

## Outline

- **PTB & Foundation of BESSY I (1974 - 1977)**
- **BESSY I (1977 to 1982)**
- **University of Applied Science (1982 – 2006)**
- **ELETTRA (1998 - 1993)**
- **LISA, ROSY & DIFL (1991 - 1995)**
- **ANKA (1997 – 2001)**
- **SESAME (2001 -2003)**
- **Australian Synchrotron Project (1998 -2006)**
- **ALBA (2004 – 2012)**
- **IRAN – ILSF (2010 – 2013)**
- **MAX-Lab (2012-2014)**
- **ESRF – EBS (2015 – present)**

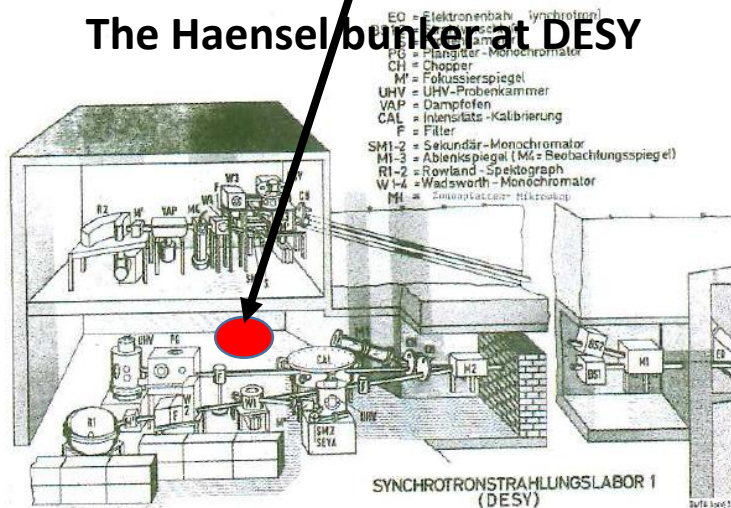
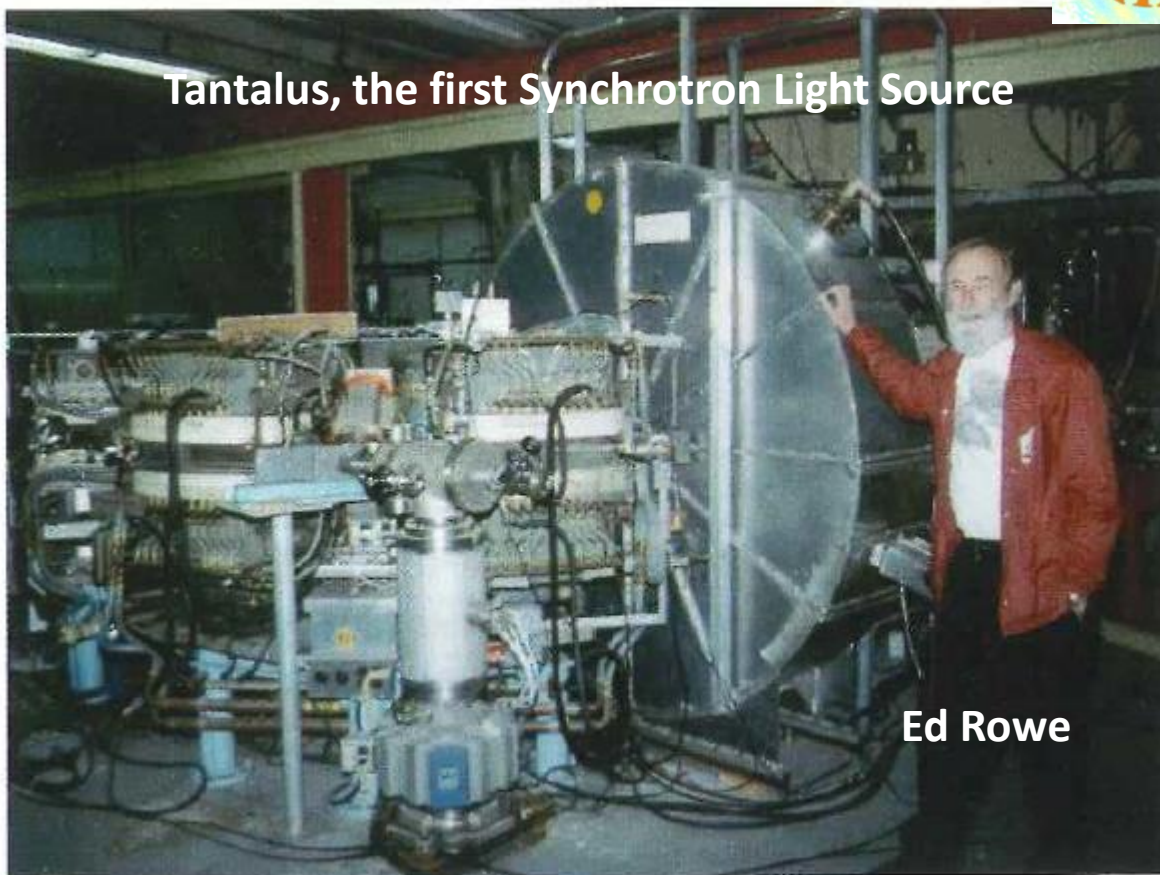
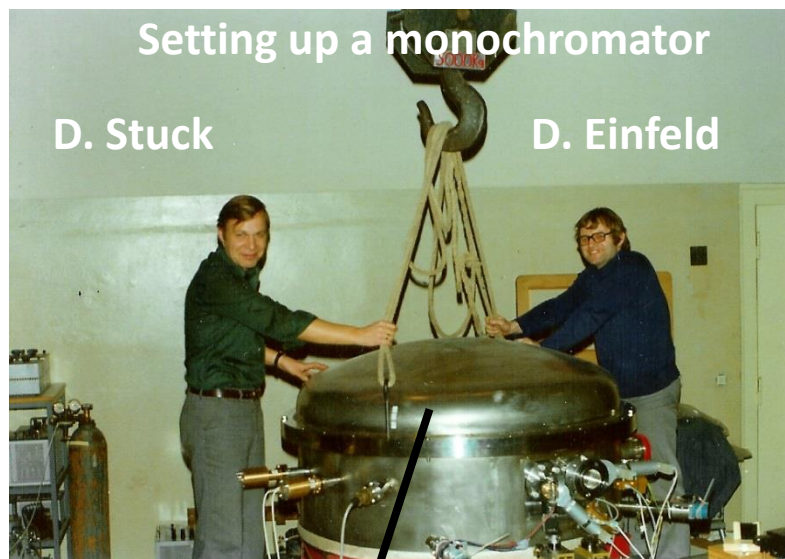


Figure 2: First lab for SR at DESY. In 1964, only the lower floor, called the "Haensel Bunker," existed with a single beamline.

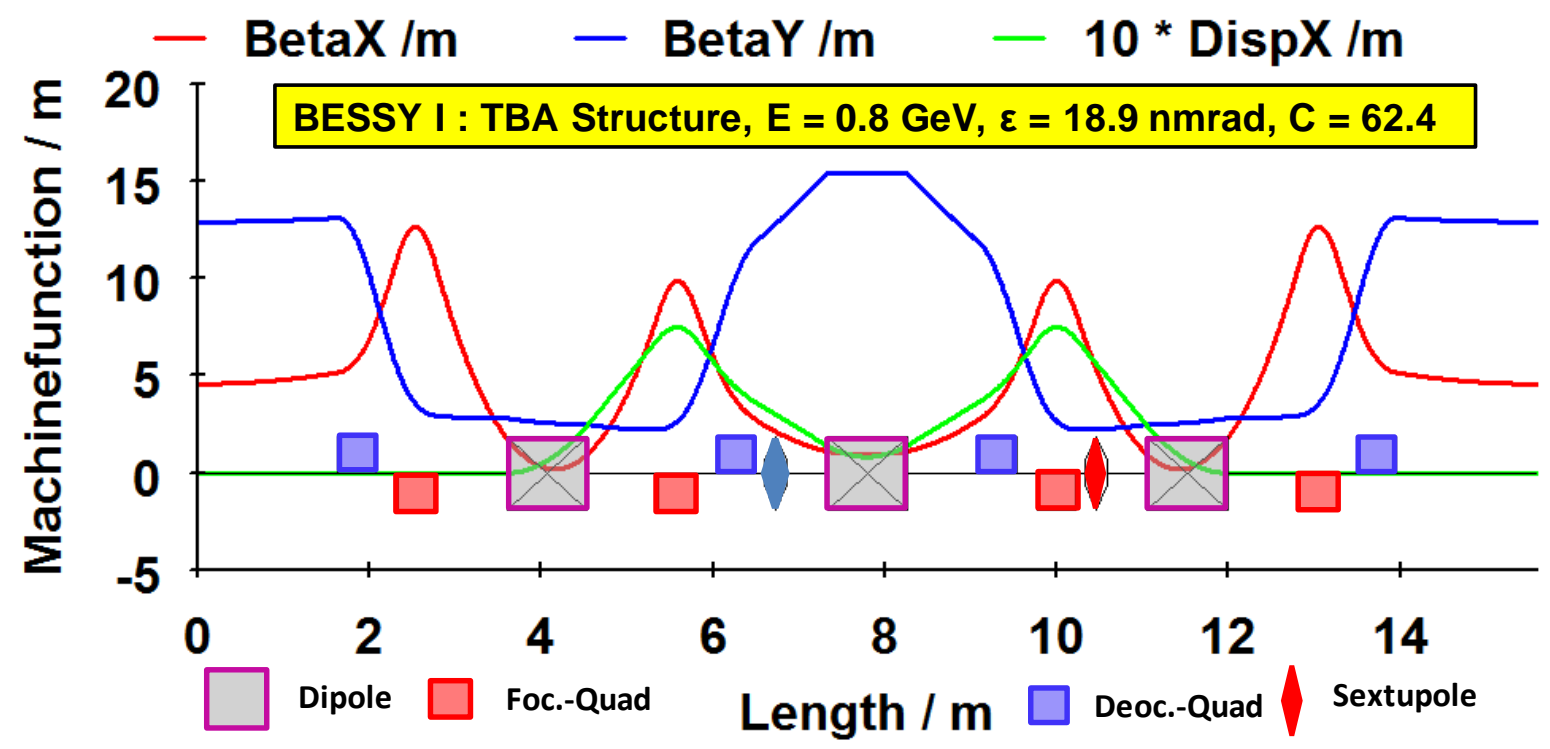
Figure 2: Tantalus and Ed Rowe, its primary builder and director of SRC.





# Original Lattice (TBA) of BESSY I

The birth of the TBA-lattice





# The Machine Division of BESSY I (17 People)



Rudolf Richter

Dieter Einfeld

Ernst Wehreter

Rudolf Maier

Gottfried Muelhaupt

v. Egan-Krieger

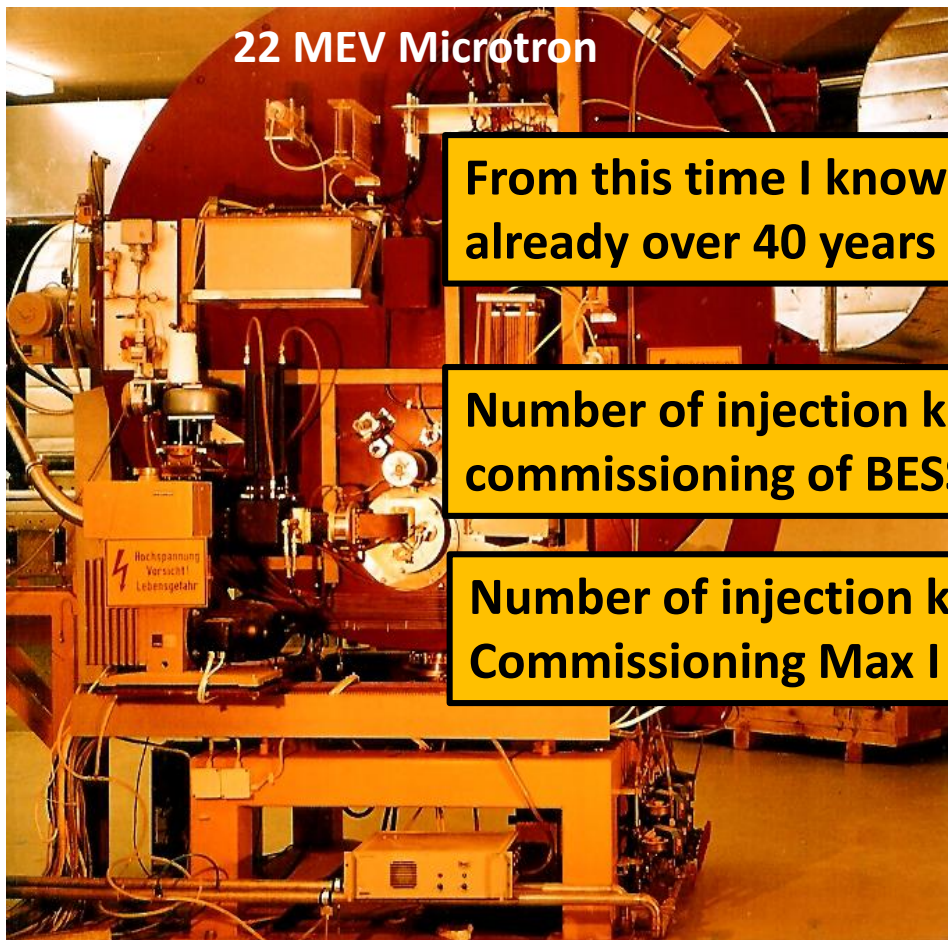
Wolf-Dieter Klotz



Lothar Schulz

Lothar Schulz





**From this time I know Mikael Eriksson already over 40 years**

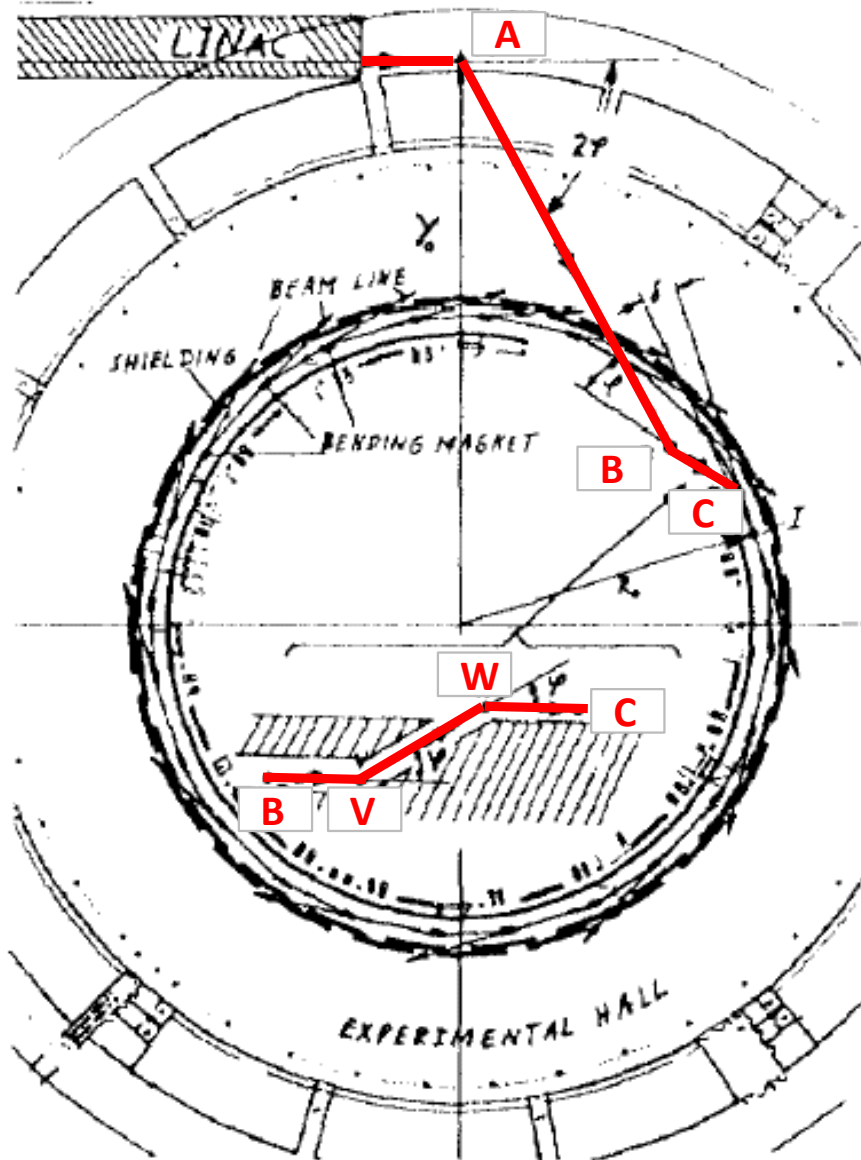
**Number of injection kicker/ commissioning of BESSY I**

