



Istituto Nazionale
di Fisica Nucleare
Sez. di FIRENZE



LHCPhenoNet Mid Term Meeting

Leandro Cieri

LHCphenOnet

Istituto di Fisica Nucleare
Sezione di Firenze

16-20 September 2012, Ravello, Italy

Leandro Cieri

Marie Curie Fellow (ESR)

LHCphenOnet



- Contract started: 01/02/2012
- Ending date: 30/04/2013
- Supervisor: Stefano Catani
- Co-supervisor: Daniel de Florian
- Host Institute: INFN, Sez. Firenze
- Previous Institute: Universidad de Buenos Aires
- Home country: Argentina



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Research project (Project overview)

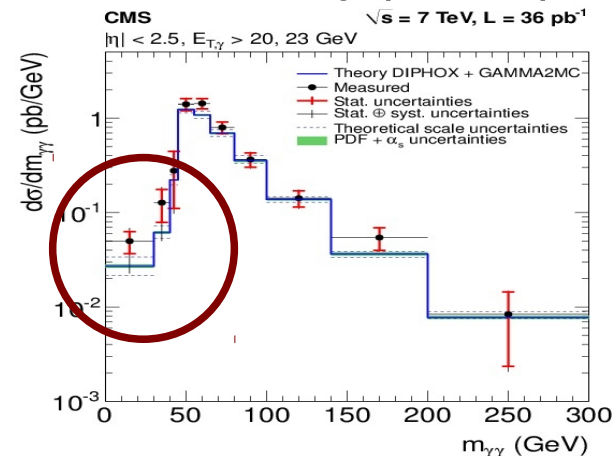
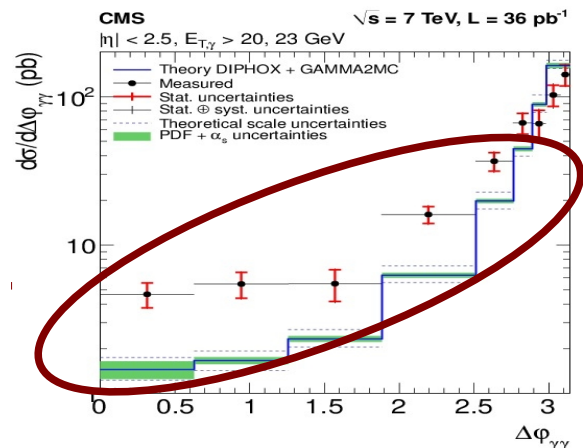
- Calculation of the diphoton production at Next-to-Next-to-leading-order in pQCD

