EUROPEAN SCIENCE FOUNDATION
MEETING 2004, NETWORK ON FUTURE ADVANCED LIGHT SOURCES (FALS)

WORKSHOP
"NEEDS AND OPPORTUNITIES FOR FUTURE ADVANCED LIGHT SOURCES"

PROPRIANO, CORSICA, FRANCE FROM OCTOBER THE 10TH TO OCTOBER THE 12TH, 2004

Web site : http://www-drecam.cea.fr

GUIDE OF EUROPEAN SOURCES
(FEL, HARMONICS, PLASMAS)
- IN CONSTRUCTION -

SOURCES CHARACTERISTICS

Institute or Laboratory : BESSY

Person to contact (name and e-mail) : Dr. Dieter Krämer , kraemer@bessy.de

		UNITS
TYPE OF SOURCE: **Linac driven high-gain-harmonic generation free electron laser**		
RANGE OF PHOTON ENERGY :	24 - 1000	eV
POLARIZATION :	variable	(lin H, lin V or circular)
TUNABILITY :	full range in three FEL lines	
IF YES : ON WHAT ENERGY RANGE?	24 - 1000	eV
REPETITION RATE :	1000	Hz
PULSE DURATION:	20	rms
ENERGY PER PULSE:	0.030 - 0.280	mJ
PEAK POWER:	1.5×10^{9} - 14×10^{9} W	
AVERAGE POWER:	0.03 - 0.28	W
BANDWIDTH (FWHM)[%]:	0.04 - 0.4	
NUMBER OF PHOTONS PER PULSE:	2×10^{11} - 7×10^{13}	
AVERAGE FLUX OF PHOTONS**:	2×10^{14} - 7×10^{16}	s^{-1}/0.1% bandwidth
PEAK BRILLANCE*:	0.6×10^{30} - 13×10^{30}	
AVERAGE BRILLANCE*:	0.3×10^{20} - 6.8×10^{20}	
SOURCE SIZE :	60×10^{-6} - 120×10^{-6}	m
BEAMLINE NUMBER :	9	

REMARK(S) : TDR available at www.bessy.de
*in unit of photons/(s mrad^2 mm^2 0.1% bandwidth)

SOURCES CHARACTERISTICS

Institute or Laboratory : Sincrotrone Trieste (ELETTRA laboratory)

Person to contact (name and e-mail) : Bruno Diviacco, bruno.diviacco@elettra.trieste.it

		UNITS
TYPE OF SOURCE: **Storage ring free electron laser (EUFELE)**		
RANGE OF PHOTON ENERGY :	2 - 7	eV
POLARIZATION :	arbitrary	
TUNABILITY :	YES	
IF YES : ON WHAT ENERGY RANGE?		
REPETITION RATE :	4.6	MHz
PULSE DURATION:	10	ps
ENERGY PER PULSE:	0. 1	microJ
PEAK POWER:	10	kW
AVERAGE POWER:	500	mW
BANDWIDTH (FWHM)[%]:	0.01 - 0.1%	
NUMBER OF PHOTONS PER PULSE:	10^{11}	
AVERAGE FLUX OF PHOTONS**:		s^{-1}/0.1% bandwidth
PEAK BRILLANCE*:		
AVERAGE BRILLANCE*:		
SOURCE SIZE :		m
BEAMLINE NUMBER :		
REMARK(S) :		

*in unit of photons/(s mrad^2 mm^2 0.1% bandwidth)
**IF POSSIBLE ADD A FIGURE SHOWING THE FLUX (OR THE BRILLANCE) VERSUS THE WAVELENGTH

SOURCES CHARACTERISTICS

Institute or Laboratory : ELETTRA

Person to contact (name and e-mail) : Carlo J. Bocchetta, carlo.bocchetta@elettra.trieste.it

		UNITS
TYPE OF SOURCE: **Seeded FEL (FERMI@Elettra)**		
RANGE OF PHOTON ENERGY :	12 to 124	eV
POLARIZATION :	H, V & C	(lin H, lin V or circular)
TUNABILITY :	Yes	
IF YES : ON WHAT ENERGY RANGE?	12 to 31 and 25 to 124 eV	
REPETITION RATE :	50	Hz
PULSE DURATION:	~250 - 100	fs
ENERGY PER PULSE:	1 to 0.7	mJ
PEAK POWER:	2 to 4	GW
AVERAGE POWER:	65 to 45	mW
BANDWIDTH (FWHM)[%]:	0.4	
NUMBER OF PHOTONS PER PULSE:	55 to 4 x 10^{13}	
AVERAGE FLUX OF PHOTONS**:	30 to 2 x 10^{15}	s^{-1}/0.1% bandwidth
PEAK BRILLANCE*:	0.3 to 7 x 10^{30}	
AVERAGE BRILLANCE*:	1 to 9 x 10^{19}	
SOURCE SIZE :	< 100	micron
BEAMLINE NUMBER :	4	

REMARK(S) : Numbers given refer to SASE simulations, the seeded case is expected to give a slight decrease in peak power (up to an order of magnitude). The spectral width will be reduced to a single spike determined by the seed laser.

