```
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

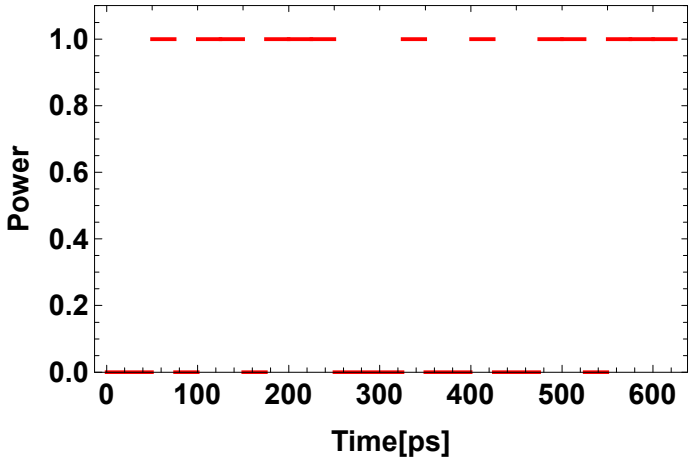
38.25mm

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[ ]=



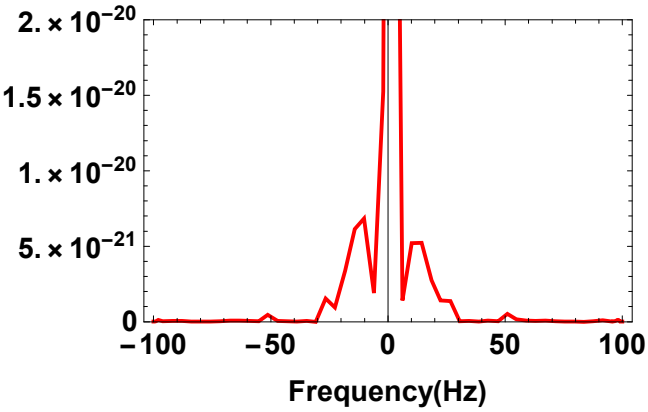
In[ ]:=
$$\int_0^{bit*25*10^{-12}} signal[t1] * e^{-i*2*Pi*f*t1}\, dt1$$

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))
```

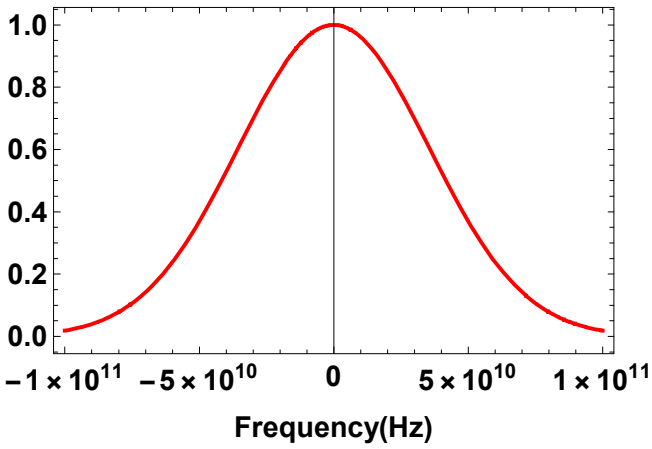
In[ ]:=
```
Plot[(Re[fc[f * 10^9]]^2 + Im[fc[f * 10^9]]^2), {f, -100, 100},
 プロット
 PlotStyle → {Red, Thick}, Frame → True, FrameLabel → {"Frequency(Hz)",},
             赤   太い      枠        真      枠ラベル
 BaseStyle → {Bold, FontSize → 15}, PlotRange → {0, 20 * 10^-21}]
             太字   フォントサイズ      プ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

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

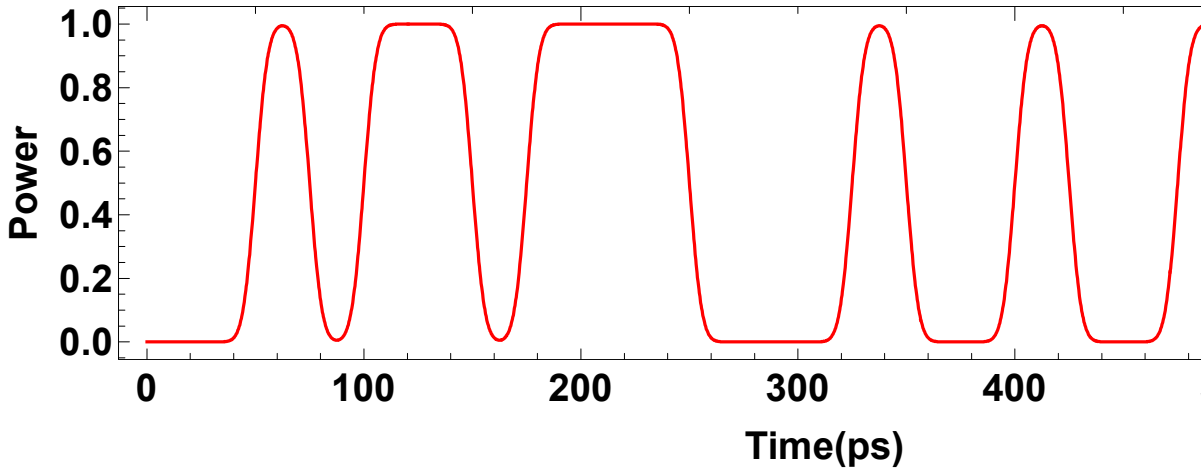
In[ ]:=
```
minnrz = -MinValue[sig[x1 * 10^-12], x1];
```
最小値

