

Gravitational-Wave Triggers & EM Follow-up

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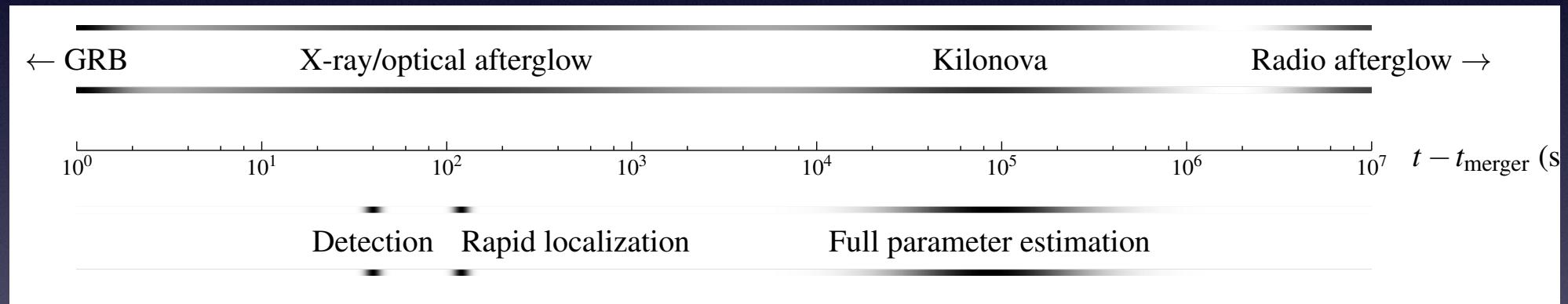


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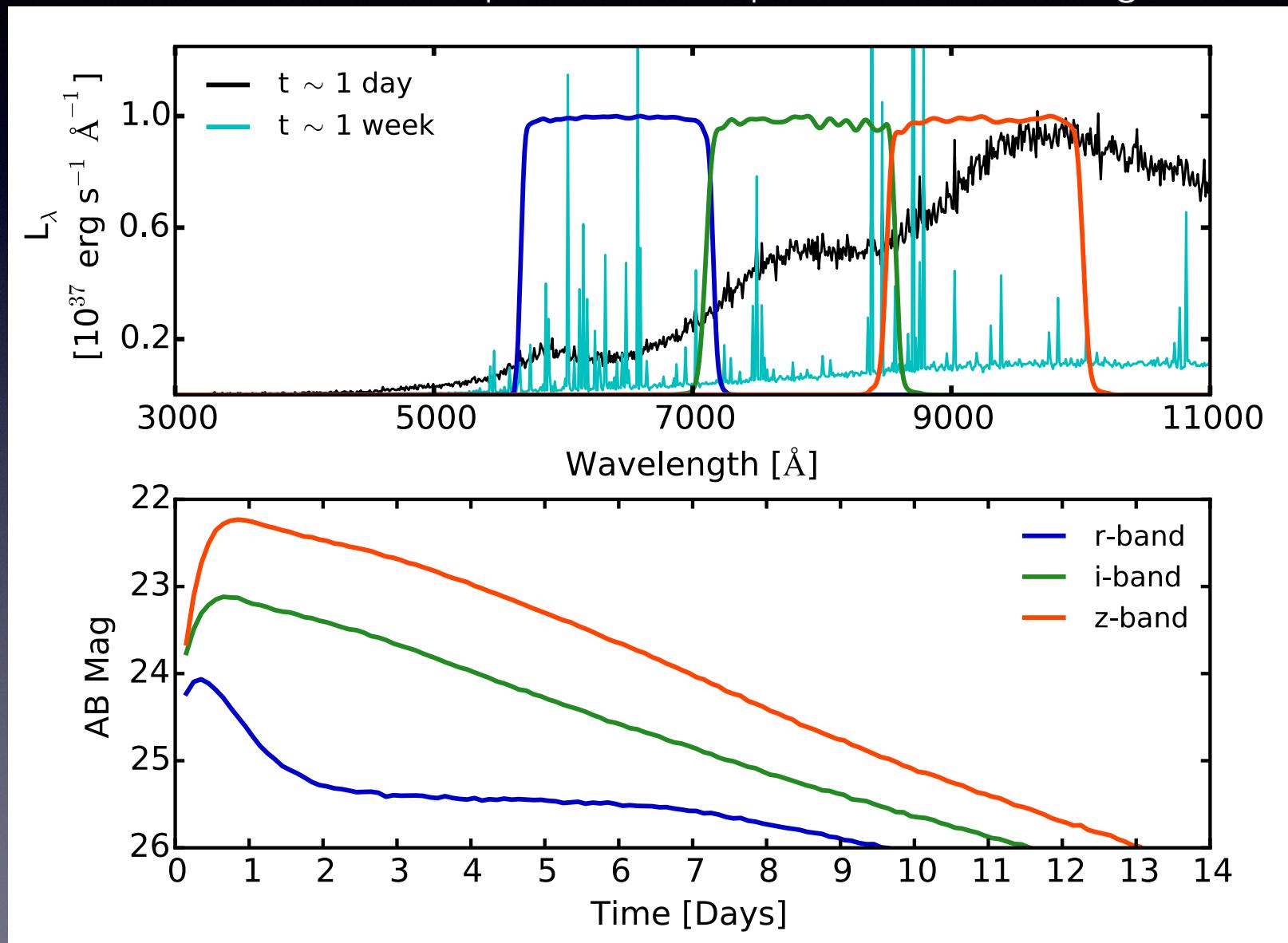
Expected EM counterparts to GW inspirals with NS

