Higgs-Truth Quark NJL 3-State System: A Detailed History of Observations

Frank Dodd (Tony) Smith, Jr. - 2017

Abstract:

E8 Physics (viXra 1602.0319, 1701.0495, 1701.0496) views Higgs as a Nambu-Jona-Lasinio (NJL) type Truth Quark -Truth antiQuark Condensate with 3 mass states for Higgs and Truth Quark:

Low-mass - 125 GeV Higgs and 130 GeV Truth Quark
Middle-mass - 200 GeV Higgs and 174 GeV Truth Quark
High-mass - 240 GeV Higgs and 220 GeV TruthQquark

This paper describes observations of Higgs and Truth Quark mass states by experiments such as (descriptions from Wikipedia):

ARGUS - a particle physics experiment at the electron-positron collider DORIS II at DESY in Hamburg - commissioned in 1982 - operated until 1992.
HERA - DESY's largest synchrotron and storage ring for electrons and positrons - began operation in 1990 - started taking data in 1992 - closed in 2007 - detectors H1 and ZEUS

FERMILAB - site of Tevatron proton-antiproton collider at Batavia, Illinois - Tevatron was completed in 1983 and closed in 2011 - detectors CDF and D0

LEP - electron-positron collider at CERN in Geneva used from 1989 until 2000
LHC - proton-proton collider at CERN re-using the LEP tunnel - the largest single machine on Earth - built between 1998 and 2008 - detectors CMS and ATLAS - first research run at 7 to 8 TeV was from 2010 to 2013 - restarted at 13 TeV in 2015 - by the end of 2016 had 36 fb(-1) at 13 TeV - during 2017 had collected an additional 45 fb(-1) at 13 TeV for a total of 80 fb(-1) = 80 x 100 Trillion = 8 Quadrillion = 8 x 10^15 events.

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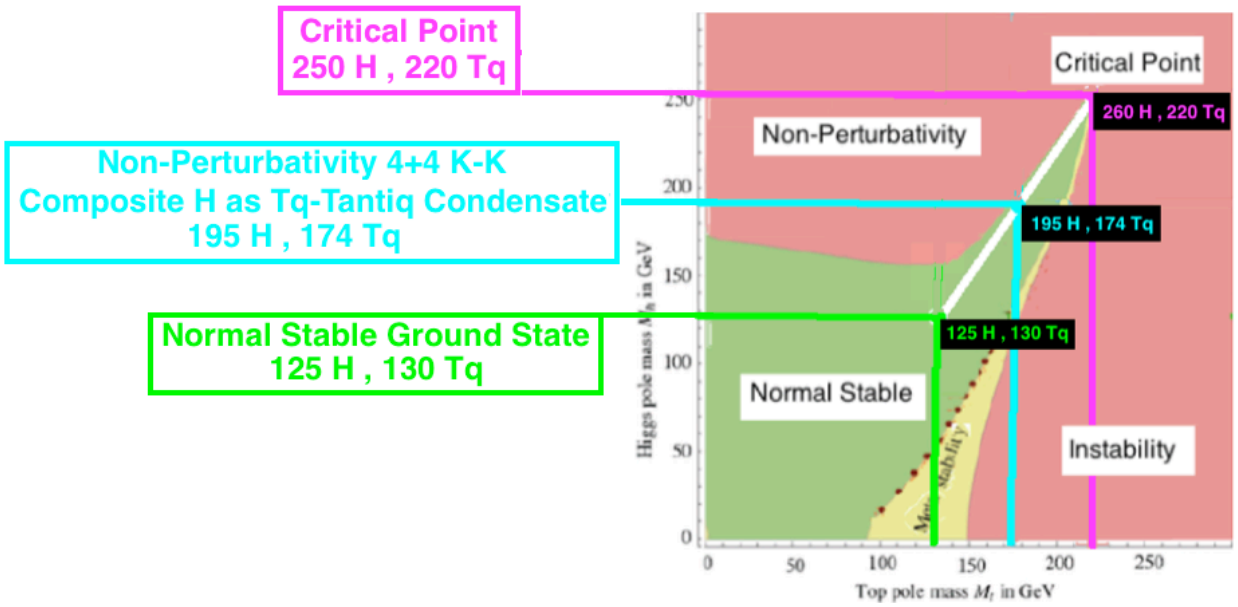
a Nambu-Jona-Lasinio (NJL) type Truth Quark -Truth antiQuark Condensate
with 3 mass states for Higgs and Truth Quark:

Low-mass - 125 GeV Higgs and 130 GeV Truth Quark
Middle-mass - 200 GeV Higgs and 174 GeV Truth Quark
High-mass - 240 GeV Higgs and 220 GeV Truth Quark



Those 3 sets of Higgs and Truth Quark mass states are, respectively:

in the Normal Stable region with STABLE Universe

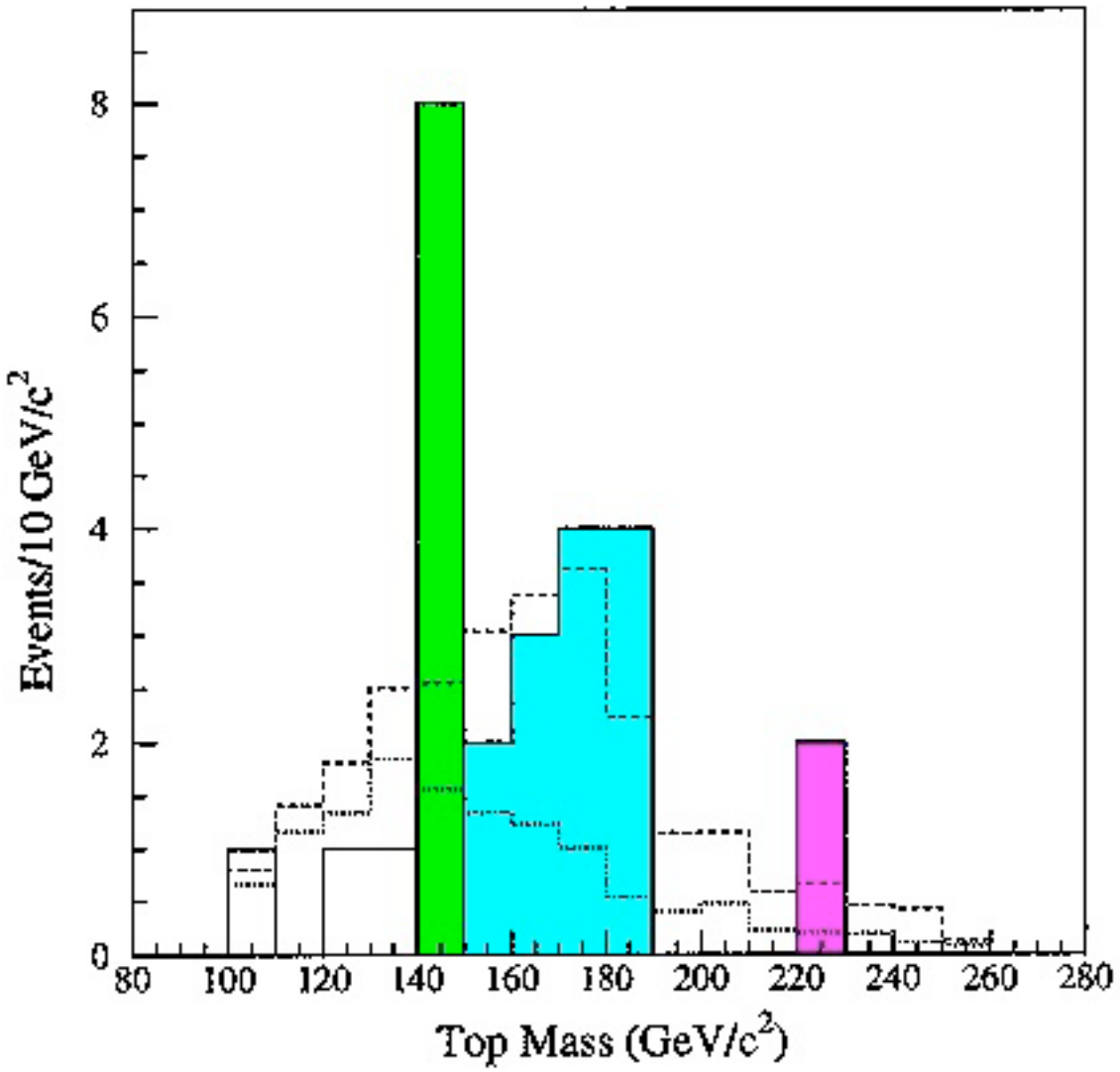
on the boundary line of non-perturbativity at which Higgs compositeness
and 8-dim Kaluza-Klein spacetime structure become manifest
(see hep-ph/0311165 by Hashimoto, Tanabashi, and Yamawaki)

at the critical point beyond which Electroweak Symmetry is NOT broken
and W and Z bosons stay massless

1994 CDF observation of Truth Quark

26 April 1994 - FERMILAB-PUB-94/097E

A semileptonic histogram showed **three mass states of the Truth quark**



The green bar represents a bin in the **140-150 GeV** range consistent with the E8 Physics prediction of a Truth Quark Ground State around 130 GeV.
This peak was rejected by CDF Fermilab on the (in my opinion spurious) grounds "... We assume the mass combinations in the 140 to 150 GeV/c^2 bin represent a statistical fluctuation since their width is narrower than expected for a top signal ...".