```
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

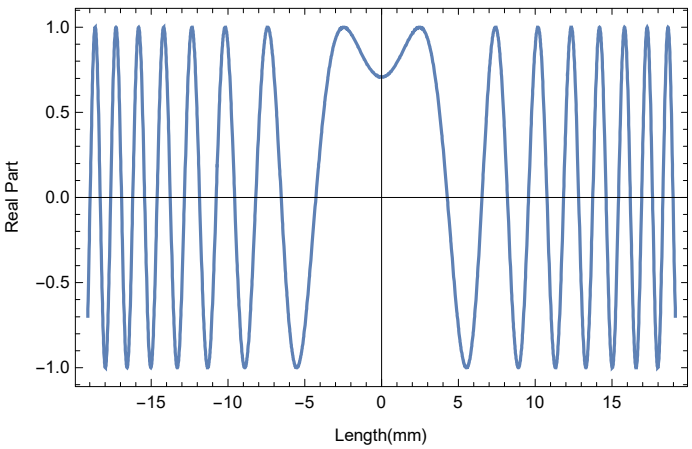
```
In[ ]:= f[x_] := 1 / Sqrt[2 * Pi * β2 * 80] * 10^6 * Exp[+i * ((t[x] * 10^-3)^2 / (2 * β2 * 80) - Pi / 4)];
```