*in unit of photons/(s $mrad^2$ mm^2 0.1% bandwidth)

SOURCES CHARACTERISTICS

Institute or Laboratory : DESY

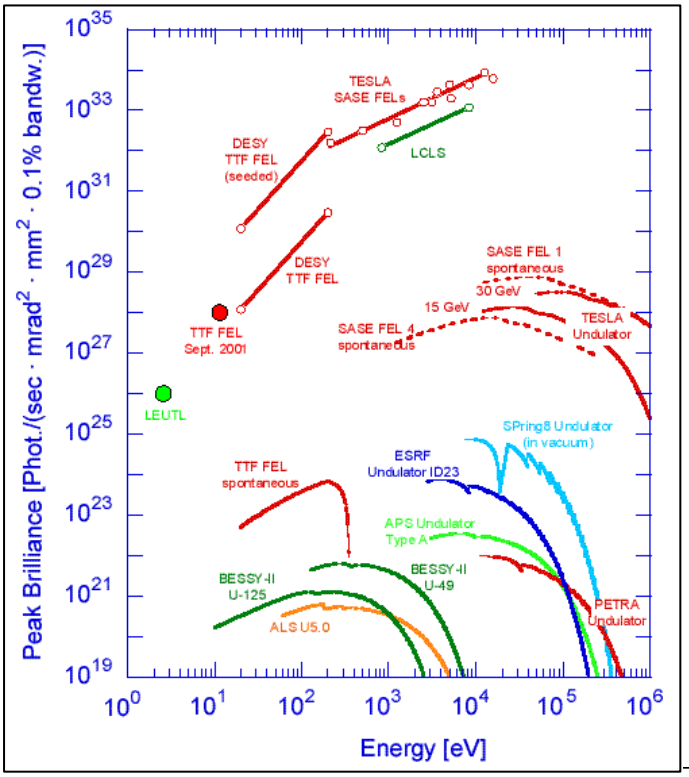
Person to contact (name and e-mail) : Josef Feldhaus, josef.feldhaus@desy.de

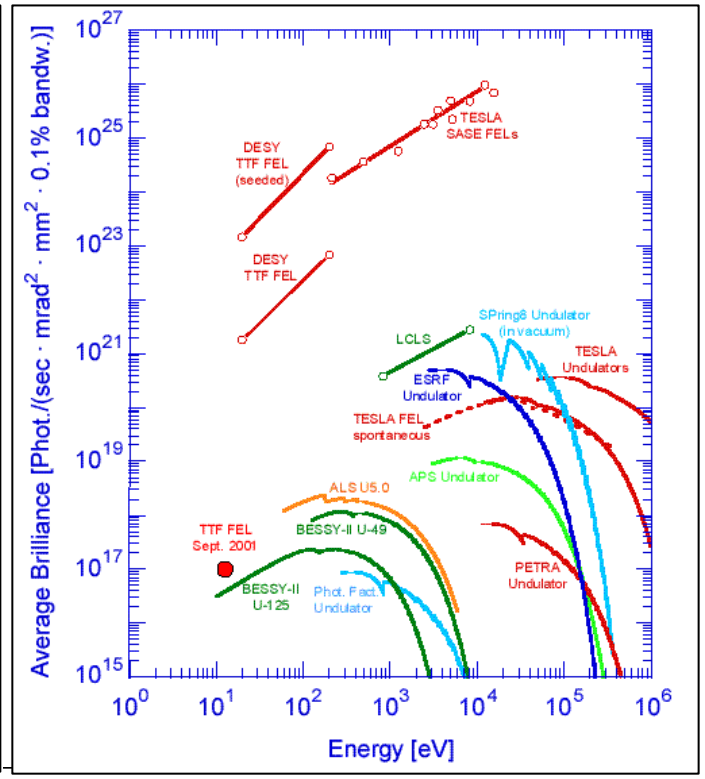
		UNITS
TYPE OF SOURCE: **FEL (SASE, later with self-seeding)**		
RANGE OF PHOTON ENERGY (1. harmonic) :	~20-200	eV
POLARIZATION :	lin H	(lin H, lin V or circular)
TUNABILITY :	yes	
IF YES : ON WHAT ENERGY RANGE?	~20-200	eV
REPETITION RATE :	up to 72000	per second (10 pulse trains)
PULSE DURATION:	~100	fs
ENERGY PER PULSE:	0.1-1	mJ
PEAK POWER:	a few	GW
AVERAGE POWER:	up to 40	W
BANDWIDTH (FWHM)[%]:	~0.5	%
NUMBER OF PHOTONS PER PULSE:	10^{13}-10^{14}	
AVERAGE FLUX OF PHOTONS**:	up to 10^{18}	s^{-1}/0.1% bandwidth
PEAK BRILLANCE*:	$2 \cdot 10^{30}$	at 6.4 nm
AVERAGE BRILLANCE*:	$3 \cdot 10^{22}$	at 6.4 nm
SOURCE SIZE :	<200	µm
BEAMLINE NUMBER :	5	

