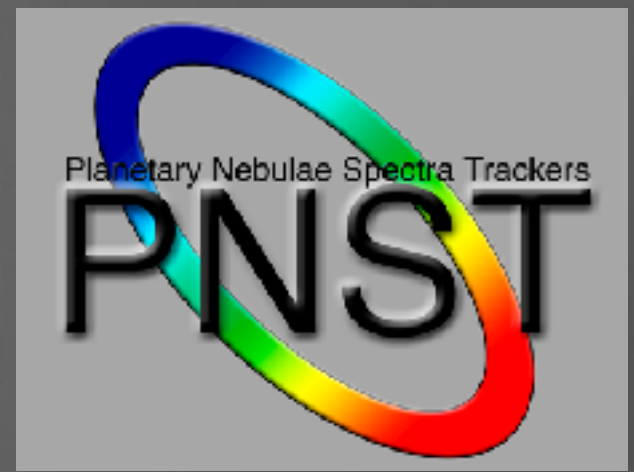
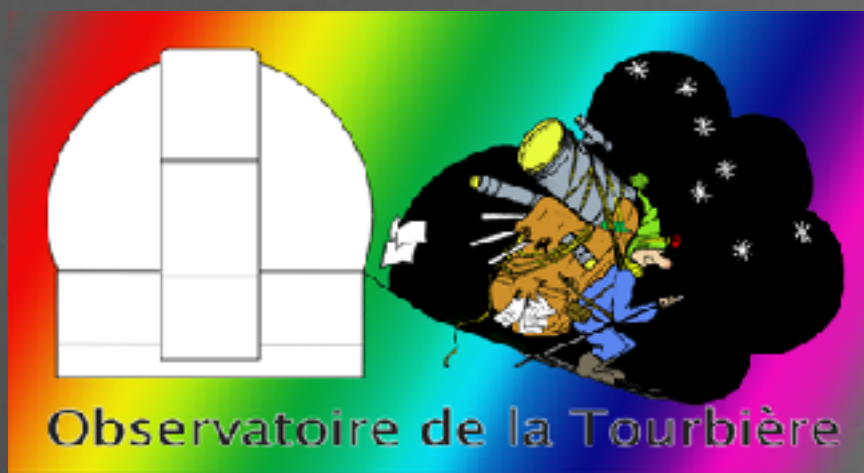
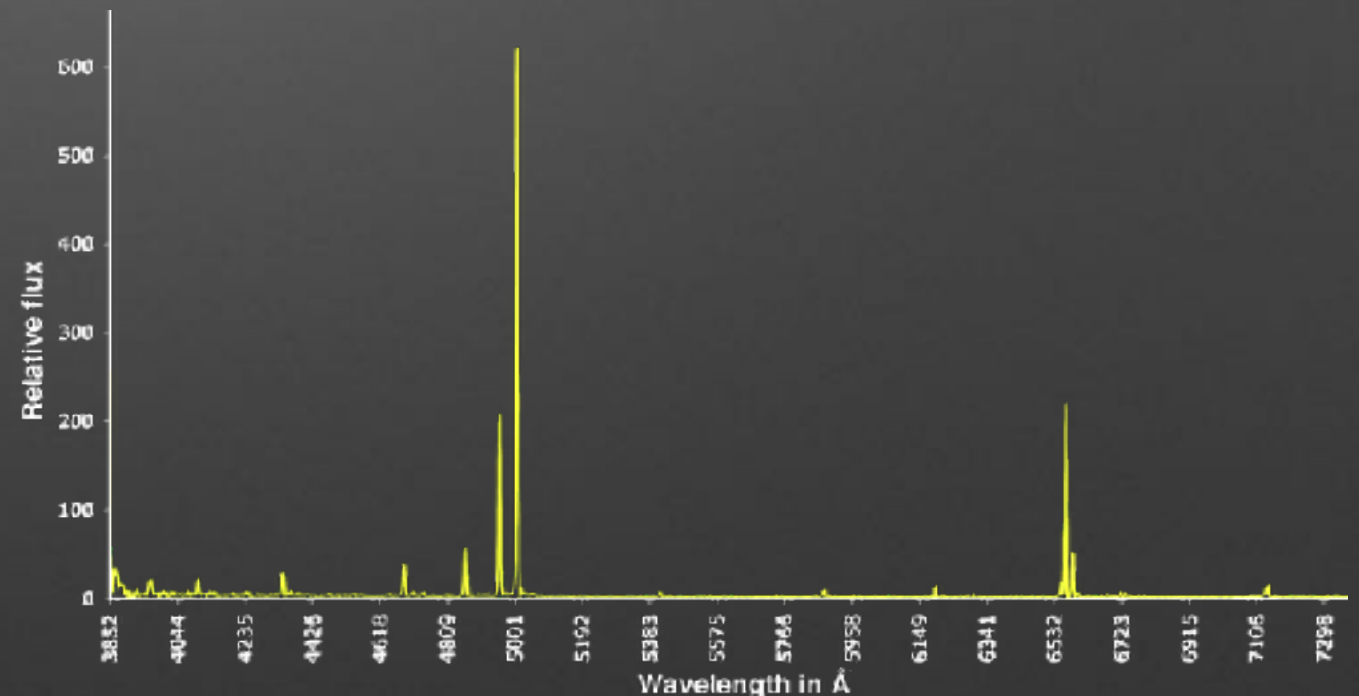
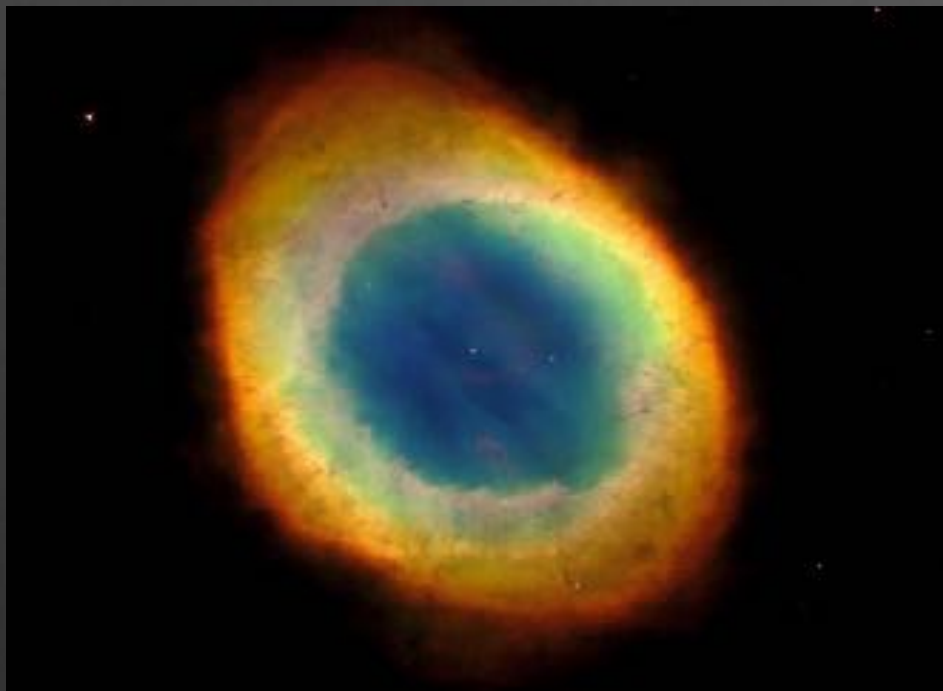




Confirmation of planetary nebula candidates with spectroscopy



A Pro/Am collaboration



Pr. Agnès Acker (retiree)
Strasbourg observatory



Pr. Quentin Parker
Hong Kong University

The goal : **discover new Planetary Nebulas.**

- Proposed by **Agnès Acker** in 2003 at a CNRS Pro/Am congress
- 2008-2011 first discovery of new PN by **Nicolas Outters** & **Pascal Le Dû**
- First PN confirmation in 2012 with a spectrum of **Christian Buil**
- 2014, creation of the French list of PN candidates
- In 2017, **Agnès Acker** retires and **Quentin Parker** takes over the project
- In 2019, more than **400** PN candidates were found and **32** PN confirmed

PN meeting in February, 2014

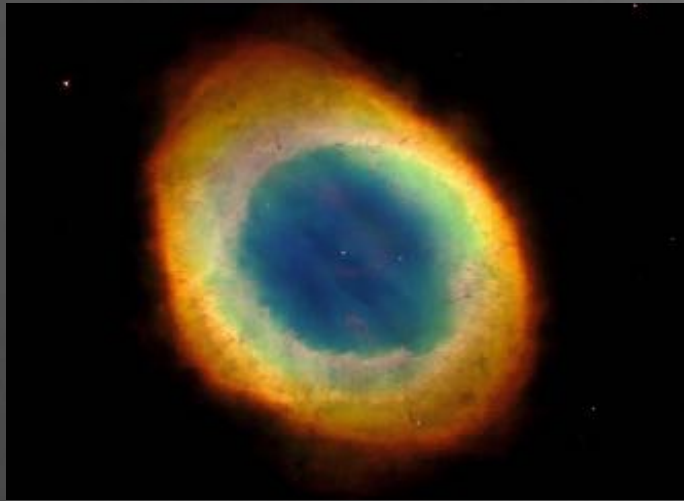


First meeting with the **observers/discoverers** and the spectroscopists around **Agnès Acker**.

IAP (Institut d'Astrophysique de Paris)

Wanted objects

Some well known examples ...



M57



Helix



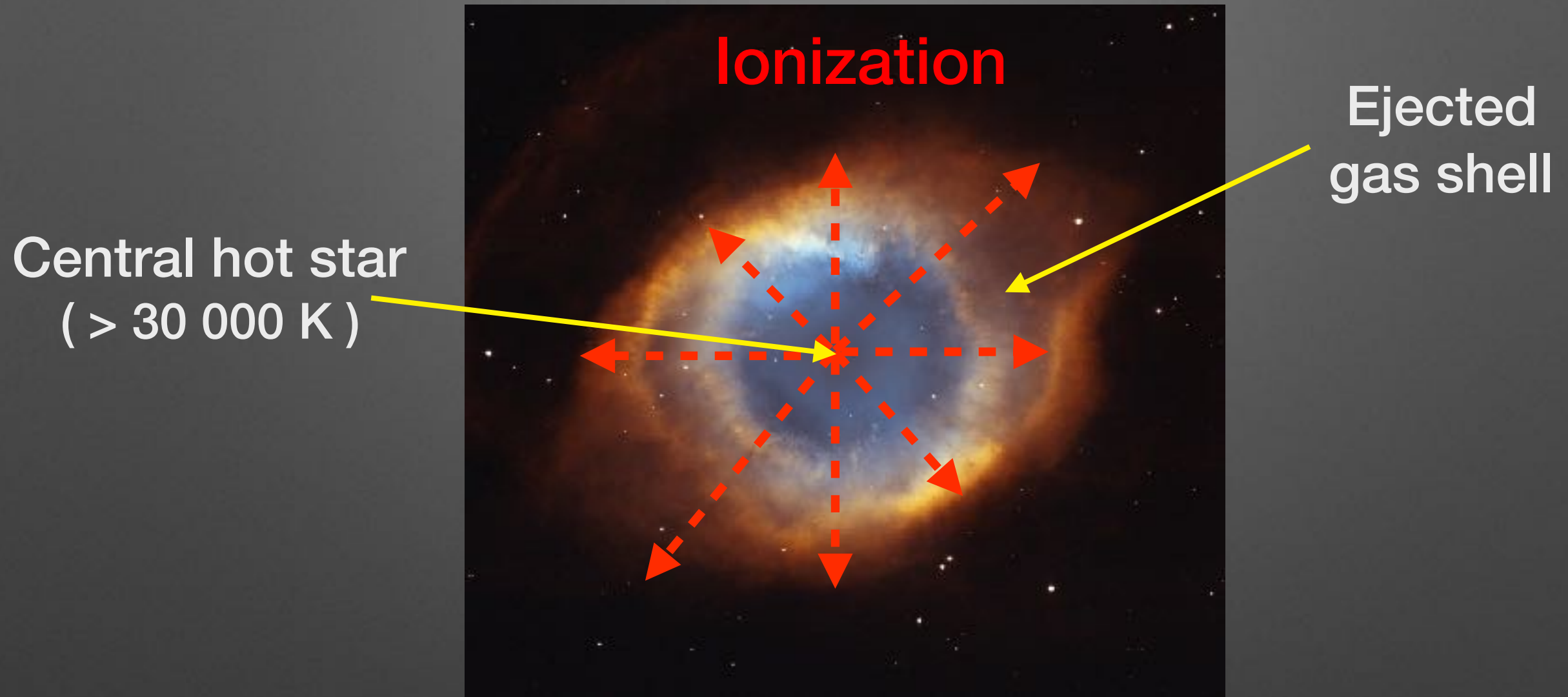
NGC 2392

... and a new "bubble" discovered in 2008 by the American amateur **Dave Jurasevich** and validated and named by **Agnès Acker**



Ju1 PN G75.5+1.7

What is a Planetary Nebula ?



- Planetary Nebula form when dying stars cast off their outer layers of gas.
- The central star becomes very hot, it ionizes the shell of gas ejected by it.

Discovery of PN candidates

How to discover a PN ?

Found by amateurs :

- On professional surveys :

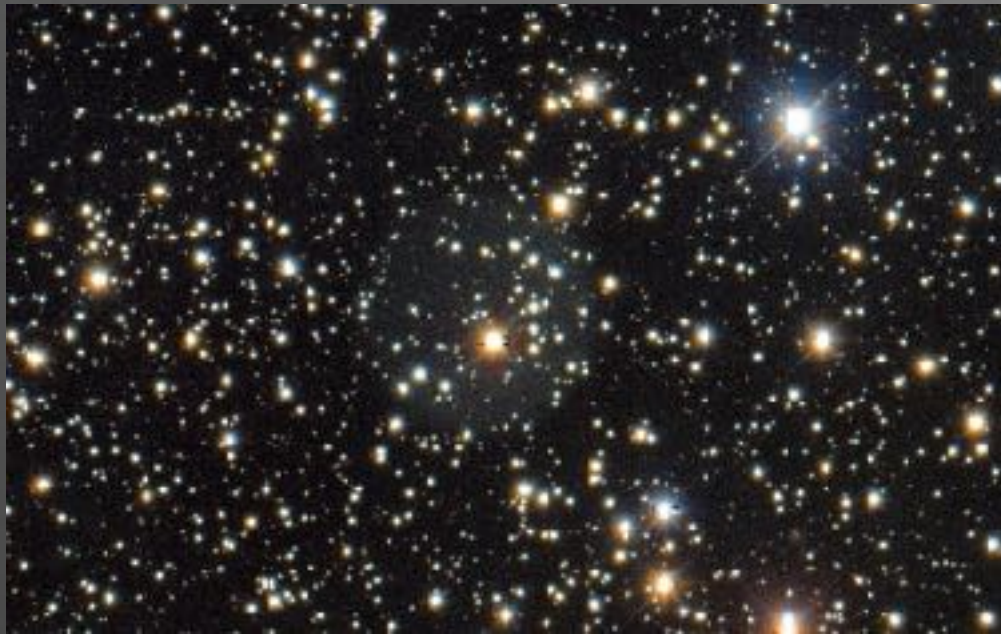
DSS (red, blue), **SDSS** (color), **Wise** (color, W3, W4), **skymap.org**, **DeCaPS** (color), **PanSTARRS**, **SHS**, etc...

