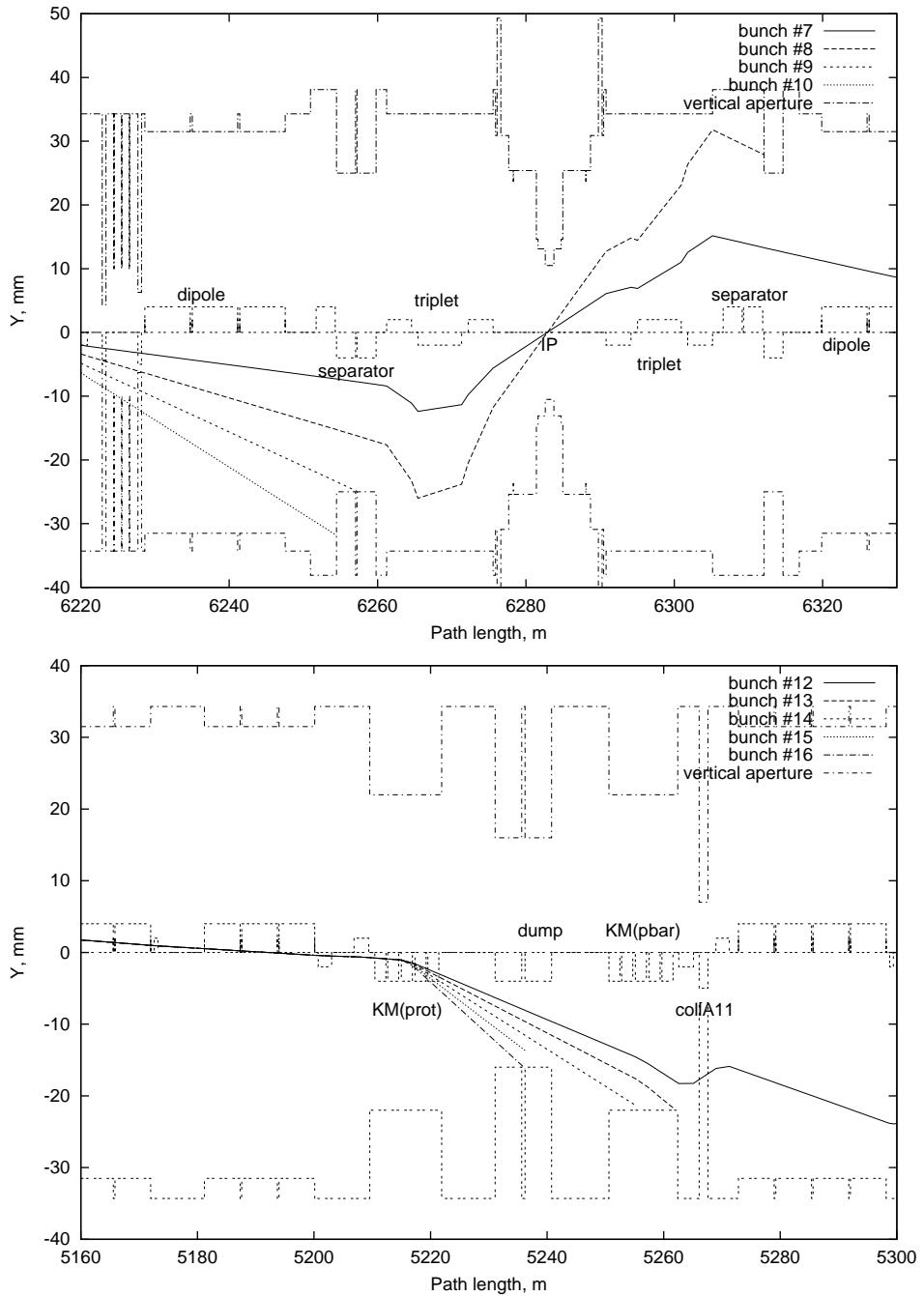


Figure 4: Trajectory of the 7-th to 10-th bunches (top) and 12-th to 16-th bunches (bottom) at proton kicker prefire at 1000 GeV.

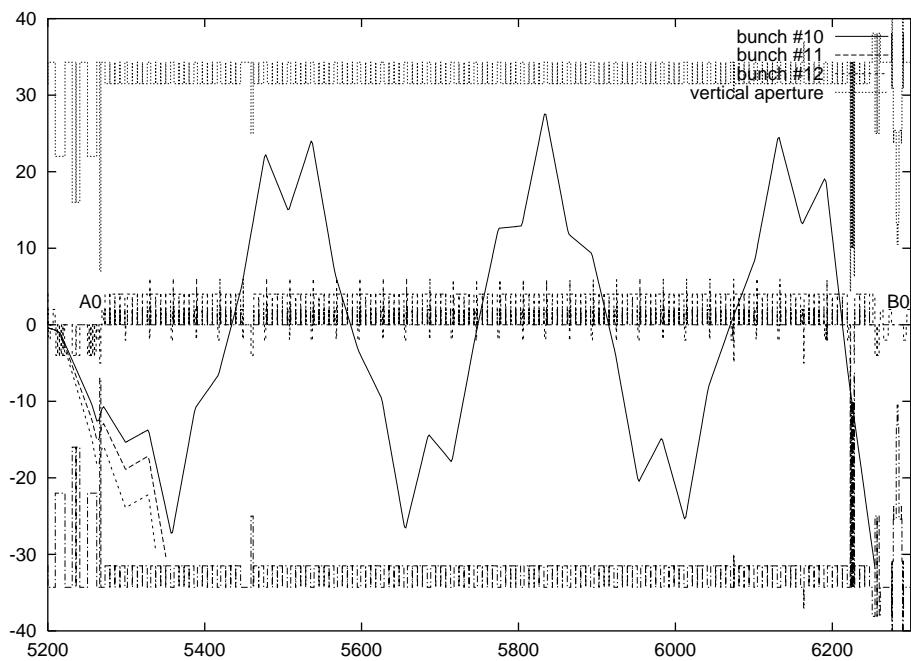


Figure 5: Trajectory of the 10-th to 12-th bunch at proton kicker prefire at 1000 GeV.

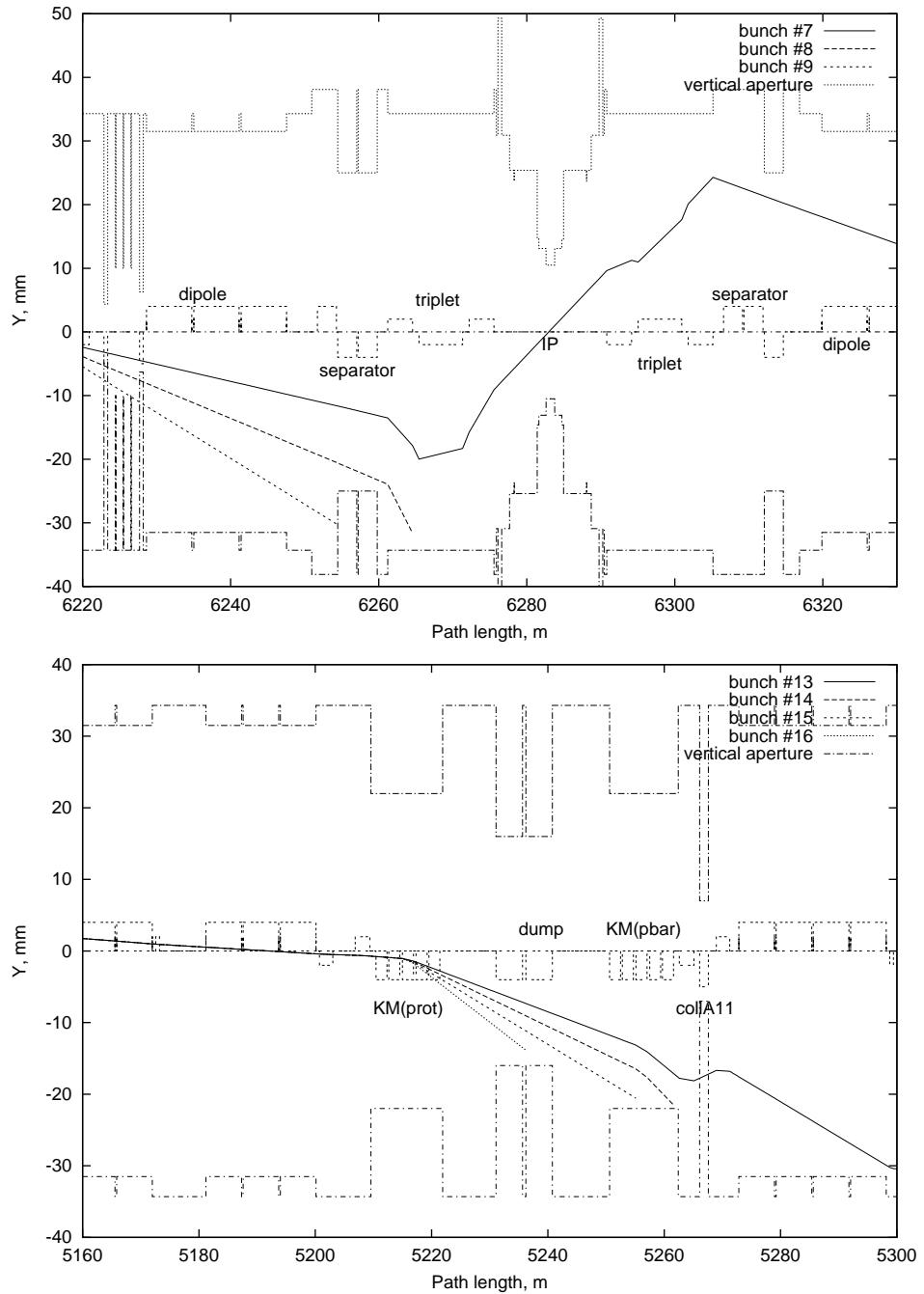


Figure 6: Trajectory of the 7-th to 9-th bunch (top) and 13-th to 16-th bunches (bottom) at antiproton kicker prefire at 1000 GeV.

