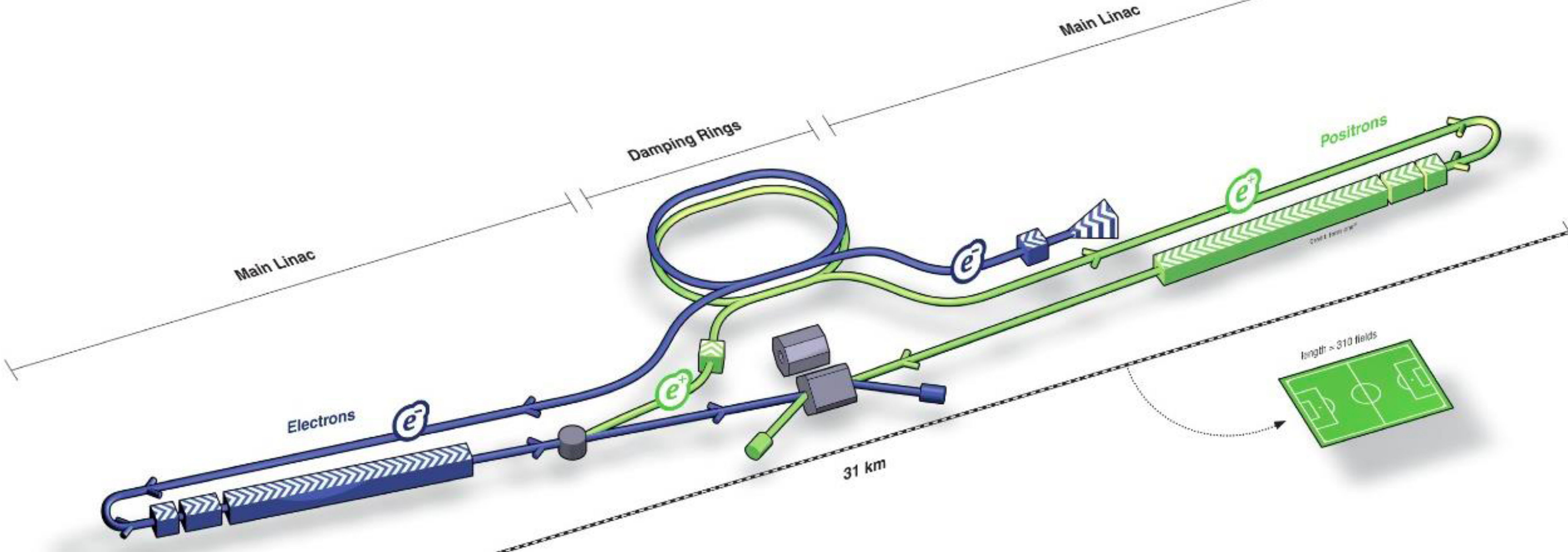


ILC

LINEAR COLLIDER COLLABORATION

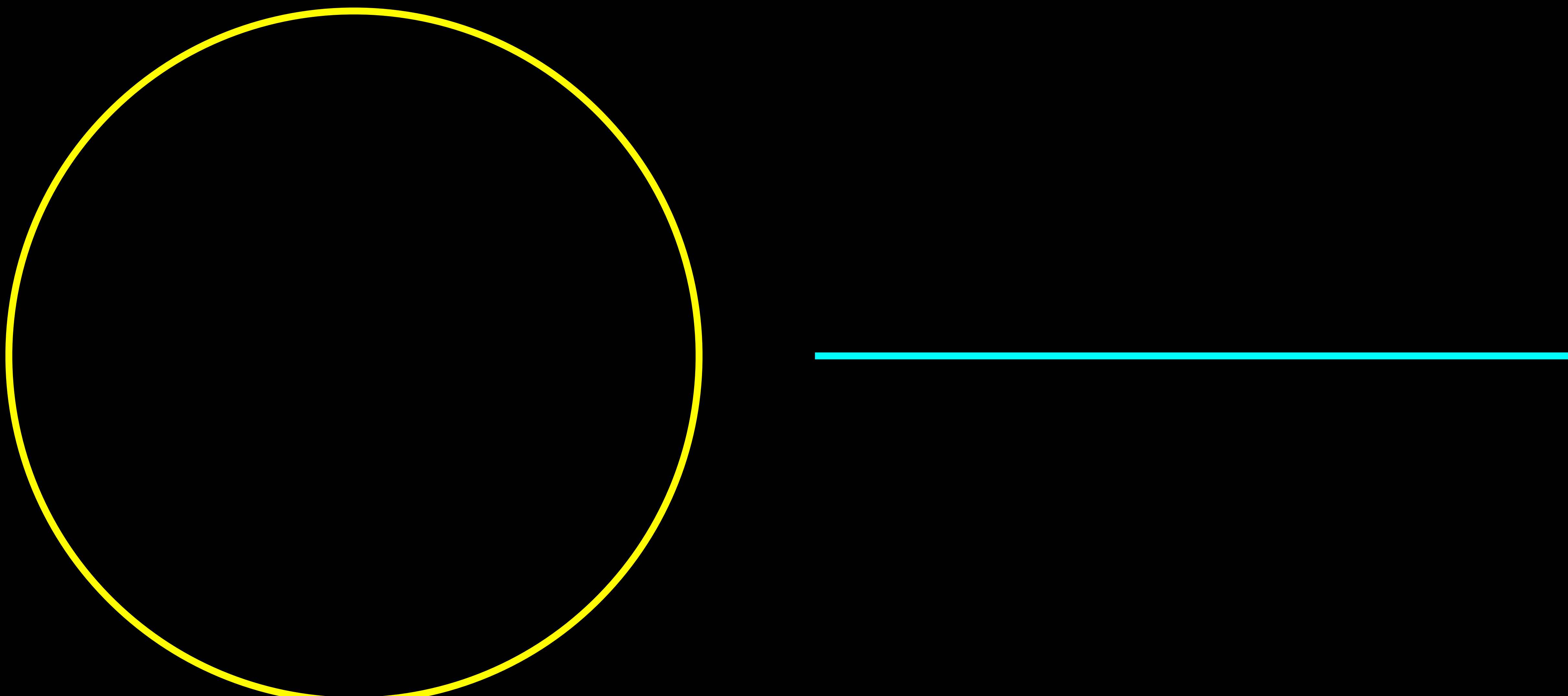
Hitoshi Murayama (Berkeley & Kavli IPMU)

Aspen Winter Conference

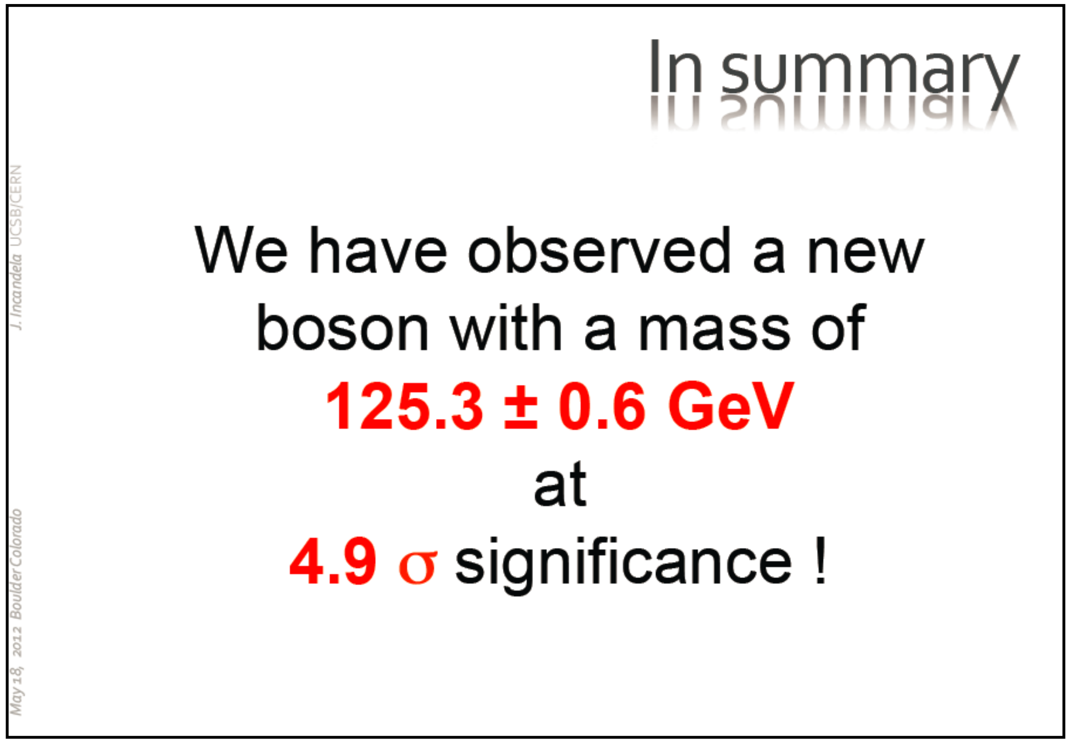
BERKELEY CENTER FOR THEORETICAL PHYSICS
BERKELEY LAB
東京大学 THE UNIVERSITY OF TOKYO
TODIAS 東京大学国際高等研究所 TODAI INSTITUTES FOR ADVANCED STUDY
KAVLI IPMU INSTITUTE FOR THE PHYSICS AND MATHEMATICS OF THE UNIVERSE

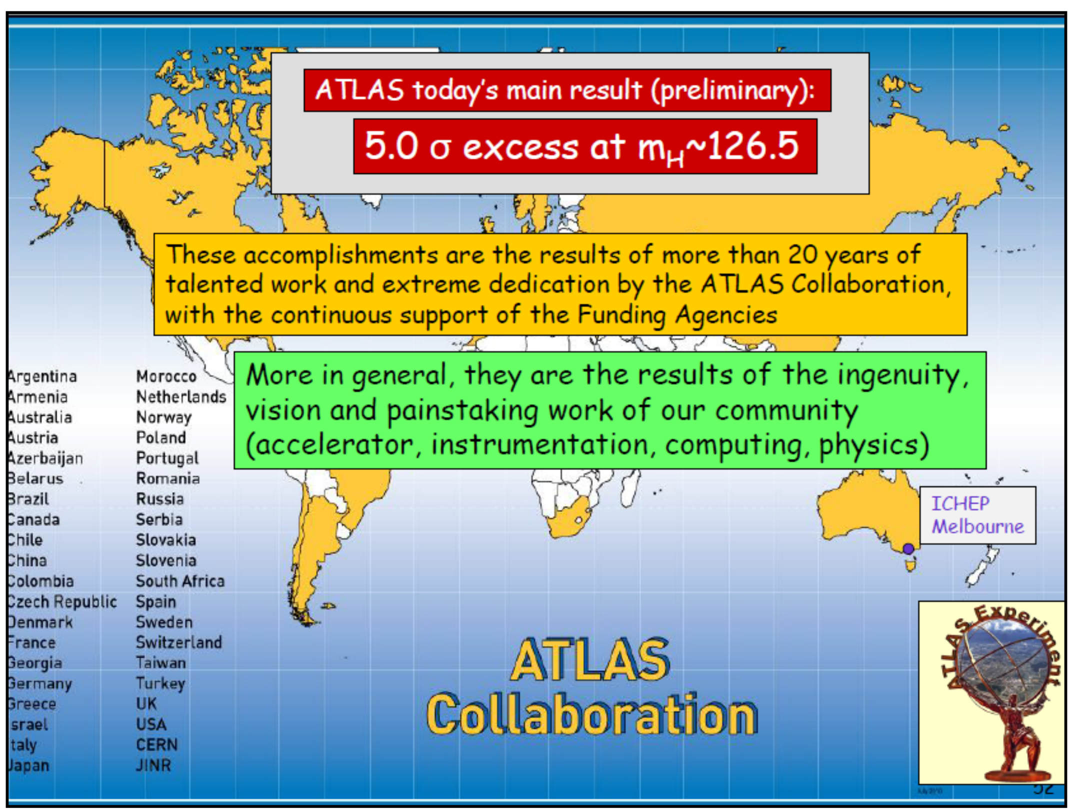

ASPEN
ASPEN

Exploring the Physics Frontier with Circular Colliders



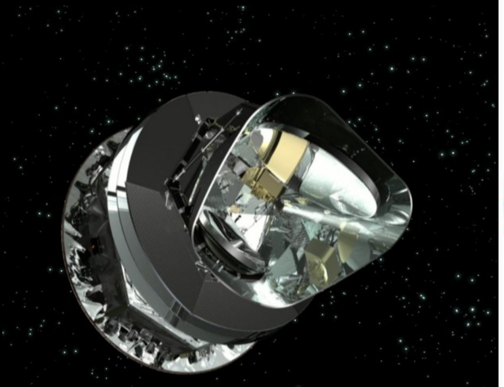
July 4, 2012


In summary
We have observed a new boson with a mass of
125.3 ± 0.6 GeV
at
4.9 σ significance !
J. Incandela UCSB/CERN
May 18, 2012 Boulder Colorado

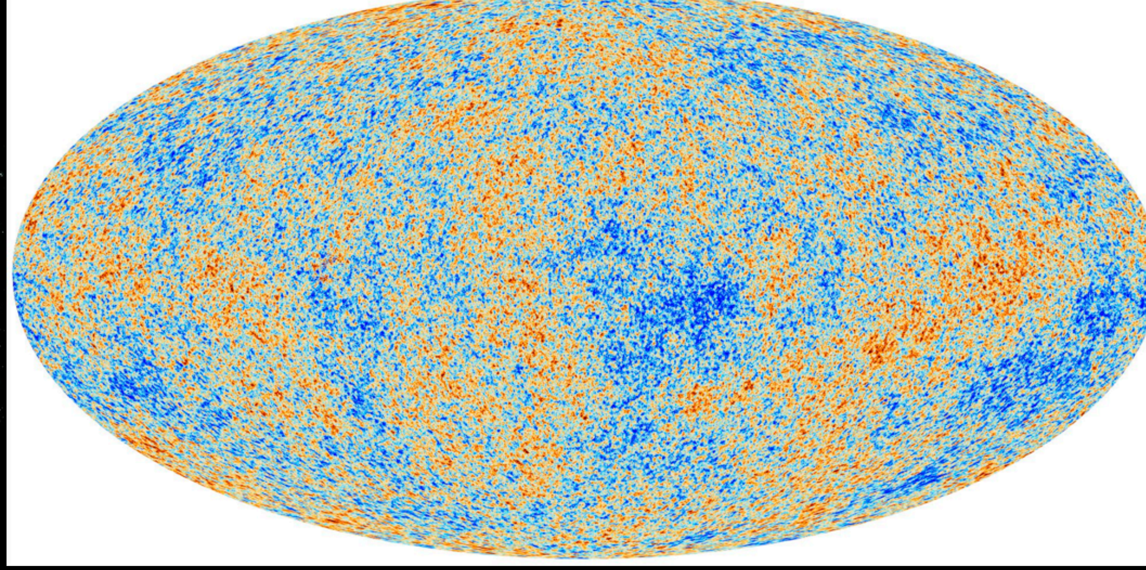

ATLAS today's main result (preliminary):
5.0 σ excess at m_H~126.5
These accomplishments are the results of more than 20 years of talented work and extreme dedication by the ATLAS Collaboration, with the continuous support of the Funding Agencies
More in general, they are the results of the ingenuity, vision and painstaking work of our community (accelerator, instrumentation, computing, physics)
ICHEP Melbourne
Morocco
Netherlands
Norway
Poland
Portugal
Romania
Russia
Serbia
Slovakia
Slovenia
South Africa
Spain
Sweden
Switzerland
Taiwan
Turkey
UK
USA
CERN
JINR
ATLAS Collaboration
ATLAS Experiment

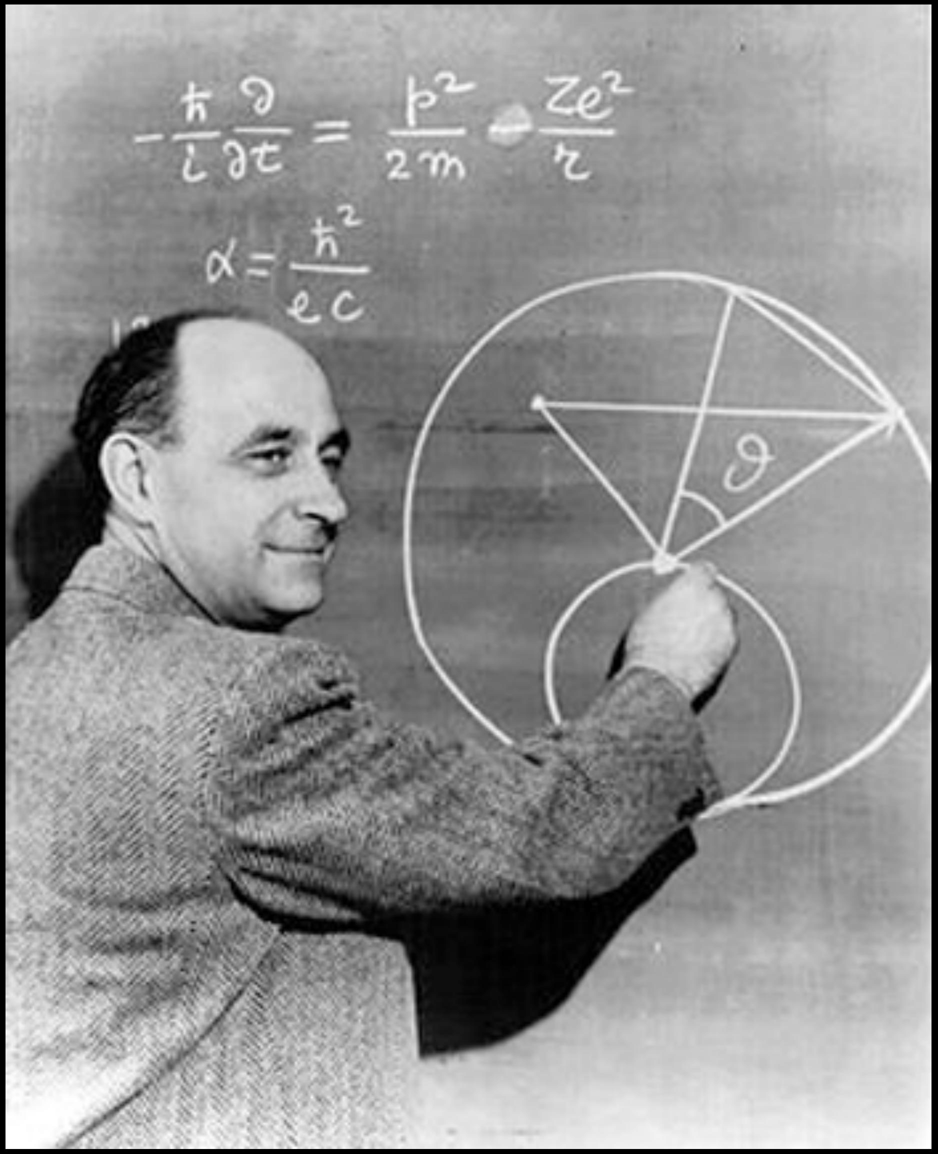

CERN
Higgs search
update 04.07.2012

Minimal



Planck





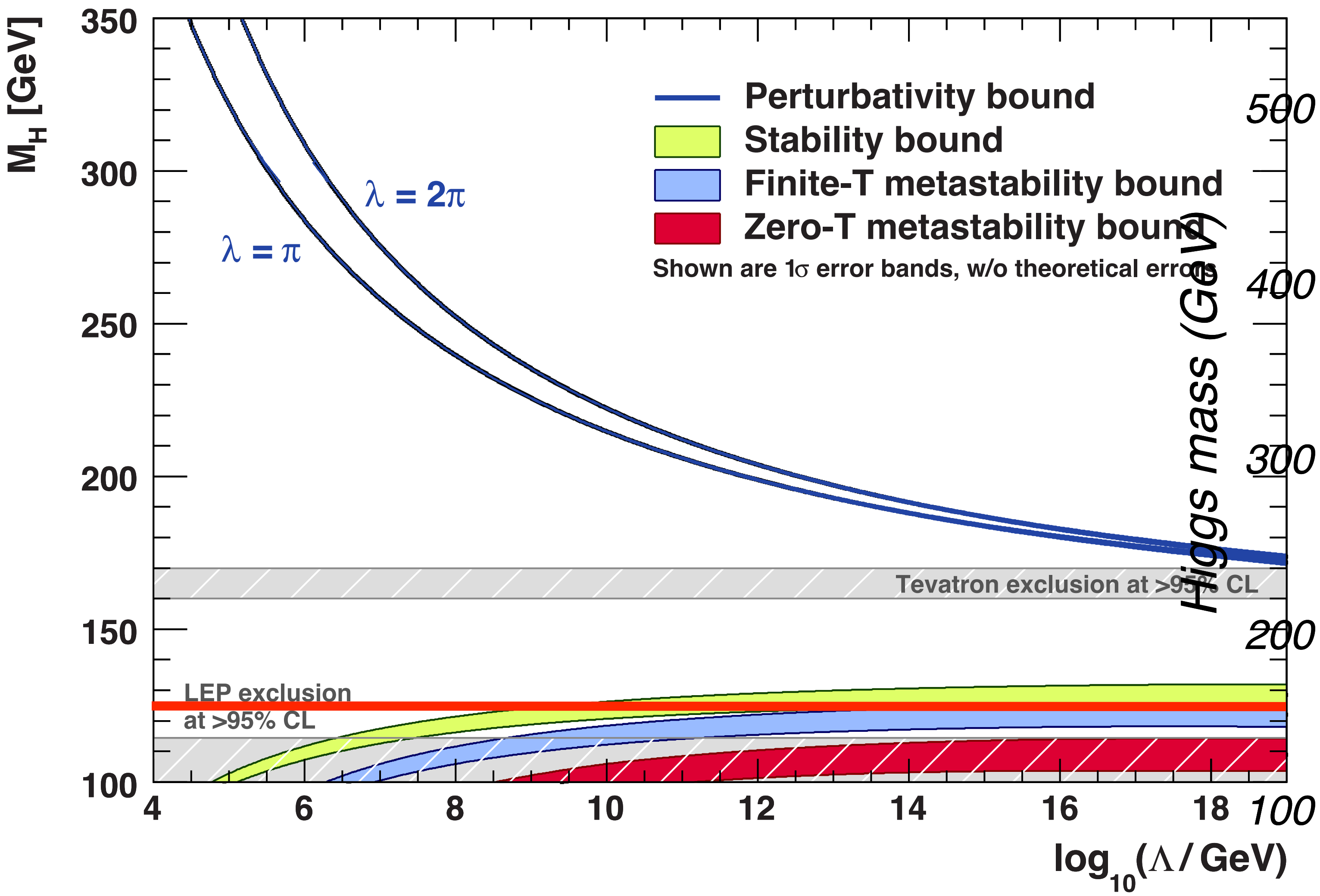
- It looks very much like *the* Standard Model Higgs boson
- now a UV complete theory of strong, weak, EM forces possibly valid up to even M_{Pl}
- cosmology also looks minimal single-field inflation (Planck)

Where do we go next?

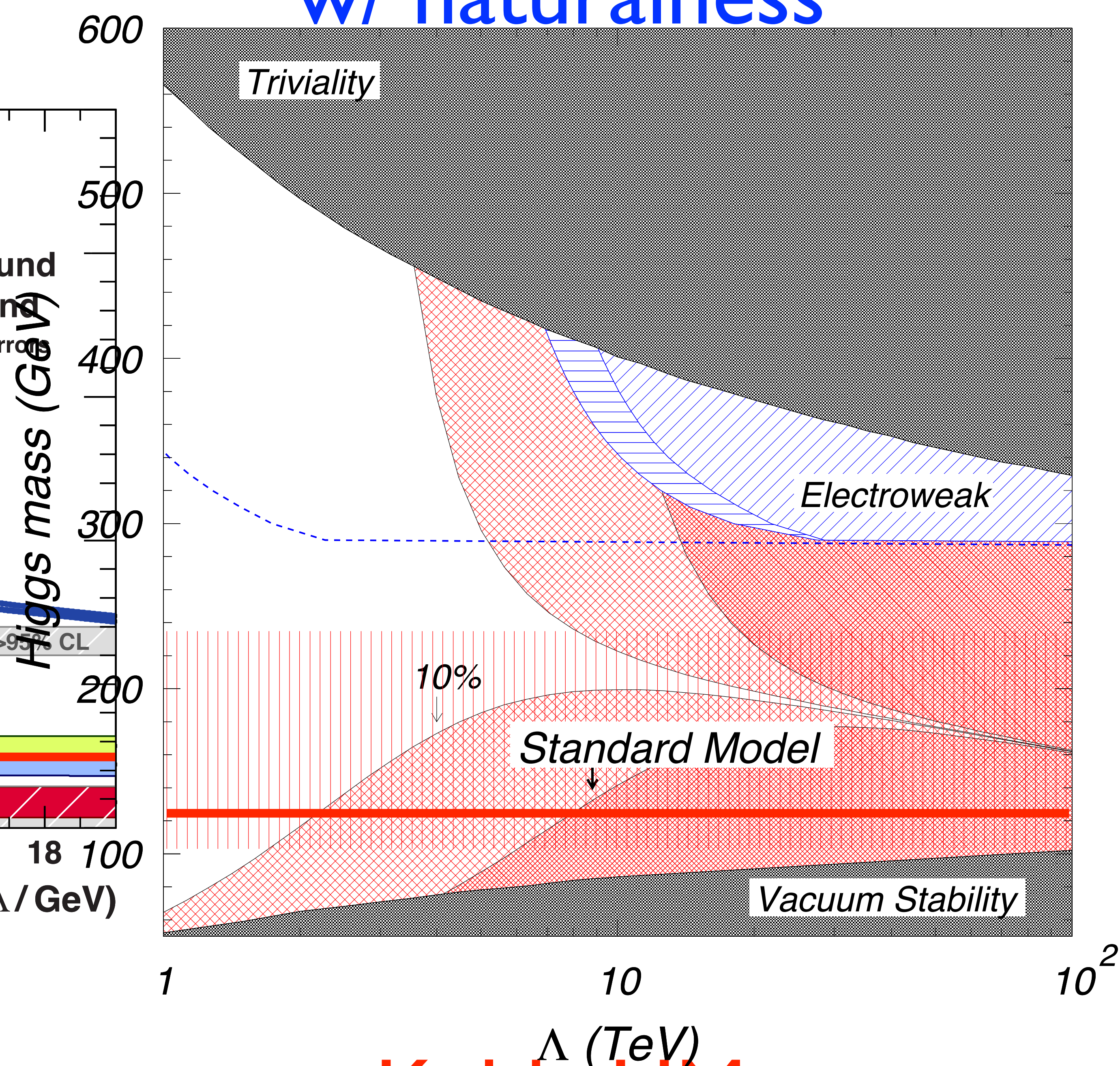
Is energy frontier dead?

Next energy scale

w/o naturalness

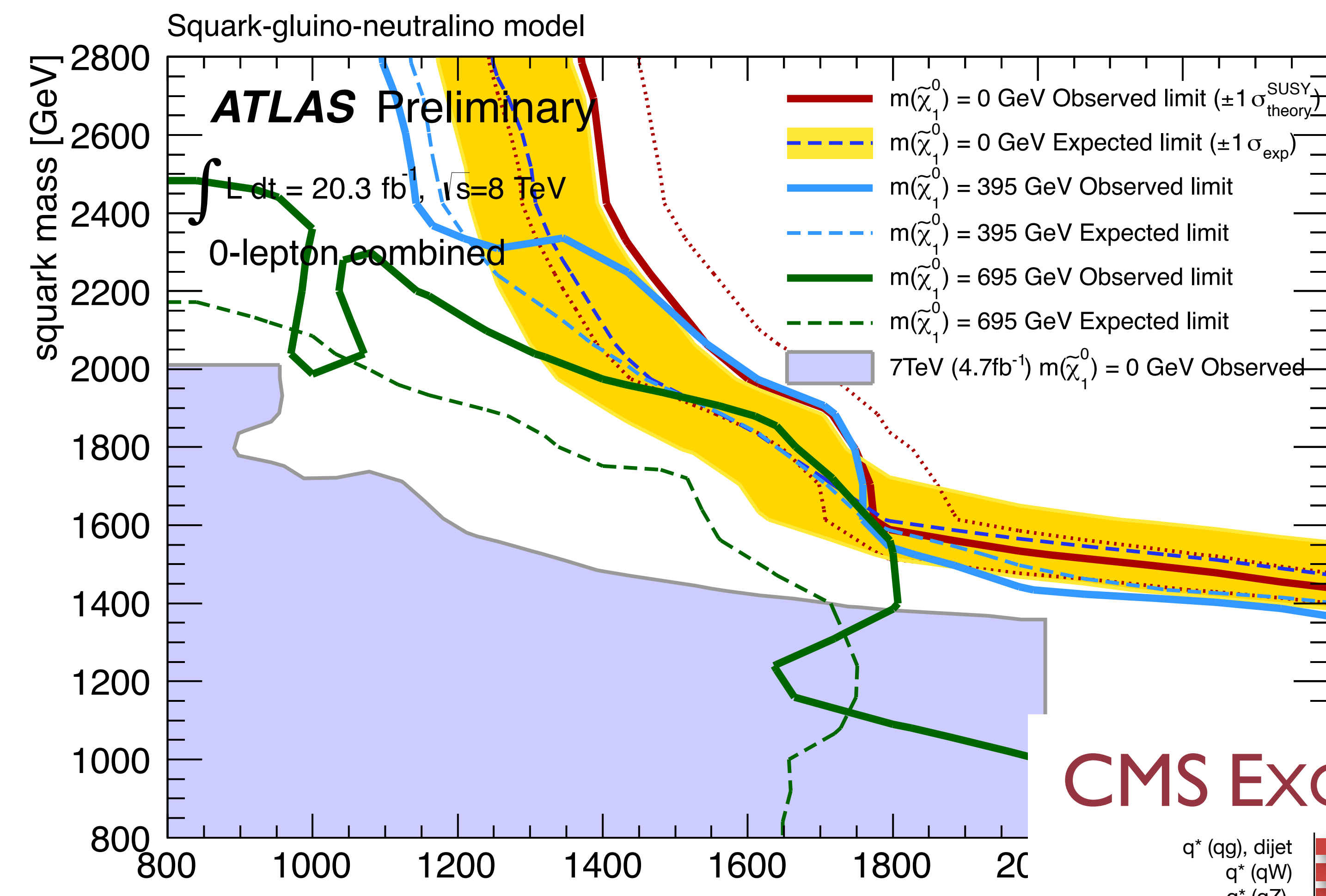


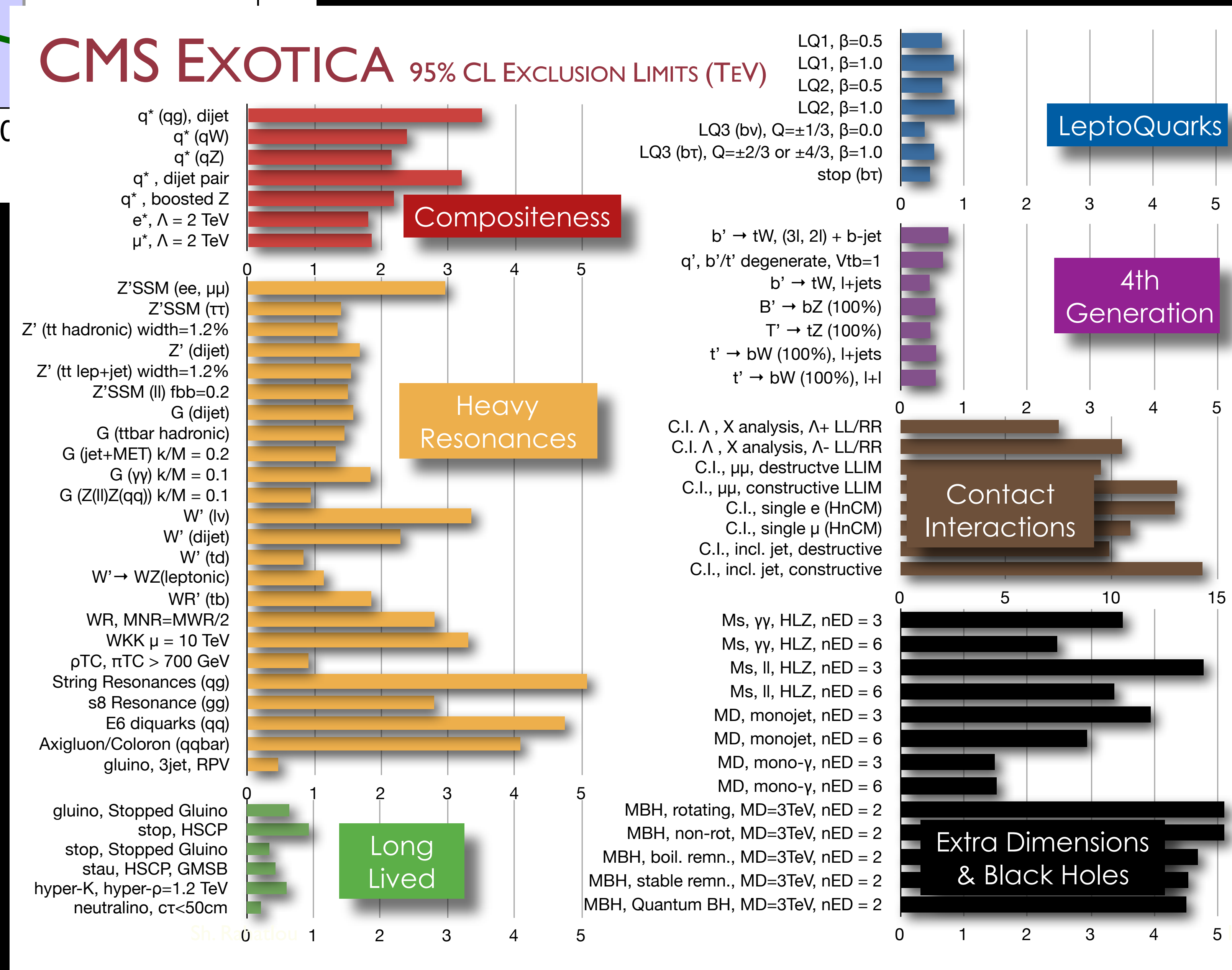
w/ naturalness



Harigaya, Matsumoto, HM

Kolda HM





no sign of
new physics
that explains
mass of the Higgs!

