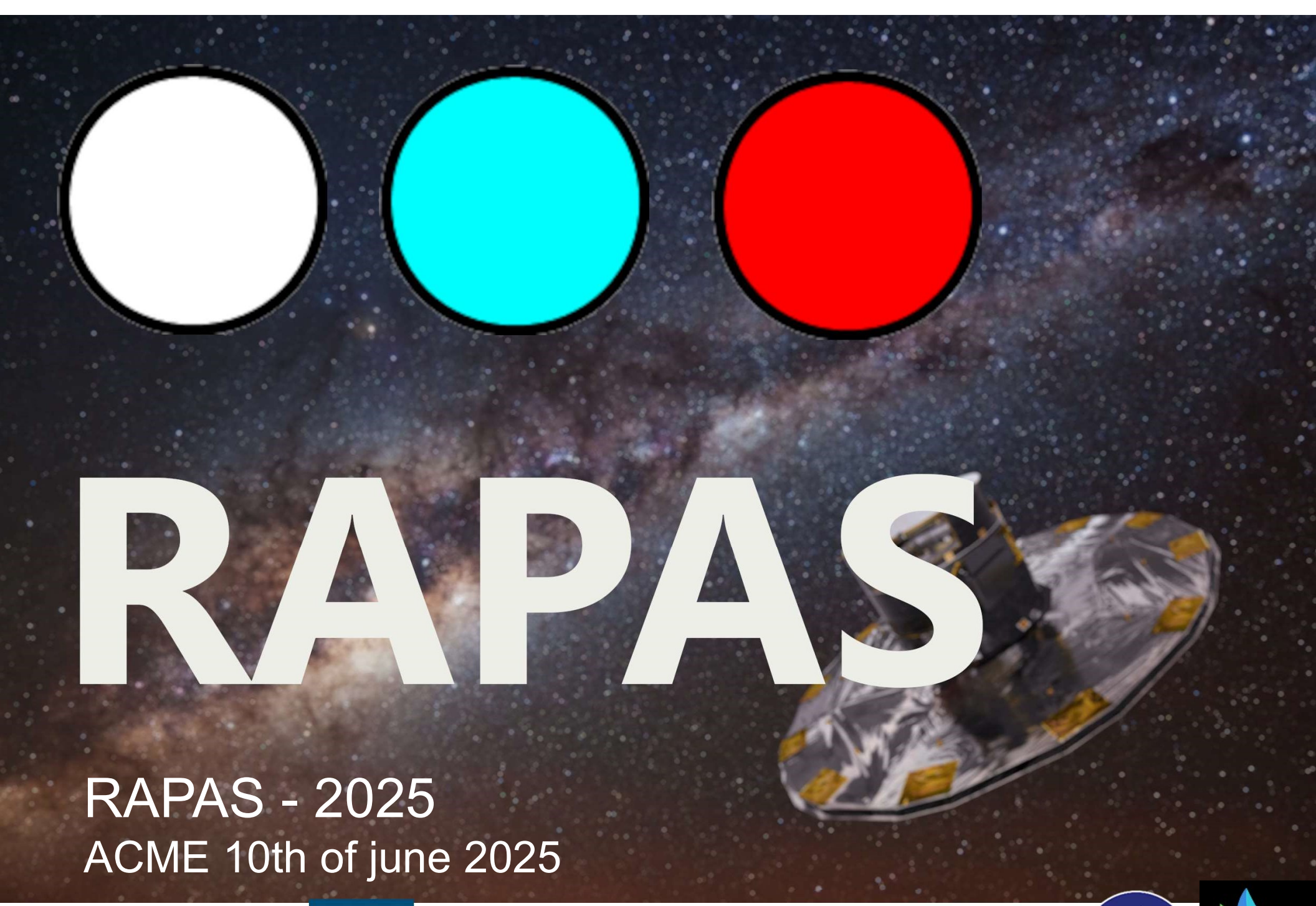
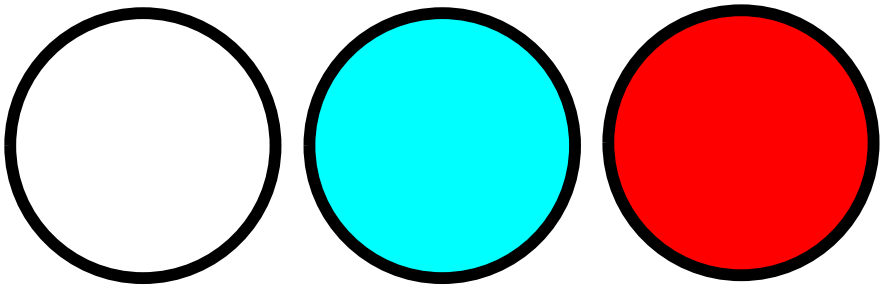


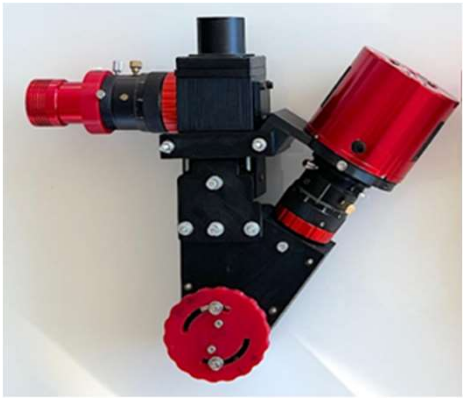
RAPAS - 2025

ACME 10th of june 2025

thierrymidavaine@sfr.fr

RAPAS : Réseau Amateur Professionnel pour les Alertes Scientifiques, a Pro-Am project





T. Midavaine[1 2], W. Thuillot[3], M. Dennefeld[4], C. Buil[5], S. Neveu[1], M. Serrau[1 6 7], F. Schüssler[8], P. Amiot[9 10], P. André[11], É. Barbotin[12], P. Barroy[7], P.M. Bergé[11], G. Biesse[1], D. Bregou[11], R. Cabanac[9 10], Y. Delisle[7], F. Denjean[25], J.L. Dumont[13], P. Dupouy[14], T. Dusserre[9 10], D. Fardin[11], J.N. Ferrier[27], J.P. Godard[16], E. Guthleben[11], R. Hellot[15], M. Irzyk[7], C. Latgé[11], C. Laulhere[1], P.Y. Lechapelain[26], A. Leroy[7 10 16], J.M. Lopez[17], F. Losse[18], E. Maris[19], J.B. Marquette[1 20], P. Martinez[1 11], P.J. Mercier[13], C. Pantacchini[21], J. Paufique[22], M. Rieutord[9 10], P.F. Rocci[7], T. Salomon[25], C. Sartini[11], R. Savalle[3], B. Tregon[28], J.M. Vienney[7], J.P. Vignes[23], A. Wünsche[24]

[1] Société astronomique de France
[2] Club Eclipse
[3] Observatoire de Paris IMCCE PSL univ
[4] Institut d'Astrophysique de Paris (IAP)
[5] ARAS AUDE
[6] Dauban Grappa
[7] TJMS Buthiers CPS Planète Sciences
[8] CEA IRFU Astro-COLIBRI
[9] Observatoire Midi Pyrénées (OMP)
[10] AT60
[11] Adagio Observatoire de Belesta
[12] Astroclub Charantais
[13] Société Astronomique de Touraine
[14] Observatoire de Dax
[15] Observatoire Rosheim - TRBL
[16] Uranoscope de l'Ile de France
[17] Observatoire des Pises
[18] Observatoire Saint Pardon de Conques
[19] CEPHEE73
[20] SF2A
[21] Observatoire de Benayes
[22] ESO
[23] Deep Sky Chile
[24] Observatoire des Baronnies Provençale
[25] Astronomie Gironde 33
[26]
[27] Escalier aux étoiles
[28] Obs du Clocher de Brantôme en Périgord

Scientific Council of Paris Observatory : API (Action Pluri-annuelle Incitative ProAm)

The Scientific Council of Paris Observatory launched a call for proposal for three years : AIP (Action PluriAnnuel Incitative ProAm) 2022 – 2023 – 2024 - extended in 2025) where RAPAS project is an API selection each years

- 2022 funding the first step :
  - the manufacturing of a first batch of 25 filters sets
  - Kick off workshop and foundation of the RAPAS network 8-9 October 2022
- 2023 funding the second step :
  - realization of 2 spectrograph prototypes (low dispersion and high limiting mag) to record SED
  - Workshop 2, photometric test feedbacks, spectro design, toward 2024 (25-26 nov 2023)
- 2024 funding a third step with an additional private donation :
  - Astro-COLIBRI alerts filtering for the RAPAS network capabilities
  - 2nd batch of RAPAS 30 filters with the support of a donation including orders from Pro Observatories
  - Workshop 3 scheduled on the 14th and 15th of december 2024 at Paris Observatory
- 2025 funding a fourth step
  - A Master 2 internship awarded to Martin Grandidiier at Jules Vernes University Amiens for an improved design of the filter multilayer coating
  - A training session for RAPAS Observers at OHP 22-26 Aug 2025 to consolidate processing pipeline
- The French RAPAS network is ready to answer to alerts and deliver data.
- On the way to an international network ?

A new ProAm collaboration : Le Réseau Amateurs Professionnels pour les Alertes Scientifiques (RAPAS)
Amateurs-Professionnals Network for Scientific Alerts

RAPAS project is aiming to build an amateur network to answer to a selected list of alerts

- We are inviting amateurs to register in this network with preliminary data related to their observatory facility and telescope setup on the Gemini portal.
- **https://gemini.obspm.fr/20220101-rapas/**
- Get access to tutorials and data : **https://rapas.imcce.fr/**

- More than 80 registered telescopes,
- We deliver to 50 observers a set of 3 ABC filters to unify the photometric data delivered in using Gaia catalog with G, Gbp and Grp photometric system.
- We designed 2 new high sensitivity - low resolution spectrographs
- Some telescopes are testing spectrograph prototypes, to assess the range of magnitude and Resolution to deliver alert SED (Spectral Energy Distribution)

- Then the purpose is to assess the photometric accuracy of the network along 2023 and 2024 and start to react to Astro-COLIBRI selected alerts
- In 2025 connect the network to alert programs and released data

More and more transient events are released where amateurs could provide answers

1. Solar System Objects (SSO) : beyond Gaia-fun-SSO alerts are still running :

- Asteroids with satellite candidates are targets to track : GaiaMOONS program
- NEA alerts from MPC and the Near-Earth Objects Coordination Center from ESA
- Target magnitude class is 20 and beyond to keep on track on the nights following the discovery in retrieval fields from 10 to 30 arcmin

2. Optical stellar ou extragalactic alerts from new rising sources or from strong photometric variations :

- ZTF $3^{E}5$, ASSAS-SN, ATLAS, CRTS, … and end 2025 start of LSST Vera Rubin $1^{E}7$ alerts/y
- Eruptive stars, Cataclysmic's, Novae, SN, gravitational lensing (BH-TOM2)

3. Multimessenger Astronomy alerts : discover the optical counter part and characterize its optical signature

• GW (Gravitational waves detection)	LIGO, VIRGO, KAGRA (GrandMa and KNC)
• Neutrinos	Ice Cube
• GRB (Gamma Ray Burst) and X sgnals	Fermi, Swift, SVOM…
• FRB (Fast Radio Burst)	
• …	

These alert designations have a poor accuracies > from several arc min to several 1°

RAPAS registered telescope features

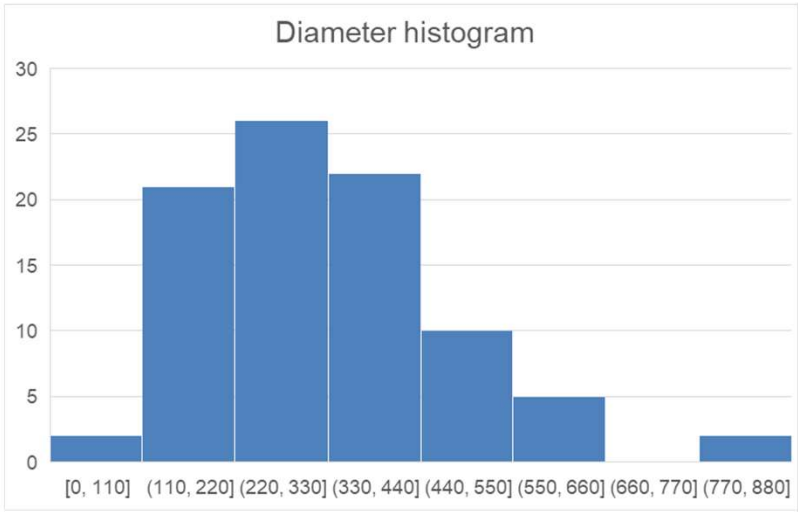
- Diameter
- Field of View (FoV)
- Geometric étendues (Pupil Area x FoV)

