```
In[ ]:= Clear["Global`*"]
```
クリア

Initial Value

```
In[ ]:= L = 80;(*km*)
bit = 25;
λ = 1.55 * 10^-6;(*m*)
d = 16;(*ps/km･nm*)
c = 3 * 10^8;
β2 = d/(2 * Pi * c) λ^2 * 10^-3;
nm = 3.96;(*電気信号の実効屈折率*)
ng = 2.19;(*光波の群屈折率*)
c = 3 * 10^8;
y = 38.25 * 10^-3;(*mm*)
t[l_] := l/c * (nm + ng);(*s*)
total = t[y];
initial = 1000;
pitch = 50 * 10^-6;(*um*)
pitchmm = pitch * 10^3;
Δt = pitch * (nm + ng) / (3 * 10^8);
sumw = (total + Δt * initial) / Δt ;
polnumber = 1 + IntegerPart[sumw] - initial;
```
整数部分
```
electrodelength = N[pitch * polnumber];
```
数値
```
electrodelengthmm = electrodelength * 10^3;
Print[β2, "ps^2/km"]
```
出力表示
```
Print[total * 10^12, "ps"]
```
出力表示
```
Print[Δt * 10^12, "ps"]
```
出力表示
```
Print[sumw, "point"]
```
出力表示
```
Print["Rev pattern is", polnumber, "point"]
```
出力表示
```
Print["electrodelength is", electrodelength * 10^3, "mm"]
```
出力表示
```
Print[electrodelengthmm, "mm"]
```
出力表示

$2.03931 \times 10^{-23} \mathrm{ps}^2/\mathrm{km}$

784.125ps

1.025ps

1765.point

Rev pattern is765point

electrodelength is38.25mm

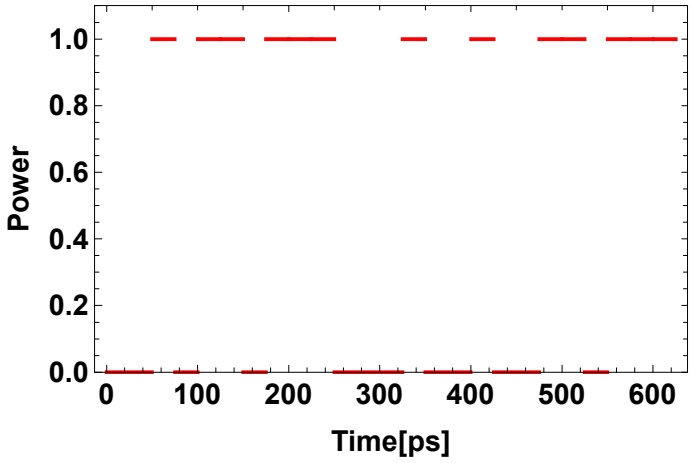
38.25mm

Product Random NRZ Signal

```
In[ ]:= (*For[i=1;j=0,i≤bit,i++,
          繰返し評価
          For[m=j;random=RandomChoice[{0,1}],j≤m+1,j=j+1,digital[j]=random]]
          繰返し評価          ランダムな選択

         rm=Table[digital[t],{t,1,bit}]*)
            リストを作成
digital[1] = 0;
digital[2] = 1;
digital[3] = 0;
digital[4] = 1;
digital[5] = 1;
digital[6] = 0;
digital[7] = 1;
digital[8] = 1;
digital[9] = 1;
digital[10] = 0;
digital[11] = 0;
digital[12] = 0;
digital[13] = 1;
digital[14] = 0;
digital[15] = 0;
digital[16] = 1;
digital[17] = 0;
digital[18] = 0;
digital[19] = 1;
digital[20] = 1;
digital[21] = 0;
digital[22] = 1;
digital[23] = 1;
digital[24] = 1;
digital[25] = 1;

rm = Table[digital[t], {t, 1, bit}]
     リストを作成
step1[t_, i_] := If[digital[i] == 1, If[i * 25 * 10^-12 < t < (i + 1) * 25 * 10^-12, 1, 0],
                    If文                  If文
  If[i * 25 * 10^-12 < t < (i + 1) * 25 * 10^-12, 0, 0]]
  If文

signal[t_] := signal[t] = Sum[step1[t, i], {i, 1, bit}]

Plot[signal[t * 10^-12], {t, 0, bit * 25}, PlotStyle → {Red, Thick},
プロット                                  プロットスタイル  赤   太い
 Frame → True, FrameLabel → {"Time[ps]", "Power"},
 枠      真     枠ラベル                   ベキ
 BaseStyle → {Bold, FontSize → 15}, PlotRange → {0, 1.1}]
 ベーススタイル      太字  フォントサイズ       プロット範囲
```

Out[ ]= {0, 1, 0, 1, 1, 0, 1, 1, 1, 0, 0, 0, 1, 0, 0, 1, 0, 0, 1, 1, 0, 1, 1, 1, 1}

Out[ ]=



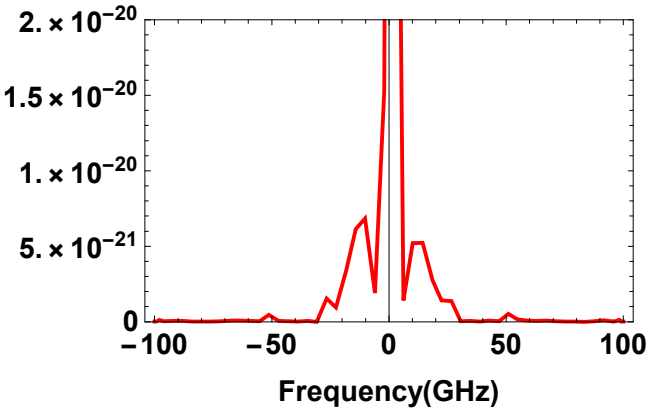
In[ ]:=
$$\int_0^{bit*25*10^{-12}} signal[t1] * e^{-i*2*Pi*f*t1}\, dt1$$

