Searches using Photons and/or Jets at CDF

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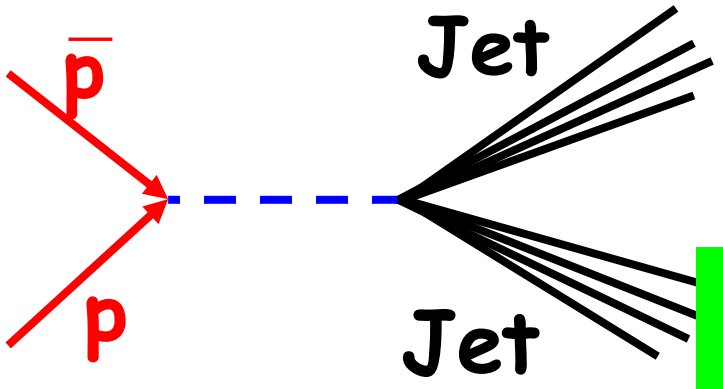
For the
CDF collaboration

Outline

The CDF detector and tools are working so well that the next generation of more sophisticated analyses are coming out with 2 fb^{-1} of data

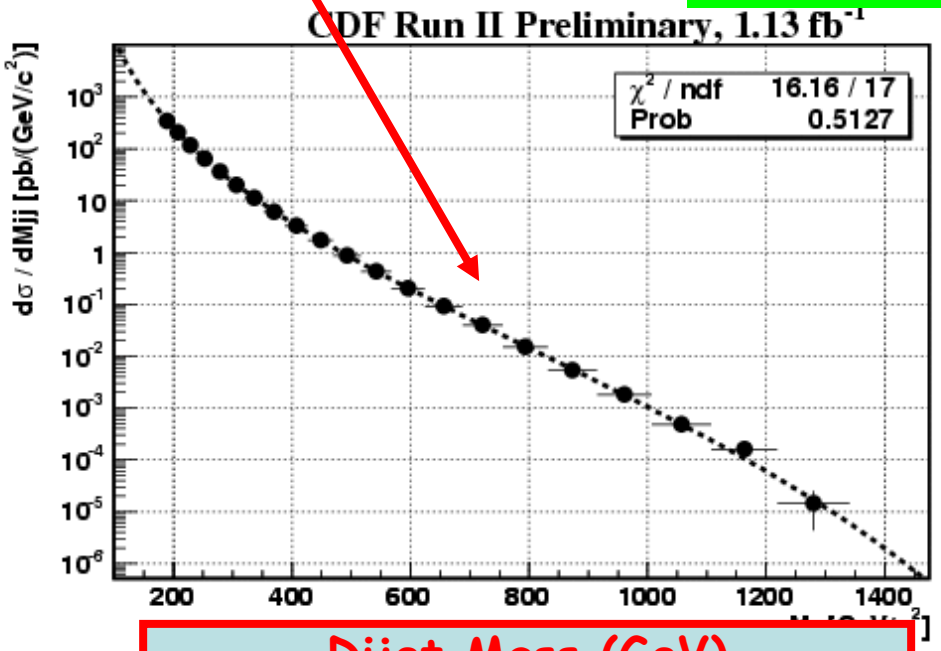
1. Dijets: Mass and Met
2. γ+b+jet+Met
3. Lepton+γ+*b*+Met: Model-independent searches and a first measurement of the ttγ Cross Section
4. γ+jets and $\gamma\gamma$+Met: Model-independent searches and new limits on Gauge Mediated Supersymmetry

