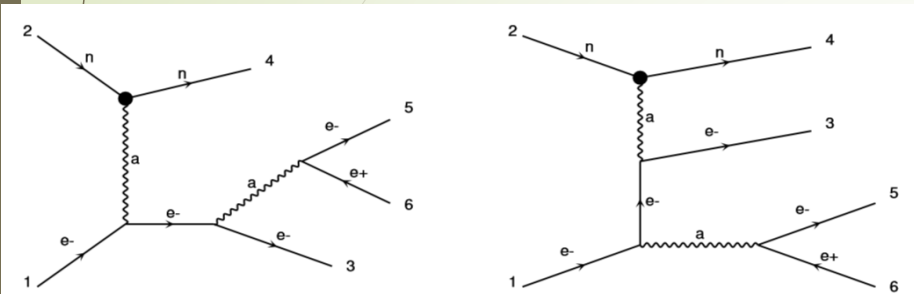


MG5 vs Beranek MC  
for hps qed background  
(updated 04/14/2017)

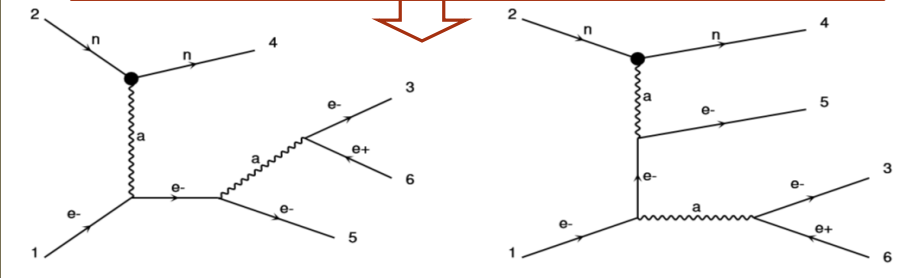
*Ani Simonyan*

# Cross section for Diagrams :

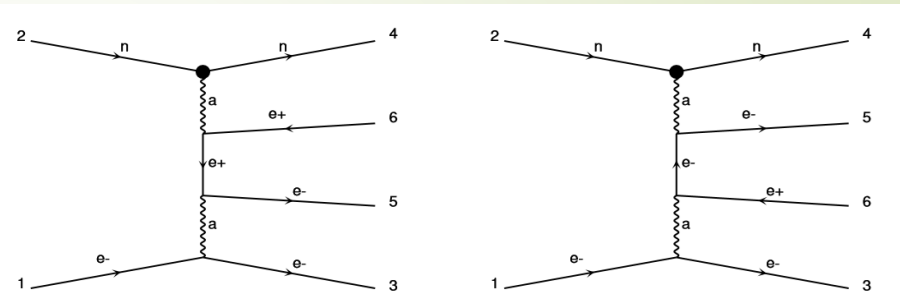
## ➤ Radiative Tridents (Rad)



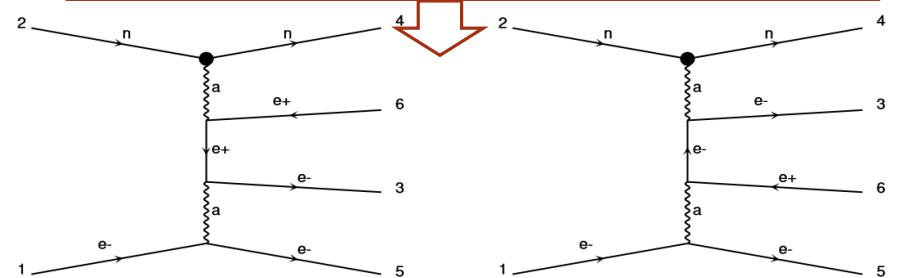
with exchange diagrams



## ➤ Bethe-Heitler (BH)



with exchange diagrams



**Background = Radiative + Bethe-Heitler (Rad&BH)**  
**(Tridents with all the interferences and exchange diagrams.)**

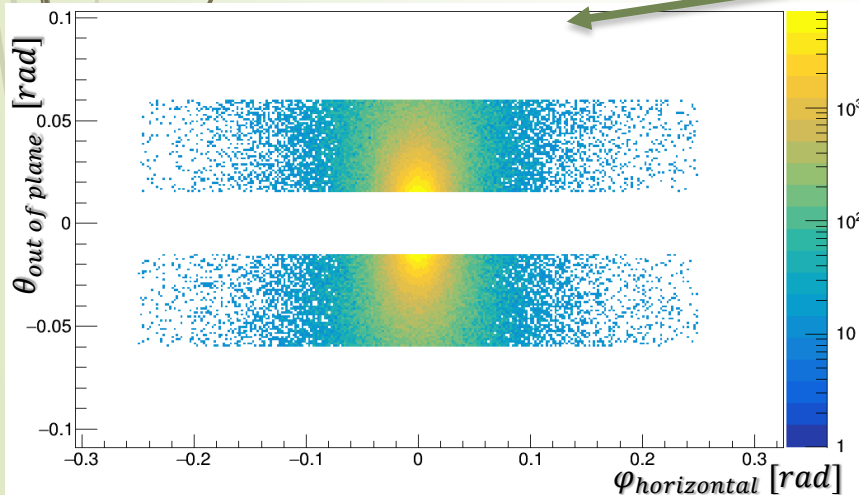
Cross-section calculated:

- MG5 simulation (MG5)
- MC integration calculation based on theoretical model(Beranek)

# Kinematic Range/Acceptance:

## MadGraph5

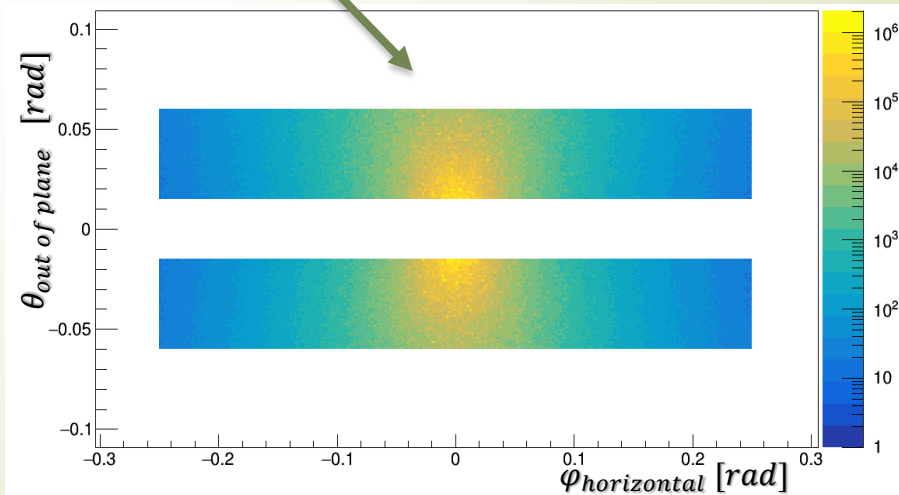
- Ebeam=1.056GeV
- Min lepton energy 0.05GeV
- Esum > 0.5 GeV
- e+,e- in diff ecal modules
- Initial acceptance :  $|\varphi| < \pi$   
 $|\theta_y| > 10$  [mrad]
- Selected acceptance:



