



# Summary Talk: BSM Session

European Linear Collider Workshop ECFA LC2013

31st May, 2013

Aoife Bharucha

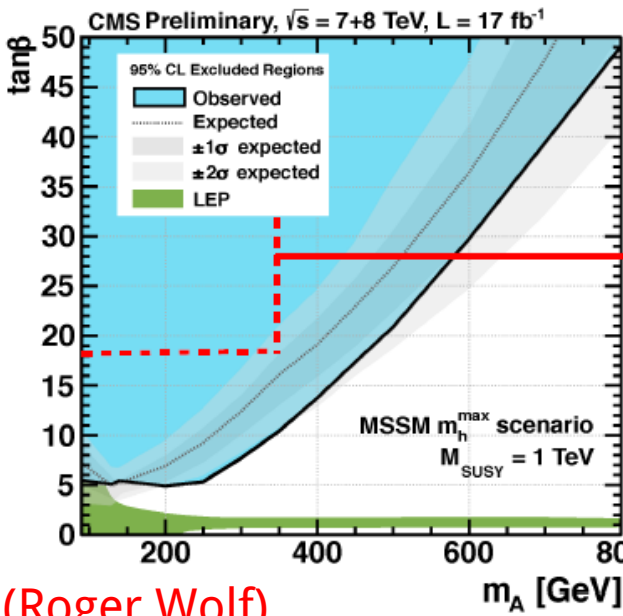


Universität Hamburg

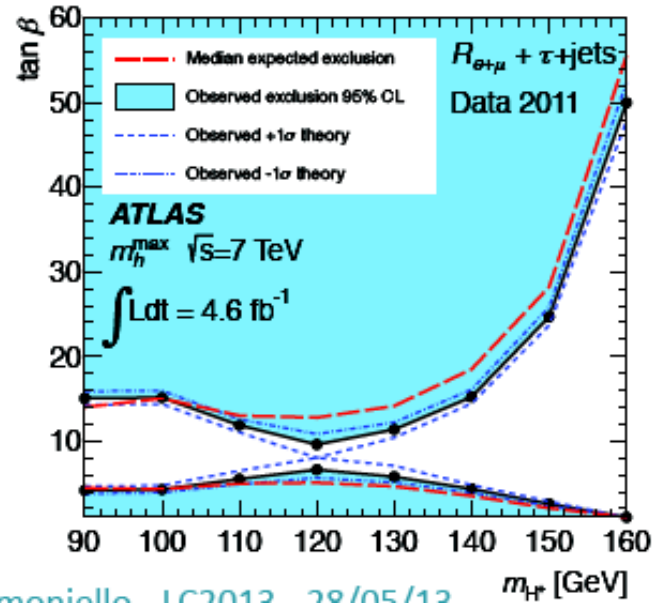
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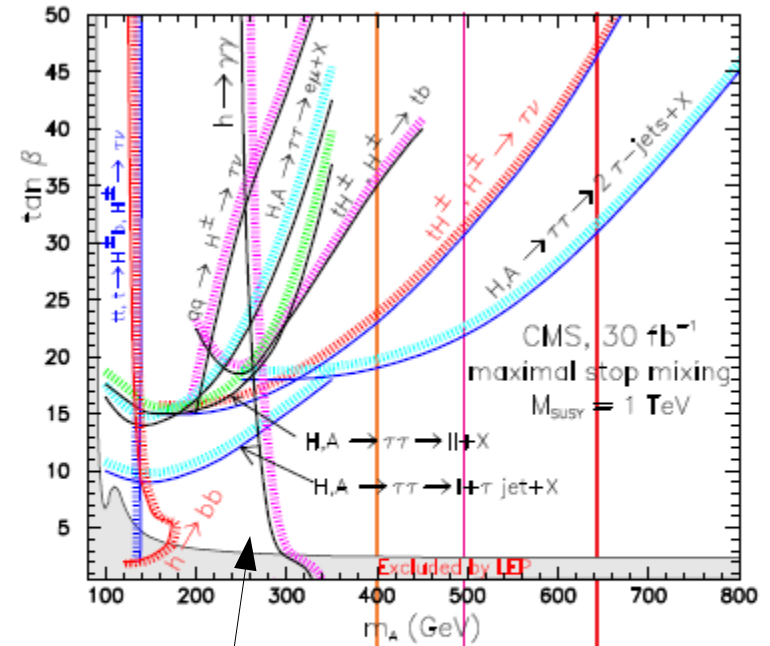
# The LHC: shaping how we see the future



