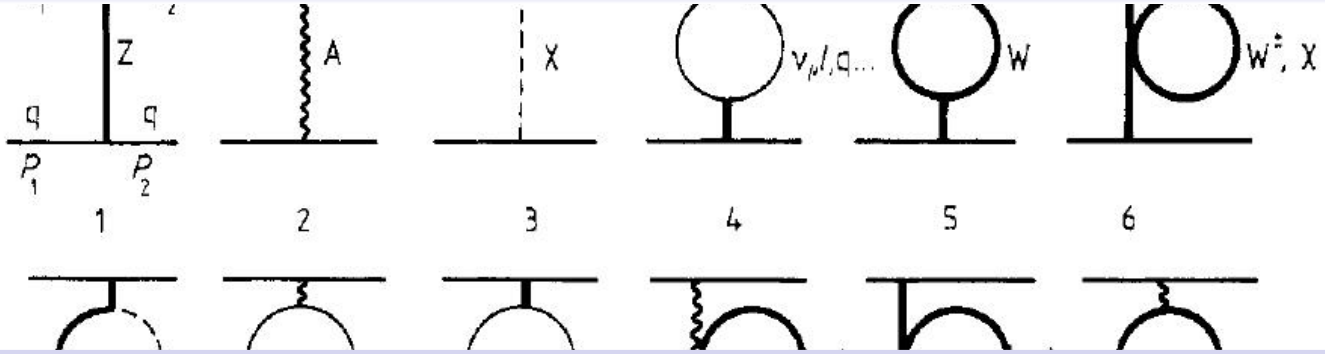
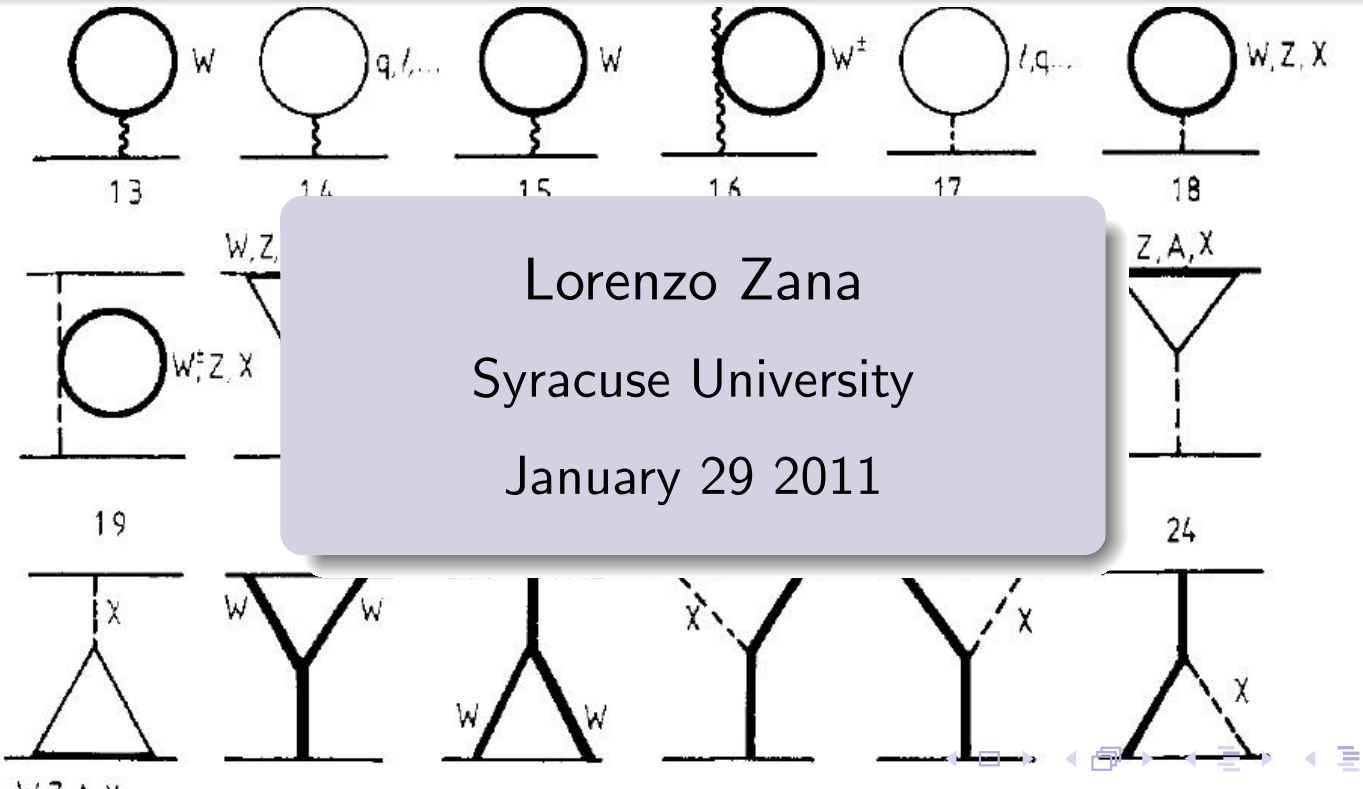


