

20th Open LHCTopWG Meeting

December 1-3, 2021

Virtual Edition
(still...)

Introduction

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Wolfgang Wagner (Wuppertal)
Maria Aldaya (DESY)



Nicolas Tonon (1993 - 2021)



It is with incredible sadness that we must inform you of the sudden and tragic passing of a bright young star in CMS, Nicolas Tonon, on October 23. He made key contributions to the [first evidence of \$tZq\$ production](#), [searches for \$tH\$ and FCNC \$t-H\$](#) , and [pioneered probing \$t-Z\$ couplings in EFT using machine learning techniques](#). He is sorely missed by his friends and colleagues from CMS.

LHCtopWG: Introduction

- 20th open session of the LHC Top Working Group
 - Forum for public discussions (ATLAS+CMS+LHCb+TH) on combination and interpretation of top physics measurements at the LHC
 - Open sessions (twice per year) – aim always to allow time for discussion
 - **Since this year:** Seminars on specific topics on demand
 - **let us know your suggestions!**
- Documentation and coordinates
 - Integrated in the LPCC structure at CERN:
<http://lpcc.web.cern.ch/lhc-working-groups>
 - Agendas available at <https://indico.cern.ch/categoryDisplay.py?categId=4463>
 - Public summary plots at
<https://twiki.cern.ch/twiki/bin/view/LHCPhysics/LHCtopWGSummaryPlots>
 - Subscribe to main open mailing list: lhc-toplhwcg@cern.ch

Welcome to the second open session of 2021!



LHCtopWG in the virtual world

- Online-only meeting due to the continuing Covid19 pandemic
 - 3-half-day structure with only afternoon sessions, accommodating different time zones
 - Sessions will be recorded
 - We hope the workshop will continue to stimulate as many discussions as the “in-person” version
 - Questions can be asked using the “raise hand” option and/or typed in the zoom chat
 - The “Breaks” can also be used to continue discussions!
- Positive note:
 - Increased attendance from interested people since the meeting became virtual
- For the future: keep the best of both worlds
 - Plan to have the [meeting in May 2022 in hybrid-format](#) (depending on covid situation)
 - Let us know if you have any suggestions for improving the meeting!

LHCTopWG Contacts

- **Theory:** Fabio Maltoni
- **ATLAS:** Wolfgang Wagner
- **CMS:** Maria Aldaya
- **LHCb:** Steve Farry

Contacts for on-going combinations / working groups:

New since last Open Meeting

- **Top pair cross section:** Veronique Boisvert (ATLAS), Jan Kieseler (CMS)
- **Delta Phi Spin Correlation:** Miriam Watson & James Howarth (ATLAS), Giulia Negro & Afiq Anuar (CMS)
- **Top mass:** Mark Owen (ATLAS), Steve Wimpenny, Martijn Mulders, Matteo Defranchis (CMS)
- **tt differential cross sections:** James Howarth & Marino Romano (ATLAS), Otto Hindrichs, Olaf Behnke, & M. A. (CMS)
- **EFT:** Laura Barranco & Peter Berta (ATLAS), Kirill Skovpen & **Nicolas Tonon (CMS)**
- **Common MC:** Michael Fenton, Dominic Hirschbühl, & Reinhard Schwienhorst (ATLAS), Giulia Negro (CMS)
- **Harmonization of modelling uncertainties:** **Andrea Knue & Dominic Hirschbühl (ATLAS), Efe Yazgan & Enrique Palencia (CMS)**

Also contacts for dedicated topics as needed (JES, b-tagging, pseudo-top definitions, theoretical calculations, etc)

Also contacts for global EFT effort within **LHC EFT WG:** <https://lpsc.web.cern.ch/lhc-eft-wg>
Nuno Castro (ATLAS), **Nadjieh Jafari (CMS)**, Eleni Vryonidou (Theory)

Ongoing Combinations

New! Top quark pair cross-section 7 & 8 TeV + extraction top pole mass & α_s
- stay tuned for Friday!