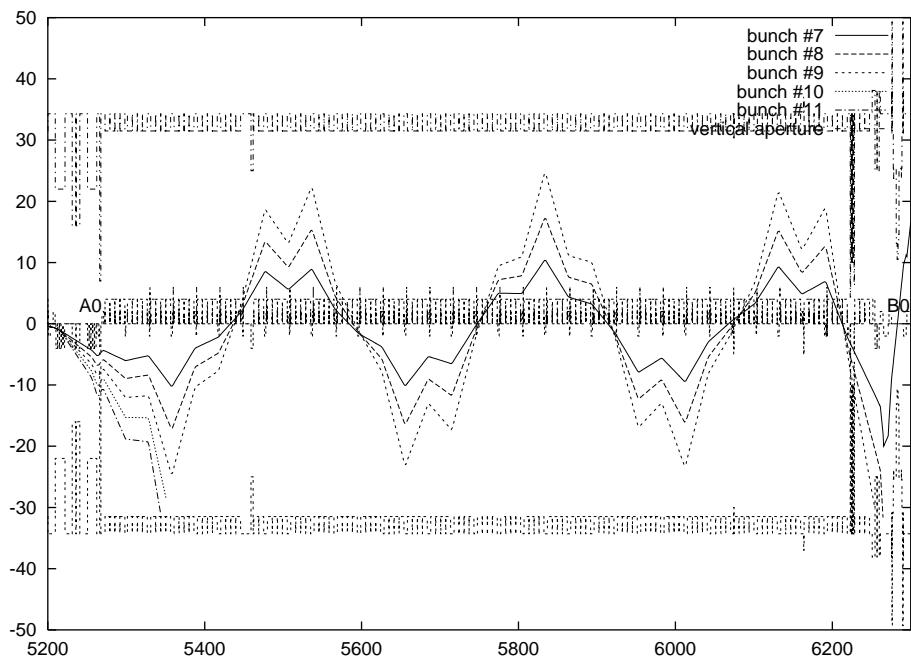


Figure 7: Trajectory of the 7-th to 11-th bunch at antiproton kicker prefire at 1000 GeV.

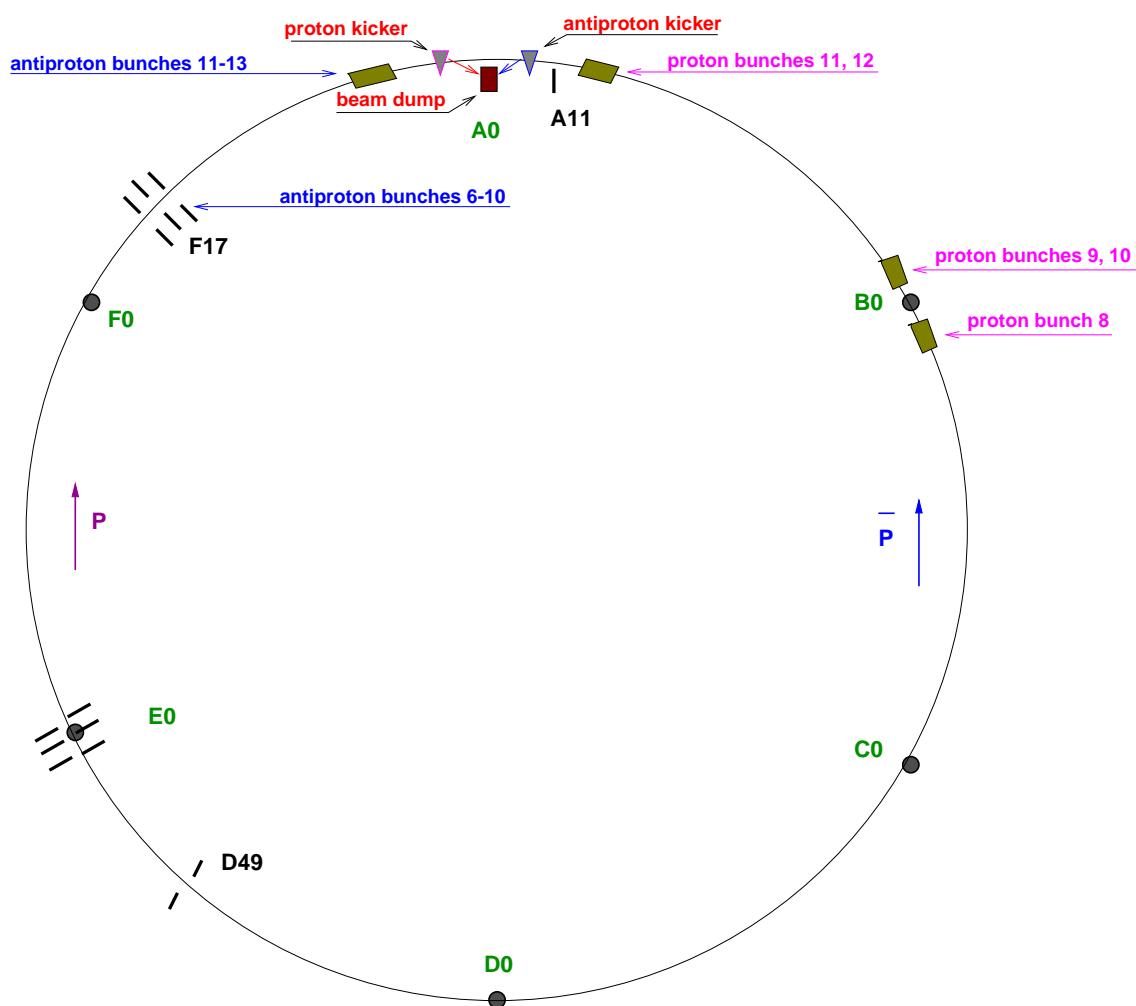


Figure 8: Particle loss location at the Tevatron proton kicker prefire.

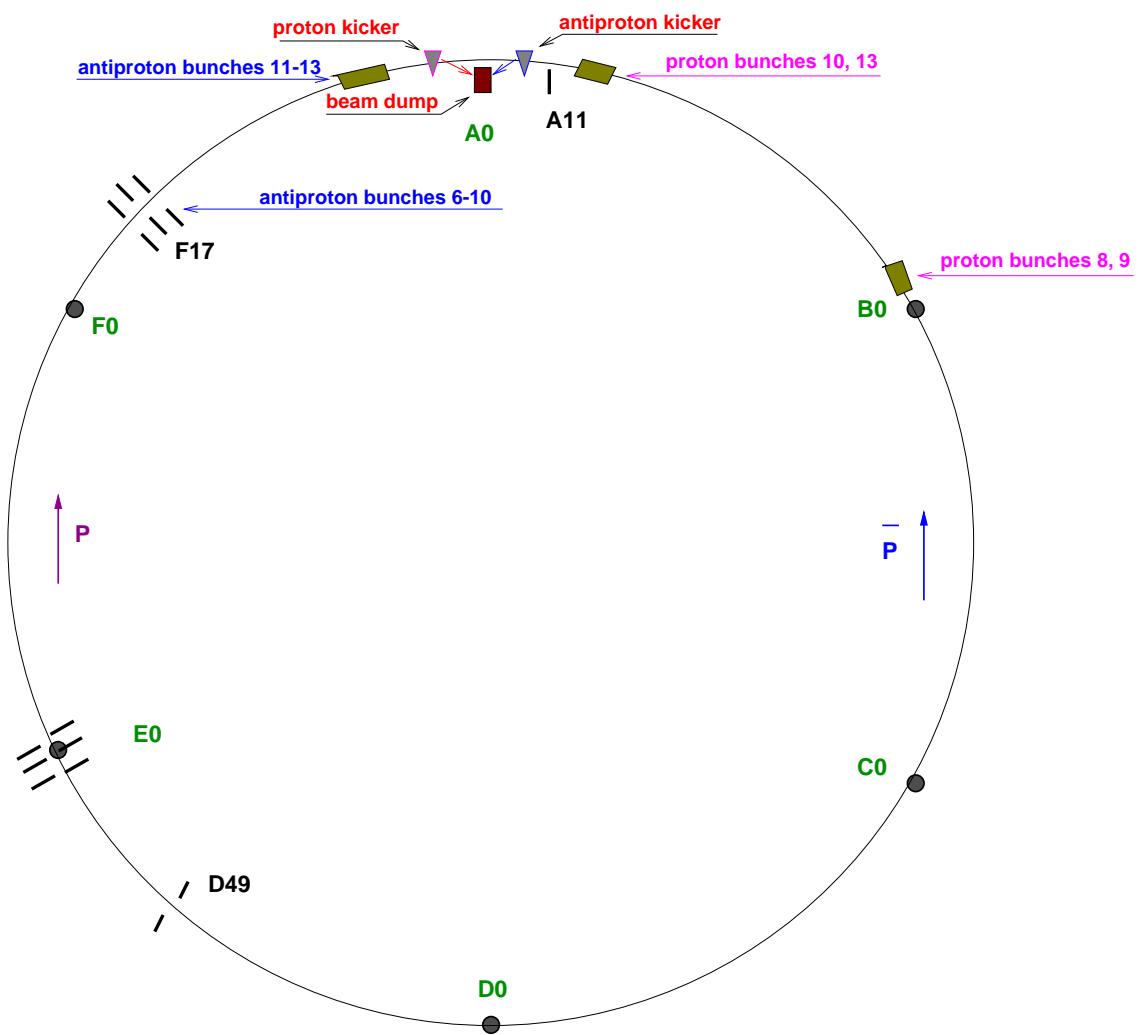


Figure 9: Particle loss location at the Tevatron antiproton kicker prefire.

