```
(* Geometrical efficiency *)
(* Angle detector:*)
d = 1.0;
l = 2 * 0.15; (* half the length of the bars *)
w = 0.045; (* width of the scintillators *)
s = 0.005; (* spacing between scintillators 0.045 *)
angledet = {};
deltaangledet = 2 ArcTan[w / (2 * d)] * 180 / Pi;
deltaanglespace = 2 ArcTan[s / (2 * d)] * 180 / Pi;
anglein = 5;
Do[
  angleout = anglein + deltaangledet;
  AppendTo[angledet, {anglein, angleout}];
  angleout = angleout + deltaanglespace;
  anglein = angleout;
  , {i, 1, 24}
 ];
angledet
angledet[[12, 2]]
```

{{5, 7.57788}, {7.86435, 10.4422}, {10.7287, 13.3066}, {13.5931, 16.1709},
 {16.4574, 19.0353}, {19.3218, 21.8996}, {22.1861, 24.764}, {25.0505, 27.6283},
 {27.9148, 30.4927}, {30.7792, 33.3571}, {33.6435, 36.2214}, {36.5079, 39.0858},
 {39.3722, 41.9501}, {42.2366, 44.8145}, {45.1009, 47.6788}, {47.9653, 50.5432},
 {50.8297, 53.4075}, {53.694, 56.2719}, {56.5584, 59.1362}, {59.4227, 62.0006},
 {62.2871, 64.8649}, {65.1514, 67.7293}, {68.0158, 70.5937}, {70.8801, 73.458}}

39.0858

```
180 - angledet[[24, 2]]
```

106.542

```
(* Isotropic neutron distribution *)
det = 0;
listalpha = {};
Do[
 thet = ArcCos[2 Random[] - 1];
 phy = 2 Pi * Random[];
 z = d Sin[thet] Cos[phy] / Sqrt[Cos[thet]^2 + Sin[thet]^2 Sin[phy]^2];
 x2 = Sin[thet] Sin[phy];
 x3 = Cos[thet];
 alpha = If[x2 ≥ 0 && x3 ≥ 0, ArcTan[x2 / x3] * 180 / Pi,
   If[x2 ≥ 0 && x3 < 0, 180 - ArcTan[x2 / (-x3)] * 180 / Pi,
     If[x2 < 0 && x3 < 0, 180 + ArcTan[x2 / x3] * 180 / Pi,
       If[x2 < 0 && x3 >= 0, 360 - ArcTan[(-x2) / x3] * 180 / Pi
        ]
       ]
      ]
     ];
 AppendTo[listalpha, alpha];
 If[z < 1 / 2 && z > -1 / 2,
  Do[
    If[alpha > angledet[[i, 1]] && alpha ≤ angledet[[i, 2]],
      det ++];
     , {i, 1, 24}
    ];
 ];
 (*Print[z," ", alpha];*)
 , {j, 1, 10 000}
]
det / 10 000 * 100.0
```

2.72

```
listalpha[]
```

{212.144, 79.5595, 214.908, 101.05, 166.222,
  304.208, 132.814, 47.6167, 331.67, ··· 9982 ··· , 224.864, 75.6914,
  21.5393, 346.816, 217.772, 123.948, 102.439, 251.096, 296.285}[ ]

