MMODA
LIGO-VIRGO-KAGRA

HANDS-ON SESSION

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MMODA context

Object name *

1E 1740.7-2942

Resolve | Explore

RA: 265.97845833

Dec: -29.74516667

Start time *: 2017-03-06T13:26:48.0

End time *: 2017-03-06T15:32:27.0

Time unit: IS

Hard X-rays: INTEGRAL ISGRI | X-rays: INTEGRAL JEM-X | Gamma-rays: INTEGRAL SPI-ACS | Gamma-rays: Polar | Gamma-rays: CTAO LST1 simulators | Visible/Infrared: DESI Legacy Survey | Neutrino: IceCube

Modelling-GW: SGWB | Gamma-rays: HESS DL3 Demo | Cosmic rays: Auger | Gravitational waves: LIGO-VIRGO-KAGRA | Visible: GAIA

Query parameters :

Product Type

- Parameters estimation
- Skymap search
- Catalogs event selection

RA std (deg): 1

deg

DEC std (deg)

Output: 1E 1740.7-2942

Query parameters | Log | Share | API code | View on Renku

Output: skymap

Download

Output Name

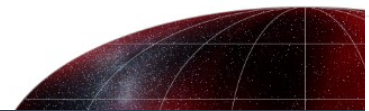
grb_in_p

1 - skym

2 - skym

3 - skym

4 - skym



MMODA Help > LIGO-VIRGO-KAGRA

‹ Auger | up | GAIA › | Help outline

Module: Gravitational Waves Transients Catalog (GWTC) Skymaps Search

This notebook looks for gravitational waves events around a given set of (ra,dec) localization coordinates. Optionally one can identify the galaxies present in the density probability area of the matching GW events. The catalogs come from the LIGO, Virgo, and KAGRA (LVK) Collaborations. They consist in GWTC-4 catalog and previous ones (GWTC-1, GWTC-2, GWTC-2.1, GWTC-3).

The events are binary mergers between black holes and neutron stars. Both black holes and neutron stars are classified as compact objects. The LVK detectors are sensitive to three different types of compact binary mergers:

- Binary black hole (BBH) merger
- Binary neutron star (BNS) merger
- Neutron star - black hole (NSBH) merger

All the data used in this notebook can be found at Gravitational Wave Open Science Centre (GWOSC)

Input parameters (MMODA)

Here we define the input parameters for the notebook:

- RA (deg): the input right ascension (on top common panel)
- Dec (deg) : the input declination (on top common panel)
- rastd : the ra standard deviation (used for galaxy and grb catalogs search)
- decstd : the dec standard deviation (used for galaxy and grb catalogs search)
- prob : the probability density envelope [0,1] (used for gw source search)
- waveform : Waveform approximant used for generating skymap [Mixed;IMRPhenomXPHM;SEOBNRv4PHM]
- use_glade : Use GLADE+ Catalog
- use_grb : Use GRBweb Catalog

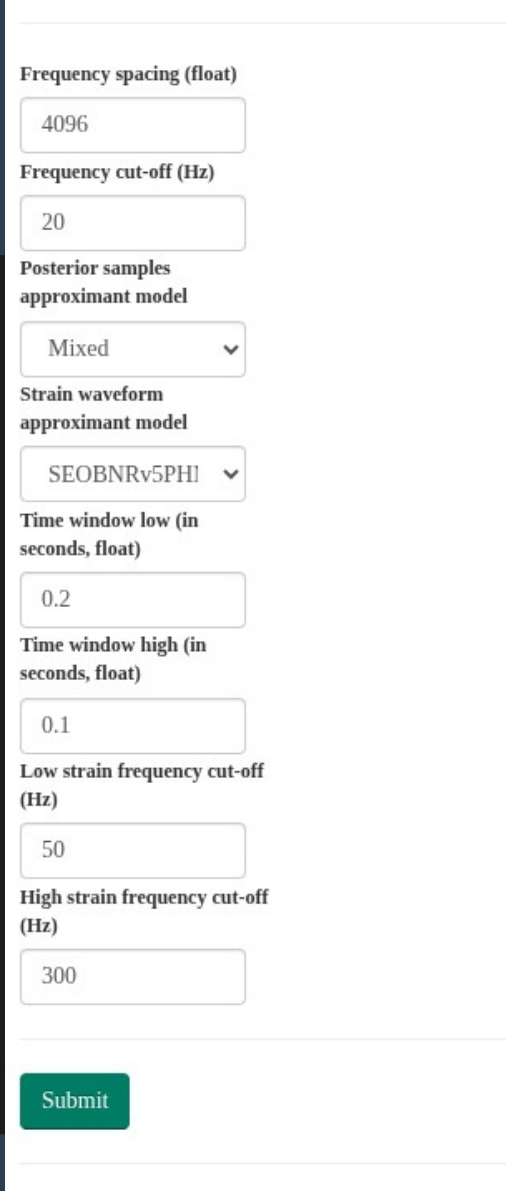
Write a feedback | Close

LIGO-VIRGO-KAGRA Product Types

- Parameters estimation (given source name)
- Skymap search (given ra,dec)
- Catalogs event selection (given time window)

