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People • NCS

Albrecht Sievers • Alain Perrigouard* • Gabriel Paubert • Hans Ungerechts •
Juan Peñalver • Salvador Sanchez • Walter Brunswig

People • other

TAPAS
designed and developed by IAA-CSIC & IRAM Granada
currently maintained by Pablo Mellado

Pool Observations
IRAM Granada staff
current pool managers: Claudia Marka • Israel Hermelo

* in the past
Telescope

30 m diameter
80 to 350 GHz
### Instruments

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Heterodyne</strong></td>
<td>EMIR 4 bands dual polarization 2 bands simultaneously</td>
</tr>
<tr>
<td></td>
<td>HERA 1.3 mm band dual polarization 9 pixels</td>
</tr>
<tr>
<td><strong>Backends</strong></td>
<td>BBC continuum</td>
</tr>
<tr>
<td></td>
<td>NBC continuum</td>
</tr>
<tr>
<td></td>
<td>WILMA autocorrelator</td>
</tr>
<tr>
<td></td>
<td>FTS 100,000s of channels</td>
</tr>
<tr>
<td></td>
<td>VESPA autocorrelator high resolution</td>
</tr>
<tr>
<td></td>
<td>/XPOL polarimetry</td>
</tr>
<tr>
<td><strong>Continuum</strong></td>
<td>NIKA 2 dual polarization 5,000 pixels</td>
</tr>
<tr>
<td></td>
<td>own backend / data acquisition <a href="http://ipag.osug.fr/nika2/Welcome.html">http://ipag.osug.fr/nika2/Welcome.html</a></td>
</tr>
<tr>
<td><strong>Special</strong></td>
<td>VLBI pulsars</td>
</tr>
<tr>
<td><strong>Test</strong></td>
<td>HEMT etc.</td>
</tr>
<tr>
<td><strong>Data volume</strong></td>
<td>up to 1 Terabyte / day possible</td>
</tr>
<tr>
<td></td>
<td>currently 30 Terabyte / year (mainly FTS)</td>
</tr>
<tr>
<td></td>
<td>archive 100 Terabyte</td>
</tr>
</tbody>
</table>
Switching Modes

• controlled by TTL hardware signals

<table>
<thead>
<tr>
<th>Beam</th>
<th>Wobbler</th>
<th>Frequency</th>
<th>Total Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>chopper wheel</td>
<td>2ndary</td>
<td>for heterodyne</td>
<td></td>
</tr>
</tbody>
</table>

Observing Modes

• antenna movements

<table>
<thead>
<tr>
<th>Calibrate</th>
<th>Pointing</th>
<th>Focus</th>
<th>Tip</th>
</tr>
</thead>
<tbody>
<tr>
<td>for heterodyne</td>
<td>cross scans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Track</td>
<td>OnOff</td>
<td>OTF map</td>
<td>Lissajous OTF</td>
</tr>
<tr>
<td>1 antenna position</td>
<td>2 positions</td>
<td>many positions</td>
<td>curves / for NIKA</td>
</tr>
<tr>
<td>VLBI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIY</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

→ flexible subscan sequences

• any Switching Mode can be combined with any Observing Mode
not all combinations are useful/used yet
Control System and Observing Modes at the IRAM 30m

[Image of the control system interface]

- NAME: [Screen Display]
- SYSTEM: [Screen Display]
- LATITUDE: [Screen Display]
- VELOCITY: [Screen Display]

OFFSET

- SOURCE: [Screen Display]
- Catalogue Source: [Screen Display]

ACTIVE lineName frequency [GHz] SB /doppler width /gain [dB] /tempLoad /efficiency /scale

E290 E10 99.243442 12 Doppler 0.050 -1 L L L 0.0 20.75 antenna

OFFTAPER

- On-The-Fly Taper
- xStart yStart
- xEnd yEnd
- length1
- /azName
- /azCenter
- /azReference
- /azZigzag

/azTaper 30
/azStop dx dy 0.00 10.0
/azSpeed xStart xEnd 13.33 13.33
/azTz 20.000
/azTz 10.000
/azTz 10.000

CONDITIONS

- elevation less than 84.177

/crLoop: NOR

PAXO/BACKEND: its /DEFAULTS /FINDS

Refresh
Observing Modes • Operation Modes

traditional – observing astronomer at PV
remote observer
VLBI
observing pools
monitoring of source fluxes, polarization etc.

