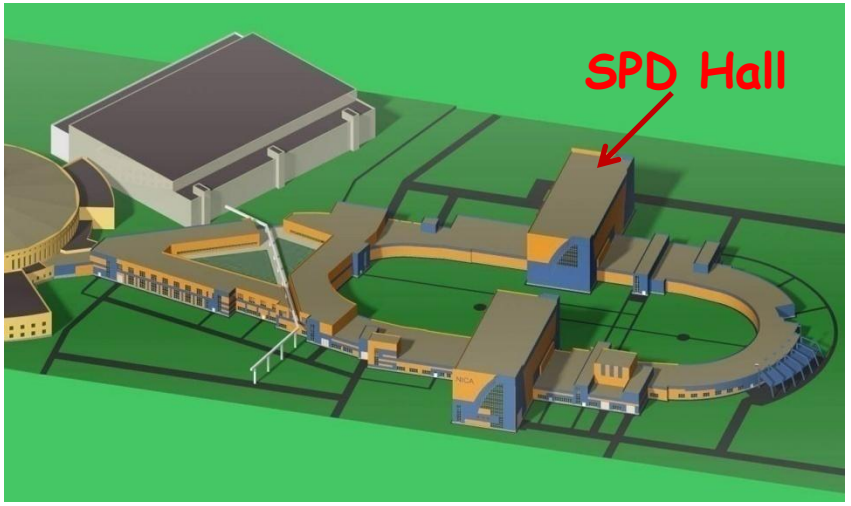
Background studies for DY measurements with SPD

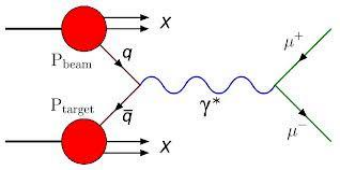
G.V.Meshcheryakov, A.P.Nagaytsev

JINR , Dubna

1. Introduction.
2. Background sources.
3. Estimations on contribution from π-decays.
4. Outlook.



1. Introduction.

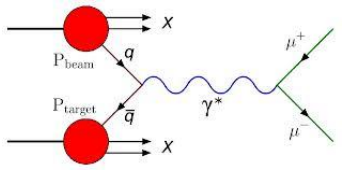


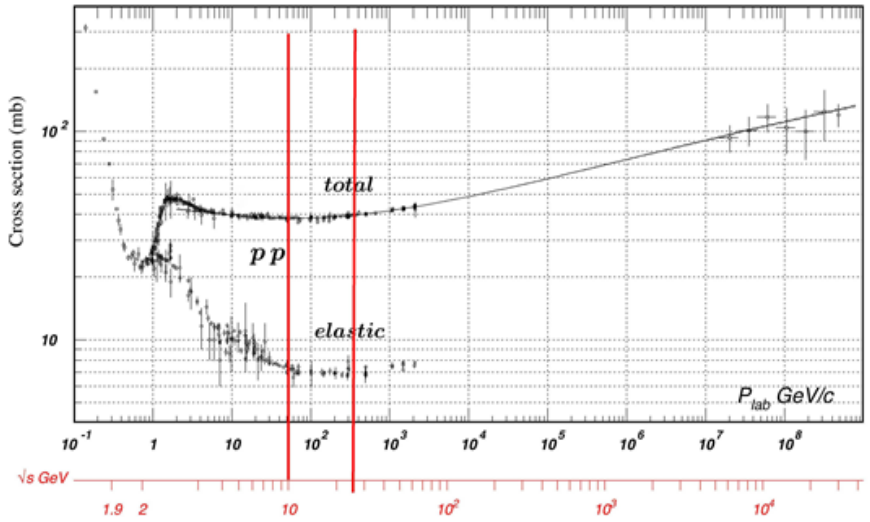
The SPD design is based on main physical tasks proposed for spin program at NICA.

