



# Canadian Light Source

## An Introduction for LEAPS WG2 Workshop



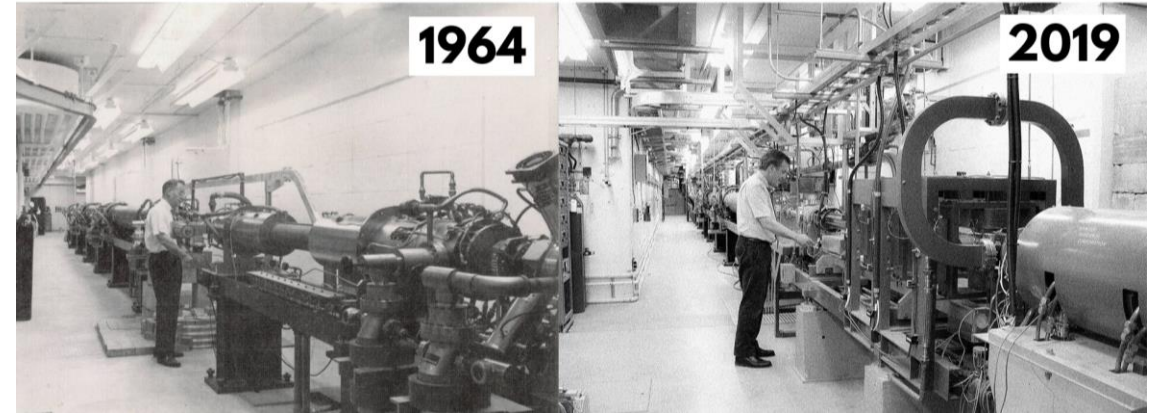
- CLS – Canadian Light Source
- Canada's only synchrotron
- National Facility located on a University campus





# Accelerators at CLS

- 300 MeV Linac, 2856 MHz, from 1964, originally used in the Saskatchewan Accelerator Laboratory, still used to inject the booster synchrotron.
- 2.9 GeV booster, 500 MHz RF, 1 Hz rep rate.
- 2.9 GeV, 171 m circumference Storage Ring.
- 1 CESR/B type SRF cavity.
- RF power limited to 220 mA.



SAL linac tunnel...

