

ENGRAVE: O3, O4 and the Gap

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GW170817 lessons & open questions

- Are all BNS similar to GW170817 (EM side)?
- Rate?
- Population?
- Are all BNS associated with SGRB?
- Are all SGRB associated with BNS?
- NSBH ?
- r-process heavy element production

We were lucky

Need of coordination



Electromagnetic counterparts of gravitational wave sources
at the Very Large Telescope
<http://www.engrave-eso.org/>





Governing Council

- Marica Branchesi
- Enzo Brocato
- Paolo D'Avanzo
- Jens Hjorth
- Peter Jonker
- Elena Pian
- Stephen Smartt (Chair)
- Jesper Sollerman
- Danny Steeghs
- Nial Tanvir

Executive Committee

- Stefano Covino —→ Morgan Fraser
- Andrew Levan (Chair)
- Kate Maguire
- Daniele Malesani
- Susanna Vergani

>280 members

O3



Large Programme @ VLT

~ 230hr to follow-up EM candidate counterparts
photometry, spectroscopy, polarimetry

"Spin-off" radio-mm and HST awarded programs

Many ENGRAVE members have time
at different facilities to search for the EM counterpart

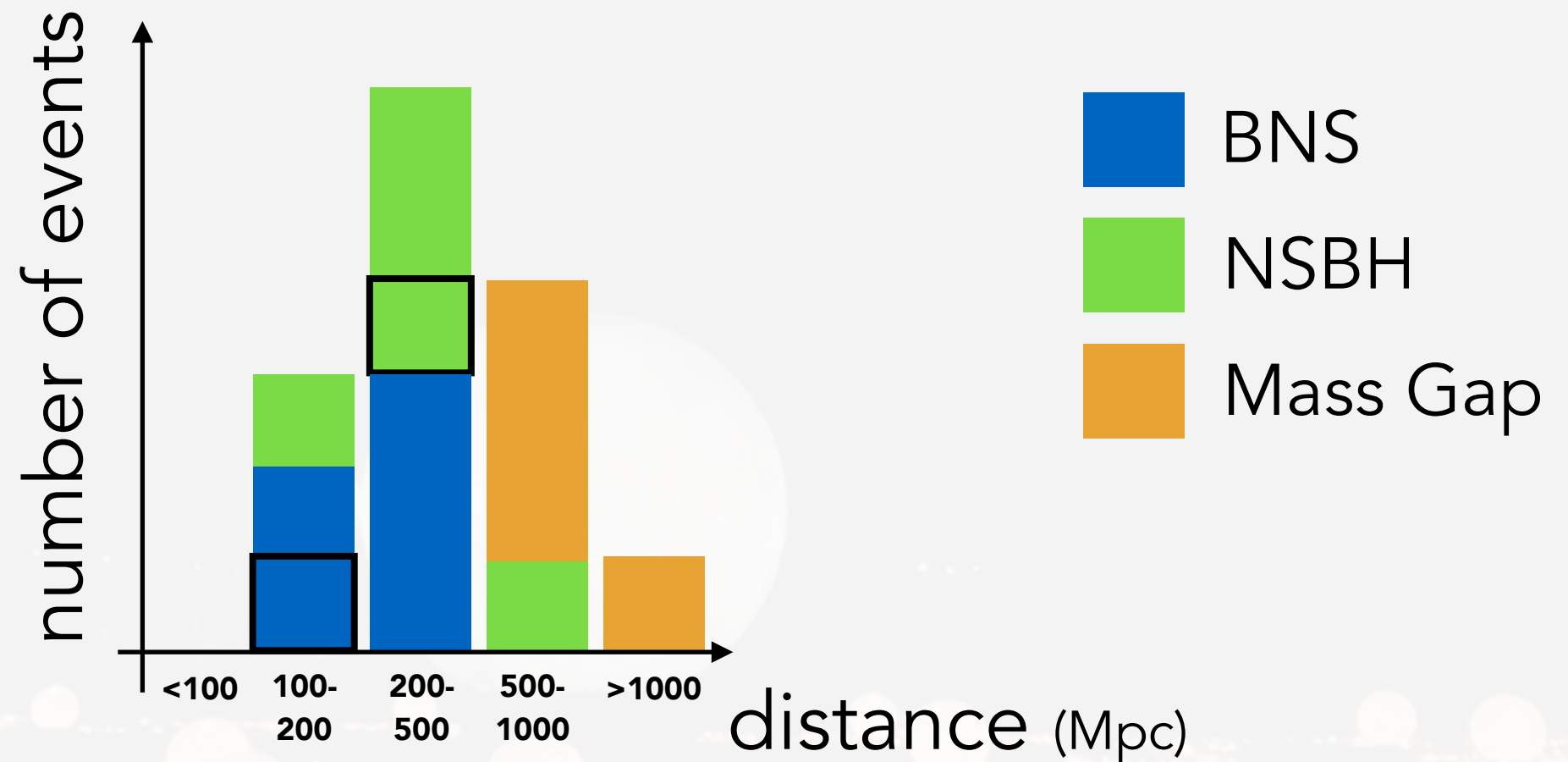
O3



Weekly on-call Operations Team & Writing Team

WG: imaging, spectroscopy, polarimetry, theory,
infrastructure, epo, external

O3

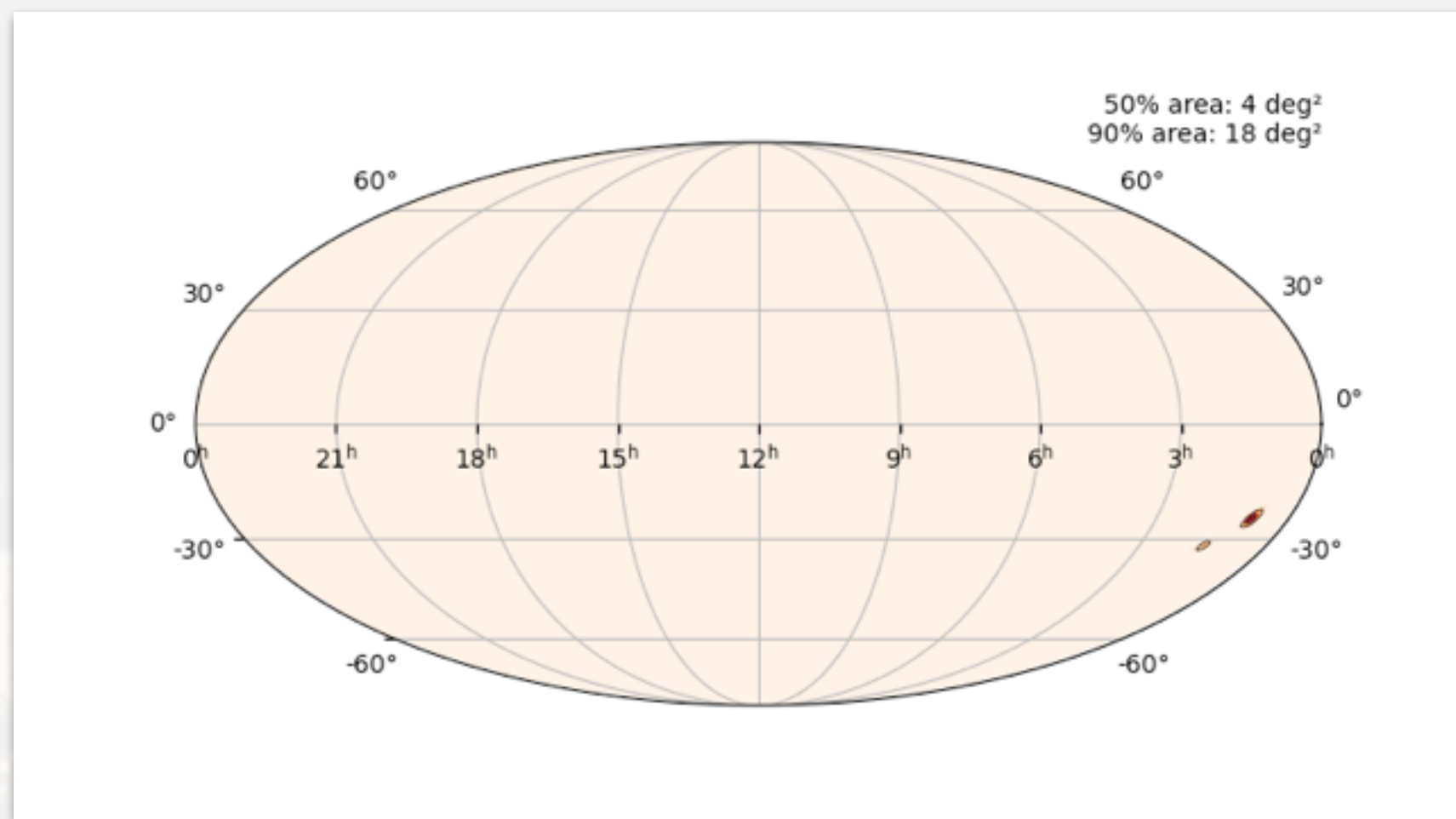
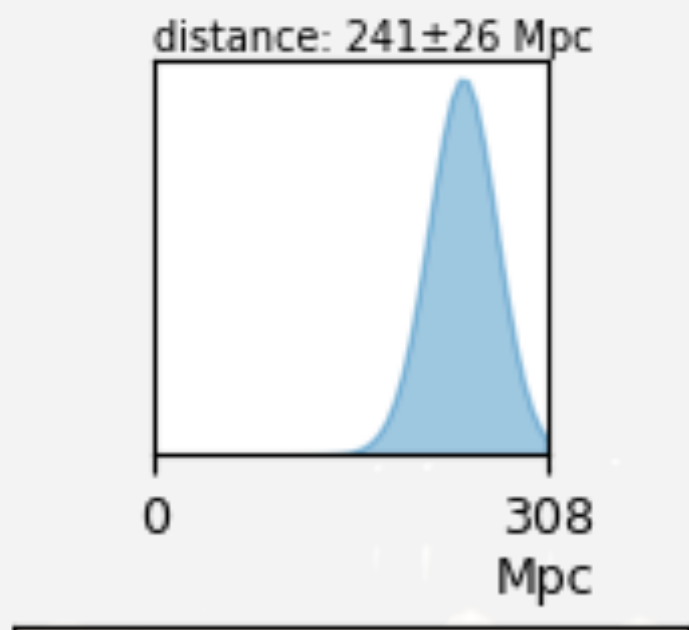


1! event with localisation $<10 \text{ deg}^2$
GW190814 (NSBH?)

