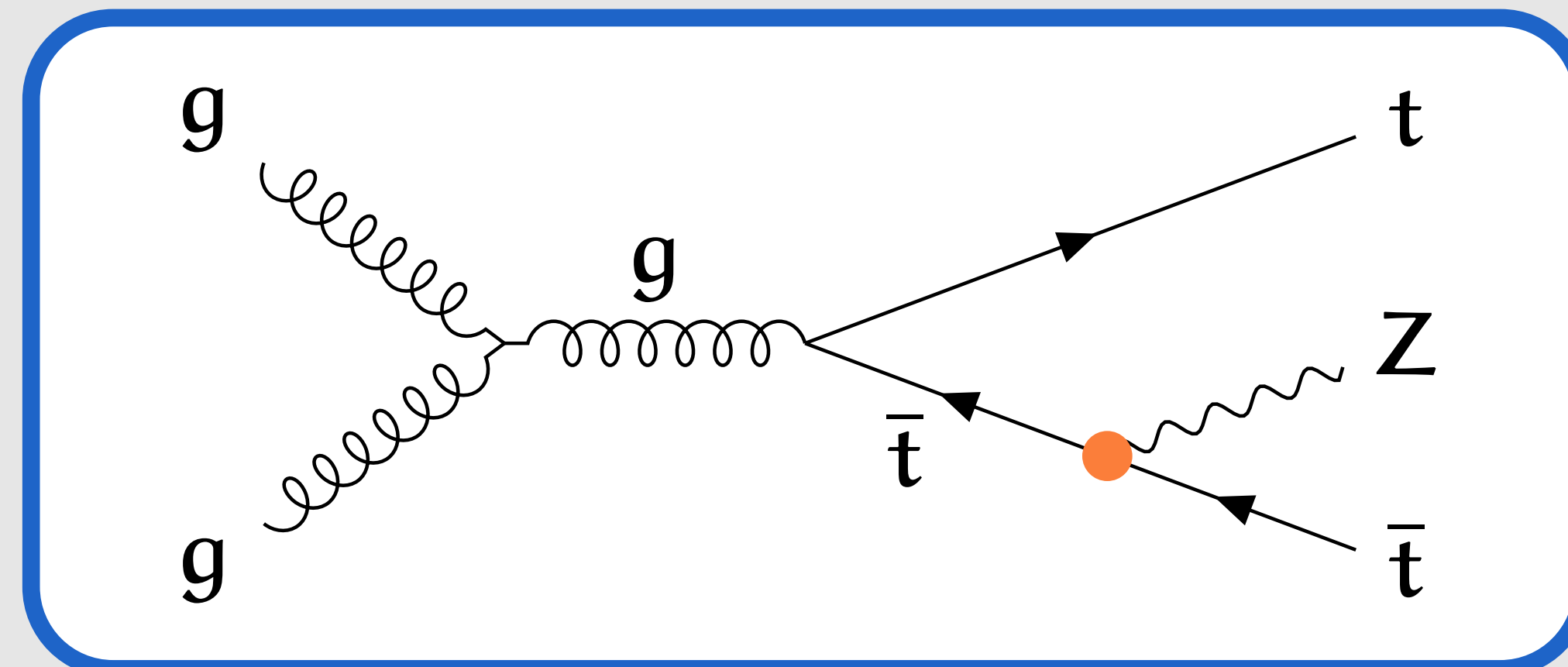


DIFFERENTIAL CROSS SECTION MEASUREMENTS OF $t\bar{t}+V$ PRODUCTION AT THE CMS EXPERIMENT

Why $t\bar{t} + V$?

