KaVA ESTEMA (Expanded Study on Stellar Masers) Status Report

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About ESTEMA
- The first stage of the KaVA Large Programs (LPs) on circumstellar H₂O and SiO masers
- Aiming snapshot imaging of 80 stars in H₂O and SiO masers
- Spending about 230 hours during 2015 October—2017 February
- Yielding maps of ~40 stars in H₂O and/or SiO masers
- Statistical view of circumstellar maser on microscopic (maser spots) to macroscopic (circumstellar envelopes) scale
- Finally selecting about 20 stars for the one-decade intensive monitoring project in the KaVA second stage LP

Current status on observations and data handling
- About 90% of observations complete (10% from recovery in 2017)
- About 90% of correlation complete
- ~80% of inspection complete, following ingest processing
- Calibration pipeline in development/tested

ESTEMA fringe inspection (integration < 3 min) (as to 2017 Jan.)

- H₂O masers: 33/74 fringe detections
- ²⁸SiO J =1→0 v=1&2 masers: 40/72 fringe detections
  21 stars simultaneously detectable in H₂O and ²⁸SiO J =1→0 v =1&2 masers
- ²⁹SiO J =1→0 v=0 masers: not yet inspected (KVN or VERA/OCTAVE wide only)
- ²⁸SiO J =2→1 v =1 masers (KVN only): 18/70 fringe detections
- ²⁸SiO J =3→2 v =1 masers (KVN only): 1/69 fringe detections
- ²⁸SiO J =1→0 v=3 masers: not yet inspected (VERA/OCTAVE wide only)

Fringe detection rates slightly lower than planned in proposal submission in K/Q-band masers

Future perspectives: Proposing one of KaVA “legacy” projects

- Targeting >10 stars for one decade monitoring
- biweekly—quarter monthly maser mapping in light curve phase spacing: Δφ~1/20
- Observations for > 250 hours/year
- Proposing by the middle of 2017
  - Detecting pulsation-driven shock waves and/or periodic behaviors in circumstellar envelopes
  - Finding evolution of inhomogeneity in CSEs
- Synergies with ALMA (thermal/sub-mm masers), VLTI (star images), JASMINE (stellar astrometry), and SKA-VLBI (OH masers)
First two hours of observation block

**VERA B-beam**

**VERA A-beam**

**KVN**

Second day (Q-band in VERA)

**VERA B-beam**

**VERA A-beam** + OCTAVE

**KVN**

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**ESTEMA**

**target stars**

(see KaVA Homepage)

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**Scan pattern in KaVA/ESTEMA observations**

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6-9 hours per session for 4—6 sources

20 pairs of K/Q-band sessions with VERA