


FSD simulation

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Add info in sim particles

- Now we can select only particles which track has FSD point
- Weight to QN can be Q^2

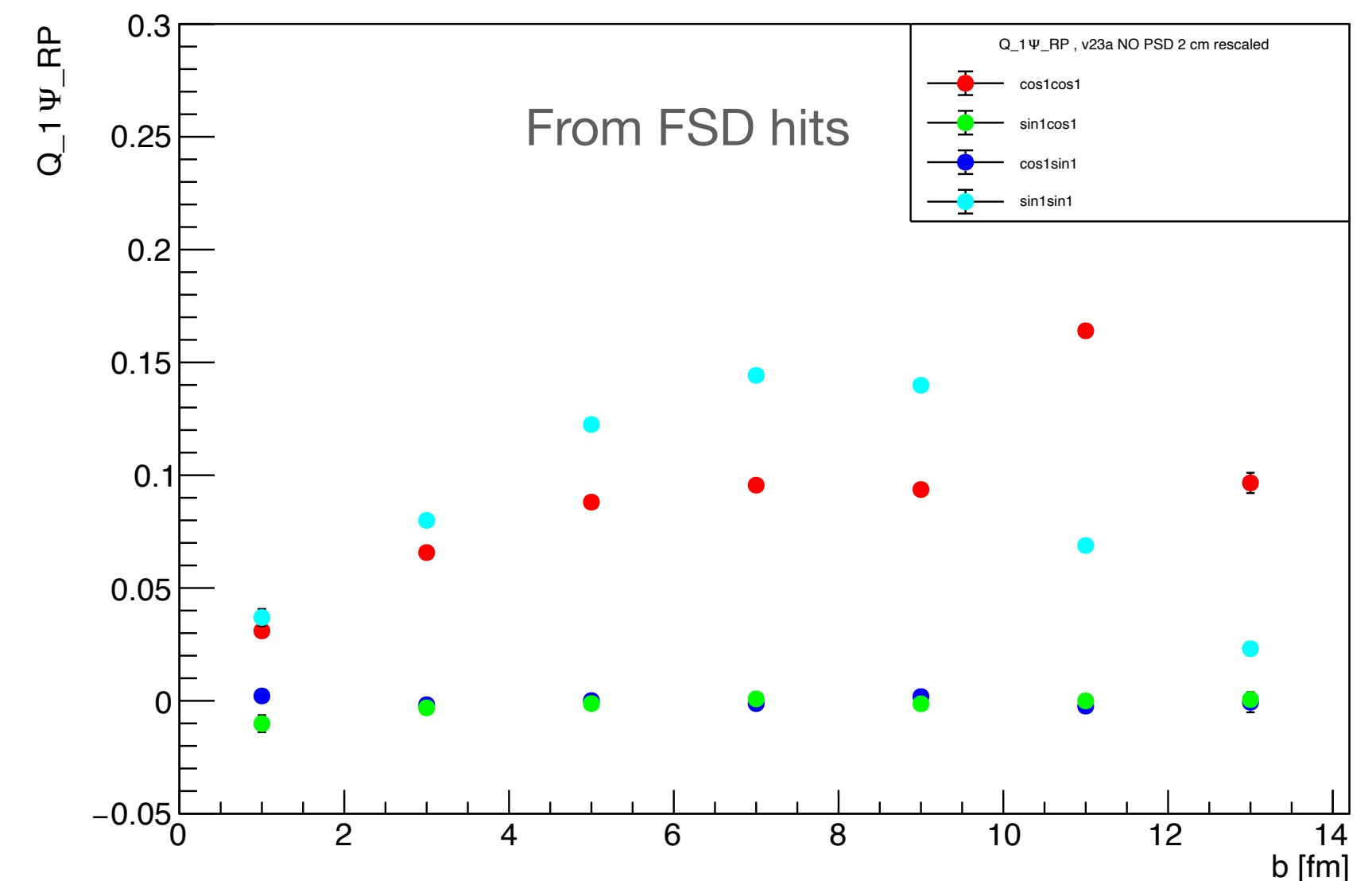
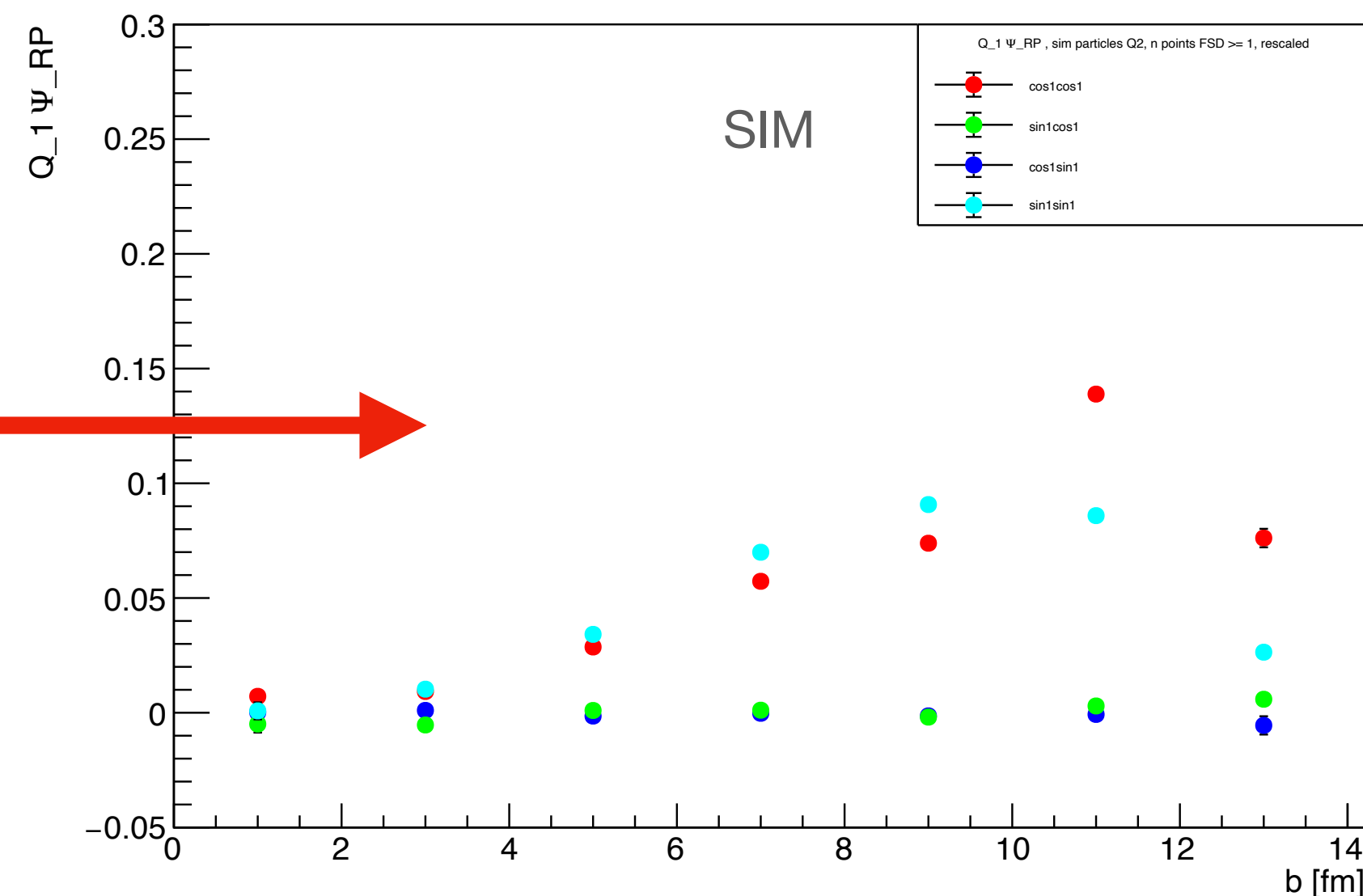
```
track.SetMomentum(mctrack->GetPx(), mctrack->GetPy(), mctrack->GetPz());
track.SetMass(float(mctrack->GetMass()));
track.SetPid(int(mctrack->GetPdgCode()));
track.SetField(int(mctrack->GetGeantProcessId()), igeant_id_);
track.SetField(int(mctrack->GetNPoints(ECbmModuleId::kMvd)), in_hits_);
track.SetField(int(mctrack->GetNPoints(ECbmModuleId::kSts)), in_hits_ + 1);
track.SetField(int(mctrack->GetNPoints(ECbmModuleId::kTrd)), in_hits_ + 2);
track.SetField(int(mctrack->GetUniqueID()), icbm_id_);
track.SetField(float(mctrack->GetCharge()*mctrack->GetCharge()), icharge2_);
track.SetField(int(mctrack->GetNPoints(ECbmModuleId::kFsd)), in_points_fsd_);
```



