GOTO

GRAVITATIONAL-WAVE OPTICAL TRANSIENT OBSERVER

University of Warwick – Monash University
Armagh Observatory – University of Sheffield – University of Leicester

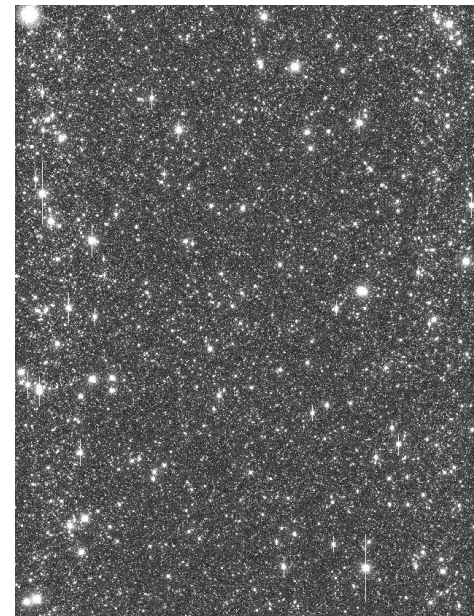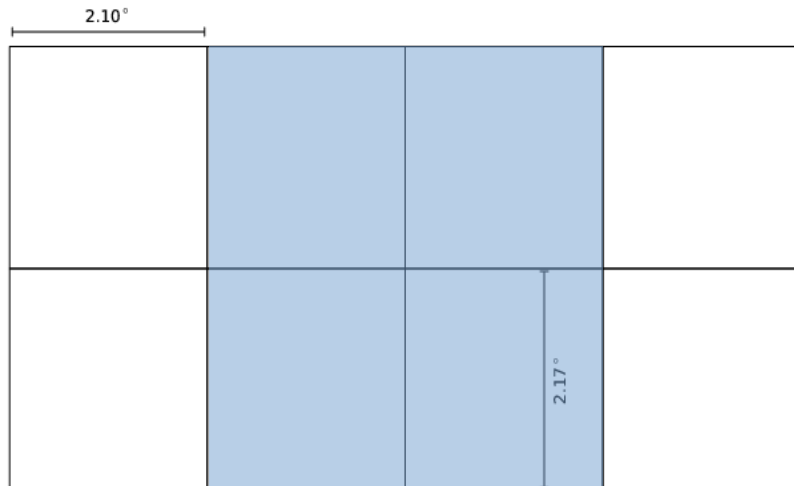http://www.goto-observatory.org

