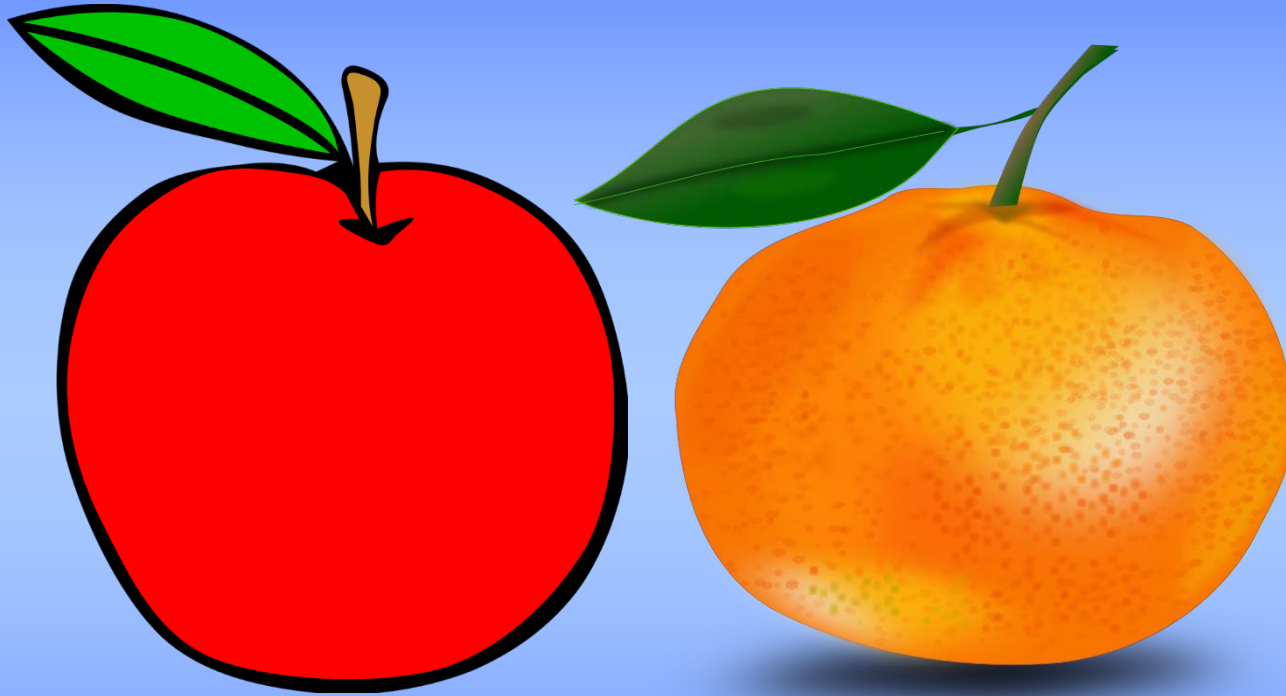


# aGC summary plots



Marc-André Pleier

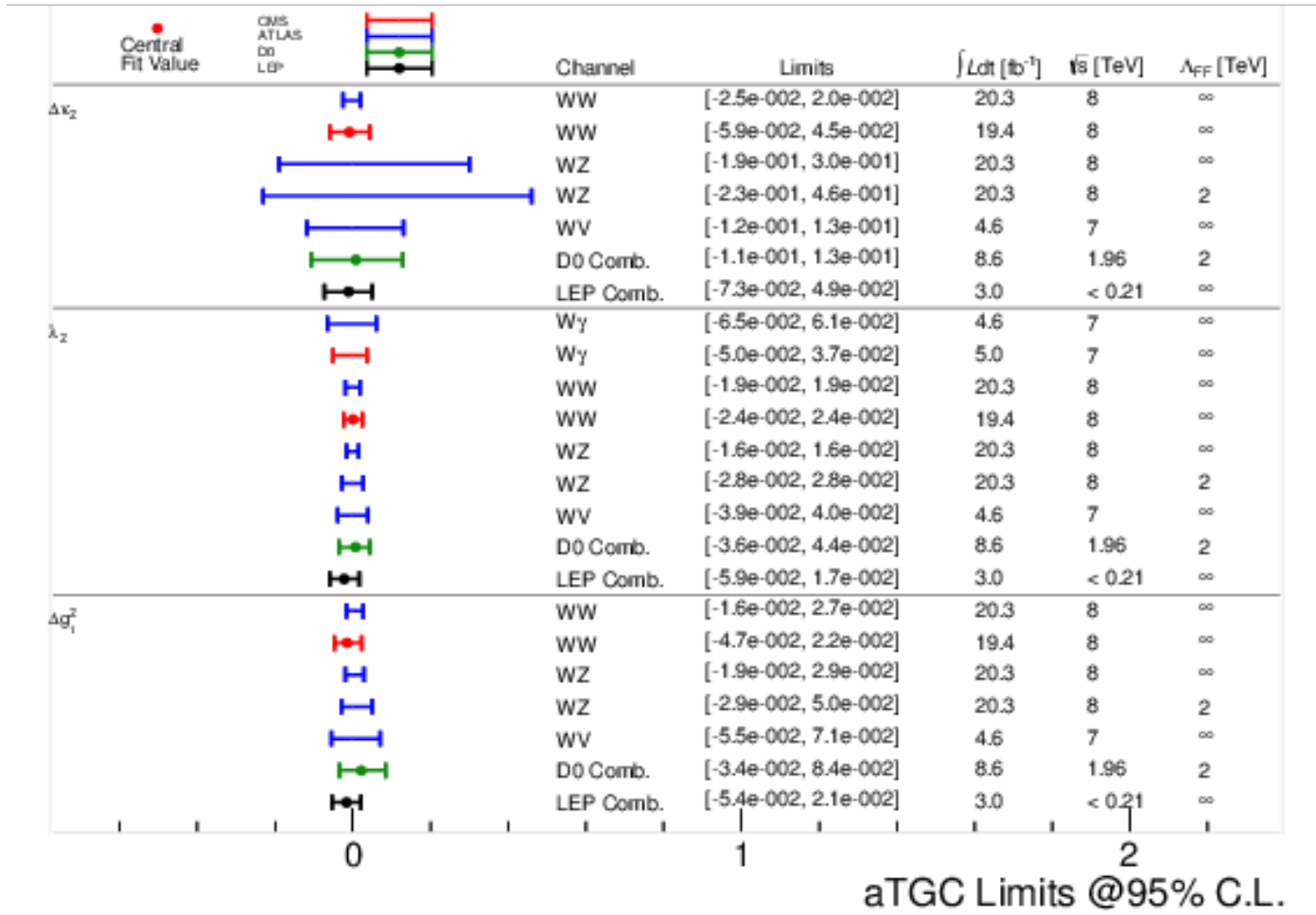


# aGC summaries

- ❖ ATLAS and CMS both set limits on aTGCs, aQGCs
  - Differences in unitarisation approaches, MC implementation (e.g. MG5 vs. VBFNLO), parameter choice within MC (MG5)
  - Trying to get apple-to-apple comparison
- ❖ Using [plotting framework](#) by Matt Herndon ...
  - Tweaked to my own preferences
  - All measurements input from scratch
  - Mistakes are quite possible – please report any issues you might find
- ❖ ...and hand-made plots by Dan Green (can easily be implemented in above fwk as well).
- ❖ Form factor exponents  $n$  are given where applicable.
- ❖ Limits used in these slides are based on Run I only
  - Not much is missing really (ATLAS WZ 13 TeV prelim result)
- ❖ Plots will be used in RMP article by Green, Meade, Pleier

# WWZ aTGC limits in LEP scenario

❖ Note modest impact of unitarisation,  $n=2$  here.