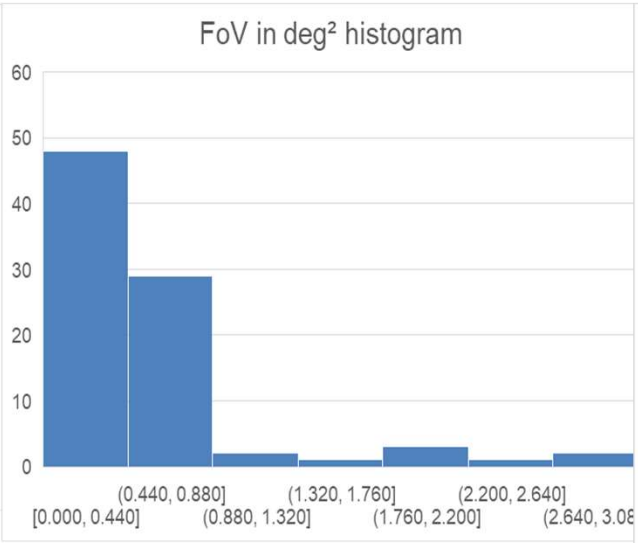
Pupil Area

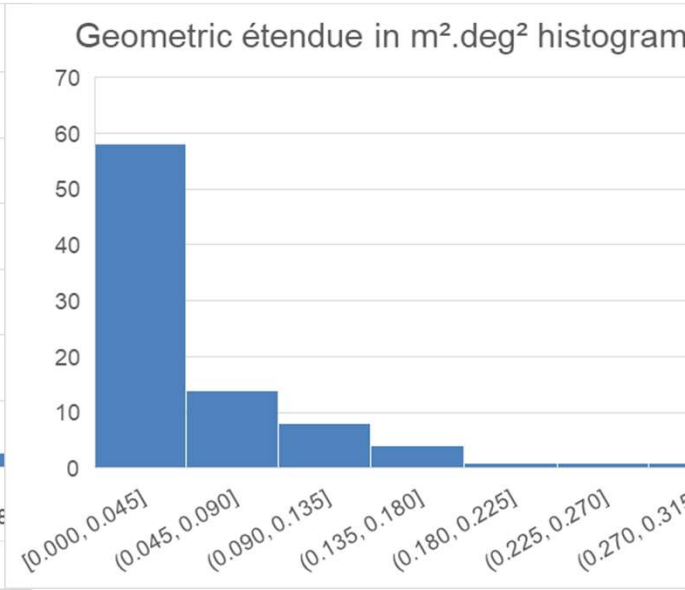
Focal length

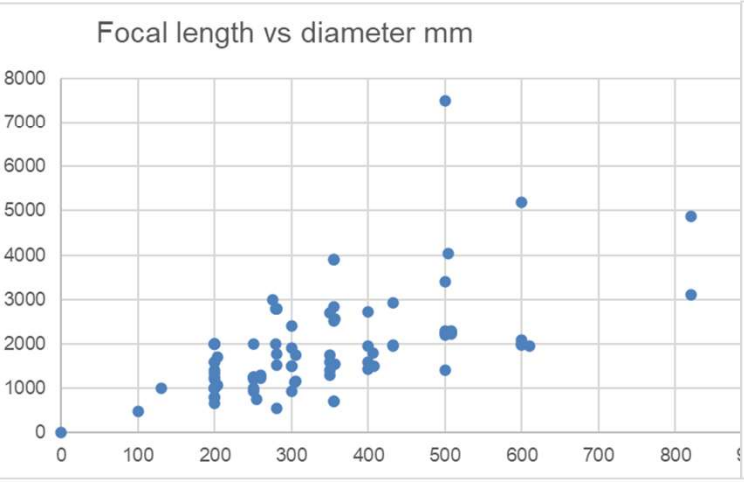
F/D f number

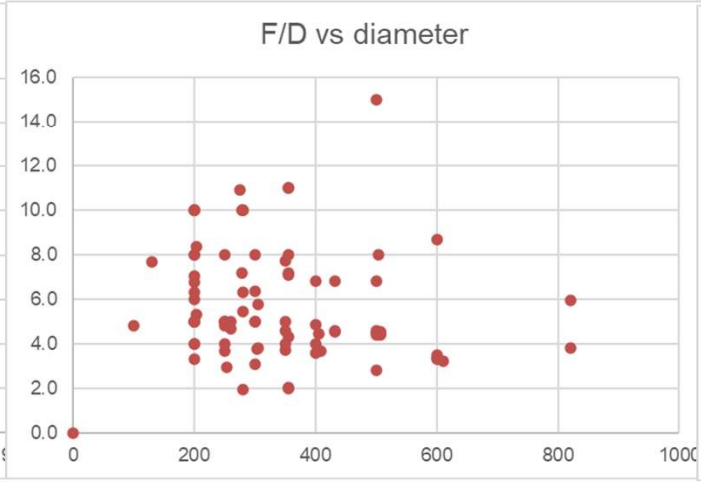
focal plane array area

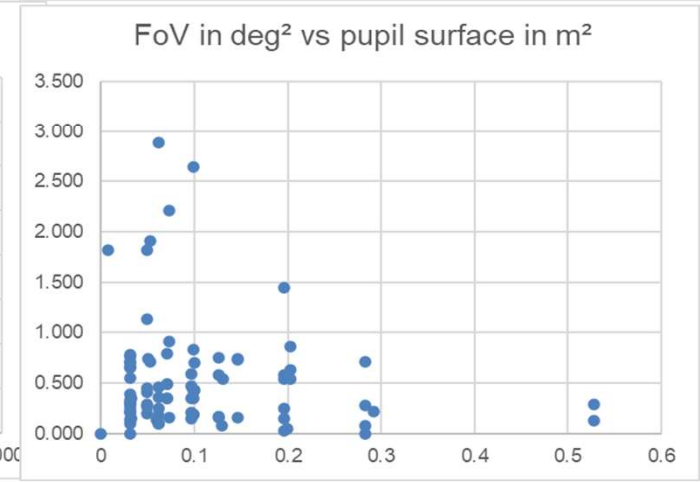


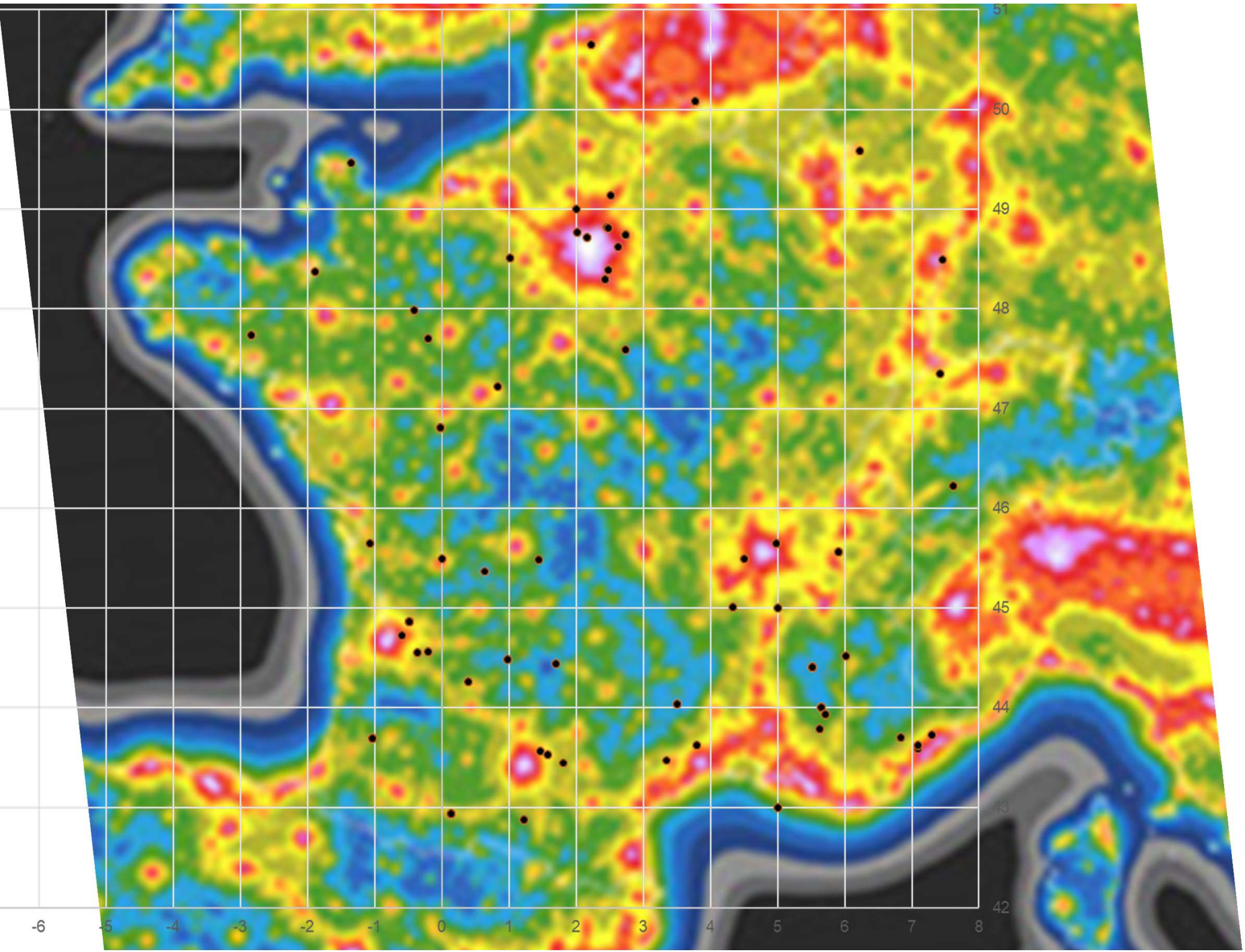








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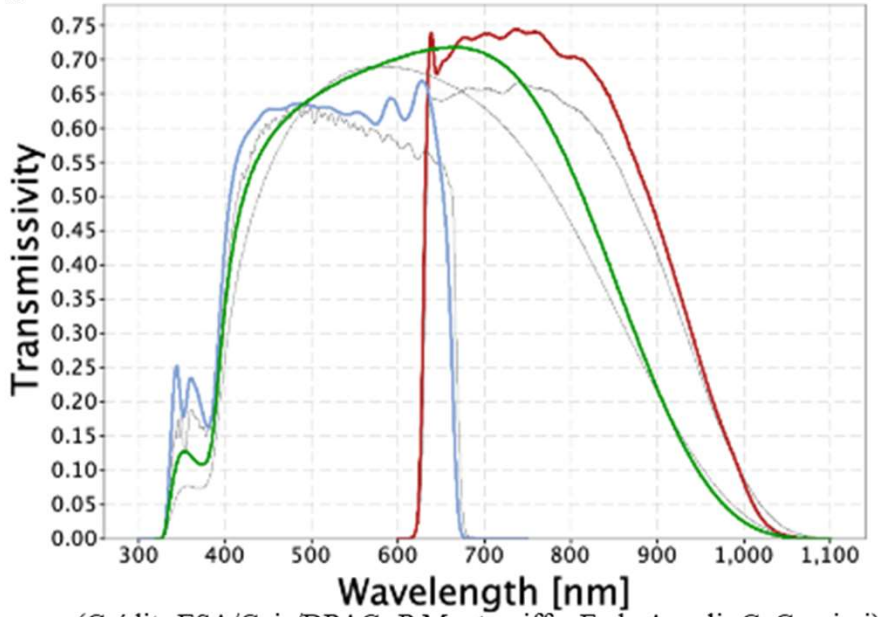
The Gaia catalog opportunities

Gaia mission delivers alerts :

- https://gaiafunsso.imcce.fr/
- http://gsaweb.ast.cam.ac.uk/alerts/home

Gaia mission delivers astrometric and photometric catalogues 1,8 Giga objects up mag 20.7 in 3 bands G, 1,5 Giga objects in G_{BP} and G_{RP} outside the Earth atmosphere.

- Gaia DR1 2016
- Gaia DR2 (Grappa extract) 2018
- Gaia EDR3 (Grappa extract) 2020
- Gaia DR3 June 2022
- Gaia DR4 end of 2026 (2.8 10^9 objects)
- Gaia DR5-FR is scheduled in 2030
- …



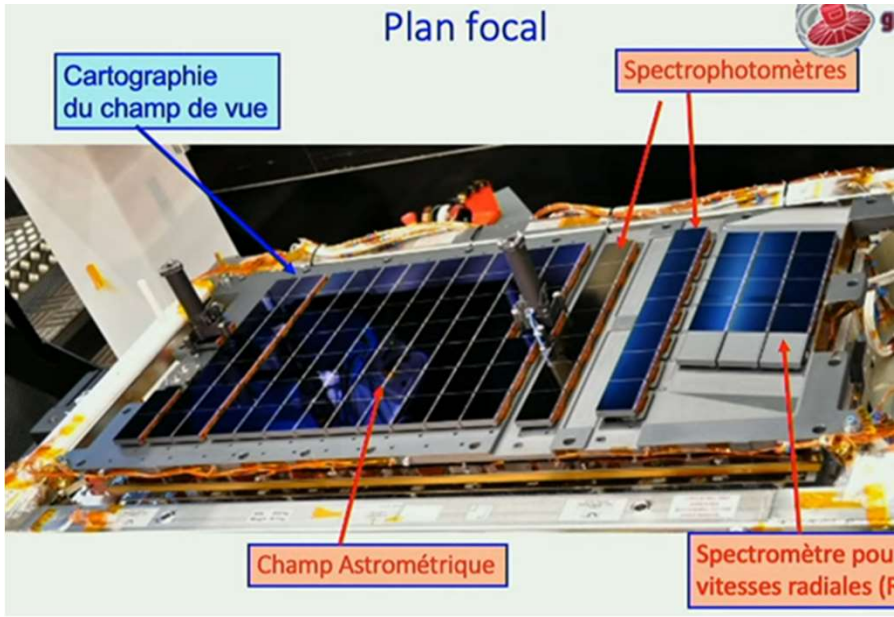
(Crédits ESA/Gaia/DPAC, P.Montegriffo, F. de Angeli, C. Cacciari)

The three Gaia optical filters are not available :

The 3 Gaia photometric wide bands bring an enhanced SNR and magnitude upper limit for amateur telescopes. It allows direct photometric reduction with the G, Gbp and Grp Gaia catalog. Several Amateur softwares are used in the network :

- Prism V11 with Grappa (EDR3) Marc Serrau
- Muniwin
- AstroImage J and Gaia EDR3 via Vizier
- Siril 1.4
- Tycho Tracker 2025
- Astropy suite and STD pipe

Gaia DR3 catalog accy



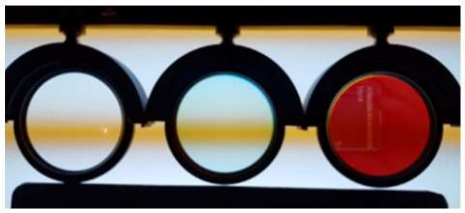
Photometry : G, G_{BP}, and G_{RP} published as part of Gaia EDR3, (other data are new in Gaia DR3)

The G band is defined by the quantum efficiency of the CCD used for astrometry
The G_{BP} and G_{RP} bands are defined by the prism spectrum and pixel binning of dedicated CCD for the 2 Gaia sub bands.

- The G-band photometric uncertainties are ~0.3 mmag for G<13, 1 mmag at G=17, and 6 mmag at G=20 mag.
- The GBP-band photometric uncertainties are ~0.9 mmag for G<13, 12 mmag at G=17, and 108 mmag at G=20 mag.
- The GRP-band photometric uncertainties are ~0.6 mmag for G<13, 6 mmag at G=17, and 52 mmag at G=20 mag.
- More information on the properties and limitations of the BP/RP spectra will be published closer to the release of Gaia DR3.

The three RAPAS filters : A, B, C

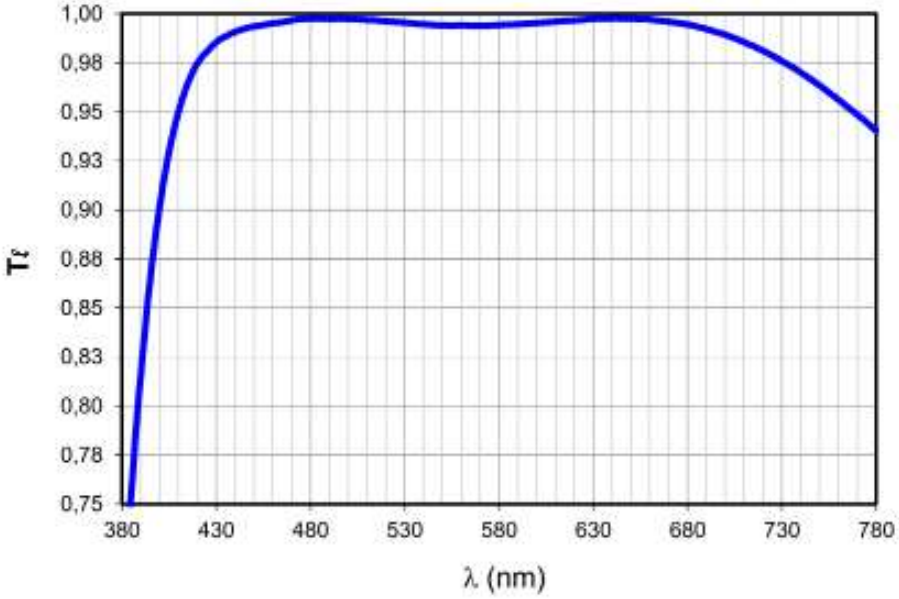
Getting the Gaia filters ?



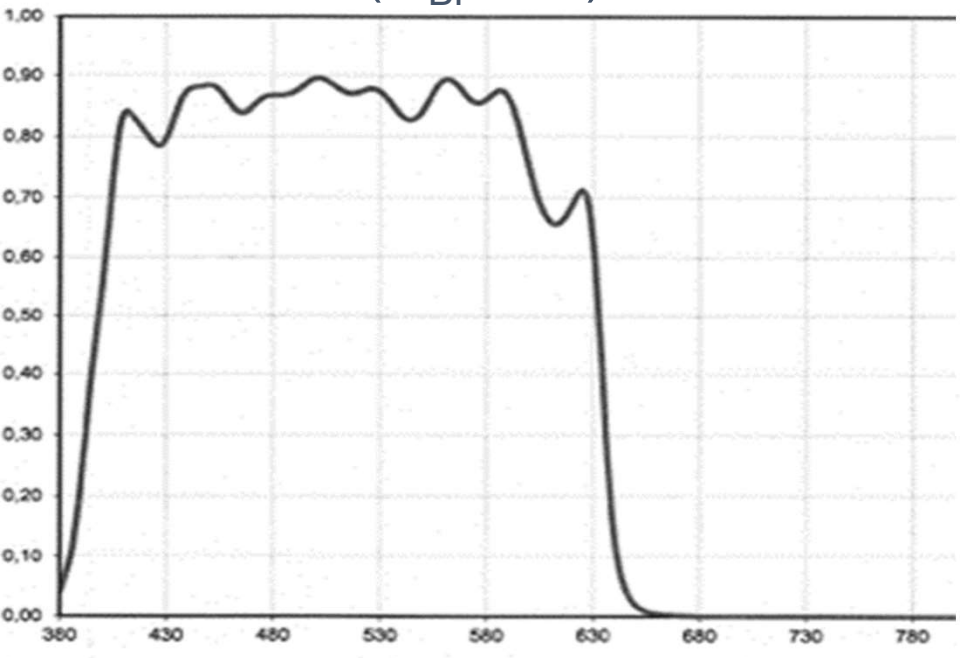
Pictures of the three filters A, B, C set : in 2022 a first batch of 25 fi… was released

- Packing
- Normal transmission
- Aspect angle transmission
- Reflexion

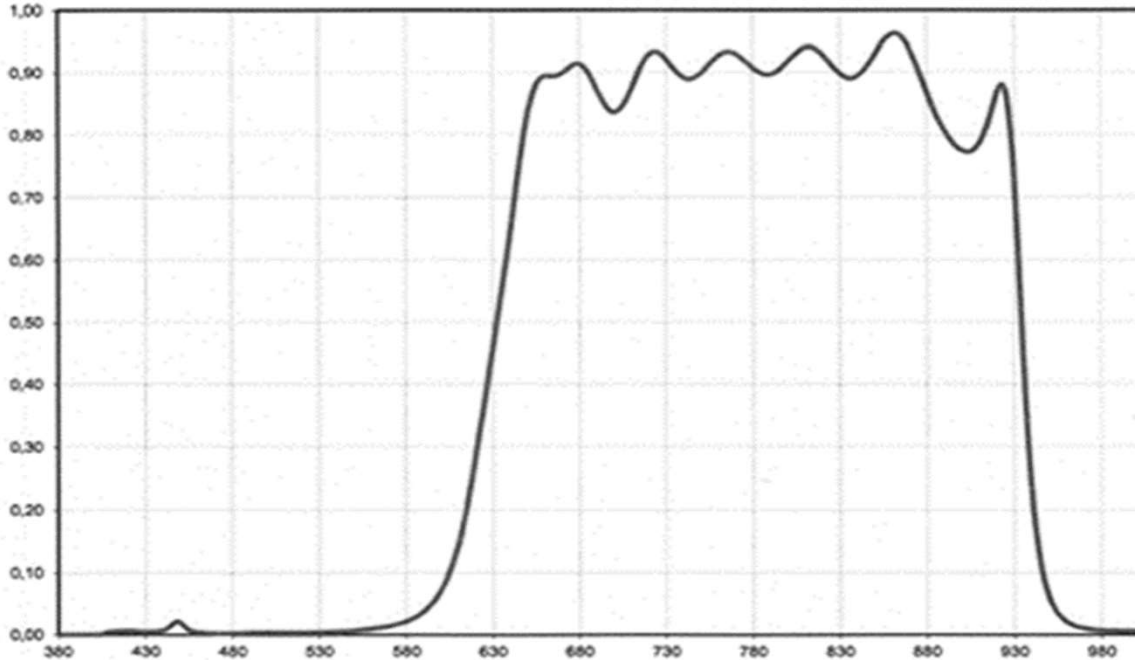
A filter (G like)



B Filter (G_{BP} like)



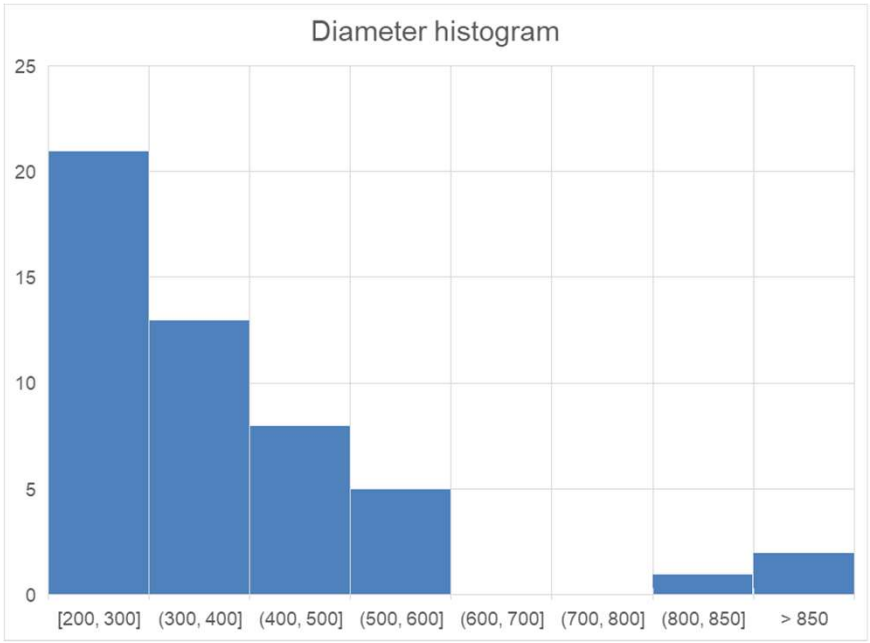
C filter (G_{RP} like)

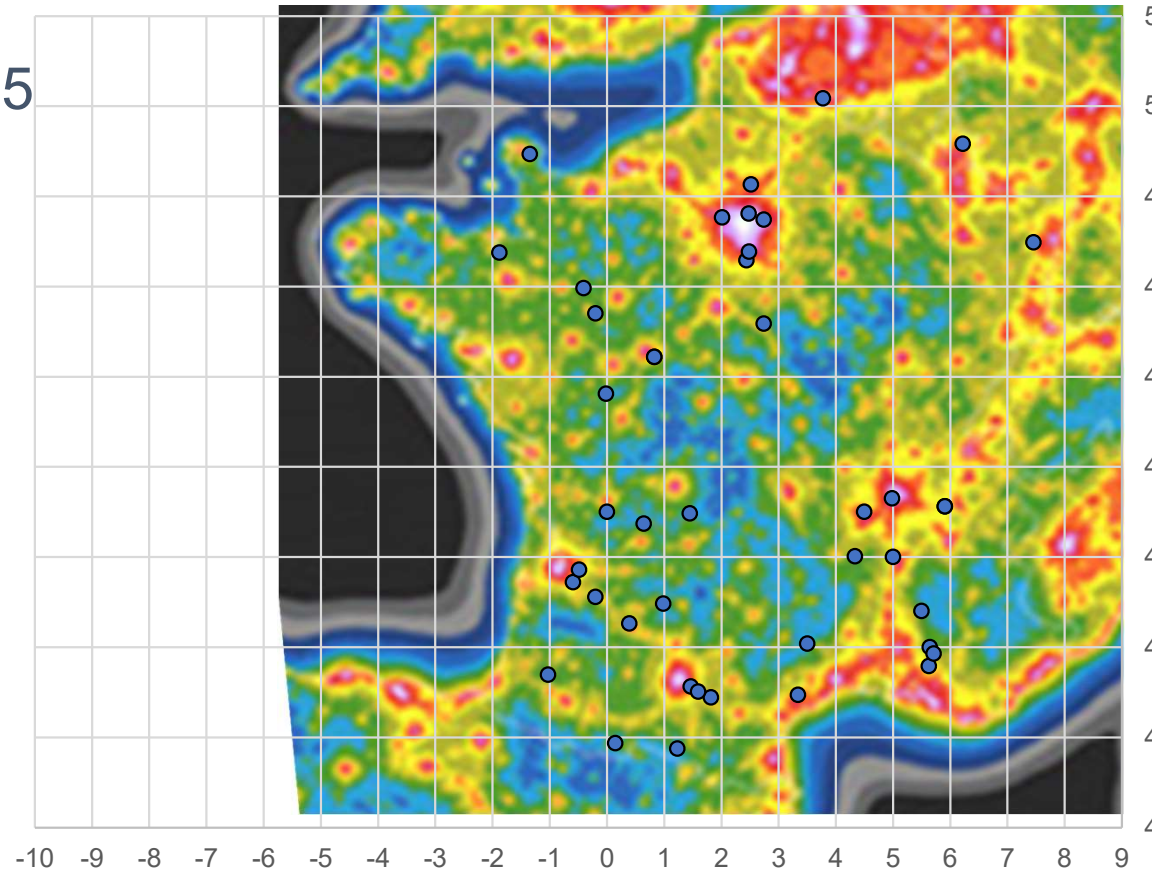


The delivery of the 2 RAPAS filter batches :
First end of 2022, then the second 2025 1st semester

