

# MultiGigaBit Optical Sources

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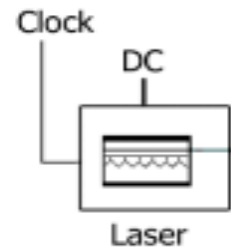
# Advantages of short pulses based Systems

- Low average Power
- Greater BitRate
- Pulse interaction is reduced

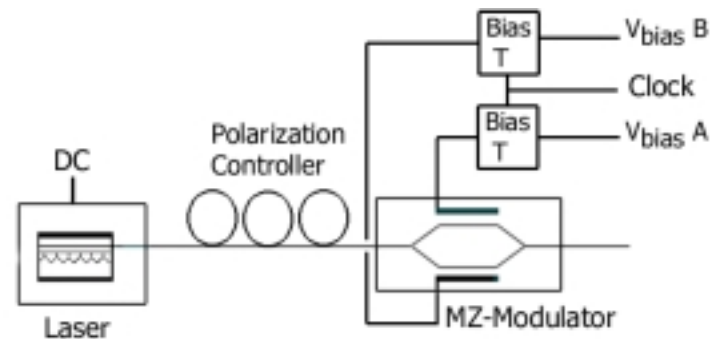


# Types of Short Pulses Sources

Gain-Switching technique



External modulation



Lasers operated in mode-lock or injection-lock

# Types of Short Pulses Sources

	Gain-Switching	External	Mode-Locked
Advantages	Simplicity	Shapping is possible	Very Short Pulses
Inconvenient	Jitter and Chirp	Requires Mach-Zehnder	Complexity

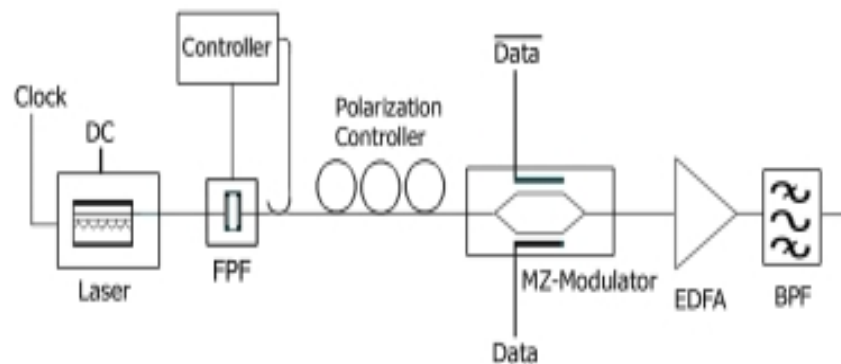
- Some sources of Solitons were developed by this GLI, under the Emiton project, using the GS technique.
- The Mode-Lock/Injection-Lock technique was also studied and demonstrated [1].
- Our attention is now focused on the external modulation.