The following subjects are under consideration:

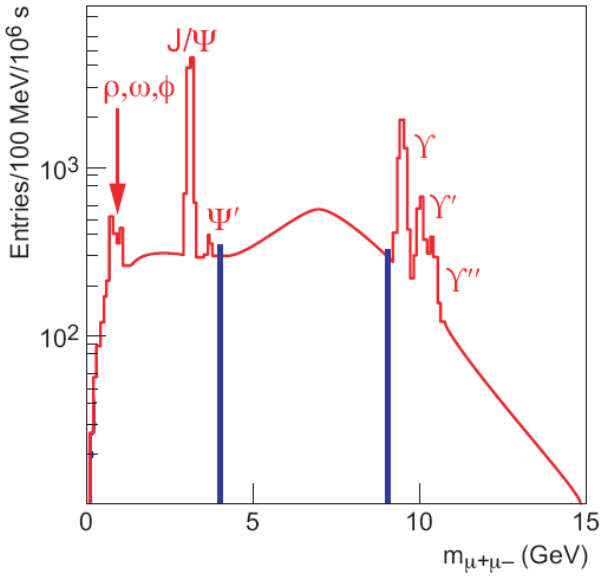
- **DY processes.**
- **J/Ψ production processes.**
- **Studies of elastic reactions.**
- **Spin effects in one and two hadron production processes.**
- **Prompt photons.**
- **Spin effects in inclusive high-p_T reactions.**
- **Final spin states effects and polarization effects in heavy ion collisions.**

1. Introduction.



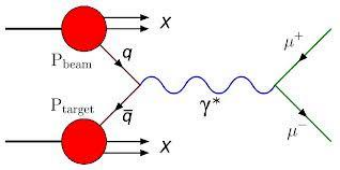


Taking into account the estimated total DY cross section (~0.1 nb) and the total inelastic pp interaction cross section at s ~ 700 GeV (~25 mB) , one needs to reject backgrounds to DY at level of $\underline{10^9}$



Typical invariant dilepton mass distribution for DY measurements. Take the region between 4 and 9 GeV

2. Background sources.

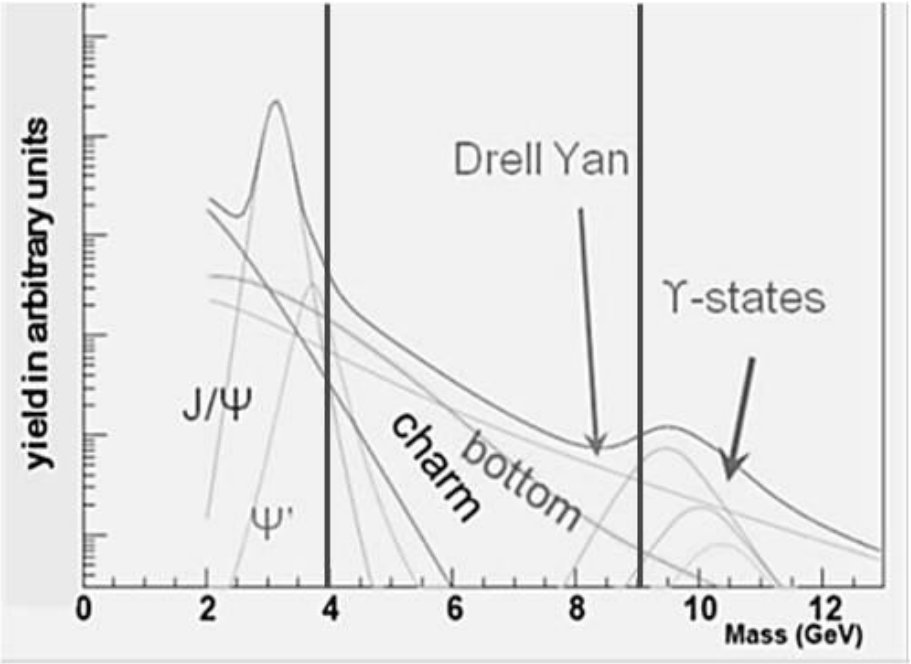


The main background sources:

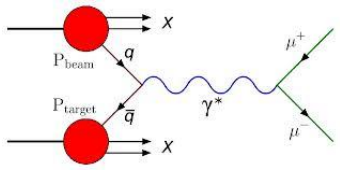
- reactions with open charm, J/Ψ , Ψ' productions,
- K and π decays,
- due to vertex resolution,
- due to time resolution depens on NICA bunch structure,
- PID misidentification,
- conversion for DY measurements via e+e-.