## Beranek MC

- Ebeam=1.056GeV
- Min lepton energy 0.15GeV
- Esum > 0.5 GeV
- e+,e- in diff ecal modules
- Acceptance :

$$|\varphi_{horizontal}| < 250 \text{ [mrad]}$$
$$-60 < \theta_{out\ of\ plane} < -15 \text{ [mrad]}$$
$$60 < \theta_{out\ of\ plane} < 15 \text{ [mrad]}$$



# Comparing XS of Rad&BH/Rad/BH for MG5 vs Beranek in various kinematic regions:

- $E_{\min} > 0.15, E_{\text{sum}} > 0.5$
- $E_{\min} > 0.15, E_{\text{sum}} > 0.6$
- $E_{\min} > 0.15, E_{\text{sum}} > 0.7$
- $E_{\min} > 0.15, E_{\text{sum}} > 0.8$
- $E_{\min} > 0.15, E_{\text{sum}} > 1.0$
- $E_{\min} > 0.25, E_{\text{sum}} > 0.8$
- $E_{\min} > 0.5, E_{\text{sum}} > 0.5$

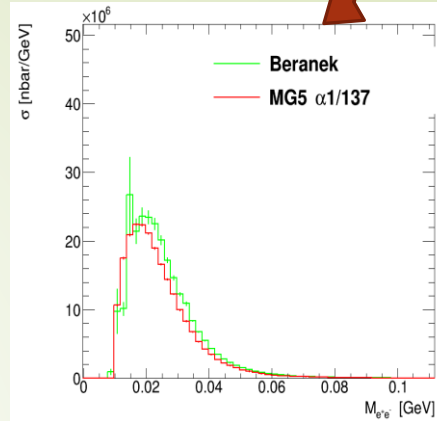
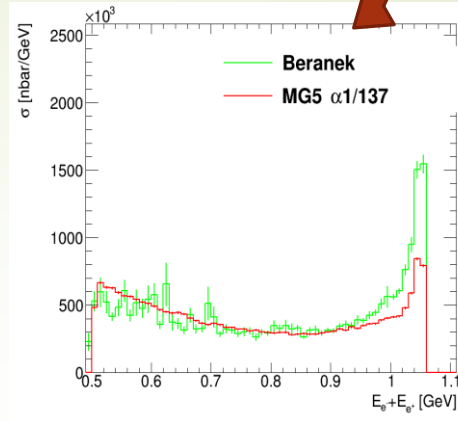
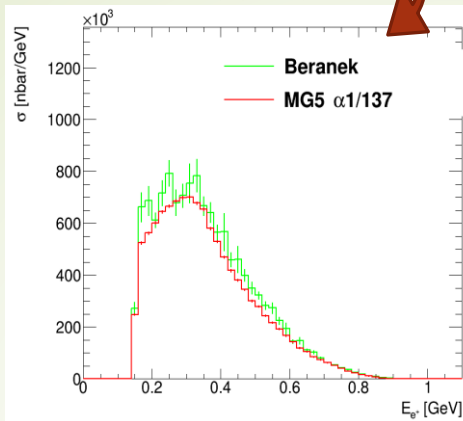
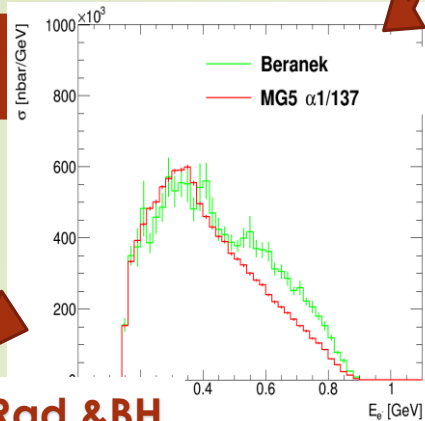
➔  $E_{min} > 0.15$ ,  $E_{sum} > 0.5$

**Electron**

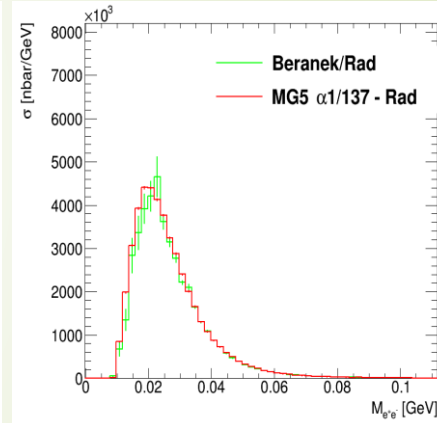
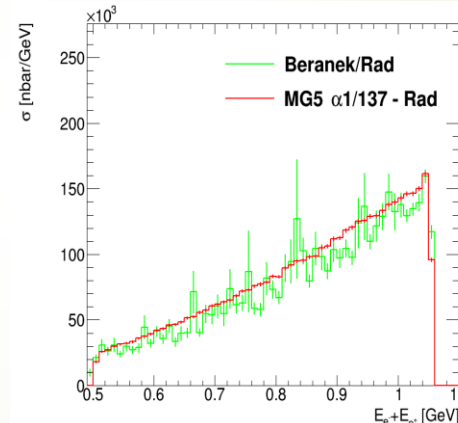
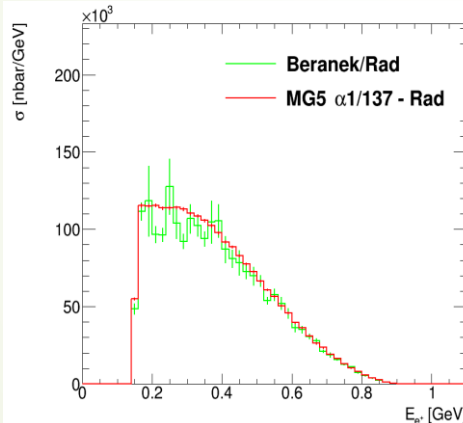
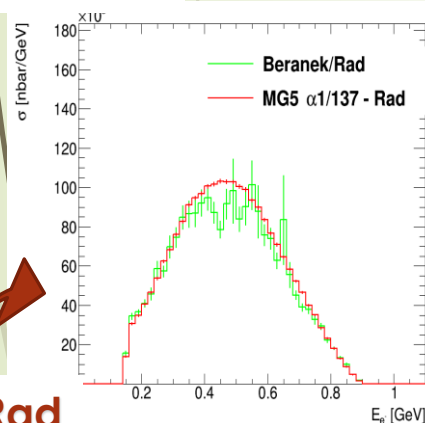
**Positron**

