

ALCPG2011 Summary

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Summary attempt



of your work.

It will be incomplete and biased.

Apologies for items omitted.

Too many activities in addition to full workshop program

Views presented

Views from taking quite a step back:

this



not even this



Somewhat also from "the IP" i.e. only interested in properties of particles coming to IP, not how they were made or manipulated.

What is being considered.

ILC 250, 350, 500Gev → 1TeV

CLIC 3TeV and now coming down

Muon Collider ~3TeV

At different levels of reality

Technically Real

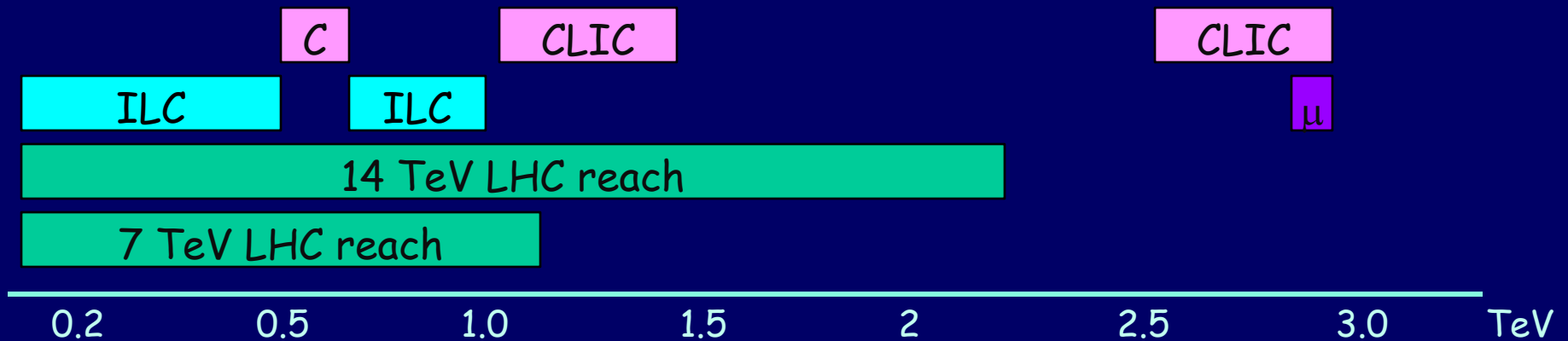
In the future

R&D program

Energy scale reach overview

Very simplified

LHC "reach" is $\sim 1/6$ of cms energy; depends on coupling & luminosity



Scanning over whole range not possible

Reality not folded in

Muon collider

There was a session, Tuesday morning, on work on Muon Collider

Description of the ongoing and future R&D program

Start of simulation of backgrounds and initial concept of detector for physics studies

