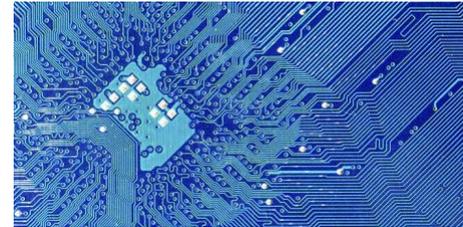
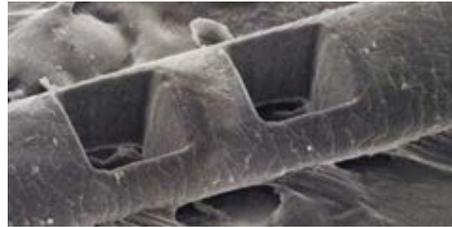
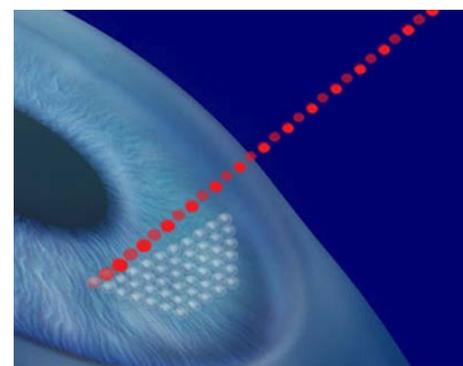
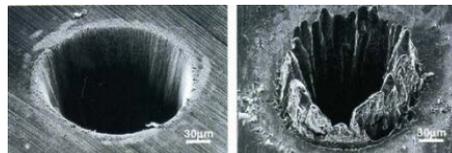
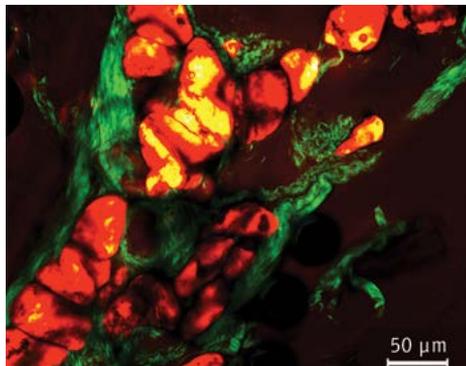


# ULTRAFAST LASERS

AVANCES EN I+D Y APLICACIONES INDUSTRIALES



## “Láseres ad hoc”



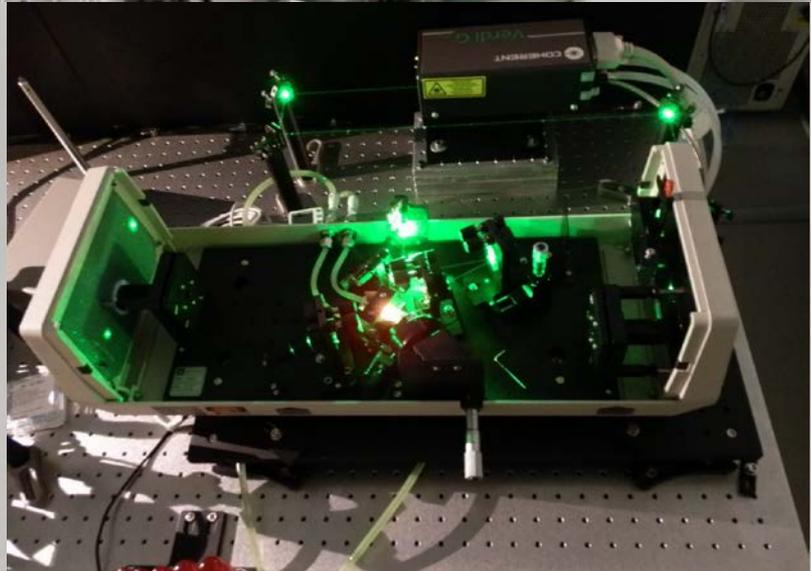
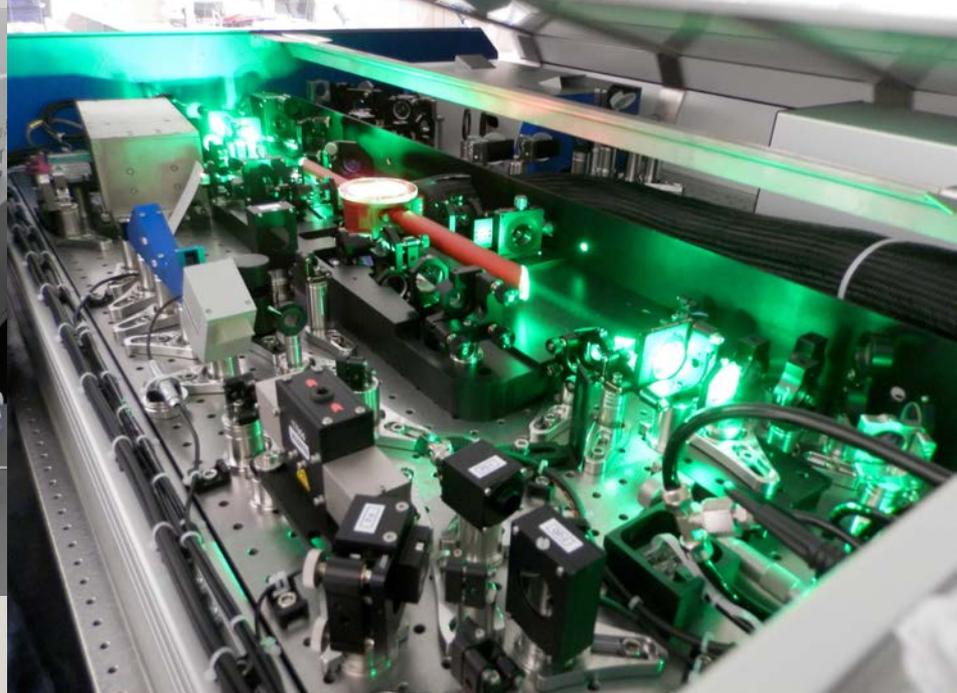
## ICTS: Instalación Científico-Técnica Singular