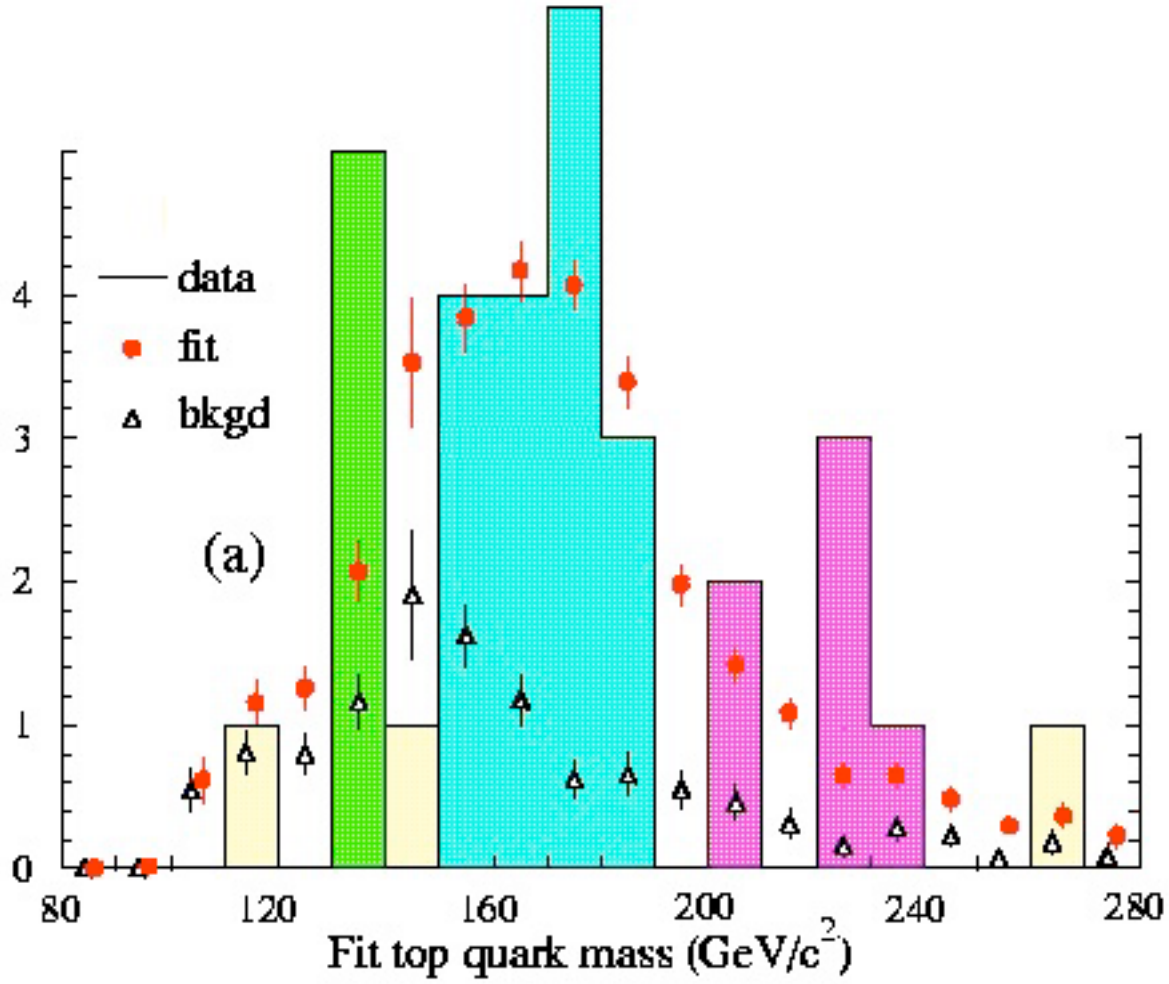
The cyan bar represents a broader peak in the **160-180 GeV** range consistent with the 174 GeV mass state of the Truth Quark that is accepted by the Consensus of the Physics Community as the one and only mass state of the Truth Quark.

The magenta bar represents a bin in the **220-230 GeV** range consistent with the NJL Higgs-Truth Quark system of E8 Physics and hep-ph 9603293 and 0311165.
This peak was rejected by CDF Fermilab as too small (only 2 events) to be significant.

1997 D0 observation of Truth Quark

1997 - D0 hep-ex/9703008

A semileptonic histogram also showed **three states of the Truth Quark**



Despite confirmation of the Truth Quark Ground State around 130-140 GeV by D0 Fermilab continued (and continues to the present day) to refuse to accept it.

Fermilab happily accepted the confirmation of the Truth Quark state around 174 GeV.

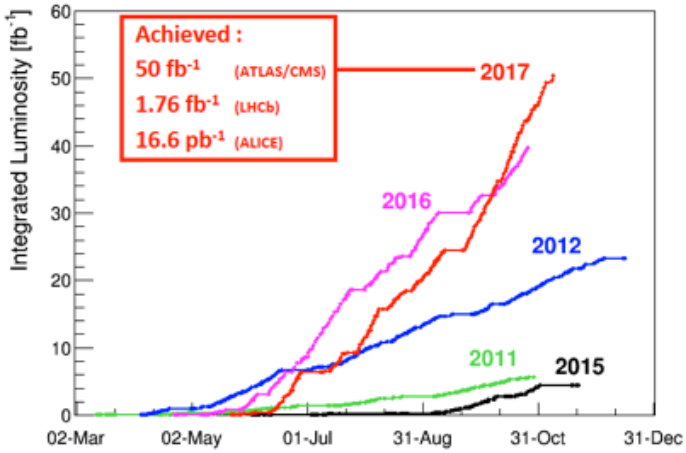
Despite D0 having 6 events (not just 2) for Truth Quark in the 200-240 GeV range Fermilab continued (and continues to the present day) to refuse to accept it.

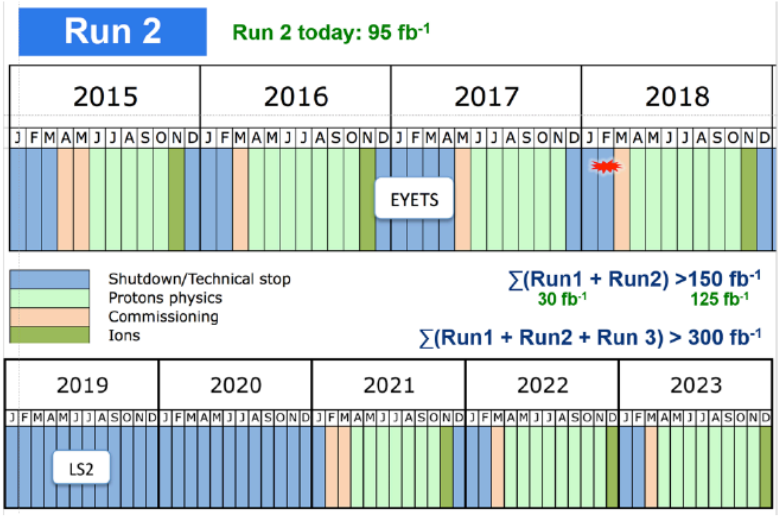
In Tommaso Dorigo's blog entry "Proofread my PASCOS 2006 proceedings" 5 Sep 2007 particularly comment 11 (by me) and comment 13 (Tommaso's reply to 11):
I asked: "... With respect to the CDF figure ...[and]... the D0 figure ... what are the odds of such large fluctuations [green peaks] showing up at the same energy level in two totally independent sets of data ? ...".

Tommaso replied: "... It is **of the order of 4-sigma**. ...".

