Low-Q^2 tagger acceptance

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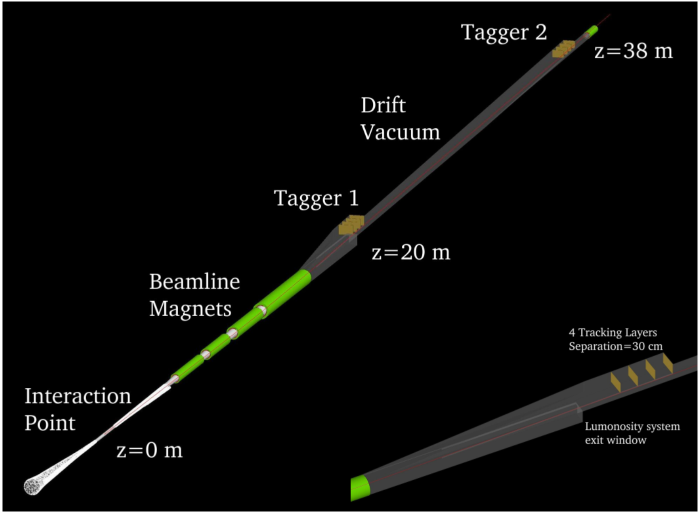
February 6, 2022

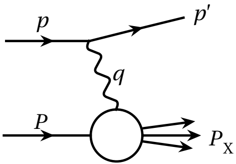
GD/I Meeting

Geometry layout

- Two detectors, Tagger 1 and 2 are considered along electron outgoing beampipe
- The taggers are implemented as a set of tracking layers; calorimeter behind them is also a part of the design
- Beamline magnets (green cylinders) are all outside the central detector

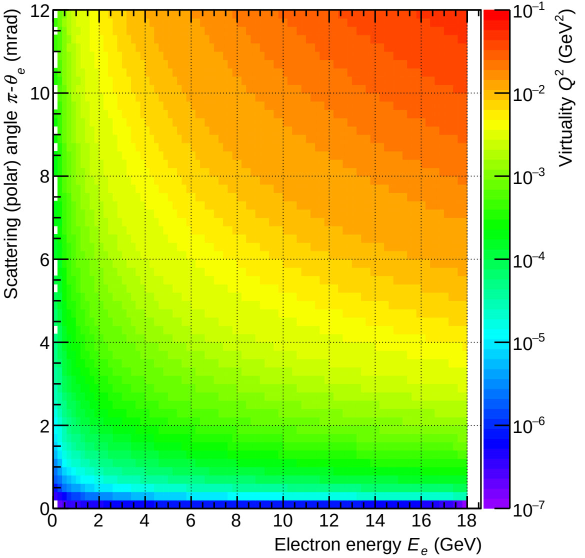


Phase space relevant for taggers



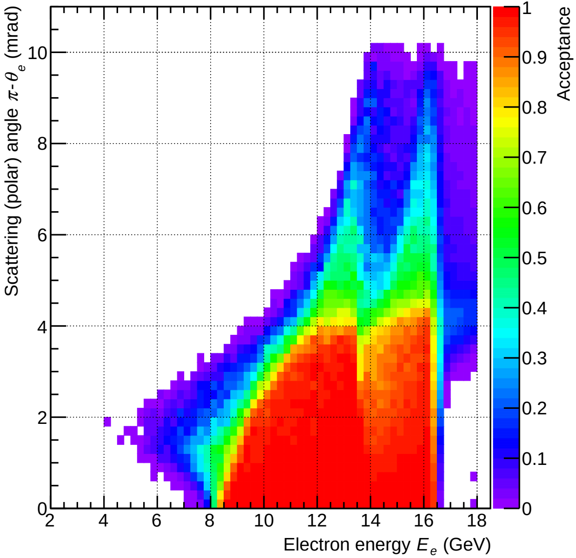
Scattering angle is the angle between p and p'

- Region of interest for tagger detectors is for scattering angles less than 10 mrad
- Q^2 (color scale) is shown as a function of electron energy and scattering angle
- Choice for two tagger detectors is mainly motivated by reaching the same Q^2 at different energies and angles



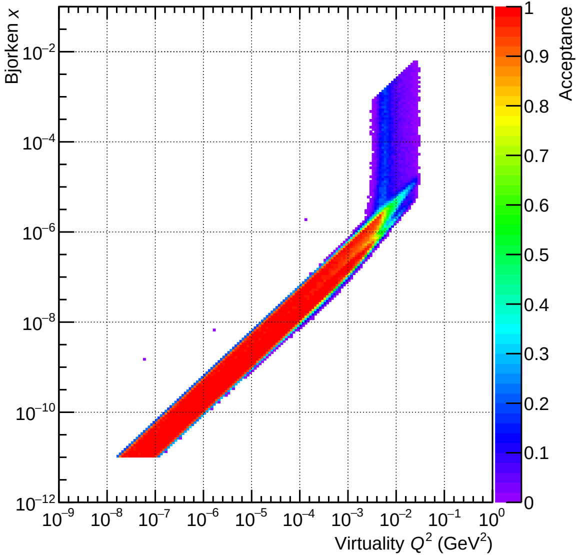
Acceptance in electron energy and scattering angle