REMARK(S) : **1 FEL beam can be switched by mirrors to 5 experimental stations, 2 of which are behind a high-resolution monochromator (~10^{-4} bandwidth); focusing mirrors are used to produce 100 µm and 20 µm spots initially, later also smaller.**

*in unit of photons/(s mrad^2 mm^2 0.1% bandwidth)

**IF POSSIBLE ADD A FIGURE SHOWING THE FLUX (OR THE BRILLANCE) VERSUS THE WAVELENGTH





4GLS SOURCES CHARACTERISTICS

Institute or Laboratory : CCLRC DARESBURY LABORATORY

Person to contact (name and e-mail) : Elaine Seddon, e.seddon@dl.ac.uk

TYPE OF SOURCE: **XUV-FEL**

RANGE OF PHOTON ENERGY :	10-100 eV
POLARIZATION :	VARIABLE
TUNABILITY :	YES
REPETITION RATE :	Current target 10 kHz
PULSE DURATION:	Current target 200 fs
ENERGY PER PULSE:	~2 mJ
PEAK POWER:	MW - GW
BANDWIDTH (FWHM)[%]:	
NUMBER OF PHOTONS PER PULSE:	1e14
PEAK BRILLANCE:	See figure
AVERAGE BRILLIANCE:	
BEAMLINE NUMBER :	Probably two stations

REMARK(S) :
4GLS will incorporate superconducting linac technology with energy recovery in a multi-user facility providing a suite of light sources – spontaneous SR sources (i.e. traditional SR but in more intense, shorter bursts), stimulated sources (i.e. free electron lasers) and combinations of these sources with each other or conventional lasers. 4GLS is the leading recirculating proposal in Europe and the most comprehensive in terms of utilisation of combined sources.

The XUV-FEL is one part of the suite of light sources making up 4GLS. Parameters quoted for the XUV-FEL are without seeding but this will be adopted; the output specification with seeding is the subject of current work.

4GLS SOURCES CHARACTERISTICS

Institute or Laboratory : CCLRC DARESBURY LABORATORY

Person to contact (name and e-mail) : Elaine Seddon, e.seddon@dl.ac.uk

TYPE OF SOURCE: **VUV FEL**

RANGE OF PHOTON ENERGY :	3-10 eV,
POLARIZATION :	VARIABLE
TUNABILITY :	YES
REPETITION RATE :	MHz
PULSE DURATION:	Current target 200 fs
ENERGY PER PULSE:	~μJ
PEAK POWER:	
BANDWIDTH (FWHM)[%]:	
NUMBER OF PHOTONS PER PULSE:	
PEAK BRILLANCE: See figure (values for unseeded XUVFEL)	
AVERAGE BRILLIANCE:	
BEAMLINE NUMBER :	

REMARK(S) :

The VUV-FEL is one part of the suite of light sources making up 4GLS. Parameters quoted for the VUV-FEL assume that the device is an oscillator.

4GLS SOURCES CHARACTERISTICS

Institute or Laboratory: CCLRC DARESBURY LABORATORY

Person to contact (name and e-mail): Elaine Seddon, e.seddon@dl.ac.uk

TYPE OF SOURCE: **IR FEL**

RANGE OF PHOTON ENERGY :	0.01-0.4 eV
POLARIZATION :	VARIABLE
TUNABILITY :	YES
REPETITION RATE :	10 MHz
PULSE DURATION:	0.2-1ps
ENERGY PER PULSE:	70μJ
PEAK POWER:	MW-GW
BANDWIDTH (FWHM)[%]:	
NUMBER OF PHOTONS PER PULSE:	$2x10^{16}$
PEAK BRILLANCE:	See figure
AVERAGE BRILLIANCE:	
BEAMLINE NUMBER :	Probably 2 stations

REMARK(S) :
The IR-FEL is one part of the suite of light sources making up 4GLS.