(Roger Wolf)

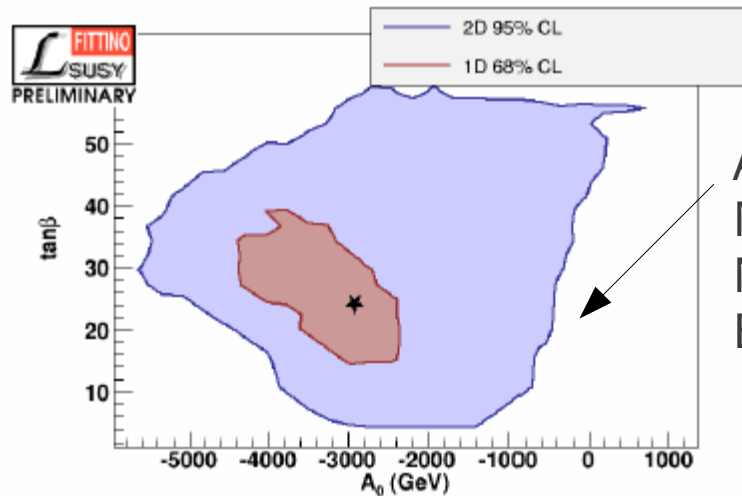


(Rosa Simoniello)



LHC+ ILC complementarity

(Sven Heinemeyer)



(Bjoern Sarrazin)

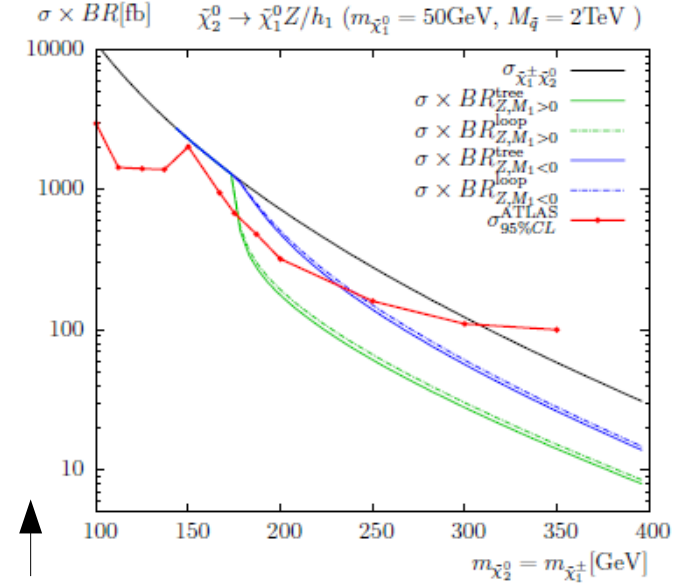
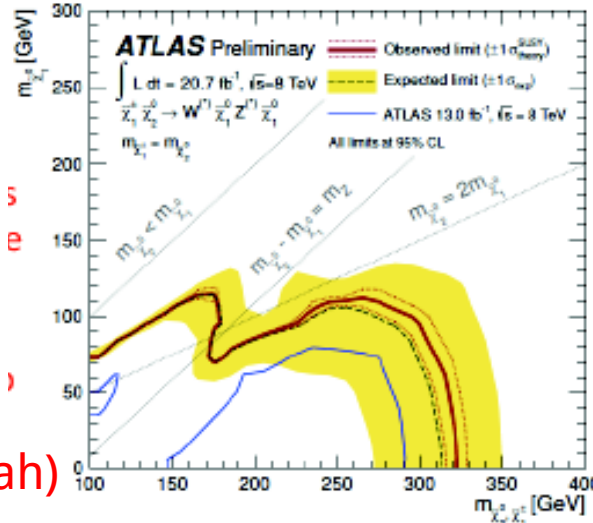
According to Fittino+  
Mastercode CMSSM/  
NUHM1 can fit data,  
But with  $m_h \sim 125$  GeV  
"less likely".

Needed: New SUSY models in agreement with  
- higher colored mass scales (LHC)  
- lower uncolored mass scales (EWPO;  $(g-2)\mu$ )

Lots seems to be excluded!?

