

# DRAGNET

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RO overleg - Dwingeloo - 150703

# DRAGNET GPU Cluster

Delivered and installed at CIT Groningen  
by ClusterVision on July 9th-10th, 2015

Cees

Alexander

Jason

Vlad

Sotiris



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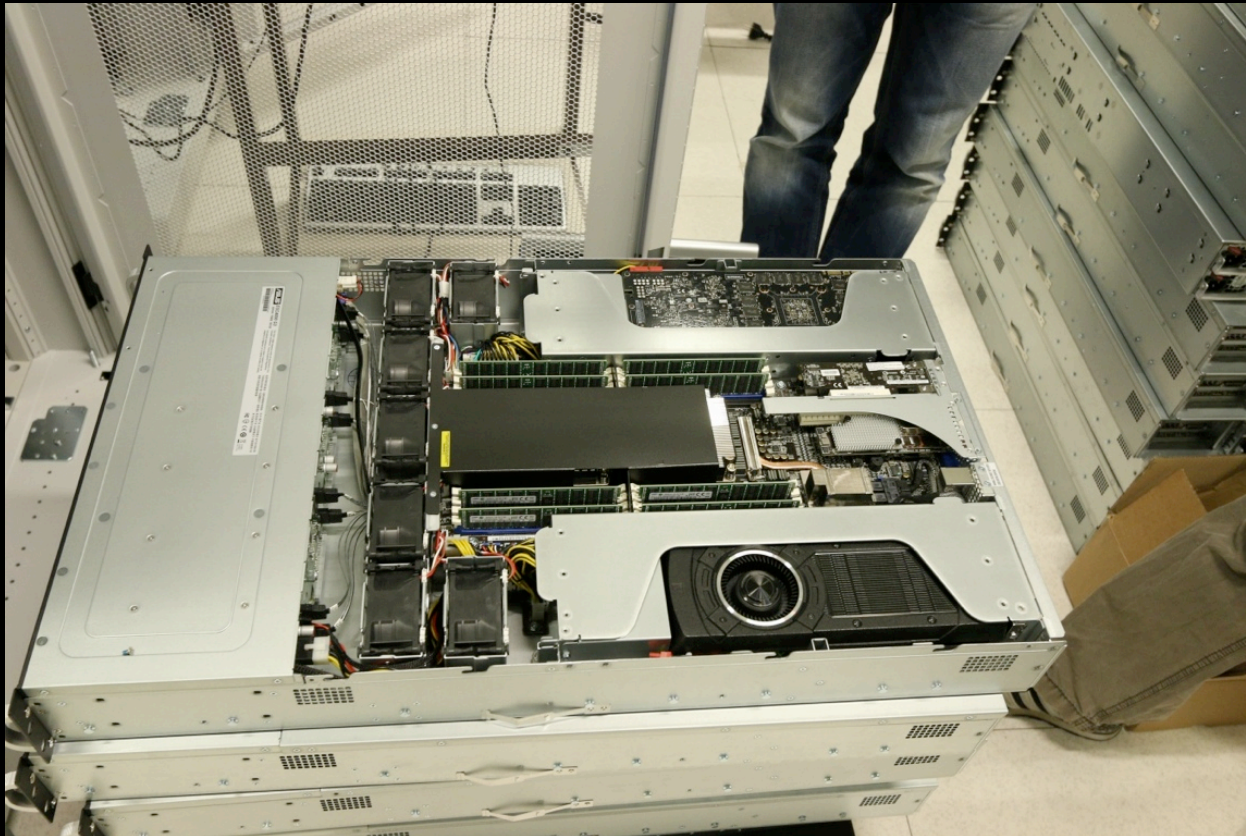
Sotiris

Special thanks to:  
Edwin Stuut  
Henk Jonkers  
Arjen Koers  
Hopko Meijering  
Mike Sipior  
Teun Grit

# DRAGNET & LOTAAAS Teams

- Jason Hessels (PI)
- Alexander van Amesfoort
- Cees Bassa
- Vlad Kondratiev
- Sotiris Sanidas
- Daniele Michilli
- Sally Cooper
- Ben Stappers
- Joeri van Leeuwen
- Aris Karastergiou
- LOFAR Pulsar Working Group