By comparison of the signal at different wavelengths.

- On the own amateurs images :

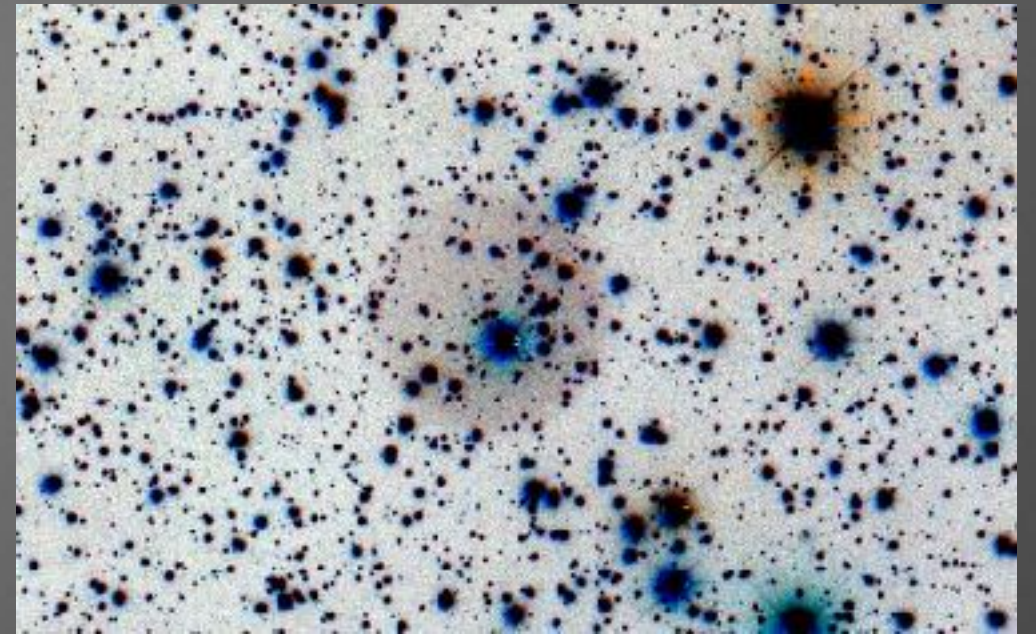
Detection on **H-Alpha** and **[OIII]** filters or SHO color images.

1- On professional surveys

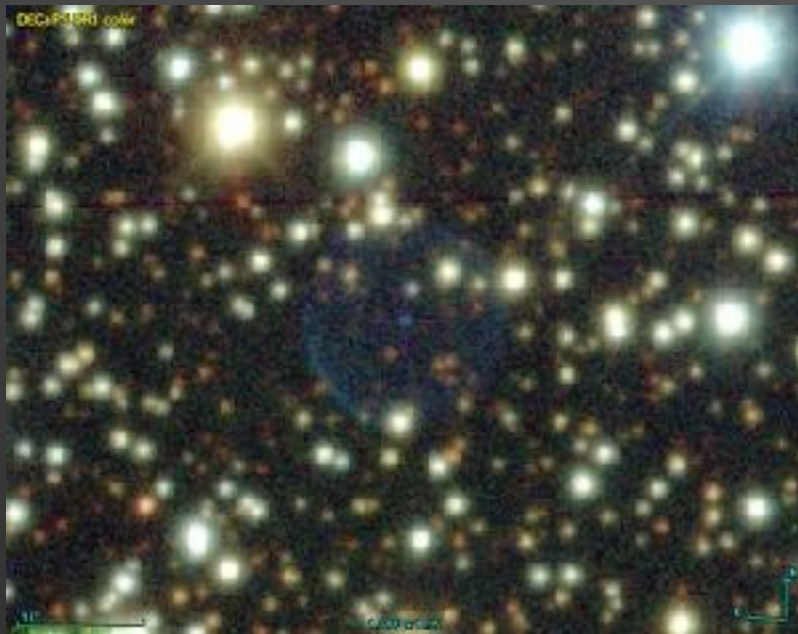


PN candidate : **Dr 3**

Discover by German amateur Marcel Drechsler

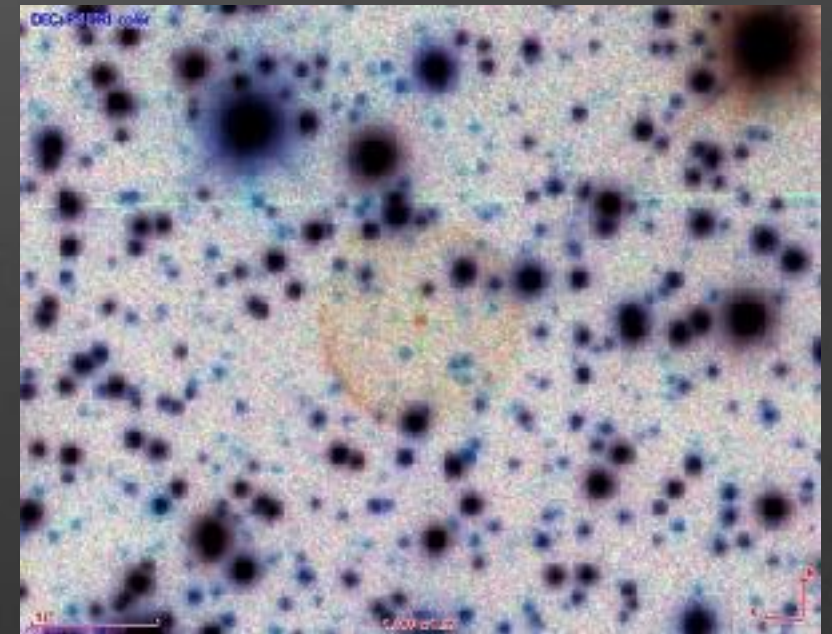


Negative image



PN candidate : **Pre 59**

Discover by Tryge Prestagrd in Norway



Negative image

2- On the own amateur images



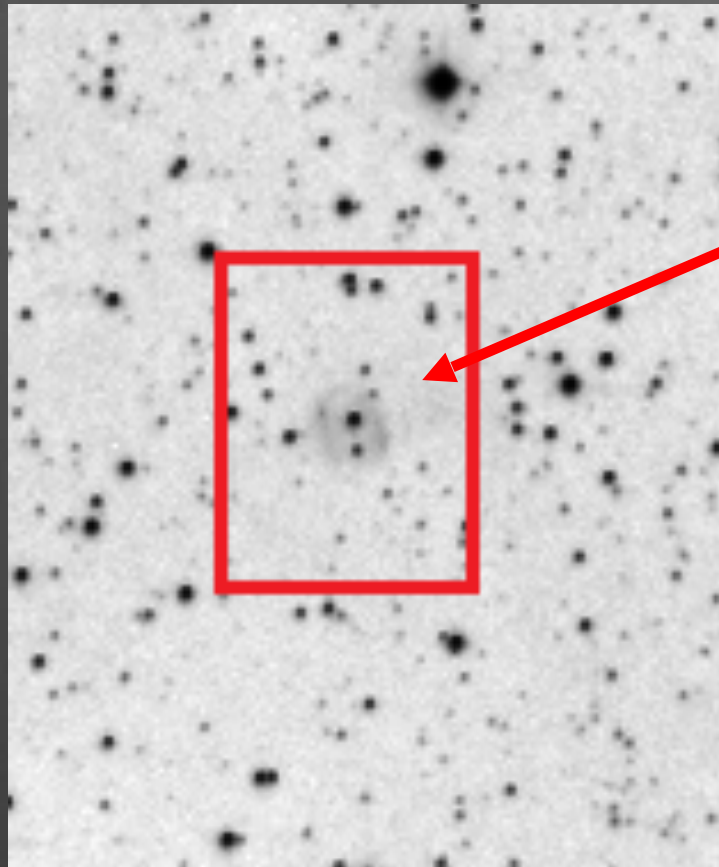
Ou 6
(0,2' x 0,2')

PN discovered by **Nicolas Outters**
close to LDN 895 nebula in 2013

SHO image taken in France
with a Newton 400 mm at F/d 3,8

Total exposure : 21h40

2- On the own amateur images



LDû 13
(0,7' x 0,9')



PN discovered by **Pascal Le Dû**
close to NGC 7635 nebula in 2013

H Alpha image taken in France
with a FSQ 106 EDX Takahashi
Total exposure : 15h40

To find the PN candidates list

The screenshot shows the VizieR web interface. At the top, there is a navigation bar with links to Portal, Simbad, VizieR, Aladin, X-Match, Other, and Help. The main title is 'Catalog'. Below it, the catalog name 'J/other/LAstr/114.54' is displayed, along with a description 'New planetary nebulae candidates (Le Du+, 2018)'. There are links for 'ReadMe+ftp', 'Similar Catalogs', and '2018LAstr.114...54L'. A small image of a nebula is shown on the right. Below the catalog name, there are two tables listed: 'J/other/LAstr/114.54/table1' (259 rows) and 'J/other/LAstr/114.54/table2' (39 rows). There are checkboxes for each table and a 'Reset All' button. At the bottom, there are buttons for 'Query selected Tables' and 'Join selected Tables'. A note indicates that '(c)' indicates tables which contain celestial coordinates. On the left side, there is a 'Search Criteria' panel with 'Keywords' and 'Tables' sections. The 'Tables' section shows 'J/other/LAstr/114.54' and its tables. There is also a 'Preferences' panel with a 'max' value of 50, a 'HTML Table' checkbox, and a 'Compute' button. At the bottom, there is a 'Mirrors' section with 'CDS, France' selected.

The list of likely PN candidates is available on
Strasbourg Data Center (CDS)

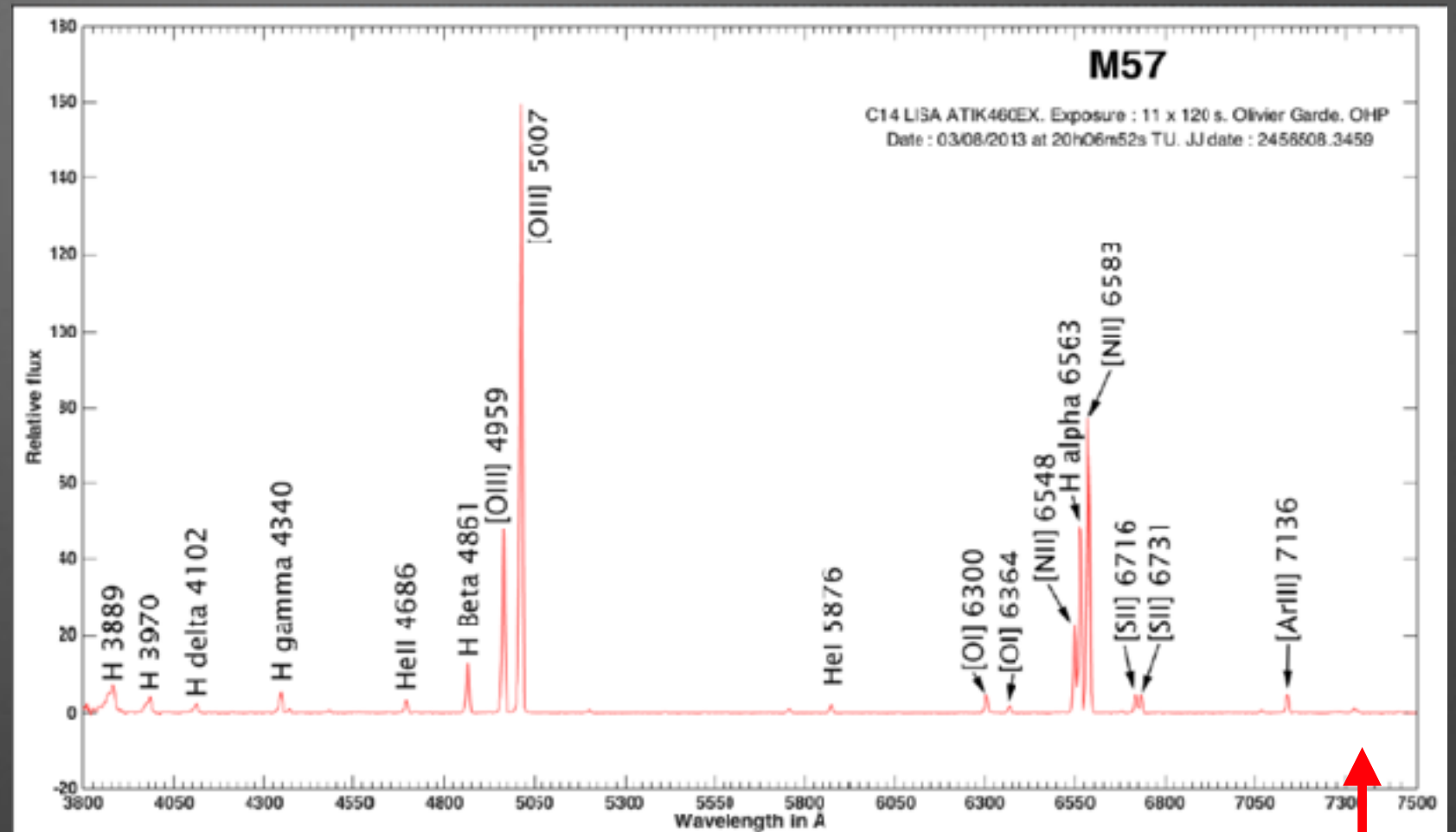
<http://vizier.u-strasbg.fr/viz-bin/VizieR?-source=J/other/LAstr/114.54>

How to confirm a PN candidate ?