- ## Leading-order



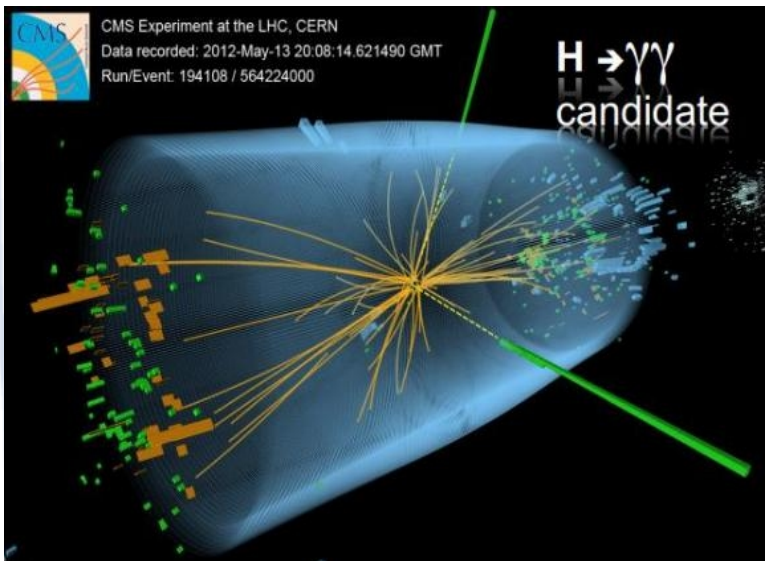
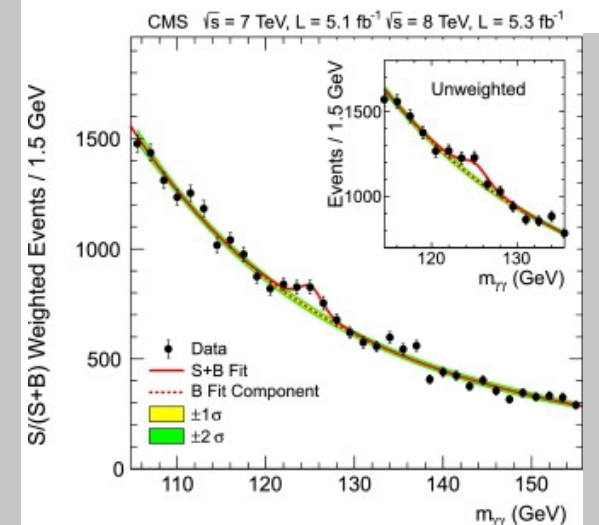
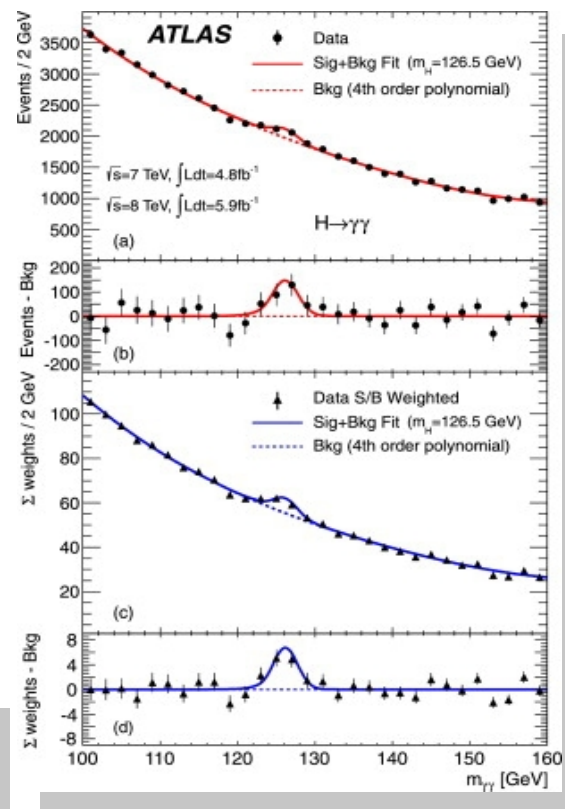
Research project (Project overview)

- Calculation of the diphoton production at **Next-to-Next** to-leading-order in pQCD
- Why?
 - Test Standard Model, BSM
 - Main background in Higgs boson searches
- Why this precision?
 - To describe the Higgs background in the best way
 - Some discrepancies found: theory(NLO) vs. data



Research project (Project overview)

