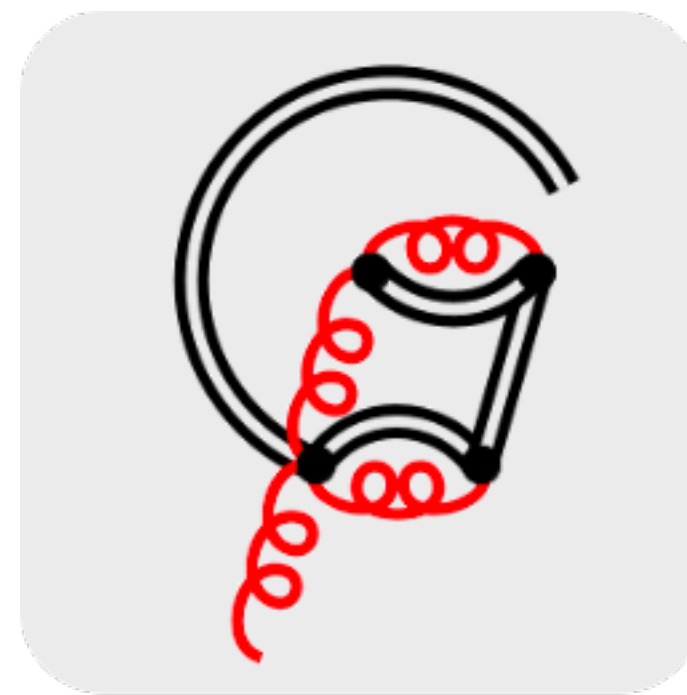


FeynGame

Acquiring Feynman diagrams in a playful way

R. Harlander
RWTH Aachen University



Autors:

R. Harlander
Y. Klein
M. Lipp
M. Schaaf

26th International Particle Physics Outreach Group Meeting
CERN, 30 November 2023



SUISSE
FRANCE

CMS

LHCb

ATLAS

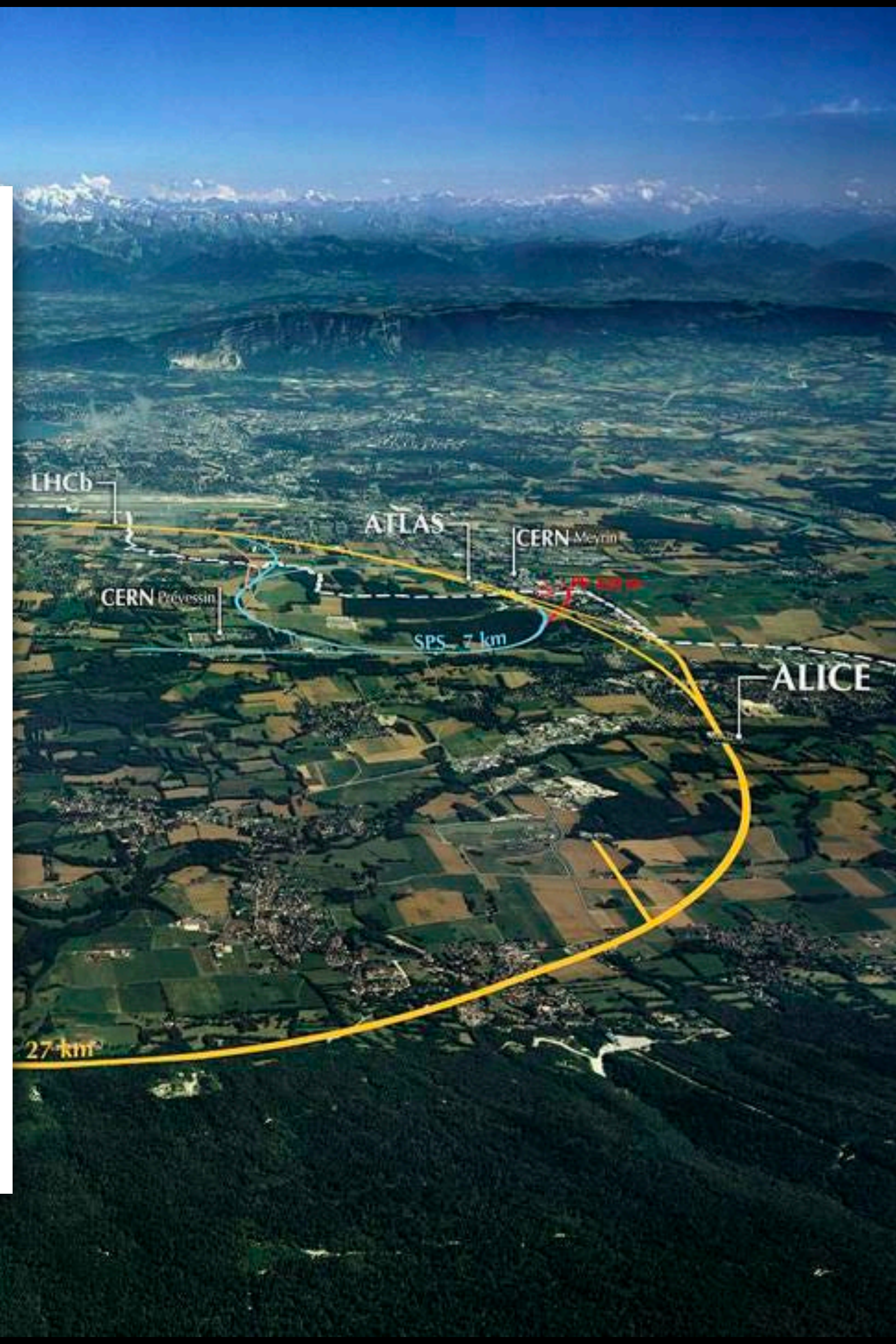
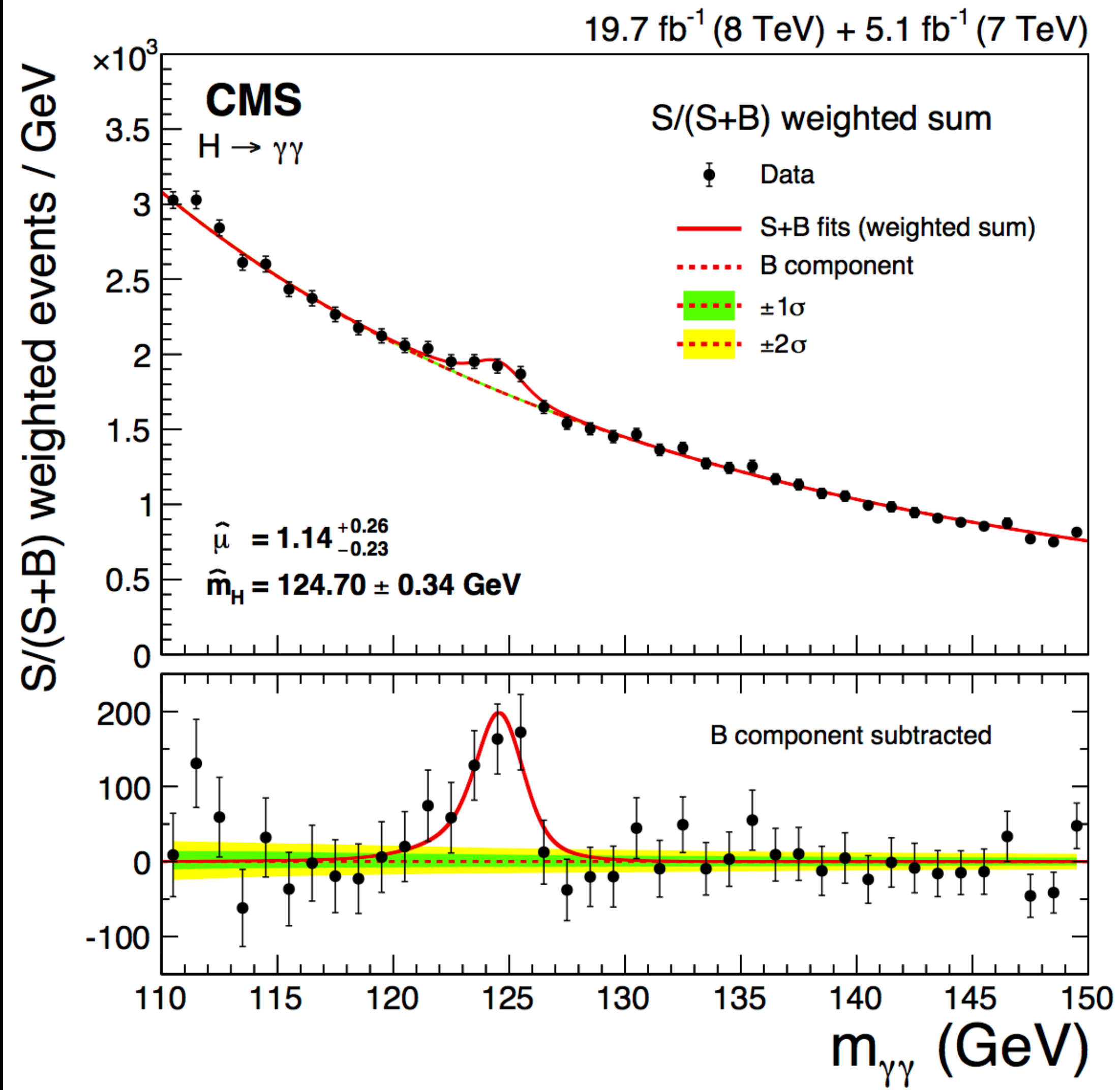
CERN Meyrin

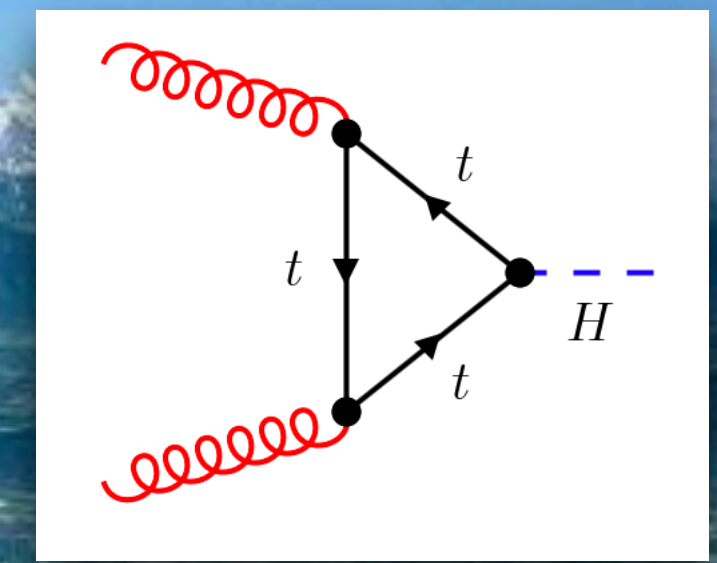
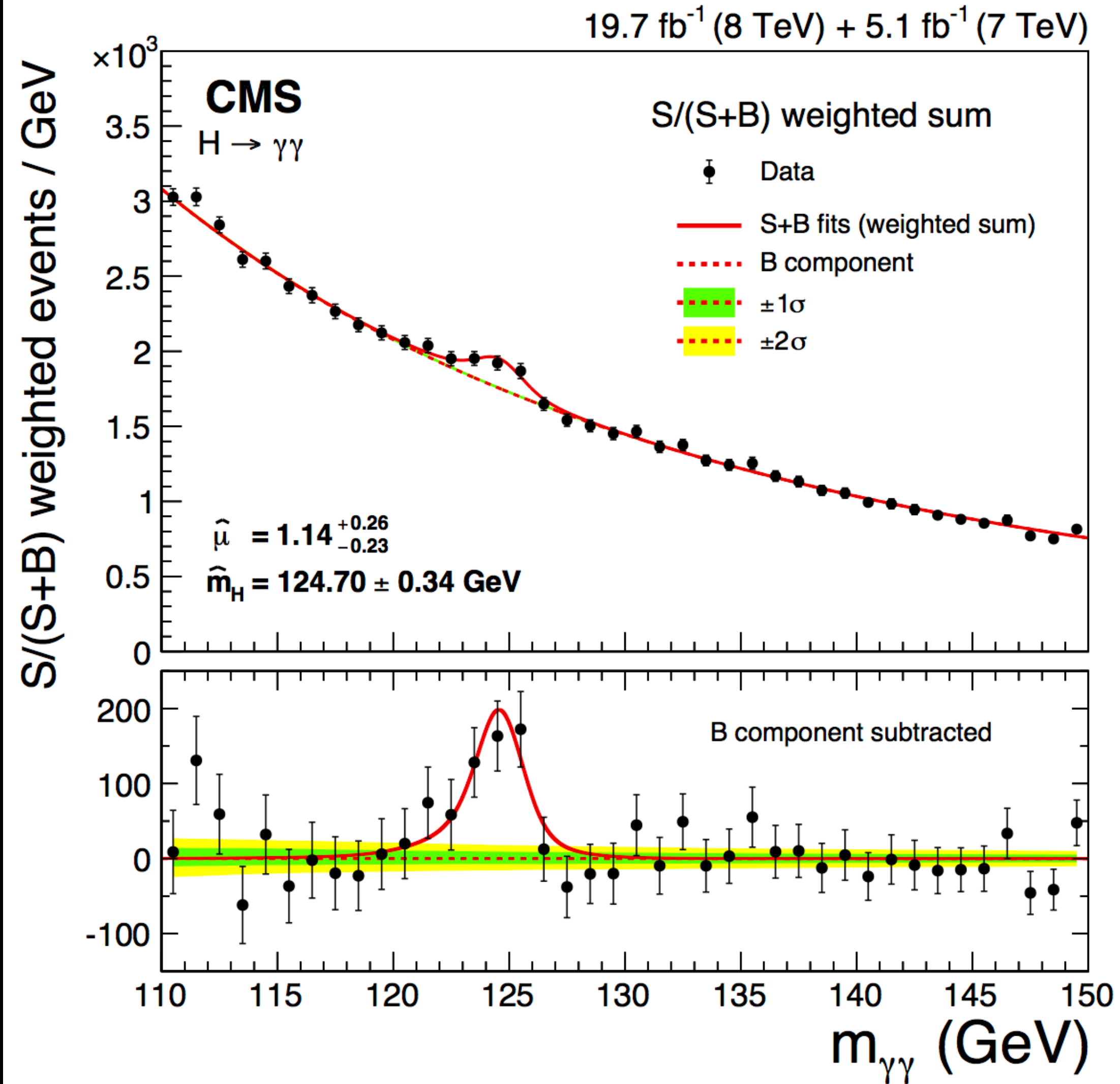
CERN Preessin

