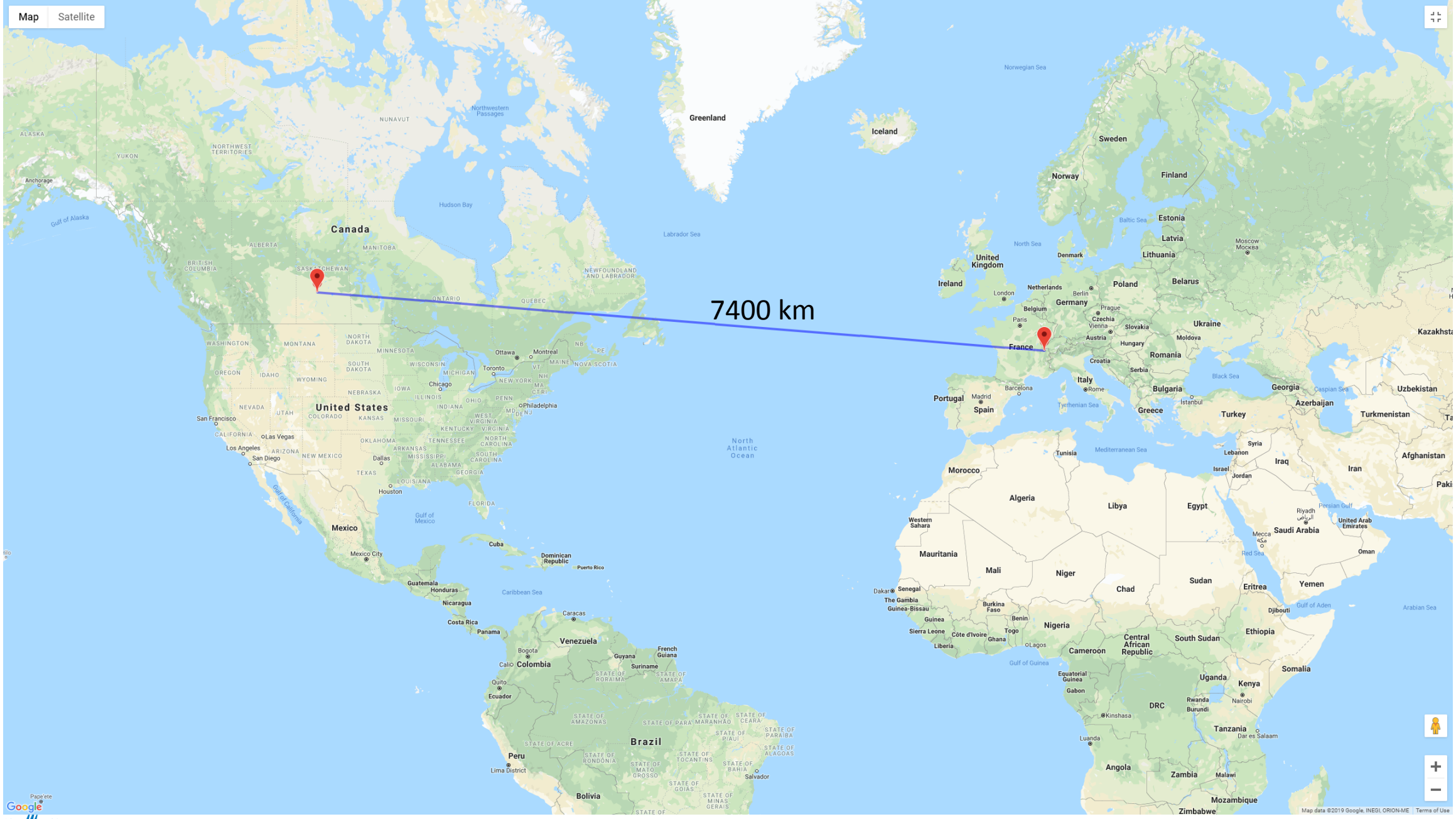

Canadian Light Source
Centre canadien de rayonnement synchrotron
Canadian Light Source



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THE BRIGHTEST LIGHT IN CANADA | lightsource.ca

