CORRELATOR REPORT, EVN Correlator at JIVE
EVN TOG MEETING, March 2018, Shanghai

12 March 2018 (statistics cover 24 April 2017 − 11 March 2018)
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SCIENCE OPERATIONS

Sessions and their Experiments

The table below summarizes projects correlated, distributed, and released from 24 April 2017 to 11 March 2018. The table lists the number of experiments as well as the network hours and correlator hours for both user and test/NME experiments. The definitions of network and correlator hours remain the same as in previous reports. Multiple correlator passes for SFXC typically occur only for phase−referenced spectral−line experiments (separate "continuum" and "line" passes) and for pulsar observations wanting multiple gating/binning configurations.

	User Experiments			Test & Network Monitoring		
	N	Ntwk_hr	Corr_hr	N	Ntwk_hr	Corr_hr
Correlated	71	480	509	23	75	75
Distributed	79	565.5	594.5	20	70	72
Released	78	562	591	20	67	69

The following table summarizes the sessions with any activity in their user experiments since the previous report (entries = remaining to do / total).

		to correlate	to distribute	
Jul−Nov'15 OoS/RA	−	4/4	59/59hr	4/4 GA037A,B; EG089A,B
Feb−May OoS/RA	−	6/6	56/56hr	6/6 EG089C−D; EG097A−D (CorrOnly)
Sep−Nov OoS/RA	−	3/3	28/28hr	3/3 EG094A,B; GA038
Sess 3/2106	−	1/22	4/198hr	1/22 to corr: EK036B
Sess 1/2017	−	3/22	9/148hr	3/22 to corr: EK036C; GK049C−D
Sess 2/2017	−	4/26	38/231hr	4/26 to corr: EM128B;EM127C−D;EK036D
Jun OoS/RA	−	2/2	13.5/13.5hr	2/2 EG094C,D
Sess 3/2017	−	24	270hr	prognosis
Nov−Feb e−	−	0/14	0/72.5hr	0/14 1 trigg, 2 ToO
Nov−Dec OoS/RA	−	2/2	26/26hr	2/2 EG097E,F (CorrOnly)
Feb OoS (not RA)	−	1/1	18/18hr	1/1 GK052 (Q−band)

Some landmarks since the previous TOG report:

Session 3/2016
- *) Except for EK036B, all experiments correlated by 15 May and distributed by 26 June.
- *) EK036B: waiting on PI to provide feedback about in−beam calibrators to use in multiple phase−center correlation. The ability to search for such in−beam calibrators was the rationale behind correlating the first epoch EK036A in a wide−field mode (2.5 TB of output FITS files). To avoid tying up disk−packs, the EK036B data has been transferred onto FlexBuffs (only 9.37 TB in total). A similar situation also applies for EK036C (session 1/2017) and EK036D (session 2/2017).

Session 1/2017
- *) Fringes to the Nkutunse (Ghana) station at 6cm in the NME.
- *) Except for EK036C and GK049C−D, all experiments correlated by 24 August. The GK049 observations are pulsar scintellometry; communication of the pulsar ephemerides and correlation gating/binning preferences was delayed due to the PI moving to a new institute. The gate−fitting mostly done; pulse stationary in low−res (64 bins); need to match in−pulse bins in fractional periods to PI's single−dish 256−bin profile.
- *) All observations besides these three have been distributed by 22 October. The final two were also pulsar observations, correlated with 64 bins across the full period.

Session 2/2017
*) First global+LBA at L-band
*) e-MERLIN: the first compelling fringes to 4 out-stations (512Mbps each) came in some of the 2-s ftp fringe-test segments in N17C2. The sampler statistics remain not ideal -- essentially 1-bit sampling with a ~20% asymmetry around 0.
*) Two more operational FlexBuff/e-shipping stations (Medicina, Noto), bringing the total to six. Tianma65 also e-shipped much of the session owning to disk-pack problems (40.5 TB in total).
*) Kunming joined in all NMEs and some user experiments (to fill the 16TB of packs that we sent)
*) T6 had a single linear-pol in both circular-pol channels at L-band
*) Correlation of user experiments begun 24 October; except for EK036D, EM128B, EM127C-D all experiments correlated by 25 January and distributed by 5 February.

Session 3/2017
*) 4 frequency bands: X/SX, C, K, L(18 & 21 cm). Only one global.
*) The X/SX block has 3 user experiments, in three entirely different modes, including one geo-like observation which requires shifting the DBBC firmware to the older version to enable 14 distinct BBCs.
*) No new operational FlexBuff/e-shipping station expected. The FlexBuff unit for Westerbork has arrived and been installed, but they had issues with their Fila10G that have not yet been resolved, for which their DBBC has to go to Bonn for service after the session.
*) Kunming participates in most of the X/SX block.
*) e-MERLIN out-stations to join the NMEs and five L-band user experiments. Outstation patching this time incorporates what we understand to be a more "natural" 64MHz, USB-only channelization, with four out-stations at 1Gbps or two at 2Gbps (this exercised only in one mode of the C-band NME).
*) Observations include the third 24-hour epoch of the 699 multiple phase-center project (this time explicitly including out-stations in the schedule.
*) some packs from NRAO arrived only in early March; some packs from T6/Sh needed e-shipping.
*) correlation NMEs started in the week of 5 March.

