Oral Presentation:

The sPHENIX TPC Project (Klaus Dehmelt)

A state-of-the-art detector, called sPHENIX, is being planned at RHIC for measuring jets, jet correlations and upsilons to study the microscopic nature of the Quark-Gluon Plasma. Precision vertexing and tracking, as well as calorimetry, will be provided over full azimuth and pseudorapidities of |eta| < 1.1. The data will be continuously recorded making use of the 15 kHz RHIC collision rate in the region of interest. A high resolution and low mass tracking system for reconstructing the three upsilon states is needed. The tracking system comprises silicon pixel and strip detectors and a compact TPC.
The TPC at the present planning stage will be using quadruple-GEM detectors as a readout, following the path of the ALICE-TPC upgrade, with a modified Neon-based gas mixture. The main tasks of this configuration are the achievement of sufficient momentum resolution and combating ion back-flow.
The motivation and the design of the technology choices will be presented along with the present status of the project. Furthermore, alternative readout structures, like hybrids of MicroMegas and GEMs will be discussed.

Posters:

sPHENIX Compact TPC for Tracking and Particle Identification (Carlos Perez)

Heavy ion collisions provide a direct experimental framework to study the properties of the Quark-Gluon Plasma.
The sPHENIX detector will be the next state-of-the-art system to measure hard processes observables with high accuracy in a broad p$_\mathrm{T}$ range.
The sPHENIX tracking system will feature a compact Time Projection Chamber working in continuous read-out mode as the main tracking detector.
The compact TPC combines both good spatial resolution, below 2% at 5 GeV/c, together with high rate withstand, as high as 100 kHz. It spans geometrically in a volume covering 2.2 units of pseudo-rapidity and 20 < R < 78 cm.
One of the technologies considered is a quad-GEM configuration connected to 200k readout channels using SAMPA chips able to read ~4Gbit/s.
For such configuration one of the key aspects of the design will be the ability to mitigate space charge distortion due to ion backflow. Several studies in this regard were done and will be shown here.

sPHENIX TPC simulation studies (Sourav Tarafdar)

Proposed upgrade of PHENIX to sPHENIX at RHIC is focused on measuring jets, jet correlations and three states of upsilons to determine the temperature dependence of transport coefficients of the quark-gluon plasma and complementing measurements being made at LHC. The sPHENIX detector will have GEM based Time Projection Chamber (TPC) as an outer

tracking detector with a length of 211 cm and outer radius of 75 cm spanning phase space of full azimuth and 2 units in rapidity. Space charge due to the accumulation of less mobile positive ions within TPC volume is considered one of the important factor determining the performance of GEM-based TPC in Heavy Ion collision environment. Also, selection of suitable gas mixture is important to achieve high mobility of ionized electrons and ions within TPC gas volume. This poster is intended to present the simulation of the effect of space charge and diffusion coefficients of different gas mixtures in TPC on tracking performance.

The mechanical design for the sPHENIX TPC (Niveditha Ramasubramanian)

The sPHENIX collaboration plans to build a world class jet detector at RHIC. Previously inaccessible measurements include jets reconstructed with hadronic calorimeters and fully resolved upsilon states. The current plan includes a highly granular silicon pixel detector (MAPS), a silicon strip detector (INTT) and a time projection chamber (TPC). The tracking system will work in the continuous readout, at high data collection rates -15kHz- and will be able to provide momentum resolution below 2% at 5 GeV/c, which is suitable for upsilon reconstruction. The TPC will span a radius from 20 to 78 cm and 2.2 units in pseudorapidity, smaller than TPCs used in current heavy ion experiments, and will be exposed to high electric and magnetic fields. In this poster, we present the mechanical design and construction of the outer field cage of the TPC.

R&D and related Simulation Studies for the sPHENIX Time Projection Chamber (Prakhar Garg)

The proposed sPHENIX detector design is focused mainly on a physics program of precise upsilon spectroscopy and jet measurements, which require a high tracking efficiency and excellent momentum resolution. A time projection chamber (TPC) is proposed as the outer tracking detector for sPHENIX, which has a rapidity coverage of $|\eta|<1.1$ and full azimuthal coverage. The sPHENIX TPC design has to be optimized for operation in the high rate, high charged particle multiplicity environment that is anticipated at RHIC in 2022. In this poster, we show the results of R&D, its related simulations and describe the ongoing efforts to optimize the design of the sPHENIX TPC.