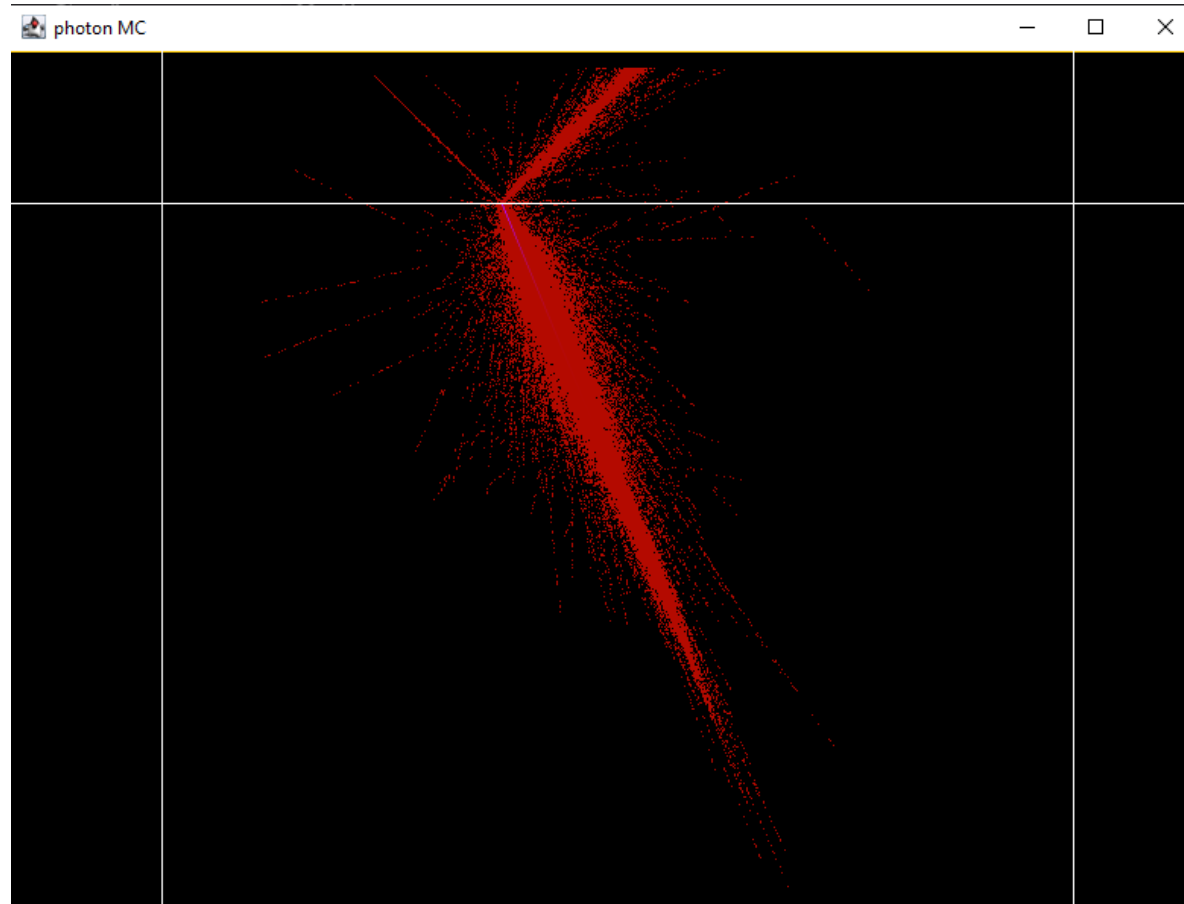


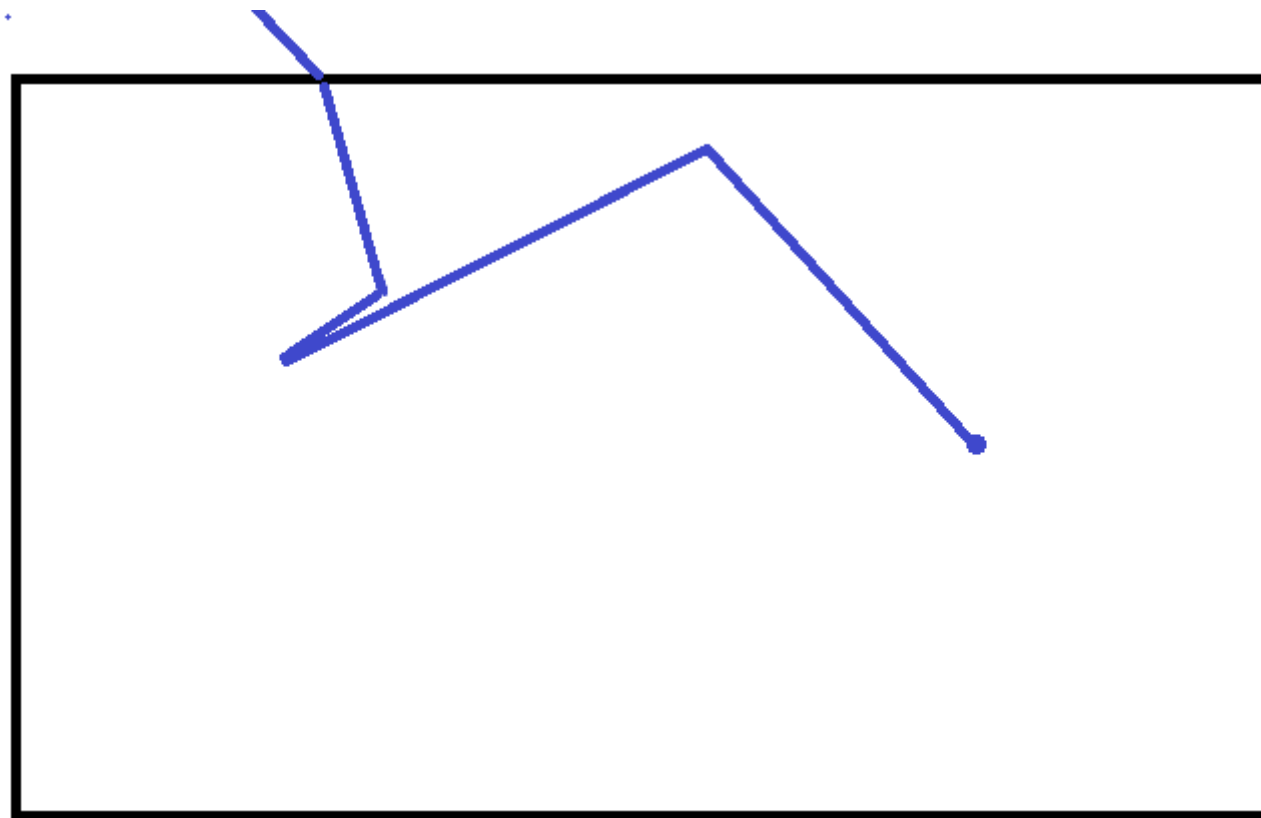
Wyznaczanie rozkładu przestrzennego wiązki fotonowej w materiale częściowo przezroczystym metodą Monte Carlo



