Test of 5A-type Molecular-sieve @Kobe

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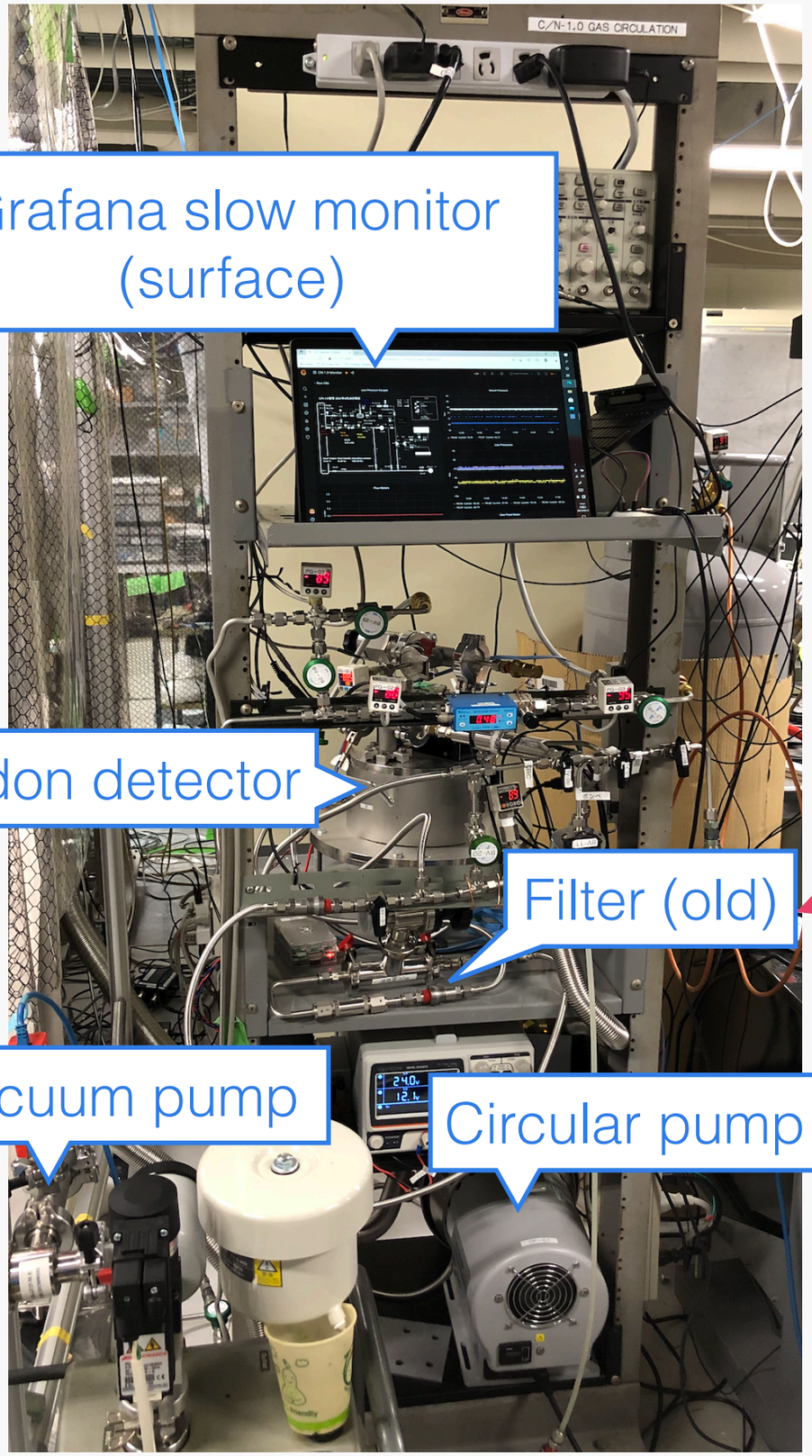
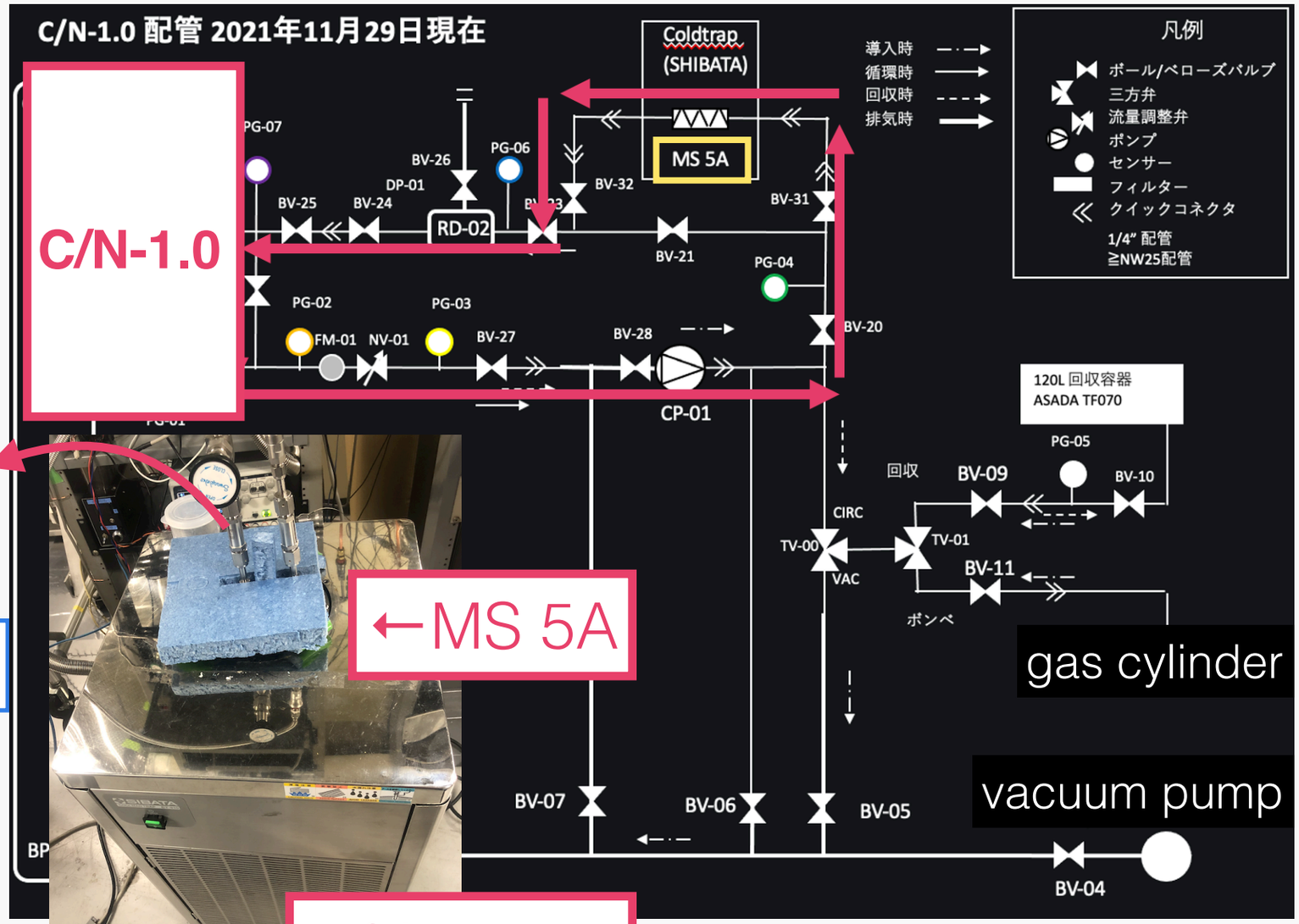
(Review) Circular system for C/N-1.0



