```
Clear["Global`*"]
```
クリア

Initial Value

```
L = 60;(*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

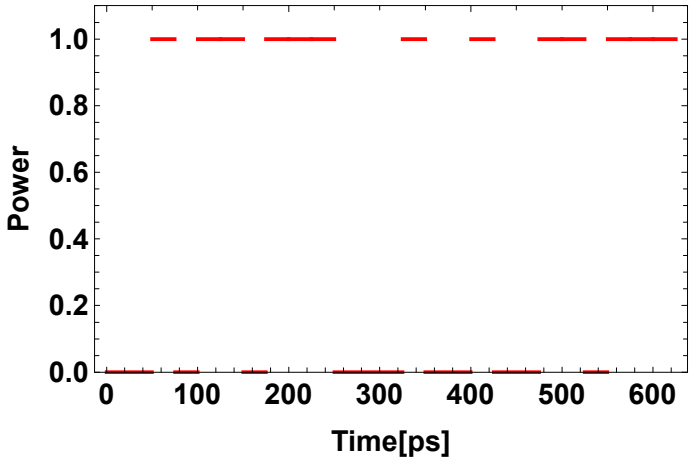
electrodelength is38.25mm

38.25mm

Product Random NRZ Signal

```
(*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] = ∑_{i=1}^{bit} step1[t, i]

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
```

```
{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}
```

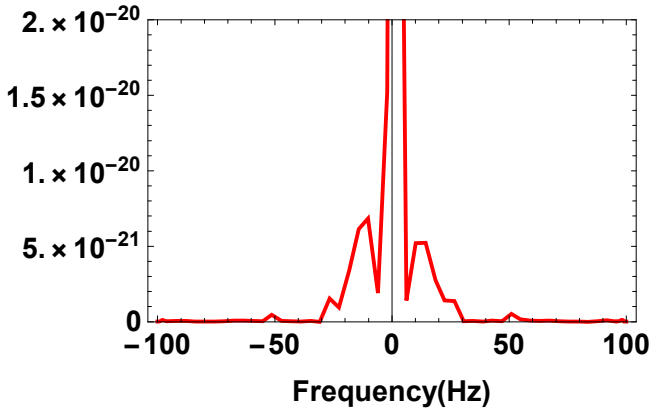


$$\int_0^{bit*25*10^{-12}} signal[t1] * e^{-i*2*Pi*f*t1}\, dt1$$

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

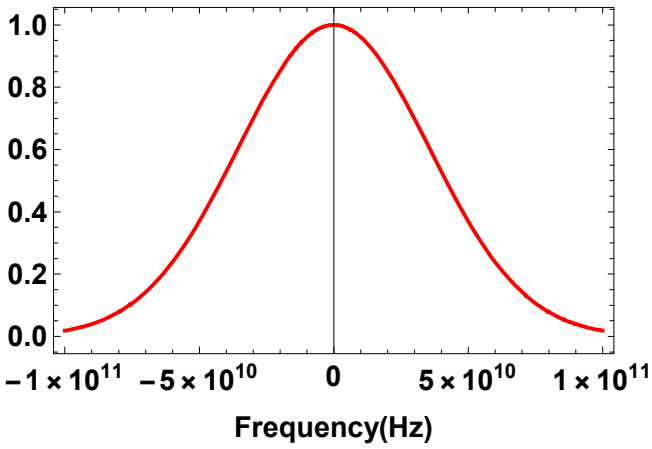
```
fc[f_] :=
 -1/(2 f π) i e^(-i f π/800000000) (-1 + e^(i f π/20000000000)) (1 + e^(i f π/20000000000) + e^(i f π/10000000000) + e^(i f π/5000000000) + e^(i f π/4000000000) + e^(i f π/2500000000) +
    e^(11 i f π/20000000000) + e^(3 i f π/4000000000) + e^(i f π/1250000000) + e^(17 i f π/20000000000)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

```
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(Hz)",},
              赤   太い      枠       真      枠ラベル
  BaseStyle → {Bold, FontSize → 15}, PlotRange → {0, 20 * 10^-21}]
              太字   フォントサイズ       プロット範囲
```



```
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




```
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

```
minnrz = -MinValue[sig[x1 * 10^-12], x1];
```