Ongoing combinations under review within the collaborations:

- **Delta Phi Spin Correlation at 13 TeV** (started with [comparison plots](#))
- **Top mass Run1 combination** - finalizing studies to select combination approach

Planned Run1 combinations that are a bit further away:

- **Differential ttbar distributions** (started with comparisons)

Ongoing efforts for upcoming Run2 combinations:

- **Common MC sample studies** - update today!
- **Discussion on harmonization of systematic uncertainties** - update today!
- **Revisiting phase-space definitions (experiment + theory)**

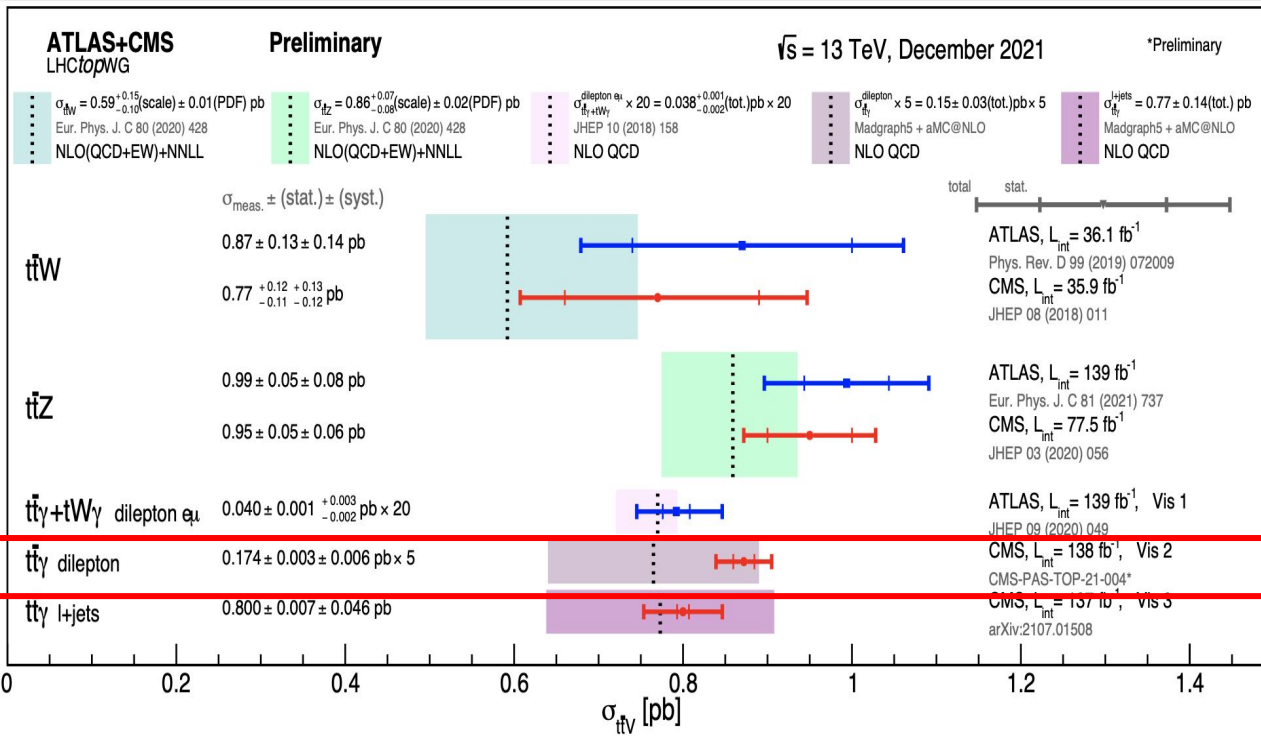
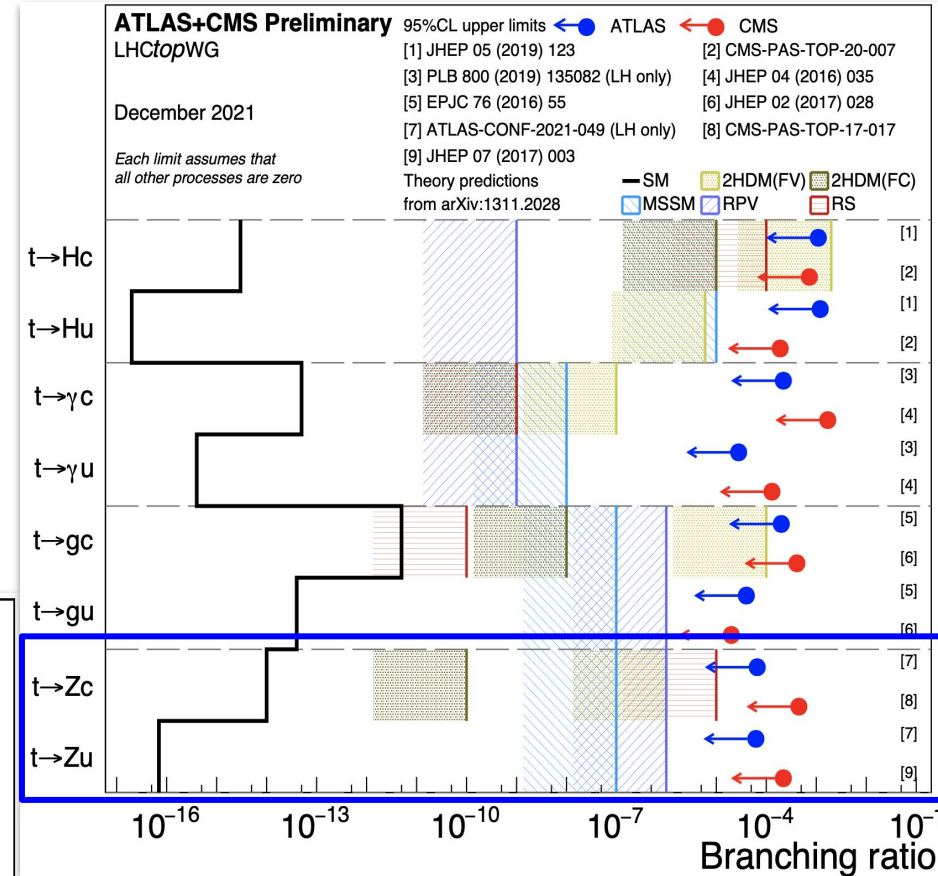
Need to address JES and b-tagging correlations for Run2

