

The TNG roadmap

Ennio Poretti



ROADMAP AFTER THE MEETING HELD IN PADOVA (March 2017)

Invite INAF community to submit LARGE PROGRAMS, all topics eligible

*** LARGE PROGRAMS AT TNG ***

In the era of mature 8m-class telescopes, and with 40m-class telescopes approaching the event horizon, it is mandatory to define compelling scientific programs that justify the investments that the Italian astronomical community is making to maintain TNG operative and competitive. TNG is offering competitive instrumentation, especially in the case of HARPS-N and GIANO, which can be jointly used in the GIARPS instrumental combination.

As a bare indication, "Large/Long" programs should require at least 10 nights/semester and a minimum of 40 nights of total time for execution.

La missione e le prospettive scientifiche di TNG nell'astrofisica del 2020

Telescopio Nazionale Galileo

INAF
ISTITUTO NAZIONALE
DI ASTROFISICA
NATIONAL INSTITUTE
FOR ASTROPHYSICS

La missione e le prospettive scientifiche di TNG nell'astrofisica del 2020

The slide features a background image of the TNG telescope structure at dusk. On the left is the logo of the Galileo National Telescope, which consists of a blue rectangle with a white circle at the bottom and a yellow star at the top, flanked by two vertical white bars. On the right is the INAF logo, which includes a white diamond and a white circle. The text 'La missione e le prospettive scientifiche di TNG nell'astrofisica del 2020' is written in white at the top and bottom of the slide. The INAF logo and name are on the right side.

AOT37 : NINE LARGE PROGRAM PROPOSALS SUBMITTED

GAPS2: the origin of planetary systems diversity

Stellar Population Astrophysics: the detailed, age-resolved chemistry of the MW disk

GHOST: GIARPS High-resolution Observations of T Tauri stars

A legacy catalogue of QSO spectral templates with DOLORES

Shine on the crazy Universe: exploring the transient and variable sky with the TNG

Resolving the Inner Structure of Proto-Planetary Discs: a combined GIARPS/TNG and GRAVITY/MLTI Survey

The present Solar System: a reservoir of pre-biotic material

Decipher the distribution of basaltic material in the main belt region through Spectroscopic observations

LSST templates: studying peculiar SN and intermediate-Luminosity Optical Transients with TNG

AOT 38: LONG-TERM PROGRAMS at TNG

In this call TNG opens observing time to less time-demanding programs, but still having the need to extend over a few consecutive semesters to be completed and/or to ensure the necessary follow-up.

The "Long Term" programs must be able to strictly address major open problems in modern astrophysics, characterizing the TNG role in the next 1-2 years. The basic features of these "Long Term" programs are:

All topics in modern astronomy are eligible.

Programs can only use any of the permanently instrument installed and commissioned on TNG: DOLORES, NICS, HARPS-N, GIANO-B, also in the so-called GIARPS mode.

Programs may extend up to 3 semesters, and use a maximum of 30 hours per semester.

APPROVED LONG-TERM PROGRAMS

A38 TAC_22	White dwarfs	HARPS-N	5 hours
A38 TAC_29	GW	DOLORES + NICS	30
A41 TAC_8	Transients	DOLORES + NICS	20
A41 TAC_18	GW	DOLORES + NICS	30
A41 TAC_54	White Dwarfs	HARPS-N	1.5
A44 TAC_3	White dwarfs	HARPS-N	3
A44 TAC_22	Transients	DOLORES + NICS	20
A44 TAC_33	GW, kilonovae	DOLORES + NICS	12

