# RHIC p-Carbon Polarimeter Target Lifetime Issue*

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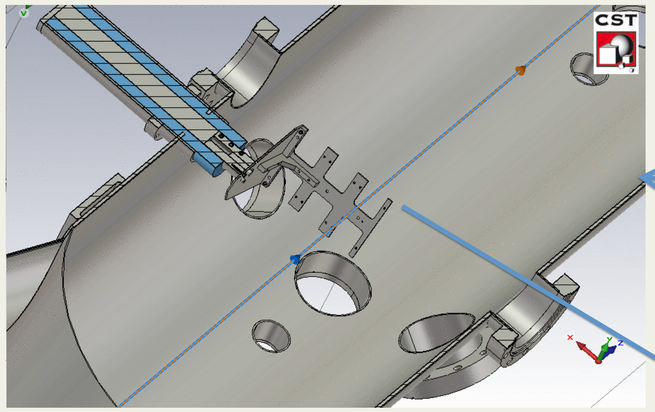
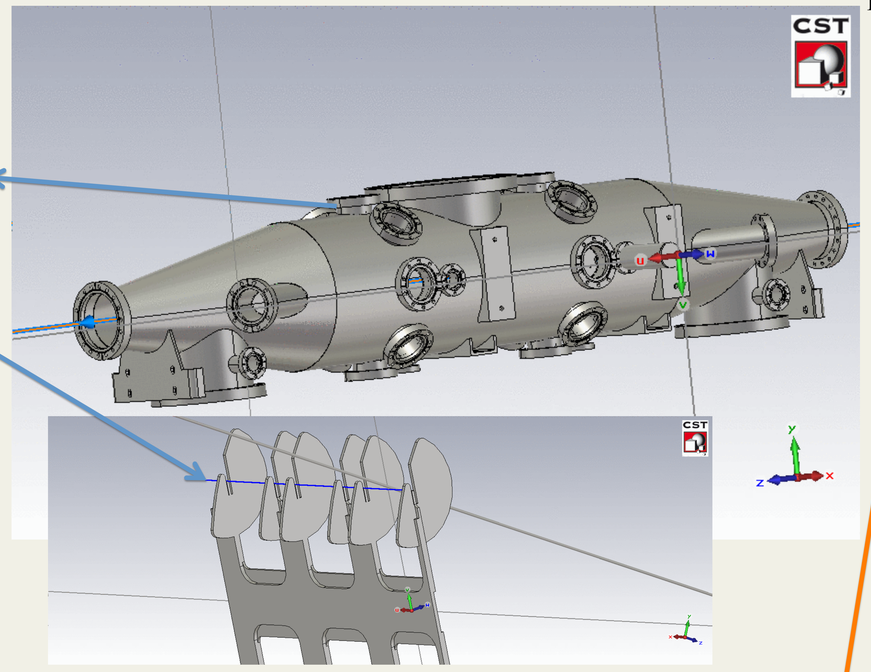
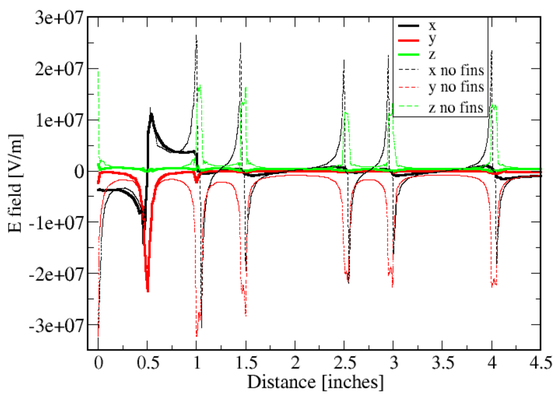
RHIC polarized proton operation requires fast and reliable proton polarimeter for polarization monitoring during stores. Polarimeters based on p-Carbon elastic scattering in the Coulomb Nuclear Interference(CNI) region has been used. Two polarimeters are installed in each of the two collider rings and they are capable to provide important polarization profile information. The polarimeter also provides valuable information for polarization loss on the energy ramp. As the intensity increases over years, the carbon target life time is getting shorter and target replacement during operation is necessary. Simulations and experiment tests have been done to address the target lifetime issue. This paper summarizes the recent operation and the target test results.

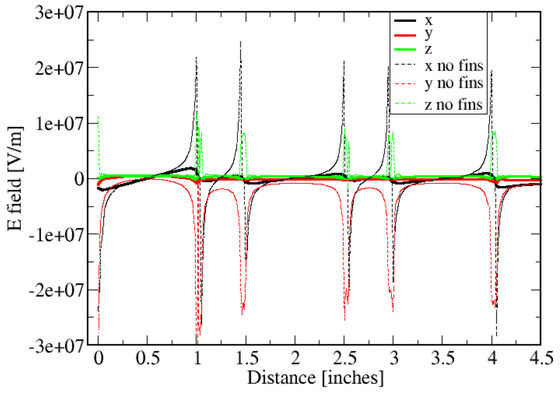



**Simulation Results When Beam is at One Target**



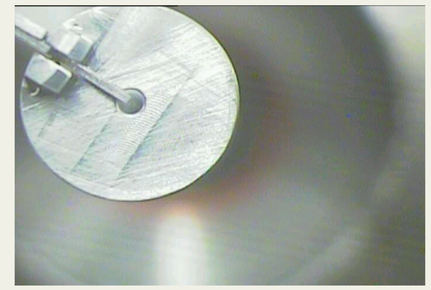

**Simulation Results When Beam is out of Target**




Target glowing when crossing proton beam.

Target at beam center.

Target glowing when outside proton beam. Note the glowing tail of nearby target.



The actual fin installed in the beam test.

A bright flash from the target without fins happened when switching targets. The targets without fins were damaged, but the targets with fins survived. All targets were outside He beam during this operation. A resonance condition was suspected.

Typical target life time is 50-100 measurements at store with full intensity. Some targets were lost before use or just after a few uses. Cameras were installed at view ports to check the target behavior. Target glowing at tails were observed. This could be due to the induced electric fields on the target wires. Simulations were done with CST-Studio (https://www.cst.com).The results shows that adding fins to the target frame can greatly reduce the induced electric fields at the edge of target frames. The targets with and without fins were installed and tested with Au and He beams. The results showed that the targets with fins have weaker glowing light and can also be protected when resonance condition encountered.

Without Fins

With Fins

Targets were parked 1.5cm away from Au beam.

## Summary

The pC CNI polarimeters in RHIC provide fast, polarization (with polarization profile) measurements. The analyzing power of this polarimeter has been calibrated by the simultaneous polarization measurements in the absolute H- jet polarimeter at various energies. This polarimeter is ideal for high-energy proton polarimetry: fast measurement, low cost and compact size.

As intensity increases, the target life time becomes an important issue. Observed continuous glowing light from target ends outside beam implies that the temperature is high and this could damage target. The experimental results showed that the targets with fins do get weaker light, which in turn implies better life time. In addition, the target breakage of targets without fins gave another strong reason to install the fins as the fins can protect targets. The plan is to install the fins for all possible targets in the coming polarized proton operation.

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