

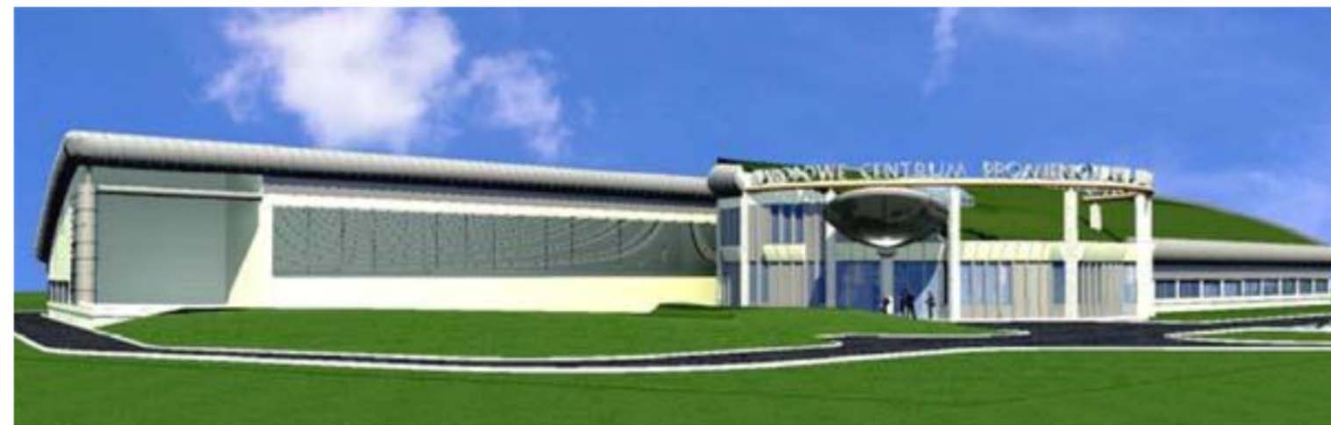


SOLARIS

The First Synchrotron in Poland



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Outline



- Short history
- The project's fundamentals
- Machine parameters
- Time schedule and current activities
- International cooperation
- Summary



History of efforts



- ~ **1998** first idea emerged
- **1998-2006** several failed tries:
 - transfer BESSY or SuperACO, Aurora-2, low-energy ring based on Metrology Light Source
- **2006-2008** fight for a 3 GeV ring – Canadian Light Source
 - September 2006 – application for establishing The National Synchrotron Radiation Centre
 - February 2007 – the Centre listed an ‘indicative’ project
 - **September 2008: only 40 M€ allocated**
- **End of 2008** preliminary contract adjusted to budget -signed
- **2009** series of international brain storms: *the best synchrotron light source for 25 M€*
 - **1.5 GeV ring project based on the MAX-Lab technology**
- **October 2009** adjusted feasibility study submitted
- **February 2010** evaluation process successfully completed and **the project approved**



Three important dates



- **30 October 2009**

Memorandum of Understanding between MAX-lab and Jagiellonian University





Three important dates



- **9 April 2010**

The Minister of Science and Higher Education and The Jagiellonian University Rector signed the contract for National Electromagnetic Radiation Research Centre at the Jagiellonian University





Three important dates



- **24 March 2011**

Building company was selected and contract was signed





Structure

Jagiellonian University

Wide Units

National Synchrotron Radiation
Centre SOLARIS

Head of the NSRC
Prof. Marek Stankiewicz

Machine

Prof. Carlo Bocchetta
Machine Leader
MSc. Piotr Goryl
Control Systems
Dr. Piotr Tracz
RF Systems
MSc. Łukasz Walczak
Vacuum Systems
Dr. Adriana Wawrzyniak
Accelerator Physics

Beamlines

**Beamlines
Managers**

Administration

Michał Młynarczyk
Head of Administration
Ewa Musiał – *Secretary*
*Others from the
University*

website:
www.synchrotron.pl

Faculties

Faculty of Physics, Astronomy and
Applied Computer Science

Institute of Physics

Synchrotron Radiation Department

Staff:

Prof. Krzysztof Królas
Head of Department
Prof. Marek Stankiewicz
Head of the NSRC
Dr. Jacek Kołodziej
Dr. Paweł Korecki
Dr. Piotr Tracz
Ms. Krystyna Szalkowska -secretary
Students:
MSc. Grzegorz Goryl
MSc. Natalia Tomaszewska
Mr. Karol Dąbrowski

