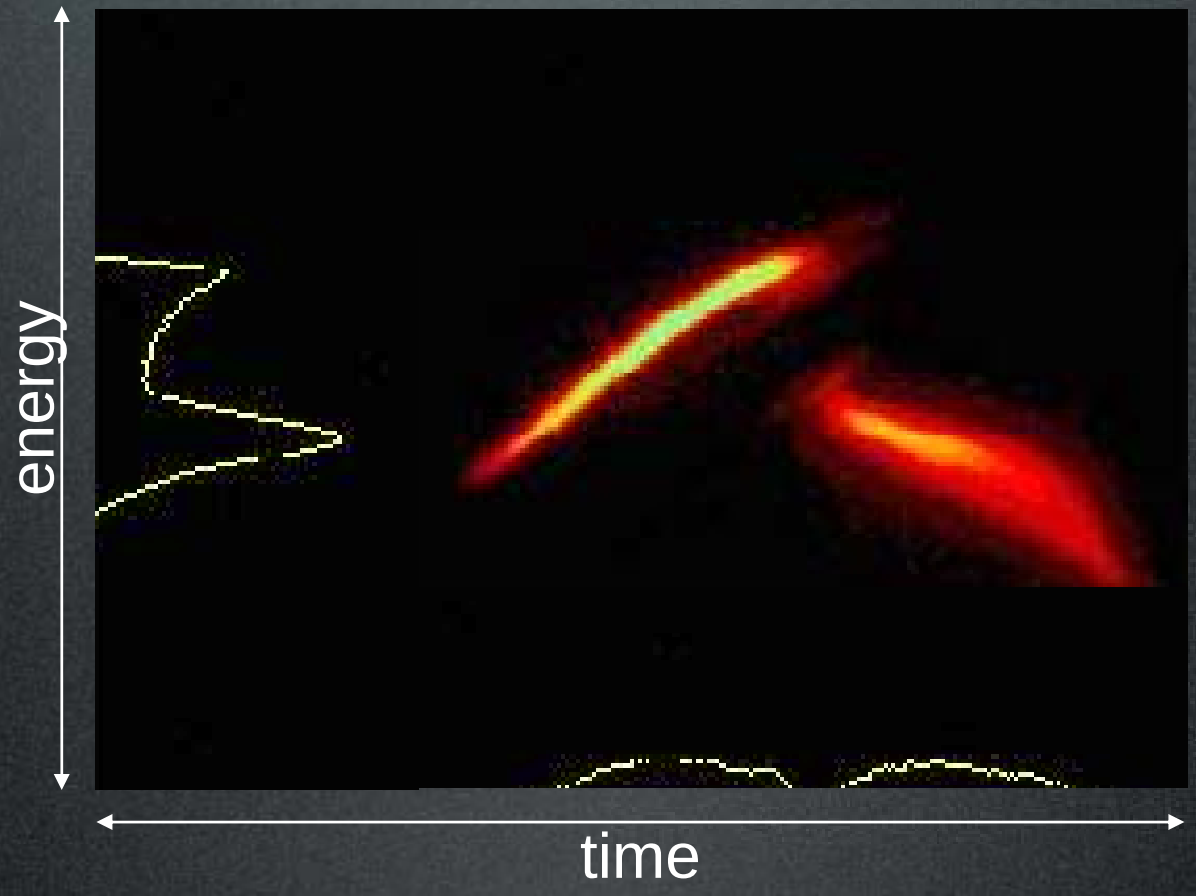
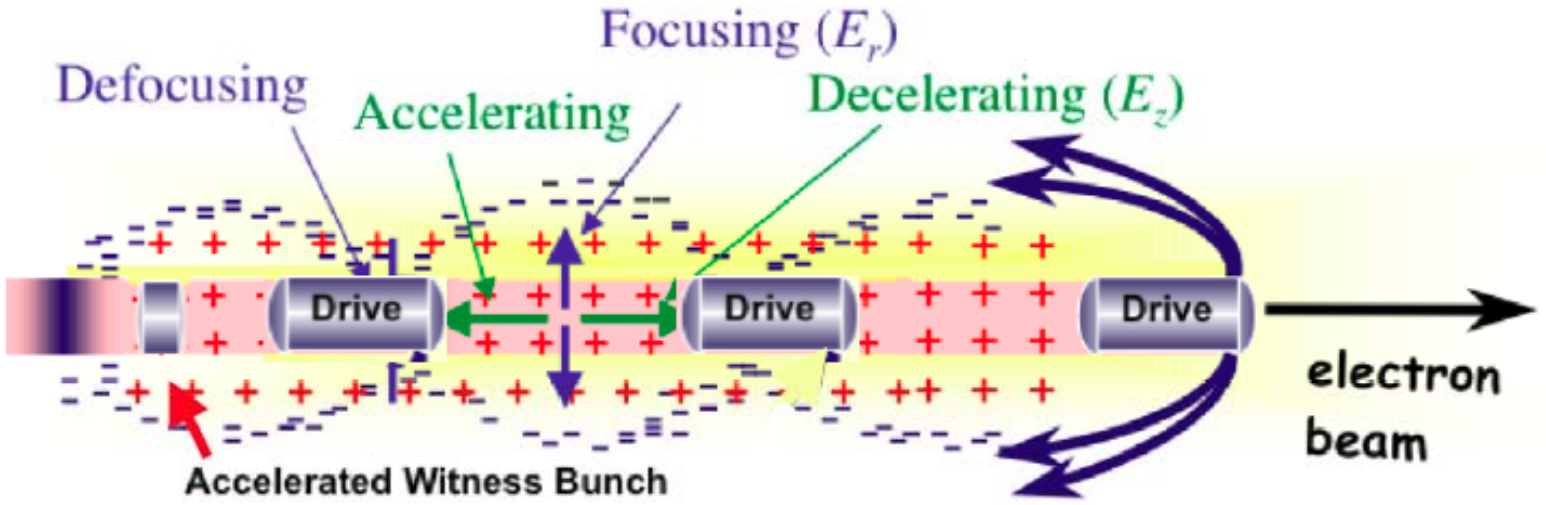
COMB status