**Esum**

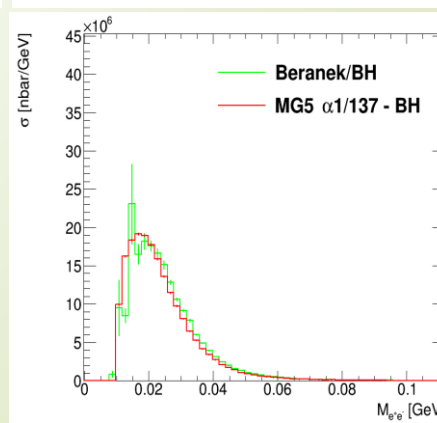
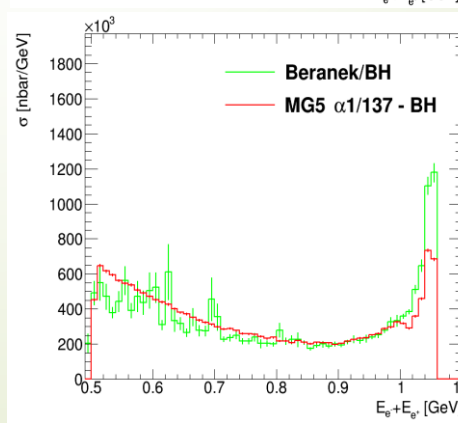
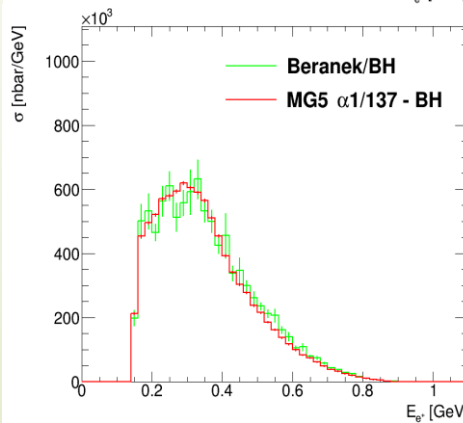
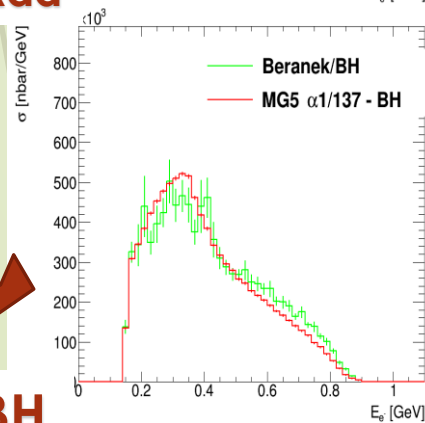
**M inv.**



**Rad & BH**



**Rad**



**BH**

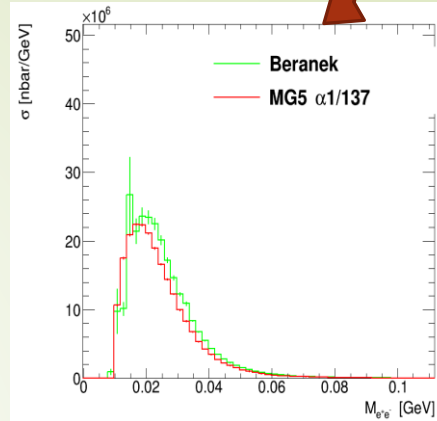
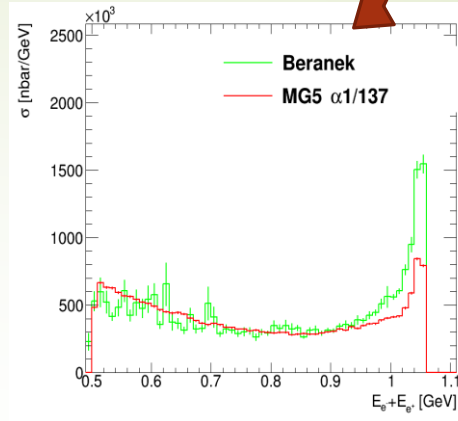
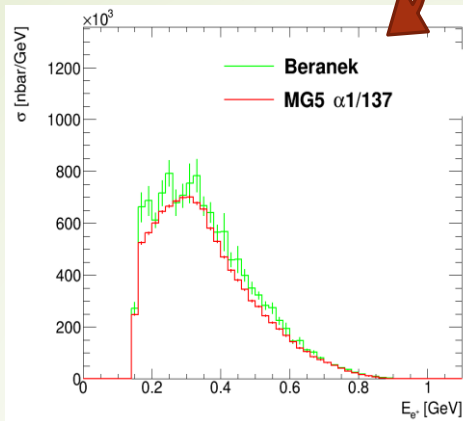
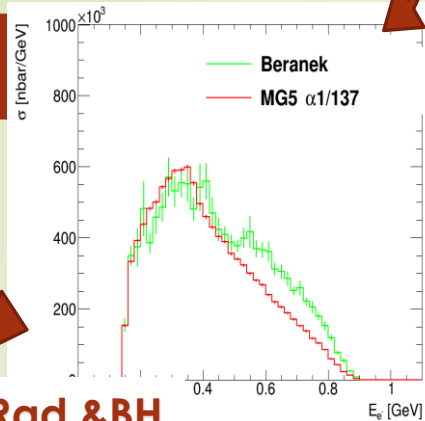
➔  $E_{min} > 0.15$ ,  $E_{sum} > 0.5$