Singer et al. 2014, ApJ, arxiv/1304.0670



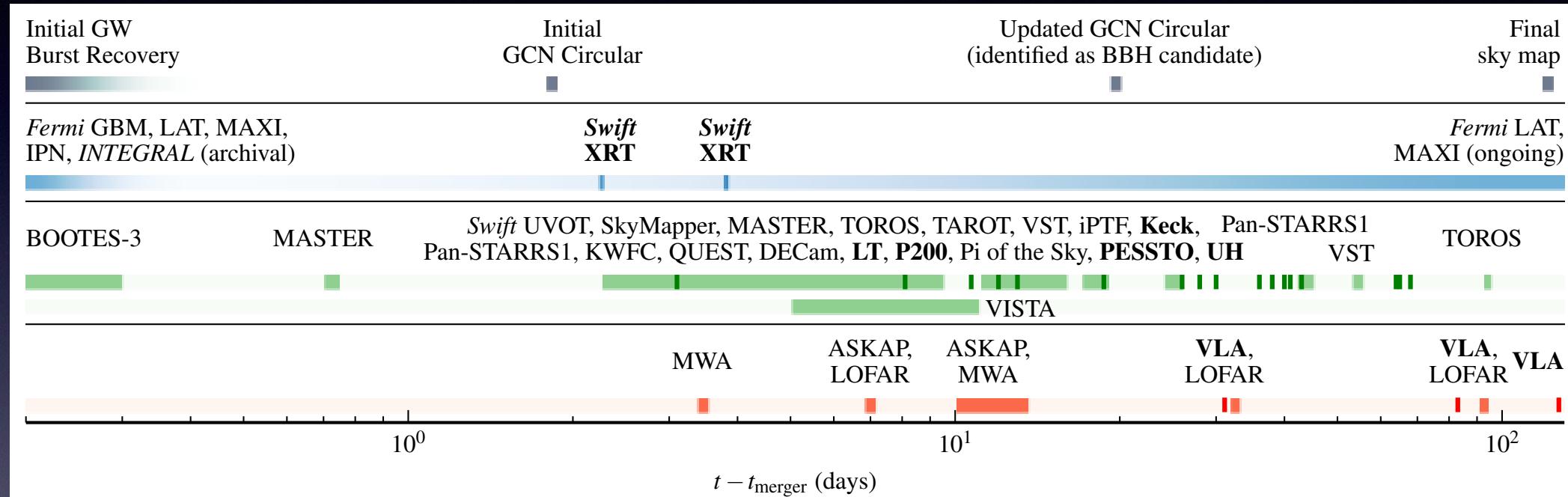
Example Kilonova Light Curves

Barnes & Kasen 2013 plot from Cowperthwaite and Berger 2015



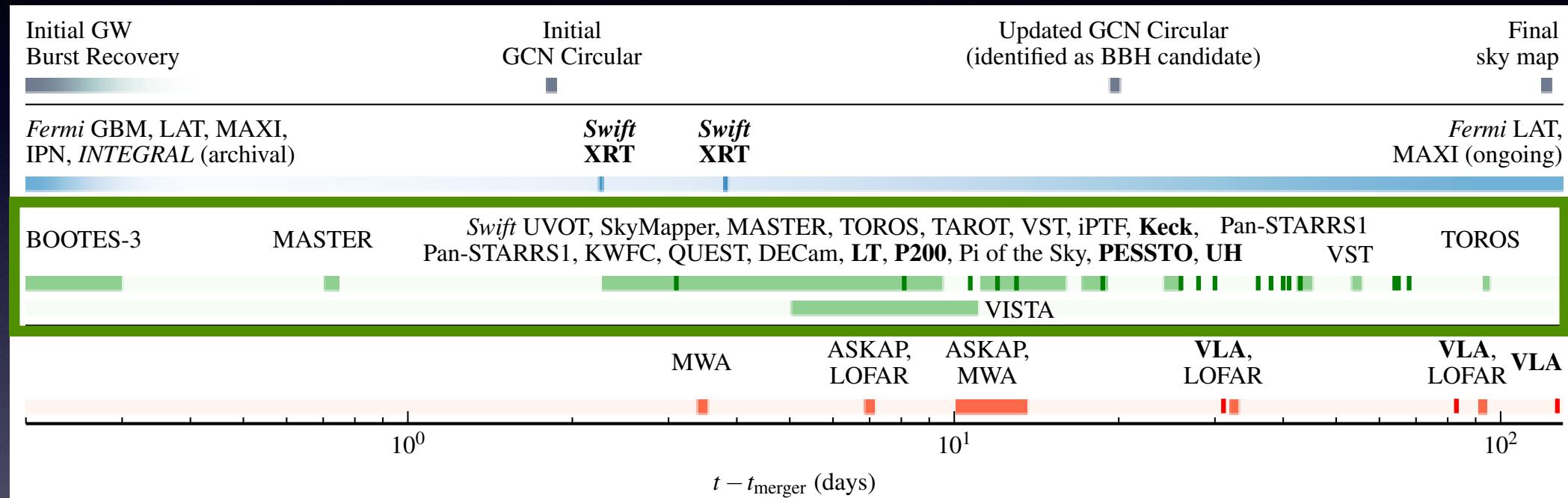
EM Follow-up of GW150914

The LVC, EM Collabs, ApJL, arxiv/1602.08492



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The LVC, EM Collabs, ApJL, arxiv/1602.08492



Advanced LIGO: Plan for Observing Runs

So far

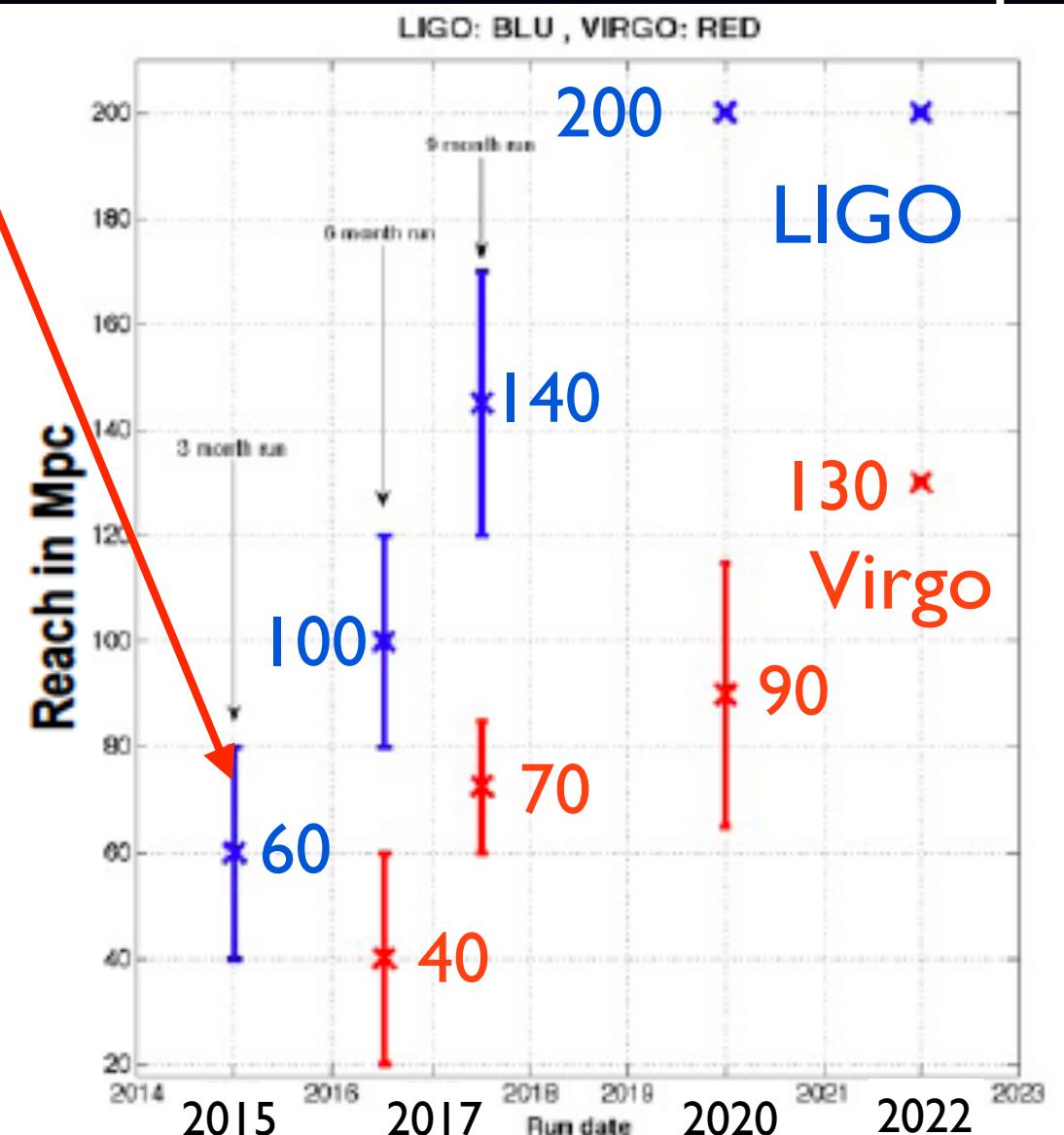
Second generation interferometers to begin science operations:

- Advanced LIGO (2 interferometers) – 2015
- Advanced Virgo (1 interferometer) – 2016

Approximate run schedule:

- **Advanced LIGO:**
 - ~ 3 month run in 2015,
 - ~ 6 month run in 2016-17
 - ~ 9 month run in 2017-18
- **Advanced Virgo:**
 - ~ 6 month run in 2016-17
 - ~ 9 month run in 2017-18
- *Modification of run schedules is likely as we learn more about the instruments*

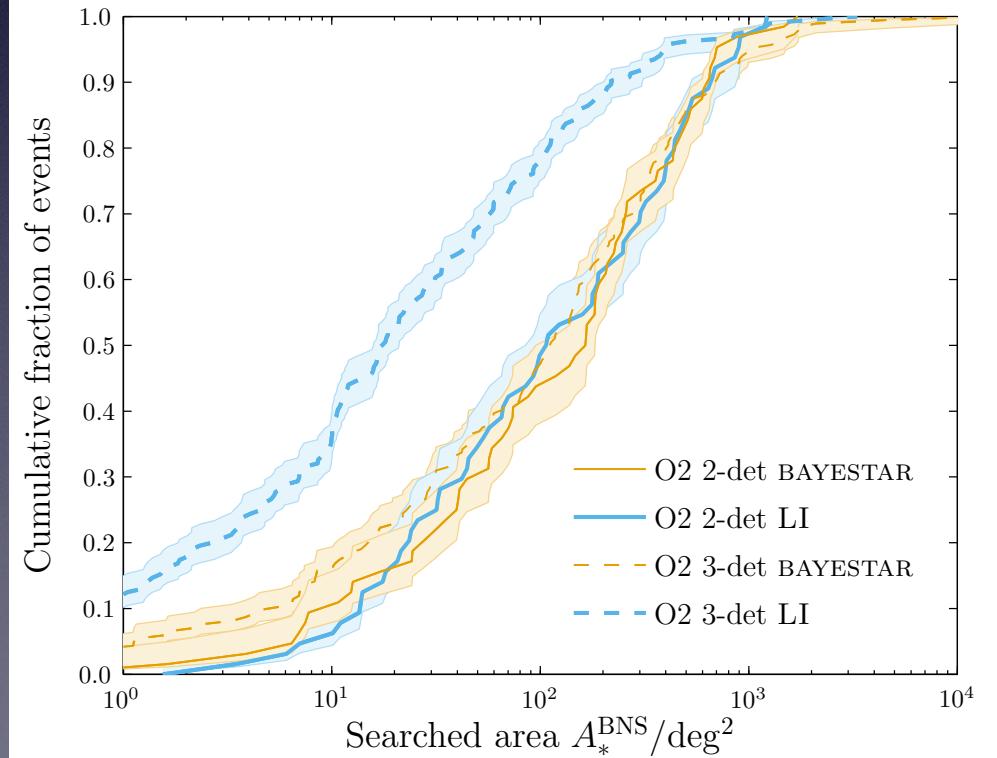
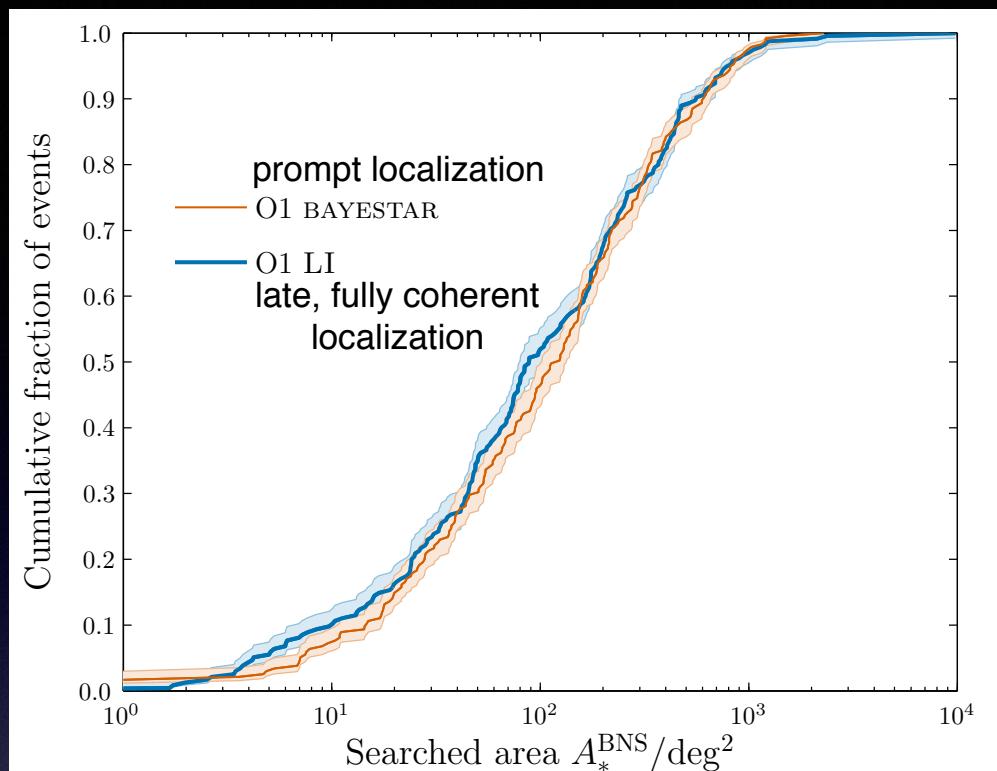
NS-NS Reach in Mpc