Summary plots

<https://twiki.cern.ch/twiki/bin/view/LHCPhysics/LHCtopWGSummaryPlots>

New plots since last Open Meeting and other updates (some examples):

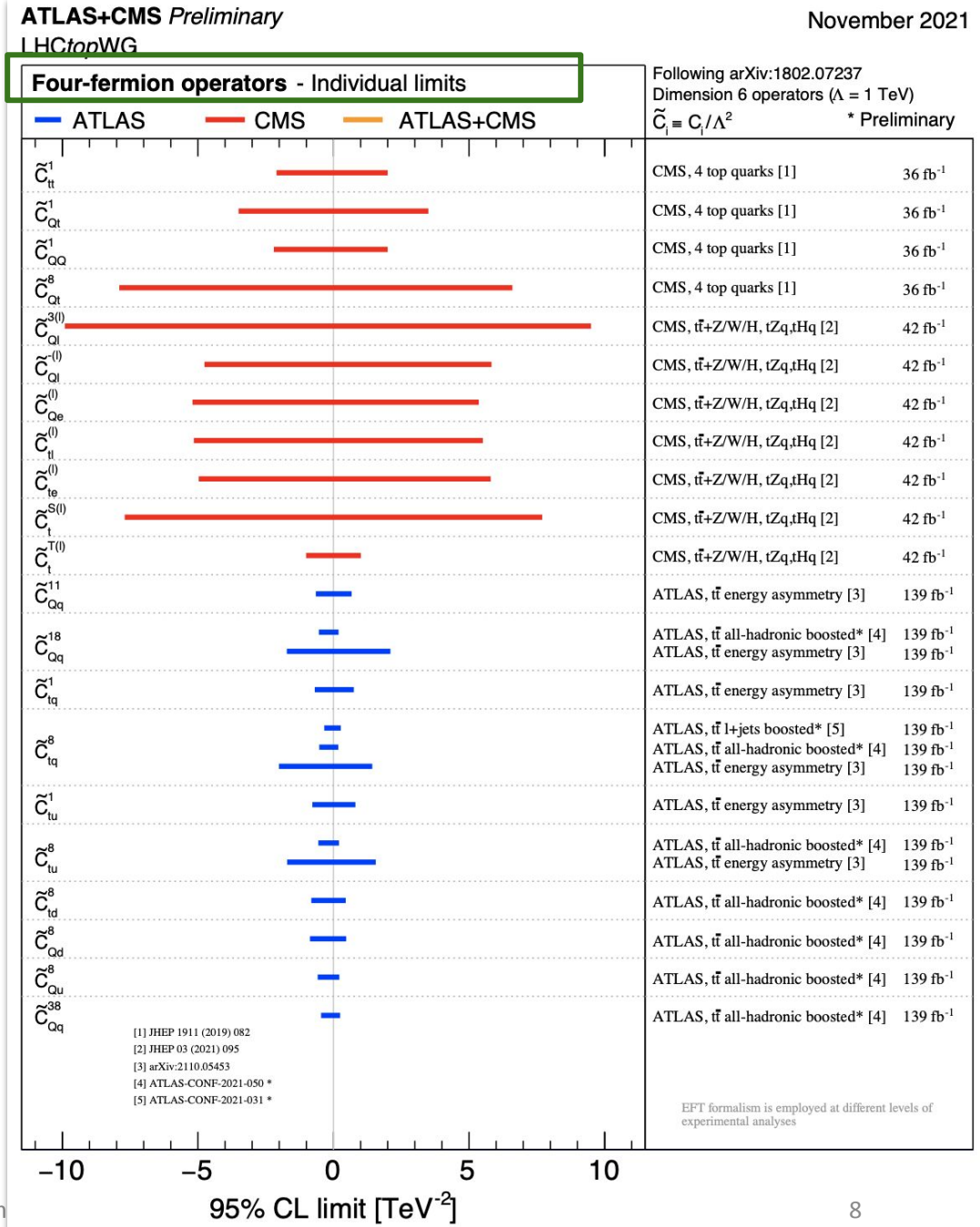
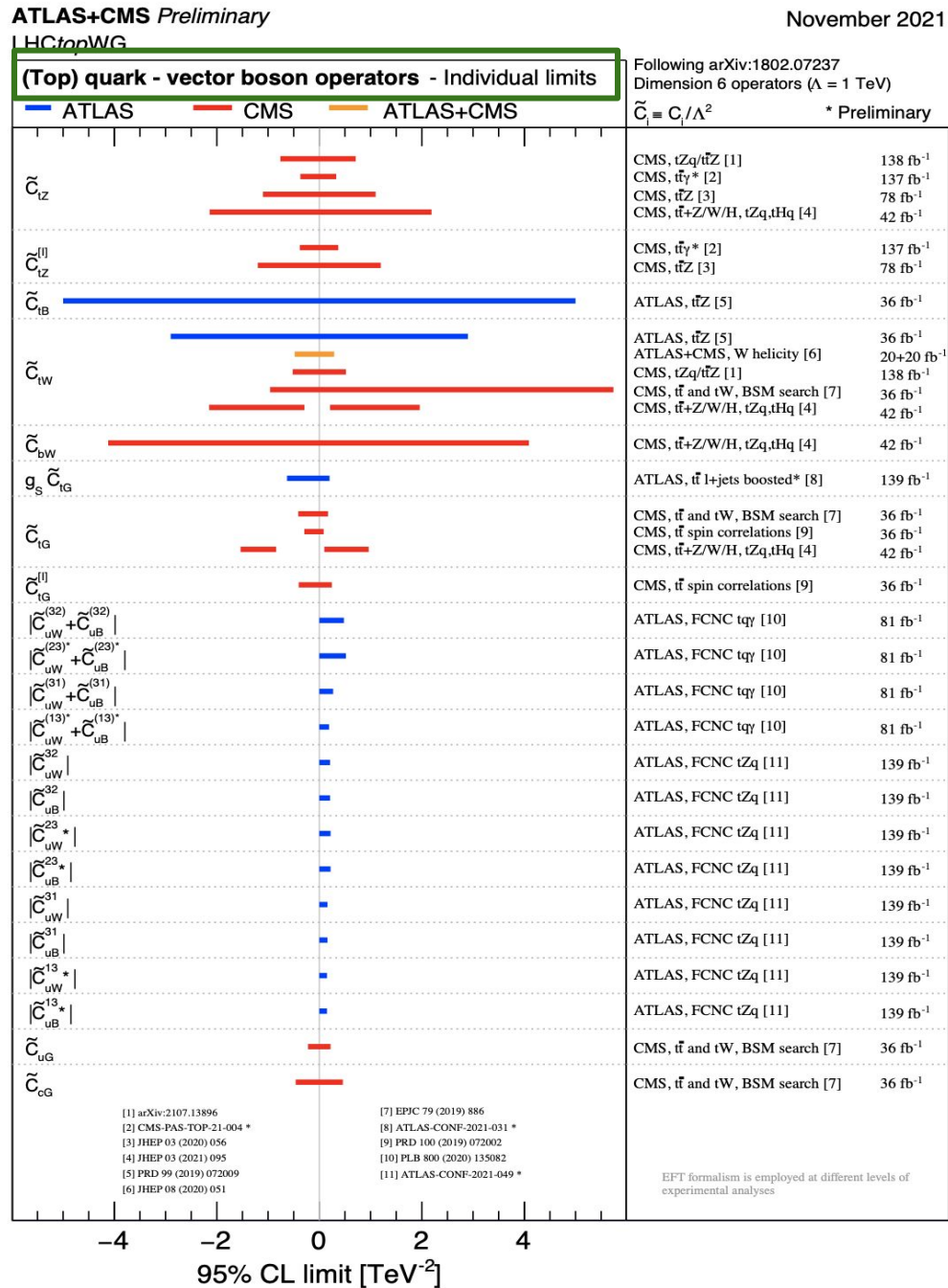
Adding CMS ttγ in dileptons