Nima's anguish

Nima's anguish

m_H=125 GeV seems almost maliciously designed to prolong the agony of BSM theorists….

Is naturalness dead?

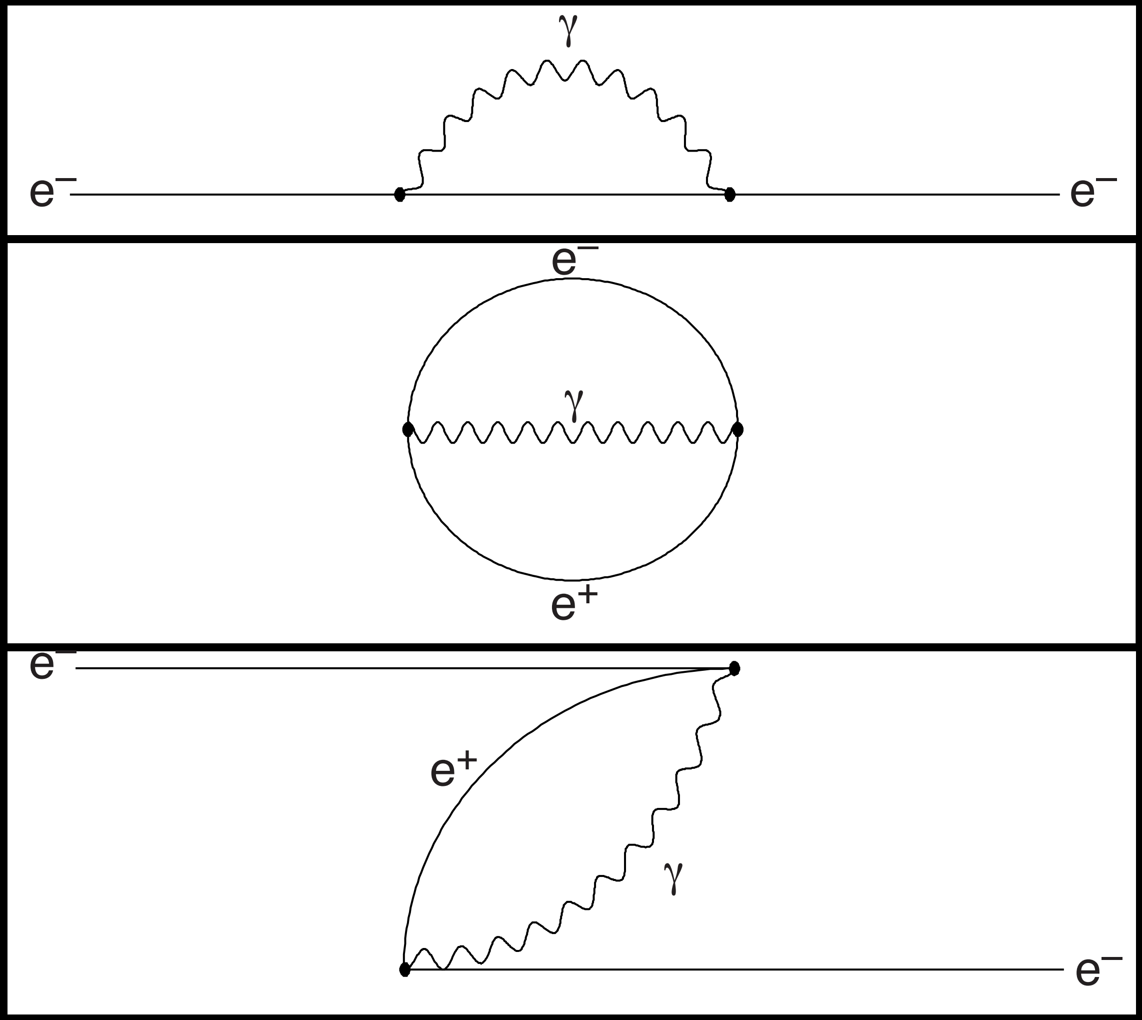
Electron mass is natural by doubling #particles

- Electron creates a force to repel itself

$$\Delta m_e c^2 \sim \frac{e^2}{r_e} \sim \mathrm{GeV}\frac{10^{-17}\mathrm{cm}}{r_e}$$

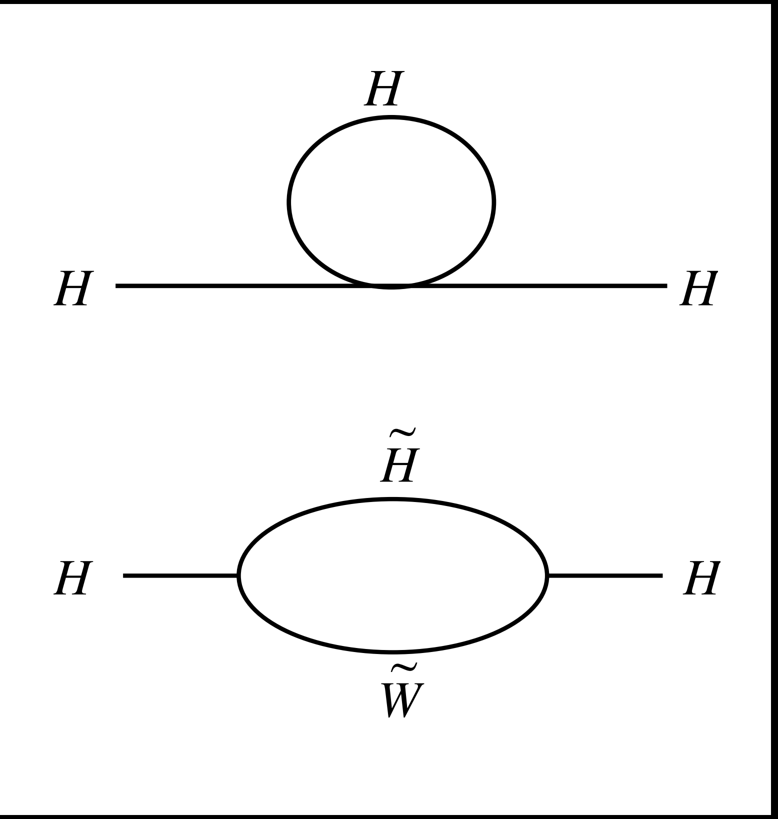
- 10^{-4} fine-tuning?
- quantum mechanics and anti-matter

⇒ only 10% of mass even for Planck-size $r_e \sim 10^{-33}$cm



$$\Delta m_e \sim m_e \frac{\alpha}{4\pi} \log(m_e r_e)$$

Higgs mass is natural by doubling #particles?



- Higgs also repels itself
- Double #particles again ⇒ superpartners
- only log sensitivity to UV
- Standard Model made consistent up to higher energies

$$\Delta m_H^2 \sim \frac{\alpha}{4\pi} m_{SUSY}^2 \log(m_H r_H)$$

⇒ I still take it seriously

uneasiness in cosmology

- Before COBE, upper limit on CMB anisotropy kept getting better and better
- Before 1998, the universe appeared younger than oldest stars
- cosmologists got antsy
- "crisis in standard cosmology"
- it turned out a little "fine-tuned"
  - low quadrupole
  - dark energy

"Bang! A Big Theory May Be Shot"
A new study of the stars could rewrite the history of the universe
Times, Jan 14 (1991)

uneasiness in cosmology

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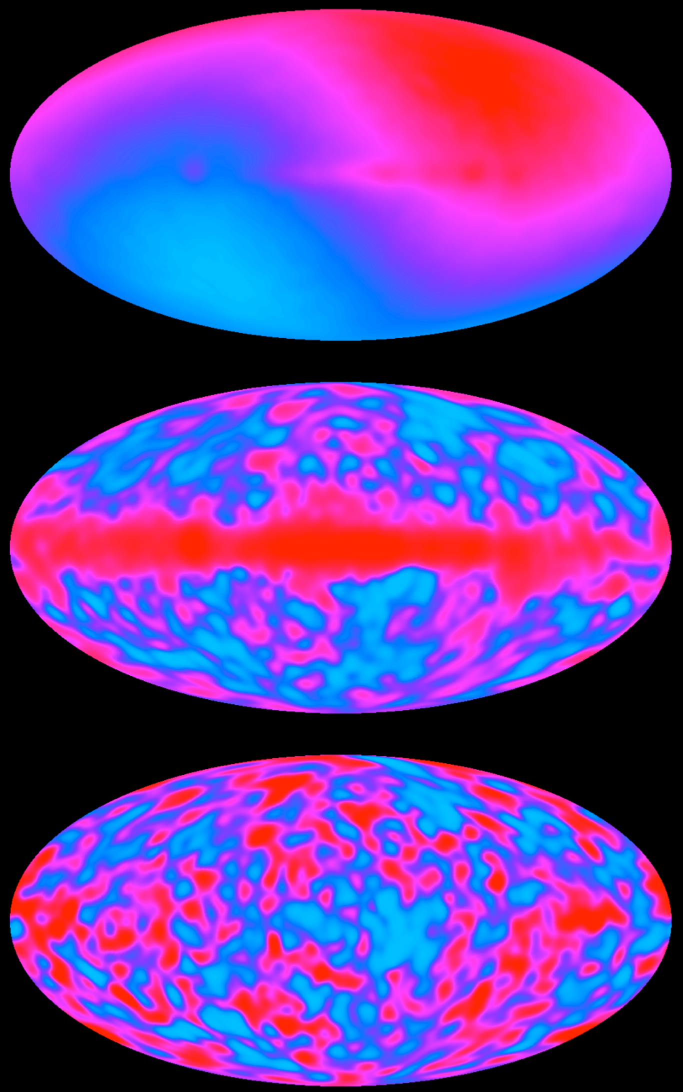

“Bang! A E … hot”
A new stud … write
the history
Times, Jan

uneasiness in cosmology

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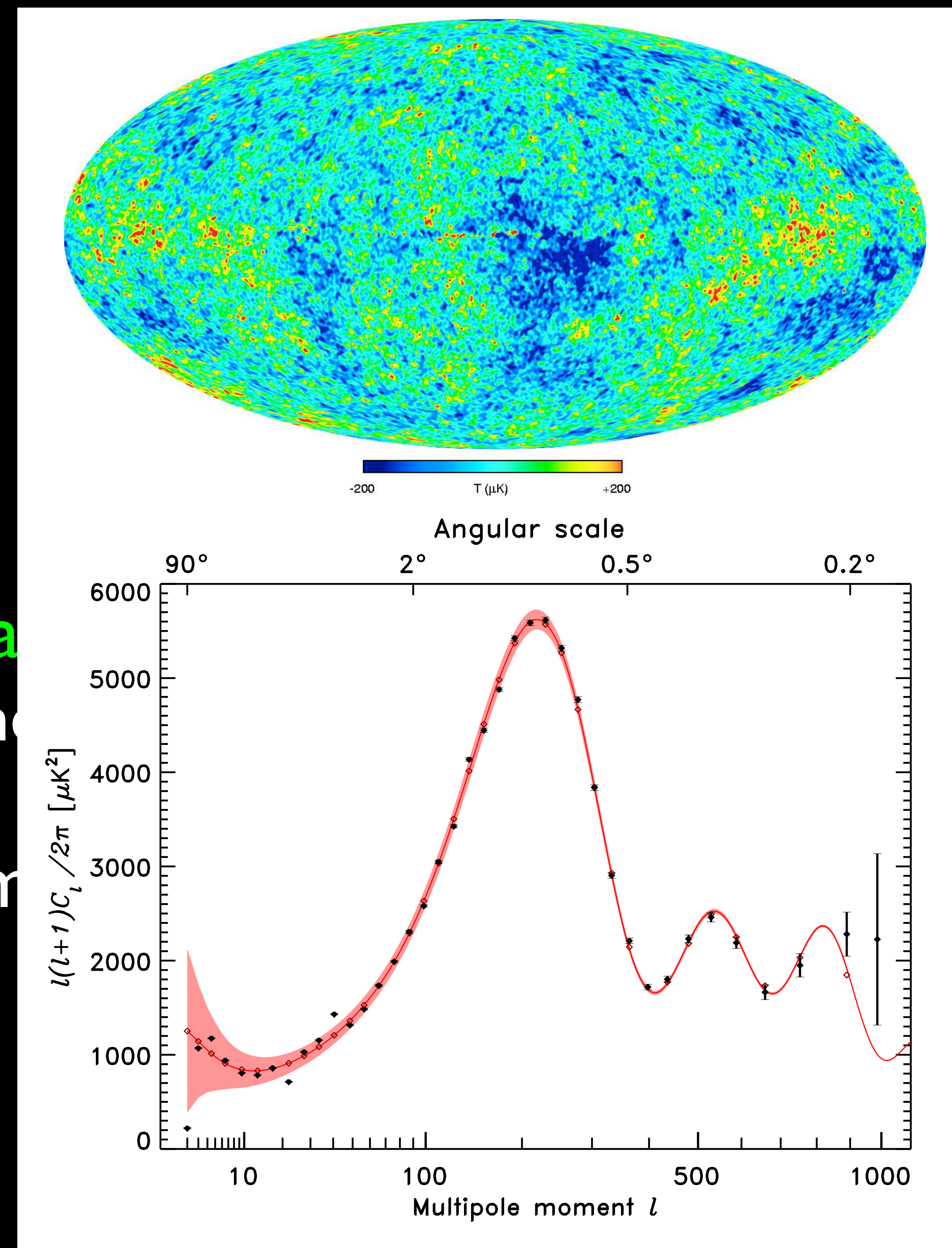
“Ba ”

A n e

the

Tim



U

- Before COBE, up
  on CMB anisotro
  getting better and
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  appeared younge
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- “crisis in standard
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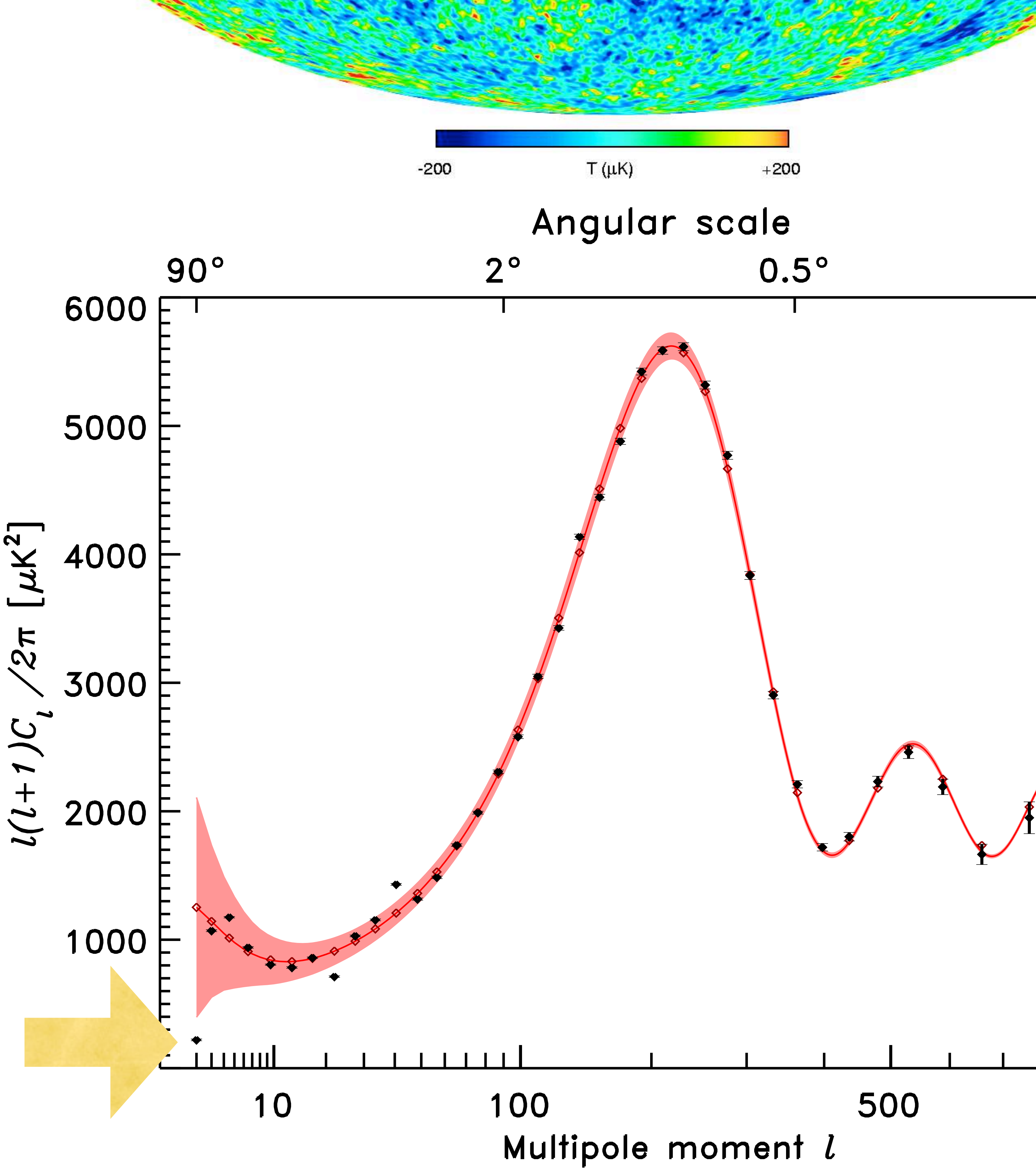
2% tuning



patience

It took 10 years for CDF to discover the top quark.

VOLUME 74, NUMBER 14 PHYSICAL REVIEW LETTERS 3 APRIL 1995

Observation of Top Quark Production in $\overline{p}p$ Collisions with the Collider Detector at Fermilab

F. Abe,[14] H. Akimoto,[32] A. Akopian,[27] M. G. Albrow,[7] S. R. Amendolia,[24] D. Amidei,[17] J. Antos,[29] C. Anway-Wiese,[4]
S. Aota,[32] G. Apollinari,[27] T. Asakawa,[32] W. Ashmanskas,[15] M. Atac,[7] P. Auchincloss,[26] F. Azfar,[22]
P. Azzi-Bacchetta,[21] N. Bacchetta,[21] W. Badgett,[17] S. Bagdasarov,[27] M. W. Bailey,[19] J. Bao,[35] P. de Barbaro,[26]
A. Barbaro-Galtieri,[15] V. E. Barnes,[25] B. A. Barnett,[13] P. Bartalini,[24] G. Bauer,[16] T. Baumann,[9] F. Bedeschi,[24]
S. Behrends,[3] S. Belforte,[24] G. Bellettini,[24] J. Bellinger,[34] D. Benjamin,[31] J. Benlloch,[16] J. Bensinger,[3] D. Benton,[22]
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C. Blocker,[3] A. Bodek,[26] W. Bokhari,[16] V. Bolognesi,[24] D. Bortoletto,[25] J. Boudreau,[23] G. Brandenburg,[9]
L. Breccia,[2] C. Bromberg,[18] E. Buckley-Geer,[7] H. S. Budd,[26] K. Burkett,[17] G. Busetto,[21] A. Byon-Wagner,[7]
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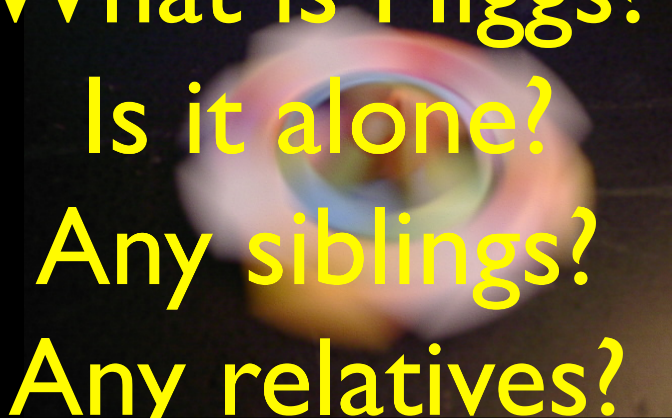
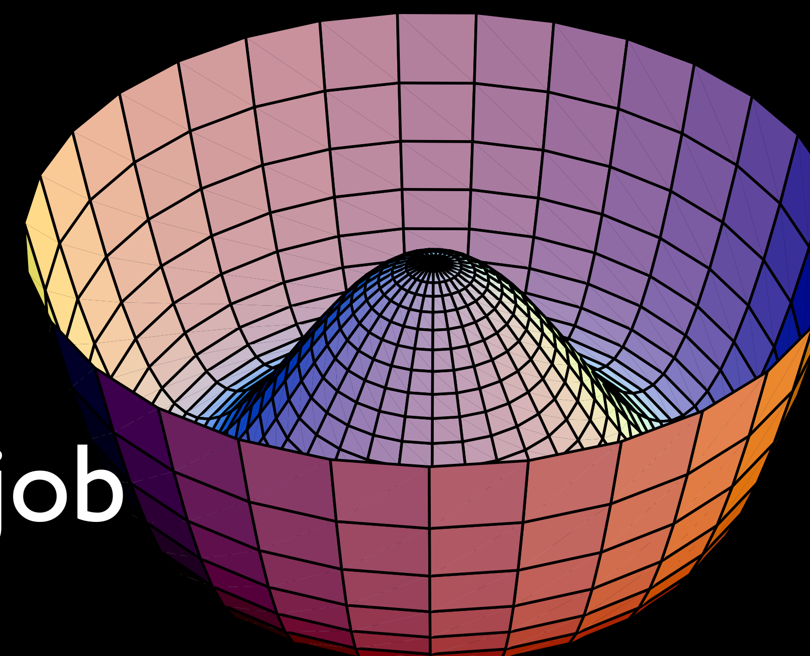
LHC14, HL-LHC

naturalness



What is Higgs?
Is it alone?
Any siblings?
Any relatives?
Why frozen?

- Higgs boson is the *only spin 0 particle* in the standard model
  - it is *faceless*
  - one of its kind, no context
  - but does the most important job
- looks very artificial
- we still don't know *dynamics* behind the Higgs condensate
- *Higgsless theories*: now dead



Theoretical Foundation for Scalar Bosons?

Supersymmetry

- Higgs just one of *many* scalar bosons
- SUSY loops make m_h^2 negative

composite

- spins cancel among constituents
- condensate by a strong attractive force, holography

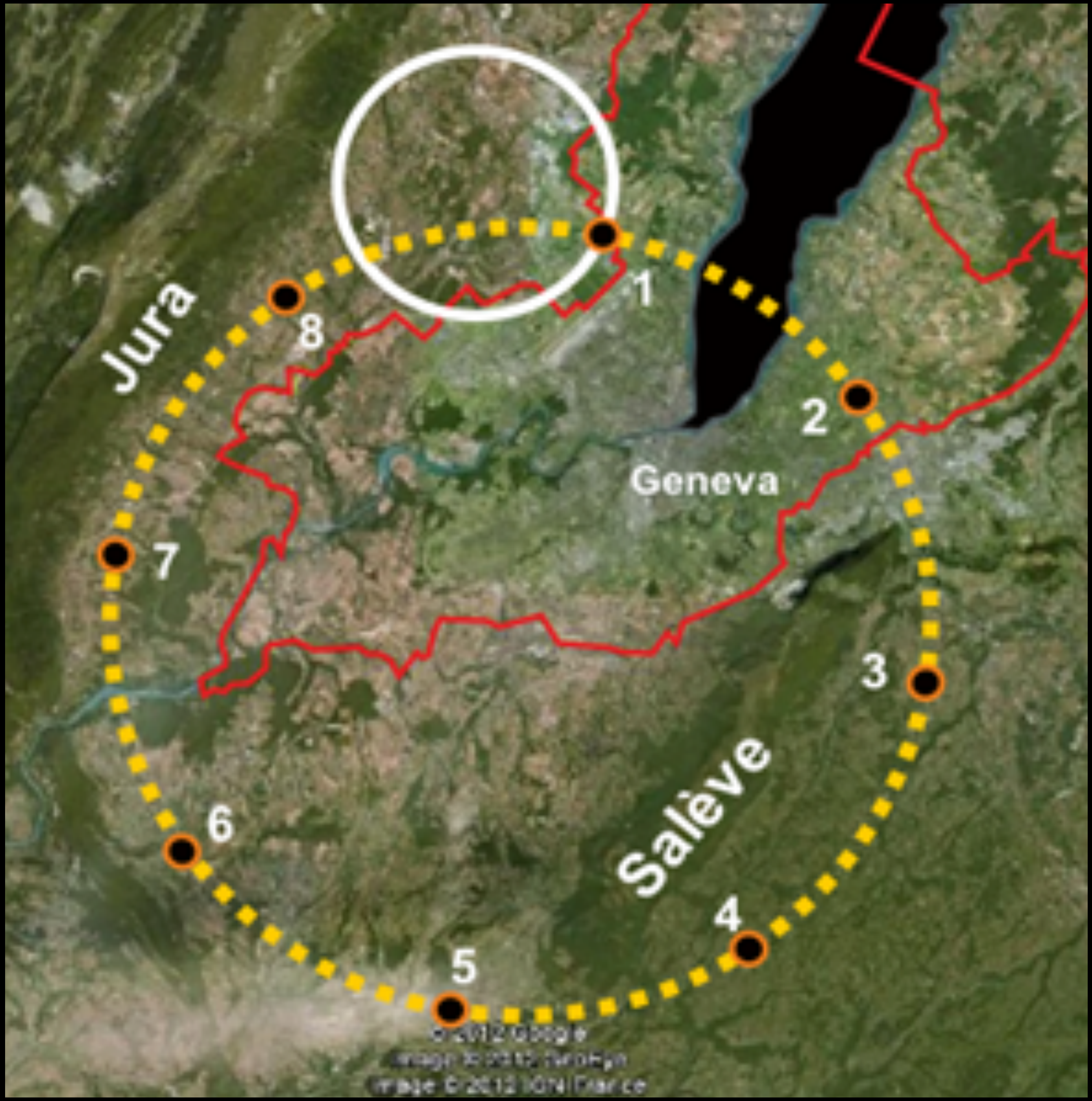
Extra dimension

- Higgs spinning in extra dimensions
- new forces from particles running in extra D

another “naturalness” argument

higher energies?