Only a spectrum can reveal the nature of a PN



M57

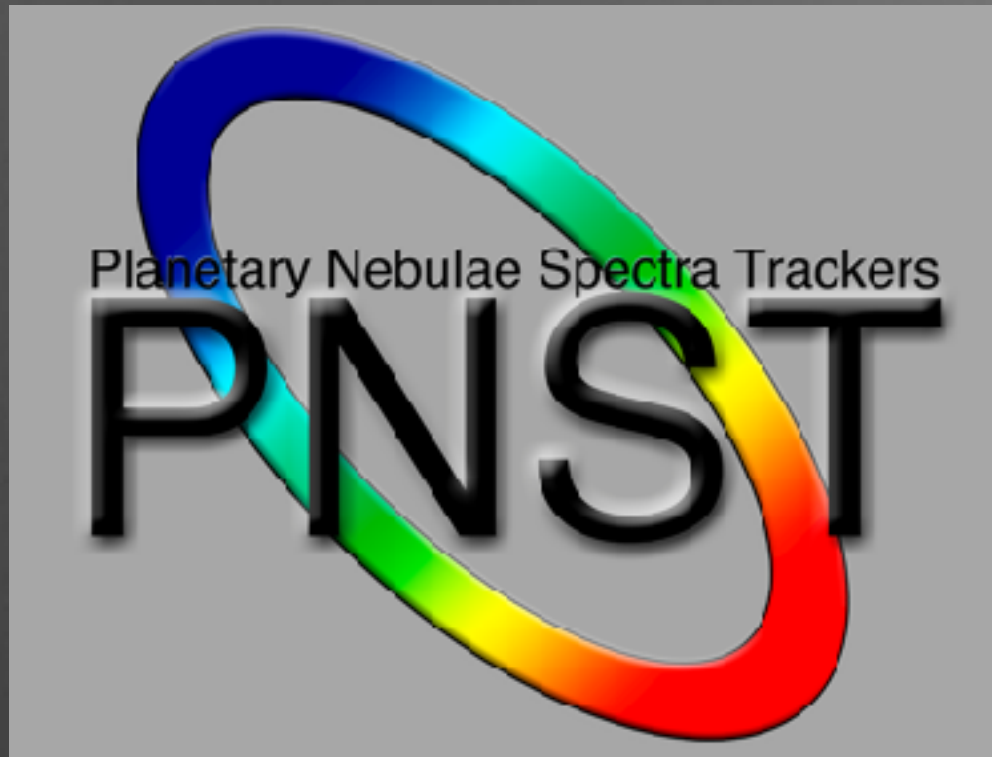


A typical PN spectrum



2D spectrum

In 2017 : **creation of a group of amateurs**



Planetary Nebula Spectra Trackers

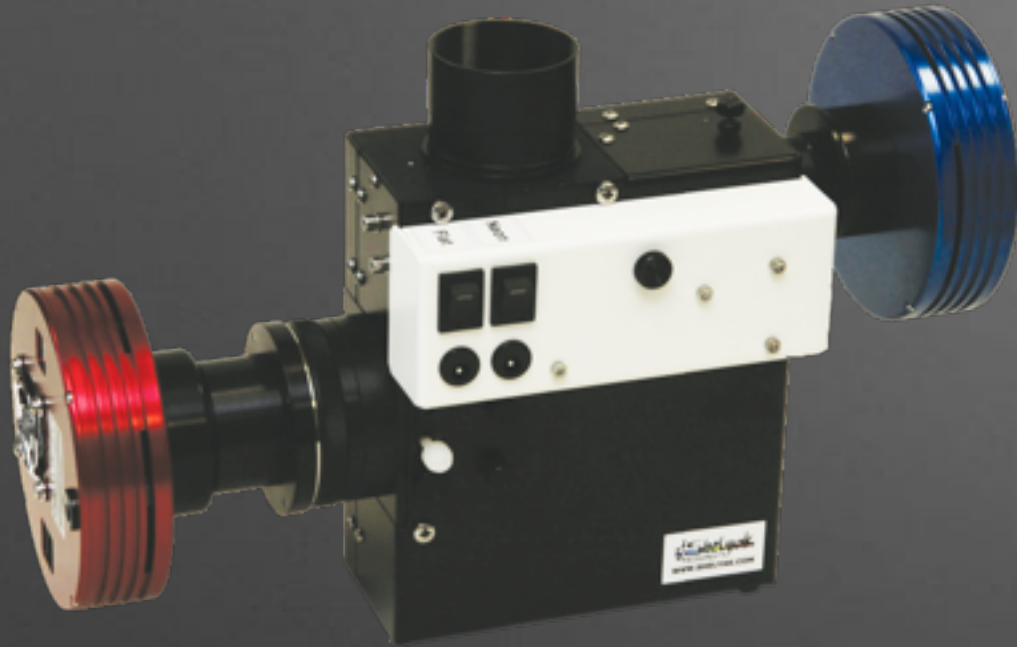


(left to right) **Olivier**, **Stéphane** and **Pascal**
at OHP spectro party in France

Our goal : **confirm PN candidates with spectroscopy**

The spectrographs

Use a good efficiency spectrograph



LISA



Alpy 600



UVEX III

(Photo : C. Buil)