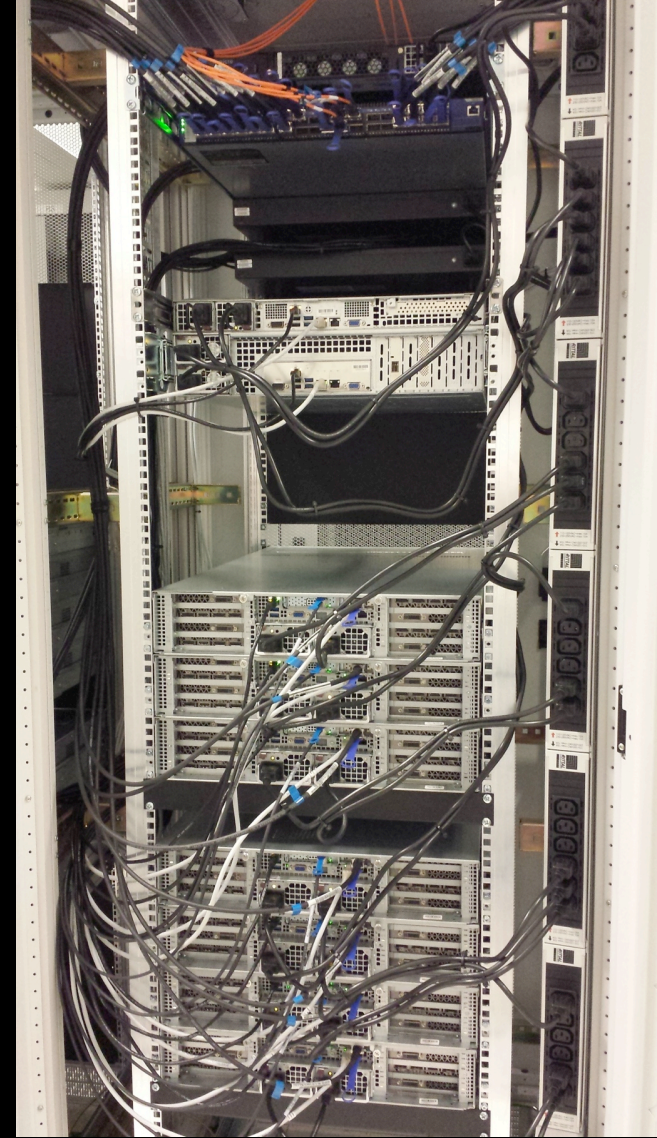
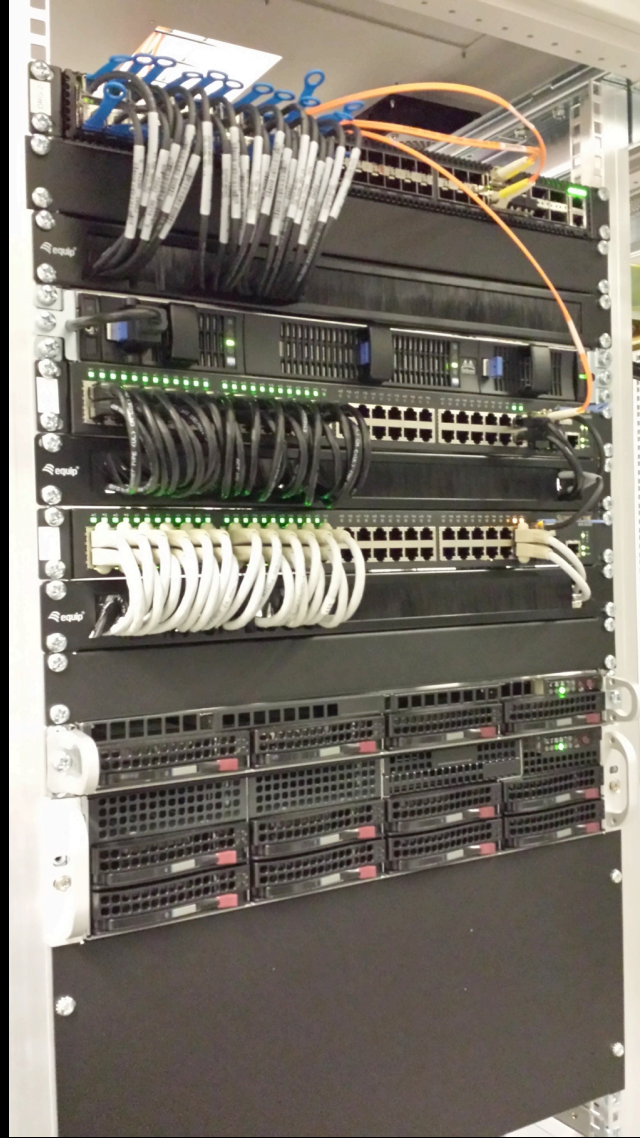
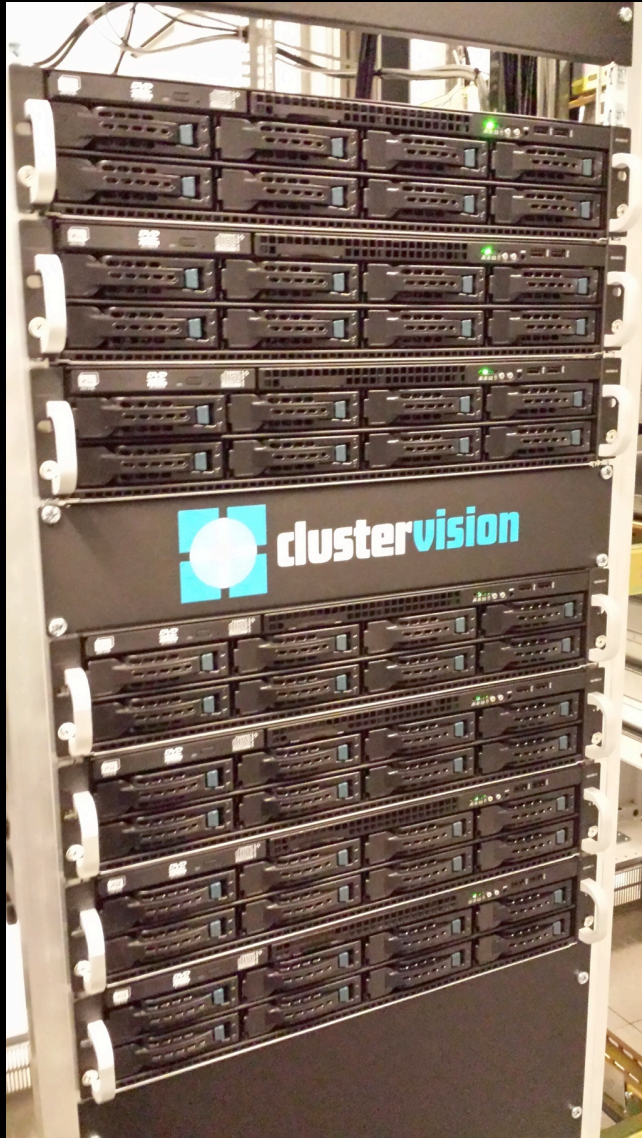
# DRAGNET Worker Nodes (23x)



