



מכון ויצמן למדע
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Run-1 TGC rate analysis and extrapolation to NSW

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WIS

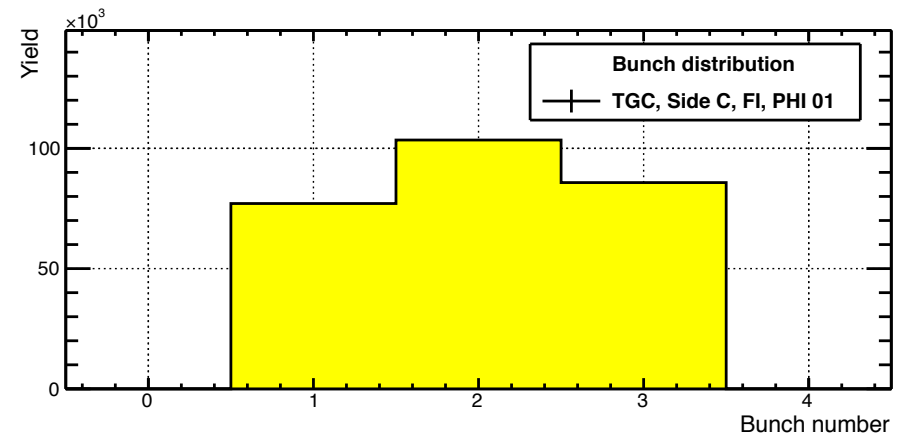
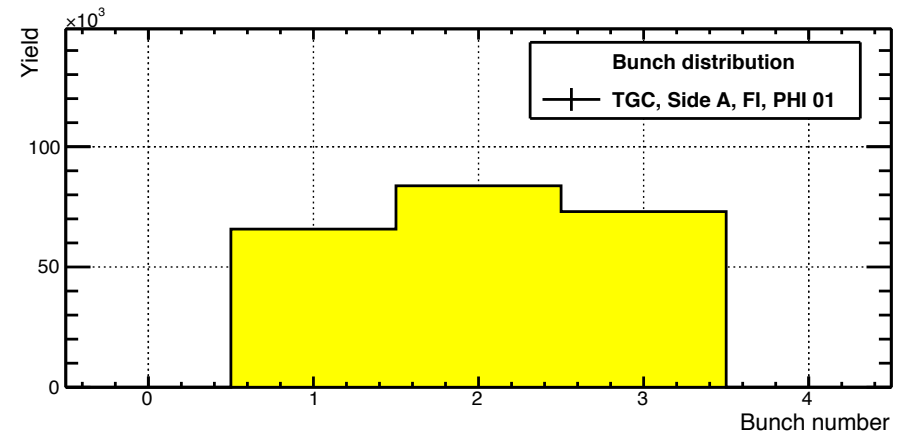


Data set and trigger

- **Data:** Run-1, 15th of November 2012, run #214553
- **Luminosity:** $L_{\text{peak}} = 6.7 \times 10^{33} \text{ Hz/cm}^2$, $L_{\text{ave}} = 3.8 \times 10^{33} \text{ Hz/cm}^2$
- **Trigger:** L1_RD0 _FILLED
- **Statistics:** 720474 analyzed events
- **Detectors:**
TGC (T10 doublets) from present SW, FI station, 24 detectors on each side A and C;
TGC (T1, T3, T6, T7 and T8 triplets) from BW, M1 station, FW & EC, 48 detectors on each side A and C;

