Thoughts on new topics for new group(s)

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04-06 November 2025, DY workshop

This session

Description

1) Photon induced lepton pair production. This talk + L. Forthomme
2) di-photon analysis probing to qq state and TMDs. This talk
3) mu mu + gamma (Louis) L. Moureaux
...

Introduction of METU Ankara group

My alma mater institute.

Group is currently being restructured under supervision of Prof. Ozpineci.

1 PhD and 1 MSc student are currently involved in this analysis effort

1PhD and 2 MSc joining very soon + possibly some other researchers in a near future

A picture from summer visit and discussion session in Ankara

Idea 1: di-photon final state

Studying the di-photon final state

Potential to probe QCD ISR effects → TMDs

Several trigger options exist:

Single Photon triggers: Mainly for higher masses (mγγ)

Di-photon triggers: Standard H (125), special low mass triggers (as used in low mass search[1])—> down to 25 GeV of pT 2025.

Full list of photon triggers that I extracted are (2024 run 285142) here

Can be a fast track measurement with standard object.

In-line with our groups expertise of TMD related phenomenology

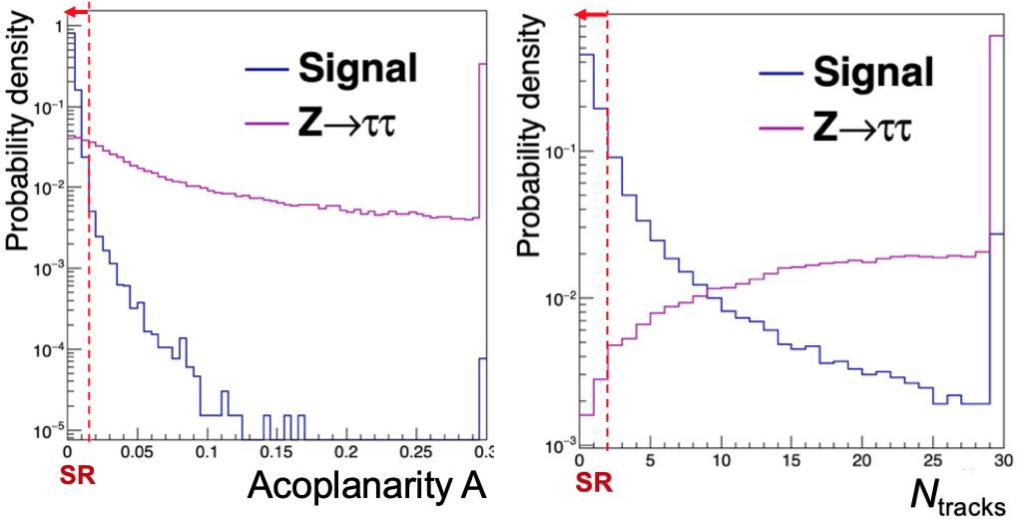
[1]:CMS HIG-24-014: low mass diphoton search [cadi]

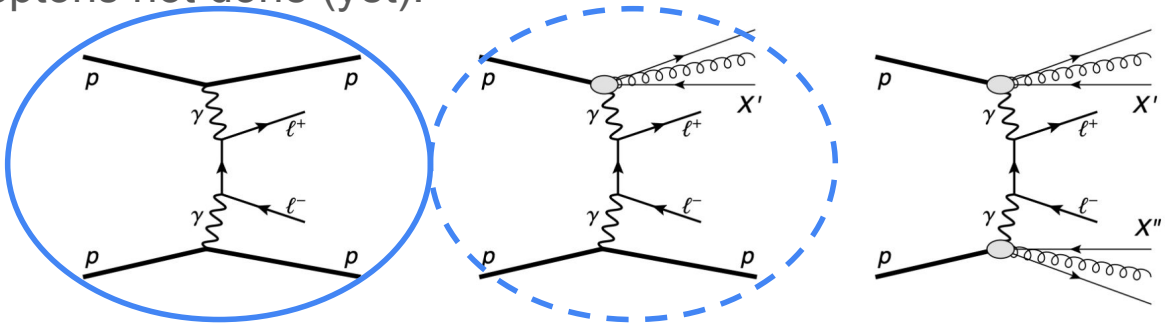
Idea 2: photon induced dilepton production

→ ATLAS, CMS and LHCb have several photon induced results in ll, WW, γγ final state.

→ Recent CMS result in di-tau final state, observation of the process and measuring g-2 anomalous coupling. [SMP-23-005]

→ ee and mumu final states are not covered. Differential measurement in mass of dileptons not done (yet).