Demonstrate 4D cooling by 2016
Demo proposal for 6D cooling in 2016

Challenging

MUON COLLIDER 2011

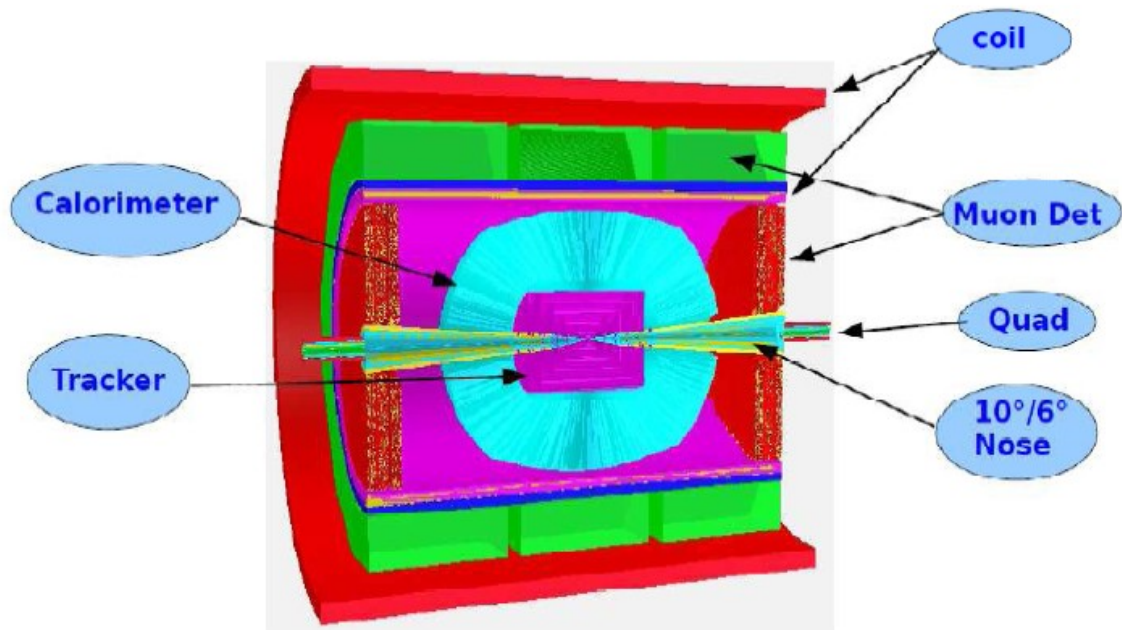
PHYSICS - DETECTORS - ACCELERATORS

June 27-July 1, 2011

The Peaks Resort, Telluride, Colorado

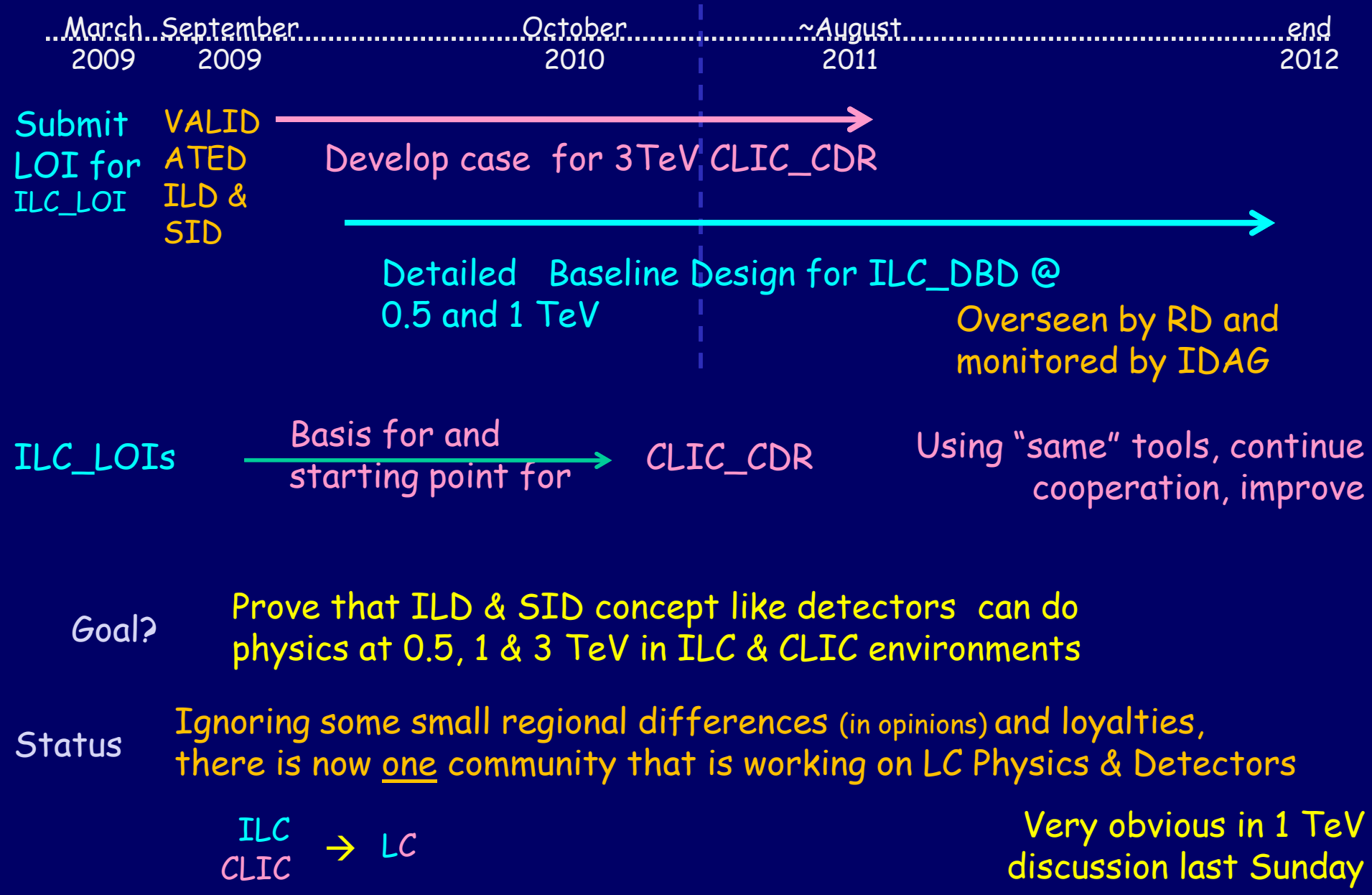


Baseline Detector for μ Coll Studies



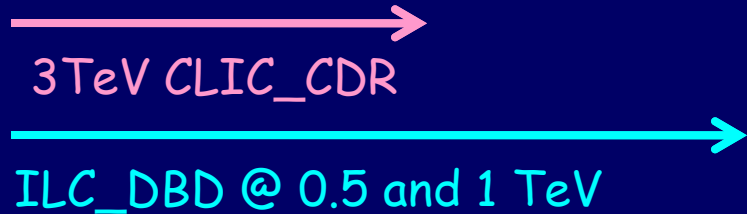
Baseline Detector for μ Collider (&CLIC) studies is SiD + FTD (from SILC)
+ Muon Chamber (from 4th Concept)
Total Active Dual Readout Calorimeter (new Concept)

Physics & Detectors : History & Goals up to 2012



Time line after 2012

2010	2011	2012	2013	2014	2015	2016
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What comes after 2012?
 ILC: RD is done in 2012 (mission complete)

Morale issue: came up during first day of ALCPG2011
 ILCSC discussing that

However for Physics & Detectors (with current concepts, including R&D) there is a clear path forward.



