

Esperienza sull'interferenza luminosa

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Codice

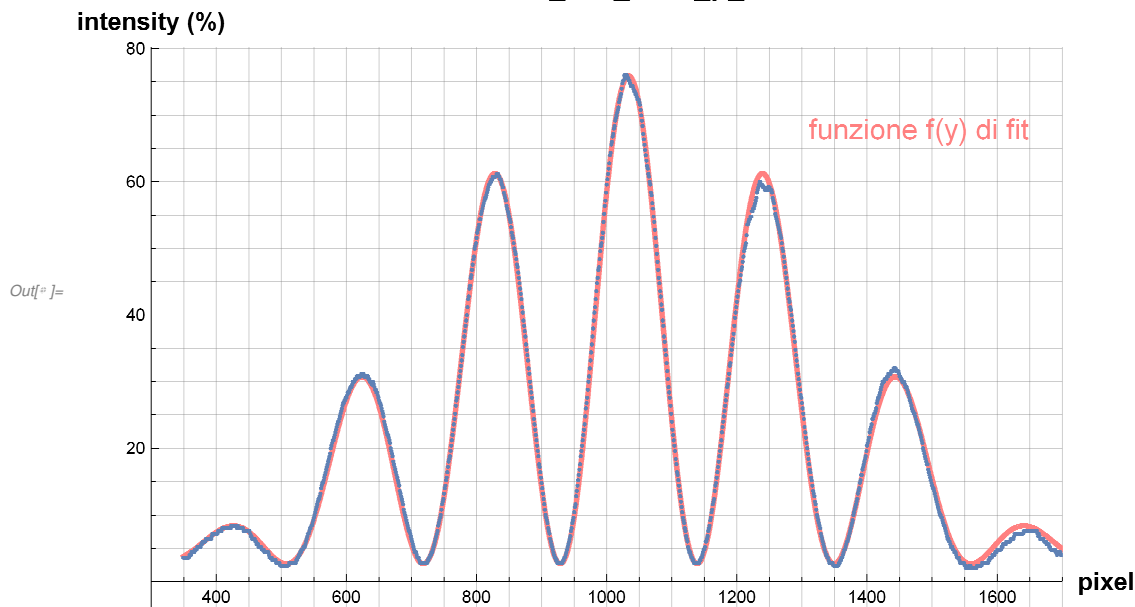
Elaborazione con interpolazione del modello teorico

2fenditure_075_3335_p_1.txt

Con puntatore laser

```
In[*]:= confrontaGrafici["2fenditure_075_3335_p_1.txt", {350, 1700}, {0.004, 0.016, 80, 1020, 2}]
```

2fenditure_075_3335_p_1.txt



```
In[*]:= par1 =
```

```
parametriModello["2fenditure_075_3335_p_1.txt", {350, 1700}, {0.004, 0.016, 80, 1020, 2}]
```

```
Out[*]:= {0.00388617, 0.0149303, 73.2483, 1033.72, 2.65618}
```

calcolo della lunghezza d'onda in **nm** tramite il solo modello teorico

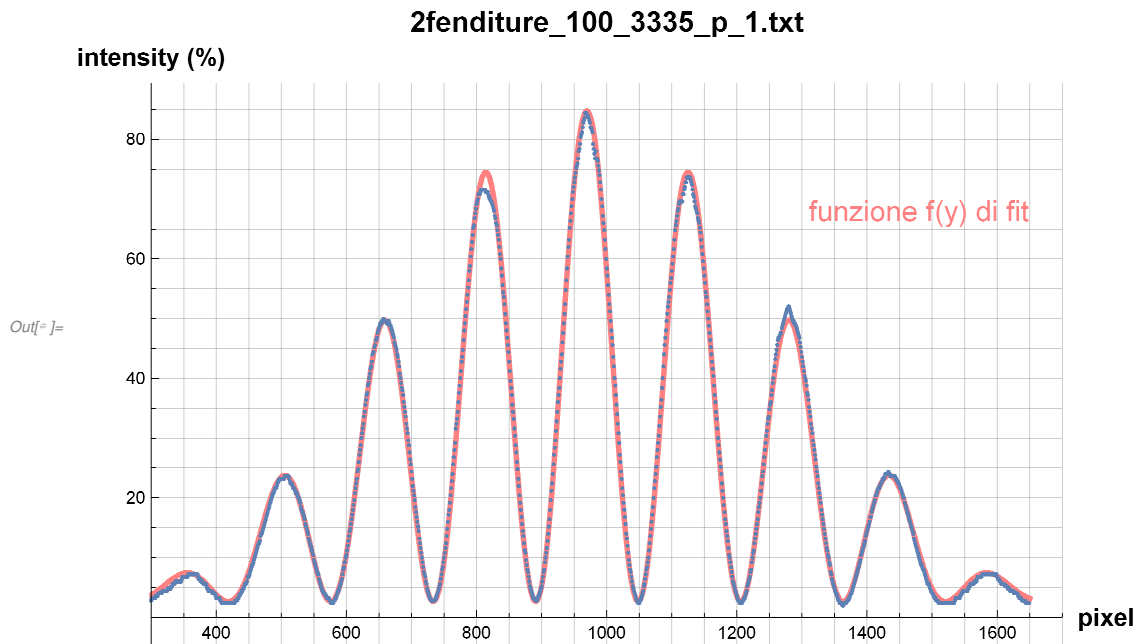
```
In[*]:= calcolaLambda["2fenditure_075_3335_p_1.txt", par1]
```

```
Out[*]:= 646.958
```