- HL-LHC boosts reach
- We believe we should keep aiming at higher energies
- *100 TeV pp would be great!*

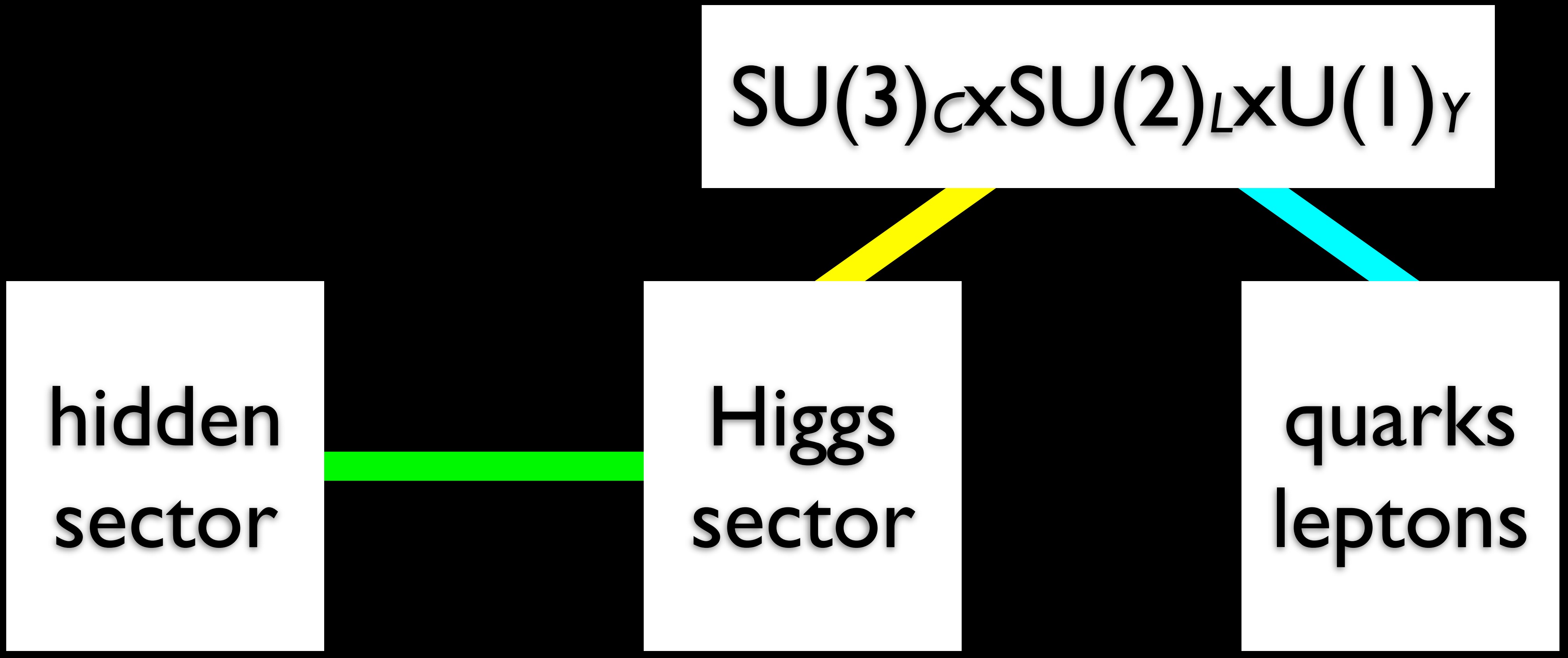


we should exploit the energy scale we know: Higgs


Higgs boson
need to find everything
under the lamp post
learn where
to go next

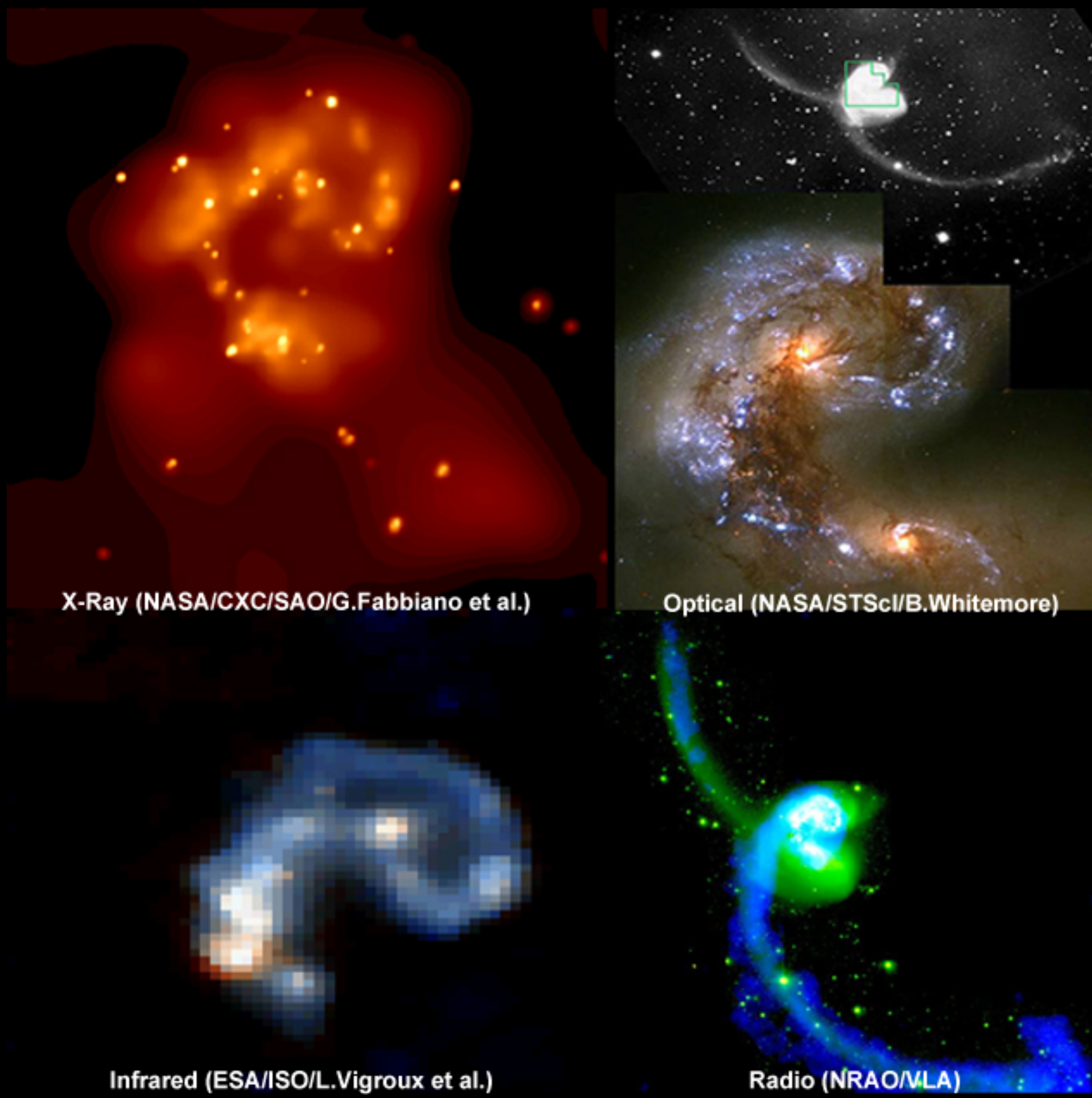
Higgs as a portal

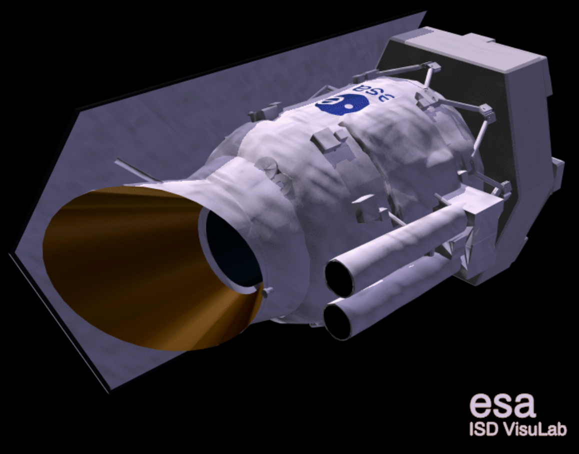
- having discovered the Higgs?
- Higgs boson may connect the Standard Model to other "sectors"



$$\mathcal{L} = \mathcal{O}_{hidden} H^\dagger H$$

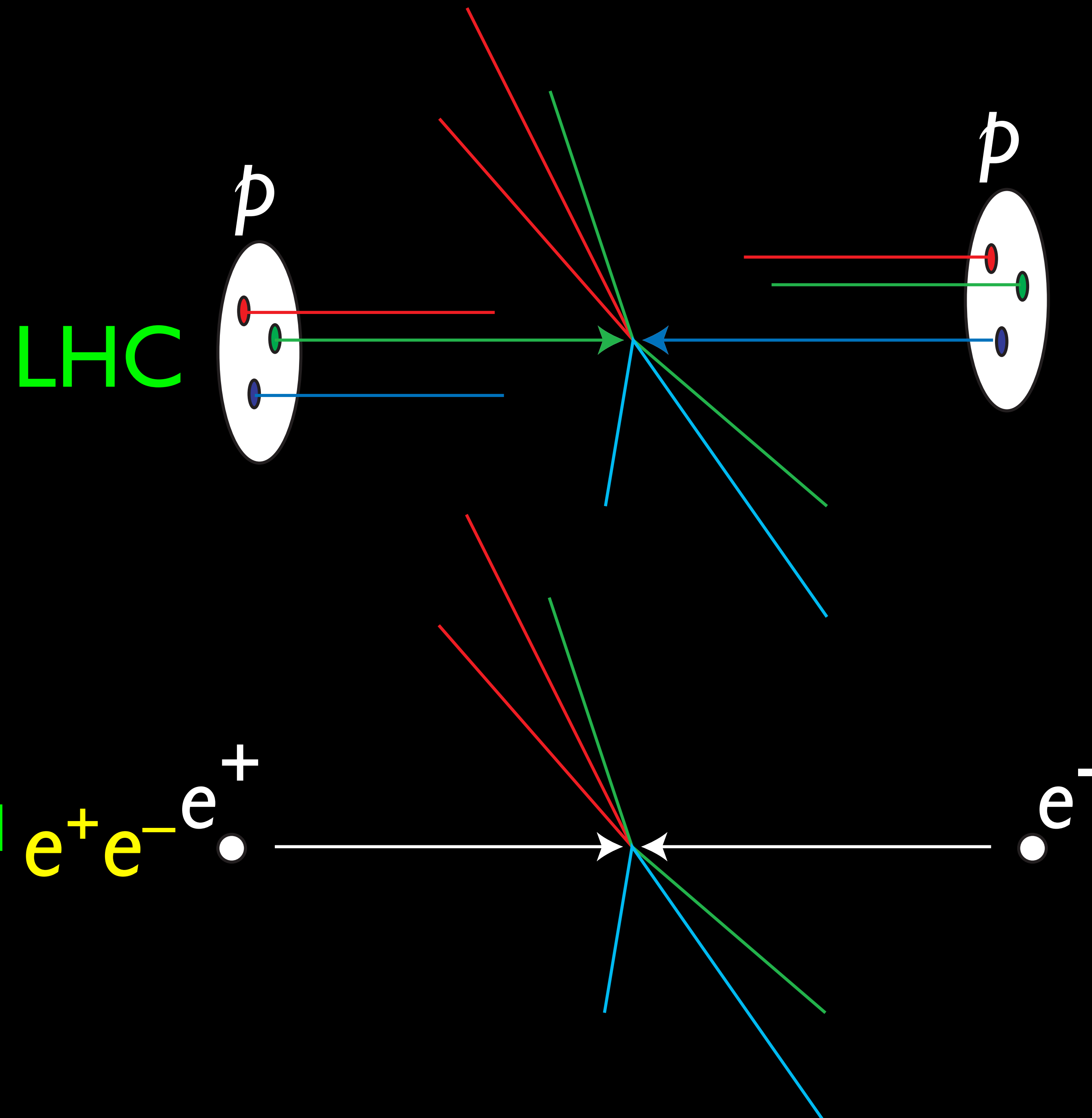
Need many probes for full understanding





e^+e^-

- e^+, e^- are elementary particles
- well-defined energy, angular momentum
- uses its full energy
- can produce particles democratically
- can capture nearly full information



History of Colliders

1. precision measurements of neutral current (*i.e.* polarized $e+d$) predicted m_W, m_Z
2. UA1/UA2 discovered *W*/*Z* particles
3. LEP *nailed* the gauge sector

History of Colliders

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2. LHC discovered *a Higgs particle*
3. LC *nails* the Higgs sector?

History of Colliders

1. precision measurements of neutral current (*i.e.* polarized *e*+*d*) predicted m_W, m_Z
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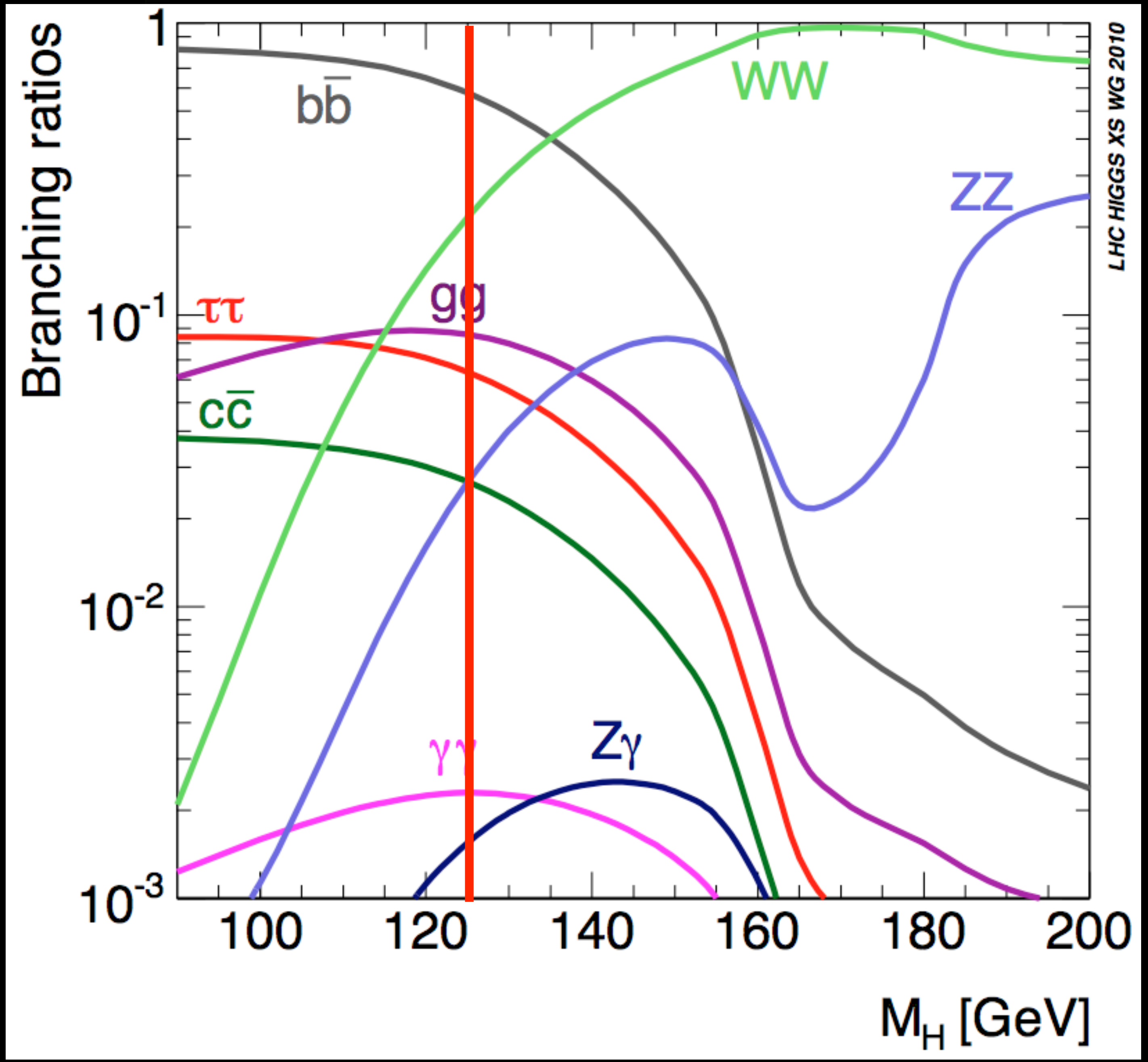
1. precision measurements of *W* and *Z* (*i.e.* LEP + Tevatron) predicted m_H
2. LHC discovered *a Higgs particle*
3. LC *nails* the Higgs sector?
1. precision measurements at LC predict ???

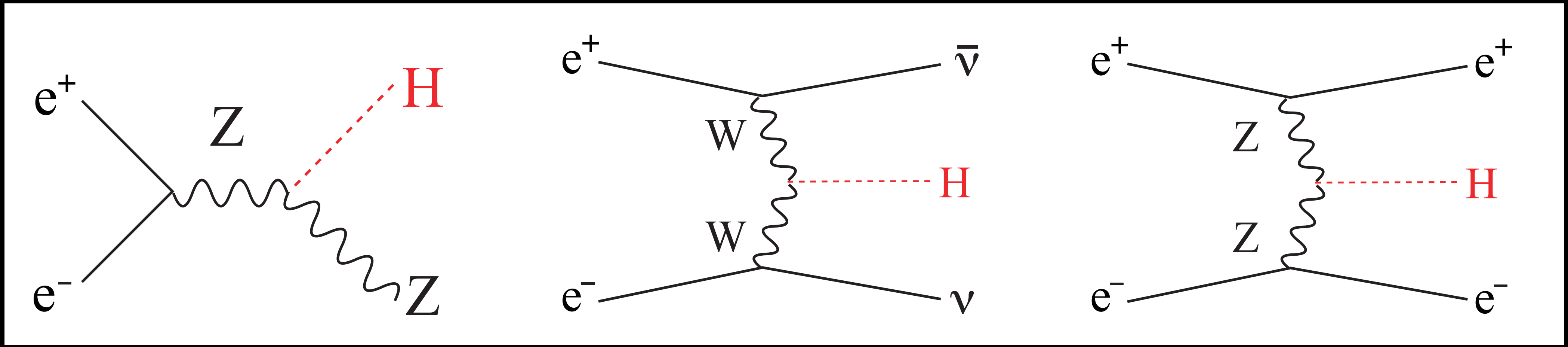
dream case for experiments

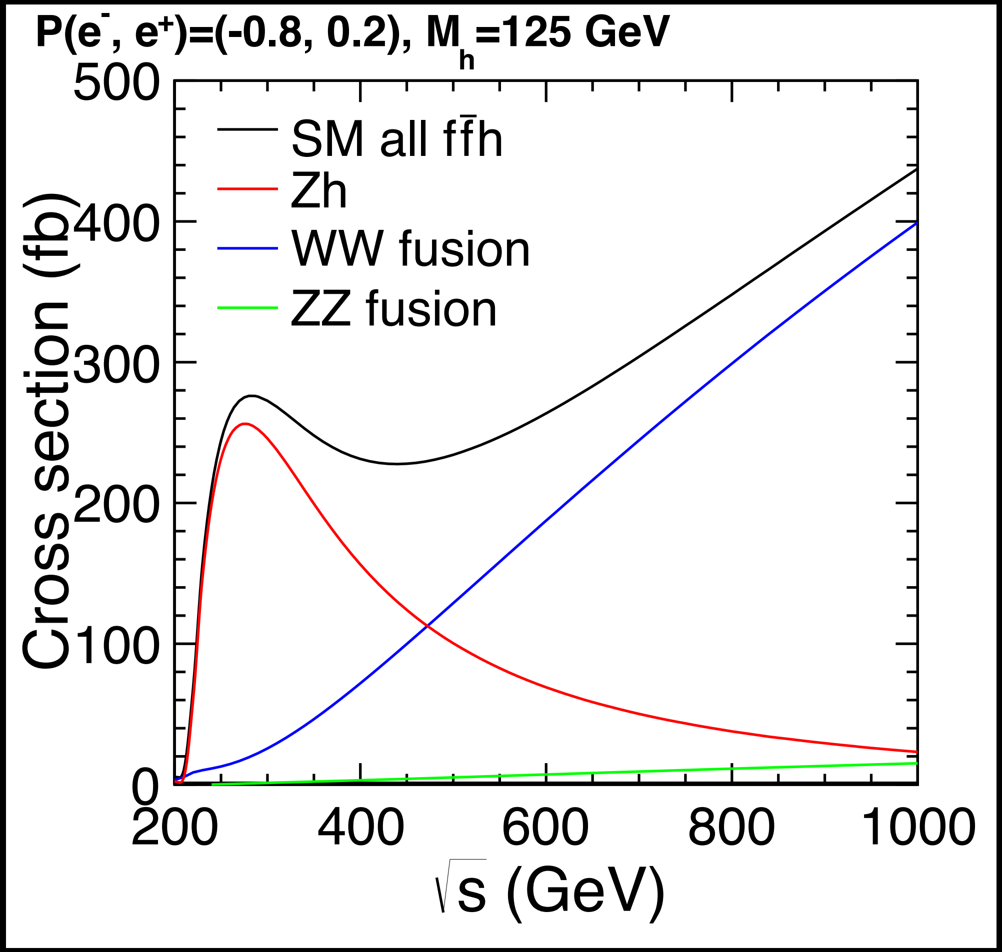


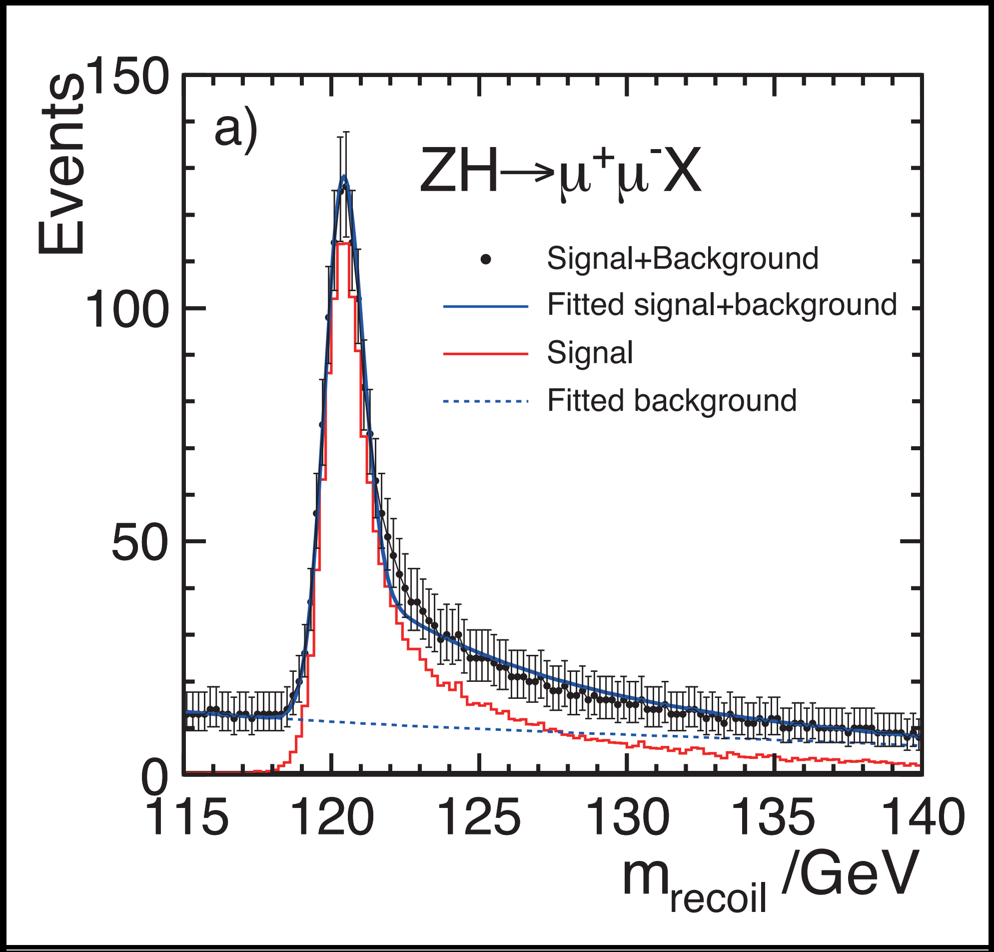
can measure them all!

production mechanisms

$$E_Z = \frac{\sqrt{s}}{2}\left(1 + \frac{m_Z^2}{s} - \frac{m_h^2}{s}\right)$$

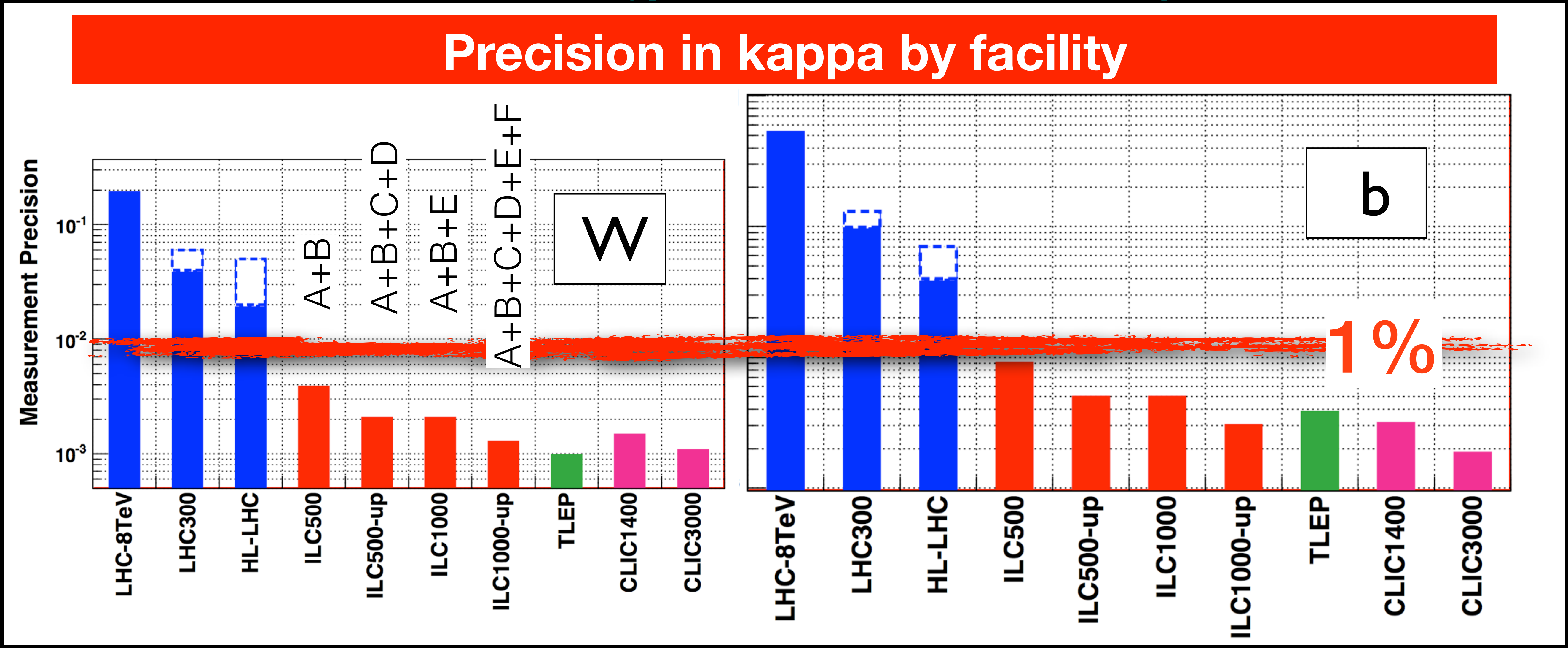






Milk every drop

Snowmass Energy Frontier WG Chip Brock



$$\frac{BR(h \to b\bar{b})}{BR(h \to b\bar{b})_{SM}} \sim 1 + \mathcal{O}(10\%) \left(\frac{400\text{GeV}}{m_A}\right)^2$$

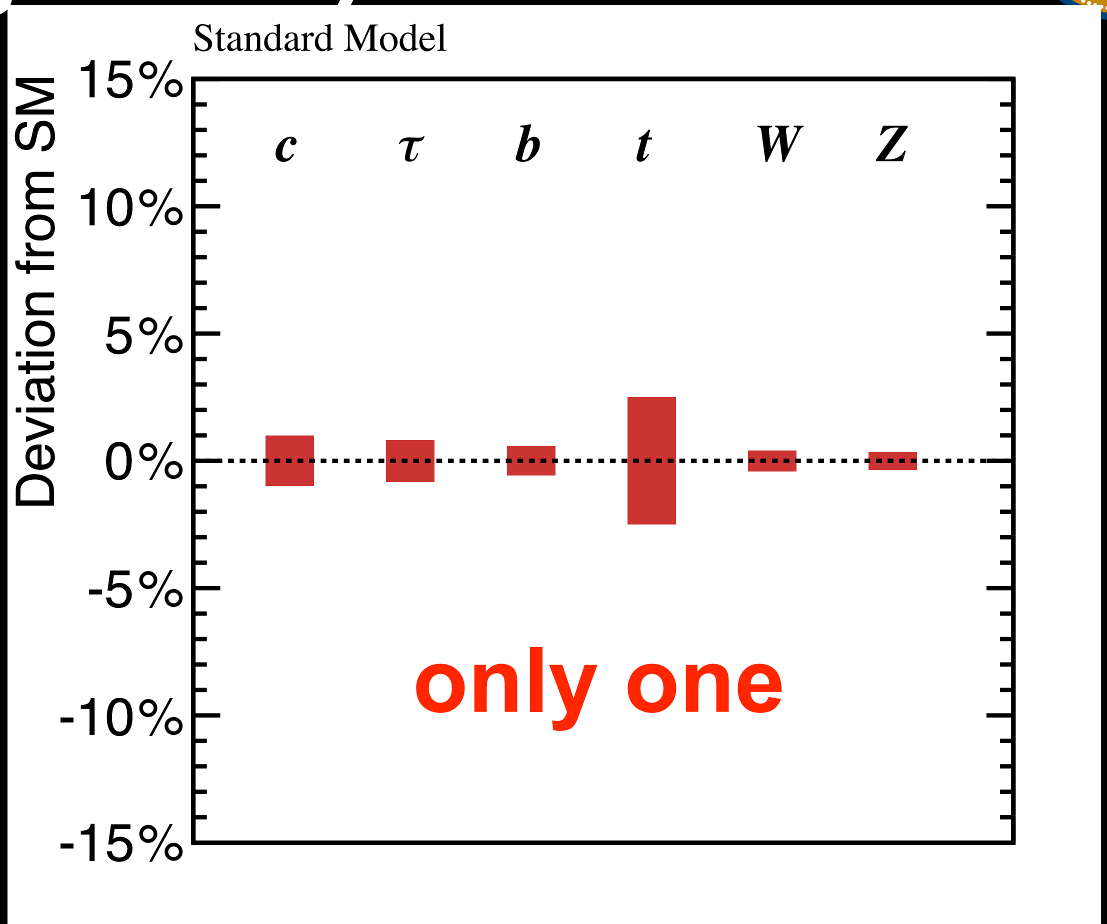
⇒ Discover *siblings* of Higgs boson >TeV