Krzysztof Ulaczyk, University of Warwick

Robotic array of **40 cm f/2.5** astrographs

Phase I:
- Prototype 4x40 cm
- Field of view ~ 18 sqr. deg
- 200 Mpixels at pixel scale of 1.2 arcsec.
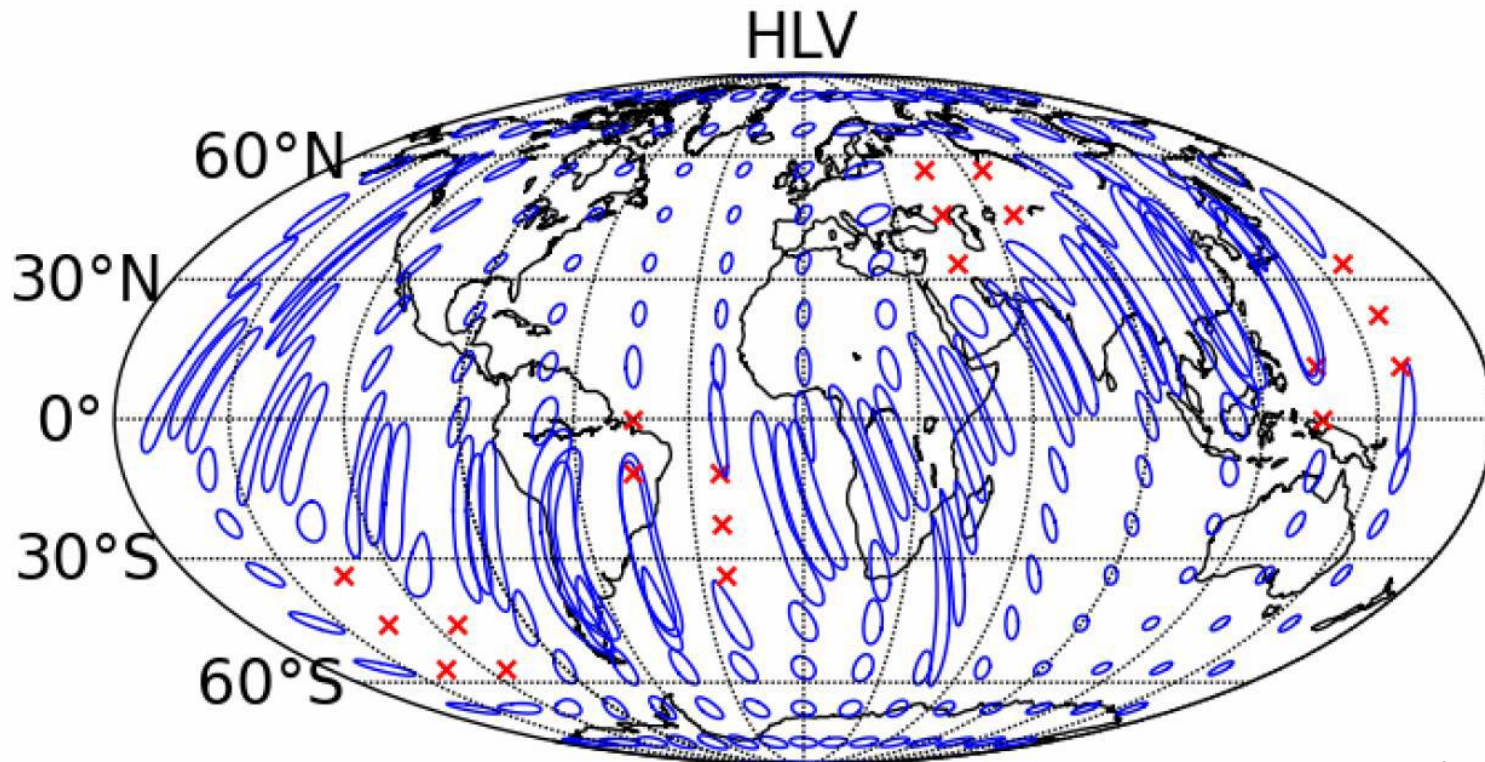- depth of 21-22 mag in a wide optical passband in 5-10 mins

2.10°

2.17°

Visualisation of GOTO dome near Warwick facilities
(SuperWASP / 1.0 m)

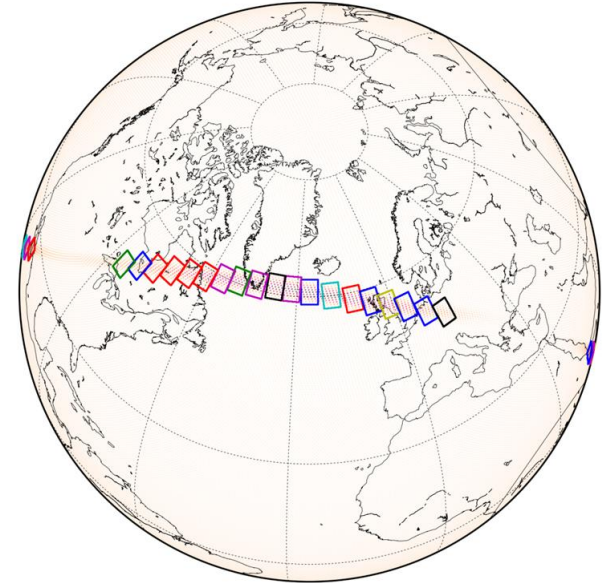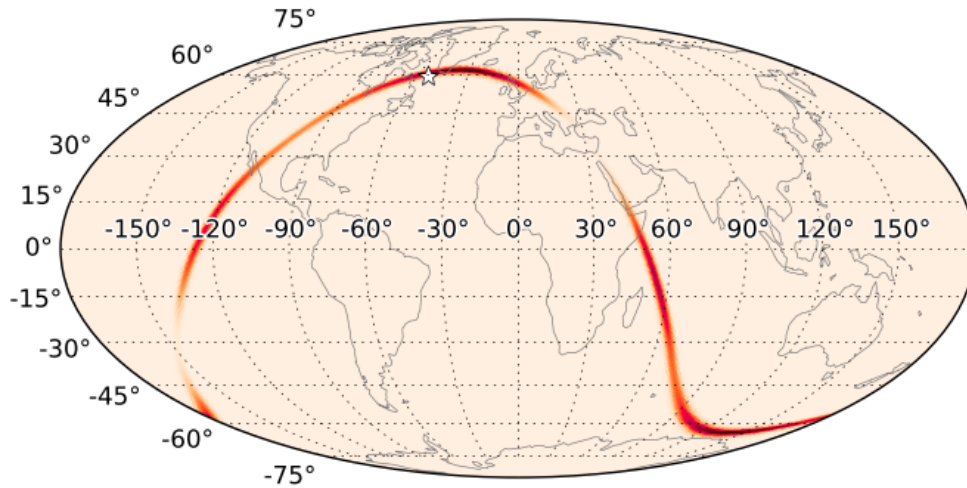Roque de los Muchachos Observatory
(La Palma)