Massimo Ferrario
on behalf of the COMB team



Coherent plasma Oscillations by Multiple electron Bunches for FEL and Linear Collider applications



Weak blowout regime (new!) with resonant amplification of plasma wave y a train of high Brightness electron bunches produced by **Laser Comb** new!) technique ==> **5 GV/m** with a train of 3 bunches, 100 pC/bunch, 50 m long, 20 μm spot size, in a plasma of density 10^{22} e^-/m^3 at λ_p=300 μm ?

Strong blowout regime (new!) with pC/fs bunches ==> TV/m regime ?

Acceleration of a train of bunches for high Luminosity Colliders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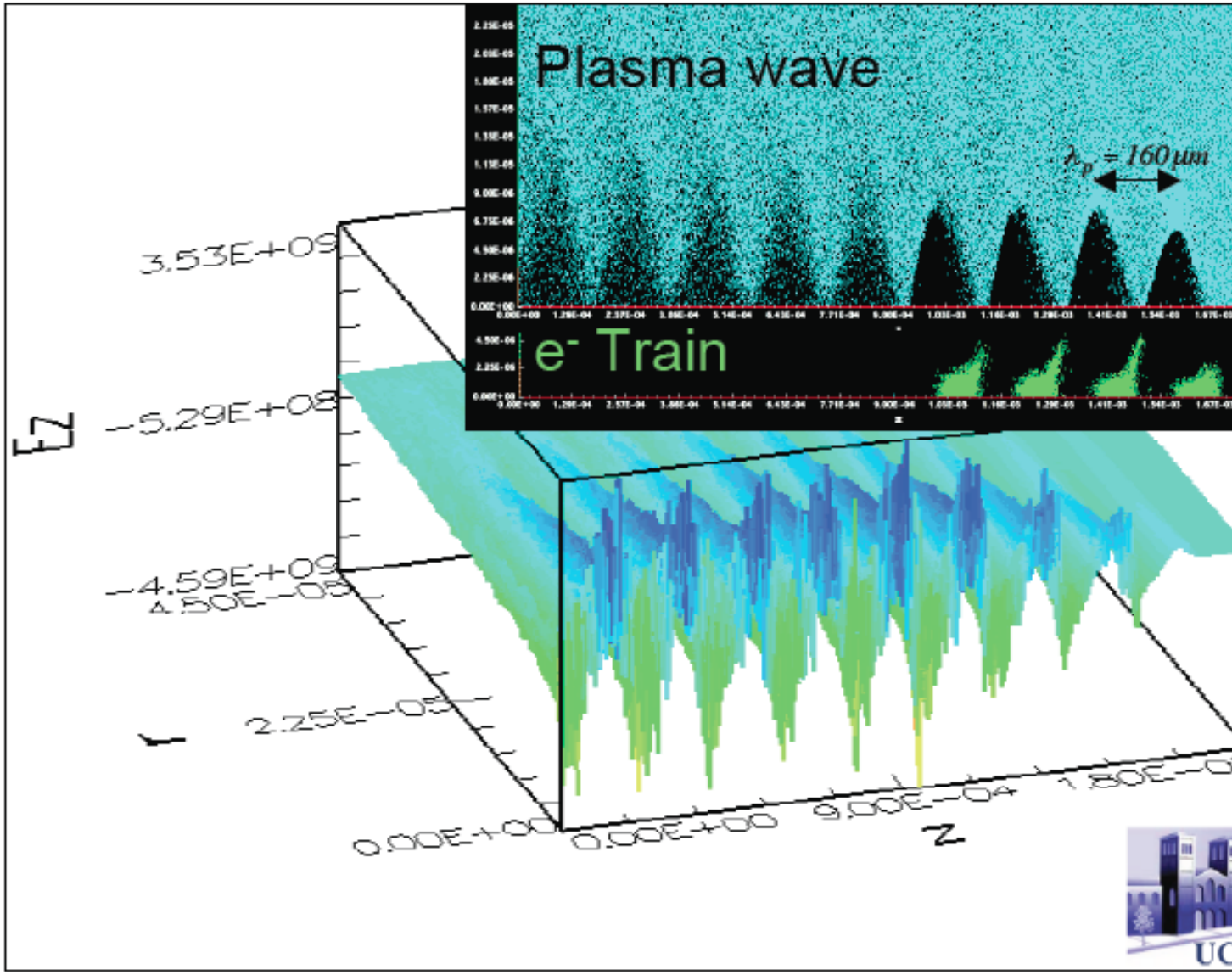
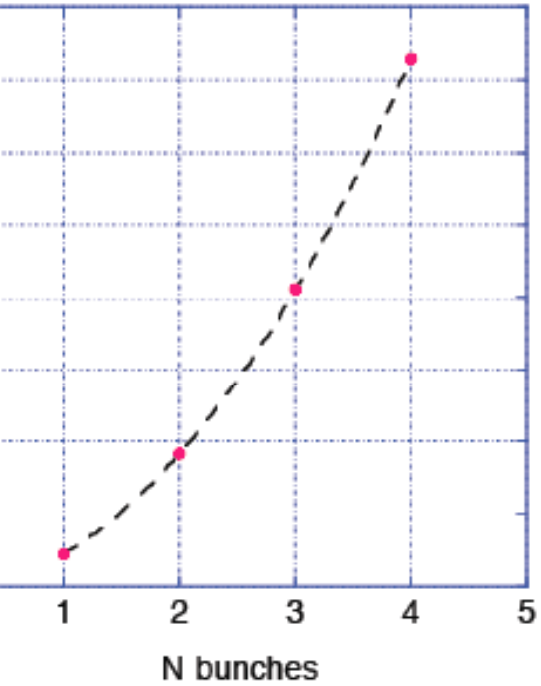
relatively low charge and longitudinal and transverse beam size smaller than a plasma
length $\sigma_z, \sigma_r << \lambda_p$ In this case, the beam density may exceed that of the plasma,
ucing blowout, but due to the small total charge, producing a disturbance that behaves
ny ways as linear, having frequency essentially that of linear plasma oscillations.