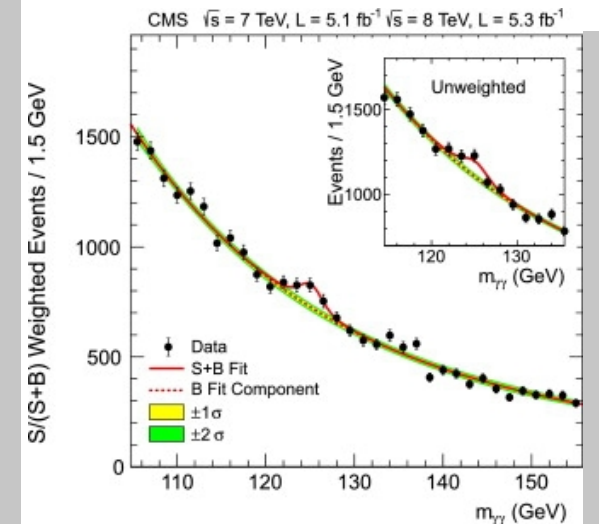
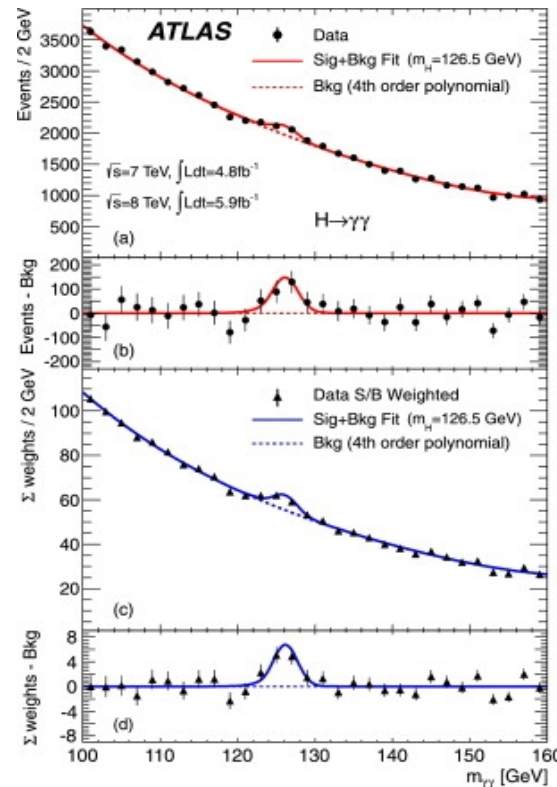
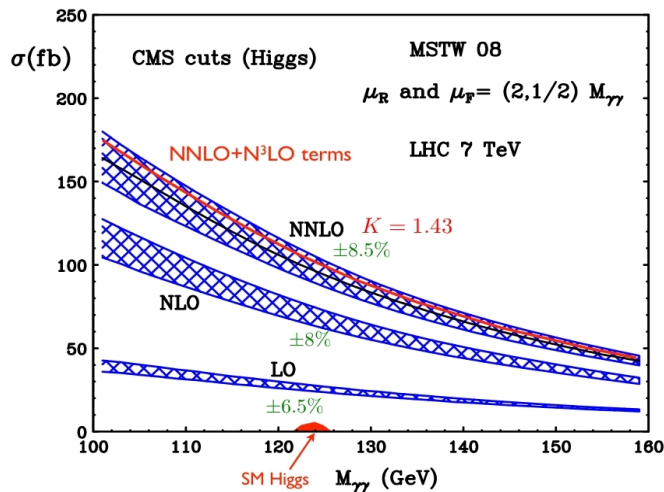
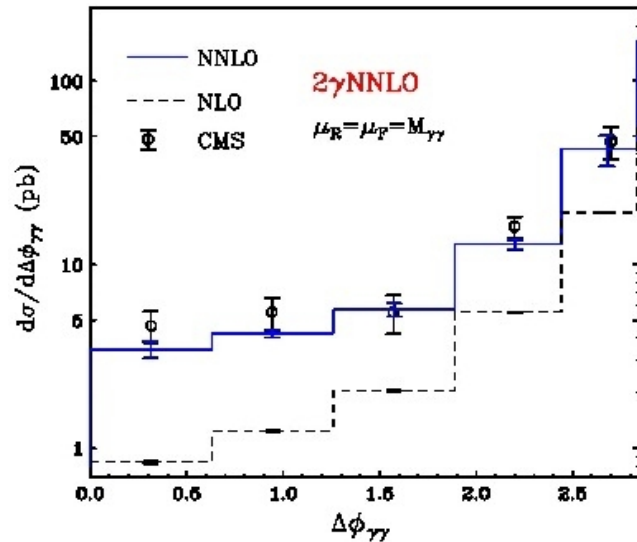
All the precedent motivations are renovated by the spectacular observation of a new neutral boson ($M \sim 125$ GeV)