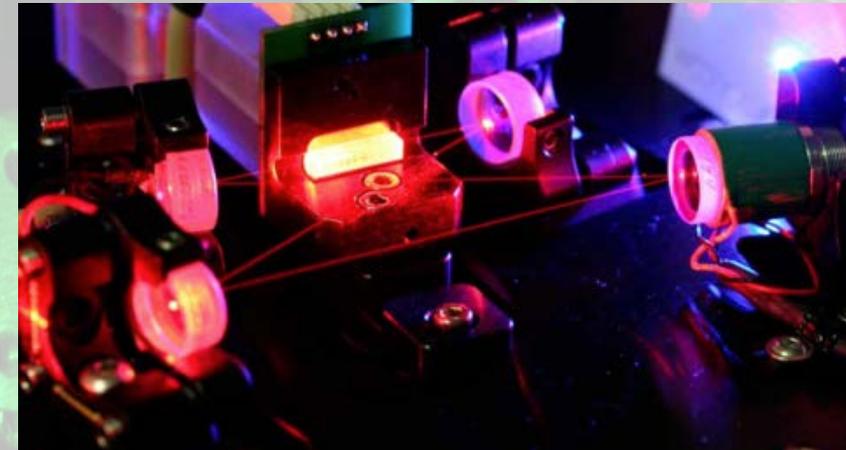
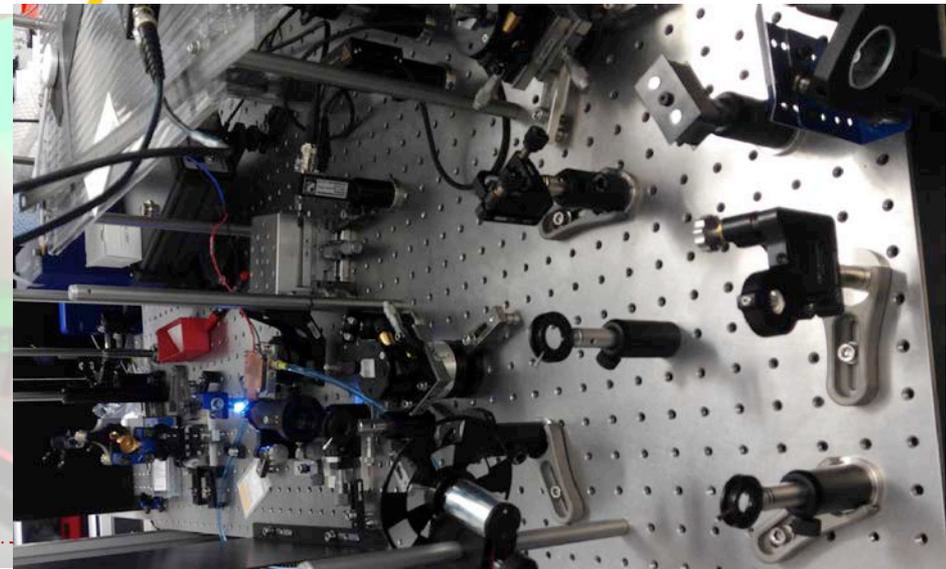
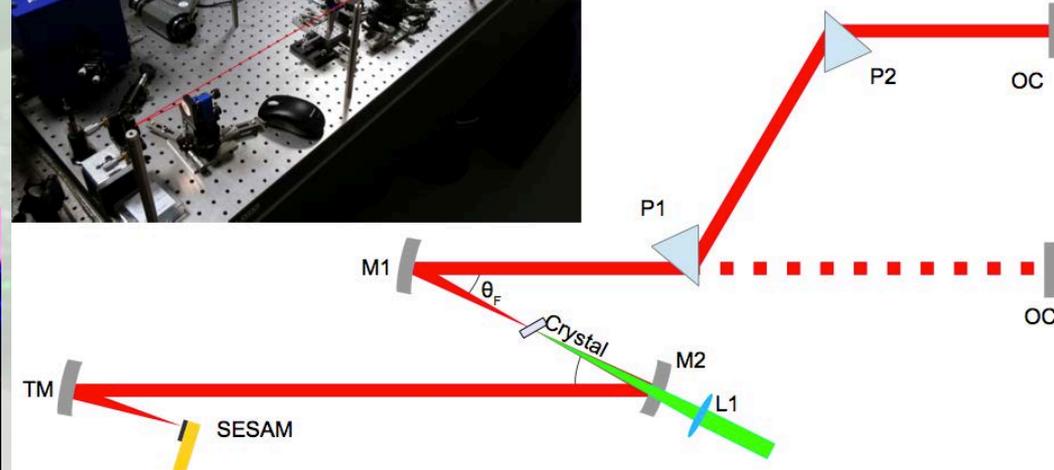
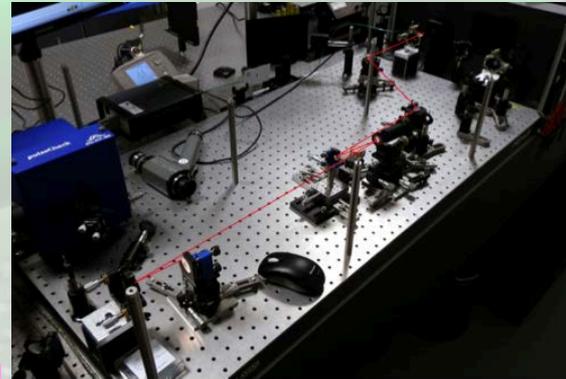
Usuarios: Empresas y Centros Investigación