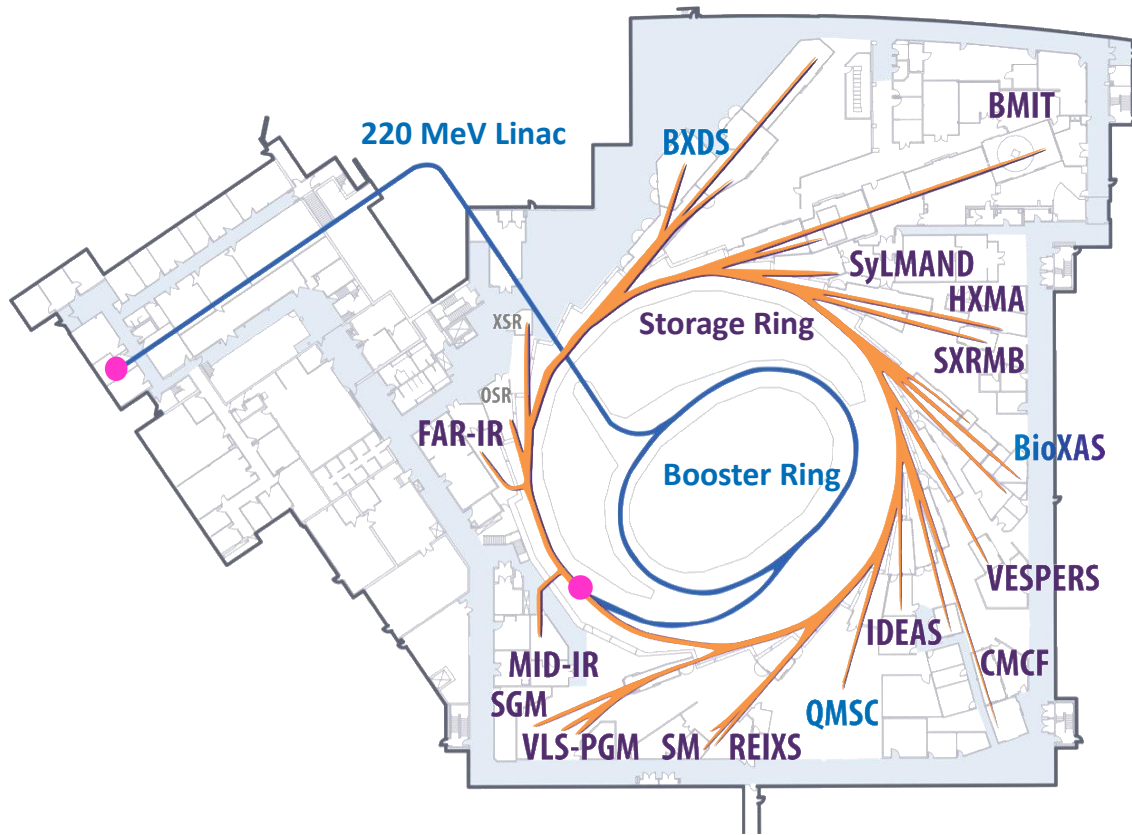
...CLS linac tunnel



CLS located on campus at the University of Saskatchewan



# Beamline Overview



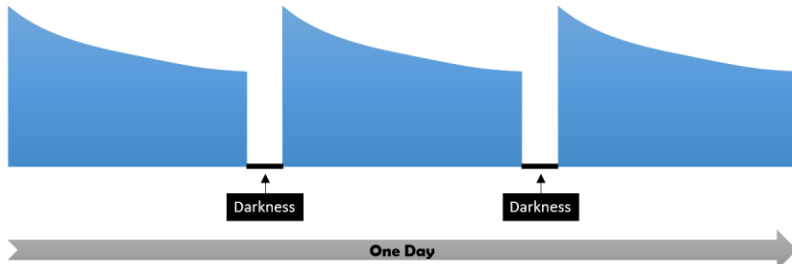
- 23 Beamlines (depending on how you count branch lines).
- 1 remaining straight available for the last beamport (funding application submitted for beamline, decision due Nov 2020).
- Many IDs constructed in CLS magnet lab and local industry.