SPS 7 km

ALICE

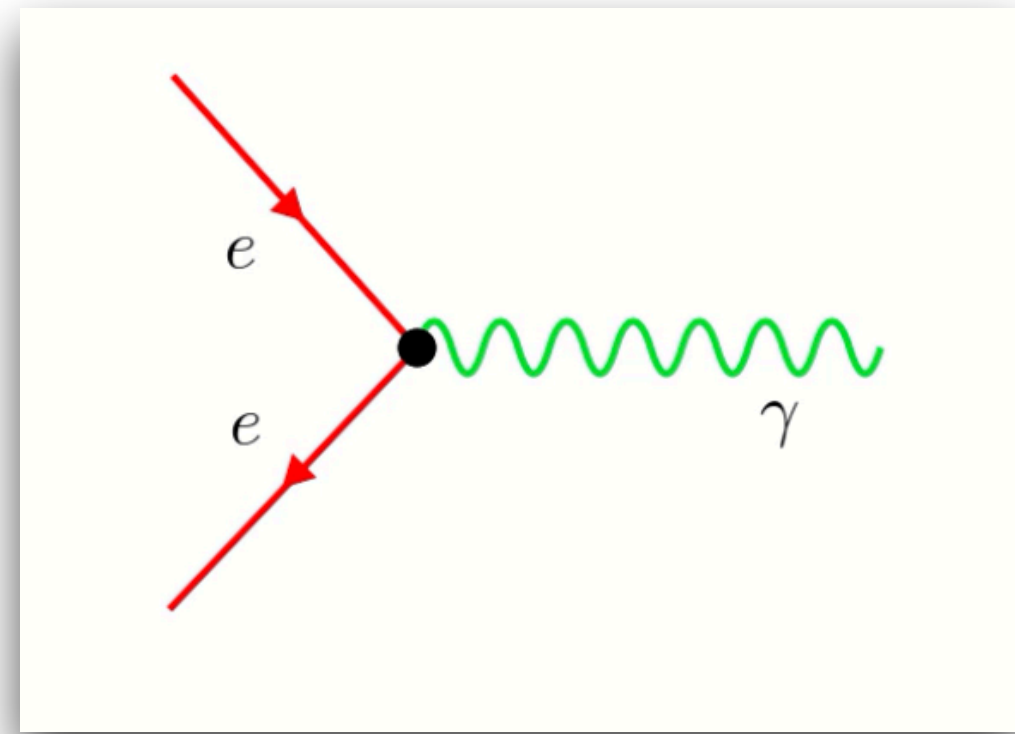
LHC 27 km



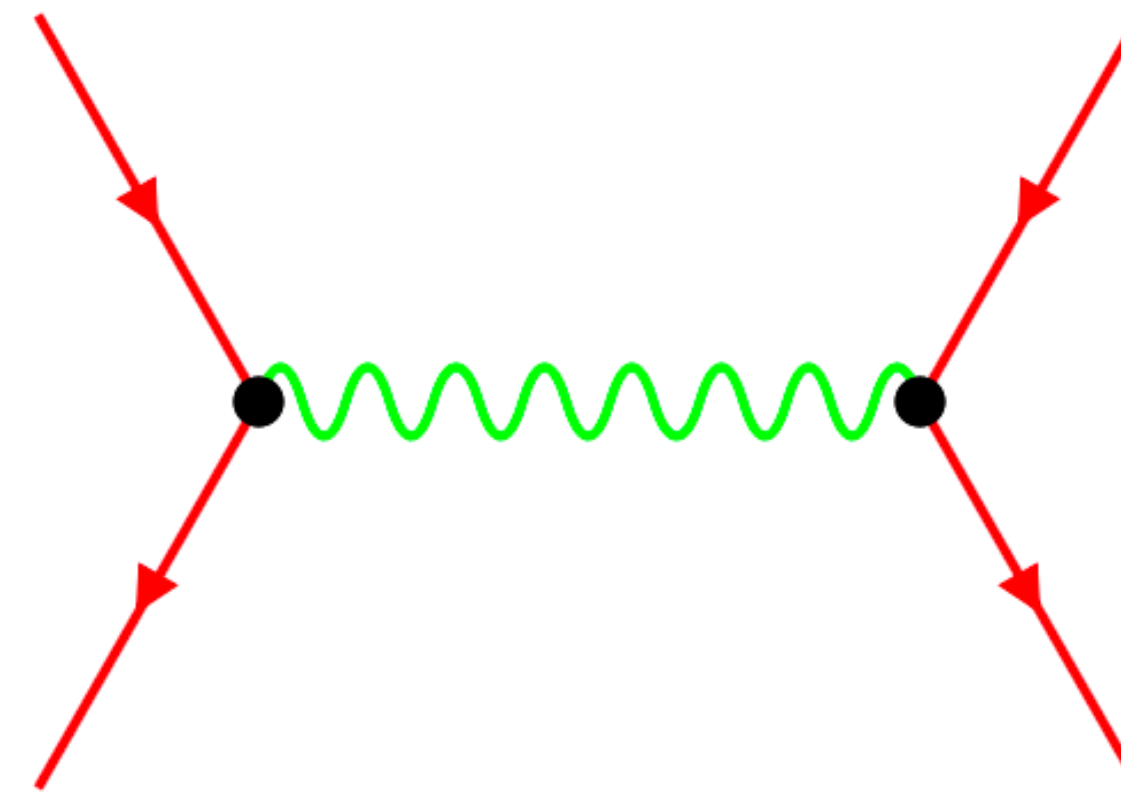
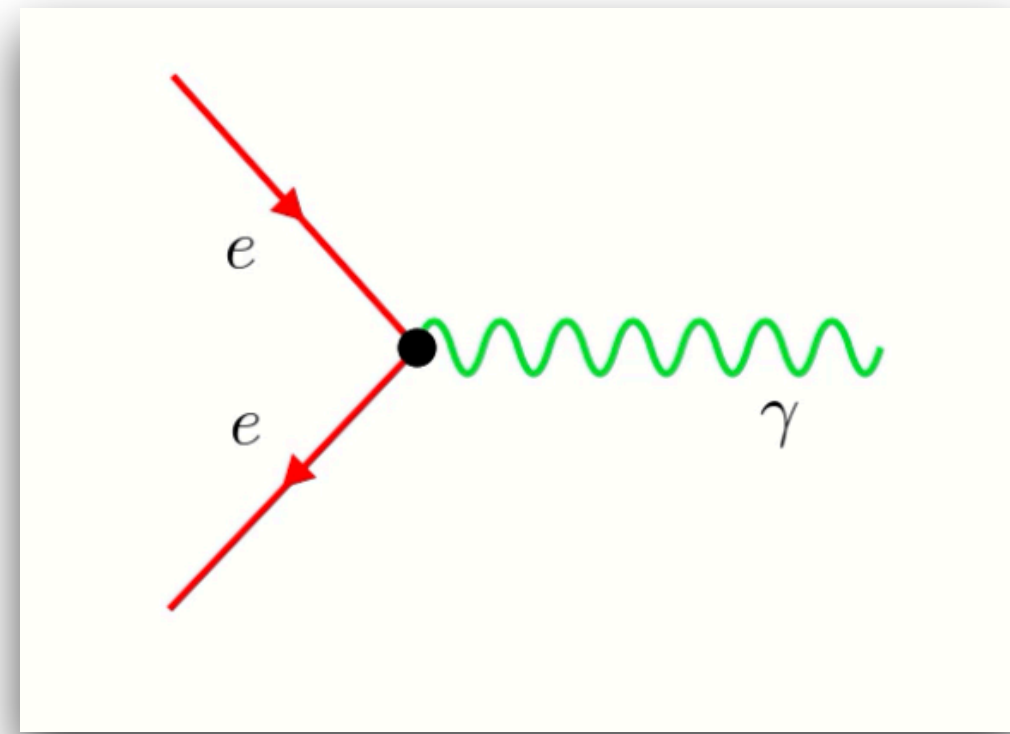


Quantum Electrodynamics

Quantum Electrodynamics

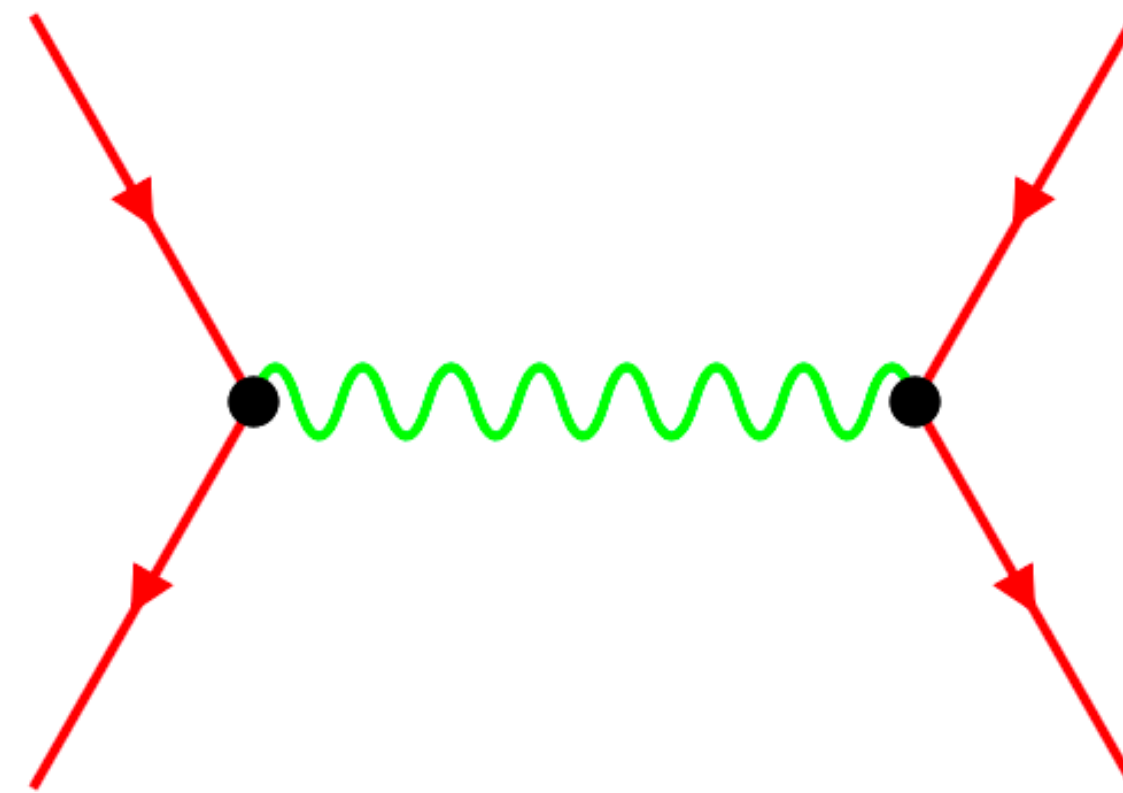
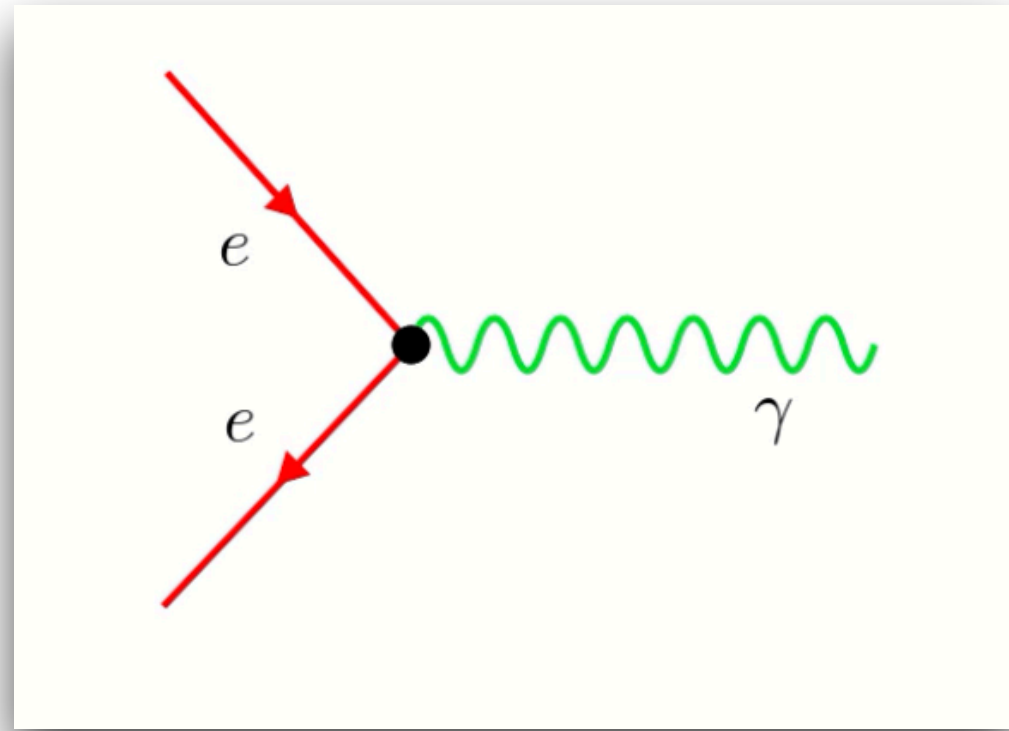


