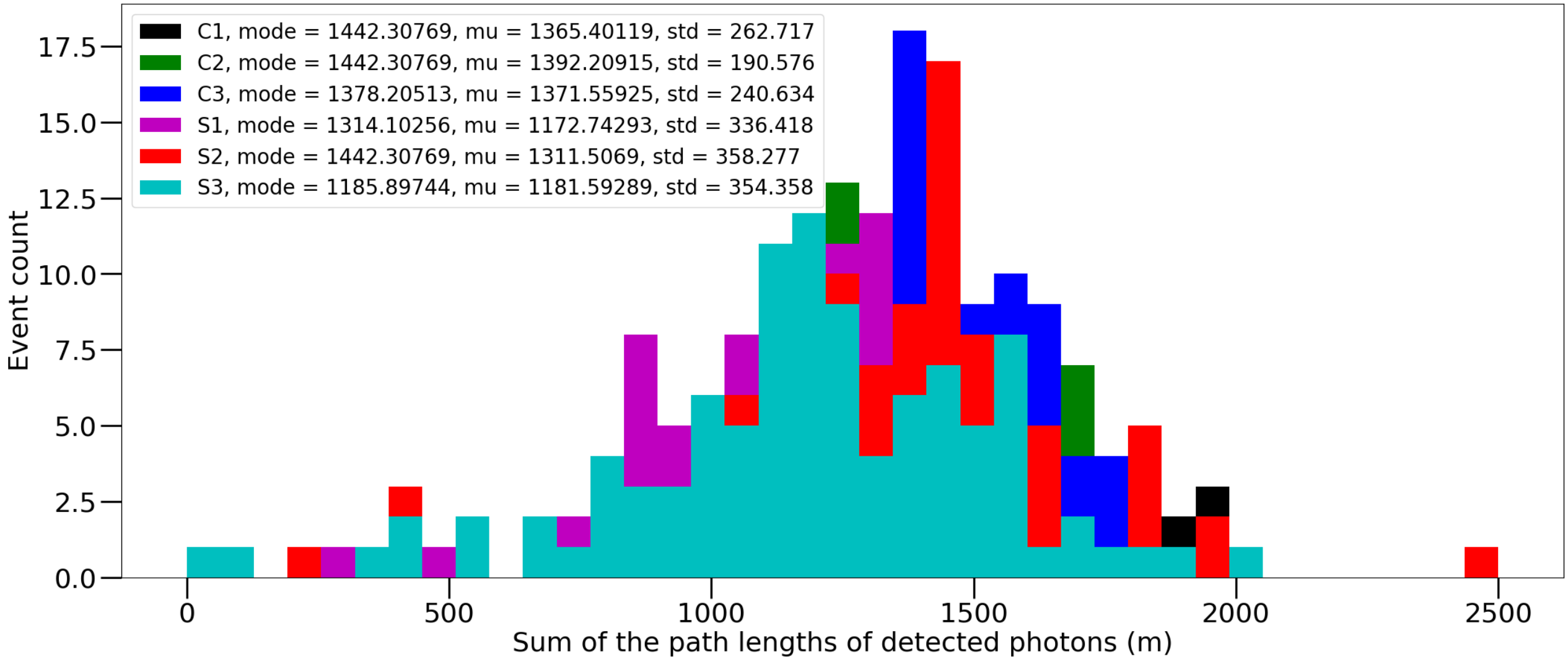
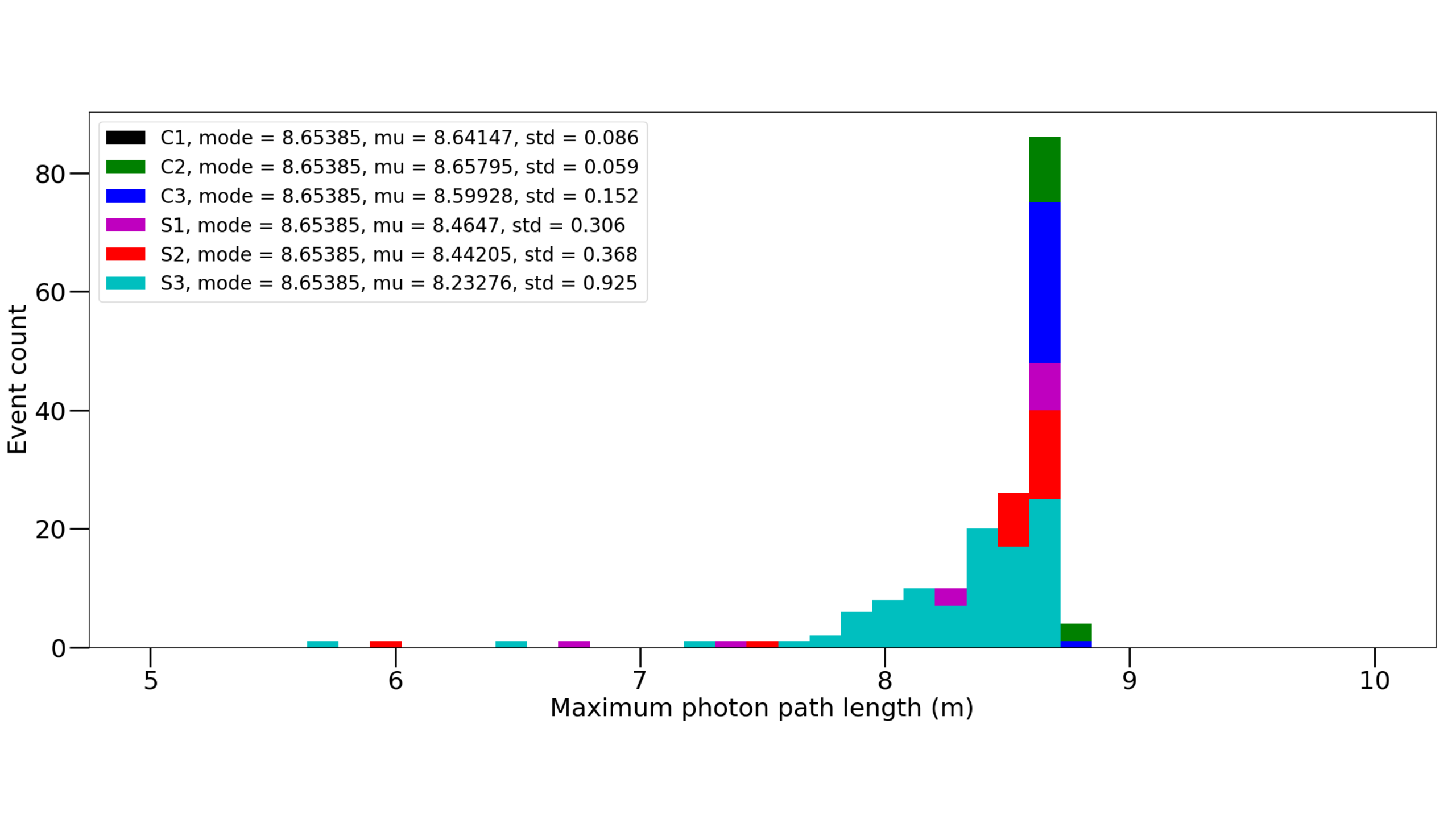
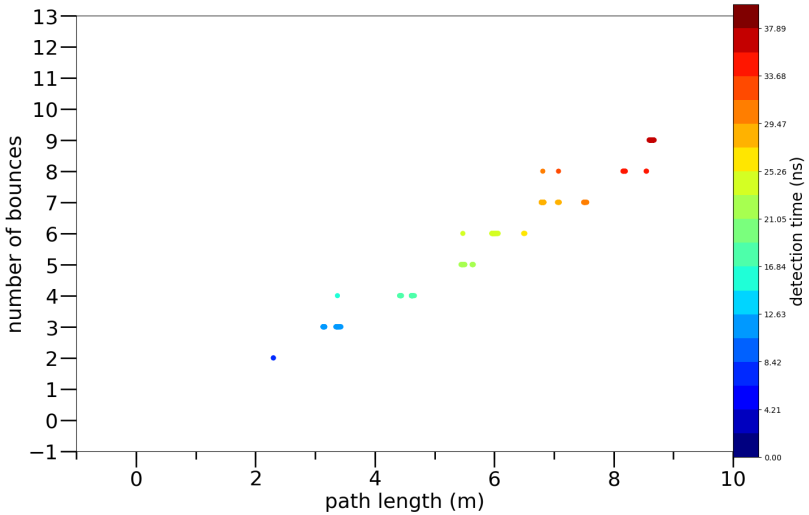
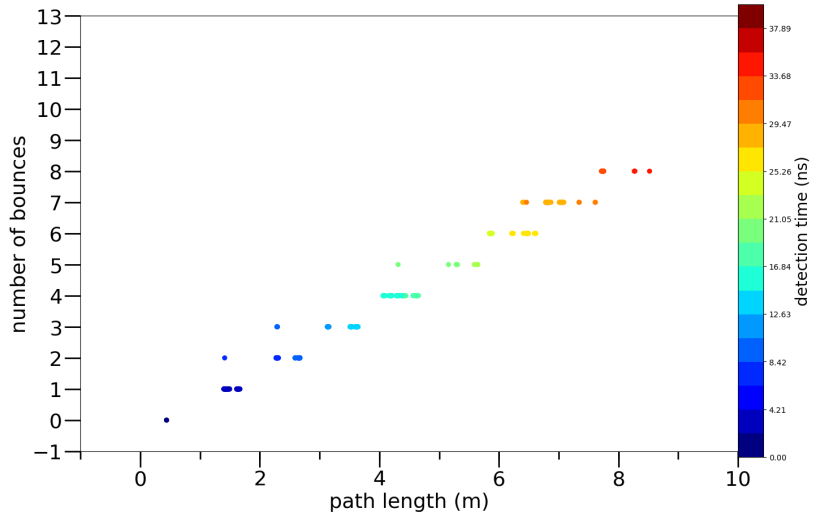
Evan’s OTPC log

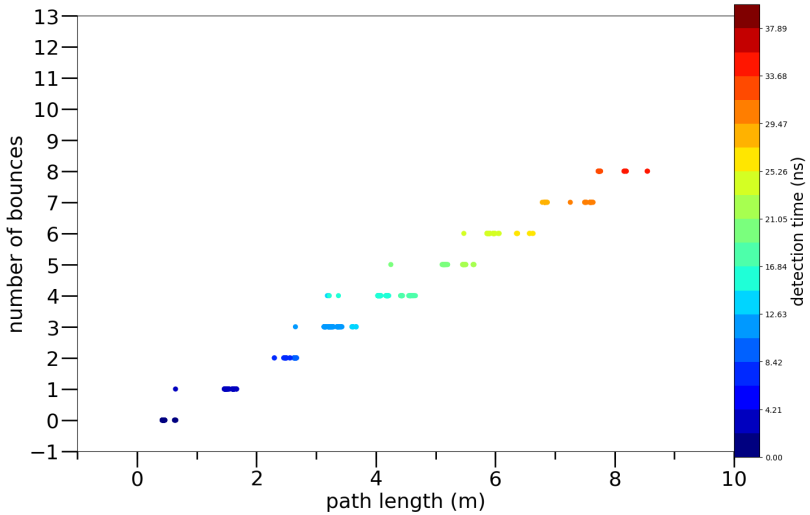
Updated 4/2/17


C1, mode = 1442.30769, mu = 1365.40119, std = 262.717
C2, mode = 1442.30769, mu = 1392.20915, std = 190.576
C3, mode = 1378.20513, mu = 1371.55925, std = 240.634
S1, mode = 1314.10256, mu = 1172.74293, std = 336.418
S2, mode = 1442.30769, mu = 1311.5069, std = 358.277
S3, mode = 1185.89744, mu = 1181.59289, std = 354.358
Event count
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
0
500
1000
1500
2000
2500
Sum of the path lengths of detected photons (m)


C1, mode = 8.65385, mu = 8.64147, std = 0.086
C2, mode = 8.65385, mu = 8.65795, std = 0.059
C3, mode = 8.65385, mu = 8.59928, std = 0.152
S1, mode = 8.65385, mu = 8.4647, std = 0.306
S2, mode = 8.65385, mu = 8.44205, std = 0.368
S3, mode = 8.65385, mu = 8.23276, std = 0.925
Event count
0
20
40
60
80
5
6
7
8
9
10
Maximum photon path length (m)



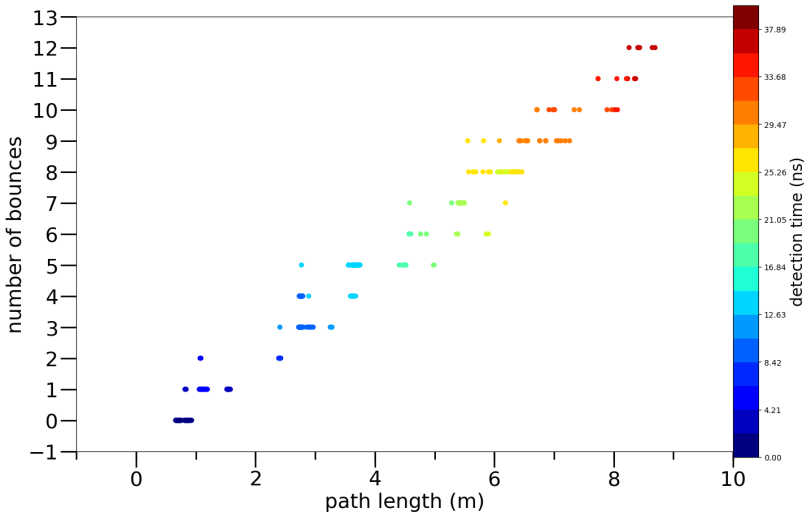


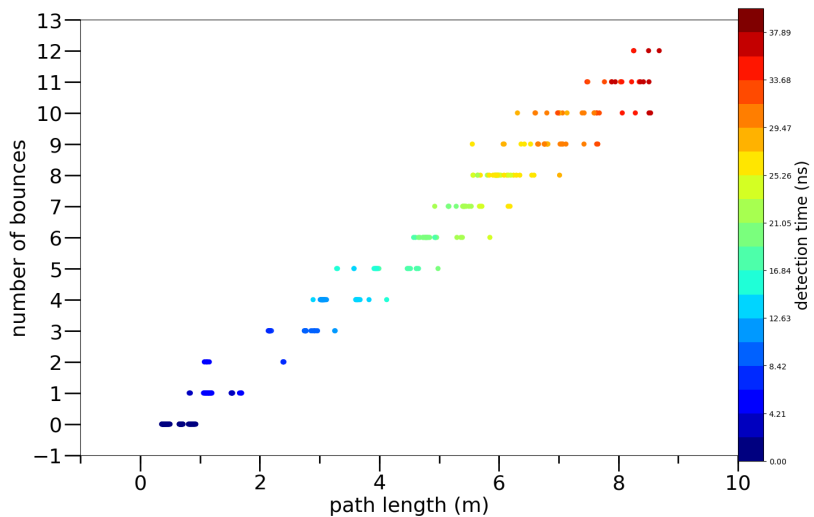


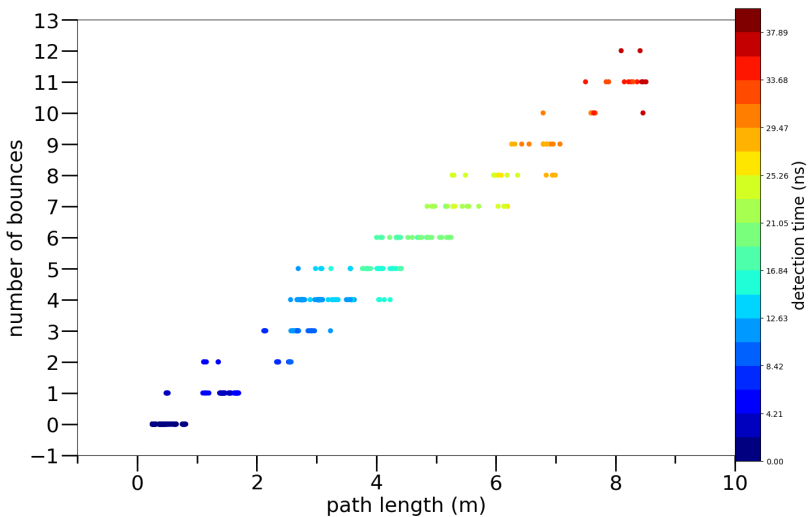
Spheres

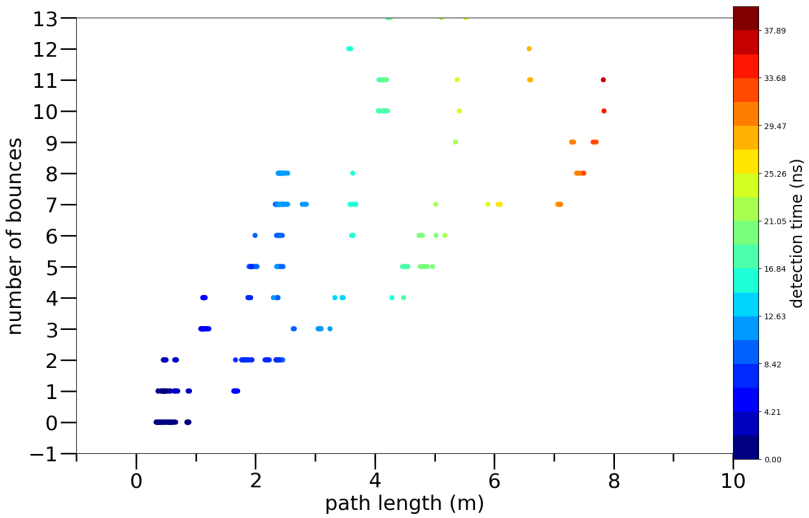
Increasing coverage fraction/number of LAPPDs

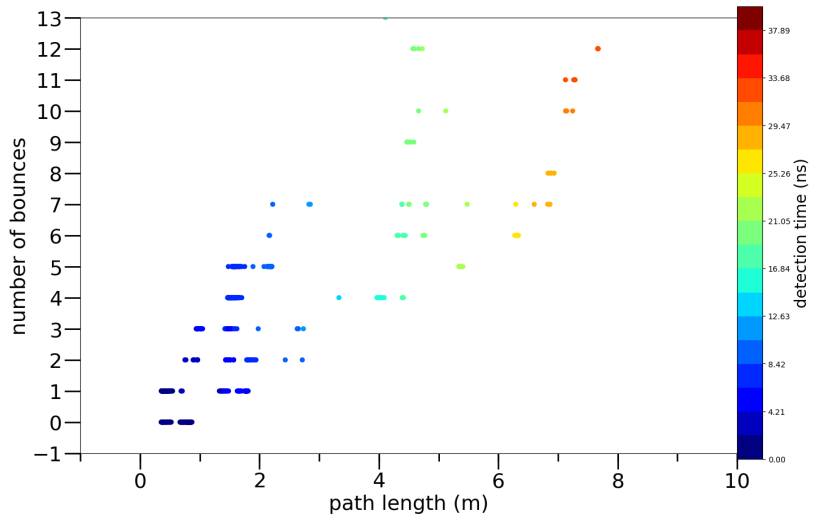
Cylinders

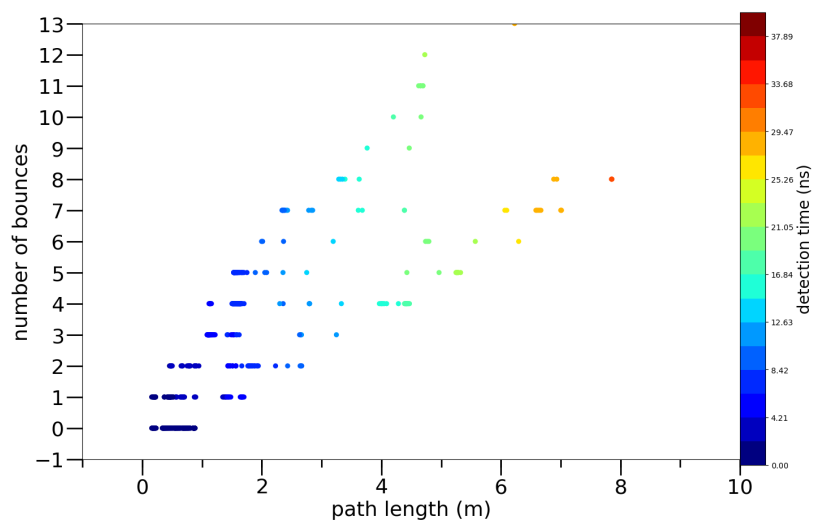








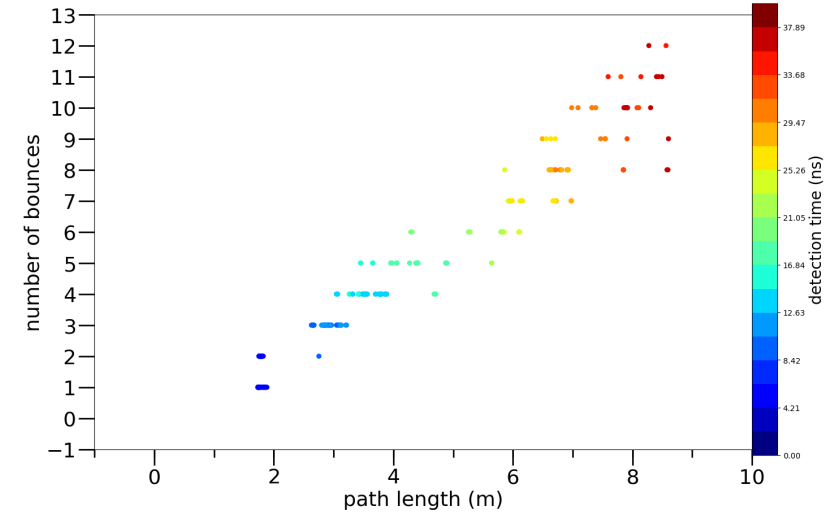


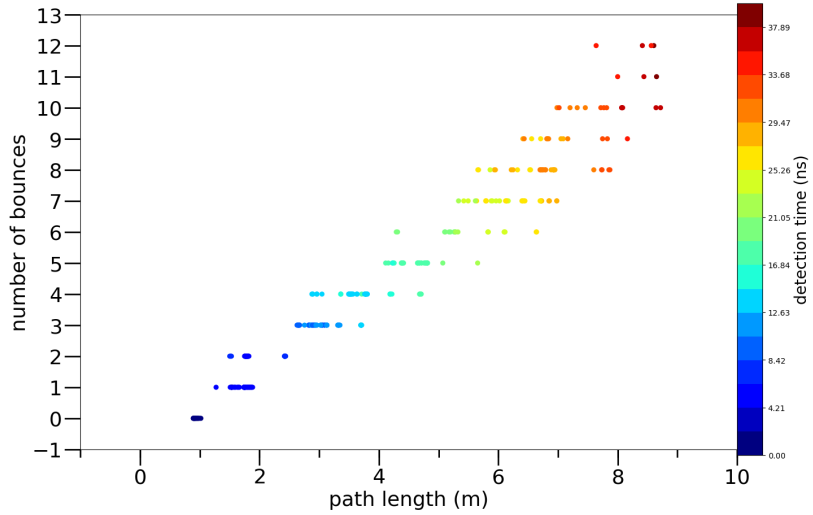


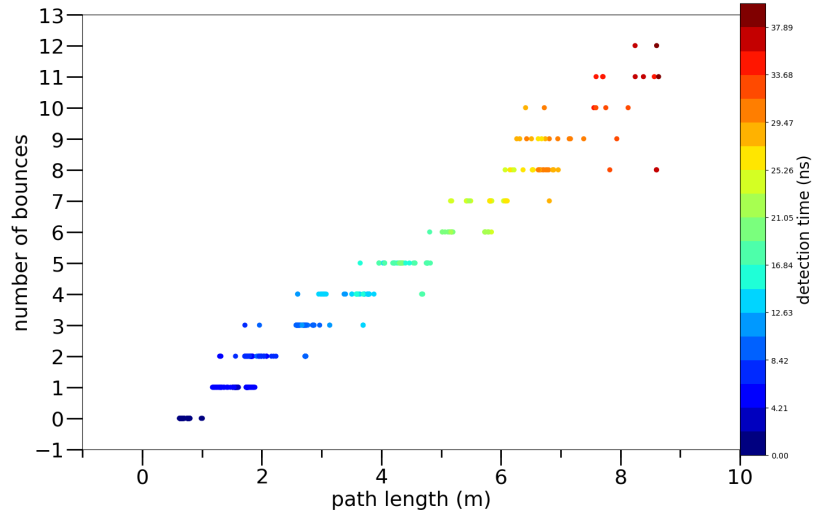
Spheres

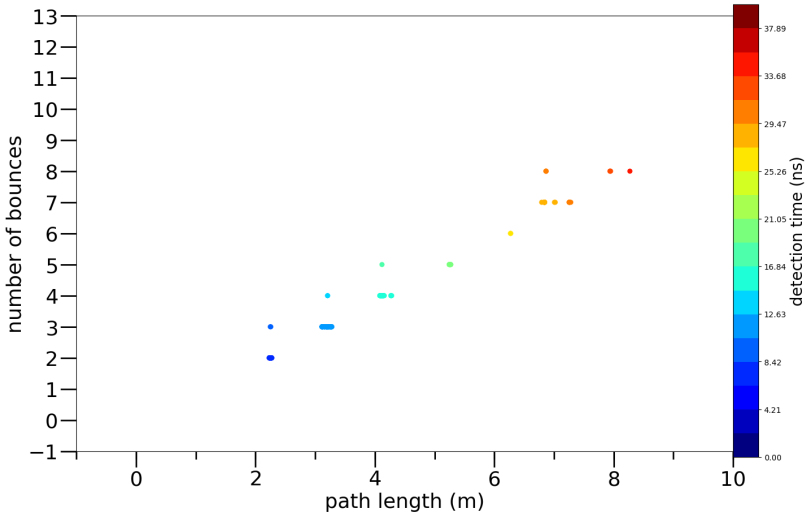
Increasing coverage fraction/number of LAPPDs

