

Date form last updated: 2016-04-07 (please feel free to submit as sections are updated)

Completed by: Dale Schick-Martin

1. Cyclotron Facility – Contact info

Institute (name/address):	The Saskatchewan Centre for Cyclotron Sciences (Sylvia Fedoruk Canadian Centre for Nuclear Innovation) 120 Maintenance Road, Saskatoon, Saskatchewan
Institution URL:	www.fedorukcentre.ca
Person in charge (name/ph#/email):	TBD 1-306-966-3386
Position/title:	Facility Manager
Cyclotron manager/engineer (name/ph#/email)	Dale Schick-Martin 1-306-966-3397 d.schickm@fedorukcentre.ca
QA manager (name/ph#/email)	Shannon Colbert 1-306-966-3384 shannon.colbert@fedorukcentre.ca
QC manager	N/A
Other senior staff (titles/name/ph#/email):	N/A

2. Cyclotron characteristics

Cyclotron manufacturer/model	Advanced Cyclotron Systems TR-24
Cyclotron installation date (Year):	2014; SAT completed late 2015
Dual beam?	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes
Any upgrades?	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes, Describe:
Particles:	<input checked="" type="checkbox"/> ¹ H <input type="checkbox"/> ² H <input type="checkbox"/> ³ He <input type="checkbox"/> ⁴ He
Particle energy, or range (MeV):	18-24 ¹ H _____ ² H _____ ³ He _____ ⁴ He
Max particle current (uA):	500 ¹ H _____ ² H _____ ³ He _____ ⁴ He
Typical particle current (uA):	100 ¹ H _____ ² H _____ ³ He _____ ⁴ He

3. Cyclotron Operation Prefer not to answer

Planned operating days per week:	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7
Number of planned maintenance days/month:	1-2
Number of planned shutdown weeks per year:	Up to 2 @ 2 weeks
Total operating hours (h)/week:	
h/week for radionuclide production:	20
h/week for research:	20
h/week for maintenance:	8
h/week for applications:	

4. Is the cyclotron used to produce Prefer not to answer

Calibration sources? (specify which & quantity)	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes
Mossbauer sources? (specify which & quantity)	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes
X-ray sources? (specify which & quantity)	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes
Intense neutron beam? (specify average $E_n = ?$)	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes

5. Application questions Prefer not to answer

Are pre-clinical studies using cyclotron radiopharmaceuticals carried out on-site?	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes (if available, types of radiotracers and name(s) and email(s) of PIs): Planned
Are clinical studies using cyclotron radiopharmaceuticals carried out on-site?	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (if available, types of radiotracers and name(s) and email(s) of PIs):
Are cyclotron radionuclides/labelled compounds used or planned to be used for agricultural applications such as plant biochemistry/research?	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes (if available, types of radiotracers and name(s) and email(s) of PIs): Planned
Is the cyclotron used for nuclear reaction cross-section measurements?	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (if available, name(s) and email(s) of PIs):
Is the cyclotron used for targetry development?	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes (if available, types of isotopes, and name(s) and email(s) of PIs):
Is the cyclotron used for materials science?	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes (if available, name(s) and email(s) of PIs): Planned
Is the cyclotron used for radiography?	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (if available, name(s) and email(s) of PIs):
Is the cyclotron used for radiobiology?	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (if available, name(s) and email(s) of PIs):
Is the cyclotron used for physics research?	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes (if available, name(s) and email(s) of PIs): Planned
Is the cyclotron used for activation analysis?	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (if available, name(s) and email(s) of PIs):
Is the cyclotron used for proton therapy?	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (if available, name(s) and email(s) of PIs):
Is the cyclotron used for neutron therapy?	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (if available, name(s) and email(s) of PIs):
Other (specify)	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (if available, name(s) and email(s) of PIs):

6. Types of imaging equipment N/A, Prefer not to answer

Single photon (specify if gamma camera, SPECT, or SPECT-CT):	
Number of clinical scanners:	0
Number of pre-clinical scanners:	0
Number of plant biochemistry scanners:	0
PET (specify if PET, PET/CT, or PET/MR):	
Number of clinical scanners:	0
Number of pre-clinical scanners:	1 (Expected mid-2016)
Number of plant biochemistry scanners:	1 (Expected late-2016)

7. Do you supply radionuclide(s), radiotracer(s), or radiopharmaceutical(s) to other institutions? (No/ Yes/ Prefer not to answer). If yes, and if available, please provide the name of product, institution, and supply frequency:

Product	Institution	Frequency
[F-18]FDG	Royal University Hospital	Daily beginning mid-2016

8. Cyclotron/radionuclide/radiochemistry/radiopharmacy training

Is the cyclotron used for education and training in nuclear sciences, health physics, etc?	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes (if available, name(s) and email(s) of PIs): Planned
Does your institute participate in trainee exchange (for production):	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (if available, name(s) and email(s) of PIs):
Does your institute participate in trainee exchange (for research):	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes (if available, name(s) and email(s) of PIs): Planned
Does your institute accept IAEA research fellows for training/experience:	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes (if available, name(s) and email(s) of PIs): Planned
Other training opportunities (specify):	<input type="checkbox"/> No <input type="checkbox"/> Yes (if available, name(s) and email(s) of PIs):

