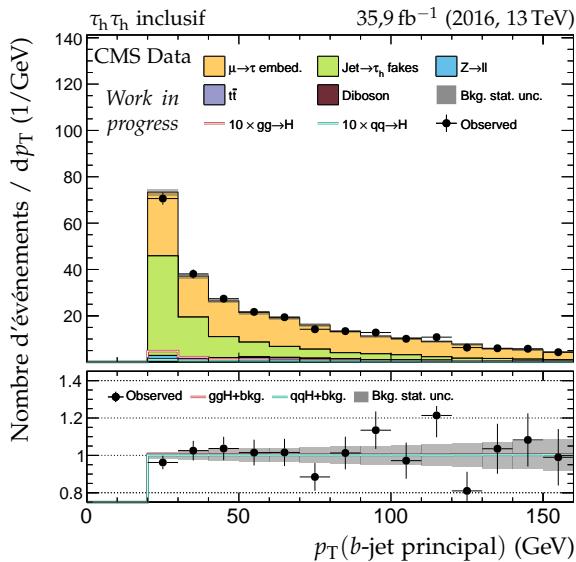
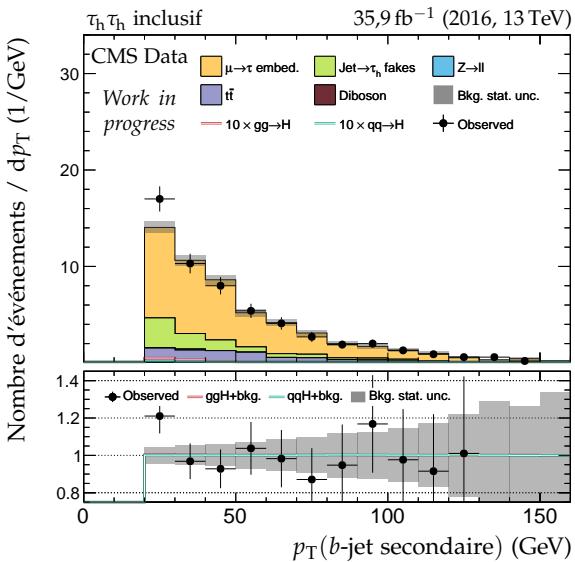


**Annexe X**  
**Distributions de contrôle –  $H \rightarrow \tau\tau$**

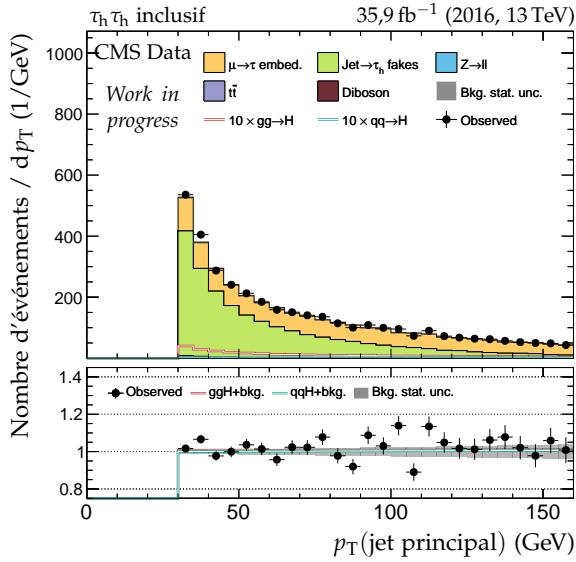
## 2 ANNEXE X. DISTRIBUTIONS DE CONTRÔLE – $H \rightarrow \tau\tau$



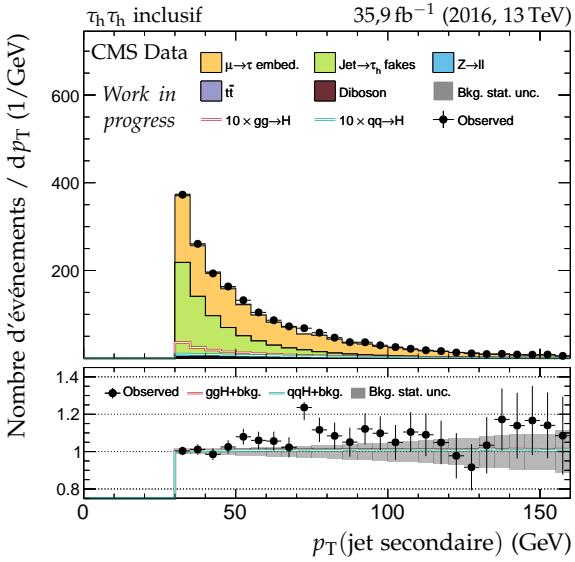
(a) Impulsion transverse du b-jet principal.



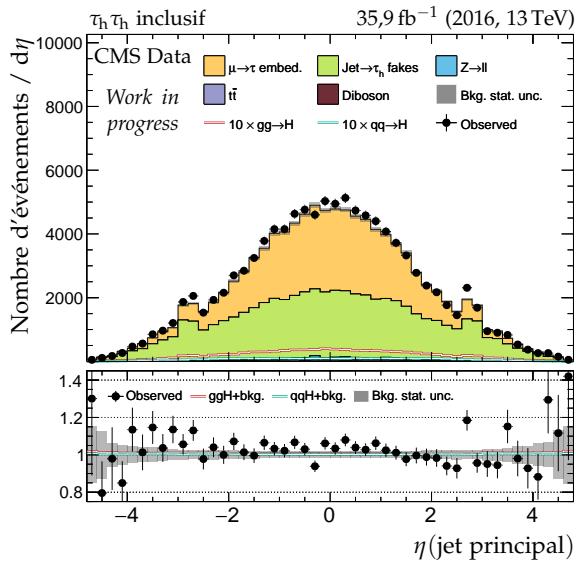
(b) Impulsion transverse du b-jet secondaire.



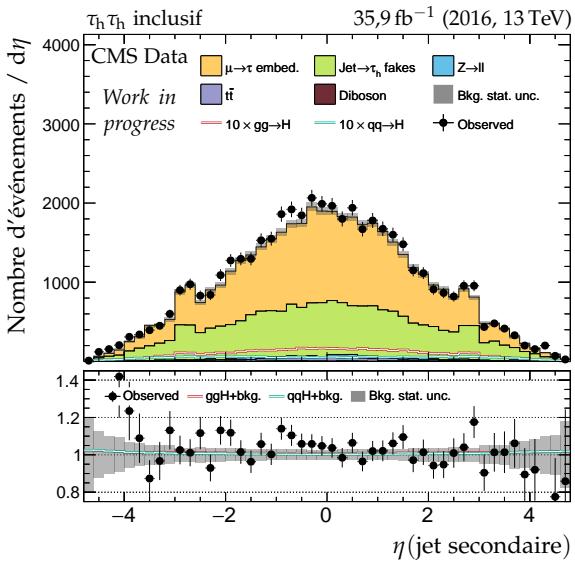
(c) Impulsion transverse du jet principal.



(d) Impulsion transverse du jet secondaire.

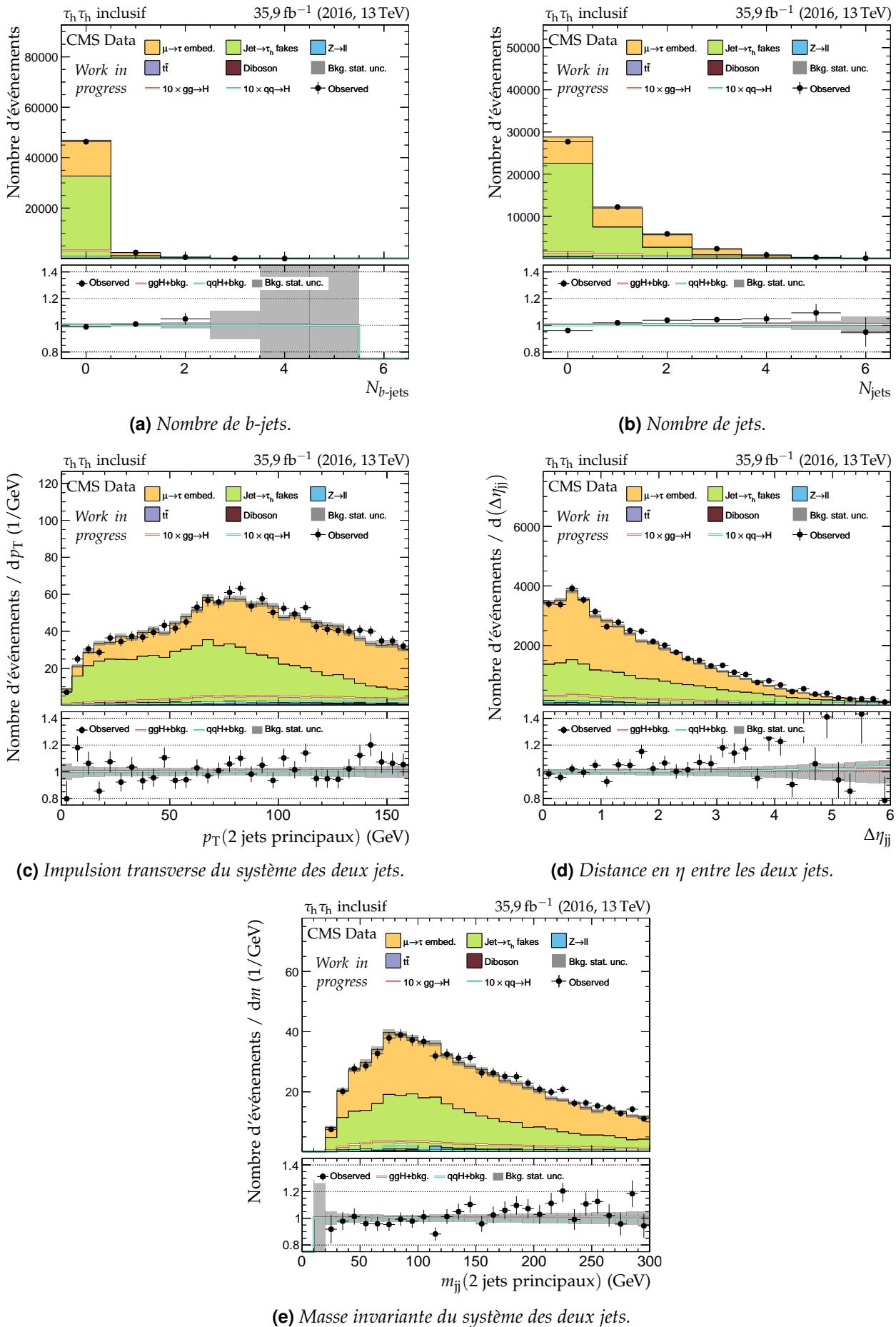


(e) Pseudo-rapidité du jet principal.

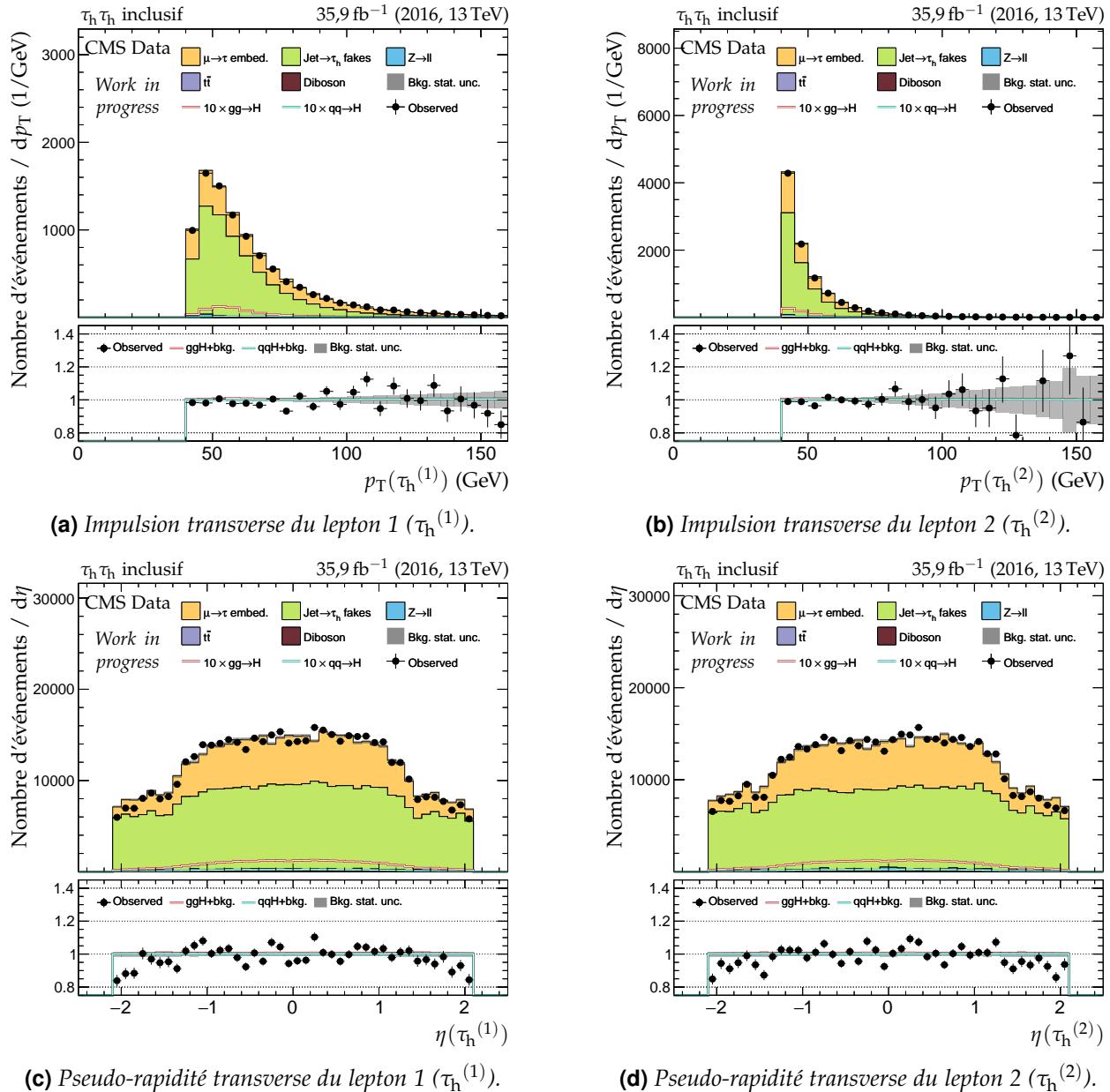


(f) Pseudo-rapidité du jet secondaire.

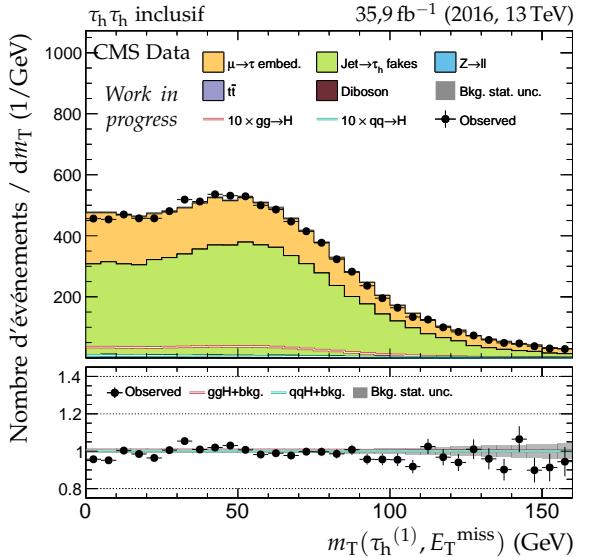
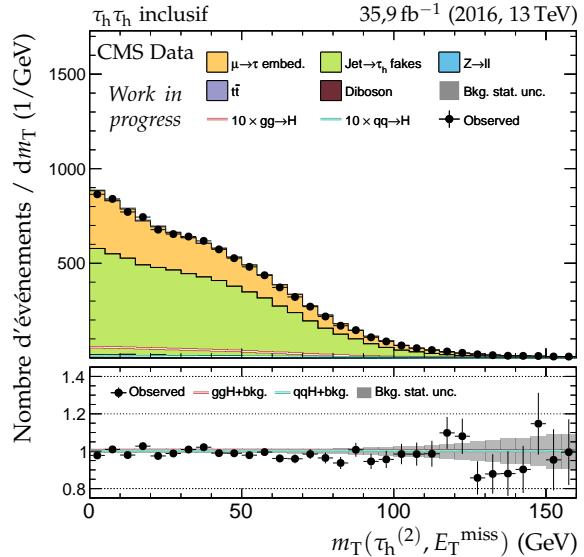
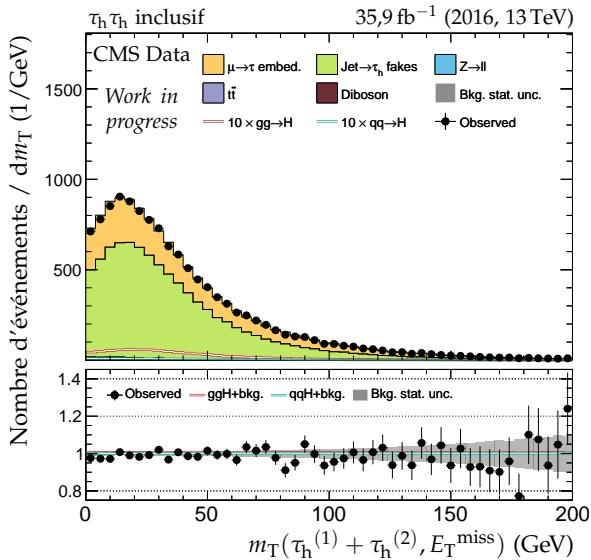
Figure X.1 – Distributions de contrôle pour le canal  $\tau_h \tau_h$  en 2016 : cinématique des jets.



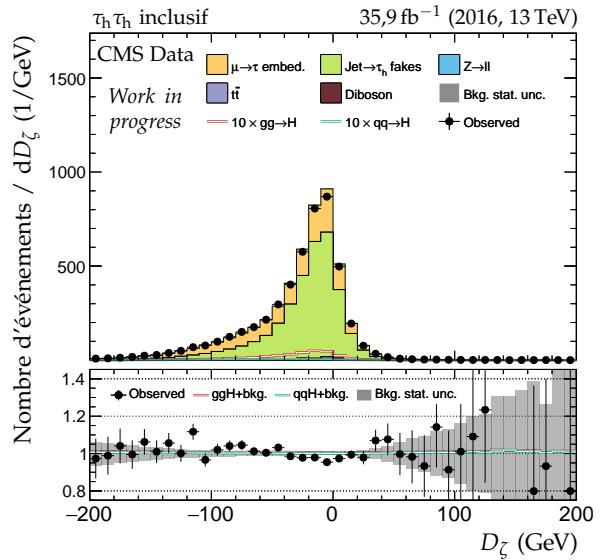
**Figure X.2 – Distributions de contrôle pour le canal  $\tau_h \tau_h$  en 2016 : nombre de jets et système des deux jets principaux.**



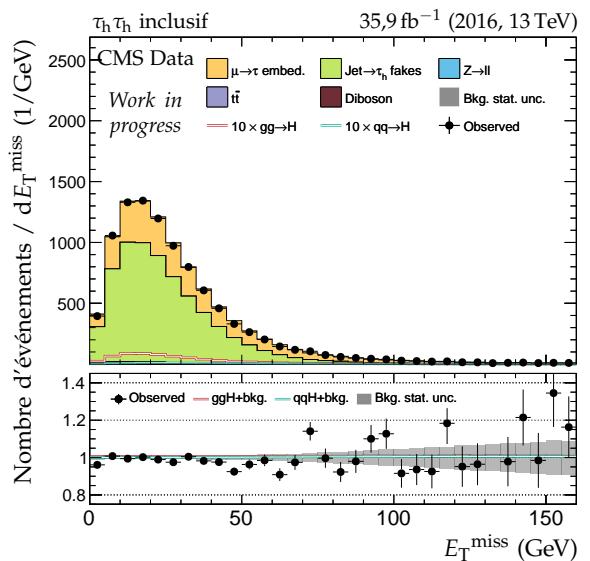
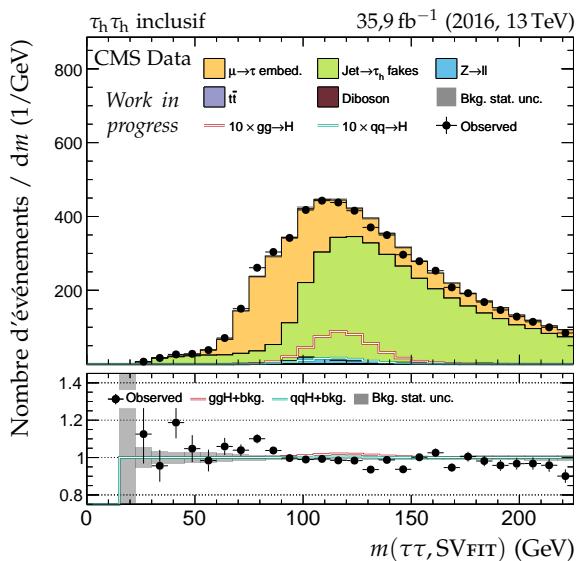
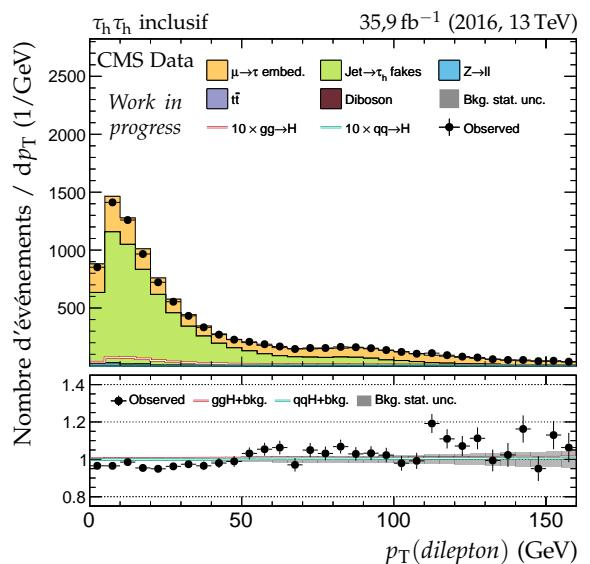
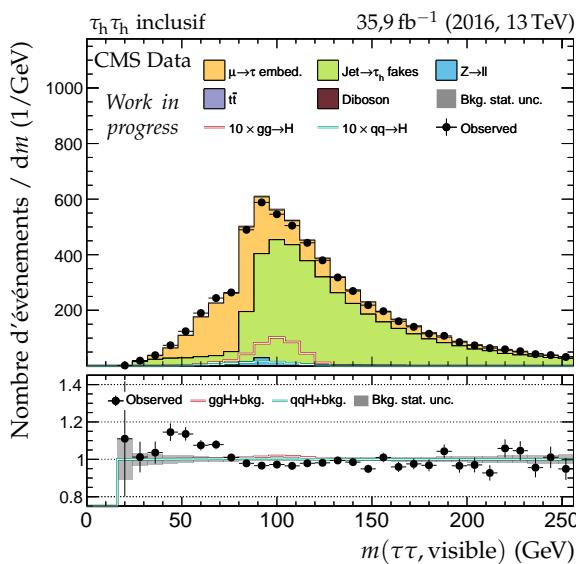
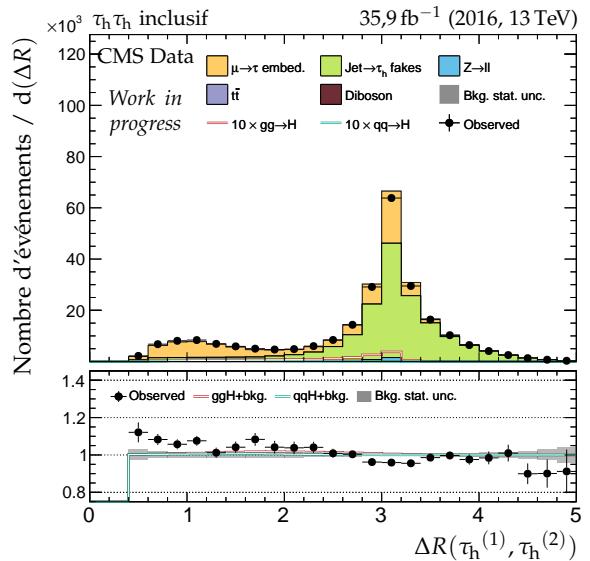
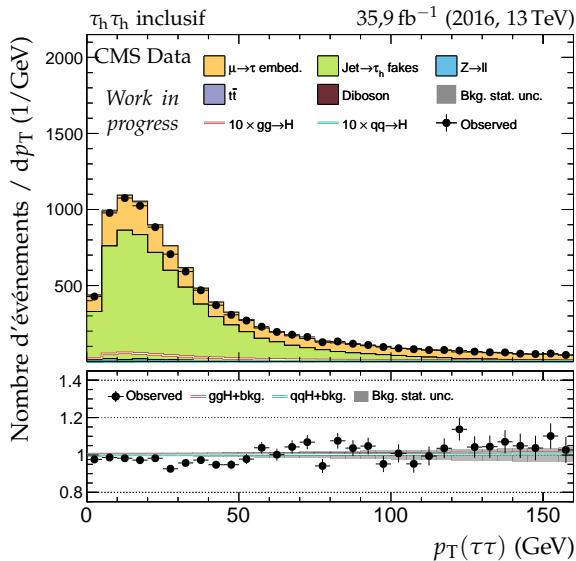
**Figure X.3 – Distributions de contrôle pour le canal  $\tau_h\tau_h$  en 2016 : cinématique des leptons ( $\tau_h^{(1)}, \tau_h^{(2)}$ ).**

(a) Masse transverse du lepton 1 ( $\tau_h^{(1)}$ ).(b) Masse transverse du lepton 2 ( $\tau_h^{(2)}$ ).

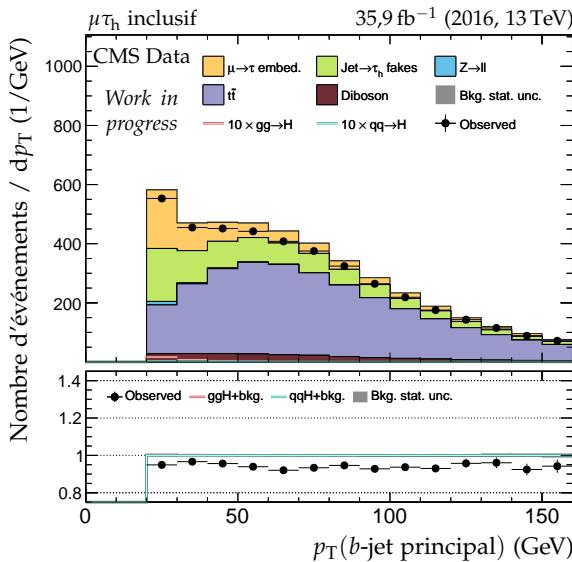
(c) Masse transverse du dilepton.

(d) Valeur de  $D_\zeta$ .**Figure X.4 – Distributions de contrôle pour le canal  $\tau_h \tau_h$  en 2016 : masses transverses et  $D_\zeta$ .**

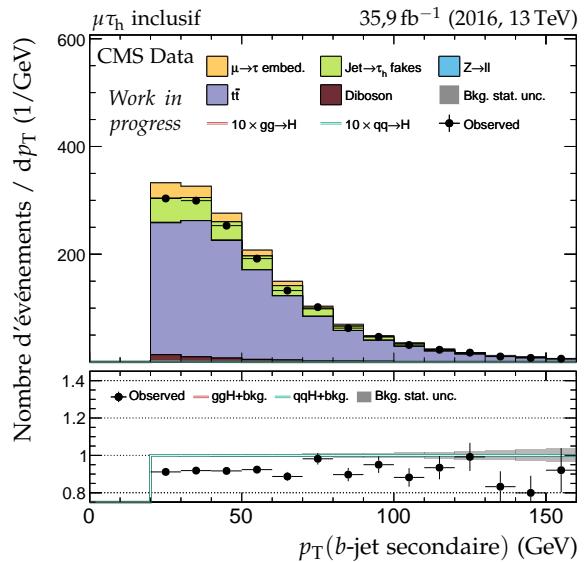
## 6 ANNEXE X. DISTRIBUTIONS DE CONTRÔLE – $H \rightarrow \tau\tau$



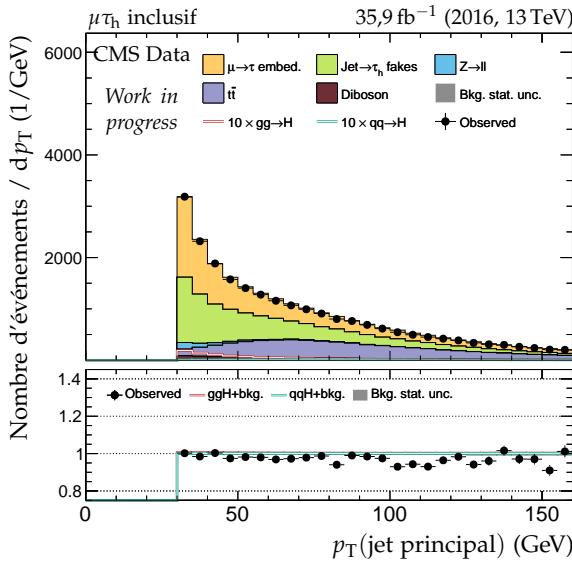
**Figure X.5 – Distributions de contrôle pour le canal  $\tau_h \tau_h$  en 2016 : dilepton et énergie transverse manquante.**



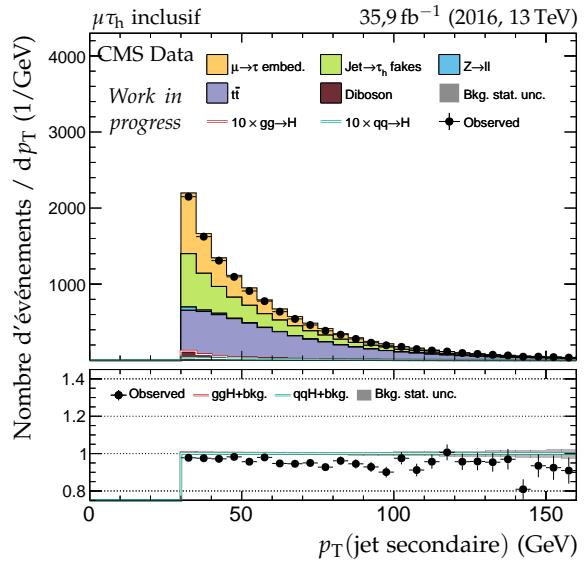
(a) Impulsion transverse du b-jet principal.



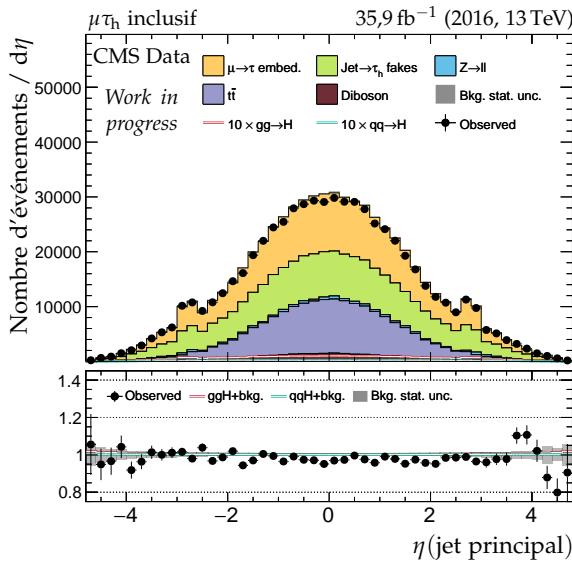
(b) Impulsion transverse du b-jet secondaire.



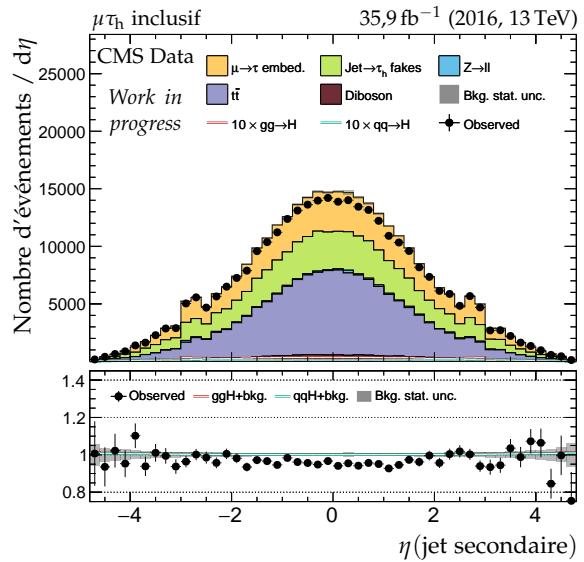
(c) Impulsion transverse du jet principal.



(d) Impulsion transverse du jet secondaire.



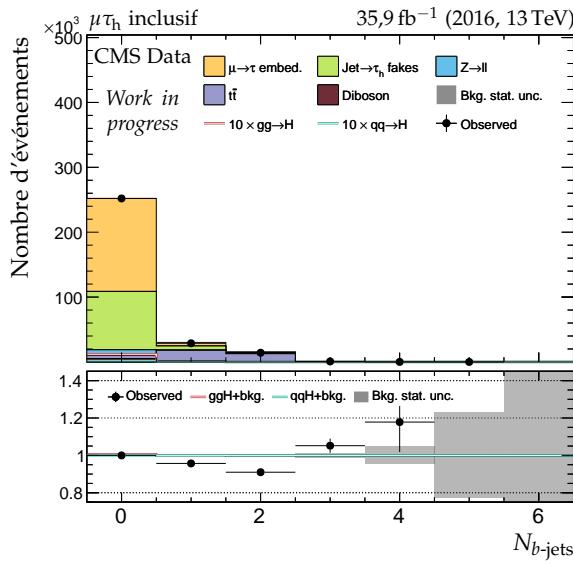
(e) Pseudo-rapidité du jet principal.



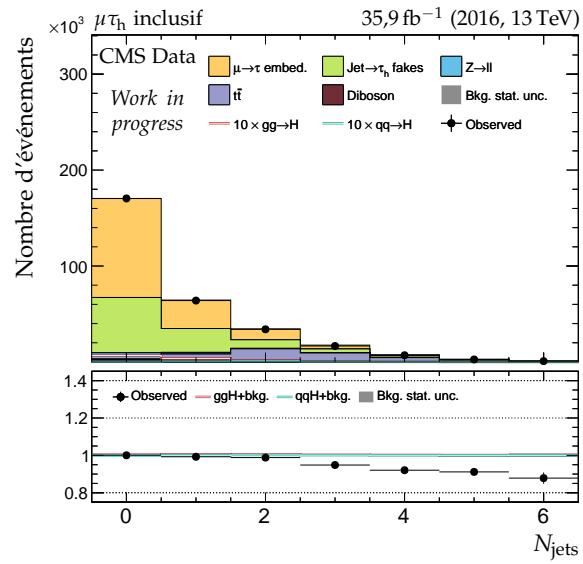
(f) Pseudo-rapidité du jet secondaire.

**Figure X.6 – Distributions de contrôle pour le canal  $\mu\tau_h$  en 2016 : cinématique des jets.**

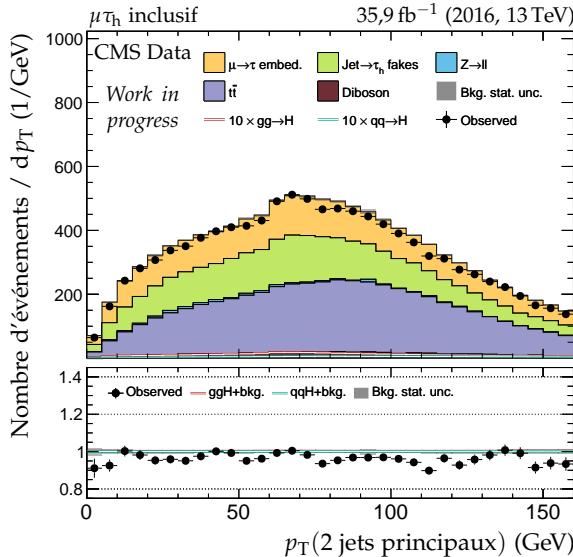
## 8 ANNEXE X. DISTRIBUTIONS DE CONTRÔLE – $H \rightarrow \tau\tau$



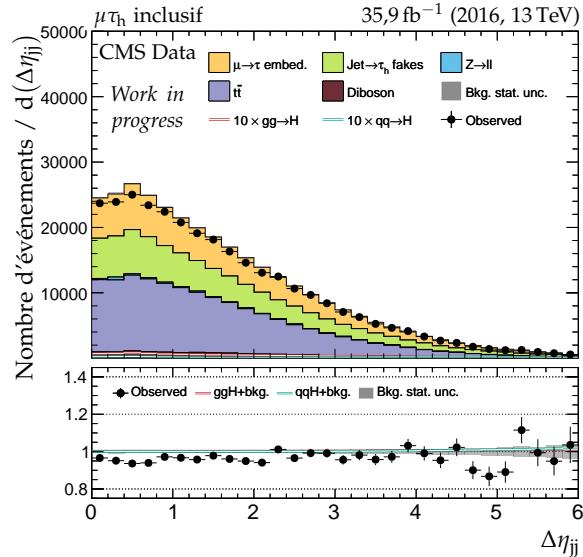
(a) Nombre de  $b$ -jets.



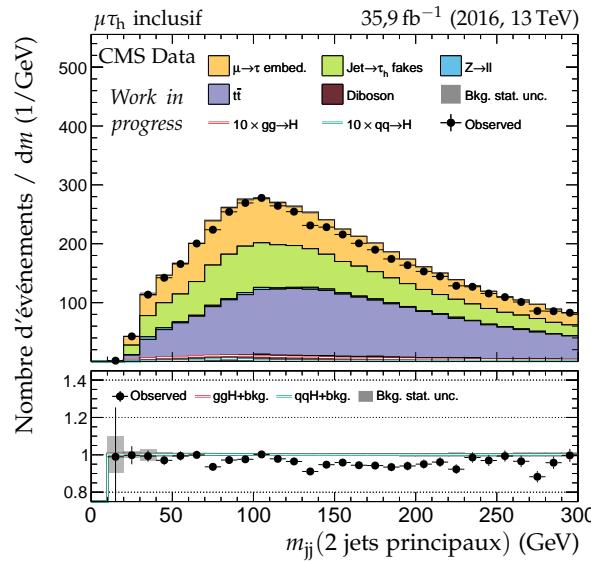
(b) Nombre de jets.



(c) Impulsion transverse du système des deux jets.

