



the waking Giant

FAST
EV21

Timeline



- **Project Approval:** Dec., 2007
- **Commence Construction:** March, 2011
- **Opening ceremony:** Sep. 25, 2016
- **19 beam L-band array:** to be delivered in Dec., 2016
- **Backend upgrade (for commensal survey):**
 - under development, to be expected in Spring of 2017
- **Commissioning:** 2016 - ~2018
- **Operation:** ~2019

Current Status

Commissioning goals: 2000 m²/K, 6 hr tracking, 10'' pointing

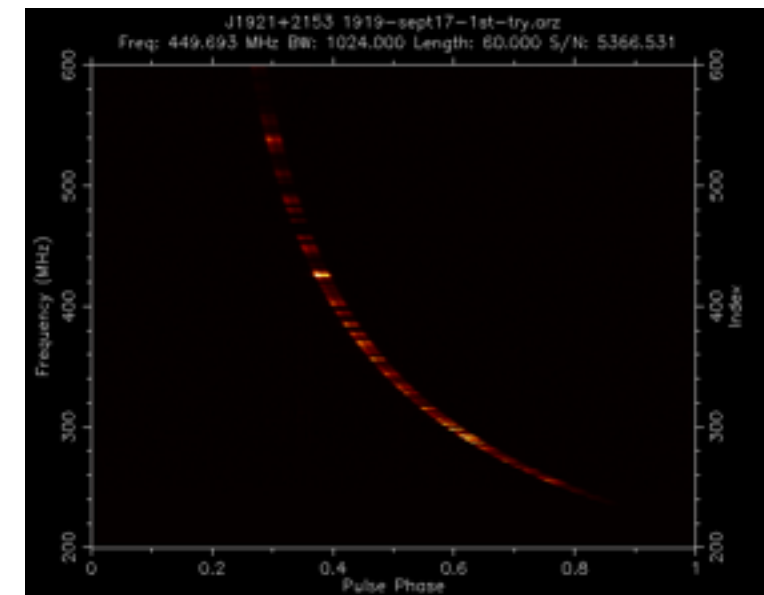
- Director: **Prof. Yan, Jun**; Acting Director: **Prof. Zheng, Xiaonian**
- Chief Scientist & Chief Engineer: **Prof. Nan, Rendong**
- CAS Steering Committee (Chair: **Prof. Wu, Xiangping**); CAS User Committee (To be announced)
- Science group leader: **Prof. Zhu, Ming**
- Commissioning core-team leader: **Prof. Jiang, Peng**

Suggested (DL) Operational mode: ~50% large surveys, ~50% PI-driven open time

UWBR: Dream came true!

