水チェMC

Event Display

A.Murakami

Motivation 1

- ある1点から、ある角度でミューオンを発射させた際にどういう光量分布になるか。
  - vertex、ミューオンの角度が再構成できるか。

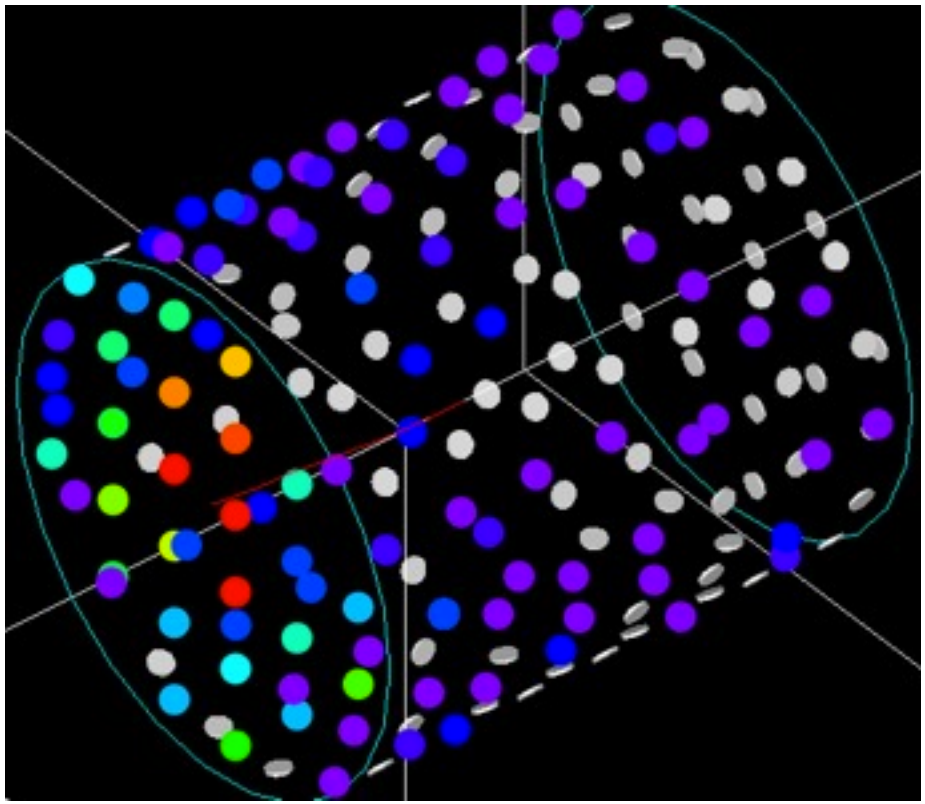
MC Setting

- μ :
  - Kinetic Energy : 200, 400, 600, 800 MeV
  - Vertex : (0, 0, 0) (タンク中心)
  - Z軸との角度(θ)：0, 10, 15, 30, 60 度

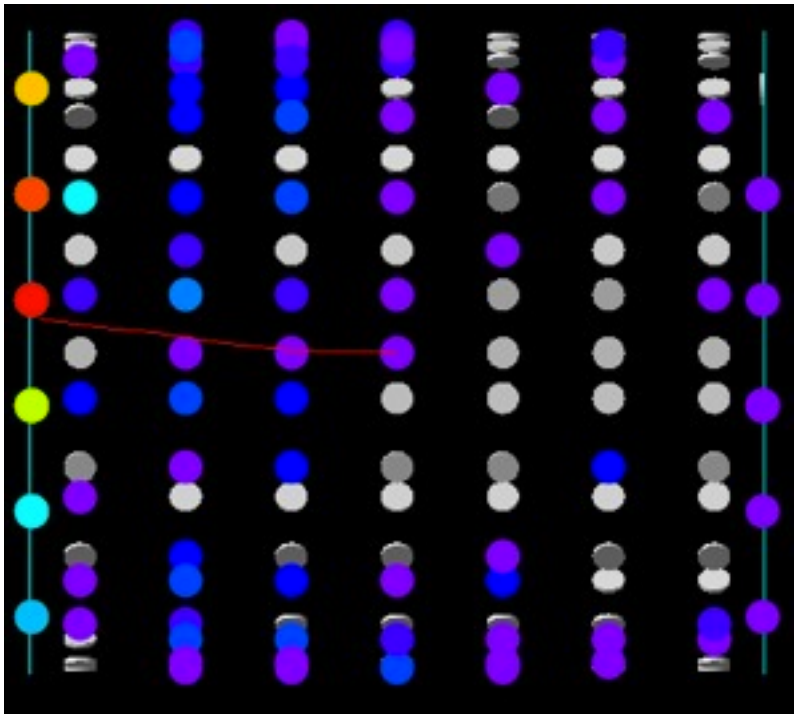
PMTの色

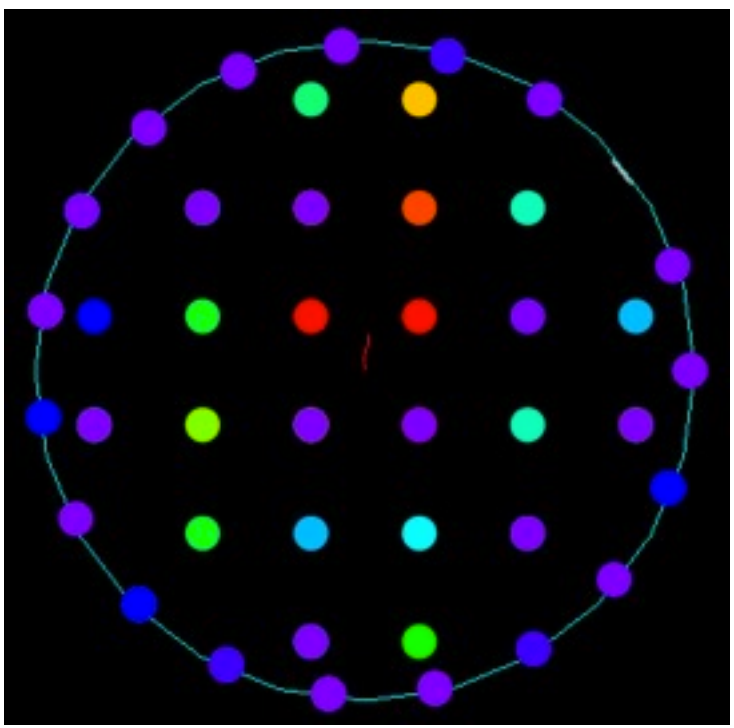
- 1 p.e. ~ 20 p.e.
  - 1 p.e. 刻みで紫色から赤色へのグラデーション
- 20 p.e. ~
  - 全て赤色

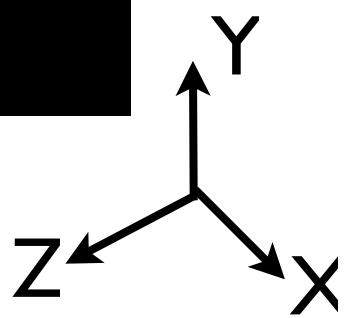
$$\theta = 0°$$



beam
(+Z)