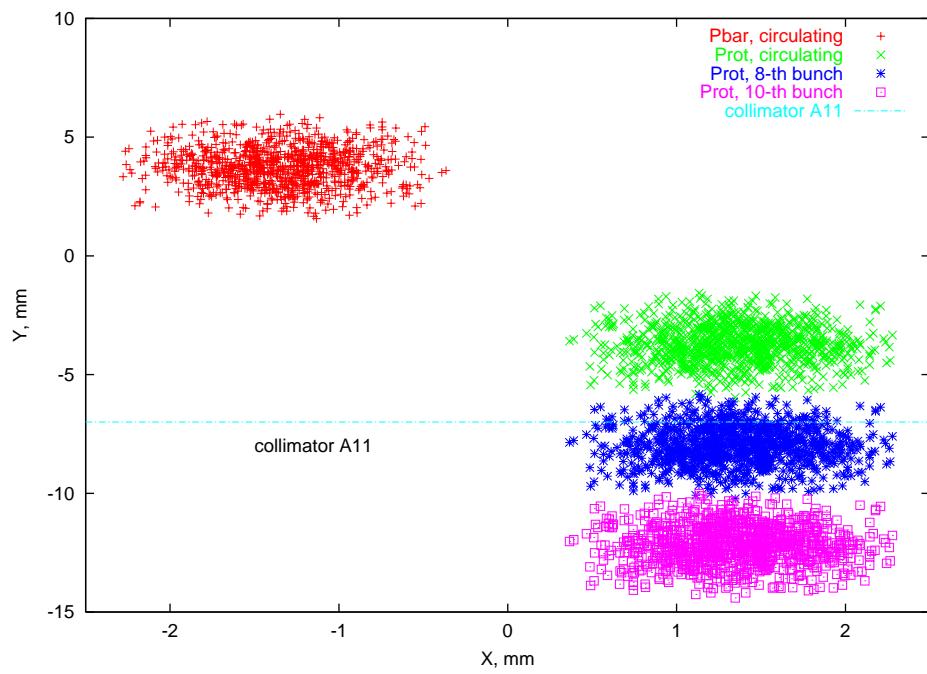


Figure 10: Position of the circulating beams and 8-th and 10-th bunches at the A11 collimator entrance at proton kicker prefire.

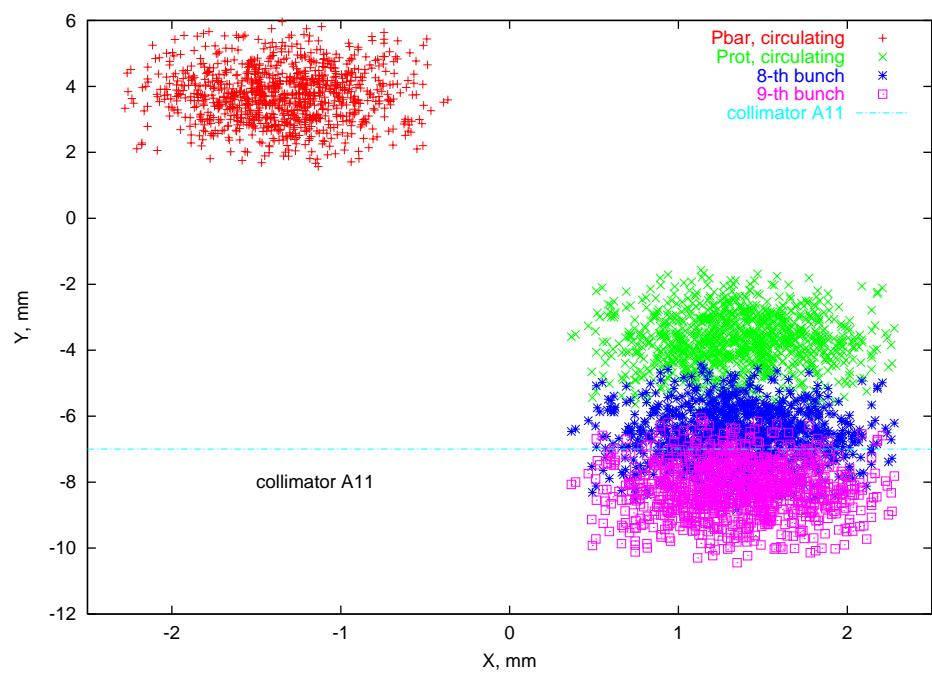


Figure 11: Position of the circulating beams and 8-th and 9-th bunches at the A11 collimator entrance at antiproton kicker prefire.

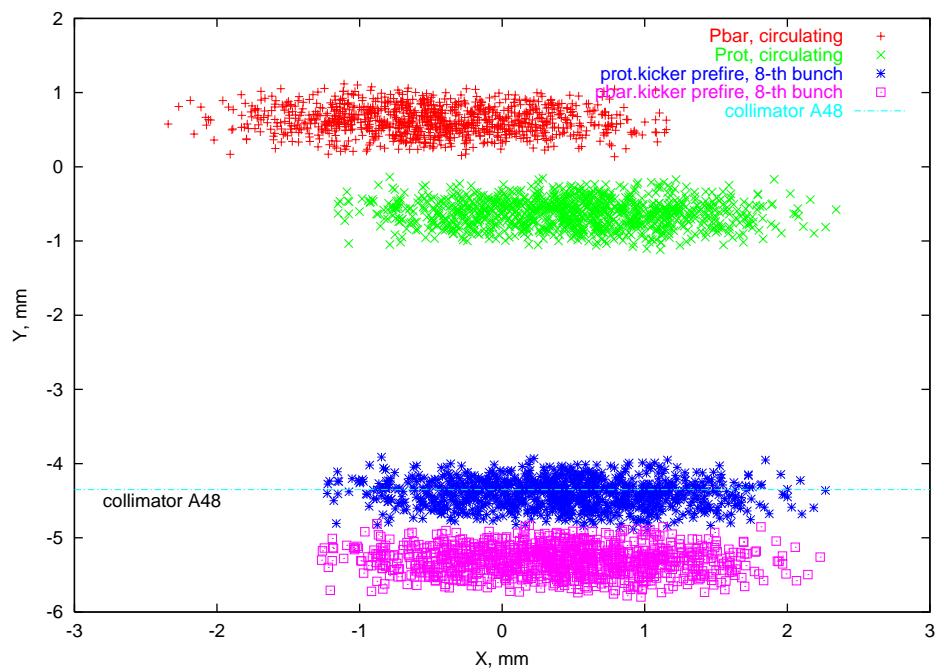


Figure 12: Position of the circulating beams and 8-th bunch at the A48 collimator entrance at proton and antiproton kicker prefire.

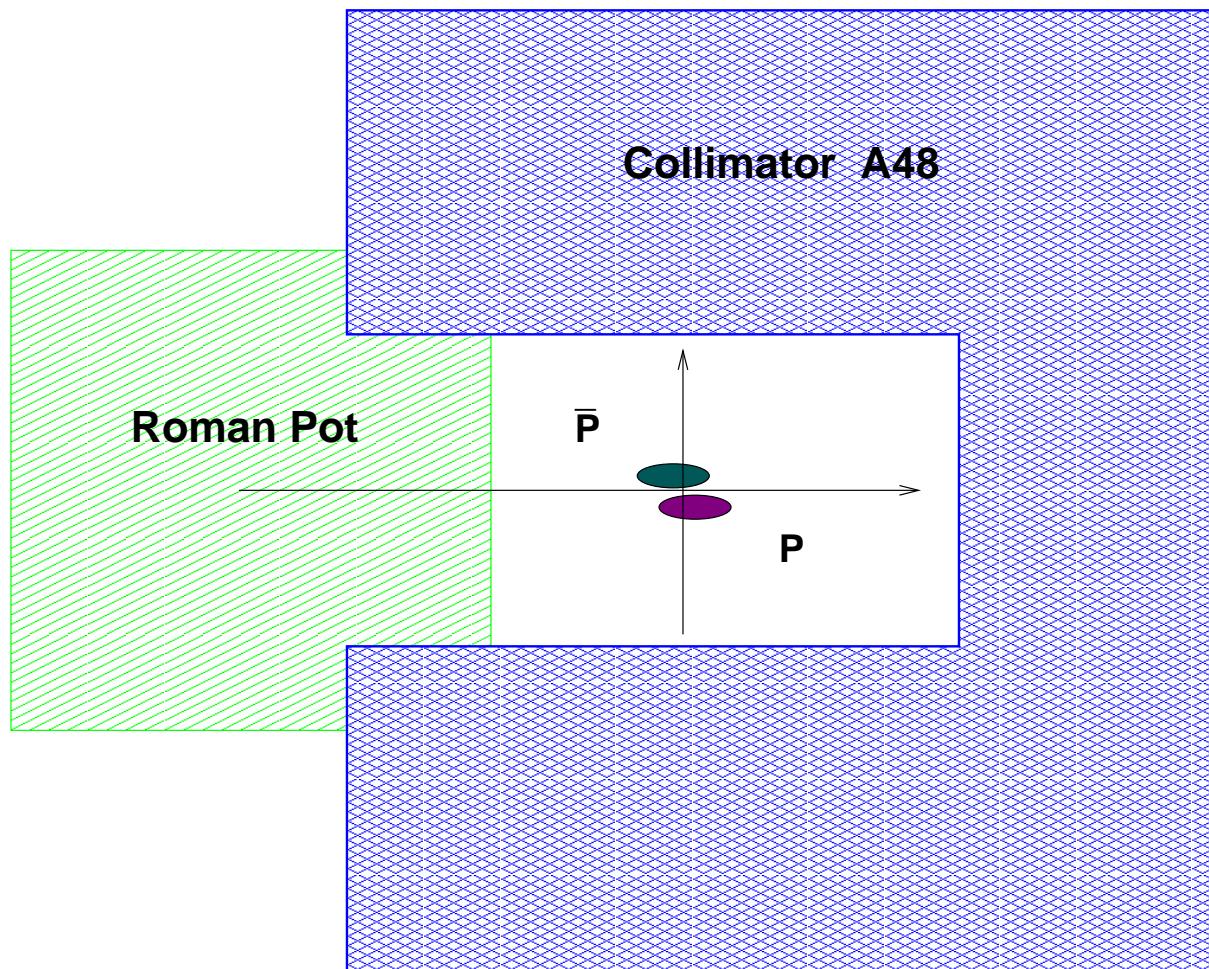


Figure 13: Collimator A48 downstream of the Roman Pots.

