
Write a ≳ 10 pages paper on this subject and prepare a 35 minutes blackboard presentation for this. No transparencies, no laptops. The calculations required for the scattering amplitudes must be explicitly presented in the paper.

**Date of the presentation:** May 1st

**Possible References:** The original papers on the subject is from Lee, Quigg and Thacker, Phys Rev Lett 38 (1977) 883 and Phys Rev D16 (1977) 1519.

For more pedagogical presentation you can follow, for example, the Higgs Hunter’s Guide book by Gunnion, Haber, Kane and Dawson
II. CP VIOLATION IN $B \to J/\psi K_s$

Write a $\geq 10$ pages paper on this subject and prepare a 35 minutes blackboard presentation for this. No transparencies, no laptops. The final answer should be derived but also explanation for contributions which are neglected. Also a brief discussion for how this was measured (what was the signal how it was reconstructed), in the asymmetric B-factories, should be included (why asymmetric?). http://www.hip.fi/btau/talks/talkRA.ppt

**Date of the presentation:** May 1st

III. W POLARIZATION IN $t \rightarrow Wb$

Write a $\gtrsim 10$ pages paper on this subject and prepare a 35 minutes blackboard presentation for this. No transparencies, no laptops. Explain via explicit calculation why in the SM we expect roughly 70%-30% longitudinal-transversial $W$ polarization in top decay. Explain also how can this be tested at the Tevatron/LHC.

**Date of the presentation:** May 6th

**Possible References:** Michael E. Peskin and Daniel V. Schroeder, An Introduction to Quantum Field Theory (the book, the subsection on top decay within the SM); F. Hubaut, E. Monnier, P. Pralavorio, K. Smolek and V. Simak, “ATLAS sensitivity to top quark and $W$ boson polarization in $t$ anti-$t$ Eur. Phys. J. C 44S2, 13 (2005) [arXiv:hep-ex/0508061].
IV. SUSY VS. UNIVERSAL EXTRA DIMENSIONS SIGNALS AT THE LHC

Write a \textgreater{} 10 pages paper on this subject and prepare a 35 minutes blackboard presentation for this. No transparencies, no laptops. Explain how a minimal model of universal extra dimension can mimic the LHC signatures of the MSSM. Emphasized should be made on the connection with an unbroken $Z_2$ symmetry, the missing energy signal at the LHC and the possibility to have dark matter candidate in both frameworks.

**Date of the presentation:** May 6th

V. RANDALL-SUNDRUM AND THE HIERARCHY PROBLEM

Write a $\geq 10$ pages paper on this subject and prepare a 35 minutes blackboard presentation for this. No transparencies, no laptops. Explain how the Randall-Sundrum idea solves the hierarchy problem and maintain the weakness of gravity as required by observations.

**Date of the presentation:** May 8th