BACKGROUND STUDIES

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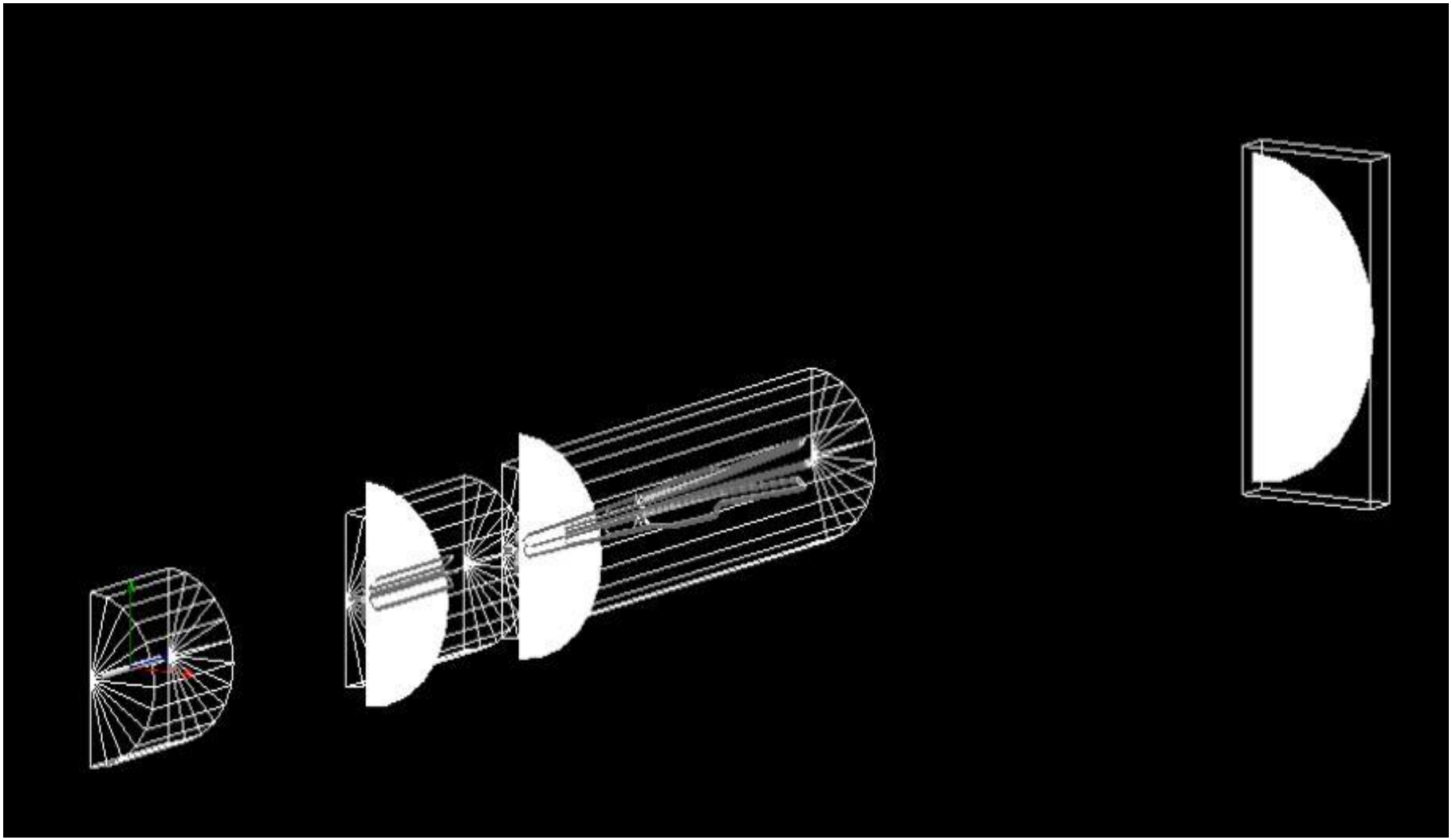
Geometry and Simulation