## **CENTRO DE LÁSERES PULSADOS ULTRAIINTENSOS ULTRACORTOS - CLPU**

- 800 nm, 1030 nm y armónicos
- 6 fs – ps
- Potencia promedio 1W –  $10^{15}$  W
- 1 mJ – 30 J



## Láseres ad hoc?? Necesidades específicas de un específico uso.



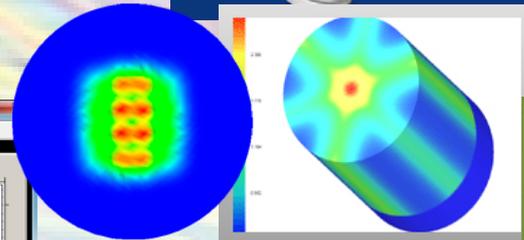
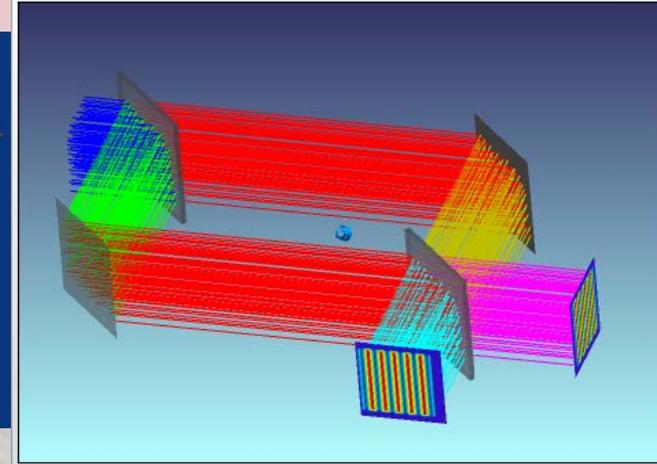
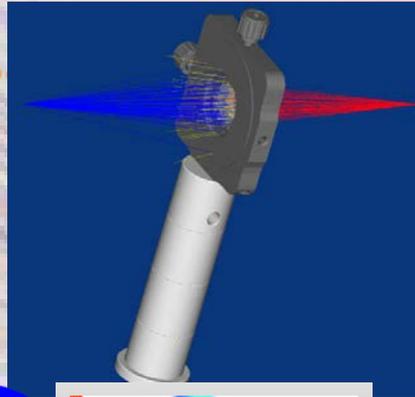
### Diseño de osciladores láser y amplificadores.



