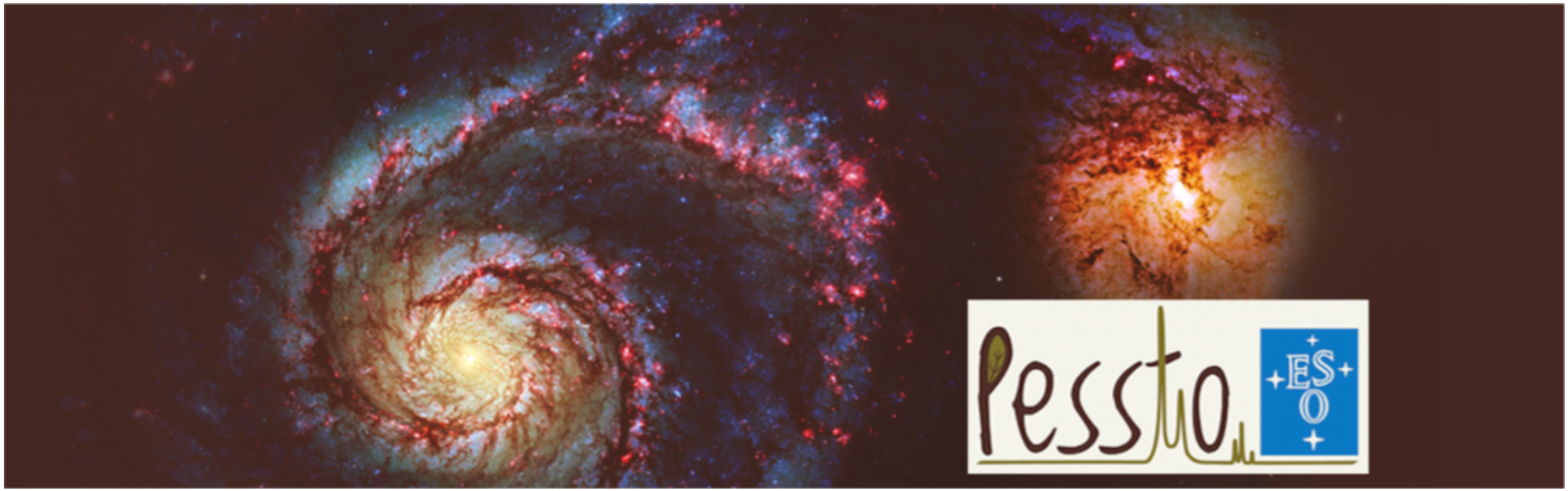


ePESSTO
extended-Public ESO Spectroscopic Survey for Transient Objects

Maria Teresa Botticella
INAF-OSSERVATORIO ASTRONOMICO DI CAPODIMONTE
on behalf of ePESSTO collaboration

PESSTO in a nutshell

5 years Large Programme (April 2012-March 2017) PI S. Smartt

to provide **immediate public** classifications and spectra of transients through Astronomer's Telegrams, IAU Transient Name Server, WiSeREP

25 institutes
1180 transients classified
308 transients followed
3 full public data releases
65 papers

A&A 579, A40 (2015)
DOI: 10.1051/0004-6361/201425237

Astronomy & Astrophysics

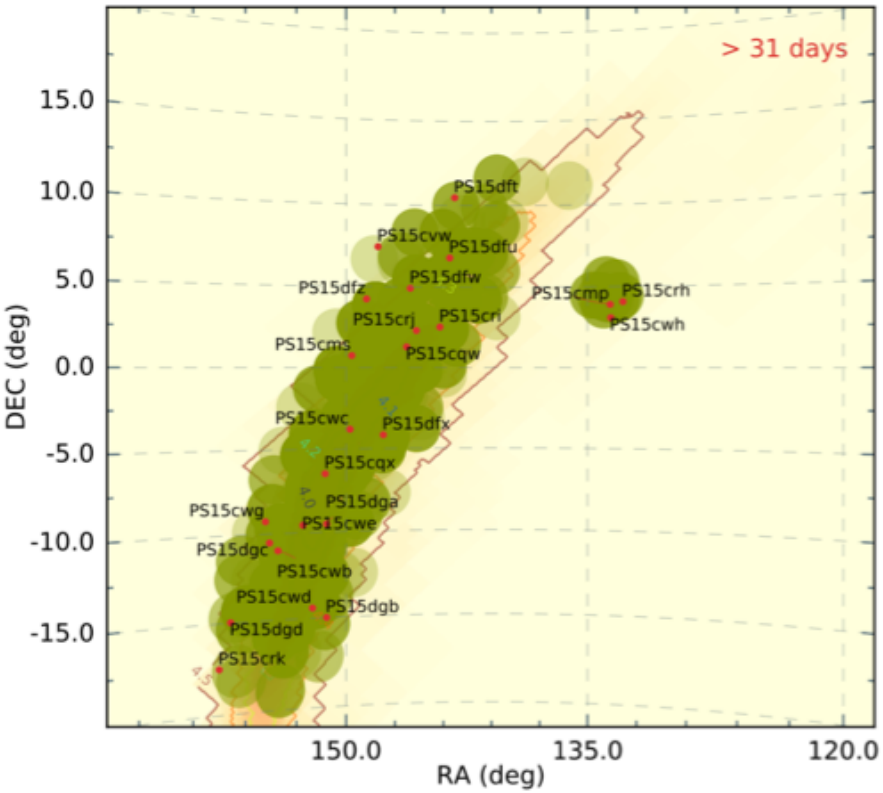
PESSTO: survey description and products from the first data release by the Public ESO Spectroscopic Survey of Transient Objects⋆,⋆⋆

