



Present and future science with  
CARMENES (RIA), February 20-21, 2019

# CARMENES operation and maintenance at **Calar Alto**

**Marco Azzaro**  
CAHA



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# Access Protocols

- Calibration room
  - Inform M. Azzaro, note down times
- Climatic rooms (VIS + NIR), instructions on doors
  - Inform M. Azzaro who will inform CMT
  - Wait for authorization
  - Wear clean room protections, minimize time inside
  - Note down Name and start-finish Times.
- In case of danger for the instrument
  - If possible, inform M. Azzaro or department head or Pedro Amado.



# The LN2 for CARMENES

## Mechanics dept.



- VERY IMPORTANT element. 7500 l deposit
  - Dedicated to CARMENES
  - Consumption is 4 times higher, 12000 l/M, 42 K€/year, extra cost = 32 K€/year
  - Reliable + Available, storage lasts 2 weeks, snow problems last less.
- Re-filling + pressurization (daily cycle), 3 350 l + 2 150 l dewars
  - 350l dewars are re-filled in cycle, pressurized during 24h. Two are always serviced and one in use.
- Vacuum pumping + checks.





# Software & computers

## Computing dept.



- ICS – Tel interface
  - Large program specific to CARMENES
- NIR- VIS reset
  - Soft, hard reset, Reboot.
  - Wolf reset rarely used. Ross needs frequent resets because of Geirs (NIR data management).
- Archive
  - Specific to CARMENES, modification of global archive
  - Disk space had to be increased (+ 30 TB) to fit raw NIR data.
- Health check of the whole system every hour
  - All computers at CAHA are monitored, CARMENES computers part of the checks (space, running programs, services etc.)



# Electronics

## Electronics dept.



- Parameter checks (SCADA)
  - Vacuum
  - Temperatures
- Rough pumps periodic maintenance
  - Operate Rough Pumps some time to eliminate condensation
- Lamps substitution
- Protocols for various kinds of interventions (Interlocks)
- Fiber-shaker monitoring and maintenance



# Climatic system

## Maintenance dept.



- VIS + NIR rooms at  $12 \pm 0.1$  °C
  - Climatic system checks
  - Oxygen sensors checks
- Ice (carmenes/foto/cooling\_sys/....)
  - On-Off valve outlet



# Spares

- Two closeby rooms dedicated to spares
- LN2 lines
  - Available for improving the system (less parts like manifolds)
  - Less access to the rooms required
- Electronics
  - On-Off valve
  - Boards + ROE etc.
- Lamps (ThAr, Uar, Une, flats, FP)
- Uar + Une lamps being ordered





# Maintenance / checks

- LN2 lines vacuum
- SP regenerations
- Sensors (vacuum, oxygen)
- Ice
  - On-Off valve outlet
- Neon tank checks
  - Pressure
- Fiber-shakers
  - Working





# Foreseen interventions



- Normal maintenance (periodic)
  - Lines vacuum, SP regeneration,
- Major (one-time)
  - NIR + VIS LN2 manifolds removal + NIR On-Off relay substitution + make fiber-shakers visible from outside + GPU lines vacuum.
  - NIR SP independization
  - NIR + VIS damping system calibration