ESTIMATES OF RADIATIVE CORRECTIONS IN SOLID

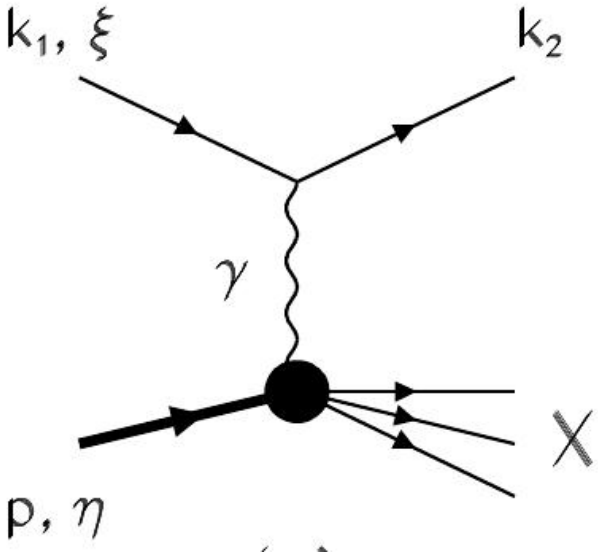


Lorenzo Zana

Syracuse University

January 29 2011

Radiative Correction

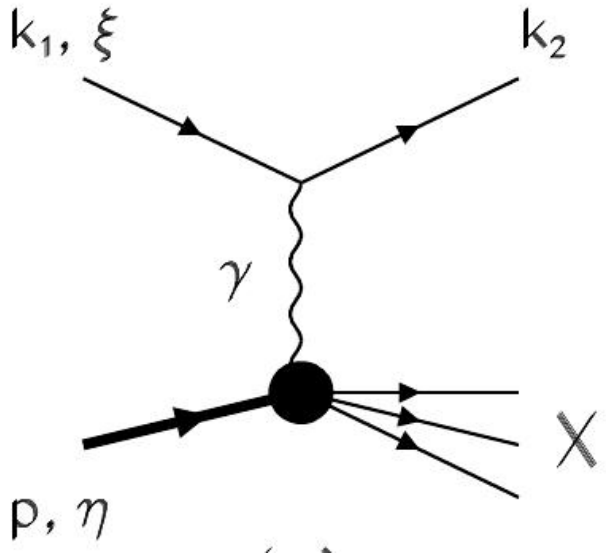


Polarized lepton-nucleon DIS

$$l(k_1, \xi) + N(p, \eta) \rightarrow l'(k_2) + X$$

- Born level

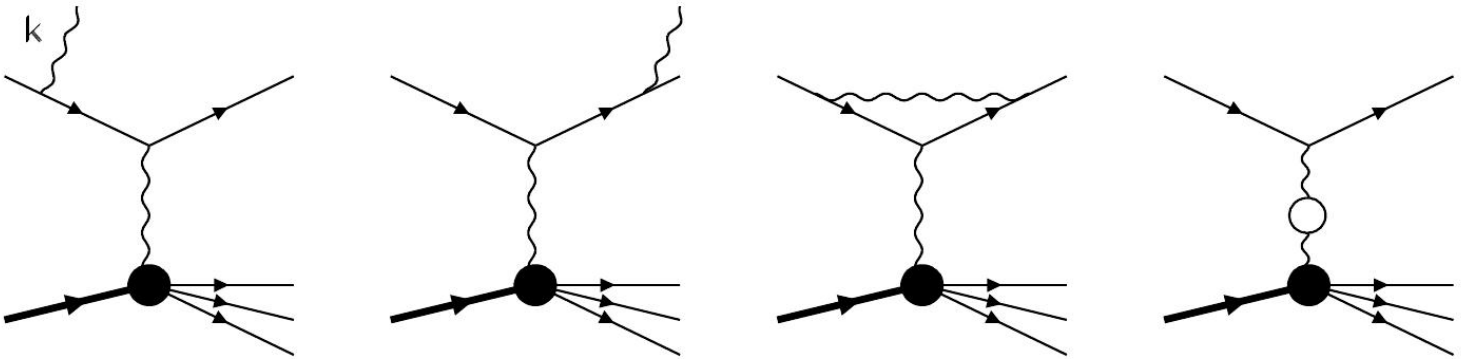
Radiative Correction



Polarized lepton-nucleon DIS

$$l(k_1, \xi) + N(p, \eta) \rightarrow l'(k_2) + X$$

- Born level
- + lowest order QED corrections



Different Contributions

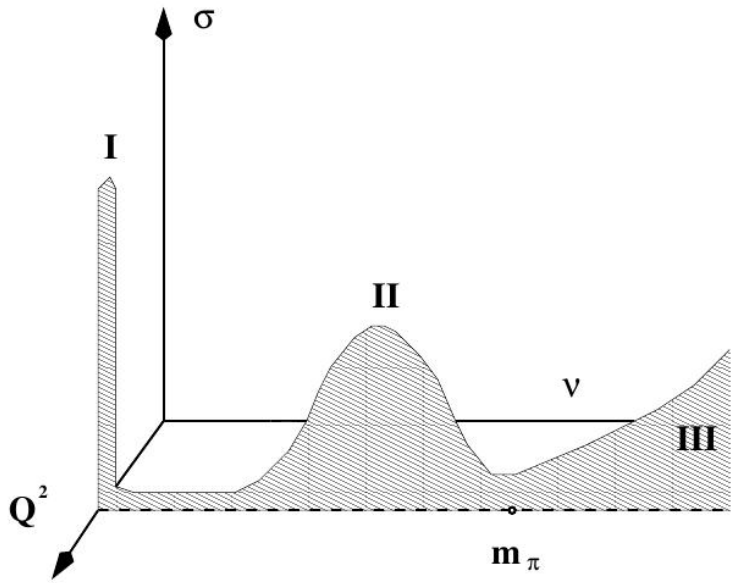
The channel of the reaction is no more specified

Contribution from:

I elastic channel

II quasi-elastic channel

III inelastic channel



Different Contributions

The channel of the reaction is no more specified

Contribution from:

I elastic channel

II quasi-elastic channel

III inelastic channel

IV virtual photon correction

Radiative Correction

$$\sigma_{RC} = \sigma^{el} + \sigma^{q} + \sigma^{in} + \sigma^{v}$$

Radiative Correction PVDIS

PVDIS

Studying the parity violating asymmetry

$$A_{PV} = \frac{\sigma_R - \sigma_L}{\sigma_R + \sigma_L}$$

THE FULL ELECTROWEAK INTERACTION IS IMPORTANT

Radiative Correction PVDIS

PVDIS

Studying the parity violating asymmetry

$$A_{PV} = \frac{\sigma_R - \sigma_L}{\sigma_R + \sigma_L}$$

THE FULL ELECTROWEAK INTERACTION IS IMPORTANT

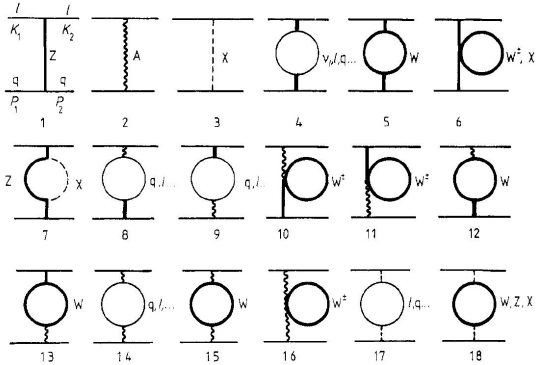
SO....