Smartt et al 2015

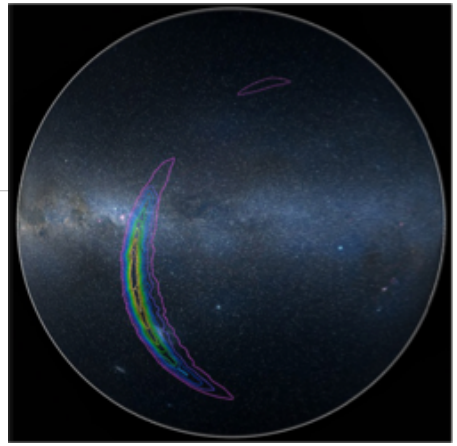
PESSTO search for GW EM counterpart

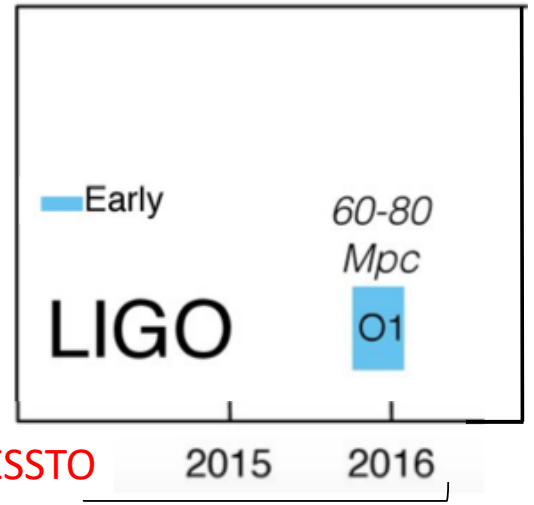
GW150914

BH-BH merger



Smartt et al 2016a





Search for counterpart candidates

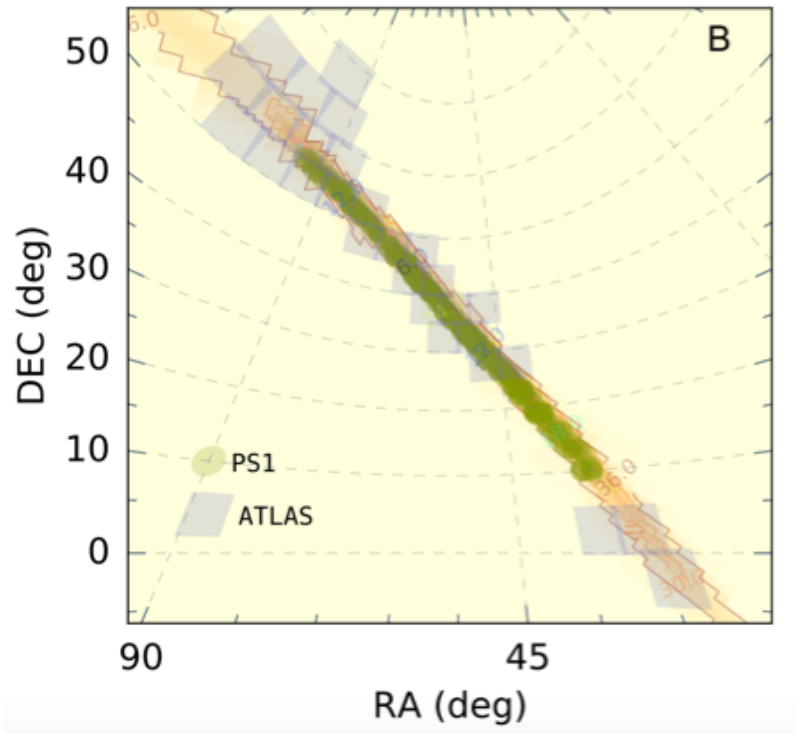
Pan STARRS 442 sq degrees m_{lim} ~ 21

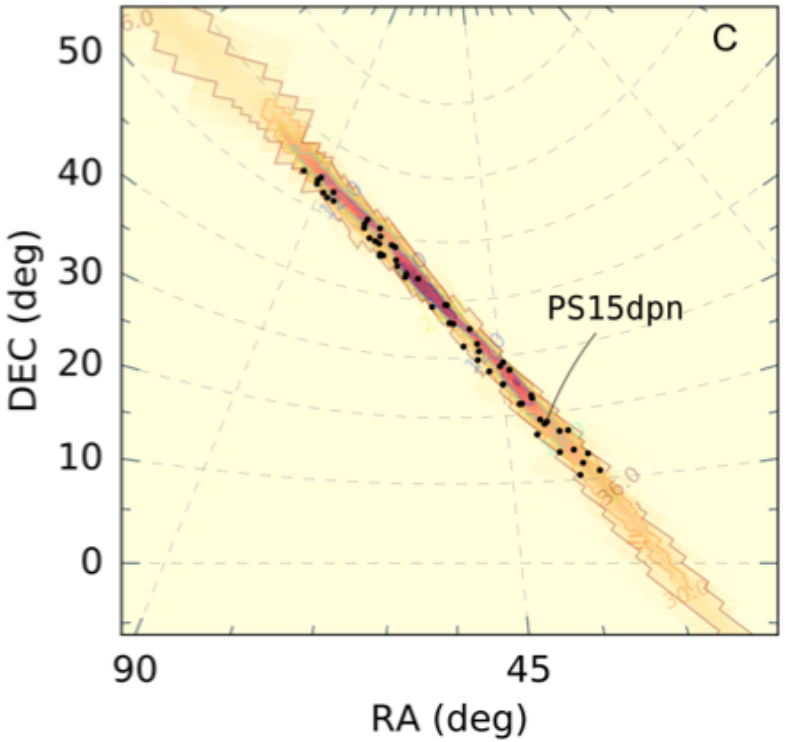
56 candidates over 41 days

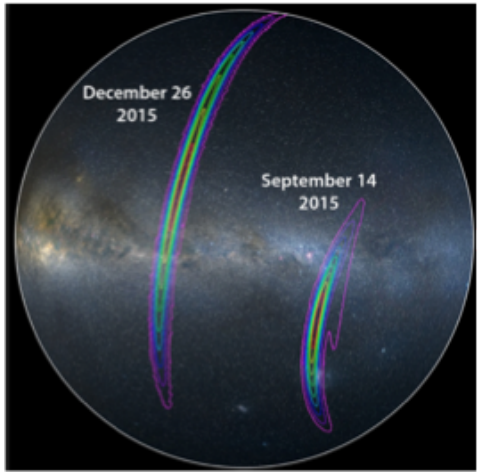
Spectroscopic classification and follow-up