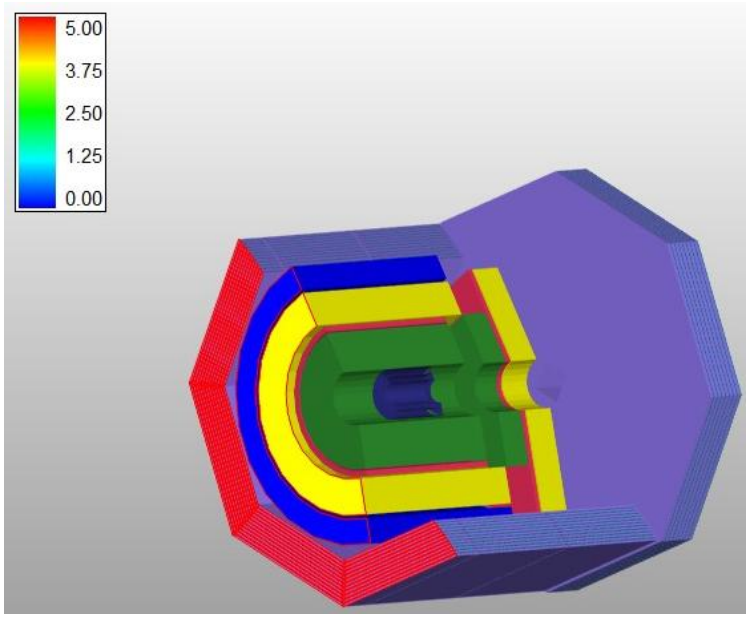
$D^0 \to e^+ anything (6,53\%)$
$D^0 \to \mu^+ anything (6,7\%)$

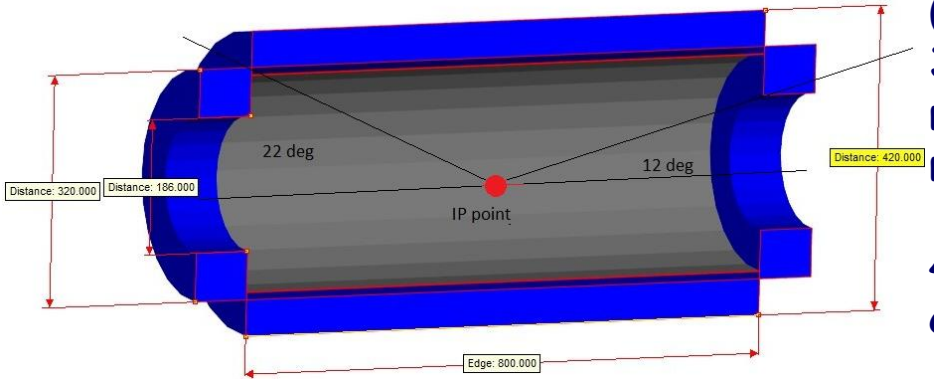
$J/\psi \to e^+e^- (5,94\%)$
$J/\psi \to \mu^+\mu^- (5,93\%)$



3. Estimations on contribution from π-decays.







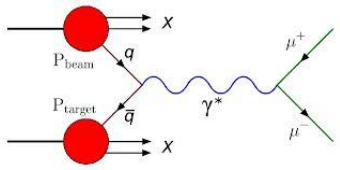
MC studies with PYTHIA (mininal bias setting) and GEANT, 100 M generated events.

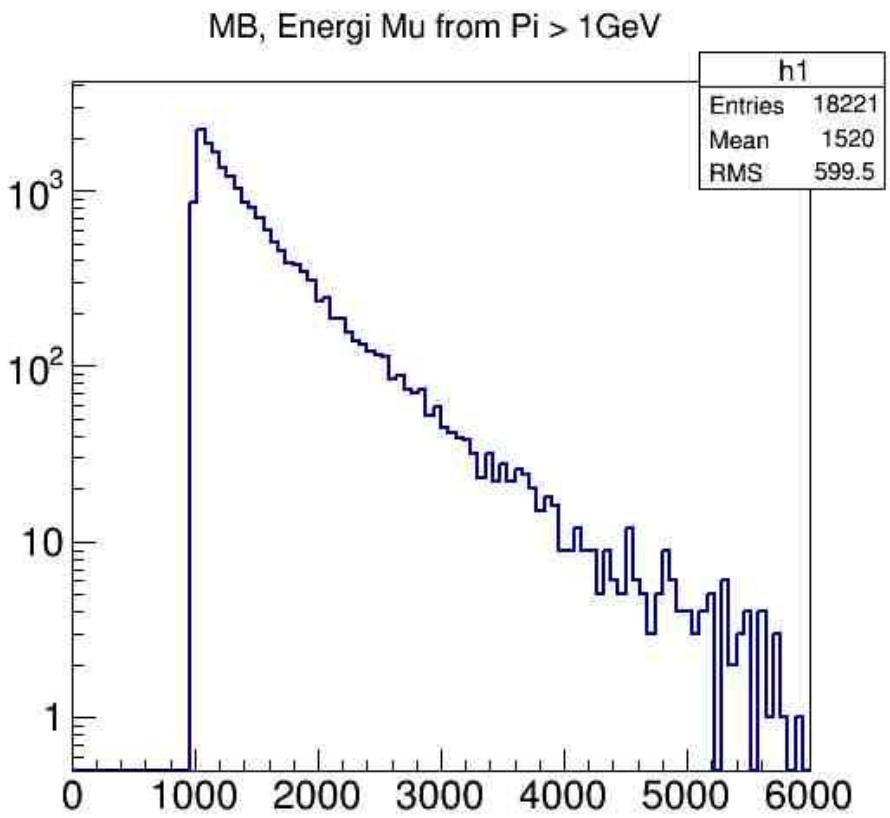
The analysis is performed for volume not covered by detectors (before VD).

