

# Hand-on sessions

## Play with GW170817



Entire Github: <https://github.com/gw-odw/odw-2022>

We will have a look on <https://gw-odw.thinkific.com/courses/take/workshop-5/texts/32204545-tutorial-1-3>

### 1.3 Q-transforms with GWpy

In this tutorial we will learn to use the Q-transform to visualize mergers. We will also learn how to gate data to filter out loud glitches in the data.

We will use the Binary Neutron Star GW170817 as an example.

1. Run tutorial 1.3

[\[Launch in Colab\]](#) [\[Launch in Binder\]](#)

Or run it on your computer:

[https://github.com/gw-odw/odw-2022/tree/master/Tutorials/Day\\_1](https://github.com/gw-odw/odw-2022/tree/master/Tutorials/Day_1)

2. Then, add code to the tutorial to complete the activity.

```
# -- Uncomment following line if running in Google Colab
! pip install -q 'gwpy==2.0.2'
```

Uncomment this line  
Then execution, run all code

This notebook covers some different ways of representing data, including

- the spectrogram
- the Q-transform

## STEP 1 - load data

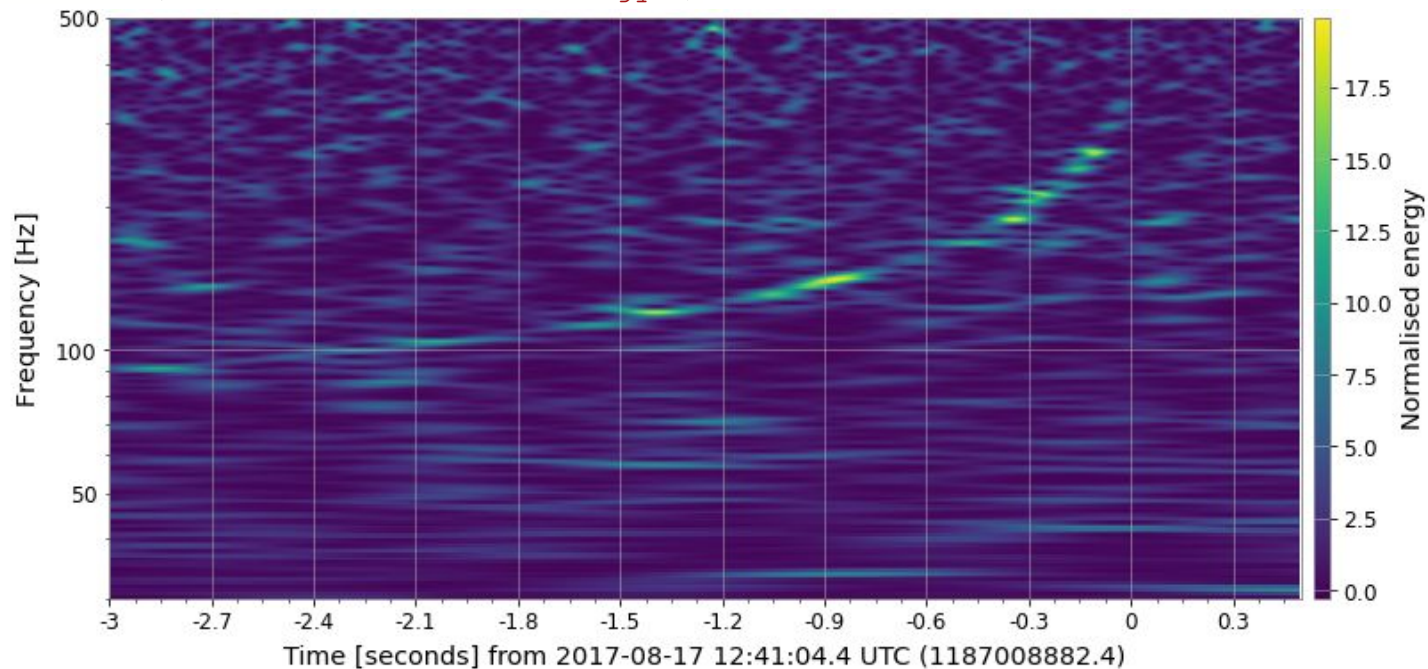
```
gps = event_gps('GW170817')
ldata = TimeSeries.fetch_open_data('L1', int(gps)-512, int(gps)+512, cache=True)
```

## STEP 2 - spectrogram

```
specgram = ldata.spectrogram2(fftlength=4, overlap=2, window='hann') ** (1/2.)
plot = specgram.plot(norm='log', vmin=1e-23, vmax=1e-19)
ax = plot.gca()
ax.set_ylim(40, 4000)
ax.set_yscale('log')
ax.colorbar(label='GW strain ASD [strain/$\sqrt{\mathrm{Hz}}$]')
plot.show()
```