EFOSC2 on NTT
SNIFS on the UH 2.2m telescope

PESSTO search for GW EM counterpart







GW151226
BH-BH merger

Smartt et al 2016b

<u>Search for counterpart candidates</u>

Pan STARRS 290 sq degrees m_{lim} ~ 21
ATLAS 57 sq degrees m_{lim} ~ 19
49 candidates over 28 days

<u>Spectroscopic classification and follow-up</u>

EFOSC2 on NTT
GMOS on Gemini North Telescope
SNIFS on the UH 2.2m Telescope

extended PESSTO

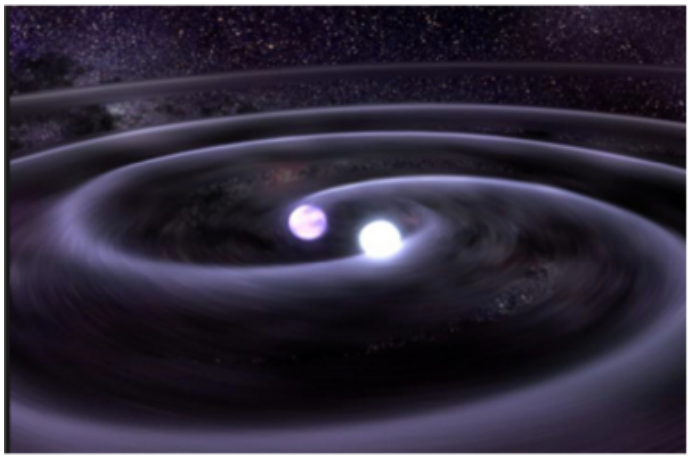
2 years Programme (April 2017-March 2019) PI S. Smartt

immediate public classifications and spectra of transients
same observational strategy of PESSTO

focus on the most exciting new transient populations

- nuclear transients
- tidal disruption events
- Superluminous supernovae
- Gamma ray bursts
- transients associated with high energy triggers
  radio detections
  GW and high energy neutrino sources

ePESSTO Science Groups



- Interacting transients (SNe IIn/Ibn and ILOTs) (Pastorello / Fraser)
- Supernova progenitors science group (Fraser / Elias Rosa)
- Revealing the Sources of High-energy Cosmic Neutrinos (Franckowiak)
- Spectral homogeneity of SNe Ia in the Hubble flow and a subset of SNe Ib/c (Goobar)
- ePESSTO Radio Followup (Horesh)
- Type II supernovae in the most extreme metallicity environments (Gutierrez)
- Superluminous supernovae (Inserra)
- Discovering and characterizing fast radio burst (FRB) optical counterparts (Malesani)
- Nuclear supernovae (Kankare)
- Over-luminous type Ia supernovae (Dimitriadis)
- Flash Spectroscopy: a snap of the SN pre-explosion activity (Terreran)
- ePESSTO observations of transients with Kepler light curves (Nordin)
- Type Ia SN U-band variability (Nordin)
- Luminous, non-interacting type II supernovae: understanding the powering mechanism of bright SNe II (Anderson)
- Progenitors and explosion physics of SNe Ia at z<0.02 (Maguire)
- Environmental studies of supernovae (Galbany)
- Testing SNe II as distance indicators at near-IR wavelengths (Rodriguez)
- ePESSTO follow-up of Gamma-ray bursts (D'Avanzo)
- Stripped-envelope Supernovae (IIb, Ib, Ic), including GRB/XRF-SNe (Mazzali)
- Tidal disruption events (Jonker/Leloudas)
- Supernovae Ia-CSM (Cartier)
- Faint or fast-evolving, non-interacting Type I Supernovae (Taubenberger)
- Probing the progenitors of nearby SNe with DLT40 and LCO (Valenti)
- AVS and Fisheye flashes (Smartt)
- Classification of transients in the GW skymaps of LIGO and VIRGO (Smartt)
- GRAWITA Electromagnetic counterpart of Gravitational Wave searches (Botticella)

Classification of transients in the GW skymaps of LIGO and VIRGO (PI Smartt)

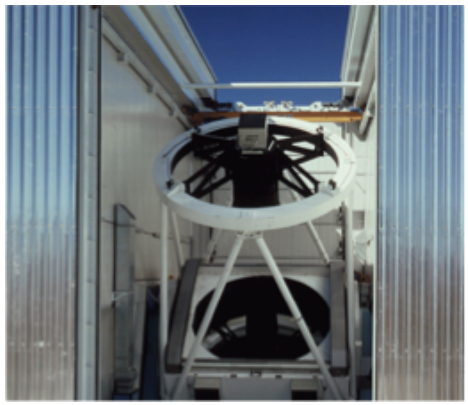
GRAWITA Electromagnetic counterpart of Gravitational Wave search (PI Botticella)

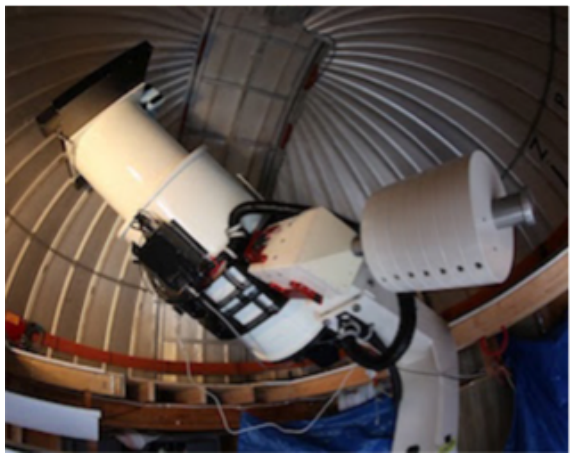
Search for GW EM counterpart candidates

UK-US team

Science leads : S. Smartt (QUB), K. Chambers and J. Tonry (UH)

Pan-STARRS
1.8m telescope
7 sq degree FOV





ATLAS
2 x 0.5m telescopes
29 sq degree FOV

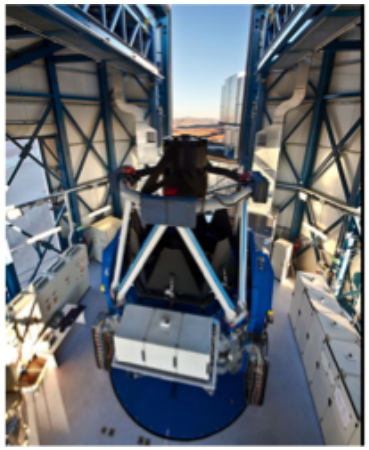
Search for GW EM counterpart candidates

GRAWITA (GRAvitational Wave Inaf TeAm)