N_b=4
Q=16 pC
N_e=10^8
n_e=3 10^{22} m^{-3}
λ_p=190 μm
=> 3 GV/m

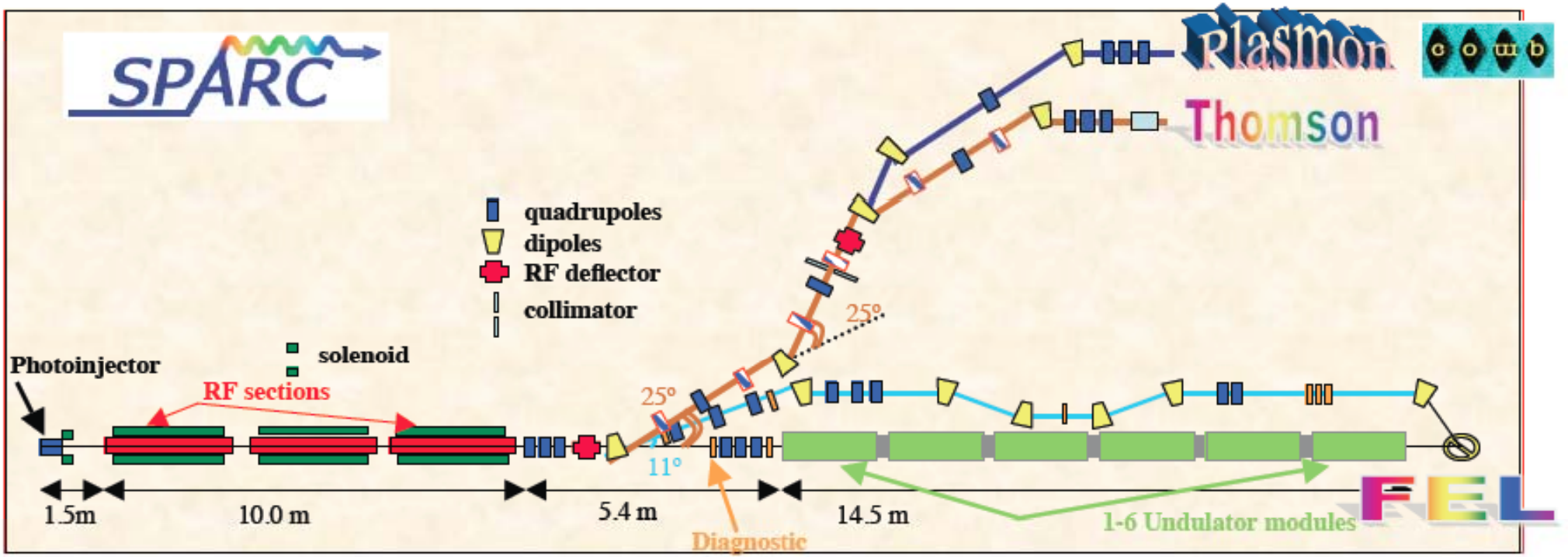


rating field versus number of bunches



$$m] = 76 \times 10^{-33} \times n_p[m^{-3}] \times N_e \times N_b^2$$

Goals for a 3 years program



- Experimental demonstration of laser comb technique at SPARC

  Laser system upgrade - 2011

  High resolution comb diagnostic with Electro Optical Sampling - 2012

- Delivery of a Technical Design Report for the final experiment

  Electron beam plasma interaction simulations - 2011-12

  Plasma channel design and test 2012-13

UCLA USC

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Euro missing (Missioni interne Sez. Mi)