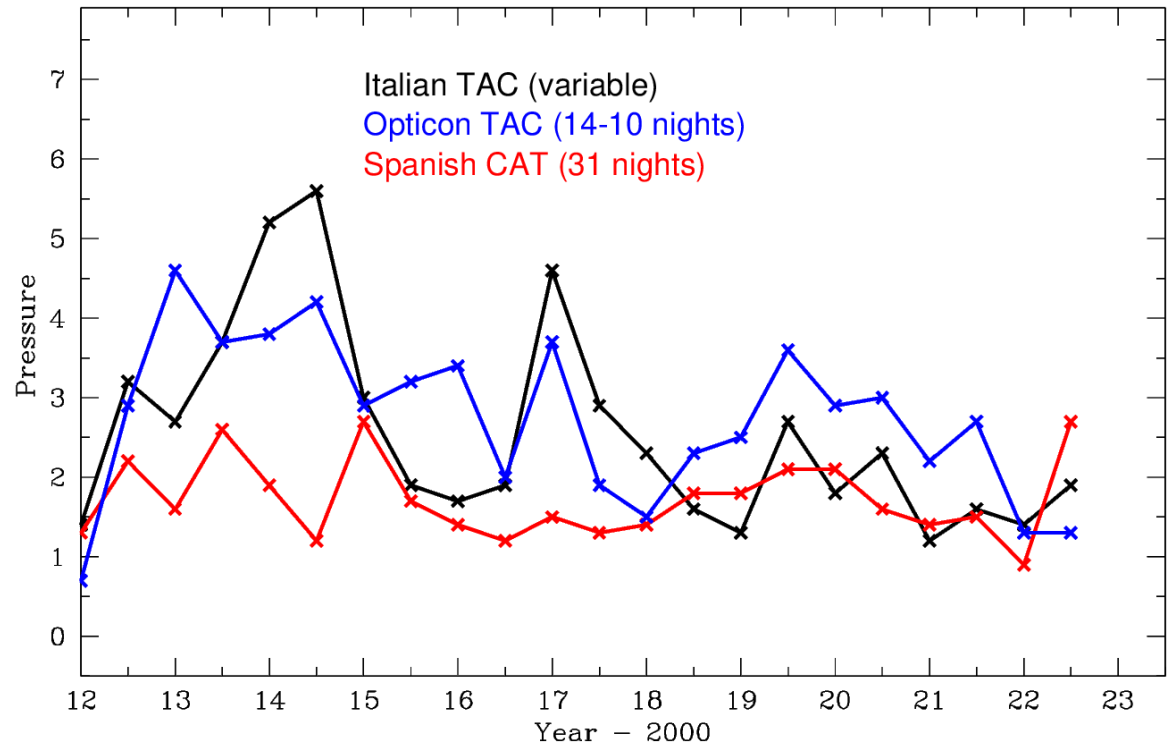
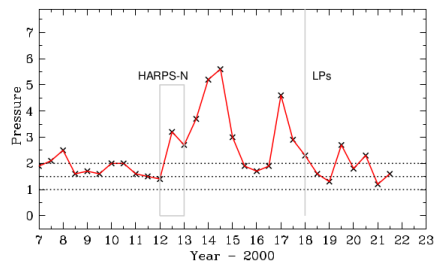
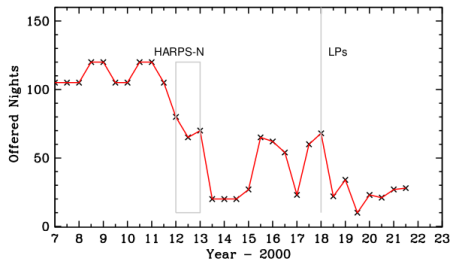
Typically, 4 nights/semester

	AOT 38	AOT 39	AOT 40	AOT 41	AOT 42	AOT 43	AOT 44	AOT 45	AOT 46	AOT 47
INAF OPEN TIME	12	12	10	18	16	26	28	37	29	37
INAF Large Prog.	47	47	39	43	43	34	36	34	34	34
INAF Long Term	-	4	3	-	6	6	-	4	6	-
GTO (INAF-GTO agr.)	40	40	33	40	40	40	40	40	40	40
Spanish CAT (Intl. protocol)	31	31	26	31	31	31	31	31	31	31
CCI ITP (Intl. protocol)	8	7	7	8	7	7	8	3	8	7
OPTICON	10	10	10	10	10	10	10	10	10	10
TNG-NOT (Agreement)	10	10	8	5	5	5	5	--	--	--
Technical nights (DDT.payback....)	24	22	42 Alum.	28 PAO	24	24	24	24	24	24

