Report about the workshop on Subaru PI-type (visiting) instruments

Naoyuki Tamura
(Subaru Telescope, NAOJ)
Oct 31, 2025 JST

Organizing committee: Akiyama (Tohoku), Kawabata (Hioshima), Kuzuhara, Kotani (ABC/NAOJ), Komiyama (Hosei), Okita, Koyama, Takagi, Hattori, Tamura (Subaru)

Thanks to: Adamson, Nitta, Kim, Seifahrt, Rousselle (Gemini) and O'mera (Keck)

The workshop

Overall success!

- 1-day workshop on Oct 28 (Tue) 2025 JST (a day before Subaru Users Meeting Day 1)
- First attempt focusing on Subaru PI-type (visiting) instruments
- Largely not scientific, but rather technical and programmatic
- ~60 participants (~30 onsite and ~30 remote)
- Quite a few interactions occurred for Q&A and discussions

The workshop program (which last longer than planned)

- 10:00-10:20 Opening & introduction: This presentation
- **10:20-12:00 Short talks of PI-type instrument programs (1)**
- (12:00-13:30 Lunch break)
- 13:30-13:40 Inputs from SAC
- **13:40-14:42 Short talks of PI-type instrument programs (2)**
- (14:42-15:00 Break)
- 15:00-16:20 A few talks as primers for the subsequent discussion session
  - Summary of the feedback from the questionnaire
  - Lessons learnt for future from past acceptances & operations of PI-type instruments
  - Examples of instrument's "productivity" evaluation
  - Similar frameworks at the other observatories
- 16:20-17:00 Discussions

a. **Project description (especially uniqueness and strength)**
b. **Challenges/difficulties**
c. **Enough or not (especially budget & human power)**
d. **Requests to the observatory**

Hope the WS was informative and useful for discussions of future!

Outline of this reporting presentation

- Brief history and current situation of Subaru PI-type instruments
- Motivating questions, corresponding actions to the workshop and presented materials
- Discussions and actions to the future

Subaru's instrument lineup

- Facility instruments – Often community driven
  - [Operating] AO188/3k FOCAS, HDS, HSC, IRCS, MOIRCS, PFS
  - [Decommissioned] AO36, CIAO, CISCO/OHS, COMICS, FMOS, Suprime-Cam
- PI-type (visiting) instruments & devices (i.e. with no science detectors)

Getting onboard:
- ALOHA
- HDS-comb
- HRSIP
- Blue NINJA
- exo-NINJA
- Ohana Nui
- Ultra-Doppler

