The status of the eSMA

Sandrine Bottinelli (Leiden Observatory)

Richard Chamberlin (CSO), Remo Tilanus (JCMT), Ken Young (CfA/SAO),
Huib Jan van Langevelde (Leiden/JIVE), Ewine van Dishoeck (Leiden),
Michiel Hogerheijde (Leiden), and the eSMA commissioning team

What is the eSMA?

- collaboration between the SMA, the JCMT, and the CSO, to join all three observatories into a single interferometer array

- will operate part-time in 345 GHz atmospheric window to study Solar System bodies, protoplanetary disks, star forming regions, evolved star envelopes, nearby galaxies, and ultraluminous galaxies at cosmological distances.

JCMT 15m

Netherlands/UK/Canada

CSO 10.4m

Caltech/NSF

SMA 8×6m

SAO(Cfa)/ASIAA(Taiwan)

Why eSMA?

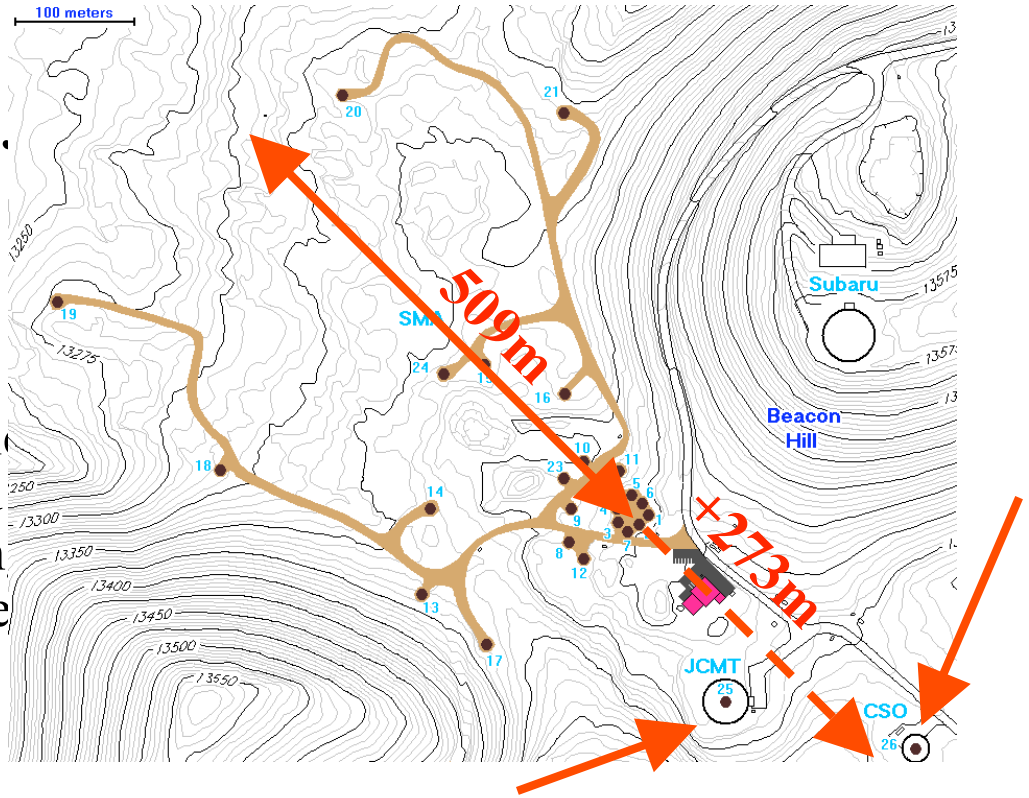
I. More sensitivity:

SMA +

8x6m +

288 +

→ (1) more than doubl
⇒ observing speed
→ (2) add the collectin
⇒ sensitive high-re



II. More resolution:

longest baseline extended from 509 → 782 m ⇔ 0.43" → 0.28"