Prénom	Nom	Club, affiliation ou observatoir	Longitud	Latitude	Dis	Diam	Surf	Foca	f/D	Camera	Capteur	taill	taille	pixel µ	Champ °	F Gui	D filtr	Logiciels	Commenta	N° c	Date de liv	exposition	G
Patrick	Martinez	SAF - ADAGIO - Observatoire d	1.8163	43.4442	A05	820	0.528	3110	3.8	Moravian C	CMOS	24	36	3.76	0.2932454		50			12	11/11/2022		20
Yannic	Delisle	CPS TJMS Buthiers	2.4380	48.2918	199	600	0.283	2100	3.5	QHY268MM	IMX571	15.7	23.5	3.76	0.2746424		50	PrismV11		5	09/10/2022		20.9
Michel	Rieutord	Observatoire Midi-Pyrénées	0.1450	42.9369		508	0.203	2299	4.5		C'est le T50	24	36	3.76	0.5366217		50			19	26/06/2023		
Thierry	Midavaine	Observatoire Salvia	-0.4075	47.9825	i73	500	0.196	1400	2.8	ASI6200MM	IMX455	24	36	3.76	1.4469995	0	50	PrismV11	vignettage su	1	31/10/2022	600	20.6
Jean-Marie	Lopez	SAM- Observatoire des Pises	3.5036	44.0392	122	500	0.196	2200	4.4	ASI6200MM	IMX455	24	36	3.76	0.5860027		50	PrismV11		14	13/11/2022		20.8
Philippe	Dupouy	Observatoire de Dax	-1.0300	43.6933		500	0.196	2250	4.5	ASI1600MM		13.38	17.69	3.8	0.3908247		36			7		aout 2025	17.3
Louise	Vaslin	Observatoire Jocelyn Bell de Tou	1.4685	43.5632		500	0.196	2279	4.6			37	37		0.8652488		50		pas opération	6	12/11/2022	Fin 2025	
Éric	Barbotin	Astroclub charentais	0.0000	45.5000		500	0.196	3400	6.8			24	36		0.2453552		50			16	01/05/2023		
Anaël	Wünsche	Observatoire des Baronnies Pro	5.5000	44.4000	B10	430	0.145	1970	4.6			24	36		0.7308178		50			8	11/11/2022	120	20.2
Florent	Losse	St Pardon de Conques (observat	-0.2031	44.5588	l93	408	0.131	1500	3.7	ASI2600MM	IMX	15.7	23.5	3.76	0.5382914		36		Très actif sur	23	13/11/2022	60	
Jean-Louis	Dumont	Société Astronomique de Tourai	0.8300	47.2200		400	0.126	1600	4.0	ZWO 183MM		8	13.9		0.1586376			Prism V11		13	13/02/2024		22.08
Marc	Serrau	SAF & Planète-Sciences	5.6475	43.9997	B24 et	400	0.126	2730	6.8	QHY268M	IMX571	15.7	23.5	3.76	0.1666825		50	Prism V11		18	13/11/2022	3600	21.3
Arnaud	Leroy	Uranoscope de l'Ile de France	2.7422	48.7422	A07	355	0.099	710	2.0			11.31	11.31	3.76	0.8329816		50		porte filtes m	11	11/11/2022		
Philippe	Morel	Observatoire Charles Fehrenbac	3.7761	50.0848		355	0.099	3910	11.0			24	36		0.1855244		50.8			2	13/11/2022	Vega	
Christian	Pantacchini	Observatoire de Benayes	1.4500	45.4833		304	0.073	1141	3.8	Moravian g3	KAI11000	24.2	36.3	9	2.2148436		50		Nom obs AA	22	13/11/2022	echange de filtre	
Patrick	Sogorb	Club Luberon Sud Astro, Bastid	5.6281	43.7908	D11	280	0.062	1530	5.5				16		0.359		31.75			17		retour des filtres	
Lisa	Maris		5.9106	45.5614		280	0.062	1764	6.3	ATIK4000	KAI 04022	16.05	16.67	7.4	0.2453453					25		1200	19.9
Roger	Hellot	Observatoire Rosheim-TRBL	7.4594	48.4900		279	0.061	2790	10.0	QHY268M	IMX571	16.7	25.1	3.76	0.1767758		31.75			4		nov-23	
Jean-Marie	Vugnon	club eclipse	-0.0177	46.8111		260	0.053	1220	4.7			24	36				50			21	13/11/2022		
Jean-Baptist	Marquette		0.3911	44.2616	D99	250	0.049	923	3.7	ZWOASI183MM	pro	8.81	13.19	2.4	0.4477668		31.75	Siril		24	01/12/2023		
Guy	Copin	GAP 47	0.9833	44.4833		250	0.049	1250	5.0				23.2		1.1307752		50		Très interress	20	Poste		
Arnaud	Leroy	Uranoscope de l'Ile de France	0.8300	47.2200		250	0.049	1250	5.0	PlayerOne	IMX533	11.31	11.31	3.76	0.2687476					11		720	
Patrick	Wullaert	SAF, Astro-Club d'Ouzouer sur l	2.7401	47.5880		200	0.031	1000	5.0			7	11.25		0.2585172		31.75		Mon club pos	15	11/11/2022	prêt pour des	premières m
Jean-Noël	Ferrier	Escalier aux Etoiles	2.4817	48.8072		260	0.053	1300	5.0		IMX571	15.7	23.5	3.76	0.0942127		50.4			9			18.2
Patrick	Baroni																			3		rechanges	
Lot 2																							
jean-pascal	Vignes	Exoclock collaboration	-70.8500	-30.5200		432	0.147	1959	4.5			24.0	36.00	3.76	0.7390477					26	07/01/2025		
jean-Sébasti	Devaux	OAV	3.3425	43.4706		350	0.096	1600	4.6			8.9	13.2		0.1506488					27	07/01/2025		
Jean-Christo	Dalouzy	Observatoire de Rouen	-1.3480	49.4680		350	0.096	1400	4.0			10.0	12.5		0.2093604					28	07/01/2025		
Cyrille	de Brebisso	CAM, Observatoire Hubert Reev	4.3350	45.0070		600	0.283	5200	8.7			25.0	26		0.0789133					29	07/01/2025		
Yoann	Degot Longh	Observatoire de Haute Provence	5.7122	43.9289		600	0.283	2000	3.3			24.0	36		0.7090585					30	07/01/2025		
Guillaume	Biesse	SAF	4.9833	45.6500		300	0.071	928	3.1	ASI533MM	IMX533	11.3	11.31	3.76	0.4876001					31	07/01/2025		
Cédric	Latgé	ADAGIO	0.0000	0.0000		355	0.099	715	2.0			17.5	23.5		2.6404523					32	07/01/2025		
Frédéric	Pertuisot	AAL, K26	6.2201	49.5822		356	0.1	2560	7.2			24.0	36		0.4327816					33			
Bernard	Trégon	Observatoire du Clocher Brantôr	0.6437	45.3712		203.2	0.032	1081	5.3	Atik 460EX		10.0	12.5		0.3511371			TychoTracker		34	07/01/2025		
Sébastien	Cretier	Observatoire de Buthiers	2.4847	48.3866		200	0.031	1000	5.0			12.9	12.9		0.5462767					35	25/01/2025		
Jérôme	Miroux		0.0000	0.0000		250	0.049	1200	4.8			11.3	11.31	3.76	0.2916094					36	16/01/2025		
Thomas	Salomon	Astronomie Gironde 33	-0.5900	44.7200		355	0.099	2840	8.0			24.0	36		0.3516527				impression 3[	37	07/01/2025		
Fred	Denjean	Astronomie Gironde 33 AG33	-0.4845	44.8592		200	0.031	1260	6.3	ASI2600MM	PRO	15.7	23.5	3.76	0.7628752			Siril		38	07/01/2025	360	18.2
Pierre-Yves	Lechapelain		5.9106	45.5614		280	0.062	1764	6.3	ASI533MM	IMX533	15.2	15.30	3.76	0.2453453	guidage :	31.8	std pipe		39	16/01/2025	1800	21
Arnaud	Leroy		46.505833	-15.8339		355	0.099	2510	7.1			15.7	28.3		0.4173126					40	24/01/2025	éré 2025	
Thomas	Ravinet		1.2294444	42.8753		504	0.2	4032	8.0			13.1	15.97		0.0514878					41			
Emmanuel	Brochard	Club Eclipse	2.0144	48.7650		305	0.073	1159	3.8	QHYCCD268M		13.5	23.6	3.76	0.9112253		50.0			42	25/01/2025		
Guy	Brabant	AFA	5.0000	45.0000		200	0.031	660	3.3											43			
Cyril	Cavadore	cyril.cavadore@gmail.com	4.5000	45.5000		300	0.071	2400	8.0			24.0	36.00		0.4924076					44			
Stéphane	Charbonnel	https://groups.io/g/RAPAS/mem	-0.2000	47.7000	949	300	0.071	1900	6.3	ATIK11	KAI11000	24.0	36.07	9	0.1855244		50.0			45			
Franck	Spingler	Observatoire de Saint Domineuc	-1.8805	48.3753	Y84	400	0.126	1440	3.6			23.5	15.70		0.5408479					46			

The delivery of 2 filter batches : 2025





Selected areas to assess magnitude upper limit

Edgar Everhart Sky&Telescope Jan 1984

Finding Your Telescope's Magnitude Limit

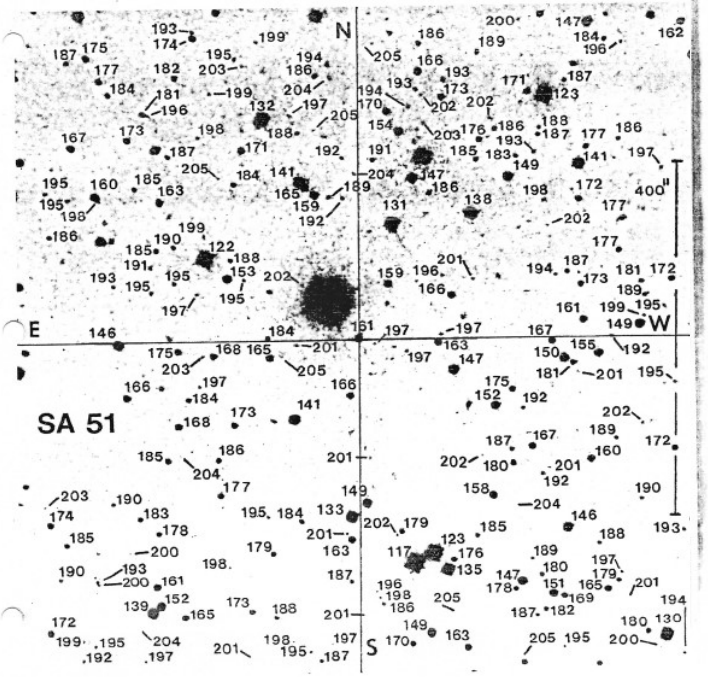
EDGAR EVERHART, *Chamberlin Observatory, University of Denver*

HOW FAINT will it reach? This is a question that often comes to mind when considering a telescope or camera to be turned toward the heavens. While there are numerous tables that cite the limiting stellar magnitude for a given telescope aperture (see, for example, page 193 of the March, 1980, issue), in practice this limit is affected by many factors.

The condition and number of optical surfaces in a system will affect performance, as will light pollution and other atmospheric effects. For the observer, the physical condition of the eye is important, while photographers must consider such factors as film, filters, exposure times, and developing methods.

Therefore, in order to determine the limiting magnitude of a particular instrument, it is best to observe or photograph the sky directly. This calls for some type of star atlas or chart showing the magnitudes of selected stars. But herein lies a problem: Even binoculars and short exposures with small cameras will reveal stars fainter than those plotted in Wil Tirion's *Sky Atlas 2000.0* (limiting magnitude 8.0) or *The AAVSO Variable Star Atlas* (limit about 9.0).

For fainter magnitudes there are the Vehrenberg *Atlas of the Selected Areas* and charts for certain variable stars prepared by the American Association of Var-



Star Observers. Both include stars to about 16th magnitude — adequate for visual observers working with instruments up to nearly 30-inch aperture. But photographers can reach even fainter stars with surprisingly modest equipment.

Sixty years ago, the famous 16-inch (0.4-meter) Metcalf camera at Harvard Observatory was recording stars to magnitude 16. Today, however, advances in emulsions and hypersensitizing techniques make it possible for the same size telescope to photograph stars of 21st magnitude. Smaller telescopes can easily reach beyond the 16th-magnitude limit of the charts mentioned above.

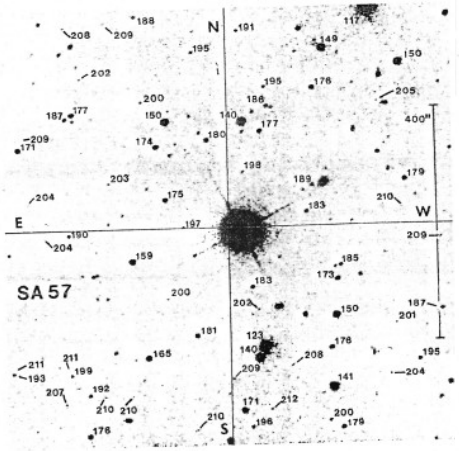
Large observatories have special methods for calibrating photographic plates and determining the magnitudes of faint stars on them. The photographs described and reproduced here will be useful for smaller servatories and advanced amateurs, as y contain accurate star brightnesses down to 21st magnitude.

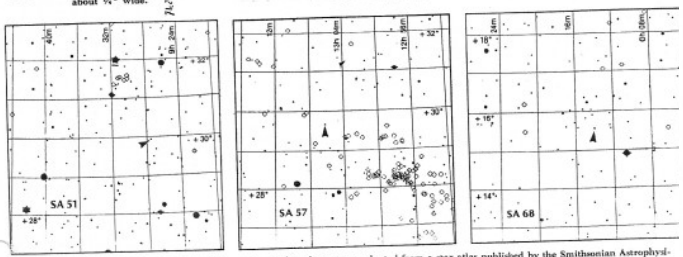
The magnitudes marked on the photographs are from a paper by L.-T. G. Chiu published in the *Astrophysical Journal Supplement* for September, 1980. Chiu was studying the structure of our galaxy as determined by proper motions of stars. For this work he used numerous photographs made in blue, yellow, and red light with the giant reflectors at Lick, Kitt Peak, and Palomar observatories. Chiu credits I. R. King and co-workers at the University of California, Berkeley, for the photovisual magnitudes of the stars. They used an iris photometer calibrated with photoelectric sequences. Photovisual magnitudes do not correspond exactly with what the eye sees but are reasonably close.

Chiu studied stars in Selected Areas (SA) 51, 57, and 68, each nearly centered on an 8th- or 9th-magnitude star listed in the Smithsonian Astrophysical Observatory *Star Catalog*. These areas are fairly well distributed in right ascension, and at least one field is accessible on most nights in the Northern Hemisphere.

Although the magnitudes listed in Chiu's tables are quite accurate, he did not include charts. I remedied this by photographing all three areas with the 16-inch f/5.5 astrographic reflector at Chamberlin Observatory's Dick Mountain Field Station near Bailey, Colorado. The exposures, made between December, 1980, and July, 1981, were 75 to 100 minutes in duration on nights of good seeing. I used Kodak's Technical Pan Film 2415, which was hypersensitized before exposure by soaking in forming gas (8 percent hydro-

The photographic charts with this article were prepared by the author and are more fully described in the text. Each is nearly centered on a bright star listed in the table on page 30, while finder charts for the fields are below. Photovisual magnitudes are shown for selected stars with decimal points omitted (for example, 184 indicates a star of magnitude 18.4). All photographs have north up, and each field is about ¼° wide.





These finder charts for the three Selected Areas described in the text are adapted from a star atlas published by the Smithsonian Astrophysical Observatory. North is up, and each field is 5° square. Arrows denote the bright star near the center of each of the author's photographs. The finder chart for SA 51 contains Gemini's bright stars Castor at top center and Pollux at lower left. The brightest star in the SA 57 finder is 4th-magnitude Beta Comae Berenices at lower left. SA 68 is located just northeast of 3rd-magnitude Gamma Pegasi.

PRIMARY STAR IN EACH SELECTED AREA

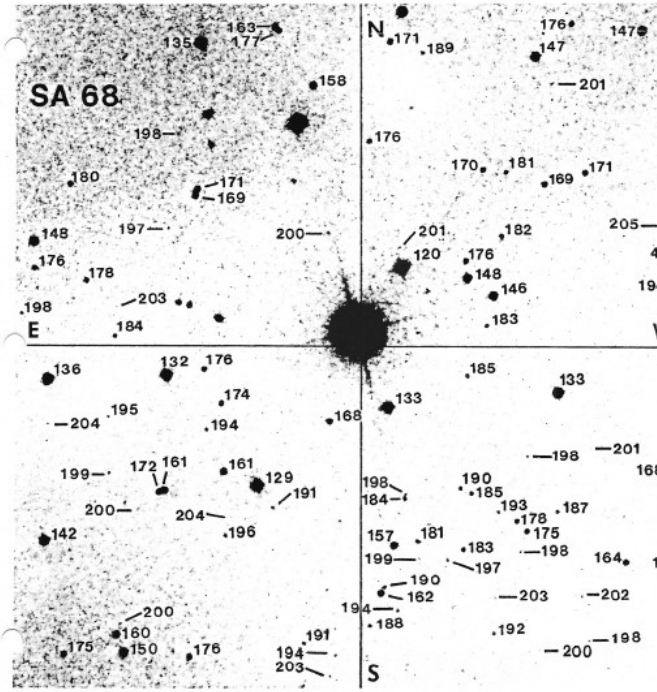
Area	*Star*	*Mag.*	*1950.0*	*2000.0*
SA 51	SAO 79445	9.1	7h 27.5m, +29° 56′	7h 30.6m, +29° 50′
SA 57	SAO 82672	8.1	13h 6.3m, +29° 39′	13h 8.6m, +29° 23′
SA 68	SAO 91810	8.2	0h 14.0m, +15° 34′	0h 16.6m, +15° 50′

gen, 92 percent nitrogen) at atmospheric pressure for five hours at 60° C. The 4 x 5 film sheets were processed in D-19 developer for five minutes at 21° C.

My negatives were enlarged 24 times and made into reverse prints (black stars on a white background). The exact scale as reproduced here can be found from the line 400 arc seconds long on the right side of each print.

Within the borders of the photograph of SA 51, Chiu's list contains 235 stars to photovisual magnitude 20.5. Of these, seven stars are covered by the image of a brighter one. Six of magnitude 20.5 are shown on the photograph, but another of the same brightness is not.

For the photograph of SA 57, Chiu's list contains 65 stars. Of these, two were covered by other images and three were not found. Among the 60 stars marked are five with magnitudes from 21.0 to 21.2



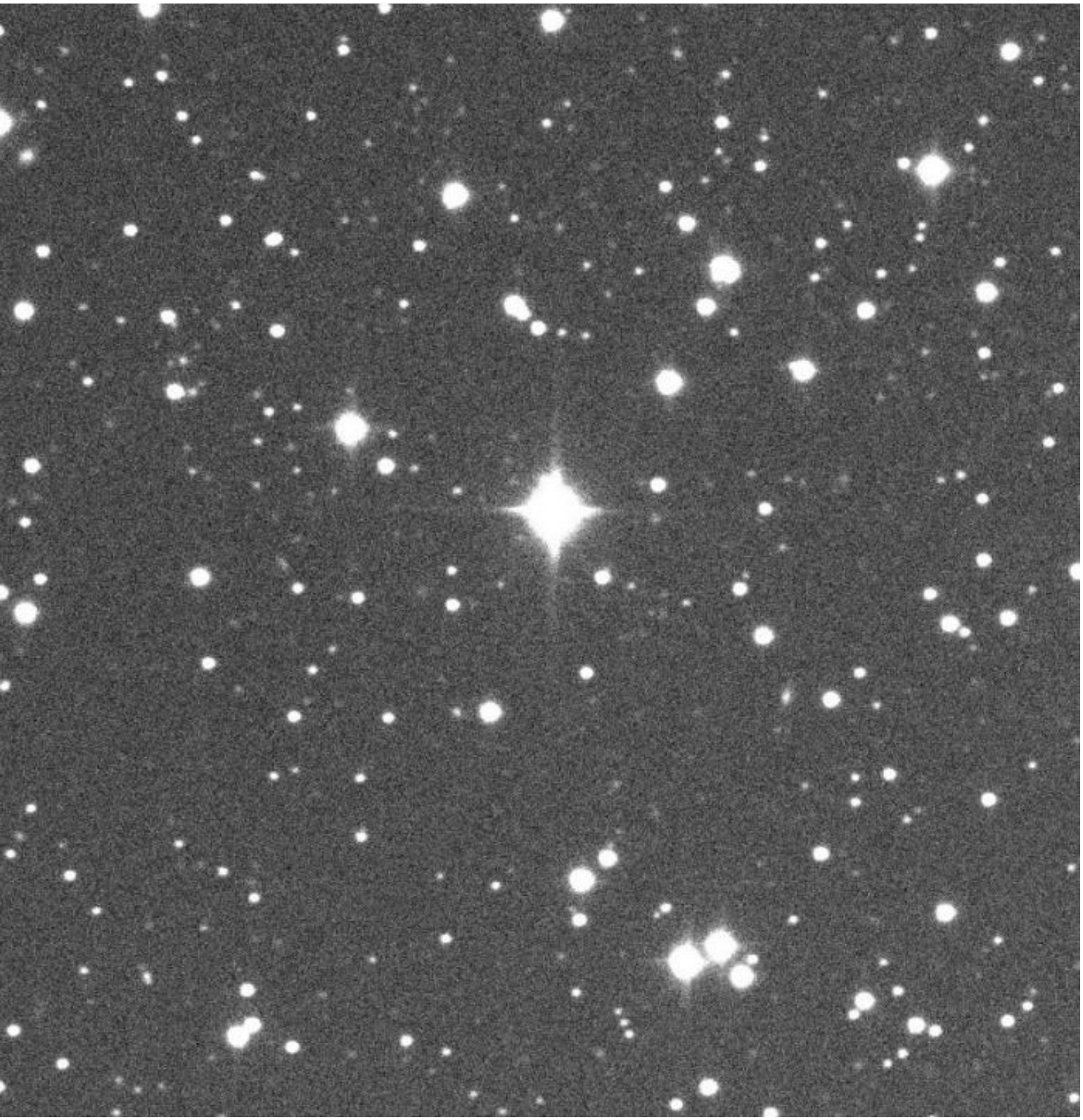
(the basis for my earlier stateme
day a 16-inch telescope can r
magnitude stars). The photogr
68 should contain 89 stars from
but one was not found. The rem
some as faint as magnitude 20
visible.