Opiekun projektu : dr hab inż. Tomasz Chwiej

Przygotował: Jan Król - Łęgowski

Idea projektu

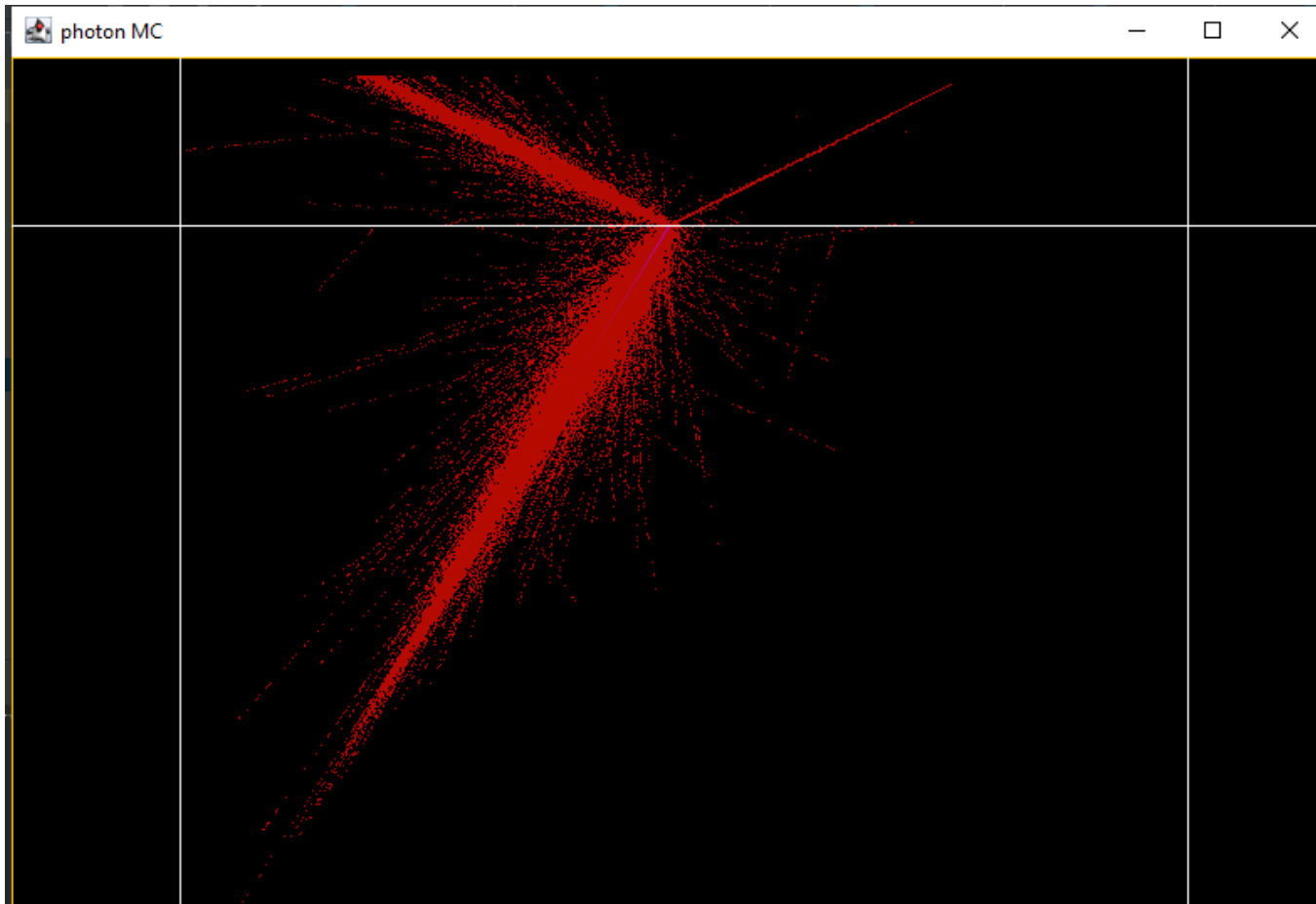


Absorpcja i rozproszenie

```
public class Photon {  
    double wage;  
    Point pos;  
    Point Uvector;  
    Point StatVector;  
    Medium medium;  
    boolean alive;  
}
```

```
public class Medium {  
    double Ua;  
    double Us;  
    double Ut;  
    double g;  
    double n;  
}
```

Absorpcja

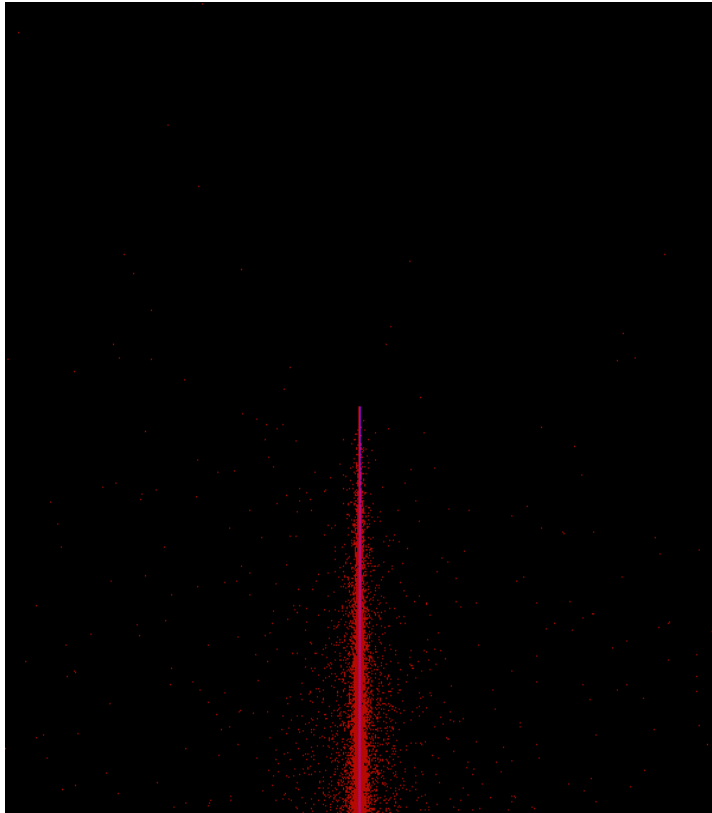


$$\Delta W = \frac{\mu_a}{\mu_e + \mu_s}$$

```
public void wageUpdate(){  
    this.wage -= medium.Ua / medium.Ut;  
}
```