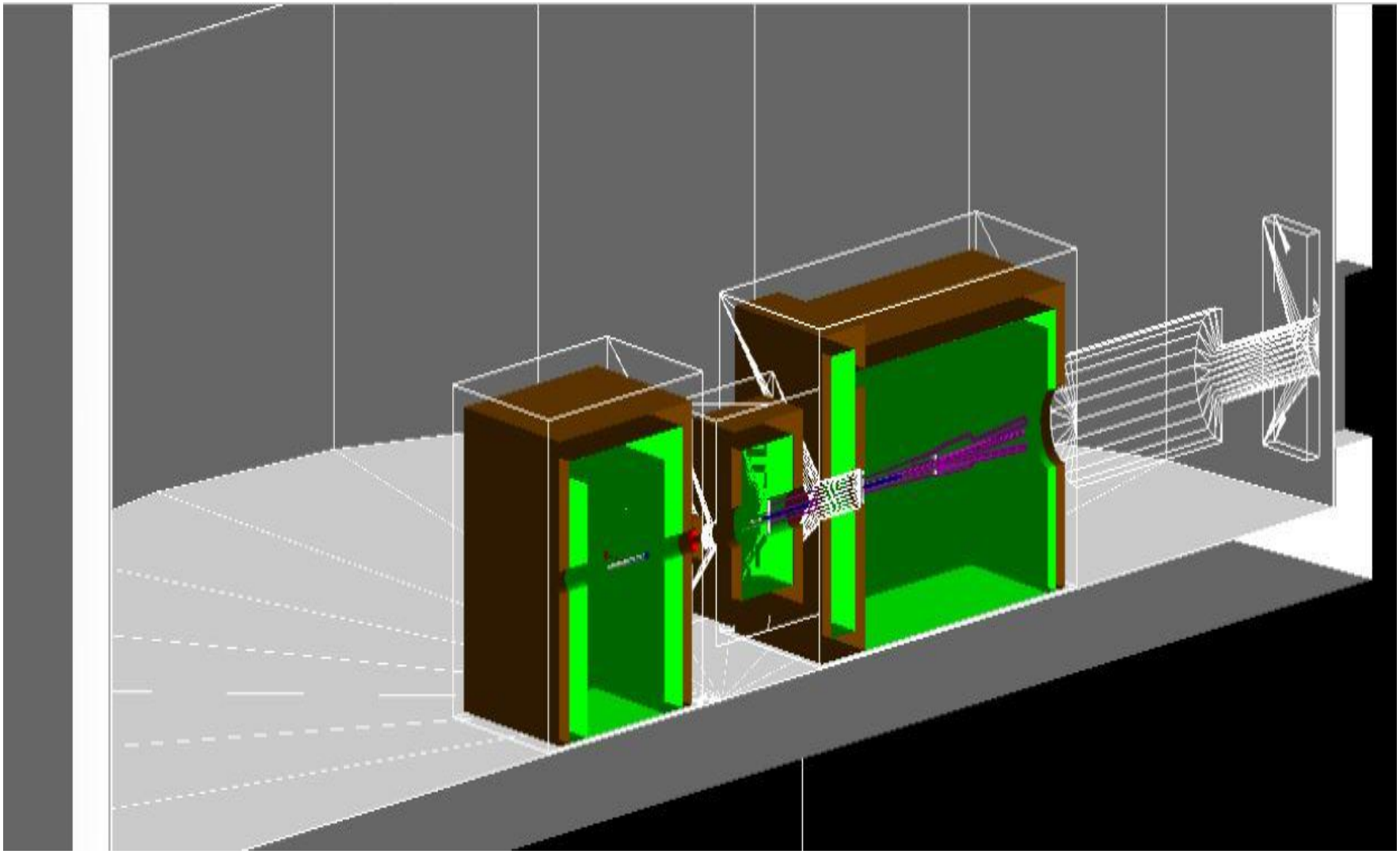
- Geometry_Sculpt vs Geometry_Dose
- Simulation Specifications:
  - Remoll_05_02_2016
  - Geant 4.10.00.p03
  - Root 5.34.13
  - Physics List: QGSP_BERT_HP
  - Turned off all sensitive detectors except SensDet 200, 201, 28
  - Detector 28 is a plane vacuum detector of 10 mm thickness with front face at 28.495 m.
  - Server : JLAB

Geometry_Sculpt



Geometry_Dose

Ref: Feb 4, 2016, Simulation Teleconference, Rakitha B.



Analysis

- Modified Dustin's scripts to calculate secondary rates along with primary rates for different rings and sectors at detector plane (z=28.495 m).

