

VLBI2010 – An International VLBI Service Project in Support of the Global Geodetic Observing System

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Goals

In recent years the International VLBI Service for Geodesy and Astrometry (IVS) has developed the concept and specifications of a next generation VLBI system called VLBI2010 based on the results of the Final Report of IVS-Working Group 3. The goals of the new VLBI system are to achieve (on scales up to the size of the Earth):

- 1 mm position accuracy,
- 0.1 mm/yr velocity accuracy,
- continuous observations, and
- results available in near real-time.

These goals fully meet the requirements of the Global Geodetic Observing System (GGOS) of the International Association of Geodesy (IAG). GGOS itself is based on several international Services such as the IVS and is part of the higher level Global Earth Observing System of Systems (GEOSS) initiated by the intergovernmental Group on Earth Observations (GEO), currently composed of 81 countries.

IVS-Product Improvements

In order to reach the goals of GGOS and to satisfy user needs several products of the IVS require an improvement, which can be achieved by an increase of the number of observations. User request continuous VLBI observations.

Category	Products	Accuracy	Frequency of solutions	Resolution	Timeliness
IVS-Products requesting 24h/7d observations	x, y, z time series (one solution per session)	2.5 mm	7 d/w	1 day	1 day
	sporadic events	2.5 mm	7 d/w	< 1 day	near real time
	annual solution coordinates	1.2 mm	yearly	-	1 month
	velocities (multi session)	0.1-0.3 mm/yr	yearly	-	1 month
CRF	radio source coordinates	0.25 mas for as many sources as possible	yearly	-	1 month
EOP	u, v time series	0.5 mas	monthly	1 month	1 month
	UT1-UTC	5 μs	7 d/w continuous	10 min	near real time
	dep. dt.	25-50 μas	7 d/w	1 day	near real time
	sc. yr	25-50 μas	7 d/w	10 min	near real time
geodynamical parameters	solid Earth index h, l	0.1%	1 y	1 y	1 month
	ocean loading A, q	1%	1 y	1 y	1 month
	atmosphere loading	10%	1 y	1 y	1 month
	topographic parameters	1-2 mm	7 d/w	10 min	near real time
physical parameters	zenith delay	0.3-0.5 mm	7 d/w	2 h	-
	gradients	0.5 TEC-units	7 d/w	1 h	near real time
	ionospheric mapping	0.1%	1 y	all sessions used	1 month
	light deflection parameter	0.1%	1 y	all sessions used	1 month