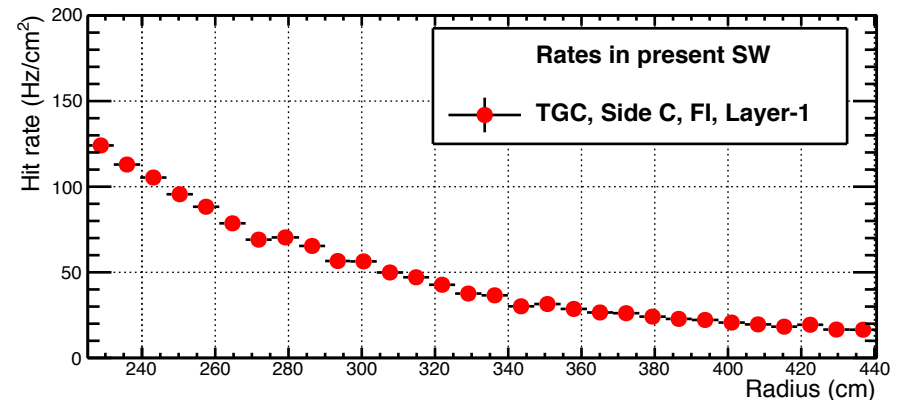
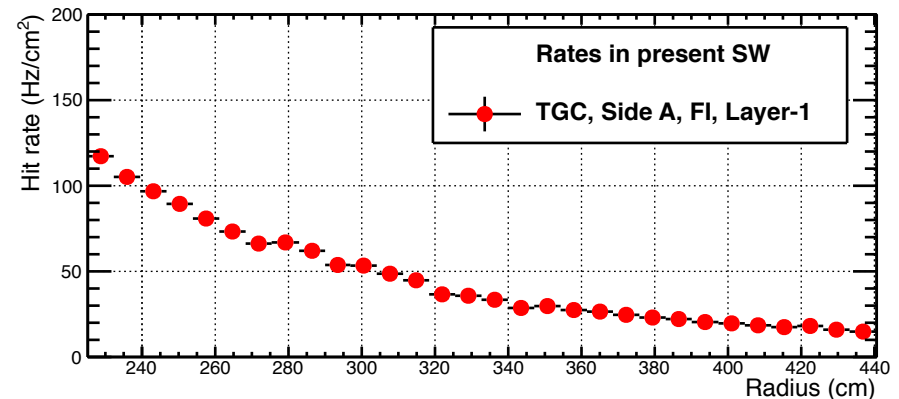
Bunch crossing distribution

- Three bunch crossing present in the data: previous, current and next, each 25 ns length.
- Only current (central) bunch crossing has been used in the present analysis.
- Consequently the distributions of the raw hit rates per event, derived in this analysis, has been normalized to the number of analyzed events and the length of a single bunch crossing of 25 ns.