Out[ ]=
$$-\frac{1}{2\,f\,\pi}\,i\,e^{-\frac{i\,f\,\pi}{800000000}}\left(-1+e^{\frac{i\,f\,\pi}{20000000000}}\right)\left(1+e^{\frac{i\,f\,\pi}{20000000000}}+e^{\frac{i\,f\,\pi}{10000000000}}+e^{\frac{i\,f\,\pi}{5000000000}}+e^{\frac{i\,f\,\pi}{4000000000}}+e^{\frac{i\,f\,\pi}{2500000000}}+e^{\frac{11\,i\,f\,\pi}{20000000000}}+e^{\frac{3\,i\,f\,\pi}{4000000000}}+e^{\frac{i\,f\,\pi}{1250000000}}+e^{\frac{17\,i\,f\,\pi}{20000000000}}+e^{\frac{19\,i\,f\,\pi}{20000000000}}+e^{\frac{i\,f\,\pi}{1000000000}}+e^{\frac{11\,i\,f\,\pi}{10000000000}}\right)$$

In[ ]:=
```
fc[f_] :=
 -1/(2 f π) i e^(-i f π/800000000) (-1 + e^(i f π/20000000000)) (1 + e^(i f π/20000000000) + e^(i f π/10000000000) + e^(i f π/5000000000) + e^(i f π/4000000000) + e^(i f π/2500000000) +
   e^(11 i f π/20000000000) + e^(3 i f π/4000000000) + e^(i f π/1250000000) + e^(17 i f π/20000000000) + e^(19 i f π/20000000000) + e^(i f π/1000000000) + e^(11 i f π/10000000000))
```

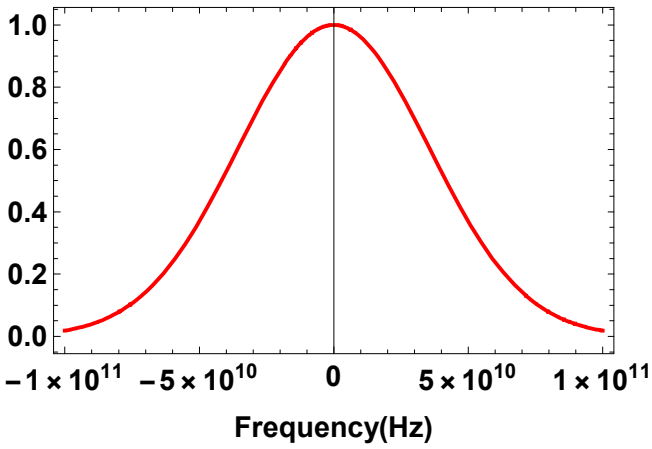
In[ ]:=
```
Plot[(Re[fc[f * 10^9]]^2 + Im[fc[f * 10^9]]^2), {f, -100, 100},
 プロット
 PlotStyle → {Red, Thick}, Frame → True, FrameLabel → {"Frequency(GHz)",},
             赤   太い      枠      真     枠ラベル
 BaseStyle → {Bold, FontSize → 15}, PlotRange → {0, 20 * 10^-21}]
 ベーススタイル   太字   フォントサイズ      プロット範囲
```

Out[ ]=



In[ ]:=
```
mado[f_] := e^-(f*10^-10.7)^2
Plot[mado[f], {f, -100 * 10^9, 100 * 10^9}, PlotStyle → {Red, Thick}, Frame → True,
 FrameLabel → {"Frequency(Hz)",}, BaseStyle → {Bold, FontSize → 15}]
```
プロット　プロットスタイル　赤　太い　枠　真　枠ラベル　ベーススタイル　太字　フォントサイズ

Out[ ]=



In[ ]:=
```
For[i = 1, i ≤ 1200, i++, sinsper1[i] = Re[fc[i * 10^8]] * mado[i * 10^8]]
```
繰返し評価　実部

```
For[i = 1, i ≤ 1200, i++, sinspei1[i] = Im[fc[i * 10^8]] * mado[i * 10^8]]
```
繰返し評価　複素数の虚部

```
sig[t_] := sig[t] =
 (Sum[sinsper1[i] * Cos[2 * Pi * i * 10^8 * t], {i, 1, 1200}] + Sum[sinspei1[i] * Sin[-2 * Pi * i * 10^8 * t], {i, 1, 1200}])
```
余弦　円周率　正弦　円周率

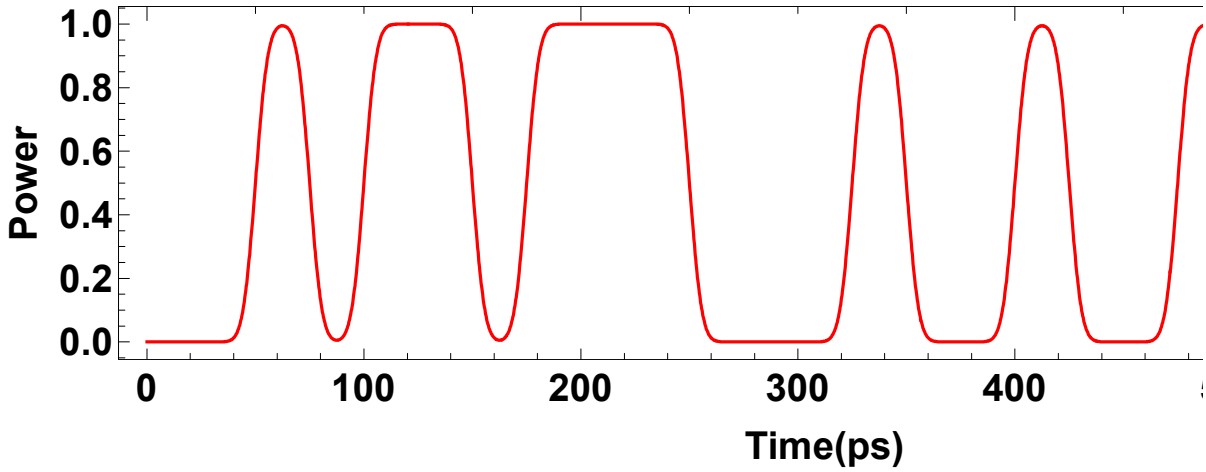
In[ ]:=
```
minnrz = -MinValue[sig[x1 * 10^-12], x1];
```
最小値

```
maxnrz = MaxValue[sig[x] + minnrz, x];
```
最大値

```
nrzsig[t_] := (sig[t] + minnrz) / maxnrz;
```

```
In[ ]:= Plot[nrzsig[t * 10^-12], {t, 0, bit * 25}, Frame → True, FrameLabel → {"Time(ps)", "Power"},
        PlotStyle → {Red}, BaseStyle → {FontSize → 20, Red, FontWeight → Bold},
        LabelStyle → {GrayLevel[0], Bold}, AspectRatio -> 1 / 4, ImageSize → 800]
```

