



INFN - Consiglio di Sezione – Gruppo V
3 luglio 2012 - Milano

LIANA

Laser Ion Acceleration for Nuclear Applications

2011-2013

Activity presentation

Giuseppe Bertuccio

Sezioni INFN: LNS, Messina, Milano

Joined experiments: LIANA & NDT

Resp. Naz (LNS): L. Torrisi (Liana), A. Anzalone (NDT)

Resp. loc. Milano: prof. G. Bertuccio

Referees:

Marco Cavenago

Luigi Palumbo

Riccardo Musenich

Massimo Carpinelli

Research Team and Collaboration

Sez. Catania – LNS

Prof. L. Torrisi (Unime+LNS - 0.6),

Prof. S. Cavallaro (Unict+LNS – 0)

Dr. P. Cirrone (LNS - 0.2)

Prof. L. Andò (LNS – 0.5)

Dr. L. Giuffrida (LNS – 0.3)

Prof. S. Manciagli (LNS – 1.0)

Dr. P. Musumeci (0.3)

Total TFE: 2.9

Sez. Catania – Messina

Prof. A.M. Mezzasalma (0.4)

Dr. F. Caridi (0.3)

Dr. F. Di Bartolo (0.5)

Dr. A. Italiano (0.2)

Prof. G. Mondio (0.2)

Total TFE: 1.6

Sez. Milano

Prof. G. Bertuccio (0.5),

Dr. D. Yongbiao (1.0)

Dr. D. Macera (0.5)

Total TFE: 2.0

Collaborations:

University of Milan Bicocca (Prof. D. Batani)

University of Pisa (Prof. D. Giulietti)

IP-ASCR, Prague, Czech Rep. (Dr. J. Krasa)

PALS-Lab, Prague, Czech Rep. (Dr. J. Ullschmied, Dr. D. Margarone)

IPPLM, Warsaw, Poland (Prof. J. Wolowski);

Irkutsk State University, Russia (Prof. V. L. Paperny)

LIANA Physics

Study and Characterization of high Temperature and Density Plasmas generated by Power Laser Pulses

1. Laser Ion Acceleration:

Plasma ion acceleration at laser intensities: 10^{10} W/cm² (LNS-Catania); 10^{16} W/cm² (PALS-Prague); 10^{20} W/cm² (FLAME-Frascati)

Targets: Thick and thin targets; target composition; target geometry; target coupling

Electric field in plasma measurements (in forward and backward directions);

Distributions: Ion energy, Charge states, Angular, Temperature, Density, Gradients;

Proton acceleration: Research maximum energy and current, monocromatization;

Fast Ion Diagnostics using new developed SiC and Diamond detectors

2. Nuclear Applications:

Proton and light particle **Ion sources**

Proton and light particles **Post-acceleration** up to 100 kV voltage

Measurements of **Nuclear events** (D-D reaction, nuclear reactions, excitations and disexcitations, nuclear reactions,...)

3. Radiation Detectors:

Study of Silicon Carbide detectors at very high intensity and complex radiation exposures (UV, X, H⁺, Ions)

2012 Activity

Analysis of experimental data
taken at PALS - Prague

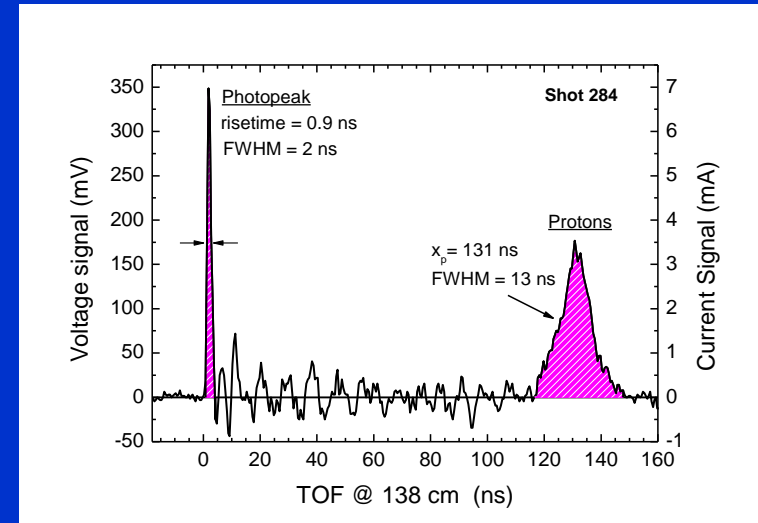
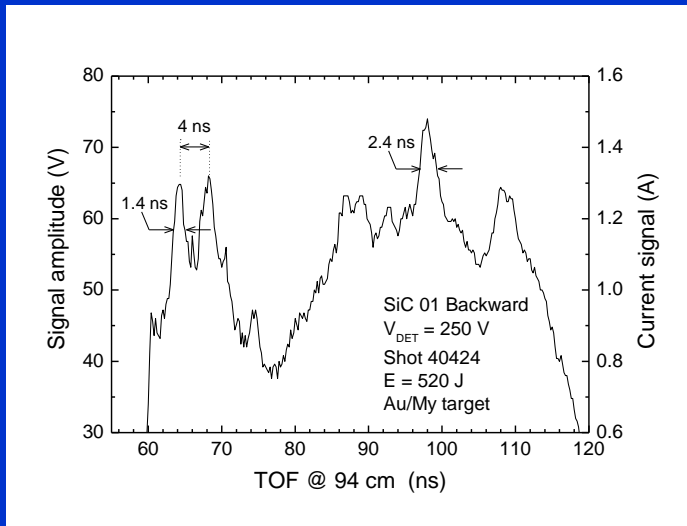
Experiment at Advanced Photonics Research
Institute (APRI - South Korea)
using 100 TW Laser



SUMMARY FOR PRESENTATION AT NSS 2012, ANAHEIM - CALIFORNIA, OCT. 29 - NOV. 3

Sub-Nanosecond Time of Flight SiC Detectors to Intense Laser Generated Plasma Radiation

G. Bertuccio^{1,2}, D. Puglisi^{1,2}, D. Margarone³,
J. Prokupek³, T. Mocek⁴, I.J. Kim⁵, T.M. Jeong⁵



SUMMARY of RESULTS

- SiC Detector in time of flight configuration
- Very high amplitude signals and S/N
- Sub-nanosecond time response
- No degradation of detector response

2013 Milestones & support

Milestones 2013

1. Experiment at PALS using different SiC detectors – data analysis
2. Development of a Monte Carlo simulator to study and optimizing high speed response and timing properties of SiC detectors
3. Characterization of SiC detectors of a new run with large-area position-sensitive SiC devices for plasma analysis

MI	1.0 k€	(Meeting and experiments at LNS)
ME	5.0 k€	(Experiment at PALS, conference)
Con.	2.0 k€	(Electrical/mechanical components)
Inv.	3.0 k€	(Probeheads for detector chip testing)
Serv.	8.0 k€	(Contribution to SiC detector production run)
TOTAL	19,0 k€	