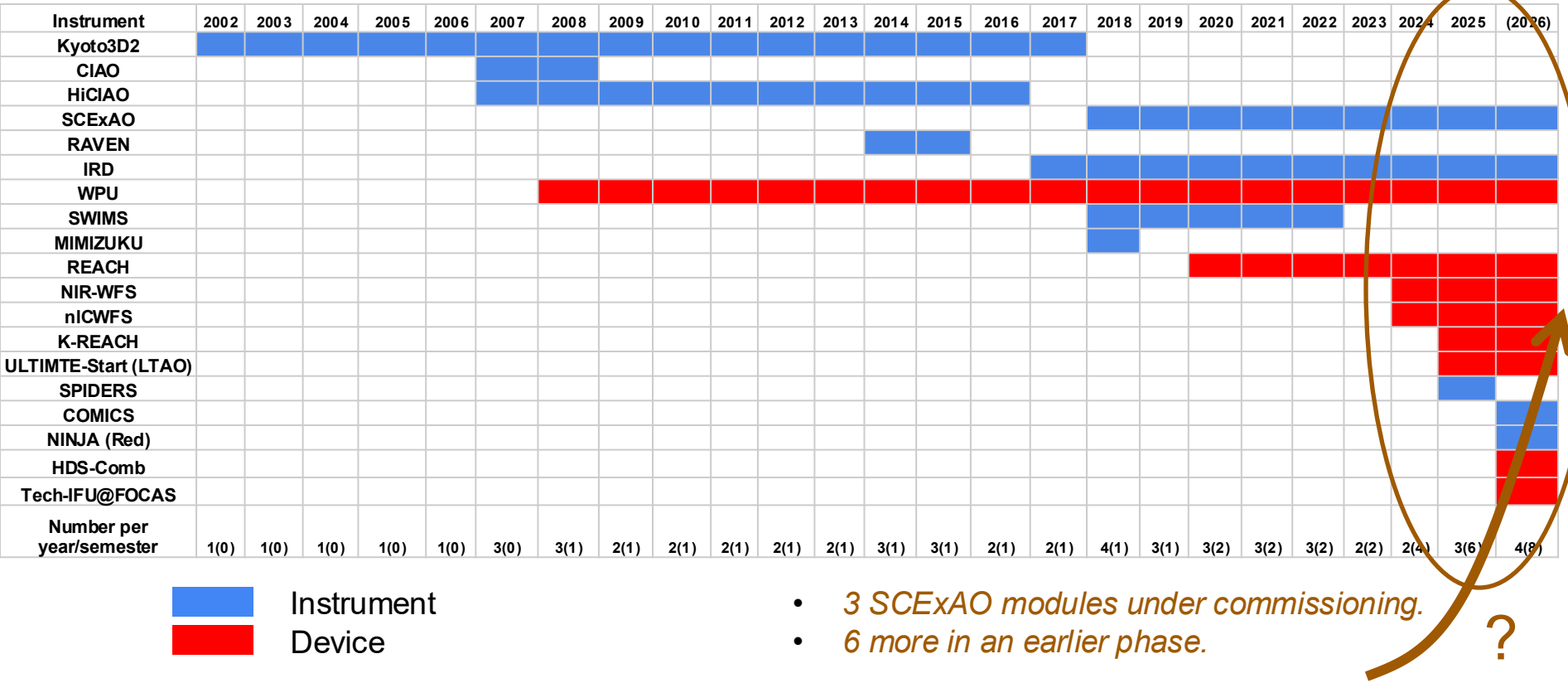
Implementation:
- COMICS (TBC)
- K-REACH
- Red NINJA
- nICWFS
- SCExAO (FIRST-PL, GLINT, upgraded MEC)
- SPIDERS
- Tech IFU(@FOCAS)
- ULTIMATE-Start

Operation:
- IRD
- NIR-WFS
- NsIR-WPU
- REACH
- SCExAO (CHARIS, VAMPIRES, FastPDI)

Decommissioned:
- CIAO (last phase)
- HiCIAO
- Kyoto3D2
- MIMIZUKU
- RAVEN
- SWIMS

The PI-type instruments have been:
- Complimentarily adding different functions to Subaru from those of the facility instruments.
- Providing more opportunities of instrumentation to Subaru (generally smaller scale than facility instruments) with the community.

Visiting instruments/devices at Subaru



Instrument	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	(2026)
Kyoto3D2																									
CIAO																									
HiCIAO																									
SCExAO																									
RAVEN																									
IRD																									
WPU																									
SWIMS																									
MIMIZUKU																									
REACH																									
NIR-WFS																									
nICWFS																									
K-REACH																									
ULTIMTE-Start (LTAO)																									
SPIDERS																									
COMICS																									
NINJA (Red)																									
HDS-Comb																									
Tech-IFU@FOCAS																									
Number per year/semester	1(0)	1(0)	1(0)	1(0)	1(0)	3(0)	3(1)	2(1)	2(1)	2(1)	2(1)	2(1)	3(1)	3(1)	2(1)	2(1)	4(1)	3(1)	3(2)	3(2)	3(2)	2(2)	2(4)	3(6)	4(8)