Quantum Electrodynamics

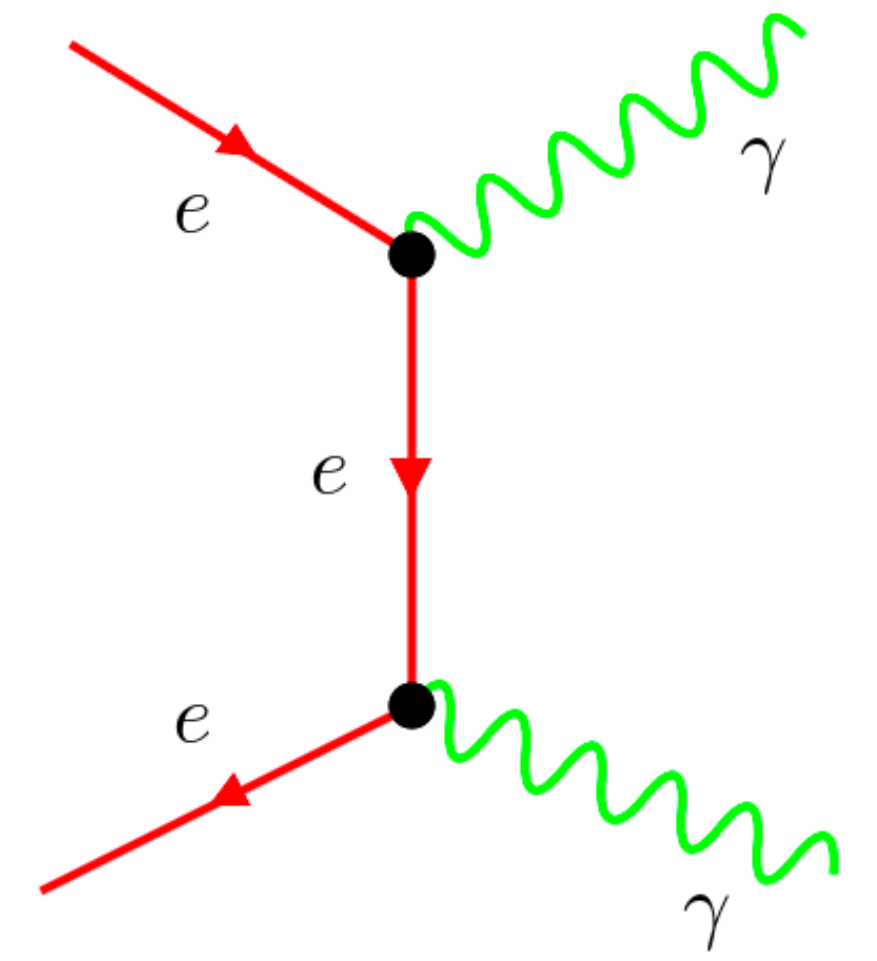


$$e^+e^- \rightarrow e^+e^-$$

Quantum Electrodynamics

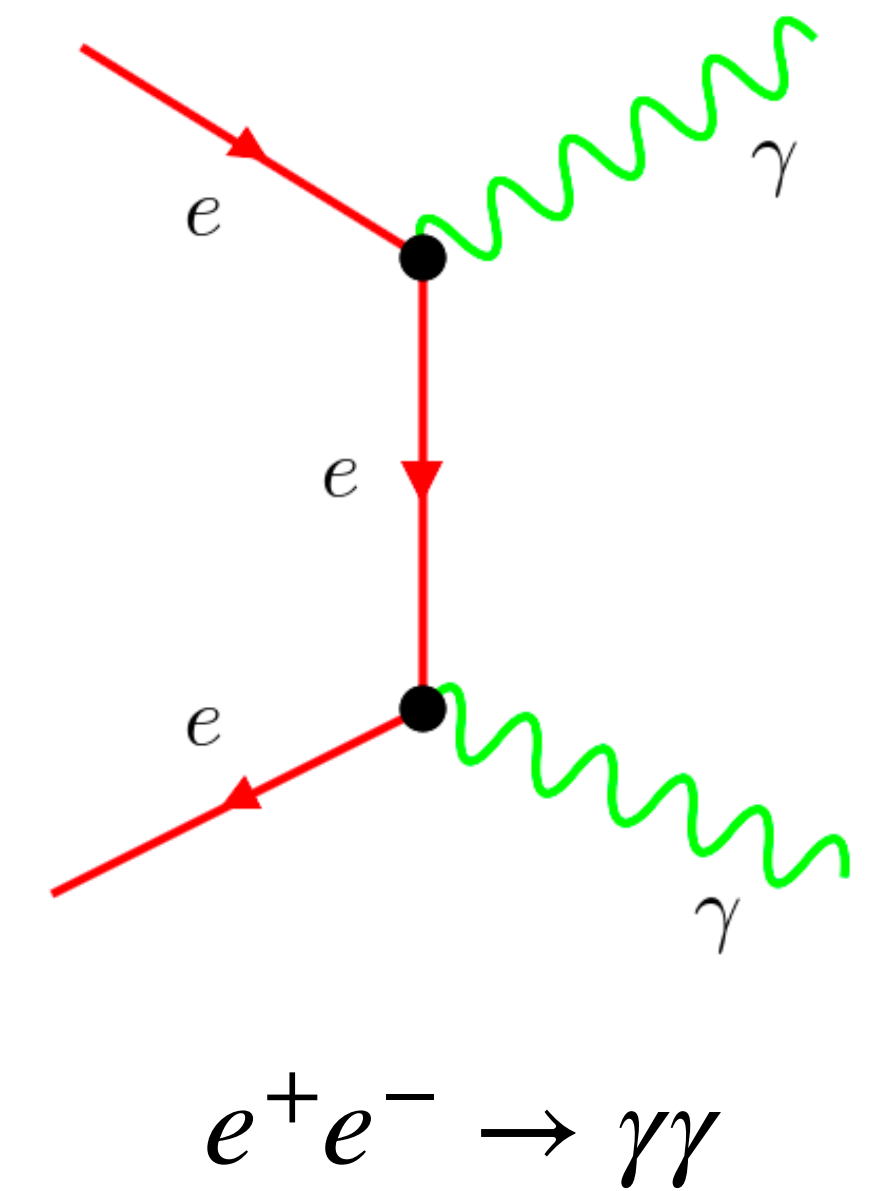
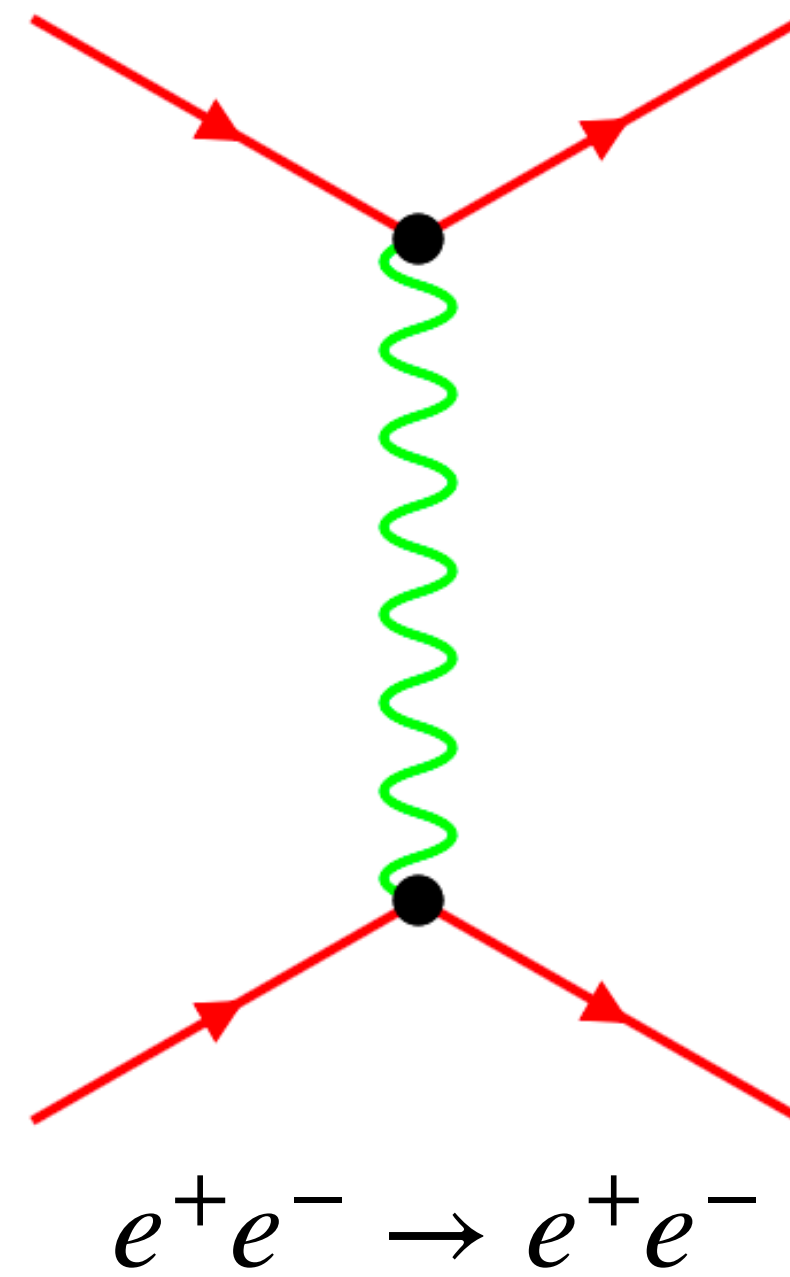
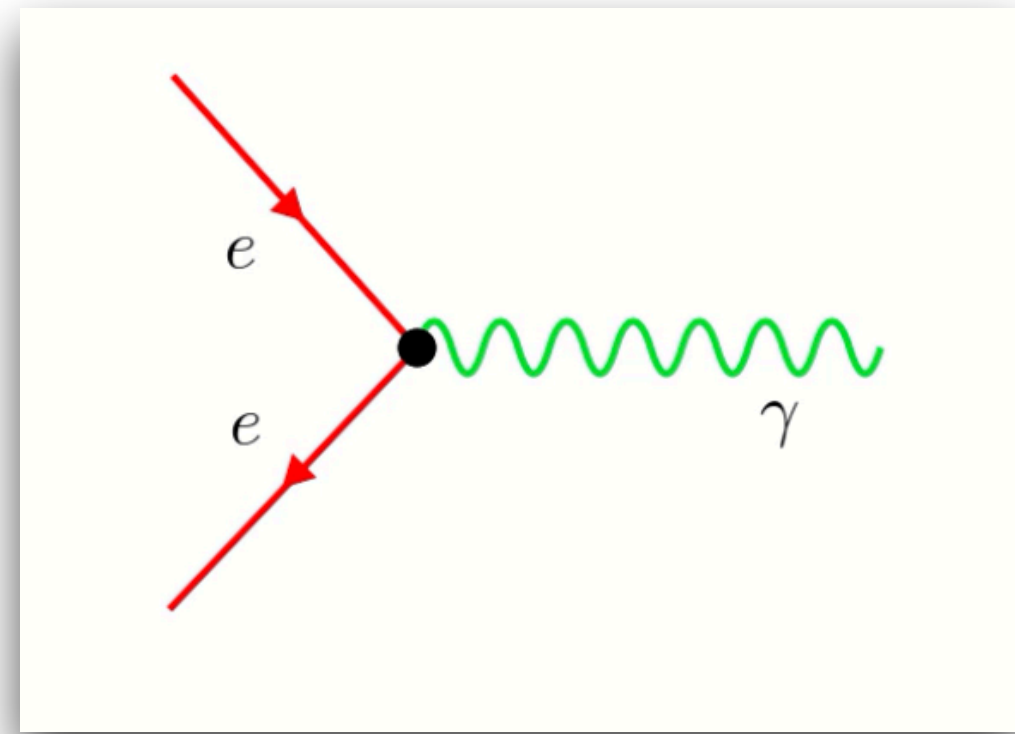