| path length m | element number | kinetic energy loss | | element | aperture | | element length m | name |
|------------------|----------------|---------------------|-------------|-------------|----------|-------|---------------------|---------|
| | | PAK prefire | AAK prefire | | hor. | vert. | | |
| 18.621 | 15 | 48.9540 | | quadrupole | 34.30 | 34.30 | 0.8763 | DTRIPB |
| 21.974 | 16 | 110.8959 | 225.7880 | quadrupole | 34.30 | 34.30 | 3.3528 | CB0Q2D |
| 31.477 | 30 | 838.2132 | 8.9916 | separator | 38.10 | 25.00 | 2.5718 | B11VESE |
| 2061.779 | 2088 | 21.4261 | | roman pot | 10.00 | 10.00 | 0.0377 | ROMA2S |
| 2071.061 | 2102 | 0.9991 | 20.5314 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA2Q |
| 2101.880 | 2123 | 0.7471 | | str. sect. | 34.30 | 34.30 | 0.1206 | DV2H |
| 2117.846 | 2140 | 24.4609 | | roman pot | 10.00 | 10.00 | 0.0377 | ROMP1Q |
| 2127.126 | 2153 | 20.1495 | | roman pot | 10.00 | 10.00 | 0.0377 | ROMP1S |
| 2143.595 | 2172 | 1.4417 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2149.996 | 2177 | 3.4511 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2156.397 | 2182 | 1.8009 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2172.474 | 2199 | 0.9526 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2178.875 | 2205 | 0.9663 | | str. sect. | 34.30 | 34.30 | 0.0000 | BENDQ |
| 2185.276 | 2209 | 0.9971 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2195.817 | 2225 | 2.9971 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2202.218 | 2230 | 1.9981 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2208.619 | 2235 | 4.9951 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2215.019 | 2240 | 1.9980 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2231.961 | 2258 | 1.9981 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2244.763 | 2268 | 0.9990 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2333.574 | 2369 | 0.9990 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2423.223 | 2461 | 0.9990 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 3083.420 | 3139 | 0.9990 | | separator | 25.00 | 38.10 | 2.5718 | D48HESE |
| 3109.904 | 3170 | 5.9969 | | collimator | 20.00 | 20.00 | 0.0050 | colD49 |
| 3122.833 | 3195 | 0.9992 | | collimator | 20.00 | 20.00 | 0.0025 | colE01 |
| 3124.328 | 3196 | 11.9839 | | collimator | 20.00 | 20.00 | 1.4950 | colE01 |
| 3162.666 | 3226 | 43.9587 | 21.9787 | collimator | 20.00 | 20.00 | 1.5000 | colE02 |
| 4405.368 | 4488 | 0.9990 | | collimator | 20.00 | 20.00 | 1.5000 | coF171 |
| 4407.219 | 4494 | 46.9551 | | collimator | 20.00 | 20.00 | 1.5000 | coF172 |
| 5235.636 | 5347 | 23420.0153 | 22289.0658 | AØdump | 28.00 | 28.00 | 4.5593 | DA0PAB |
| 5240.772 | 5350 | 1392.6927 | 1375.7086 | AØdump | 28.00 | 28.00 | 4.5593 | DA0PBAB |
| 5252.494 | 5354 | 163.8462 | 99.9062 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5252.799 | 5355 | 10.9897 | | pbar kicker | 22.00 | 22.00 | 0.3048 | D12IN |
| 5254.692 | 5356 | 143.8650 | 17.9831 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5255.149 | 5357 | 68.9353 | 23.9775 | pbar kicker | 22.00 | 22.00 | 0.4572 | D18IN |
| 5257.041 | 5358 | 540.4926 | 485.5442 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5257.498 | 5359 | 113.8931 | 205.8068 | pbar kicker | 22.00 | 22.00 | 0.4572 | D18IN |
| 5259.391 | 5360 | 145.8631 | 265.7505 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5259.695 | 5361 | 22.9784 | 2.9972 | pbar kicker | 22.00 | 22.00 | 0.3048 | D12IN |
| 5261.588 | 5362 | 349.6718 | 321.6980 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5262.403 | 5363 | 211.8012 | 278.7383 | pbar kicker | 22.00 | 22.00 | 0.8150 | DA0SP12 |
| 5291.759 | 5394 | 395.6286 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5307.670 | 5413 | 78.9259 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5314.071 | 5418 | 83.9212 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5320.471 | 5423 | 167.8424 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5326.872 | 5428 | 328.6915 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5330.635 | 5438 | 214.7984 | | str. sect. | 34.30 | 34.30 | 0.4064 | DPACKU2 |
| 5331.152 | 5440 | 124.8828 | | str. sect. | 34.30 | 34.30 | 0.5175 | DPACKOU |
| 5337.413 | 5443 | 394.6296 | 999.0622 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5343.814 | 5448 | 999.0622 | 124.8828 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5350.215 | 5453 | 0.9991 | 874.1794 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5356.616 | 5458 | 998.0631 | 792.2563 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5832.510 | 5942 | 2.9972 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 6247.548 | 6376 | 203.8087 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 6257.044 | 6394 | 1427.6598 | 999.0622 | separator | 38.10 | 25.00 | 2.5718 | A49VESE |
| 6259.803 | 6396 | 461.5667 | 55.9475 | separator | 38.10 | 25.00 | 2.5718 | A49VESE |
| 6265.446 | 6407 | 108.8978 | 668.3726 | quadrupole | 34.30 | 34.30 | 0.8763 | DTRIPB |

Table 2: Proton beam loss at the proton (3-d column) and antiproton (4-th column) abort kicker prefire without collimators A11 and A48. Roman pots are in a working position. The first bunch is in 0.396 μ sec after the kicker prefire. The delay from the moment of prefire and the rest modules start is 2 μ sec. Each unit of kinetic energy loss (column No.3 and 4) corresponds to $2.8 \cdot 10^8$ particles lost.

| path length m | element number | kinetic energy loss | | element | aperture | | element length m | name |
|---------------------|-------------------|-----------------------|-------------|-------------|----------|-------|------------------------|---------|
| | | PAK prefire GeV/Pc | AAK prefire | | hor. | vert. | | |
| 18.621 | 15 | 0.0000 | 23.9773 | quadrupole | 34.30 | 34.30 | 0.8763 | DTRIPB |
| 21.974 | 16 | 42.9575 | 102.9030 | quadrupole | 34.30 | 34.30 | 3.3528 | CB0Q2D |
| 31.477 | 30 | 95.9099 | 10.9895 | separator | 38.10 | 25.00 | 2.5718 | B11VESE |
| 2061.742 | 2087 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA1S |
| 2061.779 | 2088 | 0.0000 | 23.4244 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA2S |
| 2071.023 | 2101 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA1Q |
| 2071.061 | 2102 | 0.0000 | 19.5322 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA2Q |
| 2117.846 | 2140 | 0.0000 | 24.2018 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP1Q |
| 2117.884 | 2141 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP2Q |
| 2127.126 | 2153 | 0.0000 | 20.1475 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP1S |
| 2127.164 | 2154 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP2S |
| 2143.595 | 2172 | 0.0000 | 1.4508 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2149.996 | 2177 | 0.0000 | 2.5679 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2156.397 | 2182 | 0.0000 | 2.6839 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2166.074 | 2194 | 0.0000 | 0.9990 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2172.474 | 2199 | 0.0000 | 1.9496 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2178.875 | 2205 | 0.0000 | 0.9663 | str. sect. | 34.30 | 34.30 | 0.0000 | BENDQ |
| 2195.817 | 2225 | 0.0000 | 2.9971 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2202.218 | 2230 | 0.0000 | 3.9961 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2208.619 | 2235 | 0.0000 | 2.9971 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2215.019 | 2240 | 0.0000 | 1.9981 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2231.961 | 2258 | 0.0000 | 0.9990 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2304.250 | 2328 | 0.0000 | 0.9990 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2423.223 | 2461 | 0.0000 | 0.9990 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2512.454 | 2550 | 0.0000 | 1.9981 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 3083.420 | 3139 | 0.0000 | 0.9990 | separator | 25.00 | 38.10 | 2.5718 | D48HESE |
| 3109.904 | 3170 | 0.0000 | 5.9947 | collimator | 20.00 | 20.00 | 0.0050 | colD49 |
| 3122.833 | 3195 | 0.0000 | 1.9982 | collimator | 20.00 | 20.00 | 0.0025 | colE01 |
| 3124.328 | 3196 | 0.0000 | 10.9870 | collimator | 20.00 | 20.00 | 1.4950 | colE01 |
| 3162.666 | 3226 | 0.0000 | 23.1317 | collimator | 20.00 | 20.00 | 1.5000 | colE02 |
| 3164.520 | 3232 | 1.9954 | | collimator | 20.00 | 20.00 | 1.5000 | cole03 |
| 3197.194 | 3274 | 0.0000 | 0.8450 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 4405.368 | 4488 | 0.0000 | 1.9977 | collimator | 20.00 | 20.00 | 1.5000 | coF171 |
| 4407.219 | 4494 | 0.0000 | 33.9665 | collimator | 20.00 | 20.00 | 1.5000 | coF172 |
| 5235.636 | 5347 | 23246.1764 | 22331.0258 | AØdump | 28.00 | 28.00 | 4.5593 | DA0PAB |
| 5240.772 | 5350 | 1406.6795 | 1341.7405 | AØdump | 28.00 | 28.00 | 4.5593 | DA0PBAB |
| 5252.494 | 5354 | 171.8387 | 102.9034 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5252.799 | 5355 | 9.9906 | | pbar kicker | 22.00 | 22.00 | 0.3048 | D12IN |
| 5254.692 | 5356 | 157.8518 | 24.9766 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5255.149 | 5357 | 70.9334 | 20.9803 | pbar kicker | 22.00 | 22.00 | 0.4572 | D18IN |
| 5257.041 | 5358 | 543.4898 | 491.5386 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5257.498 | 5359 | 122.8846 | 212.8002 | pbar kicker | 22.00 | 22.00 | 0.4572 | D18IN |
| 5259.391 | 5360 | 123.8837 | 248.7665 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5259.695 | 5361 | 16.9841 | 1.9981 | pbar kicker | 22.00 | 22.00 | 0.3048 | D12IN |
| 5261.588 | 5362 | 337.6830 | 317.7018 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5262.403 | 5363 | 235.7787 | 286.7308 | pbar kicker | 22.00 | 22.00 | 0.8150 | DA0SP12 |
| 5267.588 | 5369 | 5383.1027 | 5604.7516 | collimator | 20.00 | 7.00 | 1.5000 | collA11 |
| 5291.759 | 5394 | 0.8565 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5350.215 | 5453 | 0.0000 | 0.9923 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5426.644 | 5533 | 0.9929 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 6224.452 | 6348 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0010 | RPOT3 |
| 6224.493 | 6349 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0410 | RPOT3 |
| 6225.494 | 6351 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0010 | RPOT2 |
| 6225.535 | 6352 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0410 | RPOT2 |
| 6241.148 | 6372 | 0.0000 | 0.9984 | roman pot | 34.30 | 34.30 | 0.0000 | BENDQ |
| 6257.044 | 6394 | 0.0000 | 78.9233 | separator | 38.10 | 25.00 | 2.5718 | A49VESE |
| 6259.803 | 6396 | 0.0000 | 47.9550 | separator | 38.10 | 25.00 | 2.5718 | A49VESE |
| 6265.446 | 6407 | 0.0000 | 522.5093 | quadrupole | 34.30 | 34.30 | 0.8763 | DTRIPB |