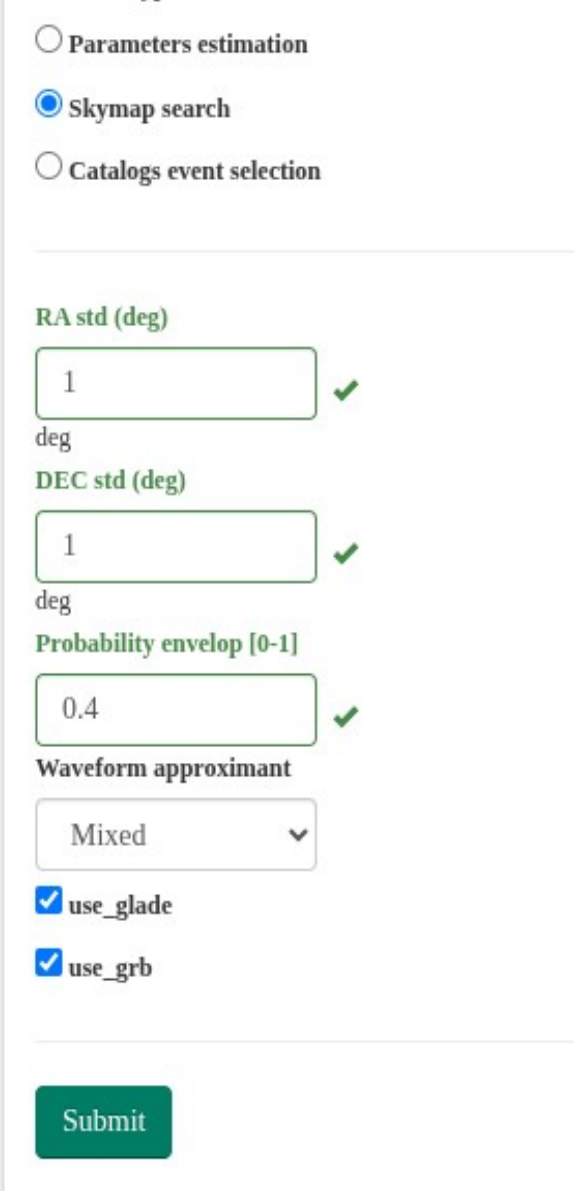
Parameters estimation

- Attempt to reproduce this notebook: https://zenodo.org/records/8177023
- Official data release catalogs (GWTC)
- Given a *source name* (GW150914 etc...)
- shows a few PE (waveform model dependent)
- Adjustable detector calibrated strain
- (*Gwpy* library Timeseries)
- Plot detector projected waveform



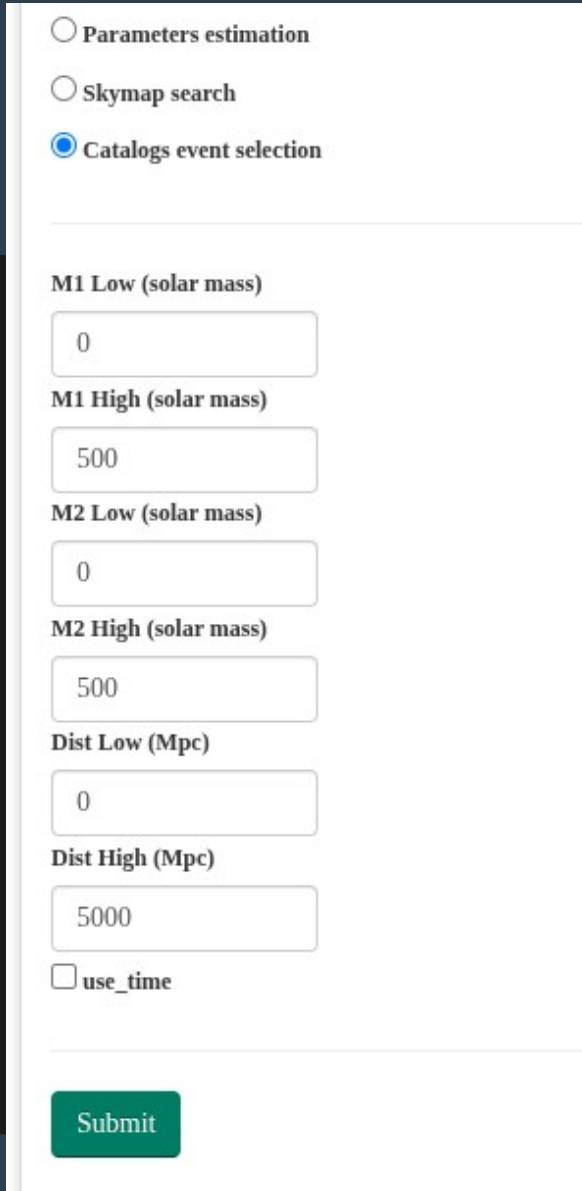
Skymap search

- Scanning catalogs skymaps given localization (*ra,dec*) → probability envelop
- Shows galaxies (ra±std,dec±std,dist)
- Shows GRB (ra±std,dec±std)



Catalogs event selection

- Given *time window* (or not)
- M_1/M_2/dist adjustable
- Uses *gwosc* library (query_events)
- Gives source name with gps list



Useful links

- https://www.astro.unige.ch/mmoda/
- https://gwosc.org
- GWTC-2.1 catalog
- GWTC-3 catalog
- GWTC-4 catalog