The development of a sub-picosecond resolution x-ray streak camera.

Graham NAYLOR, Kees SCHEIDT, Jean-Marc FILHOL

(ESRF)

Collaborators:

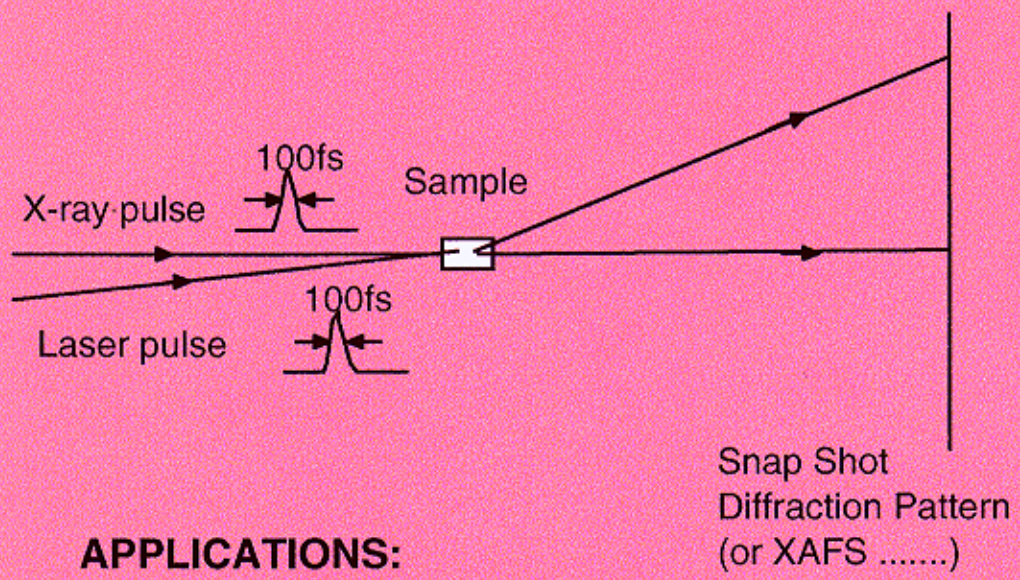
C.Cote, G.Mourou (CUOS), J.C.Keiffer (INRS), J.C.Rebuffie (Photonis), D.Kaplan (Alliage)

ULTRA FAST TIME RESOLVED STUDIES

- Why should we do it
- How we can do it now
  - Technical developments
- Prospects for the future
  - What are the experiments?

DIAG

How can we do it?

