Observing Schedule for Electromagnetic Follow-up of Gravitational Wave Sources

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Plan of talk

- Constraints of EM follow-up
- Optimal Algorithm for follow-up
- Simulation results



EM counterparts of GW source

Merger of binary neutron star



What electromagnetic signals do we expect ?



EM counterparts of GW source





How GW detectors localize the source?



Aasi et al. 2013

Localization of GW source from three detectors





Patches of the GW error regions in the sky



Mansi M. Kasliwal and Samaya Nissanke



Optimal method over Setting and Rising constraints



Following-up Constraints



- Setting of the patch.
- Rising of the patch.
- Sunrise
- Multiple imaging of same area.



GW patch on the sky

A patch of **305 square degrees** has two islands. One is near the Sun, which can't be observed.





Visible part of the Patch



Probability density/sq.deg.												
0.000	0.025	0.050	0.075	0.100	0.125	0.150	0.175					





Optimal Array



Greedy Array



Implementation of Optimal method in iPTF

• We are implementing the Optimal method to iPTF for GW follow-up.



Kasliwal M. et al. 2016 arXiv:1602.08764v2



We checked our algorithm for the three O1 GW triggers.

Trigger Name	iPTF Exposure 1	iPTF Exposure 2	iPTF Exposure 3	iPTF total Probability	Optimal Exposure	Optimal Probability.
GW20150917	0.0110	0.0160	0.0	0.0270	2	0.0397
LVGC194575	0.0104	0.1583	0.0014	0.1701	2	0.1906
GW20151226	0.0010	0.0051	0.3581	0.3630	3	0.3939



Summary

- Developded an Optimal algorithm with multi imaging.
- Better for Large FOV for large patches (>300 sq.deg.).
- Implementing in iPTF for follow-up.



Thank you everyone

I want to thank separately Mansi Varun Anupama

