

Update of MC Simulations

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Status of the Monte Carlo simulations

Link to the spreadsheet with contaminations and background rates in DMM and KMM:

https://docs.google.com/spreadsheets/d/1j-zV_J_Qijx5RKv6jD9fb4xSRTMqARNcoqU7qkc3jXw/edit?usp=sharing

Complete simulations with the “old” geometry (no CIS, simplified vessel, old shield design):

- Crystal PMTs (kovar body + quartz window + ceramic plate)
- Enclosure copper body

Complete simulations with latest geometry for PoP:

- Enclosure copper belts and bars
- Enclosure teflon belts
- CIS Copper
- CIS Steel
- Steel Vessel
- Crystal wrapping
- Vessel PMTs
- Upper limits of External Bkg (Ambra's Thesis)
- Crystal (Maddalena)

NEW !

Results presented at the last MC meetings:

<https://agenda.infn.it/getFile.py/access?contribId=1&resId=0&materialId=slides&confId=12980>

<https://agenda.infn.it/getFile.py/access?contribId=1&resId=0&materialId=slides&confId=1283>

<https://agenda.infn.it/getFile.py/access?contribId=0&resId=0&materialId=slides&confId=12833>

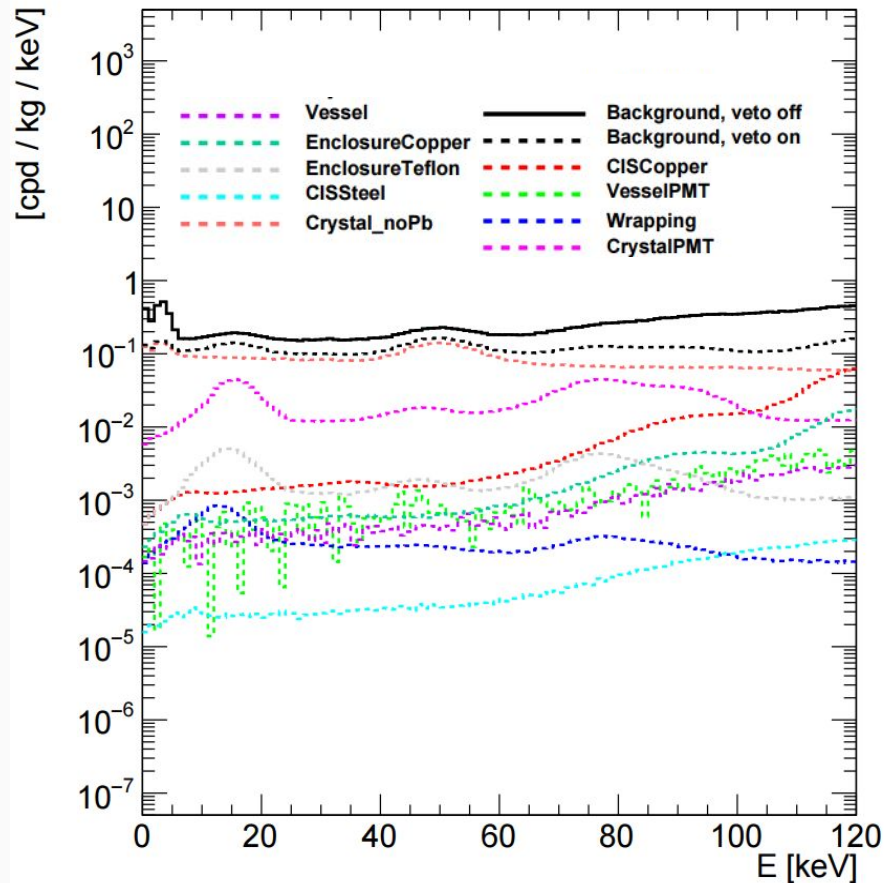
Ongoing simulations:

- Liquid scintillator (Francis) ?

