

Introduction

Physics Plenary during P&P Week, September 11, 2019

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GEORG-AUGUST-UNIVERSITÄT
GÖTTINGEN



BERGISCHE
UNIVERSITÄT
WUPPERTAL

- Papers and CONF notes in circulation: 4 new results for TOP2019
- News from Physics Coordination / future analyses
- Working on approval comments
- New subgroup definition in the Top WG
- Modelling uncertainties
- Handing over the baton

Documents in Circulation

Papers in First Circulation:

SUSY	SUSY EW Compressed
TOPQ	ST tZ observation in trilepton ...
TOPQ	MS SMT top mass 36 fb-1
STDM	Soft Drop Jet Observables at ...

Papers in Second Circulation:

STDM	Inclusive single diffraction at ...
BPHY	Bc Bplus production ratio 8TeV
SUSY	SUSY Wh(1Lbb)
SUSY	SUSY WH(gammagamma)
SUSY	Direct staus

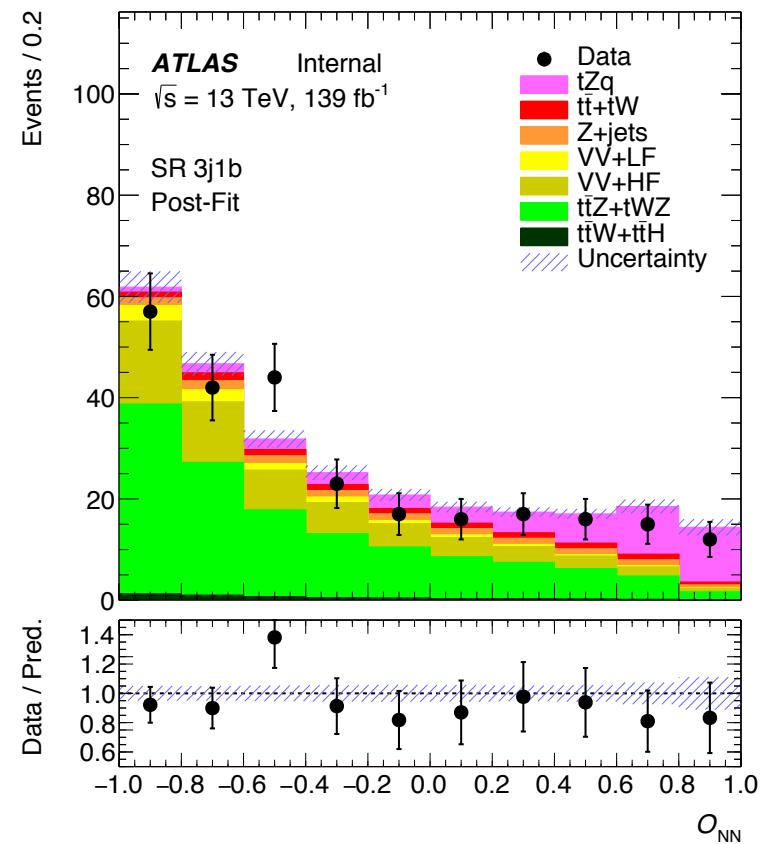
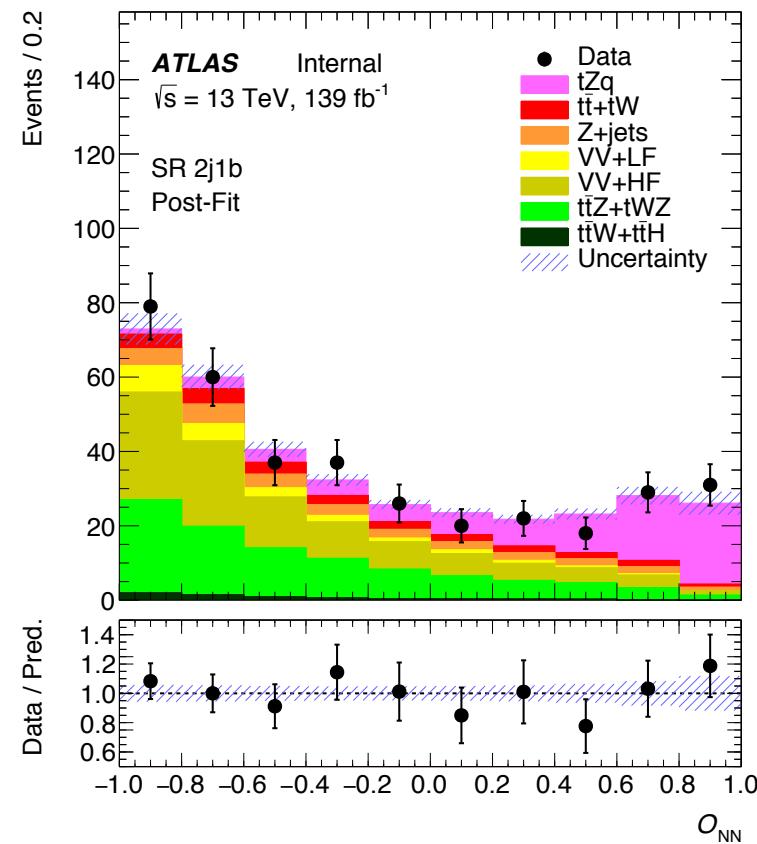
CONF Notes in Circulation:

HIGG	HTop ttH multileptons 2015-...
TOPQ	ttgamma in emu channel
TOPQ	XS ttbar inclusive xs I+jets 13 ...

In circulation: tZq production observation

- Observation well above 5 s.d.! (9.2 s.d. in the asymptotic approx.)
- Total uncertainty of cross-section measurement: **15%**
- Statistical uncertainty dominates: 12%

Uncertainty source	$\Delta\sigma/\sigma [\%]$
tZq PDF	4.2
Prompt lepton backgrounds	3.4
Non-prompt leptons/fakes	2.3
Jets+ E_T^{miss}	2.1
Luminosity	1.7
Leptons	1.7
Pile-up	1.2
MC statistics	1.0
tZq QCD radiation	0.8
b -tagging	0.4
Total systematic	8.0
Statistics	12



[TOPQ-2018-01](#)

CONF conversion

In circulation: Measurement of m_t based on $m_{\ell\mu}$



- Identifies muons inside b -jets with a soft muon tagger (SMT) in the lepton+jets channel.
- Reduced sensitivity to jet energy scale uncertainties.

Result:

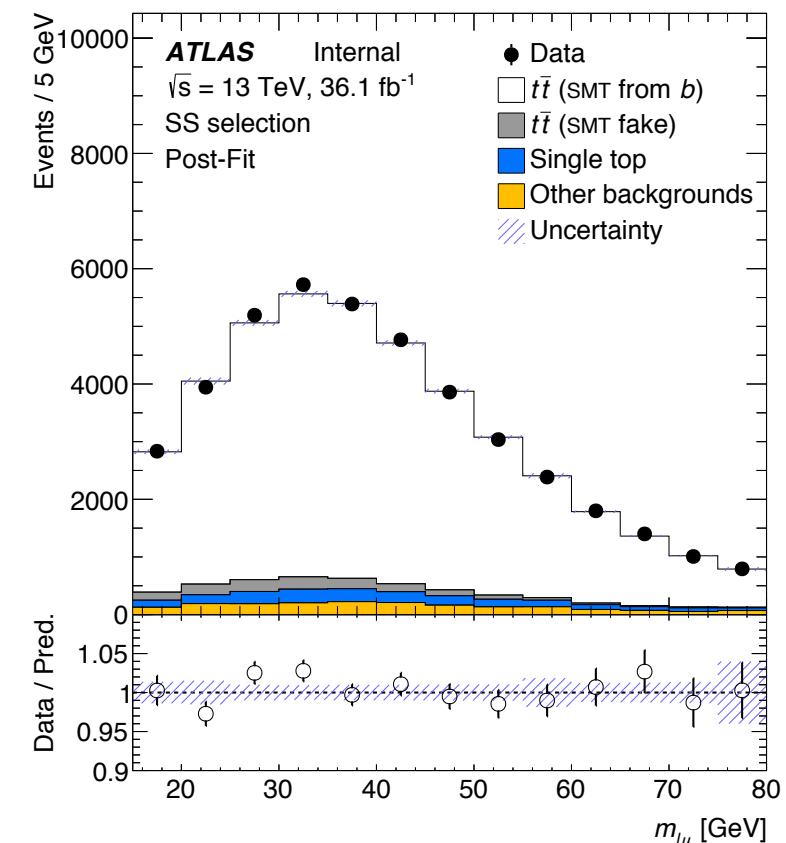
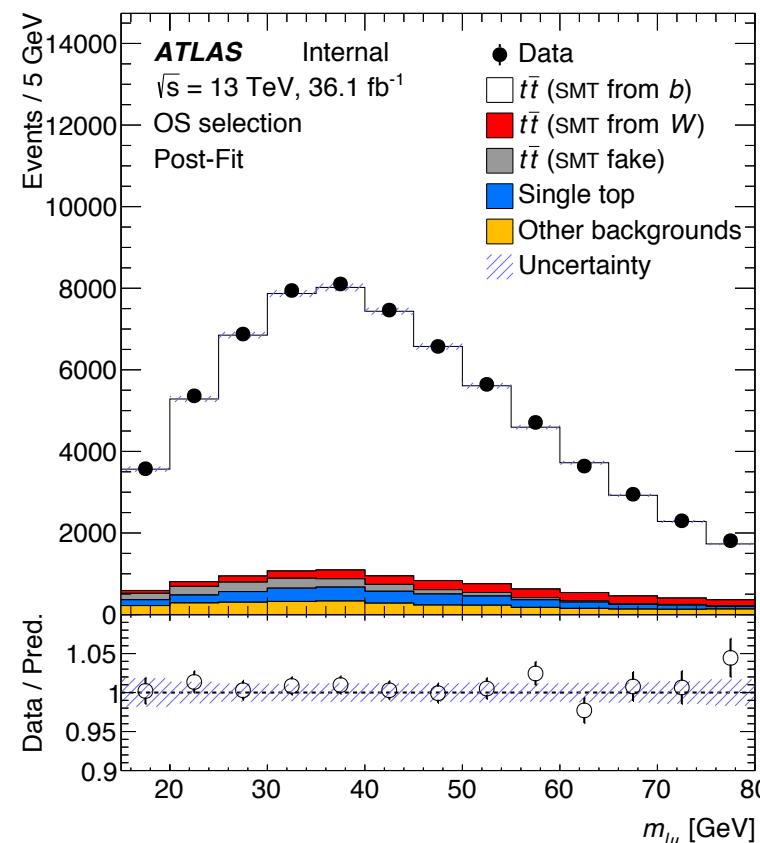
$$m_t = 174.50 \pm 0.78 \text{ GeV}$$