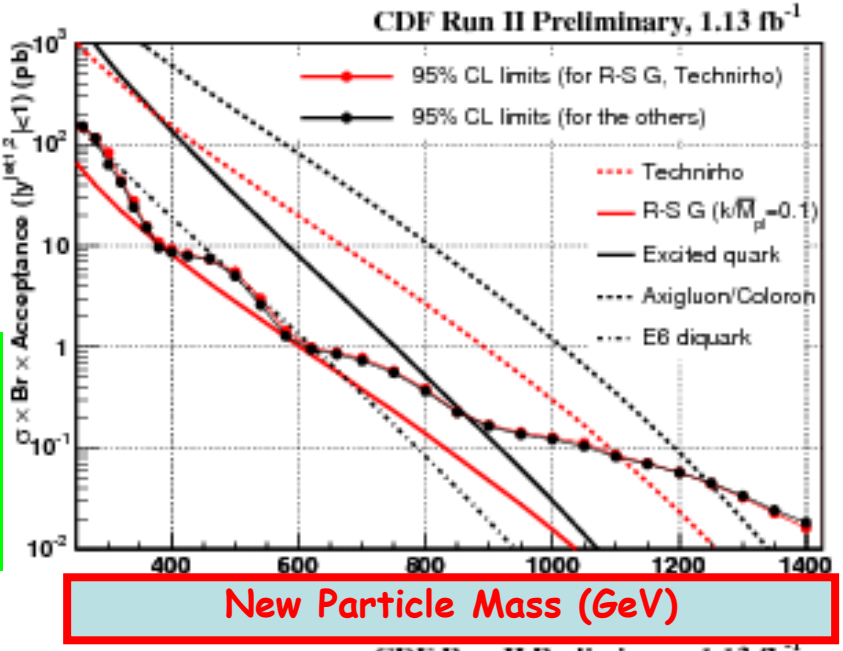
New Physics in Dijets

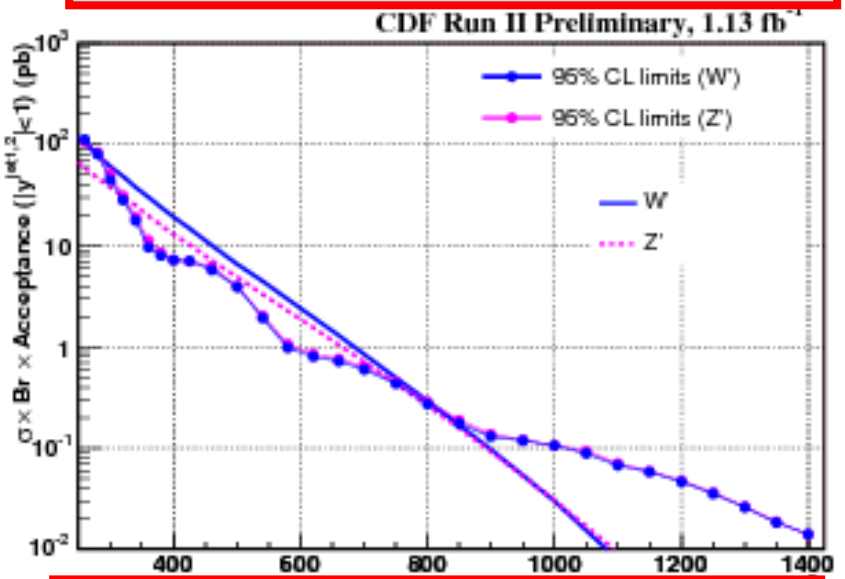


Look for Mass Bumps

Sensitive To Lots of Models



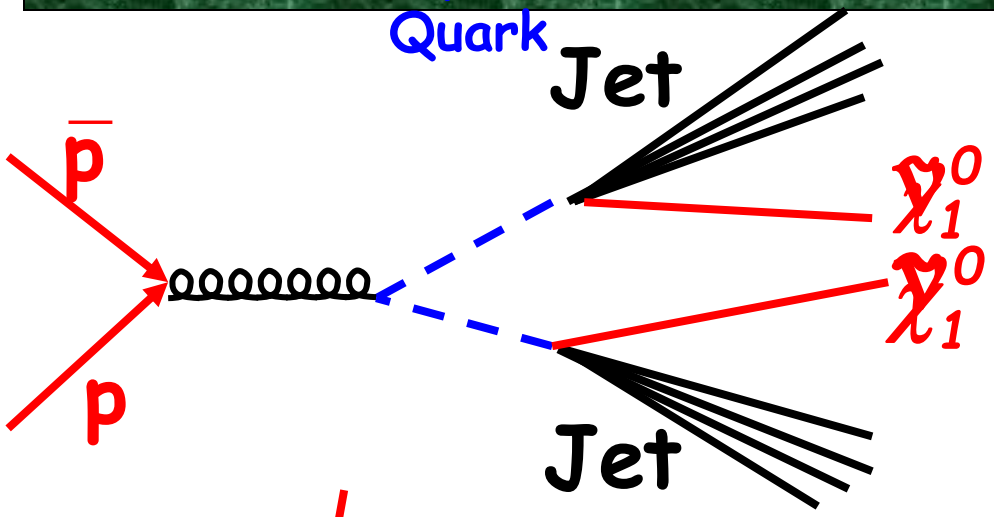




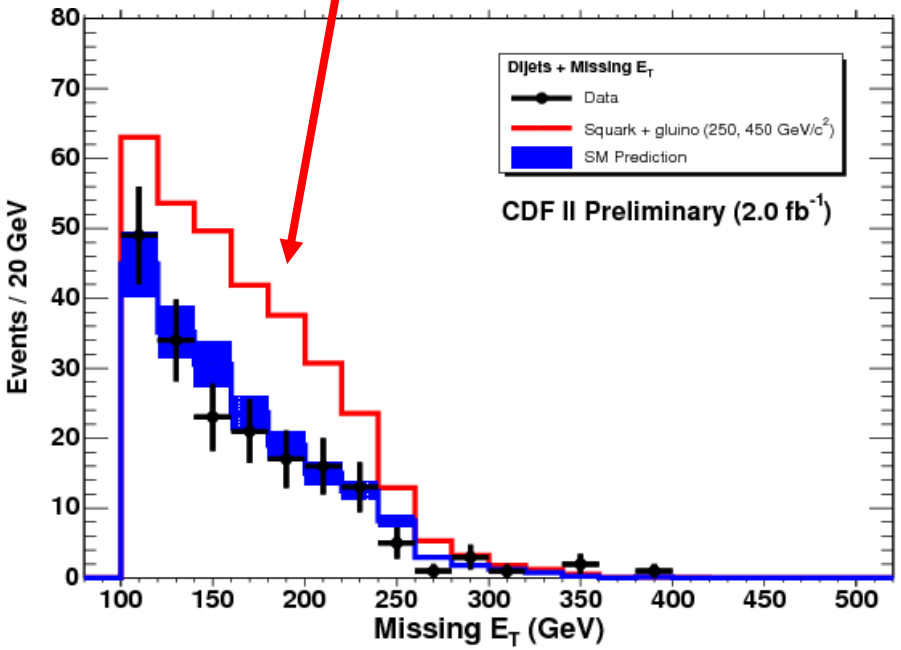
New Physics in Dijets+Met

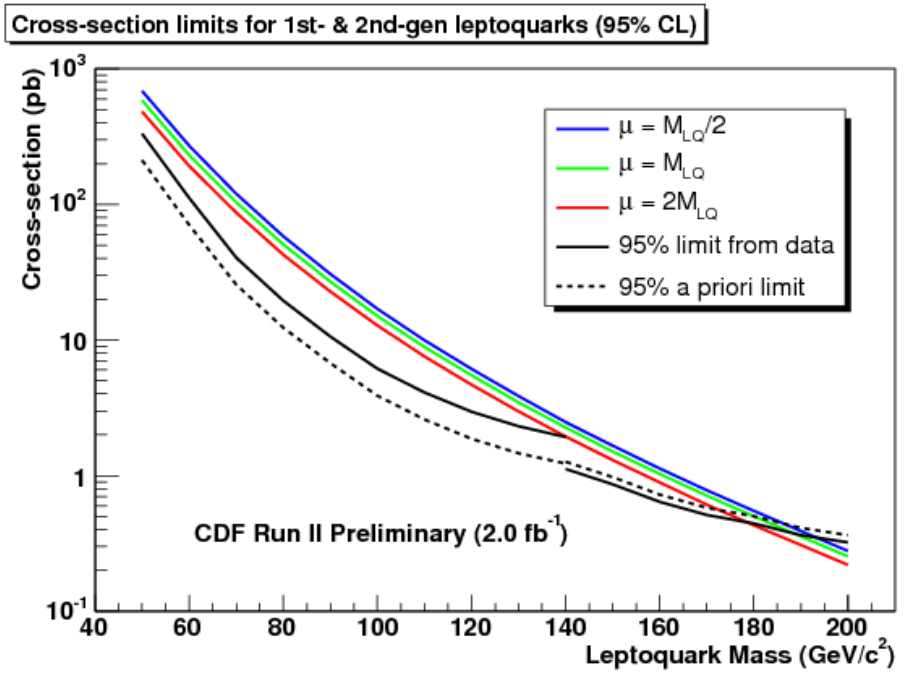
Squark

Lepto-Quark