Science leads : E. Brocato, E. Cappellaro, M. Branchesi, E. Palazzi, P. D'Avanzo, A. Grado, S. Covino

VST
2.6m telescope
1 sq degree FOV

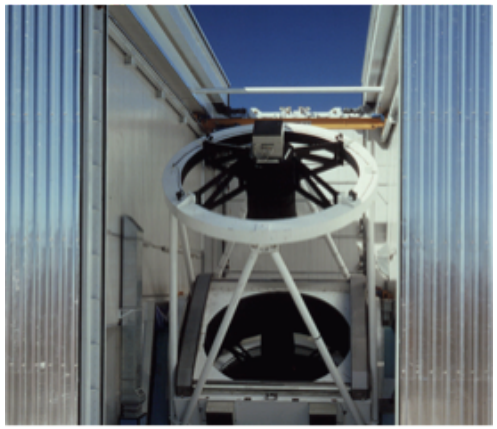
(A. Grado talk)



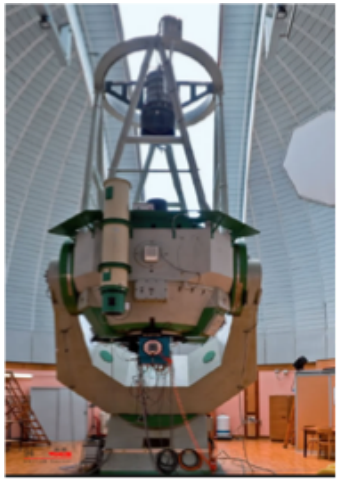
REM
0.6 m

(E. Palazzi talk)

Campo Imperatore
0.9m Schmidt Telescope
1.3 sq degree FOV



Copernico telescope
1.8 m



Observational strategy

Each ePESSTO observing run usually consists of 10 nights per lunation split into **three separate sub-runs**

- 4 nights around dark moon (EFOSC2 only)
- gap of 5 nights
- 3 nights (moon is a few days before first quarter, ~10% illumination) (2N EFOSC2 ; 1N SOFI)
- gap of 5 nights
- 3 nights mostly bright time (~ 75% illumination) (2N EFOSC2 ; 1N SOFI)

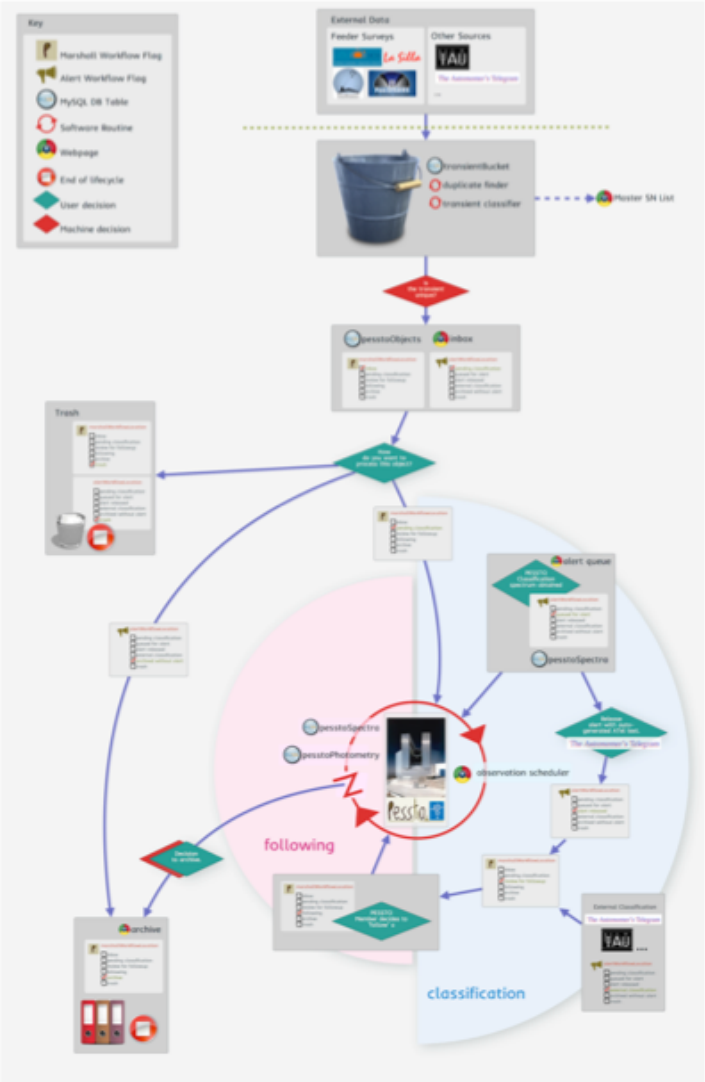
Target Alert Team
target selection and priority list