- MS 5A (received from Hiroshi) was included with cooling system
  - ➡ circulation just started!
- The system can be replaced to (or put together with) others
  - ➡ e.g. sheffield circulation system



5A type molecular sieve (MS)

- Radon BG is successfully reduced by 5A type MS

  ➡ already studied by Hiroshi and Rob

- Also tested in Kobe using **pure air** (1.0 atm)

SF_6 couldn't be tested because of shortage of gas…

RI activity for developed MS (2^{nd} production) :

Sample name	^{226}Ra (mBq/kg)	^{232}Th (mBq/kg)
4AMS (powder)	**40.4+/-11.4**	**63.4+/-10.6**
5AMS	**14.2+/-7.0**	**58.8+/-8.6**

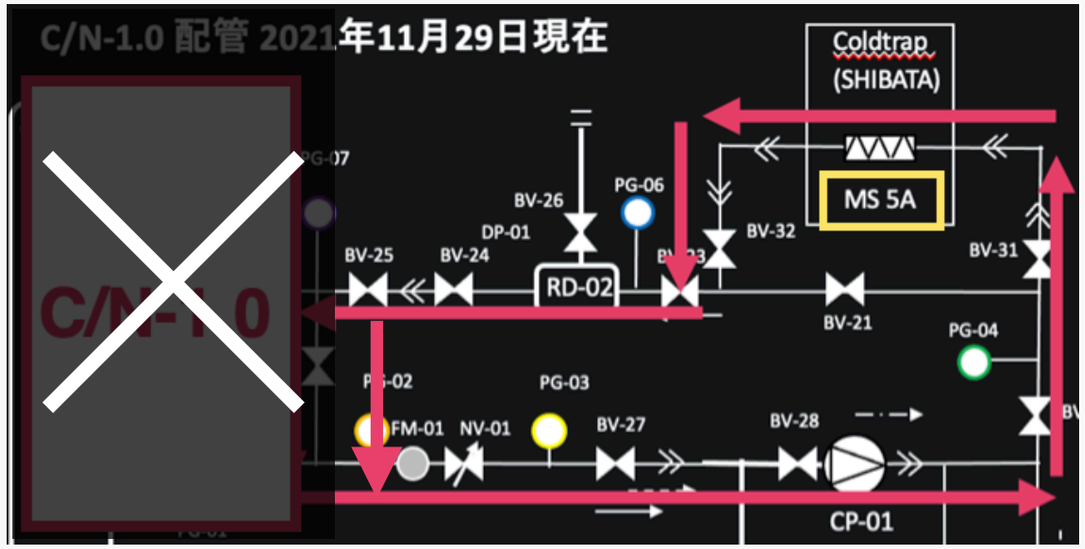
- 4AMS still has more activity than expected from the material, but 5AMS reaches around 1ppb (~ 12mBq / kg for Ra) in U conversion.
- We sent ~ 100g of this 5AMS to Kobe University and Sheffield University for radon removal test.