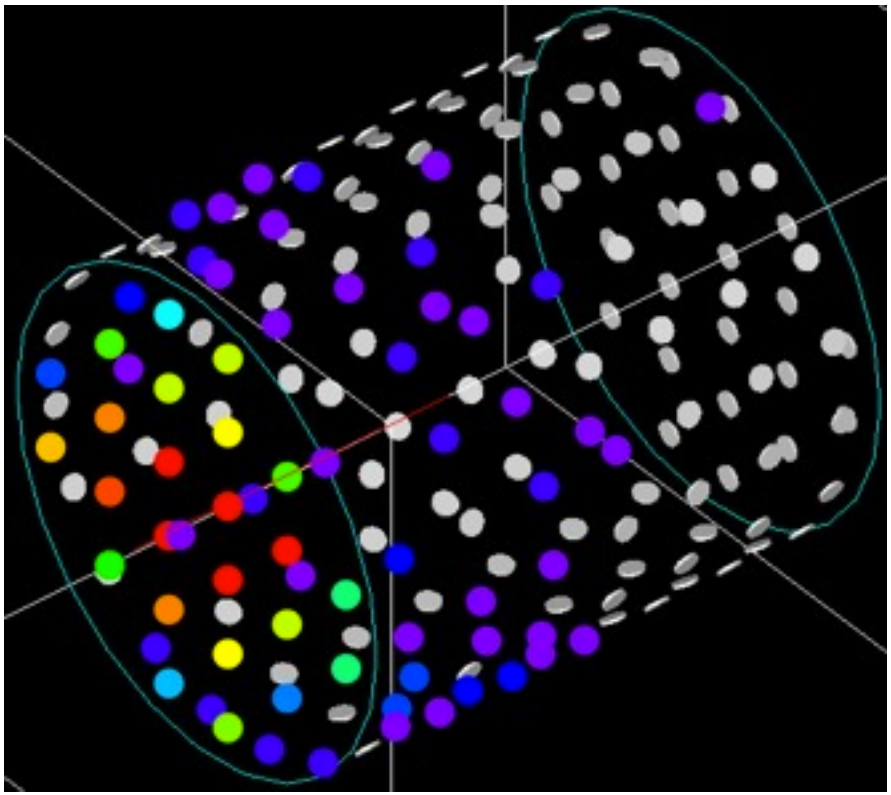


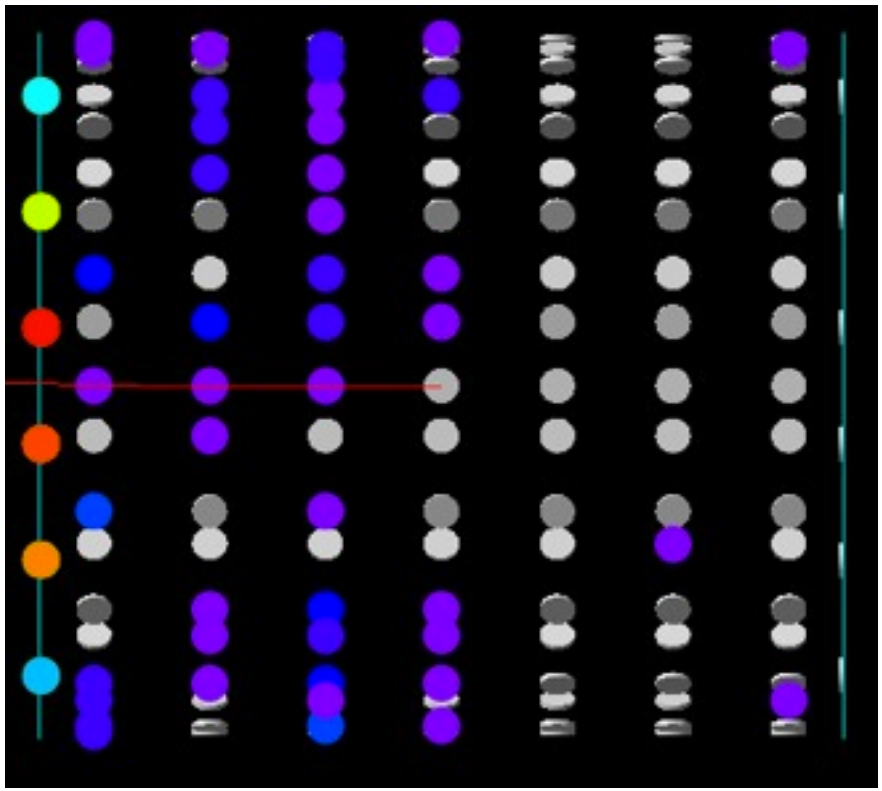


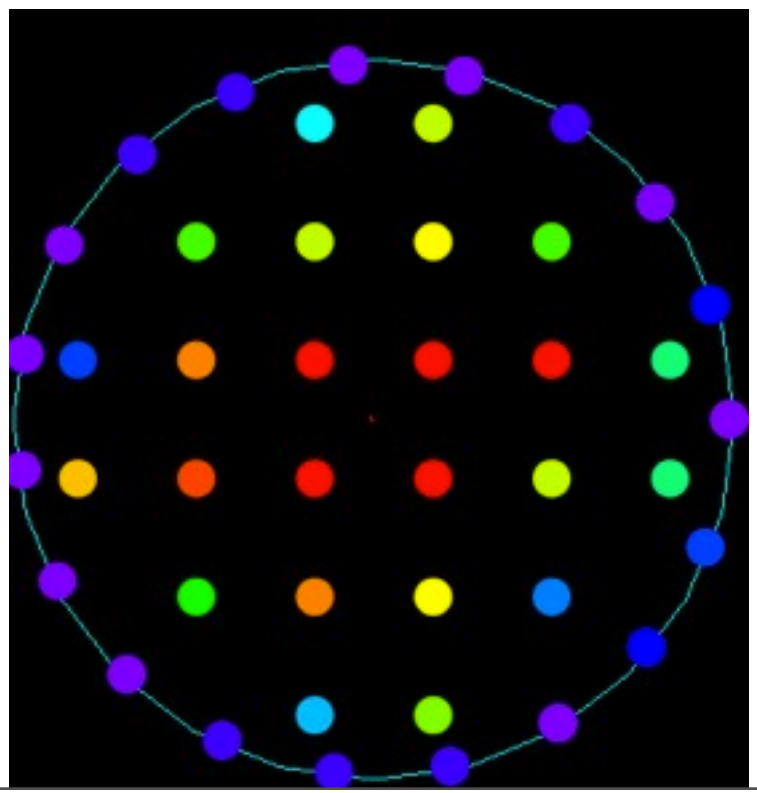
ビーム下流(+Z)
から見た図

Energy: 200
Dir: 0,0,1
theta: 0

Generated # of photons : 31277
Generated # of p.e. : 6028

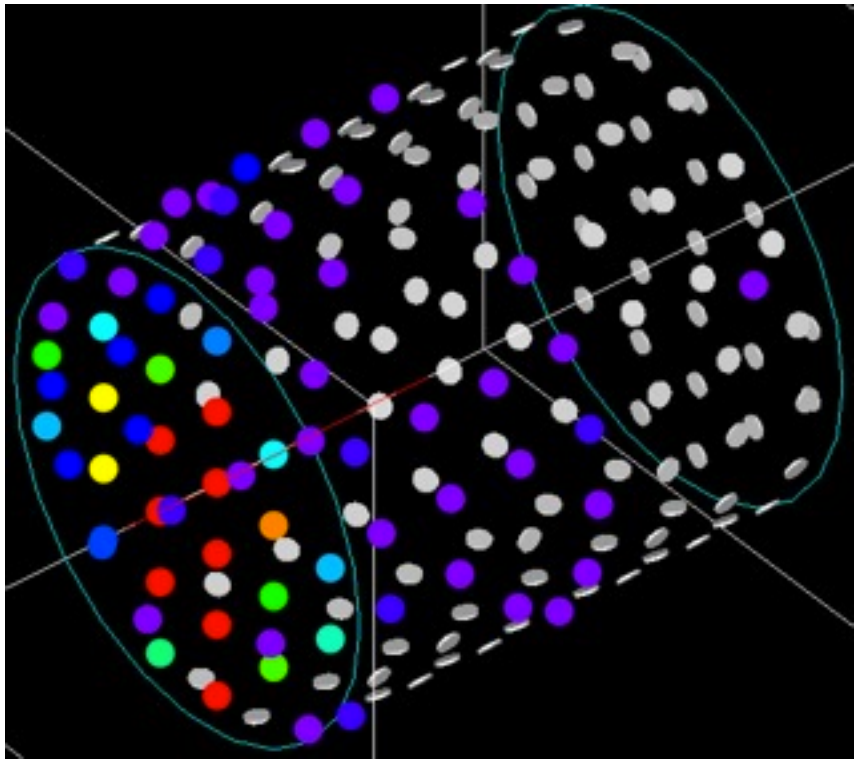


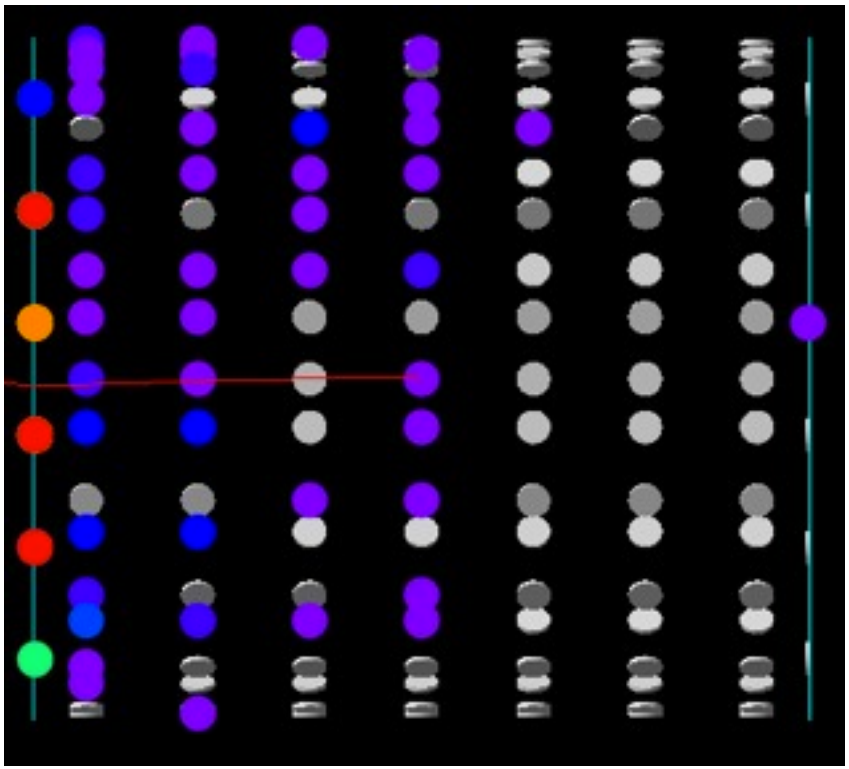


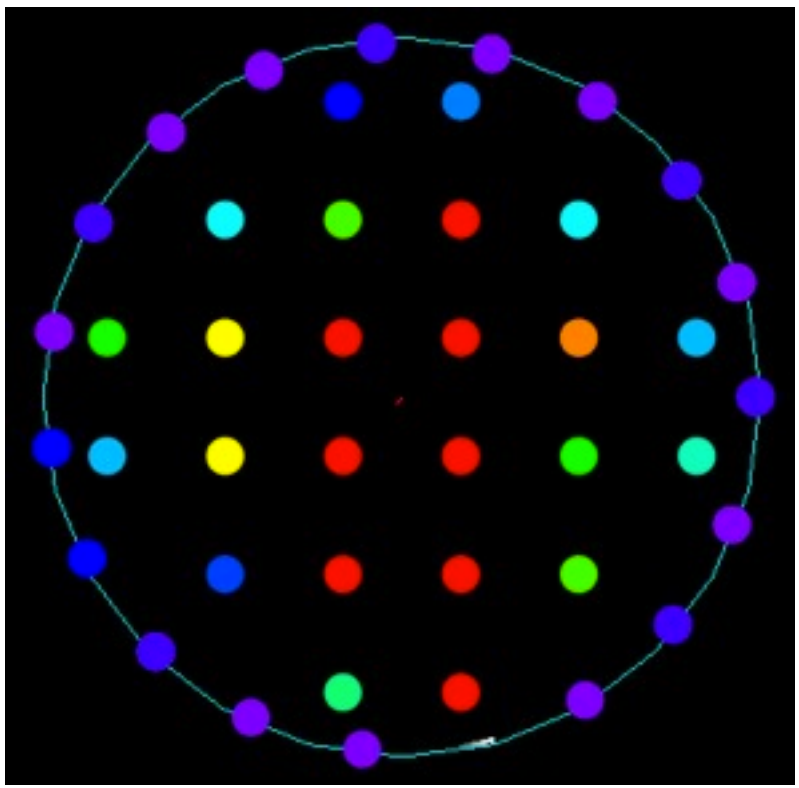


Energy: 400
Dir: 0,0,1
theta: 0

# of optical photons produced in this event : 37695
# of photo-electrons produced in this event : 7034

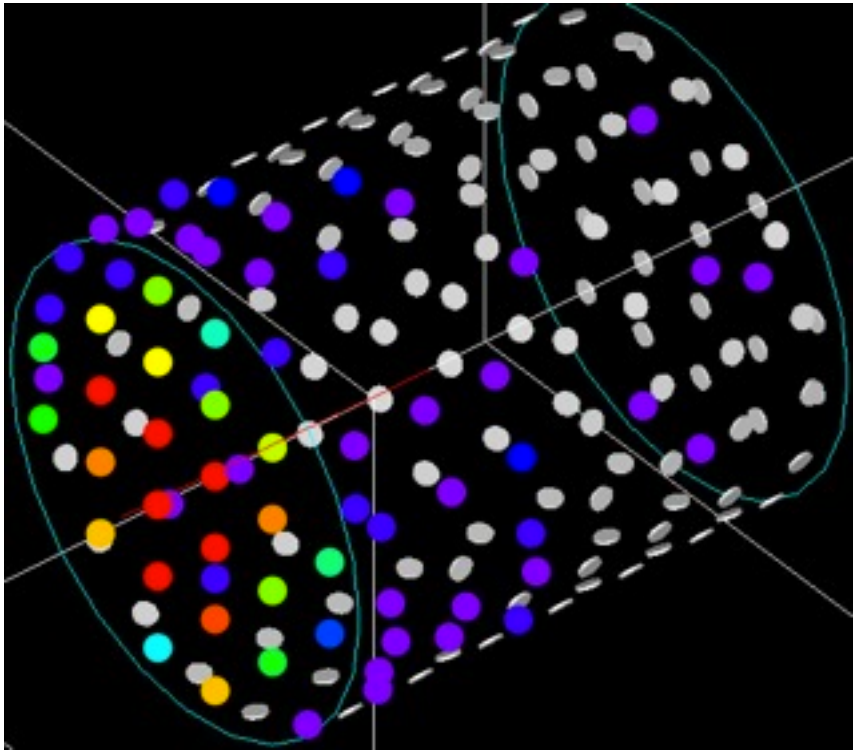


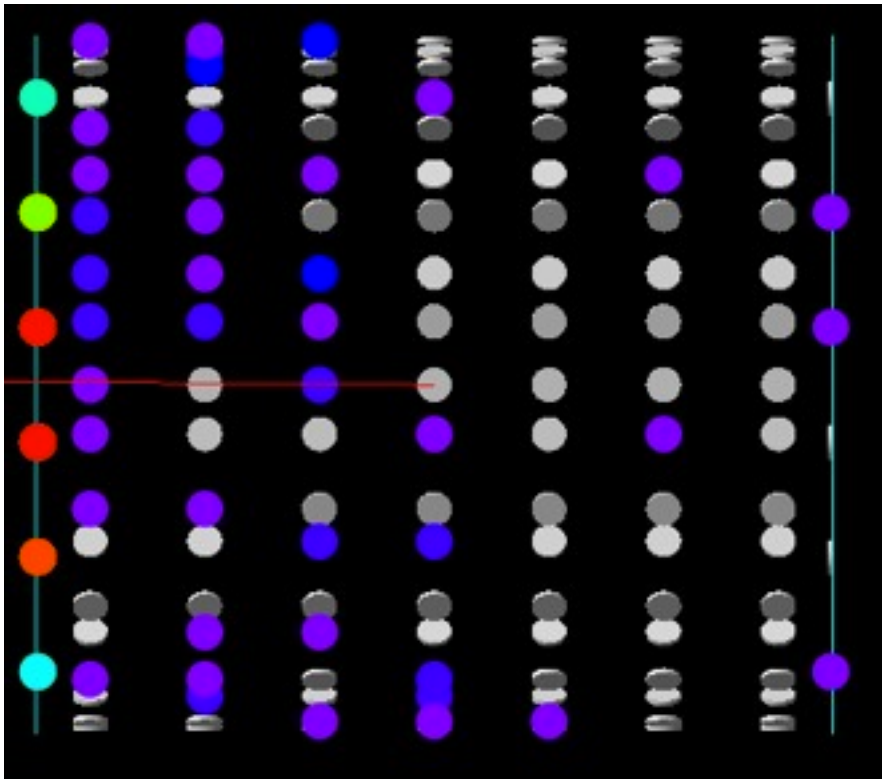


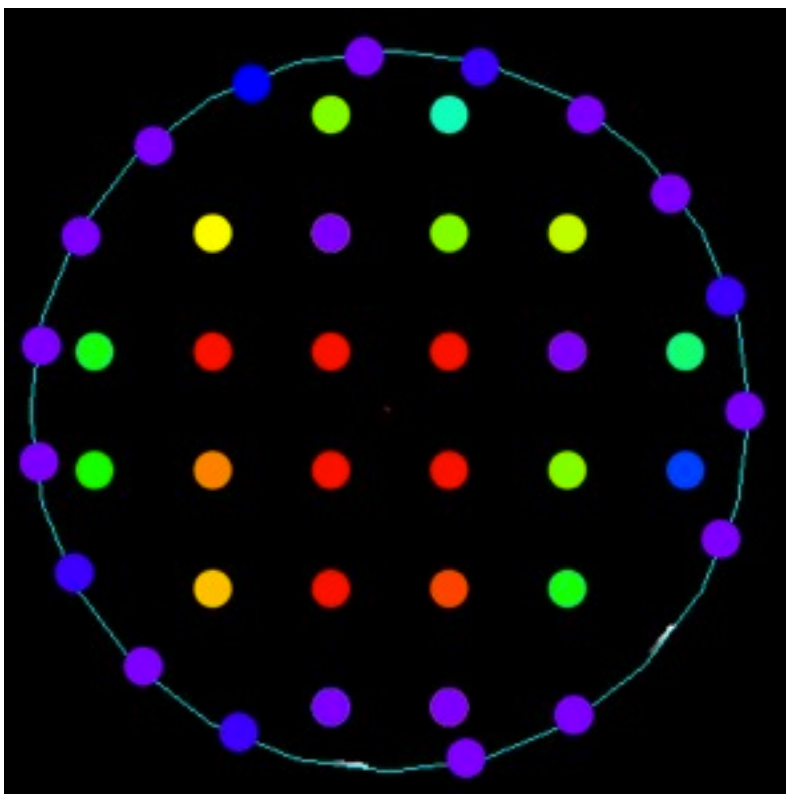


Energy: 600
Dir: 0,0,1
theta: 0

# of optical photons produced in this event : 39088
# of photo-electrons produced in this event : 7304





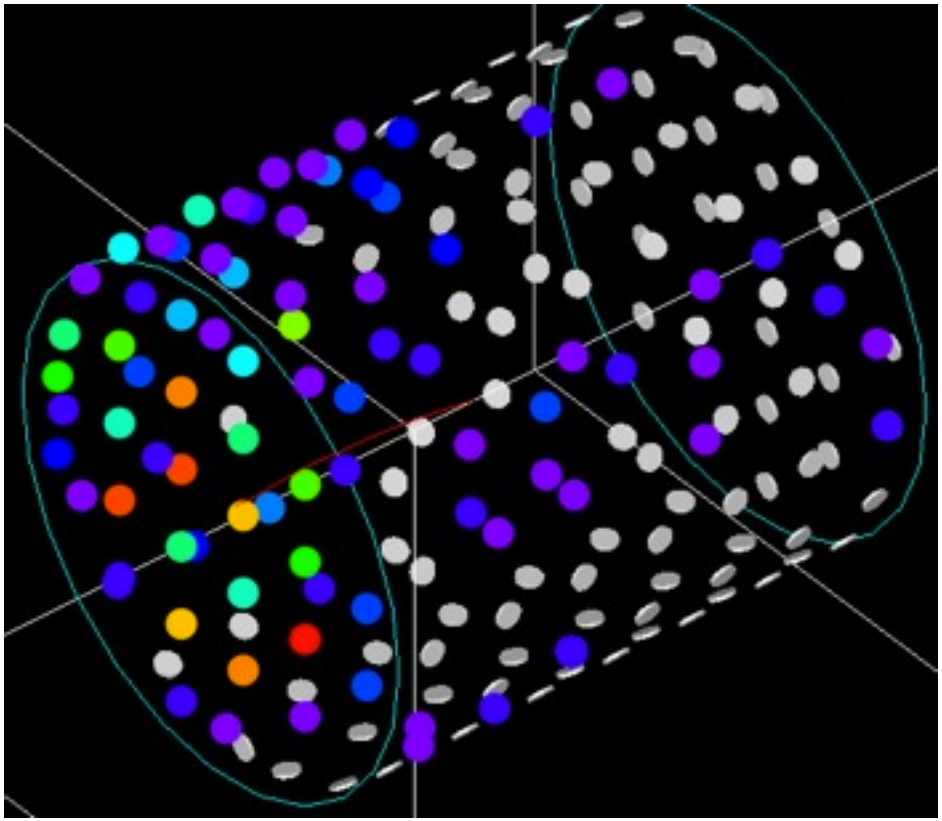


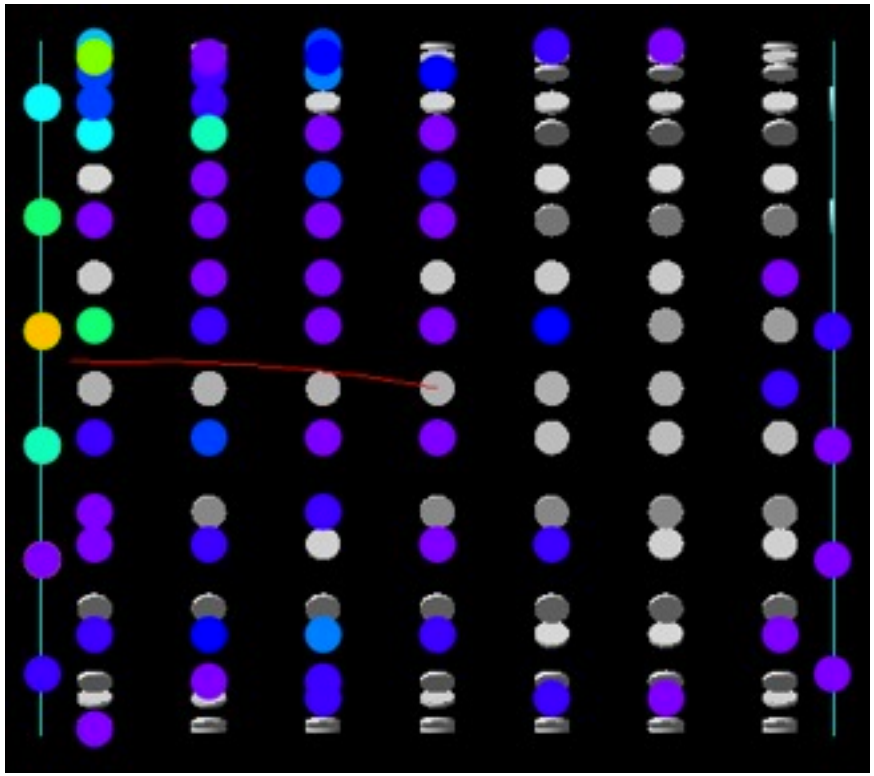
Energy: 800

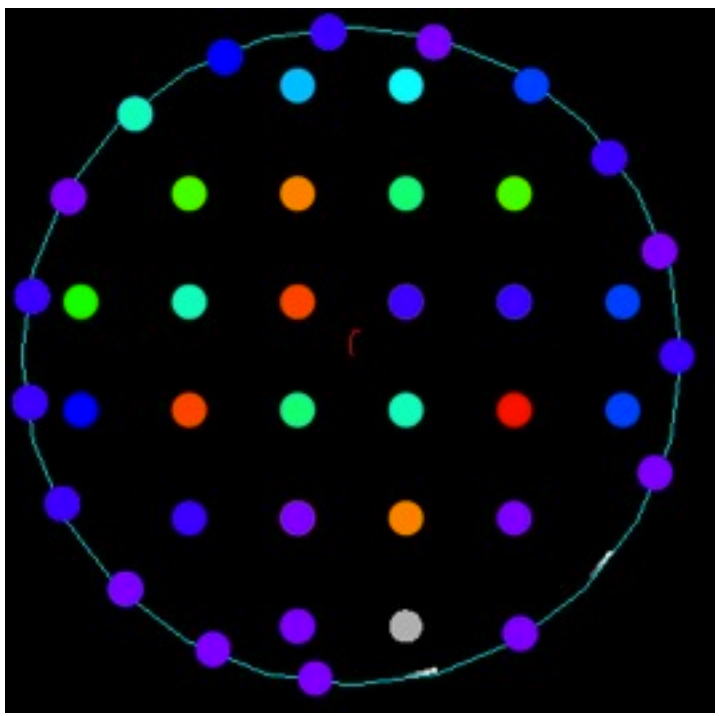
# of optical photons produced in this event : 38218

