

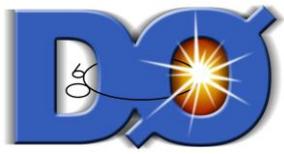


Looking for physics beyond the standard model in Tevatron data

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Friday 10 June 2014



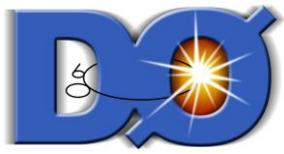


..... in one slide



- Unfortunately we did not make any discovery for physics beyond the standard model
 - Not because we did not try
 - Pioneered many new types of searches
 - Advanced limits by in comparison to UA1/UA2 and LEP

- Fortunately we did not make fools of ourselves
 - We did not discover something that wasn't there (our colleagues at B0 have a long list to their credit)
 - We did not miss anything that was there (are we 100% sure of this ?)



Archeology (1)



- A long list of conveners of New Phenomena (SUSY/Exotics) working groups from 1992 to 2012
 - Nick Hadley, Andy White
 - Wyatt Merritt, Dave Cutts
 - Sarah Eno, John Hobbs
 - Marc Paterno
 - Greg Landsberg, Eric Flattum
 - Sharon Hagopian, Gustaaf Brooijmans
 - Laurent Duflot
 - Volker Buescher, Jean-Francois Grivaz
 - Arnd Meyer, Yuri Gershtein
 - Todd Adams, Patrice Verdier
 - Arnaud Duperrin
 - Mike Eads, Michel Jaffré

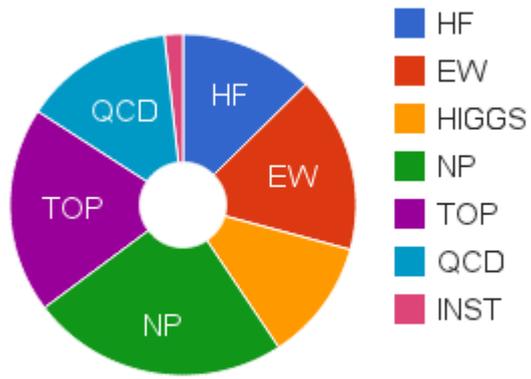
Not an exact chronological order, some have served more than one (2 year) term
Any omission is my mistake



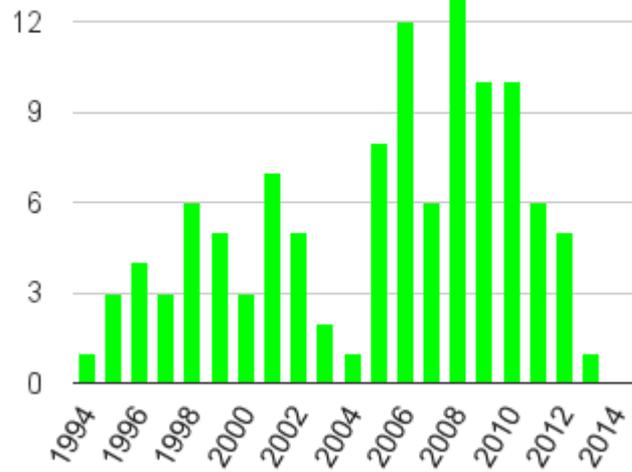
Archeology (2)



DØ Topics (Submitted)



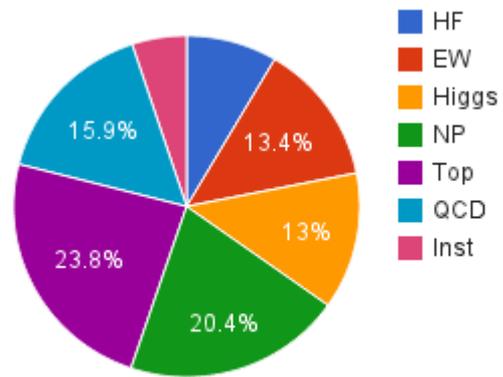
DØ NP Publications



New Phenomena:

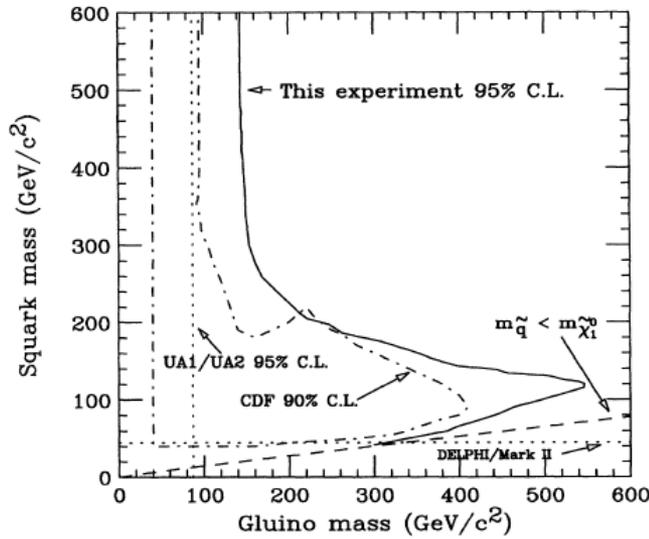
- **111 publications out of 462 (24%)**
- **96 PhD theses out of 471 (20%)**