Observer Team
observation plans and OBs

Support Team
data reduction and release

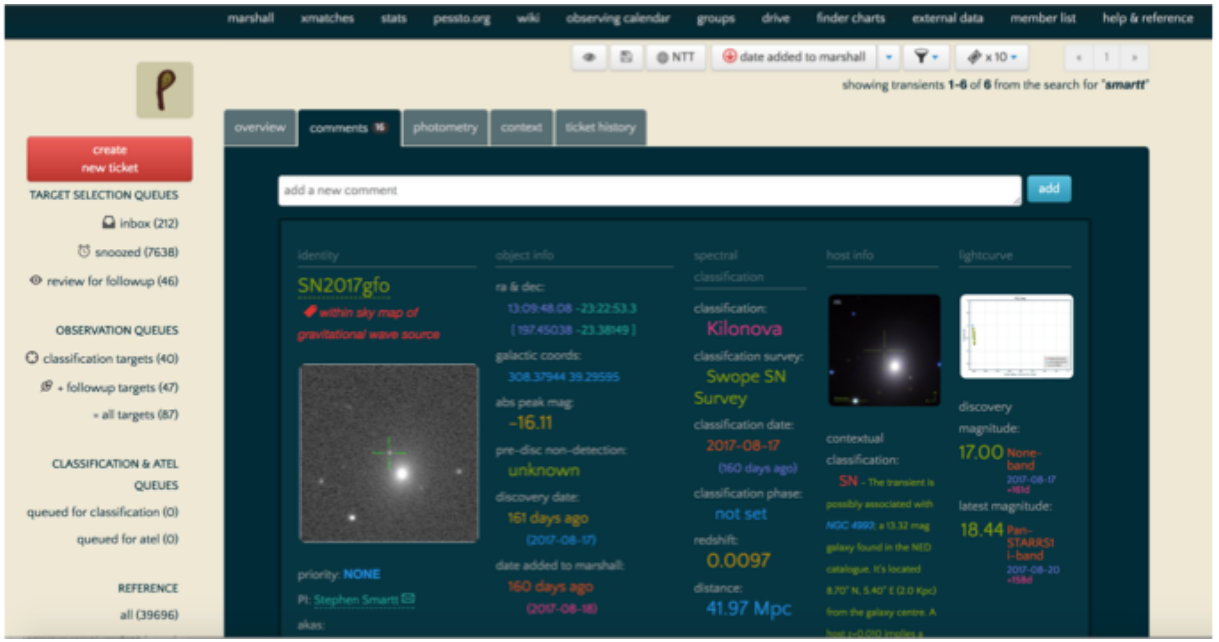
Lunation	Dates	Responsible Institution(s)	Observer 1	Observer2	Observer3	Support Team
August 2017	16th Aug (1n)	Warwick / Edinburgh	Joe Lyman	David Homan		Support Team: Mark Magee TAT: Maria Teresa Botticella, Kate Maguire
September 2017	10th Sep - 13th Sep (4n)	Cambridge / Warsaw	Mariusz Gromadzki	Kris Rybicki		Dublin / Fraser TAT: Joe Anderson, Annalisa De Cia
	18th Sep - 20th Sep (3n)		Simon Hodgkin	Mariusz Gromadzki	Zuzanna Kostrzewa-Rutkowska	TAT: Lluís Galbany, Joe Lyman
	27th Sep - 30th Sep (4n)		Simon Hodgkin	Kris Rybicki		TAT: Regis Cartier, Janet Chen

ePESSTO Marshall



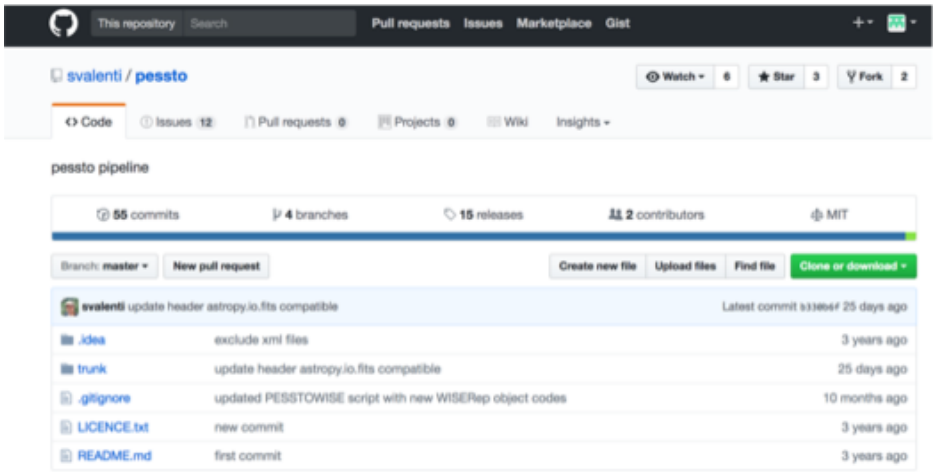
all high priority candidates

from our data streams are ingested in the Marshall

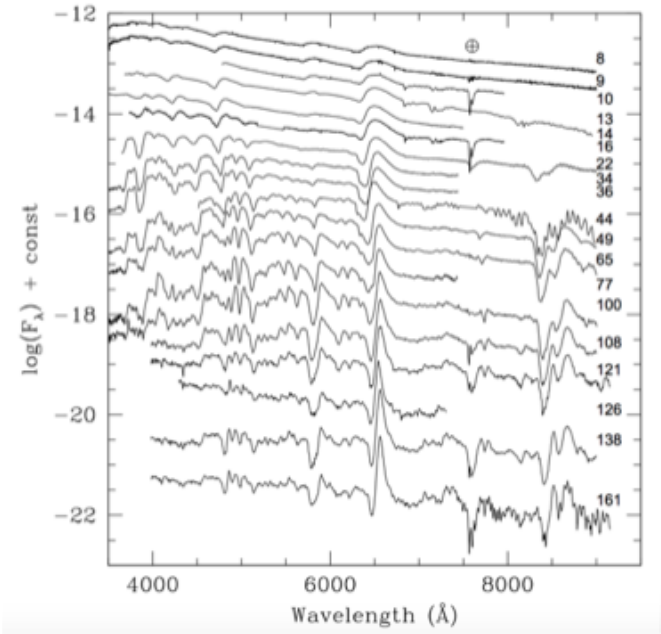


ePESSTO pipeline

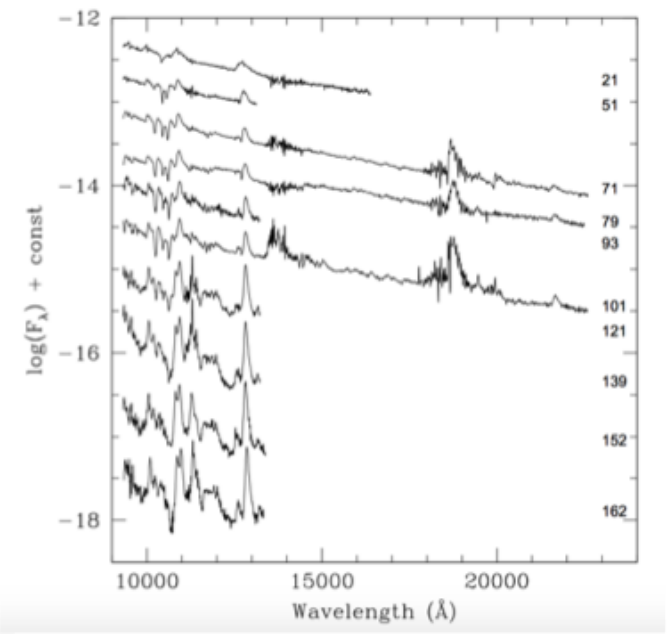
Fully reduced and flux calibrated spectra
Reduced images