To do

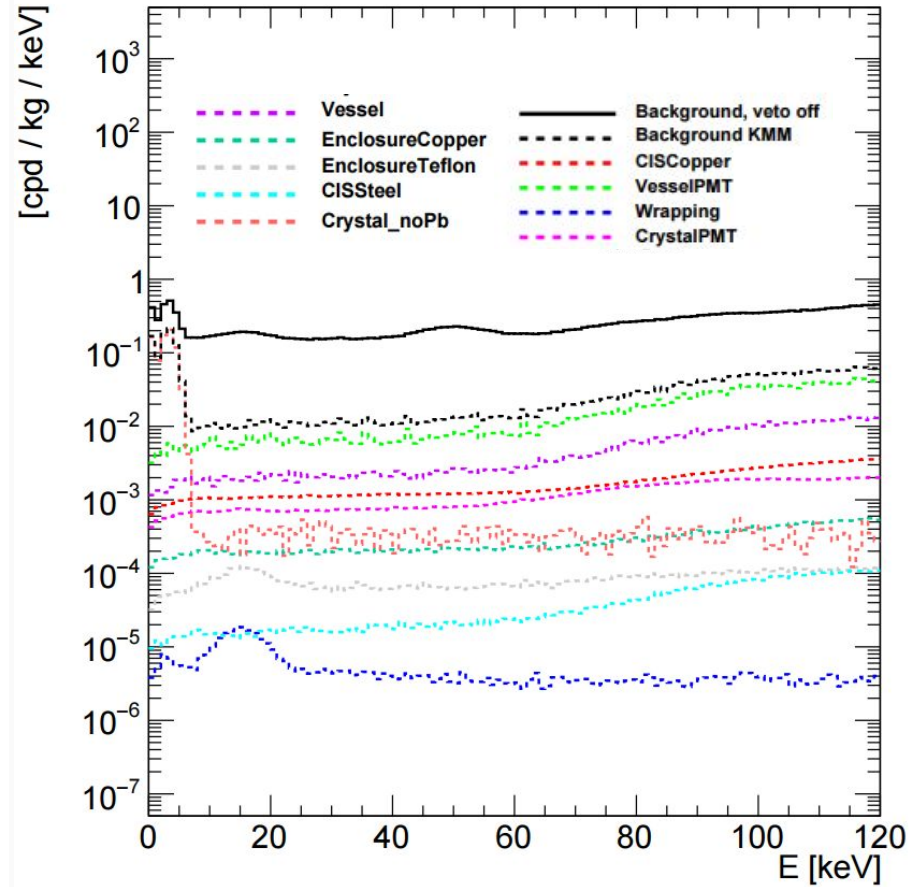
- Decide whether old complete simulations have to be repeated
- Shielding (PE)
- Decide how to present and summarize results (next slides are just an example)
- External backgrounds : discuss if will go in another paper

TOTAL Background (..so far)



Note that some contributions are **missing**:

- Main cylinder of copper enclosure
- liquid scintillator
- PE + steel + Pb shielding



Highest contribution in KMM given by **veto PMTs** and **Vessel** for their positioning wrt the LS and crystal

Thanks to Francesco and Maddalena for sending us their results!

TOTAL Background (..so far)

Geometry Element	BKG [cpd/kg]	BKG-DMM [cpd/kg]	BKG-KMM[cpd/kg]
Crystal Wrapping	0.00134 +/- 1e-05	0.001145 +/- 1e-05	1.593e-05 +/- 1.1e-06
Crystal PMTs	0.05846 +/- 6.6e-05	0.03718 +/- 5.7e-05	0.001272 +/- 9.2e-06
Enclosure Internal Teflon	0.01654 +/- 0.00014	0.01408 +/- 0.00014	0.0001264 +/- 5.6e-06
Enclosure Internal Copper	0.007455 +/- 6.1e-05	0.00179 +/- 2.9e-05	0.0003462 +/- 1.2e-05
CIS Copper	0.0005448 +/- 7.1e-06	0.0001015 +/- 3.1e-06	2.626e-05 +/- 1.6e-06
CIS Steel	0.0005448 +/- 7.1e-06	0.0001015 +/- 3.1e-06	2.626e-05 +/- 1.6e-06
Vessel	0.03852 +/- 0.00072	0.001047 +/- 0.00012	0.002994 +/- 0.0002
Vessel PMTs	0.08598 +/- 0.0033	0.001341 +/- 0.00041	0.01079 +/- 0.0012
Total internal [NEW]	0.2391 +/- 0.0034	0.06047 +/- 0.00045	0.01079 +/- 0.0012
Crystal no Pb [NEW]	1.547 +/- 0.0034	0.5637 +/- 0.00043	0.4291 +/- 0.0012
Enclosure copper*	2.6e-2	6.8e-3 after 6 months	2.8e-3 (2.1 after 60 days)
PE shield (40 cm box)*	1.2e-2	3.3e-4	9.1e-4
External gammas**		< 1.61 x 10 ⁻² (99% C.L.)	(2.74 ± 0.82) x 10 ⁻²