NO BNS with localisation $<100 \text{ deg}^2$

GW190814 (NSBH?)

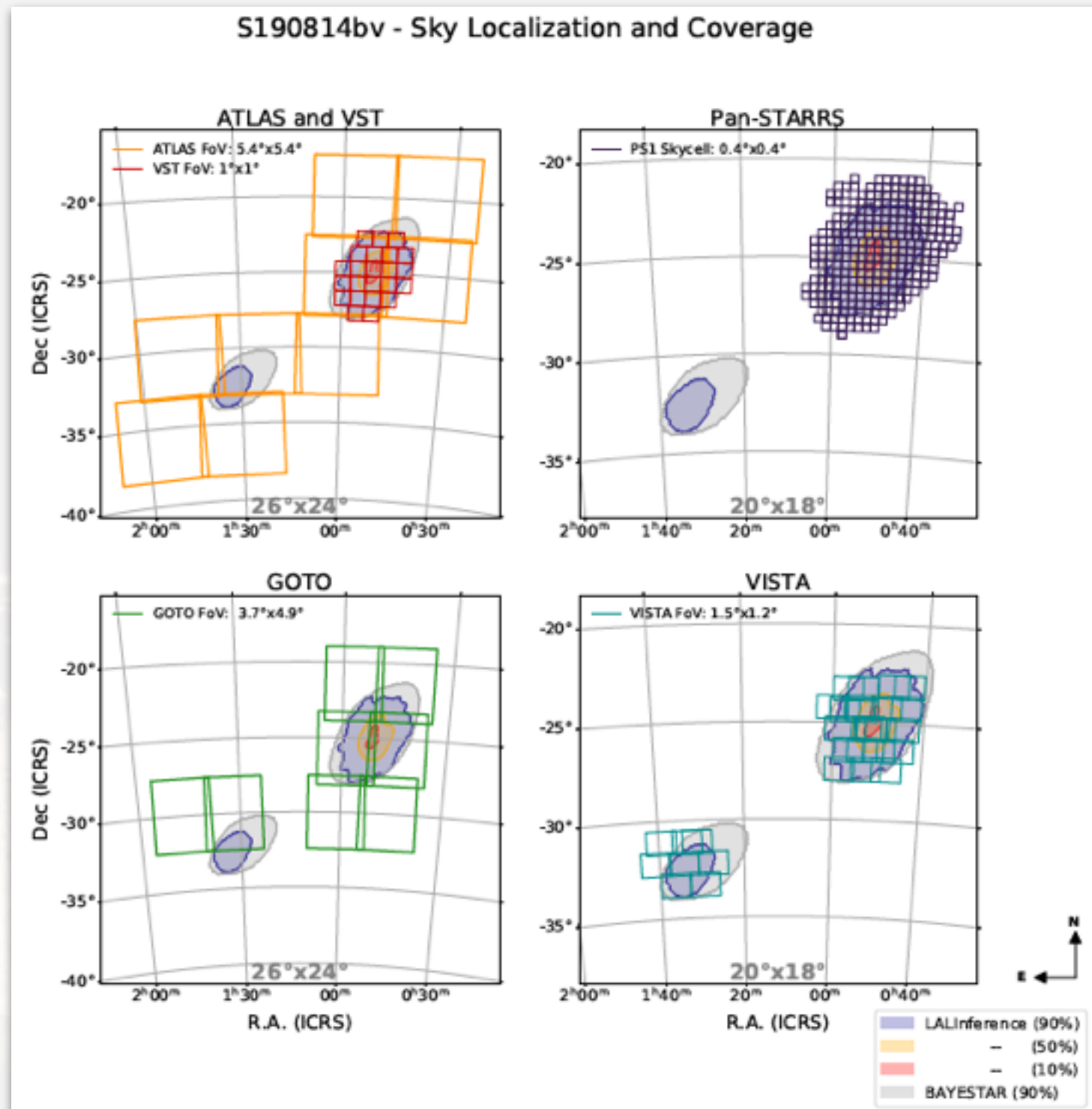
Abbott et al. 2020





GW190814