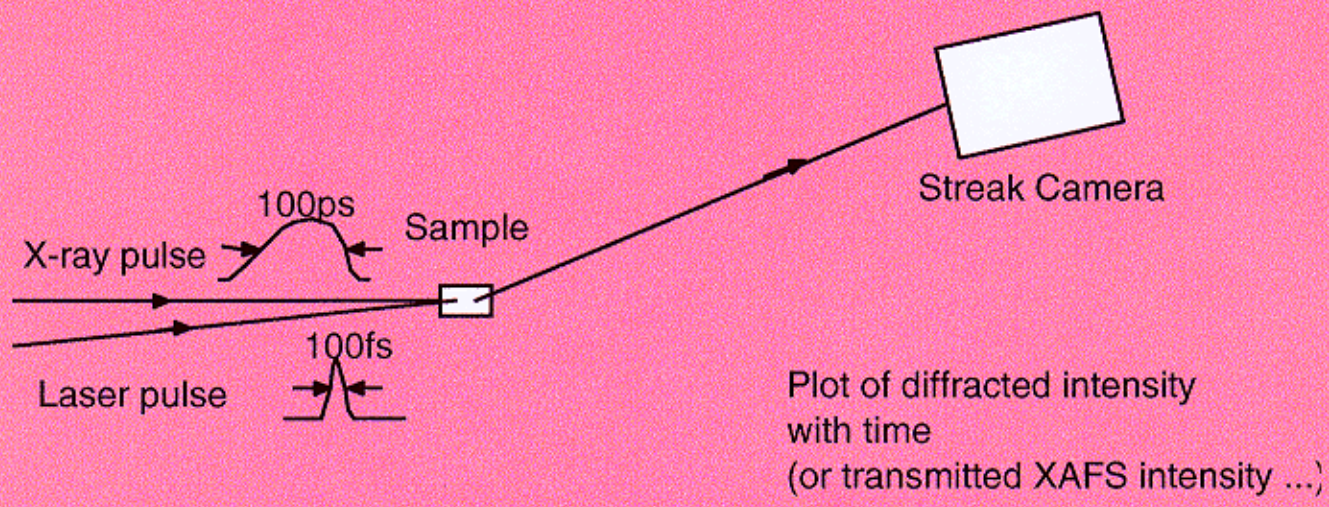


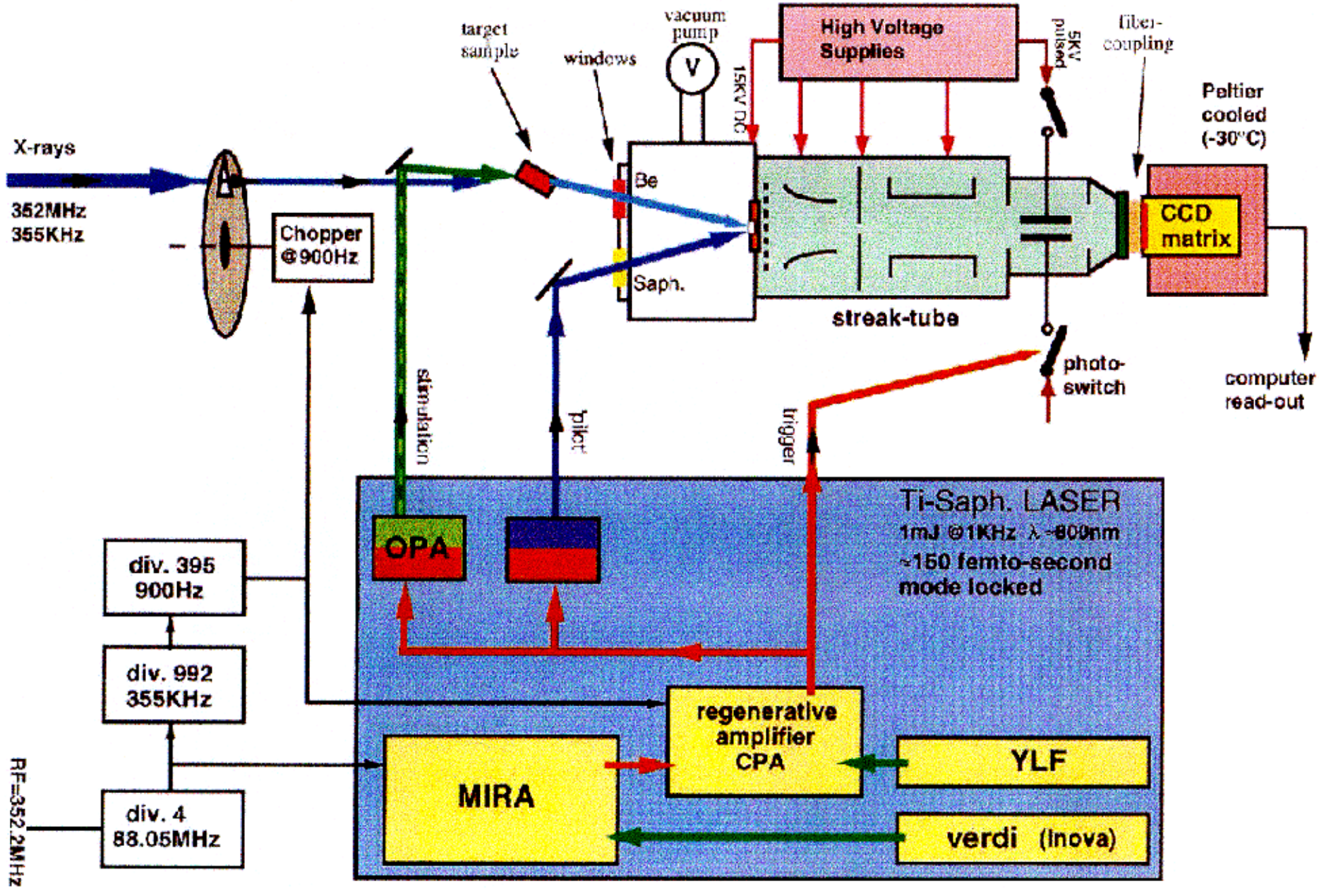
APPLICATIONS:

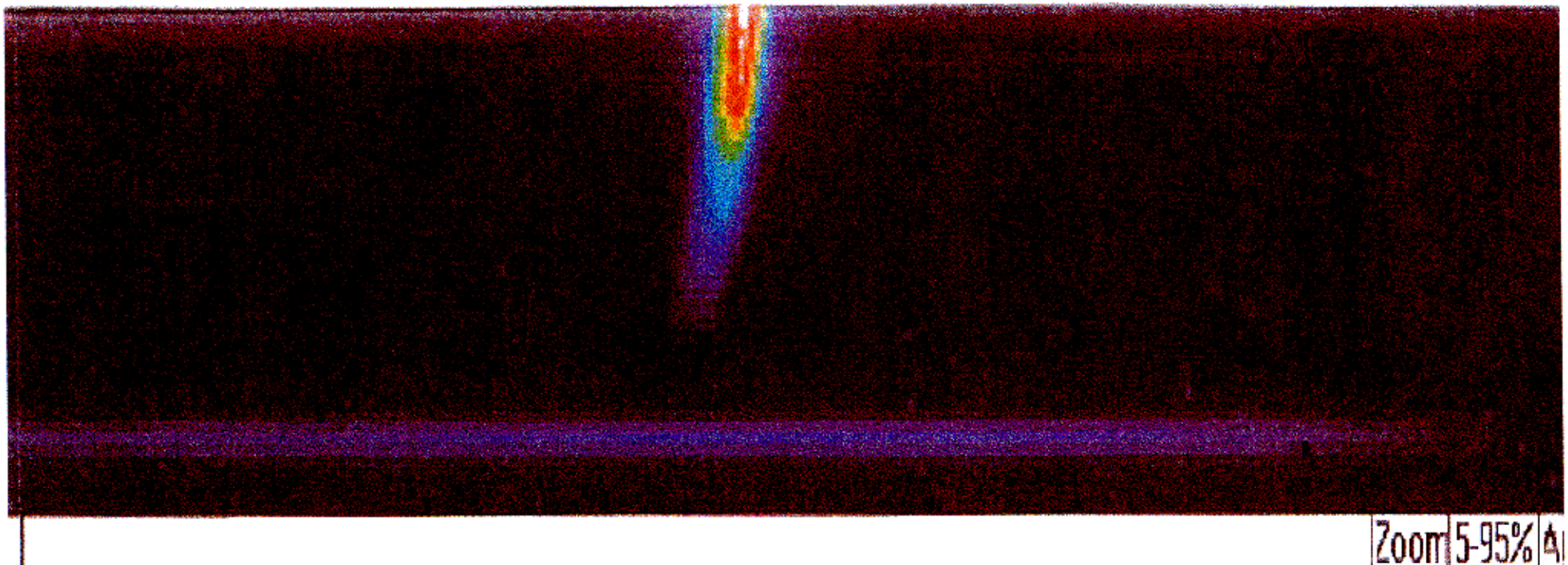
Rapid disorderring

Photo-excitation of proteins

Photo-dissociation




X-rays
352MHz
355KHz
Chopper
@900Hz
target
sample
windows
vacuum
pump
V
15KV DC
High Voltage
Supplies
5KV
pulsed
fiber-
coupling
Peltier
cooled
(-30°C)
Be
Saph.
streak-tube
CCD
matrix
photo-
switch
computer
read-out
stimulation
pilot
trigger
Ti-Saph. LASER
1mJ @1KHz λ~800nm
~150 femto-second
mode locked
OPA
regenerative
amplifier
CPA
MIRA
YLF
verdi (Inova)
div. 395
900Hz
div. 992
355KHz
div. 4
88.05MHz
RF=352.2MHz