Now includes the whole world (compared to ~2009 CERN has joined)

Also provides a way to continue effort on ILC

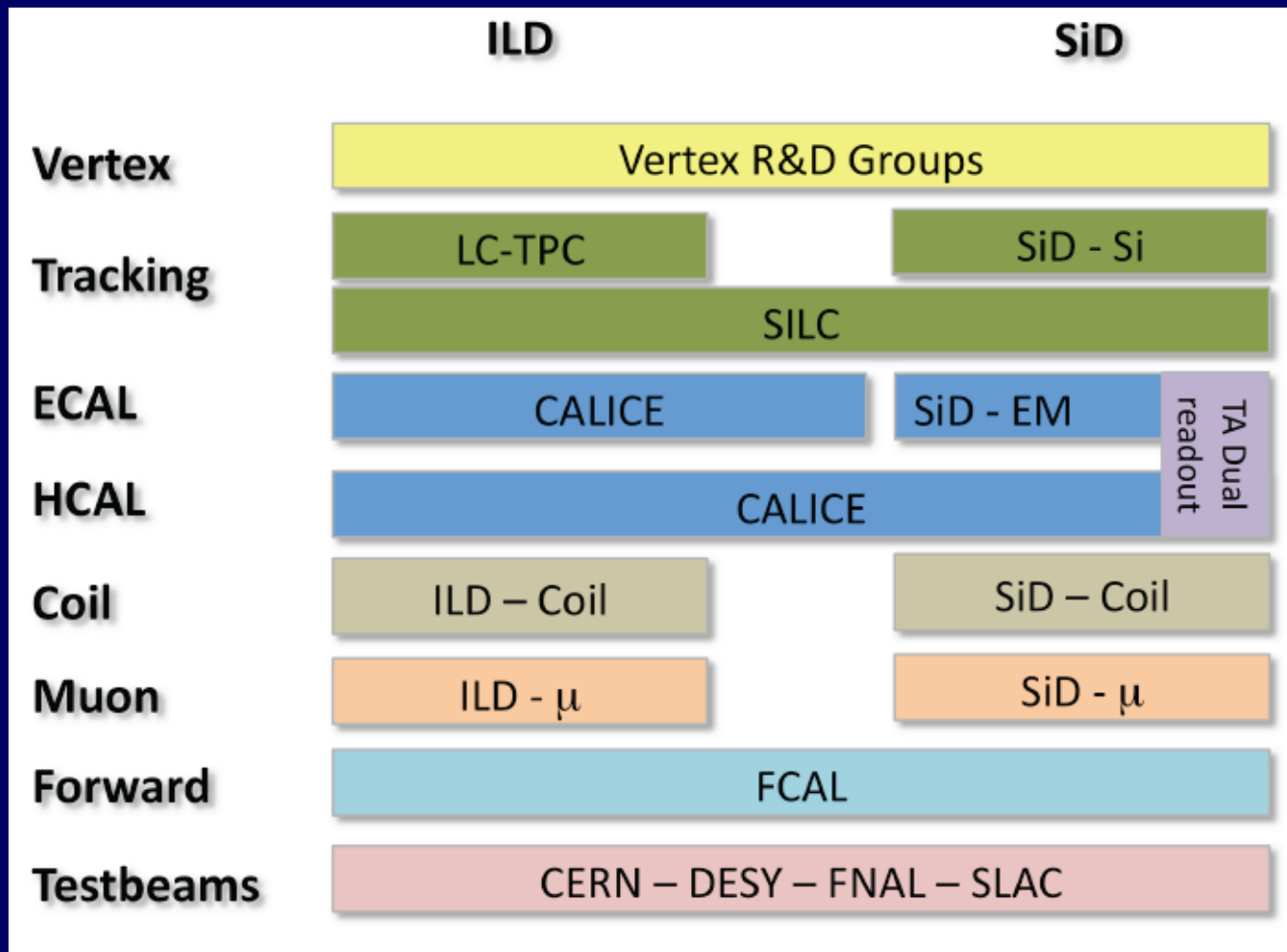
The Detector R&D program

Matrix of R&D collaborations and detector concepts is convoluted:

ILD R&D is carried out by R&D collaborations

SiD mainly carried out by concept

But it works !



Detector R&D program

Still very active program,
 even vibrant.

Clearly benefitted over the years
 by having ambitious physics goals at
 ILC--- drives the program

On all fronts activities and even matured in last couple of
 years with more efforts in testbeams and more to come

Areas:	<p>Vertex CCDs, MAPS CMOS, Chronopixel, Vertical 3D</p> <p>Tracking TPC : LP in 1.2T, GEM & Micromegas (GRIDPIX) SI: SILC wide range; SiD: low mass, no hybrid module</p> <p>ECAL PFA: SiW ECAL prototypes by SiD & CALICE; CALICE scintillator</p> <p>HCAL CALICE: AHCAL, DHCAL with data; SDHCAL planned; AHCAL with W absorber; worldwide program; crystal</p> <p>Muon Scintillator strip based and RPC</p> <p>Forward Preparing prototype for FCAL</p>
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Several testbeam sessions and more testbeams coming (SLAC)

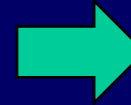
Something community can be proud of.

Detector R&D program

VERY rewarding to see pay off of ILC detector R&D in other areas.