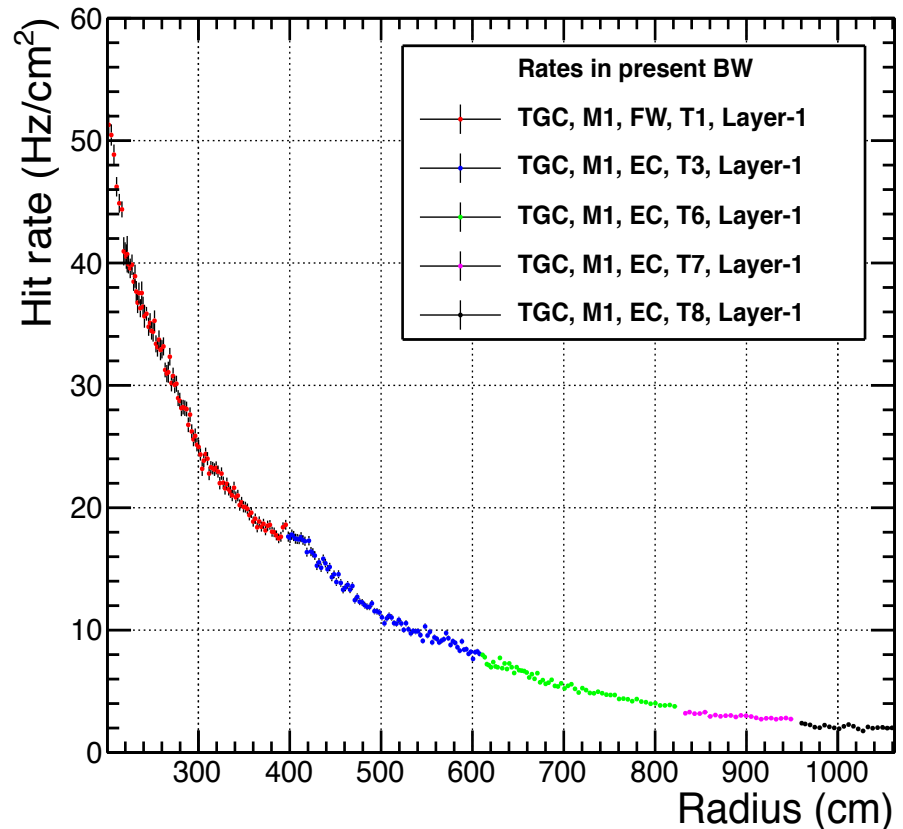
Measured total hit rates in SW

- The definition of a hit is a fired wire together with a strip partner in the first gas gap of T10 doublet, so-called Layer-1.
- The extracted raw number of hits versus wire group position has been normalized to the area of each particular group of the ganged wires.
- Since it was verified that there is no ϕ dependence all working detectors were combined together on each side.



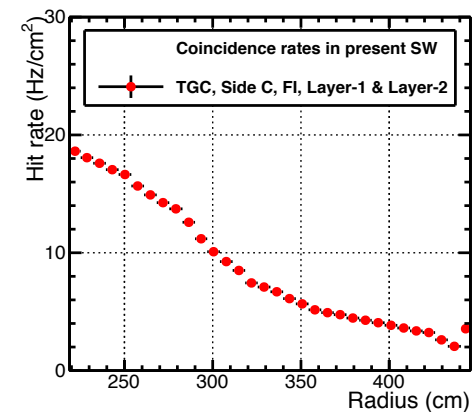
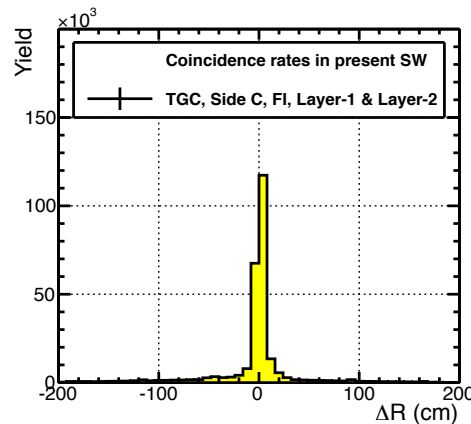
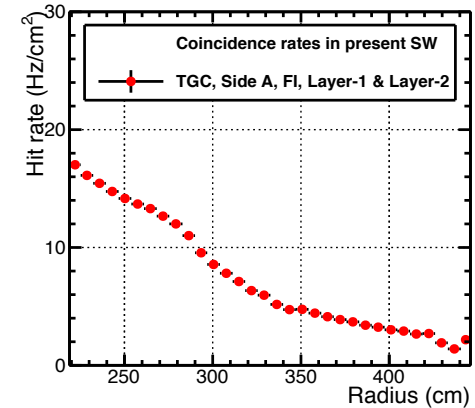
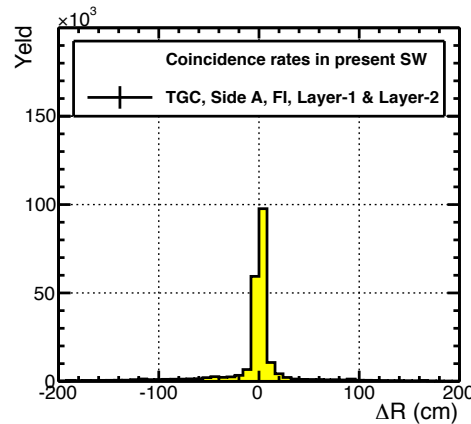
Measured total hit rates in BW

- The definition of a hit is a fired wire together with a strip partner in the first gas gap of T1, T3, T6, T7 and T8 triplets.
- The extracted raw number of hits versus wire group position has been normalized to the area of each particular group of the ganged wires.
- Since it was verified that there is no ϕ dependence all working detectors were combined together on each side.



Correlated hit rates in SW

- The definition of a hit in this case is a coincidence between two fired wire hits from each gas gap of T10 doublets, Layer-1 & Layer-2.

