

The Observation Model as an integration framework

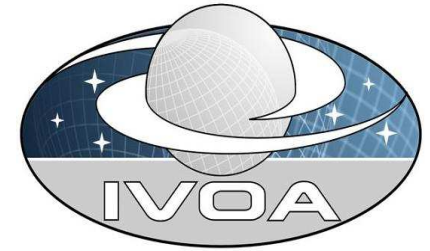
F.Bonnarel on behalf of
DM Working Group



A Full IVOA Observation data Model ?

- Current trends in the IVOA:
 - Keep it simple
 - Reinforcement of User's requirements
 - More involving of archives
- Obs Model Core Components (« ObsTAP ») built along these lines
- Is a Full Observatory Model still usefull/possible ?





Full Observation Data Model

- What is it: *a metadata model*
- What is it for: *Interoperable description for data discovery and preprocessing or use by VOtools*
- How it is built:
 - *Independant packages :*
 - Curation, DataID, Target, Provenance, Char, Mapping
 - *Each package:*
 - is very flexible
 - can be serialised with minimal to extended information



Altova XMLSpy - [Obs]

File Edit Project XML DTD/Schema Schema design XSL/XQuery Authentic Convert View Browser WSDL SOAP Tools Window Help

XML

Observation

- xmns:xsi http://www.w3.org/2001/XMLSchema-instance
- xmns:stc http://www.ivoa.net/xml/STC/stc-v1.30.xsd
- xmns:cha http://www.ivoa.net/xml/Characterisation/Characterisation-v1.11.xsd
- xmns:xlink http://www.w3.org/1999/xlink
- xmns http://www.ivoa.net/xml/Observation/Observation.xsd
- xsi:schemaLoca... http://www.ivoa.net/xml/Observation/Observation.xsd Observation2.xsd

Comment Curation as in Spectrum

Curation

- Publisher SAO
- PublisherID ivo://cfa.harvard.edu
- Contact

Comment Data ID section

DataID

- Title Arp 220 Image
- Creator STScI/JHU
- DatasetID ivo://stsci.edu/mast#10314
- Date 2003-12-31T14:00:02Z
- Version 1
- Instrument BCS
- Logo http://stsci.edu/hvo/sdsslogo.jpg

Comment Access to the actual data

Access

- acref http://sdss.jhu.edu/images/sdss/10314.fits
- format application/fits

Comment Characterisation

char

cha:characterisationAxis (4)

cha:axisName	cha:ucd	cha:unit	cha:coordsystem	cha:independe...	cha:accuracy	cha:cal
1 Sky	pos.eq	deg	cha:coordsystem id TT-ICRS-TOPO xlink:type simple xlink:href ivo://STCLib/CoordSys#TT-ICRS-TOPO	true		CALIBRATE
2 Time	time	d	cha:coordsystem idref TT-ICRS-TOPO			CALIBRATE
3 spectral	em.wl	m	cha:coordsystem idref TT-ICRS-TOPO			CALIBRATE
4 "Flux density"	"phot.flux.density;em.wavelength"	"erg cm**(-2) s**(-1) Angstrom**(-1)"	cha:coordsystem idref TT-ICRS-TOPO		cha:accuracy	CALIBRATE

Comment <prov>

Comment

Comment

Comment <prov>

Text Grid Schema/WSDL Authentic Browser

Obs

Ln 1, Col 1 CAP NUM SCRL

démarrer 3 Microsoft Offi... 3 Explorateur ... Mail :: Inbox (55)... alinda.u-strasbg... VOTableSTC-200... ssa-v097.pdf Microsoft PowerP... Altova XMLSpy - ... FR 11:34

Observation container contains
Curation, dataID, and Access with « char »



Use cases for extended char: footprint

- NVO footprint effort:
 - Link footprint stc descriptions to ivo DataID and to other metadata details
 - Part of their general footprint effort
- Footprint in VOTABLE: reuse of obsDM/Char and stc utypes for Regions