2 detectors
LLO-LHO
O1

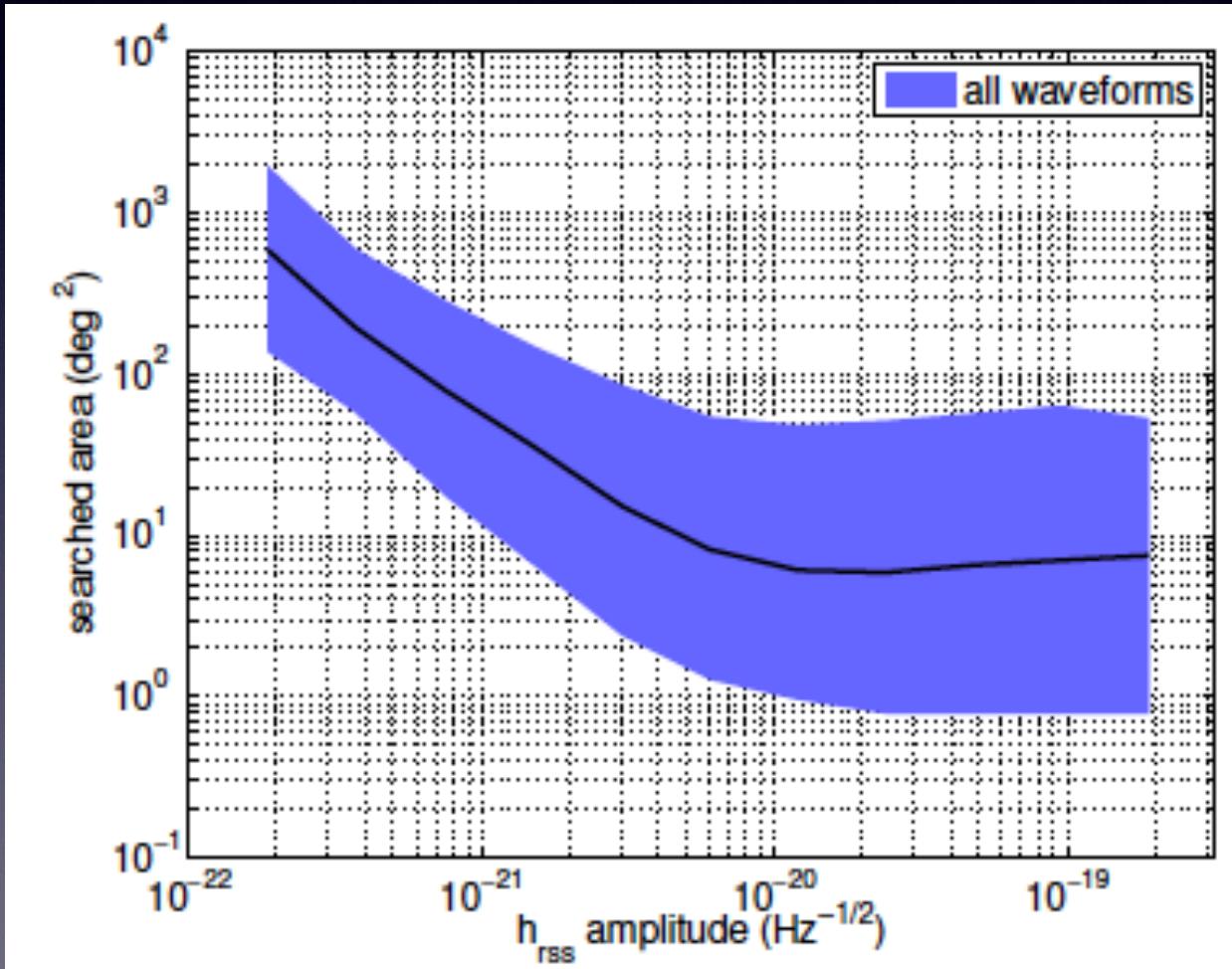
with 3 detectors
late localization
is clearly better