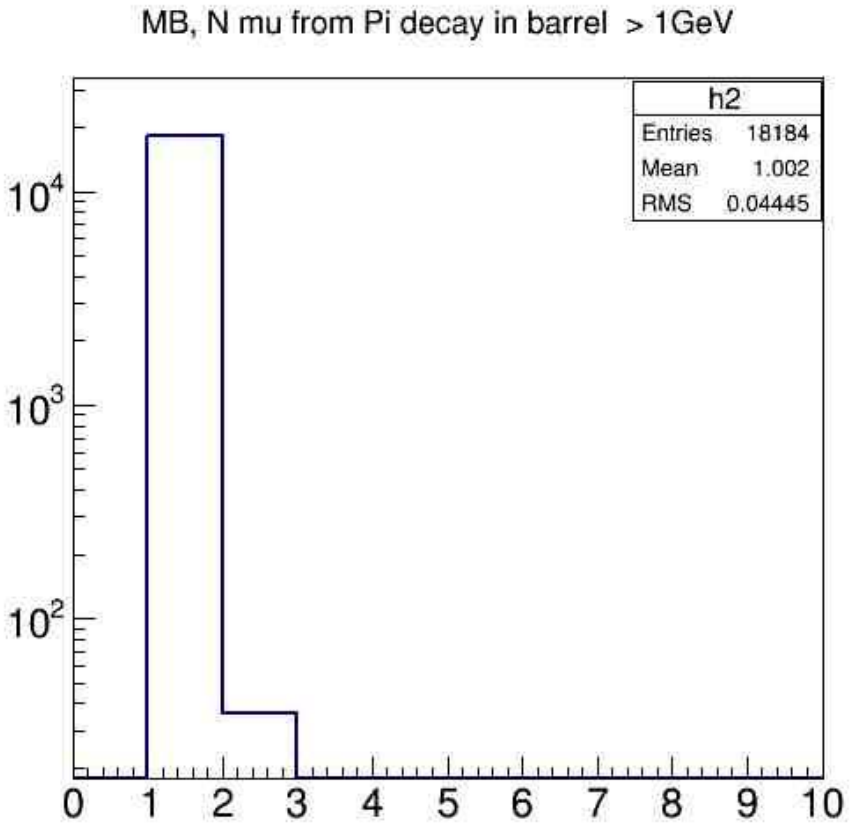
The approach to minimize the background contribution for this region can be as follows:

1. To use cut on charge particle energy equal to 1 GeV;
2. To take to reconstruct just events with negative and positive charge particles (trigger selection);
3. To select the events where invariant mass of charge particle (assumed to be muons+/-) is greater then 4 GeV.
4. To select just tracks with XY projection crossing (or close) beam profile.

3. Estimations on contribution from π-decays.







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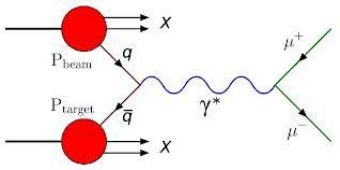