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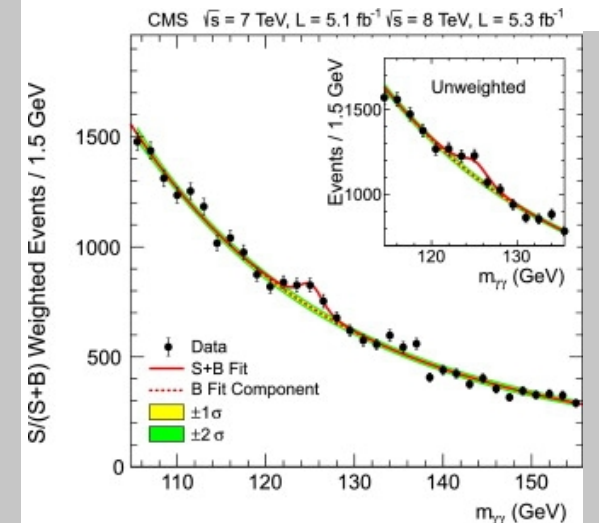
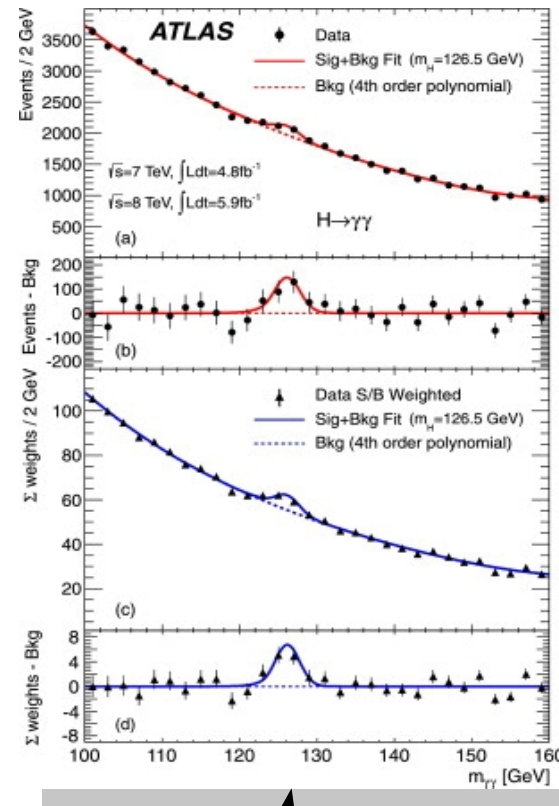
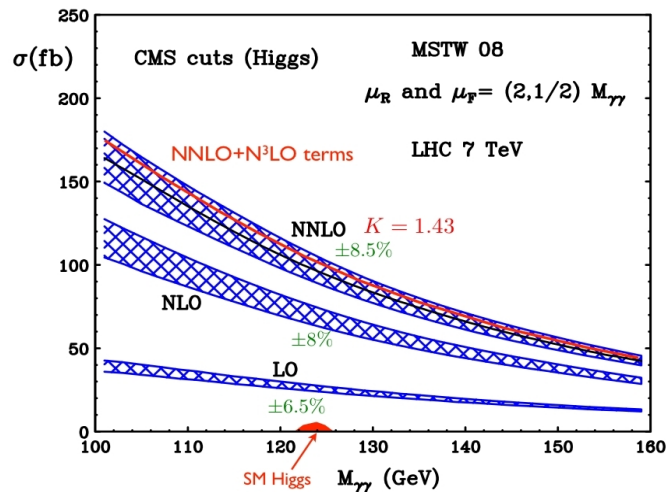
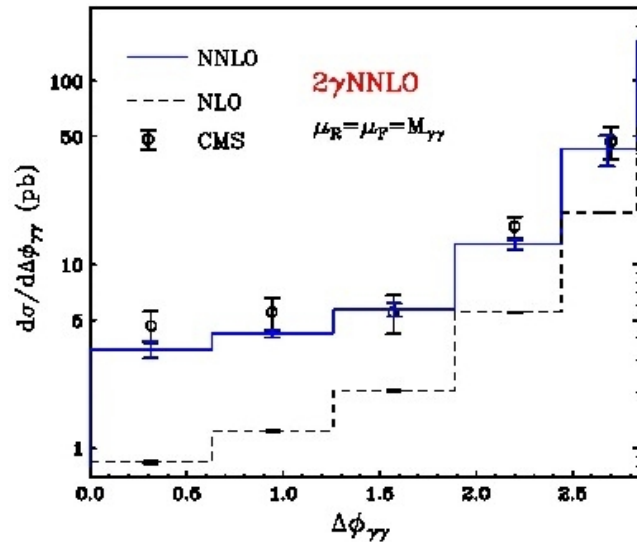