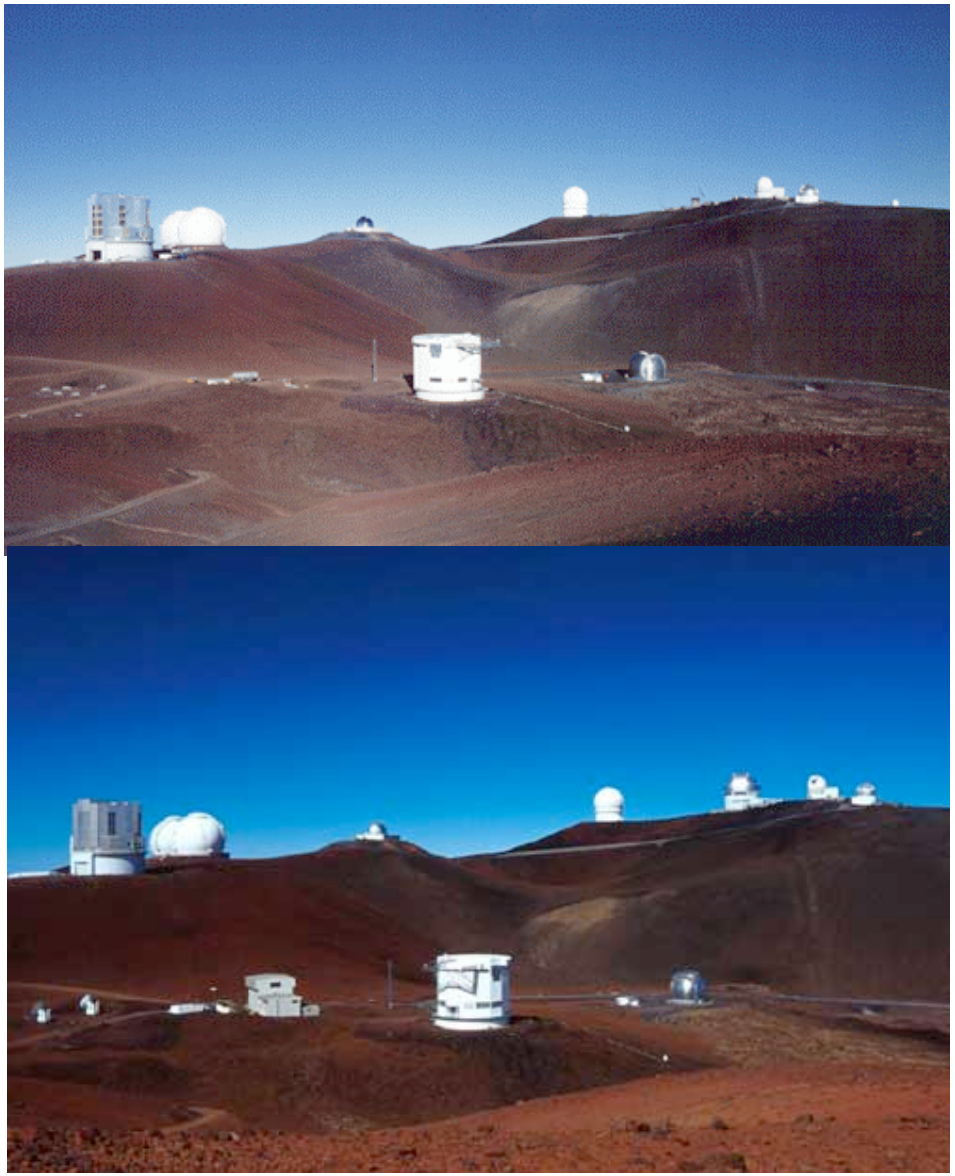
⇒ ~30% increase in resolution

Goals

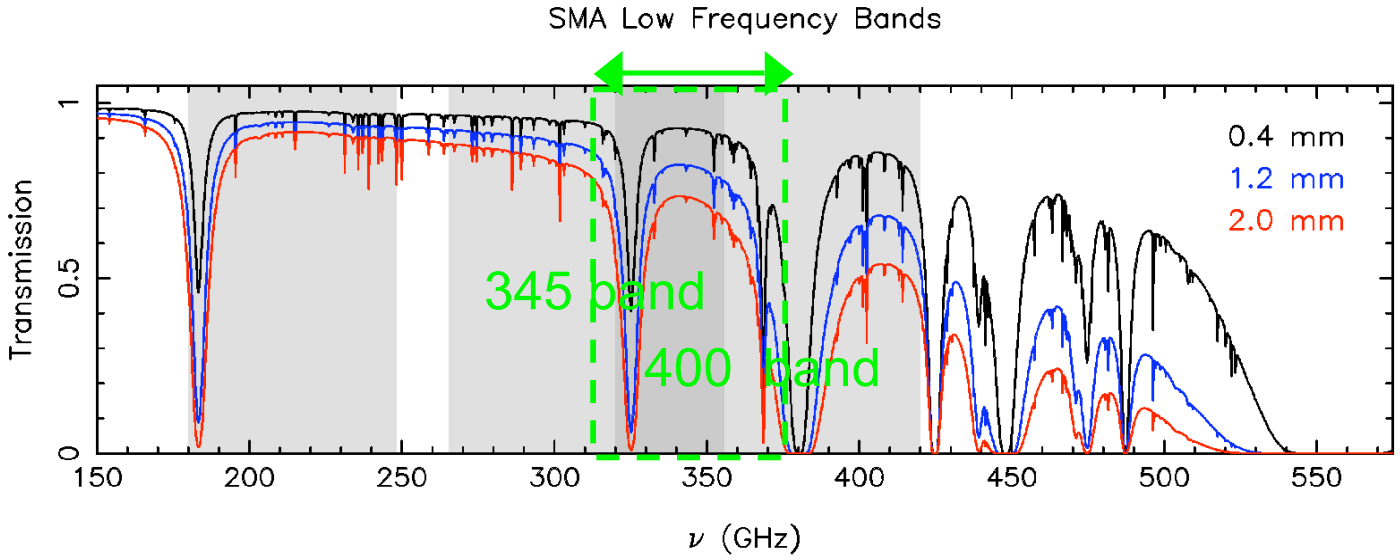
- Only facility capable of routine high-angular observations at 345 GHz before ALMA.
- Important complement for ALMA for northern sources.
- Experience in interferometry at high frequency for young researcher who will use ALMA.

Historical Perspective

- 1986: Dedication of the CSO
- 1987: First light at the JCMT
- 1994-1995: JCMT-CSO interferometer
- 1999-2003: SMA antennas deployed to Mauna Kea
- 2001: JCMT MoU
- 2005 May: SMA IF/LO equipment to JCMT
- 2005 Sep: SMA IF/LO equipment to CSO
- 2007-2008: first eSMA science



