

# Characterization of time dependent distortions in the sPHENIX TPC using the Central Membrane

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## Abstract

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2 The Time Projection Chamber (TPC) is the main tracking detector in sPHENIX. Charged  
3 particles which pass through the TPC ionize the gas, with the transverse position being given  
4 by the readout pad and the time for the ionization electrons to drift to the endcaps defining  
5 the z position. The ionization electrons are then clustered together in order to track particles  
6 and determine their momenta. In order to accurately track particles, calibrations must be  
7 performed and the performance of the TPC must be understood. As part of normal operations,  
8 space charge builds up within the TPC, leading to tracking distortions. These distortions must  
9 be accurately characterized over time such that they can be corrected as they evolve. Several  
10 calibration systems are used for this, including a set of diffused lasers which illuminate the  
11 Central Membrane of the TPC. Aluminum stripes, deposited on the Central Membrane at  
12 well-surveyed positions, emit photoelectrons when struck by the diffuse laser. The resulting  
13 pattern can be reconstructed and used to characterize the 3-dimensional distortions at the  
14 position of the Central Membrane. These distortions are then extrapolated to the endcaps of  
15 the TPC in order to provide corrections throughout its entire volume. This poster will discuss  
16 the design, algorithm, and performance of the time dependent distortions corrections in the  
17 sPHENIX TPC and identify how this effort fits into the broader sPHENIX TPC calibration  
18 scheme.