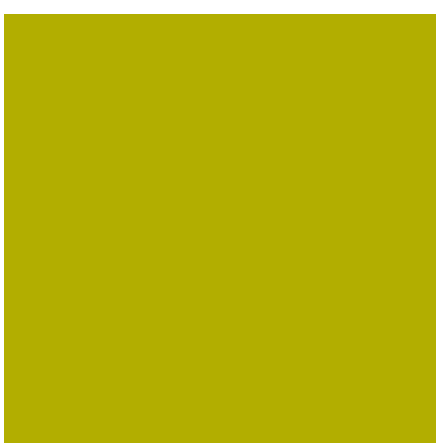
S1/S2 Validation



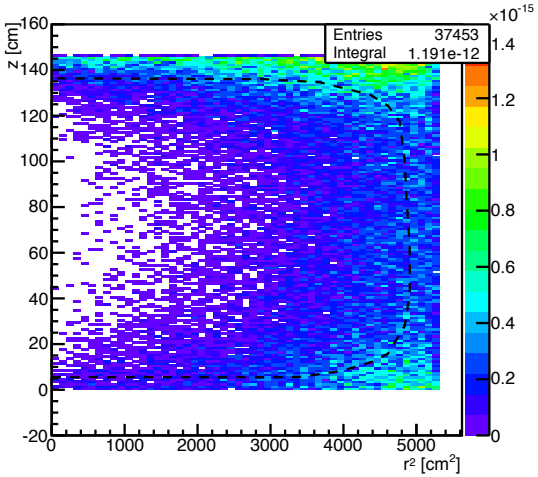
Bhawna Gomber, Ty Stiegler
Scott Haselschwardt, Jim Dobson

Outline

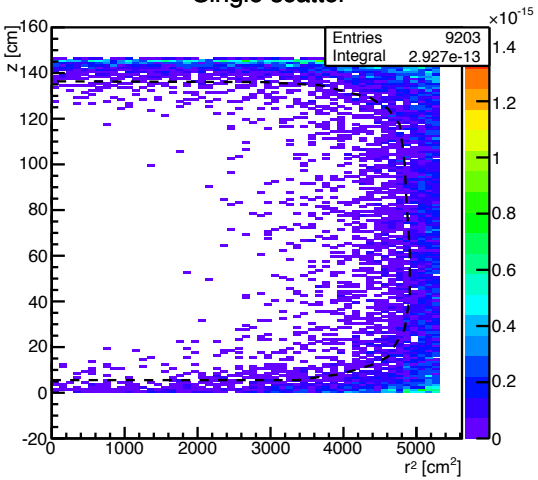
- 2 Simulations
  - gamma's from U238
  - Neutron's from Thorium
- Applied all the energy deposits cuts
  - For NR, roi is between 6-30 KeV
  - For ER, roi is between 0-100 KeV (at the end we scale to 1.5-6.5 KeV)
- Estimate the number of events passing all the energy deposits cuts
- Optimize the S1/S2 cuts based on results from energy only cuts, detector performance, 1.5 and collaboration level discussions.

Energy deposits for neutrons (from Thorium)

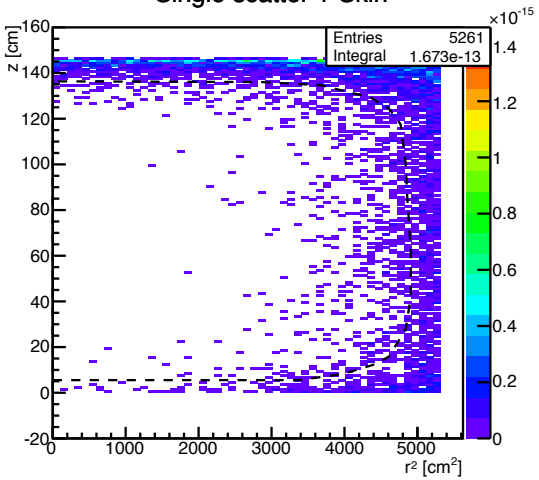
ROI



Single scatter

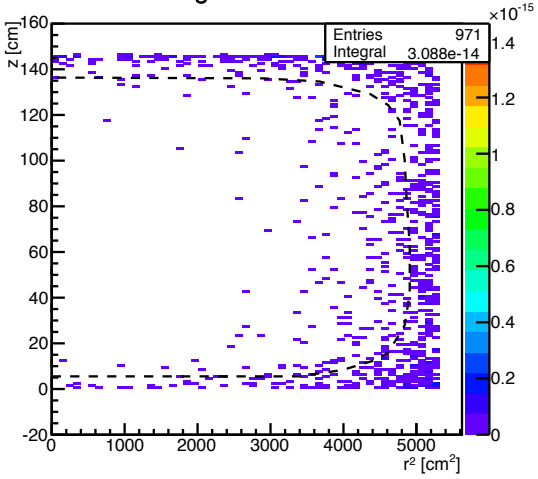


Single scatter + Skin

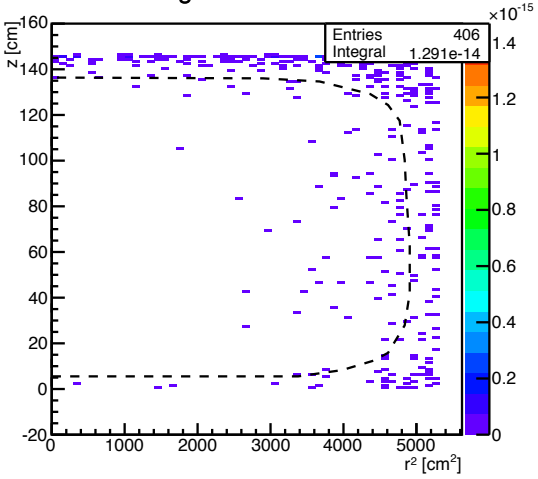


lz_vessels_Th_an_neutron, n(beamOn): 2000000

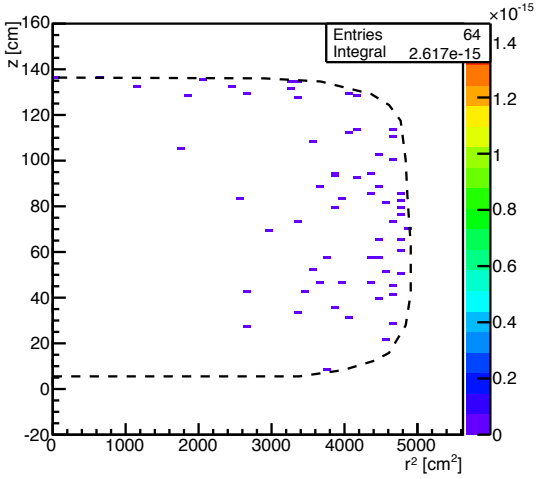
Single scatter + OD



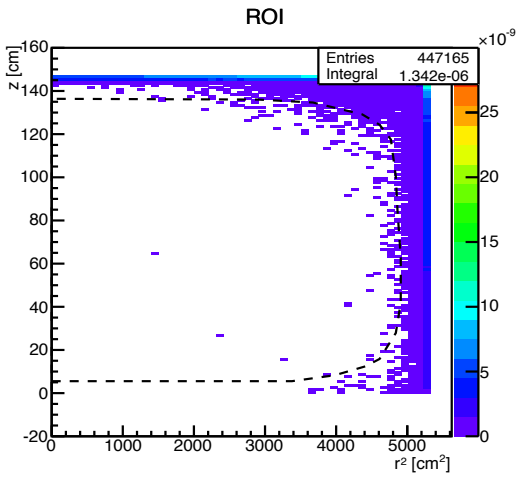
Single scatter + vetoes

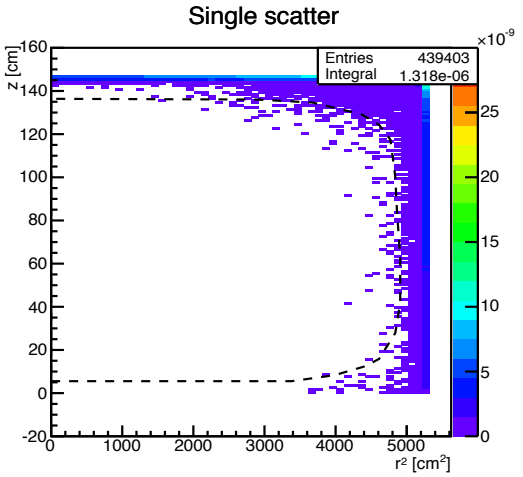


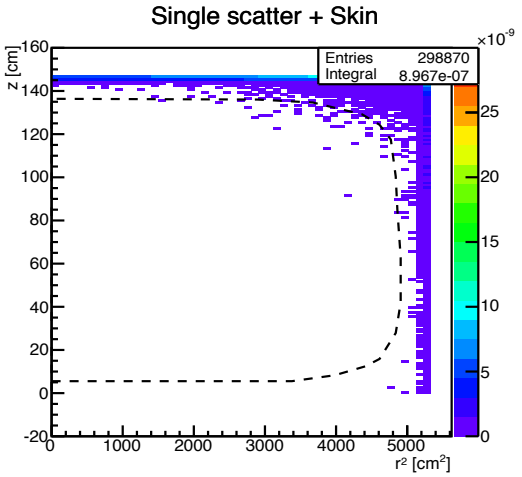
5.6t fiducial



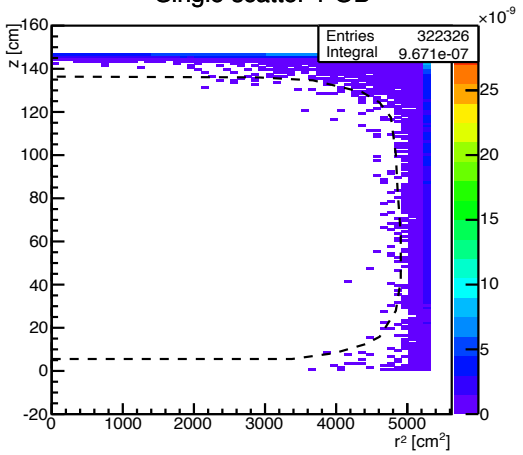
Enery deposits for gammas (from U238)

