

Welcome to the session of work package 7



Photon Beamlines and Experiments

Agenda

IRUVX-PP Kick-off Meeting BLOCK I

Venue:	Date:	Vers. 01
DESY	10. Apr 08	

POS	TIME	SLOT	ACTION	Comment	Responsible
	9:15	00:10	Start	Welcome & round of introduction	K. Tiedtke
	9:25	00:10	Plenary Talk	Introduction & Motivation, experience of FLASH	K. Tiedtke
	9:35	00:10	WP7.1: Design of beamline	Status, Milestones&Deliverables, How to collaborate? 5 min.	MAX-LAB: NN
	9:45	00:10	WP7.2: Photon diagnostics	"	DESY: H. Wabnitz
	9:55	00:10	WP7.3.1: Radiation damage of optics	"	STFC: M. Bowler
	10:05	00:10	WP7.3.2: Microfocusing optics	"	ELETTRA: D. Cocco
	10:15	00:10	WP7.3.3: Multiple use of the FEL beam	"	BESSY: D. Schondelmeier
	10:25	00:20	Discussion	How do we organise the collaboration in WP & controlling	D. Cocco, K. Tiedtke
	10:45	00:10	Summary	Working plan & next Meetings	D. Cocco, K. Tiedtke
	10:55		End		
	11:00	00:25	Coffee Break		

Wp contacts

New Work Package No.	BESSY	STFC	DESY	ELETTRA	MAX-Lab	INFN	PSI	SOLEIL	POLFEL
WP0			Josef Feldhaus; Ute Krell; Matthias Kreuzeder						
WP1	Wolfgang Eberhardt, Eberhard Jaeschke	Mike Dunne Marion Bowler	Josef Feldhaus Ute Krell	Albin Wrulich Fabio Mazzolini	Sverker Werin	Luigi Palumbo Giuseppe Dattoli/ENEA	Marco Pedrozzi	JP Caminade	G. Wrochna
WP2	Olaf Schwarzkopf, Wolfgang Eberhardt	Paul Vernon	Rolf Treusch	Giorgio Paolucci	Ulf Johansson	Maurizio Benfatto	Heinz Weyer	P. Morin	
WP3	Wolfgang Anders, Torsten Kamps	Elaine Seddon	Christopher Gerth	Paolo Craievich	Gunnar Öhrwall	Alessandro Gallo Gian Piero Gallerano	Rene Bakker	JP Caminade	
WP4	Christian Jung	Pat Ridley	Elke Ploenjes	Andrea Crivelli	Svante Svensson	Patrizio Antici	Albin Wrulich	JP Caminade	
WP5	Olaf Schwarzkopf	Jane Binks	Matthias Kreuzeder Ute Krell	Bibi Palatini	Annika Nyberg	Luciano Catani	Heinz Weyer	JP Caminade	
WP6	Walter Braun	Liz Towns-Andrews	Markus Tischer	Riccardo Tommasini	Ake Kvick	Claudio Sanelli	Volker Schlott	JP Caminade	
WP7	Daniel Schondelmeier	Frances Quinn	Kai Tiedtke Hubertus Wabnitz	Daniele Cocco	Svante Svensson; Jorgen Larsson	Valerio Rossi Albertini Roberto Cimino	(Rafael Abela)	P. Morin	
WP8	Torsten Quast	Jim Clarke, Steve Jamison	Holger Schlarb; Axel Winter	Laura Badano Anton Rohlev	Sverker Werin	Massimo Ferrario, Luca Giannessi	Volker Schlott	M. E. Couprie	
	Jens Knobloch Hermann Dürr	Marion Bowler Elaine Seddon	Elke Plönjes Holger Schlarb	Albin Wrulich	Nils Martensson Sverker Werin	Massimo Ferrario Luigi Palumbo	Marco Pedrozzi Volker Schlott	M. E. Couprie P. Morin	G. Wrochna