- First m_t measurement based on top-quark decay products at 13 TeV
- Most precise single measurement by ATLAS
- Uncertainties are mostly uncorrelated with the 8 TeV measurements

More in Marco Vanadia's talk!

[TOPQ-2017-17](#)

CONF conversion



In circulation: $t\bar{t}$ fiducial and total cross section



- Profile-likelihood fit to discriminants in 3 regions

$$\sigma_{\text{inc}} = 829.7 \pm 0.4 \text{ (stat.)} \pm^{+35.3}_{-34.5} \text{ (syst.)}$$

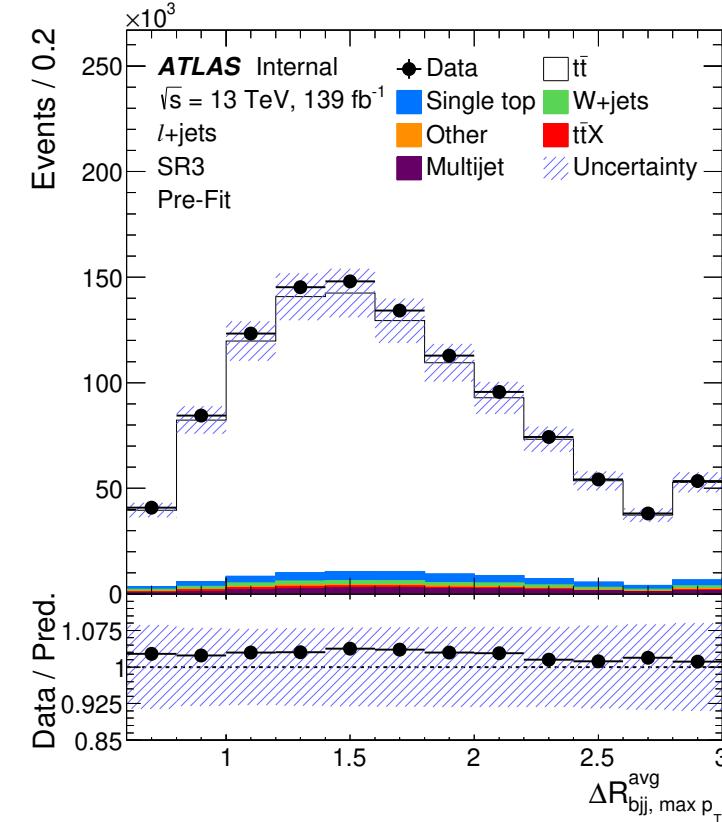
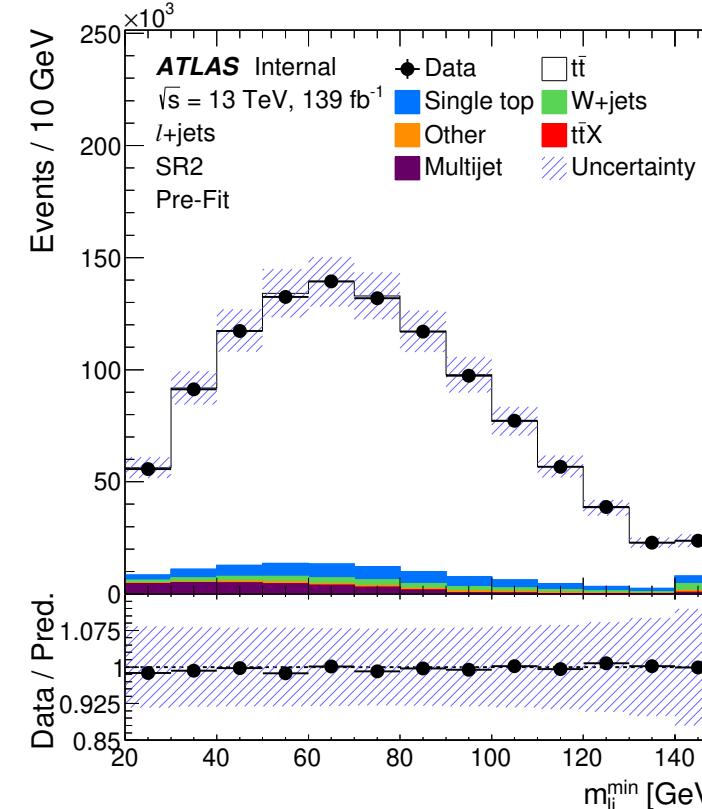
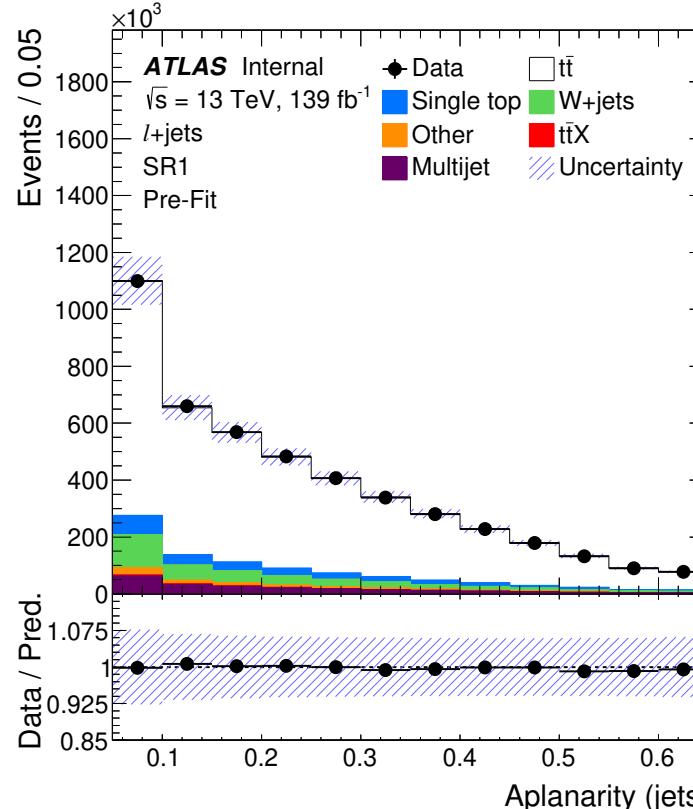
$\equiv 4.3\%$ precision

(SM pred.: 832 pb)

[TOPQ-2019-05](#)

CONF note

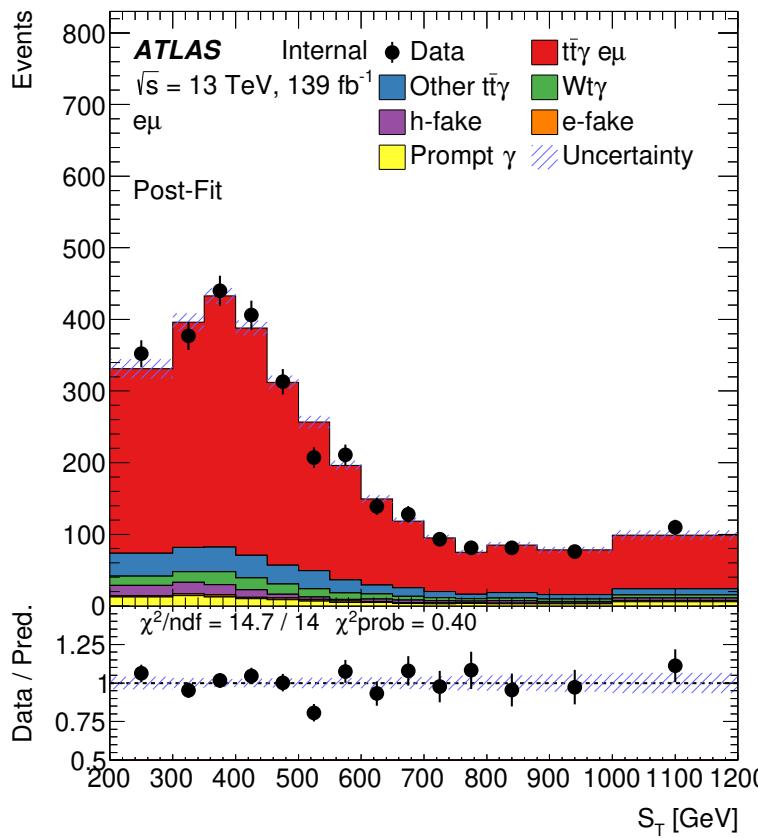
- Precision of the fiducial measurement: 3.9%



