In[∘]:= (*Defining variables*)

$\lambda := 800$ (*nm*)

$c := 300$ (*$\frac{nm}{fs}$*)

$w0 := 2 * \pi * \frac{c}{\lambda}$ (*$\frac{rad}{fs}$*)

$I0 := 1.2 * 10^{14}$ (*$\frac{W}{cm^2}$*)

$\epsilon 0 := 8.85 * 10^{-12}$ (*$\frac{As}{Vm}$*)

$cm := 3 * 10^{8}$ (*$\frac{m}{s}$*)

$e := 1.602 * 10^{-19}$ (*C*)

constante

$m := 9.109 * 10^{-31}$ (*Kg*)

$UP := 9.33 * 10^{-14} (I0) (\lambda * 10^{-3})^{2}$ (*eV*)

$Ip := 15.7596$ (*eV*)

$hw := (6.582 * 10^{-16}) \left(\frac{w0}{1 * 10^{-15}}\right)$ (*eV*)

In[∘]:= (*The cut-off is given by: *)

$1.32\, Ip + 3.17 * UP$ (*eV*)

Out[∘]= 43.5171

In[∘]:= (*The best material for this cut-off is then the aluminum*)

In[∘]:= (*The harmonic is*)

$\text{Round}\left[\frac{1.32\, Ip + 3.17 * UP}{hw}\right] + 1$ (*To make it odd*)

entero más próximo

Out[∘]= 29

In[∘]:= (*Which corresponds to a radiaton of *)

cuál

$29 * w0$ // N (*PHz*)

valor numérico

Out[∘]= 68.3296

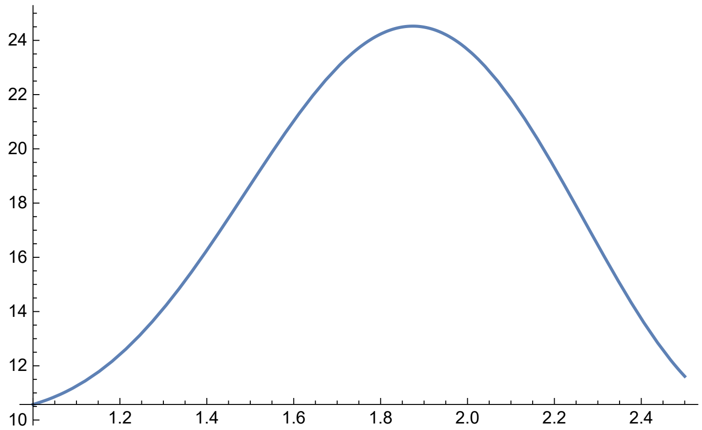
(*Average GDD from the classical model:*)

$vt[t\_] := \left(\text{Sin}[w0 * t] - \text{Cos}\left[\frac{\pi}{2}\left(\text{Sin}\left[\frac{1}{3}\left(-\frac{\pi}{2} + w0 * t\right)\right]\right)\right]\right)$

seno coseno seno

$Nh[t\_] := \frac{Ip + 2\, UP * vt[t]^{2}}{hw}$

In[∘]:= `Plot[Nh[t], {t, 1, 2.5}]`
representación gráfica

Out[∘]=



In[∘]:= $\frac{1.5 - 1.35}{(\mathrm{Nh}[1.5] - \mathrm{Nh}[1.35]) * \mathrm{w0}}$ (*GDD in $fs^2$ from the plot*)

Out[∘]= 0.0180404

In[∘]:=
```
(*Analysis of the image from the slide using ImageJ software. The
 pixels for the x and y axis were determined using the software and
 then the points for the slope were given by this. The values are:
  (*in x*)
    47 - 87
    47- 20
    87-47
    40-20
    2-1 (*pixels*)
    (*in y*)
    0-222
    0.1-187
    0.0028-1 (*pixels*)*)
```

In[∘]:= (*For the first point (57,180) and the second (63,202). This gives a slope of:*)
para cada