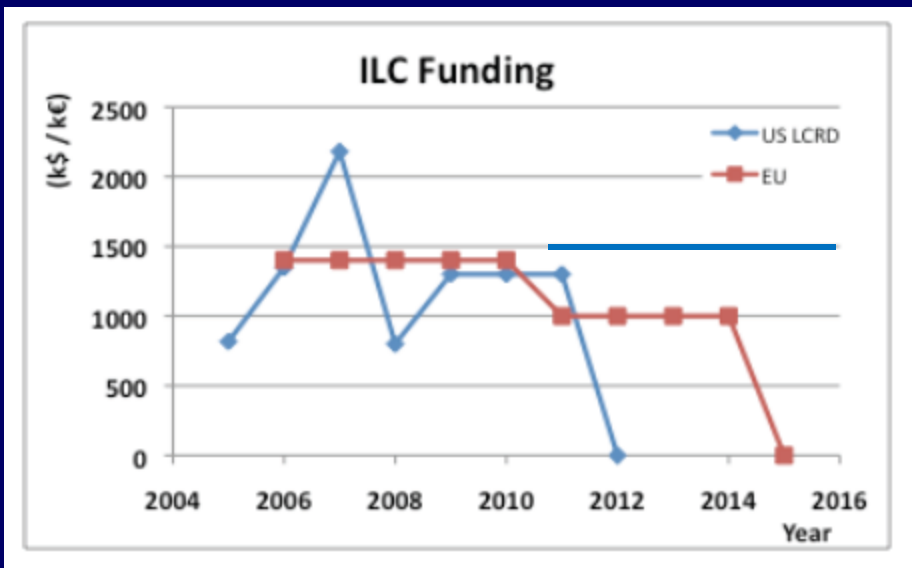
Collected by ILC
 RD Detector R&D
 committee

ILC
 3D silicon
 INGRID techn.
 SPIROC
 Mimosa
 DEPFET
 COSMo TPC



Others
 LHC upgrade
 CAST (axion search)
 PEBS balloon exp.
 STAR
 Belle
 T2K TPC

Correction:



New funding request in US for support of Detector R&D at all lepton colliders (LCDRD)

Dtecto

LHC and 1 TeV

Interesting session

"Theory " talk projecting current LHC sensitivity
An outline of a 1 TeV ILC
ILD and SiD at 1 TeV

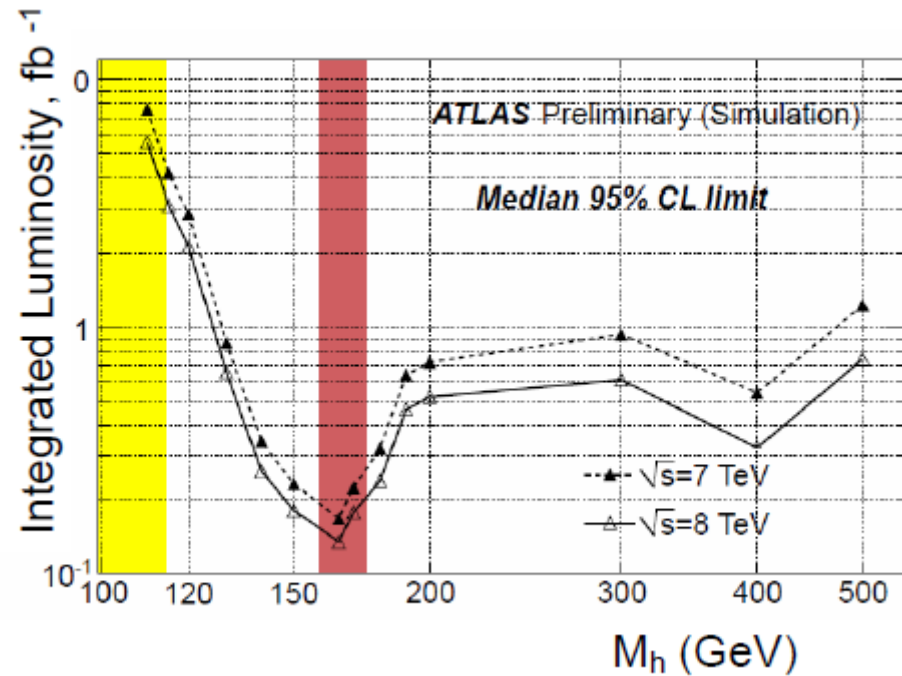
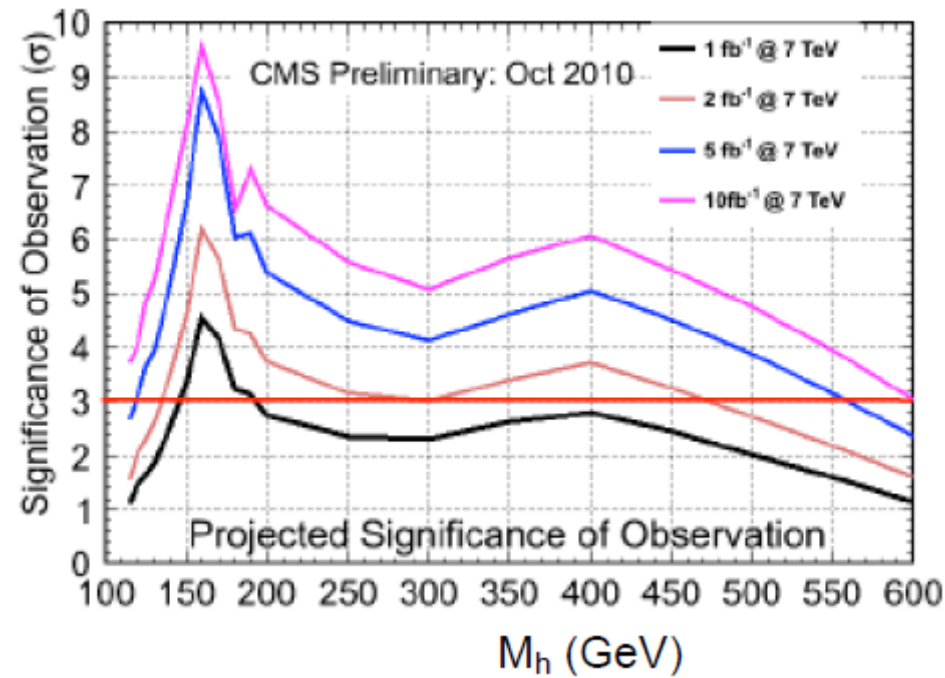