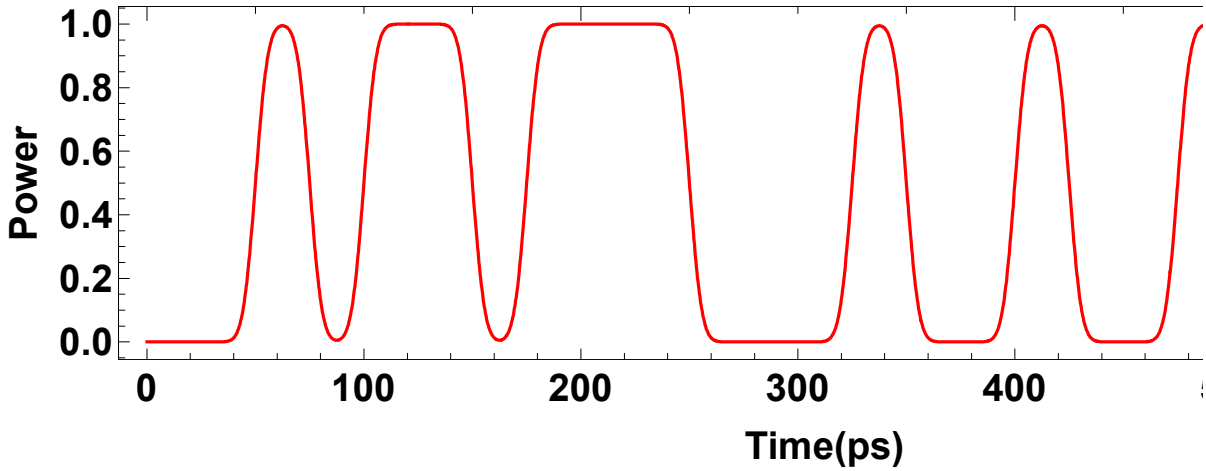
最小値

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

最大値

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

```
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]
```



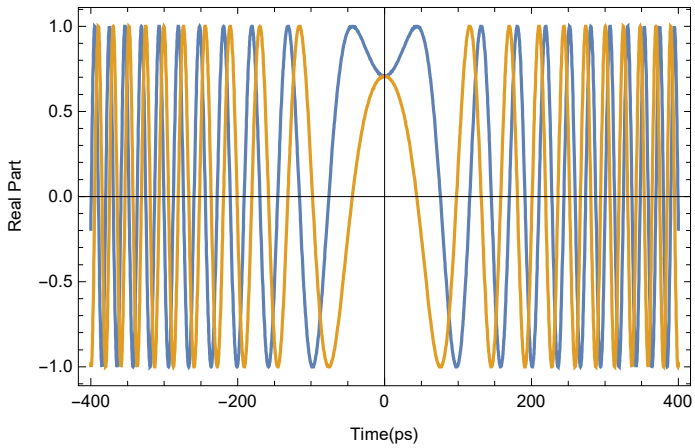
Function for Compensation Fiber Dispersion

```
(*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)]);*)

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

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

Impulse Responce for Fiber Dispersion

```
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"}]
```



Impulse Responce for CompensationDispersion

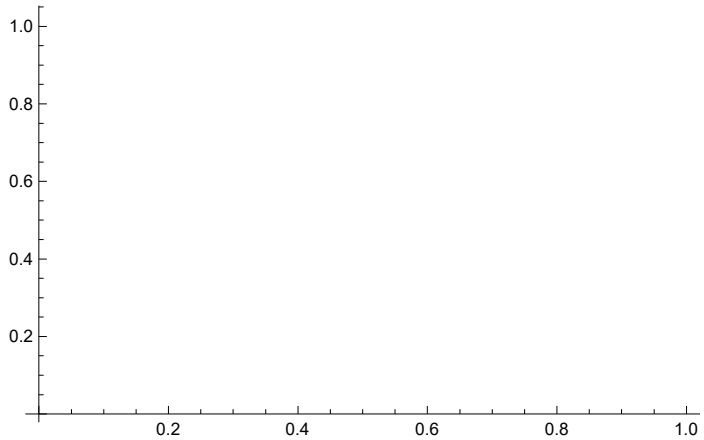
```
(*hcmp[t_]:=1/2(1/Sqrt[2*Pi*β2*60]*10^6*Exp[+i*(t^2/(2*β2*60)-Pi/4)]+
 1/Sqrt[2*Pi*β2*80]*10^6*Exp[+i*(t^2/(2*β2*80)-Pi/4)]);*)
```

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

Sampling

