Some statistics of scheduled EVN projects

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I have recently produced summary tables of scheduled EVN projects, both for the EVN Biennial Report and also to assist in assessing the EVN MK5A disk requirements if we run future continuum projects at a default recording bit-rate of 1 Gb/s. I present here some statistics for the period since I took over EVN session scheduling from Rolf Schwartz in 2002.

Table 1 shows the details for the 10 sessions from May 2002 to June 2005, including the number of hours actually scheduled for VLBI observations, and the amount of time scheduled for telescope radiometry, "CAL", which is used for deriving visibility amplitude calibration values. The generally uneven distribution of project GST interval requirements and the need to schedule time for receiver changes makes the average "scheduling efficiency" around 57% This average rises to 61% if one excludes the catastrophic February 2003 session when a crack was found in the Effelsberg azimuth track just before the start of the session, preventing it taking part.

TABLE 1: SESSION STATISTICS

SESSION	LENGTH (days)	NO. FREQ.	SCHEDULED DAYS VLBI + CAL	SCHEDULING EFFICIENCY
may02	15	3	8.4	56 %
nov02	14	3	8.8 + 0.3	65 %
feb03	17	3	2.4 + 0.3	16 %
may03	21	4	14.1 + 0.6	70 %
oct03	18	3	9.7 + 0.9	59 %
feb04	16	4	6.7 + 0.6	46 %
may04	21	3	10.5 + 0.5	52 %
oct04	22	4	15.2 + 0.9	73 %
feb05	21	4	11.1 + 0.7	56 %
jun05	12	2	8.5 + 0.4	74 %
TOTAL	177	33	95.4 + 5.2	57 %

Tables 2-4 show the total number of scheduled observations, "N-OBS", and the total amount of EVN time scheduled (given both in hours and days) for various categories of observation. Note that a single proposal may result in several observations if it requires multiple epochs, frequencies or sources. Also, at some observatories (e.g. Shanghai) the amount of time observing may be less than that scheduled, due to the earlier setting of sources.

Table 2 shows the total amount of observing, divided by project type, correlators, and participating telescopes. Note two basic statistics: 78% of all observed projects were processed at the EVN correlator at JIVE and 7.6% of observing time is spent on test observations. Note also the large range in individual telescope participation. This is largely due to the variation in the number of receivers available at the observatories, although Arecibo, Wettzell, Cambridge and Robledo (an EVN "affiliate") all have limited availability. But no telescope was scheduled for all observations.

TABLE 2: EVN OBSERVATIONS

may02–jun05	N–OBS	HOURS	DAYS
TOTAL	210	2290.7	95.4
EVN–only	103	1421.2	59.2
GLOBAL	57	681.0	28.4
Short Obs.	3	13.0	0.5
Tests	47	175.5	7.3
Bonn–Corr.	15	257.0	10.7
EVN–Corr.	164	1688.2	70.3
VLBA–Corr.	31	345.5	14.4
EVN+MERLIN	46	598.5	24.9
Eb	186	2110.7	87.9
Wb	171	1846.2	76.9
Jb	185	1986.7	82.8
Cm	93	998.2	41.6
On	176	1960.2	81.7
Mc	182	2022.2	84.3
Nt	154	1692.7	70.5
Tr	138	1527.2	63.6
Ur	88	936.0	39.0
Sh	77	821.0	34.2
Hh	71	610.0	25.4
Ar	30	86.5	3.6
Yb	3	51.0	2.1
Mh	18	216.0	9.0
Wz	3	72.0	3.0
Ro	19	205.0	8.5

Table 3 shows numbers for user projects only, i.e. excluding test observations. These numbers are also divided into line and continuum projects, and by wavelength. Note that 6cm and 18/21cm are still the most popular wavelengths. One third of all user projects are spectral line observations. Global projects involving the VLBA and/or other NRAO telescopes account for 35% of observations. Under an agreement with JPL the DSN 70m antenna at Robledo is made available for observing together with the EVN for short periods and observed on average 1.5 user projects per session.

TABLE 3: USER OBSERVATIONS

may02–jun05	N–OBS	HOURS	DAYS
TOTAL	163	2115.2	88.1
EVN+MERLIN	40	572.5	23.9
Continuum	109	1454.0	60.6
Spec. Line	54	661.2	27.6
Bonn–Corr.	14	253.0	10.5
EVN–Corr.	118	1516.7	63.2
VLBA–Corr.	31	345.5	14.4
Wavelength:			
1.3 cm	11	176.0	7.3
5 cm	16	181.0	7.5
6 cm	51	652.5	27.2
3.6/13 cm	11	177.5	7.4
18/21 cm	61	804.2	33.5
30 cm	3	35.5	1.5
90 cm	10	88.5	3.7

Some 25% of observations are combined EVN+MERLIN. Table 4 shows a breakdown by line and continuum and by wavelength for these projects. By far the most popular wavelength is 18cm. Some 40% are spectral line projects.

TABLE 4: EVN+MERLIN OBSERVATIONS

	N−OBS	HOURS	DAYS
TOTAL	40	572.5	23.9
1.3 cm	1	13.0	0.5
5 cm	6	91.0	3.8
6 cm	8	120.0	5.0
18/21 cm	25	348.5	14.5
Continuum	24	362.5	15.1
Spec. Line	16	210.0	8.8

Finally, the estimated total quantity of data scheduled for recording for all 10 sessions and all stations was 1558.7 TBytes, or an average of 156 TB per session, corresponding to 264 thin tapes. (In practice more tapes were needed since the required number of tapes per station per experiment is quantized.) The quantity of data is, of course, proportional to the bandwidth used and varies a lot between projects. For continuum projects at wavelengths longer than 18/20 cm the RF bandwidth available for use is severely restricted by interference, and for spectral line projects there is no sensitivity gain by increasing the recorded bandwidth. However, for short−wavelength continuum projects, higher sensitivity could be achieved by observing at the maximum possible recordable EVN bandwidth. However, this has never been the EVN "default" mode since we have been limited by the number of tapes available in each session. The MK5A disk recording system now in use throughout the EVN allows a maximum bit−rate of 1024 Mb/s, typically realized using 2 polarisations, 2 bits/sample recording and 128 MHz bandwidth per polarization. If all short−wavelength continuum projects had been recorded at this bit−rate in the last 10 sessions, the total requirement per session would have been 433 TB, an increase by a factor of 2.8. The EVN is working towards implementing this as a default mode for continuum observations by increasing the quantity of MK5A disk−packs available in each session.