Operating Funding Partners

Capital Funding Partners

Canadian Light Source

- CLS is a 3rd Generation Synchrotron
  - Provides high intensity wide spectrum radiation for scientific studies
  - Use of Insertion Devices
- Located in Saskatoon, Saskatchewan, Canada
  - 7400 km West of Geneva
- CLS was the 15th of 25 such facilities in the world

Saskatoon

- Saskatoon
  - 250,000 people
  - Largest city in Saskatchewan
  - “Bridge City”, “Hub City”
  - On South Saskatchewan River
  - Location of the only Synchrotron in Canada

Early History - SAL

1976 – Pulse Stretcher Ring Proposal
"Research Possibilities with Synchrotron Radiation"
1988 – A Light Workshop
"Applications of Synchrotron Light"

1990 – formation of the "Canadian Institute for Synchrotron Radiation" (CISR)
SAL to do storage ring design study
1994 – workshop at SAL
1.5 GeV → 2.5 GeV Triple Bend Achromat → Double Bend Achromat (DBA)
8 straights → 12 straights
1998 – workshop at SAL
2.5 GeV → 2.9 GeV 20 keV photons using higher undulator harmonics

1999 (January) – "The Proposal for Construction of a National Synchrotron Light Source for Canada"

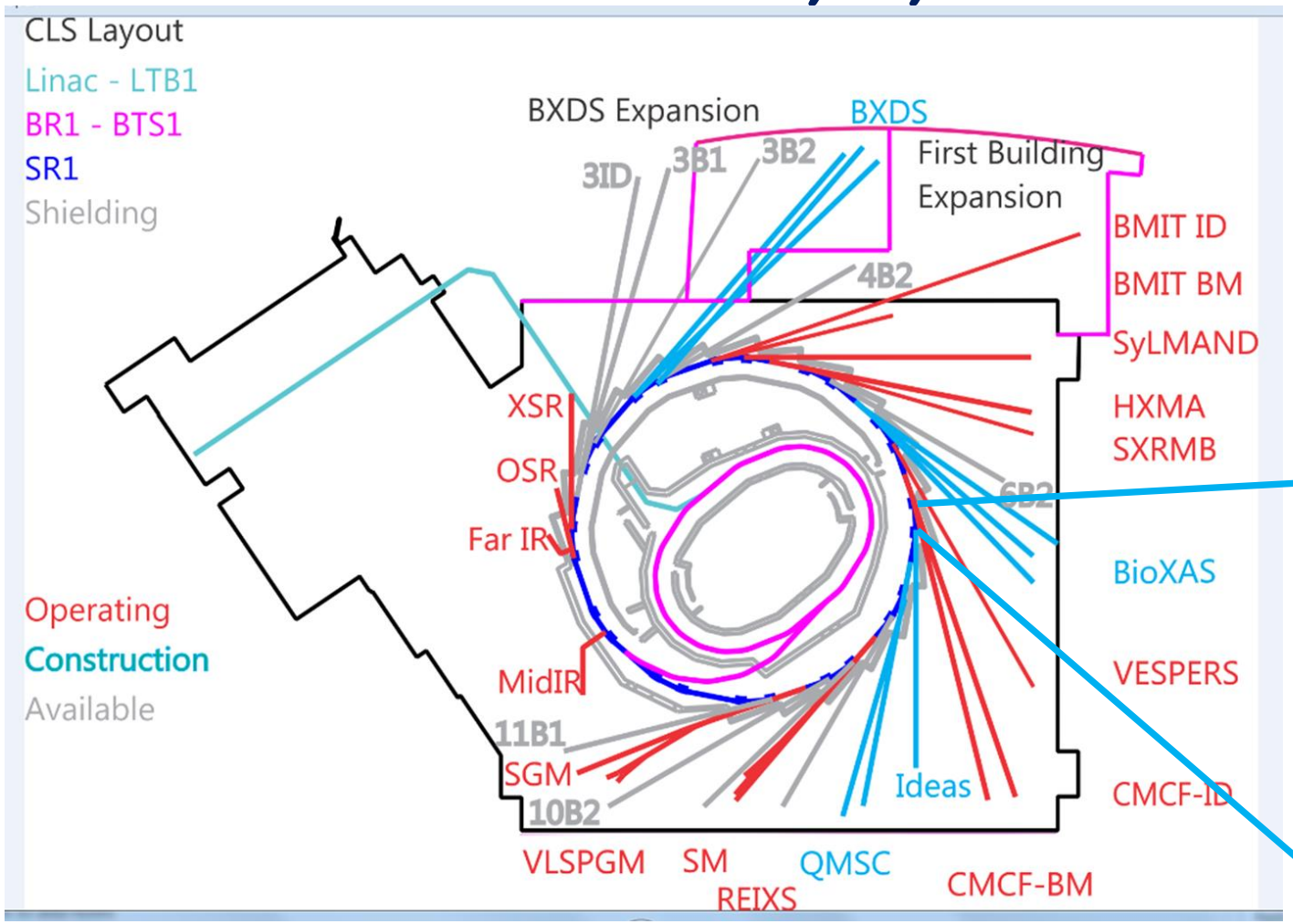
Early History - CLS

- 1999 (January) – “The Proposal for Construction of a National Synchrotron Light Source for Canada”
- March 1999 – SAL closes
- April 1999 - Canadian Light Source (CLS) is funded and construction begins

CLS Storage Ring

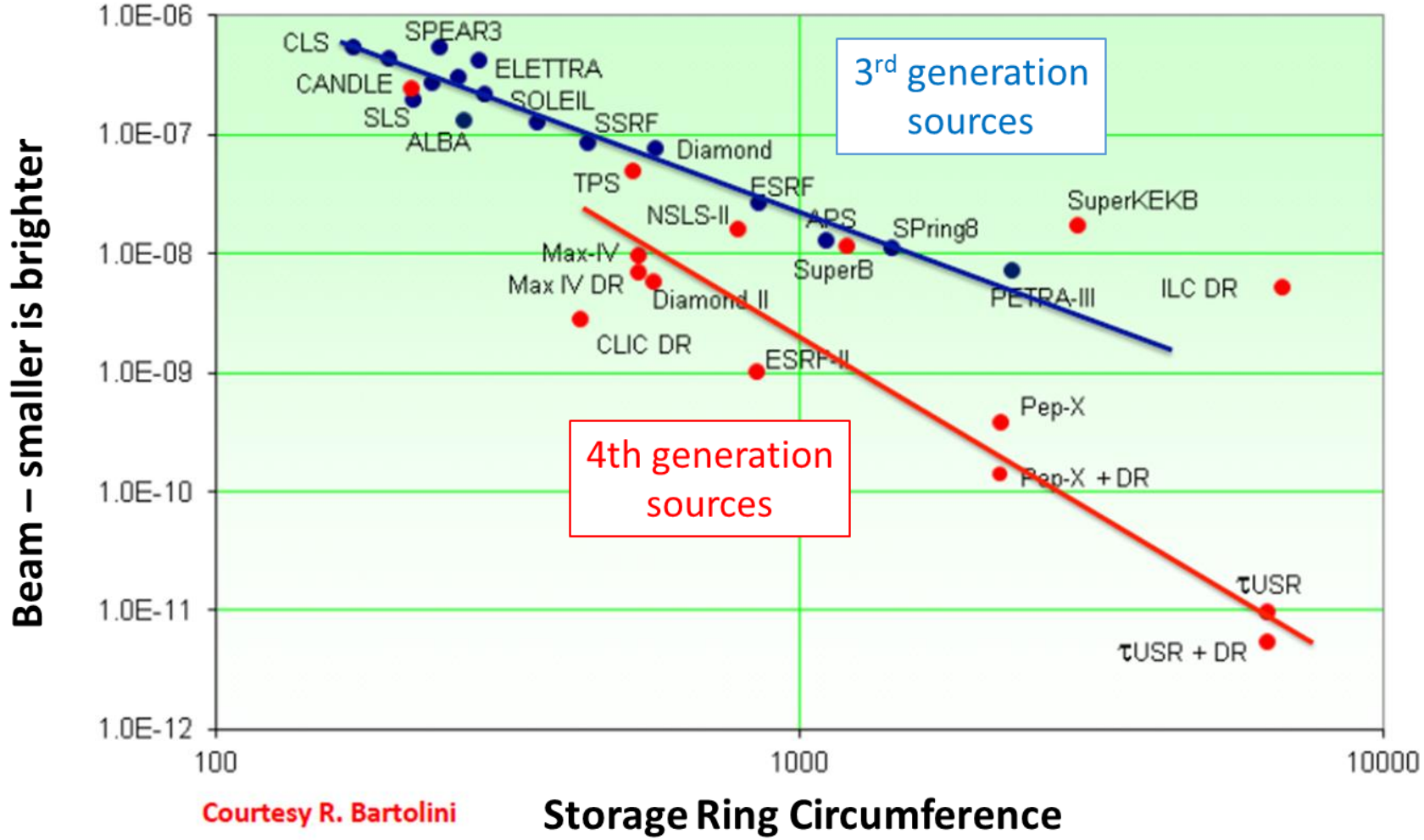
- 2.9 GeV DBA lattice with 12-fold period
- 170.88 m circumference
- E_{loss} per turn: ~ 1.1 MeV with all IDs operating
- Total RF Voltage: 2.2 to 2.4 MV
- CESR-B 500MHz SRF cavity, TCF-50 Linde plant > proceeding with upgrade to 2 cavity operation
- Maximum Current: ~230 mA
- ~10 mm bunch length