2016-2017 LHC 13 TeV observation of Higgs

On 28 Feb 2017 the 133rd LHCC Meeting - OPEN Session - presented slides:
LHC Machine Status Report - Markus Zerlauth -





LHC schedule 2018

A production year to complete Run 2

Goal ~55-60 fb^{-1}

(131 days of p-p physics)
BCMS 25ns , 13 TeV
keeping the LHC availability close to 50% (stable beams)

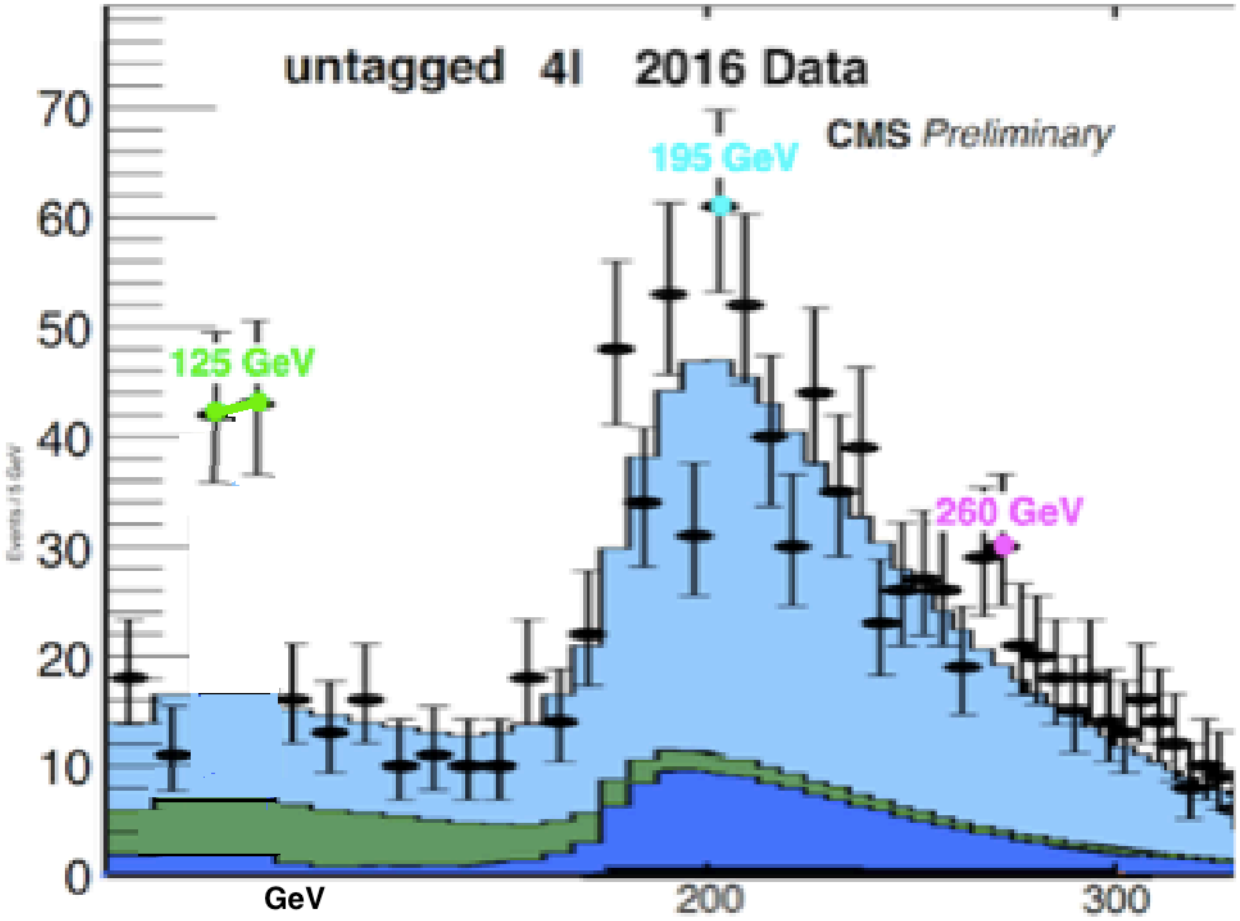
As of now (March 2018) the LHC should have taken 2 independent sets of 13 TeV data each about 50 fb-1:

2015-2016 Run 2 (45 fb-1) 2017 Run2 (50 fb-1)

2015-2016 Run 2 (45 fb-1)

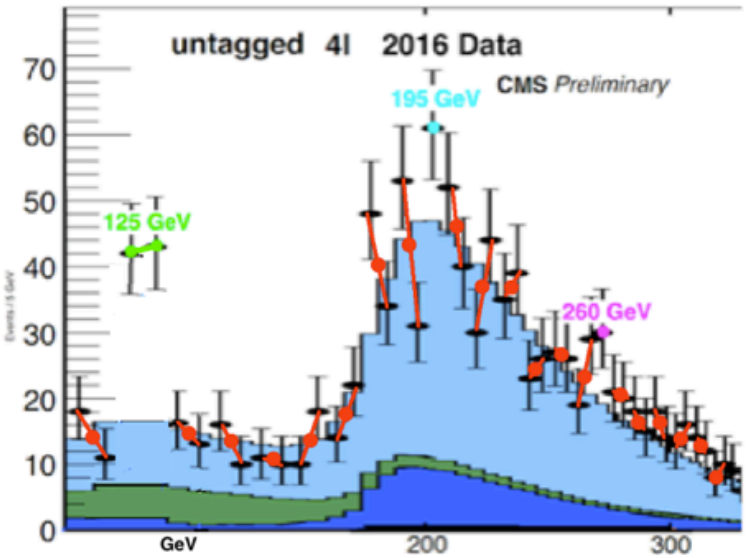
2015-2016 Run2 (45 fb-1) for Higgs -> ZZ* -> 4l Channel

CMS gave indications of 3 Higgs Mass States in this CMS histogram with 5 Gev bins, from CMS PAS HIG-17-012 , especially Figure 2-a ,

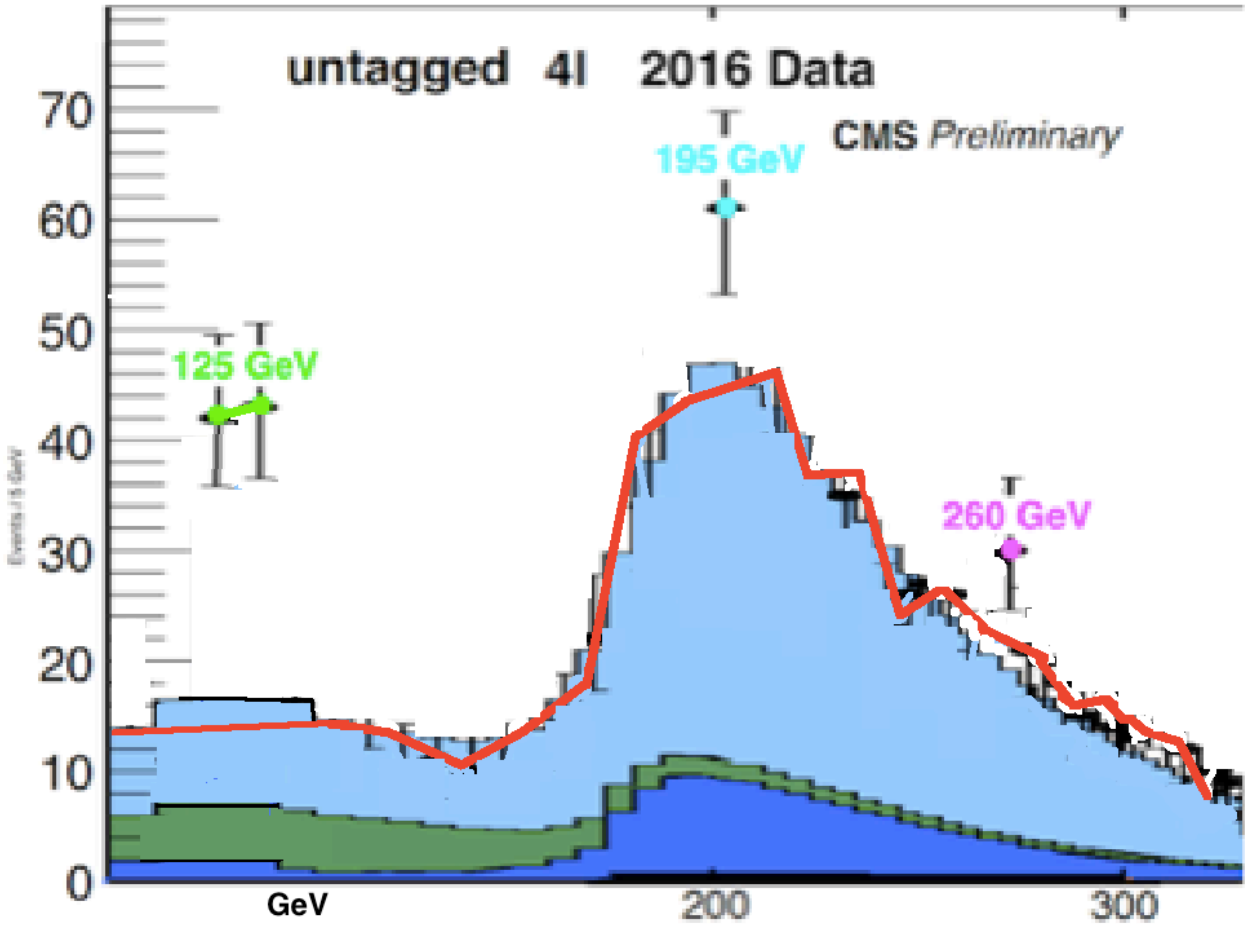


Tommaso Dorigo on 16 May 2011 blogged a post titled “Choose Bins Wisely”
to which Lubos Motl commented “... the main trade-off here is clear.
If the bins are too wide, you lose the detailed information about the x-coordinate.
If the bins are too narrow, you lose the information about the y-coordinates -
the number of events / objects in each bin becomes too fluctuating ...
It’s always possible to merge bins into bigger ones ...”