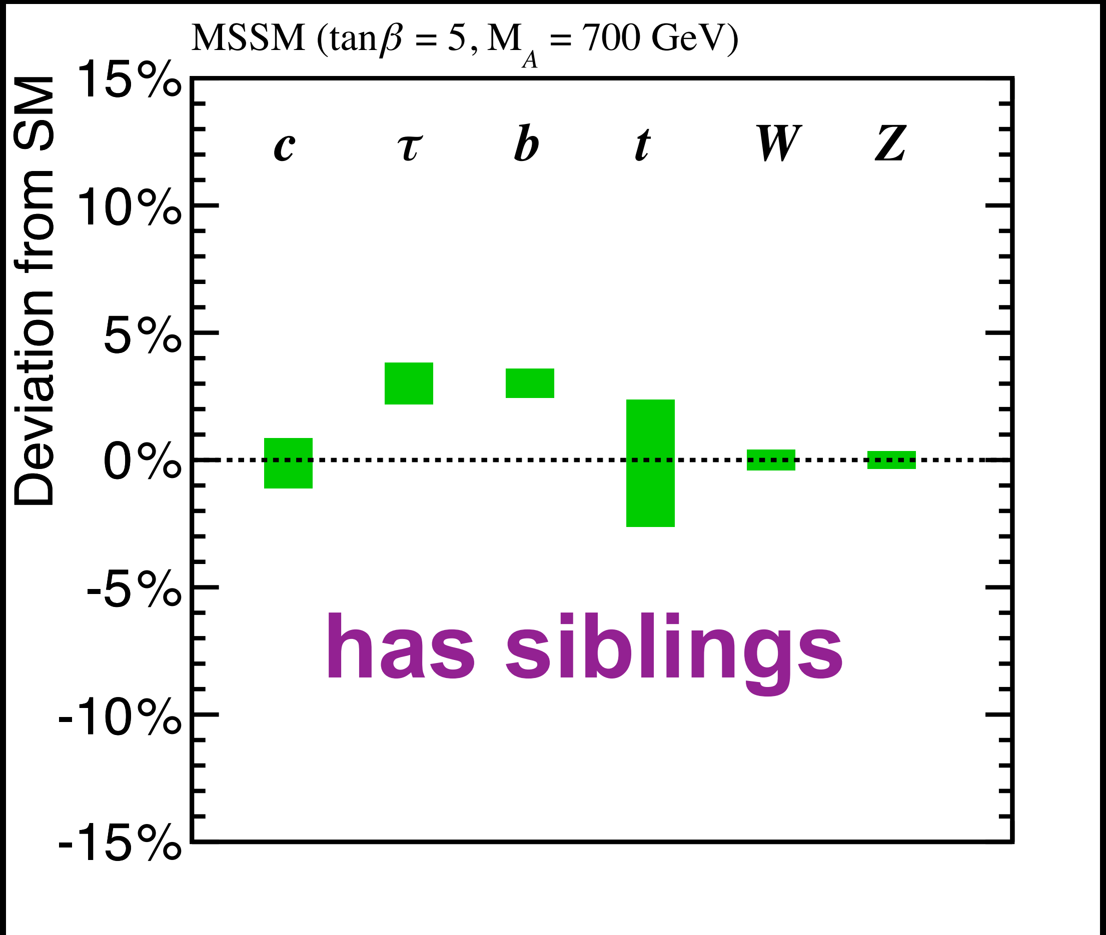
energy reach ∝ $(\text{precision})^{-1/2}$ ⇒ composite? $4\pi f$~100TeV

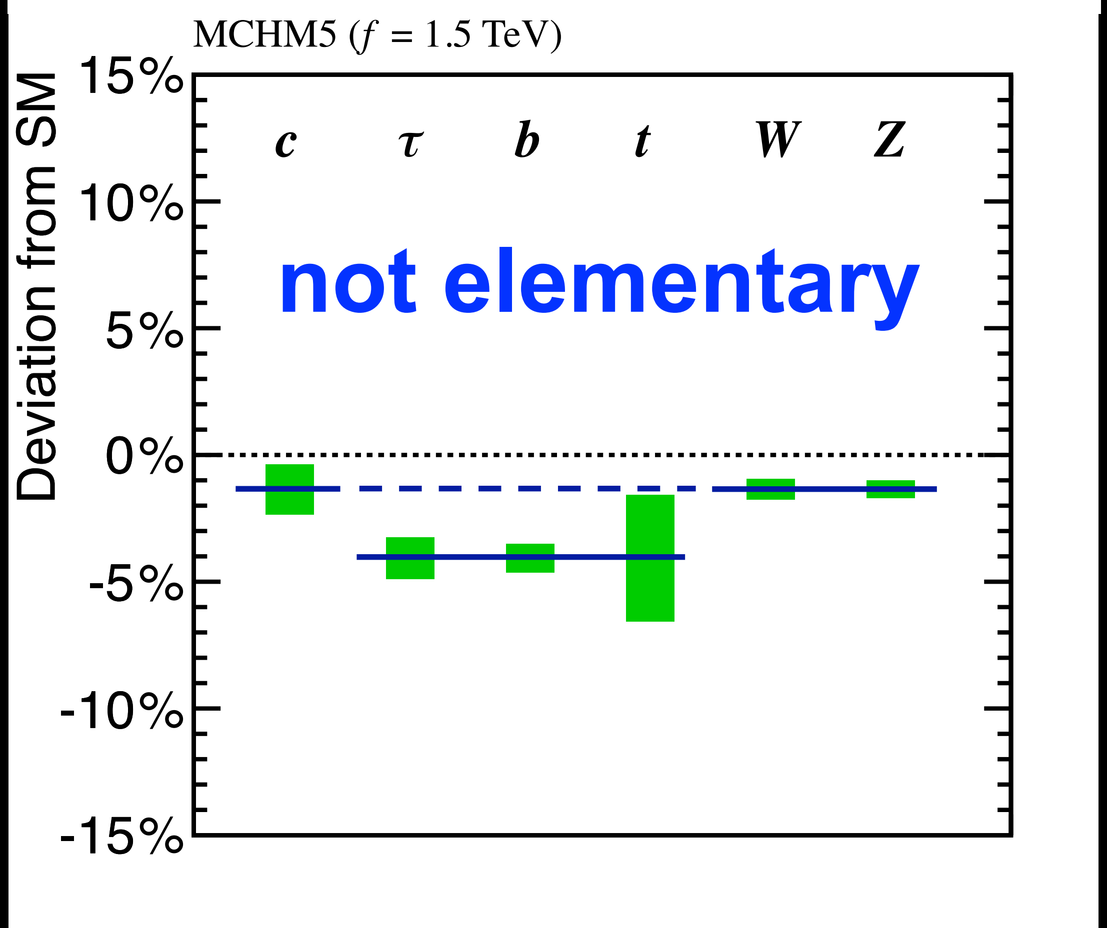
What is Higgs really?

Only one? (SM)
has siblings? (2DHM)
not elementary?

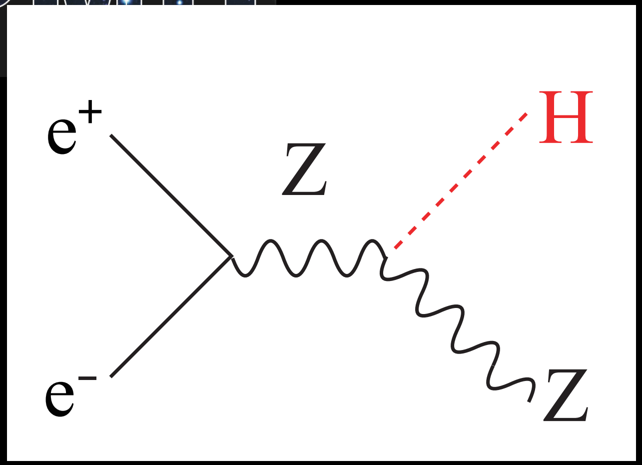
Lumi 1920 fb-1, sqrt(s) = 250 GeV
Lumi 2670 fb-1, sqrt(s) = 500 GeV



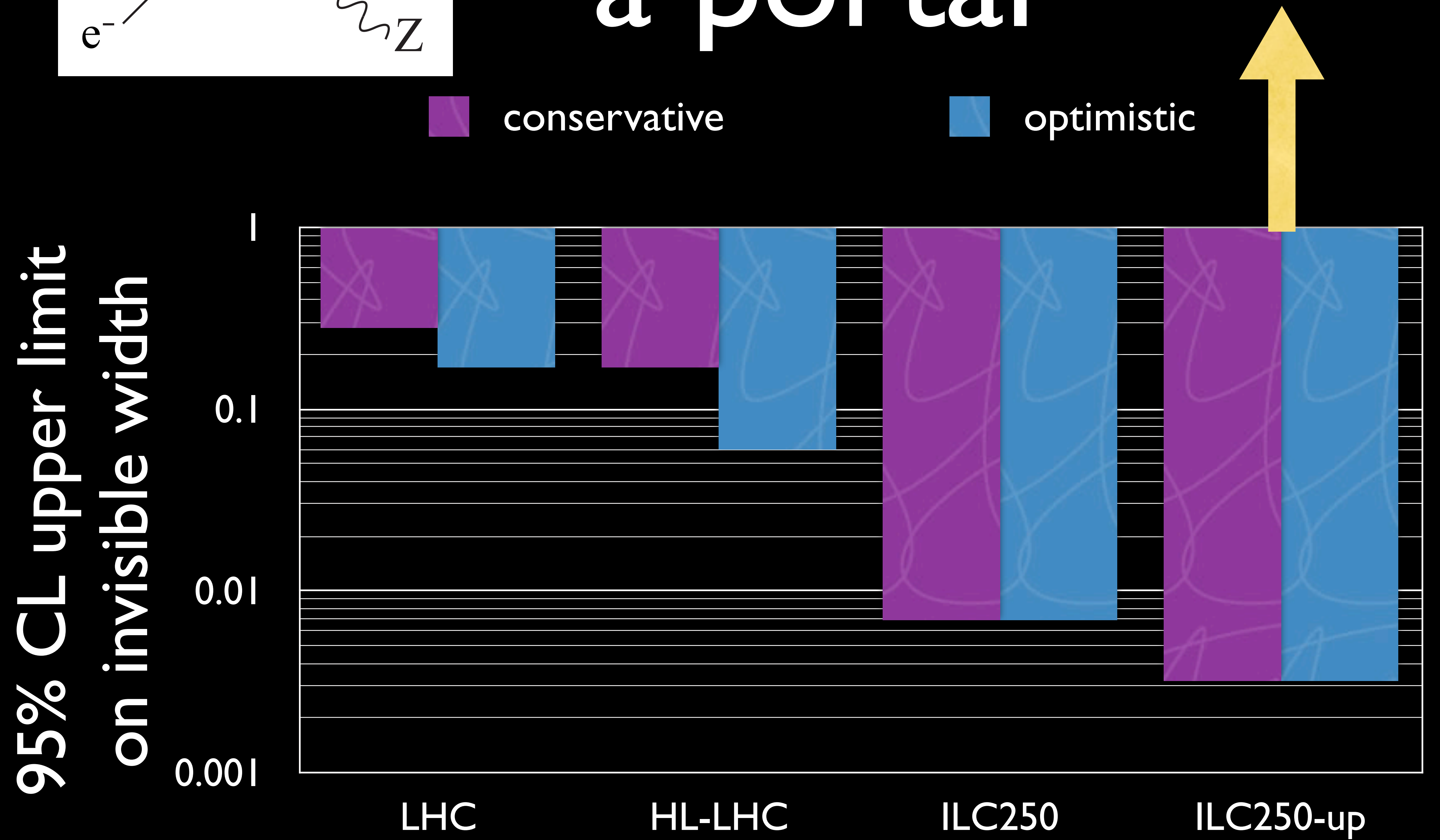




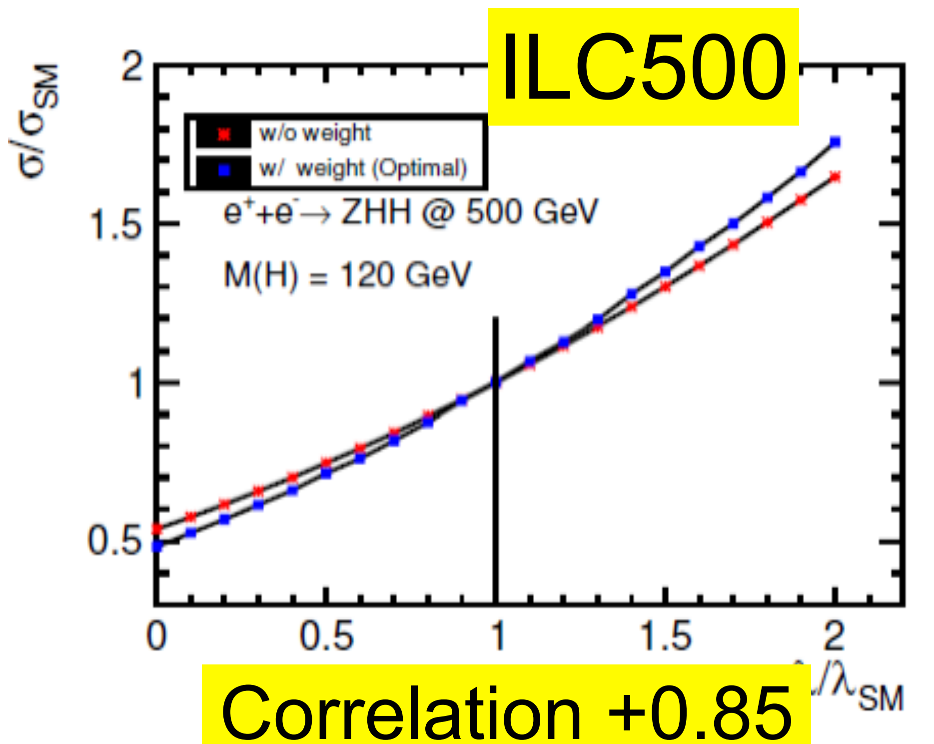
Higgs as a portal



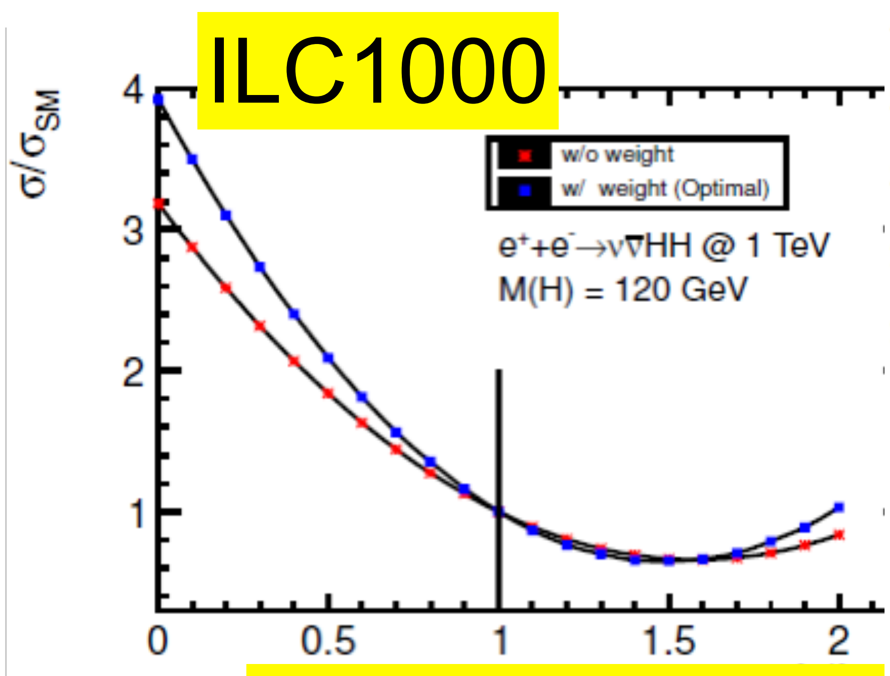
dark matter?



Higgs self-coupling (2/2)

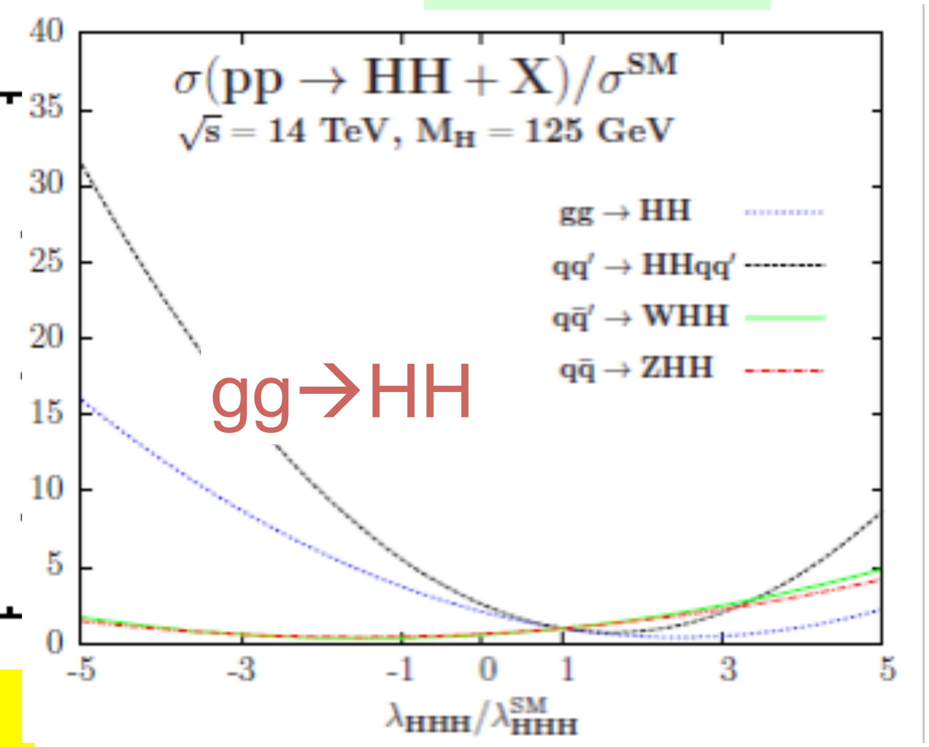


Correlation +0.85
36% @ ILC500up



Correlation -1.8
10% @ ILC1000up

HL-LHC



Correlation -0.8

Lumi 2670 fb-1, sqrt(s) = 500 GeV
Lumi 4170 fb-1, sqrt(s) = 1 TeV

ILC-LHC synergy

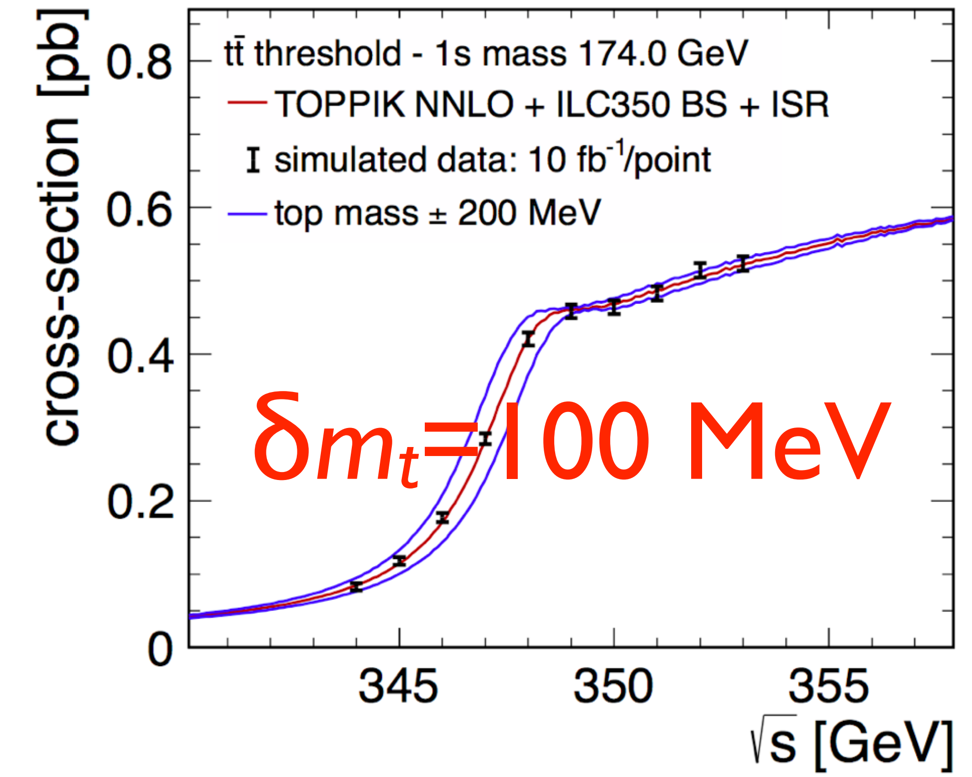
- Effect of interfering diagrams:
  - Negative correlation: better sensitivity for λ<1 (HL-LHC)
  - Positive correlation: better sensitivity for λ>1 (ILC500)
- Large deviations predicted by EW baryogenesis scenarios, testable at ILC
- 10% precision achievable with ILC1000

Is ILC only about Higgs?

EW top-Neutral VB couplings

projected precision of $t-\gamma,\ t-Z^0$ couplings

Collider	LHC		ILC/CLIC
CM Energy [TeV]	14	14	0.5
Luminosity [fb^{-1}]	300	3000	500
SM Couplings			
photon, F_{1V}^{γ} (0.666)	0.042	0.014	0.002
Z boson, F_{1V}^{Z} (0.24)	0.50	0.17	0.003
Z boson, F_{1A}^{Z} (0.6)	0.058	?	0.005
Non-SM couplings			
photon, F_{1A}^{γ}	0.05	?	?
photon, F_{2V}^{γ}	0.037	0.025	0.003
photon, F_{2A}^{γ}	0.017	0.011	0.007
Z boson, F_{2V}^{Z}	0.25	0.17	0.006
Z boson, ReF_{2A}^{Z}	0.35	0.25	0.008
Z boson, ImF_{2A}^{Z}	0.035	0.025	0.015



BSM: 2-10 %

LHC : few %

ILC/CLIC: sub-%

Snowmass Energy Frontier Group Chip Brock

Now...a new target: BSM

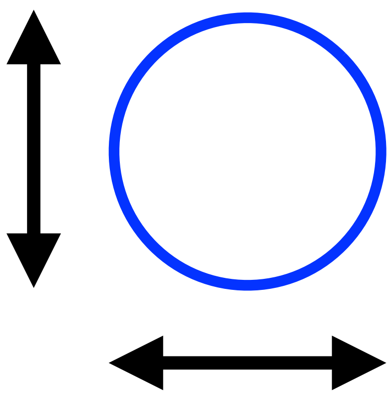
Premium on M_W

Now fits include M_h

This is now a BSM search

δM_W

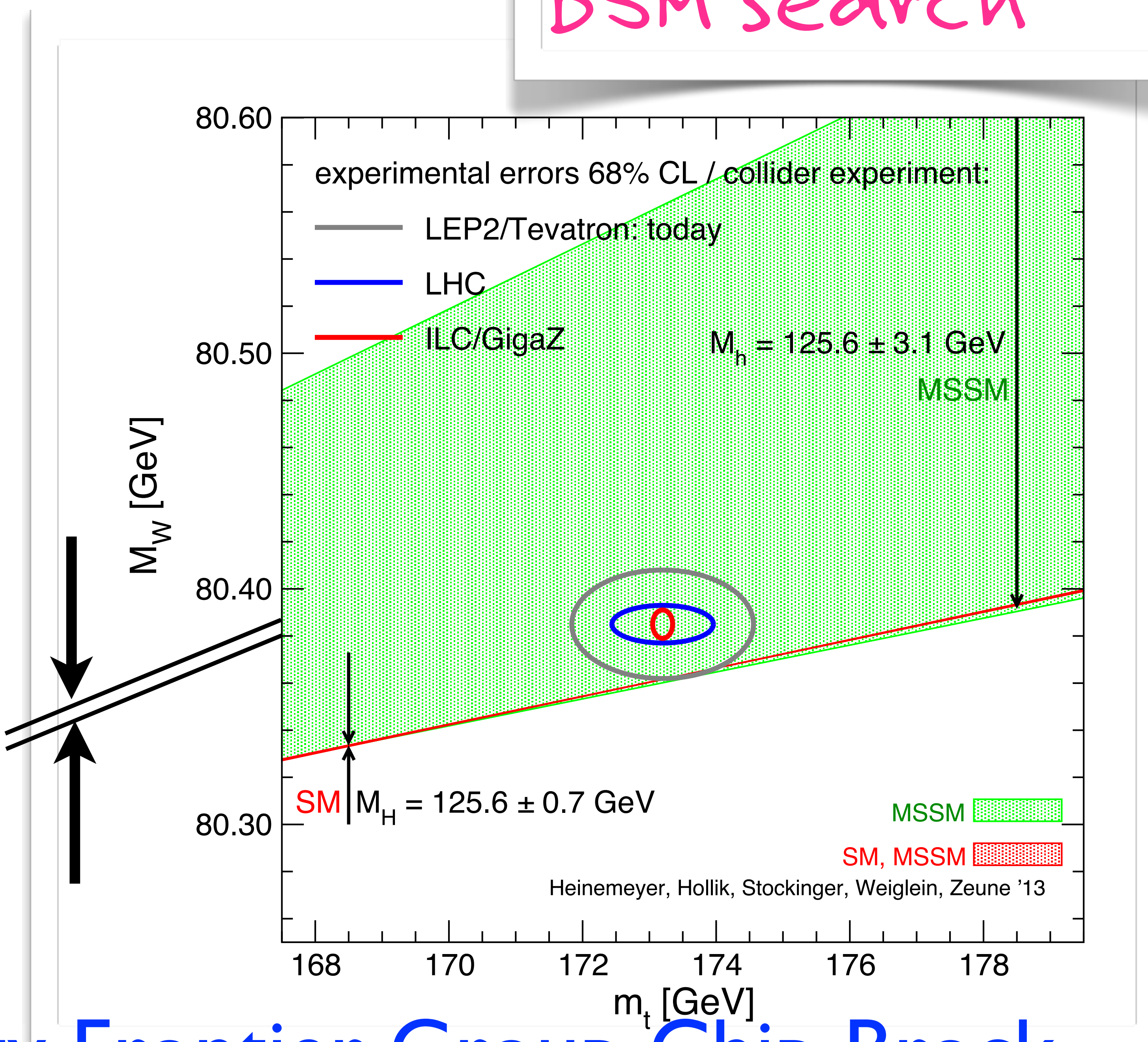
$\sim 5\ \mathrm{MeV}/c^2$



$\sim 500\ \mathrm{MeV}/c^2$

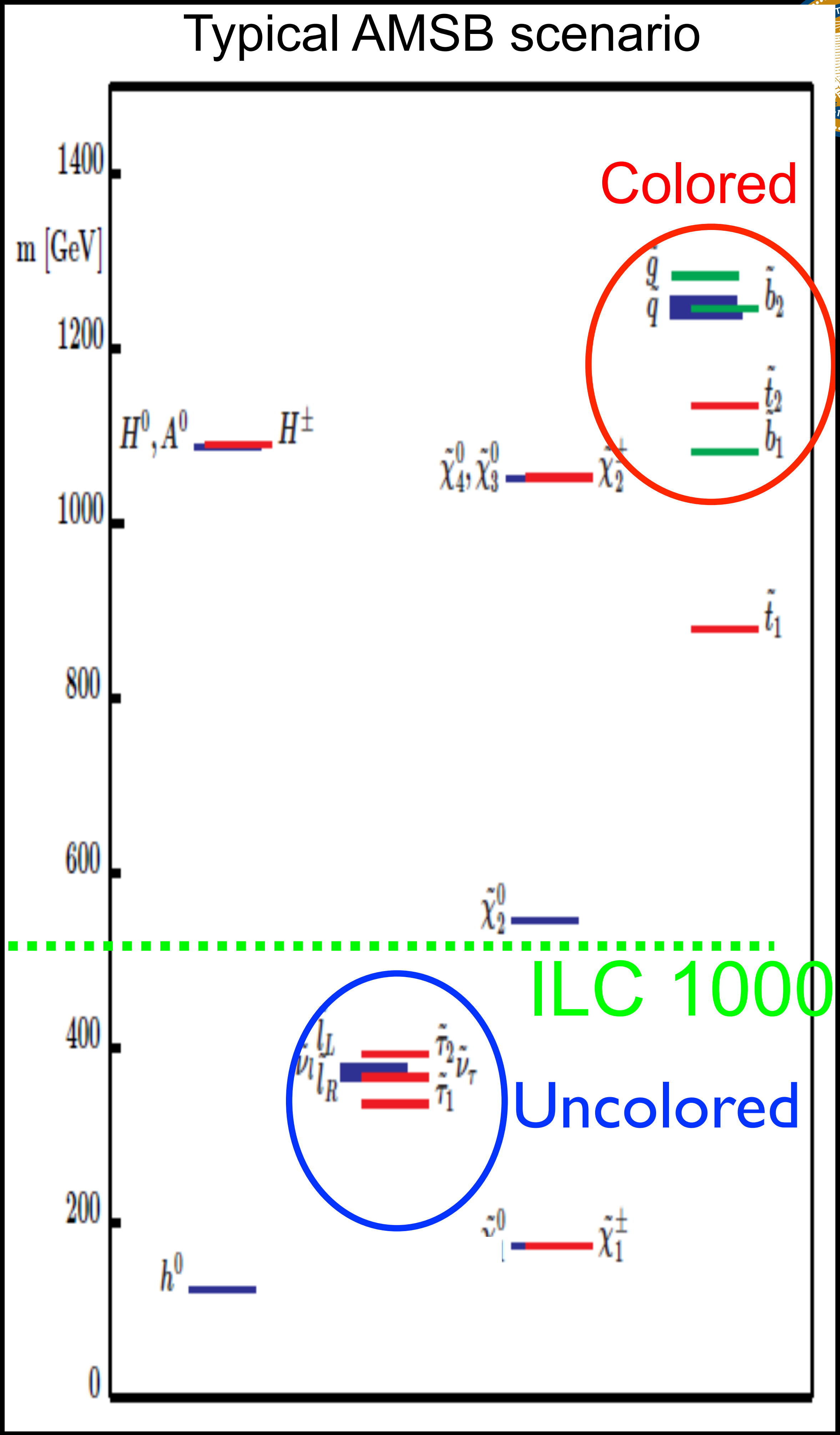
δm_t

$\delta M_W \sim 5\ \mathrm{MeV}/c^2$



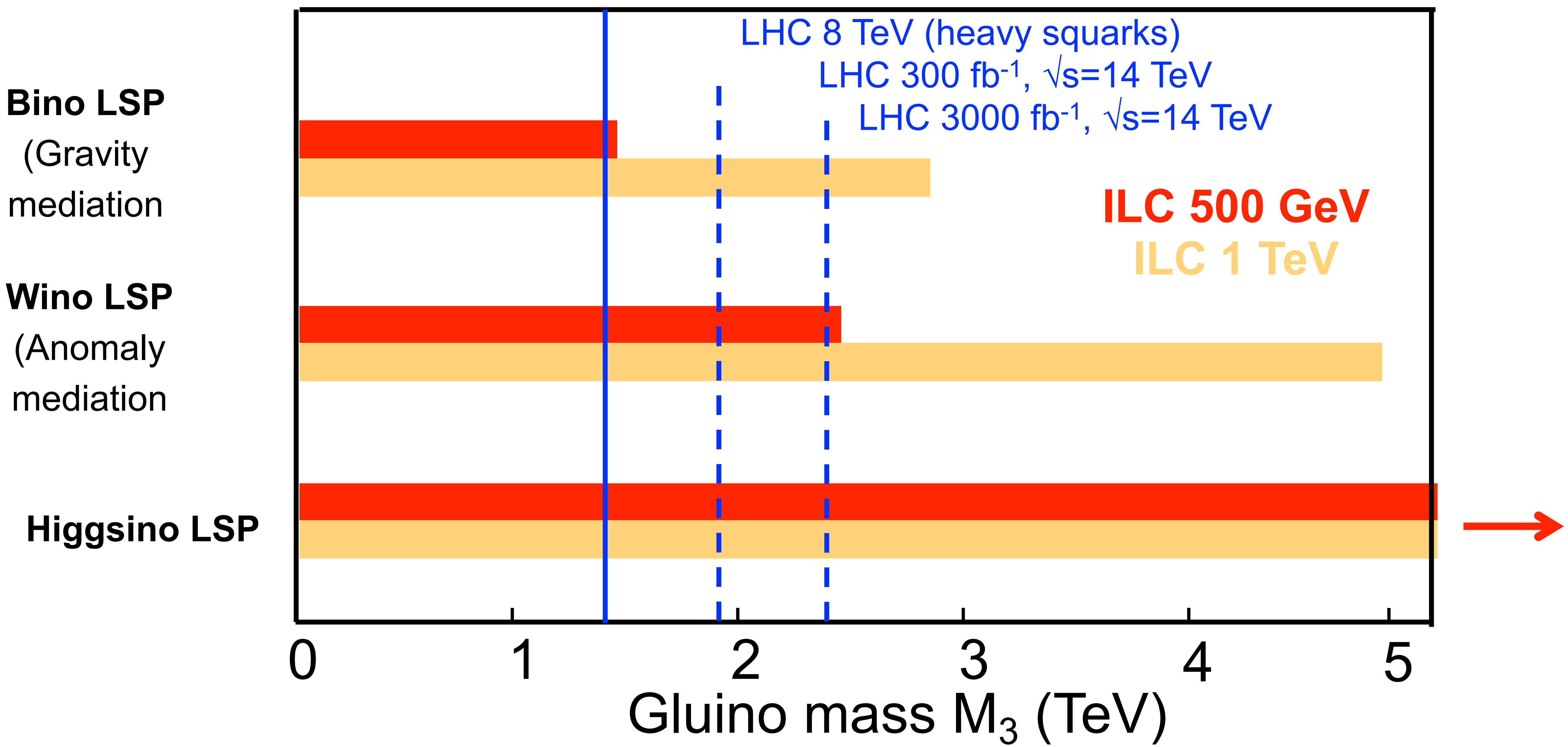
New physics

- access to color-neutral new particles?
- once any hint of new physics, upgradability is the key