XML

Observation

- xmlns:xsi** http://www.w3.org/2001/XMLSchema-instance
- xmlns:stc** http://www.ivoa.net/xml/STC/stc-v1.30.xsd
- xmlns:cha** http://www.ivoa.net/xml/Characterisation/Characterisation-v1.9.xsd
- xmlns:xlink** http://www.w3.org/1999/xlink
- xmlns:vr** http://www.ivoa.net/xml/VOResource/v1.0
- xmlns** http://www.ivoa.net/xml/Observation/Observation.xsd
- xsi:schemaLocation** http://www.ivoa.net/xml/Observation/Observation.xsd Observation3.xsd

Comment Curation as in VoResource

Curation

- Publisher** Smithsonian Astronomical Observatory
- PublisherID** ivo://cfa.harvard.edu
- Contact**

Comment Data ID section

DataID

- Title** Arp 220 Image
- Creator** STSci/JHU
- DatasetID** ivo://stsci.edu/mast
- Date** 2003-12-31T14:00:02Z
- Version** 1
- Instrument** BCS
- Logo** http://stsci.edu/ivo/sds/slogo.jpg

Comment Access to the actual data

Access

- acref** http://sdss.jhu.edu/images/sdss/10314.fits
- format** application/fits

Comment Characterisation

char

- Comment** <prov>
- Comment** <prov>
- Comment**
- Comment**

Observation footprint examples in collaboration with NVO

undersamplingStatus true

cha:regularsamplingStatus true

cha:coverage

cha:coverage

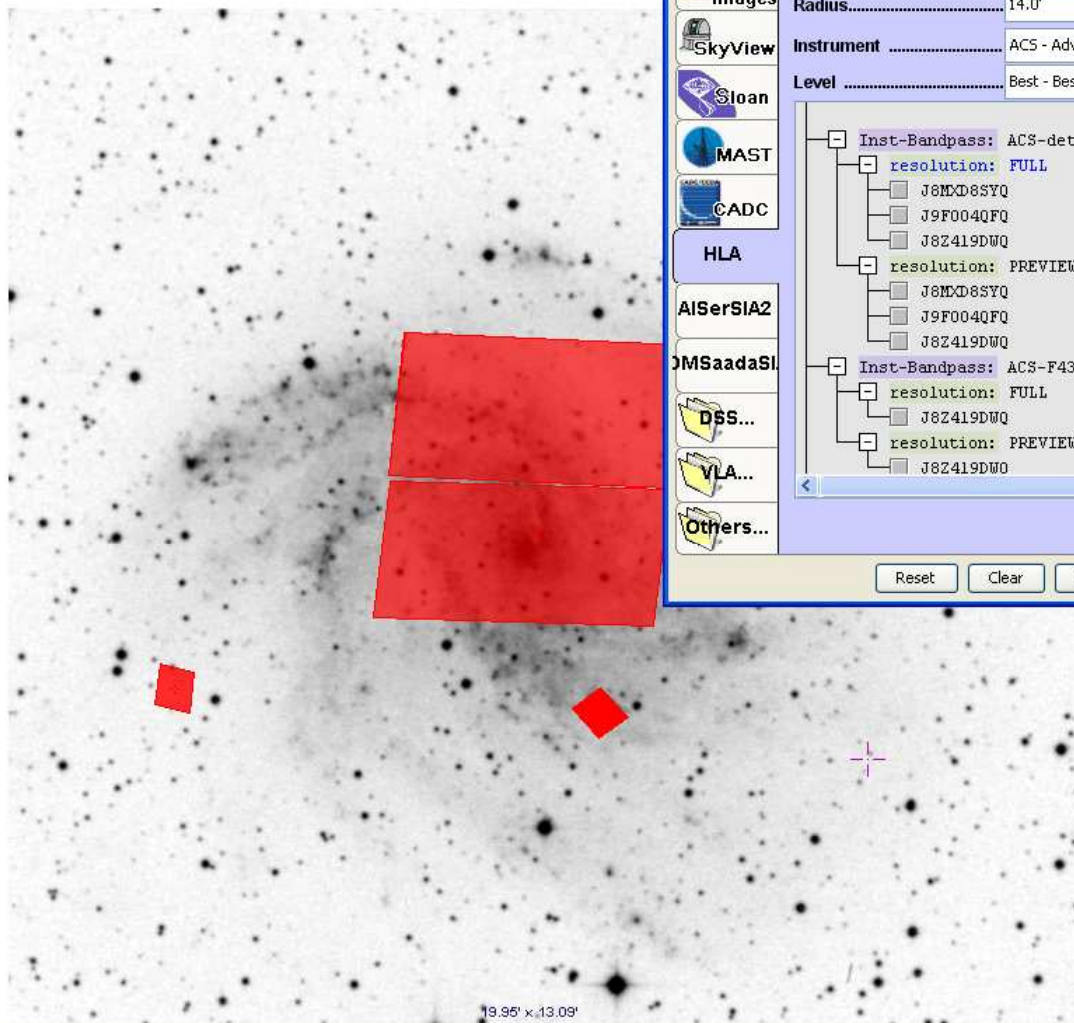
- cha:location**
 - cha:coord**
 - coord_system_id** TT-ICRS-TOPO
 - stc:Position2D**
 - s...RA**
 - s...Dec**
 - stc:Value2**
 - s** 132.4210
 - s** 12.1232
- cha:bounds**
 - cha:unit** arcsec
 - cha:Extent** 20
 - cha:limits**
 - coord_system_id** TT-ICRS-TOPO
 - xsi:type** cha:CharCoordAreaTypeInte
 - cha:Interval**
- Comment** The spatial support is actually the footprint
- cha:support**
 - cha:coordsystem** id=RegionCoordSys
 - cha:Area**
 - coord_system_id** RegionCoordSys
 - stc:Polygon**
 - stc:Vertex (4)**
 - stc:Position**
 - stc:C1** 0.2
 - stc:C2** -0.1
 - stc:Position**
 - stc:C1** -0.2
 - stc:C2** -0.1
 - stc:Position**
 - stc:C1** -0.2
 - stc:C2** 0.1
 - stc:Position**
 - stc:C1** 0.2
 - stc:C2** 0.1