- 4x TitanX GPUs
- 2x 8-core CPUs
- 14TB disk space
- 128GB RAM
- 10Gb Eth
- 1 Gb Eth
- Infiniband

Aggregate single precision compute  
power ~0.5 Petaflop

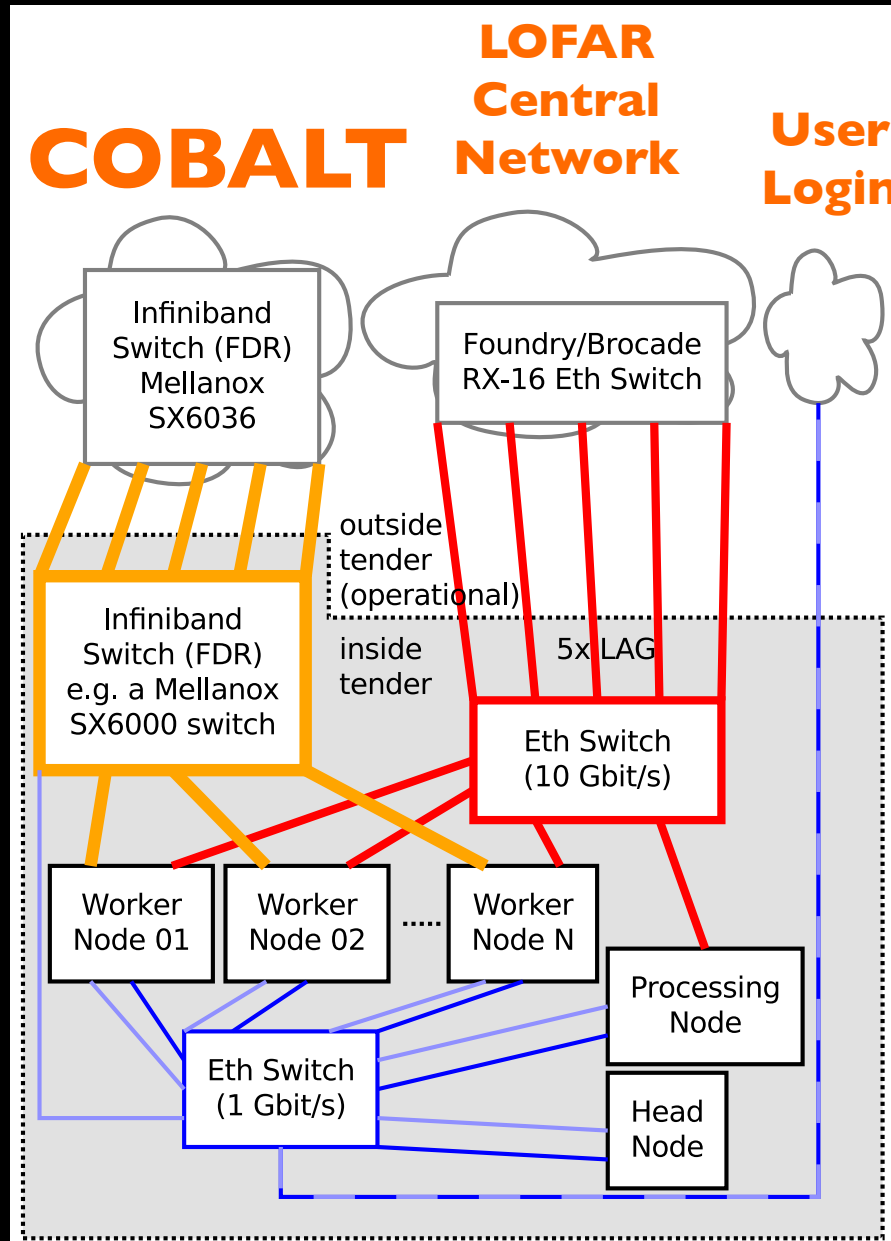
# DRAGNET GPU Cluster



... even more powerful when plugged in!