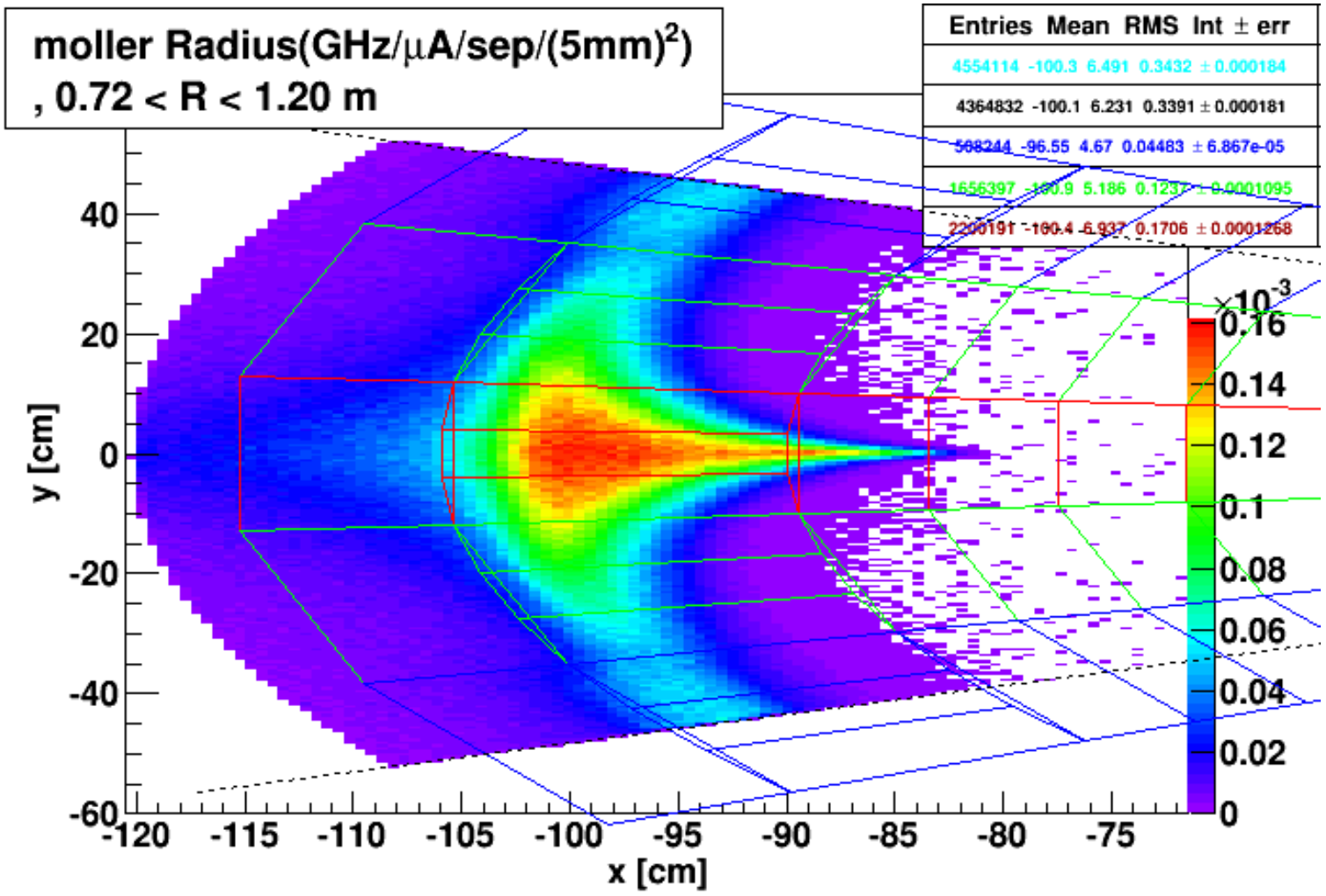
```
  case 2:
   for( hit_idx = 0; hit_idx < fT->hit_n; hit_idx++ ){
         //if( fT->hit_det[hit_idx] != fDet ) continue; // Only pay attention to specified detector
         // Match hit to generated particle
         if ((fT->hit_det[hit_idx]!=fDet)||(fT->hit_pid[hit_idx]!=fPid)) continue;
         //if ((fT->hit_det[hit_idx]!=fDet)||(fT->hit_pid[hit_idx]==11)||(fT->hit_pid[hit_idx]==-11)||(fT->hit_pid
[hit_idx]==22)||(fT->hit_pid[hit_idx]==2112)) continue;
         if( fT->hit_trid[hit_idx] > fT->ev_npart ){
           // Determine sector
           double hitphi = atan2(fT->hit_y[hit_idx],fT->hit_x[hit_idx]);
           if( hitphi < 0 ) hitphi += 2.0*3.14159;
           double secphi = fmod(hitphi, 2.0*3.14159/7 );

           // logic from onefile.C
           if( secphi < 3.14159/28. ){ sidx = kSect1; }
           else if(  secphi < 3.0*3.14159/28. ){ sidx = kSect2; }
           else if(  secphi < 5.0*3.14159/28. ){ sidx = kSect3; }
           else if(  secphi < 7.0*3.14159/28. ){ sidx = kSect2; }
           else { sidx = kSect1; }

           if (strcmp(fName,"thcom") == 0 && fT->hit_trid[hit_idx] == 2) fT->ev_thcom = 180 - fT->ev_thcom;


      if(28.495 == fT->hit_z[hit_idx] ){
           if (fRmin < fT->hit_r[hit_idx] && fT->hit_r[hit_idx] < fRmax){
             if(sidx >= 0 && vidx >= 0) FillOne(fH[kCut][sidx][vidx], ev_idx, hit_idx, nentries, gen);
             if(vidx >= 0) FillOne(fH[kCut][kAll][vidx], ev_idx, hit_idx, nentries, gen);
             if(sidx >= 0) FillOne(fH[kCut][sidx][kFull], ev_idx, hit_idx, nentries, gen);
             FillOne(fH[kCut][kAll][kFull], ev_idx, hit_idx, nentries, gen);
           }
```