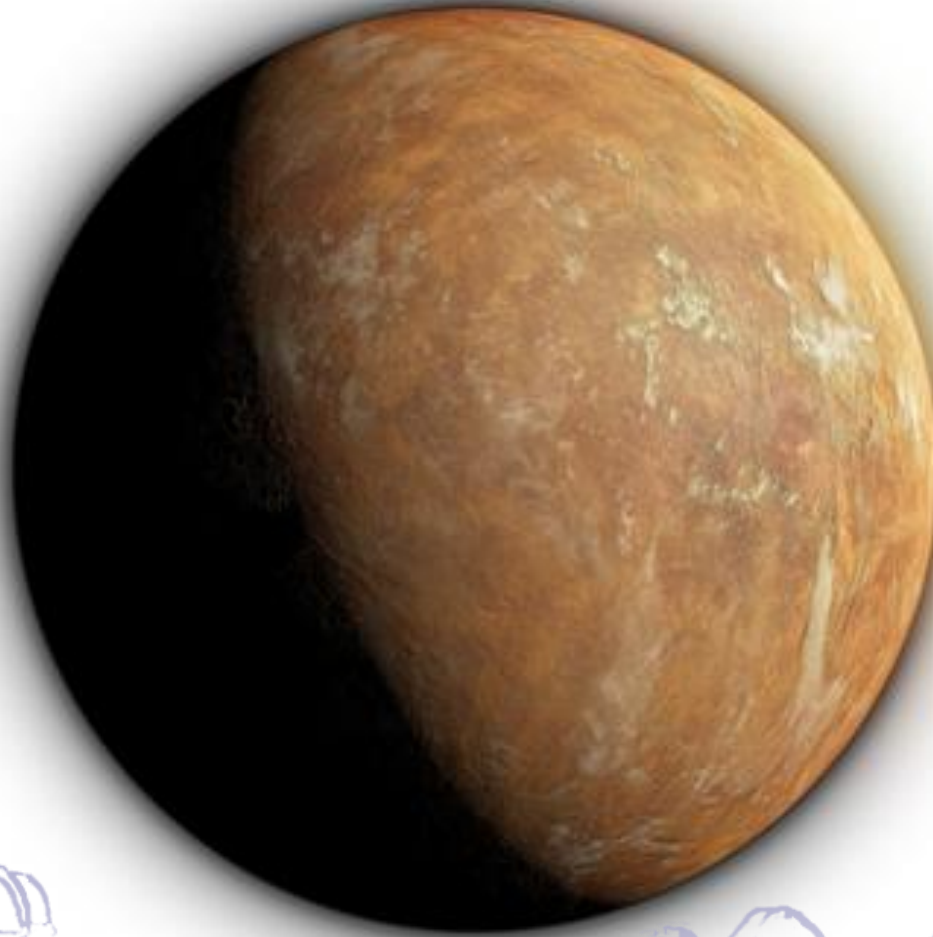


# The Dark Side of Carmenes

*(the observer's point of view)*



Rubén Hedrosa  
&  
Gilles Bergond  
  
Calar Alto Obs.