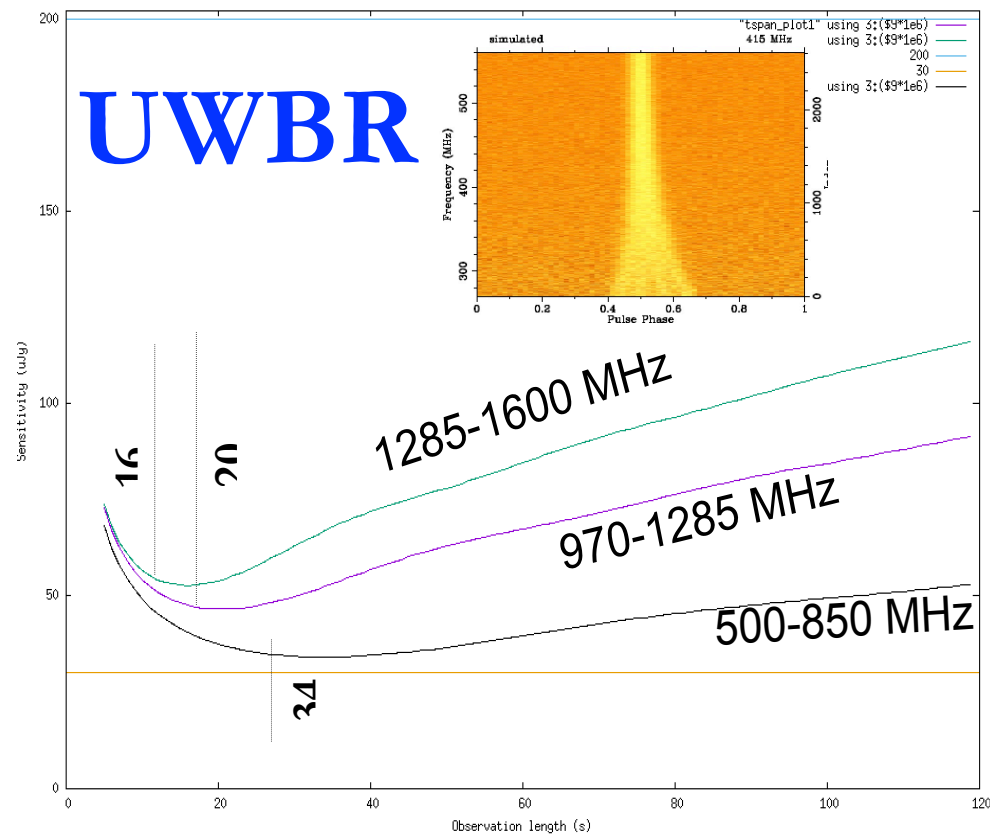


2012于加州理工
3年合作研发

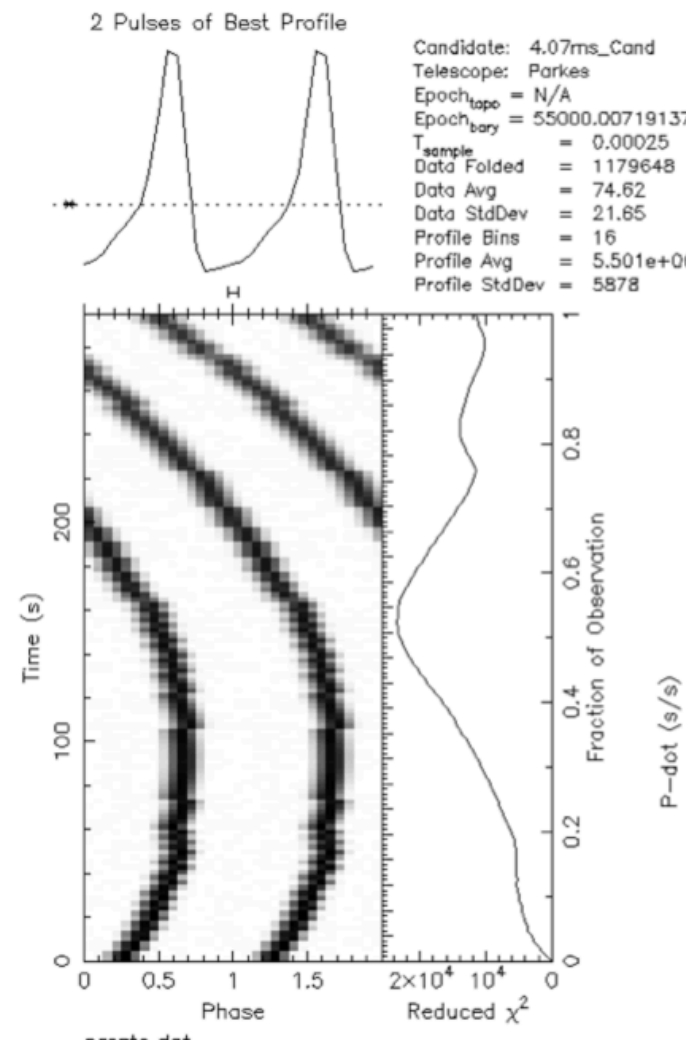
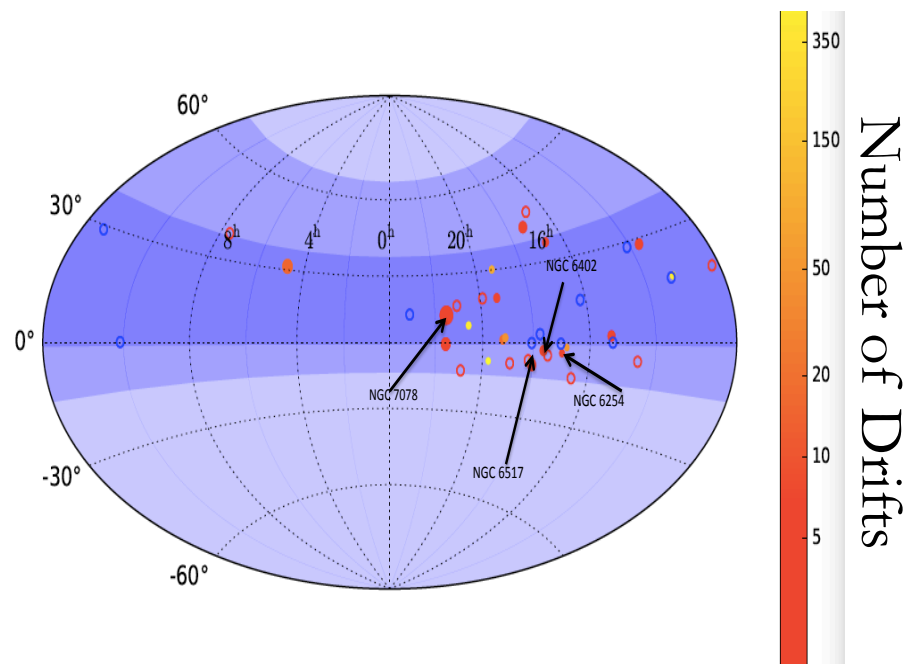


Built, installed, commission started.

