

Finalizing the paper draft

Marcel Vos (IFIC- CSIC/UV, Valencia)

Decoherence meeting, June 2nd 2026



CSIC
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS



VNIVERSITAT
DE VALÈNCIA



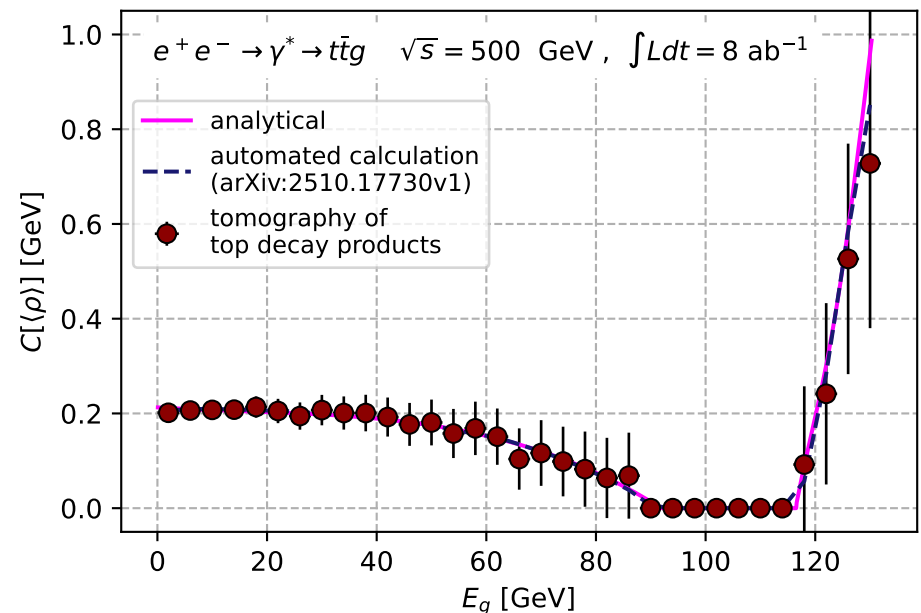
GENERALITAT
VALENCIANA

AITANA

- Our preprint presents a **new opportunity to study decoherence** at colliders
- SM predictions from analytical and automated calculations and tomography
 - Several two-fermion processes with Final State Radiation
 - Experimental prospects for observation of decoherence

New figure 2 includes analytical prediction for $e^+e^- \rightarrow \gamma^* \rightarrow t\bar{t}g$

Move existing figure to “end matter” to document full $e^+e^- \rightarrow Z/\gamma \rightarrow t\bar{t}g$

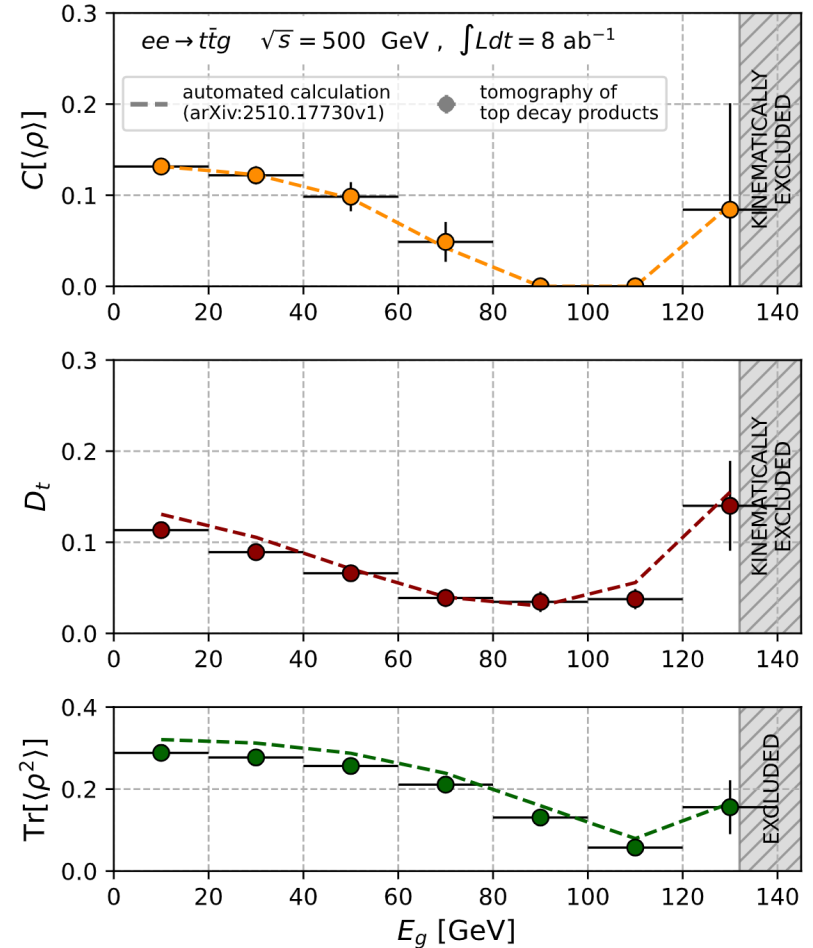


Is it decoherence?

Clearly, the $t\bar{t}$ quantum system loses entanglement; already for low p_T FSR, but most dramatic at high p_T

Coherence + discord – intended to quantify the degree of quantumness of the system – show a similar (but not identical) trend

The purity of the quantum system decreases – the quantum superposition turns into a classical mixture



Add the observations on the tripartite system: entanglement is transferred to $t\bar{t}$ -gluon system for $S \rightarrow t\bar{t}g$ decay, but lost in additional degrees of freedom for $e^+e^- \rightarrow t\bar{t}g$

All this looks like decoherence to me!! Change the wording and title back.

Future work

We expect longer write-ups on the calculations

- analytical $e^+e^- \rightarrow ttg$, Leonardo, Rafa, Fabio,...
- tri-partite predictions, Kazuki, Leonardo...

We refer to these as “authors, title, work in progress” from the current draft

A full tri-partite analysis with an assessment of experimental feasibility

- $H \rightarrow ZZ^* \rightarrow Z\tau^+\tau^-$, ttZ (low statistics, trivial polarimetry)
- photon polarimetry with conversions, gluon polarimetry with substructure, ...

Unfortunately, our QuantEra project proposal was not successful. We should continue with this program and I hope we can find other calls for additional funding.

Conferences

TOP26 is in Turkey!

<https://indico.cern.ch/event/1643686/>

Registration is open!

Maria Moreno accepted a talk on our paper at the conference

We should send abstracts to specialized workshops (TOP, LHC, but also Tau, Belle 2, FCCee) and general conferences (Moriond?)

TOP2027 could be in Valencia and we can make this a special topic

19th International Workshop on Top Quark Physics
TOP 2026
Antalya, Türkiye
5 - 9 October

International Advisory Committee
Tomas Dado
Jorgen D'Hondt
Gauthier Durieux
Tae Jaong Kim [Co-Chair]
Andrea Kuee
Seung J. Lee
Fabio Maltoni
Ken Mimasu
Alexander Mitov
Antônio Olinde
Enrique Palencia Cortezon
Rene Poncelet
Robert Schöfbeck
Roberto Tenchini
Marcel Vos
Malgorzata Worek [Co-Chair]

Local Organizing Committee
Didar Dobur [Chair]
Simone Devoto
Beatriz Lopes
Kiriil Skovpen
Jan van der Linden
Ayul Adiguzel
Altan Cakir

EPPG^{UV}
Ghent University
Experimental Particle
Physics and gravity

GHENT UNIVERSITY

fwo