OpticStudio<sup>TM</sup> 14.

Matlab  
Mathematica

...



TiCa Simulation: Cavity Power

Simulation Parameters	
<b>Precision</b>	<b>Cavity</b>
Npts (2 <sup>n</sup> ) 11	wlmit_c (um) 50
Error 0.005	wlmit_p (um) 50
<b>Crystal</b>	Z1_c (cm) 0.5
sigma (10 <sup>-15</sup> cm <sup>-2</sup> ) 3	Z1_p (cm) 0.5
tau (us) 3.2	T_OC (%) 3.5
lc (cm) 1	eta (%) 2
<b>Pump Beam</b>	<b>Fundamental Beam</b>
Lambda_p (nm) 832	Lambda_c (nm) 800
alpha_p (cm <sup>-1</sup> ) 2.5	alpha_c (cm <sup>-1</sup> ) 0.005
n_p ( ) 1.76	n_c ( ) 1.77
Ppump (W) 15	
<b>Static Parameters</b>	
Calculated Parameters	
FOM ( ) 313	
L_cav (cm/cm <sup>2</sup> ) 0.26	
P_cavity (W) 79.57	
P_out (W) 2.785	
Calculate	
<b>Sweep</b>	
Fine Sweep	Coarse Sweep
Crystal	FOM
Min 0.2	Min 50
Max 3.5	Max 500
Npts 50	Npts 5
Save Plot	
Save Data	

**P<sub>OUT</sub> vs. Crystal Length vs. FOM**

Legend:

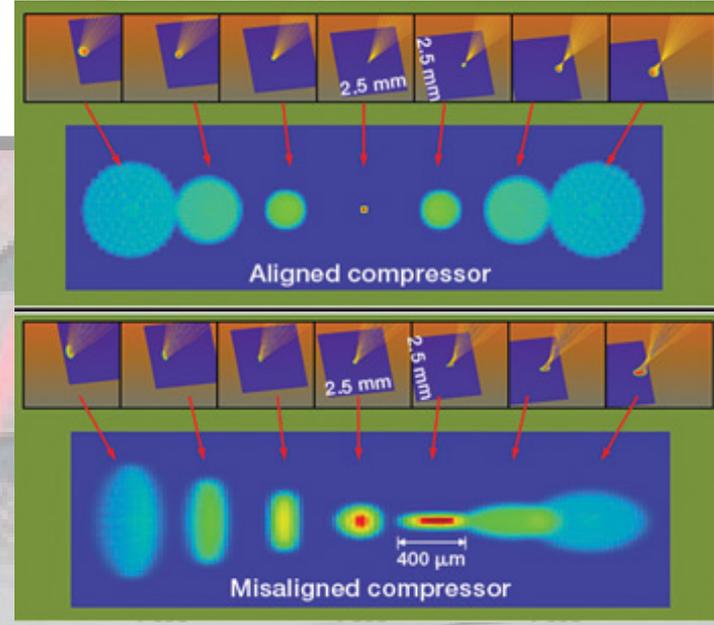
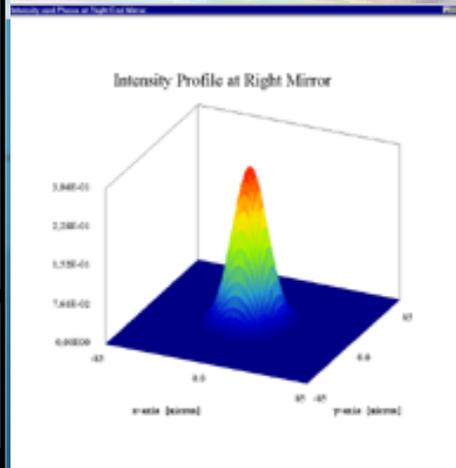
- FOM = 50.0
- FOM = 162.5
- FOM = 275.0
- FOM = 387.5
- FOM = 500.0