Out[ ]=



Function for Compensation Fiber Dispersion

```
In[ ]:= (*f[x_]:=1/2 ( 1/Sqrt[2*Pi*β2*60] *10^6*Exp[+i*( (t[x]*10^-3)^2/(2*β2*60) - Pi/4 )] +
        1/Sqrt[2*Pi*β2*80] *10^6*Exp[+i*( (t[x]*10^-3)^2/(2*β2*80) - Pi/4 )] );*)
```

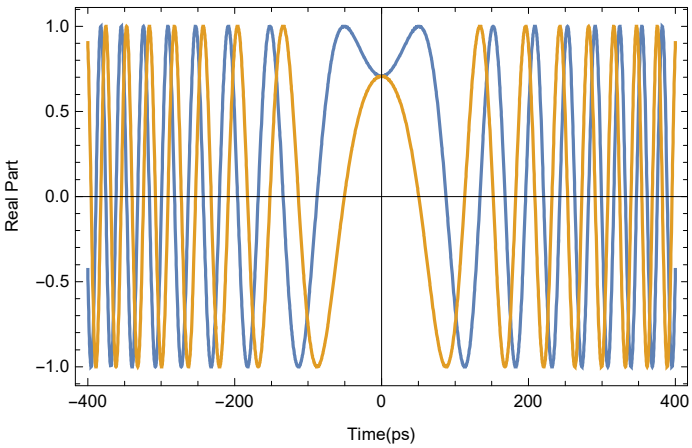
```
In[ ]:= (*FindMaximum[{Re@f[x1],{0<x1<10}},{x1,3}]*)
```

```
In[ ]:= (*max=9.87972350691273`*^15;
        Plot[Re@f[1]/max,{1,-electrodelengthmm/2,electrodelengthmm/2},
        Frame→True,FrameLabel→{"Length(mm)","Real Part"}]*)
```

Impulse Responce for Fiber Dispersion

In[ ]:=
```
hdis[t_] := (*1/Sqrt[2*Pi*β2*L]*10^6**)Exp[-i*(t^2/(2*β2*L) - Pi/4)];(*Impluse ver.time*)

(*FindMaximum[{Re@hdis[x1],{0<x1<10}},{x1,3}]
max=9.876974769287008`*^15;*)
Plot[{Re@hdis[t*10^-12], Im@hdis[t*10^-12]},
 {t, -400, 400}, Frame → True, FrameLabel → {"Time(ps)", "Real Part"}]
```

Out[ ]=



Impulse Responce for CompensationDispersion

In[ ]:=
```
(*hcmp[t_]:=1/2(1/Sqrt[2*Pi*β2*60]*10^6*Exp[+i*(t^2/(2*β2*60)-Pi/4)]+
 1/Sqrt[2*Pi*β2*80]*10^6*Exp[+i*(t^2/(2*β2*80)-Pi/4)]);*)
```

In[ ]:=
```
(*Plot[{Re@hcmp[t*10^-12],Im@hcmp[t*10^-12]},
 {t,-400,400},Frame→True,FrameLabel→{"Time(ps)","Real Part"}]*)
```