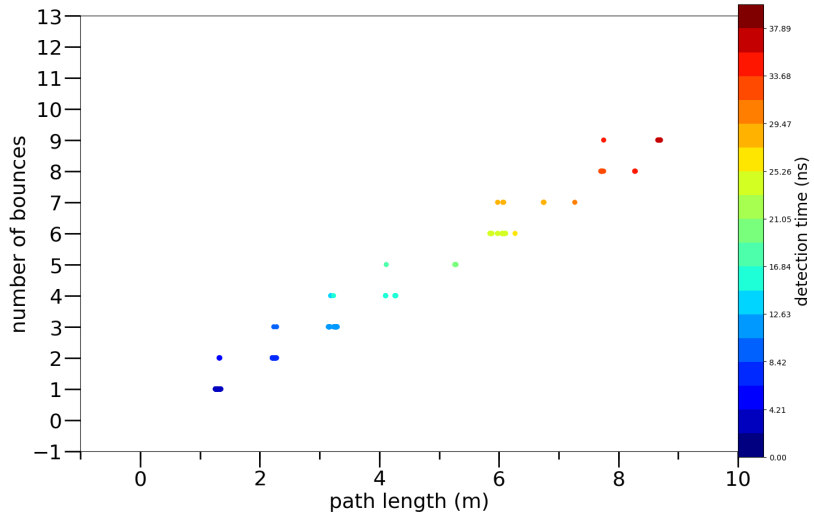
Cylinders

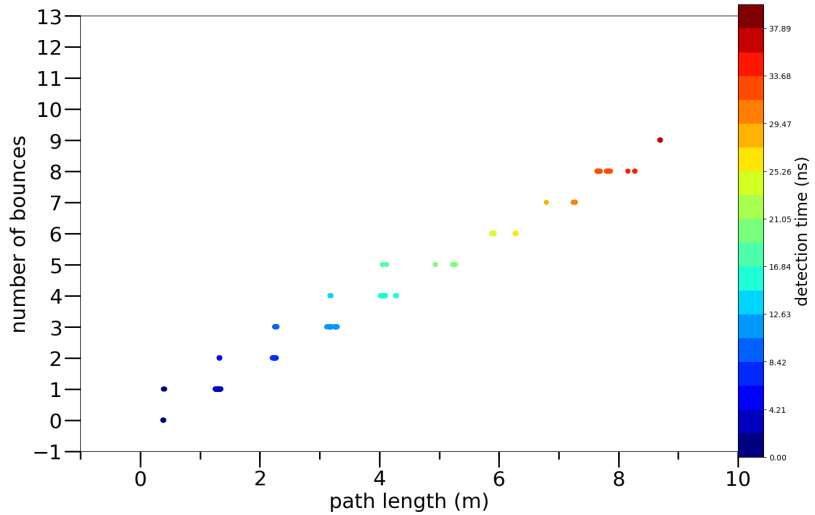








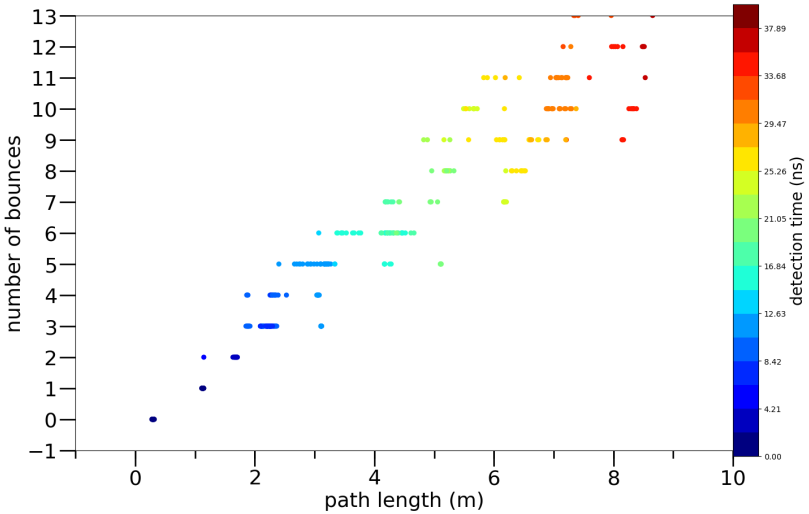


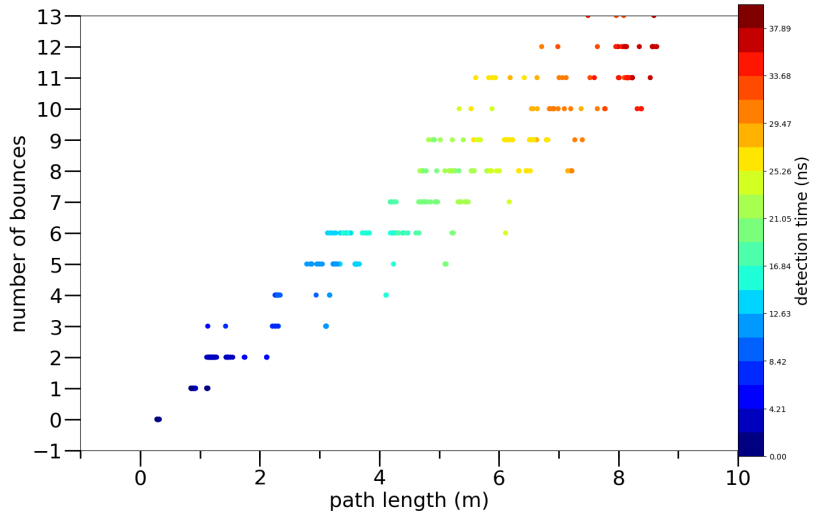


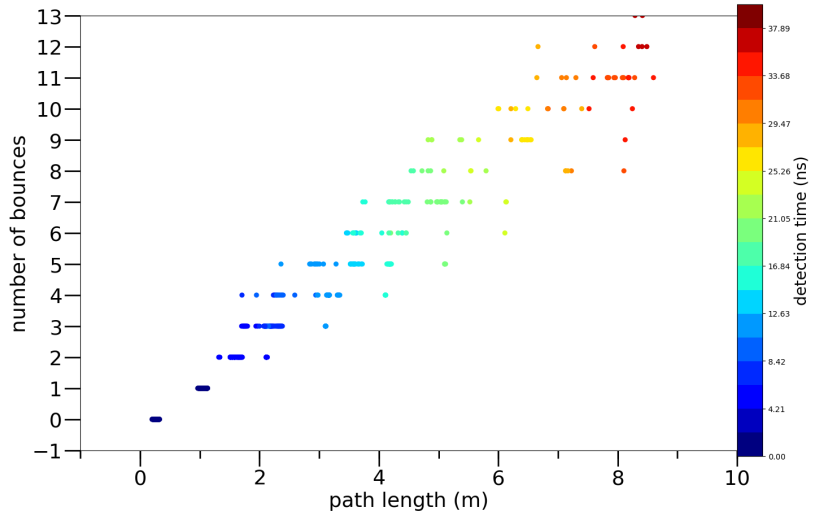
Spheres

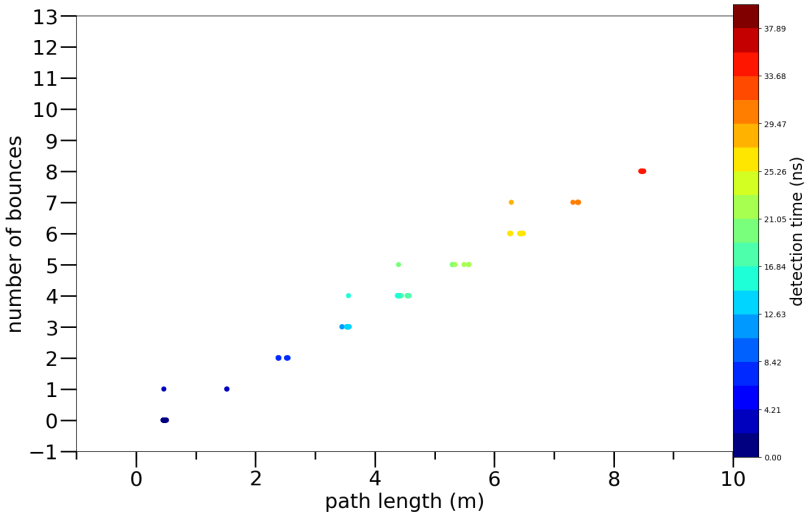
Increasing coverage fraction/number of LAPPDs

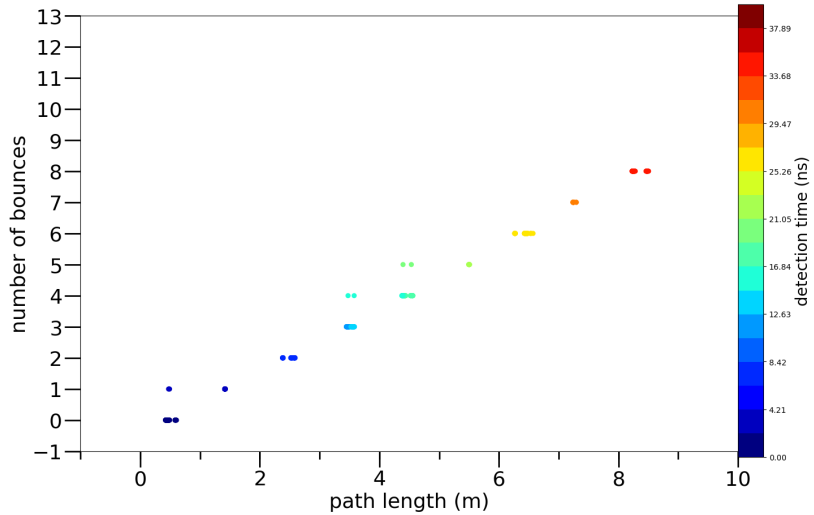
Cylinders

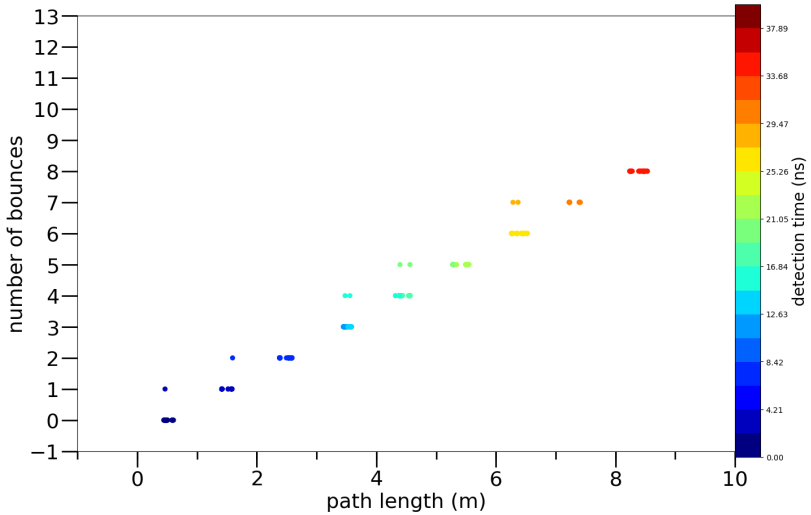








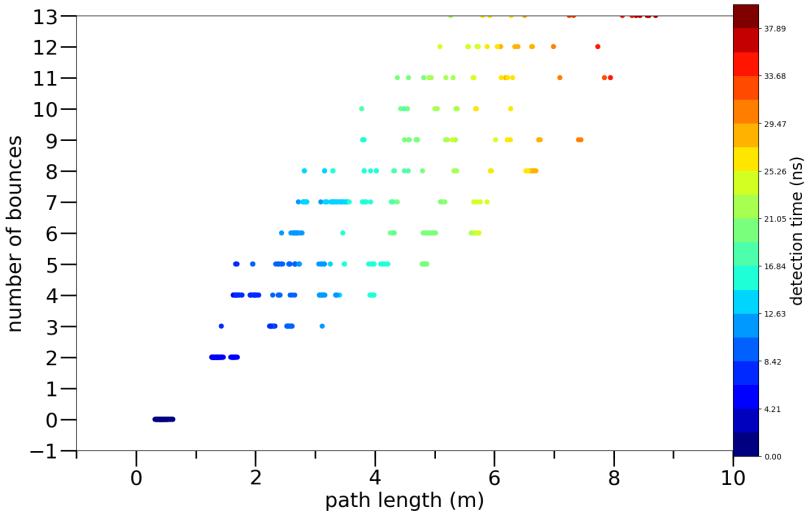


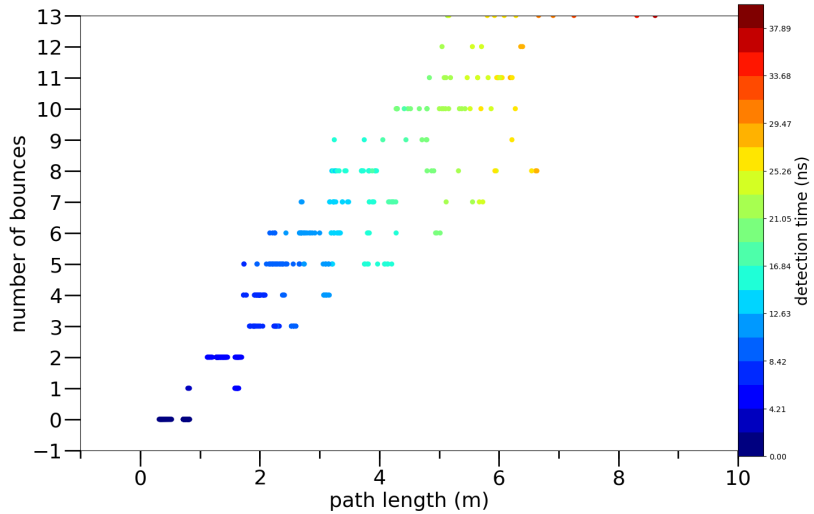


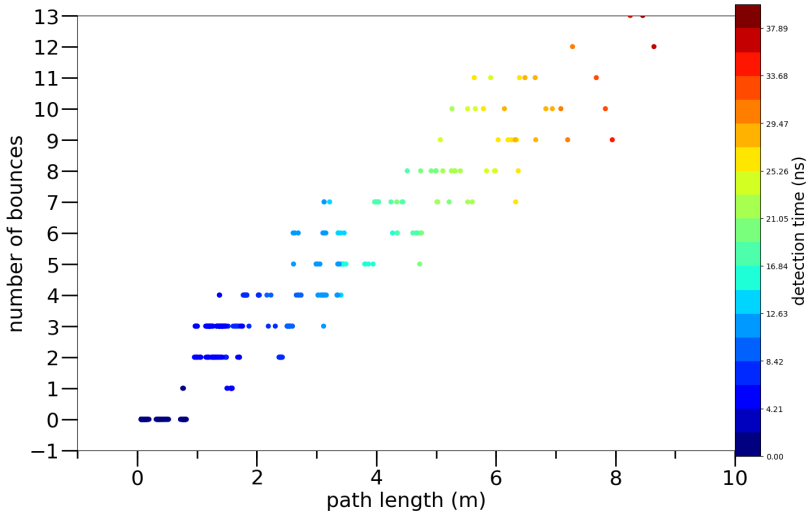
Spheres

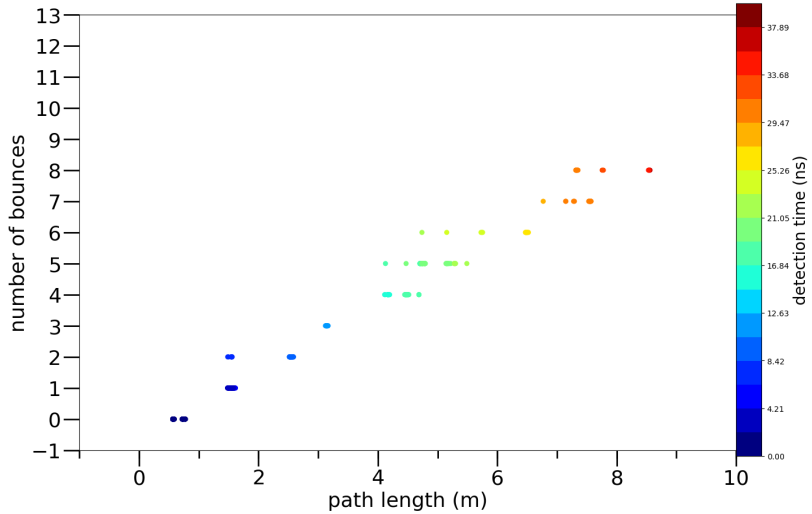
Increasing coverage fraction/number of LAPPDs

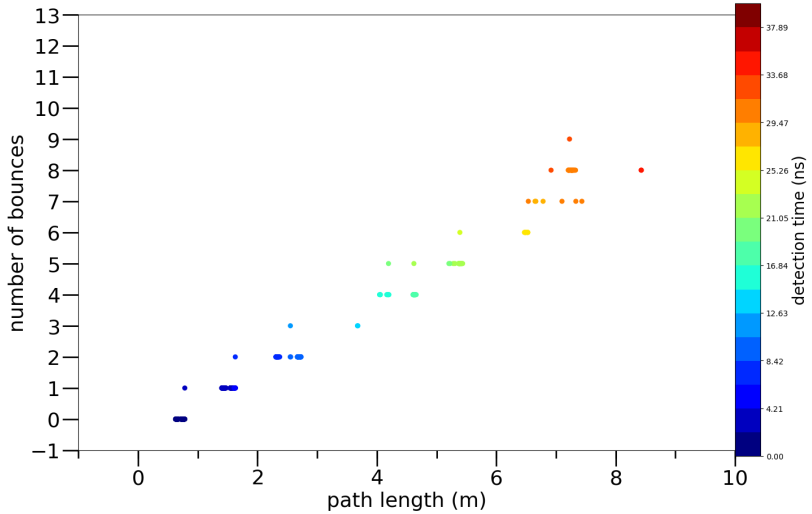
Cylinders

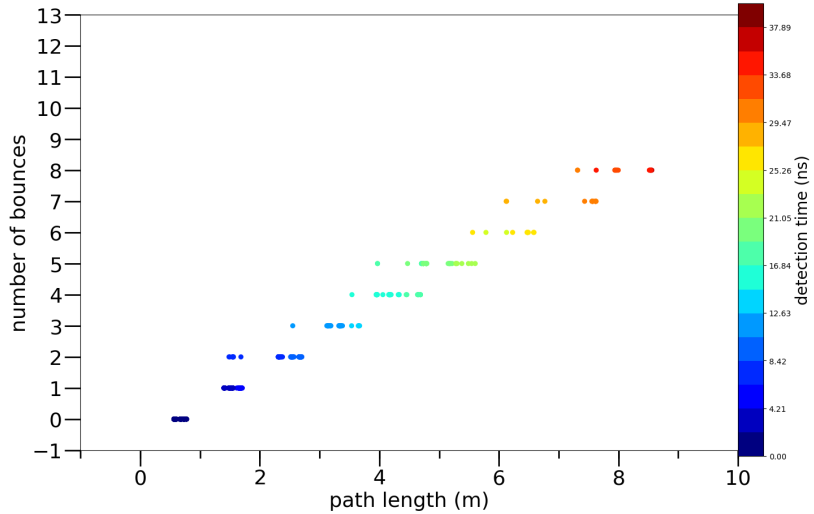








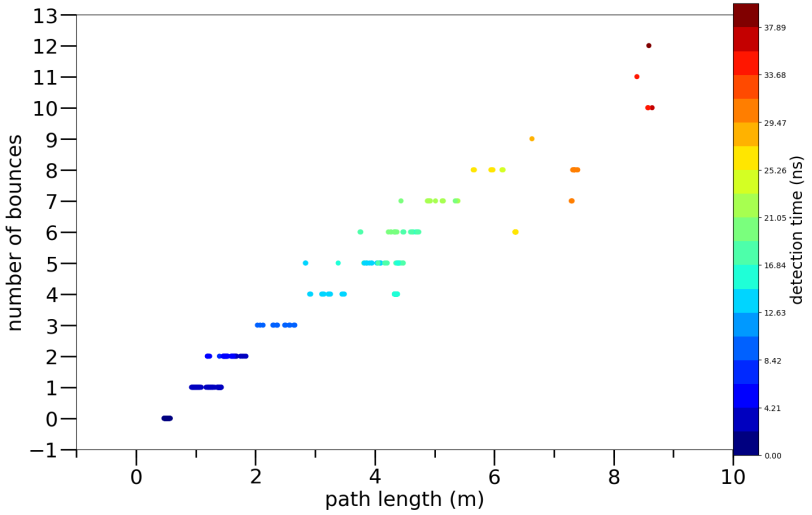


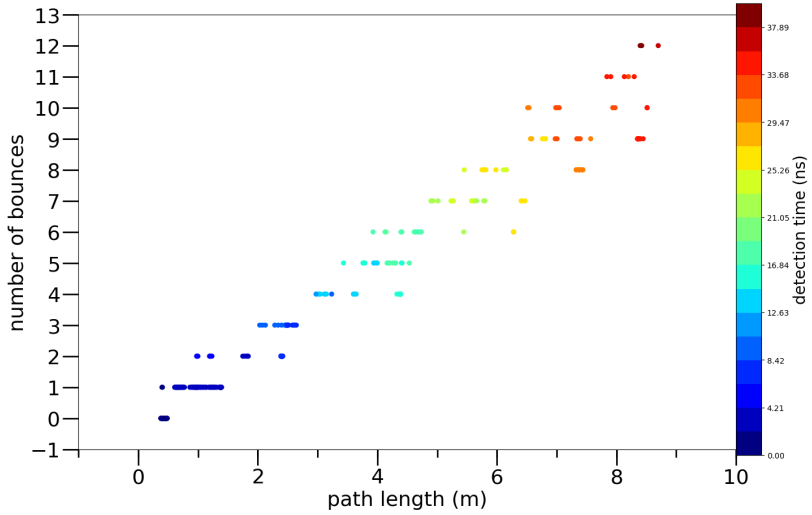


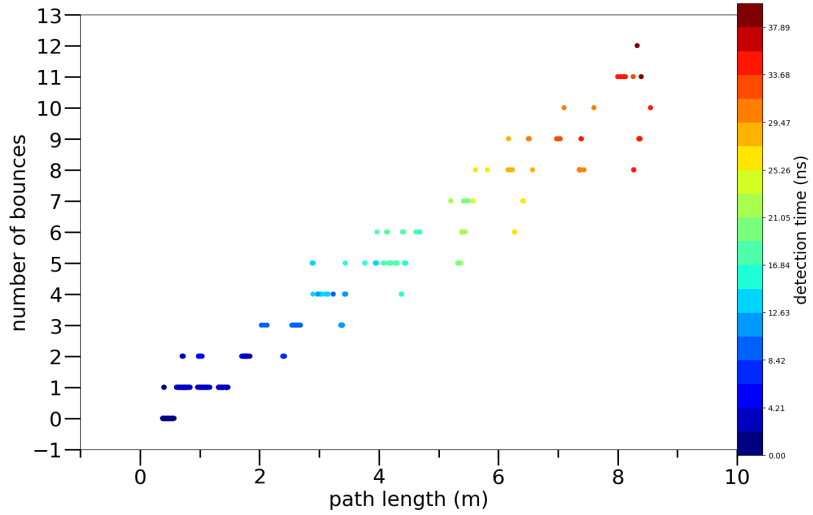
Spheres

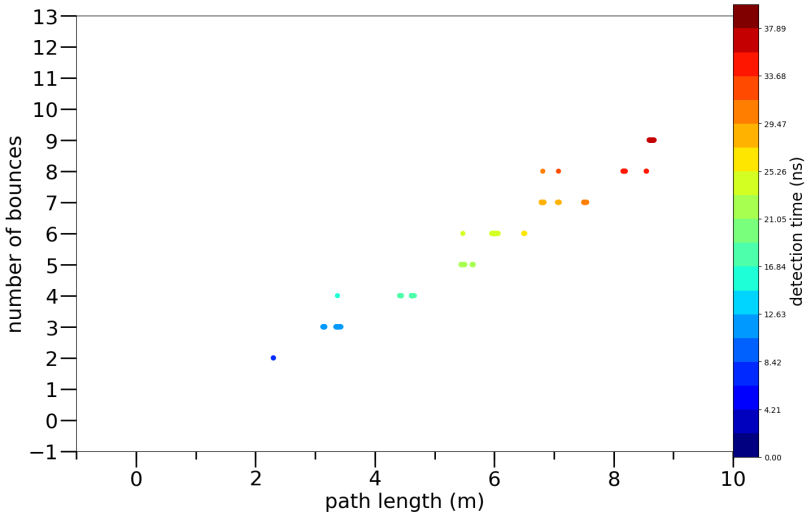
Increasing coverage fraction/number of LAPPDs