Instrument

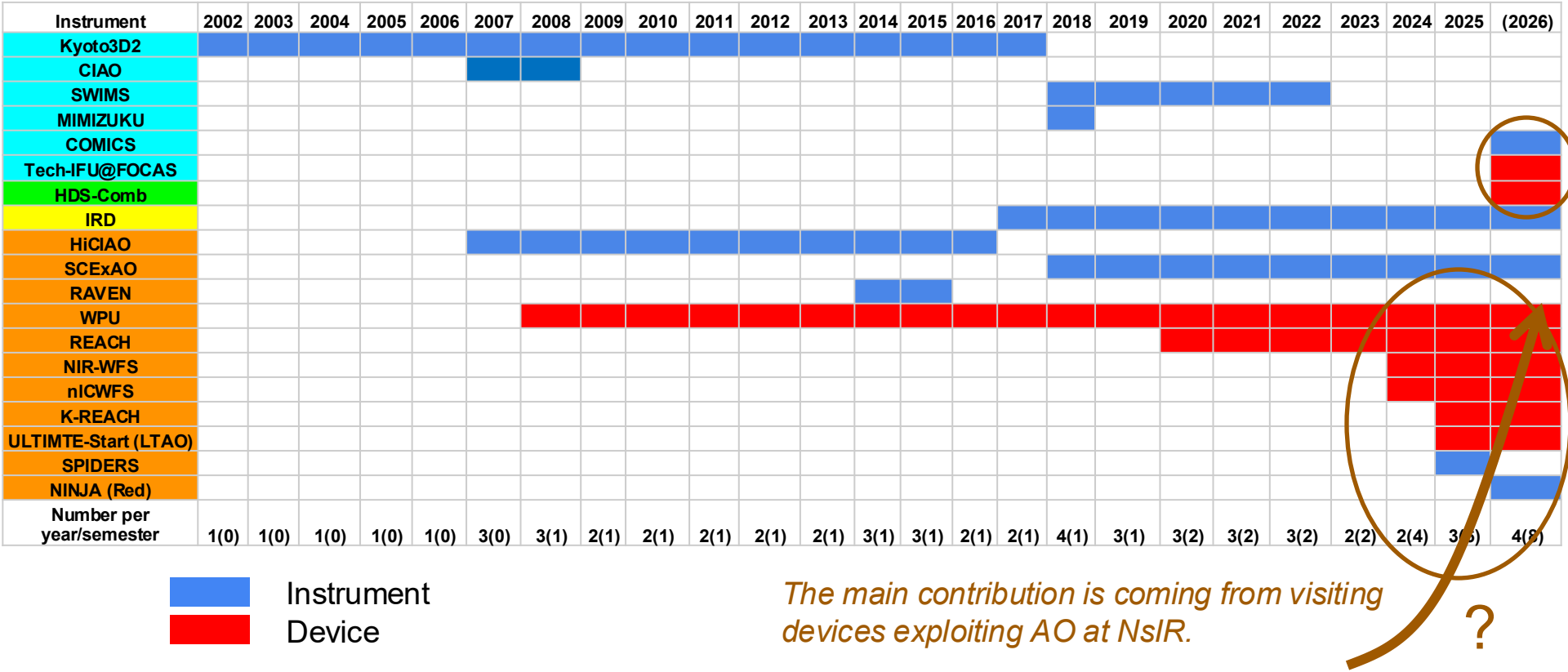
Device

- *3 SCExAO modules under commissioning.*
- *6 more in an earlier phase.*

?

Blue: Cs | NsOpt | Coude | NsIR

Visiting instruments/devices at Subaru



Instrument
Device

The main contribution is coming from visiting devices exploiting AO at NsIR.

?

https://www.naoj.org/Instruments/ApprovalProcessPIinstrument_v30_Dec212023.pdf
(You can find this link at the top of “Visiting instruments” section.)

Key facts on PI-type instrument framework

1. Definition of PI-type instrumentation program

The observatory expects a PI-type instrumentation program can be of multiple types such as:

- Development of a new instrument for carry-in to Subaru
- Carry-in of an already-built instrument to Subaru
- Modification (including addition of extra component(s)) of an existing Subaru instrument for upgrades.