Globular Clusters



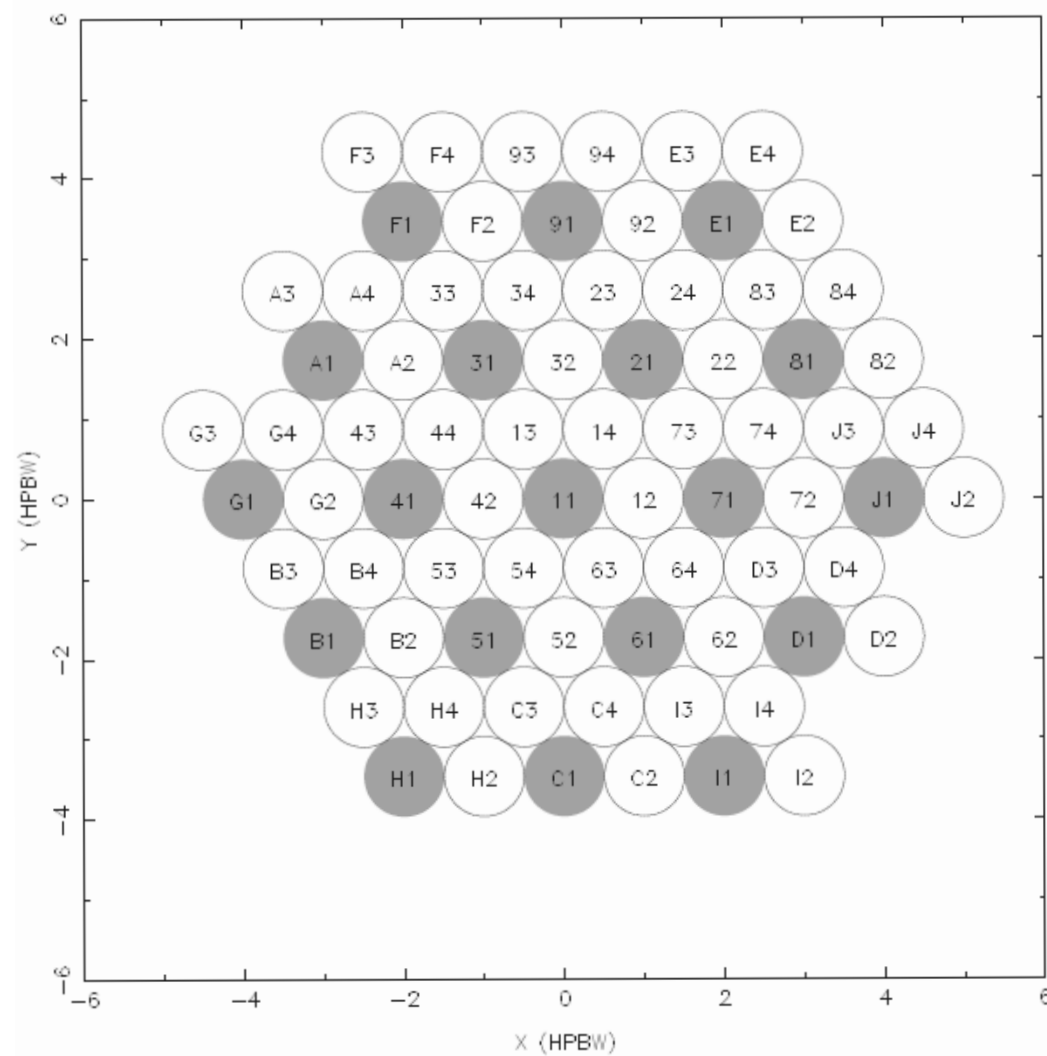
Zhang, Hobbs & Li et al. 2016, RAA



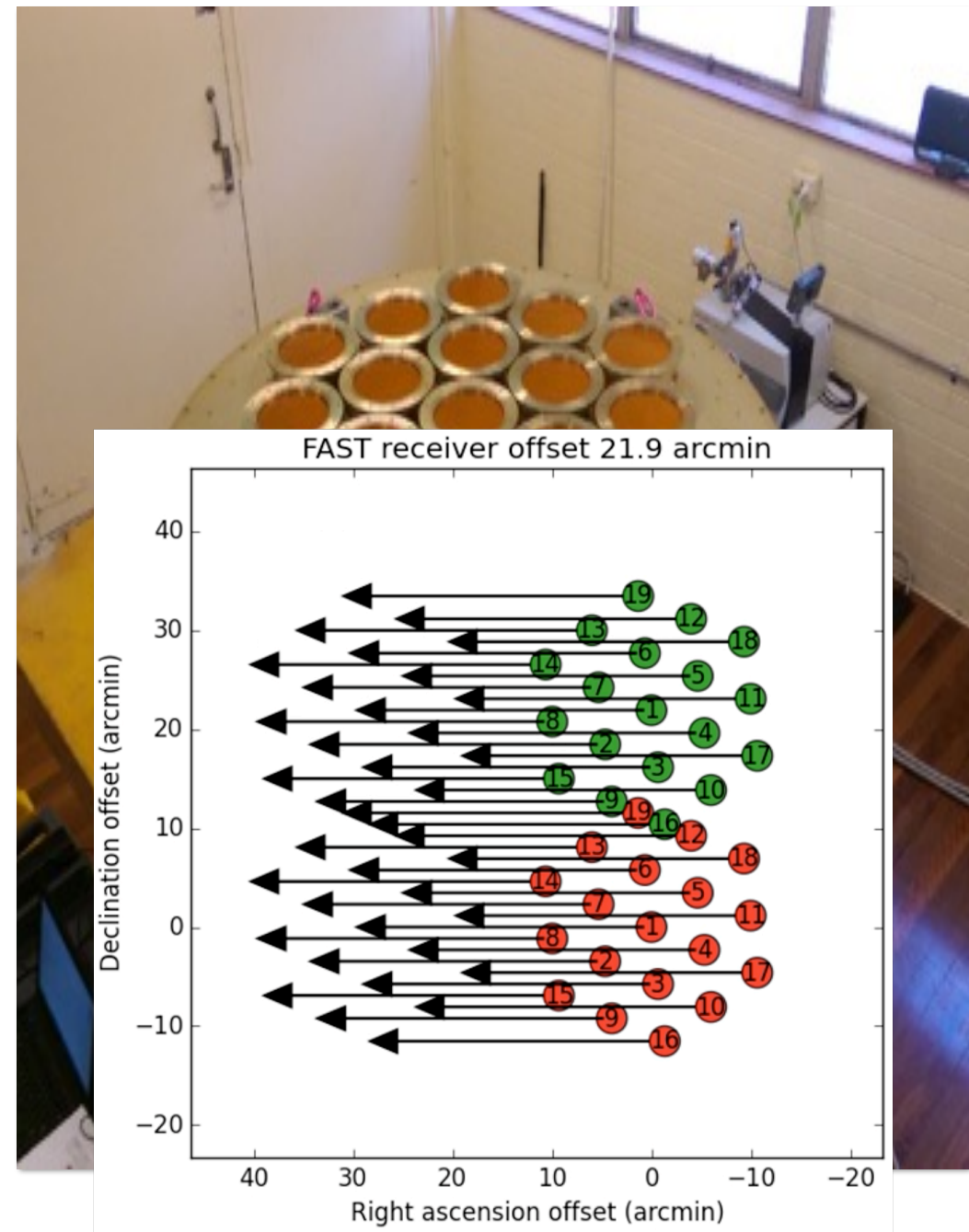
Simulated
Binary Pulsars

Continuous data stream in time