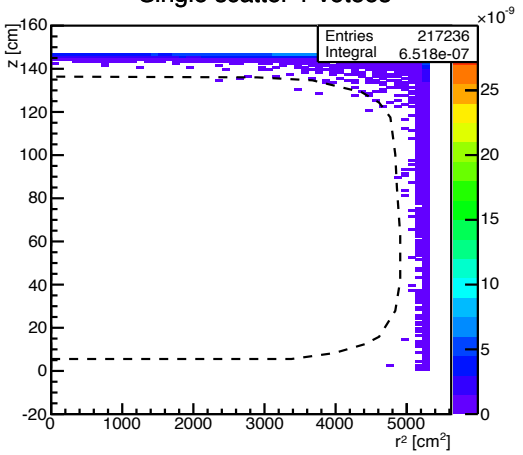


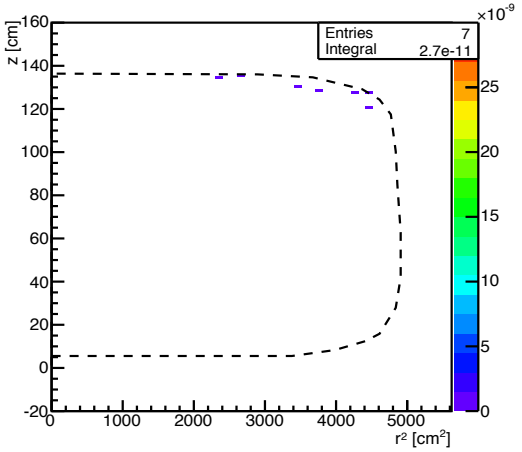




lz_vessels_U238_g4decay, n(beamOn): 200000000





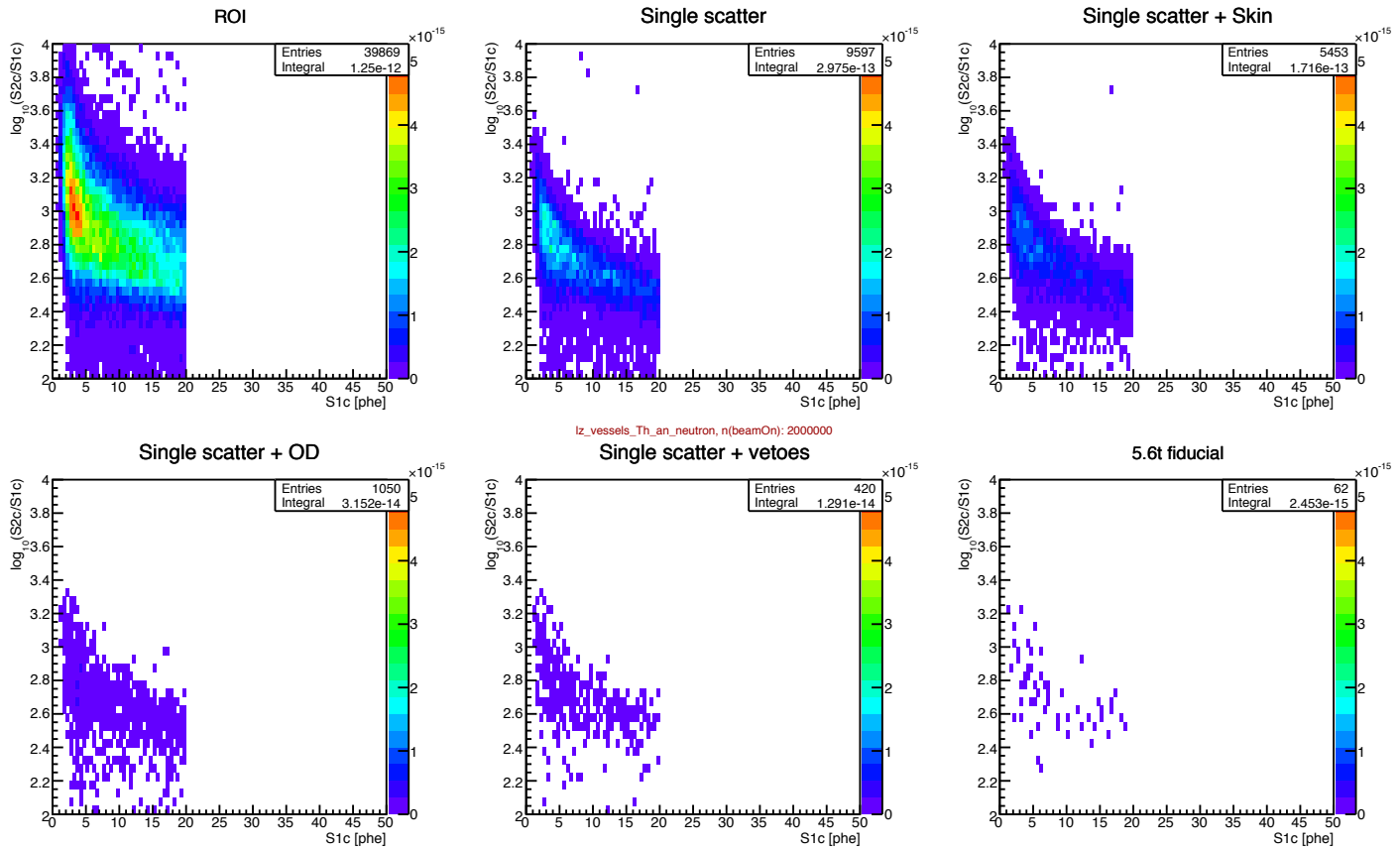


S1/S2 Validation

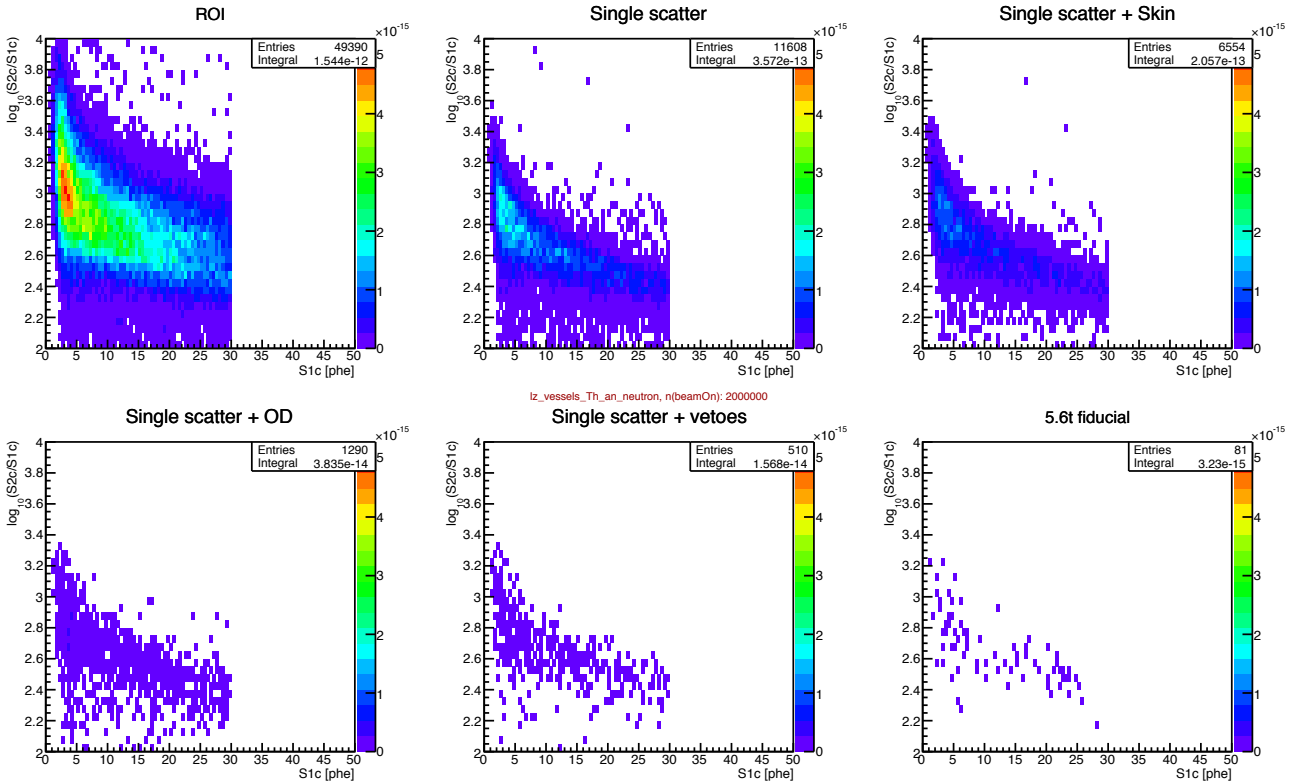
- 2 Simulations (using libNEST)
  - gamma's from U238
  - neutron's from Thorium
- Variations for corrected S1 cut
  - roi_lo = 0, 1,2
  - roi_hi = 20,30,40,50
- Looked at the discrimination plots log(S2c/S1c) as a function of S1c
  - roi_lo < S1_c < roi_hi
  - raw S2 > 250