Table 1: Summary of primary goals of IVS Working Group 2

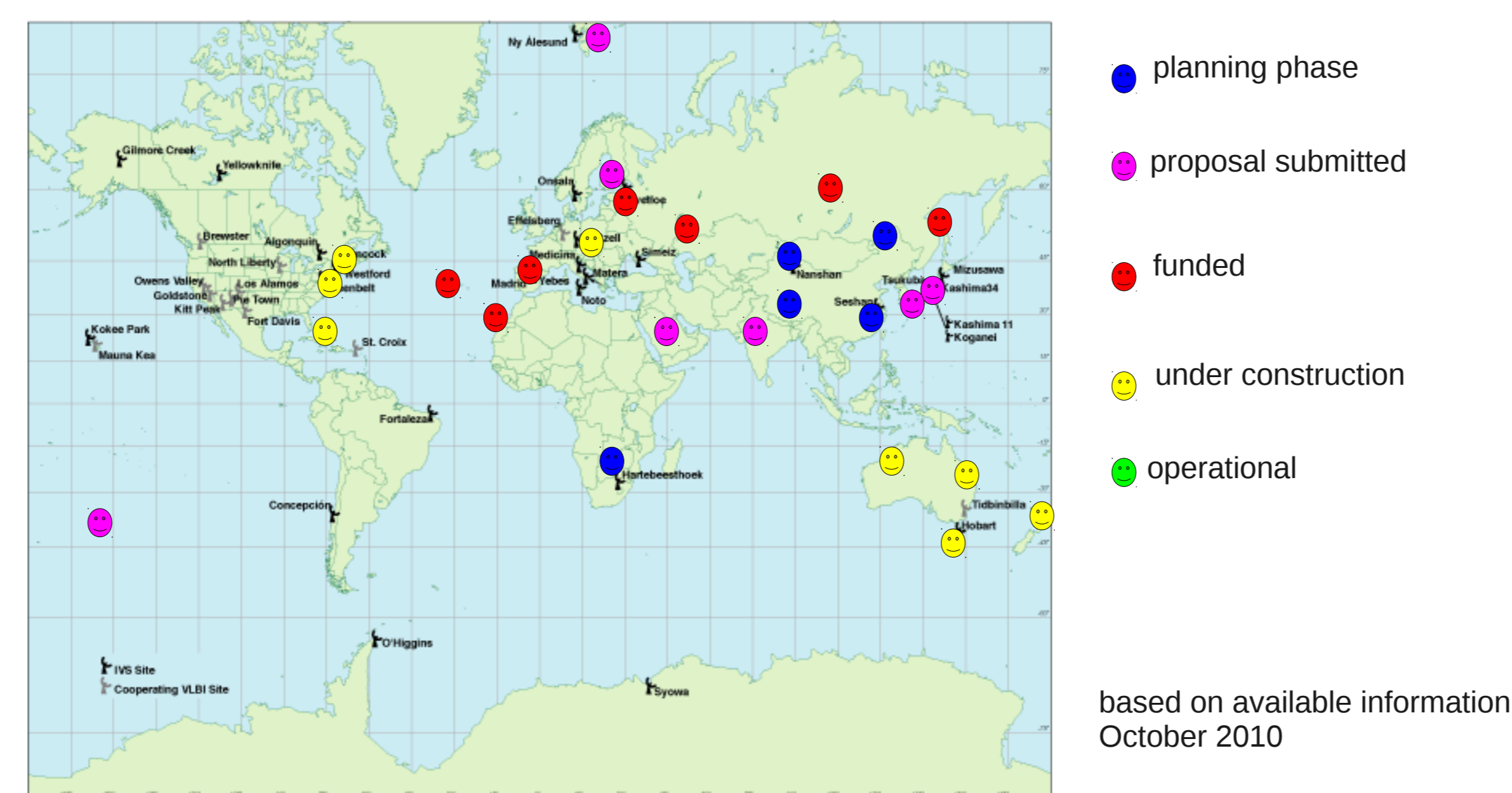
http://ivsc.gsfc.nasa.gov/about/wg/wg2/IVS_WG2_report_130202-letter.pdf

In order to reach the proposed improvements the IVS VLBI2010 Project Executive Group (V2PEG) is providing strategic leadership to VLBI2010. If you are interested in support for your VLBI2010 activities, please contact ivs-v2peg@ivsc.gsfc.nasa.gov.

Worldwide Activities

The IVS faces the challenge to setup a homogeneous global distribution of VLBI2010 compatible network stations. The world map shows the effort of many national institutions to contribute to the future VLBI2010 observing network with own instruments.

