

Pulse shaping system state at INFN-Milano

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Outline

- The goal
- The so far work
 - Theoretical work (3 paper)
 - Lab work (development of the laser as a tool for investigations and diagnostic tools)
- Comments and conclusions

The goal

Obtain rectangular laser pulses of 10-30 ps
With fast rise time
starting from a “gaussian” laser pulse

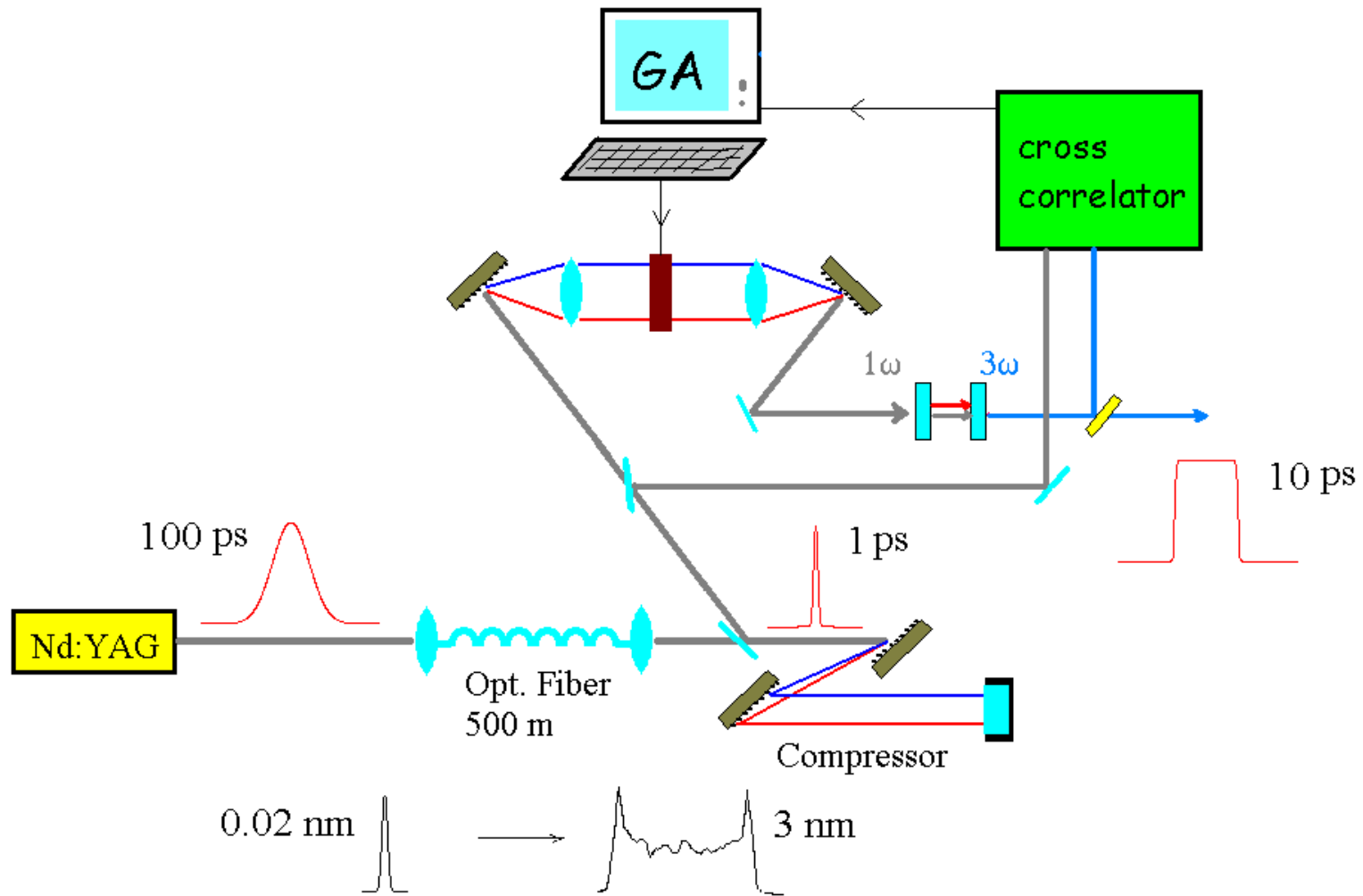
Two technologies are programmed

- SLM Spatial Light Modulator
- Dazzler-AOPDF

Theoretical work

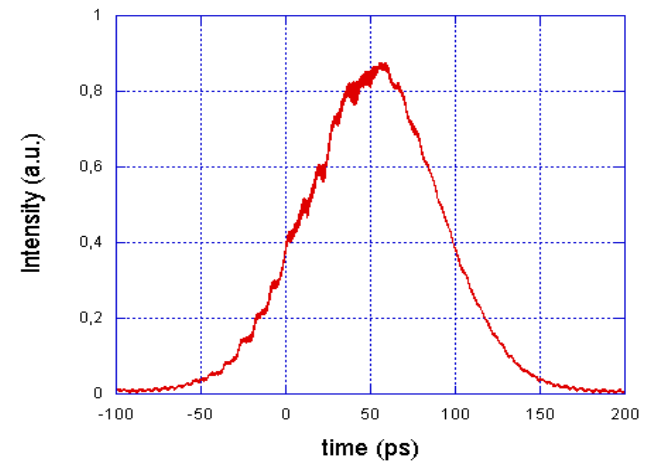
- 3 paper
 - “A laser pulse shaper for the low-emittance radiofrequency SPARC electron gun”, S. Cialdi, I. Boscolo, Nuc. Inst. Meth. A 526 (2004) 239-248
 - “Feature of a phase-only shaper set for a long rectangular pulse”, S. Cialdi, I. Boscolo, A. Flacco, J. Opt. Soc. Am. B, 2, 1693 (2004)
 - “A shaper for providing long laser target waveforms”, S. Cialdi, I. Boscolo, in press NIM next month.
- 1 paper in progress
 - Effects on the pulse shape of the harmonics generation