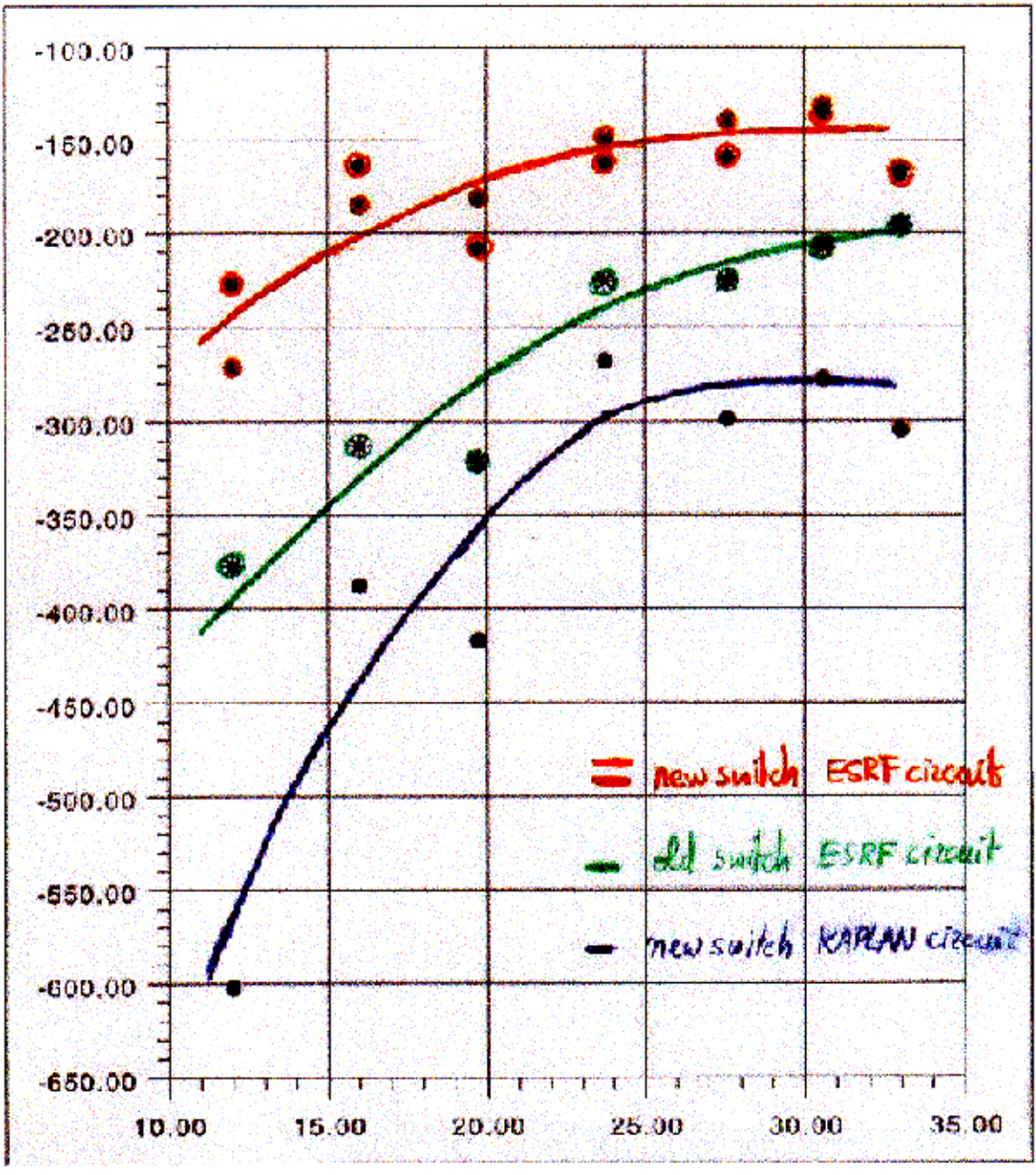

Zoom
5-95%

Switch Development

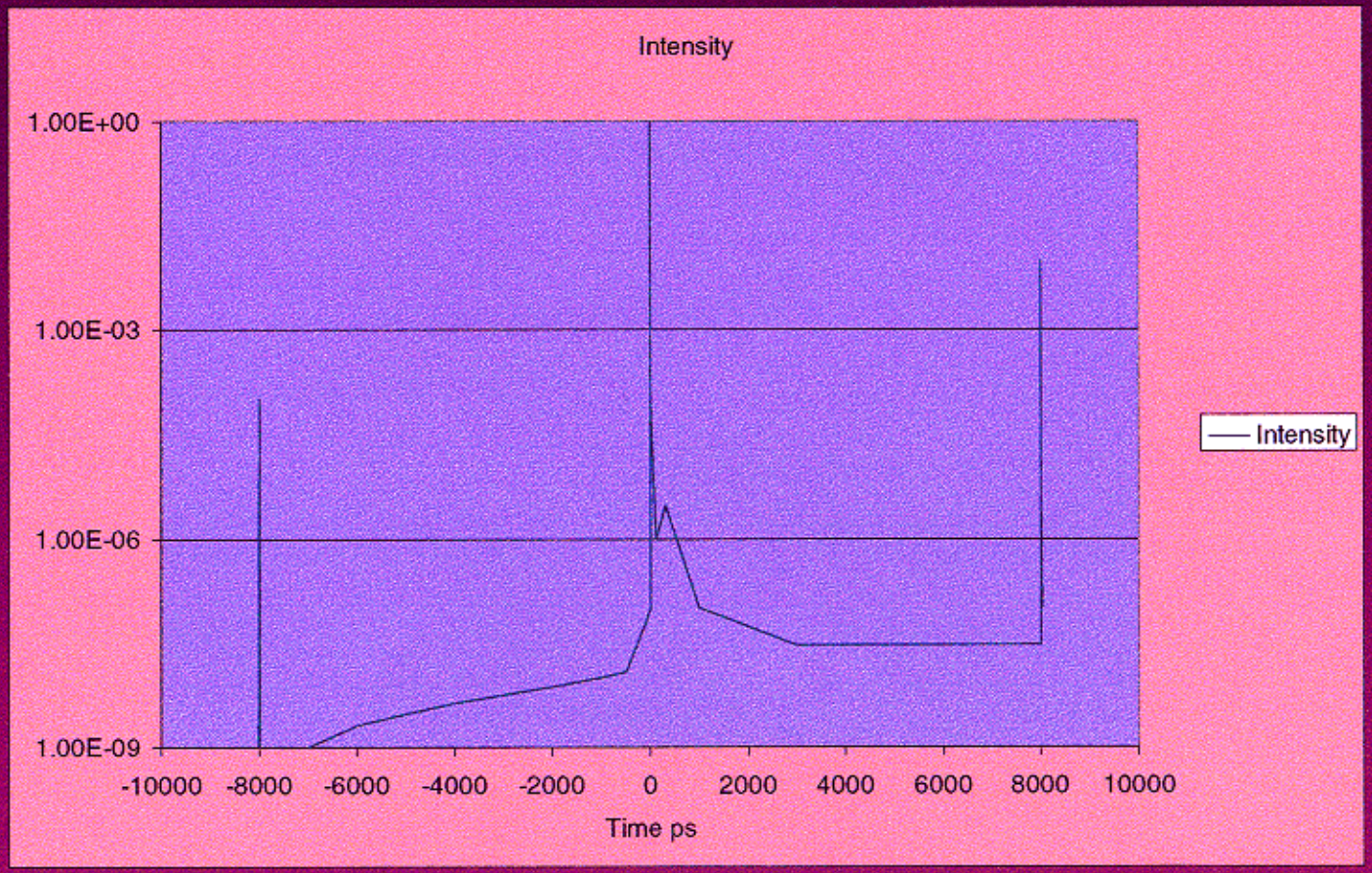
- Circuit Design
- Sensitivity to laser purity / amplitude stability
- Lifetime/Breakdown of the photoconductive switch component

