# Study of Mg ion fragmentation cross-sections for shielding purposes using GEANT4


**Presented by**

**Nitika Sangwan**

Department of Physics,

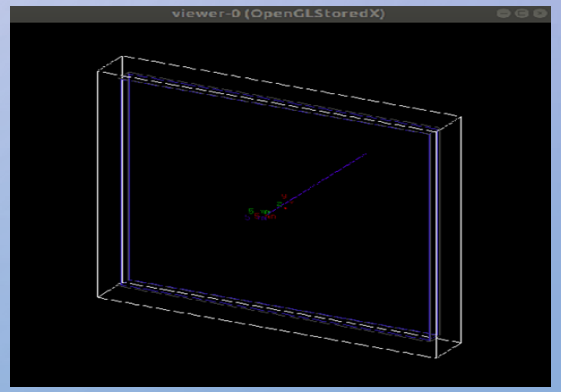
National Institute of Technology, Kurukshetra-136119 (India)

*nitikasangwan133@gmail.com*



***In this study, the PFXS are calculated for $^{24}$Mg ions of energy 370 MeV/n and ~470 MeV/n in carbon (C) material. The study utilized the QMD and the INCL++ physics model for simulation to compute the PFXS by the three-dimensional Monte Carlo toolkit Geant4. The comparative analysis is carried out between the simulated outcome of Geant4, the experimental data, and the results generated by the PHITS code system.***

- The spectrum of high energy ions (HZE) from galactic cosmic rays (GCRs) and solar particle event (SPE) is very broad in space.
- This adds a significant concern for astronauts and equipment for mission exploration which could impair their performance and can cause the space mission failure.
- The partial fragmentation cross-sections (PFXS) and linear energy deposition are two very important factors to estimate the dose deposition and risk possibilities.
- Radiation exposure assessment on the human exploration missions remains a challenge due to incomplete understanding of many physical processes.
- The 3-D Monte Carlo Geant4 simulation toolkit can be used to estimate the PFXS of HZE ions.
- Magnesium (Mg) ion is one of the most contributing ions in HZE spectrum.
- The simulation is performed for $^{24}$Mg ions of energy 370 MeV/n and ~470 MeV/n in carbon (C) material.
- The comparative analysis is carried out with the experimental data and the PHITS code system.
- Two different physics models, the QMD and the INCL++ are used.