Table 3: Proton beam loss at the proton (3-d column) and antiproton (4-th column) abort kicker prefire with collimators A11. Roman pots are in a working position. The first bunch is in 0.396 μ sec after the kicker prefire. The delay from the moment of prefire and the rest modules start is 2 μ sec. Each unit of kinetic energy loss (column No.3 and 4) corresponds to $2.8 \cdot 10^8$ particles lost.

| path length m | element number | kinetic energy loss | | element | aperture | | element length m | name |
|------------------|----------------|-----------------------|-------------|-------------|----------|-------|---------------------|---------|
| | | PAK prefire GeV/Pc | AAK prefire | | hor. | vert. | | |
| 18.621 | 15 | 0.0000 | 1.9967 | quadrupole | 34.30 | 34.30 | 0.8763 | DTRIPB |
| 21.974 | 16 | 4.9932 | 8.9845 | quadrupole | 34.30 | 34.30 | 3.3528 | CB0Q2D |
| 31.477 | 30 | 33.9662 | 10.9884 | separator | 38.10 | 25.00 | 2.5718 | B11VESE |
| 107.822 | 110 | 0.0000 | 0.9697 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 150.367 | 148 | 0.0000 | 0.9977 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 203.453 | 203 | 0.0000 | 0.9981 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2034.595 | 2040 | 0.9980 | 0.0000 | collimator | 9.15 | 4.35 | 0.5000 | dumpD03 |
| 2061.666 | 2085 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA1S |
| 2061.742 | 2087 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA1S |
| 2061.779 | 2088 | 0.0000 | 23.4244 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA2S |
| 2064.856 | 2091 | 0.0000 | 0.9976 | separator | 25.00 | 38.10 | 2.5718 | C49HESE |
| 2071.023 | 2101 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA1Q |
| 2071.061 | 2102 | 0.0000 | 19.5322 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA2Q |
| 2117.846 | 2140 | 0.0000 | 24.2018 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP1Q |
| 2117.884 | 2141 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP2Q |
| 2127.126 | 2153 | 0.0000 | 20.1475 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP1S |
| 2127.164 | 2154 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP2S |
| 2143.595 | 2172 | 0.0000 | 1.4508 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2149.996 | 2177 | 0.0000 | 2.5679 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2156.397 | 2182 | 0.0000 | 2.6839 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2166.074 | 2194 | 0.0000 | 0.9990 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2172.474 | 2199 | 0.0000 | 1.9496 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2178.875 | 2205 | 0.0000 | 0.9663 | str. sect. | 34.30 | 34.30 | 0.0000 | BENDQ |
| 2195.817 | 2225 | 0.0000 | 2.9971 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2202.218 | 2230 | 0.0000 | 3.9961 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2208.619 | 2235 | 0.0000 | 2.9971 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2215.019 | 2240 | 0.0000 | 1.9981 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2231.961 | 2258 | 0.0000 | 0.9990 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2304.250 | 2328 | 0.0000 | 0.9990 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2423.223 | 2461 | 0.0000 | 0.9990 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2512.454 | 2550 | 0.0000 | 1.9981 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 3083.420 | 3139 | 0.0000 | 0.9990 | separator | 25.00 | 38.10 | 2.5718 | D48HESE |
| 3109.904 | 3170 | 0.0000 | 5.9947 | collimator | 20.00 | 20.00 | 0.0050 | colD49 |
| 3122.833 | 3195 | 0.0000 | 1.9982 | collimator | 20.00 | 20.00 | 0.0025 | colE01 |
| 3124.328 | 3196 | 0.0000 | 10.9870 | collimator | 20.00 | 20.00 | 1.4950 | colE01 |
| 3162.666 | 3226 | 1.9977 | 23.1317 | collimator | 20.00 | 20.00 | 1.5000 | colE02 |
| 3164.520 | 3232 | 1.9954 | 0.9987 | collimator | 20.00 | 20.00 | 1.5000 | cole03 |
| 3197.194 | 3274 | 0.0000 | 0.8450 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 4405.368 | 4488 | 0.0000 | 0.9990 | collimator | 20.00 | 20.00 | 1.5000 | coF171 |
| 4407.219 | 4494 | 0.0000 | 33.9665 | collimator | 20.00 | 20.00 | 1.5000 | coF172 |
| 5235.636 | 5347 | 23259.1642 | 22311.0450 | AØdump | 28.00 | 28.00 | 4.5593 | DA0PAB |
| 5240.772 | 5350 | 1398.6870 | 1353.7292 | AØdump | 28.00 | 28.00 | 4.5593 | DA0PBAB |
| 5252.494 | 5354 | 173.8368 | 109.8968 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5252.799 | 5355 | 2.9972 | 0.0000 | pbar kicker | 22.00 | 22.00 | 0.3048 | D12IN |
| 5254.692 | 5356 | 164.8453 | 17.9831 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5255.149 | 5357 | 77.9268 | 23.9775 | pbar kicker | 22.00 | 22.00 | 0.4572 | D18IN |
| 5257.041 | 5358 | 545.4879 | 513.5180 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5257.498 | 5359 | 101.9043 | 195.8162 | pbar kicker | 22.00 | 22.00 | 0.4572 | D18IN |
| 5259.391 | 5360 | 116.8903 | 247.7674 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5259.695 | 5361 | 12.9878 | 4.9953 | pbar kicker | 22.00 | 22.00 | 0.3048 | D12IN |
| 5261.588 | 5362 | 320.6990 | 319.6999 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5262.403 | 5363 | 223.7899 | 285.7318 | pbar kicker | 22.00 | 22.00 | 0.8150 | DA0SP12 |
| 5267.588 | 5369 | 5428.0605 | 5596.0470 | collimator | 20.00 | 7.00 | 1.5000 | collA11 |
| 5291.759 | 5394 | 0.8565 | 0.7113 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5350.215 | 5453 | 0.0000 | 0.9923 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5426.644 | 5533 | 0.9929 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 6223.390 | 6343 | 95.1165 | 748.3185 | collimator | 9.15 | 4.35 | 0.5000 | dumpB03 |
| 6247.548 | 6376 | 0.7976 | 3.0893 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 6247.548 | 6377 | 0.0000 | 0.9443 | str. sect. | 34.30 | 34.30 | 0.0000 | BENDQ |
| 6257.044 | 6394 | 0.0000 | 7.9797 | separator | 38.10 | 25.00 | 2.5718 | A49VESE |
| 6259.803 | 6396 | 0.0000 | 2.9942 | separator | 38.10 | 25.00 | 2.5718 | A49VESE |
| 6265.446 | 6407 | 0.9983 | 3.9929 | quadrupole | 34.30 | 34.30 | 0.8763 | DTRIPB |

Table 4: Proton beam loss at the proton (3-d column) and antiproton (4-th column) abort kicker prefire with collimators A11 at $Y = -7$ mm and A48 at $Y = -4.35$ mm. The first bunch is in $0.396 \mu\text{sec}$ after the kicker prefire. Roman pots are in a working position. The delay from the moment of prefire and the rest modules start is $2 \mu\text{sec}$. Each unit of kinetic energy loss (column No.3 and 4) corresponds to $2.8 \cdot 10^8$ particles lost.

