

Photometry Data Measurements description in VOTables

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VOTable 1.2

```
<FIELD name="Flux" ID="co14" datatype="float"
  ucd="phot.flux;em.radio.200-400MHz" width="6"
  precision="1" unit="mJy" />
```

```
<FIELD name="e_Flux" ID="co15" datatype="float"
  ucd="stat.error;phot.flux;em.radio.200-400MHz"
  width="4" precision="1" unit="mJy"/>
```

```
<GROUP name="Flux" ucd="phot.flux;em.radio.200-400MHz">
```

```
<DESCRIPTION>Flux measured at 352MHz </DESCRIPTION>
```

```
<PARAM name="Freq" ucd="em.freq" unit="MHz"
  datatype="float" value="352"/>
```

```
<FIELDref ref="co14"/>
```

```
<FIELDref ref="co15"/>
```

```
</GROUP>
```

Data Models in VOTable

- How to represent Data Model metadata in VOTable ?
- Data Model has :
 - Structure (hierarchy)
 - utypes

VOTable 1.2

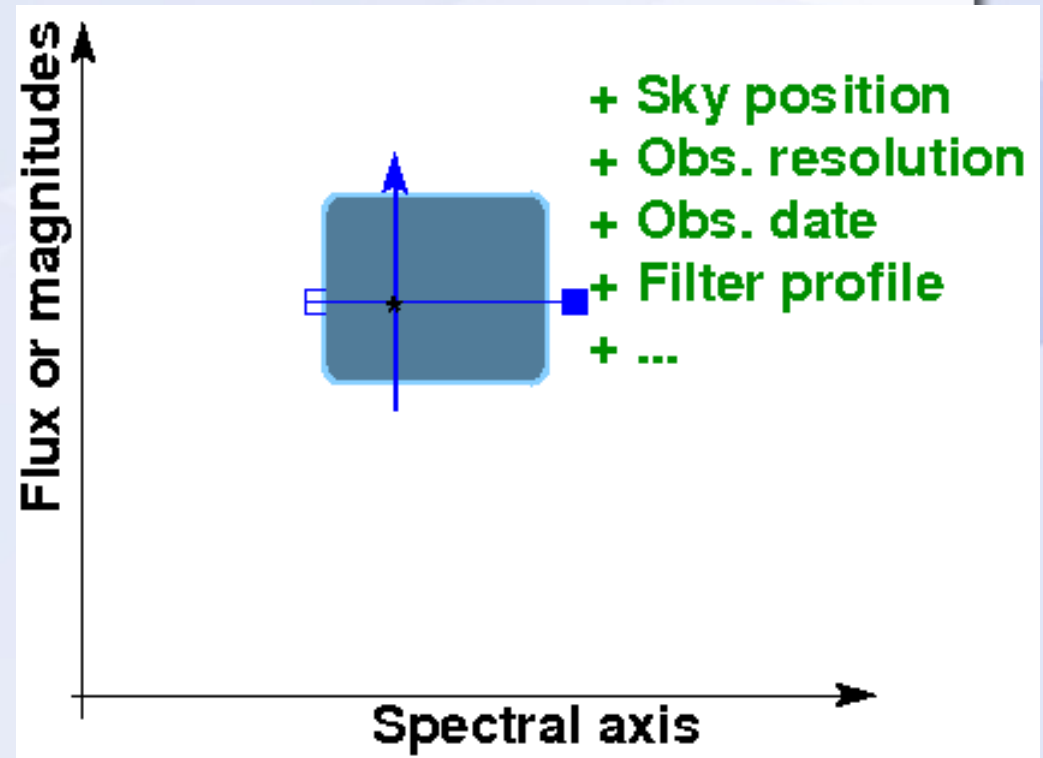
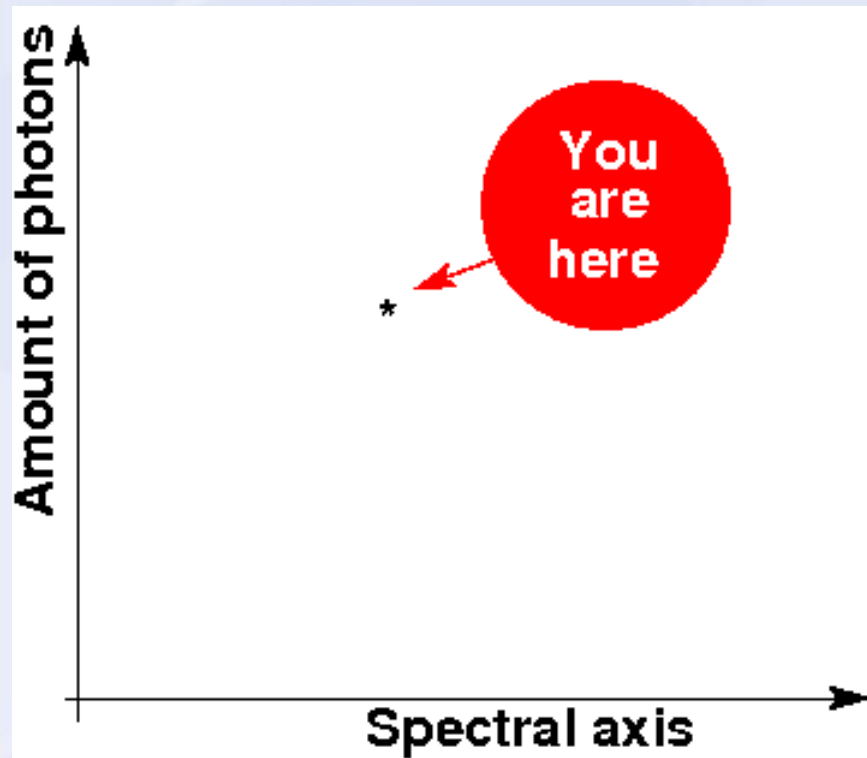
- **<FIELD>**s : name, ID, ucd, utype, unit, ref (+...)
- **<PARAM>**s : idem + value
- **<GROUP>**s : name, ID, ucd, utype, ref.