Technical specifications: receivers

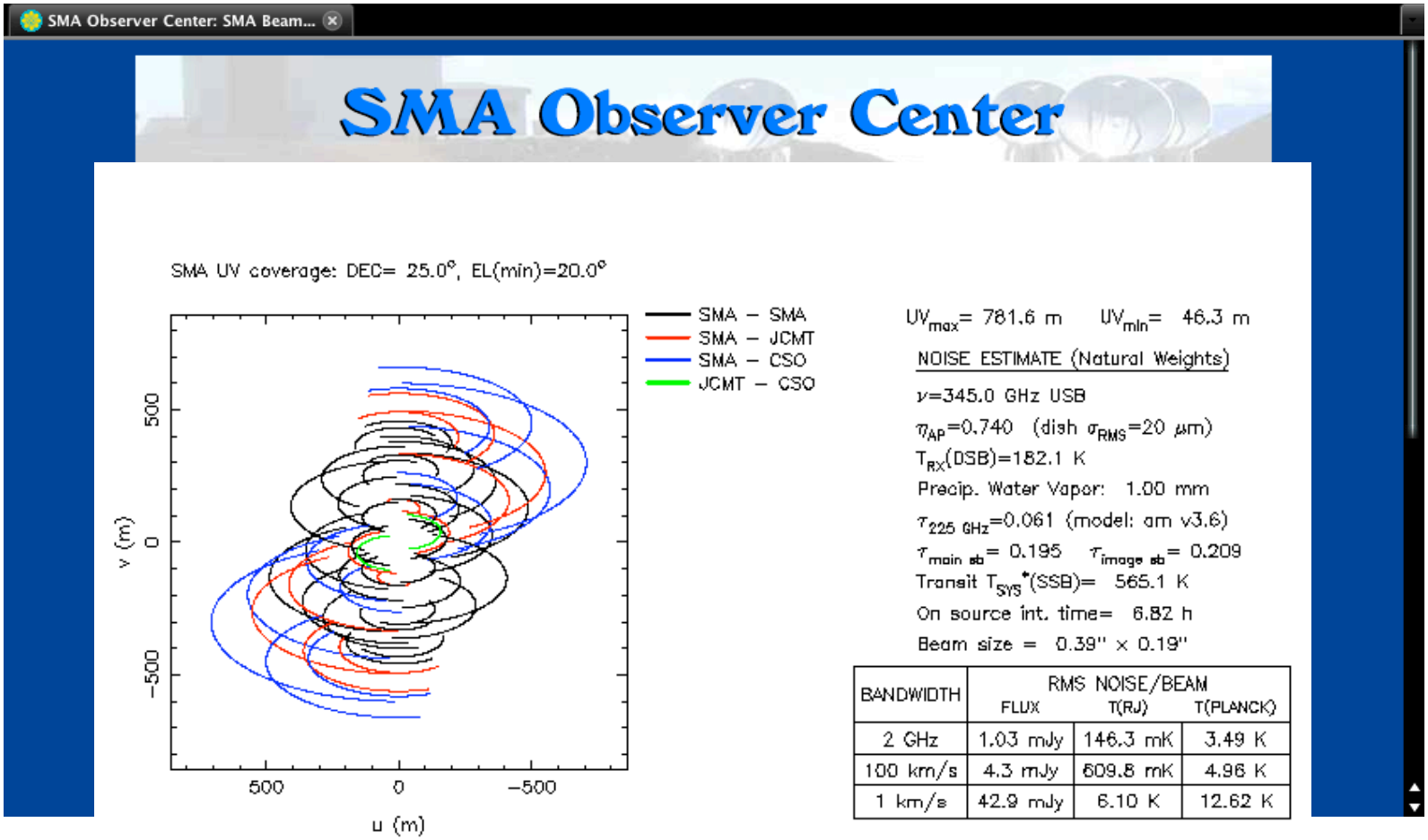


- Operating frequencies:
  - 320-375 GHz, single polarization
  - 330-350 GHz, dual polarization (SMA+JCMT only)
- Bandwith: 2 GHz
- Resolution: 800 kHz (standard), and up to 25 kHz
  (⇔ 0.7 and 0.022 km/s at 345 GHz)

Other properties and expected sensitivities

	eSMA_sp	eSMA_dp	SMA_sp	SMA_dp
Mean diameter (m)	7.4		6	
Longest baseline (m)	782		509	
Resolution (" / AU at 150 pc)	0.28 / 42		0.43 / 64	
Continuum (mJy/beam)	1.03	0.86	1.84	1.39
Line (K per 1 km/s channel)	6.10	4.14	8.45	5.92