PRESSURE ON OFFERED OBSERVING TIME

63 nights INAF
 40 nights GTO
 31 nights Spain
 23 nights INTL
 24 nights "Technical"

Enough pressure to
 guarantee "good science"



OBSERVING PROGRAMS MOSTLY FULLY EXECUTED !

2. Status of observations

A total of 80 nights or equivalently 720 hours of observing time over six semesters has been requested to fulfil the science goals of the *SPA Large Programme*.

The TAC (A37_TAC13) granted $117+117=234$ hrs in Periods 37 and 38, $117+117=234$ hrs in Periods 39 and 40 (only 99 out of the 117 hrs actually scheduled in Period 40 due to telescope maintenance in October 2019) and $81+81=162$ hr in Periods 41 and 42 of observing time.

A grand-total of 612 hrs of observing time have been nominally scheduled during the six semesters from Period 37 to 42, implying a cut of 108 hrs (i.e. 15%) with respect to our request.

Such a 15% cut applied by the TAC had an impact on the SPA science. Indeed, we have been forced to modify our strategy and significantly cut the observations of especially interesting but faint targets (about 80 stars), like old and/or reddened variables and MS stars in some older and/or more distant open clusters. These targets were also critical to properly sample specific regions of the age/Galactocentric distance parameter space. We could only partially mitigate that problem with observations of more luminous field stars with known distances from Gaia.

In 2018 and 2019 observations have been mostly executed in visitor mode. In 2019 we appreciated the possibility to have a second observer paid by the TNG in two relatively long runs.

We are especially grateful to the TNG personnel for executing service observations during the entire 2020, due to Covid-19 restrictions.

According to the official table with the status of SPA observations made available to us by the TNG Director, 596 hrs of open telescope was recorded out to the 612 hrs nominally scheduled.

During the 596 hrs of observations in the six semesters from Period 37 to Period 42, we secured spectra for 520 stars in the disk field and associated star clusters, spreading a wide range of Galactocentric distances and divided in three main age groups, as shown in Figure 1 and detailed below .