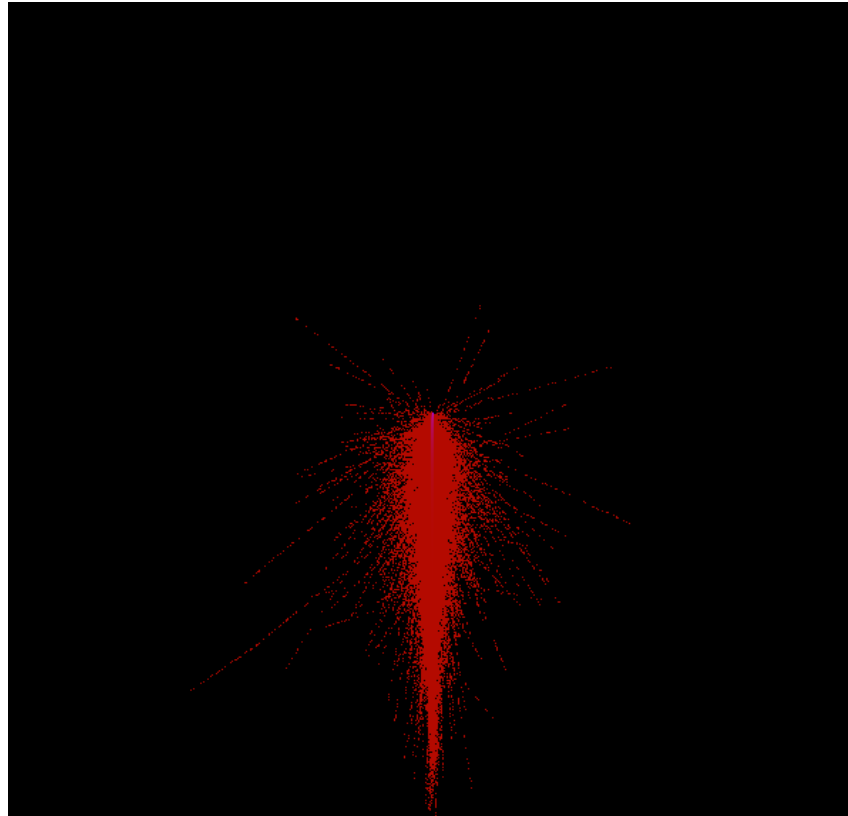
```
public void wageRoulette(double border){  
    Random rand = new Random();  
    if(rand.nextDouble() < border)  
        this.alive = false;  
    else  
        this.wage = this.wage * 1/border;  
}
```