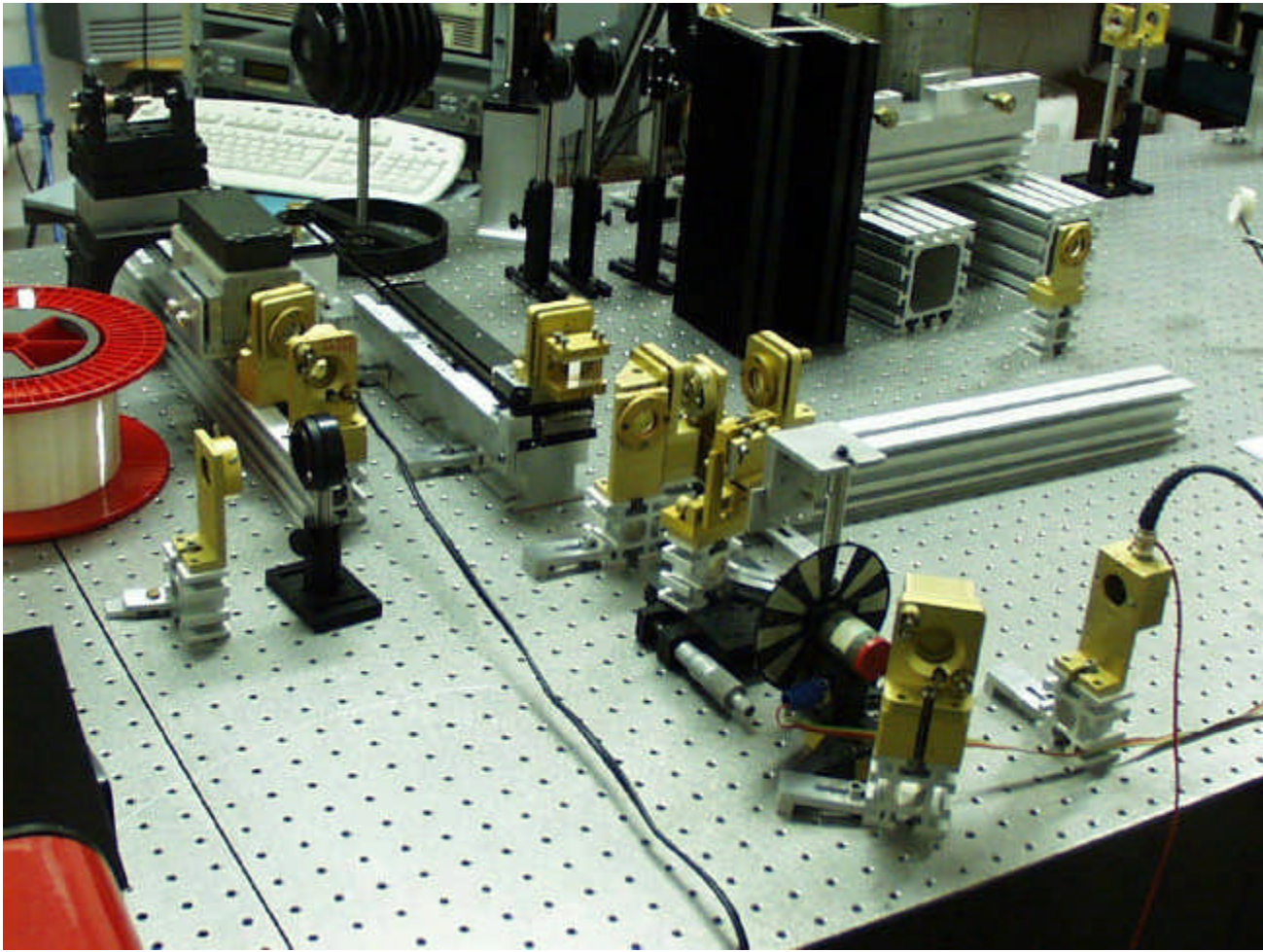
Lab work



Laser oscillator

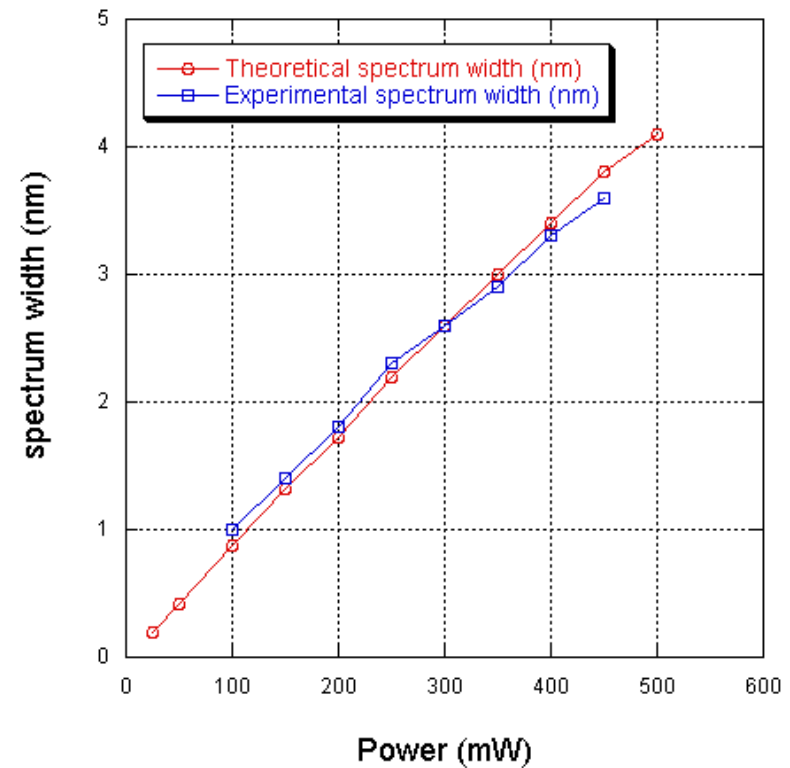
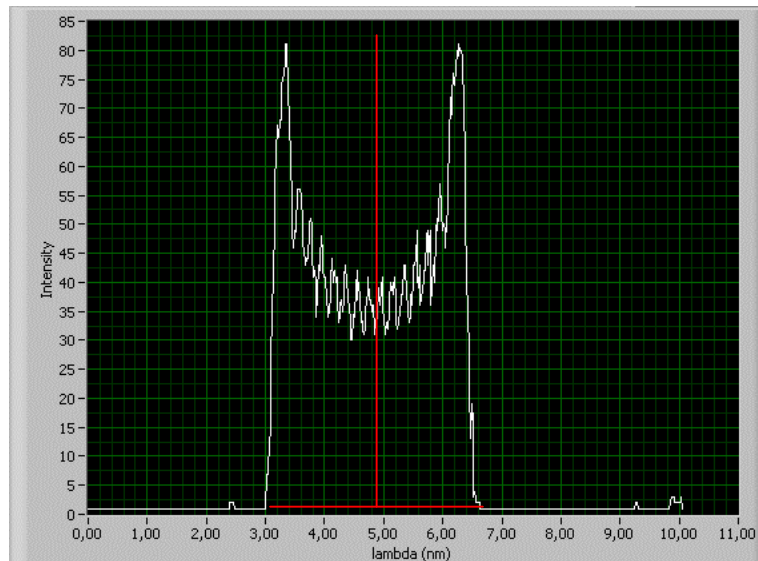
- The developed laser source for pulse shaping investigation:
 - Nd:YAG oscillator with active mode-locker 100 MHz
 - Pulse length $\Delta\tau = 100$ ps
 - Power Stability $\sigma/I_{\text{mean}} = 1.5$ %