Session 1/2018
*) 4 frequency bands: L, 5cm, C, K; an out-of-session Q-band global on 1 Feb.
*) GG084A (a gravitational-wave counterpart project) added between v1 & v2 of block schedule led to some re-shuffling of packs for NRAO stations between this and upcoming Apr-May RadAst going to Bonn, plus a top-off of 10x8TB from newly released experiments from JIVE).
*) Jb converts to a FlexBuff station.
*) Wb now with 4 core2 boards via 2 conditioning modules. User schedules with Wb made in both 4- and 2-core2 board versions. 2Gbps still limited by use of 5B rather than 5B+. Wb FlexBuff unit at JIVE, but e-shipping not done because of no fila10G yet. (this leaves Tr as the only two core2-board DBBC station...)
*) Km added to all 6cm and 5cm observations.
*) Sr added to 5cm and 1.3cm NMEs, and parts of user 5cm observations
*) Nkutunse (Ghana) agreed to join the 6cm NME. Slew speeds/acceleration dramatically increased (now comparable to Jb2).
*) no user experiment wanted eMERLIN outstations, will join all NMEs
*) Irbene used the 16m for all but L-band, which remained the 32m.
*) eMERLIN out-station fringes found in ftp fringe-test segments in NMEs, with improved sampler-stats: much better symmetry around zero and a relationship between the low/high states of the magnitude bits much more like typical 2-bit data (although not yet universally good across all channels...).

e-EVN:
*) 8 target-of-opportunity observations, from 6 different proposals.
*) First user experiment to use recorded e-EVN at 2Gbps (6 stations, plus 5 others at 1Gbps or 512Mbps)
*) during the clock-search portion of the November e-EVN day; On sent two back-end's worth of 2Gbps data, and Mc was able to participate in spite of flooding at the Bologna research-network node. During this period, a new record of 20 Gbps summed over all stations was correlated real-time (ignoring that O8 had a packet loss of ~0.5% and the other "On" had ~4%)
*) First Mh e-EVN in the out-of-session e-ToO RP030B (4 Feb.) since March 2014, and the first 2Gbps e-VLBI from Mh.

NETWORK SUPPORT

Fringes from the Nkutunse telescope (Ghana) in the session 1/2017 C-band NME were found in May, once the full data were e-shipped to JIVE. With a Rb frequency standard, there were the anticipated phase(t) excursions on time-scales of 10's of seconds, but the fringe was clear.

Various tests over this period have included:

4Gbps PFB e-VLBI:	FR041	10 May			
UniBoard e-VLBI:	FT015	14 Jul	FT016	11 Sep	
	FT020	15 Dec	FT021/2	17 Jan	(16 & 32MHz SB)
fila10G/VDIF corner-turning:	FT018	16 Oct	FT019	15 Nov	
DBBC firmware v.106/v.106E:	FR042	14 Nov			
Ys-Santa Maria:	EURD03	24 Nov	FR044	18 Dec	
	FR045	29 Jan	FR046	21 Feb	
Mh e-VLBI test:	FT023	31 Jan			

USER SUPPORT

ASTRON and JIVE hosted the biennial European Radio Interferometry School (ERIS) from 16-20 October. JIVE staff provided the VLBI techniques lecture, conducted the VLBI tutorials (one for the full school, the follow-up one to students who selected it among two others in parallel-tutorial sessions), and mentored the group writing VLBI-related proposals for their "practical exercise".

There were 4 EVN data-reduction or observation-planning visits to JIVE in this period plus a two-week visit by L. Petrov and a one-week visit by I. Mutie, who extended his stay in Dwingeloo following the ERIS. He is a student at the Technical University of Kenya in Nairobi, and learned the process of VLBI data reduction through AIPS and CASA by using the data from an NME. The upgrade of three work-stations in the JIVE Visitors' Room was completed; as anticipated this comprised significantly increased disk capacity, a portion of which in the form of SSDs, and larger screens. The target application is better support of larger data sets arising from the enhanced wide-field capabilities of SFXC.

The revision of the EVN Data Reduction Guide on the EVN Users' Guide web page was completed, with the spectral-line portion still receiving attention.

JIVE continued to provide PIs with experiment-specific template "setini" blocks and station catalogs, and to follow the new procedure for depositing schedules in which PIs send their key files to JIVE rather than posting sched output directly to the VLBEER server themselves. There were three first-time EVN PIs in sess.2/17 (accounting for 8 observations), one in sess.3/17, and one in ses.1/18 (for 3 observations). In sess.3/17, one team insisted on makin their own snap files, not being happy with how the field system treats the "global" scan start-time as the epoch at which to begin recording,

which does make it more difficult for slower-slewing stations to fire their cal-diode while on-source -- emphasizing the importance of the push to get continuous-cal operational much more widely throughout the EVN.
(the driving force behind this continues to submit proposals for similar geo-like projects...)

The fitsfinder utility in the EVN Archive, which enters information from the archived FITS files into a database to permit searching the Archive across a variety of query parameters, overcame the difficulties reported previously with registering the information from FITS files correlated in Bonn. Thus the first experiment correlated at Bonn is now fully incorporated into the EVN Archive. I need to restart liaison with Bonn to pull over more such observations onto the EVN Archive. We have also adjusted the main "tabs" of the EVN Archive (e.g., FITS files, standard plots, pipeline results) to include a separate tab for proposal abstract, which will be populated for archived observations resulting from proposals submitted on or after the October 2017 deadline. Abstracts from proposals submitted via the NorthStar tool will be extracted automatically from the NorthStar database during the process of archiving the experiment; those from ToO or short-observation proposals (which do not pass through NorthStar) will be extracted manually from the proposal pdf/ps/txt into a file and passed via a command-line parameter in the standard archiving script.