Neutron simulations

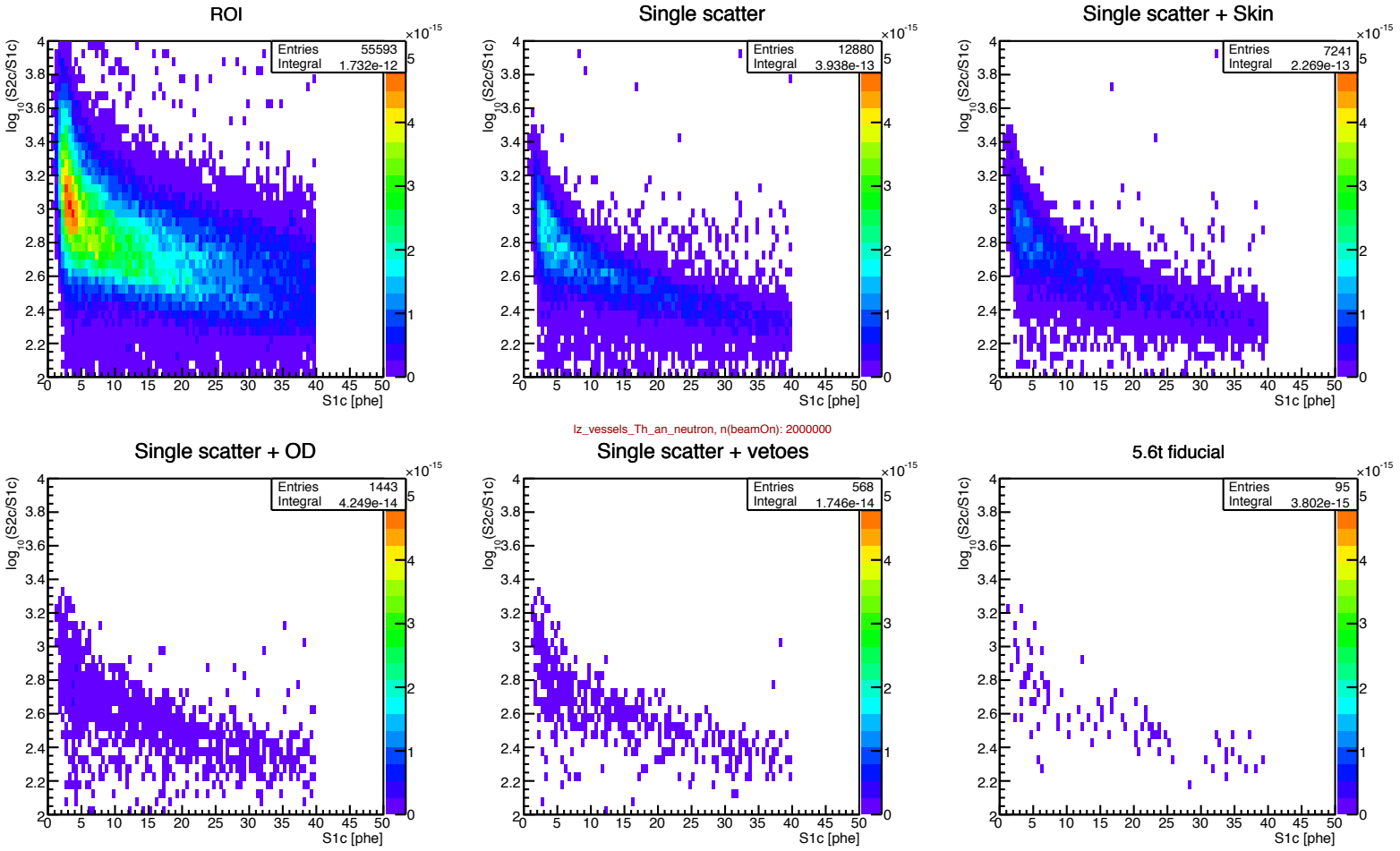
Log(S2/S1) as a function of S1 for roi_lo = 0, roi_hi=20



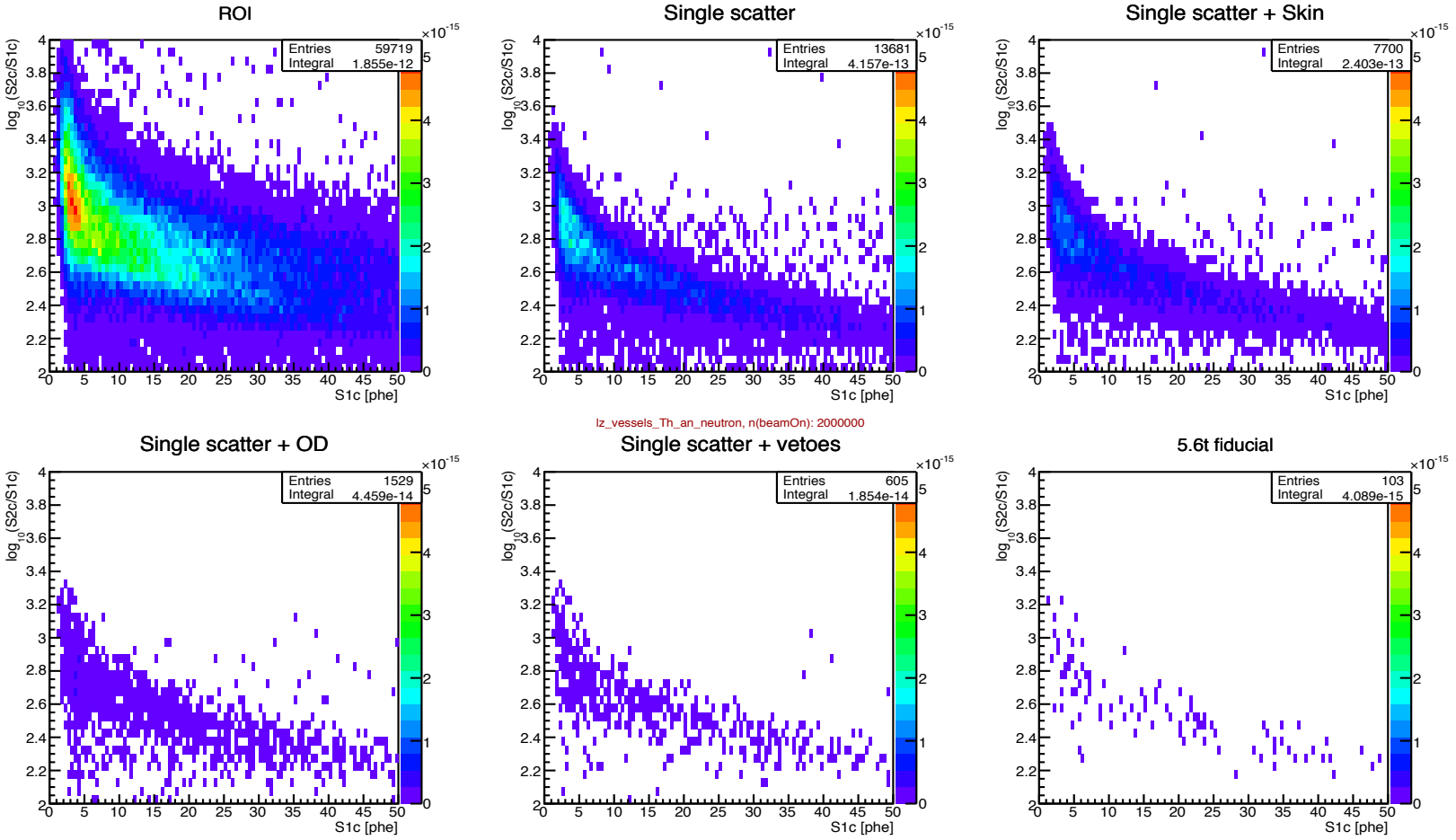
Log(S2/S1) as a function of S1 for roi_lo = 0 roi_hi=30