Euro required for QFLUID code

Time schedule

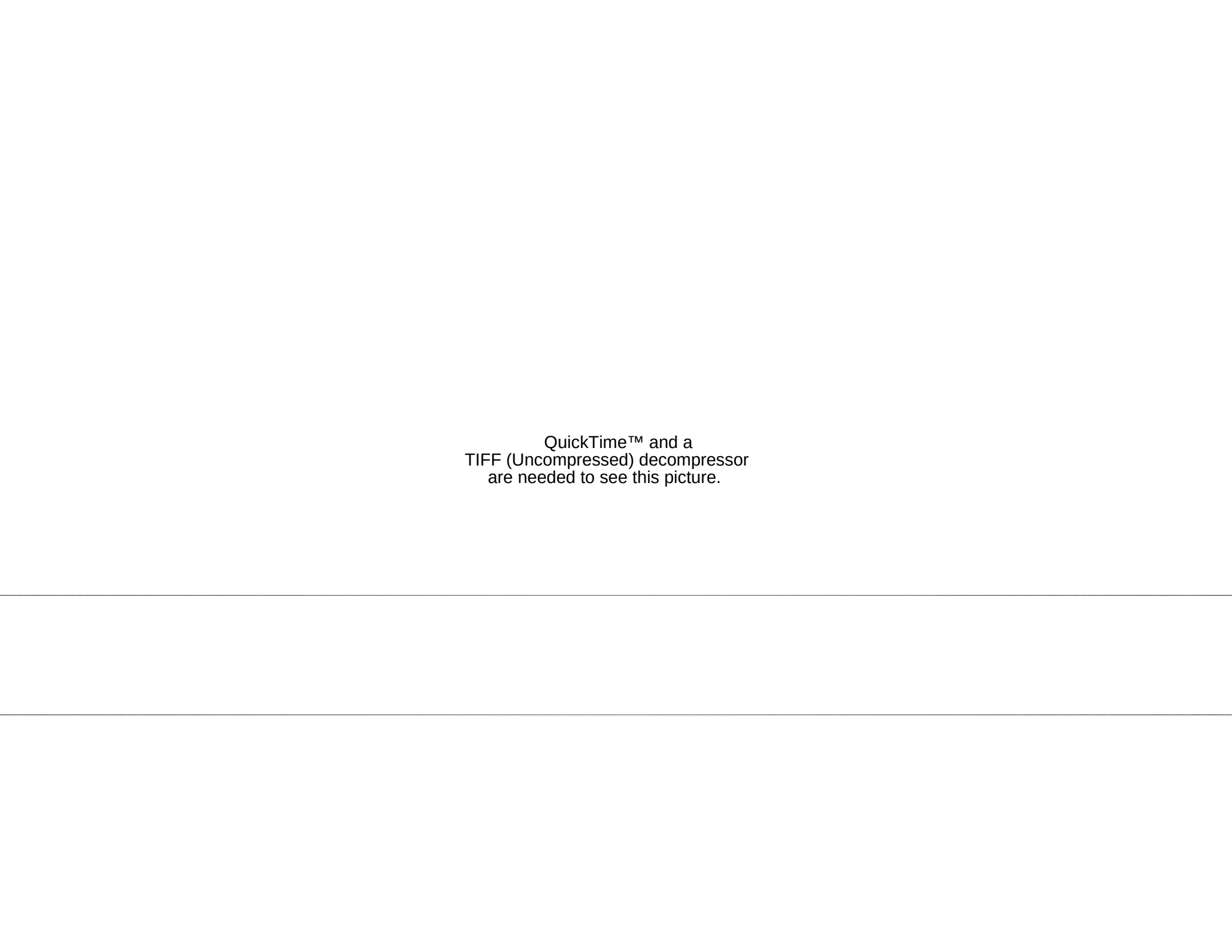
o dinamica del fascio di elettroni in regime laser comb in corso

a sperimentale della qualita' del fascio di elettroni prodotto con la tecnica LC entro Aprile

de del sistema laser per realizzazione di un treno di impulsi ultra-corti entro Giugno

o teorico/numerico interazione Fascio di Elettroni-Plasma in corso

Plasma simulations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Laser Comb experiments