Also Sensitive To Lots of Models



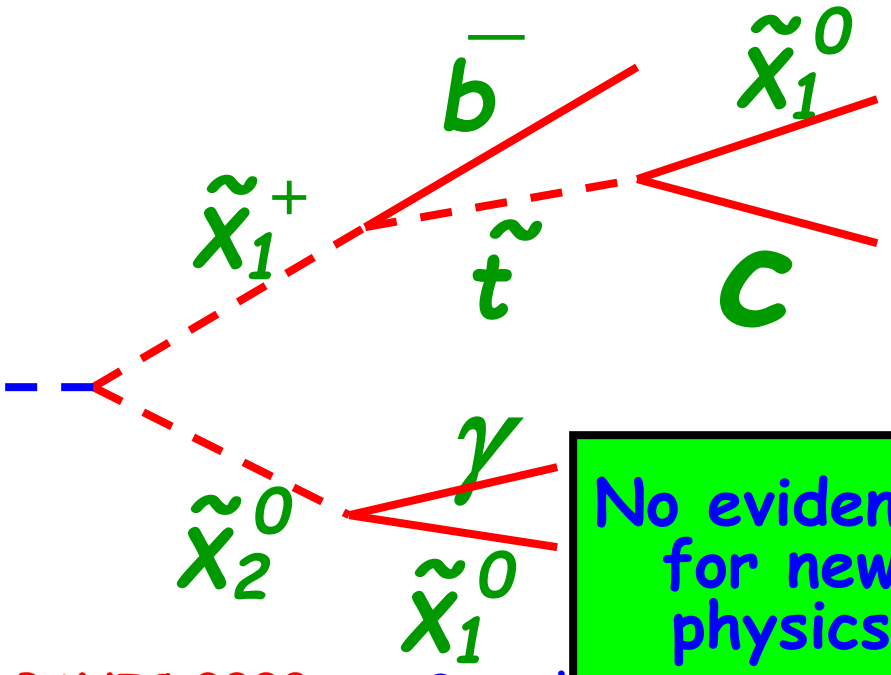


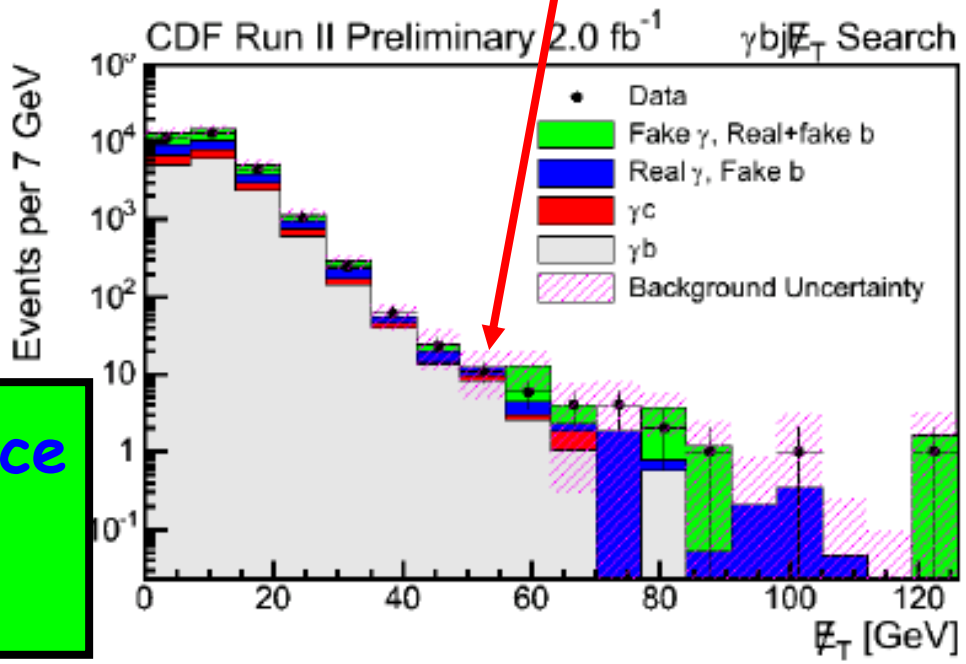
γ+b+jet+Met

Model-independent search in the γ+b+jet+Met final state

Sensitive to a number of different models

Potential to observe an excess in multiple distributions

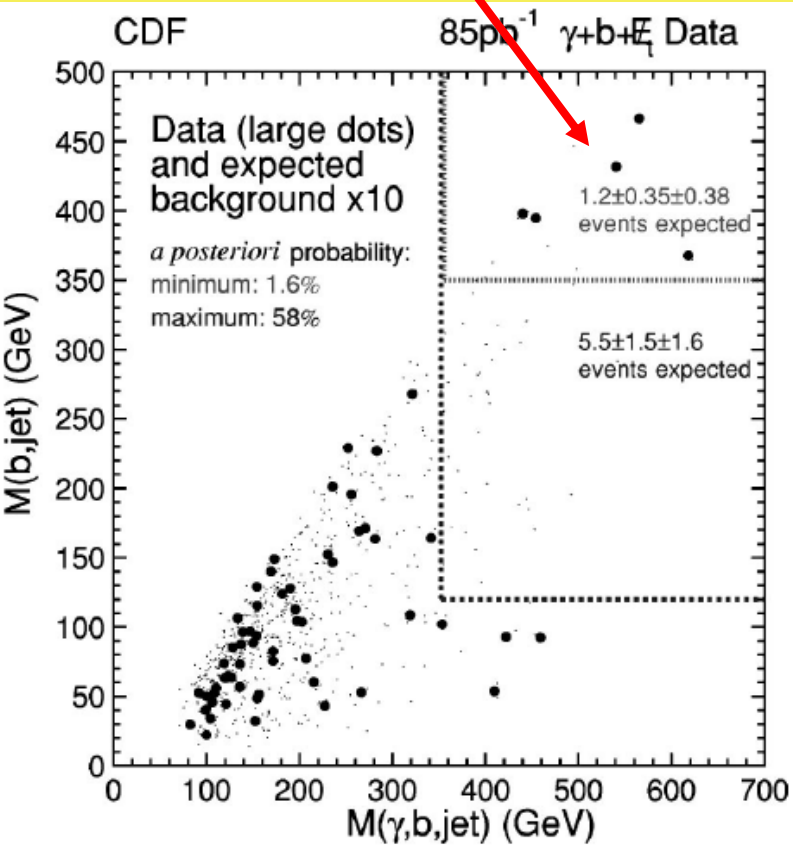




No evidence for new physics