**Electron**

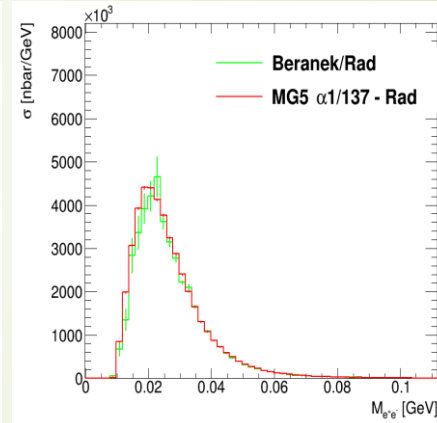
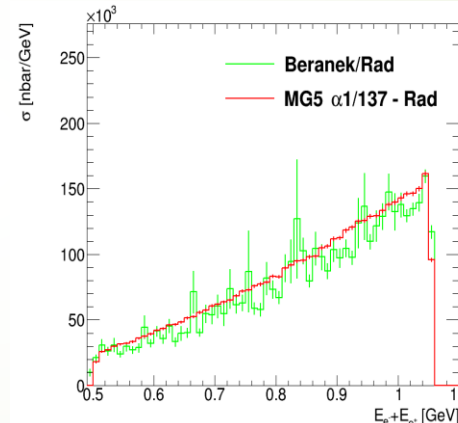
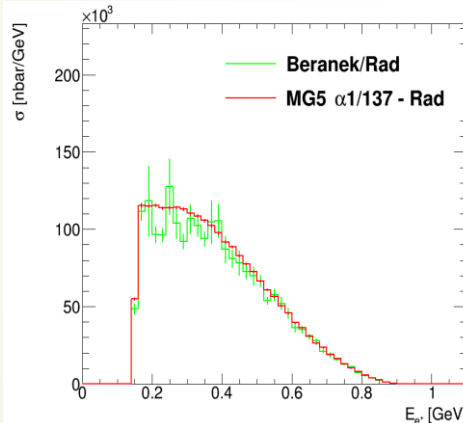
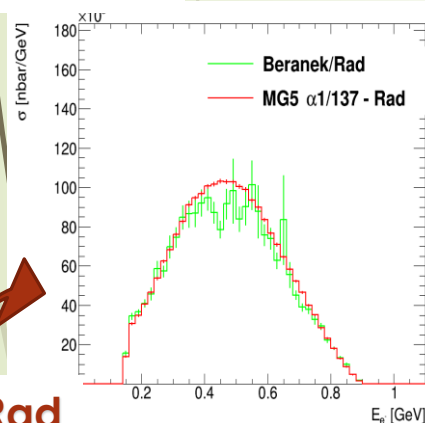
**Positron**

**Esum**

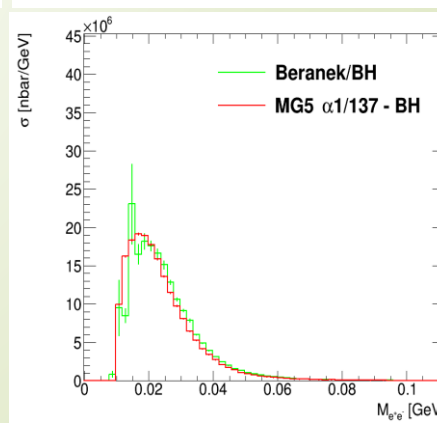
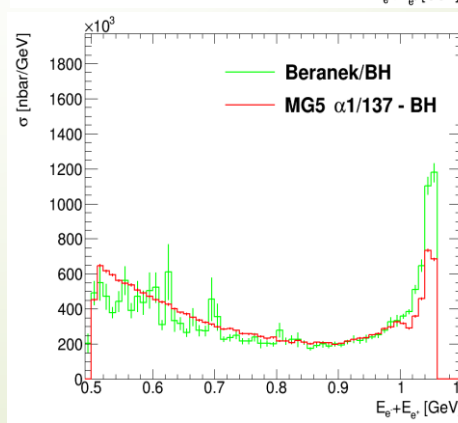
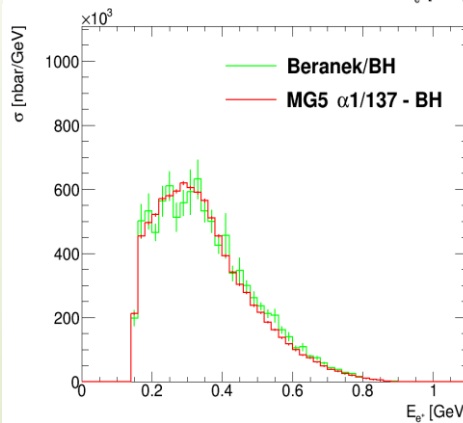
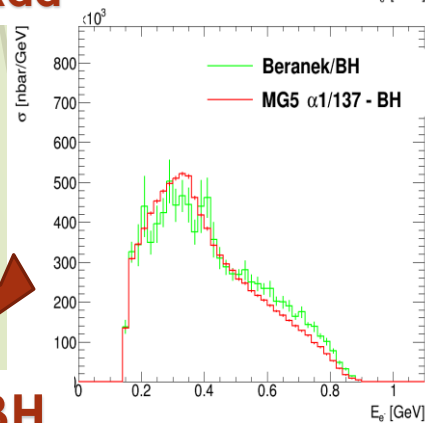
**M inv.**



**Rad & BH**



**Rad**



**BH**

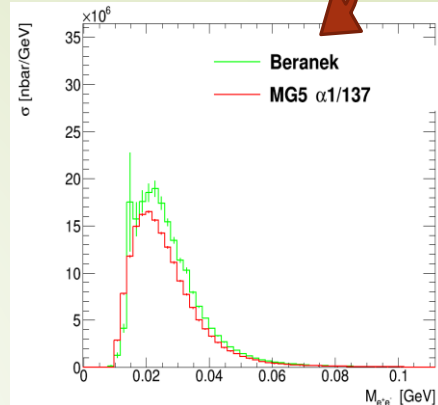
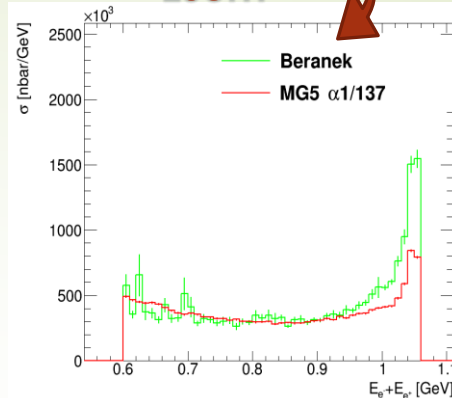
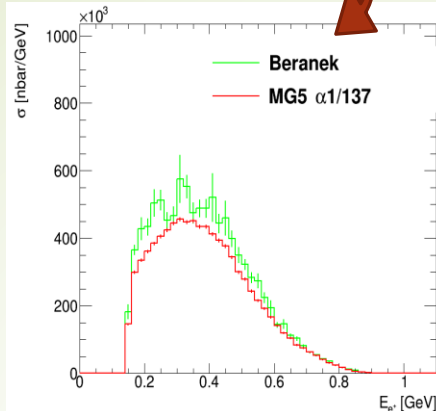
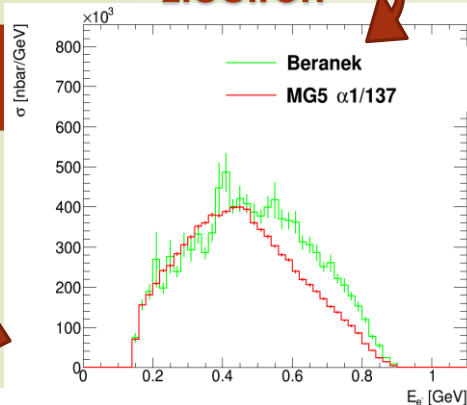
→  $E_{min} > 0.15$ ,  $E_{sum} > 0.6$