DØ Theses by subject

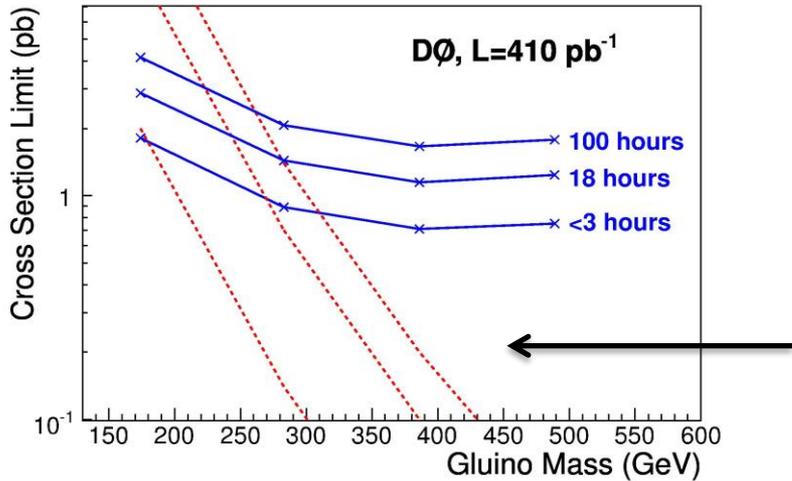
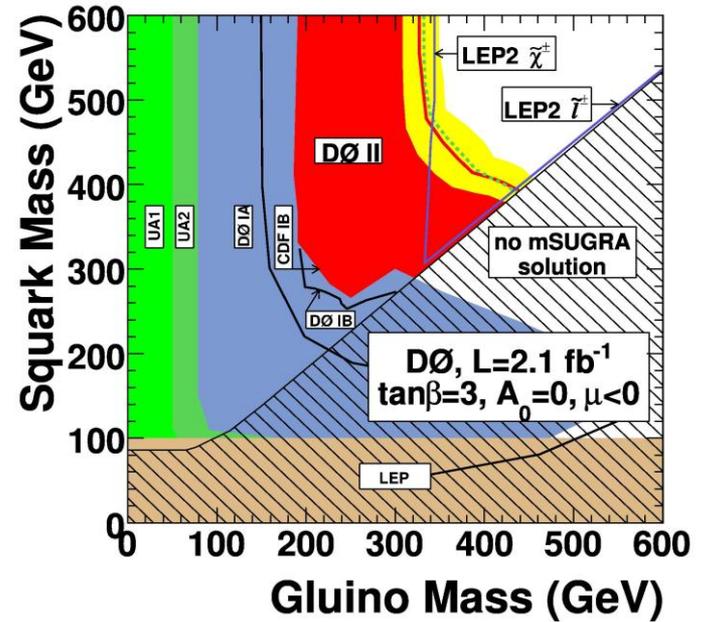




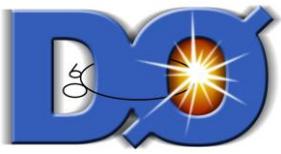
Jets + missing ET



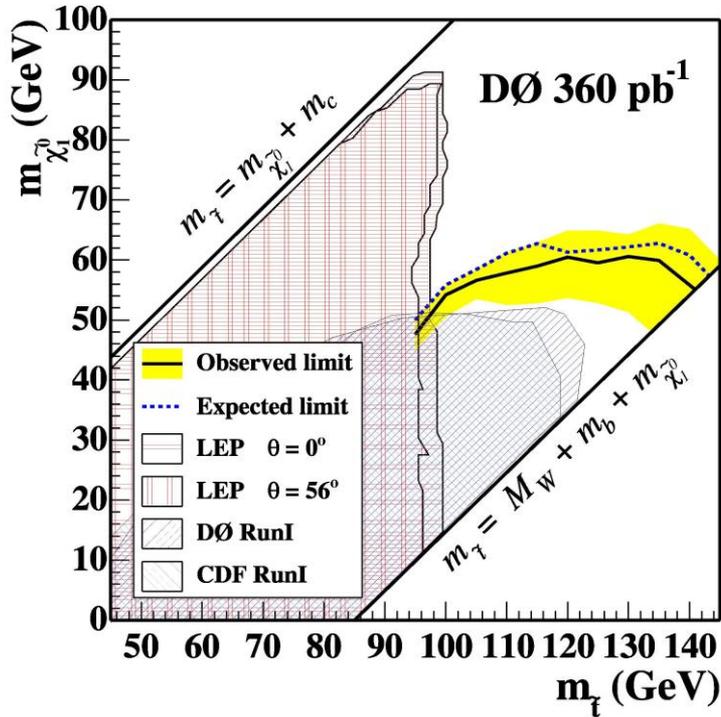
From 14 pb^{-1} in 1995 to 2.1 fb^{-1} in 2008:
 $m_{\tilde{g}}$ limit goes from 144 GeV to 308 GeV