cha:AreaType Polygon set

CALIBRATED	cha:numBins xsi:type=cha:numBins1Type
CALIBRATED	cha:numBins xsi:type=cha:numBins1Type

Location ICRS Pixel full

SSII.F-DSS2.143



Others

Image servers

- Aladin images
- SkyView
- Sloan
- MAST
- CADC
- HLA
- AISerSIA2
- JMSaadaSl
- DSS...
- VLA...
- Others...

Hubble Legacy Archive Footprint Data

Target..... NGC 6946

Radius..... 14.0'

Instrument ACS - Advanced Camera for Survey

Level Best - Best Available

- Inst-Bandpass: ACS-detection
 - resolution: FULL
 - J8MXD8SYQ
 - J9F004QFQ
 - J8Z419DWQ
 - resolution: PREVIEW
 - J8MXD8SYQ
 - J9F004QFQ
 - J8Z419DWQ
- Inst-Bandpass: ACS-F435W
 - resolution: FULL
 - J8Z419DWQ
 - resolution: PREVIEW
 - J8Z419DWQ

Catalog servers

VizieR Catalogs

Surveys

Missions

SDSS

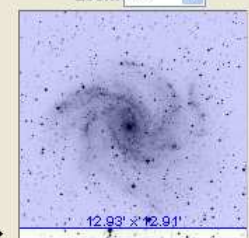
INED

SkyBot

Others..

- 9788.F814W.JCM
- 9788.F814W.J8M
- POSSIIF-DSS2.143

Zoom 1x



multiview match

Search



Use cases for extended char

- Observation/ Voevent matching:
Is a Gamma ray observation consistent in time with some given VoEvent ? (Use case from HESS)
 - Requires Observation Time support:
 - Support as a list of Time Intervals.
 - Is VOEvent date contained in one of those?





Use case for extended char: variation maps

- The use cases: name the maps to address access to them.
 - Error map
 - Resolution map
 - Etc....
- Char 2 provides a mechanism to describe access to auxiliary data inside FITS files.
(extensions or whatever....)

