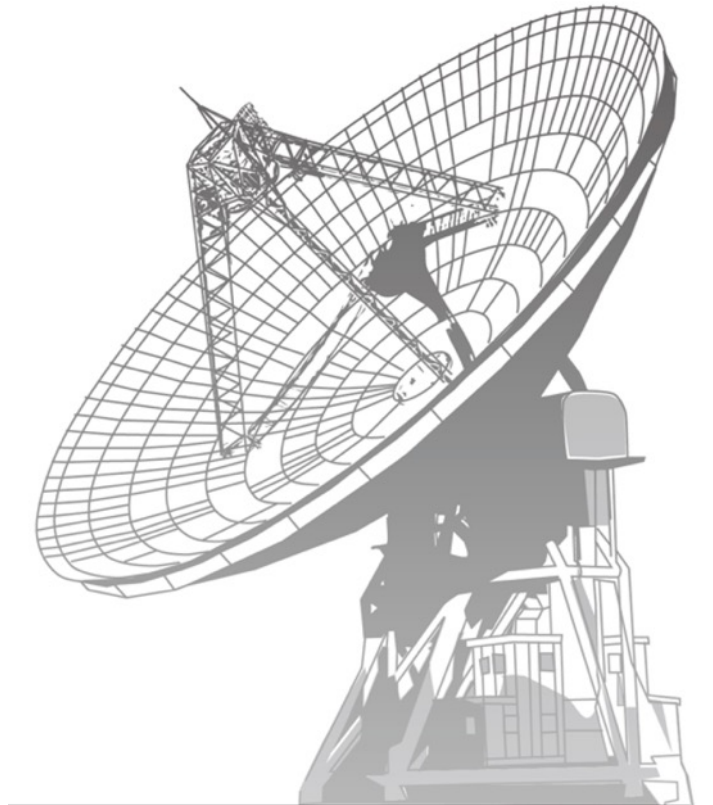


Status of Nobeyama Observations 2023

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(Nobeyama Radio Observatory)



Contents

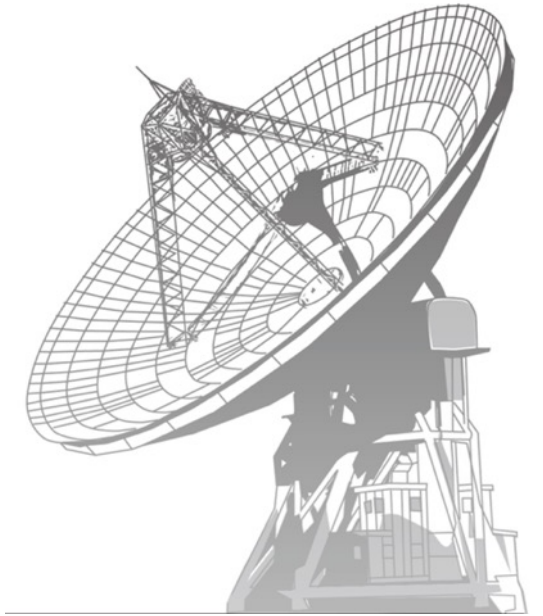
- This report:
 - 1. Charged telescope time statistics
 - 2. Instrument status
 - 3. Development activities
 - 4. Publication & outreach
 - 5. Outlook for FY2024
- Tatematsu-san's presentation
 - Future prospect



1. Charged Telescope Time Statistics

- **Charged Telescope Time**

- 10,000 yen/hour (30,000 yen/hour for foreign users)
- What will be charged:
 - contiguous 45m telescope operation
 - use of facility receivers
- What will income be used for:
 - annual operation cost (electricity and/or maintenance)
 - repair cost of (future) large breakdown



	Deadlines	Periods	Charged	Scientific Assessment
Regular	B (2023/8/1)	11/1 – 3/31	Yes	No
	C (2023/12/1)	2/1 – 3/31	Yes	No
Development	A (2023/6/1)	9/1 – 10/31	Yes	No
Tutorial	A (2023/6/1)	9/1 – 10/31	Yes	No
Student	B (2023/8/1)	11/1 – 3/31	No	Yes