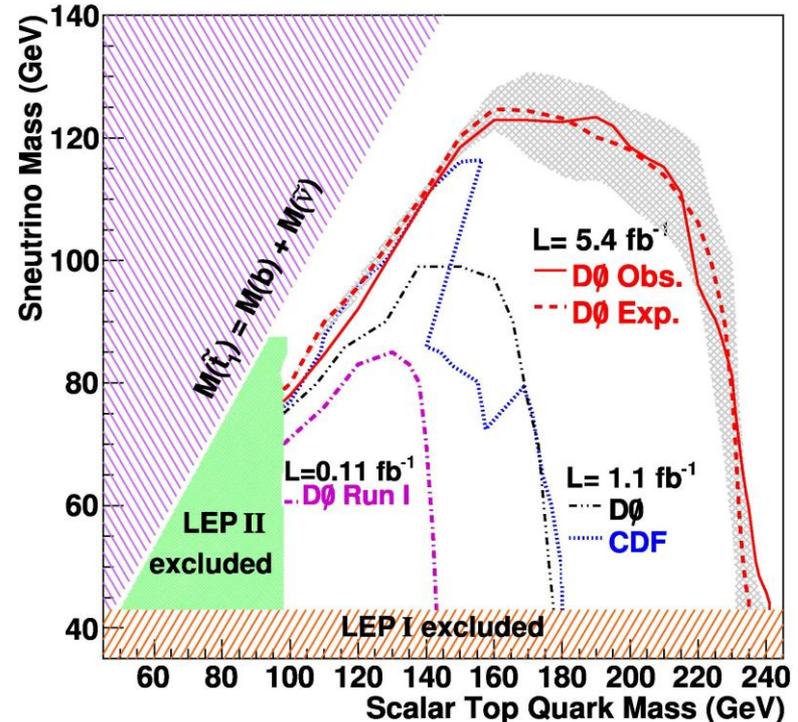
Stopped gluinos with long lifetimes:
 Not really sure about live time /
 efficiency estimation



Scalar Tops



Searched both for 2 and 3 body decays
 Did we really explore the full phase space of possibilities ?

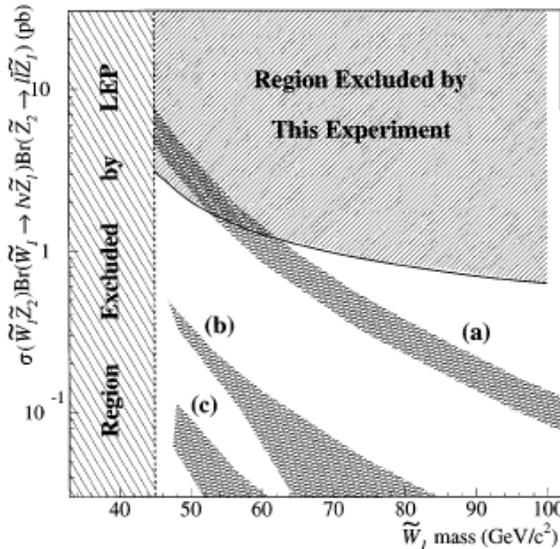


One of the things that I disliked most about DØ analyses: the separation / differences between $e e$, $e \mu$, $\mu \mu$, Final states

