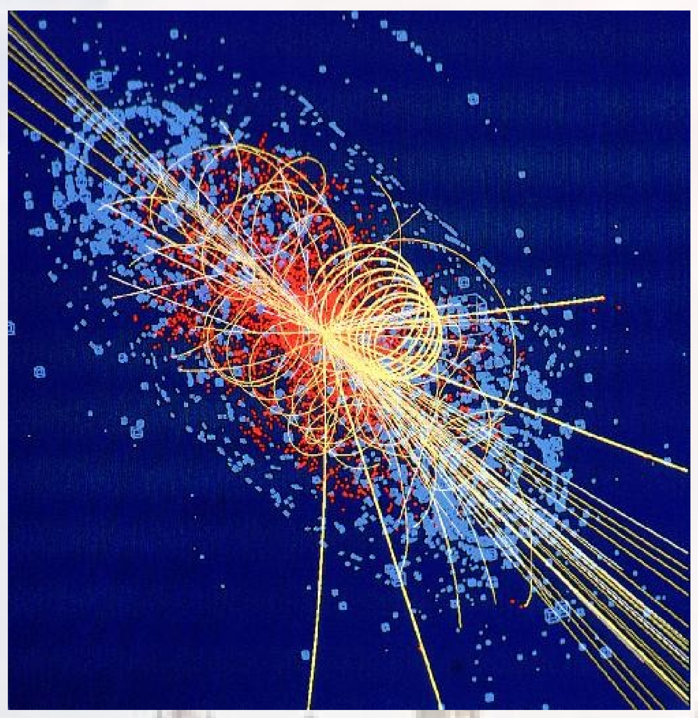
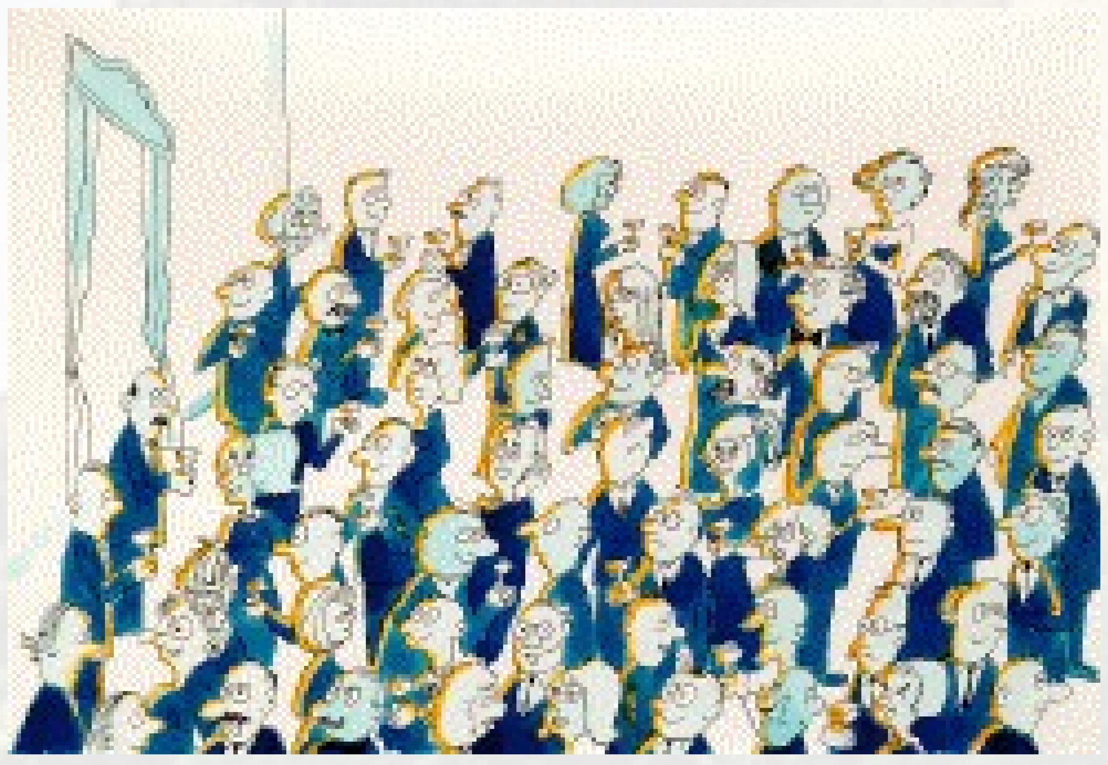
Durham University