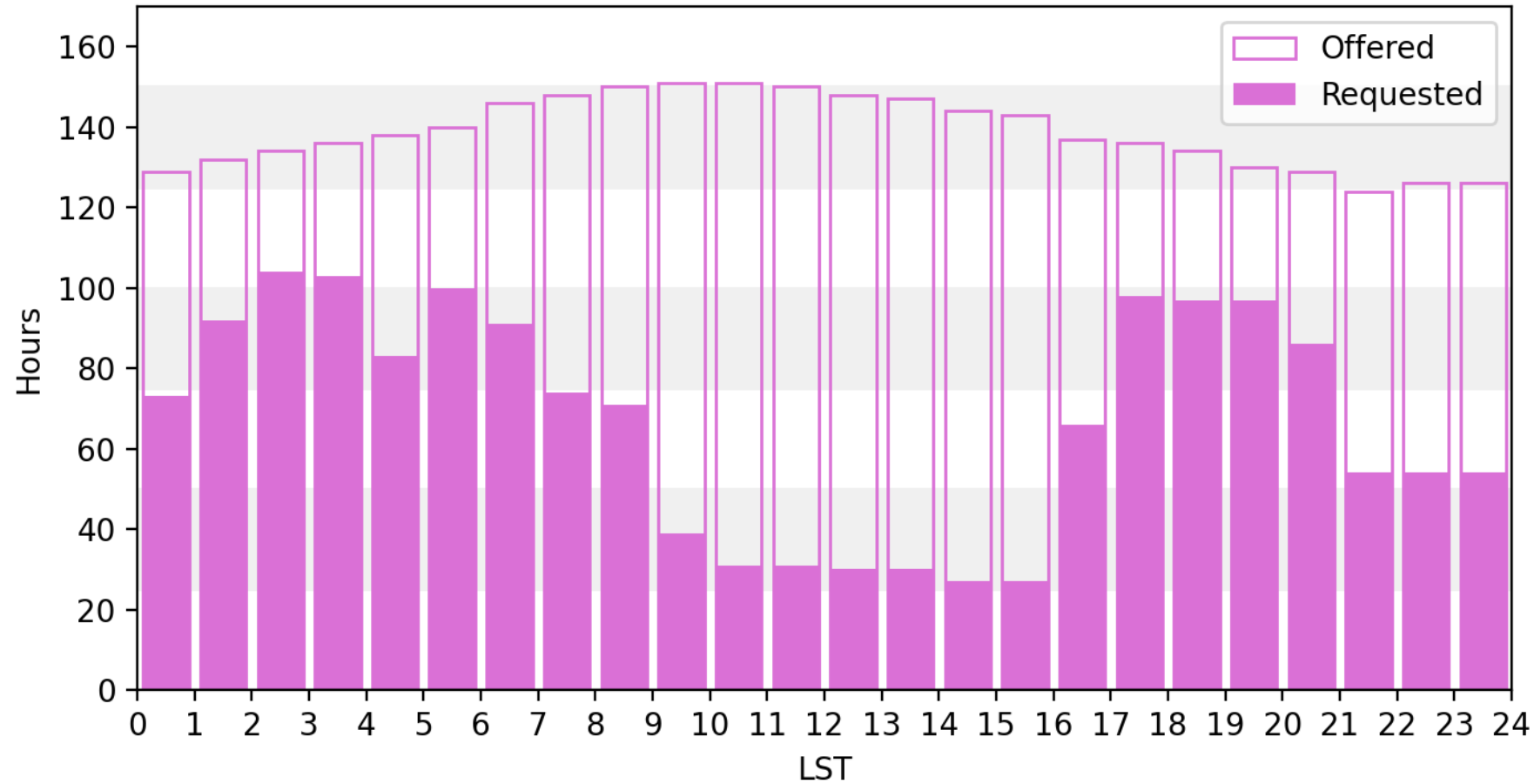
1. Charged Telescope Time Statistics

- 2nd year of Charged Telescope Time
- Statistics 2023
 - Totally 37 proposals with 1916 hours requests were received.
 - (Last year: 47 proposals with 3070 hours requests)
 - Thank you very much for your contribution!