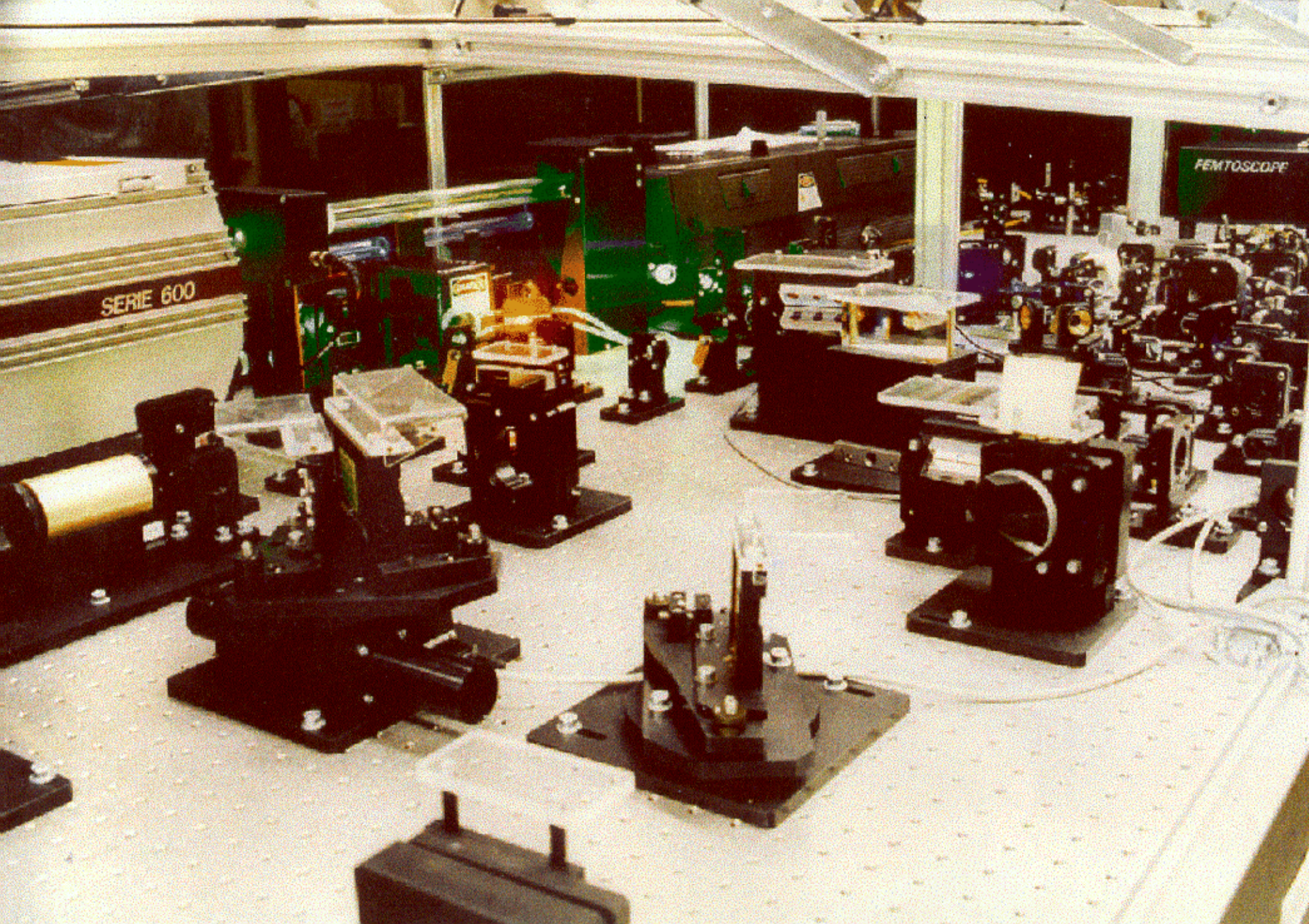
DIAG

sensitivity to amplitude variations (in fs/%) versus laser energy (mW @900Hz)