Sample Output



Sectors and Radial Extent of Rings

- Each ring is divided into three sectors : Blue (Open), Green (Transition), and Red (Closed).
- Radial Extent of Rings (in meters):
  - Ring 1: Quartz (0.60-0.72), Lightguide(0.72-1.20)
  - Ring 2: Quartz (0.72-0.78), Lightguide(0.78-1.20)
  - Ring 3: Quartz (0.78-0.84), Lightguide(0.84-1.20)
  - Ring 4: Quartz (0.84-0.90), Lightguide(0.90-1.20)
  - Ring 5: Quartz (0.90-1.06), Lightguide(1.06-1.20)
  - Ring 6: Quartz (1.06-1.16), Lightguide(1.16-1.20)

Analysis

- Results are tabulated in excel.

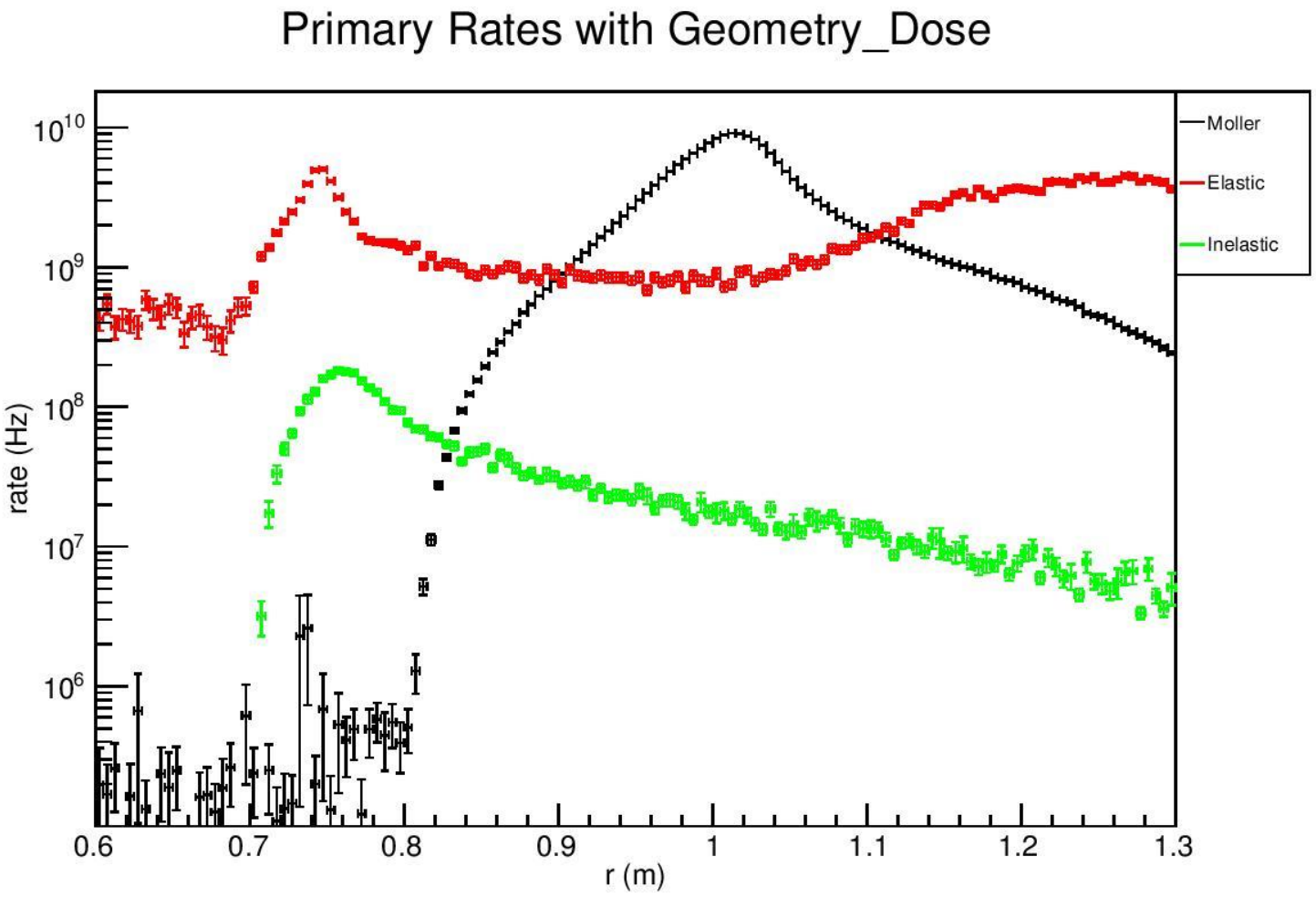
		Rate	GHz/muA/sep																		
		Power	W/muA/sep																		
	Ring	1												2							
	Sector	Open				Transition				Closed				Open				Transition			
		Quartz		LightGuide		Quartz		LightGuide		Quartz		LightGuide		Quartz		LightGuide		Quartz		LightGuide		Quar
		Rate	Power	Rate	Power	Rate	Power	Rate	Power	Rate	Power	Rate	Power	Rate	Power	Rate	Power	Rate	Power	Rate	Power	Rate	P
Moller	primary e-	7.37E-07		0.04483		4.26E-06		1.24E-01		2.64E-06		1.71E-01		4.64E-06		4.48E-02		3.58E-06		1.24E-01		5.64E-06	
	secondary e-	1.71E-05		0.000195		4.24E-05		0.000493		2.31E-05		0.000396		1.11E-05		0.000184		1.85E-05		0.000475		8.97E-06	
	e+	2.32E-05		0.000113		3.47E-05		0.00025		1.79E-05		0.000139		1.06E-05		0.000103		1.63E-05		0.000233		9.61E-06	
	photon	2.71E-03		0.01494		1.48E-02		0.05013		9.38E-03		0.02931		1.46E-03		0.01348		7.81E-03		0.04231		4.94E-03	
	neutron	3.23E-06		2.15E-05		6.02E-06		4.23E-05		3.53E-06		1.97E-05		1.11E-06		2.04E-05		4.37E-06		3.79E-05		1.44E-06	
	other	2.21E-07		1.02E-06		0.00E+00		1.50E-06		1.43E-07		5.01E-07		0.00E+00		1.02E-06		5.67E-08		1.44E-06		1.08E-07	
Elastic	primary e-	0.0003498		0.01152		0.001999		0.05692		0.02107		0.1943		0.001071		0.01044		0.01261		0.04431		0.04795	
