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U.S. Naval Observatory
Press Release

For Immediate Release

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USNO Dedicates New Correlator Facility

A newly-developed next-generation software-based correlator has achieved initial operating capability (IOC) at the U.S. Naval Observatory (USNO) in Washington, DC. This new device combines specialized software with high-speed computer processors and mass storage capability to more efficiently process very long baseline interferometry (VLBI) data.

In a ceremony held on February 7, 2013 to mark this operational achievement, the new correlator facility was named in honor of the late Dr. Gart Westerhout, a pioneer in radio astronomy who served as the USNO's Scientific Director from 1977 – 1993. Dr. Westerhout passed away in October, 2012.

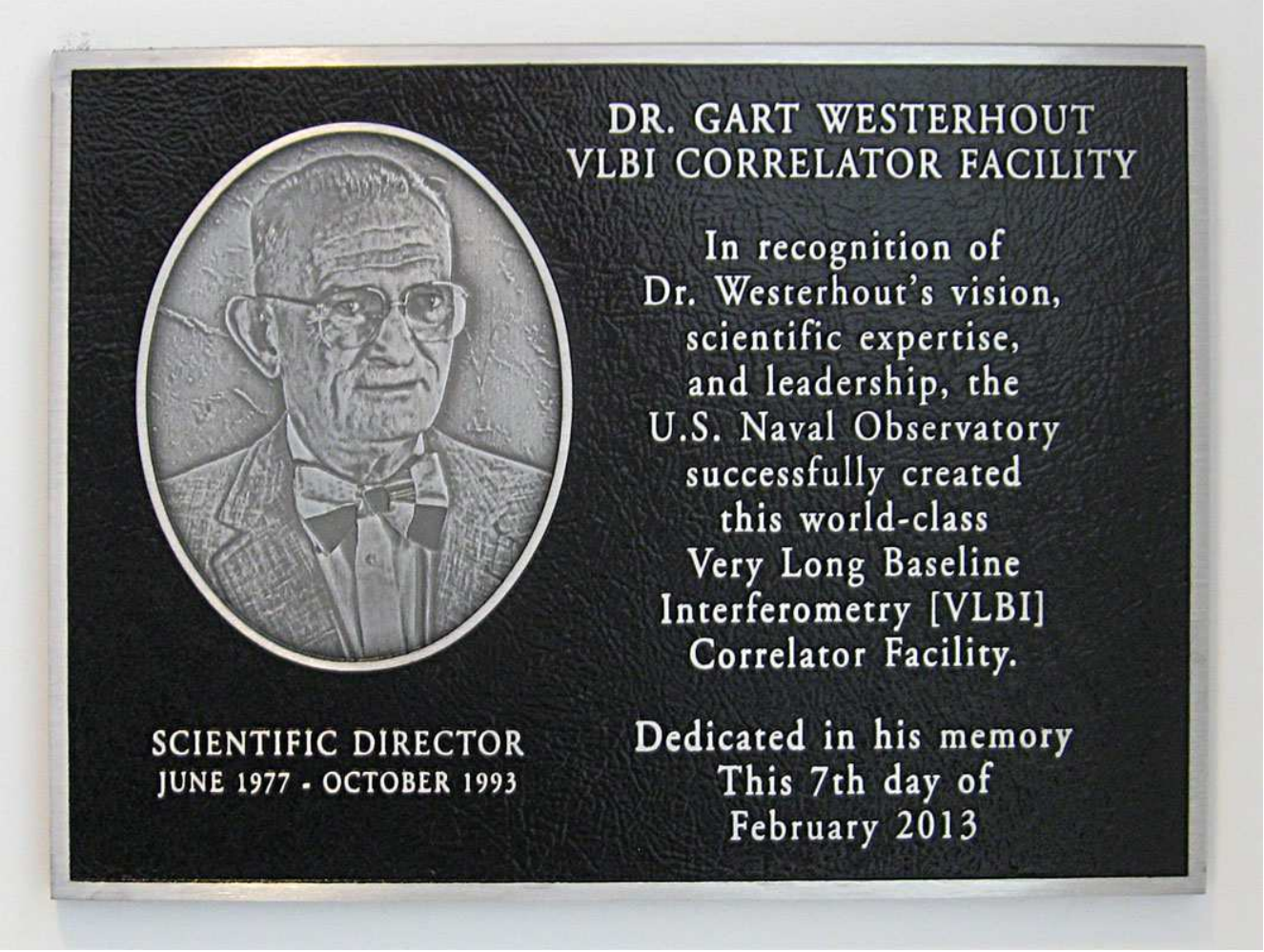
The innovation of this next-generation of correlator is that it employs off-the-shelf hardware as compared to older generations of correlators for which dedicated, custom-built integrated circuits were required. This design change enables the U.S. Naval Observatory to provide the most accurate observations and predictions to meet future Earth orientation and celestial reference needs for the Navy, the DoD and the nation, while using a system that is more economical to build and maintain.

The Dr. Gart Westerhout VLBI Correlator Facility is a world-class installation used to reduce VLBI data. The technique of VLBI is to simultaneously collect radio signals from distant astronomical objects using widely separated radio telescopes. The data streams from each of these radio telescopes are transferred to USNO and then processed through the correlator in order to determine the observed geometric orientation of the individual antennas within the terrestrial reference frame (TRF). Determination of this orientation allows for the very precise calculation of the Earth's orientation in space and the sky positions of the radio sources that are used to make a Celestial Reference Frame (CRF). Earth orientation parameters (EOPs) are used by navigation systems (e.g. the Global Positioning System), communication systems, and by other space-observing systems.
The CRF provides the fundamental reference frame for all astronomy, and is used for celestial navigation, precise pointing, the determination of the Earth's orientation in space, and the orbits of Earth's man-made satellites.

The Naval Observatory began its involvement in VLBI during Dr. Westerhout's tenure as Scientific Director. With his leadership, USNO was able to obtain the resources necessary to build, staff, and host its original Mark III Correlator. The USNO's correlator is one of only seven such devices currently operating in the world, of which three are based in the U.S.

Phase I of the new software correlator (using 33 computing nodes and 528 processing cores) will process data rates of up to two gigabits per second from up to 15 individual stations. Phase II of the correlator, now under development, should double that speed and capacity. Phase II is needed to

handle the increased data flow expected from next-generation VLBI data collection systems and will meet the needs of the DoD for near-real-time EOP data delivery now and into the future.



Dedication plaque unveiled at IOC ceremony for the USNO's new VLBI Software Correlator. Photograph courtesy of Dr. Thomas Swanson

The heart of the new correlator: 33 COTS computing nodes can process 2 Gbps from up to 15 stations.
USNO Photograph by Geoff Chester, VIRIN 130313-N-JA159-001