9. Radionuclide production – ^{18}F (F) N/A, Prefer not to answer

Reaction	<input checked="" type="checkbox"/> $^{18}\text{O}(p,n)^{18}\text{F}$; <input type="checkbox"/> $^{16}\text{O}(^3\text{He},p)^{18}\text{F}$; <input type="checkbox"/> $^{20}\text{Ne}(d,\gamma)^{18}\text{F}$; <input type="checkbox"/> $^{16}\text{O}(\alpha,d)^{18}\text{F}$
Typical current (μA):	80-100
Typical energy (MeV):	18
Typical yield (GBq):	350
Typical target pressure (psi):	120-150

Is target He cooled?	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes
Typical beam time (min):	90
Typical Y_{sat} if known (GBq/ μA)	7
% Isotopic enrichment ^{18}O	98
^{18}O supplier(s)	Rotem
Target volume [^{18}O]H ₂ O (mL)	4.2
Usage per year [^{18}O]H ₂ O (mL)	1000 Estimated
Do you recycle [^{18}O]H ₂ O?	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes (if "yes", <input type="checkbox"/> in-house <input checked="" type="checkbox"/> return to supplier)

10. Radionuclide production – ^{11}C ($[^{11}\text{C}]\text{CH}_4$) N/A, Prefer not to answer

Typical current (μA):	
Typical energy (MeV):	
Typical yield (GBq):	
Typical target pressure (psi):	
Typical beam time (min):	
Typical Y_{sat} if known (GBq/ μA):	
Gas mixture:	
Target volume:	
$[^{11}\text{C}]\text{CH}_3\text{I}$ production ASU model:	
Typical yield (GBq):	
Typical yield (% d.c.):	

11. Radionuclide production – ^{11}C ($[^{11}\text{C}]\text{CO}_2$) N/A, Prefer not to answer

Typical current (μA):	40
Typical energy (MeV):	18
Typical yield (GBq):	155
Typical target pressure (psi):	650
Typical beam time (min):	40
Typical Y_{sat} if known (GBq/ μA):	
Gas mixture:	N ₂ /O ₂ (0.5%)
Target volume:	
$[^{11}\text{C}]\text{CH}_3\text{I}$ production ASU model:	TBD
Typical yield (GBq):	
Typical yield (% d.c.):	

12. Other radionuclides produced N/A, Prefer not to answer

Product	Yield on batch (GBq)	Irradiation parameters (MeV/ μA /min)	Typical target mass/material	Extraction method	Used on site?	Distribution/sales?
^{13}N	85	18/80/30	4.2mL Water		<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes
^{15}O					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
$^{18}\text{F}\text{-F}_2$					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes

⁴⁴ Sc					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
⁶⁴ Cu					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
⁶⁷ Ga					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
⁸⁶ Y					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
⁸⁹ Zr	Planned				<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
^{94m} Tc					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
^{99m} Tc					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
¹⁰³ Pd					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
¹¹¹ In					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
¹²³ I					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
¹²⁴ I					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
²⁰¹ Tl					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
²¹¹ At					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
Other:					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes

13. Radiopharmaceutical production – ¹⁸F(FDG) N/A, Prefer not to answer

Production frequency (batches/week)	5
Used on site	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes
Distribution/sales	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes
ASU model	GE FASTLab
Typical yield (GBq):	200
Typical yield (% , decay corrected):	85 <input type="checkbox"/> pre/post dose-cal; or <input checked="" type="checkbox"/> indirectly via ASU
ASU model	<input checked="" type="checkbox"/> N/A
Typical yield (GBq):	
Typical yield (% , decay corrected):	_____ <input type="checkbox"/> pre/post dose-cal; or <input type="checkbox"/> indirectly via ASU
ASU model	<input checked="" type="checkbox"/> N/A
Typical yield (GBq):	
Typical yield (% , decay corrected):	_____ <input type="checkbox"/> pre/post dose-cal; or <input type="checkbox"/> indirectly via ASU

14. Radiopharmaceutical production – Other Products (please copy table for as many products as desired)

N/A, Prefer not to answer

Product:	
Production frequency (batches/week)	
Stage:	<input type="checkbox"/> R&D <input type="checkbox"/> Pre-clinical <input type="checkbox"/> Clinical
Used on site	<input type="checkbox"/> No <input type="checkbox"/> Yes
Distribution/sales	<input type="checkbox"/> No <input type="checkbox"/> Yes
ASU model	

Typical yield (GBq):	
Typical yield (% , decay corrected):	_____ <input type="checkbox"/> pre/post dose-cal; or <input type="checkbox"/> indirectly via ASU
ASU model	<input type="checkbox"/> N/A
Typical yield (GBq):	
Typical yield (% , decay corrected):	_____ <input type="checkbox"/> pre/post dose-cal; or <input type="checkbox"/> indirectly via ASU

15. Radionuclides and radiopharmaceuticals planned to be produced in the next 1-3 years (specify)

N/A, Prefer not to answer

Product:	Application:

16. Additional comments: N/A

Facility is in the late stages of the commissioning (cyclotron) and validation (FDG) process. Some answers are based on plans which have yet to be enacted. Data from actual runs is limited, so typical activities are estimates from the limited exemplar runs we have.