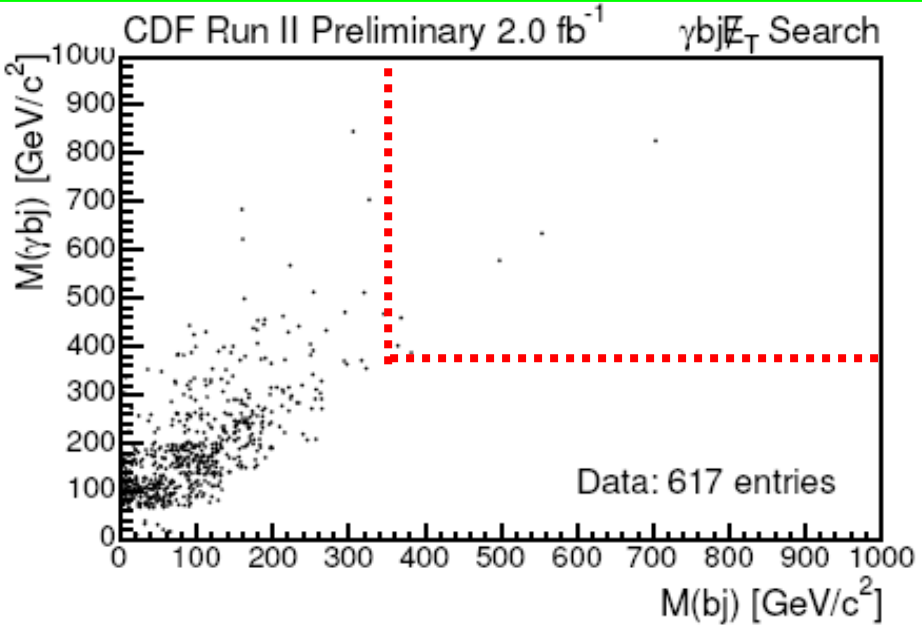
γ+b+jet+Met

In Run I with 85 pb^{-1} a small excess was observed



Compare with 20 times the data and a better detector

Potential anomaly not confirmed

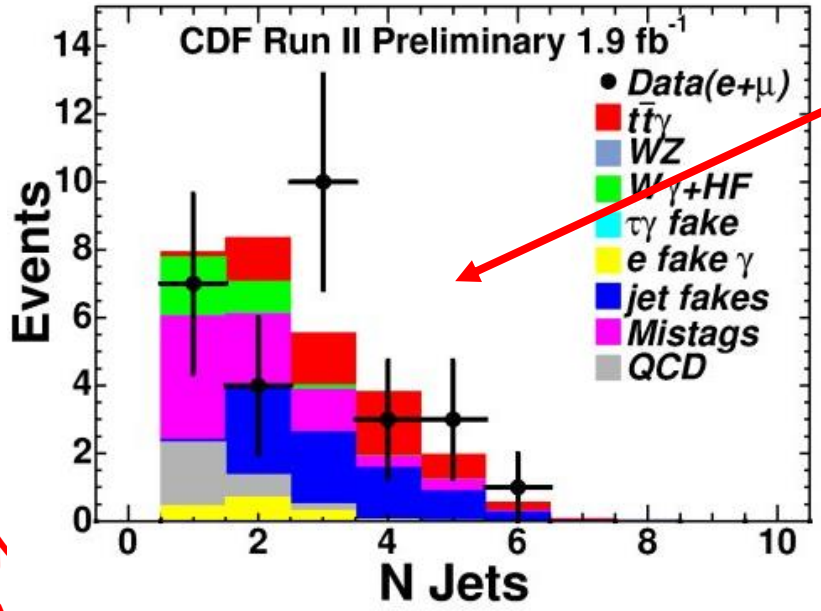


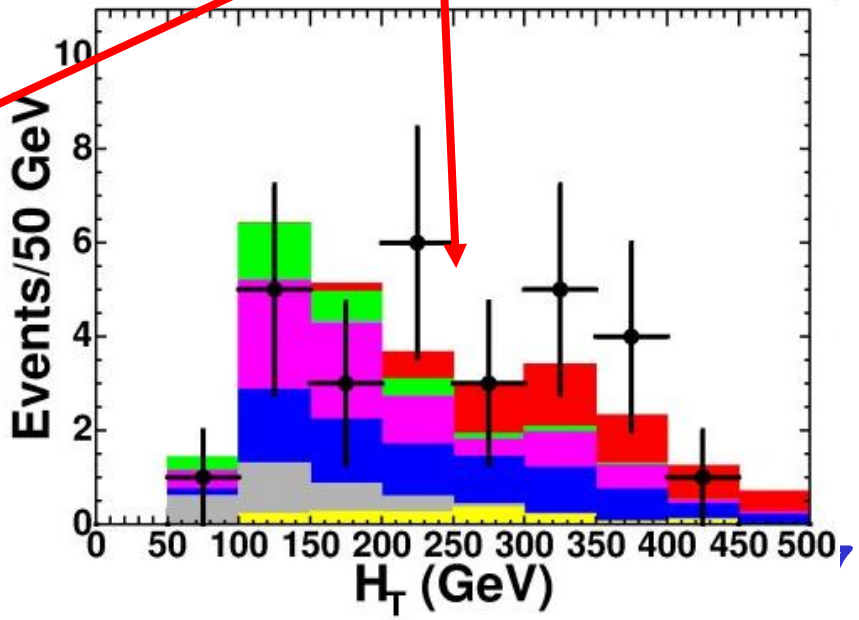
Search in l+γ+b+Met

Another example of a CDF Model-independent search for new physics