[ service observing ]

Note: there is always a telescope operator on site
usually also a staff astronomer on duty (AOD) and a cook
Observing Pools

flexibility in particular to respond to weather conditions

~ dozen projects

typically a few weeks

restricted to standard observations

separate execution queues according to (weather) requirements

observations done by some astronomers from the projects + AOD + pool managers

→ generally better chance to complete projects than in fixed scheduling
Control System and Observing Modes at the IRAM 30m

Monitoring

VNC

www monitoring – auto updating or static

antenna Data Stream Viewer
Control System and Observing Modes at the IRAM 30m

Tapas Log • Record • Supervise

TAPAS - Telescope Archive for Public Access System
IRAM 30m Archive

Staff
Current status
Latest scans
ID Start time Project Source Tau225 Receiver Frequency Line Az. EL. pX pY fZ Comments
2015-09-10.174 2015-09-10 13:16:33 06:15 LARS11 0.45 E230 211.500 LARS11_C02 135.72 51.29 2.00 10.00 -2.30
2015-09-10.173 2015-09-10 13:11:07 06:15 LARS11 0.45 E230 211.500 LARS11_C02 135.45 51.17 2.00 10.00 -2.30
2015-09-10.172 2015-09-10 13:09:28 06:15 LARS11 0.45 E230 211.500 LARS11_C02 133.64 50.38 2.00 10.00 -2.30
2015-09-10.171 2015-09-10 13:07:42 06:15 12C1-0.55 0.45 E230 211.500 LARS11_C02 163.53 45.81 2.00 10.00 -2.30
2015-09-10.170 2015-09-10 12:38:33 06:15 12C1-0.55 0.45 E230 211.500 LARS11_C02 160.26 45.23 2.00 10.00 -2.30
2015-09-10.169 2015-09-10 12:15:14 06:15 12C1-0.55 0.45 E90 0230 110.000 220.000 LARS11_C02 159.75 45.11 4.50 12.00 -2.30
2015-09-10.168 2015-09-10 12:32:53 06:15 12C1-0.55 0.45 E90 0230 110.000 220.000 LARS11_C02 156.92 44.96 4.50 12.00 -2.30
2015-09-10.167 2015-09-10 12:47:42 06:15 LARS5 0.45 E90 0230 110.000 220.000 LARS11_C02 108.41 71.31 4.50 12.00 -2.30
2015-09-10.166 2015-09-10 12:43:00 06:15 LARS5 0.45 E90 0230 110.000 220.000 LARS11_C02 106.87 70.42 4.50 12.00 -2.30
2015-09-10.165 2015-09-10 12:38:16 06:15 LARS5 0.45 E90 0230 110.000 220.000 LARS11_C02 105.43 69.52 4.50 12.00 -2.30
2015-09-10.164 2015-09-10 12:37:39 06:15 LARS5 0.45 E90 0230 110.000 220.000 LARS11_C02 104.16 68.61 4.50 12.00 -2.30
2015-09-10.163 2015-09-10 12:32:56 06:15 LARS5 0.45 E90 0230 110.000 220.000 LARS11_C02 103.90 68.49 4.50 12.00 -2.30
2015-09-10.162 2015-09-10 12:28:15 06:15 LARS5 0.45 E90 0230 110.000 220.000 LARS11_C02 102.64 67.58 4.50 12.00 -2.30
2015-09-10.161 2015-09-10 12:23:33 06:15 LARS5 0.45 E90 0230 110.000 220.000 LARS11_C02 101.47 66.67 4.50 12.00 -2.30
2015-09-10.160 2015-09-10 12:22:56 06:15 LARS5 0.45 E90 0230 110.000 220.000 LARS11_C02 100.43 65.75 4.50 12.00 -2.30