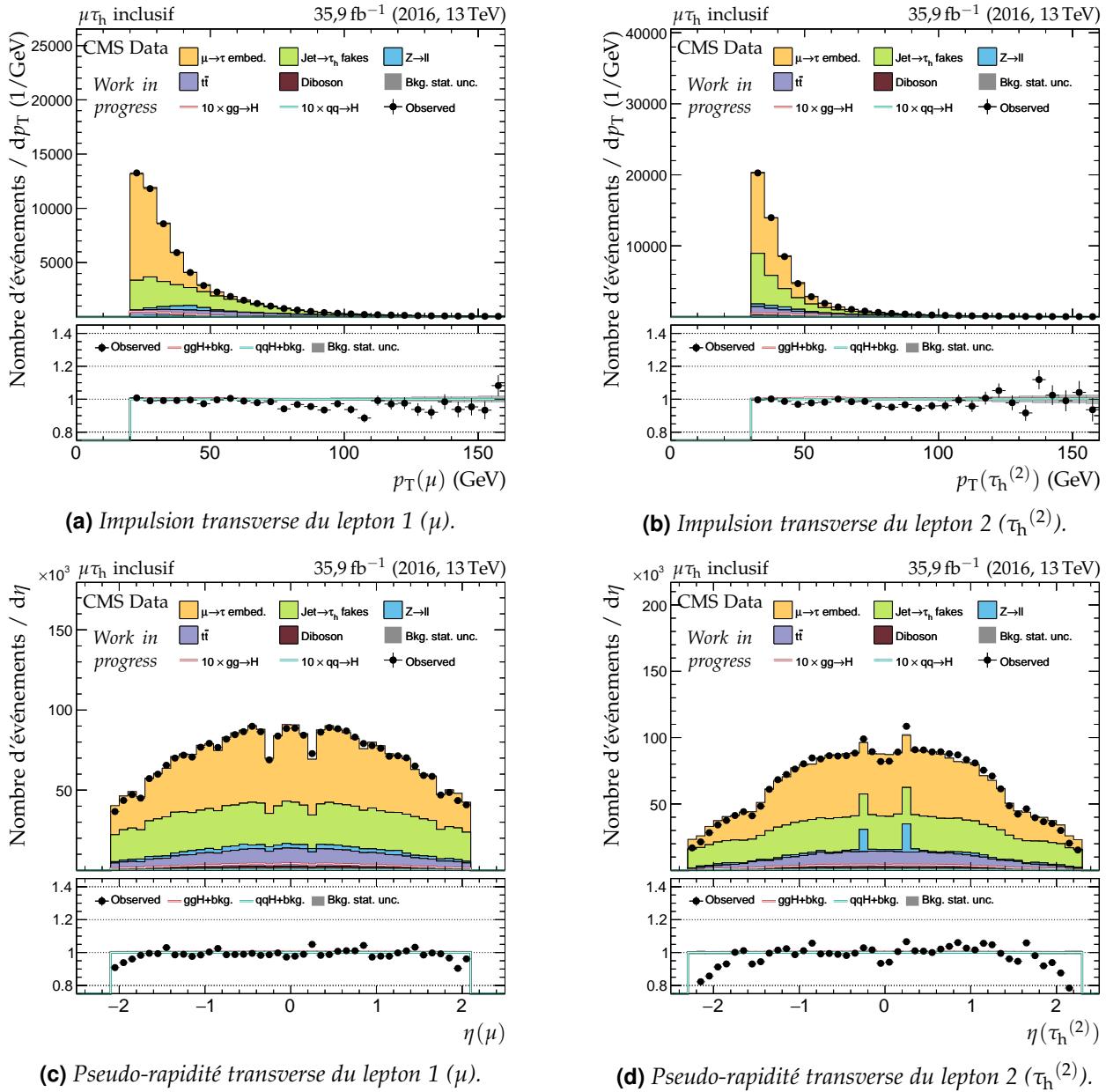


(d) Distance en  $\eta$  entre les deux jets.

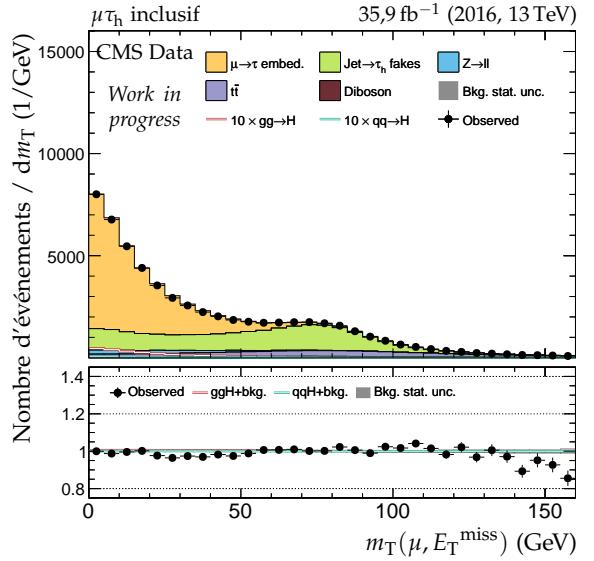


(e) Masse invariante du système des deux jets.

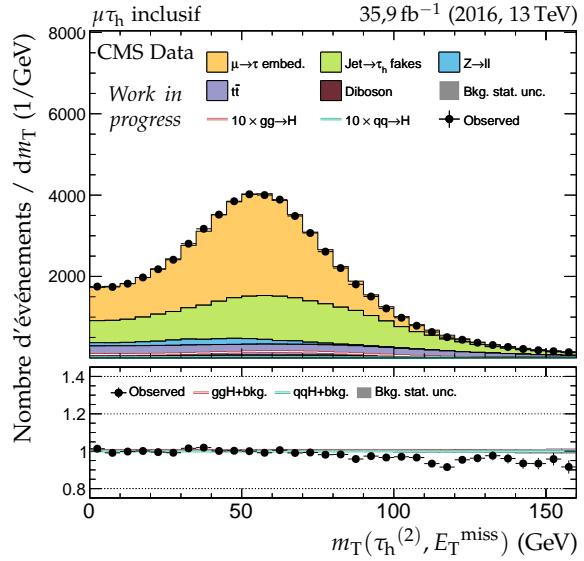
**Figure X.7** – Distributions de contrôle pour le canal  $\mu\tau_h$  en 2016 : nombre de jets et système des deux jets principaux.



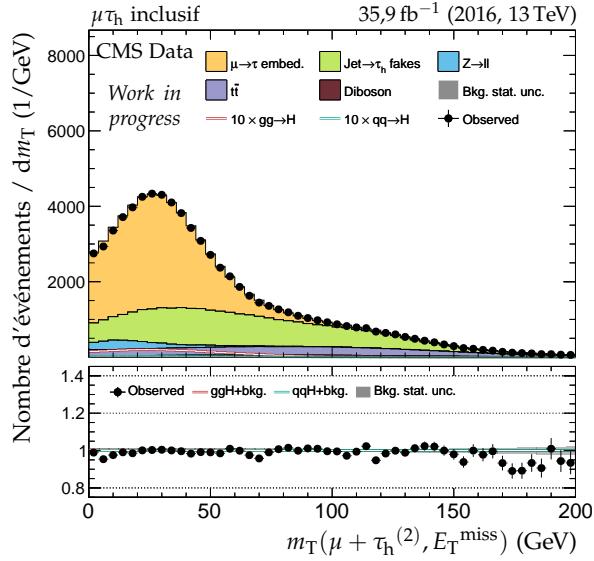
**Figure X.8 – Distributions de contrôle pour le canal  $\mu\tau_h$  en 2016 : cinématique des leptons ( $\mu, \tau_h^{(2)}$ ).**



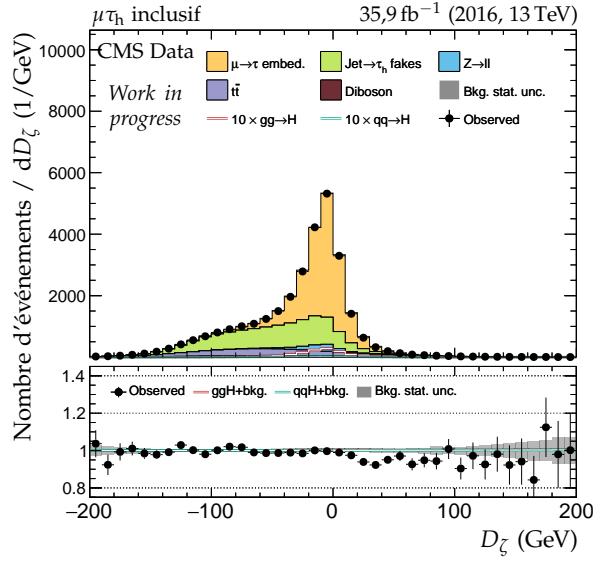
(a) Masse transverse du lepton 1 ( $\mu$ ).



(b) Masse transverse du lepton 2 ( $\tau_h^{(2)}$ ).

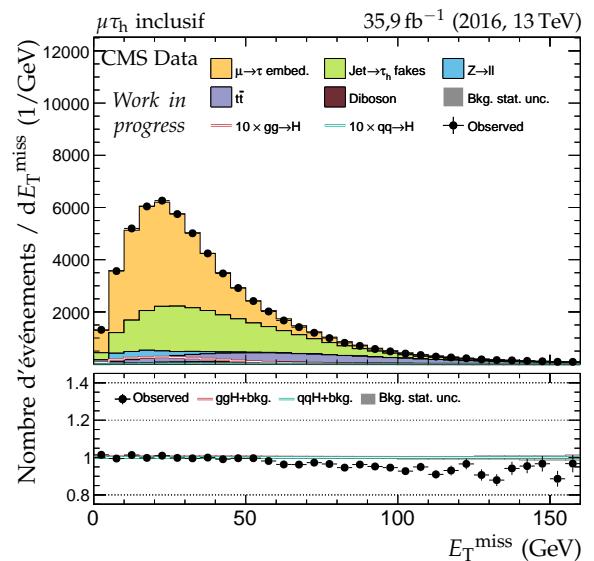
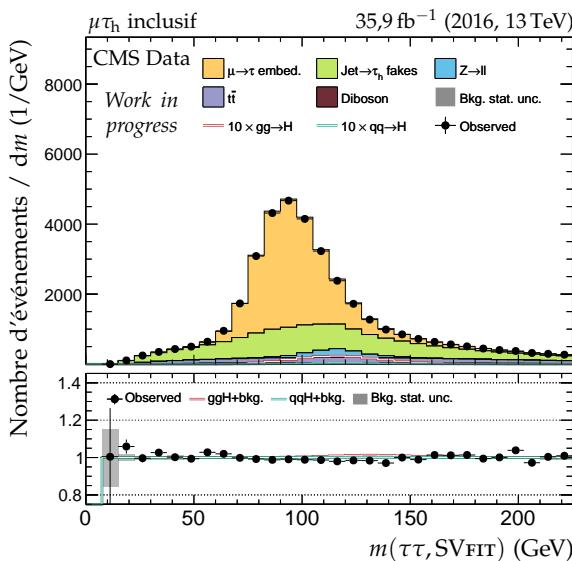
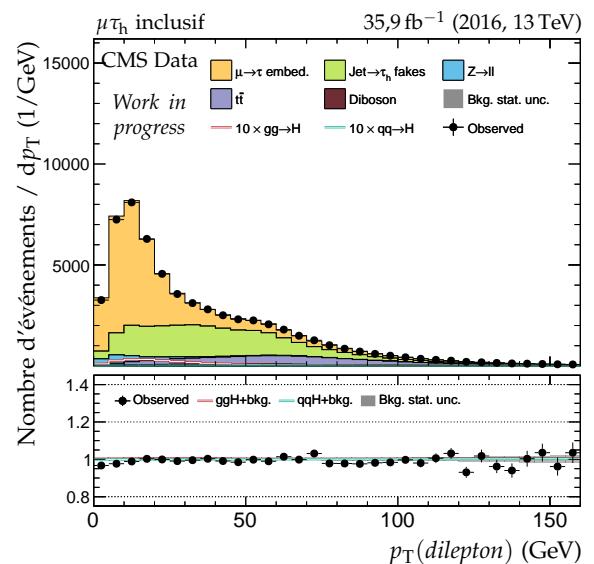
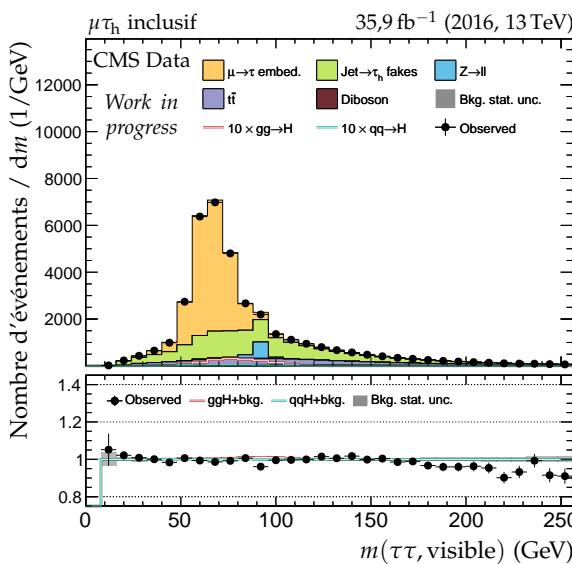
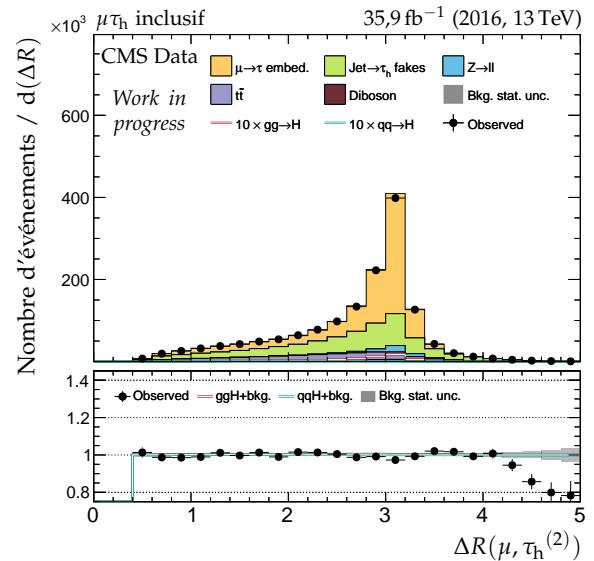
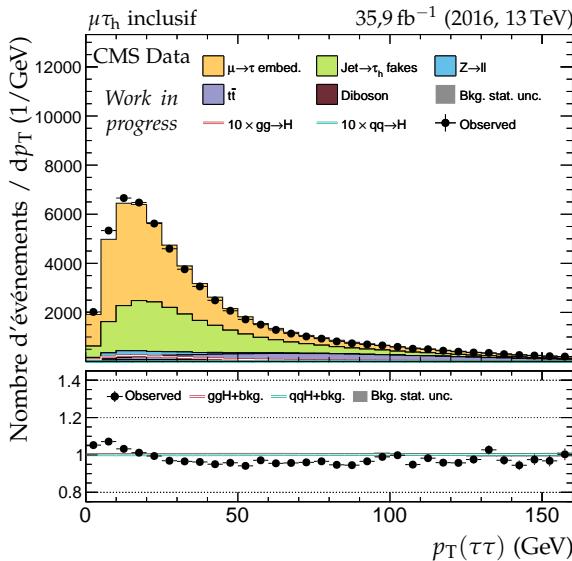


(c) Masse transverse du dilepton.

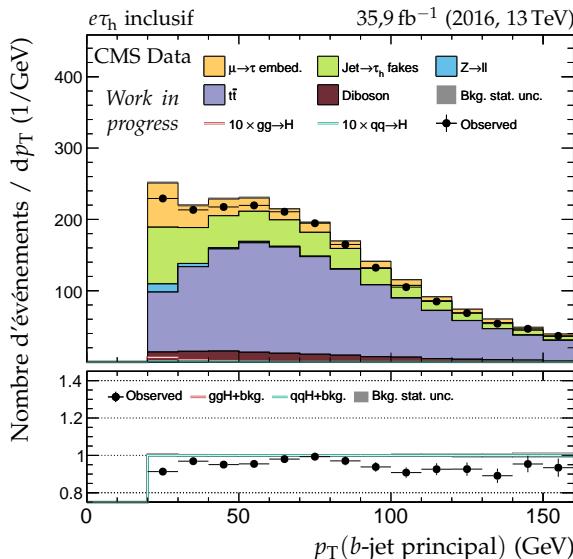


(d) Valeur de  $D_\zeta$ .

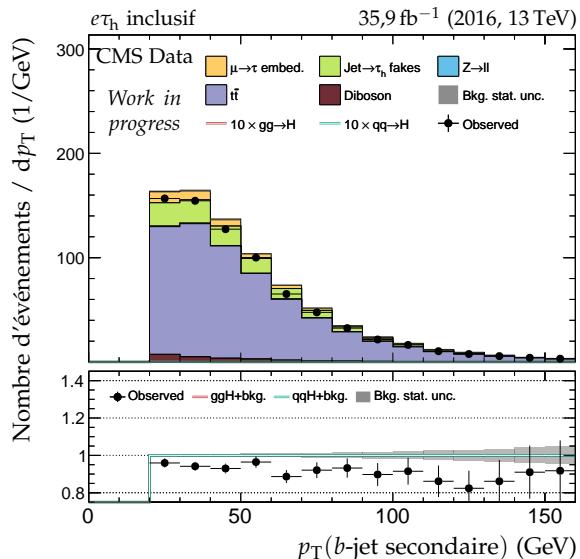
**Figure X.9** – Distributions de contrôle pour le canal  $\mu\tau_h$  en 2016 : masses transverses et  $D_\zeta$ .



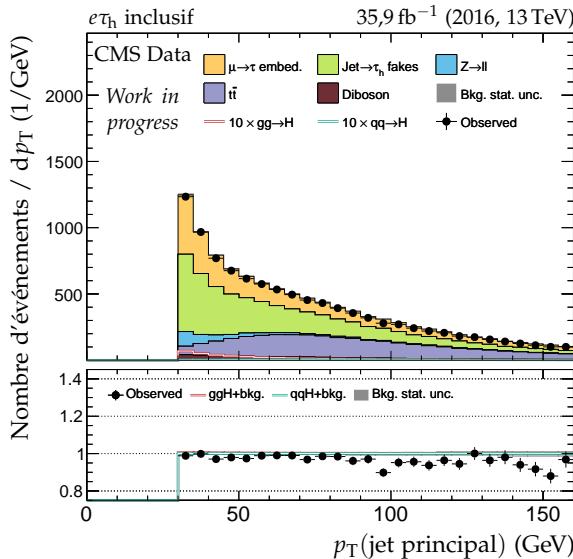
**Figure X.10 – Distributions de contrôle pour le canal  $\mu\tau_h$  en 2016 : dilepton et énergie transverse manquante.**



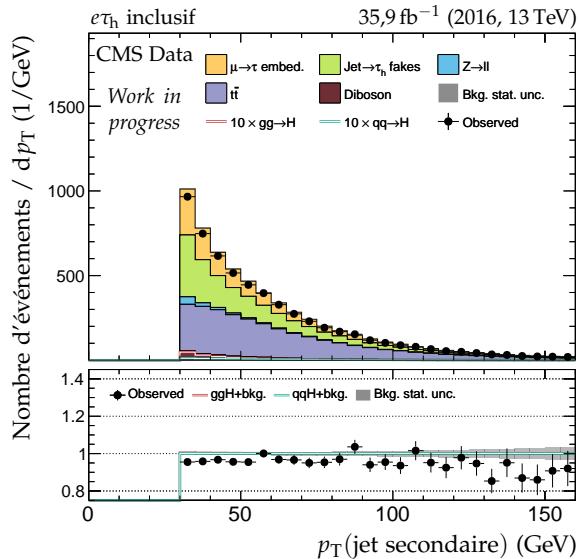
(a) Impulsion transverse du b-jet principal.



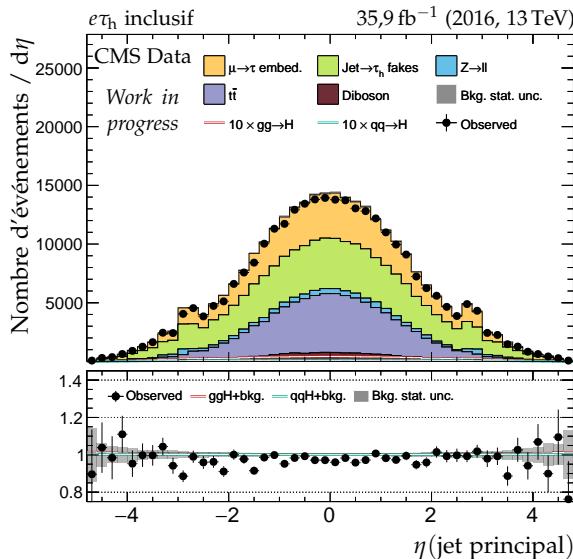
(b) Impulsion transverse du b-jet secondaire.



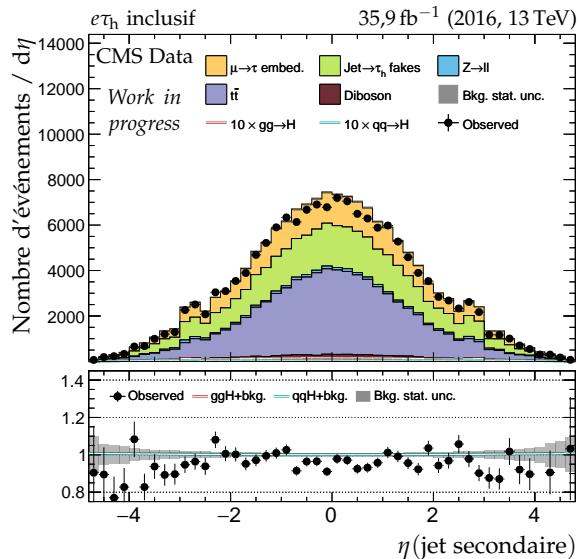
(c) Impulsion transverse du jet principal.



(d) Impulsion transverse du jet secondaire.

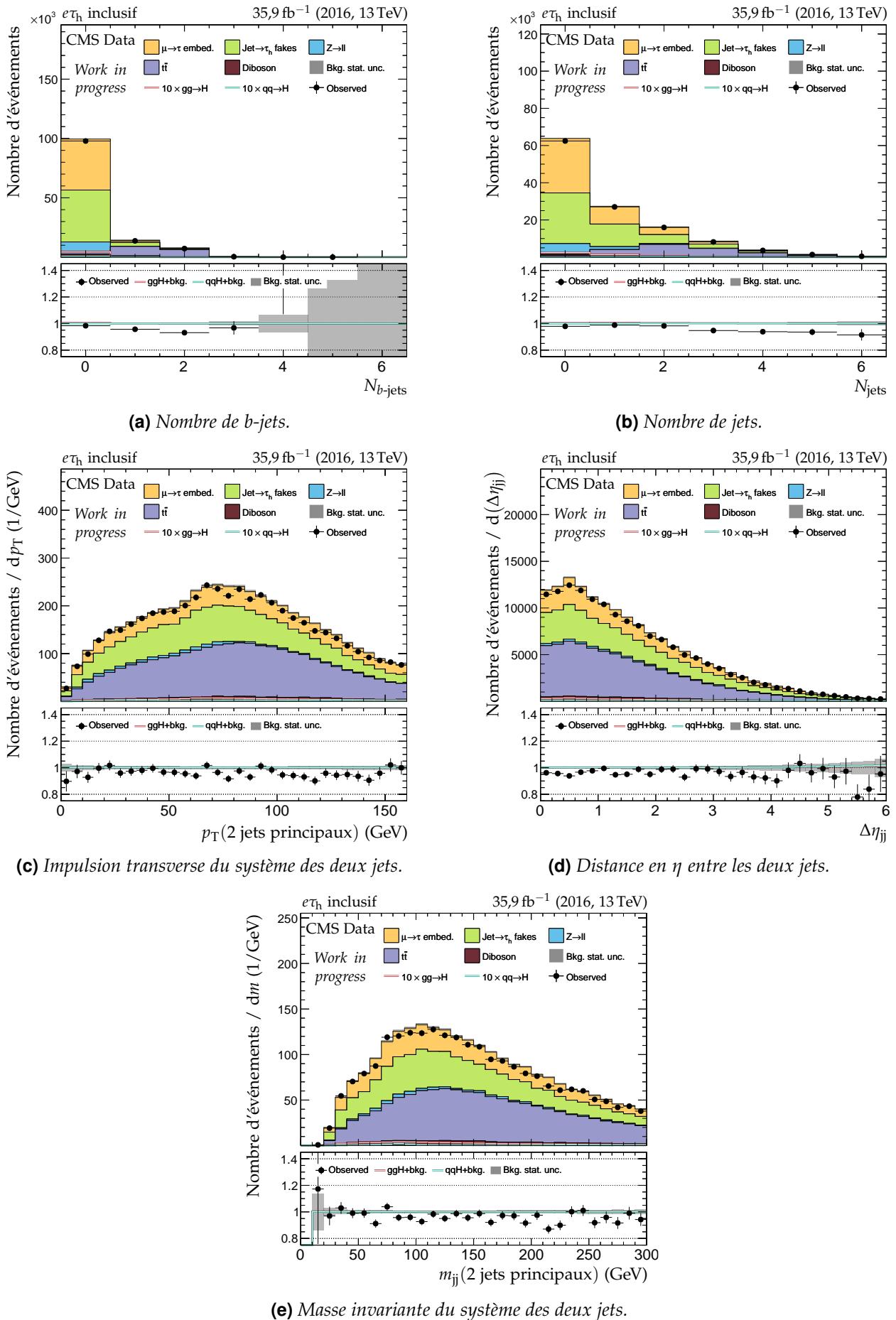


(e) Pseudo-rapidité du jet principal.

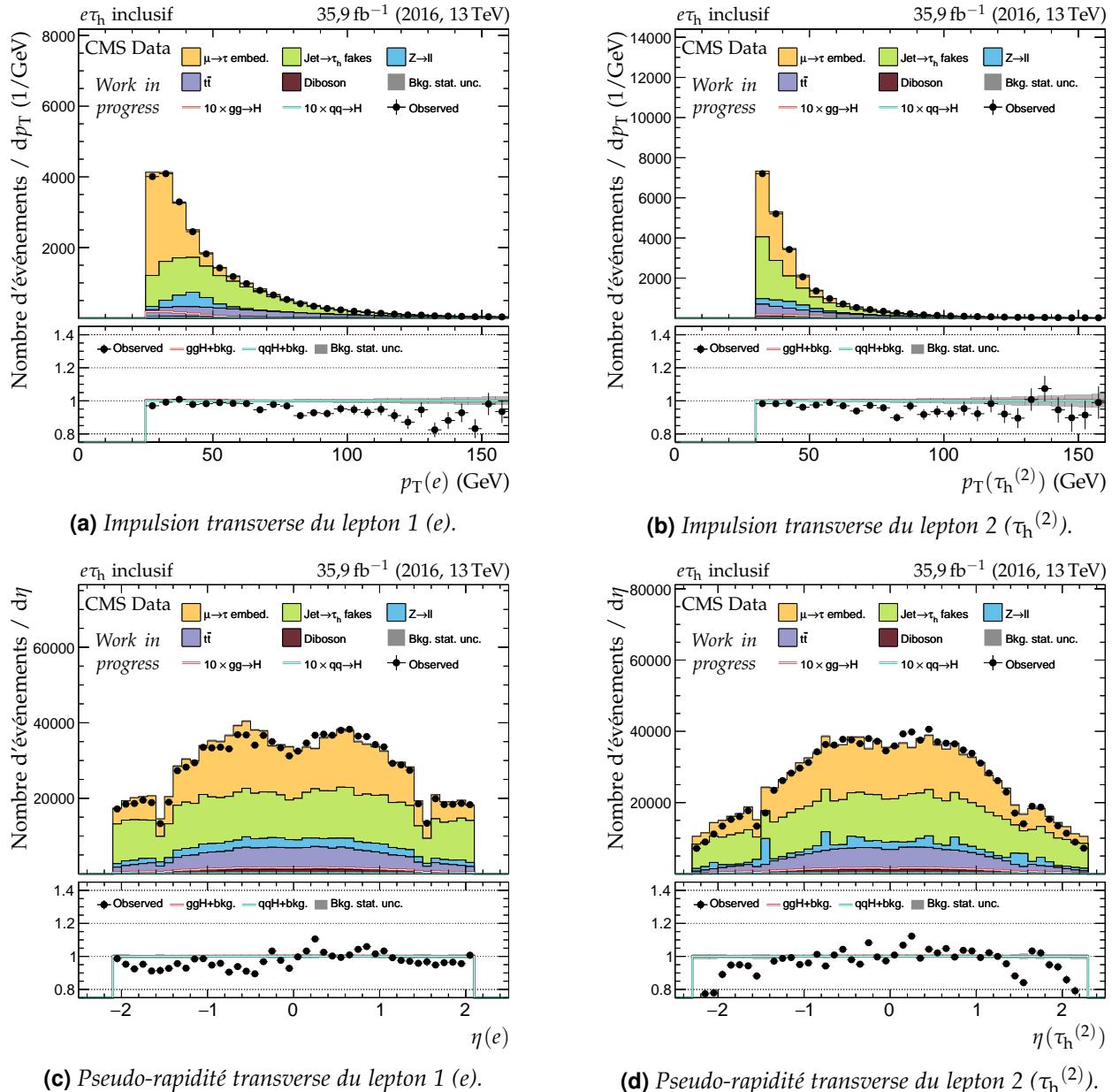


(f) Pseudo-rapidité du jet secondaire.

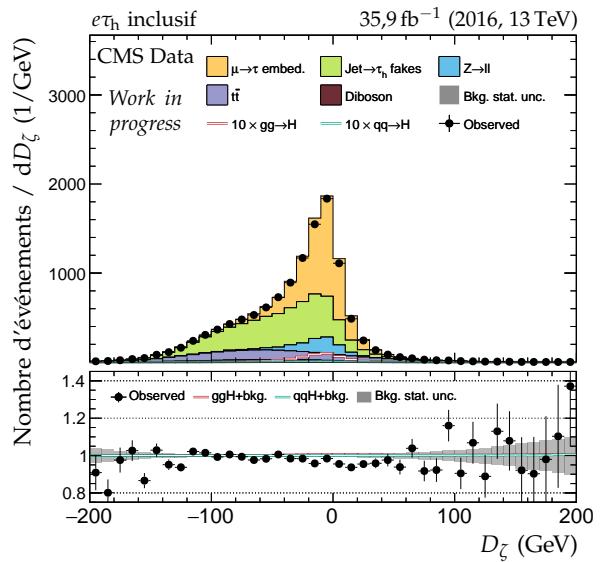
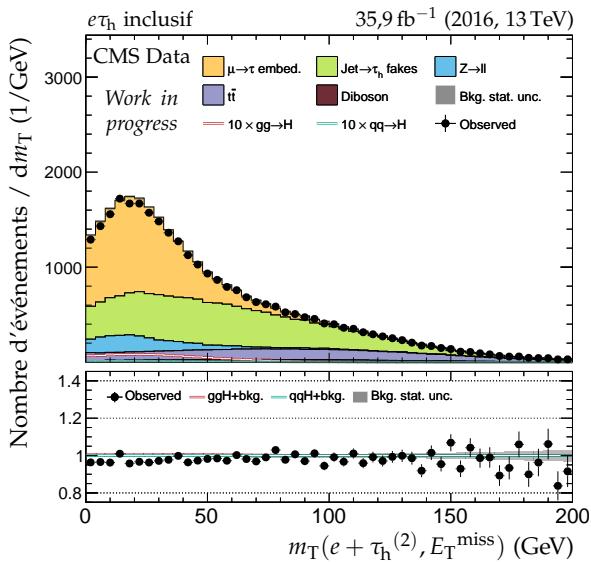
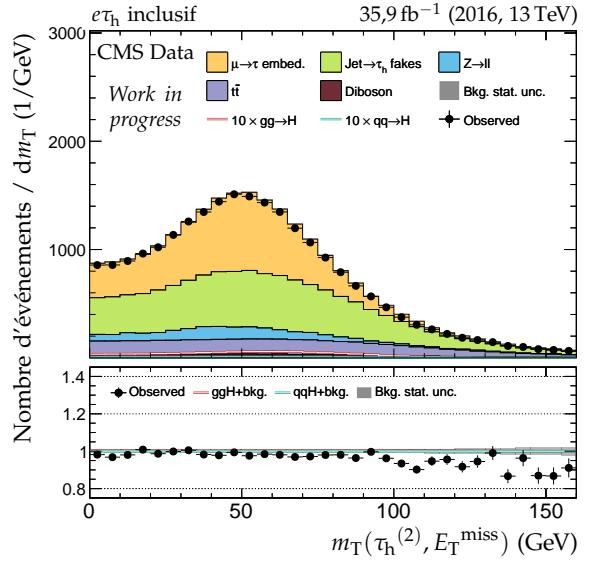
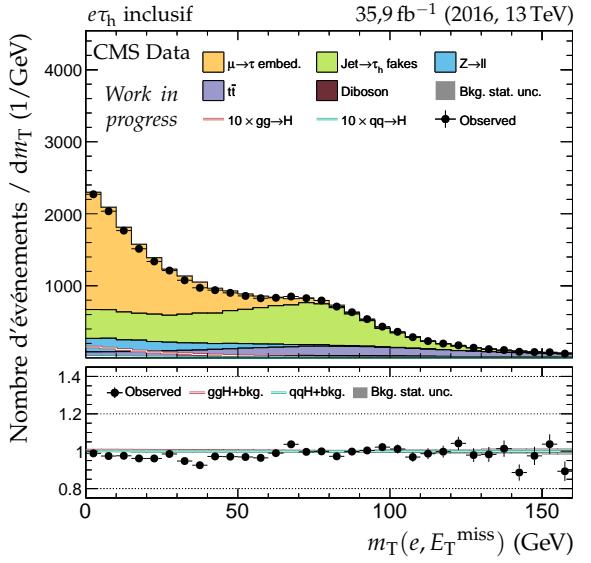
**Figure X.11** – Distributions de contrôle pour le canal  $e\tau_h$  en 2016 : cinématique des jets.