	secondary e-	0.0007314		0.004532		0.001562		0.009917		0.0007496		0.00549		0.000444		0.004088		0.000832		0.009085		0.000588	
	e+	0.0005111		0.002772		0.0009391		0.00514		0.0003929		0.002945		0.000281		0.002491		0.000564		0.004576		0.000305	
	photon	0.02237		0.1451		0.0734		0.3522		0.04562		0.205		1.36E-02		0.1315		0.04126		0.3109		0.02482	
	neutron	4.26E-06		6.77E-05		2.85E-05		0.00017		1.26E-05		7.07E-05		2.08E-05		4.69E-05		3.94E-05		0.000131		3.02E-06	
	other	0.00E+00		4.05E-06		3.93E-07		4.71E-06		1.08E-06		2.71E-06		0		4.05E-06		1.02E-06		3.69E-06		0	
Inelastic	primary e-	4.44E-09		0.000393		2.93E-05		2.33E-03		6.15E-05		3.90E-03		0.00013		0.000263		0.000965		0.001356		0.001612	
	secondary e-	2.09E-06		2.02E-05		2.43E-06		2.58E-05		1.41E-06		1.57E-05		1.61E-06		1.86E-05		3.41E-07		2.55E-05		1.72E-08	
	e+	2.85E-06		1.36E-05		1.32E-05		1.63E-05		2.88E-07		5.61E-06		7.81E-07		1.29E-05		3.78E-07		1.59E-05		2.99E-07	
	photon	2.90E-04		0.001615		8.05E-04		3.23E-03		5.60E-04		1.85E-03		0.000151		0.001464		0.000411		0.002822		0.000271	
	neutron	2.49E-08		1.21E-06		2.90E-08		3.87E-07		1.66E-08		1.49E-06		5.41E-08		1.16E-06		1.57E-08		3.71E-07		2.11E-07	
	other	2.01E-09		1.88E-07		1.09E-08		4.90E-08		4.14E-09		8.84E-08		3.22E-10		1.88E-07		1.10E-09		4.79E-08		4.39E-10	
Beam	primary e-	0.0001783		0.01712		0.002497		0.1252		0.01864		0.4194		0.000981		0.01614		0.01623		0.109		0.05475	
	secondary e-	0.002854		0.05912		0.007045		0.1335		0.01801		0.1636		0.000892		0.05823		0.002854		0.1306		0.006688	
	e+	0.01097		0.02167		0.009096		0.02666		0.003745		0.01418		0.003299		0.01837		0.002319		0.02434		0.001427	
	photon	0.06403		0.3765		0.3101		1.421		0.2167		0.9234		0.04031		0.3362		0.1833		1.238		0.1168	
	neutron	8.92E-05		0.000268		0.00E+00		0.000624		0		0.000535		0		0.000268		8.92E-05		0.000535		8.92E-05	

