



Progress report on the SOLCRYS laboratory construction at SOLARIS synchrotron

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53nd (video)meeting of the PAC for CMP at JINR Dubna: January 25, 2021







- SOLARIS machine and beamlines
- SOLCRYS laboratory for Condensed Matter Research
- Synchrotron radiation source
- Experimental hall extension
- JINR beamlines





SOLARIS machine (2015)







SOLARIS beamlines









SOLCRYS main activities









- SOLARIS machine and beamlines
- SOLCRYS laboratory for Condensed Matter Research
- Synchrotron radiation source
- Experimental hall extension
- JINR beamlines



Super-Conducting Wiggler for energy 5-20 keV



- Technical dialogue, conceptual design, external consultations on technical specification – 2019
- Tender offer submitted in June 2020





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Source activities schedule



Contract signed







Source activities

- Tender offer for SCW submitted by BINP
- Cryo-coolers not included
- Tender for cryo-coolers (December 2020)
- Offer by Sumitomo

Item	Price (EUR)	Price (USD)	Project (USD)
SCW	985 000	1 103 200	
Cryocoollers	110 970	125 000	
Transfer of cryocoolers & issurances	20 000	22 500	
Vaccum equipment	120 000	135 000	
TOTAL TOTAL (incl. taxes - VAT)	1 235 970 1 1 520 243 1	L 390 466 L 705 473	<u>1 316 000</u>





Budget adjustment

Support from Polish government

Agreement with the Ministry of Science and Higher Education (01/07/2020).

For 2020-2021 we received a support for construction of extended experimental hall, upgrade of cooling water system.

TOTAL: 18 100 000 PL ~ 4 M€







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Experimental hall extension design







Experimental hall extension design Liquid nitrogen transfer line for SOLCRYS







Experimental hall extension design Compressed air transfer line for SOLCRYS







Experimental hall extension design











Extension hall schedule

Stage																				tir	me	sca	le																
Preparation of initial documentation																											1												
Conceptual project - FIBAT																						4																	
Preparation tender documentation																																							
Zer des fan en en tier mei est en en tred																																							
Executive project																																							
Preparation of tender for construction																																							
Tender for hall construction, contract																																							
Construction site organization																																							
Spadework, demolition works																																							
Hall construction - an open shell																																							
Hall construction - a closed raw state																																							
Lieculear minastructure																																							
Water, sanitary and sewage infrastructure																																							
Cooling water infrastructure	L																																						
Ventilation and air conditioning systems																																							
LN2 system																																							
Other internal works																																							
Internal finishing works																																							
External finishing works																																							
Roads, parking places etc																																							
Tests, acceptance																																							
months	IV	۷	V	V	IVII	IX	х	XI	XII	T	Ш	Ш	IV	v	VI	VII	VIII	IX	х	XI	XII	T	Ш	ш	IV	v٧	VII	IX	XI	XII	1	Ш	Ш	IV	V	VI V	/II VI	III D	:
years					20	19								2020 2021												2022													

involved: P. Bulira & his team; NCPS IT group, M. Kozak, T. Kołodziej, J. Sławek, G. Gazdowicz, TEAM sc & co-workers

Financial support from MSHE







- SOLARIS machine and beamlines
- SOLCRYS laboratory for Condensed Matter Research
- Building extension design
- Superconducting wiggler tender
- JINR beamlines