I wish to thank Elizabeth Roe
University of Arizona for calling
tion to Chiu's original paper, a
Hoag at Lowell Observatory for
and suggestions while I was wo
on this project.

*Edgar Everhart is the director o
lin Observatory at the University
where he teaches physics and astron
currently active in astrometry, part
determination of accurate positions*

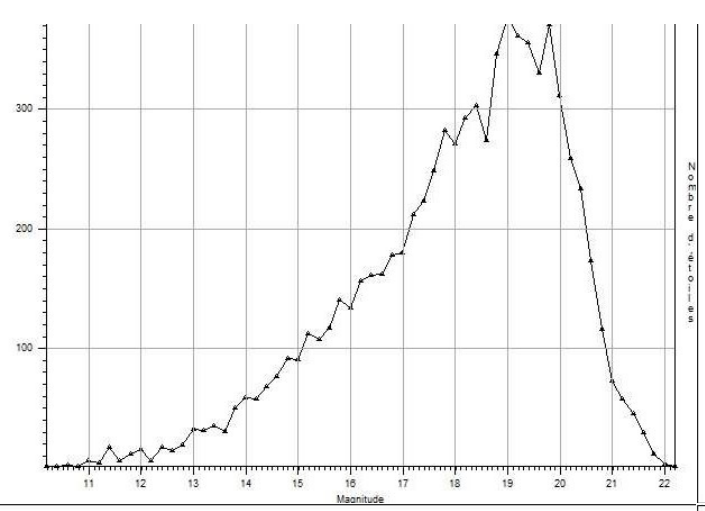
PRIMARY STAR IN EACH SELECTED AREA

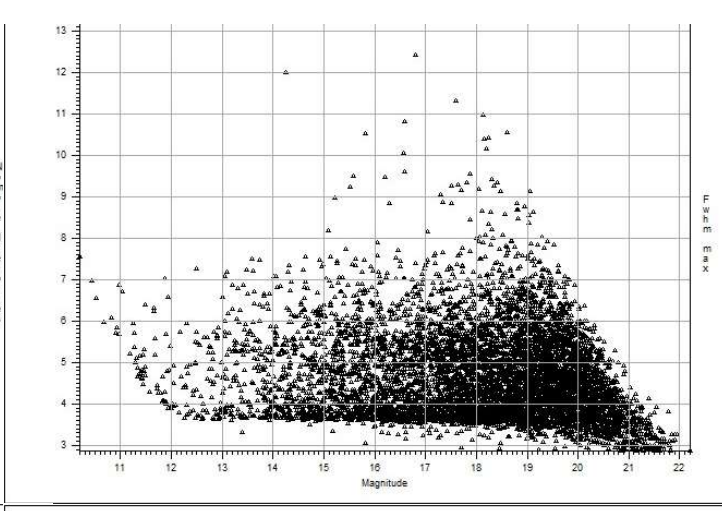
Area	*Star*	*Mag.*	*1950.0*	*2000.0*
SA 51	SAO 79445	9.1	7h 27.5m, +29° 56′	7h 30.6m, +29° 50′
SA 57	SAO 82672	8.1	13h 6.3m, +29° 39′	13h 8.6m, +29° 23′
SA 68	SAO 91810	8.2	0h 14.0m, +15° 34′	0h 16.6m, +15° 50′

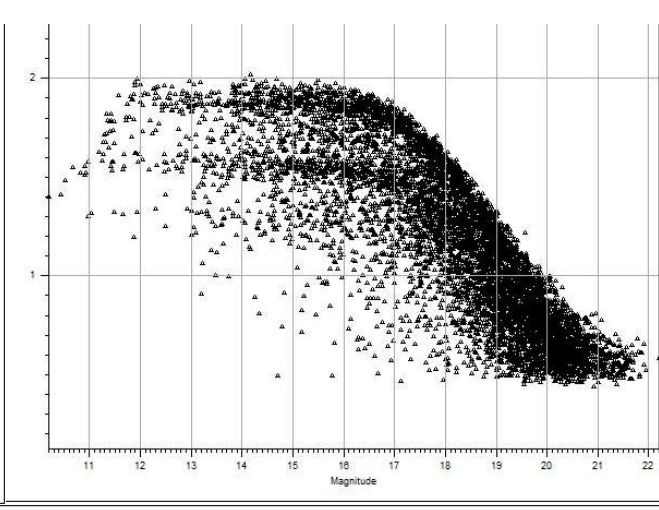


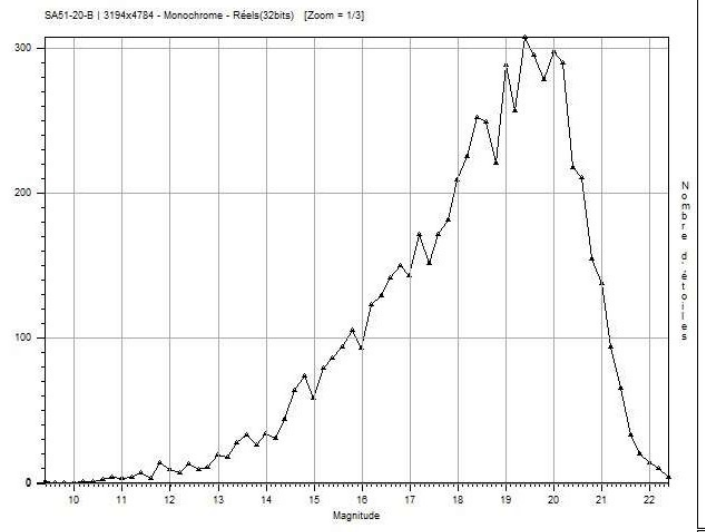
5 stacked 60s exposures
500 mm aperture
1400 mm focal length
IMX455 CMOS detector
less than 1,5^{e} rms noise

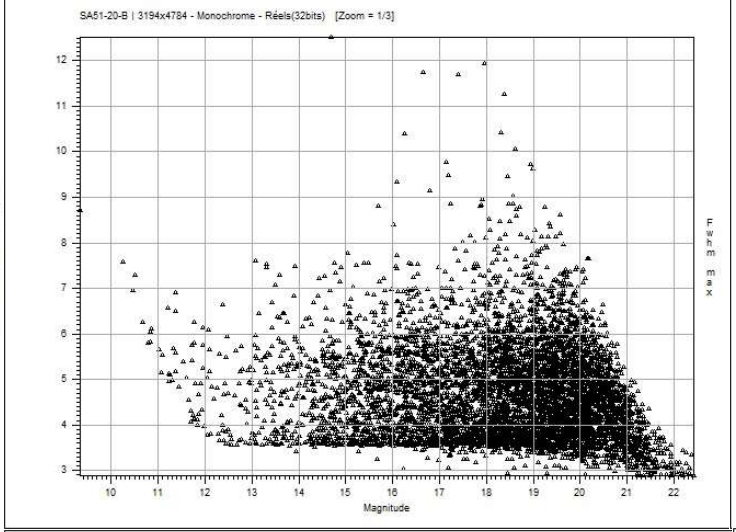
Thierry Midavaine

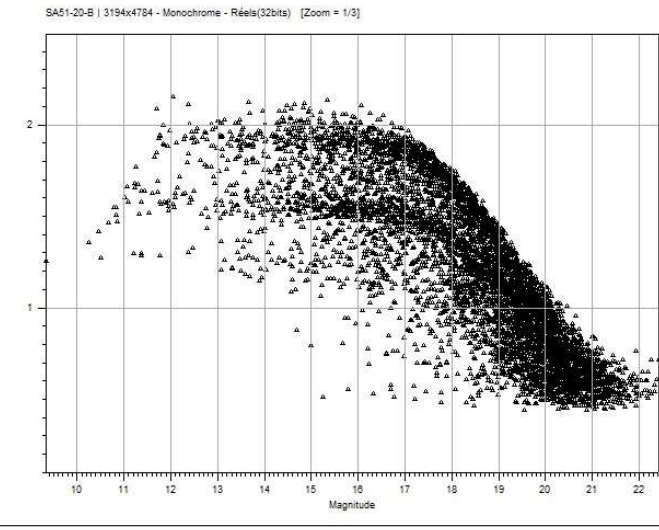

Magnitude
Nombre d'étoiles

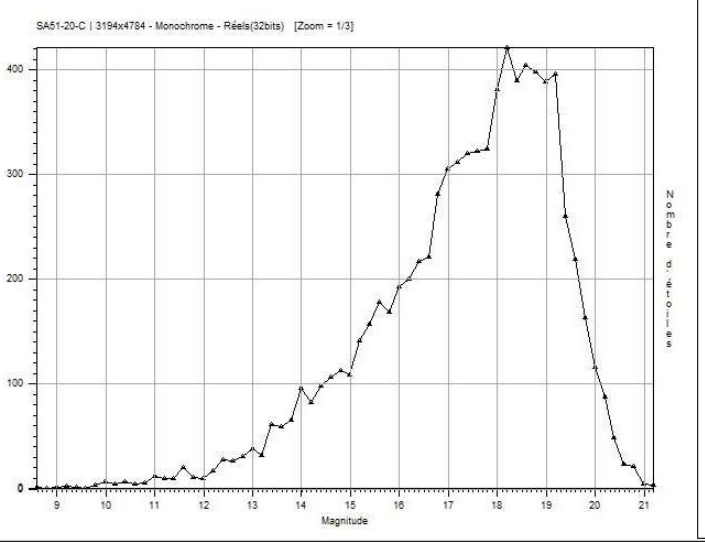

Magnitude
Fwhm max

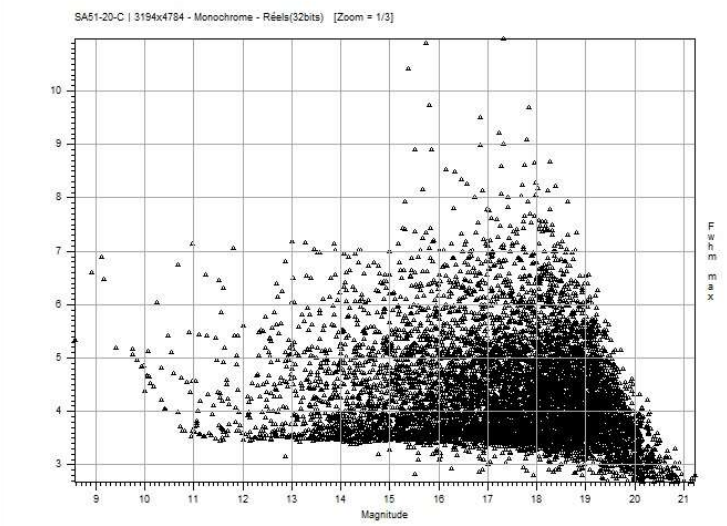

Magnitude

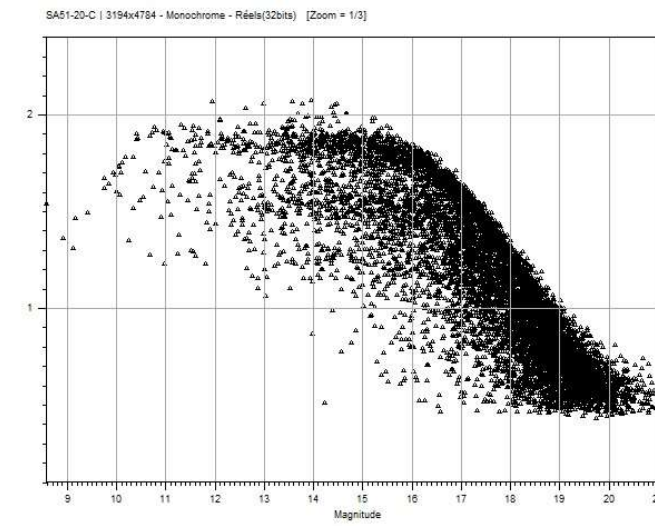

SA51-20-B | 3194x4784 - Monochrome - Réels(32bits) [Zoom = 1/3]
Magnitude
Nombre d'étoiles

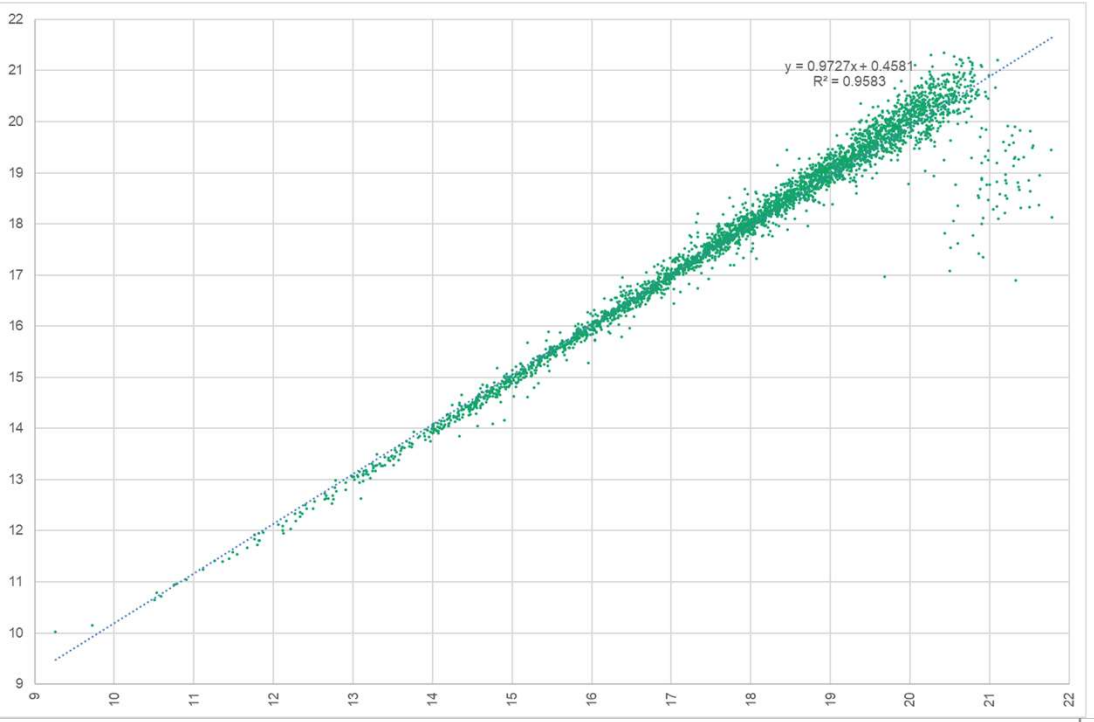

SA51-20-B | 3194x4784 - Monochrome - Réels(32bits) [Zoom = 1/3]
Magnitude
Fwhm max

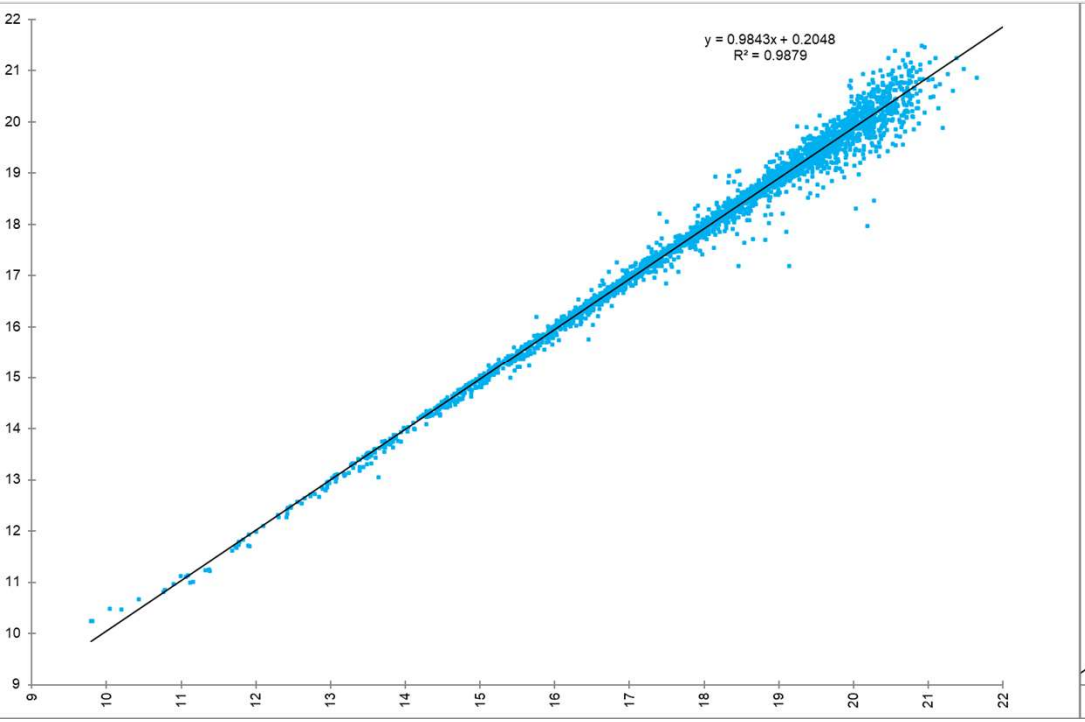

SA51-20-B | 3194x4784 - Monochrome - Réels(32bits) [Zoom = 1/3]
Magnitude

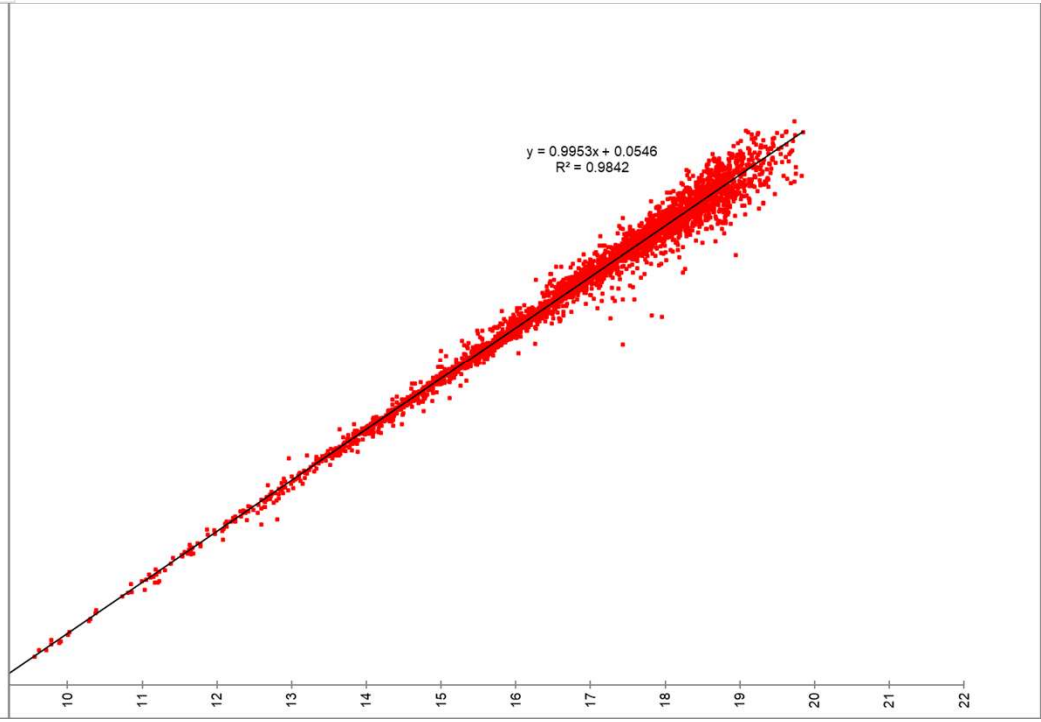

SA51-20-C | 3194x4784 - Monochrome - Réels(32bits) [Zoom = 1/3]
Magnitude
Nombre d'étoiles