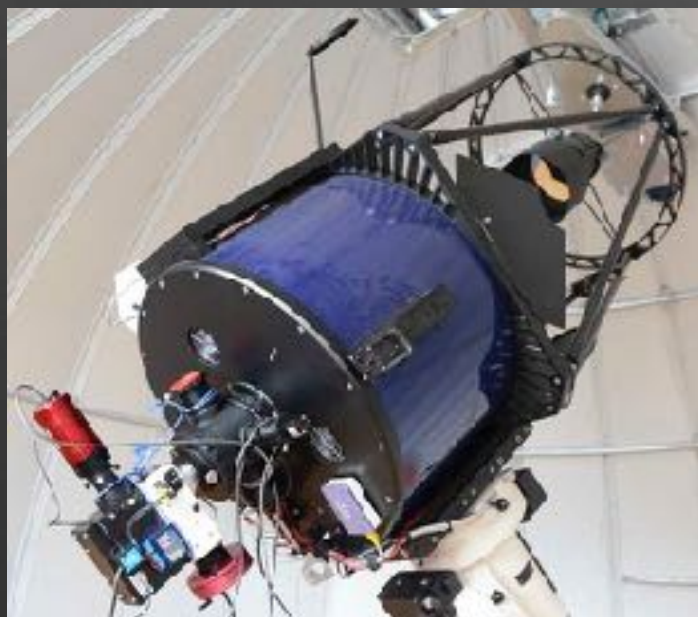
Optical instruments



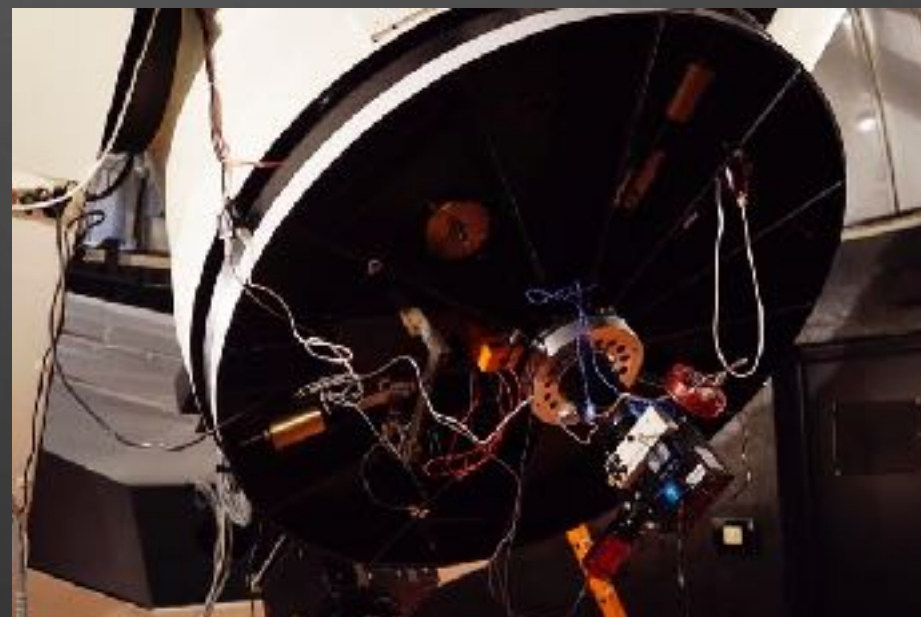
Newton 200mm @ f/d 5



SCT 355mm @ f/d 7

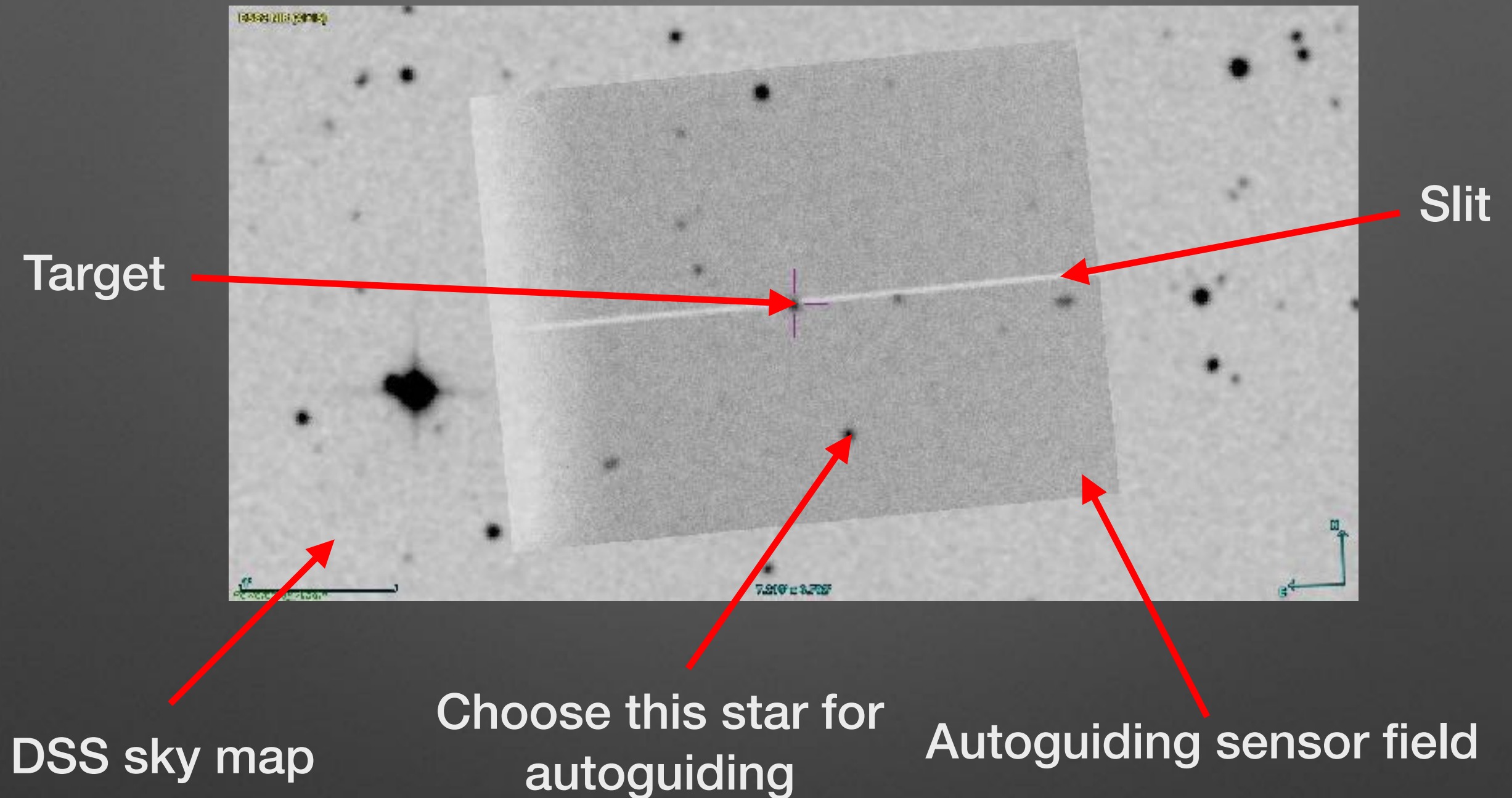


RC 500mm @ f/d 6



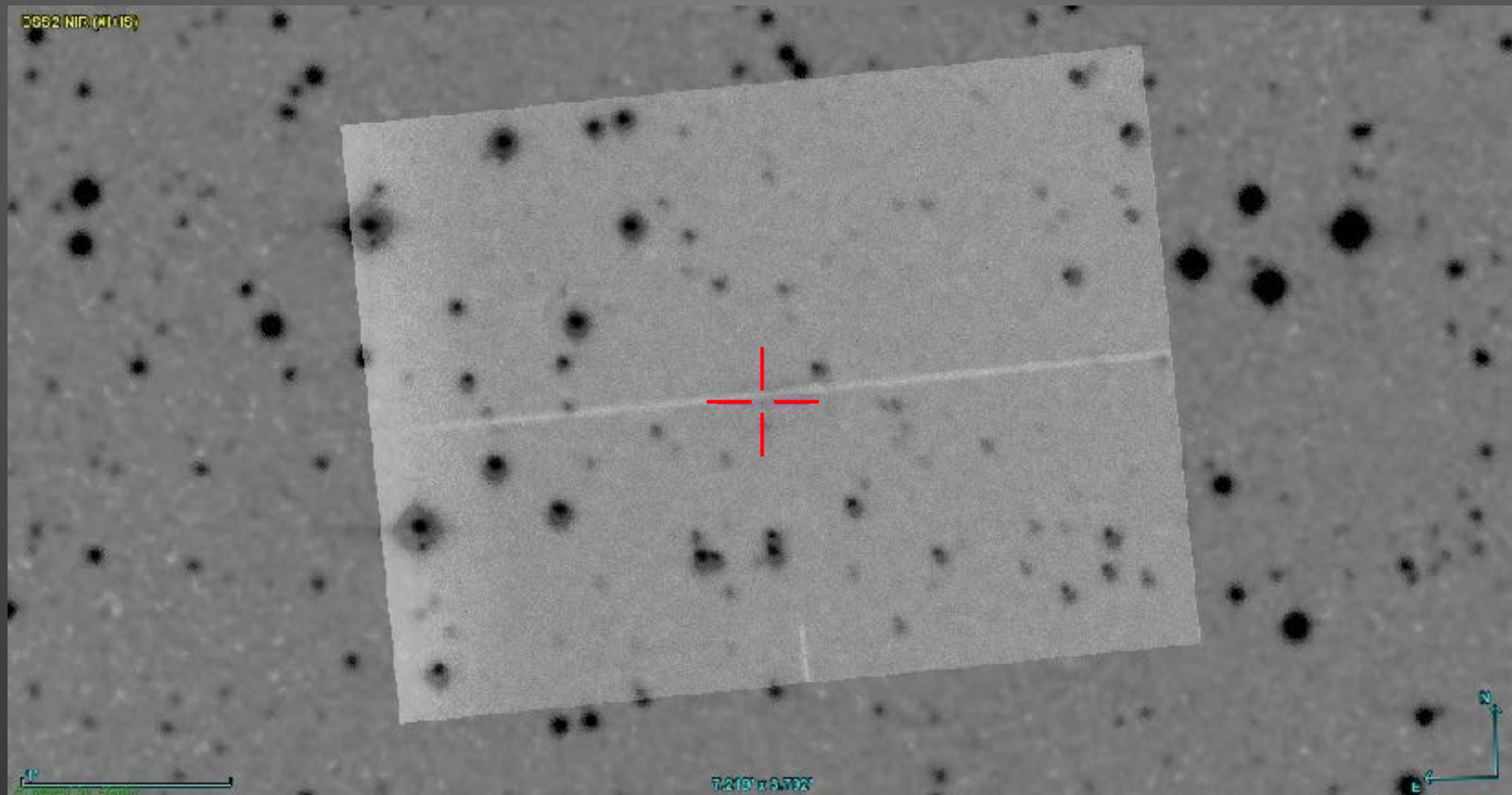
TC 1m @ f/d 7

Pointing and autoguiding



Hold the target in the slit while autoguiding on a nearby star

Pointing and autoguiding



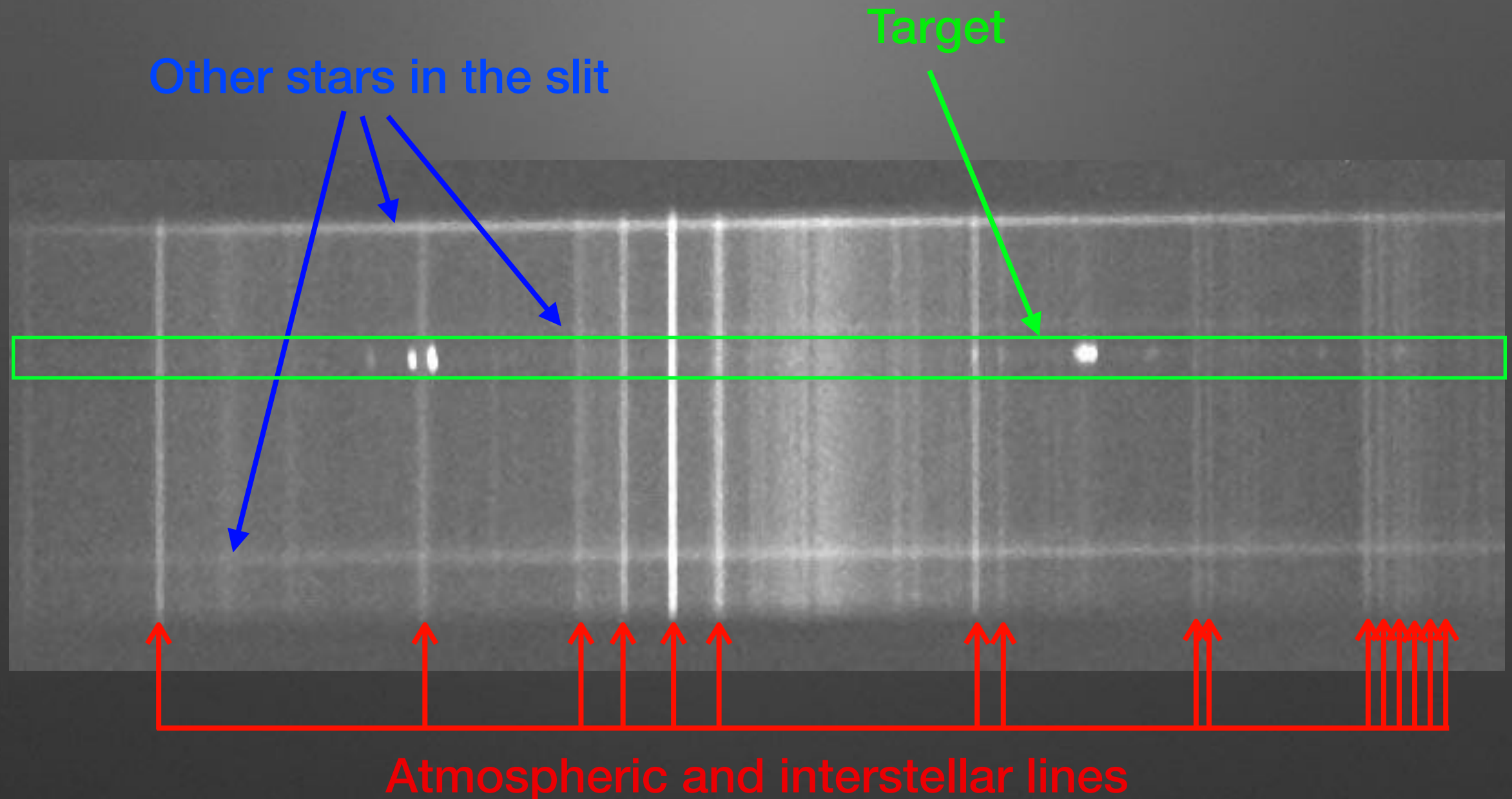
- Sometimes we don't see the target on the autoguider
- Centering the target with the field map

Take spectra

- Several single exposures on the target (4 x 900s to 6 x 1200s total exposure)
- Ar/Ne calibration lamp for calibration
- Tungsten/Halogen lamp for flat (more than 40)
- Spectrum on reference star close to the target. You can use the spreadsheet made by **François Teyssier** :
Reference Star Finder
www.astronomie-amateur.fr/Documents%20Spectro/ReferenceStarFinder.xlsm
- Bias and darks (about 50 bias and 15 darks)

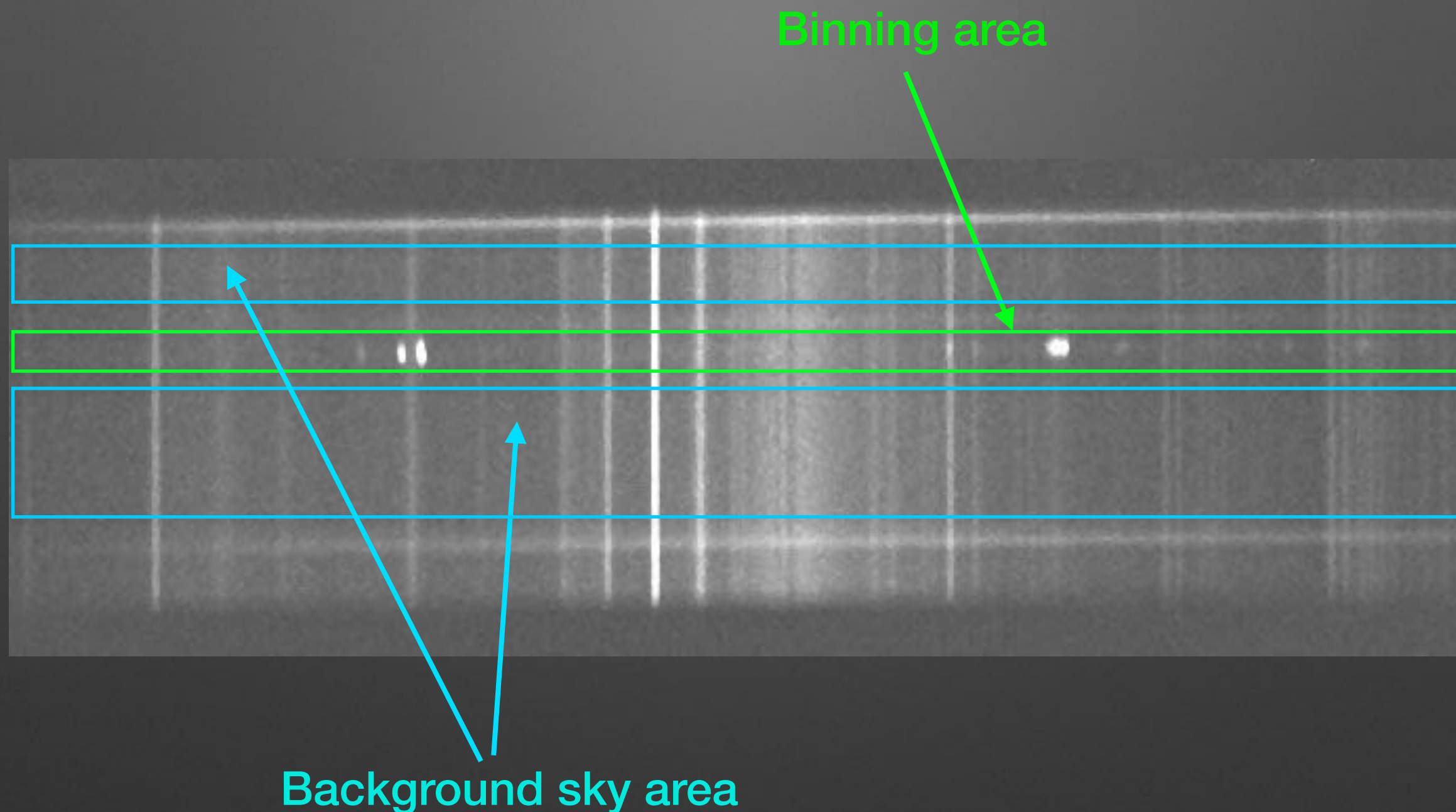
Take spectra

Raw spectrum : 900s exposure (hot pixels removed)



Process spectra

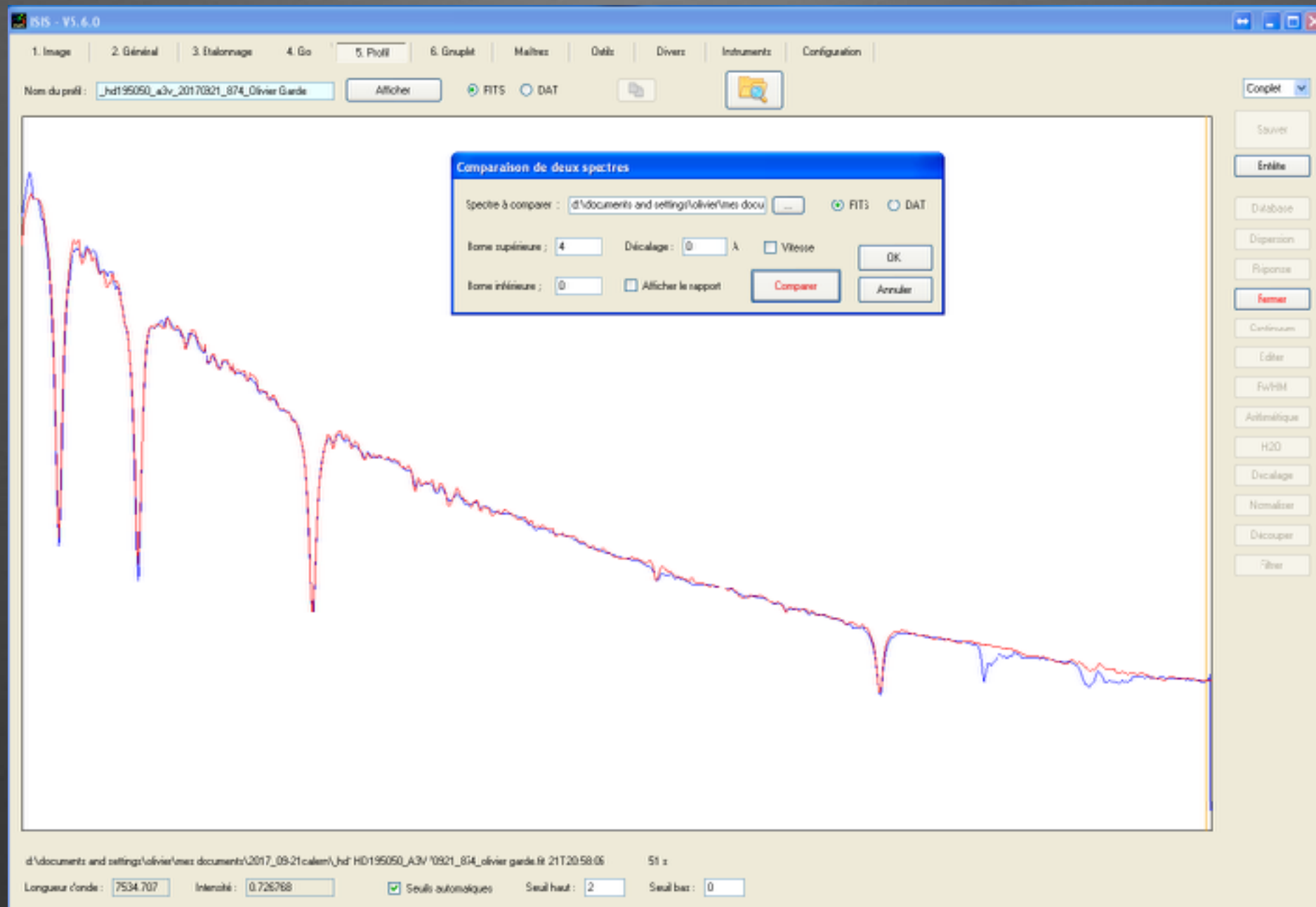
Raw spectrum : 900s exposure (hot pixels removed)



During the reduction process -> subtraction of the background sky

Take spectra

Reference star for instrumental response

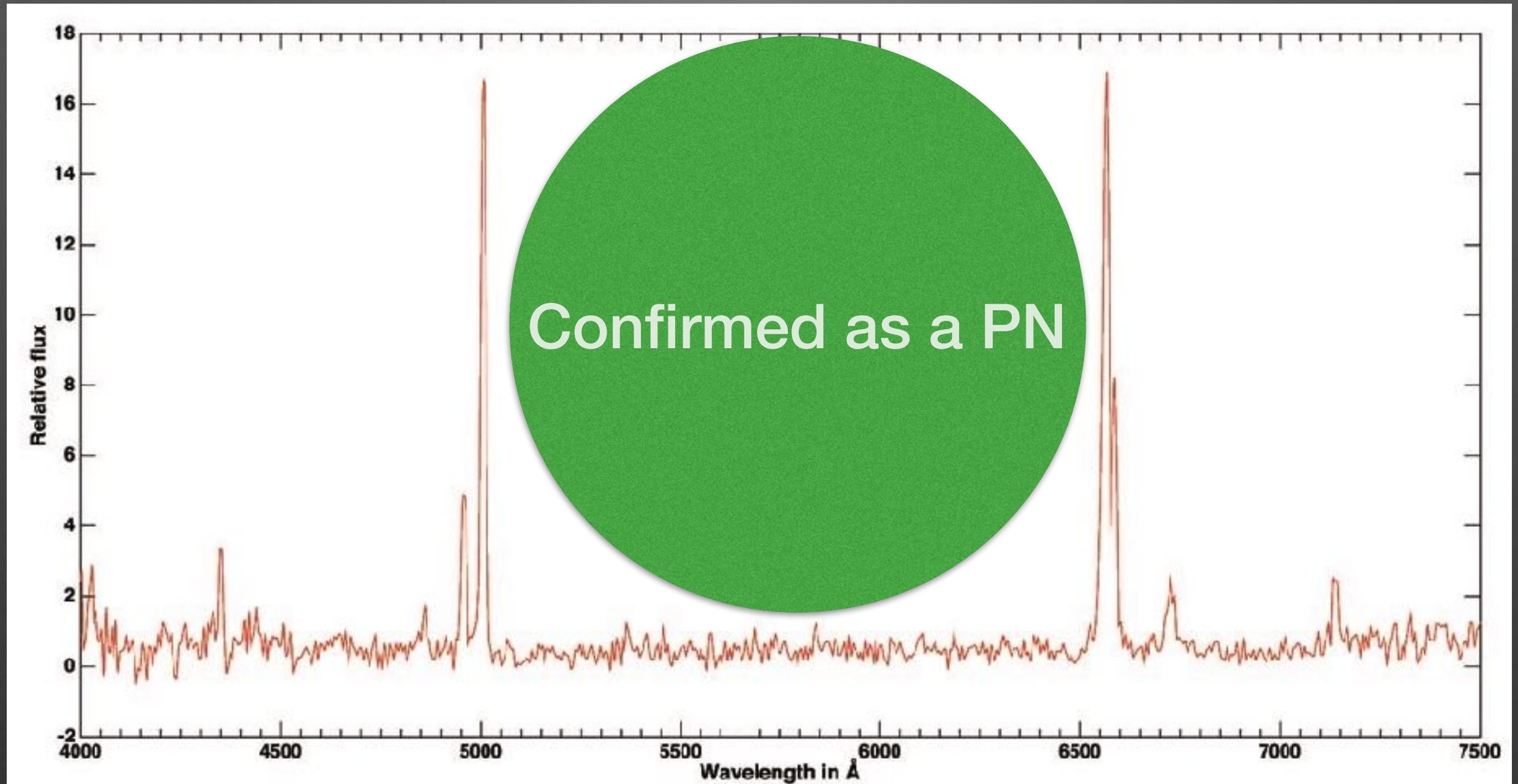


In red : a Pickles or Miles reference spectrum

In blue : The star taken on the sky

Some results

Ra 24



4 x 900s with a LISA R=420 (50μm slit)