# Top-Up and Current upgrade plans



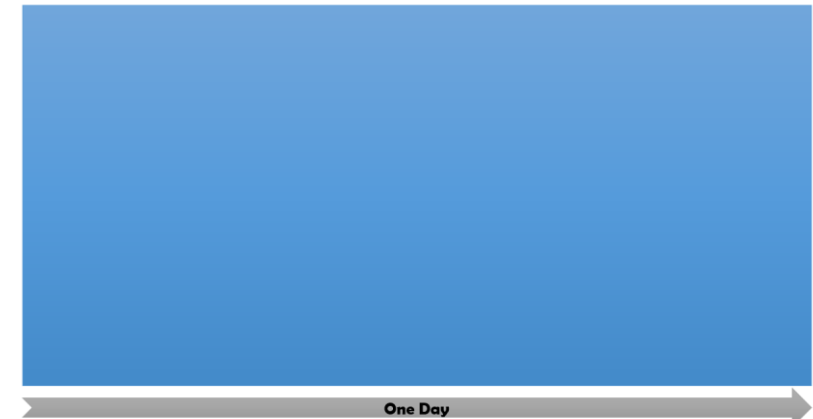
2005-2018



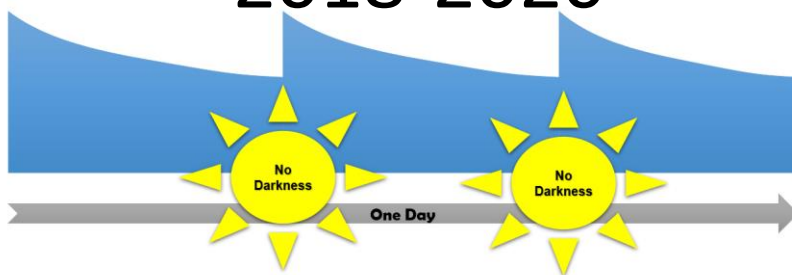
2021-2023



2024-2027

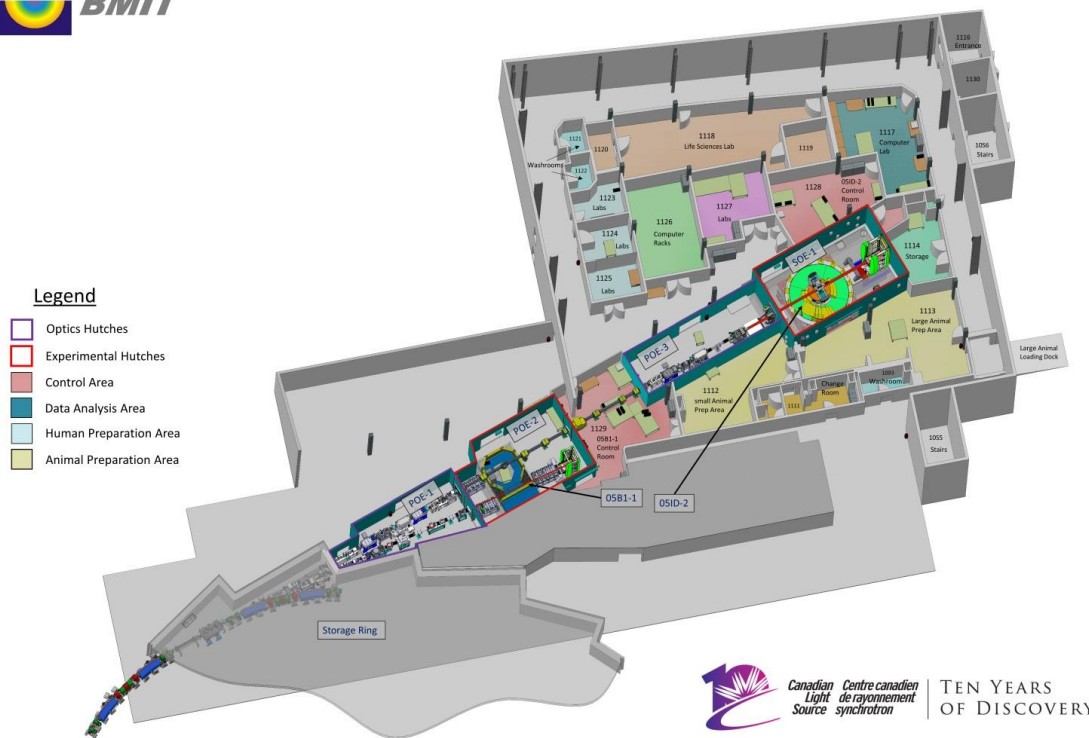


2018-2020





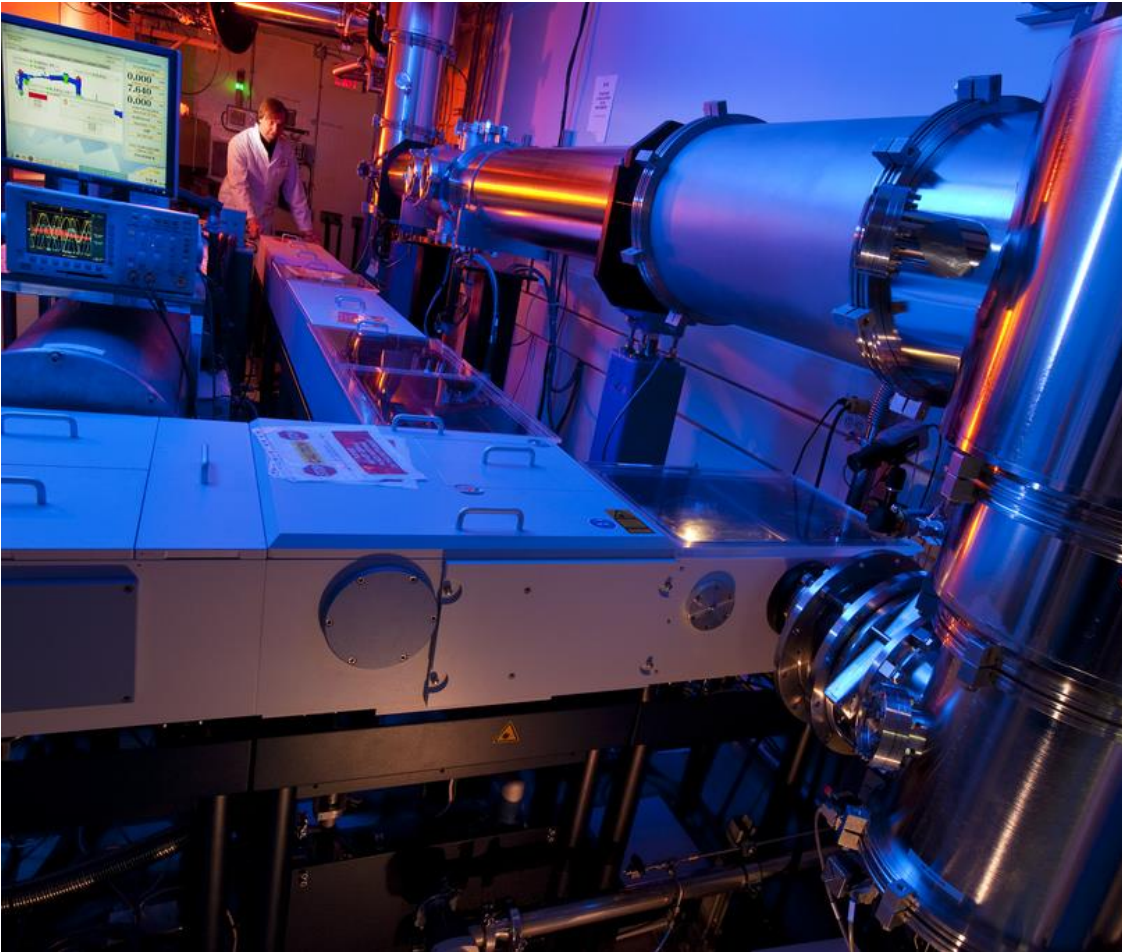