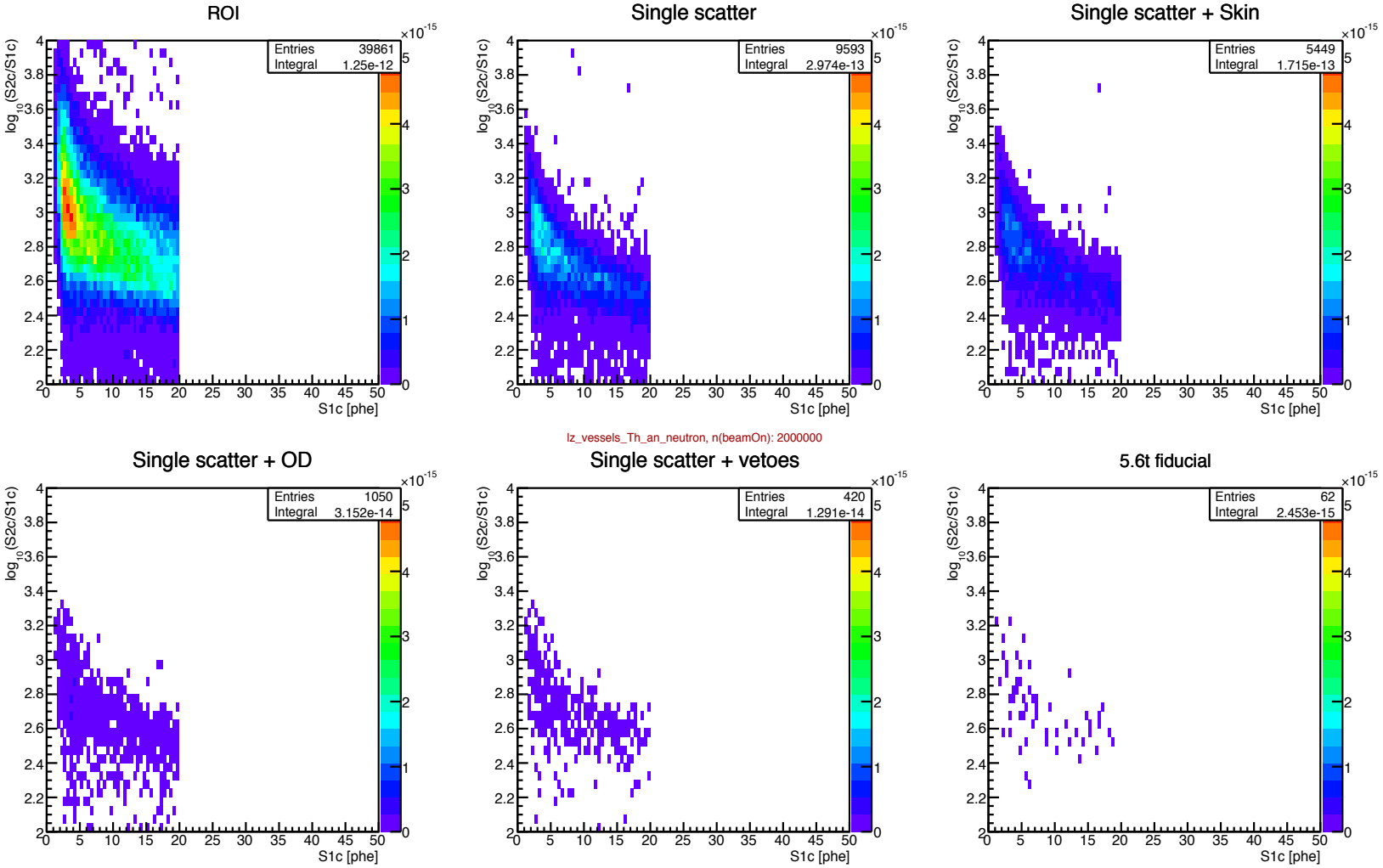
Log(S2/S1) as a function of S1 for roi_lo = 0 roi_hi=40



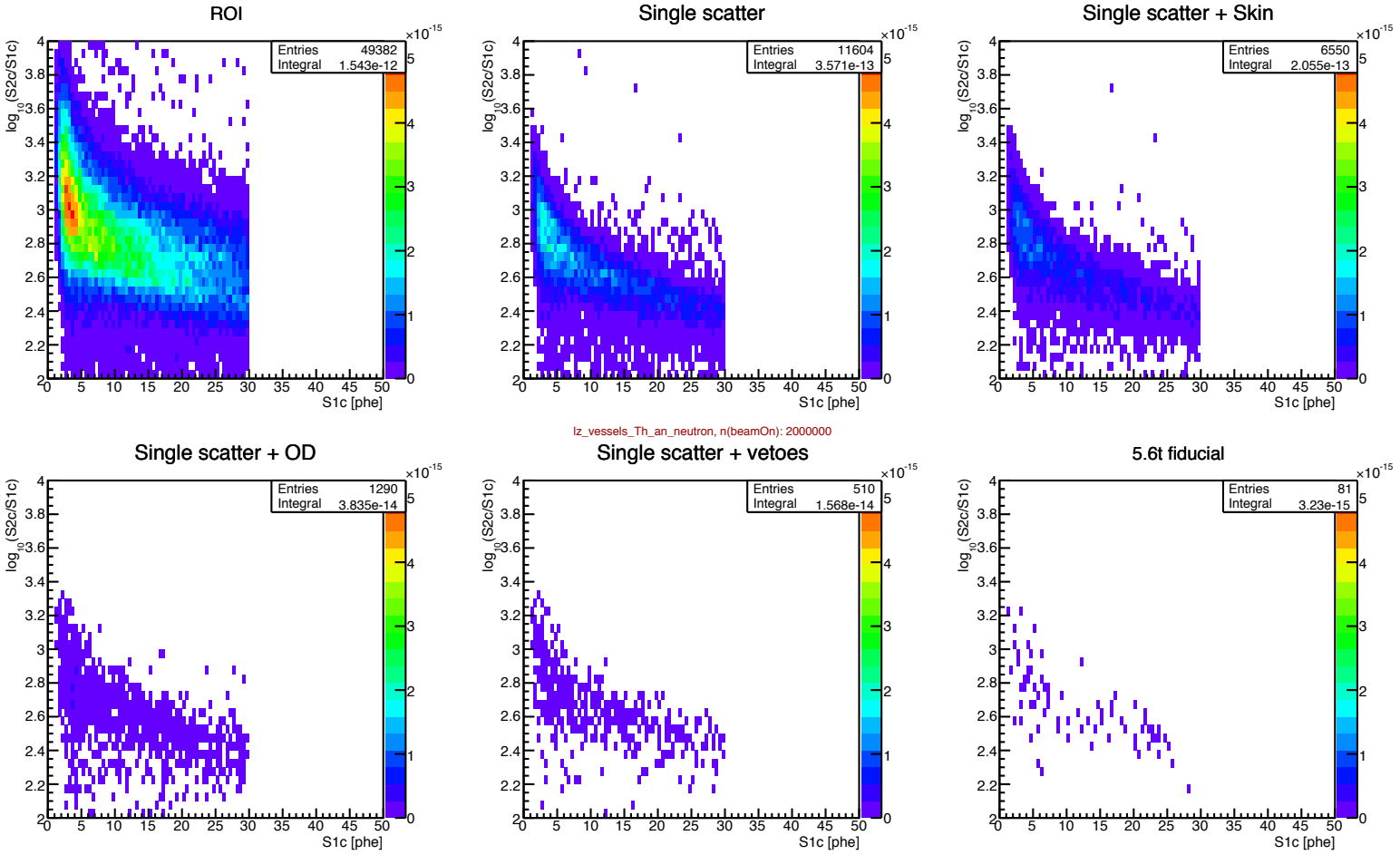
Log(S2/S1) as a function of S1 for roi_lo = 0 roi_hi=50



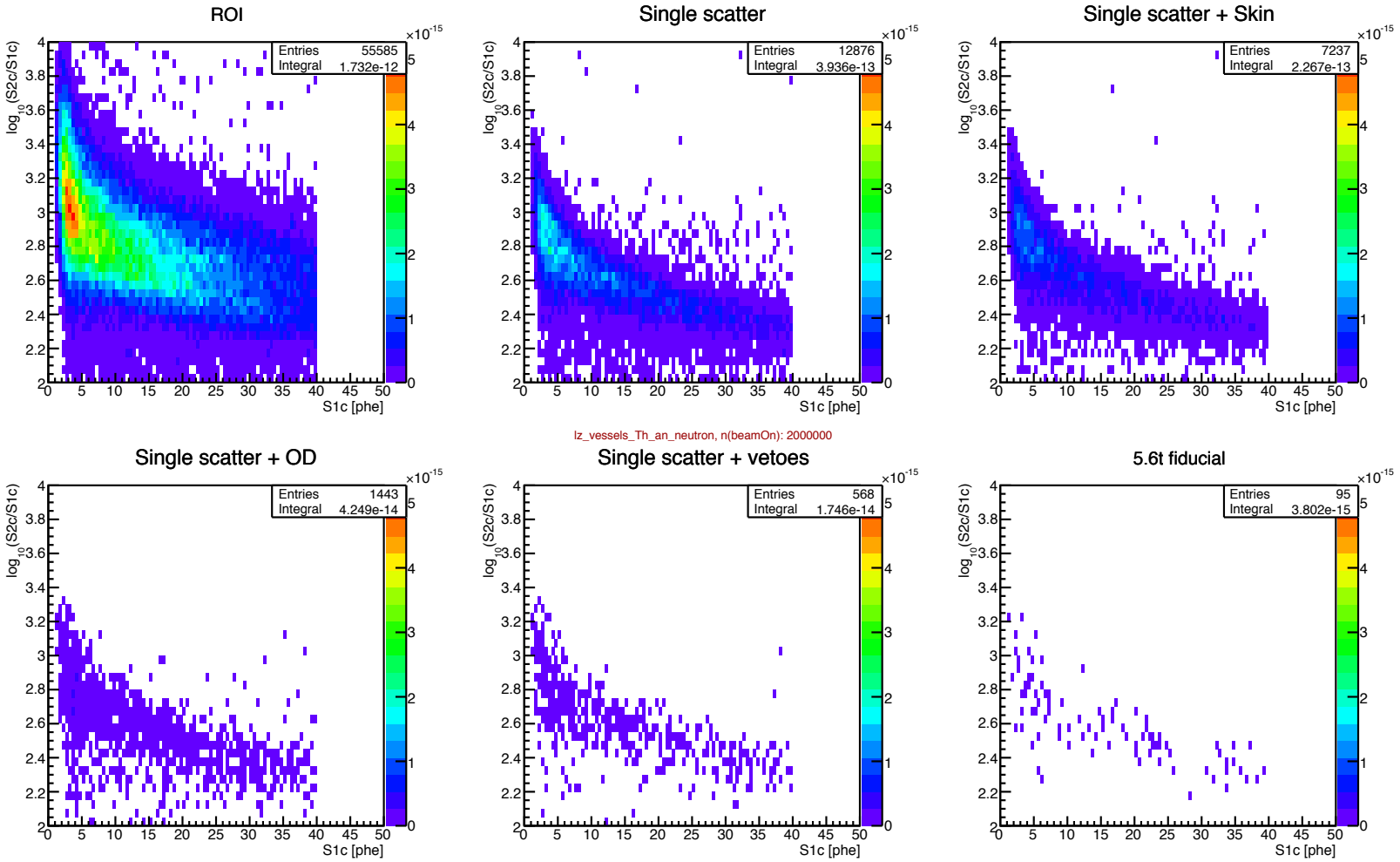
Log(S2/S1) as a function of S1 for roi_lo = 1 roi_hi=20