Scientific instrument

The observatory welcomes not only programs that aim at being scientifically productive in its operation phase, but also those purely for engineering purposes such as a demonstrator of novel technology and application.

Technology demonstration

Although details can vary from program to program, a PI-type instrumentation program is basically executed by PI’s resources external to the observatory.

A team can contact us ***after*** building an instrument/device ... ***Safer to have discussions before construction?***

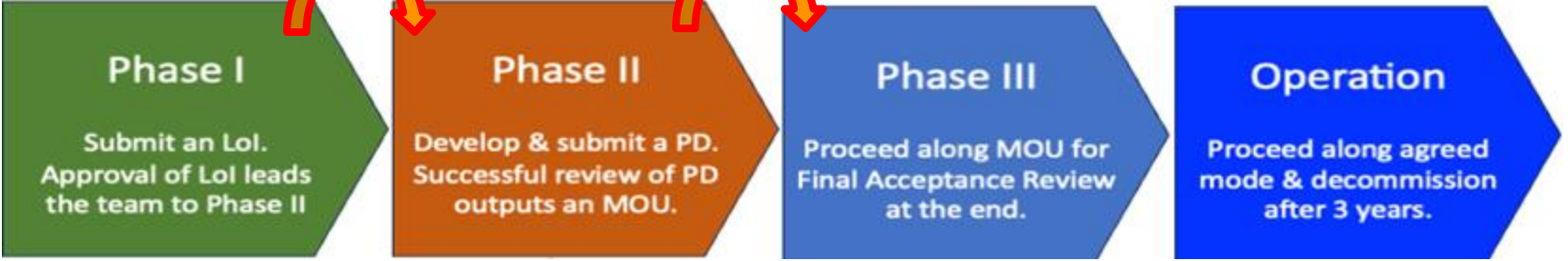
Key facts on PI-type instrument framework

- Acceptance procedure

LoI

Proposal Document (PD) Review → MOU

Readiness reviews are set at major milestones such as before shipping, starts of engineering works at the summit, and engineering observations.



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Operation:
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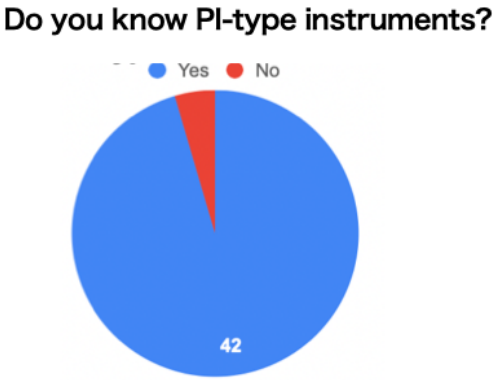
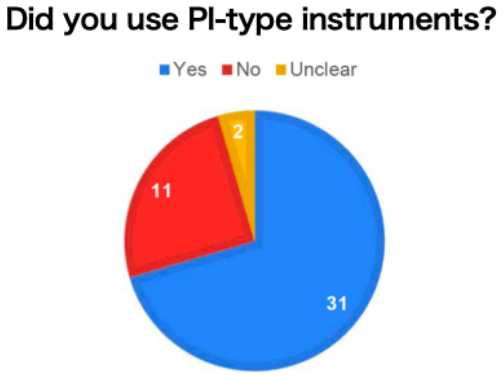
- REACH
- SCExAO (CHARIS, VAMPIRES, FastPDI)

Motivating questions & corresponding actions

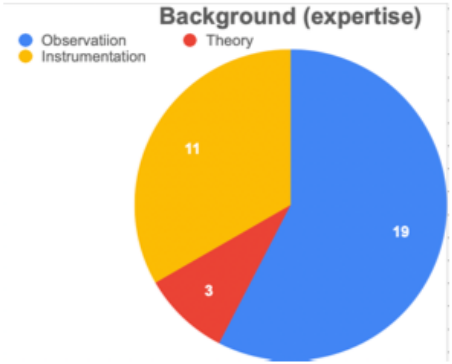
- Is this framework popular? Will the trend be continuing?
  - Potential demands from both developers & users
- How should outputs from this framework be maximized?
- How should this framework be run sustainably?