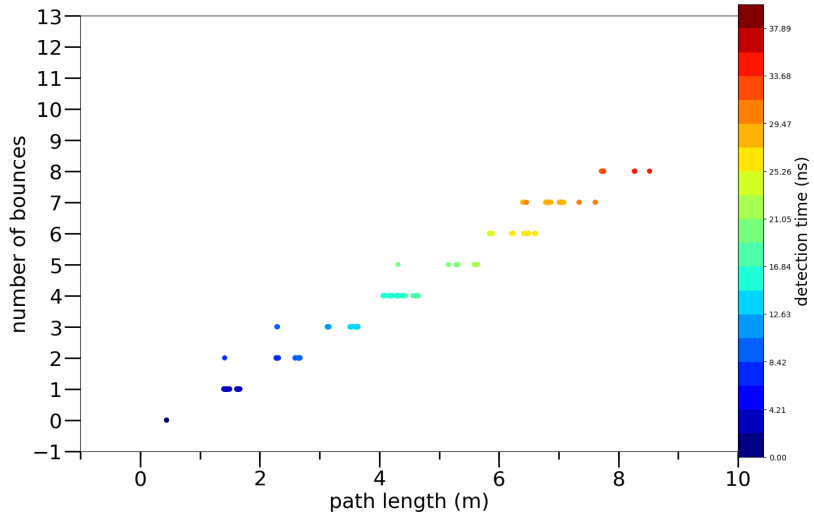
Cylinders

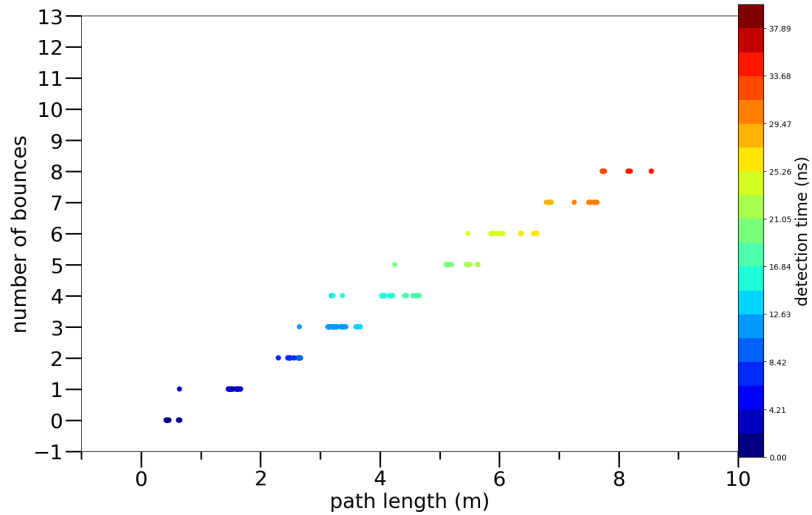








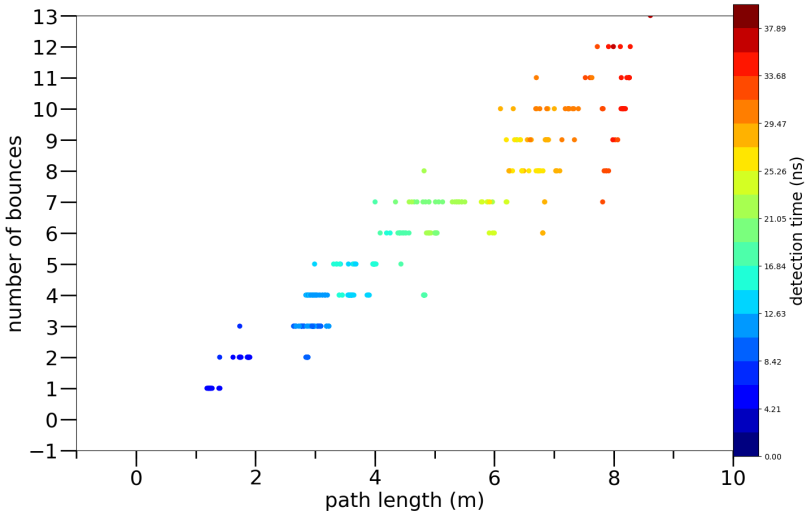


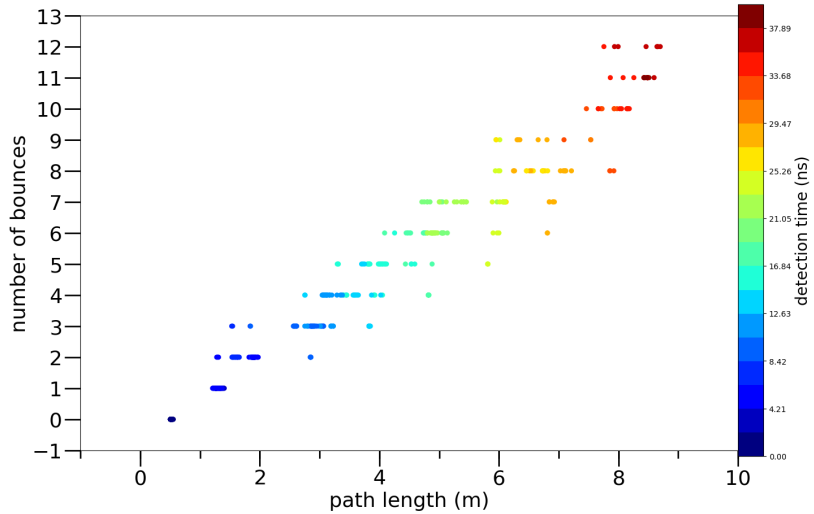


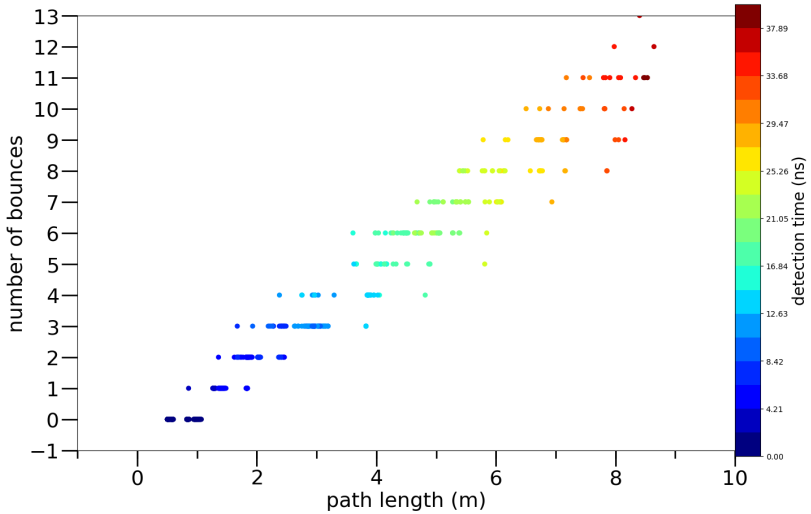
Spheres

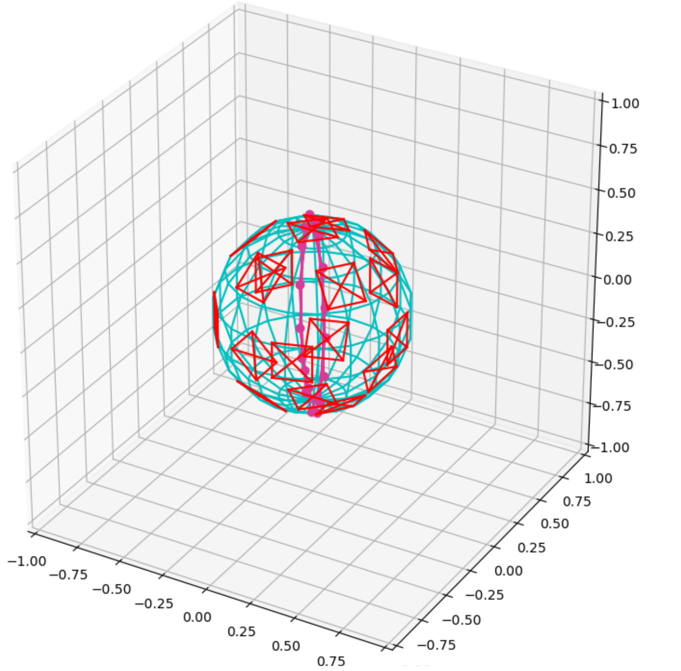
Increasing coverage fraction/number of LAPPDs

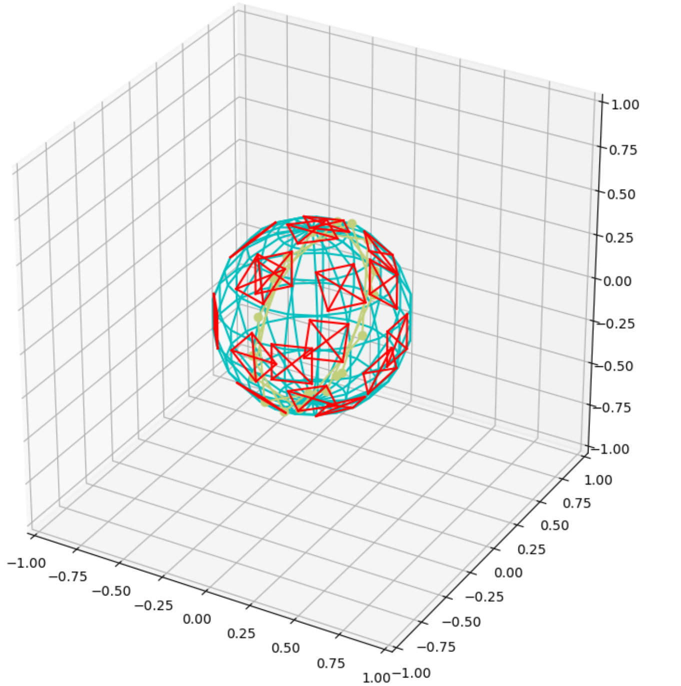
Cylinders

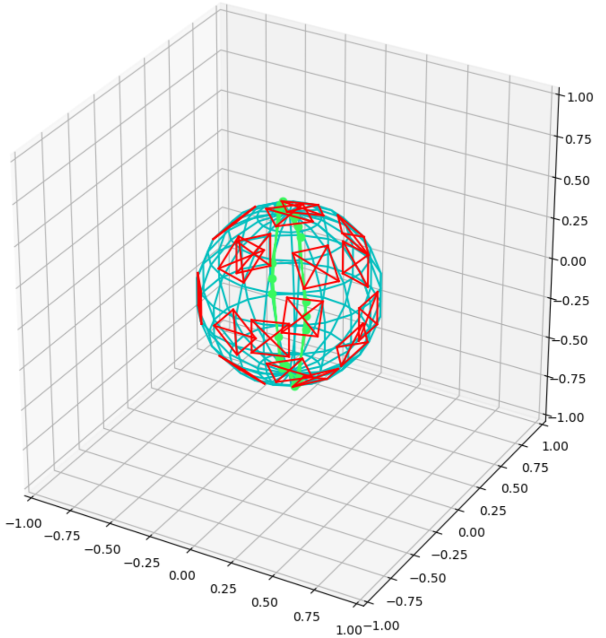


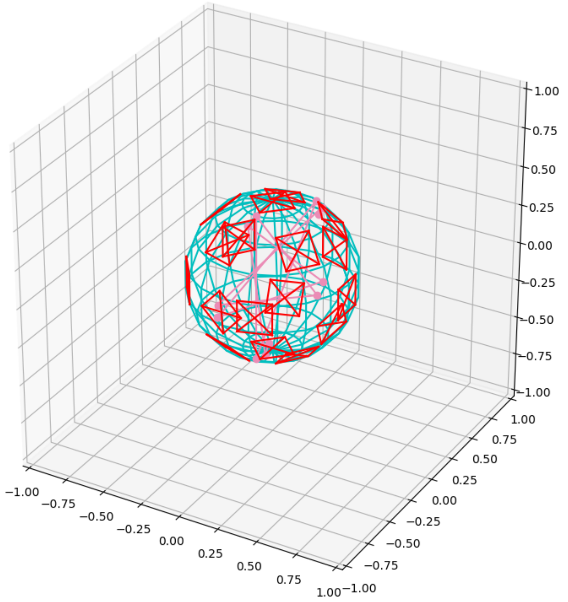


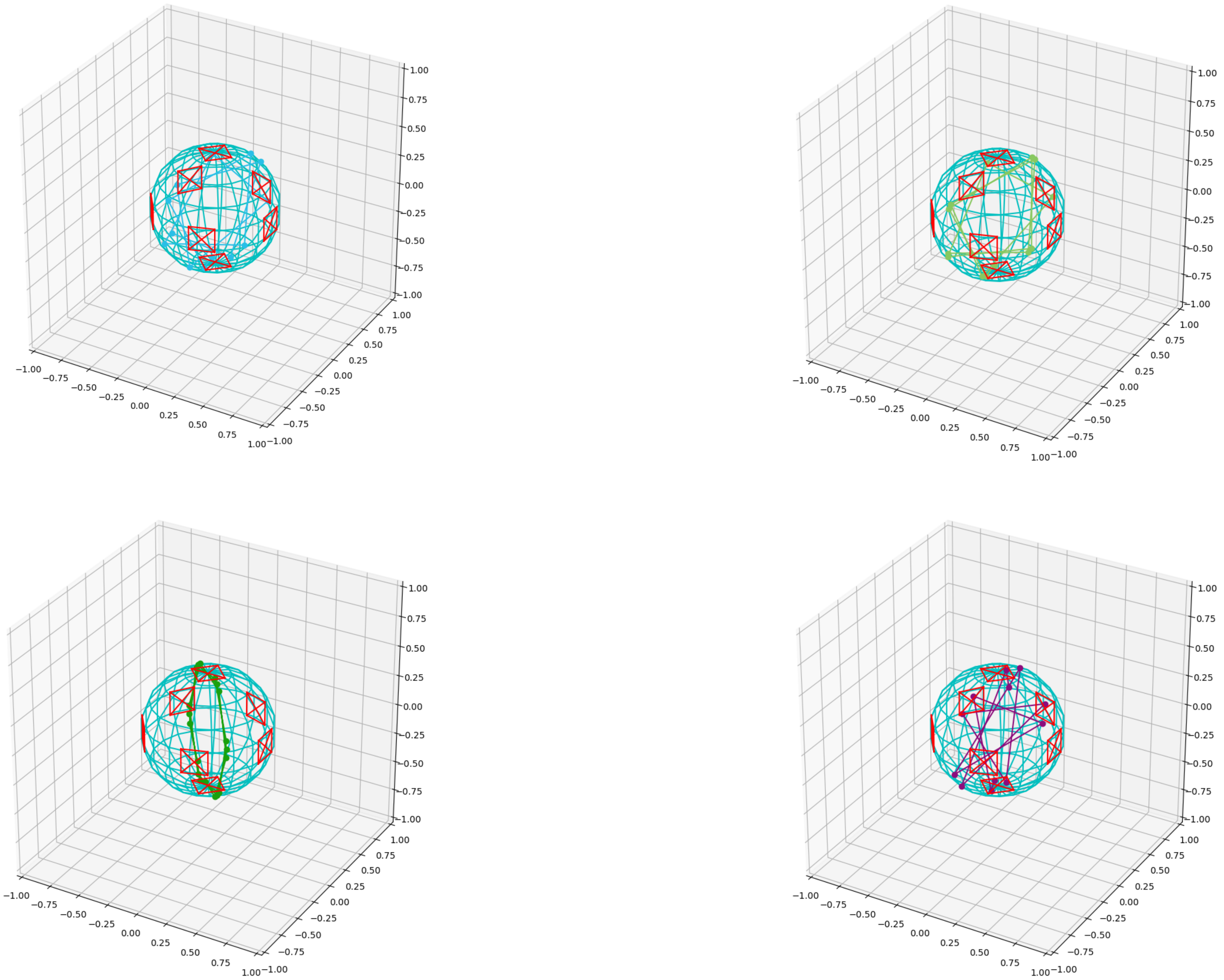


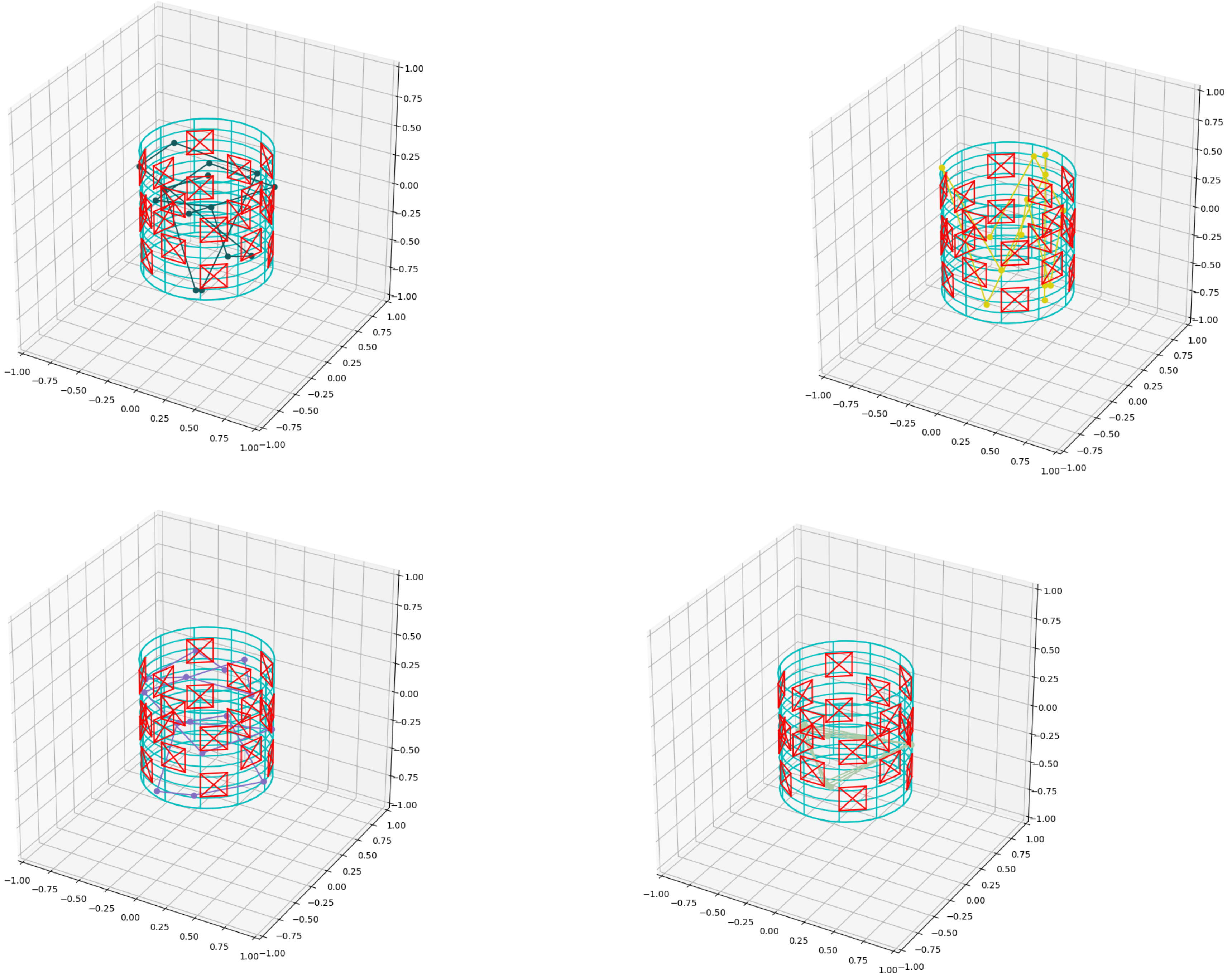

−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75
−0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00
1.00 0.75 0.50 0.25 0.00 −0.25 −0.50 −0.75 −1.00


−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00
−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00
1.00 0.75 0.50 0.25 0.00 −0.25 −0.50 −0.75 −1.00

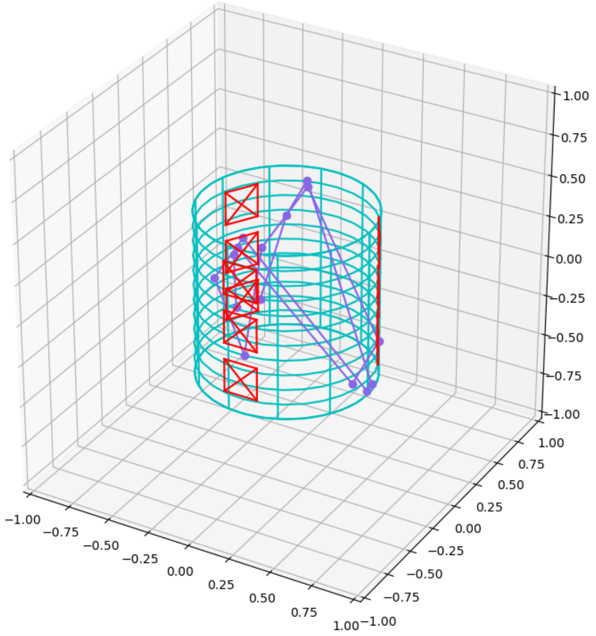

−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00
−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00
1.00 0.75 0.50 0.25 0.00 −0.25 −0.50 −0.75 −1.00

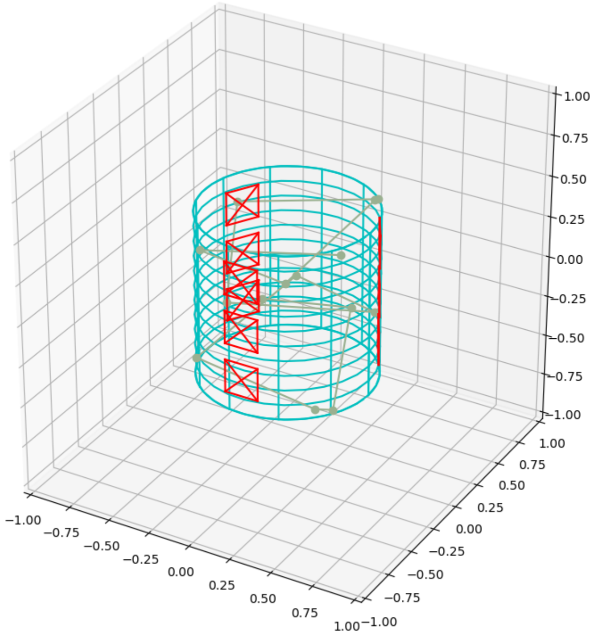

−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00
−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00
1.00 0.75 0.50 0.25 0.00 −0.25 −0.50 −0.75 −1.00