# DRAGNET GPU Cluster

DRAGNET & COBALT are next-door neighbors



- Raw Data Network
  - Infiniband (54 Gbit/s)
  - Batch Data Network
  - Ethernet (10 Gbit/s)
- User Access Network
  - (Login/NFS/PXE, OoBM/IPMI/MGT)
  - Ethernet (1 Gbit/s)

van Amesfoort



**Merging  
Black Holes**



**Supernovae**

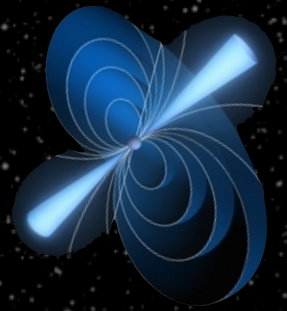


**Magnetar  
Giant Flares**

**Extragalactic**



**Evaporating  
Black Holes**



**Super-giant  
Pulses**

**On-sky time  
and**

**Advanced processing**



**Gamma-ray  
Bursts**

**Galactic**

**ETI**



**Flare stars**



**Terrestrial**

**Pernicious RFI  
Atmospheric effects**

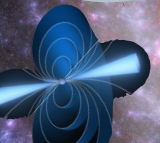


**"Blitzars"**

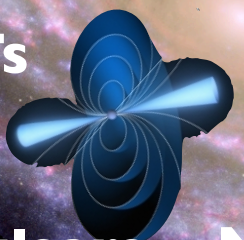
**Magnetars**



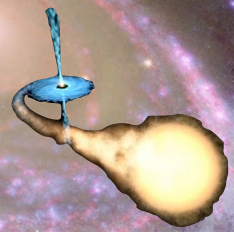
**RRATs**



**Pulsars**



**Micro-quasars**



**We are here**



# LOTAAS

LOFAR Tied-Array All-Sky Survey

A high-time-resolution, all-sky survey using LOFAR's Superterp and "Coherent Stokes" (tied-array) mode.

