

Top threshold @ ILC (informal) simulation status

Filimon Gournaris
University College London

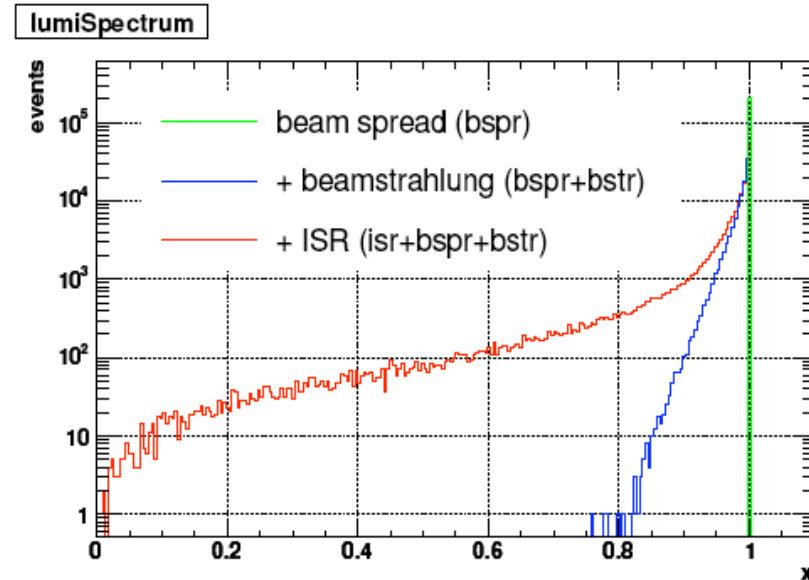
Stewart T. Boogert
Royal Holloway, University of London

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LAL Orsay

Top threshold @ ILC

- The top will be measured at the ILC by a threshold scan at $\sqrt{s} \approx 2M_t$
- One of the main uncertainties in this measurement will come from knowledge of the machine's **luminosity spectrum**
- Various energy loss mechanisms give a complicated luminosity spectrum at the ILC



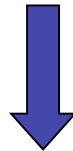
- Hence the top threshold observables will be smeared by the luminosity spectrum effects

$$\frac{d\sigma_{obs}^{e^+e^-}}{d\Omega}(\sqrt{s}) = \int_0^1 dx_1 dx_2 D_{e^+e^-}(x_1, x_2, \sqrt{s}) \frac{d\sigma^{e^+e^-}}{d\Omega'}(x_1, x_2, \sqrt{s})$$

- For precise threshold physics, a good knowledge of the luminosity spectrum and its inclusion in event generation is fundamental

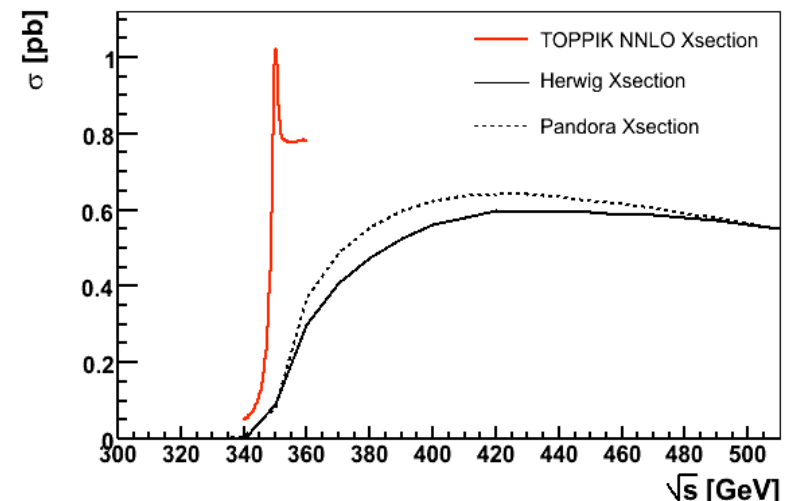
Top threshold simulation status

- Currently only simulations of total cross-section smeared with lumi spectrum exist.
- To make concrete analysis of luminosity spectrum impact, need a full simulation including differential quantities.
 - Fast top threshold monte carlo.
- MC's currently on the market (Pandora, Herwig etc) not precise enough.
- TOPPIK (Hoang & Teubner) is currently best available theoretical description :
 - NNLO QCD including differential quantities
 - NNLL total cross-section & NLO rescattering correction calculations exist.