Upper limits



Measurements



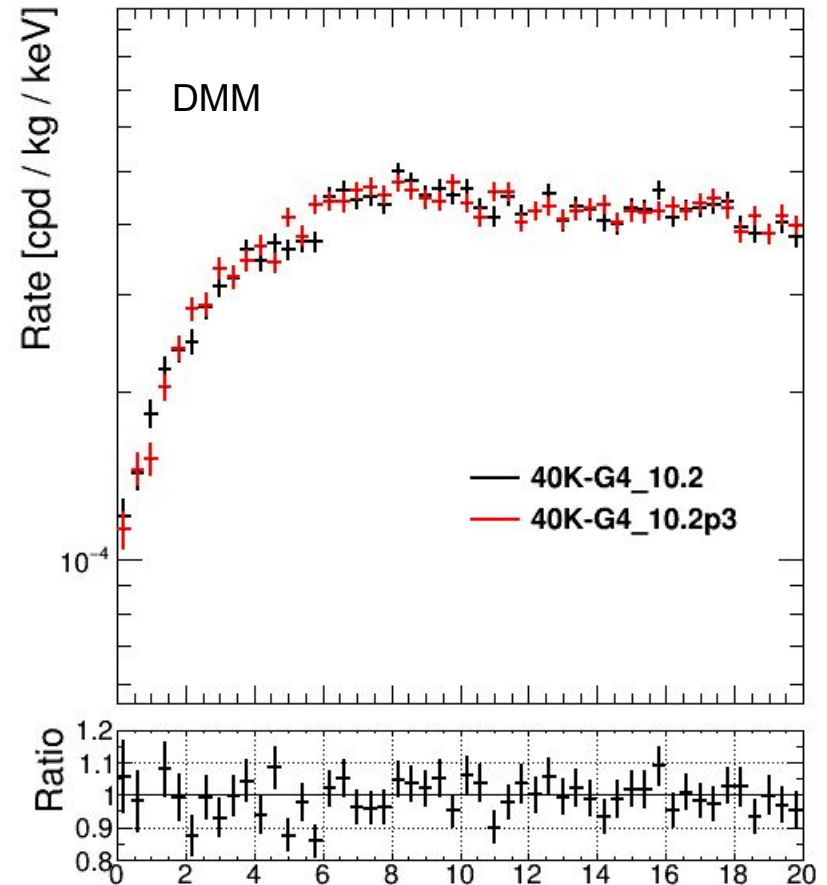
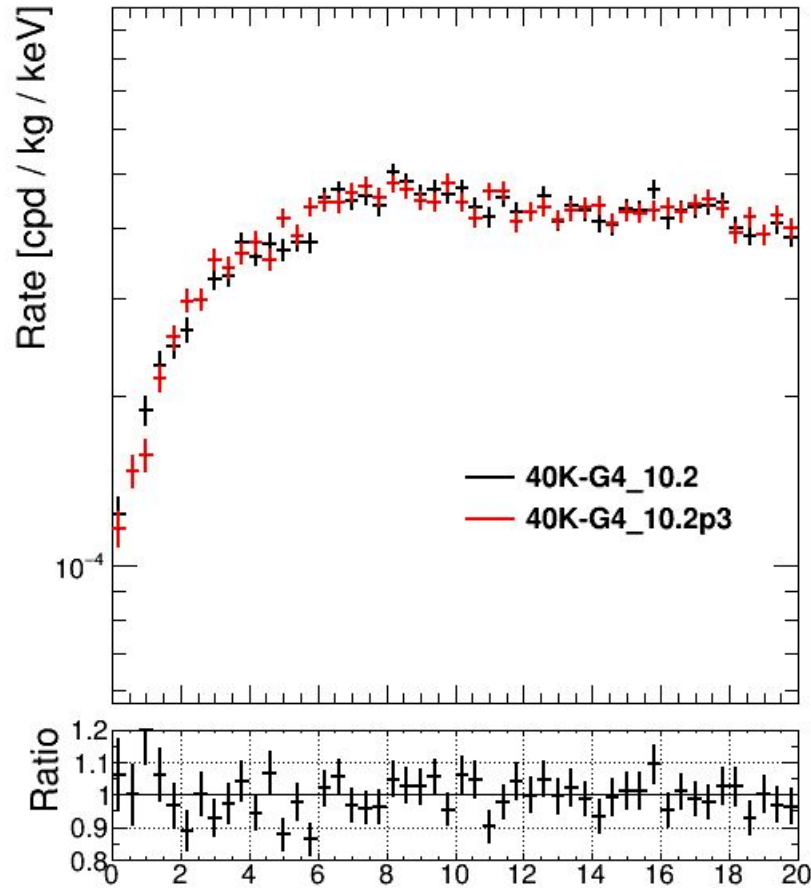
Old simulations