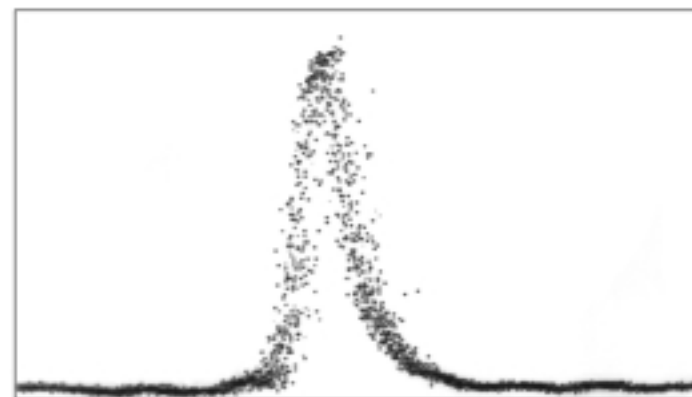
[1] Work developed on EMITON project



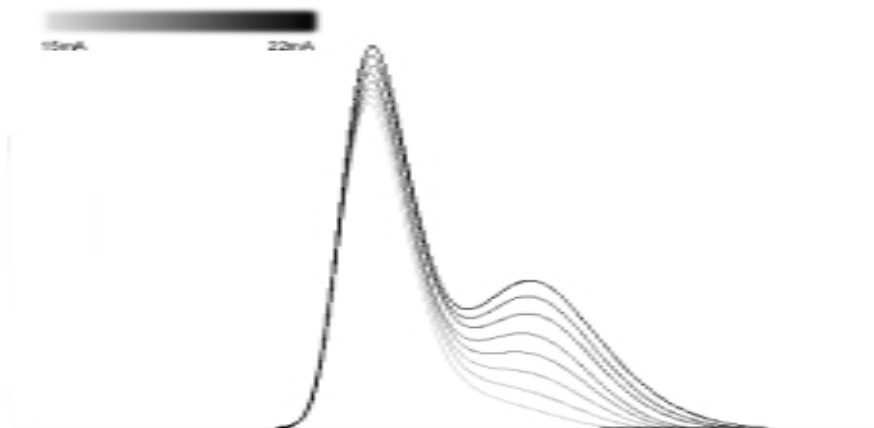
# Multigigabit Sources based on Gain-Switching