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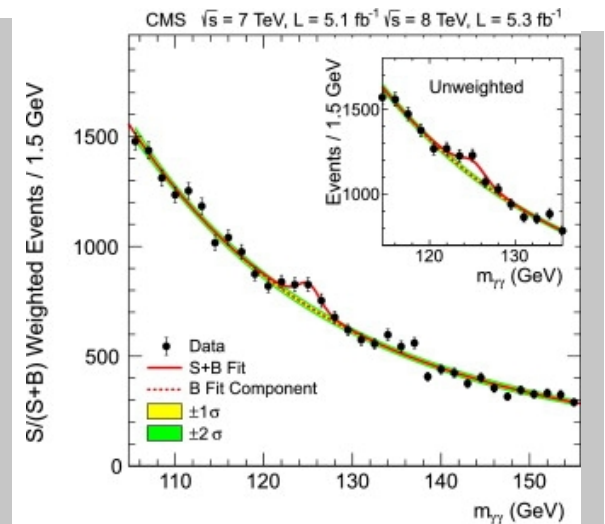
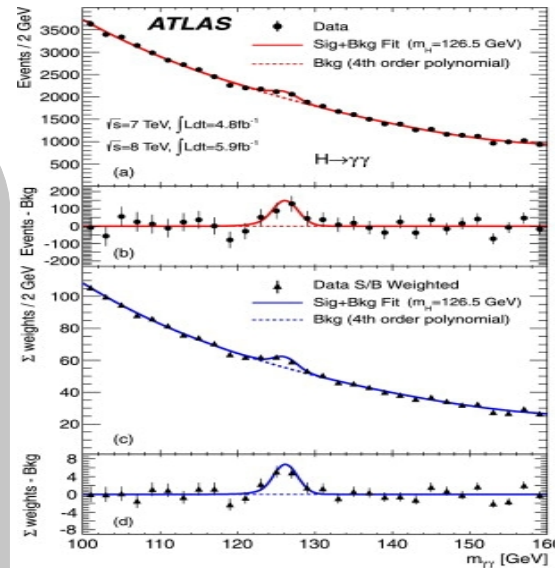
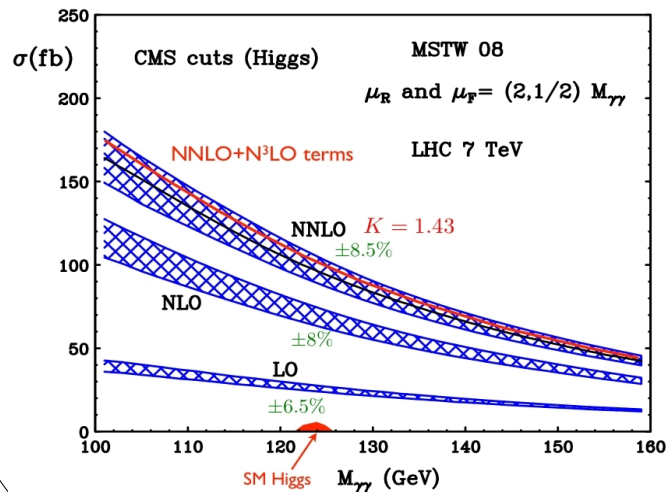
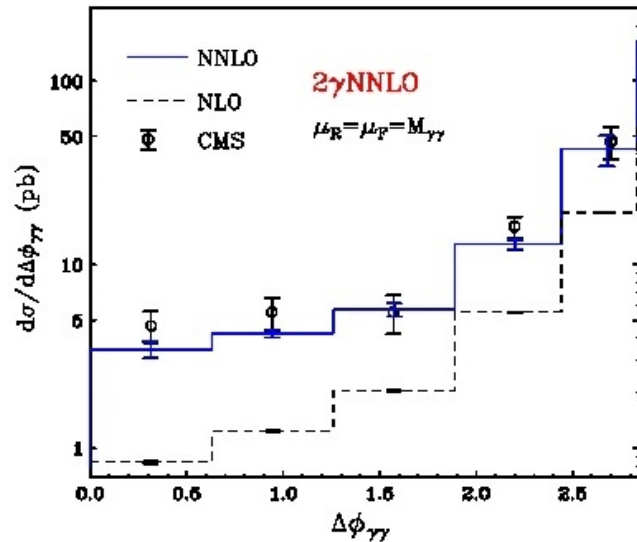