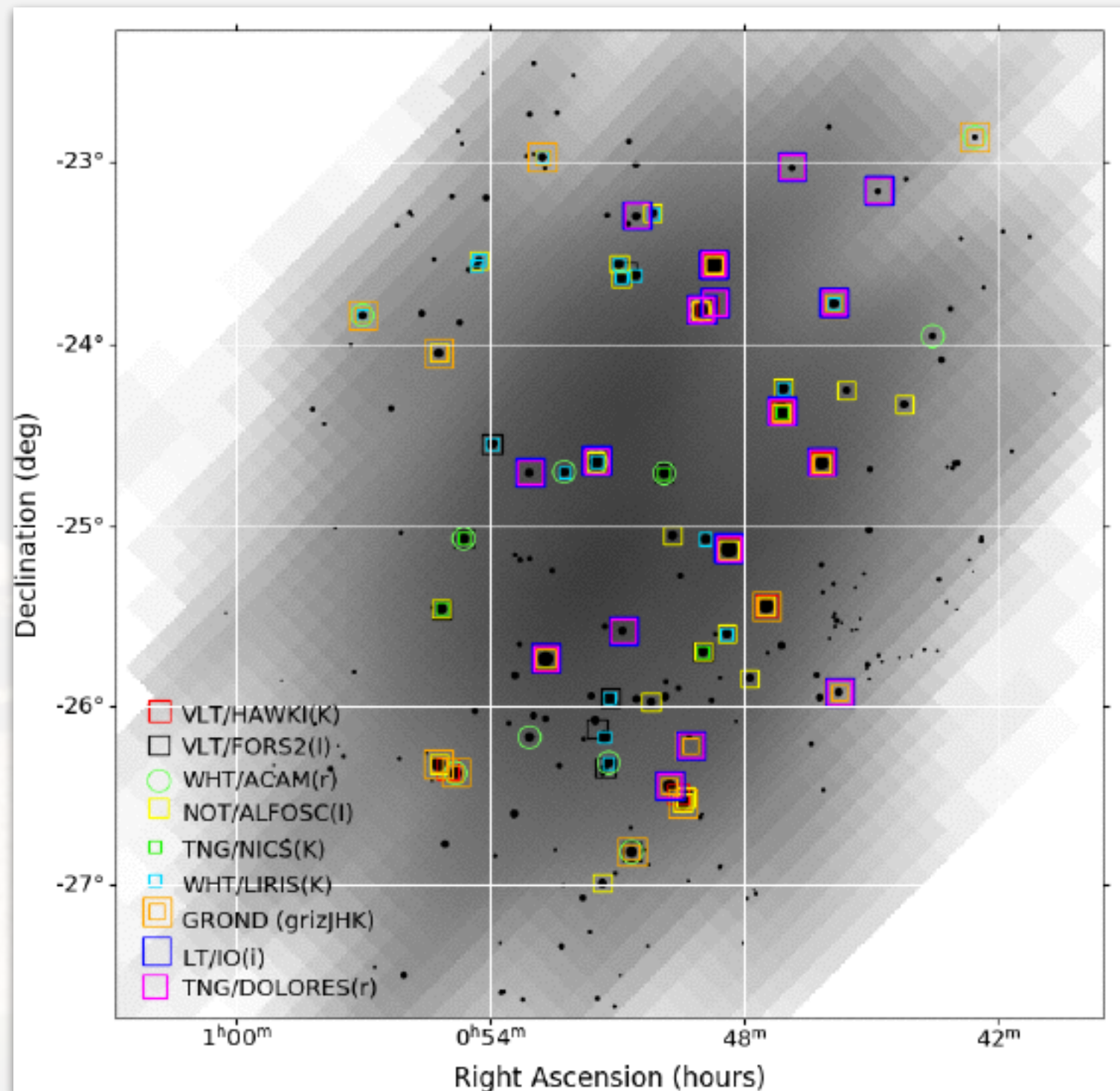
Ackley et al. 2020





GW190814

Ackley et al. 2020

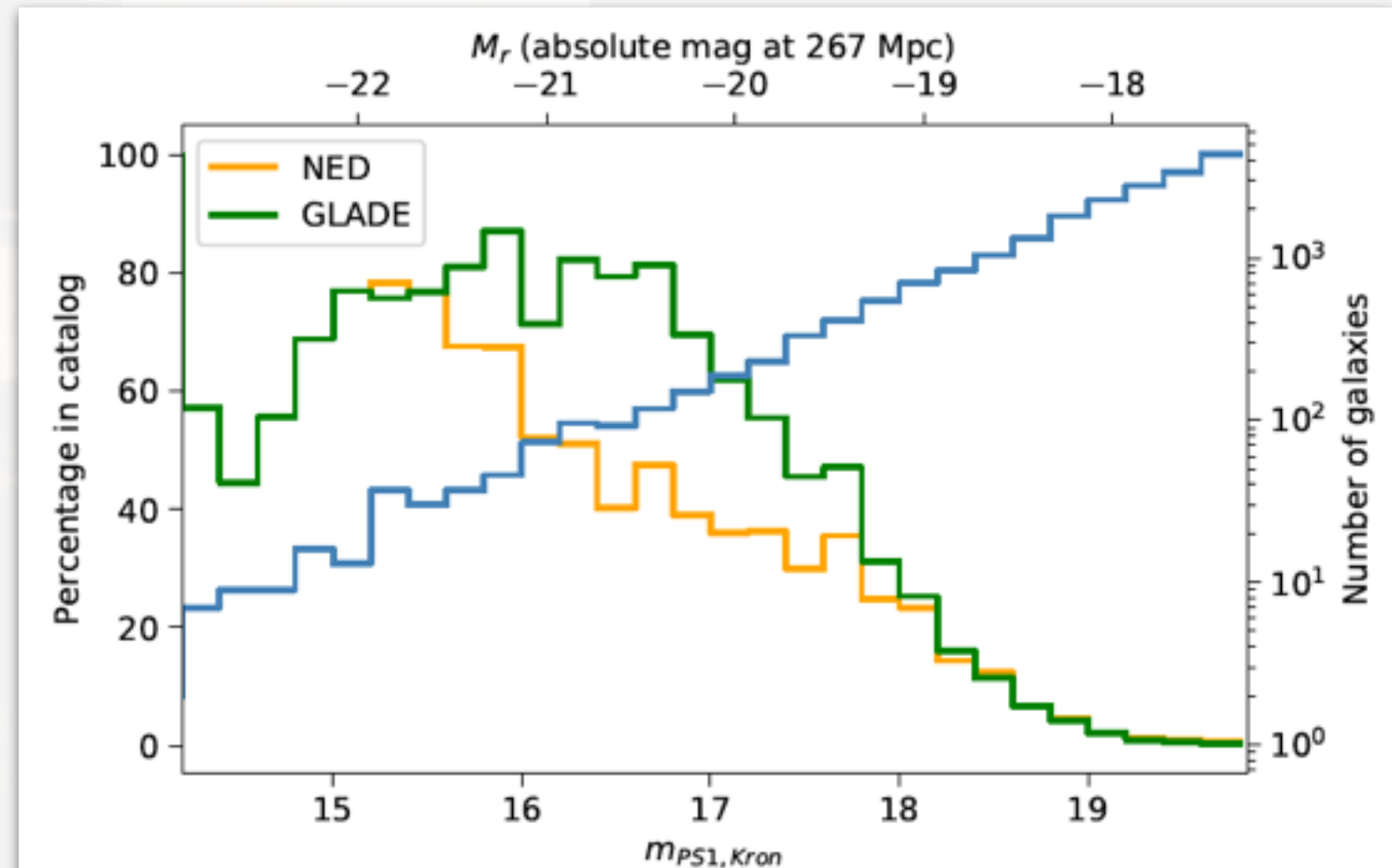
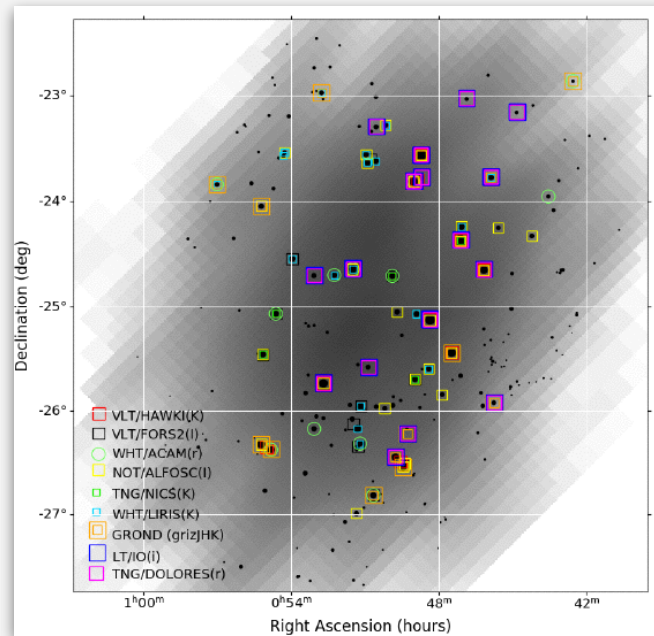




