



Title:

[NCS. Projects and Planning](#)

Identifier - Master URL: not published on WWW

Revision: ncs30mProjectsPlanning, v 1.1.5

Date: 2012-11-08

Expiration Date: 2012-12-31

Supersedes: v 1.1.4

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Publisher: IRAM, Granada, Spain

Subject and Keywords: new control system, NCS 30m, Planning, TT NCS

About this document:

planning for NCS development and TT

NCS for NIKA

Tune the Tones

follow-up on:

email exchange 2012-09, 10

discussion WB-HU 2012-10-11

Notes (2012-11-08):

We changed “tuning” to “tune”, which is more in line with other paKo language.

Items done or prepared are marked ✓

new subscan type “tune”

✓ we will introduce a new subscan type “tune”

in:

- ✓ pako (HU)
- ✓ coordinator, messages, monitoring (WB)
- data
- ✓ for this subscan, the observer will be able to specify through paKo
 - xOffset yOffset
 - /system [projection | trueHorizon]
 - /tSubscan tSubscan
- ✓ for this subscan, the antenna Mount drive will execute a Track subscan like a single subscan of the Track observing mode
- ✓ there will be a message (Elvin) at the start of this subscan including the information that this is the start of a “tune” subscan
 - TBD (WB): check if this needs a special implementation
- ✓ there will follow a backOnTrack message from antenna MD for the same subscan, which indicates that
 - ✓ the antenna has reached xOffset yOffset and
 - ✓ the antenna will track this position for the time tSubscan (this indicates that NIKA should execute the tune within the time tSubscan)

support subscan “tune” in paKo commands DIYLIST & SUBSCAN

- ✓ we will support the subscan type “tune” in paKo commands DIYLIST and SUBSCAN (see below for HELP on the current version of these commands)
 - this will be implemented through a new option /Tune of the variant of the SUBSCAN command for track subscans (2 parameters)
- ✓ this will allow as a special case to have a scan with only 1 subscan “tune” so that we can do a tune by itself, or followed in the next scan by any standard observing mode

- ✓ this will allow to define a sequence of subscans at different elevations, with a “tune” followed by a standard “track” at each elevation (DIY Tip with tune at each elevation)
- ✓ this will allow to define a sequence of “tune” and “OTF” subscans (DIY OTF with flexible tune subscans)
- ✓ we will provide help with writing these scripts
- ✓ we will allow in paKo to specify a “Purpose” (a text variable) which will be carried through the NCS data.
The purpose of the variable “Purpose” is to indicate, e.g., that a DIY scan is intended to be used as a TIP or an OTFMAP. This could be used, e.g., by data processing or logging.

Timeline

We may not be able to provide all the above for the NIKA run in November 2012.

✓ For November 2012, we will prioritize on the highlighted items above in the sequence as listed.

→ Some features will have to be tested/ debugged in the startup phase of the NIKA run!

At a later time, we can consider to include “tune” subscans directly in the observing modes, e.g., OTFMAP.

Items Done & Status (2012-11-08)

We have implemented or prepared most of the features described above in paKo (HU) and the coordinator subsystem and messages (WB). However, we have only had limited time on 2012-10-23 to test an early step toward the new pako. The new features should be tested as soon as possible with NIKA.

1st contact for general HELP and support is the AOD, AS.

Contact for paKo commands is HU.

Contact for the execution of observations and messages is WB.

Notes and details about the messages

The Elvin message at the start of a “tune” subscan follows quickly after the antenna mount drive sync message “subscanStarted”. However, there can then be a “long” time until the “backOnTrack” message.

Within a scan, the antenna mount drive software sends the subscanStarted message at the time of the first slow loop with a commanded position corresponding to the subscan. Depending on the position, the antenna may then take considerable time to go to the position. For example, in a typical TIP done with the script below, the antenna will take about 1 minute (!) for the elevation change from the first (highest) elevation to the second elevation.