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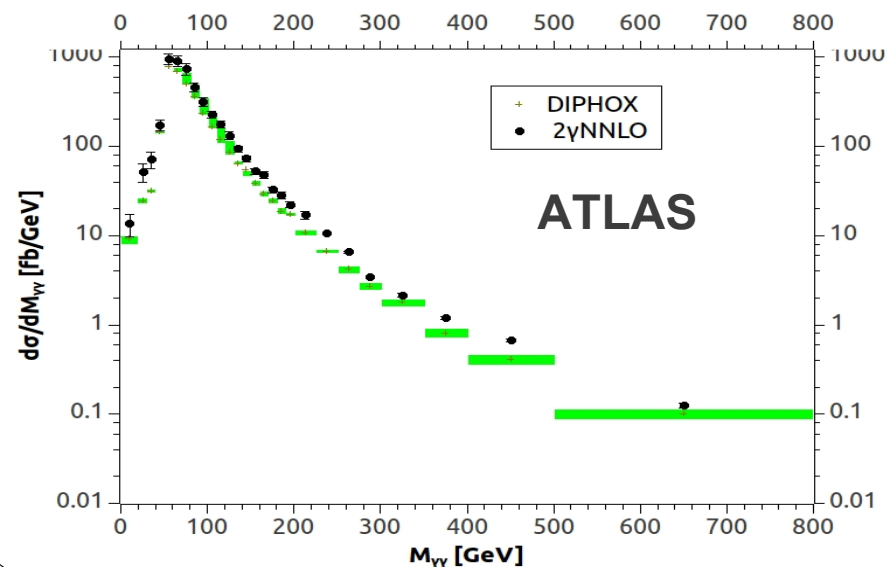
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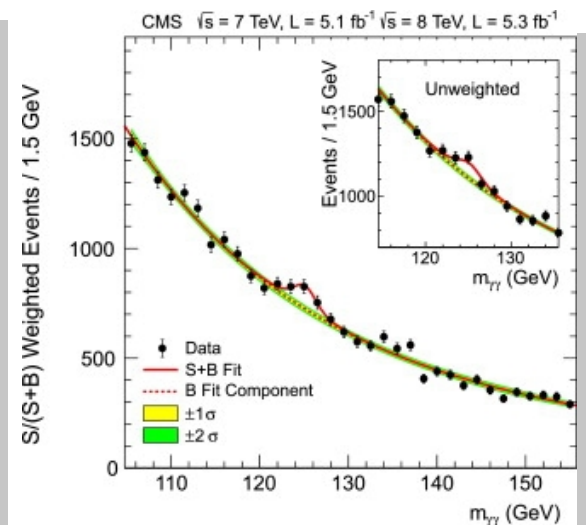
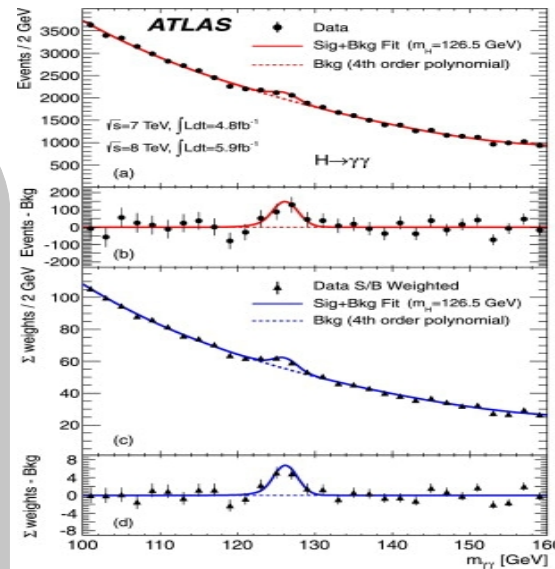
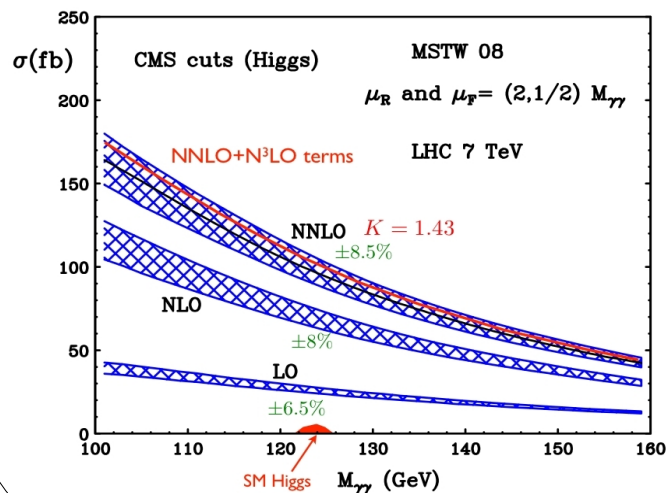