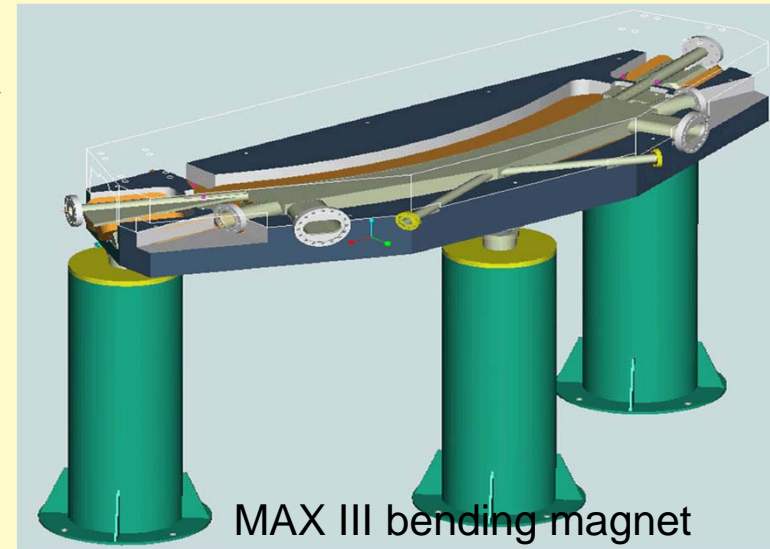
website:
www.if.uj.edu.pl/pl/ZPS/index_en.htm



The project's fundamentals



- Building – 15 M€
- Machine (injector, storage ring, beamline) – 25M€
- Close cooperation with MAX-Lab:
 - MAXIV facility
 - 3 GeV storage ring
 - 1.5 GeV storage ring in two copies
 - SPF – short pulse facility
- **Integrated magnets technology**
 - ✓ 1 block for the entire DBA in the 1.5 GeV ring
 - ✓ Compact lattice
 - ✓ Combined- function magnets for compact optics
 - Gradient dipoles in both rings
 - Quads with integr. sextupole in 1.5 GeV ring
- Solid-iron magnet block magnets
 - excellent alignment
- Massive concrete supports with mounting plate
 - excellent stability
- **NEG coated vacuum chambers**
 - ✓ reduction of ion pumps and lumped absorbers
- **100 MHz RF system + 300MHz Landau Cavities**



MAX III bending magnet

- M. Eriksson, M. Bergqvist, L.-J. Lindgren, M. Brandin, M. Sjöström, S. Thorin, *Proceedings of EPAC 2006*, Edinburgh, Scotland
- G. LeBlanc, Å. Andersson, M. Demirkan, M. Eriksson, L.-J. Lindgren, H. Tarawneh, S. Werin, B. Anderberg, *Proceedings of the 2003 Particle Accelerator Conference*

MAX III magnetic cell

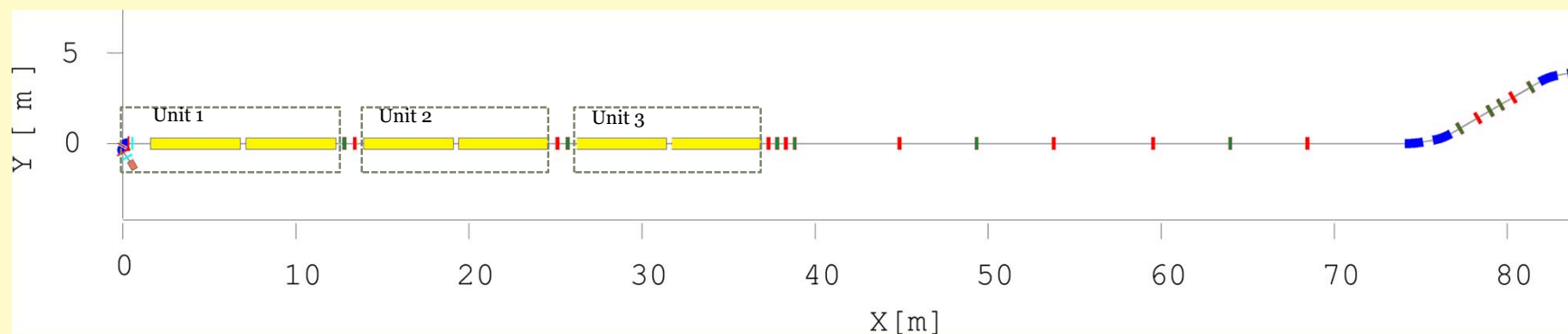
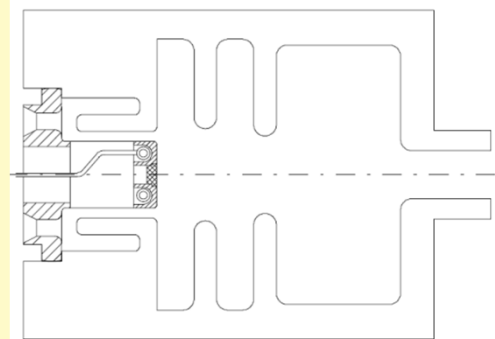