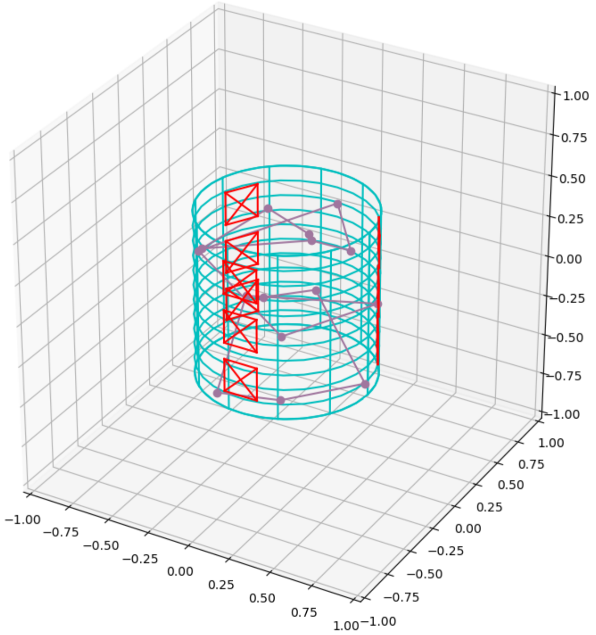

−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00

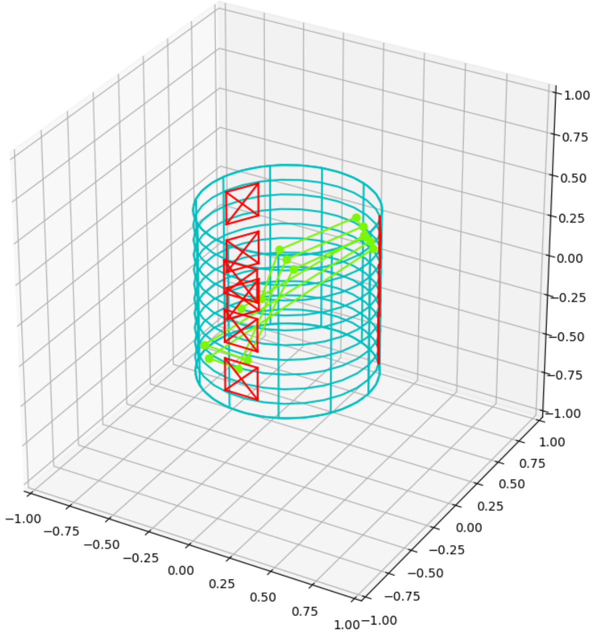


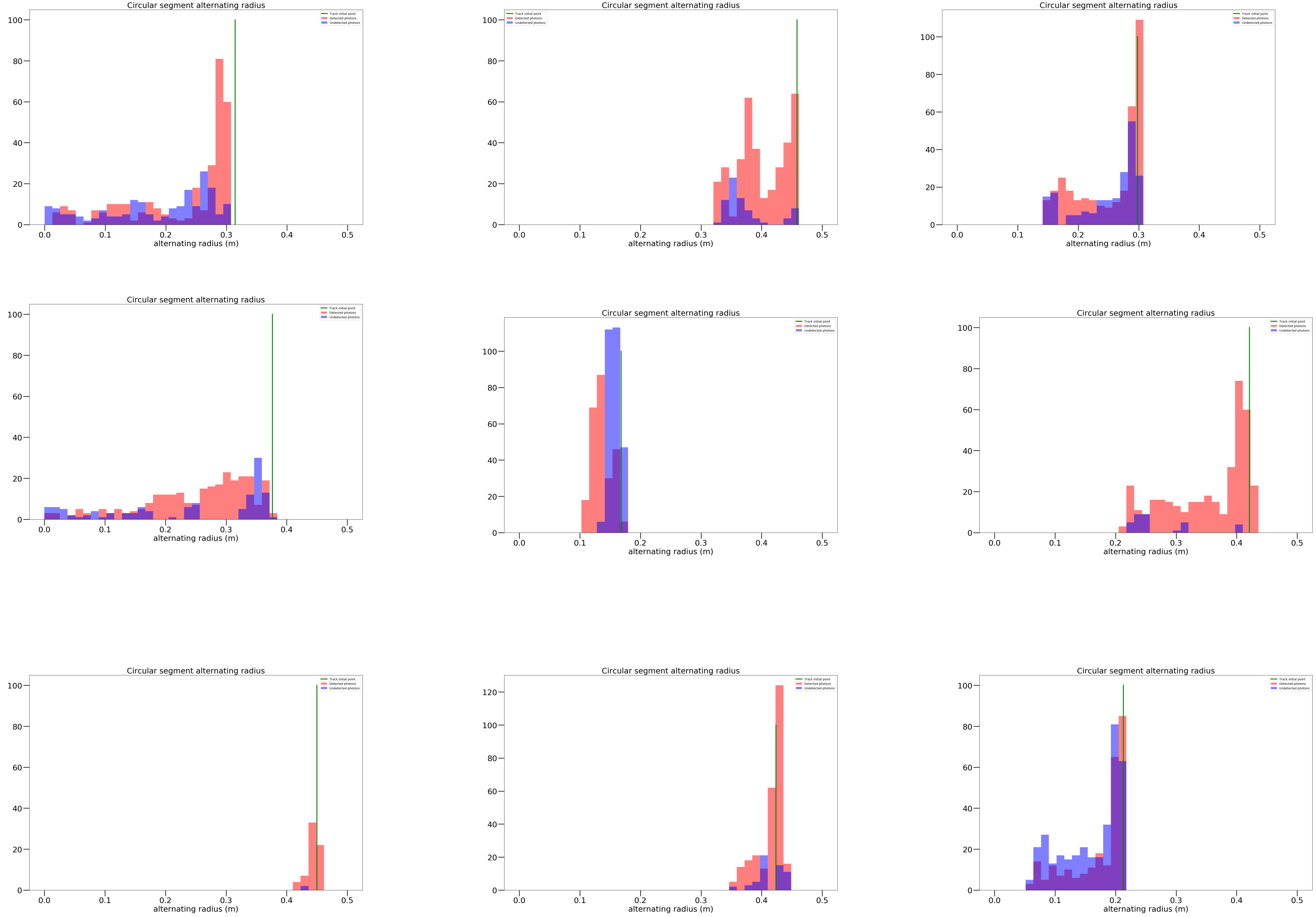
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00

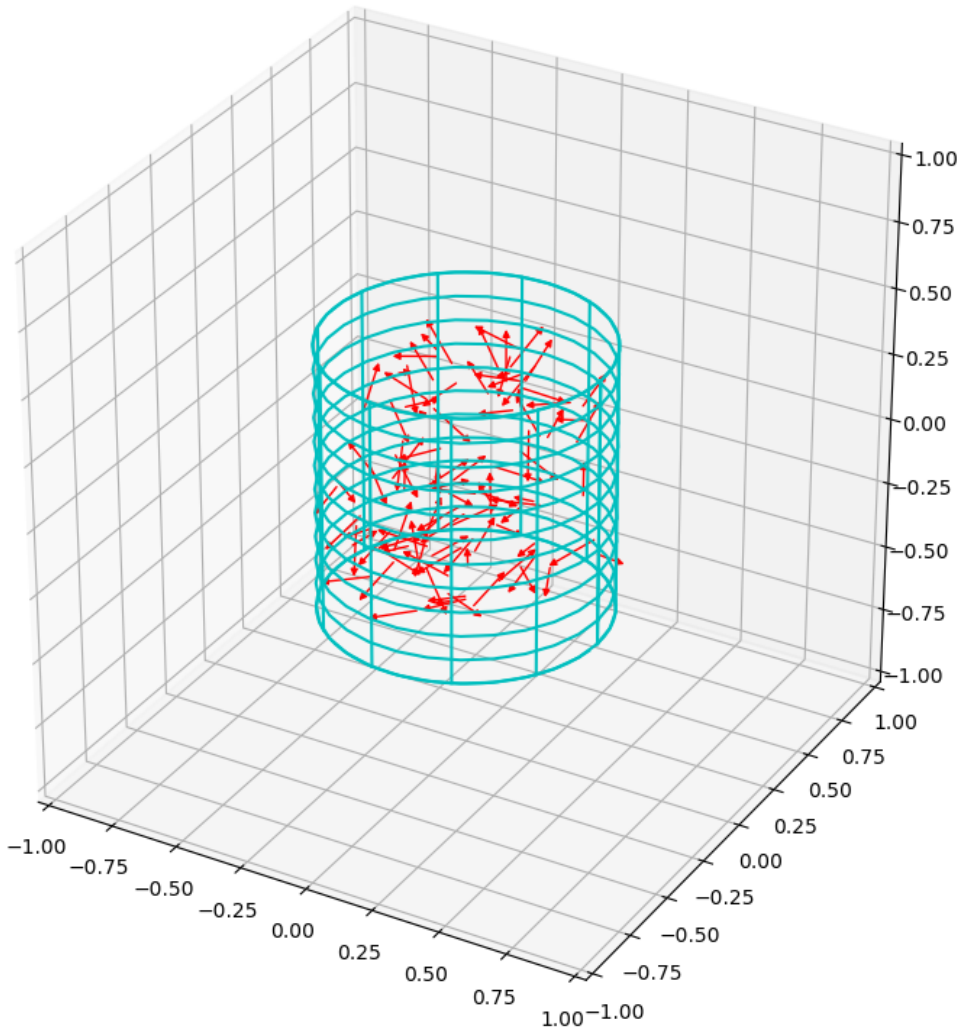

−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00
−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00
−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00

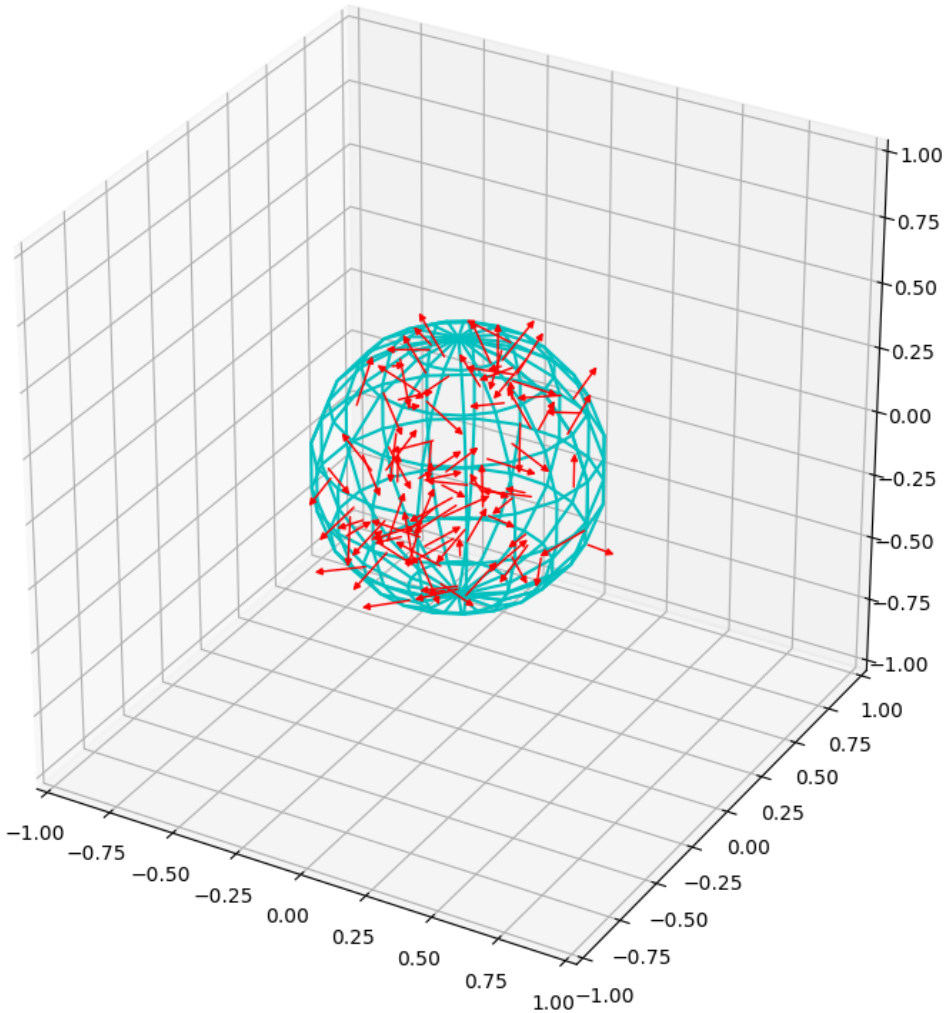

−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00
−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00
−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00

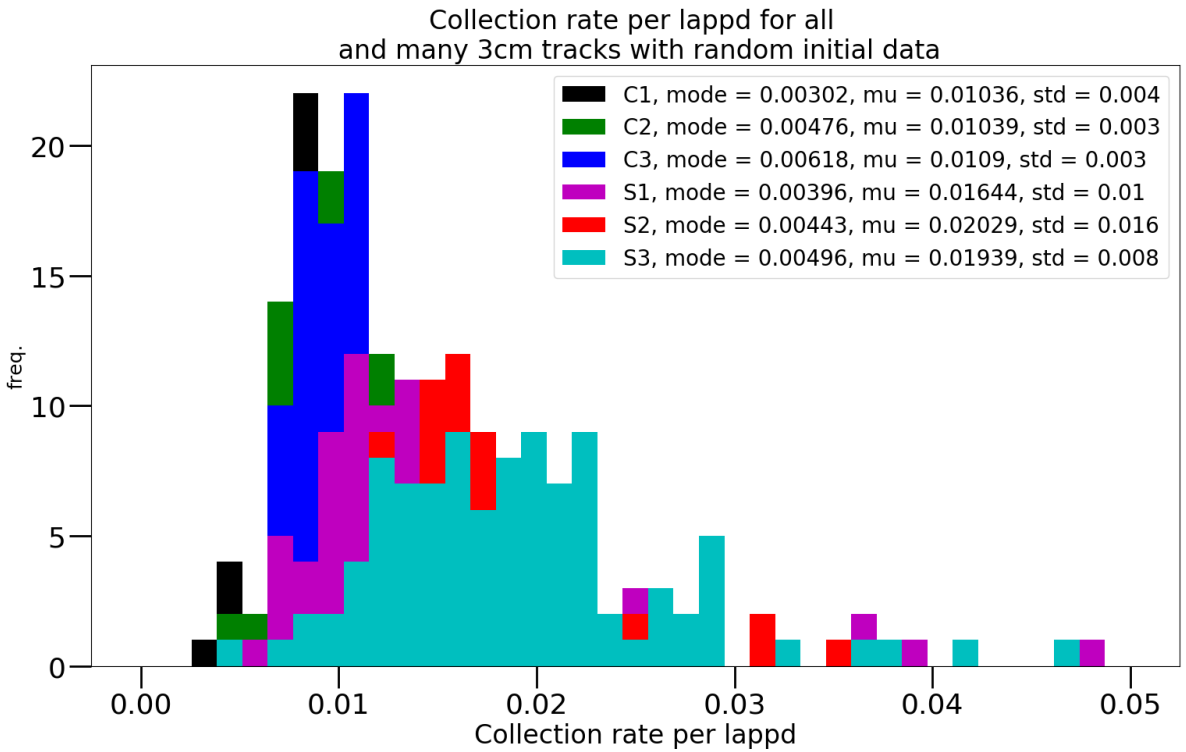

−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00
−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00
−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00

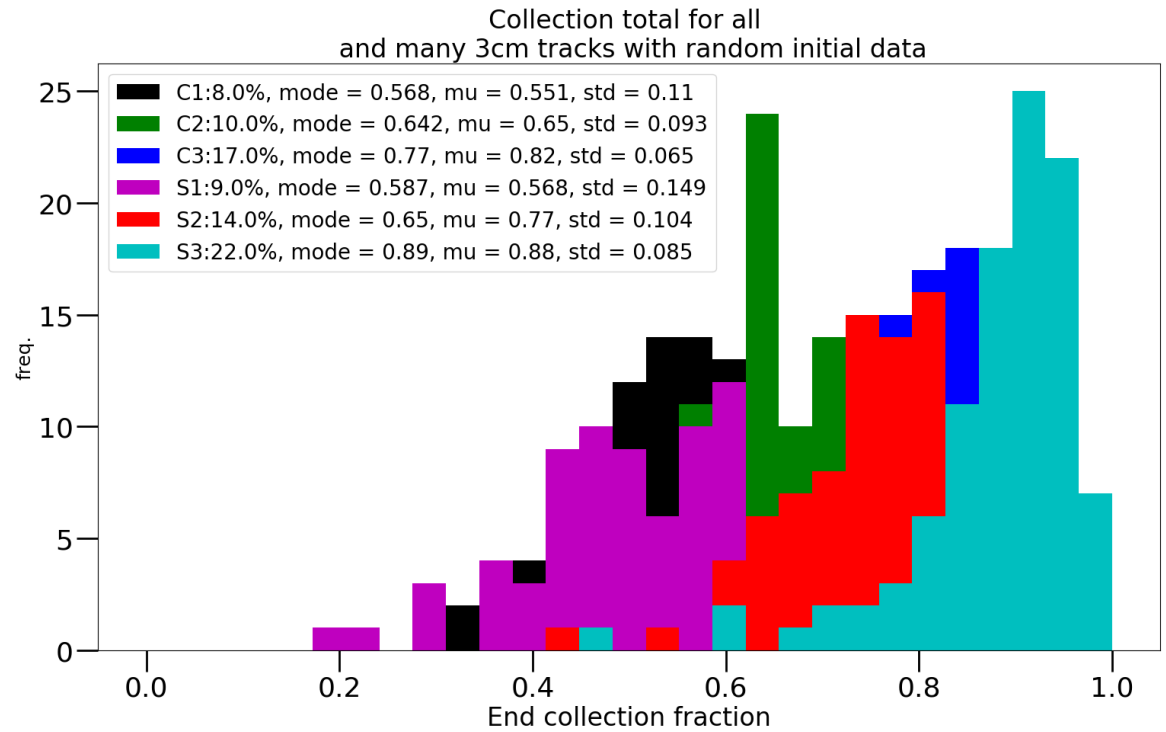

−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00
−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00
−1.00 −0.75 −0.50 −0.25 0.00 0.25 0.50 0.75 1.00

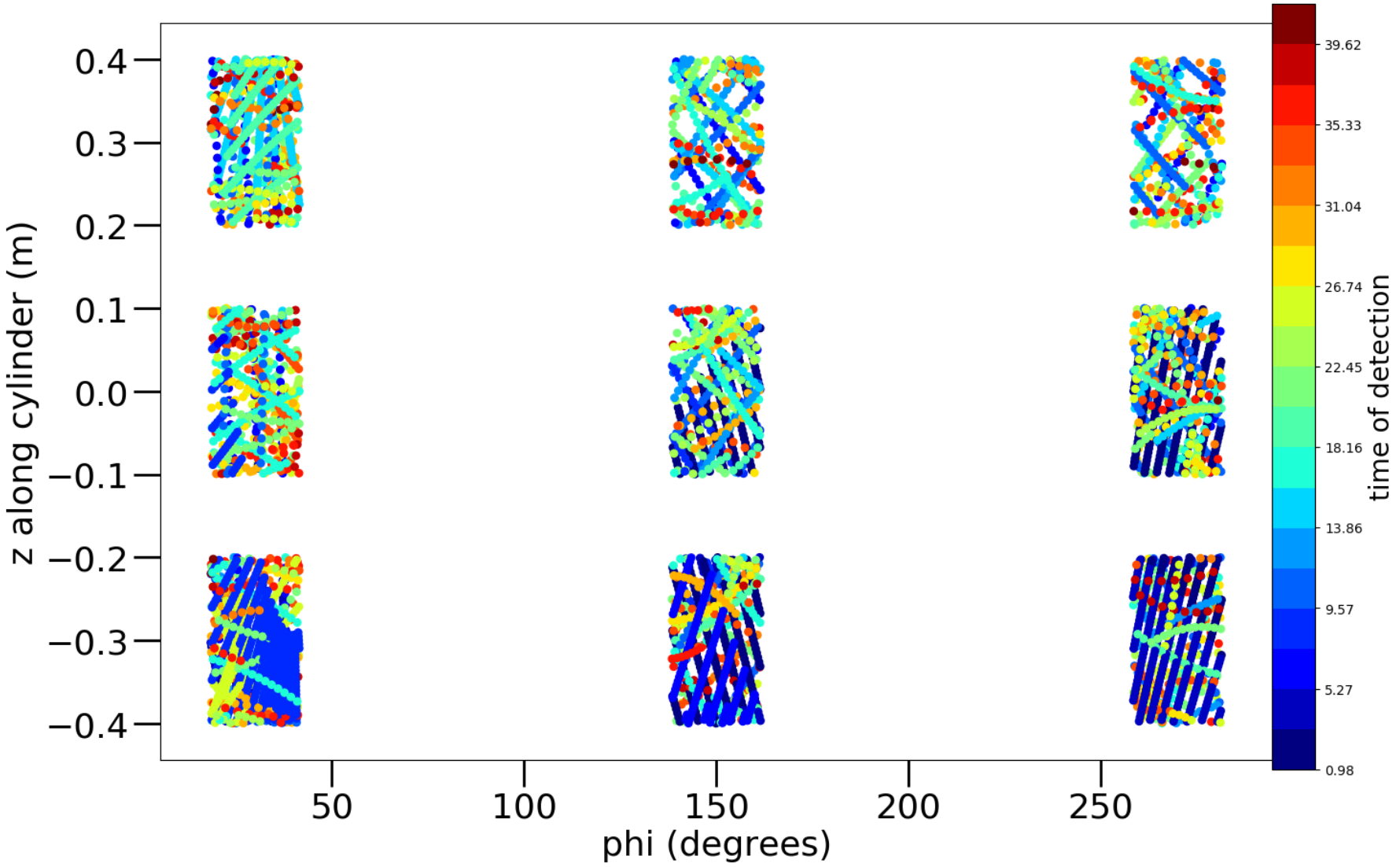

Circular segment alternating radius
Track initial point
Detected photons
Undetected photons
alternating radius (m)

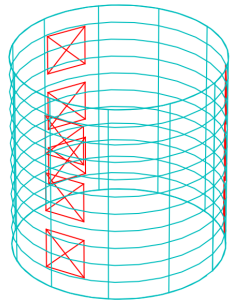

1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00


1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00

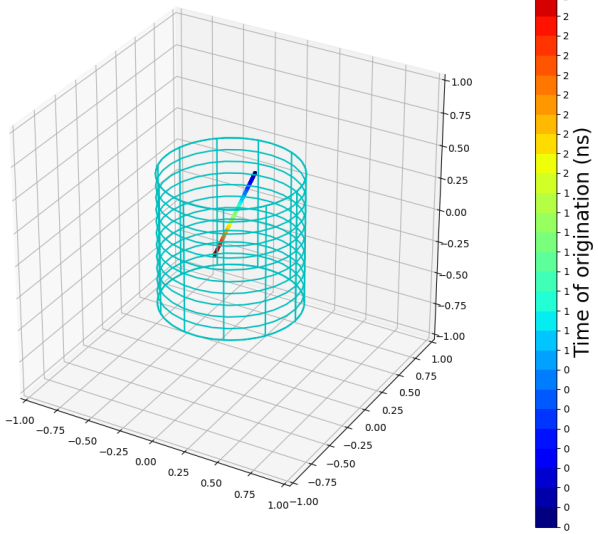

Collection rate per lappd for all
and many 3cm tracks with random initial data
C1, mode = 0.00302, mu = 0.01036, std = 0.004
C2, mode = 0.00476, mu = 0.01039, std = 0.003
C3, mode = 0.00618, mu = 0.0109, std = 0.003
S1, mode = 0.00396, mu = 0.01644, std = 0.01
S2, mode = 0.00443, mu = 0.02029, std = 0.016
S3, mode = 0.00496, mu = 0.01939, std = 0.008
freq.
0
5
10
15
20
0.00
0.01
0.02
0.03
0.04
0.05
Collection rate per lappd