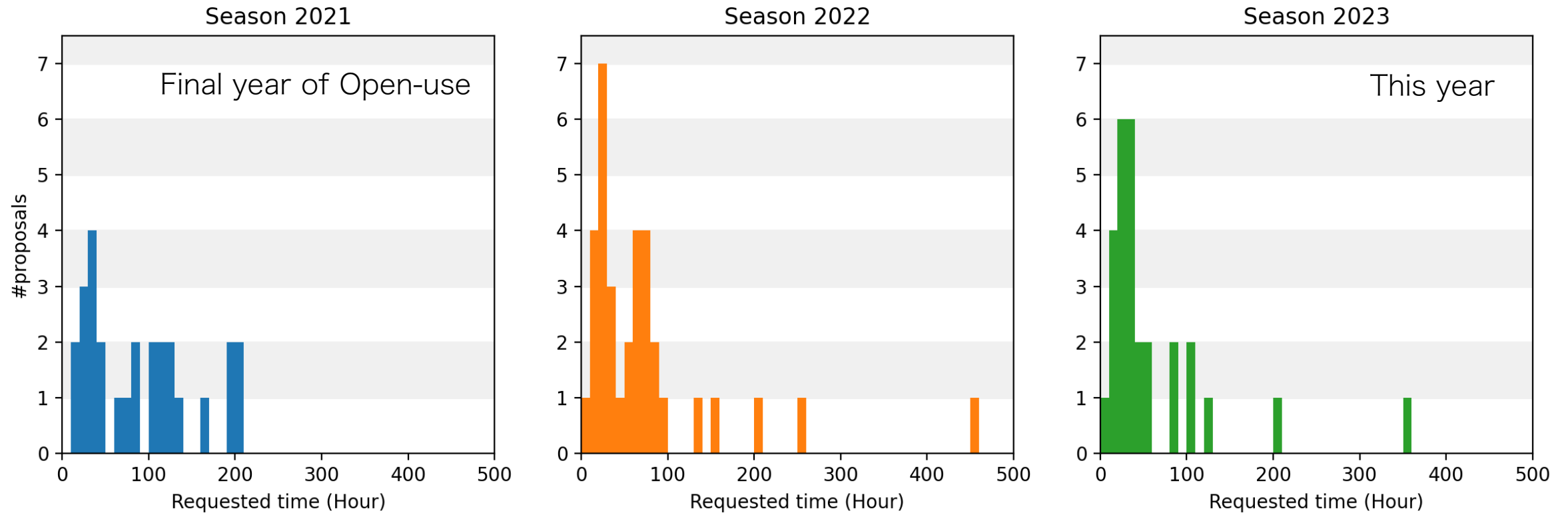
Deadline	Type	Number of Proposals Received	Requested Observation Time [h]	Allocated Observation Time [h]	(Allocation for foreign institute [h])	NRO income [M JPY]
A : 2023/6/1	Development Programs	5	145	145	18	1.991
A : 2023/6/1	Hands-on Tutorials	3	40	40	0	0.440
B : 2023/8/1	Regular Programs	18	1319	1319	0	14.509
B : 2023/8/1	Student Programs	4	142	88	0	0
C : 2023/12/1	Regular Programs	7	205	205	0	2.255
	Total	37	1851	1797	18	19.195

1. Charged Telescope Time Statistics

Requested time (Season 2023; Regular, Student)



1. Charged Telescope Time Statistics



- **Small programs are preferred:** most proposals request <50 hours
- **Opportunity for large programs (>200 hours):** easier to submit than open-use era
- **Wish in the future:** encourage the community to submit mid-size programs (100-200 hours) that should increase the impact of science outcomes

1.1. Student Time (Free-of-Charge)

- Student Time (free-of-charge)
 - Up to 100 hours (24 hours * 4 days)
 - Scientifically reviewed by part of JSAC members
- Statistics 2023
 - Received: 4 proposals, 142 hours (last season: 3 proposals 54 hours)
 - Accepted: 3 proposals, 88 hours

Please encourage your students to submit!

2. Instrument Status

	Available	Under development
Antenna	Main dish Antenna rail Master collimator	MAO (Tamura et al.)
Frontend	H22, H40, Z45 FOREST H22 & H40 H22 & Z45 (new!)	eQ (Chiong, Nakamura et al.) 7BEE (Tatematsu et al.) Tsukuba-cam (Kuno et al.) H22 & H40 & TZ (Imai, Niinuma et al.)
Backend	SAM45 Continuum BE VLBI BE	FMLO (Taniguchi, A. et al.) RF SoC Spectrometer (Nishimura et al.)