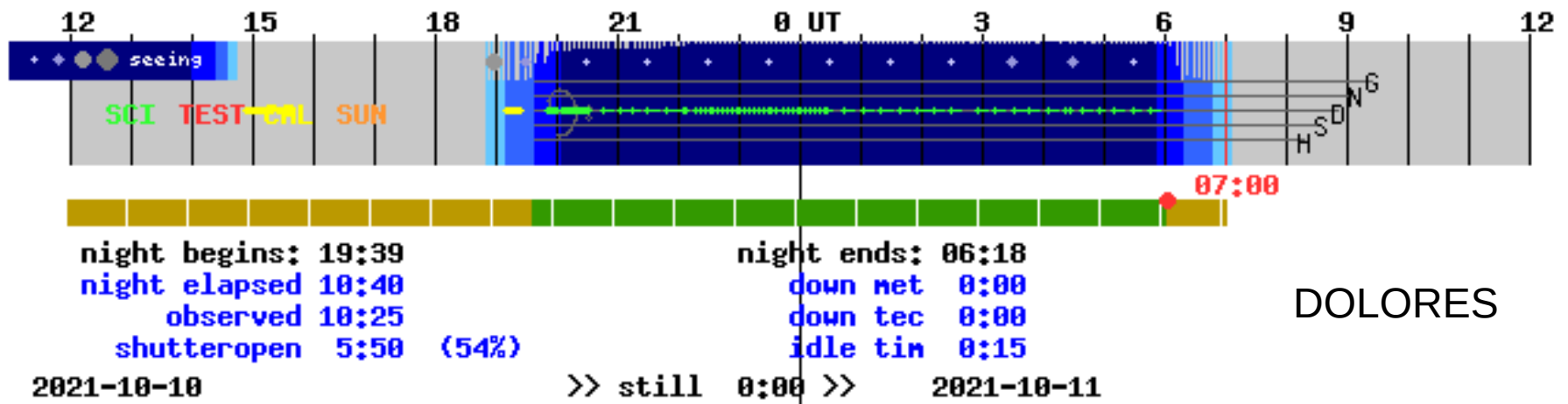
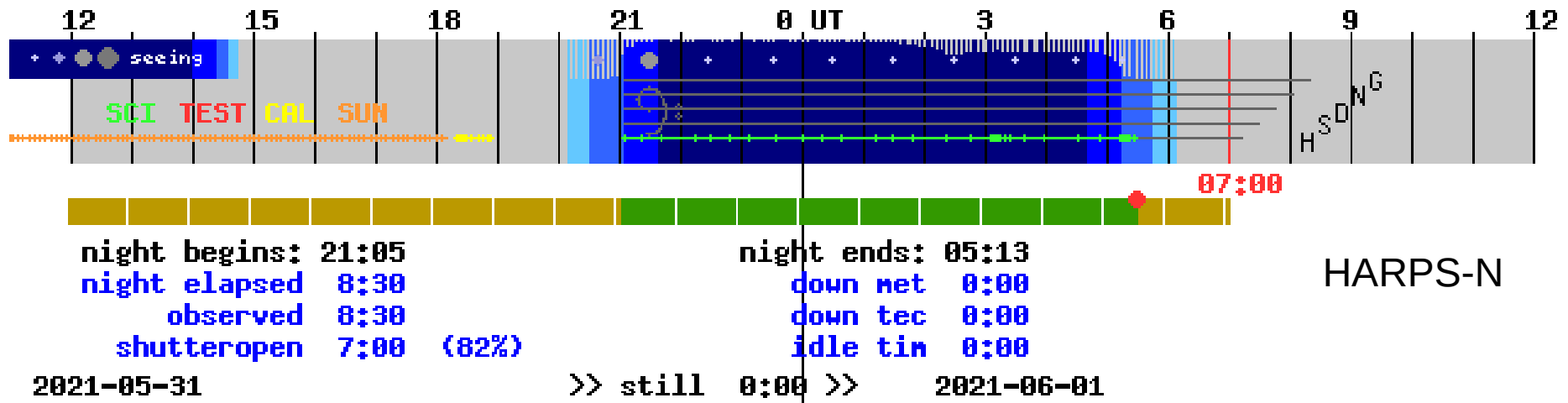
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Night Statistics