Natural extension of the γ+lepton+Met search

Potential to observe an excess in multiple distributions

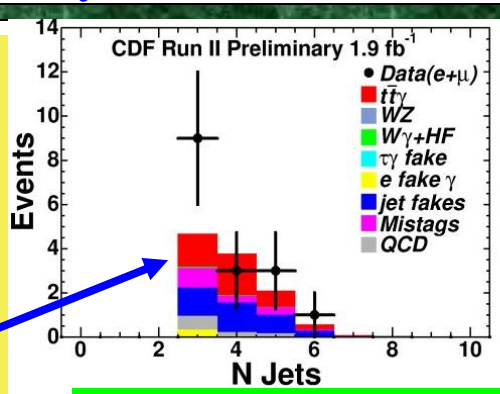


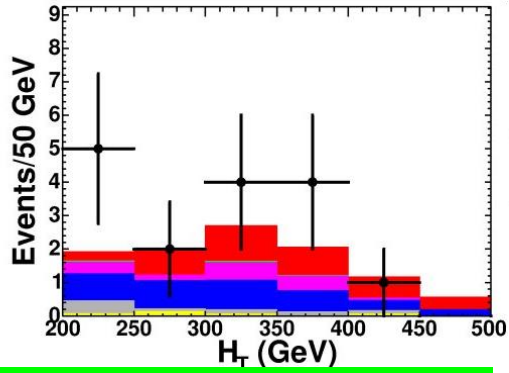


Measure the $t\bar{t}\gamma$ Cross Section

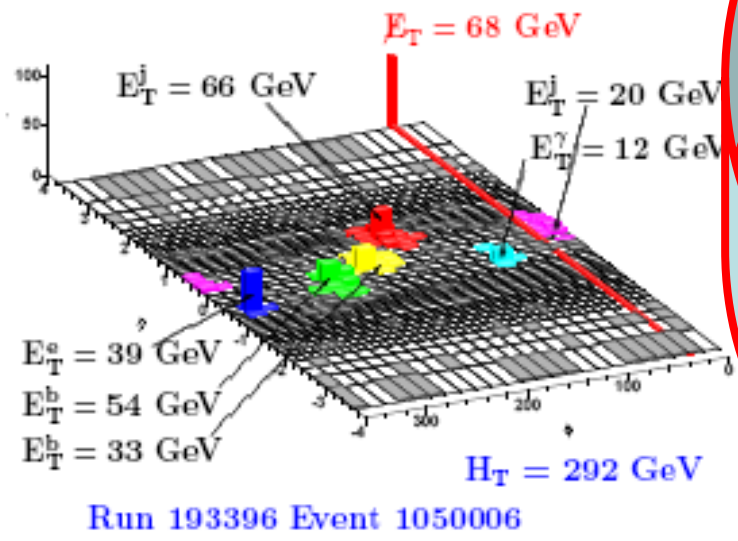
Natural extension of the lγbMet analysis