Introduction to work package 7

Photon Beamlines and Experiments

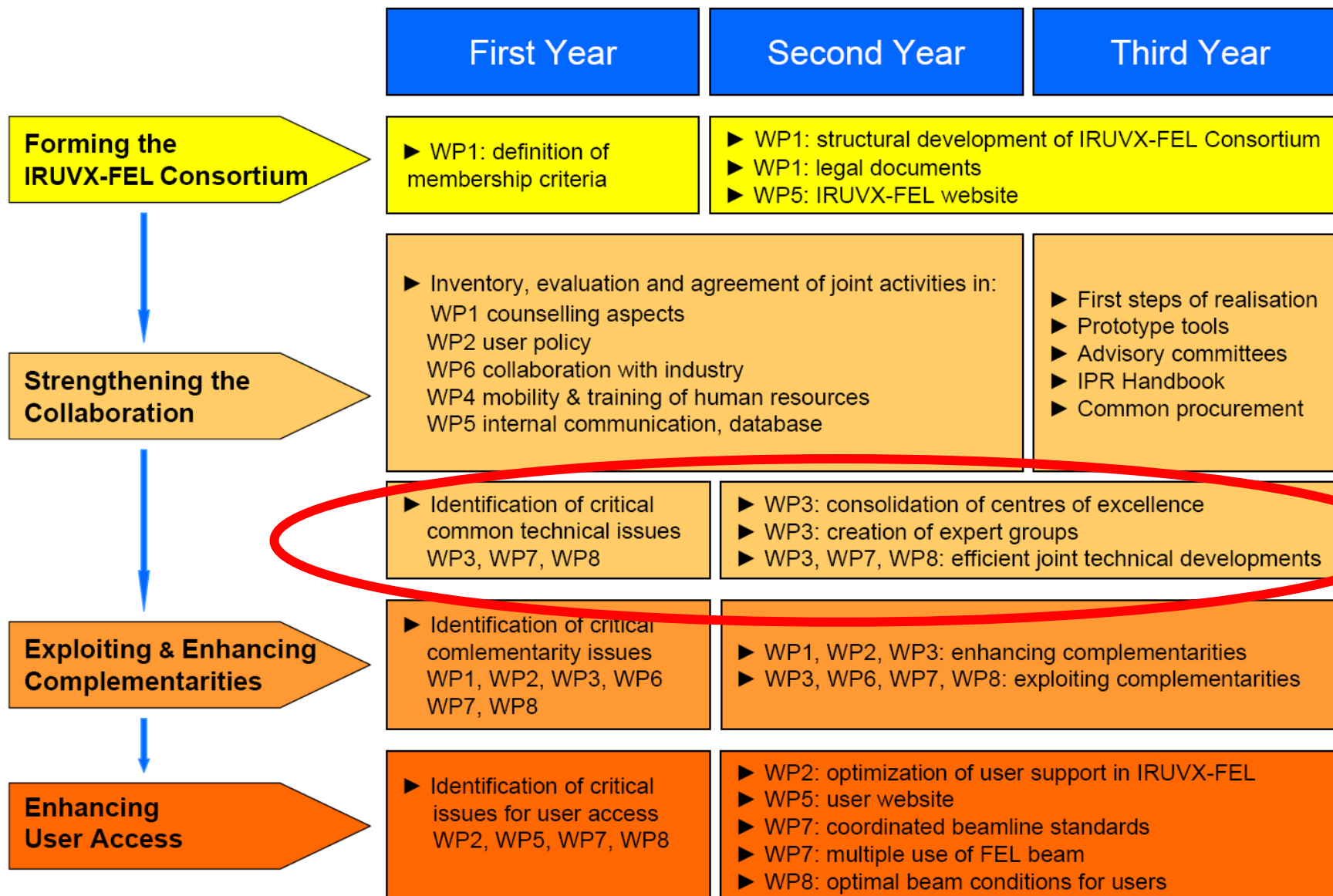


Objectives of this work package ...

“Prepare a common technical infrastructure to exploit the new facilities from the start with the highest efficiency”.

“Joint technical work on advanced photon diagnostics for commissioning and operation as well as optimized concepts for photon beam delivery”.

Project Objectives



What are these critical common technical issues?

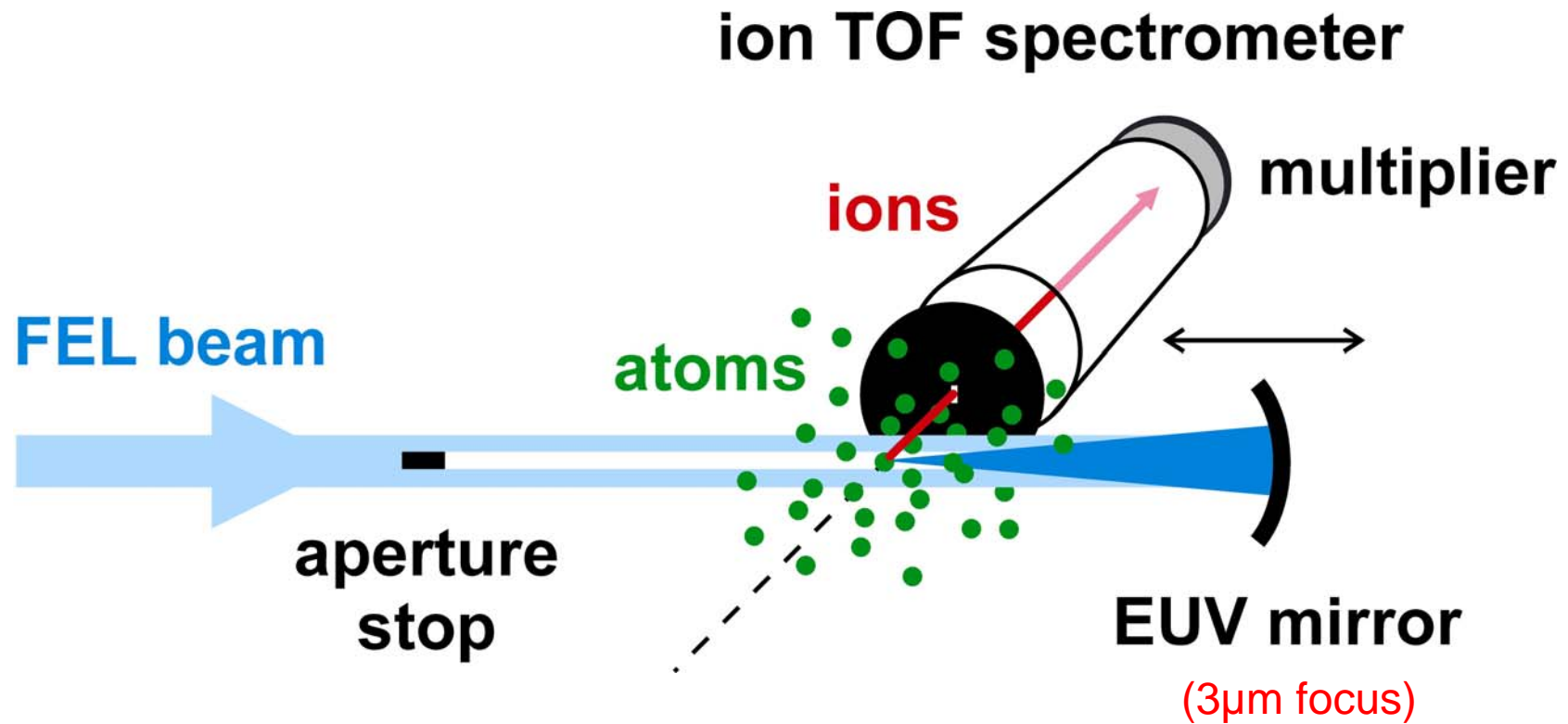
What do users need to perform successfully experiments at FELs?