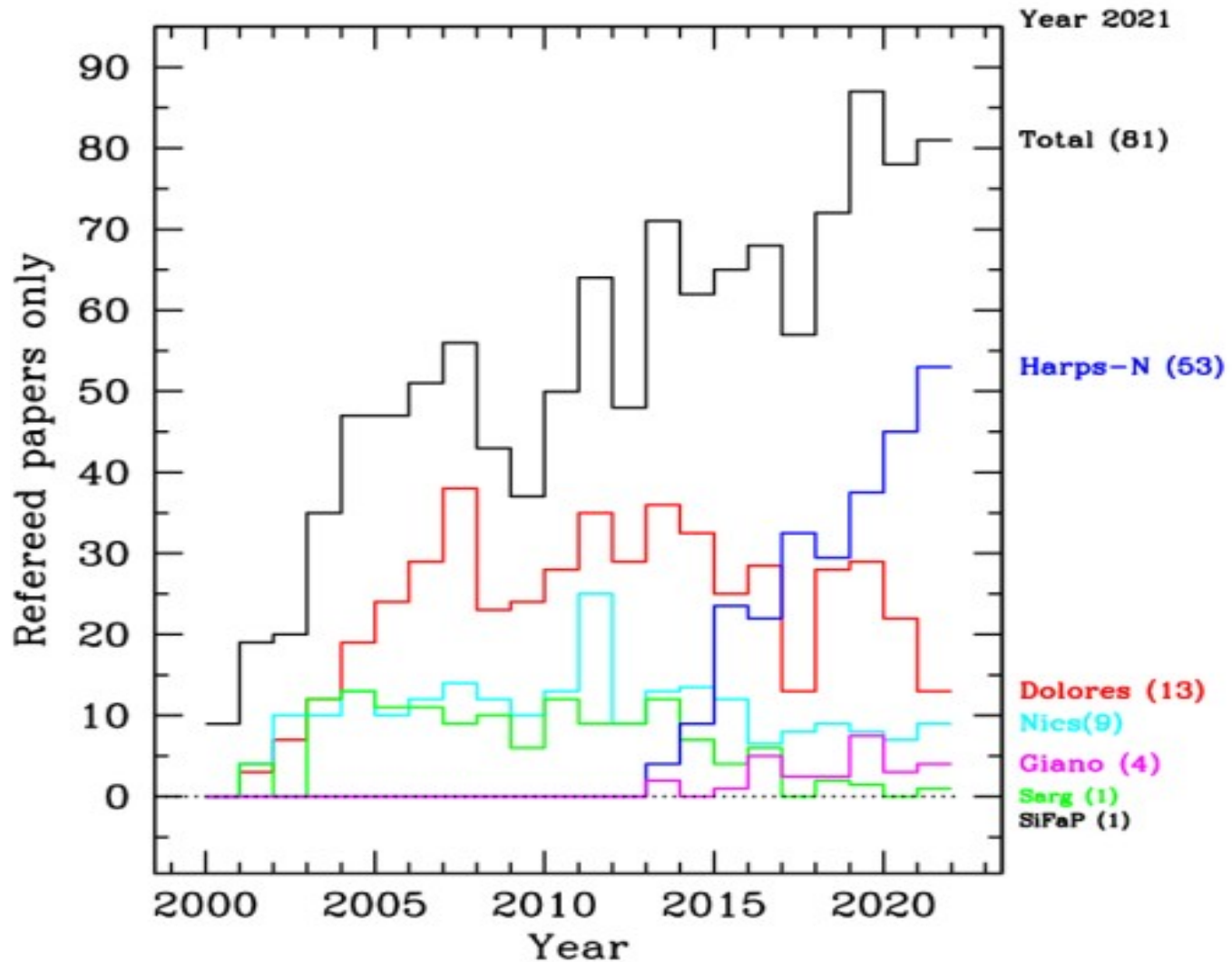
	2021	2020	2019	2018	2017	2016	2015
	[%]	[%]	[%]	[%]	[%]	[%]	[%]
Down meteo	28.7	26.5	14.4	27.0	22.7	25.3	23.3
Technical failures	2.2	2.7	3.1	2.8	2.0	1.4	2.2
Engineering time	2.6	2.2	5.9	5.3	5.6	4.9	2.7
Idle time	0.5	0.6	0.6	0.5	0.6	1.0	0.4
Observed time	66.7	68.1	76.0	64.6	68.9	67.3	71.4
Open Shutter	77.6	74.6	71.9	76.2	72.8	74.1	72.7

2.5 nights out of 10 lost for bad weather
 You observe 7 nights out of 10
 Open shutter 5.25 nights out of 10