$$e^+e^- \rightarrow e^+e^-$$

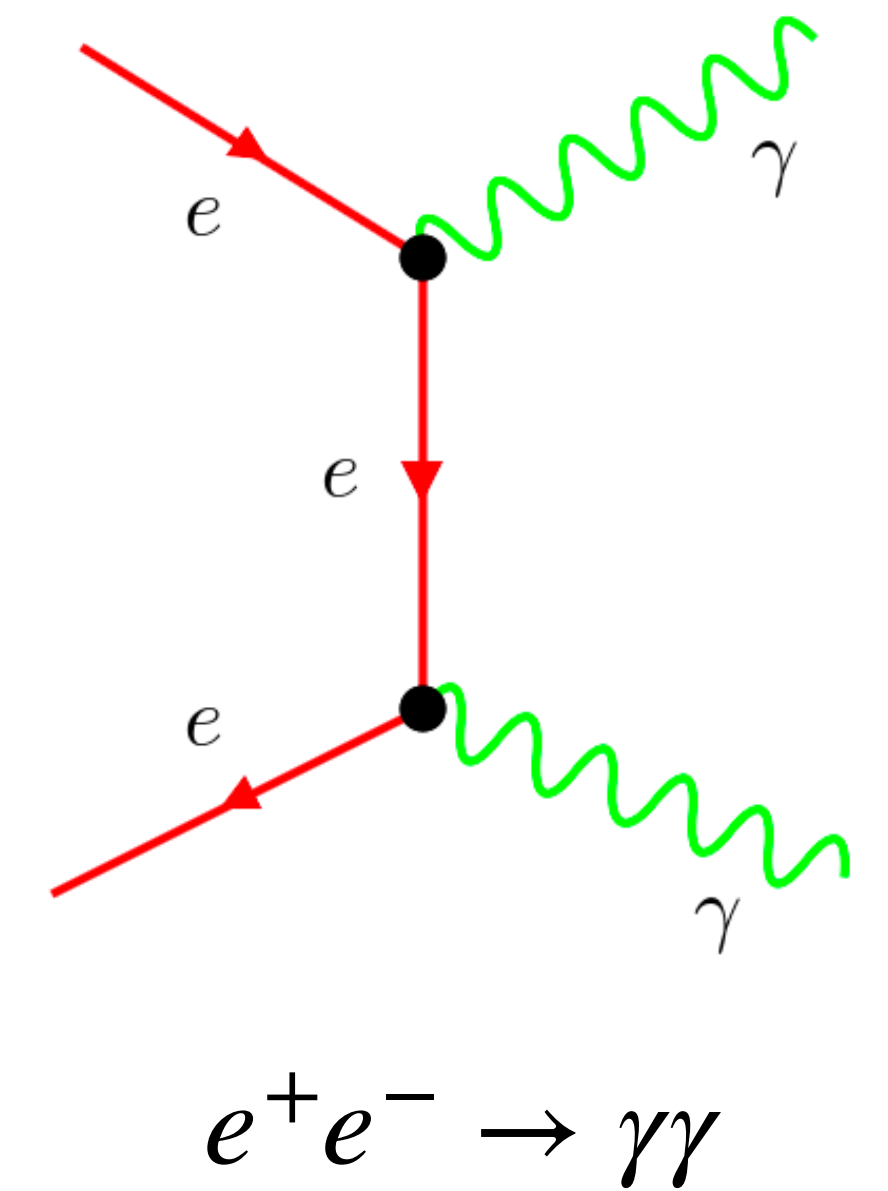
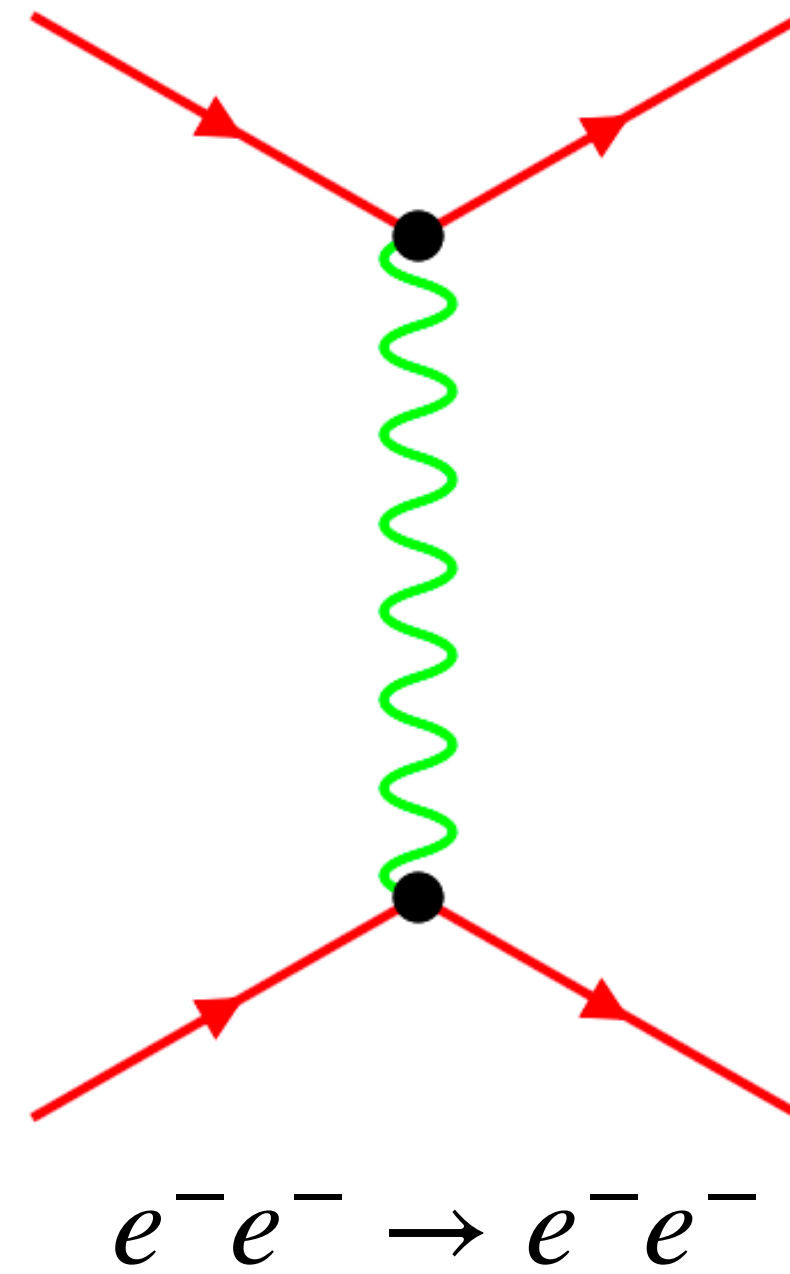
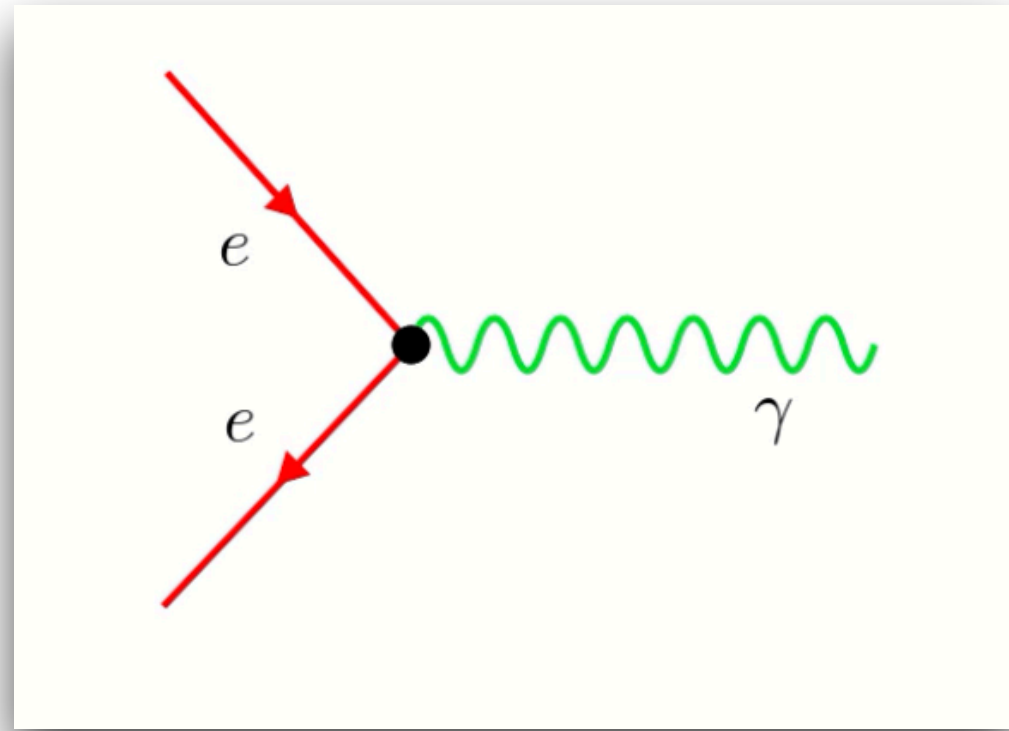