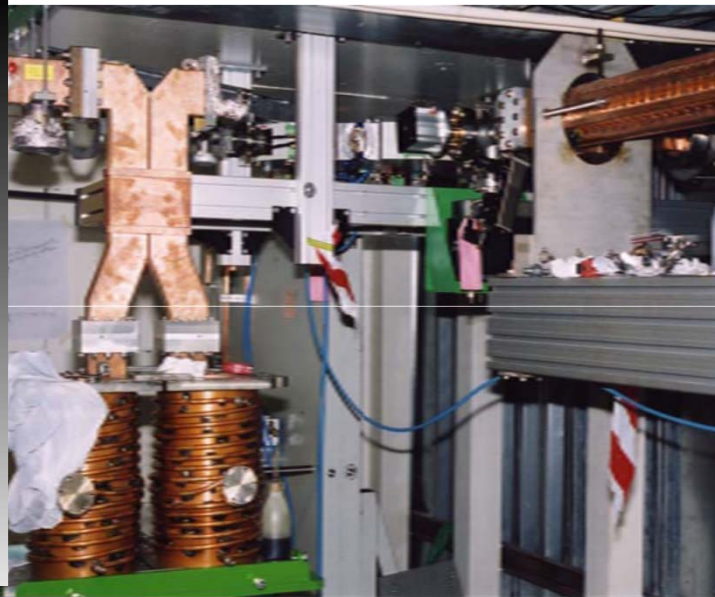
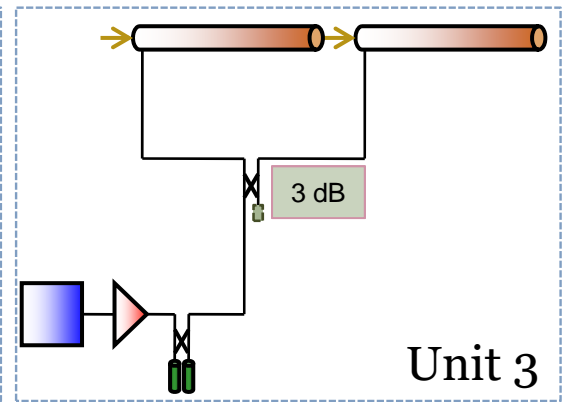
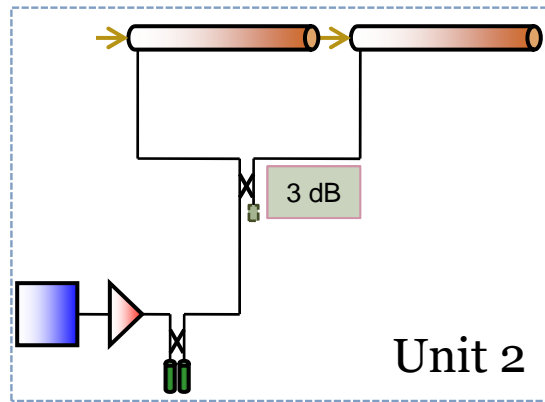
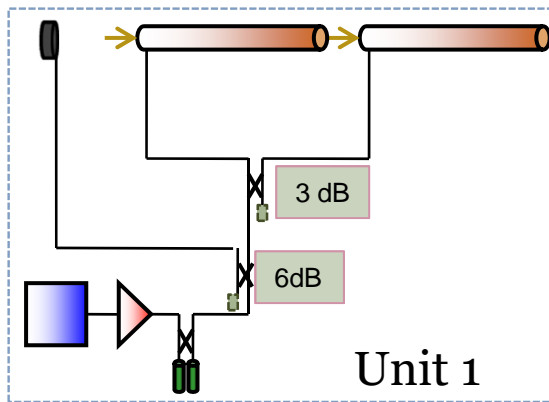