New VLBI2010 radio telescopes for IVS



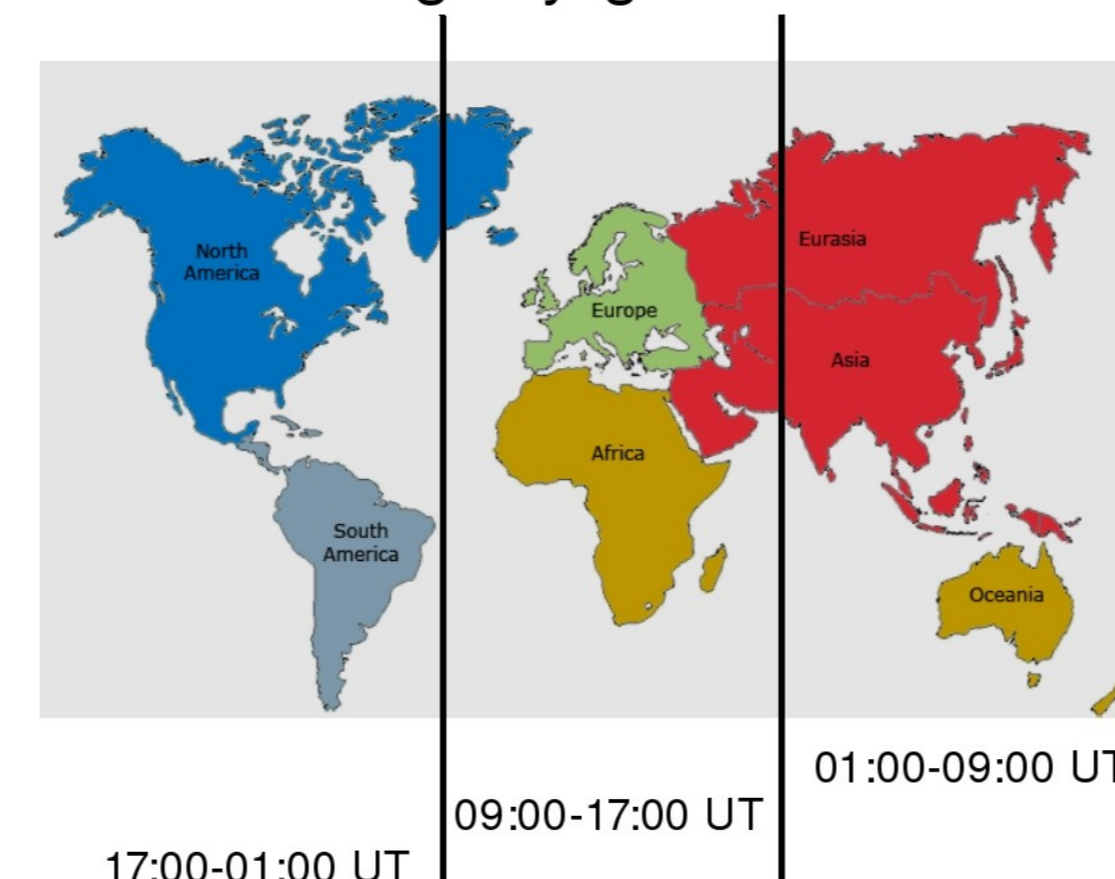
based on available information October 2010

NASA is currently discussing to establish 10 additional observatories, including a VLBI2010 component (sites are not decided yet). The global VLBI2010 network needs still more radio telescope sites, especially in South America, Africa, India and in the Pacific region.

VLBI2010 Network Operation

Continuous VLBI observations require reliable instruments for VLBI and remote network control. It is proposed to introduce a shared daylight zone remote control to the future VLBI2010 operation.