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

Out[ ]= $\{9.87697 \times 10^{15}, \{x1 \to 2.4694\}\}$

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

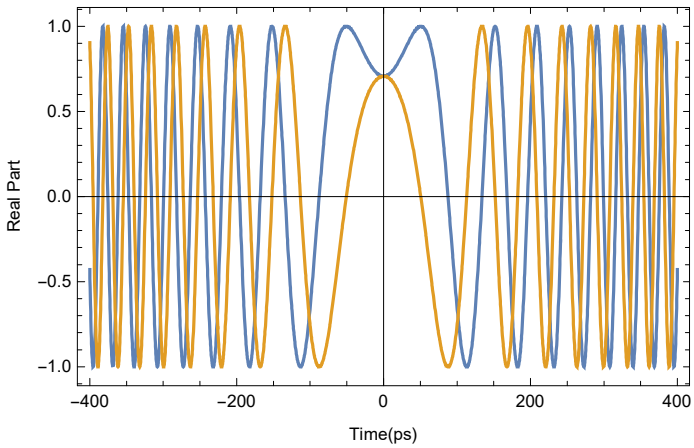
Out[ ]=



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}]
          極大値を求める  実部
        max=9.876974769287008`*^15;*)
        Plot[{Re@hdis[t*10^-12], Im@hdis[t*10^-12]},
              実部               複素数の虚部
         {t, -400, 400}, Frame → True, FrameLabel → {"Time(ps)", "Real Part"}]
                          枠      真    枠ラベル                  実…  部分
```

Out[ ]=

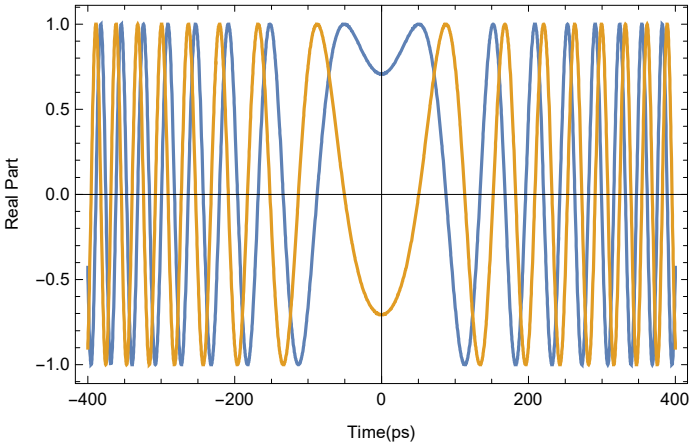


Impulse Responce for CompensationDispersion

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

In[ ]:=
```
Plot[{Re@hcmp[t * 10^-12], Im@hcmp[t * 10^-12]}, {t, -400, 400},
 Frame → True, FrameLabel → {"Time(ps)", "Real Part"}]
```
プロット 実部 複素数の虚部 真 枠ラベル 実… 部分

Out[ ]=



Sampling

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

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

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

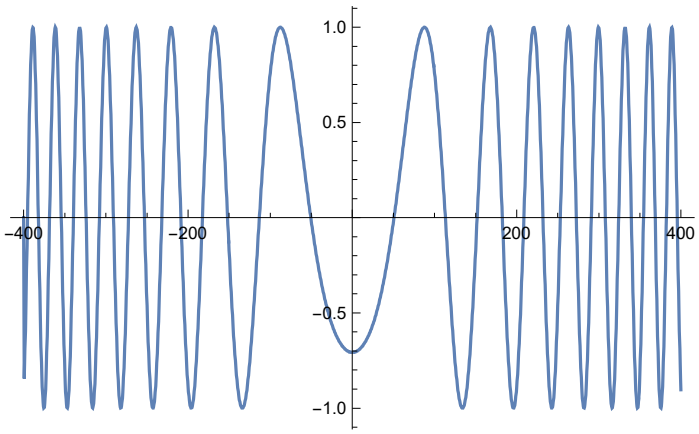
In[ ]:=
```
IntegerPart[total * 10^12]
```
整数部分

Out[ ]=
```
784
```

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[ ]:= simu0[a_] := simu0[a] = Sum[hdis2[z] * hcmp3[a - z], {z, -10000, 10000, samp}]
                                総和
        simu1[a_] := simu1[a] = Sum[nrzsig2[t] * simu0[a - t], {t, -100, 25 * bit + 100, samp}]
                                総和

In[ ]:= simu1[-100.]

Out[ ]= 589.996 + 183.268 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., 617.804}, {-99.5, 585.684}, {-99., 552.016}, {-98.5, 517.103},
 {-98., 481.295}, {-97.5, 444.984}, {-97., 408.589}, {-96.5, 372.558},
 {-96., 337.349}, {-95.5, 303.43}, {-95., 271.255}, {-94.5, 241.254}, {-94., 213.796},