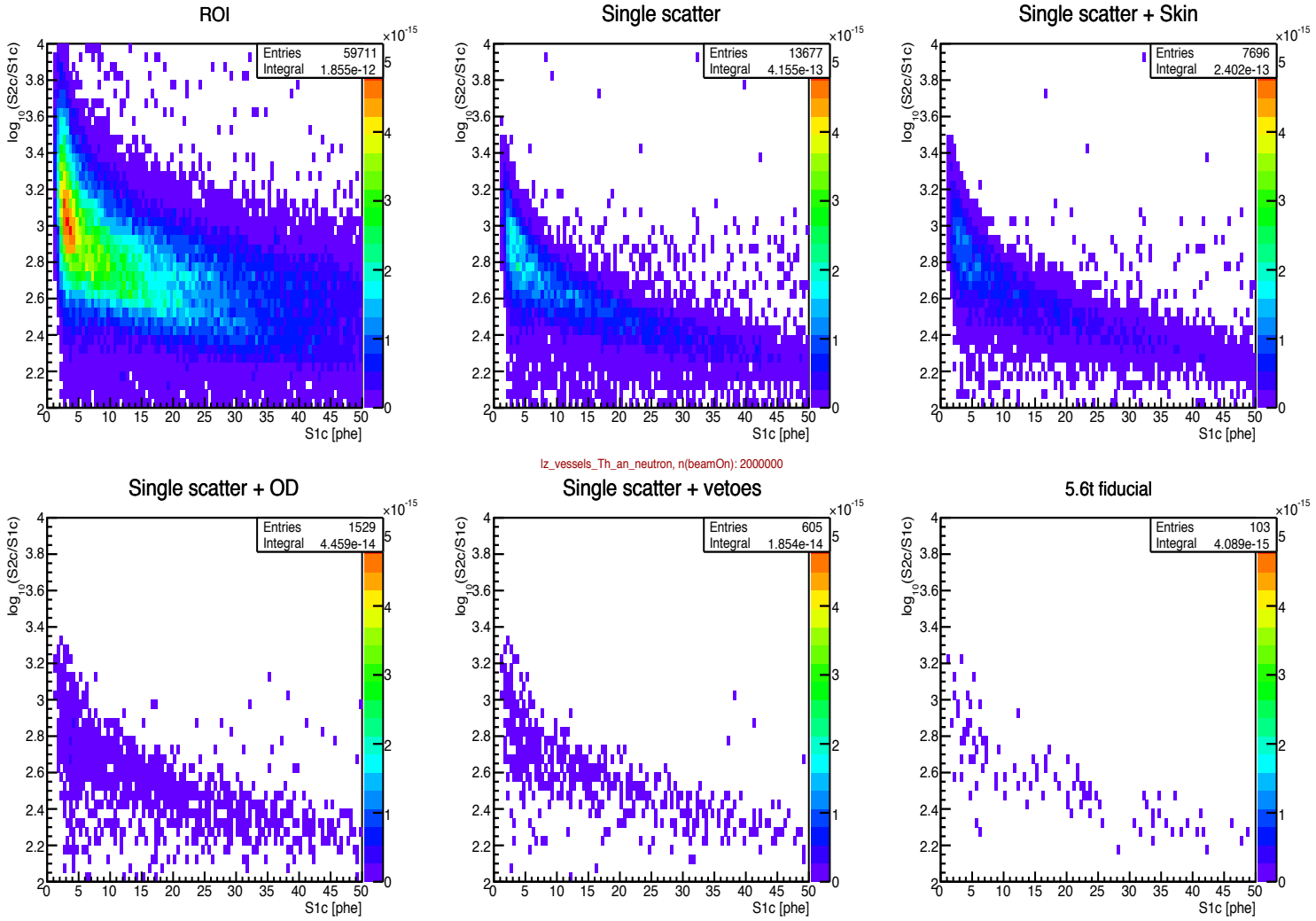
Log(S2/S1) as a function of S1 for roi_lo = 1 roi_hi=30



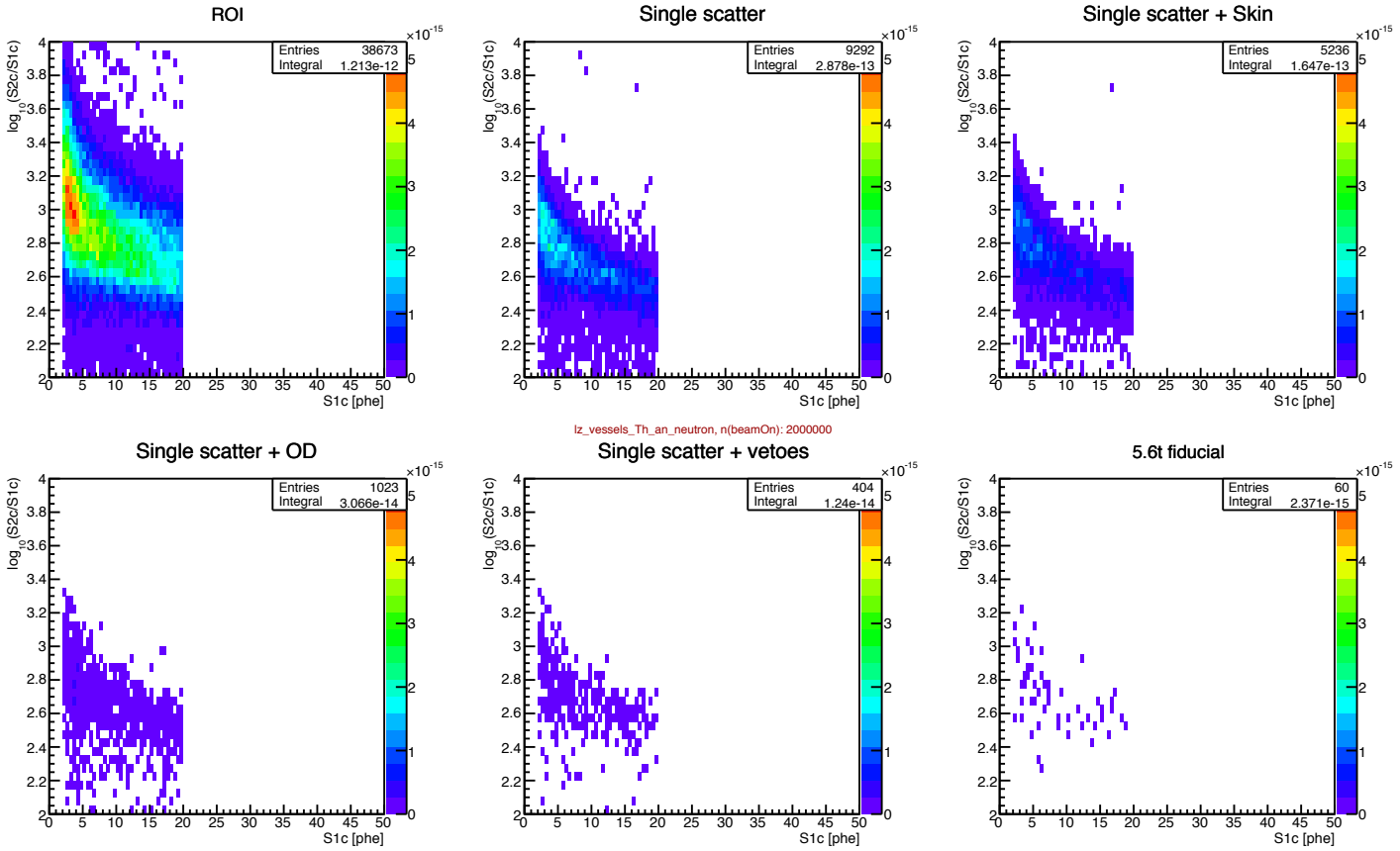
Log(S2/S1) as a function of S1 for roi_lo = 1 roi_hi=40



