



## THE NOBEYAMA MILLIMETER ARRAY

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### 1. Extended Abstract

The construction of the Nobeyama Millimeter Array (NMA) was started in 1978 as a large-scale open use facility in Japan and completed in 1982. The NMA was consisted of five 10-m antennas initially and expanded to six antennas in 1993 with a maximum baseline of about 600m located at 1350m altitude. After the detection of first fringes at 22GHz and 115GHz in 1982, it took two more years until the first aperture synthesis observation was made at 22GHz, the result of which was presented at the meeting held in Granada 1984[1]. Because of the lack of experiences not only in aperture synthesis but also in millimeter wave interferometry, it was quite a challenging task to complete the overall observation system after the completion of the hardware part of the system.

A parametric amplifier was used for the 22GHz frontend and for the IF amplifier for the 115GHz cooled Schottky diode mixer. Due to a difficulty in maintaining the stability the parametric amplifiers were replaced with cooled HEMT amplifiers in 1986 when the phase I open use of the NMA started. In the later phase the frontends were replaced with SIS mixers with 1.4GHz cooled IF amplifiers. The receiving frequency bands were 22-24GHz, 40-50GHz, and 80-120GHz.

In 2011, after 29 years since the detection of the first fringes, the NMA stopped the operation.

In total, 222 papers were published in the refereed journals and 267 papers in the proceedings of international conferences.

In 1983, just after the completion of the construction of the NMA, Japanese science community started a discussion about the future project of millimeter wave astronomy.

One of the proposals was to build a large interferometer array in millimeter and submillimeter wavelengths to be built at higher altitude than 4000m to enable high resolution interferometric observations at submillimeter wavelengths. The Japanese team started a site survey in 1992 to identify the best site in northern Chile and discussed possible collaborations among the similar projects proposed in other countries[2].

A brief history of the NMA and the road to the ALMA will be reported.

### 2. References

1. M. Ishiguro, K. -I. Morita, T. Kasuga, T. Kanzawa, H. Iwashita, Y. Chikada, J. Inatani, H. Suzuki, K. Handa, T. Takahashi, H. Tanaka, H. Kobayashi, and R. Kawabe, "The Nobeyama Millimeter-Wave Interferometer," Proc. of *International Symposium on Millimeter and Submillimeter Wave Radio Astronomy*, 1984, pp. 75-84
2. M. Ishiguro, R. Kawabe, N. Nakai, K. -I. Morita, S. K. Okumura and N. Ohashi, "The Large Millimeter Array", 1994, pp.405-412, Proc. of the IAU Colloq. 140, *Astronomy with Millimeter and Submillimeter Wave Interferometry*, eds. M. Ishiguro and Wm J. Welch, ASP Conf. Ser. 59.