Example:

Multi-photon excitation of atoms in gas phase

M. Richter, A.A. Sorokin (PTB), T. Feigl (IOF), H. Wabnitz, K. Tiedtke, (DESY): FLASH, September 22, 2006

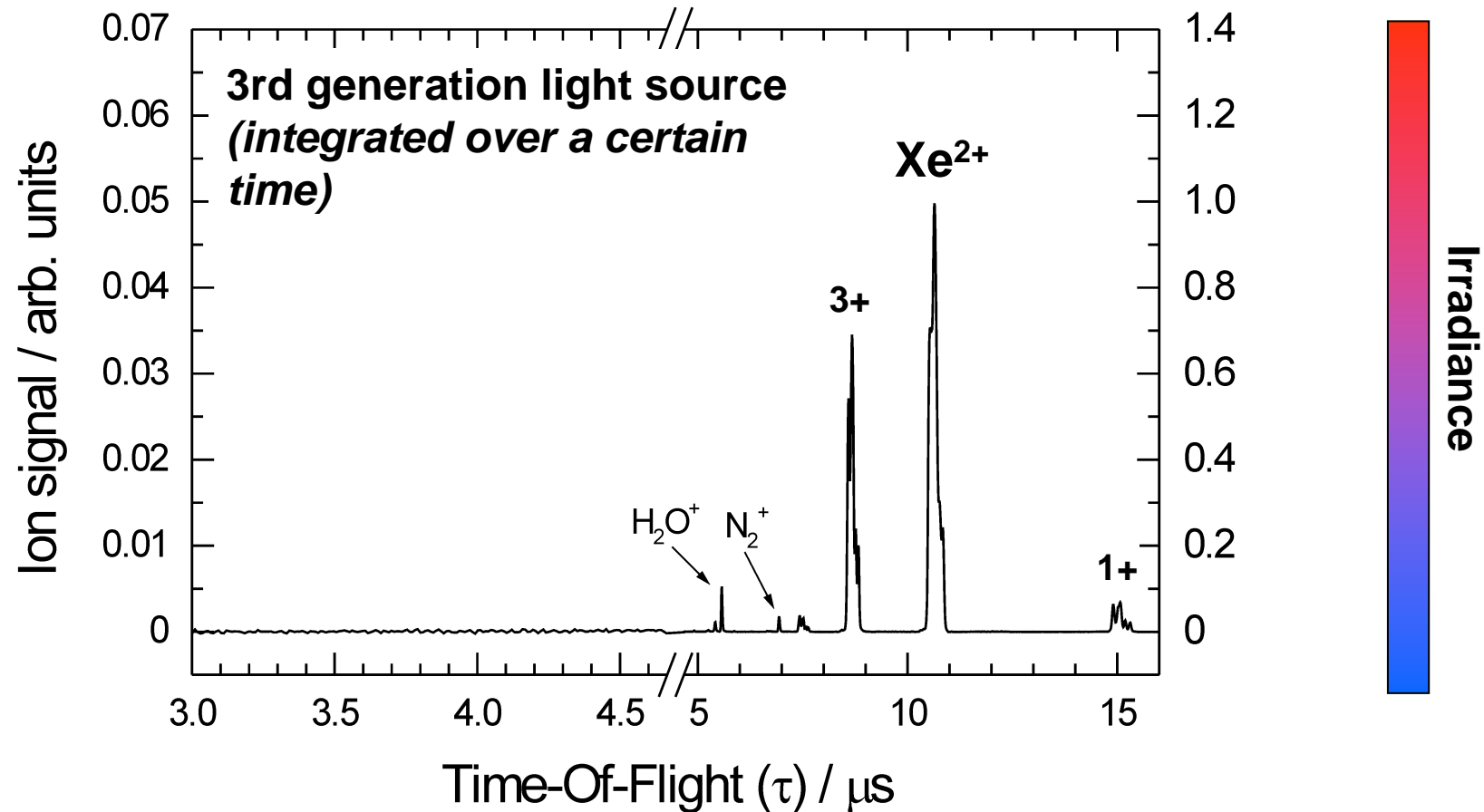
Ion-mass spectroscopy in a peta watt- focus of a spherical mirror at 13nm