**Number of injection kicker Commissioning Max I**

800MeV BESSY I  
Booster  
Synchrotron

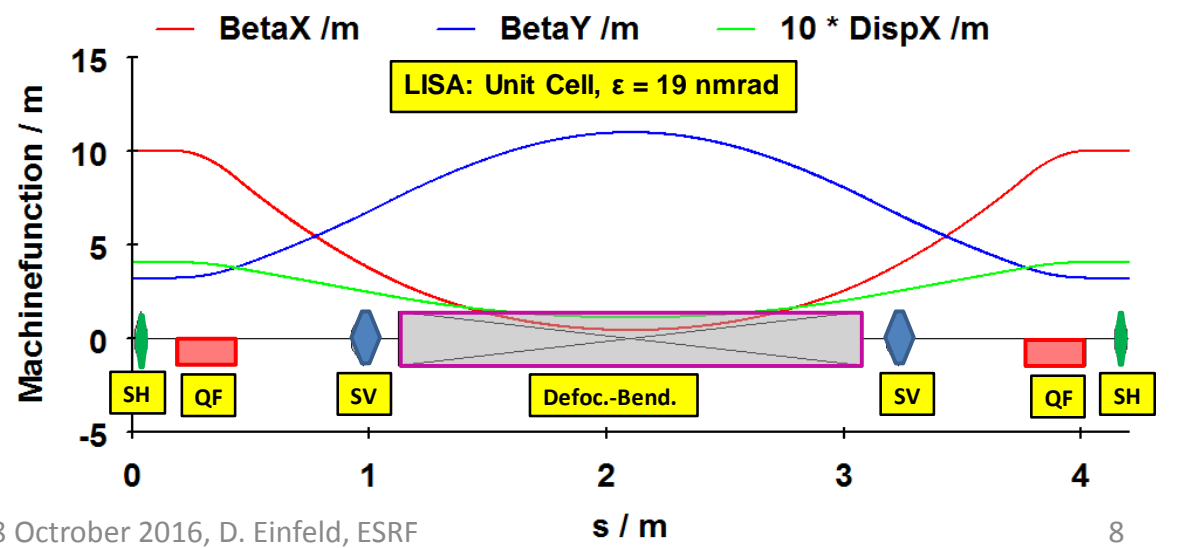
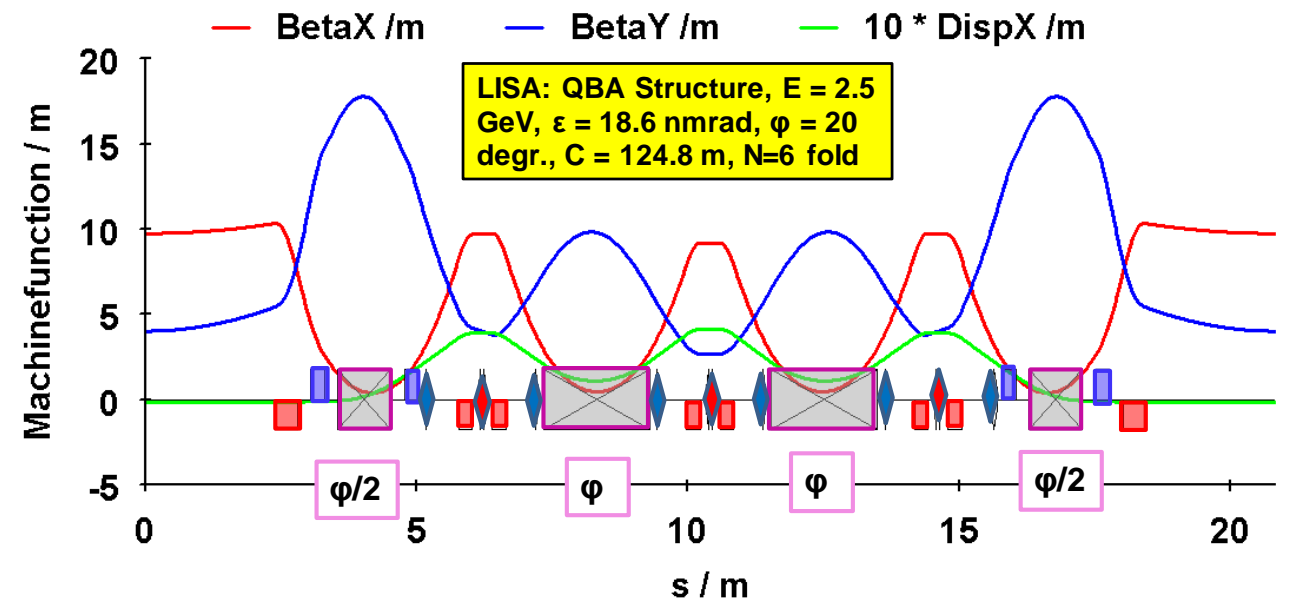
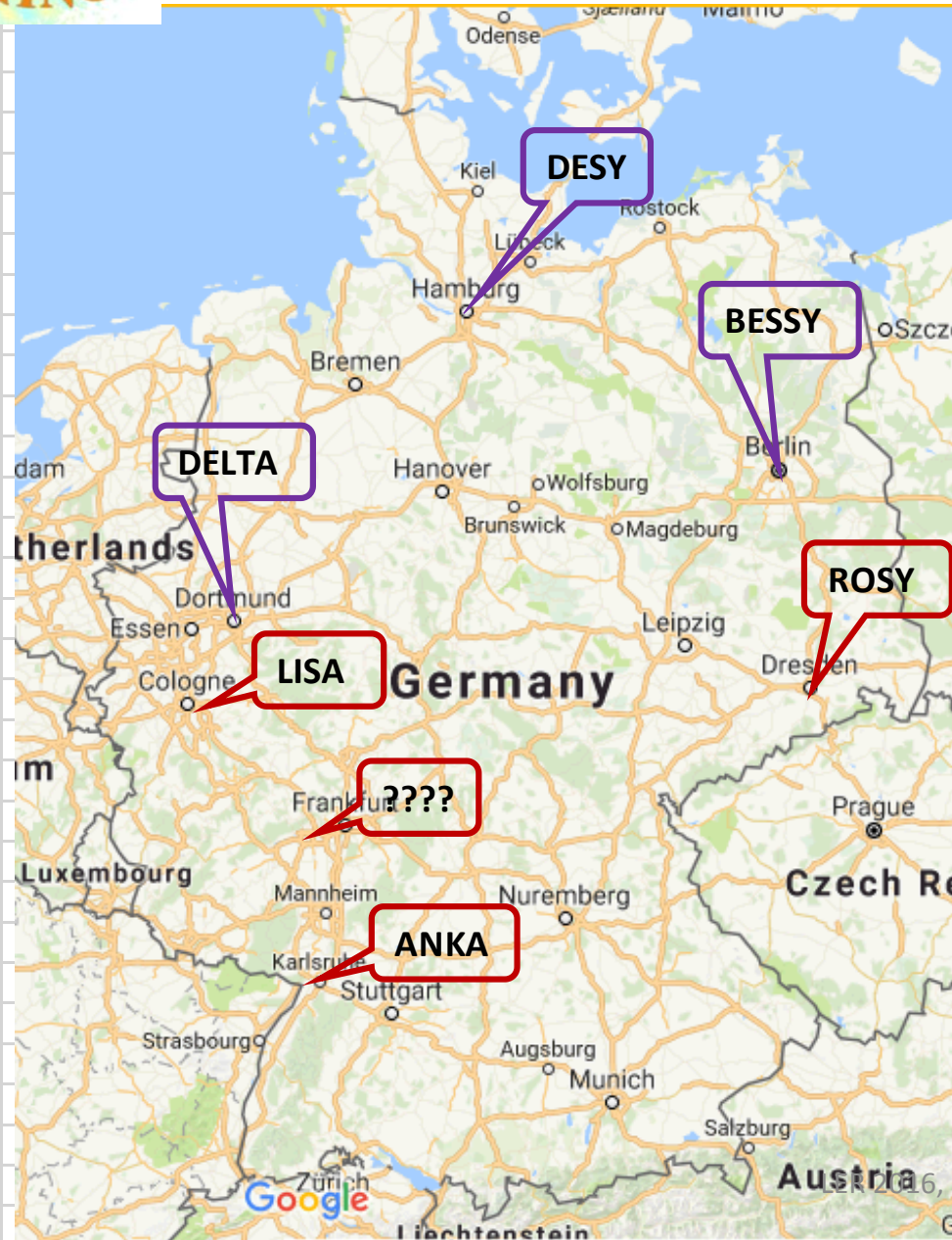
Energy (MeV)	800
Circumference(m)	38.4
Horizontal Emittance (nmrad)	155
Vertical Emittance (nmrad)	16
Alfa	0.18

22 MEV Microtron



## **ELETTRA (1998 - 1993)**

- Design of Transfer-Line
- Design of Magnets
- Following up Magnet Production
- Meeting Mark Plesko
- Meeting Emanuel Karantzoli
- Meeting Carlo Bocchetta
- Discussion about DIFL





SPIE 2013, 201-212 (1993)

**Design of a diffraction—limited light source  
(SPIE-Paper)**

D. Einfeld\* and M. Plesko\*\*

\* Research Ctr. Rossendorf, P.O.B. 19, 0-8051 Dresden, FRG\*\* Sincrotrone Trieste, Padriciano 99, 1-34012 Trieste, ITALY

PAC 95, 177 (1995)

**Design of a Diffraction Limited Light Source (DIFL)**

D. Einfeld, J. Schaper, Fachhochschule Ostfriesland, Constantiaplatz 4, D-26723 Emden

M. Plesko, Institute Jozef Stefan, Jamova 39, P.O.B. 100, SLO-61111 Ljubljana

e-mail: einfeld@alpha.fho-emden.de

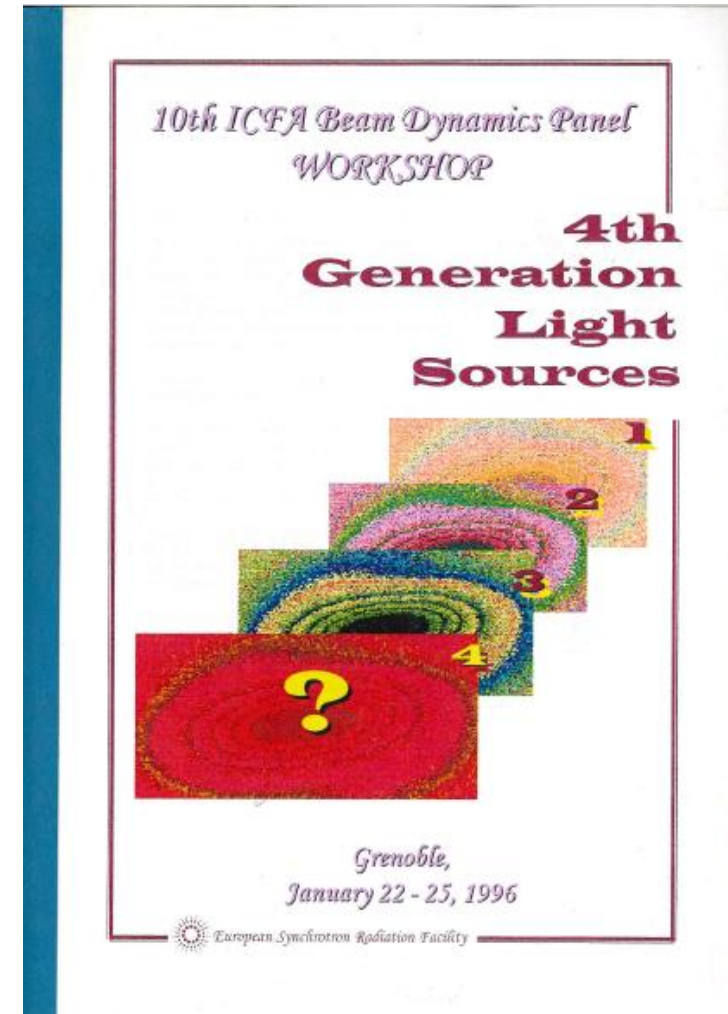
ICFA Workshop on the 4th Generation Light Sources, Grenoble

**Design of a Diffraction Limited Light Source (DIFL)****(Grenoble – ESRF-Paper)**

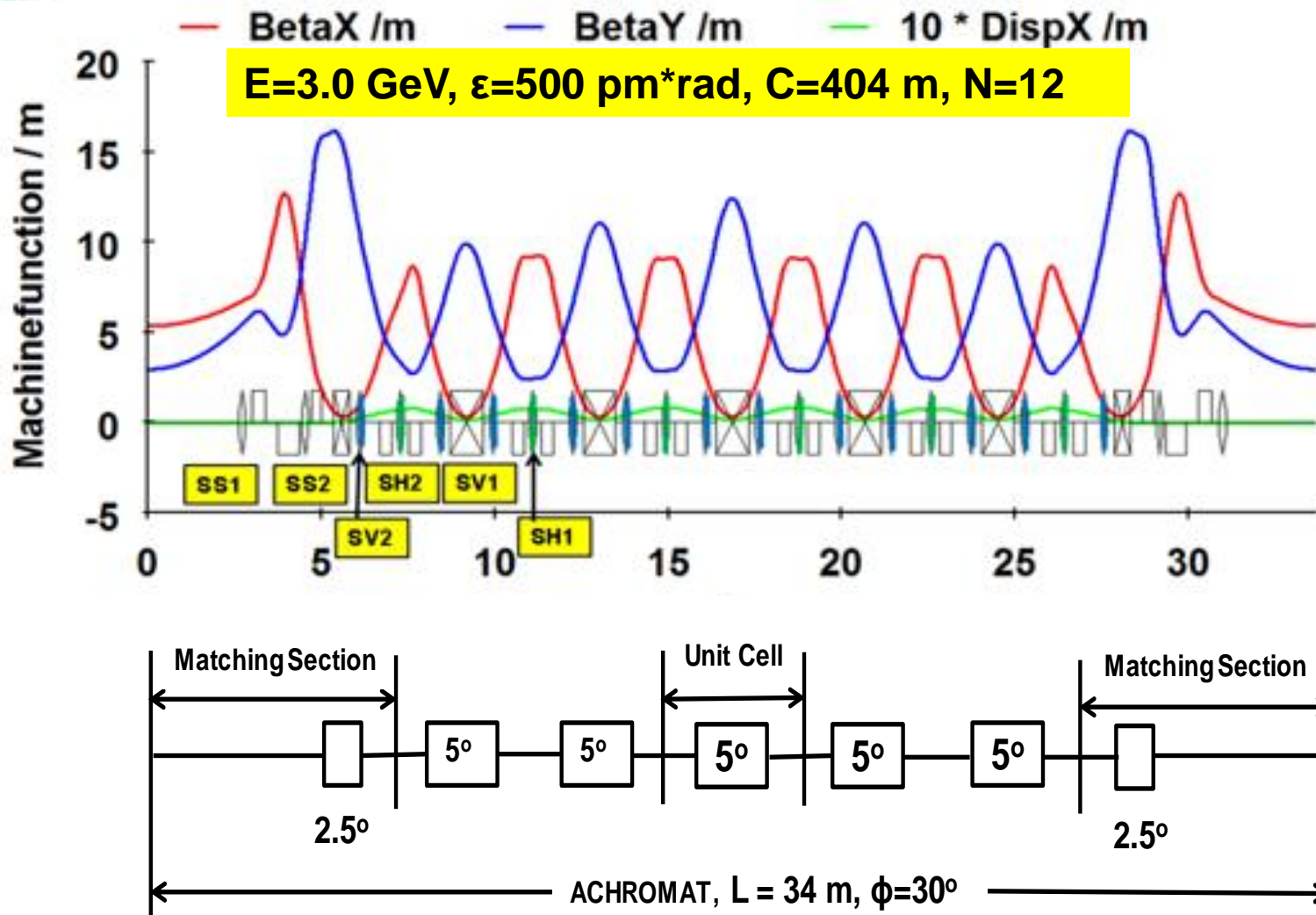
D. Einfeld, J. Schaper, Fachhochschule Ostfriesland, Constantiaplatz 4, D-26723 Emden

M. Plesko, Institute Jozef Stefan, Jamova 39, P.O.B. 100, SLO-61111 Ljubljana

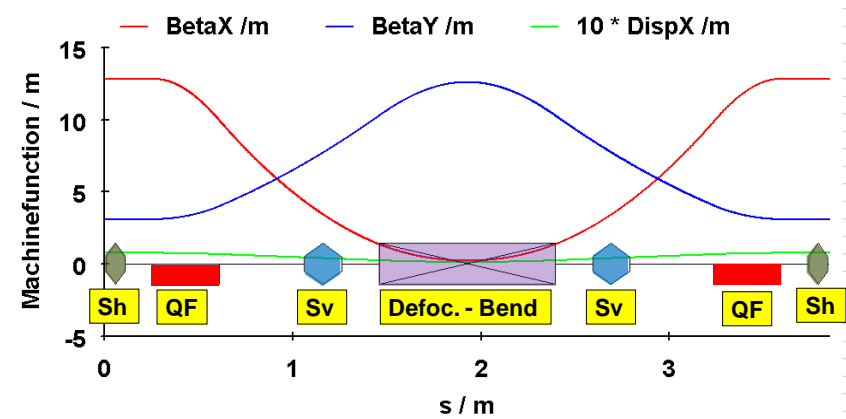
e-mail: einfeld@alpha.fho-emden.de



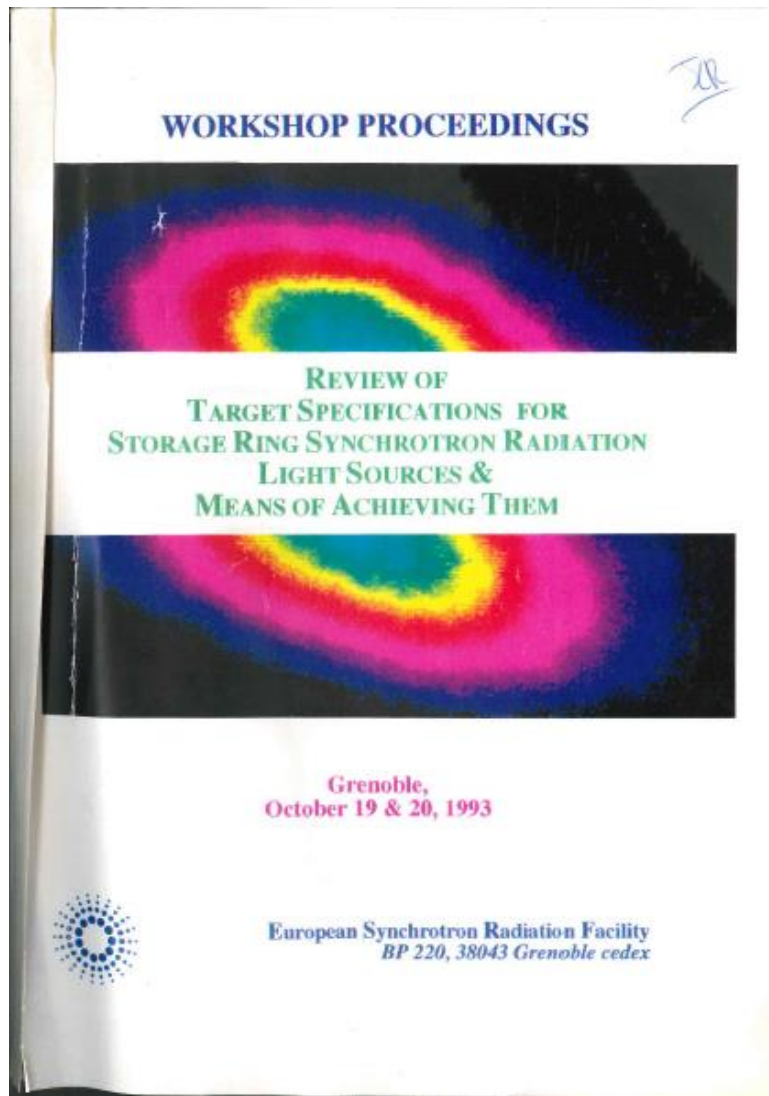
# Lattice of DIFL (7BA)



**Machine function of the chosen lattice DIFL for the proposed diffraction limited light source**







PAC 93, Washington DC

## The QBA Optics for the 3.2 GeV Synchrotron Light Source ROSY II

D.Einfeld #) and M.Plesko<sup>+</sup>)

#) Research Center Rossendorf e.V., B.O. 19 D - 8051 Dresden  
<sup>+</sup>) Sincrotrone Trieste, Padriciano 99, I - 34012 Trieste

## The Synchrotron Light Source ROSY

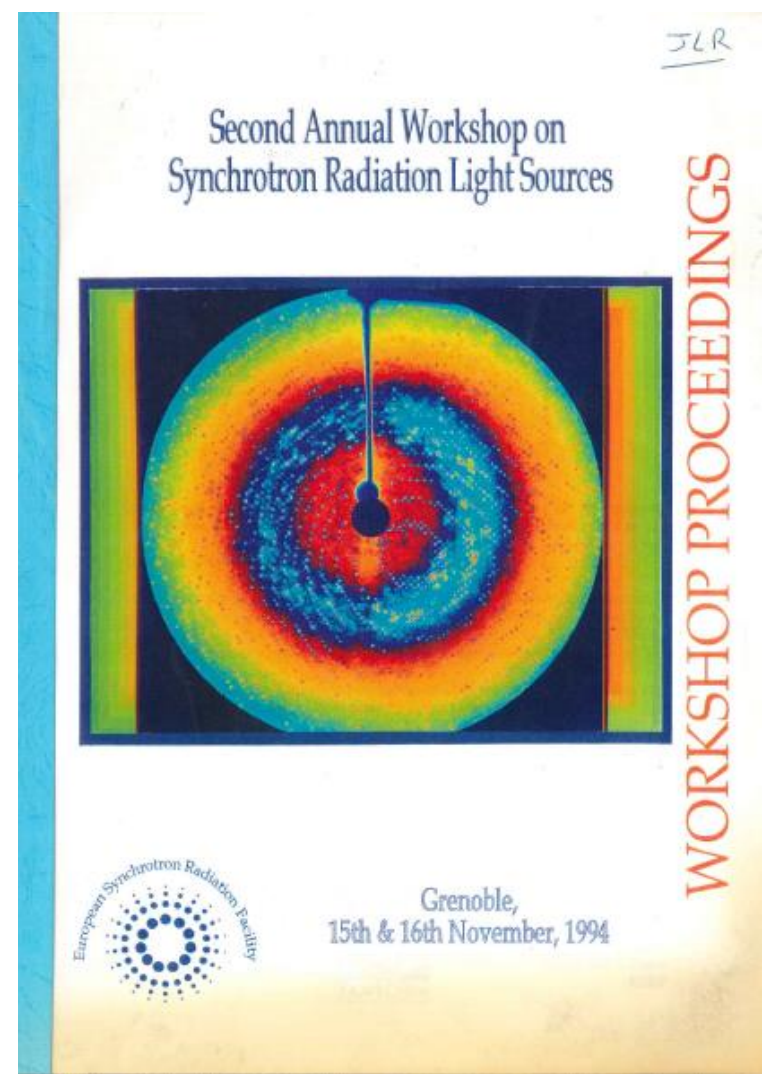
D.Einfeld, H.Büttig, S.Dienel, W.Gläser, Th.Goetz<sup>\*</sup>), H.Guratzsch, B.Hartmann, D.Janssen, H.Krug, J.Linnemann, W.Matz, J.B.Murphy<sup>+</sup>), W.Neumann, W.Oehme, M.Picard<sup>\*</sup>), M.Plesko<sup>~</sup>), D.Pröhl, R.Rossmannith<sup>#</sup>), R.Schlenk, D.Tomassini<sup>~</sup>), H.Tyrroff