In circulation: Measurement of $t\bar{t} + \gamma$ production



- Electron-muon channel
- Fiducial and differential cross sections.

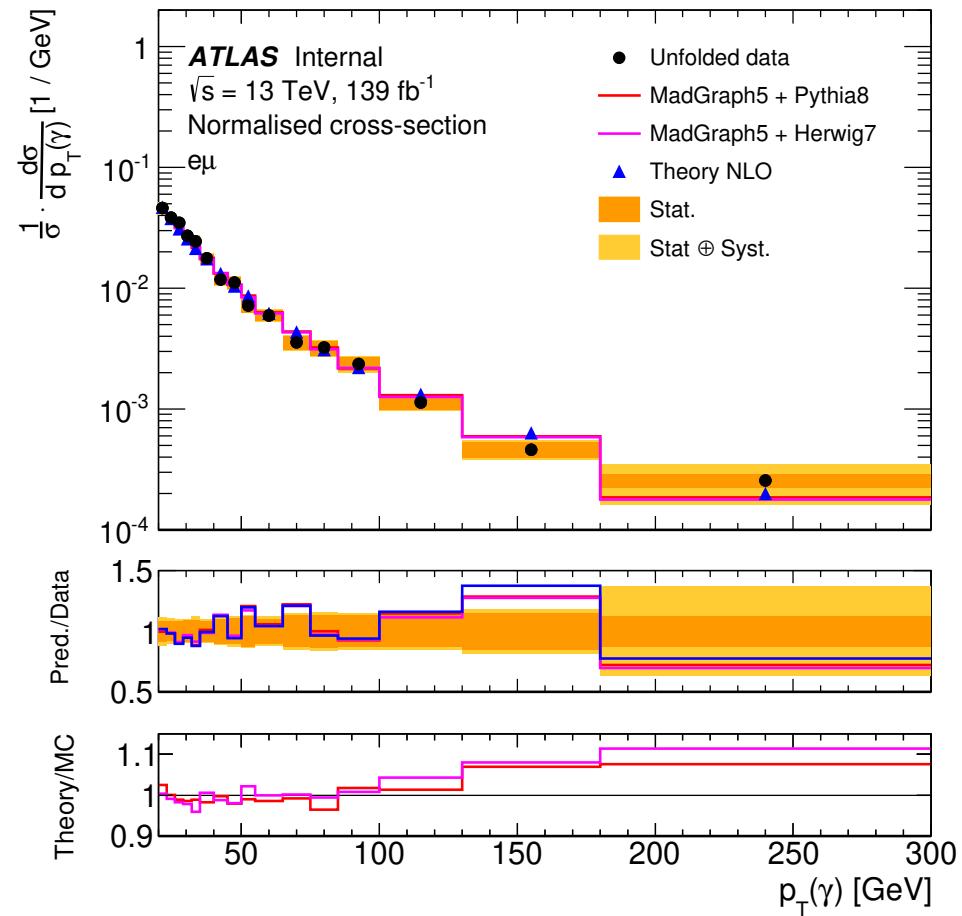


- Fit to S_T = scalar sum of all transverse momenta in the event.
- Five variables are unfolded and compared to the latest theory predictions.

More in Carmen Diez Pardos talk!

[TOPQ-2018-46](#)

CONF note



- MC sample production
 - September is the last month with good Grid availability to submit MC production for some time.
 - Mass production of new V+jets samples will start in October.
 - Even if in doubt, submit your requests now. It does not hurt to have more.
- “Papers which do not go to ATLAS circulation this year need to use precision recommendations.”
 - Most of our ongoing analyses should push to circulate before Christmas.
 - Analyses going for Winter 2020 need to update their data with a new production using recommendations available end of October.

