

Memo about unitarisation handling for ATLAS measurements of anomalous gauge couplings

Remarks

- The main focus of the experiments should be to provide (fiducial) cross section measurements and unfolded distributions. Limits on anomalous gauge couplings can be provided in addition to the measurements.
- If the EFT/aGC approach is becoming unphysical at LHC scales (e.g. measurements approaching new physics scale) it may be time to drop it entirely and to focus on limits on specific models for the new physics.
- Limit setting and optimization should be ideally performed with unitarised models, albeit any unitarisation scheme introduces a model dependence.

Triple gauge boson couplings:

- For charged TGCs the recommendation is to use the **EFT formalism** to translate the non--unitarised anomalous TGC results into the EFT approach. (Annals of Physics 335 (2013) 21–32, <http://arxiv.org/abs/1205.4231>).
- Neutral TGCs can also be translated into EFT parameters, although the mapping is non trivial (<http://arxiv.org/abs/1308.6323>). Clarification about the unitarisation requirements are needed.
- For legacy reasons it is recommended to quote limits on aTGCs also with a dipole form factor, see details below.

Quartic gauge boson couplings:

- For aQGC/dim–8 operator limits the **K--matrix unitarisation** should be used where such an implementation is available (e.g. for VBS processes WW and WZ in Whizard, <http://arxiv.org/abs/0806.4145>).
As of now, the k–matrix unitarisation is only available for 2–2 processes.
- Where the K--matrix unitarisation is not available it is recommended to quote limits on aQGCs with a dipole form factor, see details below.

Details on the dipole form factor unitarisation scheme:

- The form factor exponent n should be the lowest possible and the scale Λ_{FF} chosen as the rounded largest value which still preserves unitarity for the extracted (2D) aTGC/aQGC limits.
- Representing limits as a function of unitarisation scale to exhibit the model dependence of the results is providing additional information.

-- AnjaVest - 13 Nov 2013

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