We were sometimes very inefficient

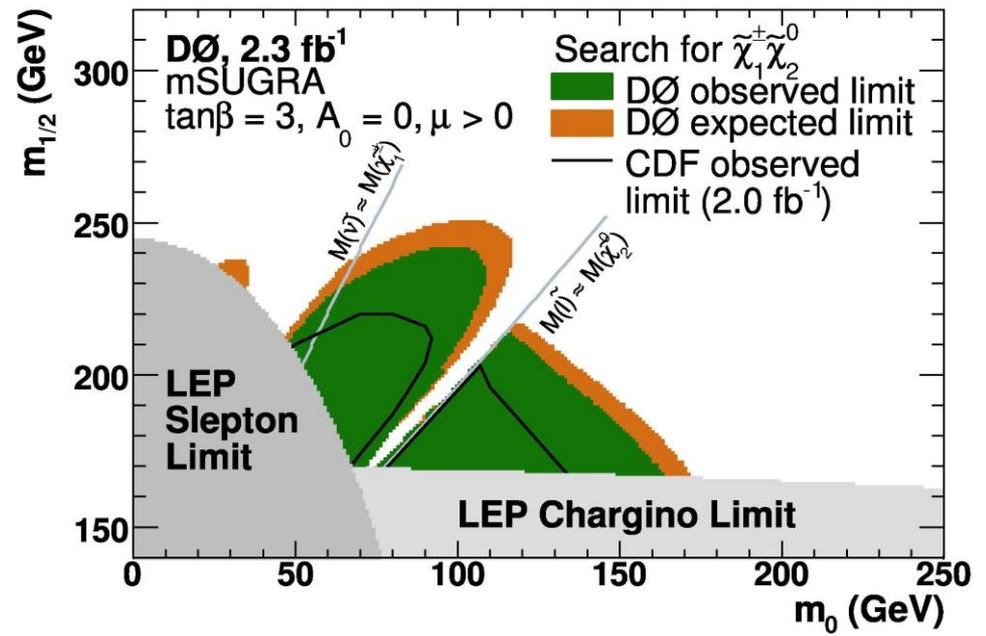
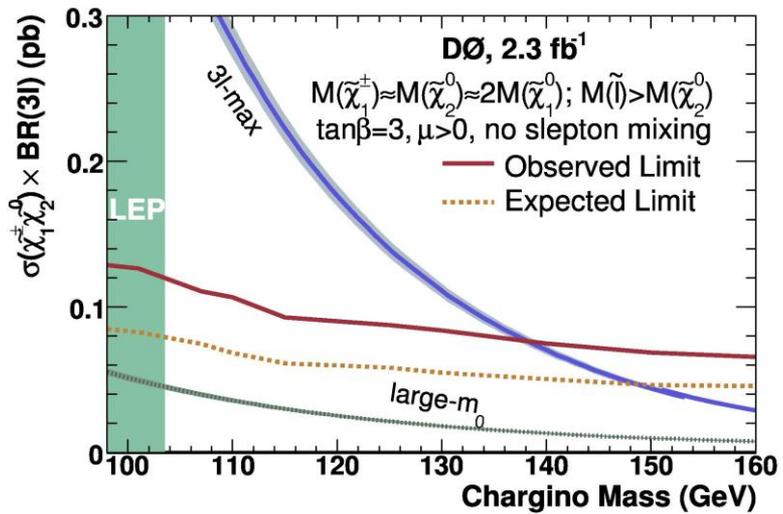


Trileptons



Gained more than 1 order of magnitude in cross section sensitivity

Extended reach on sleptons/charginos

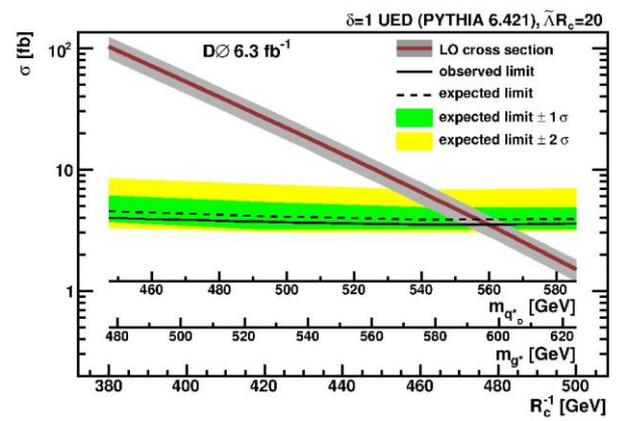
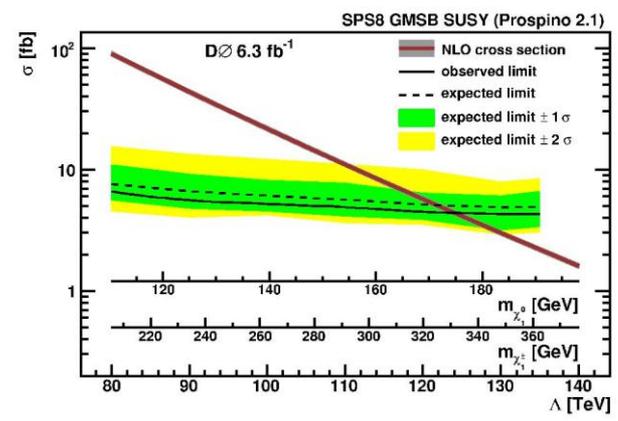
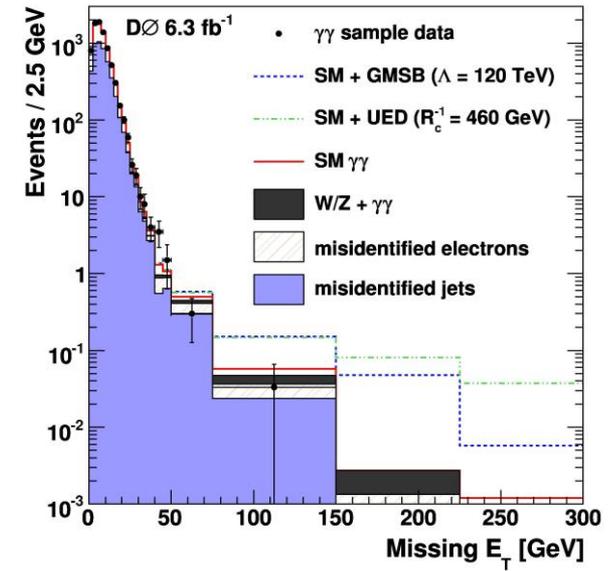
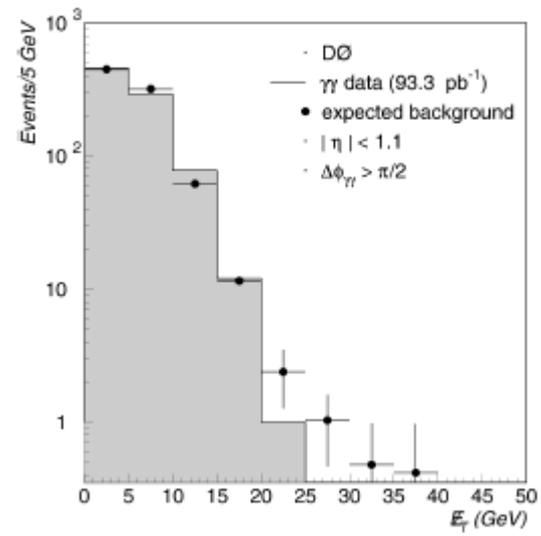