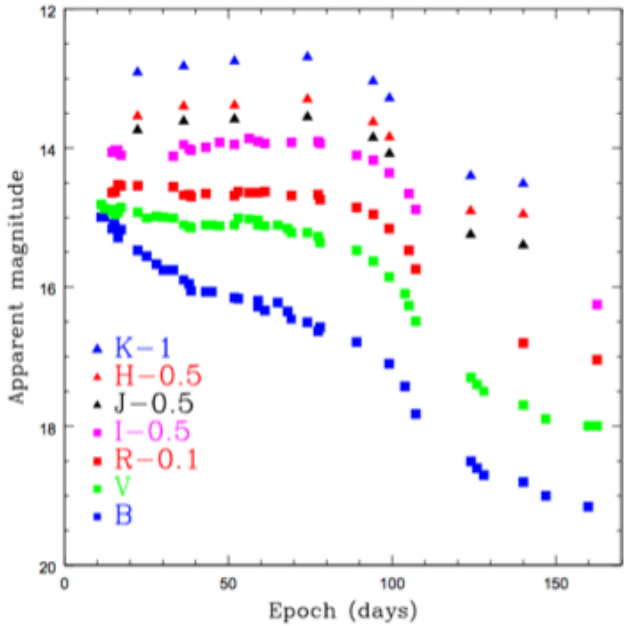
EFOSC2



SOFI



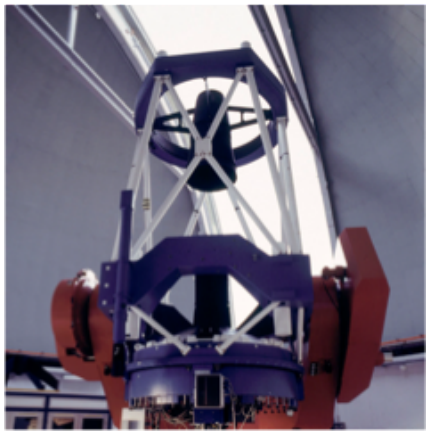
SN2012ec



Follow up of GW EM counterpart candidates

UK-US team

Photometry



GROND

(J. Chen talk)

Spectroscopy

VLT

Gemini North

Follow up of GW EM counterpart candidates

GRAWITA team

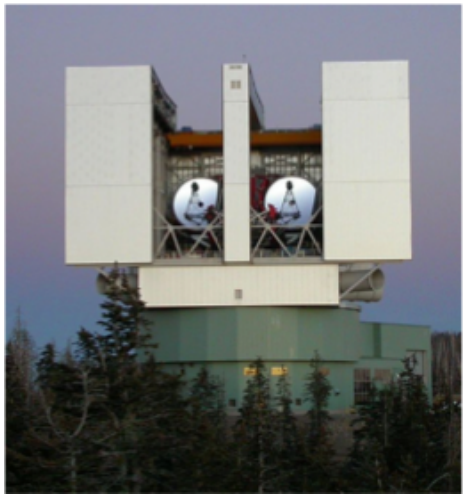
REM

Copernico

VLT

P. D Avanzo talk

TNG
3.6 m



LBT
2x8.2 m

In summary

ePESSTO is

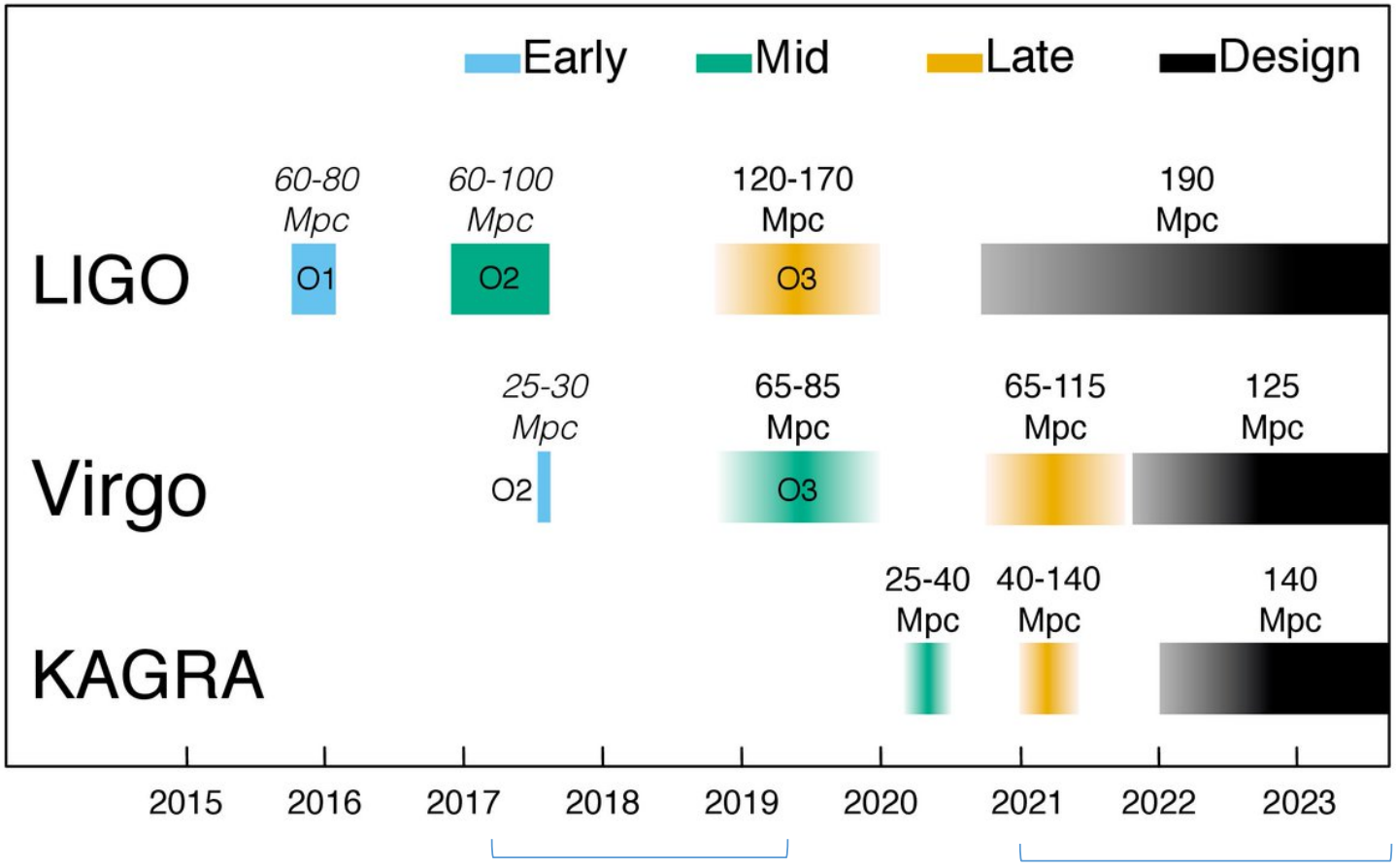
- fast and competitive in the spectroscopic classification of the candidates
- critical for filtering and selecting candidates for follow up with larger telescopes

