Laboratoire d'Annecy de Physique des Particules

Les exercices...

LHC Masterclasses

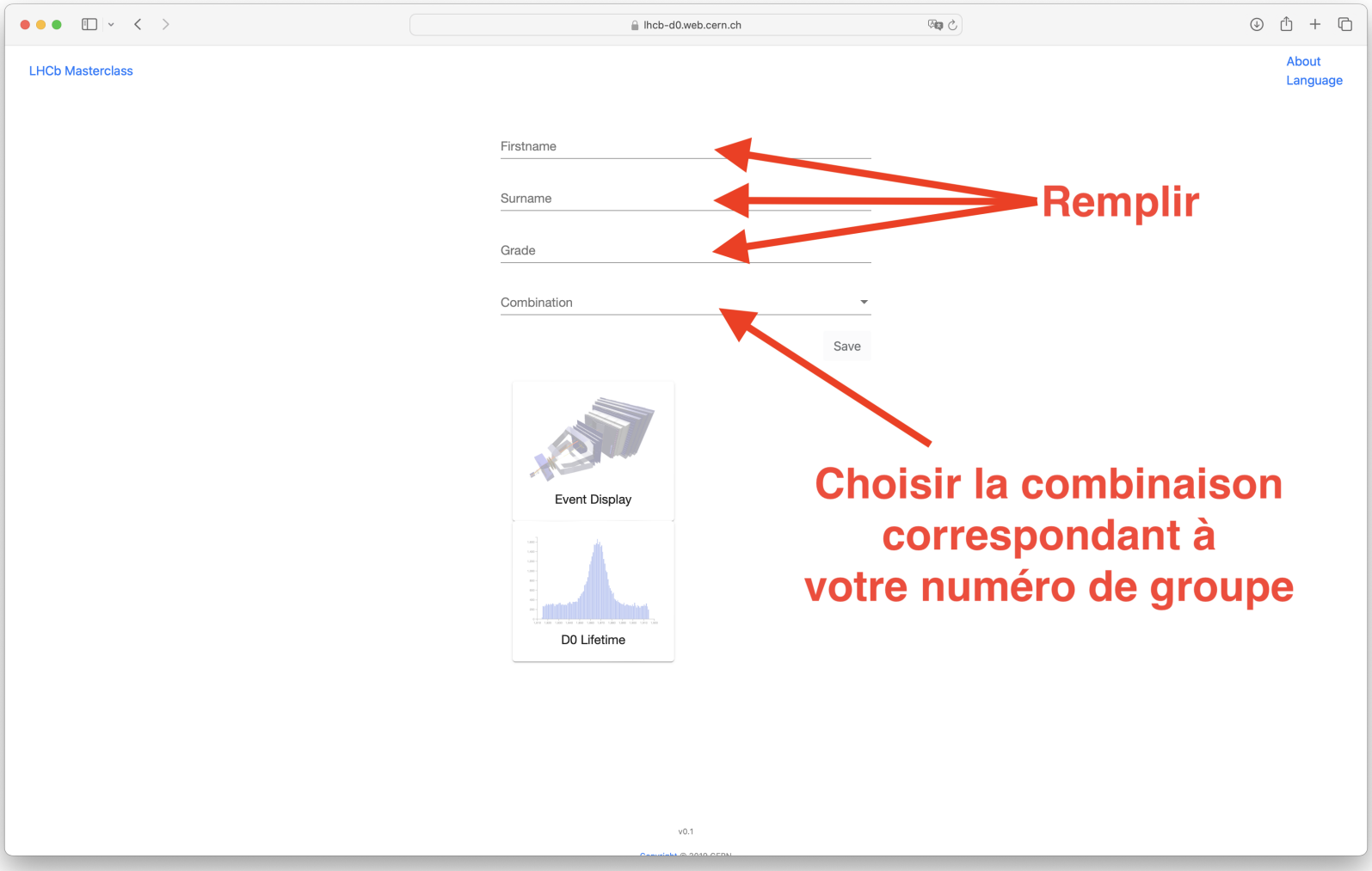
15 mars 2024

JF Marchand

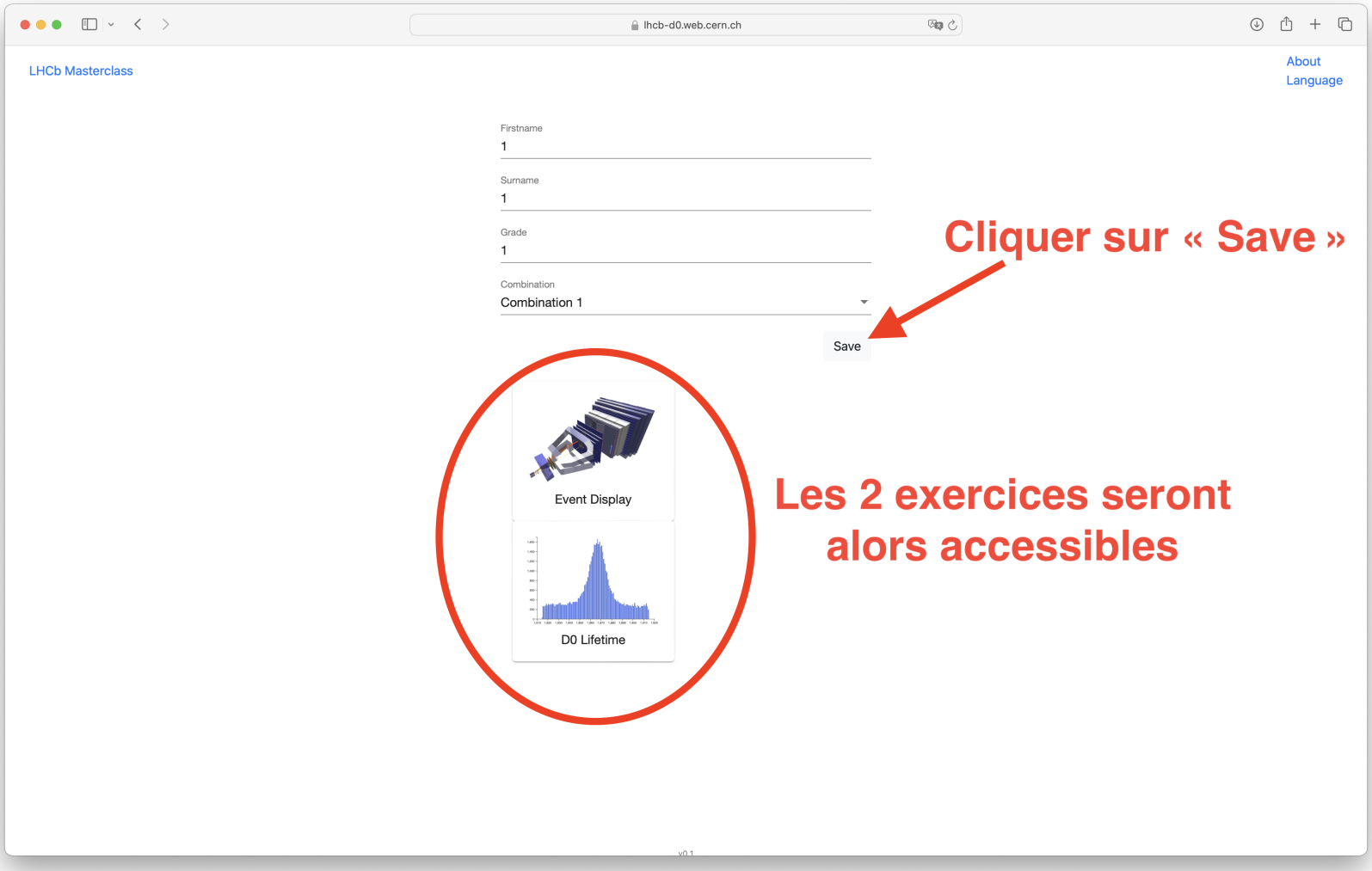
cnrs

UNIVERSITÉ SAVOIE MONT BLANC

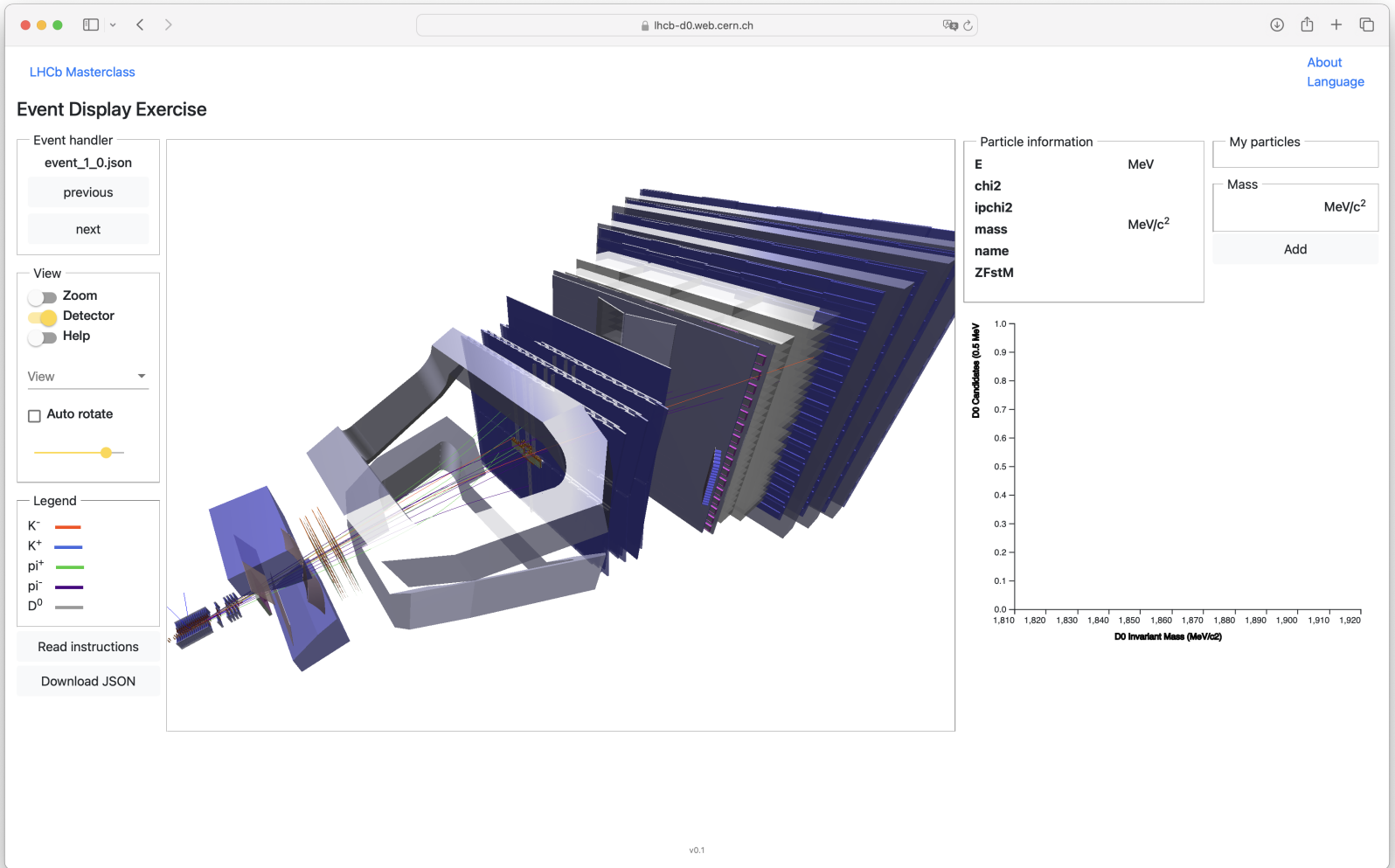
Préparation des exercices

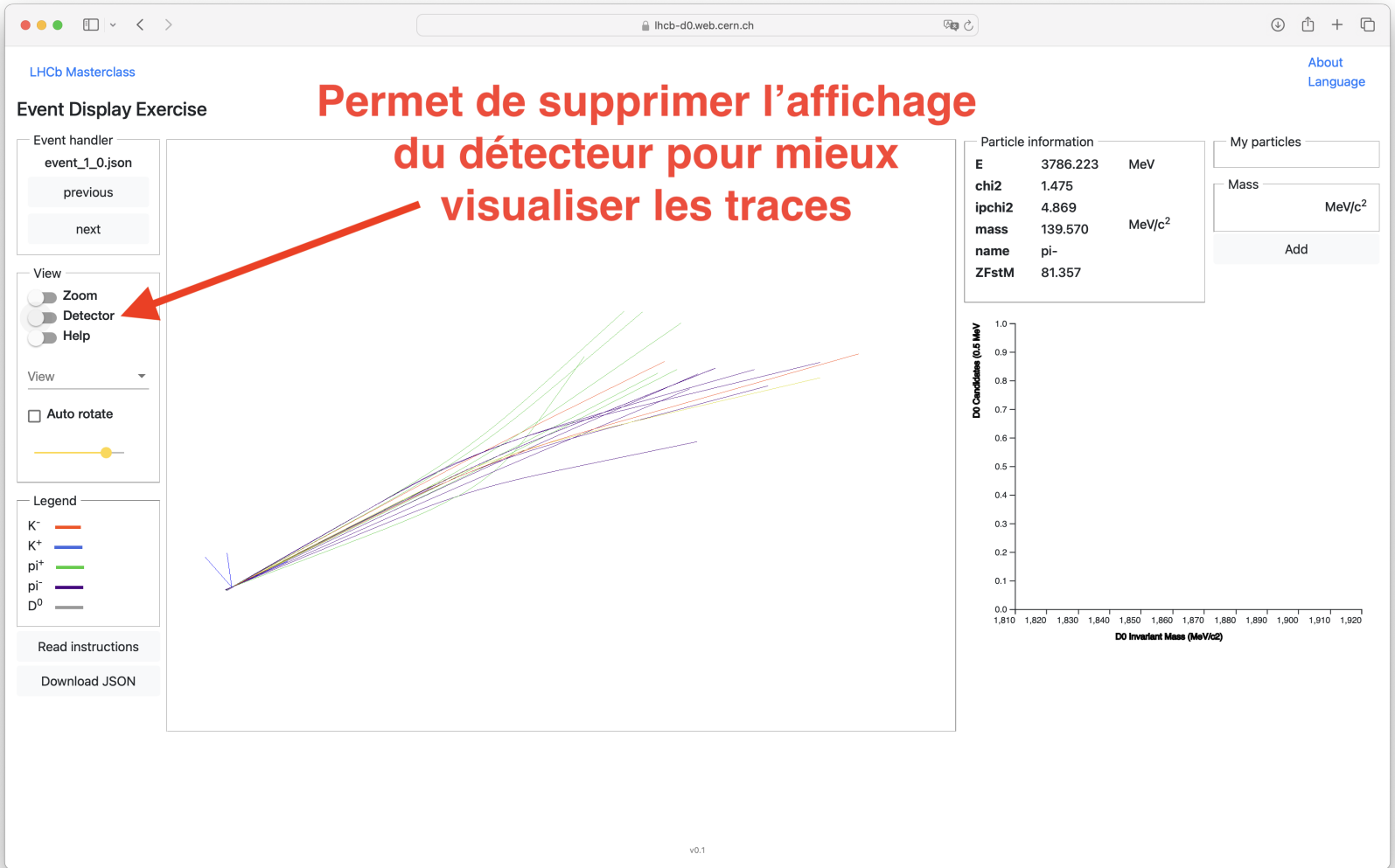


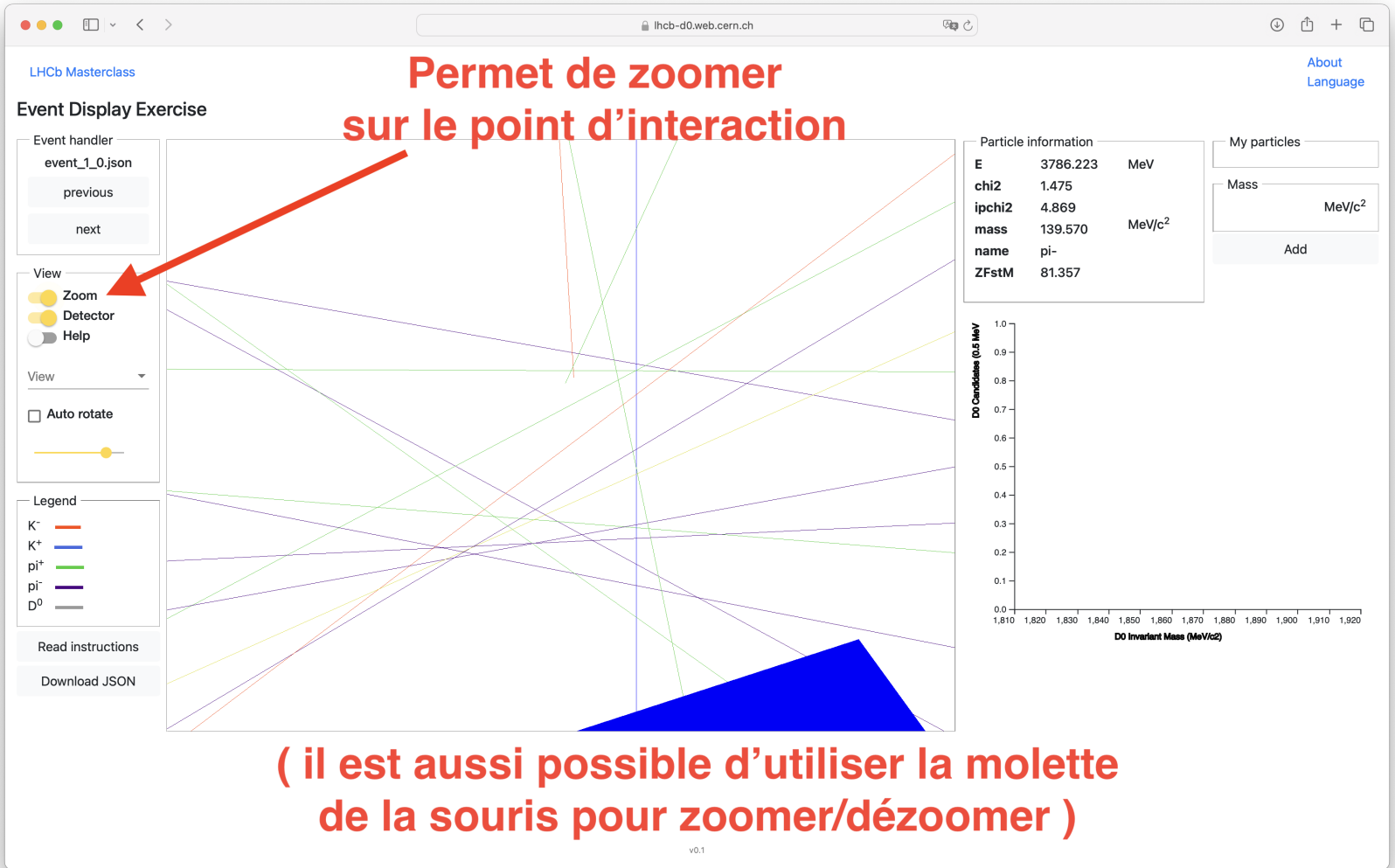
Préparation des exercices



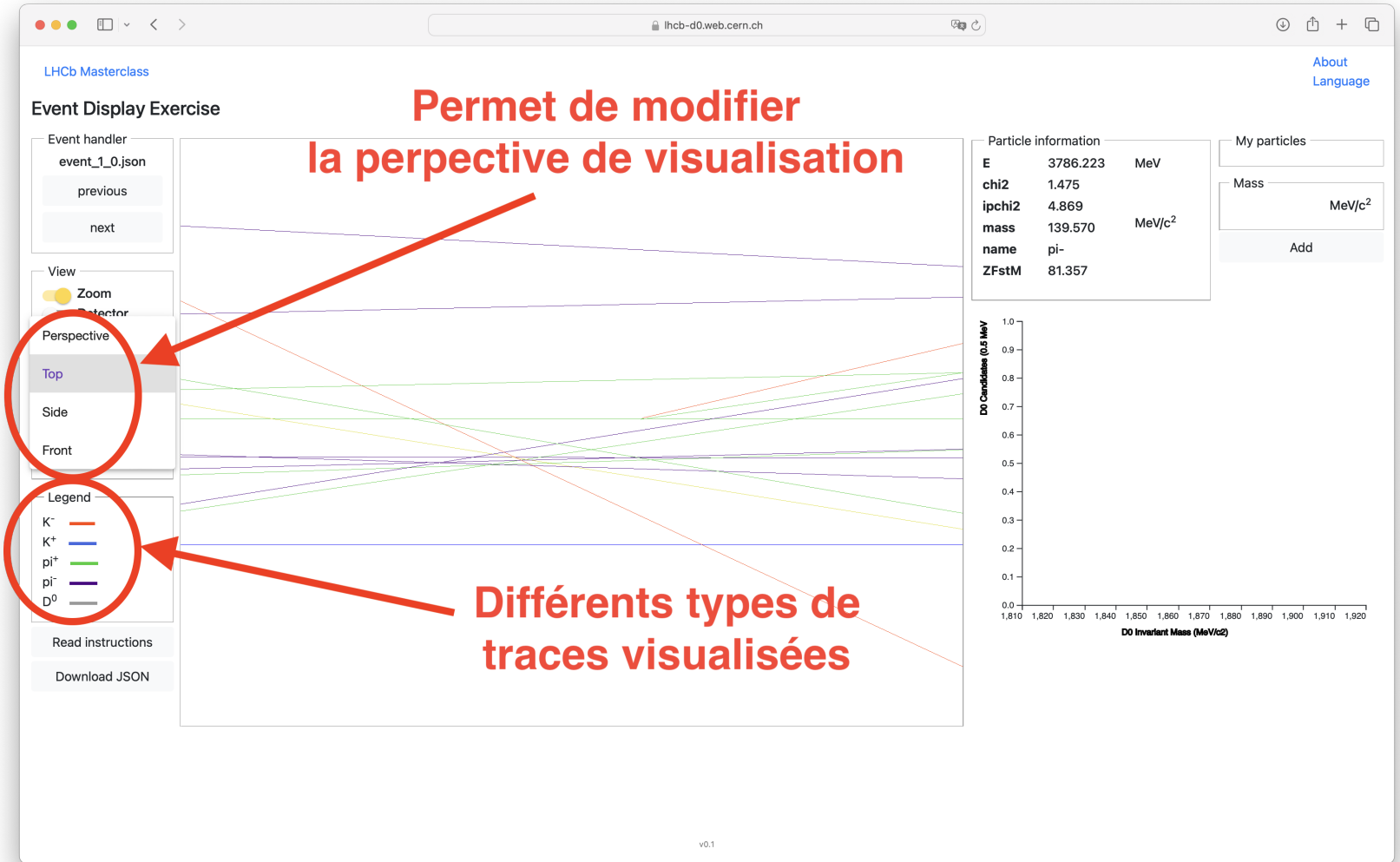
Exercice 1

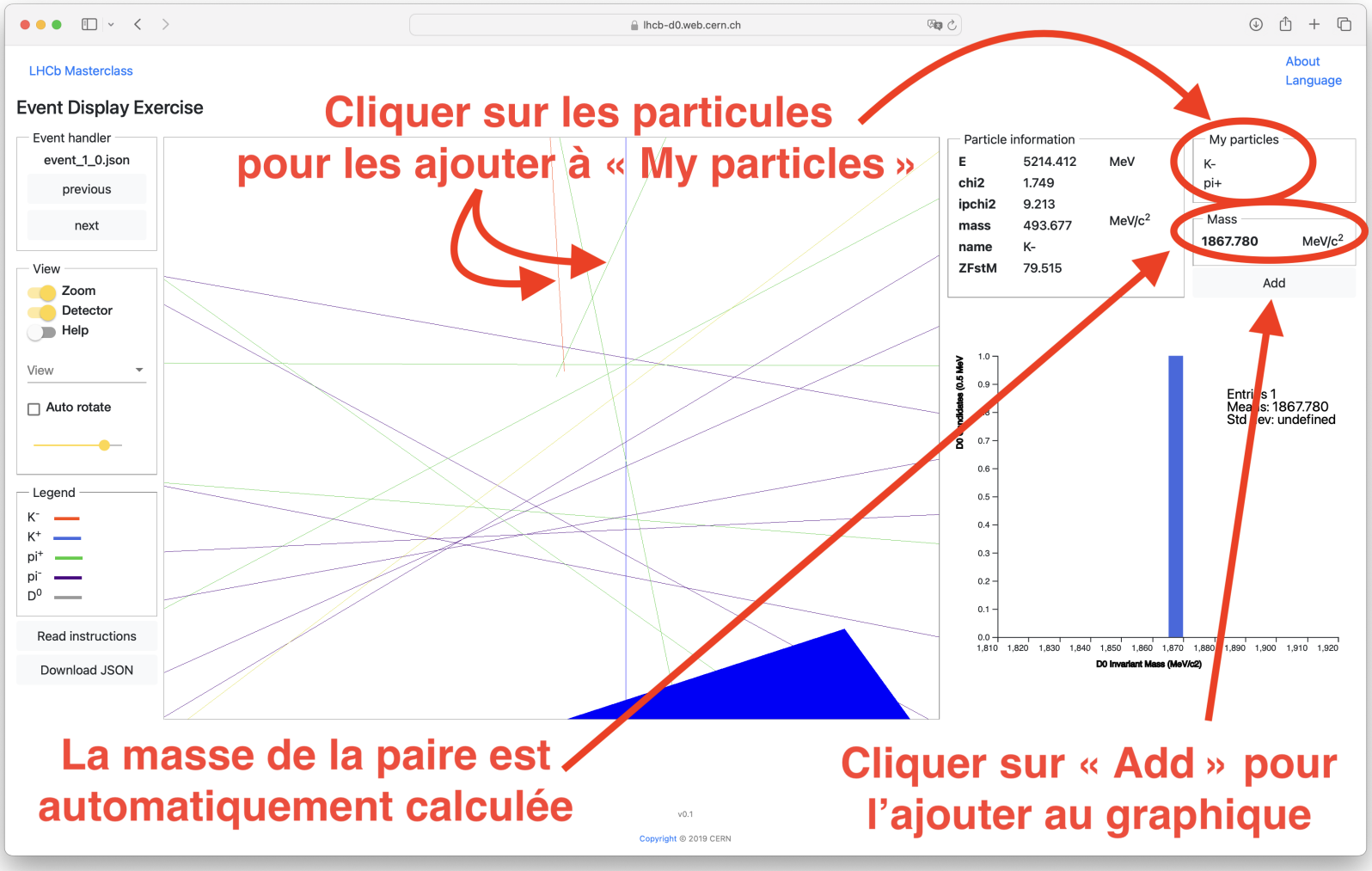

lhcb-d0.web.cern.ch
LHCb Masterclass
About
Language
Event Display Exercise
Event handler
event_1_0.json
previous
next
View
Zoom
Detector
Help
View
Auto rotate