Principal goal: find EM counterparts to GW sources

HLV

Aasi et al. 2013

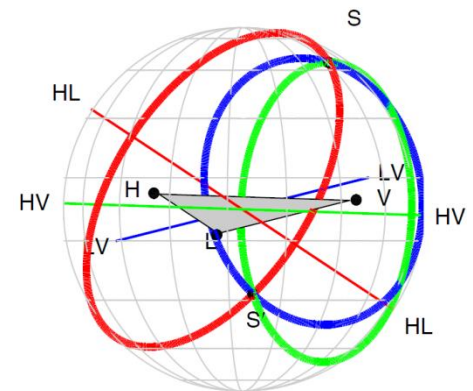Source localisation errors

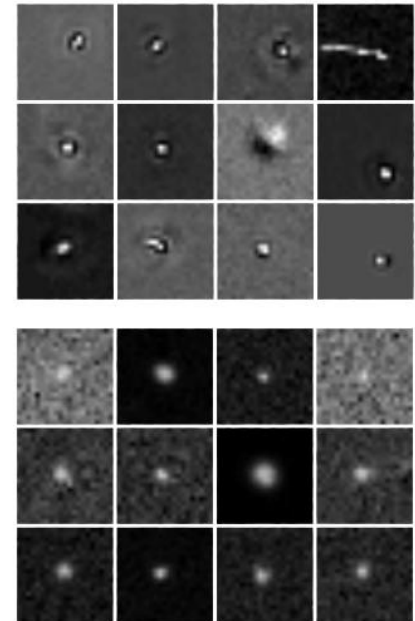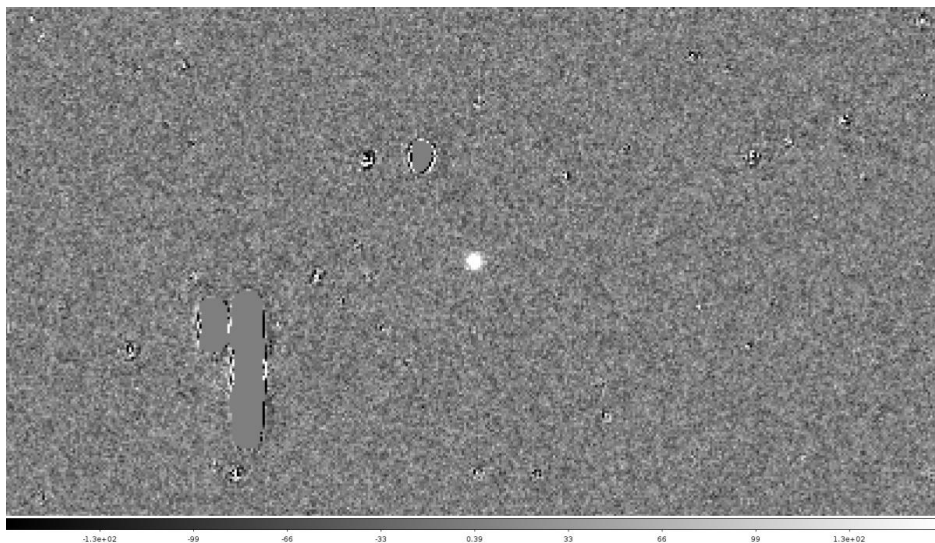Scalable, upgradable design optimized to search
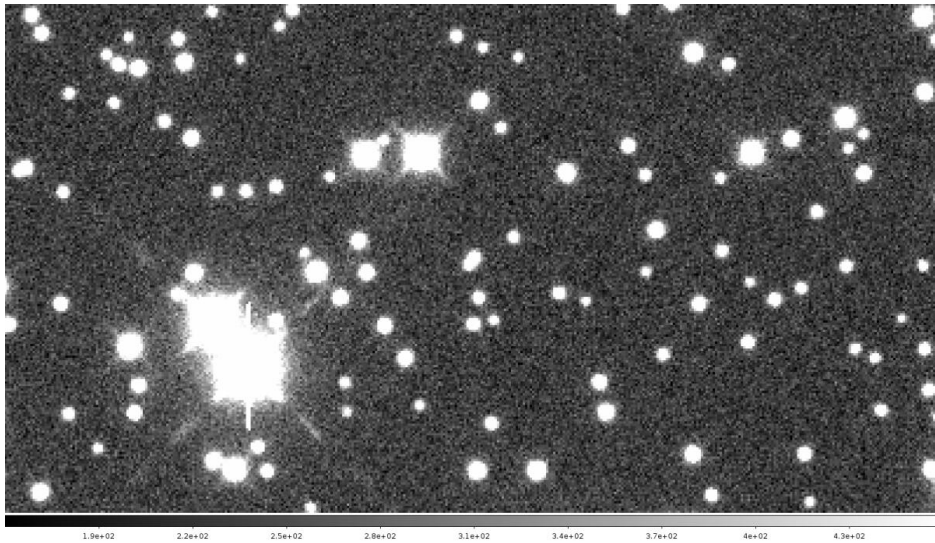large LIGO skymaps