| path length m | element number | kinetic energy loss | | element | aperture | | element length m | name |
|------------------|----------------|-----------------------|-------------|-------------|----------|-------|---------------------|---------|
| | | PAK prefire GeV/Pc | AAK prefire | | hor. | vert. | | |
| 21.974 | 16 | 7.9893 | 10.9770 | quadrupole | 34.30 | 34.30 | 3.3528 | CB0Q2D |
| 31.477 | 30 | 39.9612 | 14.9822 | separator | 38.10 | 25.00 | 2.5718 | B11VESE |
| 150.367 | 148 | | 0.9977 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 203.453 | 203 | 0.9983 | 0.9981 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 3109.904 | 3170 | | 0.0000 | collimator | 20.00 | 20.00 | 0.0050 | colD49 |
| 3122.833 | 3195 | | 0.0000 | collimator | 20.00 | 20.00 | 0.0025 | colE01 |
| 3124.328 | 3196 | | 0.9976 | collimator | 20.00 | 20.00 | 1.4950 | colE01 |
| 3162.666 | 3226 | 0.9988 | 0.9970 | collimator | 20.00 | 20.00 | 1.5000 | colE02 |
| 3164.520 | 3232 | 0.9981 | 0.0000 | collimator | 20.00 | 20.00 | 1.5000 | colE03 |
| 4407.219 | 4494 | | 4.9953 | collimator | 20.00 | 20.00 | 1.5000 | coF172 |
| 5235.636 | 5347 | 23258.1658 | 22500.8770 | AØdump | 28.00 | 28.00 | 4.5593 | DA0PAB |
| 5240.772 | 5350 | 1398.6870 | 1363.7199 | AØdump | 28.00 | 28.00 | 4.5593 | DA0PBAB |
| 5252.494 | 5354 | 173.8368 | 98.9072 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5252.799 | 5355 | 2.9972 | | pbar kicker | 22.00 | 22.00 | 0.3048 | D12IN |
| 5254.692 | 5356 | 164.8453 | 22.9784 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5255.149 | 5357 | 77.9268 | 32.9691 | pbar kicker | 22.00 | 22.00 | 0.4572 | D18IN |
| 5257.041 | 5358 | 545.4879 | 466.5620 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5257.498 | 5359 | 101.9043 | 220.7927 | pbar kicker | 22.00 | 22.00 | 0.4572 | D18IN |
| 5259.391 | 5360 | 116.8903 | 255.7599 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5259.695 | 5361 | 12.9878 | 0.9991 | pbar kicker | 22.00 | 22.00 | 0.3048 | D12IN |
| 5261.588 | 5362 | 320.6990 | 305.7130 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5262.403 | 5363 | 223.7899 | 288.7290 | pbar kicker | 22.00 | 22.00 | 0.8150 | DA0SP12 |
| 5267.588 | 5369 | 5409.9216 | 5629.7153 | collimator | 20.00 | 7.00 | 1.5000 | collA11 |
| 5291.759 | 5394 | 0.8770 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5298.160 | 5399 | 0.8518 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5314.071 | 5418 | 0.9642 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5326.872 | 5428 | 0.9965 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5350.215 | 5453 | 0.9988 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5426.644 | 5533 | 0.9929 | | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 6223.390 | 6343 | 103.9017 | 716.3232 | collimator | 9.15 | 4.35 | 0.5000 | dumpB03 |
| 6241.148 | 6371 | | 0.8620 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 6241.148 | 6372 | | 0.7396 | dipole | 34.30 | 34.30 | 0.0000 | BENDQ |
| 6247.548 | 6376 | | 3.2247 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 6247.548 | 6377 | | 0.9443 | dipole | 34.30 | 34.30 | 0.0000 | BENDQ |
| 6257.044 | 6394 | 0.9984 | 9.9799 | separator | 38.10 | 25.00 | 2.5718 | A49VESE |
| 6259.803 | 6396 | | 6.9865 | separator | 38.10 | 25.00 | 2.5718 | A49VESE |
| 6264.569 | 6406 | | 0.9980 | quadrupole | 34.30 | 34.30 | 3.3528 | CB0Q2F |
| 6265.446 | 6407 | 0.9985 | 4.9897 | quadrupole | 34.30 | 34.30 | 0.8763 | DTRIPB |

Table 5: Proton beam loss at the proton (3-d column) and antiproton (4-th column) abort kicker prefire with collimators A11 at $Y = -7$ mm and A48 at $Y = -4.35$ mm. Roman pots are in a garage position. The first bunch is in 0.396 μ sec after the kicker prefire. The delay from the moment of prefire and the rest modules start is 2 μ sec. Each unit of kinetic energy loss (column No.3 and 4) corresponds to $2.8 \cdot 10^8$ particles lost.

| path length m | element number | kinetic energy loss | | element | aperture | | element length m | name |
|------------------|----------------|-----------------------|-------------|-------------|----------|-------|---------------------|---------|
| | | PAK prefire GeV/Pc | AAK prefire | | hor. | vert. | | |
| 18.621 | 15 | 0.0000 | 0.9983 | quadrupole | 34.30 | 34.30 | 0.8763 | DTRIPB |
| 21.974 | 16 | 0.0000 | 45.9391 | quadrupole | 34.30 | 34.30 | 3.3528 | CB0Q2D |
| 31.477 | 30 | 4.9945 | 366.6470 | separator | 38.10 | 25.00 | 2.5718 | B11VESE |
| 120.623 | 120 | 0.0000 | 0.9912 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 197.052 | 198 | 0.0000 | 0.9964 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 217.408 | 222 | 0.9965 | 0.0000 | separator | 25.00 | 38.10 | 2.5718 | B17HESE |
| 262.939 | 263 | 0.0000 | 0.9921 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 328.827 | 330 | 0.0000 | 0.9990 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 1958.092 | 1958 | 0.0000 | 0.9959 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 1970.894 | 1968 | 0.0000 | 0.9977 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2061.779 | 2088 | 2.1546 | 6.2627 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA2S |
| 2064.856 | 2091 | 0.0000 | 0.9986 | separator | 25.00 | 38.10 | 2.5718 | C49HESE |
| 2070.948 | 2099 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA1Q |
| 2071.061 | 2102 | 0.0004 | 9.0798 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA2Q |
| 2117.771 | 2138 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP1Q |
| 2117.808 | 2139 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP2Q |
| 2117.846 | 2140 | 1.9987 | 8.9957 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP1Q |
| 2117.884 | 2141 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP2Q |
| 2127.089 | 2152 | 0.0000 | 0.9986 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP2S |
| 2127.126 | 2153 | 0.9994 | 2.2875 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP1S |
| 2127.164 | 2154 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP2S |
| 2143.595 | 2172 | 0.0000 | 0.9115 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2149.996 | 2177 | 0.0000 | 1.5303 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2156.397 | 2183 | 0.8487 | 0.0000 | dipole | 34.30 | 34.30 | 0.0000 | BENDQ |
| 2158.106 | 2186 | 0.0000 | 0.9110 | str. sect. | 34.30 | 34.30 | 1.4018 | CD0Q5F |
| 2195.817 | 2225 | 0.0000 | 0.9990 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2202.218 | 2230 | 0.0000 | 0.9990 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2215.019 | 2240 | 0.9936 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2231.961 | 2258 | 0.0000 | 0.9962 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2238.362 | 2263 | 0.9990 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2304.250 | 2328 | 0.9990 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2423.223 | 2461 | 0.9990 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 3109.904 | 3170 | 0.9992 | 1.9983 | collimator | 20.00 | 20.00 | 0.0050 | colD49 |
| 3122.833 | 3195 | 0.0000 | 0.0000 | collimator | 20.00 | 20.00 | 0.0025 | colE01 |
| 3124.328 | 3196 | 0.0000 | 5.9922 | collimator | 20.00 | 20.00 | 1.4950 | colE01 |
| 3162.666 | 3226 | 5.9942 | 13.9815 | collimator | 20.00 | 20.00 | 1.5000 | colE02 |
| 4407.219 | 4494 | 1.9971 | 10.9900 | collimator | 20.00 | 20.00 | 1.5000 | coF172 |
| 5235.636 | 5347 | 23367.0613 | 21957.3844 | AØdump | 28.00 | 28.00 | 4.5593 | DA0PAB |
| 5240.772 | 5350 | 1192.8802 | 1084.9815 | AØdump | 28.00 | 28.00 | 4.5593 | DA0PBAB |
| 5252.494 | 5354 | 324.6952 | 282.7346 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5252.799 | 5355 | 68.9353 | 73.9306 | pbar kicker | 22.00 | 22.00 | 0.3048 | D12IN |
| 5254.692 | 5356 | 362.6596 | 404.6202 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5255.149 | 5357 | 36.9653 | 63.9400 | pbar kicker | 22.00 | 22.00 | 0.4572 | D18IN |
| 5257.041 | 5358 | 103.9025 | 61.9419 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5257.498 | 5359 | 76.9278 | 24.9766 | pbar kicker | 22.00 | 22.00 | 0.4572 | D18IN |
| 5259.391 | 5360 | 559.4748 | 558.4758 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5259.695 | 5361 | 81.9231 | 110.8959 | pbar kicker | 22.00 | 22.00 | 0.3048 | D12IN |
| 5261.588 | 5362 | 213.7993 | 296.7215 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5262.403 | 5363 | 22.9784 | 9.9906 | pbar kicker | 22.00 | 22.00 | 0.8150 | DA0SP12 |
| 5267.588 | 5369 | 5516.9802 | 5690.6730 | collimator | 20.00 | 7.00 | 1.5000 | collA11 |
| 5291.759 | 5394 | 0.8559 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5320.471 | 5423 | 0.0000 | 0.9914 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5343.814 | 5448 | 0.9969 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5356.616 | 5458 | 1.9976 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5386.359 | 5488 | 0.9947 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 6223.390 | 6343 | 9.0872 | 834.7526 | collimator | 9.15 | 4.35 | 0.5000 | dumpB03 |
| 6241.148 | 6372 | 0.9017 | 0.0000 | str. sect. | 34.30 | 34.30 | 0.0000 | BENDQ |
| 6247.548 | 6376 | 0.0000 | 4.8566 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 6250.580 | 6384 | 0.0000 | 0.8476 | str. sect. | 34.30 | 34.30 | 0.5357 | DLB3 |
| 6254.285 | 6392 | 0.0000 | 1.8227 | separator | 25.00 | 38.10 | 2.5718 | A49HESE |
| 6257.044 | 6394 | 0.9986 | 10.9795 | separator | 38.10 | 25.00 | 2.5718 | A49VESE |
| 6259.803 | 6396 | 0.0000 | 3.9943 | separator | 38.10 | 25.00 | 2.5718 | A49VESE |
| 6264.569 | 6406 | 0.0000 | 0.9928 | quadrupole | 34.30 | 34.30 | 3.3528 | CB0Q2F |
| 6265.446 | 6407 | 0.0000 | 1.9968 | quadrupole | 34.30 | 34.30 | 0.8763 | DTRIPB |