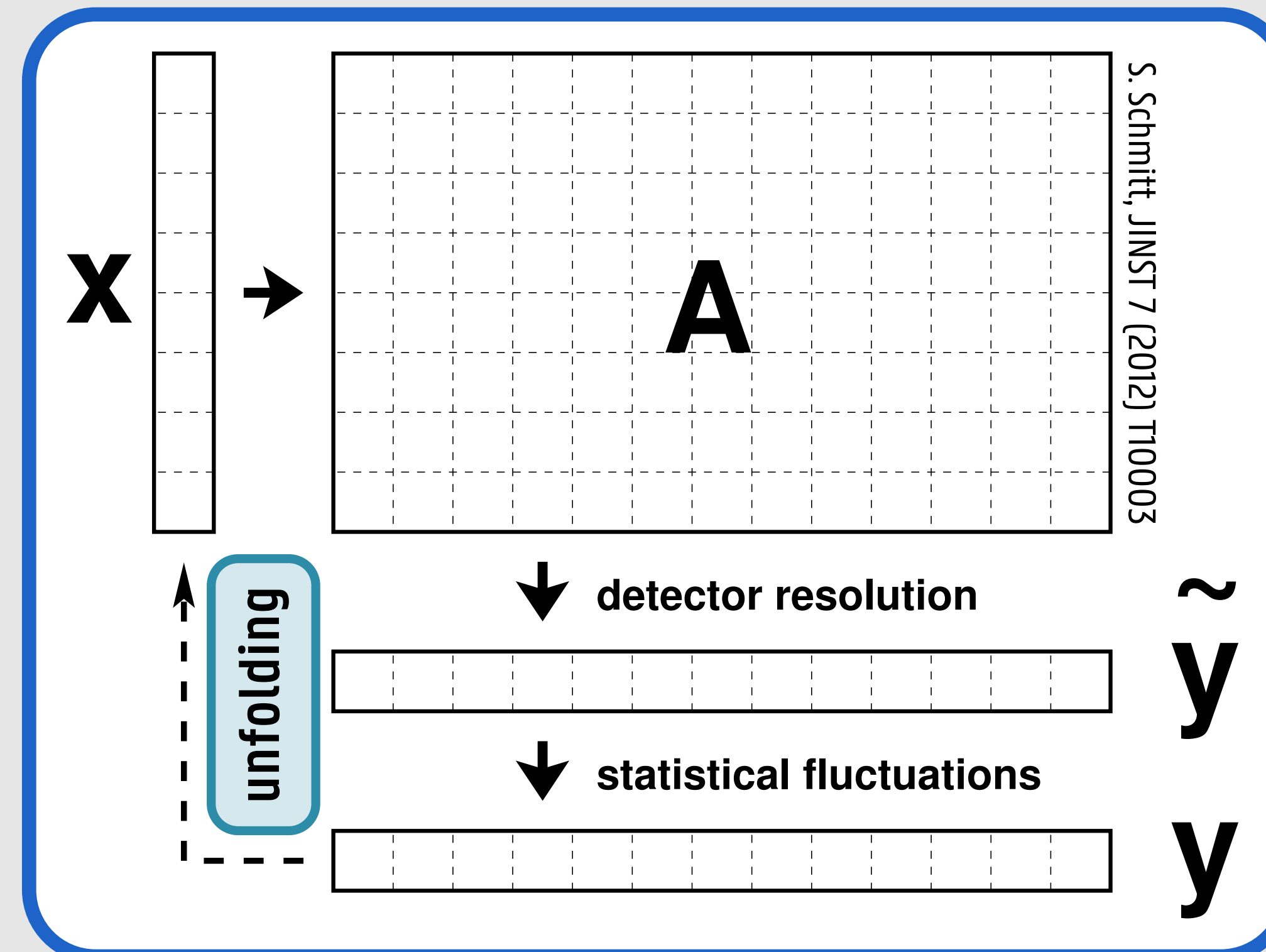


experimental probe of electroweak top quark couplings

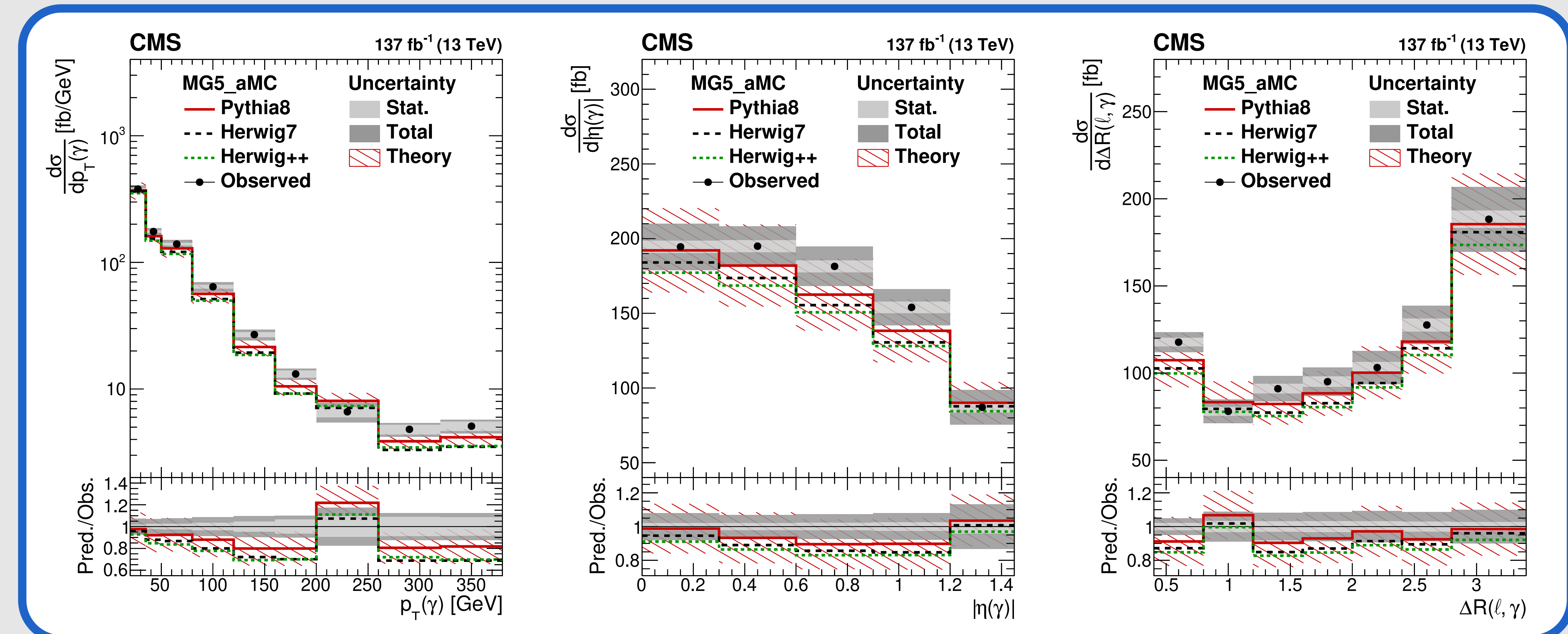
increased sensitivity in differential distributions

$t\bar{t} + Z$ and $t\bar{t} + \gamma$ provide complementary constraints

Differentially how?