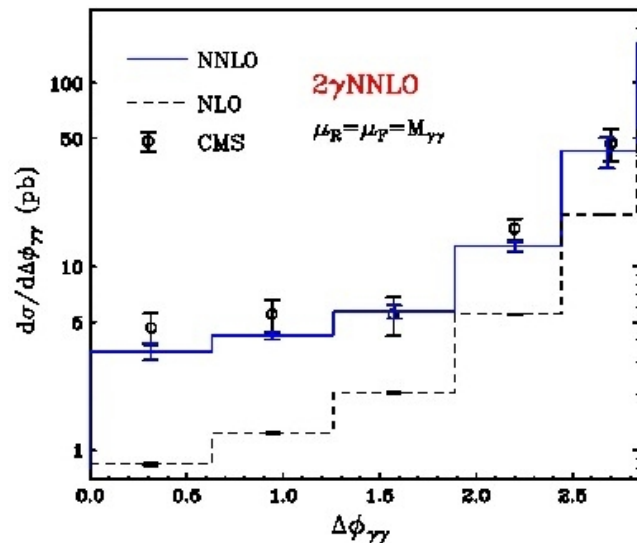
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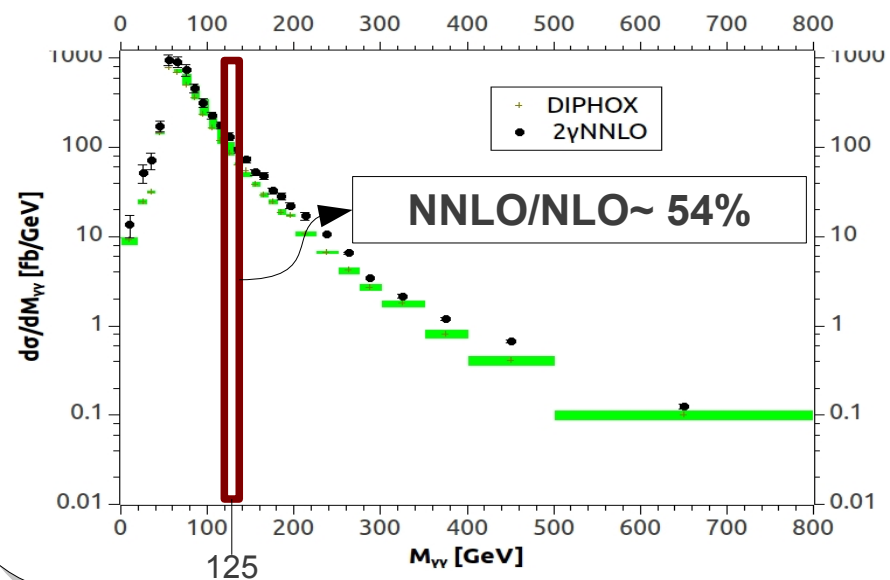
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Research project (Project overview)

