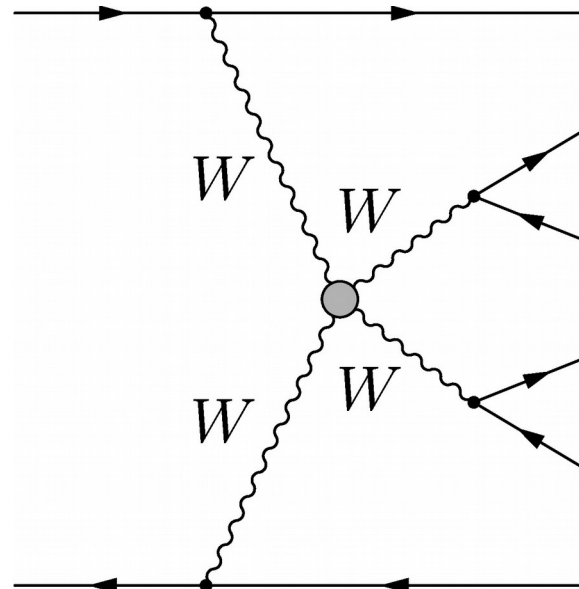


# WG2 Discussion

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COST meeting  
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- Matthias Mozer
- CMS / KIT
- Working on
  - Di-Boson resonances
  - Di-Boson aTGC
  - VBS
  - boosted hadronic decays



- Joany Manjarres Ramos
- ATLAS / TU Dresden
- Working on
  - SM WZ cross section
  - Di-Boson aTGC
  - VBS
  - $H \rightarrow ZZ$
  - WZ resonances

## Activities so far

- Review of experimental results (Joany, Narei)
  - => no particular outcome, but basis for future work
  - => List of papers maintained on **WG2 Twiki**
  
- Review of combinations methods (MM)
  - => Some discussion during previous meeting: full combination preferred
  - => **Action item: bring this point to the collaborations**
  
- Review of regularization issues (MM)
  - => Some discussion during previous meeting: everyone prefers no regularization if sensitivity allows
  - => **Action item: estimate sensitivity for future measurements**
  - => **promised by MM, but not delivered!**
  
- Overview of detector acceptance/common selection (Xavier, Jonas, ...)
  - => matured recently, so discuss today
  - => **Action item: publish on Twiki and circulate for wider adoption**

# Actual Activities vs Stated Goals

- **“Means will be developed for the isolation of the scattering of longitudinal vector boson modes and establish a protocol to be followed for theoretical predictions and the interpretation of experimental results, which will allow the measurement of the longitudinal component at the High Luminosity Large Hadron Collider.”**
- **Deliverables:**
  - state-of-the-art review and comparative study of available tools/computer codes
  - Theoretical motivations for EFT scan in terms of UV-complete theories
  - Validity of the EFT framework in VBS-like processes
  - Development of effective field theory parameterisations with NLO precision in QCD and EWK calculations
  - Determination of a standard reference for effective field theory parameterisation, to be used in all VBS studies and analyses within the first two years of the action
  - Definition of analysis strategies to probe BSM effects
  - Estimate of the reach of the HL-LHC in terms of exclusion/discovery of BSM physics
- Activities mostly ongoing in WG1

**Shared with WG1**

## Actual Activities vs Stated Goals

- **Define milestones for Vector Boson Scattering studies at the end of the Large Hadron Collider Run 2 data taking, including accuracy targets, such that they are coherent between the experimental analyses and the theoretical calculations.**
- Overlap with WG1: Baseline EFT base
- Overlap with WG3: agreement on kinematic selection
- Progress being made:
  - => common selection
  - => common Delphes setup (WG3)

## Actual Activities vs Stated Goals

- “Identify the measurements best suited for the determination of the Standard Model cross sections for Vector Boson Scattering processes, and determine the best algorithms to enhance the signal component over the background.”
- **Deliverables:** Recommendations on preferred sensitive variables
- **Tasks needed:**
  - Review previous publications on the subject
  - Dedicated simulation studies (in cooperation with WG3)
- No dedicated work yet  
=> will likely need input from previous points.

Shared with WG3

## Actual Activities vs Stated Goals

- “Develop effective ways to combine the experimental and theoretical advances into recommended standards for Vector Boson Scattering analyses, allowing direct comparison among experiments and theoretical forecasts.”
- **Tasks needed:**
  - Review of current status
  - Evaluate approaches to unitarization
  - Determine overlaps between theoretical domain of validity and experimentally accessible phase-space
- Deliverable is “Recommendations for combination (arxiv paper)”

## Actual Activities vs Stated Goals

- **“Define milestones for Vector Boson Scattering studies at the end of the Large Hadron Collider Run 2 data taking, including accuracy targets, such that they are coherent between the experimental analyses and the theoretical calculations.”**
- **Tasks needed:**
  - Simulation studies based on current analysis, scaling to higher luminosities
  - Coordinate accuracy targets with WG1
- **“Define the necessary features in theoretical calculations to achieve the Large Hadron Collider Run 2 data accuracy targets, and coordinate the implementation and validation of these theoretical features.”**
- **Tasks needed:**
  - Discussion among the theory groups as well as with experimental experts in collaboration with WG2
  - Needs cooperation with WG1
- Depends on previous items, will need to wait a bit



## Actual Activities vs Stated Goals

- “Define the procedure to combine separate experimental results obtained by the ATLAS and CMS collaborations.”
- **Tasks needed**
  - Agreement on EFT parameterization (see previous goal)
  - Agreement on unitarization schemes
  - Investigate software tools and their suitability for the combination of VBS measurements
  - New point raised during MC meeting:  
investigate need for additional/new tools
  - Coordinate treatment of systematic uncertainties
- Decent progress within VBSCAN
  - => but result was to pursue full likelihood-level combination
  - => requires activism within the experiments
  - => **Action Item: Propaganda campaign!**