CLS 2016 – Phase I, II, III beamlines



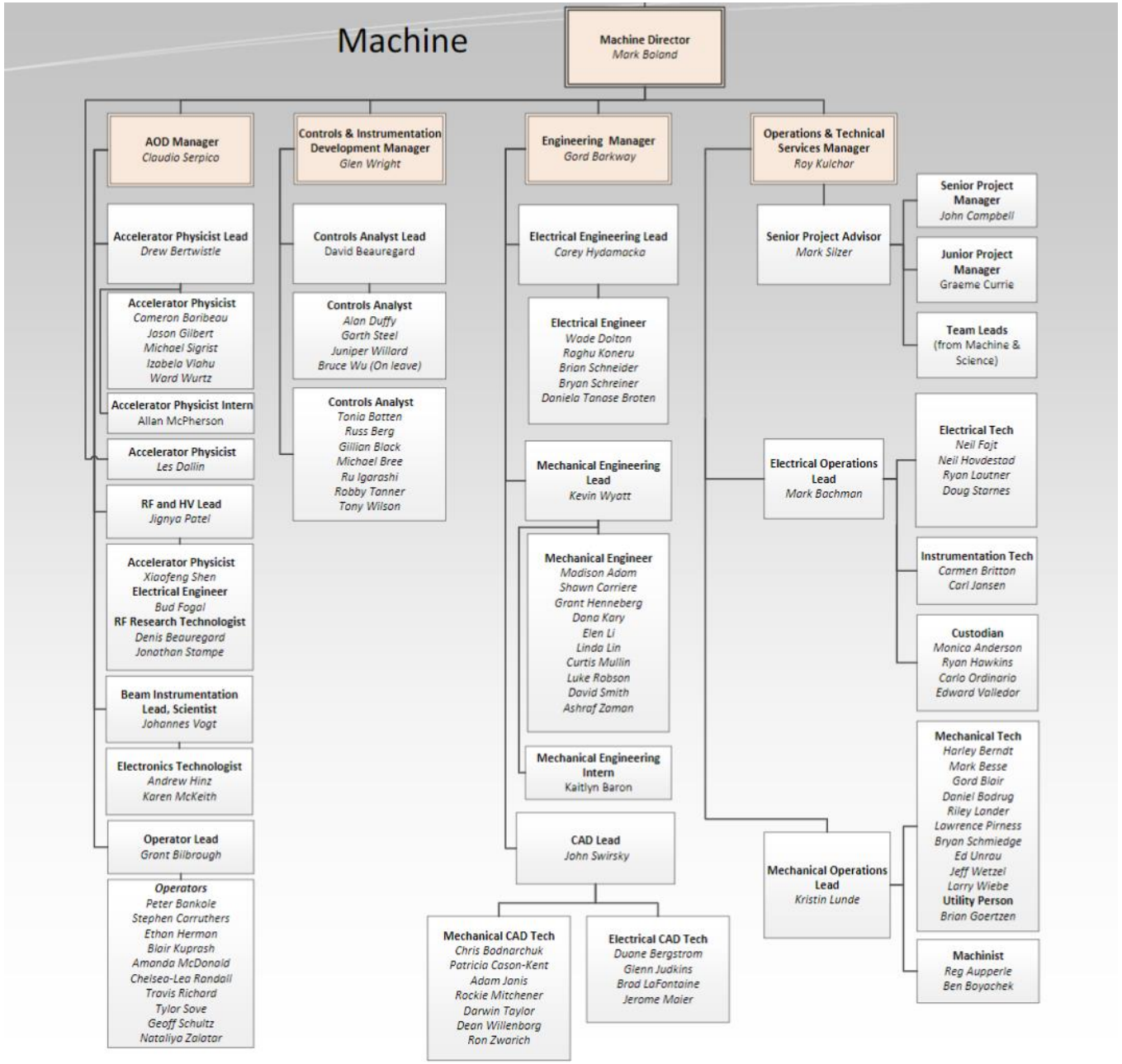
QMSC Double EPU
Install Spring 2017

Ranking


1.0E-06
1.0E-07
1.0E-08
1.0E-09
1.0E-10
1.0E-11
1.0E-12
Beam – smaller is brighter
100
1000
10000
Storage Ring Circumference
CLS
SPEAR3
ELETTRA
CANDLE
SOLEIL
SLS
SSRF
ALBA
Diamond
TPS
ESRF
NSLS-II
APS
SPring8
SuperKEKB
Max-IV
Max IV DR
SuperB
Diamond II
PETRA-III
ILC DR
CLIC DR
ESRF-II
Pep-X
Pep-X + DR
τUSR
τUSR + DR
3rd generation sources
4th generation sources
Courtesy R. Bartolini

Engineering at the CLS

- What we look after
  - Maintenance – Aging Facility Concerns – Failures (Photon Shutter)
  - Detailed Machine Design – Accelerators and Beamlines
  - Technical Water and HVAC – Facility services
  - Project Management – Technical Direction – Beamline/ Cryo
  - Purchasing
  - MIP - Innovation
- Two major “shutdowns” per year
  - March/April and October/November
  - Usually 4 to 8 weeks long


Machine
Machine Director
Mark Boland
AOD Manager
Claudio Serpico
Accelerator Physicist Lead
Drew Bertwistle
Accelerator Physicist
Cameron Baribeau
Jason Gilbert
Michael Sigrist
Izabela Vlahu
Ward Wurtz
Accelerator Physicist Intern
Allan McPherson
Accelerator Physicist
Les Dallin
RF and HV Lead
Jignya Patel
Accelerator Physicist
Xiaofeng Shen
Electrical Engineer
Bud Fogal
RF Research Technologist
Denis Beauregard
Jonathan Stampe
Beam Instrumentation Lead, Scientist
Johannes Vogt
Electronics Technologist
Andrew Hinz
Karen McKeith
Operator Lead
Grant Bilbrough
Operators
Peter Bankole
Stephen Carruthers
Ethan Herman
Blair Kuprash
Amanda McDonald
Chelsea-Lea Randall
Travis Richard