Analysis

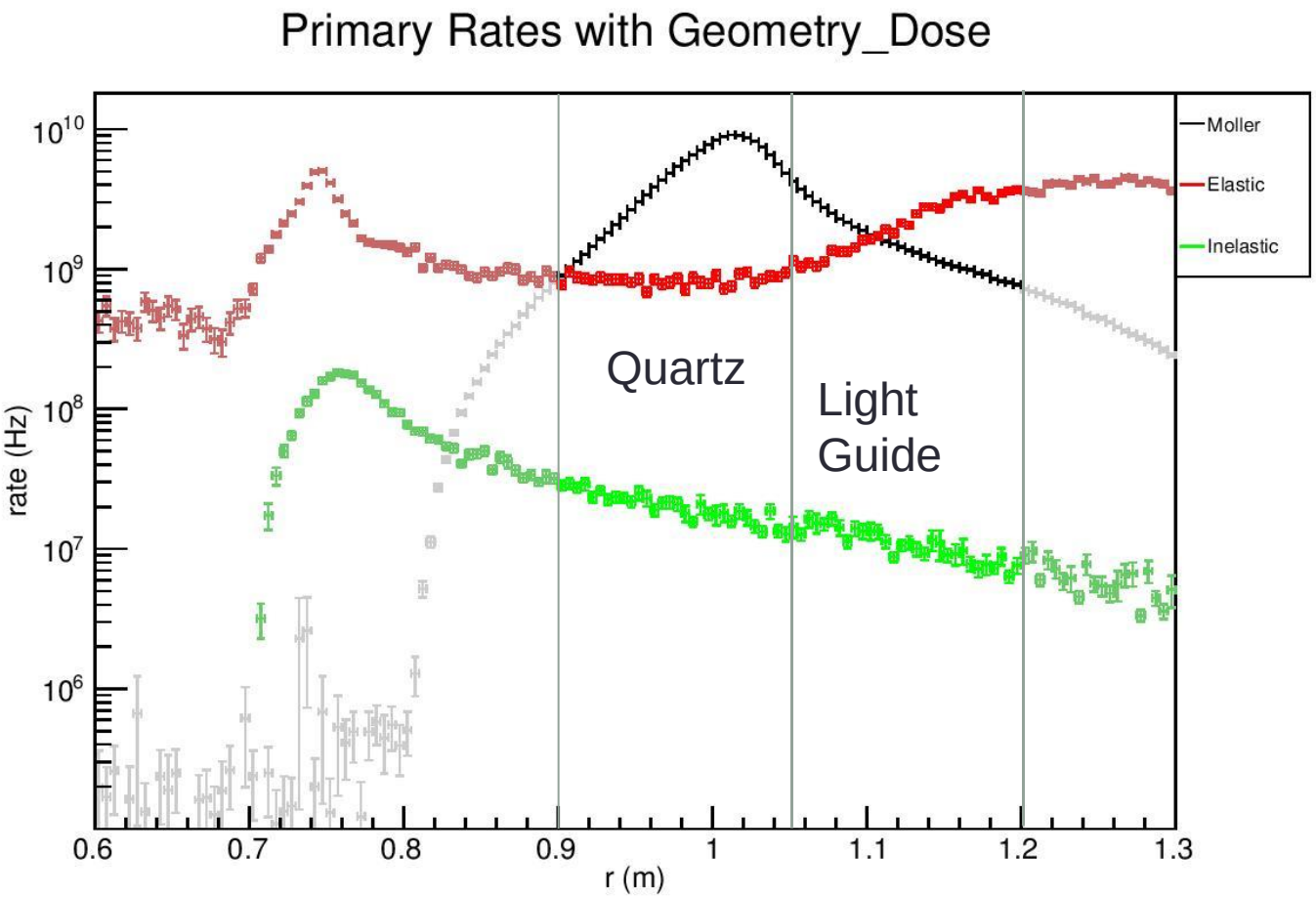
- Final total primary and background rates are calculated and plotted against ring number.