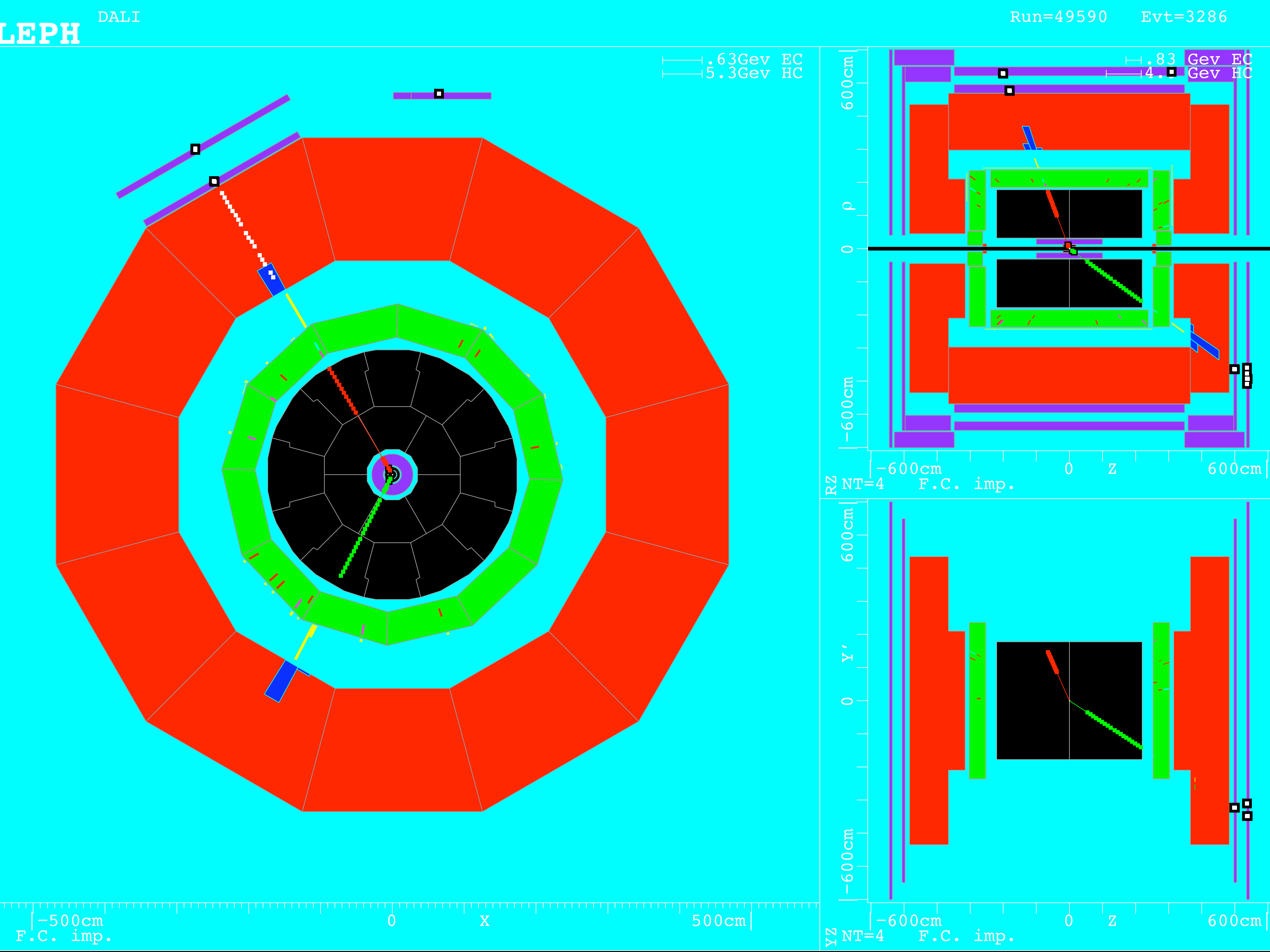


Sensitivity to SUSY

Gluino search at LHC
Chargino/Neutralino search at ILC
→ Comparison assuming gaugino mass relations



* Assumptions: MSUGRA/GMSB relation $M_1 : M_2 : M_3 = 1 : 2 : 6$; AMSB relation $M_1 : M_2 : M_3 = 3.3 : 1 : 10.5$

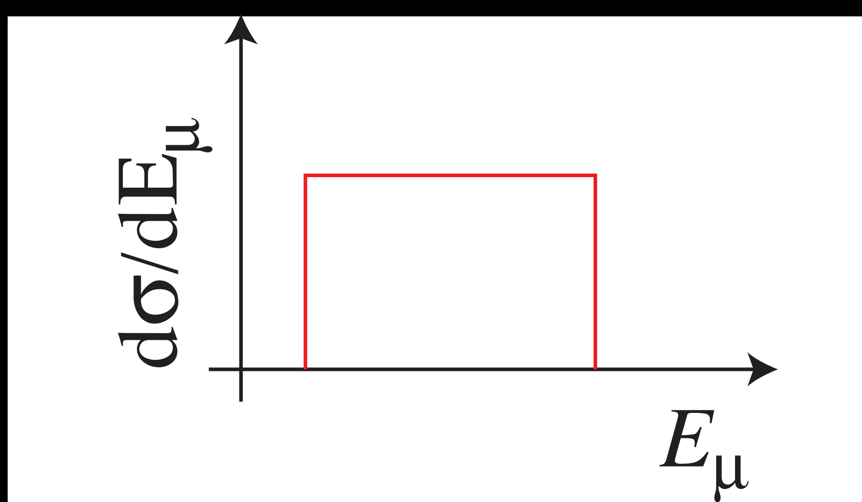


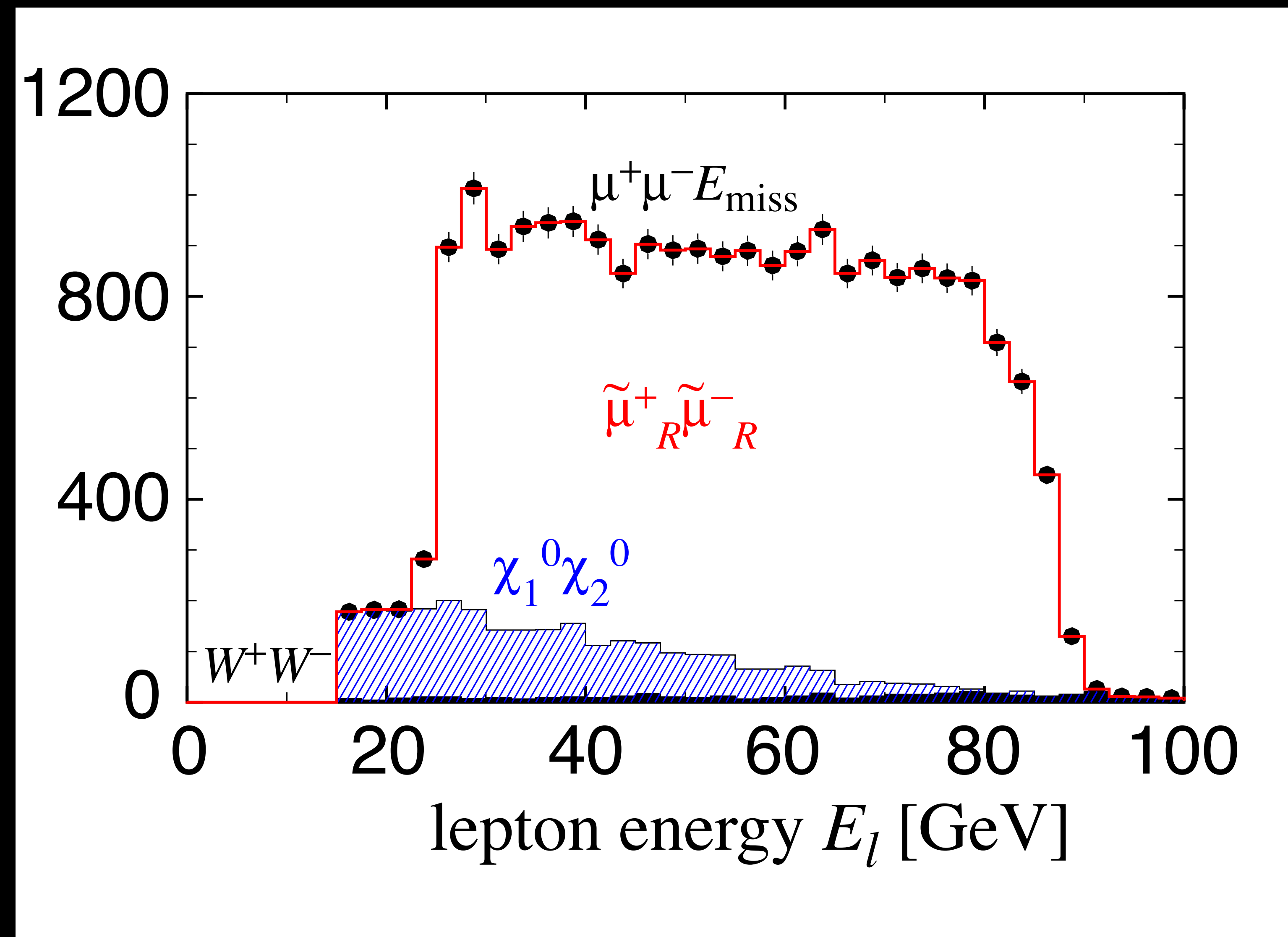
LEPH
DALI
Run=49590 Evt=3286
.63Gev EC
5.3Gev HC
.83 Gev EC
4. Gev HC
600cm
ρ
0
-600cm
-600cm
0
Z
600cm
RZ
NT=4
F.C. imp.
600cm
Y'
0
-600cm
-600cm
0
Z
600cm
YZ
NT=4
F.C. imp.
-500cm
0
X
500cm
F.C. imp.

$\tilde{\mu} \to \mu\chi^0$

- fit to the kinetic distribution

$$m_{\tilde{\mu}} = 132.0 \pm 0.3\ \text{GeV}$$
$$m_{\tilde{\chi}^0} = 71.9 \pm 0.1\ \text{GeV}$$

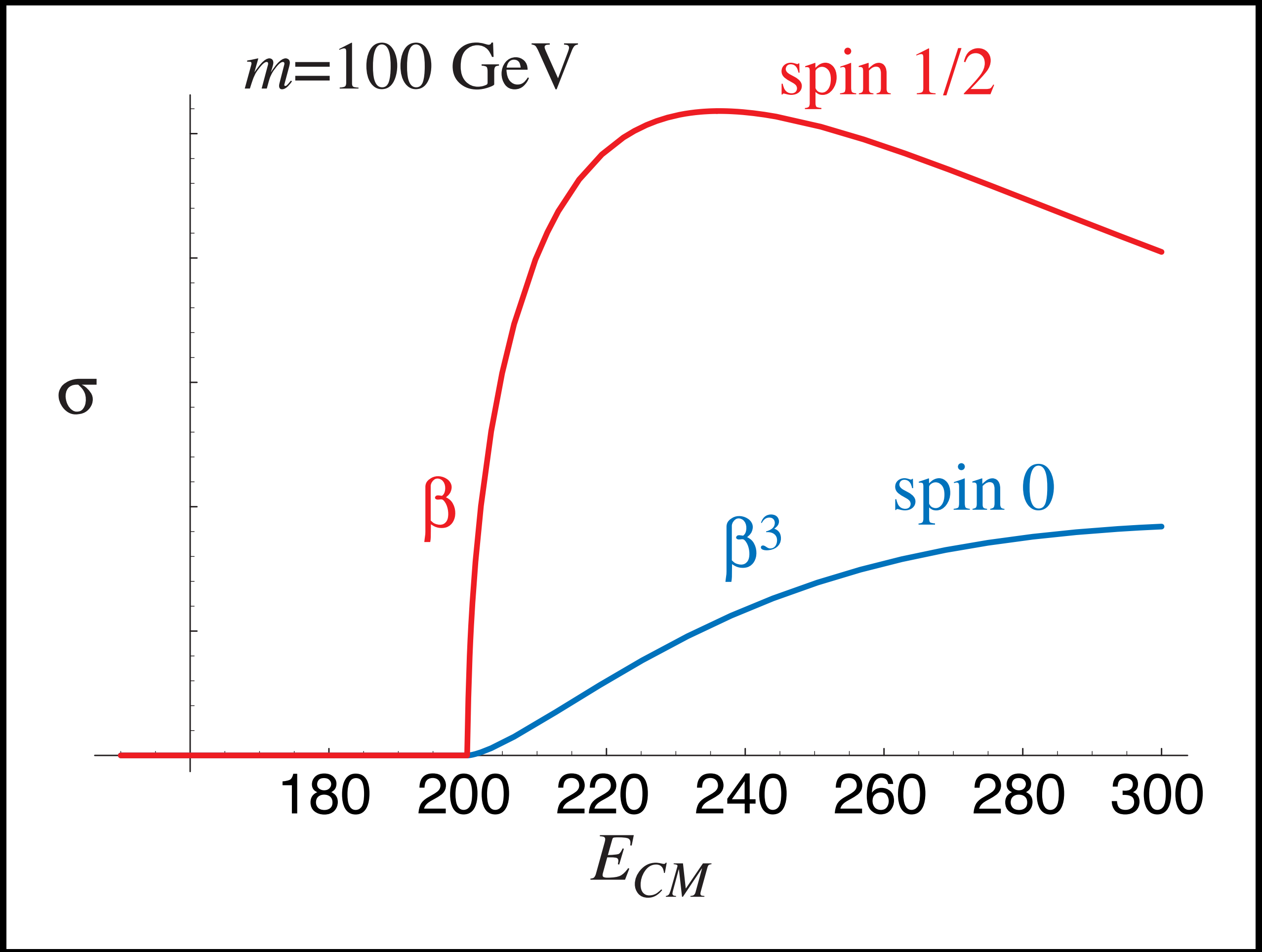


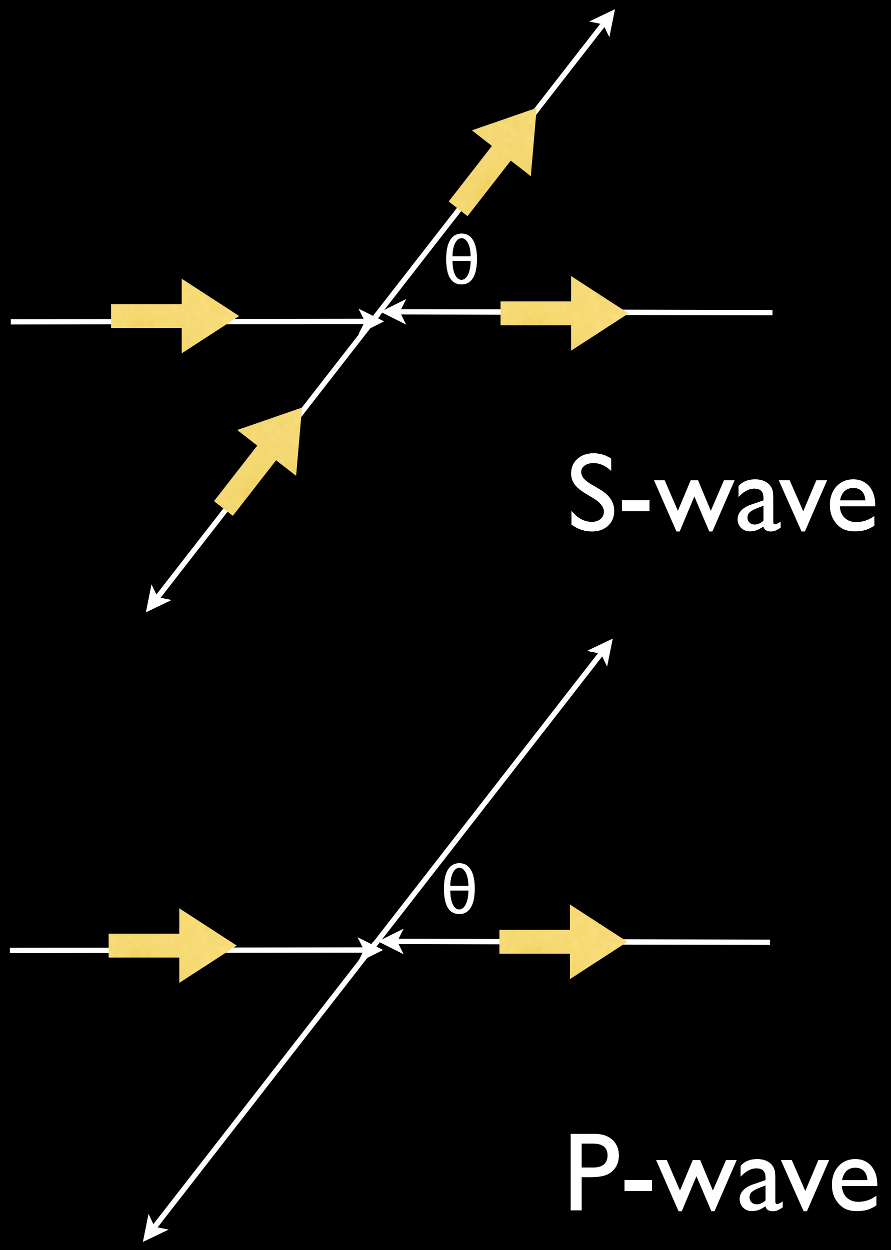


$$\frac{\sqrt{s}}{4}\left(1-\frac{m^2_{\tilde{\chi}^0}}{m^0_{\tilde{\mu}}}\right)(1-\beta_{\tilde{\mu}}) < E_\mu < \frac{\sqrt{s}}{4}\left(1-\frac{m^2_{\tilde{\chi}^0}}{m^0_{\tilde{\mu}}}\right)(1+\beta_{\tilde{\mu}})$$

Spin

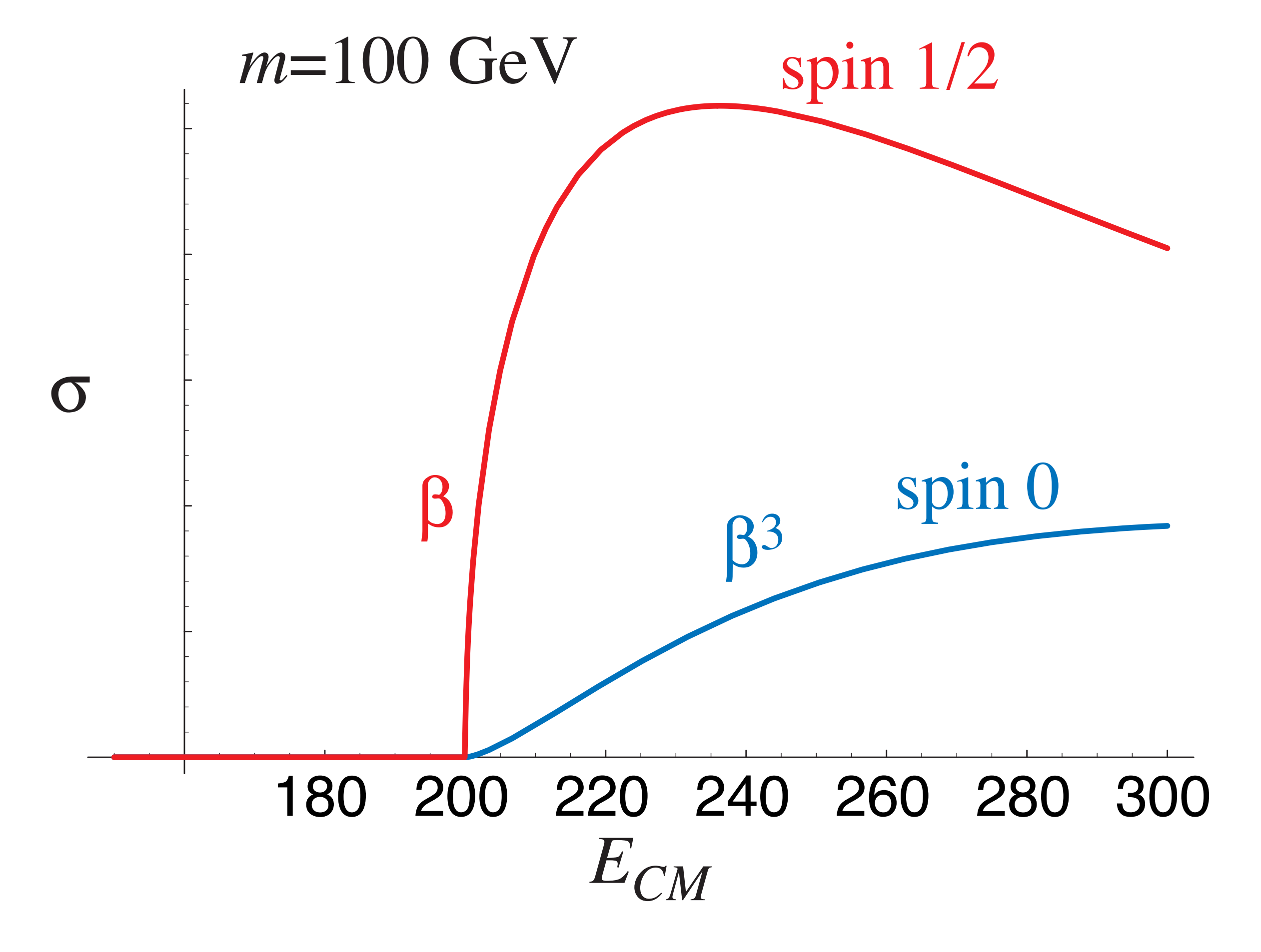
- threshold behavior
  non-relativistic limit: L, S separately conserved
- $\sigma \propto \beta^{2L+1}$

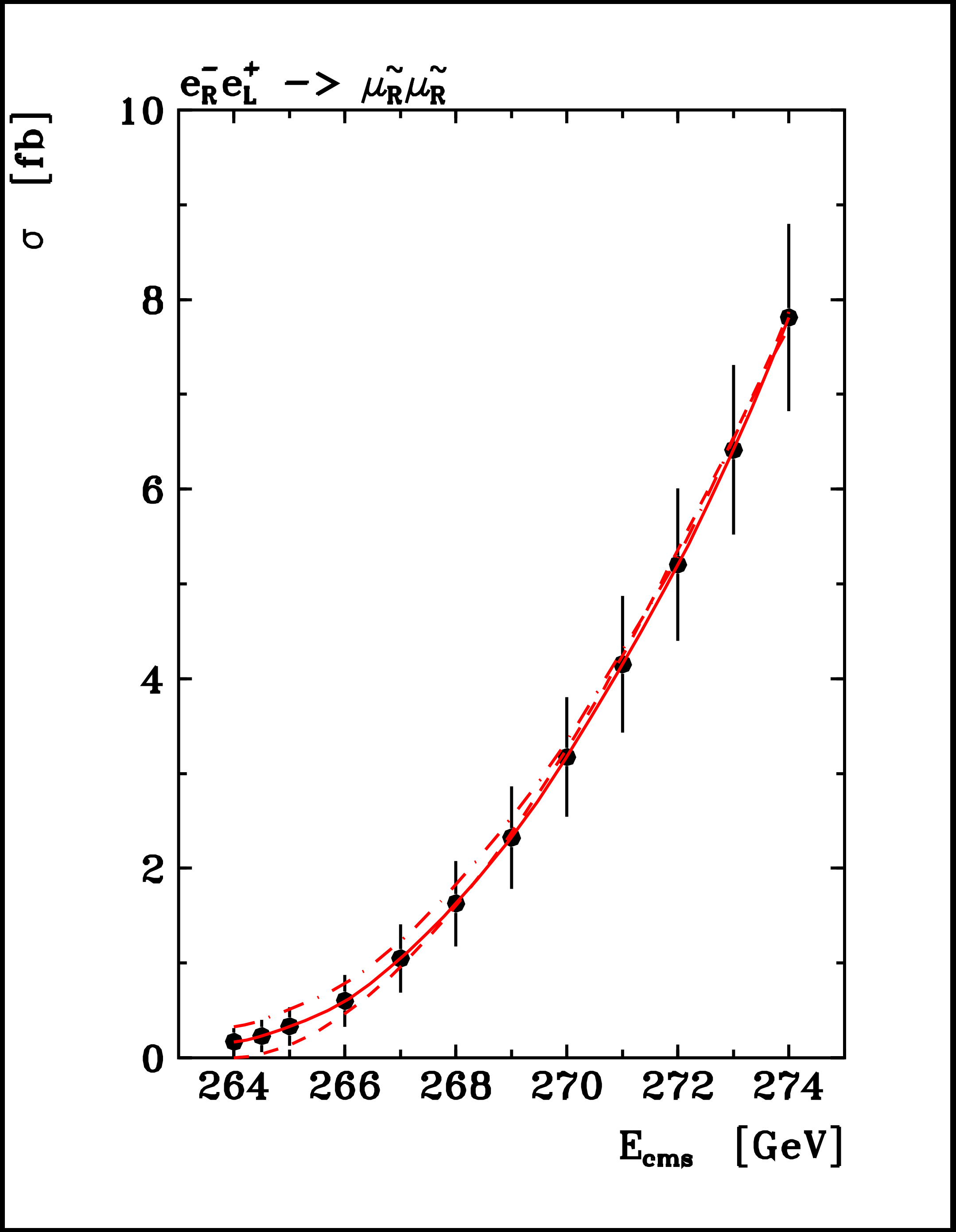




Spin

- threshold behavior
  non-relativistic limit: L, S separately conserved
- $\sigma \propto \beta^{2L+1}$

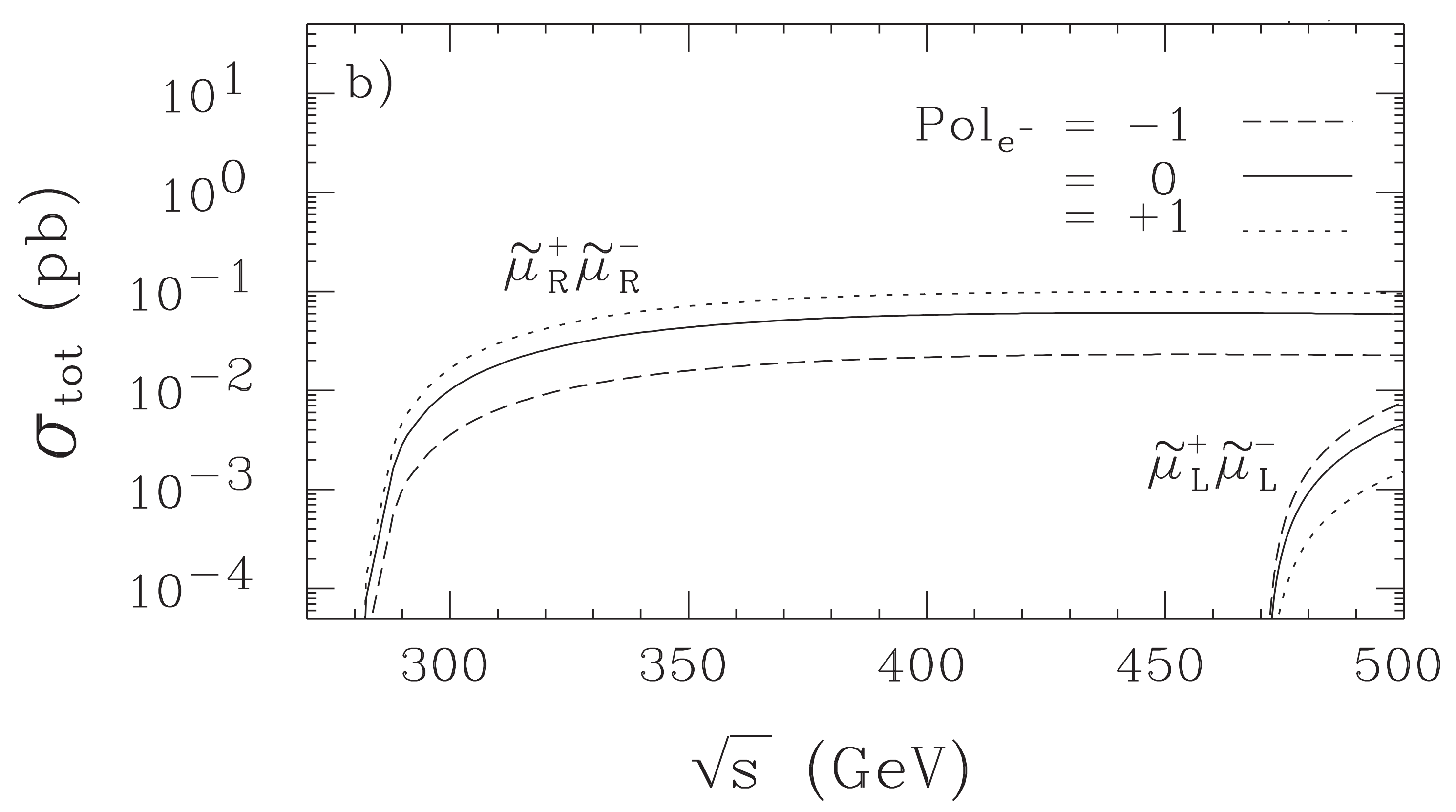


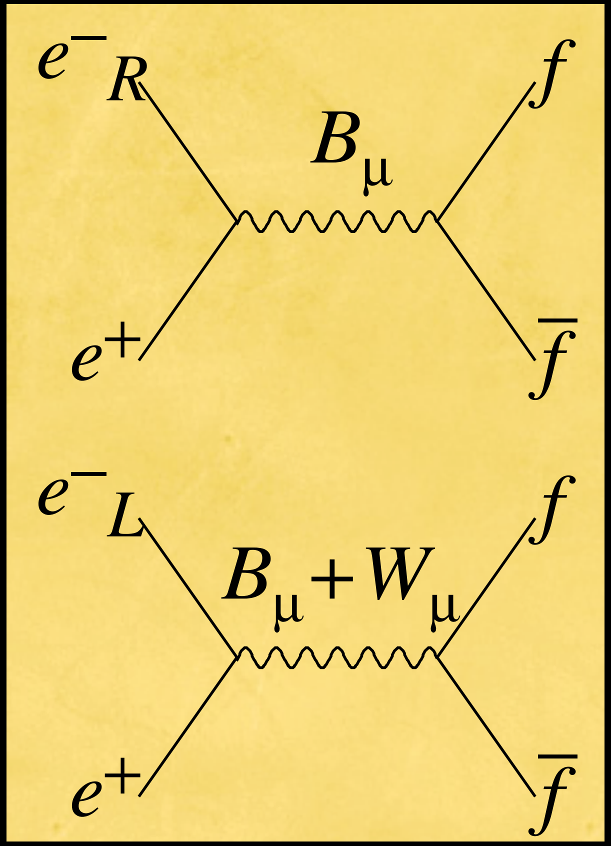


$m_{\tilde{\mu}} = 132.0 \pm 0.09$ GeV
$m_{\tilde{\chi}^0} = 71.9 \pm 0.05$ GeV

once new particle found

- Use polarized electron beam
- can ignore $m_Z^2 \ll s$
- e_R couples only to B_μ
- e_L couples to $B_\mu + W_\mu^0$
- can determine quantum #s