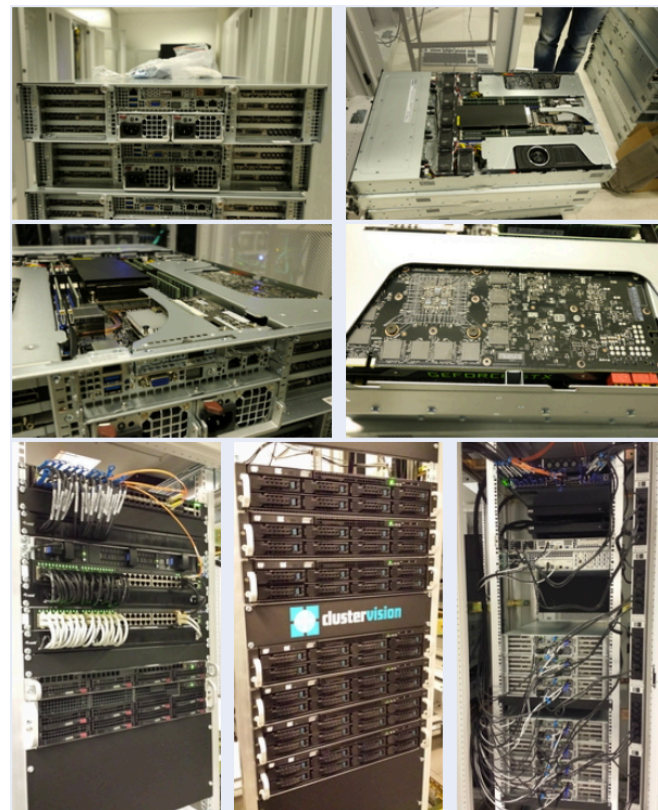
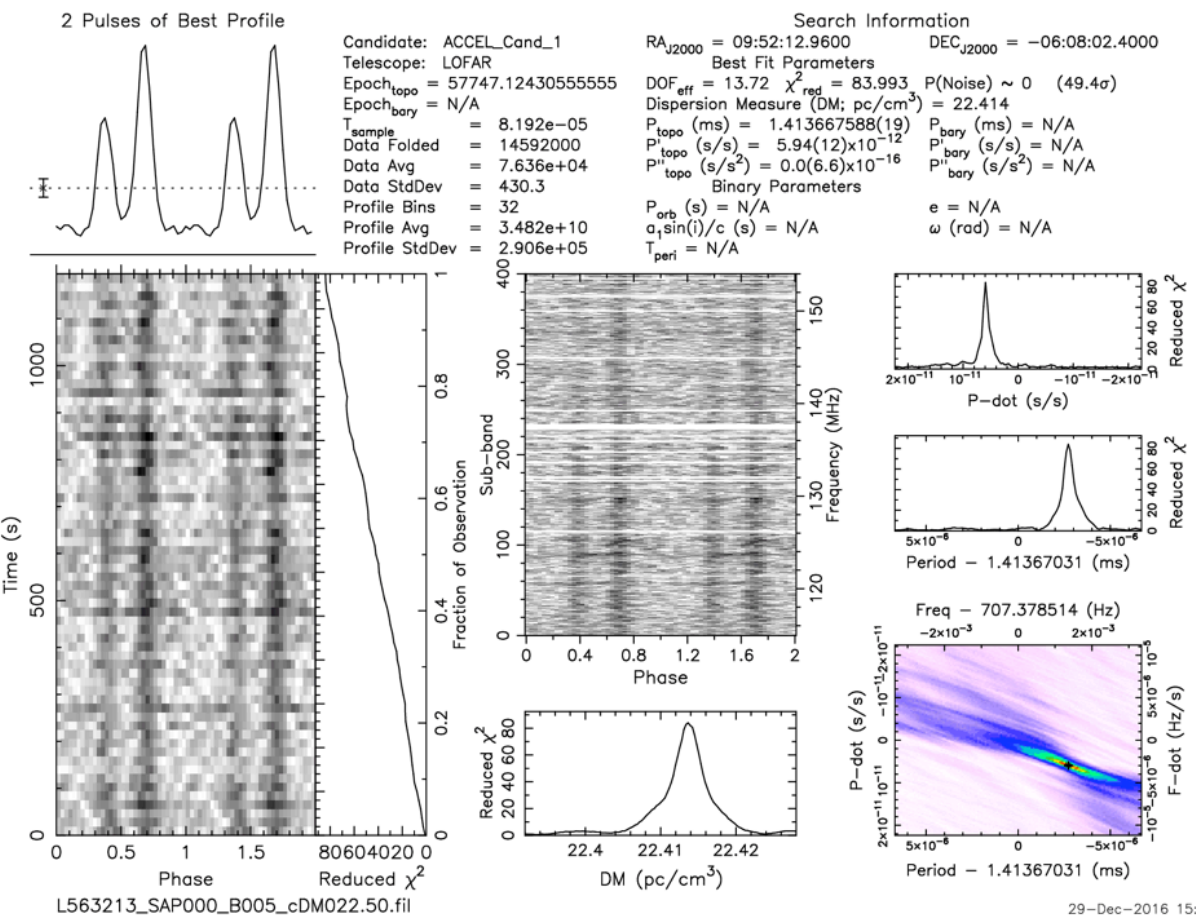
<http://www.astron.nl/lotaas/>

# DRAGNET

Dynamic Radio Astronomy of Galactic Neutron Stars and Extragalactic Transients

A substantial hardware and software extension to LOFAR's ability to search for pulsars and fast transients.