THE HIGGS BOSON

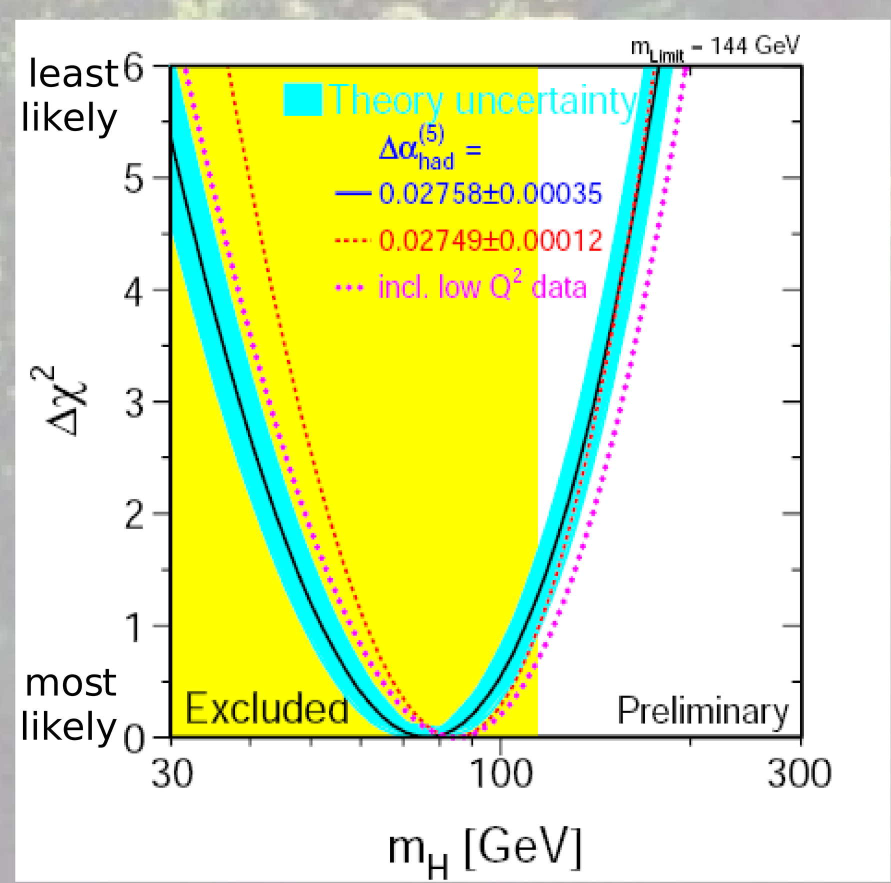


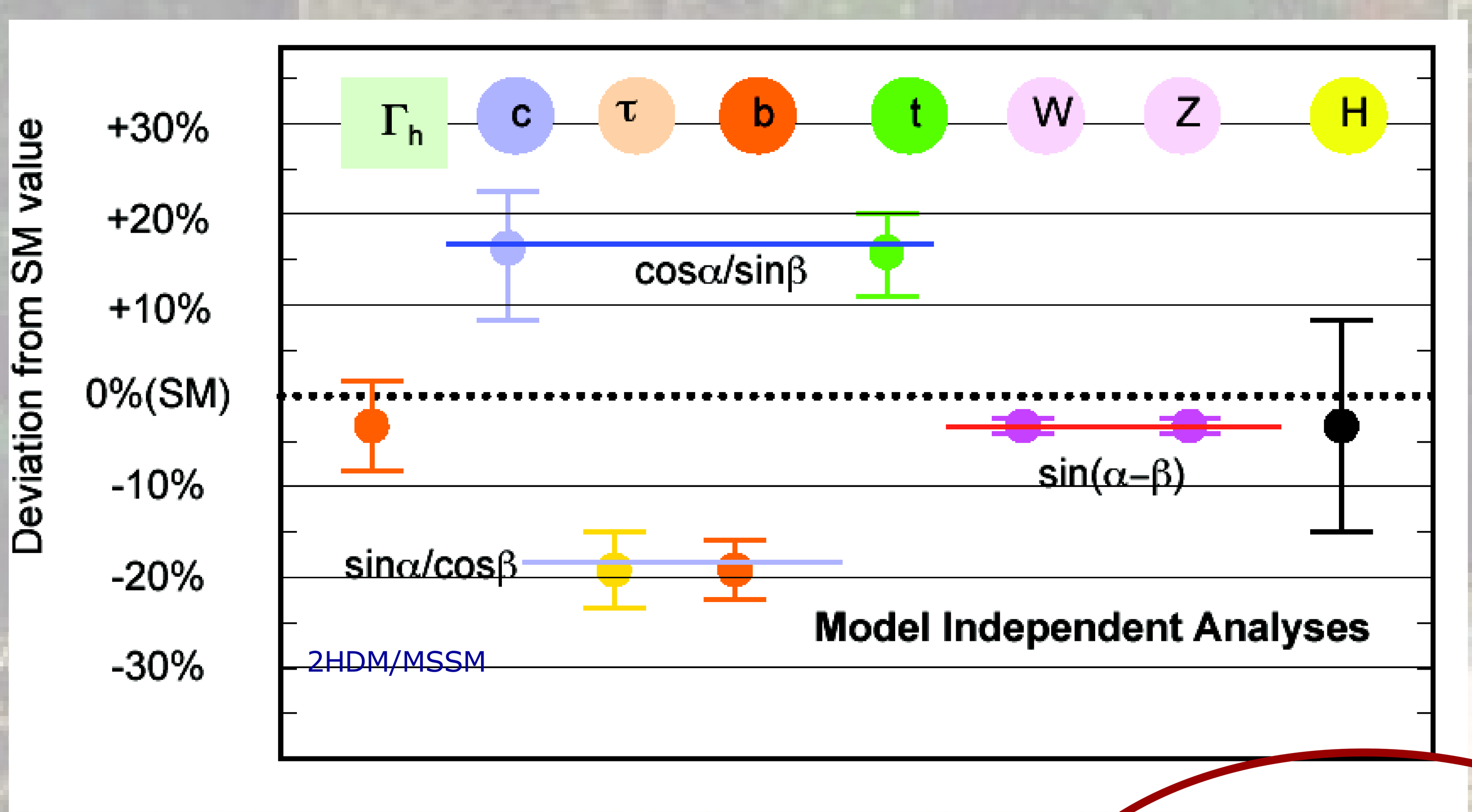
In 1964, Peter Higgs suggested the existence of a new field (now called the Higgs field) to explain why particles have mass. The Higgs mechanism explains mass by saying that the Universe is filled with the Higgs field. Interacting with the Higgs field gives the particles mass.

The Higgs boson would be experimental evidence of the Higgs mechanism. The Higgs field doesn't just interact with particles – it also interacts with itself. This self-interaction is the Higgs boson. The analogy most often used is to think of the Higgs field as a room full of physicists. Suddenly, Einstein walks into the room and everyone gathers around him. This makes it very difficult for Einstein to walk through the room – he (the particle) has acquired mass by interacting with the physicists (the Higgs field).



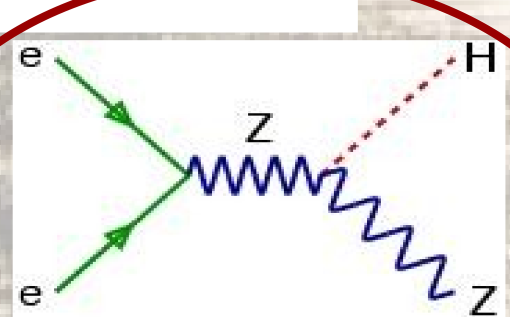
Although we haven't yet directly detected a Higgs boson, there is a vast amount of indirect evidence that its mass is within the kinematic range to be seen at the LHC and ILC. In order to understand the origin of mass we need to measure its mass and couplings with high precision. The ILC will be able to make these precision measurements and to establish uniquely the Higgs mechanism. It will even be possible to verify whether it behaves like a Standard Model Higgs boson or whether it points to new physics beyond the Standard Model, such as Supersymmetry.





At the ILC, we will be able to make a decay-mode-independent observation of the properties of the Higgs boson to incredible precision. For instance,

* Mass (to within 50MeV)
* Absolute couplings (to within 1-5 %)
* Total width
* Self coupling (to within ~20%)



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