Some thoughts on doing $F^D_{2,L}$ with Sartre

EIC TF meeting

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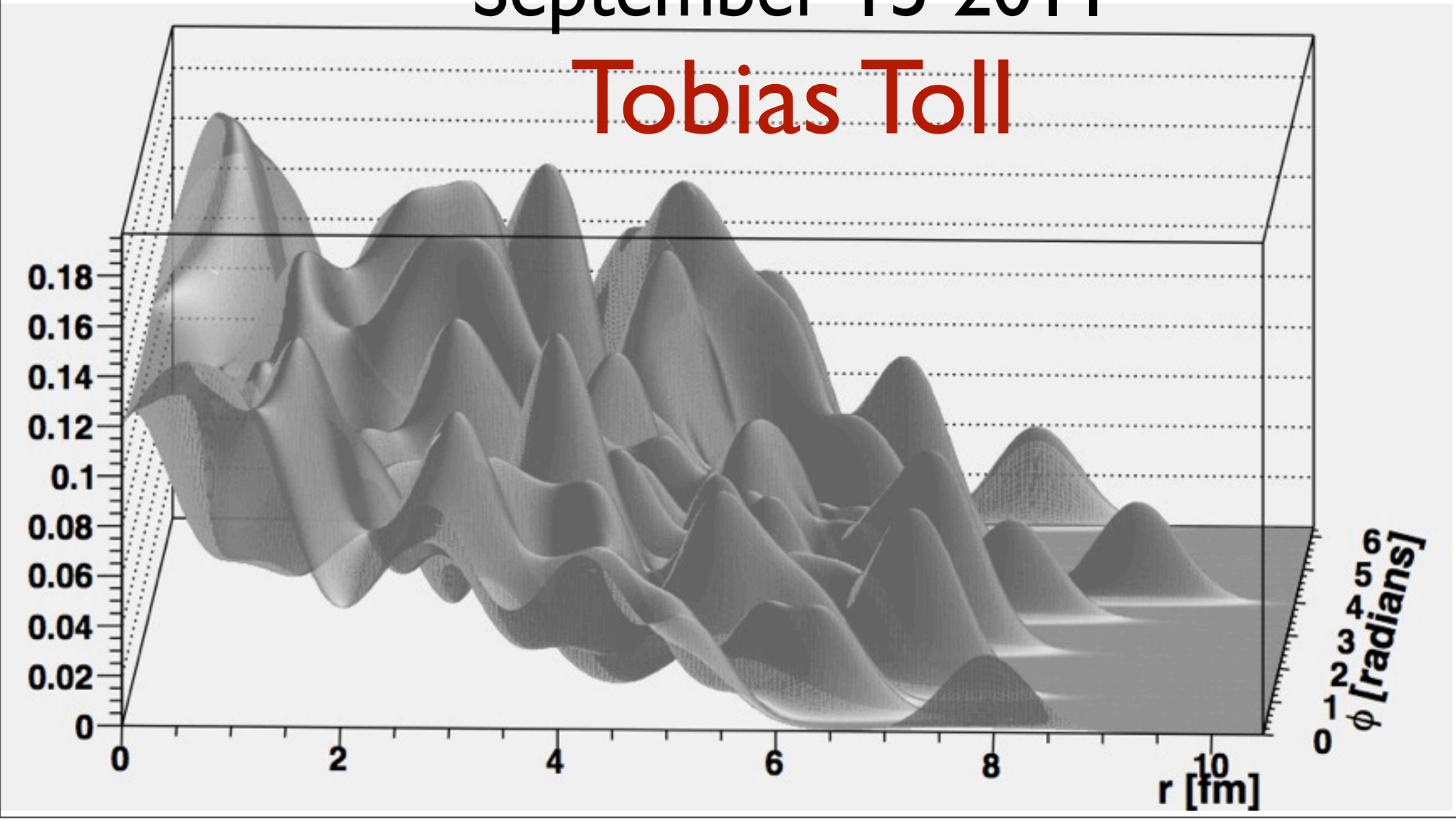

Using the dipole model for the physics of F^D_2 and F^D_L

DPM-Jet or RAPGAP may be the best to use for detector studies etc. for rap. gap. detection but they don't contain the interesting saturation physics for which the diffractive structure functions are such powerful observables.

Sartre can provide that.

Contents:

Next slide: all the equations

Then: Discussion

Diffractive structure functions in the dipole model

Modified from:

Nuclear enhancement and suppression of diffractive structure functions at high energies
H. Kowalski, T. Lappi, C. Marquet, and R. Venugopalan
A unified description of diffractive deep inelastic scattering with saturation
Cyrille Marquet

Assuming z is not needed:

$$F^D_{T,q\bar{q}}(x_{I\!P}, Q^2, t, \beta, z) \propto \frac{N_C Q^4}{16\pi^3 x_{I\!P}\beta} \sum_f e_f^2 z(1-z)[\epsilon^2(z^2+(1-z)^2\Phi_1 + m_f^2\Phi_0]$$

$\pi-$factors

$$F^D_{L,q\bar{q}}(x_{I\!P}, Q^2, t, \beta, z) \propto \frac{N_C Q^6}{4\pi^3 x_{I\!P}\beta} \sum_f e_f^2 z^3(1-z)^3\Phi_0$$

$$\Phi_n^{\text{coherent}} = \left| \left\langle \int \mathrm{d}r \mathrm{d}^2\mathbf{b} r K_n(\epsilon r) J_n(kr) e^{i\mathbf{b}\cdot\boldsymbol{\Delta}} \frac{\mathrm{d}\sigma_{q\bar{q}}}{\mathrm{d}^2\mathbf{b}}(\mathbf{b}, r, x_{I\!P}, \Omega) \right\rangle_\Omega \right|^2$$

$$\Phi_n^{\text{total}} = \left\langle \left| \int \mathrm{d}r \mathrm{d}^2\mathbf{b} r K_n(\epsilon r) J_n(kr) e^{i\mathbf{b}\cdot\boldsymbol{\Delta}} \frac{\mathrm{d}\sigma_{q\bar{q}}}{\mathrm{d}^2\mathbf{b}}(\mathbf{b}, r, x_{I\!P}, \Omega) \right|^2 \right\rangle_\Omega$$

$$\beta = \frac{x}{x_{I\!P}} = \frac{Q^2}{Q^2 + M_X^2} \qquad \epsilon^2 = z(1-z)Q^2 + m_f^2$$

$$k^2 = z(1-z)M_X^2 - m_f^2$$

Technical Questions:

The generated phase-space will be 5 dimensional:

Q^2 and x are needed to reconstruct the electron,

β and z are needed for the fragmentation, and

t is needed to reconstruct the scattered proton/Ion

It is not possible for us, with the current setup to simulate incoherent diffractive events with 5 variables, need to investigate if some of the variables could be made approximate

Coherent diffraction would not be a problem

General Questions:

What do we want/expect to find?

How can Sartre help in this?

Which diffraction? Rap. gap. events in DIS?
By requiring nothing in the ZDC, is this enough to say that we have a (coherent) diffractive event?

Is it possible to measure incoherent diffraction without "contamination" from DIS? Is a very forward rap. gap. enough?

Can the physics be simulated by two (weighted) generators, one giving non diffractive DIS with some rap. gap's and Sartre supplementing the diffraction?