Legend
K-
K+
pi+
pi-
D0
Read instructions
Download JSON
Particle information
E MeV
chi2
ipchi2
mass MeV/c2
name
ZFstM
My particles
Mass
MeV/c2
Add
D0 Candidates (0.5 MeV
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1,810 1,820 1,830 1,840 1,850 1,860 1,870 1,880 1,890 1,900 1,910 1,920
D0 Invariant Mass (MeV/c2)
v0.1


lhcb-d0.web.cern.ch
LHCb Masterclass
About
Language
Event Display Exercise
Permet de supprimer l'affichage du détecteur pour mieux visualiser les traces
Event handler
event_1_0.json
previous
next
View
Zoom
Detector
Help
View
Auto rotate
Legend
K-
K+
pi+
pi-
D0
Read instructions
Download JSON
Particle information
E 3786.223 MeV
chi2 1.475
ipchi2 4.869
mass 139.570 MeV/c2
name pi-
ZFstM 81.357
My particles
Mass
MeV/c2
Add
D0 Candidates (0.5 MeV
D0 Invariant Mass (MeV/c2)
v0.1


lhcb-d0.web.cern.ch
LHCb Masterclass
About
Language
Event Display Exercise
Permet de zoomer
sur le point d'interaction
Event handler
event_1_0.json
previous
next
View
Zoom
Detector
Help
View
Auto rotate
Legend
K-
K+
pi+
pi-
D0
Read instructions
Download JSON
Particle information
E 3786.223 MeV
chi2 1.475
ipchi2 4.869
mass 139.570 MeV/c2
name pi-
ZFstM 81.357
My particles
Mass
MeV/c2
Add
D0 Candidates (0.5 MeV
D0 Invariant Mass (MeV/c2)
(il est aussi possible d'utiliser la molette
de la souris pour zoomer/dézoomer)
v0.1