# of photo-electrons produced in this event : 7291

$$\theta = 10^\circ$$

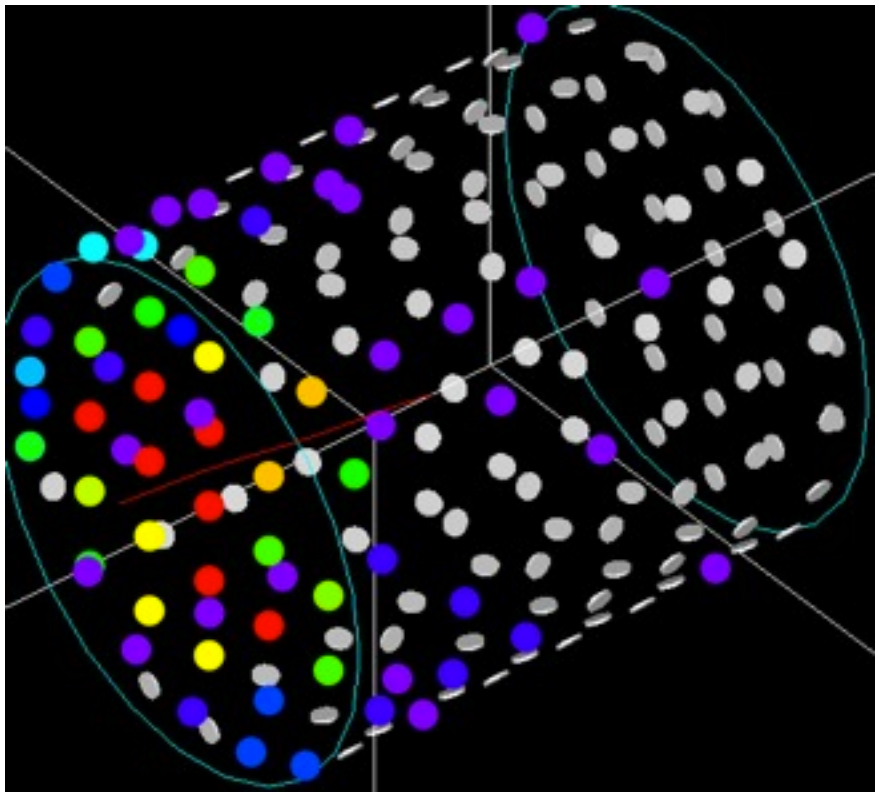


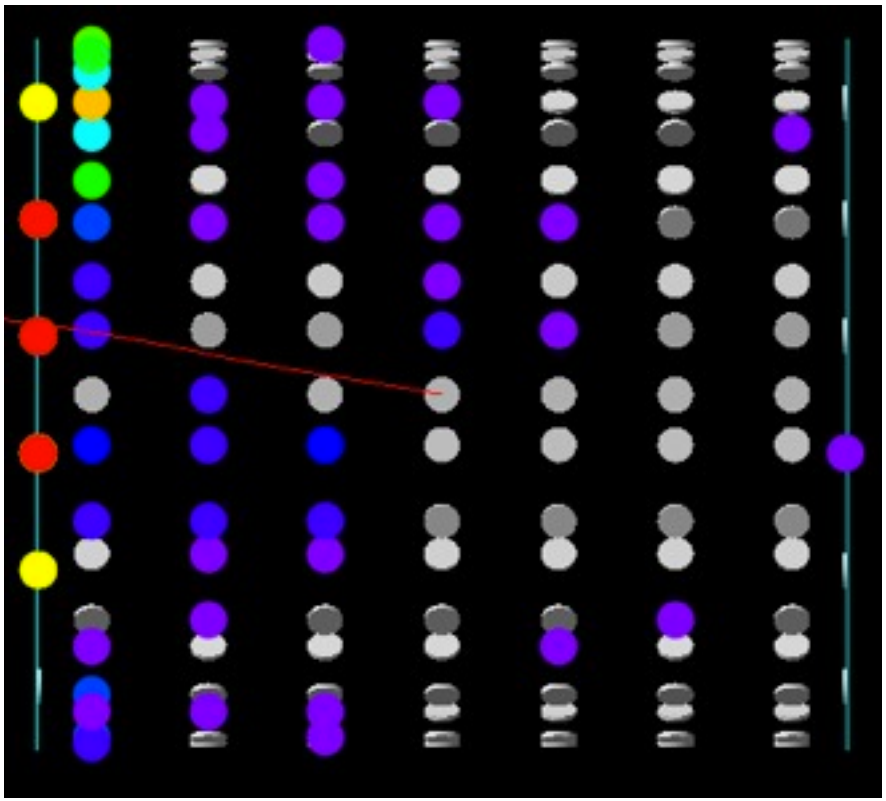


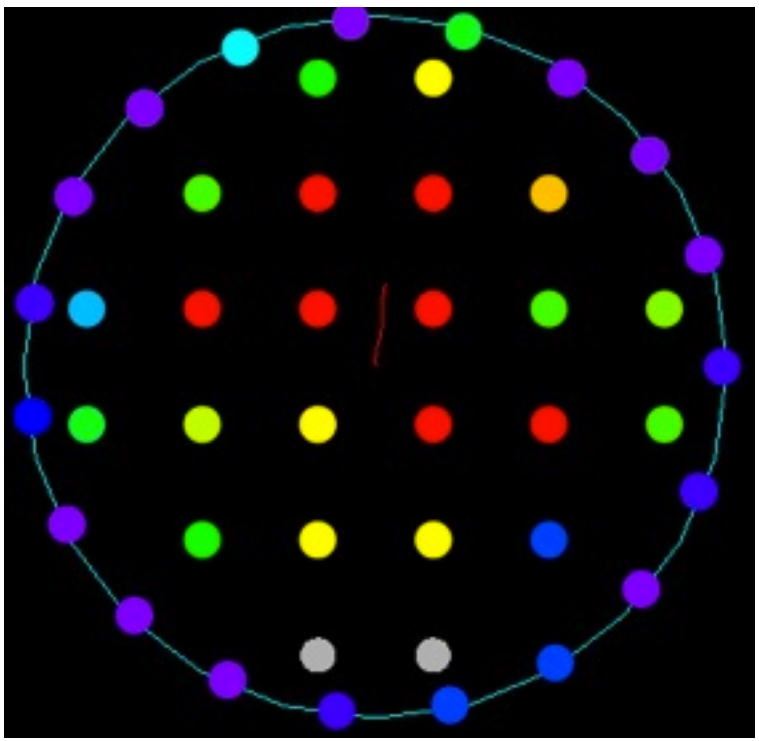


Energy: 200

# of optical photons produced
in this event : 27125
# of photo-electrons produced
in this event : 5270

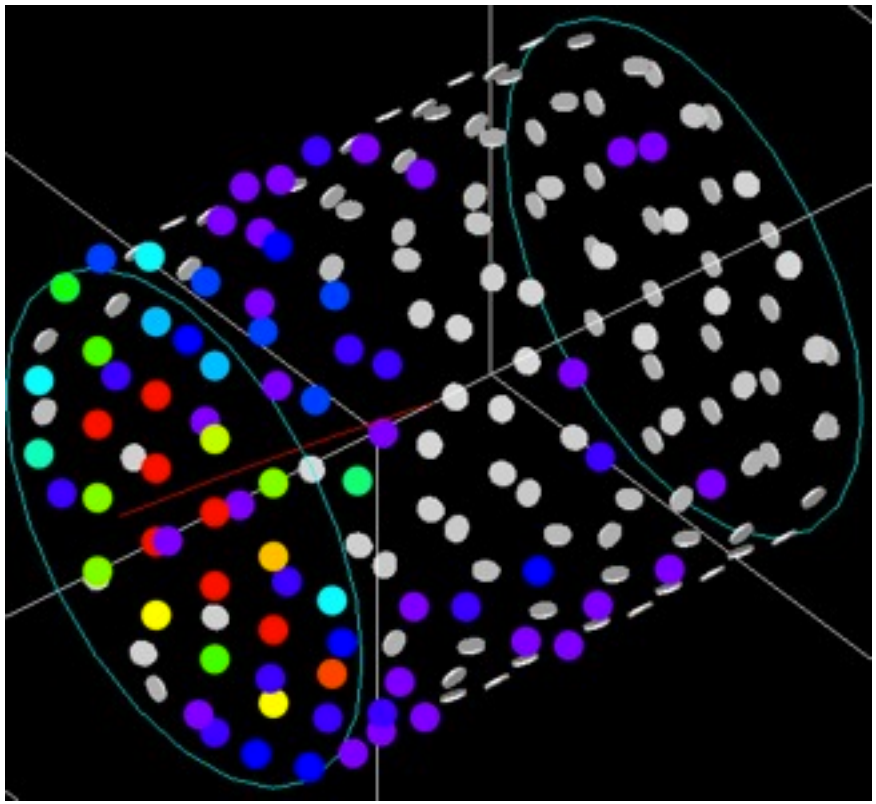


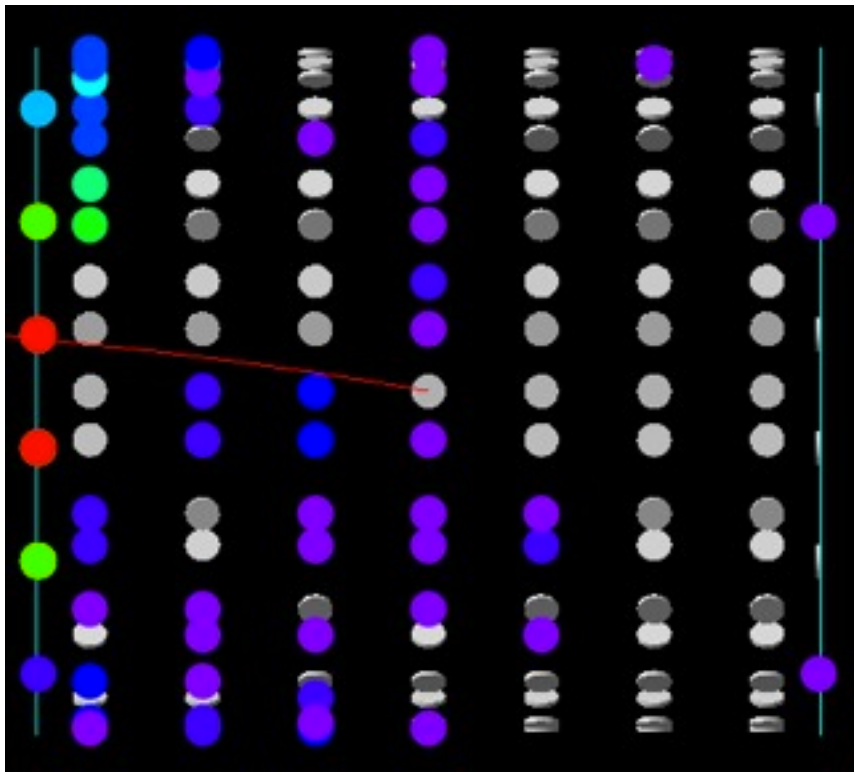


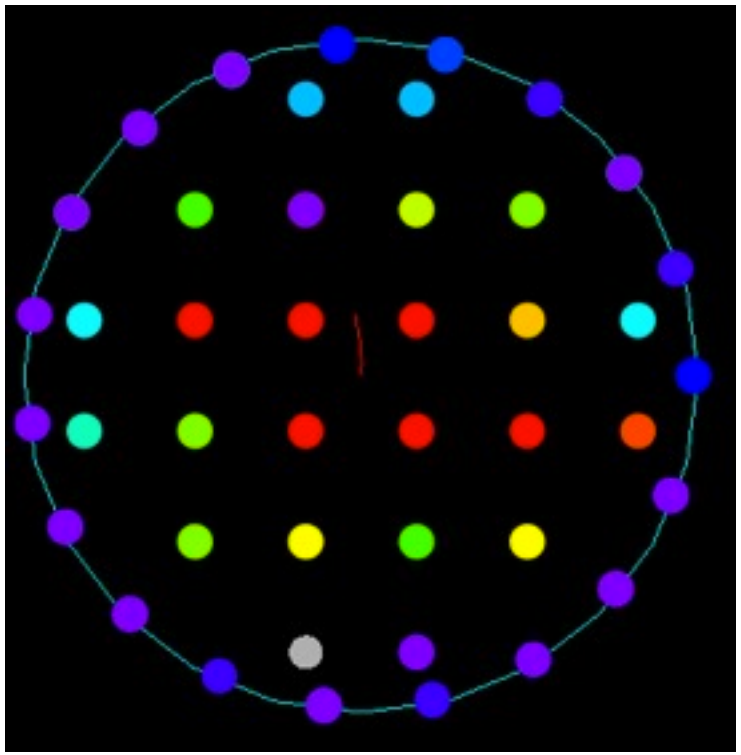


Energy: 400

# of optical photons produced
in this event : 37775
# of photo-electrons produced
in this event : 7148



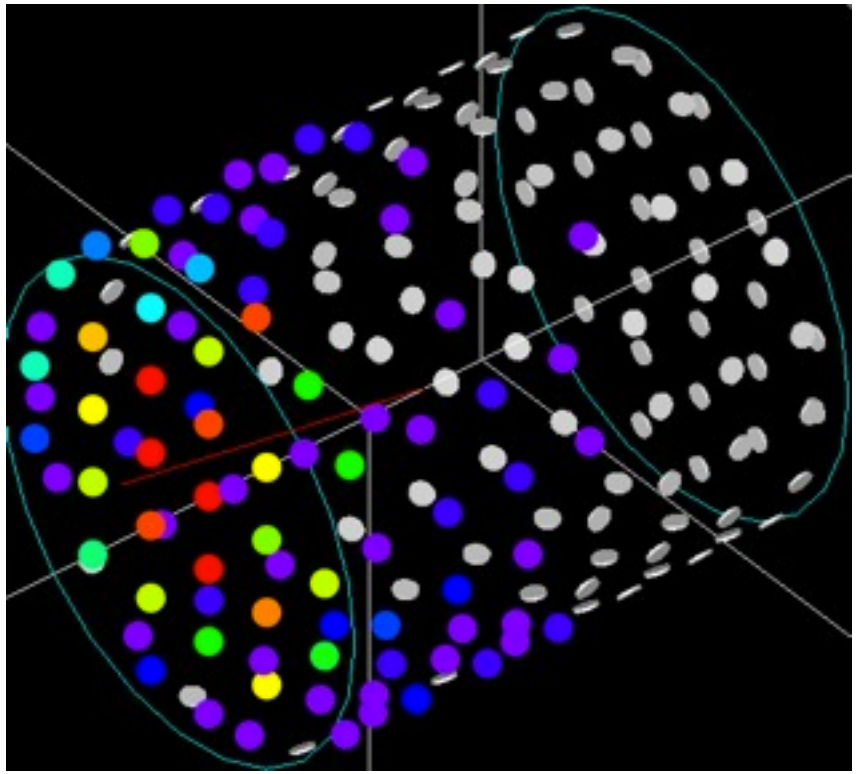