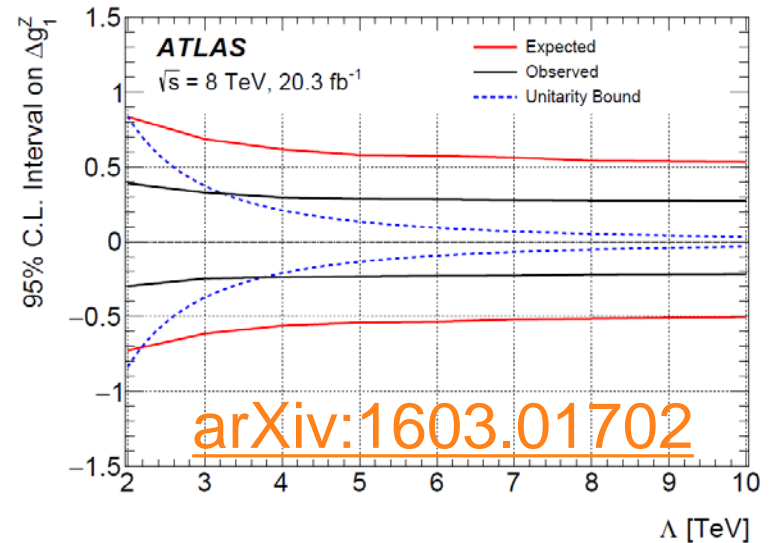
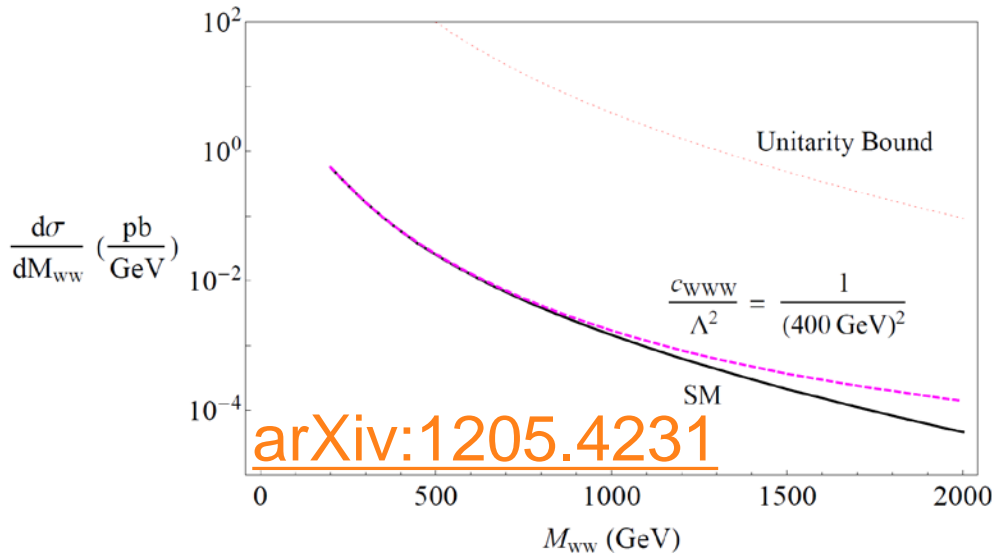
❖ Need to add CMS WZ.

# Unitarity bounds

❖ aTGCs in LEP scenario w/o unitarisation can be directly translated into EFT coefficients:

$$\begin{aligned} \frac{c_W}{\Lambda^2} &= \frac{2}{M_Z^2} \Delta g_1^Z = \frac{2}{M_Z^2} (\tan^2 \theta_W \Delta \kappa_\gamma + \Delta \kappa_Z) \\ \frac{c_B}{\Lambda^2} &= \frac{2}{M_W^2} \Delta \kappa_\gamma - \frac{2}{M_Z^2} \Delta g_1^Z \\ \frac{c_{WWW}}{\Lambda^2} &= \frac{2}{3g^2 m_W^2} \lambda_\gamma = \frac{2}{3g^2 m_W^2} \lambda_Z \end{aligned}$$