Table 6: Proton beam loss at the proton (3-d column) and antiproton (4-th column) abort kicker prefire with collimators A11 at $Y = -7$ mm and A48 at $Y = -4.35$ mm. Roman pots are in a working position. The first bunch is in 0.198 μ sec after the kicker prefire. The delay from the moment of prefire and the rest modules start is 2 μ sec. Each unit of kinetic energy loss (column No.3 and 4) corresponds to $2.8 \cdot 10^8$ particles lost.

| path length | element number | kinetic energy loss PAK prefire | kinetic energy loss AAK prefire | element | aperture hor. | aperture vert. | element length | name |
|-------------|----------------|------------------------------------|------------------------------------|-------------|------------------|-------------------|-------------------|---------|
| m | | GeV/Pc | | | mm | mm | m | |
| 21.974 | 16 | 5.9923 | 24.9403 | quadrupole | 34.30 | 34.30 | 3.3528 | CB0Q2D |
| 31.477 | 30 | 327.6898 | 207.7895 | separator | 38.10 | 25.00 | 2.5718 | B11VESE |
| 143.966 | 143 | 0.0000 | 1.9890 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 150.367 | 148 | 0.0000 | 2.9943 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 209.853 | 208 | 0.0000 | 0.9954 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 217.408 | 222 | 0.0000 | 1.9940 | separator | 25.00 | 38.10 | 2.5718 | B17HESE |
| 328.827 | 330 | 0.0000 | 0.9966 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2034.595 | 2040 | 0.9988 | 0.0000 | collimator | 9.15 | 4.35 | 0.5000 | dumpD03 |
| 2061.666 | 2085 | 0.0000 | 0.9988 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA1S |
| 2061.704 | 2086 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA2S |
| 2061.779 | 2088 | 3.9976 | 0.0001 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA2S |
| 2070.948 | 2099 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA1Q |
| 2070.985 | 2100 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA2Q |
| 2071.061 | 2102 | 11.1945 | 1.9982 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA2Q |
| 2117.771 | 2138 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP1Q |
| 2117.846 | 2140 | 4.0935 | 1.9982 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP1Q |
| 2127.051 | 2151 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP1S |
| 2127.126 | 2153 | 3.9967 | 1.9981 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP1S |
| 2149.996 | 2177 | 0.9027 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2156.397 | 2182 | 0.7949 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2208.619 | 2235 | 0.9991 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2238.362 | 2263 | 0.9990 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2304.250 | 2328 | 0.9990 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 3109.904 | 3170 | 0.9992 | 0.0000 | collimator | 20.00 | 20.00 | 0.0050 | colD49 |
| 3122.833 | 3195 | 0.0000 | 0.0000 | collimator | 20.00 | 20.00 | 0.0025 | colE01 |
| 3124.328 | 3196 | 3.9939 | 0.9988 | collimator | 20.00 | 20.00 | 1.4950 | colE01 |
| 3162.666 | 3226 | 30.9699 | 2.9952 | collimator | 20.00 | 20.00 | 1.5000 | colE02 |
| 3164.520 | 3232 | 0.9989 | 0.9977 | collimator | 20.00 | 20.00 | 1.5000 | colE03 |
| 4407.219 | 4494 | 4.9936 | 0.0000 | collimator | 20.00 | 20.00 | 1.5000 | coF172 |
| 5235.636 | 5347 | 23162.2538 | 22531.8483 | AØdump | 28.00 | 28.00 | 4.5593 | DA0PAB |
| 5240.772 | 5350 | 1103.9637 | 1327.7536 | AØdump | 28.00 | 28.00 | 4.5593 | DA0PBAB |
| 5252.494 | 5354 | 338.6821 | 115.8912 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5252.799 | 5355 | 76.9278 | 0.0000 | pbar kicker | 22.00 | 22.00 | 0.3048 | D12IN |
| 5254.692 | 5356 | 328.6915 | 14.9859 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5255.149 | 5357 | 32.9691 | 30.9709 | pbar kicker | 22.00 | 22.00 | 0.4572 | D18IN |
| 5257.041 | 5358 | 54.9484 | 487.5423 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5257.498 | 5359 | 63.9400 | 191.8199 | pbar kicker | 22.00 | 22.00 | 0.4572 | D18IN |
| 5259.391 | 5360 | 565.4692 | 273.7430 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5259.695 | 5361 | 84.9203 | 0.9991 | pbar kicker | 22.00 | 22.00 | 0.3048 | D12IN |
| 5261.588 | 5362 | 253.7618 | 205.8068 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5262.403 | 5363 | 5.9944 | 257.7580 | pbar kicker | 22.00 | 22.00 | 0.8150 | DA0SP12 |
| 5267.588 | 5369 | 5431.6932 | 5578.7855 | collimator | 20.00 | 7.00 | 1.5000 | collA11 |
| 5285.358 | 5389 | 0.7055 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5291.759 | 5394 | 1.5238 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5326.872 | 5428 | 0.9857 | 0.9858 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5326.872 | 5429 | 0.9987 | 0.0000 | dipole | 34.30 | 34.30 | 0.0000 | BENDQ |
| 5337.413 | 5443 | 0.0000 | 0.9969 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5350.215 | 5453 | 0.9958 | 0.9989 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5356.616 | 5458 | 0.0000 | 0.9987 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 6223.390 | 6343 | 54.1217 | 676.7990 | collimator | 9.15 | 4.35 | 0.5000 | dumpB03 |
| 6241.148 | 6371 | 0.0000 | 1.4601 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 6247.548 | 6376 | 0.8310 | 3.4289 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 6254.285 | 6392 | 0.0000 | 0.9025 | separator | 25.00 | 38.10 | 2.5718 | A49HESE |
| 6257.044 | 6394 | 0.0000 | 5.9887 | separator | 38.10 | 25.00 | 2.5718 | A49VESE |
| 6259.803 | 6396 | 0.0000 | 1.9958 | separator | 38.10 | 25.00 | 2.5718 | A49VESE |
| 6264.569 | 6406 | 0.0000 | 0.9592 | quadrupole | 34.30 | 34.30 | 3.3528 | CB0Q2F |
| 6265.446 | 6407 | 0.9984 | 1.9574 | quadrupole | 34.30 | 34.30 | 0.8763 | DTRIPB |
| 6281.641 | 6418 | 0.0000 | 0.9286 | str. sect. | 14.60 | 14.60 | 0.2280 | DB0C |

Table 7: Proton beam loss at the proton (3-d column) and antiproton (4-th column) abort kicker prefire with collimators A11 at $Y = -7 \text{ mm}$ and A48 at $Y = -4.35 \text{ mm}$. Roman pots are in a working position. The first bunch is in $0.396 \mu\text{sec}$ after the kicker prefire. The delay from the moment of prefire and the rest modules start is $1.2 \mu\text{sec}$. Each unit of kinetic energy loss (column No.3 and 4) corresponds to $2.8 \cdot 10^8$ particles lost.