The complete emitter

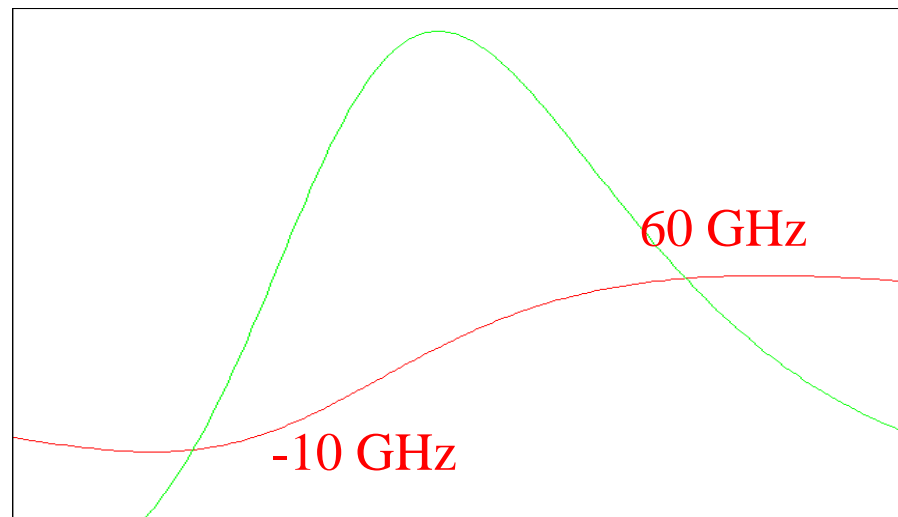


Pulse Shape obtained

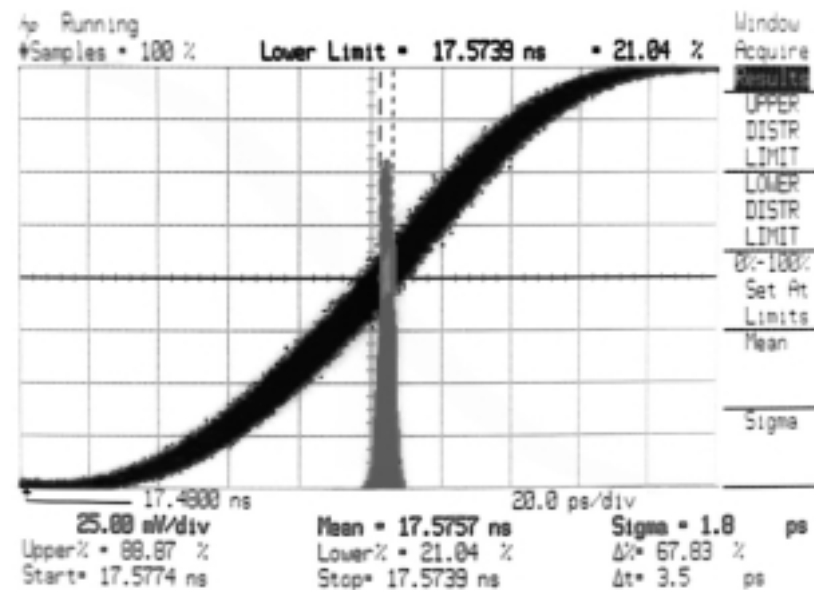


# Multigigabit Sources based on Gain-Switching

Optical Power



Chirp



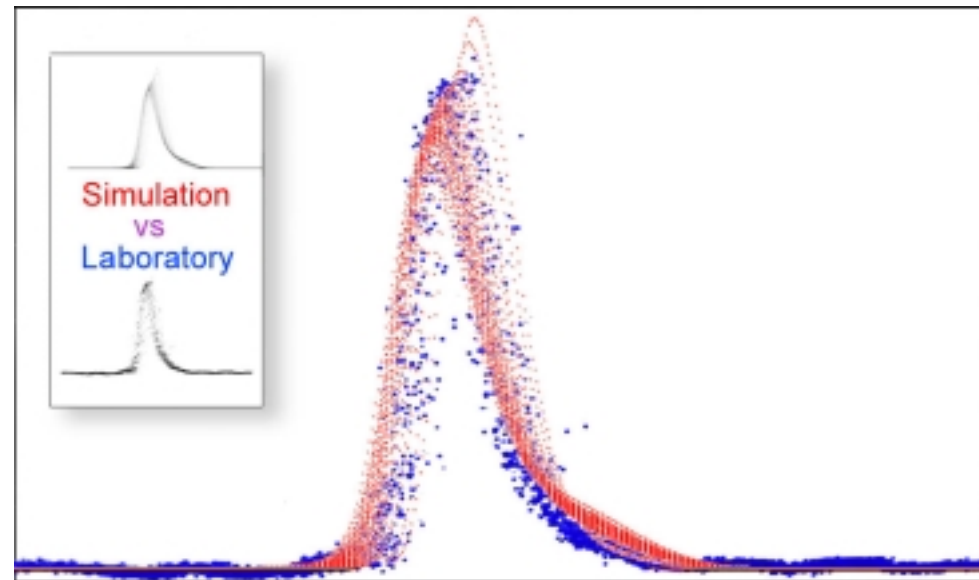
Experimental measurement of the Jitter

# Multigigabit Sources based on Gain-Switching

It's simple to obtain a close to soliton shape

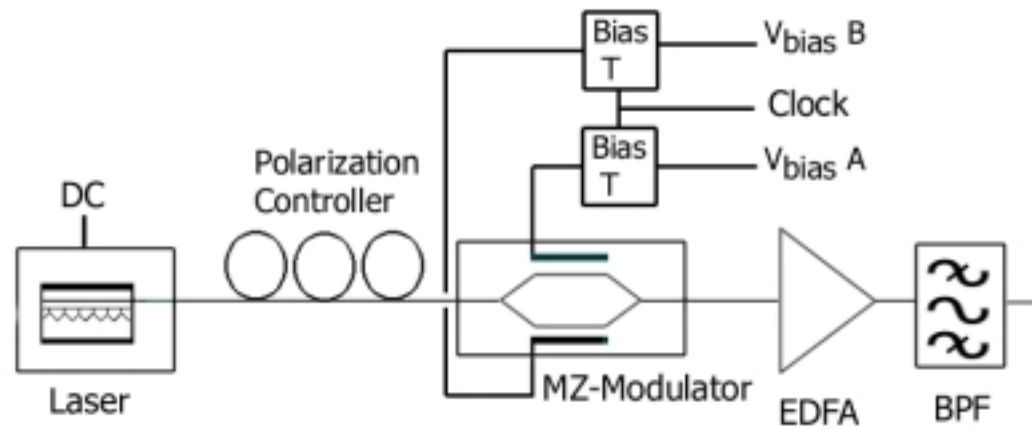
Quite noisy  
(RIN and Jitter)

Chirp (carrier frequency  
shift)