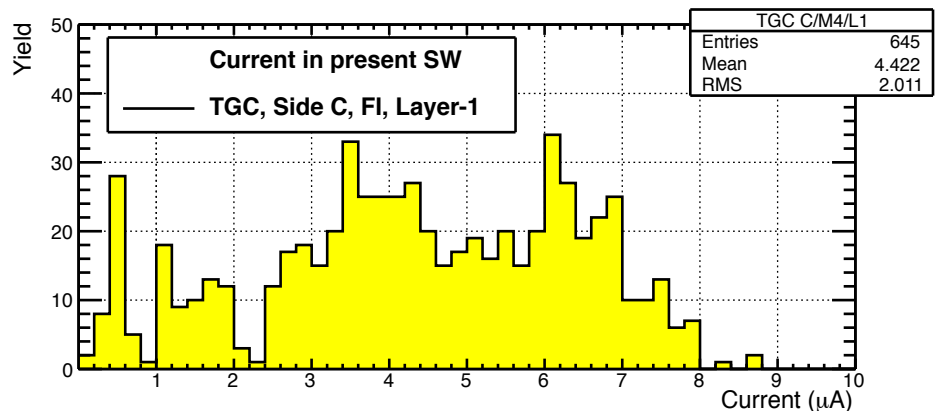
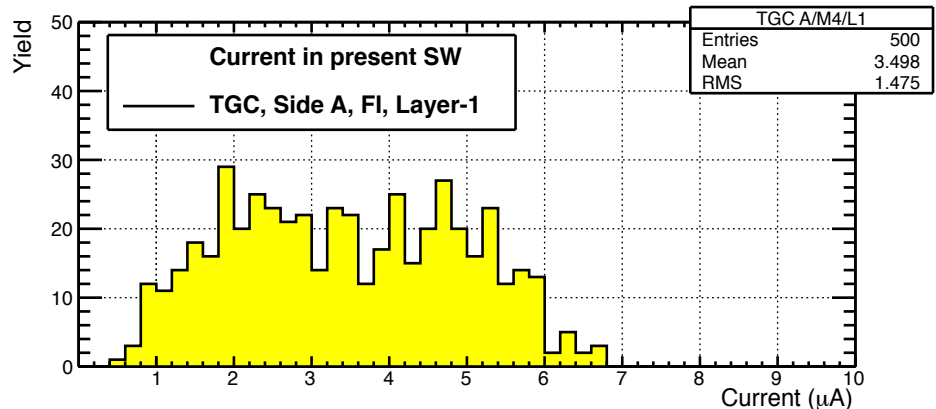


Measured charge per hit in SW

- Used TGC HV currents recorded by DCS during this particular run #214553.
- Using the average current and the average hit rate the average charge per hit has been calculated.
- Obtained results:

Side A: $\langle Q \rangle = 3.81 \pm 0.07$ pC

Side C: $\langle Q \rangle = 4.47 \pm 0.09$ pC



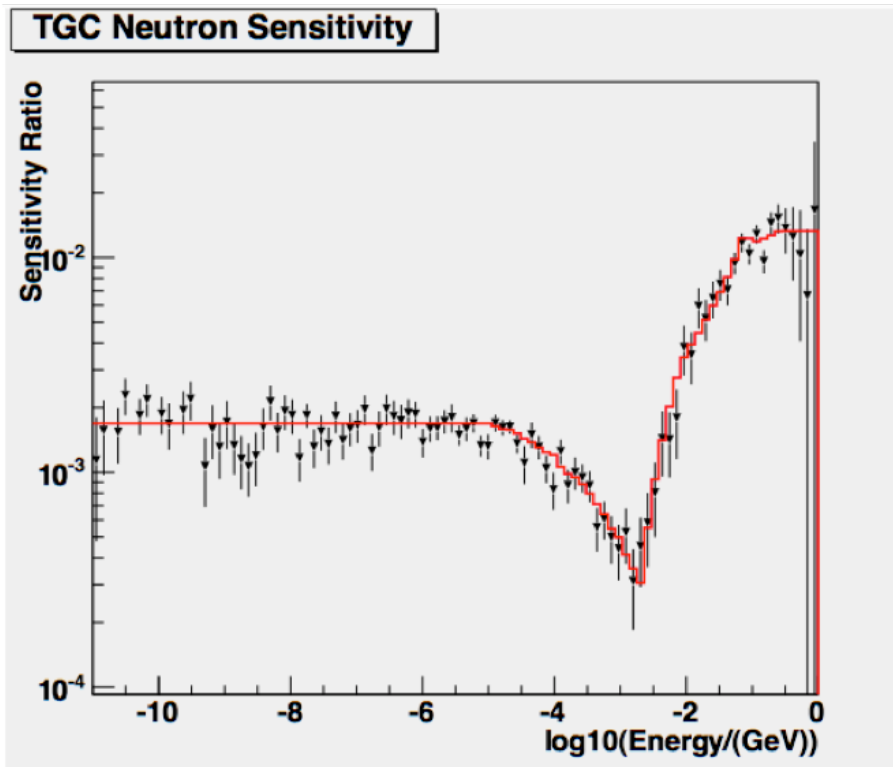


MC simulations used for comparison

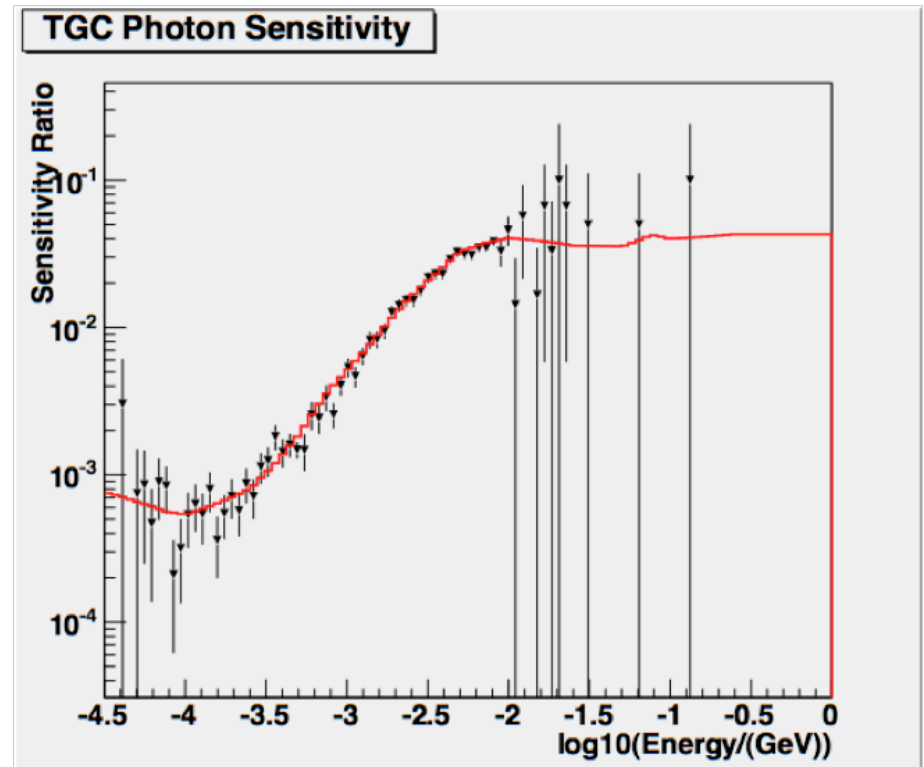
- FLUGG based stand-alone cavern background application.
- The geometry is defined using Geant-4.
- The sensitive detector elements have been simplified.
- Detailed shielding and beam line elements.
- FLUKA package for physics modeling.
- Phojet generator, p+p collisions at $\sqrt{s} = 8$ TeV.
- Particles, their decay products and interaction daughters are tracked by FLUGG application.
- The information recorded when they cross any of the logical scoring volumes defined around each muon station.
- For more details please: **ATL-COM-MUON-2014-027**