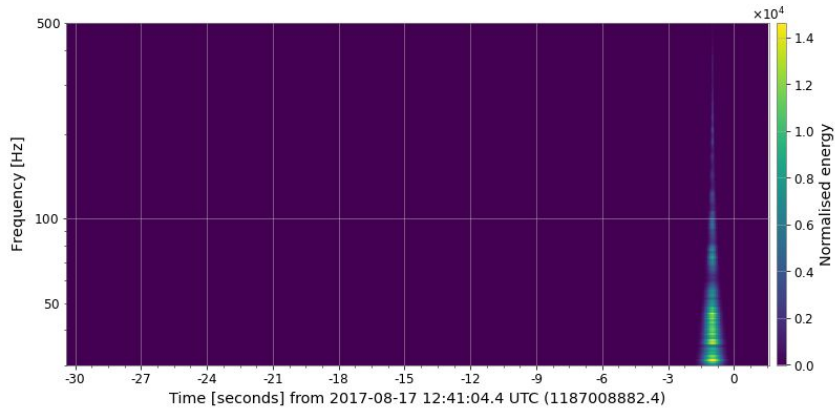
## STEP 3 - Q-transform with H1

```
segment = (int(gps) - 30, int(gps) + 2)
hdata = TimeSeries.fetch_open_data('H1', *segment, verbose=True, cache=True)
hq2 = hdata.q_transform(frange=(30, 500), qrange=(80, 110),
outseg=(gps-3, gps+0.5))
plot = hq2.plot()
ax = plot.gca()
ax.set_epoch(gps)
ax.set_yscale('log')
ax.colorbar(label="Normalised energy")
```

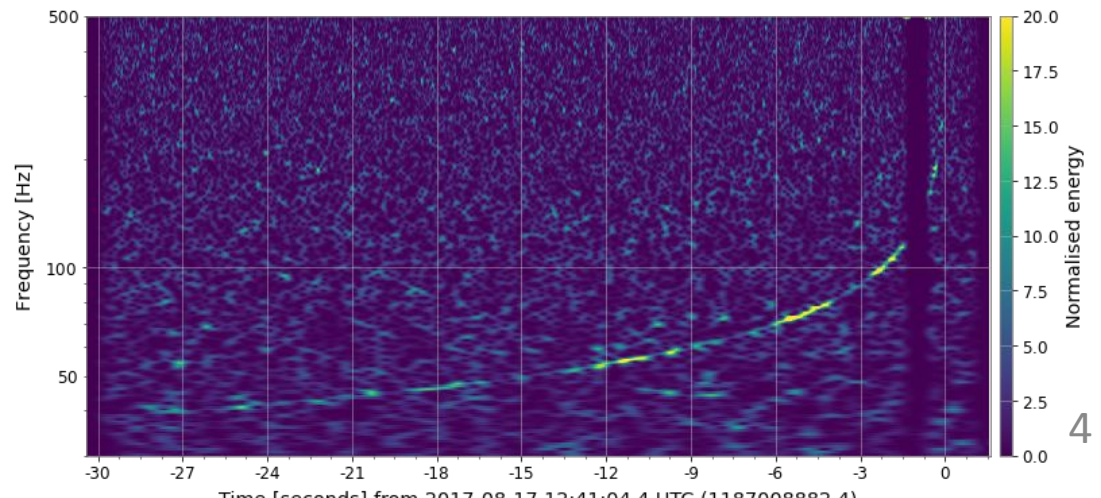


## STEP 4 - Gating with L1

```
ldata = TimeSeries.fetch_open_data('L1', *segment, verbose=True)
```



```
plot.colorbar[0].mappable.set_clim(0,20)  
gated_ldata = ldata.gate(tzero=0.25, tpad=0.25)  
gated_lq = gated_ldata.q_transform(frange=(30, 500),  
qrange=(100, 110))  
plot = gated_lq.plot()
```



Bonus - Play with GW170814 !

→ Looks at all the circulars: <https://gcn.gsfc.nasa.gov/other/G298048.gcn3>

→ Find DLT40 report, when the observations happened ? Which filters ? Which photometry system

What are the coordinates on the source ?

Start DS9 - <https://sites.google.com/cfa.harvard.edu/saoimages9>

In the header found

- ds9 18894587.fits.gz, when is the observation date ?
- ds9 19011664.fits.gz

Add a region with the correct coordinate

Go to simbad - coordinates and query Simbad

#### Enter coordinates:

Coordinates:

13:09:48.09-23:22:53.4.6

*The following writings are allowed:*

20 54 05.689 +37 01 17.38  
10:12:45.3-45:17:50  
15h17m-11d10m  
15h17+89d15  
275d11m15.6954s+17d59m59.876s  
12.34567h-17.87654d  
350.123456d-17.33333d <=> 350.123456 -17.33333