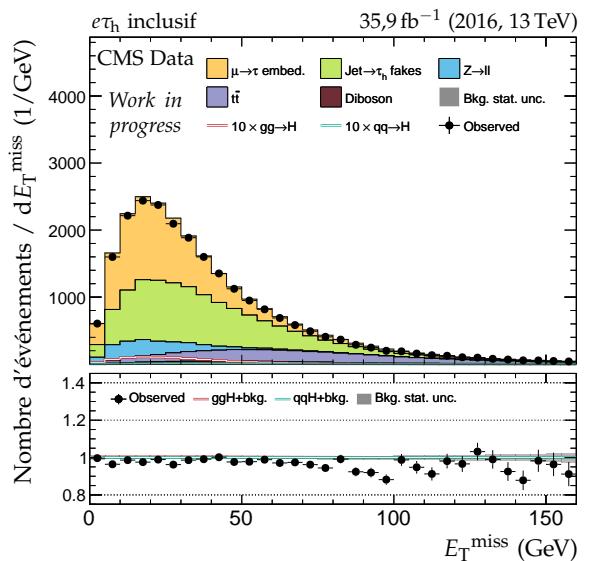
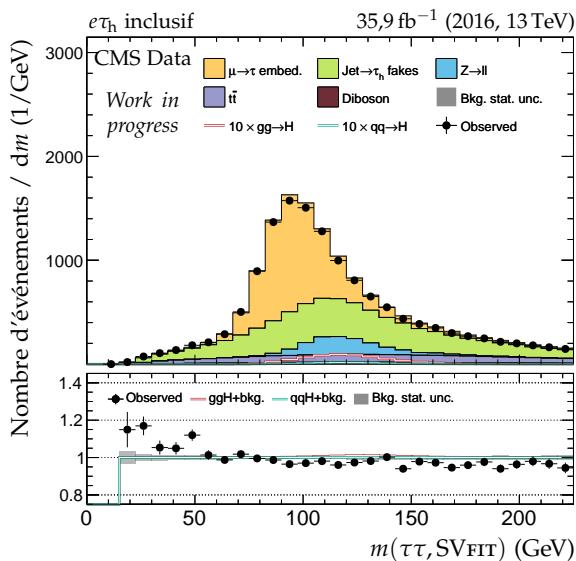
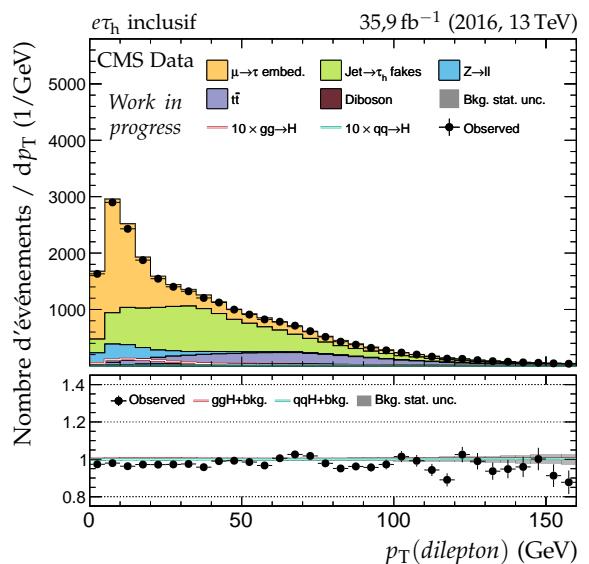
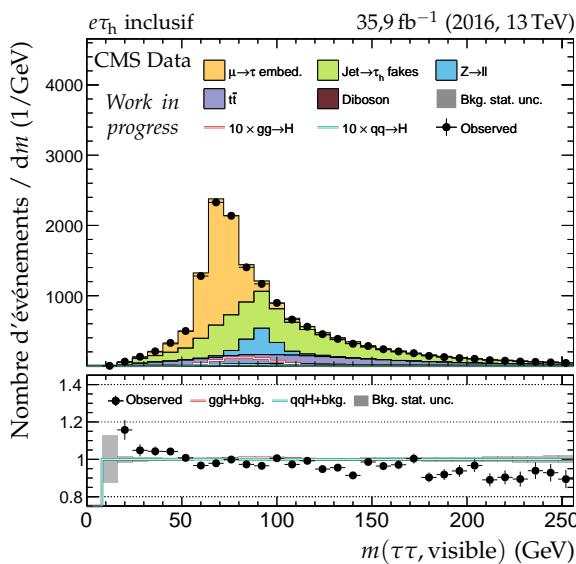
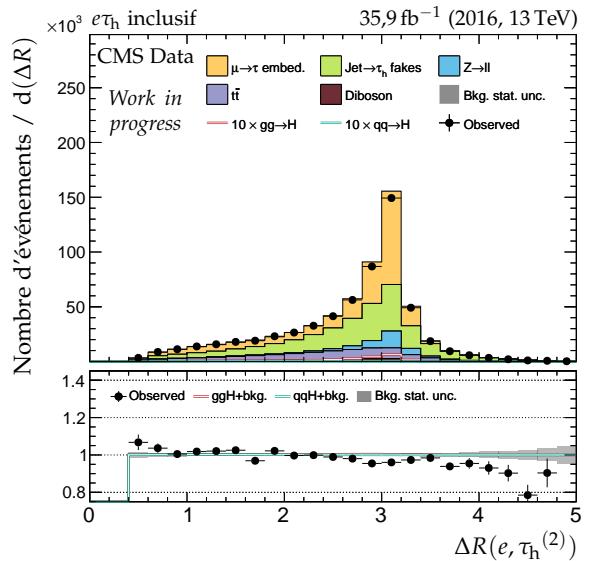
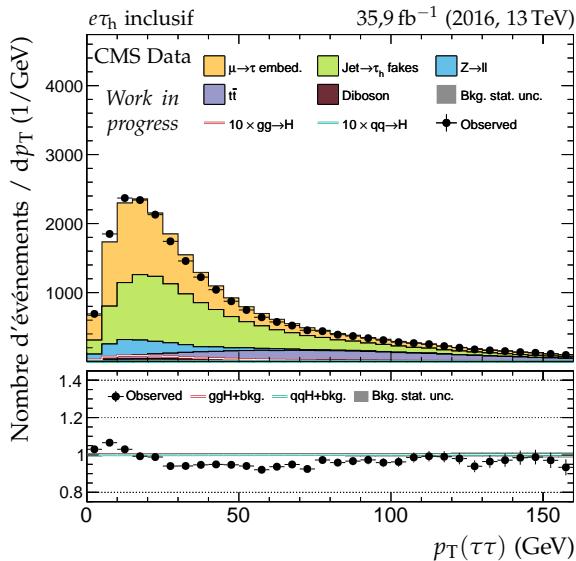
**Figure X.12 – Distributions de contrôle pour le canal  $e\tau_h$  en 2016 : nombre de jets et système des deux jets principaux.**



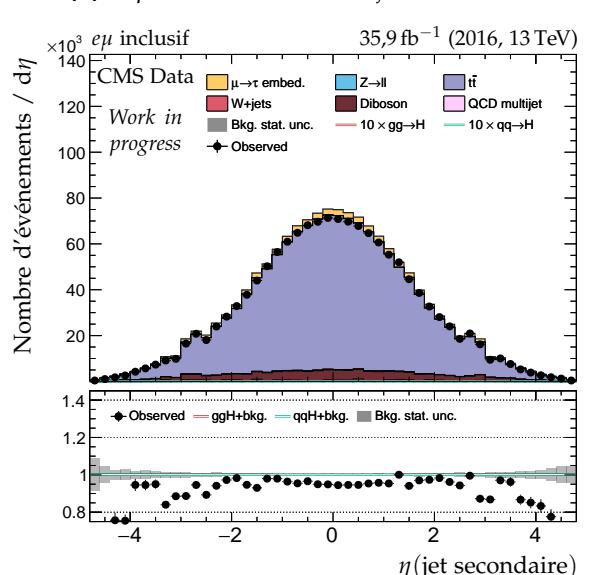
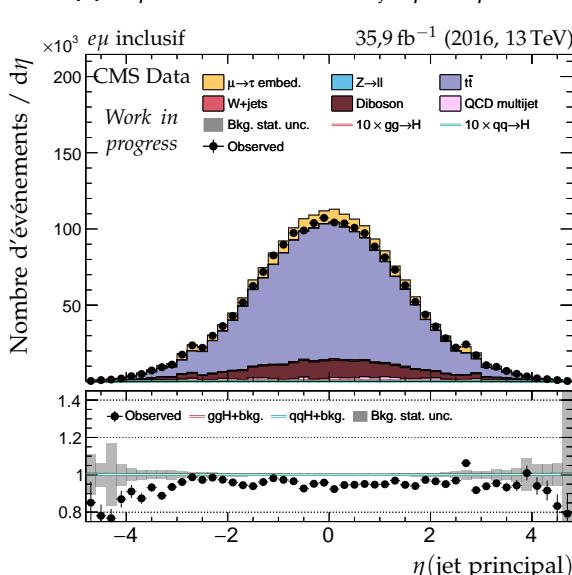
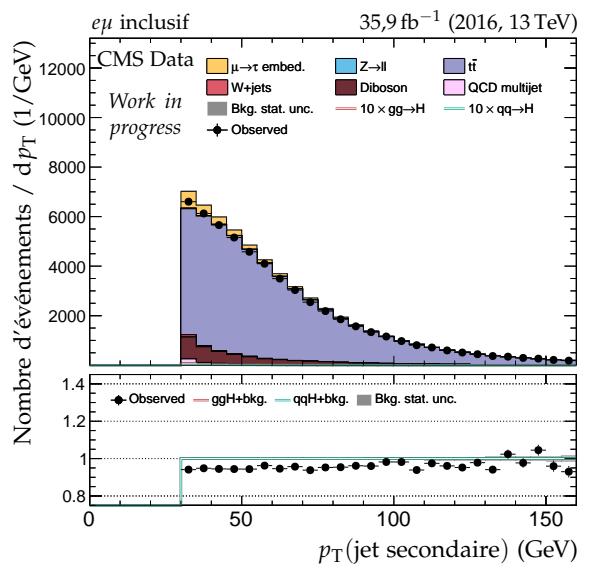
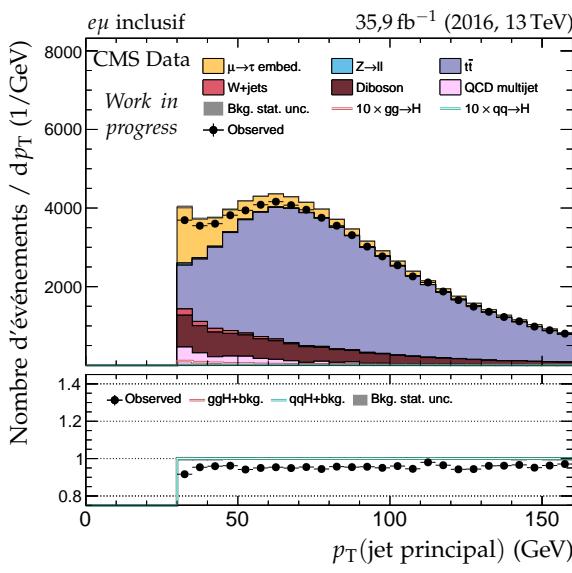
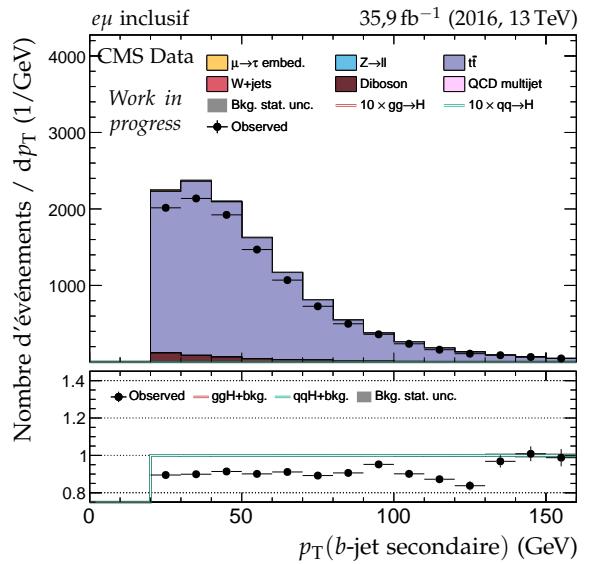
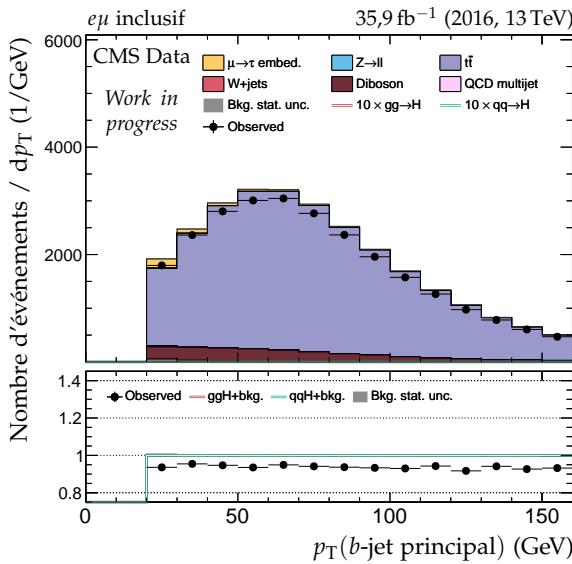
**Figure X.13 – Distributions de contrôle pour le canal  $e\tau_h$  en 2016 : cinématique des leptons ( $e, \tau_h^{(2)}$ ).**



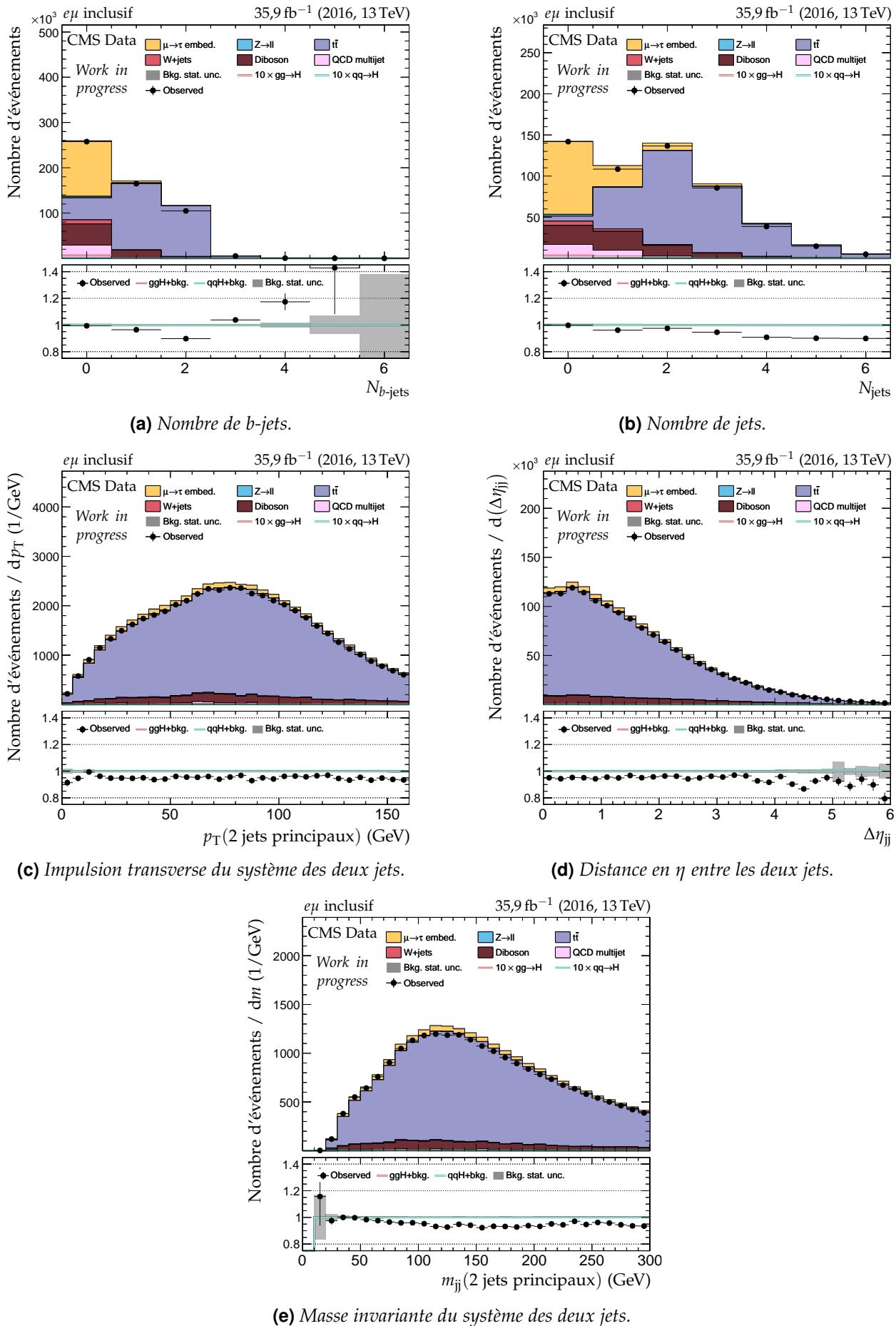
**Figure X.14 – Distributions de contrôle pour le canal  $e\tau_h$  en 2016 : masses transverses et  $D_\zeta$ .**



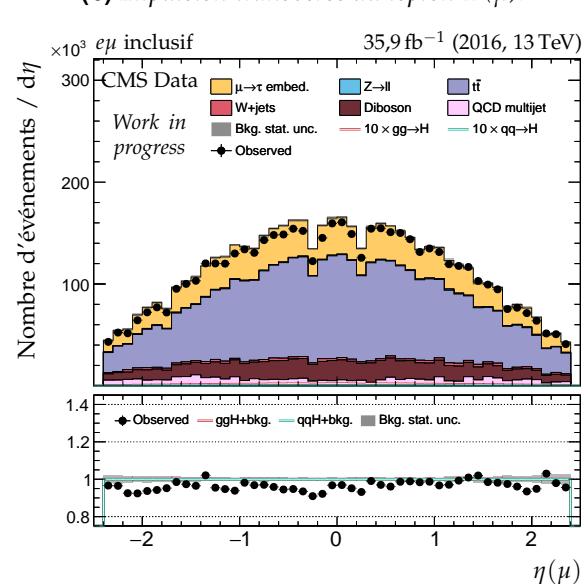
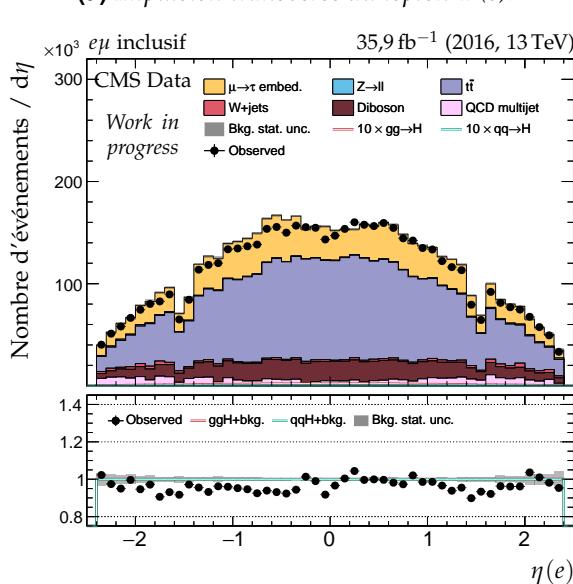
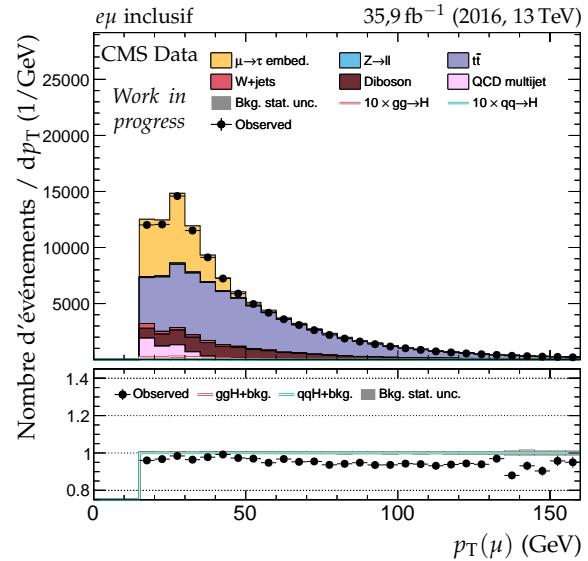
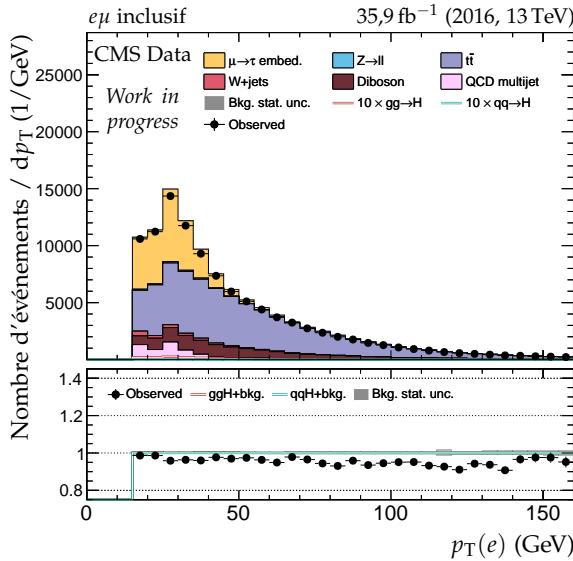
**Figure X.15 – Distributions de contrôle pour le canal  $e\tau_h$  en 2016 : dilepton et énergie transverse manquante.**



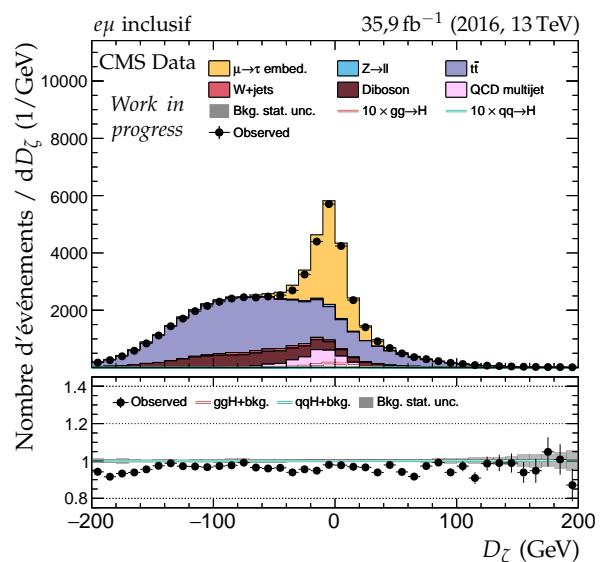
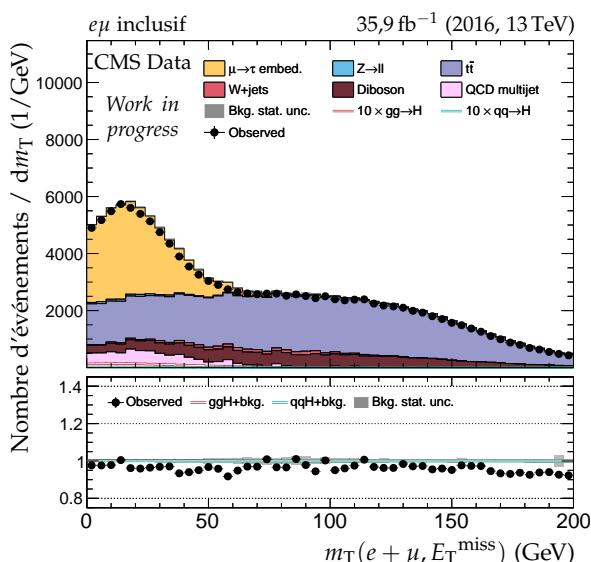
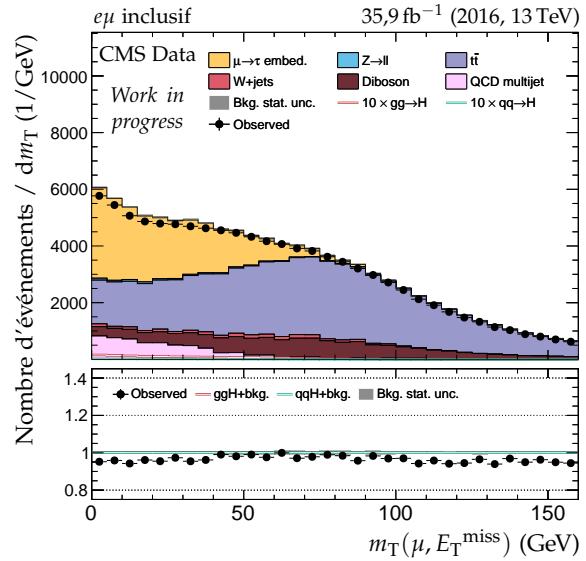
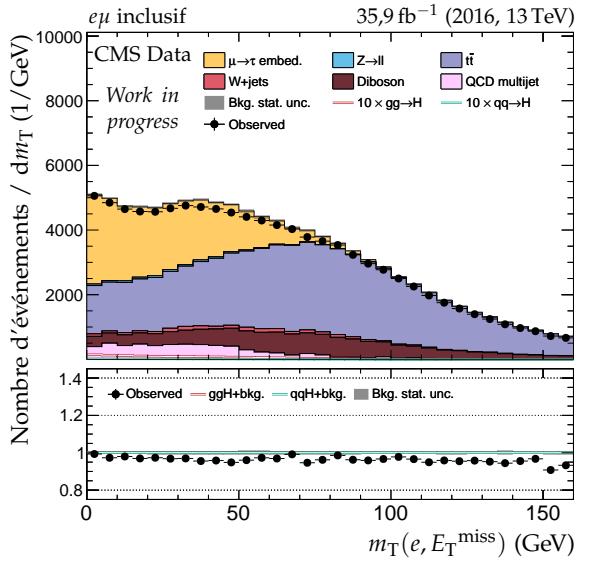
**Figure X.16 – Distributions de contrôle pour le canal  $e\mu$  en 2016 : cinématique des jets.**



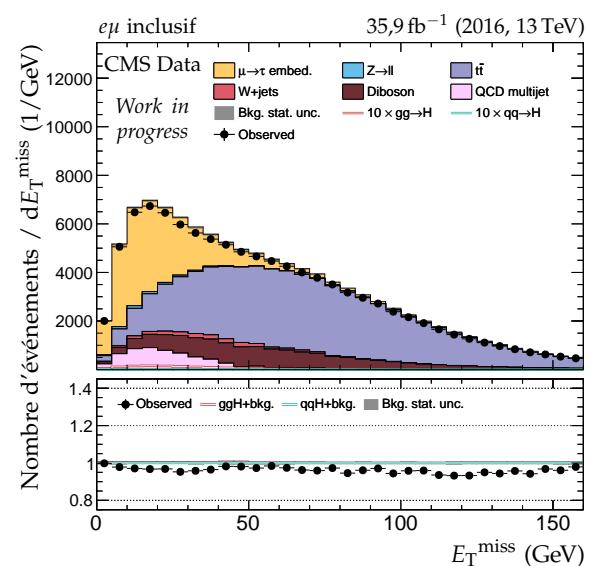
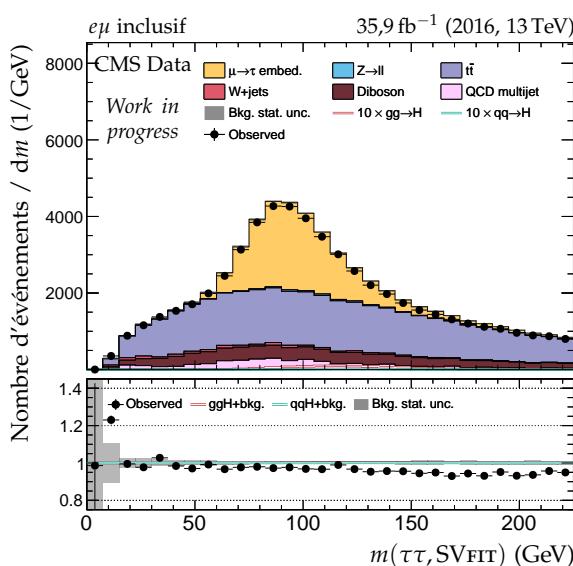
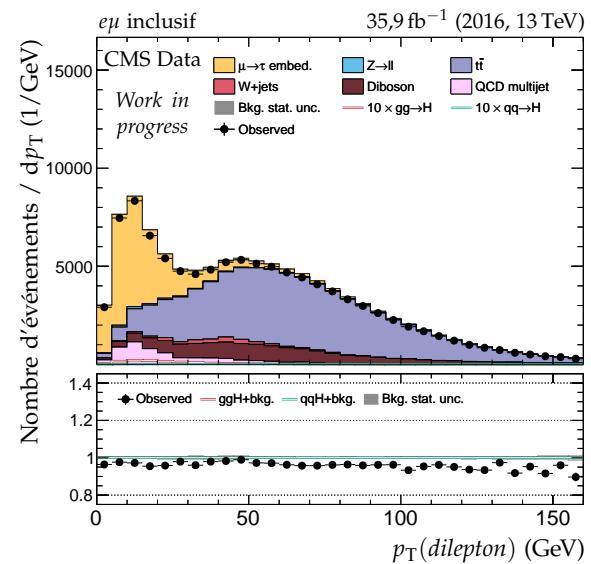
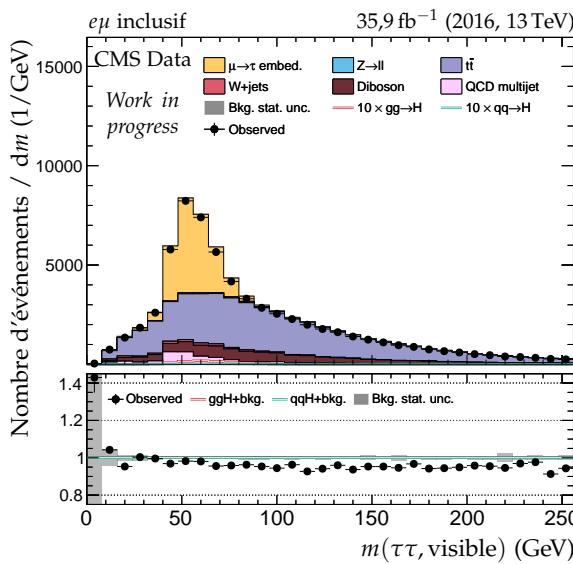
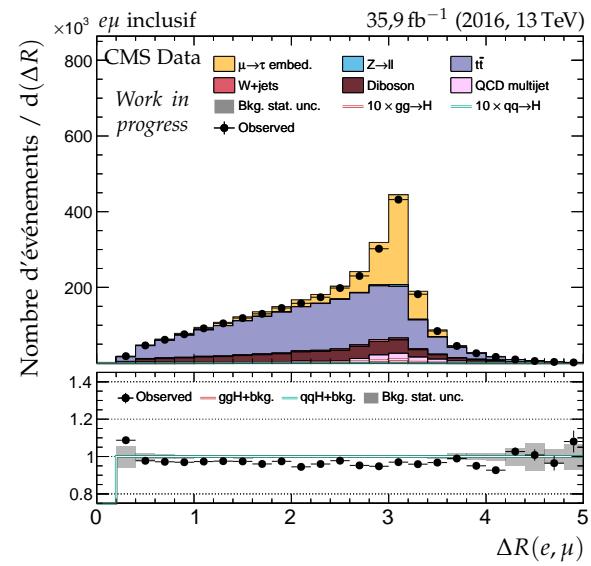
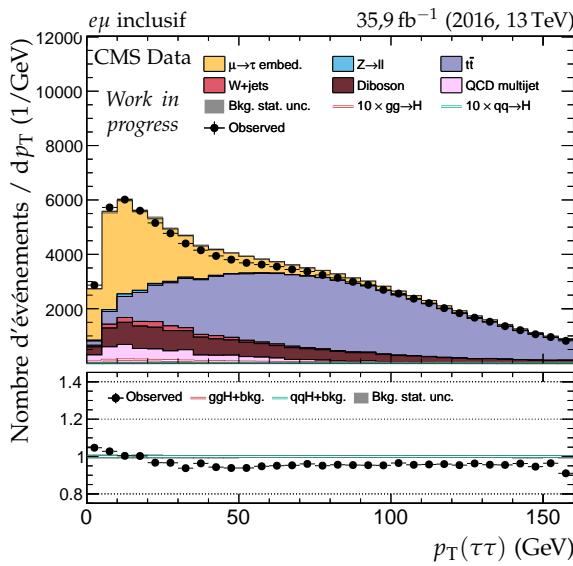
**Figure X.17** – Distributions de contrôle pour le canal  $e\mu$  en 2016 : nombre de jets et système des deux jets principaux.



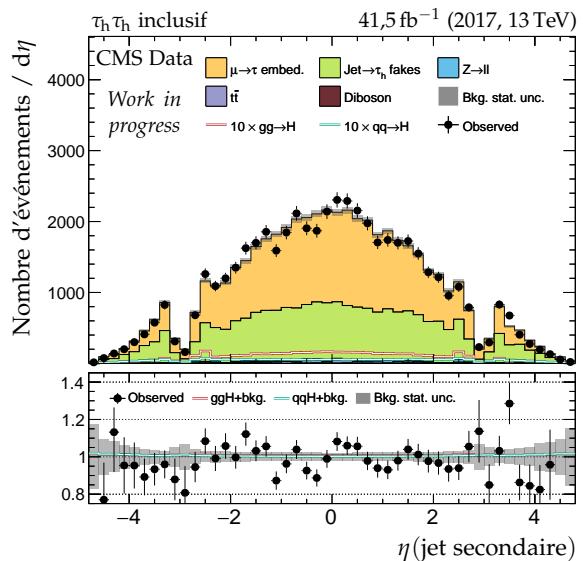
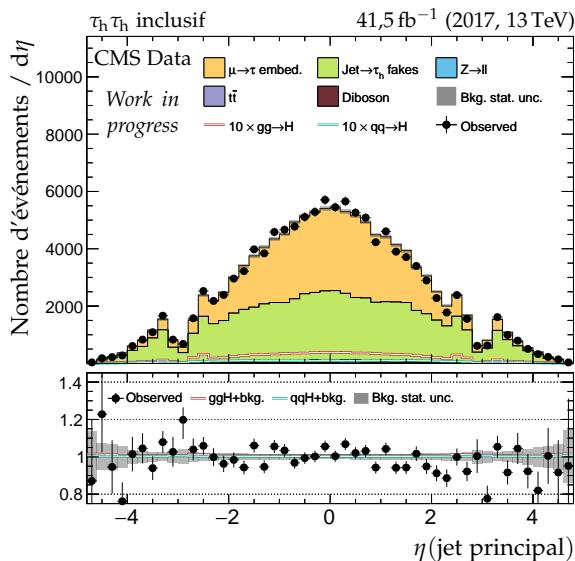
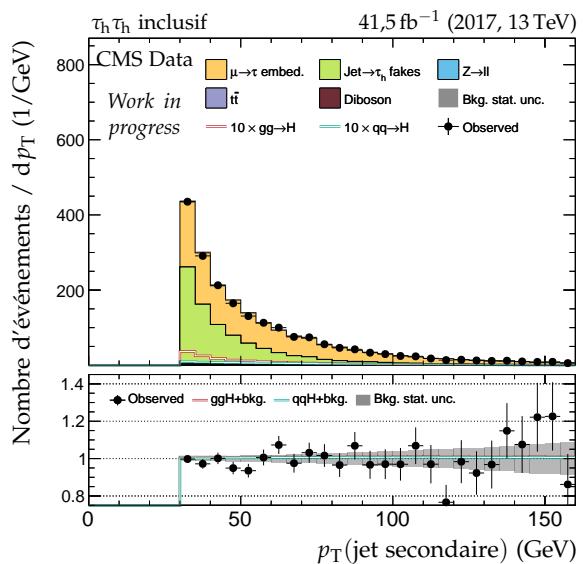
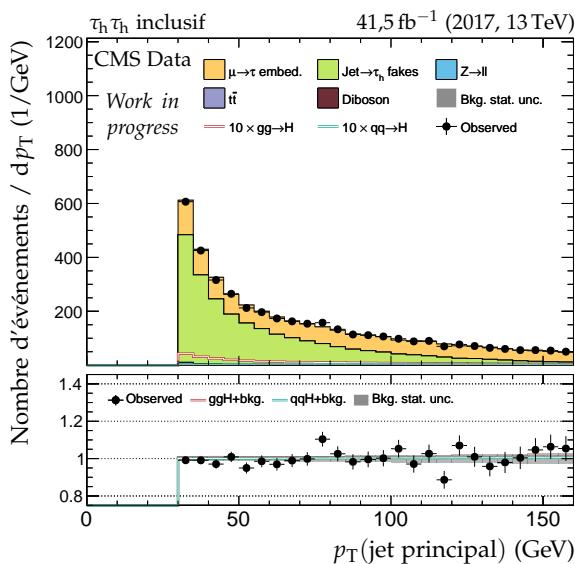
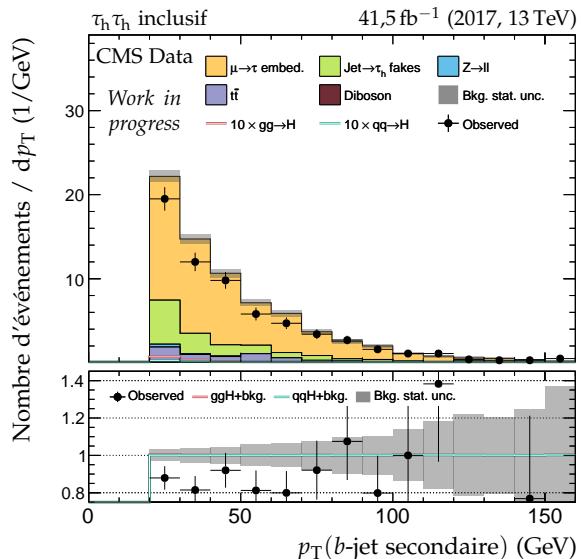
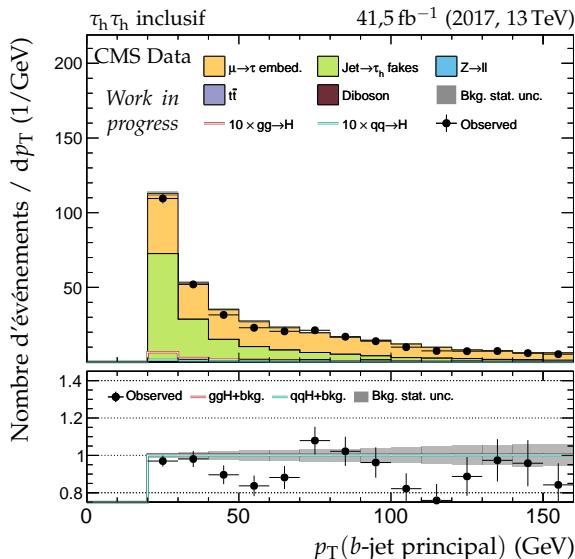
**Figure X.18 – Distributions de contrôle pour le canal  $e\mu$  en 2016 : cinématique des leptons ( $e, \mu$ ).**



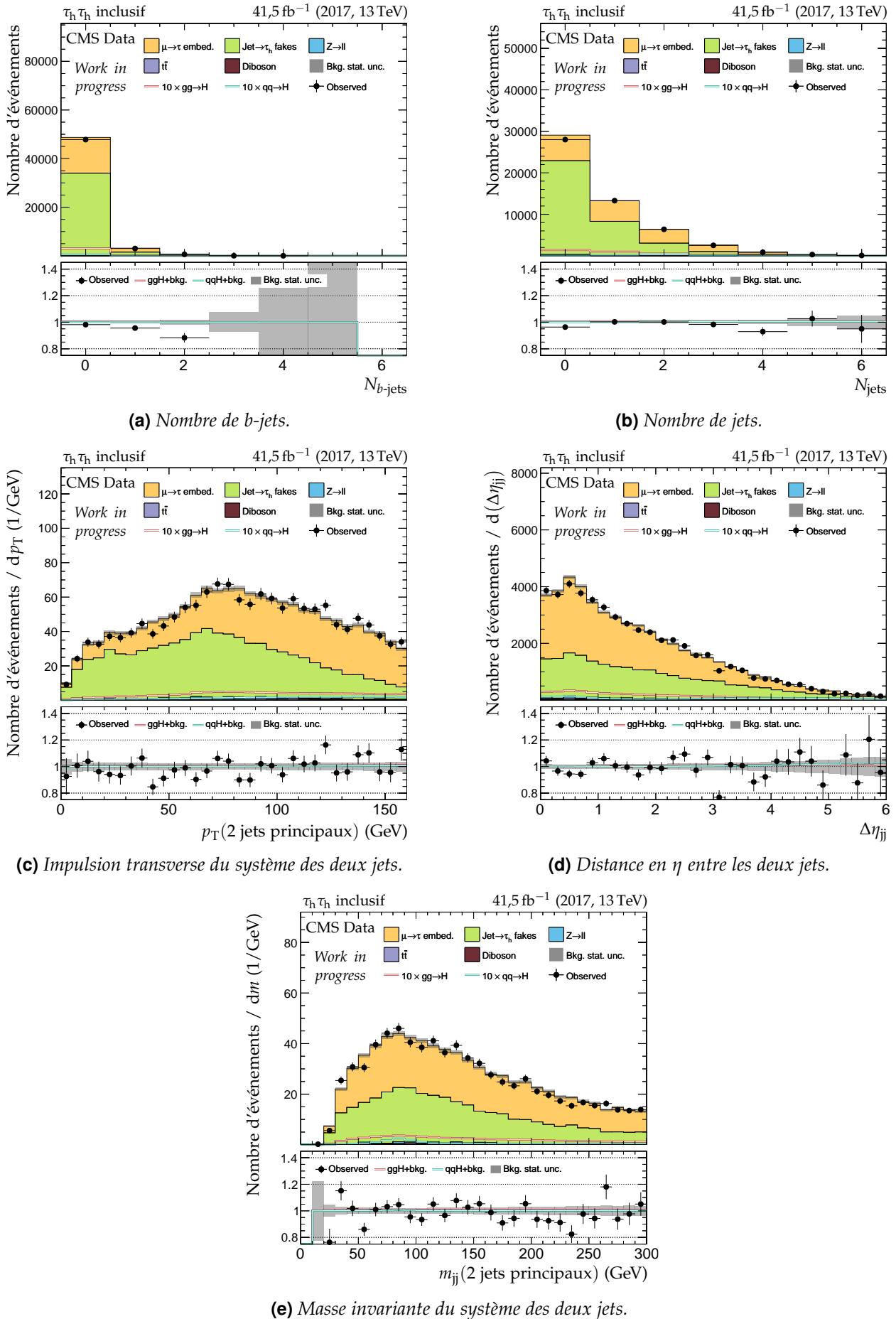
**Figure X.19** – Distributions de contrôle pour le canal  $e\mu$  en 2016 : masses transverses et  $D_\zeta$ .