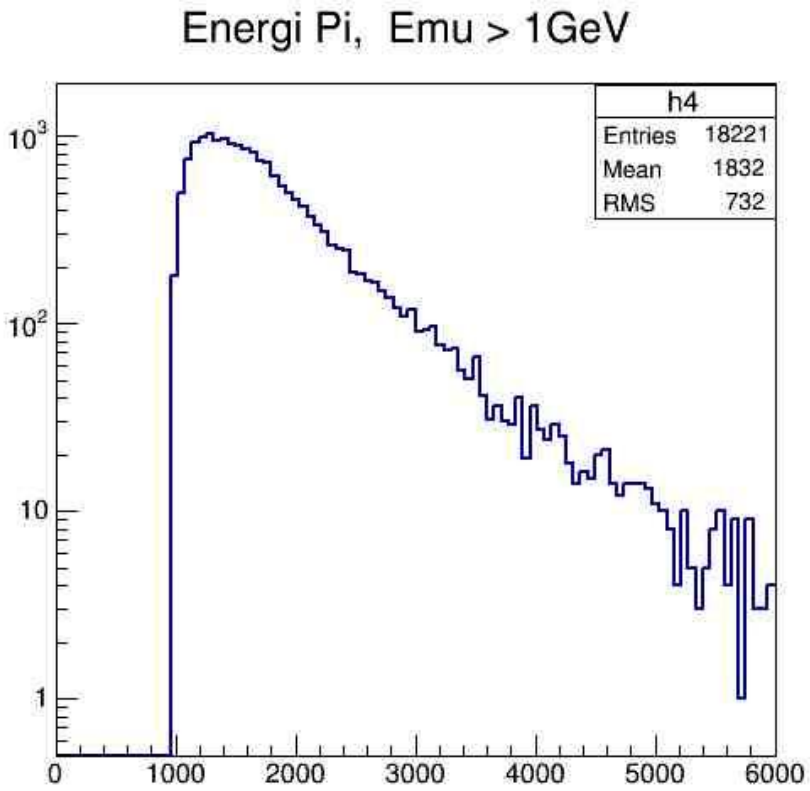

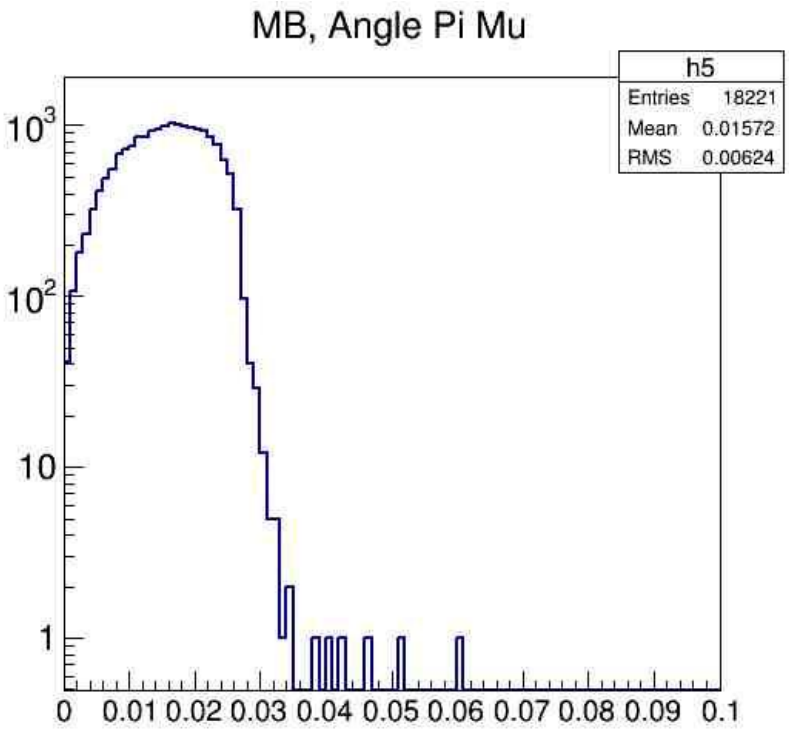

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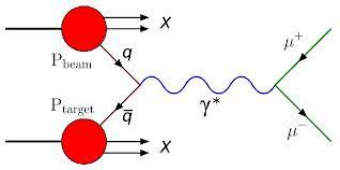