$$e^+e^- \rightarrow \gamma\gamma$$

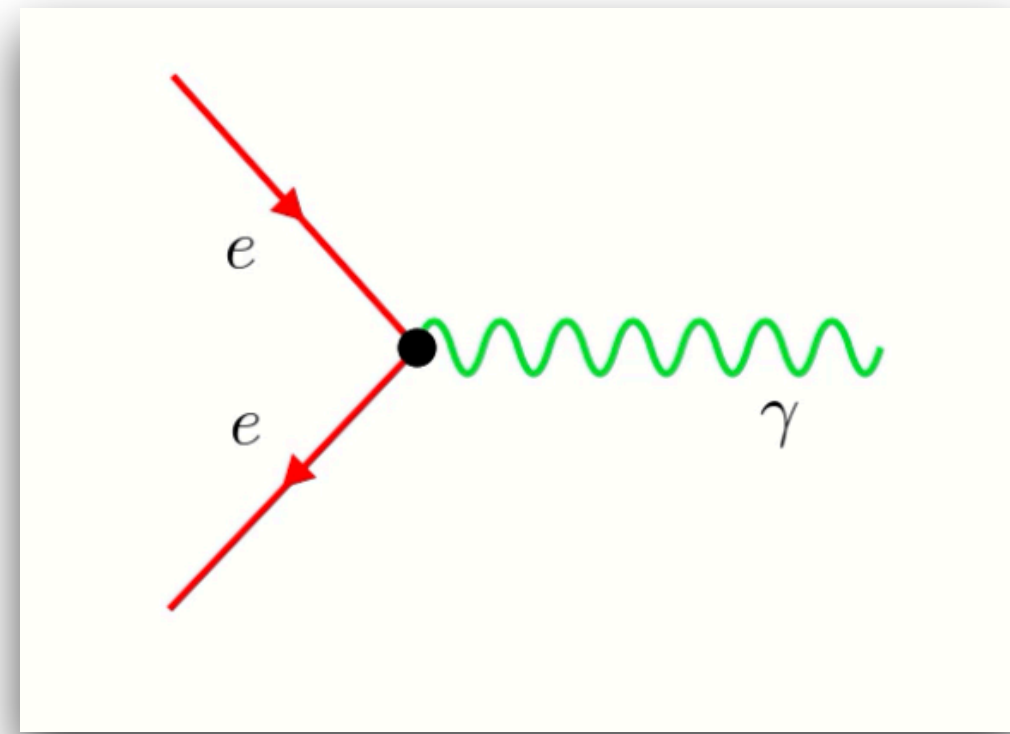
Quantum Electrodynamics



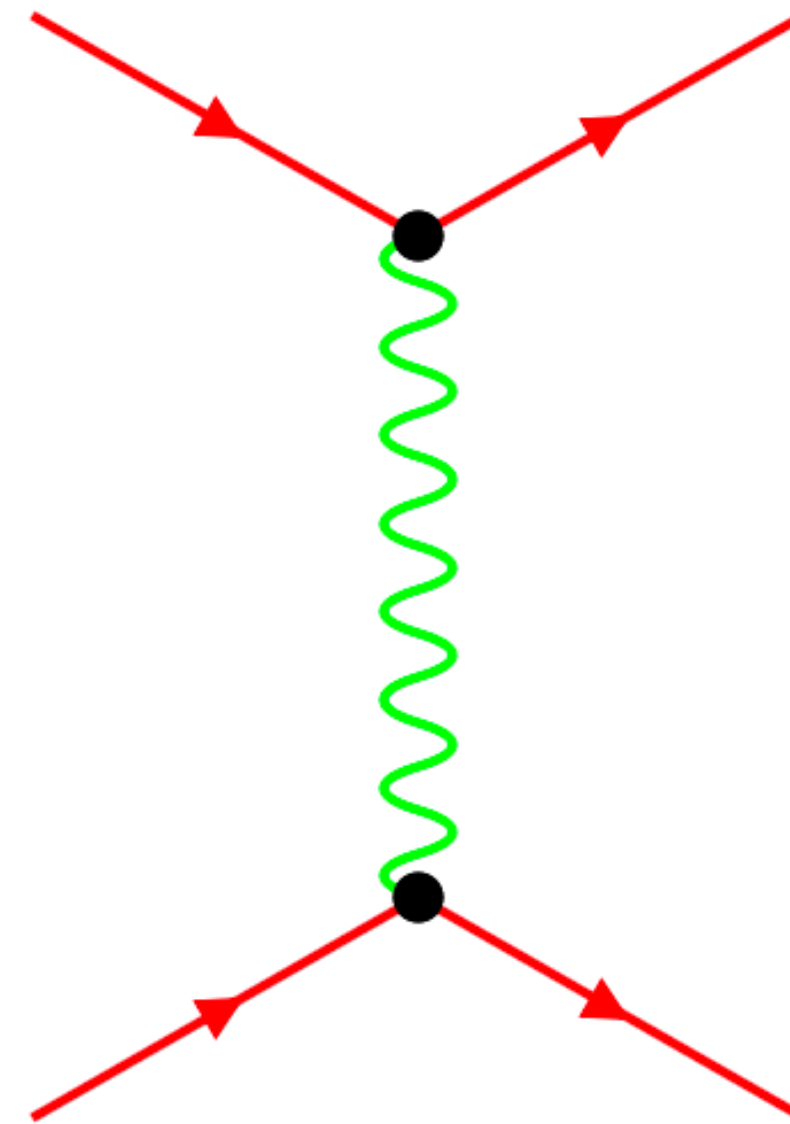
Quantum Electrodynamics



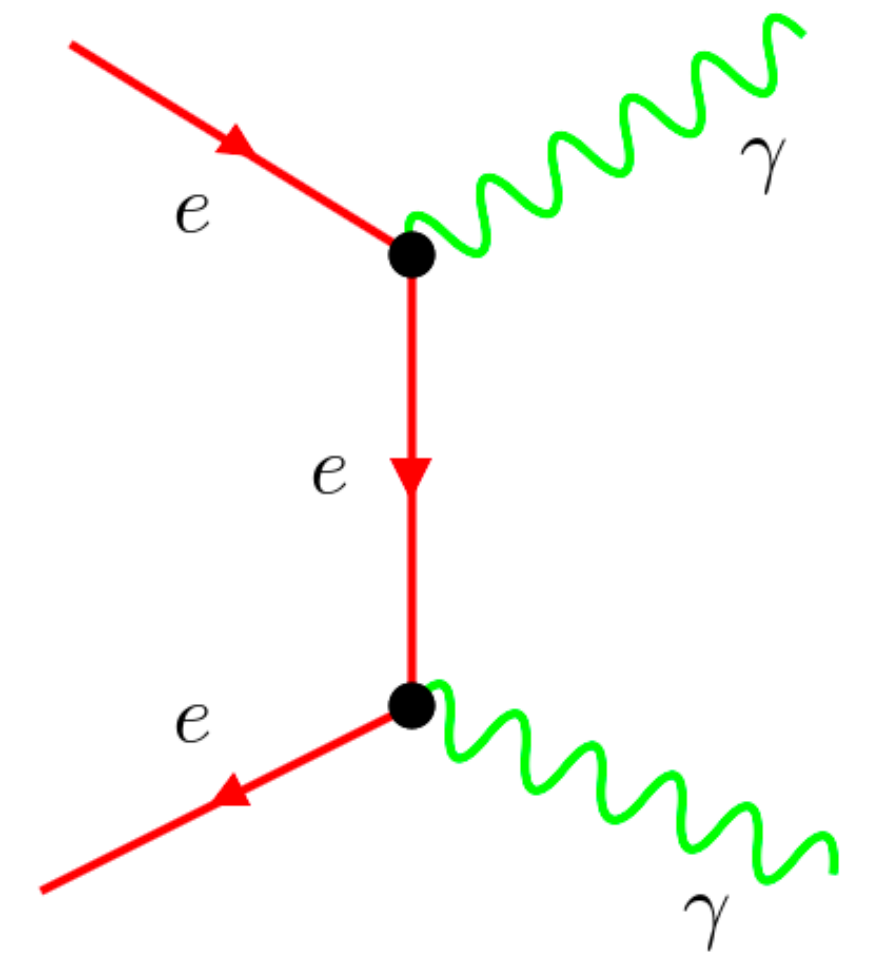
Quantum Electrodynamics



$$= ie\gamma^\mu$$

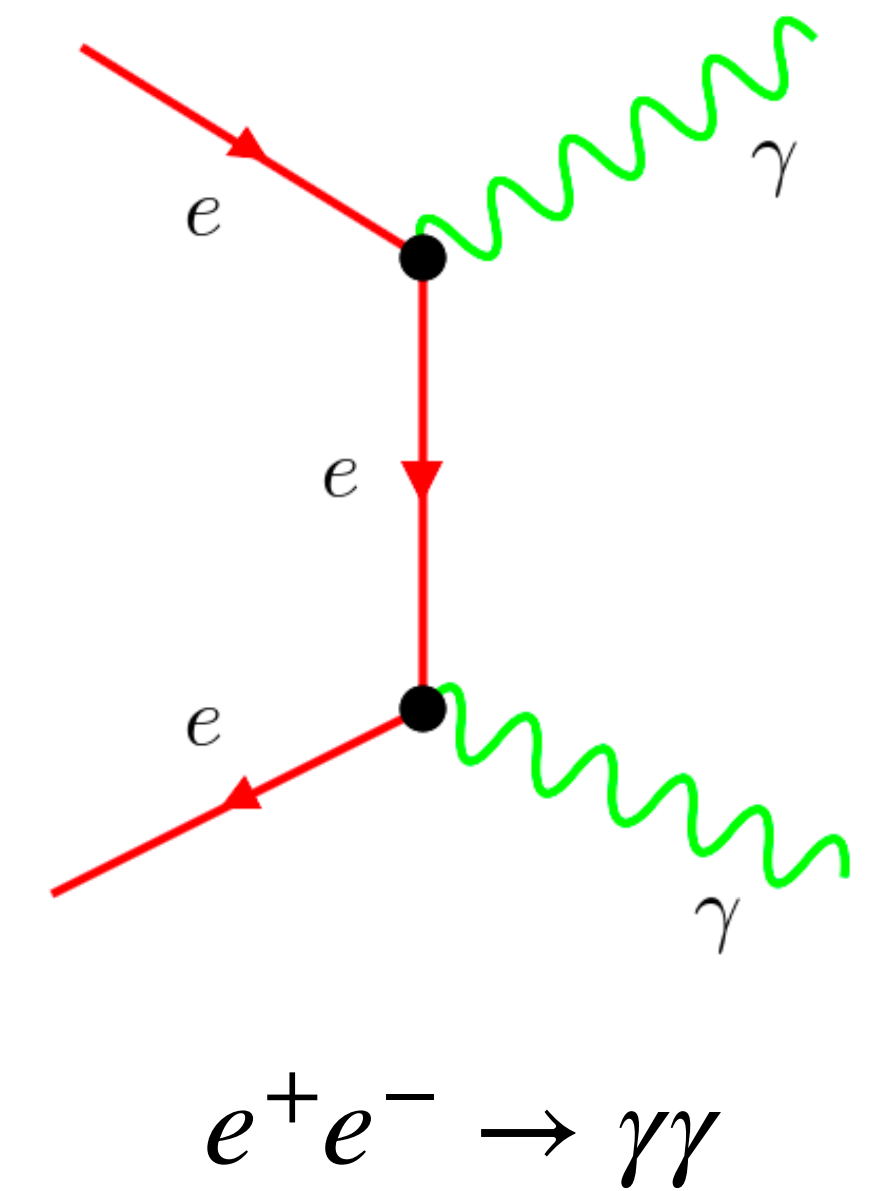
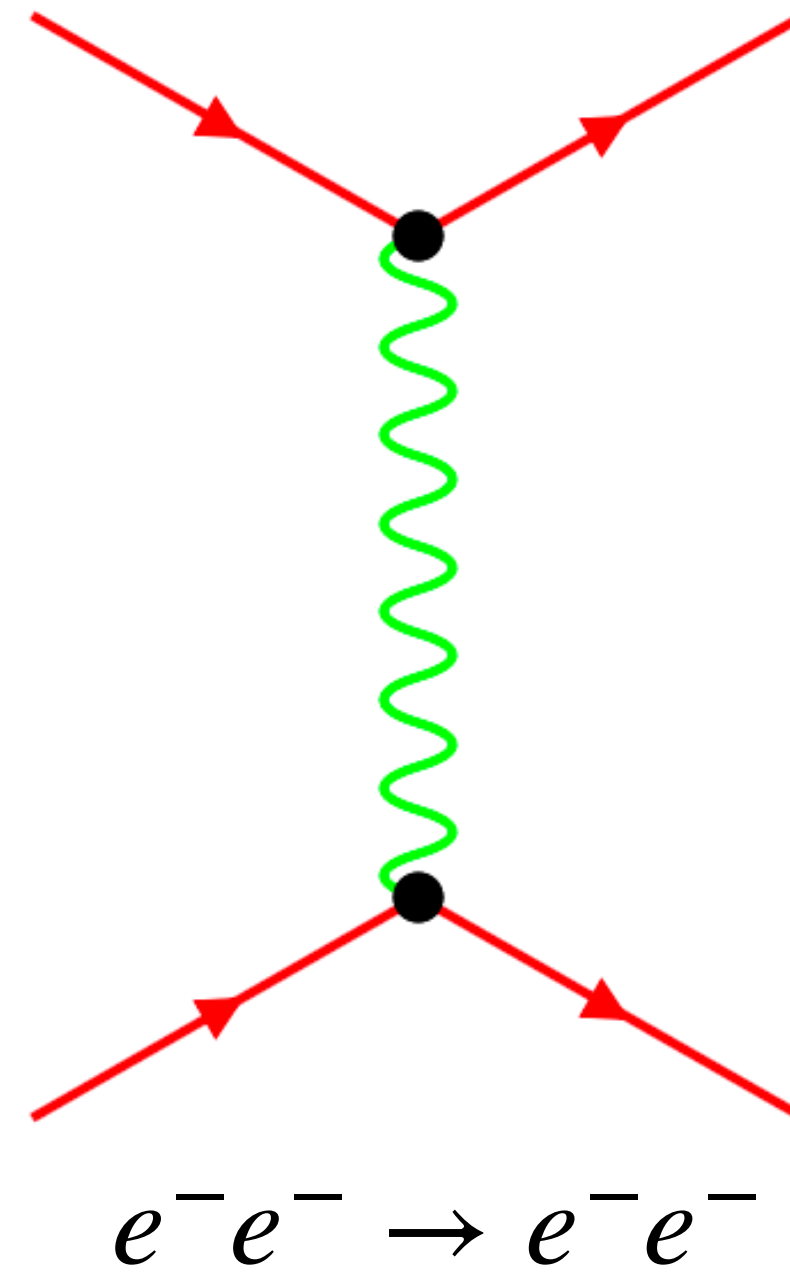
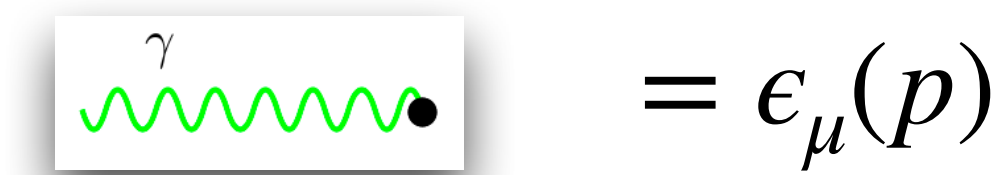
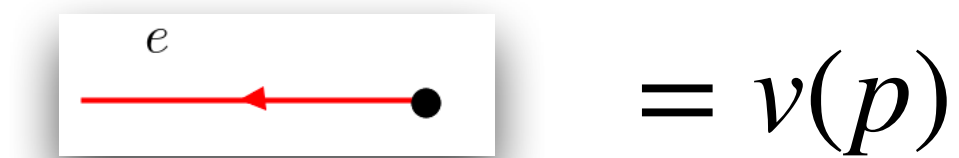
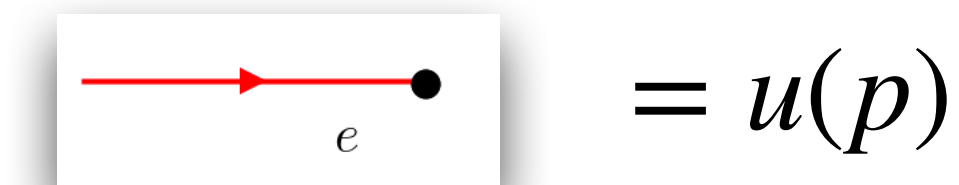
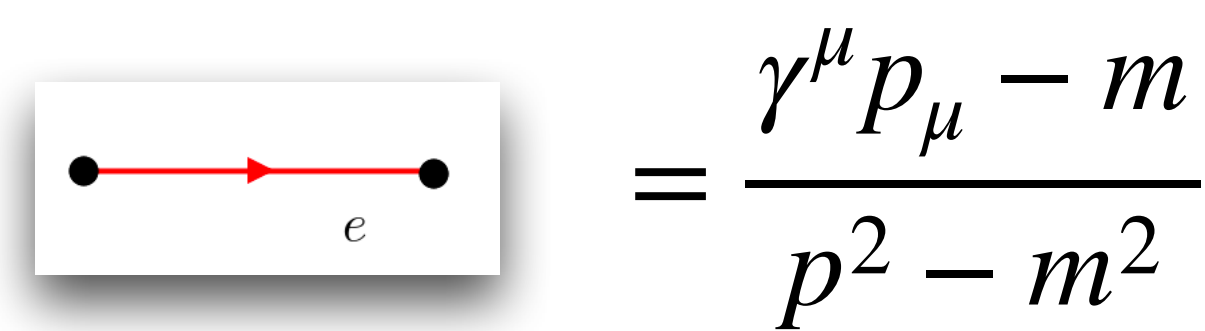
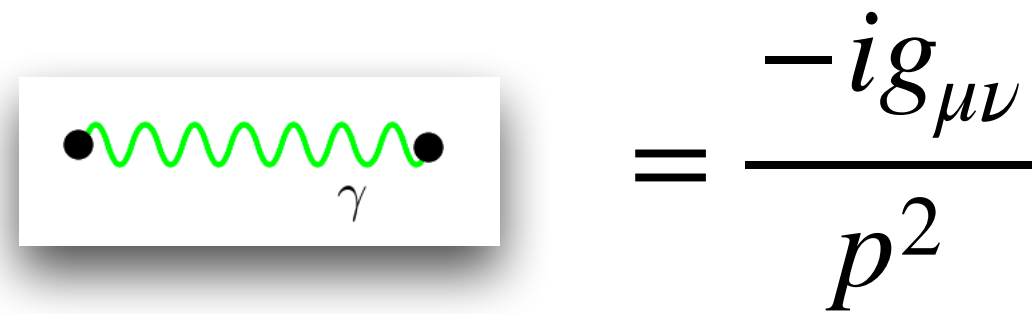
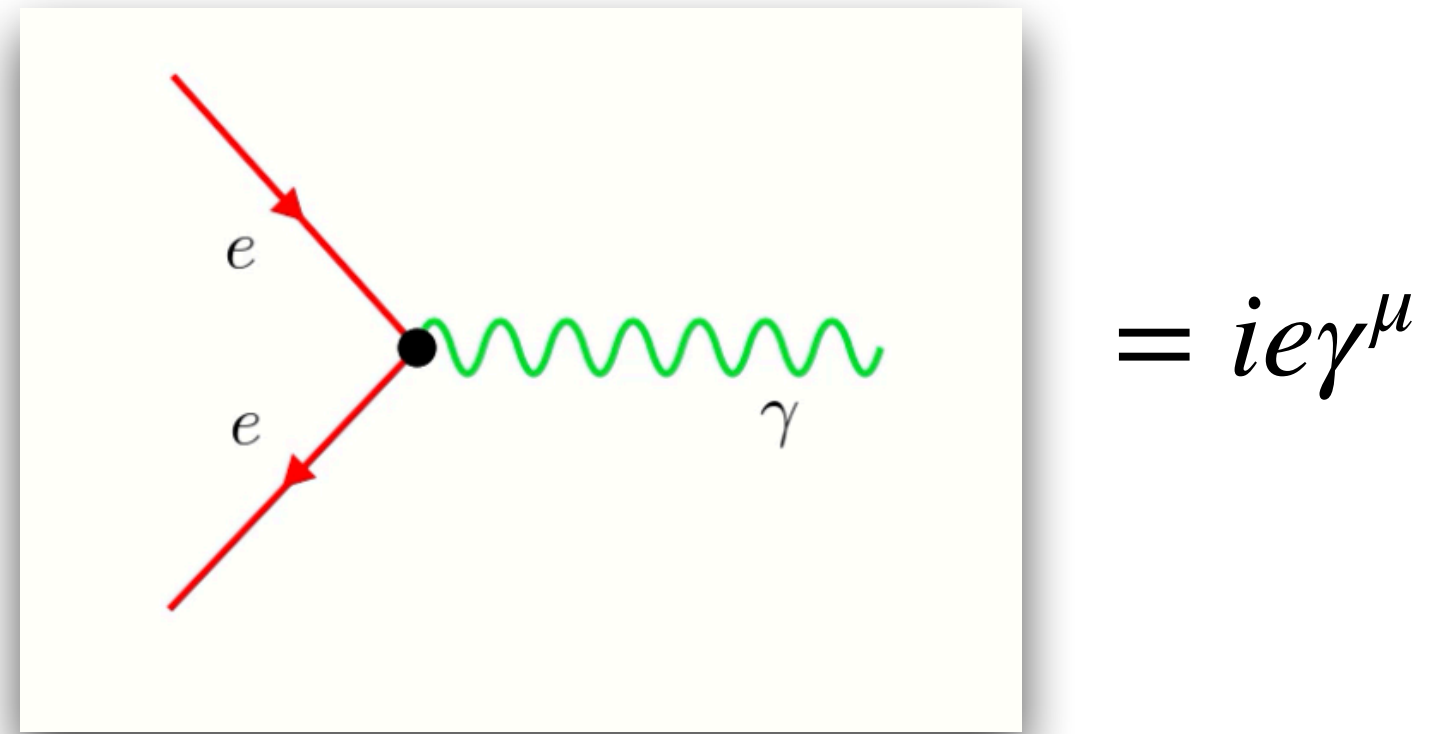