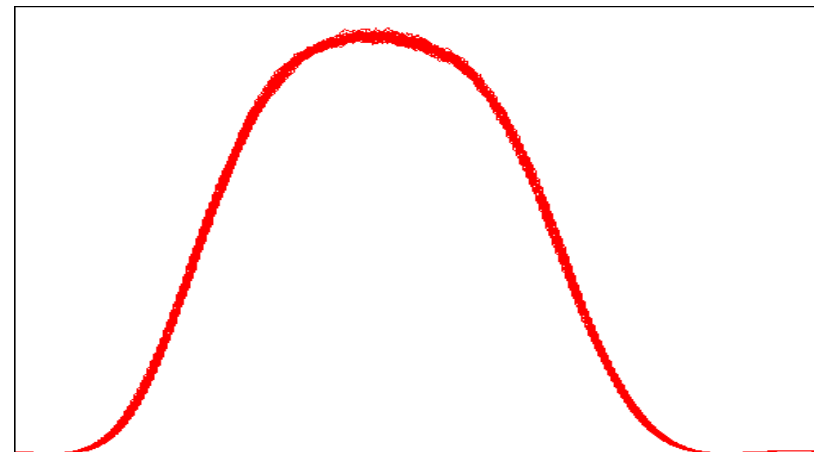
More perfect and controllable pulses are needed in order to obtain more favorable dispersion lengths.

# Multigigabit Sources based on External Modulation



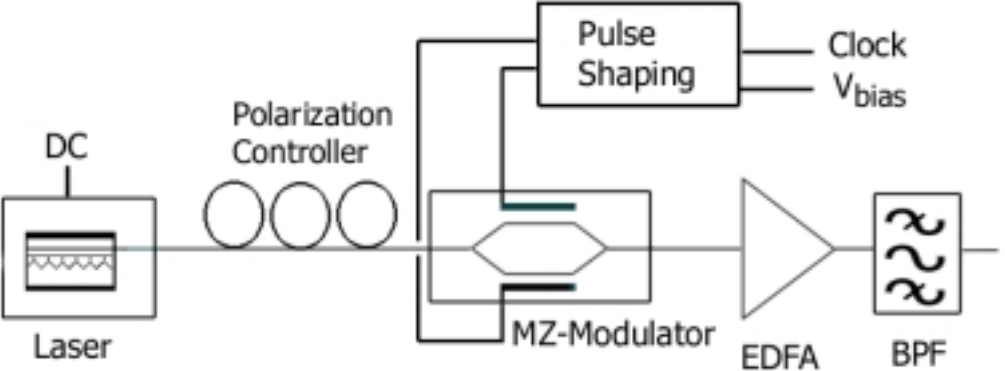
The complete  
Emitter

Pulse Shape obtained



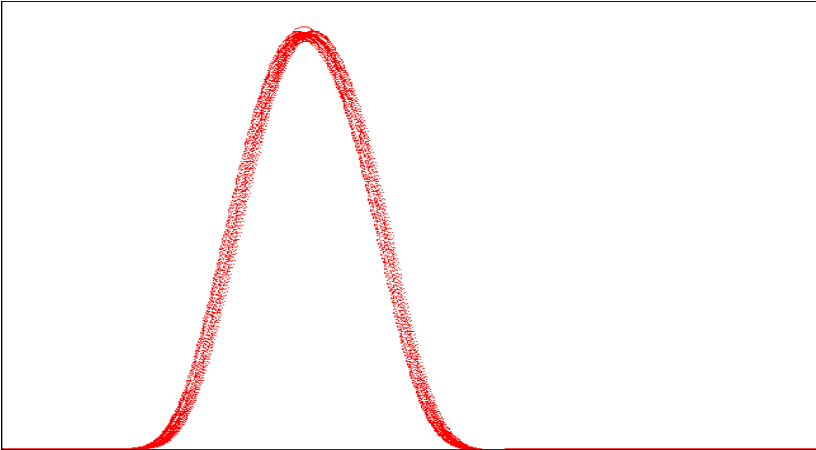


# Multigigabit Sources based on External Modulation with Shapping



The complete Emitter

Pulse Shape obtained



# Multigigabit Sources based on External Modulation with Shapping

It is possible to improve the shape of the optical pulse by adequate shaping of the electrical driving signal.

