New CLS e-linac

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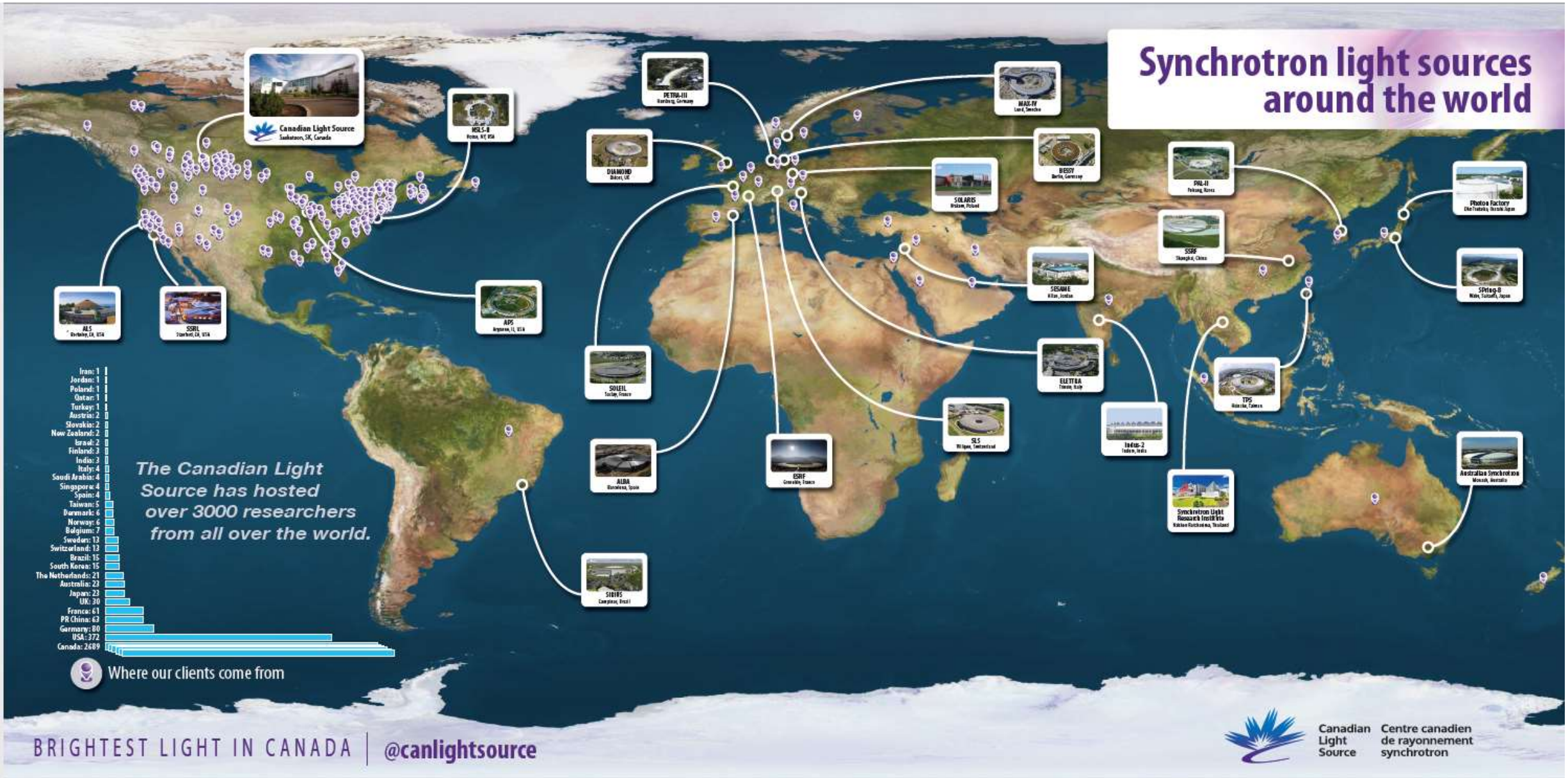
National research facility for synchrotron light

- Canada's only synchrotron light source.
- Owned by the UofS and funded primarily through federal funding.
- Operating since 2005 for open user access.
- One of 20 of its type in the world.
- Used by thousands of researchers from Canada and around the world.