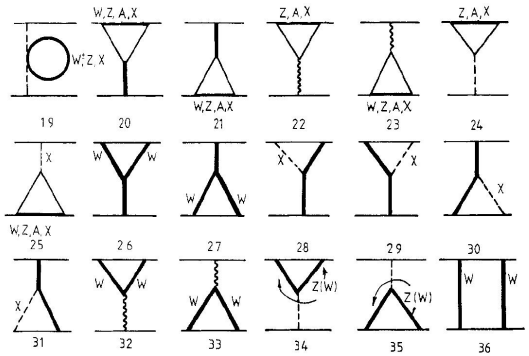
JUST TO ONE LOOP .... A LITTLE MORE DIAGRAMS

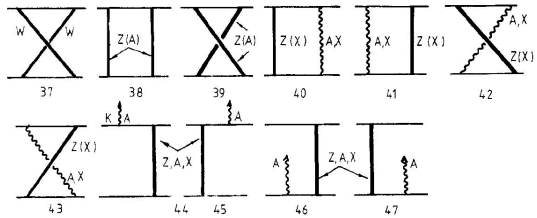
Radiative Correction PVDIS

SO....

JUST TO ONE LOOP .... A LITTLE MORE DIAGRAMS



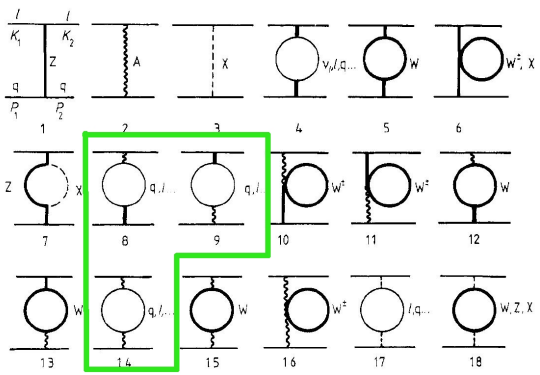


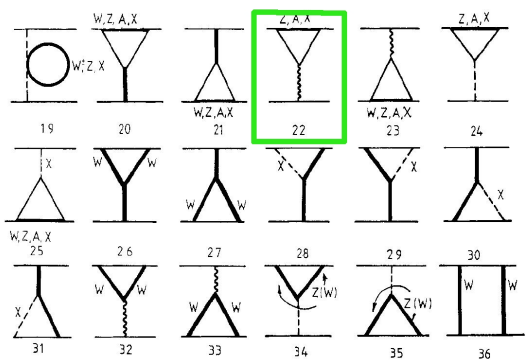


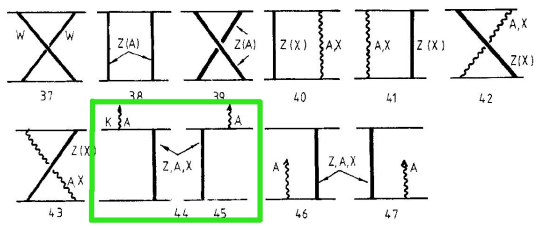
Radiative Correction PVDIS

At $E = 280 GeV$ and $q^2 > 100 GeV^2$

90% Radiative Correction to A_{PV} is given by a restricted set







Radiative Correction PVDIS

More information on Radiative Corrections for measurements of Parity violating asymmetries *D.Yu.Bardin, O.M.Fedorenko, N.M.Shumeiko, JINR E2-12761*

Estimates for Radiative Correction

RADIATIVE CORRECTION PVDIS

- How much important will be each single contribution to the Radiative correction
- STRAGGLING FROM THE TARGET MATERIAL

Estimates for Radiative Correction

RADIATIVE CORRECTION PVDIS

- How much important will be each single contribution to the Radiative correction
- STRAGGLING FROM THE TARGET MATERIAL

L.W. Mo, Y.S. Tsai, Rev. Mod. Phys. 1969. V.41. P.205

$$\frac{d\sigma}{d\Omega dE}(E_s, E_p, T) =$$

$$= \int_0^T \frac{dt}{T} \int_{E_{s(min)}(E_p)}^{E_s} dE'_s \int_{E_p}^{E_{p(max)}(E'_p)} dE'_p \, I_e(E_s, E'_s, t)\, \sigma(E_s, E'_s)\, I_e(E'_p, E_p, (T-t))$$

Estimates for Radiative Correction

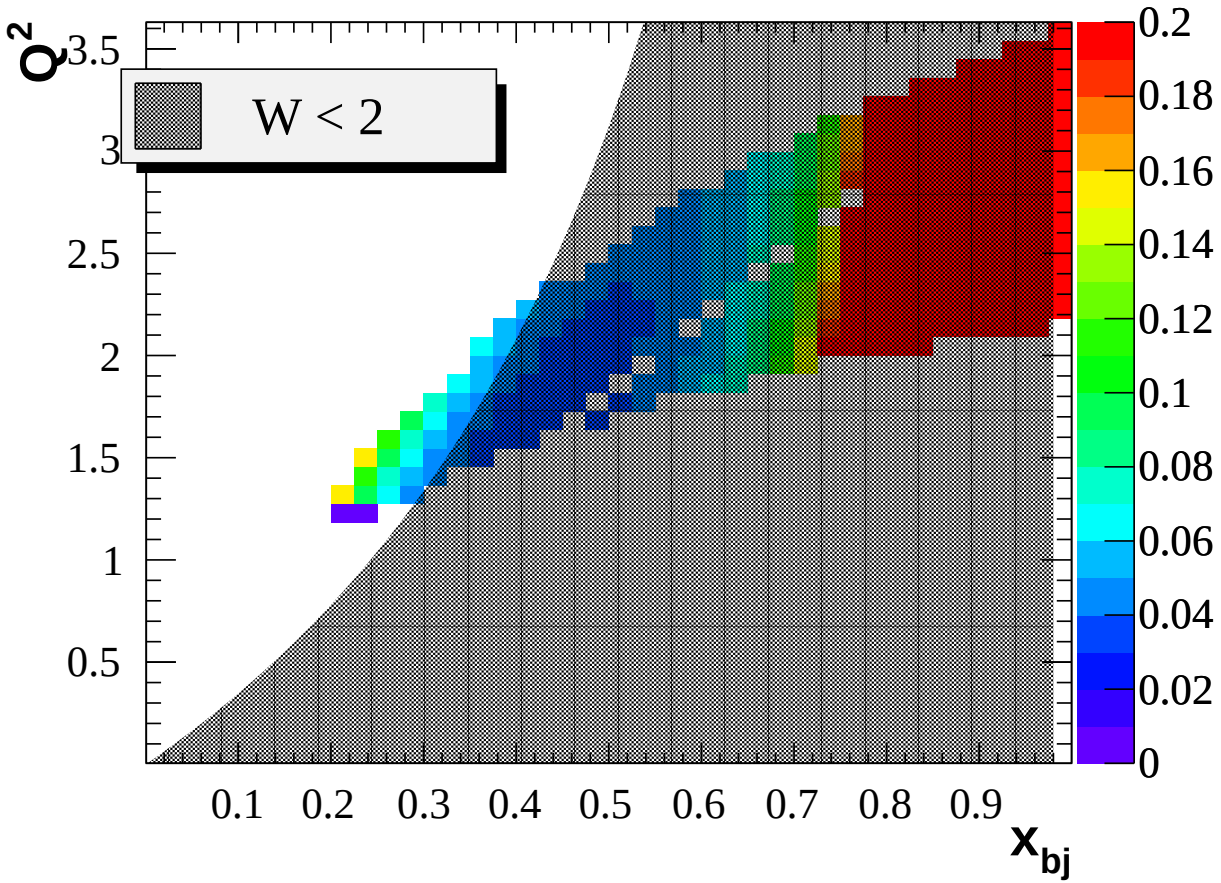
$$= \int_0^T \frac{dt}{T} \int_{E_{s(min)}(E_p)}^{E_s} dE_s' \int_{E_p}^{E_{p(max)}(E_p')} dE_p' \, I_e(E_s, E_s', t) \, \sigma(E_s, E_s') \, I_e(E_p', E_p, (T-t))$$