```
samp = 0.5;(*sampling number*)

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

```
(*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

(*IntegerPart[total*10^12]*)
  整数部分

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.

(*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

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

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
```



Simulation

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

```
simu1[-100.]
```

```
-22.9081 + 31.7428 i
```

```
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.
```

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

```
{{-100., 39.1457}, {-99.5, 39.6098}, {-99., 40.0263}, {-98.5, 40.3949},
 {-98., 40.7161}, {-97.5, 40.9912}, {-97., 41.2221}, {-96.5, 41.4115},
 {-96., 41.5626}, {-95.5, 41.6793}, {-95., 41.7659}, {-94.5, 41.8273},
 {-94., 41.8685}, {-93.5, 41.8948}, {-93., 41.9114}, {-92.5, 41.9236},
 {-92., 41.9361}, {-91.5, 41.9535}, {-91., 41.9798}, {-90.5, 42.018}, {-90., 42.0708},
 {-89.5, 42.1398}, {-89., 42.2257}, {-88.5, 42.3284}, {-88., 42.447}, {-87.5, 42.5799},
 {-87., 42.7247}, {-86.5, 42.8787}, {-86., 43.0385}, {-85.5, 43.2009},
 {-85., 43.3625}, {-84.5, 43.5198}, {-84., 43.67}, {-83.5, 43.8104}, {-83., 43.9388},
 {-82.5, 44.054}, {-82., 44.1551}, {-81.5, 44.2421}, {-81., 44.3159}, {-80.5, 44.378},
 {-80., 44.4308}, {-79.5, 44.4771}, {-79., 44.5208}, {-78.5, 44.5658},
 {-78., 44.6167}, {-77.5, 44.6783}, {-77., 44.7555}, {-76.5, 44.8529},
 {-76., 44.9753}, {-75.5, 45.1268}, {-75., 45.311}, {-74.5, 45.5309},
 {-74., 45.7887}, {-73.5, 46.0859}, {-73., 46.4228}, {-72.5, 46.7991},
 {-72., 47.2134}, {-71.5, 47.6635}, {-71., 48.1464}, {-70.5, 48.6585},
 {-70., 49.1953}, {-69.5, 49.7521}, {-69., 50.3235}, {-68.5, 50.9039}, {-68., 51.4875},
 {-67.5, 52.0681}, {-67., 52.6396}, {-66.5, 53.1958}, {-66., 53.7304},
 {-65.5, 54.2373}, {-65., 54.7103}, {-64.5, 55.1433}, {-64., 55.5307},
 {-63.5, 55.8665}, {-63., 56.1453}, {-62.5, 56.3619}, {-62., 56.5111},
 {-61.5, 56.5884}, {-61., 56.5894}, {-60.5, 56.5102}, {-60., 56.3474},
```