In the above CMS histogram,
it is clear that there are large fluctuations between adjacent bins
so to smooth out that noisy variation between neighboring bins
I merged the non-signal 5 GeV bins pairwise to get 10 GeV bins
(the red lines connect the merged bins producing the new data red dots):



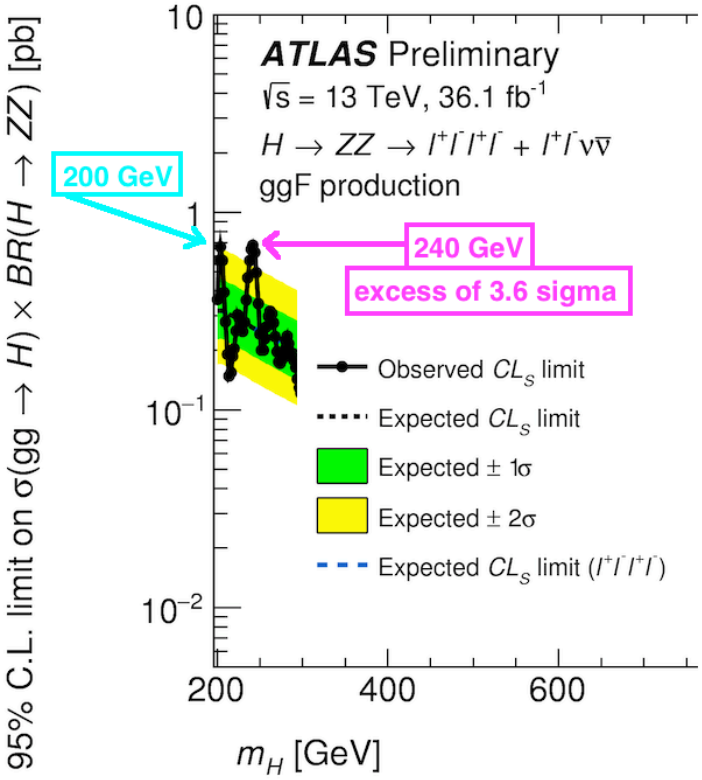
which produced a much smoother plot more consistent with the CMS background in which the two states at 195 GeV and 260 GeV are shown much more clearly:



ATLAS analysis of Higgs -> ZZ* -> 4l of 2016 LHC run was in ATLAS-CONF-2017-058
"... A search for heavy resonances decaying into a pair of Z bosons leading to l+ l- l+ l- ... final state... where l stands for either an electron or a muon, is presented.
[that includes the Higgs -> ZZ* -> 4l channel]
The search uses proton–proton collision data at a centre-of-mass energy of 13 TeV corresponding to an integrated luminosity of 36.1 fb-1 collected with the ATLAS detector during 2015 and 2016 at the Large Hadron Collider ...

excess ...[is]... observed in the data for m4l around 240 ... GeV ...
with a local significance of 3.6 sigma

estimated under the asymptotic approximation,
assuming the signal comes only from ggF production ...
The excess at 240 GeV is observed mostly in the 4e channel ...
Figure 6 presents the expected and observed limits at 95% confidence level on sigma x BR(H->ZZ) of a narrow-width scalar for the ggF ... production modes, as well as the expected limits [figure truncated to relevant 140 - 300 GeV range]...



...".

2017 Run2 (50 fb-1)

2017 Run2 is also a data set of about 50 fb-1 so it should have equal weight of the independent 2015-2016 Run2 data set. If the results are similar for both of the two independent 50 fb-1 data sets,
the 3 Mass State Nambu-Jona-Lasinio Higgs-Tquark model will be Supported and should be serlously considered as a realistic physics model.

2018 Run2 should produce a third 50 fb-1 data set. If its results are also similar to the 2015-2016 Run2 results, I think that it should be considered Confirmation of the 3 Mass State Nambu-Jona-Lasinio Higgs-Tquark model.

Since the LHC will be shut down in 2019 and 2020, there will be no new results until Run3 of 2021-2022-2023 for which the total data of about 150 fb-1
will only be of the same size (50+50+50) fb-1 as Run2 of 2015-2016-2017-2018 and is therefore not likely to change the Run2 results.

Detailed History of Other Observations of Higgs and Truth Quark

1988 - Truth Quark - Nir, Nuclear Physics B306 (1988) 14 -
ARGUS B-Bbar experiments set limits on the Mass of the Truth Quark, showing it to be between 43 GeV and 180 GeV, and likely to be between **83 GeV and 180 GeV**.

1992 - Low-mass Truth Quark - **Dalitz, Goldstein**, Phys. Lett. B 287 (1992) 225-230) -
A simple idealized procedure is proposed for the analysis of individual top-antitop quark pair production and dilepton decay events, in terms of the top quark mass. This procedure is illustrated by its application to the CDF candidate event.
If this event really represents top-antitop production and decay, then the top quark mass would be **131 +22 -11 GeV**.

1993-Low-mass Truth Quark- **Kondo, Chikamatsu, Kim** J. Phys. Soc. Japan 62: 1177-82 -
the dilepton candidate found during the Fermilab 1988-89 run can be interpreted as from the top antitop pair

1993 - Low-mass Truth Quark - **Dalitz, Goldstein**, hep-ph/9308345 -
Now that LEP experiments have measured with high accuracy many quantities related with the electroweak interactions, these measurements can be compared with the corrected theoretical predictions in order to draw some conclusions concerning the top quark and any other particles of high mass. ... With the LEP data updated to July 1992, Ellis et al. have given the value ... $m_t = 124(27)$GeV, (2.1) using α_S (M_Z^2) $= 0.118(8)$. ...
One good ($\mu^- e^+$) candidate event has ... been published by the CDF collaboration ...

A second (μe) candidate was shown by the CDF collaboration in their report given at the November 1992 Chicago Meeting of the Division of Particles and Fields of the American Physical Society, although no measurement details were released.
It was well known at that meeting that the DO collaboration also had their first (μe) candidate. Although the integrated luminosities IL are not known to us precisely, a value of about 20 pb^{-1} for CDF (including IL=4.7 pb^{-1} from their 1989 paper) and 10 pb^{-1} for DO would appear plausible estimates, at least of the right order of magnitude. ...
On the assumption that these three (μe) candidates do stem from top-antitop production, and that the integrated luminosity up to November 1992 was about 30 pb^{-1}, the probability distribution for m_t ... peak is at **120 GeV**, the one-deviation limits being **109 and 135 GeV**. ... the peak value thus determined for m_t is not strongly dependent on our estimate for IL, nor on the number of μe events. ...".

1995 - Middle-mass Truth Quark - **CDF** hep-ex/9503002 -
analyzing about 50 pb-1 of data, mostly Semileptonic events
gets a T-quark mass of about **176 GeV**

1995 - Middle-mass Truth Quark - **D0** hep-ex/9503003 -
analyzing about 50 pb-1 of data, mostly Semileptonic events
gets a T-quark mass of about **199 GeV**

1995 - Low, Middle-mass Truth Quark - **Dalitz, Goldstein** hep-ph/9506232 -
analyze the recent seven L(+/-)4jet events and, in accord with CDF,
get a mass estimate of about **175 GeV** for those events.
Their analysis of e(+/-)mu(+/-)2jet events gives
a somewhat lower peak t-quark mass (about **156 GeV**).
When they consider the CDF event 45047/104393 to
be a dilepton event with both leptons hard, and combining two jets into a single jet,
they get a good fit as a t-tbar event with t-quark mass **136 (+18 -14) GeV**.