Berry et al. 2014

Skymap and tiling for two-detector trigger 469497 in 2016

The challenge: search area is of order few 100 sqr. deg. and
properties of EM counterparts are uncertain
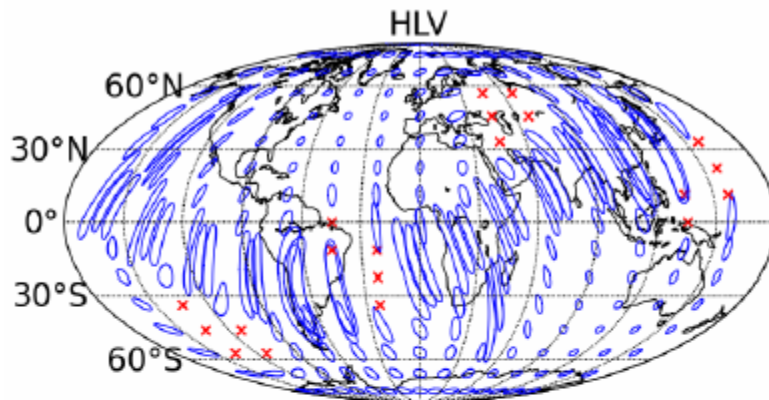Data analysis requires real-time data reduction and classification
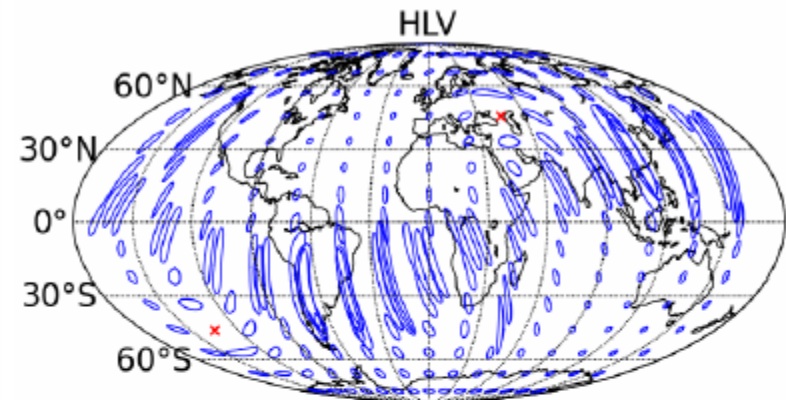
New source detection

