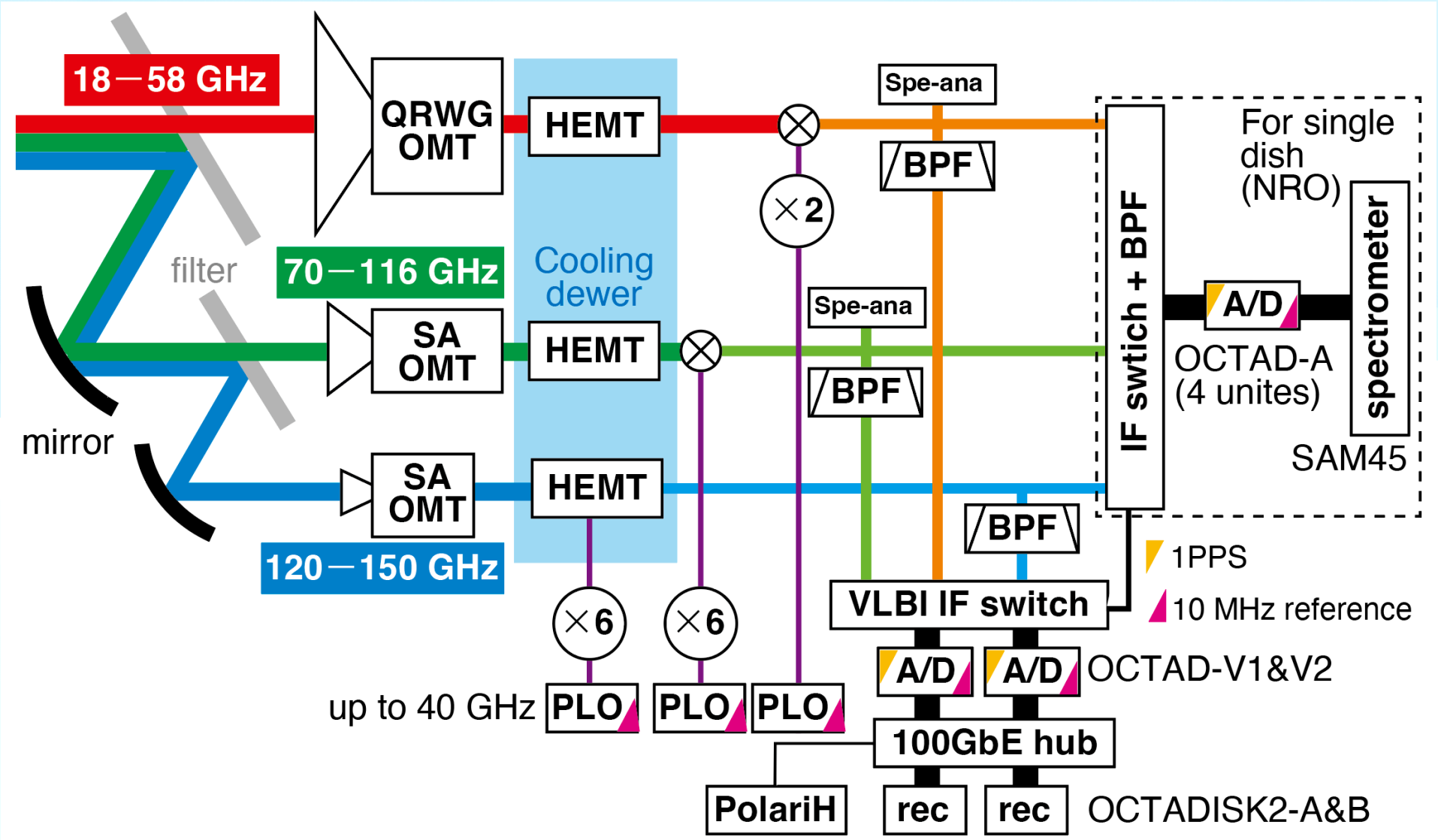
NOCTURNE

Nobeyama Octatonic-scale bands, Unitary-frame Receivers Nexus

IMAI, Hiroshi

Amanogawa Galaxy Astronomy Research Center / Center for General Education
Kagoshima University)