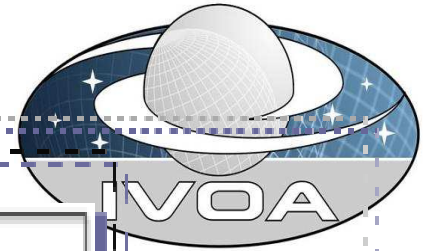




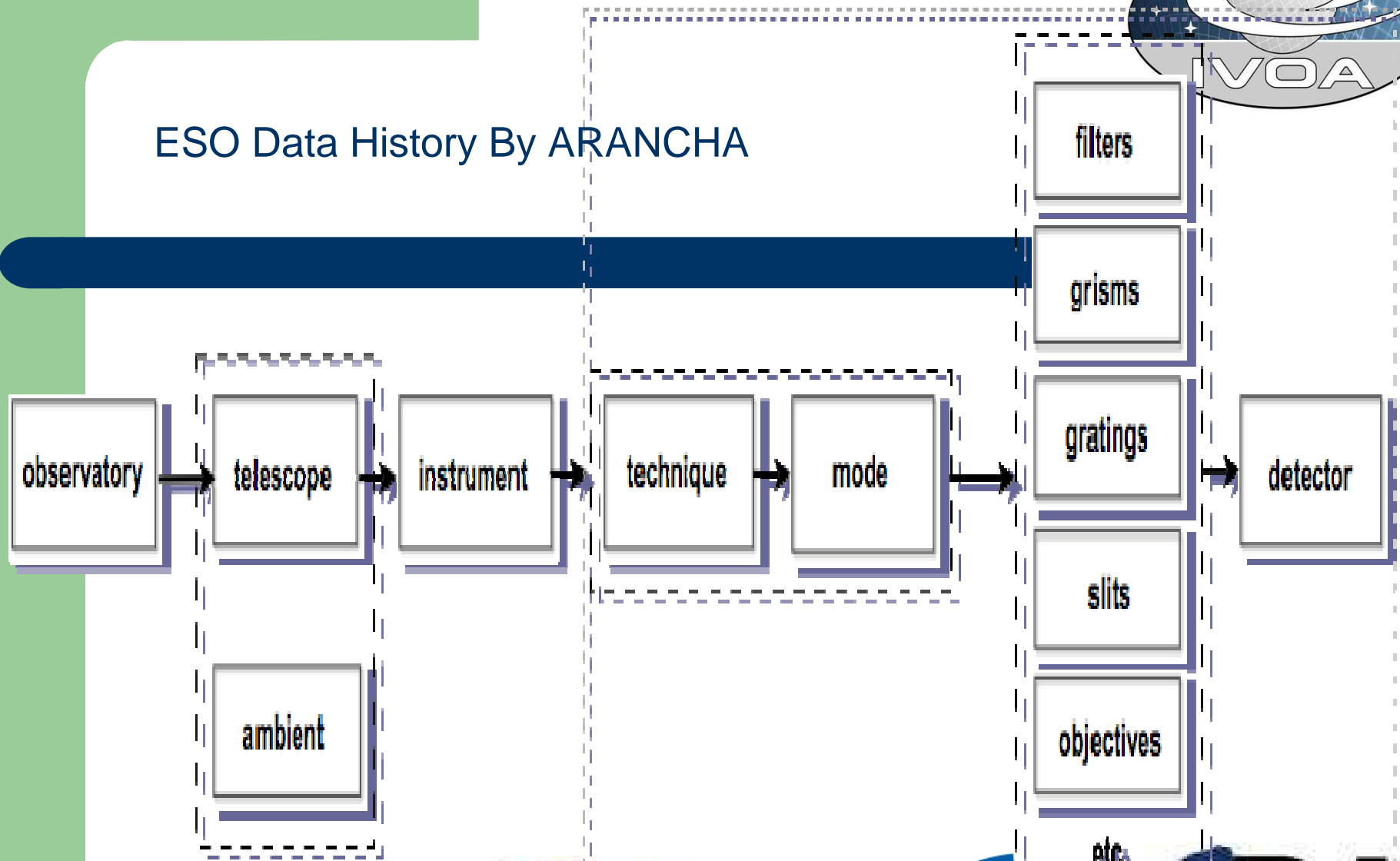
Use cases for Provenance

- See Juan et al presentation + Igor's use cases
 - Information about « Creator »
 - Instrumental path
 - Processing history
 - Linkage to progenitors