Photoelectric effect at ultrahigh intensities

A.A. Sorokin, S.V. Bobashev, T. Feigl, K. Tiedtke, H. Wabnitz, and M. Richter,
Phys. Rev. Lett. 99, 213002 (2007)

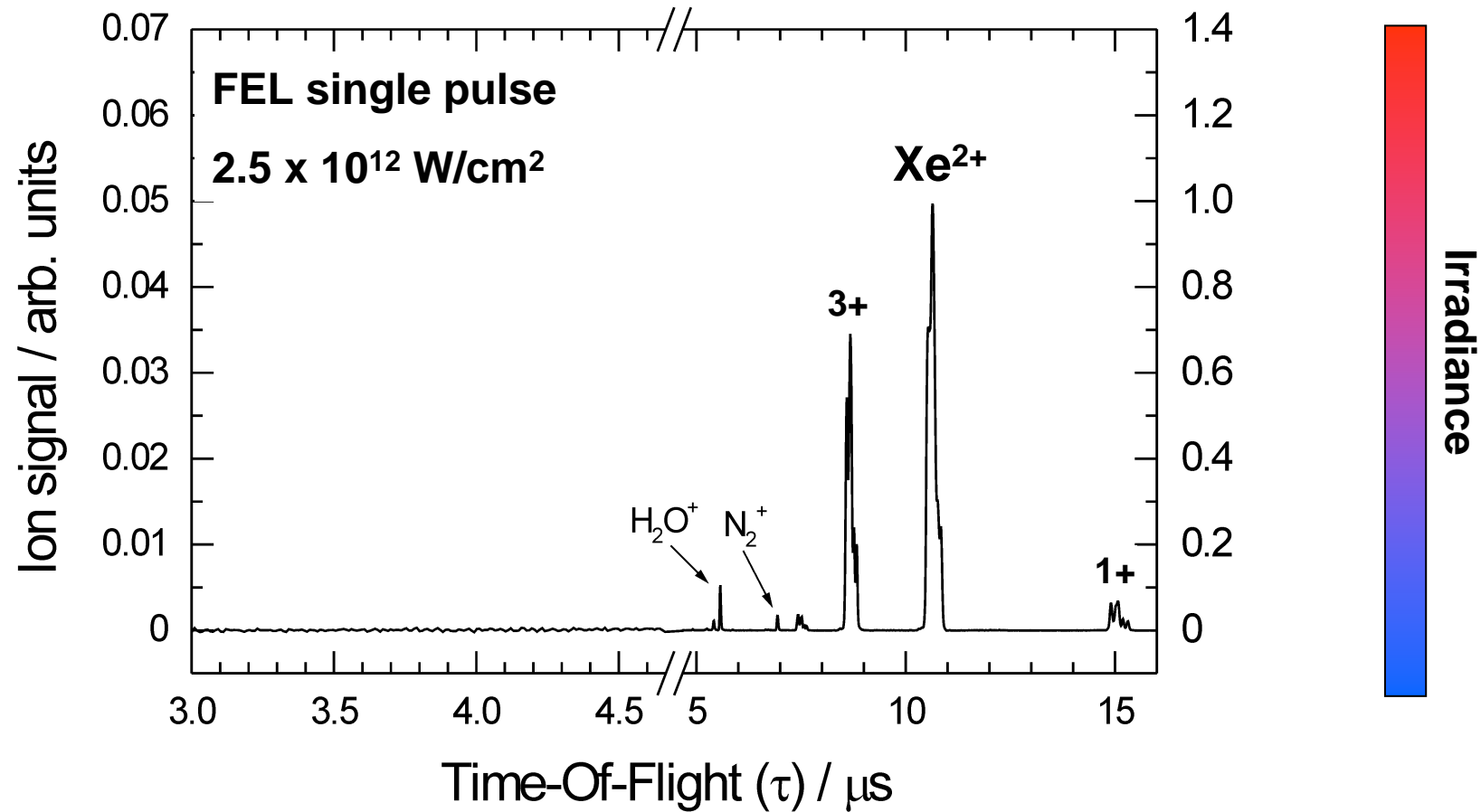
Multiple ionization of xenon in the EUV (13.4 nm / 92.7 eV)