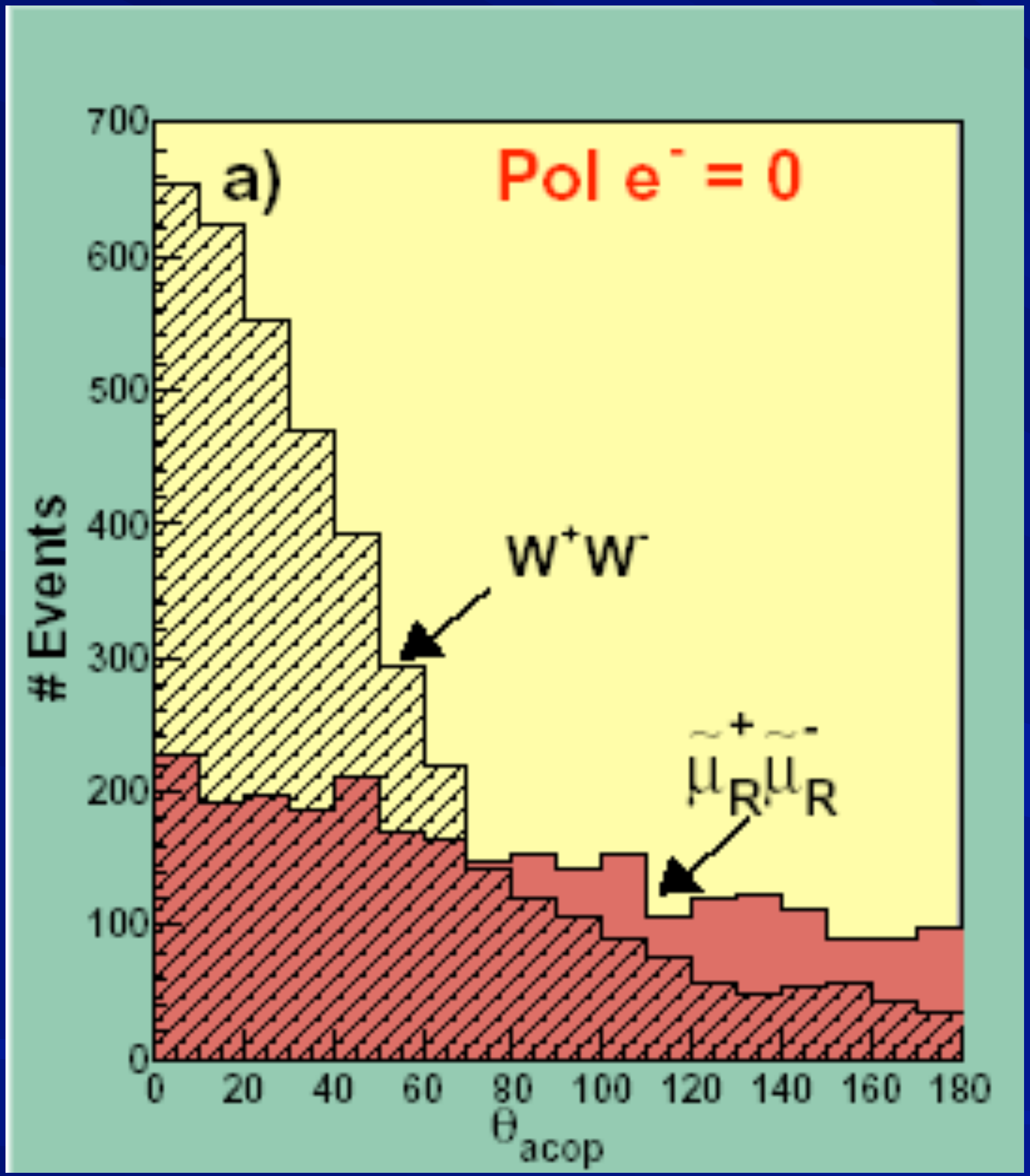


$\propto (g'^2 Y_f)^2$

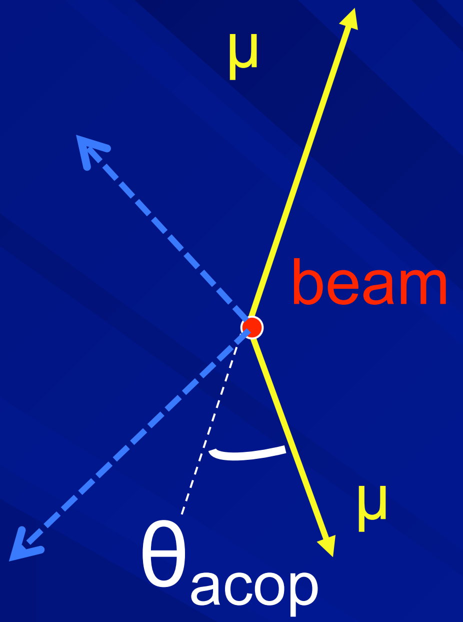
$\propto (g'^2 Y_f + g^2 I_{3f})^2$

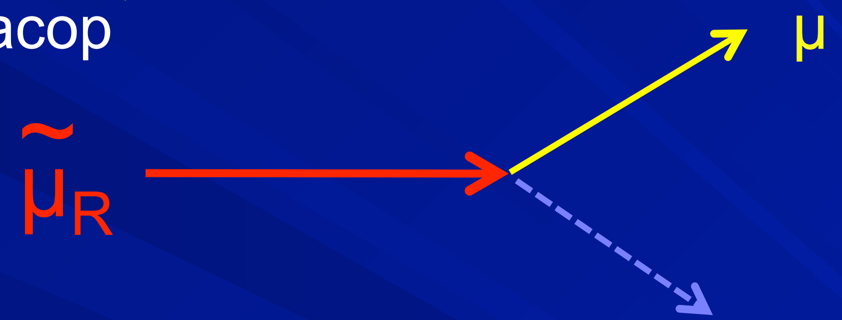
Power of electron polarization at ILC

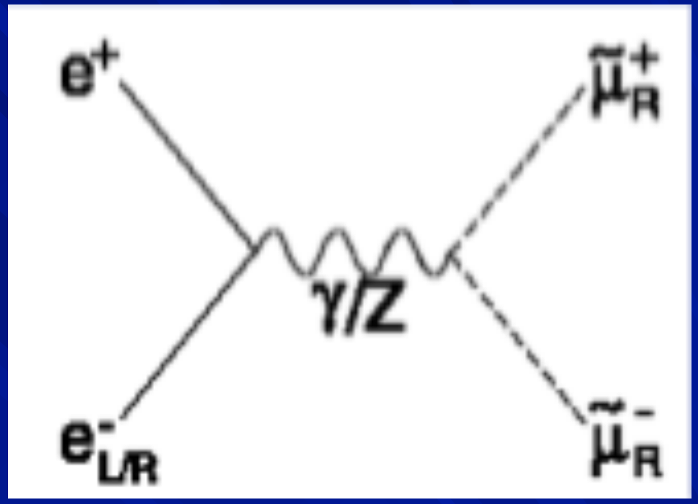
Scalar muon production

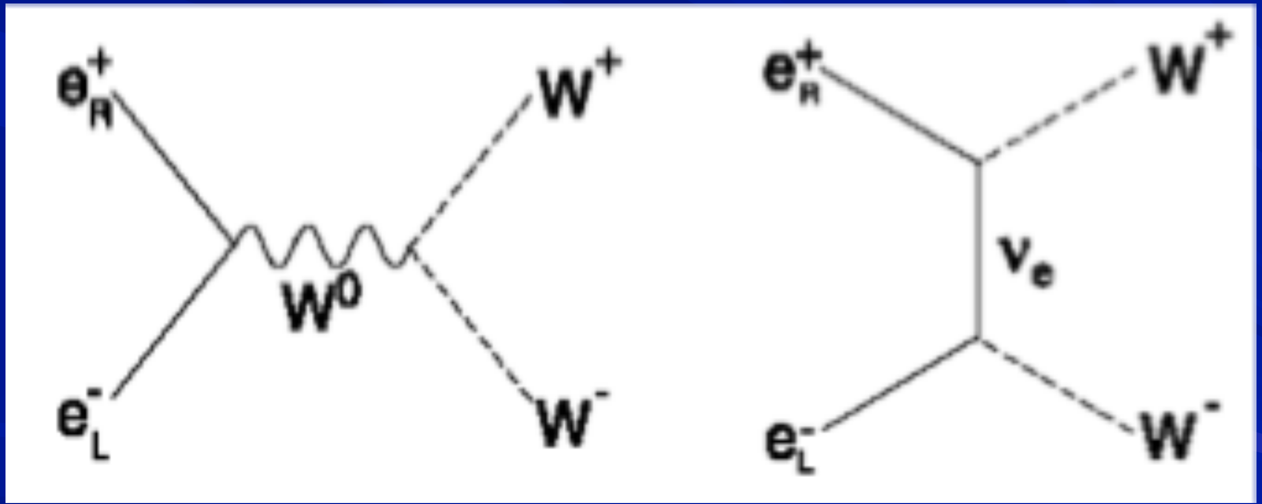


Unpolarized





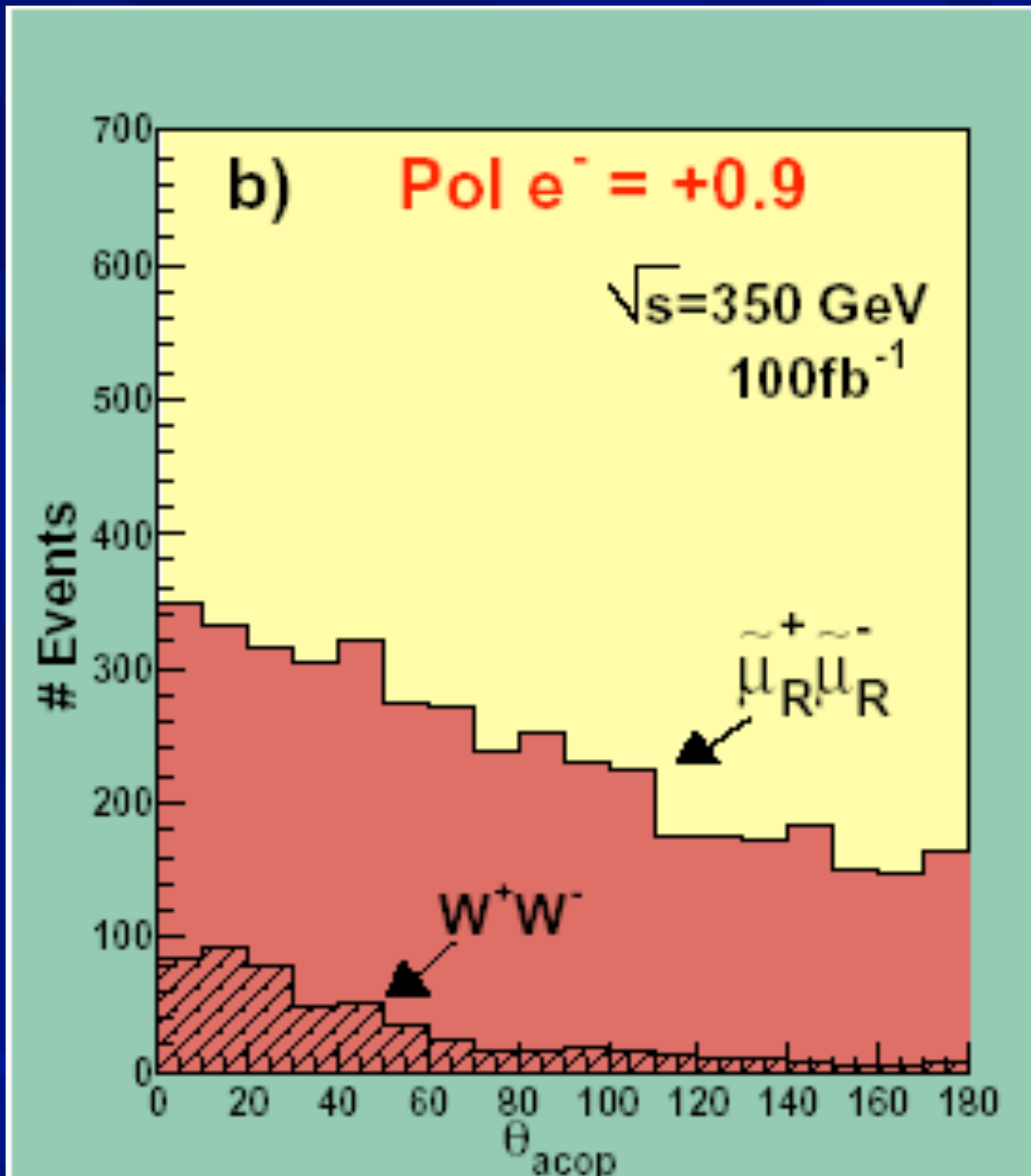




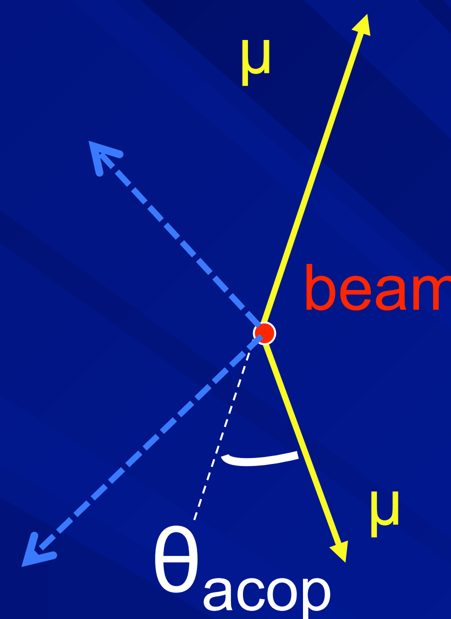
Background signal

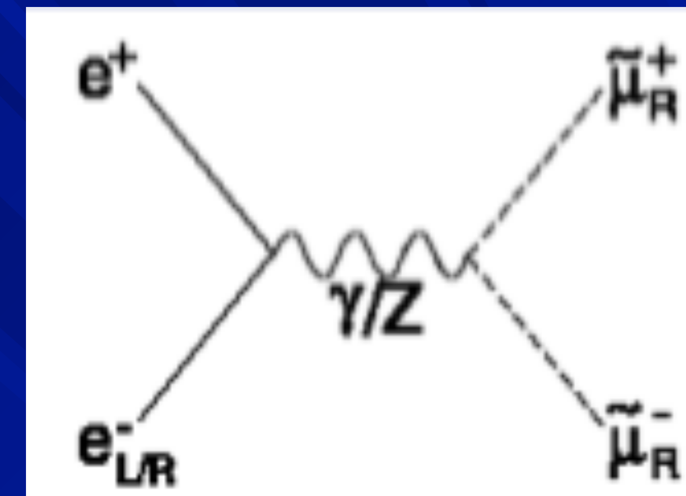
Power of electron polarization at ILC

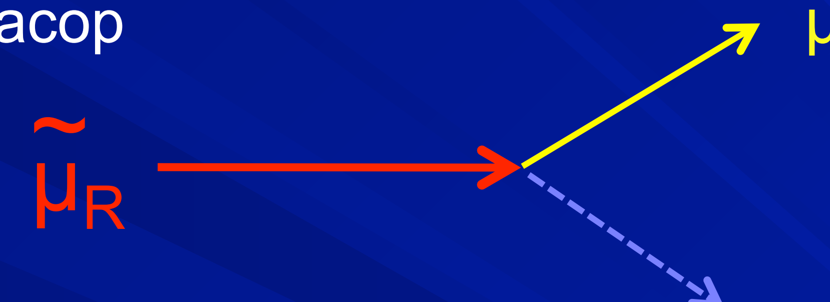
Scalar muon production

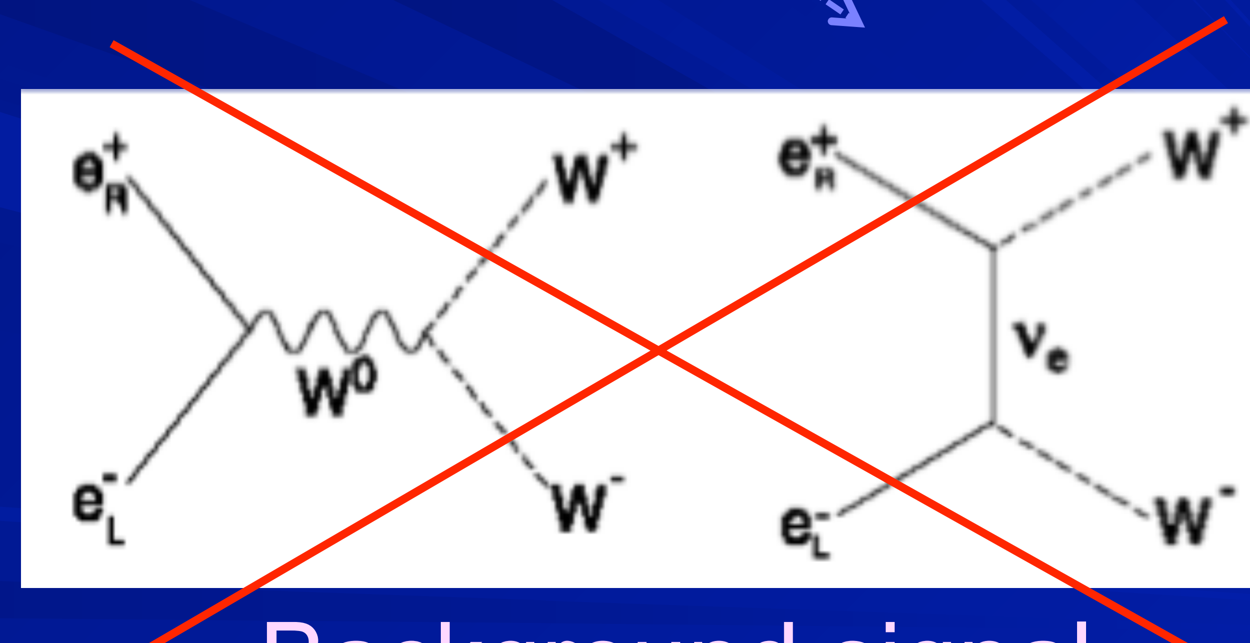


Polarized (90% e^-_R)





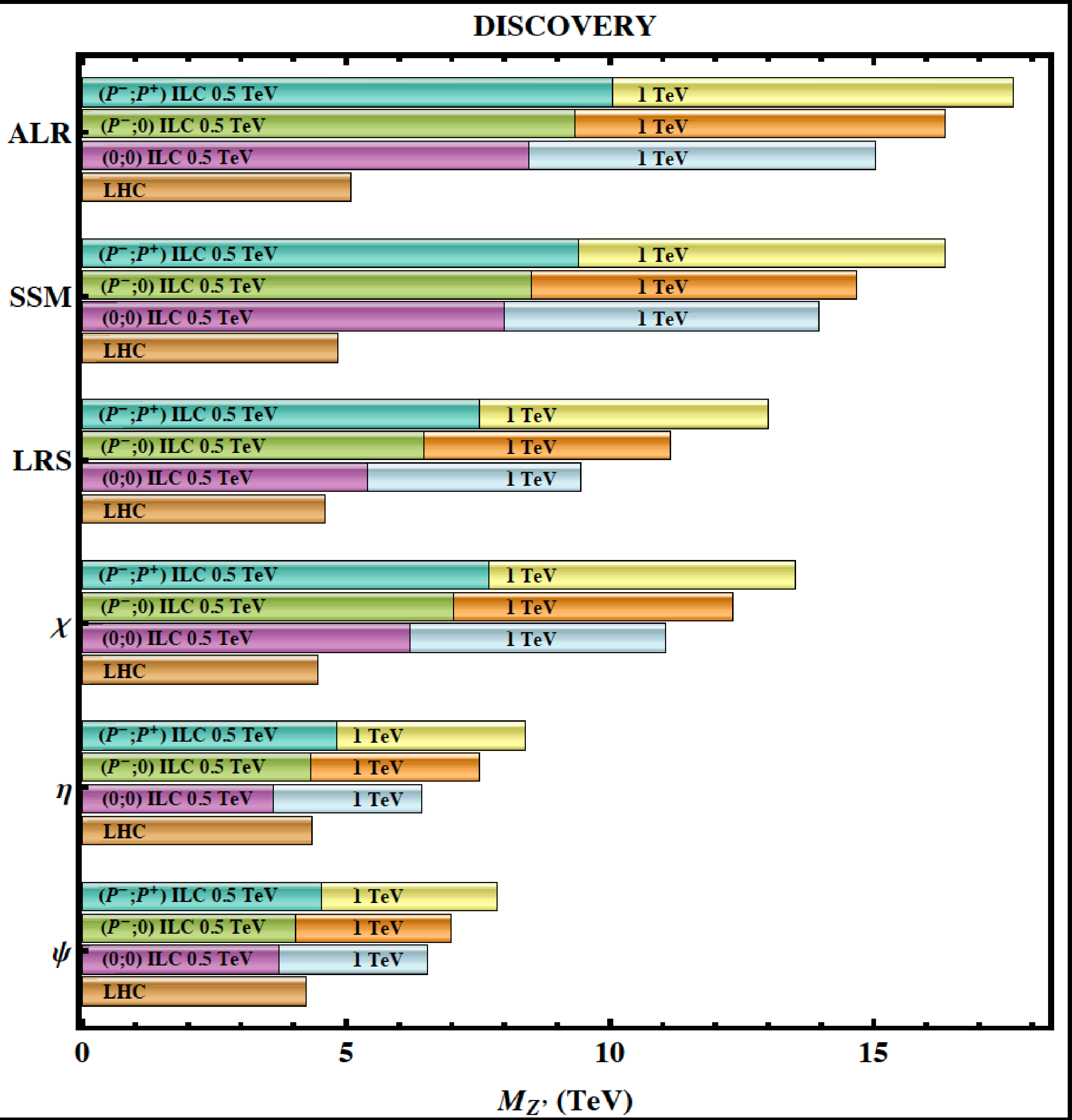


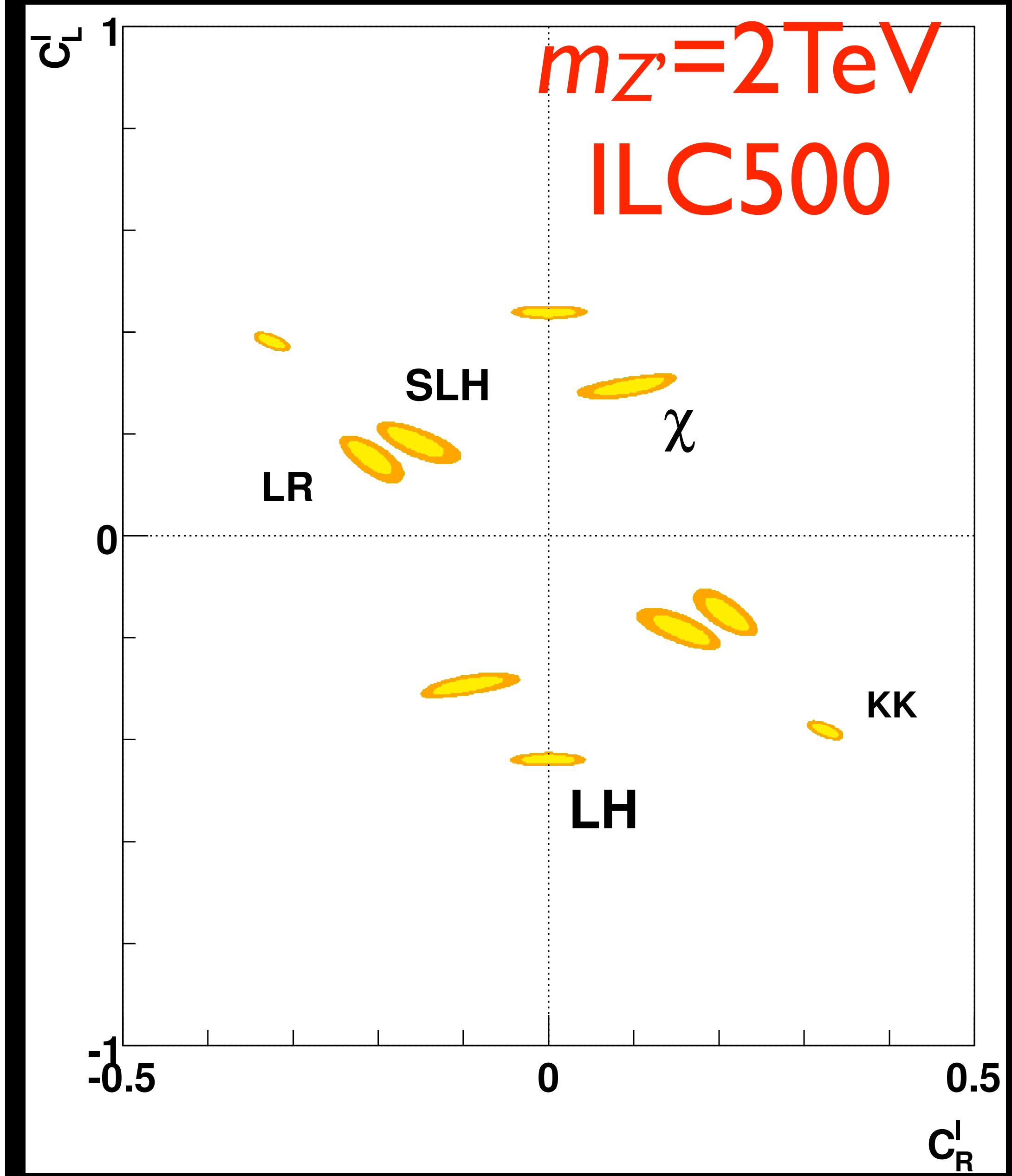


Background signal

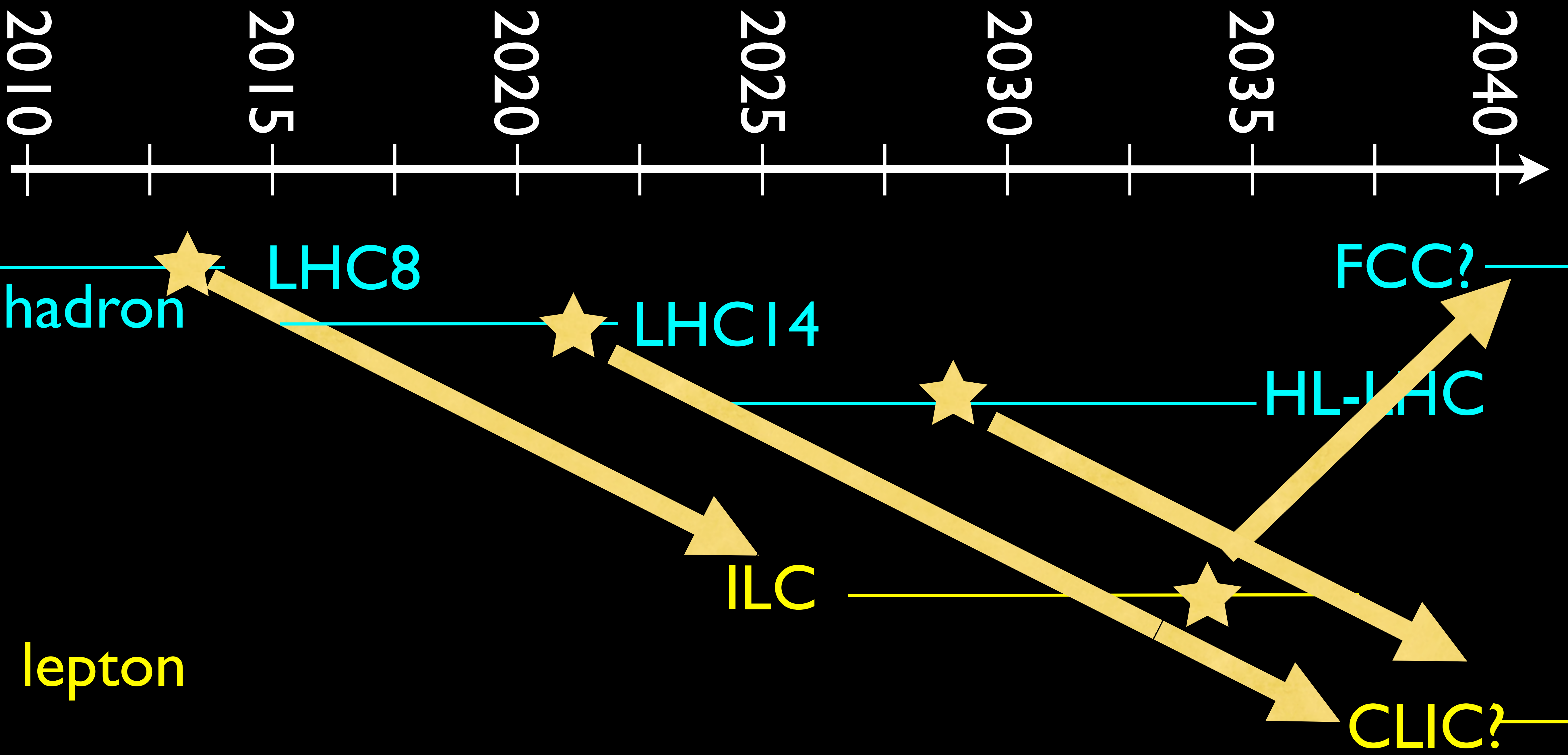
Sachio Komamiya @ Snowmass 2013

a new gauge boson

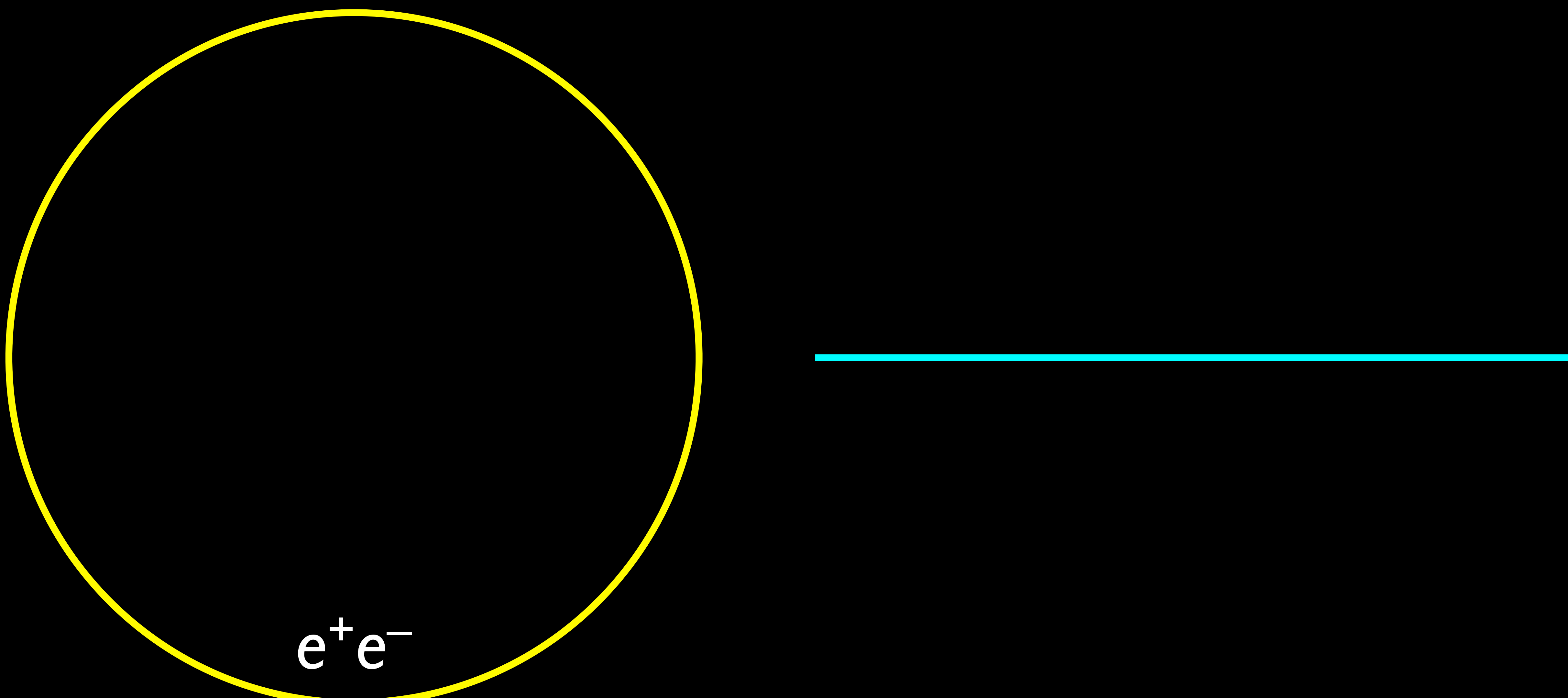




timeline?