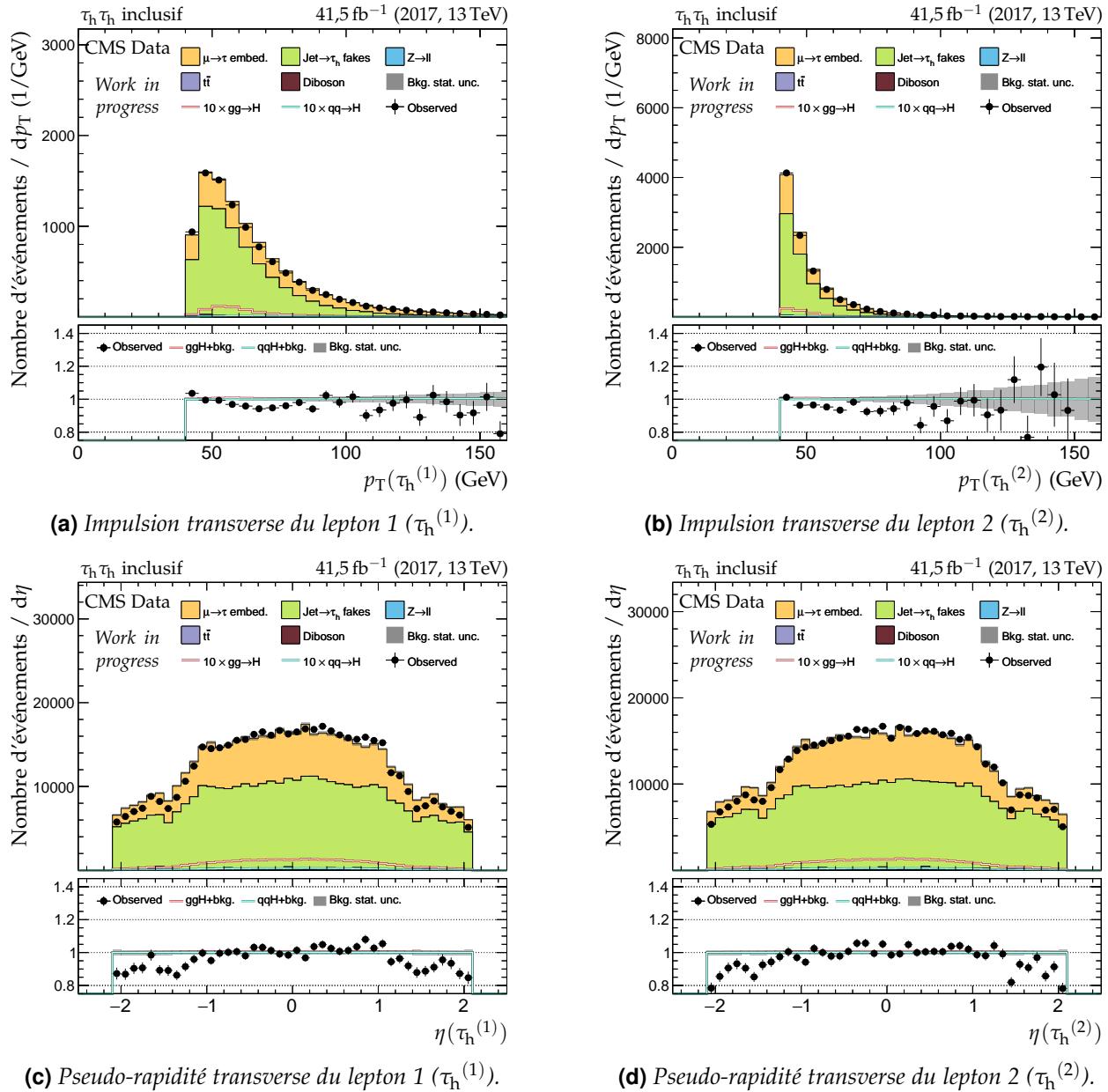
**Figure X.20 – Distributions de contrôle pour le canal  $e\mu$  en 2016 : dilepton et énergie transverse manquante.**



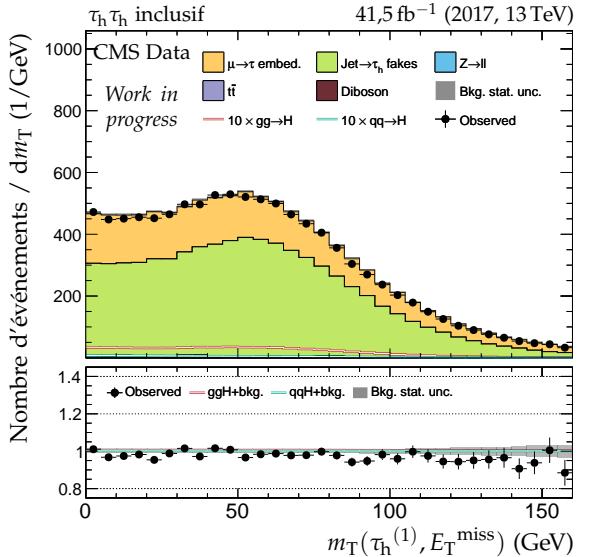
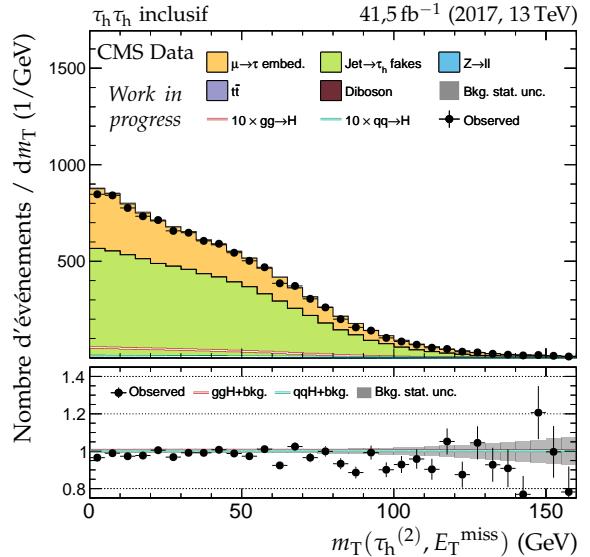
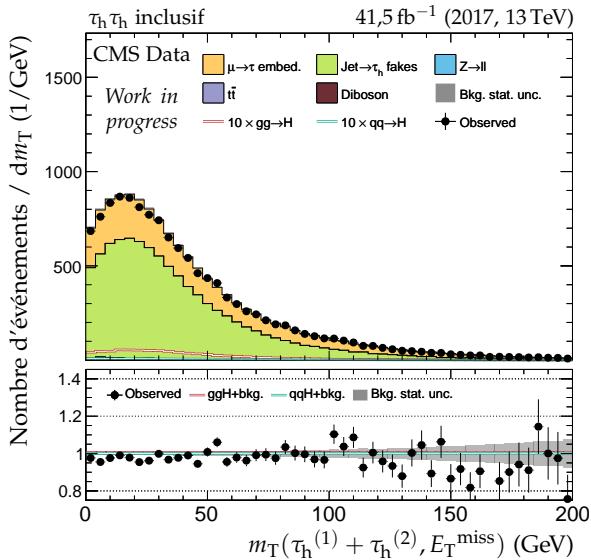
**Figure X.21 – Distributions de contrôle pour le canal  $\tau_h\tau_h$  en 2017 : cinématique des jets.**



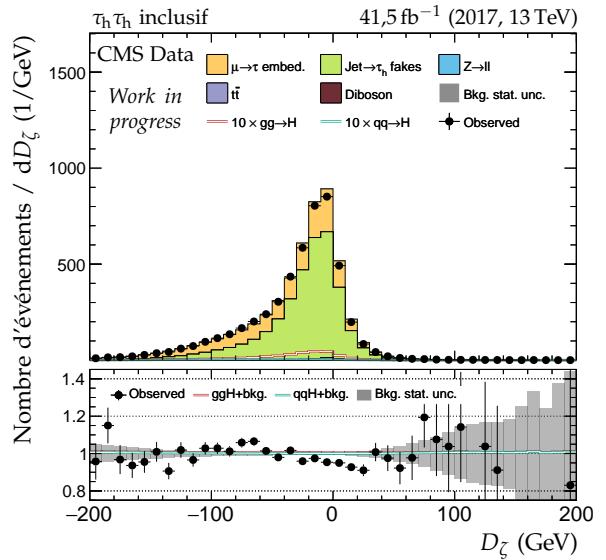
**Figure X.22 – Distributions de contrôle pour le canal  $\tau_h \tau_h$  en 2017 : nombre de jets et système des deux jets principaux.**

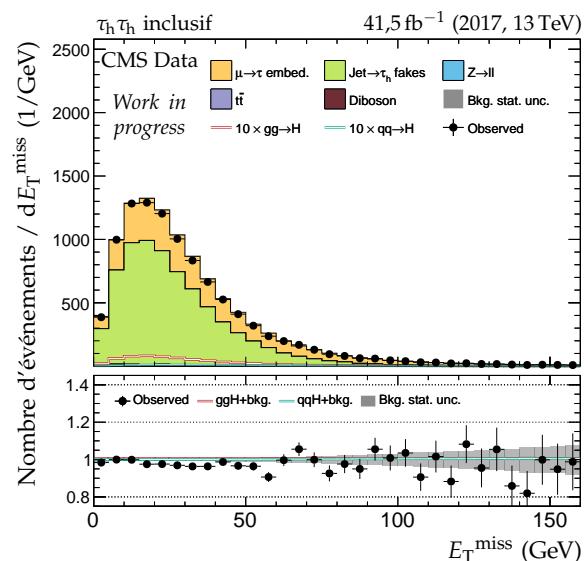
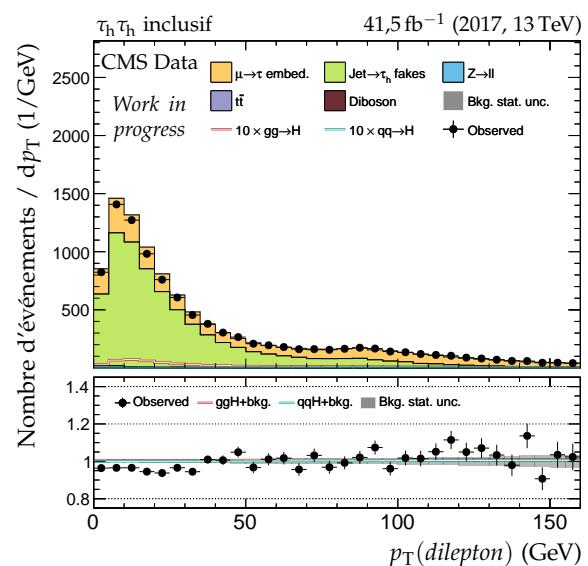
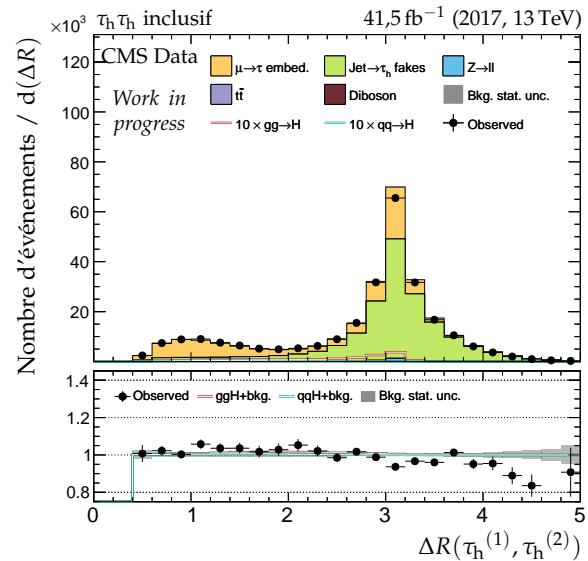
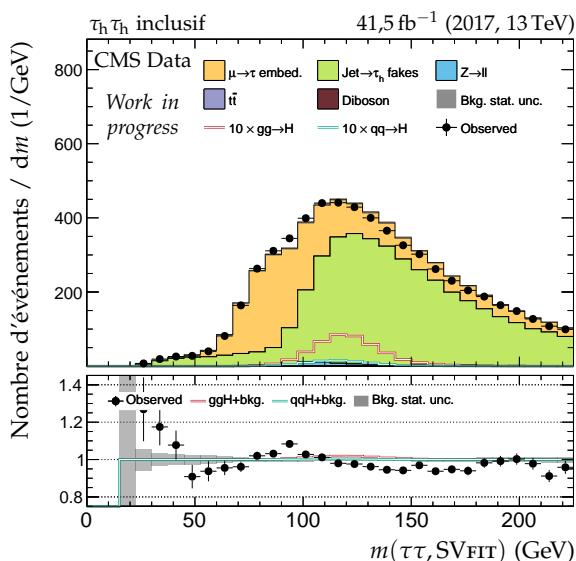
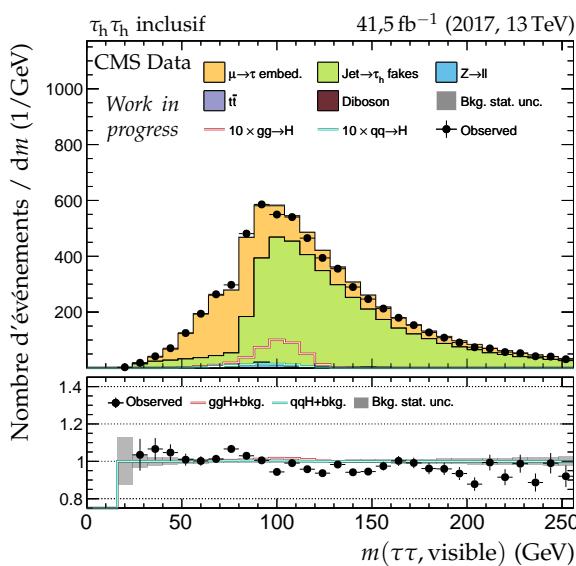
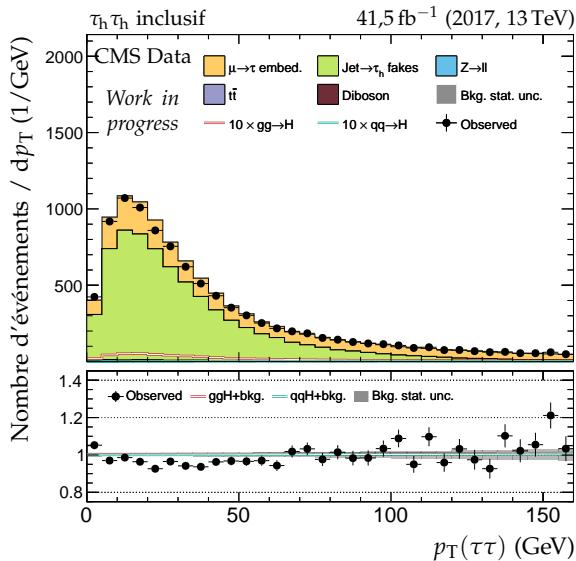


**Figure X.23 – Distributions de contrôle pour le canal  $\tau_h\tau_h$  en 2017 : cinématique des leptons ( $\tau_h^{(1)}, \tau_h^{(2)}$ ).**

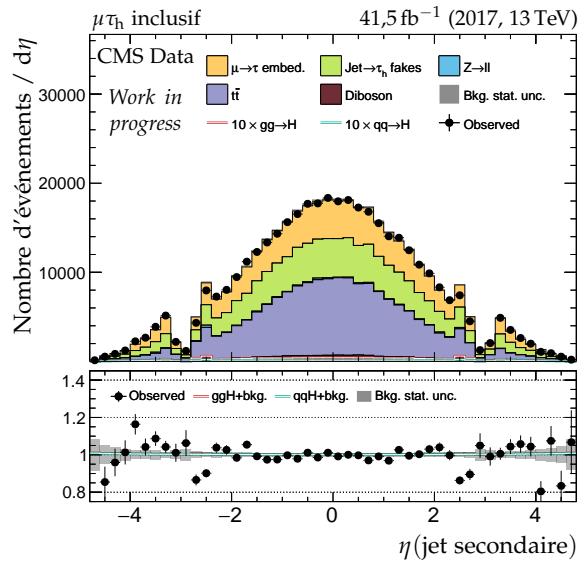
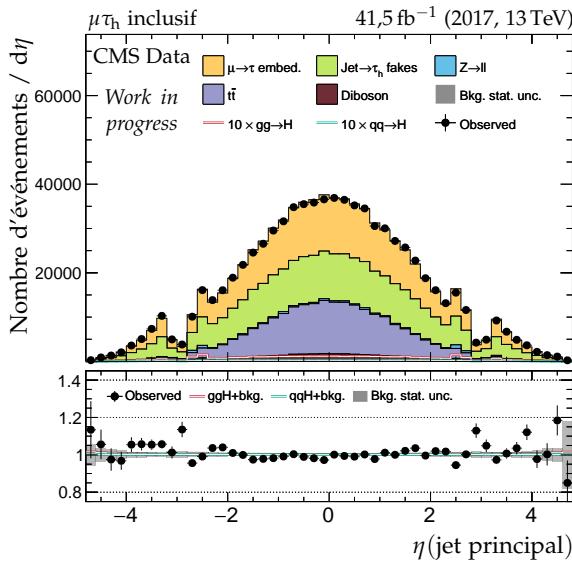
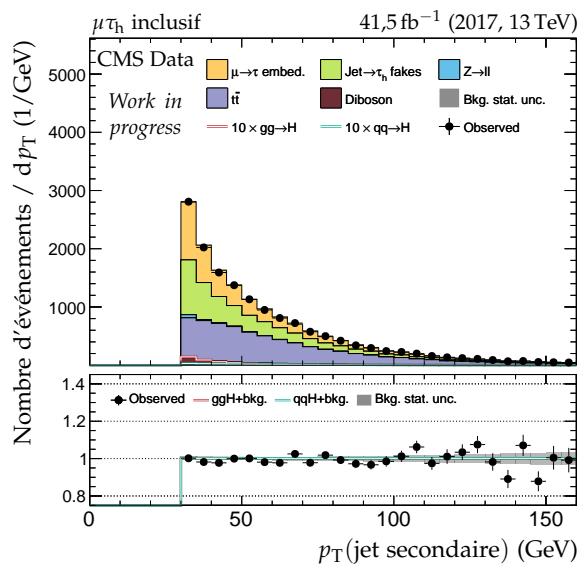
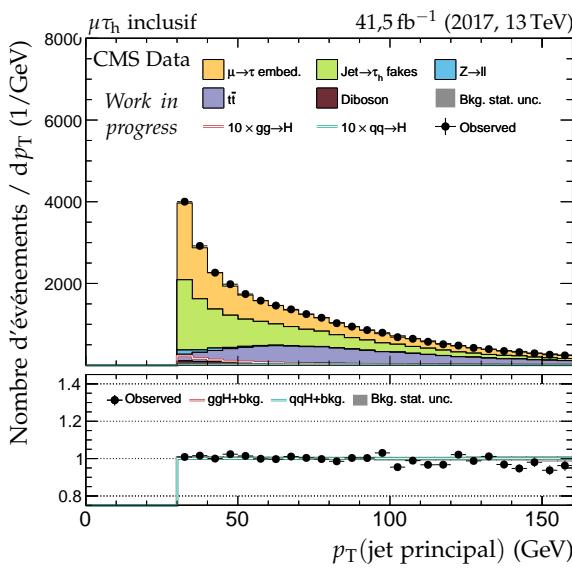
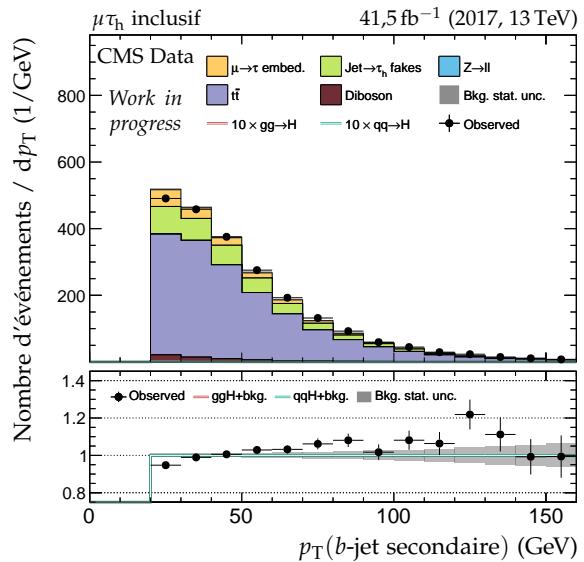
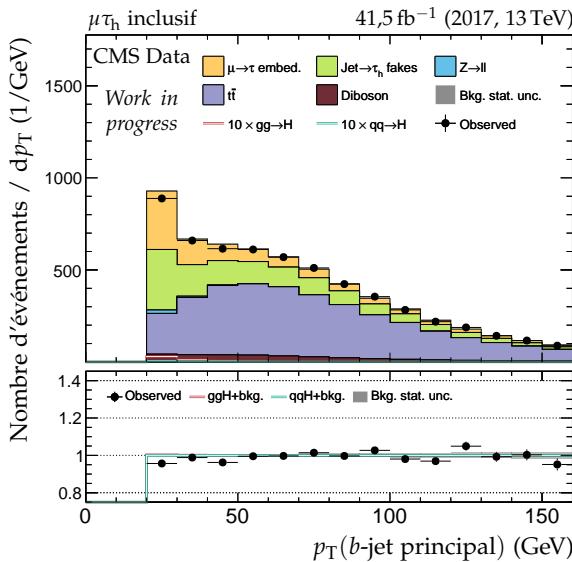
(a) Masse transverse du lepton 1 ( $\tau_h^{(1)}$ ).(b) Masse transverse du lepton 2 ( $\tau_h^{(2)}$ ).

(c) Masse transverse du dilepton.

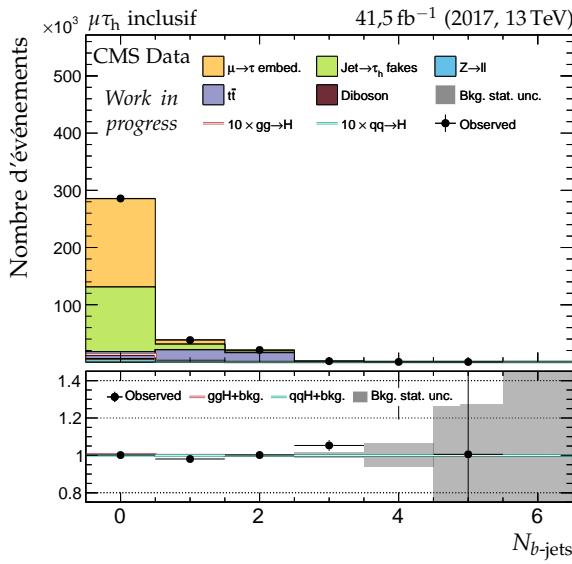
(d) Valeur de  $D_\zeta$ .**Figure X.24 – Distributions de contrôle pour le canal  $\tau_h\tau_h$  en 2017 : masses transverses et  $D_\zeta$ .**



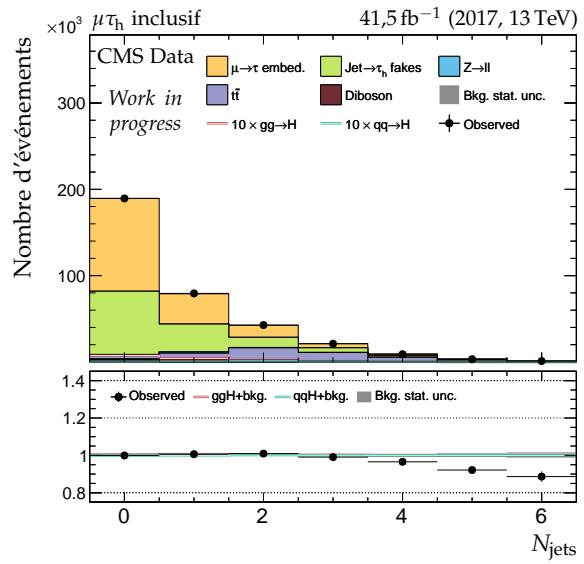
**Figure X.25 – Distributions de contrôle pour le canal  $\tau_h \tau_h$  en 2017 : dilepton et énergie transverse manquante.**



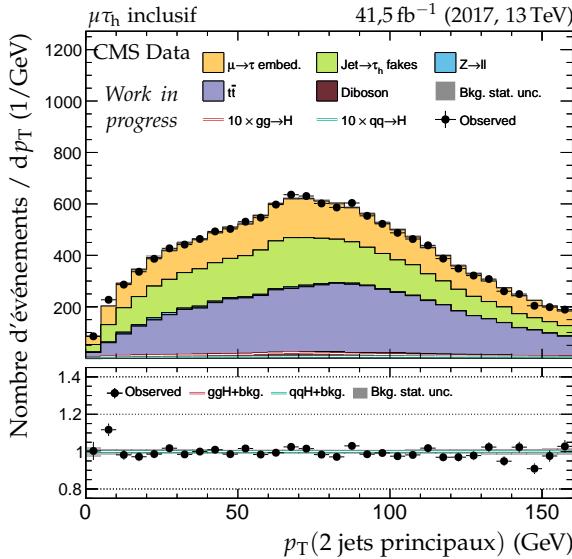
**Figure X.26 – Distributions de contrôle pour le canal  $\mu\tau_h$  en 2017 : cinématique des jets.**



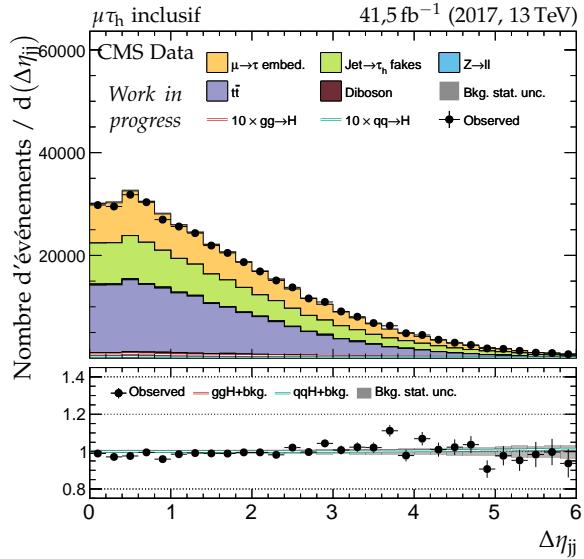
(a) Nombre de  $b$ -jets.



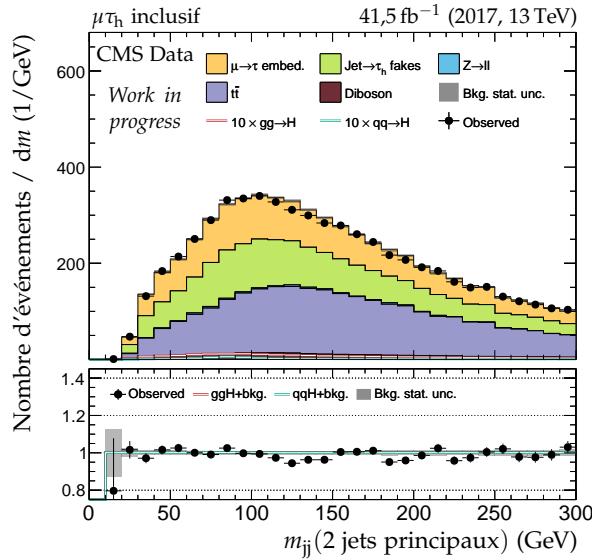
(b) Nombre de jets.



(c) Impulsion transverse du système des deux jets.

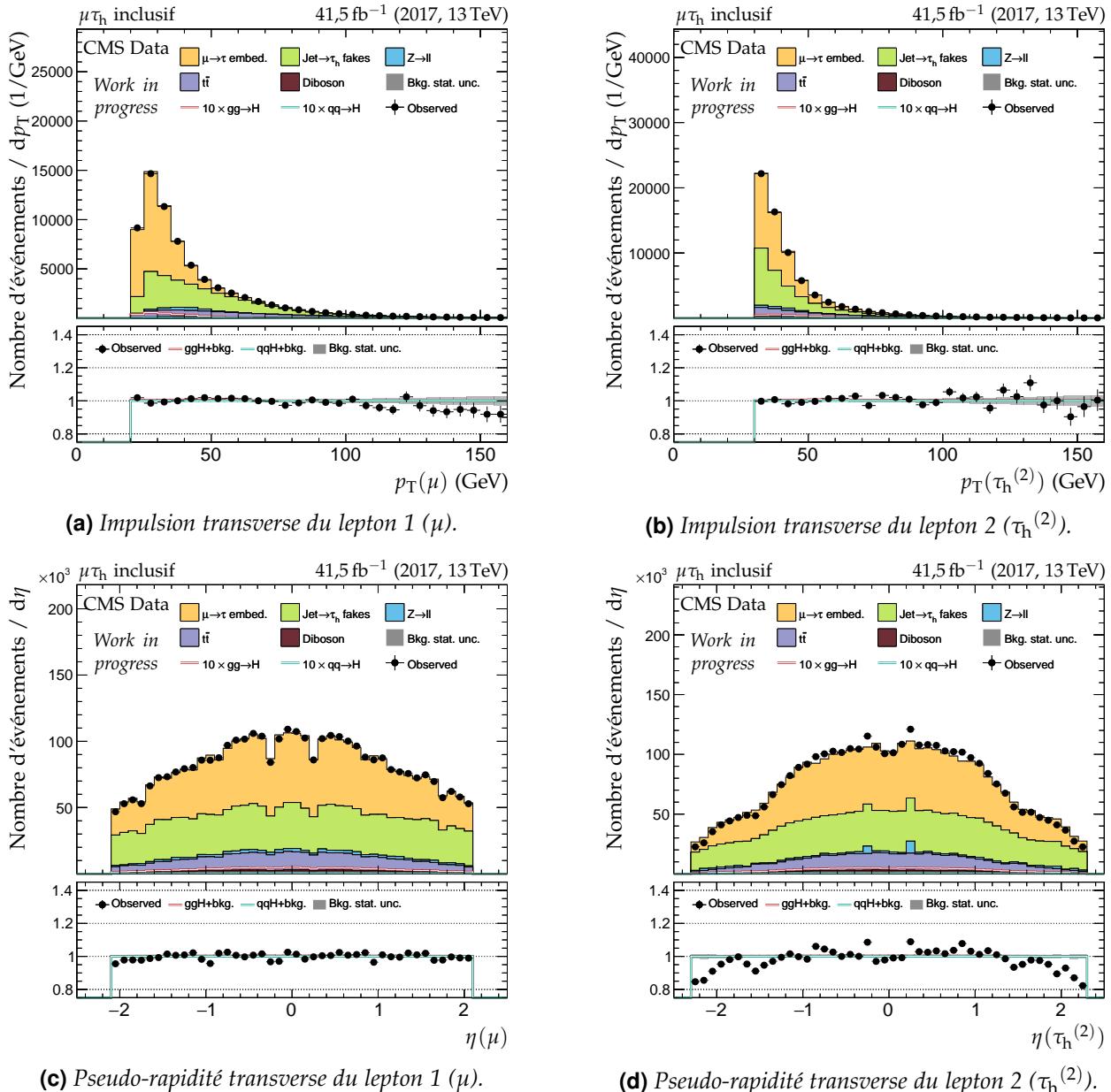


(d) Distance en  $\eta$  entre les deux jets.

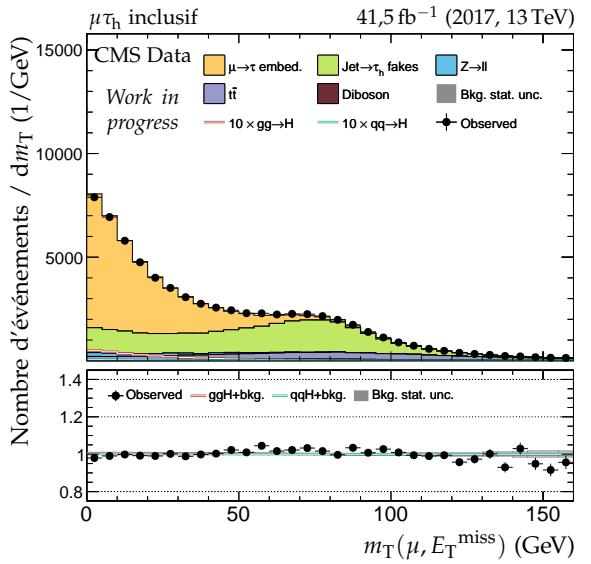


(e) Masse invariante du système des deux jets.

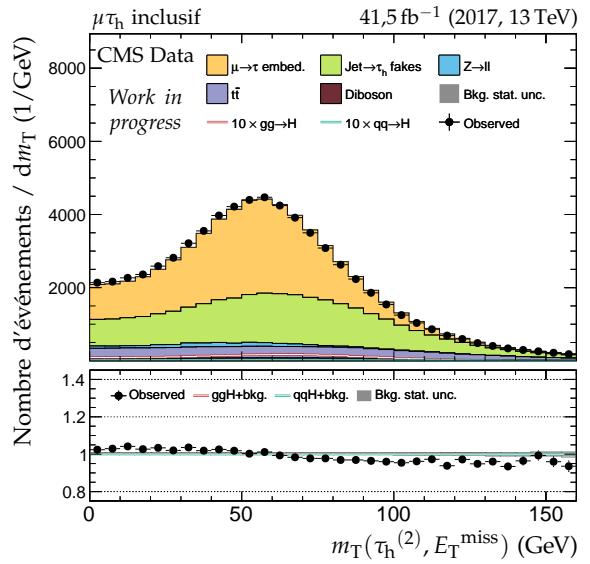
**Figure X.27** – Distributions de contrôle pour le canal  $\mu\tau_h$  en 2017 : nombre de jets et système des deux jets principaux.



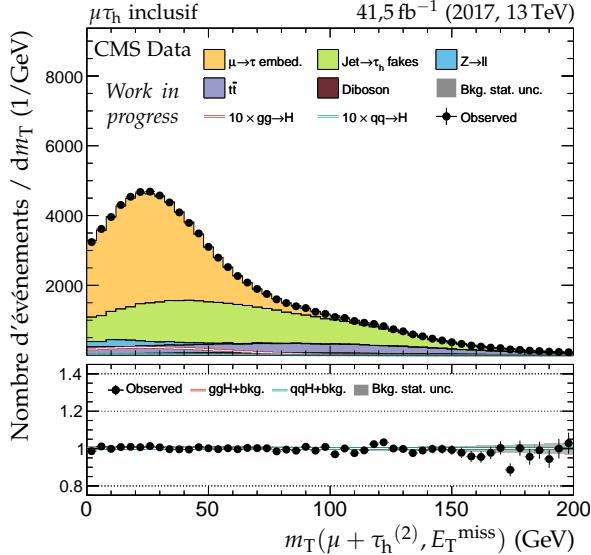
**Figure X.28 – Distributions de contrôle pour le canal  $\mu\tau_h$  en 2017 : cinématique des leptons ( $\mu, \tau_h^{(2)}$ ).**



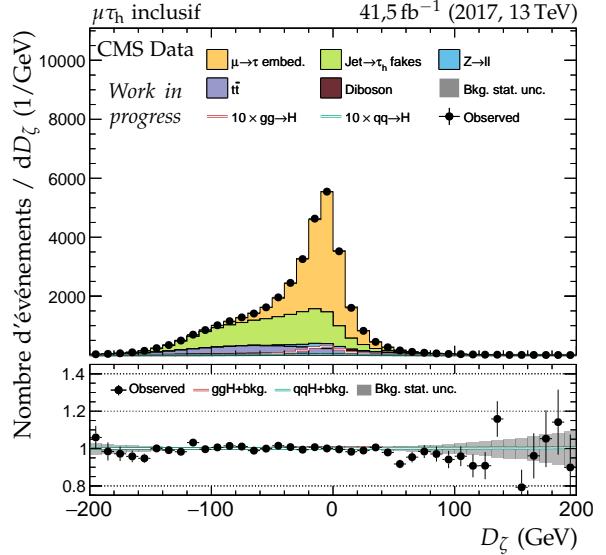
(a) Masse transverse du lepton 1 ( $\mu$ ).



(b) Masse transverse du lepton 2 ( $\tau_h^{(2)}$ ).

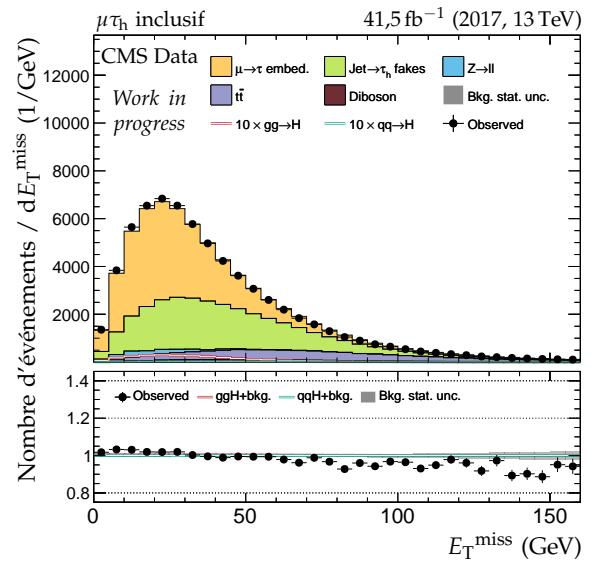
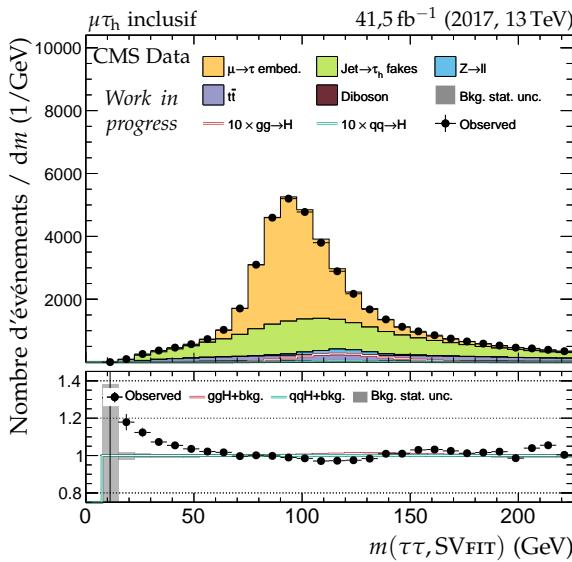
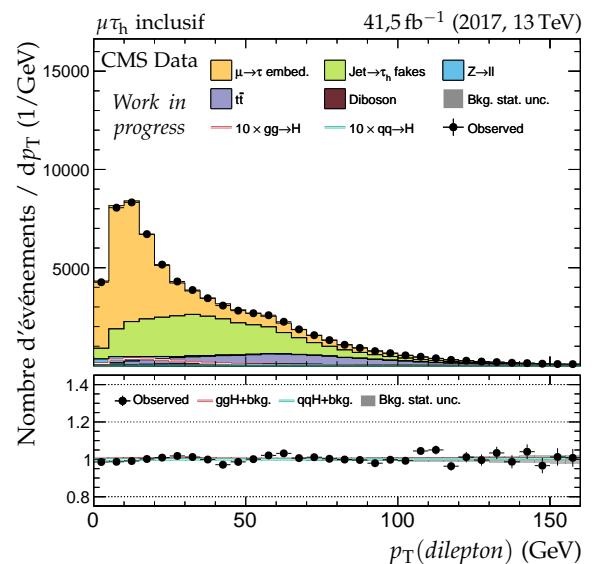
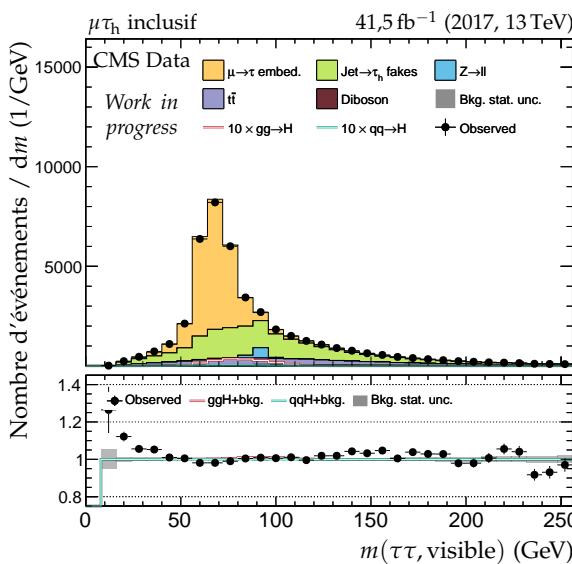
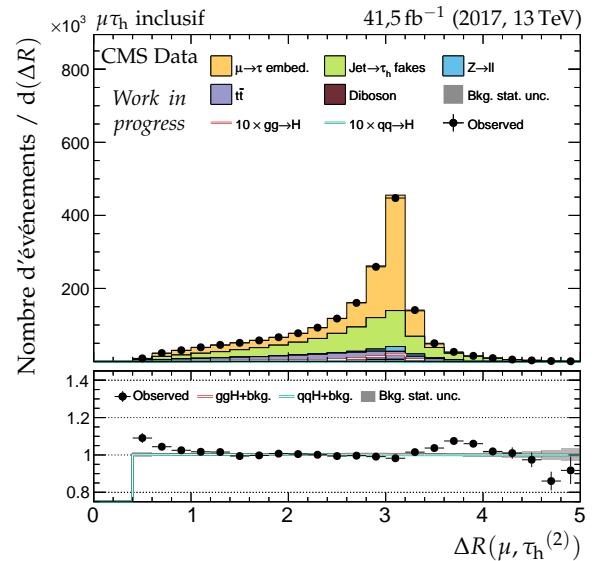
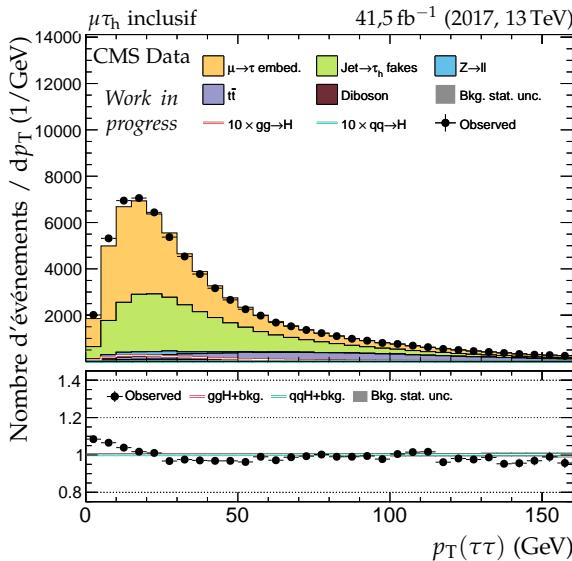


(c) Masse transverse du dilepton.