where:

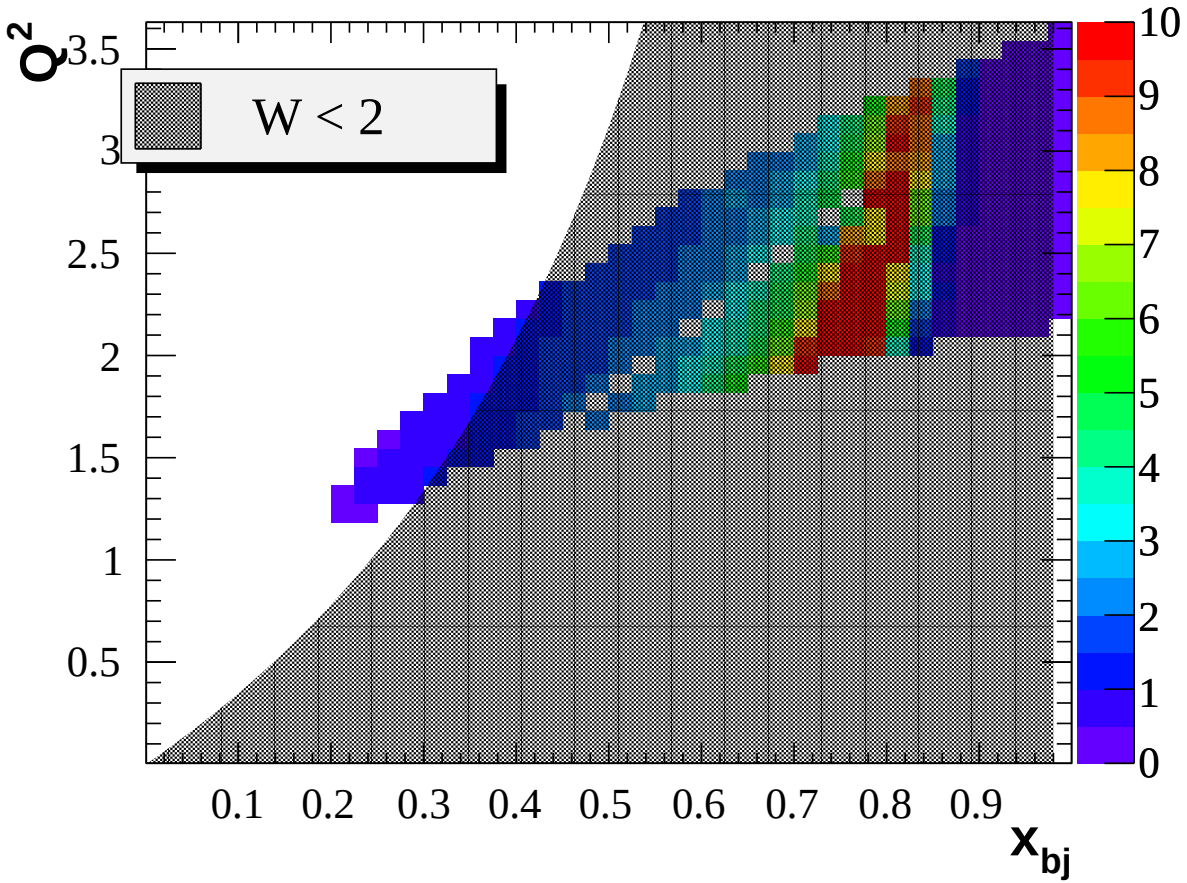
- T length of the target
- E_s (incoming) and E_p (outgoing) electron energy
- $I_e(E_1, E_2, t)$ modified Bethe and Heitler for straggling
- t with and without equivalent radiator