ESO Data History By ARANCHA

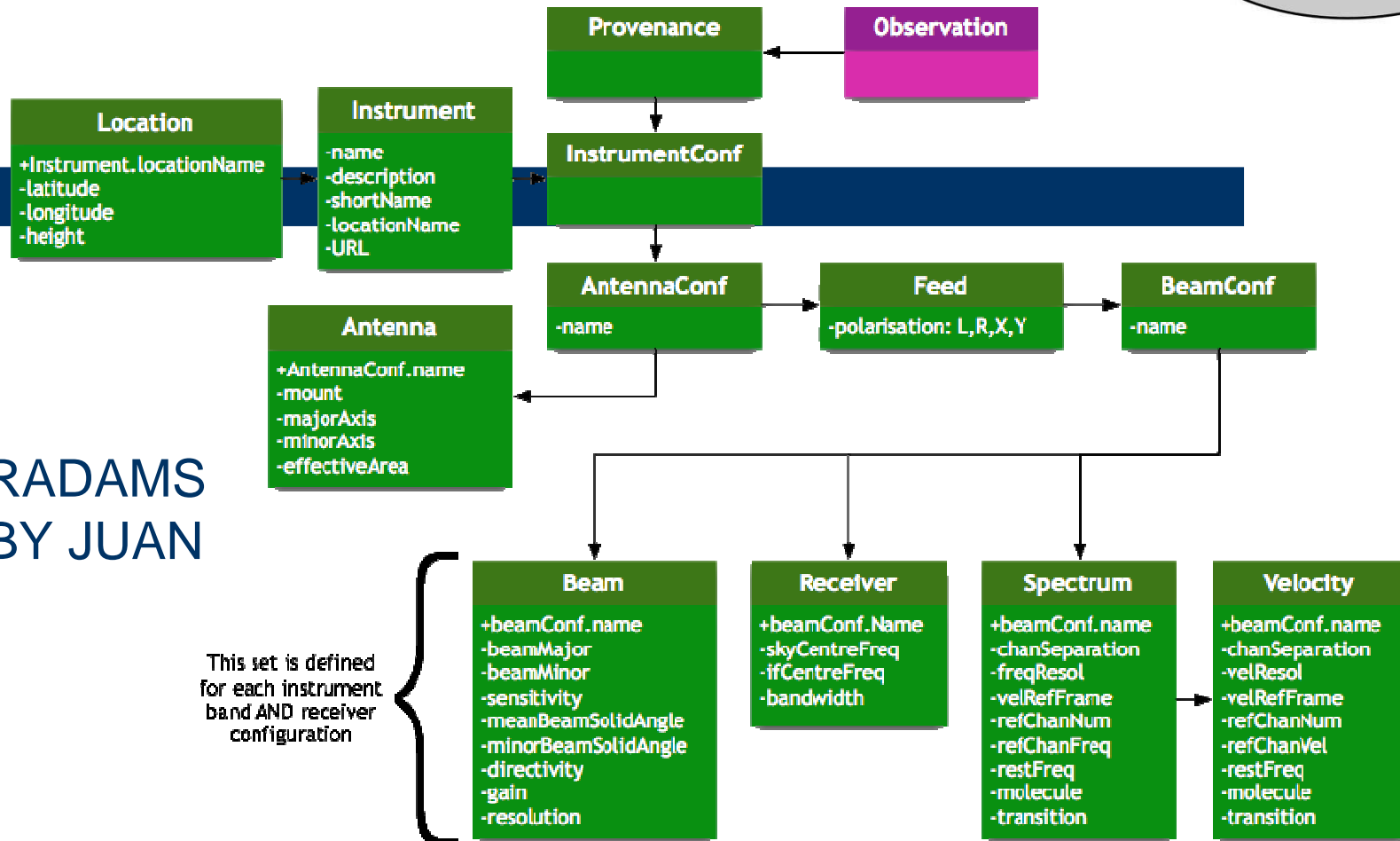


UNIVERSITÉ DE STRASBOURG





RADAMS BY JUAN





name	CFHT
observatoryLoc...	stc description

Mosaic Processing stage

s

Telescope

name	CFH
diameter	

Focus

name	MegaPrime
type	Prime

Grating

Filter

name	M756
band	R
transmissionCurve	

Detector

name	MEGACAM
type	CCDArray

Algorithm

associated data
data access

metadata access

2)