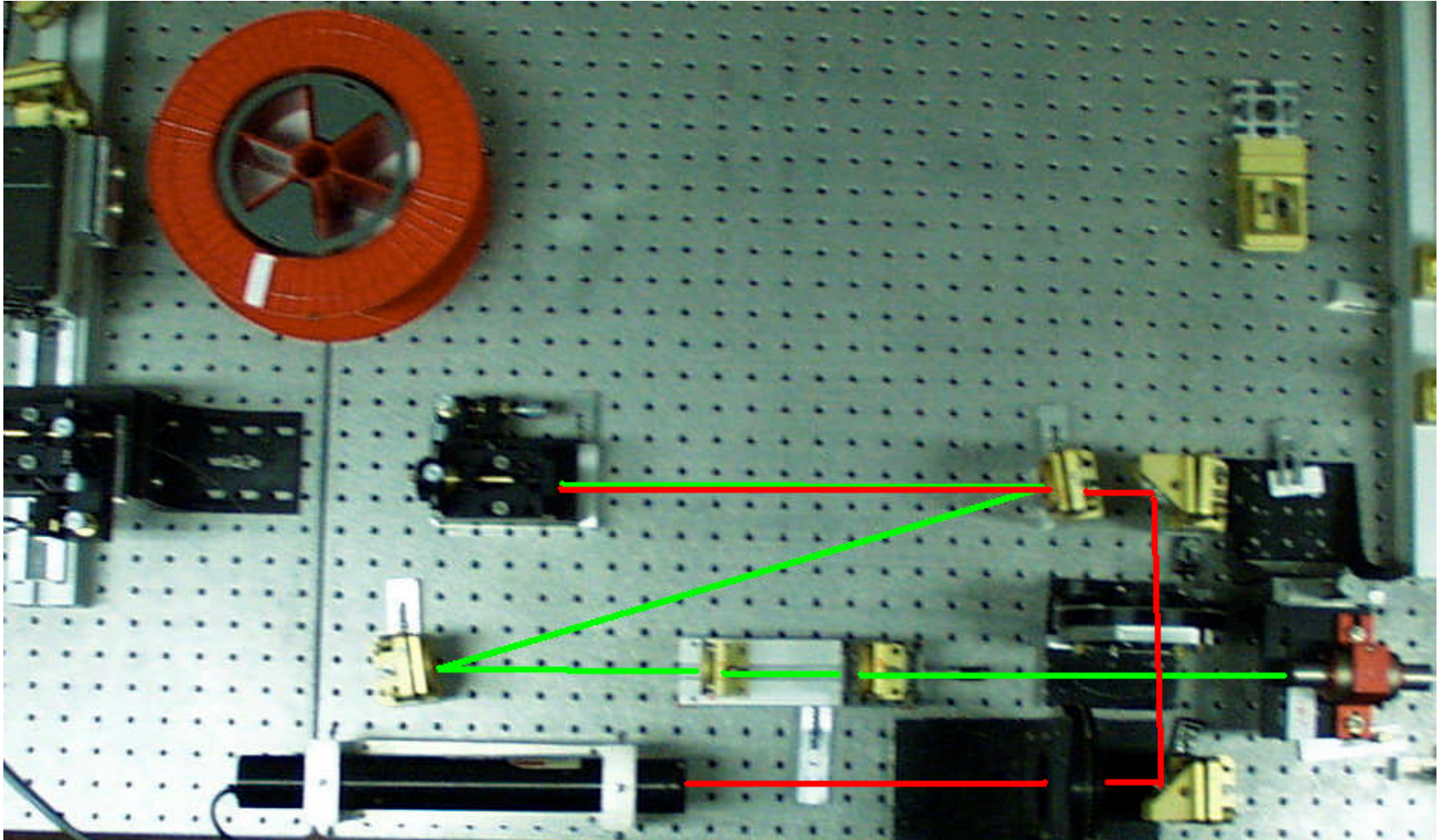


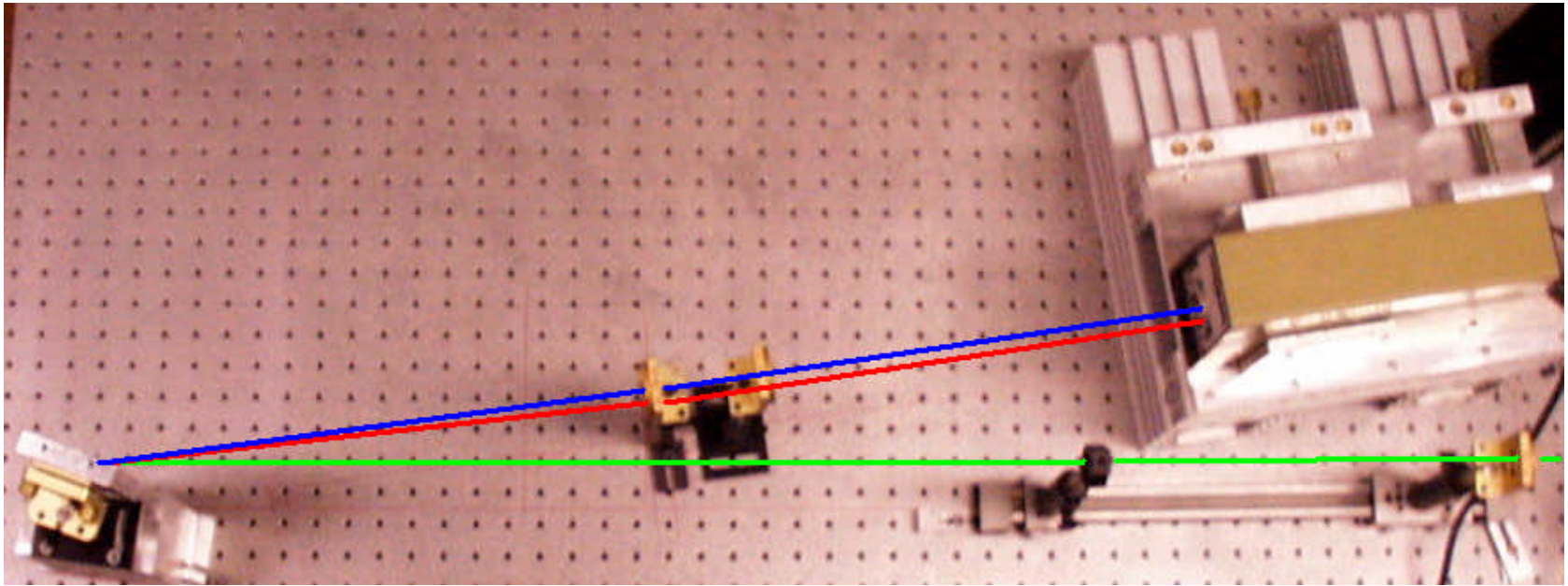
Optic fiber results

- 40 % energy coupling (ok)
- Spectrum widening from 0.02 nm to 4 nm (ok)

