The Transients KP

Ralph Wijers,
On behalf of the TKP
Topics TBD

- Meat of science in later talks
- Organisation of TKP
- Global goals and strategy
- An invitation
Bohdan Paczyński
1940-2007

High-energy, versatile astrophysicist

Surveyor of the universe
Key Projects?

‘Large observing projects that have driven (or will drive) the design and specification of LOFAR’

Now: EoR, SRV, TRA, CR

TRA: fast response, high-rate real-time data processing, flexible configuration, dedispersion, tied-array, RSM mode
Organisation and People

LOFAR TKP PIs
Rob Fender (So'ton / UvA)
Ralph Wijers (UvA)
Ben Stappers (ASTRON / UvA)

Full members
Sera Markoff (UvA)        Rudy Wijnands (UvA)
Heino Falcke (ASTRON)     Philippe Zarka (Paris)
Rachel Osten (UMD)        James Miller-Jones (UvA)
Casey Law (UvA)           Hanno Spreeuw (UvA)
Bart Scheers (UvA)        Michiel van Haarlem (ASTRON)
Michael Wise (UvA)        Dipankar Maitra (UvA)
Joe Masters (UvA)         John Swinbank (UvA)

Science working groups
JETS
Markoff
Fender
Wijers
Falcke
Miller-Jones
Jonker

PLANETS
Zarka
Spreeuw
Griessmeier

PULSARS
Stappers
Kramer

FLARE STARS
Osten
Guedel

SERENDITY / FOLLOW-UP
Wise
Wijnands
Markoff
Jonker
Maitra

Technical working groups
SOFTWARE
Wise / Law
Miller-Jones, Spreeuw, Coenen
Scheers, Masters, Swinbank

HARDWARE
Stappers
Goals

- Trawl the sky for known and unknown types of variable source, produce triggers and light curves [public!]

- Improve our understanding of many extreme astrophysical sources: pulsars, black holes, GRBs, exoplanets, flare stars, ...
Some expectations

<table>
<thead>
<tr>
<th>Class of object</th>
<th>Time-scale</th>
<th>Expected / year</th>
<th>Maximum Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRB afterglows + X-ray binaries</td>
<td>minutes-months</td>
<td>~100</td>
<td>Observable universe</td>
</tr>
<tr>
<td>LIGO Events / pulsar flares</td>
<td>msec / hours</td>
<td>0-10</td>
<td>Observable universe</td>
</tr>
<tr>
<td>Radio Supernovae</td>
<td>days / months</td>
<td>~ 5</td>
<td>100 Mpc</td>
</tr>
<tr>
<td>Intermediate mass BH</td>
<td>days</td>
<td>1-5</td>
<td>30 Mpc</td>
</tr>
<tr>
<td>Flare Stars</td>
<td>msec / hours</td>
<td>100-1000</td>
<td>1 kpc</td>
</tr>
<tr>
<td>Exo-planets</td>
<td>min / hours</td>
<td>10-100</td>
<td>30 pc</td>
</tr>
</tbody>
</table>
Use Case 1: RSM

- ‘All-sky all the time’
- Down to 1 sec
- 30+120MHz, 11+1.4mJy / 320s (32MHz bandw.)
- CS-1 test: poster C. Law
Use case 2: Target [class]

- Targeted observations of known sources
- E.g. XRBs, Exoplanets, GRB/SN
- Full-array mode!

James Miller-Jones
Use case 3: ‘Piggybacking’

- Full-array map has similar number of pixels as core map, so why not analyse that data stream too?

- Con: no control over settings, inhomogeneous

- Pro: increased discovery space with same data
Use case 4: Pulsars

- With core, in tied-array mode, dedispersed
- Surveys: 1000-2000 new
- Followup: timing, emission physics, ISM studies, ...
Transients Pipeline

- **Aim:** analyse variability in input on timescales of 1, 2, 5, 10, ... Sec, dedispersed, in near-real time

- **Requires:**
  - Detection
  - Recognition

- **Action:**
  - Triggering - alert & followup
  - Cataloguing

- **Posters** Law, Coenen
Recap

- Catalogue the low-frequency variable radio sky, with trigger alerts
- Detailed studies of some classes of object
Help available?

- Software pipeline: formidable task
- Expertise on radio transients/variables
- Resources at other instruments, for triggered & simultaneous observations

- Come and talk!