http://sma1.sma.hawaii.edu

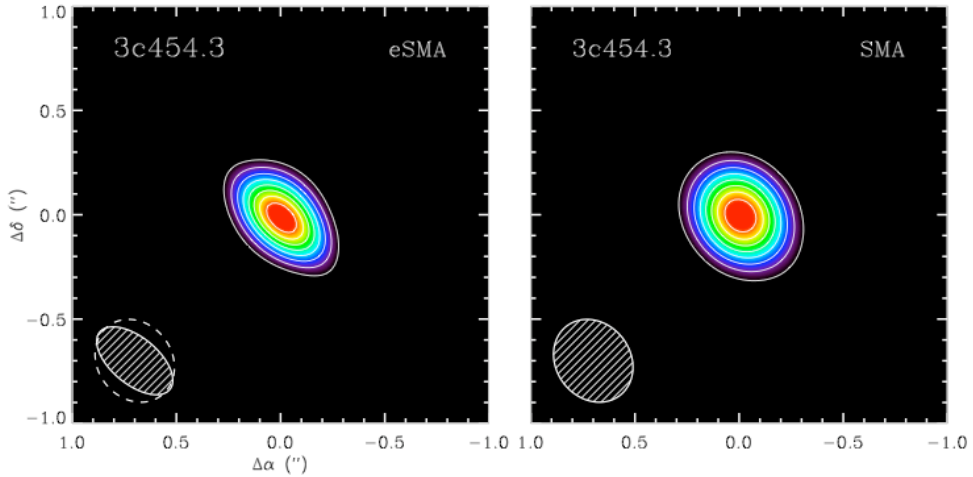


BANDWIDTH	RMS NOISE/BEAM FLUX	T(RJ)	T(PLANCK)
2 GHz	1.03 mJy	146.3 mK	3.49 K
100 km/s	4.3 mJy	609.8 mK	4.96 K
1 km/s	42.9 mJy	6.10 K	12.62 K

One Stop Shopping for All Your (e)SMA Needs

Recent eSMA achievements

- 2006 Dec 14: image of a quasar with SMA-JCMT at 230 GHz
- 2007 May 31: first eSMA image of a quasar at 267 GHz (SMA in very-extended configuration)