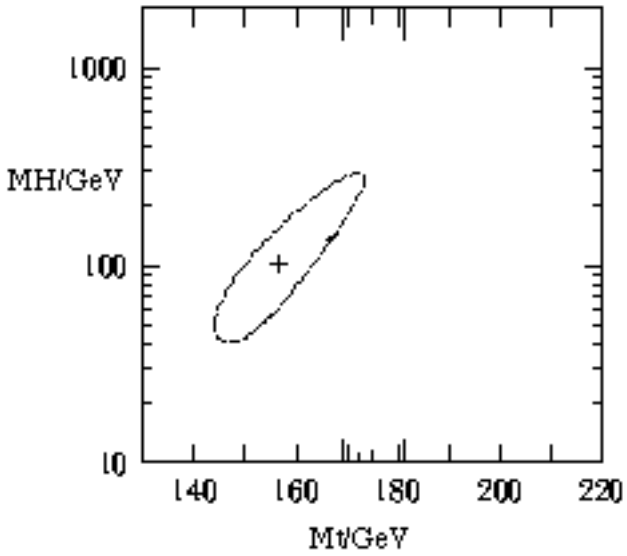
1995 - Low-mass Truth Quark -**Kondo** Oral History Interview by K. Staley 10 October 1995 -
the dilepton candidate found during the Fermilab 1988-89 run could be reconstructed as decay of a top-antitop pair with top mass of around **130 GeV/c2** with a very broad error.

1996 - Low-mass Truth Quark - **Goldstein** hep-ph/9611314 -
Top-antitop quark pairs produced at the Tevatron have a sizeable spin correlation. That correlation feeds into the angular distribution of the decay products, particularly in the dilepton channel. Including the expected correlation in an overall analysis of a handful of actual dilepton events continues to favor a lower top mass (centered on **155 GeV**) than the single lepton events.

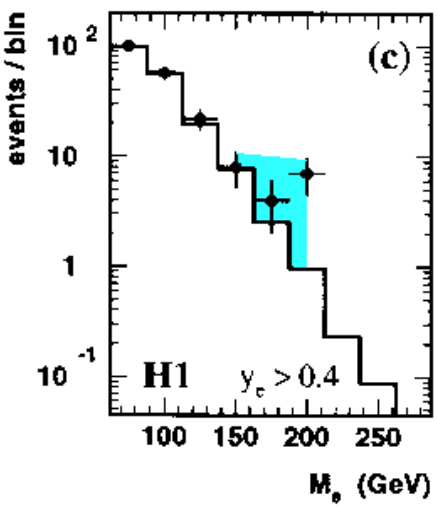
1996 - Low, Middle-mass Truth Quark - **Heinson** hep-ex/9601006 -
results on top quark physics from the DZero collaboration since the discovery of the top quark in March 1995 with about 50 pb^(-1) of data from 1992 to 1995:
For Semi-Leptonic Lepton + Jets events: Mt = **199 +24 -30 GeV**;
For Dilepton events: Mt = **145 +/- 32 GeV**.

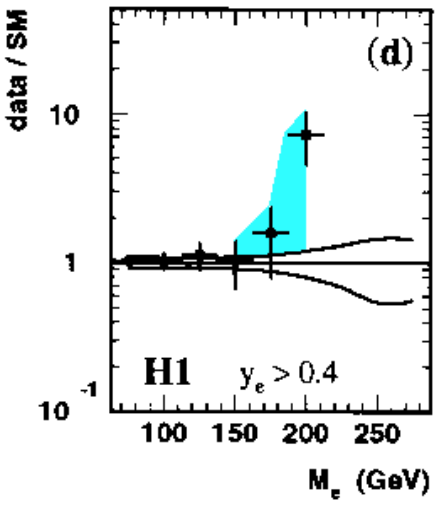
1996 - Low, Middle-mass Truth Quark - **Campagnari, Franklin** hep-ex/9608003 -
For Semi-Leptonic Lepton + Jets events:
CDF kinematic result: Mt = **180 +/- 12(stat) (+19/-15)(syst) GeV**;
CDF mass reconstruction result: Mt = **176 +/- 9 GeV**;
D0 mass reconstruction result: Mt = **170 +/- 18 GeV**.
For Dilepton events:
CDF kinematic result:
Mt = **159 (+24/-22)(stat) +/- 17(syst) GeV**;
D0 mass reconstruction result:
Mt = **145 +/- 25(stat) +/- 20(syst) GeV**.

1996 - Low-mass Truth Quark, Low-mass Higgs - Dittmaier, Schildknecht
hep-ph/9609488 -
implications of 1996 electroweak data on the Higgs and T-quark masses -
If the LEP value of the Weinberg angle s2w = 0.23200 is used,
and the SLD value s2w = 0.23165 is excluded
then, approximately, Mt = **155 GeV** and MH = **100 GeV**:

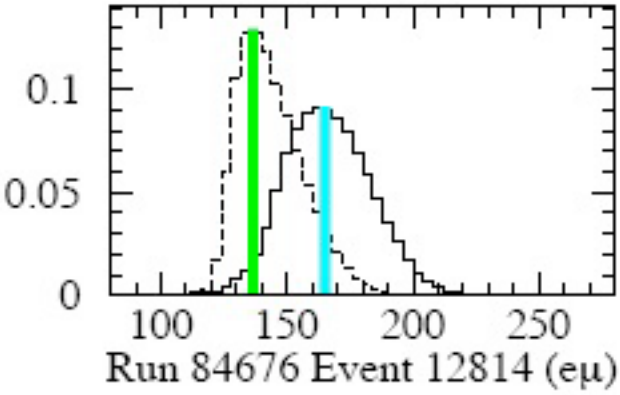


1997 - Middle-mass Truth Quark - HERA H1 hep-ex/9702012 -
The following histograms show that the HERA H1 events begin to appear with unusual frequency at the **150-200 GeV** and compare the HERA H1 observed data with the 1-sigma deviation line from the standard NC DIS expected data





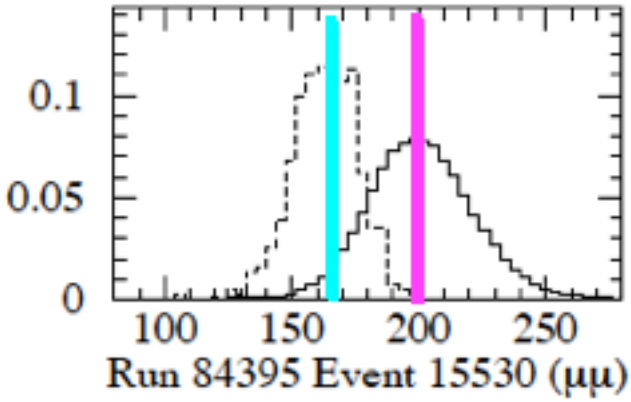
1997 - Low, Middle, High-mass Truth Quark - Varnes U. C. Berkeley Ph.D. Thesis FERMILAB-THESIS-1997-28
https://www-d0.fnal.gov/results/publications_talks/thesis/varnes/thesis.ps
In his 1997 Ph.D. thesis Erich Ward Varnes (page 159) said:
"... distributions for the dilepton candidates. For events with more than two jets, the dashed curves show the results of considering only the two highest ET jets in the reconstruction ...



..." (colored bars added by me)

The event for all 3 jets (solid curve) seems to me to correspond to
decay of a middle (cyan) T-quark state
with one of the 3 jets corresponding to
decay from the Triviality boundary to the Normal Stable Region (green) T-quark state,
whose immediately subsequent decay corresponds to the 2-jet (dashed curve) event at
the low (green) energy level.

In the Varnes thesis there is one dilepton event with 3 jets (solid curve)



that seems to me to correspond to decay of a high (magenta) T-quark state
with one of the 3 jets corresponding to
decay from the Critical Point down to the Triviality Boundary (cyan) T-quark state,
whose immediately subsequent decay corresponds to the 2-jet (dashed curve) event.