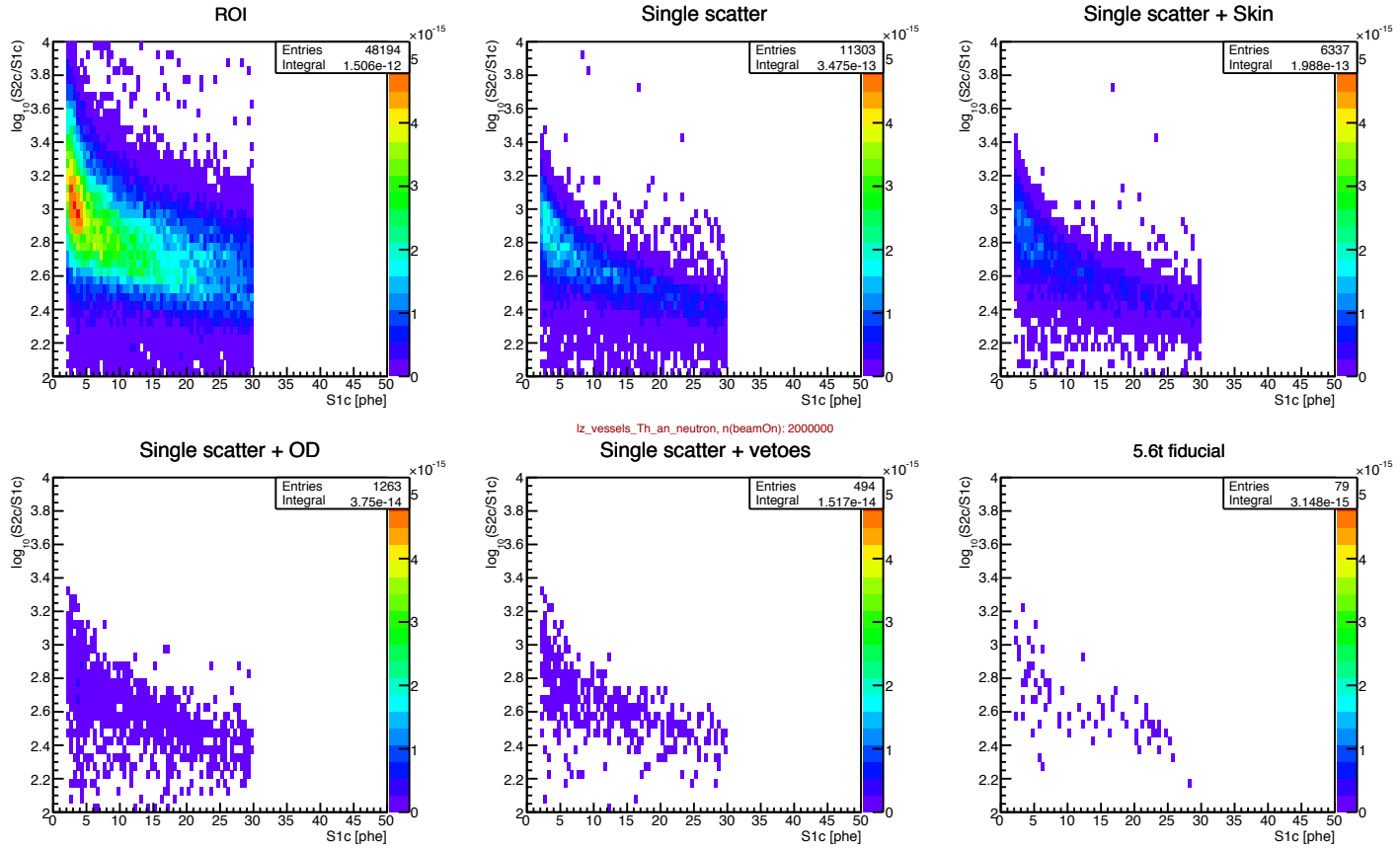
Log(S2/S1) as a function of S1 for roi_lo = 1 roi_hi=50



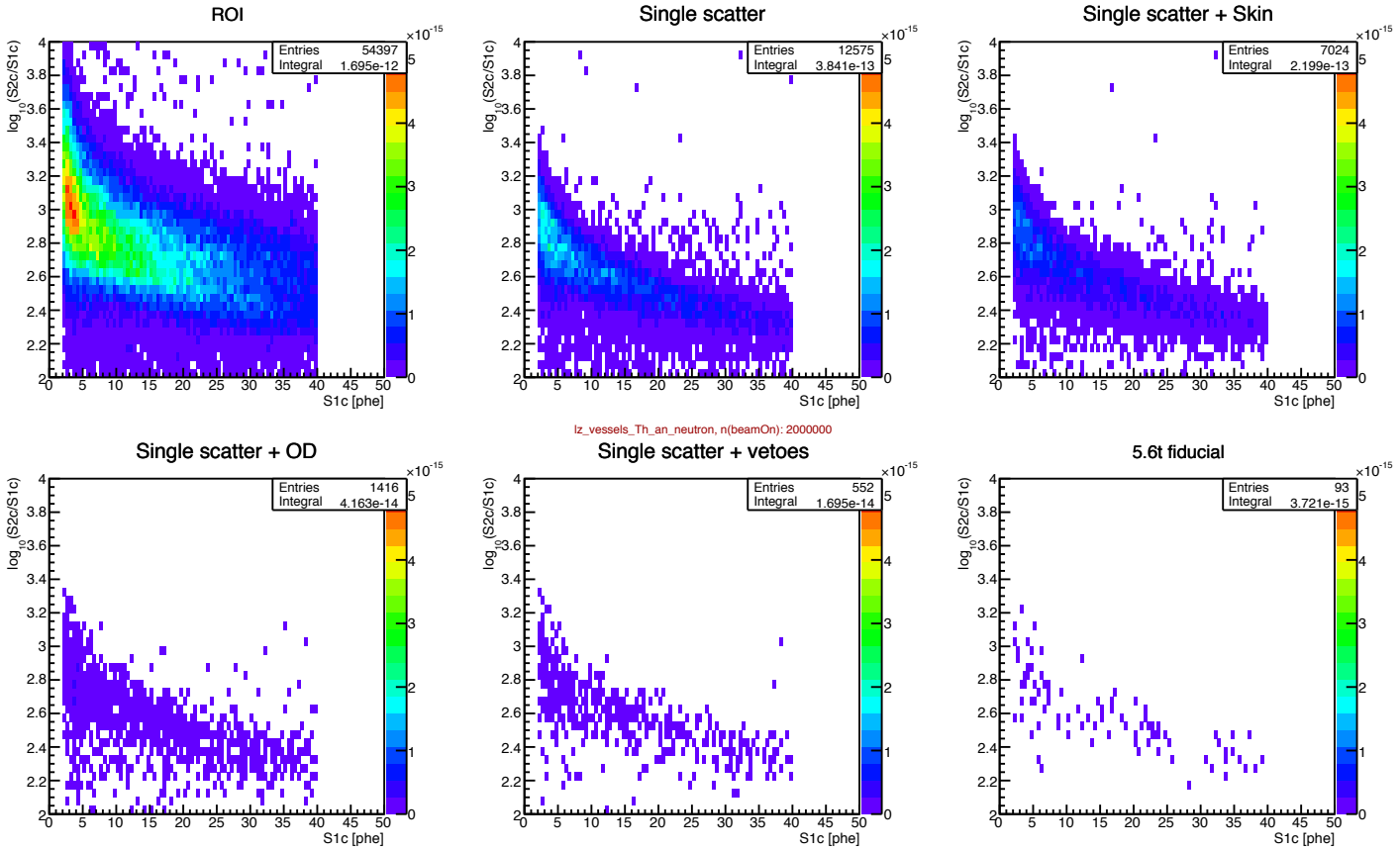
Log(S2/S1) as a function of S1 for roi_lo = 2 roi_ hi=20