Absorpcja



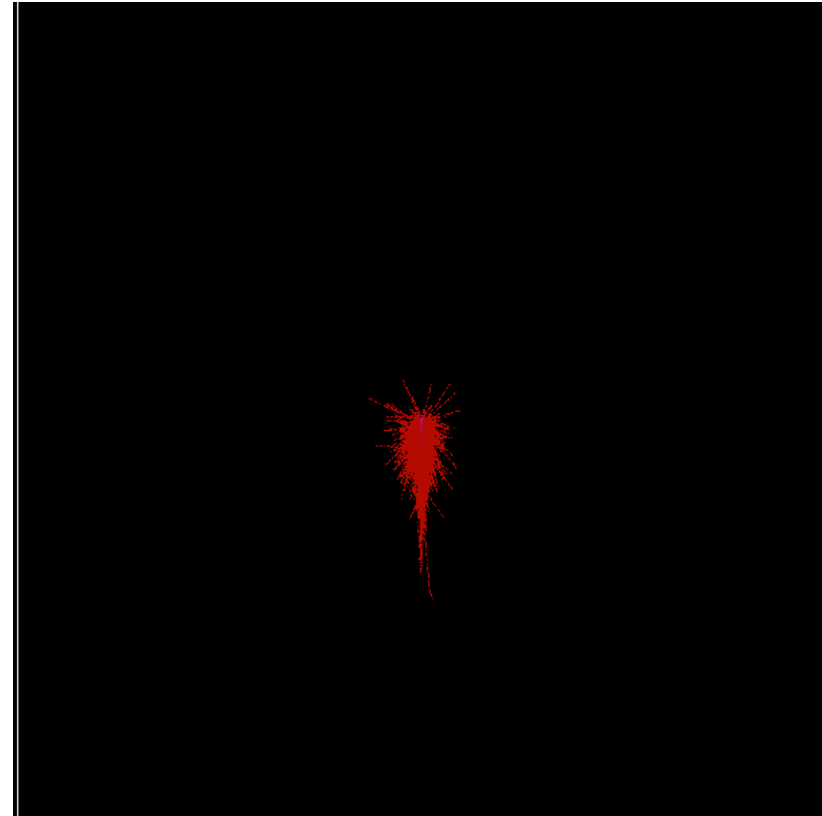
Ua1

<<



Ua2

<<



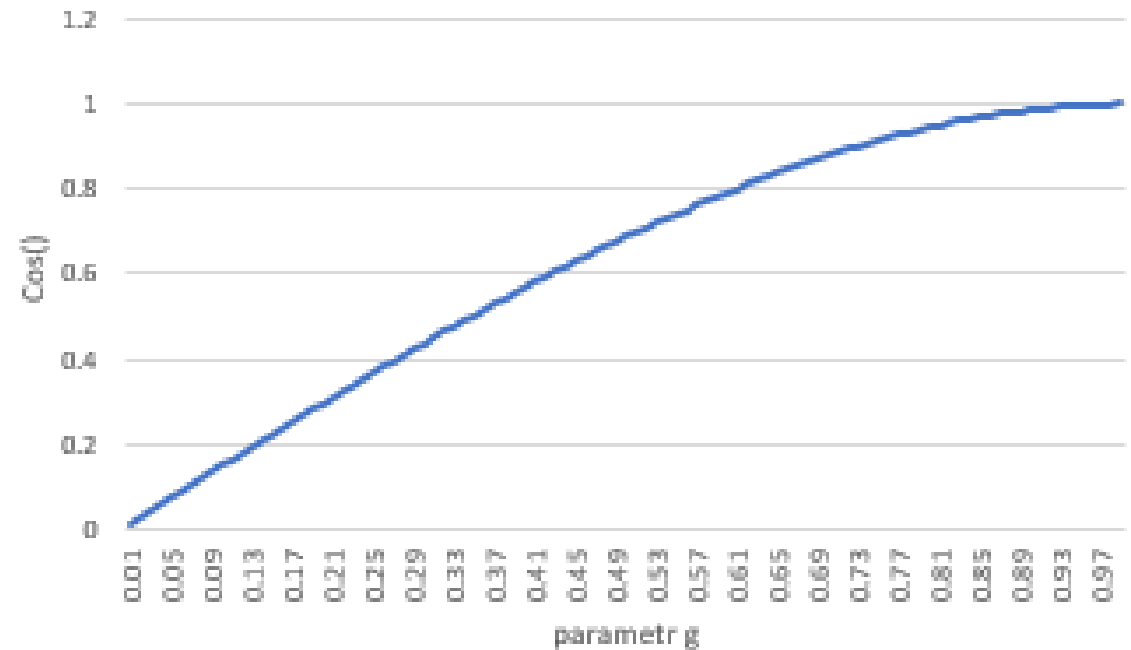
Ua3

Rozpraszanie

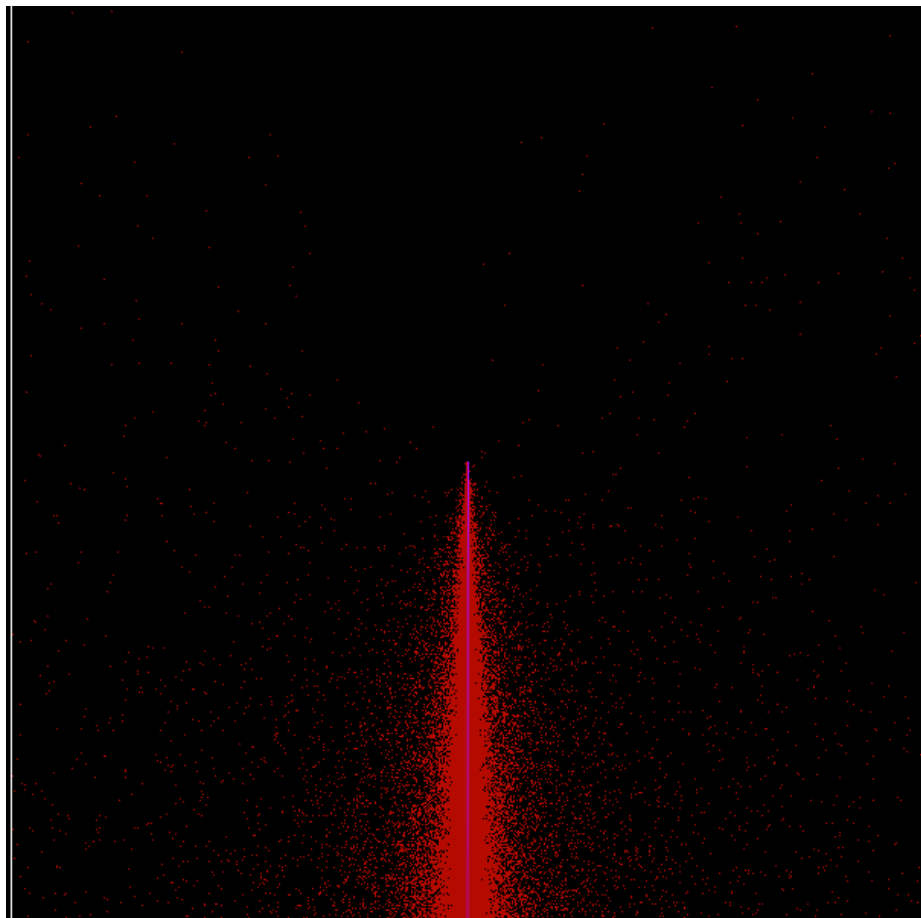