with inputs  
from the whole  
CAHA  
Astronomy  
Department



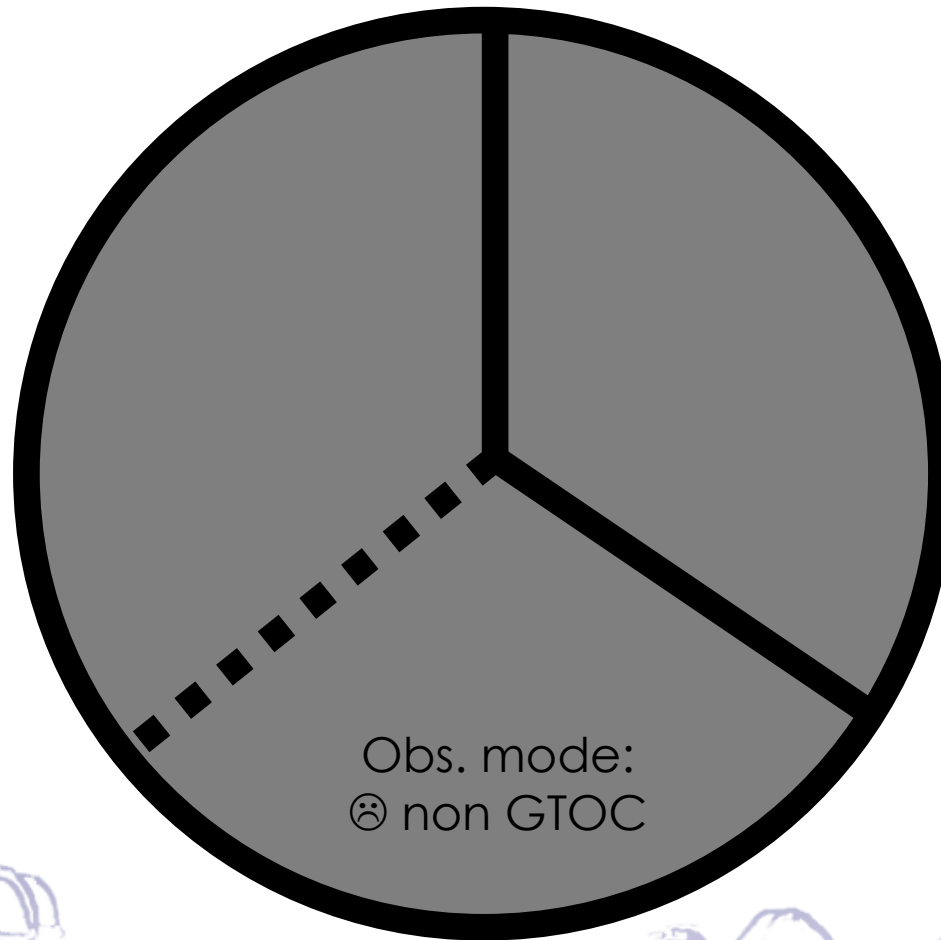


# The Dark Side of Carmenes

*(the observer's point of view)*

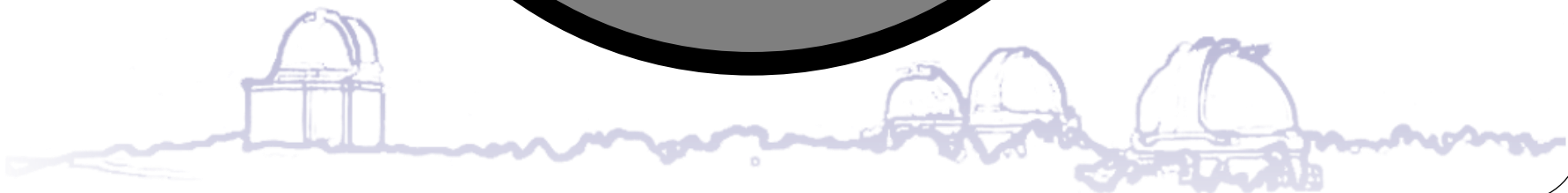


GUI NOT  
FRIENDLY



ICS ERRORS  
DAILY or so

Obs. mode:  
☹ non GTOC





# Night operation of Carmenes



## Persistent ICS errors

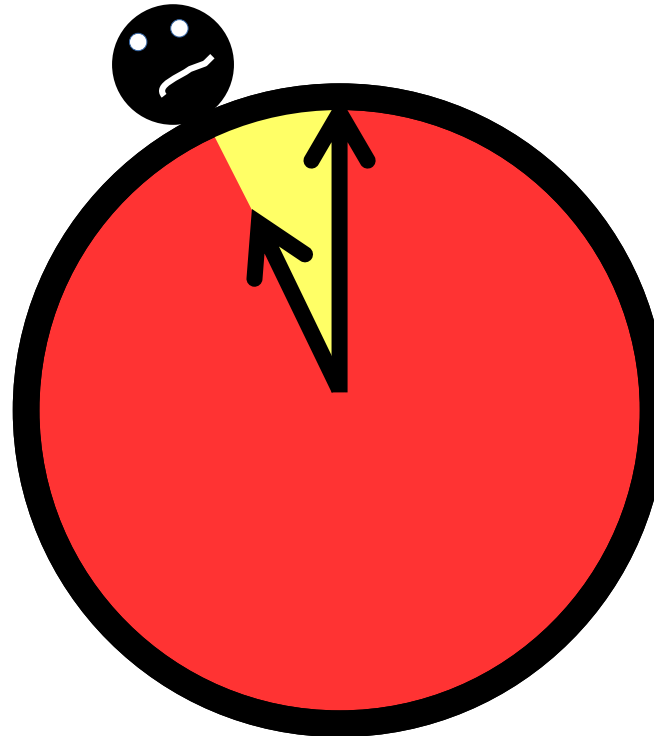
### CARMENES time lost:

2016: 56.3 h in 45 events

2017: 80.5 h in 54 events

2018: 45.3 h in 35 events

1h15 to 1h30 lost/event!