**Sweep Parameters**

X data	Y1 data	Y2 data	Y3 data	Y4 data	Y5 data	Y6 data
0.2050	1.3017	1.0191	1.7022	1.0229	1.8458	
0.2673	1.5362	2.1135	2.2579	2.3234	2.3609	
0.3347	1.6822	2.4378	2.6382	2.7310	2.7843	
0.4520	1.7684	2.6823	2.9391	3.0599	3.1301	
0.6184	1.8038	2.8625	3.1743	3.3233	3.4108	
0.8387	1.8105	2.9915	3.3554	3.5319	3.6362	
0.0641	1.7952	3.0793	3.4919	3.6952	3.8151	
0.6714	1.7642	3.1343	3.5918	3.8205	3.9579	
0.7300	1.7227	3.1631	3.6670	3.9158	4.0077	

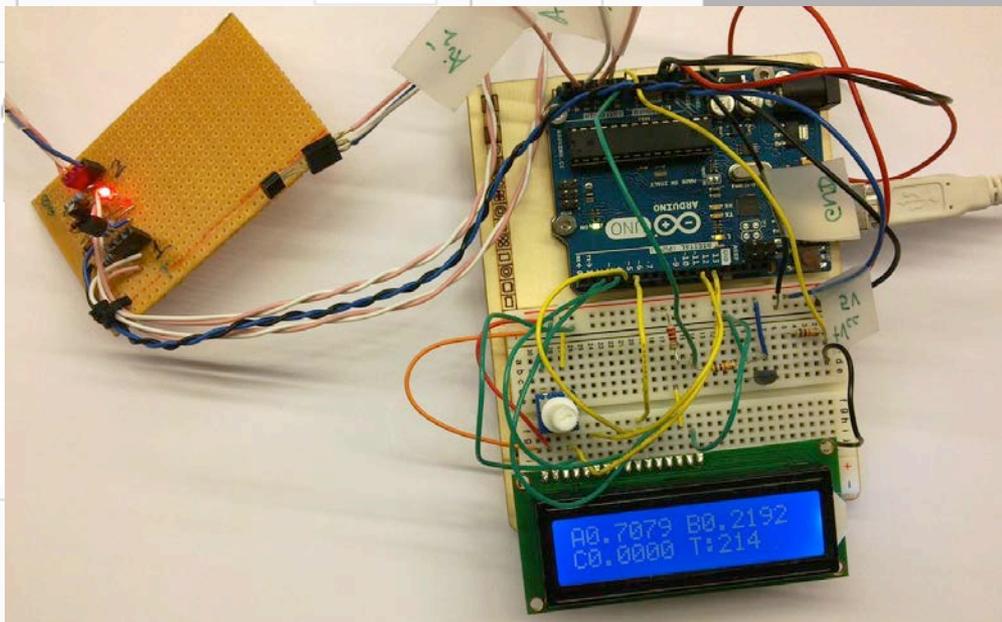
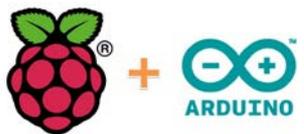
Time Elapsed (s) 3.965