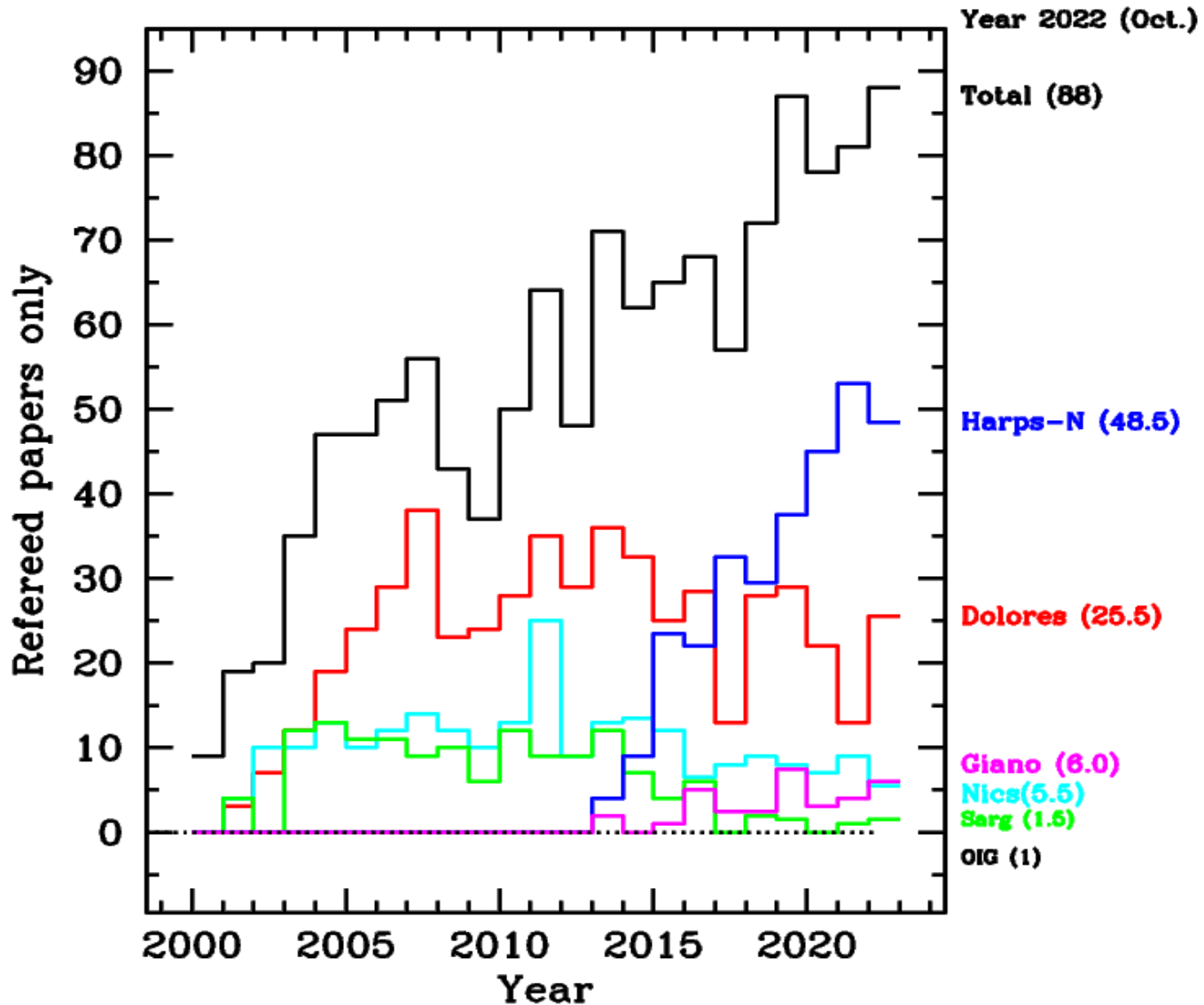
Publication record 2021 (source TNG webpage)

Peer-review journals only



Publication record 2022 (October) (source TNG webpage)

Peer-review journals only



INAF HOLDS THE LEADERSHIP OF HIGH-RES PAPERS

Publication record *(source TNG webpage)*
Peer-review journals only

	2013	2014	2015	2016	2017	2018	2019	2020	2021
HARPS-N	4	9	22.5	22	31	29	33	40	47
High Resolution	6	9	24.5	27	35	32	45	48	57
INAF	4	2	11	9.5	9	9	14	17.5	22.5
GTO	1	3	5	6	6	5	11	9	7
SPAIN	0	1	3.5	7.5	8	9	10	12.5	10.5
Rest of World (archival data!)	1	3	5	4	12	9	10	9	17

TNG is following its roadmap

With HARPS-N, TNG is a strong player in the exo-planetary game. Infrared and optical high-resolution is an asset, independently of the science case.