View over CLS beamline experimental floor.


Synchrotron light sources around the world
Canadian Light Source
Saskatoon, SK, Canada
NSLS-II
PETRA-III
MAX-IV
DIAMOND
SOLARIS
BESSY
PAL-II
Photon Factory
SSRF
SESAME
SPring-8
ALS
SSRL
APS
SOLEIL
ELETTRA
TPS
SLS
Indus-2
ESRF
ALBA
Australian Synchrotron
Synchrotron Light Research Institute
SIRIUS
Iran: 1
Jordan: 1
Poland: 1
Qatar: 1
Turkey: 1
Austria: 2
Slovakia: 2
New Zealand: 2
Israel: 2
Finland: 3
India: 3
Italy: 4
Saudi Arabia: 4
Singapore: 4
Spain: 4
Taiwan: 5
Denmark: 6
Norway: 6
Belgium: 7
Sweden: 13
Switzerland: 13
Brazil: 15
South Korea: 15
The Netherlands: 21
Australia: 23
Japan: 23
UK: 30
France: 61
PR China: 63
Germany: 80
USA: 372
Canada: 2689
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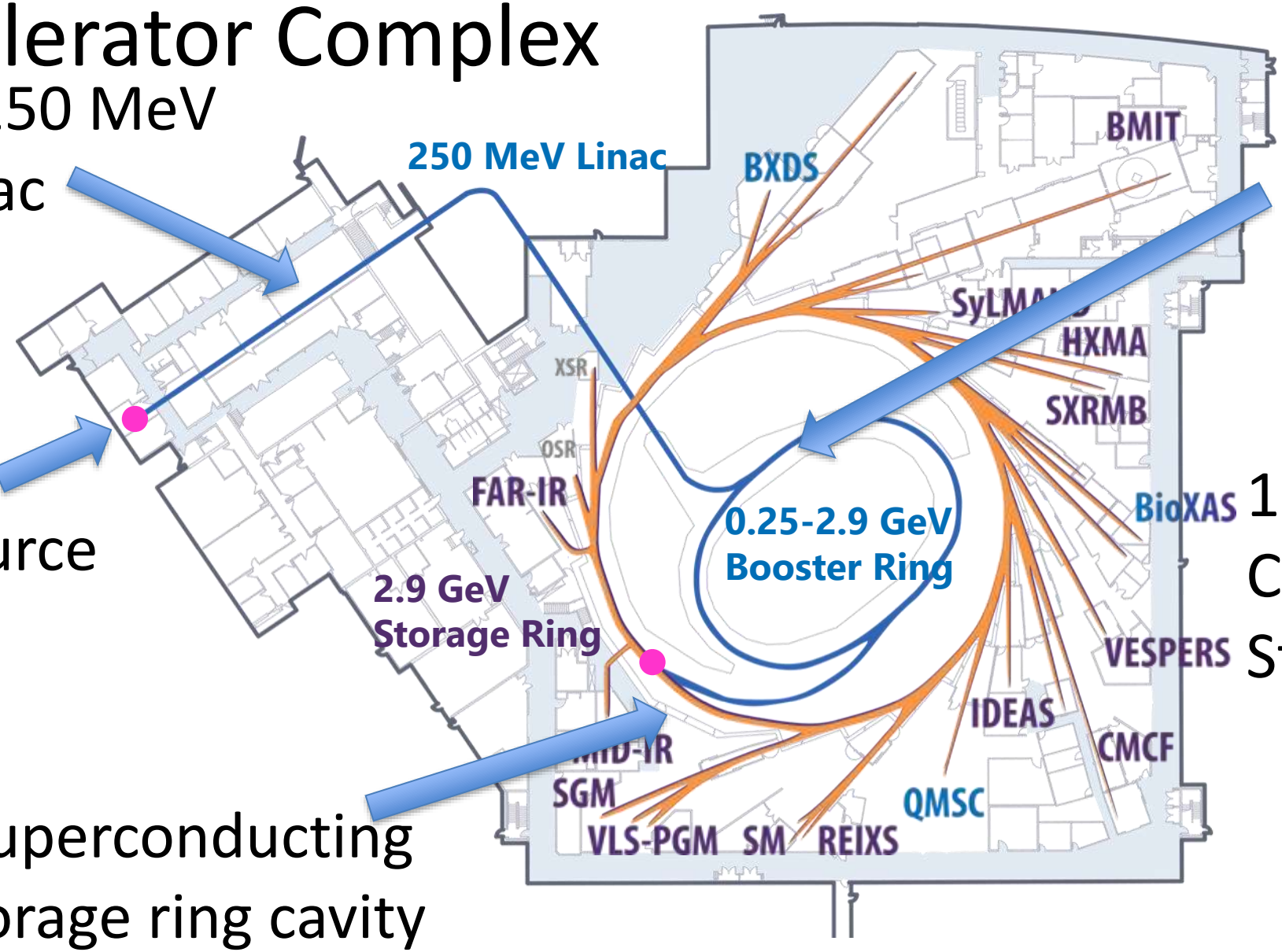
https://www.lightsource.ca/public/tours.php#VirtualTour