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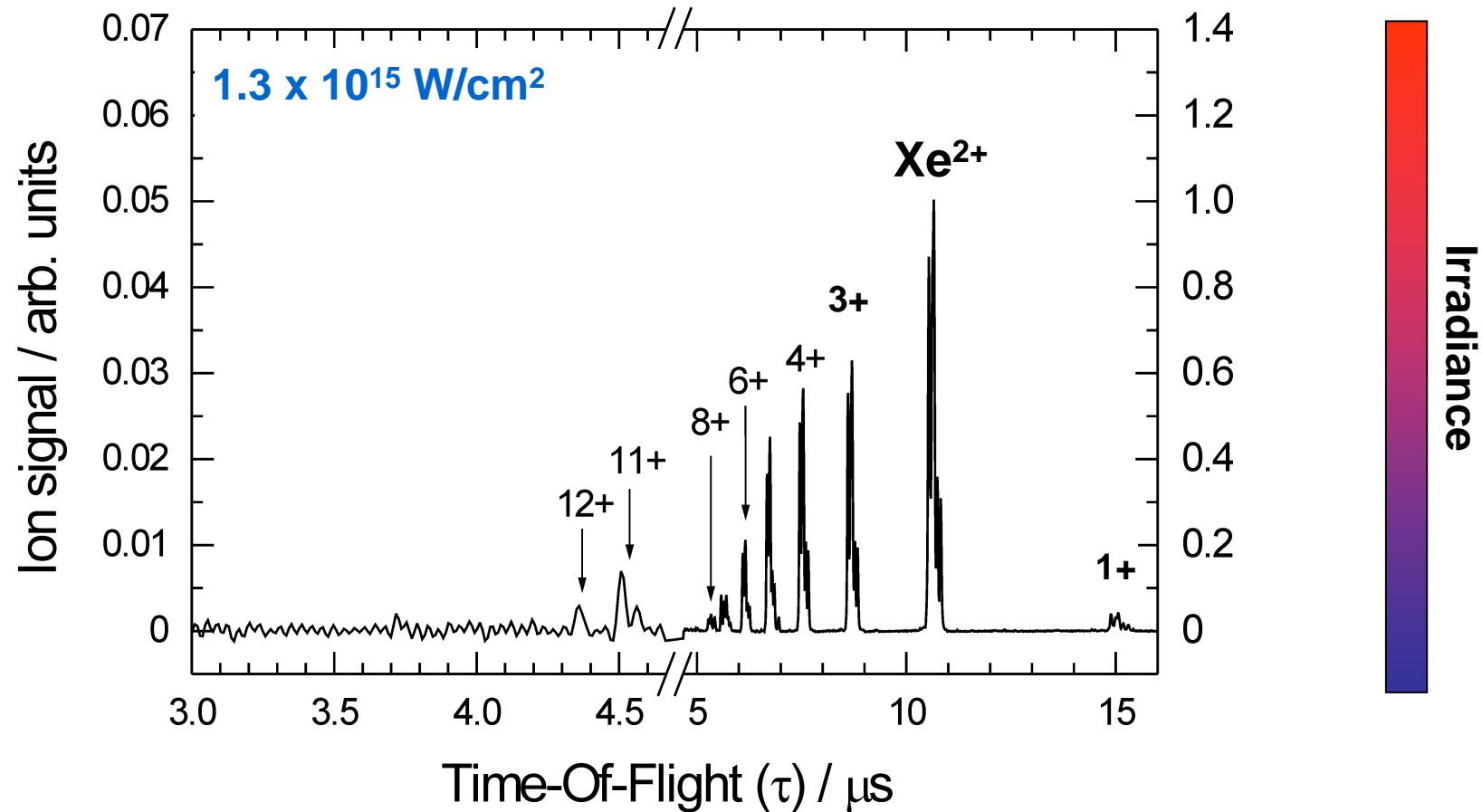
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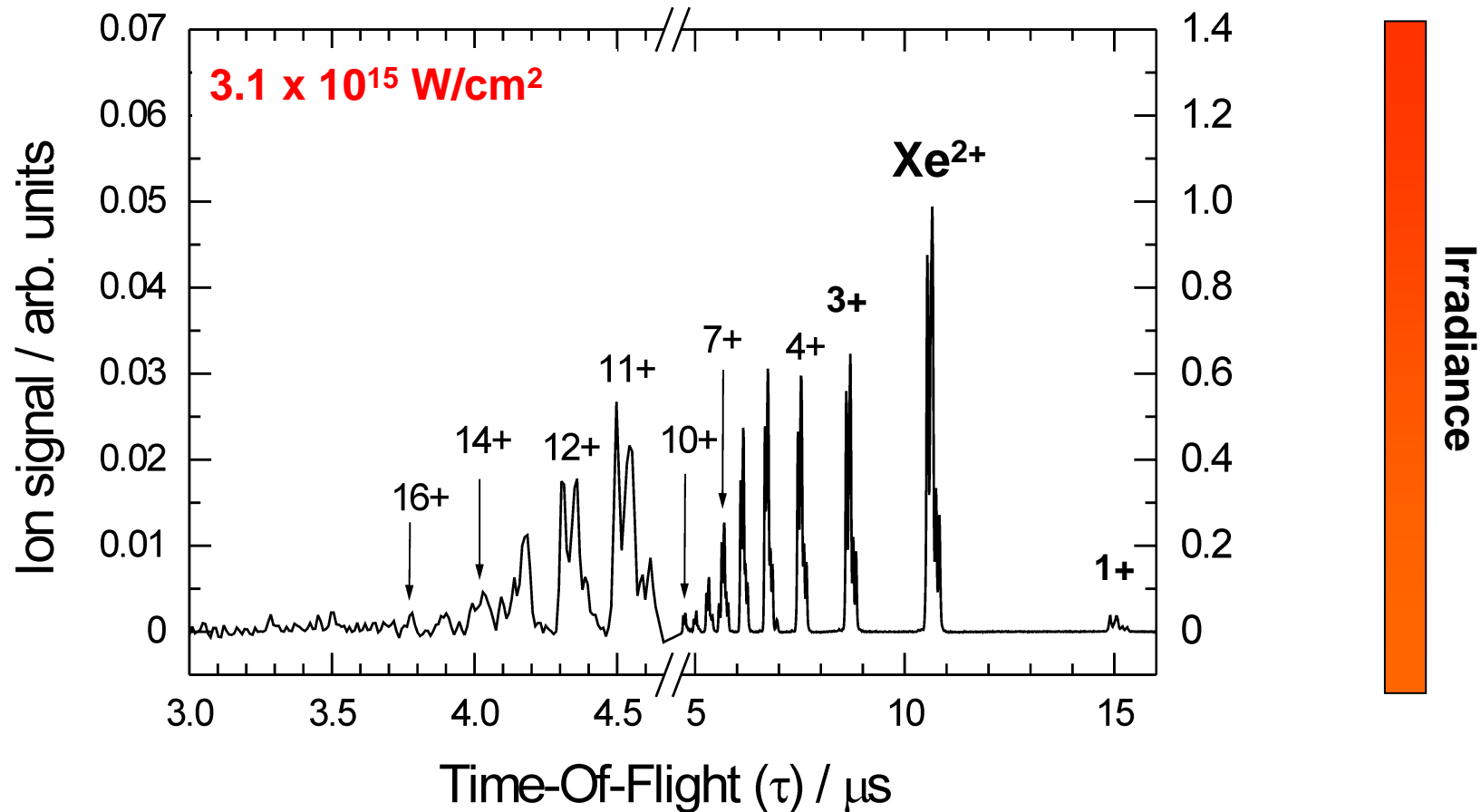
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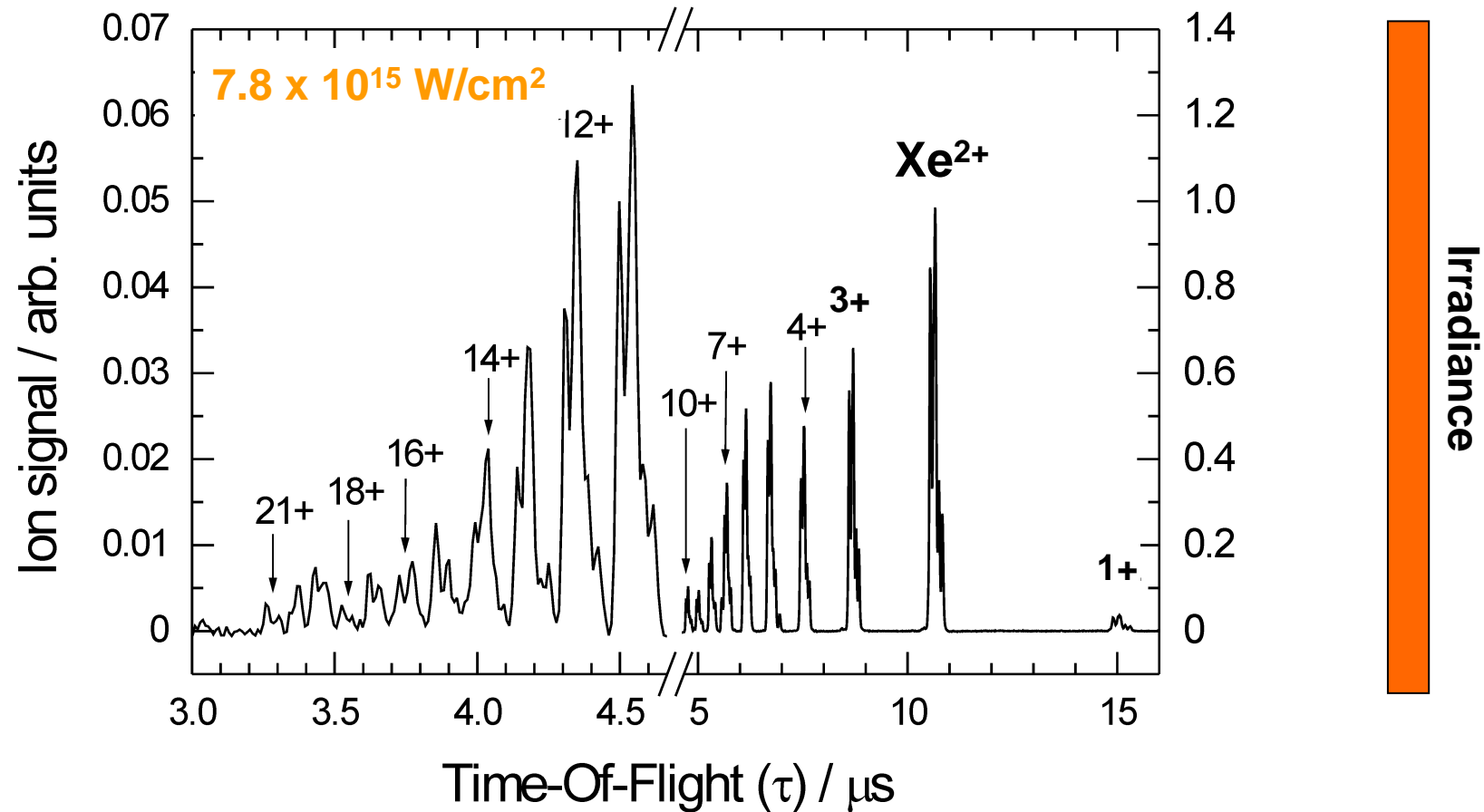
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Multi-photon multiple ionization of xenon in the EUV