Some results

Ra 24

PN Ra 24

other query modes : Identifier query Coordinate query Criteria query Reference query Basic query Script submission TAP Output options Help

C.D.S. - SIMBAD4 rel 1.7 - 2019.02.13CET16:39:39

Available data : Basic data • Identifiers • Plot & Images • Bibliography • Measurements • External archives • Notes • Annotations

Basic data :

NAME PN Ra 24 -- Planetary Nebula

Other object types: PN (RC3,PN), ISM (IPEASX)

ICRS coord. (*ep*=J2000) : 19 37 40.0 +20 35 47 [] D 2015LAstr.129b..42F

FK4 coord. (*ep*=B1950 *eq*=1950) : 19 35 29.1 +20 28 57 []

Gal coord. (*ep*=J2000) : 056.4230 -00.3725 []

Angular size (*arcmin*): 0.52 0.52 90 (Opt) D 2014MNRAS.443.3388S

SIMBAD query around with radius 2 arcmin

Interactive AladinLite view

19 37 40.000 +20 35 47.00

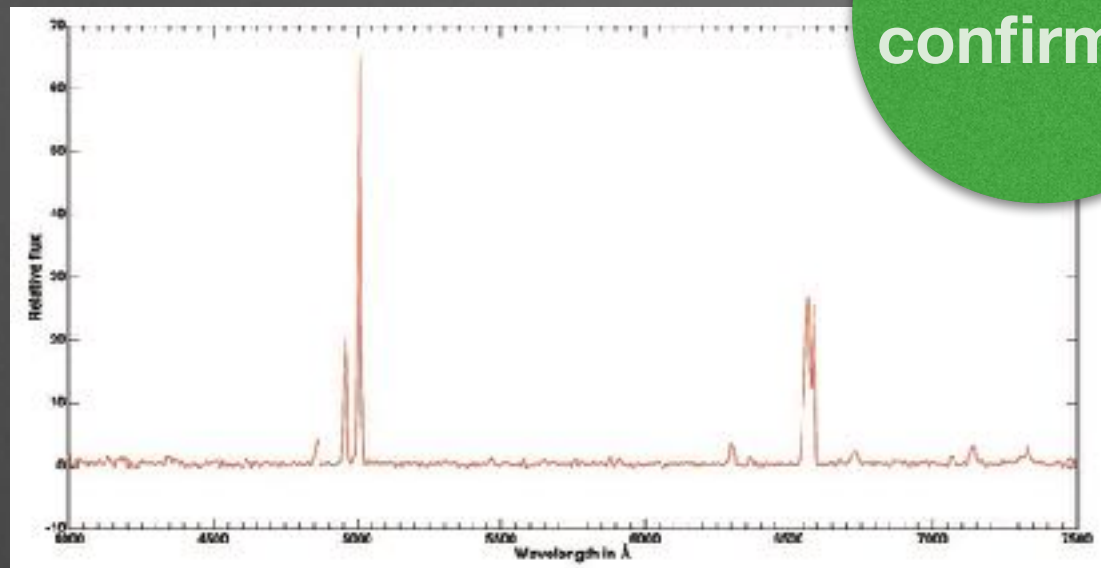
F0.1 1.99'