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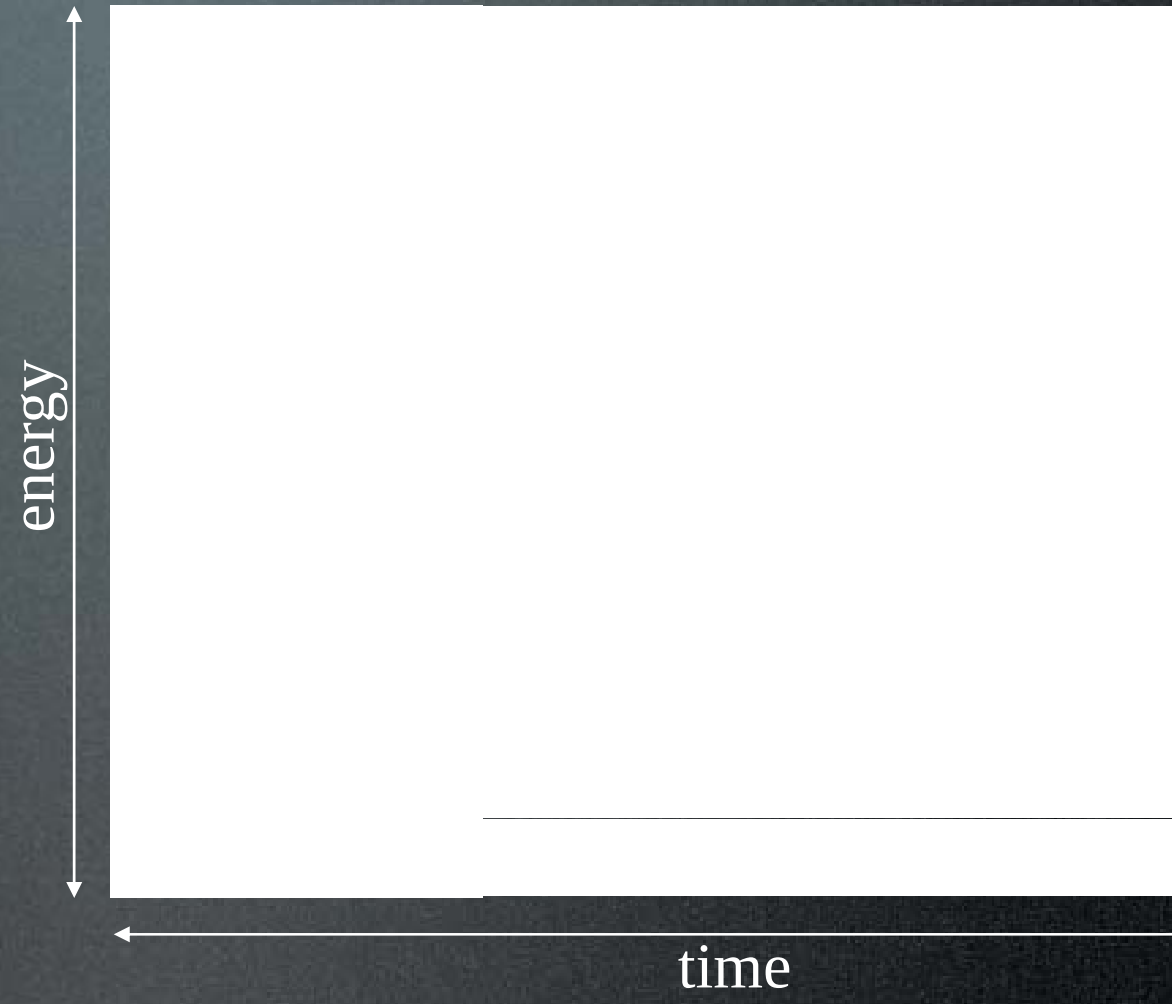