Beam forming by weighted Fourier transform
RFI rejection by utilizing time domain information

Zhang et al. 2017, in prep



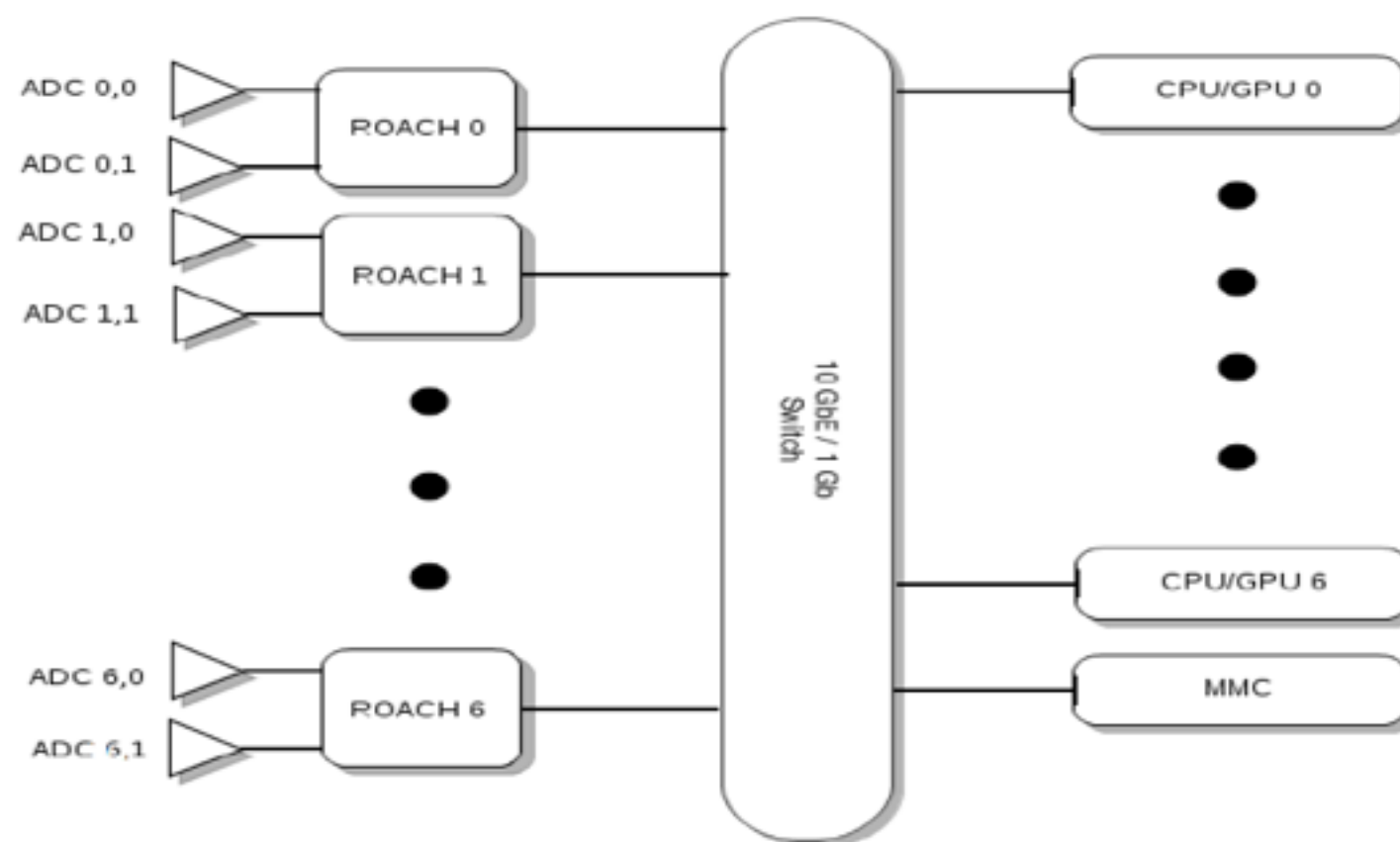
- 19 beams
- 1.05 – 1.45 GHz, 25K T_{sys}