QN - N points FSD > 1 (hole r = 5 cm)

- Calculated from all simulated particles (primary + secondary) which leave hit in FSD
- Results compared to ones calculated from FSD hits
- High weight of low energy secondary electrons

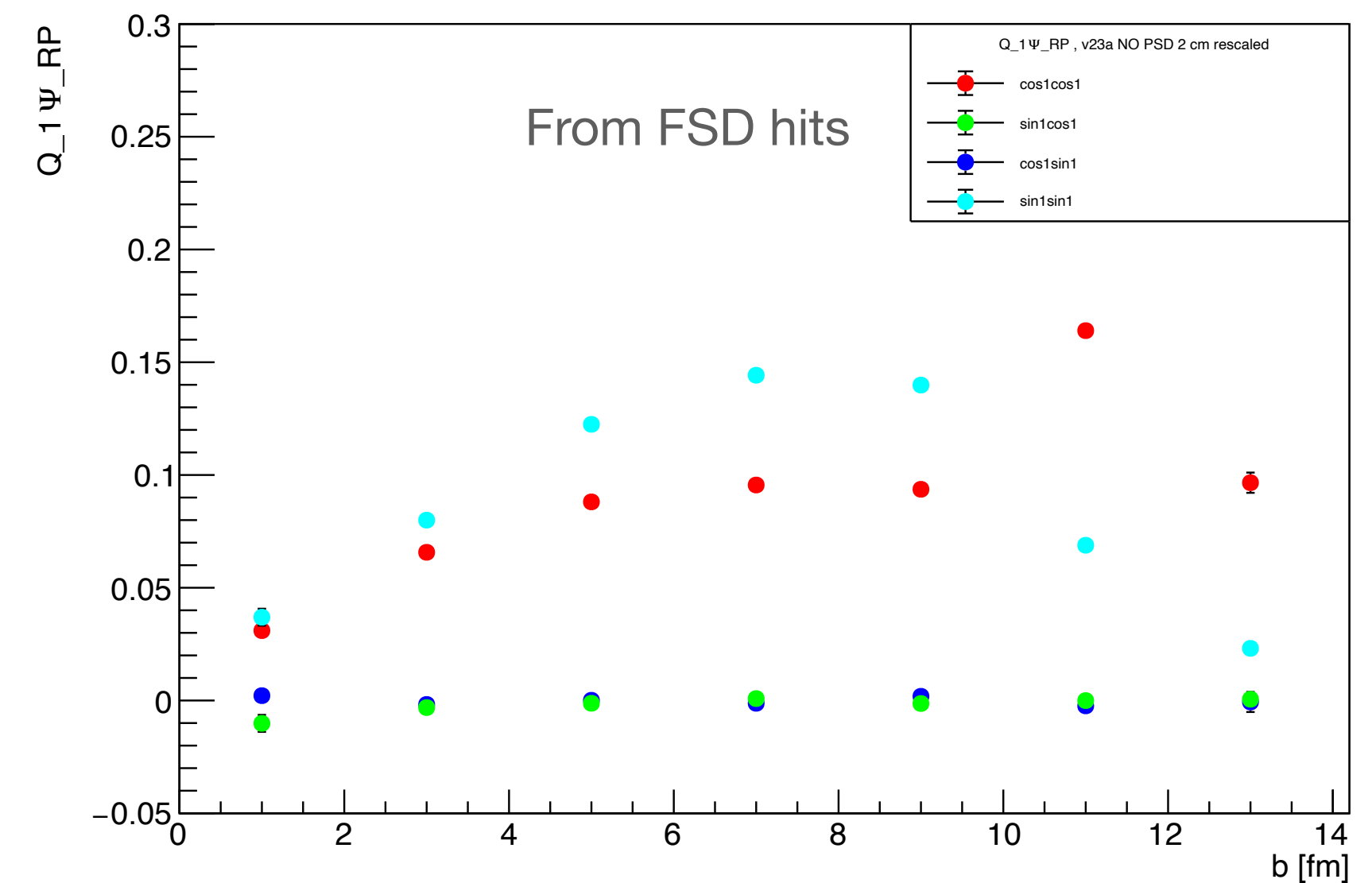
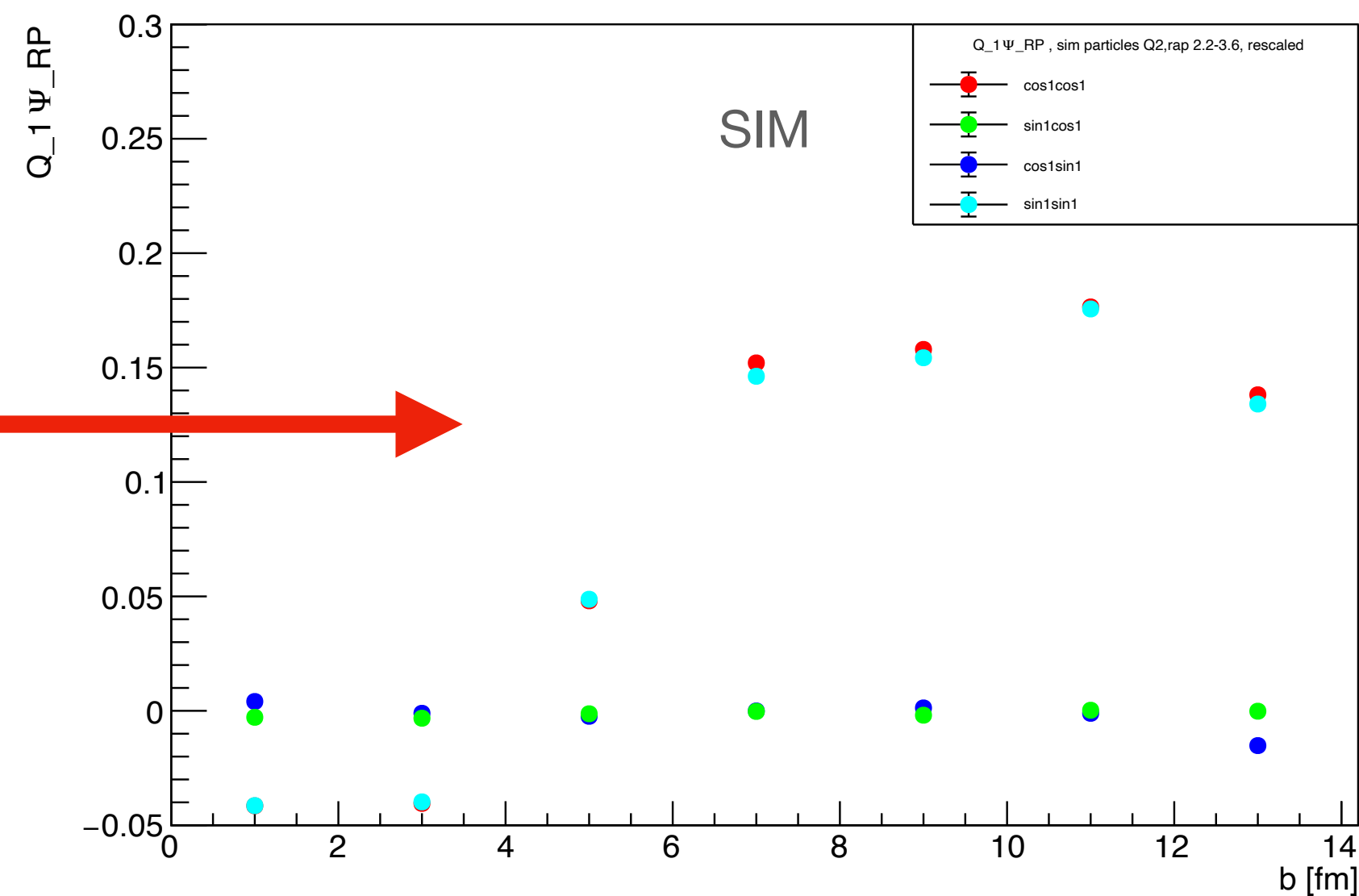
```
_cuts:  
- &n_fsd  
  SimParticles/n_points_fsd: { range: [0.5, 3] }  
cbm_analysis:  
  event-variables:  
    - SimEventHeader/b  
  axes:  
    - { name: SimEventHeader/b, bin-edges: [0, 2, 4, 6, 8, 10, 12, 14]}  
  q-vectors:  
    - name: Q_psi  
      type: track  
      phi: SimParticles/phi  
      weight: SimParticles/charge2  
      norm: m  
      corrections:  
        - recentering  
        - twist-and-rescale  
      cuts:  
        *n_fsd  
    - name: R_psi  
      type: psi  
      phi: SimEventHeader/psi_RP  
      weight: Ones  
      norm: m
```



QN - rapidity cut

- Rapidity cut - 2.2 - 3.6 - on sim particles + weight Q2 (neutrons has zero contribution)