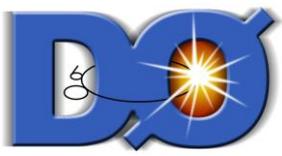


GMSB and Extra Dimensions

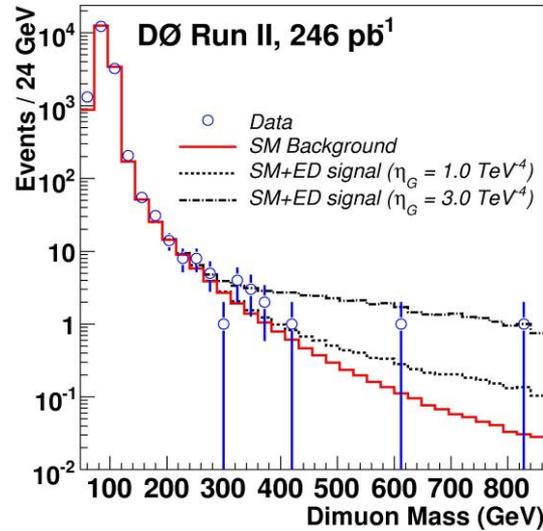
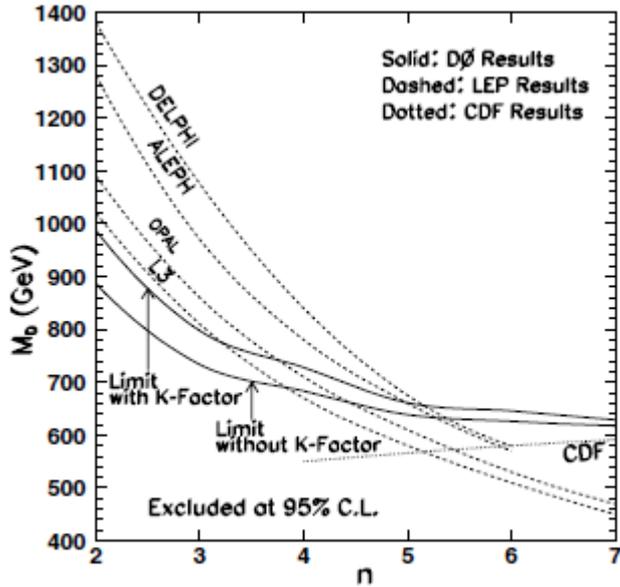


Diphoton events with missing transverse momentum:
 note the MET of the highest event

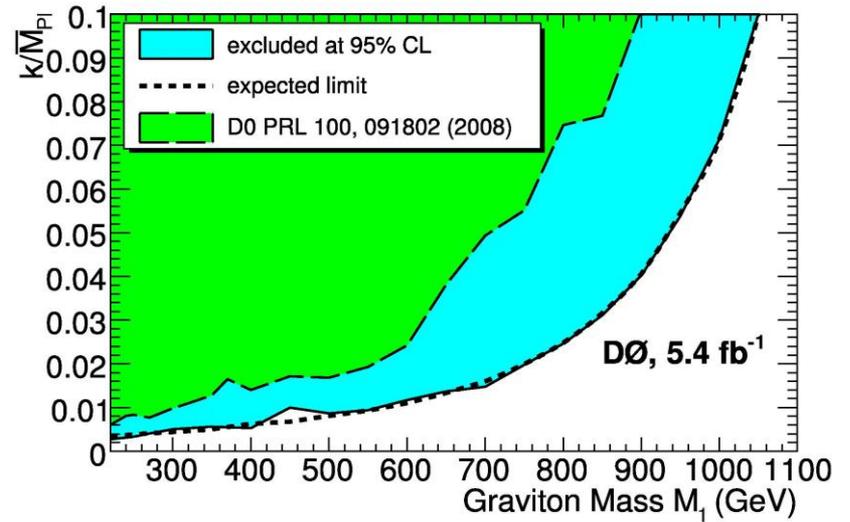
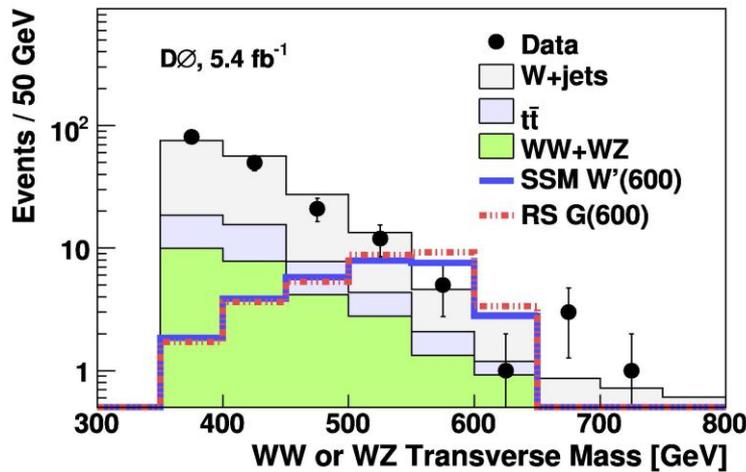