SA51-20-C | 3194x4784 - Monochrome - Réels(32bits) [Zoom = 1/3]
Magnitude
Fwhm max

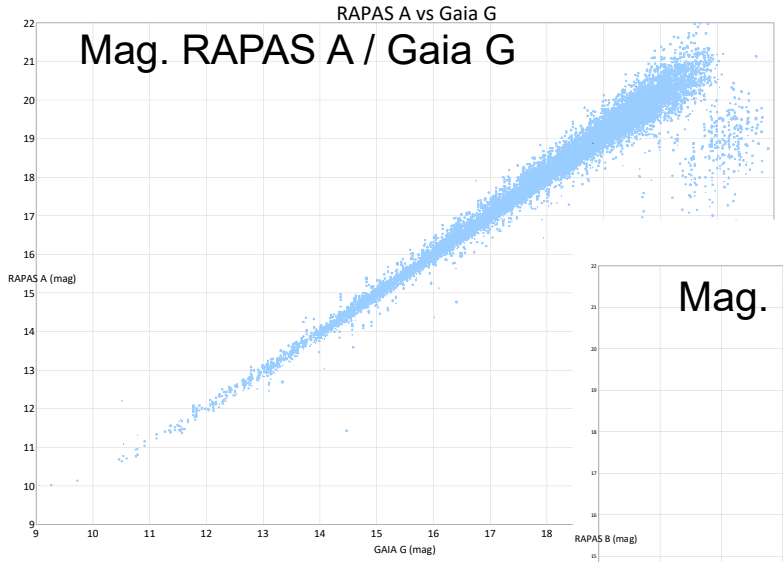

SA51-20-C | 3194x4784 - Monochrome - Réels(32bits) [Zoom = 1/3]
Magnitude

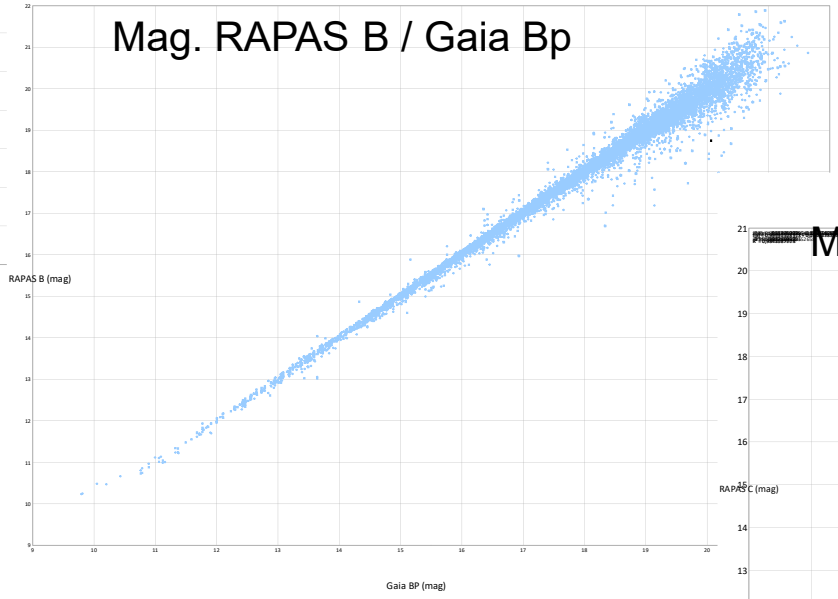

y = 0.9727x + 0.4581
R² = 0.9583

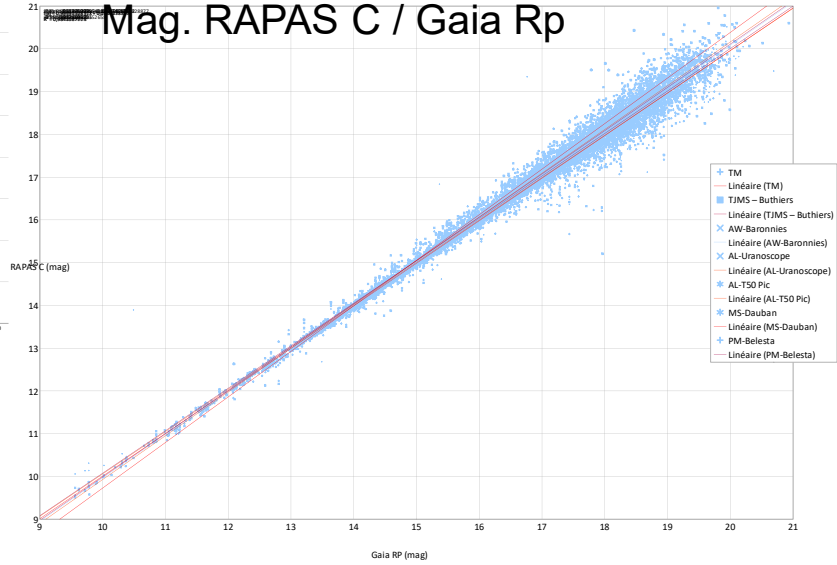

y = 0.9843x + 0.2048
R² = 0.9879

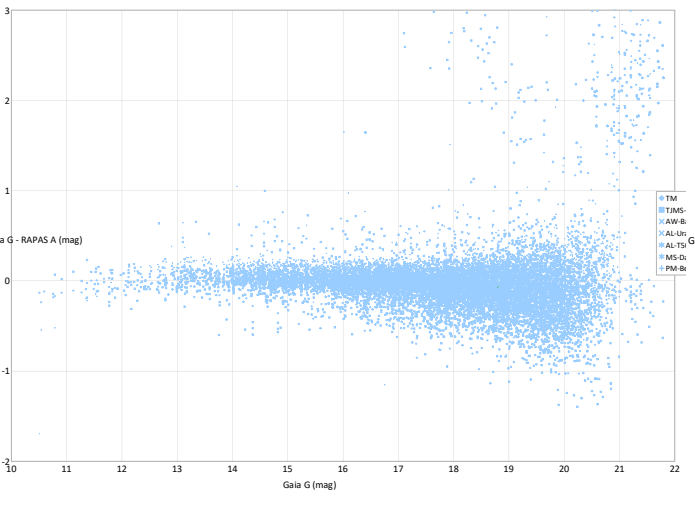

y = 0.9953x + 0.0546
R² = 0.9842

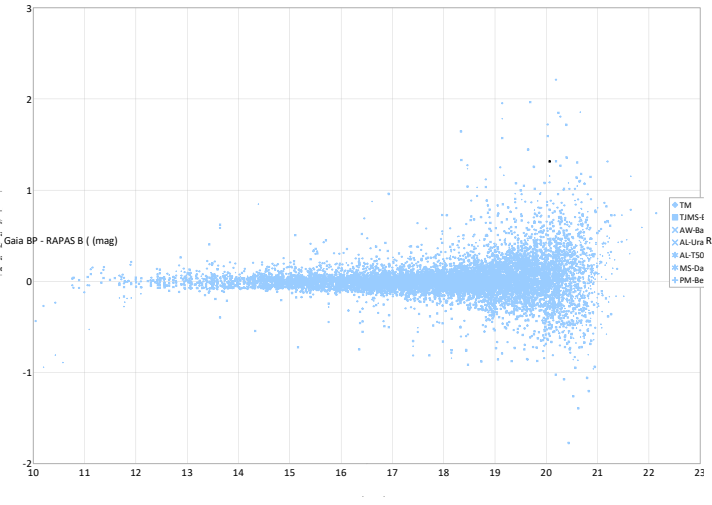
First photometric assessment accuracy from Marc Serrau tool measured magnitude with ABC filters vs Gaia catalog in G Gbp Grp

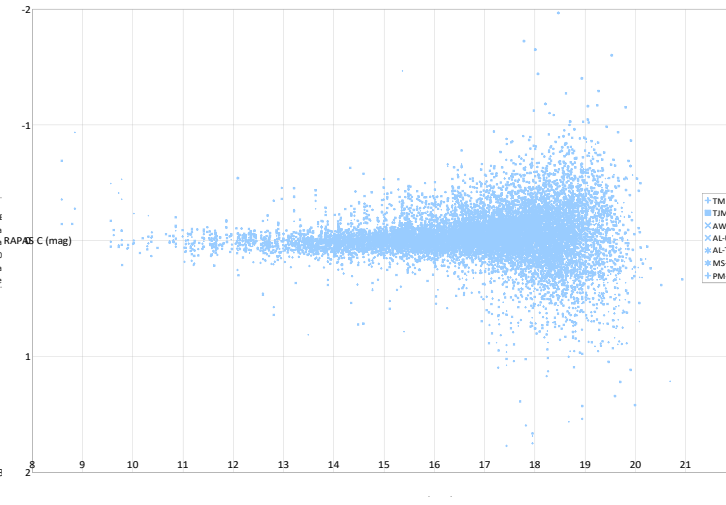




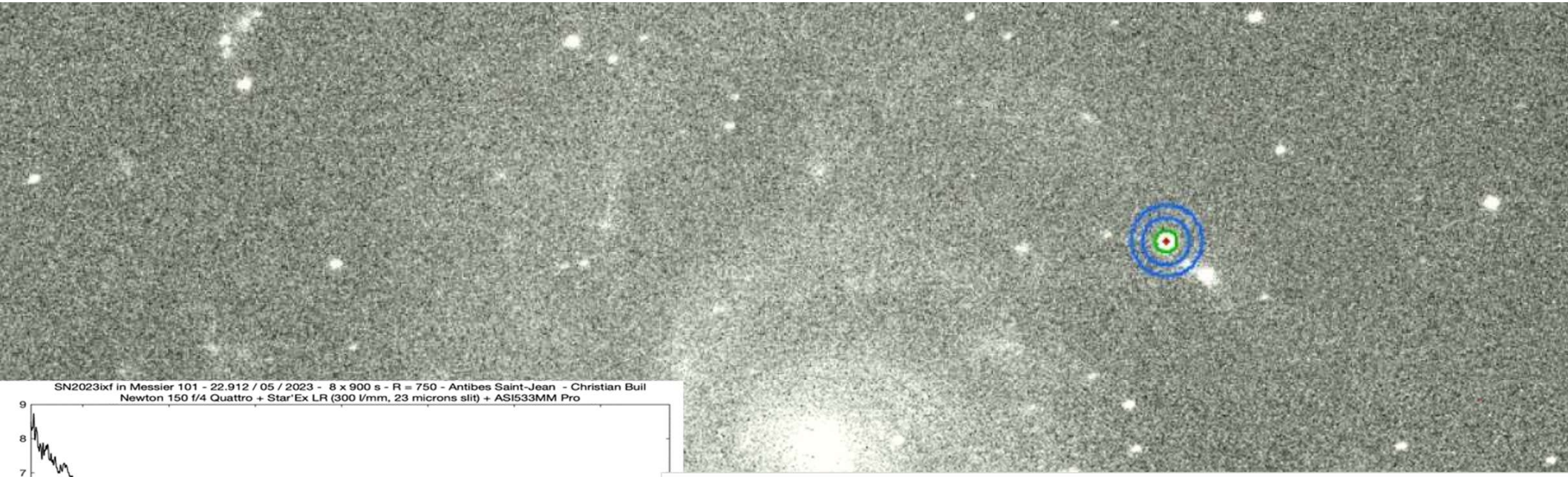


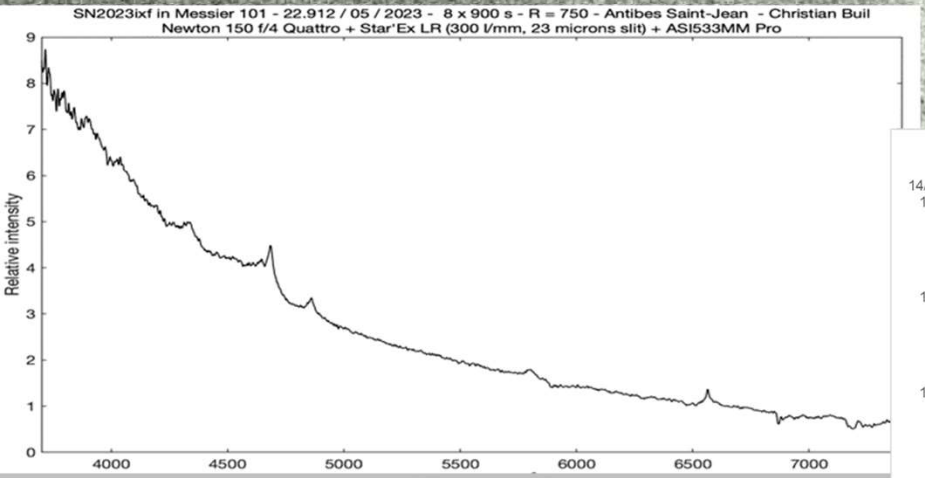


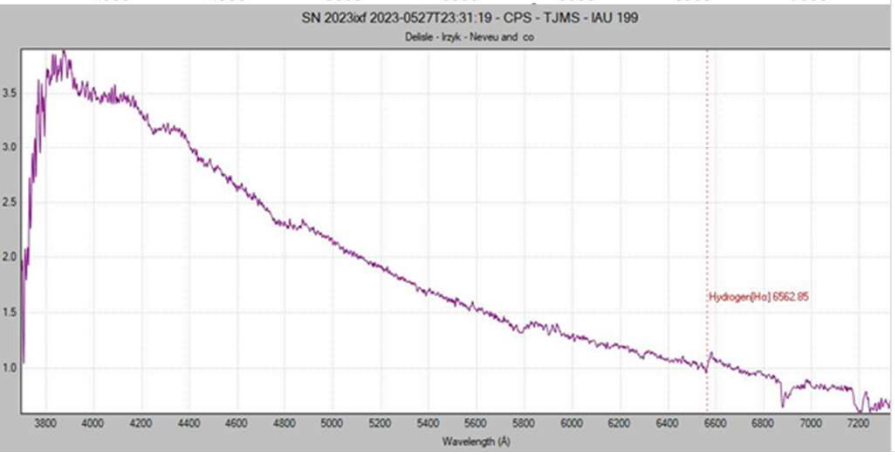


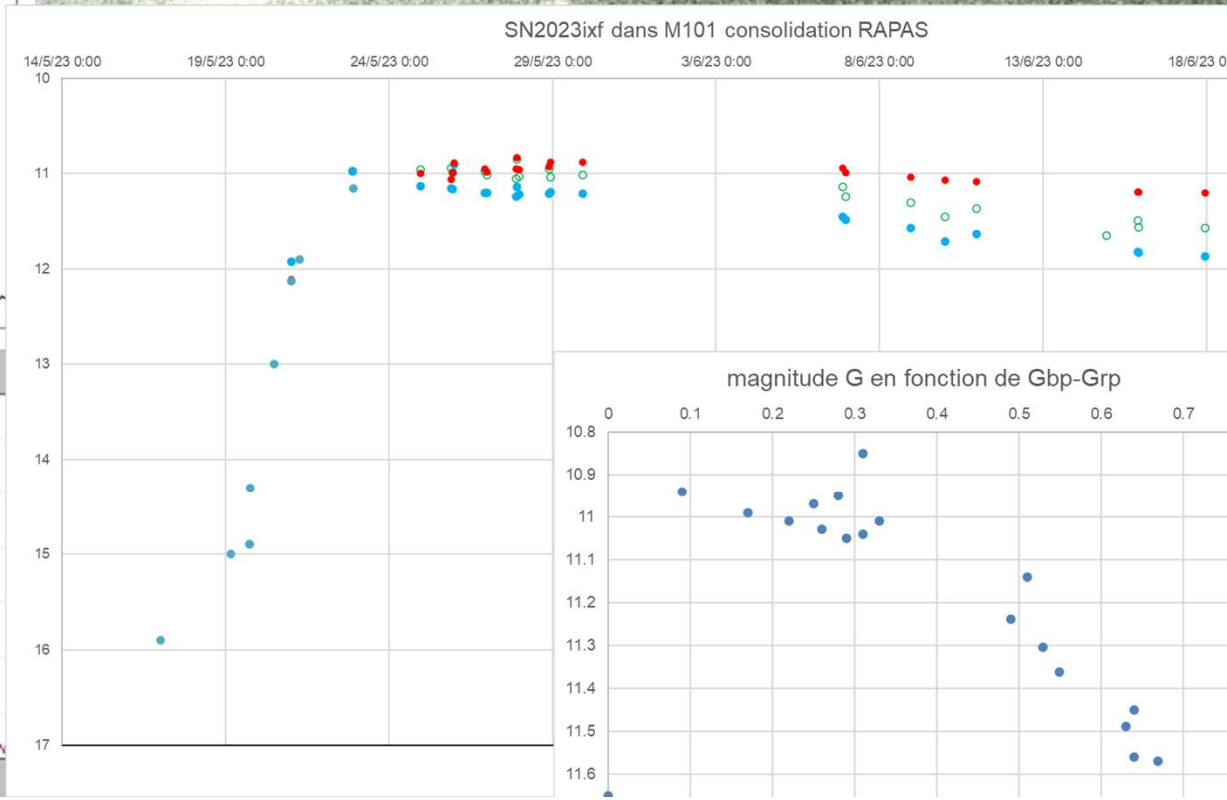


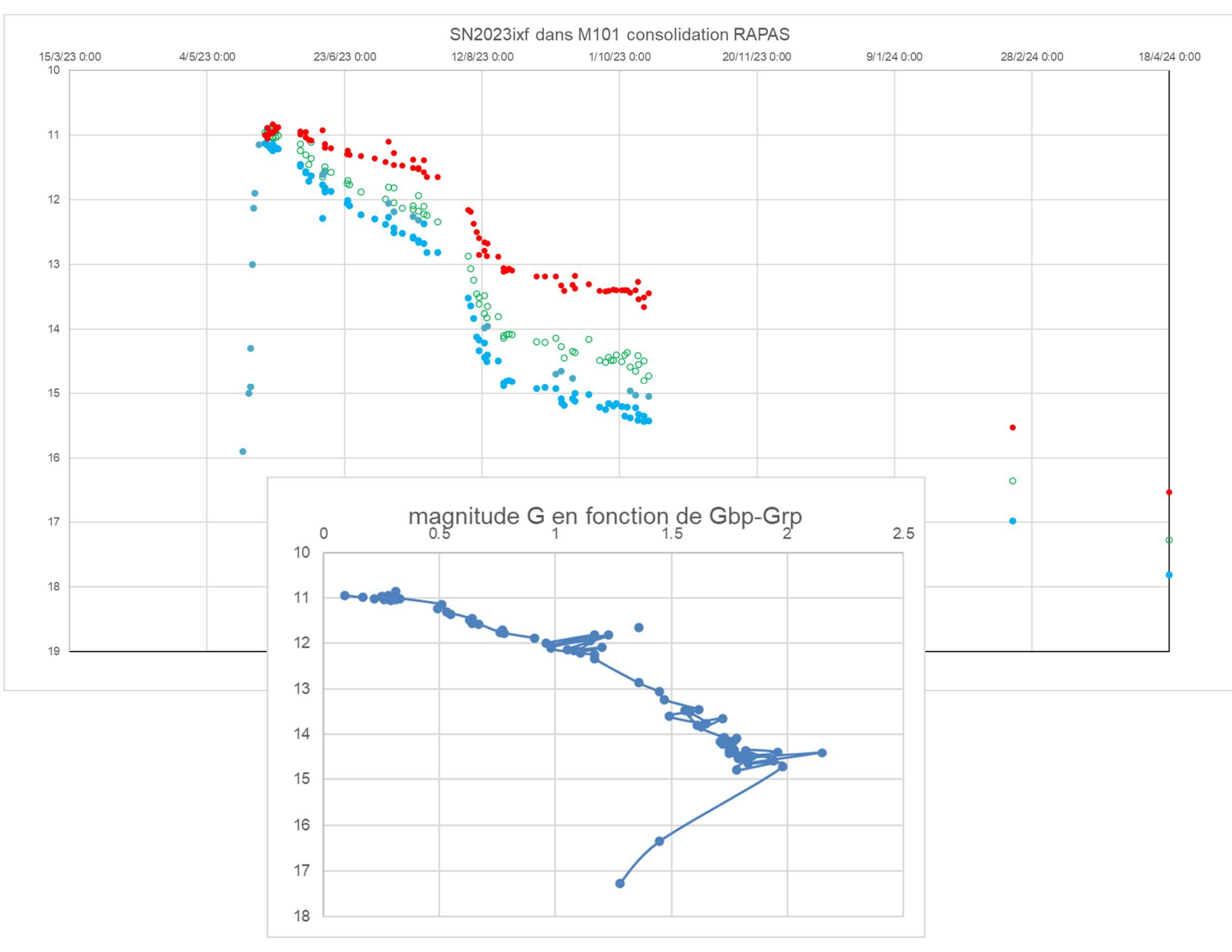
First test on the RAPAS network :
SN2023ixf from M101 discovered on the 19th of may 2023 at m=14,90