{−59.5, 56.0983}, {−59., 55.7605}, {−58.5, 55.3325}, {−58., 54.8136},
{−57.5, 54.2039}, {−57., 53.5042}, {−56.5, 52.7166}, {−56., 51.844}, {−55.5, 50.8904},
{−55., 49.8613}, {−54.5, 48.7629}, {−54., 47.6029}, {−53.5, 46.3902}, {−53., 45.1351},
{−52.5, 43.8489}, {−52., 42.5442}, {−51.5, 41.2348}, {−51., 39.9352},
{−50.5, 38.661}, {−50., 37.428}, {−49.5, 36.2523}, {−49., 35.1494}, {−48.5, 34.1343},
{−48., 33.2199}, {−47.5, 32.4171}, {−47., 31.7336}, {−46.5, 31.1738}, {−46., 30.738},
{−45.5, 30.4223}, {−45., 30.2191}, {−44.5, 30.1174}, {−44., 30.1033},
{−43.5, 30.1613}, {−43., 30.2748}, {−42.5, 30.4272}, {−42., 30.6023},
{−41.5, 30.7854}, {−41., 30.9631}, {−40.5, 31.124}, {−40., 31.2589}, {−39.5, 31.3607},
{−39., 31.4243}, {−38.5, 31.4469}, {−38., 31.4277}, {−37.5, 31.368}, {−37., 31.2706},
{−36.5, 31.1402}, {−36., 30.9829}, {−35.5, 30.8063}, {−35., 30.6188}, {−34.5, 30.43},
{−34., 30.2499}, {−33.5, 30.089}, {−33., 29.9576}, {−32.5, 29.866}, {−32., 29.8238},
{−31.5, 29.8397}, {−31., 29.921}, {−30.5, 30.074}, {−30., 30.3031}, {−29.5, 30.6111},
{−29., 30.9993}, {−28.5, 31.4674}, {−28., 32.0135}, {−27.5, 32.6348},
{−27., 33.3273}, {−26.5, 34.0865}, {−26., 34.907}, {−25.5, 35.7833}, {−25., 36.7096},
{−24.5, 37.6801}, {−24., 38.6888}, {−23.5, 39.7299}, {−23., 40.7975},
{−22.5, 41.8859}, {−22., 42.9894}, {−21.5, 44.1025}, {−21., 45.2195},
{−20.5, 46.3349}, {−20., 47.4433}, {−19.5, 48.5393}, {−19., 49.6175},
{−18.5, 50.6727}, {−18., 51.6997}, {−17.5, 52.6936}, {−17., 53.6493},
{−16.5, 54.5622}, {−16., 55.4279}, {−15.5, 56.242}, {−15., 57.0005}, {−14.5, 57.6998},
{−14., 58.3365}, {−13.5, 58.9076}, {−13., 59.4102}, {−12.5, 59.8421},
{−12., 60.2014}, {−11.5, 60.4865}, {−11., 60.6962}, {−10.5, 60.8298},
{−10., 60.887}, {−9.5, 60.8681}, {−9., 60.7737}, {−8.5, 60.605}, {−8., 60.3637},
{−7.5, 60.0521}, {−7., 59.6731}, {−6.5, 59.2302}, {−6., 58.7277}, {−5.5, 58.1706},
{−5., 57.5646}, {−4.5, 56.9161}, {−4., 56.2324}, {−3.5, 55.5215}, {−3., 54.7922},
{−2.5, 54.0539}, {−2., 53.3164}, {−1.5, 52.59}, {−1., 51.8853}, {−0.5, 51.2127},
{0., 50.5821}, {0.5, 50.0029}, {1., 49.4833}, {1.5, 49.0302}, {2., 48.6484},
{2.5, 48.341}, {3., 48.1085}, {3.5, 47.949}, {4., 47.8582}, {4.5, 47.8292},
{5., 47.8531}, {5.5, 47.919}, {6., 48.0146}, {6.5, 48.1265}, {7., 48.2404},
{7.5, 48.3421}, {8., 48.4173}, {8.5, 48.4524}, {9., 48.4347}, {9.5, 48.3525},
{10., 48.1957}, {10.5, 47.9556}, {11., 47.6255}, {11.5, 47.2003}, {12., 46.6769},
{12.5, 46.0543}, {13., 45.3333}, {13.5, 44.5168}, {14., 43.6097}, {14.5, 42.6186},
{15., 41.552}, {15.5, 40.42}, {16., 39.2343}, {16.5, 38.0078}, {17., 36.7545},
{17.5, 35.4891}, {18., 34.227}, {18.5, 32.9832}, {19., 31.7726}, {19.5, 30.6088},
{20., 29.504}, {20.5, 28.4681}, {21., 27.5084}, {21.5, 26.6287}, {22., 25.8296},
{22.5, 25.108}, {23., 24.4574}, {23.5, 23.8683}, {24., 23.329}, {24.5, 22.8266},
{25., 22.3474}, {25.5, 21.8784}, {26., 21.4076}, {26.5, 20.9253}, {27., 20.4245},
{27.5, 19.9014}, {28., 19.356}, {28.5, 18.7924}, {29., 18.2196}, {29.5, 17.6514},
{30., 17.1068}, {30.5, 16.6101}, {31., 16.1905}, {31.5, 15.8803}, {32., 15.713},
{32.5, 15.7199}, {33., 15.9261}, {33.5, 16.347}, {34., 16.9869}, {34.5, 17.8394},
{35., 18.8899}, {35.5, 20.1189}, {36., 21.5047}, {36.5, 23.026}, {37., 24.6632},
{37.5, 26.399}, {38., 28.2185}, {38.5, 30.1095}, {39., 32.0618}, {39.5, 34.0672},
{40., 36.1187}, {40.5, 38.2109}, {41., 40.3388}, {41.5, 42.4981}, {42., 44.6849},
{42.5, 46.8951}, {43., 49.1246}, {43.5, 51.3689}, {44., 53.623}, {44.5, 55.8815},
{45., 58.1383}, {45.5, 60.3871}, {46., 62.6208}, {46.5, 64.832}, {47., 67.0131},
{47.5, 69.1564}, {48., 71.2542}, {48.5, 73.2989}, {49., 75.2837}, {49.5, 77.2018},
{50., 79.0478}, {50.5, 80.8167}, {51., 82.505}, {51.5, 84.1103}, {52., 85.6312},
{52.5, 87.0682}, {53., 88.423}, {53.5, 89.6985}, {54., 90.8992}, {54.5, 92.0309},
{55., 93.1003}, {55.5, 94.1152}, {56., 95.084}, {56.5, 96.0156}, {57., 96.9191},
{57.5, 97.8031}, {58., 98.6762}, {58.5, 99.5458}, {59., 100.418}, {59.5, 101.299},