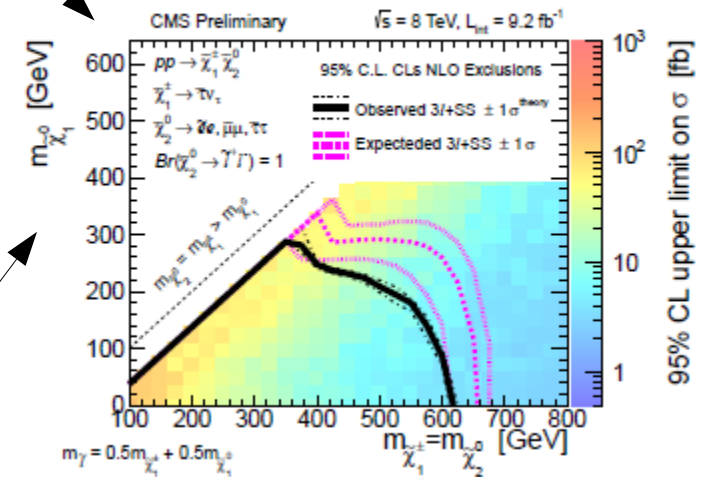
(also see talks by Jhunjie Zhu+ Steven Worm)

(Rachik Soualah)



Simplified Models: (F v.d.Pahlen) Require interpretation!

$\tau$ -enriched,  $x = 0.5$



Lukas Vanelderren

The most optimistic plot I could find!

Are stops heavy or light?

# What kind of models are people thinking of?

Motivated by  $g-2$   $\rightarrow$

(Koichi Hamaguchi) Naturalness+mh: beyond the MSSM to e.g. NMSSM OR: "g-2 motivated MSSM":  $O(100 \text{ GeV})$  slepton/bino can be tested at LC !!

## Why construction of ILC must begin immediately

(Howie Baer)

INSTEAD of  $M_Z \sim M_{\text{susy}} \sim m_h$ :

- $\mu^2 \sim m_Z^2/2$
- $-m_{H_u}^2 \sim m_Z^2/2$
- $\Sigma(\tilde{t}_{1,2}) \sim m_Z^2/2$

Guided by Naturalness

## Cosmological motivations:

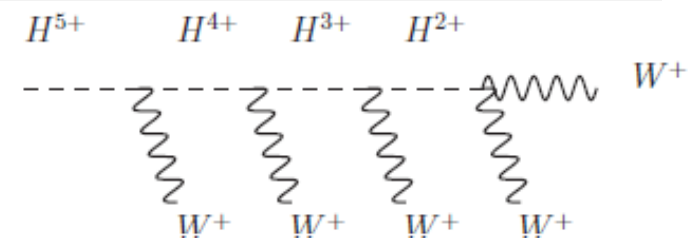
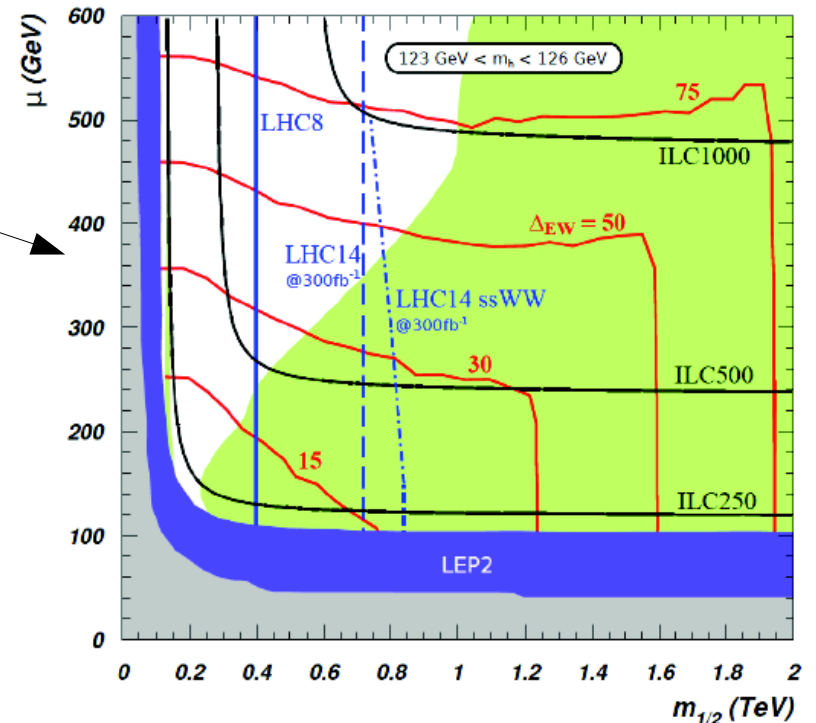
SUSY strongly-coupled Higgs sector and electroweak baryogenesis (T. Yamada)