CLS Accelerator Complex

2856 MHz 250 MeV electron linac

250 kV DC electron source

500 MHz Superconducting 2.9 GeV Storage ring cavity



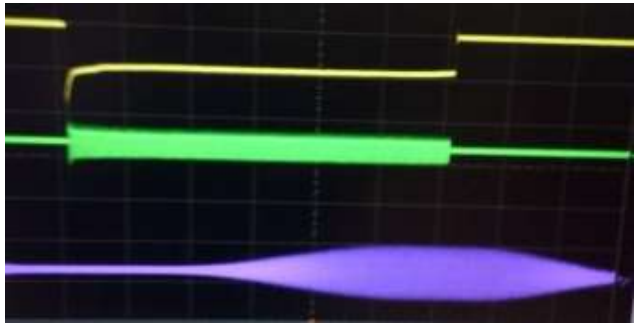
500 MHz 0.25-2.9 GeV booster cavity

171 m Circumference Storage Ring

CLS Electron Injection Scheme

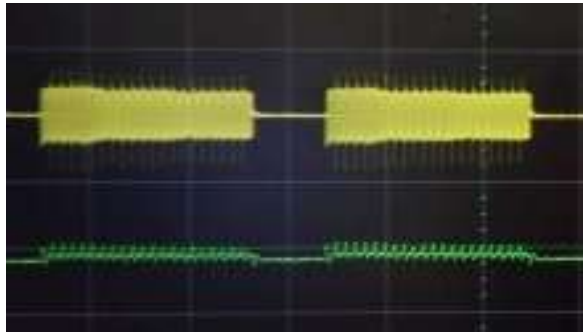
- Linac: 250 MeV, 1-140 ns, 3 nC, 1 Hz rep. rate. (booster limit)
- Booster Synchrotron: 0.25 – 2.9 GeV, 1 Hz ramp, 65% eff. to SR
- Storage Ring: 0.5 nC every 3-4 minutes across 500 ns train