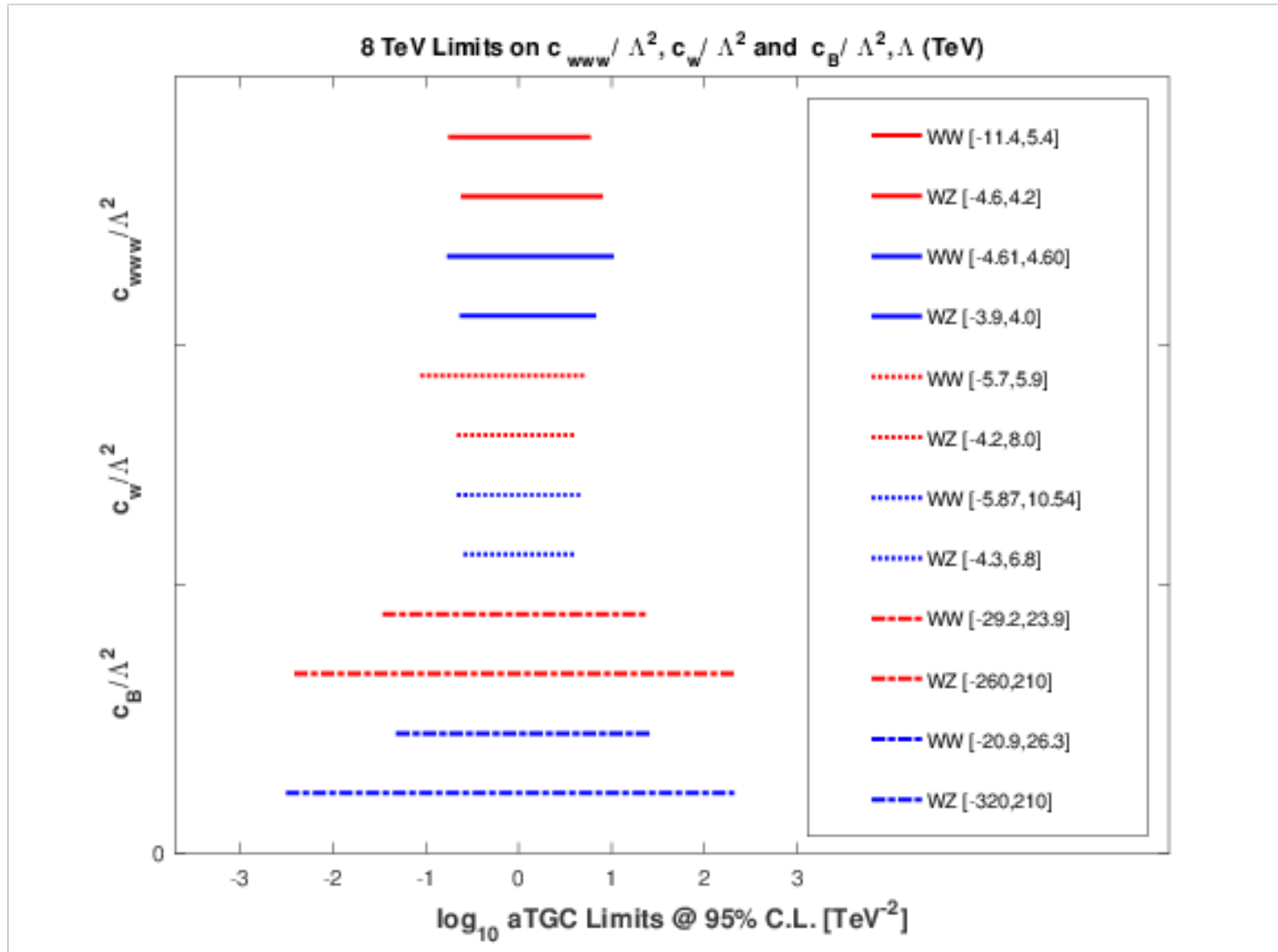
❖ No unitarity violation expected @LHC for dim-6:



❖ How to reconcile? ATLAS aTGC bound ensures unitarity is not violated at *arbitrary high center of mass energies*.