NOCTURNE system concept



Proposal background

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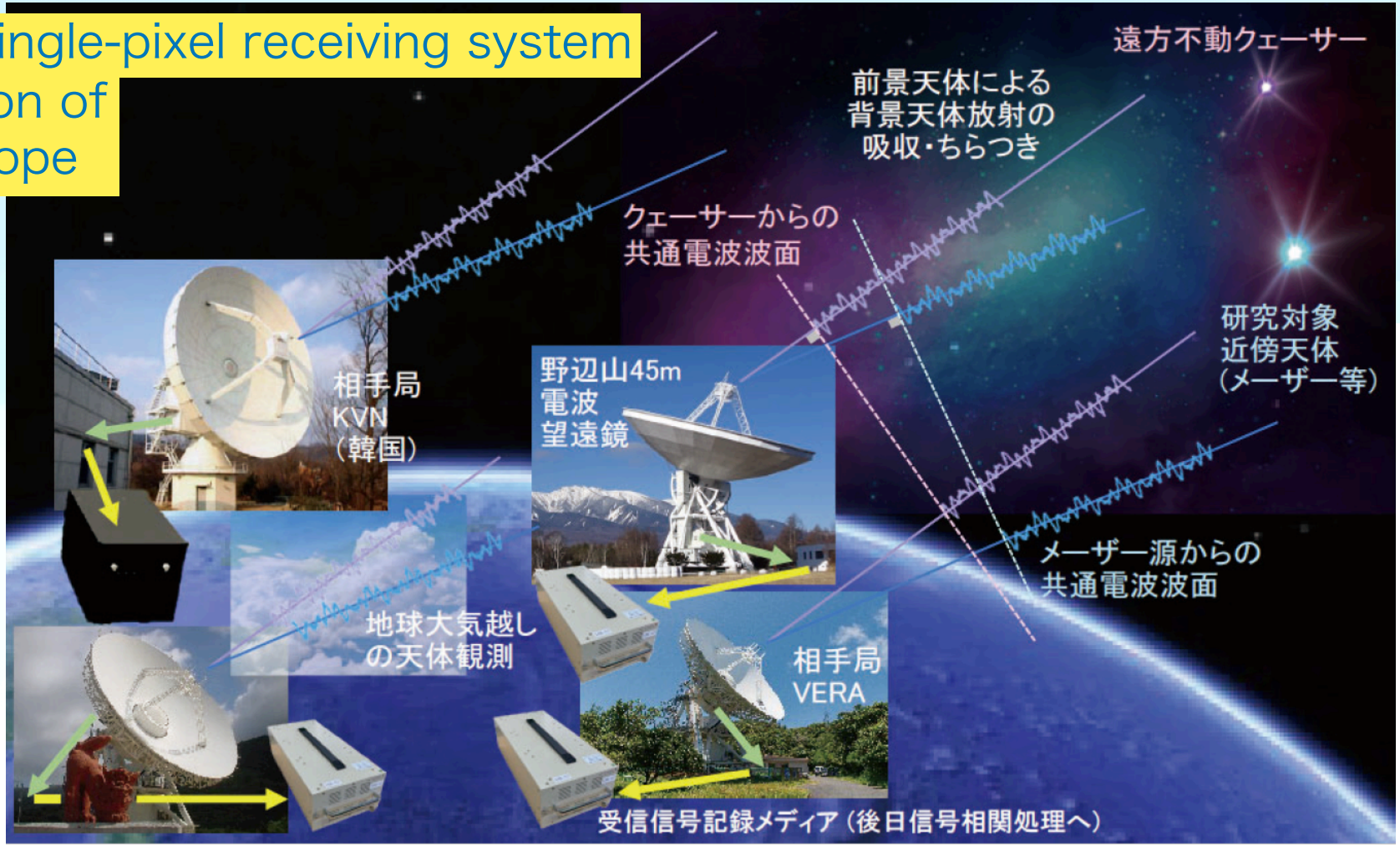
- Ultra-wide band, single-pixel receiving system for next generation of NRO 45 m telescope

18—150 GHz (up to 230 GHz in future)