Booster Ramp



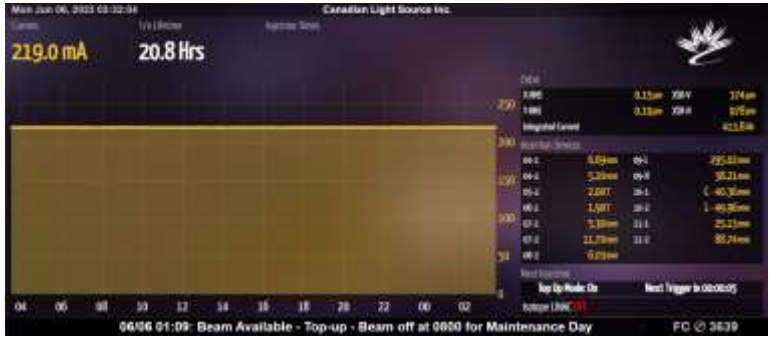
1 second

Stored Bunches



500 ns

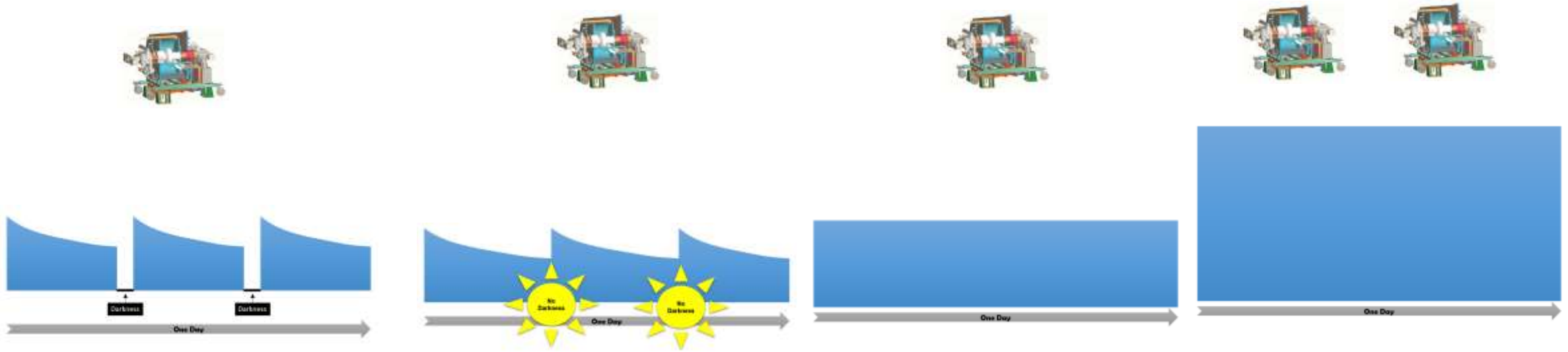
Top-Up User Beam



1 day

CLS Operations Evolution

- Decay mode: linac used every 8 hours to fill storage ring
- Top-Up: mode every 2-3 minutes require 0.5 nC from linac
- Currently limited by RF power



