Press release

Georgia State University and ALPAO sign agreement for adaptive optics upgrade on telescopes at CHARA Array

MOUNT WILSON, Calif. (USA) – September 1st, 2016 – Georgia State University's Center for High Angular Resolution Astronomy (CHARA) and the French company ALPAO have signed a contract for the development of an adaptive optics upgrade for the CHARA Array, the largest optical interferometer array in the world.

Georgia State and ALPAO will develop new deformable mirrors and improve the sensitivity of the interferometric telescopes on Mount Wilson, Calif. ALPAO will develop and manufacture six deformable mirrors, each composed of 69 actuators to deform a plane mirror membrane. These deformable mirrors represent state-of-the-art instrumentation to correct for the effect of atmospheric turbulence. The goal of this technique, known as adaptive optics, is to observe stars and their surroundings as clearly as they would appear in space.

Photo courtesy Eric Simison
Sea West Enterprises

"We are delighted to begin this new stage in CHARA's scientific mission with deformable mirrors from ALPAO," said CHARA Array Director Theo ten Brummelaar. "Investigators around the world are now planning new programs with the adaptive optics system that will reveal some of the smallest objects in the sky ever measured."

This work will complete the first major facility upgrade of the CHARA Array since its initial construction. Ten Brummelaar and collaborators from Georgia State have carefully considered the most effective approaches to enhance the sensitivity of the instrument. The main goal of this work, funded by the U.S. National Science Foundation, is to add deformable mirrors to each of the six 1-meter telescopes, completing the development and implementation of fast adaptive optics capabilities at each telescope.

To simplify the telescope upgrade, the size of the deformable mirror will match the corresponding flat mirror now used on the six CHARA telescopes. The optical surface will form an ellipse measuring 177 x 125 mm (about 7 x 5 inches). Computer control of the actuators will push the surface into a shape that compensates for turbulence in Earth's atmosphere.

Together, these modifications should allow the telescopes to measure stars three times fainter than now possible. The new system will increase the number of nights with high-quality data by about a factor of three in the summer and five in the winter, with much faster observation times. New important areas of study will include the study of high-interest targets, such as dusty debris disks around young stars and accretion disks and gas flows around newborn stars.

"ALPAO is proud to work with CHARA, the world's highest angular resolution telescope at near-infrared wavelengths," said Vincent Hardy, sales manager of ALPAO. "This contract will push us to develop six specific deformable mirrors with a precise elliptical surface. All of our team is very excited to be a part of this project for the future of the interferometric telescope and the development of astronomical science."

About CHARA

Encouraged by the success of the program of binary star speckle interferometry initiated at Georgia State in 1977, the Center for High Angular Resolution Astronomy (CHARA) was established in 1984 with the goal of promoting, designing, funding and operating a major new instrument capable of achieving new levels of angular resolution. Such an instrument is able to measure the sizes of thousands of stars, see the individual components of binary stars gravitationally bound together in orbits having periods as short as one day, and even detect and image surface details on stars whose existence has only been inferred. With nearly 300 people in attendance, the CHARA Array was dedicated on October 4, 2000. On September 19, 2001 the Array achieved starlight fringes on its 331-meter baseline, the longest baseline (by a factor of three) ever achieved by an optical interferometer. The Cleon C. Arrington Remote Operations Center for the CHARA Array, located on the Georgia State campus in Atlanta, was dedicated on February 28, 2002. This facility is permitting GSU faculty, staff and students to participate in observing activities at the Array on Mt. Wilson, enabling the remote control of all CHARA facilities from across the country.

With this in mind, CHARA has entered into several collaborations with groups offering unique instruments or technologies for enhanced performance. At present these collaborations include a joint observing effort with astronomers from the *Laboratoire d'Etudes Spatiales et d'Instumentation en Astrophysique* (LESIA) of the *Observatoire de Paris* who have located their "Fiber Linked Unit for Optical Recombination" (FLUOR) at the CHARA Beam Synthesis Facility. A collaboration with astronomers from the University of Michigan has led to the development of an imaging beam combiner which has already produced the first images of stellar surfaces and close binary stars. An agreement between GSU and *L'Observatoire de la Côte d'Azur* (France) has brought a third new beam combiner to the Array capable of providing spectroscopic and polarimetric channels for high resolution work. Finally, a joint project between CHARA and astronomers from the University of Sydney (Australia) has led to the development of a fourth beam combiner with significantly improved sensitivity to fainter objects while also providing measurements of very high precision. These international collaborations have brought significant added value to the science capabilities of the CHARA Array.

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About ALPAO

ALPAO designs and manufactures a complete range of adaptive optics products for use in research and industry from 2005. ALPAO provides deformable mirrors, wavefront sensors and software. With a background in astronomy, ALPAO's products are tailor-made for various applications, such as astronomy, ophthalmology, microscopy, wireless optical communications and laser applications.

Thanks to breakthrough technologies, ALPAO has introduced several products over the years, such as a low-speed deformable mirror (DM) in 2006, its own wavefront sensor for closed loop operations in 2007, a hi-speed DM in 2008, new drive electronics in 2009, the DM97-08 dedicated to vision science application in 2013 and the DM468 and 820 in 2015. This year, the French company signed two major contracts with the European Southern Observatory (ESO) to develop new deformable mirrors for next generation instruments. These two projects will both be at the state-of-the-art level for astronomical applications.

With more than 10 years of experience in adaptive optics, ALPAO's deformable mirrors allow large stroke, fast deformation, high resolution images and very good optical quality.

ALPAO is an international company with customers on four continents in over 20 countries. More than 90 percent of its turnover comes from exports.

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