Exercice 1

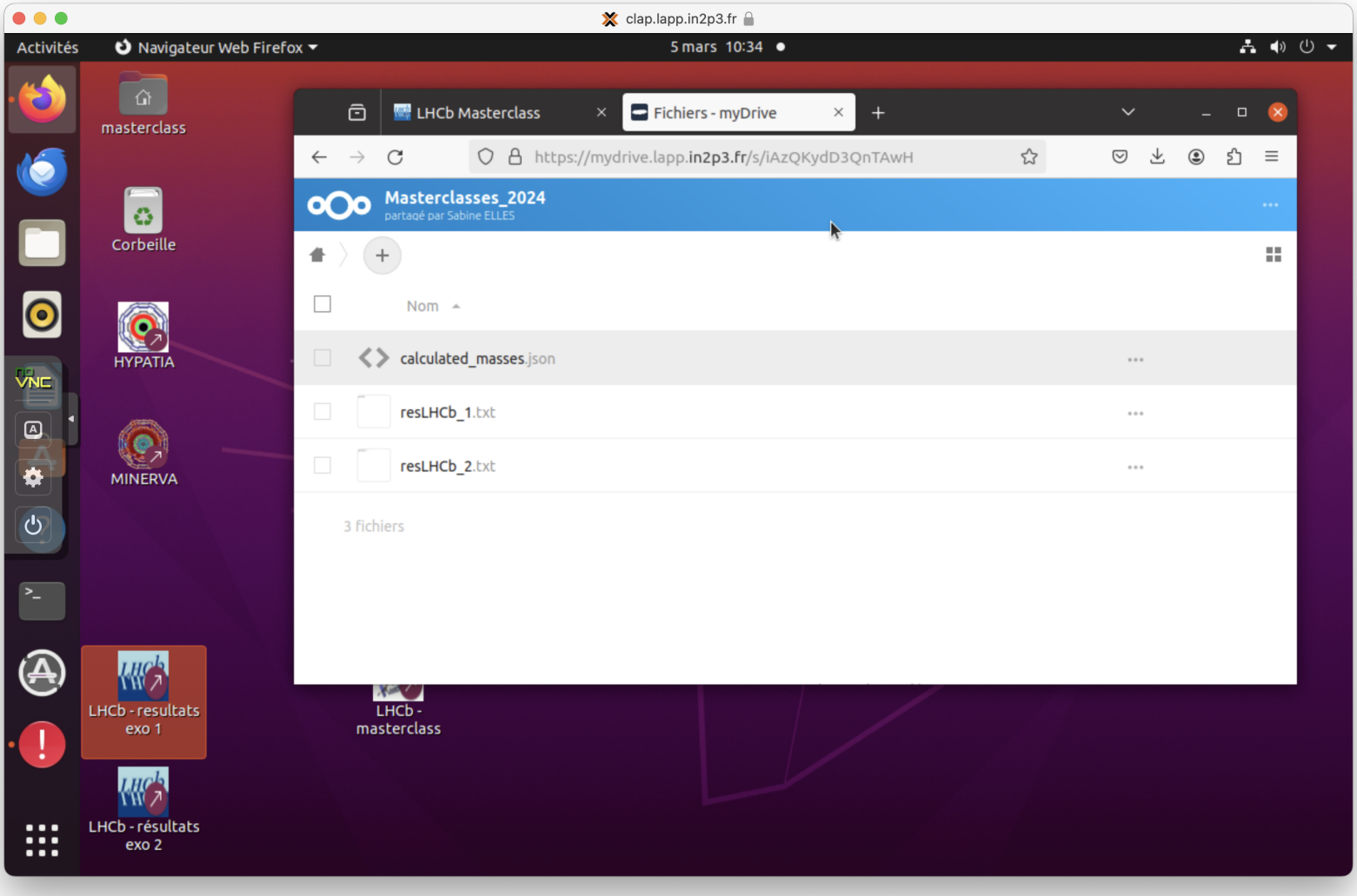

lhcb-d0.web.cern.ch
LHCb Masterclass
About
Language
Event Display Exercise
Permet de modifier
la perpective de visualisation
Event handler
event_1_0.json
previous
next
View
Zoom
Perspective
Top
Side
Front
Legend
K-
K+
pi+
pi-
D0
Read instructions
Download JSON
Différents types de
traces visualisées
Particle information
E 3786.223 MeV
chi2 1.475
ipchi2 4.869
mass 139.570 MeV/c2
name pi-
ZFstM 81.357
My particles
Mass
MeV/c2
Add
D0 Candidates (0.5 MeV
D0 Invariant Mass (MeV/c2)
v0.1


lhcb-d0.web.cern.ch
LHCb Masterclass
About
Language
Event Display Exercise
Cliquer sur les particules
pour les ajouter à « My particles »
Event handler
event_1_0.json
previous
next
View
Zoom
Detector
Help
View
Auto rotate
Legend
K-
K+
pi+
pi-
D0
Read instructions
Download JSON
Particle information
E 5214.412 MeV
chi2 1.749
ipchi2 9.213
mass 493.677 MeV/c2
name K-
ZFstM 79.515
My particles
K-
pi+
Mass
1867.780 MeV/c2
Add
Entries 1
Mean: 1867.780
Std Dev: undefined
D0 Invariant Mass (MeV/c2)
La masse de la paire est
automatiquement calculée
Cliquer sur « Add » pour
l'ajouter au graphique
v0.1
Copyright © 2019 CERN