3 detectors
LLO-LHO-Virgo
O2: 2016-2017



Localization: Unmodelled Bursts

Aasi et al 2013; arXiv: 1304.0670



at advanced
design sensitivity
for both LIGO & Virgo

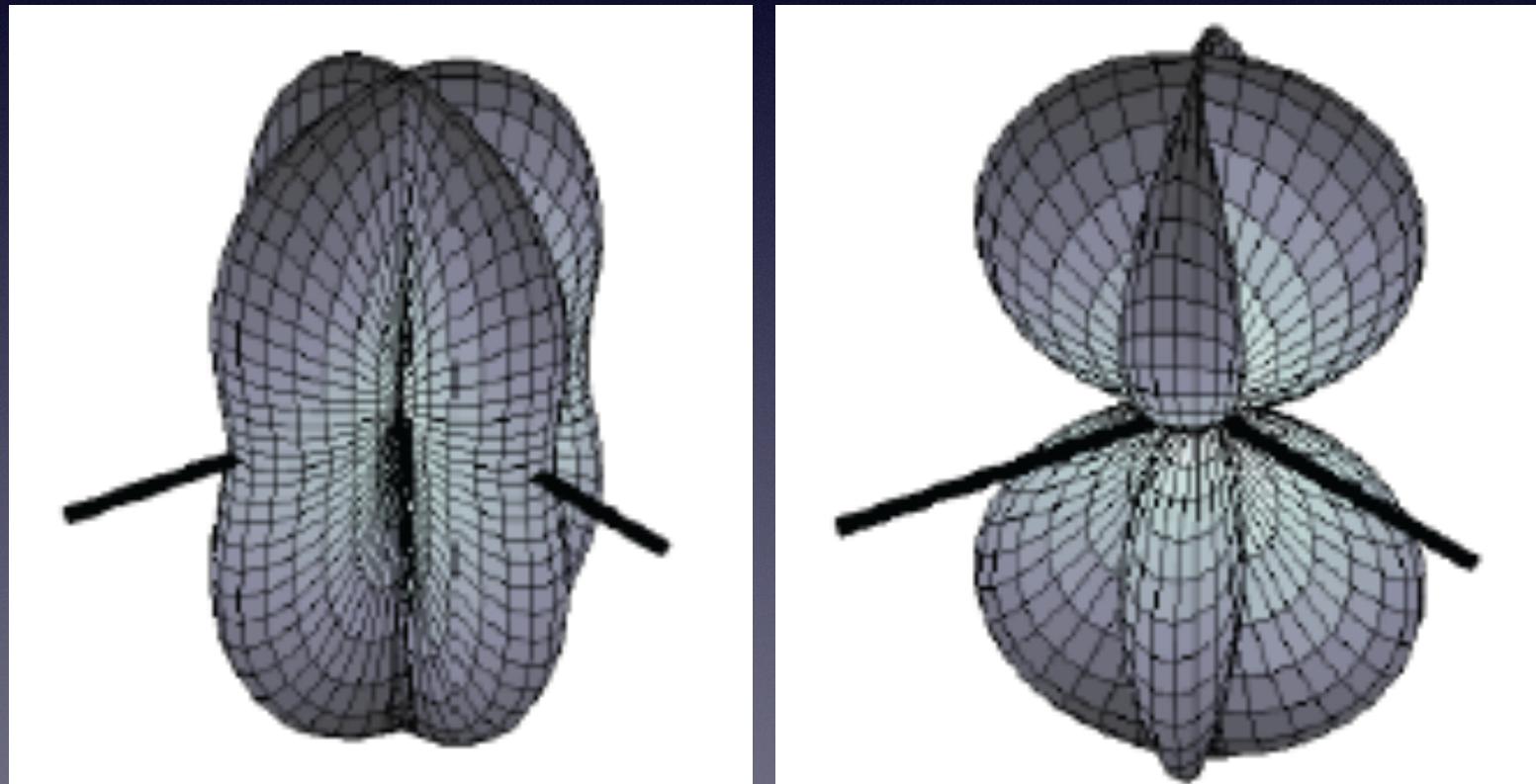
wide range of
potential burst signals

median sky areas
~ 50 - 500 deg²

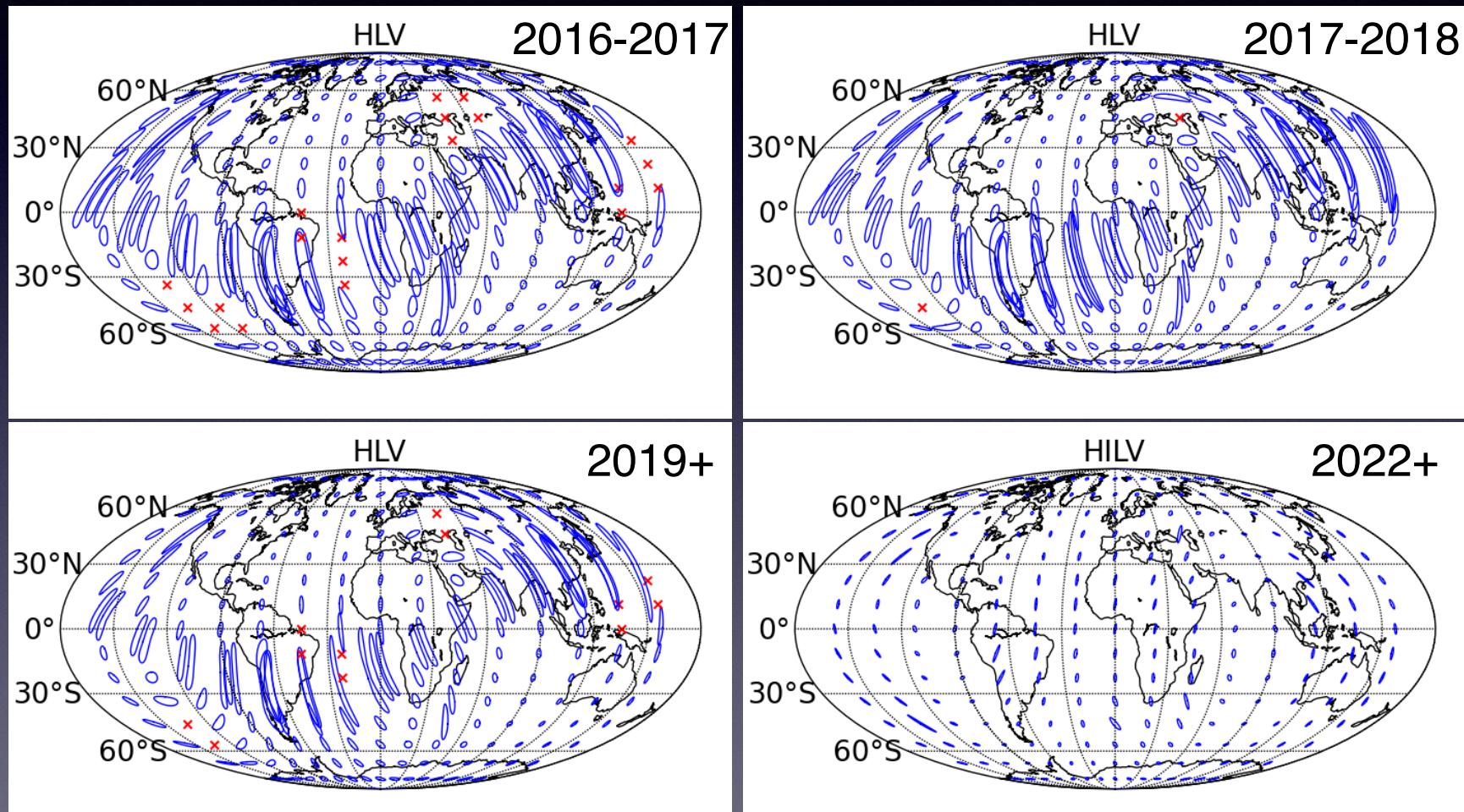
LIGO/Virgo Antenna Pattern

gravitational-wave strain

$$h(t) = \mathcal{F}_+ h_+ + \mathcal{F}_x h_x$$



LIGO-India will be great!