$$s = \frac{-\ln(U)}{Ut}$$

$$U \in (0, 1.0)$$

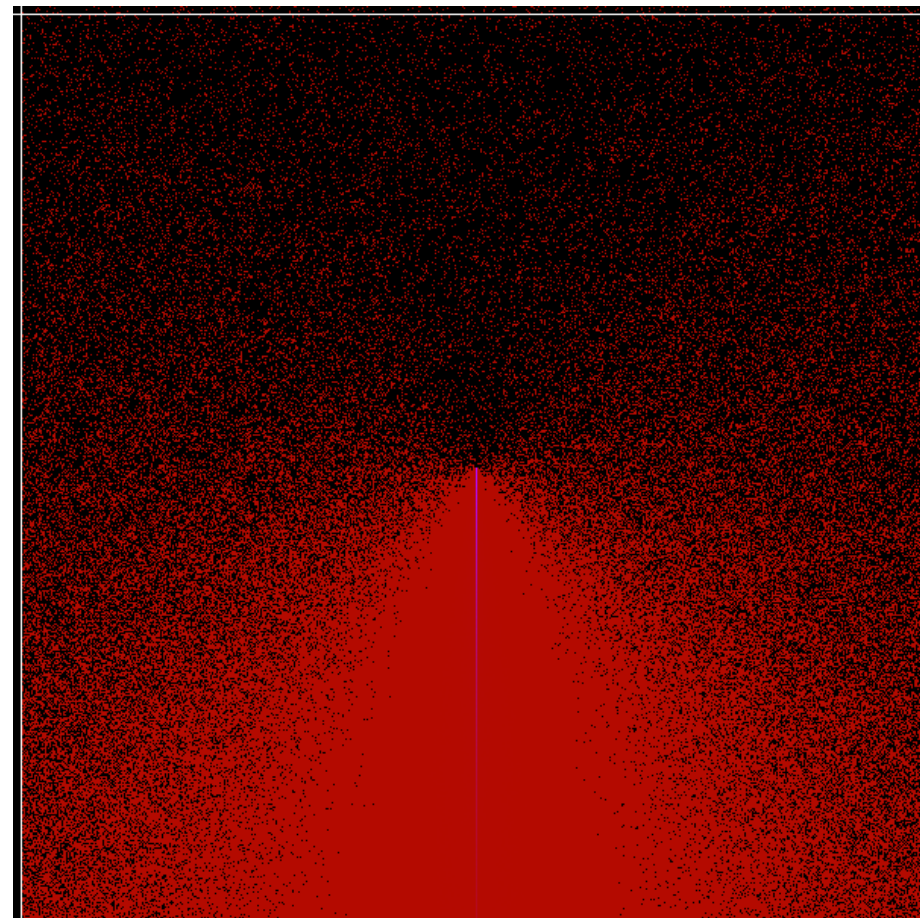
$$\cos(\Theta) = \frac{1}{2g} \left(1 + g^2 - \left(\frac{1 - g^2}{1 - g + 2g \cdot U} \right)^2 \right)$$



