Omicron: update Mar. 04, 2016

Related links:
Documentation
Technical note

Omicron: current situation at Cascina

- Omicron installation: `/virgoDev/Omicron/v2r1`
  → move to /virgoApp?

- Omicron triggers: `/data/procdata/detchar/triggers/Omicron/`

- Omicron web area: `/data/procdata/web/Omicron`

Documentation to use Omicron at Cascina

Omicron: current developments

Next release v2r2 in preparation

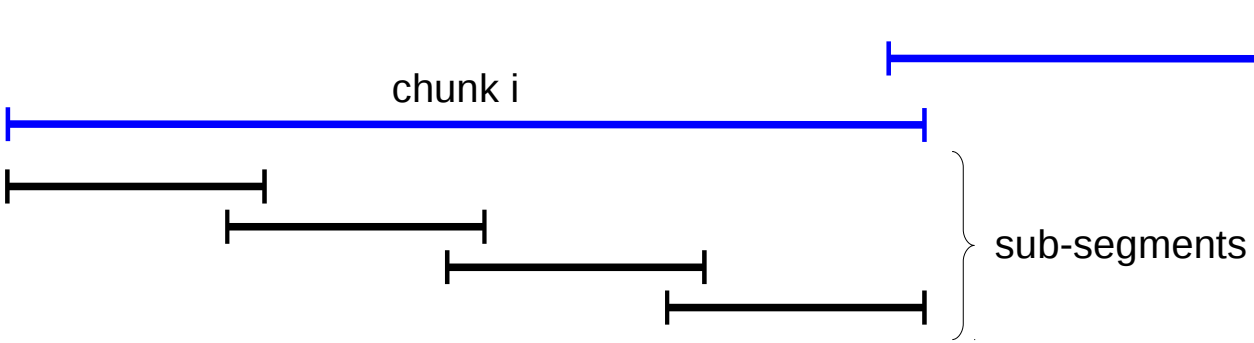
- Dynamic PSD estimation
- New timing structure
- New data product: whitened data
- Further optimization: real-to-complex FFTs, reduce the number of data containers

Joint LIGO-Virgo developments

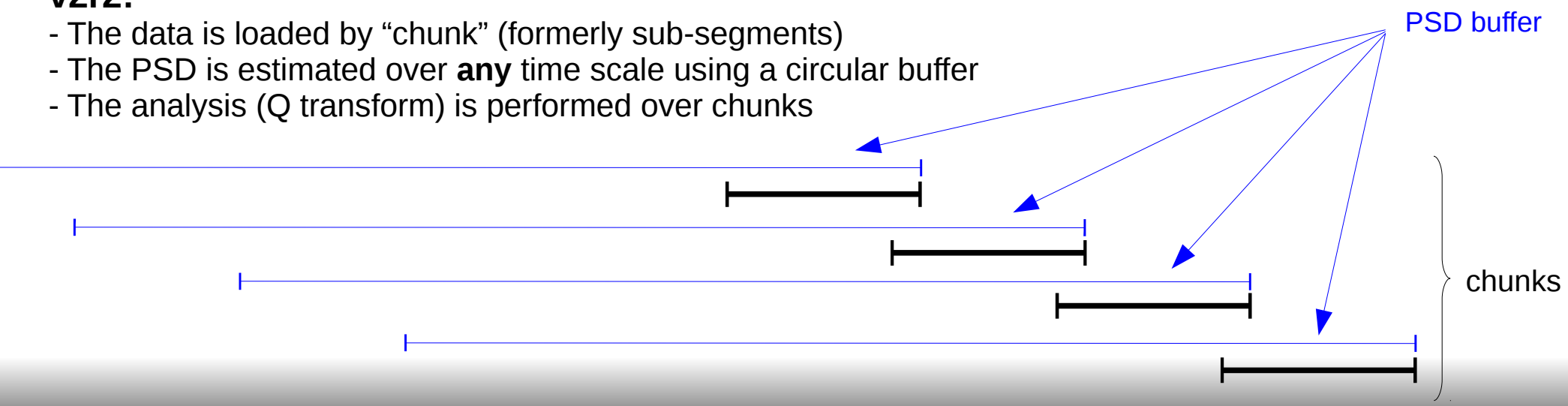
- New convention for trigger directory and file naming
- Improve error handles
- More control on the output
- Effort to move toward the native ROOT format

Omicron: PSD estimation (& timing structure)

v2r1:
- The data is loaded by “chunk”
- The PSD is estimated over 1 chunk
- The analysis (Q transform) is performed over sub-segments