type	algorithm	AssociatedData																																																							
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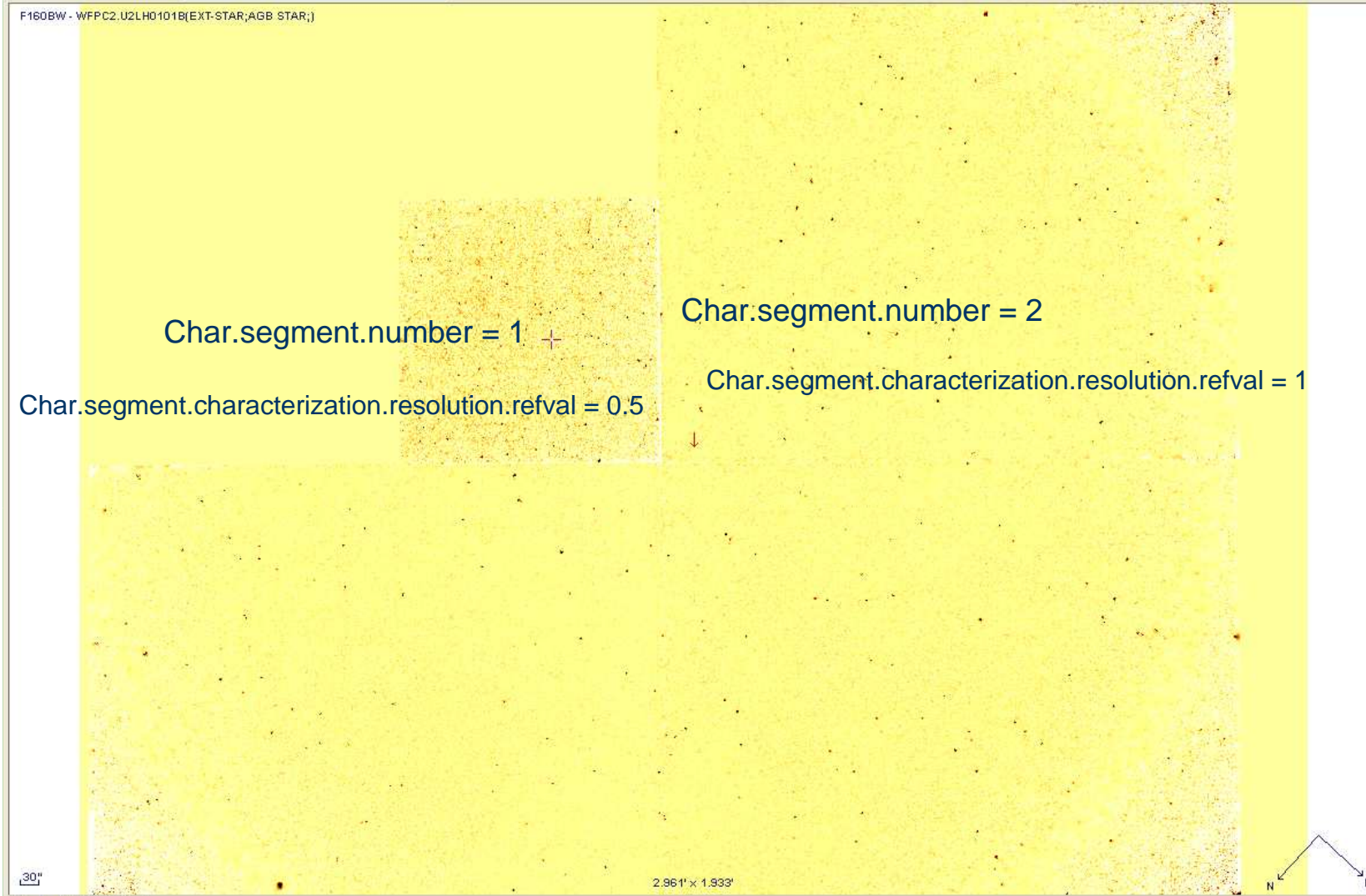


Use cases for Complex char

- Multi «spatial» segments: WFPC2
- Multi-Polarization states: see Anita's talk....
- Common feature:
 - a general level 1 + 2 global charac
 - + full charac of each « segment »