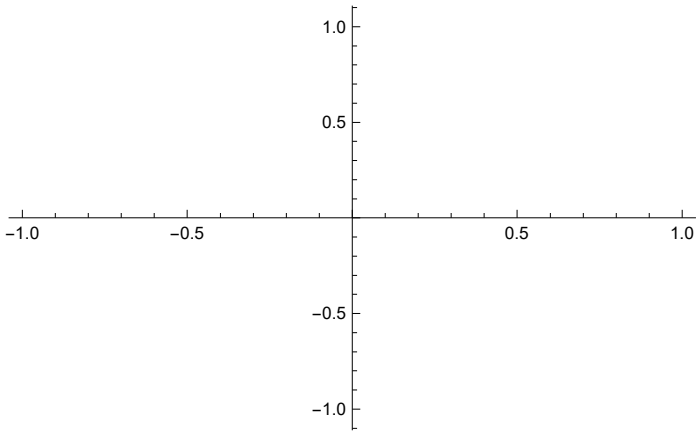
Sampling

In[ ]:=
```
samp = 0.5;(*sampling number*)
```

In[ ]:=
```
bound = IntegerPart[total * 10^12];
```

```
In[ ]:= (*For[i=-100000,i≤-bound/2,i=i+samp,hcmp2[i]=0]
          繰返し評価
        For[j=0;
        繰返し評価
          i=-bound/2,i≤bound/2,i=i+samp;
          j=j+samp,hcmp2[i]=hcmp[j*10^-12]]
        For[i=bound/2,i≤100000,i=i+samp,hcmp2[i]=0]*)
        繰返し評価

In[ ]:= (*IntegerPart[total*10^12]*)
          整数部分

In[ ]:= For[i = -100., i ≤ bit * 25 + 100, i = i + samp,
        繰返し評価
         nrzsig2[i] = nrzsig[i * 10^-12];
         If[Mod[i, 500] == 0, Print[i]]]
        If文 剰余                出力表示

        0.

        500.

In[ ]:= (*For[i=-100000,i≤-400,i=i+samp,hcmp3[i]=0]
          繰返し評価
        For[i=-400,i≤400,i=i+samp,hcmp3[i]=hcmp[i*10^-12]]
        繰返し評価
        For[i=400,i≤100000,i=i+samp,hcmp3[i]=0]*)
        繰返し評価

In[ ]:= For[i = -100000, i ≤ 100000, i = i + samp, hdis2[i] = hdis[i * 10^-12]]
        繰返し評価

In[ ]:= ListLinePlot[Table[{m, Im@hcmp3[m]}, {m, -400, 400, samp}]]
        折れ線グラフ(… リストを作成 複素数の虚部
```

Out[ ]=



Simulation

```
In[ ]:= simu1[a_] := simu1[a] = Sum[nrzsig2[t] * hdis2[a - t], {t, -100, 25 * bit + 100, samp}]
                                 総和
```

In[ ]:=
```
simu1[-100.]
```

Out[ ]=
```
24.0754 - 16.6179 i
```

In[ ]:=
```
For[i = -100., i ≤ 25 * bit + 100, i = i + samp, after[i] = simu1[i];
 繰返し評価
 If[Mod[i, 50] == 0, Print[i]]]
 If文 剰余  出力表示
```

```
-100.
-50.
0.
50.
100.
150.
200.
250.
300.
350.
400.
450.
500.
550.
600.
650.
700.
```

In[ ]:=
```
aftersig = Table[{m, Abs[after[m]]}, {m, -100, 25 * bit + 100, samp}]
           リストを作成  絶対値
```

Out[ ]=
```
{{-100., 29.2537}, {-99.5, 29.0662}, {-99., 28.8942}, {-98.5, 28.7349},
 {-98., 28.5858}, {-97.5, 28.4445}, {-97., 28.3087}, {-96.5, 28.1766},
 {-96., 28.0467}, {-95.5, 27.9177}, {-95., 27.7891}, {-94.5, 27.6606},
 {-94., 27.5324}, {-93.5, 27.4054}, {-93., 27.2808}, {-92.5, 27.1604},
 {-92., 27.0465}, {-91.5, 26.9416}, {-91., 26.8488}, {-90.5, 26.7717},
 {-90., 26.7138}, {-89.5, 26.6791}, {-89., 26.6715}, {-88.5, 26.6952}, {-88., 26.754},
 {-87.5, 26.8519}, {-87., 26.9923}, {-86.5, 27.1783}, {-86., 27.4128},
 {-85.5, 27.6978}, {-85., 28.035}, {-84.5, 28.4253}, {-84., 28.8691}, {-83.5, 29.366},
 {-83., 29.9151}, {-82.5, 30.5149}, {-82., 31.1633}, {-81.5, 31.8578},
 {-81., 32.5954}, {-80.5, 33.3727}, {-80., 34.186}, {-79.5, 35.0313}, {-79., 35.9042},
 {-78.5, 36.8004}, {-78., 37.7152}, {-77.5, 38.6437}, {-77., 39.5809},
 {-76.5, 40.5218}, {-76., 41.4613}, {-75.5, 42.394}, {-75., 43.3146}, {-74.5, 44.2179},
 {-74., 45.0986}, {-73.5, 45.9512}, {-73., 46.7706}, {-72.5, 47.5515}, {-72., 48.289},
 {-71.5, 48.9782}, {-71., 49.6144}, {-70.5, 50.1932}, {-70., 50.7105},
 {-69.5, 51.1625}, {-69., 51.5459}, {-68.5, 51.8579}, {-68., 52.0961},
 {-67.5, 52.2589}, {-67., 52.345}, {-66.5, 52.3542}, {-66., 52.287}, {-65.5, 52.1445},
 {-65., 51.9291}, {-64.5, 51.6439}, {-64., 51.2931}, {-63.5, 50.882}, {-63., 50.4172},
 {-62.5, 49.9061}, {-62., 49.3578}, {-61.5, 48.7821}, {-61., 48.1902},
 {-60.5, 47.5943}, {-60., 47.0076}, {-59.5, 46.4441}, {-59., 45.9181},
```

