Description of the measurements obtained in an Observation: the **Observable** axis

In the definition of the Observation data model Core components, we have introduced a data product type to categorize all kinds of data products: light curves, images, cubes, event lists, spectrum, etc.

Each of these data products can be described in the physical space using the Characterisation Axis concept described in the Characterisation DM.
Then we can express the spanning of a dataset on spatial, spectral, temporal domain.

In order to determine the physical nature of the value stored in each data set element (a pixel for an image, a spectel for a spectrum, etc.., an IFU elt for a cube, we need another concept to represent what has been measured.
This is called the ObservableAxis in the Characterisation DM and re-used in the Observation Core Components Data Model.

Definition: we call **observable** a measurement obtained from some physical quantity, varying as a function of some parameter axis (spatial, time, etc.).
For instance, in a flux calibrated IFU data cube, obtained with the MUSE instrument, a pixel value in the cube is a flux obtained at a special position, taken at time t and a specific wavelength lambda.
F= f(pos, lambda,t) ;

For an event list, we do not have an observable spanned on some parameter axis as these data are sparse and just given as lists of events:
Event = (t, pos, energy, photon counts) but we can derive an image (a map) whose observable is the photon counts as a function of the position.

Here we consider a set of possible observable currently present in the observation founds in most of the archives.
According to the Characterisation data model (http://www.ivoa.net/Documents/latest/CharacterisationDM.html), the observable axis has a name, a UCD, and a unit field as general features.
These are listed in the document available here
http://www.ivoa.net/internal/IVOA/ObsTap/ListForObservable19Oct2010.pdf

The most usual case for the observable is a quantity derived from luminous energy.
This is true for 2D images, spectral cubes, light curves, etc.
The recorded quantity varies according to observing and reduction conditions and depends on.

- Which data reduction was applied on the data?
- The detector type: a micro densitometer applied on a plate or a digital camera?
- The way the energy is integrated on solid angle? wavelength range ? time?
- Whether the quantity was obtained after polarization?

We also include as observations data sets produced with some further interpretation /combination steps but currently interpreted as observational data too.
Therefore we consider as observable some derived measurements like spectral indexes, spectral moments, radial velocities in spectral cubes, as well as line ratio or color index in multi-wavelength observations.

This table gives a list of enumerated values to be used in the Observation Core components DM and included in the next version of the Characterisation DM v2.0