# BMIT long beamline for imaging



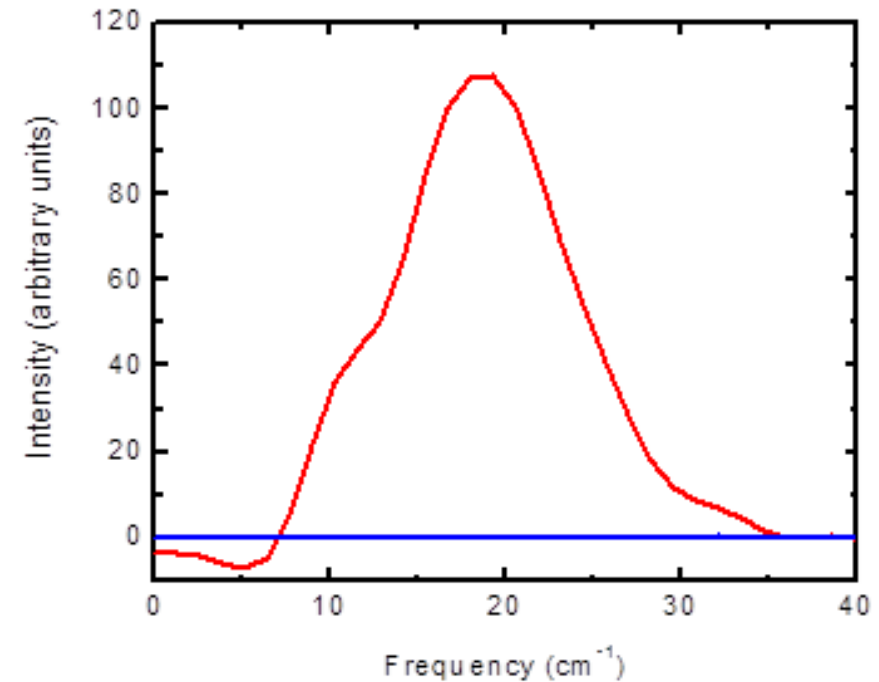
- Energy range on bend 12.6-40 keV
- Energy range on SC ID 25-150 keV
- Techniques:
  - Computer Tomography (CT)
  - Conventional Absorption Imaging
  - In-line (Propagation-based) Phase Contrast Imaging (PBI)