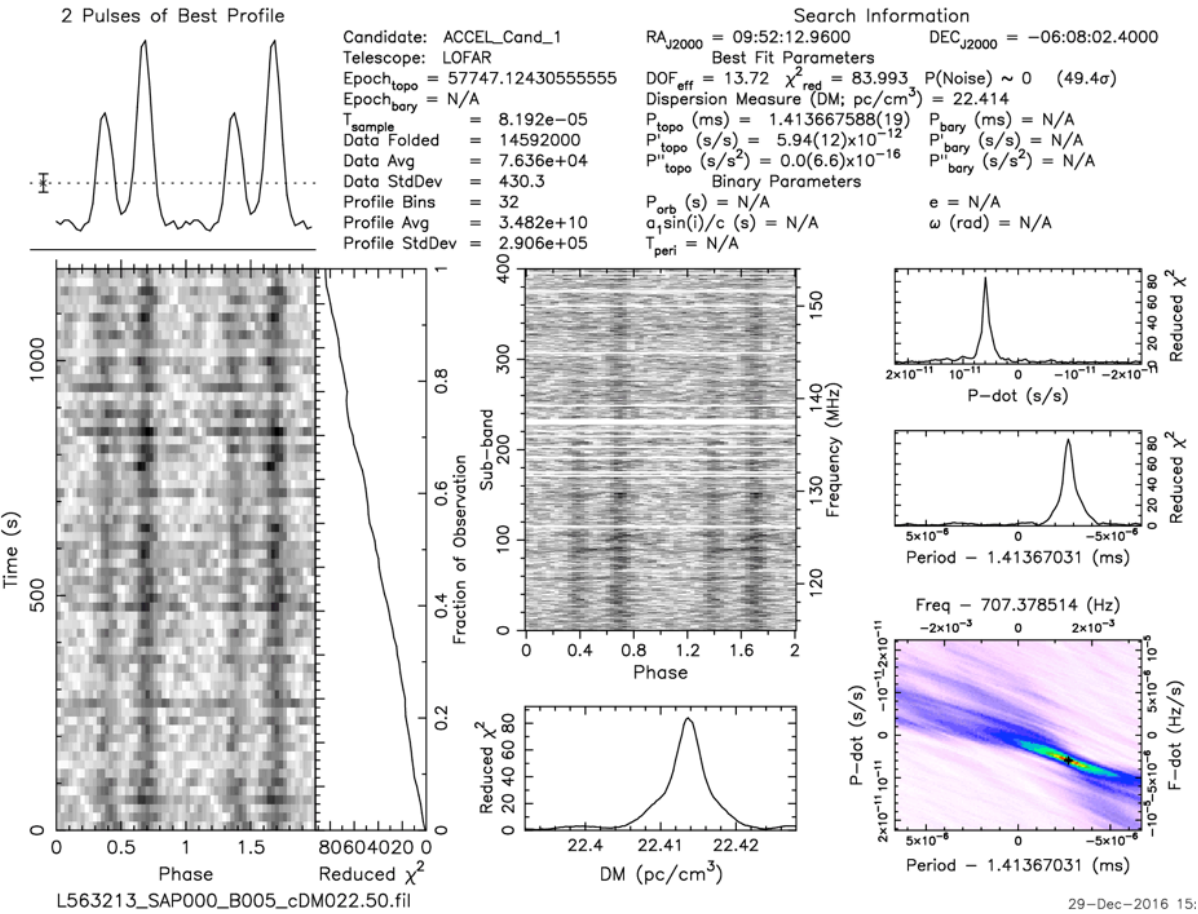
# LOFAR Discovery



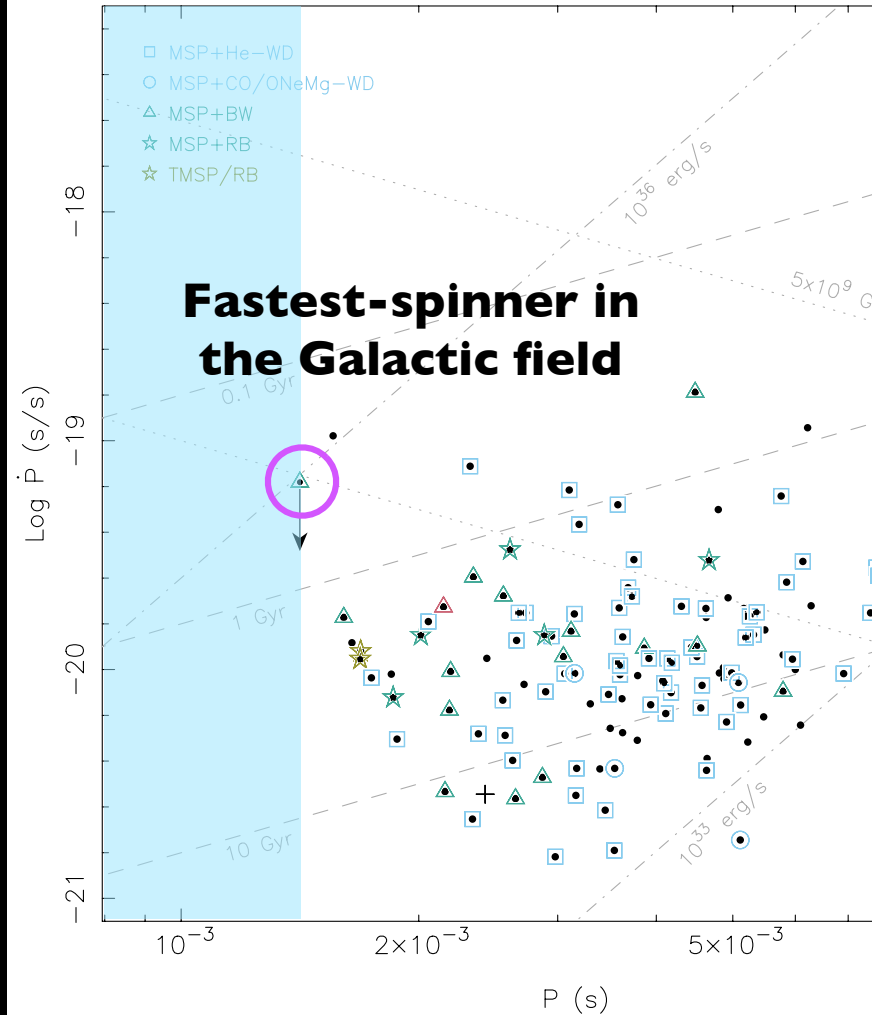
Bassa et al. 2017 (submitted)