Research Center Rossendorf Inc., Box 51 01 19, D-01314 Dresden, Germany  
<sup>\*</sup>) University of Bonn, Germany, <sup>+</sup>) NSLS Brookhaven, Upton NY, USA  
<sup>~</sup>) Sincrotrone Trieste, Italy, <sup>#</sup>) CEBAF, Newport News, VA, USA

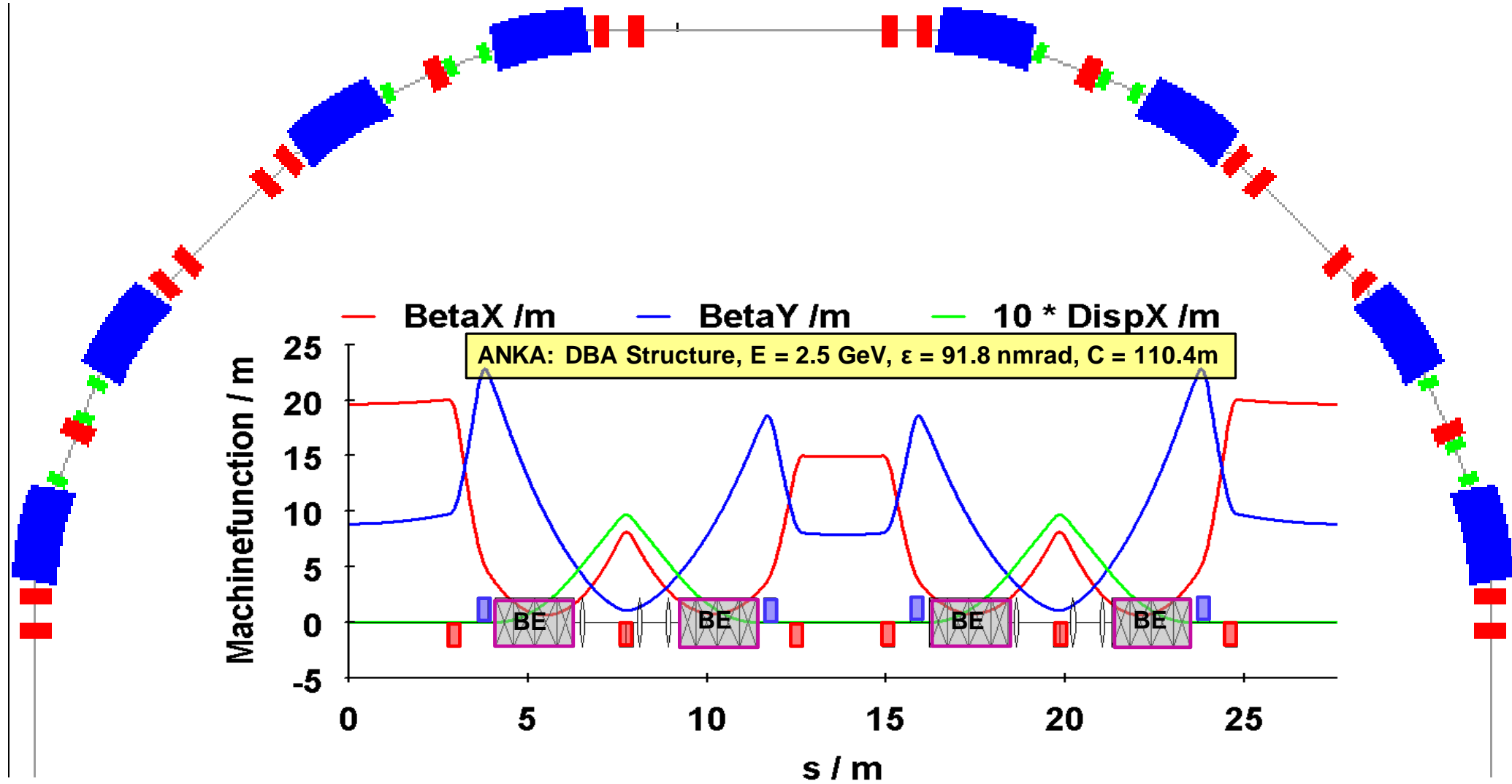
## Dynamic Aperture of the 2.5 GeV Synchrotron Radiation Source LISA

D.Einfeld #), D.Husmann<sup>+</sup>), M.Plesko<sup>§</sup>)

#) Fachhochschule Ostfriesland, Constantiaplatz 4, D - 2870 Emden  
<sup>+</sup>) Physikalisches Institut der Univ. Bonn, Nußallee 12, D - 5300 Bonn 1  
<sup>§</sup>) Sincrotrone Trieste, Padriciano 99, I - 34012 Trieste

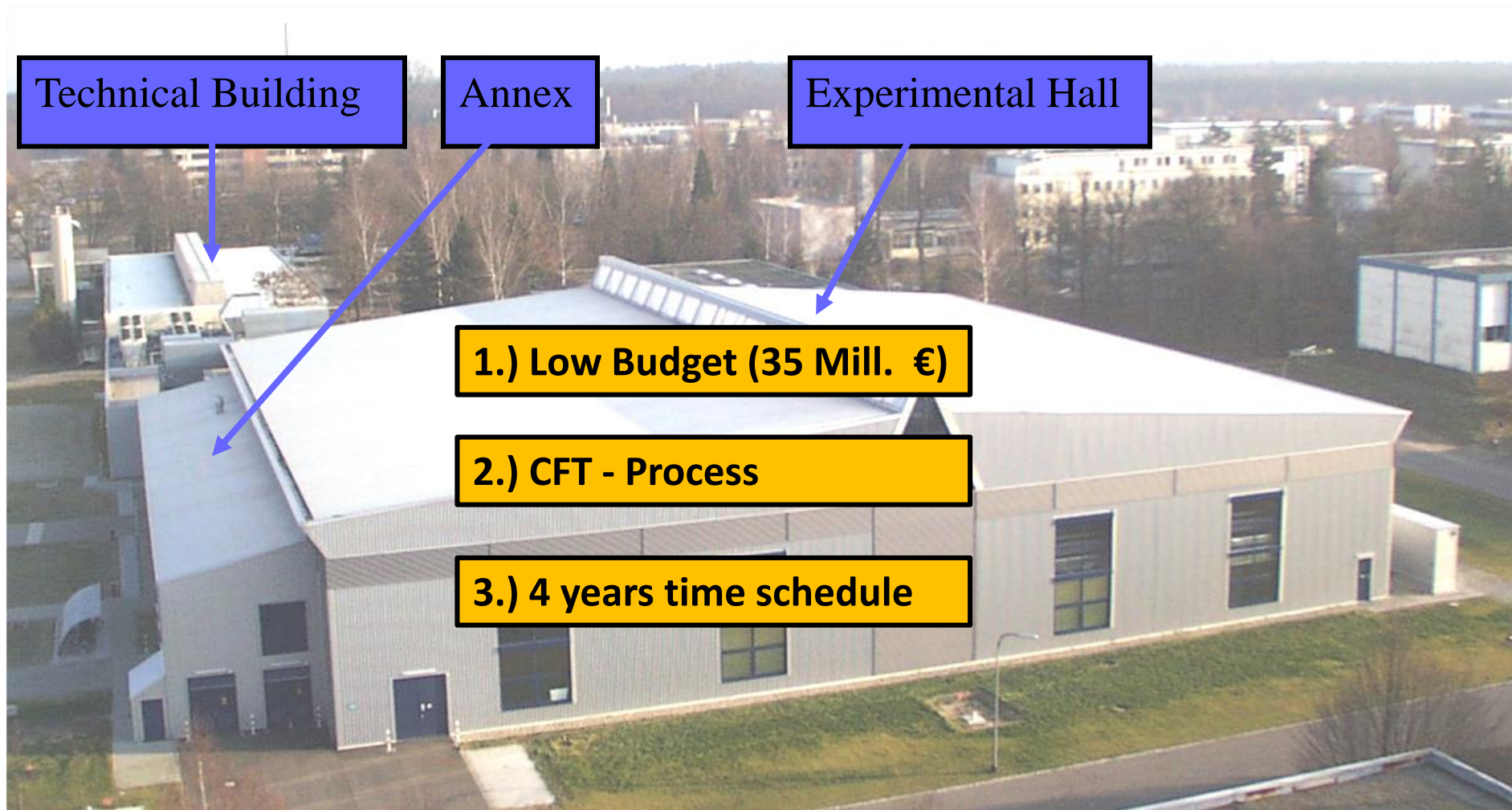


# The Project ANKA (1997-2001)

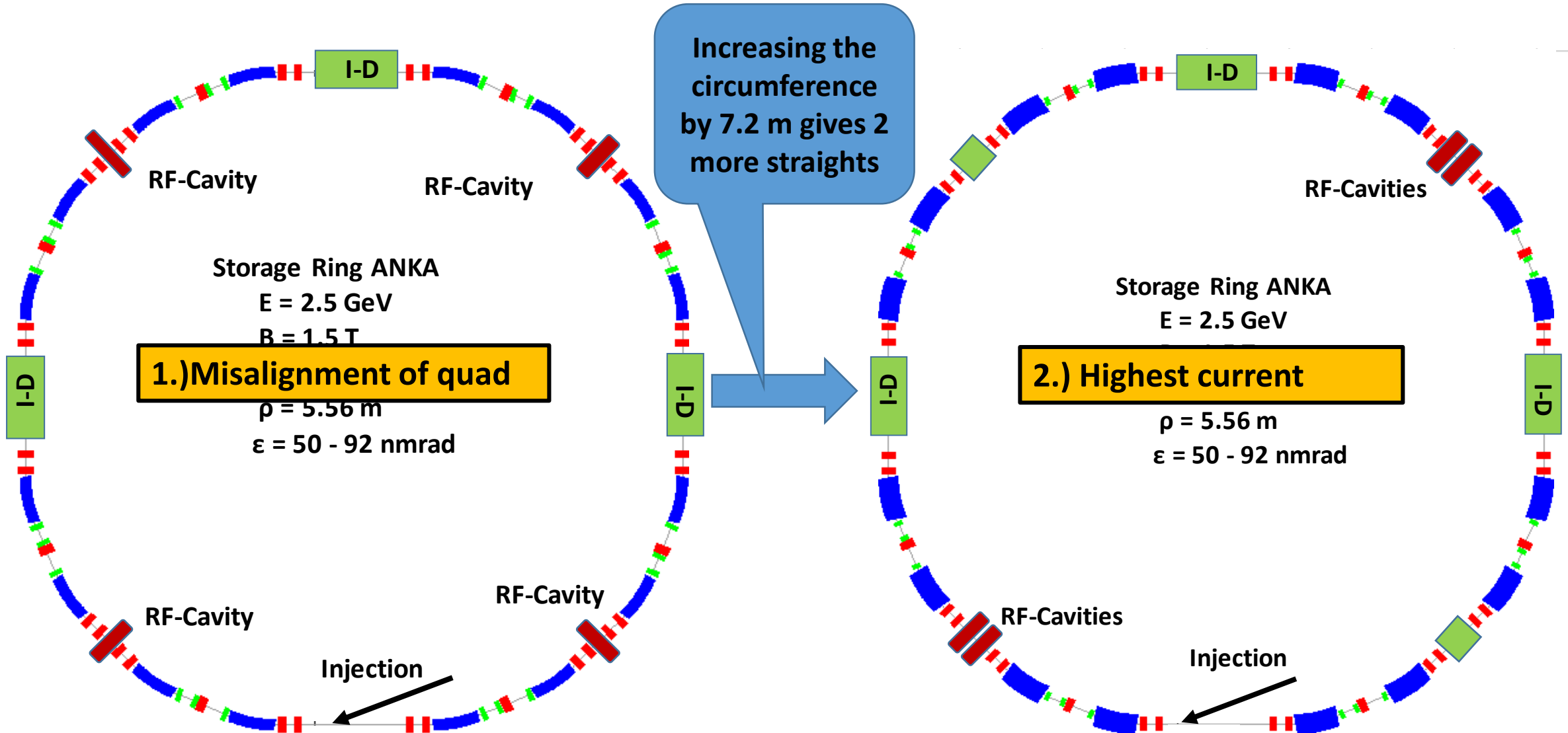




2.5 GeV Synchrotron Radiation Source dedicated for Lithography and Analytic



**ANKA (Ångstrom Karlsruhe)**





# The ANKA Staff (17 people)



Danfysik  
people

Control  
people

Montse  
Pont

Francis  
Perez





**The COSYLAB Staff in 2016**





**The project started in 2001**

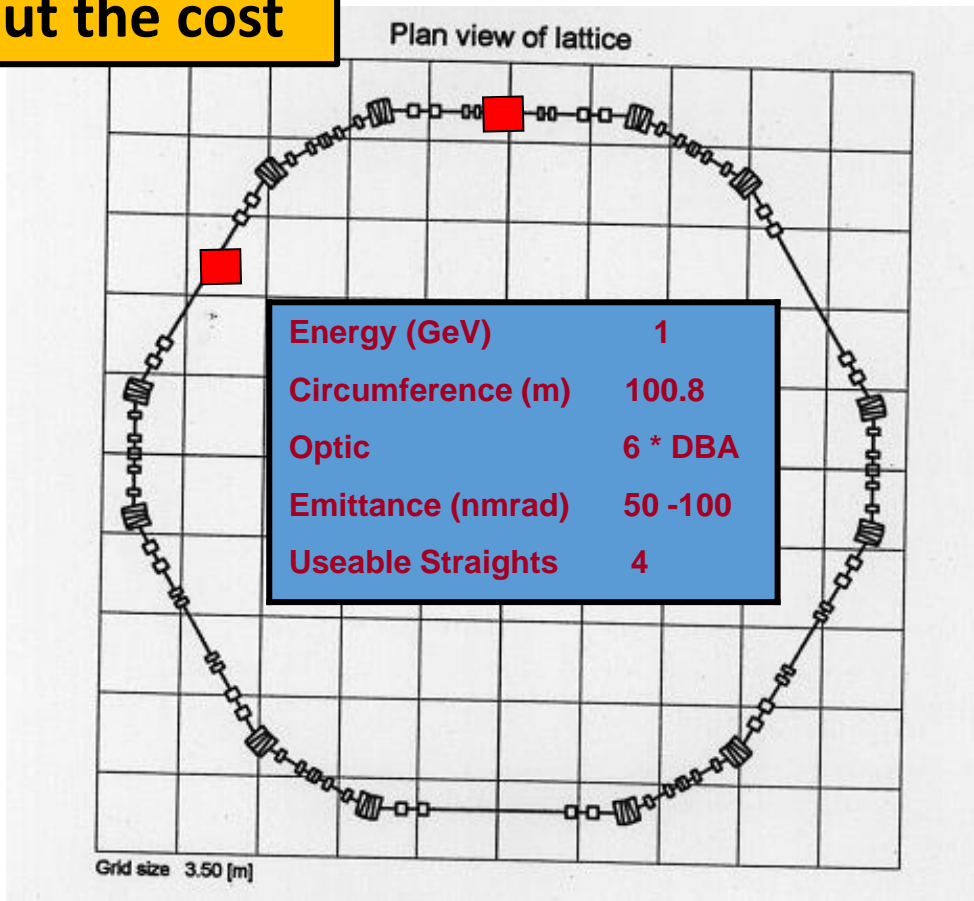
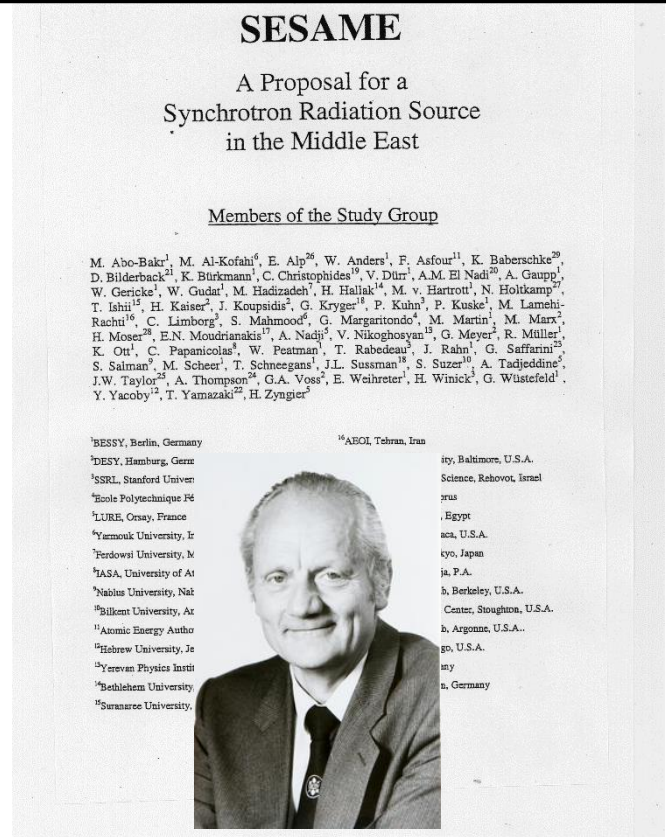
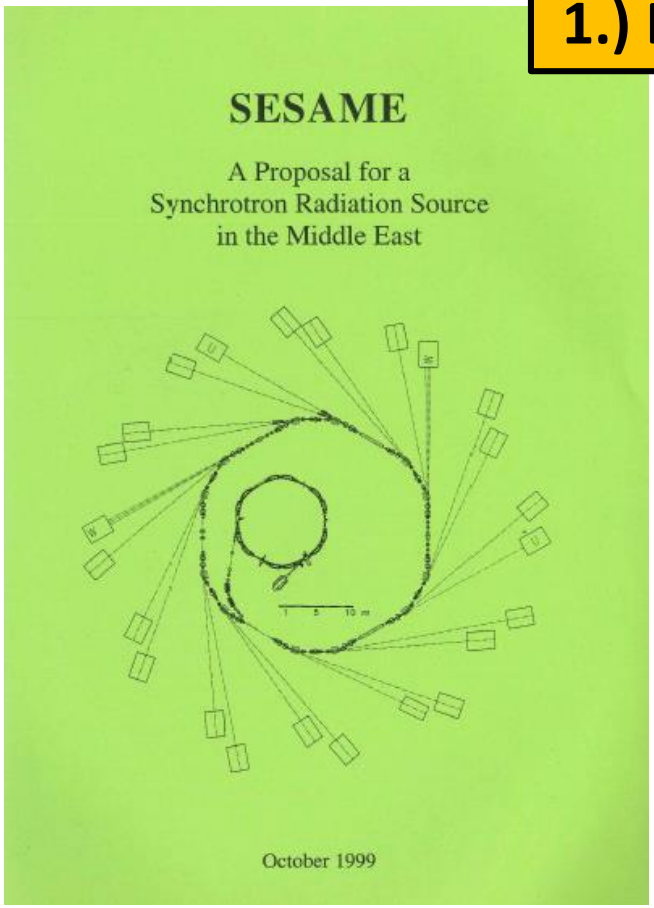