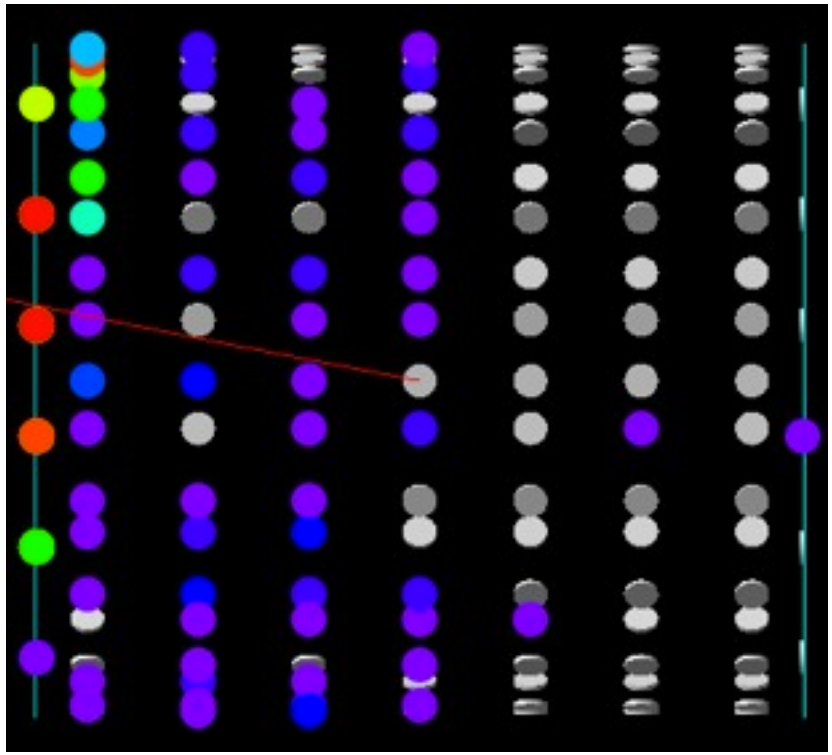


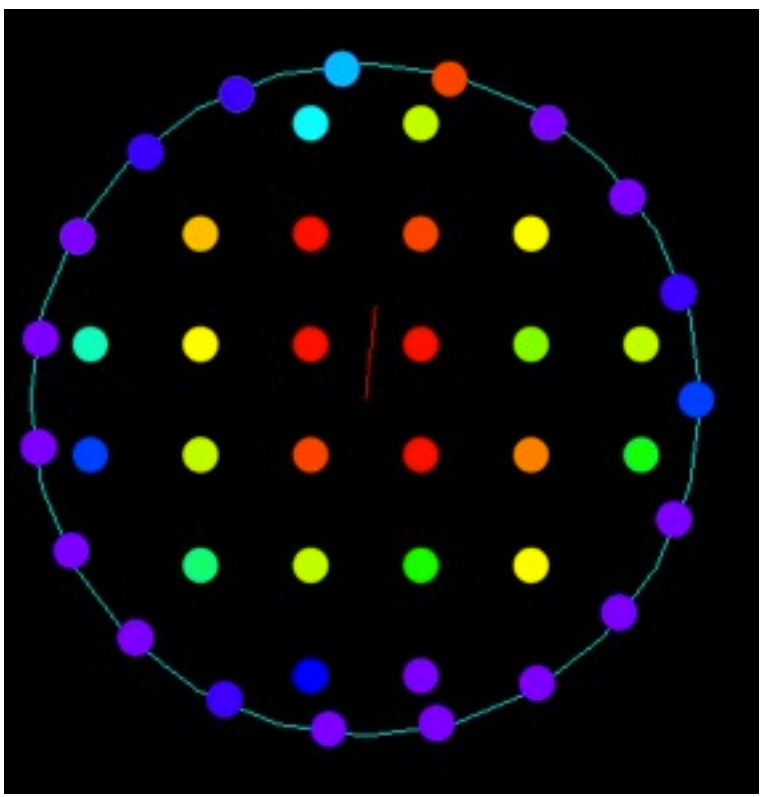
Energy: 600

# of optical photons produced in this event : 40267

# of photo-electrons produced in this event : 7784



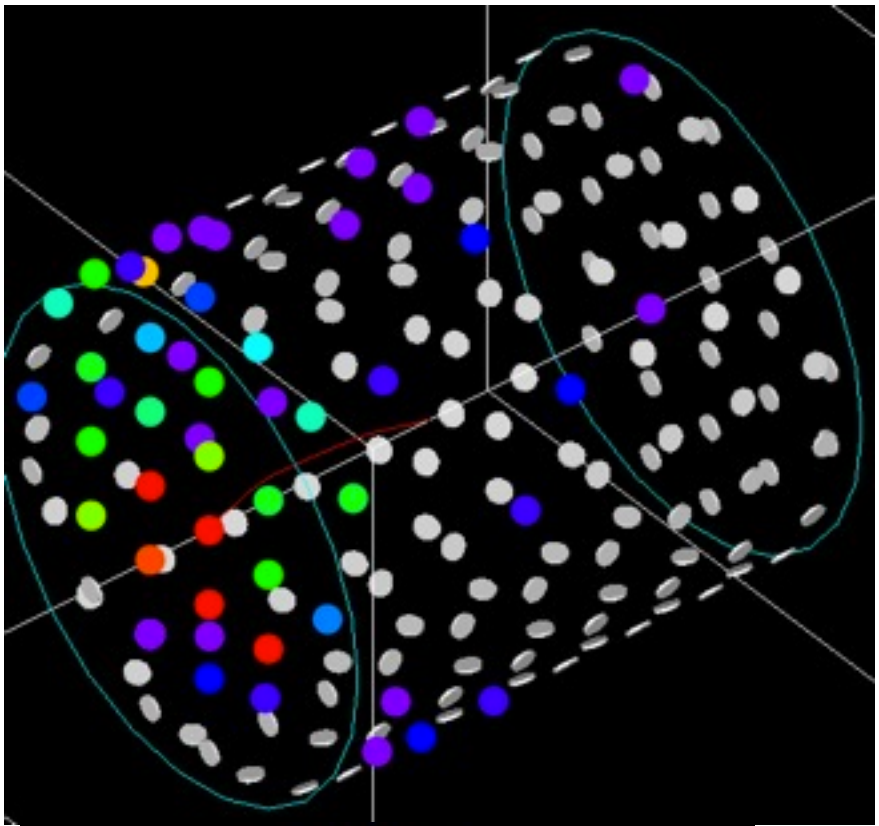


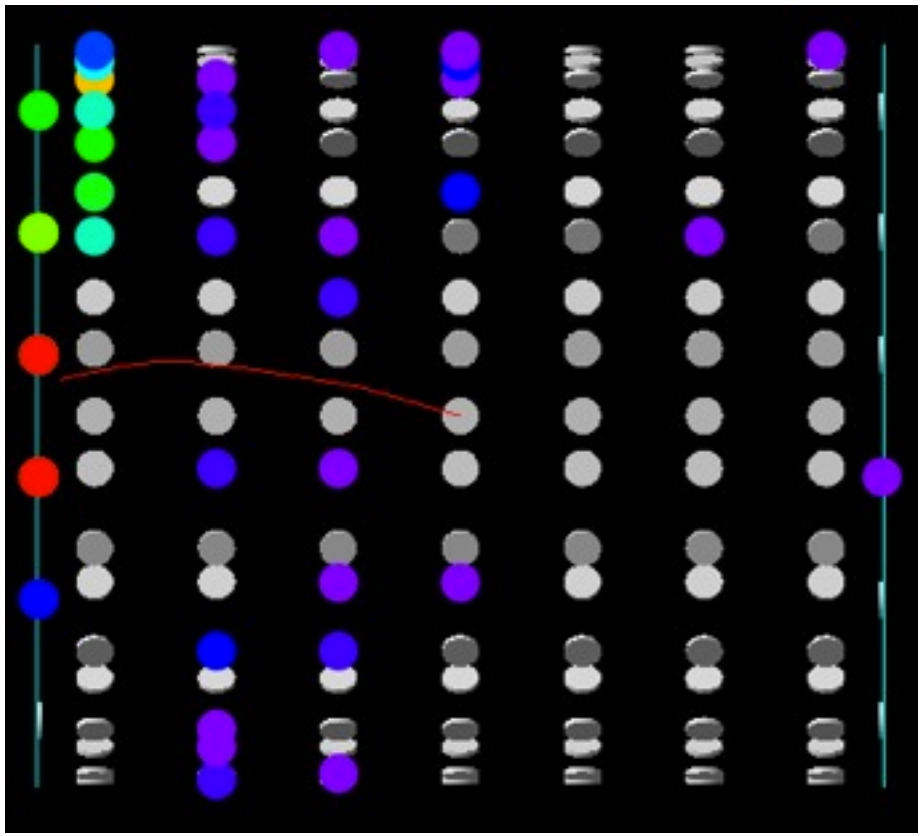


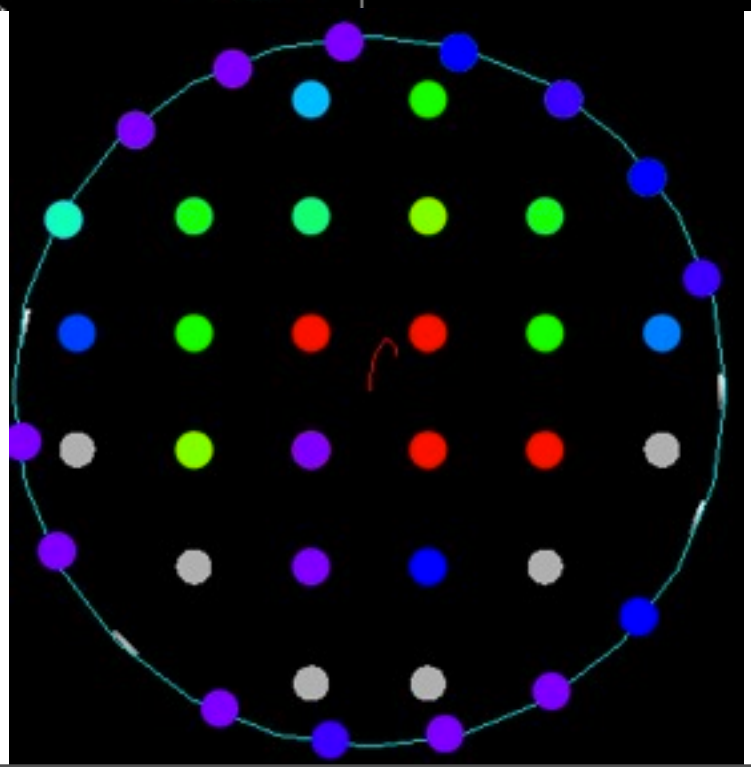
Energy: 800

# of optical photons produced
in this event : 40394
# of photo-electrons produced
in this event : 7576

$$\theta = 15°$$

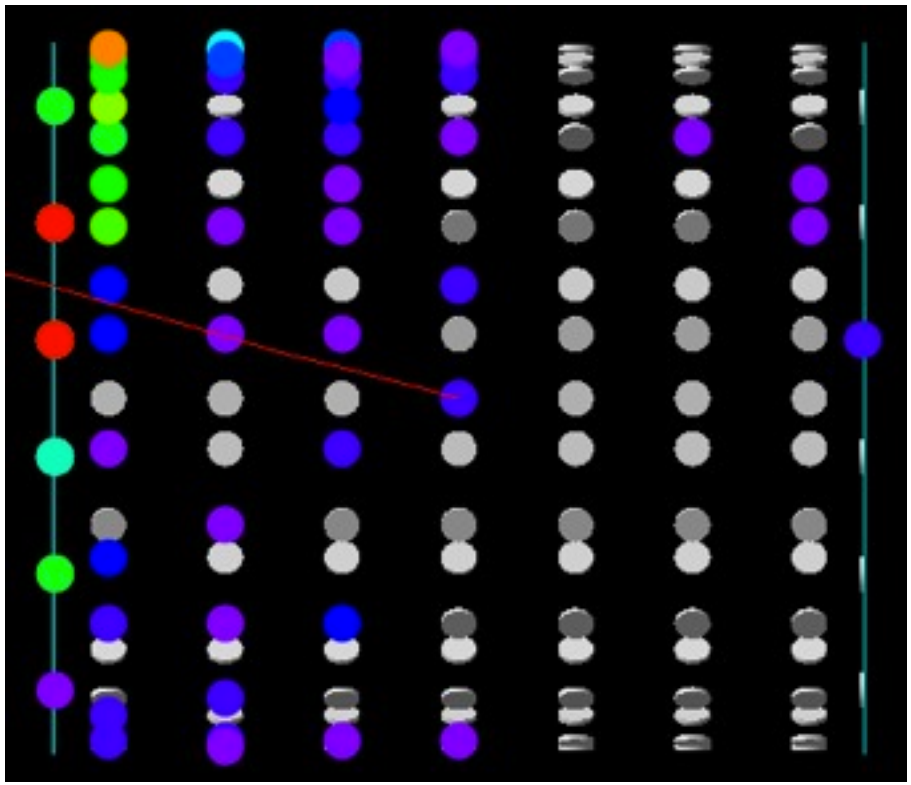


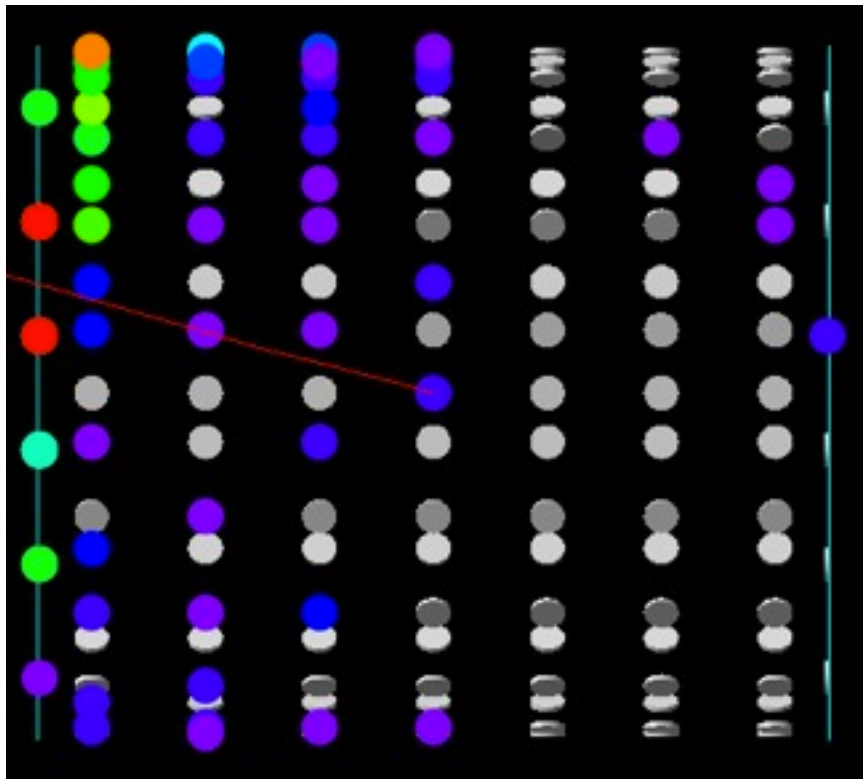


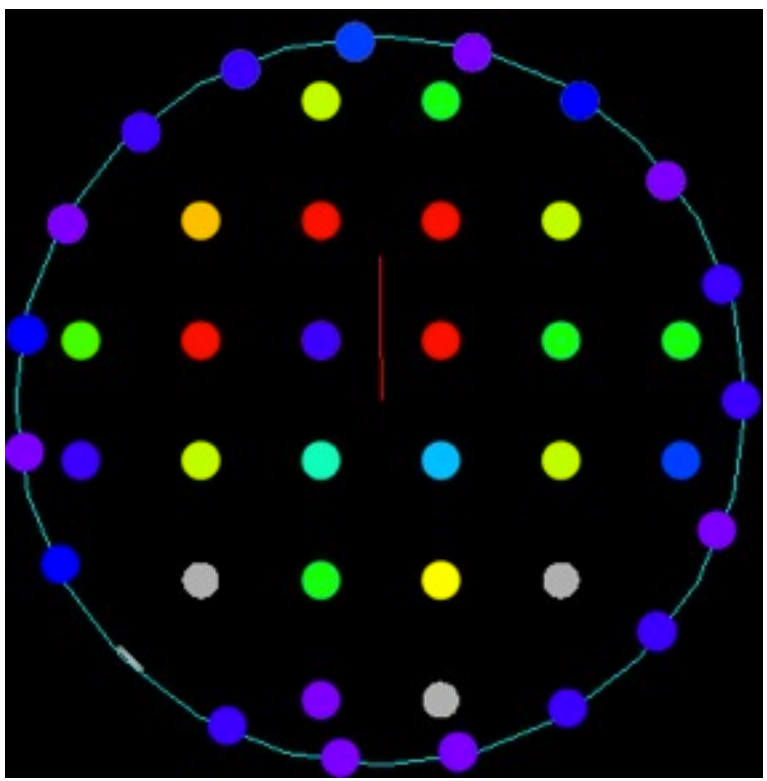


