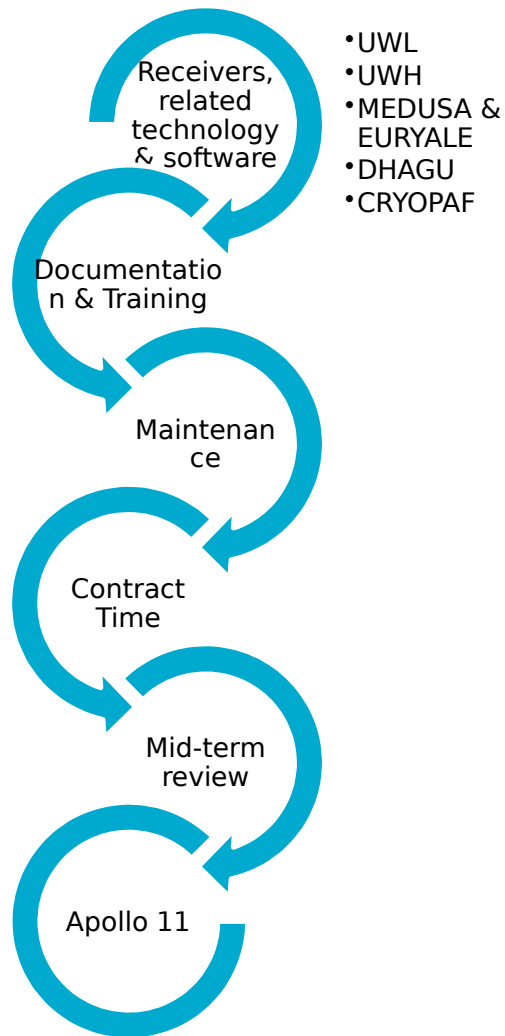




Parkes Update

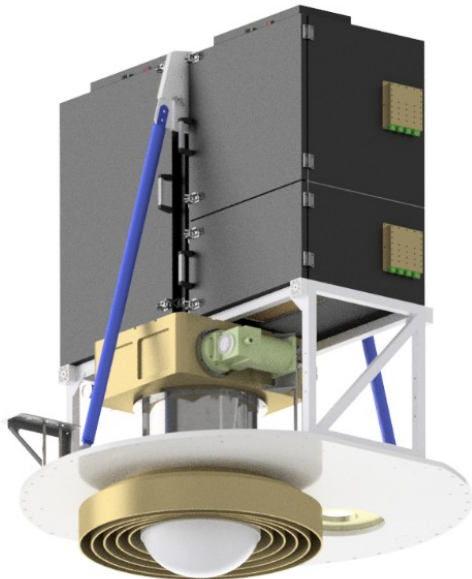
ATUC

Jimi Green | 30th October 2019





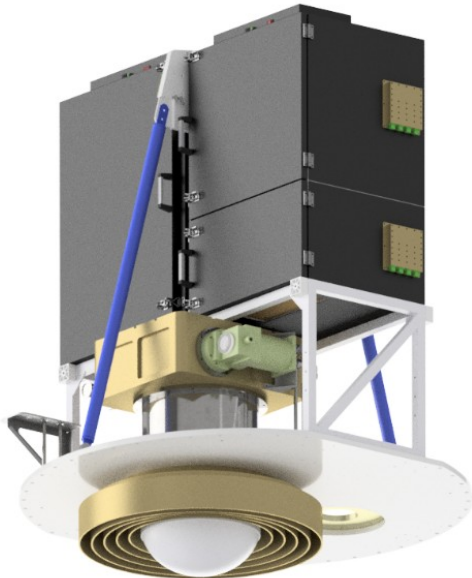
UWL Overview



- Frequency 700MHz - 4 GHz
- ~20 K System Temperature
- In regular use, replaces 4 receivers
- Exclusively requested for 2019OCT
- Overview paper submitted to PASA (July 2019, awaiting referee's report)
- Science papers
 - Dai et al. 2019 ApJ 874 14
 - Kaplan et al. 2019 ApJ in press
 - Zhang et al. 2019 ApJL accepted
- Receiver installation requires 'perfect' weather – contingency in scheduling