**Commissioning will start in 2017**



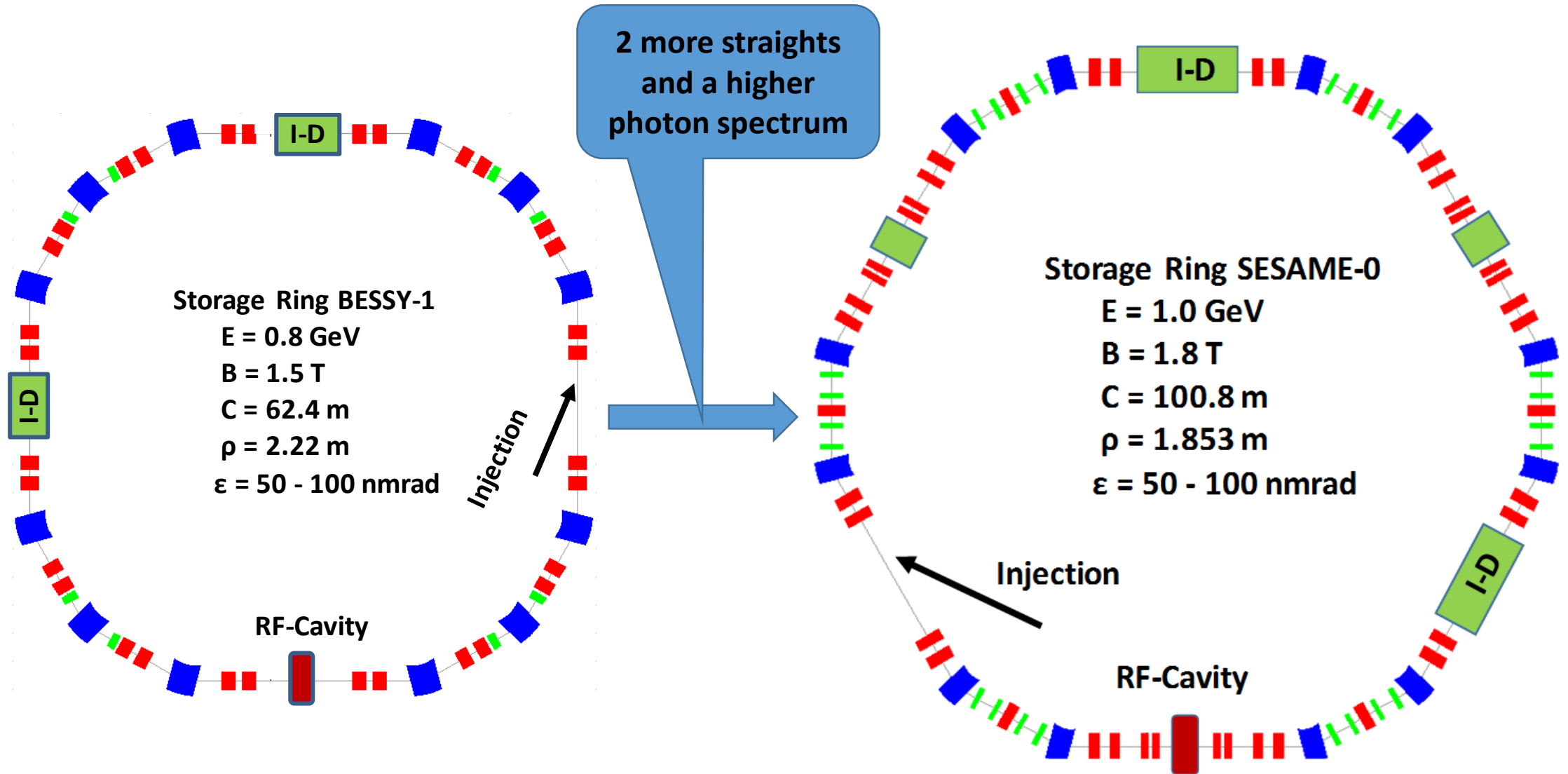
## The SESAME Project Proposal (Green Book, 1999)

### 1.) Discussion with Gus Voss about the cost

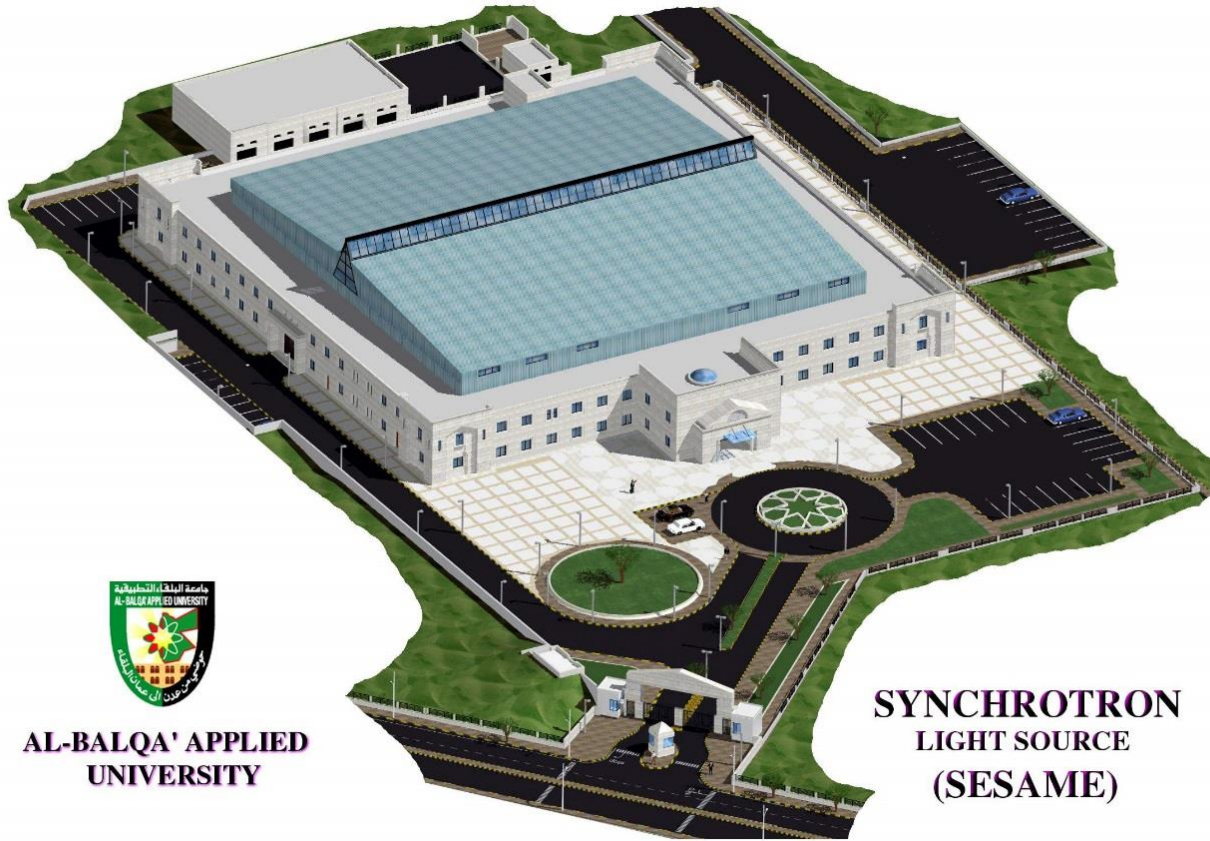


### 2.) Application for the Technical Director

# The SESAME Layout

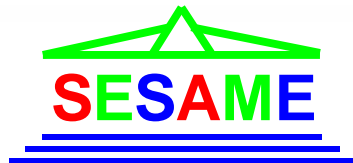






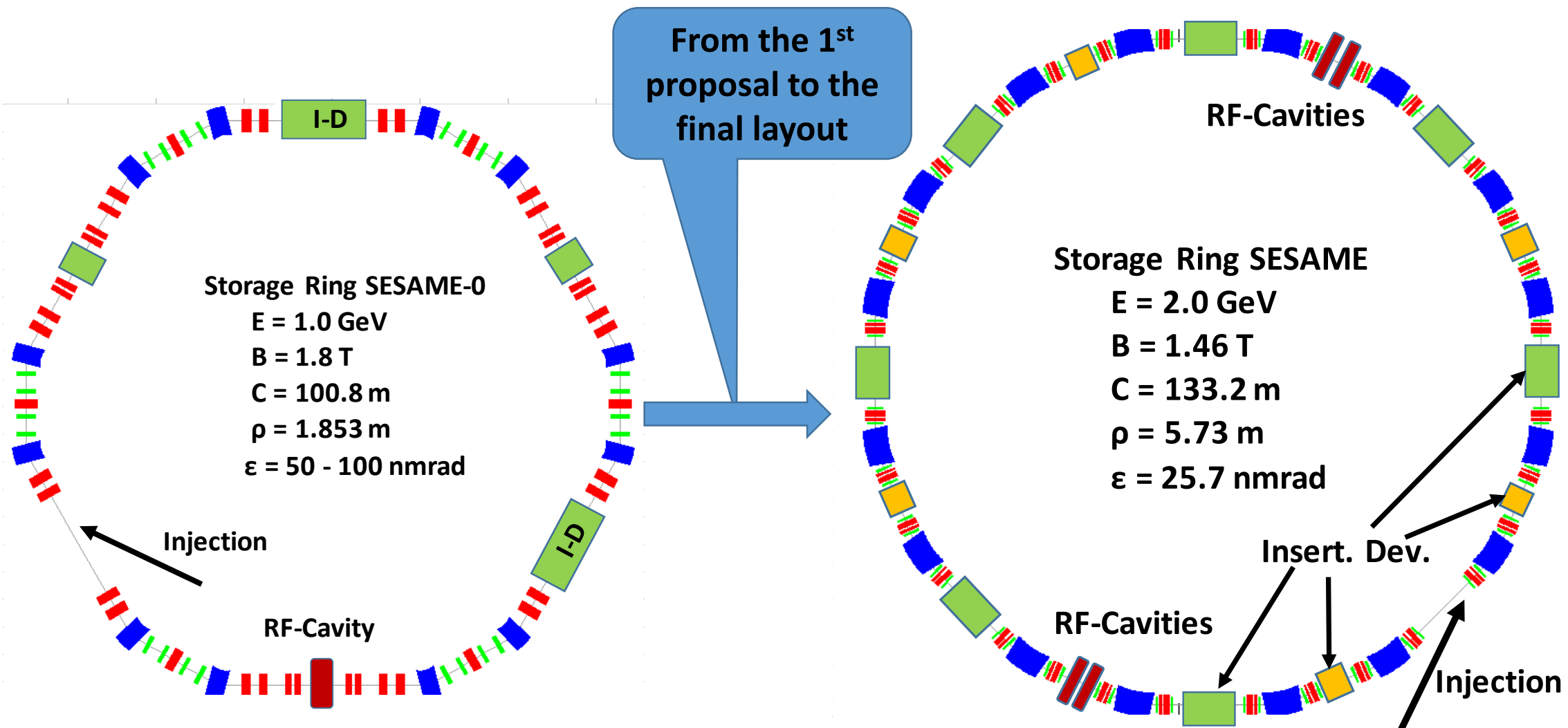
AL-BALQA' APPLIED UNIVERSITY

SYNCHROTRON LIGHT SOURCE (SESAME)

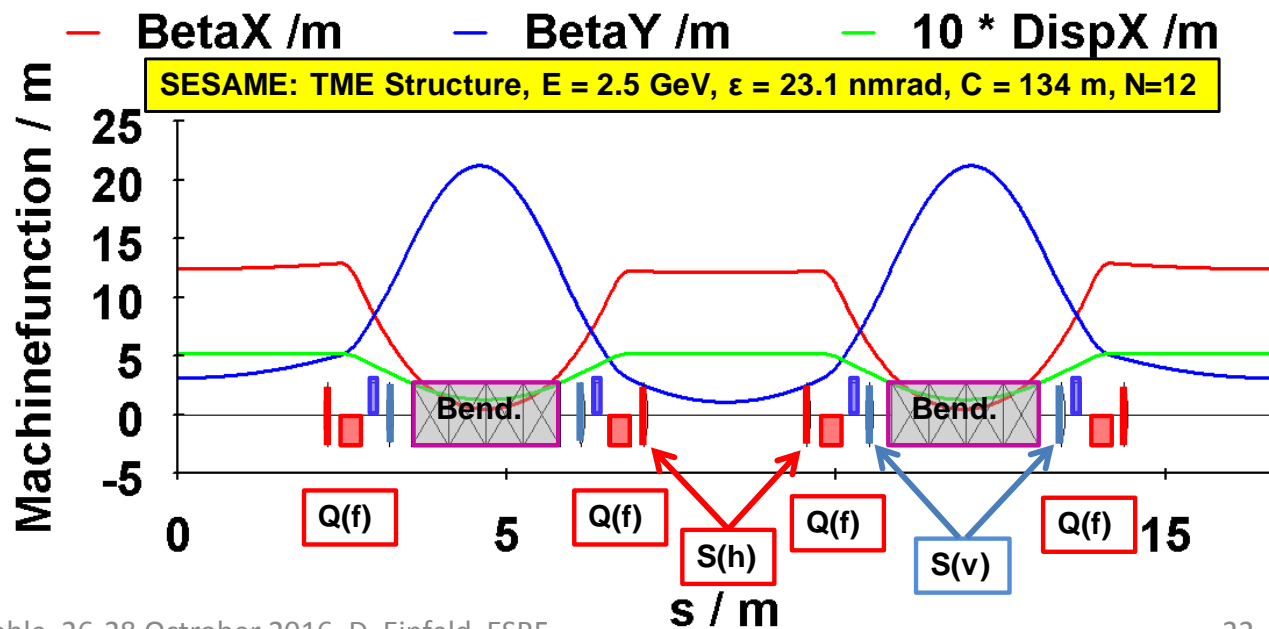
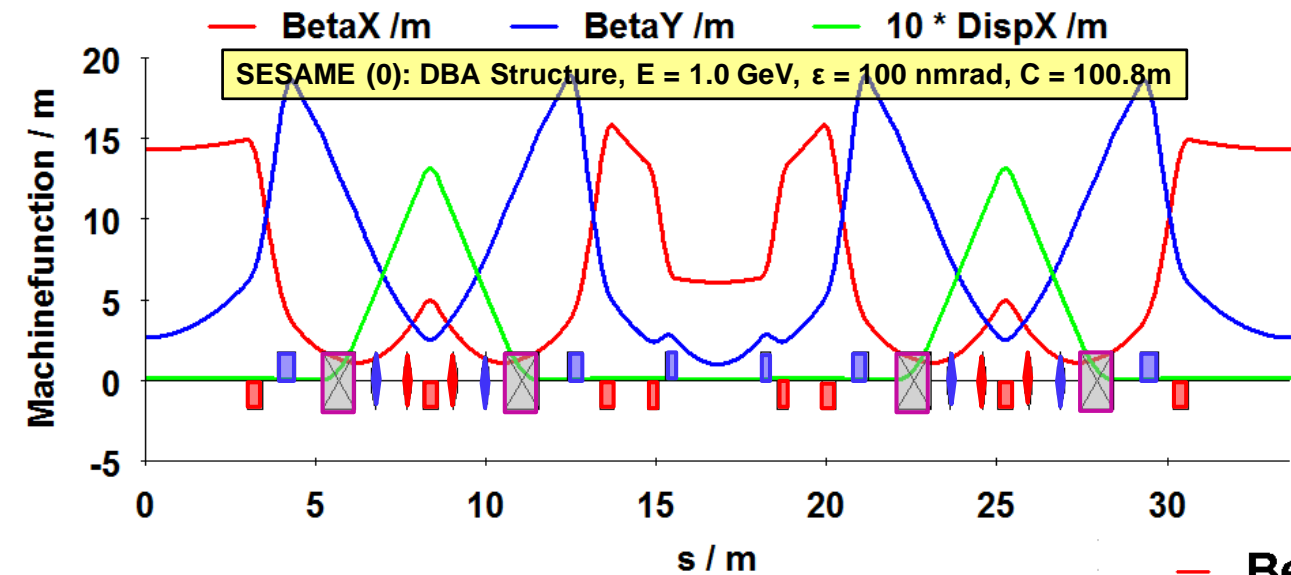


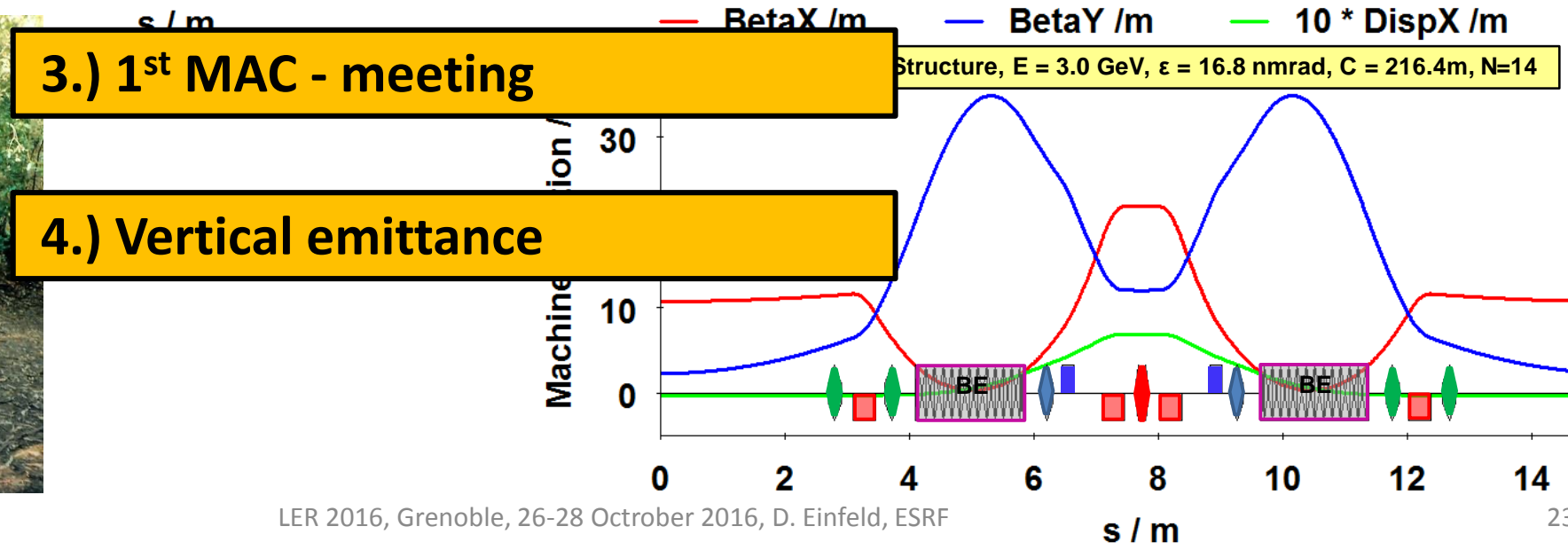
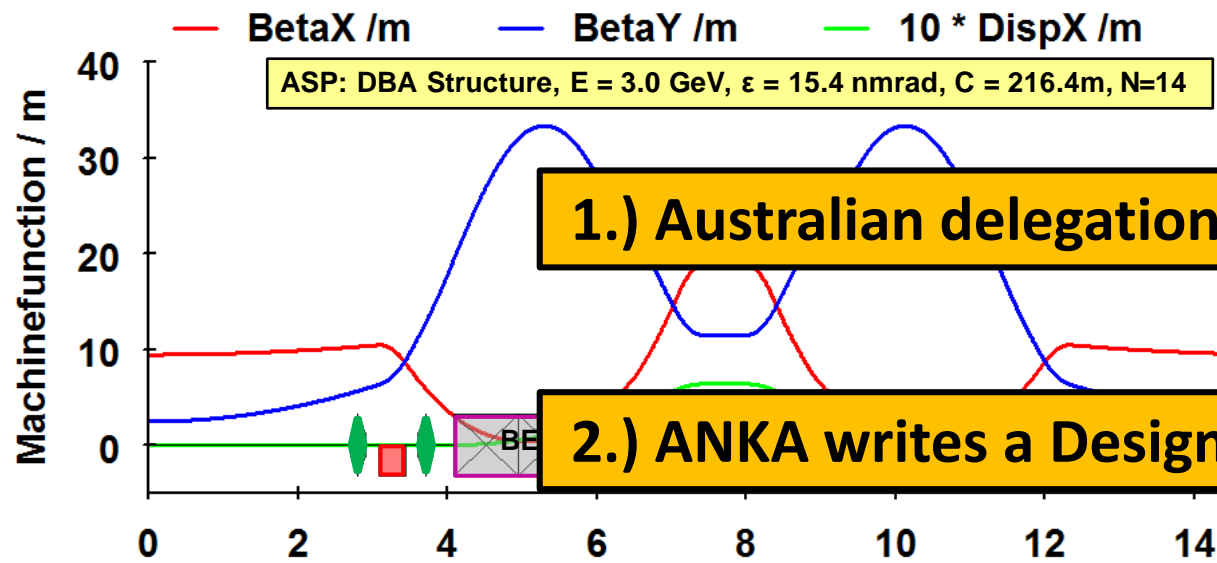


