

= AMiBA =

The Yuan @-@ Tseh Lee Array for Microwave Background Anisotropy , also known as the Array for Microwave Background Anisotropy (AMiBA) , is a radio telescope designed to observe the cosmic microwave background and the Sunyaev @-@ Zel 'dovich effect in clusters of galaxies . It is located on Mauna Loa in Hawaii , at 3 @,@ 396 metres (11 @,@ 142 ft) above sea level .

AMiBA was originally configured as a 7 @-@ element interferometer atop a hexapod mount . Observations at a wavelength of 3 mm (86 ? 102 GHz) started in October 2006 , and the detections of six clusters by the Sunyaev @-@ Zel 'dovich effect were announced in 2008 . In 2009 the telescope was upgraded to 13 elements , and it is capable of further expansion to 19 elements . AMiBA is the result of a collaboration between the Academia Sinica Institute of Astronomy and Astrophysics , the National Taiwan University and the Australia Telescope National Facility , and also involves researchers from other universities .

= = Design = =

AMiBA was initially configured as a 7 @-@ element interferometer , using 0 @.@ 576 m Cassegrain dishes mounted on a 6 m carbon fibre hexapod mount . It is located on Mauna Loa , Hawaii , and observes at 3 mm (86 ? 102 GHz) to minimize foreground emission from other , non @-@ thermal sources . The telescope has a retractable shelter , made from seven steel trusses and PVC fabric .

The receivers are based on Monolithic Microwave Integrated Circuit (MMIC) technology , with low noise amplifiers cooled to 15 K , which have 20 GHz bandwidths and provide 46 dB of amplification . The signals are mixed with a local oscillator to reduce their frequency , prior to correlation with an analog correlator . The system temperatures are between 55 and 75 K.

AMiBA started in 2000 , with funding for 4 years from the Cosmology and Particle Astrophysics Project of the Taiwan Ministry of Education . A 2 @-@ element prototype was set up on Mauna Loa in 2002 . Further funding for a second 4 years was provided by the National Science Council . The mount arrived on site in 2004 , and the platform was installed in 2005 . The first 7 elements were then installed (" AMiBA7 ") , and the telescope 's first light was in September 2006 , observing Jupiter . The telescope was dedicated in October 2006 to Yuan @-@ Tseh Lee . The array was upgraded to have thirteen 1 @.@ 2 m dishes in 2009 (" AMiBA13 ") . After extensive testing and calibration , scientific observations resumed in 2011 . It is further expandable up to 19 elements .

= = Observations = =

The primary goal of AMiBA is to observe both the temperature and polarization anisotropies in the Cosmic Microwave Background at multipoles between 800 and 8 @,@ 000 (corresponding to between 2 and 20 arcminutes on the sky) , as well as observing the thermal Sunyaev @-@ Zel 'dovich effect in clusters of galaxies , which has a maximum decrement around 100 GHz . In its initial configuration , it measures up to multipoles of 3 @,@ 000 with a resolution of around 6 arcminutes . The telescope only observes at night during good weather , using planets for calibration .

Six clusters were imaged in 2007 : the Abell clusters 1689 , 1995 , 2142 , 2163 , 2261 and 2390 , which have redshifts between 0 @.@ 091 and 0 @.@ 322 . For the largest and brightest four of these ? Abell 1689 , 2261 , 2142 and 2390 ? comparisons were made with X @-@ ray and Subaru weak lensing data to study the cluster layout and radial properties , specifically of the mass profiles and baryon content . It is predicted that AMiBA with either 13 or 19 elements will be able to detect around 80 clusters per year via the SZ effect .

= = Collaboration = =

AMiBA is the result of a collaboration between the Academia Sinica Institute of Astronomy and

Astrophysics , the National Taiwan University and the Australia Telescope National Facility . It also involves researchers from the Harvard @-@ Smithsonian Center for Astrophysics , the National Radio Astronomy Observatory , the University of Hawaii , the University of Bristol , Nottingham Trent University , the Canadian Institute for Theoretical Astrophysics and the Carnegie @-@ Mellon University .