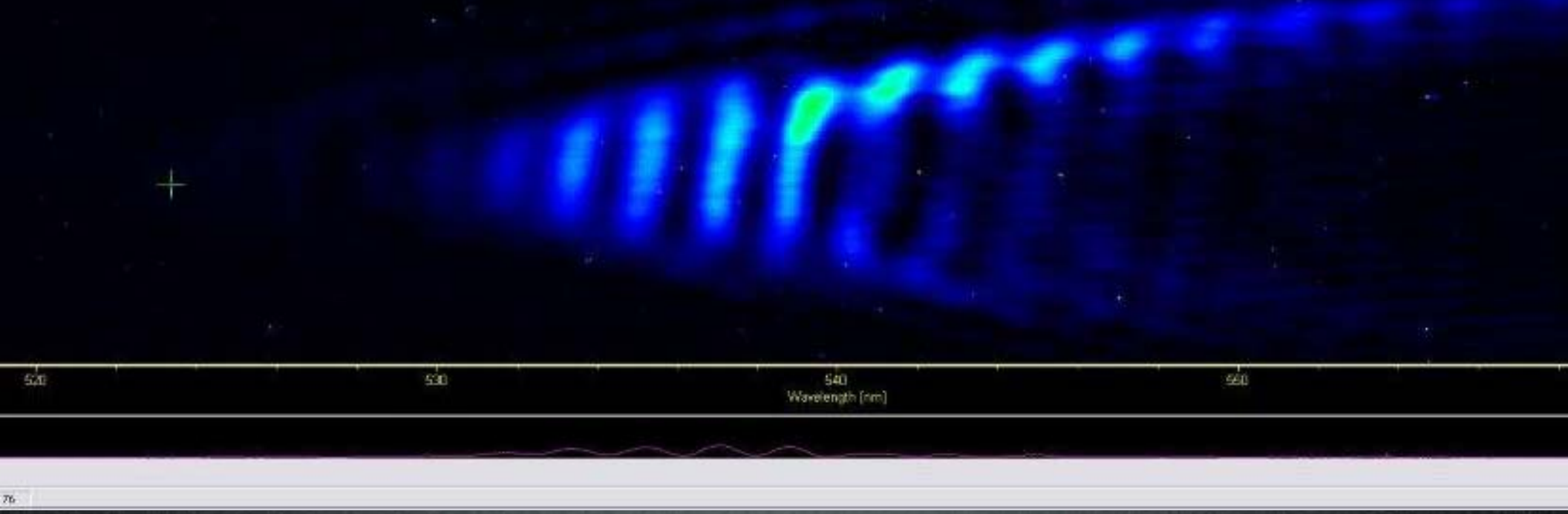
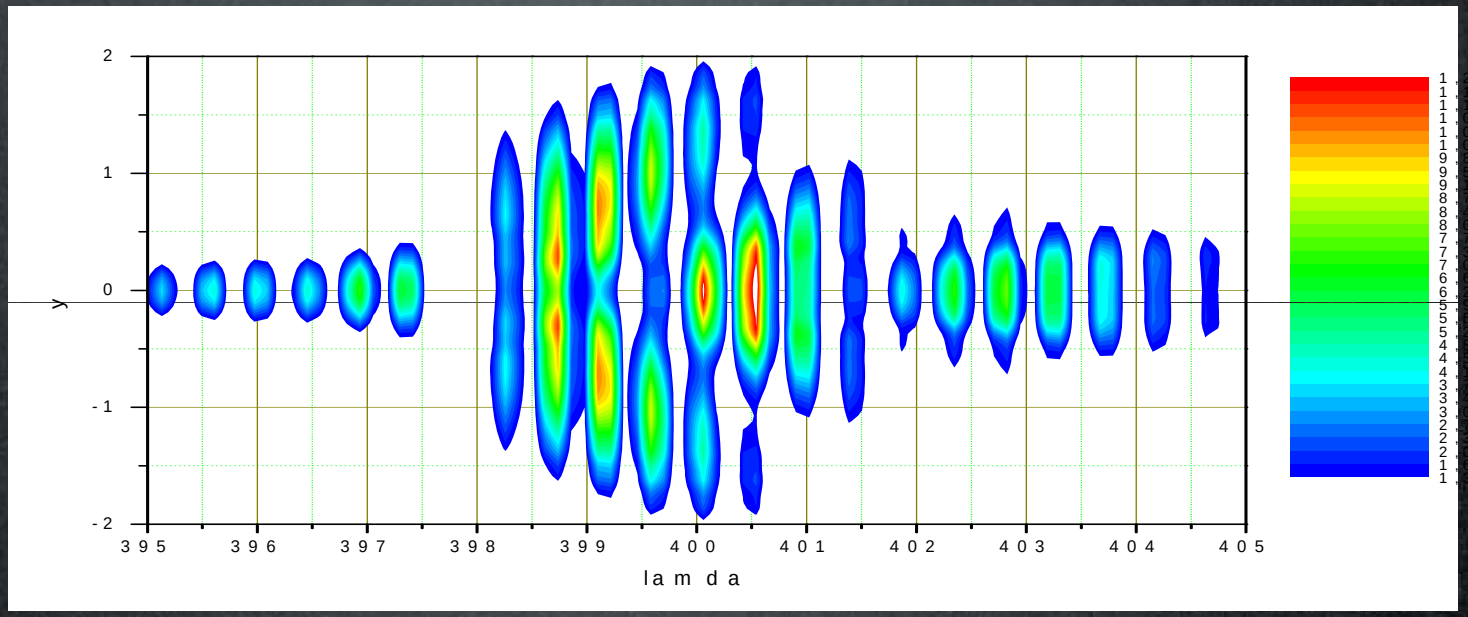


