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cnrs IN2P3
Les deux infinis

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Algorithms:
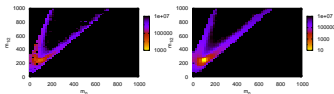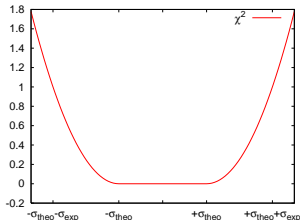
- weighted Markov chain
- cooling Markov chain ($\sim$ simulated annealing)
- modified gradient fit (Minuit)
- grid scan

Errors:

- three types:
  - Gaussian – arbitrary correlations possible
  - Poisson
  - box-shaped (RFit) [CKMFitter]
- assignment as in exp. studies
- adaption to likelihood input easy



Output:

- fully-dimensional log-likelihood map
- one- and two-dimensional distributions via
  - marginalization (Bayesian)
  - profile likelihood (Frequentist)
- list of best points



|  | $\chi^2$ | $m_0$ | $m_{1/2}$ | $\tan(\beta)$ | $A_0$ | $\mu$ | $m_t$ |
|---|---|---|---|---|---|---|---|
| SPS1a |  | 100.0 | 250.0 | 10.0 | -100.0 | + | 171.4 |
| 1) | 0.09 | 102.0 | 254.0 | 11.5 | -95.2 | + | 172.4 |
| 2) | 1.50 | 104.8 | 242.1 | 12.9 | -174.4 | − | 172.3 |

## SFitter Physics Results

## Supersymmetry

- ▶ inaugurational study Les Houches 2003      arXiv:hep-ph/0402295
- ▶ Measuring Supersymmetry      Eur. Phys. J. C **54** (2008) 617
  fit of MSSM (18 parameters) (and mSUGRA) for LHC and ILC
  degenerate solutions and badly determined parameters at the LHC
- ▶ Measuring Unification      (+C. Adam, J.-L. Kneur) arXiv:1007.2190
  characterization of degenerate solutions
  bottom-up extrapolation of MSSM solutions to GUT scale
  challenge of tachyonic solutions
  bottom-up $\neq$ top-down
- ▶ Measuring Supersymmetry with Heavy Scalars      (+E. Turlay) arXiv:1011.0759
  scalar sector decoupled
  rate measurements for parameter determination

## Higgs Couplings

- ▶ Measuring the Higgs Sector      (+M. Dührssen) JHEP **0908**, 009 (2009)
  couplings for light Higgs
  marginal improvements using ratios
  subjet analysis in $WH/ZH$, $H \rightarrow b\bar{b}$ crucial
- ▶ Measuring Hidden Higgs and Strongly-Interacting Higgs Scenarios
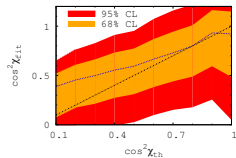       (+S. Bock, P.M. Zerwas) Phys. Lett. B **694** (2010) 44

**SFitter Physics Results**

## Measuring Hidden Higgs and Strongly-Interacting Higgs Scenarios

(+S. Bock, P.M. Zerwas) Phys. Lett. B **694** (2010) 44

**Higgs Portal**   [Patt, Wilczek]

- hidden sector (SM gauge singlet)
  connection to SM via $\mathcal{L} \supset -\eta_\chi(\Phi_S^\dagger\Phi_S)(\Phi_H^\dagger\Phi_H)$

- two parameters: $\cos\chi$, $\Gamma_H^{\mathrm{inv}}$
  $g_H = \cos\chi \cdot g_H^{\mathrm{SM}}$
  $\Gamma_H = \cos^2\chi \cdot \Gamma_H^{\mathrm{SM}} + \Gamma_H^{\mathrm{hid}}$ (invisible decays)

**Strongly Interacting Light Higgs**
[Giudice, Grojean, Pomarol, Rattazzi; Espinosa, Grojean, Mühlleitner]

- single parameter $\xi = \left(\frac{v}{f}\right)^2$ – no invisible decays
  - MCHM4 $g = \sqrt{1-\xi} \cdot g^{\mathrm{SM}} \to$ Higgs Portal
  - MCHM5 $g_{HVV} = \sqrt{1-\xi} \cdot g_{HVV}^{\mathrm{SM}}$
    $g_{Hff} = \frac{1-2\xi}{\sqrt{1-\xi}} \cdot g_{Hff}^{\mathrm{SM}}$

- double solutions (sign of coupling)
  $\mathcal{O}(10\%)$ determination with 30 fb$^{-1}$