Injector



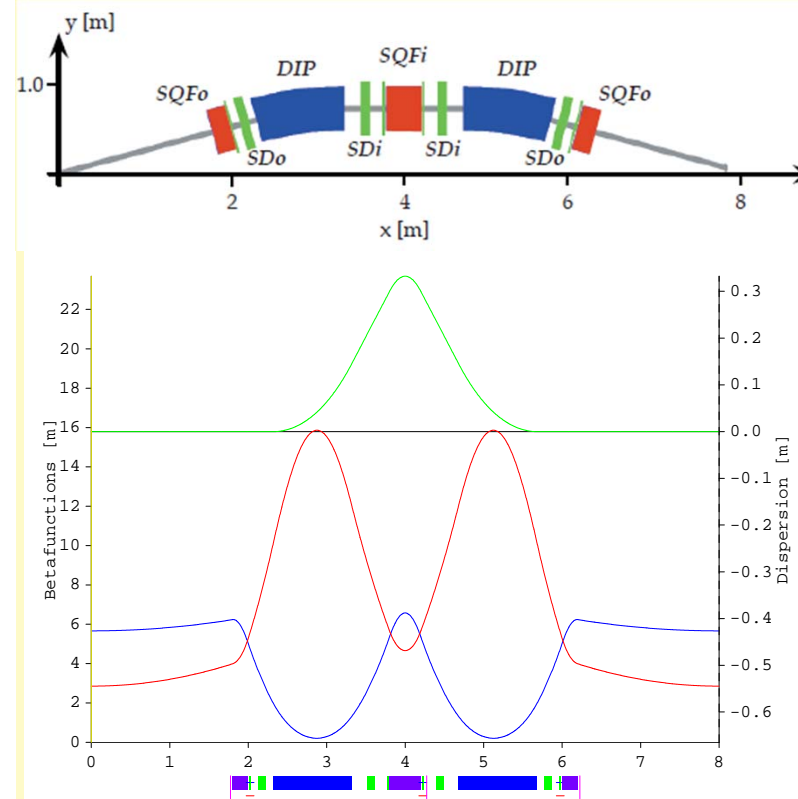
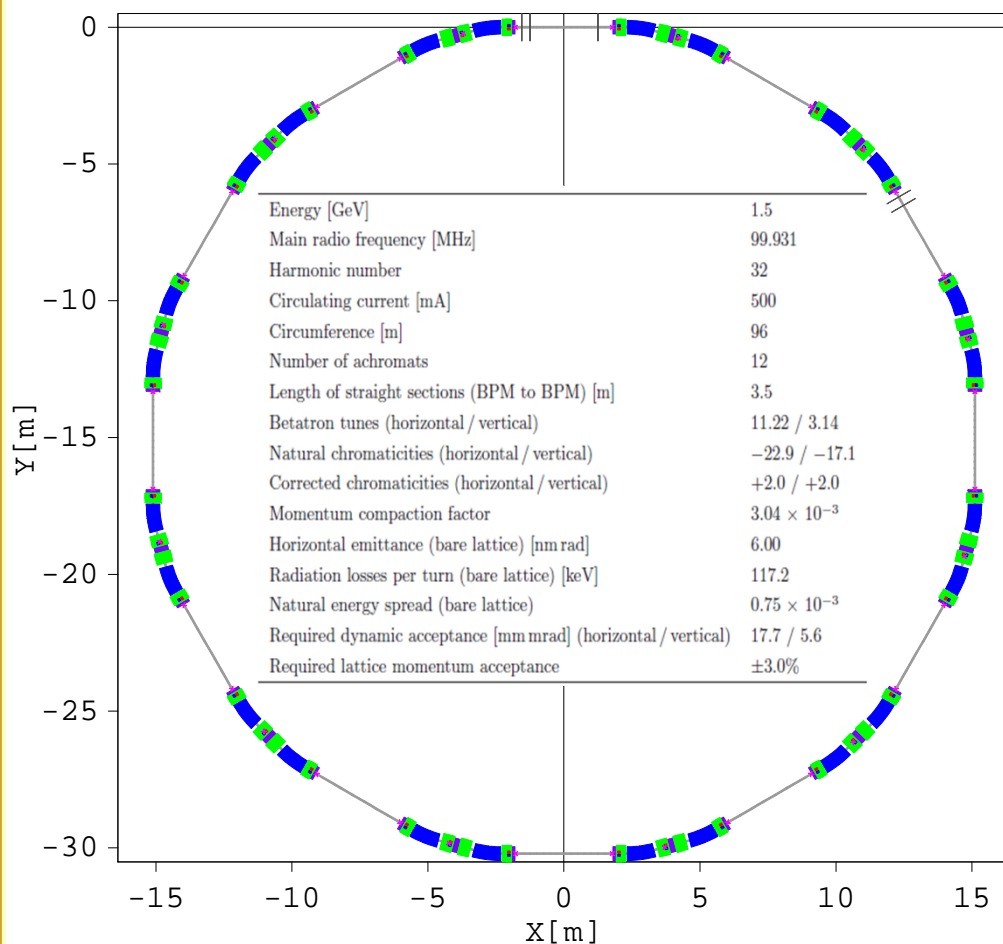
- Thermionic 3 GHz RF gun - BaO cathode
- ✓ Normalized emittance -11π mm mrad
- ✓ Energy – up to 2.3 MeV
- 6 accelerating structures combined in 3 units
- ✓ Accelerating gradient 20 MeV/m
- ✓ S-band – 2998.5 MHz
- Power: 3 RF Units :
- ✓ ScandiNova K2 modulators
- ✓ Toshiba klystrons
- ✓ SLED cavities