$$e^-e^- \rightarrow e^-e^-$$




$$e^+e^- \rightarrow \gamma\gamma$$

Quantum Electrodynamics



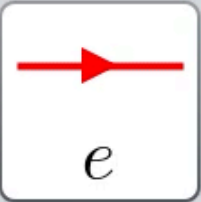
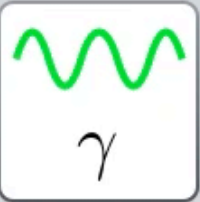
FeynGame v2.0.0 | 03.03.2023 10:26:17

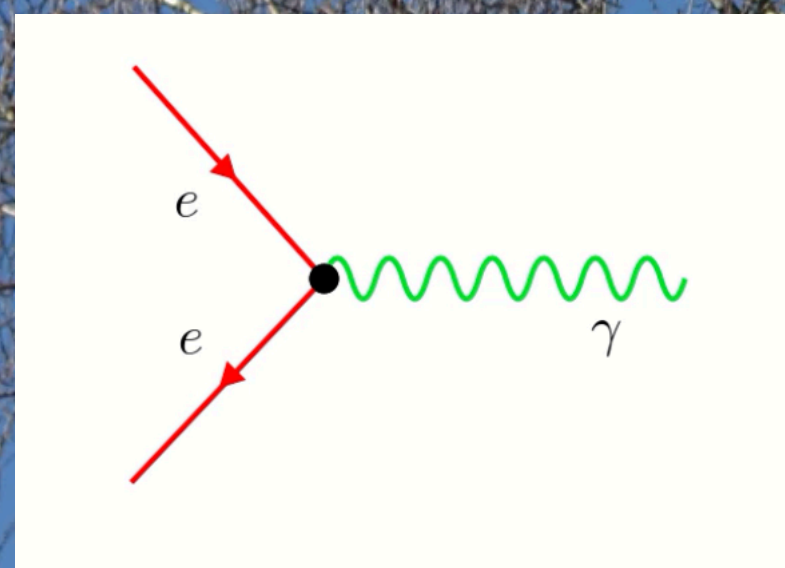
File Edit View Help



Points of this challenge: **5** Points: **0**


Retry Skip Finish



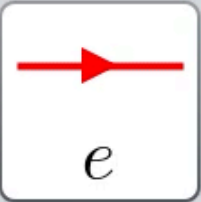
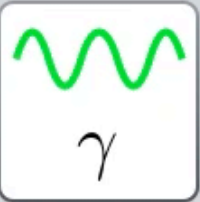
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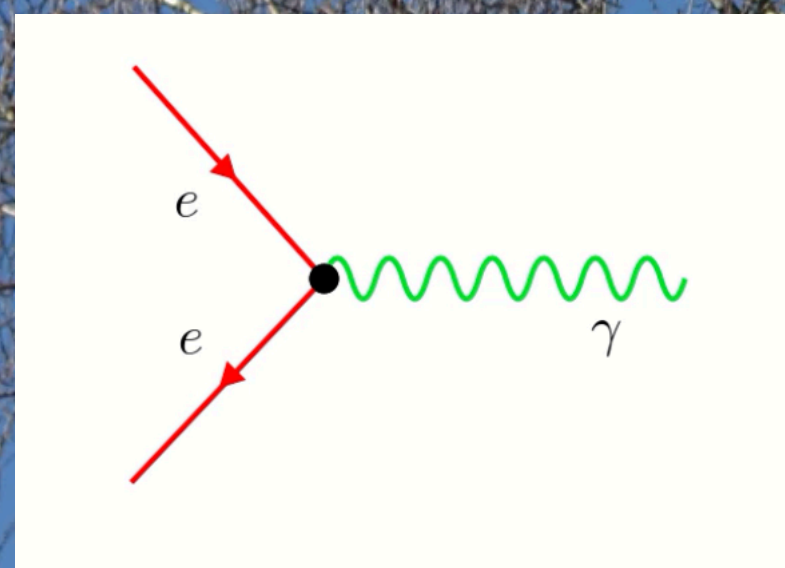
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Points of this challenge: **5** Points: **0**

Retry Skip Finish



WhatsApp
7 items

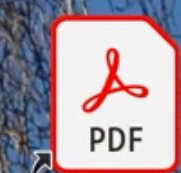
Screen Recording
2023-0...6.47.mov
01:45

sheet_07 (1).pdf

Ch

2022.pdf

Diary 2022-03
Mar.pdf



YR4.pdf

YR3.pdf

YR2.pdf

YR1.pdf

Untitled.fg - FeynGame v2.1.0 | 21.11.2023 12:48:44

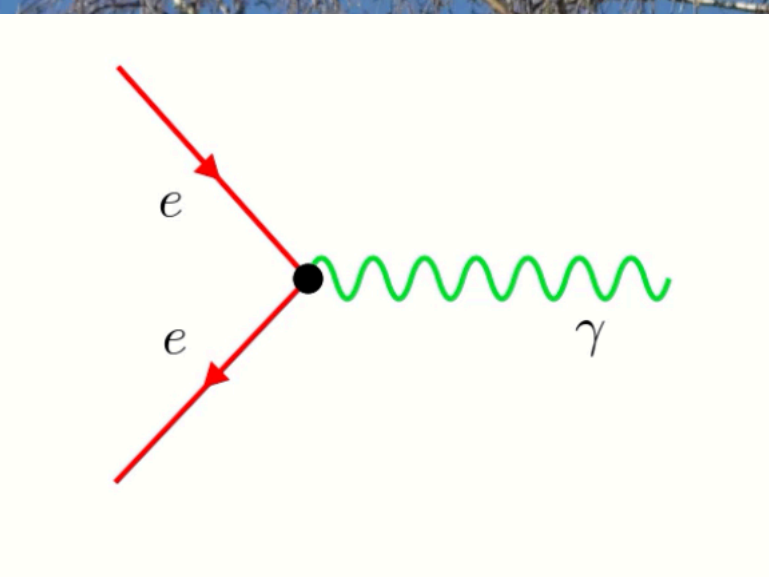
File Edit View Help

Select a tile

↓ ↓

qed X +

+ e γ



WhatsApp 7 items

CharlottesKlavier Belegung.txt

Relocated Items.nosync

Images 2 items

PDF Documents 18 items

Screen Recording 2023-0...6.47.mov 01:45

ZIP

(VU) Advanced quantu..._2110.zip 75,2 MB

Screenshot 2023-11...20.png 974x1.326

dum 7 items

Untitled.fg - FeynGame v2.1.0 | 21.11.2023 12:48:44

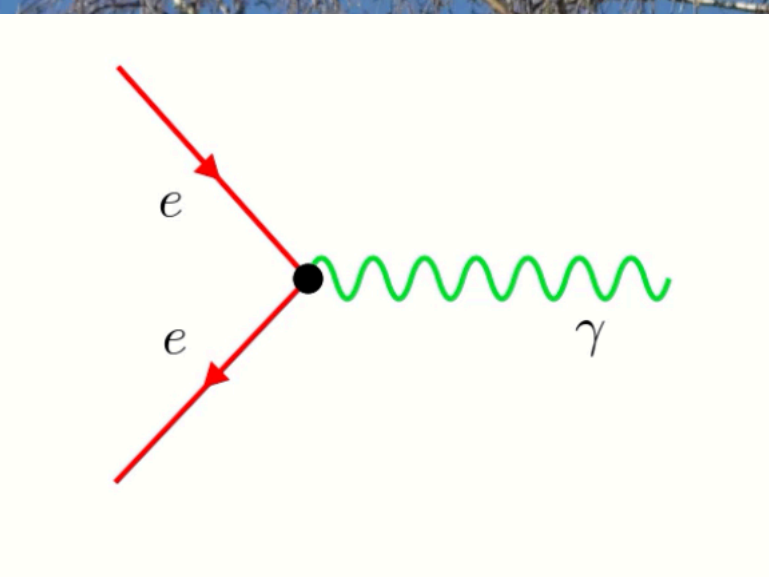
File Edit View Help

Select a tile

↓ ↓

qed X +

+ e γ



WhatsApp 7 items

CharlottesKlavier Belegung.txt

Relocated Items.nosync

Images 2 items

PDF Documents 18 items

Screen Recording 2023-0...6.47.mov 01:45

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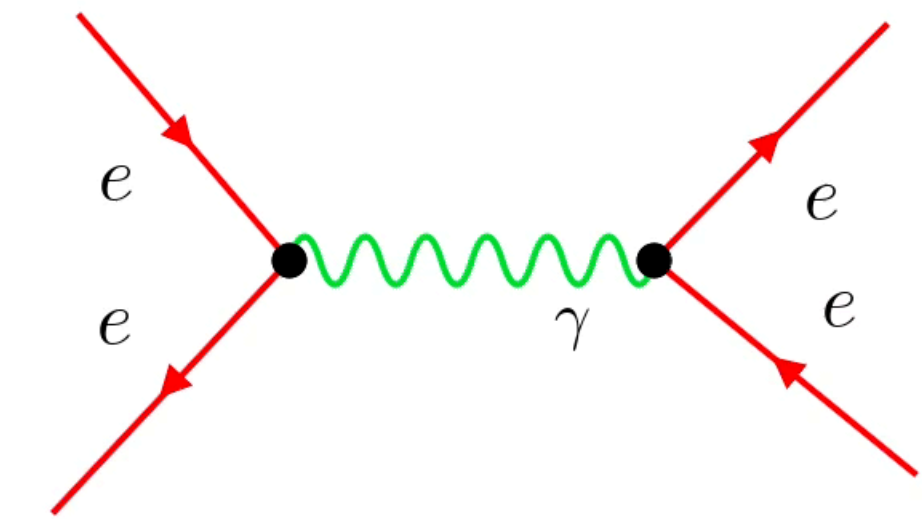
(VU) Advanced quantu..._2110.zip 75,2 MB

Screenshot 2023-11...20.png 974x1.326

dum 7 items

Untitled.fg - FeynGame v2.1.0 | 21.11.2023 12:48:44

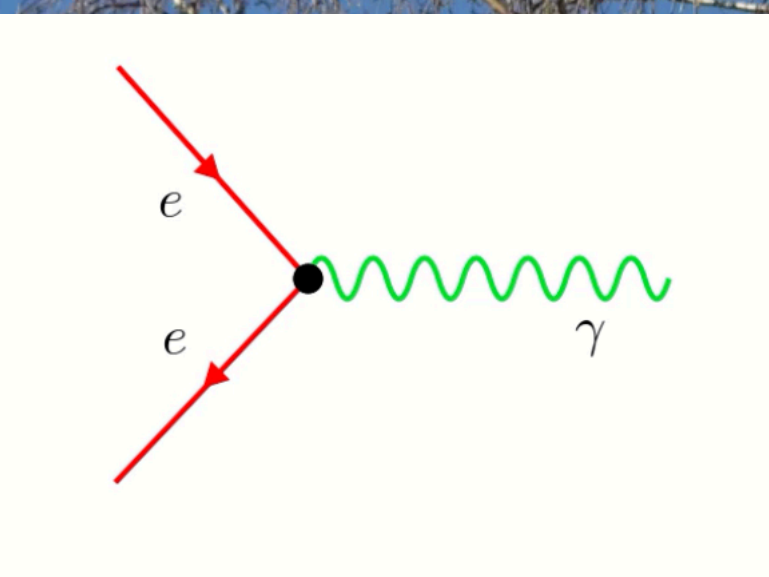
File Edit View Help



qed X +

+ e γ

The diagram shows two incoming electrons (red lines with arrows) on the left, interacting via a photon (green wavy line) to produce two outgoing electrons on the right. The interaction is represented by two black vertices connected by a green wavy line labeled with the Greek letter gamma (γ).