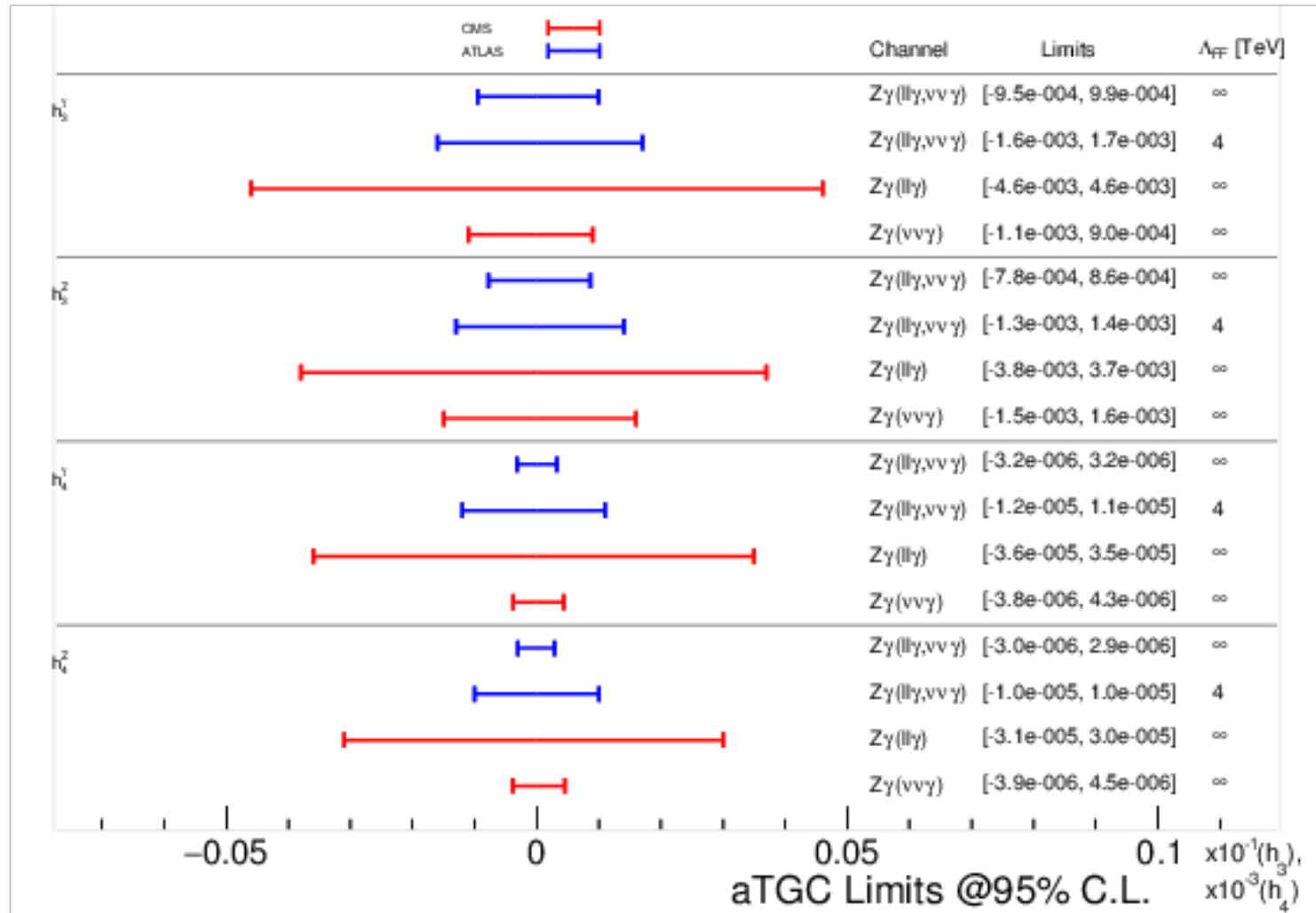
# WWZ aTGC $\rightarrow$ EFT limits

❖ No unitarisation here!