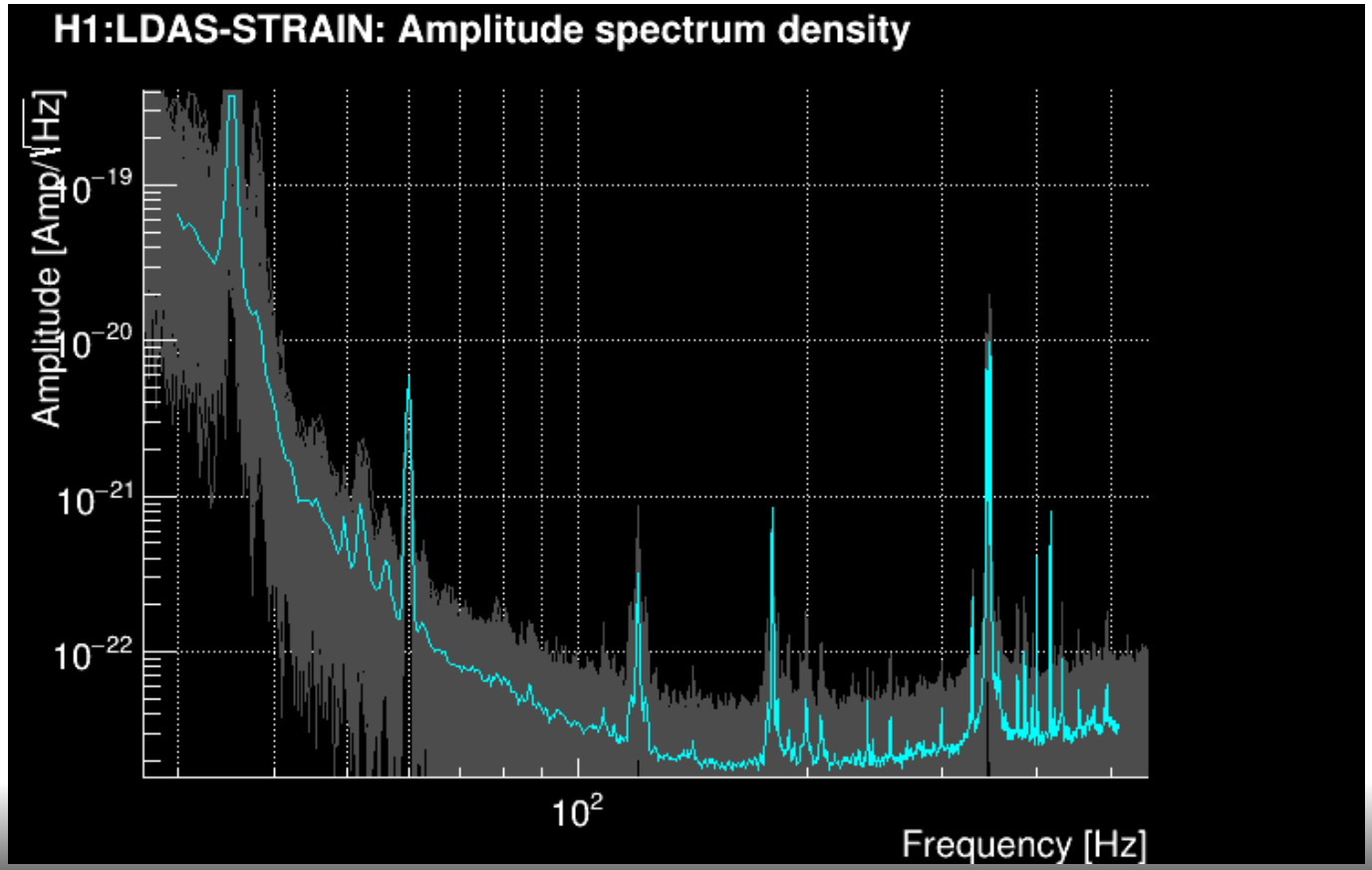
v2r2:
- The data is loaded by “chunk” (formerly sub-segments)
- The PSD is estimated over **any** time scale using a circular buffer
- The analysis (Q transform) is performed over chunks



Omicron: PSD estimation (& timing structure)

When a data chunk is loaded:

1) new PSDs are computed with the newly-loaded data vector
2) they are added to a circular buffer of PSDs (of size PSDLENGTH)
3) all the PSDs in the buffer are averaged to whiten the data chunk



Omicron: new timing options

New set of Omicron options to describe the timing structure

v2r1:

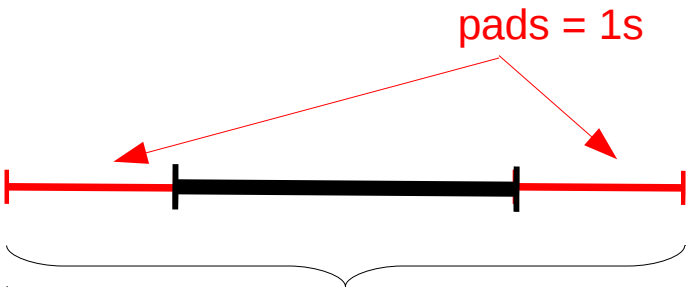
```
PARAMETER CHUNKDURATION        304
PARAMETER SEGMENTDURATION      64
PARAMETER OVERLAPDURATION      4
```

v2r2:

```
PARAMETER TIMING               64  4
PARAMETER PSDLENGTH            304
```

Omicron: consequences for the online search

For the online trigger production, we want to work with chunks which are as short as possible.
Minimum chunk duration = 4s



→ Latency > 4s

2 internal Omicron constraints:

$$f \geqslant 50 \frac{Q}{2\pi T} \quad \text{and} \quad Q \geqslant \sqrt{11}$$

→ Cannot work below 8 Hz with 4s chunks

32s chunks → > 1Hz
512s chunks → > 0.1

Omicron: web report

H1:LDAS-STRAIN [click here to expand/hide]

Processing:

Number of calls [load/data/condition/projection/write]: 3/3/3/3/3

Processed livetime: 756 sec (99.474%) → 0.009 days

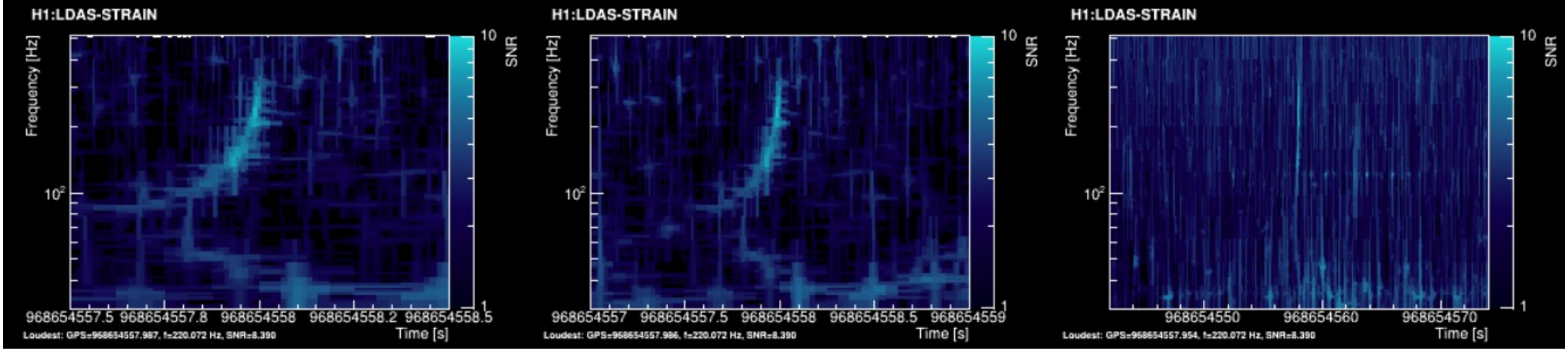
Processed segments: omicron.segments.txt

Plots:

968654306: Full map mapQ=5.1 mapQ=11.9 mapQ=27.9 mapQ=65.3 ASD PSD Conditionned time series Whitened time series Triggers

968654558: Full map mapQ=5.1 mapQ=11.9 mapQ=27.9 mapQ=65.3 ASD PSD Conditionned time series Whitened time series Triggers

968654810: Full map mapQ=5.1 mapQ=11.9 mapQ=27.9 mapQ=65.3 ASD PSD Conditionned time series Whitened time series Triggers



Any suggestion of improvement?