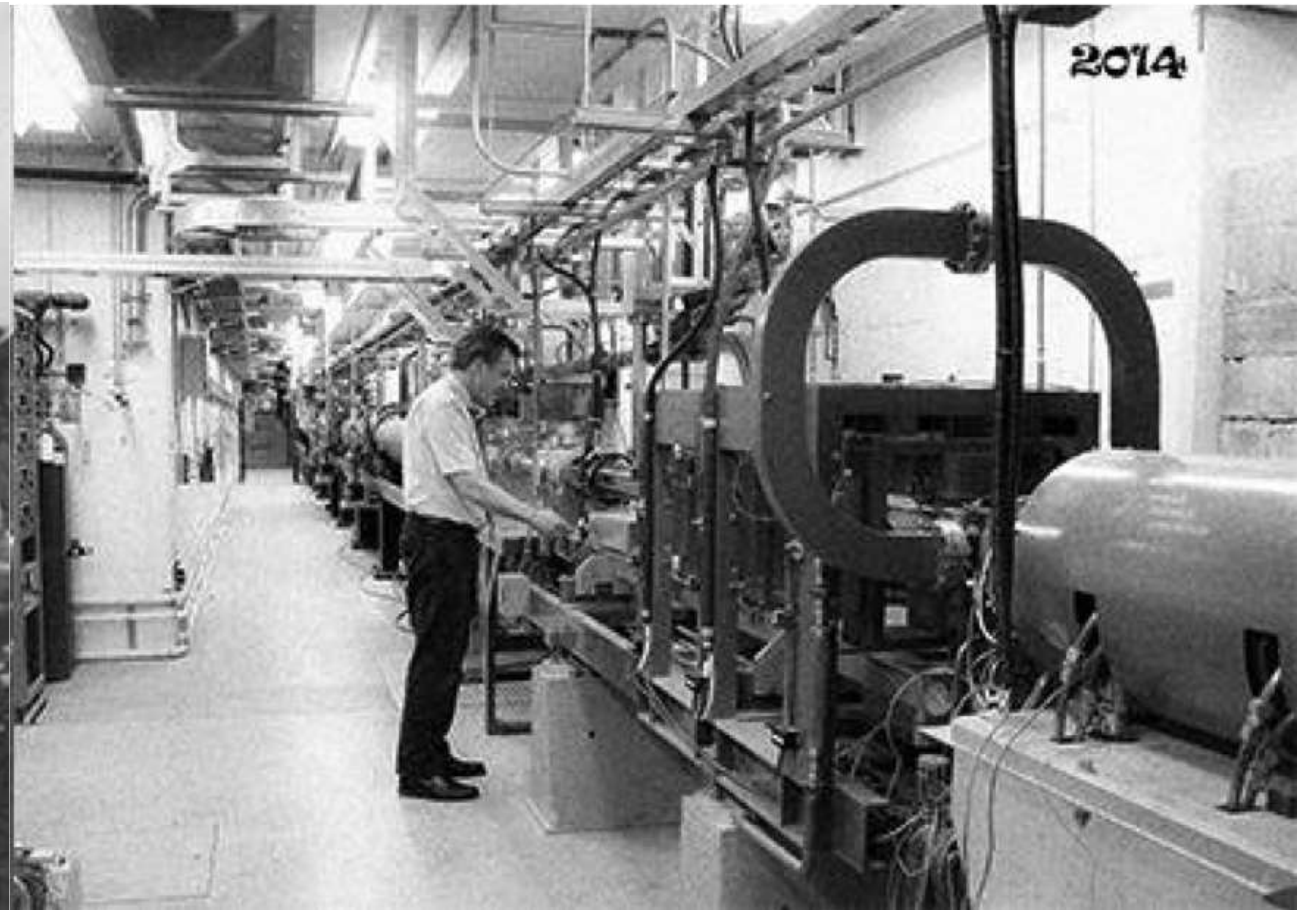
2005-2017 2018-2020 2021-2023 2024-2029

CLS Emerged from SAL

Sir John Cockcroft, Nobel laureate, turns the first sod for the Saskatchean Accelerator Laboratory. May 10th 1962. University of Saskatchewan President J.W.T. Spinks watches.

Present linac dates from this era.

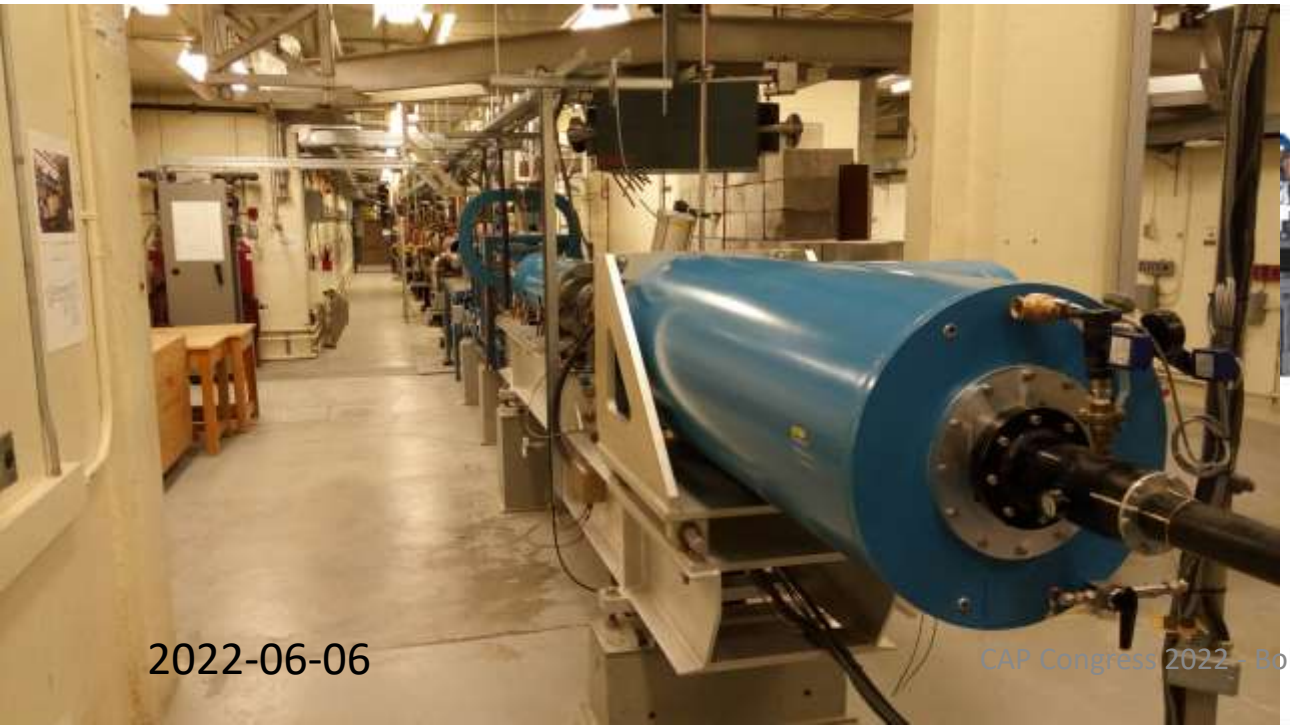
CLS built on historical SAL established in 1962