Energy: 200

# of optical photons produced
in this event : 26508
# of photo-electrons produced
in this event : 5058



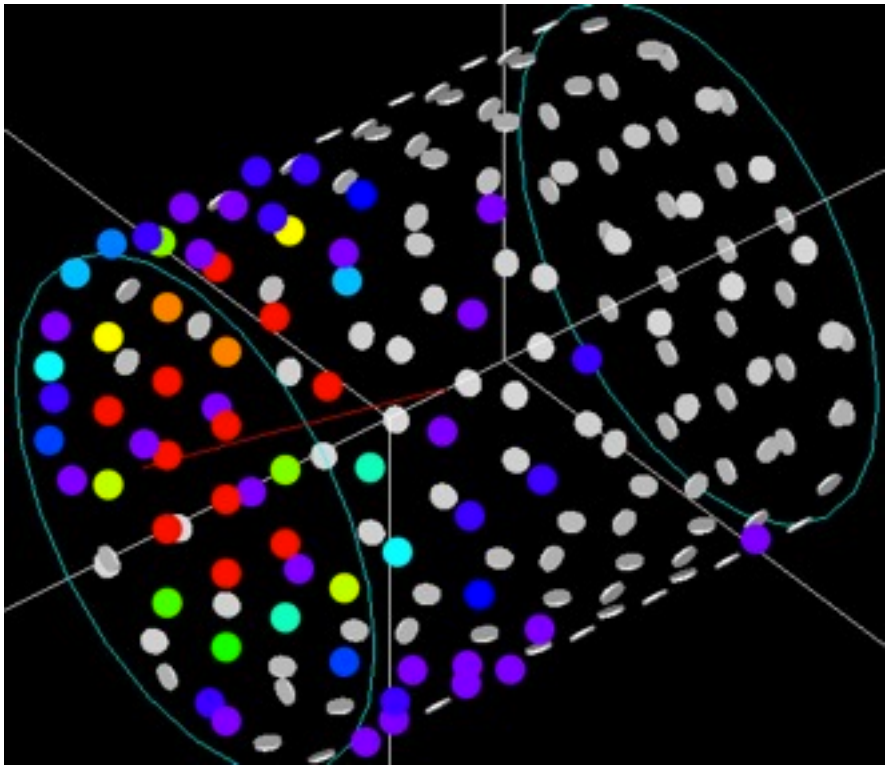


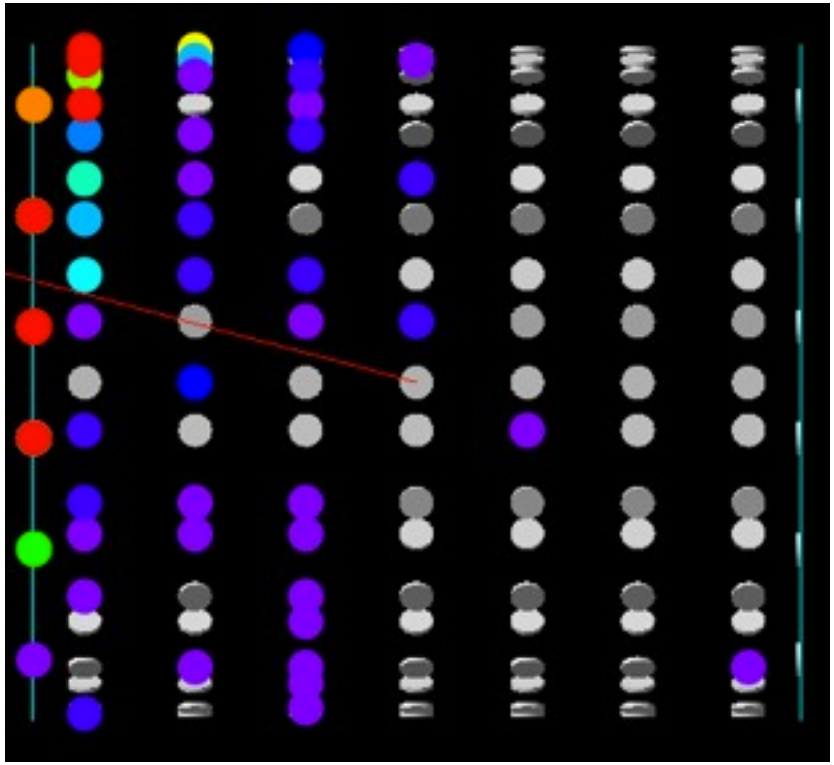


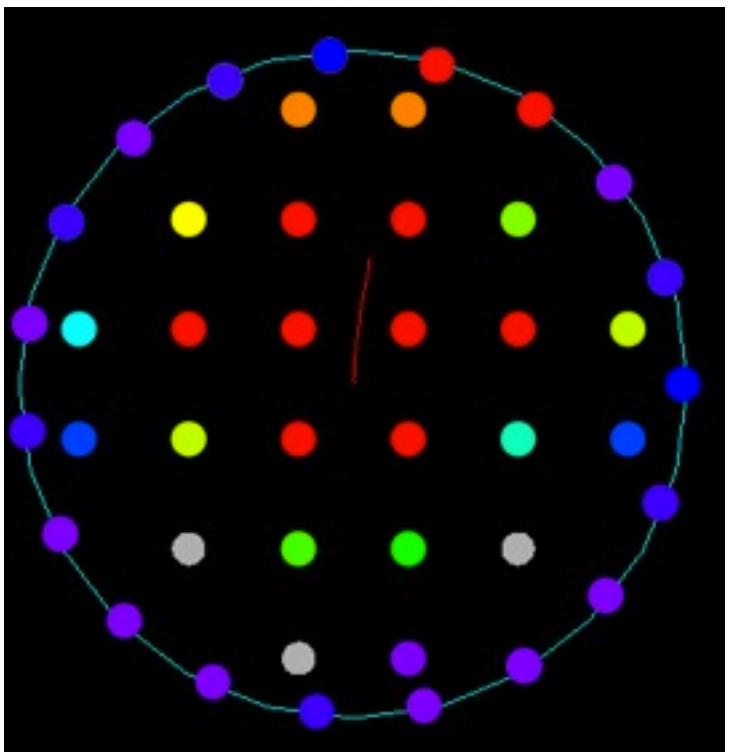
Energy: 400

# of optical photons produced in this event : 36486

# of photo-electrons produced in this event : 6952

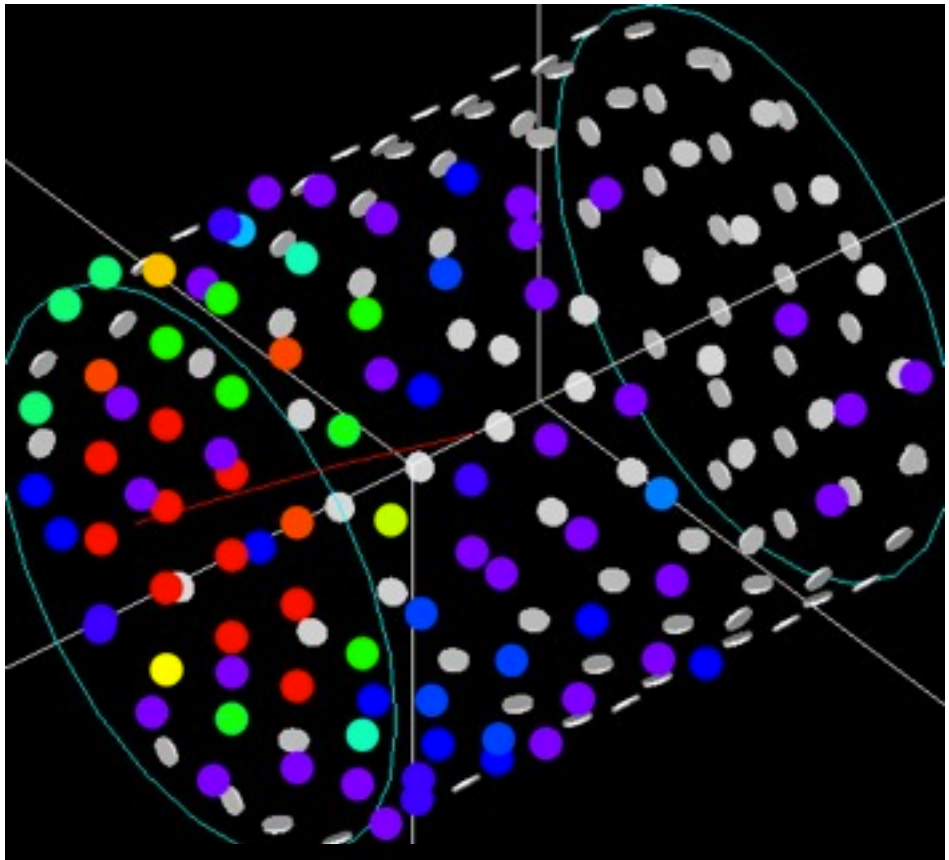


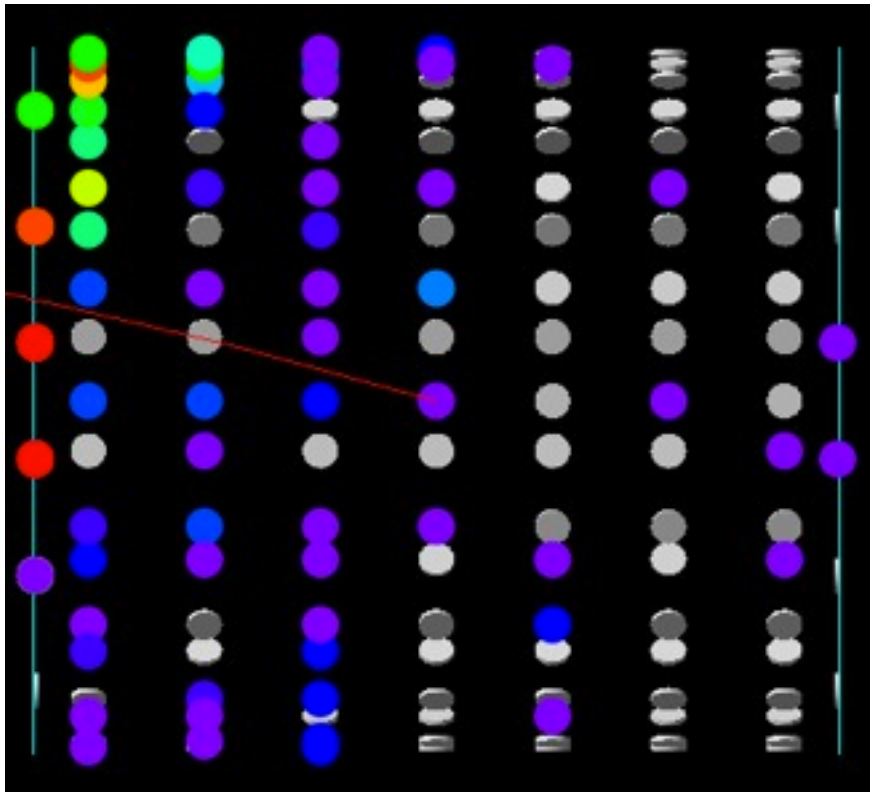


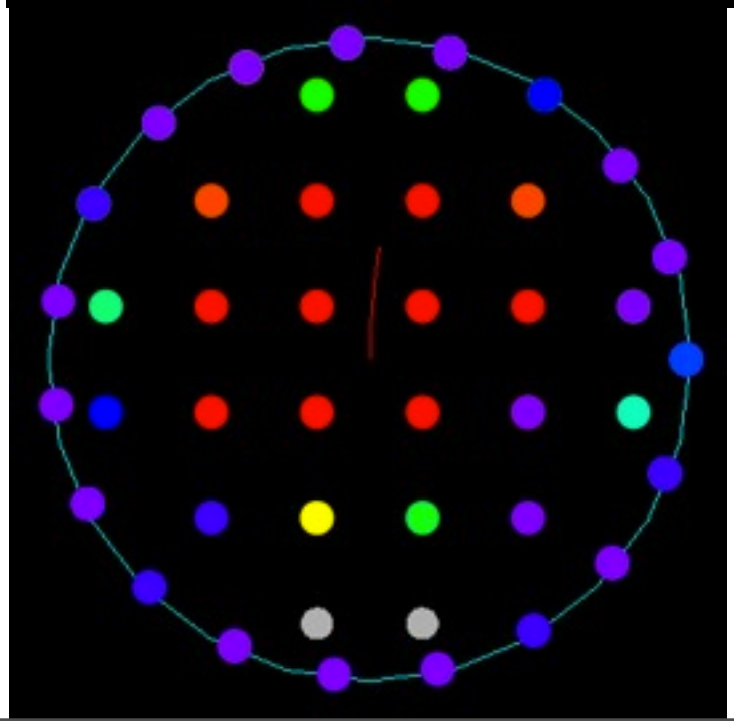


Energy: 600

# of optical photons produced
in this event : 38572
# of photo-electrons produced
in this event : 7368