**Electron**

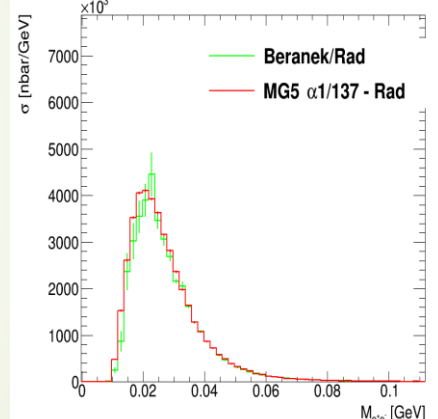
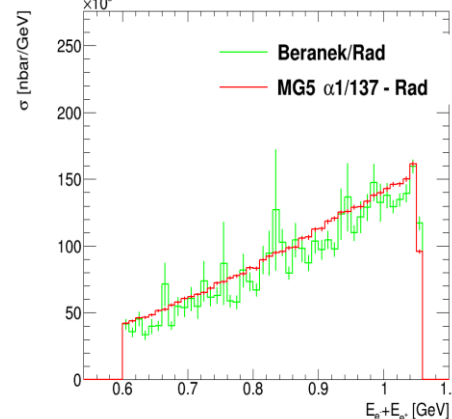
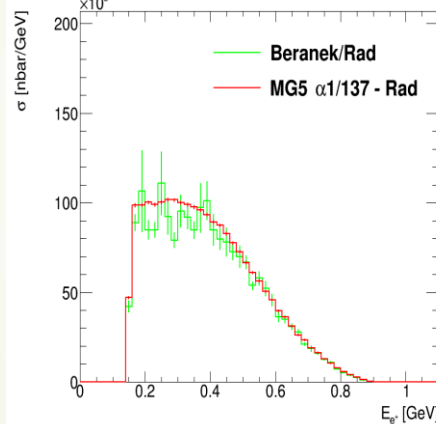
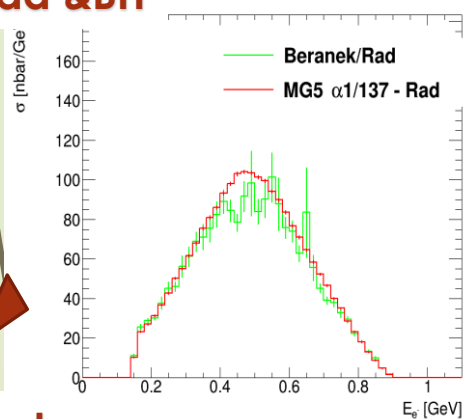
**Positron**

**Esum**

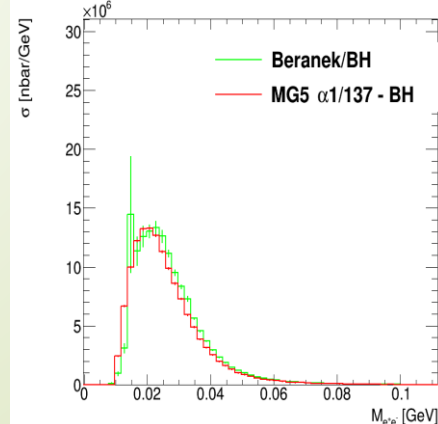
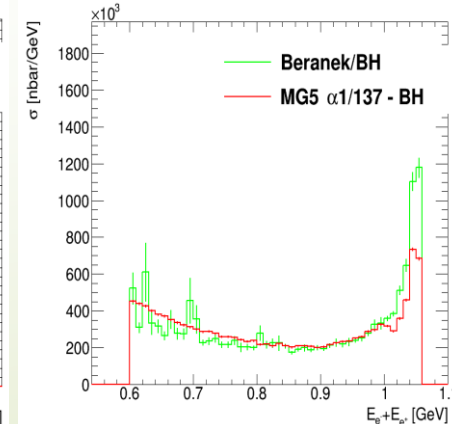
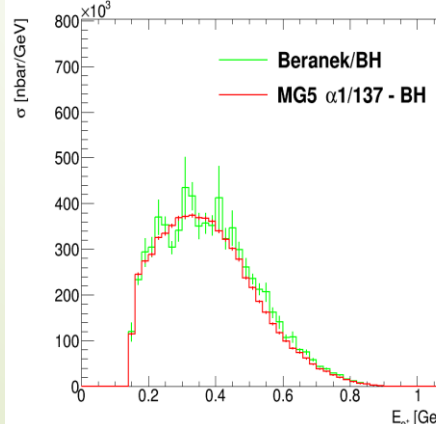
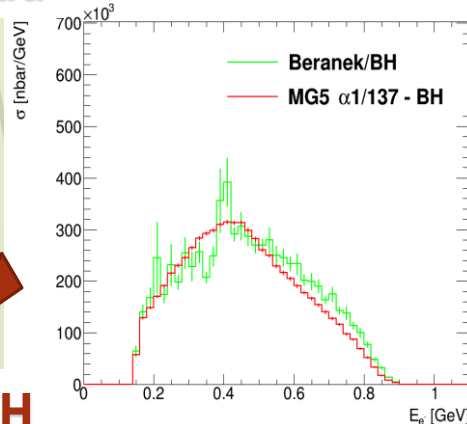
**M inv.**