F160BW - WFPC2.U2LH0101B(EXT-STAR;AGB STAR;)



select
pan
zoom
dist
draw
tag
text
filter
cross
rgb
assoc
cont
mgls
pixel
prop
del

F160BW - WFPC
F160BW - WFPC
Zoom 2/3x
2.656' x 2.656'



Use cases for Data Discovery (last but not least)

- SIAV2 (discovery of images and cubes):
 - Subset of Full data Model utypes for image and cubes :
 - char
 - Dataid
 - Provenance
 - Mapping





Use cases for Data Discovery (last but not least)

- ObsTap (or Generic Data Set discovery):
 - Subset of Full data Model utypes common to all types of datasets, allowing generic use cases and sufficient for efficient discovery:
See Mireille's talk tomorrow



5.2.6.6 Dataset Characterization Axis Metadata

The Characterization axis metadata specifies the type of physical quantity on each physical measurement axis as well as the observable.

UTYPE	Description	Req	De- fault
Char/FluxAxis.Ucd	ucd for flux	REC	
Char/SpectralAxis.Ucd	ucd for spectral coord	REC	
Char/TimeAxis.Ucd	ucd for time coord	REC	
Char/SpatialAxis.Ucd	ucd for time coord	REC	
Char/PolarizationAxis.Ucd	Ucd for pol axis	REC	

Values are specified as UCDS, as defined in the data model. For example, to specify that the flux axis is flux density per unit wavelength, the value "phot.fluDenS;em.wl" would be given.

5.2.6.7 Characterization Coverage Metadata

The Coverage component of the Characterization data model (Char) describes the coverage of the dataset in each of the four primary measurement axes.

UTYPE	Description	
Char/SpatialAxis.Coverage.Location.coord	Observed position, e.g., RA DEC	MAN
Char/SpatialAxis.Coverage.Bounds.Extent	angular area, sq deg	MAN
Char/SpatialAxis.Coverage.Bounds.limits.LoLimit2Vec		
Char/SpatialAxis.Coverage.Bounds.limits.HiLimit2Vec		
Char/SpatialAxis.Coverage.Support.AreaType		
Char/SpatialAxis.Coverage.Support.Area	Accurate Field of View	OPT
Char/TimeAxis.Coverage.Location.coord	Midpoint of exposure (MJD)	MAN
Char/TimeAxis.Coverage.Bounds.Extent	Total elapsed exposure time	REC
Char/TimeAxis.Coverage.Bounds.limits.LoLimit	Start time	OPT
Char/TimeAxis.Coverage.Bounds.limits.HiLimit	Stop time	OPT
Char/TimeAxis.Coverage.Support.Extent	Effective exposure time	OPT
Char/SpectralAxis.Coverage.Location.coord	Midpoint of Spectral coord range	MAN
Char/SpectralAxis.Coverage.Bounds.Extent	Width of spectrum in meters	MAN
Char/SpectralAxis.Coverage.Bounds.limits.LoLimit	Start in spectral coordinate	REC
Char/SpectralAxis.Coverage.Bounds.limits.HiLimit	Stop in spectral coordinate	REC
Char/PolarizationAxis.enumeration		

Within Char, Coverage specifies the *location* (central or characteristic value), *bounds* (measurement limits), *support* (region covered within the bounds), for each measurement axis. The coordinate system reference frames specified in Coordsys apply here. Spatial coordinates are specified in units of decimal degrees, spectral coordinates in units of meters, and time coordinates in units of days. The Polarization axis is peculiar in this that it gives the list of available polarization parameters for the polarization system given by the UCD (eg Q, U, V parameters for Stokes system....)

5.2.6.8 Characterization Resolution and Sampling Metadata

The Resolution component of Characterization specifies the sampling and resolution estimates for the dataset.