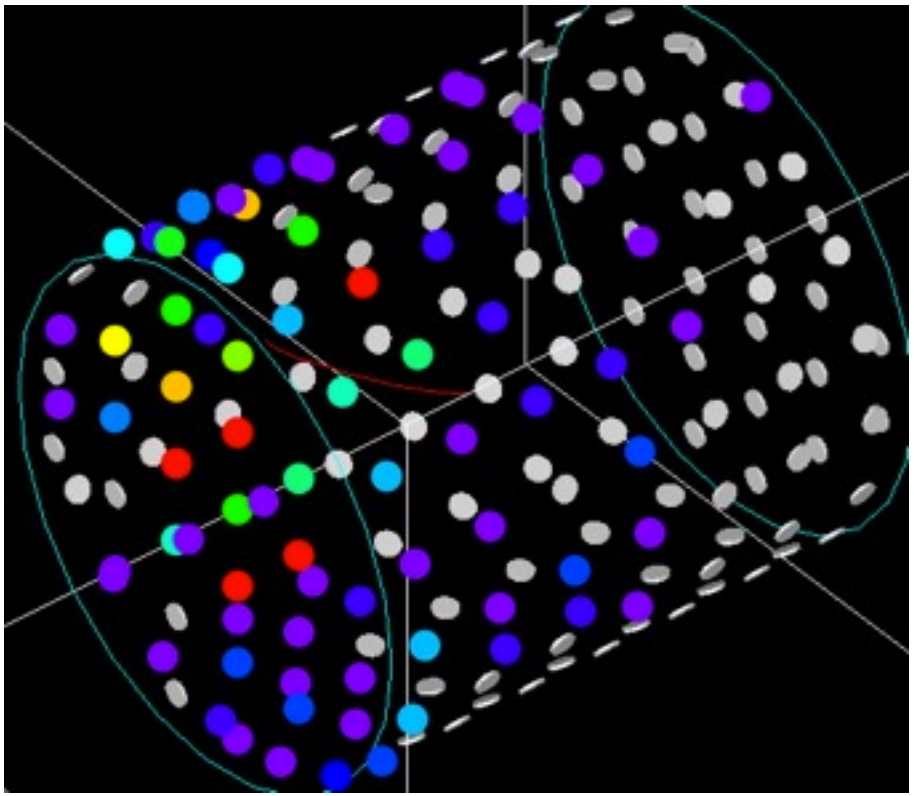


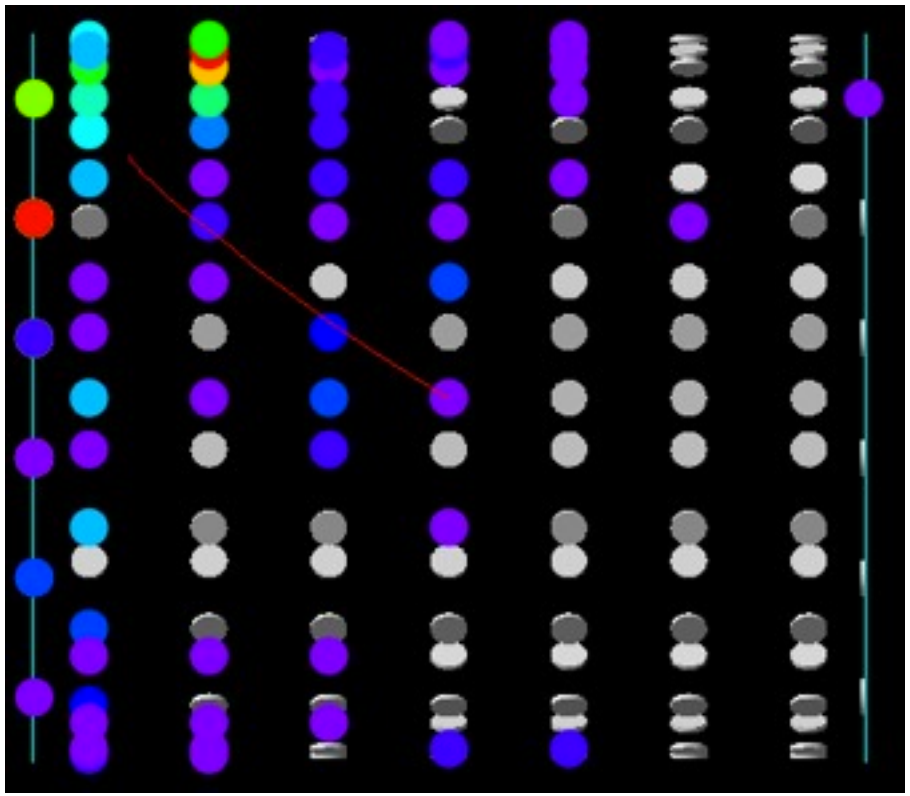


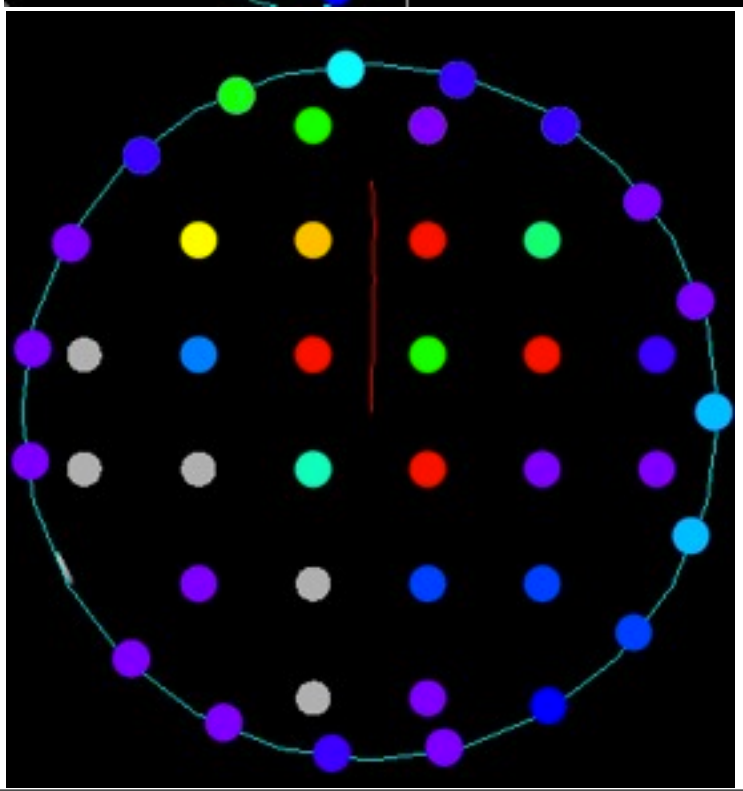
Energy: 800

# of optical photons produced
in this event : 45842
# of photo-electrons produced
in this event : 8715

$$\theta = 30°$$



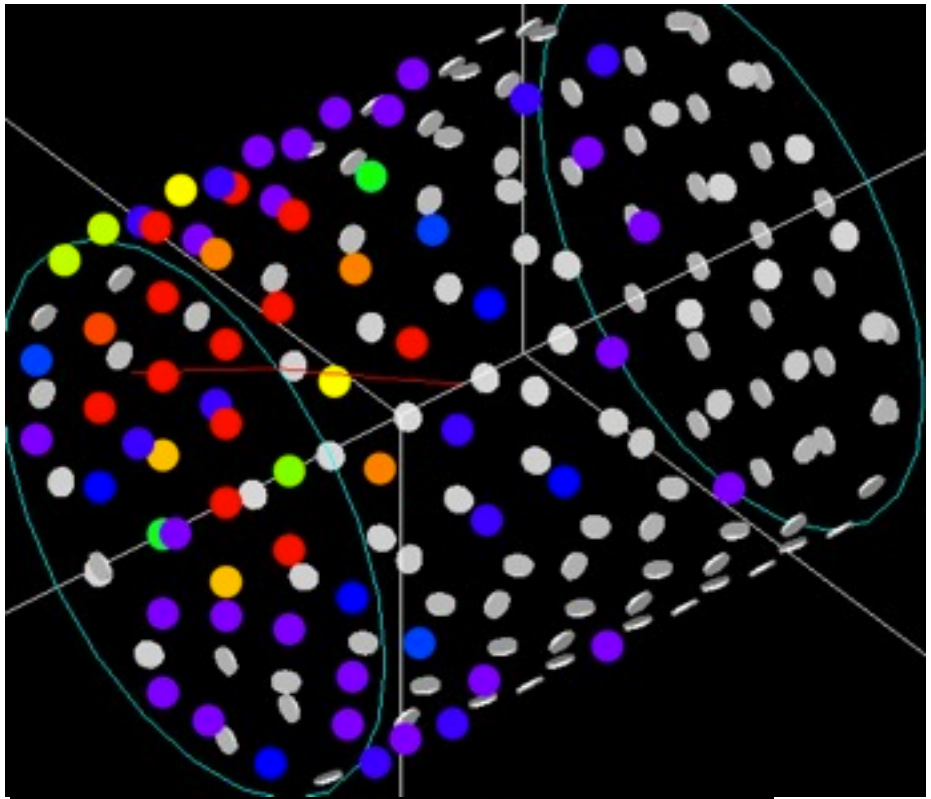


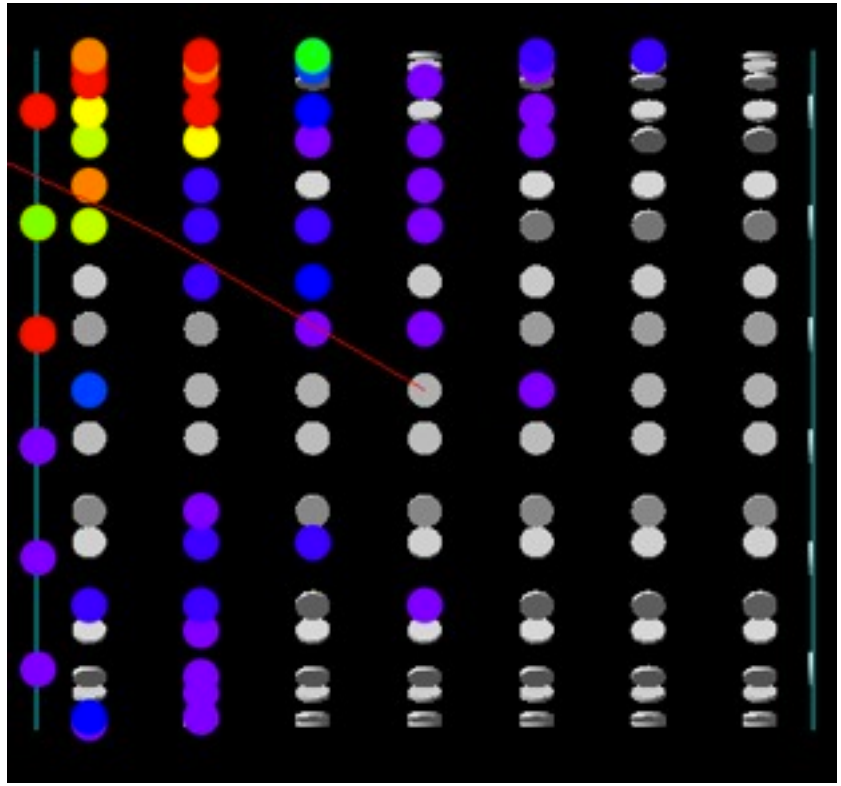


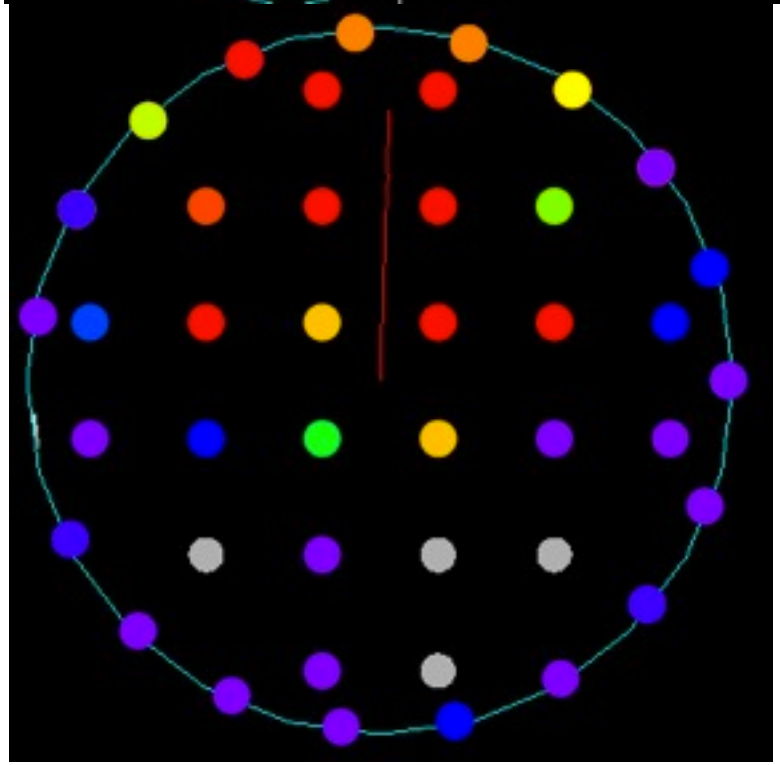
Energy: 200

# of optical photons produced in this event : 32943

# of photo-electrons produced in this event : 6252

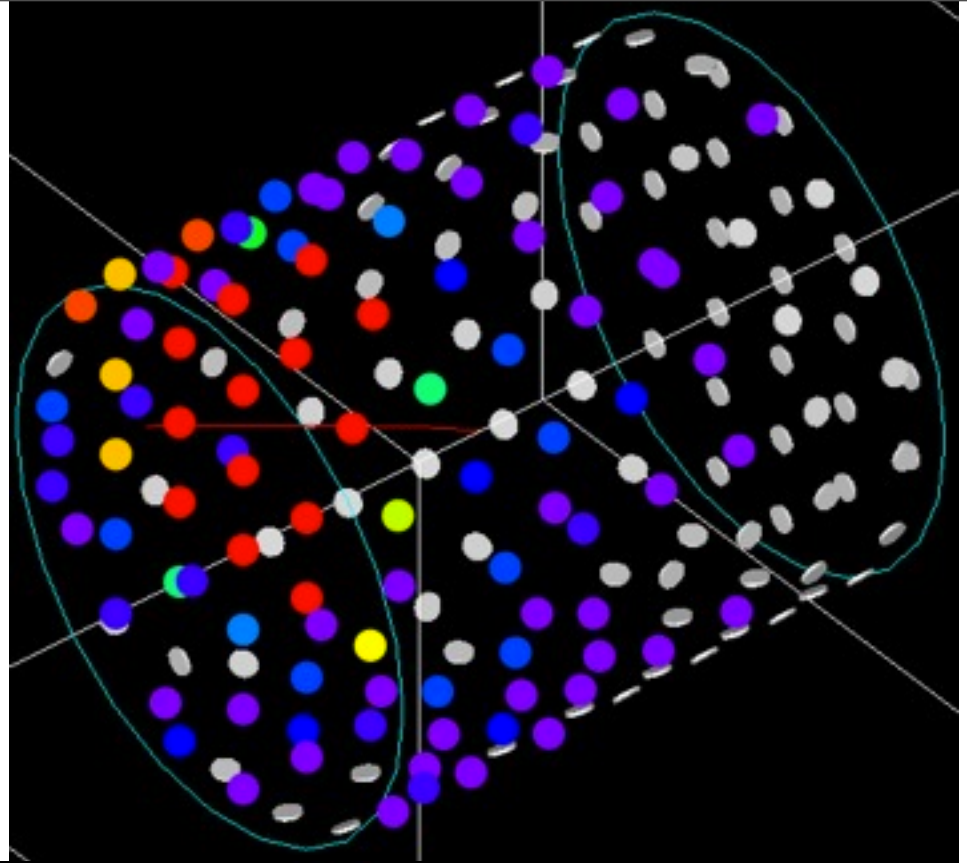


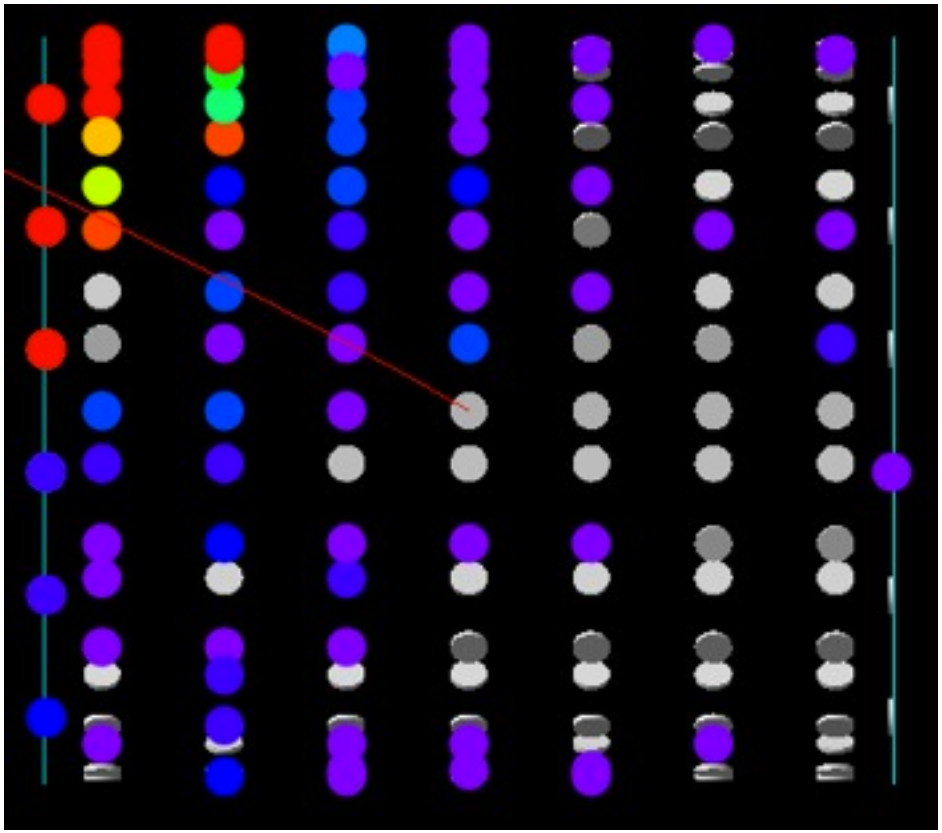