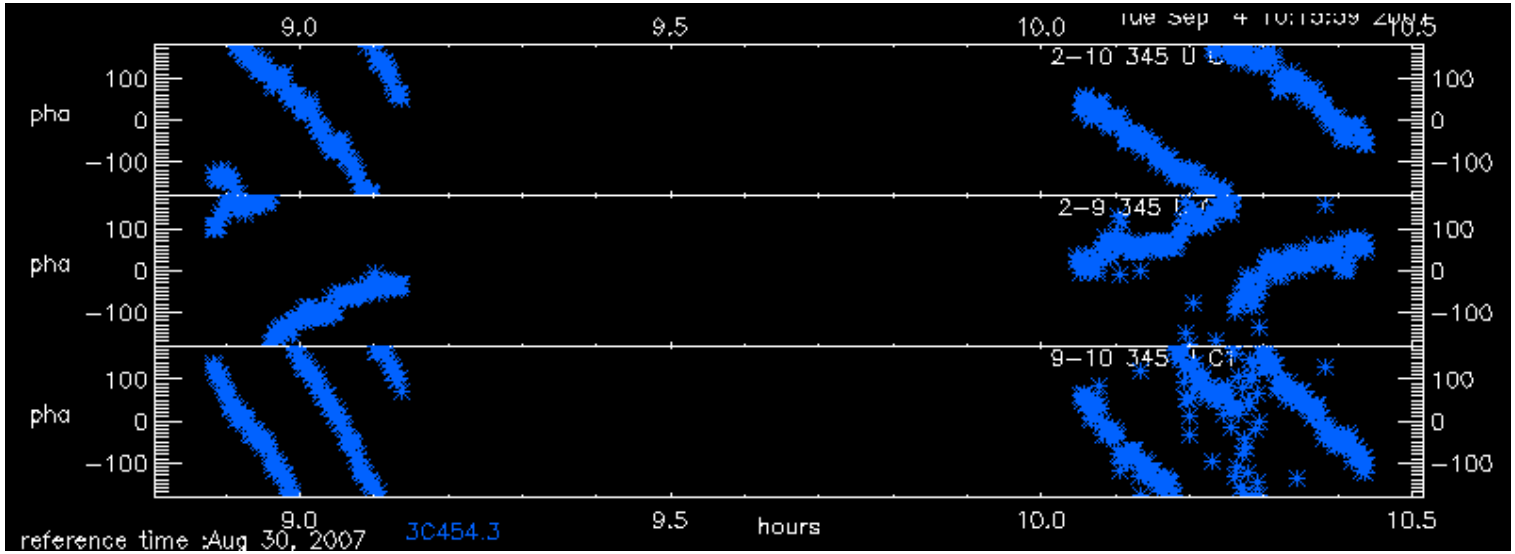


Beam: 0.22"×0.43"
rms: 3.6 mJy/beam

Beam: 0.36"×0.42"
rms: 5.2 mJy/beam

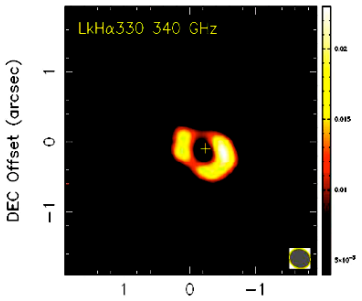
Recent eSMA achievements

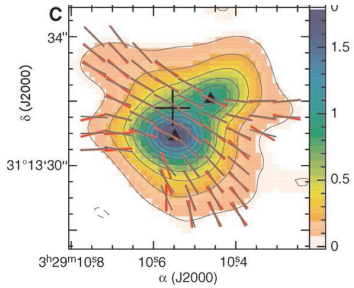
- 2007 Aug 29-30:
  - first fringes at 345 GHz with eSMA

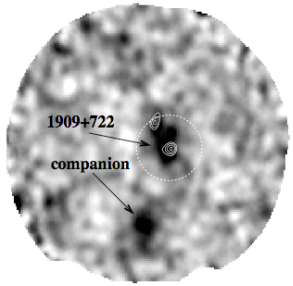


  - baseline track (267 GHz)

Early science







- Solar system: planetary atmospheres, comets.
- Low-mass SF: embedded, transitional and protoplanetary disks.
- High-mass SF: pre-stellar phases, clusters.
- Evolved stars.
- B-fields.
- Nearby galaxies: ULIRGs, galaxies centers, dense gas.
- High-z galaxies: sub-millimeter galaxies, AGNs, galaxy mergers.

http://www.strw.leidenuniv.nl/~bottinelli/esma-workshop/report_esma_workshop.pdf

Conclusions

- eSMA works! :)
- Science verification end of 2007, early science beginning of 2008
- Come and enjoy the ~~beaches~~ best northern skies

eSMA commissioning team

- Ewine van Dishoeck, Michiel Hogerheijde (Leiden)
- Huib van Langevelde (Leiden/JIVE)
- Remo Tilanus, Per Friberg (JAC)
- Richard Chamberlin, Hiroshige Yoshida (CSO)
- Ken Young, Mark Gurwell, Charlie Qi, David Wilner (CfA/SAO Cambridge)
- Rob Christensen, Derek Kubo, Paul Yamagushi (CfA/SAO Hilo)
- Mark Bentum, Rob Millenaar (Astron)
- Leo de Jong (SRON)
- Ronald Stark (NWO)
- Richard Hills, Jane Buckle, Ken Brown (Receiver groups in Cambridge and Hilo)

The development of the eSMA has been facilitated by a grant from the Netherlands Organization for Scientific Research, NWO.

Many thanks to the directors of the observatories for their support, and to Alison Peck and Todd Hunter for their involvement in the early phases of the eSMA.

http://www.strw.leidenuniv.nl/~bottinelli/esma-workshop/report_esma_workshop.pdf