- ▣ **~1 ICS error/night**  
Infamous (end 30' exp.)  
`Ice.ConnectionLost...`

- ▣ **Origin?** ("NACK-4"  
wrong error codes)

- ▣ **Solution?**  
(apart from restarting/  
resetting everything,  
and SLEEP/wait 5')

- ▣ **Script syntax?**  
`vis/nir_cal_*`



# Night operation of Carmenes

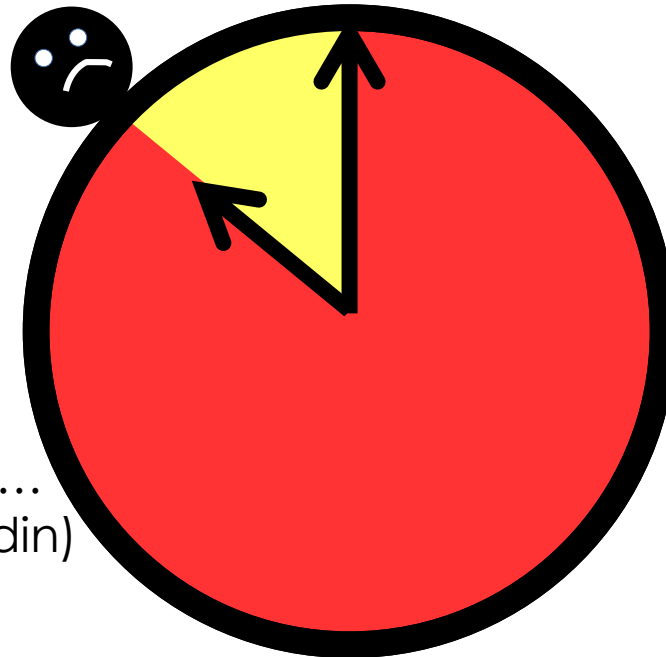


## Nice GUI... for GTOC!

### Optimized for GTOC:

Scheduler magic wand  
(but BAD=GOOD night)

Oldie DSS finding charts...  
(CCOO target list=>Aladin)



- ▣ **Non GTOC programs**  
(more every year: 79,7% in 2016 → 87,5% in 2018)
- ▣ Longer **overheads**
- ▣ **Mistakes** more likely
- ▣ **Critical for transits**  
(ADC update => reacq.;  
run VIS & NIR separately)







# Night operation of Carmenes



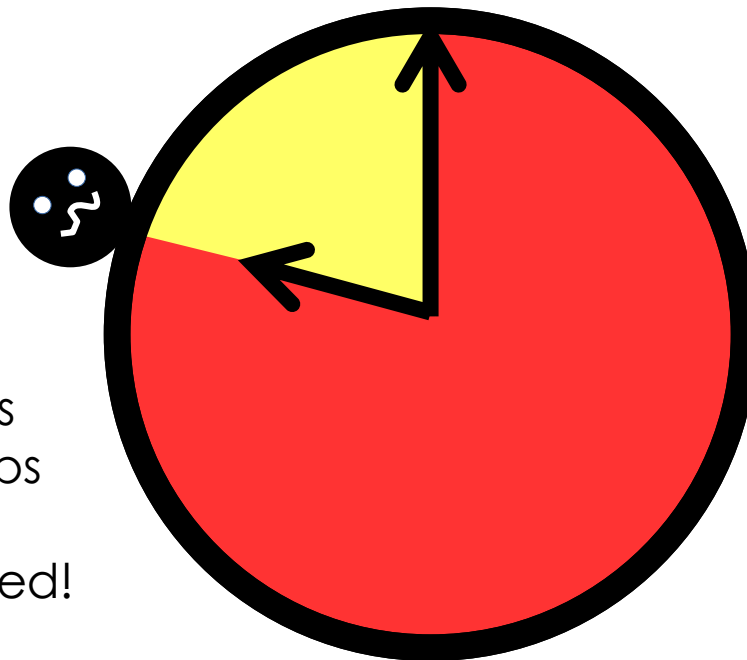
## Observation time lost

### GUI not friendly:

~260 info. boxes

~190 buttons/menus  
spread on many tabs

Only ~30 buttons used!