SN2023ixf dans M101 consolidation RAPAS
15/3/23 0:00
4/5/23 0:00
23/6/23 0:00
12/8/23 0:00
1/10/23 0:00
20/11/23 0:00
9/1/24 0:00
28/2/24 0:00
18/4/24 0:00
10
11
12
13
14
15
16
17
18
19
magnitude G en fonction de Gbp-Grp
0
0.5
1
1.5
2
2.5
10
11
12
13
14
15
16
17
18

Astro-COLIBRI / RAPAS filtering of alerts

- Deliver selected new alerts (1 a day max, 5 a week max) to RAPAS network, then :
  - Perform the alert monitoring for optical alerts in G Gbp Grp color index
  - Detect optical counterpart from multimessenger alerts
  - Deliver candidates R.A. Dec location, 1as acc with magnitude signature G Gbp Grp or color index
  - Classify each alert as a candidate or false alert
  - Deliver new alerts
- In the future, attach the SED (spectral energy distribution) to each unclassified alert to allow classification or rejection,
- End of each week alert poll for observers during the week or intending to observe next week : either we continue the monitoring or we stop it
- Every Friday issue the list of 10 RAPAS targets to follow on the next week

De Astro COLIBRI <astro.colibri@gmail.com>

Pour RAPAS@groups.io, astro.colibri@gmail.com

Réponse à RAPAS@groups.io

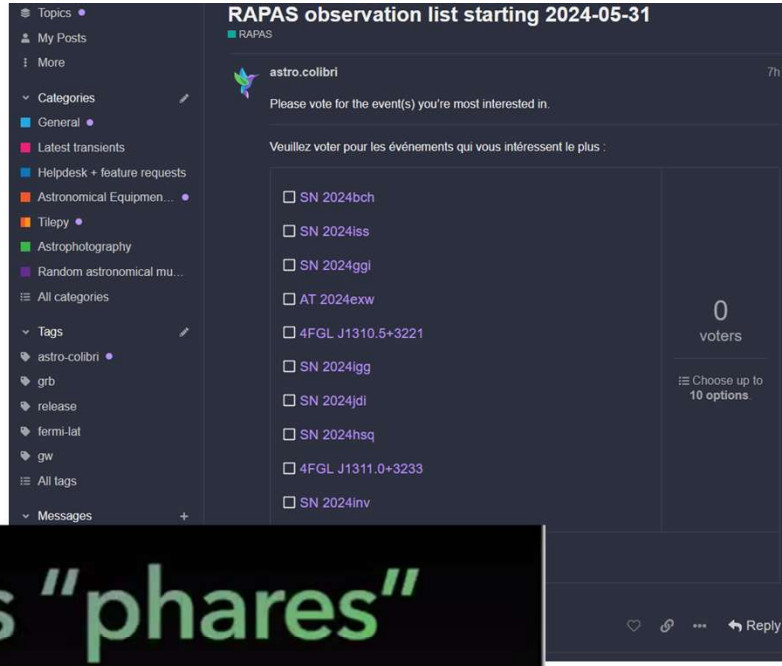
Sujet **[RAPAS] Astro-COLIBRI / RAPAS observation list (2024-05-31)**

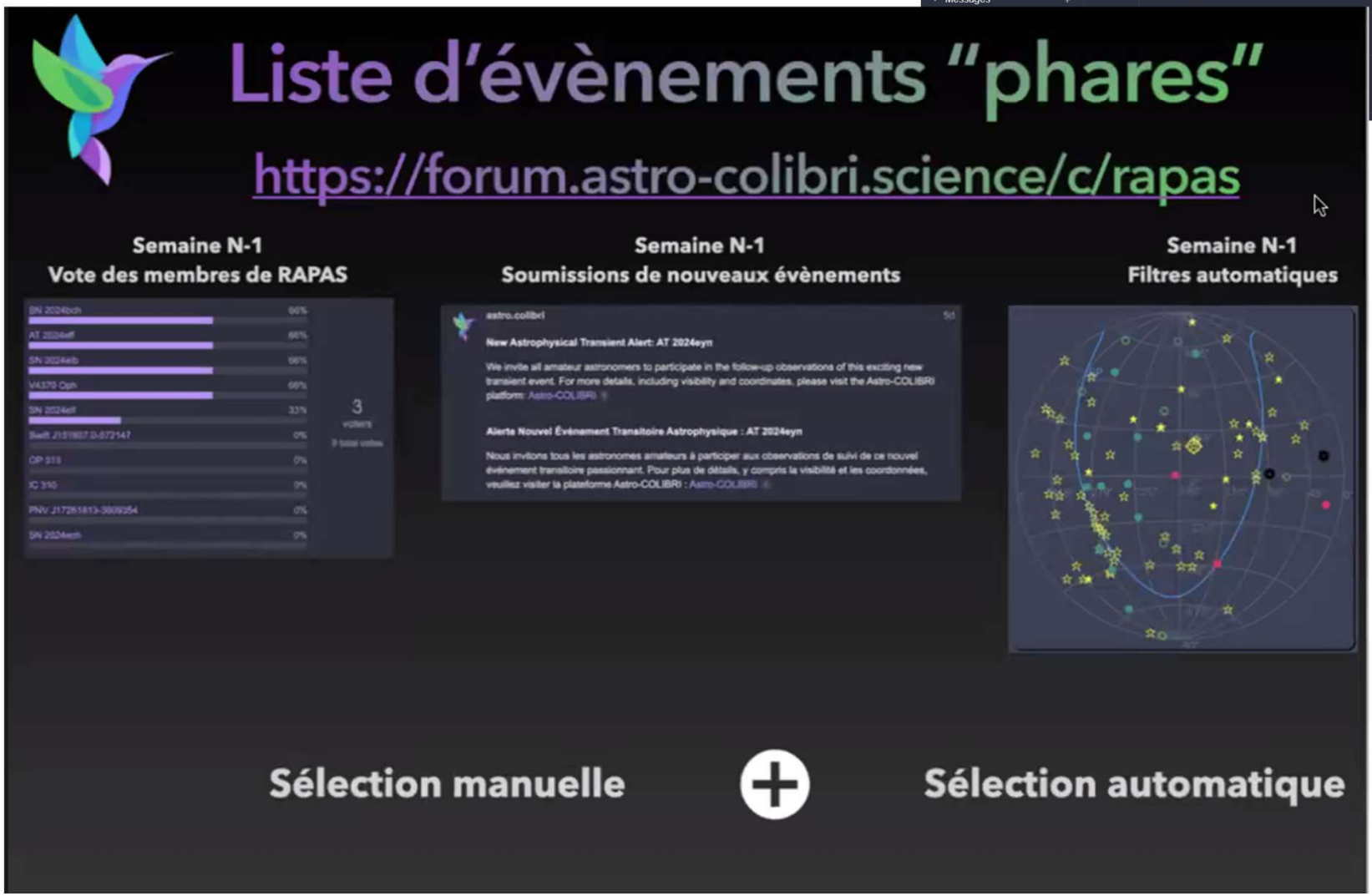
Chers membres du réseau RAPAS,

Nous sommes ravis d'annoncer une nouvelle liste de cibles astronomiques pour l'observation !

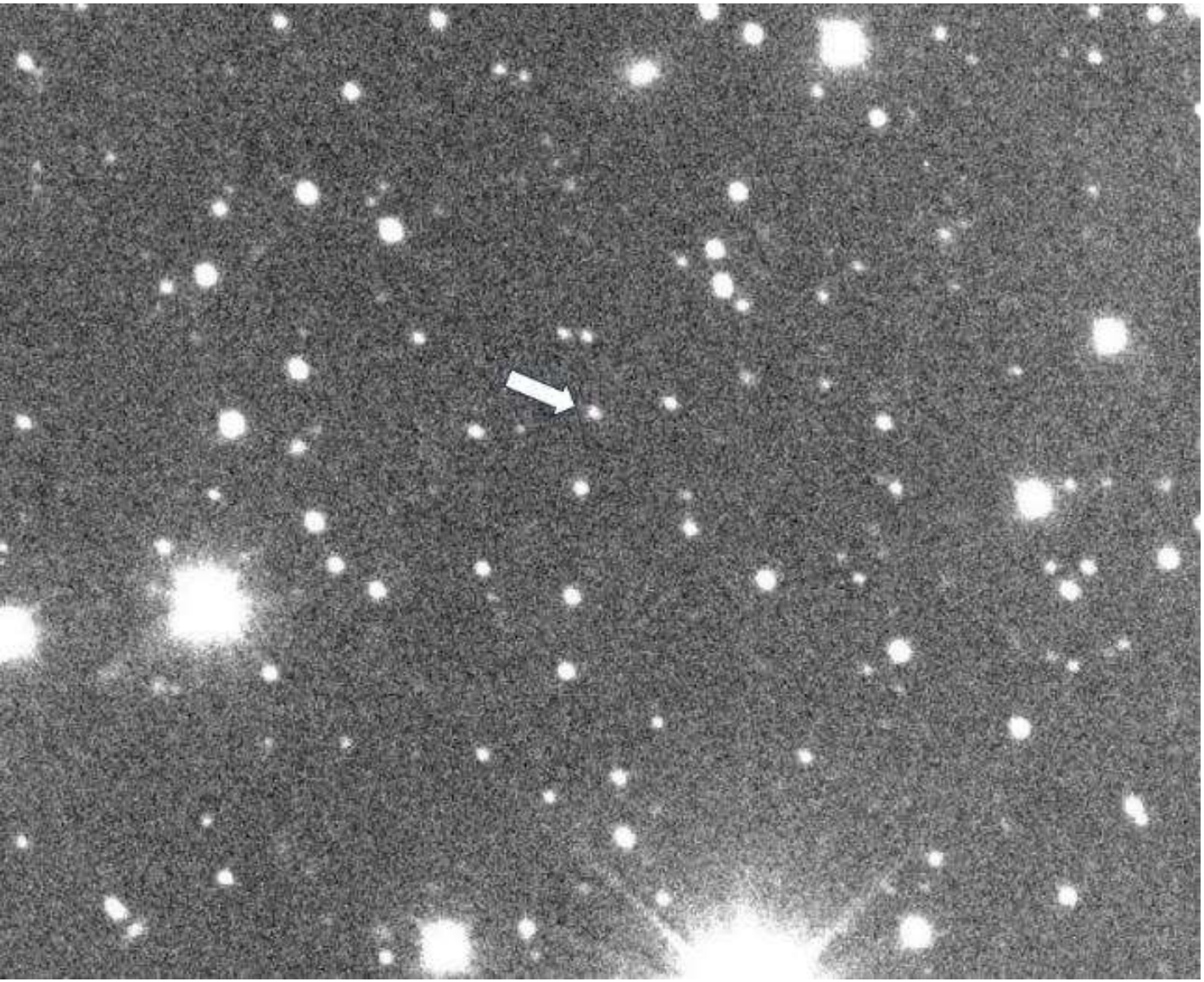
Veuillez visiter le lien suivant pour voir les détails : "RAPAS observation list starting 2024-05-31"

Ciels dégagés,
L'équipe Astro-COLIBRI





GRB240809A 3 RAPAS observers : Belesta, M. Serrau, A. Leroy



Each RAPAS observers deliver magnitude measurements on a RAPAS shared google spreadsheets

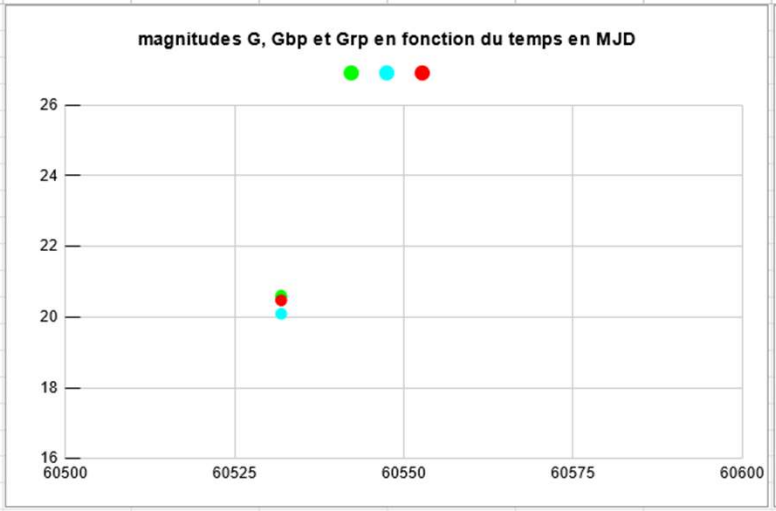
First RAPAS GCN circular : # 37159

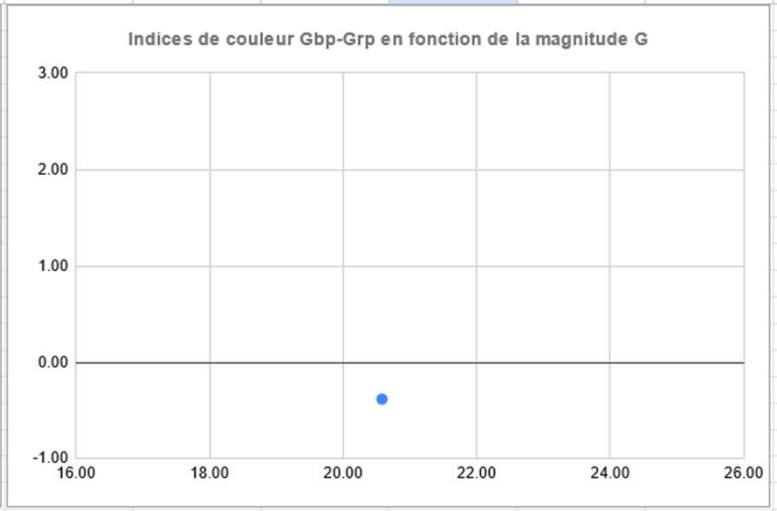
Spreadsheets to collect RAPAS observer measurements

RAPAS 2024 semestre2

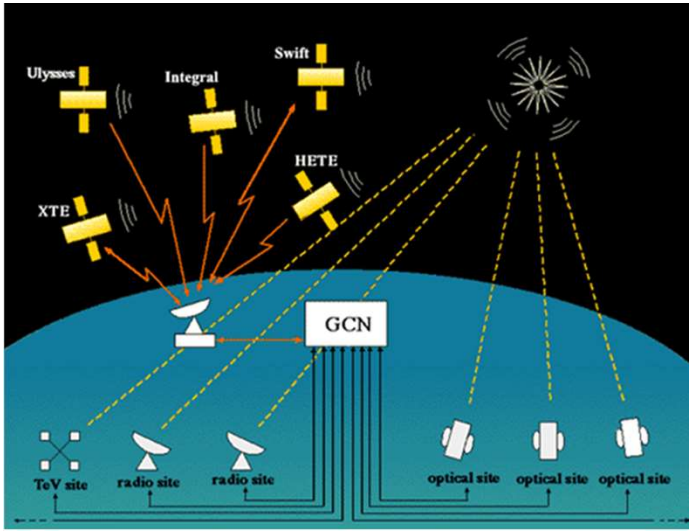
Fichier Édition Affichage Insertion Format Données Outils Extensions Aide

Nom de l'alerte	GRB 240809A	incertitude		
Date de l'alerte	09/08/2024			
RA (deg dec)			15h50m10.55s	
Dec (deg dec)			-2°19'03.3"	
galaxie hôte				
Nature				
Commentaire				
Statut AstroCOLIBRI/RAPAS				
fait l'objet de la Circulaire CGN 37159 (RAPAS #1)				





date	hh:mm:ss	MJD	RA deg dec	Dec deg dec	magnitude A/G	incertitude A/G	magnitude B/Gbp	incertitude B/Gbp	magnitude C/Grp	incertitude C/Grp	indice B-C	upper limit G	Prénom Nom	Commentaire
09/08/2024	15:52:15	60 531.66128			19.75	0.14							Arnaud Leroy	Sans filtre depuis Madagascar
09/08/2024	21:28:00	60 531.89444			20.58	0.19							Patrick Martinez, Cedric Latge	
09/08/2024	21:04:00	60 531.87778					20.10	0.32					Patrick Martinez, Cedric Latge	
09/08/2024	20:48:00	60 531.86667							20.48	0.60			Patrick Martinez, Cedric Latge	
09/08/2024	21:04:00	60 531.87778			20.58		20.10		20.48		-0.38		Patrick Martinez,	consolidation des 3 lignes précédent
09/08/2024	20:49:00	60 531.86736			20.62	0.47							Marc Serrau	



TITLE: GCN CIRCULAR
NUMBER: 37159
SUBJECT: GRB 240809A : RAPAS follow-up observations
DATE: 24/08/12 21:51:25 GMT
FROM: Thierry Midavaine at GRANDMA <thierrymidavaine@sfr.fr>

Thierry Midavaine on behalf of the RAPAS network reports (#1) :

P. Martinez and C. Latgé [1], M. Serrau [2] and A. Leroy [3] observed the Gamma-Ray Burst GRB240809A (Evans et al. GCN 37110 ; Want et al.GCN 37113) using [1] ADAGIO N 820mm telescope at Belesta Observatory (IAU A05) equiped with a Moravian CMOS camera, [2] SC 300mm telescope at Vidauban [A77] equiped with a QHYCCD CMOS camera and [3] SC 350mm telescope at Madagascar equiped with a ZWO ASI CMOS camera. [1] and [2] are equiped with the set of 3 RAPAS filters meeting the Gaia G, Gbp and Grp photometric bands. The FITS files are reduced with the Gaia photometric catalog in respective spectral bands.

The afterglow is detected RA(J2000) = 5h 50m 10.55s ; Dec(J2000) = -02d 19' 03.3" [1]

MJD (mid)	Gaia filter band	mag.(Gaia)	RAPAS station
60531.66128	G	19.75 ± 0.14	[3]
60531.86667	Grp	20.48 ± 0.60	[1]
60531.86736	G	20.52 ± 0.47	[2]
60531.87778	Gbp	20.10 ± 0.32	[1]
60531.89444	G	20.58 ± 0.19	[1]

RAPAS (https://proam-gemini.fr/rapas/) is a new ProAm collaboration funded by Paris Observatory, delivering to a network of french amateur observatories a set of 3 filters meeting the Gaia spectral bands. This network is dedicated to deliver data in the Gaia photometric system on selected astrophysical alerts by Astro-COLIBRI (https://astro-colibri.com/) or from Gaia alerts.

View this GCN Circular online at https://gcn.nasa.gov/circulars/37159.