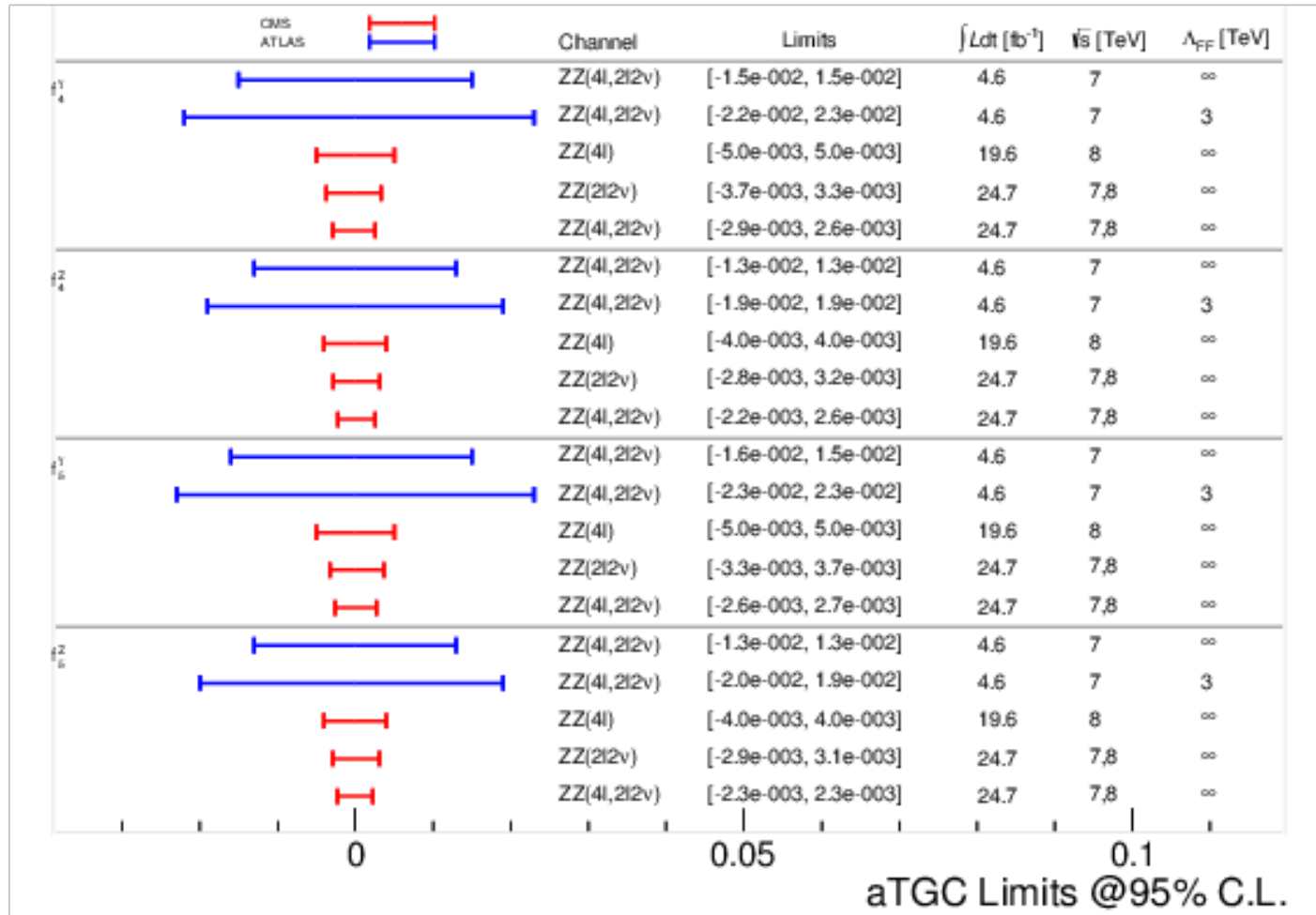
# Z $\gamma\gamma$ and Z $\gamma$ Z aTGC limits

