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Parkes Instrumentation Options

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25 October 2011

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Framework

- Inputs from New Operation Model for Parkes:
  - To keep “The Dish” delivering cutting-edge science
  - Reduced staff support
  - Remote Operations
  - Focused on project requiring less support (e.g. Large projects)

- Considerations presented here are a **starting point for discussion**

- Inputs and feedback from community are essential.

Framework

- INPUTS
  - Minimal (or nil) local support
  - Remote operations

- IMPLICATIONS
  - **Increasing reliability**
  - **Reducing complexity**

- Reducing complexity / increasing reliability:
  - reducing the number of equipment (esp. in case of redundancy)
  - phasing out old and little demanded receivers.
  - remove the residual manual setups in between receiver changes
  - allow full remote setup of equipment and observing modes offered
  - Reducing number of receiver changes

PARKES RECEIVER FLEET

Receiver	Frequency	Remotely Operatable	Perform. 1=poor, 5=good	Reliability 1=poor, 5=good	Usage (last 3yr)
MB-20	1.2-1.5 GHz	Y	5	5	54.4 %
10/50 cm	732 MHz 3.1 GHz	Y	5	5	16.4 %
H-OH	1.2-1.8 GHz	Sort of	5	5	5.5 % (now ~1%)
GALILEO	2.3 GHz	Sort of	5	5	4.6 % (now ~1%)
13 mm	16-26 GHz	Y	5	4	4.3 %
MARS	8.1-8.5 GHz	Sort of	5	5	2.4 %
Methanol 6	6 GHz	Sort of	3	3	2.4 %
Multi band (SX - C)	2.3+8.5GHz (SX) 5 GHz (C)	Sort of	2	2	1.4 %
Ku	12 GHz	Sort of	2/3	3-	0.4 %

RECEIVERS

- To reduce number of receiver changes
- Essential to give more reliability to the system (and reducing complexity of operations)
  - Most of the Fault Reports are just after a receiver change
  - System is complex
  - a few days after the receiver change usually everything run smoothly (exceptions possible!)
- A possible strategy in two stages (long and short term)

A LONG TERM SOLUTION

- Ideal situation: no receiver changes at all
- How much room in Focus Cabin? Two platforms:
  - Platform #1 => One large array
  - Platform #2 => Two individual receivers
- **Replace receiver fleet with two Ultra Wide Band Receivers (UWBR) and a PAF**
- **LONG TERM: 3-5+ years**
- **FUNDING TO BE PURSUED**

A LONG TERM SOLUTION

- PAF:
  - At least 700-1800 MHz (possibly broader)
  - funds currently actively pursued
- Receiver #1:
  - 0.7 – 4.0 GHz (see talk by D Manchester)
- Receiver #2
  - 4.0 – 15 GHz (26 GHz?)
  - ATCA's 4 – 12 GHz. Enough? To push development to > 12 GHz?

- Flexibility and agility (all bands always available)

- baseline for discussion.
- Details, freq ranges, and schedule to be assessed with Community inputs (also depending on funds and resources)

A SHORT TERM SOLUTION

- Long Term solution not in place for several years

- Short-Mid Term solution necessary

- Based on receiver performance and use (next two slides)

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PARKES USE

Observation Type	Fractional observing time
Pulsar	64.7 %
Polarization & continuum	12.9 %
VLBI	7.3 %
HI	2.9 %
Spectral lines (non HI)	4.6 %
Geodynamic	1.5 %
Others (exotic, askap, …)	6.0 %

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A SHORT TERM SOLUTION

- Most used receivers (by far)
  - MB-20
  - 10/50 cm
  - 10/50 required every some 3 weeks for PPTA
- New multibeam correlator: HIPSR. A revamp of HI surveys is likely in the next years.
- High frequency receivers follow: MARS, 13mm, METH6

- STANDARD RECEIVERS:
  - MB-20 + 10/50cm => to stay up most time

- Others receivers:
  - three possible scenarios

A SHORT TERM SOLUTION

- Scenario #1: No receiver changes (not preferred)
  - Simplest and most reliable solution
  - Only science possible with MB-20 and 10/50cm (pulsar, HI, …)
  - … too limiting

- Scenario #2: 1 receiver change (+1) per semester (preferred)
  - MB-20 and 10/50cm most of the time
  - 3-4 weeks: 10/50cm out
  - 2 other receivers up to allow VLBI and other high frequency science
  - 2 receivers a semester (+ MB-20 & 10/50cm)
  - One VLBI session per semester, with 20cm + 2 high freq receivers

- Scenario #3: 2 receiver changes (+2) per semester (not preferred)
  - Similar to #2 but more flexible
  - Up to 4 other receivers scheduled a semester
  - To be assessed whether compatible with budget/resources needs

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A SHORT TERM SOLUTION

- Parkes Receiver Fleet to be reviewed
  - shorter time for maintenance
  - Only 2 (4) receivers available per semester

=> reducing number of receivers

- choice should be driven by

  - use (must stay up for several weeks => high request)
  - performance
  - reliability / age

A SHORT TERM SOLUTION

- A POSSIBLE SCENARIO (according to the previous tables) :

Online (To use)	**Offline** (Not to use unless highly ranked scientific projects request it)	**To decommission**
MARS Old Methanol 13mm	Galileo H-OH	Multiband (S/X - C) Ku-band

- Opinion and inputs from ATUC community required here
- N.B.: short term solution => long term will give all frequencies back

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Reducing complexity between receiver changes

- Reducing complexity between receiver changes:
  - Reducing number of equipment
    => the fewer the less support we need to provide
    => eliminating redundancies
  - to eliminate residual manual reconfigurations in between receiver changes

BACKENDS

- Workhorses (to keep)
  - DFB3/4 (pulsar, polarization/continuum, spectrometer)
  - BPSR - APSR (=> HIPSR)
  - MBCORR for multibeam observations (=> HIPSR)
  - VLBI: see a few slides ahead

  - HIPSR:
    - new multibeam backend
    - Pulsar mode
    - Spectrometer mode (400 MHz, 16k channels)
    - Advanced development stage (first HI light achieved)

BACKENDS TO PHASE OUT

- AFB (see Douglas talk)
- MBCORR for **individual beam** observations:
  - require manual swapping of boards and rewiring of cables
  - Can be replaced by DFB3 (with better performances)
  - Some configurations with 4 MHz BW lost => 0.5 and 0.25 kHz resolution (but very little use, << 1%).
    Not completely true: might be recovered with HIPSR…
  - Little S/W development to be completed (to be given high priority)
  - Currently assessing whether to phase out on 1 April 2012

VLBI BACKENDS

- DAS
  - 20cm observations require conversion linear-to-circular pols
  - By an Hybrid: can be setup manually only

- Two options

1. To make the hybrid remotely settable (not recommended)

2. To migrate to DFB3 (preferred)
   - Circularisation can be done via F/W by DFB3
   - Broader BW: 1024 vs 64 MHz => room for future developments
   - further reduction of equipment to support

   - It is not new, the VLBI team is working on this since a few yrs
   - The project requires to be given high priority in the next 12 months

VLBI OPERATIONS

- Disk Swaps to be eliminated (both MK-V & DAS/DFB3)
  - Assessment on how much disk space is required to run an entire run without swaps.
  - MK-V case looks OK already.
  - Assessment required for DAS/DFB3
  - Increase the share of eVLBI time?

- No receiver changes during a VLBI session
  - One receiver change at the beginning of the session
  - Observations should be conducted with:
    + 20cm
    + 2 receivers installed at the start of the session