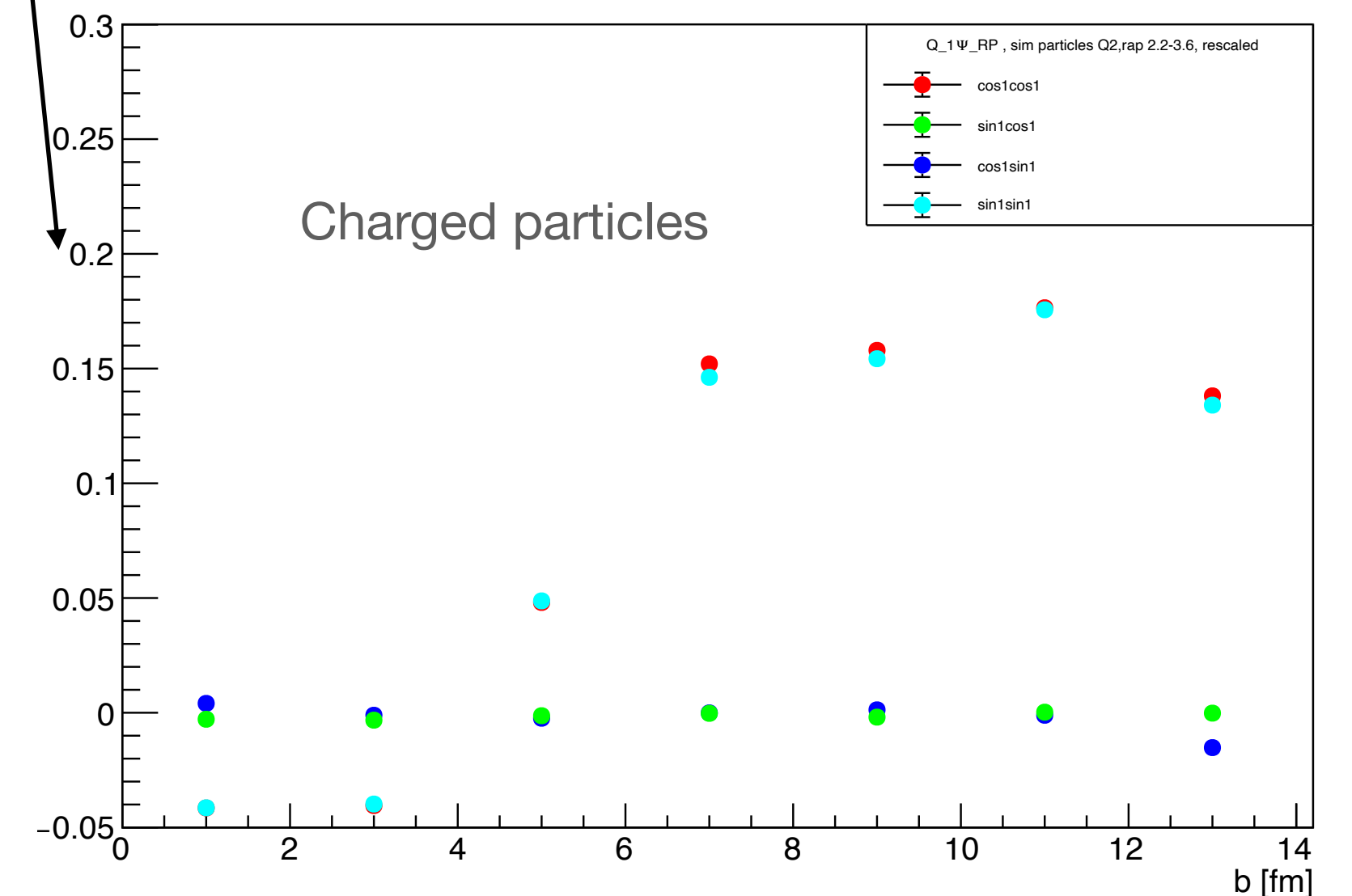
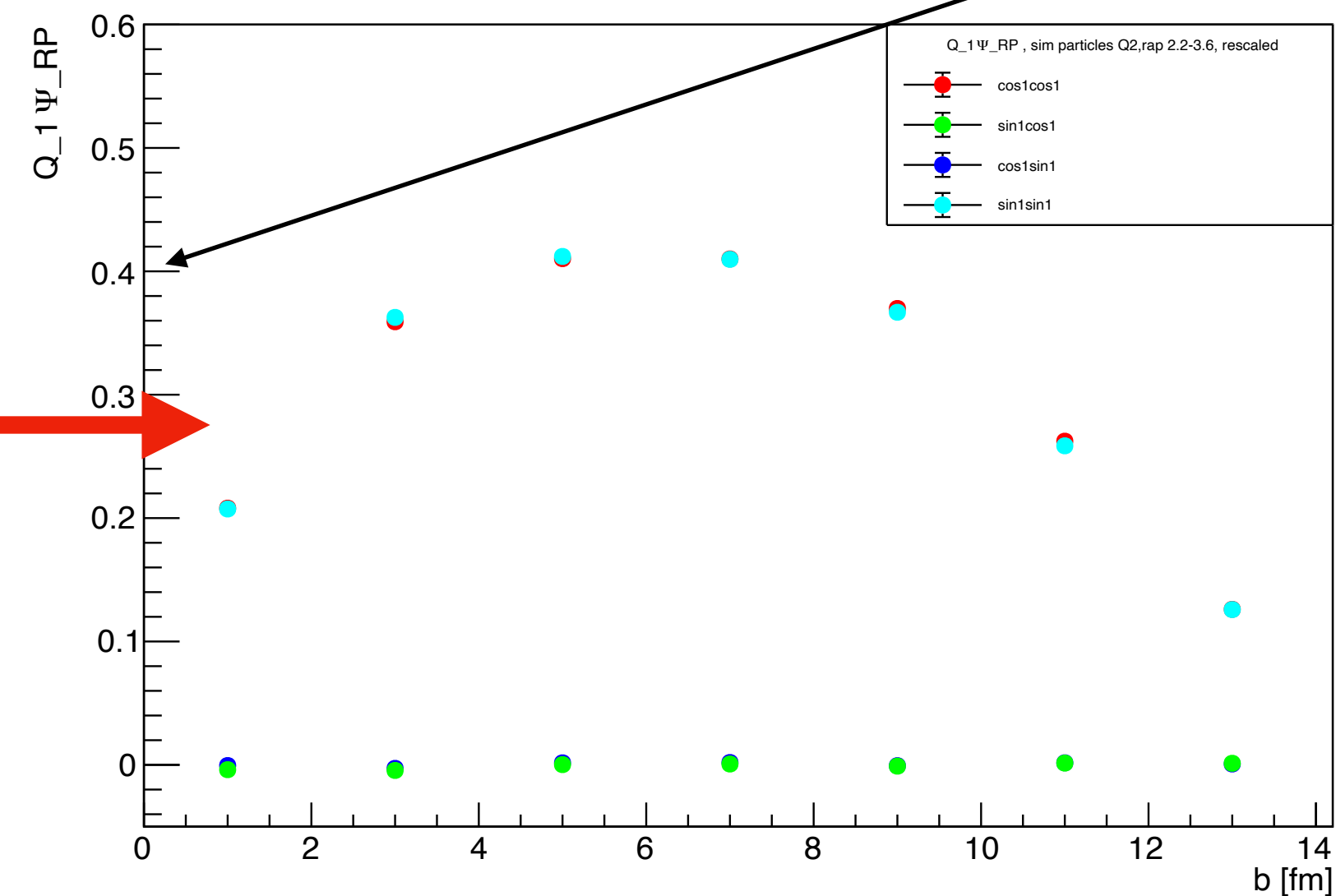
```
_cuts:  
- &rapidity  
  SimParticles/rapidity: { range: [2.2, 3.6] }  
cbm_analysis:  
  event-variables:  
    - SimEventHeader/b  
  axes:  
    - { name: SimEventHeader/b, bin-edges: [0, 2, 4, 6, 8, 10, 12, 14]}  
  q-vectors:  
    - name: Q_psi  
      type: track  
      phi: SimParticles/phi  
      weight: SimParticles/charge2  
      norm: m  
      corrections:  
        - recentering  
        - twist-and-rescale  
      cuts:  
        *rapidity  
    - name: R_psi  
      type: psi  
      phi: SimEventHeader/psi_RP  
      weight: Ones  
      norm: m
```