2fenditure_100_3335_p_1.txt

Con puntatore laser

```
In[ ]:= confrontaGrafici["2fenditure_100_3335_p_1.txt", {300, 1650}, {0.004, 0.02, 85, 1000, 2}]
```



```
In[ ]:= par2 =
```

```
  parametriModello["2fenditure_100_3335_p_1.txt", {300, 1650}, {0.004, 0.02, 85, 1000, 2}]
```

```
Out[ ]:= {0.00401297, 0.0199469, 82.0595, 969.562, 2.65548}
```

calcolo della lunghezza d'onda in **nm** tramite il solo modello teorico

```
In[ ]:= calcolaLambda["2fenditure_100_3335_p_1.txt", par2]
```

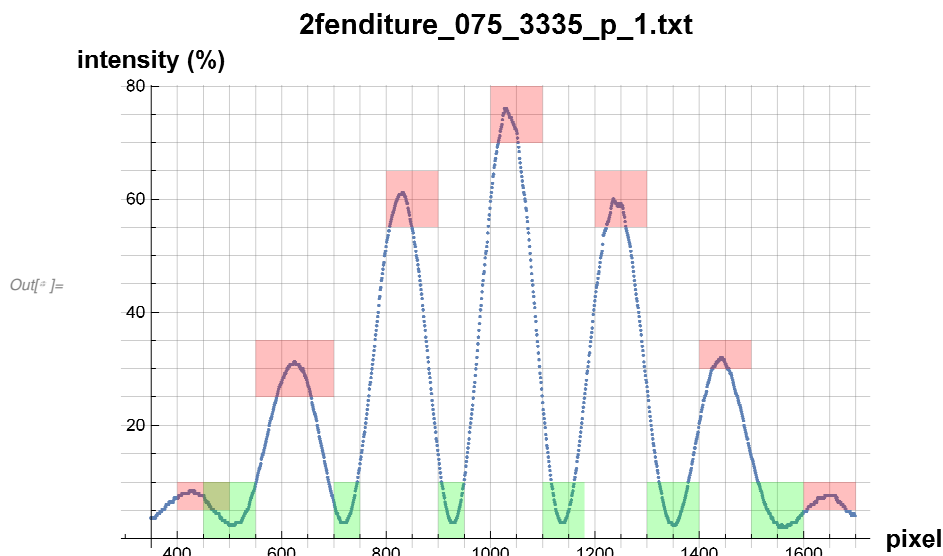
```
Out[ ]:= 645.663
```

Elaborazione con ricerca semiautomatica degli estremi

2fenditure_075_3335_p_1.txt

Zone del grafico entro le quali cercare i massimi dell'intensità (individuare in base all'output di `confrontaGrafici`).

```
In[ ]:= findMax = {{{400, 5}, {500, 10}}, {{550, 25}, {700, 35}},
  {{800, 55}, {900, 65}}, {{1000, 70}, {1100, 80}}, {{1200, 55}, {1300, 65}},
  {{1400, 30}, {1500, 35}}, {{1600, 5}, {1700, 10}}};
findMin = {{{450, 0}, {550, 10}}, {{700, 0}, {750, 10}}, {{900, 0}, {950, 10}},
  {{1100, 0}, {1180, 10}}, {{1300, 0}, {1400, 10}}, {{1500, 0}, {1600, 10}}};
In[ ]:= rappresentaZona["2fenditure_075_3335_p_1.txt", {350, 1700}, {findMax, findMin}]
```



```
In[ ]:= coordMax = coordinateEstremi["2fenditure_075_3335_p_1.txt", {350, 1700}, findMax, "max"]
Out[ ]:= {{427.6, 8.4}, {624.5, 31.2}, {832., 61.2},
  {1029.25, 76.}, {1235.5, 60.}, {1442.5, 32.}, {1651., 7.6}}

In[ ]:= deltaPx[coordMax]
Out[ ]:= {196.9, 207.5, 197.25, 206.25, 207., 208.5}

In[ ]:= MM = calcolaLambda2["2fenditure_075_3335_p_1.txt", coordMax]
Out[ ]:= {626.918, 6.70042}

In[ ]:= coordMin = coordinateEstremi["2fenditure_075_3335_p_1.txt", {350, 1700}, findMin, "min"]
Out[ ]:= {{504.5, 2.4}, {718.5, 2.8}, {928., 2.8}, {1138., 2.8}, {1352., 2.4}, {1560.43, 2.}}

In[ ]:= deltaPx[coordMin]
Out[ ]:= {214., 209.5, 210., 214., 208.429}

In[ ]:= mm = calcolaLambda2["2fenditure_075_3335_p_1.txt", coordMin]
Out[ ]:= {649.319, 3.61775}
```

Calcolo della media pesata dei due valori precedenti

```
In[6]:= mediaPesata[{MM, mm}]
```