Drift (sidereal): 漂移扫描

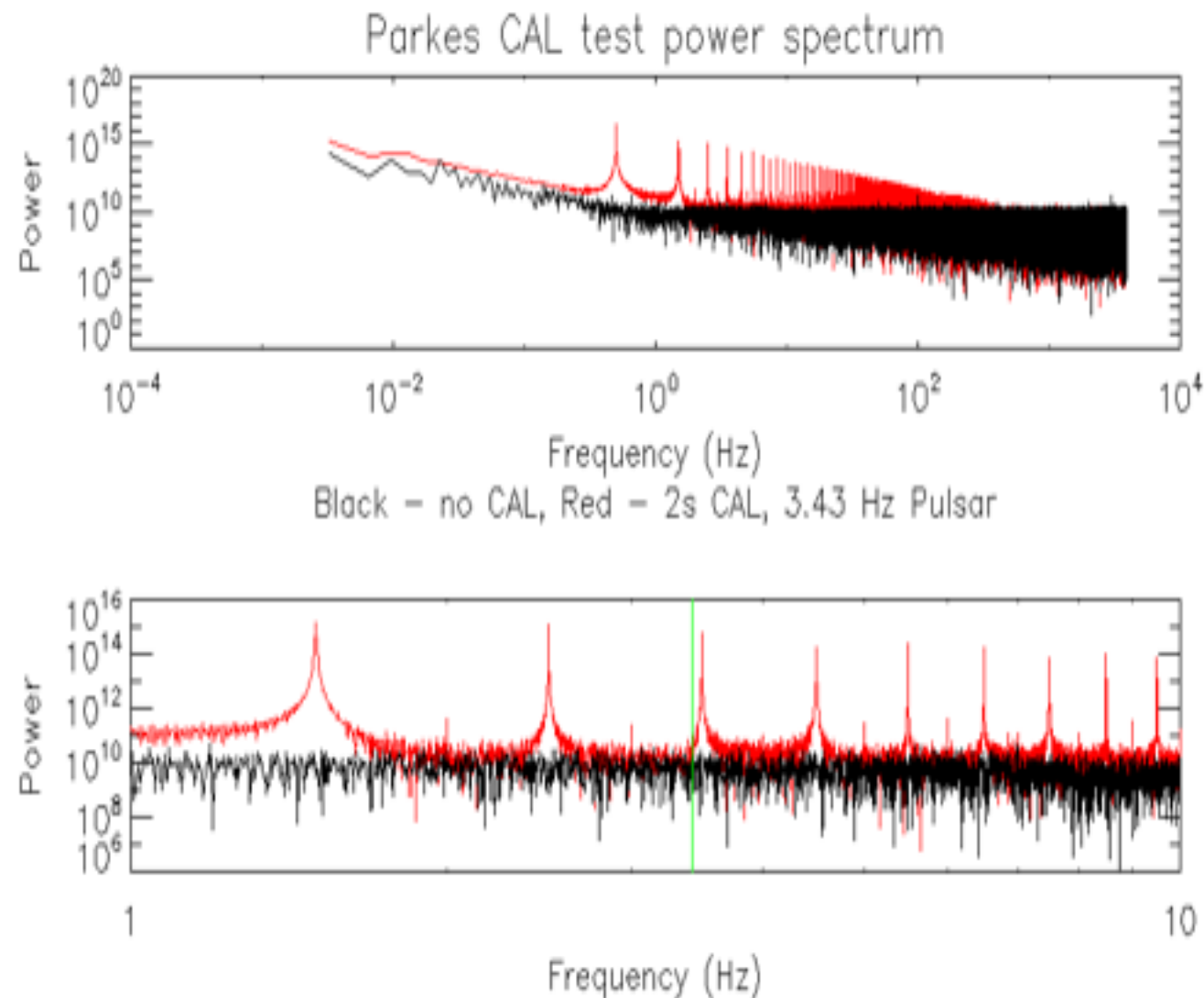
Commissioning + Upgrade

- Multi-backend
- Noise-cal strategy
- bandpass
- scan pattern
- RFI mitigation
- **FRB**: Real time trigger + Voltage data
- Pointing, tracking, beam characterization, data archiving, pipeline



How to realize a first large-scale commensal survey of pulsars, HI, and transients?