Dilepton data are described by Erich Ward Varnes in Chapter 8 of his 1997 UC Berkeley PhD thesis about D0 data at Fermilab:
"… there are six t-tbar candidate events in the dilepton final states … Three of the events contain three jets, and in these cases the results of the fits using only the leading two jets and using all combinations of three jets are given …".
There being only 6 dilepton events in Figure 8.1 of Varnes's PhD thesis

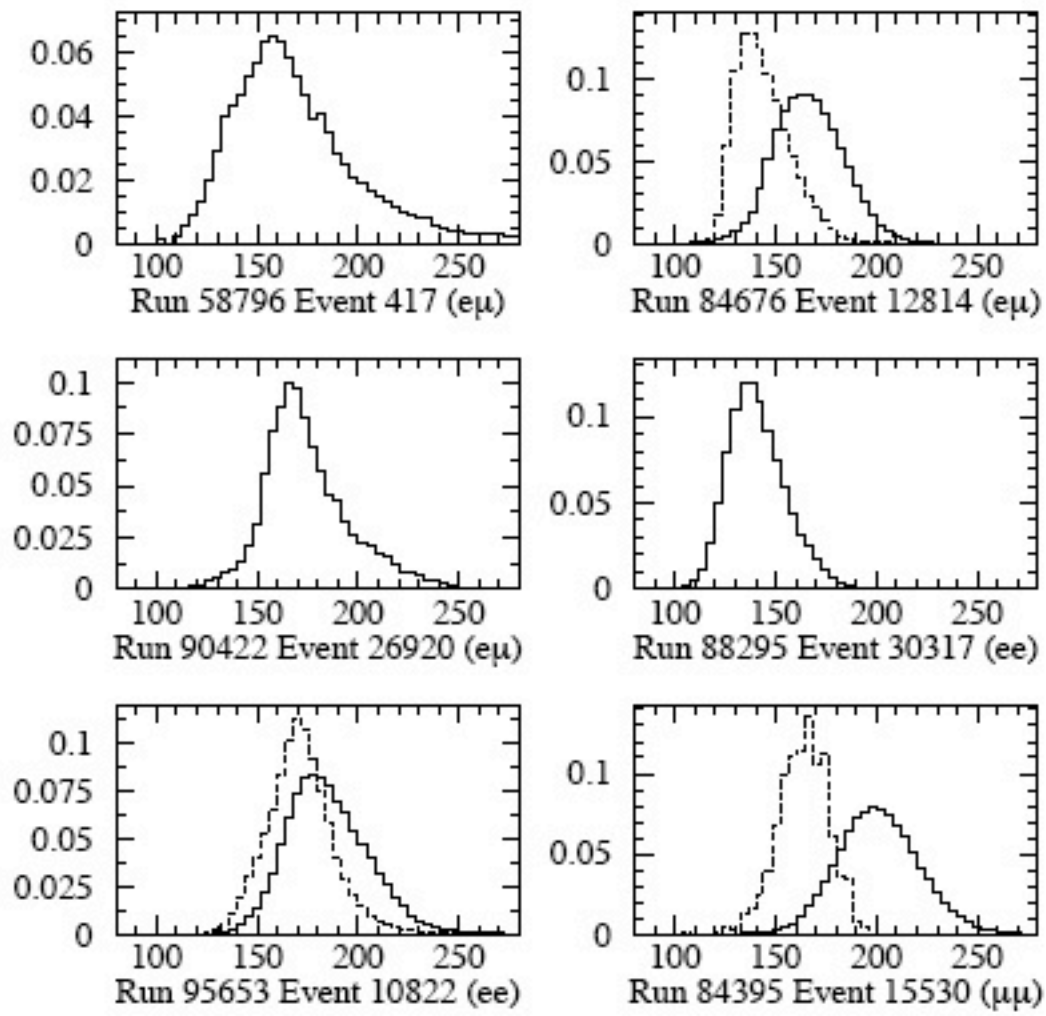


Figure 8.1: $W(m_t)$ distributions for the dilepton candidates. For events with more than two jets, the dashed curves show the results of considering only the two highest E_T jets in the reconstruction.

it is reasonable to discuss each of them,
so (mass is roughly estimated by me looking at the histograms) here they are:

Run 58796 Event 417 (e mu) - 2 jets - **160 GeV**
Run 90422 Event 26920 (e mu) - 2 jets - **170 GeV**
Run 88295 Event 30317 (e e) - 2 jets - **135 GeV**

Run 84676 Event 12814 (e mu) - more than 2 jets - **165 GeV** -
highest 2 jets - **135 GeV**
Run 95653 Event 10822 (e e) - more than 2 jets - **180 GeV** - highest 2 jets - **170 GeV**
Run 84395 Event 15530 (mu mu) - more than 2 jets - **200 GeV** -
highest 2 jets - **165 GeV**

In terms of 3 Truth Quark mass states - High around 220 GeV or so -
Middle around 174 GeV or so - Low around 130-145 GeV or so - those look like:

Run 58796 Event 417 (e mu) - direct 2-jet decay of Middle
Run 90422 Event 26920 (e mu) - direct 2-jet decay of Middle
Run 88295 Event 30317 (e e) - direct 2-jet decay of Low
Run 84676 Event 12814 (e mu) - decay of Middle to Low then 2-jet decay of Low
Run 95653 Event 10822 (e e) - decay of High to Middle then 2-jet decay of MIddle
Run 84395 Event 15530 (mu mu) - decay of High to MIddle then 2-jet decay of Middle

The 1997 UC Berkeley PhD thesis of Erich Ward Varnes says:
"... the leptonic decays of the t tbar events are divided into two broad categories:
the lepton plus jets and dilepton channels.
The former has the advantage of a large branching ratio, accounting for about 30% of all t tbar decays, with the disadvantage that electroweak processes or detector misidentification of fina-state particle can mimic the t tbar signal relatiely frequently.
Conversely,
the dilepton channels have lower backgrounds, but account for only 5% of all decays.
...
The kinematic selection of dilepton events is summarized in Table 5.2 ...

	ee	$e\mu$	$\mu\mu$
Leptons	$E_T > 20$ GeV $\lvert\eta\rvert < 2.5$	$E_T(e) > 15$ Gev, $p_T(\mu) > 15$ GeV/c $\lvert\eta(e)\rvert < 2.5$	$p_T(\mu) > 15$ GeV/c
Jets	≥ 2 with $E_T > 20$ GeV and $\lvert\eta\rvert < 2.5$		
$\not\!\!E_T$	> 25 GeV	$\not\!\!E_T > 20$ GeV $\not\!\!E_T^{\rm cal} > 10$ GeV	N/A
H_T^c	> 120 GeV	> 120 GeV	> 100 GeV

Table 5.2: Kinematic cuts for the dilepton event selection. The cut used in place of $\not\!\!E_T$ to reject $Z \to \mu\mu$ events is described in the text, as is the H_T^c variable. Also, the muon η cut is run-dependent, as detailed in Chapter 4.

...

In the dilepton channels, one expects the final state to consist of two charged leptons, two neutrinos, and two b jets (see Fig. 6.1)

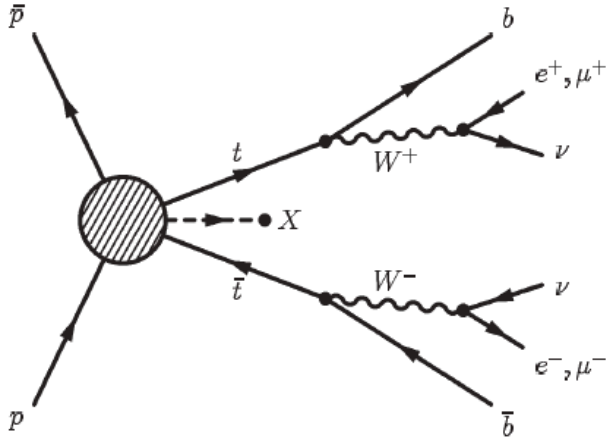
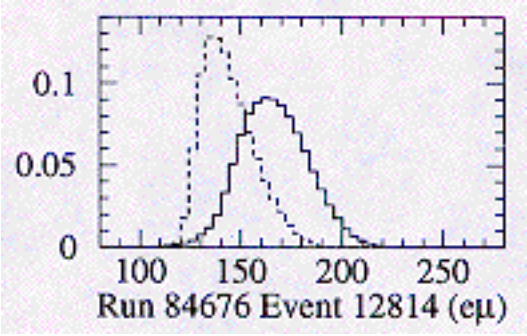


Figure 6.1: Schematic representation of $t\bar{t}$ production and decay in the dilepton channels.

so that the final state is completely specified by knowledge of the energy four-vectors of these six particles ... there are ... kinematic constraints:
The invariant mass of each lepton and neutrino pair is equal to the W mass.
The masses of the reconstructed t and tbar in the event are equal.
...
Figure 8.1: W(mt) distributions for the dilepton candidates. For events with more than two jets, the dashed curves show the results of considering only the two highest ET jets in the reconstruction ...

