

# Parkes Frontend Status Update

---

Jimi Green (on behalf of Science Operations)

June 2016

## Summary

An ongoing process has been rationalizing the front- and back-end capability at Parkes, as described previously by E. Carretti. The currently available front-ends are:

- 10/50 (modified from original, more accurately now 10/40)
- H-OH
- GALILEO
- METHANOL6 (some reliability issues)
- MARS
- S/X, C (C-band component not fully operational)
- KU
- 13mm
- MPI PAF (temporarily available with restricted access)

Recently the multibeam receiver, MB-20, has been taken down to enable the installation of the MPI PAF, for its commissioning, testing, and early observations. Following some servicing, the MB-20 will be reinstalled when the MPI PAF is shipped to Germany, currently forecast for September 2016. To note there is also a 70cm/400 MHz receiver for standby NASA tracking (last used in 2012 for the Mars Science Lander mission), although this is not formally offered and is likely to be effected by Radio Frequency Interference.

The long term receiver plan for Parkes is to have 2/3 wideband receivers on one platform, to cover the existing frequency range (700MHz to ~25GHz), and have survey capability enabled with a PAF receiver on the other platform. The ideal goal is to replace the current multibeam system with a cryogenically cooled ~1-2 GHz band next-generation/'MKIII' PAF. Under this model all receivers would be present in the focus cabin and receiver changes would only be required for new receiver testing and development. It would also be the intention to move to a model where digitization occurs at the receiver.

We will look to the community to provide their perspective on division of frequency bands for higher frequencies, the choices likely falling to either a single very wide band receiver (4 to 25 GHz) with compromised performance or two narrower wideband receivers (4 to 12 and 12 to 25 GHz for example) with performance approaching that of standard octave band receivers.

# Current developments

## Max Planck Institute Phased Array Feed

Work is ongoing commissioning the MPI PAF, including the first observations of a known pulsar.

## Vertex Radiator

A vertex radiator has been installed to aid calibration of the PAF and has the potential to remain for other uses, such as for the ultra-wideband feed (see below).

## Ultra-Wideband Feed

The Parkes Ultra Wideband (UWB) receiver will operate from 700 MHz to 4 GHz, in dual linear polarization. The receiver has been successfully prototyped and development work will continue on the UWB once the receiver group has completed work on a multibeam system for the FAST telescope in China.

# Functionality

## Current

For full details of the current receiver capability see Appendix A.

## Required

The multibeam receiver is required once the MPI PAF is taken down. Fewer, more capable receivers would allow greater flexibility in observing (e.g. switching frequencies without receiver changes) and providing a long term PAF would facilitate a single-dish ('zero-spacing') complement to ASKAP surveys.

# Roles & Responsibilities

The UWB receiver is a project based on a LIEF grant and has distributed responsibilities, but will become part of the standard national facility receiver suite. There is interest from a number of institutes in the next generation PAF, including ICRAR and Western Sydney University, and responsibilities will be dependent on the funding route.

# Projected Timeline

The UWB receiver is due for commissioning mid to late 2017. With the successful commissioning of the UWB the 10/50, H-OH and Galileo receivers will likely be decommissioned. Options for funding the development and production of a cryogenically cooled next-generation PAF will be explored, and a funding proposal could be made for the next round of LIEF grants (early 2017). This receiver would be the next priority as it feeds the development scheme of PAFs within the context of the Square Kilometre Array (SKA). This receiver would replace the MB-20. Funding and manpower would then dictate the development of the additional wideband receivers.

## **Redundancy/Backup**

Decommissioning of existing receivers only once their replacements are reliably operating. Conceivably the 10/50, H-OH and Galileo receivers could be decommissioned in 2018. The others would be dependent on development timescales.

## Appendix A: Current Frequency Coverage

Frequency (GHz)	Receiver	No. of Beams	Bandwidth (MHz)	Native Polarisation	
0.700 – 0.764	10/50	1	64	Dual Linear	RFI issues
1.230 – 1.530	MB20	13	384	Dual Linear	
1.200 – 1.800	H-OH	1	500	Dual Linear	RFI issues
2.150 – 2.270	GALILEO	1	120	Dual Circular	
2.200 – 2.500	GALILEO	1	300	Dual Circular	
2.200 – 2.500	AT S-BAND	1	300	Dual Linear	
2.200 – 2.500	AT S-BAND	1	300	Single Circular with ¼ wave	
2.290 – 2.300	GALILEO	1	10	Dual Circular	
2.600 – 3.600	10/50	1	1000	Dual Linear	
4.500 – 5.100	AT C-BAND	1	500	Single Circular with ¼ wave	Not 100% reliable
5.900 – 6.800	METH6	1	300	Dual Circular	Not 100% reliable
8.100 – 8.500	MARS	1	1000	Dual Circular	
8.100 – 8.700	AT X-BAND	1	500	Dual Linear	
8.100 – 8.700	AT X-BAND	1	500	Single Circular with ¼ wave	
12.000 – 15.000	Ku	1	500	Dual Linear	
16.000 – 26.000	13mm	1	1000	Dual Linear	
21.000 – 22.300	13mm	1	1000	Dual Circular	

## Appendix B: Proposed Frequency Coverage

Frequency (GHz)	Receiver	No. of Beams	Bandwidth (MHz)	Native Polarisation	Note
0.700 – 4.000	UWB (low)	1	?	Dual Linear	Prototyped
0.600 – 1.800	Rocket PAF	36			<i>Under discussion</i>
4.000 – 12.000	UWB (mid)	1	2 x 2000	Dual Linear	<i>Under discussion</i>
12.000 – 25.000	UWB (high)	1	2 x 2000	Dual Linear	<i>Under discussion</i>