Proposal background

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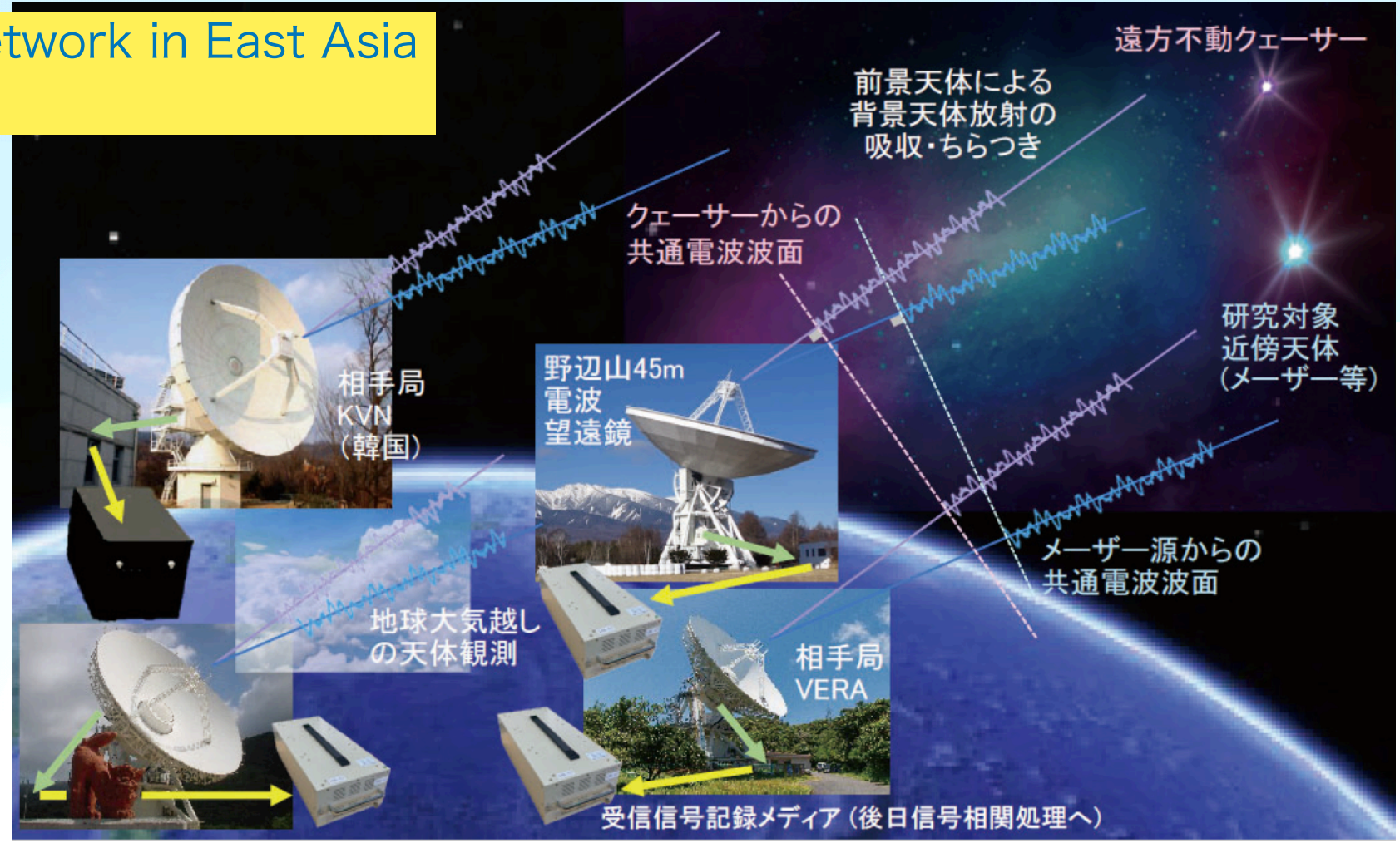
- Millimeter VLBI network in East Asia (EAVN-high)

with KVN, VERA
(and Global Millimeter VLBI Array)