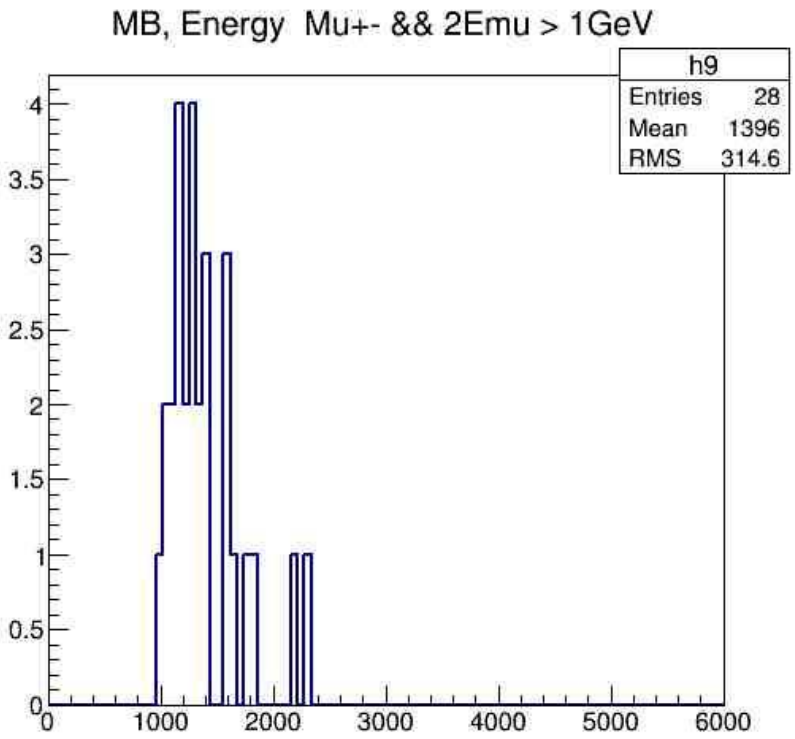

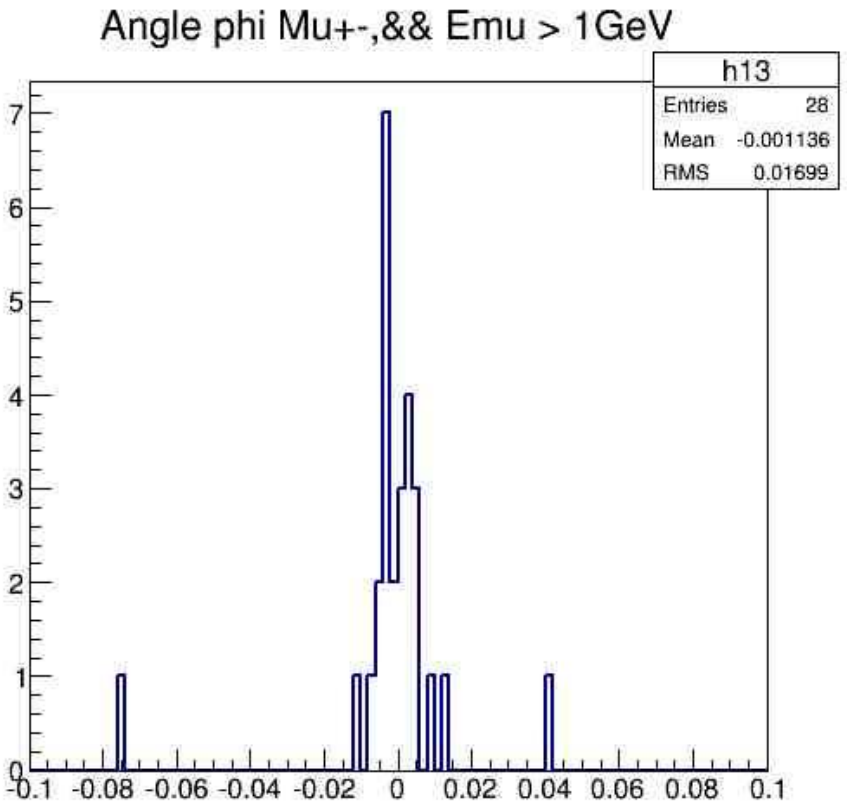

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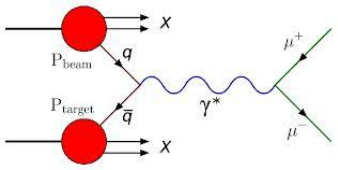