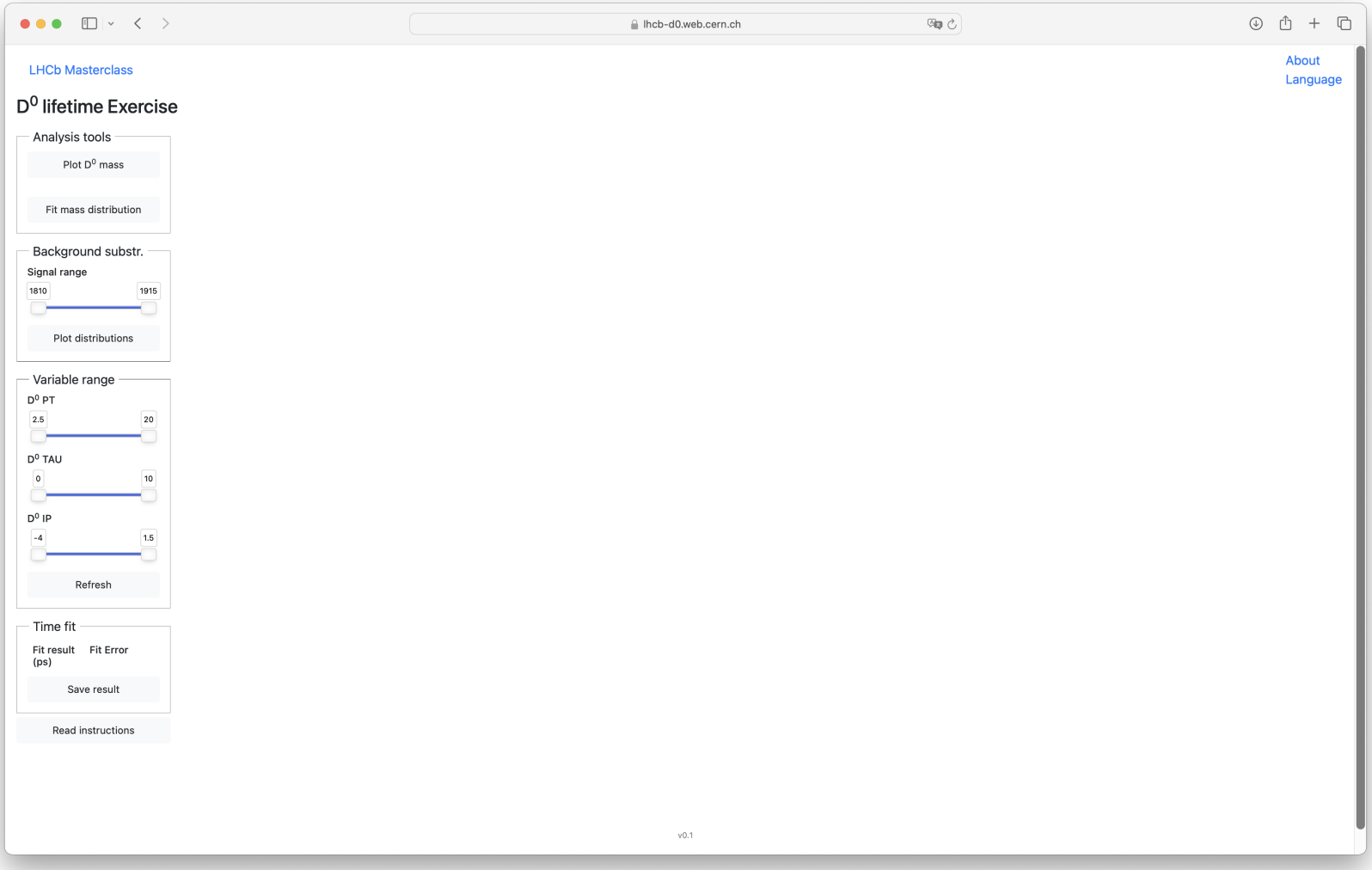
Exercice 1


lhcb-d0.web.cern.ch
LHCb Masterclass
Event Display Exercise
You have successfully completed MasterClassDisplay exercise.
Event handler
event_1_30.json
previous
next
View
Zoom
Detector
Help
View
Auto rotate
Legend
K-
K+
pi+
pi-
D0
Read instructions
Download JSON
Particle information
E MeV
chi2
ipchi2
mass MeV/c2
name
ZFstM
My particles
Mass
MeV/c2
Add
Entries 29
Means: 1867.907
Std dev: 21.025
D0 Candidates (0.5 MeV
D0 Invariant Mass (MeV/c2)
A la fin de l'exercice, téléchargez le fichier JSON,
renommez le et transférez le sur mydrive (lien sur le bureau)
Copyright © 2019 CERN

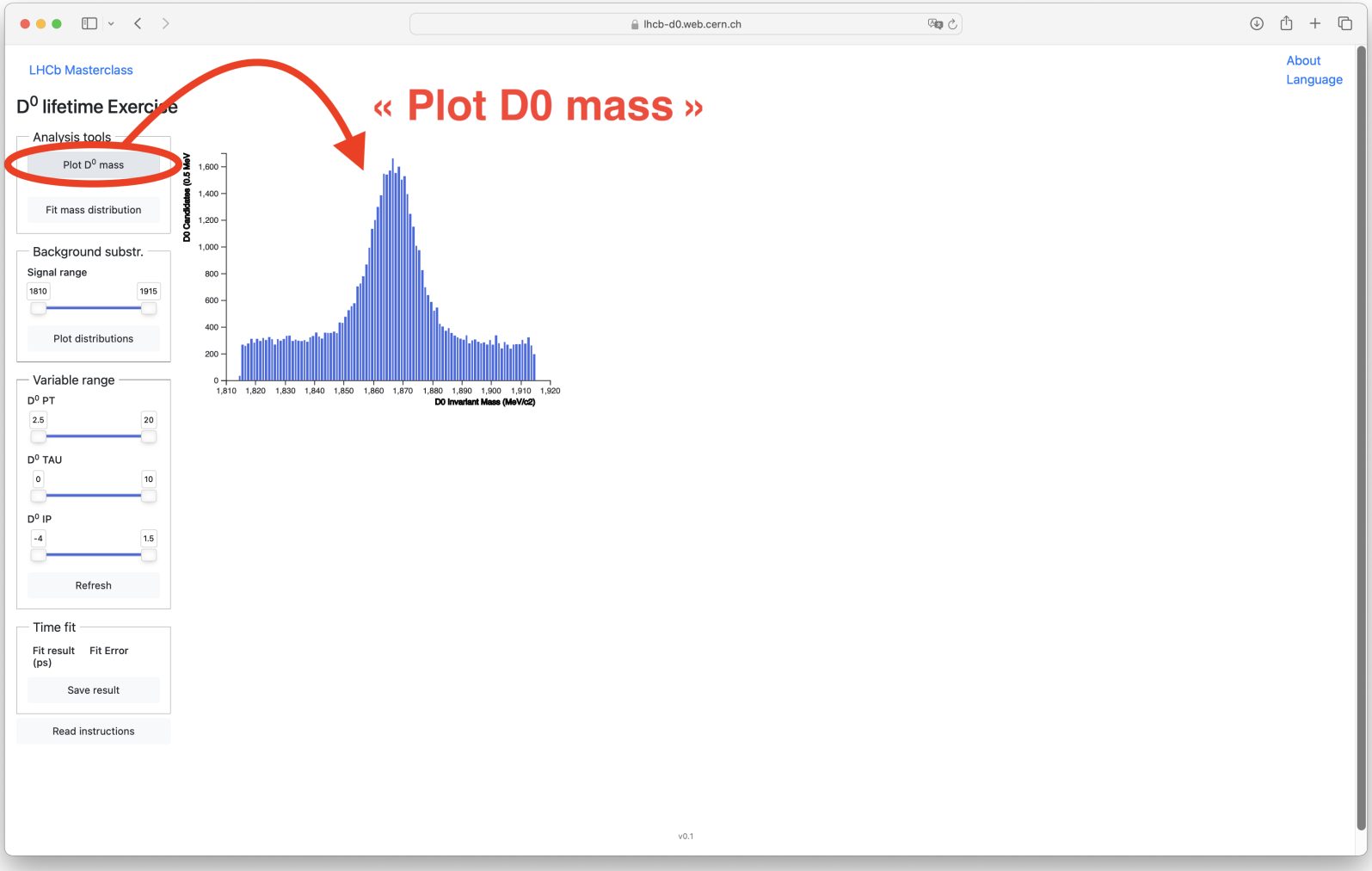
Exercice 1

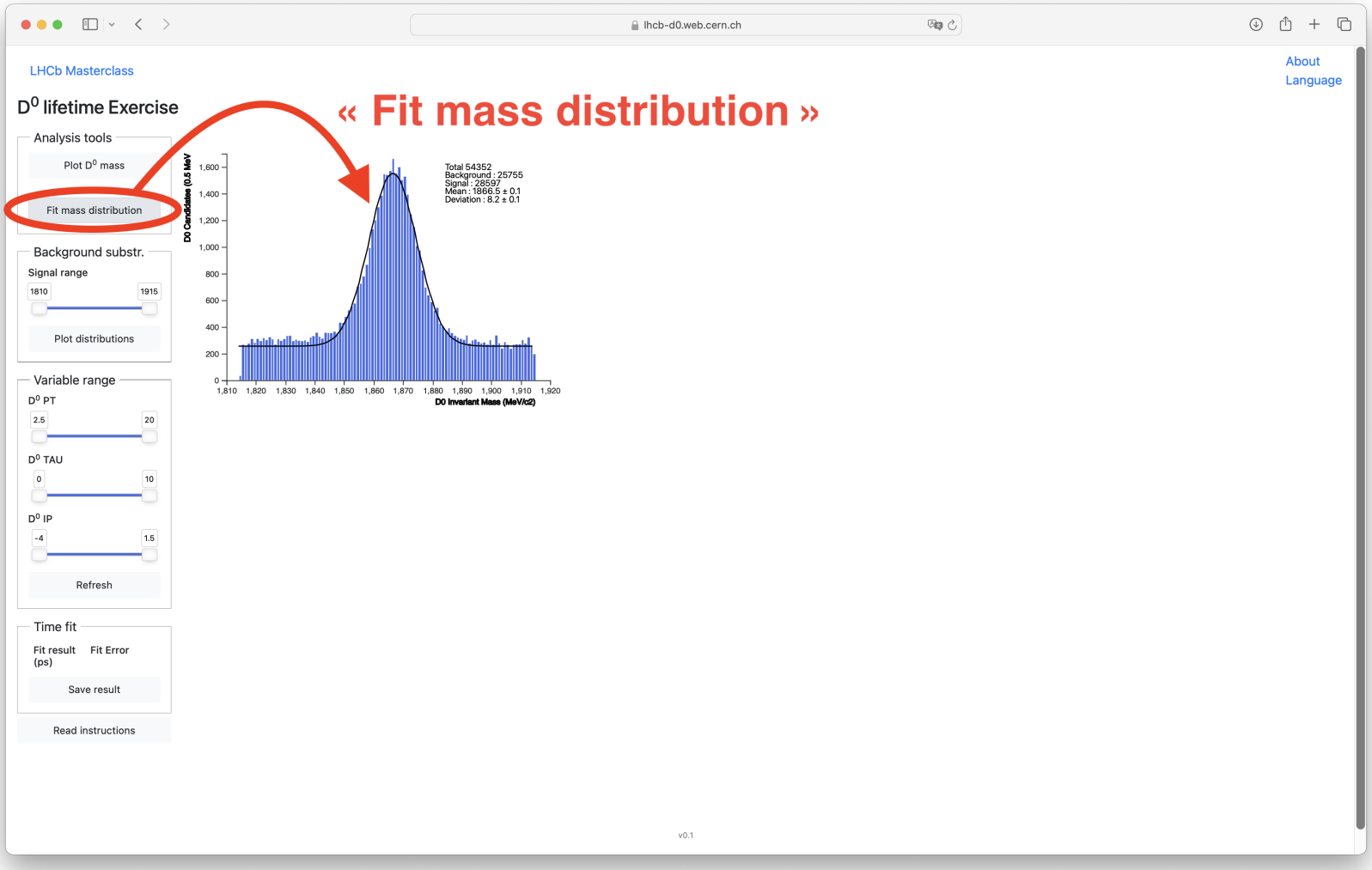

clap.lapp.in2p3.fr
Activités
Navigateur Web Firefox
5 mars 10:34
masterclass
Corbeille
HYPATIA
MINERVA
LHCb - resultats exo 1
LHCb - résultats exo 2
LHCb - masterclass
LHCb Masterclass
Fichiers - myDrive
https://mydrive.lapp.in2p3.fr/s/iAzQKydD3QnTAwH
Masterclasses_2024
partagé par Sabine ELLES
Nom
calculated_masses.json
resLHCb_1.txt
resLHCb_2.txt
3 fichiers