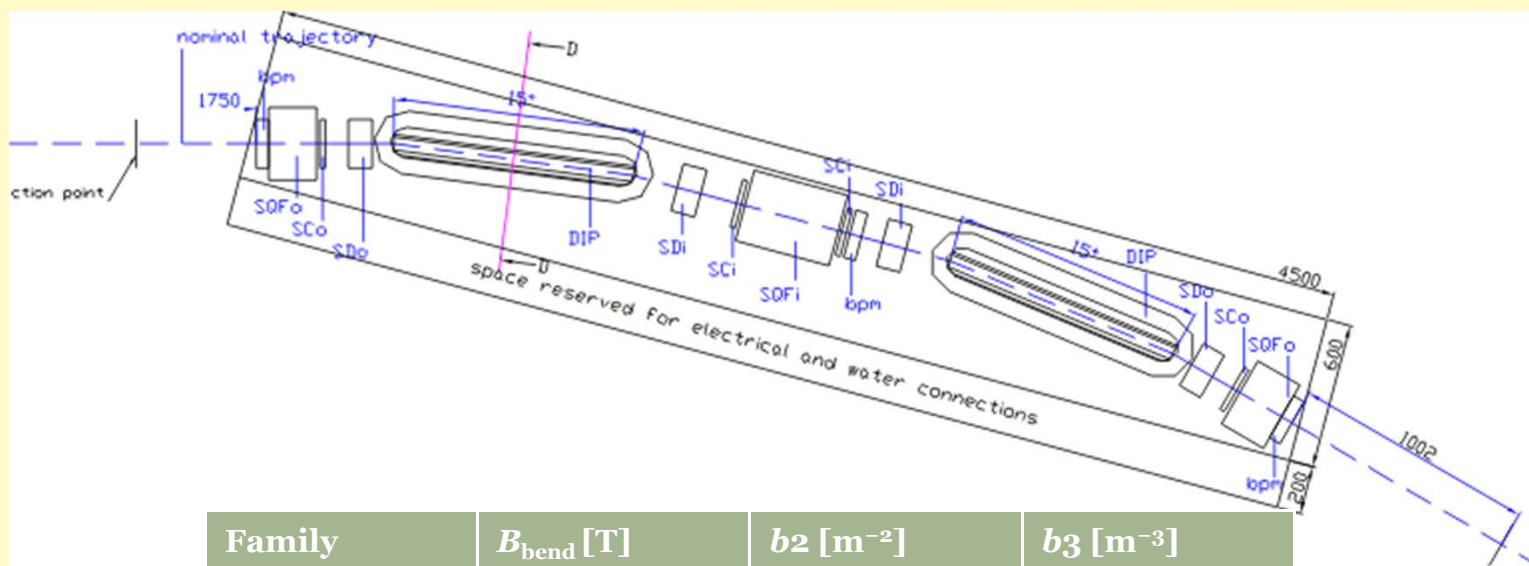
Storage Ring



Design done by MAX-lab accelerator group led by Prof. Mikael Eriksson



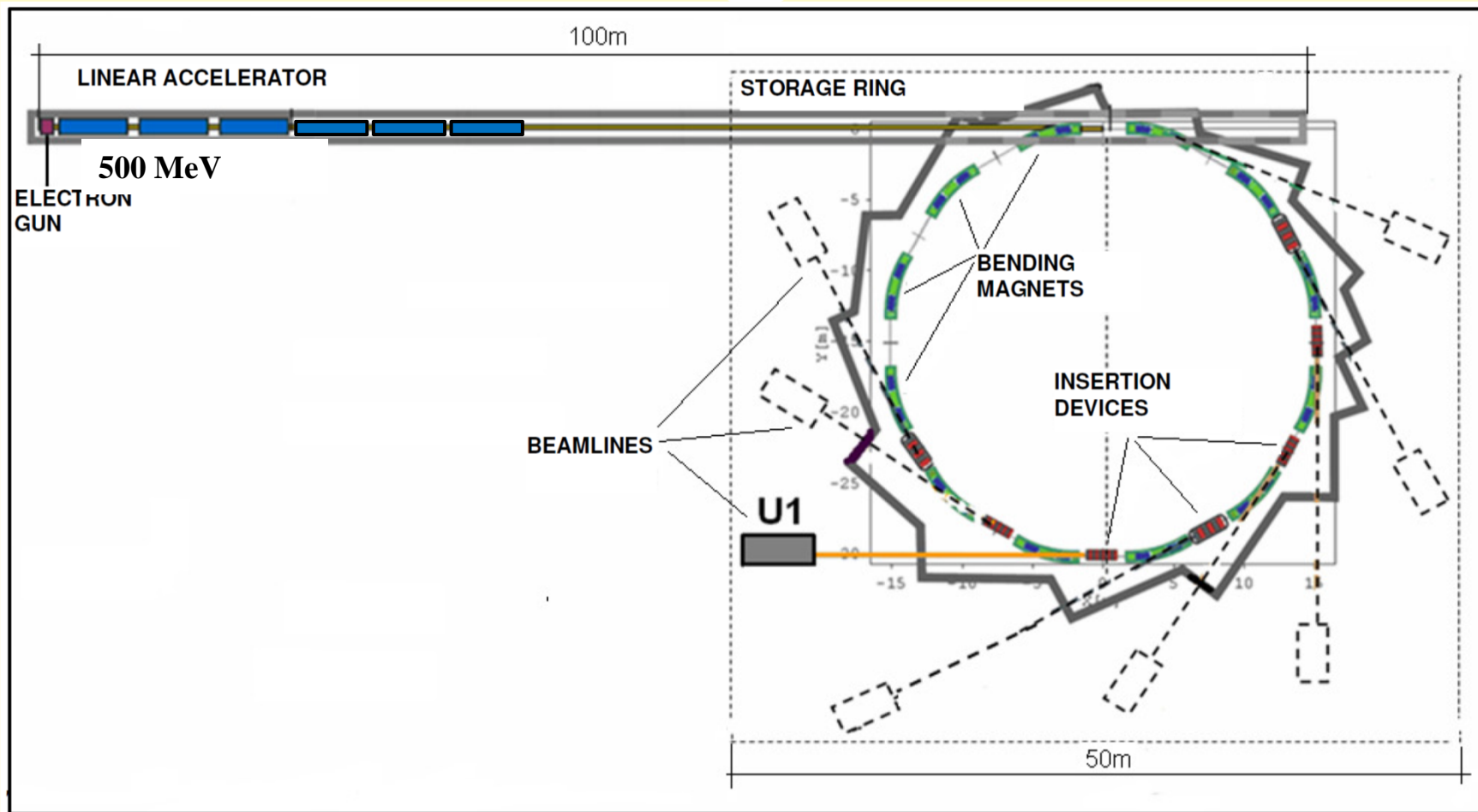
Magnets



Family	B_{bend} [T]	b_2 [m ⁻²]	b_3 [m ⁻³]
DIP	1.31	-1.35	—
SQFi	—	5.00	28.04
SQFo	—	5.74	36.68
SDi	—	—	-68.18
SDo	—	—	-84.76
SCi	—	—	-20.16
SCo	—	—	-30.00