GW190814

Ackley et al. 2020

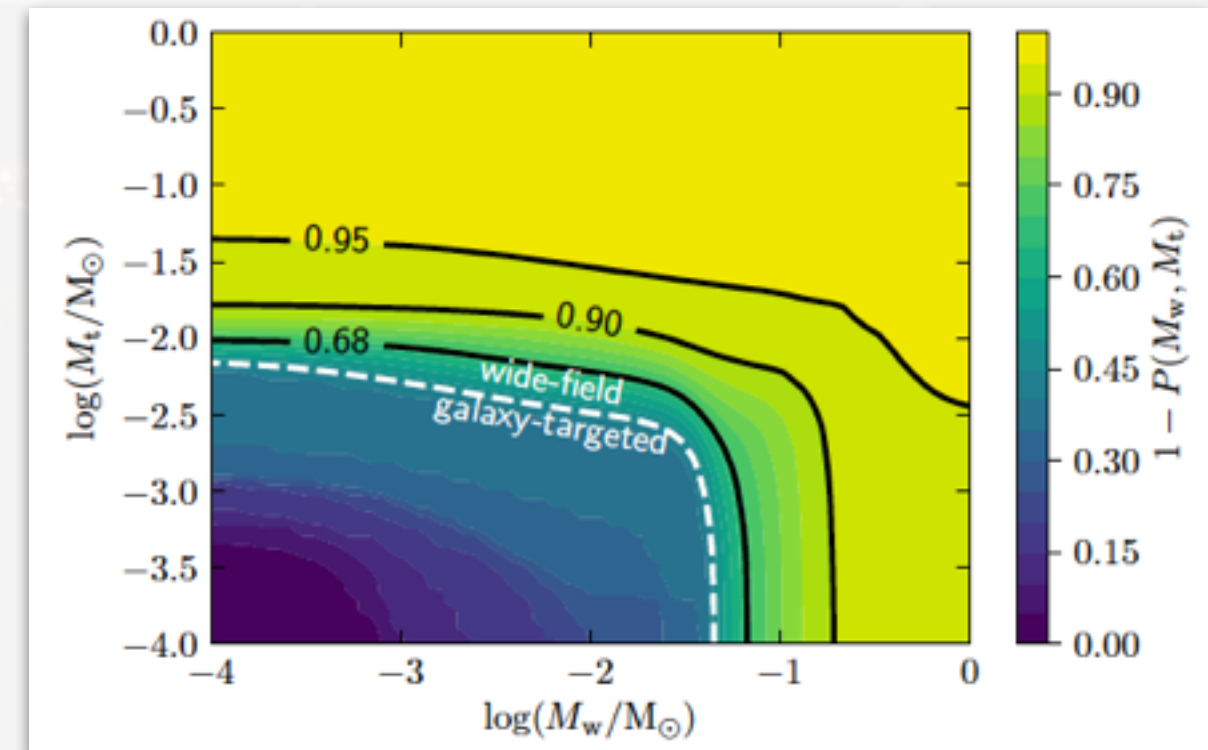
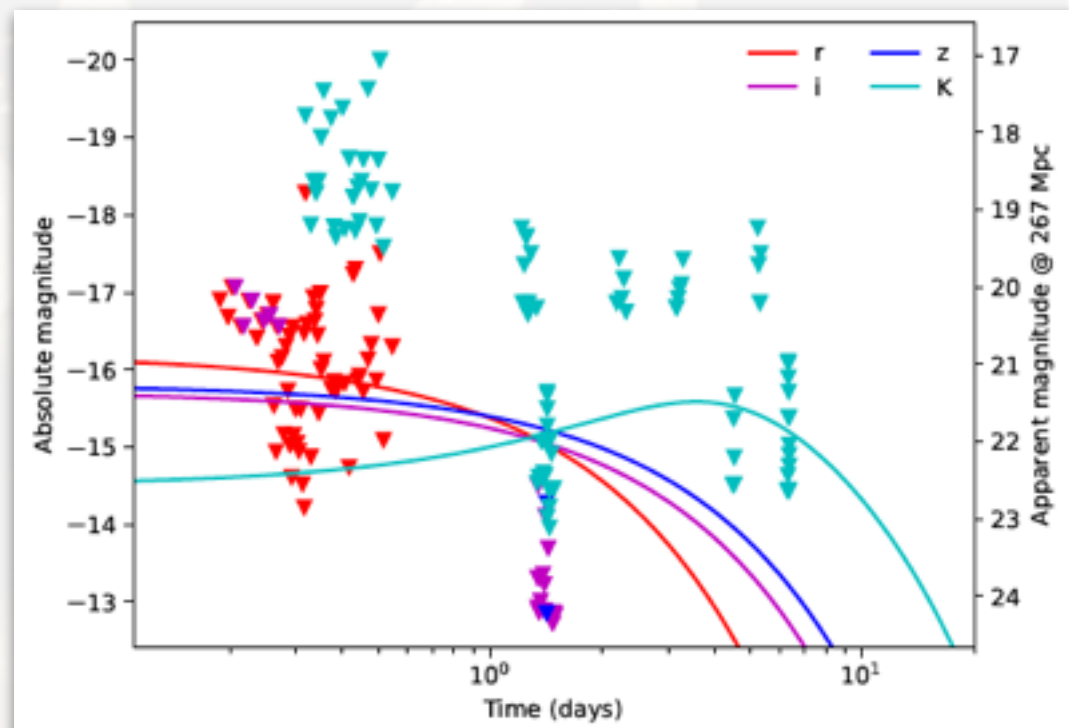