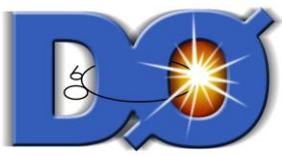


The Extra Dimension Industry

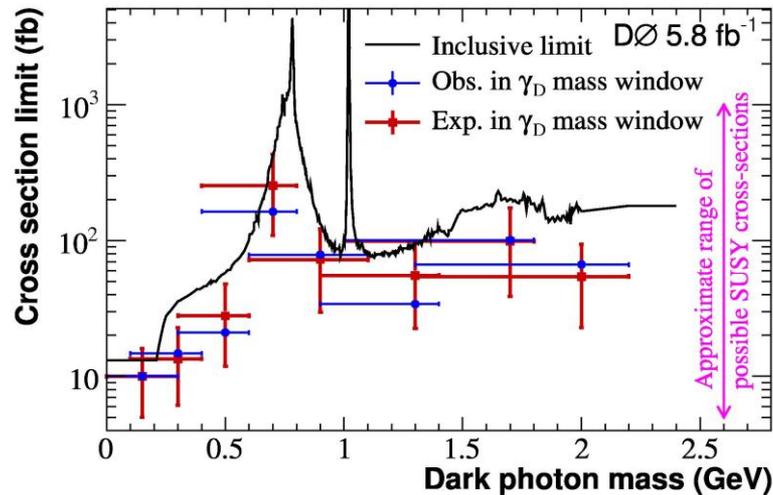
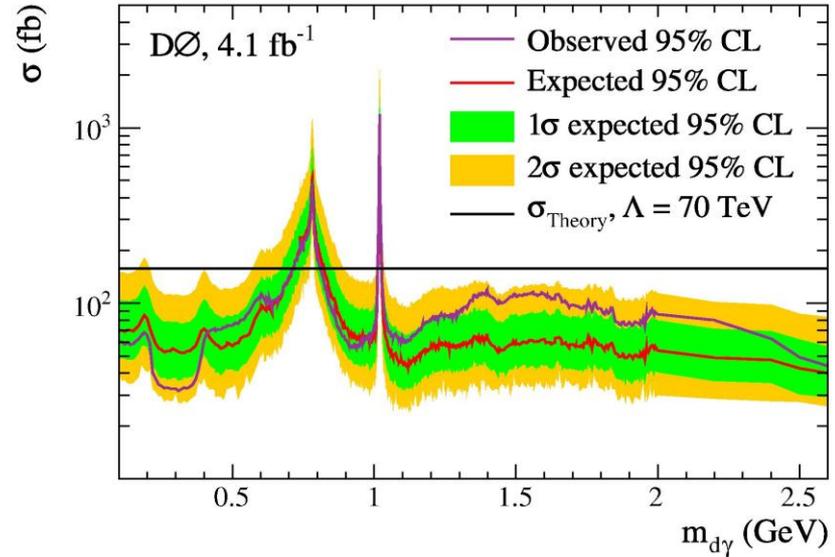
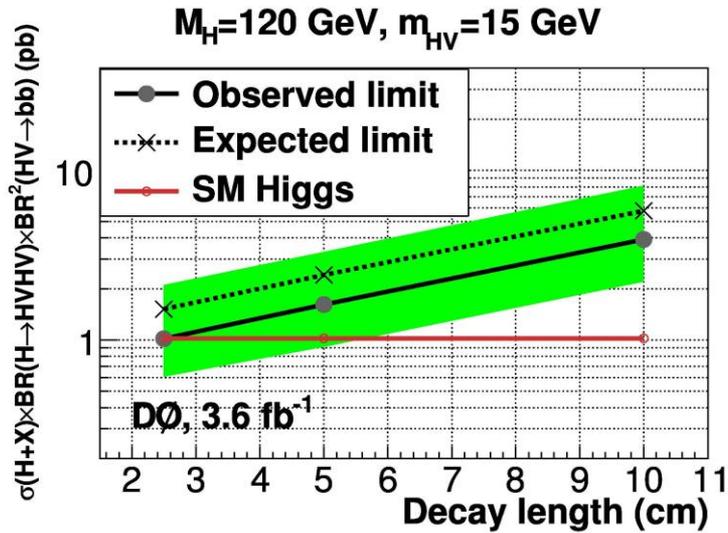