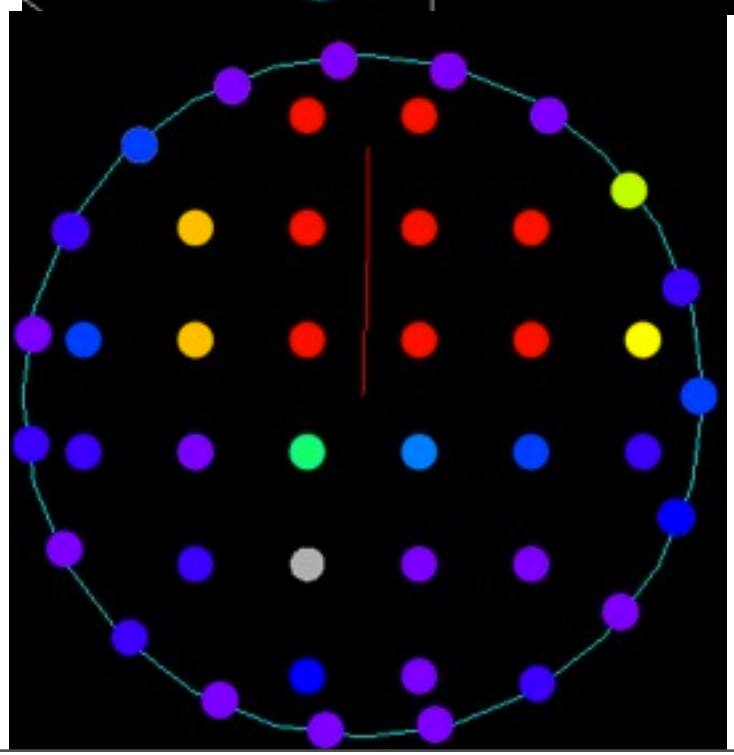


Energy: 400

# of optical photons produced
in this event : 43129
# of photo-electrons produced
in this event : 8321

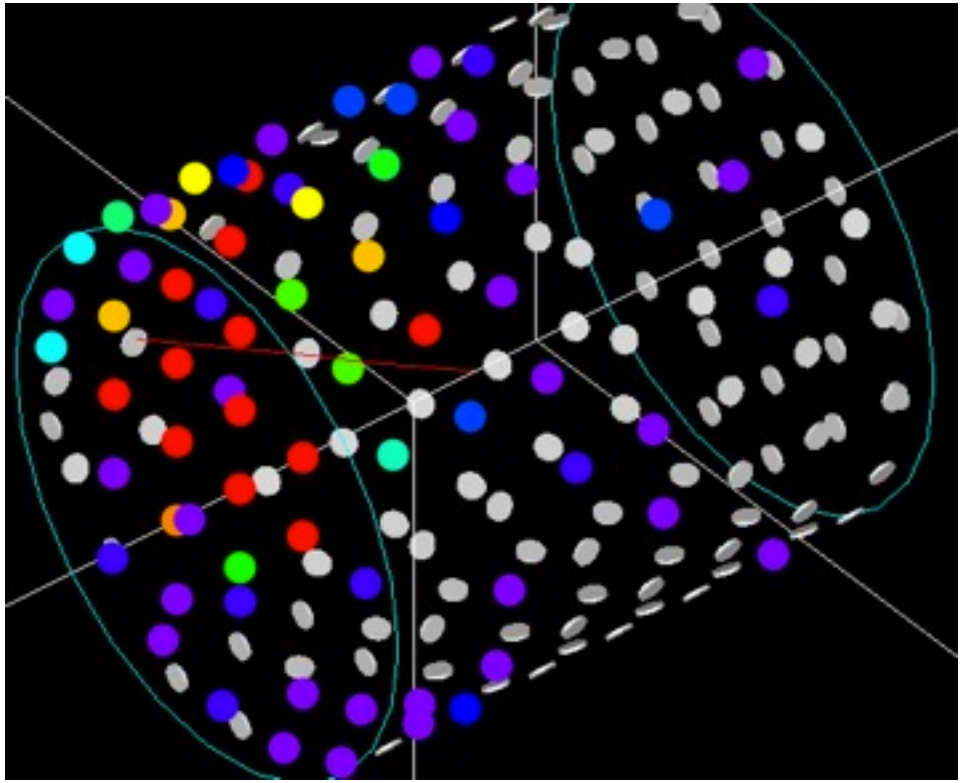


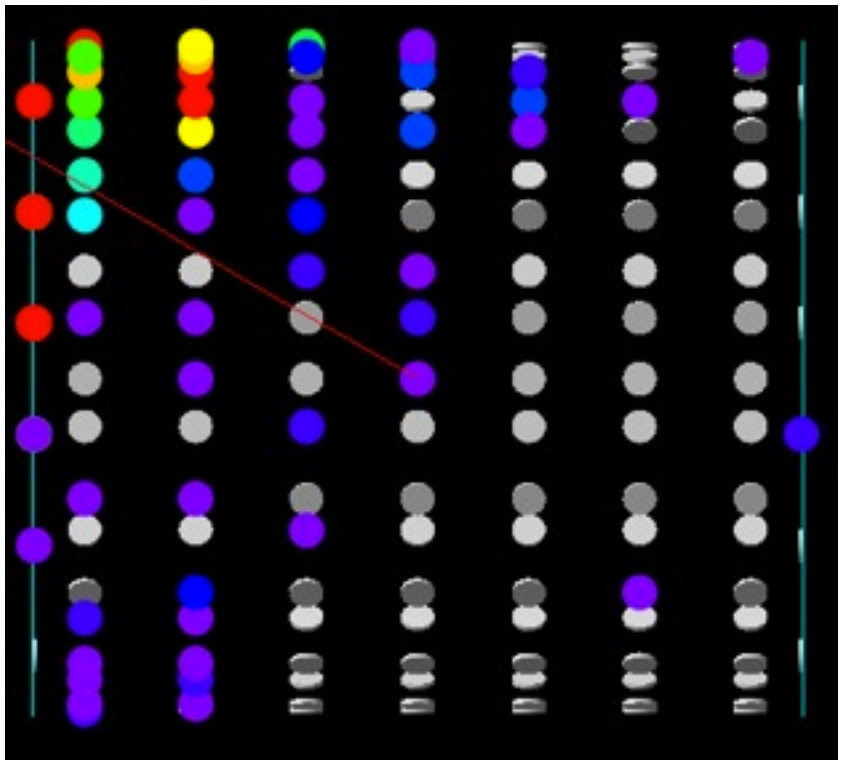


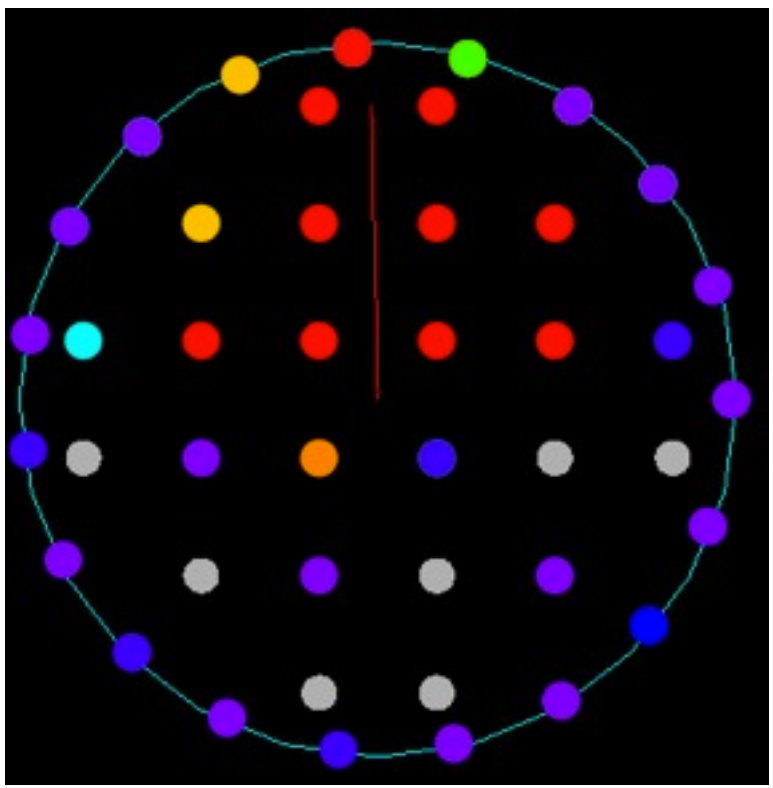


Energy: 600

# of optical photons produced
in this event : 52147
# of photo-electrons produced
in this event : 9900





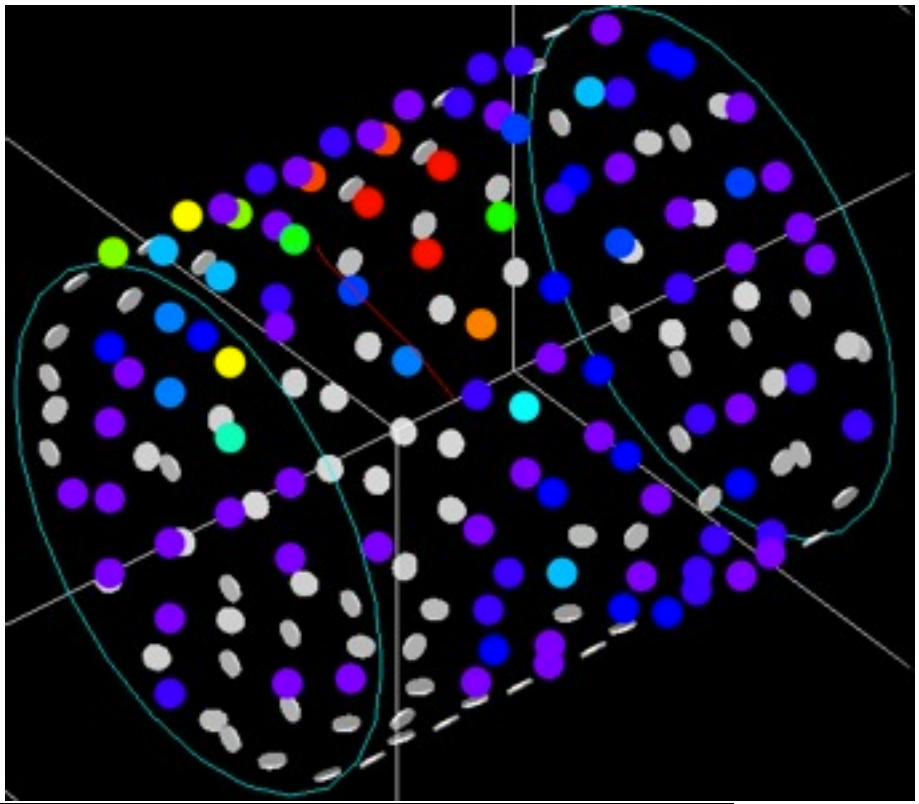


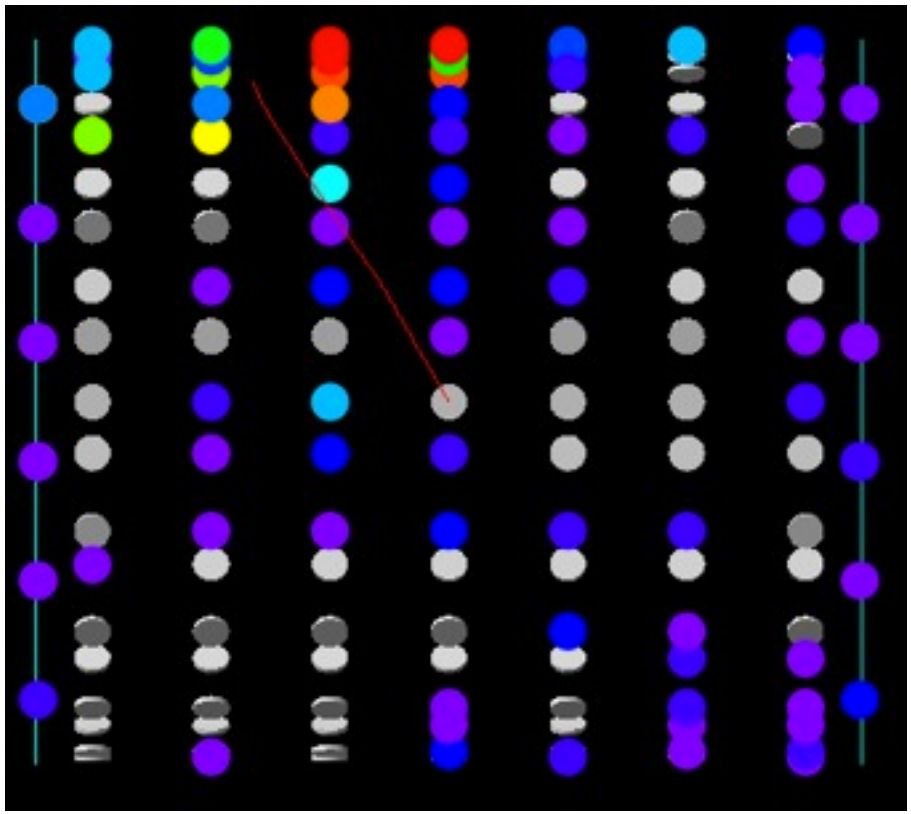
Energy: 800

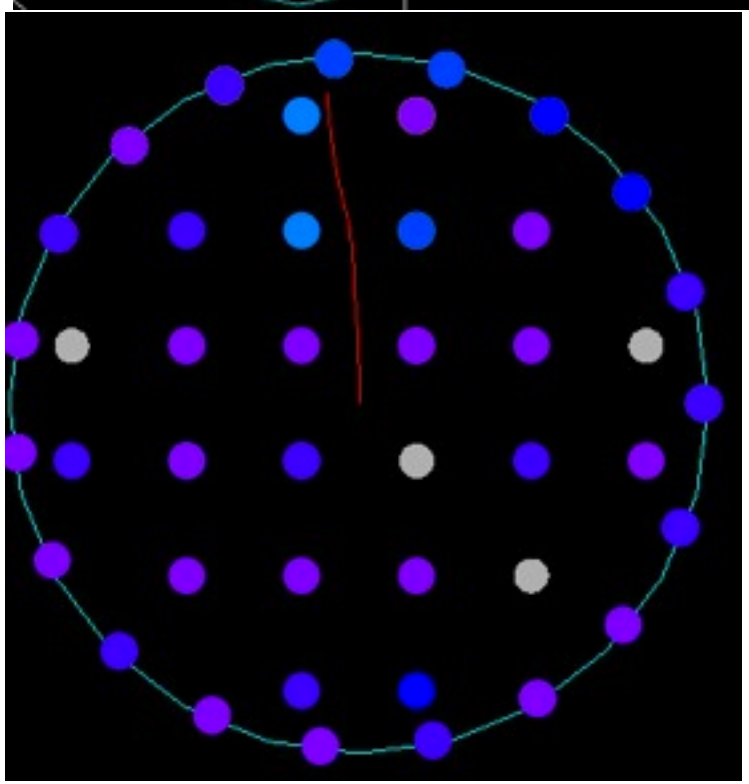
# of optical photons produced in this event : 46505