 {-93.5, 189.162}, {-93., 167.487}, {-92.5, 148.715}, {-92., 132.563},
 {-91.5, 118.527}, {-91., 105.95}, {-90.5, 94.1609}, {-90., 82.6591}, {-89.5, 71.3871},
 {-89., 61.1828}, {-88.5, 54.495}, {-88., 55.3707}, {-87.5, 66.2958}, {-87., 85.8065},
 {-86.5, 111.267}, {-86., 140.806}, {-85.5, 173.219}, {-85., 207.628},
 {-84.5, 243.288}, {-84., 279.507}, {-83.5, 315.617}, {-83., 350.967},
 {-82.5, 384.922}, {-82., 416.874}, {-81.5, 446.253}, {-81., 472.537},
 {-80.5, 495.269}, {-80., 514.063}, {-79.5, 528.622}, {-79., 538.744},
 {-78.5, 544.334}, {-78., 545.408}, {-77.5, 542.104}, {-77., 534.687},
 {-76.5, 523.545}, {-76., 509.197}, {-75.5, 492.289}, {-75., 473.582},
 {-74.5, 453.943}, {-74., 434.314}, {-73.5, 415.665}, {-73., 398.93}, {-72.5, 384.905},
 {-72., 374.146}, {-71.5, 366.869}, {-71., 362.896}, {-70.5, 361.67}, {-70., 362.336},
 {-69.5, 363.856}, {-69., 365.134}, {-68.5, 365.107}, {-68., 362.815},
 {-67.5, 357.435}, {-67., 348.303}, {-66.5, 334.92}, {-66., 316.965}, {-65.5, 294.319},
 {-65., 267.109}, {-64.5, 235.828}, {-64., 201.605}, {-63.5, 166.878},
 {-63., 137.018}, {-62.5, 122.61}, {-62., 134.984}, {-61.5, 172.706}, {-61., 226.169},
 {-60.5, 288.476}, {-60., 355.942}, {-59.5, 426.424}, {-59., 498.442},
 {-58.5, 570.819}, {-58., 642.539}, {-57.5, 712.683}, {-57., 780.416},
 {-56.5, 844.978}, {-56., 905.695}, {-55.5, 961.985}, {-55., 1013.37},
 {-54.5, 1059.49}, {-54., 1100.1}, {-53.5, 1135.09}, {-53., 1164.49}, {-52.5, 1188.44},
 {-52., 1207.24}, {-51.5, 1221.28}, {-51., 1231.07}, {-50.5, 1237.2}, {-50., 1240.31},
 {-49.5, 1241.08}, {-49., 1240.19}, {-48.5, 1238.26}, {-48., 1235.87},
 {-47.5, 1233.44}, {-47., 1231.3}, {-46.5, 1229.6}, {-46., 1228.31}, {-45.5, 1227.28},
 {-45., 1226.17}, {-44.5, 1224.54}, {-44., 1221.84}, {-43.5, 1217.49}, {-43., 1210.85},
```