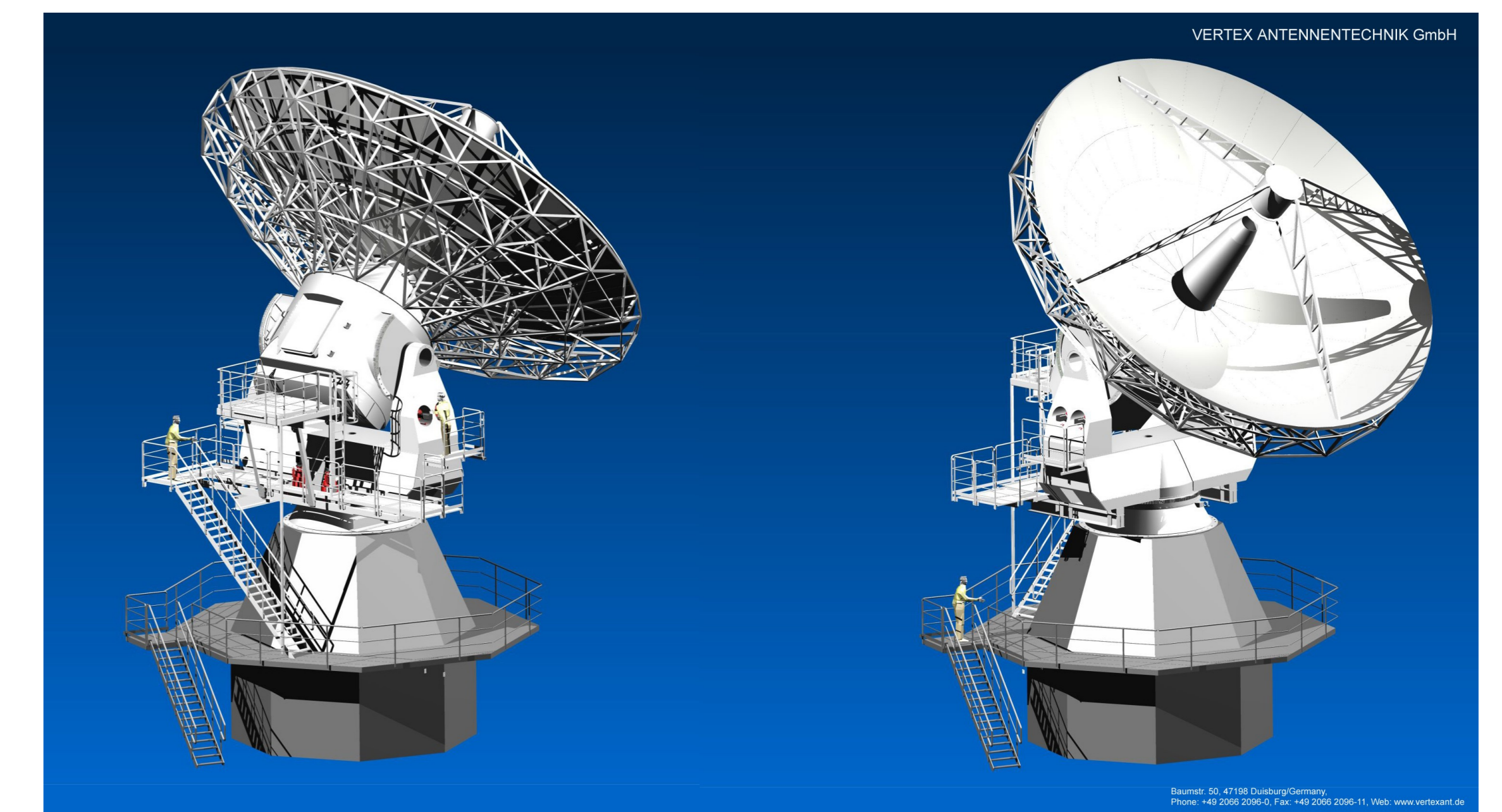
24h VLBI Network Control using daylight zones



Technological Upgrade of Instrumentation for VLBI

The VLBI2010 system involves a nearly complete replacement of the currently used dualband S/X system. It is based on a new class of fast ~12-m radio telescopes ($v_{Az}=12^\circ/s$, $v_{El}=6^\circ/s$) that can support continuous 30s slew/track cycles over a 20-year lifetime, a new "broadband" receiving system with flexible frequency allocation anywhere in the continuous 2-14 GHz frequency range, expanded eVLBI, and enhanced automation and remote control.

A new VLBI2010 radio telescope concept will be introduced by the Twin Telescope Wetzell Project (TTW). It contains two identical 13.2m radio telescopes with ring-focus optics as the optimal solution for the anticipated broadband observations. Two telescopes at one site enable new observation concepts: continuous fringes of Earth rotation, array mode for weak sources, simultaneous observations in sub-networks.



The images show an artist's visualization of the TTW and the status of its construction at Wetzell in October 2010. TTW will become operational during 2012.

A proof-of-concept for broadband observations with wideband feeds is currently conducted by NASA-GSFC and MIT Haystack Observatory.