see http://www.jlab.org/ zana/PVDIS/

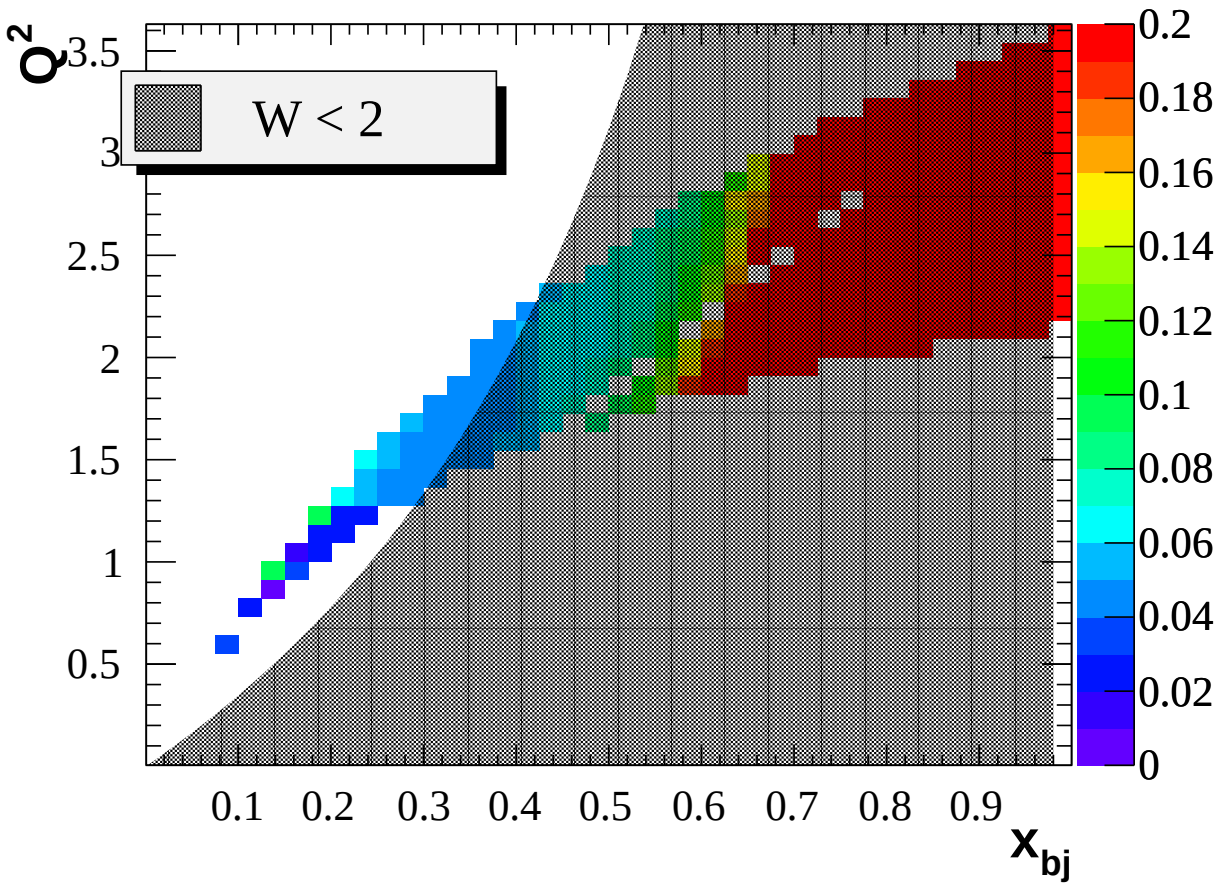
e- beam at 4.4 GeV : Ratio EL / DIS



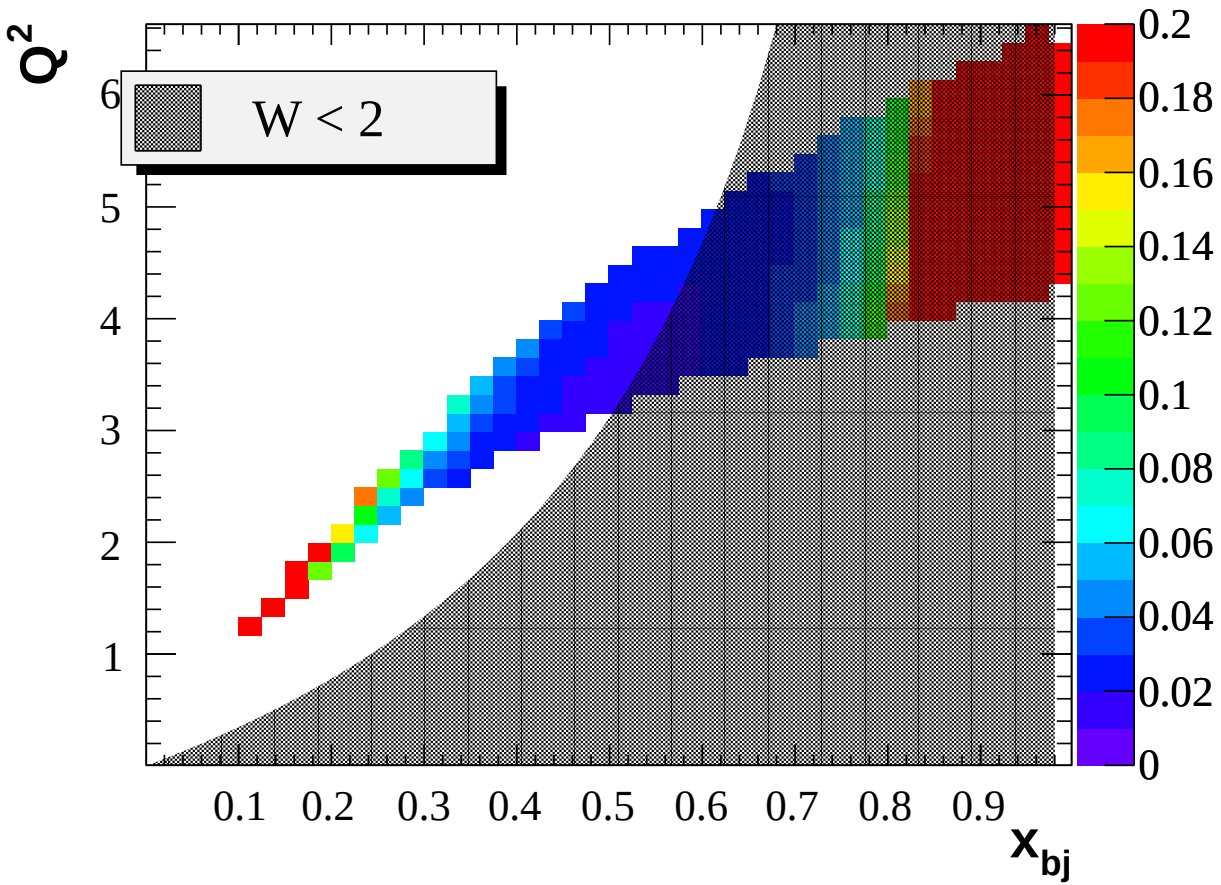
e- beam at 4.4 GeV : Ratio Δ / EL



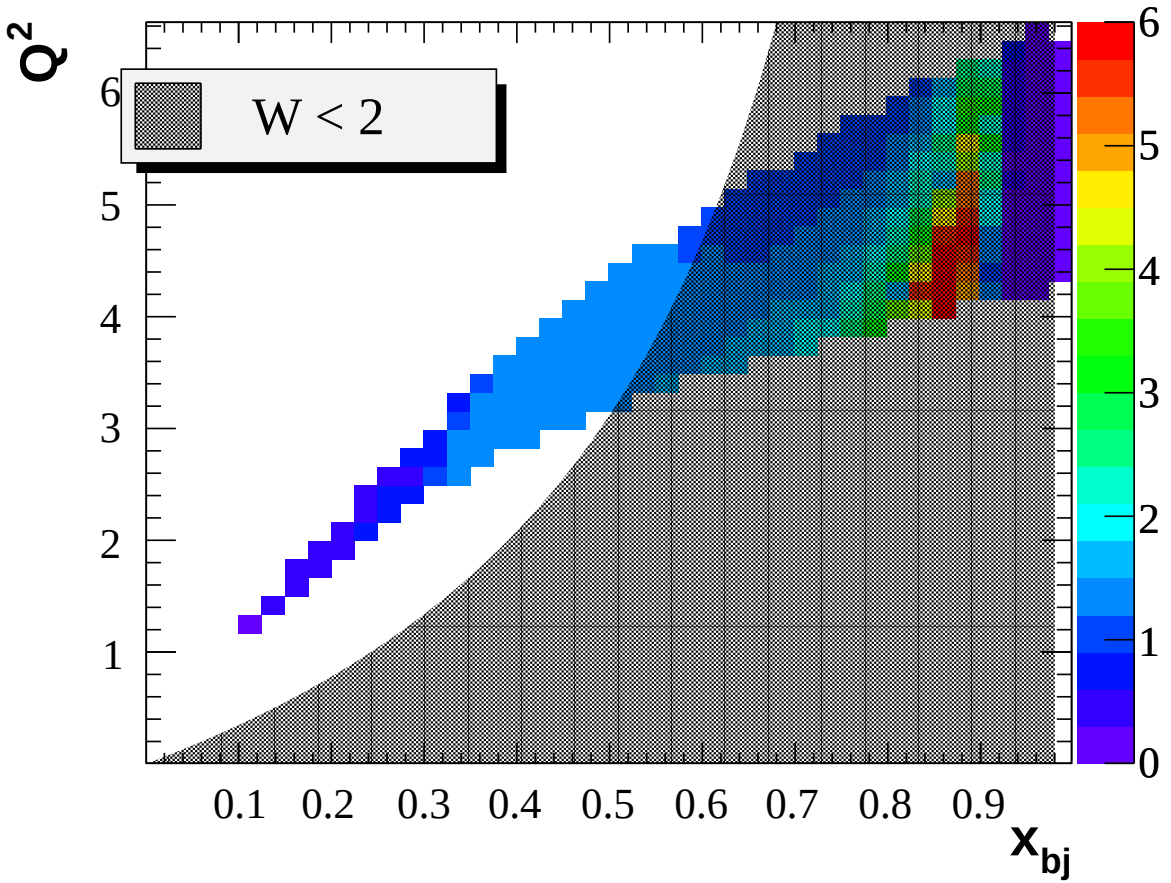
e- beam at 4.4 GeV : Ratio Δ / DIS



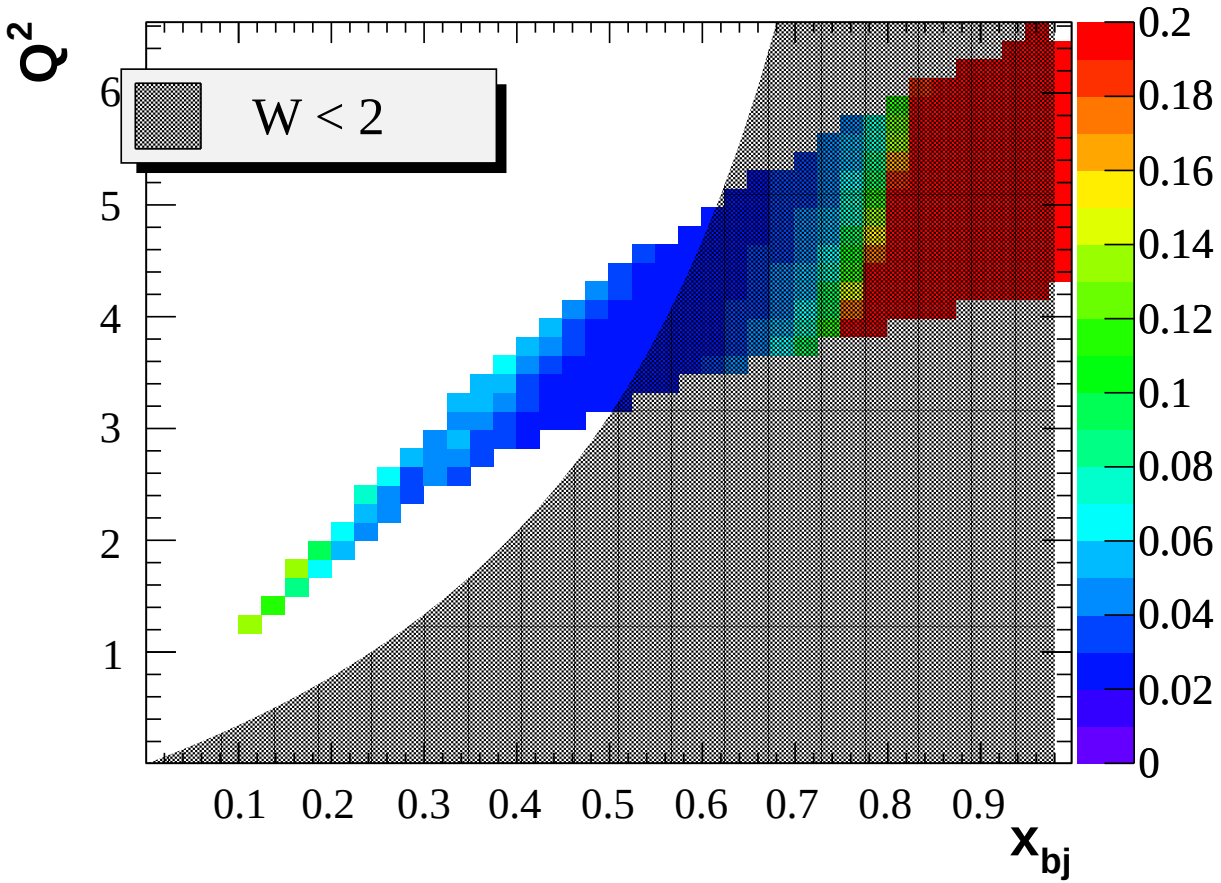
e- beam at 6.6 GeV : Ratio EL / DIS



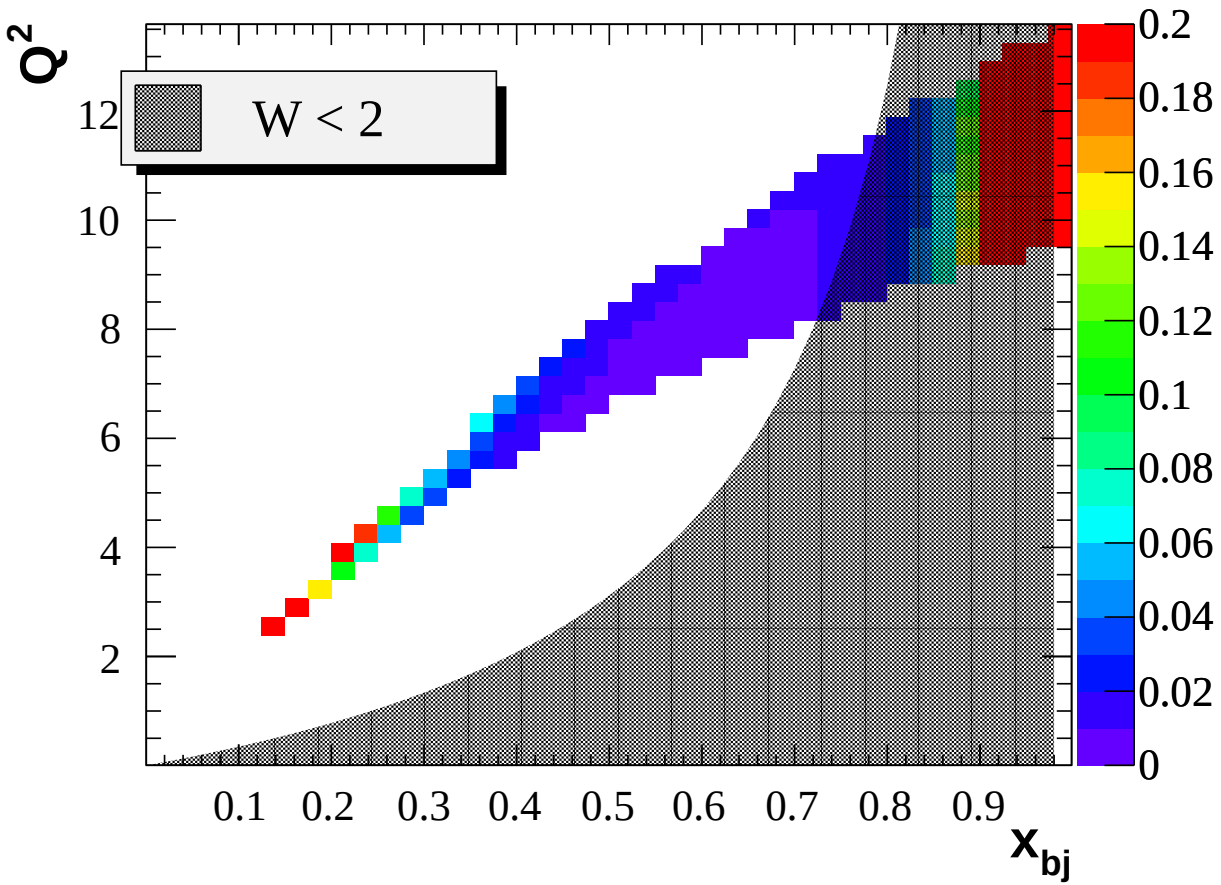
e- beam at 6.6 GeV : Ratio Δ / EL



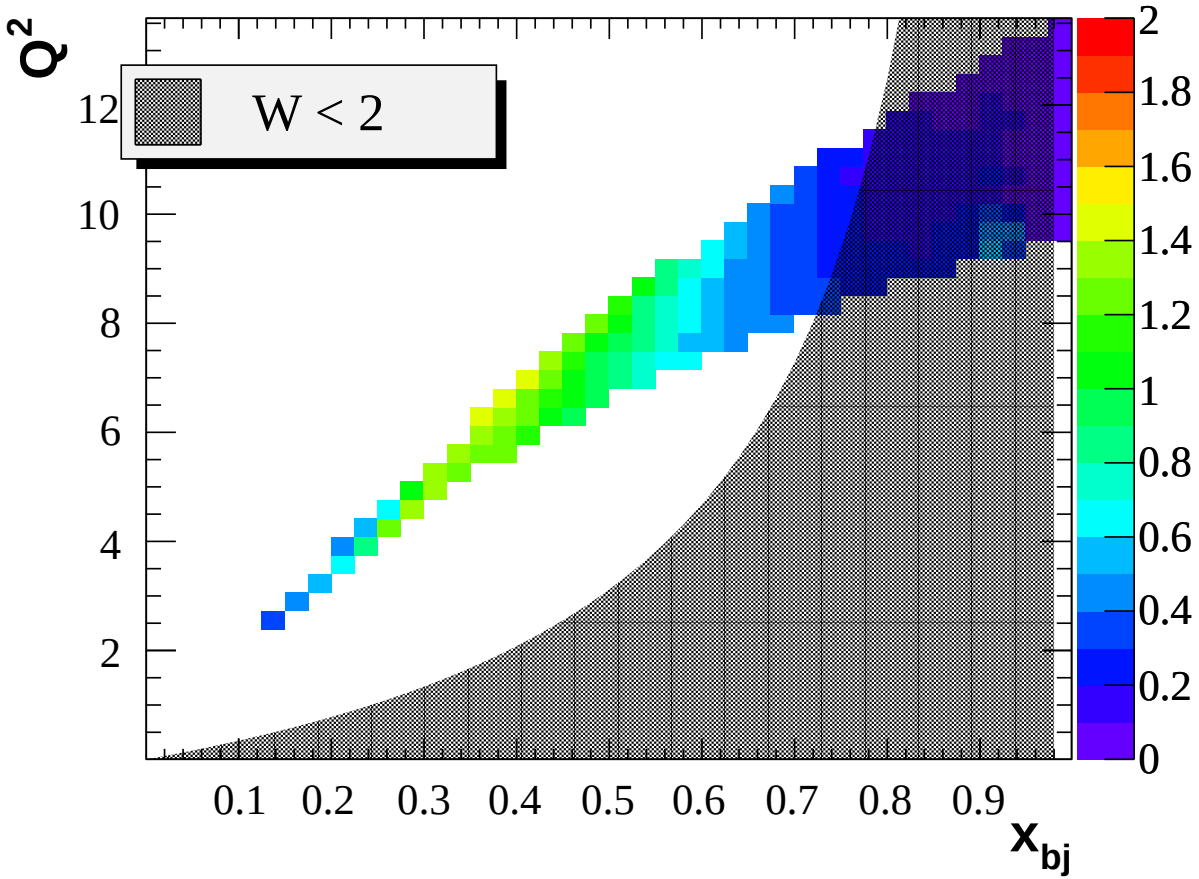