{-42.5, 1201.32}, {-42., 1188.32}, {-41.5, 1171.36}, {-41., 1150.04},
{-40.5, 1124.08}, {-40., 1093.33}, {-39.5, 1057.82}, {-39., 1017.76},
{-38.5, 973.521}, {-38., 925.738}, {-37.5, 875.266}, {-37., 823.235},
{-36.5, 771.077}, {-36., 720.545}, {-35.5, 673.71}, {-35., 632.898}, {-34.5, 600.503},
{-34., 578.655}, {-33.5, 568.752}, {-33., 571.066}, {-32.5, 584.624}, {-32., 607.481},
{-31.5, 637.21}, {-31., 671.364}, {-30.5, 707.788}, {-30., 744.743}, {-29.5, 780.939},
{-29., 815.497}, {-28.5, 847.908}, {-28., 877.97}, {-27.5, 905.731}, {-27., 931.438},
{-26.5, 955.471}, {-26., 978.289}, {-25.5, 1000.37}, {-25., 1022.14},
{-24.5, 1043.97}, {-24., 1066.06}, {-23.5, 1088.48}, {-23., 1111.16},
{-22.5, 1133.84}, {-22., 1156.16}, {-21.5, 1177.63}, {-21., 1197.72},
{-20.5, 1215.89}, {-20., 1231.58}, {-19.5, 1244.31}, {-19., 1253.68},
{-18.5, 1259.38}, {-18., 1261.24}, {-17.5, 1259.23}, {-17., 1253.44},
{-16.5, 1244.15}, {-16., 1231.77}, {-15.5, 1216.84}, {-15., 1200.03},
{-14.5, 1182.15}, {-14., 1164.03}, {-13.5, 1146.57}, {-13., 1130.65},
{-12.5, 1117.08}, {-12., 1106.54}, {-11.5, 1099.53}, {-11., 1096.33},
{-10.5, 1096.97}, {-10., 1101.24}, {-9.5, 1108.72}, {-9., 1118.79}, {-8.5, 1130.77},
{-8., 1143.89}, {-7.5, 1157.39}, {-7., 1170.59}, {-6.5, 1182.89}, {-6., 1193.82},
{-5.5, 1203.04}, {-5., 1210.38}, {-4.5, 1215.79}, {-4., 1219.38}, {-3.5, 1221.37},
{-3., 1222.09}, {-2.5, 1221.93}, {-2., 1221.34}, {-1.5, 1220.78}, {-1., 1220.67},
{-0.5, 1221.4}, {0., 1223.24}, {0.5, 1226.38}, {1., 1230.88}, {1.5, 1236.67},
{2., 1243.56}, {2.5, 1251.26}, {3., 1259.37}, {3.5, 1267.45}, {4., 1274.99},
{4.5, 1281.49}, {5., 1286.45}, {5.5, 1289.35}, {6., 1289.75}, {6.5, 1287.22},
{7., 1281.38}, {7.5, 1271.91}, {8., 1258.51}, {8.5, 1240.97}, {9., 1219.09},
{9.5, 1192.76}, {10., 1161.88}, {10.5, 1126.44}, {11., 1086.45}, {11.5, 1042.02},
{12., 993.298}, {12.5, 940.513}, {13., 883.982}, {13.5, 824.116}, {14., 761.437},
{14.5, 696.602}, {15., 630.43}, {15.5, 563.948}, {16., 498.462}, {16.5, 435.654},
{17., 377.729}, {17.5, 327.544}, {18., 288.547}, {18.5, 264.036}, {19., 255.446},
{19.5, 260.792}, {20., 275.263}, {20.5, 293.37}, {21., 310.44}, {21.5, 322.942},
{22., 328.274}, {22.5, 324.503}, {23., 310.176}, {23.5, 284.214}, {24., 245.867},
{24.5, 194.752}, {25., 131.148}, {25.5, 59.0614}, {26., 55.6685}, {26.5, 152.193},