Saw already clearly in 1 TeV session
how collaboration on detectors has paid
off i.e work on 3 TeV CLIC

Standard Model Higgs

Here cover :

SUSY & other searches push up energy scale



CMS: $10\text{fb}^{-1} \rightarrow 3\sigma$ discovery for
 $M_h : 115\text{-}600$ GeV

ATLAS: 4fb^{-1} will exclude M_h
 up to 500 GeV

Scale: first day L.Evans, $4\text{fb}^{-1}/\text{experiment}$ in 2011 should be possible

In numbers:

$$\sqrt{s}=7 \text{ TeV}$$

ATLAS + CMS $\approx 2 \times \text{CMS}$	95% CL exclusion	3σ sensitivity	5σ sensitivity
1 fb⁻¹	120 - 530	135 - 475	152 - 175
2 fb⁻¹	114 - 585	120 - 545	140 - 200
5 fb⁻¹	114 - 600	114 - 600	128 - 482
10 fb⁻¹	114 - 600	114 - 600	117 - 535

2011

2012

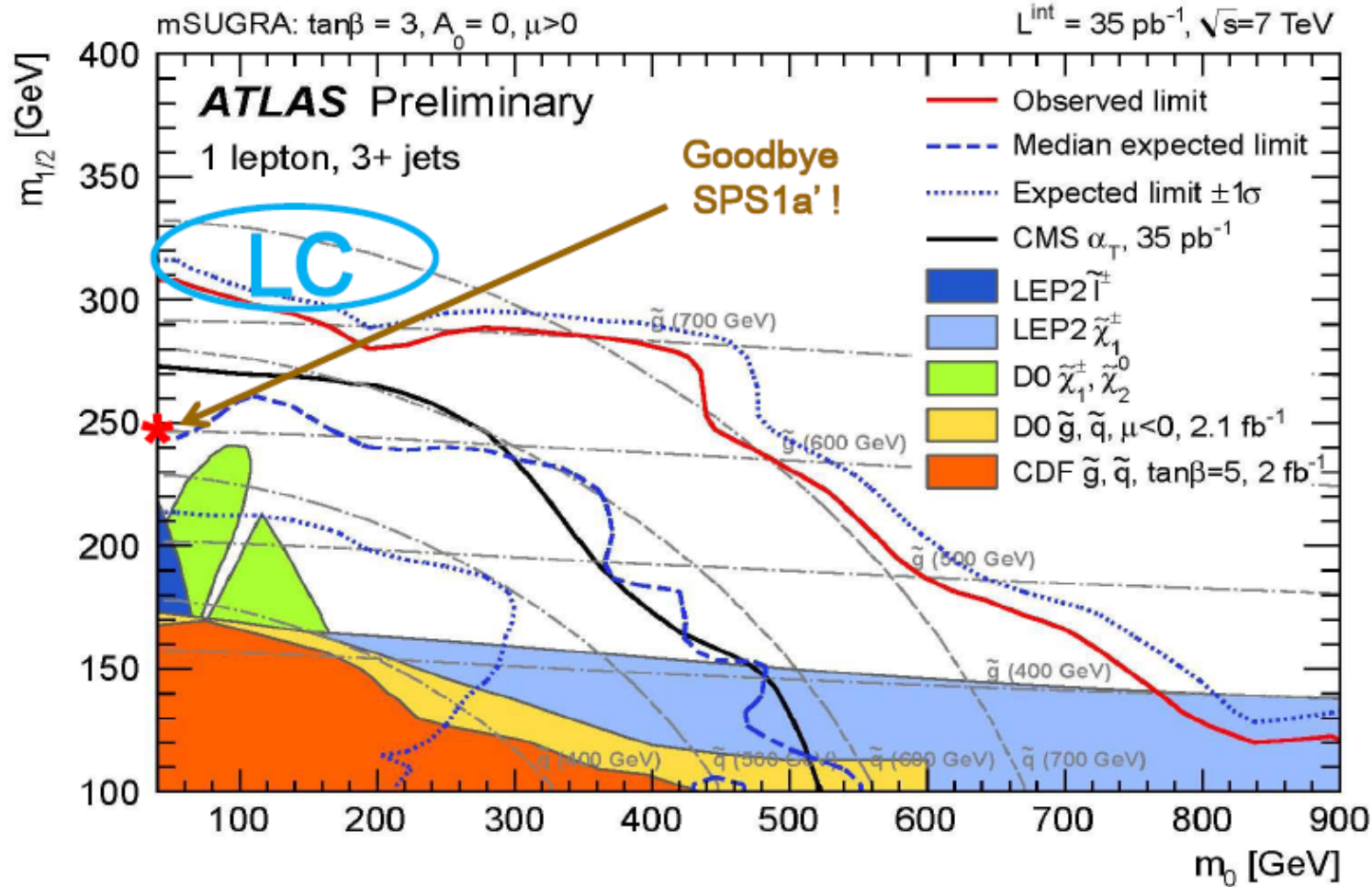
If the SM Higgs exists, we'll know its mass soon