Rozpraszanie

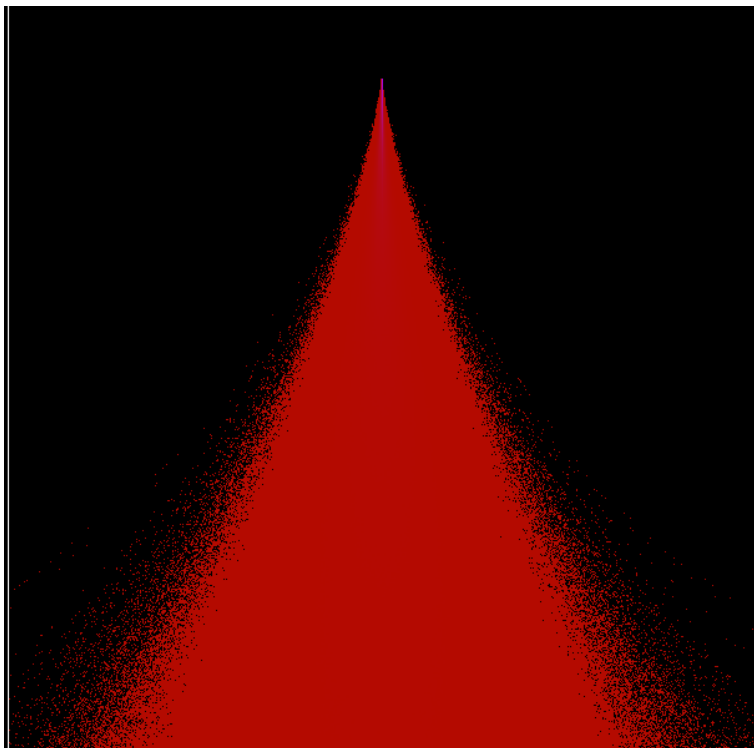


$g=0.999$

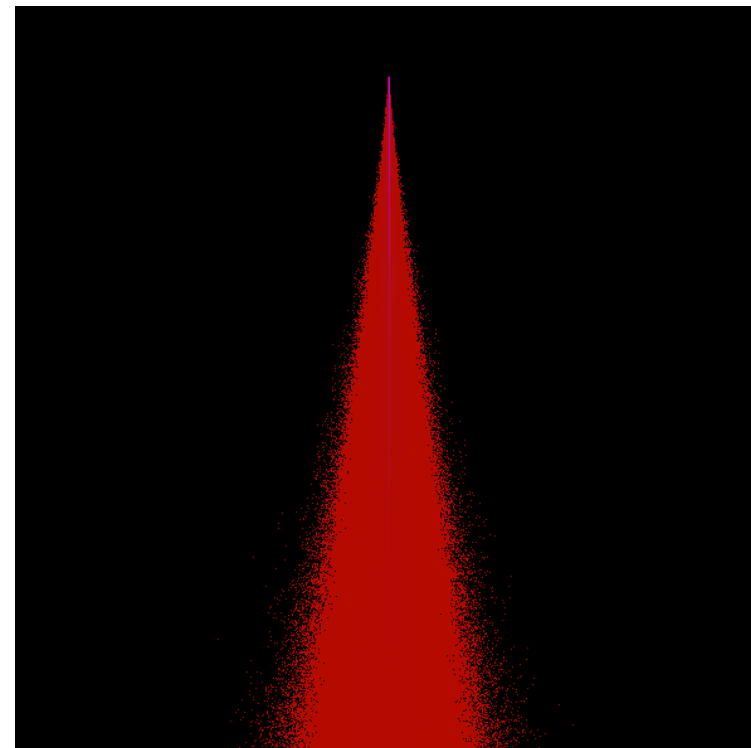


$g=0.8$

Rozpraszanie

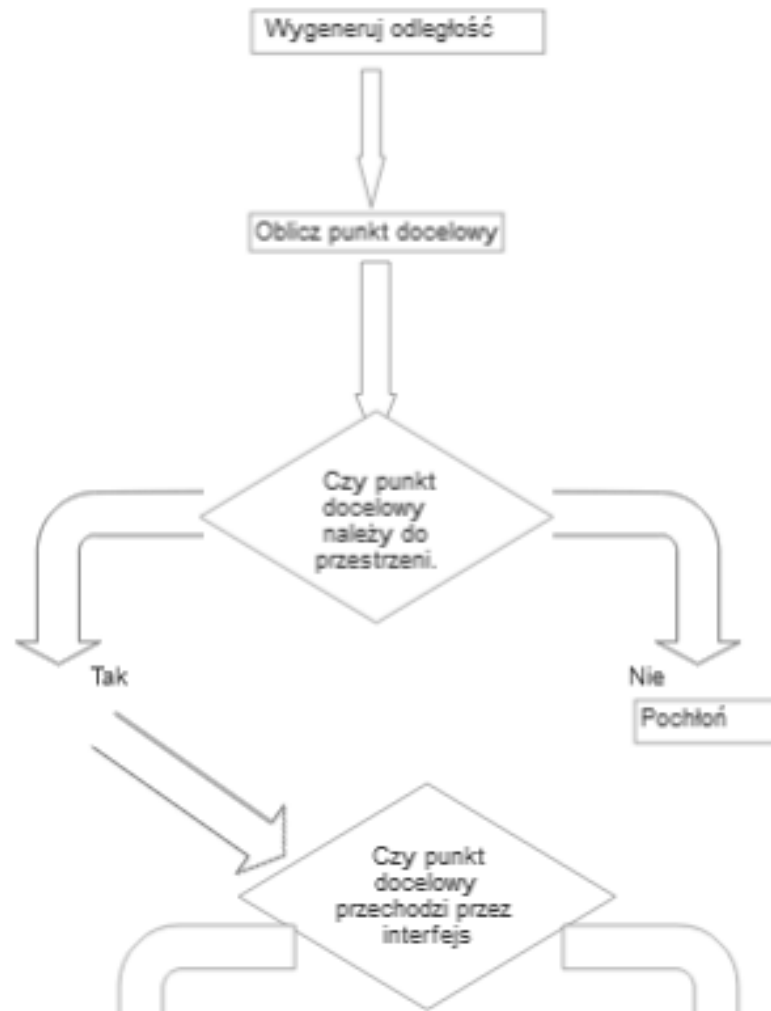


$U_s = 30$

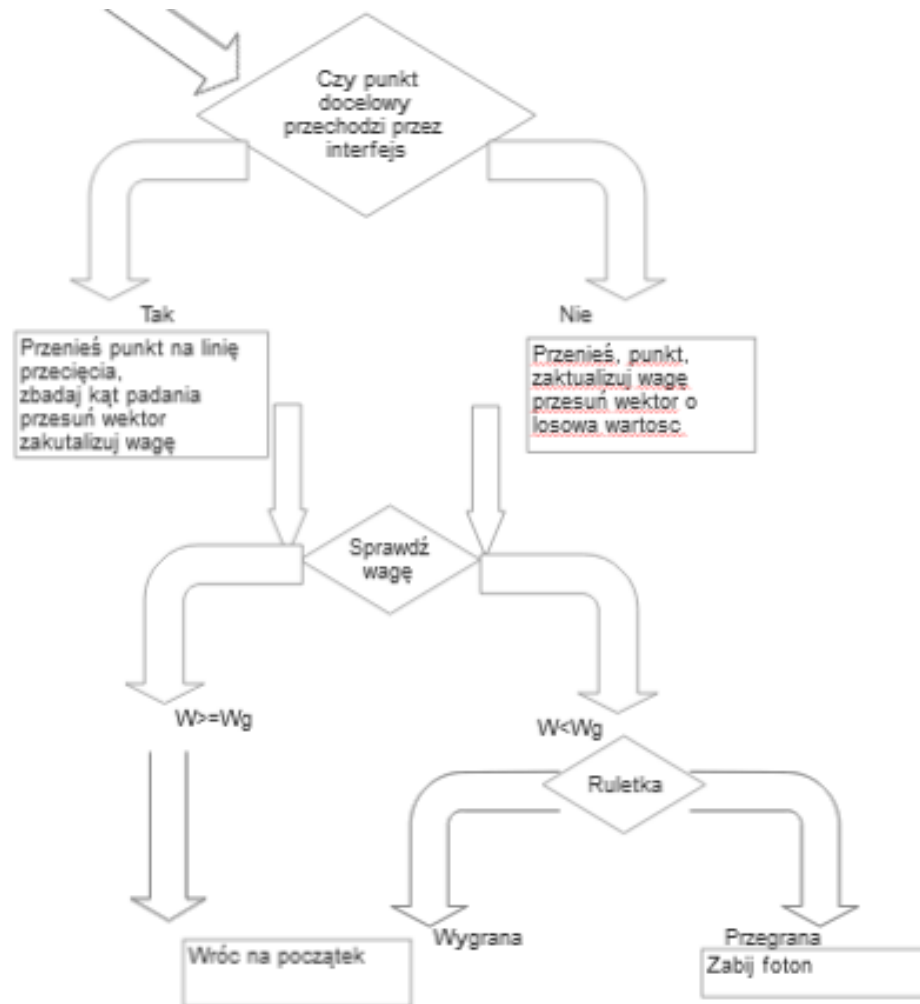


$U_s = 3$

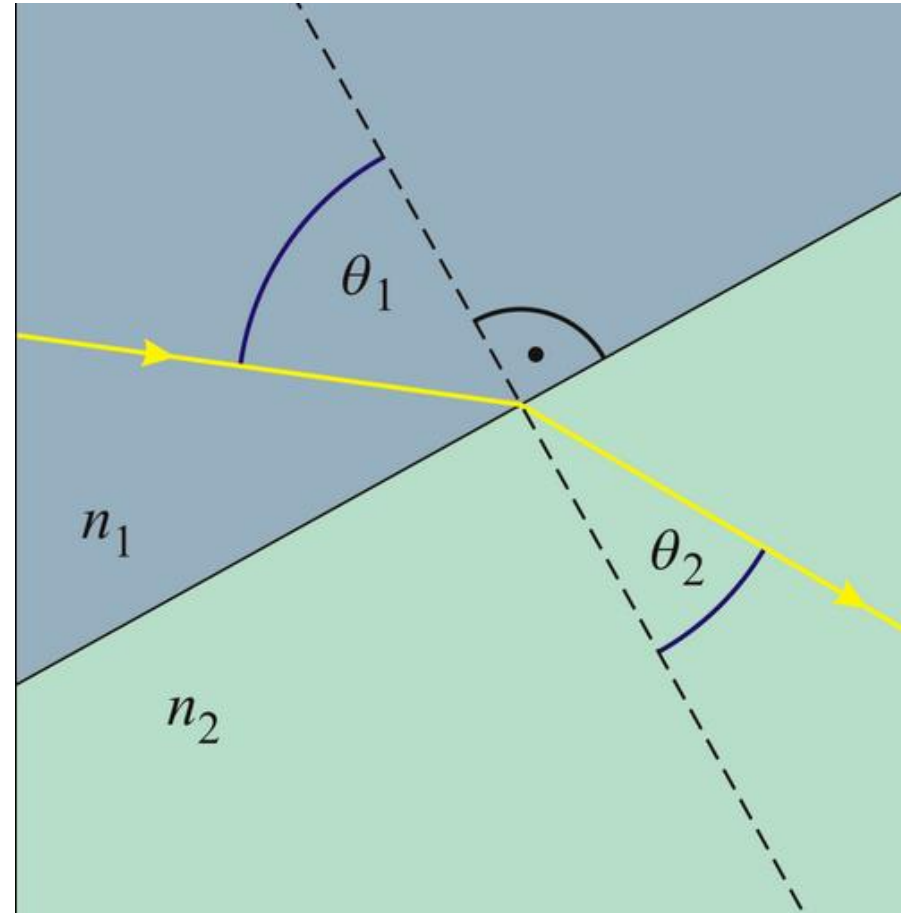
Algorytm



Algorytm



Przejście przez Interfejs - Prawo Snelliusa