❖ Note modest impact of unitarisation,  $n=i$  of  $h_i$  here.



# ZZ $\gamma$ and ZZZ aTGC limits

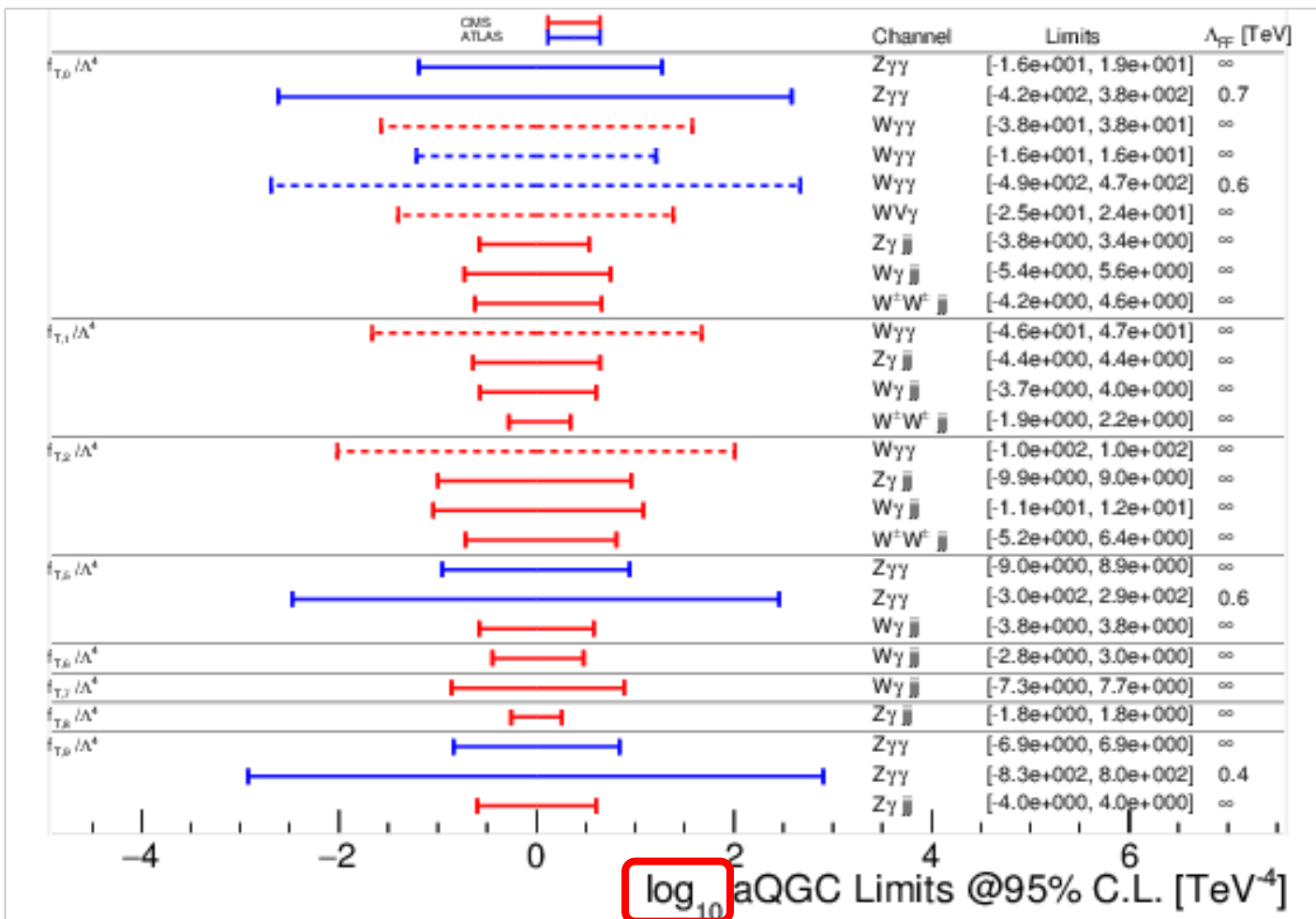
❖ Note modest impact of unitarisation,  $n=3$  here.