define the input : system : FK5

epoch : 2000

equinox : 2000

or choose : -- a predefined frame --

define a radius : 2 arc min

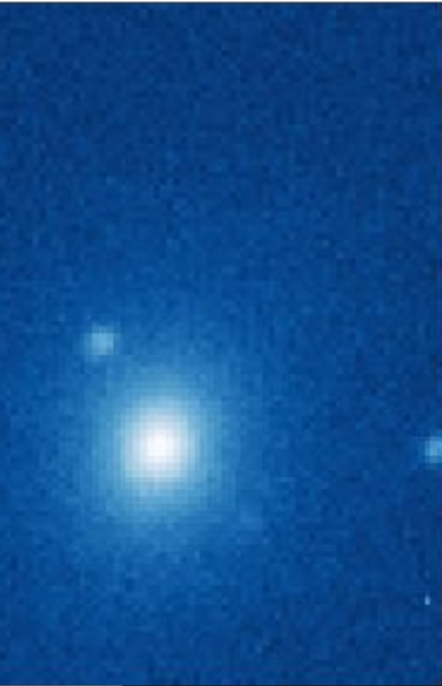
submit query

clear

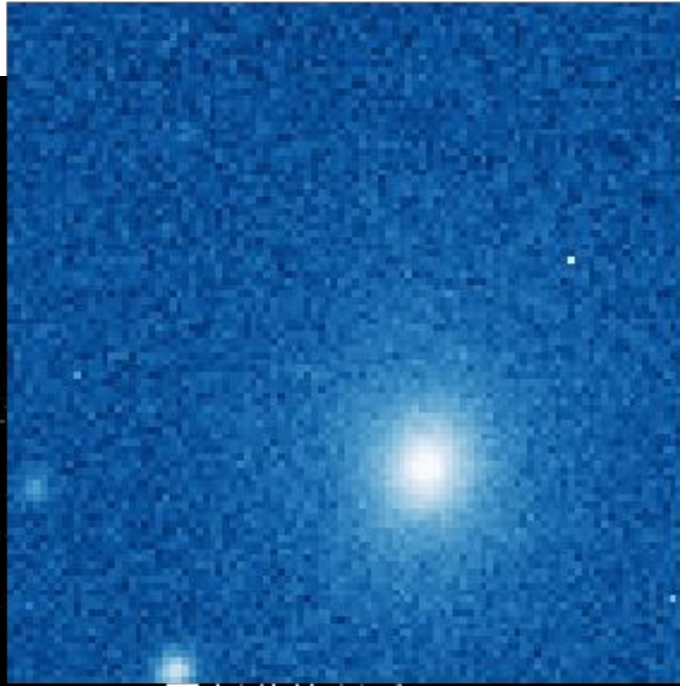
Preview



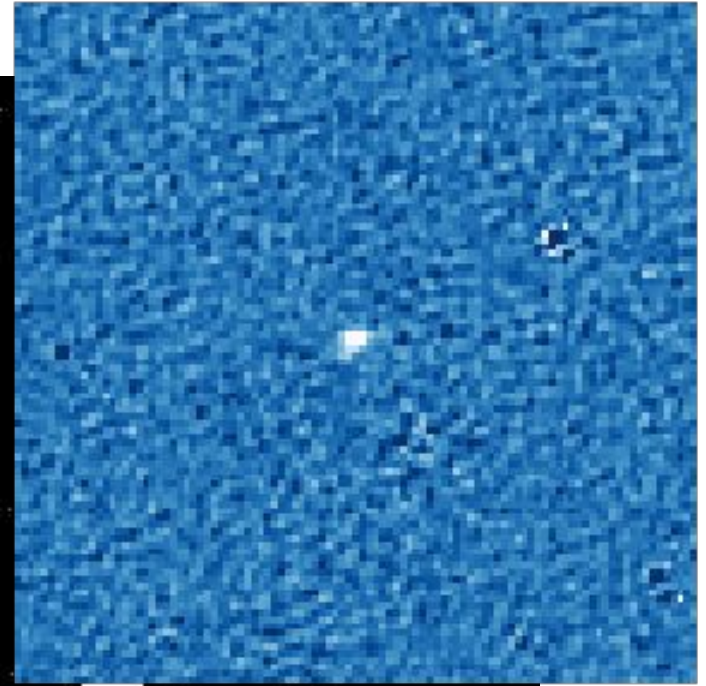
IMAGE



TEMPLATE



DIFF



Go to <https://gcn.gsfc.nasa.gov/other/G298048.gcn3>

Which space missions have seen GRB170817 ?

Go to

[https://heasarc.gsfc.nasa.gov/FTP/fermi/data/gbm/triggers/2017/bn170817529/quicklook/glg\\_lc\\_all\\_bn170817529.gif](https://heasarc.gsfc.nasa.gov/FTP/fermi/data/gbm/triggers/2017/bn170817529/quicklook/glg_lc_all_bn170817529.gif)

Which detectors from GBM triggered on GRB170817A ?

Go to

[https://heasarc.gsfc.nasa.gov/FTP/fermi/data/gbm/triggers/2017/bn170817529/quicklook/glg\\_lc\\_chant\\_of\\_bn170817529.pdf](https://heasarc.gsfc.nasa.gov/FTP/fermi/data/gbm/triggers/2017/bn170817529/quicklook/glg_lc_chant_of_bn170817529.pdf)

What is the energy range GRB170817 is visible ? why ?

Exercise retreat TTE data

<https://heasarc.gsfc.nasa.gov/FTP/fermi/data/gbm/triggers/2017/bn170817529/current/>

And create your light curve