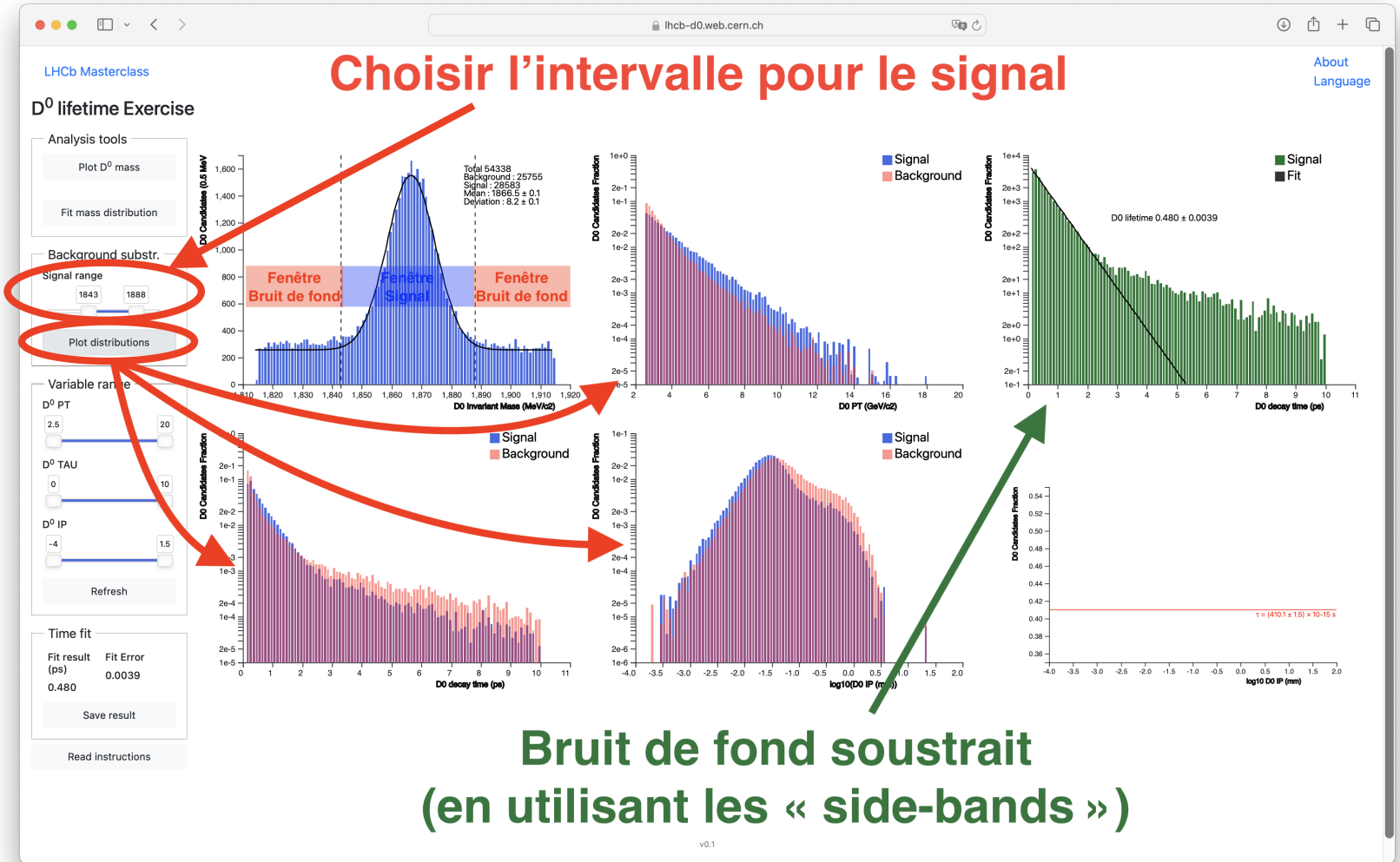
Exercice 2


lhcb-d0.web.cern.ch
LHCb Masterclass
About
Language
D0 lifetime Exercise
Analysis tools
Plot D0 mass
Fit mass distribution
Background substr.
Signal range
1810
1915
Plot distributions
Variable range
D0 PT
2.5
20
D0 TAU
0
10
D0 IP
-4
1.5
Refresh
Time fit
Fit result (ps)
Fit Error
Save result
Read instructions
v0.1

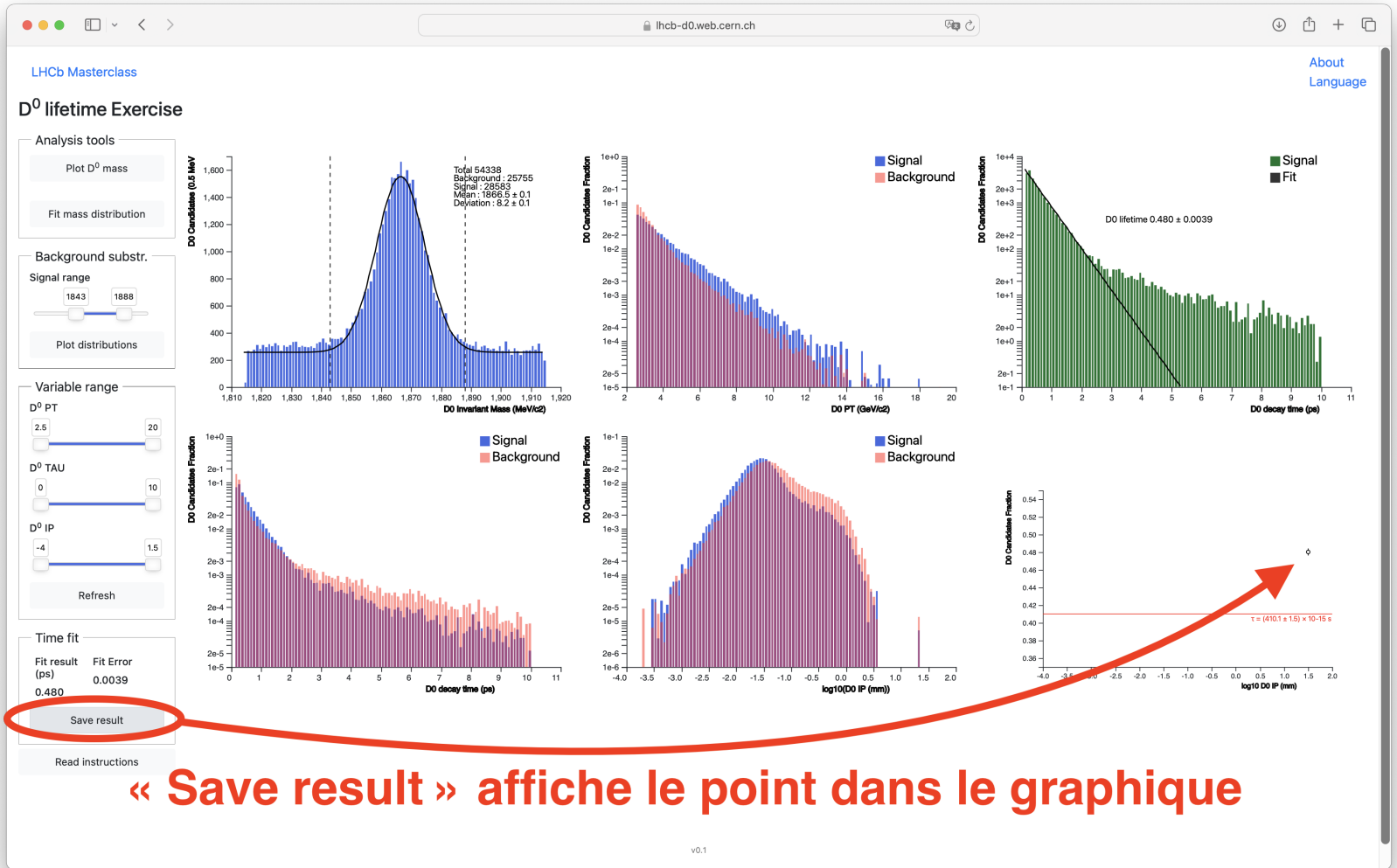
Exercice 2


lhcb-d0.web.cern.ch
LHCb Masterclass
About
Language
D0 lifetime Exercise
« Plot D0 mass »
Analysis tools
Plot D0 mass
Fit mass distribution
Background substr.
Signal range
1810
1915
Plot distributions
Variable range
D0 PT
2.5
20
D0 TAU
0
10
D0 IP
-4
1.5
Refresh
Time fit
Fit result (ps)
Fit Error
Save result
Read instructions
D0 Candidates (0.5 MeV
D0 Invariant Mass (MeV/c2)
v0.1