[*] Old geometry: <https://agenda.infn.it/getFile.py/access?contribId=2&resId=0&materialId=slides&confId=12119>

[**] Estimation from Ambra Mariani's thesis

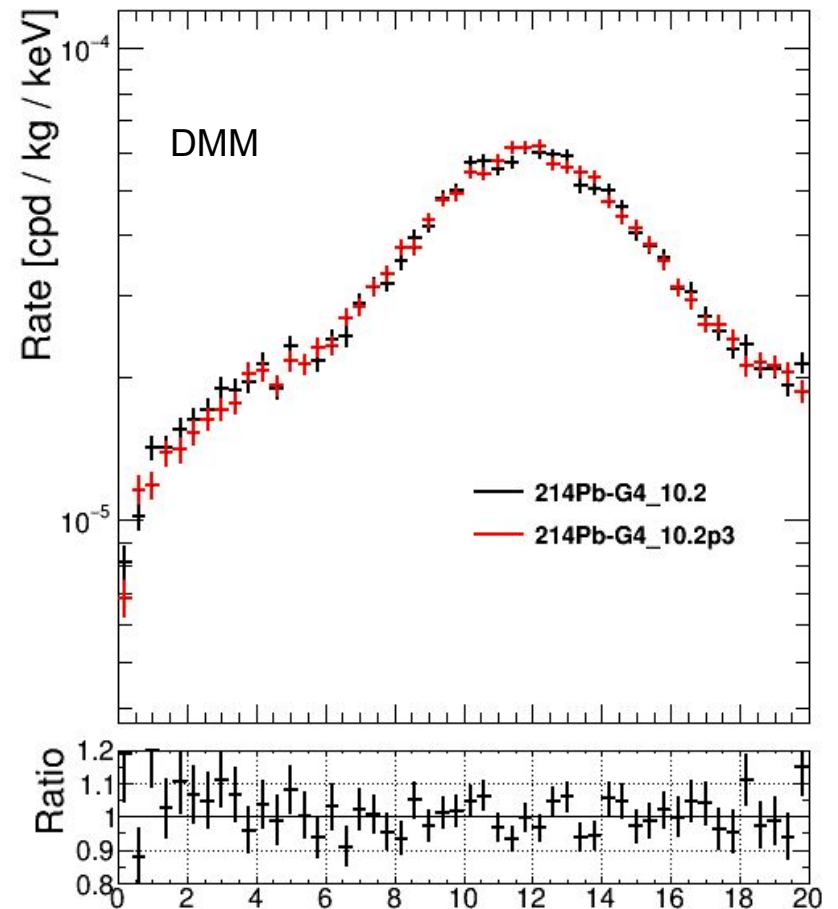
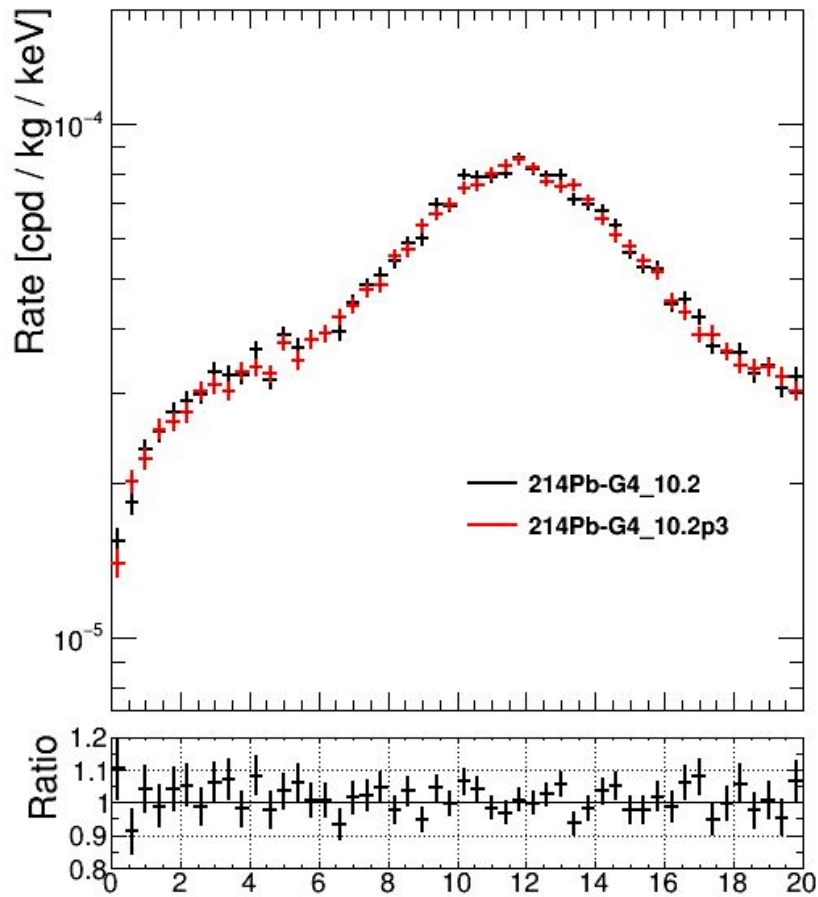
GEANT4 Upgrade

- Some cross checks after the upgrade of GEANT4 to version 10.2 patch 3 (Thanks to Maddalena)
- 40K in crystal wrapping