It is also possible to perform direct coding on the modulator.

It is possible to impose linear chirp and control  $T_0$  and  $P_0$ .

(simmetric configuration leads to null chirp)

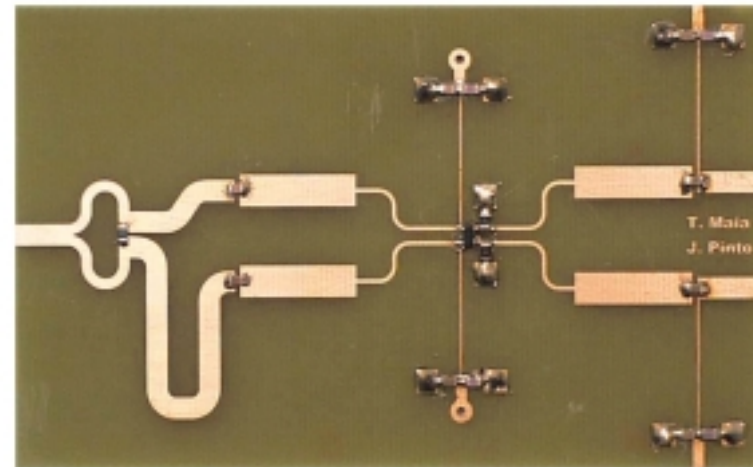
**High Insertion Loss on the modulator**



# Multigigabit Sources based on External Modulation with Shapping

## Current State of Development

Trimming of a prototype for shapping

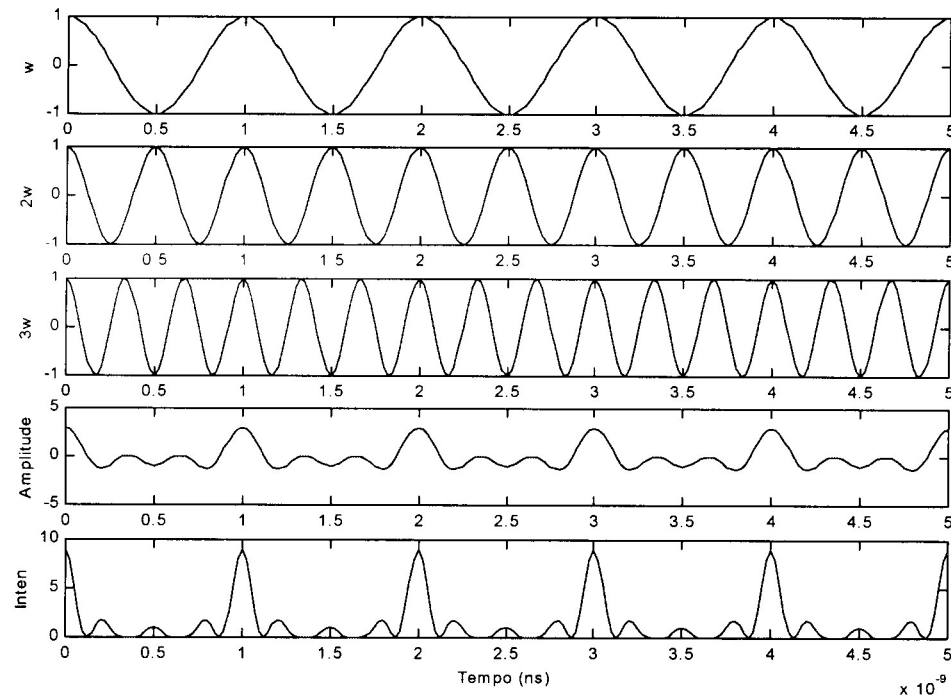


Experimental Work and subsequent validation with numerical simulation

# Multigigabit Sources based on Mode Locking for Short Pulses

This technique consists on summing different longitudinal modes within the Laser cavity.

The Locking depends on the relative phase of the modes. The analysis for this type of source is more complex.



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