We still live in a 3d world

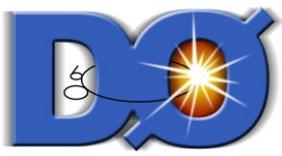




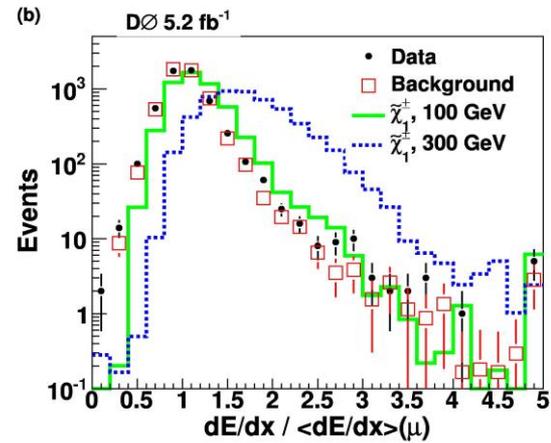
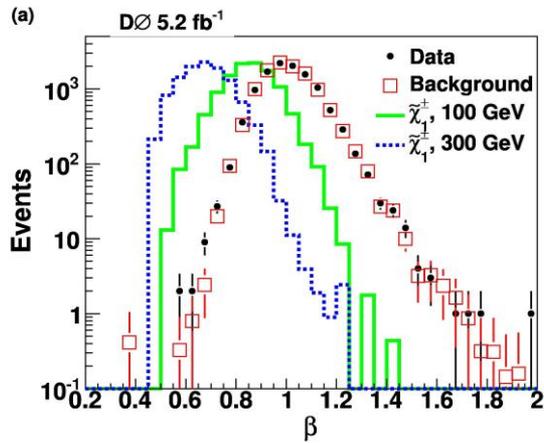
String theory inspired models



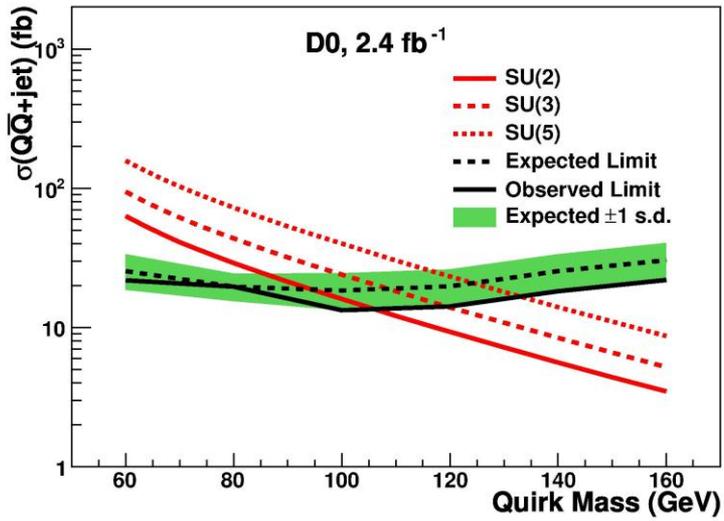
We were the first to board this boat
 In addition to ATLAS/CMS a lot of new experiments at low energy



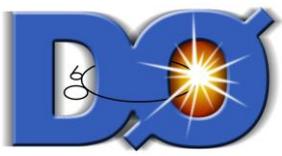
Garisto doesn't like neologisms



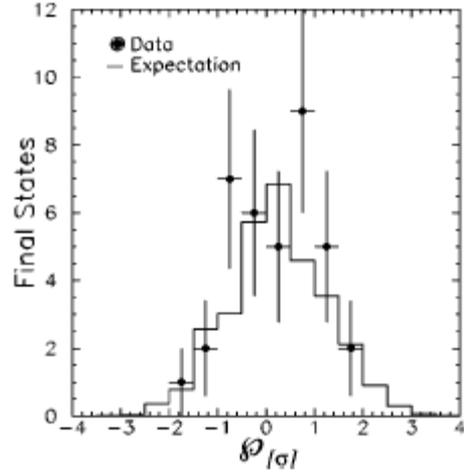
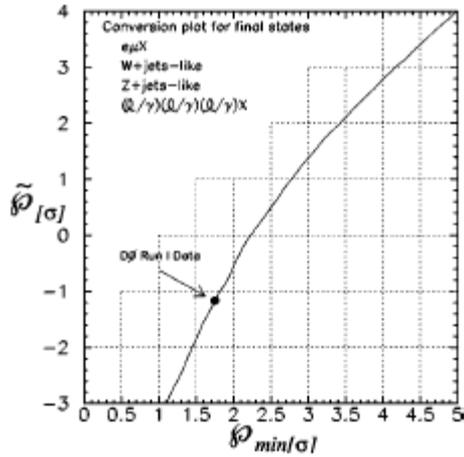
Standard searches for slowly moving heavy massive particles