{60., 102.191}, {60.5, 103.097}, {61., 104.015}, {61.5, 104.945}, {62., 105.883},
{62.5, 106.823}, {63., 107.758}, {63.5, 108.68}, {64., 109.581}, {64.5, 110.45},
{65., 111.277}, {65.5, 112.052}, {66., 112.764}, {66.5, 113.406}, {67., 113.967},
{67.5, 114.441}, {68., 114.821}, {68.5, 115.103}, {69., 115.285}, {69.5, 115.364},
{70., 115.343}, {70.5, 115.223}, {71., 115.01}, {71.5, 114.711}, {72., 114.334},
{72.5, 113.891}, {73., 113.393}, {73.5, 112.855}, {74., 112.291}, {74.5, 111.718},
{75., 111.153}, {75.5, 110.613}, {76., 110.116}, {76.5, 109.678}, {77., 109.316},
{77.5, 109.044}, {78., 108.874}, {78.5, 108.817}, {79., 108.881}, {79.5, 109.07},
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```
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{694., 2.99173}, {694.5, 4.32709}, {695., 5.65445}, {695.5, 6.97364},
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{717.5, 44.0074}, {718., 44.1332}, {718.5, 44.2316}, {719., 44.3045},
{719.5, 44.3541}, {720., 44.3825}, {720.5, 44.3917}, {721., 44.3837},
{721.5, 44.3604}, {722., 44.3235}, {722.5, 44.2745}, {723., 44.2146},
{723.5, 44.1451}, {724., 44.0666}, {724.5, 43.9799}, {725., 43.8854}}