$t\bar{t} + \gamma$ differential cross sections in lepton+jet channel



event selection: =1 lepton, =1 photon, ≥3 jets, ≥1 b-jet

backgrounds: γ from hadrons, γ is mis-ID e, $t(\bar{t})+X$ with genuine γ

$p_T(\gamma)$: photon transverse momentum

$|\ln(\gamma)|$: pseudorapidity of photon

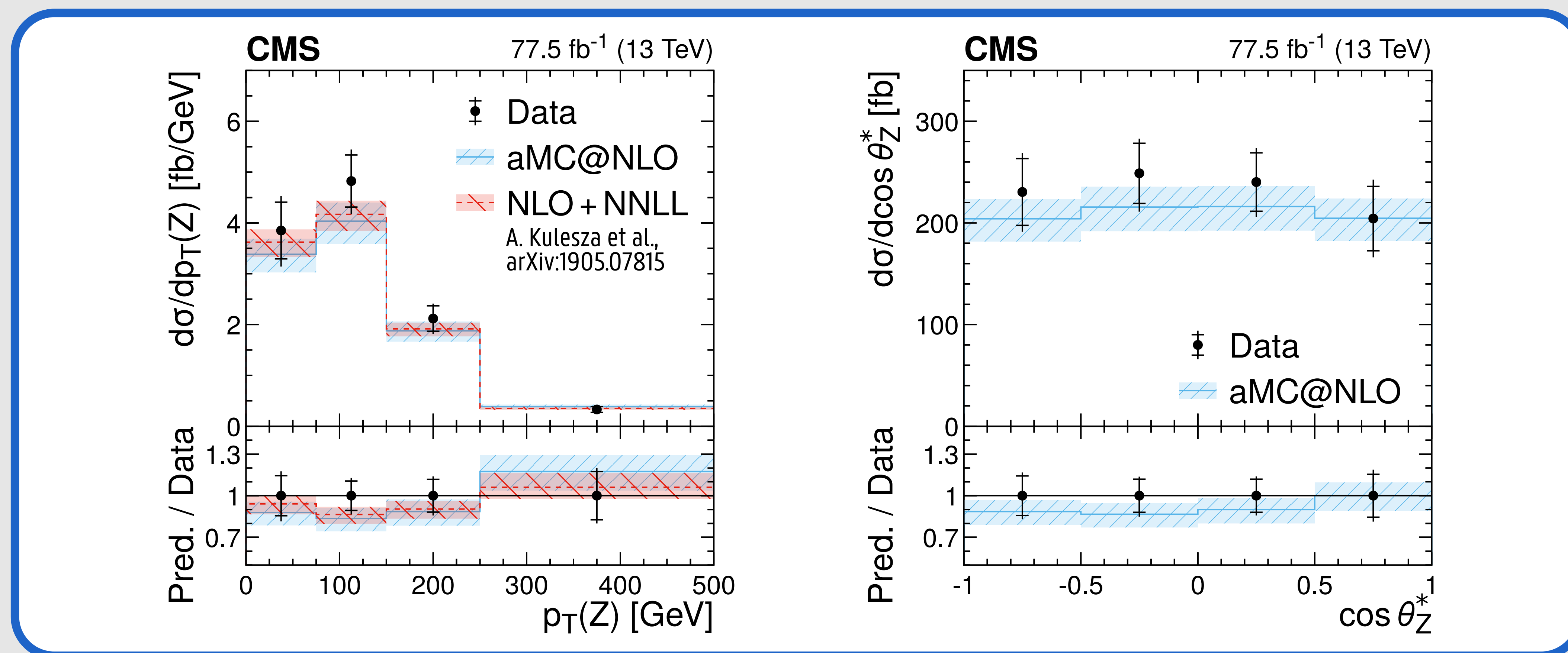
$\Delta R(\ell, \gamma)$: angular separation of lepton & photon

particle-level

uncertainties: jet energy scale, photon ID, colour reconnection

in agreement with SM

$t\bar{t} + Z(\ell\ell)$ differential cross sections in three-lepton channel



event selection: =3 leptons, $m(\ell^+\ell^-) \approx 91$ GeV, ≥3 jets, ≥1 b-jet

backgrounds: tZq , tWZ , other $t(\bar{t})+X$, WZ , $t\bar{t}/Z$ +fake ℓ

$p_T(Z)$: dilepton transverse momentum

$\cos \theta_Z^*$: angle between ℓ^- and dilepton in rest frame

parton-level

statistics limited

in agreement with SM

What else?

high-precision inclusive cross section measurements

interpretations in effective field theory framework

What's next?

$t\bar{t} + \gamma$ in dilepton channel: more data, different systematics

kinematic $t\bar{t}$ reconstruction: more observables

combined measurements: ultimate constraints

References

CMS Collaboration, Measurement of top quark pair production in association with a Z boson in proton-proton collisions at $\sqrt{s} = 13$ TeV, JHEP 03 (2020) 056.

CMS Collaboration, Measurement of the inclusive and differential $t\bar{t}$ cross sections in the single-lepton channel and EFT interpretation at $\sqrt{s} = 13$ TeV, arXiv:2107.01508, submitted to JHEP.

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