QN - neutron cut

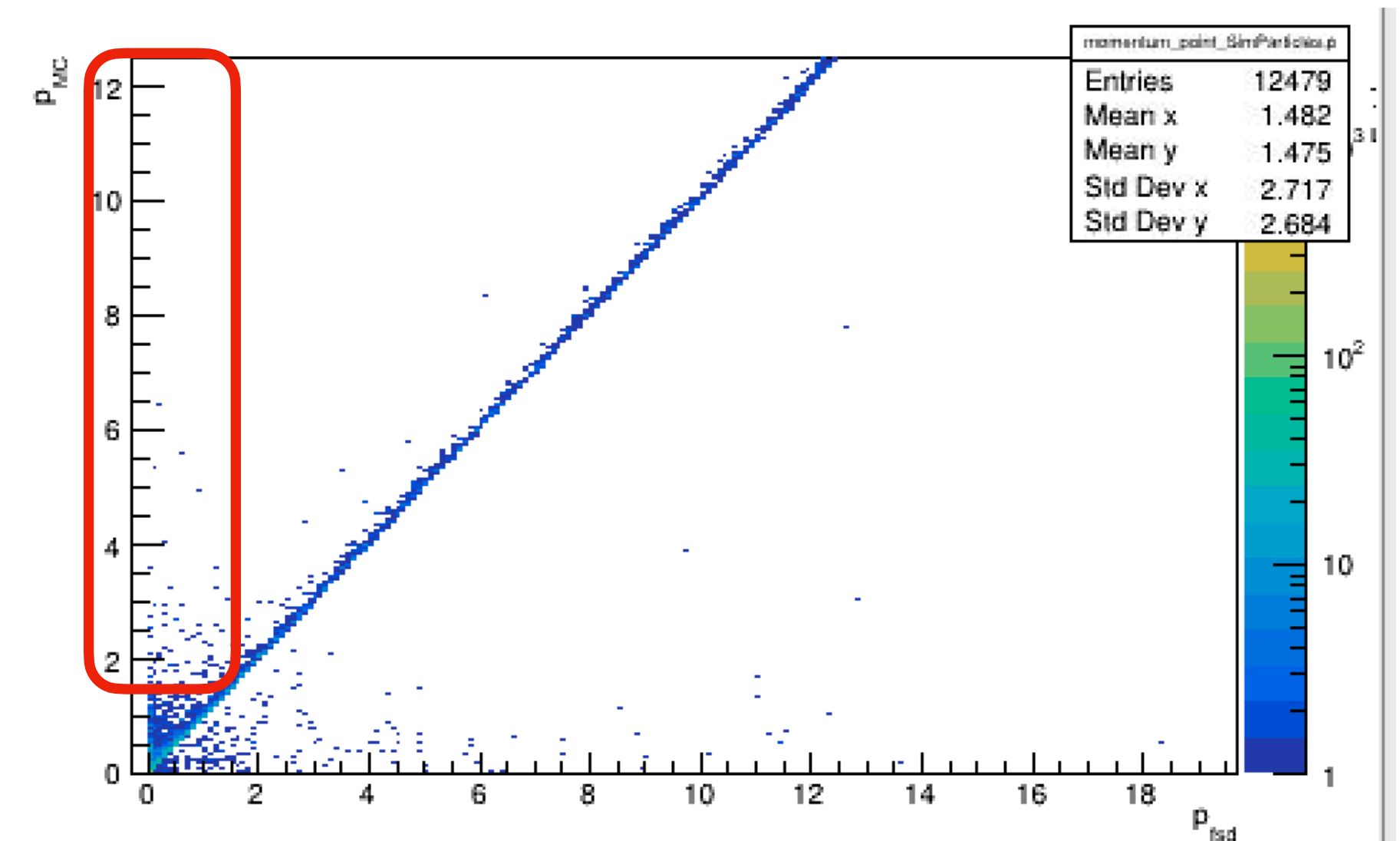
- Only neutrons in rapidity 2.2-3.6
- Neutron cause main part of correlation

```
_cuts:  
- &rapidity  
  SimParticles/rapidity: { range: [2.2, 3.6] }  
  SimParticles/pid: { range: [2111.5, 2112.5] }  
  
cbm_analysis:  
  event-variables:  
  - SimEventHeader/b  
  axes:  
  - { name: SimEventHeader/b, bin-edges: [0, 2, 4, 6, 8, 10, 12, 14] }  
  q-vectors:  
  - name: Q_psi  
    type: track  
    phi: SimParticles/phi  
    weight: Ones  
    norm: m  
    corrections:  
    - recentering  
    - twist-and-rescale  
  cuts:  
  *rapidity  
  - name: R_psi  
    type: psi  
    phi: SimEventHeader/psi_RP  
    weight: Ones  
    norm: m
```