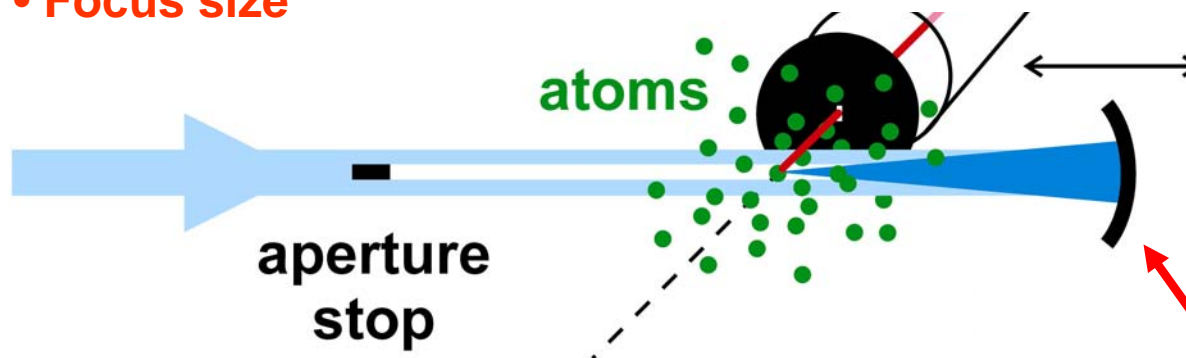
Wavelength:	13.4 nm
Photon energy:	92.7 eV
Pulse energy:	1 to 10 μJ
Pulse duration:	10 fs
Focus size:	3 μm (FWHM)
Peak irradiance:	8×10^{15} W cm⁻²
Highest charge state observed:	Xe²¹⁺
Energy absorbed per atom and pulse:	> 5 keV
Number of photons absorbed per atom and pulse:	> 57
Number of ionization steps:	≈ 19