**Rad & BH**



**Rad**

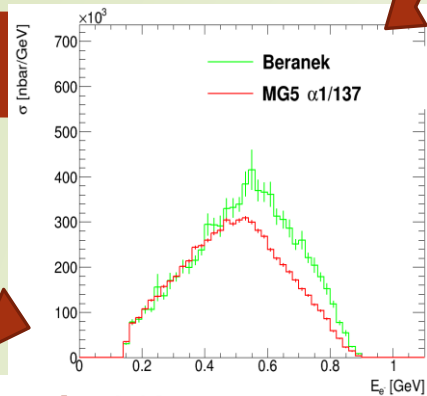


**BH**

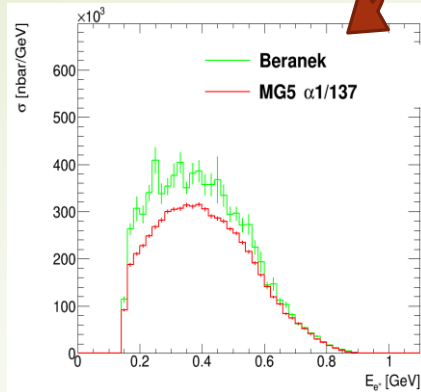


➔  $E_{min} > 0.15$ ,  $E_{sum} > 0.7$

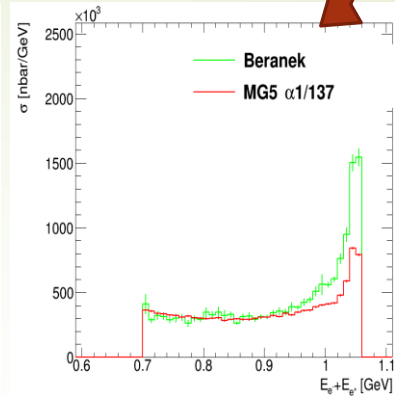
**Electron**



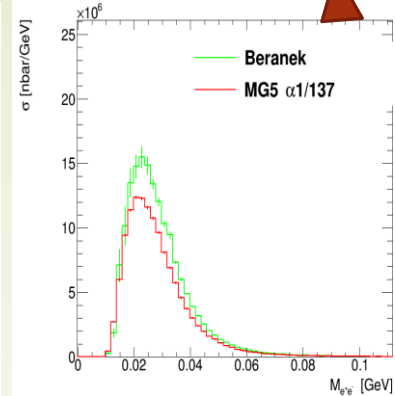
**Positron**



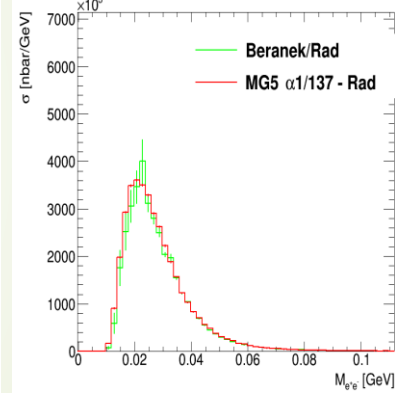
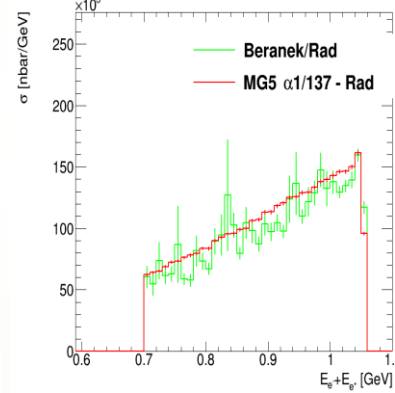
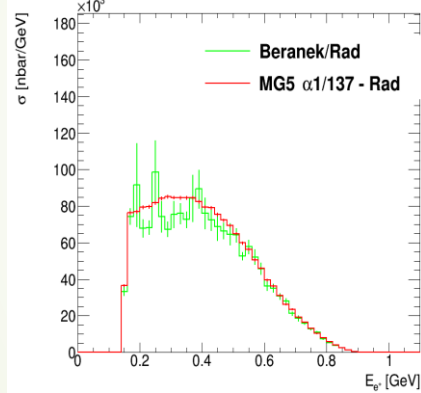
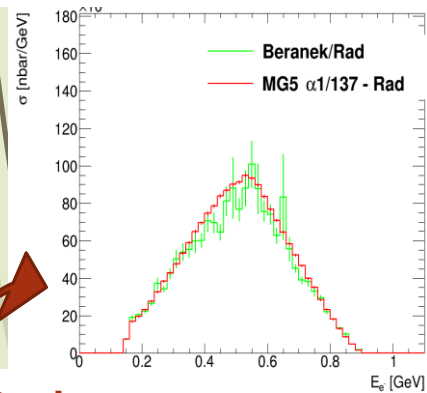
**Esum**



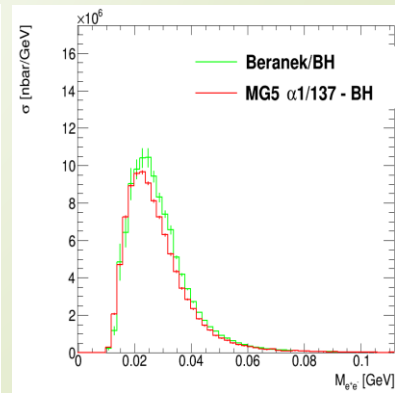
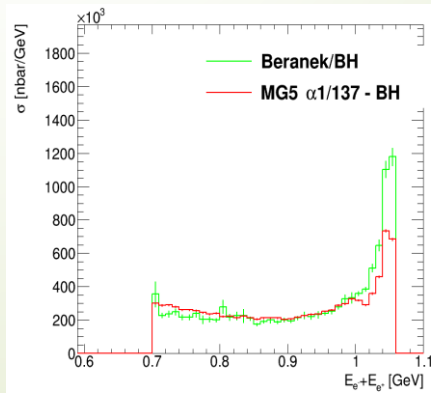
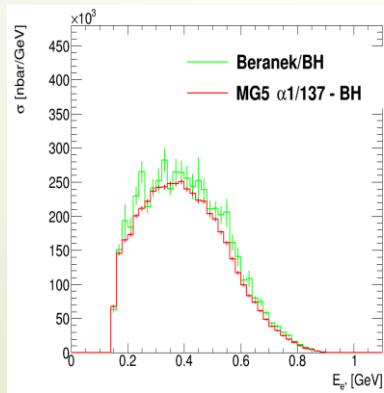
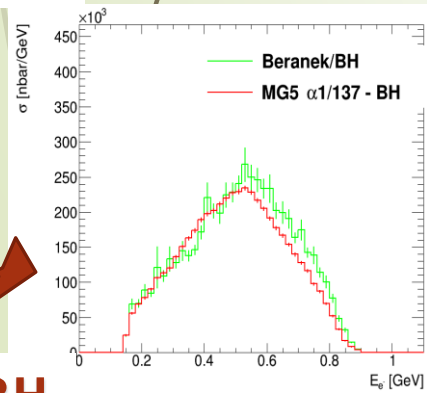
**M inv.**