4GLS SOURCES CHARACTERISTICS

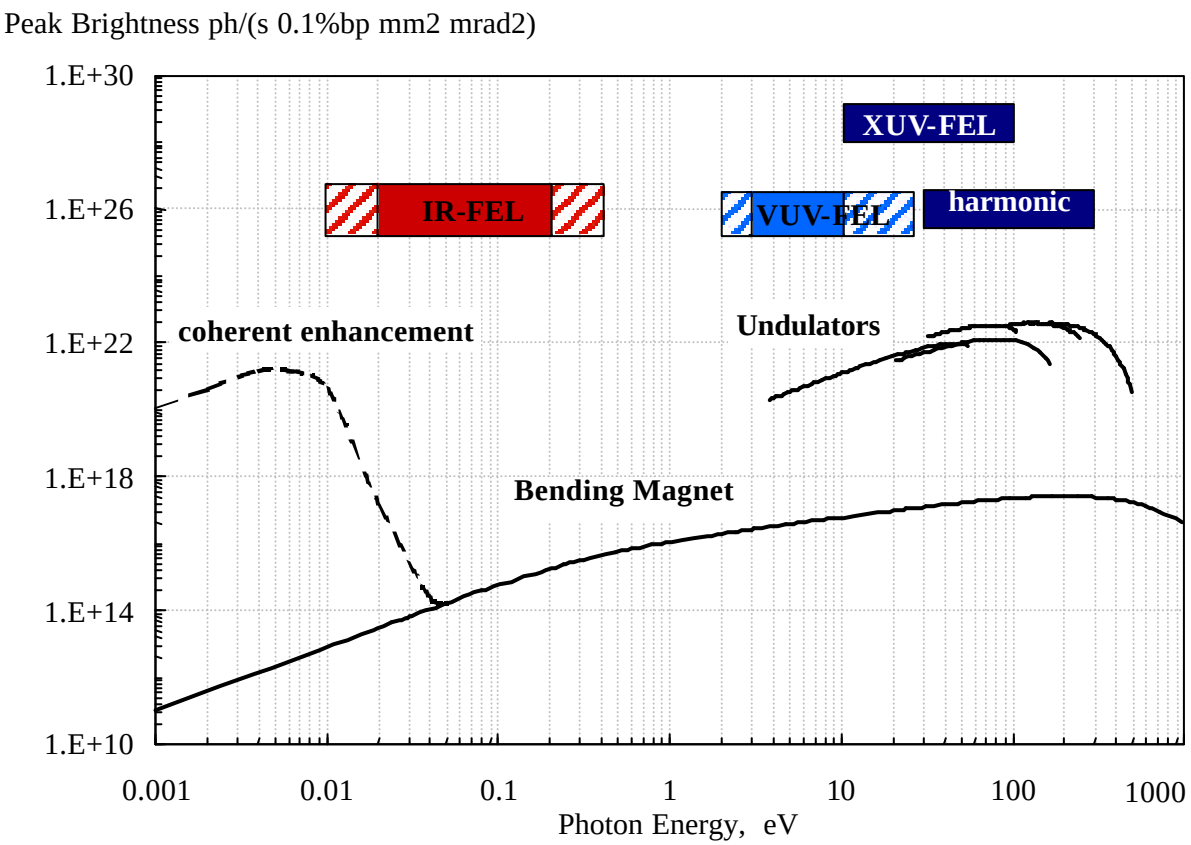
Institute or Laboratory : CCLRC DARESBURY LABORATORY

Person to contact (name and e-mail) : Elaine Seddon, e.seddon@dl.ac.uk

TYPE OF SOURCE: **SPONTANEOUS UNDULATOR RADIATION SOURCES**

RANGE OF PHOTON ENERGY :	5-600 eV
POLARIZATION :	VARIABLE
TUNABILITY :	YES
REPETITION RATE :	MHz
PULSE DURATION:	<ps
ENERGY PER PULSE:	
PEAK POWER:	
BANDWIDTH (FWHM)[%]:	
NUMBER OF PHOTONS PER PULSE:	
PEAK BRILLANCE:	
AVERAGE BRILLIANCE:	
BEAMLINE NUMBER :	Not fixed yet ca. 10

REMARK(S) :
The 4GLS project encompasses three FEL sources and spontaneous radiation from insertion devices in the return path of the energy recovery linac.