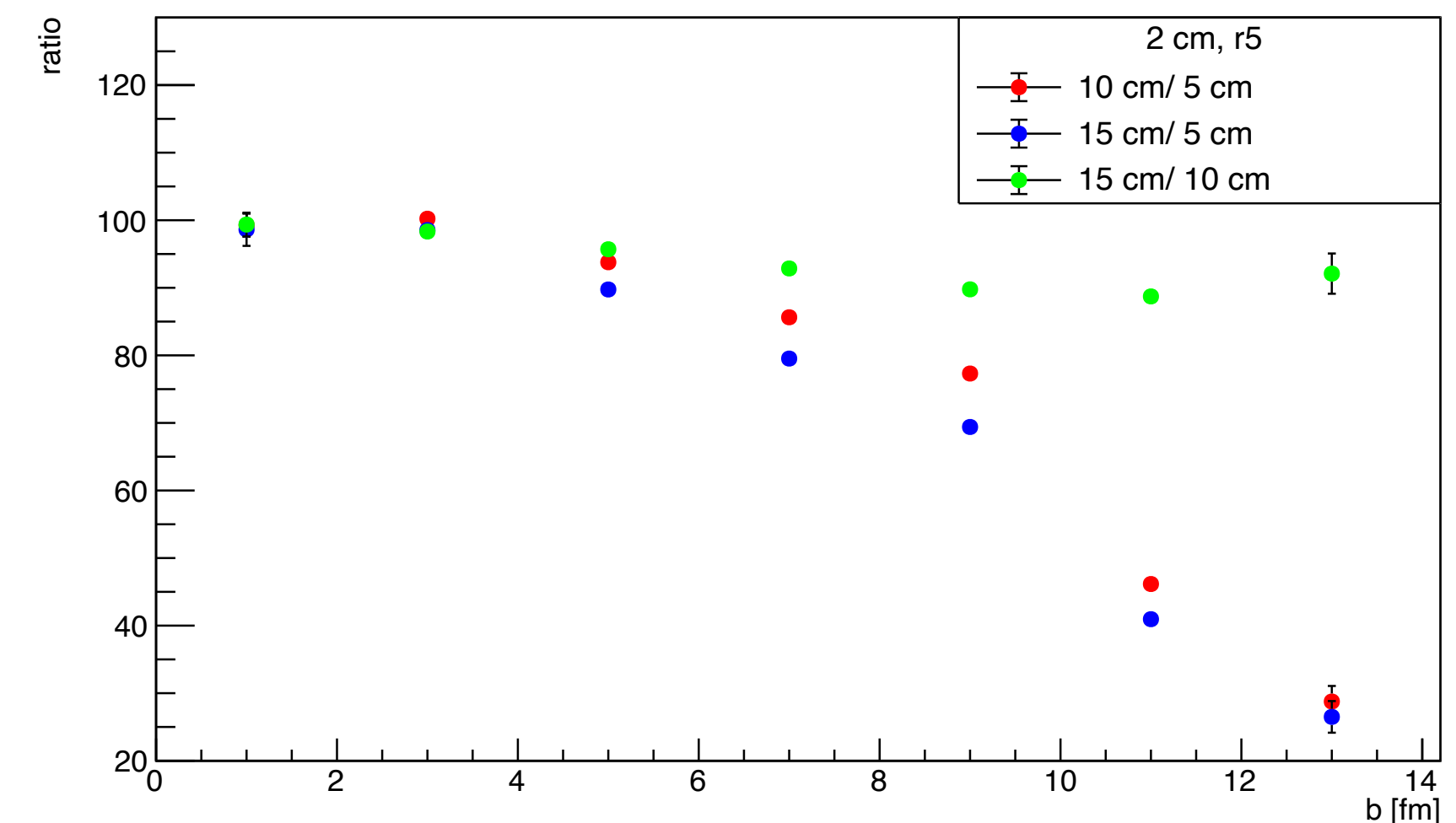
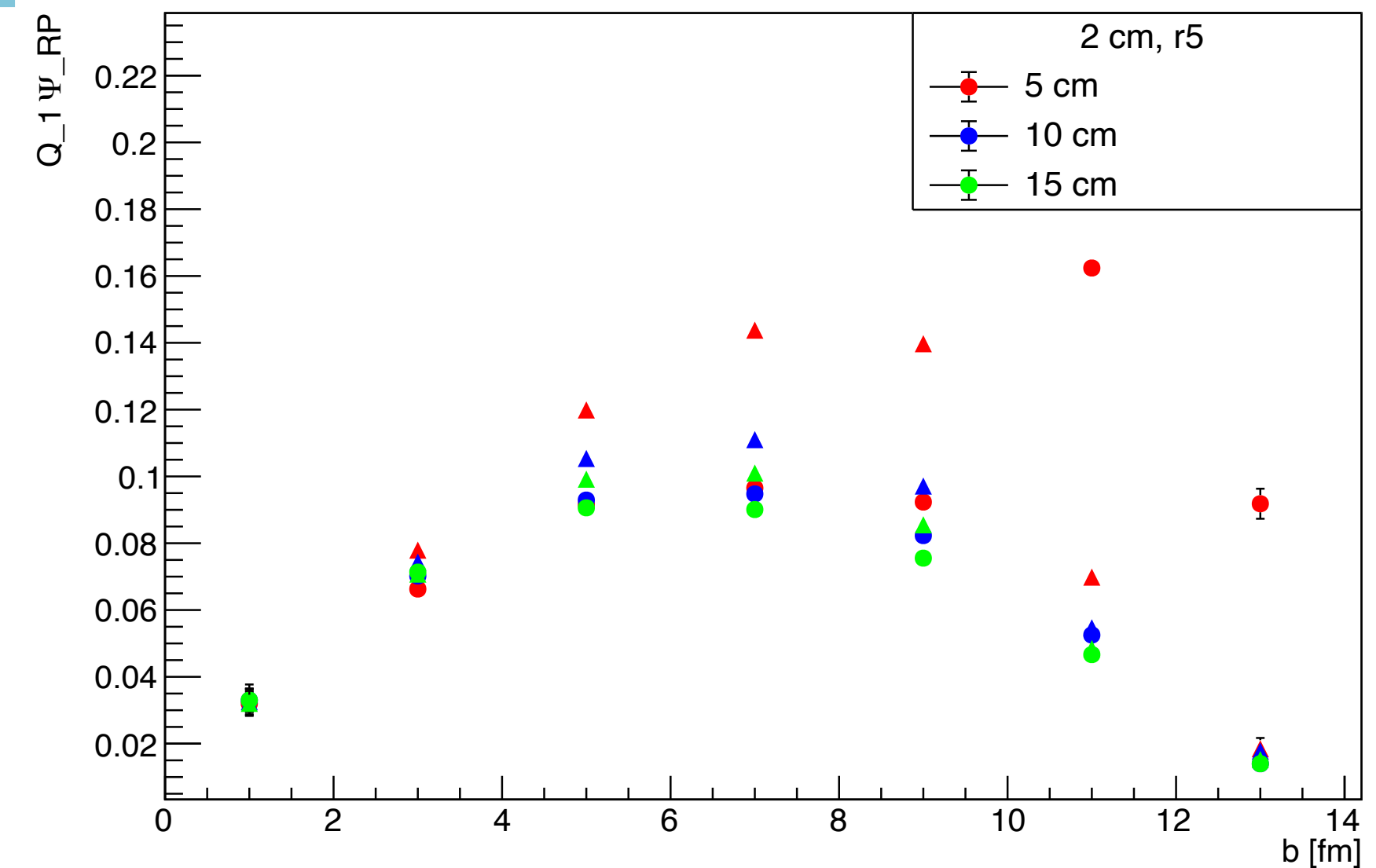
Matching problem - CbmFsdHitConvertor