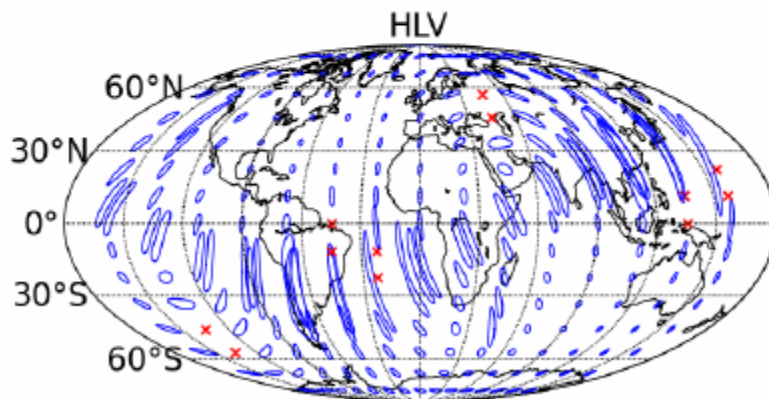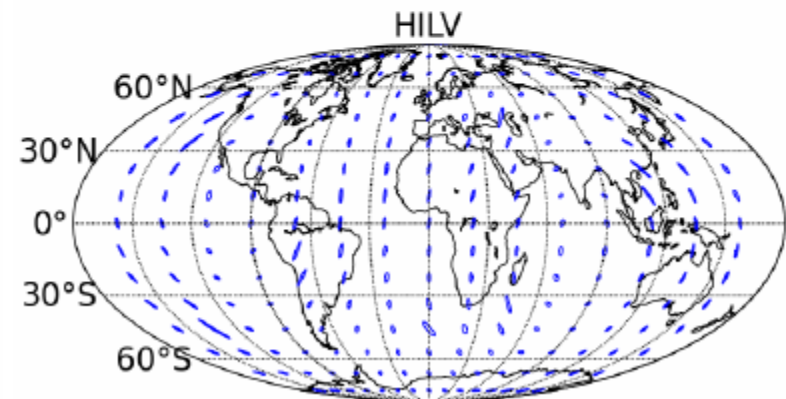# Evolution of error regions over time

2016

2017

Aasi et al. 2013

2019

2022+

Follow-up capabilities

- Quick response (slew speed > 5 deg/s)
- Multiband photometry – RGB and luminosity filters
- Camera readout time < 10 s
- Depth 21-22 mag obtained in 5-10 min
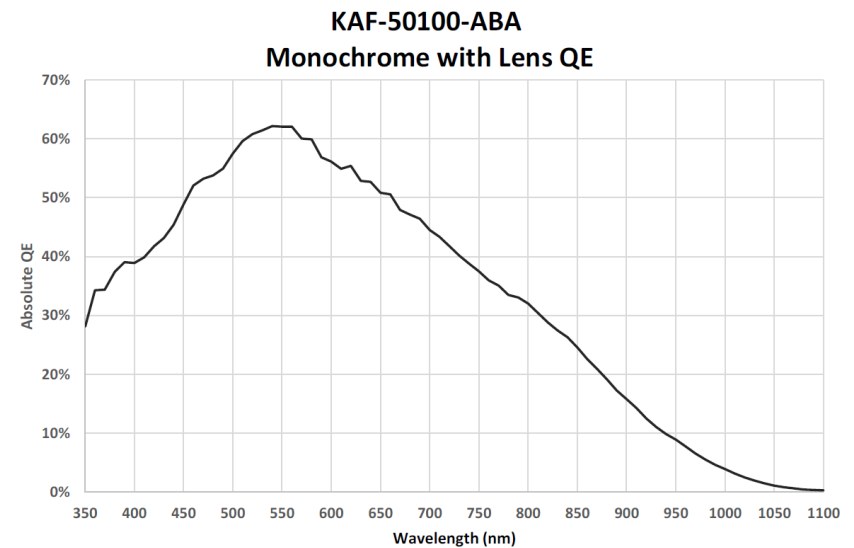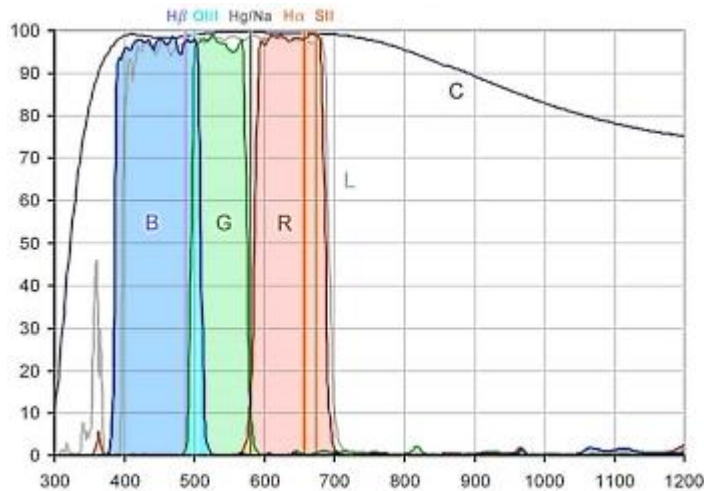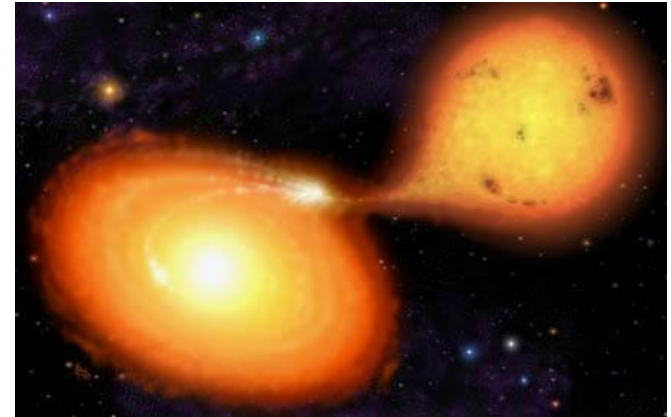- Adjustable telescopes alignment