- Questionnaire to the community (Kuzuhara-san & Komiyama-san)
- Lessons learnt from past operations (Okita-san)
- Attempts of “productivity” assessment (Koyama-san)
- Comparisons with other observatories (Tamura)

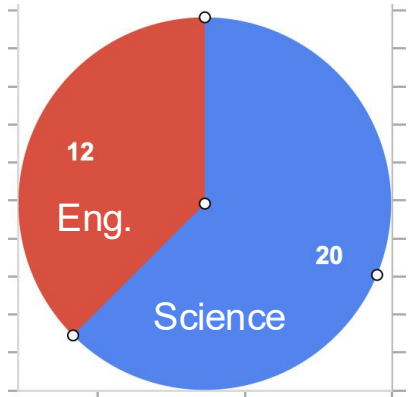




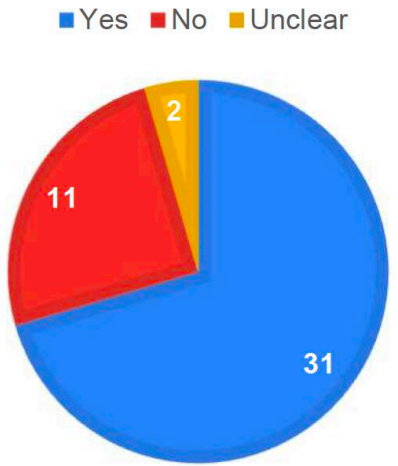
Most people knows PI-type instruments



Did you perform science or engineering observations with a PI-type instrument?



Did you consider using a PI-type instrument for your science, though you have not used it?



(Kuzuhara-san & Komiyama-san)

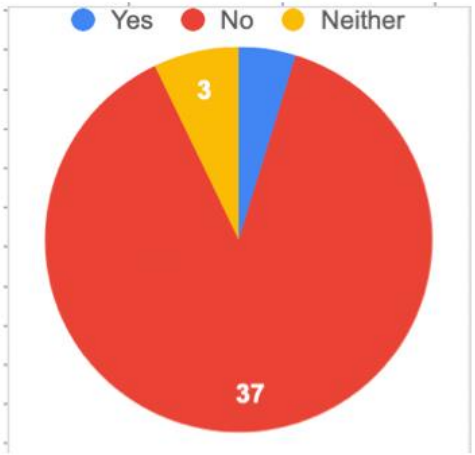
(Kuzuhara-san & Komiyama-san)

What roles or functions do you expect PI-type instruments to fulfill?

- ***Unique*** functions that cannot be supplied by general open-use instruments, to support, unique, cutting-edge, or trending sciences (finally, enhance the versatility of the Subaru as “semi-open-use instruments”)
- ***Testbed*** for future sciences, and to generate new science fields even with limited science outputs
- ***Education*** for a student and young researcher to experience the instrumentation
- To get great ***sense of achievement*** with our own efforts from instrument design to science outputs

PI-type instruments have many unique roles and complement general open-use instruments

Did PI-type instruments provide any difficulties to your work and project?



PI-type instruments themselves would have rarely been inconvenient for Subaru observers.

(Kuzuhara-san & Komiyama-san)

Limited data reduction pipeline
Limited technical information

Difficulties in using PI-type instruments

- Relatively limited preparation of (friendly) data-reduction pipelines
  - A user needs to significantly rely on the instrument team and the independent data reduction is not easy
- Limited preparation of technical information and related observation-planning software
- It is not easy for a user, who is far from the instrument team, to use an PI-type inst.

Why did you give up using PI-type instruments?

- The relationship with the PI
- It was necessary to develop many things such as calibration plans from a fundamental level

Needs of development own calibration plans?

Structural issues of PI-type instruments?