Will definitely influence thinking about low energy ILC options in 2012

mSUGRA models with mass relations

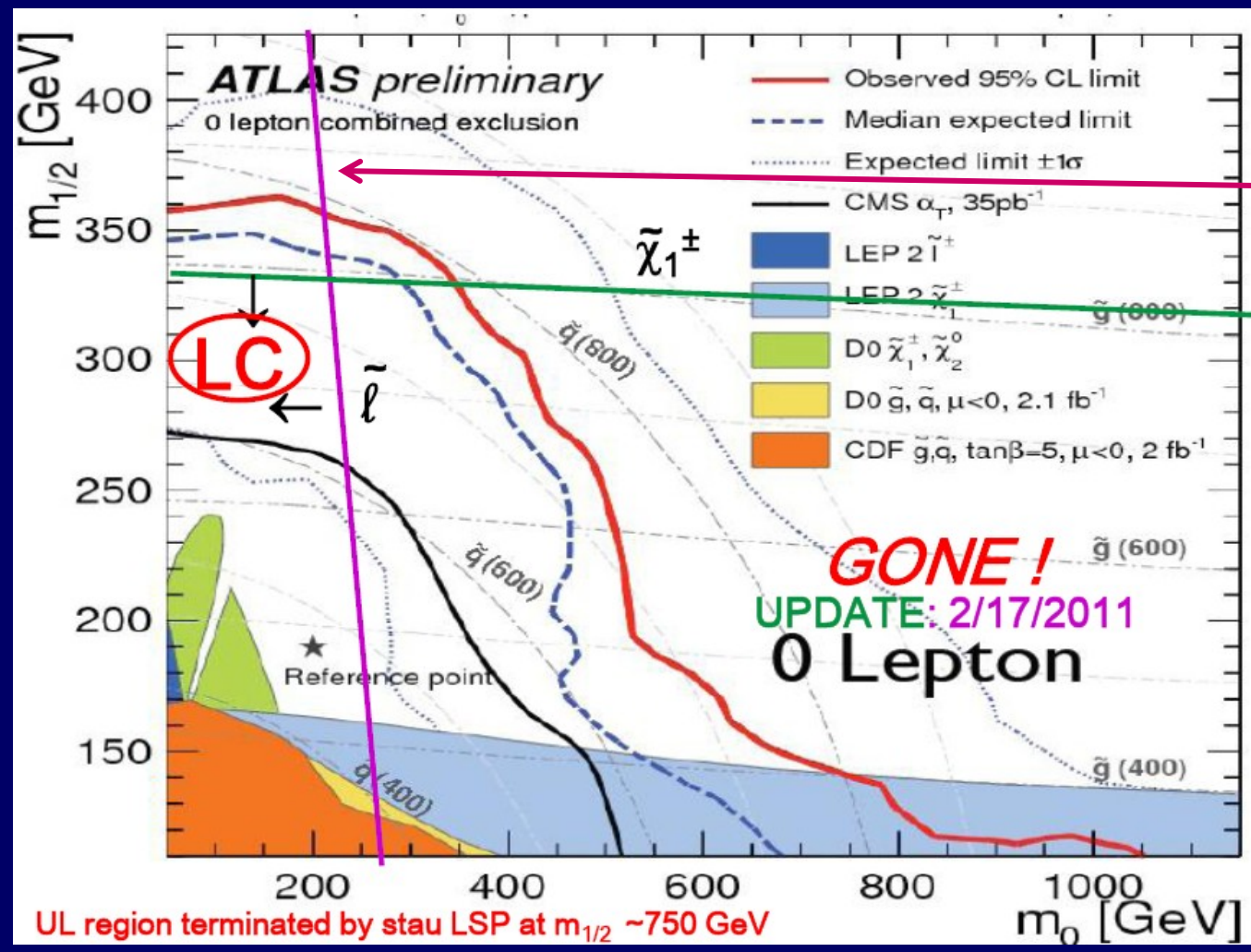
The Amazing Power of \sqrt{s} !