In other situations, the time from “subscanStarted” to “backOnTrack” may be as small as one slow loop (1 sec).

For a “track” or “tune” subscan, the “backOnTrack” message indicates the time from which the antenna is tracking the commanded position.

For a track subscan, in particular a “tune” subscan, the antenna will track the commanded position from the time given in the antenna mount drive sync message “backOnTrack” for the time requested with / tSubscan.

Then the antenna will start to move to the (first) position of the next following subscan; there is no specific message at this time!

To be conservative we recommend to always command at least 1 slow loop (1 sec) more for a tune subscan than the maximum expected time needed for the NIKA tuning from receiving “backOnTrack”.¹

New paKo Revision v 1.1.14 2012-11-14

To use the new version of paKo, after the usual:

```
goPako  
pakoDisplay
```

enter:

```
/local/users/pako/Development/gildas-src/packages/pako/main/pakoNIKA.exe
```

To get the corresponding version of paKo HELP, enter in paKo or in your paKo startup file:

```
sic logical gag_help_pako "/local/users/pako/Development/gildas-src/packages/  
pako/doc/pako-help-pako-2012-11-14v1.1.14.hlp"
```

¹ To get a tighter synchronization, we could in the future use a feedback message “tune done” from NIKA to the NCS, as we previously considered.

Examples (2012-11-08)**“Tune” by itself:**

```

!
! Id: diy-test-00.pako, v 1.1.14 2012-11-08 Hans Ungerechts
!   "tune" subscan by itself
!
DIY /clear                                ! clear DIY
!
subscan 440 330 /system Projection /tSubscan 11 /tune ! tune
!
DIY /purpose Tune                          ! set purpose for DIY
!

```

DIY OTF map with “tune”:

```

!
! Id: diy-test-02.pako, v 1.1.14 2012-11-08 Hans Ungerechts
!   OTFMAP with "tune" at the start position of each OTF subscan
!   in system "trueHorizon", OTF scanning along azimuth
!
DIY /clear                                !! clear DIY
!
define real yy xx1 xx2
!
for ii 1 to 31 by 1                        !! loop over y offsets
!                                           !!
  yy = -300+(ii-1)*20                      !! from -300 in steps of +20
!
  if (mod(ii,2).eq.1) then                !! zig-
    xx1 = -300
    xx2 = +300
  else                                     !!   -zag
    xx1 = 300
    xx2 = -300
  end if
!
  subscan xx1 yy /system trueHorizon /tSubscan 10 /tune !! tune
  subscan xx1 yy xx2 yy /t0tf 66 !! OTF
!
next yy
!
clear plot
limits 400 -400 -350 350                  !! setup for preview plot
greg\set box match
box
!
DIY /purpose "big OTF with tunes"         !! set purpose for DIY
!                                           !! this also makes the plot!
!