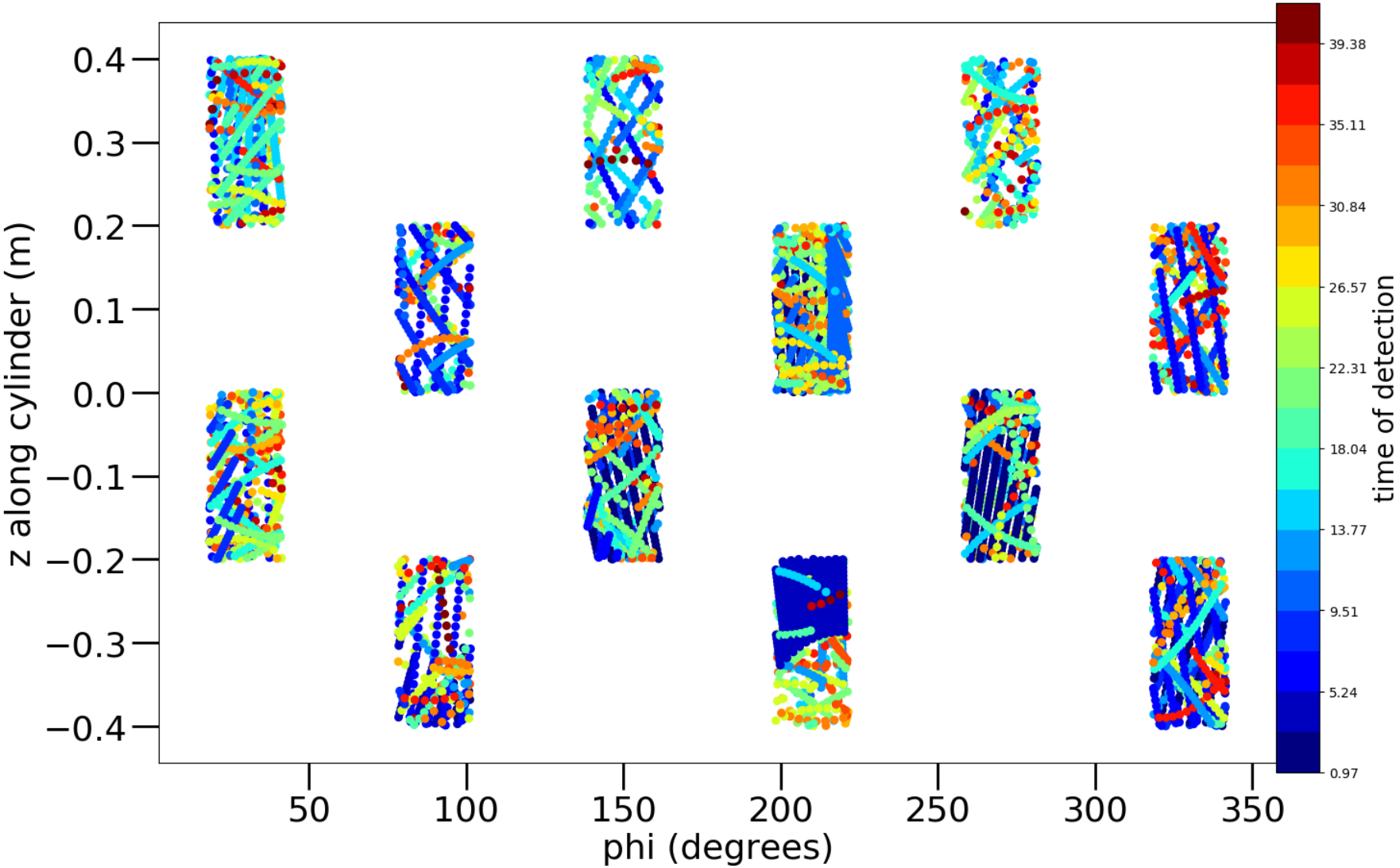

Collection total for all
and many 3cm tracks with random initial data
C1:8.0%, mode = 0.568, mu = 0.551, std = 0.11
C2:10.0%, mode = 0.642, mu = 0.65, std = 0.093
C3:17.0%, mode = 0.77, mu = 0.82, std = 0.065
S1:9.0%, mode = 0.587, mu = 0.568, std = 0.149
S2:14.0%, mode = 0.65, mu = 0.77, std = 0.104
S3:22.0%, mode = 0.89, mu = 0.88, std = 0.085
freq.
0
5
10
15
20
25
0.0
0.2
0.4
0.6
0.8
1.0
End collection fraction

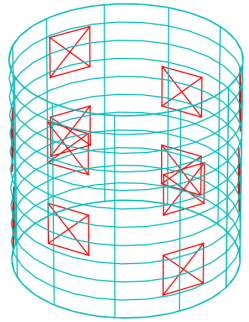




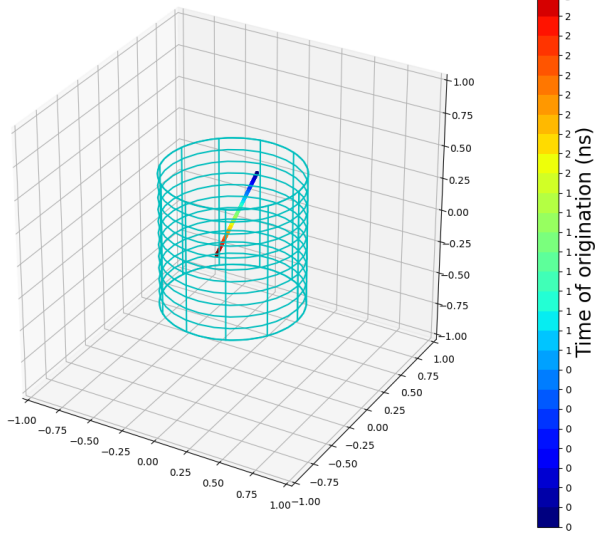
Name: Three Column Three Row
Number of photodetectors: 9
Photocathode area: 0.3598 m^2
Mirror area: 4.3526 m^2
Cathode/Mirror area: 0.0827

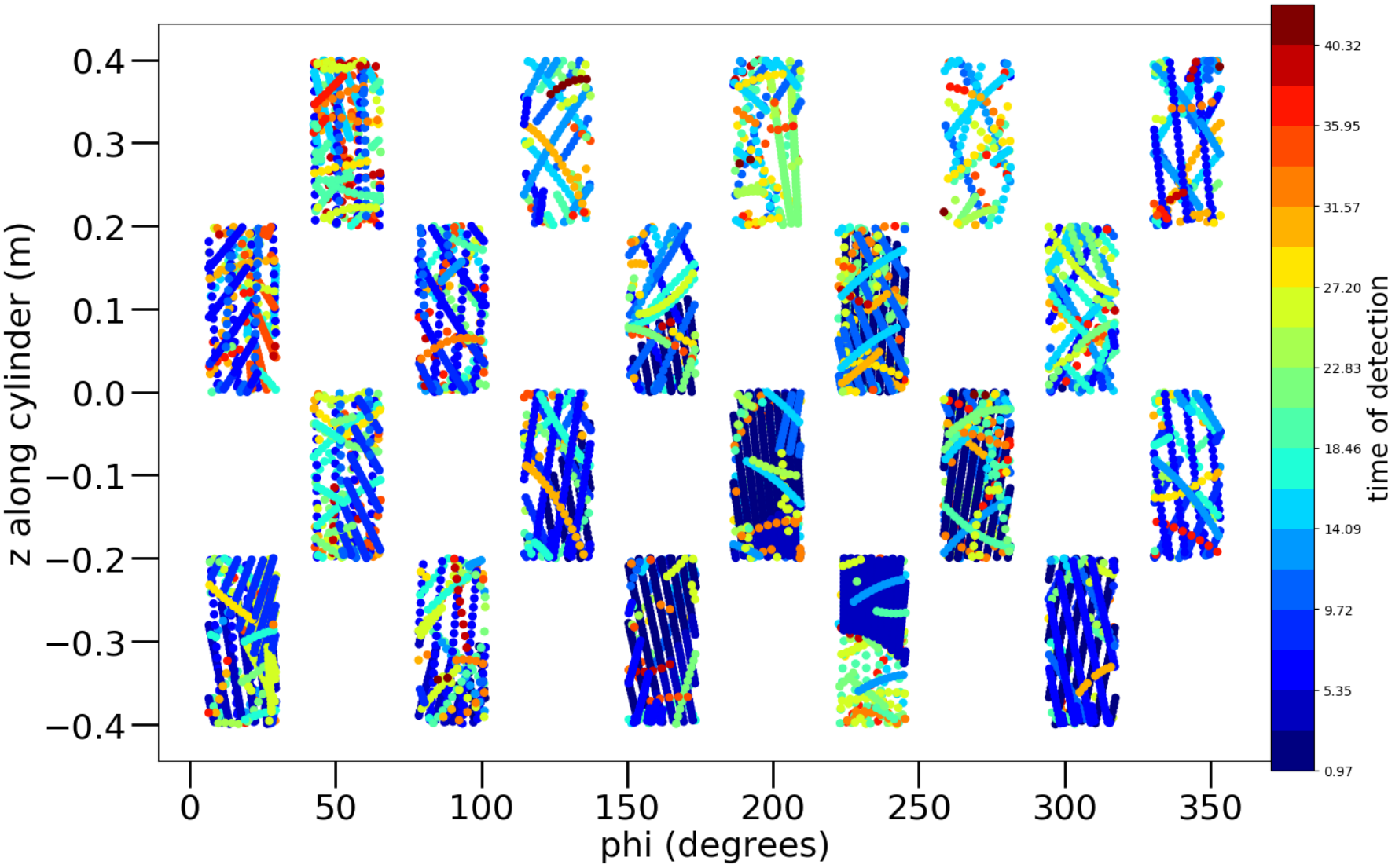


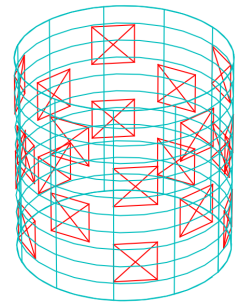




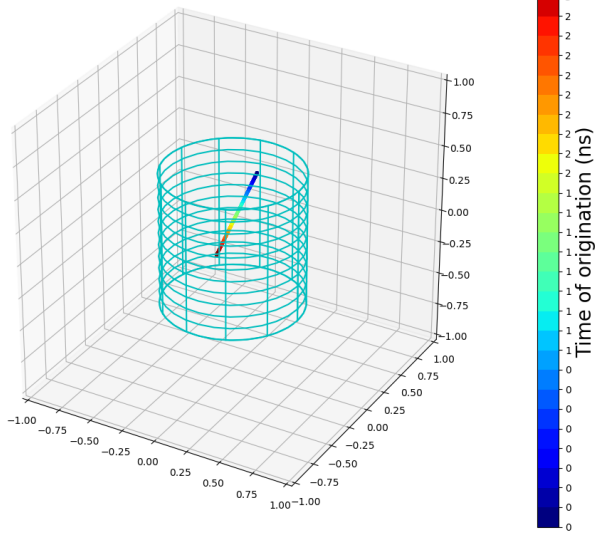
Name: 3-Checkered
Number of photodetectors: 12
Photocathode area: 0.4798 m^2
Mirror area: 4.2326 m^2
Cathode/Mirror area: 0.1133

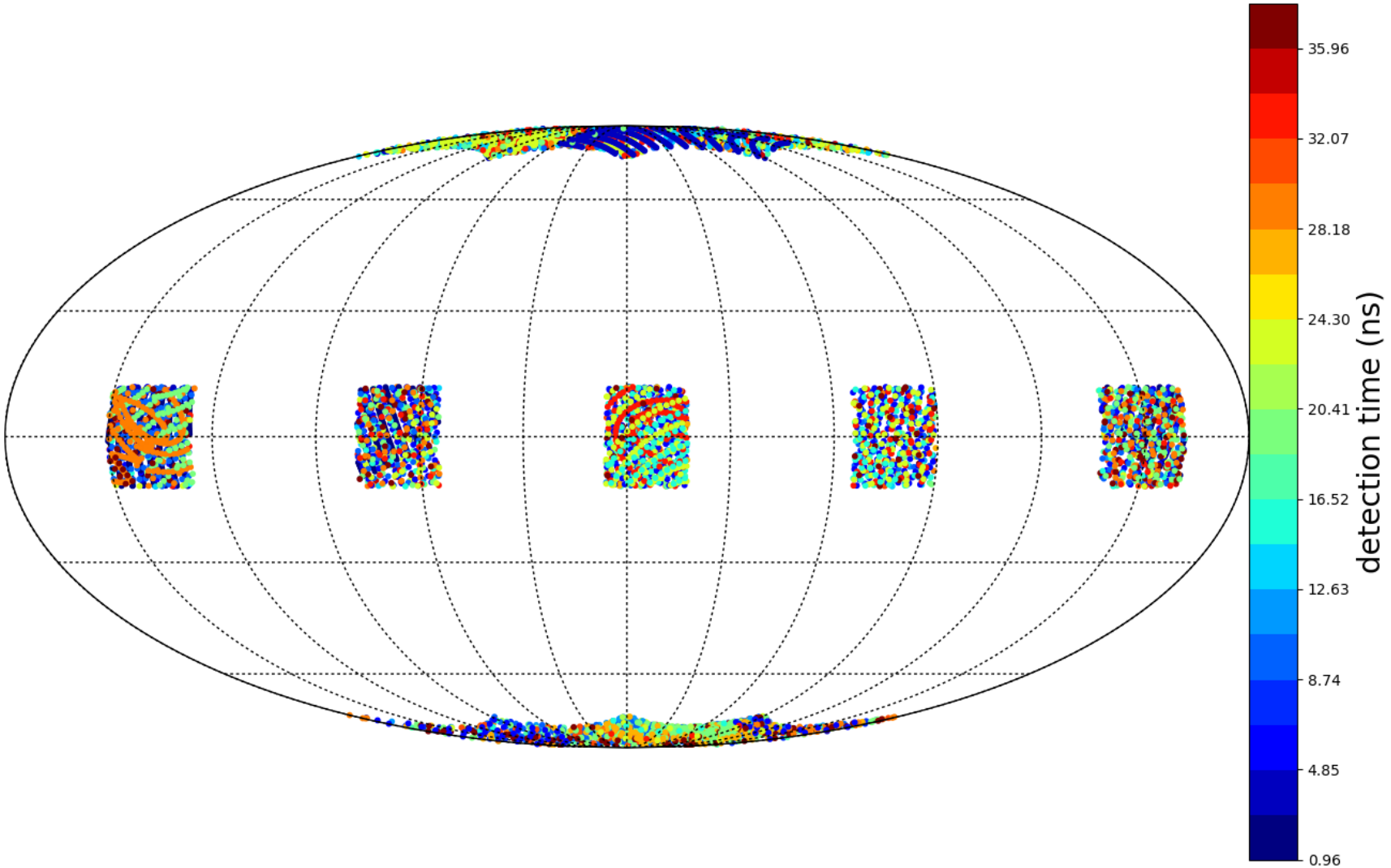


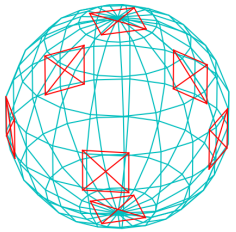




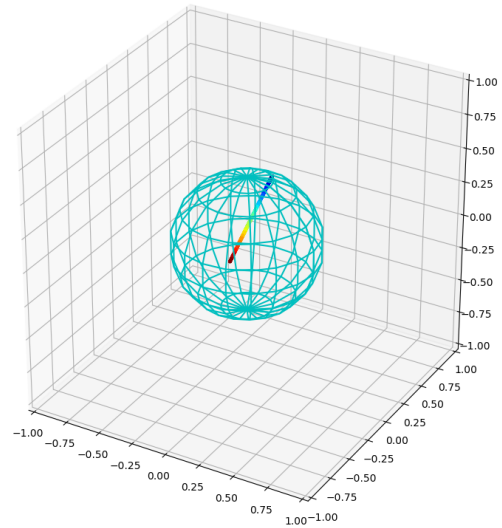
Name: 5-Checkered
Number of photodetectors: 20
Photocathode area: 0.7996 m^2
Mirror area: 3.9128 m^2
Cathode/Mirror area: 0.2044

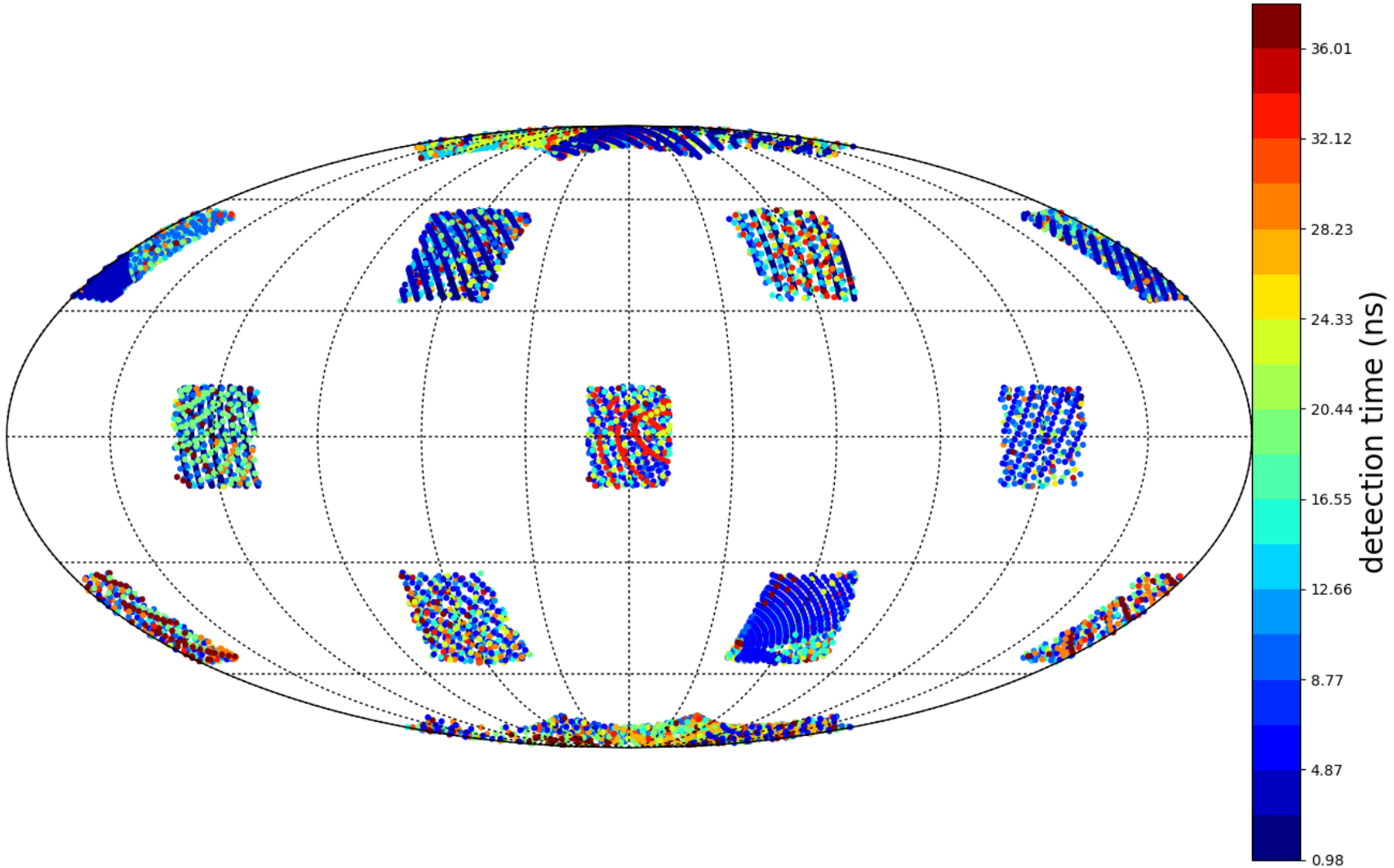


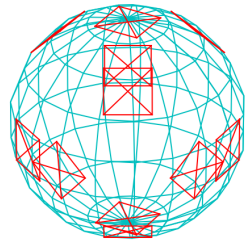




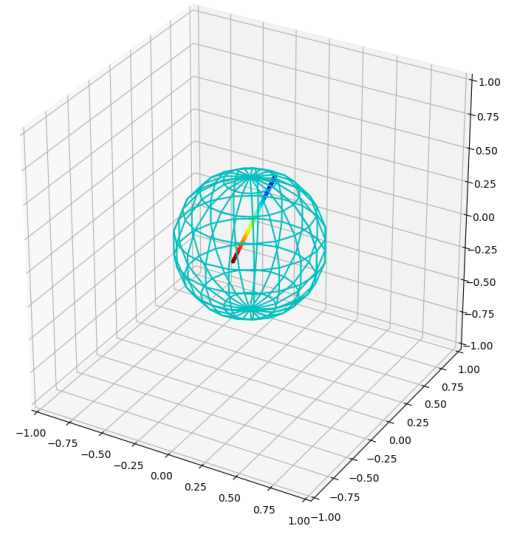
Name: 1-Belt Sphere Poles
Number of photodetectors: 7
Photocathode area: 0.2799 m^2
Mirror area: 2.8617 m^2
Cathode/Mirror area: 0.0978

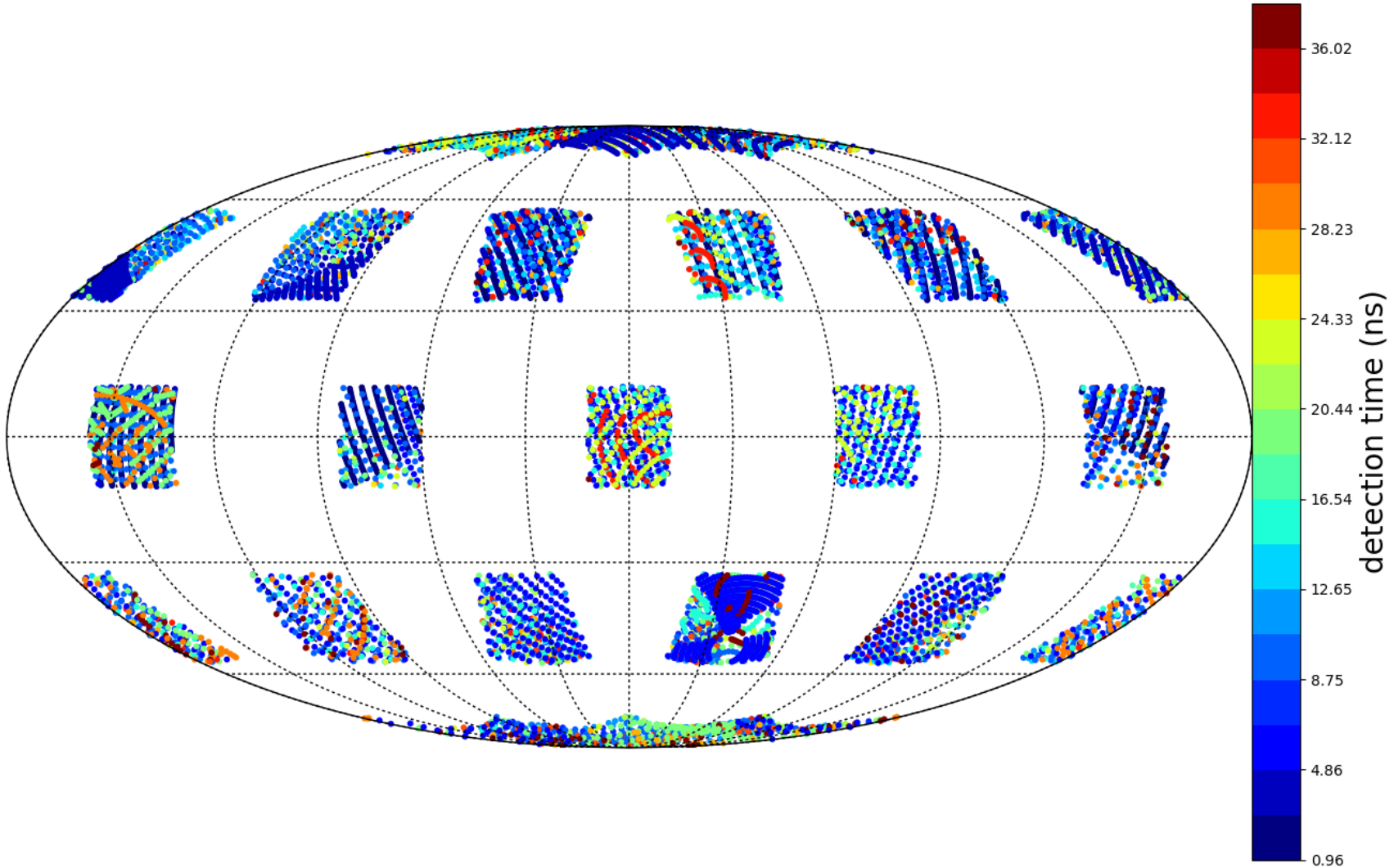


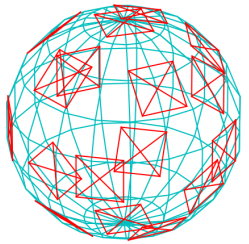




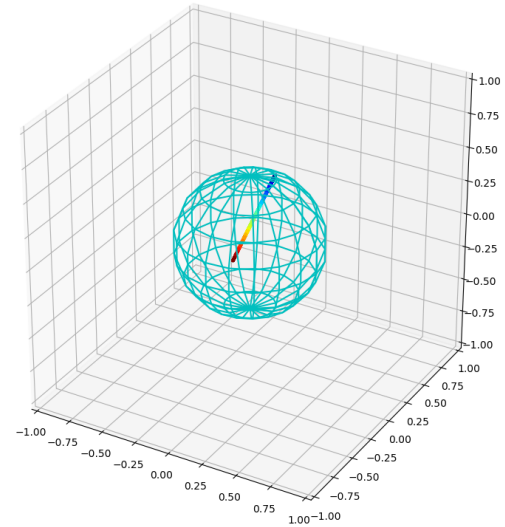
Name: Threes Sphere
Number of photodetectors: 11
Photocathode area: 0.4398 m^2
Mirror area: 2.7018 m^2
Cathode/Mirror area: 0.1628