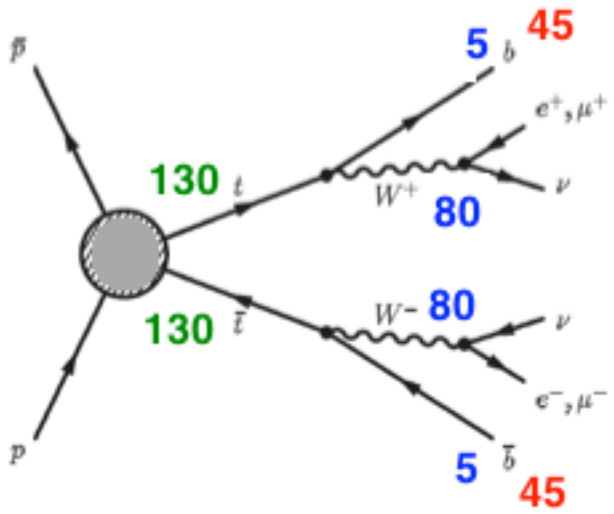


...

Run 84676 Event 12814					z vertex: -6.17 cm		
Object	E	E_x	E_y	E_z	E_T	η	ϕ
Electron	81.3	-75.4	-1.1	-30.2	74.5	-0.39	3.16
Muon	30.2	-25.2	10.6	-12.8	27.4	-0.45	2.75
$\not\!\!E_T$	–	62.0	5.2	–	62.3	–	0.08
Jet 1	93.8	38.0	-83.7	-15.6	91.9	-0.17	5.14
	(95.9)	(38.9)	(-85.6)	(-16.0)	(94.0)		
Jet 2	37.8	13.9	32.3	-11.2	35.2	-0.31	1.17
	(38.8)	(14.2)	(33.1)	(-11.4)	(36.0)		
Jet 3	31.4	-1.6	28.6	11.6	28.7	0.39	1.63
	(32.2)	(-1.6)	(29.3)	(11.9)	(29.4)		

...".

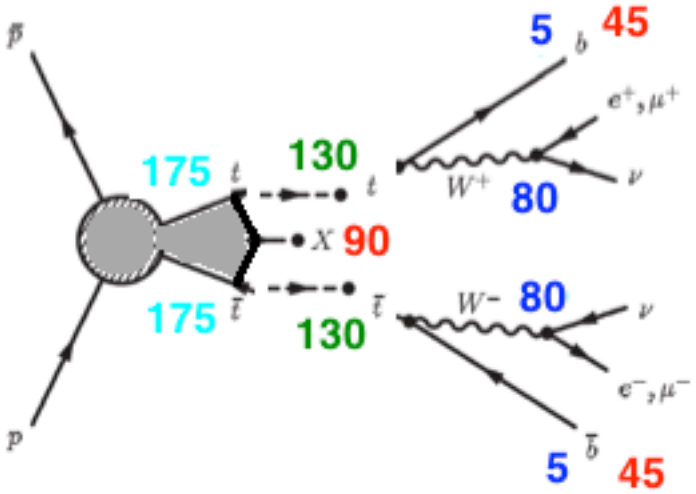
If the t and tbar are both in the 130 GeV mass state then the decay is simple with 2 jets:



and both jets are highly constrained as being related to the W - b decay process
so it is reasonable to expect that the 130 GeV decay events would fall in the narrow width of a single 10 GeV histogram bin.

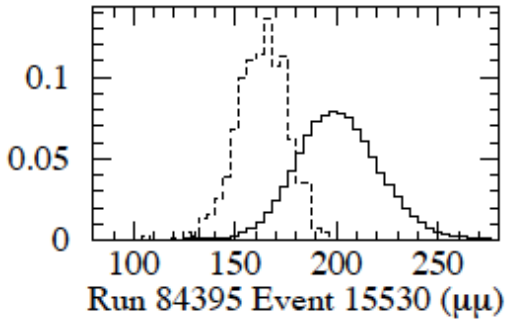
(In these two diagrams I have indicated energies only approximately for
t and tbar mass states (cyan and green) and W and b-quark (blue) and jets (red).
Actual kinematic data may vary from the idealized numbers on the diagrams,
but they should give similar physics results.)

If the t and tbar are both in the 173 GeV mass state
(as, for example, in Run 84676 Event 12814 (e mu) described above)
the decay has two stages and 3 jets:



First, the 175 GeV t and tbar both decay to the 130 GeV state, emitting a jet.
Then, the 130 GeV t and tbar decay by the simple 2-jet process.
The first jet is a process of the Higgs - Truth Quark condensate system of E8 Physics and is not a W -b decay process so it is not so highly constrained
and it is reasonable to expect that the 175 GeV decay events would appear to have a larger (on the order of 40 GeV) width.

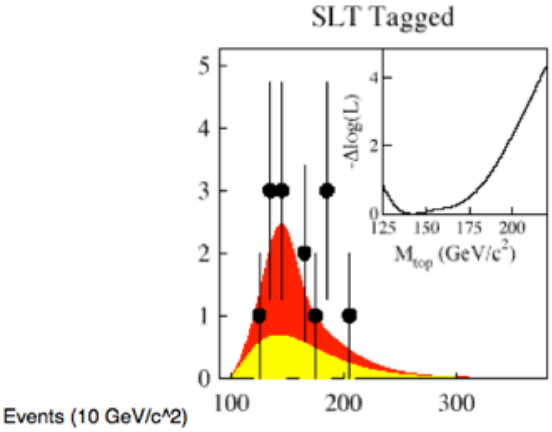
As to t and tbar being the high Truth Quark mass state (around 225 GeV)
there would be a third stage for decay from 225 GeV to 175 GeV
with a fourth jet carrying around 100 GeV of decay energy.
In the Varnes thesis there is one dilepton event



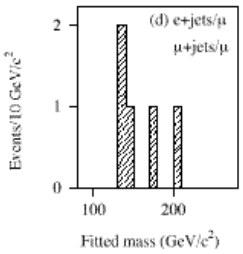
Run 84395 Event 15530					z vertex: 5.9 cm		
Object	E	E_x	E_y	E_z	E_T	η	ϕ
Muon 1	68.6	-63.9	12.7	-21.4	65.1	-0.32	2.94
Muon 2	34.9	-16.0	31.0	1.9	34.9	0.05	2.05
$\not{E}_T$	–	71.2	53.2	–	88.9	–	0.64
Jet 1	146.1	32.1	-98.2	-102.4	103.3	-0.88	5.03
	(153.5)	(33.8)	(-103.1)	(-107.6)	(108.5)		
Jet 2	35.1	-8.6	21.4	26.2	23.1	0.97	1.95
	(37.2)	(-9.1)	(22.7)	(27.7)	(24.5)		
Jet 3	47.1	-7.6	-16.8	43.0	18.4	1.58	4.29
	(52.3)	(-8.4)	(-18.6)	(47.8)	(20.5)		

that seems me to represent that third stage of decay from 225 GeV to 175 GeV.
Since it is described as a 3-jet event and not a 4-jet event as I would have expected,
my guess is that the third and fourth jets of my model were not distinguished by the
experiment so that they appeared to be one third jet.

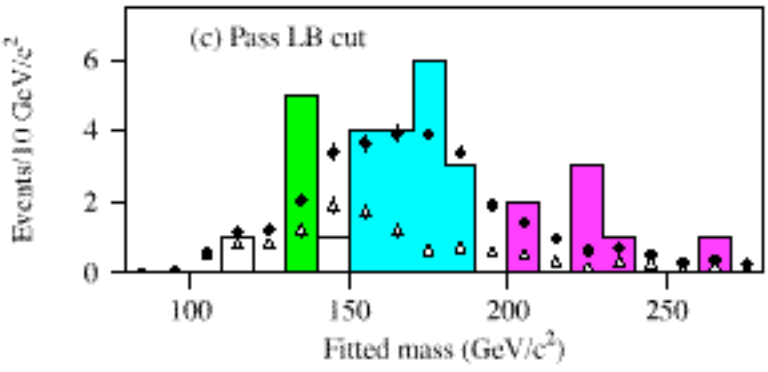
1998 - Low, Middle-mass Truth Quark - **CDF** hep-ex/9801014 -
based on lepton + 4 jet events that were either SVX tagged, SVX double tagged, or untagged ... the top quark mass is **175.9 +/- 4.8(stat.) +/- 4.9(syst.) GeV/c^2**
14 SLT tagged events with no SVX tag ... give a Truth Quark Mass of **142 GeV (+33, -14)**