```

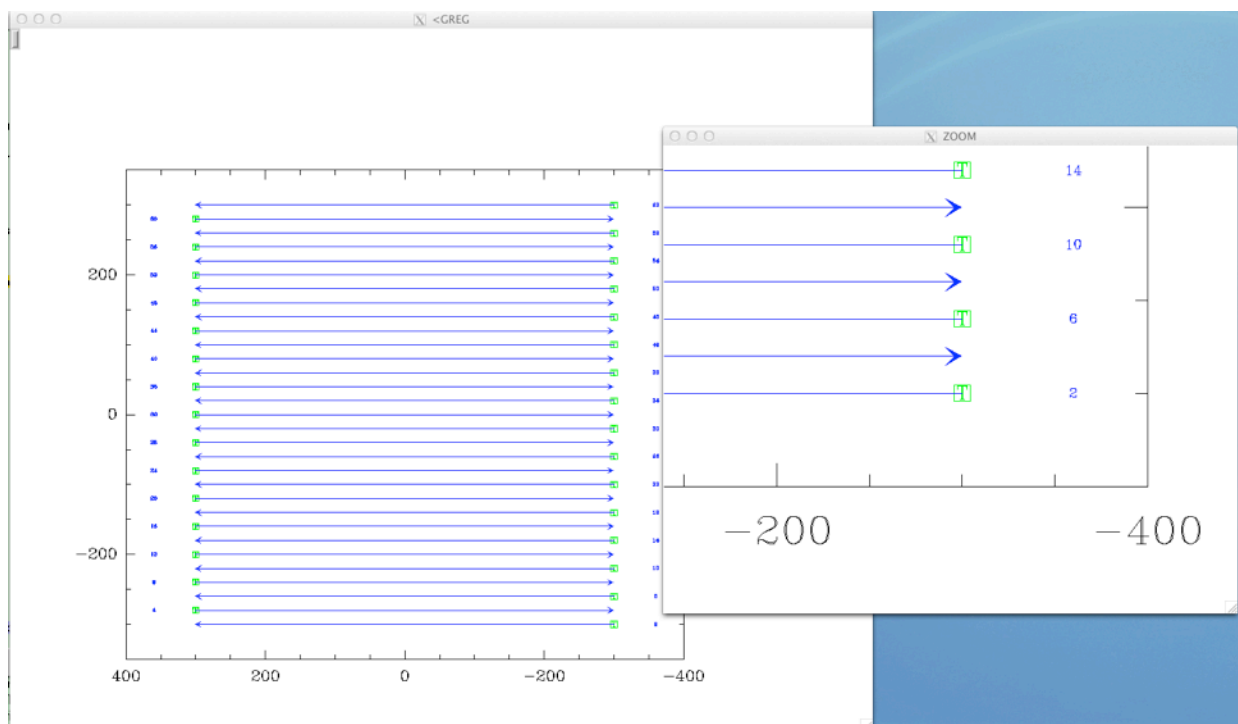


Figure: zoomed preview plot from the pako script for OTF map with “tune” .
Note the green markers with “T” that indicate the tune subscans.

Tuned DIY Tip

```

!
! Id: diy-test-12.pako, v 1.1.14 2012-11-08 Hans Ungerechts
!   DIY TIP with "tune" subscans at each elevation
!
say " --> diy-test-12.pako "
!
source DIY-Tip H0 180 10          !! "Source" at azimuth 180
!                                !! elevation 10 [deg]
!
DIY /clear                        !! clear DIY
!
define real el yEl
!
for air 1.1 to 3.5 by 0.4          !! loop over airmass
!
  el = 180.0/Pi*asin(1/air)
  yEl = el-10
!
  pako\SUBSCAN -                  !! tune
    0.0000000E+00 yEl*3600.00 -   !! el. offset in [arc sec]
  /croFlag 0 -
  /system trueHorizon -
  /tSubscan 11.00000 -            !! 11 [sec]
  /tune -
  /type track
!
  pako\SUBSCAN -                  !! on sky
    0.0000000E+00 yEl*3600.00 -   !! el. offset in [arc sec]
  /croFlag 0 -
  /system trueHorizon -