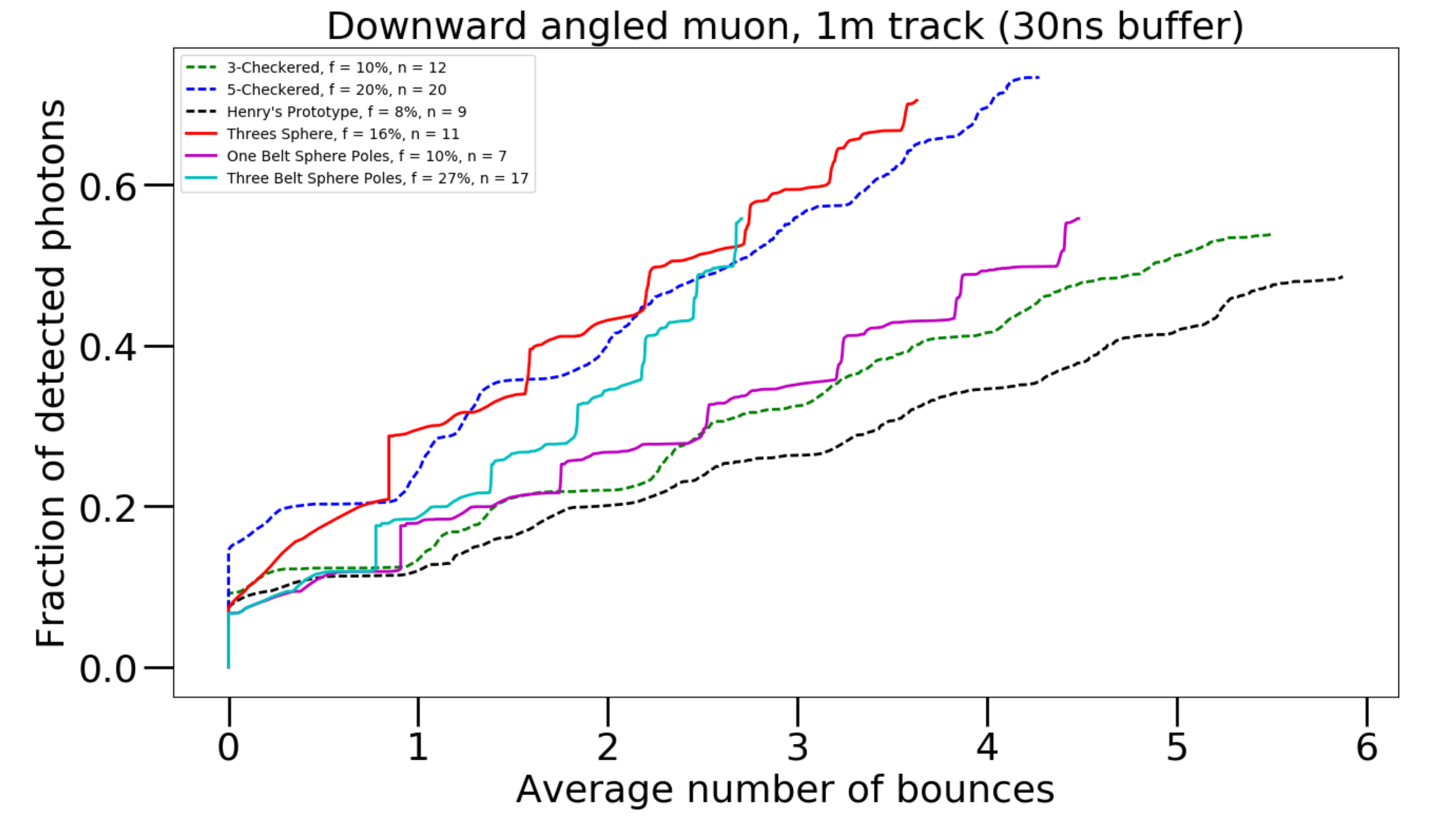


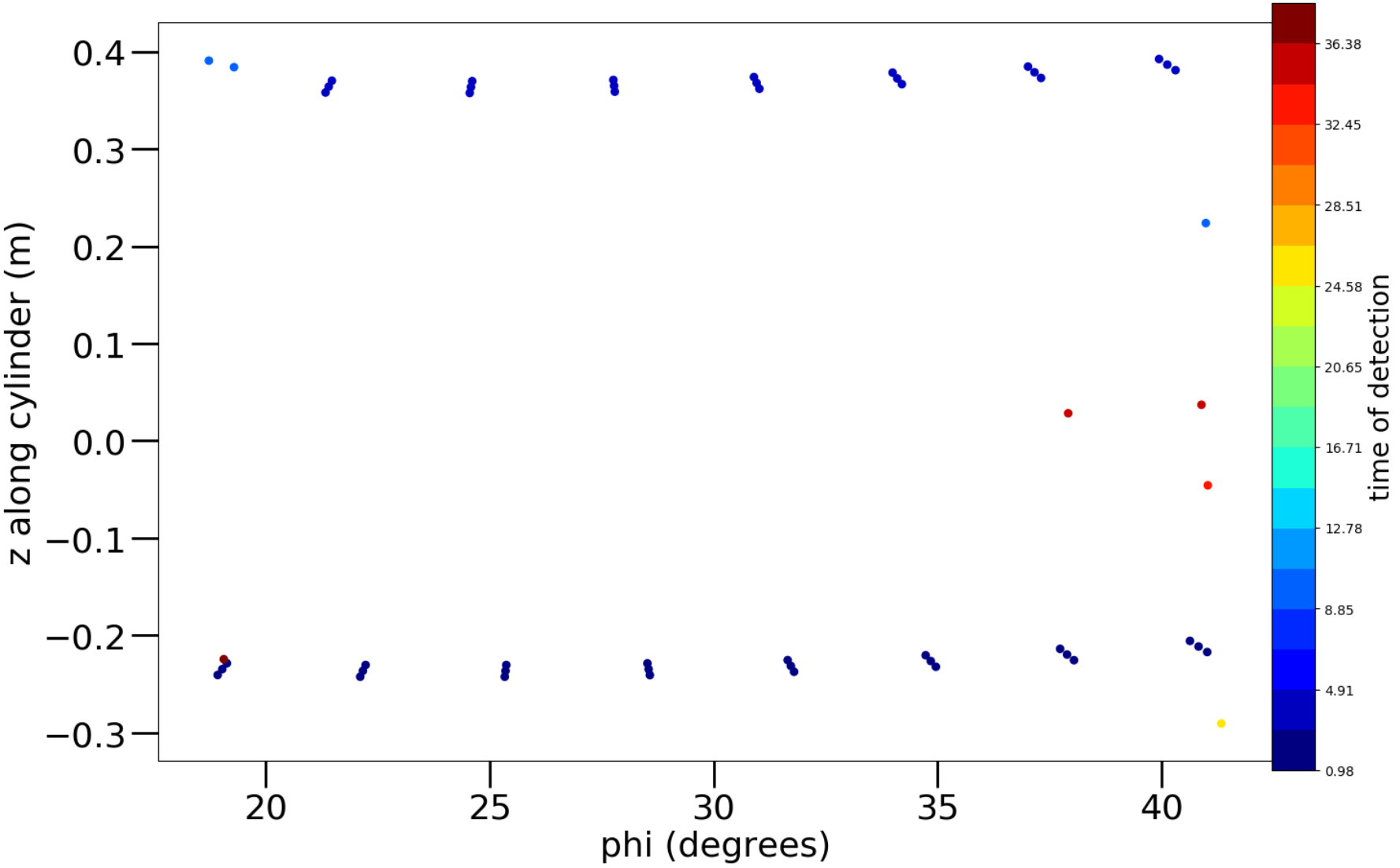


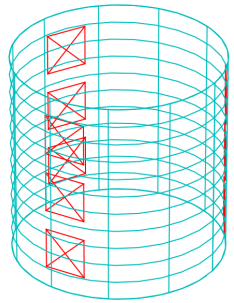


Name: 3-Belt Sphere Poles
Number of photodetectors: 17
Photocathode area: 0.6797 m^2
Mirror area: 2.4619 m^2
Cathode/Mirror area: 0.2761

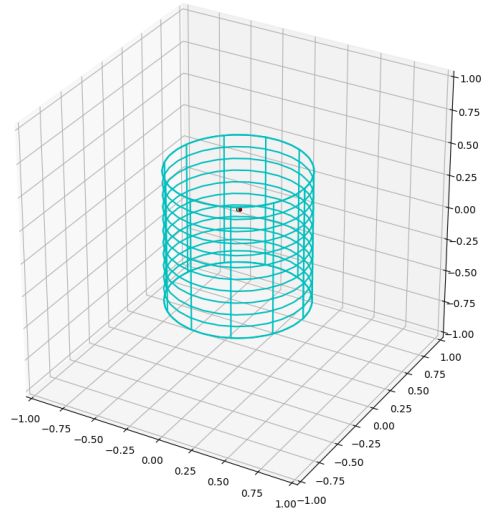


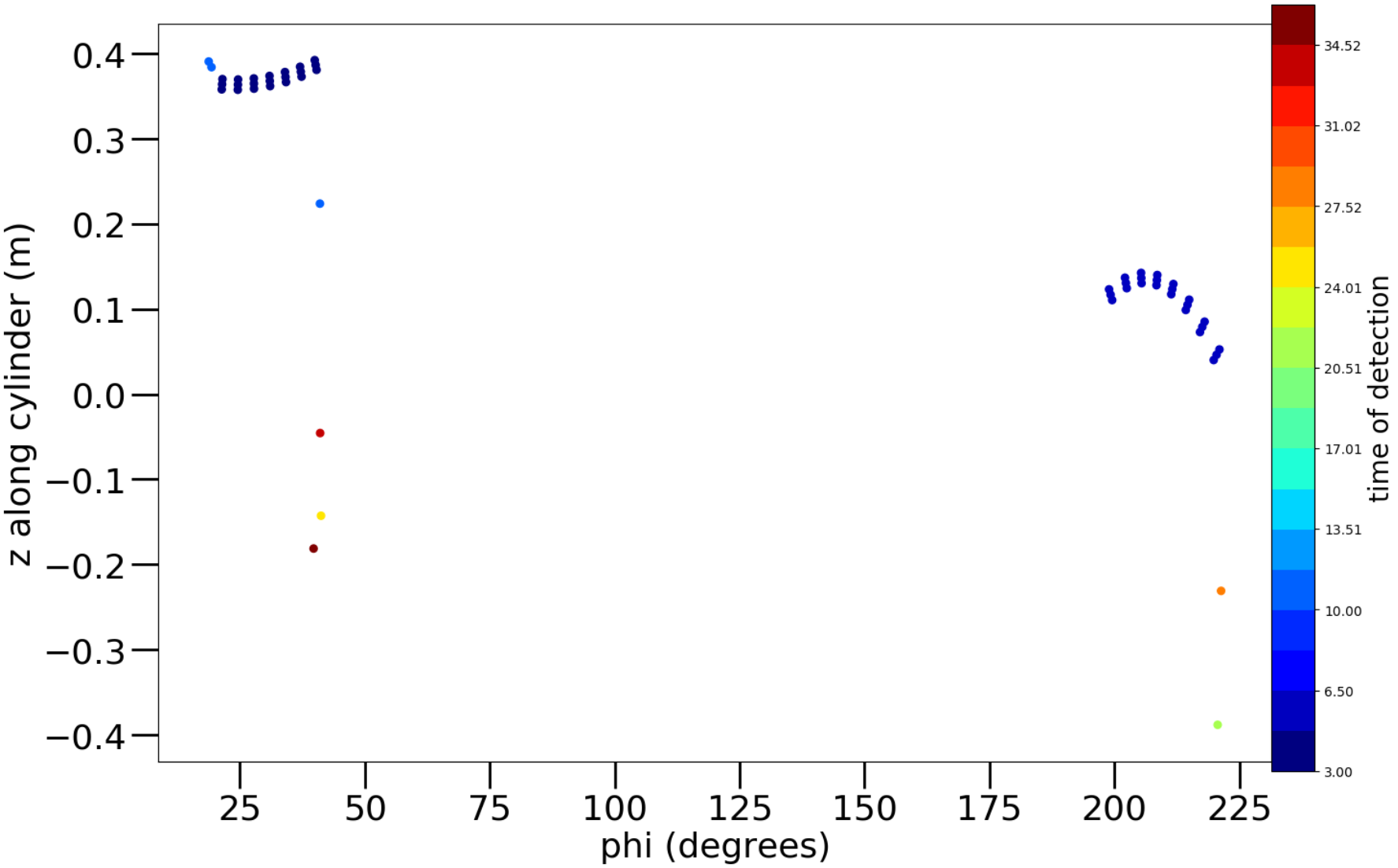

Downward angled muon, 1m track (30ns buffer)
3-Checkered, f = 10%, n = 12
5-Checkered, f = 20%, n = 20
Henry's Prototype, f = 8%, n = 9
Threes Sphere, f = 16%, n = 11
One Belt Sphere Poles, f = 10%, n = 7
Three Belt Sphere Poles, f = 27%, n = 17
Fraction of detected photons
0.0
0.2
0.4
0.6
0
1
2
3
4
5
6
Average number of bounces

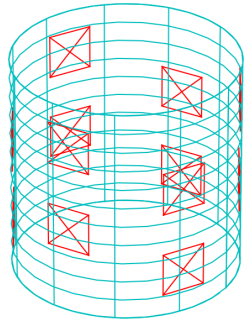




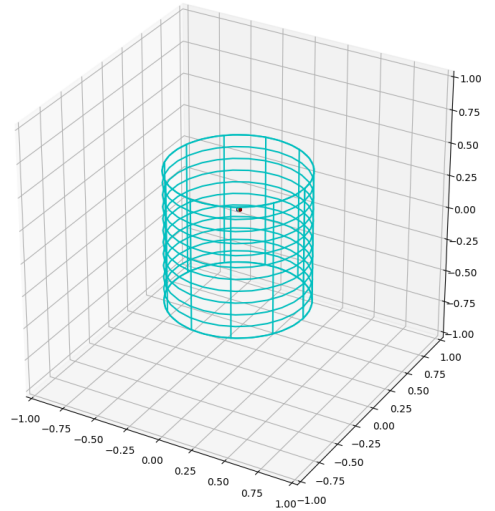
Name: Three Column Three Row
Number of photodetectors: 9
Photocathode area: 0.3598 m^2
Mirror area: 4.3526 m^2
Cathode/Mirror area: 0.0827

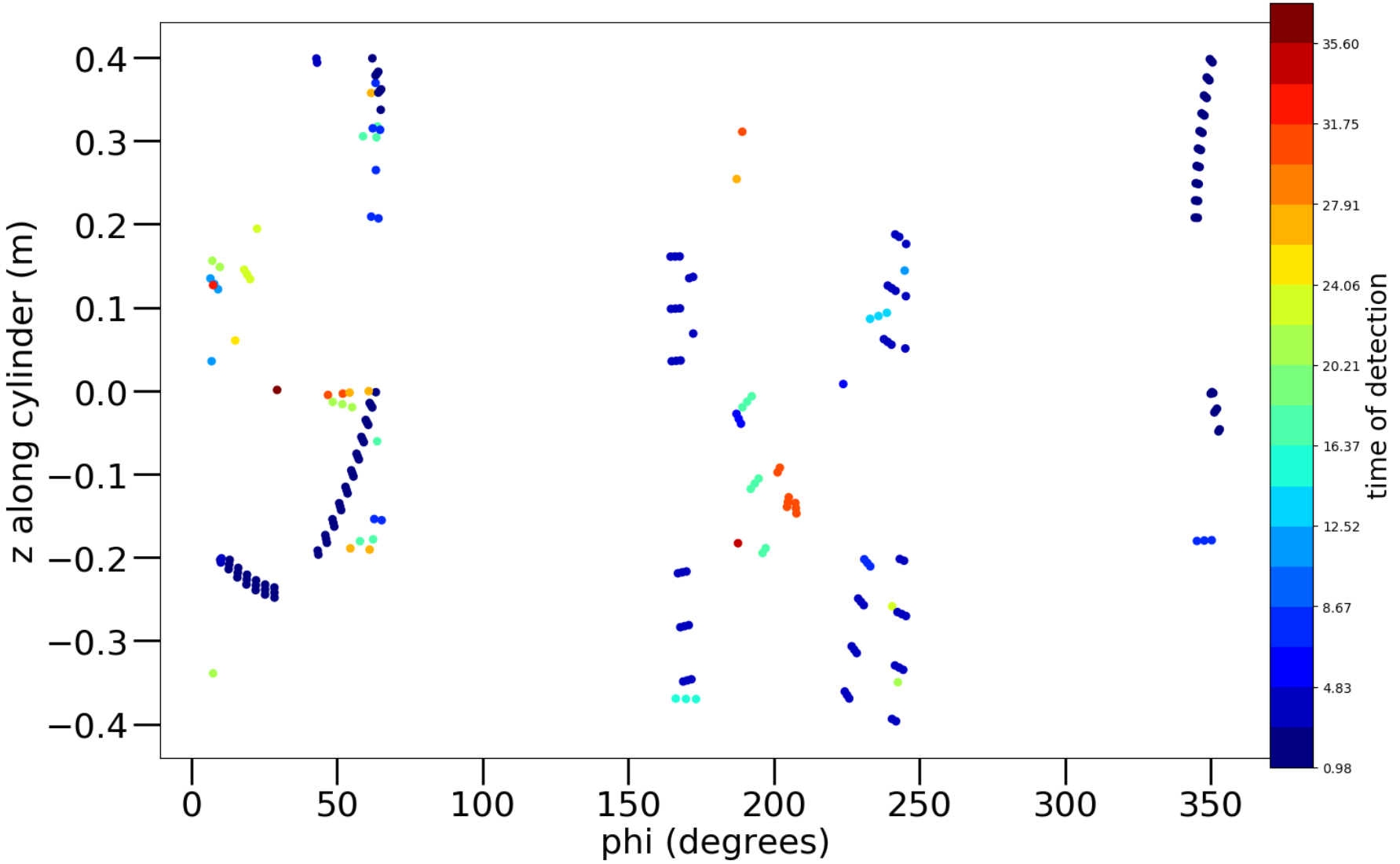


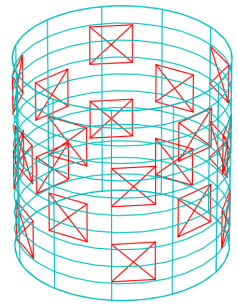




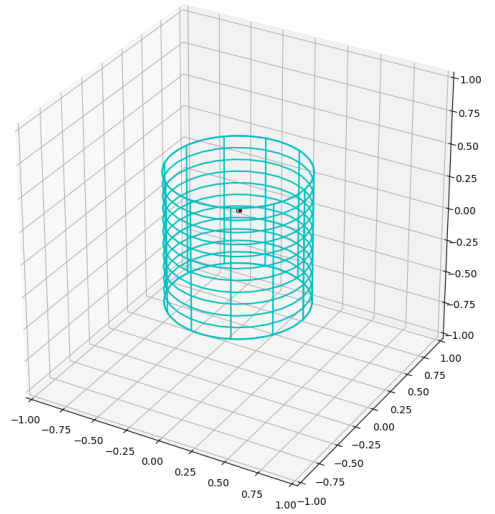
Name: 3-Checkered
Number of photodetectors: 12
Photocathode area: 0.4798 m^2
Mirror area: 4.2326 m^2
Cathode/Mirror area: 0.1133

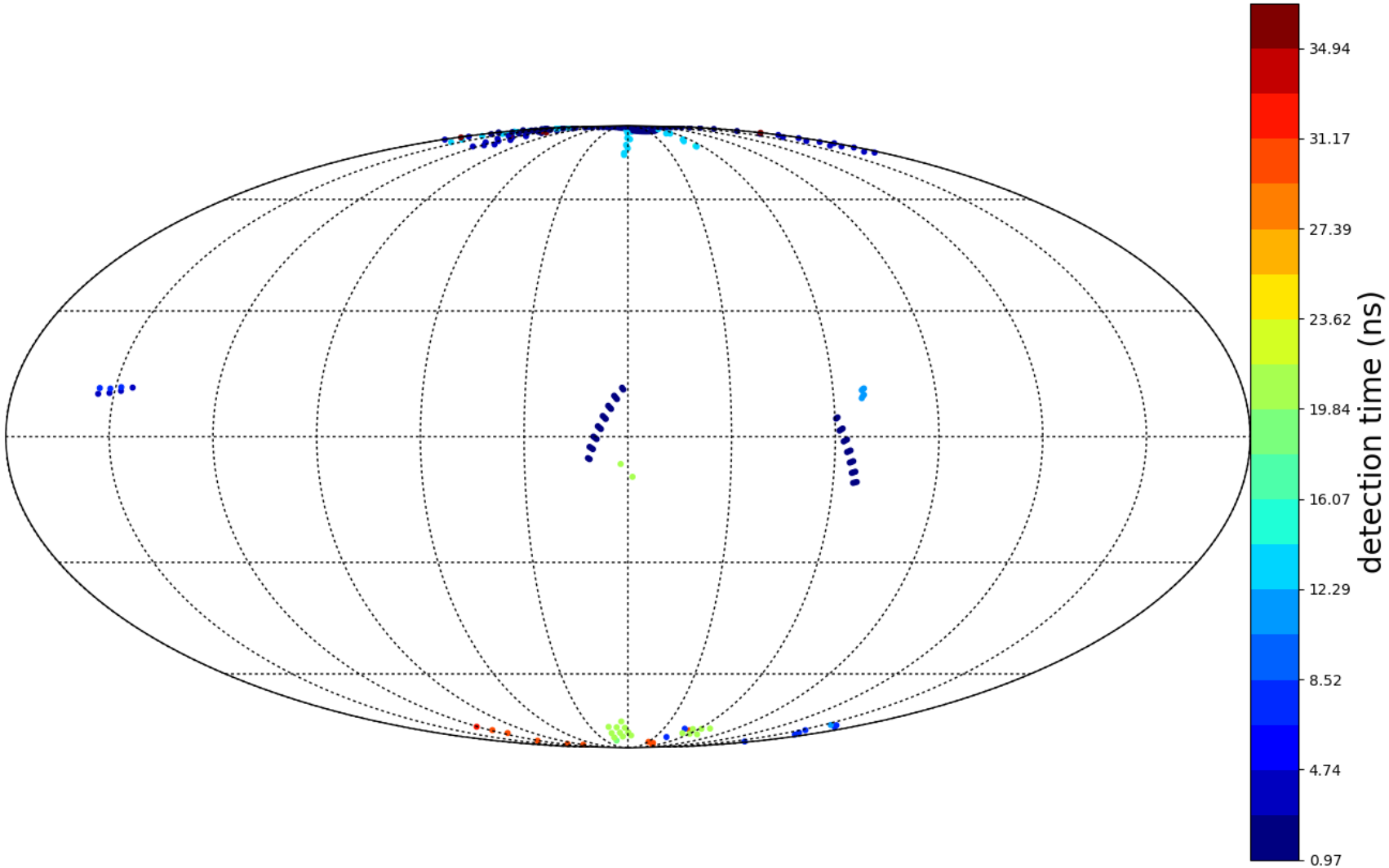


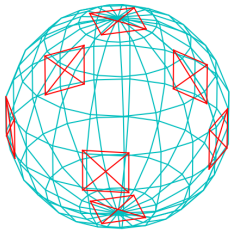




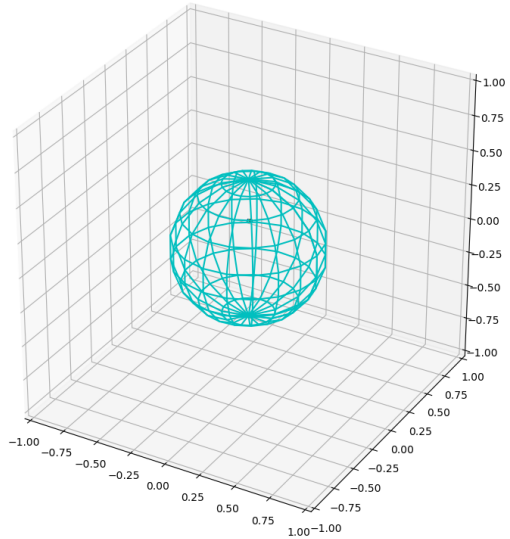
Name: 5-Checkered
Number of photodetectors: 20
Photocathode area: 0.7996 m^2
Mirror area: 3.9128 m^2
Cathode/Mirror area: 0.2044