- Severe issues
 - SAM45 problem
 - Shutter of master collimator room
 - FOREST problem
 - Hydrogen maser problem (continued from last year)

2. Instrument Status

- **SAM45 problem**

- On October 21, spectrometer SAM45 caused persistent errors. After the investigation of the NRO staff, it found that one of the module (DFP#1) seems to be broken.
- We disconnected the DFP#1, and then the control of SAM45 was restored.
- Now, SAM45 is running without DFP#1. Arrays 5-8 (and 21-24) are disabled, corresponding to a 25% loss of full performance.
- NRO has allocated 25% additional time for all observers to compensate for this problem.
- On December 14, the manufacturer came to diagnose the problem, and found a problem in SDRAM. Not fully solved yet.

- **Shutter of master collimator room**

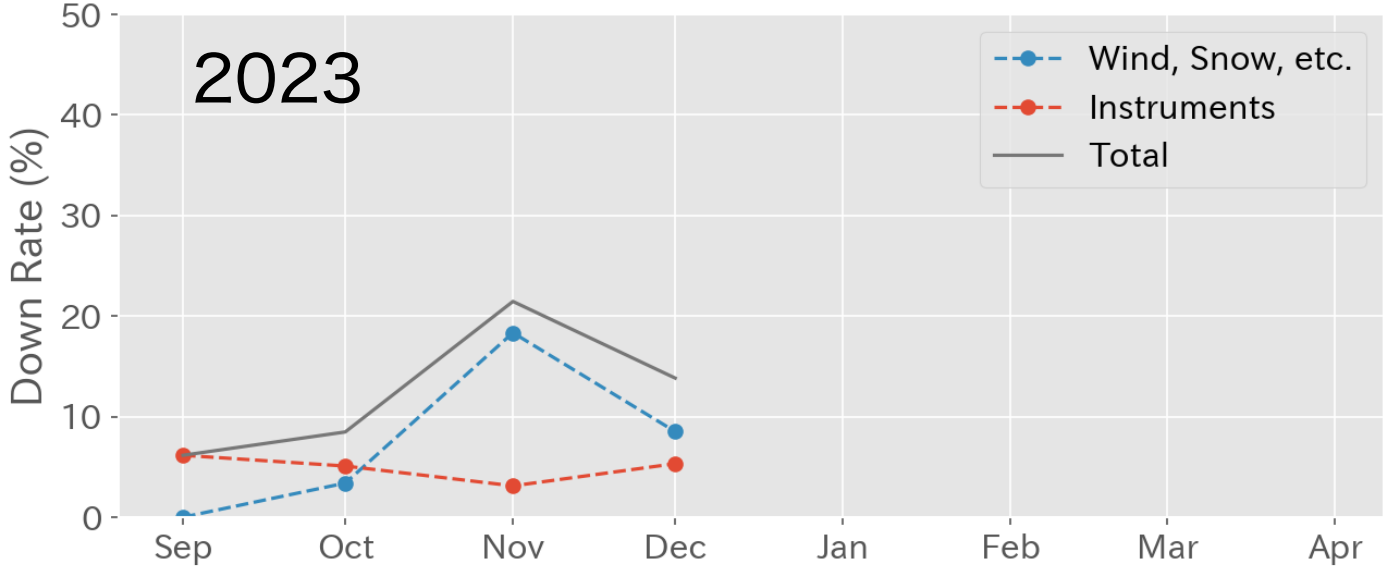
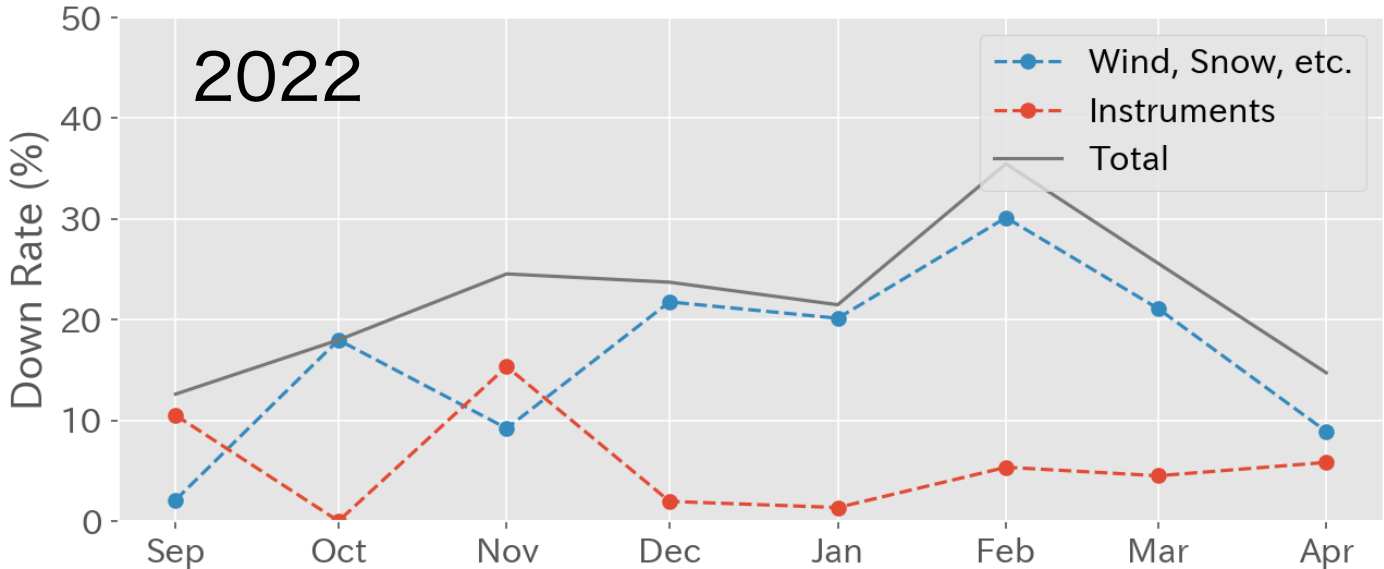
- Since last year, the shutter became stiff, and it was broken in March 2023.
- Now, the antenna cannot be set to EL=90 deg, and we use EL=85 deg instead.
- The manufacturer will repair it next July.



