VOSpec: A Tool to Handle VO Spectra Through SSAP

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Simple Spectrum Access Protocol

- ..., To define a uniform interface to spectral data. ...
  - Problem: handle units; no “uniform” solution yet.
  - Proposal from Osuna/Salgado at IVOA meeting @ Strasbourg, October 2003, to add parameters into SSA to allow for automatic unit conversion

- ..., The term “Simple” in Simple Spectrum Access Protocol refers to the design goal of simplicity in both implementing spectral data services and in retrieving spectroscopic data from distributed data collections ...
  - Try to make the retrieving simple and comparable

- ..., Required query parameters: POS, SIZE, FORMAT ...

- ..., Required response columns: FORMAT, ACREF, SED Object, Dataset Object, Coverage Object ...
ESAC proposal: Add the following three extra response columns in the SSA Protocol:

- FIELD ID="AXES" ucd=VOX:Spectrum_axes [...] 
- FIELD ID="DIMEQ" ucd=VOX:Spectrum_dimeq [...] 
- FIELD ID="SCALEQ" ucd=VOX:Spectrum_scaleq [...] 

- Allows unit conversion, spectra superimposition and multiwavelength analysis.
- Information on the Units in the metadata.
- Dimensional equation only has to be calculated once (and forever) per project.
VOSpec fact sheet

- Using VO Standards:
  - Ready to access the Registry to get SSA servers information
  - Use SIMBAD Web Service (easily integrated with rest of the tool)
  - Display VOTable information from SSA
  - Already working with available SSAP services: ISO (ESAC/ADT) and IUE (INES archive) plus SSA-modified local data for HST, XMM, etc.

- Handling spectra
  - Get spectra from SSA servers
  - Display and superimpose spectra
  - Automatic unit conversion through dimensional analysis
  - Multi-wavelength analysis
  - Polynomial/Black body/Gaussian fitting and other utilities on the way
VOSpec: Interoperable Tool

SIMBAD Web Service

Registry Access

VOTable standard

Currently directly from VOTable

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Superimposition and Multiwavelength analysis

FIELD ID="AXES" ucd=VOX:Spectrum_axes [...] 
FIELD ID="UNITS" ucd=VOX:Spectrum_units [...] 
FIELD ID="DIMEQ" ucd=VOX:Spectrum_dimeq [...] 
FIELD ID="SCALEQ" ucd=VOX:Spectrum_scaleq [...] 

<table>
<thead>
<tr>
<th>ID</th>
<th>Value</th>
<th>Unit</th>
<th>Date</th>
<th>Time</th>
<th>DIMEQ</th>
<th>Scale</th>
</tr>
</thead>
</table>

DIMEQ= MT-2

DIMEQ= ML-1T-3

VOSpec IVOA Poona Sep 2004

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DIMEQ: Easy to calculate

- Already done for:

<table>
<thead>
<tr>
<th>Project</th>
<th>Unit</th>
<th>DIMEQ</th>
<th>SCALEQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO</td>
<td>Jy</td>
<td>MT-2</td>
<td>10E-26</td>
</tr>
<tr>
<td>XMM</td>
<td>Counts/cm²/s Å</td>
<td>ML-1T-2</td>
<td>6.626E-20</td>
</tr>
<tr>
<td></td>
<td>(in c/λ units)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IUE</td>
<td>erg/cm²/s Å</td>
<td>ML-1T-3</td>
<td>1E+7</td>
</tr>
<tr>
<td>HST</td>
<td>erg/cm²/s Å</td>
<td>ML-1T-3</td>
<td>1E+7</td>
</tr>
</tbody>
</table>
A Working example: The HST case

  - Erg/s/cm²/A
  - Reference Unit (can be any): Jy

- Metadata for HST spectrum:
  - DIMEQ = ML-1T-3
  - SCALEQ = 10⁷
A Working example: The HST case

Unit conversion

\[ [J_{\text{y}}] = MT^{-2} \quad \text{Scaling factor} : 10^{-26} \]

\[ [HST] = ML^{-1}T^{-3} \quad \text{Scaling factor} : 10^7 \]

\[ \frac{[J_{\text{y}}]}{[HST]} = \frac{MT^{-2}}{ML^{-1}T^{-3}} L^1T^1 \]

\[ \lambda^n c^m = L^n L^m T^{-m} = L^1 T^1 \]

\[ n = m = 1 \quad \Rightarrow \quad \begin{cases} m = -1 \\ n = 2 \end{cases} \]

\[ [J_{\text{y}}] = [HST] \frac{2}{c} \frac{10^7}{10^{-26}} \]
VOSpec: Multi-wavelength Analysis

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VOSpec: Superimposition

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VOSpec: Unit Conversion

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VOSpec working example: Sampling AGBs

S Car

HD 101584

Alpha Cen

He 2-113

Gamma Cru

theta Aps

R Cen

Beta UMi

Delta Vir

HD 100764

R CRT

SS Vir

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Prototype tool URL

- A test version of the tool can be accessed at:

http://pma.standby.vilspa.esa.es:8080/vospec/index.html

- Production version will be announced conveniently