Peak Brightness ph/(s 0.1%bp mm2 mrad2)
1.E+30
1.E+26
1.E+22
1.E+18
1.E+14
1.E+10
XUV-FEL
IR-FEL
VUV-FEL
harmonic
coherent enhancement
Undulators
Bending Magnet
0.001
0.01
0.1
1
10
100
1000
Photon Energy, eV

SOURCES CHARACTERISTICS

Institute or laboratory : project ARC-EN-CIEL
Person to contact : Marie-Emmanuelle Couprie (couprie@drecam.cea.fr)

		UNITS
TYPE OF SOURCE: **FEL, project ARC-EN-CIEL**		
RANGE OF WAVELENGTH :	1 eV-1 keV	
POLARIZATION :	H, L, C	(lin H, lin V or circular)
TUNABILITY :	YES	
REPETITION RATE :	1-10	kHz
PULSE DURATION:	200	fs
PEAK INTENSITY:		W/cm^2
ENERGY PER PULSE:		mJ
PEAK POWER:	GW to MW	
AVERAGE POWER:	10W-1 mW	
BANDWIDTH (FWHM)[%]:	0.1-1	
COHERENCE TIME:	fs	
NUMBER OF PHOTONS PER PULSE:	1e18	
AVERAGE FLUX OF PHOTONS:	s^{-1}/0.1% bandwidth	
PEAK BRILLANCE*:	1e30	
AVERAGE BRILLANCE*:	1e22	

* in unit of photons/(s $mrad^2$ mm^2 0.1% bandwidth)

REMARKS:

SOURCES CHARACTERISTICS

Institute or Laboratory : MAX-lab

Person to contact (name and e-mail) : mikael.eriksson@maxlab.lu.se / sverker.werin@maxlab.lu.se

		UNITS
TYPE OF SOURCE: **Seeded FEL**		
RANGE OF PHOTON ENERGY :	15-1500	eV
POLARIZATION :	H/V/circ	
TUNABILITY :	some	
REPETITION RATE :	100-1000	Hz
PULSE DURATION:	>100	fs
ENERGY PER PULSE:	10	mJ
PEAK POWER:	100	GW
AVERAGE POWER:	10	W
BANDWIDTH (FWHM)[%]:	Fourier limited	
NUMBER OF PHOTONS PER PULSE:		
AVERAGE FLUX OF PHOTONS**:	s^{-1}/0.1% bandwidth	
PEAK BRILLANCE*:		
AVERAGE BRILLANCE*:		
SOURCE SIZE :		m
BEAMLINE NUMBER :		

REMARK(S) : Design study of the FEL In the MAX IV proposal

*in unit of photons/(s $mrad^2$ mm^2 0.1% bandwidth)

SOURCES CHARACTERISTICS

Institute or Laboratory :
ENEA - INFN - CNR - Un. Tor Vergata

Person to contact (name and e-mail) :
A. Renieri, renieri@frascati.enea.it
Carlo Schaerf, Carlo.Schaerf@roma2.infn.it
Luigi Palumbo, luigi.palumbo@uniroma1.it
Paolo Perfetti perfetti@ism.rm.cnr.it

		UNITS
TYPE OF SOURCE: **FEL SASE – SEEDED (SPARx)**		
RANGE OF PHOTON ENERGY :	120 - 620 eV (incl. harmonics 1..7)	
POLARIZATION (lin H, lin V or circular):	lin H	
TUNABILITY :	YES	
IF YES : ON WHAT ENERGY RANGE?	120 - 620 eV (incl. harmonics 1..7)	
REPETITION RATE :	10	Hz
PULSE DURATION:	300	fs
ENERGY PER PULSE:	2.5	mJ (@10 nm)
PEAK POWER:	$5\ 10^{9}$	W (@10 nm)
AVERAGE POWER:	$25\ 10^{-3}$	W (@10 nm)
BANDWIDTH (FWHM)[%]:	$2\ 10^{-1}$ (@10 nm)	
NUMBER OF PHOTONS PER PULSE**:	$4\ 10^{13}/4\ 10^{11}$	
AVERAGE FLUX OF PHOTONS**:	$7\ 10^{14}/8\ 10^{12}\ s^{-1}$/0.1% bandwidth	
PEAK BRILLANCE*, **:	$4\ 10^{30}/5\ 10^{28}$	
AVERAGE BRILLANCE*,***:	$4\ 10^{19}/5\ 10^{17}$	
SOURCE SIZE :	< 0.02	mm
BEAMLINE NUMBER :	1	

*in unit of photons/(s $mrad^2$ mm^2 0.1% bandwidth)
**(@10nm/3nm)

