

Measured Aperture of the Recycler Stochastic Cooling Light Pipe

Ralph J. Pasquinelli

5/22/2001

The stochastic cooling systems for the Recycler ring utilize an optical light link to transmit the signals across the ring.¹ The pipe is 24 inches inside diameter, 1850 feet in length, and was installed between January and March of 1999. The large diameter pipe is necessary to transmit up to four light links simultaneously while allowing reasonable working space on the end light tables. The cost trade off between large diameter pipe and extra labor for survey is how the 24-inch diameter was chosen. Installation photos are shown in figure 1.

During installation, detailed survey information was taken. This data was collected and transcribed to Fermilab FESS drawing 6-6-7D, which is shown in part in figure 2. Recently, the actual aperture was measured on the installed pipe. Utilizing a Meade 4-inch telescope and a video camera borrowed from Fermilab Visual Media Services, the photo in figure 3 was taken. The telescope reverses the image from left to right. This has been corrected using software, so that the image is directly correlated to the survey data. Each of the dark tick marks in the photo is spaced by one inch. Both survey and optical data are viewed from MI 21 peanut to MI 11 peanut. To take the photo, a 1 Kwatt lamp was needed for illumination. The shadow of this lamp is clearly seen in the photo and is not an aperture restriction.

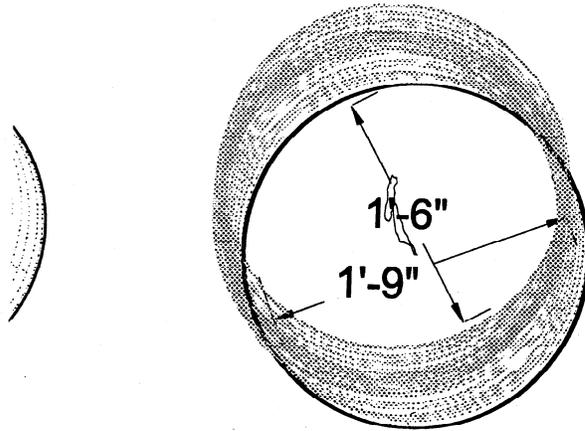
The close agreement between survey data and observation indicates that the light pipe has remained in a stable position for the last two years.

References

1. Wide Band Free Space Transmission Link Utilizing a Modulated Infrared Laser, Ralph J. Pasquinelli, Fermilab, Batavia, IL, IEEE Proceedings of the 1999 Particle Accelerator Conference, New York, New York.



Figure 1 : Light Pipe installation January 1999



APERTURE

SCALE: NONE



FERMI NATIONAL ACCELERATOR LABORATORY

UNITED STATES DEPARTMENT OF ENERGY



MI RECYCLER COOLING PHASE 1

AS BUILT JACKED PIPE APERTURE

DRAWING NO. **6-6-7D**

SK-? REV. **XX**

Figure 2: FESS survey data from Light Pipe Installation March 1999

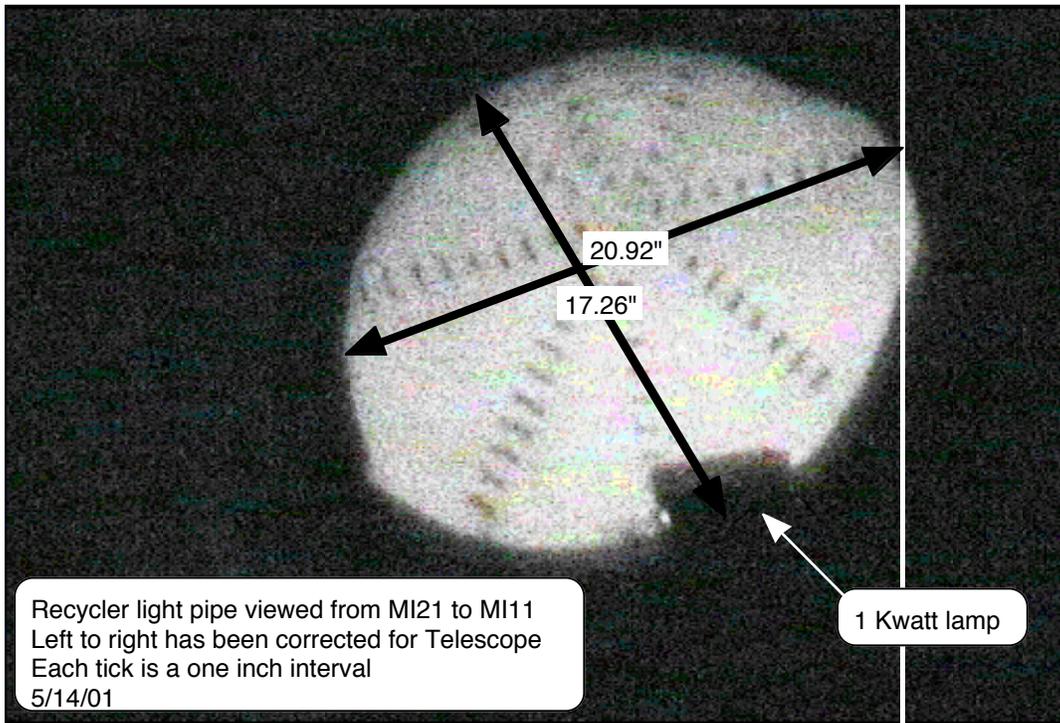


Figure 3. Visual light pipe aperture. Each tick is spaced by 1 inch. A 1 Kwatt lamp was necessary to illuminate the target.