Proposal background

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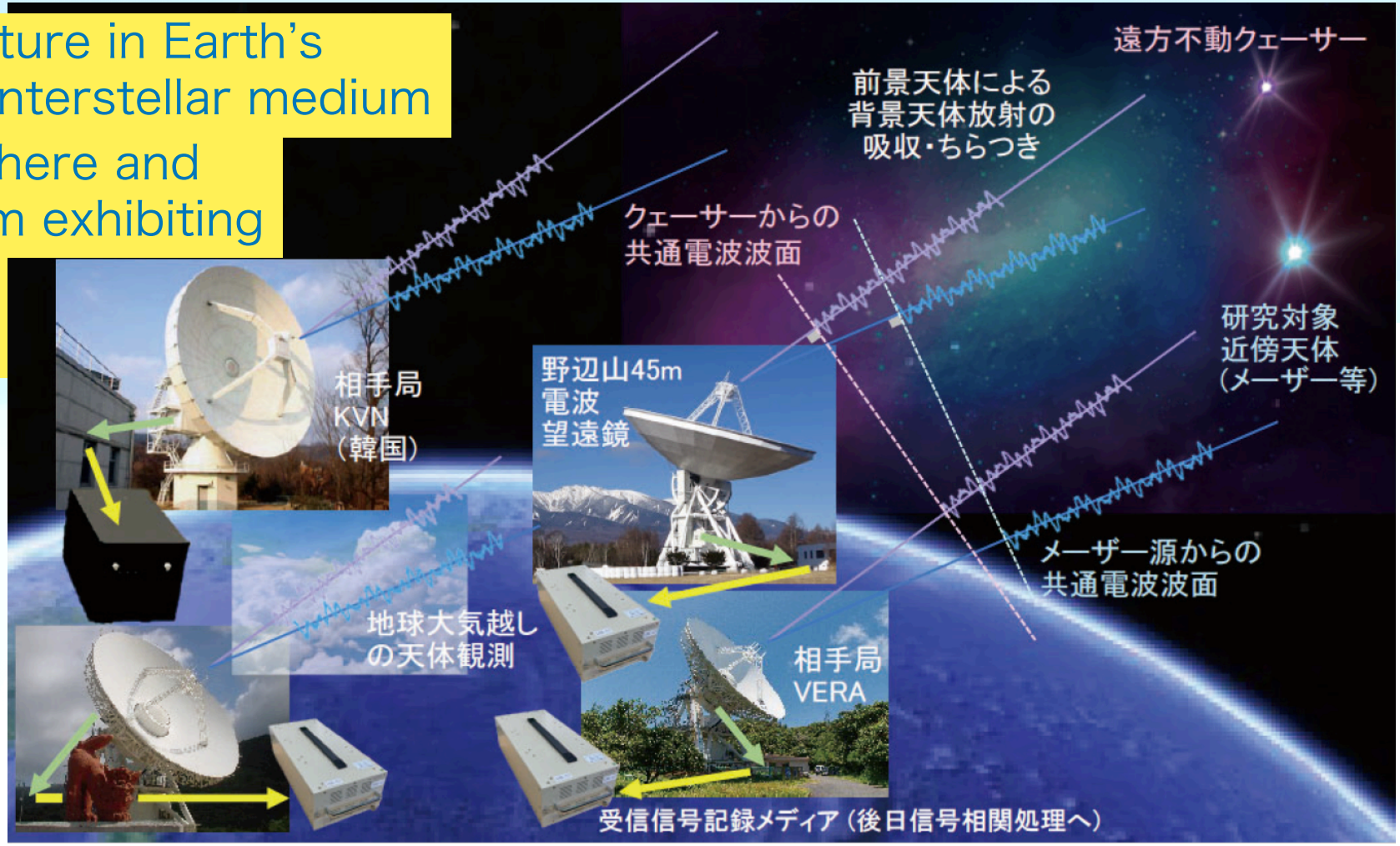
- Microscopic structure in Earth's troposphere and interstellar medium in Earth's troposphere and interstellar medium exhibiting rapid and random variation

  - Astrophysical masers
  - Interstellar tiny molecular structure (~1 au)
  - Water vapor clumps (< 1 km)
  - Blackholes and jets