# The Upgrade of SESAME



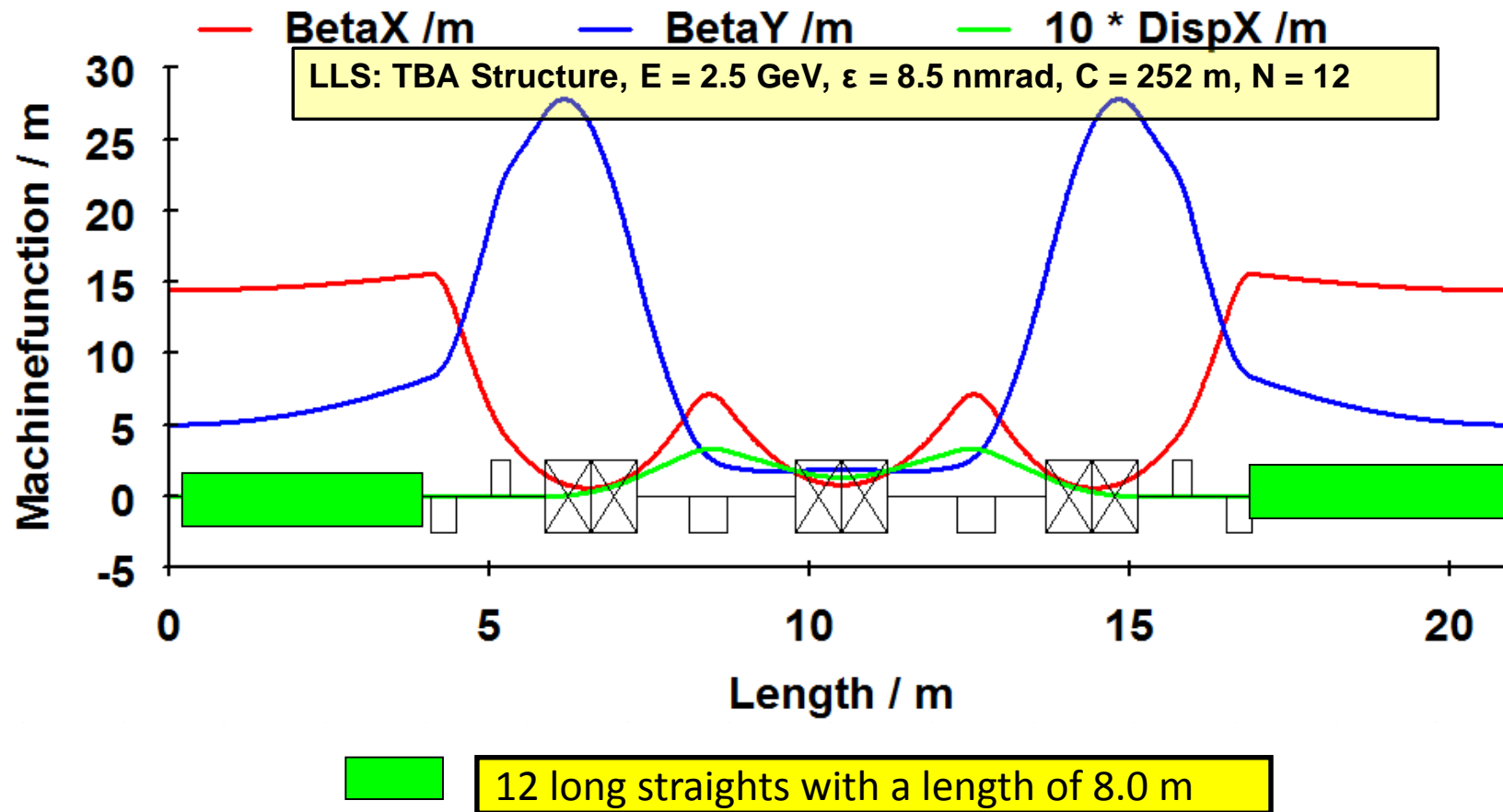
# The SESAME Lattice Machine Functions



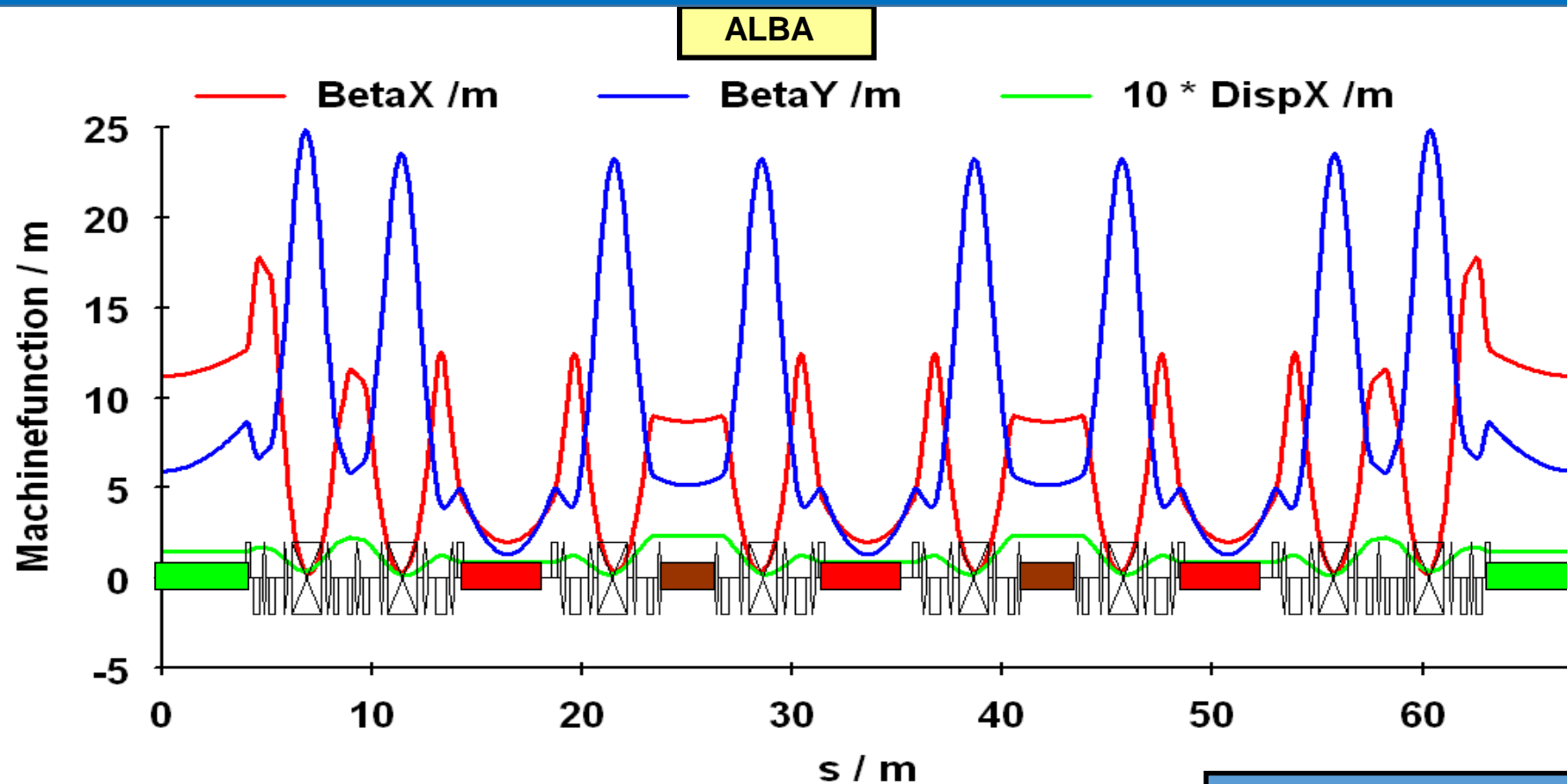




# The Lattice of the LLS in Barcelona



# The Lattice of ALBA



- 4 long straights with a length of 7.8 m
- 12 medium straights with a length of 4.3 m
- 8 short straights with a length of 2.3 m

**Circumf.= 268.8 m**  
**4 fold symmetry**  
**Emitt. = 4.5 nmrاد**  
 **$Q_x = 18.178, Q_y = 8.378$**

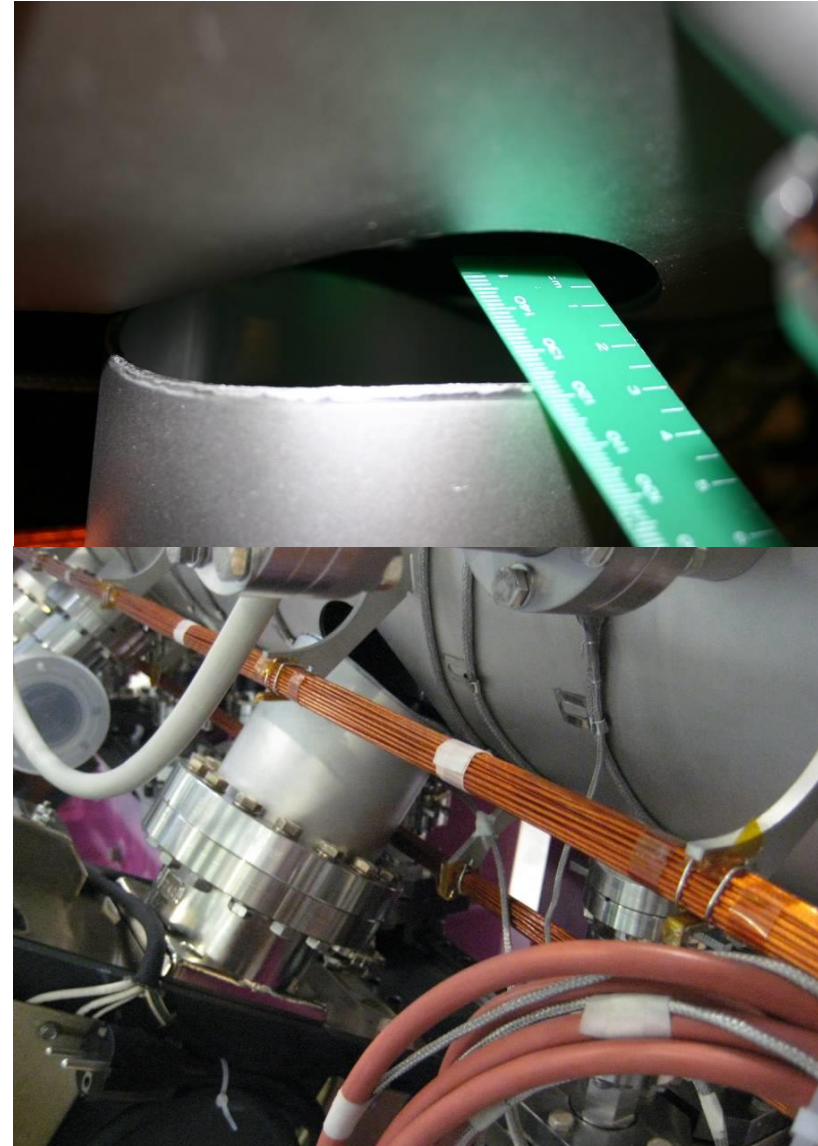
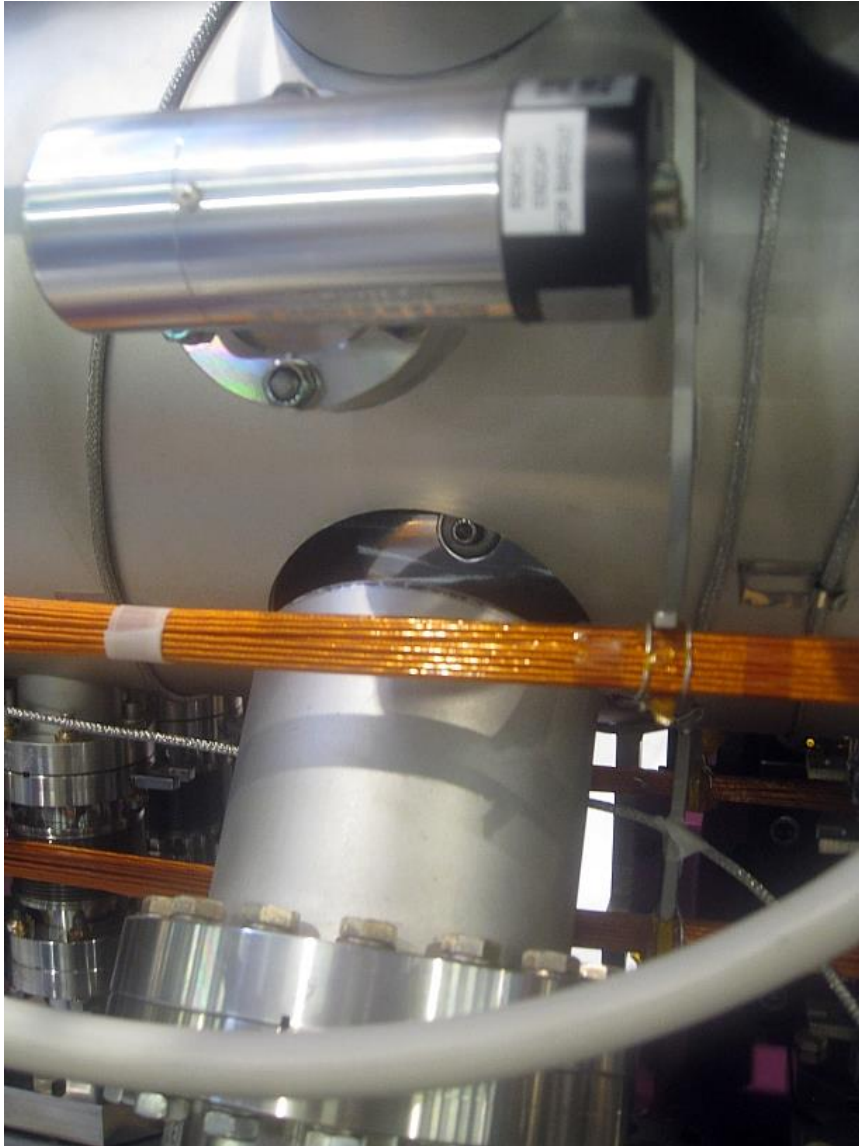
# Performance of Light Sources

Source	Lattice	Energy ( GeV )	Emittance nmrad	Ins. Length ( m )	Angle ( rad )	Circumf. ( m )	Percent. ( % )	Norm Emitt **)
MAX II	DBA	1.5	9	31.4	0.3142	90	34.9	129.0
ALS	TBA	1.9	5.6	81	0.1745	196.8	41.2	291.9
BESSY II	DBA	1.9	6.4	89	0.1963	240	37.1	234.4
ELETTRA	DBA	2	7	74.78	0.2618	258	29.0	97.5
INDUS II	DBA	2	44	36.48	0.3927	172	21.2	181.6
SLS	TBA	2.4	5	63	0.244	288	21.9	59.8
LLS	TBA	2.5	8.5	96	0.1745	252	38.1	255.9
NSLS-xray	DBA	2.5	44.5	18	0.3927	170.08	10.6	117.6
SOLEIL	TME	2.75	3.72	159.6	0.1963	354	45.1	65.0
CLS	DBA	2.9	18.2	62.4	0.2618	170.4	36.6	120.6
SPEAR III	DBA	3	18.2	67	0.16535	234.13	28.6	447.3
ASP	DBA	3	6.88	76.72	0.2244	216	35.5	67.7
DIAMOND	DBA	3	2.74	218.2	0.1309	561.6	38.9	135.7
ALBA	TME	3	4.29	103.44	0.1963	268.8	38.5	63.0
CANDLE	DBA	3	8.4	76.8	0.1963	216	35.6	123.4
NSLS-II	DBA	3	2.24	189.3	0.10472	780.3	24.3	216.7
TPS	DBA	3	1.6	198	0.1309	518.4	38.2	79.3
PAL-II	MBA	3	5.6	118.92	0.2618	281.82	42.2	34.7
SSRF	DBA	3.5	3.9	152	0.1571	432	35.2	82.1

Norm Emitt =  $\text{nm} \cdot \text{rad} / ((E^2) \cdot \dots)$



# August 2010: Delivery of 1<sup>st</sup> IVU



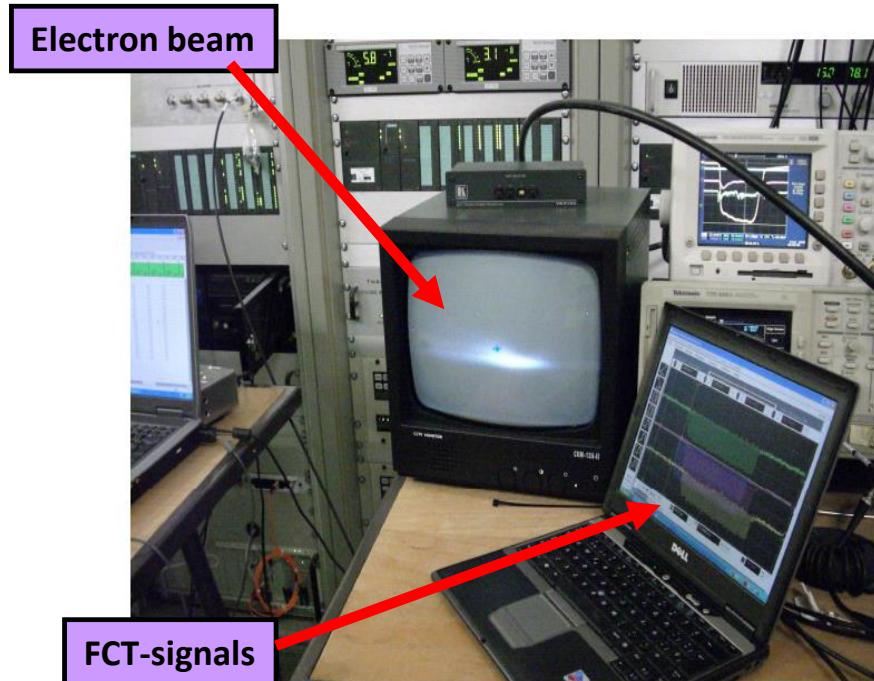
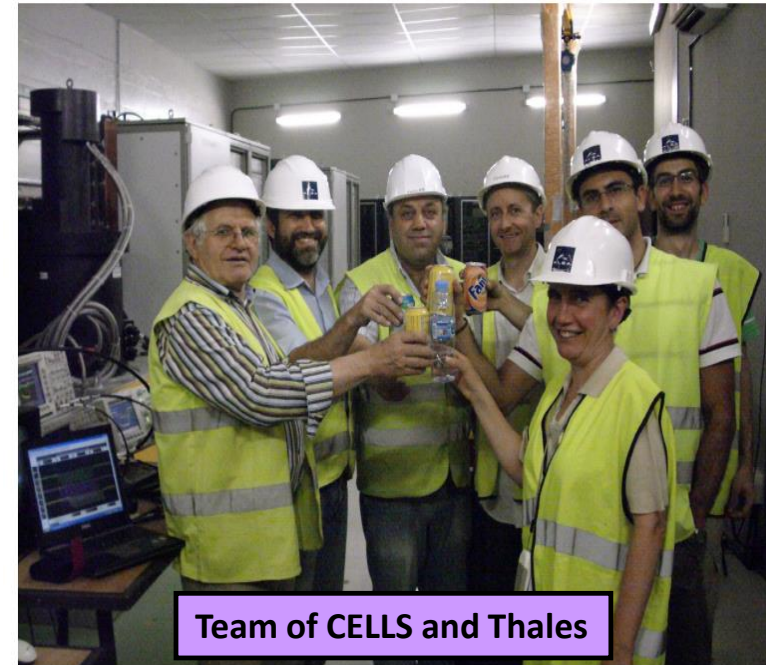