Spreadsheets to collect RAPAS observer measurements…

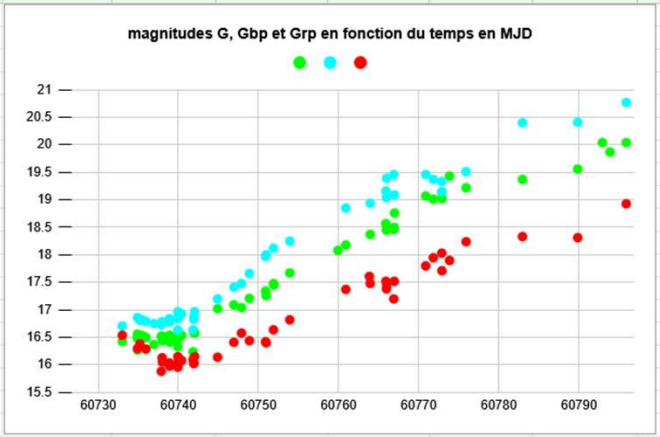
RAPAS 2025 semestre1

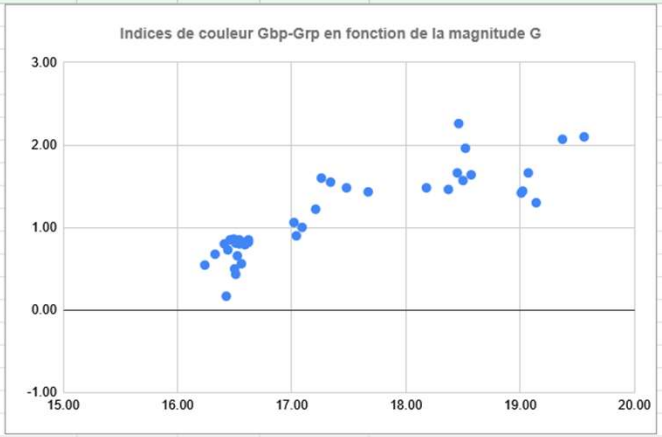
Fichier Édition Affichage Insertion Format Données Outils Extensions Aide

Partager

B4 | 28,44

	A	B	C
1	17.8	0.07647	incertitude
2	Date de l'alerte	2025/02/24	
3	RA (deg dec)	158,28	
4	Dec (deg dec)	28,44	
5	galaxie hôte	ngc3277	
6	Nature	Type Ib-Ca-rich	
7	magnitude decouverte	17,4	
8	z	2,472	
9	Commentaire		
10	Statut AstroCOLIBRI/RAPAS		
11	date de fin de l'alerte		





DATE	TC HH:MN:S	MJD	RA deg dec	Dec deg dec	magnitude A/G	incertitude A/G	magnitude B/Gbp	incertitude B/Gbp	magnitude C/Grp	incertitude C/Grp	indice B-C	upper limit G	Prénom Nom	Commentaire	champ couv
06/03/2025	09:50:24	60 733.0106			16.43	0.02	16.71	0.02	16.54	0.02	0.16		Pierre-Yves Lechapelain		85'x85'
28/02/2025	20:31:00	60 734.8550	158.28295	28.43686	16.49	0.06							Marc Serrau		30'x20'
28/02/2025	21:52:00	60 734.9111	158.28	28.437	16.56	0.07	16.86	0.06	16.30	0.11	0.56		Arnaud Leroy		
28/02/2025	22:19:00	60 734.9299	158.28	28.437	16.27	0.05							Jean-Louis Dumont (SAT37)		0.185
01/03/2025	04:38:53	60 735.1937			16.51	0.02	16.81	0.03	16.38	0.02	0.43		Pierre-Yves Lechapelain		85'x85'
01/03/2025	10:53:02	60 735.4535					16.81						Jean-Baptiste Marquette		
01/03/2025	11:05:55	60 735.4624			16.53								Jean-Baptiste Marquette		
01/03/2025	11:39:29	60 735.4857					16.82						Jean-Baptiste Marquette		
01/03/2025	11:54:58	60 735.4965			16.53								Jean-Baptiste Marquette		
01/03/2025	23:00:38	60 735.9588			16.50	0.08	16.79	0.09	16.29	0.17	0.50		Marc Serrau		30'x20'
02/03/2025	23:04:50	60 736.9617			16.37	0.22	16.75	0.07					Marc Serrau		30'x20'
03/03/2025	23:50:48	60 737.9936			16.44	0.07	16.78	0.06	16.05	0.16	0.73		Marc Serrau		30'x20'
03/03/2025	21:06:46	60 737.8797			16.52	0.06	16.73	0.07	15.89	0.18	0.84		Bernard Tregon	30x60s /filtre	39'x31'
03/03/2025	23:24:43	60 737.9755			16.525	0.023	16.79	0.02	16.13	0.10	0.66		Pierre-Yves Lechapelain		85'x85'
04/03/2025	21:34:27	60 738.8989			16.54	0.01	16.84	0.02	16.04	0.12	0.80		Pierre-Yves Lechapelain		85'x85'
04/03/2025	22:03:22	60 738.9190			16.41	0.08	16.78	0.07	15.98	0.08	0.80		Marc Serrau		30'x20'
05/03/2025	21:39:53	60 739.9027			16.46	0.05	16.84	0.04	15.99	0.18	0.85		Marc Serrau	magV=16.68+/-0.04 g'=16.95+/-0.04 r'=16.61+/-0.06	30'x20'

SN2025erh | AT2025ere | GRB250311B | SN2025coe | SN2025ccu | AT2025axj | SN2025qe | AT2024afyi | AT2024afyx | SN2024aegm | AT2024aezd | AT2024aehf | AT2024a

RAPAS step 2 : Spectrograph network

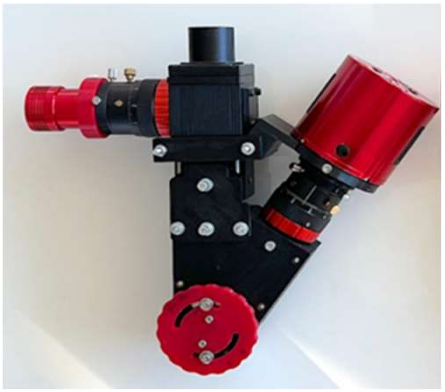
Following the candidate detection, localisation and G, Gbp and Grp magnitudes, caracterise the alarm with its spectral energy distribution :

- Reject false alarm
- Classify alert
- Release the SED :

  - Detect continuum blackbody like distribution and equivalent Temperature
  - Detect continuum not fitted to one blackbody
  - Detect temperature variation
  - Detect emission lines : H, Si,…
  - Detect broad absortion bands
  - Detect Balmer or Lyman spectral break and measure z shift.
  - Detect SED variations or changing temperature…

Design high luminosity very low dispersion spectrograph able to meet high upper limit magnitude (20 targeted) and a Resolution > 100 with >400mm diameter telescopes with 1 hour exposure.

Realisation then test on 2 spectrograph prototypes



- Alpy 200

Fitted with a 200g/mm high efficiency transmittive grating instead of grism de 600g/mm with a 2 slit width

- Realisation of a Star'Ex VLR (Very Low Resolution)

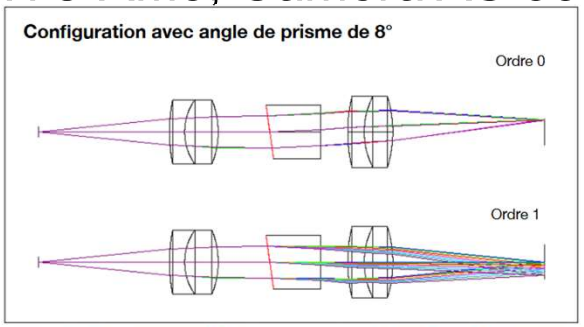
Equiped with a reflective 150 g/mm grating and optional objective focal length reduction from 80mm to 40mm

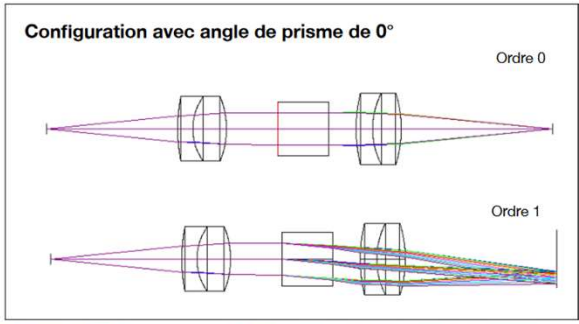
In 2024 test the 2 spectropgraphs

End 2024 validate or iterate spectrograph def to equip 5 to 10 telescopes in RAPAS network

Test StarEx 150t/mm Christian Buil

- Lunette de 80mm sur une monture ZWO AM5, Camera ASI533MM sans fente ouverture de 2mm
- 45mn d'exposition
- Magnitude 13,3

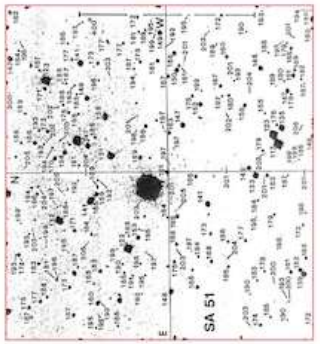




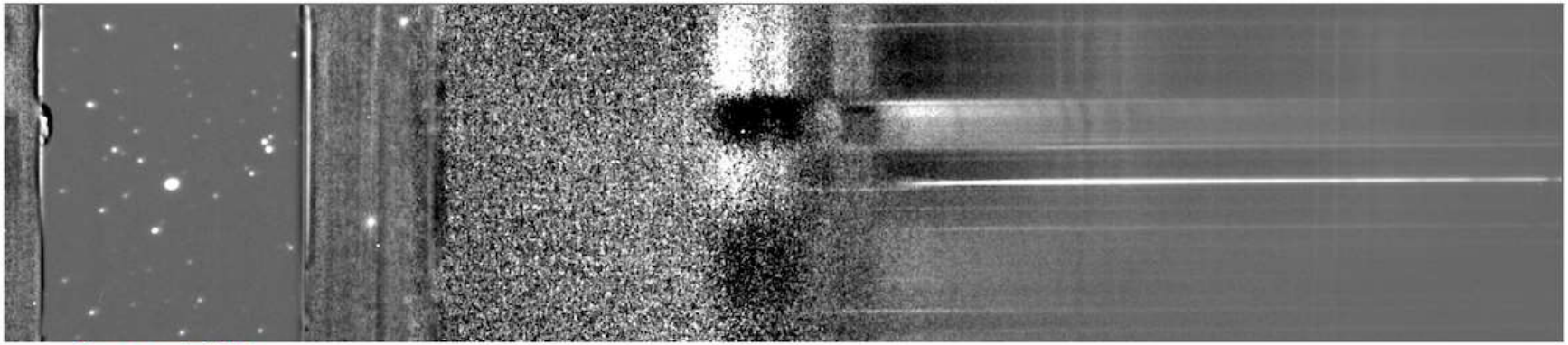
Selected Area 51 (7h30m39s, +29°49'44", 2000.0) - **Test spectrographie avec fente large (Star'Ex)**

Christian Buil - 09/03/2023

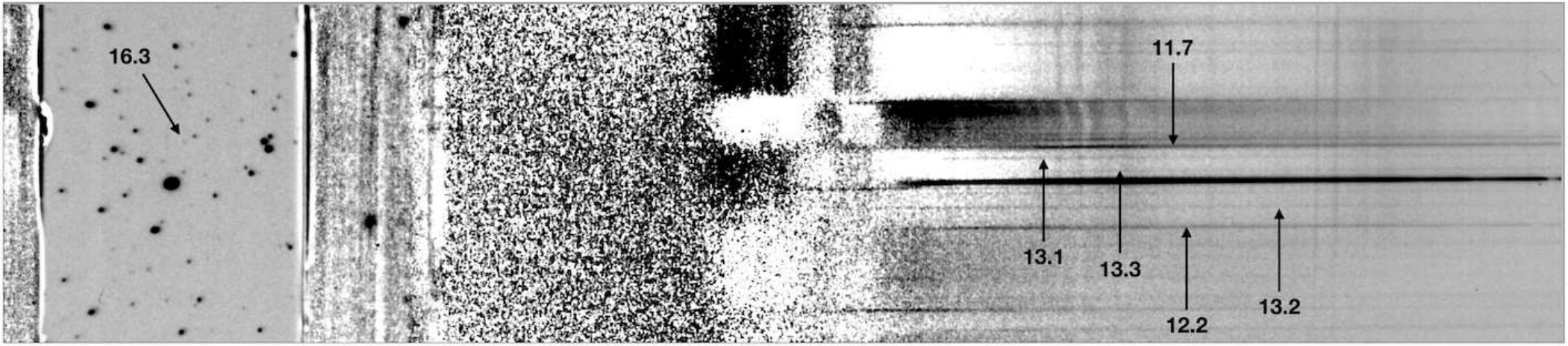
Lunette TS PhotoLine 80 ED (diamètre 80 mm, focale 480 mm) + Star'Ex LR 80x80, réseau 150 mm,
fente large (2.0 mm x 4.5 mm), caméra ASI533MM Pro - Exposition 45 mn (9x300 s) durant la Pleine Lune et en milieu urbain (Antibes)



Carte de champ SA51

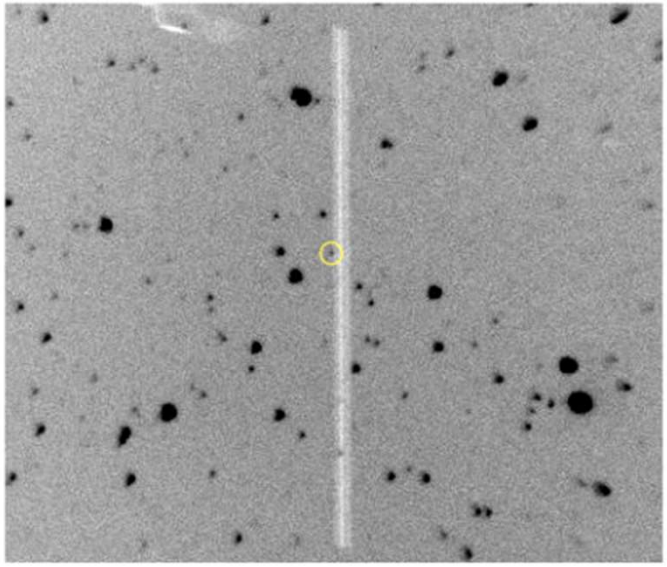


Champ spectro SA51



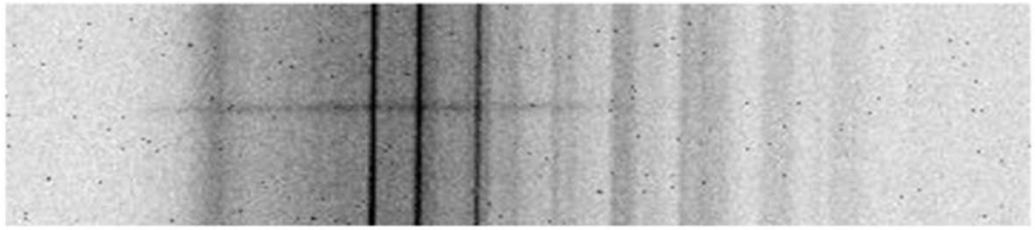
Robin Leadbeater tests with Alpy 200

SN2023vxt 18.6 r mag 10x600sec C11 f/5



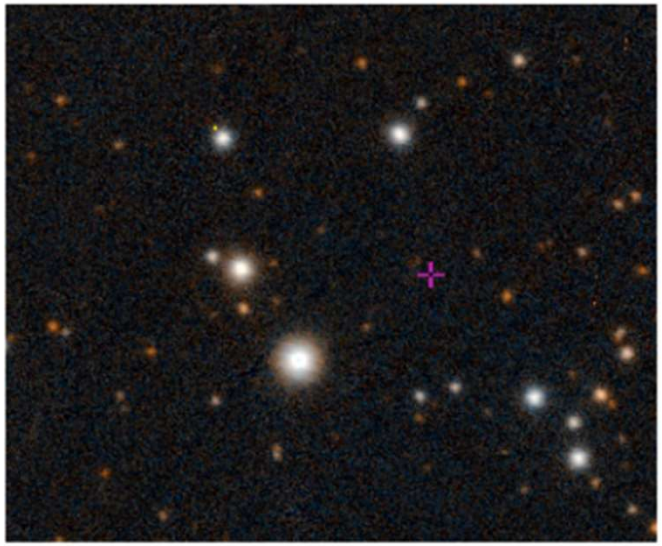
guider image (11x20sec)

SN 2023vxt 11-11-2023



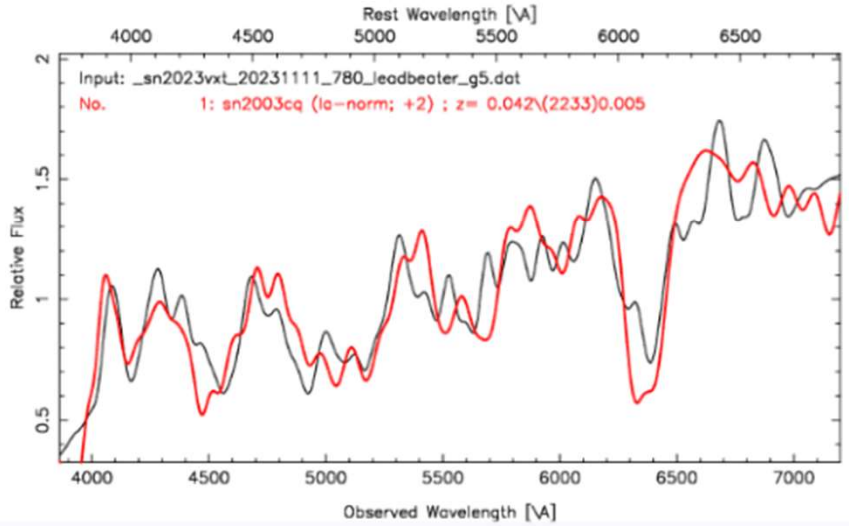
Raw spectrum image including sky background

(Light pollution (LED, NaD) Air glow (Oxygen, NaD lines ,OH molecular emission bands)



Digitised Sky Survey image

https://archive.stsci.edu/cgi-bin/dss_form



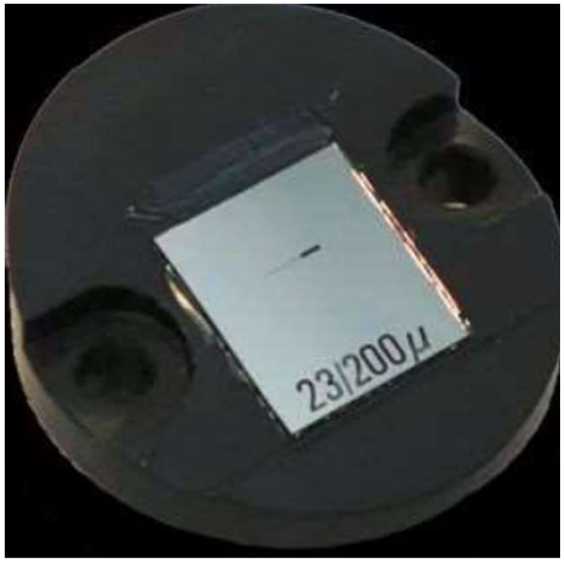
Measured spectrum (black) compared with best match from SNID (red)

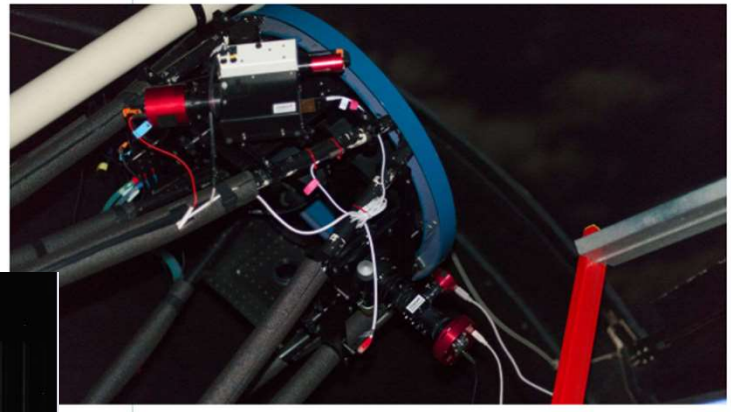
R Leadbeater Three Hills Observatory 20231119