2. Instrument Status

- **FOREST IF switch problem**
 - On December 10, IF switch that is used for IRR measurements of FOREST was broken.
 - NRO replaced it with a set of lower performance alternatives. Now it works. However, it seems to become unstable sometimes.
 - We are arranging the same model as the broken one and will replace it.
 - This problem does not affect science observations.
- **Hydrogen maser clock problem** (owned by NAOJ-Mizusawa, and used at Nobeyama)
 - Due to breakdown of the clock, VLBI operations are suspended 2023 season as well.
 - NAOJ-Mizusawa is planning to install new clock on end of this season. If its performance is confirmed, VLBI operation will be re-opened from next season.
 - This problem does not affect single dish observations.

2.1. Observation Statistics



3. Development Activities

NRO Project	Proposals accepted before 2019	Proposals accepted after 2023
7BEE (Tatematsu et al.)	eQ (Chiong, Nakamura et al.) Tsukuba-cam (Kuno et al.) HINOTORI : H22 & H40 & TZ (Imai, Niinuma et al.) MAO (Tamura et al.) FMLO (Taniguchi, A. et al.)	RF SoC Spectrometer (Nishimura et al.) Two proposals have been submitted and are under review.

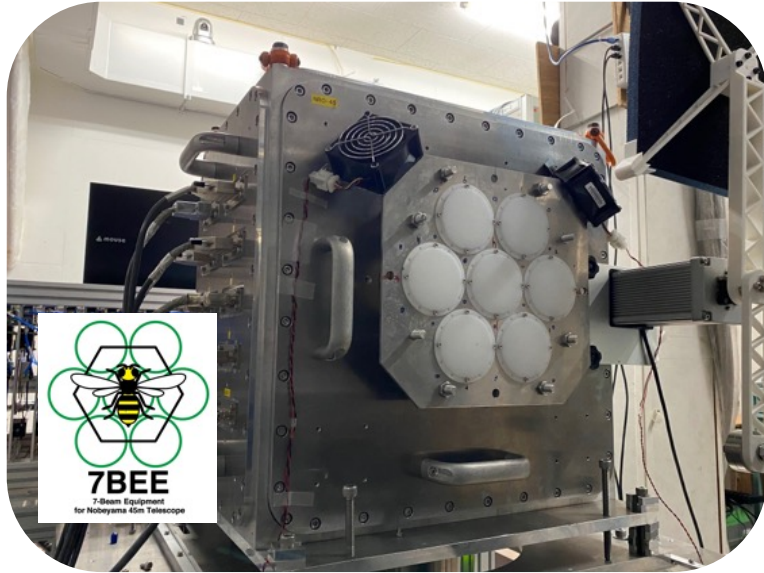
• Progress

- HINOTORI : Poster P2 Imai+
 - H22 & Z45 mode: accepted to NRO and opened for the community
 - TZ mode paper: Tsutsumi+23
- eQ
 - Project paper: Nakamura+ to be submitted soon
- MAO : Poster P1 Iwakami+