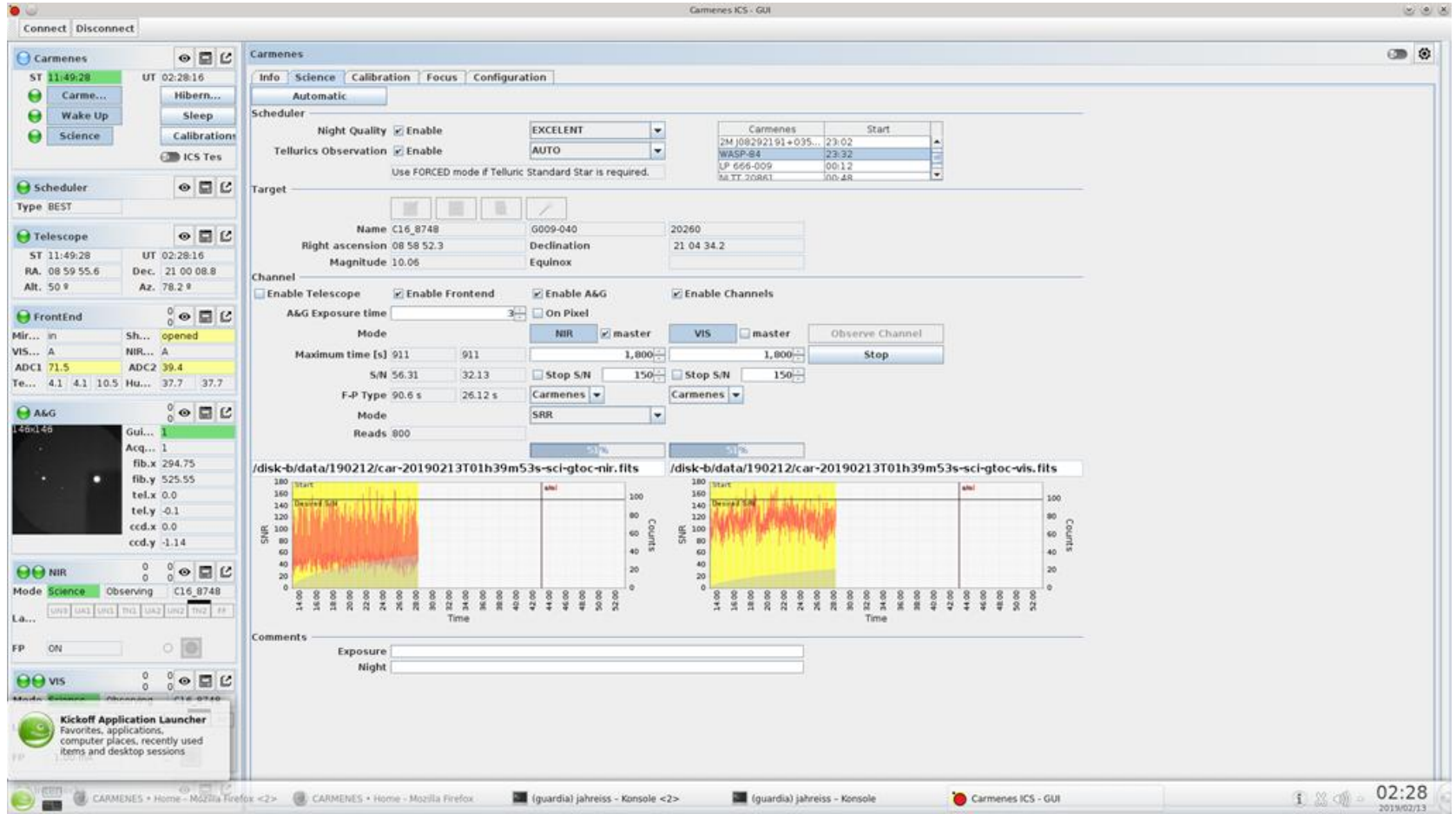


☐ Current ICS frozen

☐ GUI inherited from  
**engineering** version

☐ Simpler/more robust  
ICS & GUI for **visitors**







# A dream of GUI (for dummies)



OBS  PI  #

**SCIENCE** **CALIB** **FOCUS**

**START** Nrep  Texp

**STOP** Name

RA  DEC

**ABORT**

Texp  ☐ On pixel

**AG**

seeing

**GTOC** **transit** **user**

☐ Update ADC

**NIR** **VIS**

☐ master ☐

☐ stop S/N ☐

21% 21%



# At least in GUI... please!




OBS  PI  #

SCIENCE CALIB FOCUS

GTOC transit user

START Nrep  Texp

STOP Name New Earth 

RA  DEC

ABORT

Update ADC ☐



NIR VIS

☐ master ☐

☐ stop S/N ☐

21% 21%

AG

Texp

☐ On pixel

seeing



Call for proposals 2019B semester **DEADLINE: March 20th, 23h59 CET**



On behalf of the ~~past~~/present/*future* CARMENES service mode observers:  
(99% of a1001+ nights tale)

Belén Arroyo

*Florian Bauer*

~~Gilles Bergond~~

Alba Fernández

*Eulalia Gallego*

Ana Guijarro

Rubén Hedrosa

Israel Hermelo

Pablo Martín

~~Manuel Moreno~~

~~Ester Ramos~~



¡MUCHAS GRACIAS! for including us as co-authors in the discovery papers

2nd lamp = mirror3 / lamp 2

5th lamp = mirror6 / lamp16