1/27/2011



SUSY, pMSSM, etc LHC information

mSUGRA models with mass relations

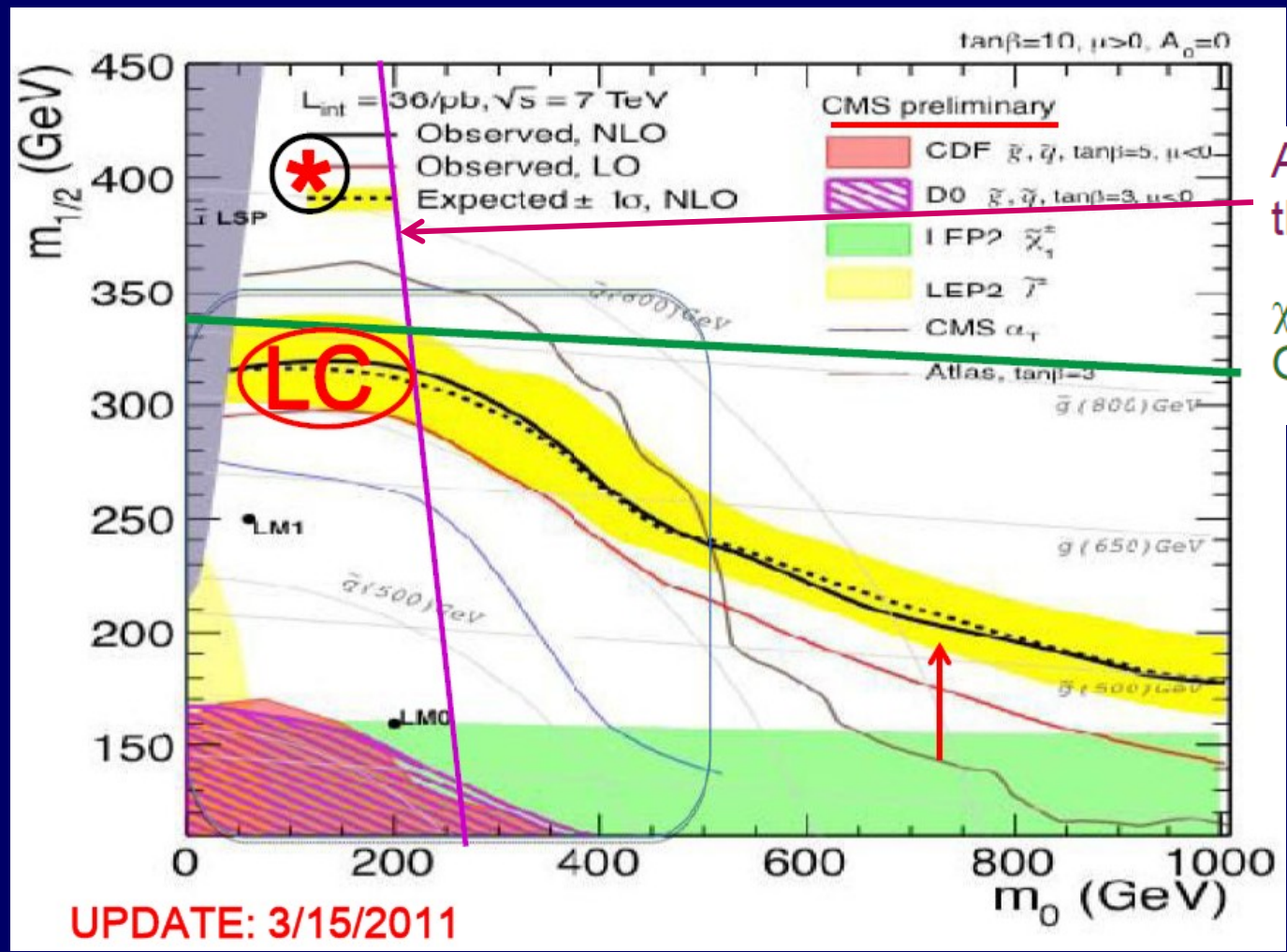


All sleptons heavier than 250 GeV

χ_1^+ heavier than 250 GeV

SUSY, pMSSM, etc LHC information

mSUGRA models with mass relations



All sleptons heavier than 250 GeV

χ_1^+ heavier than 250 GeV

Fast changing now that data are being analyzed.

pMSSM, LHC information

19 pMSSM Parameters

- Flat Priors : 10^7 models scanned , 68422 survive
- Log Priors : 2×10^6 models scanned , 2908 survive

Before LHC
 input

LC Implications

In the set of 14623(1546)
 FLAT (LOG) models not found
 at 7TeV this survives for LC

$1\text{fb}^{-1} \rightarrow 10\text{fb}^{-1}$

In the set of 672(663) FLAT
 (LOG) models not found at
 7TeV this survives for LC

Sparticle	$\sqrt{s} = 500\text{ GeV}$		$\sqrt{s} = 1\text{ TeV}$	
	Flat	Log	Flat	Log
\tilde{e}_L	107	101	3052	347
\tilde{e}_R	260	209	3938	565
$\tilde{\tau}_1$	730	381	7431	869
$\tilde{\tau}_2$	30	36	1288	207
$\tilde{\nu}_e$	151	117	3168	356
$\tilde{\nu}_\tau$	386	236	4366	553
$\tilde{\chi}_1^0$	5487	1312	14,510	1539
$\tilde{\chi}_2^0$	2738	1035	10,714	1395
$\tilde{\chi}_3^0$	429	352	5667	903
$\tilde{\chi}_4^0$	10	18	1267	202
$\tilde{\chi}_1^\pm$	4856	1208	13,561	1495
$\tilde{\chi}_2^\pm$	94	54	3412	456
\tilde{g}	0	0	1088	65
\tilde{d}_L	35	11	2459	117
\tilde{d}_R	220	96	3630	526
\tilde{u}_L	52	16	2545	123
\tilde{u}_R	124	64	3581	273
\tilde{b}_1	289	75	5553	590
\tilde{b}_2	1	0	409	21
\tilde{t}_1	93	9	3727	217
\tilde{t}_2	0	0	2	0

$1\text{fb}^{-1} \rightarrow 10\text{fb}^{-1}$

Much fewer survive
 with increased
 luminosity.....
 These LHC
 luminosities not
 unrealistic for
 2011-12.