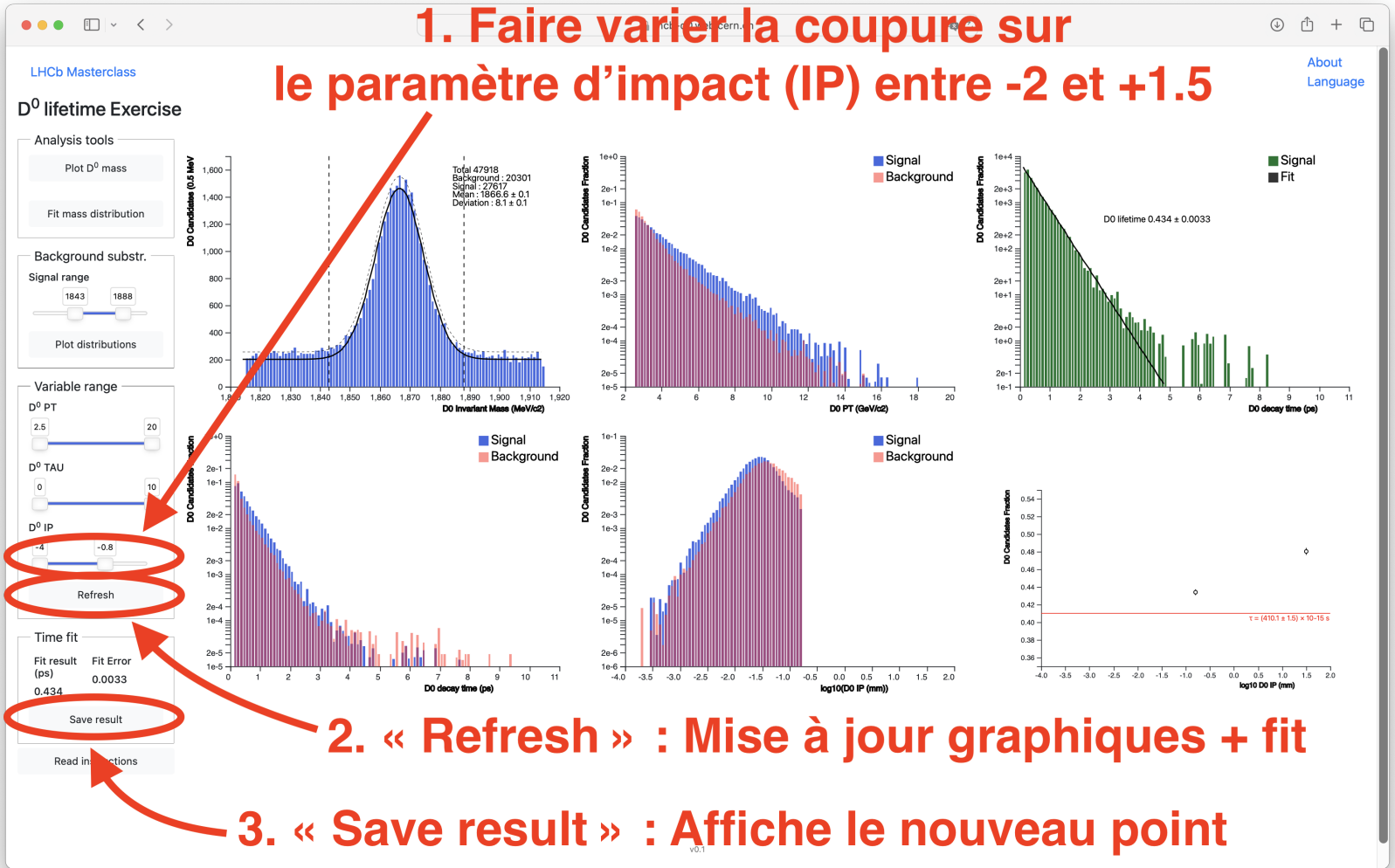

lhcb-d0.web.cern.ch
LHCb Masterclass
About
Language
D0 lifetime Exercise
« Fit mass distribution »
Analysis tools
Plot D0 mass
Fit mass distribution
Background substr.
Signal range
1810
1915
Plot distributions
Variable range
D0 PT
2.5
20
D0 TAU
0
10
D0 IP
-4
1.5
Refresh
Time fit
Fit result (ps)
Fit Error
Save result
Read instructions
Total 54352
Background : 25755
Signal : 28597
Mean : 1866.5 ± 0.1
Deviation : 8.2 ± 0.1
D0 Candidates (0.5 MeV
D0 Invariant Mass (MeV/c2)
v0.1


lhcb-d0.web.cern.ch
LHCb Masterclass
About
Language
Choisir l'intervalle pour le signal
D0 lifetime Exercise
Analysis tools
Plot D0 mass
Fit mass distribution
Background substr.
Signal range
1843
1888
Plot distributions
Variable range
D0 PT
2.5
20
D0 TAU
0
10
D0 IP
-4
1.5
Refresh
Time fit
Fit result (ps)
0.480
Fit Error
0.0039
Save result
Read instructions
Total 54338
Background : 25755
Signal : 28583
Mean : 1866.5 ± 0.1
Deviation : 8.2 ± 0.1
Fenêtre Bruit de fond
Fenêtre Signal
Fenêtre Bruit de fond
D0 Invariant Mass (MeV/c2)
Signal
Background
D0 PT (GeV/c2)
Signal
Fit
D0 lifetime 0.480 ± 0.0039
D0 decay time (ps)
D0 decay time (ps)
log10(D0 IP (mm))
log10 D0 IP (mm)
Bruit de fond soustrait
(en utilisant les « side-bands »)
v0.1