Beamlines schedule

Stage										T											tir	me	sca	ale																				
Final selection of BL technical parameters																																												
Preparation of tender documentation															٩ı	Ter	nd	er	s	101	ıld	st	ar	t iı	mr	me	di	ate	lv	af	te	r si	ico	es	sfi	ul 1	ter	nde	er	fo	r			
Beam line tender, contract															e	(pe	eri	im	en	ta	l h	all	С	ns	str	uc	tic	n																
Preliminary design, project review																																												
Construction of BL components																																										\square		
Factory Acceptance Tests																																												
Construction of infrastructure for BL (Solaris)																																												
Radiation protection calculations																																												
Hutch tender, contract																																							Τ		Τ	\square		Γ
Construction of hutch (Solaris)												Γ				Τ														Τ									Τ		Τ	\square		Γ
Delivery to Solaris												Γ				Τ	Τ										Τ		Τ	Τ									Τ		Τ	\square		Γ
Assembly and integration																T										T	Τ	Τ	Τ	T	T											\square		Γ
Instalation & commissioning without beam																T										Γ	Τ	Τ	Τ	T	T											\square		Γ
Training of NCPS staff																T										Γ	Τ	Τ	Τ	T	T				T				٦					
Comissioning and final tests with beam																																												
months	IV	۷	VI	VII	VIII	IX	X	XI	XII	I	I		IN	۷	۷	II V	/II N	/111	IX	X	XI	XII	I	I			/ \	V	IV	IIV		X	()	I X		I			IV	۷	VI	VII	VIII	IX
years		2020													2	02	1											2	022	2				2023										





Beamlines conceptual design

- Technical dialogue with FMB Oxford Ltd. (UK), IRELEC (FR), AXILON (DE)
- Beamline splitting by a fixed apperture









Beamline endstations - BioSAXS







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Beamline endstations - MX

Diffractometer for MX endstation



SUND Precision

Optional : Helium enclosure for the entire Roadrunner cryst. goniometer

High-precision Roadrunner crystallography goniometer for conventional and serial crystallography experiments.

Chi-arc segment for optimal data collection (low symmetry space groups and for phasing experiments); Chi-range: 5 – 35 degree. Automatic sample changing system (Stäubli TX60L



Figure 1: Roadrunner crystallography overview image with overall dimensions (top) and view in beam direction (bottom). The actual design might slightly differ from the version shown here.

🛞 SUND

Diffractometer for MX endstation

- pinhole positioning unit providing space for 3 three different pinholes (travel range in x: +/- 3 mm, travel range in y + 3 mm / -12 mm)
- collimator mounted on a positioning unit, mounted on a x,y positioning
- photo-diode positioning unit, carries photodiode for X-ray beam intensity measurements, mounted on a x,z positioning unit, stepper motor operated,
- capillary beamstop for ultra-low background applications, consisting of a telescopic arrangement of different diameter tantalum capillaries as described in Meents et al, pink beam serial crystallography, Nature Comm. 2019,



Diffractometer for MX endstation

Roadrunner on-axis sample viewing microscope

- 20x microscope objective, NA = 0.25, working distance: 25 mm
- dual view system providing 2 different field of views: 1000 x 800 μm² (high-magnification) and 500 x 400 μm² (low magnification).
- alternatively a 10x objective offering a two times larger field of view can be provided.
- includes 2 pcs. GBit Ethernet cameras,





Figure 2: Roadrunner inline sample viewing microscope equipped with two cameras providing two different field of views. Mounted on a 4-axes positioning system. The actual design might slightly differ from the version shown here.

Diffractometer for MX endstation





Figure 4: Roadrunner III goniometer axis for high-speed scanning applications: It consists of a servo motor operated high-precision rotation stage with is equipped with a x,z centering stage to position the sample in the rotation axis. The center of the x,z stage is further equipped with fast linear stage oriented along the rotation axis, which allows for high-speed scanning of the samples with speeds of up to 100 mm/sec. The actual design might slightly differ from the version shown here. X,y,z positioning system is not shown here.





Beamline endstations – HP/LT XRD

- Adjustable pressure up to 10 GPa
- Diamond windows
- Compatible with DAC chambers
- Weight ~100g



- Adjustable temperature and gas flow
- Cryocooling system compatible with LN2 and LHe
- Temperature range: ~10-300K
- Measurements in helium atmosphere (helium tent)
- Helium recovery system



Oxford Cryosystems - N-HeliX



ColdEdge Technologies – The Stinger







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- JINR beamlines
- Endstations and auxiliary equipment