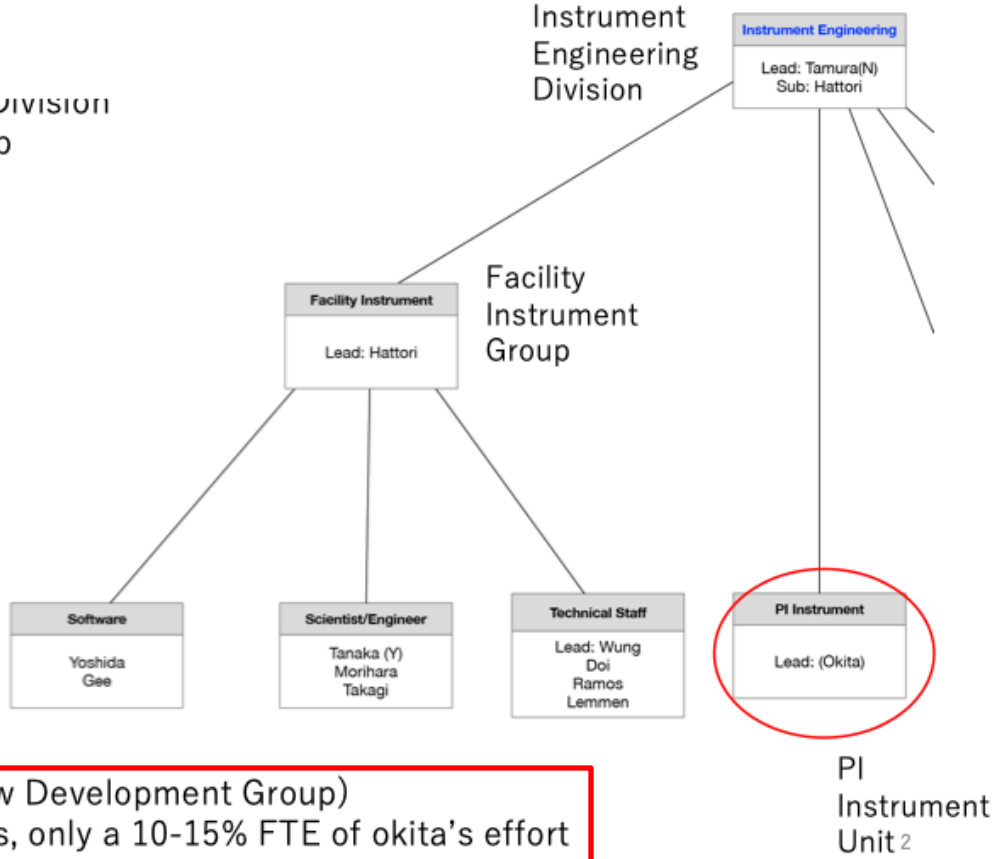
(Okita-san)

Okita's History

2014- Telescope Engineering Division
2018- New Development Group

2018- SWIMS
2018- MIMIZUKU
2021- K-REACH
2021- HDS-Comb
2021- Ultimate START
2022- NINJA
2023- COMICS
2023- Tech. IFU
…

- **Hattori: NIR-WFS, nICWFS(, DM3k, newAOCAL)**
- **Tamura: SCExAO, SPIDERS, COMICS, Ohana Nui(, NBS)**
- **Other staffs also contribute as reviewers.**