- The acceptance is shown by color scale as a function of electron energy and scattering angle
- It is defined as a fraction of events accepted by one of the taggers to all generated events in a given bin of energy and angle
- Accepted event means there is a track in one of the taggers



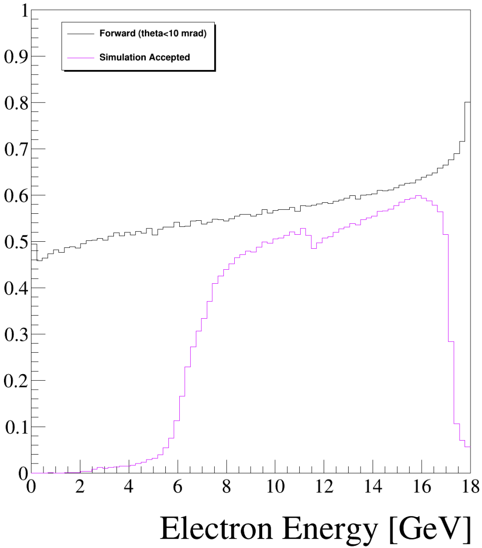
Acceptance in Q^2 and Bjorken-x

- Same procedure is applied for the acceptance as on previous page
- Color scale gives acceptance as a function of event Q^2 and Bjorken-x



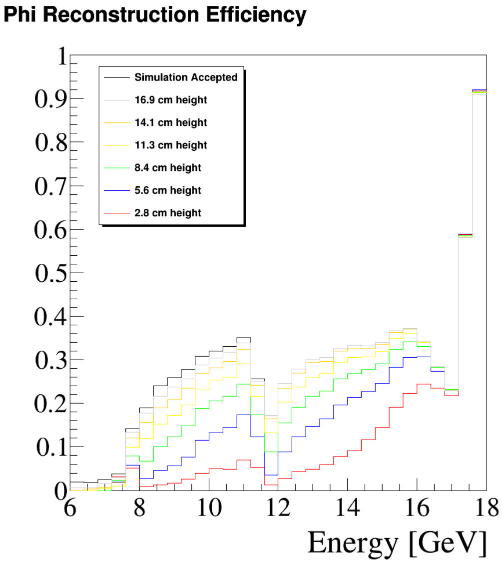
Acceptance in electron energy

- The acceptance is evaluated as a function of electron energy for all electron angles



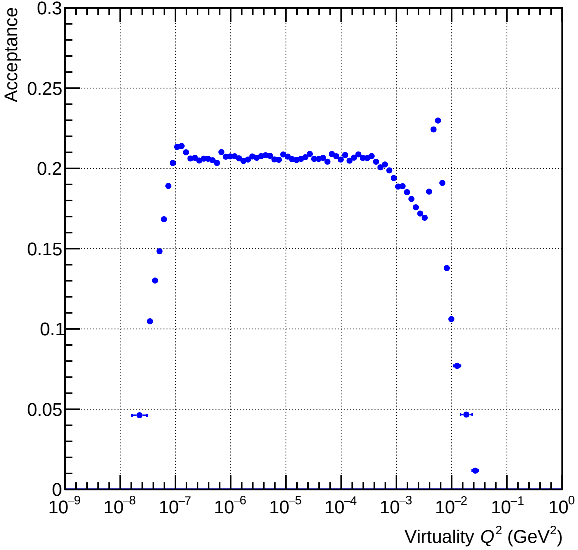
Efficiency to reconstruct electron azimuthal angle phi

- Electron azimuthal angle ϕ is important part of physics case for tagger detectors
- Efficiency to reconstruct the ϕ is given by fraction of events with valid ϕ information to all events accepted by one of the taggers
- The efficiency is shown as a function of electron energy for various geometry configurations