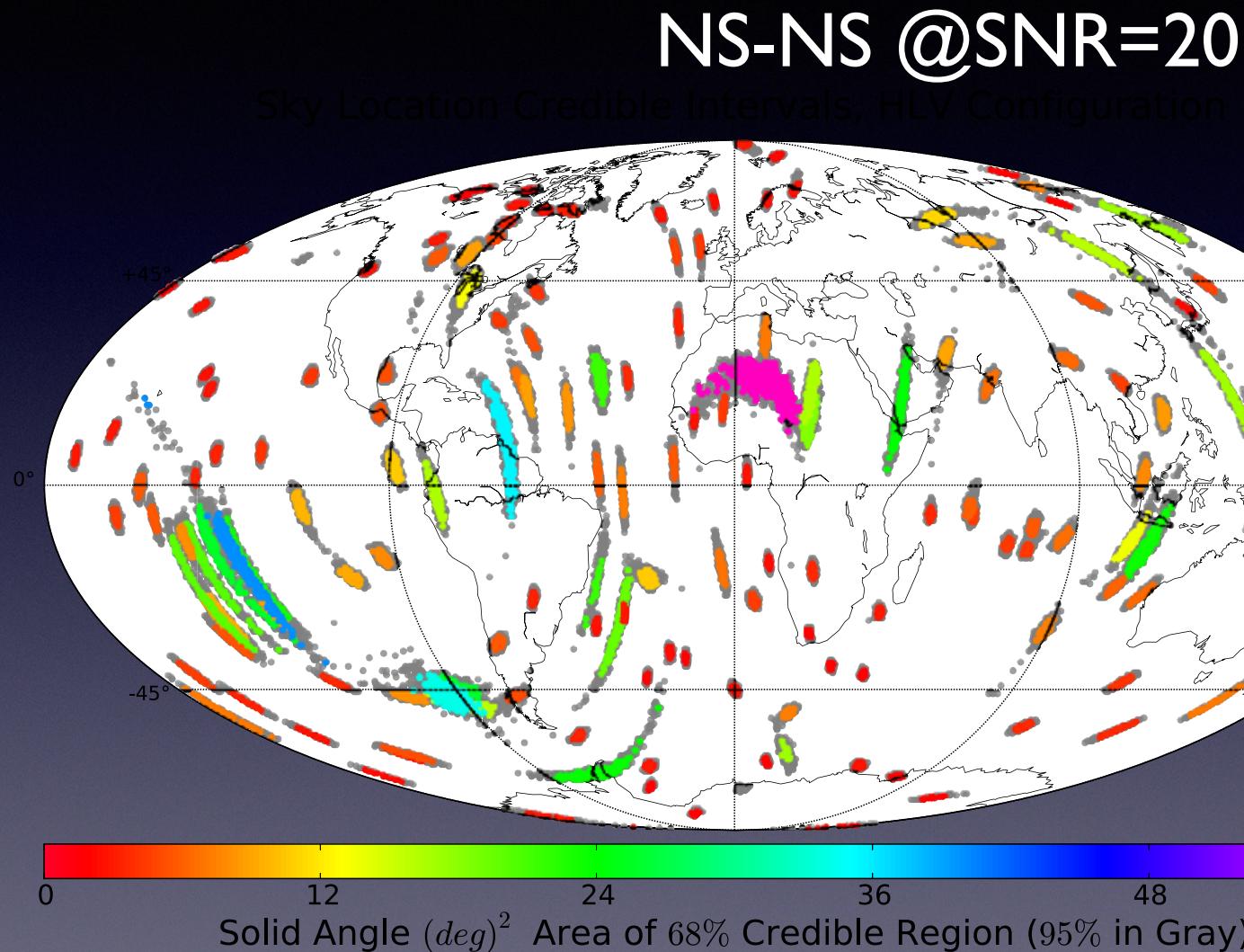


BNS with SNR~15

The LVC, LRR, arxiv/1304.0670

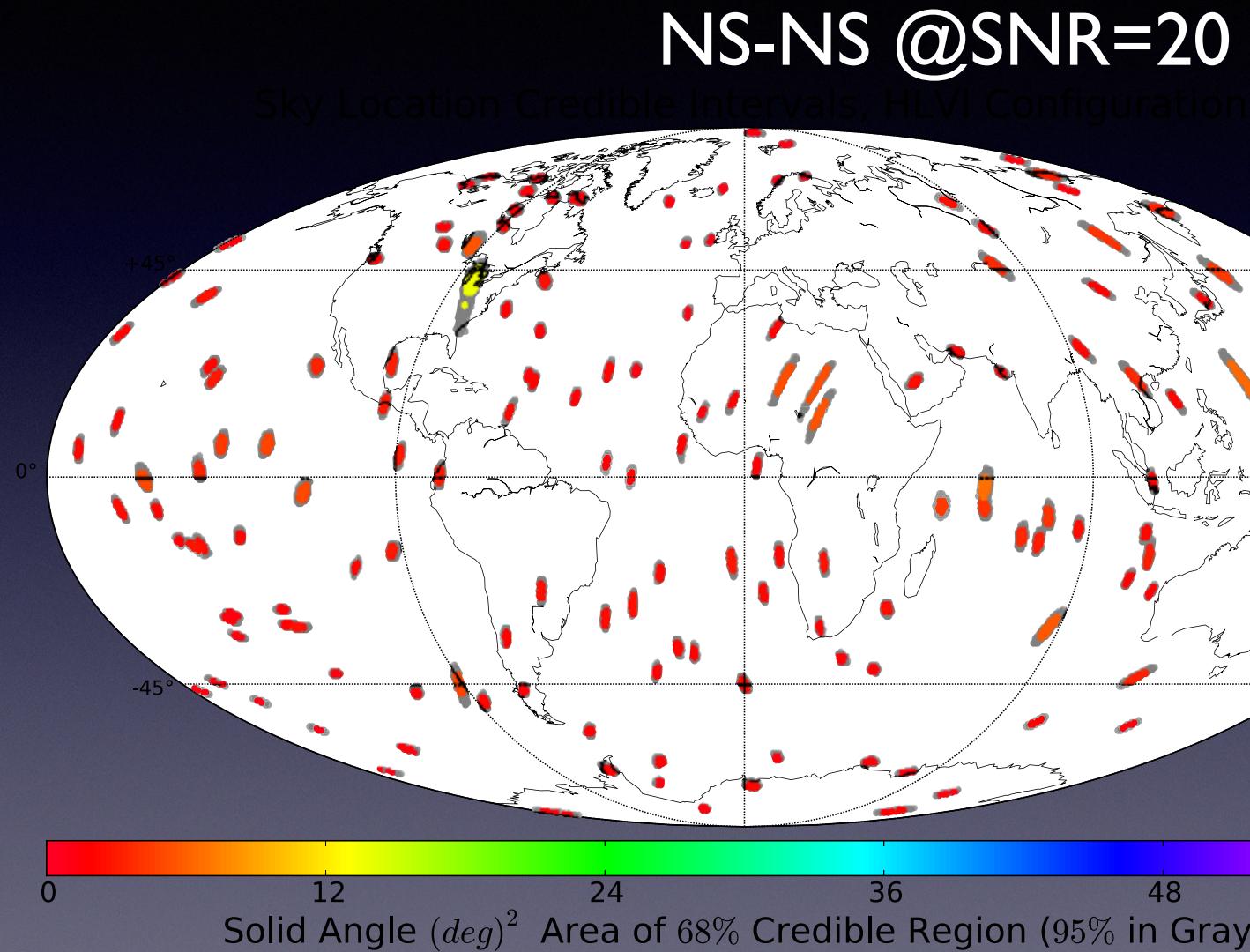
LIGO-Virgo Design Sensitivity

at 95% CL
median
error of
 $\sim 10 \text{ deg}^2$

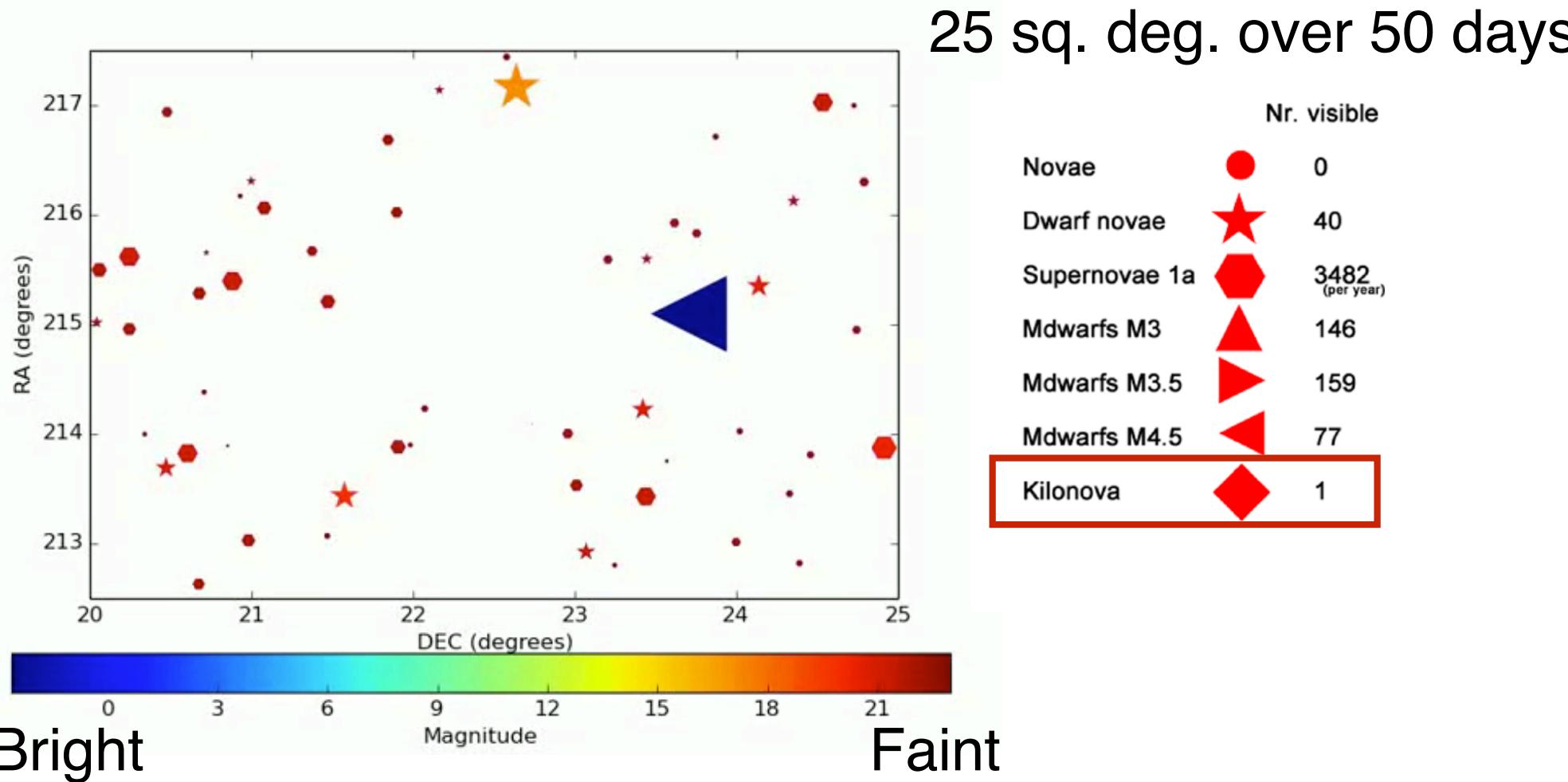


LIGO-Virgo-Indigo Design Sensitivity

at 95% CL
median
error of
~ 5 deg²