Tylor Sove
Geoff Schultz
Nataliya Zalatar
Controls & Instrumentation Development Manager
Glen Wright
Controls Analyst Lead
David Beauregard
Controls Analyst
Alan Duffy
Garth Steel
Juniper Willard
Bruce Wu (On leave)
Controls Analyst
Tonia Batten
Russ Berg
Gillian Black
Michael Bree
Ru Igarashi
Robby Tanner
Tony Wilson
Engineering Manager
Gord Barkway
Electrical Engineering Lead
Carey Hydamacka
Electrical Engineer
Wade Dolton
Raghu Koneru
Brian Schneider
Bryan Schreiner
Daniela Tanase Broten
Mechanical Engineering Lead
Kevin Wyatt
Mechanical Engineer
Madison Adam
Shawn Carriere
Grant Henneberg
Dana Kary
Elen Li
Linda Lin
Curtis Mullin
Luke Robson
David Smith
Ashraf Zaman
Mechanical Engineering Intern
Kaitlyn Baron
CAD Lead
John Swirsky
Mechanical CAD Tech
Chris Bodnarchuk
Patricia Cason-Kent
Adam Janis
Rockie Mitchener
Darwin Taylor
Dean Willenborg
Ron Zwarich
Electrical CAD Tech
Duane Bergstrom
Glenn Judkins
Brad LaFontaine
Jerome Maier
Operations & Technical Services Manager
Ray Kulchar
Senior Project Advisor
Mark Silzer
Senior Project Manager
John Campbell
Junior Project Manager
Graeme Currie
Team Leads
(from Machine & Science)
Electrical Operations Lead
Mark Bachman
Electrical Tech
Neil Fajt
Neil Hovdestad
Ryan Lautner
Doug Starnes
Instrumentation Tech
Carmen Britton
Carl Jansen
Custodian
Monica Anderson
Ryan Hawkins
Carlo Ordinario
Edward Valledor
Mechanical Operations Lead
Kristin Lunde
Mechanical Tech
Harley Berndt
Mark Besse
Gord Blair
Daniel Bodrug
Riley Lander
Lawrence Pirness
Bryan Schmiedge
Ed Unrau
Jeff Wetzel
Larry Wiebe
Utility Person
Brian Goertzen
Machinist
Reg Aupperle
Ben Boyachek