2MASS DSS SDSS

Now referenced in SIMBAD as a PN

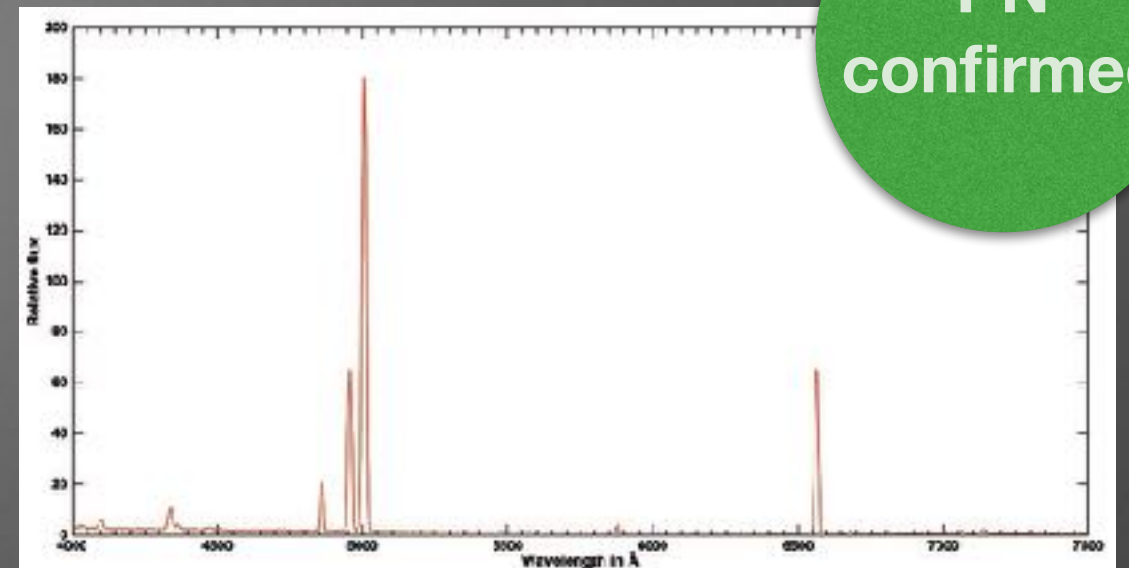
Some results

Pa 21



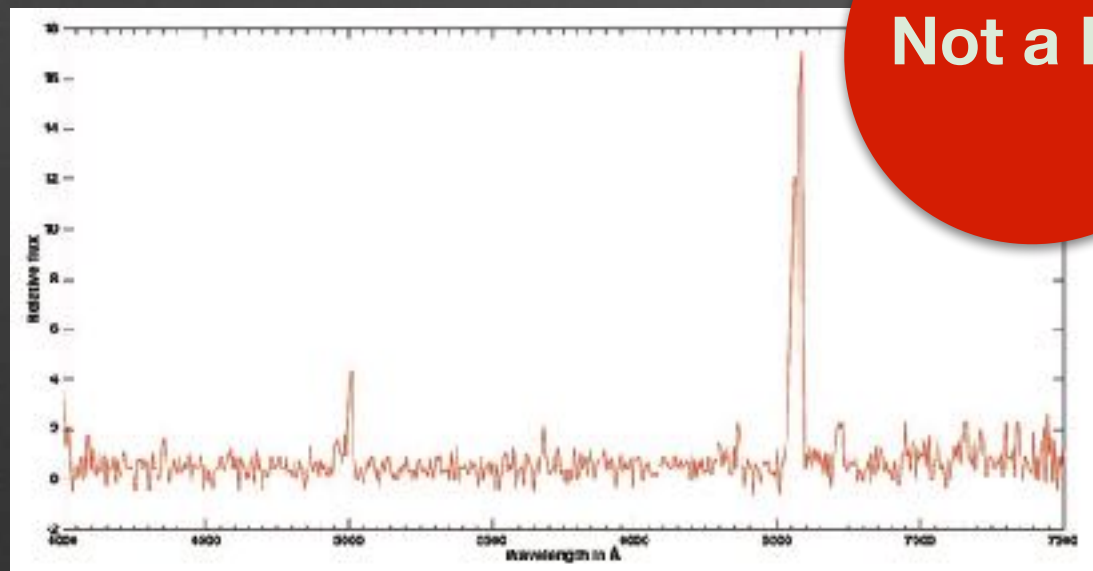
PN
confirmed

Kn 66



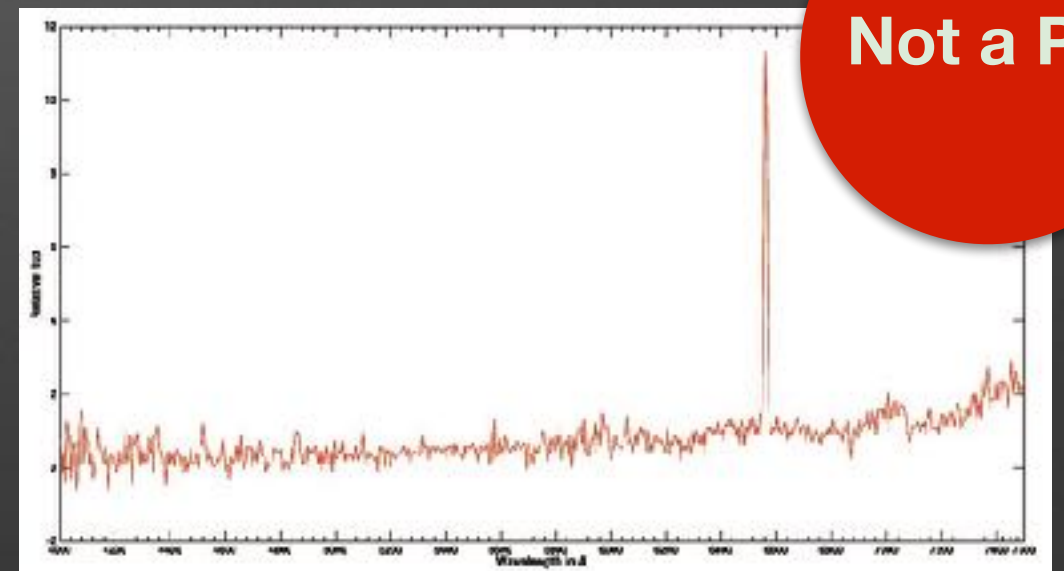
PN
confirmed

Ra 50



Not a PN

DeGaPe 32

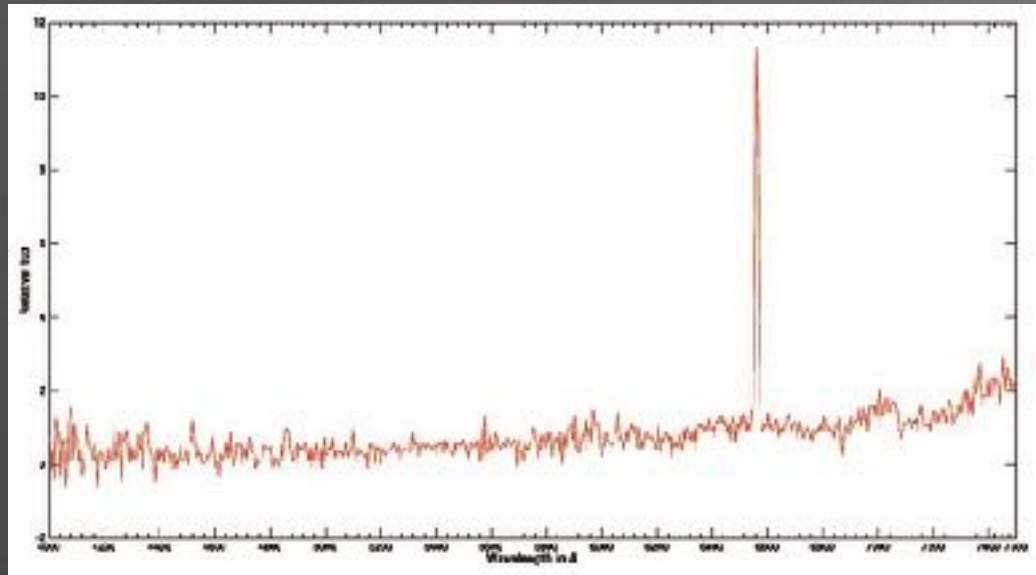


Not a PN

All these targets are under study

Some strange objects

DeGaPe 32



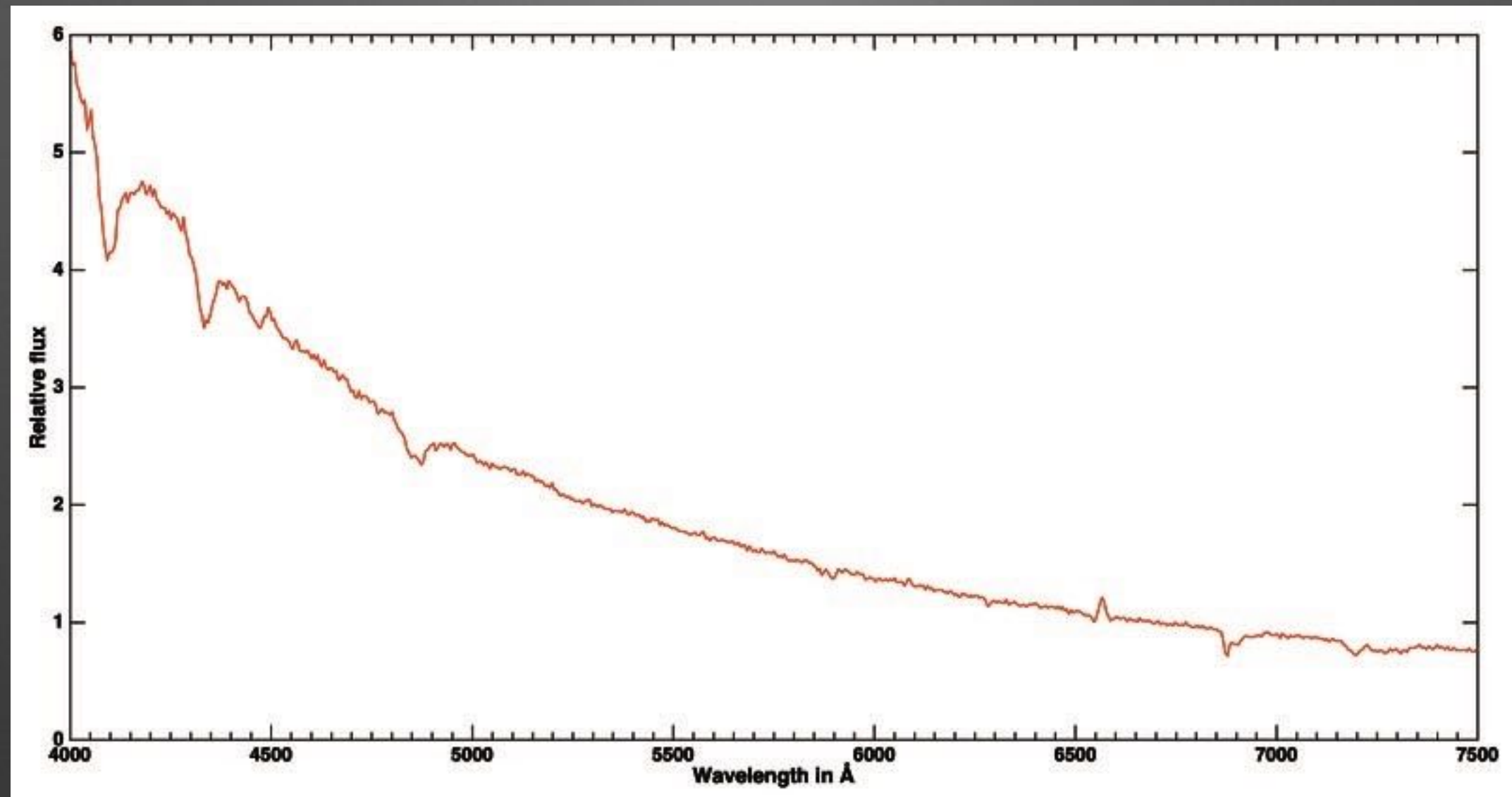
Only H alpha emission line is present

Comments by Pr Steve Shore

«DeGaPe 32 has an odd Balmer ratio but that could be an underlying photospheric absorption spectrum (so beta is weaker than it should be), the excitations very low and there's no metal line emission so this **could** be a **massive star**, heavily reddened, and perhaps a **B supergiant** of the sort of LBV group (this is near the Galactic plane, no?). The lack of forbidden lines sets an upper limit to both ionization and excitation (moderate density, perhaps some P Cyg), this could even be a **Be star** but neither a HAEBE nor a B[e].»

Some strange objects

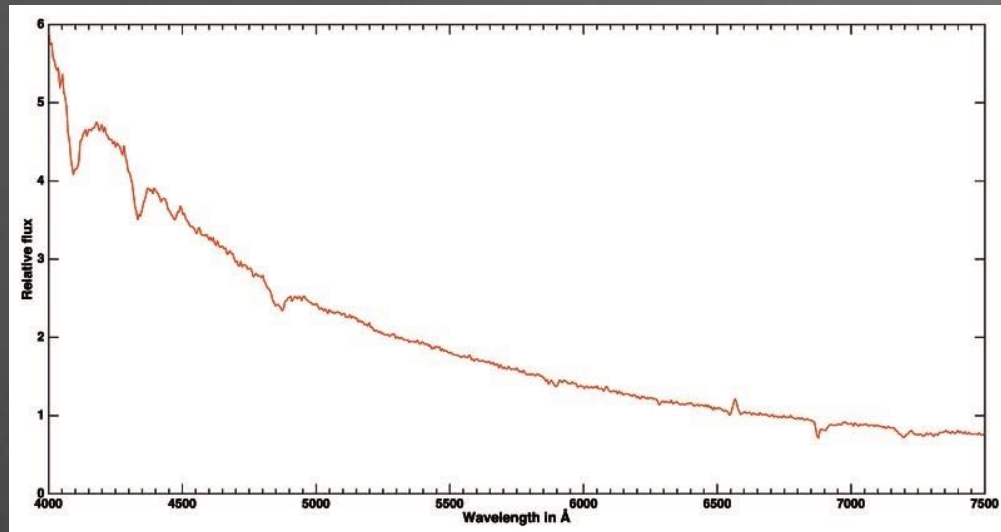
Hu 6



- Balmer lines are present
- Small H alpha emission

Some strange objects

Hu 6



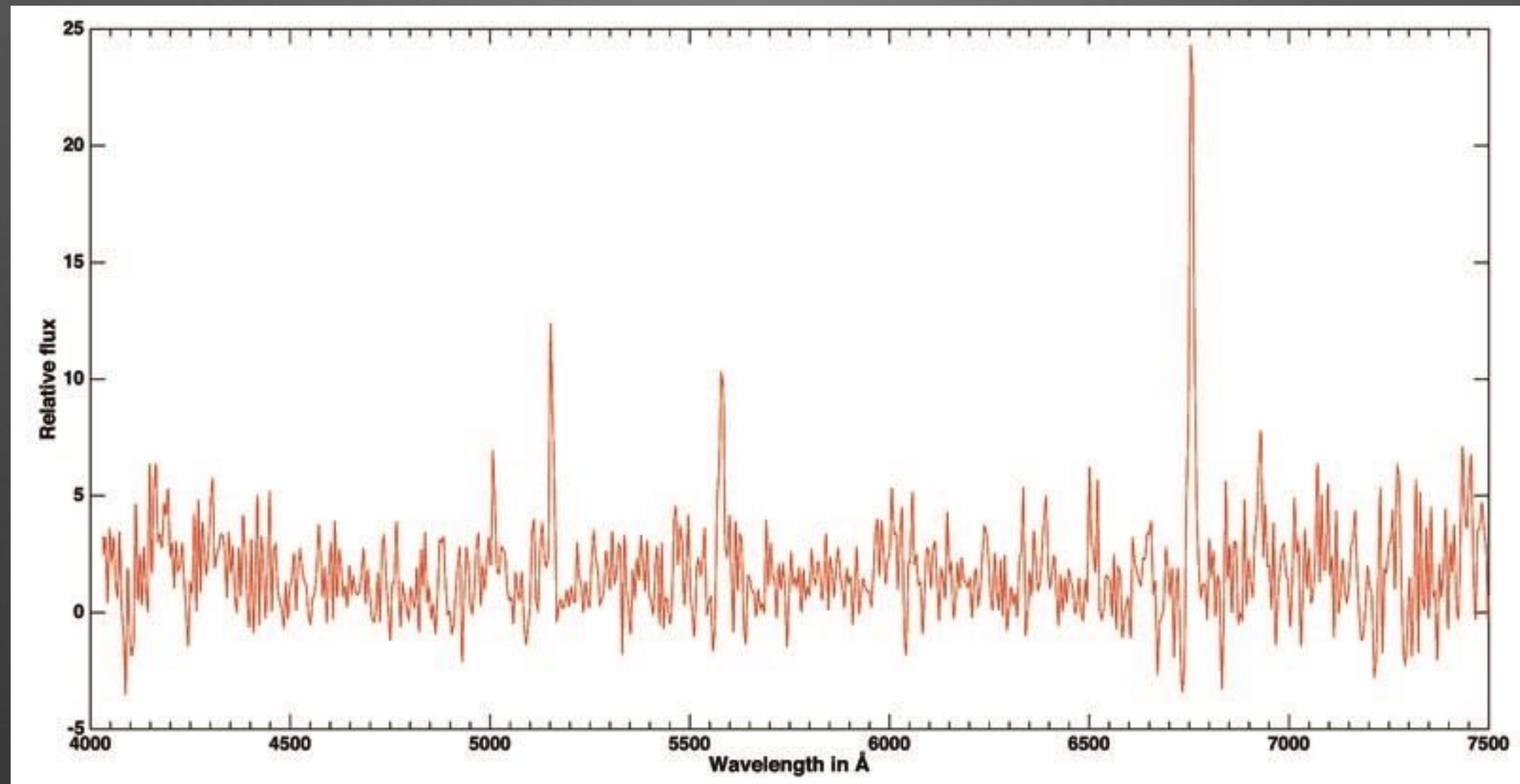
Can be a dwarf nova
(type DA WD)

Comments by Pr Steve Shore

*«Before even reading your comment, Olivier, I called this a DA type spectrum emission in the Balmer lines (just seeing the fits file). It's not *that* hot, there's an already known system CY Lyr within 10 arsec. This has a model for the UV (from an IUE low resolution observation) that gives a fit to the disk but not the WD. The optical wasn't used and it was an outburst spectrum (<http://iopscience.iop.org/article/10.1086/519065/pdf>). It's definitely not a protoplanetary or planetary. It's interesting that the Balmer emission is so weak now, that's why I think it's a **DA WD** with emission instead of what (after trying to type this) is said in then literature.*

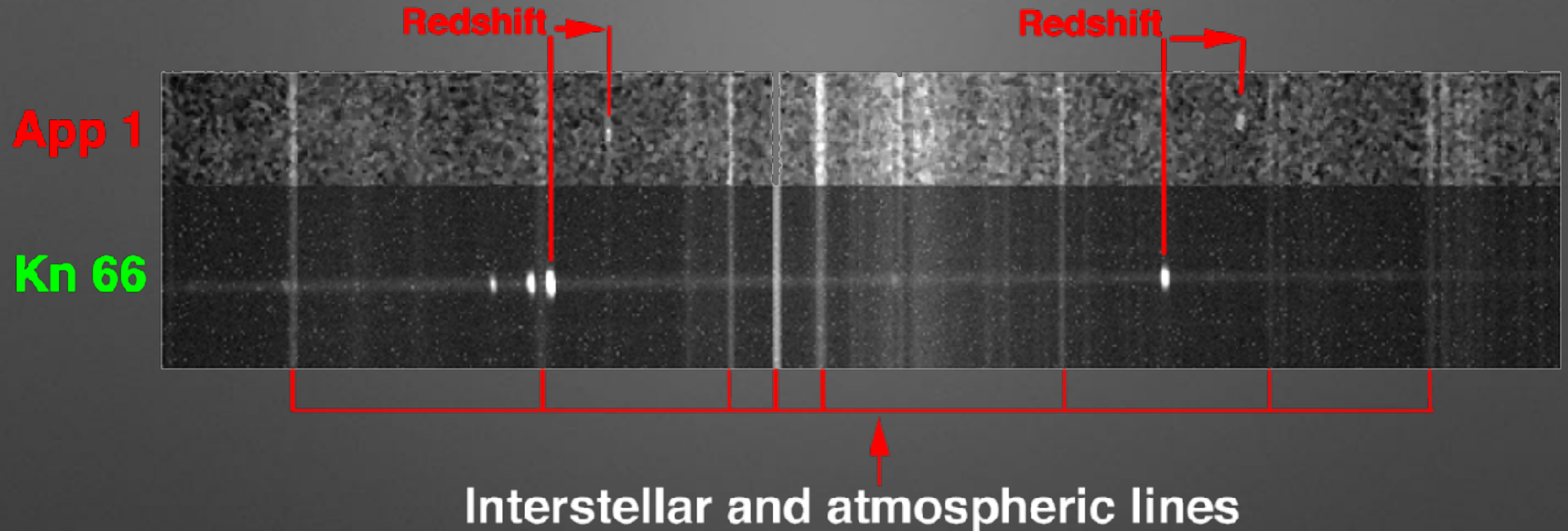
Some strange objects

App1



Emissions lines are not in the « right place »

Some strange objects



A big redshift
App 1 is not a target in our galaxy

Some strange objects

App 1

Elements	λ_0	λ_1	z
[Ar IV] 4740	4740,20	4877,92	0,02905
H β	4861,33	5007,32	0,03003
[OIII] 4959	4958,92	5106,58	0,02978
[OIII] 5007	5006,85	5153,06	0,02920
HeII 5412	5411,52	5576,45	0,03048
[SIII] 6312	6312,10	6497,35	0,02935
H α	6562,82	6756,16	0,02946
[SII] 6731	6730,70	6925,76	0,02898
Average z = 0,02954			

$$z = \frac{\lambda_{\text{Obs}} - \lambda_0}{\lambda_0}$$

Leak velocity $\approx$ 8.700 km/s - Distance $\approx$ 192 126 000 l.y.

Article in progress....

Astronomy & Astrophysics manuscript no. "VGB 3 galaxies"
January 27, 2019

©ESO 2019

Three new AGN found in spectroscopy

O. GARDE¹ P. LE DÛ² Dr. M. KOENIG³ P. DUBREUIL⁴ A. LOPEZ⁵ B. GUÉGAN⁶

¹ Observatoire de la Tourbière - F-38690 Chabons - France
e-mail: o.garde@free.fr

² Observatoire de Kermorien - F-29840 Porspoder - France
e-mail: pascal.le.du@shom.fr

³ Gernotstr. 14 D-64668 Rimbach, Germany

⁴ F-06790 Aspremont, France

⁵ F-06110 Le Cannet, France

⁶ CALA - F-69120 Vaulx-en-Velin, France

Preprint version: January 27, 2019

ABSTRACT

Context. Unreferenced objects are regularly discovered by amateur astronomers on their own images or on existing survey images, mostly planetary nebulae.

Aims. To deduce their nature, a group of amateur, the PNST (Planetary Nebulae Spectro Tracker) try to make spectra of these objects in order to identify them.

Methods. The choice of a particularly sensitive spectrograph was necessary : in order to highlight the spectral signature of these very weak objects on all the visible wavelengths domain.

Results. During two observation campaigns at the Côte d'Azur observatory on the Calern site, tree particular objects could be identified as active nucleus galaxies not yet listed.