Able to answer crucial questions in other fields, especially with another Large Program. Why not, it can be used as a glue between different groups.

For sure, TNG is an efficient complementary ground-based tool.

Since April 2022, TNG astronomers and technologists are *Associati con Incarico*. They are available for PRIN, Working Groups, Science Team, ...



AOT 47 (2023A) is now open for proposals.

📅 2022-10-27

Applications for observing time for the period [April 1st, 2023](#) - [September 30th, 2023](#) are solicited and should be submitted by Friday, Nov 25th, 2022, 12:00 UT.

The available time offered at TNG via INAF-TAC is **37 (thirty-seven) nights** in this call. [We encourage applicants to submit proposals asking a row of consecutive nights to be done in visitor mode.](#) All proposals will be judged strictly on their scientific merit.

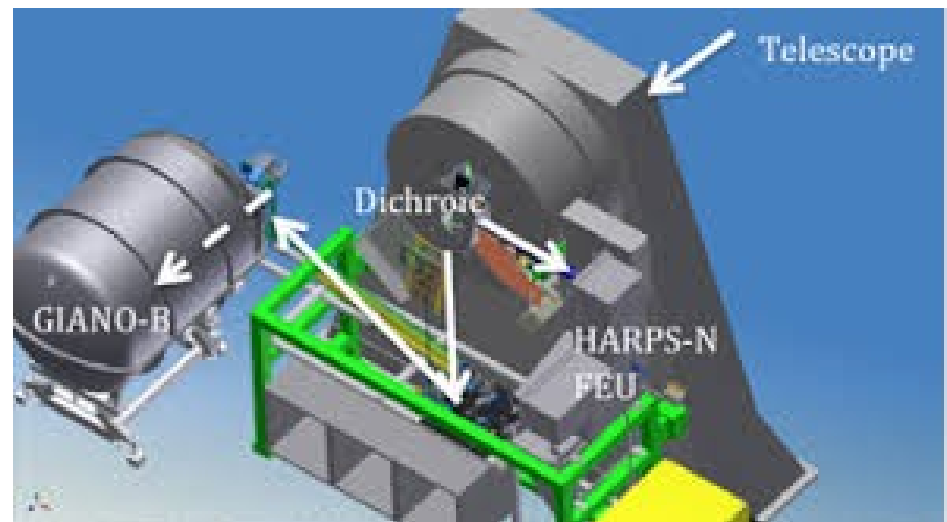
[Read more...](#)

Four interchangeable instruments

- **HARPS-N**, high-resolution spectrograph ($R=115000$) operating in the visible.
 - **GIANO-B**, high-resolution spectrograph ($R=50000$) operating in the near infrared.
 - **DOLORES**, low-resolution spectrograph ($R<6000$) and imaging.
 - **NICS**, near-infrared instrument, low-resolution spectroscopy ($R<2500$), imaging.
- and**
- **SiFAP2**, ultrarapid photometer (time resolution 8 ns), PI instrument.

GIANO-B and HARPS-N combined in the **GIARPS** observing mode. Simultaneous visible and infrared spectra of the same target.