Laser Pulse contrast



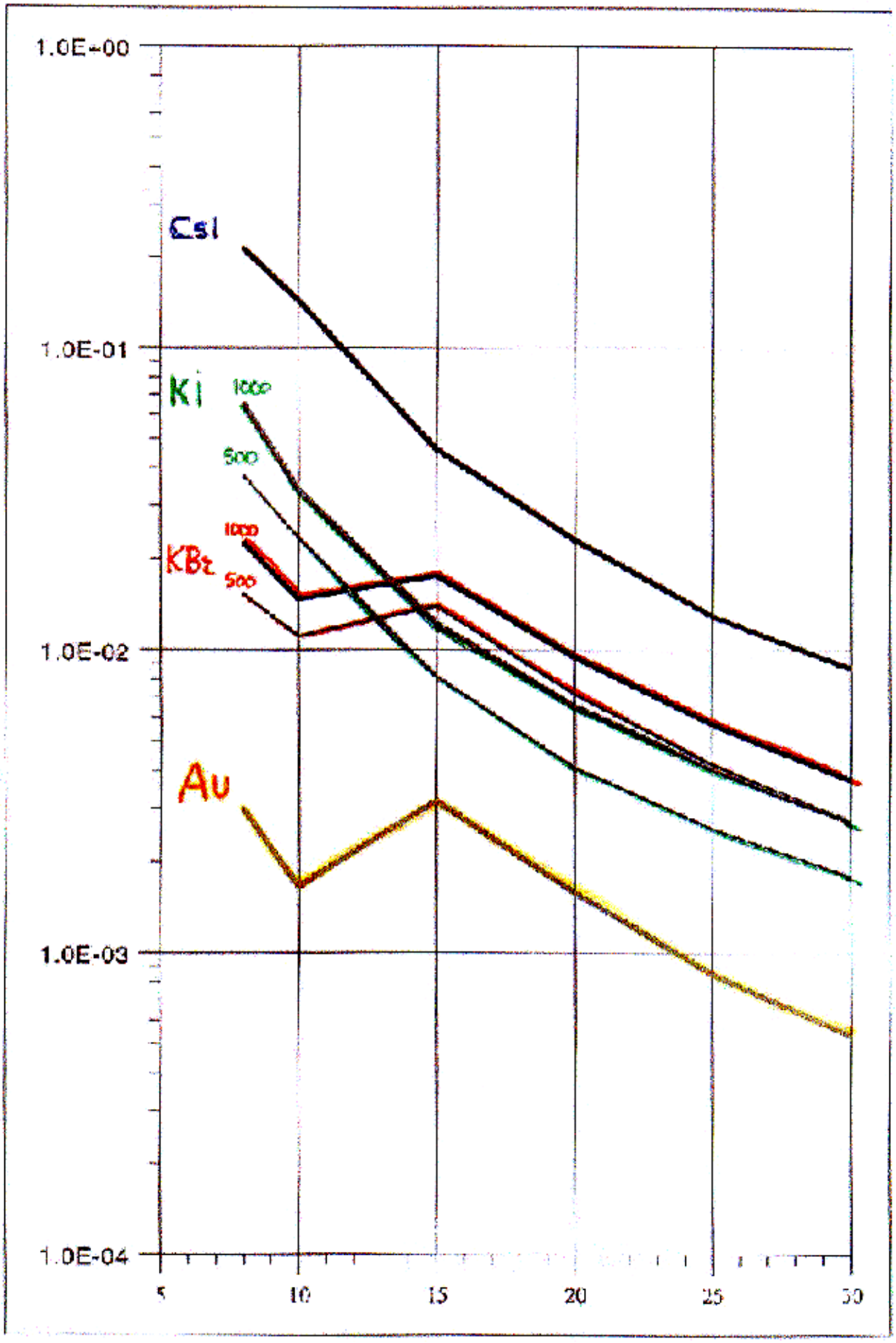

SERIE 600
FEMTOSCOPE

Streak Tube development

- Measurement of photocathode efficiency
- Reduction of Photocathode gap
- Increase of sweep plates