❖ Hope to add ATLAS 8 TeV ZZ soon.

# $f_{T,i}$ aQGC EFT limits

❖ Note **strong** impact of unitarisation,  $n=2$  here.

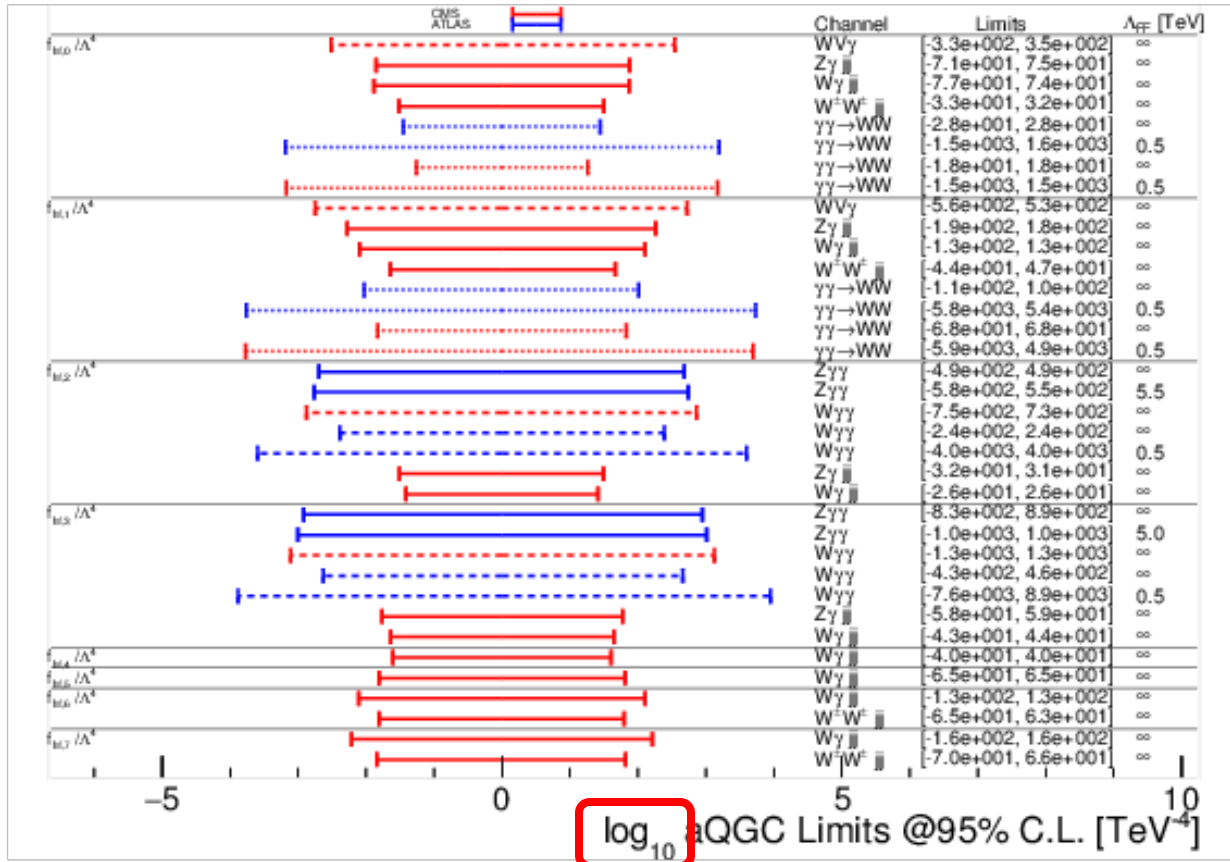


- ATLAS limits (VBFNLO) converted to CMS notation (MG5)