Omicron: online veto segments

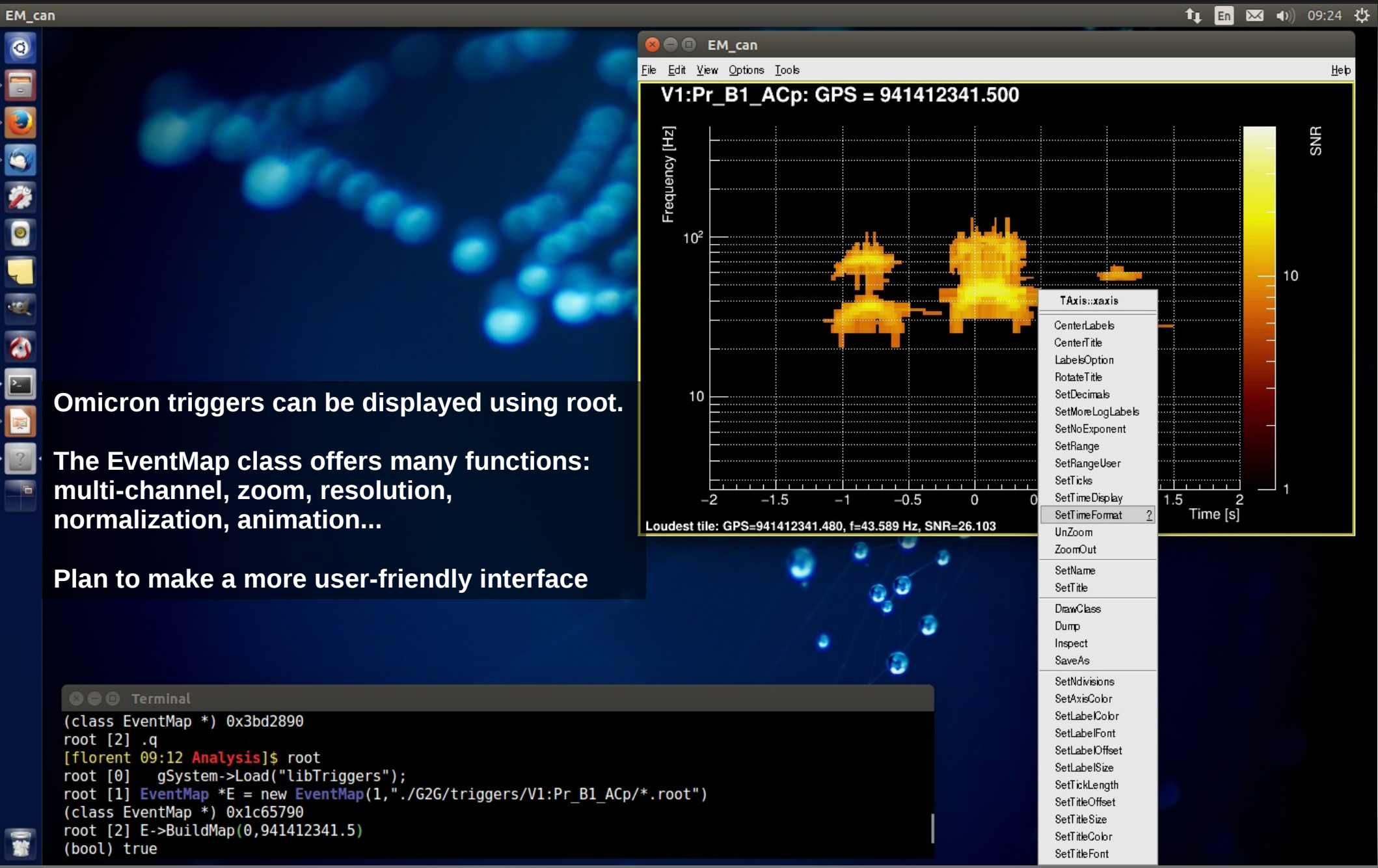
For efficiency reasons, Omicron processes are also used to generate veto segments associated to triggers (while triggers are still in memory).

A specific function, `Omicron::GetTriggerSegments(TH1D *aThr=NULL)`, was developed for that purpose:

- Triggers are selected using a threshold object given in argument. The threshold is a function of the trigger frequency and is applied to the trigger SNR.
- The function returns a list of time segments corresponding to the start/stop of a set of selected Omicron triggers

UPV was designed to produce threshold files compatible with this approach.
→ UPV vetoes will be produced with low latency.

Omicron: interactive trigger plotting



Omicron triggers can be displayed using root.

The EventMap class offers many functions: multi-channel, zoom, resolution, normalization, animation...

Plan to make a more user-friendly interface

```
Terminal
(class EventMap *) 0x3bd2890
root [2] .q
[florent 09:12 Analysis]$ root
root [0]   gSystem->Load("libTriggers");
root [1] EventMap *E = new EventMap(1,"./G2G/triggers/V1:Pr_B1_ACp/*.root")
(class EventMap *) 0x1c65790
root [2] E->BuildMap(0,941412341.5)
(bool) true
```

Omicron: coming next

- Discussion with Duncan M. at Pasadena: joint LIGO-Virgo developments
- Omicron trigger interactive display
- Technical note
- Any ideas? requests?