Asymmetric DM at ILC (Shigeki Matsumoto)

See also talks by Koji Ichikawa, T. Nabeshima

Use  $\rho=1$  as guiding principle to deduce the Higgs mixes with an SU(2) Septet (Koji Tsumura)

NUHM2:  $m_0=5 \text{ TeV}$ ,  $\tan\beta=15$ ,  $A_0=-1.6m_0$ ,  $m_A=1\text{TeV}$ ,  $m_t=173.2 \text{ GeV}$

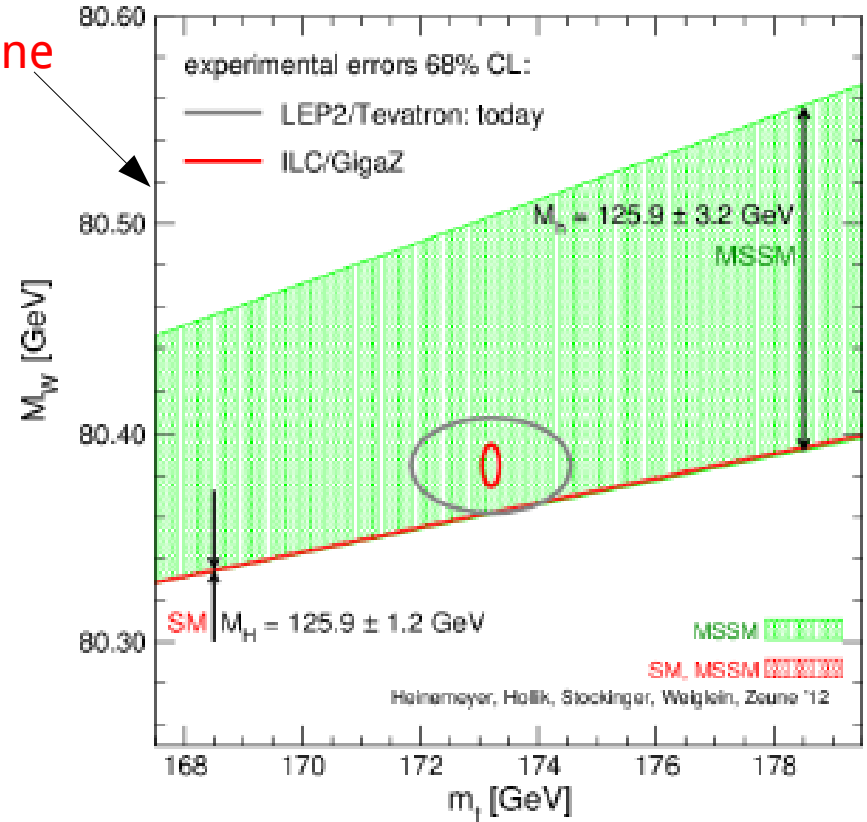


# Parameter determination (PD) and precision studies

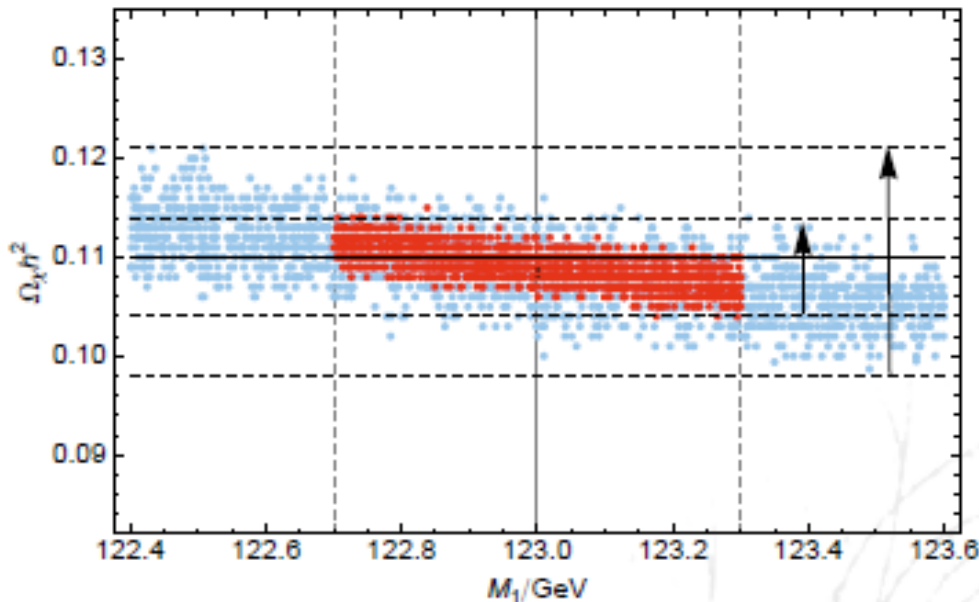
(Stefano Porto) Distinguish MSSM and NMSSM by exploiting the power of polarized beams in neutralino/chargino production at the LC.