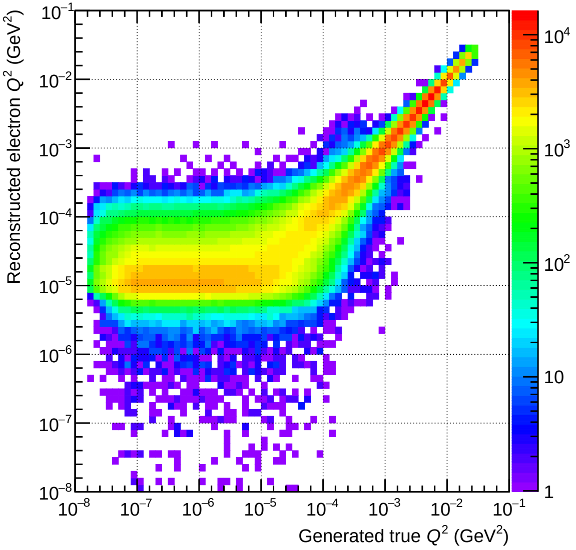
Acceptance in Q^2

- Acceptance is shown as a function of Q^2 for all accepted electron energies and angles
- Upper limit of the acceptance at $Q^2 \lesssim 10^{-1}$ GeV^2 is given by outgoing electron beampipe
- Practical lower limit for reconstruction, $Q^2 \gtrsim 10^{-4}$ GeV^2 is imposed by background rejection



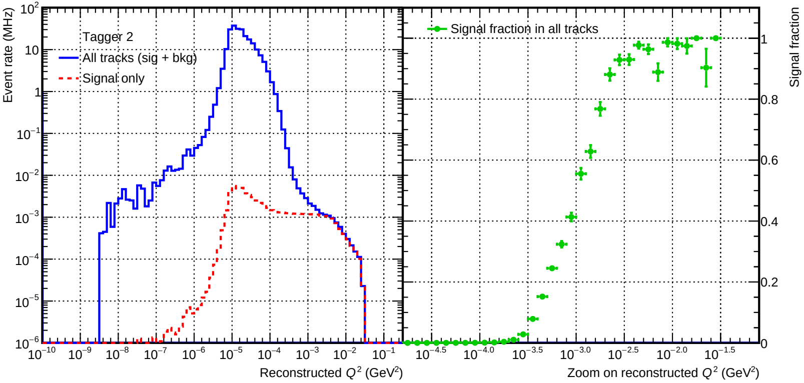
Q^2 resolution

- Reconstructed Q^2 is compared to generated true Q^2
- Beam angular divergence causes smearing of Q^2 values below 10^{-4} GeV^2 by affecting electrons at low scattering angles



Signal extraction in tagger detectors

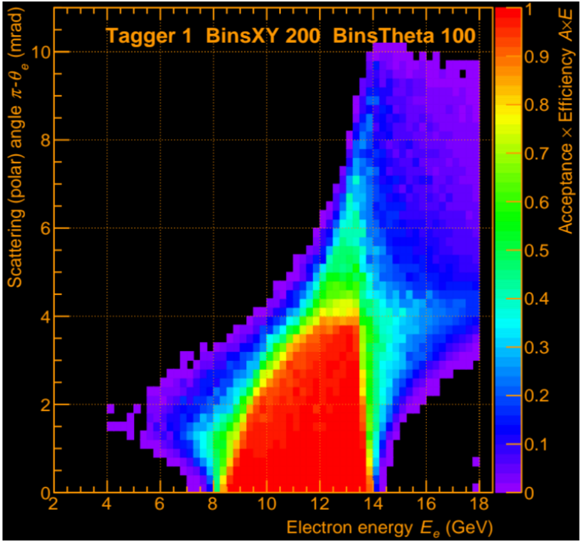
- Signal electrons from photoproduction can be identified based on their reconstructed Q^2
- Background by bremsstrahlung is embedded to the signal
- Event rate is evaluated for all tracks and for signal tracks from photoproduction

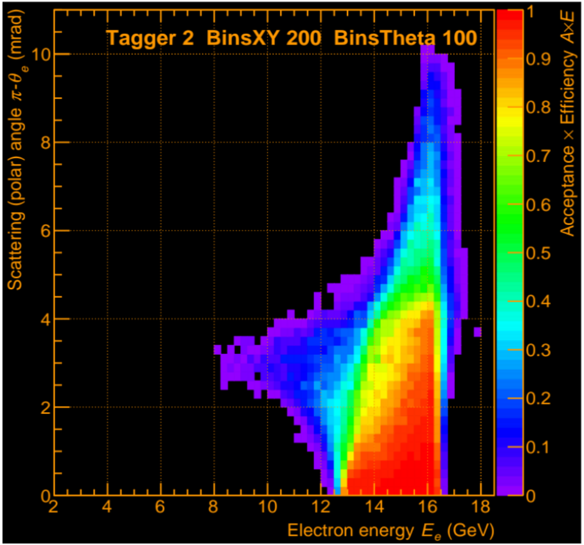


- Ratio of signal to all tracks (right panel) gives the fraction of signal in all observed tracks
- It is feasible to mark signal photoproduction tracks on event-by-event basis for $Q^2 \gtrsim 10^{-3}$ GeV^2

BACKUP

Acceptance in energy and angle for each tagger separately





Q^2 resolution for each tagger separately