UWL Developments

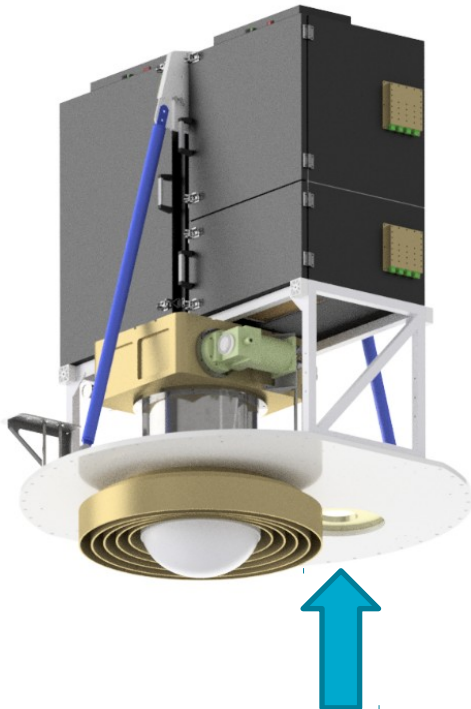


Under development:

- Scanning modes with DHAGU control
- Spectral line data visualization (~SPD)
- Accommodating existing spectral line software
- Implementation of oversampled filterbanks
- Implementation of RFI mitigation procedures
- Update of calibration procedures including transmitting signals from the vertex and pseudo-random-noise
- software pipelines for offline processing
- Commensal observing modes

ATUC Prioritisation?

UWM+H Overview

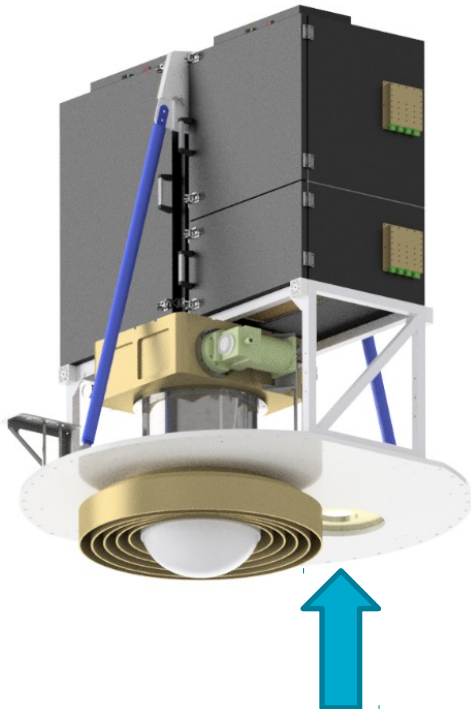


- Frequency 4 GHz - ~25 GHz
- ~20 K System Temperature
- Existing high frequency receivers' performance is degrading
- Ongoing need for VLBI motivates prioritizing this receiver as much as possible
- UWM+H (4-25) could cover 5 legacy receivers in fleet and negate need for receiver changes (physical demands require additional staff now for existing receivers)

***UWM (4-?) + UWH (?-25) -
2 bands better for
performance***



UWM+H Drivers



- Oct 2012 and Dec 2013 ATUC science meetings
- Magnetars, special pulsars, Galactic Centre studies
- Wideband, high freq. continuum
- Multi-transition surveys
 - Methanol 6.7, 12.2 GHz
 - Formaldehyde 4.8, 14.4 GHz
 - Water 22 GHz
 - Ammonia 23-25 GHz
- **Bistatic radar**
- Ongoing (+expanded?) VLBI sessions

What is the current highest profile science driver?

Is another community workshop needed?

Who might lead a LIEF?

Backend



Medusa

- GPU backend for UWL (and cryPAF and UWM+H in future)
- Flexible modes and capabilities
- Externally maintained

andrew.jameson/



Euryale

- Data staging server
- Data flow limits (OPAL updates and scheduling)
- SDHDF spectral line data format – documentation available