**Rad & BH**



**Rad**

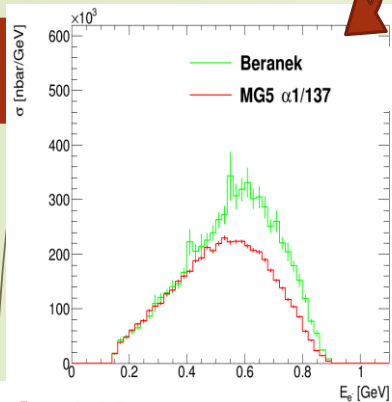


**BH**

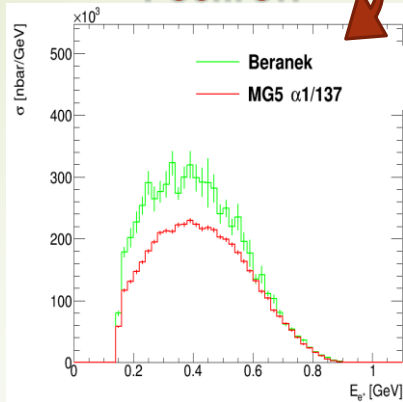


→  $E_{min} > 0.15$ ,  $E_{sum} > 0.8$

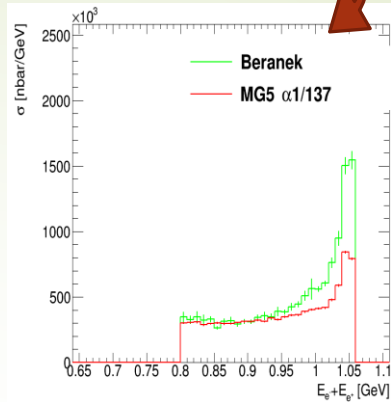
**Electron**



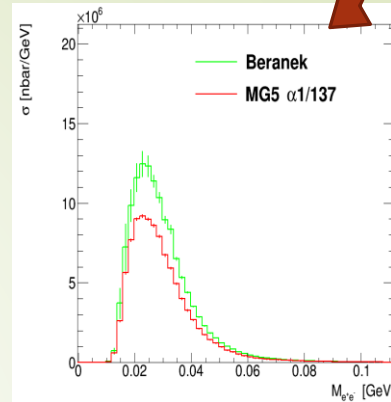
**Positron**



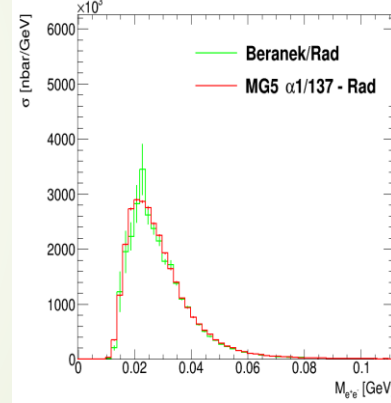
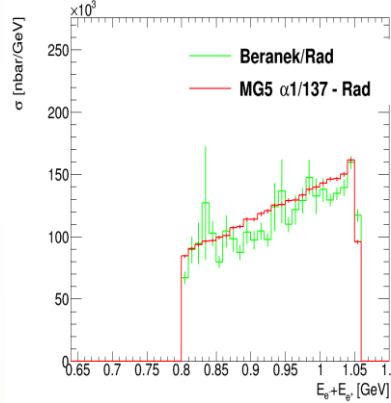
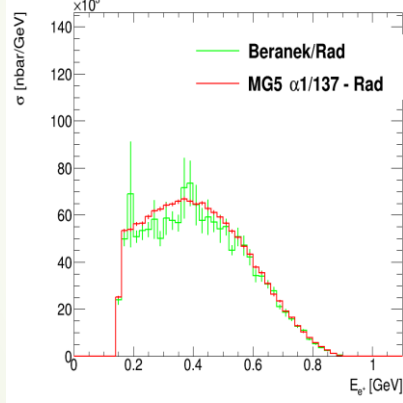
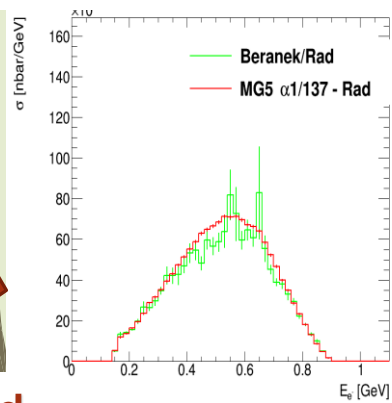
**Esum**



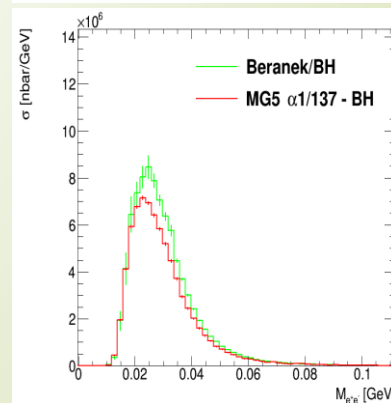
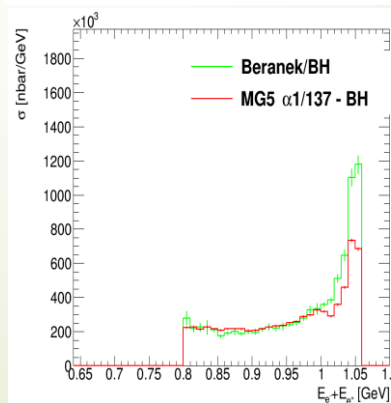
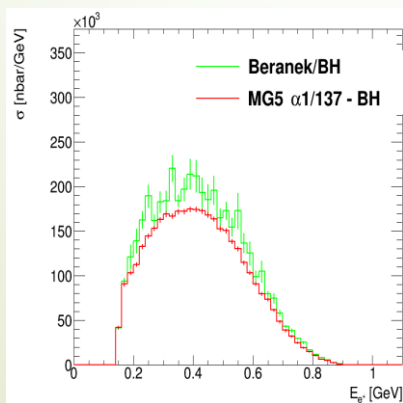
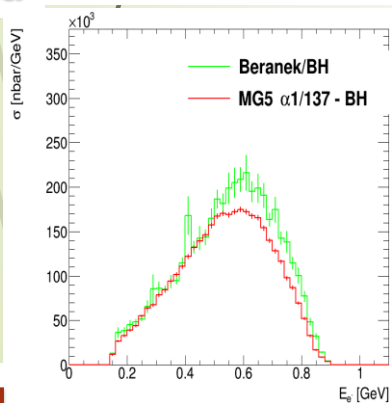
**M inv.**