{-58.5, 45.4442}, {-58., 45.0369}, {-57.5, 44.7098}, {-57., 44.4754},
{-56.5, 44.3443}, {-56., 44.3252}, {-55.5, 44.4238}, {-55., 44.643}, {-54.5, 44.9823},
{-54., 45.4384}, {-53.5, 46.0048}, {-53., 46.6723}, {-52.5, 47.4297}, {-52., 48.2638},
{-51.5, 49.1601}, {-51., 50.1034}, {-50.5, 51.0781}, {-50., 52.0687},
{-49.5, 53.0598}, {-49., 54.0371}, {-48.5, 54.9866}, {-48., 55.8956},
{-47.5, 56.7526}, {-47., 57.5473}, {-46.5, 58.2705}, {-46., 58.9146},
{-45.5, 59.4735}, {-45., 59.9425}, {-44.5, 60.3185}, {-44., 60.5996},
{-43.5, 60.786}, {-43., 60.8791}, {-42.5, 60.882}, {-42., 60.7995}, {-41.5, 60.6379},
{-41., 60.4049}, {-40.5, 60.11}, {-40., 59.764}, {-39.5, 59.3789}, {-39., 58.9682},
{-38.5, 58.5461}, {-38., 58.1277}, {-37.5, 57.7287}, {-37., 57.3646},
{-36.5, 57.0511}, {-36., 56.8027}, {-35.5, 56.6329}, {-35., 56.5536},
{-34.5, 56.5743}, {-34., 56.7023}, {-33.5, 56.9417}, {-33., 57.2938},
{-32.5, 57.7569}, {-32., 58.3263}, {-31.5, 58.9945}, {-31., 59.7517},
{-30.5, 60.586}, {-30., 61.484}, {-29.5, 62.4311}, {-29., 63.4121}, {-28.5, 64.4114},
{-28., 65.4136}, {-27.5, 66.4035}, {-27., 67.3664}, {-26.5, 68.2886},
{-26., 69.1573}, {-25.5, 69.9605}, {-25., 70.6878}, {-24.5, 71.3295},
{-24., 71.8775}, {-23.5, 72.3248}, {-23., 72.6657}, {-22.5, 72.8957},
{-22., 73.0115}, {-21.5, 73.0112}, {-21., 72.8938}, {-20.5, 72.6596},
{-20., 72.31}, {-19.5, 71.8473}, {-19., 71.275}, {-18.5, 70.5972}, {-18., 69.8191},
{-17.5, 68.9465}, {-17., 67.9861}, {-16.5, 66.945}, {-16., 65.831}, {-15.5, 64.6522},
{-15., 63.4172}, {-14.5, 62.1348}, {-14., 60.8137}, {-13.5, 59.4632},
{-13., 58.0919}, {-12.5, 56.7087}, {-12., 55.3221}, {-11.5, 53.9401},
{-11., 52.5703}, {-10.5, 51.2197}, {-10., 49.8946}, {-9.5, 48.6006}, {-9., 47.3424},
{-8.5, 46.1239}, {-8., 44.9481}, {-7.5, 43.8171}, {-7., 42.7319}, {-6.5, 41.6932},
{-6., 40.7004}, {-5.5, 39.7525}, {-5., 38.8481}, {-4.5, 37.9851}, {-4., 37.1615},
{-3.5, 36.3748}, {-3., 35.623}, {-2.5, 34.9038}, {-2., 34.2158}, {-1.5, 33.5574},
{-1., 32.9281}, {-0.5, 32.3276}, {0., 31.7564}, {0.5, 31.2156}, {1., 30.707},
{1.5, 30.2329}, {2., 29.7963}, {2.5, 29.4004}, {3., 29.0488}, {3.5, 28.7453},
{4., 28.4935}, {4.5, 28.2971}, {5., 28.1591}, {5.5, 28.0822}, {6., 28.0684},
{6.5, 28.1188}, {7., 28.2337}, {7.5, 28.4124}, {8., 28.6537}, {8.5, 28.9552},
{9., 29.3138}, {9.5, 29.7261}, {10., 30.188}, {10.5, 30.6951}, {11., 31.2428},
{11.5, 31.8265}, {12., 32.4417}, {12.5, 33.0837}, {13., 33.7484}, {13.5, 34.4317},
{14., 35.1298}, {14.5, 35.8392}, {15., 36.5568}, {15.5, 37.2799}, {16., 38.0059},
{16.5, 38.7326}, {17., 39.4584}, {17.5, 40.1815}, {18., 40.9008}, {18.5, 41.6155},
{19., 42.3248}, {19.5, 43.0286}, {20., 43.7269}, {20.5, 44.42}, {21., 45.1086},
{21.5, 45.7937}, {22., 46.4766}, {22.5, 47.1591}, {23., 47.8432}, {23.5, 48.5311},
{24., 49.2257}, {24.5, 49.9297}, {25., 50.6465}, {25.5, 51.3794}, {26., 52.132},
{26.5, 52.9079}, {27., 53.711}, {27.5, 54.5446}, {28., 55.4124}, {28.5, 56.3174},
{29., 57.2625}, {29.5, 58.25}, {30., 59.2818}, {30.5, 60.3589}, {31., 61.4819},
{31.5, 62.6505}, {32., 63.8636}, {32.5, 65.1193}, {33., 66.4149}, {33.5, 67.7469},
{34., 69.1111}, {34.5, 70.5024}, {35., 71.9153}, {35.5, 73.3437}, {36., 74.7807},
{36.5, 76.2196}, {37., 77.6528}, {37.5, 79.0731}, {38., 80.4727}, {38.5, 81.8443},
{39., 83.1803}, {39.5, 84.4737}, {40., 85.7176}, {40.5, 86.9056}, {41., 88.0318},
{41.5, 89.0908}, {42., 90.0779}, {42.5, 90.9891}, {43., 91.8211}, {43.5, 92.5715},
{44., 93.2386}, {44.5, 93.8217}, {45., 94.3208}, {45.5, 94.7369}, {46., 95.0719},
{46.5, 95.3283}, {47., 95.5096}, {47.5, 95.6199}, {48., 95.664}, {48.5, 95.6472},
{49., 95.5756}, {49.5, 95.4553}, {50., 95.2929}, {50.5, 95.095}, {51., 94.8683},
{51.5, 94.6193}, {52., 94.3542}, {52.5, 94.079}, {53., 93.799}, {53.5, 93.5188},
{54., 93.2426}, {54.5, 92.9736}, {55., 92.7141}, {55.5, 92.4658}, {56., 92.2295},
{56.5, 92.0052}, {57., 91.7924}, {57.5, 91.5899}, {58., 91.3961}, {58.5, 91.2093},