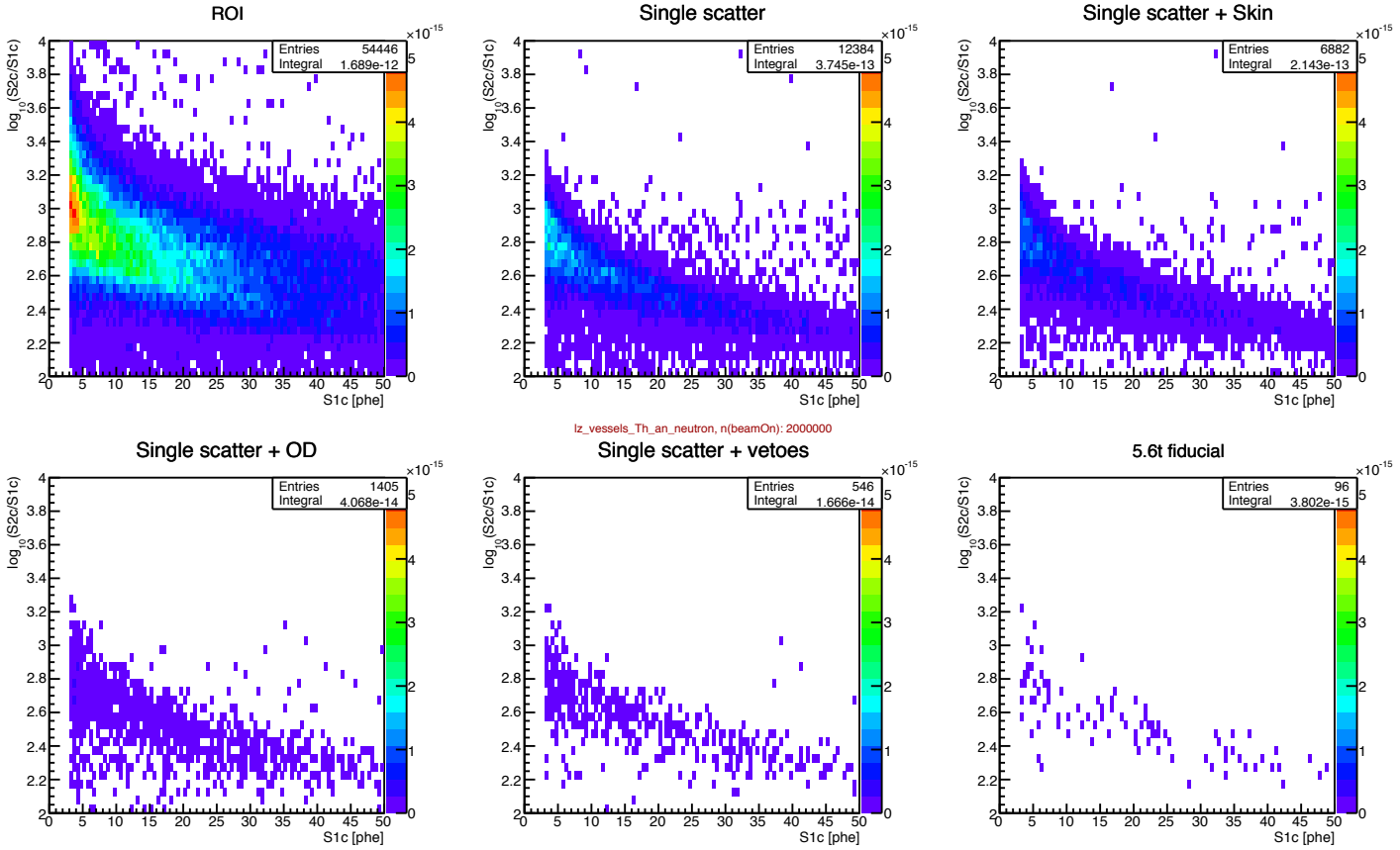
Log(S2/S1) as a function of S1 for roi_lo = 2 roi_ hi=30



Log(S2/S1) as a function of S1 for roi_lo = 2 roi_ hi=40



Log(S2/S1) as a function of S1 for roi_lo = 2 roi_ hi=50



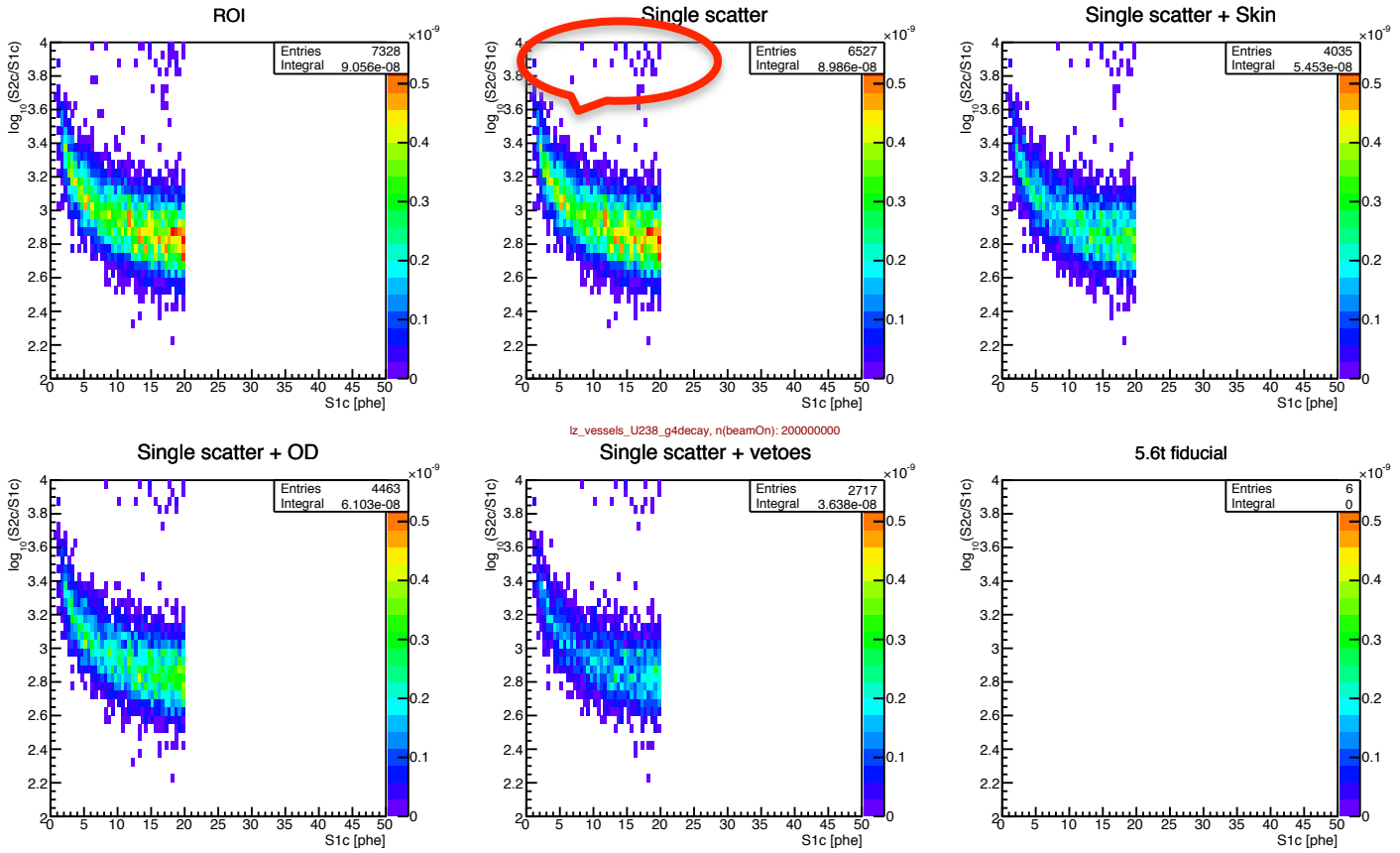
Summary from neutron simulations

- Number of events passing all the cuts matches between energy deposits simulation and S1/S2 for the case : roi_lo = 0 and roi_hi = 20
  - Energy deposits cuts : 62 events
  - S1/S2 cuts : 65 events
- We will use S1 corrected between 0 and 20 as a baseline

Gamma simulations

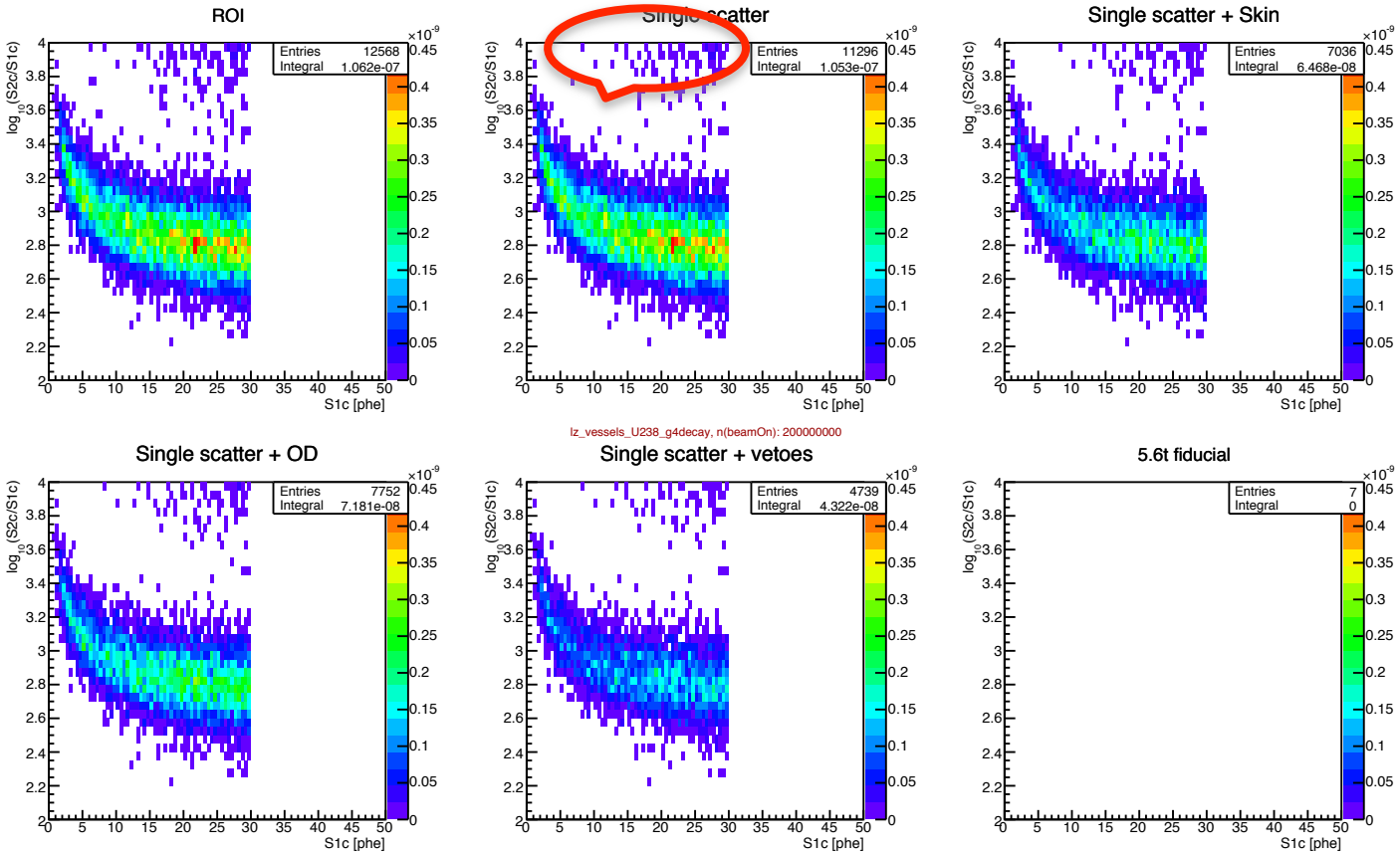
Log(S2/S1) as a function of S1 for roi_lo = 0 roi_hi=20

Problem at high log(S2/S1) ??