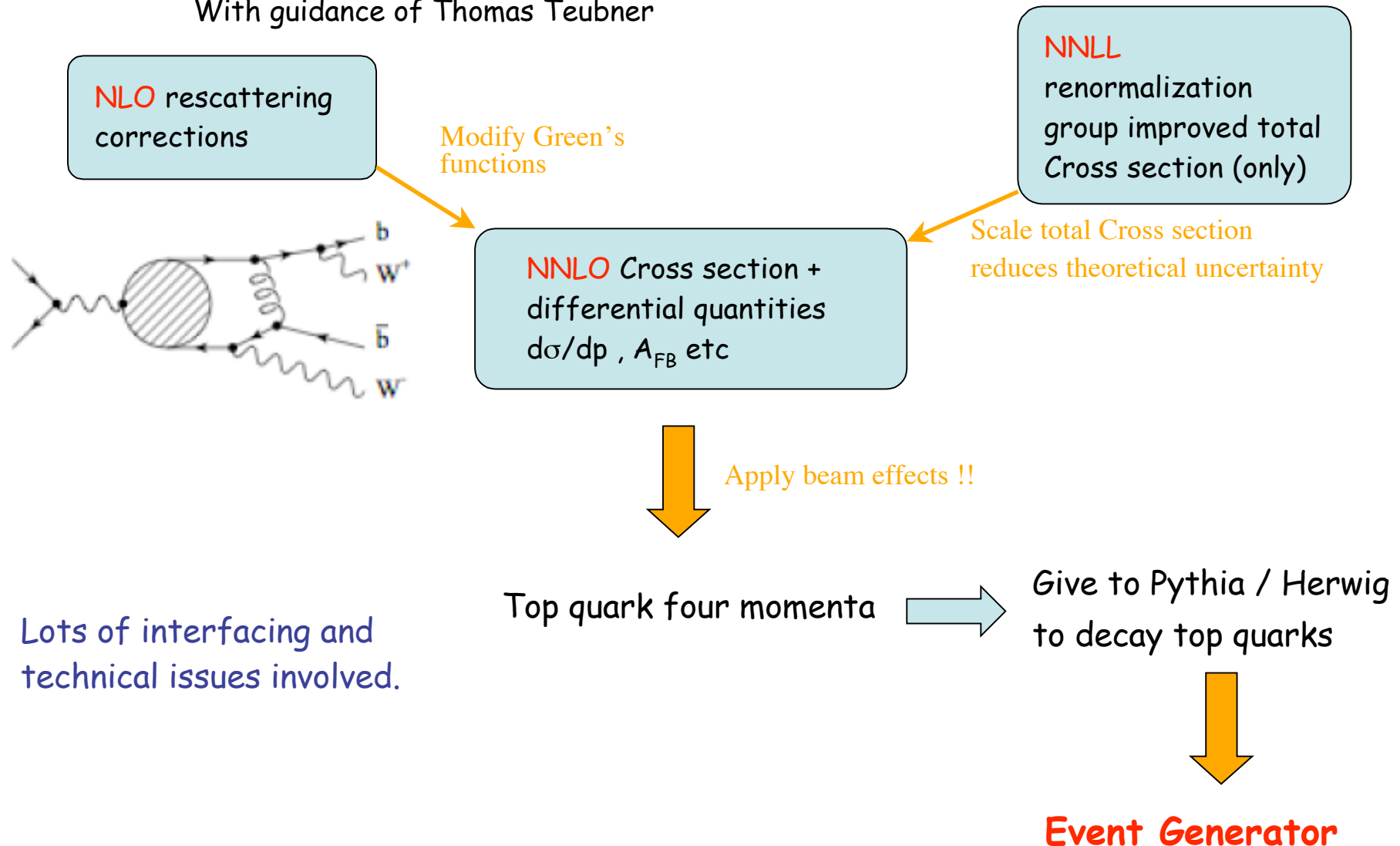
MC based on TOPPIK

- Technical challenge to make TOPPIK into an MC
 - Speed the main issue with $>1.5\text{sec}$ per calculation
- Solution is fast multidimensional interpolation