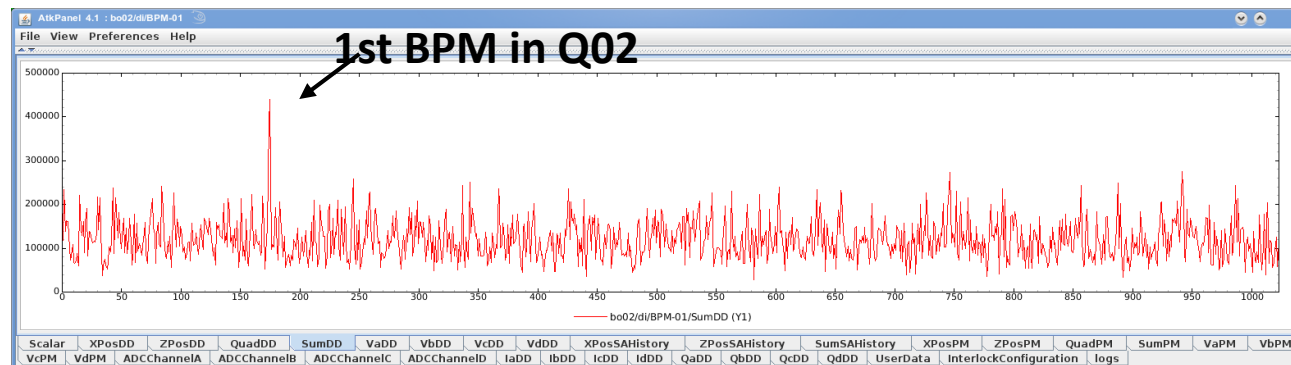
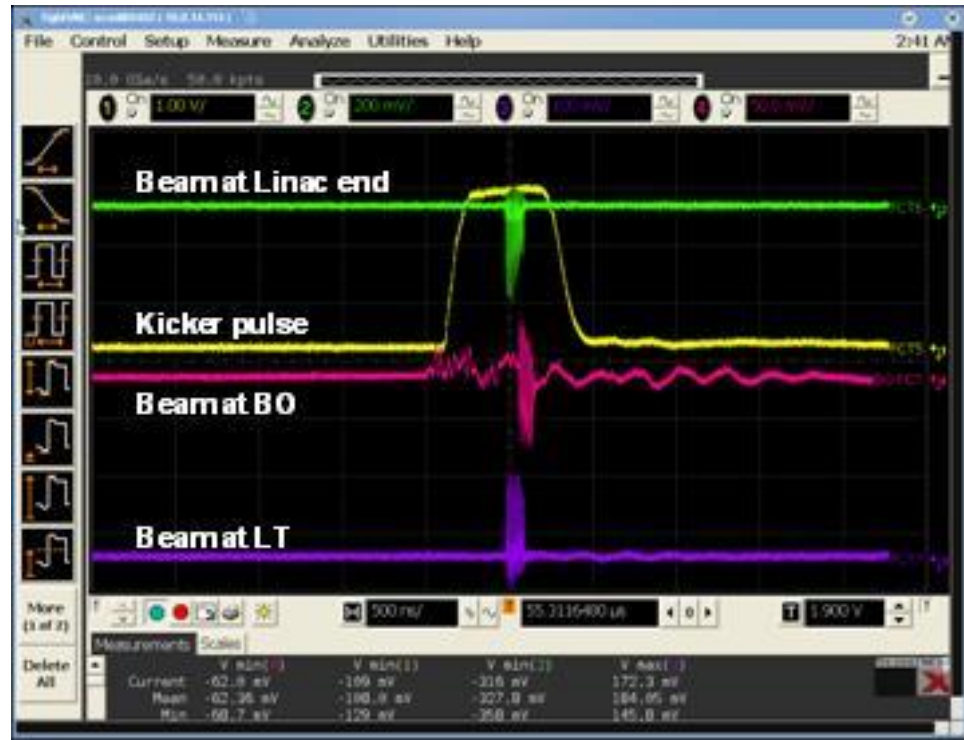
Figure 6: Beam image at SM3 (Linac Exit)



Team of CELLS and Thales

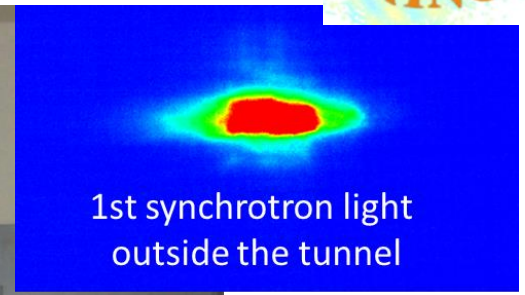
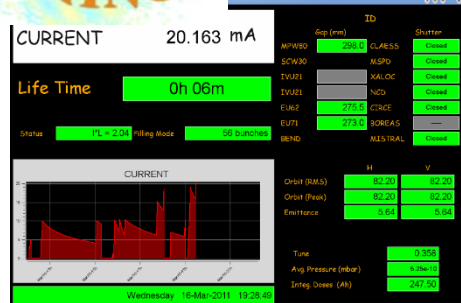
**We would like to thank all the CELLS staff involved in the preparation of the commissioning, without their effort this could not have been possible. We also would like to thanks the team from THALES for the great job they have done.**





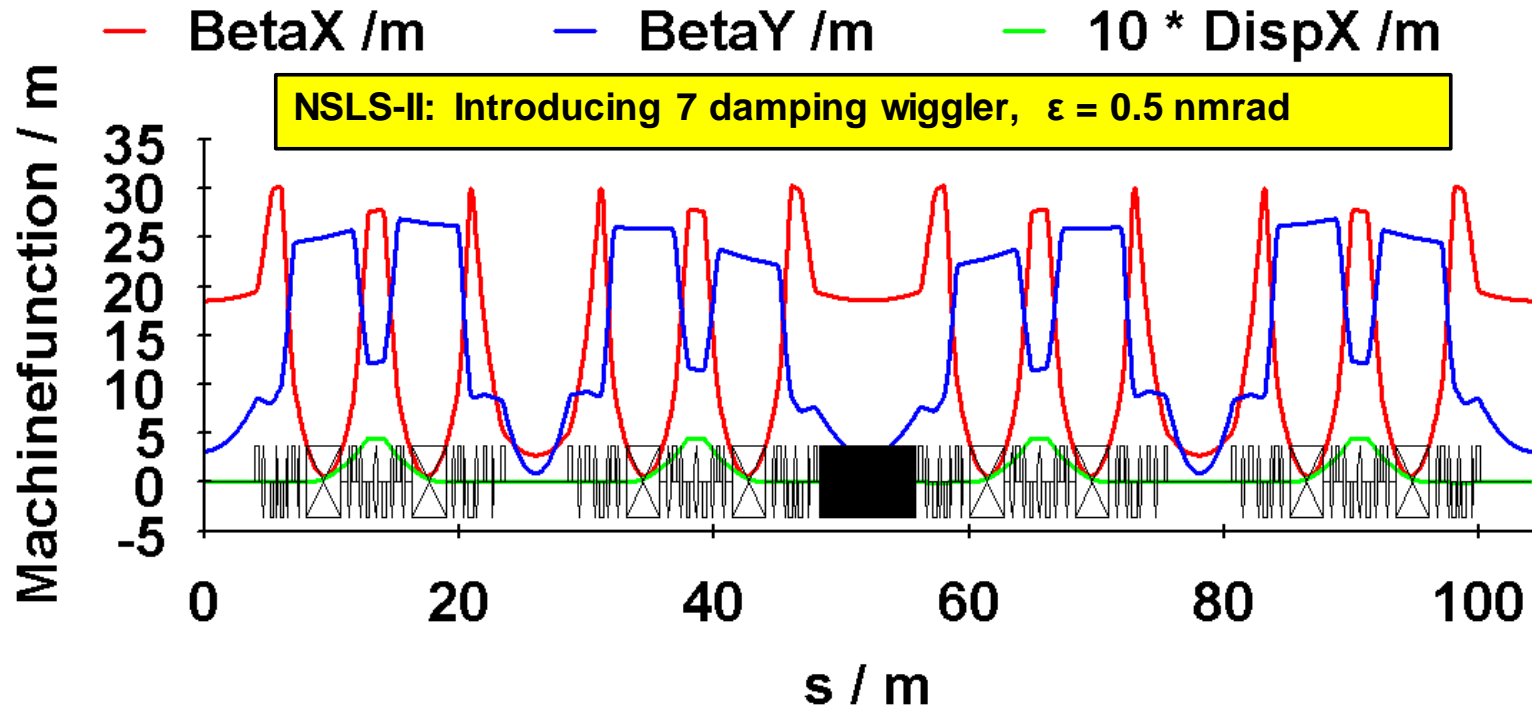


# Commissioning of ALBA (20 mA stored beam)

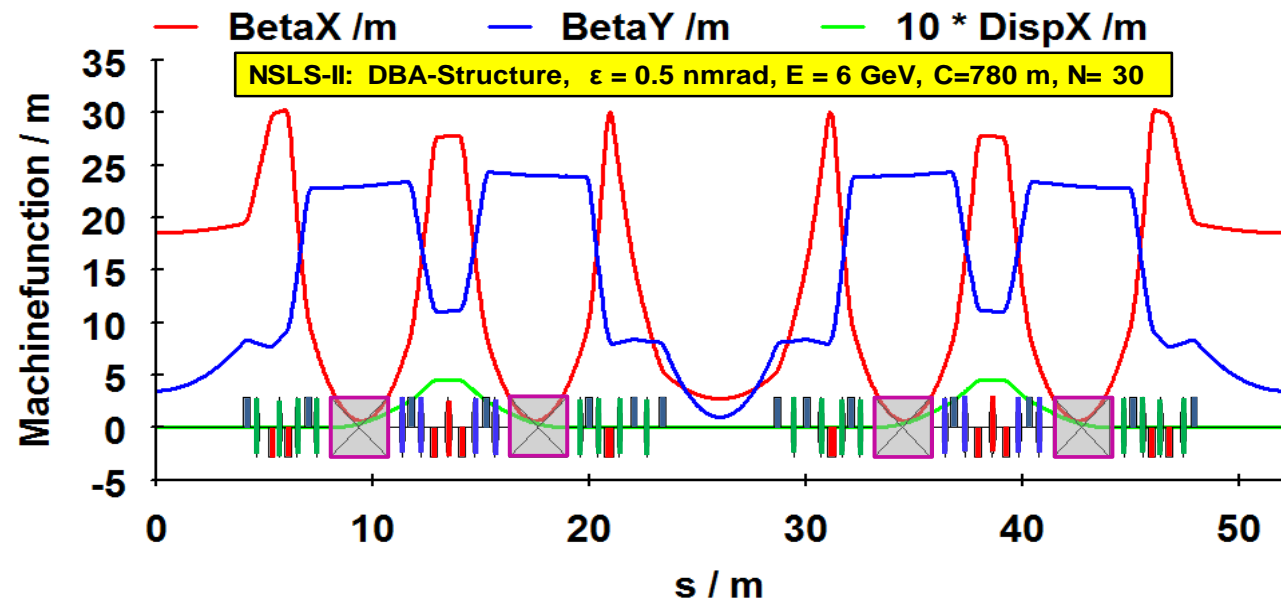


**16th of March 2011:  
A historical day of the ALBA – project,  
The Accelerator Division is celebrating this success.**

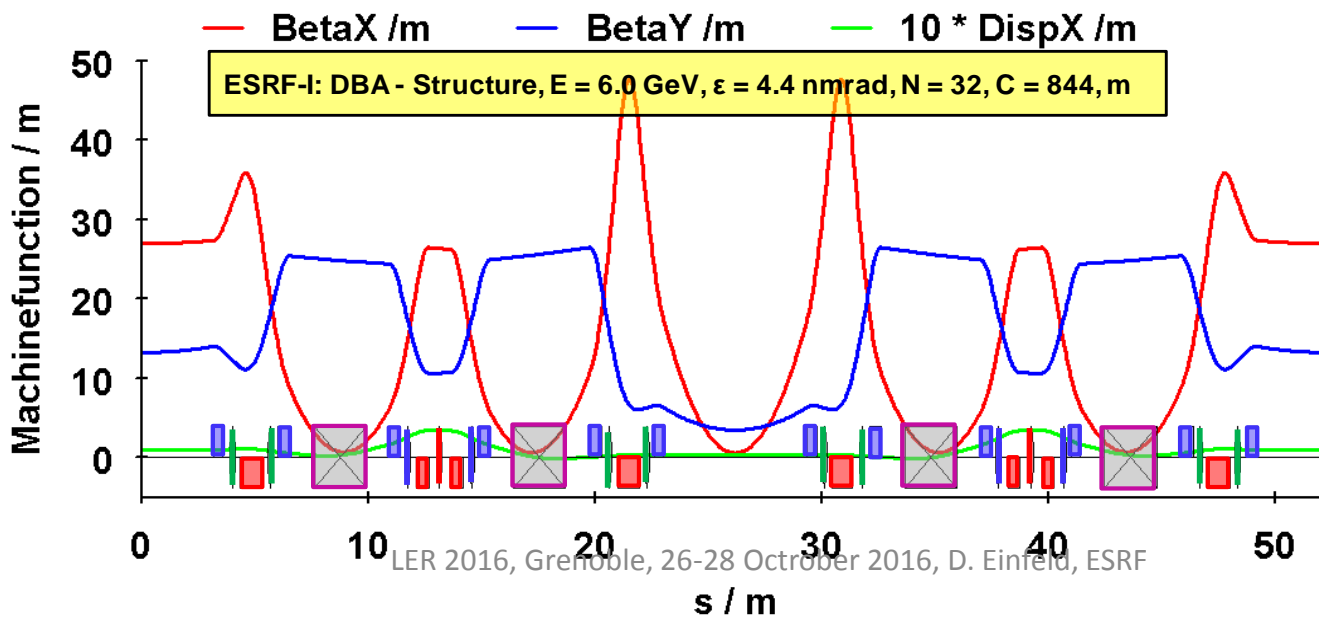
# The Project NSLS II



# The Project NSLS II

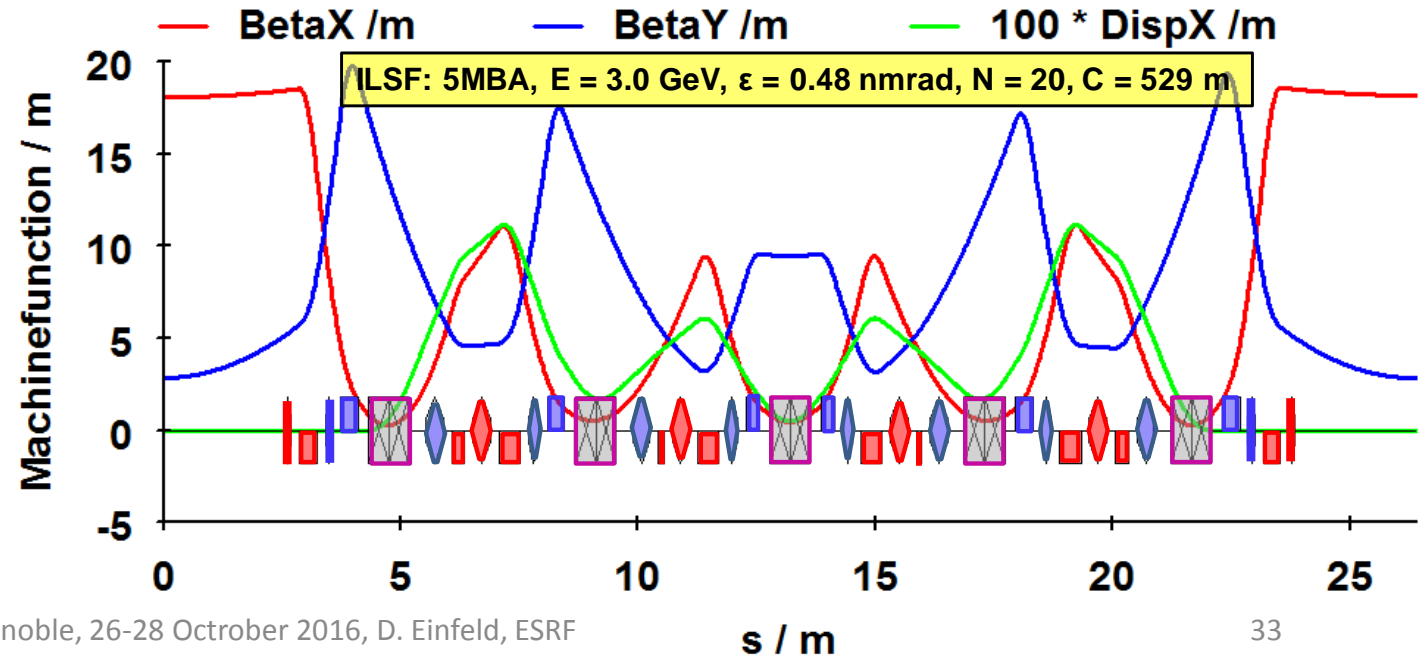
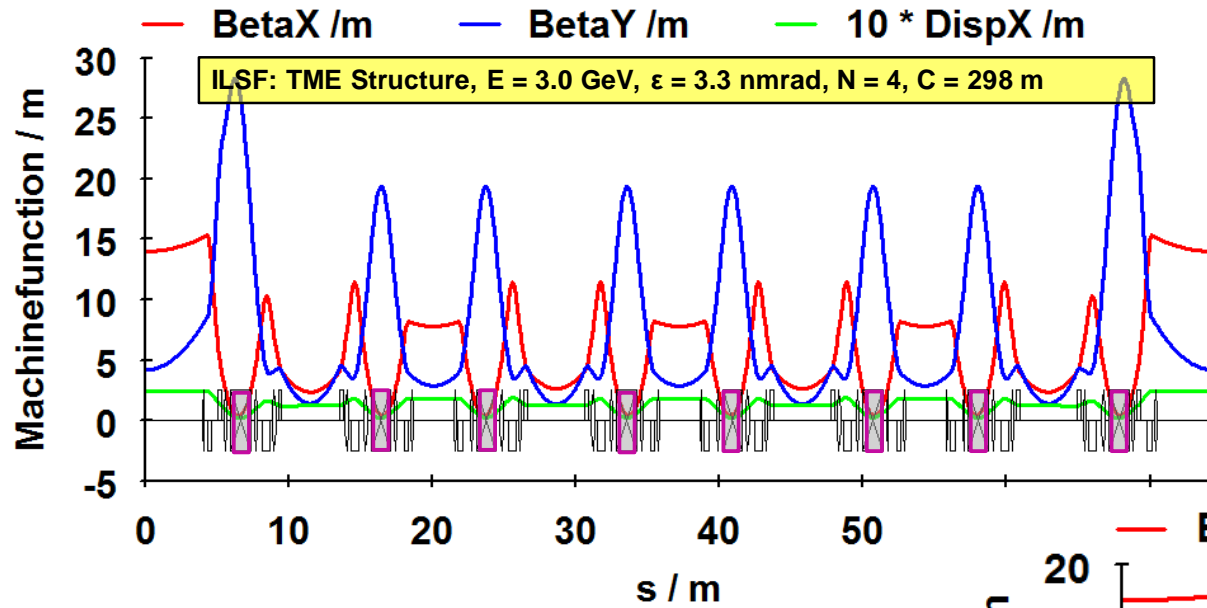