$$\frac{\sin \theta_1}{\sin \theta_2} = \frac{n_2}{n_1}$$

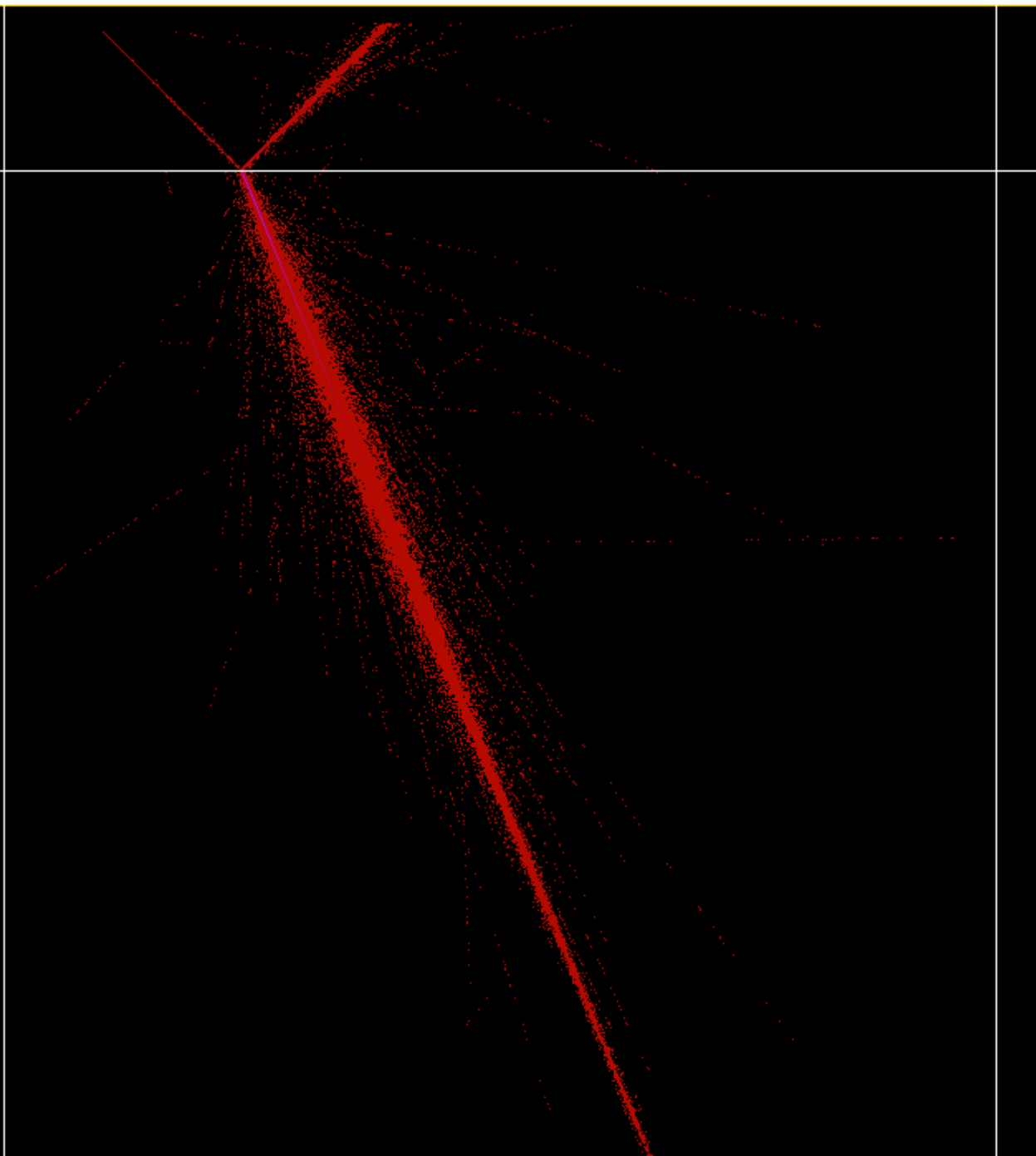
Odbicie częściowe na granicy dwóch obszarów

$$R(\alpha) = \frac{1}{2} \left(\frac{\sin^2(\alpha - \beta)}{\sin^2(\alpha + \beta)} + \frac{\operatorname{tg}^2(\alpha - \beta)}{\operatorname{tg}^2(\alpha + \beta)} \right)$$