```

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```

/tSubscan    22.00000 -                !!  22 [sec]
/type track
!
next air
!
!! device image w
clear plot
limits -10*3600 10*3600 -10*3600 80*3600 !! setup for preview plot
greg\set box match
!
DIY /purpose "tuned Tip"                !! set purpose for DIY
!
!! box & labels
limits -1 1 0 90                        !! box, Y = El. [deg]
axis yl
axis xu /tick no
axis yr
axis xl /tick no
label "Elevation [deg]" /y
!

```

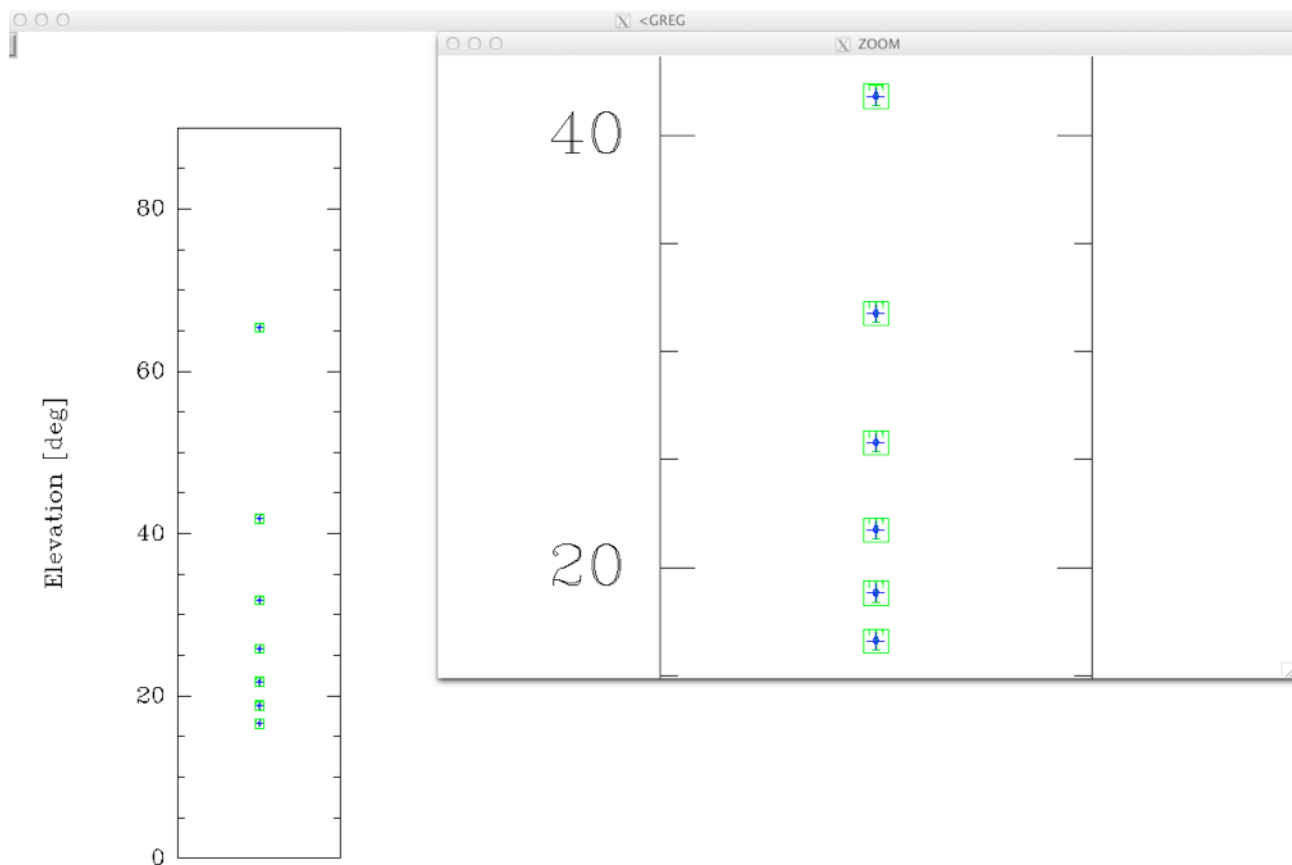


Figure: zoomed preview plot from the pako script for “tuned Tip”.
Green markers with “T” indicate the tune subscans; blue crosses standard track subscans.

Appendix:
excerpt of HELP for DIYLIST, SUBSCAN in the modified paKo (1.1.14 2012-11-14)