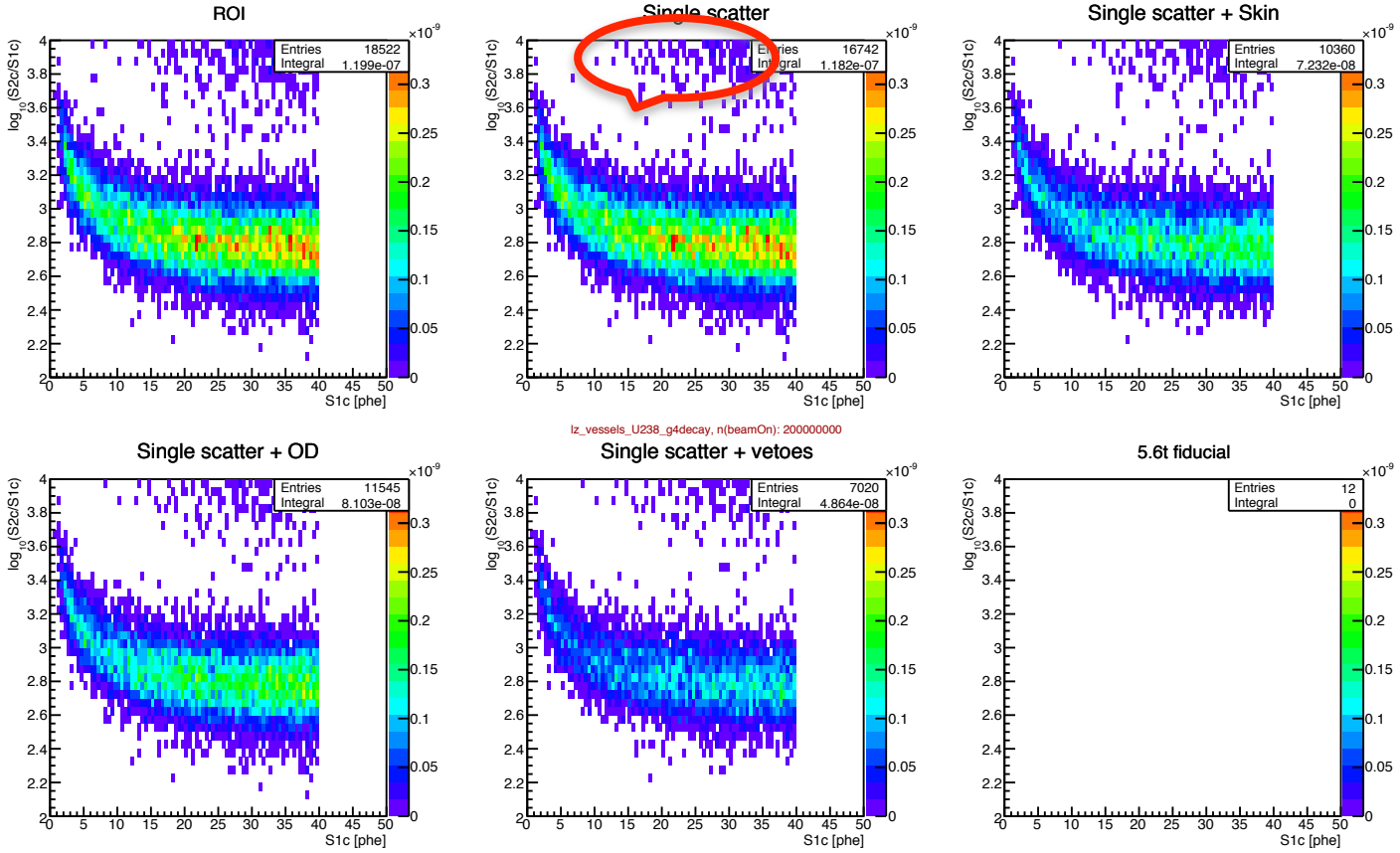
Log(S2/S1) as a function of S1 for roi_lo = 0 roi_hi=30

Problem at high log(S2/S1) ??



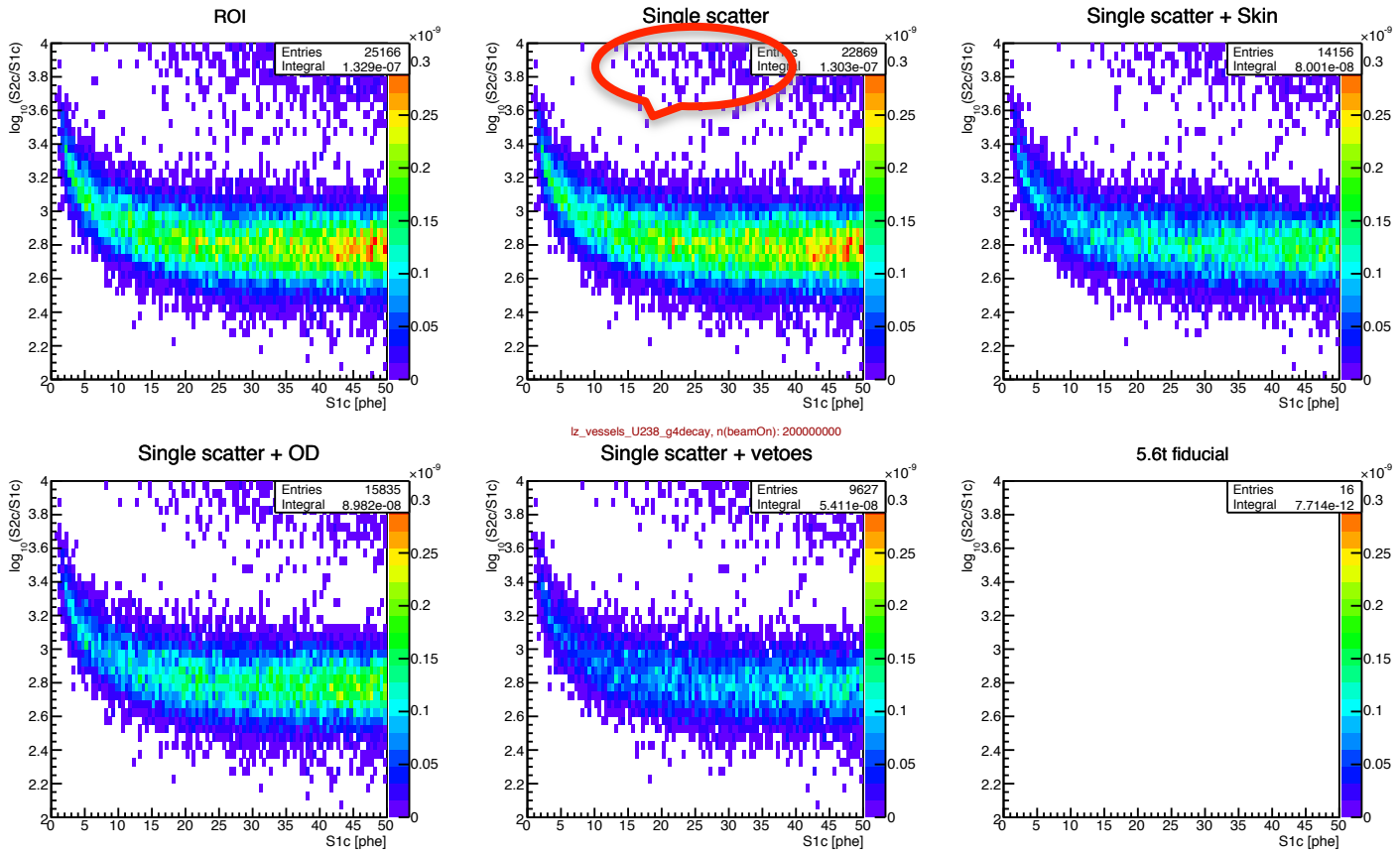
Log(S2/S1) as a function of S1 for roi_lo = 0 roi_hi=40

Problem at high log(S2/S1) ??



Log(S2/S1) as a function of S1 for roi_lo = 0 roi_hi=50

Problem at high log(S2/S1) ??



Summary from gamma simulations

- Population of events at high log(S2/S1)
- Checking the cause…