{27., 266.976}, {27.5, 393.762}, {28., 530.625}, {28.5, 675.859}, {29., 827.614},
{29.5, 983.827}, {30., 1142.22}, {30.5, 1300.29}, {31., 1455.35}, {31.5, 1604.55},
{32., 1744.88}, {32.5, 1873.2}, {33., 1986.31}, {33.5, 2080.94}, {34., 2153.82},
{34.5, 2201.72}, {35., 2221.48}, {35.5, 2210.11}, {36., 2164.82}, {36.5, 2083.21},
{37., 1963.45}, {37.5, 1804.65}, {38., 1607.77}, {38.5, 1377.6}, {39., 1128.43},
{39.5, 900.503}, {40., 794.976}, {40.5, 938.636}, {41., 1313.55}, {41.5, 1831.62},
{42., 2445.45}, {42.5, 3135.57}, {43., 3893.16}, {43.5, 4713.36}, {44., 5592.82},
{44.5, 6528.75}, {45., 7518.44}, {45.5, 8559.12}, {46., 9647.81}, {46.5, 10781.3},
{47., 11956.}, {47.5, 13168.1}, {48., 14413.7}, {48.5, 15688.2}, {49., 16987.2},
{49.5, 18305.7}, {50., 19638.7}, {50.5, 20981.}, {51., 22327.}, {51.5, 23671.3},
{52., 25008.2}, {52.5, 26331.9}, {53., 27636.8}, {53.5, 28916.9}, {54., 30166.7},
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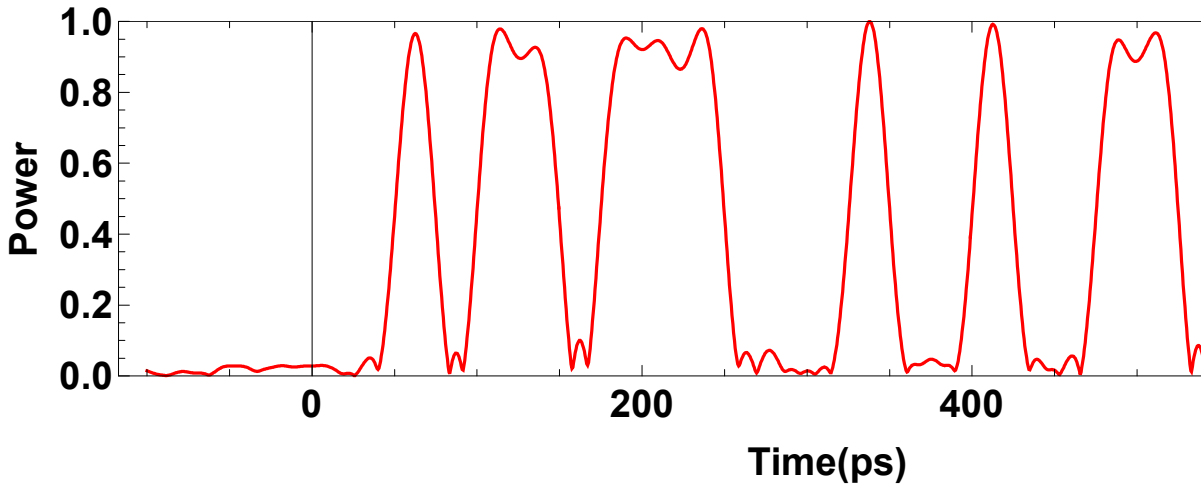
{691.5, 838.124}, {692., 803.402}, {692.5, 763.557}, {693., 719.252},
{693.5, 671.231}, {694., 620.303}, {694.5, 567.324}, {695., 513.174},
{695.5, 458.744}, {696., 404.908}, {696.5, 352.51}, {697., 302.345},
{697.5, 255.139}, {698., 211.536}, {698.5, 172.083}, {699., 137.215},
{699.5, 107.24}, {700., 82.3292}, {700.5, 62.51}, {701., 47.695}, {701.5, 37.8115},
{702., 33.0347}, {702.5, 33.7411}, {703., 39.8431}, {703.5, 50.6027},
{704., 65.1937}, {704.5, 82.9556}, {705., 103.341}, {705.5, 125.85}, {706., 150.005},
{706.5, 175.347}, {707., 201.442}, {707.5, 227.884}, {708., 254.298},
{708.5, 280.343}, {709., 305.711}, {709.5, 330.125}, {710., 353.339},
{710.5, 375.133}, {711., 395.307}, {711.5, 413.688}, {712., 430.117},
{712.5, 444.462}, {713., 456.608}, {713.5, 466.467}, {714., 473.981},
{714.5, 479.121}, {715., 481.899}, {715.5, 482.367}, {716., 480.62}, {716.5, 476.802},
{717., 471.104}, {717.5, 463.766}, {718., 455.069}, {718.5, 445.335},
{719., 434.913}, {719.5, 424.174}, {720., 413.492}, {720.5, 403.231},
{721., 393.724}, {721.5, 385.254}, {722., 378.039}, {722.5, 372.214}, {723., 367.83},
{723.5, 364.851}, {724., 363.163}, {724.5, 362.596}, {725., 362.934}}

```
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 ペキ
         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[ ]=



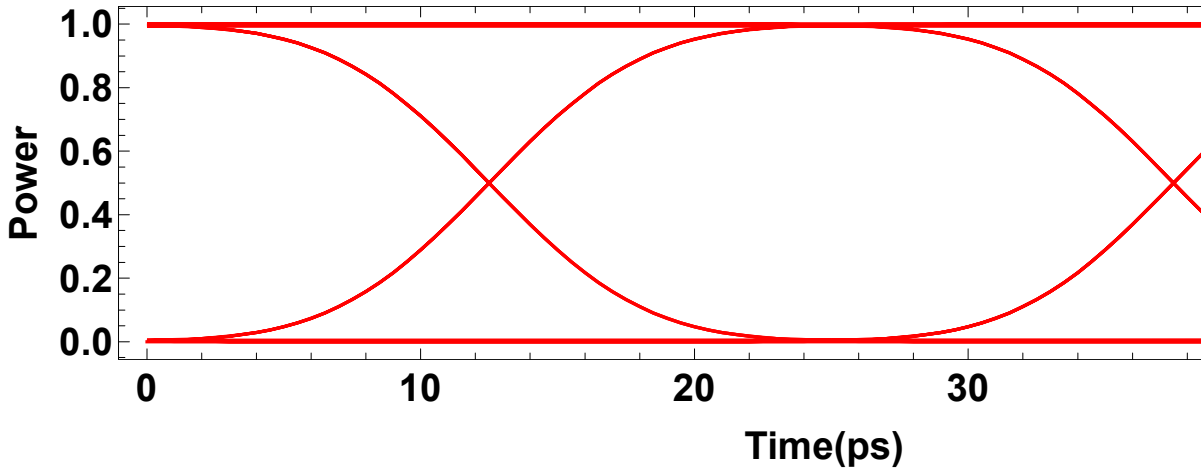
Eye Pattern