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
```
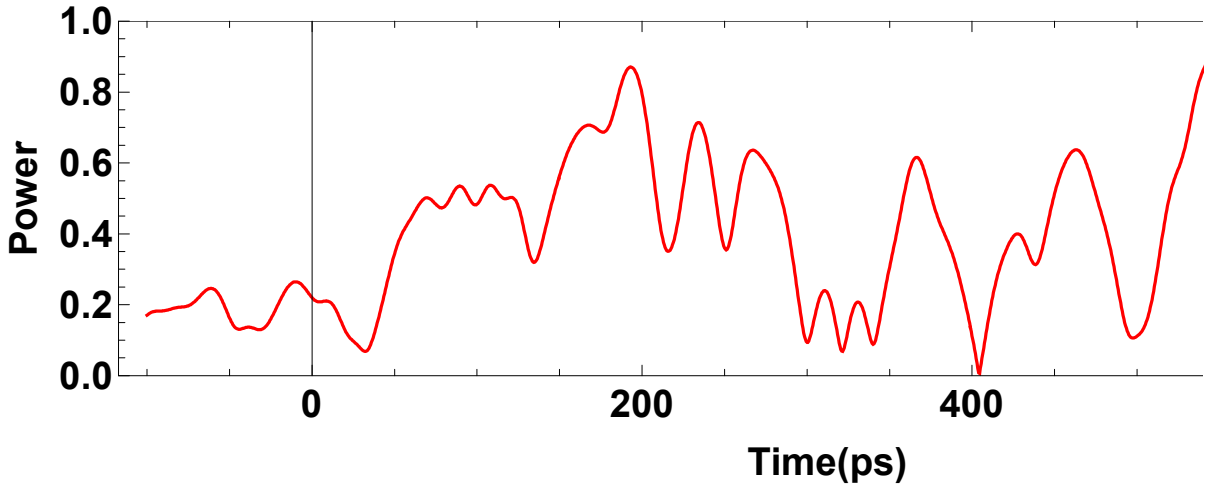



Eye Pattern

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

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

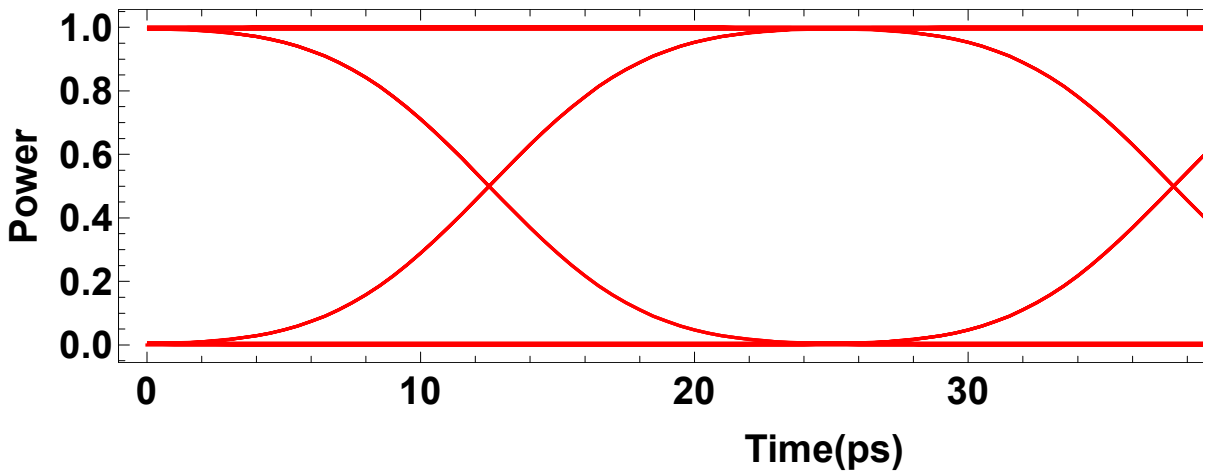
Eye is $\frac{25}{2}$

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

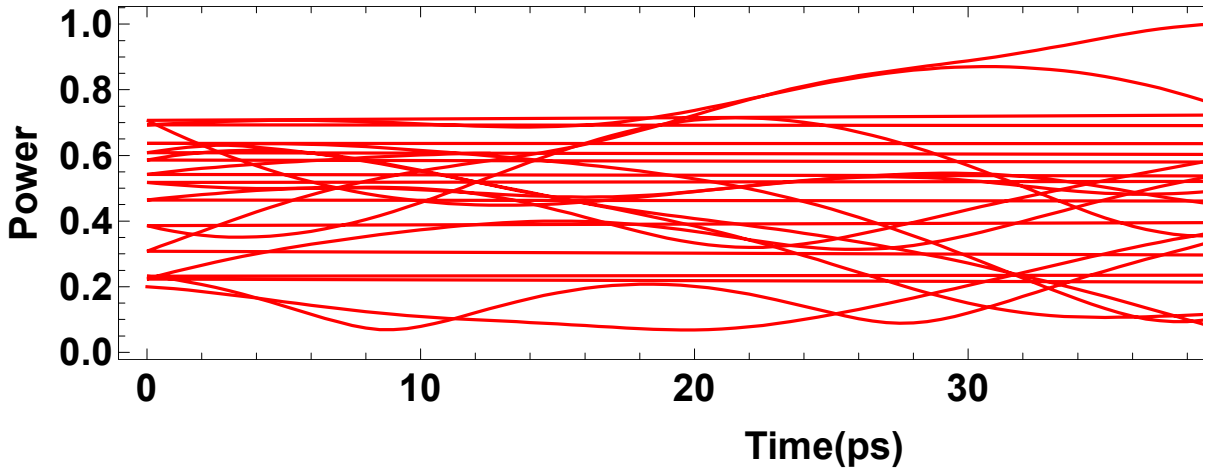
```
eyebf = Table[{eyetime[m], nrzsig2[m + 12.5]}, {m, 0, 25 * bit - 12.5, samp}];
```
リストを作成