Enrique Garcia, CLPU, 2013

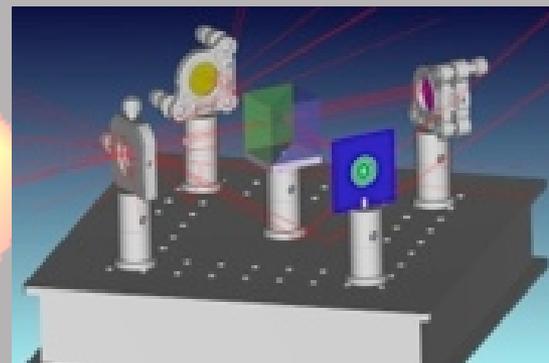


## Integración y diagnóstico

Raspberry pi, Arduino



Solidworks-CAD



Centro de mecanizado 5 ejes

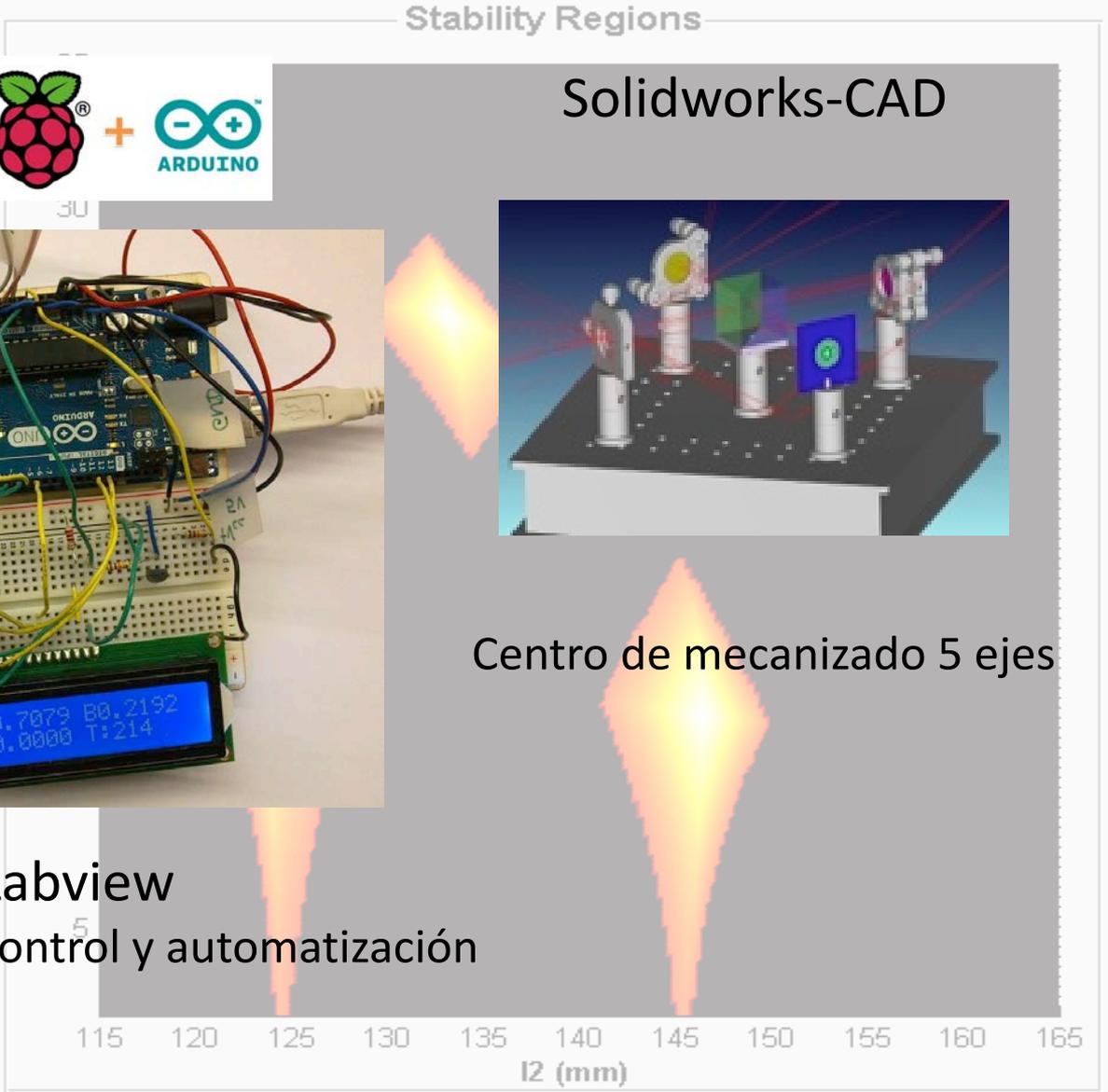
Labview  
control y automatización

Crystal Length(mm)	21
Crystal Index ( )	1.75
Arm l3 (mm)	400
R (mm)	110

l2 max (mm)	165
θmin (deg)	2
θmax (deg)	35

Progress 99.7

Run Exit



### Integración y diagnóstico

Medida de pulsos y desarrollo de autocorreladores.