  - K-edge Subtraction Imaging (KES)
  - Monochromatic Microbeam Radiation Therapy



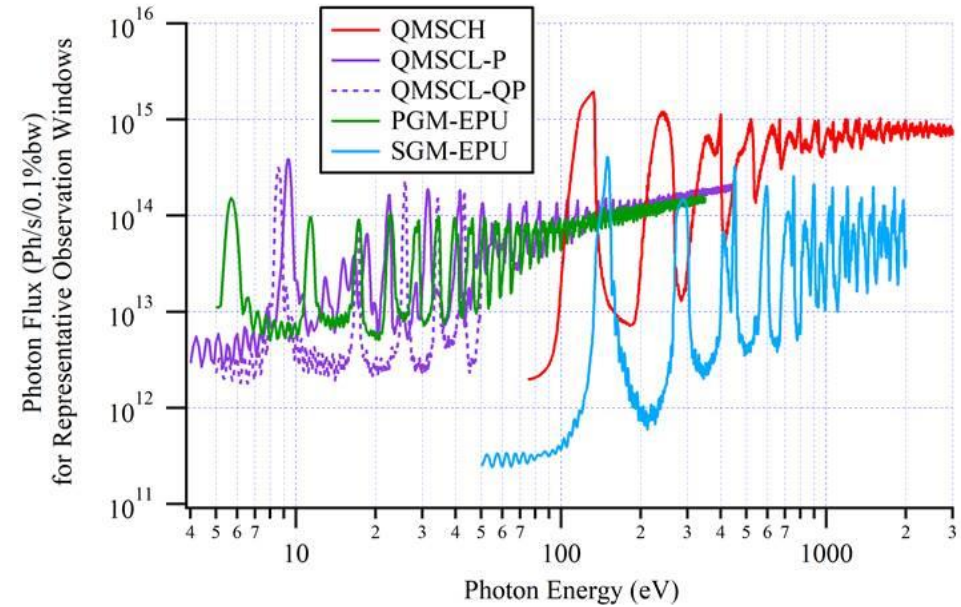
# CSR Mode for FarIR



- Special dedicated shifts for Far IR.
- $10^4$  enhancement in 7-25  $\text{cm}^{-1}$