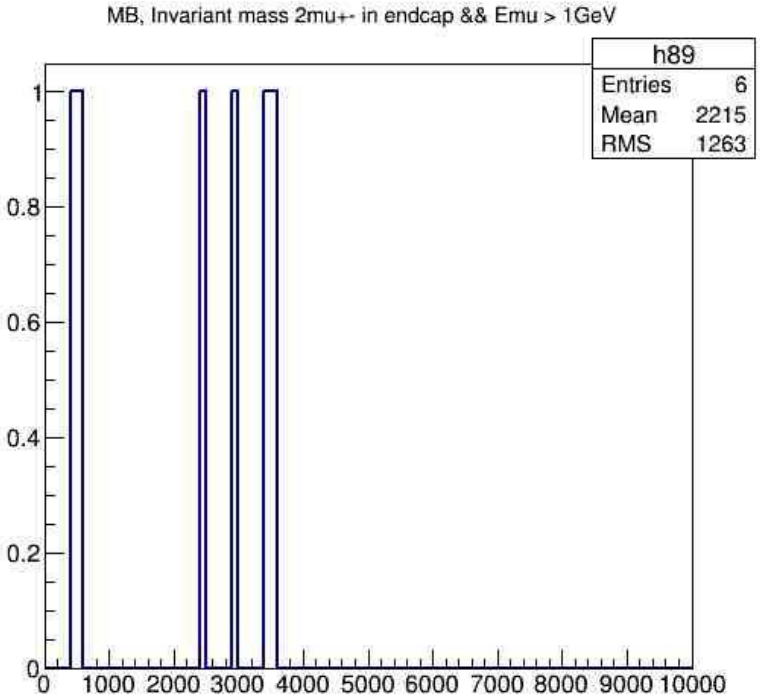

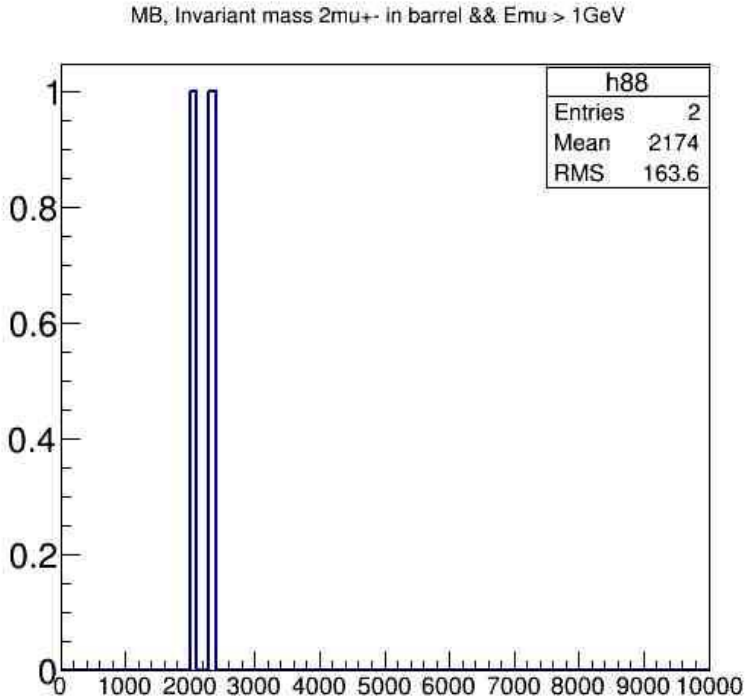

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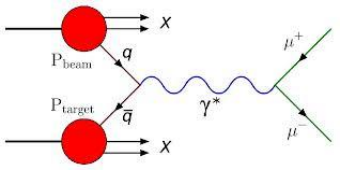
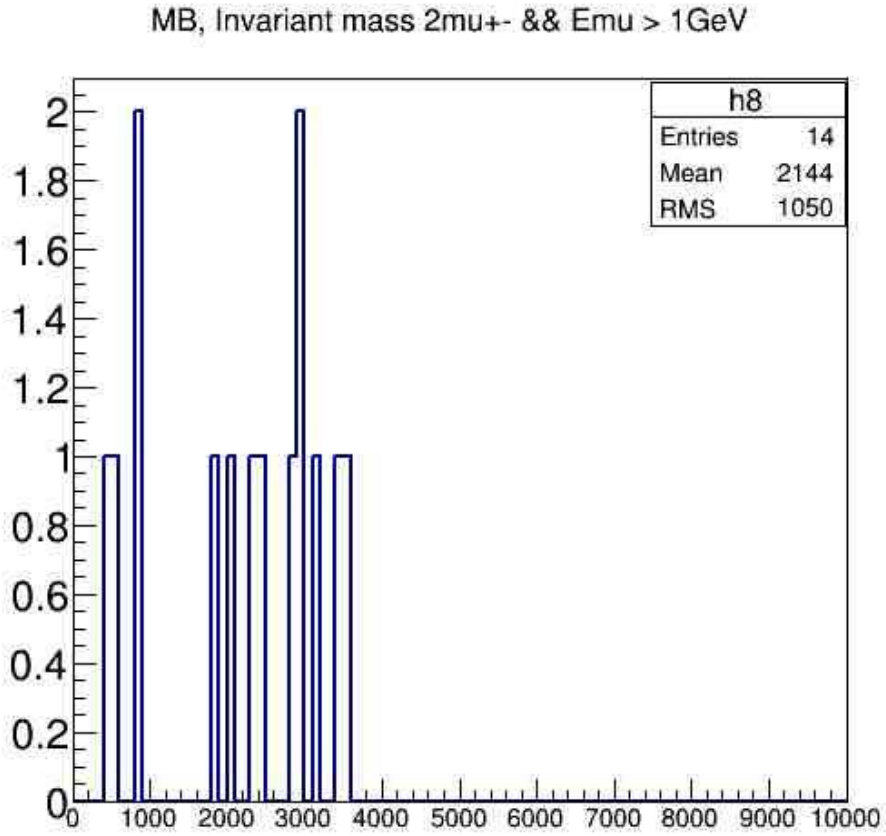
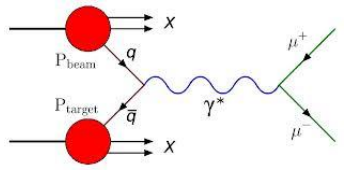