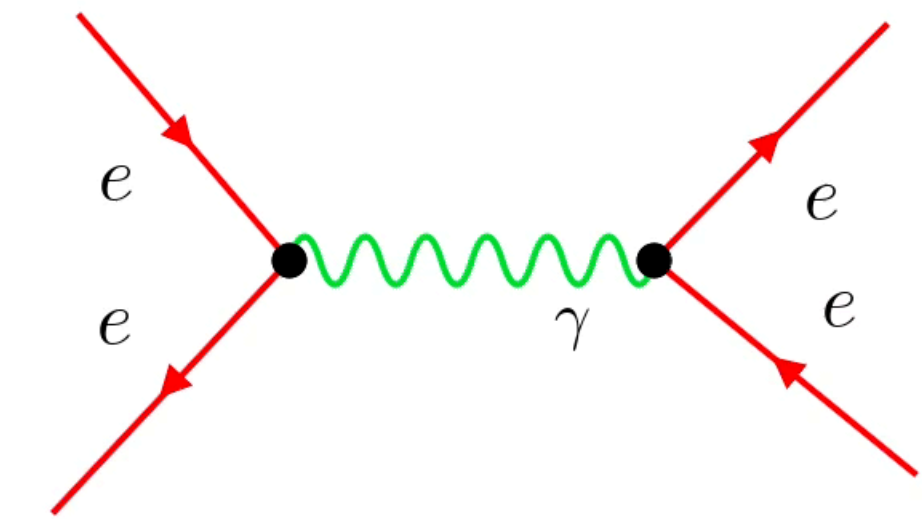


- WhatsApp 7 items
- CharlottesKlavier Belegung.txt
- Relocated Items.nosync
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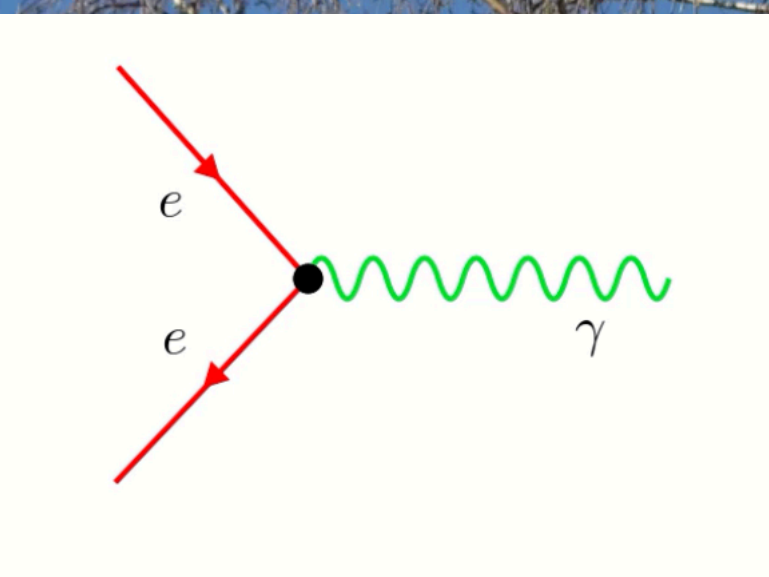
File Edit View Help



qed X +

+ e γ

The diagram shows two incoming electrons (red lines with arrows) on the left, interacting via a photon (green wavy line) to produce two outgoing electrons on the right. The interaction is represented by two black vertices connected by a green wavy line labeled with the Greek letter gamma (γ). The incoming electrons are labeled 'e' and the outgoing electrons are also labeled 'e'.



WhatsApp 7 items

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Images 2 items

PDF Documents 18 items

Screen Recording 2023-0...6.47.mov 01:45

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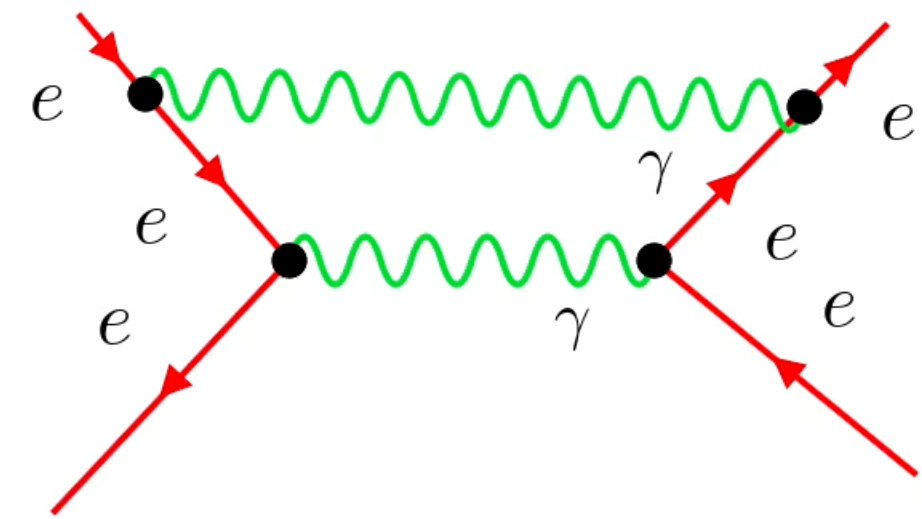
Screenshot 2023-11...20.png 974x1.326

dum 7 items

The desktop contains various icons for folders, documents, and applications. The dock on the right side of the screen shows icons for WhatsApp, Messages, Safari, and several other applications.

Untitled.fg - FeynGame v2.1.0 | 21.11.2023 12:48:44

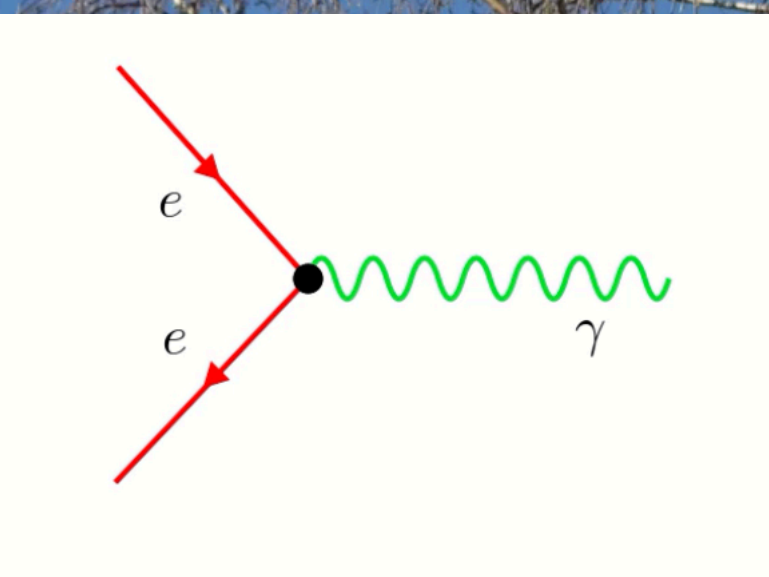
File Edit View Help



qed X +

+ e γ

The diagram shows two incoming electrons (red lines with arrows) on the left. They interact via two-photon exchange (green wavy lines) to produce two outgoing electrons on the right. The interaction is represented by two vertices (black dots) connected by two photons (γ).

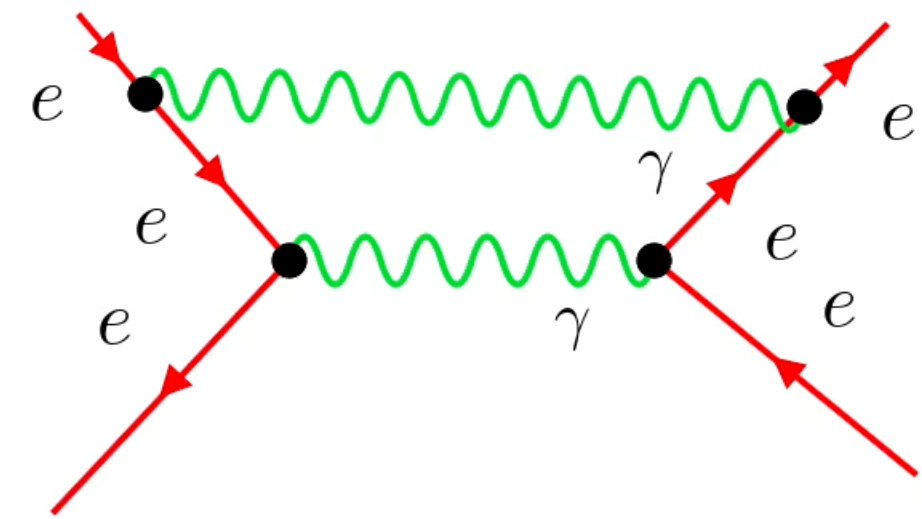


- WhatsApp 7 items
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- dum 7 items



Untitled.fg - FeynGame v2.1.0 | 21.11.2023 12:48:44

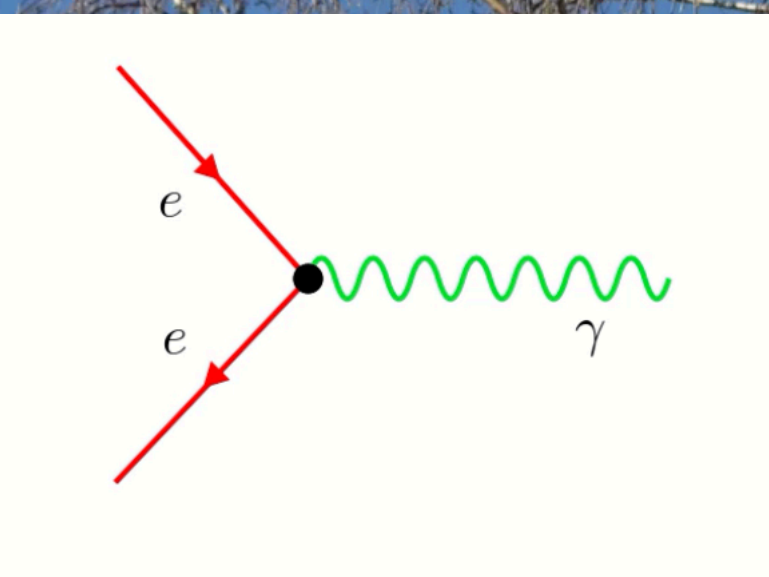
File Edit View Help



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The diagram shows two incoming electrons (red lines with arrows) on the left. They interact via two-photon exchange (green wavy lines) to produce two outgoing electrons on the right. The interaction is represented by two vertices (black dots) connected by two photons (green wavy lines). The photons are labeled with the Greek letter gamma (γ).

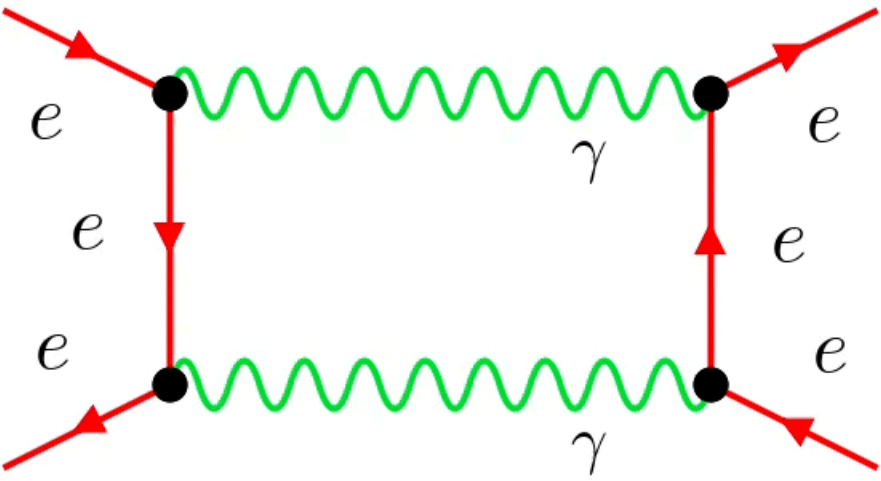


- WhatsApp 7 items
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- dum 7 items



Untitled.fg - FeynGame v2.1.0 | 21.11.2023 12:48:44

File Edit View Help



The diagram shows two incoming electrons (red arrows) on the left and two outgoing electrons (red arrows) on the right. Two green wavy lines, representing photons (γ), connect the two vertices on each side. The vertices are marked with black dots. The photon lines are labeled with γ .

qed X +

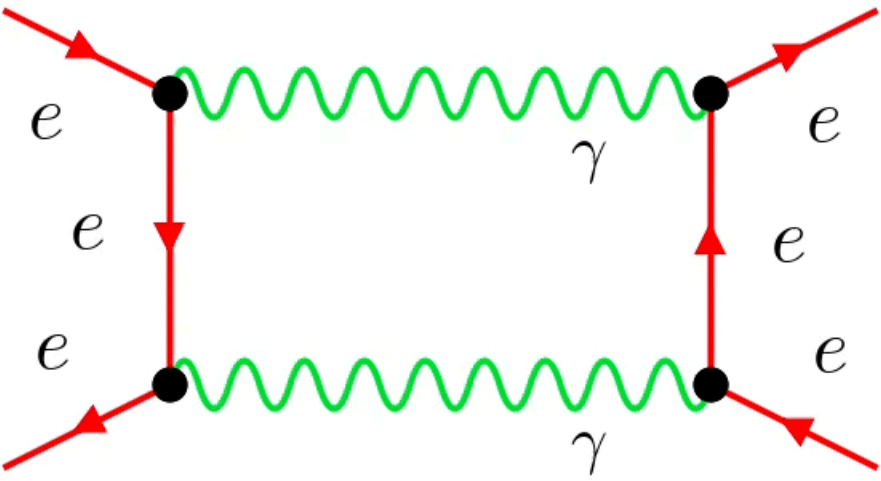
+ e γ

- WhatsApp 7 items
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- Screenshot 2023-11...20.png 974x1.326
- dum 7 items



Untitled.fg - FeynGame v2.1.0 | 21.11.2023 12:48:44

File Edit View Help



The diagram shows two incoming electrons (red arrows) on the left and two outgoing electrons (red arrows) on the right. Two green wavy lines, representing photons (γ), connect the two vertices on each side. The vertices are marked with black dots. The photon lines are labeled with γ .

qed X +

+ e γ

WhatsApp
7 items

Relocated
Items.nosync

CharlottesKlavier
Belegung.txt

Images
2 items

PDF Documents
18 items

Screen Recording
2023-0...6.47.mov
01:45

ZIP

(VU) Advanced
quantu..._2110.zip
75,2 MB

Screenshot
2023-11...20.png
974x1.326

dum
7 items

System dock containing icons for various applications including Messages, Mail, Safari, Photos, Music, App Store, and System Preferences.