- I found that only one point is added to hit -> but in convertor there is loop over all points -> only “last” (not in time order but index order) is added to hit -> it can be some secondary electron -> cuts on points (like point lenght) doesn't make a sense
- Solution: I scan all the points and add point with highest p_z (we can discuss better solution)
- It solve the problem with high momentum in creation vertex and small in p_{sd}
- This is only problem of matching hits and points but matching between hits and sim particles is correct



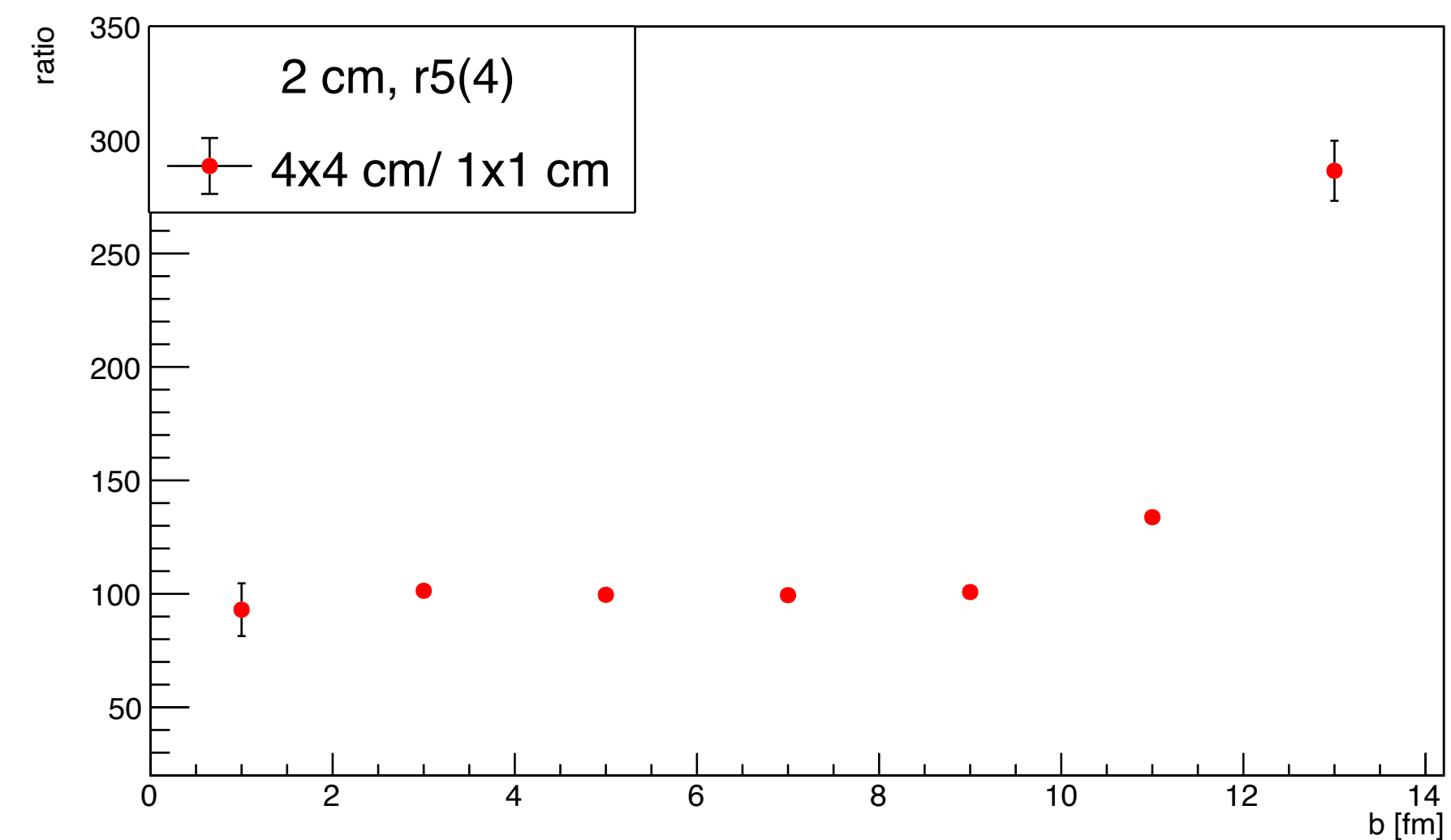
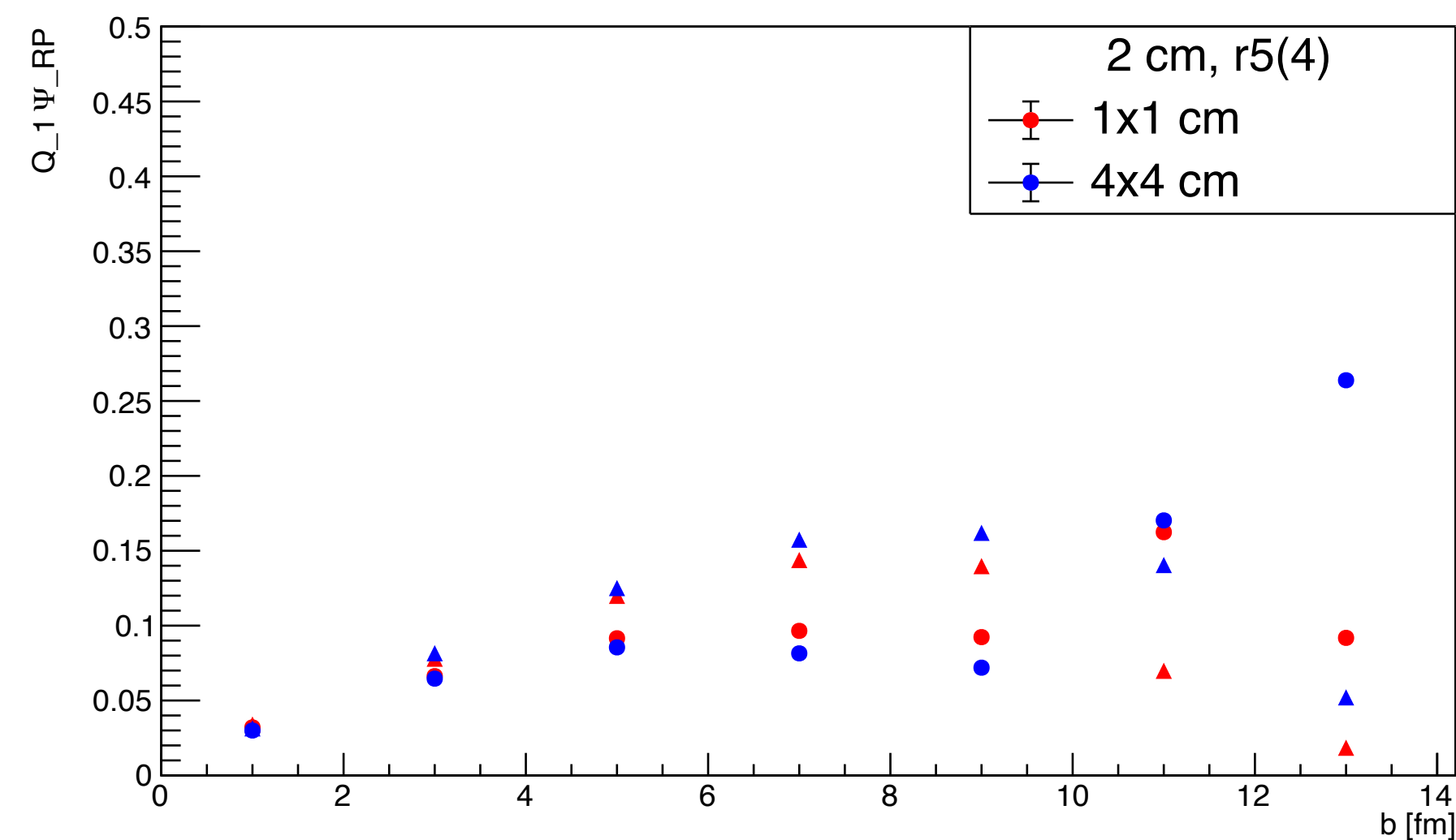
Different hole size

- FSD 2 cm 1x1 cm, hole radius 5 cm
- Cut on hole radius
 - 10 cm (circle with 10 cm radius)
 - 15 cm
- Similar results 10-15 cm hole (5% decrease)



Different granularity

- 1x1 cm with hole radius 5 cm
- 4x4 cm with hole radius 4 cm
- Similar results ($b < 10$ fm)



Different granularity - larger hole

- Hole radius > 10 cm
- Solved problem with high b
- Granularity 4 cm has better results??? -> we are ok with 4x4 cm pads