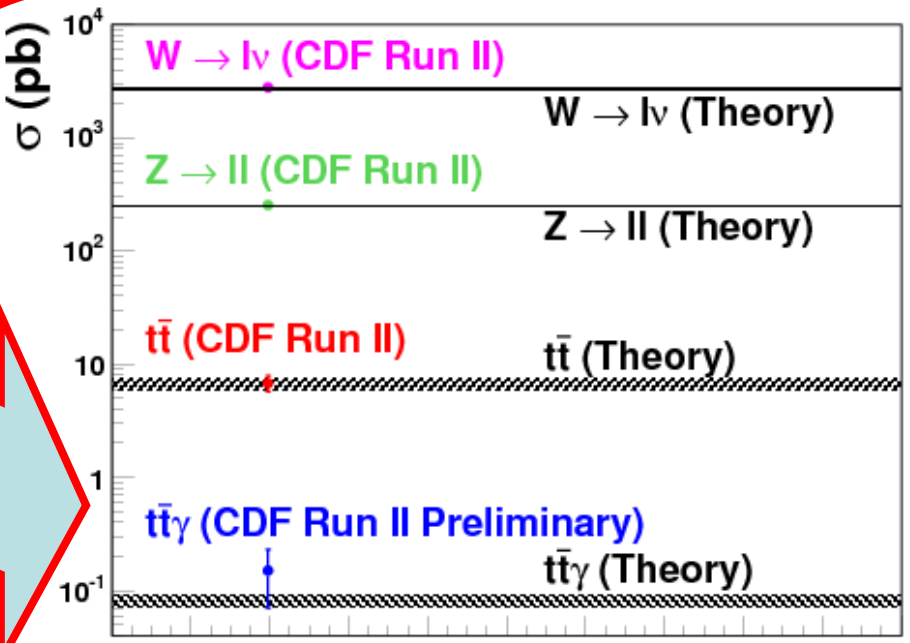
Require 3 jets and H_T>200 GeV





16 Observed events on a background of $6.7^{+2.3}_{-2.1}$

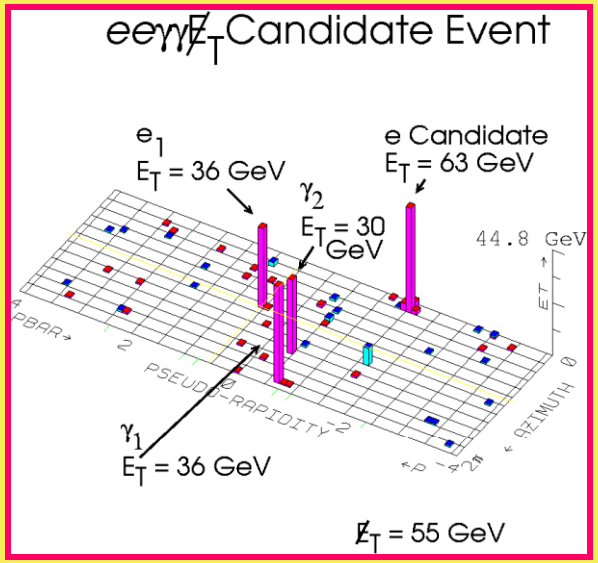




Gauge-Mediated SUSY Breaking Models

$\tilde{\chi}_1^0 \rightarrow \gamma\tilde{G}$ models provide
a warm dark matter candidate
Consistent with Astronomical
observations and models of inflation

