

# REPOSITIONING OF THE LINAC TO BOOSTER TRANSPORT LINE

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TRANSPORT LINE

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The Linac to Booster transport line, used to inject protons from the Linac into the AGS Booster, was altered and resurveyed during October 1991 in order to provide more favorable proton injection orbits into the Booster.

Based upon calculations by E. Bleser and A. Luccio [1] of proton entry trajectories and initial proton orbits inside the Booster, the injection line was reconfigured by changing the deflection angle of each of the horizontal bending dipole magnets BLI.DH2 through BLI.DH5 to 31 degrees, 32 minutes, 18.0 seconds (0.55044782 radians). This change caused a displacement of 0.956 inches in the position of the vertical quadrupole magnet BLI.QV13, and changed the injection angle by 1.435 milliradians.

The revised injection line magnet apex coordinates are listed in Table 1; spacings between successive elements are given in Table 2; bend angles of successive sections appear in Table 3.

The present note is an update of Booster Technical Note No. 160 [2], and represents the current update of Table 4-1 of the Booster Design Manual [3]. The names of the line elements were modified, to correspond to the current nomenclature conventions [4] for Booster elements.

The survey was performed during the period October 24 through November 12, 1991. The survey was made by D. Gordon, D.L. Kazmark Jr., and J.C. Roecklein.

TABLE 1 Location Of The Proton Injection Line Elements.

| Element |          | AGS Coordinates |            |
|---------|----------|-----------------|------------|
| No.     | Name     | E [inches]      | N [inches] |
| 1       | BLI.DH1  | -658.9432       | 14516.9353 |
| 2       | BLI.QH1  | -502.3375       | 14417.9046 |
| 3       | BLI.QV2  | -459.0797       | 14390.5502 |
| 4       | BLI.QH3  | -415.8219       | 14363.1959 |
| 5       | BLI.QV4  | -372.5642       | 14335.8415 |
| 6       | BLI.QH5  | -329.3064       | 14308.4872 |
| 7       | BLI.DH2  | -262.1897       | 14266.0455 |
| 8       | BLI.DH3  | -197.8755       | 14265.1821 |
| 9       | BLI.QH6  | -160.0923       | 14287.6778 |
| 10      | BLI.DH4  | -122.3092       | 14310.1735 |
| 11      | BLI.QH7  | -101.8738       | 14349.1096 |
| 12      | BLI.DH5  | -18.8105        | 14507.3722 |
| 13      | BLI.QH8  | -27.0414        | 14629.8139 |
| 14      | BLI.QV9  | -30.4742        | 14680.8796 |
| 15      | BLI.QH10 | -36.5477        | 14771.2267 |
| 16      | BLI.QV11 | -39.9805        | 14822.2925 |
| 17      | BLI.QH12 | -46.0539        | 14912.6386 |
| 18      | BLI.QV13 | -51.5993        | 14995.1304 |

TABLE 2      Spacings Between Injection Line Elements.

| From Element<br>Number | To Element<br>Number | Distance [Inches]<br>Apex-To-Apex |
|------------------------|----------------------|-----------------------------------|
| End Of Linac<br>Tank 9 | 1                    | 723.125                           |
| 1                      | 2                    | 185.290                           |
| 2                      | 3                    | 51.181                            |
| 3                      | 4                    | 51.181                            |
| 4                      | 5                    | 51.181                            |
| 5                      | 6                    | 51.181                            |
| 6                      | 7                    | 79.410                            |
| 7                      | 8                    | 64.320                            |
| 8                      | 9                    | 43.973                            |
| 9                      | 10                   | 43.973                            |
| 10                     | 11                   | 43.973                            |
| 11                     | 12                   | 178.736                           |
| 12                     | 13                   | 122.718                           |
| 13                     | 14                   | 51.181                            |
| 14                     | 15                   | 90.551                            |
| 15                     | 16                   | 51.181                            |
| 16                     | 17                   | 90.550                            |
| 17                     | 18                   | 82.678                            |

TABLE 3

Bend Angles Of Successive Sections  
Of The  
Linac-To-Booster Transport Beam Line.

| Linear Section<br>Between Apexes<br>===== | Deflection<br>Deg/Min/Sec<br>===== | From Linear Section<br>===== |
|---|------------------------------------|------------------------------|
| 1 To 7                                    | 7 / 41 / 33.5                      | Linac Beam Exit              |
| 7 To 8                                    | 31 / 32 / 18.0                     | 1 To 7                       |
| 8 To 10                                   | 31 / 32 / 18.0                     | 7 To 8                       |
| 10 To 12                                  | 31 / 32 / 18.0                     | 8 To 10                      |
| 12 To 18                                  | 31 / 32 / 18.0                     | 10 To 12                     |

## References

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1. E. Bleser , Private Communication.
2. F.X. Karl and M.A. Goldman, The October 1989 Survey Of The Linac To Booster Transport Beam Line. BNL AD Technical Note No. 160, January 29, 1990.
3. Booster Design Manual, AGS Booster Project, Accelerator Development Department, Brookhaven National Laboratory, Upton NY, Revision 1, October 1988.
4. E.H. Auerbach, A Revised Convention For Naming Sections In The Booster And Naming Booster Elements. BNL AD Booster Technical Note No. 142, June 5 1989.