2010
2015
2020
2025
2030
2035
2040
hadron
LHC8
LHC14
HL-LHC
FCC?
ILC
CLIC?
lepton

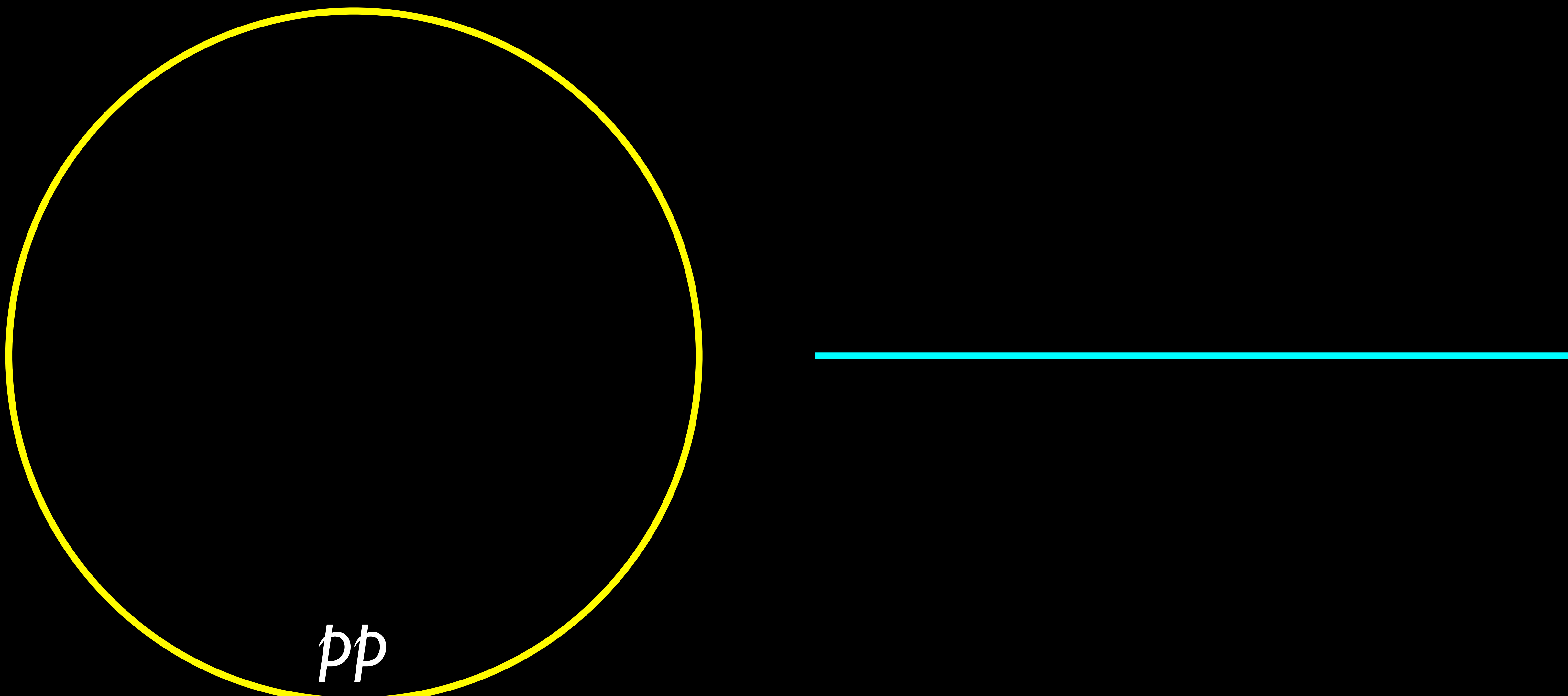
Exploring the Physics Frontier with Circular Colliders

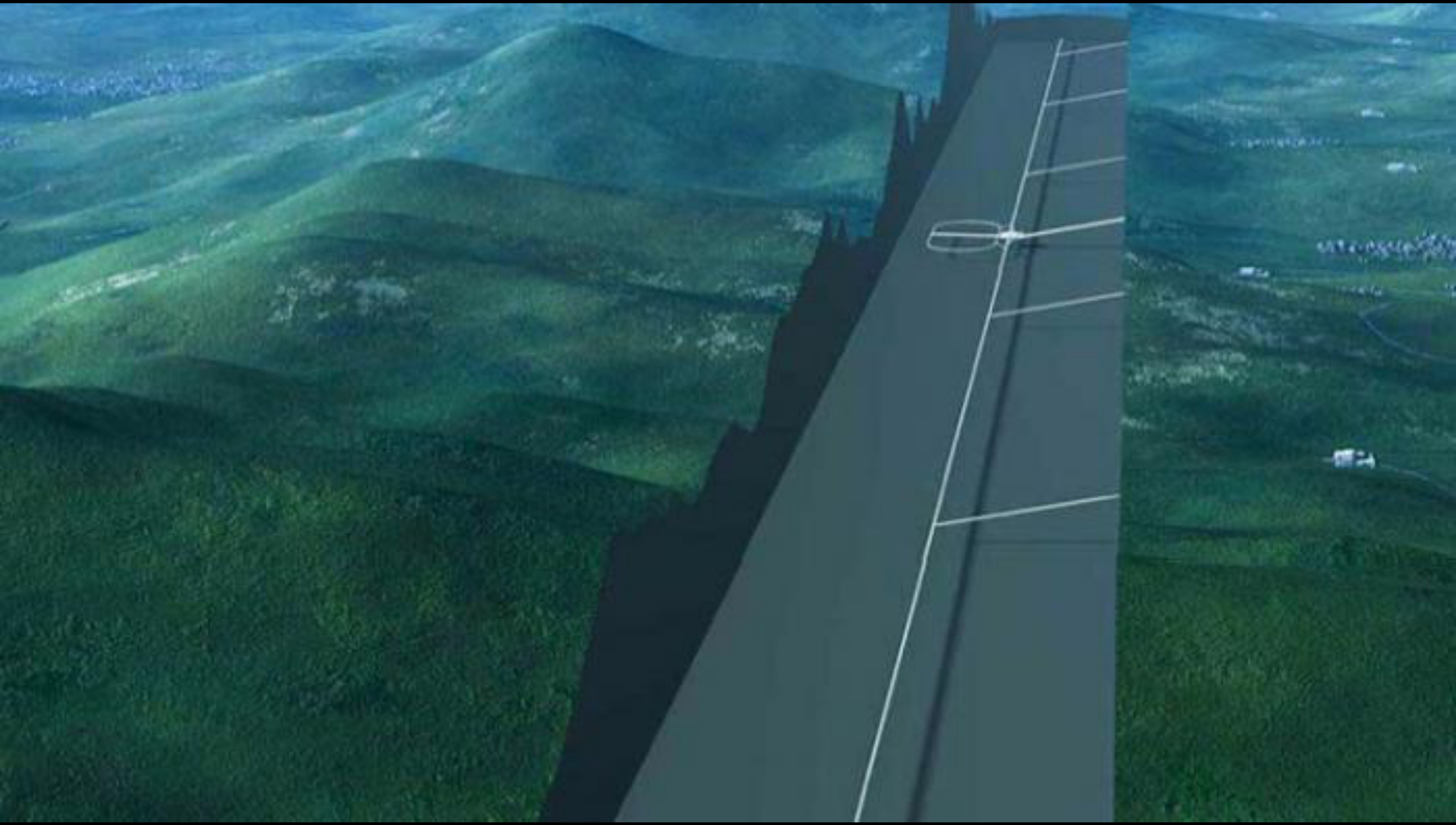


comparison

	ILC	FCCee	CEPC
lumi (250) 10^{34}	0.75 (x2)	6	2.0
lumi (350) 10^{34}	1.0 (x2)	1.6	0
lumi (500) 10^{34}	1.8 (x2)	0	0
polarization	80%/30%	0/0	0/0
max energy	1 TeV	350 GeV	240 GeV
power (MW)	128	280	
cost	$8B	€8B	

Exploring the Physics Frontier with Circular Colliders

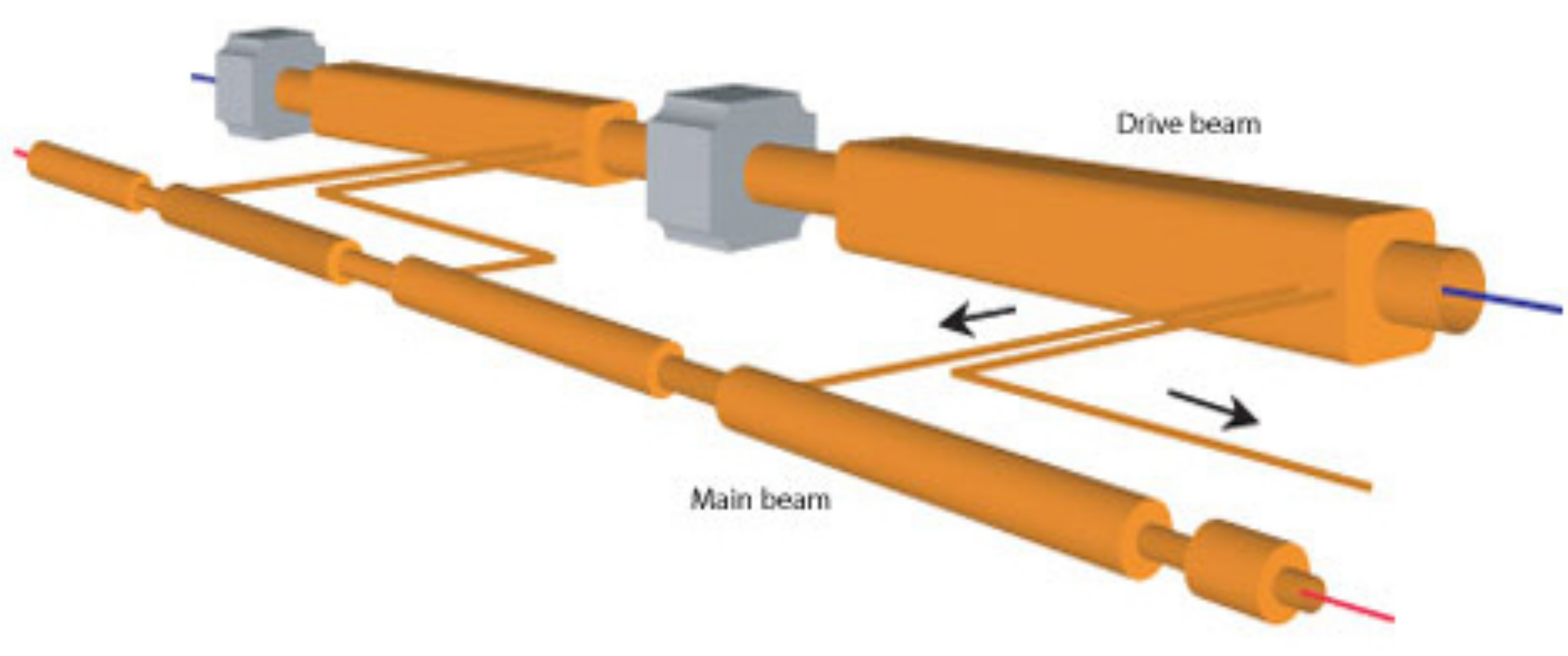


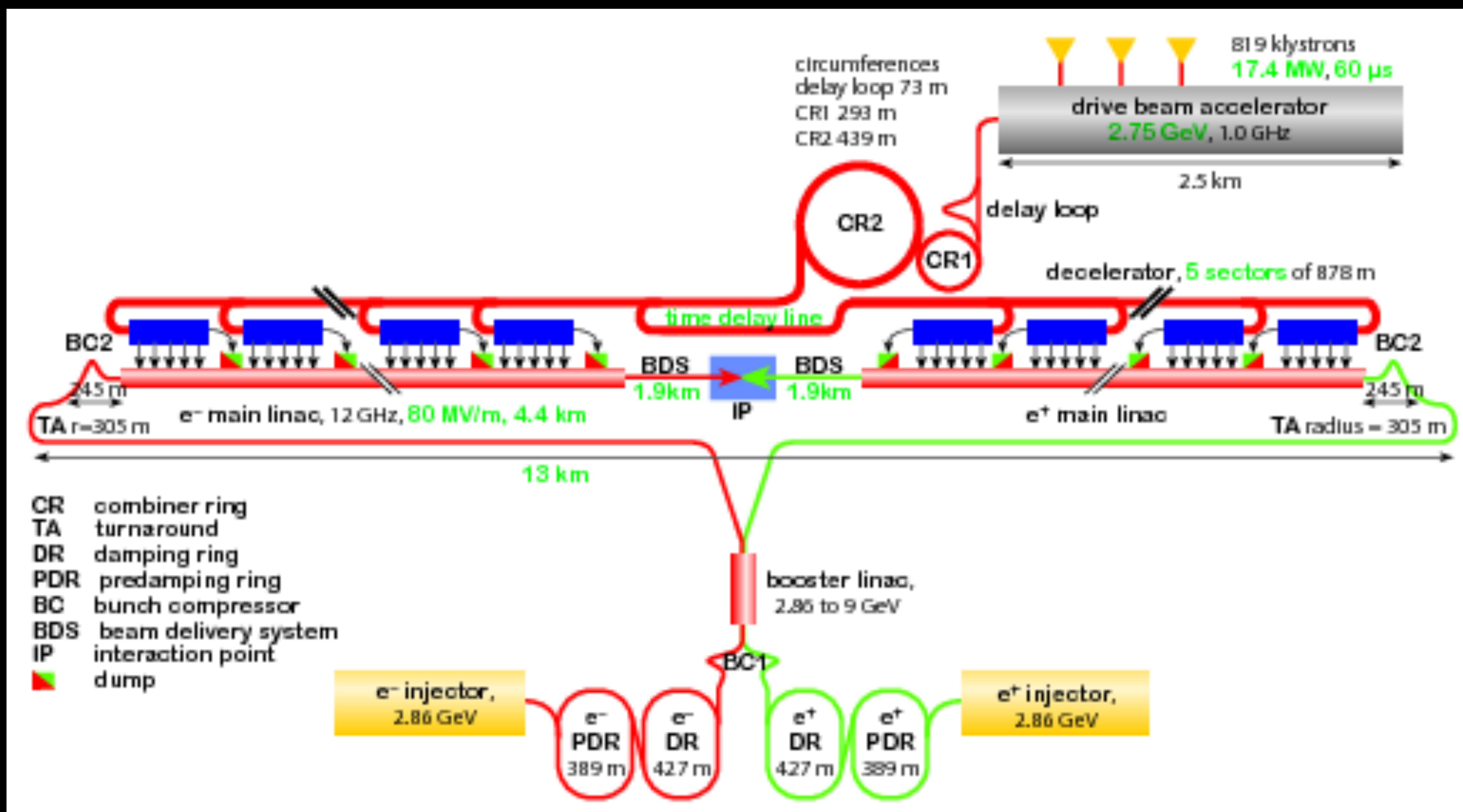


future upgrades

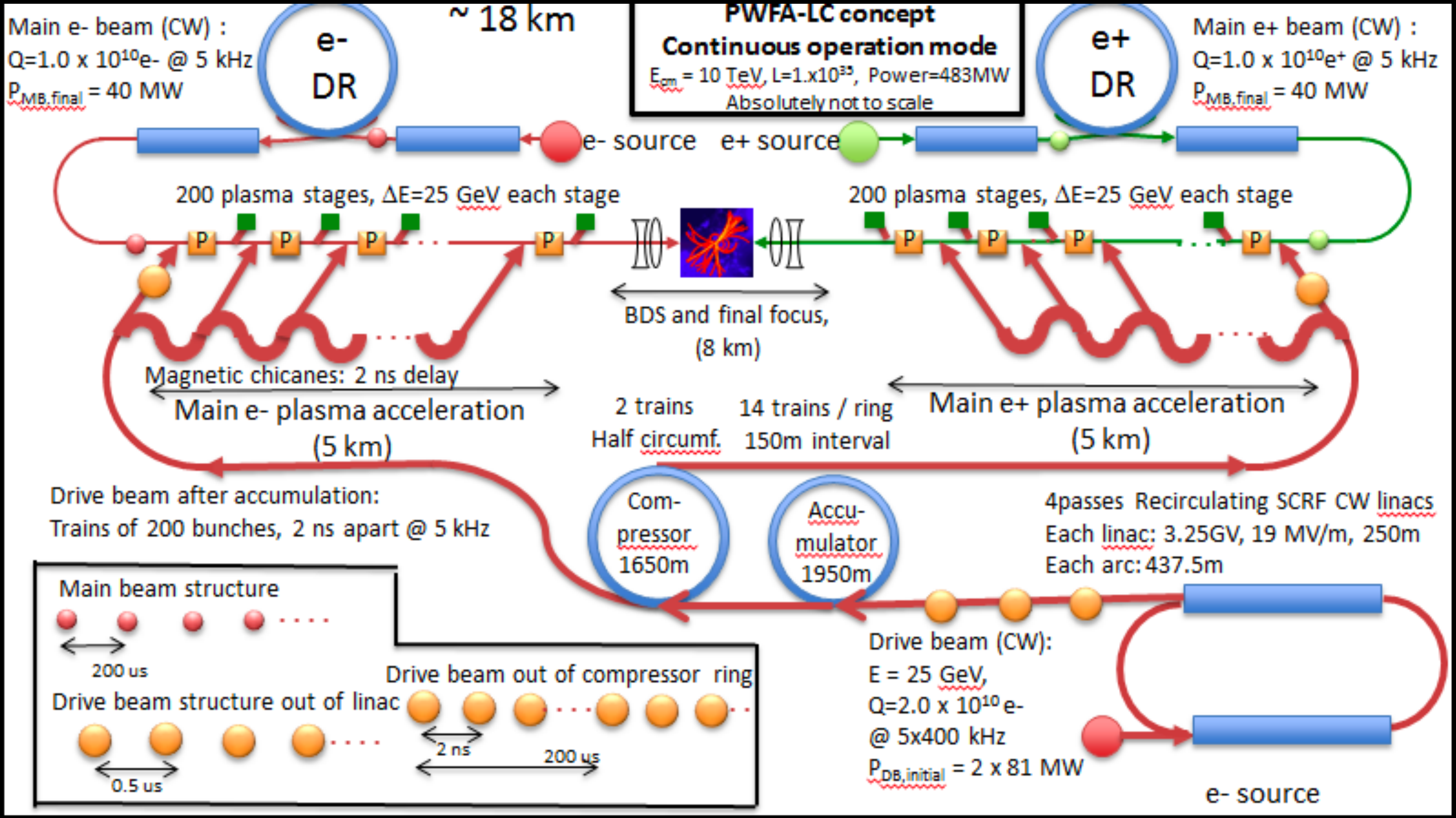
ILC	35MV/m	1TeV
CLIC	100MV/m	3TeV
PWFA	1GV/m	10TeV

CLIC


Drive beam
Main beam

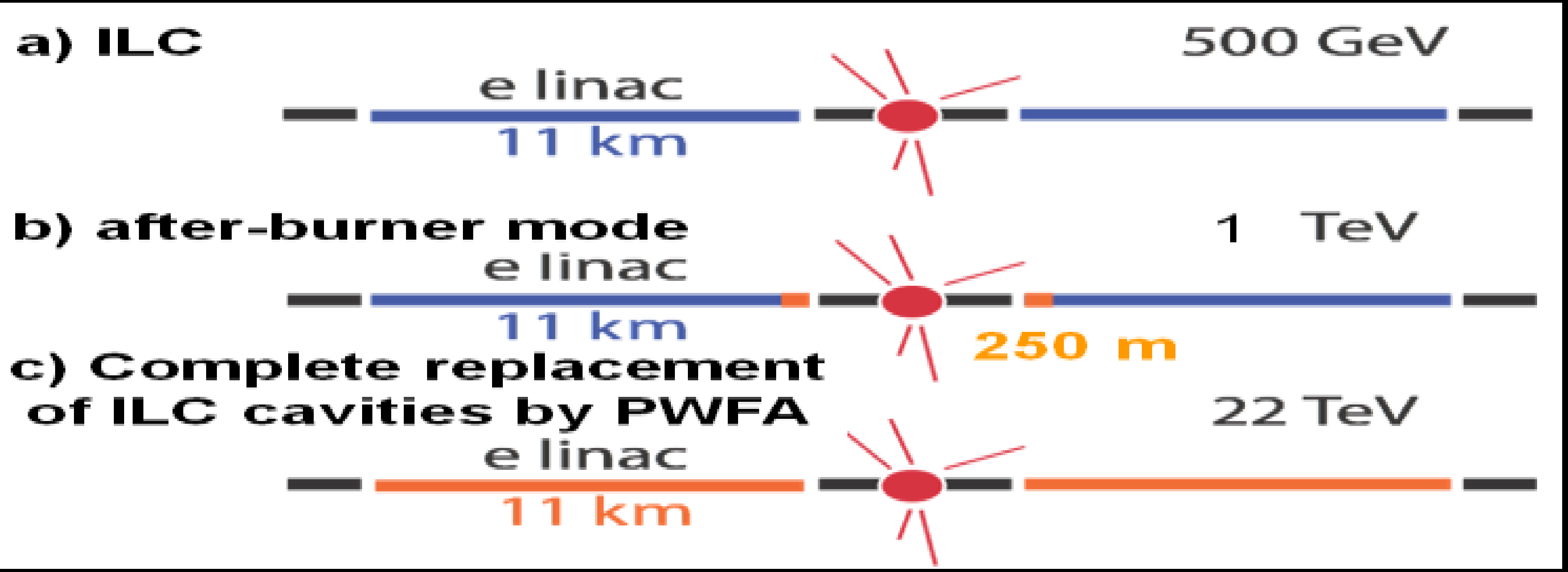

819 klystrons
17.4 MW, 60 μs
drive beam accelerator
2.75 GeV, 1.0 GHz
2.5 km
circumferences
delay loop 73 m
CR1 293 m
CR2 439 m
CR2
CR1
delay loop
decelerator, 5 sectors of 878 m
time delay line
BC2
BC2
BDS
1.9km
BDS
1.9km
IP
245 m
245 m
TA r=305 m
e⁻ main linac, 12 GHz, 80 MV/m, 4.4 km
e⁺ main linac
TA radius = 305 m
13 km
CR combiner ring
TA turnaround
DR damping ring
PDR predamping ring
BC bunch compressor
BDS beam delivery system
IP interaction point
dump
booster linac,
2.86 to 9 GeV
BC1
e⁻ injector,
2.86 GeV
e⁺ injector,
2.86 GeV
e⁻ PDR 389 m
e⁻ DR 427 m
e⁺ DR 427 m
e⁺ PDR 389 m

Plasma Wakefield



Delahaye et al, IPAC 2014

Parameter	Unit	ILC	ILC	ILC + PWFA
Energy (cm)	GeV	500	1000	PFWA = 500 to 1000
Luminosity (per IP)	$10^{34}cm^{-2}s^{-1}$	1.5	4.9	2.6
Peak (1%)Lum(/IP)	$10^{34}cm^{-2}s^{-1}$	0.88	2.2	1.3
# IP	-	1	1	1
Length	km	30	52	30
Power (wall plug)	MW	128	300	175
Lin. Acc. grad.(p/eff)	MV/m	31.5/25	36/30	7600/1000
# particles/bunch	10^{10}	2	1.74	0.66
# bunches/pulse	-	1312	2450	2450
Bunch interval	ns	554	366	366
Pulse repetition rate	Hz	5	4	15
Beam power/beam	MW	5.2	13.8	13.8
Norm Emitt (X/Y)	$10^{-6}/10^{-9}$radm	10/35	10/30	10/30
Sx, Sy, Sz at IP	nm,nm,μm	474/5.9/300	335/2.7/225	286/2.7/20
Crossing angle	mrad	14	14	14
Av # photons	-	1.70	2.0	0.7
δb beam-beam	%	3.89	9.1	9.3
Upsilon	-	0.03	0.09	0.52