{59., 91.0276}, {59.5, 90.8494}, {60., 90.6732}, {60.5, 90.4984}, {61., 90.3247},
{61.5, 90.153}, {62., 89.9853}, {62.5, 89.8246}, {63., 89.6755}, {63.5, 89.5437},
{64., 89.4366}, {64.5, 89.3627}, {65., 89.332}, {65.5, 89.3555}, {66., 89.4455},
{66.5, 89.6144}, {67., 89.8754}, {67.5, 90.2414}, {68., 90.7248}, {68.5, 91.3373},
{69., 92.0889}, {69.5, 92.9879}, {70., 94.0404}, {70.5, 95.2501}, {71., 96.6177},
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{560., 238.788}, {560.5, 237.341}, {561., 235.809}, {561.5, 234.193},
{562., 232.494}, {562.5, 230.713}, {563., 228.851}, {563.5, 226.909},
{564., 224.888}, {564.5, 222.787}, {565., 220.608}, {565.5, 218.35}, {566., 216.015},
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{575., 164.269}, {575.5, 161.267}, {576., 158.317}, {576.5, 155.427},
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{630.5, 134.756}, {631., 132.601}, {631.5, 130.398}, {632., 128.167},
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```
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{679.5, 82.3937}, {680., 81.7456}, {680.5, 81.127}, {681., 80.5199}, {681.5, 79.9059},
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{686., 71.4399}, {686.5, 69.9613}, {687., 68.3528}, {687.5, 66.6139},
{688., 64.7461}, {688.5, 62.7526}, {689., 60.6383}, {689.5, 58.4096},
{690., 56.0748}, {690.5, 53.6432}, {691., 51.126}, {691.5, 48.5356}, {692., 45.8856},
{692.5, 43.1915}, {693., 40.4698}, {693.5, 37.7391}, {694., 35.0196},
{694.5, 32.3341}, {695., 29.708}, {695.5, 27.1706}, {696., 24.7557},
{696.5, 22.5029}, {697., 20.4584}, {697.5, 18.6746}, {698., 17.2078},
{698.5, 16.1107}, {699., 15.4202}, {699.5, 15.1436}, {700., 15.2512},
{700.5, 15.6819}, {701., 16.3577}, {701.5, 17.1994}, {702., 18.1372},
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{704.5, 22.6832}, {705., 23.3828}, {705.5, 23.9826}, {706., 24.4781},
{706.5, 24.8674}, {707., 25.151}, {707.5, 25.3313}, {708., 25.4123},
{708.5, 25.3992}, {709., 25.2987}, {709.5, 25.1181}, {710., 24.8659},
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{712.5, 22.8628}, {713., 22.384}, {713.5, 21.9022}, {714., 21.4265}, {714.5, 20.965},
{715., 20.5249}, {715.5, 20.1118}, {716., 19.7303}, {716.5, 19.3831},
{717., 19.0712}, {717.5, 18.7942}, {718., 18.5501}, {718.5, 18.3355},
{719., 18.146}, {719.5, 17.9764}, {720., 17.821}, {720.5, 17.6739}, {721., 17.5293},
{721.5, 17.3816}, {722., 17.2259}, {722.5, 17.0578}, {723., 16.8736},
{723.5, 16.6705}, {724., 16.4464}, {724.5, 16.2003}, {725., 15.9315}}
```
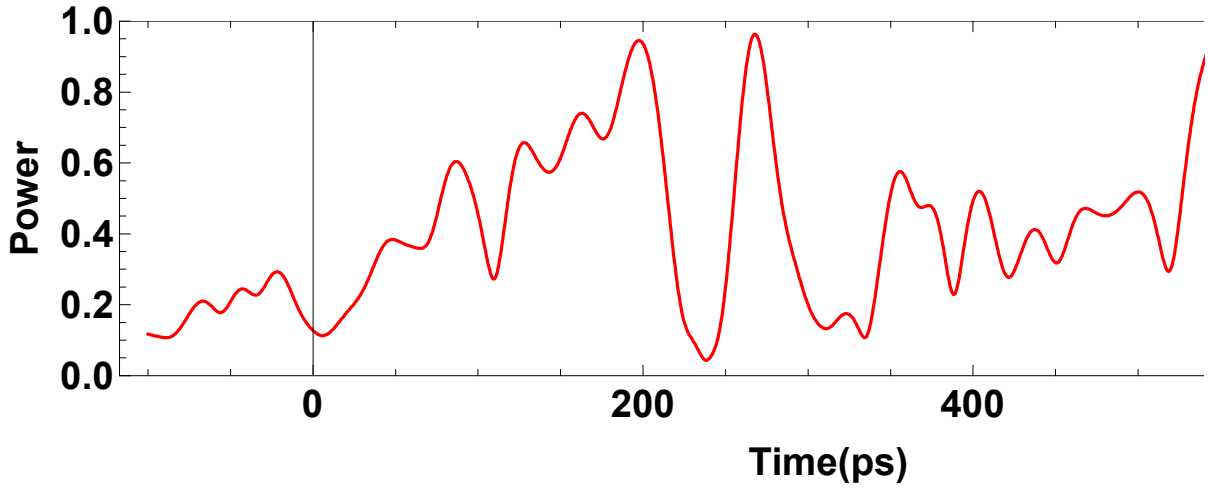

In[ ]:=
```
maxsig = Max[Table[{Abs[after[m]]}, {m, 1, 25 * bit + 100, samp}]];
         最大 リスト… 絶対値

aftersig2 = Table[{m, Abs[after[m]] / maxsig}, {m, -100, 25 * bit + 100, samp}];
            リストを作成 絶対値

ListLinePlot[aftersig2, Frame → True, FrameLabel → {"Time(ps)", "Power"},
折れ線グラフ(点を繋いでプロット) 枠 真 枠ラベル ベキ

 BaseStyle → {FontSize → 20, Red, FontWeight → Bold}, LabelStyle → {GrayLevel[0], Bold},
             フォントサイズ 赤 フォントの太さ 太字 ラベルスタイル グレーレベル 太字

 AspectRatio -> 1 / 4, PlotRange → {0, 1}, ImageSize → 800]
                       プロット範囲 画像サイズ
```

Out[ ]=



Eye Pattern

In[ ]:=
```
For[i = 0., i <= 25 * bit, i = i + samp, eyetime[i] = Mod[i, 50]]
```
繰返し評価　剰余

In[ ]:=
```
Print["Eye is ", bit * 25 / 50]
```
出力表示

