

## TRIUMF TR13

Date form last updated: 2016 May 29

Completed by: David Prevost

### 1. Cyclotron Facility – Contact info

Institute (name/address):	TRIUMF 4004 Wesbrook Mall Vancouver, BC V6T 2A3 Canada
Institution URL:	<a href="http://www.triumf.ca/">http://www.triumf.ca/</a>
Person in charge (name/ph#/email):	Dr. Paul Schaffer
Position/title:	Associate Lab Director - Life Sciences Division
Cyclotron manager/engineer (name/ph#/email)	David Prevost 604-222-1047 ext 6552 dprevost@triumf.ca
QA manager (name/ph#/email)	
QC manager	
Other senior staff (titles/name/ph#/email):	

### 2. Cyclotron characteristics

Cyclotron manufacturer/model	EBCO TR13
Cyclotron installation date (Year):	1994
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"/> $^1\text{H}$ <input type="checkbox"/> $^2\text{H}$ <input type="checkbox"/> $^3\text{He}$ <input type="checkbox"/> $^4\text{He}$
Particle energy, or range (MeV):	<u>13</u> $^1\text{H}$ <u>      </u> $^2\text{H}$ <u>      </u> $^3\text{He}$ <u>      </u> $^4\text{He}$
Max particle current (uA):	<u>100</u> $^1\text{H}$ <u>      </u> $^2\text{H}$ <u>      </u> $^3\text{He}$ <u>      </u> $^4\text{He}$
Typical particle current (uA):	<u>25</u> $^1\text{H}$ <u>      </u> $^2\text{H}$ <u>      </u> $^3\text{He}$ <u>      </u> $^4\text{He}$

### 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 type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7
Number of planned maintenance days/month:	2
Number of planned shutdown weeks per year:	0
Total operating hours (h)/week:	25
h/week for radionuclide production:	15
h/week for research:	4
h/week for maintenance:	4
h/week for applications:	2

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

Calibration sources? (specify which & quantity)	<input checked="" type="checkbox"/> No <input checked="" 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 checked="" type="checkbox"/> No <input type="checkbox"/> Yes (if available, types of radiotracers and name(s) and email(s) of PIs):
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):
Is the cyclotron used for nuclear reaction cross-section measurements?	<input type="checkbox"/> No <input checked="" 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):
Is the cyclotron used for radiography?	<input type="checkbox"/> No <input checked="" 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 checked="" type="checkbox"/> No <input type="checkbox"/> Yes (if available, name(s) and email(s) of PIs):
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 type="checkbox"/> No <input type="checkbox"/> Yes (if available, name(s) and email(s) of PIs):

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

Single photon (specify if gamma camera, SPECT, or SPECT-CT):	511 KeV Coincidence, Gamma camera, Single Photon Tomography (SPET)
Number of clinical scanners:	
Number of pre-clinical scanners:	
Number of plant biochemistry scanners:	
PET (specify if PET, PET/CT, or PET/MR):	PET: 3
Number of clinical scanners:	
Number of pre-clinical scanners:	
Number of plant biochemistry scanners:	

6. 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 (annual)
Raclopride (RAC)	UBC	50
Dihydrotetrabenazine (DTBZ)	UBC	40
Methyl Phenidate (MP)	UBC	18
Pittsburgh Compound B (PIB)	UBC	9
Methylpiperidin-4-yl Propionate (PMP)	UBC	15
Methylreboxetine (MRB)	UBC	13
Yohimbine	UBC	13
3-amino-4-(2-dimethylaminomethylphenylsulfanyl)-benzonitrile (DASB)	UBC	13
Peripheral Benzodiazapine Receptor (PBR28)	UBC	64
(2-((1E,3E)-4-(6-((11C-methylamino)pyridin-3-yl)buta-1,3-dienyl) benzo[d]thiazol-6-ol) (PBB3)	UBC	17
Fluorodopa (FDOPA)	UBC/BCCA	31
2-nitroimidazole (EF5)	BCCA	10