More natural solution for FCNC problems than mSUGRA



CDF Run I eeγγ+Met candidate event

Early Universe

Nanosecond lifetimes

Later Universe

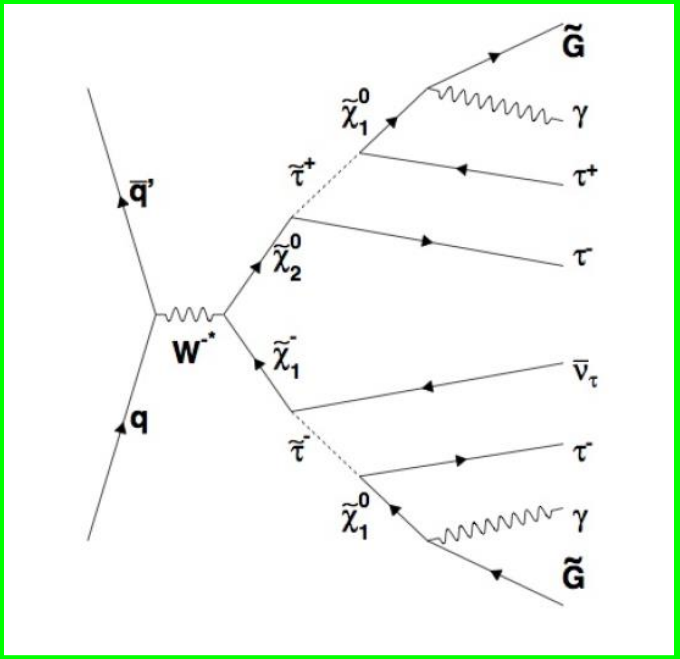
Warm Dark Matter

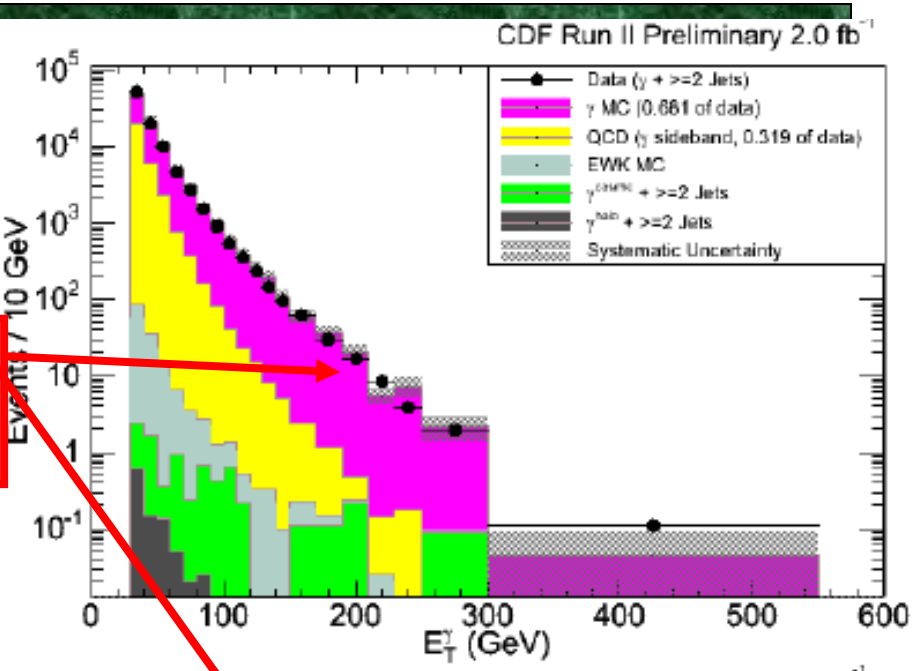
γ+Jets

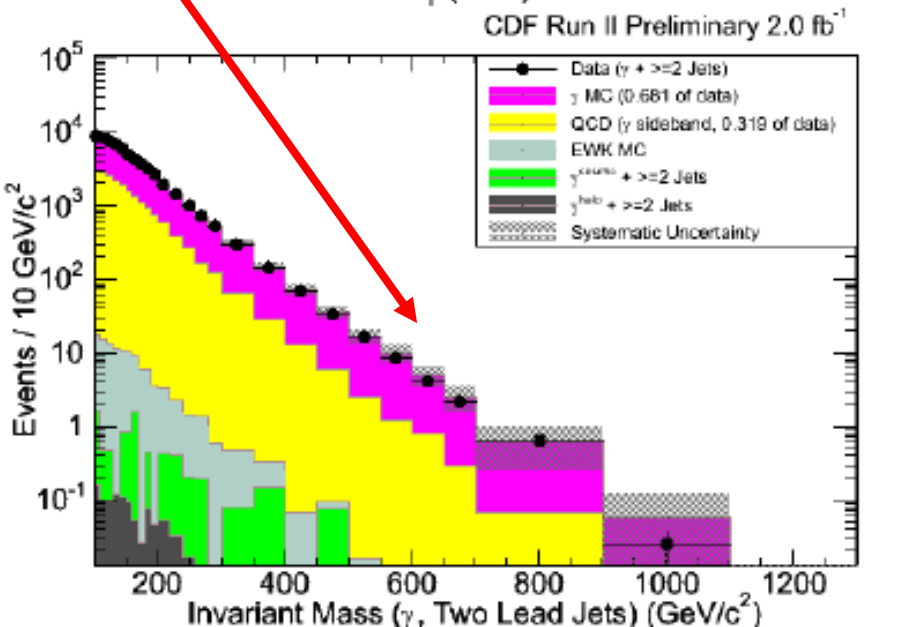
New model independent search in the γ+2 jet final state

No evidence for new physics

Limits on GMSB in progress





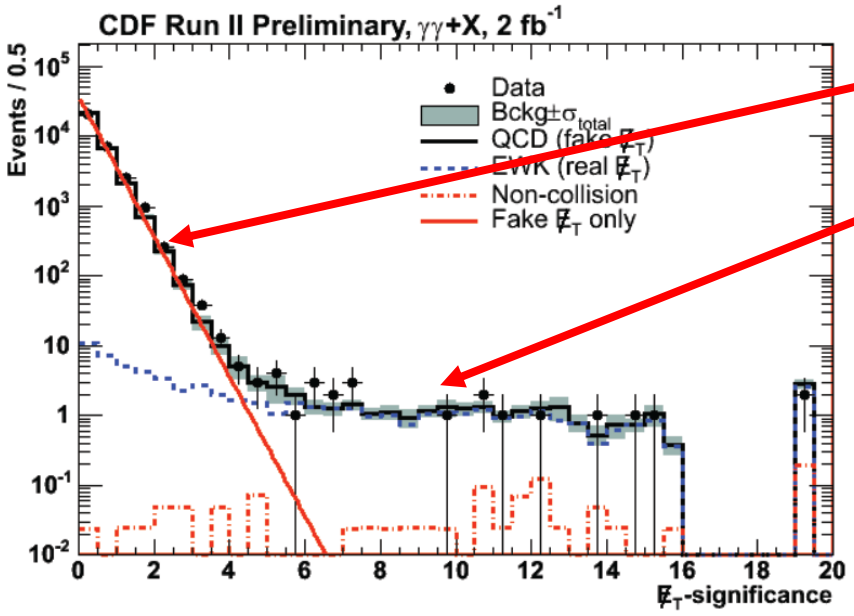


γγ+Met

New model independent search in the γγ+Met

New tool: Sophisticated mechanism to measure the significance of the Met measurement

Can straightforwardly separate QCD backgrounds with no intrinsic Met from EWK that does



	MetSig>3.0	MetSig>4.0	MetSig>5.0
Non-collision	0.89 ± 0.32	0.84 ± 0.30	0.77 ± 0.27
Fake Met (MetModel)	28.1 ± 6.8	3.6 ± 1.8	0.60 ± 0.83
"No γγ Vertex"	4.4 ± 2.0	2.5 ± 1.0	1.5 ± 0.7
γγγ (lost γ)	2.9 ± 1.0	2.2 ± 1.0	1.6 ± 1.0
EWK real MET	31.6 ± 2.0	26.7 ± 1.9	22.8 ± 1.7
Total	67.9 ± 7.5	35.8 ± 3.0	27.3 ± 2.3
Observed	82	31	23

