RHIC/AP/70

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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 system right-handed.

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.

For more information see RHIC/AP/12 W. MacKay and S. Peggs, "Accelerator Physics coordinate conventions".

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