Planning of future analyses



- Need to plan analyses of second round on full Run 2 data set (Summer 2020 and beyond).
 - Some are already planned
 - Will discuss with subgroup conveners
 - New ideas are welcome!
- Setup limited analysis program for start of Run 3 (2021 data set).
 - A few standard candle measurements
 - Measurements with low- μ
 - Look at Jay Howarth's talk from January P&P week: [Run 2 crazy ideas](#)
 - If you are interested: talk to us

Working on approval comments in an efficient manner



- Conveners' review of the responses to approval comments is a bottle neck before the conferences.
 - Needs to be efficient to serve as many analysis as possible in short time
 - Google doc to allow for a faster iteration on items
 - Follow the instructions:

Dear analysis team:

As you might have seen, we have posted our approval comments to CDS. We have also created a google doc at:

<https://docs.google.com/document>

We suggest that you answer in the google doc (pick your favourite colour excluding green/orange/red) and when you have answered some of the questions and updated the INT note, let us know and we can start iterating. You do not need to wait until you have addressed the full set of comments to start answering. However, an updated INT note is important so that we can follow the comments.

IMPORTANT: In your reply, please point us to the relevant line number or figure number in the updated note.

This is crucial to find the relevant part of the text quickly and will lead to a faster turn around.

We'll answer using the following colors:

- green = OK, no further action needed from your side
- orange = mostly addressed but some further clarification needed
- red = issue not addressed, follow-up needed

Let us know if you have any comments or questions about the content or the form.

Best regards,
Lisa and Wolfgang

The time to review the responses increases dramatically if no reference is provided or if the reference is wrong!

If we ask for a cross check or study, this always implies that this work be documented in the INT note, typically in an appendix.

Clear responses documented in INT note = fast review

Changes in subgroup definitions



- Proposed change presented in Top Plenary during July P&P Week.
- Main idea: Establish a new subgroup which gathers all „ $t\bar{t} + X$ and $t + X$ “ analyses with $X = \gamma, Z, W, b\bar{b}, t\bar{t}$. Push for more coherent treatment in MC models, background estimates, interpretations.

Rare processes

$t\bar{t} + X$ and $t + X$

Top properties and mass

Cross Section

Changes in subgroup definitions



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Rare processes

$t\bar{t} + X$ and $t + X$

Top properties and mass

Cross Section

- Received positive feed back from several people.
 - Modification of proposal:
Do not establish a “Rare processes” subgroup, but merge it with „ $t\bar{t} + X$ and $t + X$ “. Reason: most FCNC analyses have “ $t + X$ ” signature.
 - Some analyses, lepton-flavour violation, … , go to cross-section group.
 - Single top analyses will be accommodated by other appropriate subgroups
- Changes to take action April 1st 2020
 - Call for new subgroup conveners will be geared to the new structure
 - Current subgroup conveners will not lose their job, but will be re-assigned.

Analysis assignment to subgroups



New subgroup structure: analysis assignment

Top-quarks + X ($X = \gamma, Z, b\bar{b}$)	Mass and Properties	Cross Section
TOPQ-2021-XX: ST tZ->lll high precision TOPQ-2018-44: ST tgamma TOPQ-2023-XX: ST FCNC tqg TOPQ-2020-XX: ST FCNC tqgamma fulll data set TOPQ-2018-41: ST FCNC tHbb TOPQ-2019-06: tqZ FCNC couplings TOPQ-2018-05: XS 4-top TOPQ-2019-03: XS ttbar+HF dilepton TOPQ-2018-08: PR ttZ TOPQ-2018-24: PR ttgamma TOPQ-2019-18: PR ttW differential STDM-2019-03: PR Global EFT Fit TOPQ-2018-25: PR FCNC tgamma TOPQ-2019-04: PR tqH FCNC with H->gammagamma TOPQ-2019-07: PR Rare top decays to Higgs bosons TOPQ-2019-17: PR FCNC tH(tautau) in ttbar TOPQ-2017-06: PR FCNC t->qZ TOPQ-2017-07 FCNC t->qH (H->bb, tautau, combination) TOPQ-2017-15 PR FCNC t->qH (ML, WW, ZZ) and tautau	TOPQ-2018-10: ST Top-quark polarisation TOPQ-2018-13: Single top mass TOPQ-2018-14: Top width Run 2 TOPQ-2018-16: Pole mass from l+jets differential TOPQ-2018-19: Top mass with J/psi TOPQ-2018-20: Template top mass l+jets TOPQ-2018-21: Template top mass dilepton TOPQ-2018-23: Top quark pole mass from tt+1jet TOPQ-2019-13: ATLAS+CMS top mass combination TOPQ-2017-17: SMT top mass TOPQ-2018-27: Rb TOPQ-2018-02: W helicity ATLAS+CMS 8 TeV combination TOPQ-2018-03: PR Charge Asymmetry TOPQ-2018-09: PR Vts in ttbar decay TOPQ-2018-28: W helicity TOPQ-2019-08: PR ttbar spin density matrix TOPQ-2019-14: PR V_cb in ttbar events TOPQ-2016-10: PR Spin correlation TOPQ-2017-13: PR Colour flow (color flow)	TOPQ-2018-04: ST s-channel TOPQ-2020-XX: t-channel fiducial and differential XS TOPQ-2020-XX: ST Wt-ttbar interference, WWbb TOPQ-2020-XX: Run 2 single top LHC Vtb combination TOPQ-2019-01: color reconnection TOPQ-2018-11: all-had boosted TOPQ-2018-15: l+jets differential TOPQ-2018-17: Lepton differential in dilepton TOPQ-2018-26: Dilepton differential cross-sections TOPQ-2018-39: ATLAS+CMS inclusive XS combination TOPQ-2018-40: XS cross section at 5 TeV TOPQ-2018-43: ttbar XS in HI TOPQ-2019-05: ttbar l+jets inclusive xs TOPQ-2016-03: boosted all-had differential XS TOPQ-20XX-XX: XS Neutral strange particles in ttbar events TOPQ-2017-19: XS b-fragmentation TOPQ-2018-29: PR LVF tau from W from top decay TOPQ-2018-30: CPV in b-hadron decays in ttbar events TOPQ-2018-12: PR Top dead cone