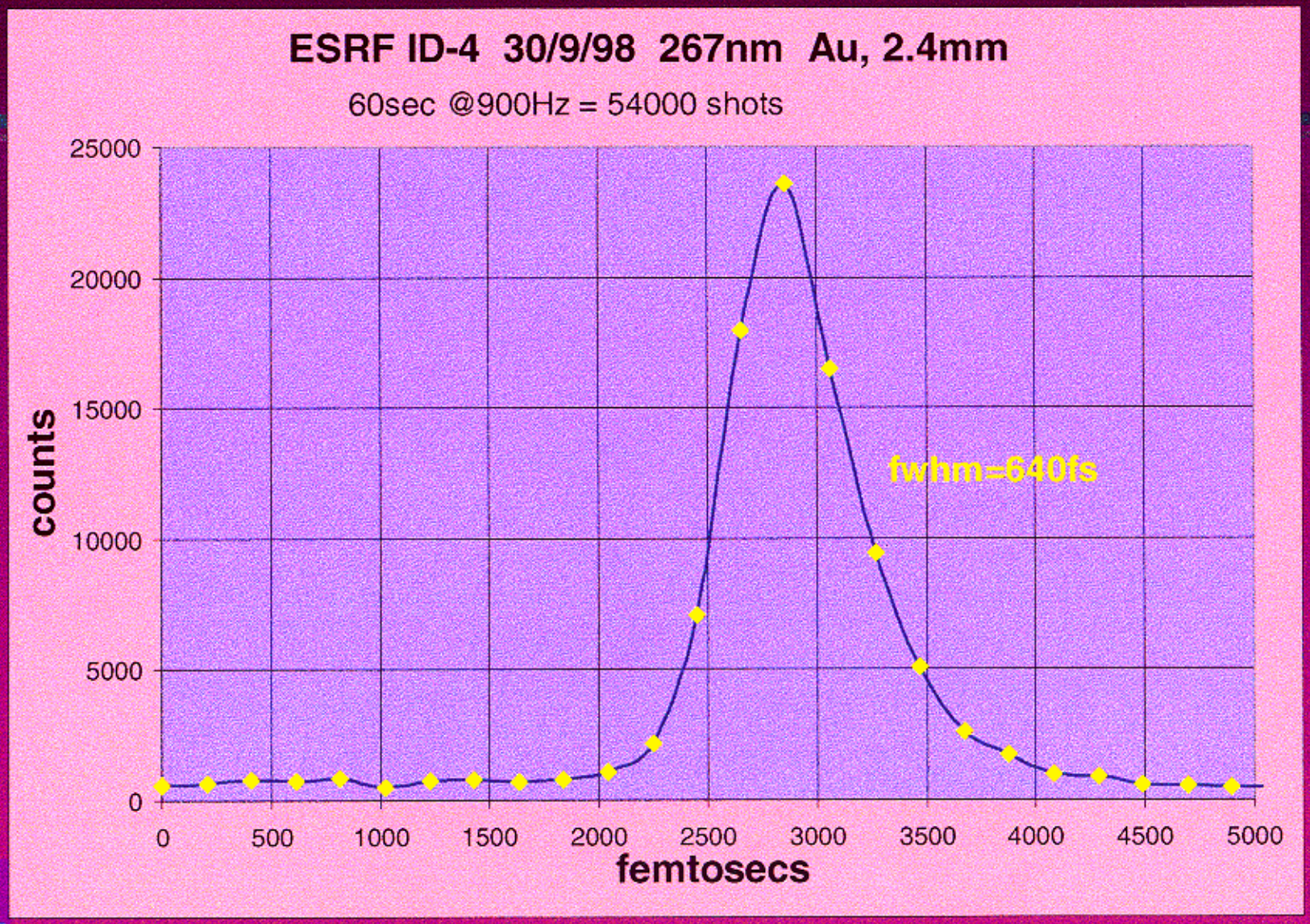
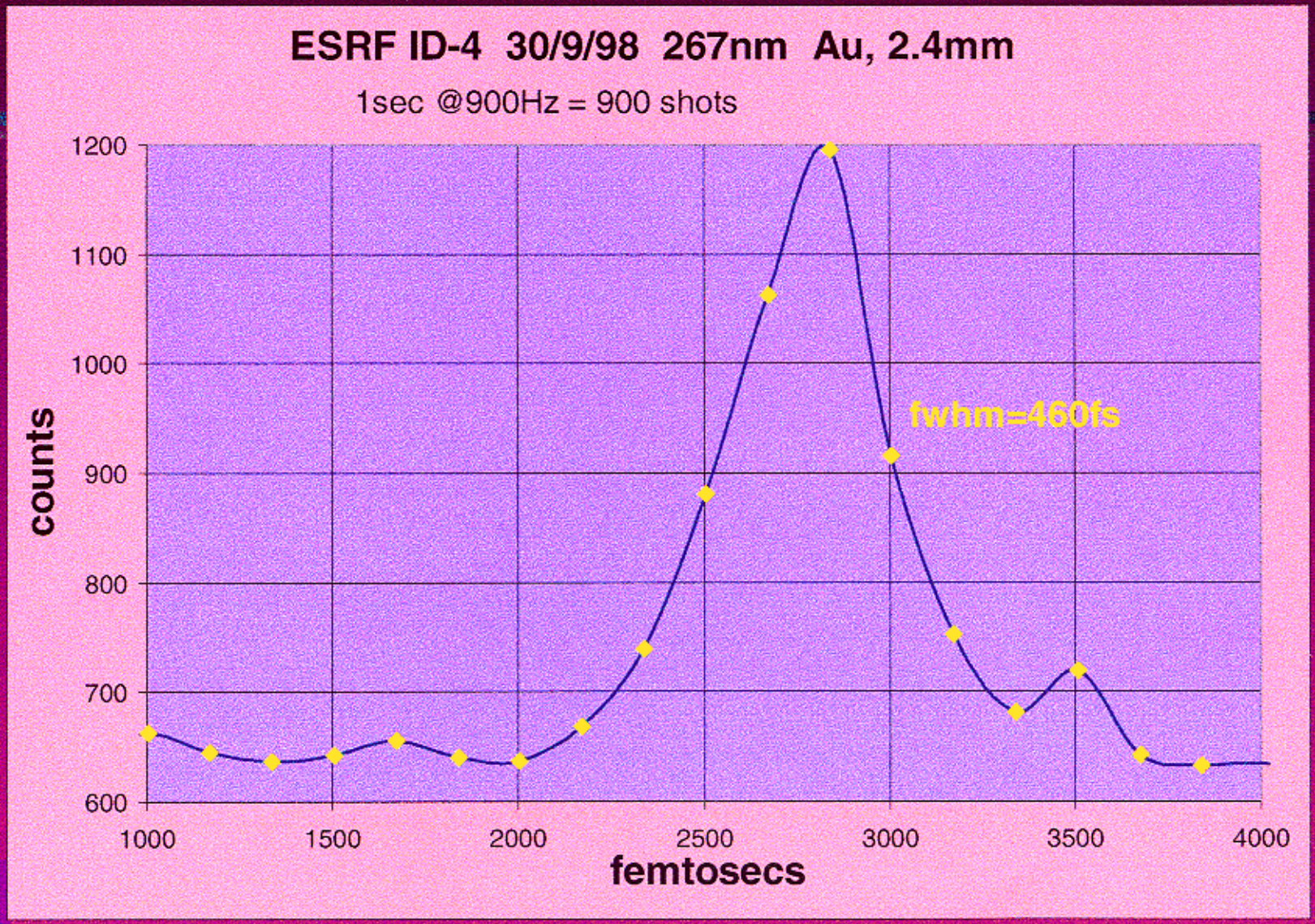
DIAG

QE in counts per photon , E in KeV



FXS, 15KV, 3mm, D5, 20-22 July 1998

Accumulation results



Accumulation results