Machine





Current Activities



- Ongoing training – 2 people at MAX-lab, 1 at PSI, 1 at ALBA
- Ongoing work on building design
- Machine design at MAX-lab
- Logo competition
- Purchasing procedures started:
 - RF Units (ScandiNova)
 - Accelerating Units (Research Instruments)
 - Steel for magnets manufacturing (AK Steel Ltd.)
 - RF Cavities (Research Instruments)
 - Waveguides tender



International Collaboration



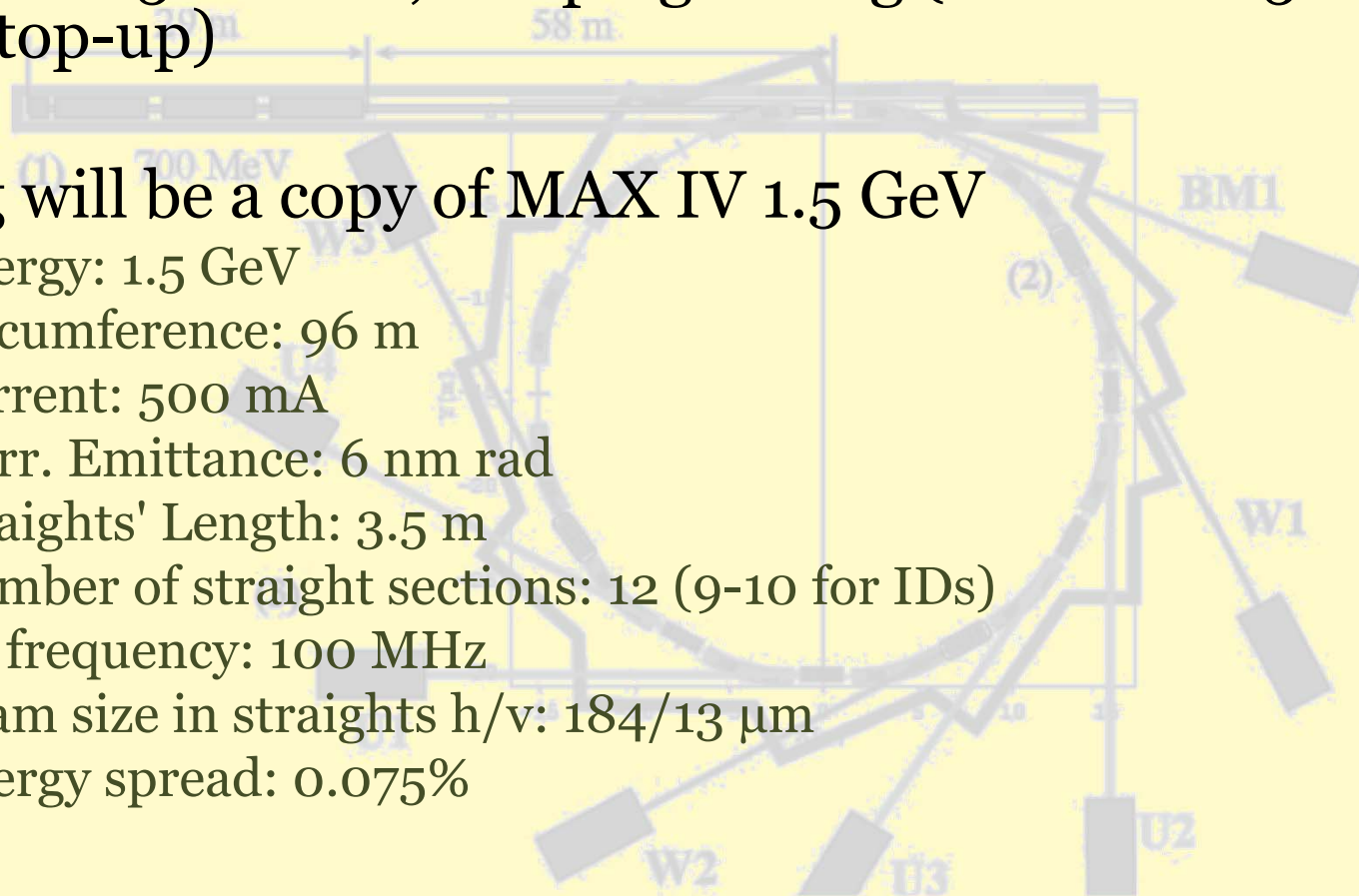
1. Agreement between MAX-lab, Lund University and Jagiellonian University (signed 20.12.2010)
 - Two identical 1.5 GeV storage rings ;
 - Design Project done by MAX-lab;
 - Tenders including option for SOLARIS;
 - Training – 2 people (Piotr Goryl, Adriana Wawrzyniak);
 - Expertise;
2. Agreement with ALBA (Barcelona, Spain) - negotiation
 - Cooperation regarding design of vacuum systems for MAX-lab and SOLARIS storage rings (NEG technology);
 - Training – 1 person (Łukasz Walczak);
3. Agreement with Swiss Light Source – PSI (Villigen, Switzerland)- negotiation
 - Training in RF systems – 1 person (Piotr Tracz);
 - Cooperation in experimental beamlines construction ;
4. Agreement with ELLETRA (Trieste, Italy) -negotiation
 - Apparatus winning;
 - Support in installation and start up of SOLARIS;
 - Cooperation in experimental beamlines construction ;