- **Our group:** Stefano Catani, Daniel de Florian, Giancarlo Ferrera, Massimiliano Grazzini, LC
- **We collaborate directly with:**

- Diphoton studies {
- **CDF** (Konstantinos Vellidis, Fermilab) (Paper to appear)
 - **D0** (Dmitry Bandurin and Peter Svoisky, Fermilab) (Paper to appear)
 - **ATLAS** (Giovanni Marchiori, CERN) (Paper to appear)

- Higgs searches {
- **ATLAS**
 - Reisaburo Tanaka, CERN
 - Teresa Dova, CERN, UNLP

- LHC
European
Strategy {
- **ATLAS** (Reisaburo Tanaka, CERN)

Research project (Project overview)

- Visits (Mobility)
 - Zürich (February 2012) (work, 2yNNLO)
 - Rencontres de Moriond (March 2012) (collaborations)
 - Paris (Workshop on Photon Physics and Simulation at Hadron Colliders) (March 2012) (collaborations)
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Overview of training

(Schools, workshops, congresses)

- LHCPhenoNet Winter School, Ascona, Switzerland (2012)
- Pauli Lectures, ETH, Zürich, Switzerland (2012)
- Rencontres de Moriond, La Thuile, Italy (2012)
- LHCPhenoNet Annual Meeting, Durham, UK (2012)
- Workshop on Photon Physics and Simulation at Hadron Colliders, Paris, France (2012)
- Seminars at INFN Physics department (all wednesdays) (2012)
- QCD 12, Montpellier, France (2012)
- HP2, Munich, Germany (2012)

Overview of training

- Learning of a different language (Italian)
- Member of the organizing committee, LHCPhenoNet, Ravello



• Publications

Deliverables and milestones

- | | | | |
|-------------|---|---|-------------|
| ■ LPN11-74 | "Diphoton spectrum in the mass range 120-140 GeV at the LHC" | } | M1.1 |
| | [arXiv:1207.3252 [hep-ph]] | | |
| ■ LPN12-082 | "Diphoton production at hadron colliders: a fully-differential QCD calculation at NNLO" | | |
| | [Phys.Rev.Lett. 108 (2012) 072001] | | |
| ■ LPN12-100 | "Vector boson production at hadron colliders: hard-collinear coefficients at the NNLO" | } | M2.1 |
| | [arXiv:1209.0158 [hep-ph]] | | |
| ■ LPN12-101 | "Diphoton production at Next-to-Next-to-Leading-Order" | } | M2.1 |
| | [arXiv:1209.3143 [hep-ph]] | | |
| ■ LPN12-007 | "Handbook of LHC Higgs Cross Sections: 2. Differential Distributions" | } | M2.1 |
| | [arXiv:1201.3084 [hep-ph]] | | |

• Numerical codes

- | | | |
|-------------------|---|-------------|
| ■ 2 γ NNLO | } | M1.1 |
|-------------------|---|-------------|

• Conferences (Presentations)

- LHCPHenoNet Winter School, Ascona (Talk)
- Rencontres de Moriond, (Talk and proceeding)
- LHCPHenoNet Annual Meeting (Talk)
- INFN, Firenze (Talk)
- QCD12 (Talk and proceeding)
- HP2 (Talk)

Future plans

- Other diboson calculations at NNLO, related to Higgs boson searches and studies
 - New code
 - Extraction of new H coefficients
- Papers to appear
 - Complete study of the phenomenology of diphoton production
 - General method to extract H coefficients at NNLO

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