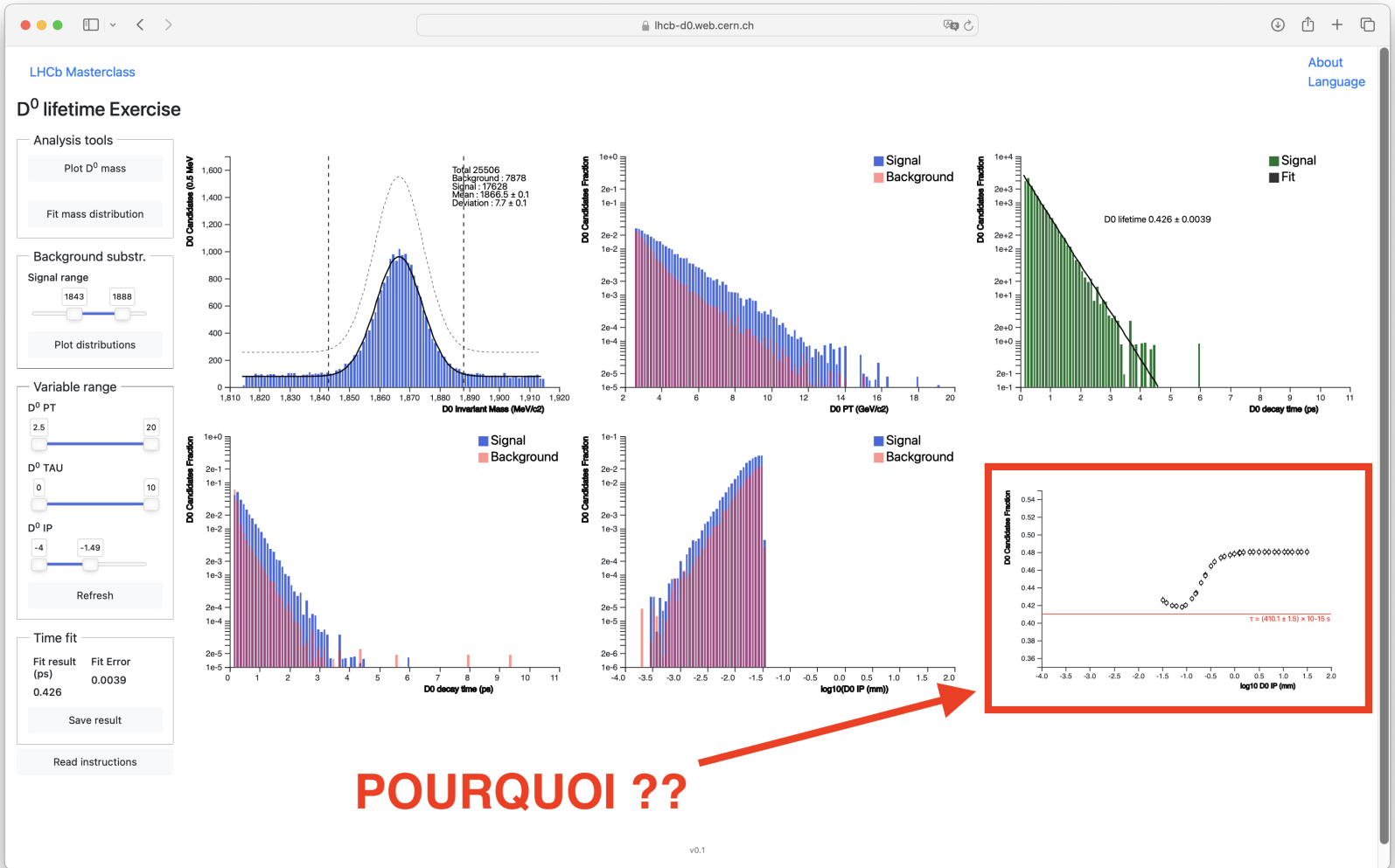
Exercice 2

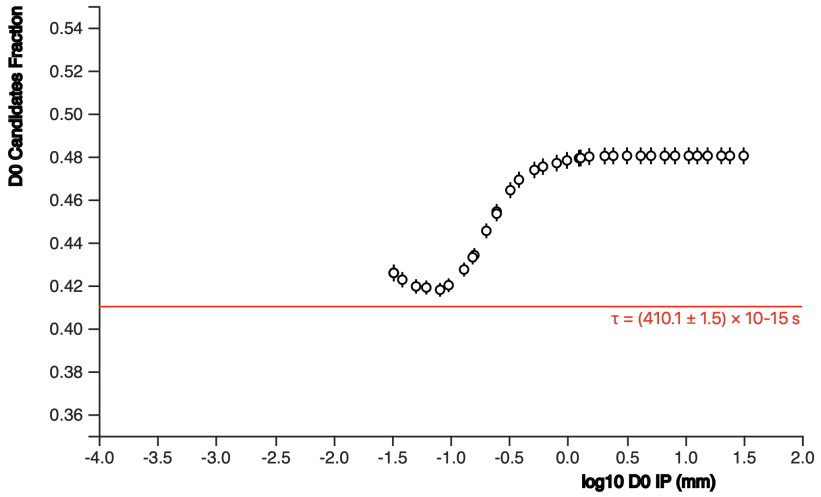


« Save result » affiche le point dans le graphique

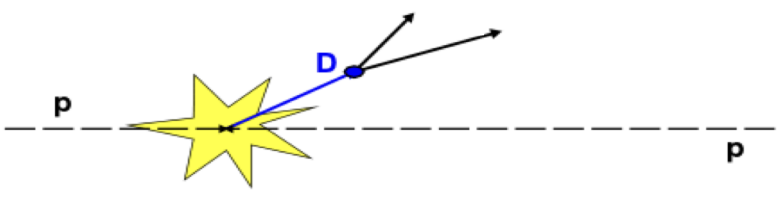

1. Faire varier la coupure sur
le paramètre d'impact (IP) entre -2 et +1.5
LHCb Masterclass
About
Language
D⁰ lifetime Exercise
Analysis tools
Plot D⁰ mass
Fit mass distribution
Background substr.
Signal range
1843
1888
Plot distributions
Variable range
D⁰ PT
2.5
20
D⁰ TAU
0
10
D⁰ IP
-4
-0.8
Refresh
Time fit
Fit result (ps)
0.434
Fit Error
0.0033
Save result
Total 47918
Background : 20301
Signal : 27617
Mean : 1866.6 ± 0.1
Deviation : 8.1 ± 0.1
D0 Invariant Mass (MeV/c2)
Signal
Background
D0 PT (GeV/c2)
Fit
D0 lifetime 0.434 ± 0.0033
D0 decay time (ps)
log10(D0 IP (mm))
log10 D0 IP (mm)
2. « Refresh » : Mise à jour graphiques + fit
3. « Save result » : Affiche le nouveau point

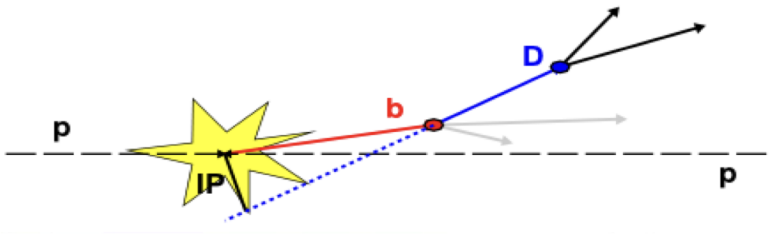
Exercice 2

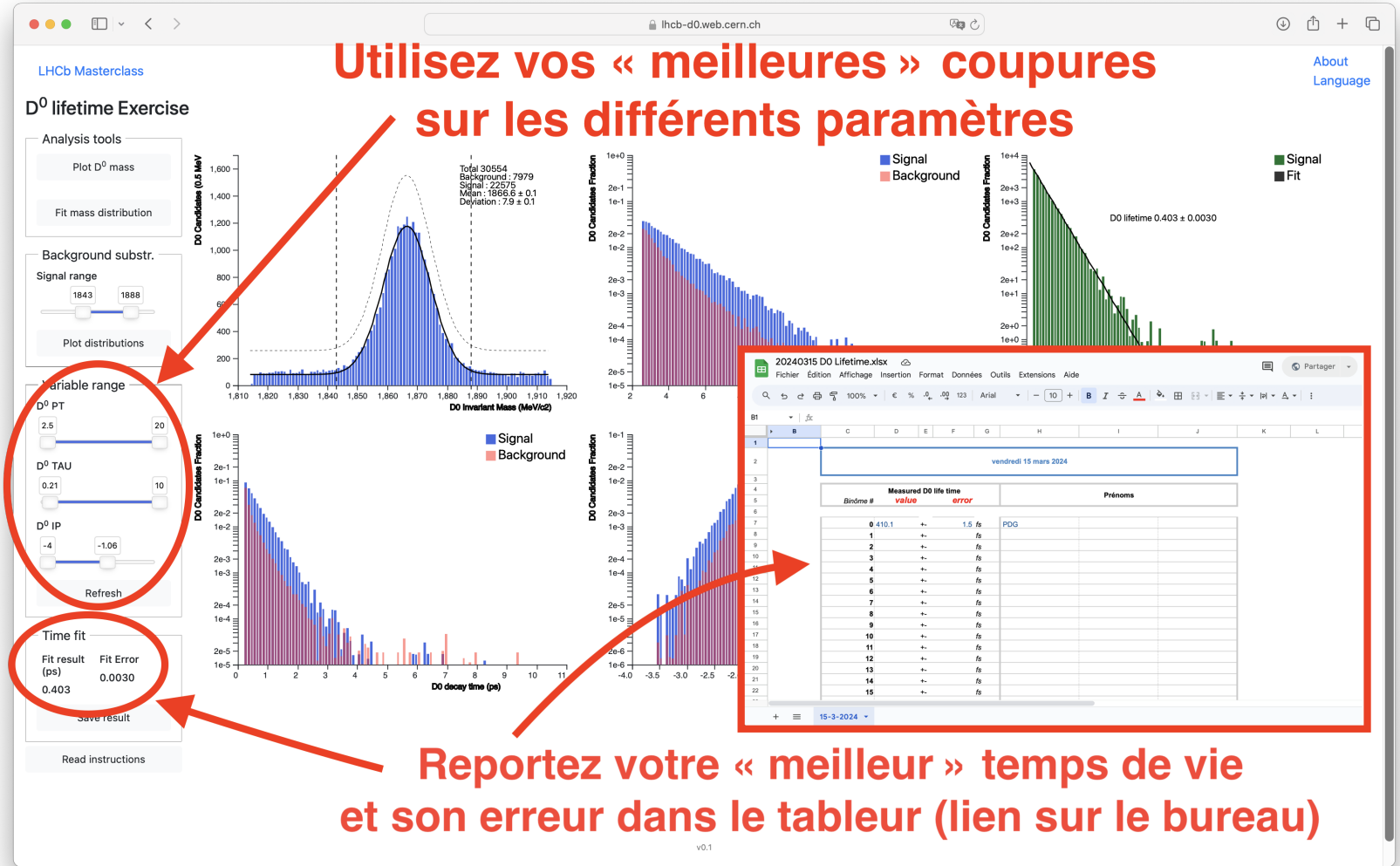

lhcb-d0.web.cern.ch
LHCb Masterclass
About
Language
D0 lifetime Exercise
Analysis tools
Plot D0 mass
Fit mass distribution
Background substr.
Signal range
1843
1888
Plot distributions
Variable range
D0 PT
2.5
20
D0 TAU
0
10
D0 IP
-4
-1.49
Refresh
Time fit
Fit result (ps)
0.426
Fit Error
0.0039
Save result
Read instructions
Total 25506
Background : 7878
Signal : 17628
Mean : 1866.5 ± 0.1
Deviation : 7.7 ± 0.1
D0 Invariant Mass (MeV/c2)
Signal
Background
D0 PT (GeV/c2)
Fit
D0 lifetime 0.426 ± 0.0039
D0 decay time (ps)
log10(D0 IP (mm))
POURQUOI ??
v0.1



- Certains D^0 viennent de désintégrations de mésons B !
- La coupure sur le paramètre d'impact est un bon moyen pour les rejeter






lhcb-d0.web.cern.ch
LHCb Masterclass
About
Language
D⁰ lifetime Exercise
Utilisez vos « meilleures » coupures
sur les différents paramètres
Analysis tools
Plot D⁰ mass
Fit mass distribution
Background substr.
Signal range
1843
1888
Plot distributions
Variable range
D⁰ PT
2.5
20
D⁰ TAU
0.21
10
D⁰ IP
-4
-1.06
Refresh
Time fit
Fit result (ps)
0.403
Fit Error
0.0030
Save result
Read instructions
Total 30554
Background : 7979
Signal : 22575
Mean : 1866.6 ± 0.1
Deviation : 7.9 ± 0.1
D0 Invariant Mass (MeV/c2)
D0 decay time (ps)
Signal
Background
Fit
D0 lifetime 0.403 ± 0.0030
20240315 D0 Lifetime.xlsx
vendredi 15 mars 2024
Measured D0 life time
Binôme #
value
error
Prénoms
PDG
Reportez votre « meilleur » temps de vie
et son erreur dans le tableur (lien sur le bureau)
v0.1