Discovery of 3 unlisted galaxies

Conclusion

Only **32** PN could be confirmed

PN RA 9

other query modes : Identifier query Coordinate query Criteria query Reference query Basic query Script submission TAP Output options Help

Query : PN RA 9 C.D.S. - SIMBAD4 rel 1.5.8 - 2016.09.17CEST12:25:04

Available data : Basic data • Identifiers • Plot & images • Bibliography • Measurements • External archives • Notes • Annotations

Basic data :

NAME PN Ra 9 -- Possible Planetary Nebula

Other object types: PN? (Ref)

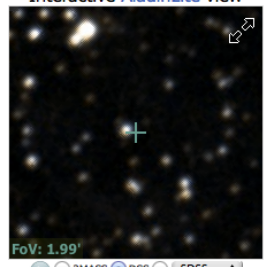
ICRS coord. (ep=J2000) : 20 31 09.0 +21 21 41 [] D 2015LAstr.129b..42F SIMBAD query around with radius 2 arcmin

FK5 coord. (ep=J2000 eq=2000) : 20 31 09.0 +21 21 41 []

FK4 coord. (ep=B1950 eq=1950) : 20 28 55.9 +21 11 31 []

Gal coord. (ep=J2000) : 063.7177 -10.5591 []

Interactive AladinLite view



FoV: 1.99'

2MASS DSS SDSS

PN Ldu 13

other query modes : Identifier query Coordinate query Criteria query Reference query Basic query Script submission TAP Output options Help

Query : PN Ldu 13 C.D.S. - SIMBAD4 rel 1.5.8 - 2016.09.17CEST12:26:16

Available data : Basic data • Identifiers • Plot & images • Bibliography • Measurements • External archives • Notes • Annotations

Basic data :

NAME PN Ldu 13 -- Planetary Nebula

Other object types: PN (Ref,PN), ISM (IPHASK)

ICRS coord. (ep=J2000) : 23 38 40.430 +61 41 40.90 [] D 2015LAstr.129a..42F SIMBAD query around with radius 2 arcmin

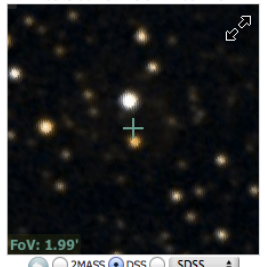
FK5 coord. (ep=J2000 eq=2000) : 23 38 40.430 +61 41 40.90 []

FK4 coord. (ep=B1950 eq=1950) : 23 36 18.75 +61 25 03.7 []

Gal coord. (ep=J2000) : 114.4192 +00.0315 []

Angular size (arcmin): 1.02 1.02 90 (Opt) D 2014MNRAS.443.3388S

Interactive AladinLite view

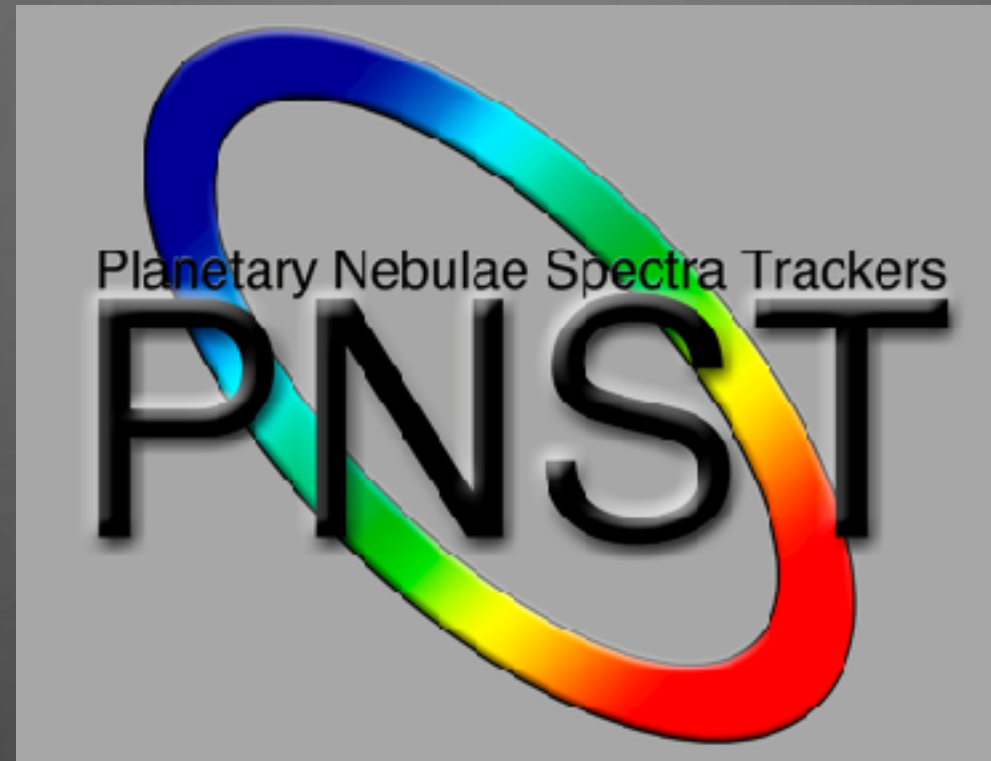


FoV: 1.99'

2MASS DSS SDSS

400 PN candidates expect to have a spectrum...

Information about PN confirmation



PNST has a new website (available in march 2019)

<http://planetarynebulae.net>

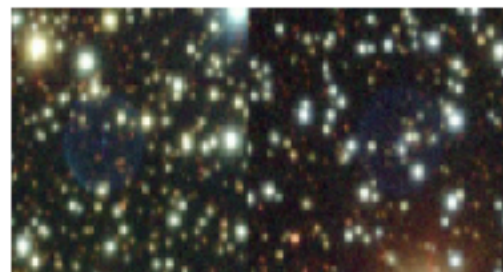
Information about PN confirmation

Planetary Nebulae .net

Actualité et catalogues des
nébuleuses planétaires francophones.

ACCUEIL | CATALOGUES | DOCUMENTATION | CANDIDATURE

Actualité des nébuleuses planétaires

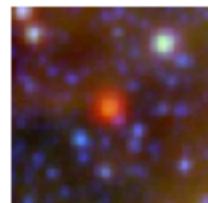


20 Février 2019 - Thomas Petit

Découverte

Mise à jour des bases de données - Février 2019

De nouveaux objets ont été découverts par les astronomes amateurs ces dernières semaines. 30 candidates nébuleuses planétaires et 7 objets ont ainsi été ajoutés à nos bases de données.



8 Janvier 2019
Thomas Petit

Découverte

Mise à jour des bases de données - Janvier 2019



26 Septembre 2018
Pascal Le Dû

Rapport de mission

Mission PNST: Calern 17-22 septembre 2018



10 Septembre 2018
Pascal Le Dû

Rapport de mission

Mission PNST: AstroQueyras 01-09 sept. 2018



20 Juillet 2018
Pascal Le Dû

Rapport de mission

Mission PNST: OHP 13-18 juillet 2018

Respecter les majuscules et les espaces !

Exemple: PN-G 262.4-01.5 ou DeCaPe 32

Recherche...

Valider

Recherche avancée...

Classification actuelle:

465 entrées au total, dont:

- 33 nébuleuses planétaires
- 13 nébuleuses planétaires probables
- 333 nébuleuses planétaires possibles
- 86 objets de natures différentes
- 48 spectres réalisés

En 2019...

59 entrées ont été ajoutées aux bases de données, dont:
- 43 candidates NP et 16 "objets"

Candidates NP non encore publiées:

Nom	Coord. galactiques	Origine
St 26	PN-G 301.0-04.5	DECaPS
St 25	PN-G 288.9+00.9	DECaPS, WISE
St 24	PN-G 337.2+02.2	DECaPS, SHS, WISE
St 23	PN-G 347.6-02.8	DECaPS, WISE
St 22	PN-G 299.2-03.1	DECaPS, SHS
Pre 64	PN-G 357.4-02.0	SHS, DECaPS
Pre 63	PN-G 356.1+05.1	SHS, DECaPS

Information about PN confirmation

The French magazine

« **L'Astronomie** »
(in French only)



The issues about PN :

- #68 January 2014
- #80 February 2015
- #91 February 2016
- #102 February 2017
- #114 March 2018
- #125 March 2019

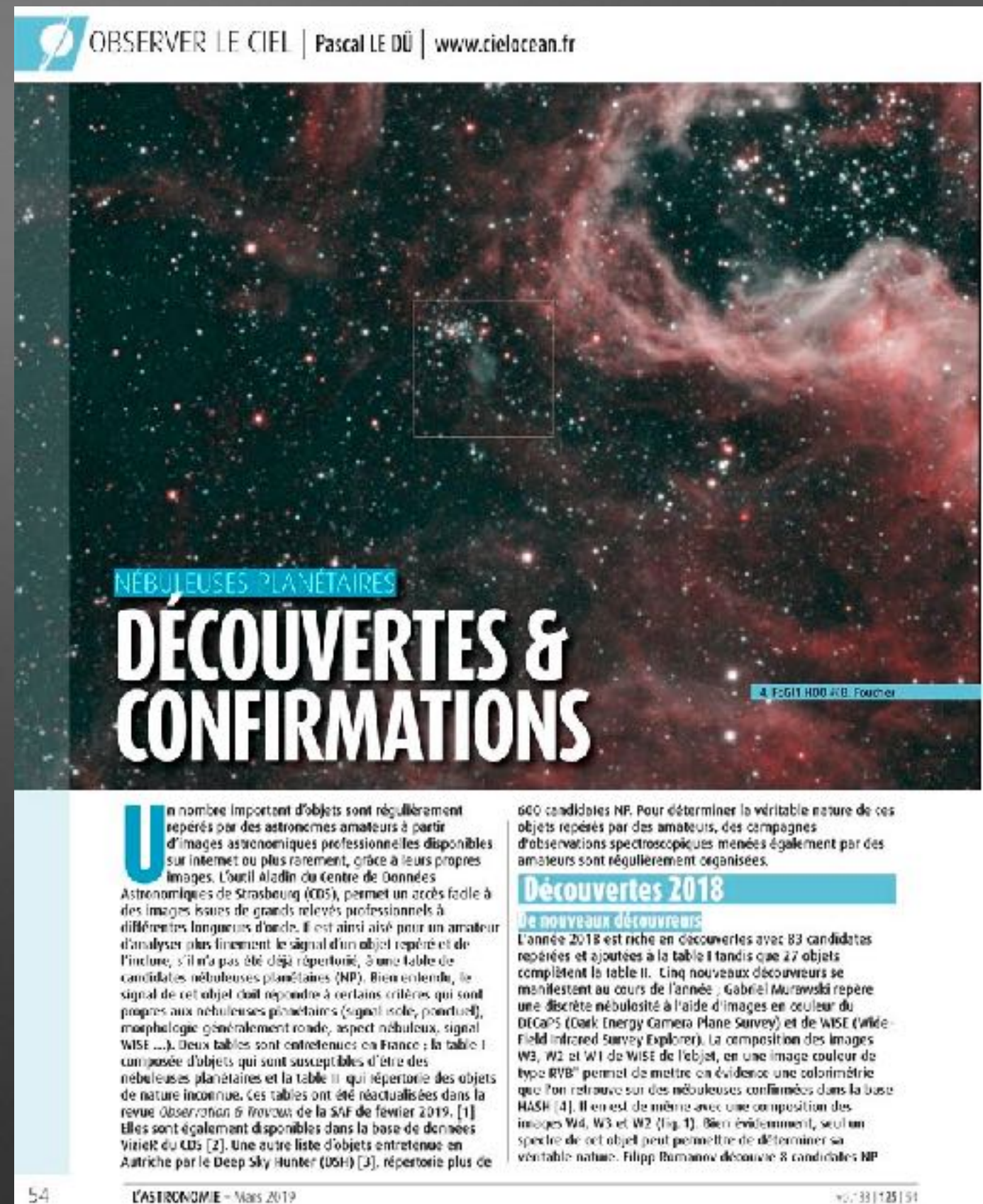


Information about PN confirmation

L'ASTRONOMIE
LE MENSUEL DE RÉFÉRENCE DES SCIENCES DE L'UNIVERS

Forthcomming
in **#125** issue

6 pages article
write by **Pascal Le Dû**



Information about PN confirmation

Planetary nebulae discovered and confirmed by amateur astronomers

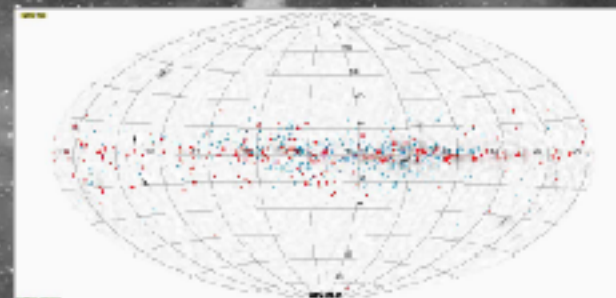
P. LeBlond¹, G.A. Parker², D. Garde³ on behalf of the UMSI team⁴, AIP⁵ team⁶, J.P. Coles¹, S. Charvát¹, J. Ferrero¹,
I. Hual¹, I. Mulato¹, M. Gethers¹, T. Prossgard¹, G. Sun¹, H. Tan¹, M. Vanhuyse¹ and S. Zoll¹

¹DSH Collaboration, ²University of Hong Kong, ³Tsinghua University
email: indraghosh@tshu.edu.cn

— S. Charbonet, P. Delnault, P. Le Dô, T. Lemoine, A. Lopez and S. Garde

Context

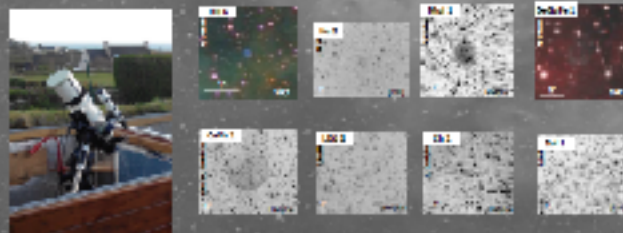
Unreferenced objects from the sky are regularly discovered by amateur astronomers from their own images or from professional images. Like the DSH list, thanks to the initiative of Agnès Acker and Pascal Le Dé¹ [15], a list of planetary nebulae candidates is maintained in France and regularly published in the *BAN* magazine and then in *VizieV*. Recently, amateur astronomers specializing in spectroscopy have managed to observe the spectra of some of these candidates to confirm their nature.



UN Candidates from ESH* list (blue) and French list (red)

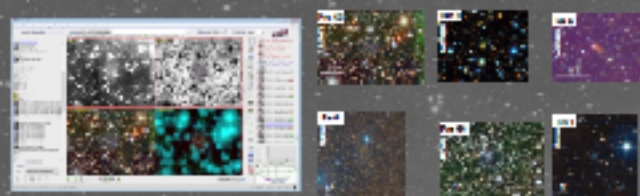
Planetary nebulae detections

Discovery from amateur images



The deletions are mainly made from instruments of small diameters with low FOV ratio, using efficient cameras with large, sensitive detectors, equipped with I alpha, [OII] and [SII] narrow-band filters [1].

Discovery from professional images



Photometric surveys at different wavelengths are easily accessible from advanced tools like Aladin from the CDS. Objects are searched in the visible (DS3, DFCaPS...) but also in the medium infrared (WISE...) [7][34].

Spectroscopies confirmations

Instruments and teams

The spectra of some candidates were acquired with modest instruments from 0.09 m to 0.3 m diameter. Specific missions have allowed amateur teams like the PNST to use larger telescopes from 0.5 m (VerniGeyras) to 1 m (Colem) diameter. The spectrographs used are of low resolution at $R \sim 5$.