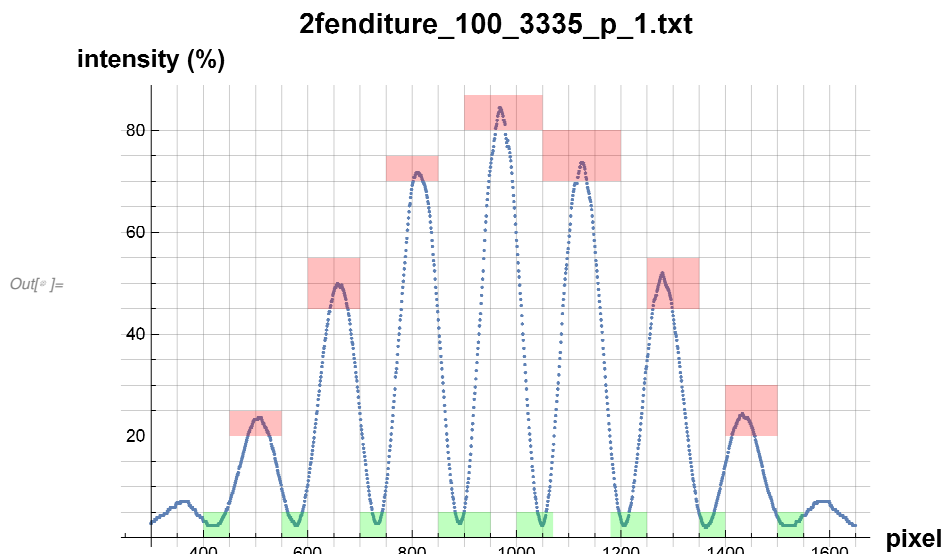
```
Out[6]= {644.263, 3.18337}
```

2fenditure_100_3335_p_1.txt

Zone del grafico entro le quali cercare i massimi dell'intensità (individuare in base all'output di **confrontaGrafici**).

```
Clear[findMax, findMin, MM, mm];
```

```
In[ ]:= findMax = {{ {450, 20}, {550, 25} }, { {600, 45}, {700, 55} },
  { {750, 70}, {850, 75} }, { {900, 80}, {1050, 87} }, { {1050, 70}, {1200, 80} },
  { {1250, 45}, {1350, 55} }, { {1400, 20}, {1500, 30} } };
findMin = {{ {400, 0}, {450, 5} }, { {550, 0}, {600, 5} }, { {700, 0}, {750, 5} },
  { {850, 0}, {950, 5} }, { {1000, 0}, {1070, 5} }, { {1180, 0}, {1250, 5} },
  { {1350, 0}, {1400, 5} }, { {1500, 0}, {1550, 5} } };
In[ ]:= rappresentaZona["2fenditure_100_3335_p_1.txt", {300, 1650}, {findMax, findMin}]
```



```
In[ ]:= coordMax = coordinateEstremi["2fenditure_100_3335_p_1.txt", {300, 1650}, findMax, "max"]
```

```
Out[ ]:= { {508., 23.6}, {657., 50.}, {810., 71.6},
  {968., 84.4}, {1125.5, 73.6}, {1279.5, 52.}, {1433., 24.4} }
```

```
In[ ]:= deltaPx[coordMax]
```

```
Out[ ]:= {149., 153., 158., 157.5, 154., 153.5}
```

```
In[ ]:= MM = calcolaLambda2["2fenditure_100_3335_p_1.txt", coordMax]
```

```
Out[ ]:= {632.008, 5.51702}
```

```
In[ ]:= coordMin = coordinateEstremi["2fenditure_100_3335_p_1.txt", {300, 1650}, findMin, "min"]
```

```
Out[ ]:= { {418., 2.4}, {578., 2.4}, {733., 2.8}, {891.5, 2.8},
  {1049., 2.4}, {1206., 2.4}, {1363., 2.}, {1522., 2.4} }
```

```
In[ ]:= deltaPx[coordMin]
```

```
Out[ ]:= {160., 155., 158.5, 157.5, 157., 157., 159.}
```

```
In[ ]:= mm = calcolaLambda2["2fenditure_100_3335_p_1.txt", coordMin]
```

```
Out[ ]:= {646.552, 2.52462}
```

Calcolo della media pesata dei due valori precedenti

```
In[*]:= mediaPesata[{MM, mm}]
```

```
Out[*]:= {644.034, 2.29568}
```