**Rad & BH**



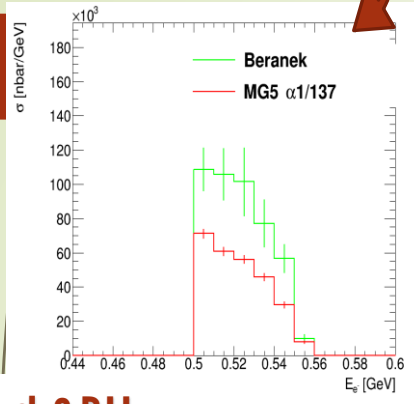
**Rad**



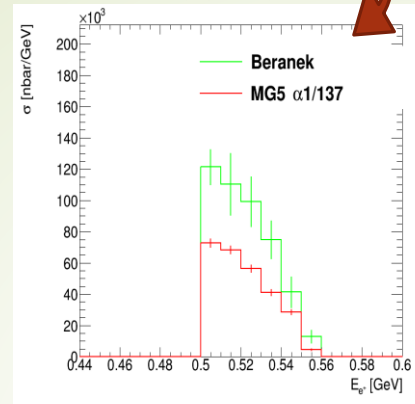
**BH**

→  $E_{min} > 0.5$ ,  $E_{sum} > 1$

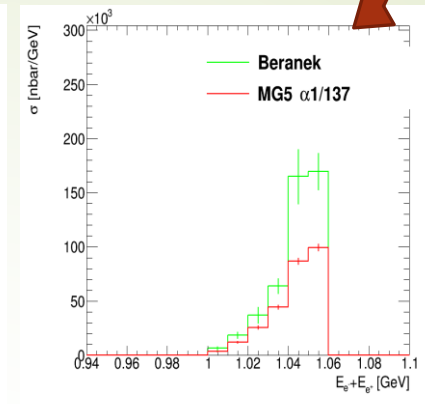
**Electron**



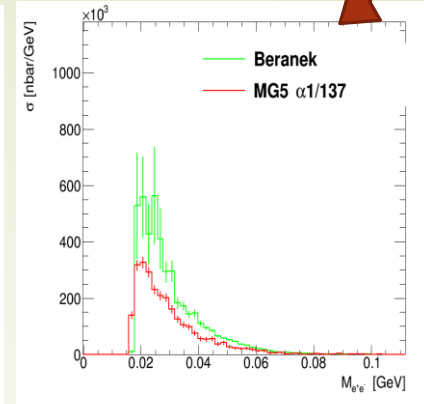
**Positron**



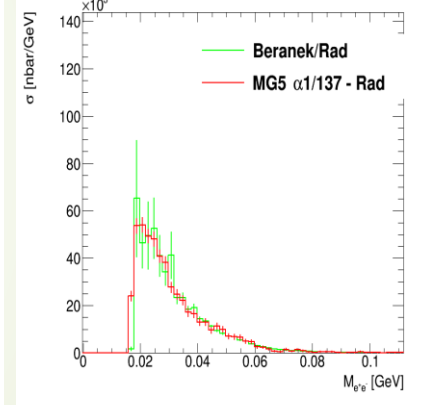
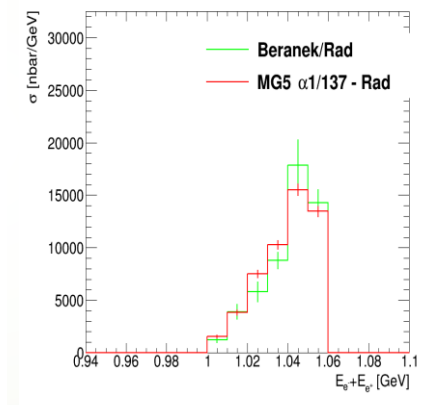
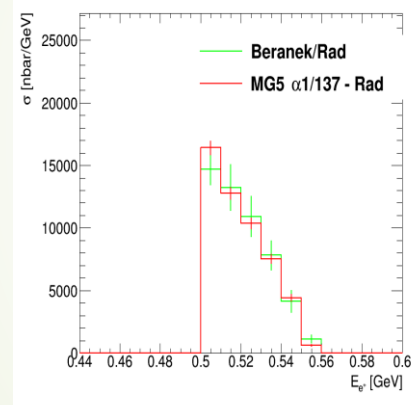
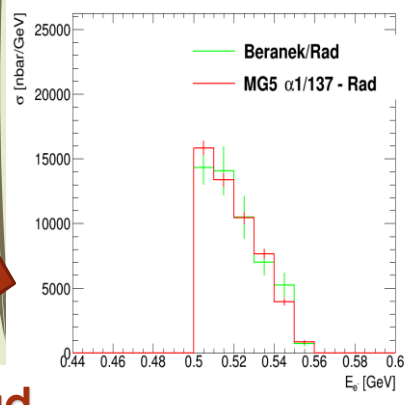
**Esum**



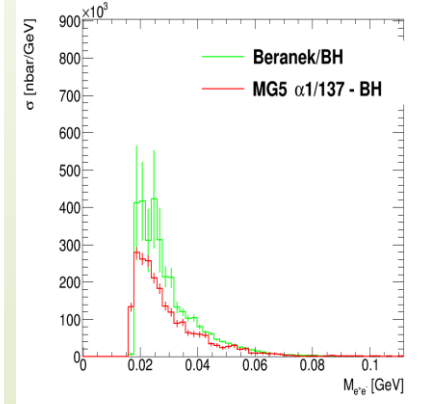
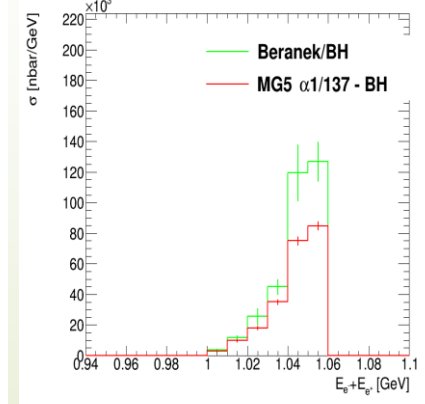
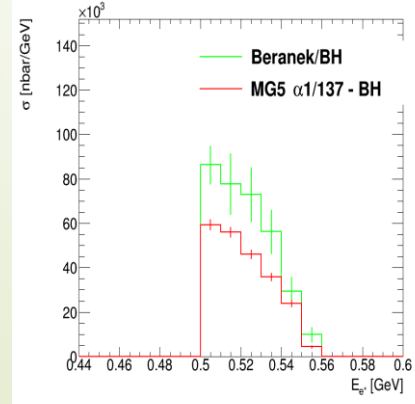
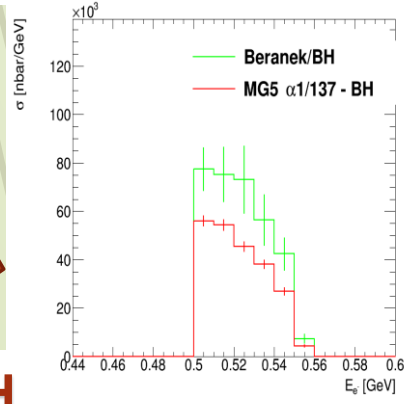
**M inv.**



**Rad & BH**



**Rad**



**BH**



Thanks