Quirks: new fermions with new SU(n) degree of freedom, form bound state observed as heavily ionizing particle



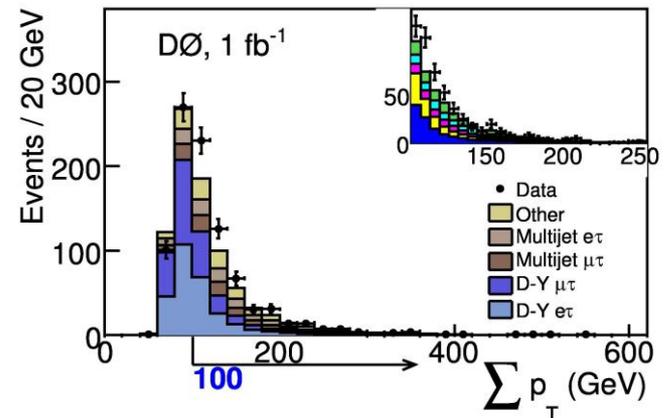
Did we really search everywhere ?



According to SLEUTH / QUAERO the Run I data are particularly uninteresting

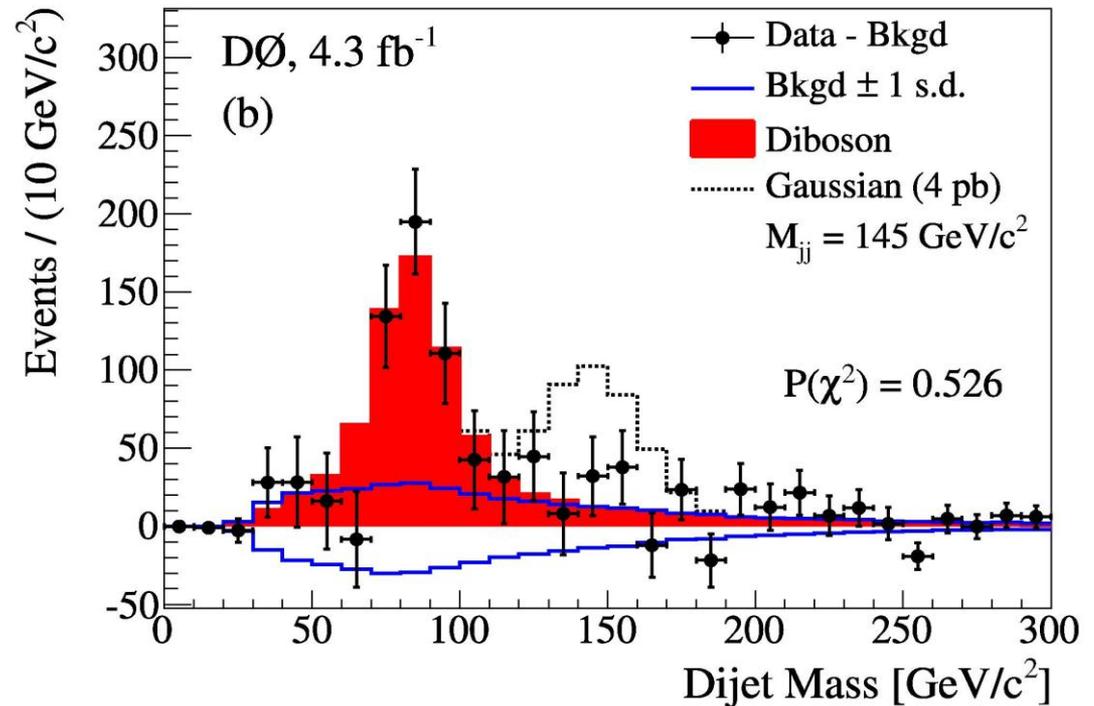
electroweak scale is demonstrated by testing the method on a particular signature in each set of final states. No evidence of new high p_T physics is observed in the course of this search, and we find that 89% of an ensemble of hypothetical similar experimental runs would have produced a final state with a candidate signal more interesting than the most interesting observed in these data.

Same thing also in Run II (most discrepant state is lepton+tau+jets+MET)





Beat on the brat (The Ramones)



You know how the story goes:

- A fraction of the CDF collaboration together with the theory group makes a discovery and a lot of noise
- We tell them they are wrong, the rest of CDF tells them they are wrong
- They are very unpleasant about this (theory group too....)
- A few years later they tell you that they have finally understood what they did wrong and sell it like a big discovery



Conclusions



- I did cover only a subset of all the searches done in Run I and Run II
- Finding something new would have been nice
- Finding something new at the LHC would really energize the field, keep on trying
- We did everything correctly, did we ?
 - I would have expected that with > 100 analysis at least one 2.5σ fluctuation would appear
- Three questions to conclude:
 - What was the first NP paper published by DØ ?
 - And the last one ?
 - How many NP meeting did I attend ?