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Unclassif

SBSS and the RIA

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RIA can potentially help provide useful nuclear cross section data of interest to **SBSS**

- Produce radioactive targets of interest for study elsewhere by the (n,γ), (n,2n), (n,n'), (n,p) etc. reactions
  - Short-lived **U** isotopes
  - Radchem detector isotopes
  - Fission products (Nb, Hf,…)
  - Other isotopes of interest
- Produce fast Charged Particle beams to study RIF on targets at the facility, p, D, T, ^{3}He, ^{4}He, ^{6}**He**, ^{6}Li, ^{7}Li, ^{8}**Li**, ^{9}**Li**,^{7}**Be**
- Study (n,2n) reaction on very short-lived isotopes with an on-site D-T neutron source
  - Radchem detector isotopes:^{86}Y,^{92}Y,^{166}Tm,^{173}Tm,^{178}Lu,^{195}Ir, etc.
  - U isotopes:^{239}U, ^{240}U

Radchem Detector Isotopes of Particular Interest ($t_{1/2}$> 1 day)

- $_{39}$Y (89 stable)
  - 87: 3.3 d
  - 88: 106.6 d
  - 90: 2.7 d
  - 91: 58.5 d
- $_{69}$Tm (169 stable)
  - 167: 9.3 d
  - 168: 93.1 d
  - 170: 128.6 d
  - 171: 1.91 y
  - 172: 2.7 d
- $_{71}$Lu (175, 176 stable)
  - 171: 8.2 d
  - 172: 6.7 d
  - 173: 1.37 y
  - 174: 3.31 y
  - 177: 6.7 d, 177m: 160.4 d

Radchem Detector Isotopes of Particular Interest ($t_{1/2}$> 1 day)

- $_{77}$**Ir (191, 193** stable)

188: 1.7 d
189: 13.2 d
190: 11.8 d
192: 73.8 d, 192m 241 y
194m: 171 d

Radchem Detector Isotopes of Additional Interest ($t_{1/2}$> 1 day)

- $_{21}$**Sc** (**45** stable)
  - **44m: 2.4 d**
  - **46: 83.8 d**
  - **47: 4.5 d**
  - **48: 1.8 d**
- $_{33}$**As** (**75** stable)
  - **72: 1.1 d**
  - **73: 80.3 d**
  - **74: 17.8 d**
  - **76: 1.1 d**
  - **77: 1.7 d**
- $_{37}$**Rb** (**85, 87** stable)
  - **83: 86.2 d**
  - **84: 83.8 d**
  - **86: 18.6 d**

Radchem Detector Isotopes of Additional Interest ($t_{1/2}$> 1 day)

- $_{40}$**Zr** (**90-92, 94, 96** stable)
  - **88: 83.4 d**
  - **89: 3.3 d**
  - **93: 1.53x10^6 y**
  - **95: 62.0 d**
- $_{45}$**Rh** (**103** stable)
  - **99: 16.1 d**
  - **101: 3.3 y**
  - **102: 20.7 d, 102m: 2.9 y**
  - **105: 1.5 d**
- $_{47}$**Ag** (**107, 109** stable)
  - **105: 41.3 d**
  - **106m: 8.3 d**
  - **108m: 418 y**
  - **110m: 249.8 d**
  - **111: 7.5 d**

Radchem Detector Isotopes of Additional Interest ($t_{1/2}$> 1 day)

- $_{62}$**Sm (144,147-150, 152,154~** stable)
  - **146: 1.03x10^{8}** y
  - **153: 1.9 d**
- $_{63}$**Eu (151, 153** stable)
  - **145: 5.9 d**
  - **146: 4.6 y**
  - **147: 24.1 d**
  - **148: 54.5 d**
  - **149: 93.1 d**
  - **150: 36.9 y**
  - **152: 13.5 y**
  - **154: 8.59 y**
  - **155: 4.76 y**
- $_{73}$**Ta (180,181** stable)
  - **179: 1.82 y**
  - **182: 114.4 d**
  - **183: 5.1 d**

Radchem Detector Isotopes of Additional Interest ($t_{1/2}$> 1 day)

- $_{74}$**W** (**180, 182-184, 186** stable)
  - **178: 21.6 d**
  - **181: 121.2 d**
  - **185: 75.1 d**
  - **187: 69.4 d**
- $_{75}$**Re** (**185, 187** stable)
  - **182: 2.7 d**
  - **183: 70.0 d**
  - **184: 38.0 d, 184m: 169 d**
  - **186: 3.8 d, 186m: 2x10^5 y**
  - **189: 1.1 d**
- $_{79}$**Au** (**197** stable)
  - **194: 1.6 d**
  - **195: 186.1 d**
  - **196: 6.2 d**
  - **198: 2.7 d, 198m: 23 d**
  - **199: 3.1 d**

Radchem Detector Isotopes of Additional Interest ($t_{1/2}$> 1 day)

- $_{81}$**Tl (203, 205** stable)
- $_{83}$**Bi (209** stable)

200: 1.1 d
201: 3.0 d
202: 12.2 d
204: 3.78 y
206: 6.2 d
207: 31.55 y
208: 3.68x10^5 y
210: 5.0 d, 210m: 3.04x10^6 y

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Short-lived U Isotopes of Interest ($t_{1/2}$> 1 day)

- $_{92}$U (233-236, 238 long-lived)

230: 20.8 d
231: 4.2 d
232: 68.9 y
237: 6.75 d

Other Isotopes of Interest ($t_{1/2}$> 1 day)

- $_{93}$**Np** (**237** long-lived)
  - **234: 4.4 d**
  - **235: 396.1 d**
  - **236: 1.54x10^{6} y**
  - **238: 2.1 d**
- $_{91}$**Pa** (**231** long-lived)
  - **229: 1.5 d**
  - **230: 17.4 d**
  - **232: 1.3 d,**
  - **233: 26.9 d**
- $_{90}$**Th** (**232** long-lived)
  - **228: 1.91 y**
  - **229: 7.34x10^{3} y**
  - **230: 7.58x10^{4} y**
- $_{82}$**Pb** (**204, 206-208** stable)
  - **202: 5.25x10^{4} y**

Conclusion

- With better nuclear cross section data the codes used to model the stockpile will be enhanced which would benefit SBSS