

New Physics at the LHC and the ILC

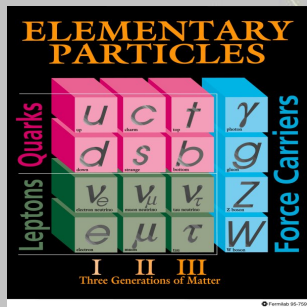
Jürgen Reuter

DESY, Hamburg

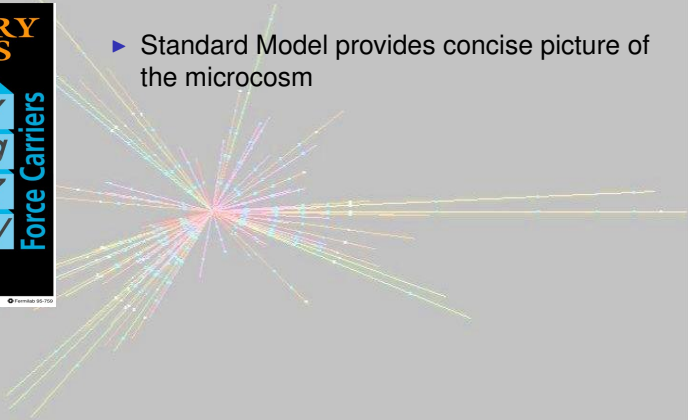
Swindon, 01.Feb.2006



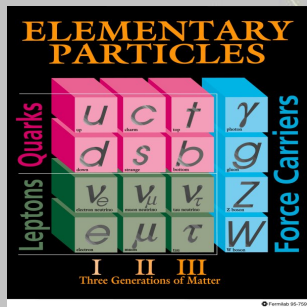
Particle Physics - Now And Then



- ▶ Standard Model provides concise picture of the microcosm

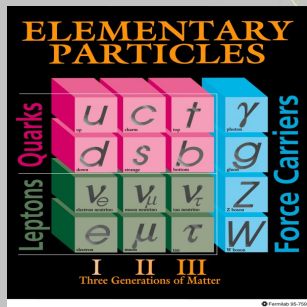


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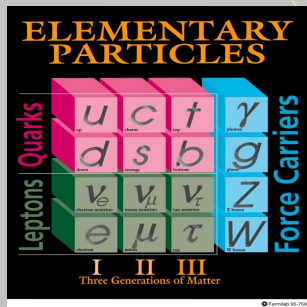
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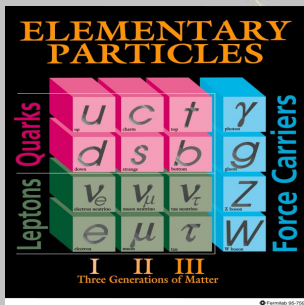
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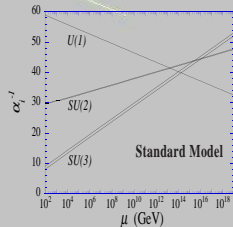
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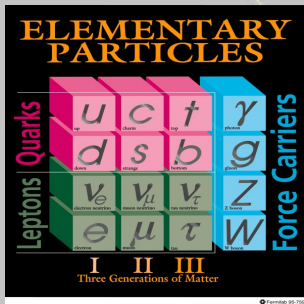


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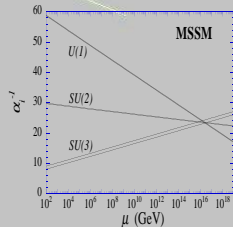


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New Developments – Theory and Experiment

► Experiments:

- Neutrino, flavour, cosmic ray experiments



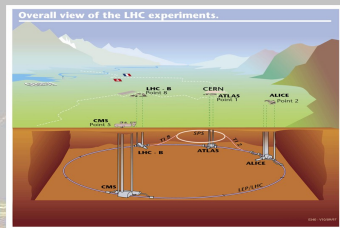
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- “High Energy Frontier”

Collider Experiments:

Tevatron ($p\bar{p}$, 1.96 TeV), **LHC** (pp , 14 TeV),
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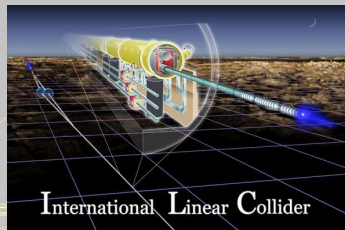
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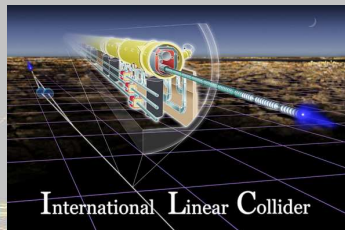
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► Theory:

- Supersymmetry: Symmetry between bosons and fermions

Wess/Zumino, '74; Dimopoulos/Georgi, '81

- Extra Dimensions

Arkani-Hamed/Dimopoulos/Dvali, '00

- Little Higgs Models: new strong interactions @ TeV scale

Arkani-Hamed *et al.*, '01

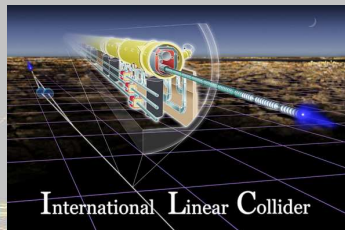
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- ▶ Generically: New particles/interactions at the TeV scale, rich phenomenology

Collider Physics Beyond the Standard Model

▶ **Supersymmetry**

precision spectroscopy, extraction of fundamental parameters (SPA), synergy of colliders (LHC/ILC WG) JR, '02; Ohl/JR, '02; JR *et al.* '05; Hagiwara/JR/Plehn *et al.* '05

▶ **Noncommutative Geometries**

Resolving power: Polarization, Astrophysical bounds Ohl/JR, '04; Ohl/Päs/JR, in prep.

▶ **Little Higgs Models**

precision spectroscopy, new light pseudoscalar particles (“axions”), cold dark matter Kilian/JR, '03; Kilian/JR/Rainwater, ('04); Kilian/JR/Rainwater, in prep.; Rainwater/JR/Schmaltz, in prep.

▶ **Additional Gauge Interactions at the TeV Scale**

Discrimination of new Z' states, precision spectroscopy Han/JR, in prep.

▶ **Phenomenology of Grand Unified Theories, e.g. E_6 : lots of new particles, interesting flavour structure**

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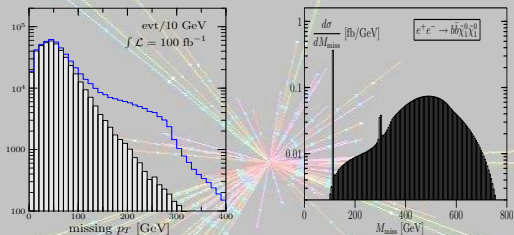
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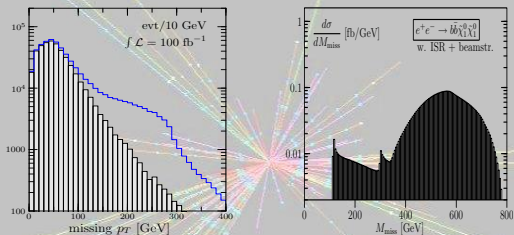
Tools: Event Generators

- ▶ Realistic simulations of collider experiments: New physics signals in multi-(4-10)-particle final states, Entanglement with SM backgrounds



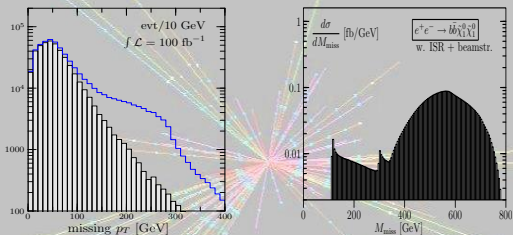
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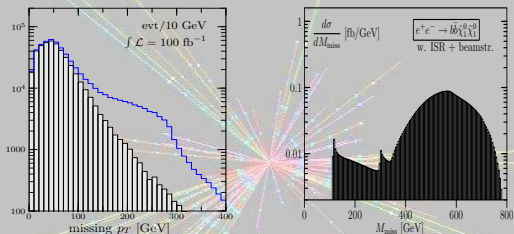


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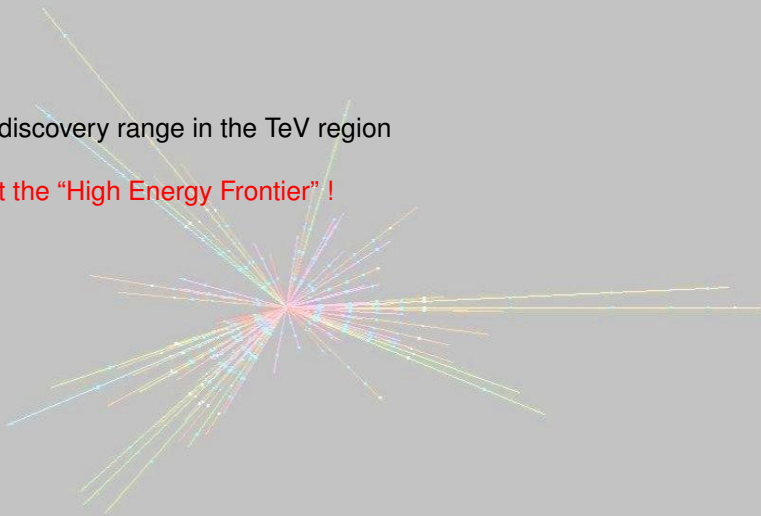
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- ▶ Future projects: Versatile tool for new physics models, inclusion of quantum corrections Kilian/JR/Robens, Kilian/Kleinschmidt/JR

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