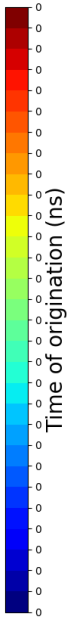


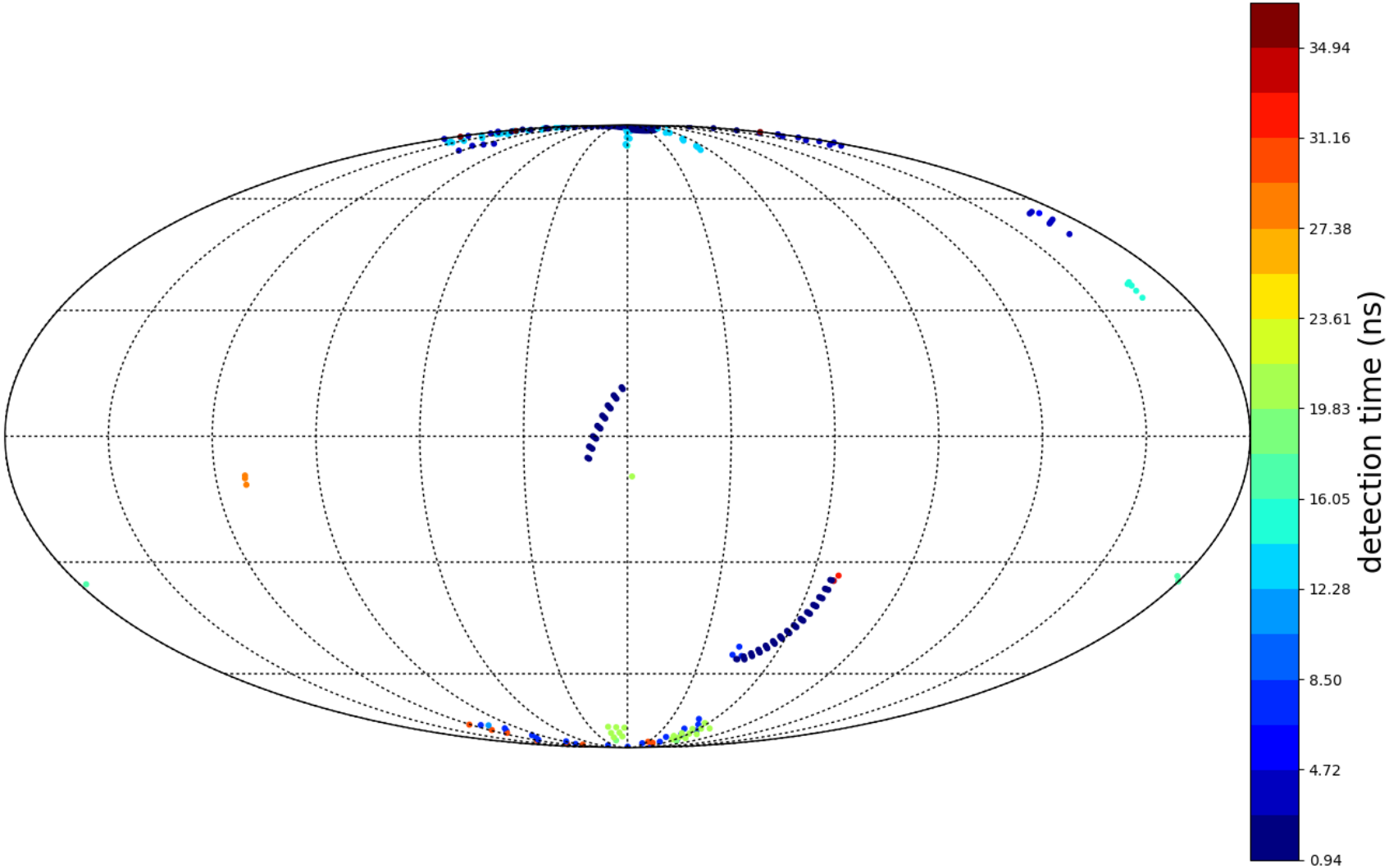


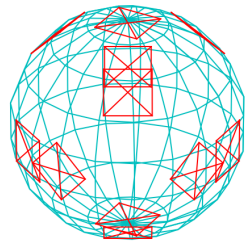


Name: 1-Belt Sphere Poles
Number of photodetectors: 7
Photocathode area: 0.2799 m^2
Mirror area: 2.8617 m^2
Cathode/Mirror area: 0.0978

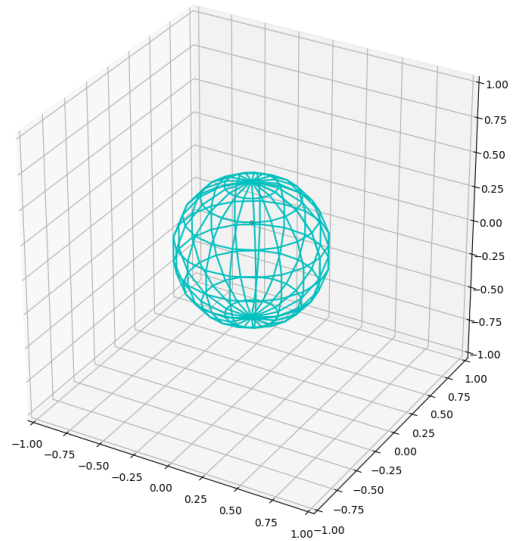


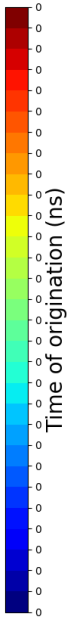


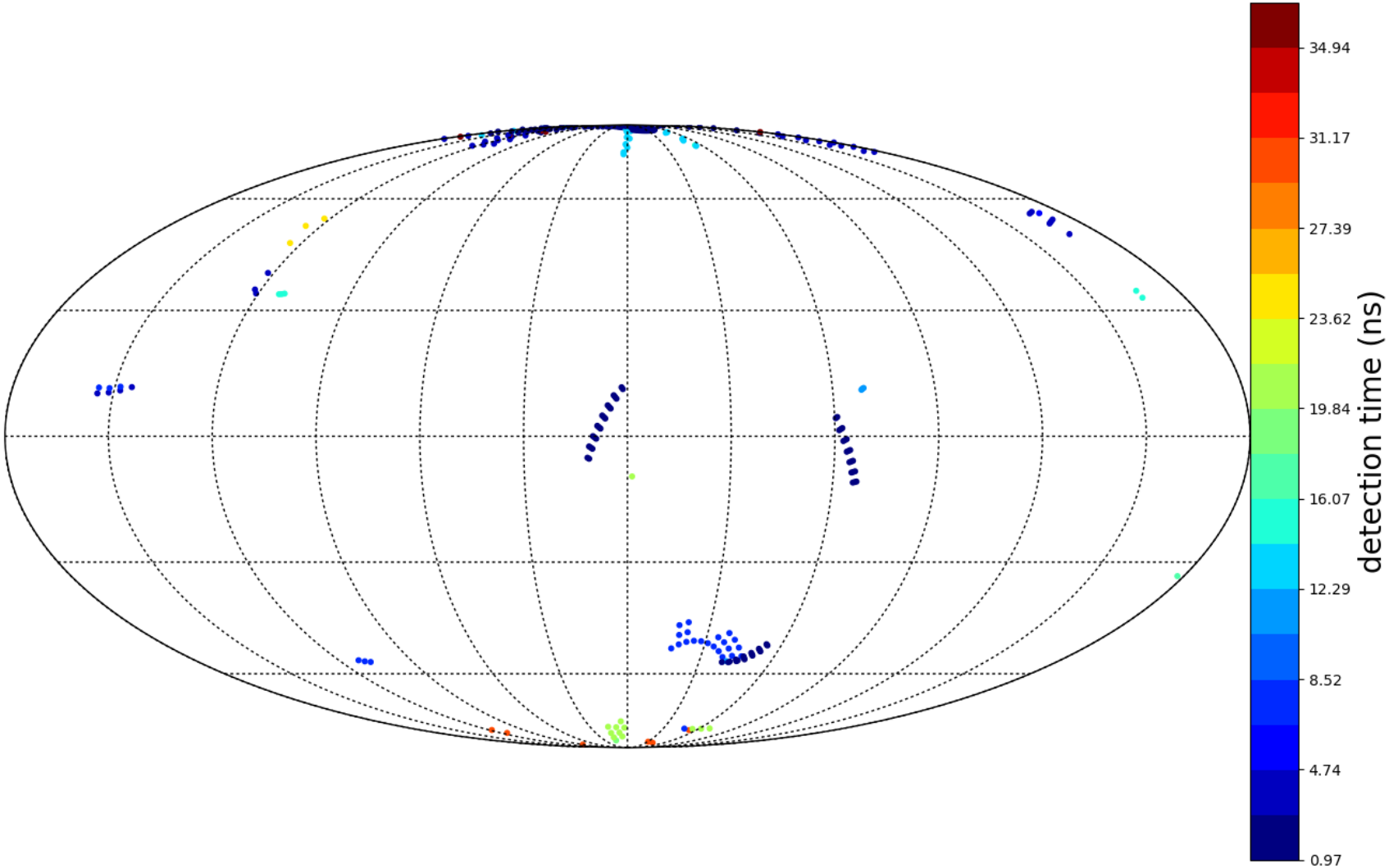


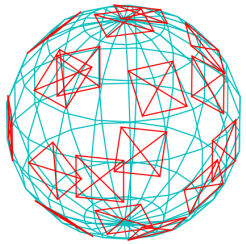


Name: Threes Sphere
Number of photodetectors: 11
Photocathode area: 0.4398 m^2
Mirror area: 2.7018 m^2
Cathode/Mirror area: 0.1628

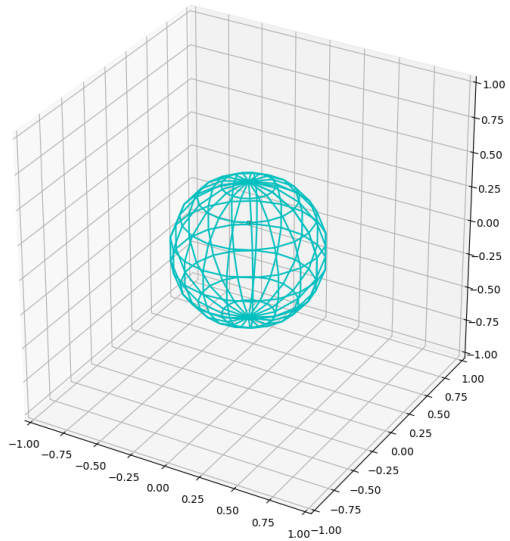


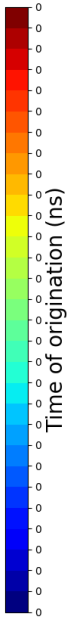


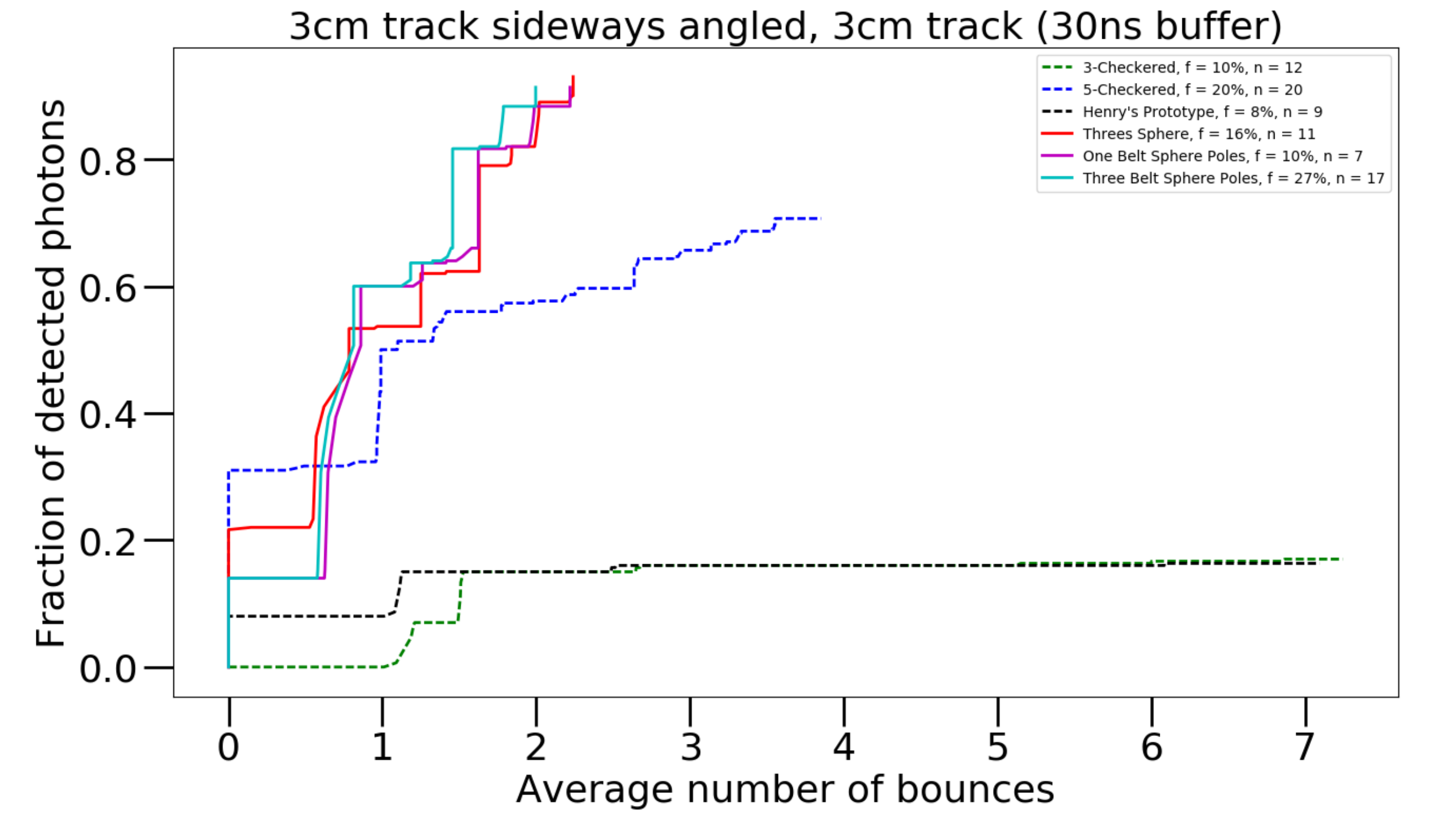


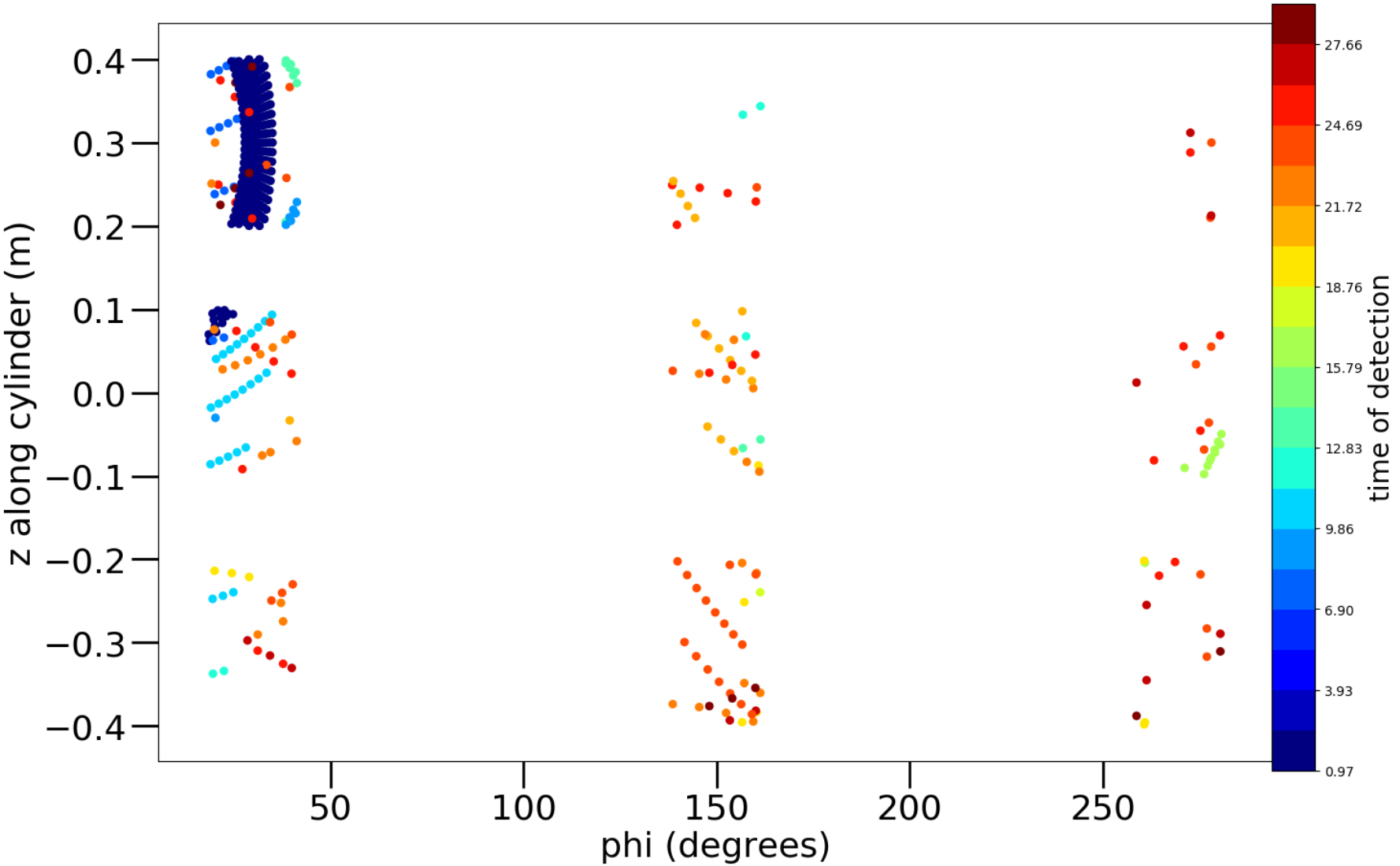


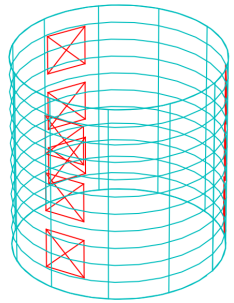
Name: 3-Belt Sphere Poles
Number of photodetectors: 17
Photocathode area: 0.6797 m^2
Mirror area: 2.4619 m^2
Cathode/Mirror area: 0.2761



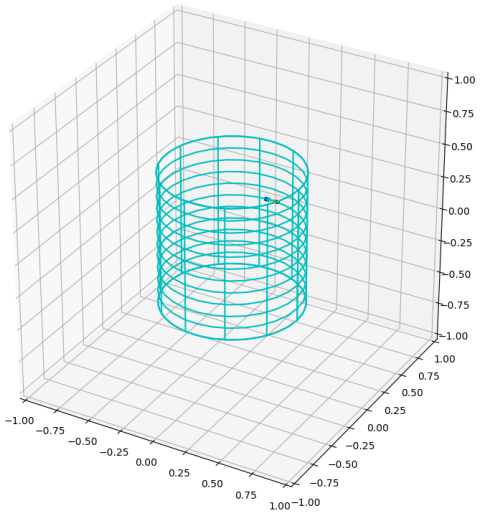


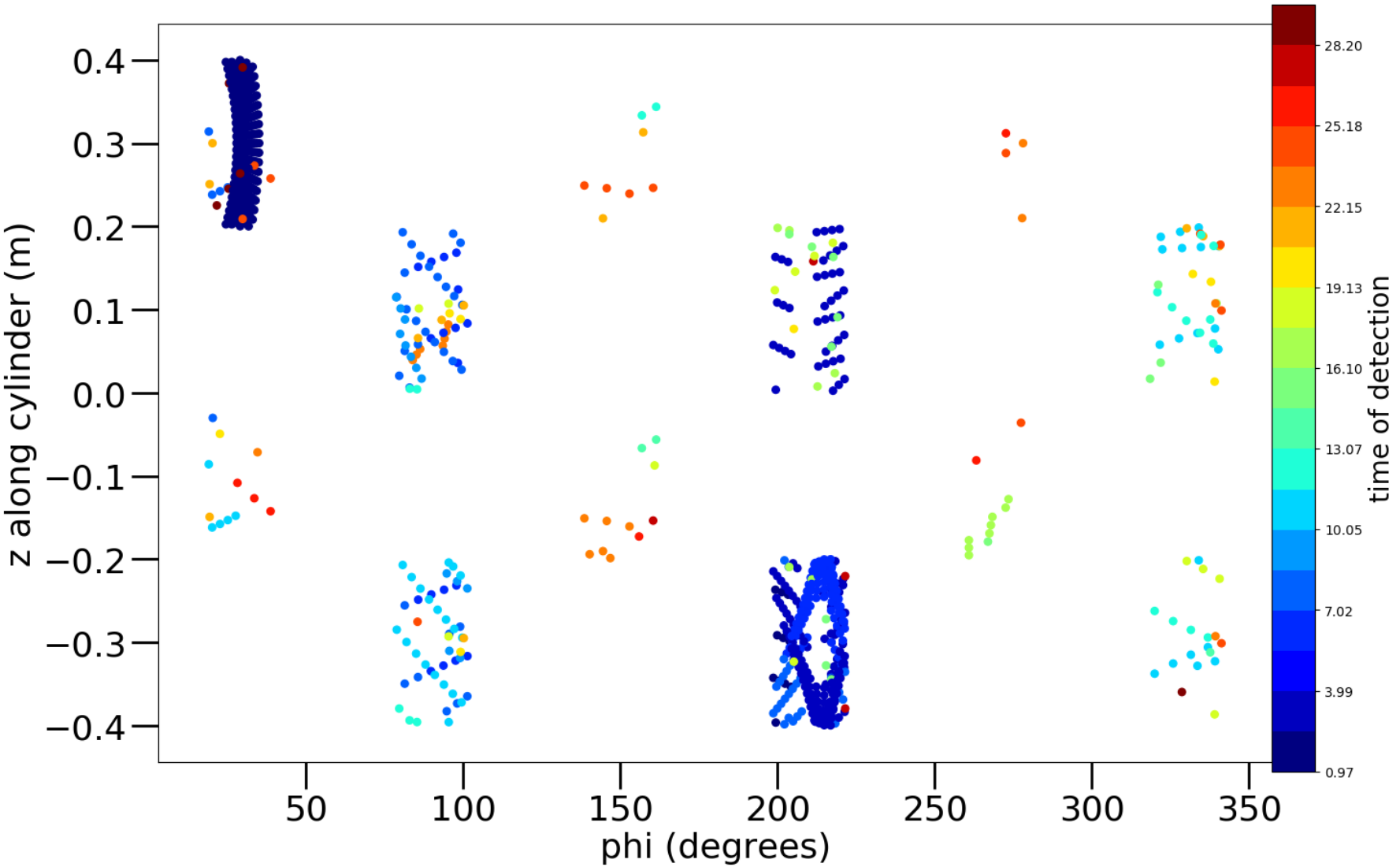

3cm track sideways angled, 3cm track (30ns buffer)
3-Checkered, f = 10%, n = 12
5-Checkered, f = 20%, n = 20
Henry's Prototype, f = 8%, n = 9
Threes Sphere, f = 16%, n = 11
One Belt Sphere Poles, f = 10%, n = 7
Three Belt Sphere Poles, f = 27%, n = 17
Fraction of detected photons
0.0
0.2
0.4
0.6
0.8
0
1
2
3
4
5
6
7
Average number of bounces

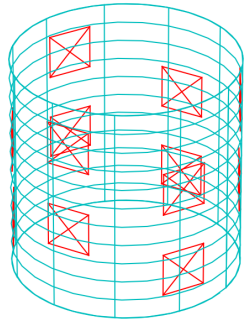




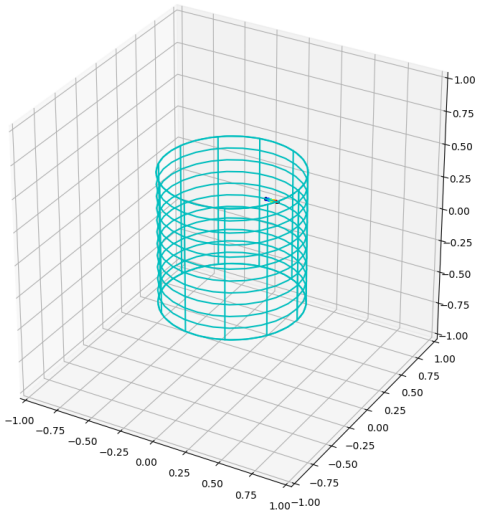
Name: Three Column Three Row
Number of photodetectors: 9
Photocathode area: 0.3598 m^2
Mirror area: 4.3526 m^2
Cathode/Mirror area: 0.0827