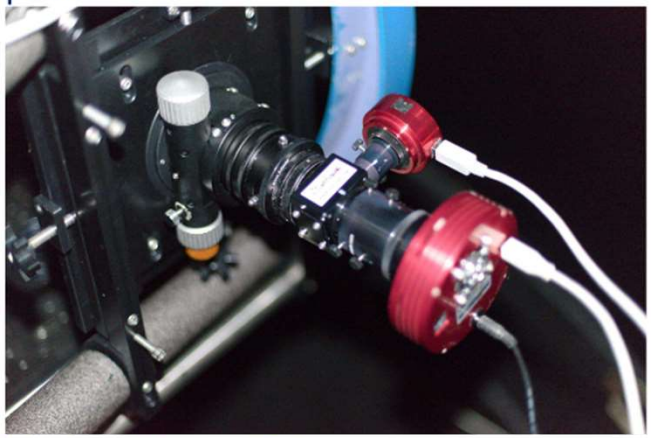
Alpy200 tests at TJMS

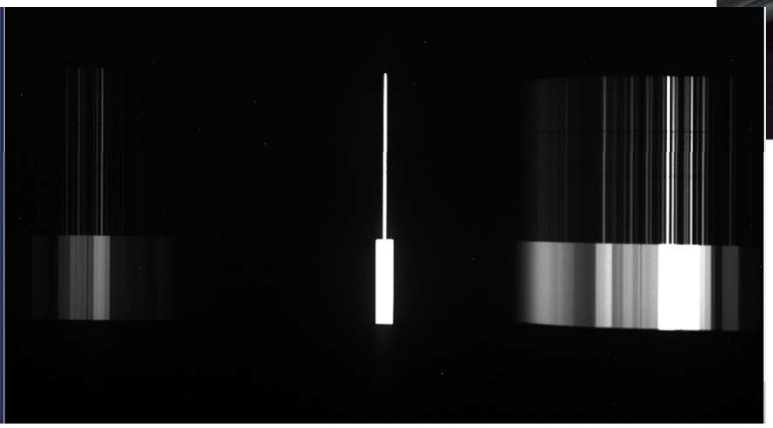
Le montage

- Le TJMS est a f/d=3,3 => utilisation d'un paracorr f/d ~3.8
- Pas de module d'étalonnage à cause du backfocus nécessaire pour le paracorr (remplacé par une bague de plus faible backfocus)
- Module de guidage avec une Asi120
- ALPY200 avec une fente photométrique 23/200 micron
- Camera science : une vénérable atik 314L+ à -10°C
- Guidage sous PhD guiding
- Positionnement et acquisition sous prism



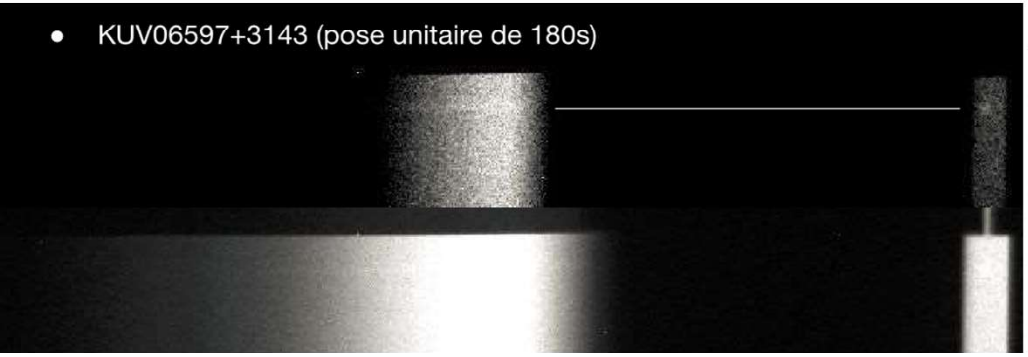


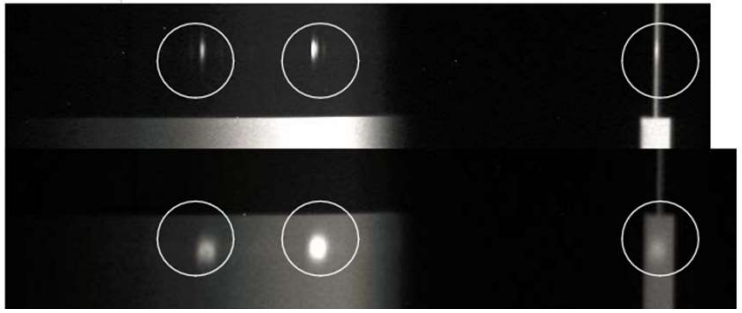




- M1_7 : nébuleuse en émission, Mag ~15.3
- En fente etroite et photométrique
- Pose de 180s
- En fente photométrique, on retrouve la forme des stars analyzers (l'objet se retrouve sur chacune des raies d'emission)

- KUV06597+3143 (pose unitaire de 180s)





Star’Ex VLR tests at TJMS

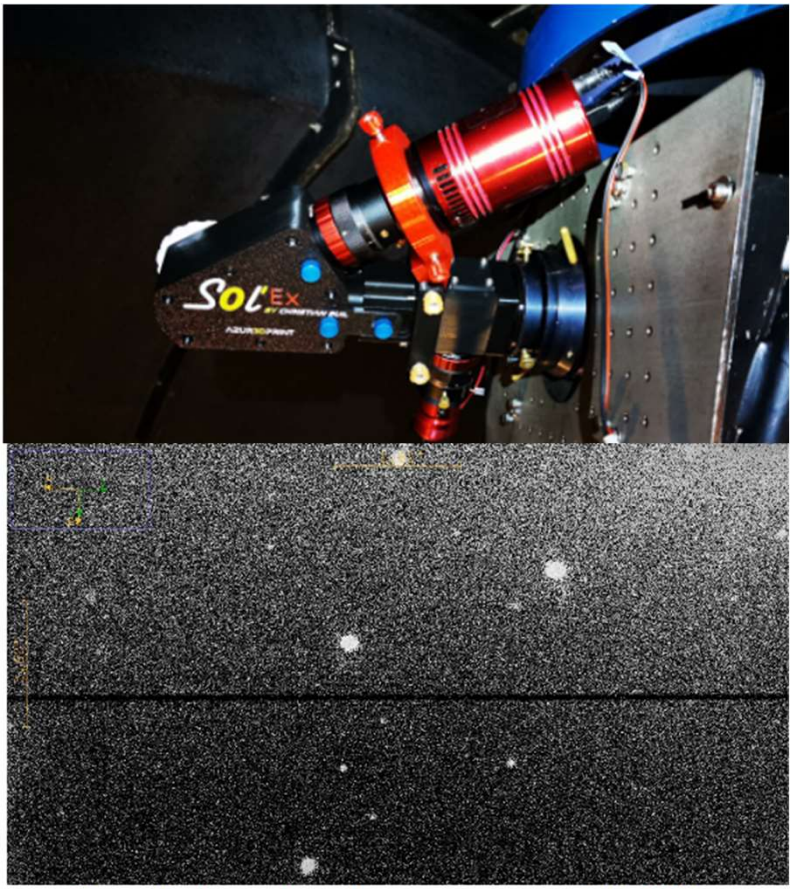
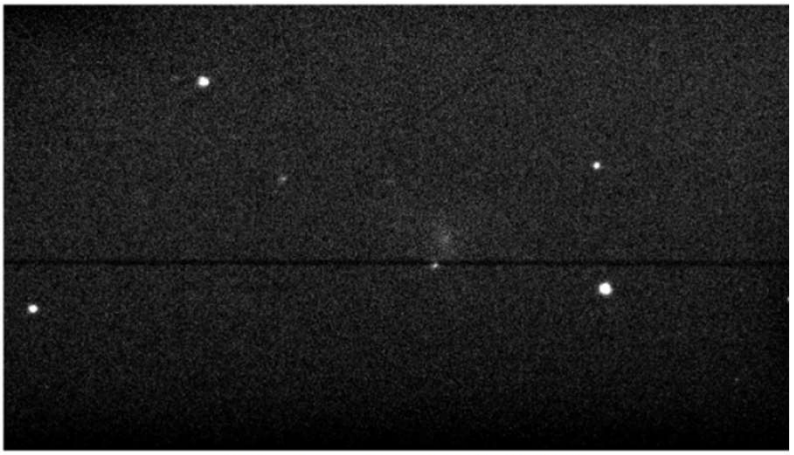
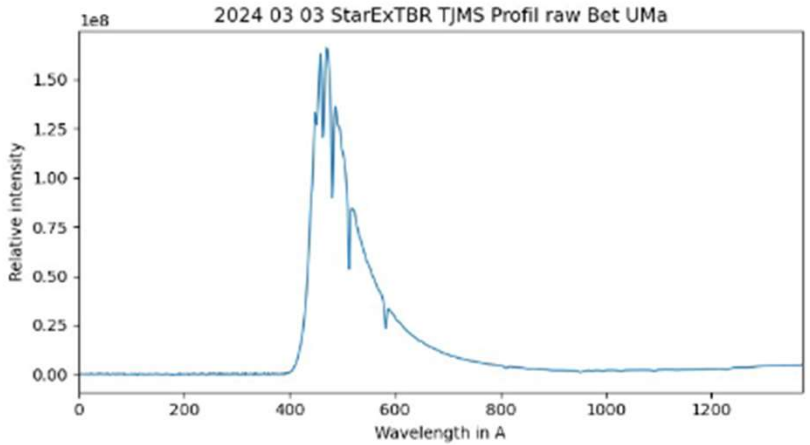


Image du champ de guidage avant centrage de Bet UMa

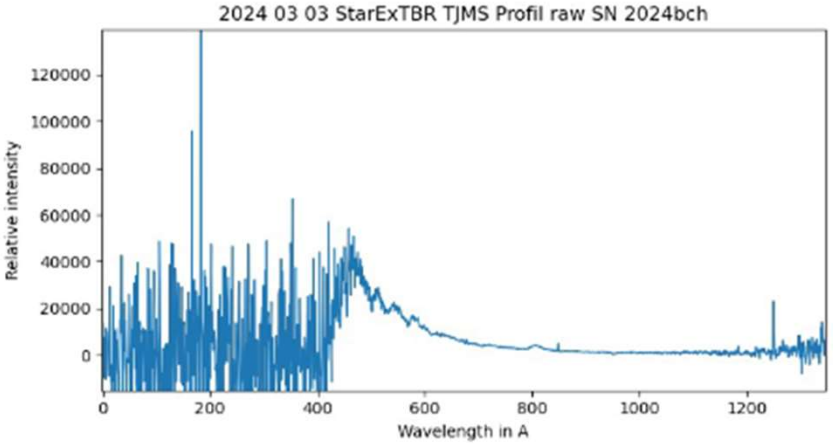


Champ de guidage de SN 2024bch

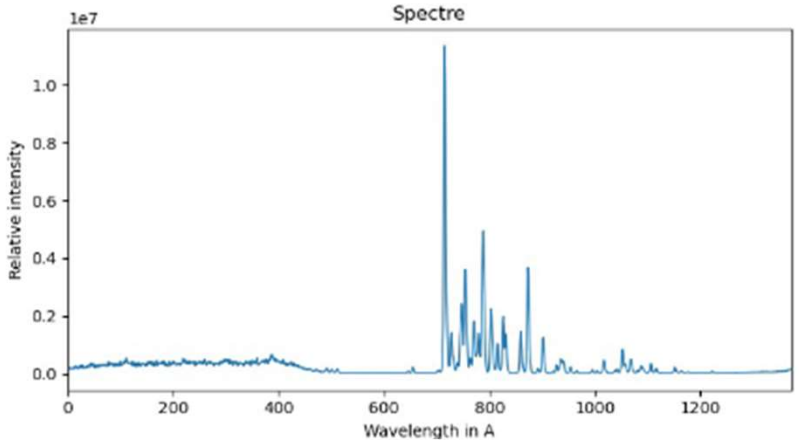
Bet UMa : _betuma_raw.fits

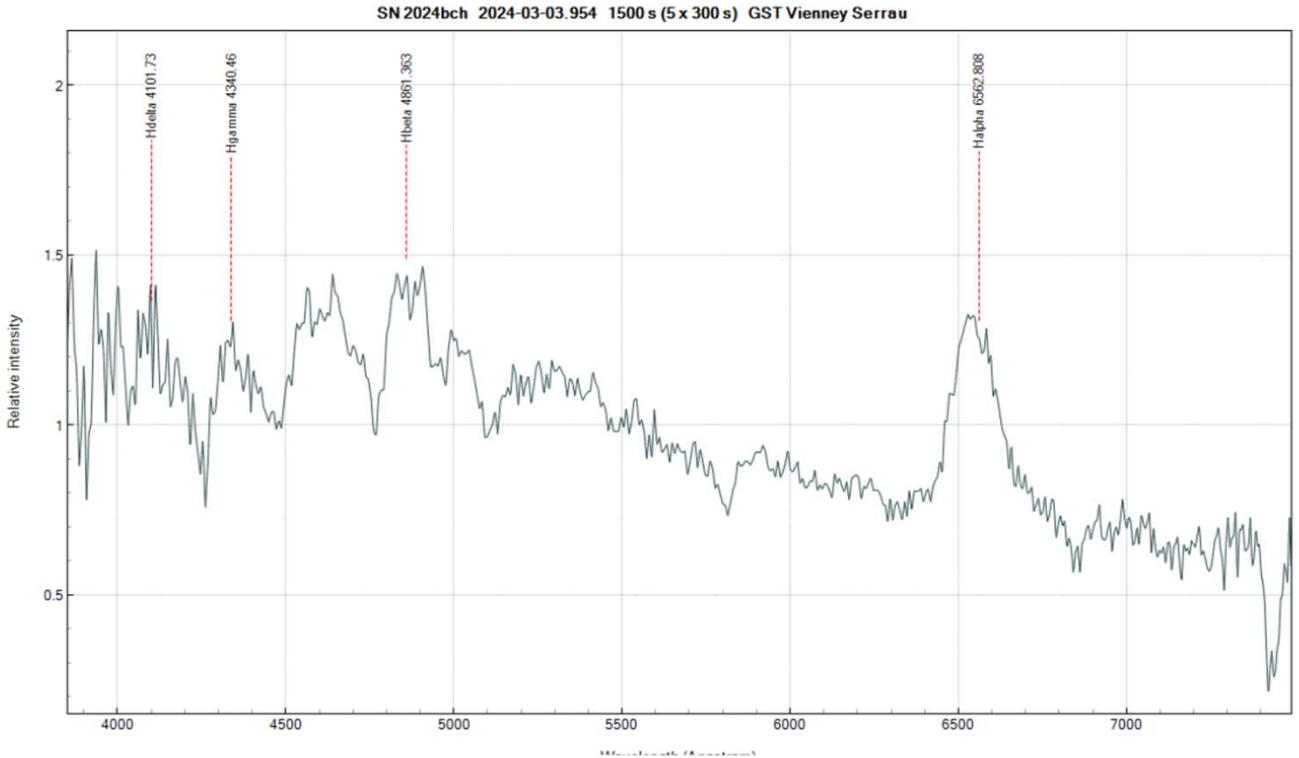


SN 2024bch : __sn2024bch_raw.fits

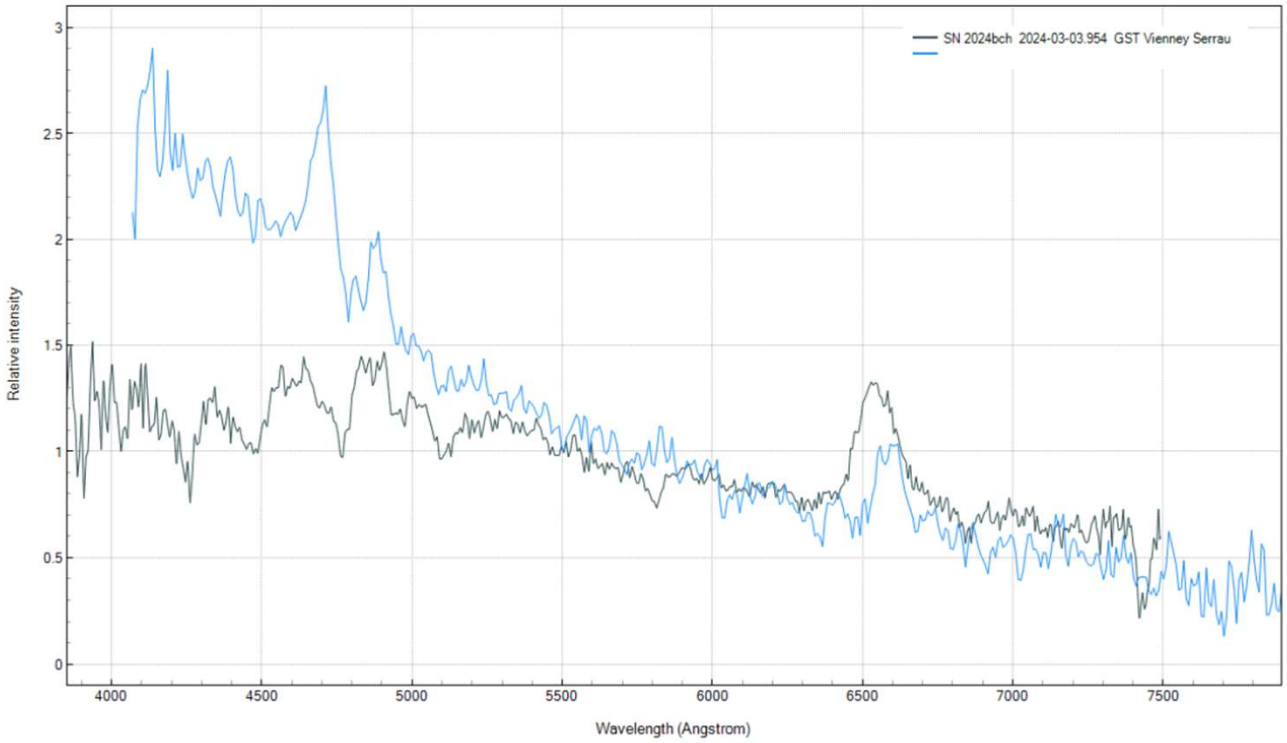


Lampe Calibration Ne : _Ne_raw.fits





SN2024bch



2024-01-29 CBalcon-vs-2024-03-03 GST

Conclusion on RAPAS 2022-2023-2024

The RAPAS network is working and growing

Three workshops organised in 2022, 2023 and 2024 at Paris observatory

Several meetings on Zoom for RAPAS network

Several presentations to promote the RAPAS project

You are welcome to join the RAPAS network… What's next ?

- https://gemini.obspm.fr/20220101-rapas/
- Get access to tutorials and data : https://rapas.imcce.fr/

You get in the loop of the alerts to deliver data :

- The registration to the RAPAS network allows you to receive messages from the mailing list : RAPAS@groups.io
- You could be then be electable to receive a set of RAPAS filters
- If you have a spectrograph experience you could join the SED RAPAS network we intend to build. You may have a spectrograph loan to perform the tests of Alpy200 and StarEx'VLR
- You could join the Astro-COLIBRI community and tick the RAPAS functionalities :
  - You download the Astro-COLIBRI app on your smartphone
  - You register to AstroCOLIBRI and create a login with in addition the membership to RAPAS
  - https://astro-colibri.science/
- In addition you are invited to register to the following programs :
- BH-TOM2 (Black Hole Target Observation Manager) : https://bh-tom2.astrolabs.pl/
- KNC (KiloNova Catcher) : http://kilonovacatcher.in2p3.fr/

RAPAS 2025

- Apply the integration in GRAPPA of variable stars file from Gaia DR3 catalog (first to reject them for the photometric reduction and release magnitude measurements)
- Choose image processing to be applied in the 3 RAPAS pipelines
    1. SSO : Tycho Tracker for MPC delivery : date RA Dec mag
    2. Optical Alerts : Prism V11, SIRIL1.4, Muniwin trade off for Alert Monitoring
    3. Optical Counterpart detection, localisation and classification : STD PIPE, RAPAS Processing Pipeline
- April – August : Master 1 Internship Martin Grandidier designing and assessing improved RAPAS filters
- 4 – 6 july Toulouse : Gemini ProAm workshop and Photometric School with a Photometric reduction session for RAPAS : Siril 1.4, Rapas photometry pipeline, user feedback
- 22 – 26 august : Internship and mission at OHP using the 1.20m telescope : share practice and develop unified processing pipeline toward circular release and publication.
- Publish GCN and TNS Circulars
- Plug to RAPAS Virtual Observatory facility provided by WIVONA
- Prepare a paper publication
- Fix the 2 spectrograph definitions attached to each telescope setup in the RAPAS network

RAPAS 2026

- Find fundings for the manufacturing of a third filter batch using the new optimized coating design
- Enlarge on an international scale the RAPAS network ? Via IAU PARC WG ?
  - Find fundings
  - RAPAS South Hemisphere
- Plug in the Vera Rubin Alerts with a RAPAS alert filtering and selection process with Julien Peloton : for the monitoring of alerts rising under mag 17 where Vera Rubin is becoming saturated.
- Launch the manufacturing of small batch of optimized Alpy200 and Star'Ex VLR for SED high magnitude able spectrographs to equip the RAPAS Spectro network with 5 telescopes to start (with 400 mm and above diameters)
- Access to PESSTO (Public ESO Spectroscopic Survey of Transient Objects www.pessto.org/marshall/
- RAPAS Data Release process for
  - GCN : GRB, …
  - TNS : SN, Novae,…
- Dec 2026 Get ready to use Gaia DR4

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