```
Eye is 25/2
```

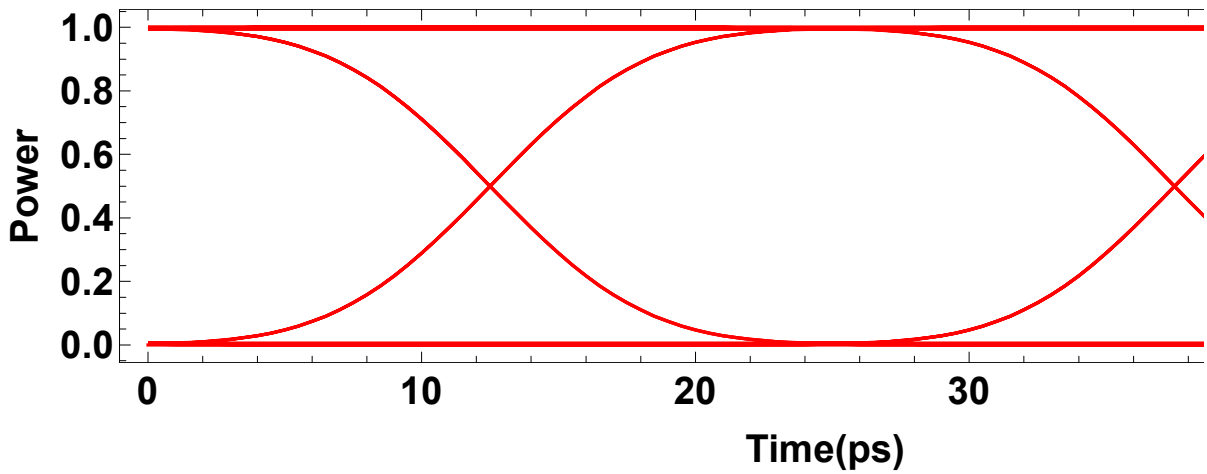
In[ ]:=
```
Table[eyetime[m], {m, 0, 25 * bit, samp}];
```
リストを作成

In[ ]:=
```
eyebf = Table[{eyetime[m], nrzsig2[m + 12.5]}, {m, 0, 25 * bit - 12.5, samp}];
```
リストを作成

```
eyeaf = Table[{eyetime[m], Abs[after[m + 12.5]] / maxsig}, {m, 0, 25 * bit - 12.5, samp}];
```
リストを作成　絶対値

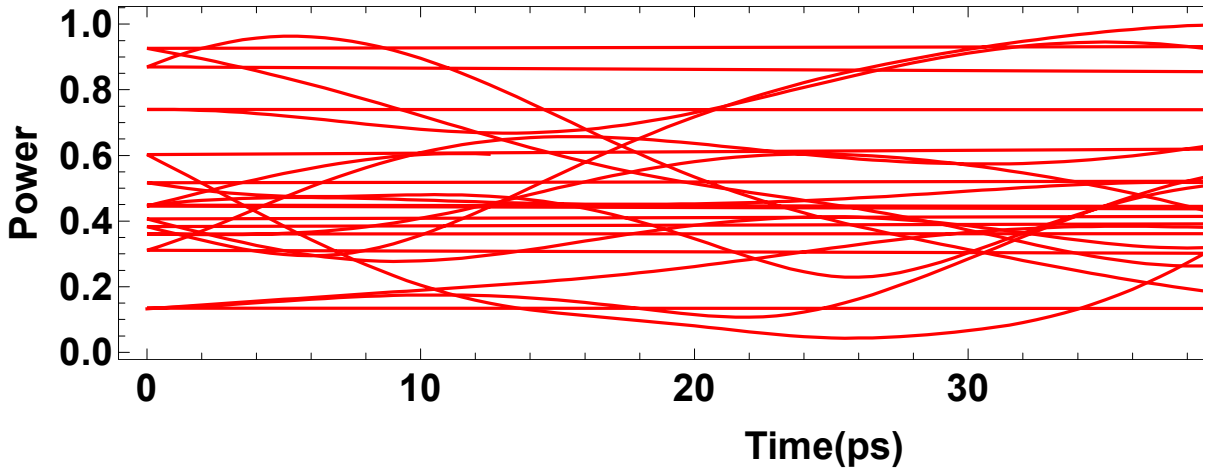
In[ ]:=
```
ListLinePlot[eyebf, Frame → True, FrameLabel → {"Time(ps)", "Power"},
 BaseStyle → {FontSize → 20, Red, FontWeight → Bold},
 LabelStyle → {GrayLevel[0], Bold}, AspectRatio -> 1 / 4, ImageSize → 800]
```
折れ線グラフ(点を繋いでプ…　枠　真　枠ラベル　ベキ
ベーススタイル　フォントサイズ　赤　フォントの太さ　太字
グレーレベル　太字　縦横比　画像サイズ

Out[ ]=



```
In[ ]:= ListLinePlot[eyeaf, Frame → True, FrameLabel → {"Time(ps)", "Power"},
        BaseStyle → {FontSize → 20, Red, FontWeight → Bold},
        LabelStyle → {GrayLevel[0], Bold}, AspectRatio -> 1 / 4, ImageSize → 800]
```

Out[ ]=



Bit Error Rate

```
In[ ]:= For[m = 22.5, m ≤ 27.5, m = m + samp, For[i = m * 2 + 1;
          j = 1, i <= (bit * 25 - 12.5) * 1/samp, i = i + 50 * 1/samp;
          j++, list_m[j] = Part[eyeaf[[All, 2]], i]]]
```

```
In[ ]:= For[j = 22.5;
         m = 1;
         n = 1;
         l0 = 0;
         l1 = 0, j ≤ 27.5, j = j + samp, For[i = 1, i ≤ bit * 25/50, i++,
          If[list_j[i] > 0.5, eye1[m] = list_j[i]; m++; l1 = l1 + 1];
          If[list_j[i] < 0.5, eye0[n] = list_j[i];
           n++;
           l0 = l0 + 1]]]
```