In[∘]:= $\frac{(180 - 202)(0.0028)}{(63 - 57)\,2}$ // N (*(ev)*)
valor numérico

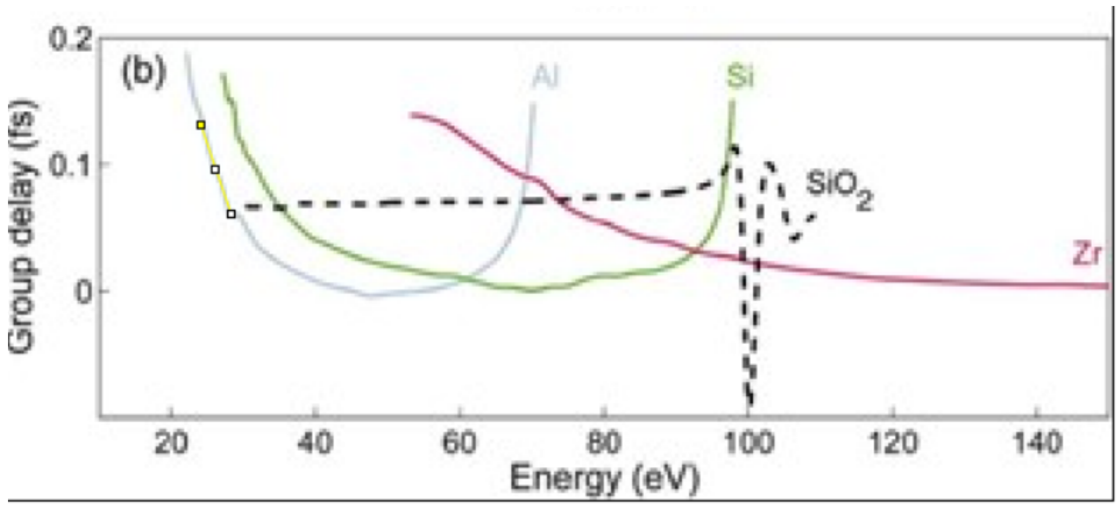
Out[∘]= -0.00513333

In[∘]:= (*In PHz*)
entrada

In[∘]:= $\frac{-0.00513}{0.6582}$

Out[∘]= -0.00779398

In[∘]:=




In[∘]:=
```
(*And the intersection is 1.10748, so the final GDD equation is: *)
 operación y

(*1.10748-0.0077w0*)
```

In[∘]:=
```
(*Equation for GD*)
GD[w_, d_] := ((1.5 - 1.35)/((Nh[1.5] - Nh[1.35]) * w0)) (w - w0) + d/200 (1.10748 - 0.00513/0.6582 w)
```

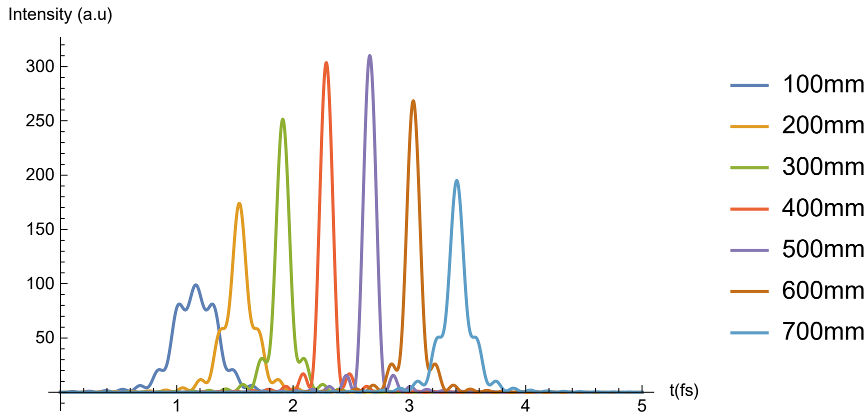
In[∘]:=
```
(*The amplitude is*)
Ampli[w_] := Piecewise[{{1, Ip/0.6582 < w < 29 * w0}}]
                 función a trozos

(*Since the GD is equal to dϕ/dw,
we can integrate the above equation with respect to w to get the phase
  of the electric field and this in the form E(w) = Ampli(w)*e^(i*ϕ(w)). Now,
                                                     número e          ahora
if we calculate the absolute value and take the square value we will
 get the intensity. Doing this for different values of d we
 can estimate which thickness produce the best compression.*)
```

In[∘]:=
```
A := {}
For[i = 100, i < 701, i += 100,
para cada
 AppendTo[A, (Abs[InverseFourierTransform[Ampli[w] e^(i*∫GD[w,i] dw), w, t]])^2]]
 añade al final
```

In[]:=
```
(*So the plot for the final pulse is*)
Plot[{A[[1]], A[[2]], A[[3]], A[[4]], A[[5]], A[[6]], A[[7]]}, {t, 0, 5}, PlotRange → All,
 PlotLegends → {"100mm", "200mm", "300mm", "400mm", "500mm", "600mm", "700mm"},
 AxesLabel → {"t(fs)", "Intensity (a.u)"}]
```
representación gráfica | rango de rep··· | todo | leyendas de representación | etiqueta de ejes

Out[]=




```
(*Then the distance of the crystal should be of 500mm since it
 produces the highest intensity value and the most compressed pulse*)
```