We will go forward and propose this structure to Physics Coordination for approval.

Top Reco / Top Processes: joint weekly meetings



- Top WG and PMG conveners discussed ways to achieve a closer communication between groups
- Will have joint meetings of Top Reco subgroup and PMG Top Processes subgroup.
- Time slot: Thursday 14:00
- Reco and MC contributions will alternate bi-weekly
- Top Reco Introduction / Announcements will continue to be on a weekly basis.

Modelling uncertainties: ISR



- In the course of the approval process of several total cross-section measurements based on profile-likelihood fits we have modified the prescriptions for the ISR modelling uncertainty for $t\bar{t}$ production.
- Previous prescription defines an “up” and “down” envelope based on 4 parameters:

Additional Radiation (ISR), variation up	Compare the nominal Powheg+Pythia8 ($hdamp=1.5$ mtop) with the samples with varied $hdamp$ ($hdamp=3$ mtop), at the same time dividing by 2 the renormalization and factorization scales and the varying the showering (Var3c Up)	To evaluate this uncertainty is necessary to use internal reweighting, instruction and details on how use these weights in Usage of weights	410480 and 410482	410482	410481	26.03.2018
Additional Radiation (ISR), variation down	Compare the nominal Powheg+Pythia8 with the samples obtained doubling the renormalization and factorization scales and the varying the showering (Var3c Down)	To evaluate this uncertainty is necessary to use internal reweighting of the nominal sample, instructions and details on how use these weights in Usage of weights	410470	410472	410471	26.03.2018

- New recommendation for analyses using the profile-likelihood technique: use the weights associated to the 4 parameters to define 4 variations represented by 4 nuisance parameters in the fit: μ_r , μ_f , $hdamp^*$ and Var3c.
- For differential cross-section measurements we recommend to continue to use the envelop prescription.

- Discussion on two main modelling uncertainties:
 - a) ME matching (to parton shower): Powheg vs. aMC@NLO
 - b) Parton shower (Pythia vs. Herwig)
- Agree on general aim to replace generator-to-generator comparisons with uncertainties within one setup and avoid digital uncertainties (on / off) if possible.
- ME matching:
 - Drop Powheg+Pythia8 vs. aMC@NLO+Pythia8*
 - Replace it by a cross-check showing that the difference between Powheg+H713 vs. aMC@NLO+H713 is covered by the modelling uncertainties applied.
 - PMG wants to add this comparison as an uncertainty. Ok, for a simple rate uncertainty, for example on fiducial acceptance, but problematic for analyses using shapes.
- Parton shower:
 - Stay for Pythia vs. Herwig, but accept constraints at the level of about 60%, split into acceptance, migration and shape uncertainties.
 - Medium-term goal: use variations inside Pythia (add splitting kernel shower variations ...)

Handing over the baton: new Top WG convener



Thank you Lisa for your tireless effort at the service of the Top WG. Best wishes for your next projects!



Lisa Shabalina

**Stay involved! We need your drive
and your expertise!**



Welcome Francesco!