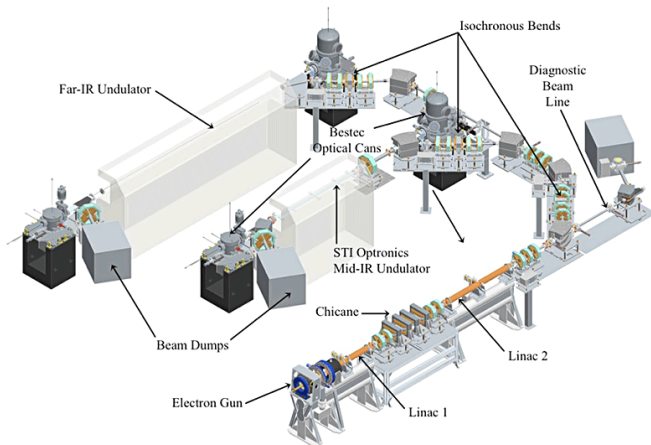
# QMSC and SGM/PGM Double ID Capabilities



Parameter	QMSC-HE	QMSC-LE	SGM-EPU	PGM-EPU
Photon Energy Range [eV]	200-1000	15-200	250-1560	12-300
Effective K-value	4.51	9.64	4.22	13.95
Undulator Period [mm]	55	180	54.2	142
Length of Magnetic Array [mm]	3923	3834	1638	1603
Number of Magnetic Periods (Full periods + 1 end period)	70+1	20+1	29+1	10+1

QMSC double ID at CLS built in Saskatchewan

# IR FEL Plans



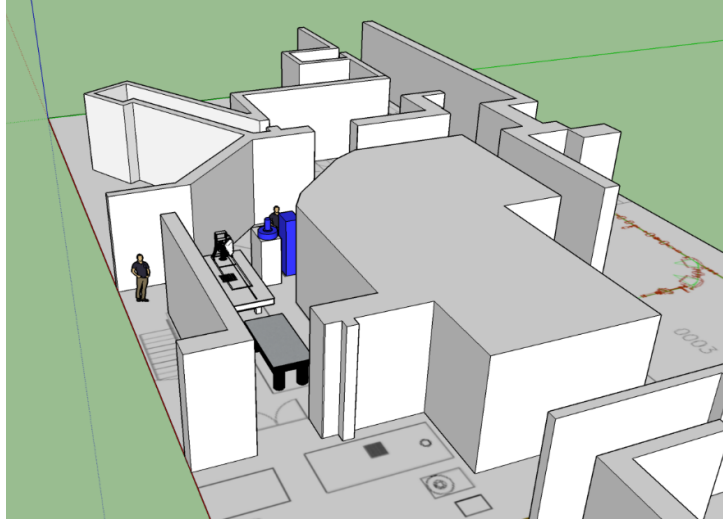
Fritz Haber Institute IR FEL

- University consortium with CLS as the institute to manage the user program.
- Application submitted based on design of the FHI IR FEL.
- Funding outcome announcement due Nov 2020.
- To be located in a new building being built at the University of Waterloo, near Toronto.





# Electron Source Lab



- New Electron Source Lab under construction, due for completion end 2020.
- Plan to install MAX IV 500 kV pulsed DC electron source and TU/e RF Photocathode.
- Development of capabilities in electron sources, in particular for CLS2 plans.





# CLS2 Plans for a New Ring

## Concept building drawing



## Preliminary lattice design parameters

CLS	2.0	2.1	2.2	
Energy		3.0		GeV
Size	590.4	589.8	588.0	m
Periodicity		16		
$v_x$	62.2	68.2	66.15	
$v_y$	22.3	20.3	21.3	
$\epsilon$	37	39	<b>25</b>	pm
$\delta$	0.08	0.08	0.10	%
Straights				
$\beta_x$	8.94	1.24	2.23	m
$\beta_y$	3.43	11.96	5.95	m
$\eta_x$	0.01	0.0	0.0	m
$\alpha_c$	5.0	2.6	5.4	$\times 10^{-5}$
RF freq.		500		MHz
RF voltage		3		MV
Harm. #	984	983	980	
Current		300		mA
Coupling		10		%
Lifetime	9.9	5.1	9.2	hr