• Development proposal restarted

- In 2023, NRO restarts call for proposals of development programs
- Two deadlines:
 - Summer: 1 proposal submitted, 1 accepted
 - Winter: 2 proposals submitted, under review
- Accepted programs can
 - apply for the budget
 - install instruments to NRO45m or NRO campus
 - use NRO45m (charged telescope time required)

3.1. Progress on 7BEE



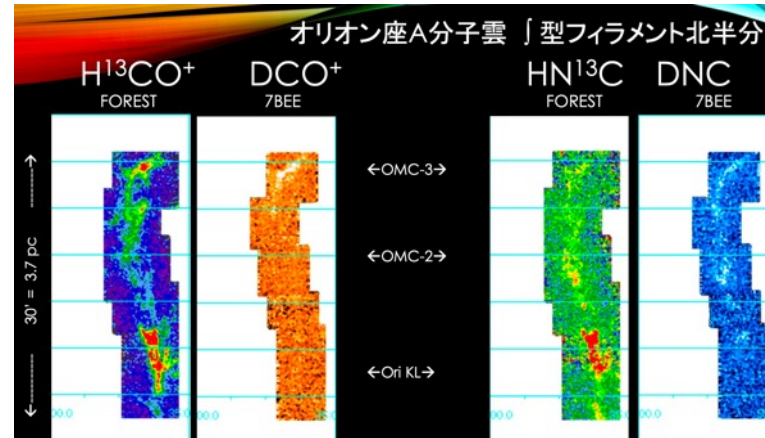
- 7 beam, 2 pol.
- 72 - 116 GHz (corresponding to ALMA Band2+3)

Deuterated mol.
→ x7 faster than T70

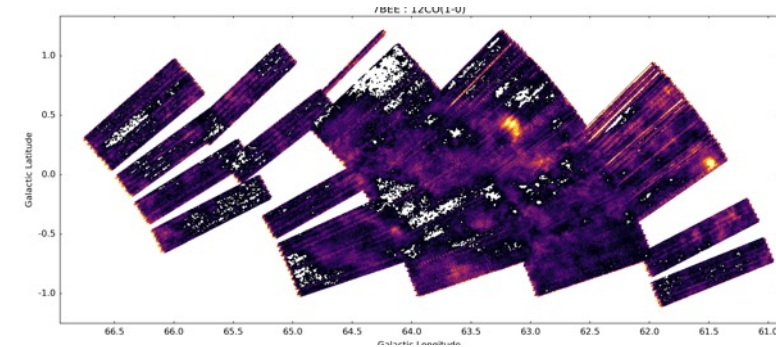
CO
→ x2 faster than FOREST

• Progress

- Installed in Aug. 2022
- First light: Sep. 3, 2022
- CSV
 - Tsys: OK
 - Squint: OK
 - Beam pattern: OK
 - Beam efficiency: OK