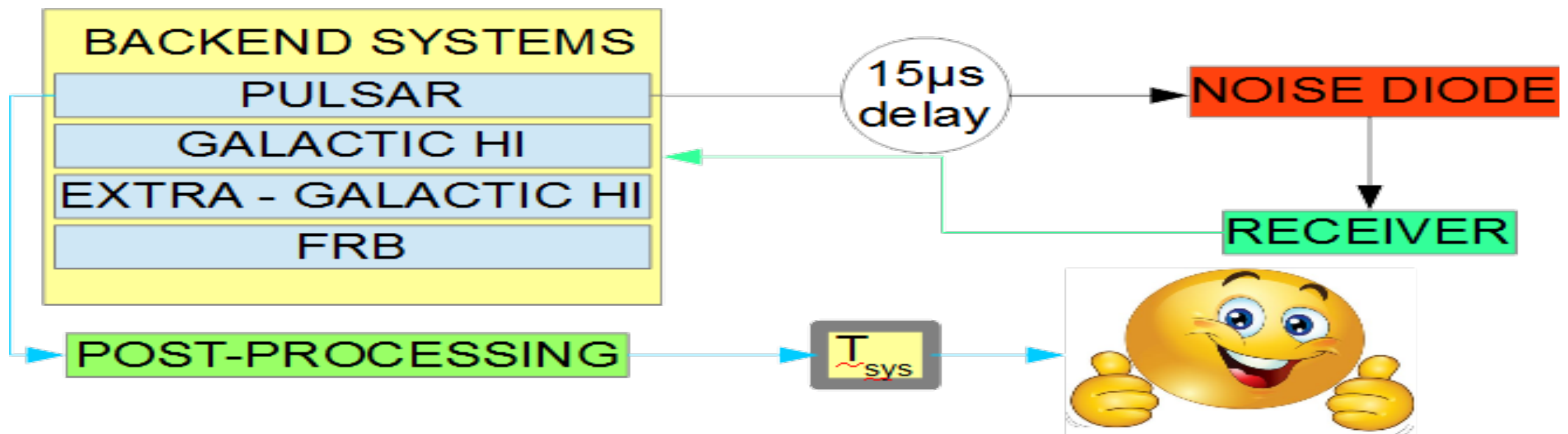
WHY THERE'S A PROBLEM



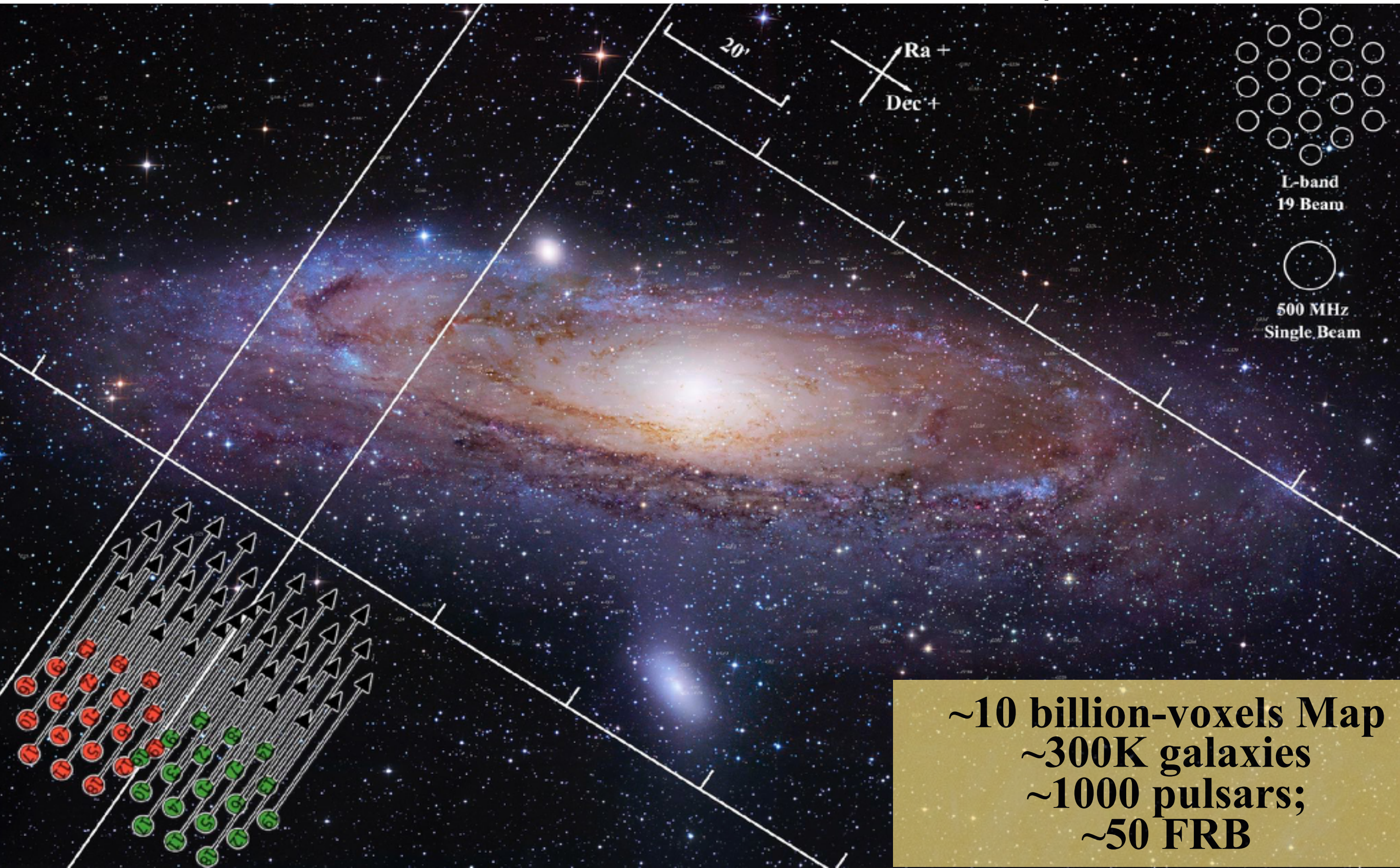
CAL SCHEME

Marko Krčo, Di Li, Dick Manchester,, George Hobbs, Bill Coles, Jim Cordes ...

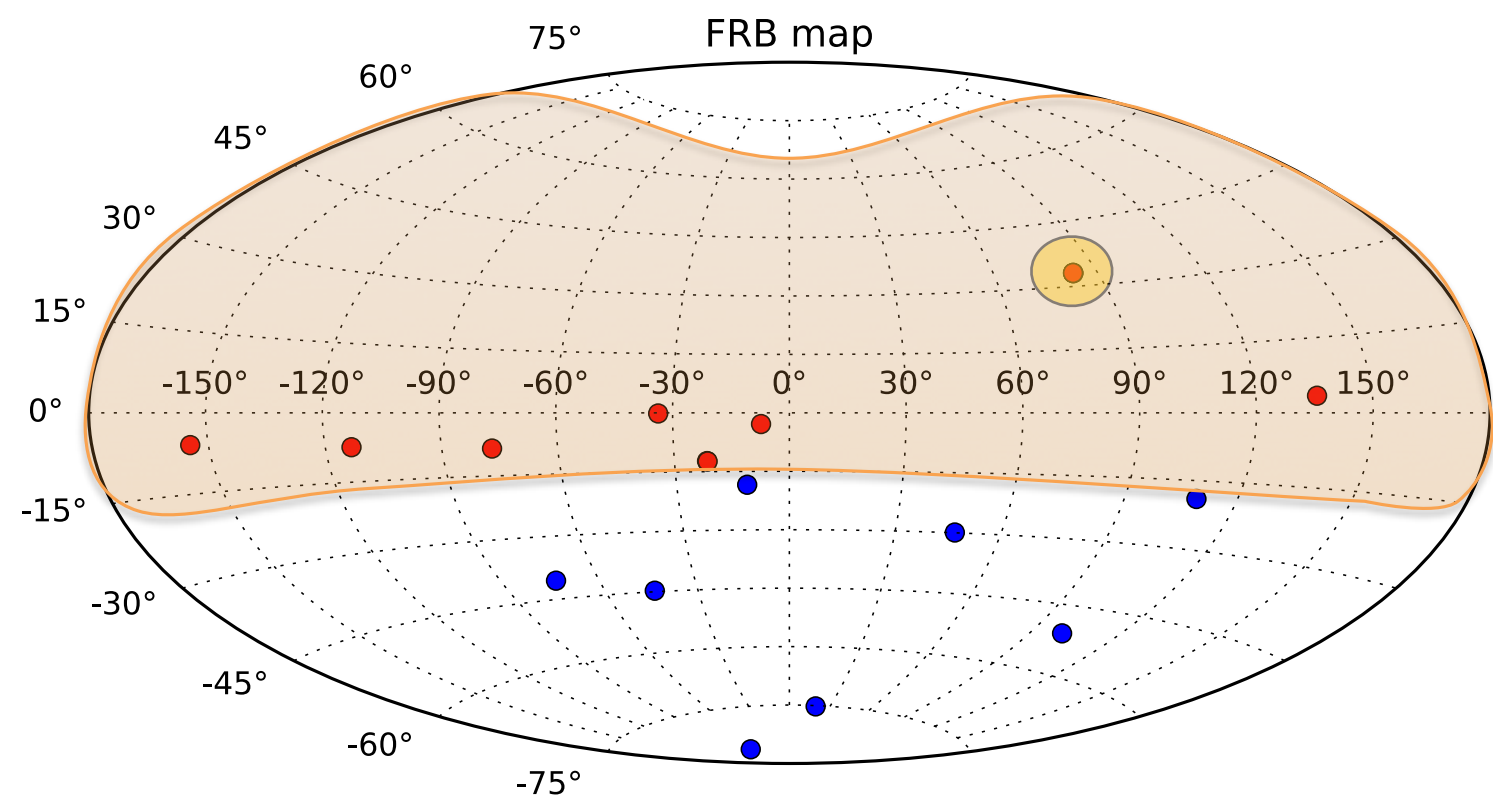
- Run a “winking” CAL at the Pulsar
backend sampling rate ($\sim 100 \mu\text{s}$)
- CAL should not influence Pulsar search
- Pulsar backend must trigger CAL
- Automated Post-processing of Pulsar
data recovers T_{sys} and CAL timing information to be shared with all groups.