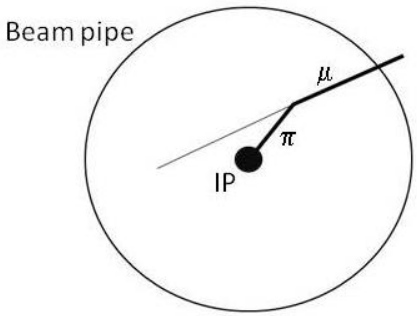


No background for $M_{\mu\mu}$ > 4 GeV

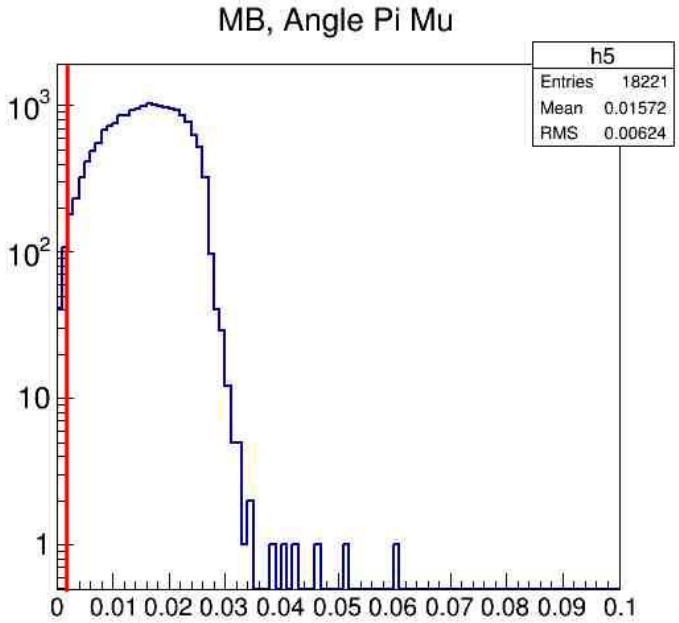
The MC studies for volumes in Vertex Detector,Central tracker, ECAL and RS are in progress.

3. Estimations on contribution from π-decays.





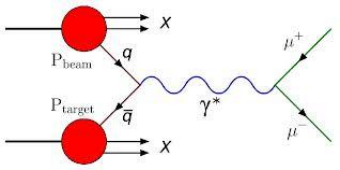
The additional possibility to minimize the background can consist of the special selection of tracks with XY projection crossing beam profile.



The distribution of angles between pions and decaying muons.

The angle range to be measured: 2 – 30 mRad.

4. Outlook



1. The background studies are very important for Drell-Yan experimental program at SPD.

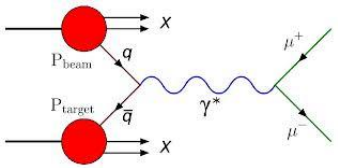
2. The preliminary list of background sources are defined.

3. The estimations for backgrounds from π-decays in beam pipe region are performed.

4. No seen background with simple set of cuts and selections (charge particle energy, negative/positive particle in event, invariant mass cut).

5. The MC studies for volumes in Vertex Detector, Central tracker, ECAL and RS are in progress.

Collaborators are welcomed !


X
P_{beam}
q
P_{target}
$\bar{q}$
X
γ^*
μ^+
μ^-