Simulazione delle diverse distribuzioni di intensità

Rappresenta la distribuzione di intensità nella sola interferenza e/o in presenza di interferenza e diffrazione e come questa intensità vari in funzione dei parametri coinvolti. Di tale simulazione si distribuisce pure la versione CDF utilizzabile con il gratuito CDF player.

```

In[ ]:= Manipulate[
Module[{coeff, interferenza, diffrazione}, interferenza[x_] := Cos[ $\pi d 10^4 / (\lambda L) x$ ]^2;
diffrazione[x_] :=
Piecewise[{{(Sin[ $\pi a 10^4 / (\lambda L) x$ ] / ( $\pi a 10^4 / (\lambda L) x$ ))^2, x  $\neq$  0}, {1, x == 0}}];
Show[Plot[{If[int == True, interferenza[x], {}], If[dif == True, diffrazione[x], {}],
If[intdif == True, interferenza[x]  $\times$  diffrazione[x], {}]}, {x, -ext, ext},
PlotRange -> All, AxesLabel -> {"y (m)", None}, PlotLabel -> "Intensity", PlotStyle ->
{Opacity[.3], Automatic, Automatic}, PlotLegends -> {"interferenza:  $\cos^2 \frac{\pi d y}{\lambda L}$ ",
"diffrazione:  $\frac{\sin^2 z}{z^2}$ ,  $z = \frac{\pi a y}{\lambda L}$ ", "interf.diffraz.:  $\frac{\sin^2 z}{z^2} \cos^2 \frac{\pi d y}{\lambda L}$ ,  $z = \frac{\pi a y}{\lambda L}$ "},
Filling -> {3 -> Axis}], PlotRange -> {{-ext, ext}, {0, 1}}, ImageSize -> 300]],
Grid[{{Control@{ $\lambda$ , 650, "lunghezza d'onda (nm)"}, 400, 700},
Control[{{int, True, "interferenza"}, {True, False}, Checkbox]}], {Control@{a, 20,
"larghezza fenditura (mm/100)"}, 1, 100}, Control[{{dif, True, "diffrazione"},
{True, False}, Checkbox]}], {Control@{d, 75, "distanza fenditure (mm/100)"},
0, 200}, Control[{{intdif, True, "interferenza+diffrazione"}, {True, False},
Checkbox]}], {Control@{L, 3.3, "distanza fenditure-schermo (m)"}, 0.5, 10}, Null},
{Control@{ext, .01, "estremo superiore intervallo (m)"}, 0.001, .1}, Null}},
Alignment -> Right, Spacings -> {5, .5}]]

```