Only one model

Sparticle	$\sqrt{s} = 500\text{ GeV}$		$\sqrt{s} = 1\text{ TeV}$	
	Flat	Log	Flat	Log
\tilde{e}_L	0	37	63	142
\tilde{e}_R	0	72	53	223
$\tilde{\tau}_1$	2	142	165	338
$\tilde{\tau}_2$	0	11	9	69
$\tilde{\nu}_e$	0	42	64	146
$\tilde{\nu}_\tau$	0	85	81	236
$\tilde{\chi}_1^0$	26	507	587	626
$\tilde{\chi}_2^0$	4	397	352	557
$\tilde{\chi}_3^0$	0	136	57	357
$\tilde{\chi}_4^0$	0	5	5	66
$\tilde{\chi}_1^\pm$	25	467	505	608
$\tilde{\chi}_2^\pm$	0	17	16	170
\tilde{g}	0	0	27	5
\tilde{d}_L	0	3	73	24
\tilde{d}_R	1	18	63	157
\tilde{u}_L	0	5	81	24
\tilde{u}_R	0	14	86	79
\tilde{b}_1	0	20	103	189
\tilde{b}_2	0	0	3	4
\tilde{t}_1	1	2	94	58
\tilde{t}_2	0	0	0	0

Conclusions

- The LHC is honing in on the 1 TeV scale
- We will soon know
 - Is there a light Higgs?
 - Is there SUSY at the TeV scale?
 - Are there Z' resonances at the TeV scale?
 - Something totally unexpected

ALCPG2011 uniqueness

Have been attending Linear Collider meetings since ~2004

Compared to some I am just a baby.....

This is the first meeting where there is really new experimental input (no matter how small and at only 7 TeV

But it made a difference

No new signatures so far and already LC energy is increasing quickly

Meeting dominated by discussion about 1 TeV ILC option

Plenary session and a lot of talks in hall ways and in other sessions

ILC Physics Reach & Prospects

Personal view:

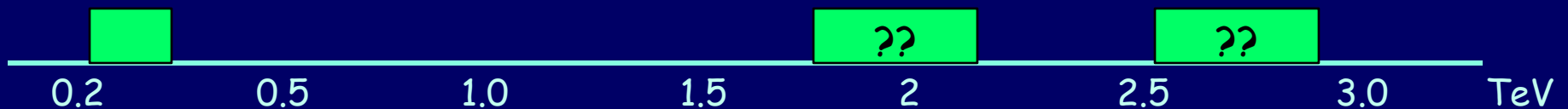
Low mass Higgs remains possible for a while

Other "predicted" states by models will be excluded with increasing mass

One possibility:

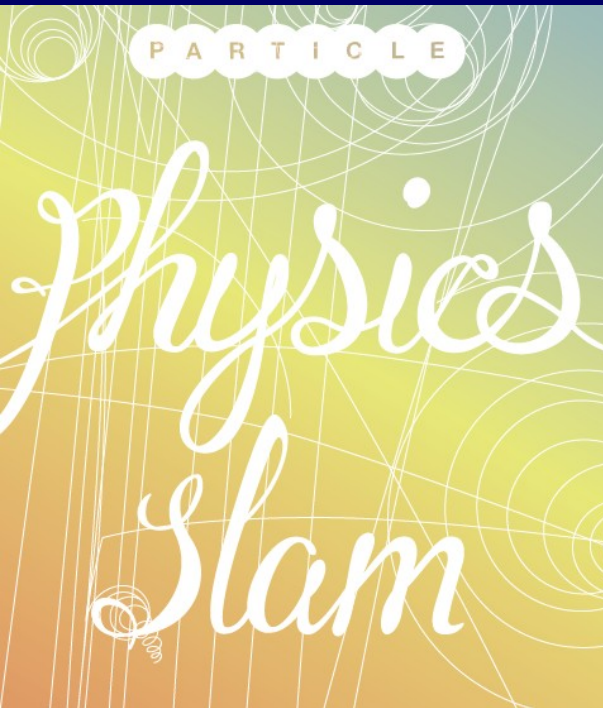
May need a low energy ILC to cover low mass Higgs

A higher energy machine to cover higher mass scale areas (TeV scale)



Physics Slam

Leah Hesla's idea



Garabad
Halladjian



Marcel
Demarteau



Marc
Wenskat



JoAnne
Hewett



Brian
Foster

Most
popular

Filled Auditorium plus
overflow lecture hall,
> 700 people

Big Success



ALCPG2011 score card

Chocolate at reception : to die for and richness had potential to do that

Reception: amazing there was food left

Weather: no serious rain

ILC-CLIC detectors ---- love fest at the 1 TeV session

Campus: beautiful, green and flowering trees in March !

Drive to King's Estate: some scenes were like from "Lord of the Rings"

Oregon wine: amazing and actual wineries

Food at breaks: it never ended, there was so much I stopped going....

People: VERY friendly, on my morning walks everybody said good morning and is smiling.

ALCPG2011 closing

Thank you !

To

Jim Brau for proposing this venue

Jim Brau for making it happen

His colleagues for help

Staff for making it work

Students for their help

To the University of Oregon

For finding my jacket.....

Putting me in B&B Excelsior Inn; great

Largest cookie supply at breaks ever

Thank you to all organizers for having ALCPG2011 at your beautiful campus and beautiful and green Oregon