SOURCES CHARACTERISTICS

Institute or Laboratory :
ENEA - INFN - CNR - Un. Tor Vergata - INFM - ST

Person to contact (name and e-mail) : A. Renieri, renieri@frascati.enea.it

		UNITS
TYPE OF SOURCE: **FEL SASE (SPARC)**		
RANGE OF PHOTON ENERGY :	2.4 - 13	eV (incl. harmonics)
POLARIZATION (lin H, lin V or circular):	lin H	
TUNABILITY :	YES	
IF YES : ON WHAT ENERGY RANGE?	2.4 - 13 eV (incl. harmonics)	
REPETITION RATE :	10 Hz	
PULSE DURATION:	2800 fs	
ENERGY PER PULSE:	0.4 mJ (@500 nm)	
PEAK POWER:	$8\ 10^{7}$ W (@500 nm)	
AVERAGE POWER:	$4\ 10^{-3}$ W (@500 nm)	
BANDWIDTH (FWHM)[%]:	$5\ 10^{-1}$ (@500 nm)	
NUMBER OF PHOTONS PER PULSE**:	$2\ 10^{14}/6\ 10^{12}$	
AVERAGE FLUX OF PHOTONS**:	$5\ 10^{15}/8\ 10^{13}$ s^{-1}/0.1% bandwidth	
PEAK BRILLANCE*, **:	$5\ 10^{28}/10^{27}$	
AVERAGE BRILLANCE*,**:	$5\ 10^{18}/10^{17}$	
SOURCE SIZE :	< 0.1mm	
BEAMLINE NUMBER :	1	

*in unit of photons/(s $mrad^2$ mm^2 0.1% bandwidth)
**(@500nm/166nm)

SOURCES CHARACTERISTICS

Institute or Laboratory : AMOLF

Person to contact (name and e-mail) : m.vrakking@amolf.nl

		UNITS
TYPE OF SOURCE: **High Harmonic Generation**		
RANGE OF PHOTON ENERGY :	10-30	eV
POLARIZATION :	lin H/V	(lin H, lin V or circular)
TUNABILITY :	Yes	
IF YES : ON WHAT ENERGY RANGE?	10-30	eV
REPETITION RATE :	currently 25 likely to become 1000 Hz	
PULSE DURATION:	currently 50, likely to become 30 fs	
ENERGY PER PULSE (driver):	currently up to 40, seeking KHz possibly up to 10 mJ	
PEAK POWER (driver)	0.8 TW, harmonics not measured	
AVERAGE POWER (driver):	2W, harmonics not measured	
BANDWIDTH (FWHM)[%]:	2.5 % (driver), harmonic measurement Instrument-limited	
NUMBER OF PHOTONS PER PULSE:	not measured	
AVERAGE FLUX OF PHOTONS**:		s^{-1}/0.1% bandwidth

REMARK(S) : Our harmonic Is a pretty 'standard' one, where we use 2m focussing (f/d ~ 80-100) of the output of a <=40 mJ, 50 fsec Ti:Sa laser to generate harmonics In a free jet expansion. We've never extensively characterized the harmonic yields, but presumably It's similar to what other people get In this type of set-up. XUV pulse durations down to 250 attoseconds have been generated with this set-up.
In the near future acquisition of a Saclay-type or Krausz-type amplifier Is likely.

*in unit of photons/(s mrad^2 mm^2 0.1% bandwidth)

** IF POSSIBLE ADD A FIGURE SHOWING THE FLUX (OR THE BRILLANCE) VERSUS THE WAVELENGTH

SOURCES CHARACTERISTICS

Institute or Laboratory : CEA-SPAM, Centre d'Etudes de Saclay

Person to contact (name and e-mail) : Pascal Salières (salieres@drecam.cea.fr), Bertrand Carré (carre@drecam.cea.fr)

		UNITS
TYPE OF SOURCE: **High-Order Harmonic Generation**		
RANGE OF PHOTON ENERGY :	4.5 - 110	eV
POLARIZATION :	linear (along the laser polarization)	
TUNABILITY :	Partial	
IF YES : ON WHAT ENERGY RANGE?		eV
REPETITION RATE :	20 Hz (1 kHz soon available)	
PULSE DURATION:	30	fs
ENERGY PER PULSE:	$1.9\ 10^{-3}$ mJ, (1.9 µJ) @ 23 eV	
PEAK POWER:	$6\ 10^{7}$	W
AVERAGE POWER:	$4\ 10^{-5}$	W
BANDWIDTH (FWHM)[%]:	0.75 %	
NUMBER OF PHOTONS PER PULSE:	$5\ 10^{11}$	
AVERAGE FLUX OF PHOTONS**:	$1.3\ 10^{12}$	s^{-1}/0.1% bandwidth
PEAK BRILLANCE*: 0.1% bandwidth)	$9\ 10^{25}$	photons/(s $mrad^2$ mm^2
AVERAGE BRILLANCE*: 0.1% bandwidth)	$5.3\ 10^{13}$	photons/(s $mrad^2$ mm^2
SOURCE SIZE :	$5\ 10^{-4}$	m

*in unit of photons/(s $mrad^2$ mm^2 0.1% bandwidth)
**IF POSSIBLE ADD A FIGURE SHOWING THE FLUX (OR THE BRILLANCE) VERSUS THE WAVELENGTH