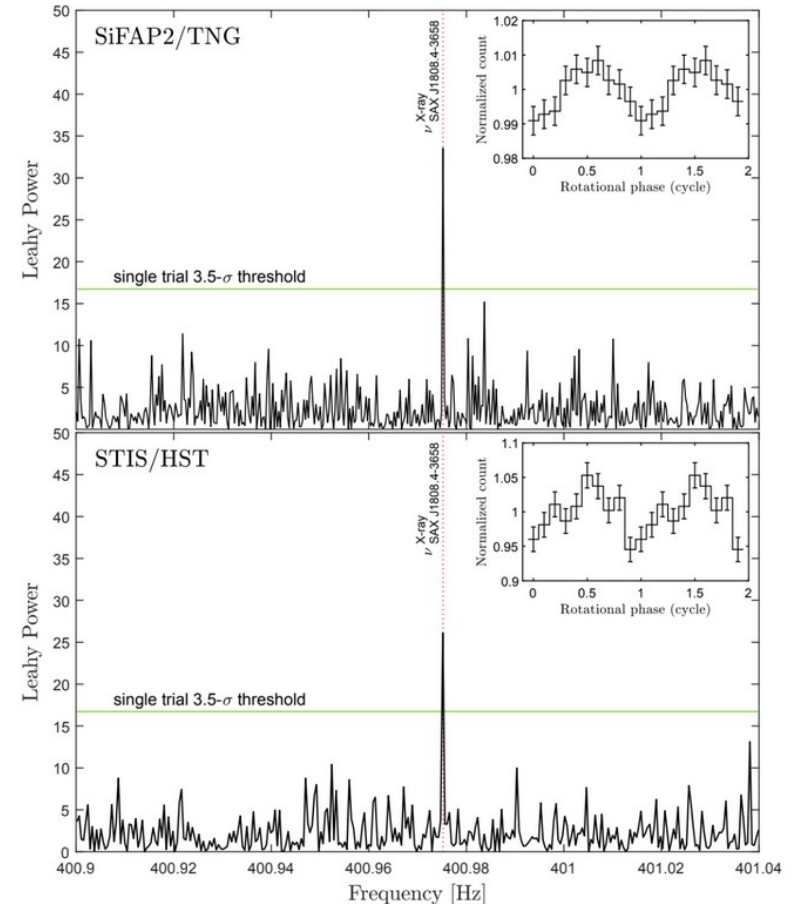
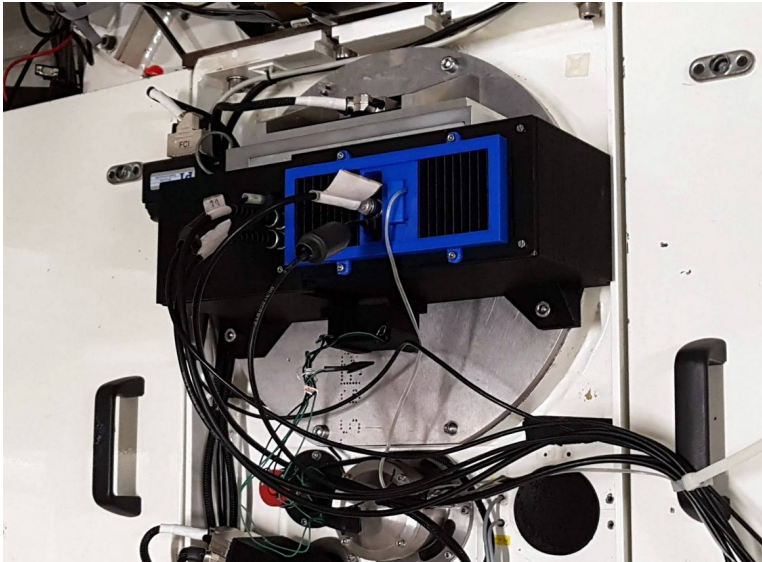
Action taken by the Italian Community : GAPS, GIANO Team, and TNG staff. Funded by own budget.



ENTERING TIME DOMAIN ASTRONOMY WITH EXCELLENCE

Silicon Fast optical Astronomical Photometer (SiFAP2) offered as a visitor instrument

**Pulses of visible light from
a millisecond pulsar**
(Ambrosino et al. 2017, *Nature Astronomy*)



First light of SiFAP2 on November 14, 2018

Ambrosino et al. 2020, Nature Astronomy