Some observed candidates

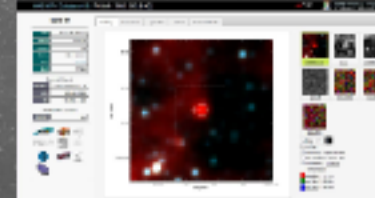
State	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34	2034-35	2035-36	2036-37	2037-38	2038-39	2039-40	2040-41	2041-42	2042-43	2043-44	2044-45	2045-46	2046-47	2047-48	2048-49	2049-50	2050-51	2051-52	2052-53	2053-54	2054-55	2055-56	2056-57	2057-58	2058-59	2059-60	2060-61	2061-62	2062-63	2063-64	2064-65	2065-66	2066-67	2067-68	2068-69	2069-70	2070-71	2071-72	2072-73	2073-74	2074-75	2075-76	2076-77	2077-78	2078-79	2079-80	2080-81	2081-82	2082-83	2083-84	2084-85	2085-86	2086-87	2087-88	2088-89	2089-90	2090-91	2091-92	2092-93	2093-94	2094-95	2095-96	2096-97	2097-98	2098-99	2099-00	2100-01	2101-02	2102-03	2103-04	2104-05	2105-06	2106-07	2107-08	2108-09	2109-10	2110-11	2111-12	2112-13	2113-14	2114-15	2115-16	2116-17	2117-18	2118-19	2119-20	2120-21	2121-22	2122-23	2123-24	2124-25	2125-26	2126-27	2127-28	2128-29	2129-30	2130-31	2131-32	2132-33	2133-34	2134-35	2135-36	2136-37	2137-38	2138-39	2139-40	2140-41	2141-42	2142-43	2143-44	2144-45	2145-46	2146-47	2147-48	2148-49	2149-50	2150-51	2151-52	2152-53	2153-54	2154-55	2155-56	2156-57	2157-58	2158-59	2159-60	2160-61	2161-62	2162-63	2163-64	2164-65	2165-66	2166-67	2167-68	2168-69	2169-70	2170-71	2171-72	2172-73	2173-74	2174-75	2175-76	2176-77	2177-78	2178-79	2179-80	2180-81	2181-82	2182-83	2183-84	2184-85	2185-86	2186-87	2187-88	2188-89	2189-90	2190-91	2191-92	2192-93	2193-94	2194-95	2195-96	2196-97	2197-98	2198-99	2199-00	2200-01	2201-02	2202-03	2203-04	2204-05	2205-06	2206-07	2207-08	2208-09	2209-10	2210-11	2211-12	2212-13	2213-14	2214-15	2215-16	2216-17	2217-18	2218-19	2219-20	2220-21	2221-22	2222-23	2223-24	2224-25	2225-26	2226-27	2227-28	2228-29	2229-30	2230-31	2231-32	2232-33	2233-34	2234-35	2235-36	2236-37	2237-38	2238-39	2239-40	2240-41	2241-42	2242-43	2243-44	2244-45	2245-46	2246-47	2247-48	2248-49	2249-50	2250-51	2251-52	2252-53	2253-54	2254-55	2255-56	2256-57	2257-58	2258-59	2259-60	2260-61	2261-62	2262-63	2263-64	2264-65	2265-66	2266-67	2267-68	2268-69	2269-70	2270-71	2271-72	2272-73	2273-74	2274-75	2275-76	2276-77	2277-78	2278-79	2279-80	2280-81	2281-82	2282-83	2283-84	2284-85	2285-86	2286-87	2287-88	2288-89	2289-90	2290-91	2291-92	2292-93	2293-94	2294-95	2295-96	2296-97	2297-98	2298-99	2299-00	2300-01	2301-02	2302-03	2303-04	2304-05	2305-06	2306-07	2307-08	2308-09	2309-10	2310-11	2311-12	2312-13	2313-14	2314-15	2315-16	2316-17	2317-18	2318-19	2319-20	2320-21	2321-22	2322-23	2323-24	2324-25	2325-26	2326-27	2327-28	2328-29	2329-30	2330-31	2331-32	2332-33	2333-34	2334-35	2335-36	2336-37	2337-38	2338-39	2339-40	2340-41	2341-42	2342-43	2343-44	2344-45	2345-46	2346-47	2347-48	2348-49	2349-50	2350-51	2351-52	2352-53	2353-54	2354-55	2355-56	2356-57	2357-58	2358-59	2359-60	2360-61	2361-62	2362-63	2363-64	2364-65	2365-66	2366-67	2367-68	2368-69	2369-70	2370-71	2371-72	2372-73	2373-74	2374-75	2375-76	2376-77	2377-78	2378-79	2379-80	2380-81	2381-82	2382-83	2383-84	2384-85	2385-86	2386-87	2387-88	2388-89	2389-90	2390-91	2391-92	2392-93	2393-94	2394-95	2395-96	2396-97	2397-98	2398-99	2399-00	2400-01	2401-02	2402-03	2403-04	2404-05	2405-06	2406-07	2407-08	2408-09	2409-10	2410-11	2411-12	2412-13	2413-14	2414-15	2415-16	2416-17	2417-18	2418-19	2419-20	2420-21	2421-22	2422-23	2423-24	2424-25	2425-26	2426-27	2427-28	2428-29	2429-30	2430-31	2431-32	2432-33	2433-34	2434-35	2435-36	2436-37	2437-38	2438-39	2439-40	2440-41	2441-42	2442-43	2443-44	2444-45	2445-46	2446-47	2447-48	2448-49	2449-50	2450-51	2451-52	2452-53	2453-54	2454-55	2455-56	2456-57	2457-58	2458-59	2459-60	2460-61	2461-62	2462-63	2463-64	2464-65	2465-66	2466-67	2467-68	2468-69	2469-70	2470-71	2471-72	2472-73	2473-74	2474-75	2475-76	2476-77	2477-78	2478-79	2479-80	2480-81	2481-82	2482-83	2483-84	2484-85	2485-86	2486-87	2487-88	2488-89	2489-90	2490-91	2491-92	2492-93	2493-94	2494-95	2495-96	2496-97	2497-98	2498-99	2499-00	2500-01	2501-02	2502-03	2503-04	2504-05	2505-06	2506-07	2507-08	2508-09	2509-10	2510-11	2511-12	2512-13	2513-14	2514-15	2515-16	2516-17	2517-18	2518-19	2519-20	2520-21	2521-22	2522-23	2523-24	2524-25	2525-26	2526-27	2527-28	2528-29	2529-30	2530-31	2531-32	2532-33	2533-34	2534-35	2535-36	2536-37	2537-38	2538-39	2539-40	2540-41	2541-42	2542-43	2543-44	2544-45	2545-46	2546-47	2547-48	2548-49	2549-50	2550-51	2551-52	2552-53	2553-54	2554-55	2555-56	2556-57	2557-58	2558-59	2559-60	2560-61	2561-62	2562-63	2563-64	2564-65	2565-66	2566-67	2567-68	2568-69	2569-70	2570-71	2571-72	2572-73	2573-74	2574-75	2575-76	2576-77	2577-78	2578-79	2579-80	2580-81	2581-82	2582-83	2583-84	2584-85	2585-86	2586-87	2587-88	2588-89	2589-90	2590-91	2591-92	2592-93	2593-94	2594-95	2595-96	2596-97	2597-98	2598-99	2599-00	2600-01	2601-02	2602-03	2603-04	2604-05	2605-06	2606-07	2607-08	2608-09	2609-10	2610-11	2611-12	2612-13	2613-14	2614-15	2615-16	2616-17	2617-18	2618-19	2619-20	2620-21	2621-22	2622-23	2623-24	2624-25	2625-26	2626-27	2627-28	2628-29	2629-30	2630-31	2631-32	2632-33	2633-34	2634-35	2635-36	2636-37	2637-38	2638-39	2639-40	2640-41	2641-42	2642-43	2643-44	2644-45	2645-46	2646-47	2647-48	2648-49	2649-50	2650-51	2651-52	2652-53	2653-54	2654-55	2655-56	2656-57	2657-58	2658-59	2659-60	2660-61	2661-62	2662-63	2663-64	2664-65	2665-66	2666-67	2667-68	2668-69	2669-70	2670-71	2671-72	2672-73	2673-74	2674-75	2675-76	2676-77	2677-78	2678-79	2679-80	2680-81	2681-82	2682-83	2683-84	2684-85	2685-86	2686-87	2687-88	2688-89	2689-90	2690-91	2691-92	2692-93	2693-94	2694-95	2695-96	2696-97	2697-98	2698-99	2699-00	2700-01	2701-02	2702-03	2703-04	2704-05	2705-06	2706-07	2707-08	2708-09	2709-10	2710-11	2711-12	2712-13	2713-14	2714-15	2715-16	2716-17	2717-18	2718-19	2719-20	2720-21	2721-22	2722-23	2723-24	2724-25	2725-26	2726-27	2727-28	2728-29	2729-30	2730-31	2731-32	2732-33	2733-34	2734-35	2735-36	2736-37	2737-38	2738-39	2739-40	2740-41	2741-42	2742-43	2743-44	2744-45	2745-46	2746-47	2747-48	2748-49	2749-50	2750-51	2751-52	2752-53	2753-54	2754-55	2755-56	2756-57	2757-58	2758-59	2759-60	2760-61	2761-62	2762-63	2763-64	2764-65	2765-66	2766-67	2767-68	2768-69	2769-70	2770-71	2771-72	2772-73	2773-74	2774-75	2775-76	2776-77	2777-78	2778-79	2779-80	2780-81	2781-82	2782-83	2783-84	2784-85	2785-86	2786-87	2787-88	2788-89	2789-90	2790-91	2791-92	2792-93	2793-94	2794-95	2795-96	2796-97	2797-98	2798-99	2799-00	2800-01	2801-02	2802-03	2803-04	2804-05	2805-06	2806-07	2807-08	2808-09	2809-10	2810-11	2811-12	2812-13	2813-14	2814-15	2815-16	2816-17	2817-18	2818-19	2819-20	2820-21	2821-22	2822-23	2823-24	2824-25	2825-26	2826-27	2827-28	2828-29	2829-30	2830-31	2831-32	2832-33	2833-34	2834-35	2835-36	2836-37	2837-38	2838-39	2839-40	2840-41	2841-42	2842-43	2843-44	2844-45	2845-46	2846-47	2847-48	2848-49	2849-50	2850-51	2851-52	2852-53	2853-54	2854-55	2855-56	2856-57	2857-58	2858-59	2859-60	2860-61	2861-62	2862-63	2863-64	2864-65	2865-66	2866-67	2867-68	2868-69	2869-70	2870-71	2871-72	2872-73	2873-74	2874-75	2875-76	2876-77	2877-78	2878-79	2879-80	2880-81	2881-82	2882-83	2883-84	2884-85	2885-86	2886-87	2887-88	2888-89	2889-90	2890-91	2891-92	2892-93	2893-94	2894-95	2895-96	2896-97	2897-98	2898-99	2899-00	2900-01	2901-02	2902-03	2903-04	2904-05	2905-06	2906-07	2907-08	2908-09	2909-10	2910-11	2911-12	2912-13	2913-14	2914-15	2915-16	2916-17	2917-18	2918-19	2919-20	2920-21	2921-22	2922-23	2923-24	2924-25	2925-26	2926-27	2927-28	2928-29	2929-30	2930-31	2931-32	2932-33	2933-34	2934-35	2935-36	2936-37	2937-38	2938-39	2939-40	2940-41	2941-42	2942-43	2943-44	2944-45	2945-46	2946-47	2947-48	2948-49	2949-50	2950-51	2951-52	2952-53	2953-54	2954-55	2955-56	2956-57	2957-58	2958-59	2959-60	2960-61	2961-62	2962-63	2963-64	2964-65	2965-66	2966-67	2967-68	2968-69	2969-70	2970-71	2971-72	2972-73	2973-74	2974-75	2975-76	2976-77	2977-78	2978-79	2979-80	2980-81	2981-82	2982-83	2983-84	2984-85	2985-86	2986-87	2987-88	2988-89	2989-90	2990-91	2991-92	2992-93	2993-94	2994-95	2995-96	2996-97	2997-98	2998-99	2999-00	3000-01	3001-02	3002-03	3003-04	3004-05	3005-06	3006-07	3007-08	3008-09	3009-10	3010-11	3011-12	3012-13	3013-14	3014-15	3015-16	3016-17	3017-18	3018-19	3019-20	3020-21	
-------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	--

Publications and dissemination of works

The articles published in the S&F magazine report on new discoveries of planetary-mass candidates $5\frac{1}{2}[1][1][1][1]$. The techniques used by the discoverers are described and studies is given to selected interesting 17N candidates with other objects that may resemble them.



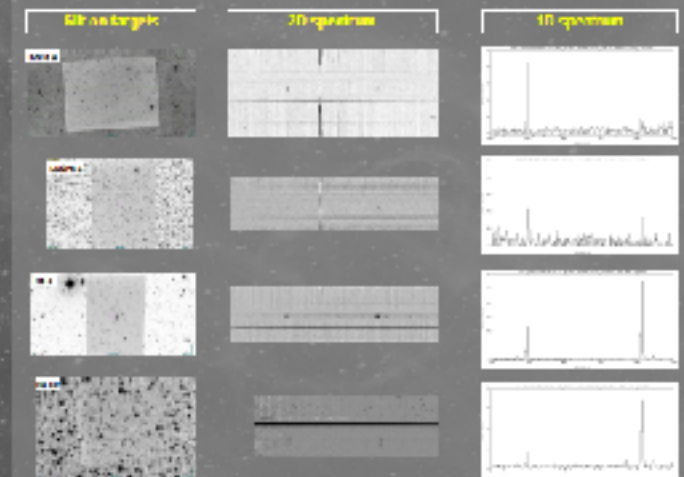
HTI candidate tables are easily searchable using the VRIET tool of the Strasbourg Astronomical Data Center (ADC) [11].



Hong Kong IAGG / Smeiburg, 14th June 1999
 nebula database (J140611) is a database of all
 known planetary nebulae, whether central or
 noncentral. Each object is associated with images,
 ultraviolet astronomy data and spectra, if available.
 The SQL database and research platform is the
 result of a collaboration between the University of
 Hong Kong, the Astronomical Observatory of
 Australia and the Astronomical Observatory of
 Smeiburg. It is maintained by Gordon Parker and
 Iwan Bujdak in Hong Kong and is open to the public.
 recently. The table of coordinates discovered by
 amateur astronomers is regularly transmitted to
 Hong Kong.

Spectrum

The instrumental response of each spectrum is determined using an observation made on a naturally non-thermalized Type A or B reference star (C 0-9, — 6) that is located near the target. Calibration is performed with Argon Fluorescent Lamp.



The treatment software generally used is ISIS. The special data are recorded with observation sheets and are transmitted to Quentin Parker.

[1] Acher, A. et al., *Nucl. Mass. Spectr.* **43**, 2225 (2012).

[2] Acher, A. et al., *Phys. Lett. B*, **714**, 316 (2012).

[3] Purvis, G. et al., *JHEP*, **03**, 200 (2003).

[2] Jacoby, G. *Light of the Art. Soc. Am.* 21, 106 (2010).

[5] Barber, G. A. et al. *Mon. Not. Roy. Astr. Soc.* 427, 3016 (2012).

4) Krumperger, M. et al. *Appl. Polym. Conf.* (2012)

[19] Li, D., P. Vassili, *Chin. J. Nat. Sci.* 35(10):140-144 (2018)

Poster presented at the SF2A congress in 2018

SMSW-2 - February 24, 2019 - Confirmation of PN candidates with spectroscopy - Olivier Garde & Pascal Le Dû

Thank you very much for your attention



Any questions ?