7. Cyclotron/radionuclide/radiochemistry/radiopharmacy training

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

--	--

8. Radionuclide production –  $^{18}\text{F}$  ( $\text{F}$ )  N/A,  Prefer not to answer

Reaction	<input checked="" type="checkbox"/> $^{18}\text{O}(\text{p},\text{n})^{18}\text{F}$ ; <input type="checkbox"/> $^{16}\text{O}(^3\text{He},\text{p})^{18}\text{F}$ ; <input type="checkbox"/> $^{20}\text{Ne}(\text{d},\gamma)^{18}\text{F}$ ; <input type="checkbox"/> $^{16}\text{O}(\alpha,\text{d})^{18}\text{F}$
Typical current ( $\mu\text{A}$ ):	20
Typical energy (MeV):	13
Typical yield (GBq):	
Typical target pressure (psi):	400
Is target He cooled?	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes
Typical beam time (min):	45
Typical $Y_{\text{sat}}$ if known (GBq/ $\mu\text{A}$ ):	
% Isotopic enrichment $^{18}\text{O}$	>95
$^{18}\text{O}$ supplier(s)	
Target volume [ $^{18}\text{O}$ ]H <sub>2</sub> O (mL)	0.5
Usage per year [ $^{18}\text{O}$ ]H <sub>2</sub> O (mL)	50
Do you recycle [ $^{18}\text{O}$ ]H <sub>2</sub> O?	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes (if “yes”, <input type="checkbox"/> in-house <input checked="" type="checkbox"/> return to supplier)

9. Radionuclide production –  $^{11}\text{C}$  ( $^{11}\text{C}$ ]CH<sub>4</sub>)  N/A,  Prefer not to answer

Typical current ( $\mu\text{A}$ ):	20
Typical energy (MeV):	13
Typical yield (GBq):	
Typical target pressure (psi):	400
Typical beam time (min):	30
Typical $Y_{\text{sat}}$ if known (GBq/ $\mu\text{A}$ ):	
Gas mixture:	10% H <sub>2</sub> , 90% N <sub>2</sub>
Target volume:	~18mL
$^{11}\text{C}$ ]CH <sub>3</sub> I production ASU model:	
Typical yield (GBq):	1.1
Typical yield (% , d.c.):	

10. Radionuclide production –  $^{11}\text{C}$  ( $^{11}\text{C}$ ]CO<sub>2</sub>)  N/A,  Prefer not to answer

Typical current ( $\mu\text{A}$ ):	25
Typical energy (MeV):	13
Typical yield (GBq):	
Typical target pressure (psi):	440
Typical beam time (min):	45
Typical $Y_{\text{sat}}$ if known (GBq/ $\mu\text{A}$ ):	
Gas mixture:	
Target volume:	~18mL
$^{11}\text{C}$ ]CH <sub>3</sub> I production ASU model:	
Typical yield (GBq):	1.6
Typical yield (% , d.c.):	

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

Product	Yield on batch (GBq)	Irradiation parameters (MeV/ $\mu$ A/min)	Typical target mass/material	Extraction method	Used on site?	Distribution/sales?
<sup>13</sup> N					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
<sup>15</sup> O					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
<sup>18</sup> F-F <sub>2</sub>					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
<sup>44</sup> Sc					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
<sup>64</sup> Cu					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
<sup>67</sup> Ga					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
<sup>86</sup> Y					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
<sup>89</sup> Zr					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
<sup>94m</sup> Tc					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
<sup>99m</sup> Tc					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
<sup>103</sup> Pd					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
<sup>111</sup> In					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
<sup>123</sup> I					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
<sup>124</sup> I					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
<sup>201</sup> Tl					<input type="checkbox"/> No <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Yes
<sup>211</sup> 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

12. Radiopharmaceutical production – <sup>18</sup>F(FDG)  N/A,  Prefer not to answer

Production frequency (batches/week)	~1
Used on site	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes
Distribution/sales	<input checked="" 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
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

13. 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

14. Radionuclides and radiopharmaceuticals planned to be produced in the next 1-3 years (specify)  N/A,  Prefer not to answer

Product:	Application:

15. Additional comments:  N/A

--