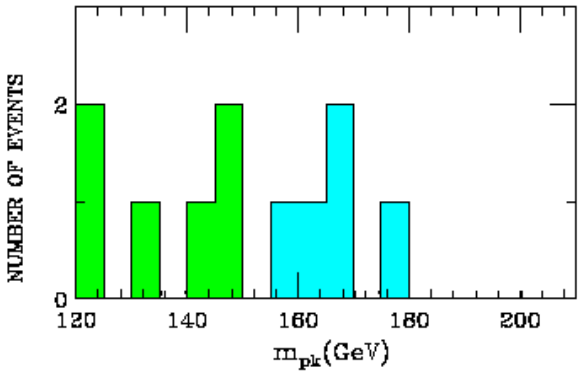
1998 - Low, Middle, High-mass Truth Quark - **D0** hep-ex/9801025 -
5 tagged lepton + jets give Truth Quark mass **130-150 GeV** for 3 of the events



of the total of 91 candidate events, 31 survived Chi-squared less than 10 cut
and also survived the Low Bias selection cut, **all three Truth Quark states** observed:

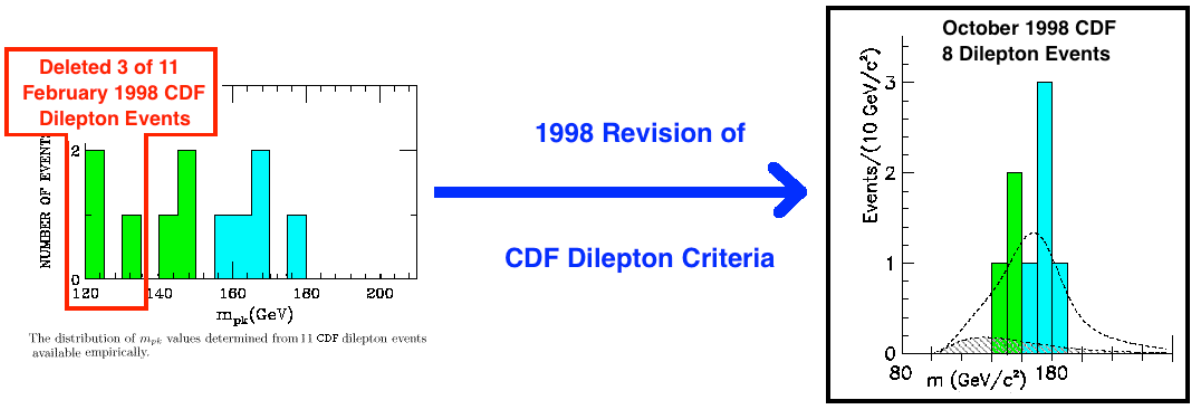


1998 - Low, Middle-mass Truth Quark - Dalitz, Goldstein hep-ph/9802249 -
11 additional CDF dilepton events which have become available since the 1997 Electron-Photon conference in Hamburg are **Low and Middle-mass Truth Quark states**:



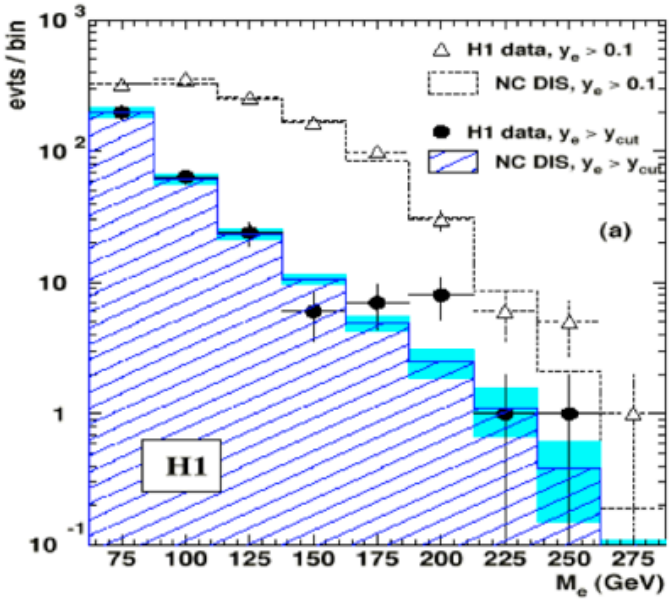
The distribution of m_{pk} values determined from 11 CDF dilepton events available empirically.

1998 - Low, Middle-mass Truth Quark - CDF hep-ex/9810029 -
CDF "present[s] a new measurement of the top quark mass ...
[that] supersedes [CDF's] previously reported result in the dilepton channel"
which revision seems to me to be cutting the lowest 3 of the 11 original events

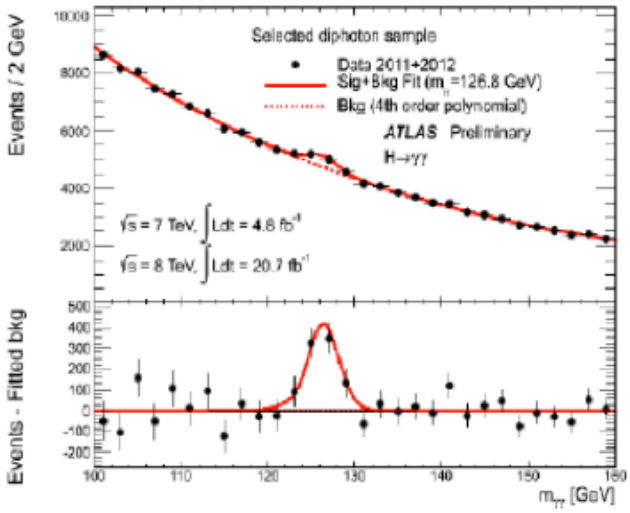


as part of a Fermilab policy of ignoring the Low-mass Truth Quark state.

1999 - Middle, High-mass Truth Quark - HERA H1, ZEUS hep-ex/9910012 - The excess in the H1 data is still present at Me = **200 GeV** but has not been corroborated by the 1997 data. Also ZEUS observes an excess at Mej **> 200 GeV**



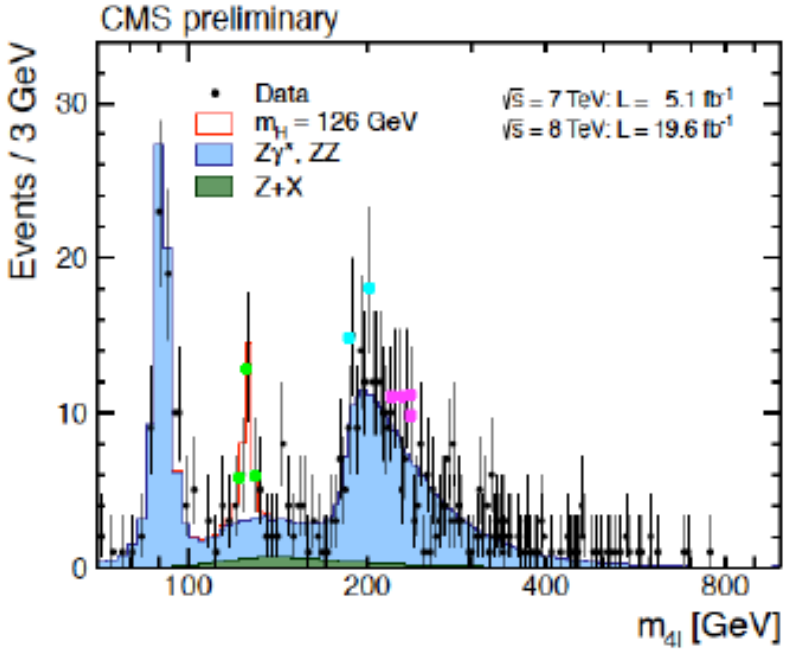
2013 - Low, Middle, High-mass Higgs - ATLAS, CMS Moriond 2013 -
In the 25/fb of data collected through the LHC run ending with the long shutdown at the end of 2012, the LHC has observed a 126 GeV (about 133 proton masses) Low-mass state of the Standard Model Higgs boson. The digamma histogram for ATLAS clearly shows only one peak below 160 GeV and it is around 126 GeV



Simple topology: two high-E_T (>40,30 GeV) isolated photons

142681 events in $100<m_{\gamma\gamma}$ [GeV]<160

A CMS histogram (some colors added by me) for the Golden Channel Higgs to ZZ to 4l shows the peak around 126 GeV (green dots - Low Higgs mass state. The CMS histogram also indicates other excesses around 200 GeV (cyan dots - Middle Higgs mass state) and around 250 GeV (magenta dots - High Higgs mass state).



An ATLAS ZZ to 4l histogram (some colors added by me) show the peak around 126 GeV (green dots - Low Higgs mass state. The ATLAS histogram also indicates other excesses around 200 GeV (cyan dots -Middle Higgs mass state)
and around 250 GeV (magenta dots - High Higgs mass state) .