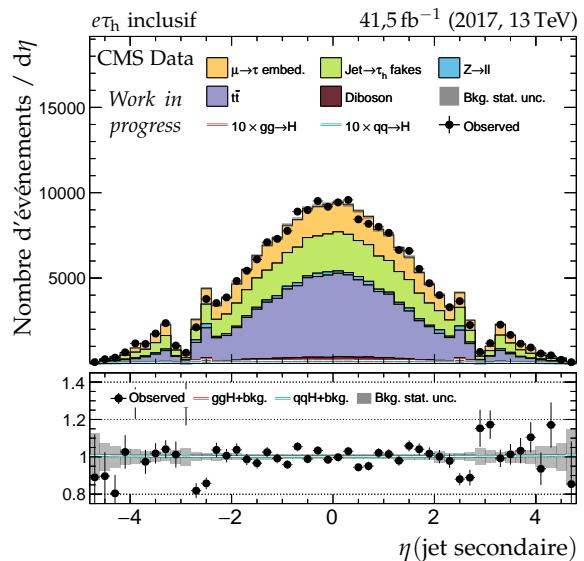
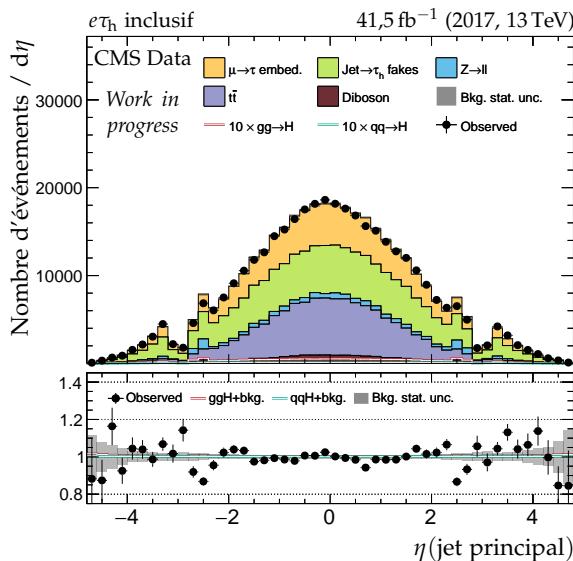
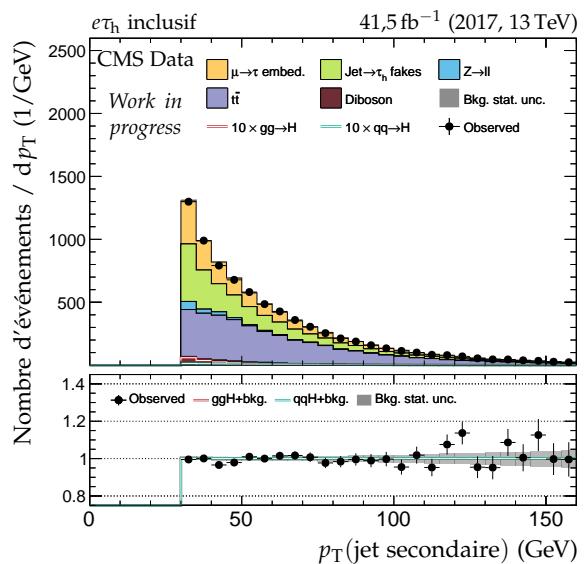
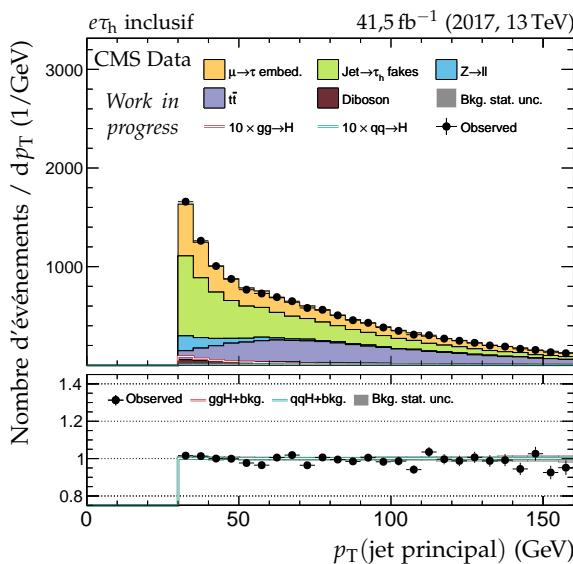
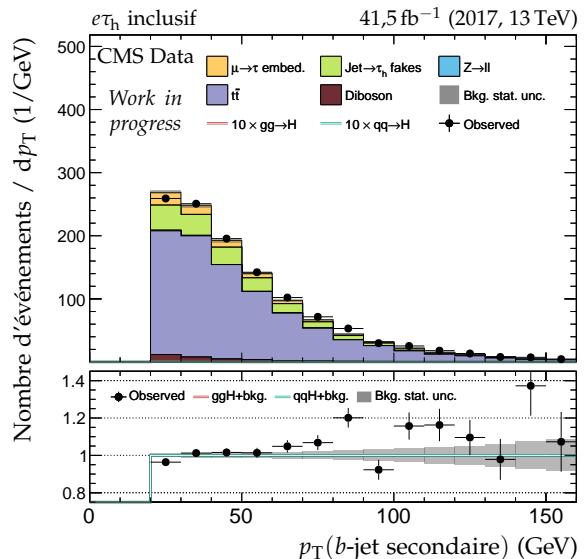
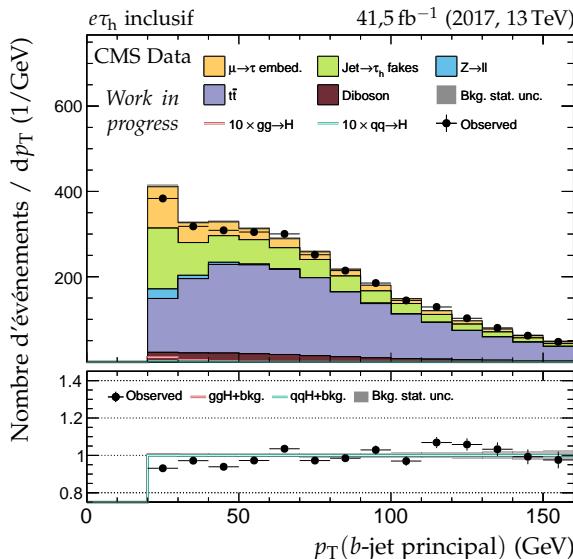


(d) Valeur de  $D_\zeta$ .

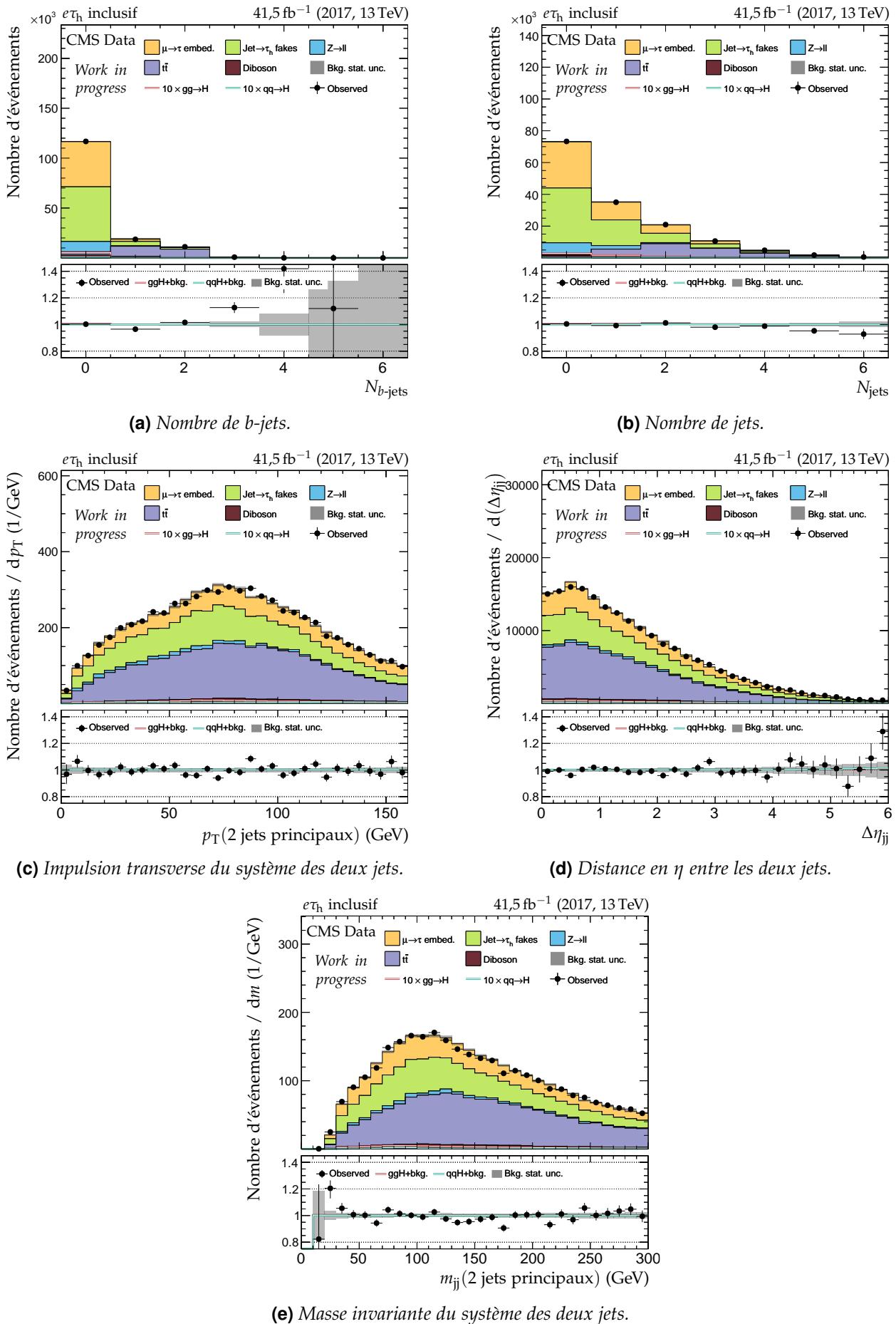
**Figure X.29** – Distributions de contrôle pour le canal  $\mu\tau_h$  en 2017 : masses transverses et  $D_\zeta$ .



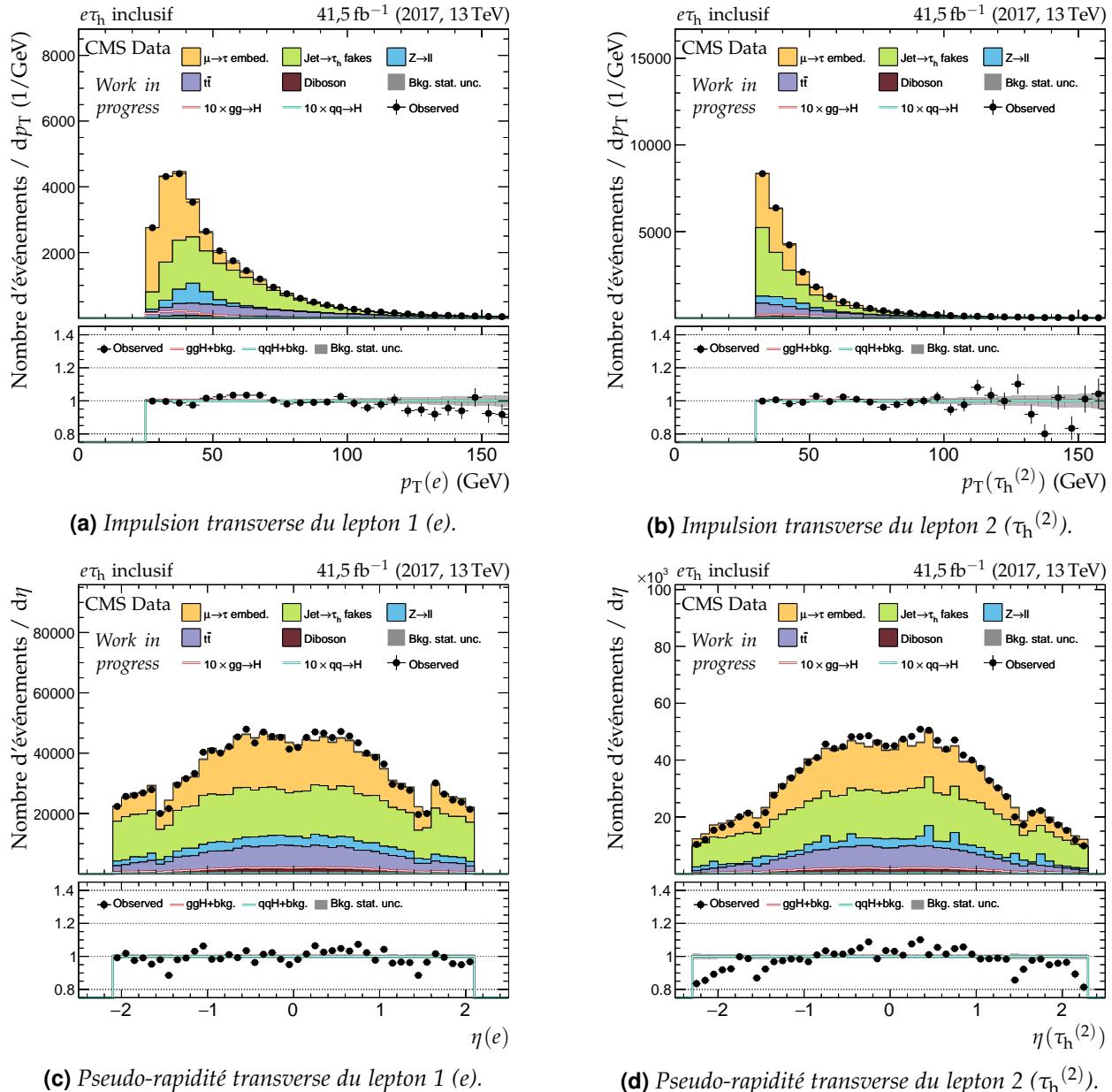
**Figure X.30 – Distributions de contrôle pour le canal  $\mu\tau_h$  en 2017 : dilepton et énergie transverse manquante.**



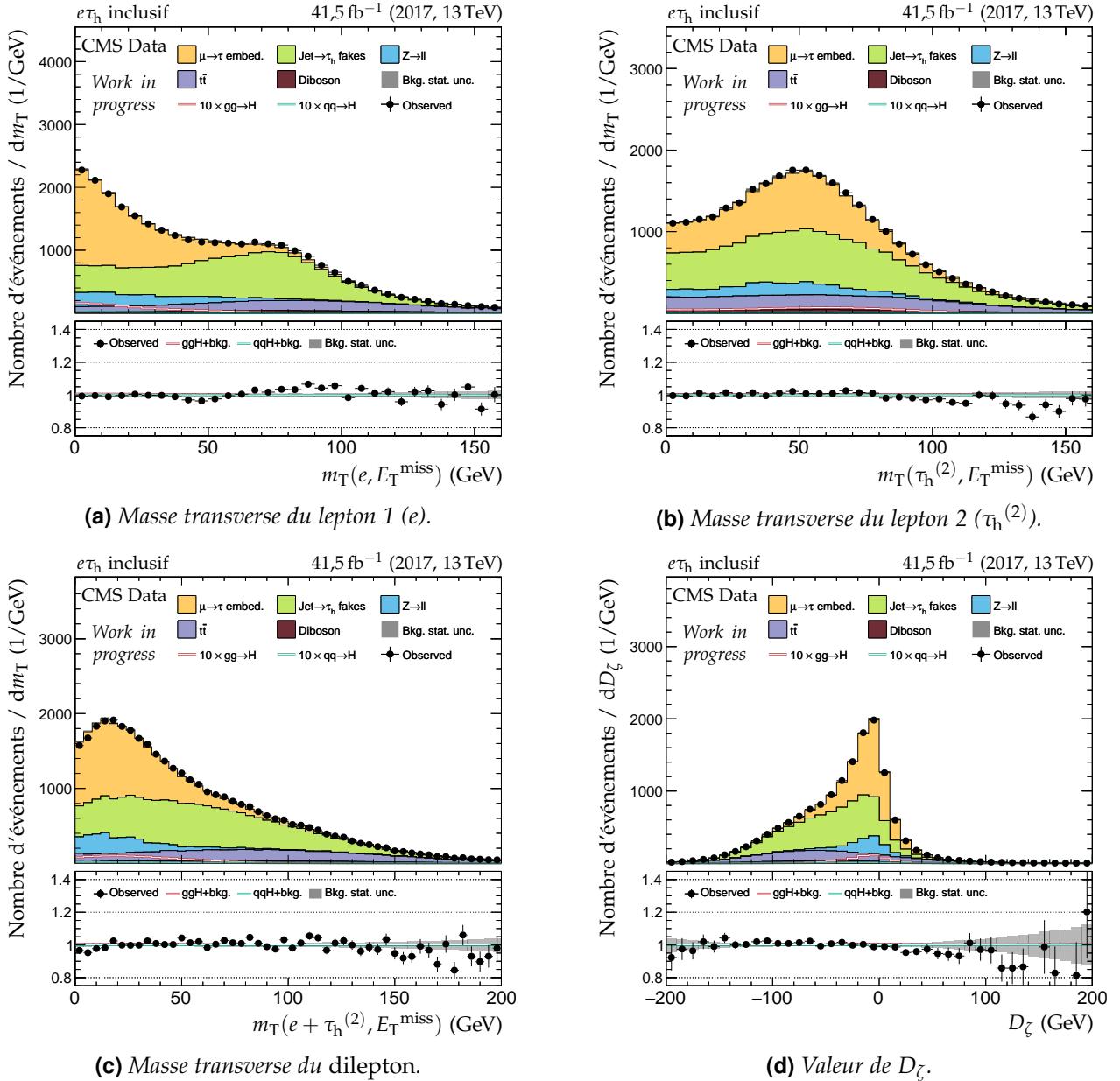
**Figure X.31** – Distributions de contrôle pour le canal  $e\tau_h$  en 2017 : cinématique des jets.



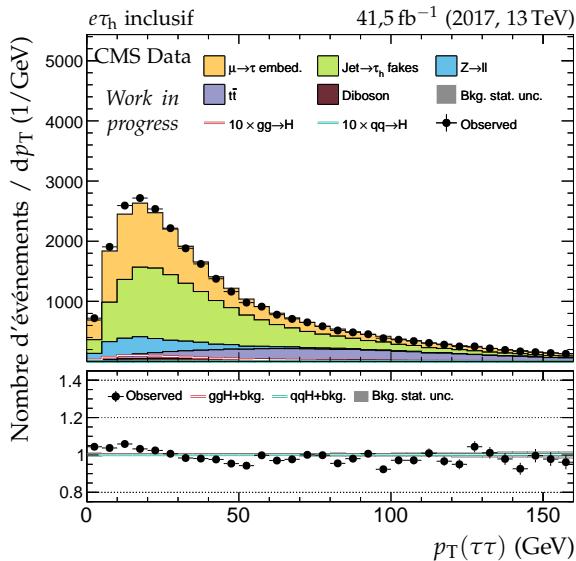
**Figure X.32 – Distributions de contrôle pour le canal  $e\tau_h$  en 2017 : nombre de jets et système des deux jets principaux.**



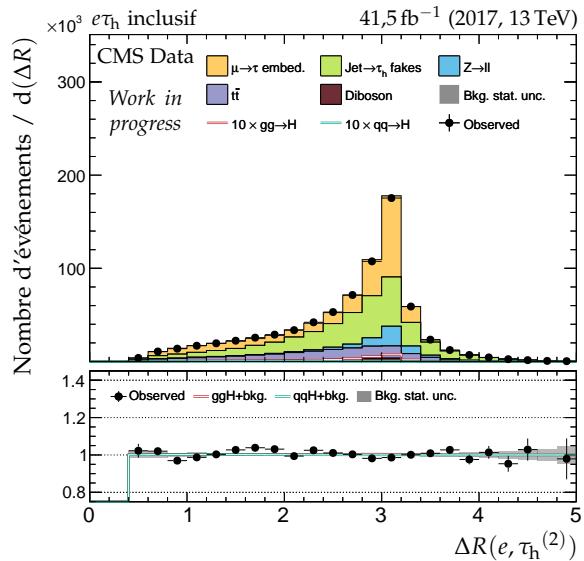
**Figure X.33 – Distributions de contrôle pour le canal  $e\tau_h$  en 2017 : cinématique des leptons ( $e, \tau_h^{(2)}$ ).**



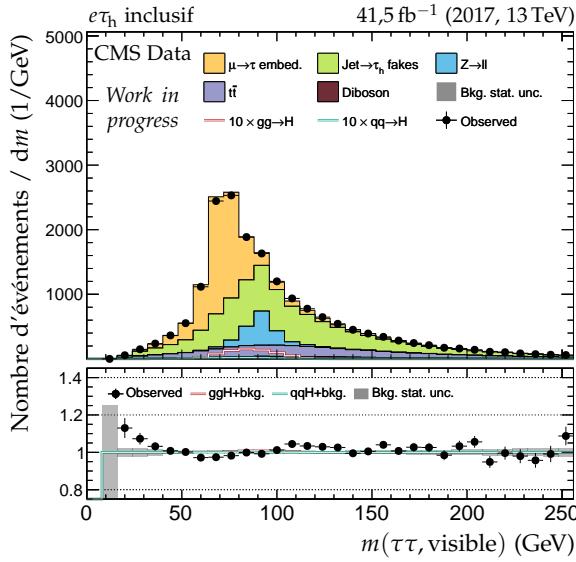
**Figure X.34 – Distributions de contrôle pour le canal  $e\tau_h$  en 2017 : masses transverses et  $D_\zeta$ .**



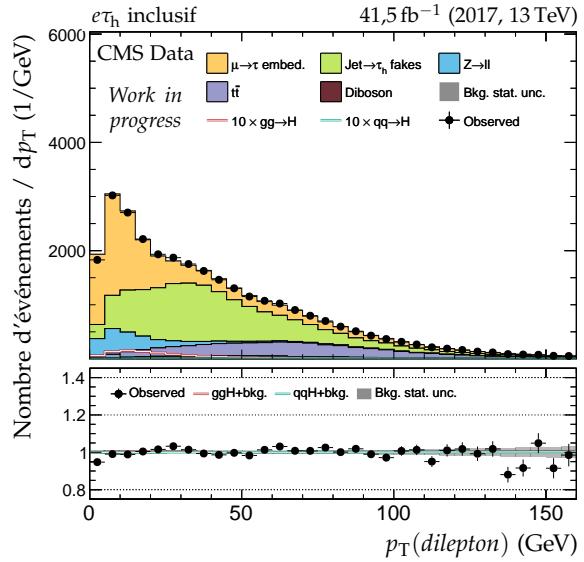
(a) Impulsion transverse du système di- $\tau$ .



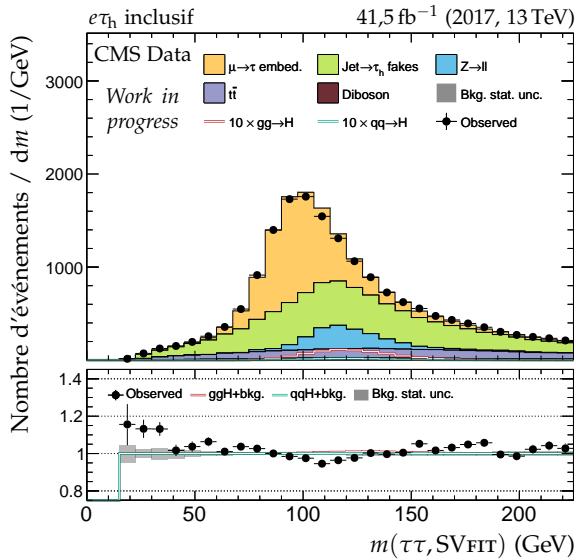
(b) Distance  $\Delta R$  entre les leptons ( $e, \tau_h^{(2)}$ ).



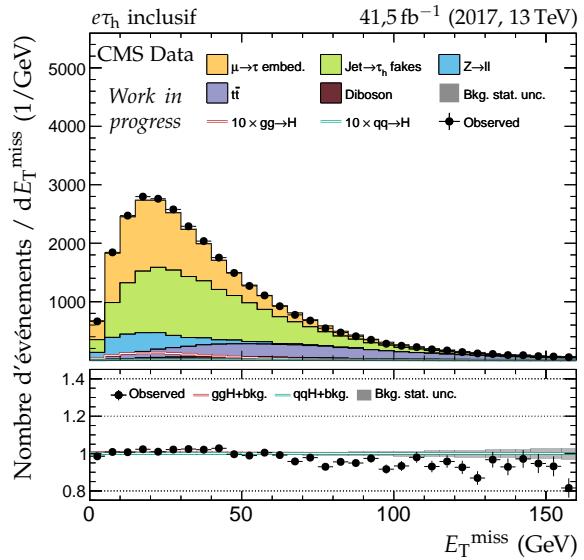
(c) Masse visible du système di- $\tau$ .



(d) Impulsion transverse du dilepton.

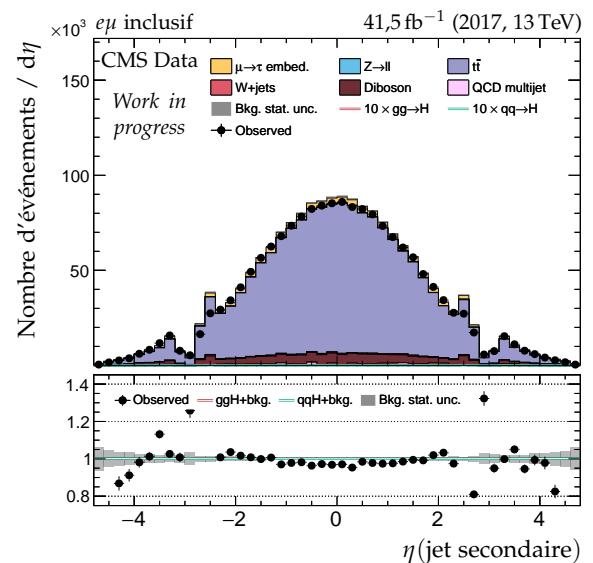
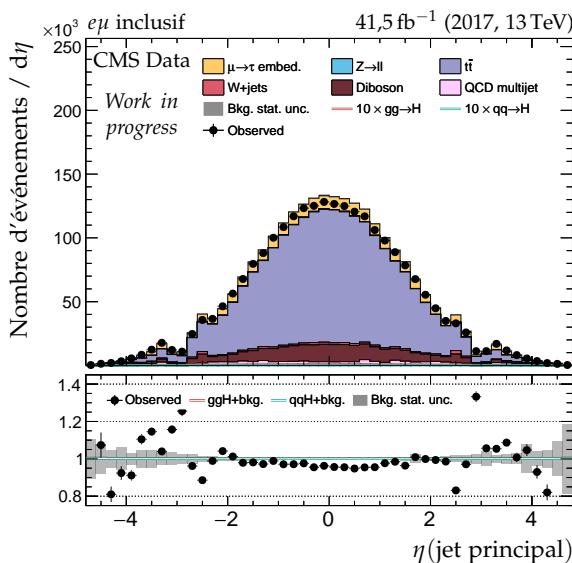
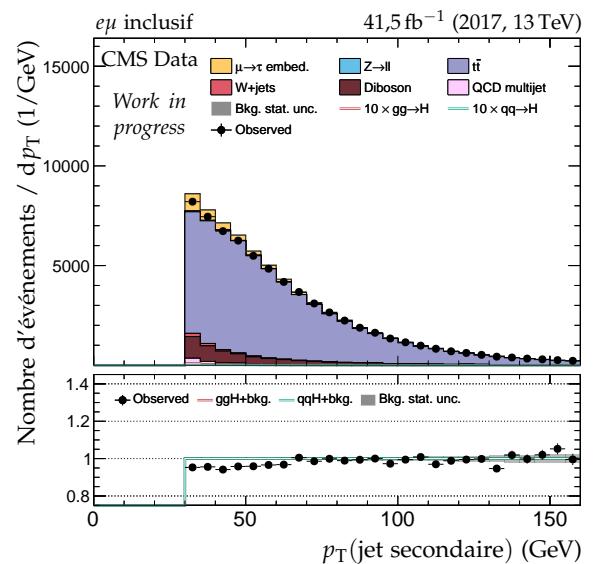
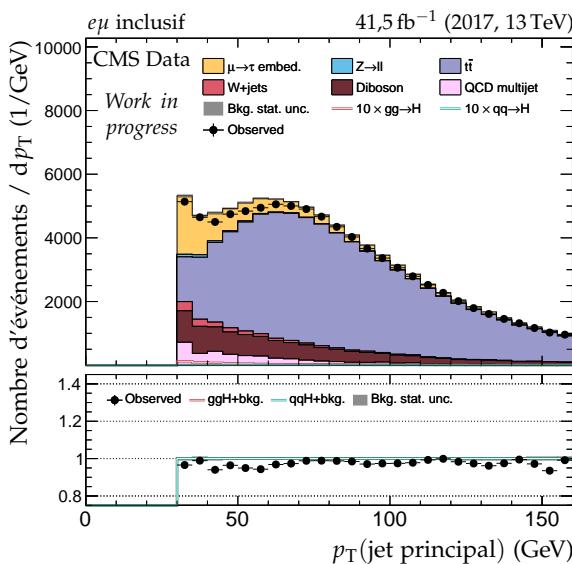
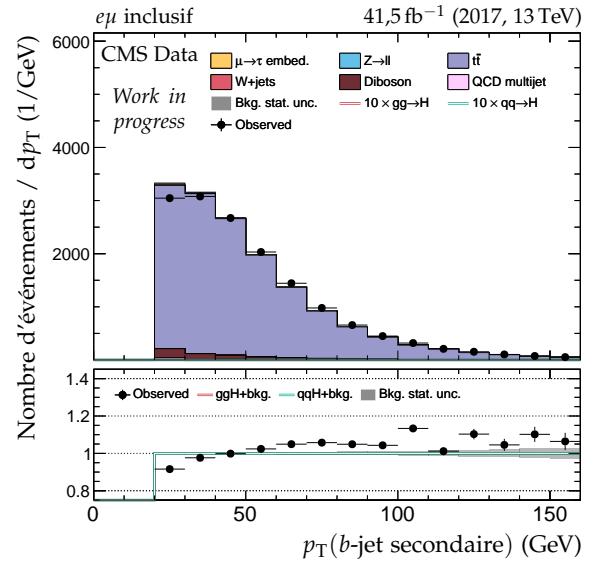
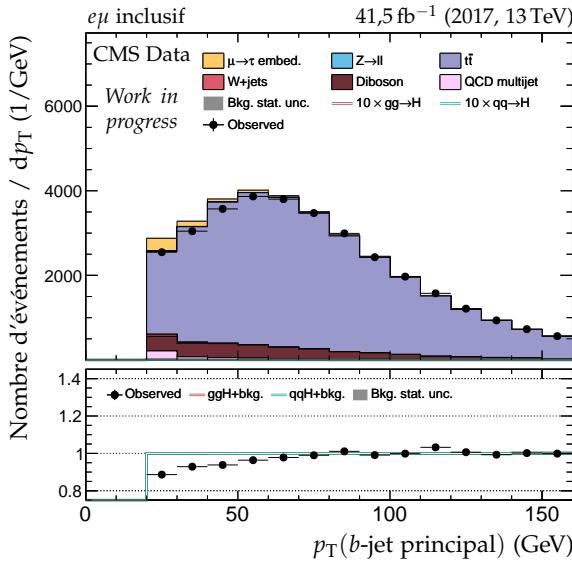


(e) Masse du système di- $\tau$  d'après SVFIT.

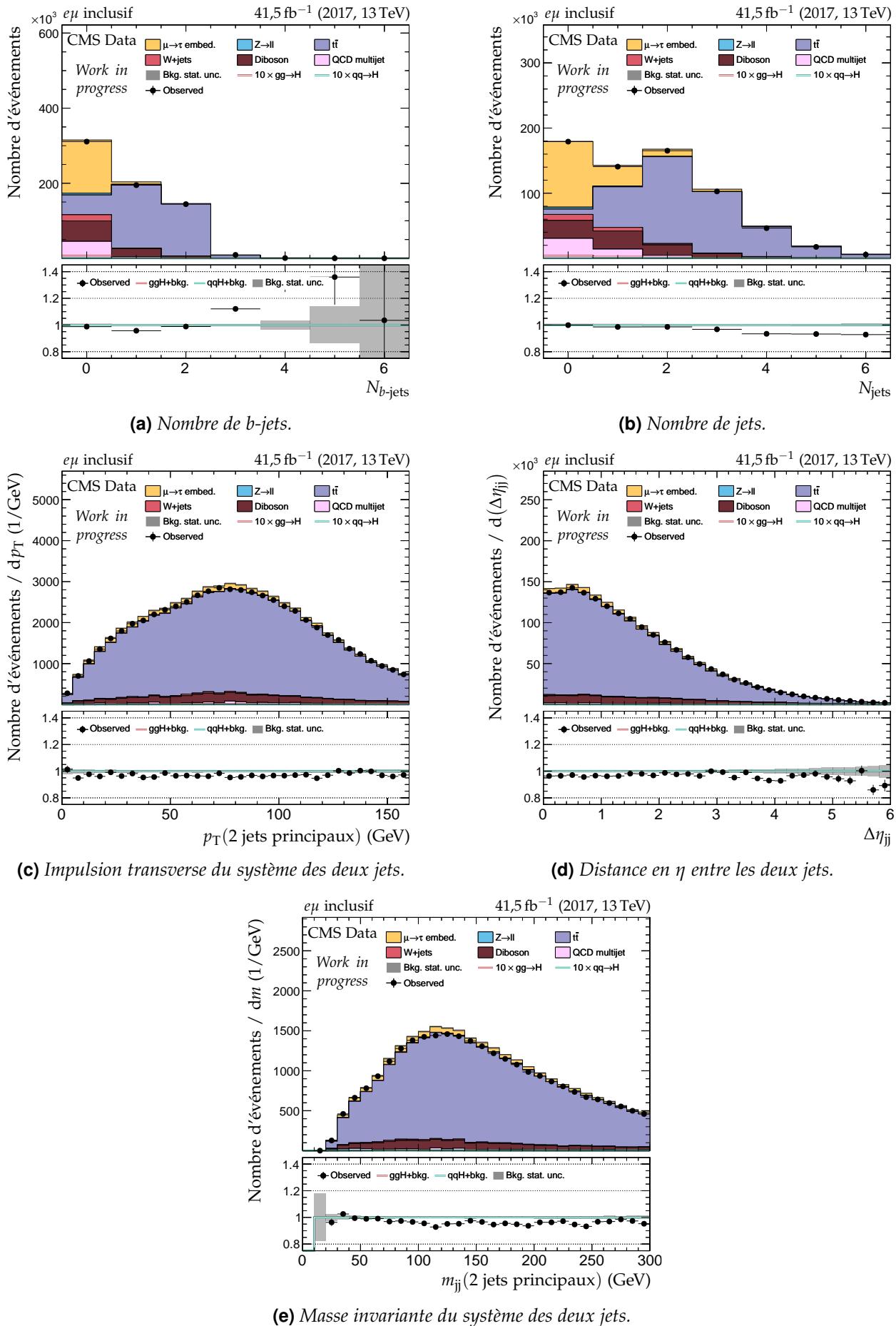


(f) Énergie transverse manquante.

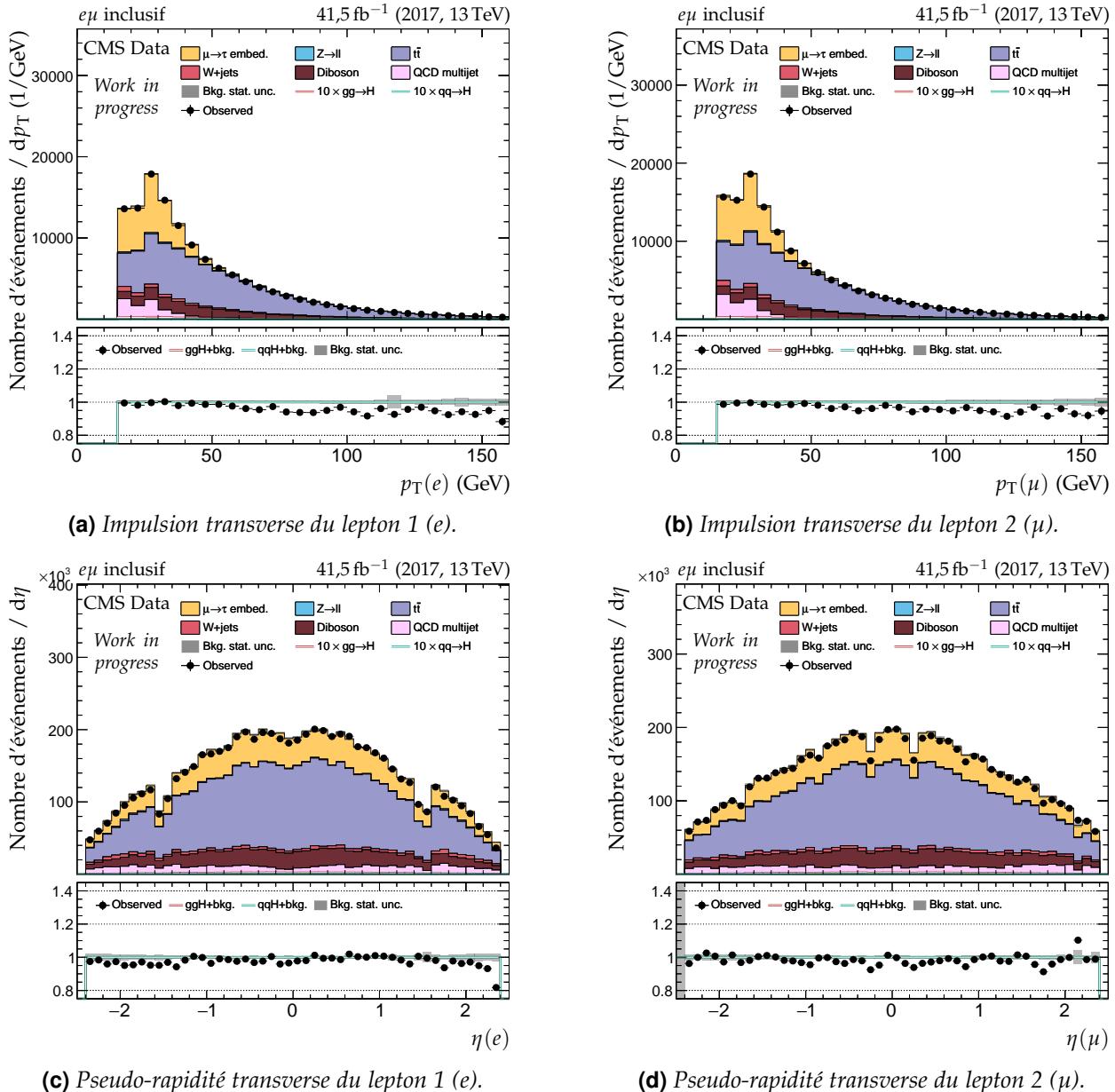
Figure X.35 – Distributions de contrôle pour le canal  $e\tau_h$  en 2017 : dilepton et énergie transverse manquante.