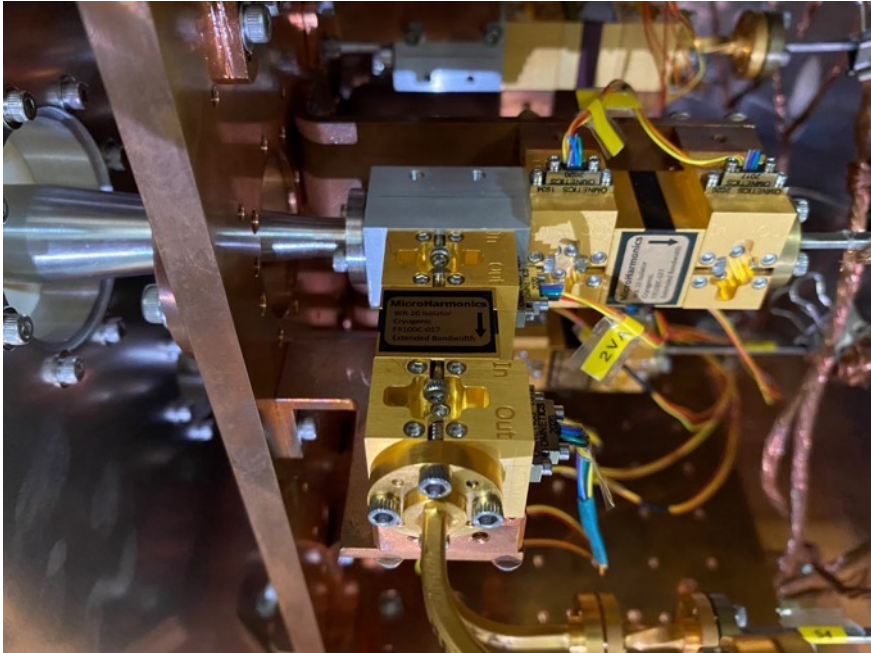


Large scale Deuterated mol. mapping
OMC (Tatematsu+)



CO fast mapping mode was developed
(Nishimura+)

3.1. Progress on 7BEE



- Malfunction on frontend
 - At installation, all IFs were OK for their gain and T_{sys} .
 - Now, the receiver have been experienced 1 year of cooled operation and several time of cooling cycle, but 80% of IFs show gain decrease, and 20% of CLNAs show bias malfunction.
 - We have decided to terminate this year's observations and begin the investigation process by disassembling the receiver.

4. Publication & Outreach

- Publications using NRO45m (Nov 2022 – Oct 2023):
 - 30 refereed papers (ApJ/ApJL/ApJS: 13, PASJ: 7, MNRAS: 4, A&A: 4, Galaxies: 1)
- NRO News Release
 - 6 releases (Nov 2022 – Oct 2023)
 - 2023-01-27 : Fujita et al. “世界初！ AIが描く 天の川銀河のガス雲分布：約14万個の「星の誕生候補地」を推定”
 - 2023-02-16 : Kaneko et al. “天の川銀河中心核近傍で「おたまじゃくし」分子雲を発見 –ブラックホールと…”
 - 2023-05-18 : Sakemi et al. “X線連星から噴き出す宇宙ジェットはパワフルな宇宙のお掃除屋さん…”
 - 2023-05-18 : Kohno et al. “KAGONMAプロジェクト：アンモニア分子の広域観測でさぐる星間ガス雲の…”
 - 2023-06-30 : Maeda et al. “星の材料があるのに星が誕生しない!?: 棒渦巻銀河における星形成抑制現象”
 - 2023-09-14 : Shimajiri et al. “星の創造の舞台!! オリオン座でのフィラメント分裂による新たな星の誕生の証拠”
 - Please let us know when your research is published!
 - NRO has some budget to support making illustration for your release

4. Publication & Outreach

- Nobeyama Open Day Online:

- July 22
- Online public lecture
 - Basic lectures
 - From news releases
- Virtual poster session
 - 電波天文学を学べる大学 (19 Univ.)

- Nobeyama Open Day On-site:

- Aug 26, 1353 visitors



- Next year

- Jul 20: On-line day
- Aug 24 : On-site day

5. Outlook for FY2024

- **Restarting Student Tutorial (学生観測実習)**
 - Main issue: insufficient staff
 - To overcome this, NRO and JSAC are considering following two steps:
 - **Step-1**
 - NRO offers free-of-charge university-led hands-on tutorial (~3 programs/year; in addition to charged ones)
 - PI using this program will be required:
 - to open the information of their university-led tutorial and to accept other university students
 - to provide staff for free-of-charge undergraduate hands-on tutorial (led by NRO) program in the next year (Step-2)
 - **Step-2**
 - NRO offers call for free-of-charge undergraduate hands-on tutorial programs (will be held on late April or May)
 - PI of Step-1 will provide staff
 - Financial support of staff travel cost will be considered

- Under the new scheme (charged-telescope-time, fewer observatory staff), observatory operation is getting on track.
 - Development proposals restarted
 - Student tutorial will be restarted soon
 - Open-day on-site event restarted
- 41 years old NRO 45m shows aging is progressing.
 - However, under the new scheme, repairing works are steadily performed.
- Your contribution is essential. Please use NRO a lot.
 - Observation, Development, Outreach, etc.
- If you find any issues or ideas, please tell us
 - through helpdesk: https://www.nro.nao.ac.jp/~nro45mrt/html/helpdesk/inquiry_form.html (日本語OK)
 - or mail: atsushi.nishimura@nao.ac.jp