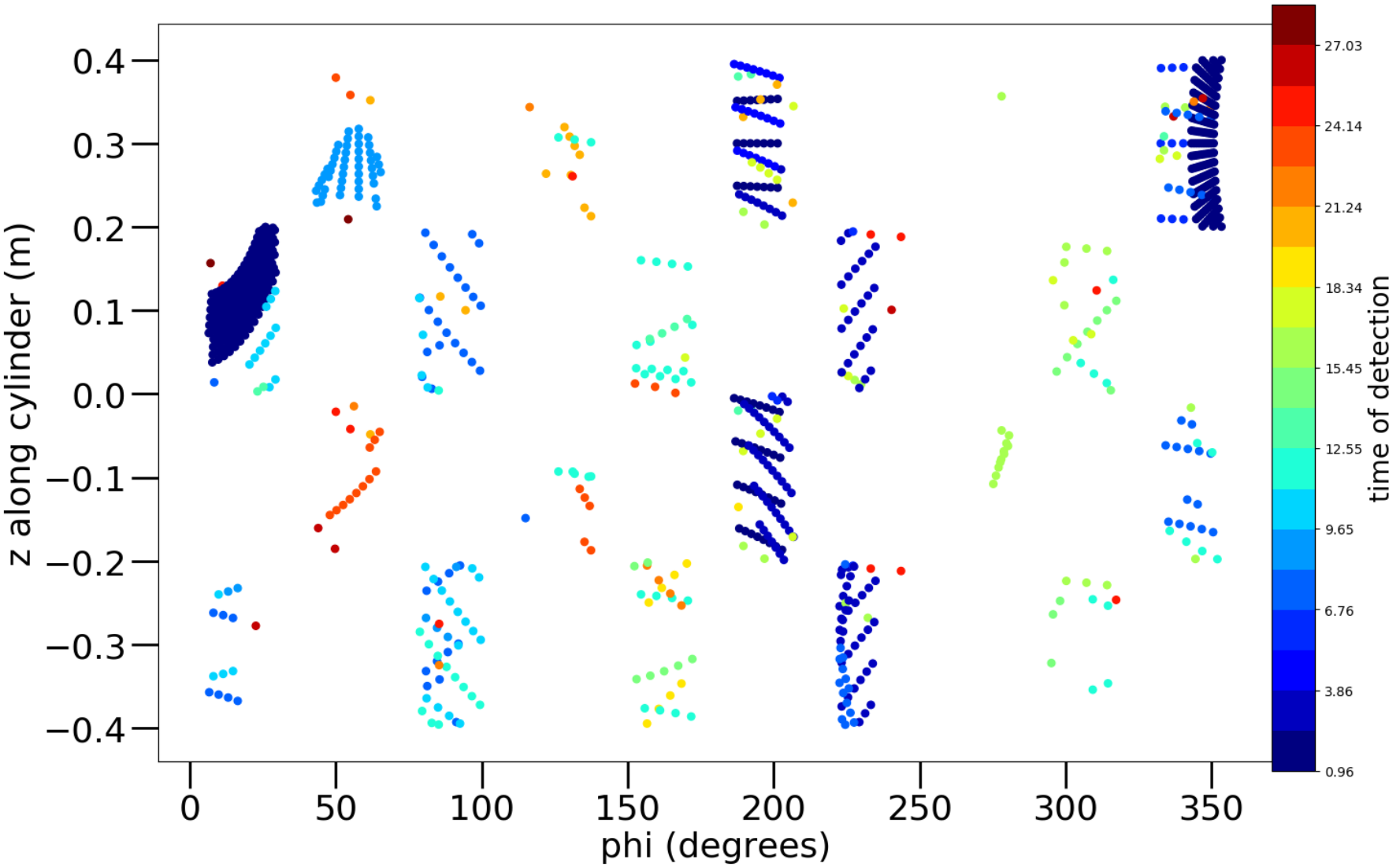


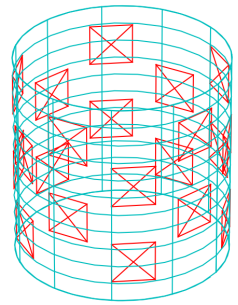




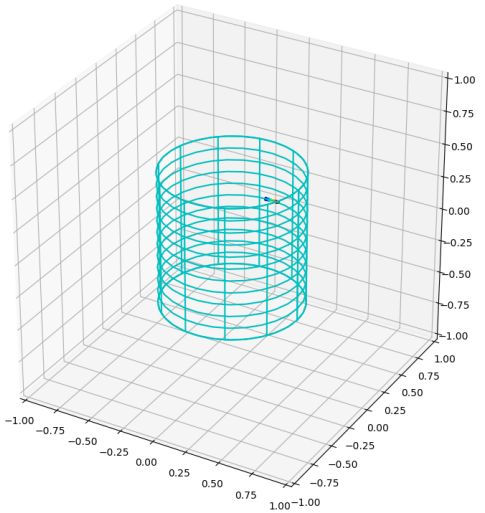
Name: 3-Checkered
Number of photodetectors: 12
Photocathode area: 0.4798 m^2
Mirror area: 4.2326 m^2
Cathode/Mirror area: 0.1133

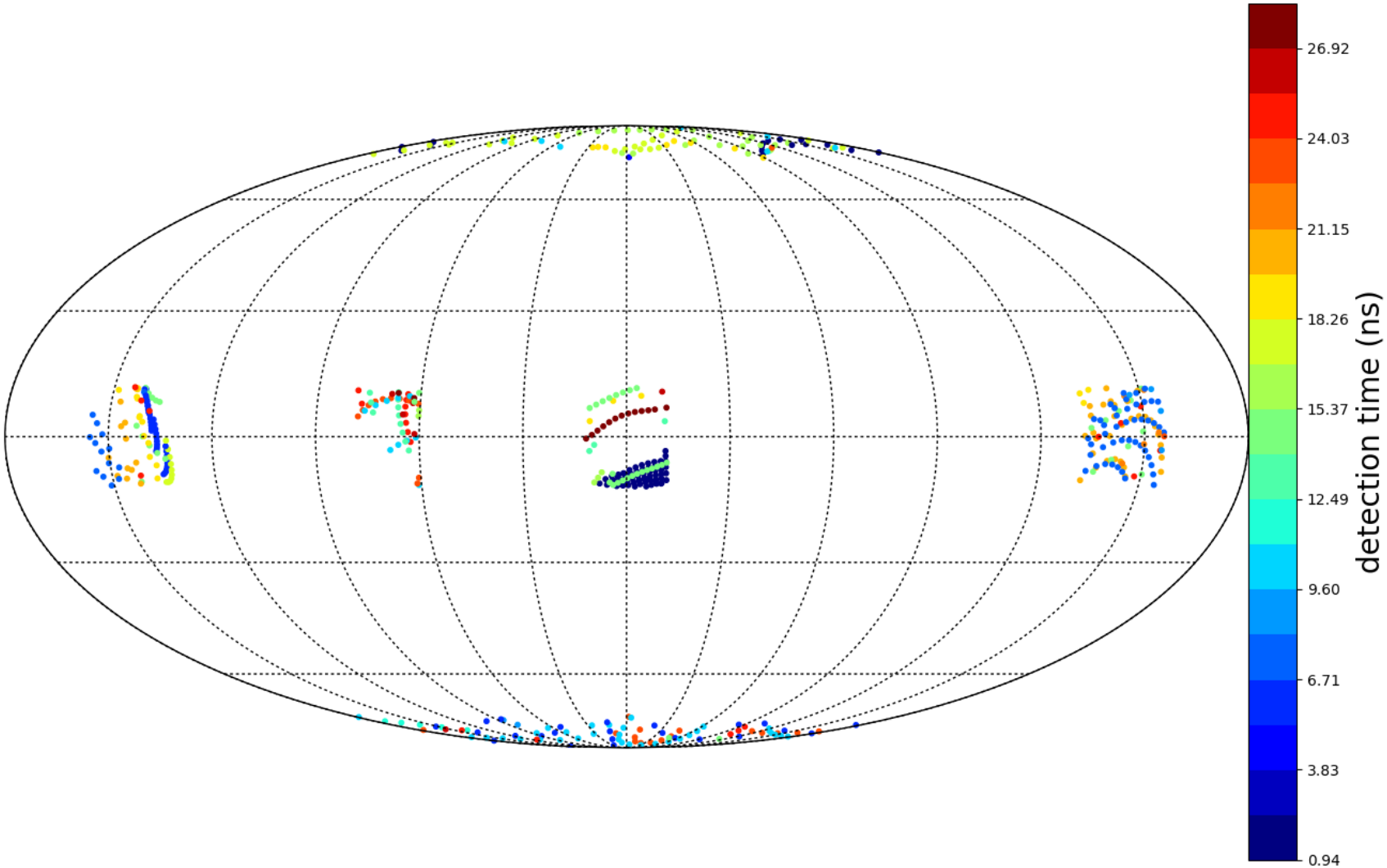


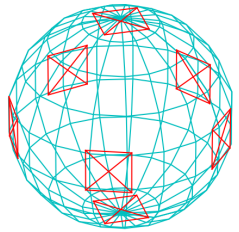




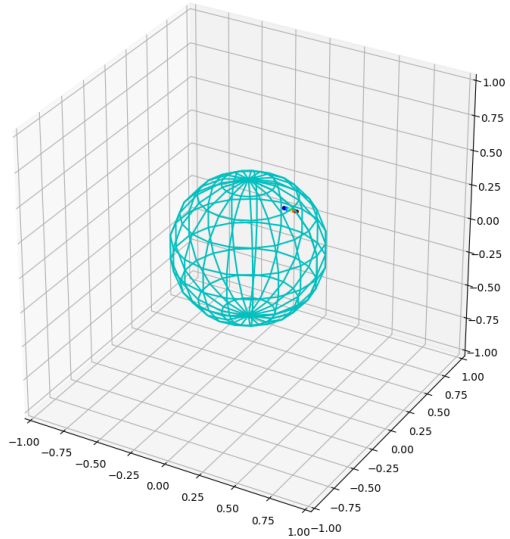
Name: 5-Checkered
Number of photodetectors: 20
Photocathode area: 0.7996 m^2
Mirror area: 3.9128 m^2
Cathode/Mirror area: 0.2044

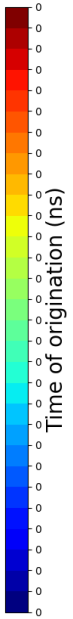


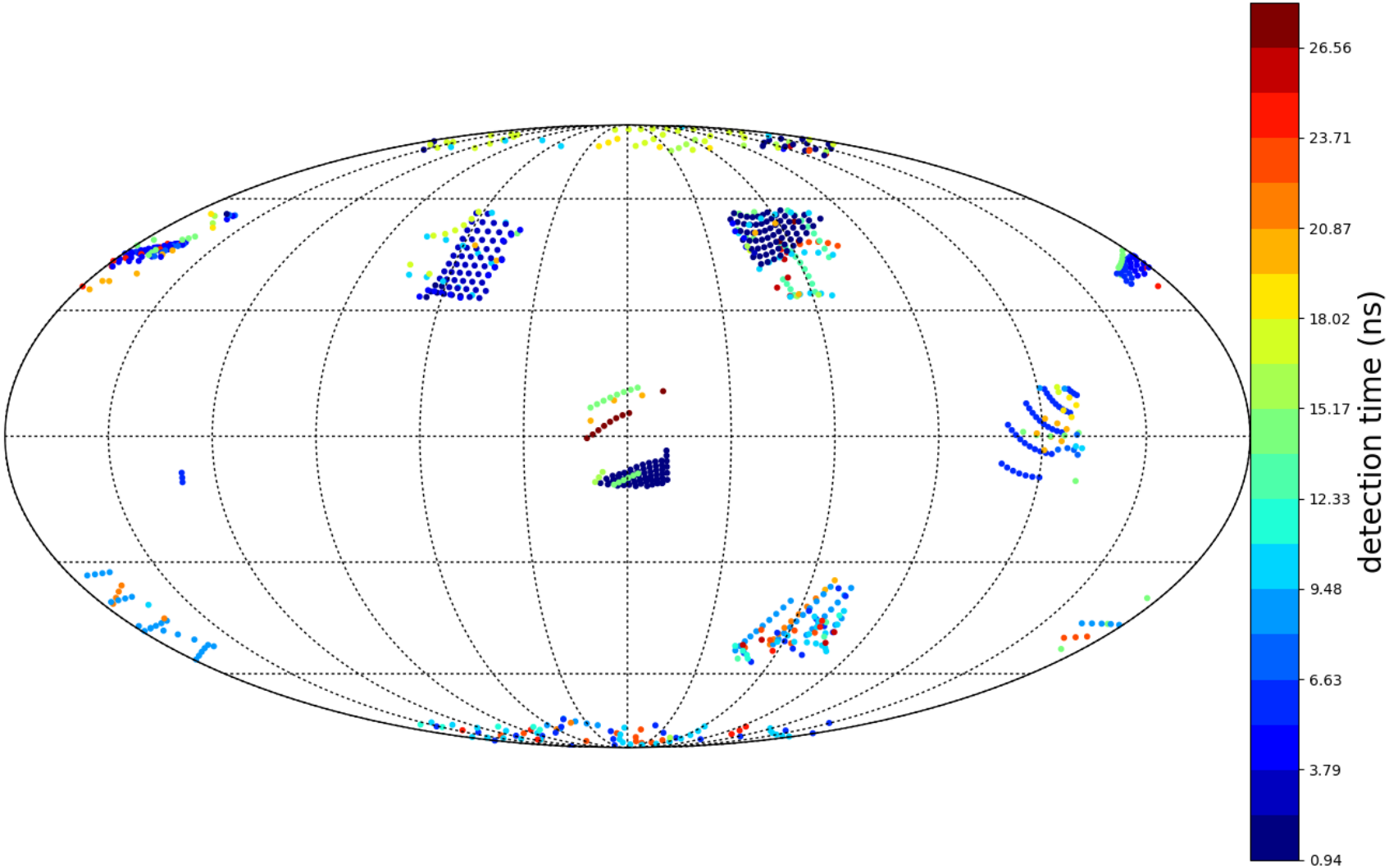


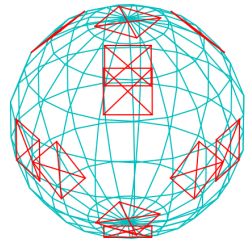


Name: 1-Belt Sphere Poles
Number of photodetectors: 7
Photocathode area: 0.2799 m^2
Mirror area: 2.8617 m^2
Cathode/Mirror area: 0.0978

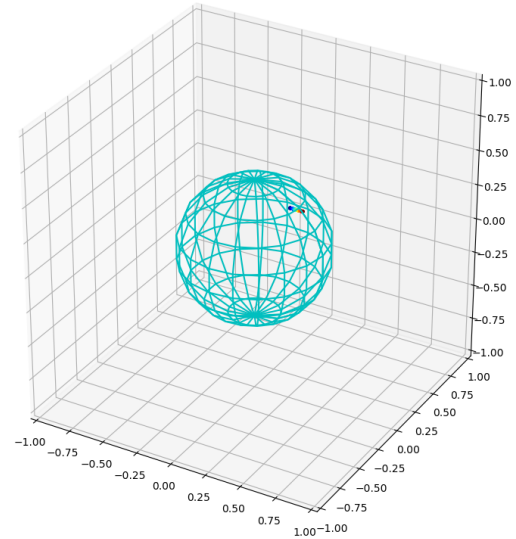


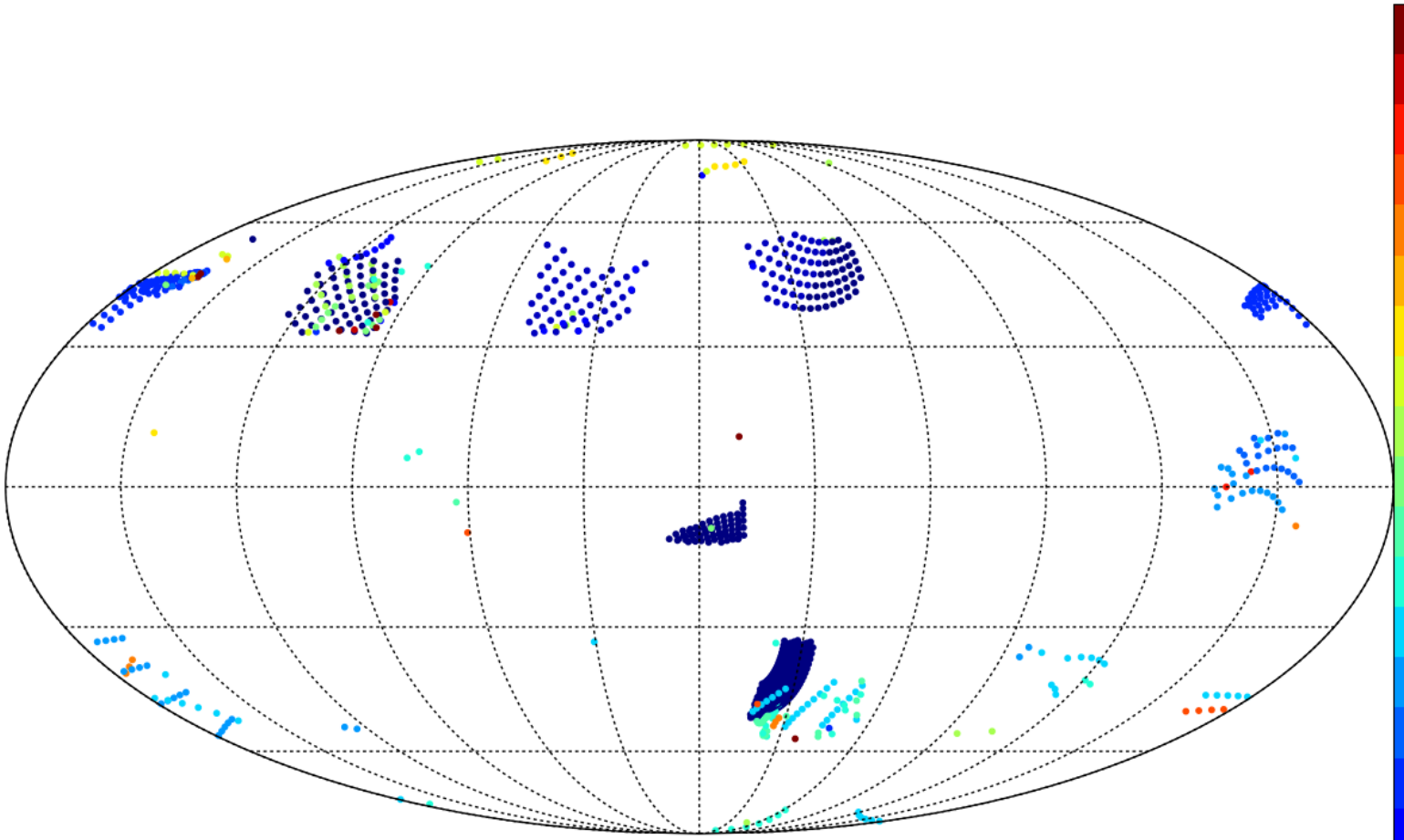


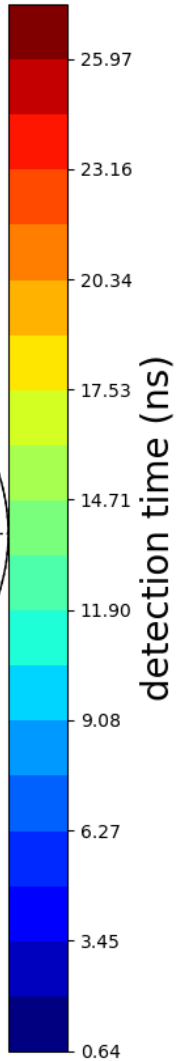


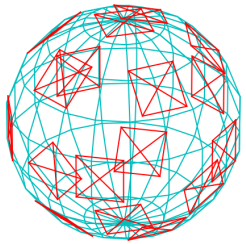


Name: Threes Sphere
Number of photodetectors: 11
Photocathode area: 0.4398 m^2
Mirror area: 2.7018 m^2
Cathode/Mirror area: 0.1628

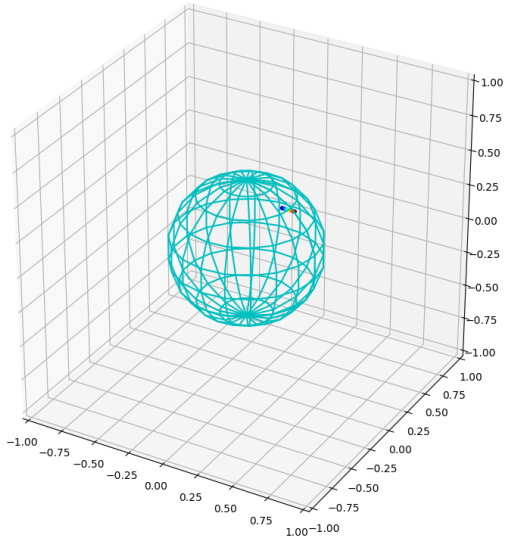


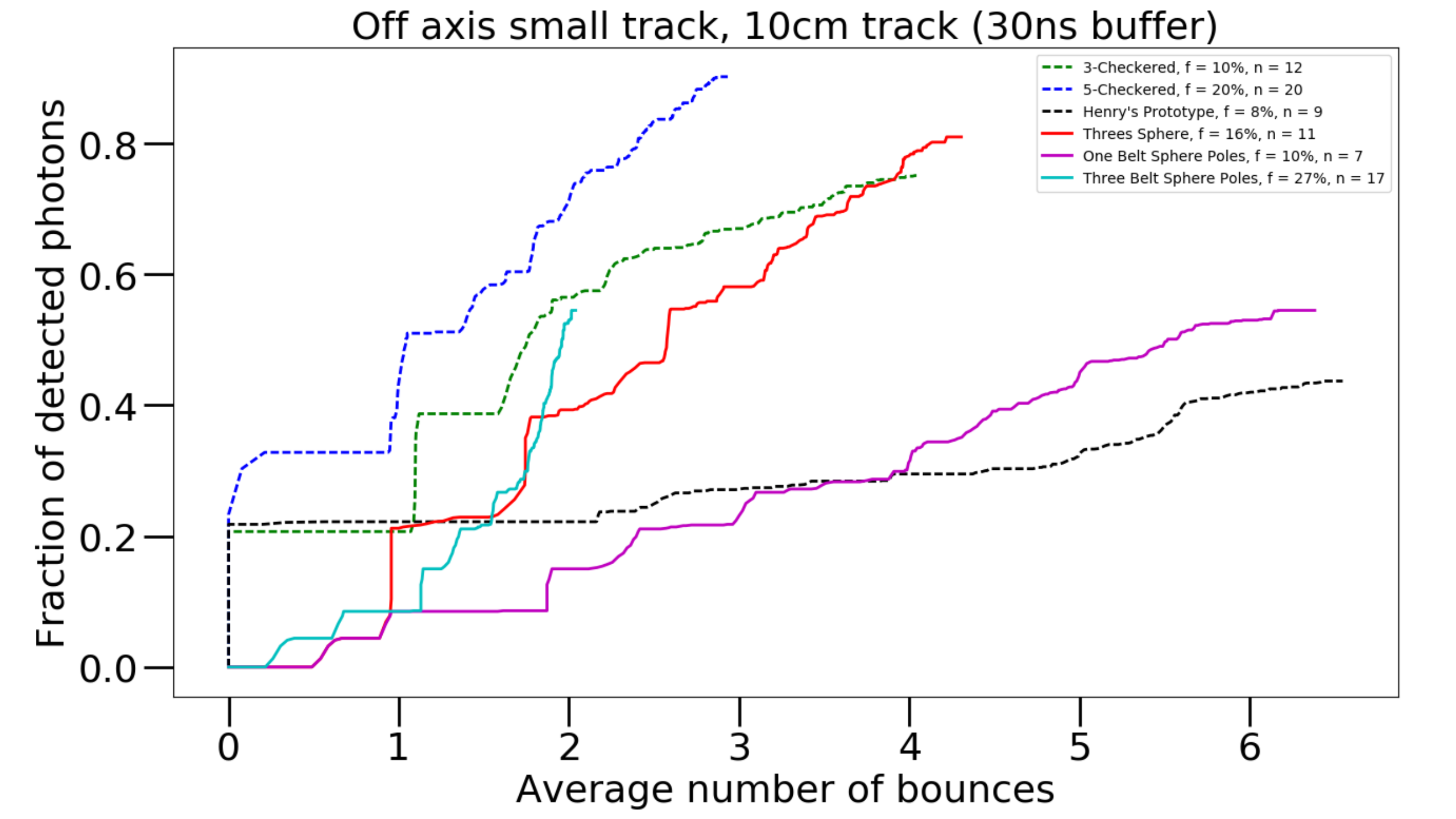






Name: 3-Belt Sphere Poles
Number of photodetectors: 17
Photocathode area: 0.6797 m^2
Mirror area: 2.4619 m^2
Cathode/Mirror area: 0.2761




Off axis small track, 10cm track (30ns buffer)
3-Checkered, f = 10%, n = 12
5-Checkered, f = 20%, n = 20
Henry's Prototype, f = 8%, n = 9
Threes Sphere, f = 16%, n = 11
One Belt Sphere Poles, f = 10%, n = 7
Three Belt Sphere Poles, f = 27%, n = 17
Fraction of detected photons
0.0
0.2
0.4
0.6
0.8
0
1
2
3
4
5
6
Average number of bounces

$$\frac{\mathrm{d}f}{\mathrm{d}\bar{n}} = \alpha \qquad \frac{\alpha}{\text{number of LAPPDs}} = \text{Collection rate per LAPPD}$$

Blue = Spherical detector
Orange = Cylindrical detector

all numbers x10^3

	3cm angled track	Offaxis 10cm track	1m throughgoing
One Belt Sphere	58.8	12.2	17.8
Triad sphere	37.7	17.1	17.7
Three Belt Sphere	27.1	27.7	18.5
Earliest prototype	2.56	7.4	9.2
Three Checkered	1.96	15.5	8.2
Five Checkered	9.17	15.4	8.6