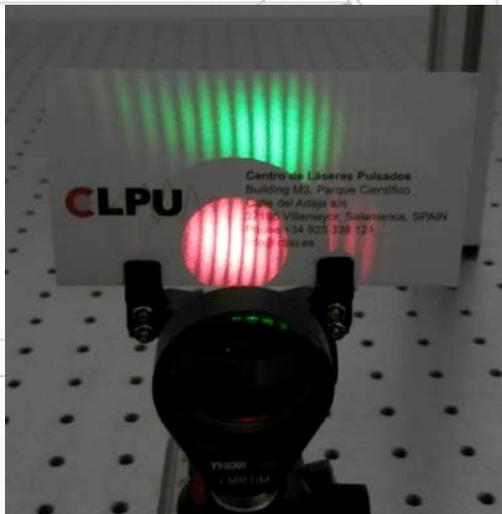
#### TiSa Stability Regions

##### Cavity Parameters

Crystal Length(mm)	21
Crystal Index ( )	1.75

R (mm)	110
--------	-----

##### Cavity Scheme

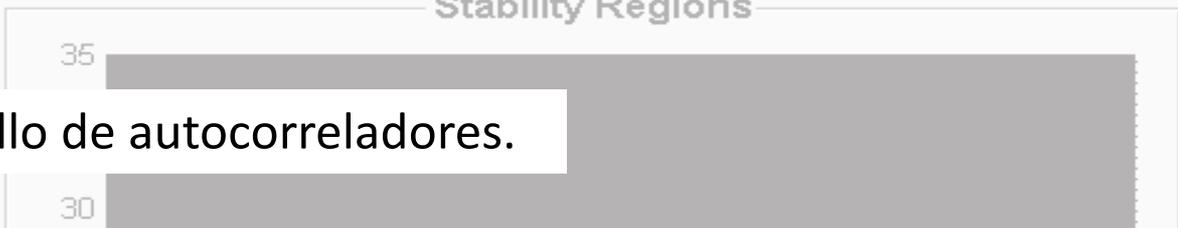
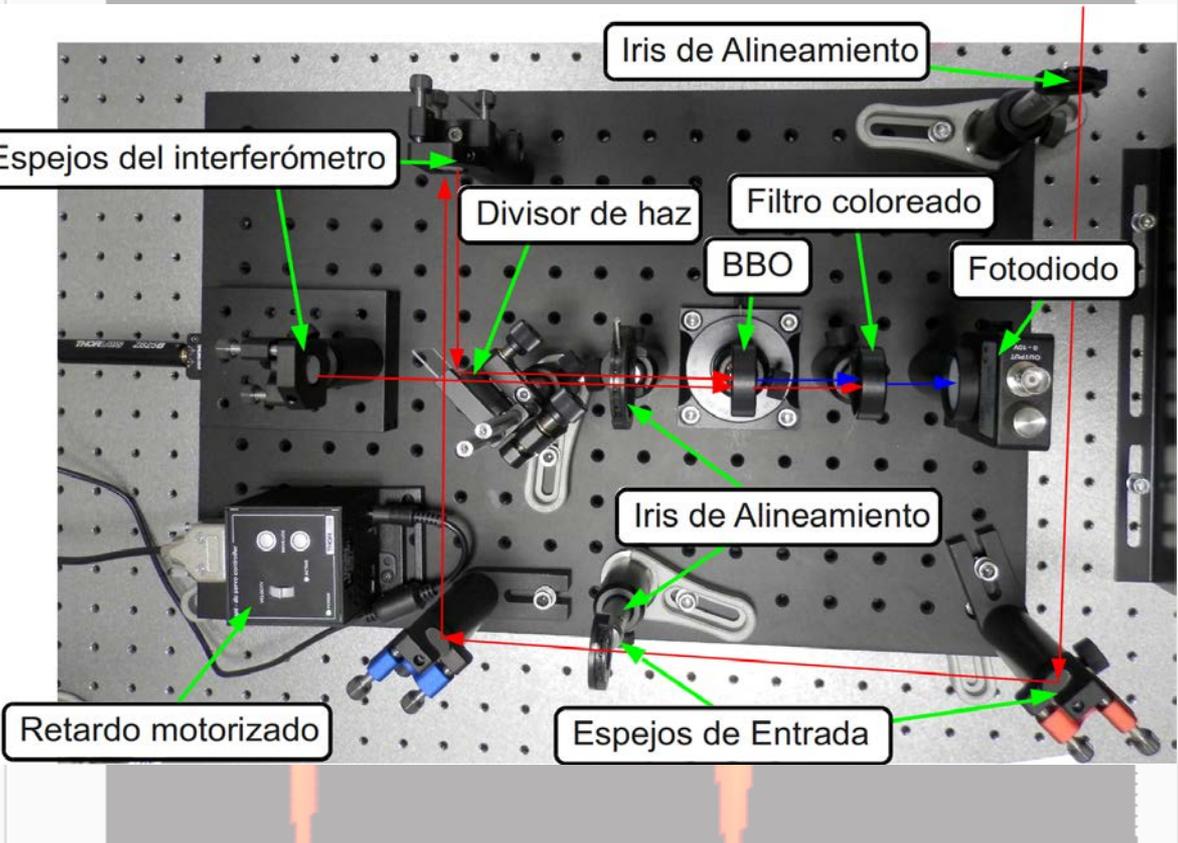