```
PAKO> show
I-SHOW          , paKo Revision v 1.1.14 2012-11-14
...
```

```
PAKO> help pako\ news
Language NEWS
```

```
paKo, v1.1.14 (2012-14)
=====
```

```
NEW in 1.1.14:
```

```
RECEIVER BOLOMETER NIKA          ! Receiver (bolometer) NIKA
```

```
SUBSCAN xOffset yOffset /TUNE          ! for NIKA
DIY      /PURPOSE "play my Tune"      ! for NIKA
```

```
PAKO> help diylist
```

```
DIYLIST
```

```
User-defined list of subscans and segments for observing mode "DIY";
to define subscans, see HELP SUBSCAN.
```

```
NB: this is a protected command (needs privilege).
```

```
DIYLIST without any parameters or options:
```

- lists defined subscans and segments
- in the pakoDisplay shows conditions, e.g., maximum possible elevation
- plots defined subscans and segments (depending on SET plotStyle)

```
Additional Help Available:
```

```
/CLEAR          /PURPOSE
```

```
PAKO>
```

```
PAKO> help diylist /purpose
```

```
DIYLIST /PURPOSE
```

```
    /PURPOSE purpose
```

```
Set a purpose for a scan, i.e., an intended use of the data.
The applies in particular to DIYLIST.
```

```
Character :: purpose          !
```

```
NOTE: /PURPOSE by itself or
      /DIY      clears the purpose.
```

```
NOTE: at this time (2012-11-08) this is only for information,
and included in the XML, but it has no practical effect.
```


PAK0> help subscan

```
SUBSCAN xOffset      yOffset
SUBSCAN xStart       yStart      xEnd      yEnd
SUBSCAN xAmplitude   yAmplitude frequencyX frequencyY xCenter yCenter
                phiX phiY
```

NB: this is a protected command (needs privilege).

Add to user-defined list of subscans and segments for observing mode "DIY"; compare command DIY. The subscan command has the 3 main variants above, depending on the number of parameters:

```
2 --> Track subscan with fixed offsets
4 --> Linear OTF segment (subscan)
8 --> Lissajous OTF segment (subscan), IMPORTANT: SEE NOTE BELOW
```

Option /TYPE allows to enforce that the command is interpreted for one the 3 different types, independant of the number of parameters.

Option /TUNE allows to specify that a Track subscan will be used to "tune" an instrument, e.g., NIKA.

```
Real :: xOffset      ! x offset fixed-position TRACK subscan
Real :: yOffset      ! y offset fixed-position TRACK subscan
```

```
Real :: xStart       ! x offset start of linear OTF segment
Real :: yStart       ! y offset start of linear OTF segment
Real :: xEnd         ! x offset end of linear OTF segment
Real :: yEnd         ! y offset end of linear OTF segment
```

...

If an asterisk * appears in place of any parameter, the value will remain unchanged from the last valid SUBSCAN command.

NOTES: pako will make its best effort to "guess" the values for unspecified parameters based on the values of its internal variables after the previous valid SUBSCAN command. Each time a SUBSCAN is accepted without error message, a subscan is added to the list; even if the command is only "SUBSCAN" by itself! Be careful that a parameter in the command line can refer to different variables depending on the type of the segment/subscan, e.g., the 1st parameter can refer to xOffset, xStart, or xAmplitude. These features should be used with special care, e.g., to experiment with the DIYLIST and SUBSCAN commands. Before START of a subscanlist, enter DIYLIST and review the list of currently defined subscans. It is recommended to collect all SUBSCAN commands in a pako script and explicitly specify all parameters for each subscan!

...
Additional Help Available:

```
/CROFLAG      /RAMP          /SYSTEM          /TOTF          /TSUBSCAN
/TUNE         /TYPE
```

PAK0> help subscan /tune

SUBSCAN /TUNE

/TUNE [yes|no]

Logical :: doTune

"Tune" an instrument, e.g., NIKA.

NOTE: this applies to Track subscans. If a valid specification of a TRACK subscan is entered without the option /TUNE, "no" is implied.