ePESSTO has access

- to wide filed telescopes to search GW optical counterpart candidates
- to larger telescopes for follow up campaign

but …

ePESSTO plans



ePESSTO ? SOXS Son Of X-Shooter
(S. Campana's talk)

ePESSTO plans

- We would like to extend ePESSTO
  bridging the gap from April 2019 until 2021

- We are planning to submit joint GRAWITA-UK&US team proposals
  for the classification of GW EM counterparts discovered in O3 at NTT
  for the follow-up of the most promising candidates at VLT

Timing is critical

GW170817

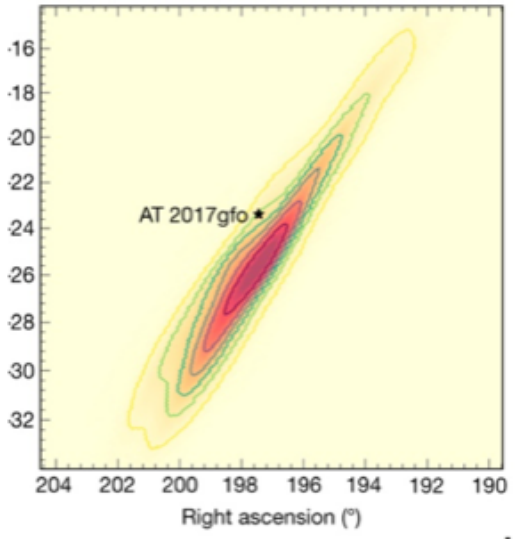
NS-NS merger

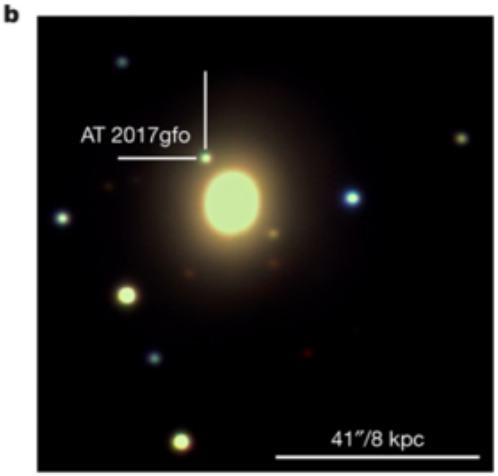
Discovery date 2017-08-17 12:41:04

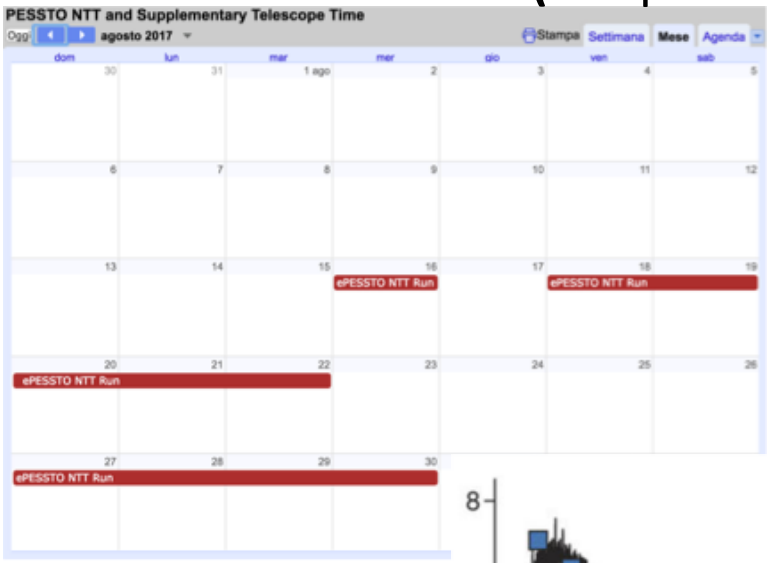
announcement 2017-08-17 13:08:17

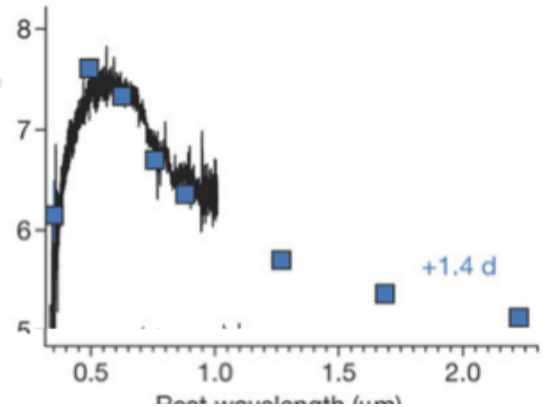
Counterpart detection 2017-08-17 23:31 UT