e- beam at 6.6 GeV : Ratio Δ / DIS



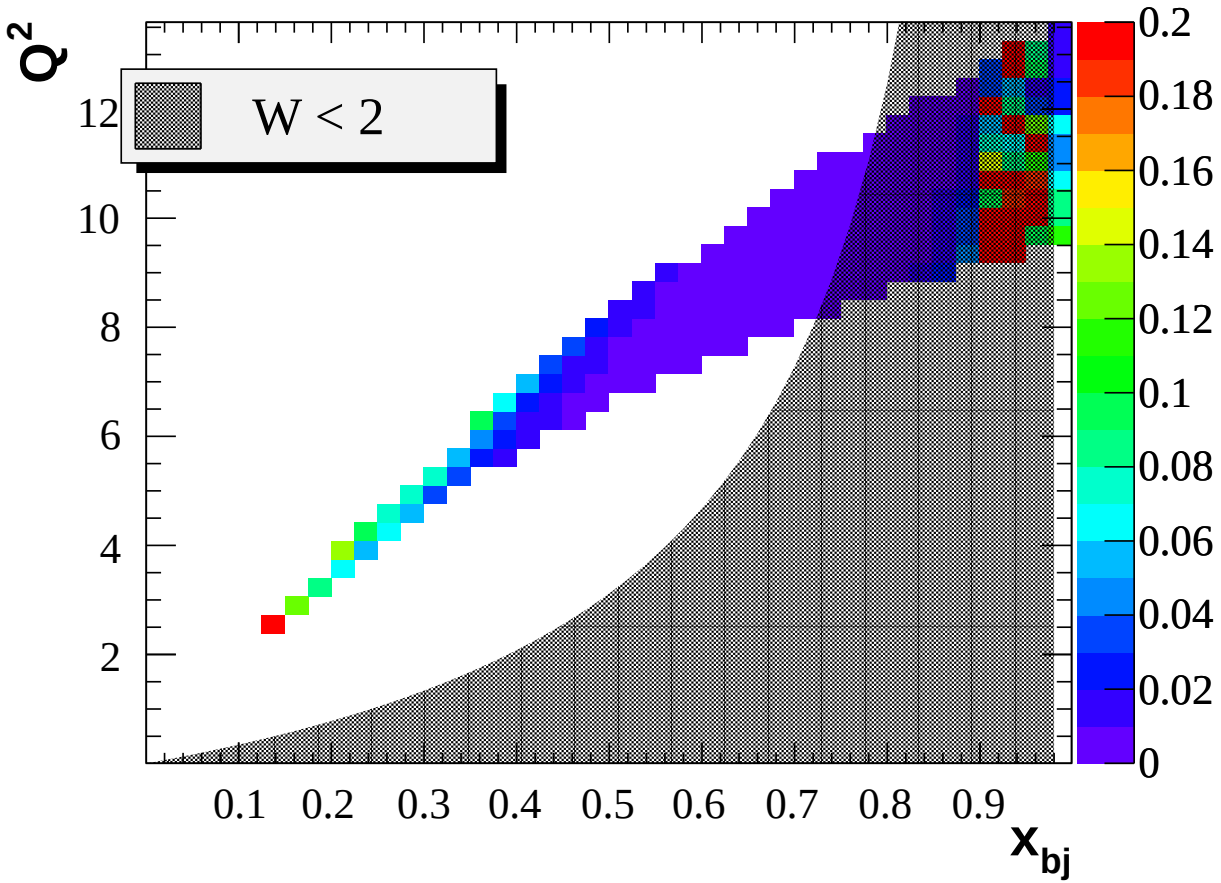
e- beam at 11 GeV : Ratio EL / DIS



e- beam at 11 GeV : Ratio Δ / EL



e- beam at 11 GeV : Ratio Δ / DIS



Event Generator

Generator

- An event generator has been developed and is now in the svn solid repository (tested and working on *ifarml6* (64bit)) https://jlabsvn.jlab.org/svnroot/solid/evgen/

Event Generator

Generator

- An event generator has been developed and is now in the svn solid repository (tested and working on *ifarml6* (64bit))
  https://jlabsvn.jlab.org/svnroot/solid/evgen/
- At now is generating uniformly in x and y
- Implementation with the cross sections under work

Conclusions

Radiative Correction:

- Estimates for radiative correction contributions to PVDIS have been calculated
- Inelastic cross section need to be added
- More resonances need to be included
- Convolution of this work with full Radiative Correction is in progress

Conclusions

Radiative Correction:

- Estimates for radiative correction contributions to PVDIS have been calculated
- Inelastic cross section need to be added
- More resonances need to be included
- Convolution of this work with full Radiative Correction is in progress

Event Generator:

- Event generator on svn repository
- Uniform in x and y
- Implementation with different cross sections in progress