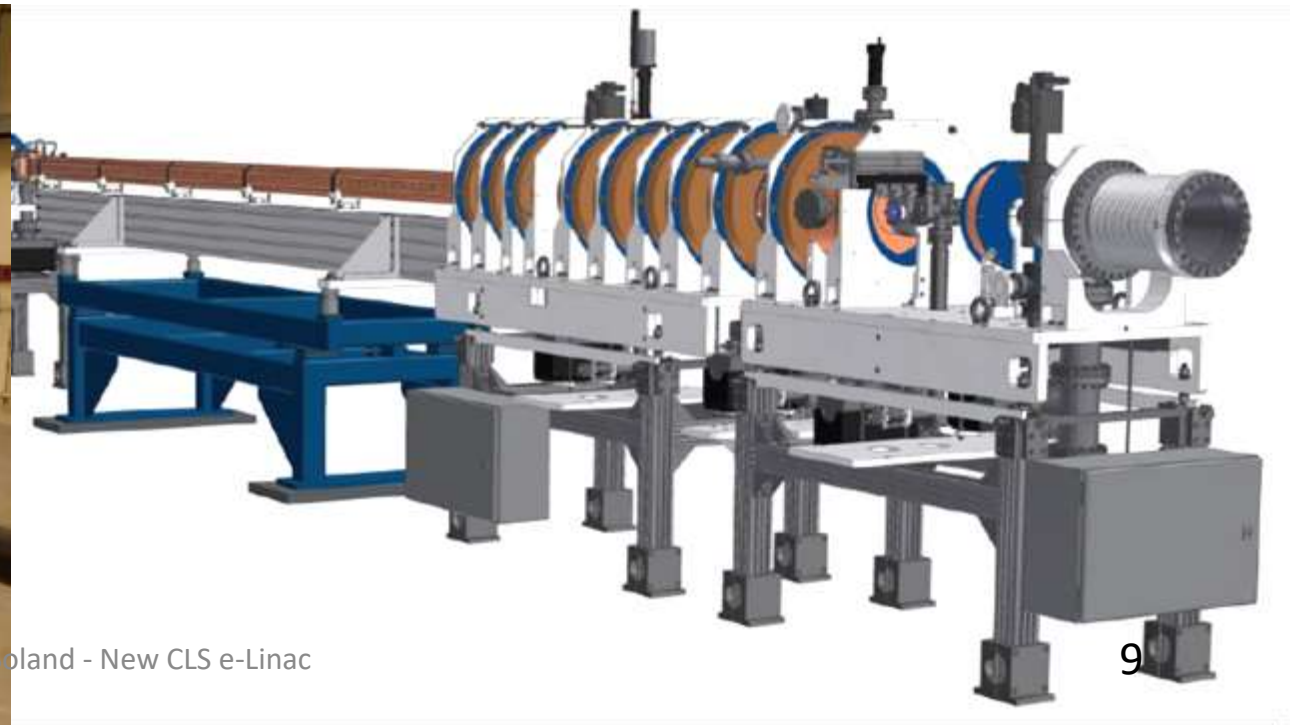


New Linac

- Funded project 2022-2025
- Negotiating contract with industry
- Dark period ~4-5 months in