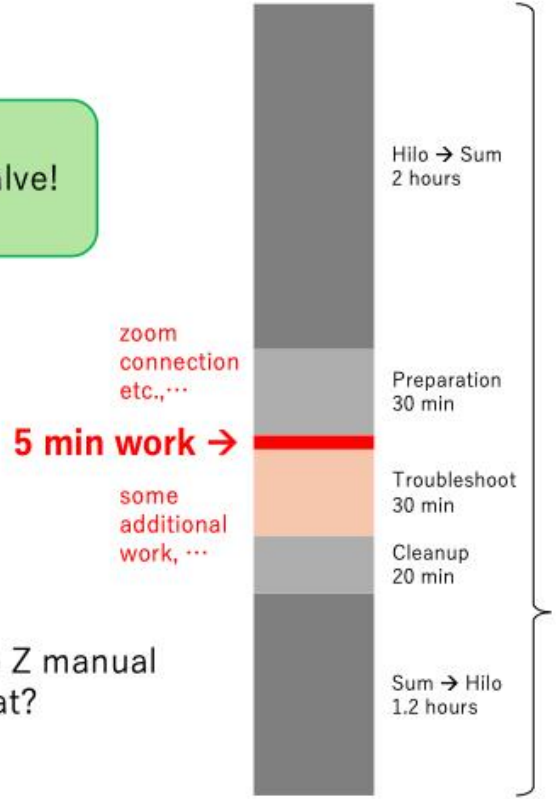


PI Instrument Unit (former New Development Group)
- No budget, no team members, only a 10-15% FTE of okita's effort

(Okita-san)

NO tiny work at Maunakea Summit

Hey, Okita-san,
Please turn off the valve!
It's just a 5 min!



4 hours 40 minutes

Plus, he is now away across the ocean!

- Due to a lack of A to Z manual
- PI would prepare that?
  - Is this realistic?

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(Okita-san)

Ideas to be Solved

Idea 1: Limit the interface
- for example, only Ns-focus, 1m x 1m x 1m, 1-ton
- We can prepare documents easily
- We can do technical support easily
- However, uniqueness of our PI instrument activity becomes weaker??
- This may fit if the community want to go a small/rapid development project

Limiting focus/port?
Very conservative interface conditions?

Idea 2: Work together
- PI should come to Subaru Telescope at the beginning of the project
- Check interfaces together
- Direct communication with engineers and technicians on-site
- This may be the only way to perform mid-scale development project
- (And work together in the operation as well)

More onsite visits & long-term staffing

- **IRD: ABC's commitments for staffing (e.g. Kudo, Harakawa, Vievard)**
- **SCExAO: Commitments from Guyon+ for staffing (Guyon, Lozi, Deo, etc)**

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(Koyama-san)

How can we evaluate the “productivity”?

Instrument Planning Task Force (~2014-2016) evaluated and provided scores for all facility instruments with the following check points:

- **Community’s demand**: Number of submitted proposals
- **Science Performance**: Publication/citation per observing night
- **Competitiveness**: Fraction of high-score proposals
- **Troubles**: Downtime due to instrument trouble
- **Work loads**: Daycrew, Instrument Division works
- **Uniqueness**: Availability of instruments with similar capabilities