New summary plots

EFT limits

more details on Thursday!



Agenda

1 Dec 2021		2 Dec 2021		3 Dec 2021	
14:00	Introduction - Fabio Maltoni (Universite Catholique de Louvain (UCL) (BE) and University of Cologne (DE)) Wolfgang Wagner (Bergische Universitaet Wuppertal (DE)) (Zoom mtg only)	14:00	New EW top fit in the SMEFT [2107.13917] - Marcos Miralles Lopez (IFIC (U.Valencia-CSIC)) (Zoom mtg only)	14:00	Combination of ATLAS and CMS tt inclusive cross sections in Run 2 - David Marzocca (INFN Trieste) (Zoom mtg only)
14:10	--- Discussion ---	14:20	--- Discussion ---	14:20	--- Discussion ---
14:15	CMS Highlight -- 1: tZq inclusive and differential cross section measurements - Luca Di Girolamo (INFN Trieste) (Zoom mtg only)	14:30	High-order effects in the EFT top interpretation - Eleni Vryonidou (University of Manchester (GB)) (Zoom mtg only)	14:30	Flavour Universality Violation and the top quark - David Marzocca (INFN Trieste) David Marzocca (Zoom mtg only)
14:35	--- Discussion ---	14:50	--- Discussion ---	14:50	--- Discussion ---
14:45	ATLAS Highlight -- 1: Energy asymmetry - Alexander Basan (Johannes Gutenberg Universitaet Mainz (DE)) (Zoom mtg only)	15:00	CMS Highlight -- 2: Probing EFT operators in (t)Z - Abideh Jafari (Deutsches Elektronen-Synchrotron (DE)) (Zoom mtg only)	15:00	Overview of DM searches in the top sector - Ulrich Andreas Haisch (University of Oxford (GB)) Uli Haisch (Zoom mtg only)
15:05	--- Discussion ---	15:20	--- Discussion ---	15:20	--- Discussion ---
15:15	Improving modelling of ttW [2108.07826, 2004.0955] - Rikkert Frederix (Lund University) (Zoom mtg only)	15:30	Towards ATLAS-CMS EFT combination - Peter Berta (Charles University, Prague (CZ)) Laura Barranco Navarro (Stockholm University (SE)) Kirill Skovpen (Ghent University (BE)) (Zoom mtg only)	15:30	--- Break ---
15:35	--- Discussion ---	16:00	Recent FCNC searches by ATLAS and CMS - Ana Peixoto (LPSC/CNRS (Grenoble, FR)) Samuel May (Boston University (US)) (Zoom mtg only)	16:00	Anomalous gamma gamma -> t Tbar scattering at the LHC - Andrea Bellora (Universita e INFN Torino (IT)) (Zoom mtg only)
15:45	Top MC mass vs. pole mass relation in ATLAS and CMS - Matteo DeFranchis (CERN) (Univ. of Valencia and CSIC (ES)) (Zoom mtg only)	16:20	--- Discussion ---	16:20	--- Discussion ---
16:05	--- Discussion ---	16:30	--- Break ---	16:30	Cross sections for ttH production with the top quark MSbar mass [arXiv:2111.12505] - Andrej Saibel (Deutsches Elektronen-Synchrotron (DE)) (Zoom mtg only)
16:15	--- Break ---	17:00	ttWZ production at the LHC in SMEFT [2111.03080] - Hesham El Faham (Universite Catholique de Louvain (UCL) (BE)) (Zoom mtg only)	16:50	--- Discussion ---
16:45	Comparison of tt differential cross sections in ATLAS and CMS - Olaf Behnke (Deutsches Elektronen-Synchrotron (DE)) Marino Romano (INFN Bologna (IT)) (Zoom mtg only)	17:20	--- Discussion ---	17:00	Triple top quark production in Standard Model [arXiv:2107.07629] - Lev Dudko (M.V. Lomonosov Moscow State University (RU)) (Zoom mtg only)
17:05	--- Discussion ---	17:30	ATLAS Highlight -- 2: ttbar boosted differential cross sections - Roman Lyssak (Czech Academy of Sciences (CZ)) (Zoom mtg only)	17:50	--- Discussion ---
17:15	Towards harmonizing modelling uncertainties in ATLAS and CMS - Efe Yazgan (National Taiwan University (TW)) Andrea Helen Knue (Albert-Ludwigs-Universitaet Freiburg (DE)) Dominic Hirscher (Bergische Universitaet Wuppertal (DE)) Jose Enrique Palencia Cortezon (Universidad de Oviedo (ES)) (Zoom mtg only)	18:00	Recent results in flavour violation and top polarisation by ATLAS and CMS - Jordy Degens (Nikhef National institute for subatomic physics (NL)) Farid Goldouzian (University of Notre Dame (US)) (Zoom mtg only)		
17:35	--- Discussion ---				
17:45	Common ATLAS and CMS MC sample and MC developments - Giulia Negro (Purdue University (US)) Jens Roggel (Bergische Universitaet Wuppertal (DE)) (Zoom mtg only)				
18:05	--- Discussion ---				
18:15	B-hadron production at NNLO in tt events with leptonic decays at LHC [2102.08267] - Terry Generet (RWTH Aachen University (DE)) (Zoom mtg only)				

Intro, highlights (experiment and theory)

EFT

ATLAS & CMS comparisons

Top(+X) modelling

New combinations

Anomalous couplings, DM searches in top, ttH production, flavour anomalies, 3top