What do user need to perform such an experiment?

The irradiance determine the physics:

- **Pulse energy**
- **Pulse length**
- **Focus size**

Pulse-resolved and on-line



Focusing optics

In this case we used multilayer mirror placed in the chamber to produce μ -focus:

- high reflectivity at 13nm,
- able to suppress higher harmonics
- withstand the high peak powers

Common critical technical issues are ...

- **Advanced photon diagnostics is crucial** (WP7.2)
(on-line and pulse resolved)
- **Optics for beam transport and focusing** (WP7.3)
 - *Microfocusing optics*
 - *Radiation damage of optics*
 - *Multiple use of the FEL beam*
- **Optimised design of beamlines and user stations** (WP7.1)



End



Discussion



Discussion

Deliverable name	WP no.	Lead beneficiary	DESY	BESSY	ELETTRA	MAXLAB	STFC
Report by user group 1 and 2	7.1	MAXLAB				Consultant contracts and report of first experiences	
Generic beamline concept based on user reports	7.1	MAXLAB			Modify the drawing of the new Fermi beamlines on the basis of the Flash experience	Conclusions and design issues for beamlines, based on consultant groups experiences and consortium member's performance	assessment of generic design concept for 4GLS proposed science case
Demonstration of lateral intensity measurement	7.2	DESY	Setup wavefront measurement system				survey of existing techniques
Demonstration of temporal intensity measurement	7.2	DESY	autocorrelator measurements		Cross check of autocorrelation measurement with other experimental techniques	On-line monitoring of the shot-to-shot jitter	survey of existing techniques
Demonstration of online jitter monitoring	7.2	MAXLAB					
Demonstration of <i>in situ</i> characterisation of the optical performance	7.31	STFC	Experimental test of Long-trace profiler concept at FLASH / develop improved wavefront sensor concept		Define the limit and possible improvement of the Long Trace Profile to be used also as an on line measurement device / Comparison with other metrological devices		summary of issues, modelling of thermal effects, conclusions on best methodology, survey of metrology tools
Demonstration of the improved fabrication scheme for adaptive mirrors	7.3.2	ELETTRA			Survey and metrological characterisation of existing polishing procedure / Realisation, metrology measurement, test with radiation of a prototype		survey of fabrication techniques
Fabrication of test structure	7.3.3	BESSY		Test structure			
Demonstration of a beam splitting technique	7.3.3	BESSY		Build a beam splitter prototype based on existing technologies	Test of the adopted beam splitter(s) with the FEL radiation		survey of distribution techniques, modelling of concepts, requirements for electron beam

WP 7.1 Optimised design of beamlines and user stations (MAXLAB)

Deliverables:

- D7.1 Report by user group 1 and 2 (MAXLAB)
- D7.2 Generic beamline concept based on user reports (MAXLAB)

Additional contribution:

ELETTRA: -Three beamlines designed based on FLASH experience.
-Monochromator issue with energetically unstable beam.

STFC: Assessment of generic design concept for 4GLS proposed science case

WP 7.2 Photon diagnostics (DESY)

Deliverables:

- D7.3 Demonstration of lateral intensity measurement (DESY)
- D7.4 Demonstration of temporal intensity measurement (DESY)
- D7.5 Demonstration of online jitter monitoring (MAXLAB)

Additional contribution:

ELETTRA: - Testing of a DESY design based I0 monitor.

- Adapting a SR concept of BPM for the FEL.
- Study of the direct correlation energy-duration.
- Autocorrelation set-up to study the temporal characteristic of the beam.

STFC: Survey of existing lateral and temporal intensity measurement techniques.