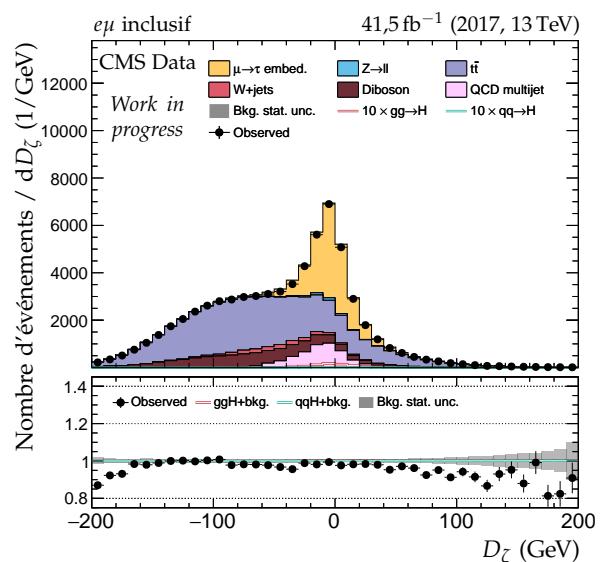
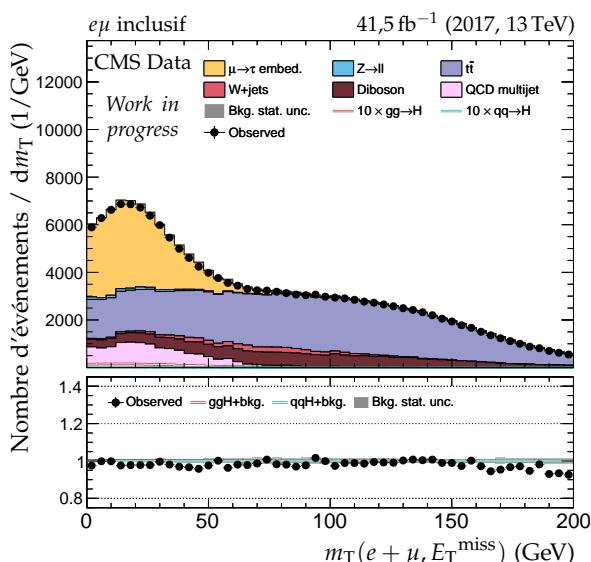
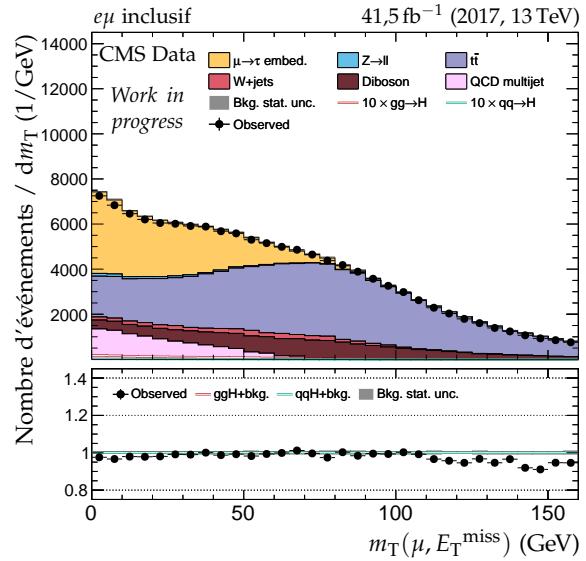
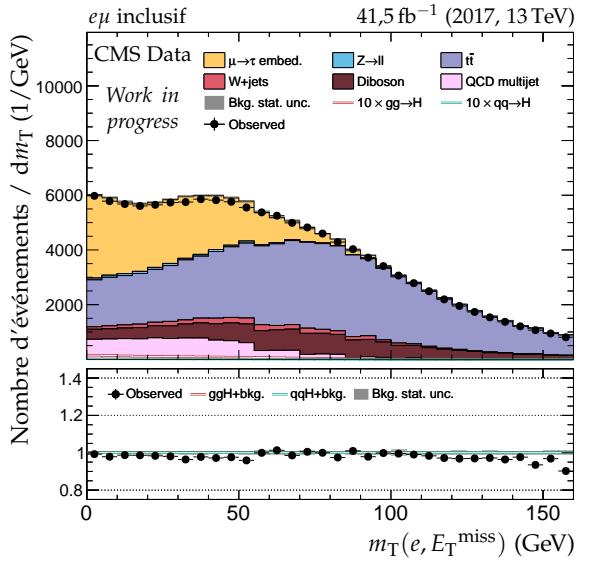
**Figure X.36 – Distributions de contrôle pour le canal  $e\mu$  en 2017 : cinématique des jets.**



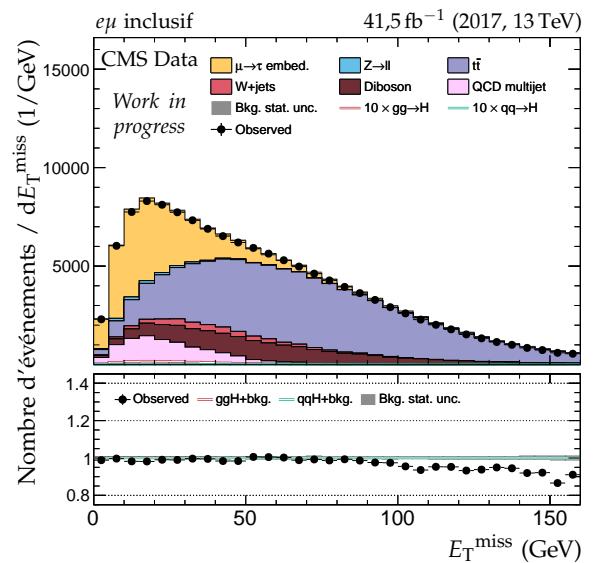
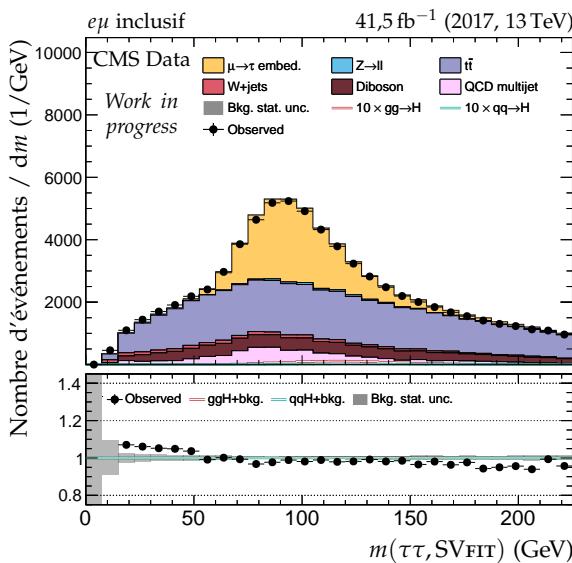
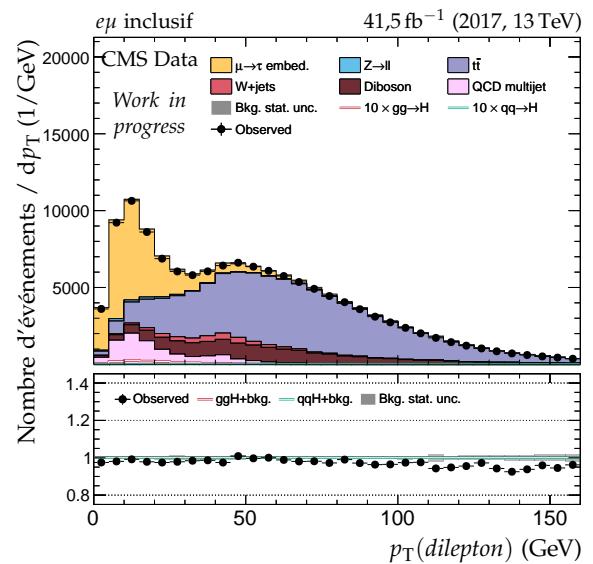
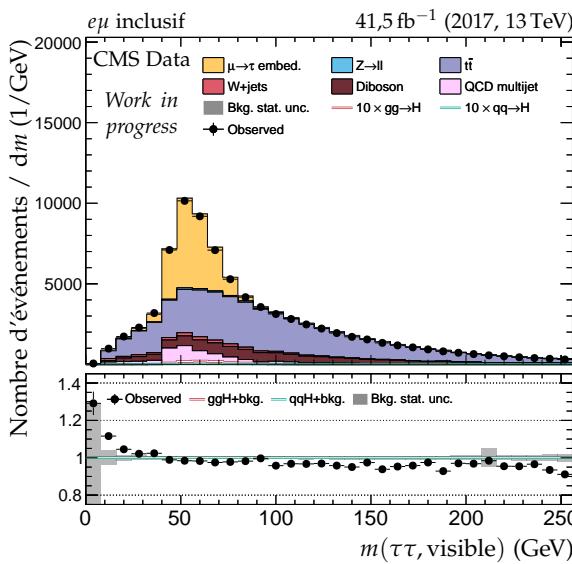
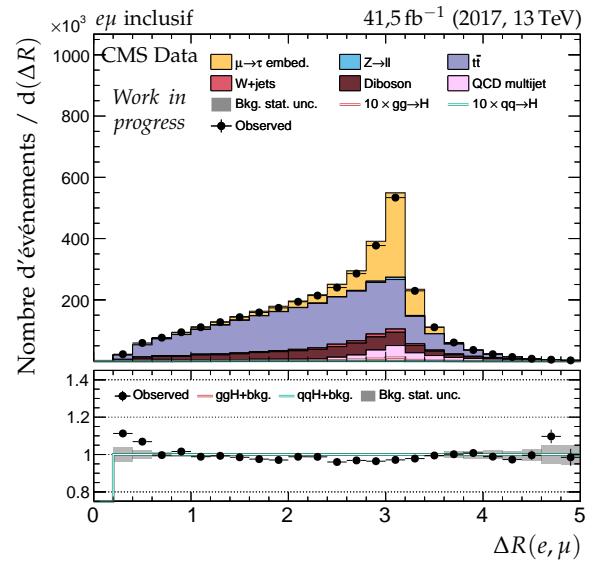
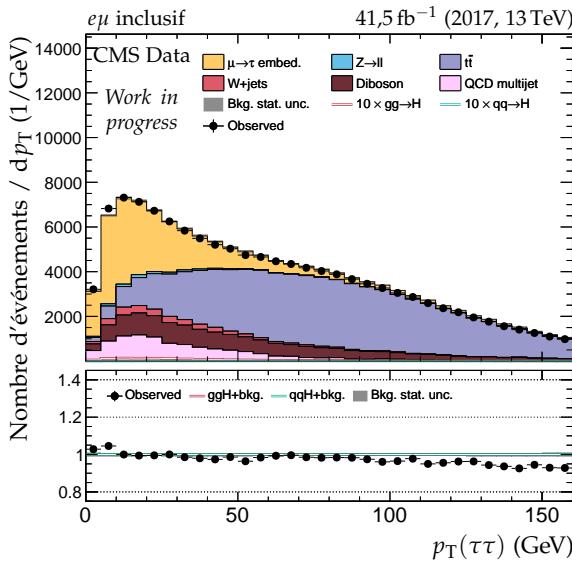
**Figure X.37** – Distributions de contrôle pour le canal  $e\mu$  en 2017 : nombre de jets et système des deux jets principaux.



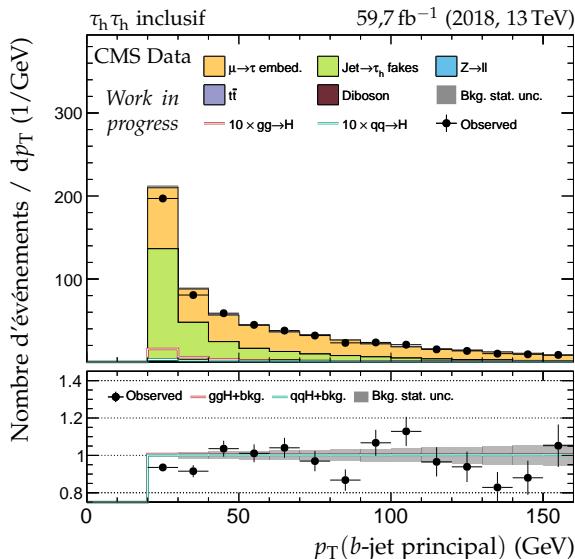
**Figure X.38 – Distributions de contrôle pour le canal  $e\mu$  en 2017 : cinématique des leptons ( $e, \mu$ ).**



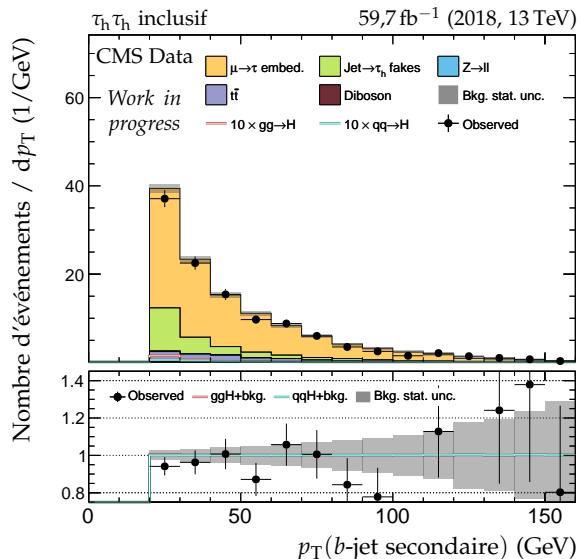
**Figure X.39** – Distributions de contrôle pour le canal  $e\mu$  en 2017 : masses transverses et  $D_\zeta$ .



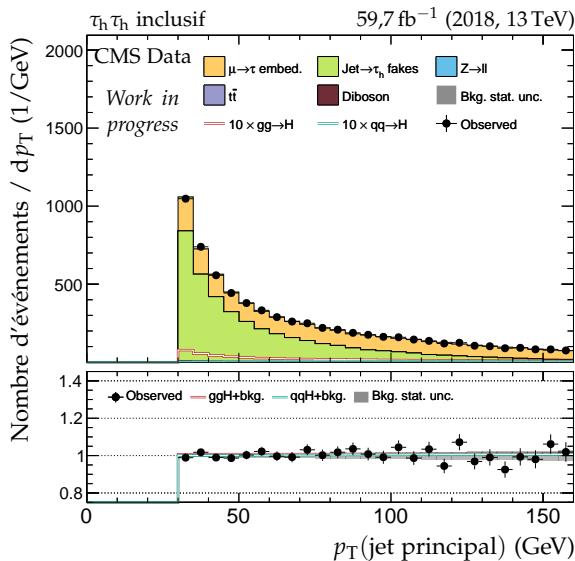
**Figure X.40 – Distributions de contrôle pour le canal  $e\mu$  en 2017 : dilepton et énergie transverse manquante.**



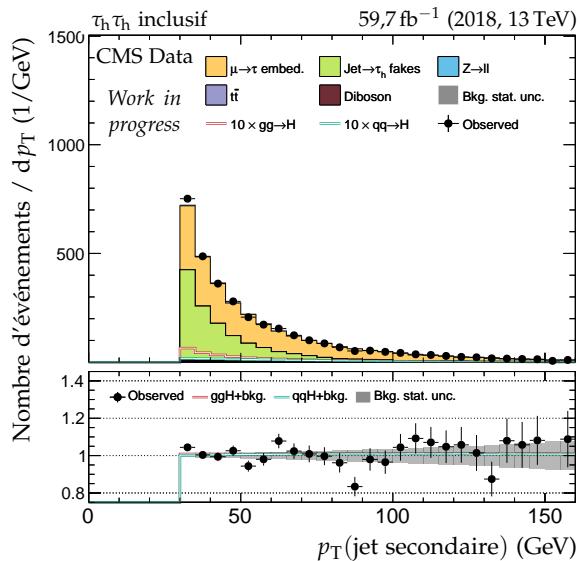
(a) Impulsion transverse du b-jet principal.



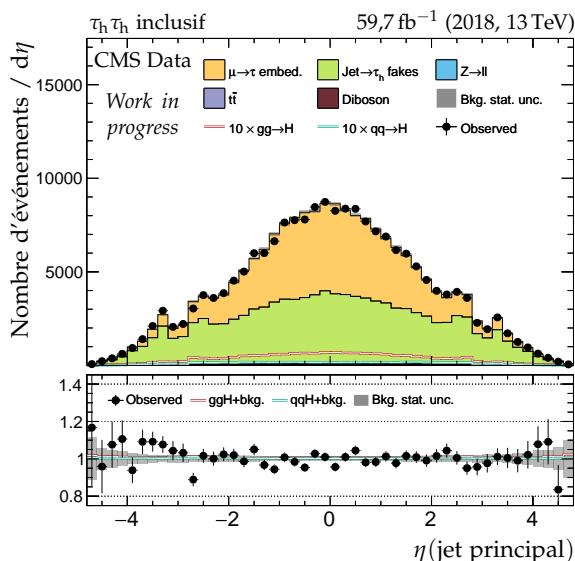
(b) Impulsion transverse du b-jet secondaire.



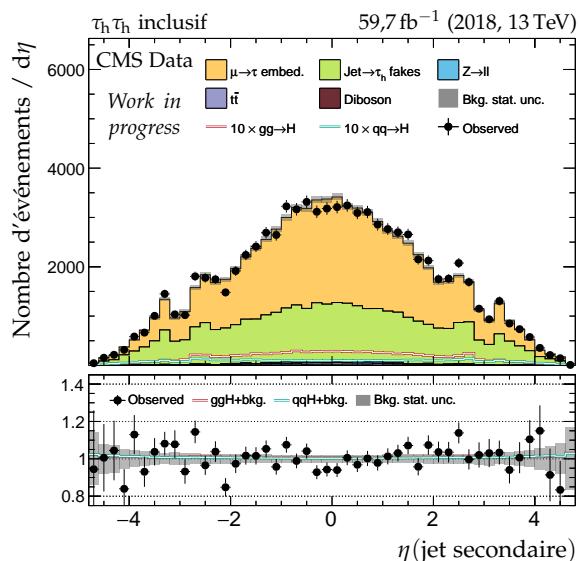
(c) Impulsion transverse du jet principal.



(d) Impulsion transverse du jet secondaire.

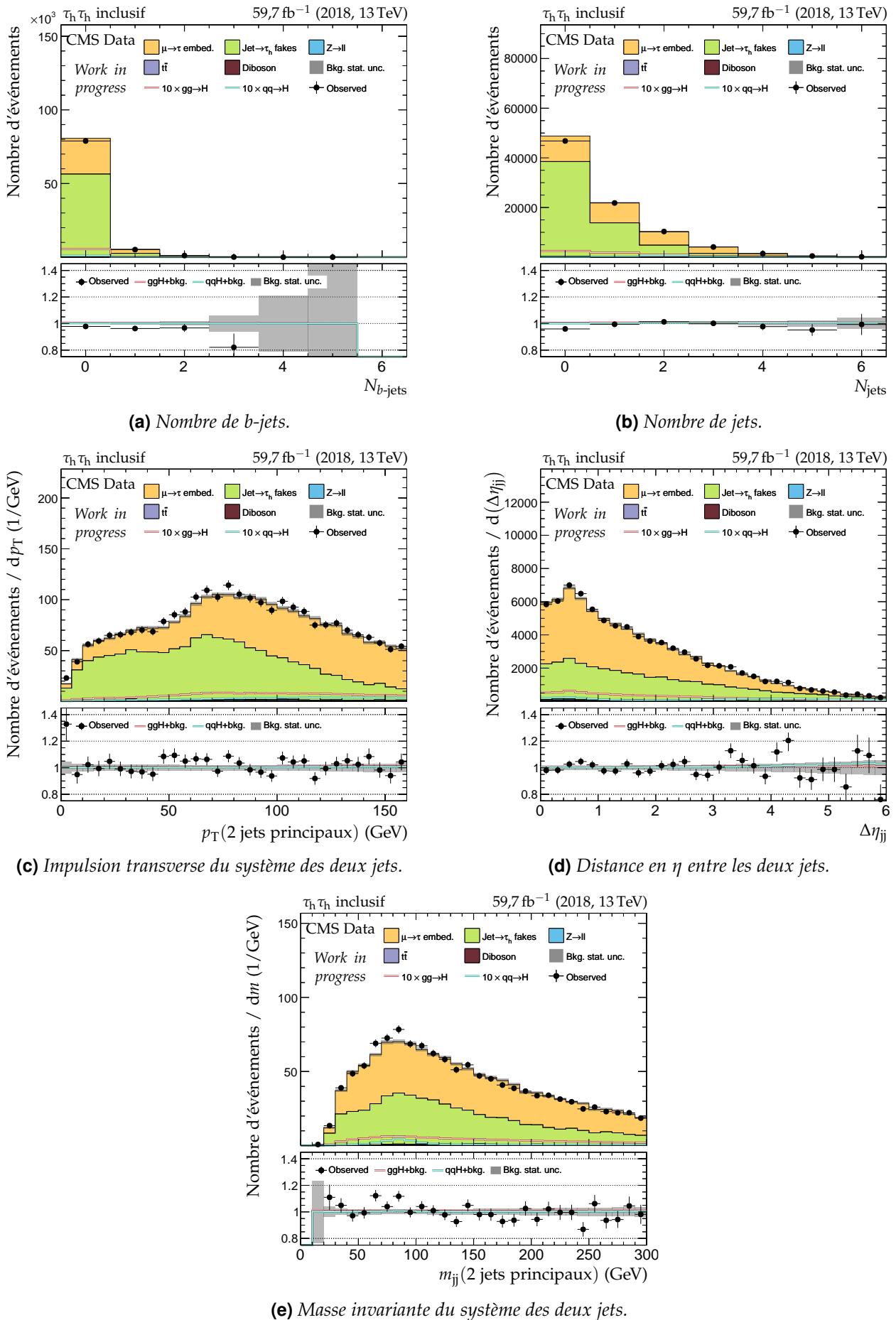


(e) Pseudo-rapidité du jet principal.

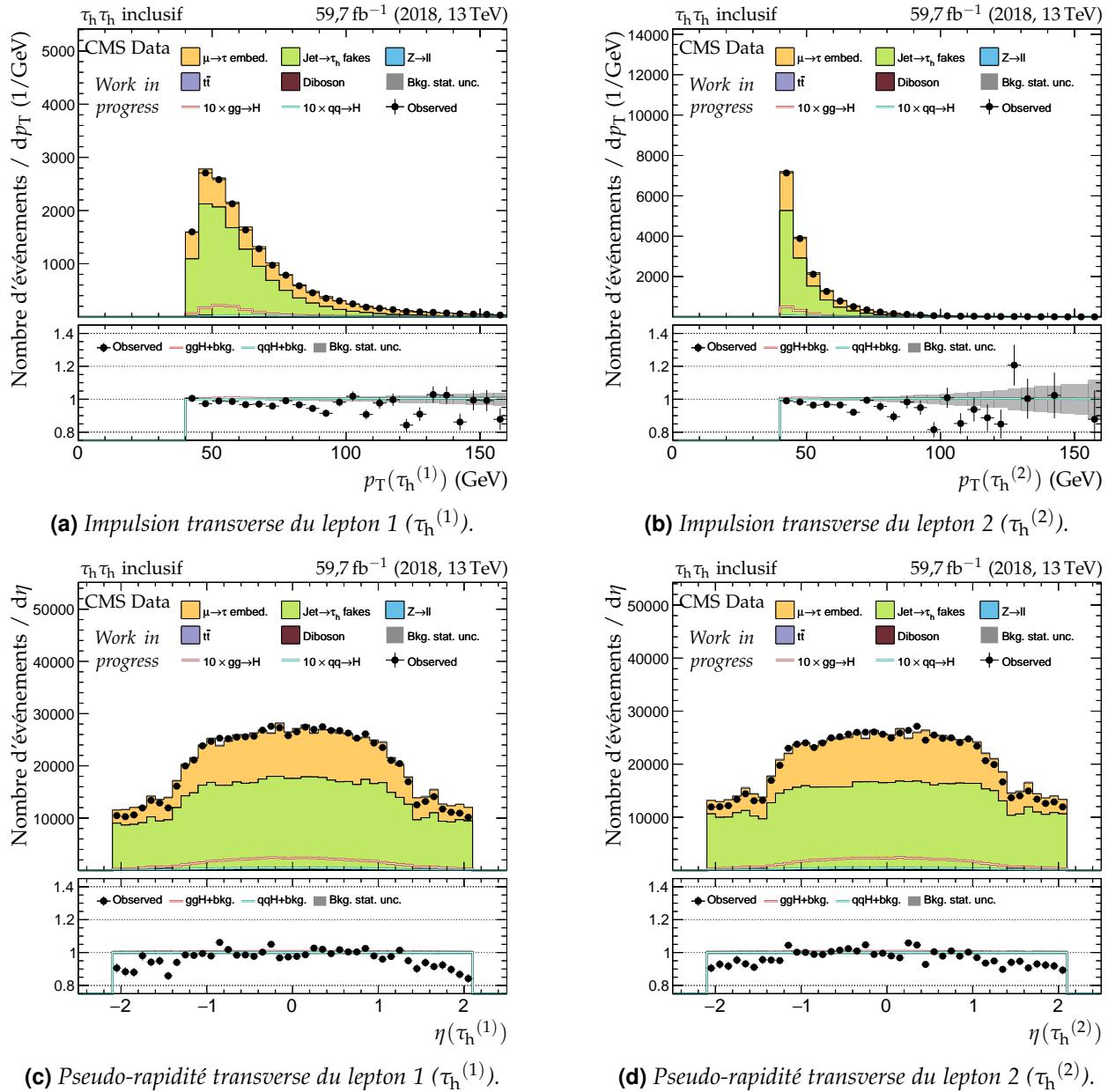


(f) Pseudo-rapidité du jet secondaire.

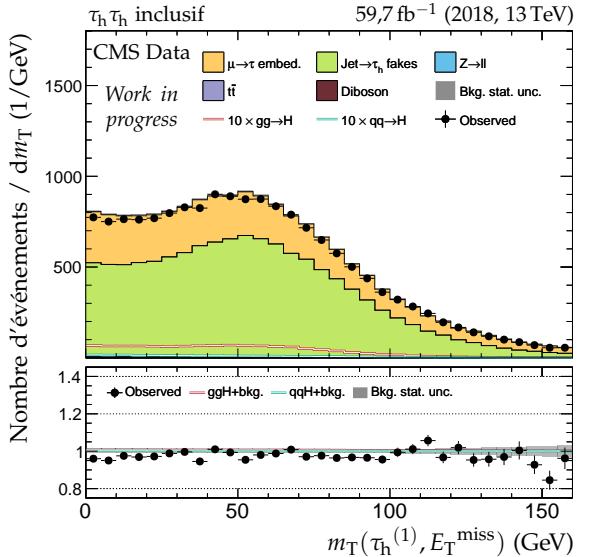
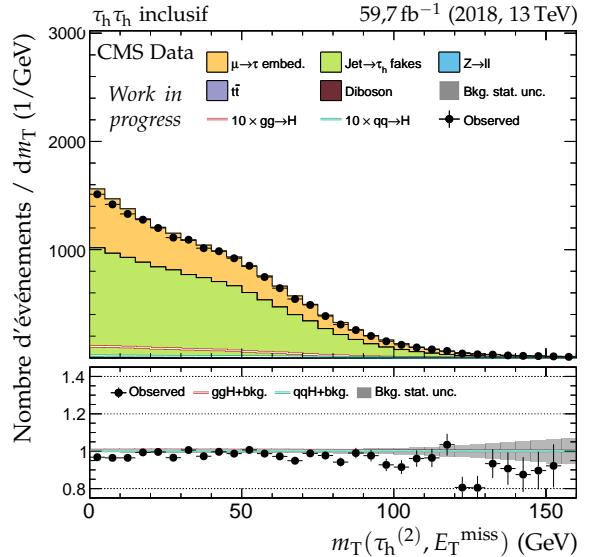
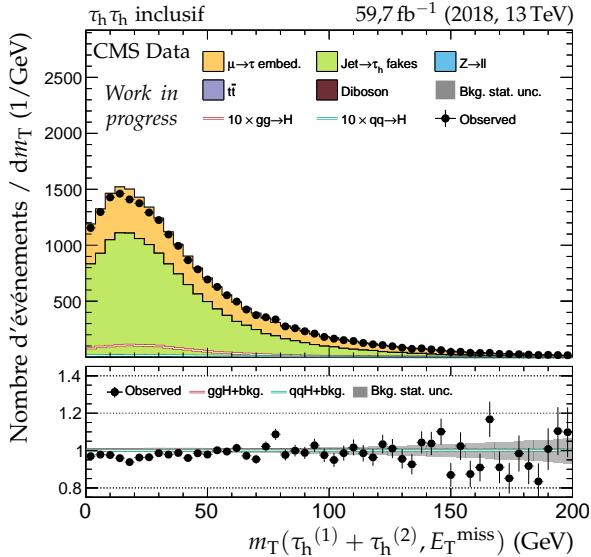
Figure X.41 – Distributions de contrôle pour le canal  $\tau_h \tau_h$  en 2018 : cinématique des jets.



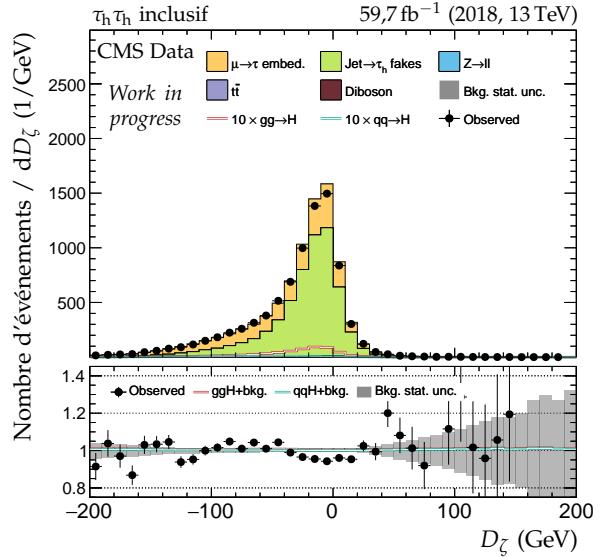
**Figure X.42 – Distributions de contrôle pour le canal  $\tau_h \tau_h$  en 2018 : nombre de jets et système des deux jets principaux.**

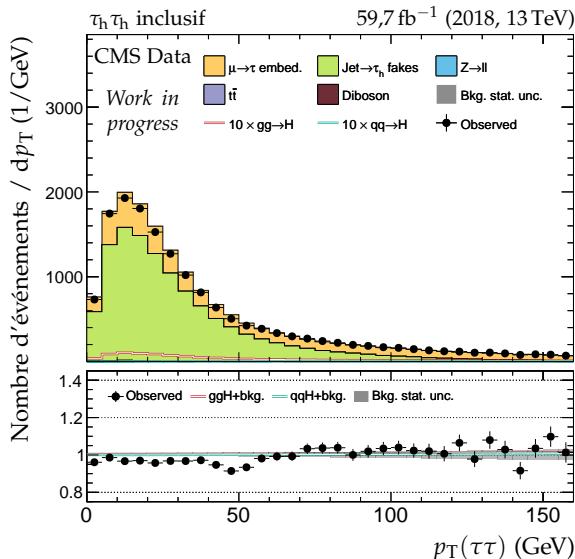


**Figure X.43 – Distributions de contrôle pour le canal  $\tau_h\tau_h$  en 2018 : cinématique des leptons ( $\tau_h^{(1)}, \tau_h^{(2)}$ ).**

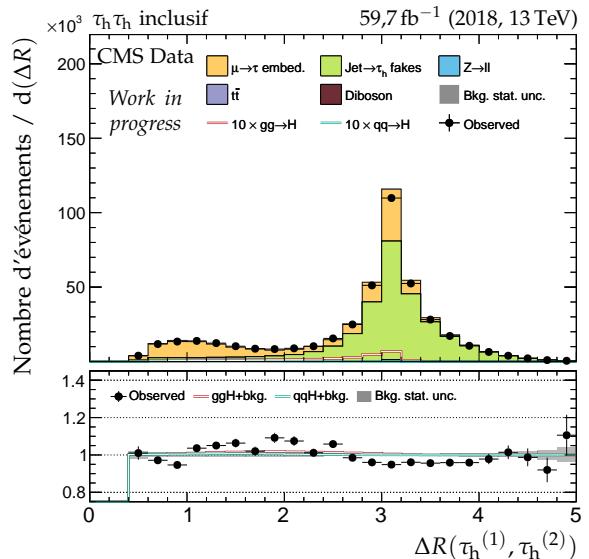
(a) Masse transverse du lepton 1 ( $\tau_h^{(1)}$ ).(b) Masse transverse du lepton 2 ( $\tau_h^{(2)}$ ).

(c) Masse transverse du dilepton.

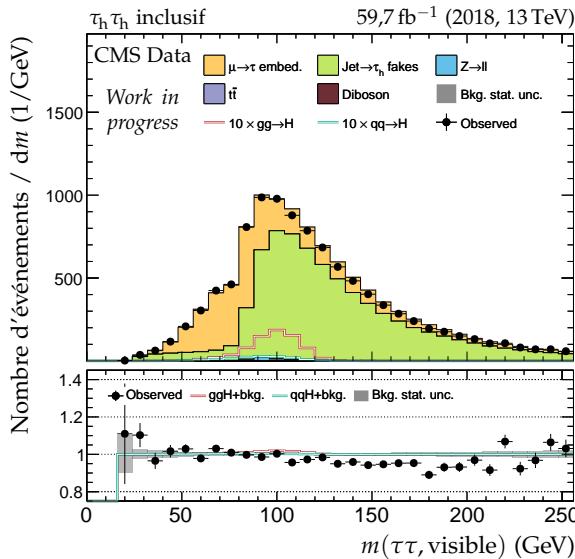
(d) Valeur de  $D_\zeta$ .**Figure X.44 – Distributions de contrôle pour le canal  $\tau_h \tau_h$  en 2018 : masses transverses et  $D_\zeta$ .**



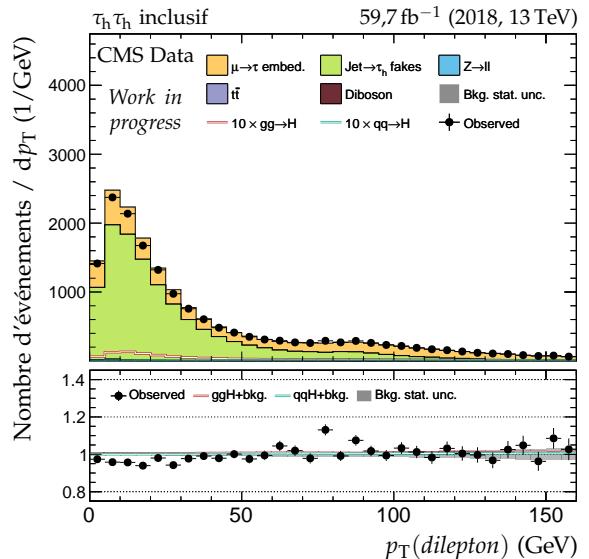
(a) Impulsion transverse du système di- $\tau$ .



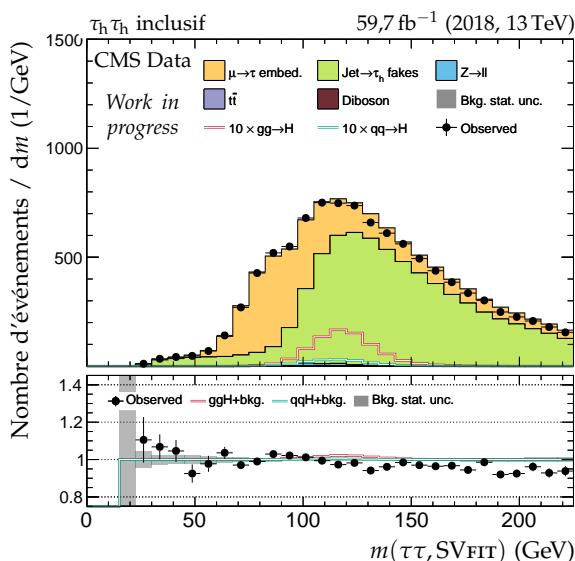
(b) Distance  $\Delta R$  entre les leptons ( $\tau_h^{(1)}, \tau_h^{(2)}$ ).



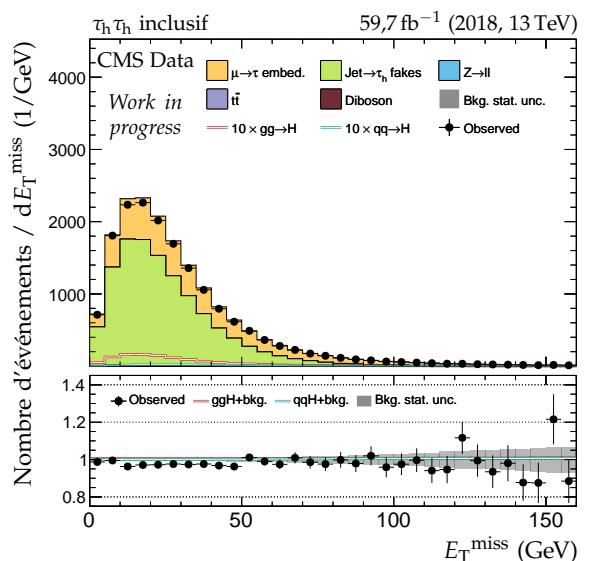
(c) Masse visible du système di- $\tau$ .



(d) Impulsion transverse du dilepton.