TGC sensitivities used in MC

Neutrons sensitivities



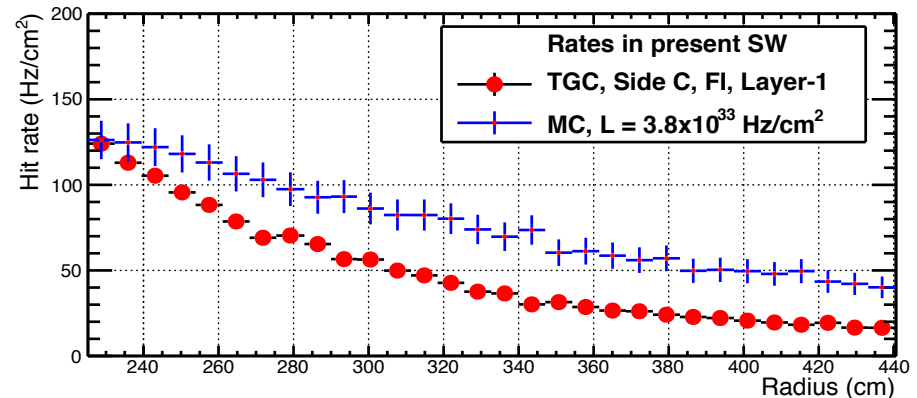
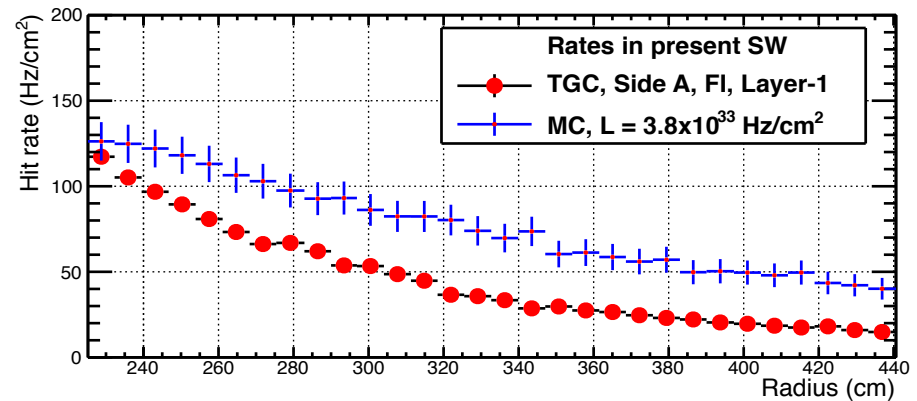
Photons sensitivities



The read lines are the actual sensitivity functions used in this MC, the black points are the result of a sample test