MAP !

PhotCal.ZeroPoint.Flux.unit
PhotCal.ZeroPoint.Flux.ucd
PhotCal.ZeroPoint.Flux.value
PhotCal.ZeroPoint.referenceMagnitude.unit
PhotCal.ZeroPoint.referenceMagnitude.ucd
PhotCal.ZeroPoint.referenceMagnitude.value

Photometry Data Measurement

- Simplest case
- Possibly



Photometry Data Model and its representation in VOTable

- Hypothesis :
 - the model provides an accurate description of the problem
 - all parameters have utypes
 - some parameters are required, others optional (possibly default values)
- Proposal :
 - Add to existing VOTables the necessary metadata
 - <GROUP>s are your friends

In practice

- One table row = one object
- Model attribute represented as :
 - PARAM if same value for all rows
 - FIELD if value in table column
- ADD hierarchy of GROUP, PARAM, PARAMref, FIELDref with model utypes (at least the required ones)

Application to photometry

- Required :
 - Spectral axis value + flux value
 - or
 - Spectral axis value + mag + ZP

- See IVOA Note

<http://www.ivoa.net/internal/IVOA/PhotometryDataModel/NOTE-PPDMDesc-0.2-20110512.pdf>

- Based on PhotDM 0.3
(&Spectrum DM)



*International
Virtual
Observatory
Alliance*

**Providing Photometric Data Measurements
Description in VOTables**

Version 0.2

IVOA Note 2011 May 12

Benefits

- Can be **added** to existing standards /protocols, e.g. CS, without breaking them
- One VOTable can represent several DMs
 - different utypes in FIELD and FIELDref
 - have different GROUPs with different utypes
- Support for photometry description could be represented as a new capability in the registry

Test implementation

- VizieR photometric description for :
 - 129 photometric systems
 - 529 individual filters
 - 2812 columns for 523 catalogues
- VOSpec prototype able to ingest it
- Aladin plugin for photometry

Example : 2MASS

```
<GROUP name="Flux1" ucd="phot" utype="spec:PhotometryPoint">
  <DESCRIPTION>2MASS J magnitude.</DESCRIPTION>
  <PARAM name="ID" ucd="meta.id;instr.filter" utype="photdm:PhotometryFilter.identifier"
unit="" datatype="char" arraysize="*" value="2MASS/2MASS.J" />
  <PARAM name="WavelengthMean" ucd="em.wl.effective"
utype="photdm:PhotometryFilter.SpectralAxis.Coverage.Location.Value" unit="Angstrom"
datatype="float" value="12410.5176673" />
  <PARAM name="WavelengthMin" ucd="em.wl;stat.min"
utype="photdm:PhotometryFilter.SpectralAxis.Coverage.Bounds.Start" unit="Angstrom"
datatype="float" value="10660" />
  <PARAM name="WavelengthMax" ucd="em.wl;stat.max"
utype="photdm:PhotometryFilter.SpectralAxis.Coverage.Bounds.Stop" unit="Angstrom"
datatype="float" value="14420" />
  <PARAM name="PhotSystem" ucd="" utype="photdm:PhotometricSystem.description" unit=""
datatype="char" arraysize="*" value="2MASS" />
  <PARAM name="WidthEff" ucd="instr.bandwidth"
utype="photdm:PhotometryFilter.SpectralAxis.Coverage.Bounds.Extent" unit="Angstrom"
datatype="float" value="1624.31986357" />
  <PARAM name="ZeroPoint" ucd="phot.mag;arith.zp"
utype="photdm:PhotCal.ZeroPoint.Flux.value" unit="Jy" datatype="float" value="1614.45260952"
/>
  <PARAM name="Description" ucd="meta.note" utype="photdm:PhotometryFilter.description"
unit="" datatype="char" arraysize="*" value="2MASS J" />
  <PARAM name="TrasmissionCurve" ucd="DATA_LINK"
utype="photdm:PhotometryFilter.transmissionCurve" datatype="char" arraysize="*"
value="http://svo.laeff.inta.es/theory/fr/fps.php?ID=2MASS/2MASS.J" />
  <FIELDref ref="phot_m1" ucd="phot.mag;em.IR.J" utype="spec:Data.FluxAxis.Value" />
  <FIELDref ref="phot_e1" ucd="stat.error;phot.mag;em.IR.J"
utype="spec:Data.FluxAxis.Accuracy.StatError" />
</GROUP>
```

Conclusions

- VOTable 1.2 offers all the elements to attach data model instance representation, with GROUP, FIELD, FIELDref, PARAMref
- Description is added to existing documents
 - does not break & adds new capability
- Application to Photometry for catalogues
- Could be used for models like Time Series
 - see also STC representation document by M. Demleitner