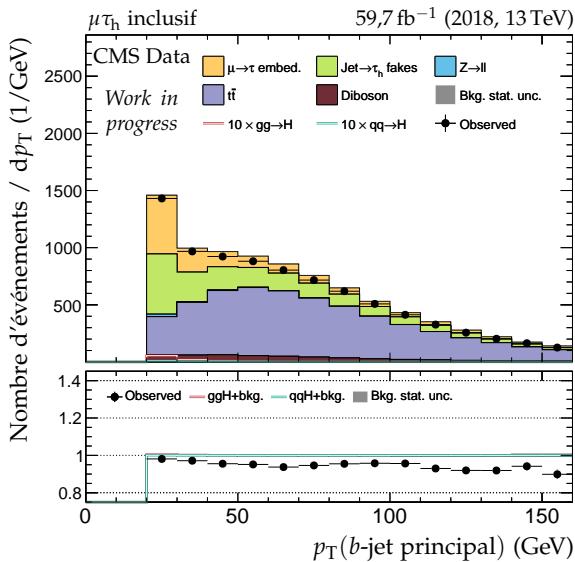


(e) Masse du système di- $\tau$  d'après SVFIT.

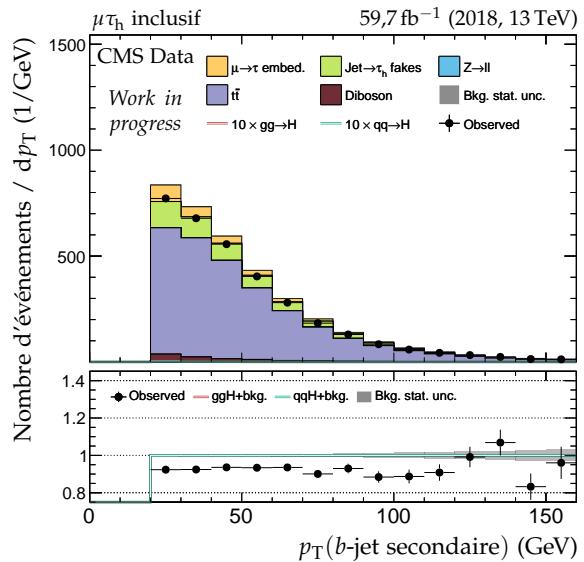


(f) Énergie transverse manquante.

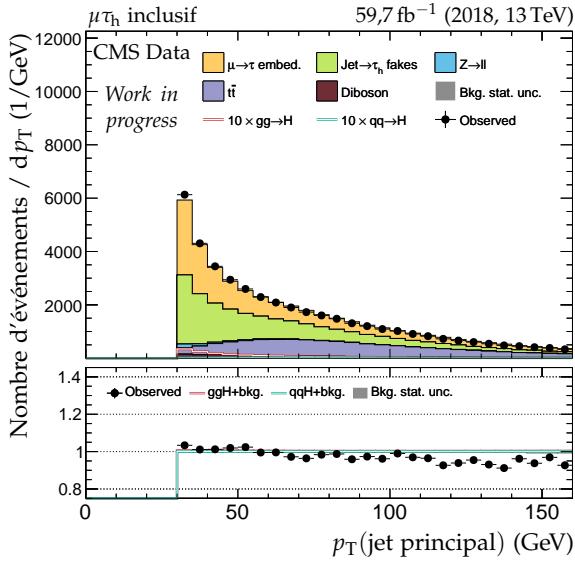
Figure X.45 – Distributions de contrôle pour le canal  $\tau_h \tau_h$  en 2018 : dilepton et énergie transverse manquante.



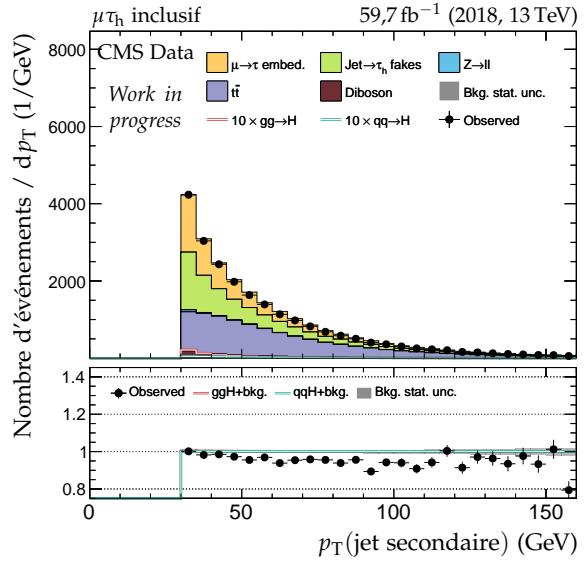
(a) Impulsion transverse du b-jet principal.



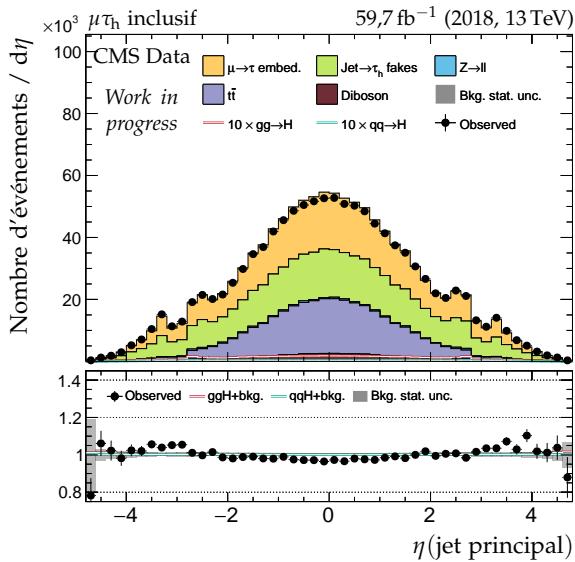
(b) Impulsion transverse du b-jet secondaire.



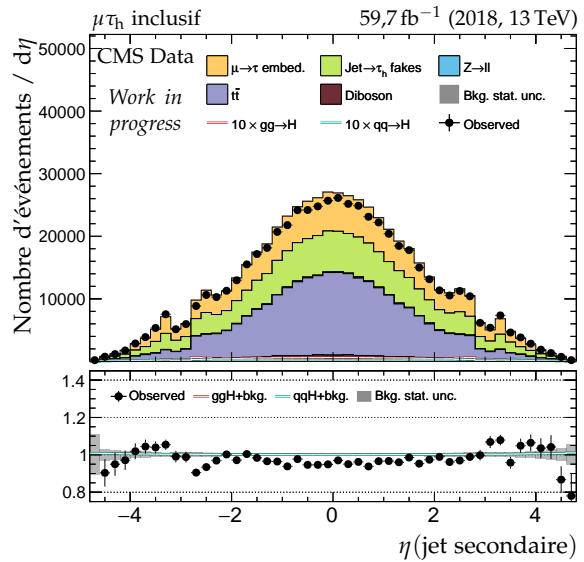
(c) Impulsion transverse du jet principal.



(d) Impulsion transverse du jet secondaire.

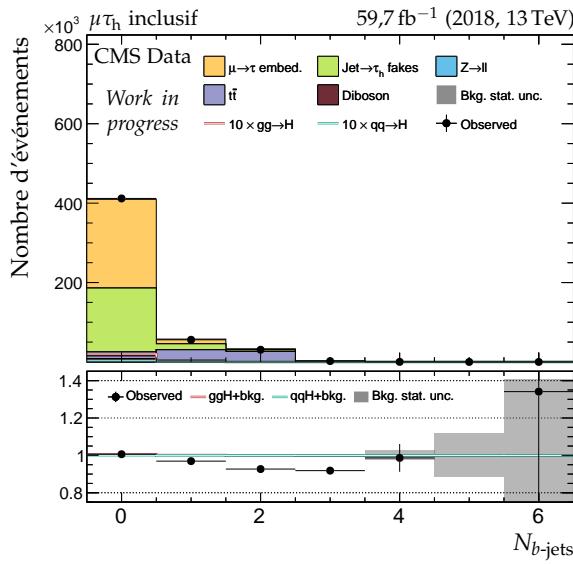
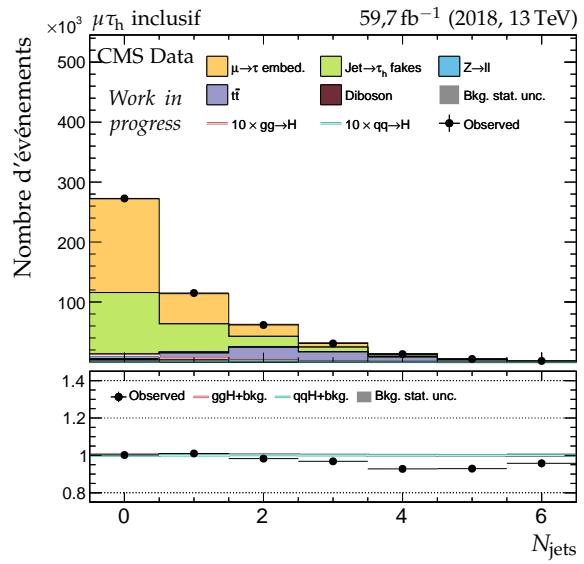


(e) Pseudo-rapidité du jet principal.

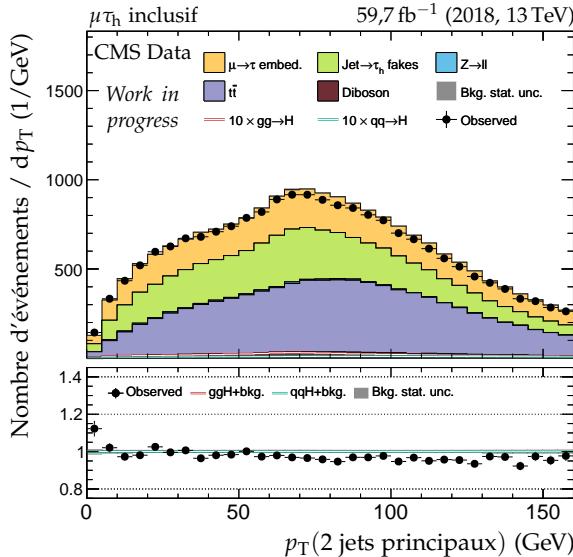


(f) Pseudo-rapidité du jet secondaire.

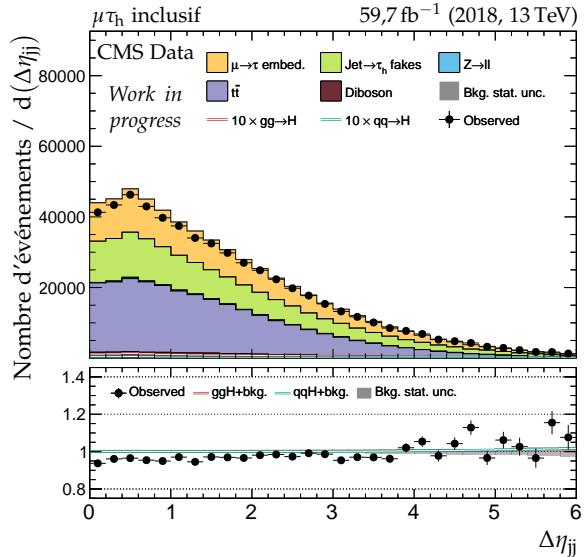
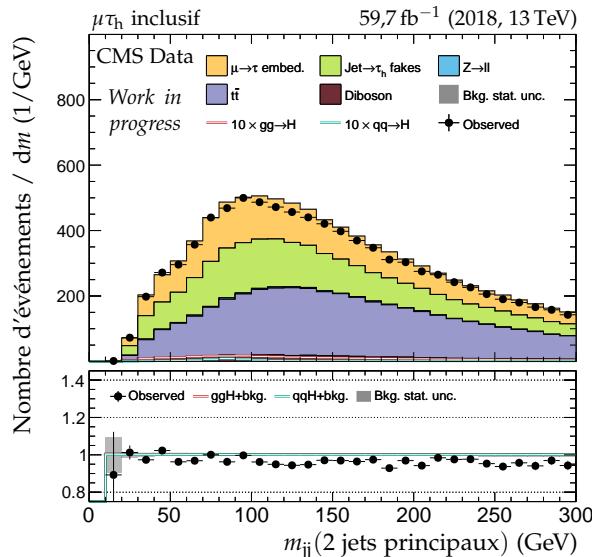
**Figure X.46** – Distributions de contrôle pour le canal  $\mu\tau_h$  en 2018 : cinématique des jets.


 (a) Nombre de  $b$ -jets.


(b) Nombre de jets.

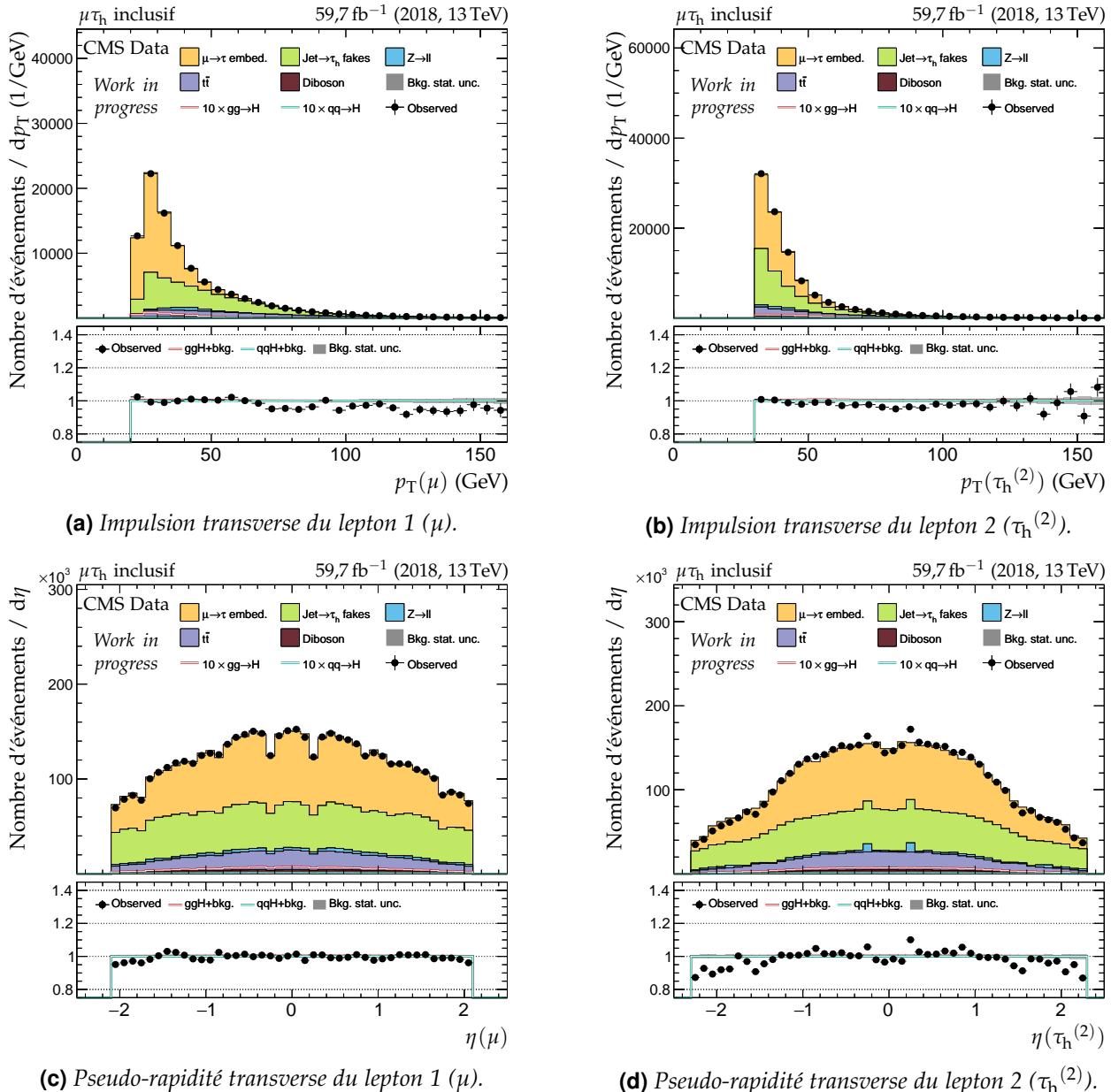


(c) Impulsion transverse du système des deux jets.

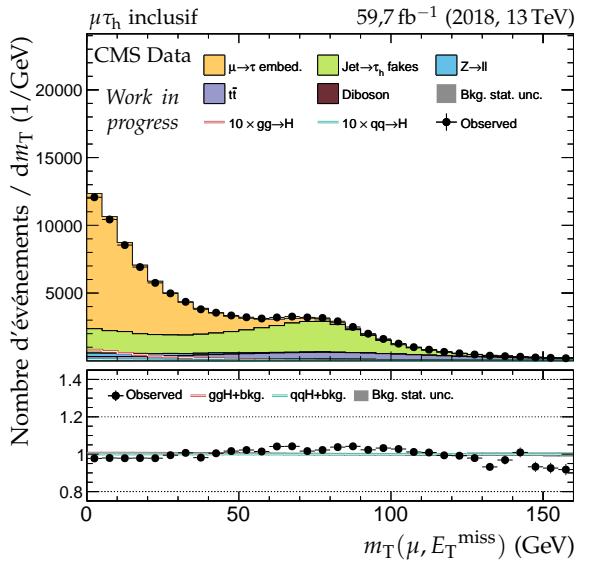

 (d) Distance en  $\eta$  entre les deux jets.


(e) Masse invariante du système des deux jets.

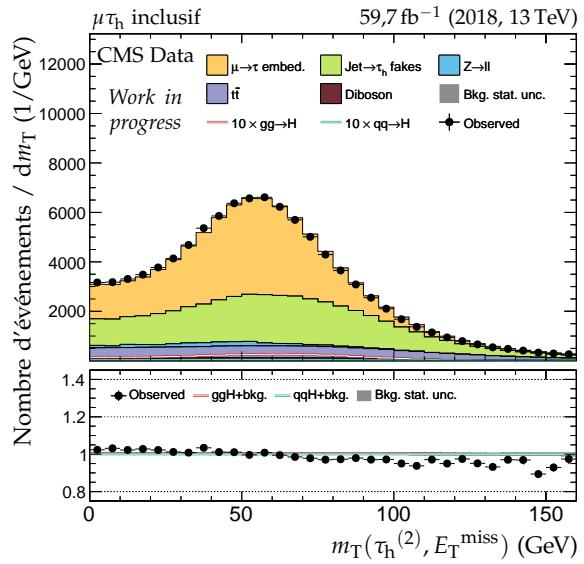
 Figure X.47 – Distributions de contrôle pour le canal  $\mu \tau_h$  en 2018 : nombre de jets et système des deux jets principaux.



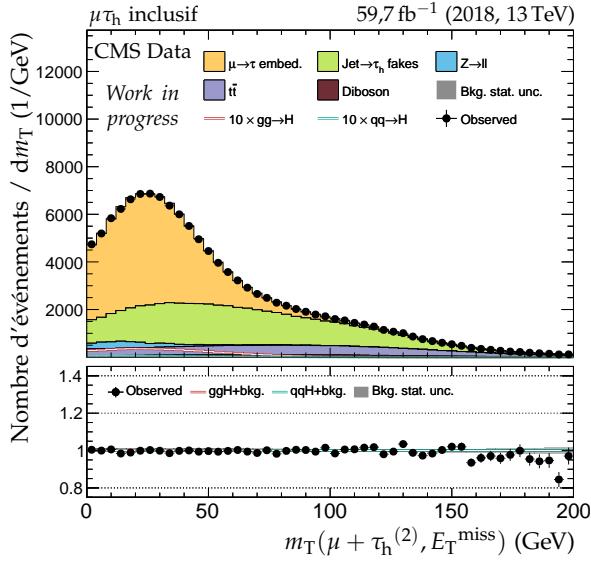
**Figure X.48 – Distributions de contrôle pour le canal  $\mu\tau_h$  en 2018 : cinématique des leptons ( $\mu, \tau_h^{(2)}$ ).**



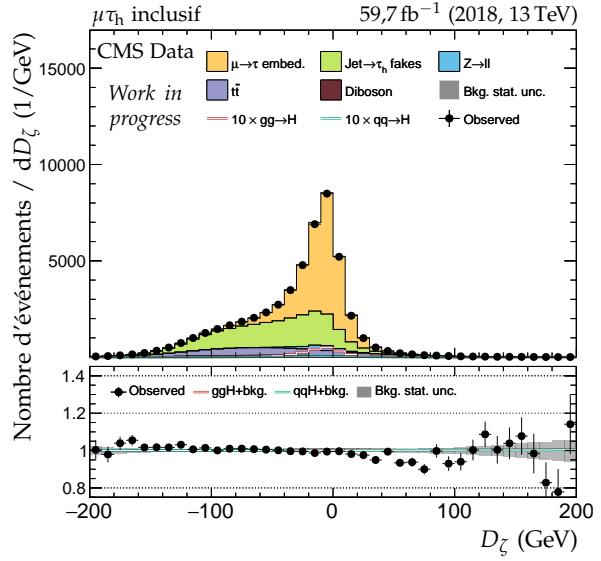
(a) Masse transverse du lepton 1 ( $\mu$ ).



(b) Masse transverse du lepton 2 ( $\tau_h^{(2)}$ ).

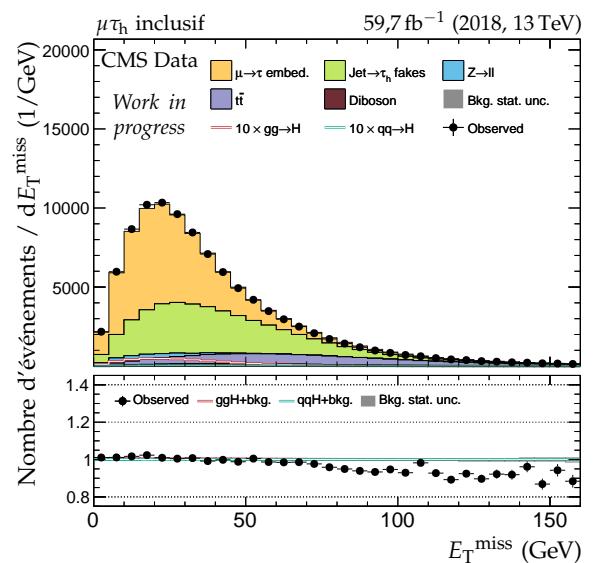
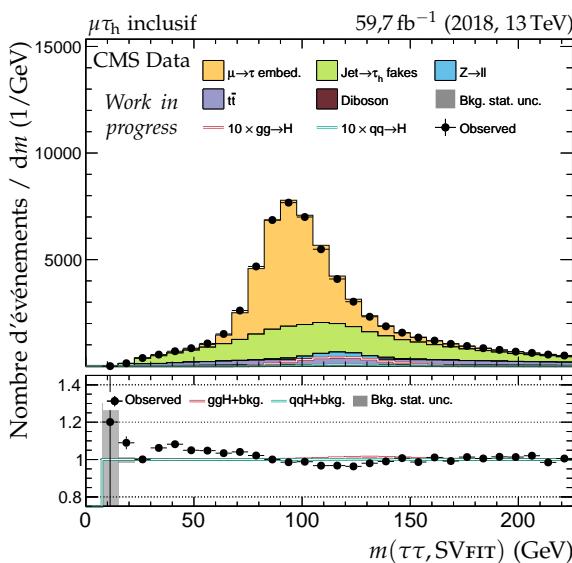
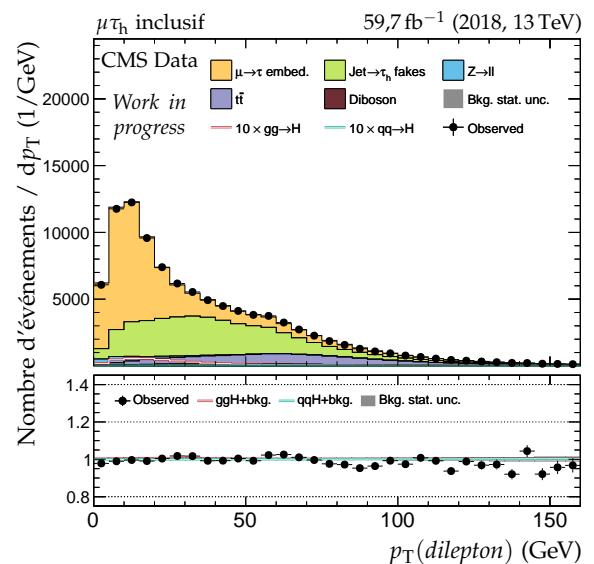
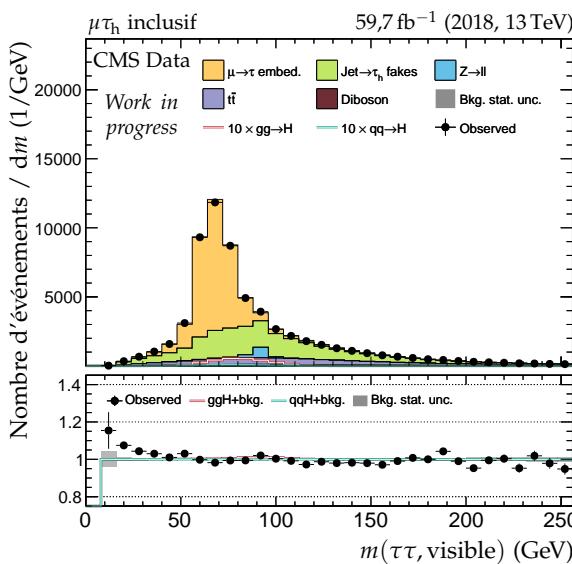
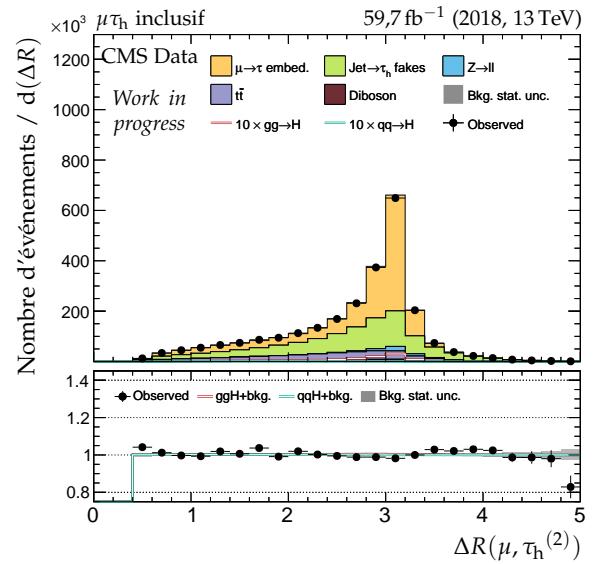
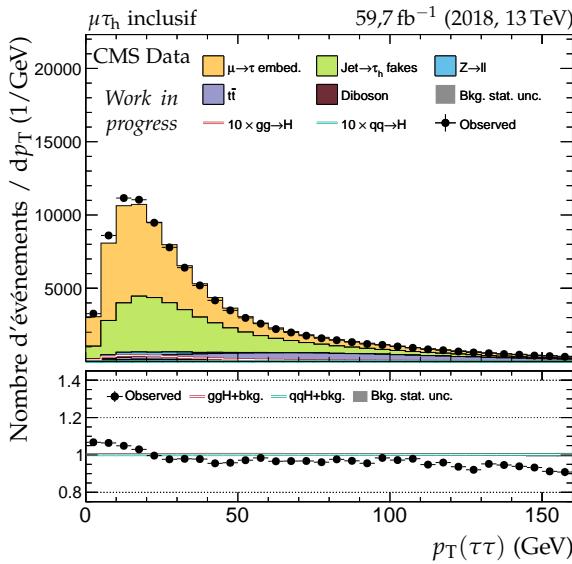


(c) Masse transverse du dilepton.

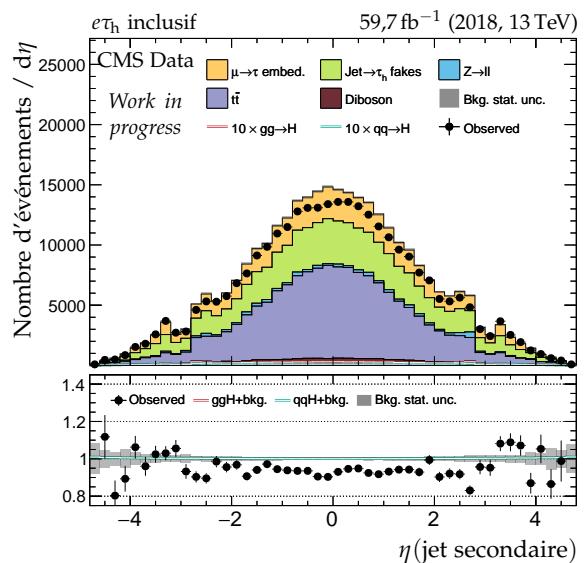
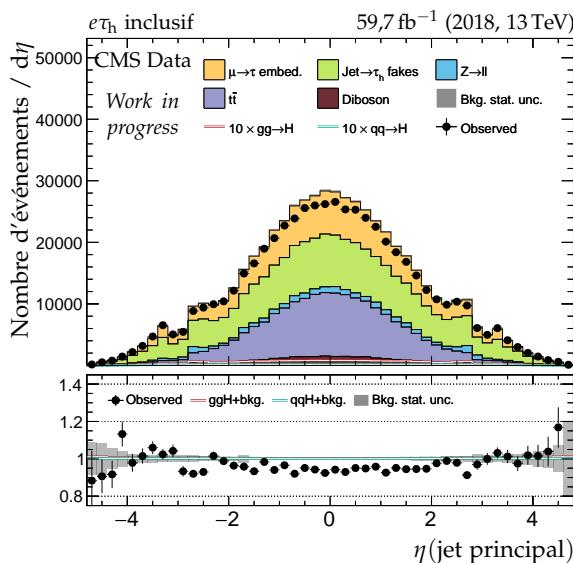
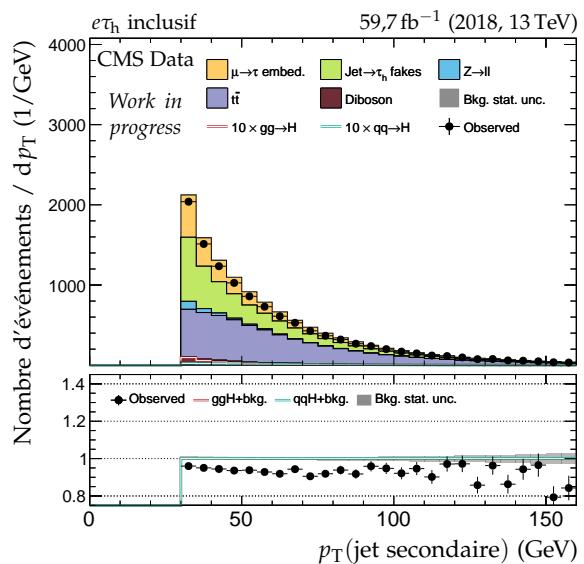
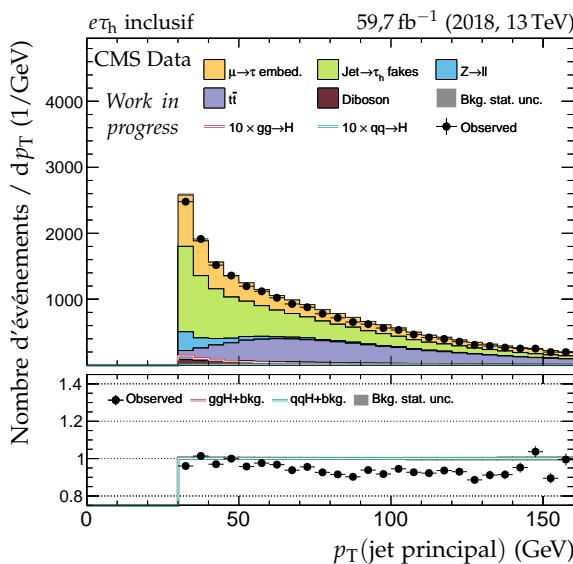
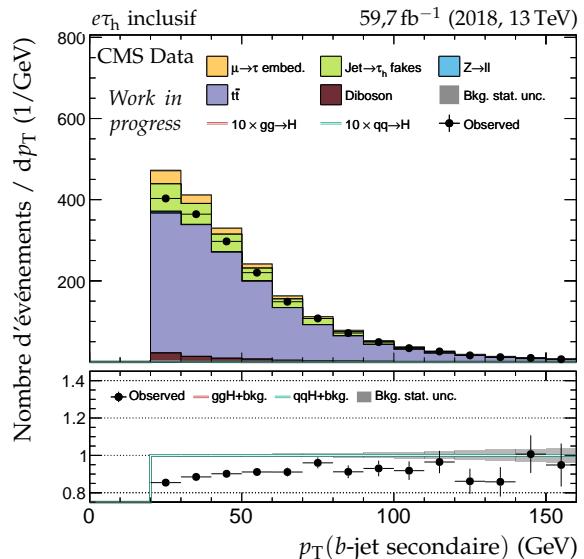
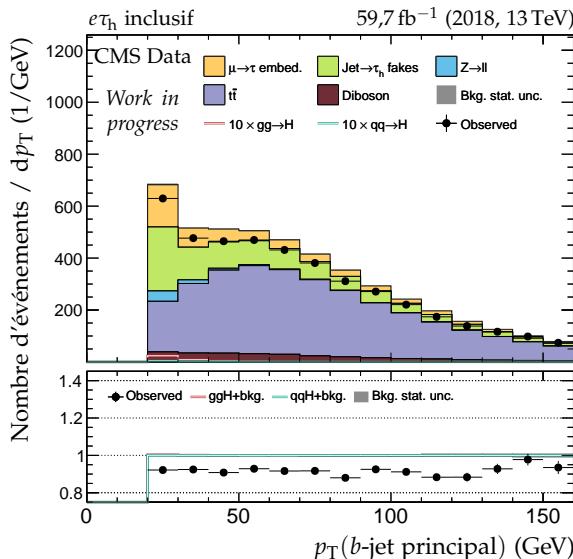


(d) Valeur de  $D_\zeta$ .

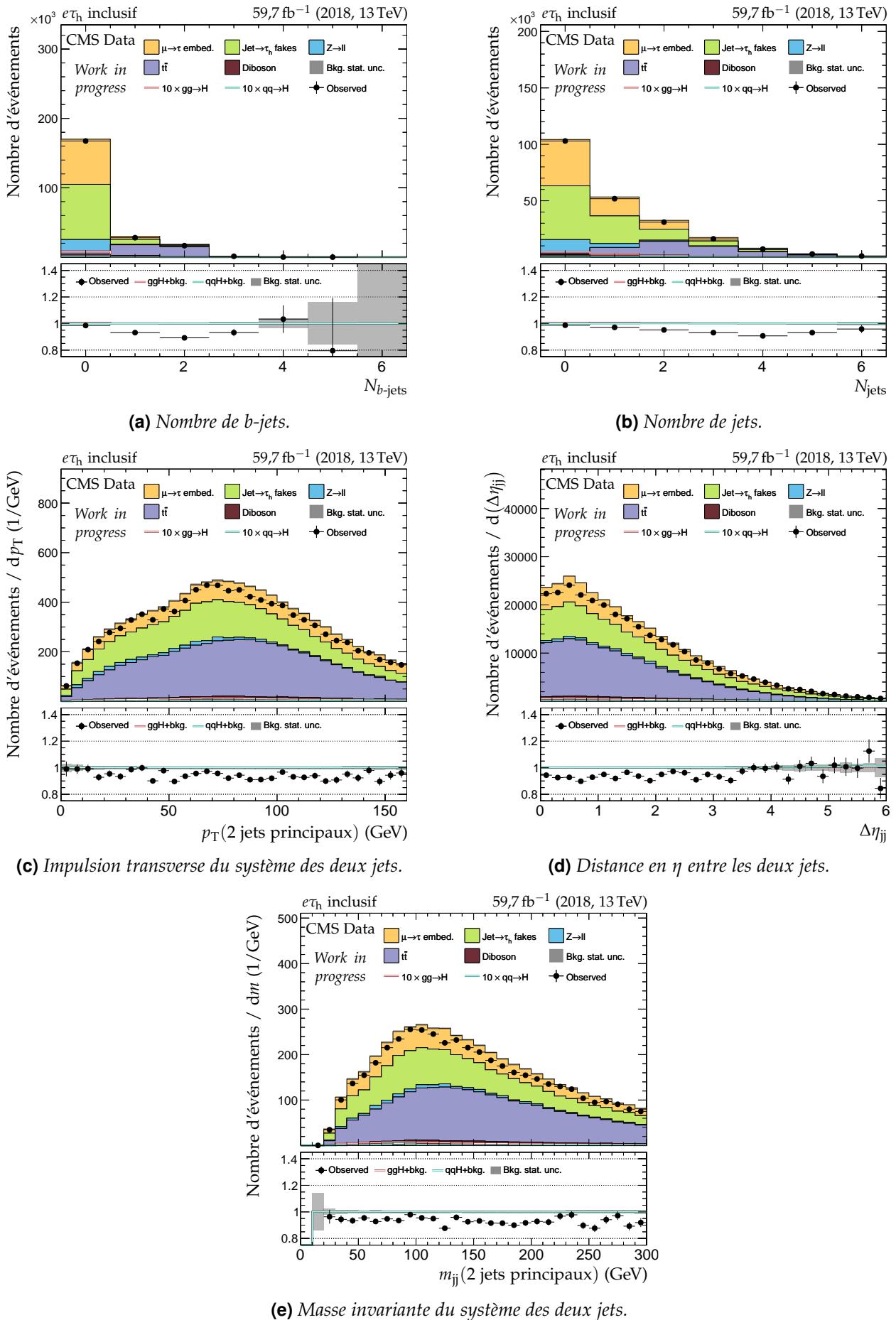
**Figure X.49** – Distributions de contrôle pour le canal  $\mu\tau_h$  en 2018 : masses transverses et  $D_\zeta$ .



