VLBI Discussion Session

**Capabilities**

What instrumentation and facilities do we currently have access to?

**Demands**

In the next 5-10 years:
What instruments/facilities are needed for the science goals?

**Advancements**

In the next 5-10 years:
What instruments/facilities are we building?
What instruments/facilities can we get involved with?
Capabilities (i)

What instrumentation and facilities do we currently have access to?

- 230GHz - EHT (ALMA Non-standard proposal), Continuum
  Now: GLT (Oct-April VLBI main focus),
  JCMT oversubscribed by 5:1 in Winter
  2020: NOEMA, Kitt Peak - powehi+jet
  SMA 230GHz only part of EHT (no other proposals)
- JCMT uses SMA maser
- Caution as we build this network to maintain user community, when funding goes to one main project, there are issues keeping community alive
  - EAVN up to 43GHz, lowest 6.7GHz (open use within 1 year)
  - FAST detected fringes at 1.6GHz
- In East Asian regions there is possibility for low frequency observations (<5GHz)
  - 86GHz upcoming at JCMT - Daytime observations possible
  - KVN, 86 GHz
What instrumentation and facilities do we currently have access to?

- GMVA - Global Millimetre Wave Network - 86GHz (Twice/year)
- Thailand (1GHz, 25GHz, first light next year), (46GHz, 86GHz first light in 2-3 years), 40 meter dish - joining VLBI network
- EHT standardised
- EHT monitoring system *open source* (central server, python client) - one website that has a display of all site conditions (and predicts Precipitable Water Vapour!)
Demands (i)

In the next 5-10 years:
What instruments/facilities are needed for the science goals?

- Wide band width
  - Multiple Frequency Receiver: Frequency Phase Transfer (need increase coherence)
  - Improve efficiency
  - Meter observation
  - Radial velocity
  - Faster time to fringes

- Over 1 day 4-5 hours (fast timescale changes in compact observations) 4 telescopes
  (Nobeyama + SPART + others)
- 1 long period variable biweekly - time exceeds 100 hours per year
- Spectral line (absorption) and AGN focus with GLT+JCMT?
- 200 hours with KVN, 100 hours with EAVLBI (per semester)

- Better organization for VLBI - central hub for decisions about go/no-go
- Expanding 86GHz capabilities for Evolved Stars, etc.
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Demands (ii)

In the next 5-10 years:
What instruments/facilities are needed for the science goals?

-Time and coordination - how fast is setup? - make VLBI observations more frequent and more flexible
-The faster the setup, the more flexible = Automation
-Flexible observing for different weather conditions at different sites
- Japan needs Mark6 data storage? - worldwide standardization
- Dynamic scheduling at 86
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Advancements

In the next 5-10 years:
What instruments/facilities are we building?
What instruments/facilities can we get involved with?

-SMA, GLT, JCMT, Tibet for high frequency VLBI
-60M submm telescope (Tibet)
-Younger generation education - building instrumentation and small dishes? ~SWAN VLBI Network~
Event Horizon Telescope (EHT) – 230 GHz VLBI
   So far, continuum only.
   Basically, ALMA users can submit 230 GHz VLBI proposal.
Current: ALMA, APEX, GLT, IRAM 30m, JCMT, LMT, SMA, SMT, SPT
Near Future: NOEMA, Kitt Peak

3 mm VLBI
   Current: KVN, NRO, GLT, ATCA, Yebes
   Near Future: JCMT, Thailand
Compact Array + Long Baseline Array (from extended to compact sources)
JCMT vs VLBA Hawaii Station
Plan for increasing bandwidth? (EHT: 64 Gbps)

VLBI Data Correlation
   SHAO
   KASI
   Any request for the upgrade?

Future Instruments
   Multiple Frequency Receiver: Frequency Phase Transfer
Future New 3 mm / 230 GHz VLBI Sites
   China (Ali)