$$U \in (0, 1.0)$$

$U \leq R(\alpha)$ – odbicie

$U > R(\alpha)$ – wiązka przechodzi

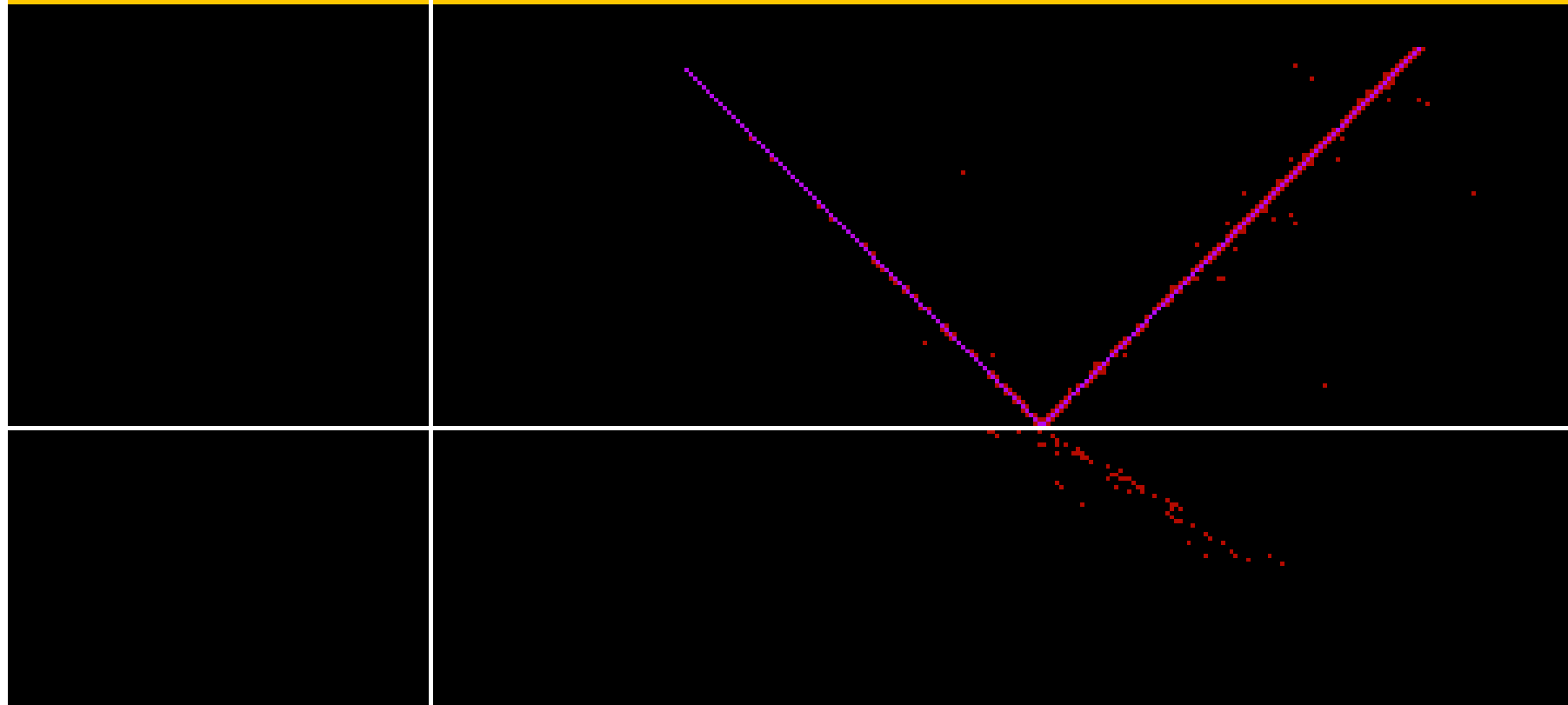


```
( ua: 1, us: 1, g: 0.99999, n: 1)
```

```
( ua: 20, us: 100, g: 0.99999, n: 2)
```

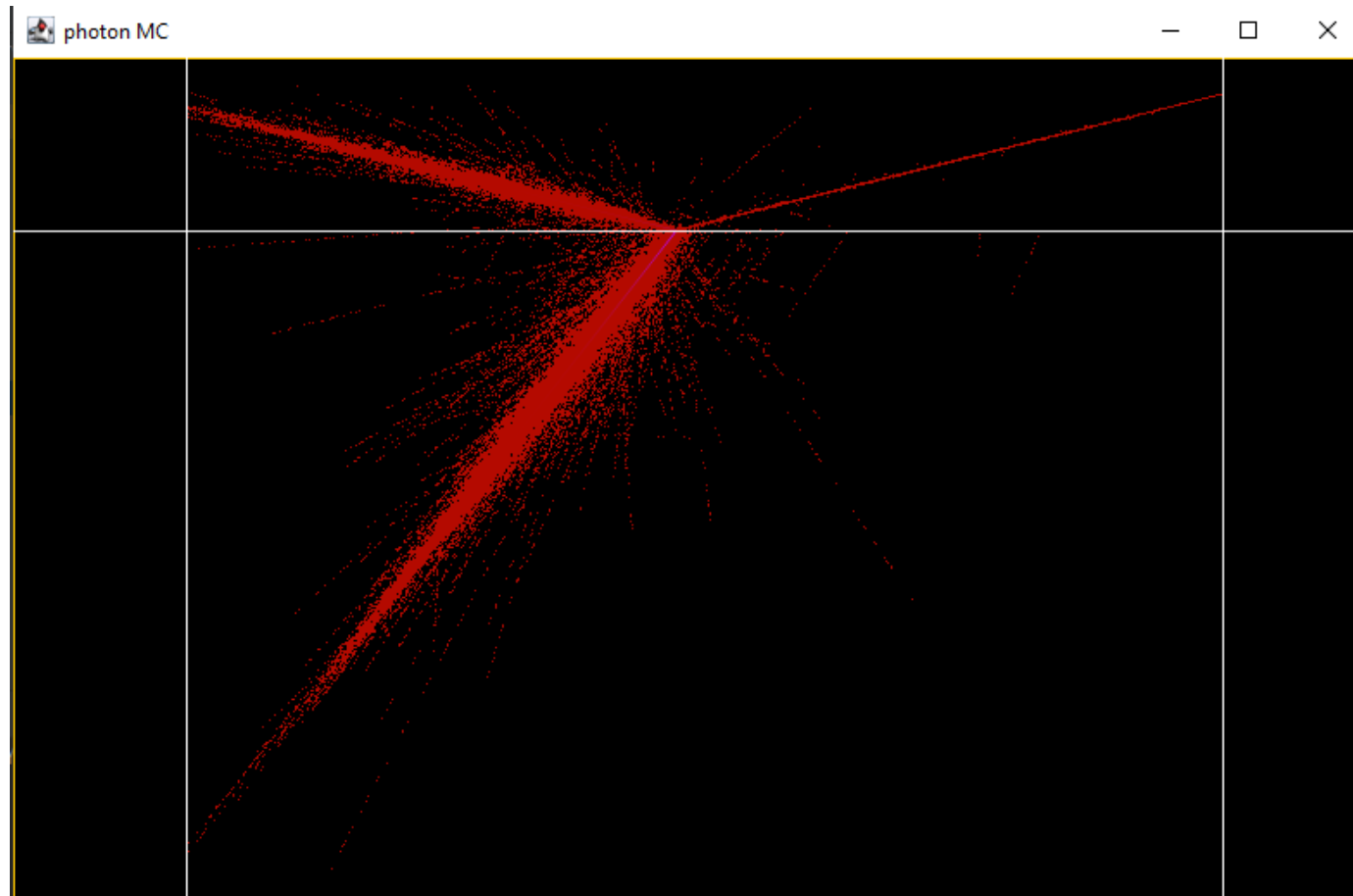


photon MC



$$N1 > N2$$

Dziękuję za uwagę



<https://github.com/PanJanke/FIS-summer-school---2D-photon-path-prediction>