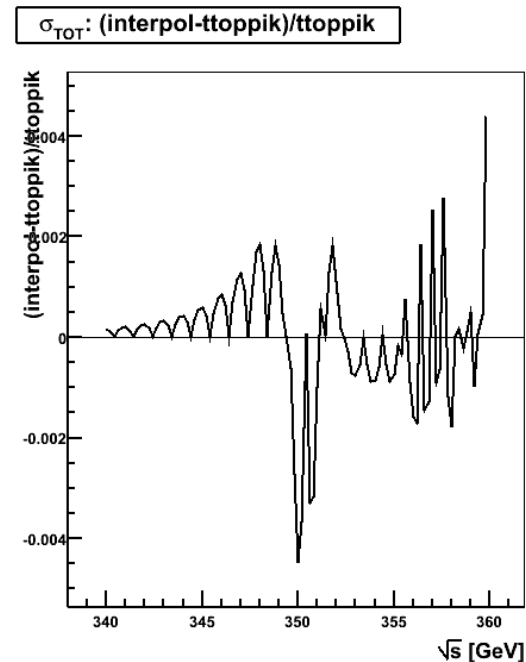
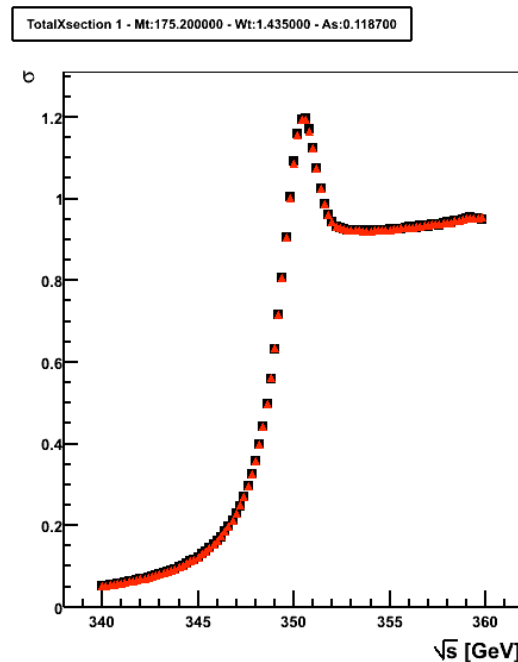
Top threshold event generator

With guidance of Thomas Teubner



topMC status

- Main problem (speed) is solved !!
 - Multidimensional interpolation (of Green f^{ns}) onto a fixed grid provides **10⁶ speed up** with accuracy better than 0.5%
 - Can interpolate in $(M_{t^+}, \Gamma_{t^+}, \alpha_s, \sqrt{s})$ parameter space (for fitting) and reproduce all TOPPIK calculations in C++ version
- Now working on interfacing with MC Integrator (FOAM) to generate distributions (a la Pandora) with the inclusion of the luminosity spectrum.
- A few issues remain, but work is well underway and should be finished soon!!



- Top quark measurement an important aspect of ILC physics programme
- The machinery are (almost) there for realistic studies of the achievable precision @ the ILC
 - Fast NNLO Monte Carlo
 - Luminosity spectrum
 - Beamstrahlung extraction from Bhabhas
 - Lumi spectrum parameterizations
 - ILC Energy Spectrometer requirements (to be defined by this analysis?)
- Analysis for Valencia meeting showed that lumi spectrum uncertainty (beam parameters) not real problem for top threshold. Does this hold in a fully differential analysis?
- Systematics related to lumi spectrum extraction ?
- Didn't talk about:
 - How top threshold analysis is done !
 - Valencia results (accelerator parameters impact)
 - Energy spectrometer

But I will be here for 1 month... So we have plenty of time to talk about them :)