No evidence for new physics

Gauge Mediated Supersymmetry

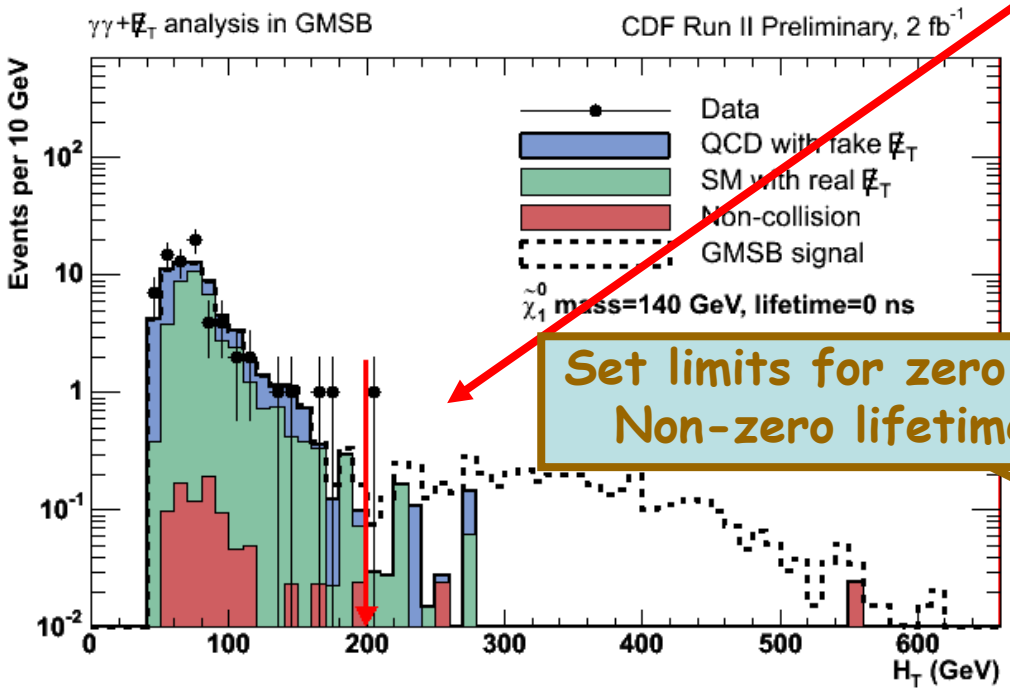
Optimize the γγ+Met analysis for 0 ns lifetime:

Significant Met and Large H_T

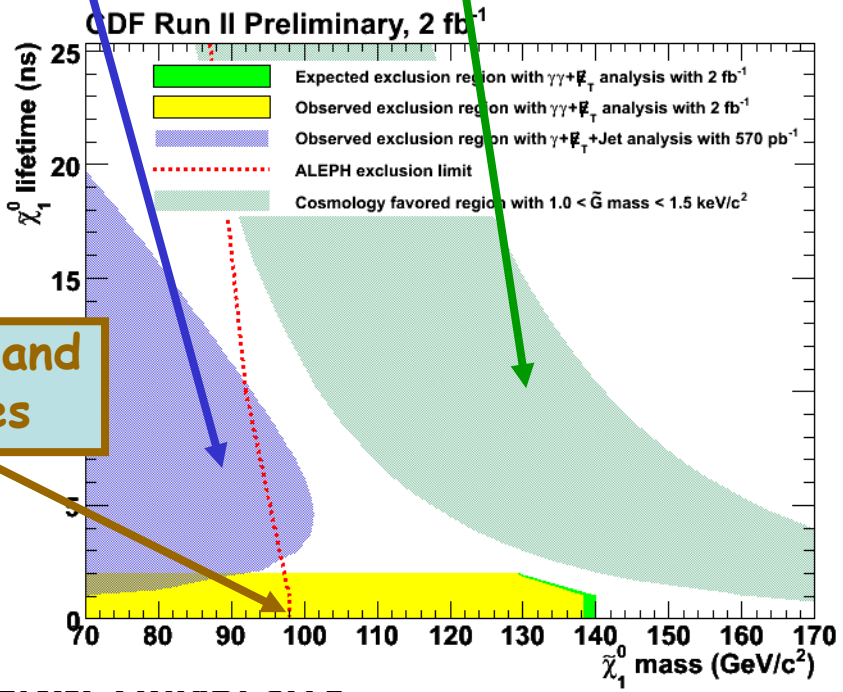
Complement to the Delayed Photon Analysis

No evidence for new physics

Approaching the Cosmology Favored Region



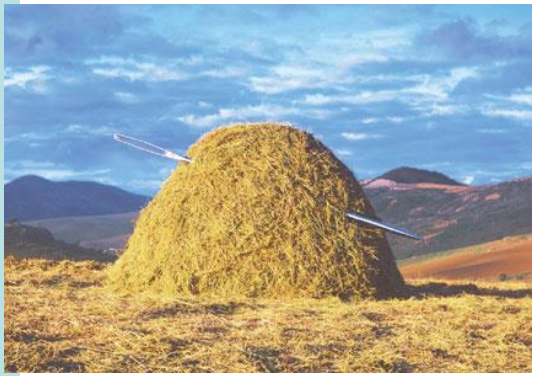
Set limits for zero and Non-zero lifetimes



Conclusions

The LHC era has started but the Tevatron is still collecting data and leading the search for Supersymmetry and Beyond the Standard Model Physics

The next generation of sophisticated tools and model-independent searches at CDF may well prove to make the discovery we all hope is just around the corner



"Don't look back — something might be gaining on you."
-Satchel Paige