| path length m | element number | kinetic energy loss | | element | aperture | | element length m | name |
|------------------|----------------|-----------------------|-------------|-------------|----------|-------|---------------------|---------|
| | | PAK prefire GeV/Pc | AAK prefire | | hor. | vert. | | |
| 21.974 | 16 | 2.9955 | 8.9826 | quadrupole | 34.30 | 34.30 | 3.3528 | CB0Q2D |
| 31.477 | 30 | 3.9929 | 23.9761 | separator | 38.10 | 25.00 | 2.5718 | B11VESE |
| 150.367 | 148 | 0.9982 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 160.908 | 164 | 0.0000 | 0.9981 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 309.625 | 315 | 0.0000 | 0.9977 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2034.595 | 2040 | 0.0000 | 0.0005 | collimator | 9.15 | 4.35 | 0.5000 | dumpD03 |
| 2036.122 | 2048 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMAD1 |
| 2061.704 | 2086 | 0.9990 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA2S |
| 2061.742 | 2087 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA1S |
| 2061.779 | 2088 | 0.9994 | 21.0882 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA2S |
| 2070.948 | 2099 | 0.0001 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA1Q |
| 2071.061 | 2102 | 0.9998 | 15.2556 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA2Q |
| 2117.771 | 2138 | 0.0000 | 0.9982 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP1Q |
| 2117.846 | 2140 | 2.9973 | 22.3616 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP1Q |
| 2117.884 | 2141 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP2Q |
| 2127.126 | 2153 | 0.9991 | 19.9831 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP1S |
| 2127.164 | 2154 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP2S |
| 2143.595 | 2173 | 0.0000 | 0.8200 | str. sect. | 34.30 | 34.30 | 0.0000 | BENDQ |
| 2149.996 | 2177 | 0.0000 | 1.6048 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2166.074 | 2194 | 0.0000 | 1.8224 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2185.276 | 2209 | 0.0000 | 0.9990 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2188.518 | 2217 | 0.0000 | 0.9990 | str. sect. | 34.30 | 34.30 | 0.6064 | CD0Q6F |
| 2202.218 | 2230 | 0.0000 | 2.9971 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2208.619 | 2235 | 0.0000 | 2.9960 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2215.019 | 2240 | 0.0000 | 0.9991 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2231.961 | 2258 | 0.0000 | 0.9962 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2297.849 | 2323 | 0.0000 | 0.9990 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2416.823 | 2456 | 0.0000 | 0.9991 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 2423.223 | 2461 | 0.0000 | 1.9981 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 3109.904 | 3170 | 0.0000 | 4.9957 | collimator | 20.00 | 20.00 | 0.0050 | colD49 |
| 3122.833 | 3195 | 0.0000 | 0.0001 | collimator | 20.00 | 20.00 | 0.0025 | colE01 |
| 3124.328 | 3196 | 1.9957 | 20.9777 | collimator | 20.00 | 20.00 | 1.4950 | colE01 |
| 3162.666 | 3226 | 1.9957 | 23.9763 | collimator | 20.00 | 20.00 | 1.5000 | colE02 |
| 3164.520 | 3232 | 0.0000 | 0.9987 | collimator | 20.00 | 20.00 | 1.5000 | colE03 |
| 3262.217 | 3338 | 0.0000 | 0.9983 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 4407.219 | 4494 | 0.9990 | 17.9808 | collimator | 20.00 | 20.00 | 1.5000 | coF172 |
| 5235.636 | 5347 | 23399.0337 | 22769.6164 | AØdump | 28.00 | 28.00 | 4.5593 | DA0PAB |
| 5240.772 | 5350 | 1318.7621 | 1092.9740 | AØdump | 28.00 | 28.00 | 4.5593 | DA0PBAB |
| 5252.494 | 5354 | 110.8959 | 275.7412 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5252.799 | 5355 | 1.9981 | 77.9268 | pbar kicker | 22.00 | 22.00 | 0.3048 | D12IN |
| 5254.692 | 5356 | 67.9362 | 446.5808 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5255.149 | 5357 | 50.9522 | 37.9644 | pbar kicker | 22.00 | 22.00 | 0.4572 | D18IN |
| 5257.041 | 5358 | 522.5095 | 56.9465 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5257.498 | 5359 | 141.8668 | 9.9906 | pbar kicker | 22.00 | 22.00 | 0.4572 | D18IN |
| 5259.391 | 5360 | 218.7946 | 426.5995 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5259.695 | 5361 | 5.9944 | 131.8762 | pbar kicker | 22.00 | 22.00 | 0.3048 | D12IN |
| 5261.588 | 5362 | 207.8049 | 415.6099 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 5262.403 | 5363 | 194.8171 | 14.9859 | pbar kicker | 22.00 | 22.00 | 0.8150 | DA0SP12 |
| 5267.588 | 5369 | 5434.3967 | 5491.1347 | collimator | 20.00 | 7.00 | 1.5000 | collA11 |
| 5291.759 | 5394 | 1.5971 | 0.7508 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5298.160 | 5399 | 0.9161 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5307.670 | 5414 | 0.0000 | 0.9867 | str. sect. | 34.30 | 34.30 | 0.0000 | BENDQ |
| 5343.814 | 5448 | 0.9989 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5350.215 | 5453 | 0.0000 | 1.9807 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5356.616 | 5458 | 0.9988 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 5743.280 | 5851 | 0.9950 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 6159.688 | 6272 | 0.9988 | 0.9988 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 6223.390 | 6343 | 262.0263 | 502.2330 | collimator | 9.15 | 4.35 | 0.5000 | dumpB03 |
| 6247.548 | 6376 | 0.7497 | 1.5032 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 6247.548 | 6377 | 0.0000 | 0.8637 | str. sect. | 34.30 | 34.30 | 0.0000 | BENDQ |
| 6249.257 | 6380 | 0.0000 | 0.9443 | str. sect. | 34.30 | 34.30 | 1.4018 | CB0Q1D |
| 6257.044 | 6394 | 0.0000 | 1.9960 | separator | 38.10 | 25.00 | 2.5718 | A49VESE |
| 6259.803 | 6396 | 1.9965 | 0.9984 | separator | 38.10 | 25.00 | 2.5718 | A49VESE |
| 6264.569 | 6406 | 0.9819 | 0.0000 | quadrupole | 34.30 | 34.30 | 3.3528 | CB0Q2F |
| 6265.446 | 6407 | 1.9950 | 5.9875 | quadrupole | 34.30 | 34.30 | 0.8763 | DTRIPB |

Table 8: Proton beam loss at the proton (3-d column) and antiproton (4-th column) abort kicker prefire with collimators A11 at $Y = -7$ mm and A48 at $Y = -4.35$ mm. Roman pots are in a working position. The first bunch is in 0.396 μ sec after the kicker prefire. The delay from the moment of prefire and the rest modules start is 1.0 μ sec. Each unit of kinetic energy loss (column №3 and 4) corresponds to $2.8 \cdot 10^8$ particles lost.

| path length m | element number | kinetic energy loss | | element | aperture | | element length m | name |
|------------------|----------------|-----------------------|-------------|-------------|----------|-------|---------------------|---------|
| | | PAK prefire GeV/Pc | AAK prefire | | hor. | vert. | | |
| 56.655 | 67 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0410 | RPOT1 |
| 56.656 | 68 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0010 | RPOT1 |
| 57.697 | 70 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0410 | RPOT2 |
| 57.698 | 71 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0010 | RPOT2 |
| 58.739 | 73 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0410 | RPOT3 |
| 58.740 | 74 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0010 | RPOT3 |
| 60.301 | 79 | 0.9990 | 0.9990 | collimator | 9.15 | 4.35 | 0.5000 | dumpB03 |
| 1046.978 | 1072 | 22416.9496 | 21942.3997 | AØdump | 28.00 | 28.00 | 4.5593 | DA0PBAB |
| 1052.114 | 1075 | 1122.9459 | 1108.9590 | AØdump | 28.00 | 28.00 | 4.5593 | DA0PAB |
| 1063.654 | 1086 | 45.9569 | 19.9812 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 1063.959 | 1087 | 69.9344 | 74.9297 | pbar kicker | 22.00 | 22.00 | 0.3048 | D12IN |
| 1065.851 | 1088 | 58.9447 | 218.7946 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 1070.550 | 1092 | 642.3970 | 740.3051 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 1070.855 | 1093 | 229.7843 | 146.8621 | pbar kicker | 22.00 | 22.00 | 0.3048 | D12IN |
| 1072.747 | 1094 | 126.8809 | 111.8950 | pbar kicker | 22.00 | 22.00 | 1.8923 | DA0KICK |
| 1089.186 | 1115 | 999.0622 | 727.3173 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 1095.587 | 1120 | 0.9990 | 271.7449 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 1117.337 | 1146 | 999.0622 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 1123.738 | 1151 | 0.9990 | 999.0622 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 1130.139 | 1156 | 826.2244 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 1136.540 | 1161 | 172.8378 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 1255.513 | 1280 | 0.9990 | 999.0622 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 1444.515 | 1477 | 26.9747 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 1877.472 | 1928 | 4182.3380 | 4586.4190 | collimator | 20.00 | 20.00 | 1.5000 | coF172 |
| 1897.067 | 1958 | 0.7533 | 0.7659 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 1903.468 | 1963 | 0.0000 | 0.7909 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 1909.869 | 1968 | 0.0000 | 0.8825 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 1910.932 | 1973 | 0.0000 | 0.9016 | dipole | 34.30 | 34.30 | 0.4064 | DPACKU2 |
| 1933.211 | 1993 | 0.0000 | 0.9826 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 1969.356 | 2029 | 0.9883 | 0.9507 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 3120.170 | 3190 | 6.9883 | 2.9962 | collimator | 20.00 | 20.00 | 1.5000 | colE03 |
| 3173.291 | 3252 | 0.0000 | 0.0000 | collimator | 20.00 | 20.00 | 0.0050 | colD49 |
| 4156.102 | 4269 | 2.2377 | 1.9984 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP1S |
| 4165.382 | 4282 | 12.0283 | 5.4933 | roman pot | 10.00 | 10.00 | 0.0377 | ROMP1Q |
| 4212.168 | 4320 | 6.0647 | 0.9993 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA2Q |
| 4221.449 | 4334 | 4.9966 | 0.9993 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA2S |
| 4221.487 | 4335 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMA1S |
| 4222.516 | 4340 | 0.7610 | 0.0000 | str. sect. | 34.30 | 34.30 | 0.7383 | DFPDSPC |
| 4230.558 | 4349 | 0.0000 | 1.4997 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 4243.360 | 4360 | 0.9298 | 0.0000 | str. sect. | 34.30 | 34.30 | 0.0000 | BENDQ |
| 4245.106 | 4369 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMAD3 |
| 4247.106 | 4374 | 0.0000 | 0.0000 | roman pot | 10.00 | 10.00 | 0.0377 | ROMAD1 |
| 4249.095 | 4382 | 7.9544 | 0.0000 | collimator | 9.15 | 4.35 | 0.5000 | dumpD03 |
| 4288.675 | 4425 | 0.0000 | 0.9990 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 4301.477 | 4435 | 1.9981 | 0.0000 | dipole | 31.50 | 31.50 | 6.1214 | BEND |
| 4308.538 | 4443 | 0.0000 | 0.9990 | collimator | 30.00 | 37.00 | 0.5208 | dumpD0Y |
| 6254.285 | 6392 | 1.9981 | 0.0000 | separator | 38.10 | 25.00 | 2.5718 | B11VESE |
| 6264.569 | 6406 | 0.9990 | 0.0000 | quadrupole | 34.30 | 34.30 | 3.3528 | CB0Q2D |

Table 9: Antiproton beam loss at the proton (3-d column) and antiproton (4-th column) abort kicker prefire with collimators A11 at $Y = -7$ mm and A48 at $Y = -4.35$ mm. Roman pots are in a working position. The first bunch is in $0.396 \mu\text{sec}$ after the kicker prefire. The delay from the moment of prefire and the rest modules start is $2.0 \mu\text{sec}$. Each unit of kinetic energy loss (column No.3 and 4) corresponds to $5.6 \cdot 10^7$ particles lost.