Machine Parameters

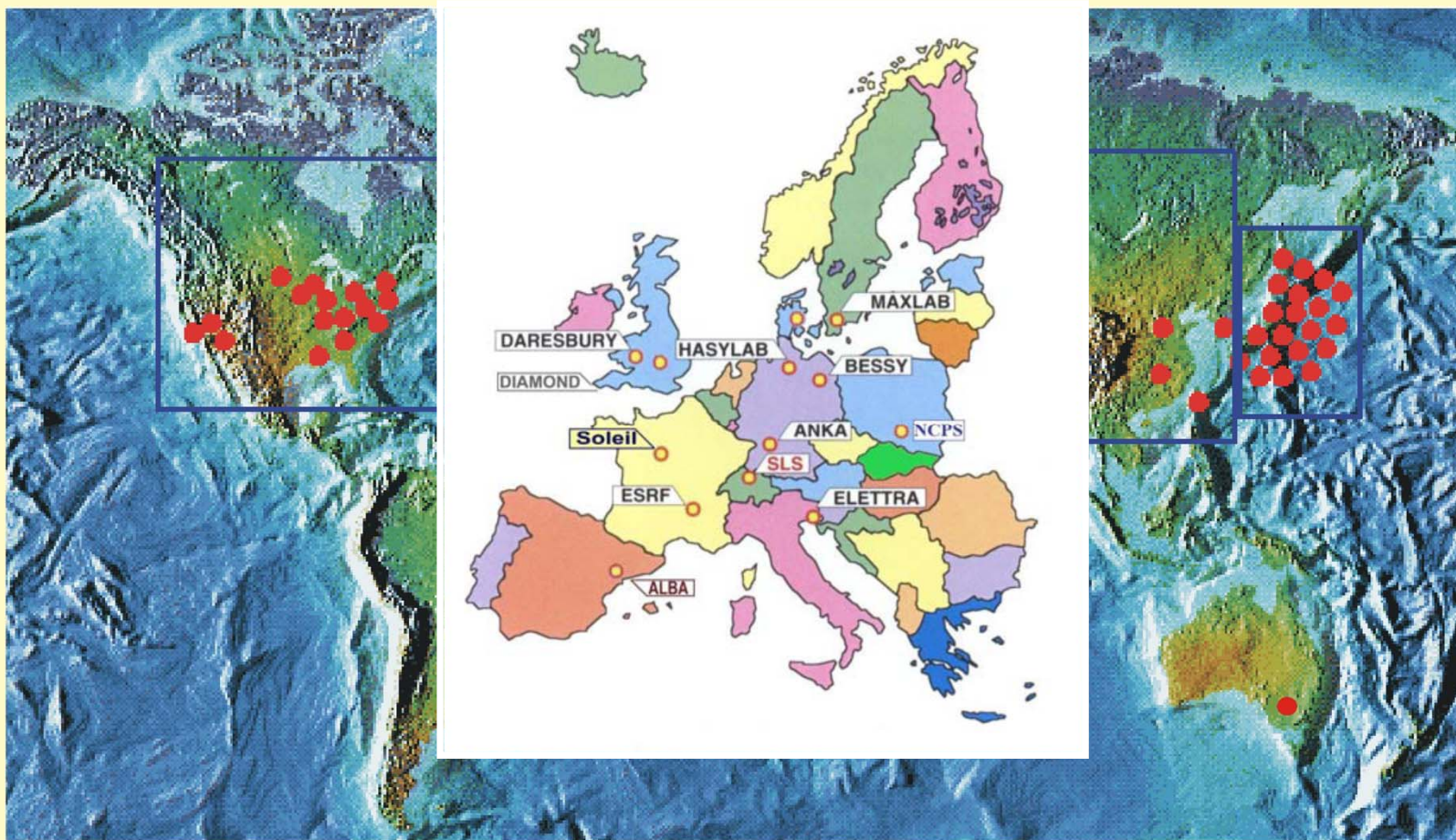


- Injector: 500 MeV, ramping in ring (in future 1.5 GeV and top-up)
- Ring will be a copy of MAX IV 1.5 GeV
 - Energy: 1.5 GeV
 - Circumference: 96 m
 - Current: 500 mA
 - Horr. Emittance: 6 nm rad
 - Straights' Length: 3.5 m
 - Number of straight sections: 12 (9-10 for IDs)
 - RF frequency: 100 MHz
 - Beam size in straights h/v: 184/13 μm
 - Energy spread: 0.075%