Detector configuration

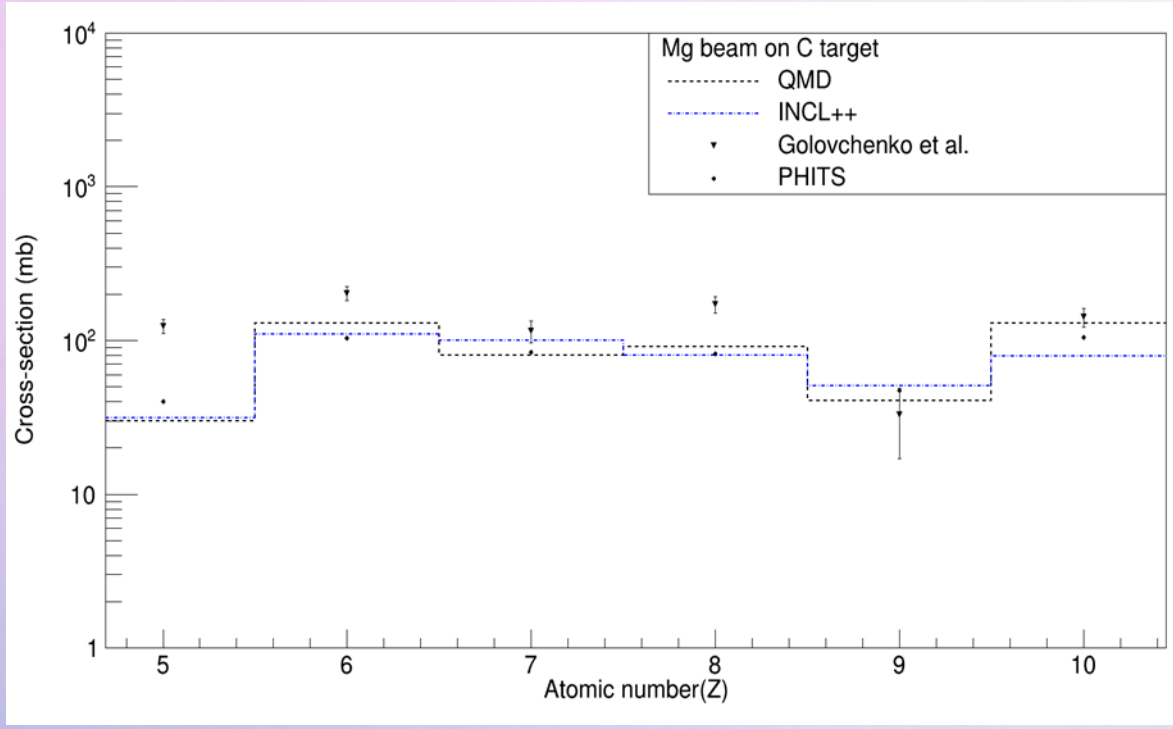



**Figure 1.**The fragmentation cross-section of Mg ion incident on C target with energy 370 A MeV.

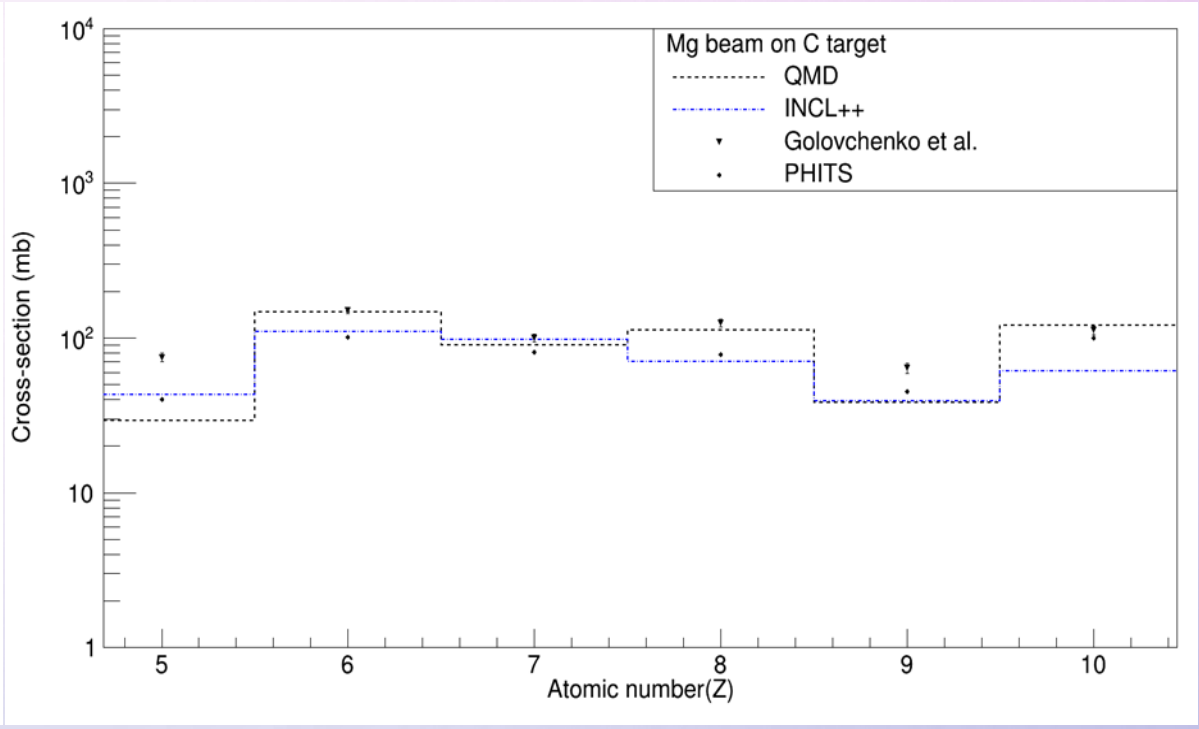



**Figure 2.** The fragmentation cross-section of Mg ion incident on C target with energy ~470 A MeV.

## Conclusion

- ✓ Fragmentation cross-section study of Mg ion on C target using Geant4 software generates good results compared to experimental data and PHITS code data.
- ✓ The QMD model offers the best agreement for PFXS with an odd-even effect.
- ✓ Both model shows close agreement for the mid Z fragments (Z=6-9).