Neutralino relic density from LC measurements+NLO EW PD

Lisa Zeune



Theshold vs. continuum masses, Scenario A



Light higgsinos+PD (K. Rolbiecki)

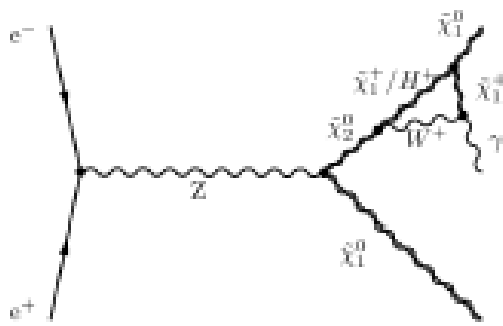
PD in littlest Higgs models (M. Asano)

(See also talks by Jan Kalinowski, A. Pankov and Gudi Moortgat-Pick)

# Facing experimentally challenging scenarios at the LC

Measurement of light Higgsinos at ILC (Hale Sert)

(see also T Tanabe, Frank Simon, Stefano Caiazza)



$$\delta M_{\tilde{\chi}_1^+} \sim 2 \text{ GeV}, \delta(\tilde{\chi}_1^+, \tilde{\chi}_1^0) 50 \text{ MeV}$$

Gaugino property determination in the fully hadronic decay mode at the ILC (Madalina Chera)

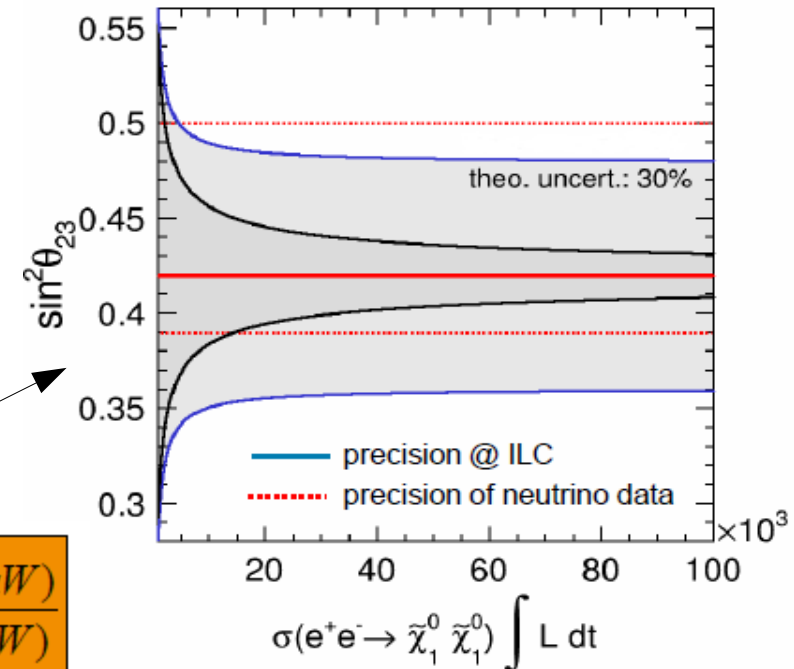
- The cross section statistical error is  $\sim 1\%$  for the  $\tilde{\chi}_1^\pm$  case and  $\sim 3\%$  in the  $\tilde{\chi}_2^0$  case for both simulations.