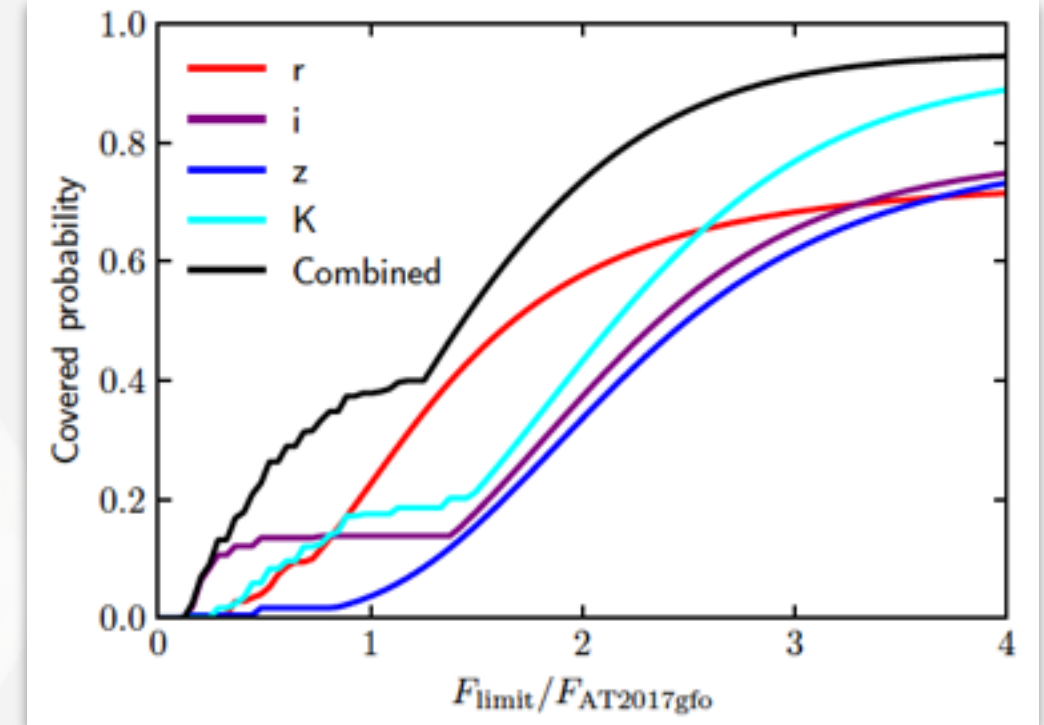
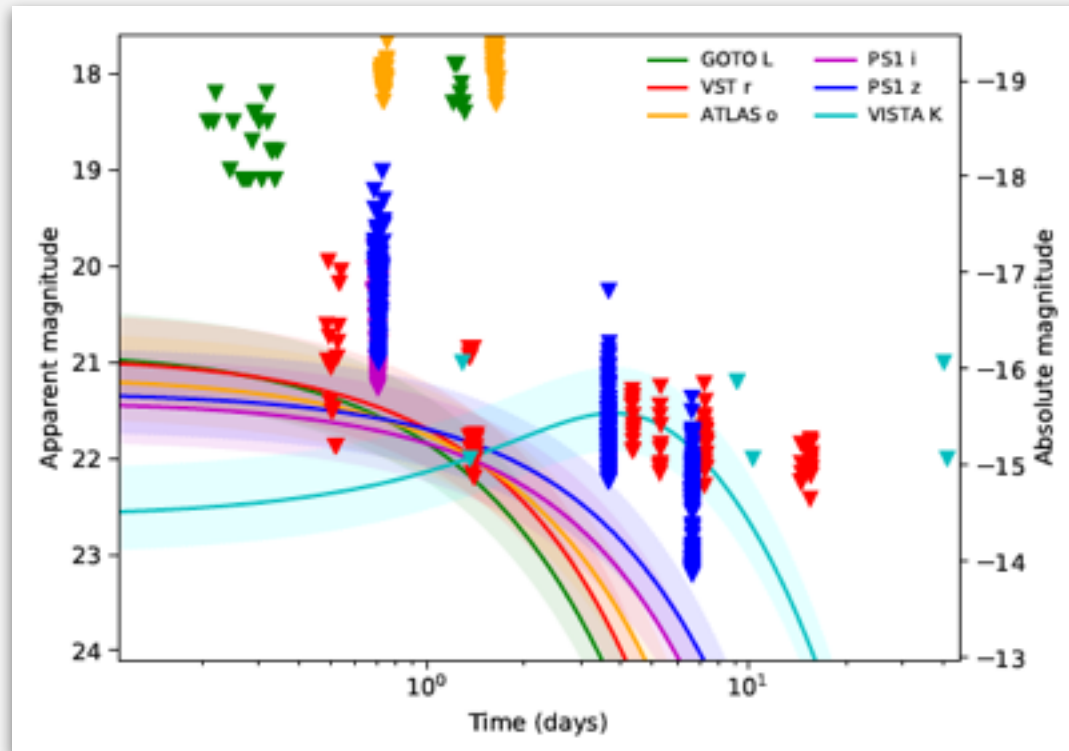
- catalogue incompleteness
- observation incompleteness