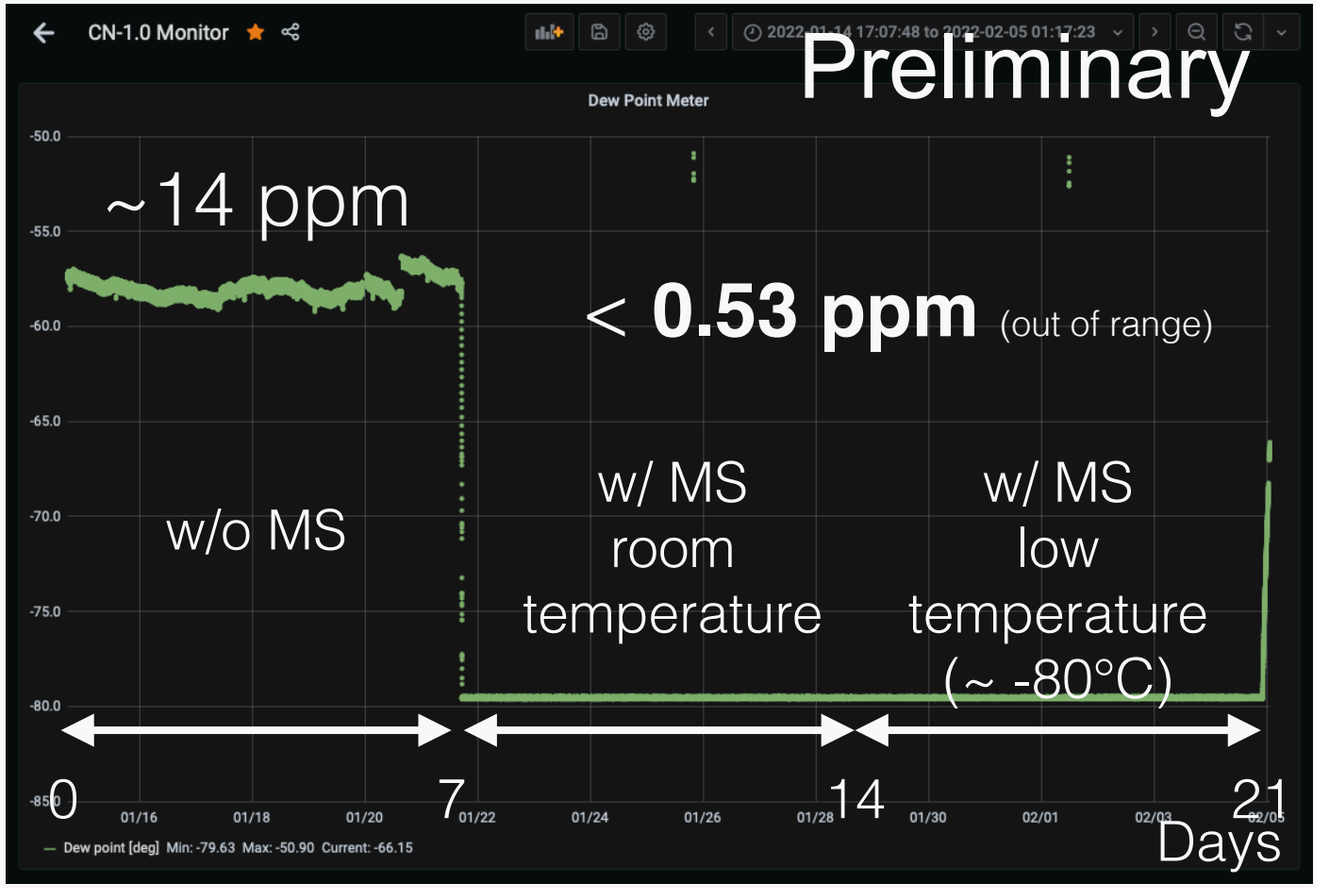
HPGe measurement @ ICRR Kamioka

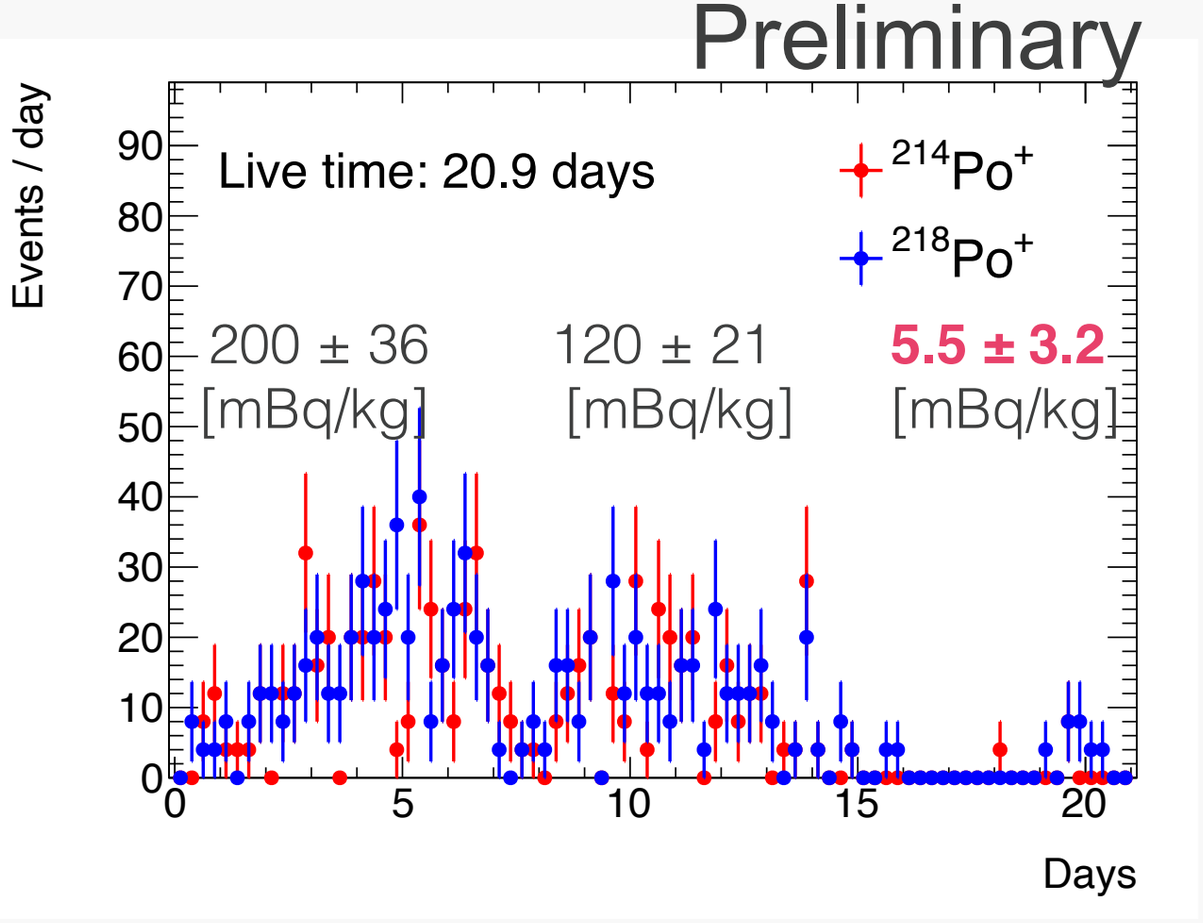
from Hiroshi (CYGNUS2022)