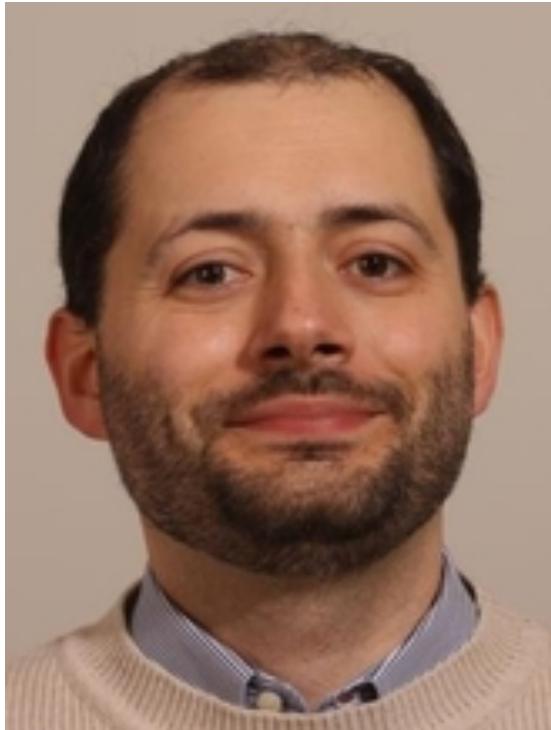


Francesco Spanò

New Top Cross Section subgroup convener



Thanks a lot Michele for 1.5 years of service to the Cross Section group and your contributions to many analyses!



Michele Faucci Giannelli

All the best for your next projects!



Welcome Marino!



Marino Romano

New Top Mass subgroup convener



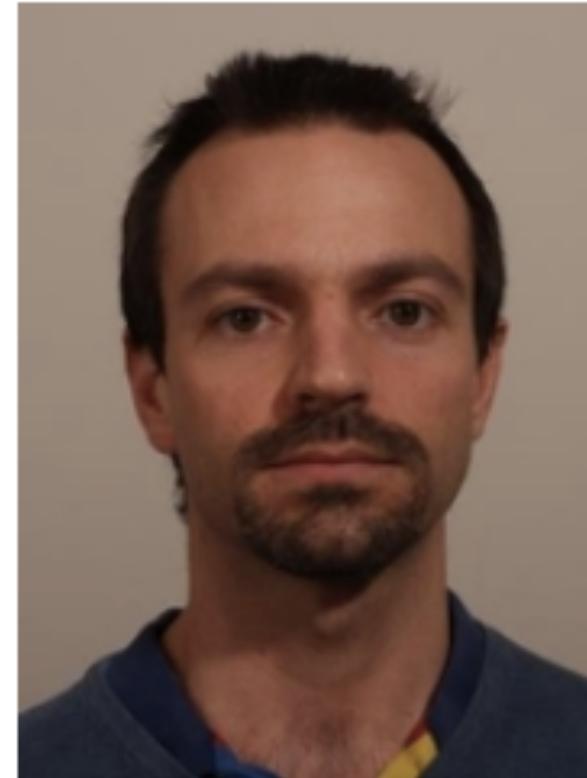
Thanks a lot Lucio for 2 years of service to the Mass group and for the strategy document!



Lucio Cerrito



Welcome Michele!



Michele Pinnamonti

Agenda of todays' Plenary



14:00	→ 14:20	The Prompt Lepton Veto (PLV) tool	⌚ 20m	
		Speaker: Fudong He (University of Science and Technology of China (CN))		
14:30	→ 14:50	Introduction	⌚ 20m	
		Speakers: Elizaveta Shabalina (Georg August Universitaet Goettingen (DE)), Wolfgang Wagner (Bergische Universitaet Wuppertal (DE))		
15:00	→ 15:15	Status and performance of PFlow jets	⌚ 15m	
		Speaker: Lewis Wilkins (Royal Holloway, University of London (GB))		
15:20	→ 15:40	Measurement of the charge asymmetry in ttbar dilepton events and combination with the measurement in the lepton+jets channel	⌚ 20m	
		Speakers: Kentaro Kawade (N), Kentaro Kawade (Shinshu University (JP))		
15:45	→ 16:05	Coffee break	⌚ 20m	
16:05	→ 16:25	Measurement of the differential ttbar production cross-sections in the resolved all-hadronic channel	⌚ 20m	
		Speaker: Serena Palazzo (The University of Edinburgh (GB))		
16:30	→ 16:45	HEPdata status in the Top WG	⌚ 15m	
		Speaker: Miriam Watson (University of Birmingham (GB))		
16:50	→ 17:10	Measurement of the top-quark mass based on a sample of events tagged by soft muons	⌚ 20m	
		Speaker: Marco Vanadia (Universita e INFN, Roma II (IT))		
17:15	→ 17:35	Measurement of ttbar + gamma production in emu channel	⌚ 20m	
		Speaker: Carmen Diez Pardos (Universitaet Siegen (DE))		