# ICS: individual channel mode

VIS + NIR + AG by hand for transits (repeated exp.)



Connect Disconnect

**Carmenes**

ST 07:23:37 UT 22:07:05  
Carme...  
Wake Up  
Science  
ICS Tes

**Scheduler**

Type

**Telescope**

ST 07:23:37 UT 22:07:05  
RA 07 23 31.4 Dec. 37 13 20.0  
Alt. 89.9 ° Az. 0 °

**FrontEnd**

Mir... in Sh... closed  
VIS... A NIR... A  
ADC1 32.2 ADC2 -0.1  
Te... 6.4 6.4 13.3 Hu... 66.0 66.0

**A&G**

1.46x1.46  
Gui... -1  
Acq... 0  
fib.x 294.5  
fib.y 525.4  
tel.x 0.0  
tel.y 0.0  
ccd.x 0.0  
ccd.y 0.0

**NIR**

Mode Science Idle Sky.FP  
La... UN3 UA1 UN1 TN1 UA2 UN2 TN2 FF  
FP ON

**VIS**

Mode Science Idle Sky.FP  
La... UN3 UA1 UN1 TN1 UA2 UN2 TN2 FF  
FP 1.00 mA

**Interlocks**

**NIR channel**

Mode Science Safe Science Idle Set mode  
Fibre shaker OFF Off On Set fibre shaker  
ExpMeter filter OPEN Closed Set ExpM filter  
Fabry-Pérot lamp ON Off On Set F-P lamp  
Target name Sky.FP  
Exposure time [s] 0 10  
Readout type SRR  
Read & Reset count 5  
External storage Save  
# Repetitions 0 1  
Start / Delay time [s] 8  
Observing 0%  
Start 2019-02-11T18:46:24  
Auto stop SN 2019-02-11T18:46:28  
Abort