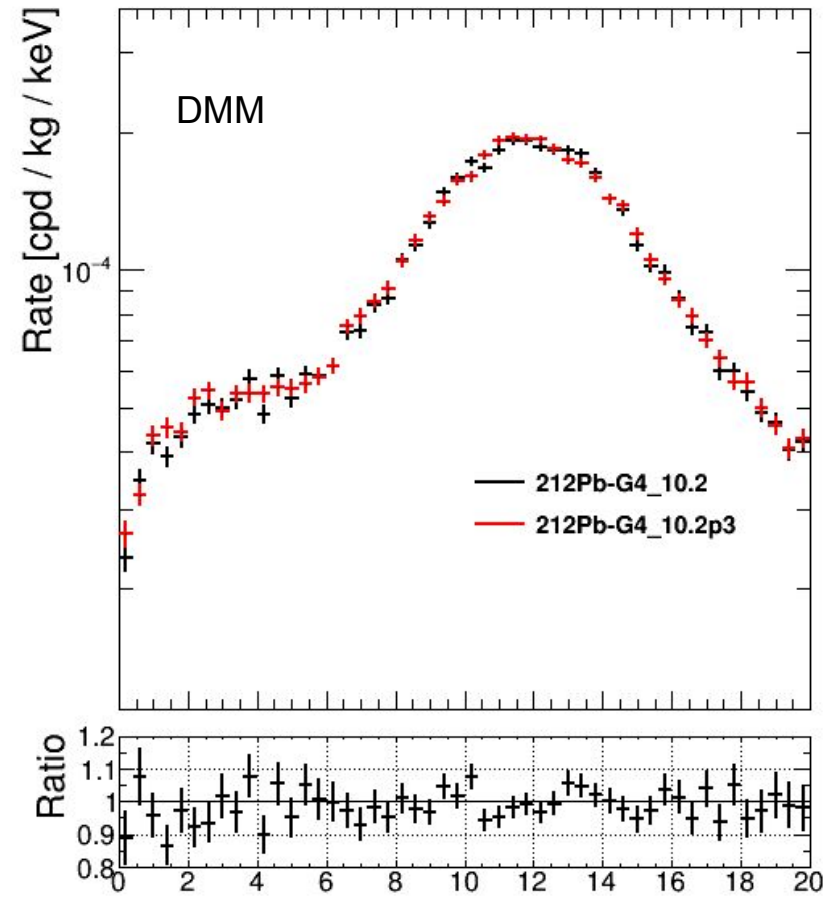
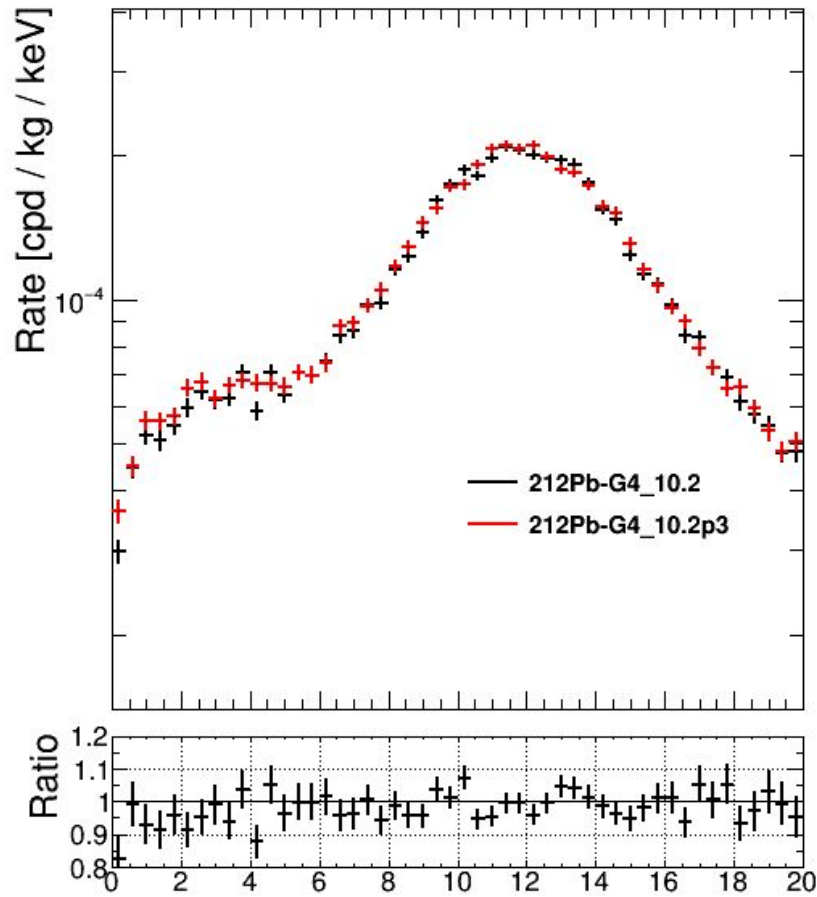
GEANT4 Upgrade

- Some cross checks after the upgrade of GEANT4 to version 10.2 patch 3 (Thanks to Maddalena)
- ^{214}Pb in crystal wrapping



GEANT4 Upgrade

- Some cross checks after the upgrade of GEANT4 to version 10.2 patch 3 (Thanks to Maddalena)
- ^{212}Pb in crystal wrapping



GEANT4 Upgrade

- Some cross checks after the upgrade of GEANT4 to version 10.2 patch 3 (Thanks to Maddalena)
- ^{228}Ra is unstable!!