SOURCES CHARACTERISTICS

Institute or Laboratory : CELIA

Person to contact (name and e-mail) : Eric Constant, constant@celia.u-bordeaux1.fr

		UNITS
TYPE OF SOURCE: **Generation of high order harmonics**		
RANGE OF PHOTON ENERGY : 10-100	eV	
POLARIZATION	lin h and lin V	
TUNABILITY :	no	
REPETITION RATE :	1000	Hz
PULSE DURATION:	50 to 5	fs
ENERGY PER PULSE:	10-100 nJ	
PEAK POWER:	W	
AVERAGE POWER:	10-100	mW
BANDWIDTH (FWHM)[%]:		
NUMBER OF PHOTONS PER PULSE:	10^{10}	
AVERAGE FLUX OF PHOTONS**:		s^{-1}/0.1% bandwidth
PEAK BRILLANCE*:		
AVERAGE BRILLANCE*:		
SOURCE SIZE :	100 µm	
BEAMLINE NUMBER :		
REMARK(S) :		

*in unit of photons/(s $mrad^2$ mm^2 0.1% bandwidth)

**IF POSSIBLE ADD A FIGURE SHOWING THE FLUX (OR THE BRILLANCE) VERSUS THE WAVELENGTH

SOURCES CHARACTERISTICS

Institute or Laboratory : Department of Physics, University of L'Aquila

Person to contact (name and e-mail) : Tomassetti Giuseppe
giuseppe.tomassetti@aquila.infn.it

		UNITS
TYPE OF SOURCE: **Capillary Discharge**		
RANGE OF PHOTON ENERGY :	26	eV
POLARIZATION :		
TUNABILITY :	no	
REPETITION RATE :	0.8	Hz
PULSE DURATION:	1.5	ns
ENERGY PER PULSE:	400	microJ
PEAK POWER:	0.3	MW
AVERAGE POWER:	0.3	mW
BANDWIDTH (FWHM)[%]:	0.01%	
NUMBER OF PHOTONS PER PULSE:	10^{14}	
AVERAGE FLUX OF PHOTONS**:	10^{14} s^{-1}/0.1% bandwidth	
PEAK BRILLANCE*:	10^{24}	
AVERAGE BRILLANCE*:	10^{15}	

SOURCE SIZE :300 micron; equivalent source: 30 micron

*in unit of photons/(s $mrad^2$ mm^2 0.1% bandwidth)

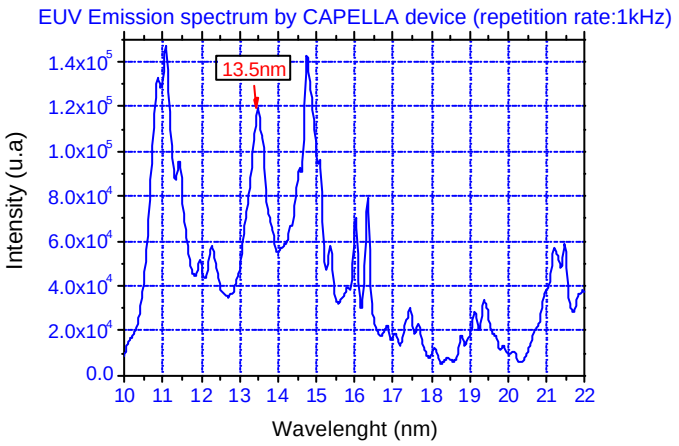
**IF POSSIBLE ADD A FIGURE SHOWING THE FLUX (OR THE BRILLANCE) VERSUS THE WAVELENGTH

SOURCES CHARACTERISTICS

Institute or Laboratory : GREMI france

Person to contact (name and e-mail) : Christophe.Cachoncinlle@univ-orleans.fr

		UNITS
TYPE OF SOURCE: **Capillary discharge plasma**		
RANGE OF PHOTON ENERGY :	50-150	eV
POLARIZATION :	none	
TUNABILITY :	broad spectra	(YES, NO)
IF YES : ON WHAT ENERGY RANGE?		eV
REPETITION RATE :	5000	Hz
PULSE DURATION:	50	ns
ENERGY PER PULSE:	0.1	mJ
PEAK POWER:	2	MW
AVERAGE POWER:	1-5	W
BANDWIDTH (FWHM)[%]:	2%	
NUMBER OF PHOTONS PER PULSE:	10^{13} at 13.6 nm	
AVERAGE FLUX OF PHOTONS**:	$5\ 10^{15}$	s^{-1}/0.1% bandwidth



PEAK BRILLANCE*:

AVERAGE BRILLANCE*:

SOURCE SIZE : diameter 500µm

BEAMLINE NUMBER :