GW190814

Ackley et al. 2020



O4

LVK Observing Scenario paper

Observation Run	Network	Expected BNS Detections	Expected NSBH Detections	Expected BBH Detections
O3	HLV	1^{+12}_{-1}	0^{+19}_{-0}	17^{+22}_{-11}
O4	HLVK	10^{+52}_{-10}	1^{+91}_{-1}	79^{+89}_{-44}
		Area (deg ²) 90% c.r.	Area (deg ²) 90% c.r.	Area (deg ²) 90% c.r.
O3	HLV	270^{+34}_{-20}	330^{+24}_{-31}	280^{+30}_{-23}
O4	HLVK	33^{+5}_{-5}	50^{+8}_{-8}	41^{+7}_{-6}

BNS

O4: aLIGO 160 – 190 Mpc, AdV 90 – 120 Mpc, KAGRA 25 – 130 Mpc



The O3-O4 Gap

Programme @ VLT (~30h/semester)
follow-up of KN candidates found by surveys

ESO is resuming operations after a break due to COVID-19
No P107 call

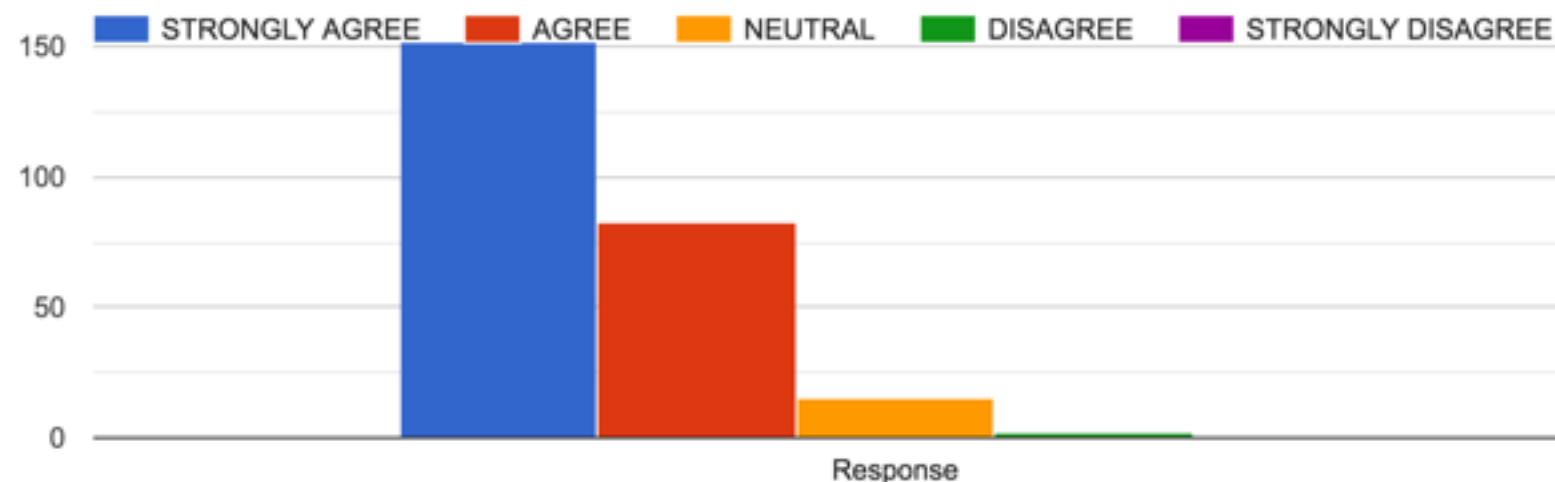


The O3-O4 Gap

Getting prepared for O4:

Survey within the collaboration
>80% confirmed their participation

ENGRAVE was formed to coordinate the work of the major groupings in ESO member states in this area. Do you agree that rationale still exists and justifies the continuation of ENGRAVE?

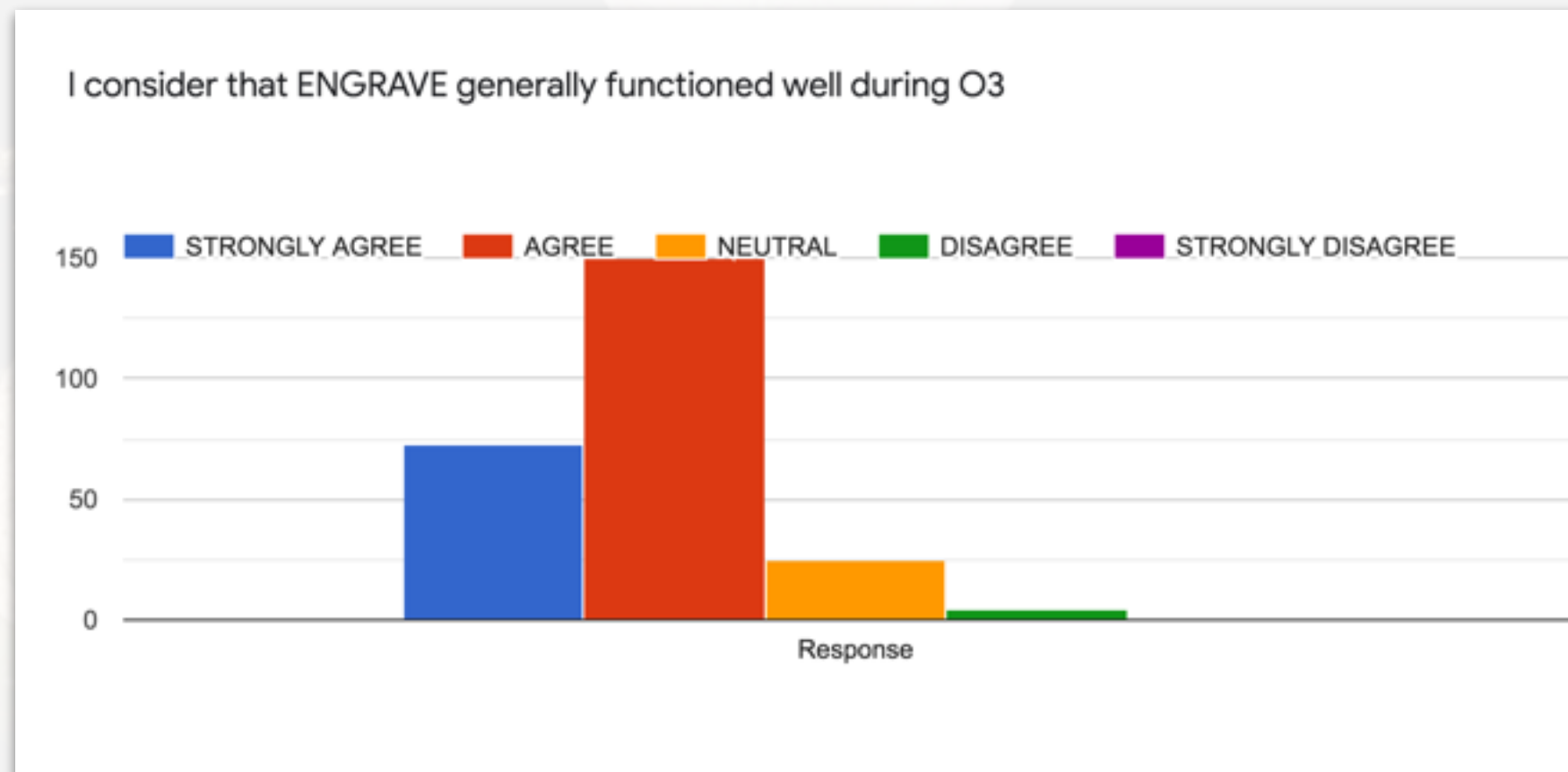




The O3-O4 Gap

Getting prepared for O4:

Survey within the collaboration
>80% confirmed their participation





The O3-O4 Gap

Getting prepared for O4:

Survey within the collaboration
>80% confirmed their participation

New call for new members
Re-organization



Merci