Load CPU [%] 0.0  
Free RAM [Mb] 49271.0  
Free HD [Mb] 159491.0

SNR  
Desired S/N  
Counts  
Time

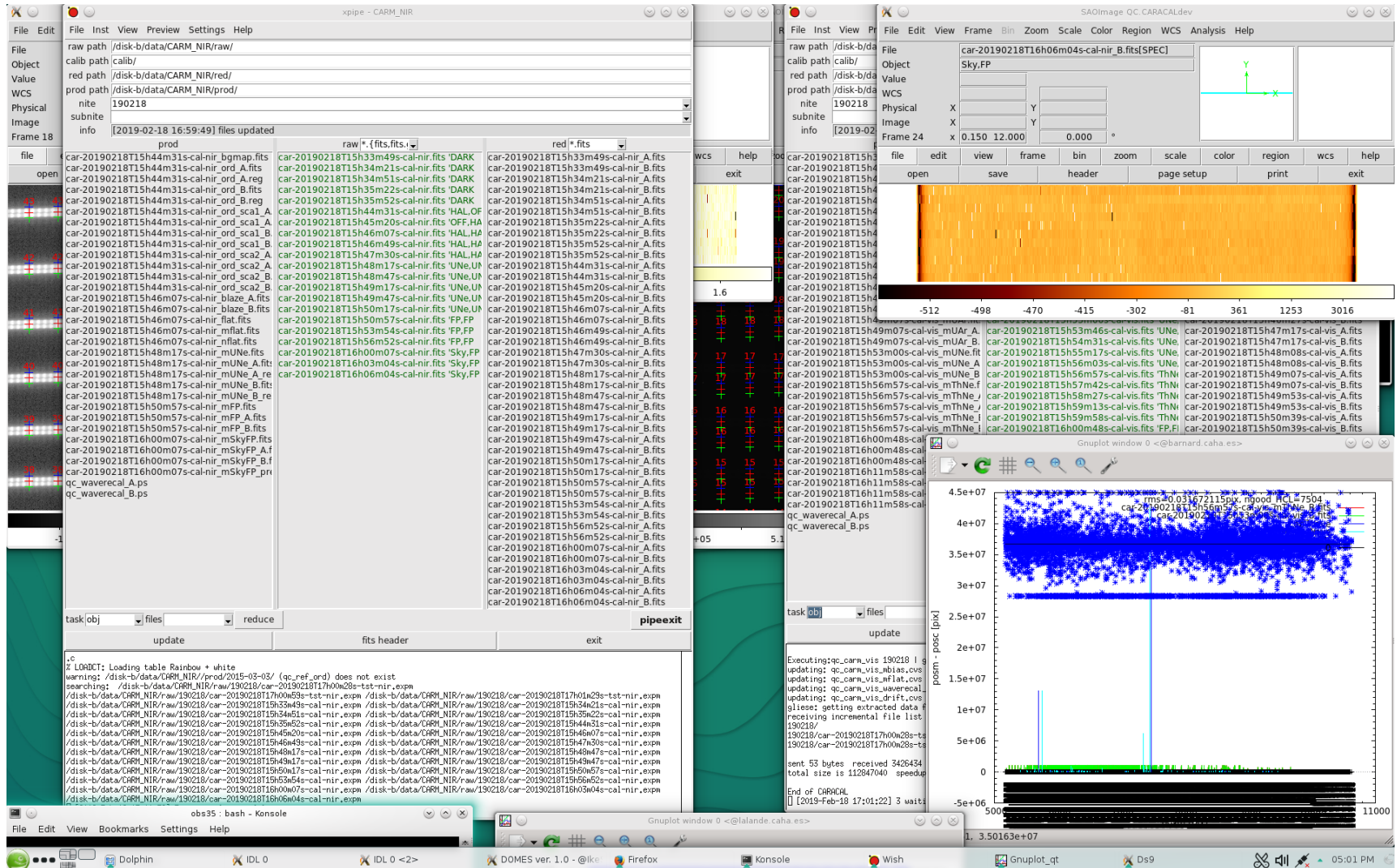
Latest file /disk-b/data/190211/car-20190211T17h31m04s-cal-nir.fits