SUISSE
FRANCE

CMS

LHCb

ATLAS

CERN Meyrin

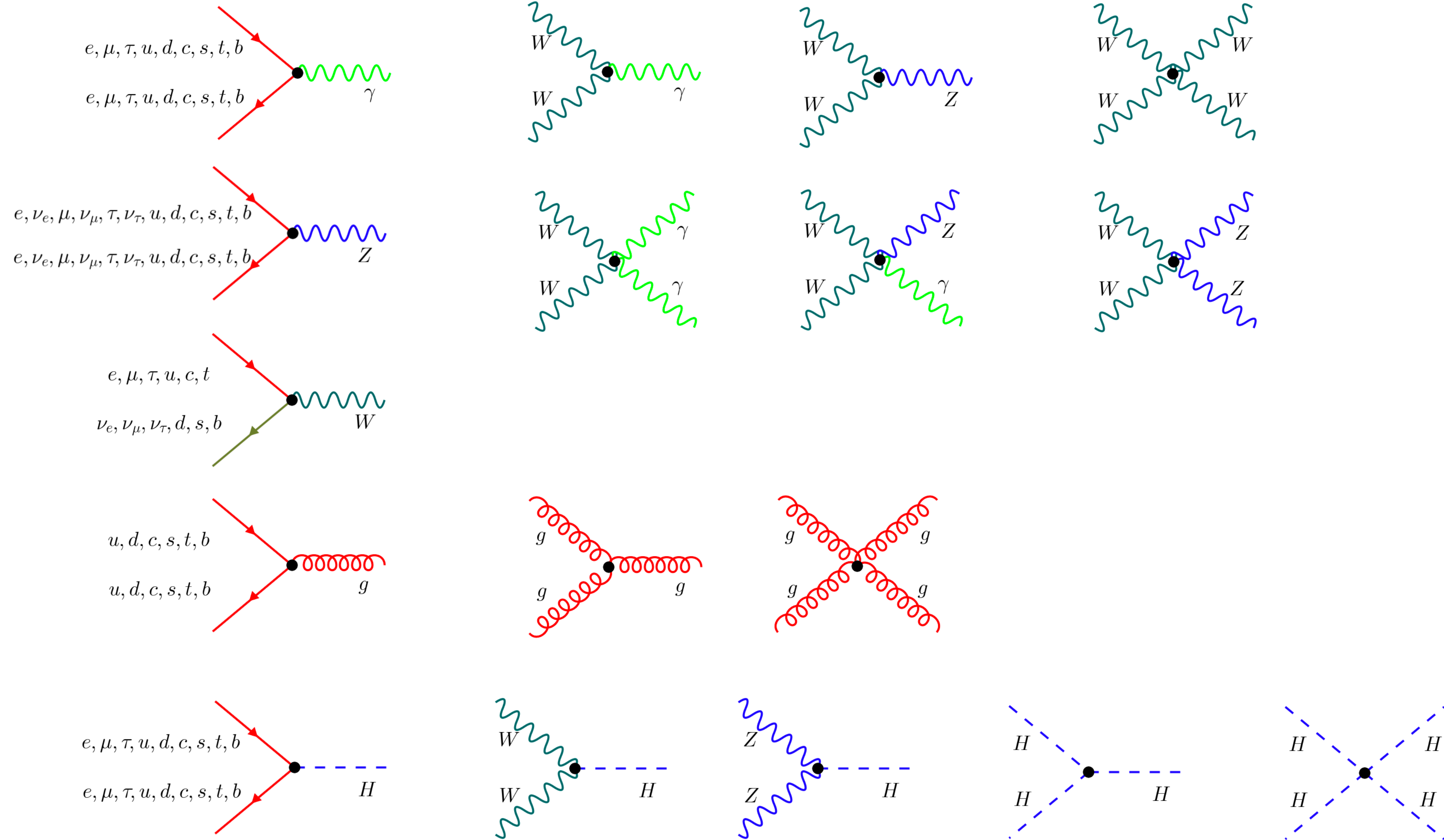
CERN Prévessin

SPS 7 km

ALICE

LHC 27 km

Das Standardmodell der Teilchenphysik:



FeynGame v2.0.0 | 03.03.2023 10:26:17

File Edit View Help

Points of this challenge: **5** Points: **0**

Retry Skip Finish

t	b	c	s	u	d	e	ν_e
μ	ν_μ	τ	ν_τ	H	g	W	γ
Z							

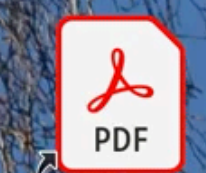
WhatsApp
7 items

Screen Recording
2023-0...6.47.mov
01:45

sheet_07 (1).pdf

2022.pdf

Diary 2022-03
Mar.pdf



YR4.pdf



YR3.pdf



YR2.pdf



YR1.pdf

FeynGame v2.0.0 | 03.03.2023 10:26:17

File Edit View Help



Points of this challenge: **5** Points: **0**

Retry			Skip			Finish	
t	b	c	s	u	d	e	ν_e
μ	ν_μ	τ	ν_τ	H	g	W	γ
Z							



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FeynGame

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Issues 0

Merge requests 1

CI/CD

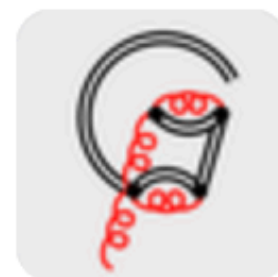
Deployments

Packages and registries

Monitor

Analytics

FeynGame > FeynGame



FeynGame

Project ID: 15446420

1,222 Commits 1 Branch 2 Tags 9.2 MB Project Storage 2 Releases

Topics: Feynman diag... Java gui



Star 8



fix in changelog

Sven Yannick Klein authored 1 year ago

4f4c4b7d



master ▼

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GNU GPLv3

CHANGELOG

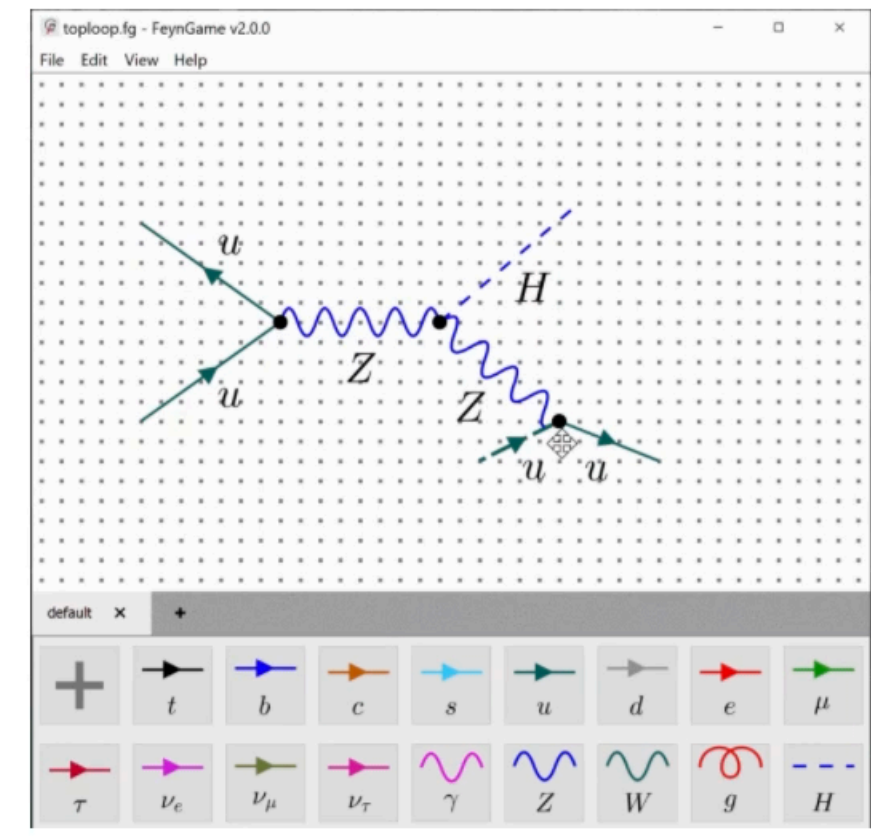
Robert Harlander Institute for Theoretical Particle Physics and Cosmology
Faculty of Mathematics, Computer Science and Natural Sciences
RWTH Aachen University
52056 Aachen, Germany
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fax: +49-241-80-22187
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Office: 28A414, Campus Melaten

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Citation: If you use FeynGame in a publication, please refer to the paper

- R.V. Harlander, S.Y. Klein, M. Lipp, FeynGame *Comp. Phys. Comm.* **256** (2020) 107465 [arXiv:2003.00896]



FeynGame-2.0.0 is available! It includes LaTeX labels, shapes, PS/EPS/PDF export, a level generator, it prints the amplitude in LaTeX format, and much more. It is as easy to use as before!

Instructions: Simply download [this jar](#), then type

Desktop sidebar containing various application icons and file names such as 'totesKlavier', 'Bilder', 'Documents', 'Ladung 23.pdf', 'thesisPreFin', 'roduction to ...heory.pdf', and 'reading_B1-1.pdf'.

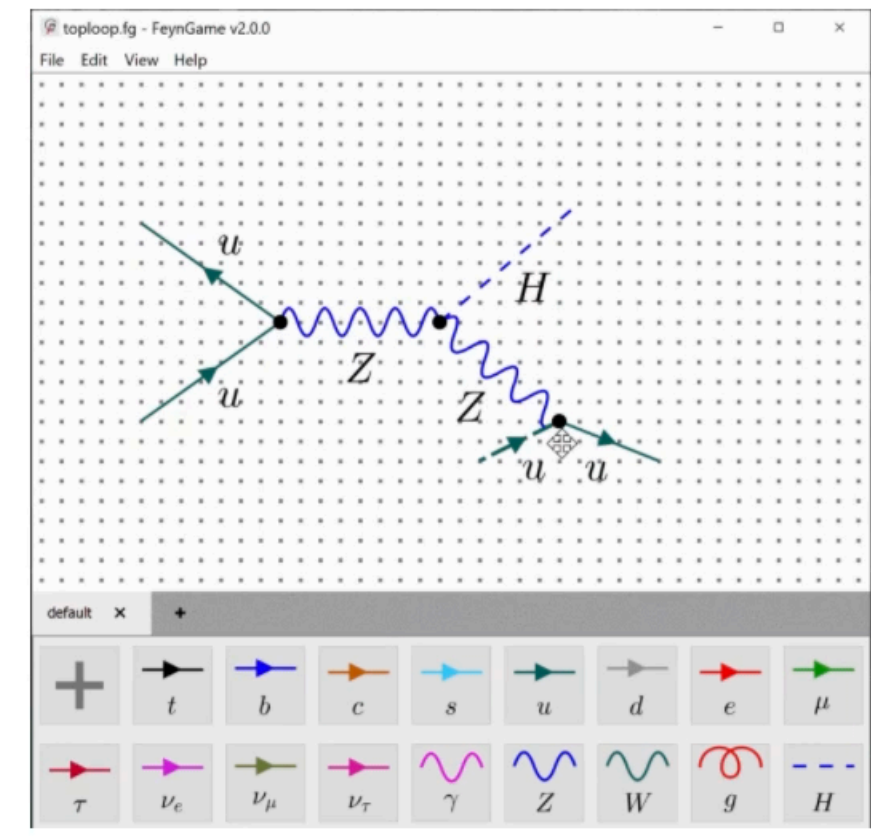
Robert Harlander Institute for Theoretical Particle Physics and Cosmology
Faculty of Mathematics, Computer Science and Natural Sciences
RWTH Aachen University
52056 Aachen, Germany
phone: +49-241-80-27045
fax: +49-241-80-22187
harlander(at)physik.rwth-aachen.de
Office: 28A414, Campus Melaten

- Home
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- Software
- Press
- collaborations:
- LHCHWG
- LHC and Philosophy
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- DFG RTG



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Erzeugung und Vernichtung von Teilchen

Robert Harlander

2



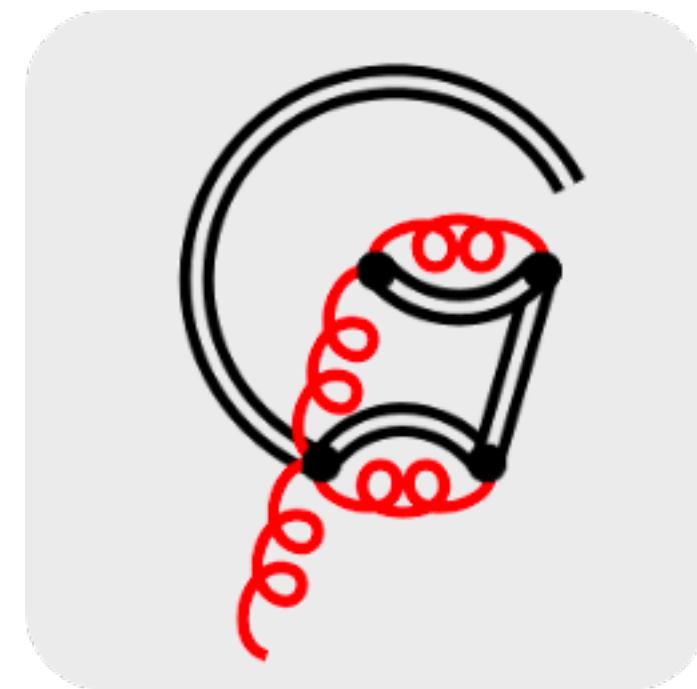
Oliver Passon
Thomas Zügge
Johannes Grebe-Ellis Hrsg.

Kohärenz im Unterricht der Elementarteilchenphysik

Tagungsband des Symposiums zur Didaktik der Teilchenphysik, Wuppertal 2018

 Springer Spektrum

FeynGame



Synthese (2021) 199:15087–15111
<https://doi.org/10.1007/s11229-021-03387-y>

ORIGINAL RESEARCH



Feynman diagrams

From complexity to simplicity and back

Robert Harlander¹ 



FeynGame