# 1.4 ms / 707 Hz radio pulsar

# LOFAR ms-Pulsar Discovery



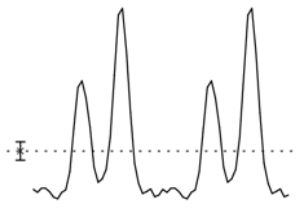
Bassa et al. 2017 (submitted)



# 1.4 ms / 707 Hz radio pulsar

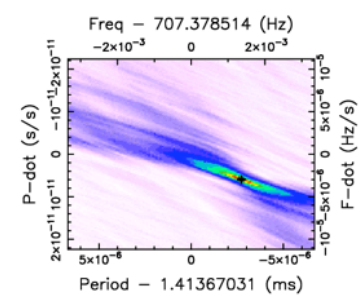
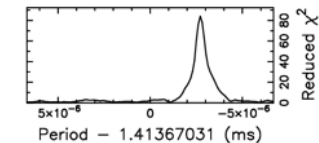
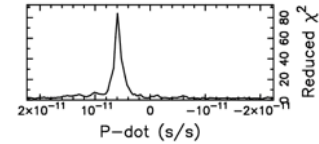
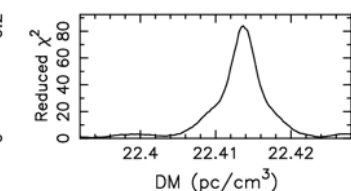
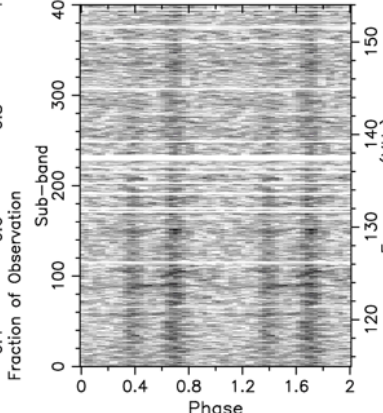
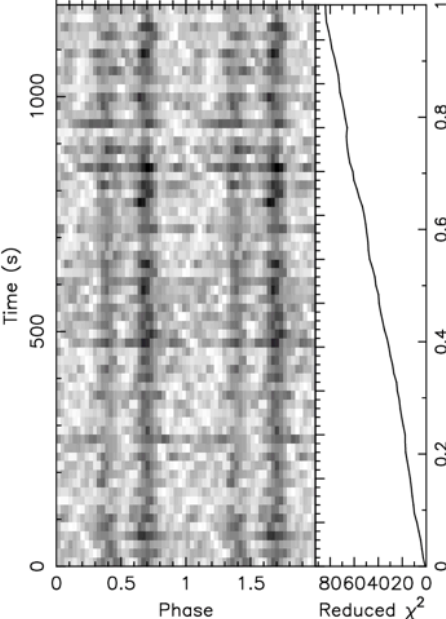
# LOFAR ms-Pulsar Discovery

2 Pulses of Best Profile



Candidate: ACCEL\_Cand\_1  
 Telescope: LOFAR  
 Epoch<sub>topo</sub> = 57747.1243055555  
 Epoch<sub>bary</sub> = N/A  
 T<sub>sample</sub> = 8.192e-05  
 Data Folded = 14592000  
 Data Avg = 7.636e+04  
 Data StdDev = 430.3  
 Profile Bins = 32  
 Profile Avg = 3.482e+10  
 Profile StdDev = 2.906e+05

Search Information  
 RA<sub>J2000</sub> = 09:52:12.9600      DEC<sub>J2000</sub> = -06:08:02.4000  
 Best Fit Parameters  
 DOF<sub>eff</sub> = 13.72     $\chi^2_{red}$  = 83.993    P(Noise)  $\sim$  0 (49.4 $\sigma$ )  
 Dispersion Measure (DM; pc/cm<sup>3</sup>) = 22.414  
 P<sub>topo</sub> (ms) = 1.413667588(19)    P<sub>bary</sub> (ms) = N/A  
 P $\dot{topo}$  (s/s) = 5.94(12) $\times$ 10<sup>-12</sup>    P $\dot{bary}$  (s/s) = N/A  
 P $\ddot{topo}$  (s/s<sup>2</sup>) = 0.0(6.6) $\times$ 10<sup>-16</sup>    P $\ddot{bary}$  (s/s<sup>2</sup>) = N/A  
 Binary Parameters  
 P<sub>orb</sub> (s) = N/A      e = N/A  
 a<sub>1</sub>sin(i)/c (s) = N/A       $\omega$  (rad) = N/A  
 T<sub>peri</sub> = N/A