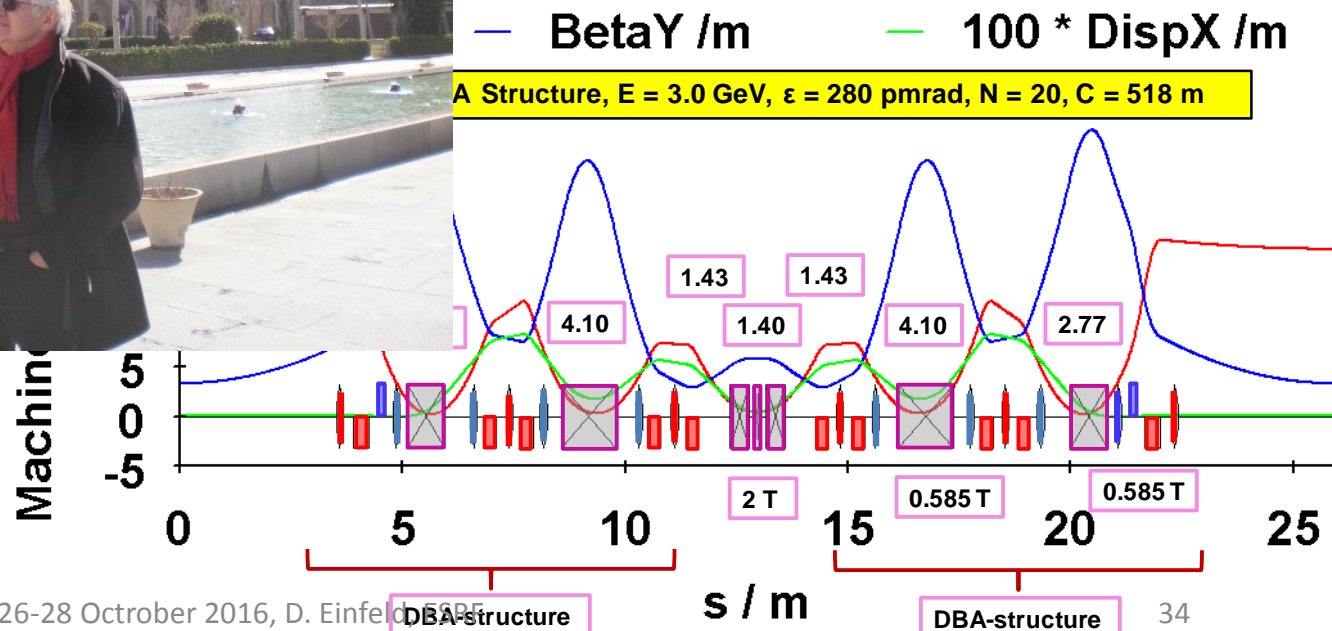
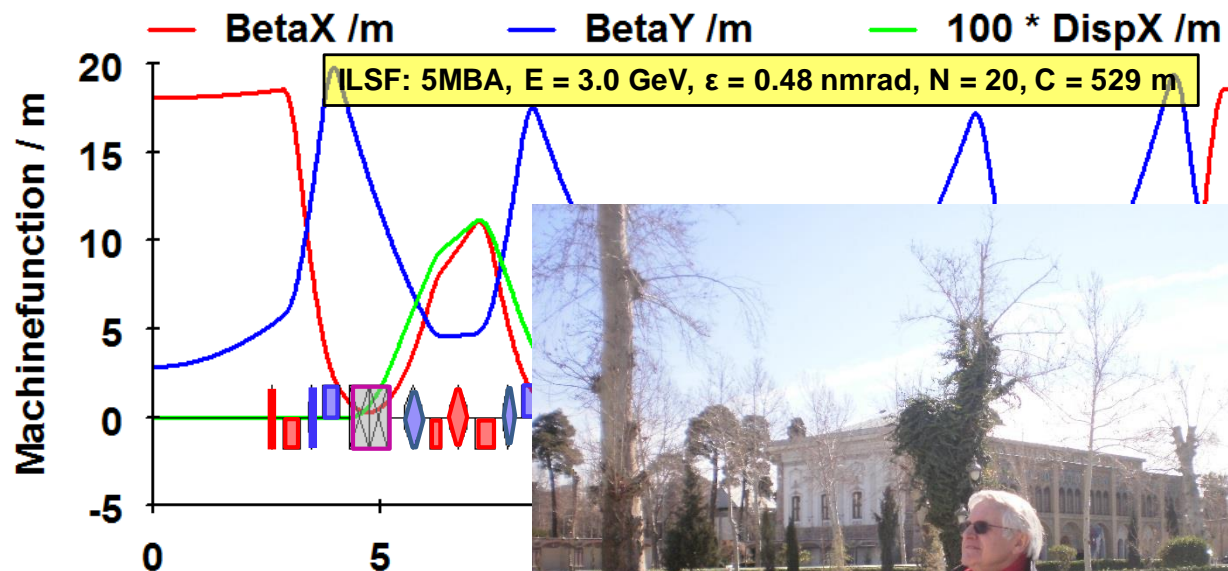
**NSLS II:  
54 elements**



**ESRF:  
38 elements**



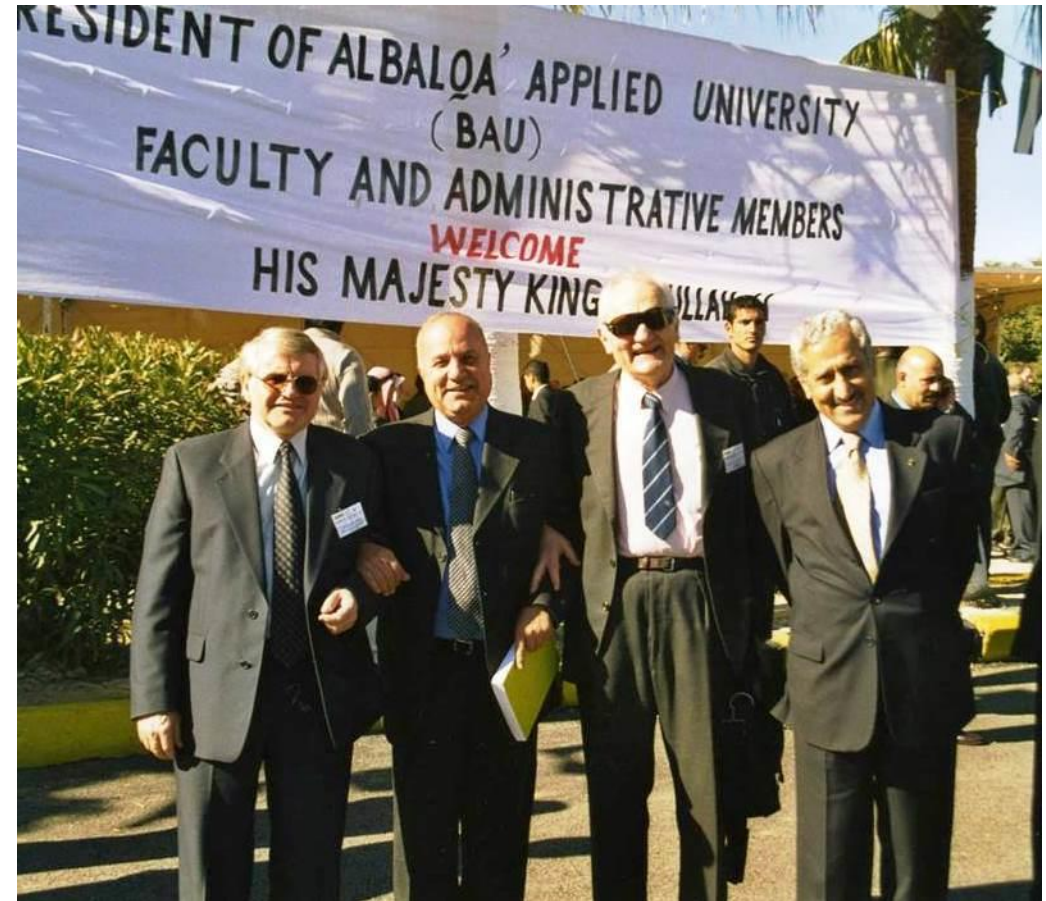












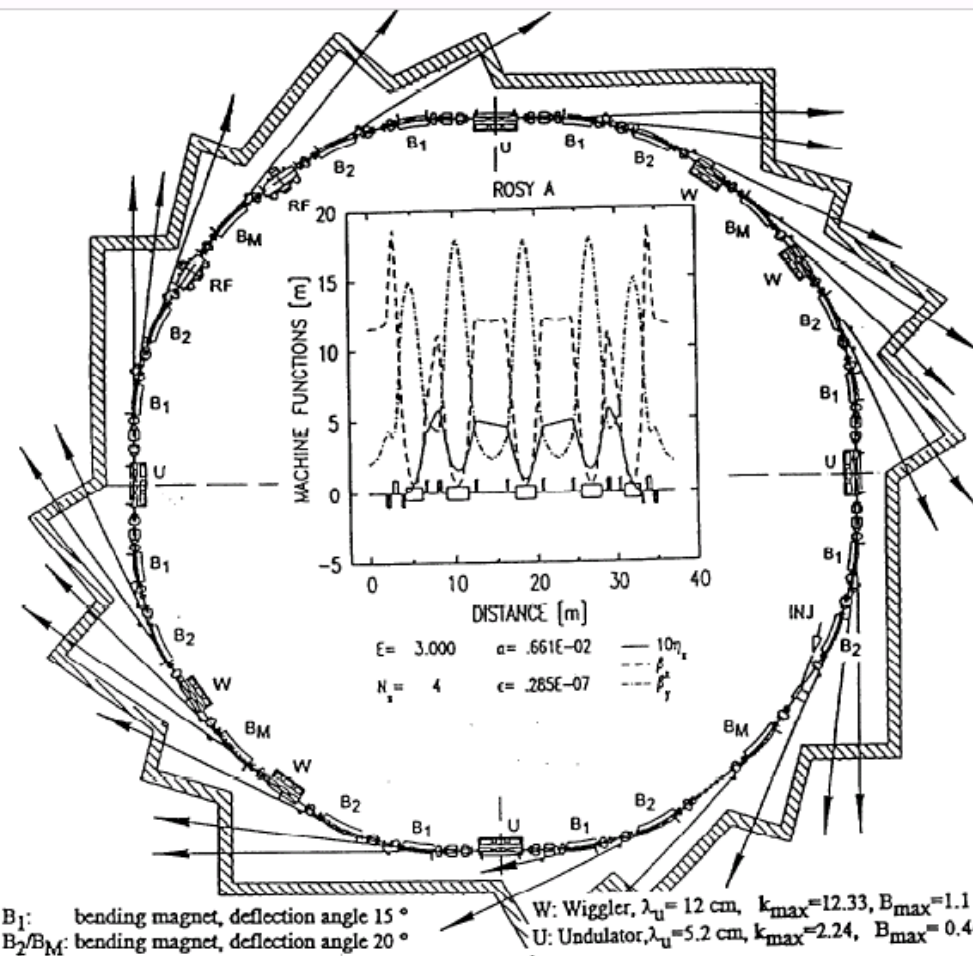
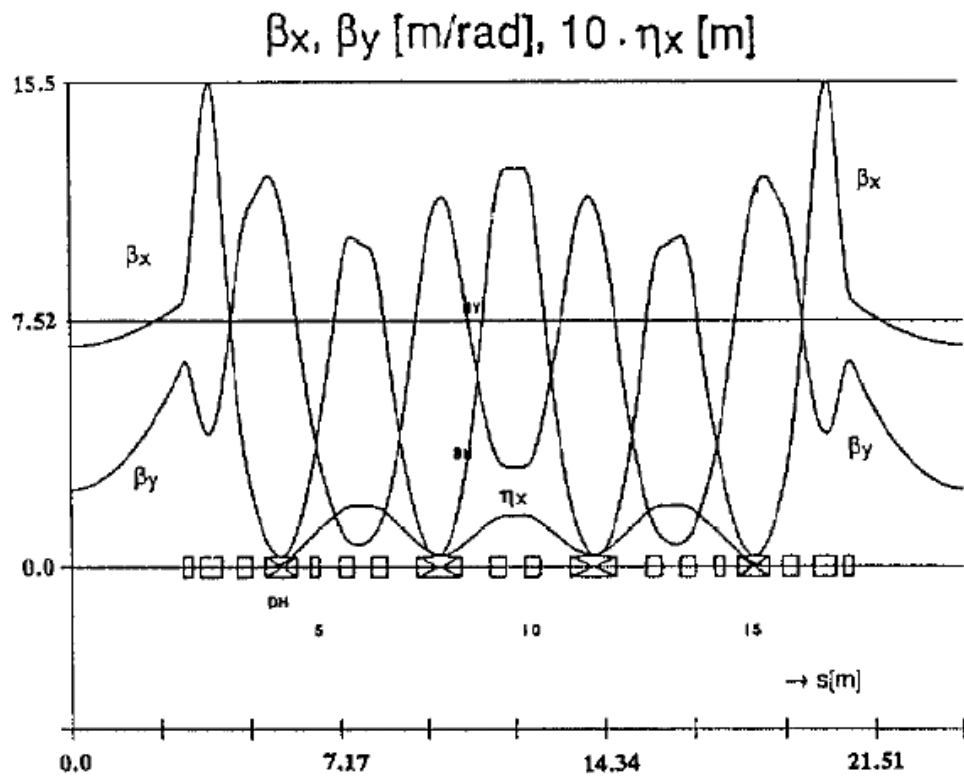
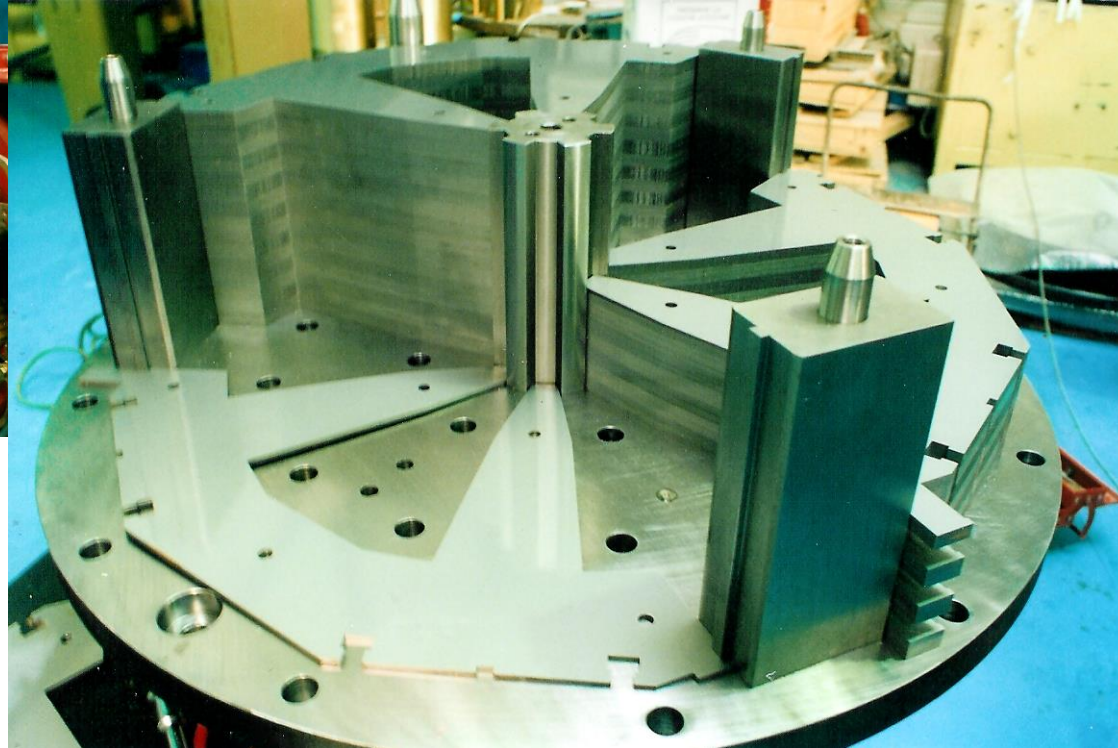


Fig.1: Layout of the 3<sup>rd</sup> Generation Synchrotron Light Source ROSY including the Lattice and Twiss Functions within one Achromat



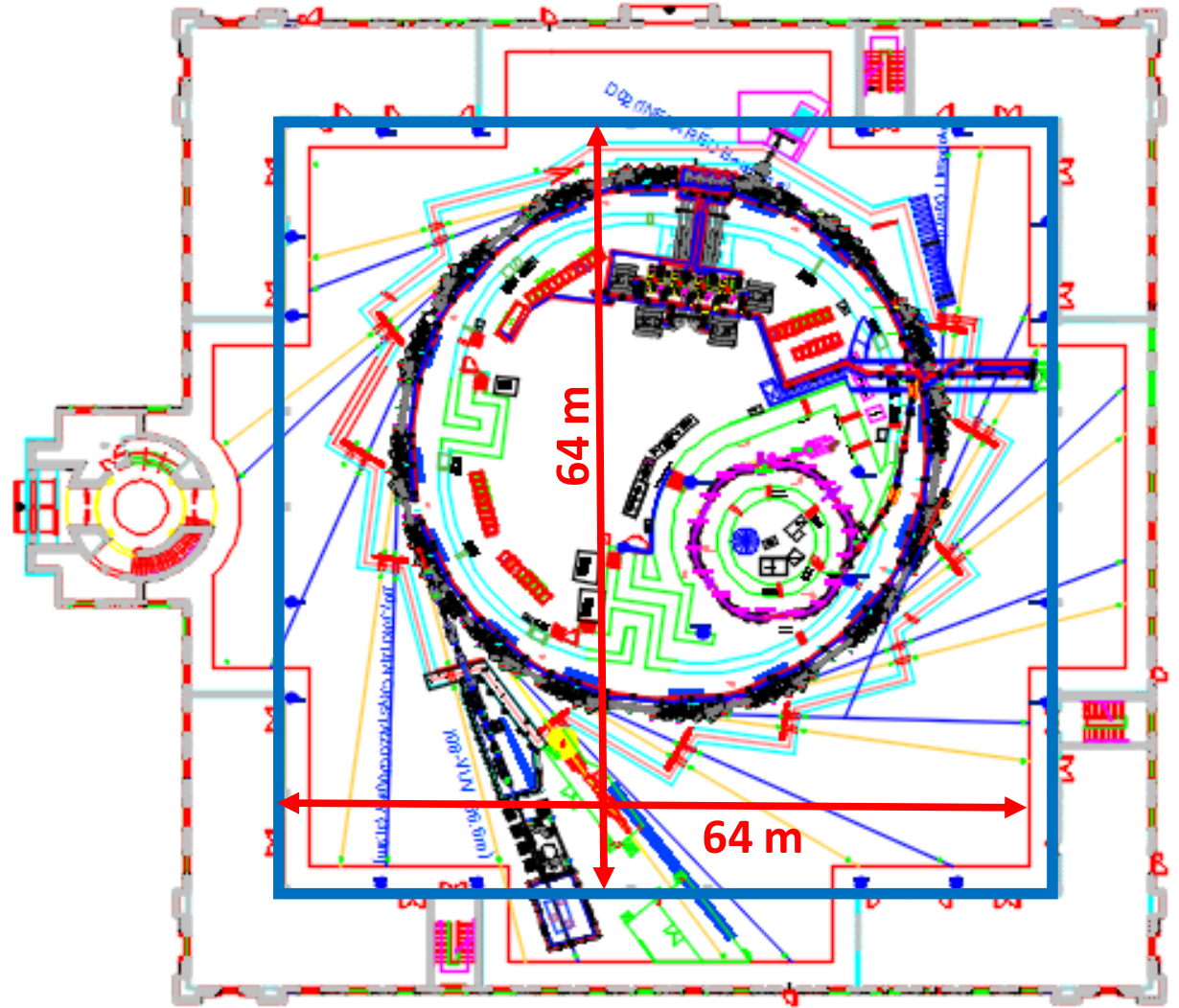
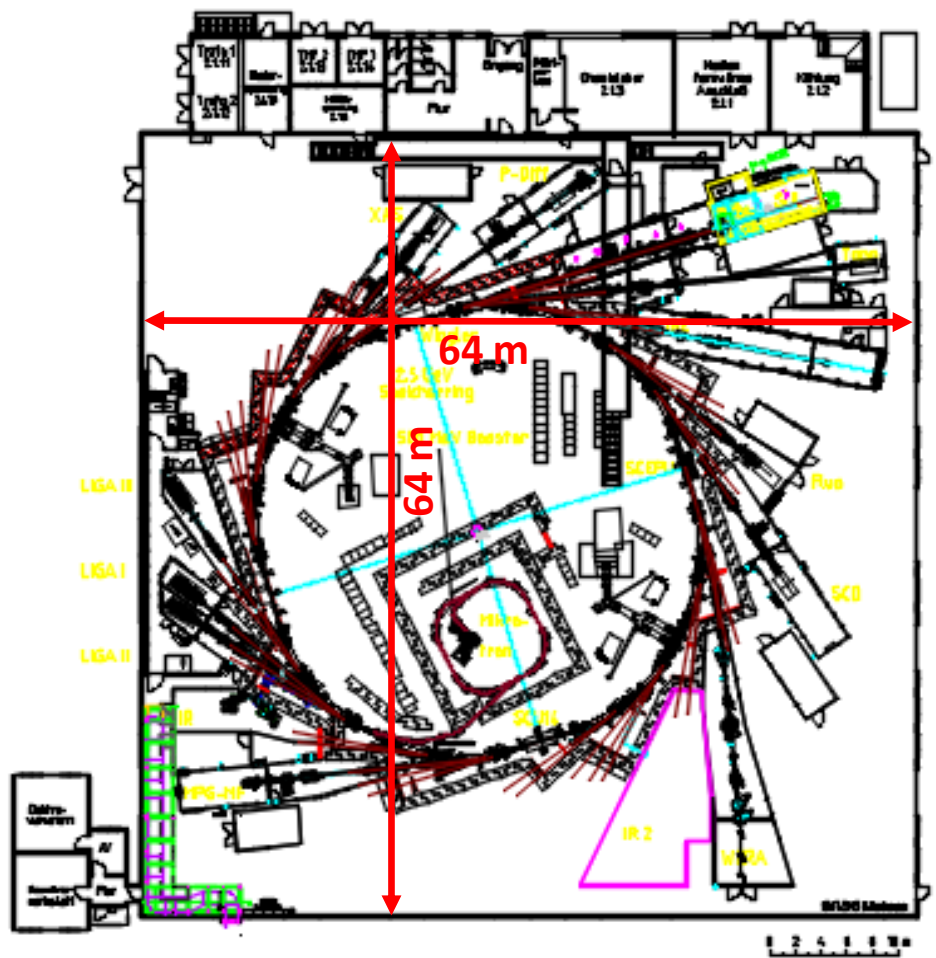