- Old SAL linac 2856 MHz
- New linac 3000 MHz synchronized with 500 MHz ring frequencies
- Design with SLED RF pulse compression and half length

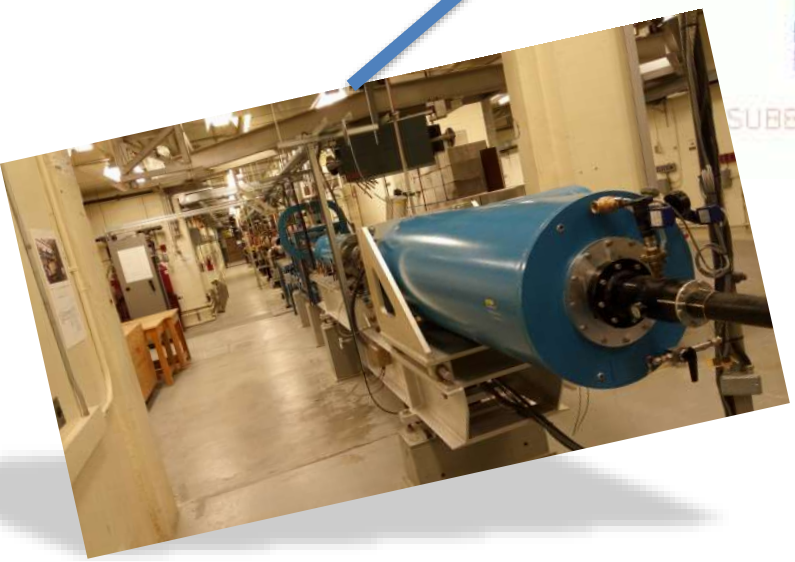


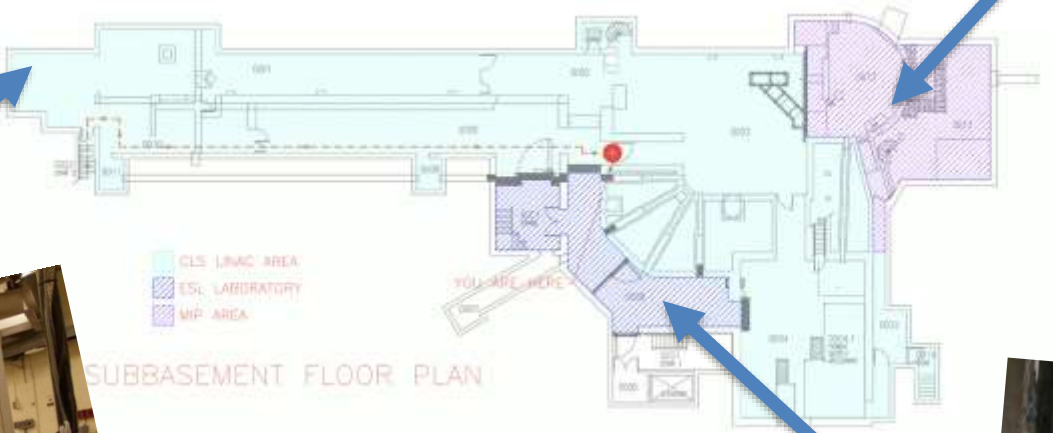


Linac Technical Requirements

Parameters	Values	Units
Nominal Beam Energy	250	MeV
Minimum Beam Energy in any RF failure mode	180	MeV
Beam charge	3	nC
Bunch Train Length, 1 to 70 bunches at 500 MHz (2 ns RF buckets)	1 to 140	ns
Center energy stability (pulse to pulse)	≤0.1	%
Energy Spread	≤0.5	%
Normalized Emittance (1σ) (X or Y)	≤50	π mm·mrad
Injector Frequency	3000.24	MHz
Booster Synchrotron RF Frequency	500.04	MHz
Injector Nominal Repetition rate	1	Hz
Modulators and Klystrons Repetition Rate	1 to 60	Hz

CLS Accelerator Tunnels Continuous Evolution



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