DHAGU - The new control system

<https://parkes-ops.atnf.csiro.au/UW>

DOY/UTC: 296/07:22:30 AEST: 17:22:30 LMST: 19:21:16 MJD: 58779

Observation Status Queue Parameter Set Scheduler Manager Medusa

Available Parameter Sets

P303

Scheduling Blocks

ID	Project	Alias	State	Template	Run/Scheduled Time	Duration
4008	P303	1934-438_cal	OBSERVED	Continuum	2019-10-23 03:40:12	00:12:57
4007	P303	G287p5toC282p5	OBSERVED	Continuum	2019-10-23 02:24:48	01:15:23
4006	P303	G287p5toC282p5plus185	OBSERVED	Continuum	2019-10-23 01:08:44	01:15:03
4005	P303	G287p5toC282p5minus185	OBSERVED	Continuum	2019-10-23 23:31:08	01:17:15
4004	P303	G287p5toC282p5	OBSERVED	Continuum	2019-10-22 23:33:17	01:16:10
4003	P303	G287p5toC282p5plus185	OBSERVED	Continuum	2019-10-22 21:06:52	01:26:24
3997	P303	1934-438_cal	OBSERVED	Continuum	2019-10-18 02:40:35	00:10:10
3992	P303	G287p5toC282p5	OBSERVED	Continuum	2019-10-18 01:24:04	01:16:30
3949	P303	G287p5toC282p5minus185	OBSERVED	Continuum	2019-10-18 00:06:45	01:17:18
3944	P303	G287p5toC282p5	OBSERVED	Continuum	2019-10-17 22:48:32	01:16:12

Showing 1 to 10 of 21 entries

DOY/UTC: 296/07:22:11 AEST: 17:22:11 LMST: 19:20:57 MJD: 58779

Observation Status Queue Parameter Set Scheduler Manager Medusa

Parameter Set

Load Reset Update Parameters Options

Select a parameter set, click column headers or click-drag first column to reorder sources. Schedule by selecting and clicking on "Schedule".

#	Name	Epoch	X	Y	Tobs	Alt/Off	Cal	LST	LST	Alt	El
1	J0304-1932_R	J2000	03:04:00	+19:00:00	80	0.0	true	01:02:43	03:07:28	69.78	-31.76
2	J0304-1932	J2000	03:04:03	+19:32:51.36	180	0.0	false	01:07:25	03:03:32	86.28	-32.13
3	J0400-1759	J2000	04:00:34	-17:59:05.28	180	0.0	false	00:33:42	09:13:39	189.79	-26.07
4	J0448-0749	J2000	04:48:41	-07:49:45.02	180	0.0	false	00:08:55	09:30:00	144.89	-19.29
5	J0630-2634	J2000	06:30:49	-26:34:42.60	180	0.0	false	01:49:27	11:13:42	167.85	-27.31
6	J0745-6353	J2000	07:45:02	-63:51:21.86	180	0.0	false	02:16:02	13:14:39	163.64	-8.83
7	J0906-4028	J2000	09:06:01	-40:28:04.44	180	0.0	false	21:02:19	07:11:19	129.99	-12.02
8	J0235-5304	J2000	02:35:56	-53:04:21.36	180	0.0	false	21:28:46	08:24:16	143.58	13.80
9	J0401-7608	J2000	04:01:52	-76:08:13.92	180	0.0	false	21:34:04	10:29:36	168.44	23.49
10	J0536-7543	J2000	05:36:31	-75:43:56.64	180	0.0	false	23:10:12	12:01:27	173.34	20.02
11	J0904-7459	J2000	09:04:11	-74:59:42.72	180	0.0	false	02:41:15	15:29:55	186.83	19.38
12	J0738-4042	J2000	07:38:32	-40:42:41.04	800	0.0	false	02:34:00	12:44:24	183.63	-15.12

DOY/UTC: 296/07:21:35 AEST: 17:21:35 LMST: 19:20:21 MJD: 58779

Observation Status Queue Parameter Set Scheduler Manager Medusa

Queue Status Synoptic Health

ID 4015
Alias P1029_11946+1805
Template Search
Scan No. 0
Scan Duration 7200
Target J1946+1805

DOY/UTC: 296/07:22:42 AEST: 17:22:42 LMST: 19:21:28 MJD: 58779

Observation Status Queue Parameter Set Scheduler Manager Medusa

Queue Scheduled

Observer in Charge George Hobbs

Queue Control

Start Stop Abort FCM

Progress: 10%

EXECUTING: SBD 4015
Template Search
Alias P1029_11946+1805
Scan No. 0
Source J1946+1805
Position 19:46:53 +18:05:41.28 J2000
Duration 7200

Unschedule Refresh

ID	Project	Alias	Scheduled	Template
No data available in table				

Showing 0 to 0 of 0 entries

Log

Search:

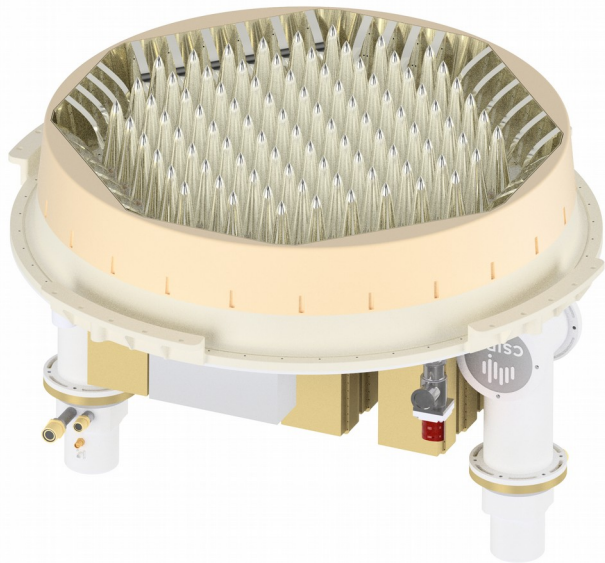
UTC Message

2019-10-23 07:22:30 opscript: Scan 0 14% complete

2019-10-23 07:22:34 opscript: Scan 0 14% complete



Cryo-PAF

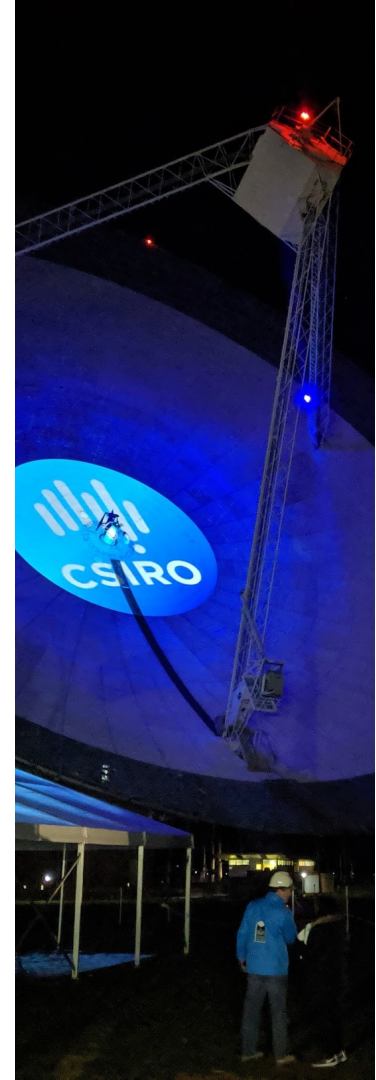
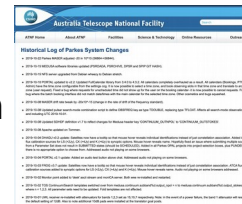
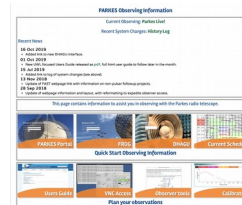


- Frequency 700 MHz – 1.9 GHz
- Field of view: 1.5deg^2
- $< 20\text{K}$ System Temperature
- > 36 Dual Polarization beams
- Instantaneous bandwidth: $> 500\text{MHz}$
- FPGA beamformer, GPU backend
- Various design work underway, but awaiting ARC LIEF decision



Documentation & Training

- New users guide
 - currently pdf only, transitioned from previous google docs guides, moving to ATCA DocBooks format ~next week
- New 'history of changes' webpage
- Consolidated mattermost channels
- PORTAL, FROG updated (latter potentially moving to Grafana/Alerta in due course)
- Recognise need for refreshed training with new systems
- Considering competency (checklist) assessments similar to ATCA ideas



ATUC Feedback on documentation & training always welcome

Maintenance

- Extensive refurbishment of (now blue) azimuth jacks
 - Currently in process of re-installation
 - Once done, hydraulic system to be refurbed and cabling
 - Complete overhaul of (now red) motor
- Azimuth 2 gearbox seal leak to be addressed (2 week March 2020 shutdown)
- Working jacks will allow for more maintenance in future
- **Within the next ~2 years, 6-8 week shutdown for zenith gearbox refurbishment - will have better idea after March shutdown, potential for impromptu in APR2020, or scheduled OCT2020, APR2021... coming up 20 years since last done.**
- *Is there a requirement for keeping traditional down conversion route for UWL and UWM+H? (flexibility always useful, e.g. Voyager tracking use last semester)*
- *Need for upgrading infrastructure for new receivers, e.g. weight of new receivers will be challenge for current translator*