**Calibration Unit**

Mirror 8 Set mirror  
Lamps 0 UN3 UA1 UN1 TN1 UA2 UN2 TN2 FF Set lamps  
Fabry-Pérot filter Open Close Open Set F-P shutter  
Fabry-Pérot shutter Closed 0 Set External F-P s...  
Science filter Open CLOSED Set filter  
Calibration filter Open CLOSED Set filter  
Temperature 1 (°C) 13.0  
Temperature 2 (°C) 14.0  
s l v f

	RFID	mAh	(V)	(A)
UN3	18	37.0	220.9	12.0
UA1	27	46.0	0.0	0.0
UN1	19	690.0	0.0	0.0
TN1	4	24.0	0.0	0.0
UA2	12	6.0	0.0	0.0
UN2	25	88.0	0.0	0.0
TN2	5	8.0	0.0	0.0
FF	0	0.0	0.0	0.0







# Hand-written nightlogs!

to complete the automatic logs in the wiki



Centro Astronómico Hispano Alemán - CARMENES observation log

Observer: Grijardo - GTOC 100% Weather: HAZE + CLOUDS Date: 13/2/2019

carmenes Notes: gtoe (#100) + heze (#219) Pages: 1 of 1

Time (UT) File(s) Object AM NIR temp SNR VStemp SNR Comments

15:33	lit-cal-short-night.txt							
17:00	lit-cal-short-night.txt							
	Cloudy + CALIMA							in "ICSTes" mode
23:45	Foco = 33.0	4.67	113			15		Sky ~ 4, hum ~ 44%, T = -0.2°C, Wind ~ 2 m/s, T <sub>f</sub> = 2.3°C, seeing ~ 1.5"
23:57	Ad STAR	26 Uma	1.03	69 → 55	200	69 → 67	271	Ext ~ 0.46 mag/Am
00:02	Wd 294	J06548+332	4.22	272 → 536	197	272 → 546	123	
00:15	Lalande 21185	J11033+359	1.03	47 → 81	202	47 → 93	148	NIGHT QUALITY = GOOD
00:20		J11511+352	1.08	363 → 674	201	363 → 683	140	
00:37 → 00:48		J11110+304	1.02	426 → 772	198	426 → 781	151	CCOO → ICE. Correction lost per NCU
1:01	WASP-84	WASP-84	4.43	1800	77	1800	98	FORCED HERRERO'S PROGRAM
1:39	HD 238090	J12123+5445	1.06	553 → 857	199	553 → 866	156	
1:57	BD+11 2576	J13299+102	4.24	225 → 410	203	225 → 421	146	Sky ~ 3
2:07		J12342+086	1.15	508 → 791	200	508 → 801	161	
2:23		J12474+097	1.14	743 → 1200	200	743 → 1205	119	
2:45		J14257+236W	1.13	502 → 968	201	502 → 978	157	
3:07		J14257+236E	1.10	560 → 1112	188	560 → 1121	140	
3:29		J14307-086	1.54	436 → 860	110	436 → 873	79	
3:46		J14342-125	1.62	534 → 1060	155	534 → 1069	83	
4:10	OT Set	J15218+209	1.10	433 → 802	202	433 → 814	139	
4:27		J15194-077	1.48	473 → 938	186	473 → 814	114	Sky ~ 8
4:46		J16303-126	1.85	236 → 461	74	236 → 474	28	
4:57	Barnards	J17578+046	1.75	123 → 238	58	123 → 248	20	FORCED due to CLOUDS
5:06	Ad STAR	109 Vir	1.23	81 →	118	29 →	178	
5:08	closed due to CLOUDS							
5:13	cal-end-night							

Astronight = 19:20 - 5:27 } ~ 18:45 - 6:00 = 11.25 h

18:45 - 23:45 = 5h = closed → 49%

23:45 - 5:15 = 5.5h = ok → 51%

5:15 - 6:00 = 0.75h = closed

2/20/2019