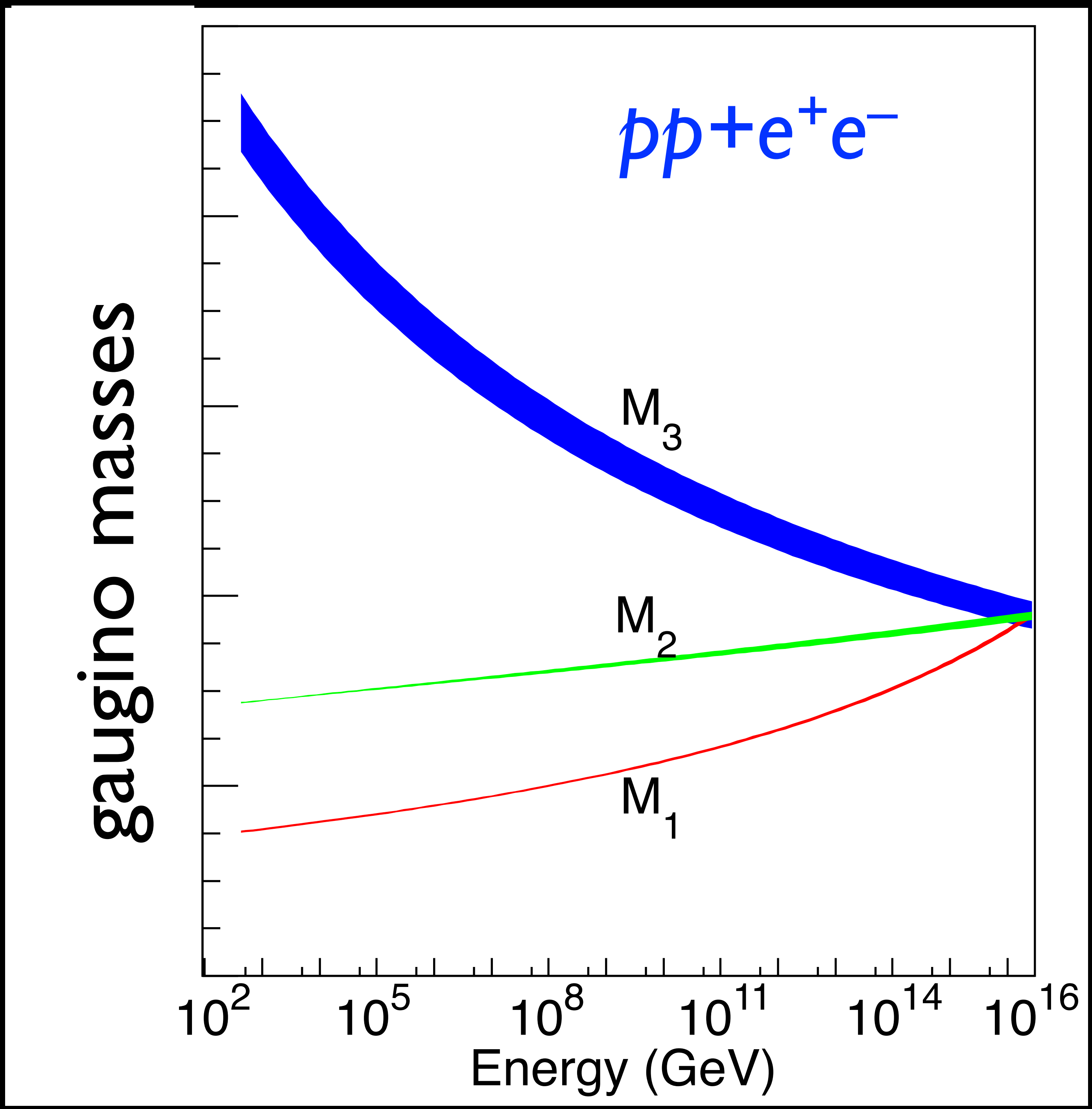


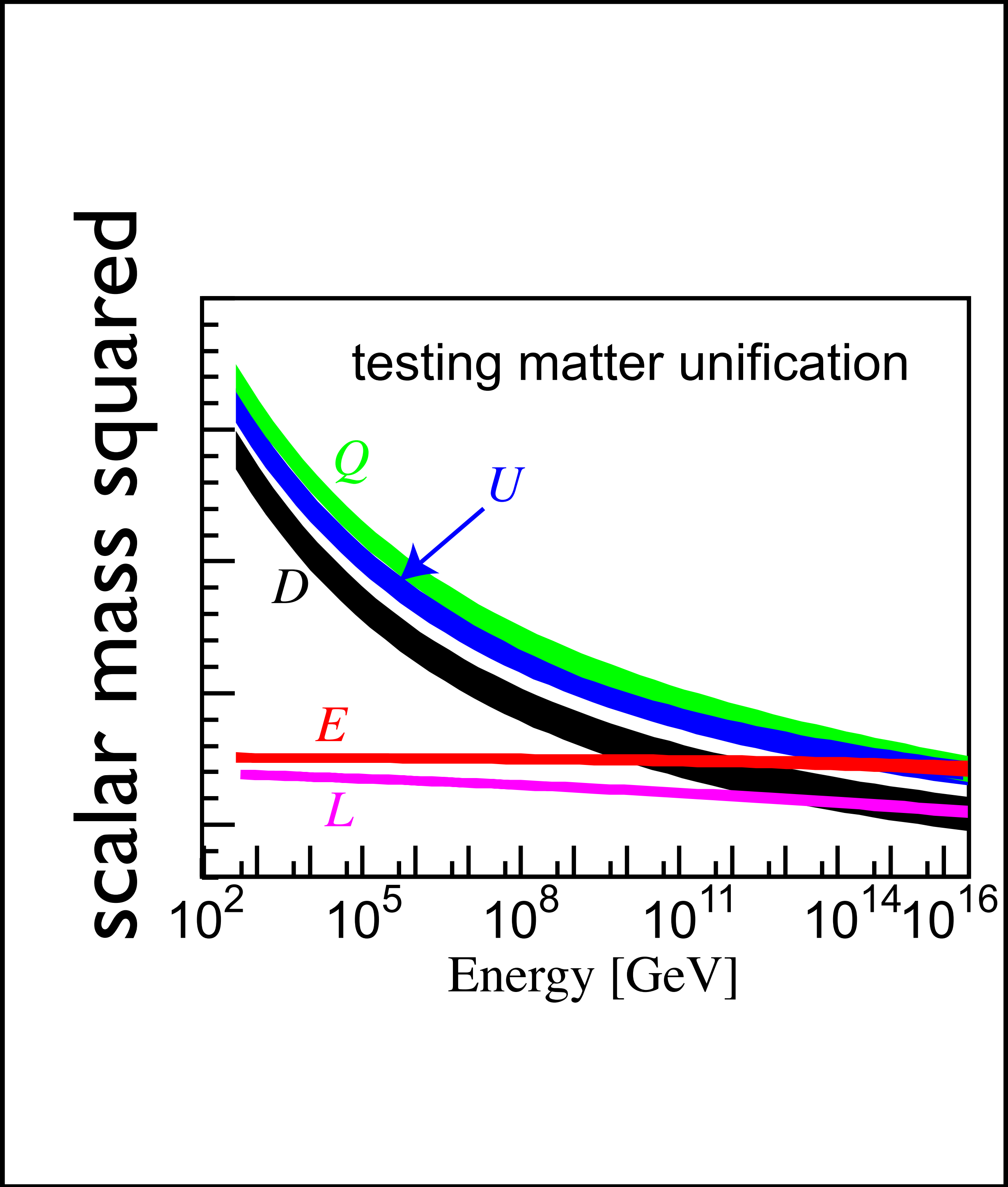
Delahaye et al, IPAC 2014

Colliding beam energy, CM	GeV	250	500	1000	3000	10000
N, experimental bunch		1.0E+10	1E+10	1.0E+10	1.0E+10	1.0E+10
Main beam bunches / train		1	1	1	1	1
Main beam bunch spacing,	nsec	3.33E+04	5.00E+04	6.67E+04	1.00E+05	2.00E+05
Repetition rate,	Hz	30000	20000	15000	10000	5000
n exp.bunch/sec,	Hz	30000	20000	15000	10000	5000
Beam power / beam at IP	W	6.0E+06	8.0E+06	1.2E+07	2.4E+07	4.0E+07
Effective accelerating gradient	MV/m	1000	1000	1000	1000	1000
Overall length of each linac	m	125	250	500	1500	5000
BDS (both sides)	km	2.00	2.50	3.50	5.00	8.00
Overall facility length	km	2.25	3.00	4.50	8.00	18.00
Drive beam						
Transfer efficiency drive to main	%	50	50	50	50	50
Drive beam power per beam	MW	12.2	16.2	24.3	48.6	81.0
Drive beam acceleration efficiency	%	39.9	42.0	44.3	45.0	45.3
Main beam acceleration efficiency	%	19.9	21.0	22.1	22.5	22.7
Wall plug to main beam efficiency	%	9.1	10.8	13.1	16.1	17.0
Total wall plug power	MW	132.9	150.4	185.5	301.3	477.9
IP Parameters						
Normalized horizontal emittance	m	1.00E-05	1.00E-05	1.00E-05	1.00E-05	1.00E-05
Normalized vertical emittance	m	3.50E-08	3.50E-08	3.50E-08	3.50E-08	3.50E-08
Horiziontal beam size at IP (1σ)	m	6.71E-07	4.74E-07	3.35E-07	1.94E-07	1.06E-07
Vertical beam size at IP (1σ)	m	3.78E-09	2.67E-09	1.89E-09	1.09E-09	5.98E-10
Bunch length at IP (1σ)	m	2.00E-05	2.00E-05	2.00E-05	2.00E-05	2.00E-05
Disruption parameter, Y		8.44E-02	2.39E-01	6.75E-01	3.51E+00	2.14E+01
delta_B	%	2.75	6.66	12.76	23.10	29.88
ngamma		0.57	0.73	0.88	1.05	1.14
Geometric Lum (cm^{-2} s^{-1})		9.41E+33	1.25E+34	1.88E+34	3.76E+34	6.27E+34
Total Luminosity (cm^{-2} s^{-1})		1.57E+34	2.09E+34	3.14E+34	6.27E+34	1.05E+35
Luminosity in 1% top energy (cm^{-2} s^{-1})		9.41E+33	1.15E+34	1.57E+34	2.51E+34	3.14E+34
Fig. merit:Luminosity/wall plug (10^{31}/MW)		11.8	13.9	16.9	20.8	21.9

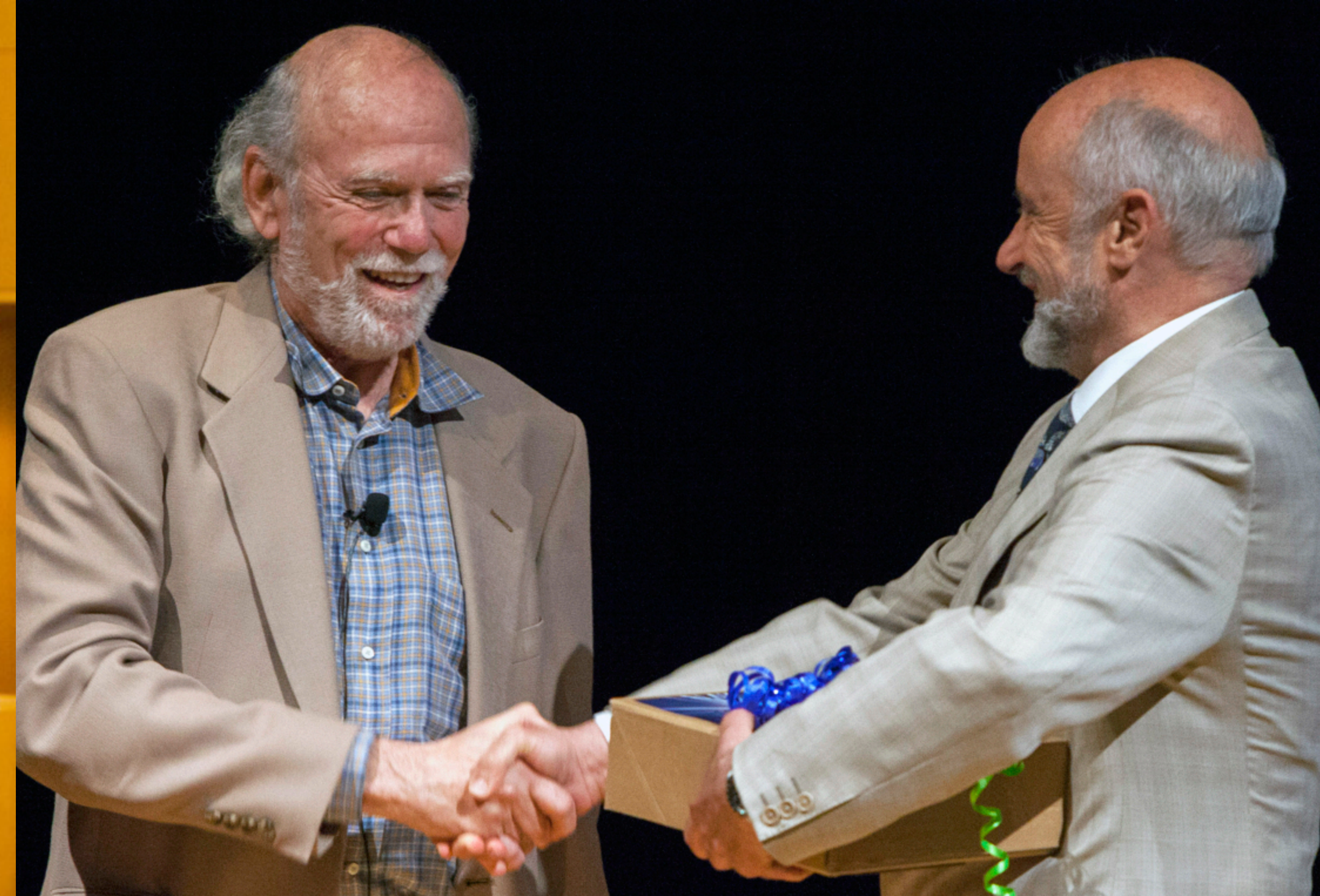
Delahaye et al, IPAC 2014

Superpartners as probe

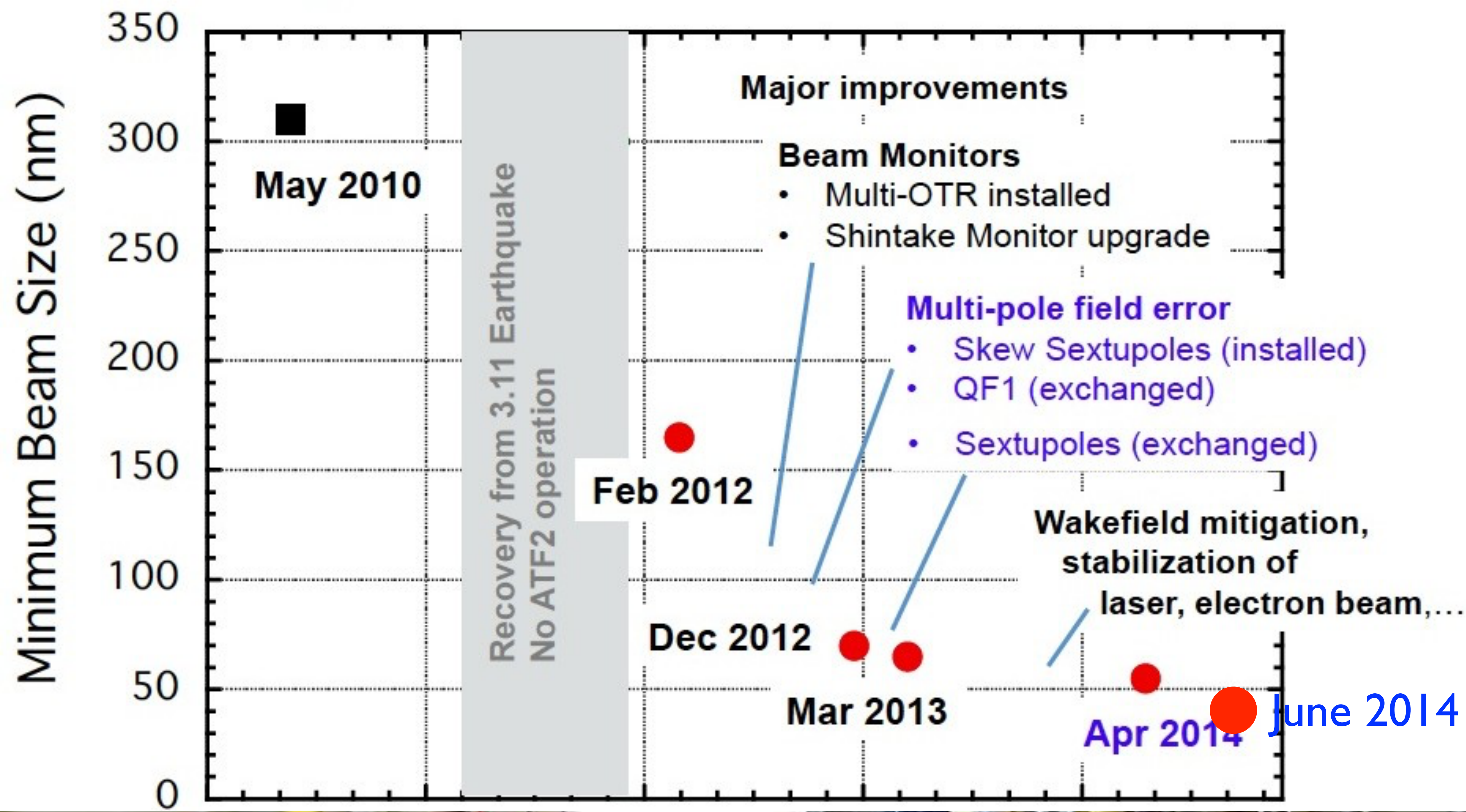


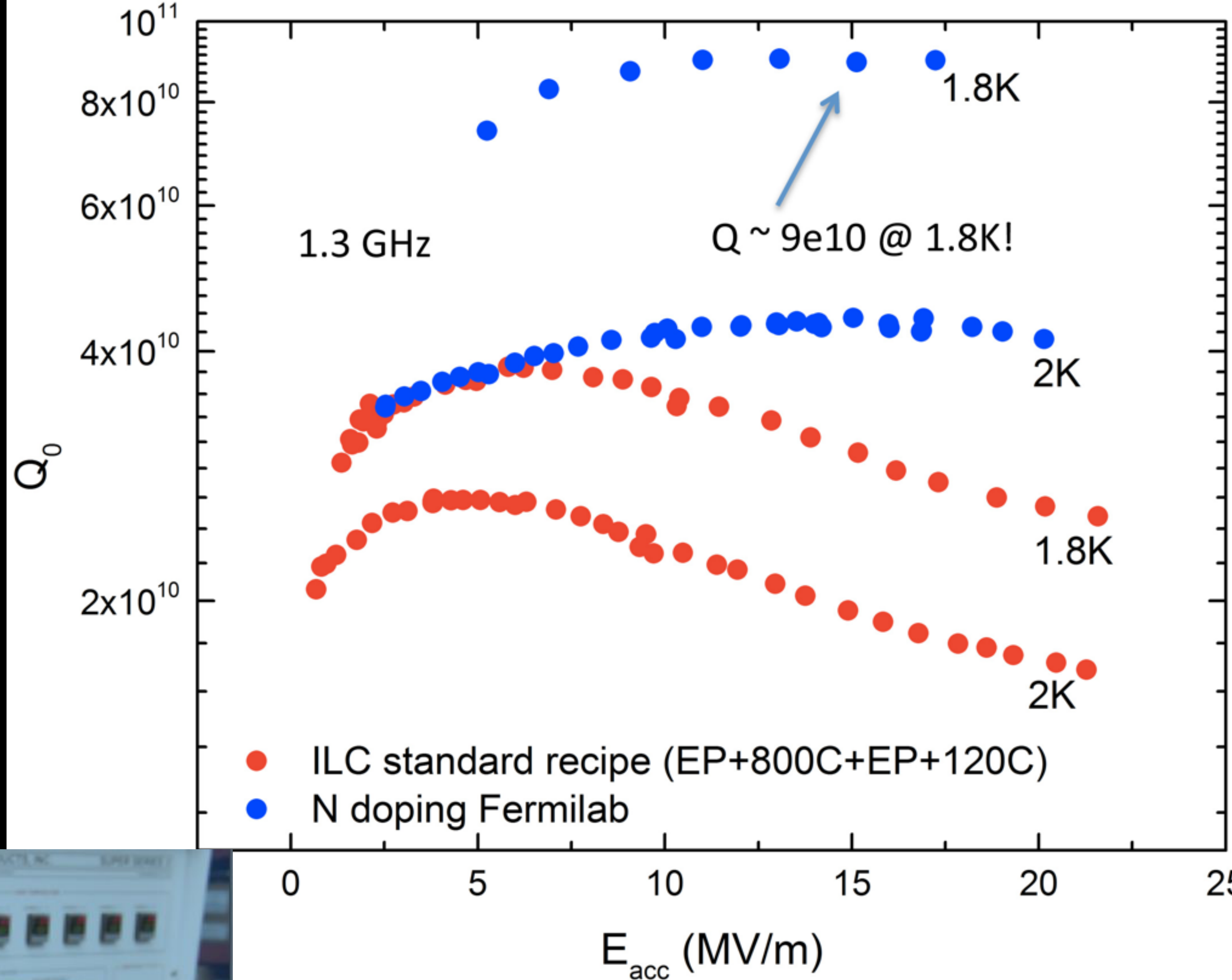


Isn’t ILC a pipe dream?



June 12, 2013
TDR handoff


Minimum Beam Size (nm)
350
300
250
200
150
100
50
0
May 2010
Recovery from 3.11 Earthquake
No ATF2 operation
Major improvements
Beam Monitors
• Multi-OTR installed
• Shintake Monitor upgrade
Multi-pole field error
• Skew Sextupoles (installed)
• QF1 (exchanged)
• Sextupoles (exchanged)
Wakefield mitigation,
stabilization of
laser, electron beam,…
Feb 2012
Dec 2012
Mar 2013
Apr 2014
June 2014


1.3 GHz
Q ~ 9e10 @ 1.8K!
1.8K
2K
1.8K
2K
ILC standard recipe (EP+800C+EP+120C)
N doping Fermilab
Q_0
E_{acc} (MV/m)
10^11
8x10^10
6x10^10
4x10^10
2x10^10
0
5
10
15
20
25


JAHEP statement Oct 2012

In March 2012, the Japan Association of High Energy Physicists (JAHEP) accepted the recommendations of the Subcommittee on Future Projects of High Energy Physics(1) and adopted them as JAHEP's basic strategy for future projects. In July 2012, a new particle consistent with a Higgs Boson was discovered at LHC, while in December 2012 the Technical Design Report of the International Linear Collider (ILC) will be completed by a worldwide collaboration.

On the basis of these developments and following the subcommittee's recommendation on ILC, JAHEP proposes that ILC be constructed in Japan as a global project with the agreement of and participation by the international community in the following scenario:

(1) Physics studies shall start with a precision study of the "Higgs Boson", and then evolve into studies of the top quark, "dark matter" particles, and Higgs self-couplings, by upgrading the accelerator. A more specific scenario is as follows:

(A) A Higgs factory with a center-of-mass energy of approximately 250 GeV shall be constructed as a first phase.

(B) The machine shall be upgraded in stages up to a center-of-mass energy of ~500 GeV, which is the baseline energy of the overall project.

(C) Technical extendability to a 1 TeV region shall be secured.

June 2013

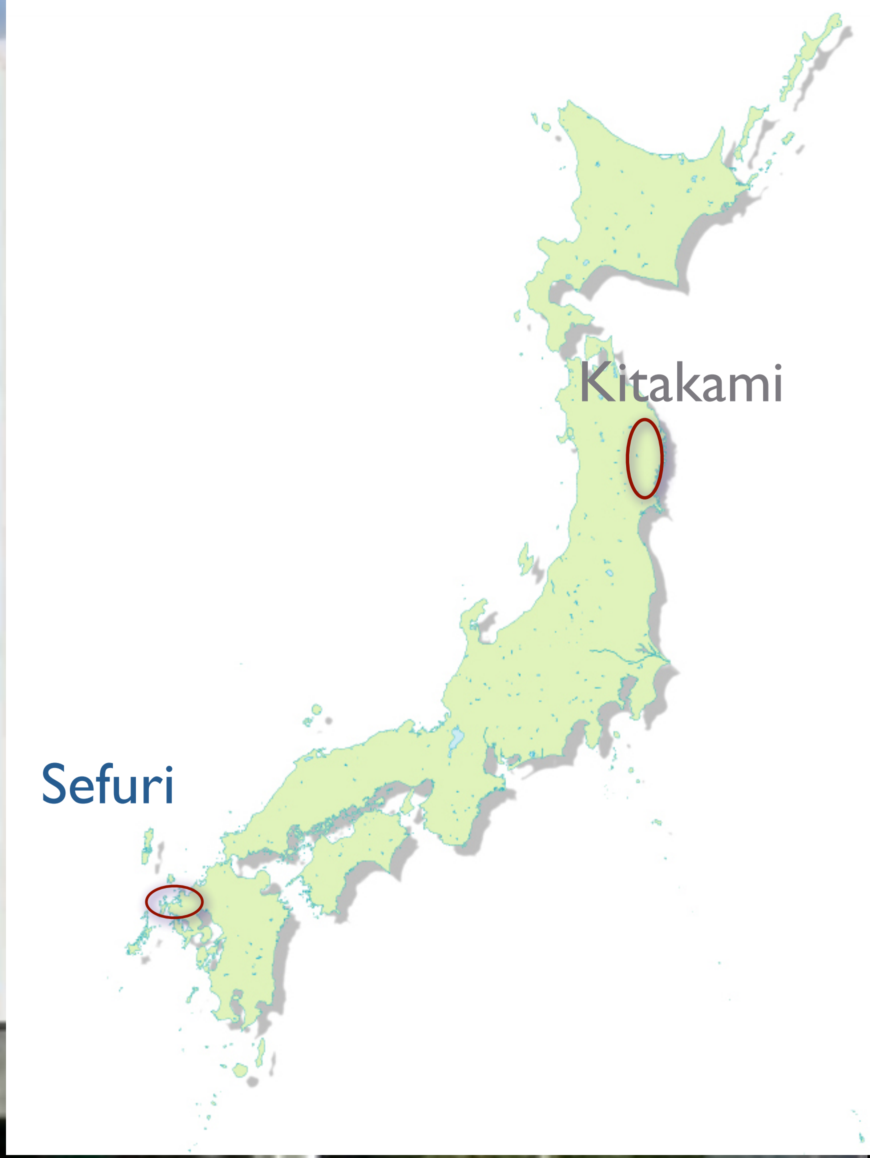
European Strategy

There is a strong scientific case for an electron-positron collider, complementary to the LHC, that can study the properties of the Higgs boson and other particles with unprecedented precision and whose energy can be upgraded. The Technical Design Report of the International Linear Collider (ILC) has been completed, with large European participation. The initiative from the Japanese particle physics community to host the ILC in Japan is most welcome, and European groups are eager to participate. Europe looks forward to a proposal from Japan to discuss a possible participation.

US P5 Report

2014.6

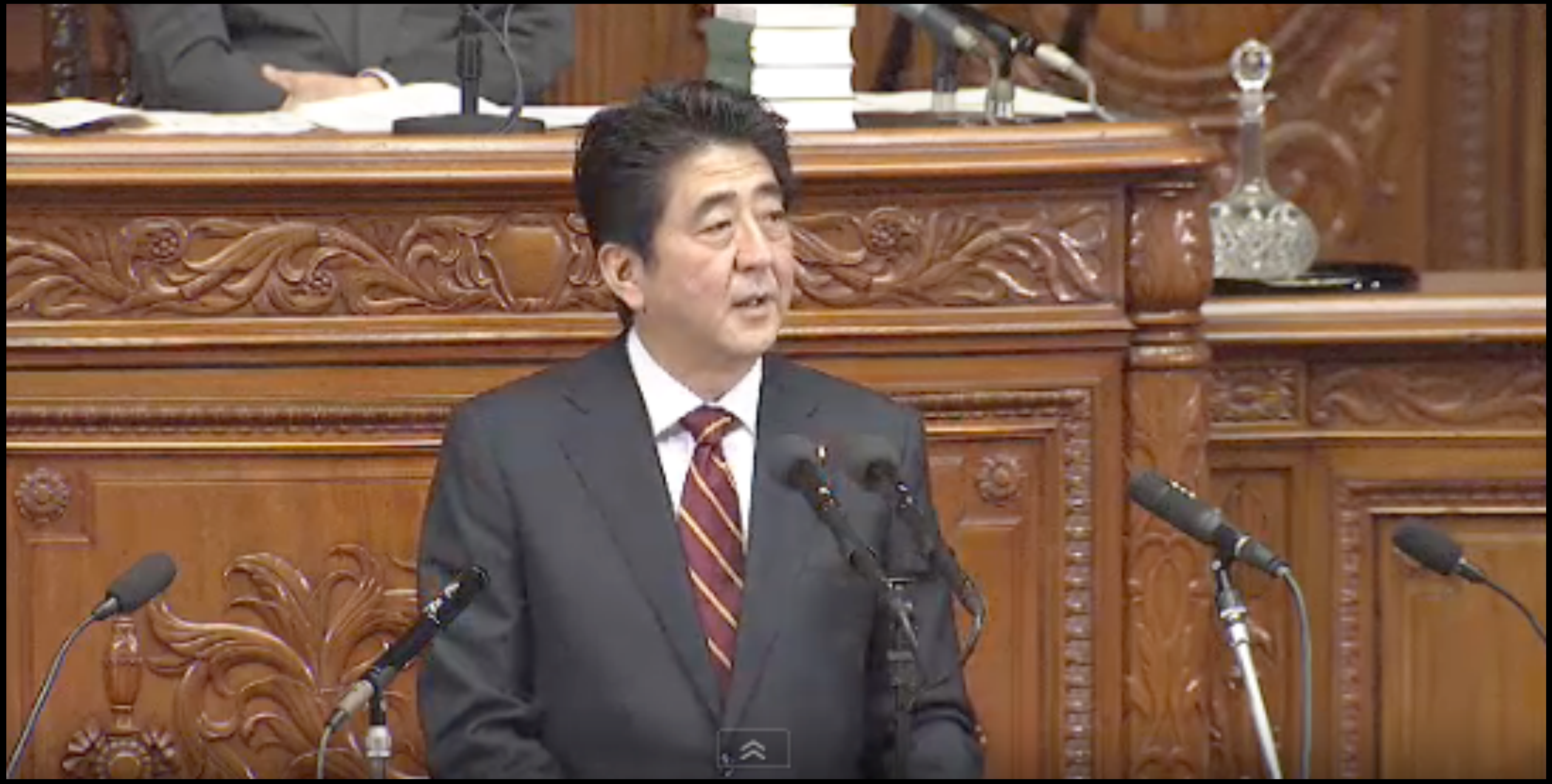
Recommendation 11: Motivated by the strong scientific importance of the ILC and the recent initiative in Japan to host it, the U.S. should engage in modest and appropriate levels of ILC accelerator and detector design in areas where the U.S. can contribute critical expertise. Consider higher levels of collaboration if ILC proceeds.



strong support from politicians, industry, regions

Inaugural Speech by PM Abe Feb 28, 2013

- *'Japan is driving global innovation in cutting-edge areas, including among others the world's first production test of marine methane hydrate, a globally unparalleled rocket launch success rate, and our attempts to develop the most advanced accelerator technology in the world.'*



PM Abe at the 83rd session of Diet

Lyn Evans meets Prime Minister Mar 27, 2013

I understand ILC is a dream for humankind.
I need to monitor the developments carefully to see what role Japan can play.

March 27

Federation of Diet members to promote a construction of international laboratory for LC

>20% of Diet members signed up to support ILC

They passed a resolution on June 12

平成 25 年 6 月 12 日

国際リニアコライダー計画推進に関する決議

リニアコライダー（先端線型加速器）
国際研究所建設推進議員連盟

1. The site must be chosen purely based on scientific reasons.
2. After the selection, we provide nationwide support.
3. Government must start a process to decide whether to host the ILC ASAP.
4. Government must create a headquarter within the cabinet to work across the ministries.
5. Government must announce its process to relevant countries.
6. Further studies must be conducted to maximize the technological and economic benefits.

知の地平を切り拓き、
を創るものであると
の技術利用によりオ
と、海外からの頭脳
育成」を加速するこ
なモデルとすること
ナンバーワン」を取

誘致の是非の検討を
と分担する交渉の早
解を得ることが必須

、世界から本計画実
プロジェクトとして、
見据えて推進すべき

１．　ＩＬＣ建設国内候補地は、科学的、学術的観点からのみ決定されるべきこと。
２．　候補地決定後は地域を超えたオールジャパンで推進すること。
３．　政府は、ＩＬＣ日本誘致の是非を可及的速やかに検討を開始すること。
４．　政府は、ＩＬＣ日本誘致の実現のために、内閣に司令塔を設置し、日本の科学技術外交の総力戦で臨むこと。政府は文科省だけでなく外務省、経産省も含めたチーム体制で、中長期の視野に立ち交渉を進めること。
５．　政府は、ＩＬＣ日本誘致の是非の検討を開始することを関係国へ発信すること。
６．　ＩＬＣの技術波及・経済波及について、最大限の効果が得られるよう、ＩＬＣ推進と並行して調査研究を推進すること。

Science Council

MEXT asked SCJ to evaluate ILC on four points

1) Scientific significance of the research using ILC, and the positioning of ILC project in the context of particle physics.
2) Positioning of ILC Project in the context of overall scientific activity in Japan.
3) Significance of hosting ILC for Japanese people and society.
4) Current state of preparation and necessary conditions for the implementation of ILC project, including securement of budget and manpower for construction and operation of ILC.

MEXT Investigation: Discussion at Working Groups

Task Force
(Head: State Minister)

→ **Special Committee On ILC Project**

1st Meeting: May 2014
2nd Meeting: Nov. 2014 (planed)
Plan to conclude by 2016

Research Contract on External Impact → Special Committee

Evaluate technological and economic Impact
[Budget 1$=100\]
FY14: $0.5M (approved)
FY15: $1.0M (requested)

Special Committee → WG1, WG2

WG1: Revisiting Scientific Merit

1st Meeting: June 2014
Held 5 Meetings

WG2: Evaluation of TDR & Cost estimates

1st Meeting: June 2014
Held 3 Meetings

Based on SCJ's recommendations, Special Committee investigates critical issues required to judge hosting ILC or not by 2016.

Timeline

Proposed by LCC

- 2013 - 2016
  - Negotiations among governments
  - Accelerator detailed design, R&Ds for cost-effective production, site study, CFS designs etc.
  - Prepare for the international lab.
- 2016 – 2018
  - 'Green-sign' for the ILC construction to be given (in early 2016)
  - International agreement reached to go ahead with the ILC
  - Formation of the ILC lab.
  - Preparation for biddings etc.
- 2018
  - Construction start (9 yrs)
- 2027
  - Construction (500 GeV) complete, (and commissioning start)
    (250 GeV is slightly shorter)