Radon measurement (w/o C/N-1.0)

- **Pure air (760 Torr)**
  - ➡ C/N-1.0 volume was bypassed
  - ➡ H_2O is dramatically reduced!
  - ➡ U-chain radon is also removed
    - ▸ especially in low temperature



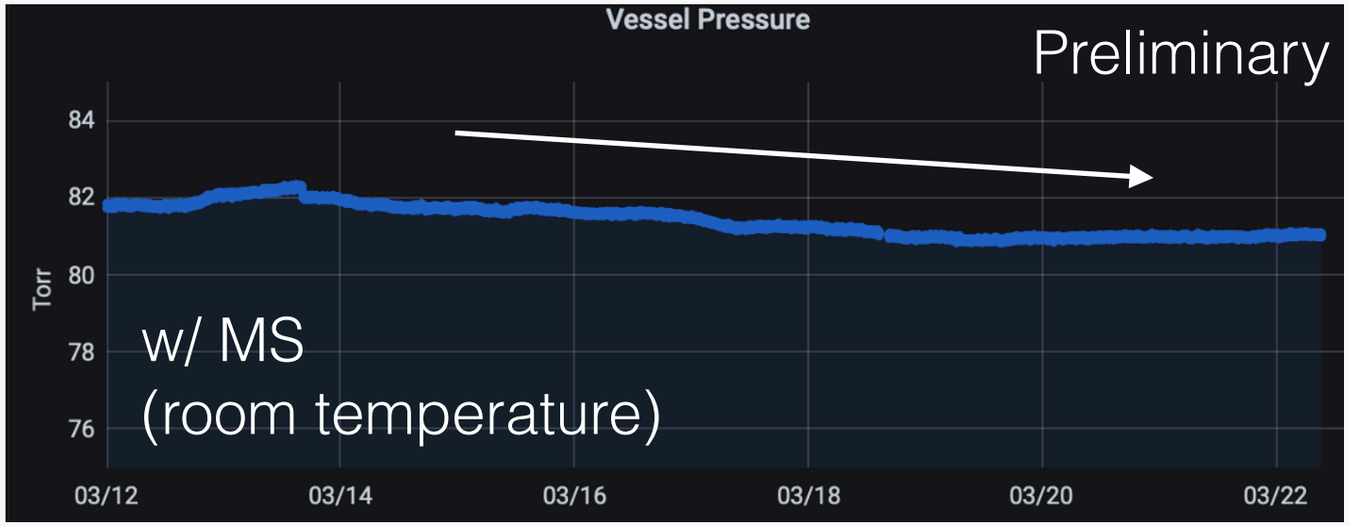




Future plan

- Circulation test including C/N-1.0 is ongoing with CF_4 gas (76 Torr)
  - ➡ CF_4 gas pressure is slightly decreasing
    - Rob reported that 5A type MS absorbs CF4
  - ➡ Radon measurement is also running
- SF_6 run is also planed to correct more knowledge of 5A type MS behaviour

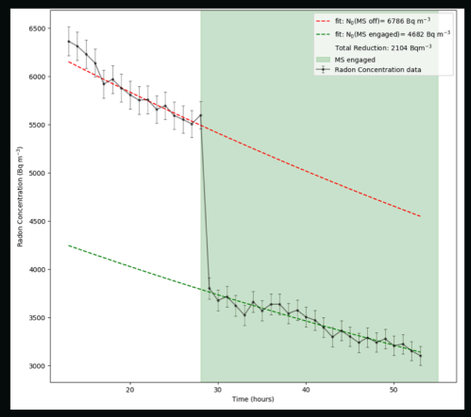
C/N-1.0 gas pressure



Application to other gases: CF_4

Introduction
Molecular Sieves
Low Background MS
Other Gases
Gas System Design
Performance Testing
Conclusions

Radon removal from CF_4



100±1 Bq/Kg
Pressure drop: ~12 torr

- ✓ 5Å type absorbs CF_4 but still removes radon (c.f. SF_6 97±1 Bq/Kg)
- ✓ Purification suitable for pure CF_4 but mixtures are problematic

from Rob (CYGNUS2022)