REMARK(S) : Incoherent braodband lampe

*in unit of photons/(s $mrad^2$ mm^2 0.1% bandwidth)
**IF POSSIBLE ADD A FIGURE SHOWING THE FLUX (OR THE BRILLANCE) VERSUS THE WAVELENGTH

SOURCES CHARACTERISTICS

Institute or Laboratory : Laboratoire d'Optique Appliquée (France)

Person to contact (name and e-mail) : Stéphane Sebban, sebban@ensta.fr

		UNITS
TYPE OF SOURCE: **soft x-ray laser**		
RANGE OF PHOTON ENERGY :	30-40	eV
POLARIZATION :	linear H and V	(lin H, lin V or circular)
TUNABILITY :	NO	(YES, NO)
IF YES : ON WHAT ENERGY RANGE?		eV
REPETITION RATE :	10	Hz
PULSE DURATION:	<1ps	
ENERGY PER PULSE:	0.001	mJ
PEAK POWER:	10^{6}	W
AVERAGE POWER:	10^{-3}	W
BANDWIDTH (FWHM)[%]:	10^{-5}	
NUMBER OF PHOTONS PER PULSE:	10^{11}	
AVERAGE FLUX OF PHOTONS**:		s^{-1}/0.1% bandwidth
PEAK BRILLANCE*:	$4\ 10^{24}$	
AVERAGE BRILLANCE*:	$4\ 10^{15}$	
SOURCE SIZE :	100	µm
BEAMLINE NUMBER :		
REMARK(S) :		

*in unit of photons/(s $mrad^2$ mm^2 0.1% bandwidth)

**IF POSSIBLE ADD A FIGURE SHOWING THE FLUX (OR THE BRILLANCE) VERSUS THE WAVELENGTH

SOURCES CHARACTERISTICS

Institute or Laboratory : University of York (based at Rutherford Appleton Laboratory)

Person to contact (name and e-mail) : G J Tallents gjt5@york.ac.uk

		UNITS
TYPE OF SOURCE: **X-ray laser from Plasma**		
RANGE OF PHOTON ENERGY :59eV - 170	eV (at discrete photon energies	
POLARIZATION :	None lin H, lin V or circular)	
TUNABILITY :	NO	
REPETITION RATE :	potentially 10	Hz
PULSE DURATION:	2000 - 40 000	fs
ENERGY PER PULSE:	up to 0.1	mJ
PEAK POWER:	10^6	W
AVERAGE POWER:	10^{-3}	W
BANDWIDTH (FWHM)[%]:	$<10^{-2}$ %	
NUMBER OF PHOTONS PER PULSE:	10^{13}	
AVERAGE FLUX OF PHOTONS**: (@10 Hz)	10^{14}	s^{-1}/0.1% bandwidth
PEAK BRILLANCE*:	10^{24}	
AVERAGE BRILLANCE*:	10^{14}	(@10 Hz)
SOURCE SIZE :	5×10^{-9}	m^2

REMARK(S) : The narrow bandwidth limits pulse durations to > 1 - 2 ps.

*in unit of photons/(s $mrad^2$ mm^2 0.1% bandwidth)

**IF POSSIBLE ADD A FIGURE SHOWING THE FLUX (OR THE BRILLANCE) VERSUS THE WAVELENGTH

SOURCES CHARACTERISTICS

Institute or Laboratory : Laboratoire d'Interaction du rayonnement X Avec la Matière
Université Paris-Sud 11, F-91405 ORSAY (France)

Person to contact (name and e-mail) : Gérard Jamelot
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		UNITS
TYPE OF SOURCE: **LASERIX (X-ray laser in laser-produced plasma)**		
RANGE OF PHOTON ENERGY :	20 – 100	eV
POLARIZATION :	NO	
TUNABILITY :	NO	
REPETITION RATE :	0.1	Hz
PULSE DURATION:	1000	fs
ENERGY PER PULSE:	0.02	mJ
PEAK POWER:	$2\ 10^{7}$	W
AVERAGE POWER:	XX (see rep rate)	W
BANDWIDTH (FWHM)[%]:	0,01 %	
NUMBER OF PHOTONS PER PULSE:	10^{12}	
AVERAGE FLUX OF PHOTONS**:	XX (see rep rate)	s^{-1}/0.1% bandwidth
PEAK BRILLANCE*:	10^{26} - 10^{27}	
AVERAGE BRILLANCE*:	XX (see rep rate)	
SOURCE SIZE :	0.03 mm	
BEAMLINE NUMBER :	1	

REMARK(S) : Monochromaticity (same peak brilliance in 0.01% bandwidth), under construction, available in 2006

*in unit of photons/(s $mrad^2$ mm^2 0.1% bandwidth)

**IF POSSIBLE ADD A FIGURE SHOWING THE FLUX (OR THE BRILLANCE) VERSUS THE WAVELENGTH