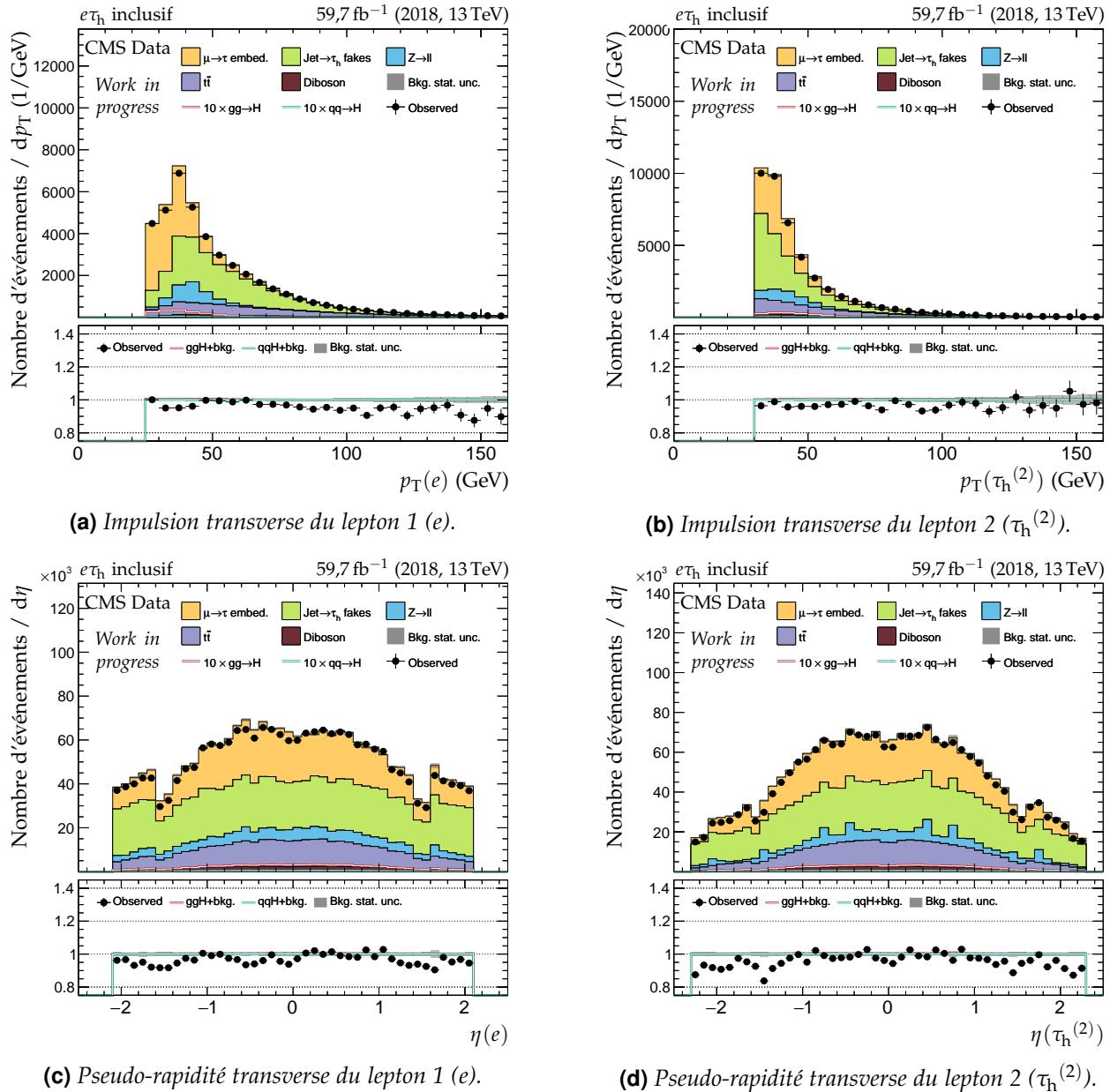
**Figure X.50 – Distributions de contrôle pour le canal  $\mu\tau_h$  en 2018 : dilepton et énergie transverse manquante.**



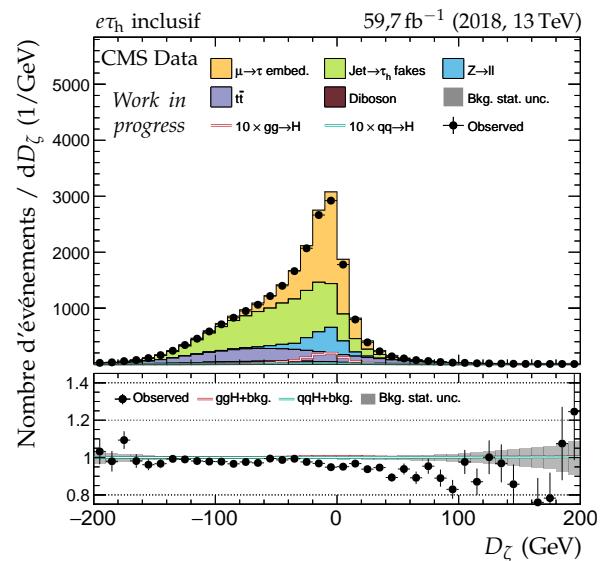
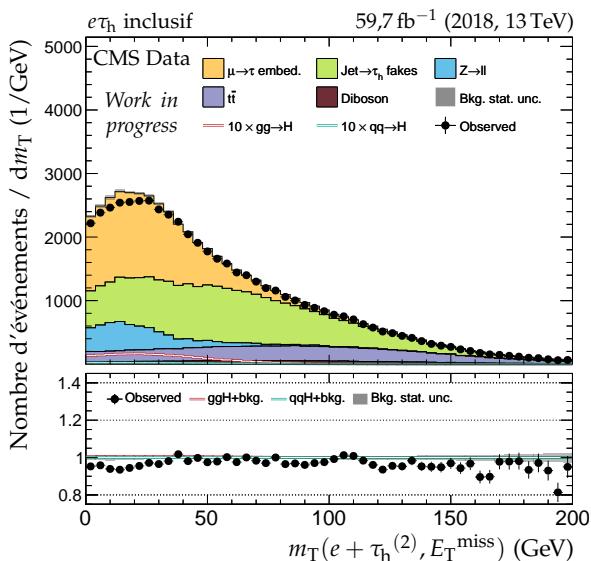
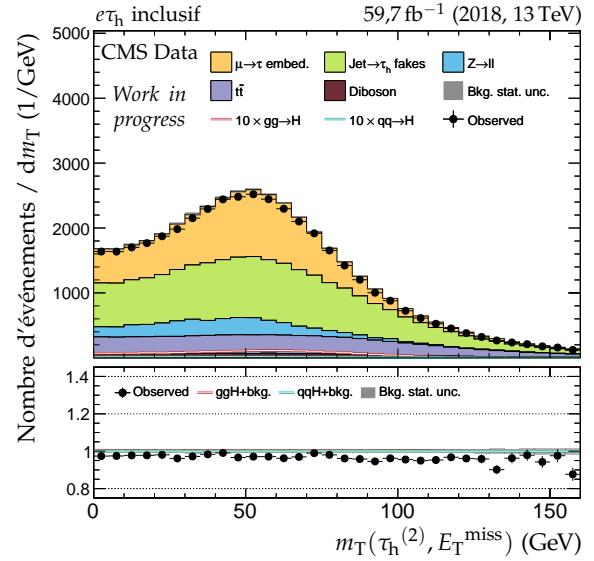
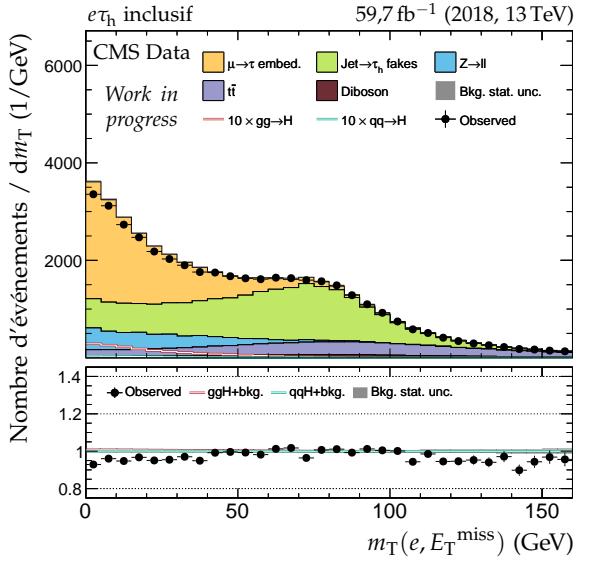
**Figure X.51** – Distributions de contrôle pour le canal  $e\tau_h$  en 2018 : cinématique des jets.



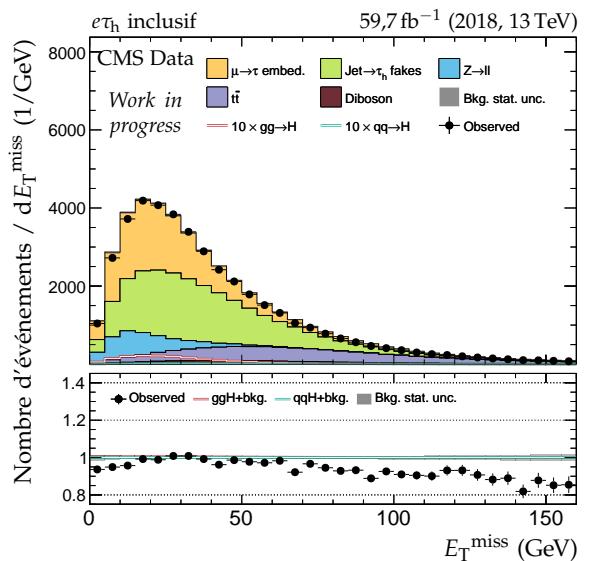
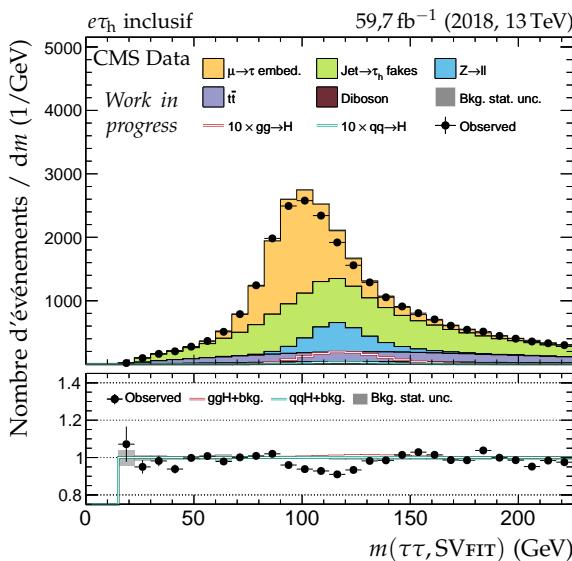
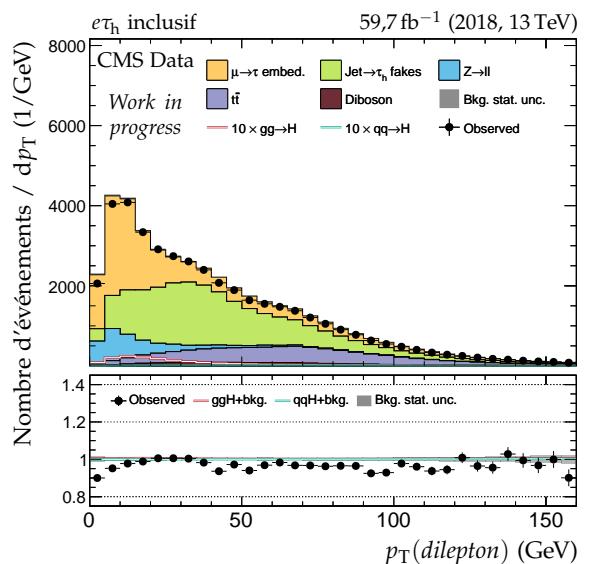
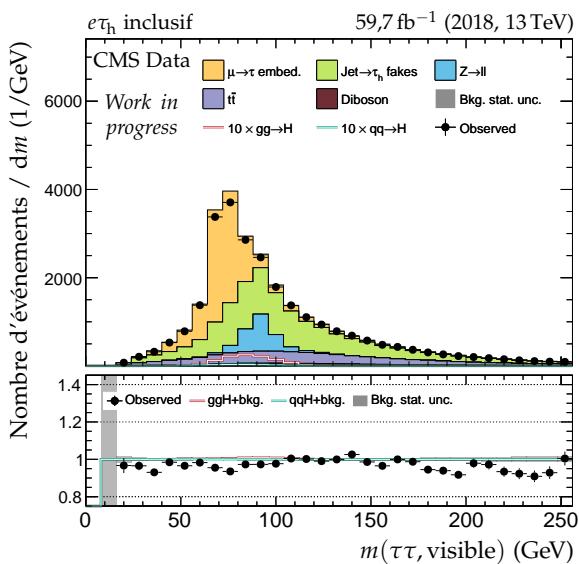
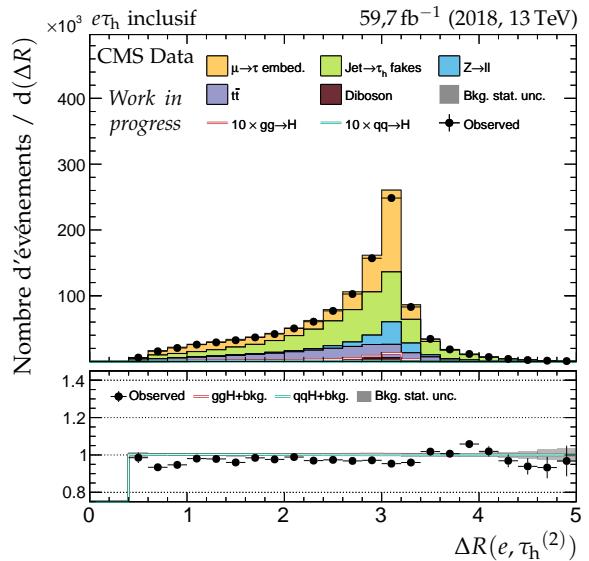
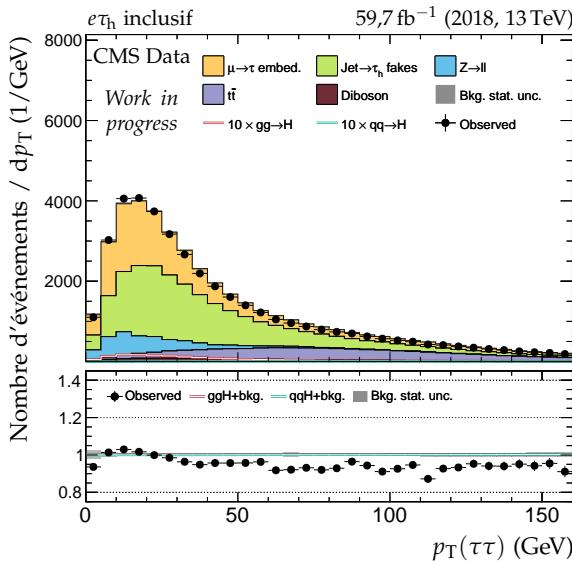
**Figure X.52 – Distributions de contrôle pour le canal  $e\tau_h$  en 2018 : nombre de jets et système des deux jets principaux.**



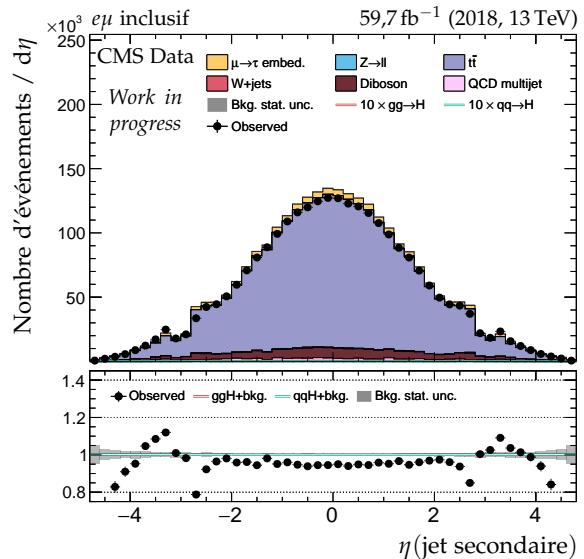
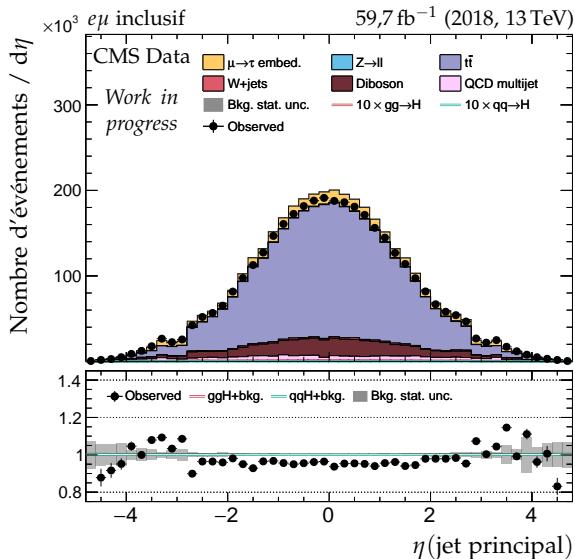
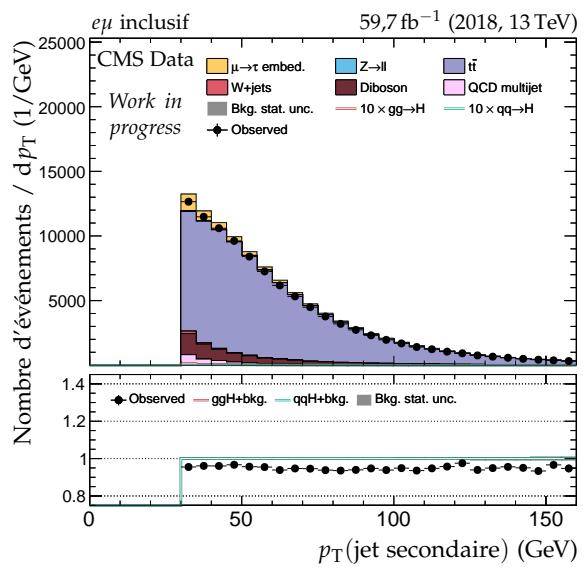
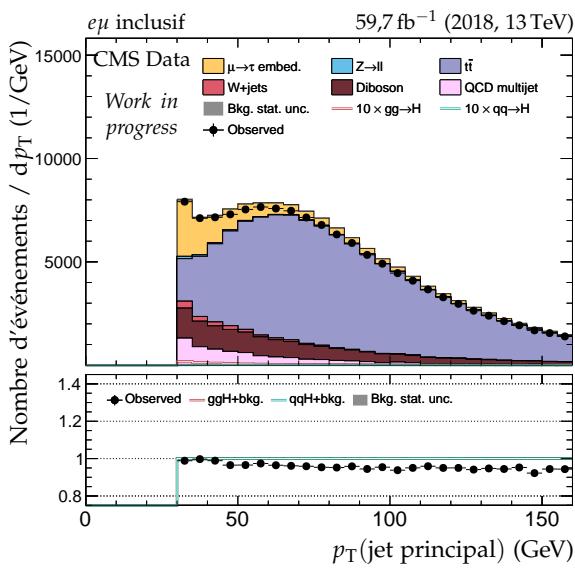
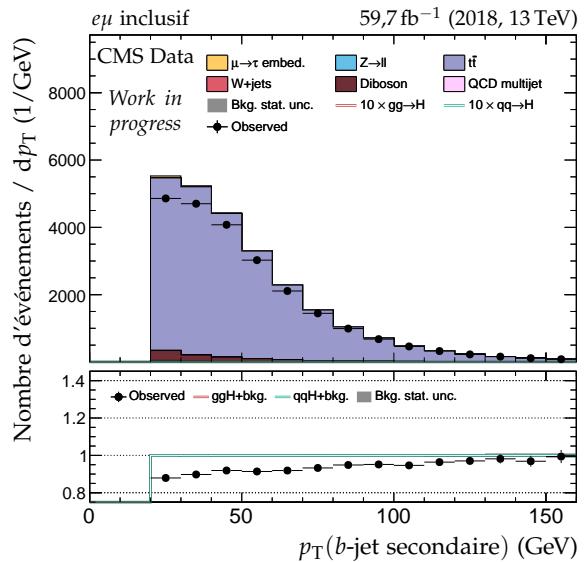
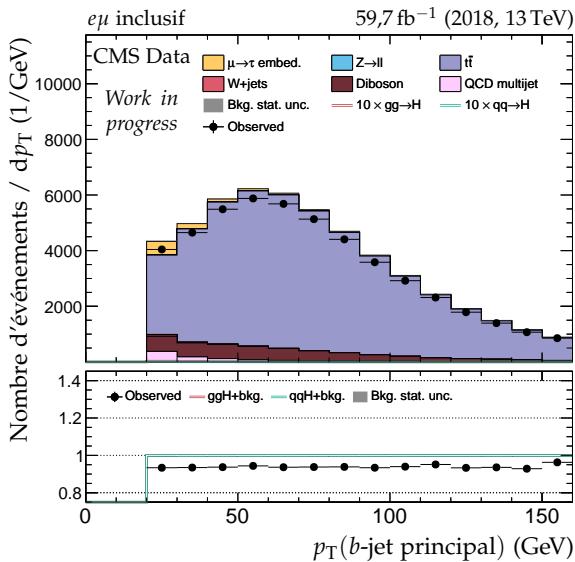
**Figure X.53 – Distributions de contrôle pour le canal  $e\tau_h$  en 2018 : cinématique des leptons ( $e, \tau_h^{(2)}$ ).**



**Figure X.54 – Distributions de contrôle pour le canal  $e\tau_h$  en 2018 : masses transverses et  $D_\zeta$ .**



**Figure X.55 – Distributions de contrôle pour le canal  $e\tau_h$  en 2018 : dilepton et énergie transverse manquante.**



**Figure X.56 – Distributions de contrôle pour le canal  $e\mu$  en 2018 : cinématique des jets.**

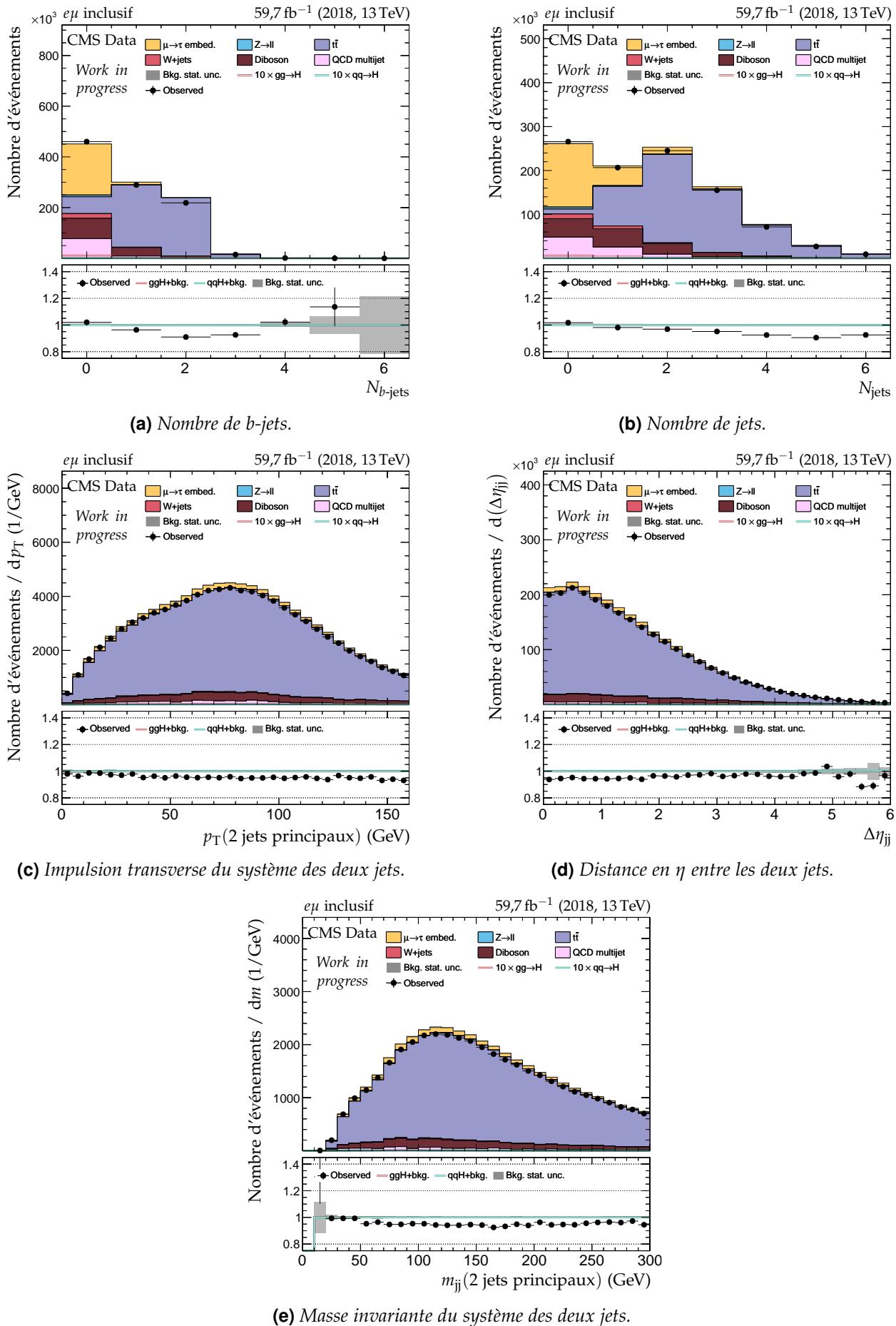
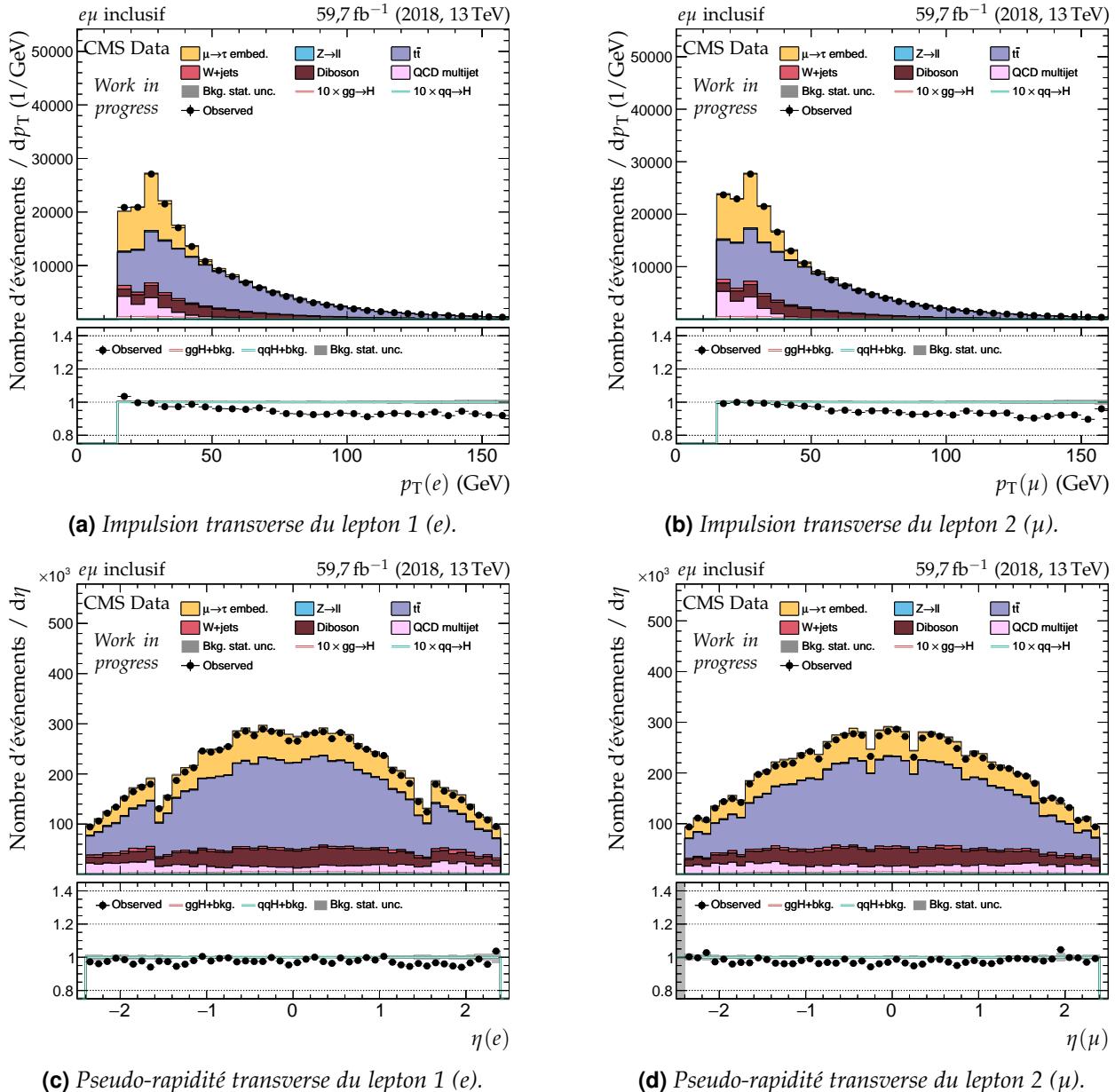
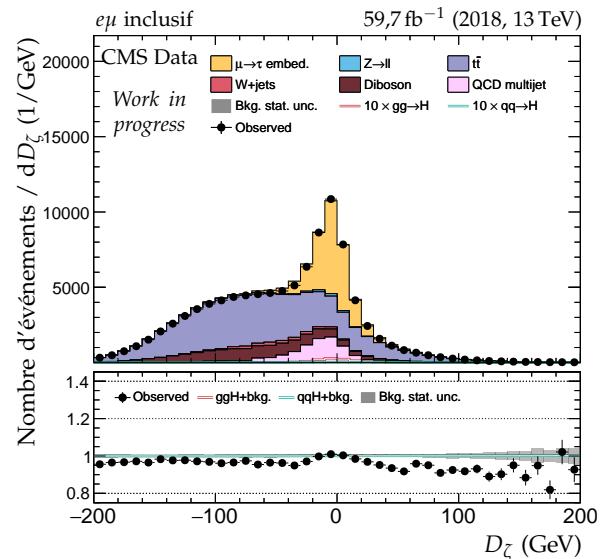
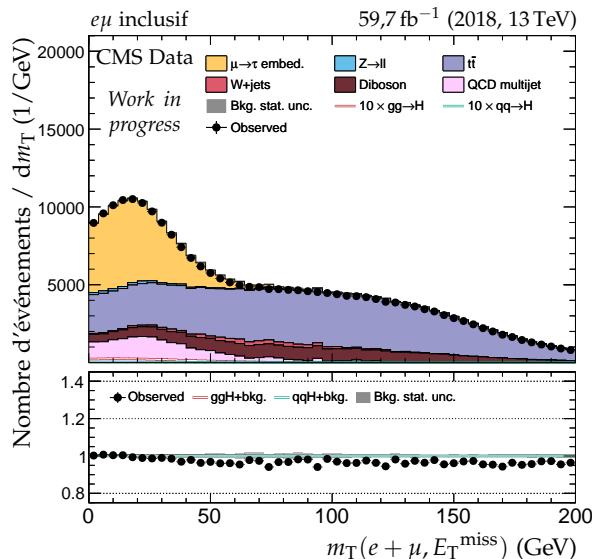
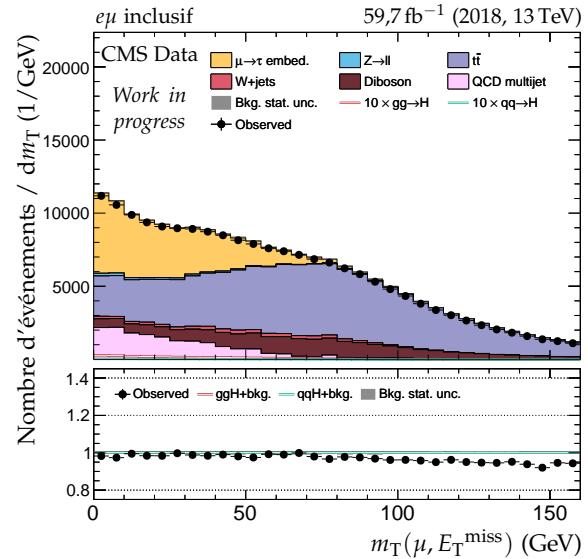
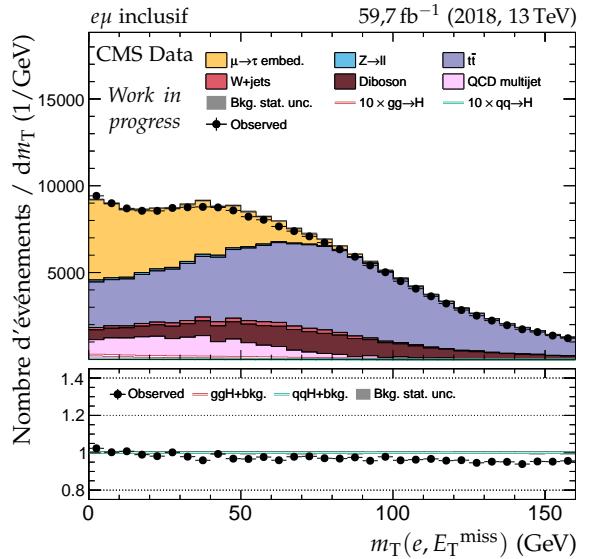


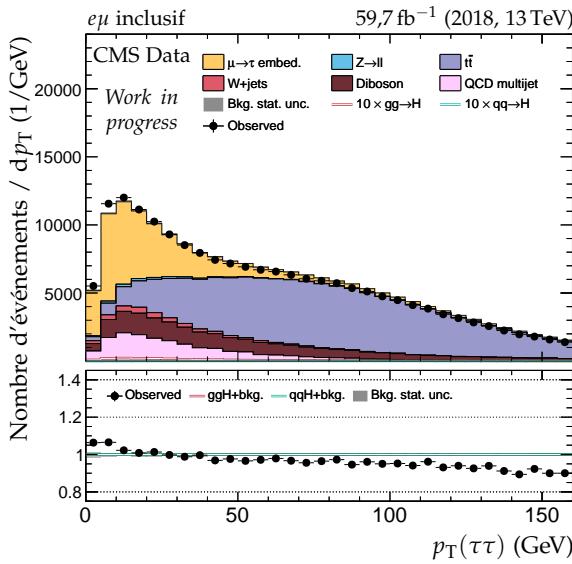
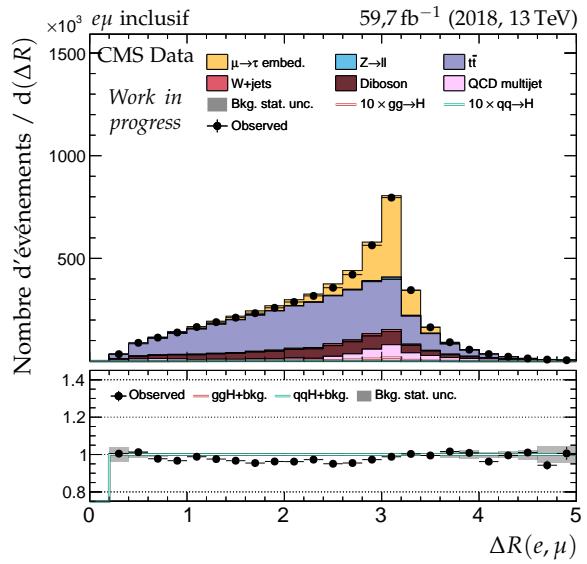
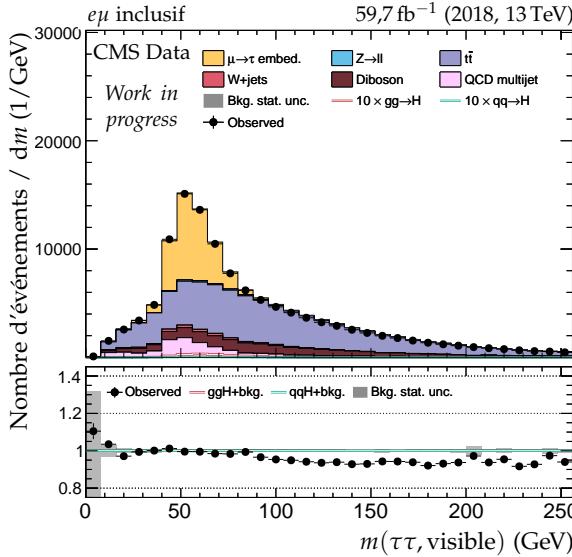
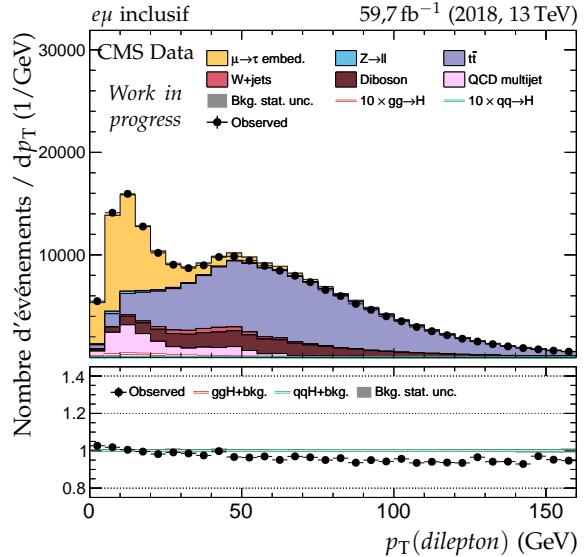
Figure X.57 – Distributions de contrôle pour le canal  $e\mu$  en 2018 : nombre de jets et système des deux jets principaux.



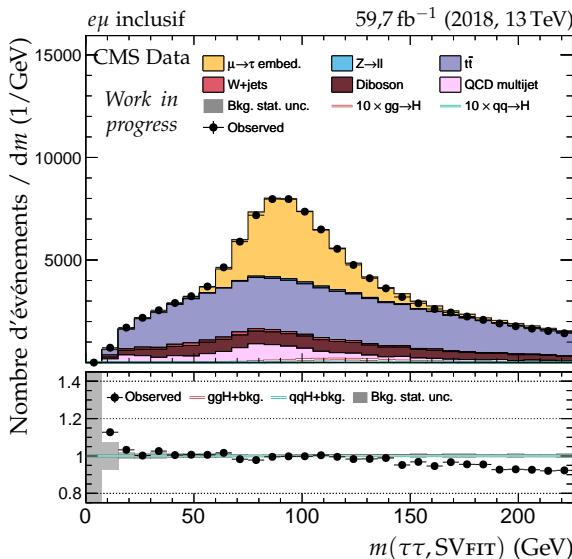
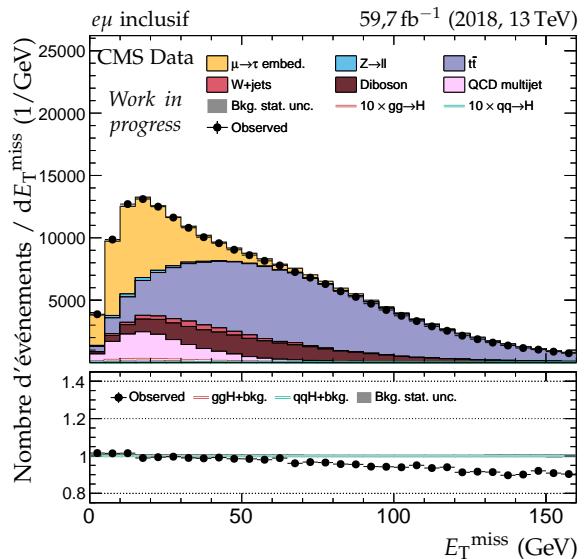
**Figure X.58 – Distributions de contrôle pour le canal  $e\mu$  en 2018 : cinématique des leptons ( $e, \mu$ ).**



**Figure X.59** – Distributions de contrôle pour le canal  $e\mu$  en 2018 : masses transverses et  $D_\zeta$ .

(a) Impulsion transverse du système di- $\tau$ .(b) Distance  $\Delta R$  entre les leptons ( $e, \mu$ ).(c) Masse visible du système di- $\tau$ .

(d) Impulsion transverse du dilepton.

(e) Masse du système di- $\tau$  d'après SVFIT.

(f) Énergie transverse manquante.

**Figure X.60** – Distributions de contrôle pour le canal  $e\mu$  en 2018 : dilepton et énergie transverse manquante.