1.) Misalignment of quad

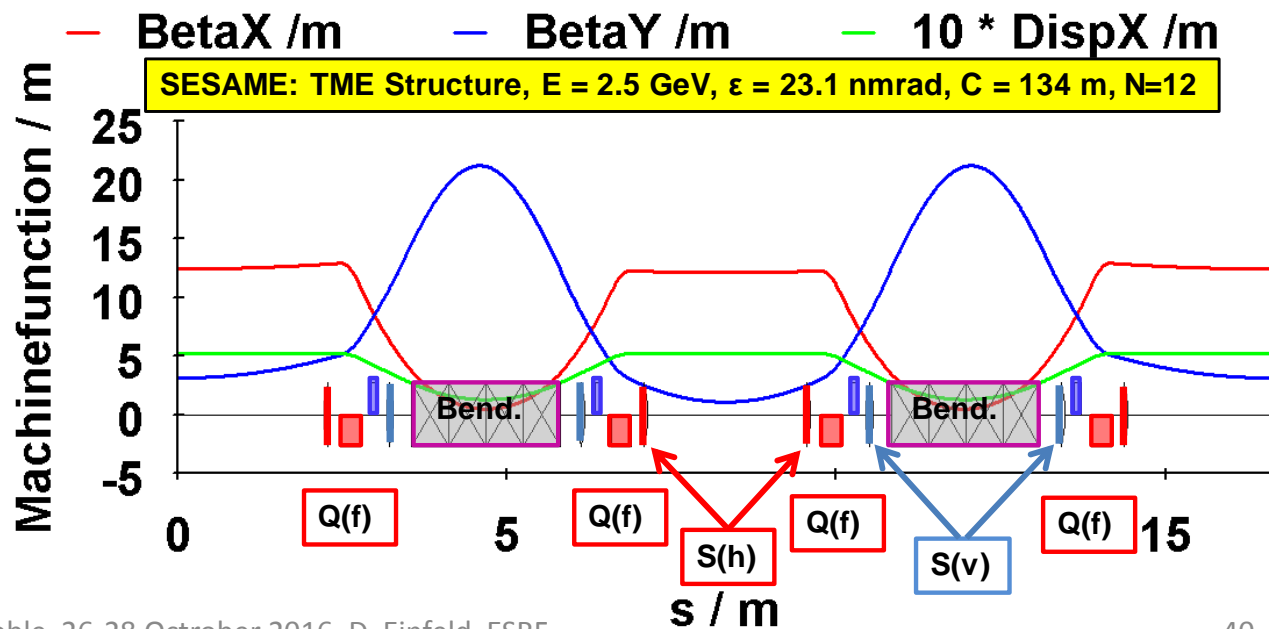
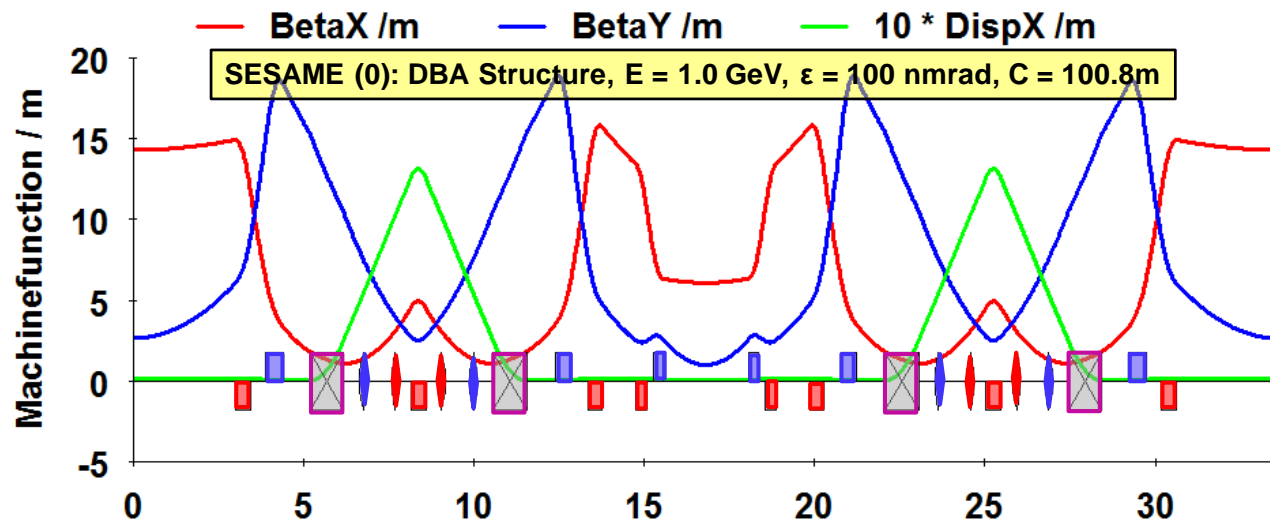
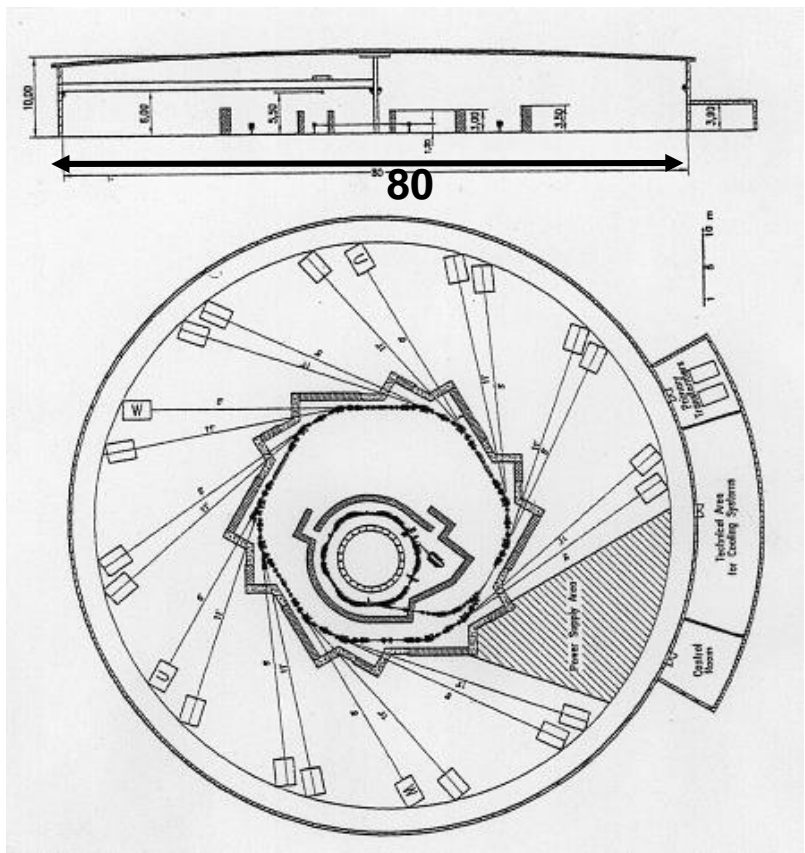
2.) Highest current



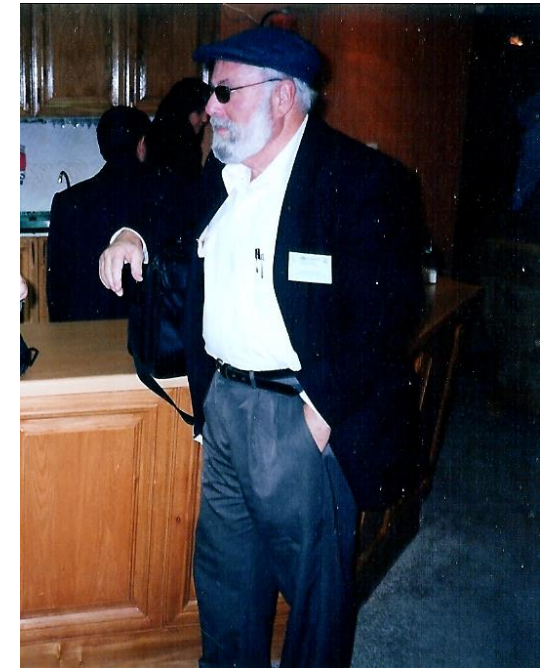
# The SESAME Building



# The SESAME Lattice Machine Functions



Eventually it happened! At the date Jun 7<sup>th</sup>, 2002 the “CONTI HARMONI” ship started its trip toward JORDAN, Al-Aqabe; caring entire BESSYI.







**DG Matsuura and Minister Toukan**



**Inauguration of SESAME**

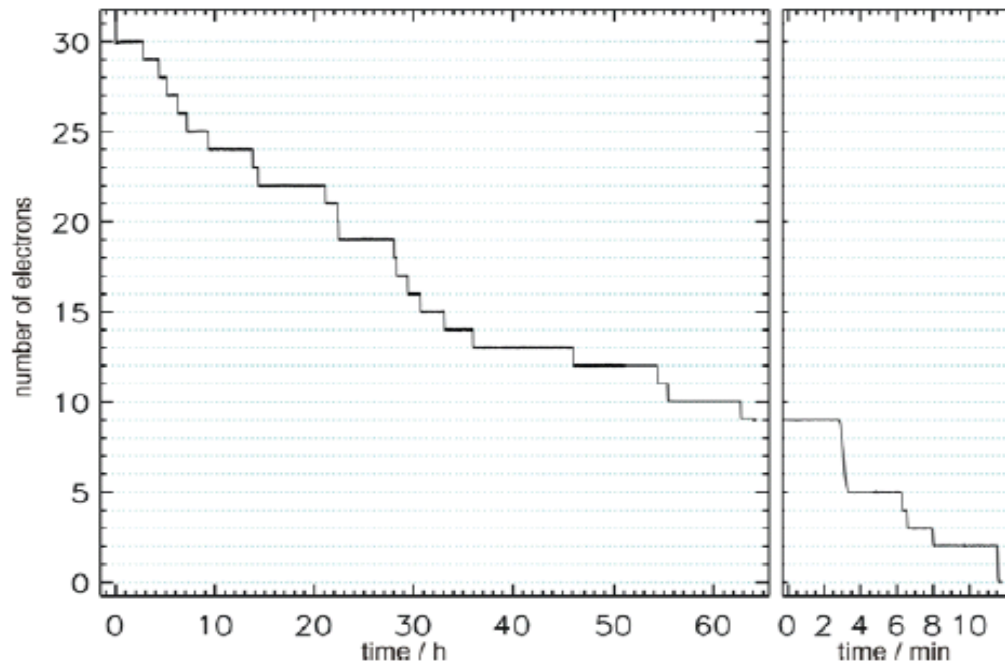


**King Abdullah II and Prof. Schopper**

elektron current: **PCT, photodiode**

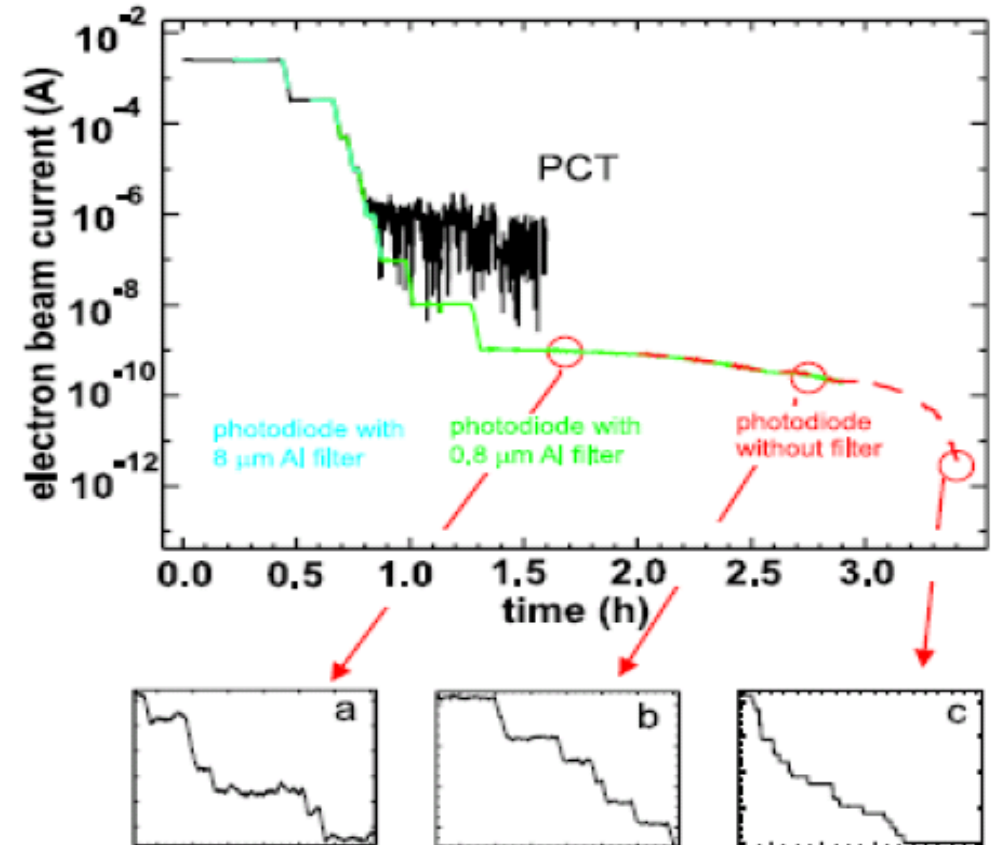
magnetic field: **NMR probe**

source size: **imaging system**



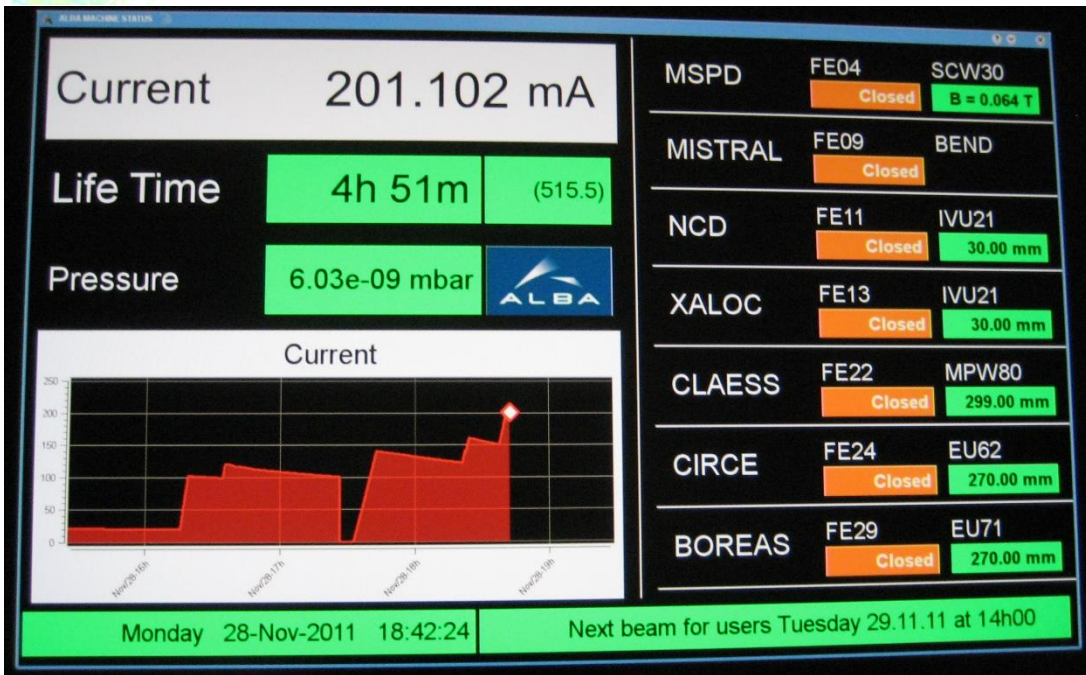
example: beam current measurement

Evaluate numbers of e- covering 12 orders



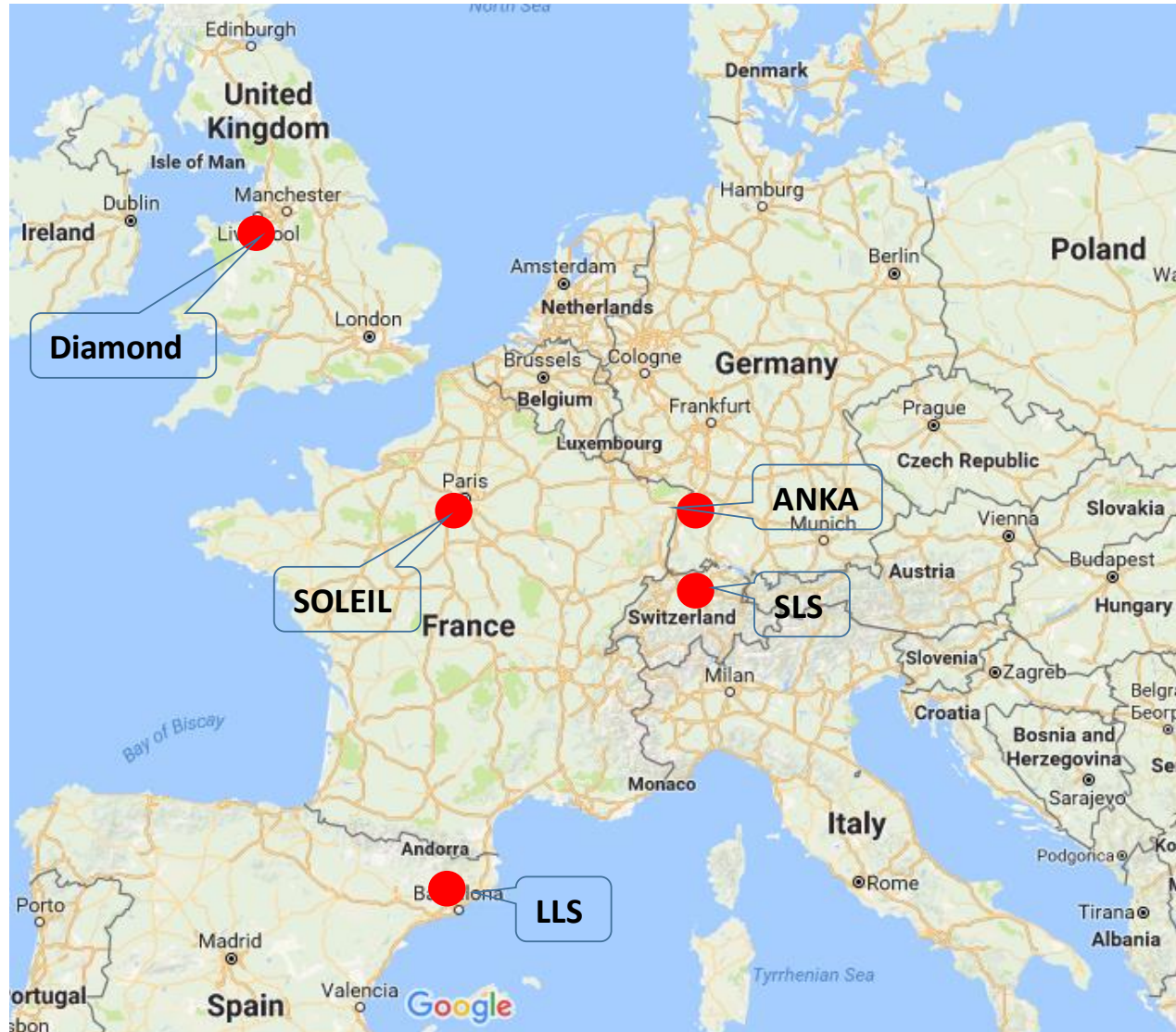


# November 2011: The highest current at ALBA (so far)





# New Sy-LI-Sources in Europe (1992-1995)









**DG Matsuura and Minister Toukan**



**Inauguration of SESAME**



**King Abdullah II and Prof. Schopper**