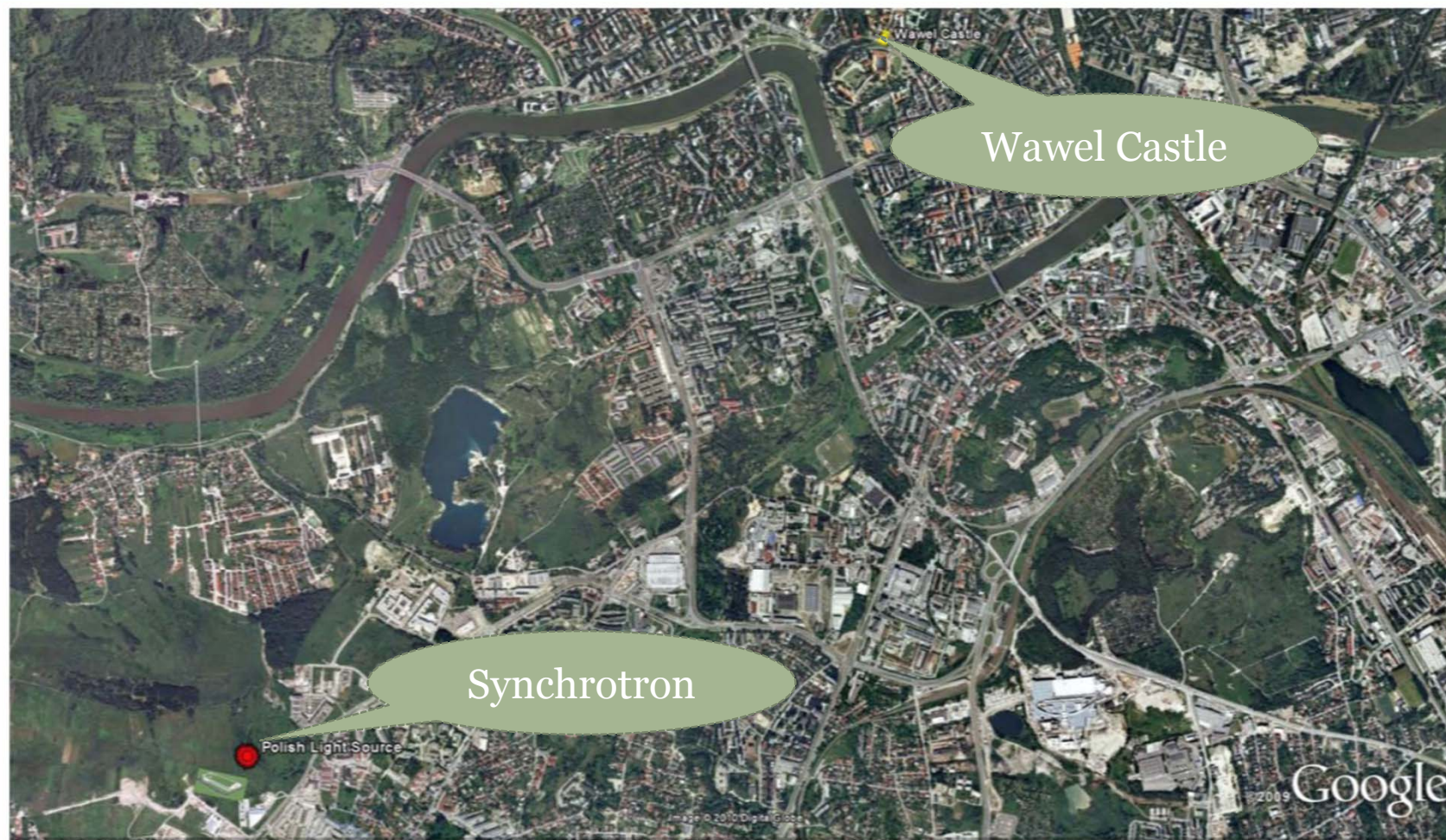


Localization





Localization





Localization



- Kraków, Poland





Acknowledgements



- **MAX-lab managers and experts**
 - Nils Martensson
 - Mikael Eriksson
 - P.F. Tavares, J. Modeer, D.Kumbaro, S. Werin, A. Andersson S. Leemann, M. Sjorstrom, S. Thorin, M. Johansson...many more
- **PSI – project support & training**
- **ALBA – collaboration in the vacuum** -Dieter Einfeld
- **Polish synchrotron radiation users community**
- **Polish Synchrotron Radiation Users Society**
- **Polish Synchrotron Consortium – 36 Polish research institutions**
- people from Jagiellonian University Institute of Physics
- M. Stankiewicz, C. Bocchetta, K. Królas, P. Goryl, P. Tracz, Ł. Walczak...others



Welcome in 2014
or even before



Thank you for your attention ☺