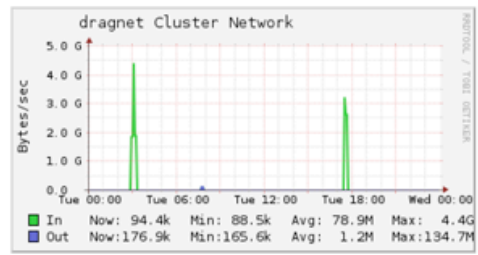
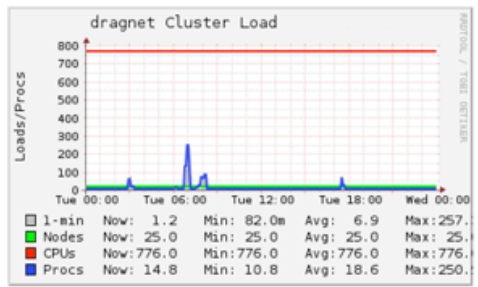
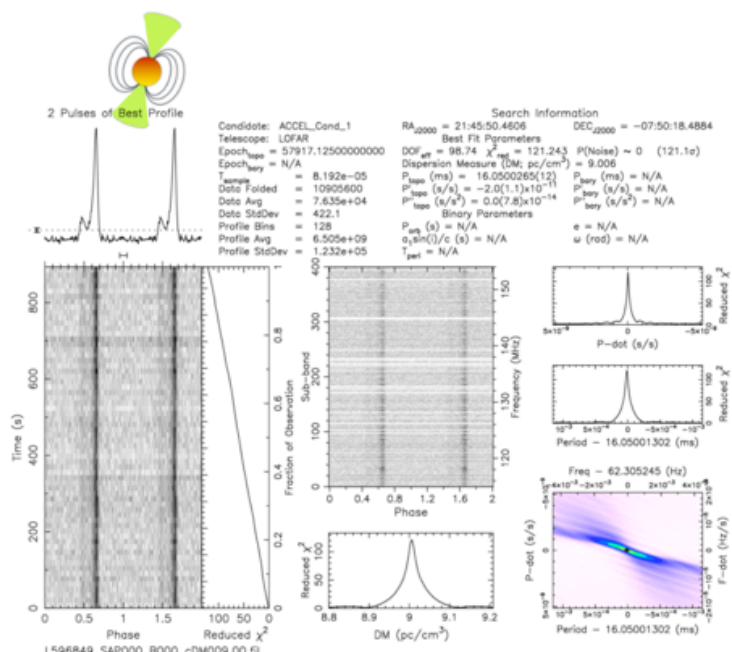
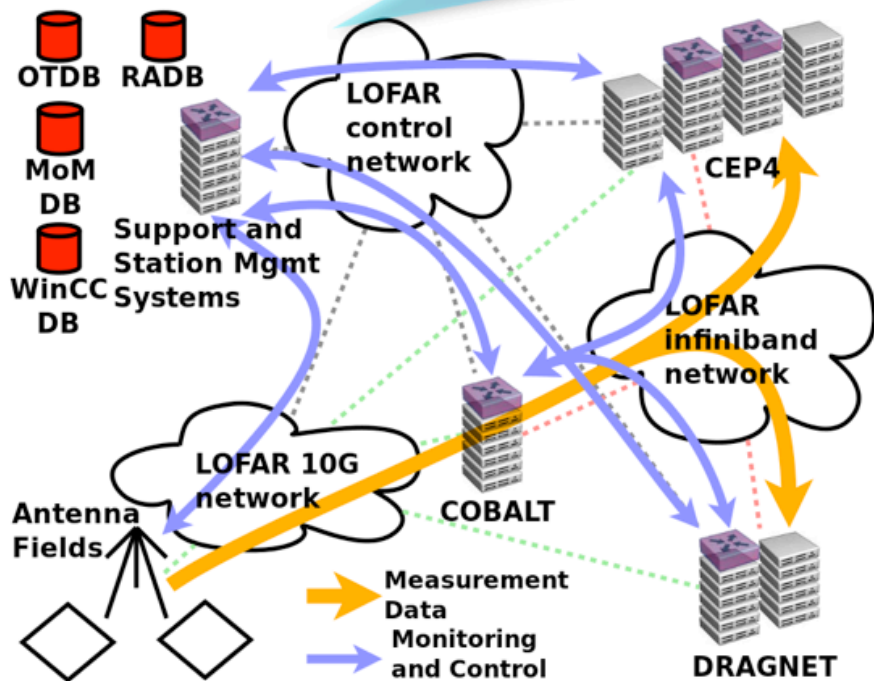
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29-Dec-2016 15:

**Bassa et al. 2017 (submitted)**

**1.4 ms / 707 Hz radio pulsar**

# DRAGNET in Operations



van Amesfoort



Daily Image I70703

# DRAGNET “Next Lights”



- Write data from COBALT to DRAGNET (dedicated obs).
- Write data commensally to DRAGNET.
- Beam-forming on DRAGNET.