**KAF-50100-ABA
Monochrome with Lens QE**
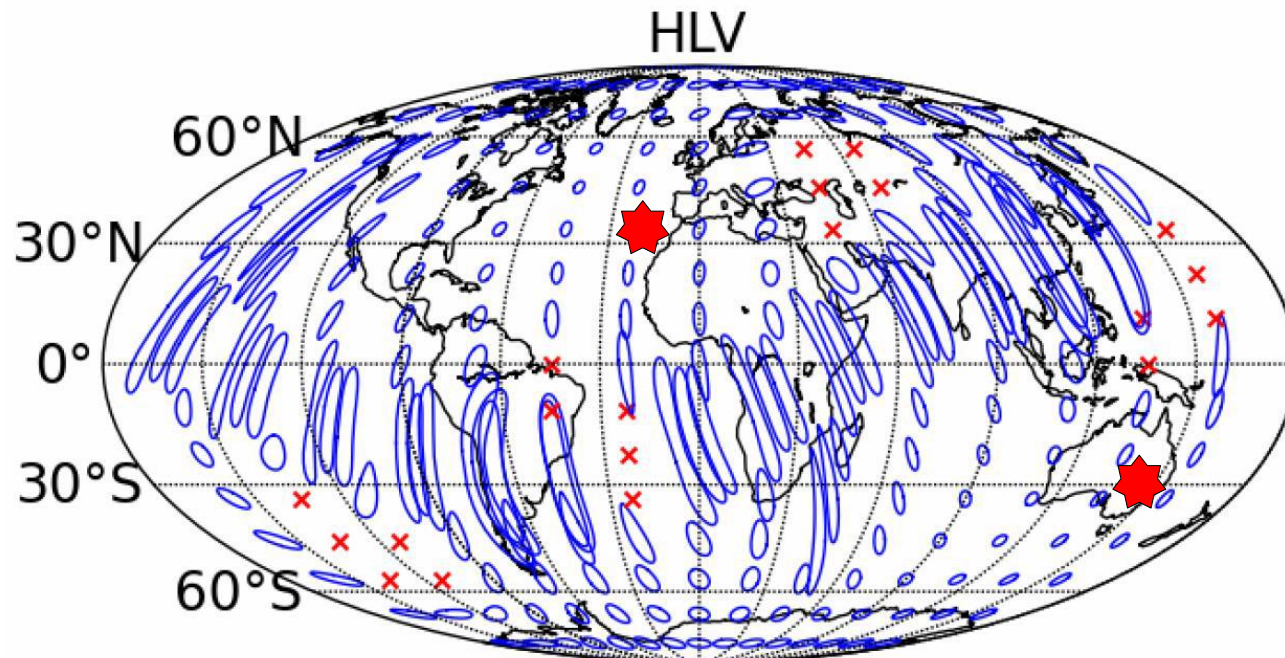
Figure 8: Spectral Response (KAF-50100-ABA version)

Time-domain science

- Other directed searches for counterparts to high- to low- energy transients (X-γ ray transients / Radio events/ Gaia alerts)

- Survey mode such as targeted low-galactic latitude search for galactic compact objects

- Harvest interesting events amongst the GW-EM false positives

- Immediate target feed to larger facilities (eg. WHT, LT)

Future

- Tweak design and scale-up to 8 astrographs at La Palma

- Second dome/mount with another 8 astrographs to establish full GOTO-North node on La Palma

- Deployment of southern node in Australia

Thank you!