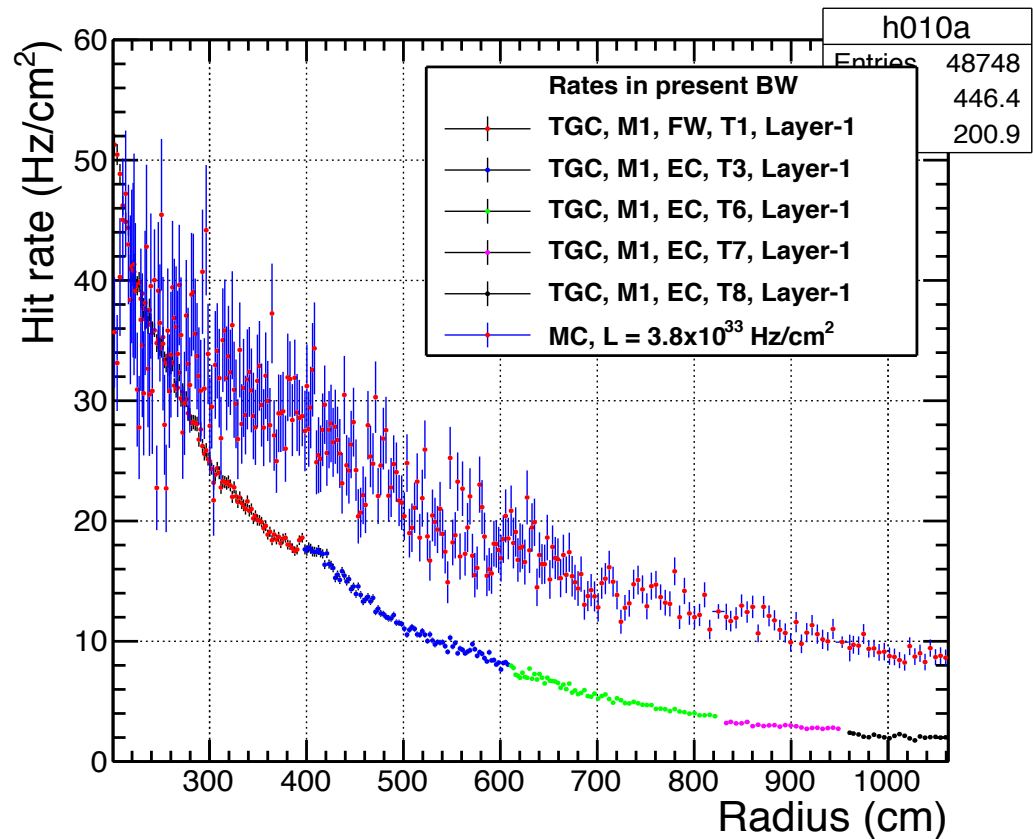
TGC hit rates in SW vs MC simulations

- In order to provide a direct comparison with the TGC hit rate measurements the simulations for Run-1 configuration have bin re-binned and scaled down for the average luminosity of this particular run #214553.
- One can see that the MC predictions are systematically higher than the TGC 2012 data.
- The reason for this discrepancy is being investigated, for the time being no solution yet.



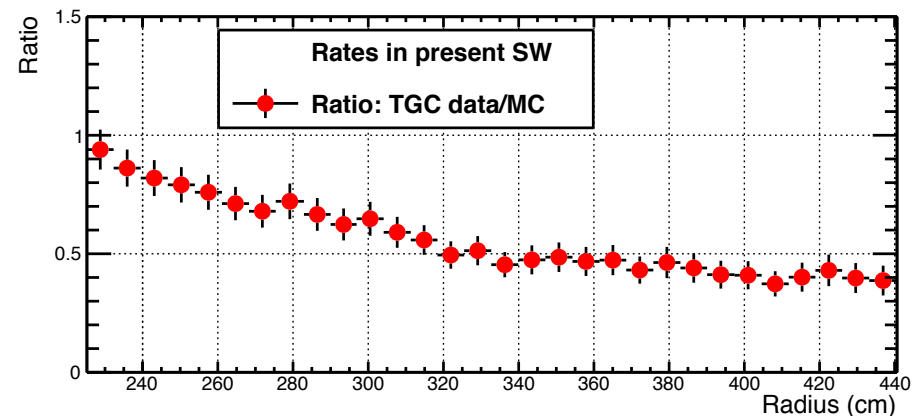
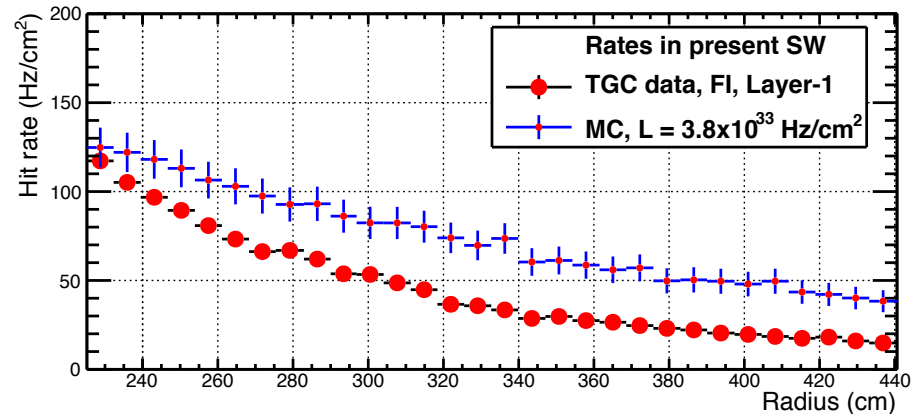
TGC hit rates in BW vs MC simulations

■ The same discrepancy is seen in TGC BW data.



TGC hit rates in SW vs MC simulations

- Taking into account not yet resolved the discrepancy between MC predictions and TGC hit rates data we have no solution now how to extrapolate the hit rates to NSW luminosities expected in Run-3.
- If data and simulation would agree perfectly, then one can plausibly believe predictions for smaller radius towards $\eta = 2.7$





Summary

- The TGC hits data analysis has been performed for the data taken in November 2012.
- The hit rates versus radius have been extracted for both SW and BW.
- The quantitative comparison between MC predictions and the Run-1 data has been performed.
- The discrepancy between MC simulations and measured hit rates has been observed.
- Will try to understand the present disagreement.
- The analysis will be repeated for Run-2 2015 data.