```
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

```
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



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



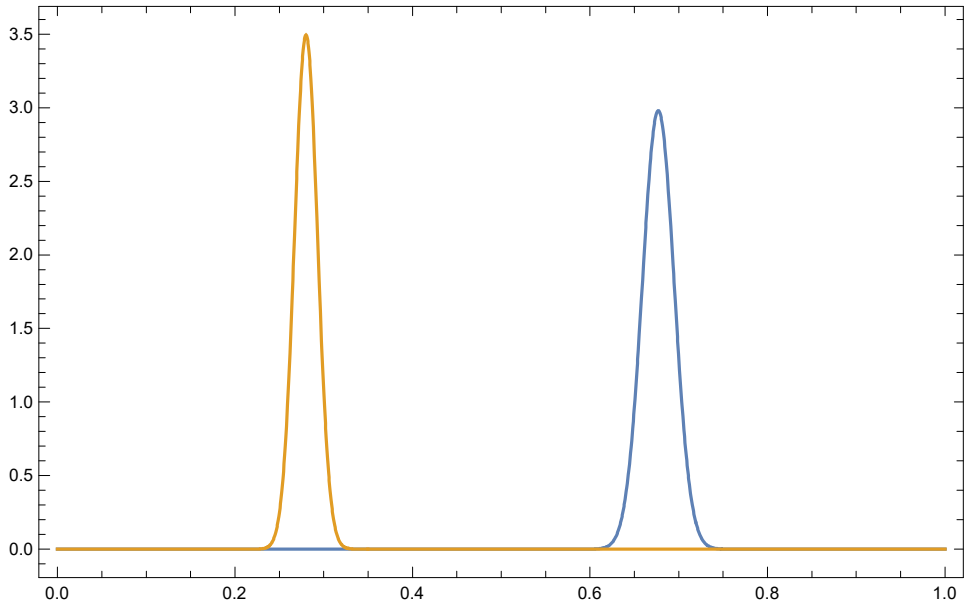
Bit Error Rate

```
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]]]

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]]]

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

```
1 is 55 point

0 is 77 point
```

```
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
$$\text{ave1} = \frac{\text{Sum}[\text{eye1}[i], \{i, 1, l1\}]}{l1};$$
$$\text{ave0} = \frac{\text{Sum}[\text{eye0}[i], \{i, 1, l0\}]}{l0};$$
```
Print["Average of 1 is ", ave1]
```
出力表示
```
Print["Average of 0 is ", ave0]
```
出力表示
```
Average of 1 is 0.676961

Average of 0 is 0.280035
```
$$\text{disp1} = \sqrt{\frac{\text{Sum}\left[(\text{eye1}[i] - \text{ave1})^2, \{i, 1, l1\}\right]}{l1}};$$
$$\text{disp0} = \sqrt{\frac{\text{Sum}\left[(\text{eye0}[i] - \text{ave0})^2, \{i, 1, l0\}\right]}{l0}};$$
```
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 0.13384

A Standard Deviation of 0 is 0.114129
```
$$\text{gauss1}[x\_] := \frac{1}{\sqrt{2 * \text{Pi} * \text{disp1}^2}} * \text{Exp}\left[\frac{-1}{2} * \left(\frac{x - \text{ave1}}{\text{disp1}^2}\right)^2\right];$$
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

```
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



$$Q = \frac{ave1 - ave0}{disp1 + disp0};$$

```
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 1.60071

Q-dB is 4.08626 dB
```

$$ber[x\_] := \frac{1}{2} * Erfc\left[\frac{x}{\sqrt{2}}\right];$$
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 0.0547204

Eye Opening is 0.375278
```

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