Science Planning FAST Commensal Survey a) + b) + c)



Fast Radio Burst



17 FRBs' location, 9 red spots are the FRBs in FAST.
(FRB121102, FRB130628, FRB110523, FRB110703,
FRB130729, FRB130626, FRB010621, FRB140514,
FRB110220).

Name	Telescope	UTC	RAJ	DECJ	NE2001 DM Limit	DM (cm ⁻³ 3pc)	Width(ms)	Flux (Jy)	DM/DM_ne
FRB121102	arecibo	2012-11-2 6:35	5:32:09	33:05:13	188	557	3	0.4	2.96
		2015-6-2 16:38	5:32:01	33:07:53		555	4.6	0.04	
		2015-6-2 16:47				558	8.7	0.02	
		2015-5-17 17:42				560	3.8	0.03	
		2015-5-17 17:51		566		3.3	0.03		
		2015-6-2 17:49		5:31:55		33:08:13	559	2.8	
		559	6.1				0.02		
		2015-6-2 17:50	556.5				6.6	0.14	
		2015-6-2 17:53	557.4				6	0.05	
		2015-6-2 17:56	558.7				8	0.05	
		2015-6-2 17:57	556.5				3.06	0.31	
		FRB130628	parkes	2013-6-28 3:57		9:03:02	3:26:16	52.58	
FRB110523	GBT	2011-5-23 15:06	21:45:12	-00:09:37	43.52	623.3	1.73	0.6	14.32
FRB110703	parkes	2011-7-3 18:59	23:30:51	-02:52:24	32.33	1103.6	4.3	0.5	34.14
FRB130729		2013-7-29 9:01	13:41:21	-05:59:43	31	861	15.61	0.22	27.77
FRB130626		2013-6-26 14:55	16:27:06	-07:27:48	66.87	952.4	1.98	0.74	14.24
FRB010621		2001-6-21 13:02	18:52:05	-08:29:35	523	748	8	0.53	1.43
FRB140514		2014-5-14 17:14	22:34:06	-12:18:46	34.9	562.7	2.8	0.471	16.12
FRB110220		2011-2-20 1:55	22:34:38	-12:23:45	34.77	944.38	5.6	1.3	27.16

$$R_{FAST} \sim (3.33 \pm 0.66) \times 10^4 \times \frac{0.15 \text{ deg}^2}{41253 \text{ deg}^2} \text{ day}^{-1} = 0.121 \pm 0.024 \text{ day}^{-1}$$

Li et al. 2016 «RAA»
FAST 19beam: 5-10 FRB/1000hrs

FAST Distributive Data Centers

数据中心存储原始数据，各地用户传输初步处理后的数据，根据课题需求优化传输。建成NGAS (Next Generation Archive System) 分布式数据管理系统。

贵州省领导听取贵师大汇报



NAOC-GZNU
FAST Early Data Center



贵州天文台

大窝凼

FAST现场数据中心

NWO-CAS Collaborations

- FAST-VLBI FRB monitoring
- High speed data transmission, high speed data storage, HPC
- Pulsar simulation, pulsar search pipeline
- FAST HI surveys - APERTIF Synergy