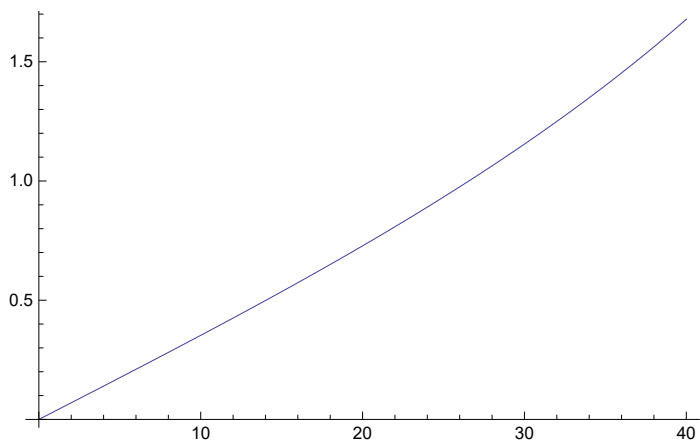large output   **show less**   **show more**   **show all**   **set size limit...**

```
d = 2;
Plot[d Tan[th * Pi / 180], {th, 0, 40}]
```



```
(* calculating the geometrical efficiency *)
d = 1;
l = 2 * 0.15; (* half the length of the bars *)
w = 0.045; (* width of the scintillators *)
s = 0.045; (* spacing between scintillators *)
effi = {};
Do[
  r = N[d Tan[the * Pi / 180]];
  (*Print[the," ",r];*)
  eff = 0;
  Do[
    phy = 360 * Random[];
    If[Abs[r Sin[phy * Pi / 180]] < l,
      Do[
        If[
          Abs[r Cos[phy * Pi / 180]] > s * (det - 1) + w * (det - 1) &&
            Abs[r Cos[phy * Pi / 180]] < s * (det - 1) + w * det, eff = eff + 1;
        ]
        , {det, 1, 12, 1}
      ]
    ];
    , {i, 1, 10 000, 1}
  ]
  AppendTo[effi, {the, eff}];
  , {the, 1, 40, 1}
]

effi3 = effi;
```

ListPlot[{effi1, effi2, effi3}, Joined → True, PlotStyle → Thick]
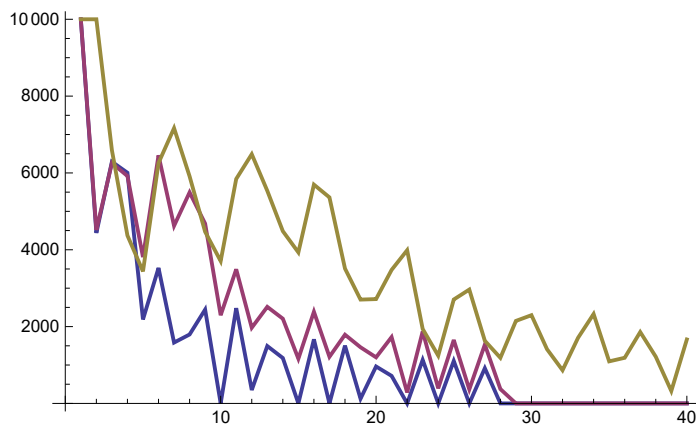
effi1

{{1, 10 000}, {2, 4438}, {3, 6292}, {4, 6005}, {5, 2186}, {6, 3527}, {7, 1584},
 {8, 1795}, {9, 2443}, {10, 0}, {11, 2480}, {12, 349}, {13, 1494}, {14, 1182},
 {15, 0}, {16, 1668}, {17, 0}, {18, 1505}, {19, 123}, {20, 962}, {21, 717}, {22, 0},
 {23, 1133}, {24, 0}, {25, 1106}, {26, 0}, {27, 916}, {28, 0}, {29, 0}, {30, 0}, {31, 0},
 {32, 0}, {33, 0}, {34, 0}, {35, 0}, {36, 0}, {37, 0}, {38, 0}, {39, 0}, {40, 0}}

effi2

{{1, 10 000}, {2, 4517}, {3, 6257}, {4, 5920}, {5, 3809}, {6, 6459}, {7, 4623}, {8, 5494},
 {9, 4681}, {10, 2296}, {11, 3492}, {12, 1971}, {13, 2514}, {14, 2206}, {15, 1164},
 {16, 2387}, {17, 1214}, {18, 1789}, {19, 1462}, {20, 1200}, {21, 1727}, {22, 285},
 {23, 1874}, {24, 392}, {25, 1652}, {26, 366}, {27, 1532}, {28, 374}, {29, 0}, {30, 0},
 {31, 0}, {32, 0}, {33, 0}, {34, 0}, {35, 0}, {36, 0}, {37, 0}, {38, 0}, {39, 0}, {40, 0}}