	Ring	5							
		Quartz				LightGuide			
		Rate	Uncertainty	Power	Uncertainty	Rate	Uncetainty	Power	Uncertainty
Primary	ee/ep/in	153.2303500	27.3830900	0.6451347					
Background	Quartz	171.9185164							
Background	Lightguide	7.18199658							
Background	e	4.3694729				114.6209779			
	e+	2.3877481				2.4036661			
	photon	165.0912585				132.6617950			
	neutron	0.0688790				0.0791235			
	other	0.0011578				0.0038051			
Lgweight	e	0.0500000							
	e+	0.0500000							
	photon	0.0100000							
	neutron	0.0500000							
	other	0.0500000							

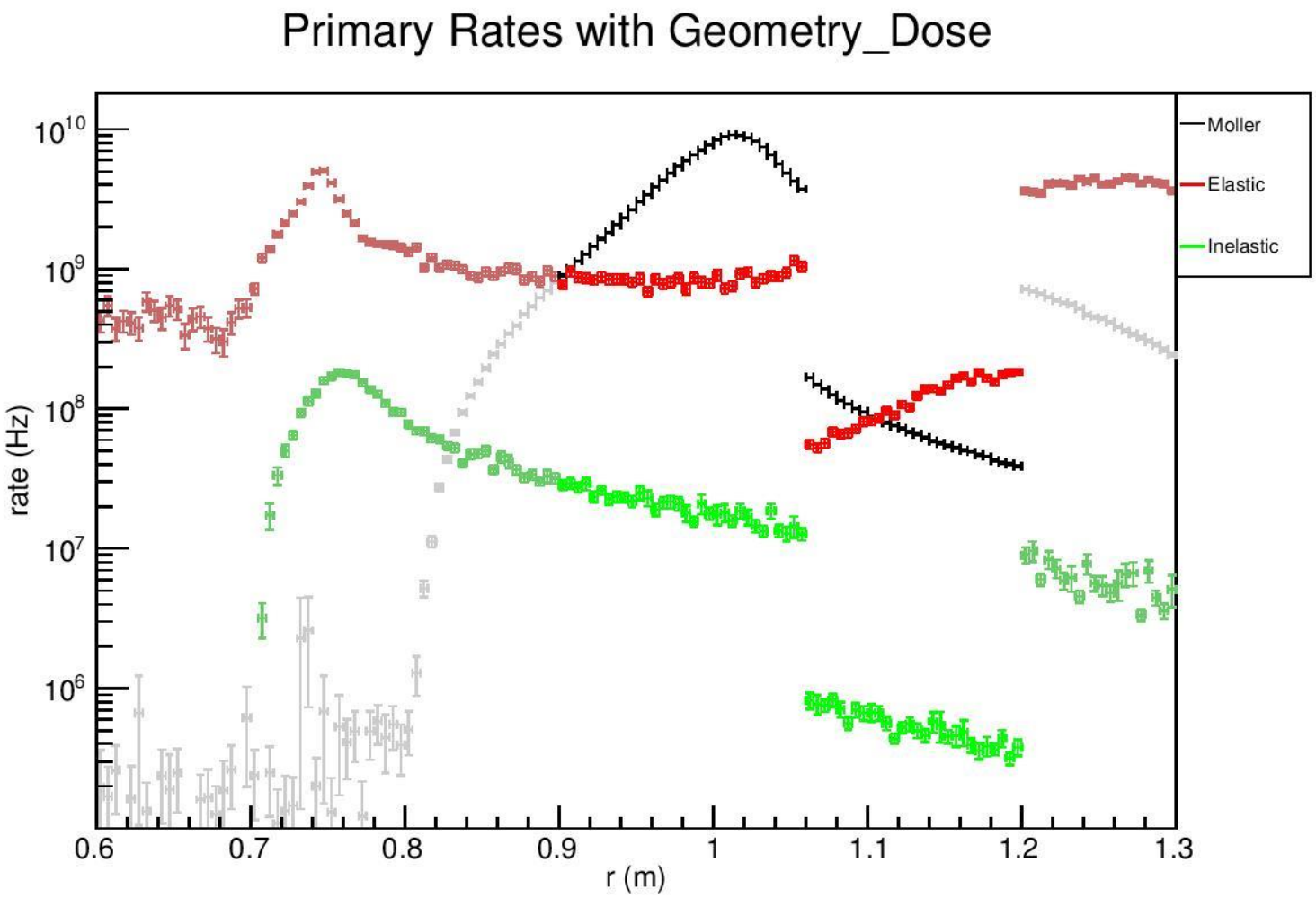
Analysis


Primary Rates with Geometry_Dose
rate (Hz)
r (m)
Moller
Elastic
Inelastic

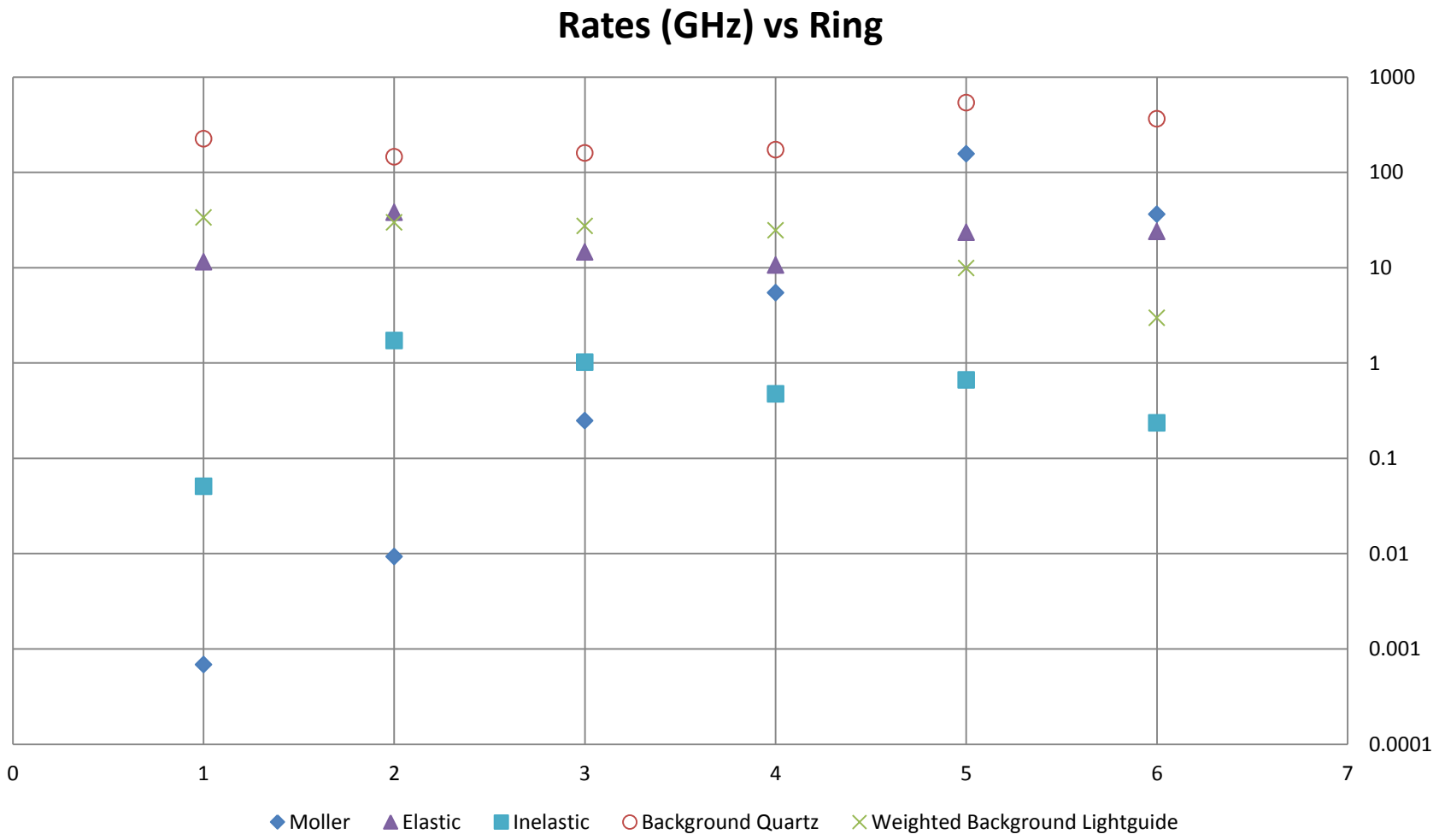
Analysis


Primary Rates with Geometry_Dose
rate (Hz)
r (m)
Moller
Elastic
Inelastic
Quartz
Light
Guide

Analysis


Primary Rates with Geometry_Dose
Moller
Elastic
Inelastic
rate (Hz)
10^{10}
10^{9}
10^{8}
10^{7}
10^{6}
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
r (m)

Geometry_Sculpt



Geometry_Dose