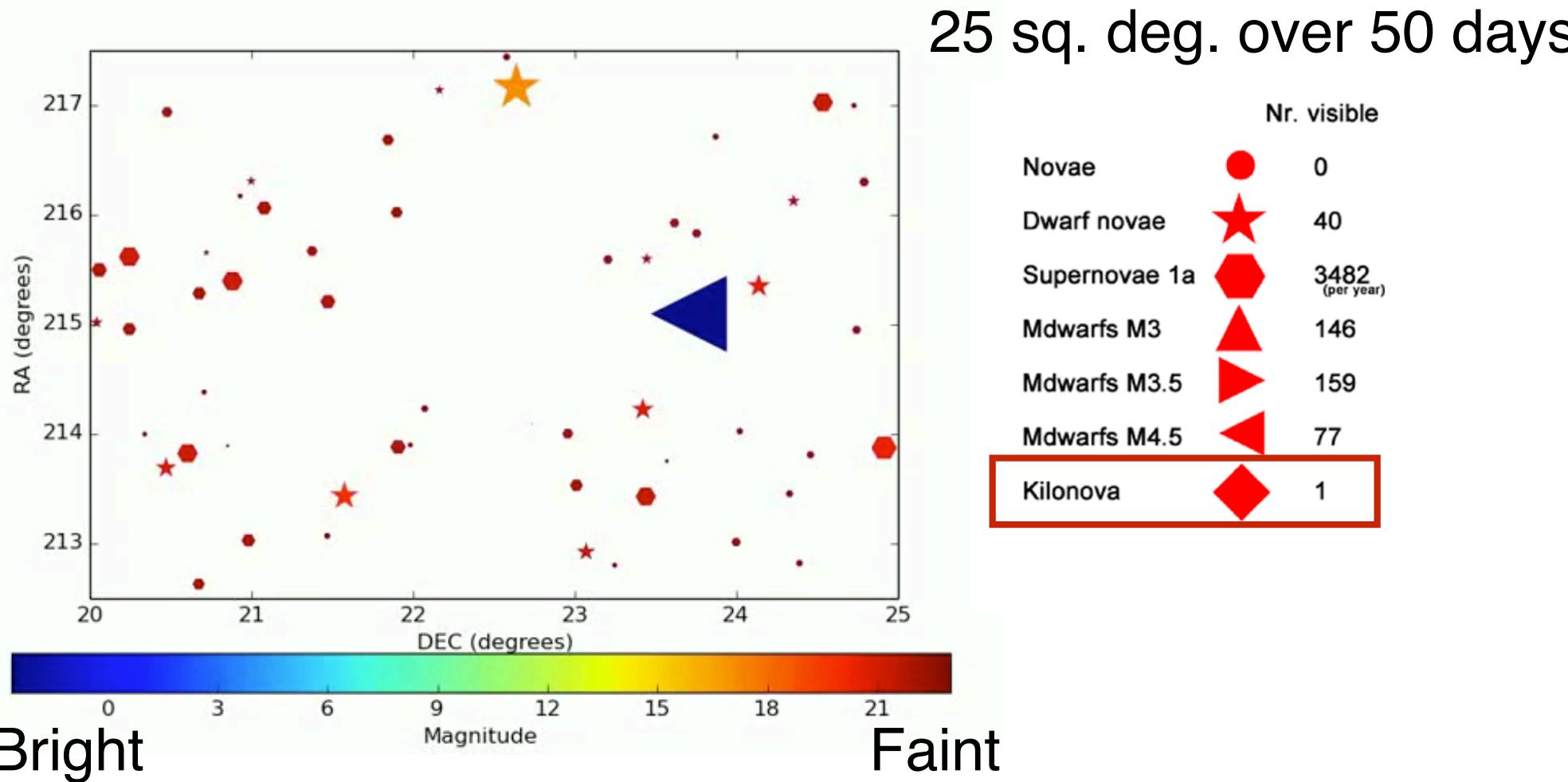
B) Identification: Galactic Transient Sky Simulator down to 21.5 mag



[Jacobs, Nissanke et al. in prep;

use in Astrophysical Transient Toolkit for LIGO-Virgo EM Follow up
open source, and being incorporated into LSST, ZTF]

B) Identification: Galactic Transient Sky Simulator down to 21.5 mag

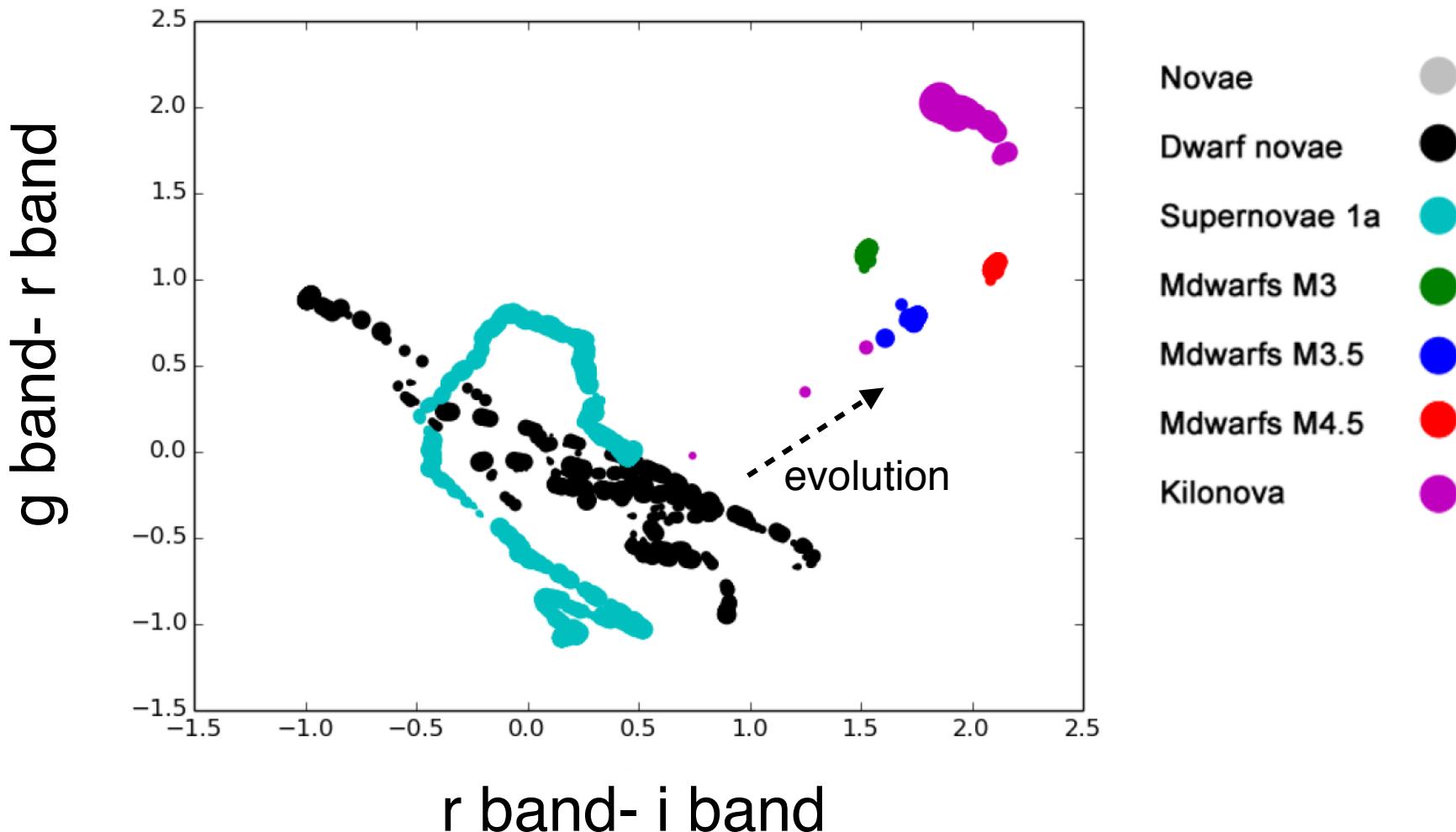


[Jacobs, Nissanke et al. in prep;

use in Astrophysical Transient Toolkit for LIGO-Virgo EM Follow up
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B) Optical Identification through different colors over 7 days

[Jacobs, Nissanke et al. in



[Extragalactic only: see Tanaka &
Hotokezaka 2014, Cowperthwaite and
Berger 2015]