Science Operation Development Education

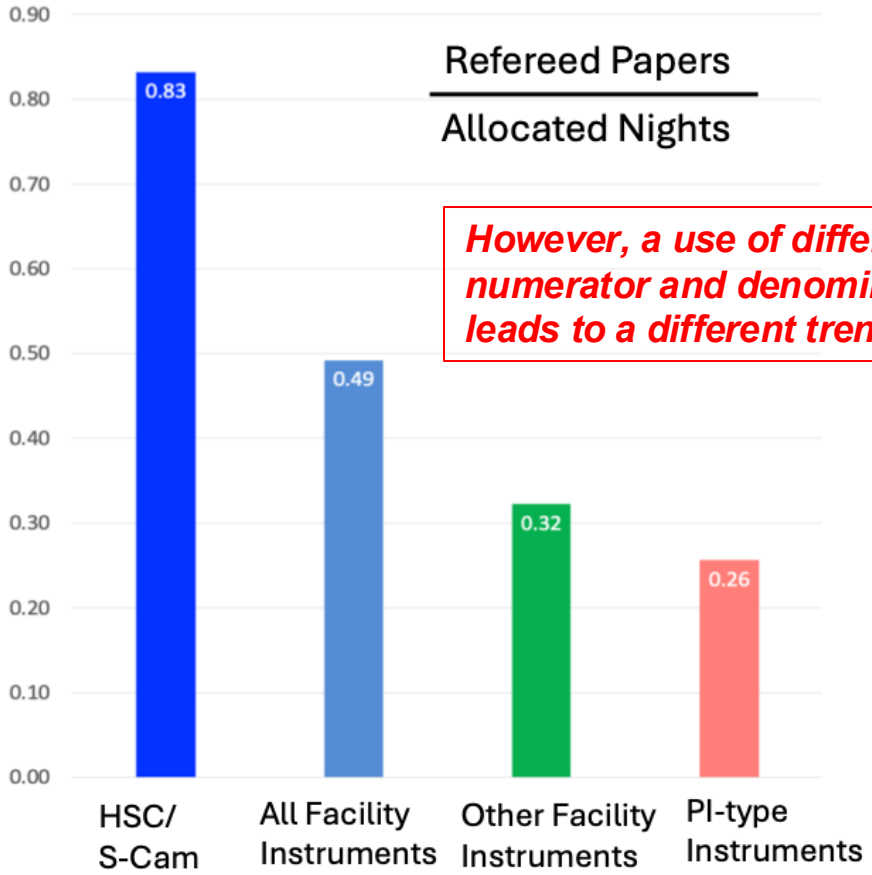
Normalization

Other important factors to evaluate productivity of PI-type instruments?
We shouldn’t evaluate PI-type instruments at first place?

(Koyama-san)

- "Publication per 1 night" – potentially one of the simple definitions of "productivity"?
- HSC/S-Cam are a factor of ~2-3x more productive than other instruments, but interestingly, there is no significant difference between other facility and PI-type instruments.

Following the discussion within the workshop SOC, we decided not to show the results for individual instruments, considering the scope of the workshop.



However, a use of different numerator and denominator leads to a different trend!

Visiting instruments (VI) at Gemini-N/S

Instrument	North or South	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024A	2024B	2025A	2025B
TEXES	N																			
GRACES	N																			
PHOENIX	S																			
POLISH2	N																			
Alopeke	N																			
Zorro	S																			
Maroon-X	N																			
IGRINS	S																			
IQUEYE	S																			
Number per year/semester	N(S)	1(0)	1(0)	1(0)	1(0)	1(0)	1(0)	1(0)	2(1)	3(1)	3(1)	5(2)	5(2)	5(2)	5(2)	4(2)	3(2)	3(1)	3(2)	3(1)

North
South
Intermittently operating

Comparisons with Gemini and VLT

	Subaru	Gemini	VLT
Instrument capabilities	High resolution, infrared, speckle, polarimetry, …		(To be understood)
Visitor focus/port	Multiple	Single	Single (Ns on UT1)
Telescope specific?	Yes mostly	No	(To be understood)
When contacting to bring VI?	Anytime	Anytime	Anytime (but 3 mo before funding app is requested)
Operation & maintenance by VI team?	Yes (mostly?)	Yes (mostly)	Yes (very likely entirely)
Observing time with VI	Open to community	Open to community	Open only to VI team
VI team in observation proposals?	Yes	No need (PI's choice)	N/A
Data archiving	Raw data	Reduced data or raw data + pipeline	No
Are there visiting devices?	Yes	No	(To be understood)
Number is increasing?	Yes	No	(To be understood)

Discussions for future

Key phrases:

- Sustainable & timely review and implementation processes
- Maximizing (current/near-term) scientific/engineering outputs unique to Subaru
- Potentials to long-term future projects such as TMT and HWO
- Visibility of PI-type instruments

Actions are yet largely TBD, but …

- Discussions with SAC are crucial for e.g.
  - Pursuing involvements of the community:
    - Evaluation of scientific competence of a proposed PI-type instrument
    - Organizing a review as a chair
  - Clarifying community's demands and priorities
- Development of a mechanism that fits long-term visiting (like "resident") instruments.
- Continuing the questionnaire for some more time.
- There will be a 2nd workshop!