uning of the VB injection phase we observed on the screen downstrea
two distinct pulses separated by ~1 ps with σ_{t1} = 0.24 ps
0.29 ps respectively.



$$= \frac{\lambda^2}{\Delta\lambda}$$



$$\left|T\right|^2 = \left|T_1\right|^2 e^{-(k-k_1)^2 \frac{\sigma_1^2}{\sqrt{2}}} + \left|T_2\right|^2 e^{-(k-k_2)^2 \frac{\sigma_2^2}{\sqrt{2}}}$$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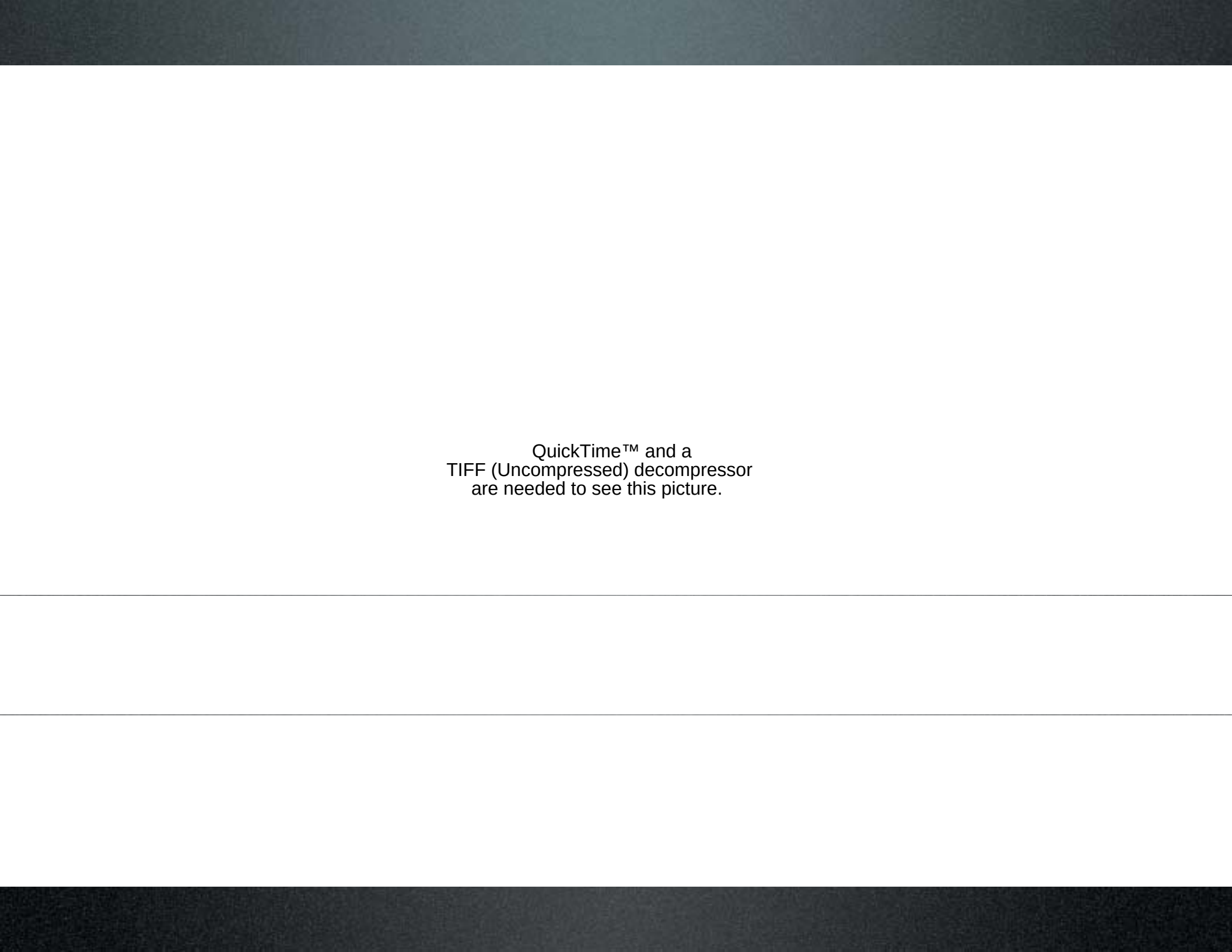
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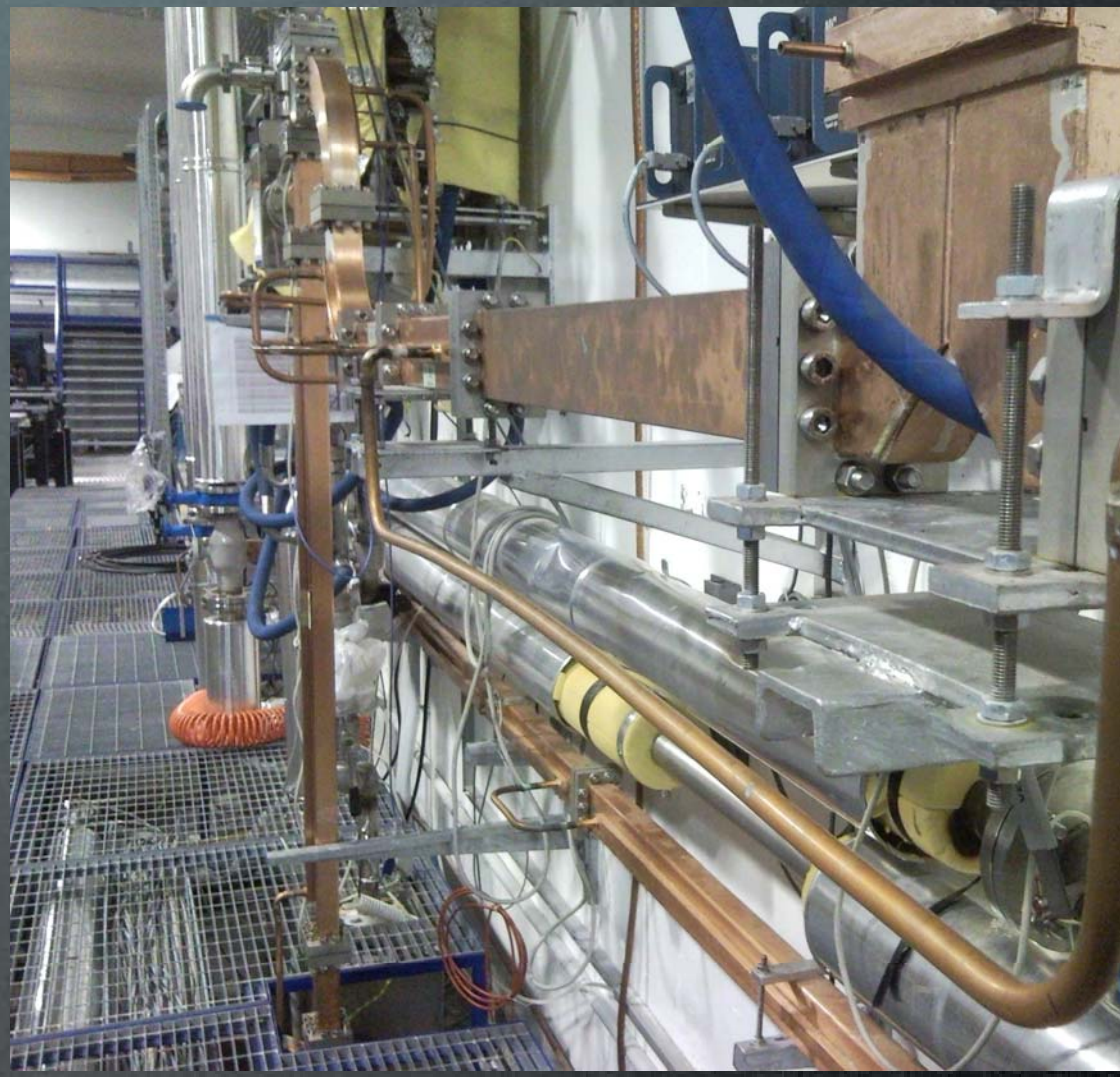