```
In[ ]:= Print["1 is ", l1, " point"]
        Print["0 is ", l0, " point"]
```

```
1 is 44 point

0 is 88 point
```

In[ ]:=
```
Table[eye1[m], {m, 1, l1, 1}];
```
リストを作成
```
Table[eye0[m], {m, 1, l0, 1}];
```
リストを作成
```
ave1 = Sum[eye1[i], {i, 1, l1}] / l1;
ave0 = Sum[eye0[i], {i, 1, l0}] / l0;
```

In[ ]:=
```
Print["Average of 1 is ", ave1]
```
出力表示
```
Print["Average of 0 is ", ave0]
```
出力表示

```
Average of 1 is 0.716006

Average of 0 is 0.310828
```

In[ ]:=
$$\text{disp1} = \sqrt{\frac{\text{Sum}\left[(\text{eye1}[i] - \text{ave1})^2, \{i, 1, l1\}\right]}{l1}};$$

$$\text{disp0} = \sqrt{\frac{\text{Sum}\left[(\text{eye0}[i] - \text{ave0})^2, \{i, 1, l0\}\right]}{l0}};$$

In[ ]:=
```
Print["A Standard Deviation of 1 is ", disp1]
```
出力表示
```
Print["A Standard Deviation of 0 is ", disp0]
```
出力表示

```
A Standard Deviation of 1 is 0.119542

A Standard Deviation of 0 is 0.144082
```

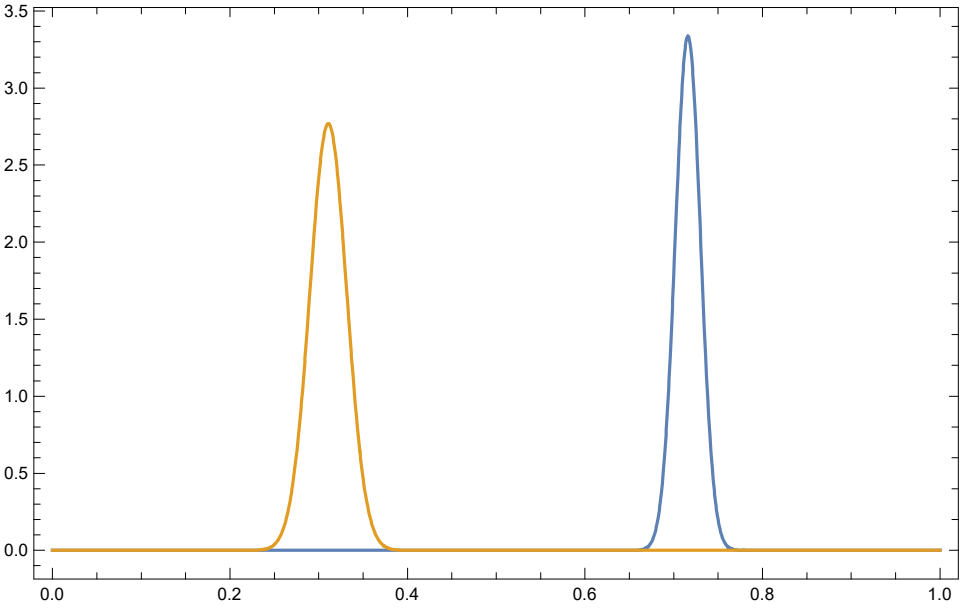
In[ ]:=
$$\text{gauss1}[x\_] := \frac{1}{\sqrt{2 * \text{Pi} * \text{disp1}^2}} * \text{Exp}\left[\frac{-1}{2} * \left(\frac{x - \text{ave1}}{\text{disp1}^2}\right)^2\right];$$
指数関数

$$\text{gauss0}[x\_] := \frac{1}{\sqrt{2 * \text{Pi} * \text{disp0}^2}} * \text{Exp}\left[\frac{-1}{2} * \left(\frac{x - \text{ave0}}{\text{disp0}^2}\right)^2\right];$$
指数関数

In[ ]:=
```
Plot[{gauss1[x], gauss0[x]}, {x, 0, 1}, PlotRange → All, Frame → True, ImageSize → 500]
```
プロット　プロット範囲　すべて　枠　真　画像サイズ

General: Exp[−1255.15]は正規化された機械数として表すには小さすぎます．精度が失われる可能性があります．

Out[ ]=



In[ ]:=
$$Q = \frac{ave1 - ave0}{disp1 + disp0};$$
```
Qdb = 20 Log10[Q];
```
底が10の対数
```
Print["Q-factor is ", Q]
```
出力表示
```
Print["Q-dB is ", Qdb, " dB"]
```
出力表示

```
Q-factor is 1.53695

Q-dB is 3.73321 dB
```

In[ ]:=
$$ber[x\_] := \frac{1}{2} * Erfc\left[\frac{x}{\sqrt{2}}\right];$$
相補誤差関数

$$Eyeopening = \frac{(ave1 - disp1) - (ave0 + disp0)}{ave1 - ave0};$$
```
Print["Bit Error Rate is ", ber[Q]]
```
出力表示
```
Print["Eye Opening is ", Eyeopening]
```
オープニング処理

```
Bit Error Rate is 0.0621524

Eye Opening is 0.349362
```

In[ ]:=
```
LogPlot[ber[z], {z, 1, 100}, PlotRange → {{1, 12}, {10^-20, 1}},
 Frame → True, FrameLabel → {"Q-factor", "Bit Error Rate"},
 BaseStyle → {FontSize → 20, Red, FontWeight → Bold},
 LabelStyle → {GrayLevel[0], Bold}, ImageSize → 500]
```
対数プロット　プロット範囲　枠　真　枠ラベル　フォントサイズ　赤　フォントの太さ　太字　グレーレベル　太字　画像サイズ

Out[ ]=