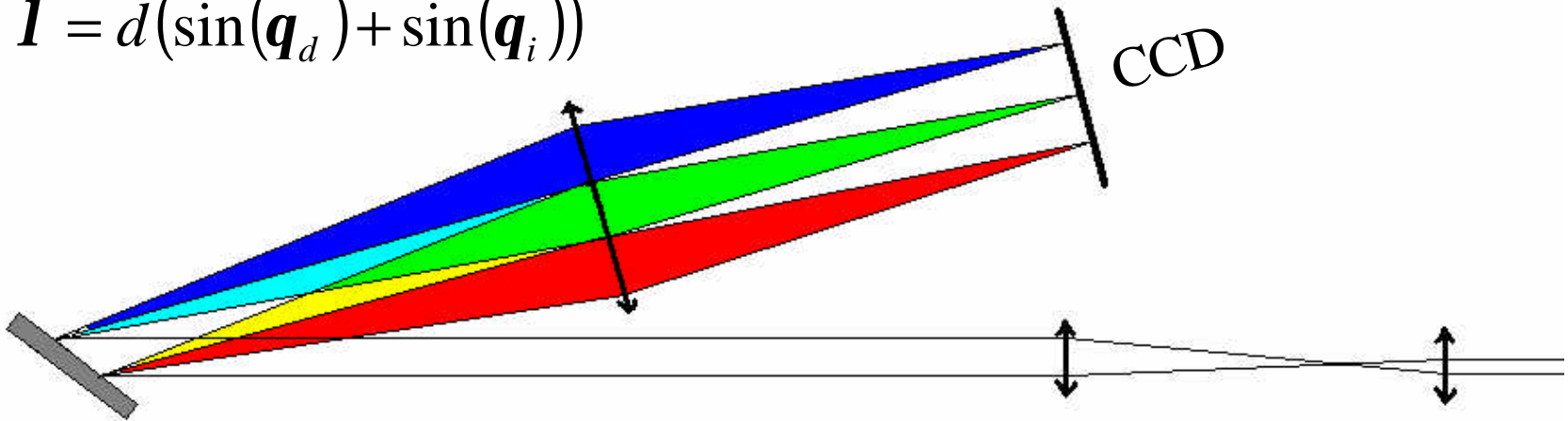


Optic fiber

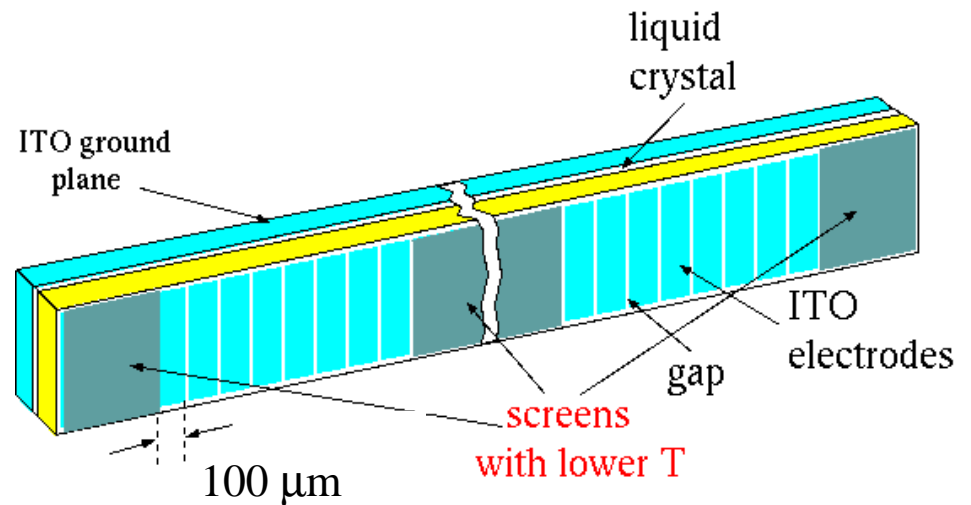
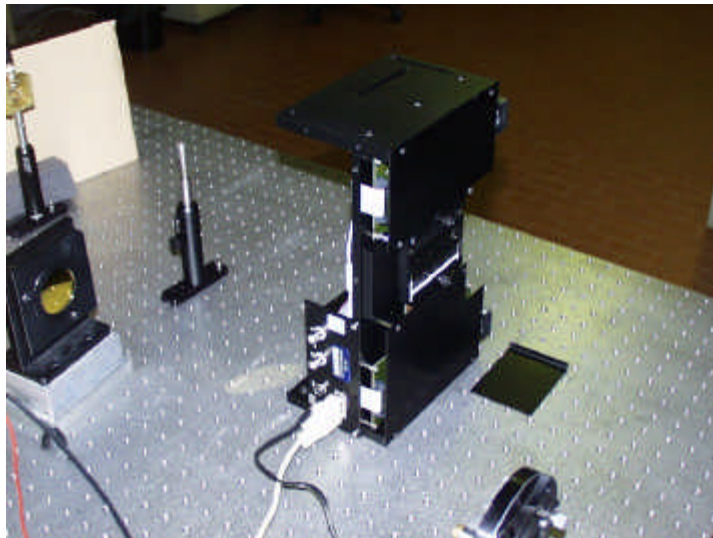
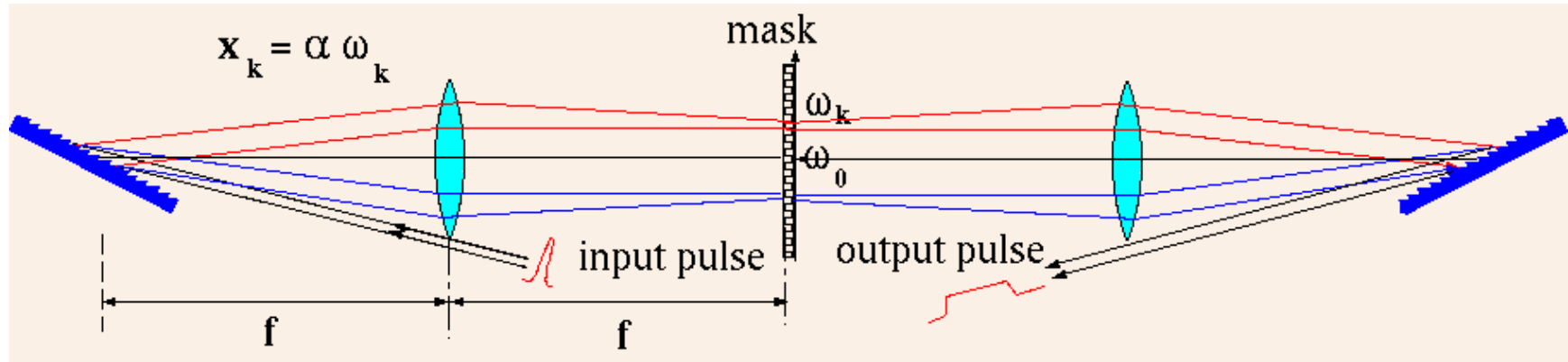




$$l = d(\sin(q_d) + \sin(q_i))$$



4f system with phase mask



Comments

- We developed the tools (laser source and diagnostics) for the pulse shaping program
- We developed the theory for the SLM phase only modulator

About the referee comment of using
the system of Politecnico Milano

That system has only Few temporal windows.

We had to develop our system.

Conclusions

- Strong advancement with the hardware: laser + diagnostic
- We foresee the necessity of the upgrade of the system with an amplifier.
- We are proceeding with the theoretical work on the:
 - Genetic algorithm
 - Non-linear effects on the rectangular pulse with the amplifier and harmonic generation