(Swope SN Survey)









- Pan-STARRS1 imaging at 2017-08-18 05:33 UT
- first ePESSTO spectrum at **2017-08-18 23:20** UT
- GROND photometric monitoring on 2017-08-18 23:15 UT

ePESSTO plans

We would like to propose ToO mode at NTT for the classification of GW optical counterparts

A possible solution :

The NTT visiting astronomers could carry out ToO observations of candidates

The ePESSTO team can quickly prepare OBs, reduce data and write the Atel

The NTT visiting astronomers could be compensated with:
- co-autorship of ePESSTO publications
- the possibility of carry out the observation they lost because of the ToO during ePESSTO nigths

Agreement between the Pan-STARRS/ATLAS team and the GRAWITA team

The two teams agree to equally **share and access all the ePESSTO follow-up data** taken for all objects

Each team can use the data as they wish and publish the spectra and/or images within the ePESSTO Publication policy and their own team's policies.

For example

1. If GRAWITA find a possible counterpart in their imaging surveys then they can trigger ePESSTO follow-up and publish those data without any restriction or co-authorship from the Pan-STARRS/ATLAS team. Similarly, if Pan-STARRS/ATLAS find a counterpart they can similarly publish the data with no restrictions. The teams only need to follow the ePESSTO publication policies. In this case, the two teams will alert each other to plans to publish through the 2 week ePESSTO process.

2. **Both teams may publish the ePESSTO data (in their own separate papers) on the same object if they wish**, since they will have their own proprietary data to add.
In this case, we expect both teams to communicate their plans through S. Smartt and M. T. Botticella to ensure that they have full knowledge of each others plans. If there are two papers, we expect to attempt to coordinate submission of independent papers so that both teams don't feel they need to race the other. This will be done on a best efforts basis, although one team should not unduly hold up the other.

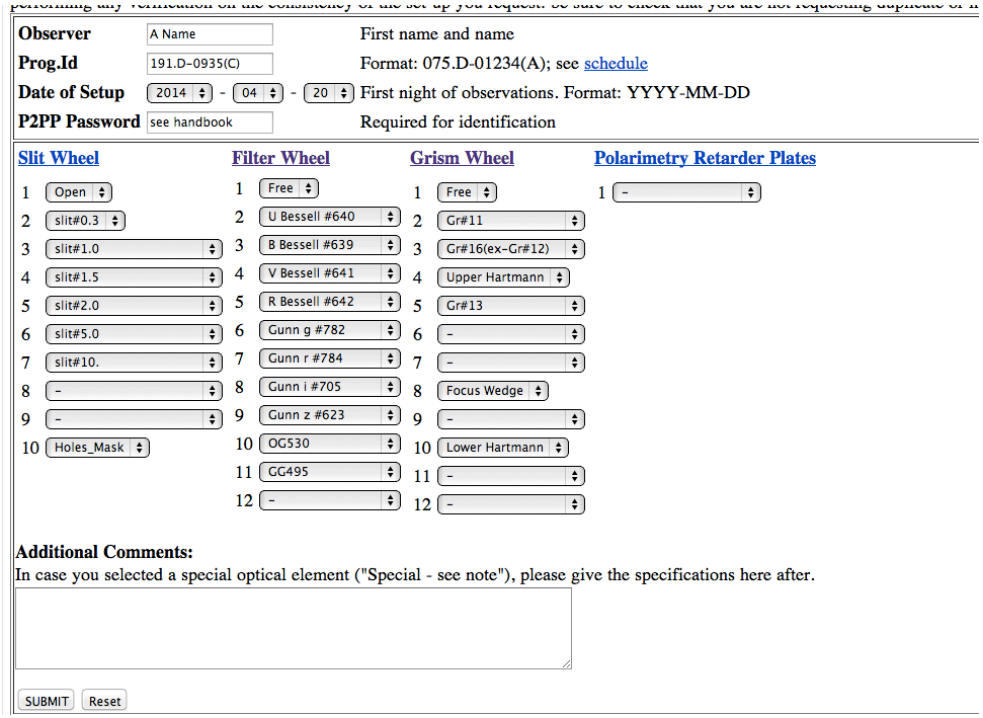
3. **Both teams may decide it is in their interest to pool their data sets and publish one paper.**
This is left to S. Smartt and M.T. Botticella to coordinate and decide on author order. In this case we would envisage all collaborators on both teams to be offered co-authorship.

4. ePESSTO may gather data on objects not discovered primarily by the PS1/ATLAS or GRAWITA projects (e.g. DES, ZTF).
In this case, if a paper were to be drafted, it would be an **ePESSTO paper** which would abide by the normal ePESSTO publication policy.
We envisage being inclusive for authorship on such a paper.
Again, the authorship issues are delegated to S. Smartt and M.T. Botticella.

The ePESSTO Science Board can rule on any disagreements.

ePESSTO setup

ePESSTO uses fixed set-ups for EFOSC2 and SOFI
which allow reduced data products to be provided rapidly and uniformly to the PESSTO survey members
and the public



Observer A Name — First name and name

Prog.Id 191.D-0935(C) — Format: 075.D-01234(A); see schedule

Date of Setup 2014 - 04 - 20 — First night of observations. Format: YYYY-MM-DD

P2PP Password see handbook — Required for identification

Slit Wheel	Filter Wheel	Grism Wheel	Polarimetry Retarder Plates
1 Open	1 Free	1 Free	1 -
2 slit#0.3	2 U Bessell #640	2 Gr#11	
3 slit#1.0	3 B Bessell #639	3 Gr#16(ex-Gr#12)	
4 slit#1.5	4 V Bessell #641	4 Upper Hartmann	
5 slit#2.0	5 R Bessell #642	5 Gr#13	
6 slit#5.0	6 Gunn g #782	6 -	
7 slit#10.	7 Gunn r #784	7 -	
8 -	8 Gunn i #705	8 Focus Wedge	
9 -	9 Gunn z #623	9 -	
10 Holes_Mask	10 OG530	10 Lower Hartmann	
	11 GG495	11 -	
	12 -	12 -	

Additional Comments:
In case you selected a special optical element ("Special - see note"), please give the specifications here after.

SUBMIT Reset