Trans-discipline concept

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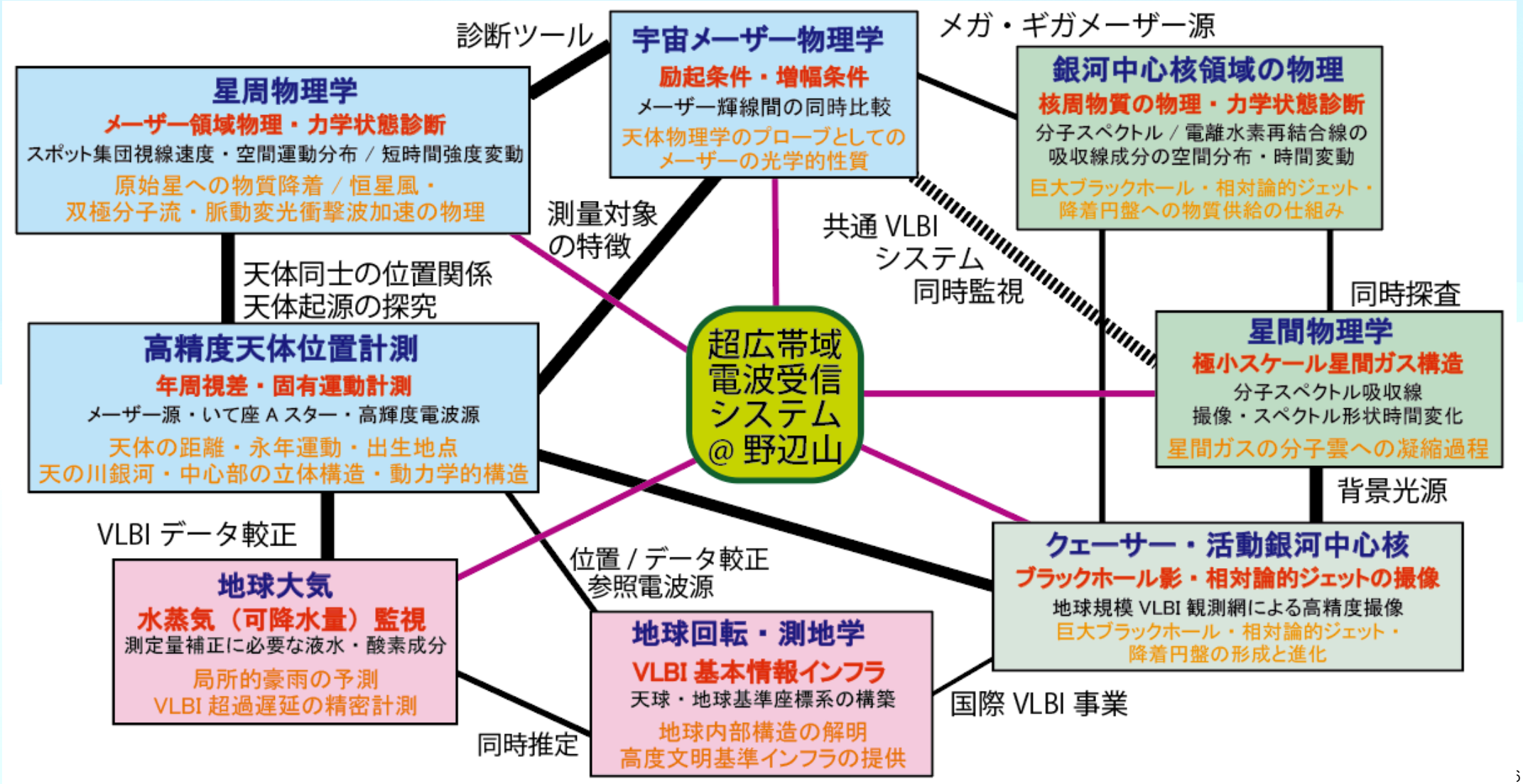
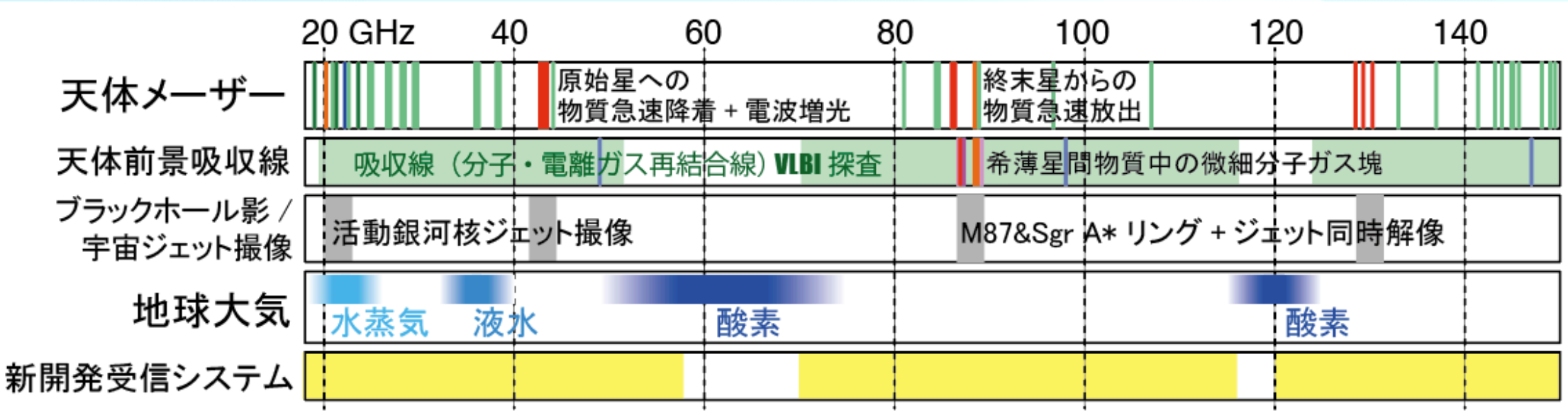