UTYPE	Description	Req	De- fault
Char/SpectralAxis.Resolution	Spectral res. FWHM	REC	BinSize
Char/TimeAxis.Resolution	Temporal res. FWHM	OPT	BinSize
Char/SpatialAxis.Resolution	Spatial resolution of data	REC	
Char/SpectralAxis.SamplingPrecision.RefVal	Wavelength bin size	OPT	
Char/TimeAxis.SamplingPrecision.RefVal	Time bin size	OPT	
Char/SpectralAxis.SamplingPrecision.FillFactor	Sampling filling factor	OPT	1.0
Char/SpatialAxis.SamplingPrecision.FillFactor	Sampling filling factor	OPT	1.0
Char/TimeAxis.SamplingPrecision.FillFactor	Sampling filling factor	OPT	1.0

The spatial and spectral resolution **should** be specified. Note that, for consistency within Char, the spectral resolution is specified here in spectral coordinate units (FWHM in meters), unlike the SPECPR query parameter, which is specified as λ/d .

5.2.6.9 Characterization Accuracy and Error Metadata

The Accuracy component of Characterization specifies the sampling, resolution, and error estimates for the dataset.

UTYPE	Description	Req	Default
Char/FluxAxis.Accuracy.StatError	Statistical error	OPT	
Char/FluxAxis.Accuracy.SysError	Systematic error	OPT	
Char/FluxAxis.CalibrationStatus	Type of flux calibration	REC	calibrated
Char/SpectralAxis.Accuracy.StatError	Spectral coord meas. error	OPT	
Char/SpectralAxis.Accuracy.SysError	Spectral coord meas. error	OPT	
Char/SpectralAxis.CalibrationStatus	Type of coord calibration	REC	calibrated
Char/TimeAxis.Accuracy.StatError	Time coord statistical error	OPT	
Char/TimeAxis.Accuracy.SysError	Time coord systematic error	OPT	
Char/TimeAxis.CalibrationStatus	Type of coord calibration	OPT	calibrated
Char/SpatialAxis.Accuracy.StatError	Astrometric statistical error	REC	
Char/SpatialAxis.Accuracy.SysError	Systematic error	OPT	
Char/SpatialAxis.CalibrationStatus	Type of coord calibration	REC	calibrated

Both overall statistical and systematic error estimates may be specified. The calibration status of all three primary measurement axes as well as the observable **should** be given, otherwise "calibrated" is assumed.

Observation Core Components DM	MANDATORY items		
Local short column name	Utype	Units	Type
type_of_data	obs:Observation.ProductType		enum
target_name	obs:Target.name		string
ra	obs:Char/SpatialAxis.Coverage.Location.coord.Position2D.Value2.C1	[deg]	float
dec	obs:Char/SpatialAxis.Coverage.Location.coord.Position2D.Value2.C2	[deg]	float
s_resolution	obs:Char/SpatialAxis.Resolution.RefVal	[arcsec]	float
s_area	obs:SpatialAxis.Coverage.Support.Extent	[arcmin**2]	float
t_start	obs:Char/TimeAxis.Coverage.Bounds.Limits.TimeInterval.StartTime	[ISO8601?, MJD?]	
t_stop	obs:Char/TimeAxis.Coverage.Bounds.Limits.TimeInterval.StopTime	[ISO8601?, MJD?]	
t_span	obs:Char/TimeAxis.Coverage.Bounds.Extent	day	float
t_exptime	obs:Char/TimeAxis.Coverage.Support.Extent	[s]	float
t_resolution	obs:Char/TimeAxis.Resolution.refVal	[s]	float
w_min	obs:Char/SpatialAxis.Coverage.Bounds.limits.Interval.LoLim	[nm]	float
w_max	obs:Char/SpatialAxis.Coverage.Bounds.limits.Interval.HiLim	[nm]	float
w_res_power	obs:Char/SpectralAxis.resolution.refVal		unitless
o_cal_status	obs:Char/FluxAxis.calibStatus		string
instrument_name	obs:Provenance/ObsConfig.instrument.name		string



General IVOA requirements

- From ObsTap to Full data model
 - A need for common Model attributes:
 - Eg : Observation Matching by Finding out Consistent attributes values in:
 - full xml serialisation for Footprints or Time support
and
 - « ObsTap » or « SIAV2 » Fields...
 - A need for same utype syntax for all protocols and applications





Time scale

- ObsTap (Observation Core components) very soon : November ?
- SIIV2 near future, WD on line
- Char2+Prov status on the DM pages this week.
- Char 2: this fall
- Full OBs+ Provenance: May 2010