Mechanical Engineering Staff

- 10 Mechanical Engineers + Interns
  - Manager – Gord
  - Lead – Kevin
  - 2 Cryogenics
  - 1 Technical water and facilities
  - 6 “Generalists”
    - Working on Key Priority Projects
    - Each assigned 2-3 beamlines/ systems
  - None are currently in any “staff engineering” role
  - Interns – small beamline projects – investigations/ upgrades

Projects and Priorities

Facility Priority Ranking

Machine			Science			Other Projects		
Priority #	Strat Plan Obj	Project	Priority #	Strat Plan Obj	Project	Priority #	Strat Plan Obj	Project
M1A	1	Safety issues & Accelerator Emergency Repairs	S1A	1	Beamline Emergency Repairs **Requires Science & Engineering Manager agreement**	P1A	3	Cyber Security and Remediation
M1B	3	Top-Up Beamline Implementation P2018-03	S1B	3	Brockhouse Undulator beamline to SCA P2012-10	P1B	4	Implementation of N286
M1C	1	Linac Section Replacement P2019-14	S1C	3	QMSC Spin to SCA P2019-17	P1C	2	Problem Identification and Resolution
M1D	1	Transverse Feedback System P2018-02	S1D	3	BioXAS Imaging to micro scale P2018-07	P1D	1	EAM Implementation P2016-25
M2A	1	Accelerator Preventative Maint	S1E	3	SGM/PGM Upgrade P2012-14			
M2B	3	Orbit Correction DIO & Software Upgrade P2019-13	S1F	3	CMCF Upgrade P2015-06			
M2C	1	CESR-B Cryomodule P2019-18	S1G	3	SM Upgrade P2012-15			
M2D	1	Electron Source and LINAC Replacement P2018-22	S1H	3	RXR Beamline cost estimate P2019-09			
M2E	3	Electron Source Lab P2018-23	S2A	1	Beamline Preventative Maintenance			
M2F	1	Low Level RF Upgrade P2018-24	S2B	1	Priority Small Projects 1. Ambient STXM Upgrade 2. Lab Construction Room 1114 3. Vespers Fast Scan			
M2G	1	BR1 LCW Filtration and Air Removal P2019-12	S2C	3	Brockhouse Wiggler beamlines to GU operations P2012-10			
M2H	3	CII Emergency Repairs*	S2D	3	QMSC to GU operations P2019-17			
M3A	1	IOC Upgrades P2015-08	S2E	3	BMIT Remainder P2017-06			
M4A	3	CII Development						

Version 8.2
2019-Aug-06

Execution order is M1 to S1, M2 to S2 to P2, etc.
Third digit letters only provide ranking within the group (i.e. P2A ranks above P2B, but not above M2C)
*Requires approval by the CEO
**This designation may receive a specialized priority level, per management decision.
SCA – Scientific Commissioning Access

What the Future holds…

588 m Storage Ring

Table 1. Machine parameters for possible CLS 2 lattice configurations.

CLS	2.0	2.1	2.2	
Energy		3.0		GeV
Size	590.4	589.8	588.0	m
Periodicity		16		
ν_x	62.2	68.2	66.15	
ν_y	22.3	20.3	21.3	
ε	37	39	**25**	pm
δ	0.08	0.08	0.10	%
Straights				
β_x	8.94	1.24	2.23	m
β_y	3.43	11.96	5.95	m
η_x	0.01	0.0	0.0	m
α_c	5.0	2.6	5.4	$x10^{-5}$
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

Thanks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