```
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

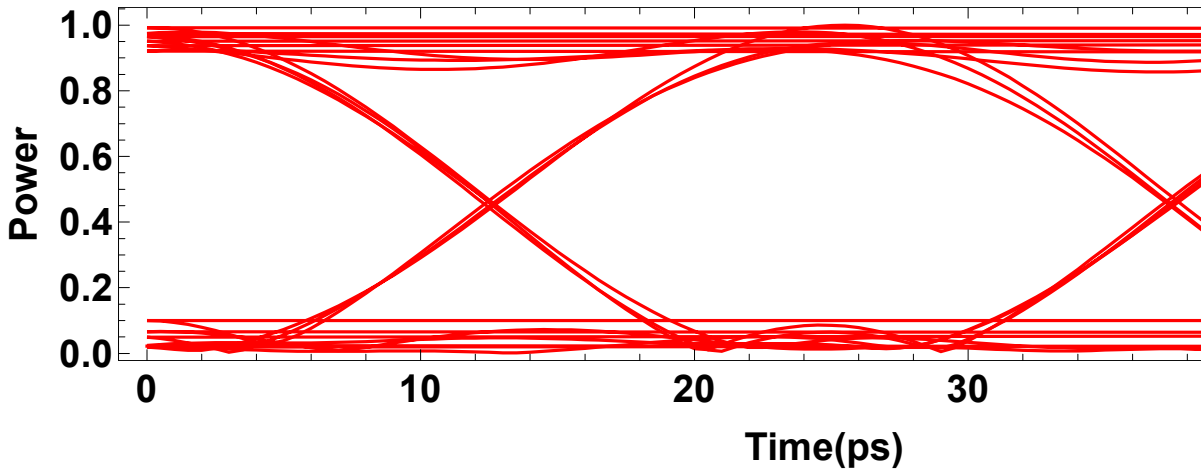
Out[ ]=




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

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[ ]=



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]]]
```

繰返し評価 | 繰返し評価
部分 | すべて

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

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

```
1 is 66 point

0 is 66 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 0.945041

Average of 0 is 0.0406386
```

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 0.0283

A Standard Deviation of 0 is 0.0213698
```

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

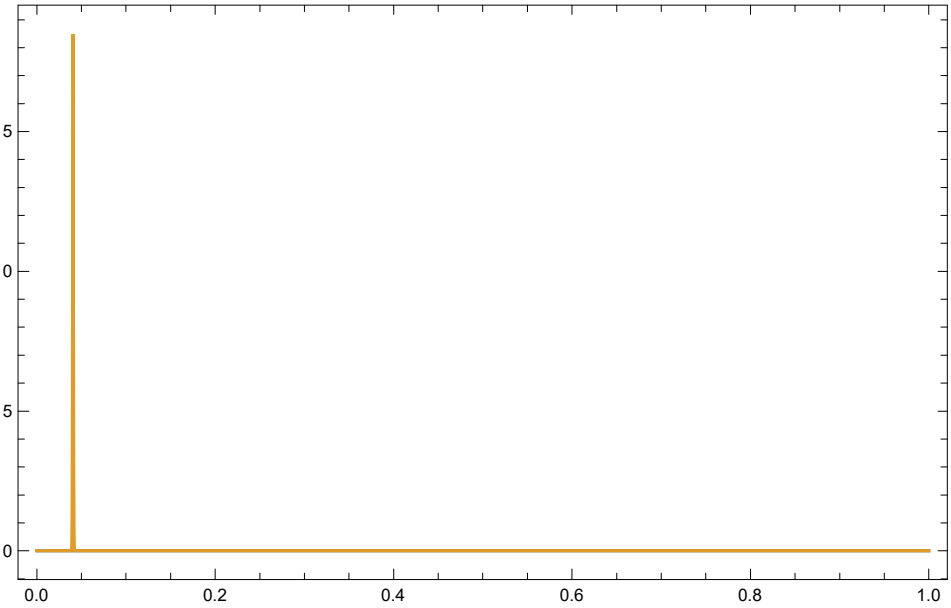
$$\text{gauss0}[x\_] := \frac{1}{\sqrt{2 * \text{Pi} * \text{disp0}^2}} * \text{Exp}\left[\frac{-1}{2} * \left(\frac{x - \text{ave0}}{\text{disp0}^2}\right)^2\right];$$
指数関数

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[−696151.]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。

General: Exp[−3955.55]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[ ]:=
$$Q = \frac{\text{ave1} - \text{ave0}}{\text{disp1} + \text{disp0}};$$

```
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 18.2083

Q-dB is 25.2054 dB
```

In[ ]:=
```
ber[x_] := 1/2 * Erfc[x/Sqrt[2]];
```
相補誤差関数

```
Eyeopening = ((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 2.21917×10^-74

Eye Opening is 0.94508
```

In[ ]:=
```
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

Out[ ]=