Latest comments
ID Start time Project Source Tau225 Receiver Frequency Line Az. EL. pX pY fZ Comments
2015-09-05.143 2015-09-05 12:03:05 E090 142.342 86.243 SKY NONE 71.36 78.16 8.00 5.00 -2.40 bad > WAIT … STOP
2015-09-05.140 2015-09-05 12:03:05 E090 142.342 86.243 SKY NONE 71.36 78.16 8.00 5.00 -2.40 bad > WAIT … STOP
**NCS 30m • Top Level Overview of System Architecture**

- **observer “pako”**
- **scanAnalyzer**
- **monitoring & logging services**
- **message services** (communication, alarms)
- **coordinator**
- **data ProcessingCS:**
  - make IMB FITS
  - data processing software

**Connections and Services**

- **operator**
- **observation queue**
- **antennaCS:**
  - mountDrive
  - secondaryDrive
  - SCU
- **receiverCS:**
- **BackendCS:**
- **switchingCS:**
- **timeServices**
- **data streams / FITS**
- **data archive**
- **Results / XML**
- **TAPAS**

**Notes:**
- only *some major* connections are indicated by lines.
- Arrows show information flow from observer’s commands to data.

Revision 2015-09-10, 1.2, HU
Hardware

General Use Computers • Servers • Supermicro • AMD / Intel • Linux/Debian
mrt-lx1 (observe)
  observation specification • device coordination • high level control
  monitoring • remote observing support
mrt-lx3 (vis)
  data calibration and display
mrt-lx2 (astro)
  project archive • offline data analysis

Local Device Control • Motorola • Intel • Linux
antenna
  local control with VME based processors and interfaces
backends
  diskless processors for VESPA, WILMA • backend access via VME
  FTS • backend access via device LAN
receivers
  EMIR VME processors • device access via CAN bus
  HERA VME processor with IRAM-built VME boards
others devices
  controlled via VME interfaces, ethernet

Walter Brunswig
https://mrt-lx1.iram.es/mainWiki/NcsArchitecture#Control_Hardware
## Software Concepts and Communication

<table>
<thead>
<tr>
<th>Device Function</th>
<th>Technology/Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation specification in XML</td>
<td>created by paKo</td>
</tr>
<tr>
<td>Devices deliver data streams →</td>
<td>time-tagged data • FITS</td>
</tr>
<tr>
<td>Backend and other data are merged →</td>
<td>IMB FITS</td>
</tr>
<tr>
<td>Data calibration software (IRAM)</td>
<td>MIRA and MRT Cal</td>
</tr>
<tr>
<td>Support of other data calibration and</td>
<td>IMB FITS</td>
</tr>
<tr>
<td>Processing, e.g., for bolometers</td>
<td></td>
</tr>
<tr>
<td>Coordinator and device control</td>
<td></td>
</tr>
<tr>
<td>NCS Messages</td>
<td>message exchange tool • Elvin</td>
</tr>
<tr>
<td>Software servers based on</td>
<td>SOAP and RPC</td>
</tr>
<tr>
<td>XML</td>
<td>Python and C</td>
</tr>
<tr>
<td>FITS</td>
<td></td>
</tr>
<tr>
<td>NCS messages</td>
<td>description of observations • logs • results → TAPAS</td>
</tr>
<tr>
<td>UDP</td>
<td>data</td>
</tr>
<tr>
<td>Linux</td>
<td>NFS</td>
</tr>
<tr>
<td>UDP</td>
<td>data</td>
</tr>
<tr>
<td>NFS</td>
<td></td>
</tr>
</tbody>
</table>

**Walter Brunswig**

https://mrt-lx1.iram.es/mainWiki/NcsArchitecture#Software_Concepts
Software Tools and Data Formats

<table>
<thead>
<tr>
<th>Tool</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIC</td>
<td>Gildas command language</td>
</tr>
<tr>
<td>XML</td>
<td>in particular VOTable</td>
</tr>
<tr>
<td>FITS</td>
<td></td>
</tr>
<tr>
<td>Python</td>
<td>TAPAS</td>
</tr>
<tr>
<td>mySQL / Django</td>
<td></td>
</tr>
<tr>
<td>FORTRAN 90/95</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Linux</td>
<td></td>
</tr>
<tr>
<td>VNC</td>
<td>monitoring • remote observations</td>
</tr>
<tr>
<td>VPN</td>
<td>monitoring • remote observations</td>
</tr>
</tbody>
</table>