Frequency coverage and science cases

- Exploring time-domain radio astronomy on sub-daily to daily scale
- Simultaneous monitoring of interstellar medium and Earth's troposphere for data calibration in source brightness/amplitudes and VLBI fringe phases



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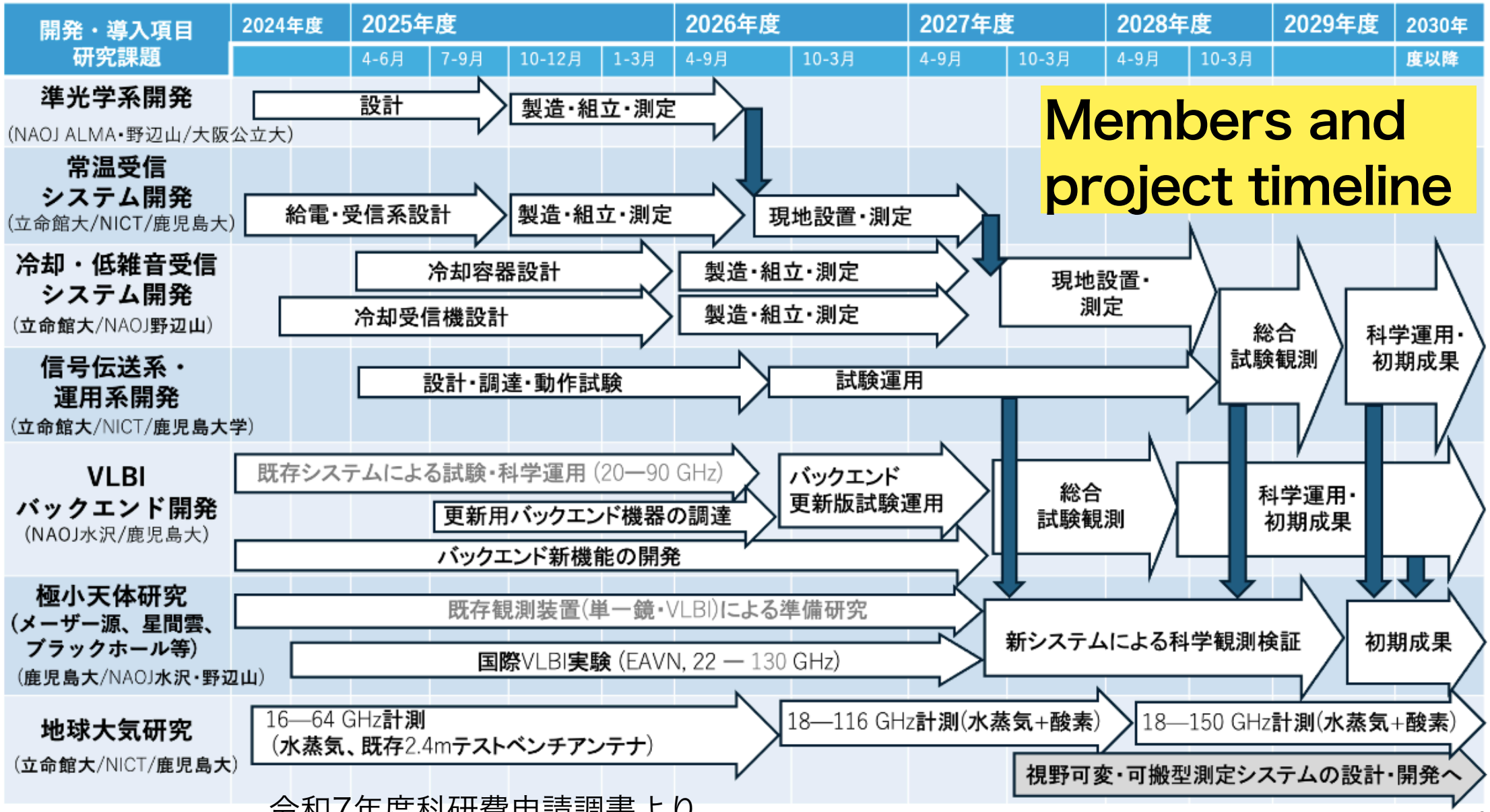
Members and project timeline