# of photo-electrons produced in this event : 8963

$$\theta = 60^\circ$$

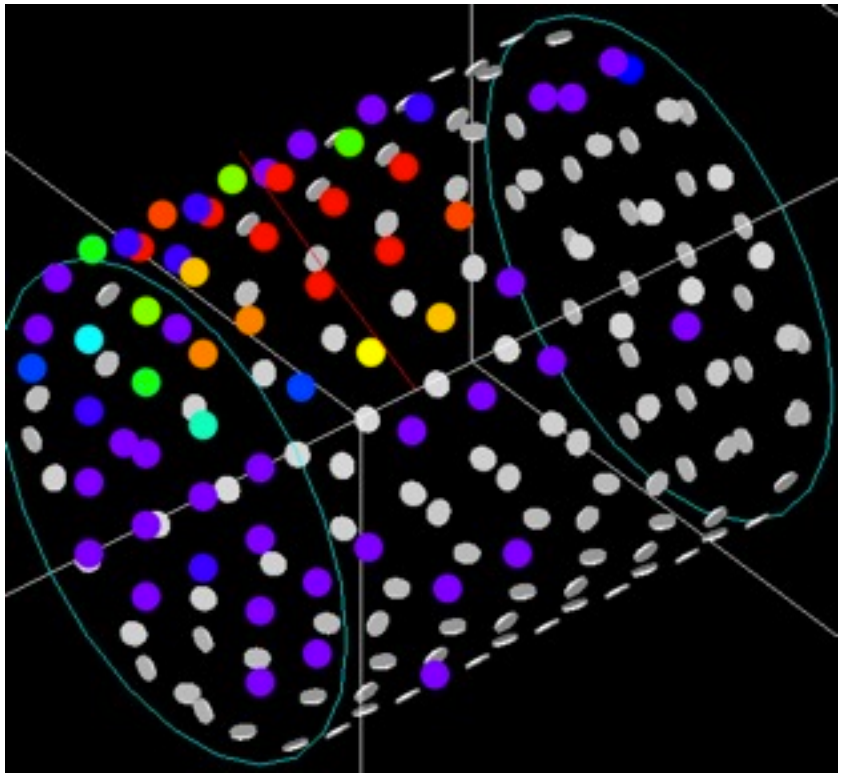


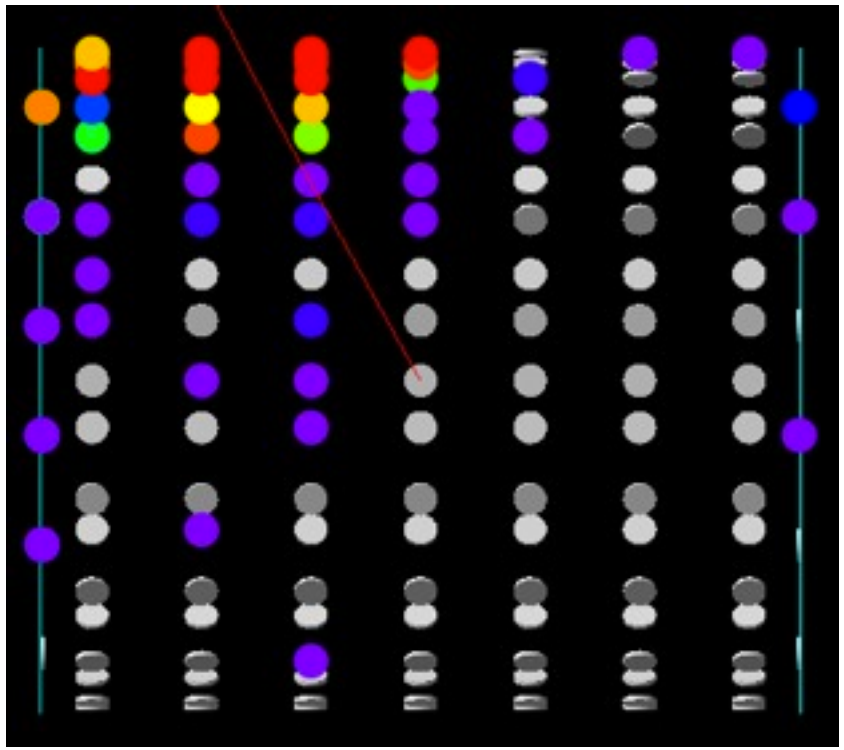


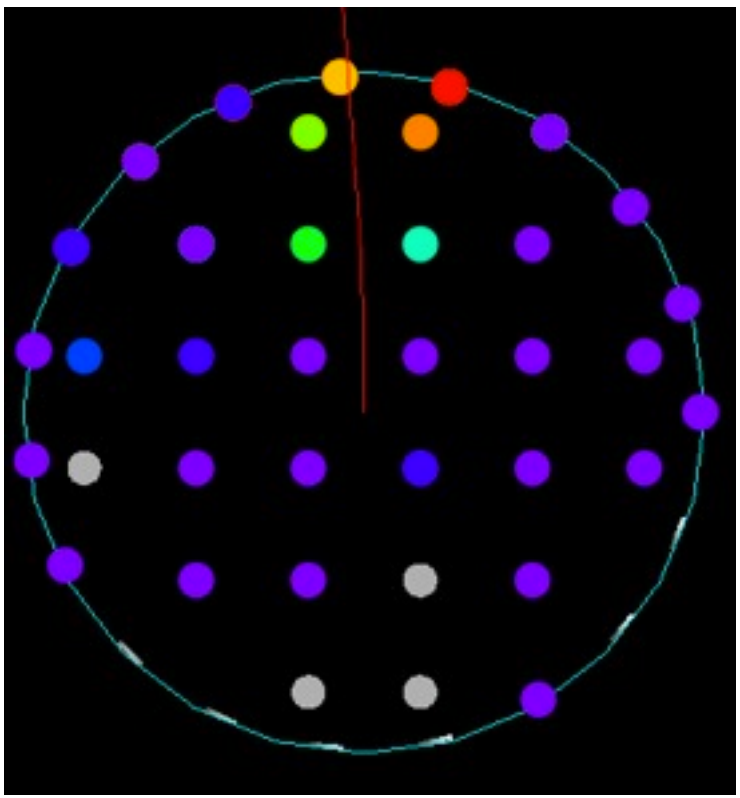


Energy: 200

# of optical photons produced
in this event : 31562
# of photo-electrons produced
in this event : 6006

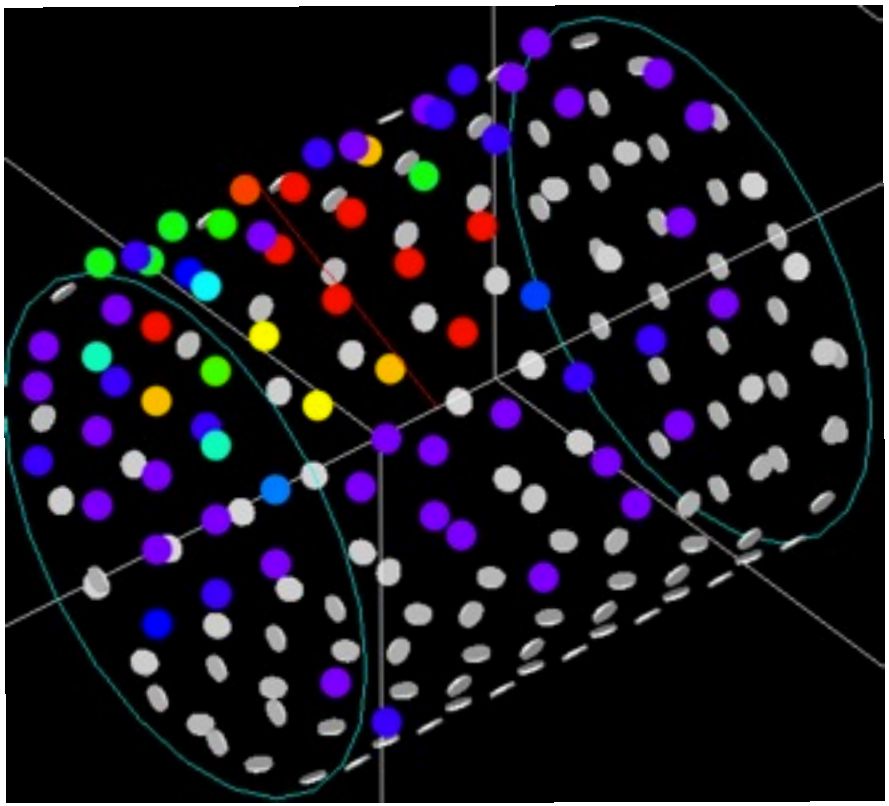


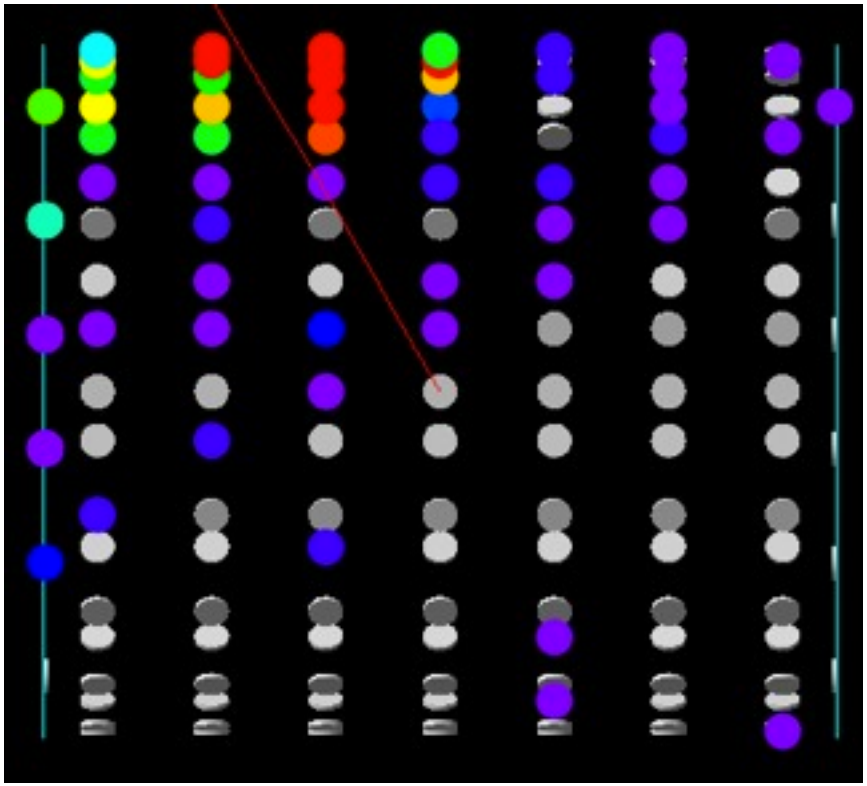


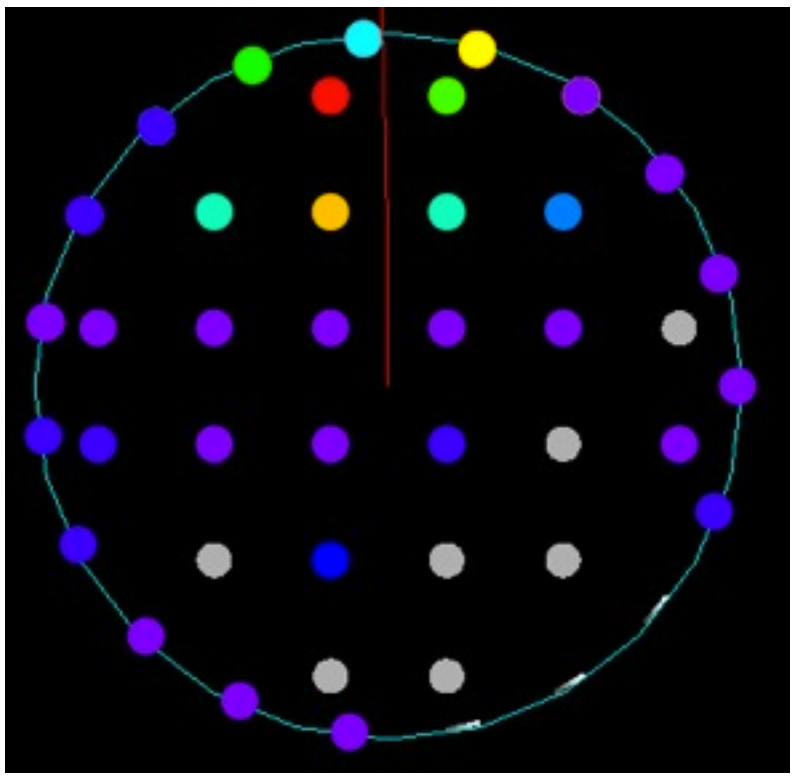


Energy: 400

# of optical photons produced
in this event : 38286
# of photo-electrons produced
in this event : 7325





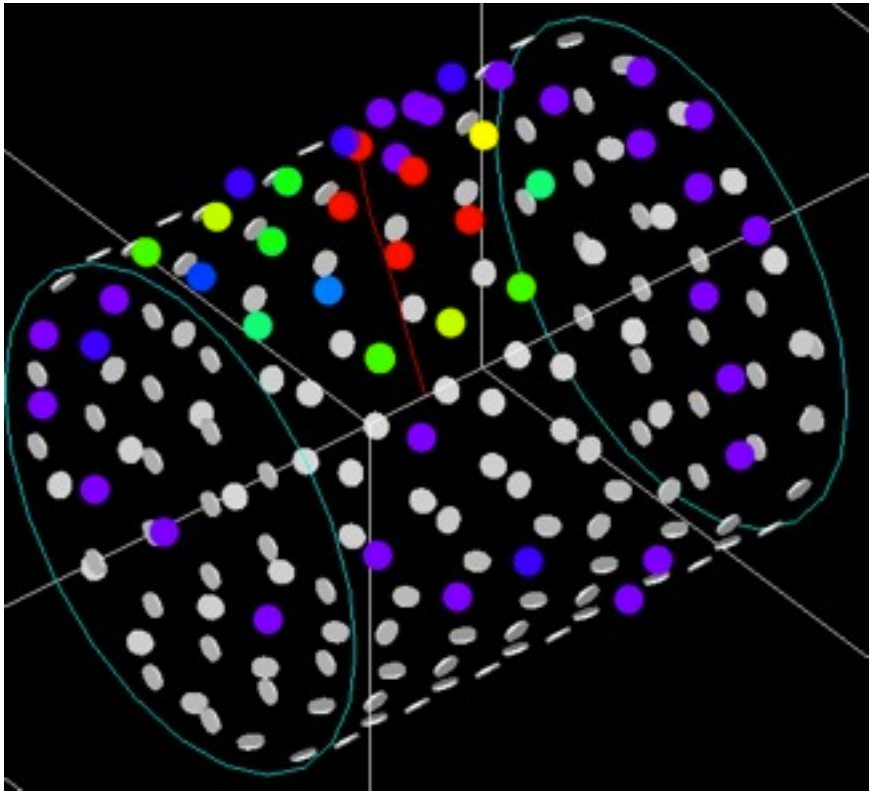


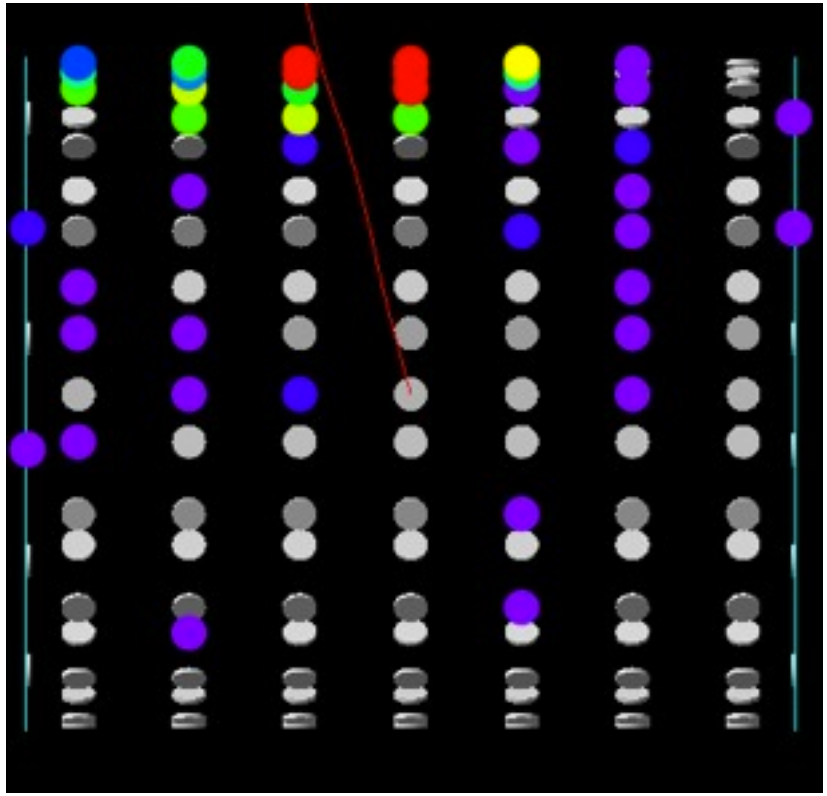
Energy: 600

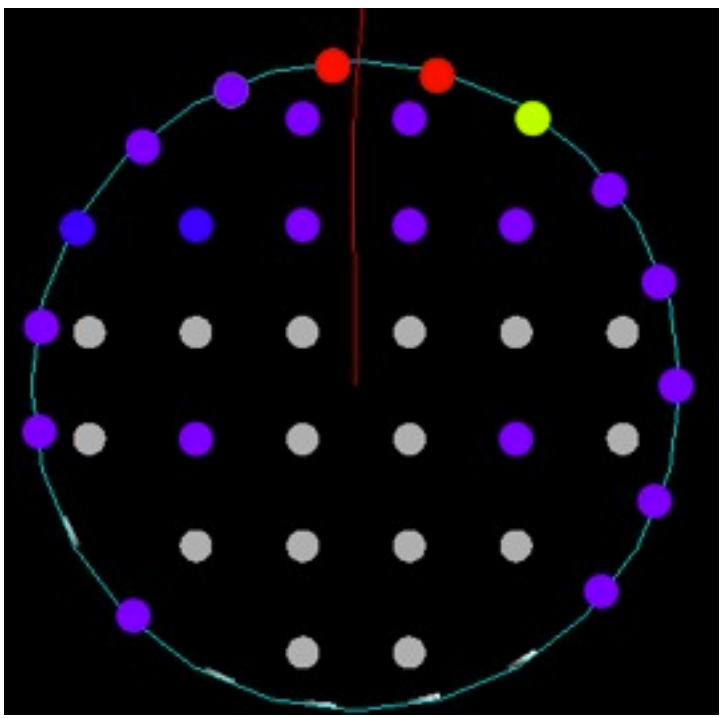
# of optical photons produced in this event : 38316

# of photo-electrons produced in this event : 7332

$$\theta = 75^\circ$$





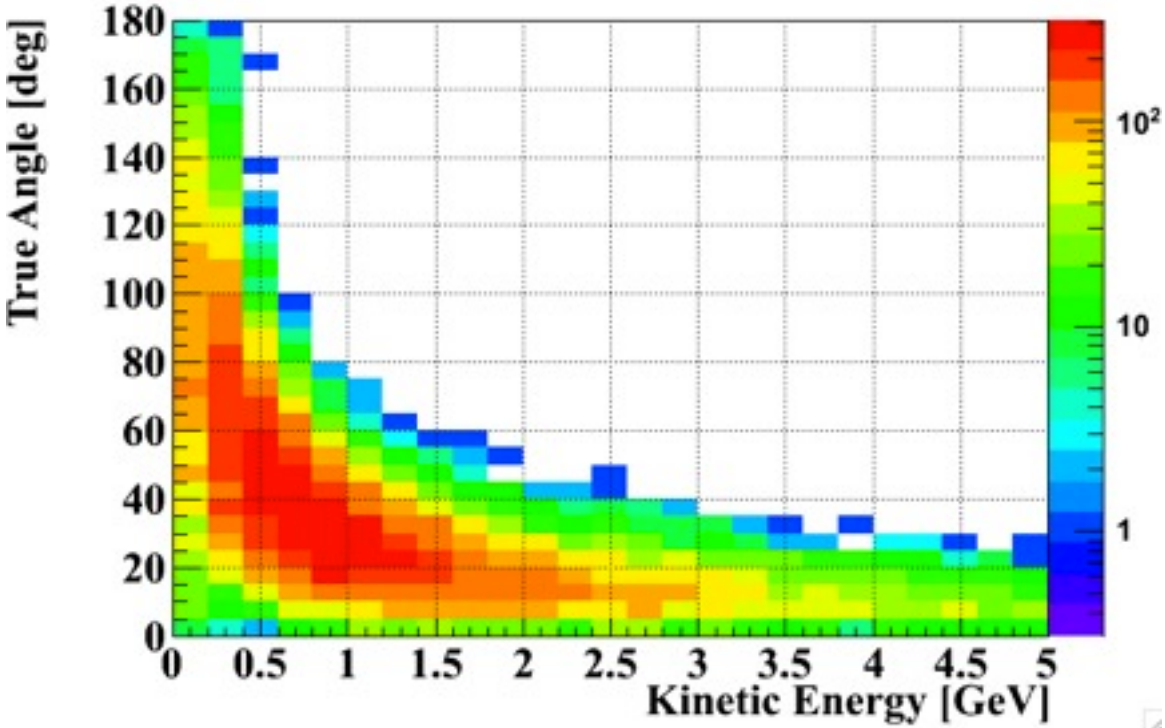


Energy: 200

# of optical photons produced in this event : 21753

# of photo-electrons produced in this event : 4181

- 赤色(p.e. > 20)の点だけを選んでくると、ミューオンのトラック周りに固まって分布。
- タンク内で止まってしまうような低エネルギーミューオンに対しては、赤色の点は少なく、再構成は難しそう。



INGRIDで用いている**鉄**でのCCQE反応で出てくるミューオンの運動エネルギーとZ軸との角度の相関

- たまたま手元にあったので、参考までに。
- 低エネルギーミューオン(200MeV ~ 400MeV)：Z軸との角度は40 ~ 80度
  - 反応位置によるが、角度が大きいものはタンク内での飛行距離が短く、止まる割合も少ない。

- PMTの色のグラデーションについて
  - 今回、えいやで20p.e.以上は赤色一色にてしまったが、20p.e.以上の光量がでるPMTの数も多く、30p.e., 40p.e. と光量の差も見られる。
    - グラデーションの分け方を変更して、20p.e.以上の領域でも光量の差がわかるようにする。

- ミューオンを様々な条件で打ち込んで、イベントディスプレイを確認するのも大事だが、実際のニュートリノ反応でどう見えるかも大事。
  - ニュートリノ反応で出てくるミューオンの運動量・角度に対して、どれだけ反応点を再構成できるか。