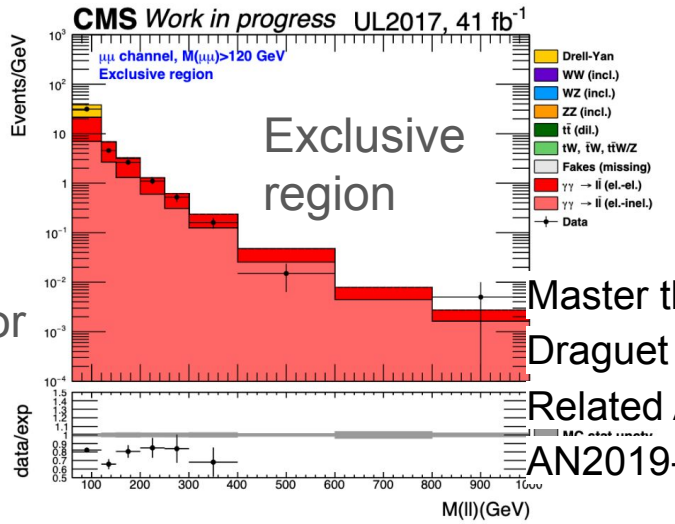


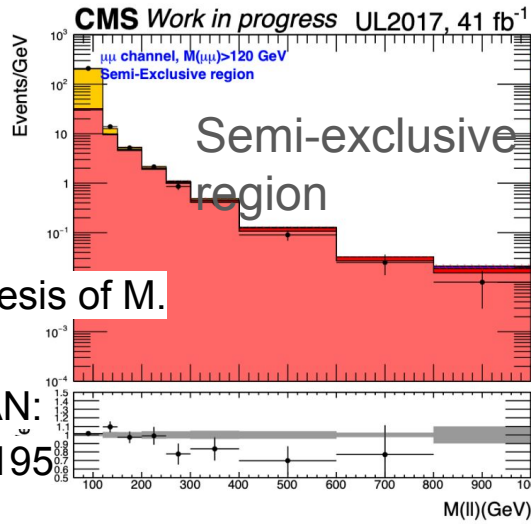
Two main observables to separate signal from other processes

L.Thomas talk L. Forthomme talk

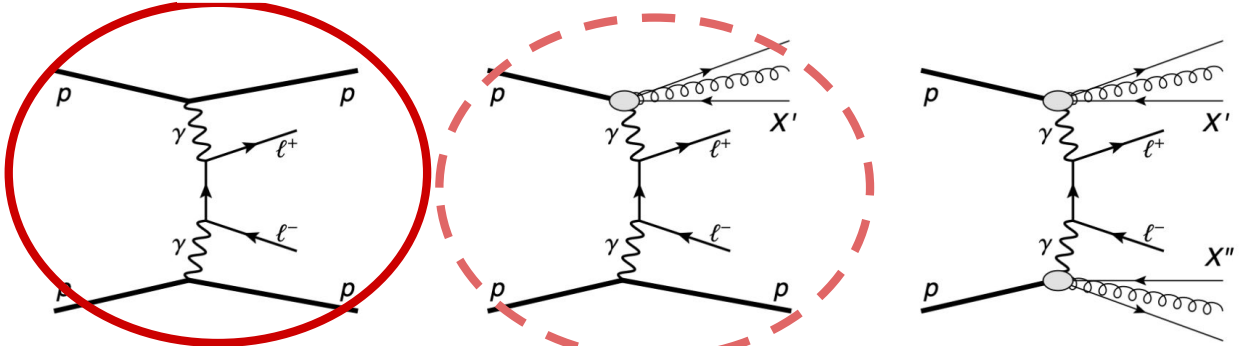
Idea 2: photon induced dilepton production

→ Initial studies show that a differential measurement is feasible (here only 2017 data)
→ Can benefit from the improvements from di-tau analysis
→ Beamspot corrections for nch distribution, selection optimisations…
→ Adding PPS or proton tagging?





Master thesis of M. Draguet
Related AN: AN2019-195



L.Thomas talk L. Forthomme t

Outlook

METU group is already engaged towards gg->ll analysis

Learning the shears package, using LLM to scrutinize → can be very helpful for the group

Room for other physics problems, sharing same framework(s), carrying out important measurements

Always room for new people/groups.

Diphoton cross section values

→ Obtained from MC: [pb]

Catalog2018_GGToMuMu_Pt-2_Mll-10To30_El-El.txt:* sample xsec: 1.139e+01
Catalog2018_GGToMuMu_Pt-2_Mll-10To30_Inel-El_El-Inel.txt:* sample xsec: 1.052e+01
Catalog2018_GGToMuMu_Pt-2_Mll-10To30_Inel-Inel.txt:* sample xsec: 1.040e+01
Catalog2018_GGToMuMu_Pt-2_Mll-30To50_El-El.txt:* sample xsec: 6.716e-01
Catalog2018_GGToMuMu_Pt-2_Mll-30To50_Inel-El_El-Inel.txt:* sample xsec: 8.958e-01
Catalog2018_GGToMuMu_Pt-2_Mll-30To50_Inel-Inel.txt:* sample xsec: 1.171e+00
Catalog2018_GGToMuMu_Pt-5_Mll-50To200_El-El.txt:* sample xsec: 2.473e-01
Catalog2018_GGToMuMu_Pt-5_Mll-50To200_Inel-El_El-Inel.txt:* sample xsec: 3.694e-01
Catalog2018_GGToMuMu_Pt-5_Mll-50To200_Inel-Inel.txt:* sample xsec: 5.615e-01
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Catalog2018_GGToMuMu_Pt-5_Mll-200To1500_Inel-El_El-Inel.txt:* sample xsec: 1.110e-02
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