WP 7.3 Optics for beam transport and focusing

7.3.1 Radiation damage of optics (STFC)

Deliverables:

- D7.6 Demonstration of in situ characterisation of the optical performance (STFC)

Additional contribution:

DESY: -Experimental test of *Long-trace profiler* concept at FLASH
-Develop improved wave front sensor concept

ELETTRA: -Define the limit and possible improvement of the *Long Trace Profile* to be used also as an on line measurement device
-Comparison with other metrological devices

WP 7.3 Optics for beam transport and focusing

7.3.2 Microfocusing optics (*ELETTRA*)

Deliverables:

- D7.7 Demonstration of the improved fabrication scheme for adaptive mirrors

Additional contribution:

STFC: Survey of fabrication techniques

7.3.3 Multiple use of the FEL beam (*BESSY*)

Deliverables:

- D7.8 Fabrication of test structure (BESSY)
- D7.9 Demonstration of a beam splitting technique (BESSY)

Additional contribution:

STFC: Survey and modelling of distribution concepts

ELETTRA: Test of the adopted beam splitter with the FEL radiation

Discussion

- How can we benefit from the additional contributions?
Contribution to the annual report?
- How can potential new partners contribute?

Control tools and meetings:

- Annual status report of each task and subtask leader.
- Meeting every six month (first meeting in March 2009)?
- Phone conference after each milestone (first in 6 month)?

Time Schedule



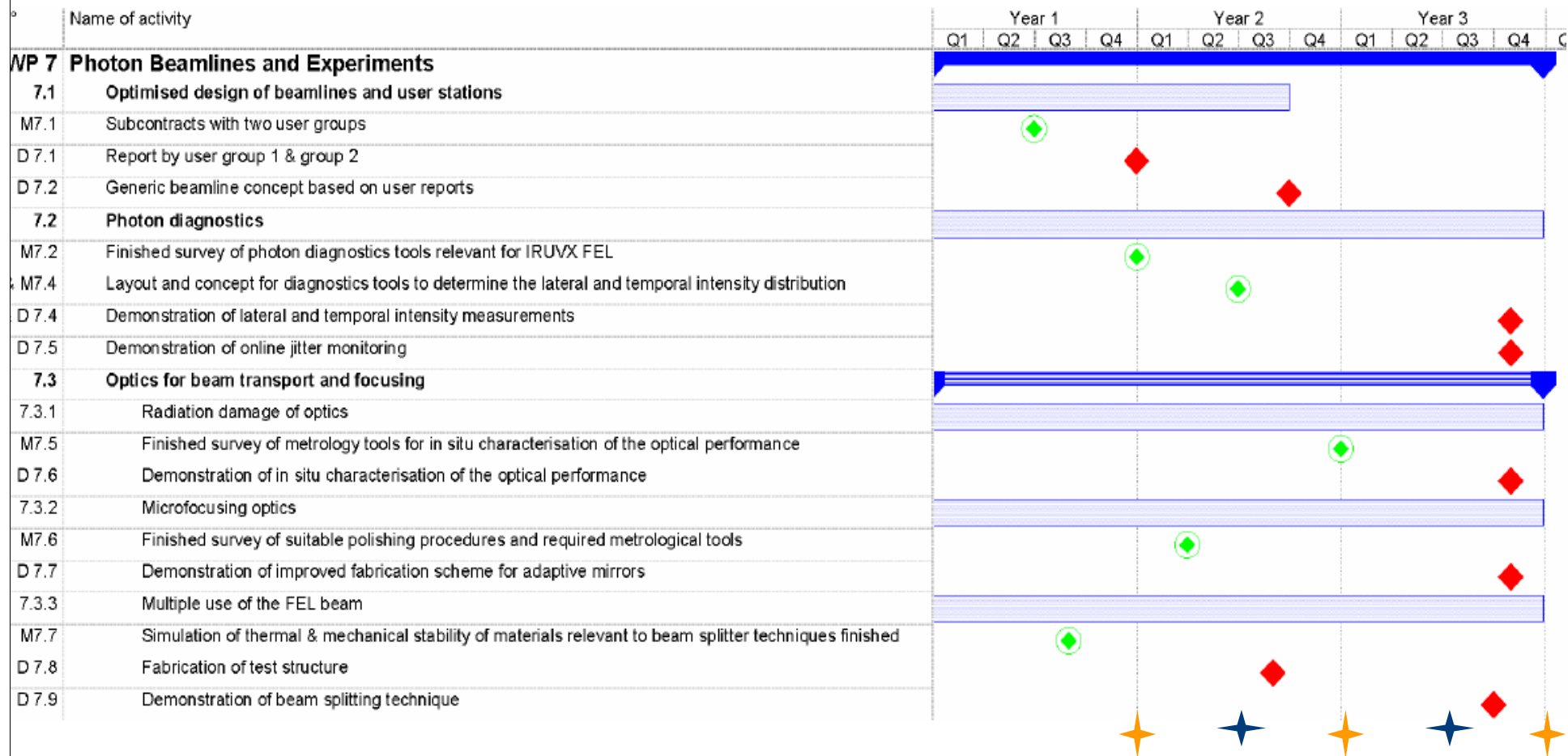
Deliverables



Milestone



Annual meeting
WP meeting





Work package 7

Summary



End