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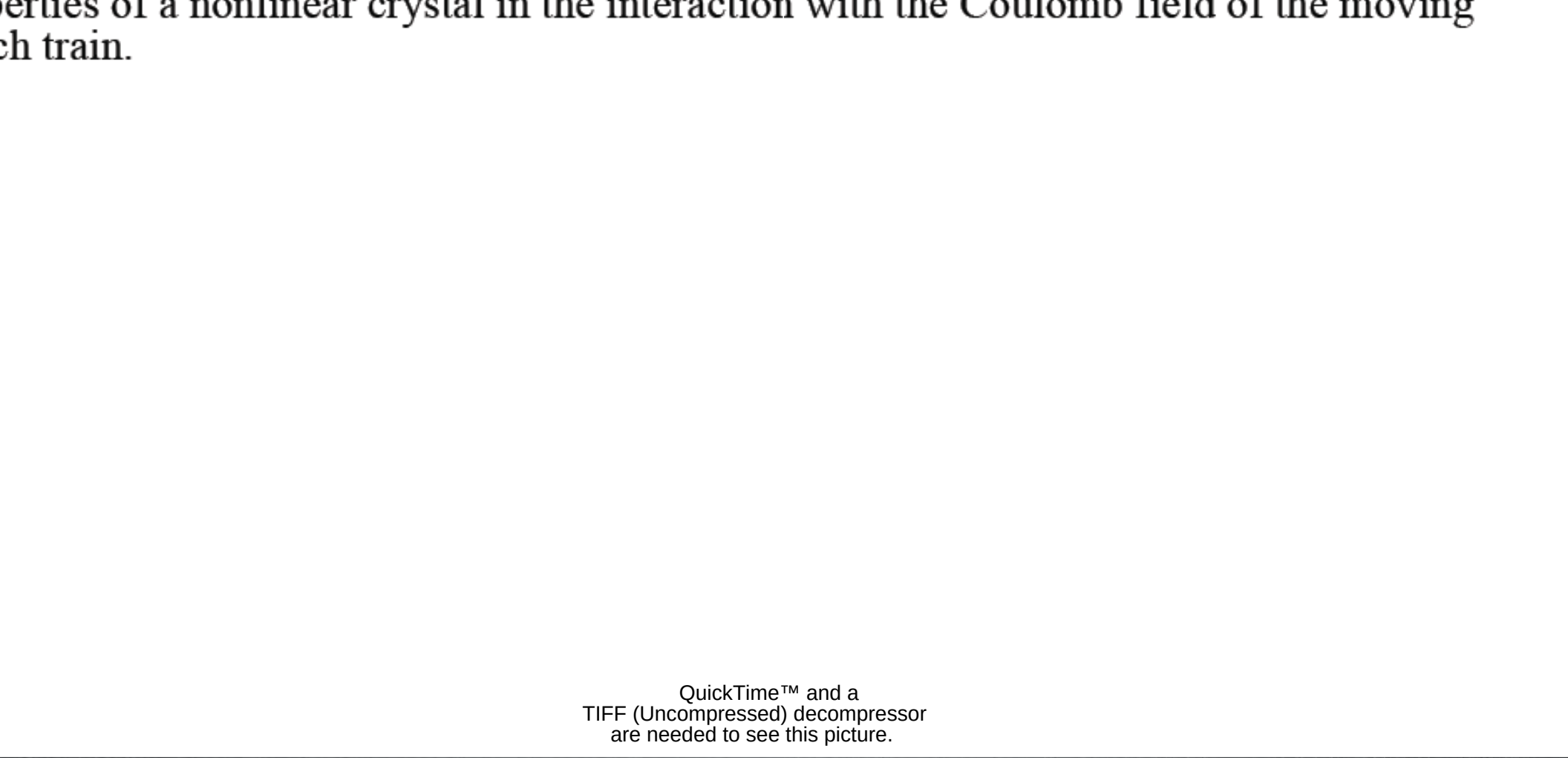
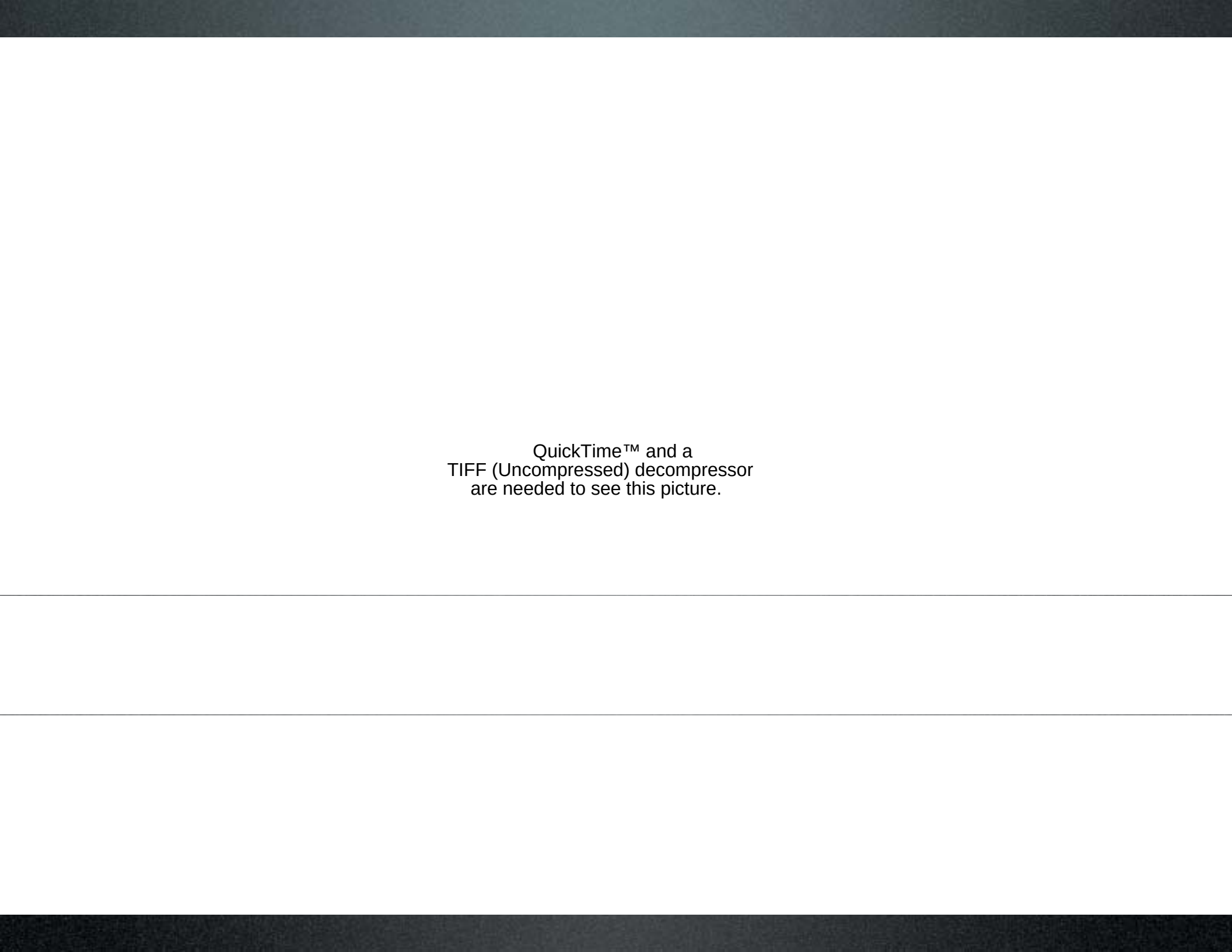
Electro-Optical Sampling

erties of a nonlinear crystal in the interaction with the Coulomb field of the moving
ch train.

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