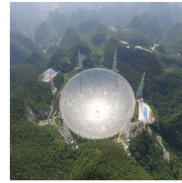


Contract Time

BREAKTHROUGH
LISTEN

Breakthrough Listen

- First pass of Galactic plane survey completed, second pass started
- Now working with student on analysing pulsar data
- Detected commensal FRB
- Commensed UWL observations
- Potential work on flare stars
- *Asteroid (514107) 2015 BZ₅₀₉* Price et al. 2019
- *Fast Radio Burst with frequency-dependent polarization* Price et al. 2019
- *Wide-bandwidth digital instrumentation for the CSIRO Parkes 64-m telescope* Price et al. 2018



FAST/NAOC

- To date, have confirmed 26 new pulsars of FAST's 134 pulsar candidates (89 of which are visible from Parkes, 60 so far observed).
- 25 of the confirmed pulsars are now the subject of a long term timing and deep-study campaign (including 5 MSPs in binary systems)
- UWL now primary receiver used for searching and timing
- Listing of projects and PIs now provided online for projects other than pulsar confirmations.
 - ~400hrs per semester, although ~500 hrs in 2019



Tracking Contract Time

	2018 APRS	2018 OCTS	2019 APR	2019 OCT
Contract	BL+FAST (1220 hrs)	BL+FAST+NASA (1535hrs)	BL+FAST (1472hrs)	BL+FAST (1307hrs)
Other	(200 hrs UWL ¹)	(213hrs UWL ¹)	(87hrs UWL ¹)	(153hrs UWL ¹)
# Proposals ²	36 (3480hrs)	38 (2795hrs)	33 (2200hrs)	32 (1920 hrs)
Cutoff grade	3.7	3.4	3.2	3.0
Projects 90-100%	11 [31%]	20* [53%]	19 [58%]	22 [69%]
Projects 40-90%	7	9*	12	3
Projects <40%	1	4*	0	2
Projects 0%	17	5*	2	5
NAPAs	3	2	2	2
Student PI success	50%	69%	100%	71%

¹This is P960 and P737 project time

²This doesn't include P960, P737, PX500/501, or NAPAs



Parkes & the Mid-Term Review (statements)

- Statements in white paper:
 - “Continue to **operate and upgrade existing radio astronomy facilities**, including Parkes and ATCA, to retain and develop world-class science capacity despite SKA delays.”
 - “**Radio instrumentation** programs must continue. This will require enhanced funding support.”
- Costings in white paper:
 - 1.7 M\$ UWH
 - 3.5 M\$ CRYOPAF
 - 3.8 M\$ p/a operating costs (2.4 M\$ direct costs without overheads)



Parkes & the Mid-Term Review (issues & risks)

• **Funding:**

- Receivers - cryo-PAF (ARC LIEF dependent) and UWH (yet to be identified, possible LIEF)
- Operations - currently in supporting model of external funded telescope time (~40%) - contract based with current Breakthrough Listen agreement 2016-2021 (25%), NAOC/FAST 2017-2020 (16%), ad-hoc a la NASA Voyager 2 tracking (~900hrs in 1 semester)

• **Maintenance:**

- Ability to be proactive vs reactive
- Aging workforce, impact on people and operations (e.g. receiver changes)
- Maintaining unique systems knowledge and risk of 'single-point failures'
- Infrastructure for new receivers (e.g. translator)

• **Science:**

- Parkes' scientific role in era of new facilities and capabilities



Apollo 11 50th Anniversary



Open Days: 20,000 visitors across 2 days (20th & 21st July)



Open Days: Tours, talks, screening of the dish, PULSE@Parkes, Ask the Experts



Open Days: ~100 Volunteers from across CSIRO



IEEE dedication: In honour of role, new plaque on a plinth



"Parkes radiotelescope and Honeysuckle Creek stations in Australia received voice and video signals from the Apollo 11 moonwalk, which were redistributed to millions of viewers. Parkes' televised images were superior to other ground stations, and NASA used them for much of the broadcast. One of the first to use the newly developed corrugated feed horn, Parkes became the model for the NASA Deep Space Network large aperture antennas."



Summary



UWL has had significant uptake and use (***the*** receiver asked for in 2019 OCT semester)



Still modes of UWL+MEDUSA+DRAGO being developed, particularly around the spectral line use cases (plus integration to existing data processing software)



Receiver changes demanding on Parkes staff and UWL has greater weather dependence



Input on science direction for UWM+H would be welcome, need for new community input or consolidation of previous?



(still) waiting to hear on Cryo-PAF LIEF funding decision



Sizeable maintenance tasks on horizon



Importance of Parkes re-emphasized in Decadal Plan Mid-Term Review



Documentation & training revival underway, still ground to cover