$\theta$ min (deg)	2
$\theta$ max (deg)	35

Progress 99.7

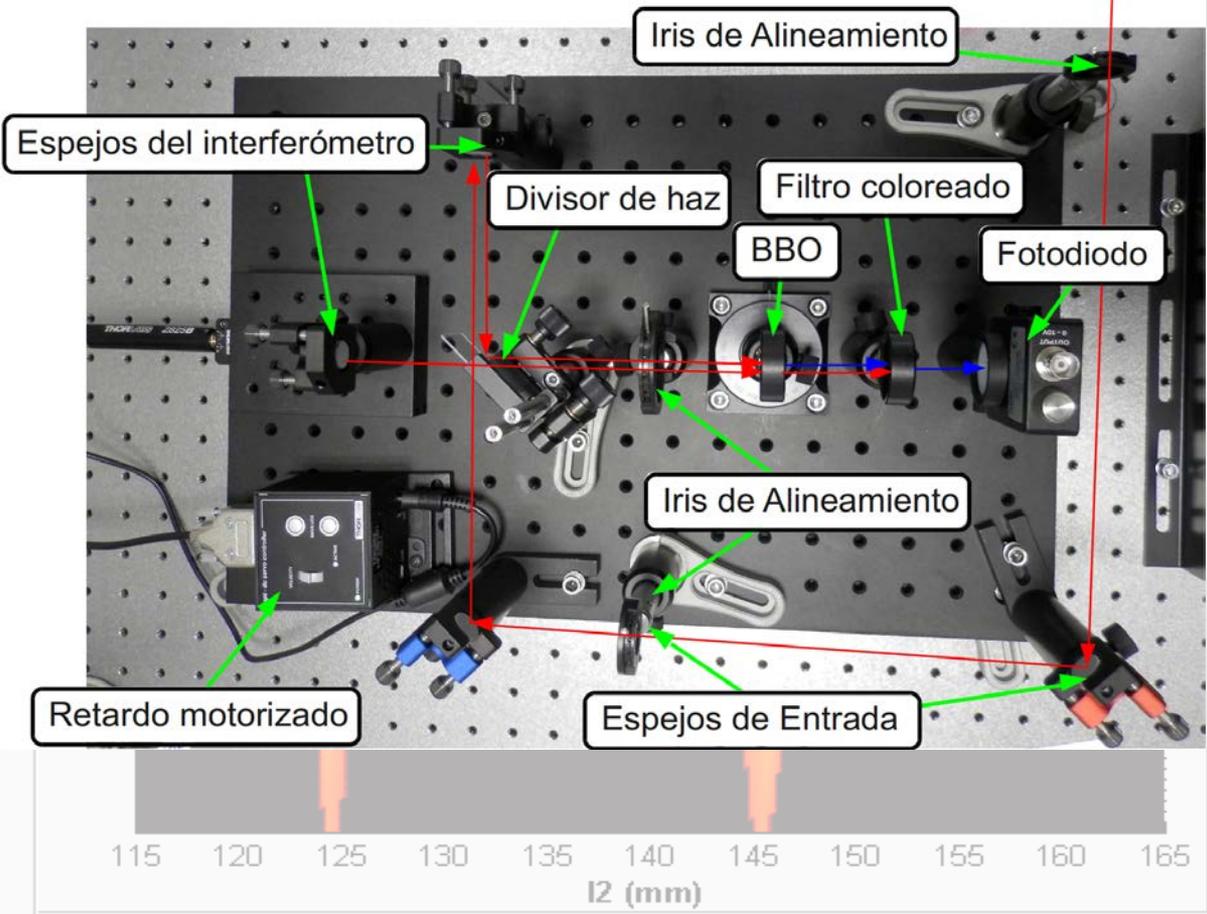
Run
Exit

#### Stability Regions

115
120
125
130
135
140
145
150
155
160
165

$l_2$  (mm)



## INNFACTOS

Jeanologia laser  
Proton laser applications  
Iberdrola

## Colaboración

Valeo  
Next  
Deneb  
ICMM  
ICMA

## En proceso

Tecnoatom  
Cerámicas  
Escuelas Odontológicas  
Patrimonio restauración



Research and development  
of new sources laser



**VOSOTROS**

**“Know-How”**

**Sinergias**

**Aportaciones**

**Marco de trabajo**

**Láseres de fs y  
amplificadores**

**Identificar necesidades y  
sinergias con centros y  
empresas**

**Equipamiento  
técnico**

**Recursos  
humanos**

**Análisis de  
aplicaciones láser**

**Desarrollo de  
sistemas láser**

**Consultoría y  
formación**