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Members in KAKENHI

- IMAI Hiroshi (PI, Kagoshima Univ.)
- UJIHARA Hideki (Ritsumeikan Univ.)
- NISHIMURA Atsushi (NAOJ/NRO)
- OYAMA Tomoaki (NAOJ/Mizusawa)
- ISHIKAWA Ryuichi (NICT/Koganei)
- YAMASAKI Yasumasa (NAOJ/ALMA)

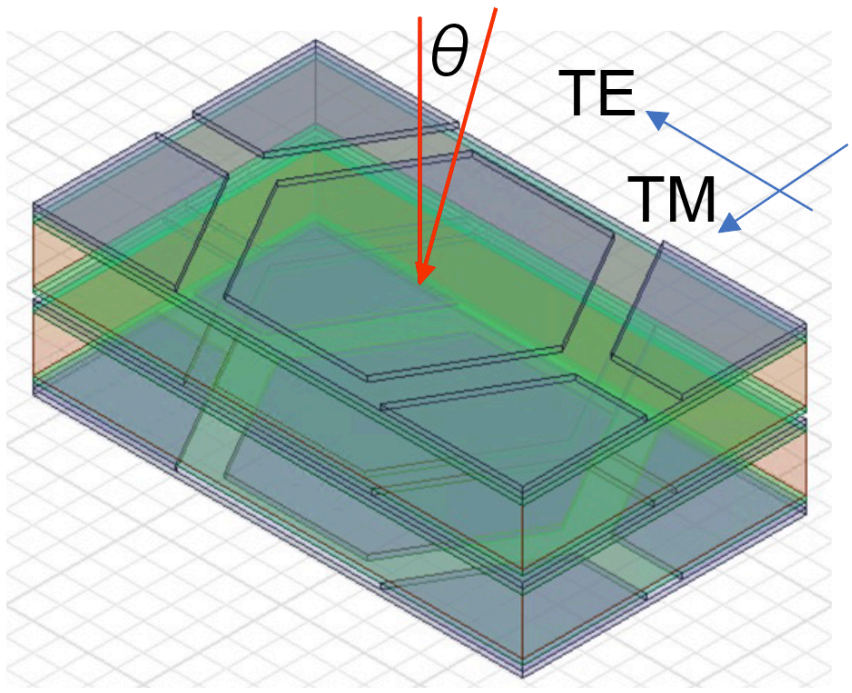
Collaborators

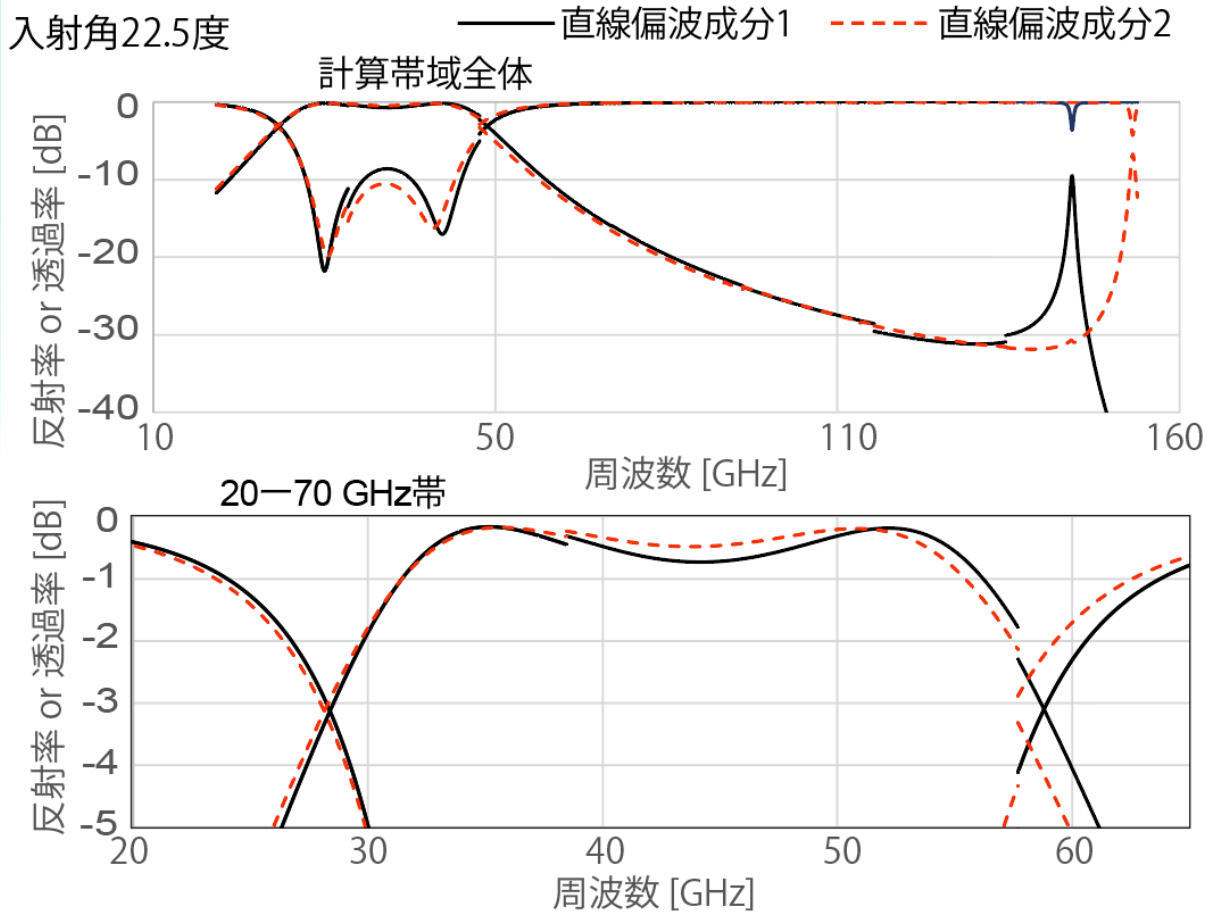
- OGAWA Hideo
  (Osaka Metropolitan Univ.)
- NAKASHIMA Keisuke
  (Kagoshima Univ.)
- .....

New members contributing to hard/software system development, commissioning/verification, and science development are welcome.

Current preparations

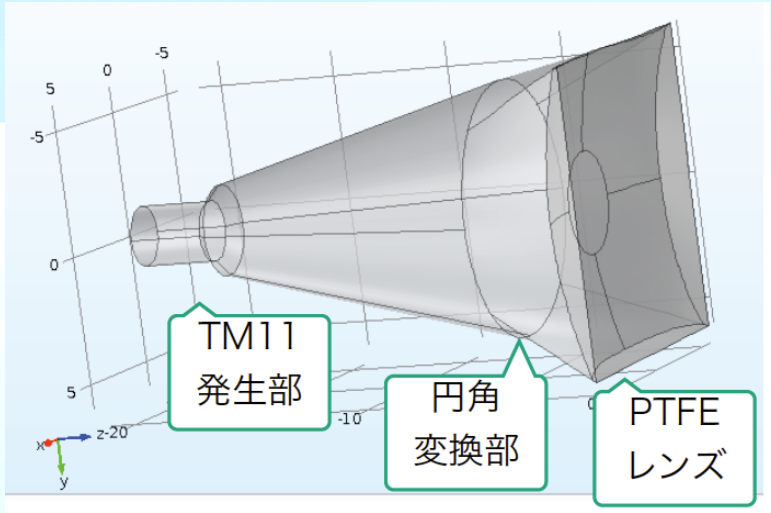
- Design and simulation of frequency separation filters (by Y. Yamasaki)





Current preparations

- 16—64 GHz receiving system as a water vapor radiometer (developed by H. Ujihara)



Design for 80—120 GHz feed horn

(rectangular ➡ circular lens for higher frequency band)

Other development

- Wide-band receivers using new wide-band OMT and LNA
- Wide-band spectrometer using RFSoC
- Linear to circular polarization conversion in A/D sampler (OCTAD) for VLBI
- Extracting precipitable water vapor (PWV) content and corresponding excess pass delay length from spectra of water vapor radiometer for astrometric calibration