



BNL-102179-2014-TECH

RHIC/AP/70;BNL-102179-2013-IR

Local Beam Line Coordinate System

W. MacKay

October 1995

Collider Accelerator Department
Brookhaven National Laboratory

U.S. Department of Energy

USDOE Office of Science (SC)

Notice: This technical note has been authored by employees of Brookhaven Science Associates, LLC under Contract No. DE-AC02-76CH00016 with the U.S. Department of Energy. The publisher by accepting the technical note for publication acknowledges that the United States Government retains a non-exclusive, paid-up, irrevocable, world-wide license to publish or reproduce the published form of this technical note, or allow others to do so, for United States Government purposes.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Local beam line coordinate system

In the ATR transfer lines (U, W, X, and Y-lines) there is a local right-handed coordinate system (x, y, z) which moves along with the beam along the design trajectory. The z -axis is tangent to the design trajectory pointing downstream. The y -axis points up, and the x -axis points to the left in the beam's-eye-view which makes the right-handed system.

The cumulative s -coordinate for the beam location along the trajectory is measured from the beginning of the U-line (a lattice marker with SiteWideName "ubegin"). The beginning of the U-line ($s=0$) is located along the perpendicular bisector between the AGS dipoles H13 and H14.

For the Blue (clockwise) ring of RHIC, the same convention holds for the local coordinate system with the $s=0$ coordinate at the 6 O'clock crossing. In this case the x -axis points radially outward, the y -axis upward and the z -axis tangentially in the direction of the beam's velocity.

For the Yellow (counterclockwise) ring of RHIC, the convention must be modified, since we want to have the x -axis radially outward. The lesser of all evils was determined to be having the z -coordinate point in the direction opposite to the beam's motion. The y axis is still upward, and the (x, y, z) system is still right-handed. The cumulative s -coordinate is measured clockwise around the ring, with $s=0$ at the 6 O'clock crossing. With this convention, there is the added advantage that the two rings have s -coordinates which propagate in the same direction. Note that for the 4, 8, and 12 O'clock crossings the s -coordinates of the two rings differ by almost a meter.

Trim magnet conventions

In the ATR, positive angles in the trim magnets of the ATR should bend the beam in the $+x$ direction for horizontal trims, and in the $+y$ direction for vertical trims.

In the U-line there are seven trim magnets powered by old monopolar supplies with reversing switches: **psutv1**, **psuth2**, **psuth3**, **psutv4**, **psutv5**, **psuth6**, and **psutv7**. The "A" polarity of these old supplies should bend the beam to the left ($+x$) for horizontal trims and up ($+y$) for vertical trims.

The rest of the trim magnets have bipolar supplies with positive currents bending left ($+x$) and up ($+y$).

Main dipole conventions

In the ATR, for horizontal main dipoles positive angles bend the beam to the right ($-x$). For vertical pitching magnets, positive angles bend the beam downward ($-y$).

All main dipole supplies with the exception of the switching magnet supply **psswm** are monopolar, so that the currents are only positive for **psuarc4**, **psuarc8**, **pswarc20**, **psxarc90**, **psyarc90**, **pswp1**, and **pswp2**. The switching magnet supply is monopolar, but has a reversing switch.

The 100A bias supplies for the lambertson and last dipole magnets of the X and Y-arcs (**psxlamt**, **psylamt**, **psxd31t**, and **psyd31t**) are bipolar and should be wired so that a positive current adds to the positive buss current.