Slepton mass measurement at CLIC: TeV scale Smuons (A. Sailer)

Using our reconstructed spectrum (e.g., Fit with  $50 \times 40 \times 40$  bins):  
 $m_{\tilde{\mu}} = (1011.56 \pm 3.0(\text{stat}) \pm 0.04(\text{par})) \text{ GeV}$   
 $m_{\tilde{\chi}_1^0} = (342.53 \pm 6.8(\text{stat}) \pm 0.07(\text{par})) \text{ GeV}$

Bilinear R-Parity violation at the ILC - neutrino physics at colliders (B. Vormwald)

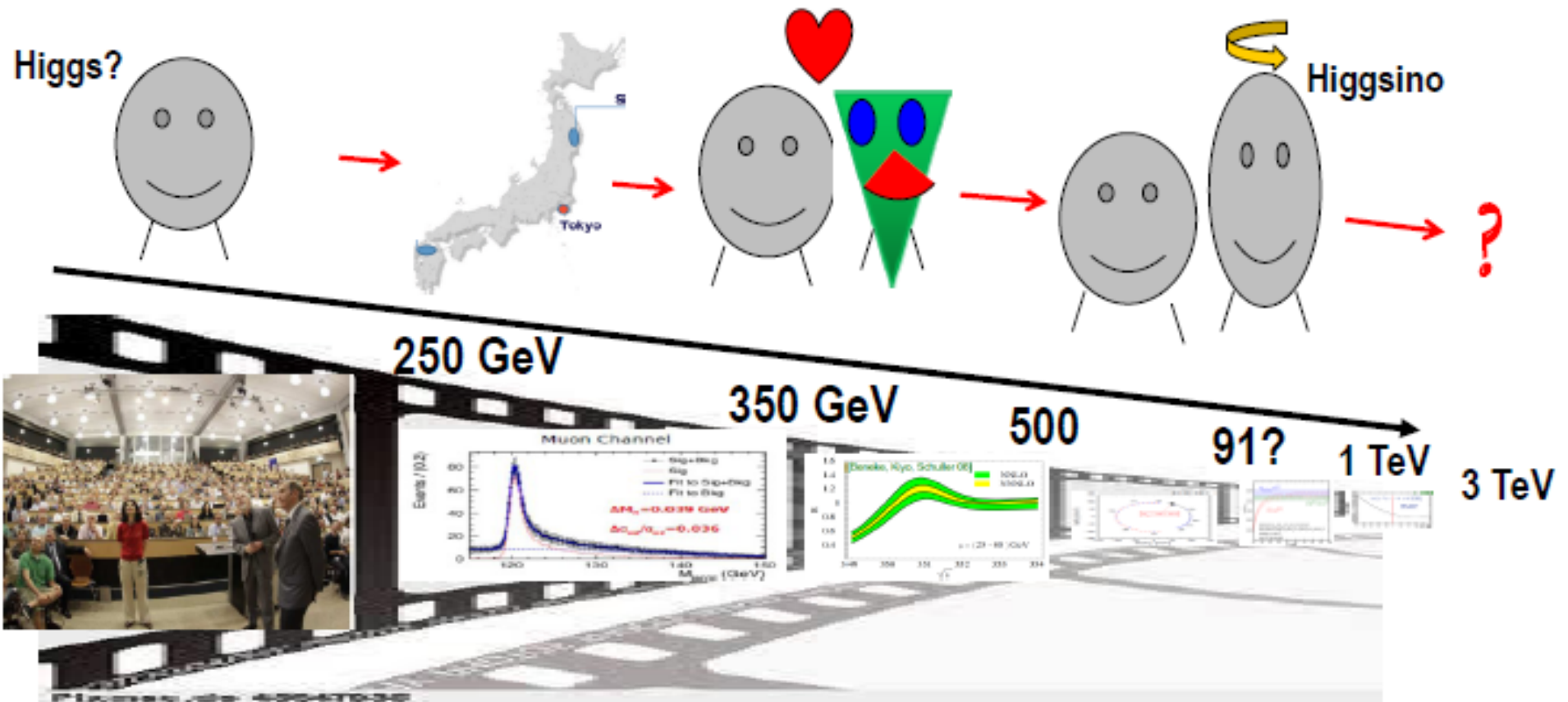
$$\tan^2 \theta_{23} = \left| \frac{\Lambda_\mu}{\Lambda_\tau} \right|^2 \equiv \frac{BR(\tilde{\chi}_1^0 \rightarrow \mu W)}{BR(\tilde{\chi}_1^0 \rightarrow \tau W)}$$



# Summary of the Summary

*In 20 years time.....we could tell a story*

- Once upon a time –it was July 4<sup>th</sup>– .....



(Courtesy of Gudi Moortgat-Pick)

*Let's do it!*