# $f_{M,i}$ aQGC EFT limits

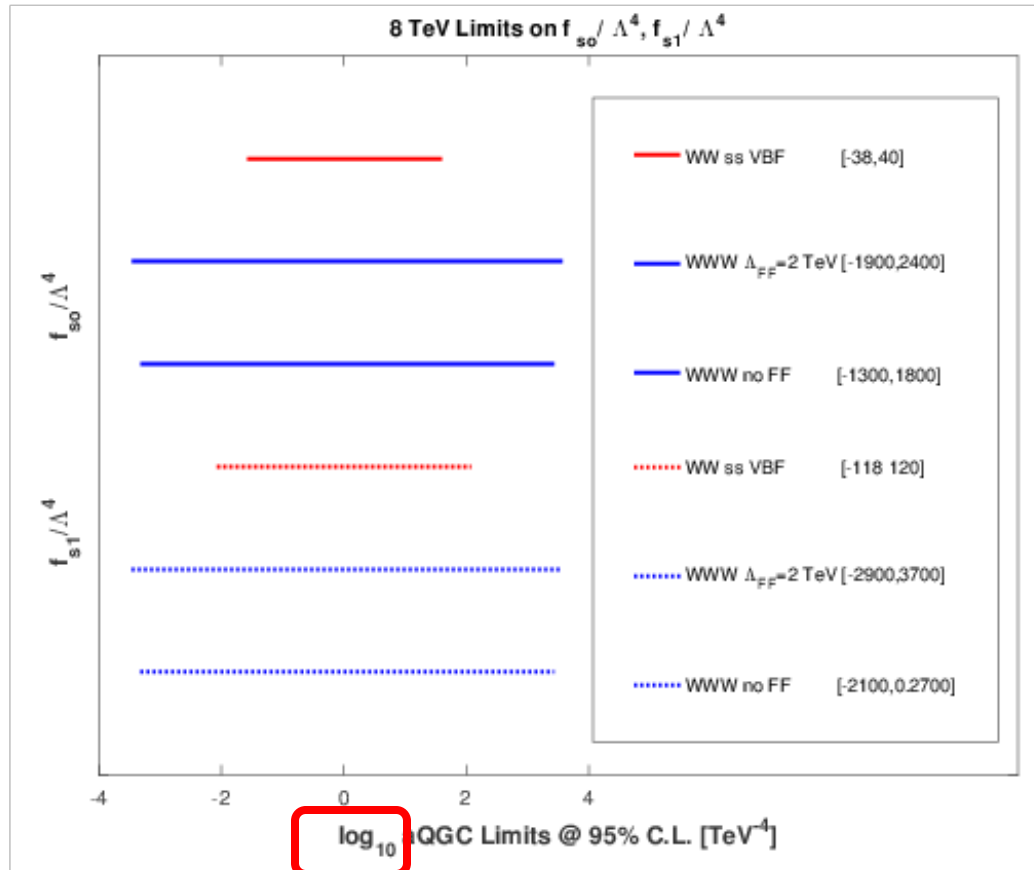
❖ Note strong impact of unitarisation, n=2 here.



- ATLAS  $V\gamma\gamma$  limits (VBFNLO) converted to CMS notation (MG5)
- $WV\gamma$  and  $\gamma\gamma \rightarrow WW$  converted from  $a_{0,C}^W$  limits to std. MG5 notation as CMS implemented their own Lagrangians in MG5 for  $f_{M,i}$
- $a_{0,C}^W$  implementation is being checked for consistency b/w ATLAS/CMS

# $f_{S,i}$ aQGC EFT limits

❖ Note modest impact of unitarisation,  $n=1$  here.



- Conversion of  $\alpha_{4,5}$  limits of ATLAS WVjj, ssWW, WZjj analyses not performed: vertex-dependent (missing  $f_{S,2}$ ); after k-matrix unitarisation

# $\alpha_{4,5}$ aQGC limits

❖ Only available w/ k-matrix unitarisation.

