Modeling Instrument Field of View : DM proposal

F.Bonnarel, T.Boch, M.Louys, L.Michel, C.Nogueira

CENTRE DE DONNÉES ASTRONOMIQUES DE STRASBOURG

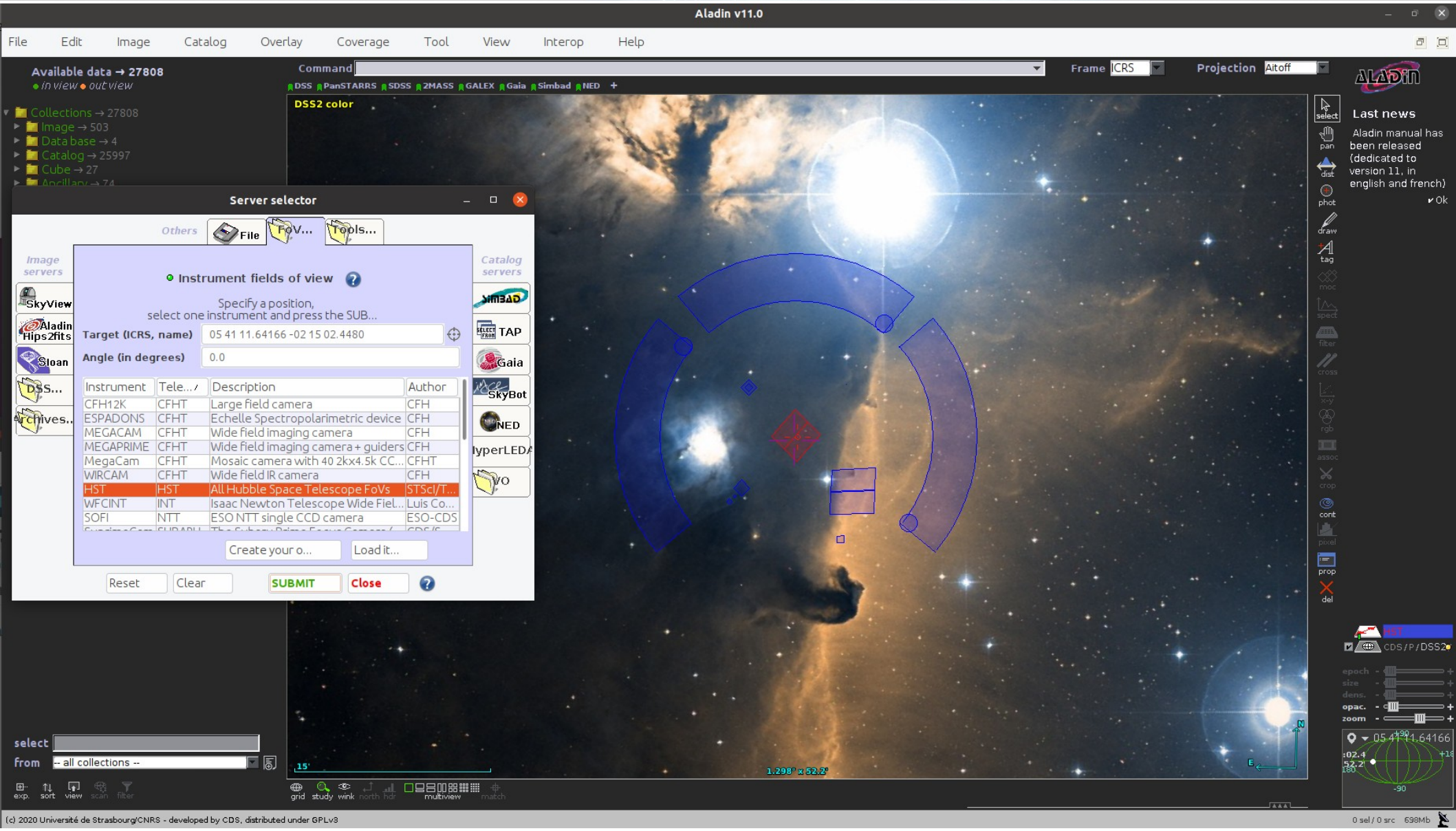
ESCAPE
European Science Cluster of Astronomy & Particle physics ESFRI research Infrastructures

IVOA

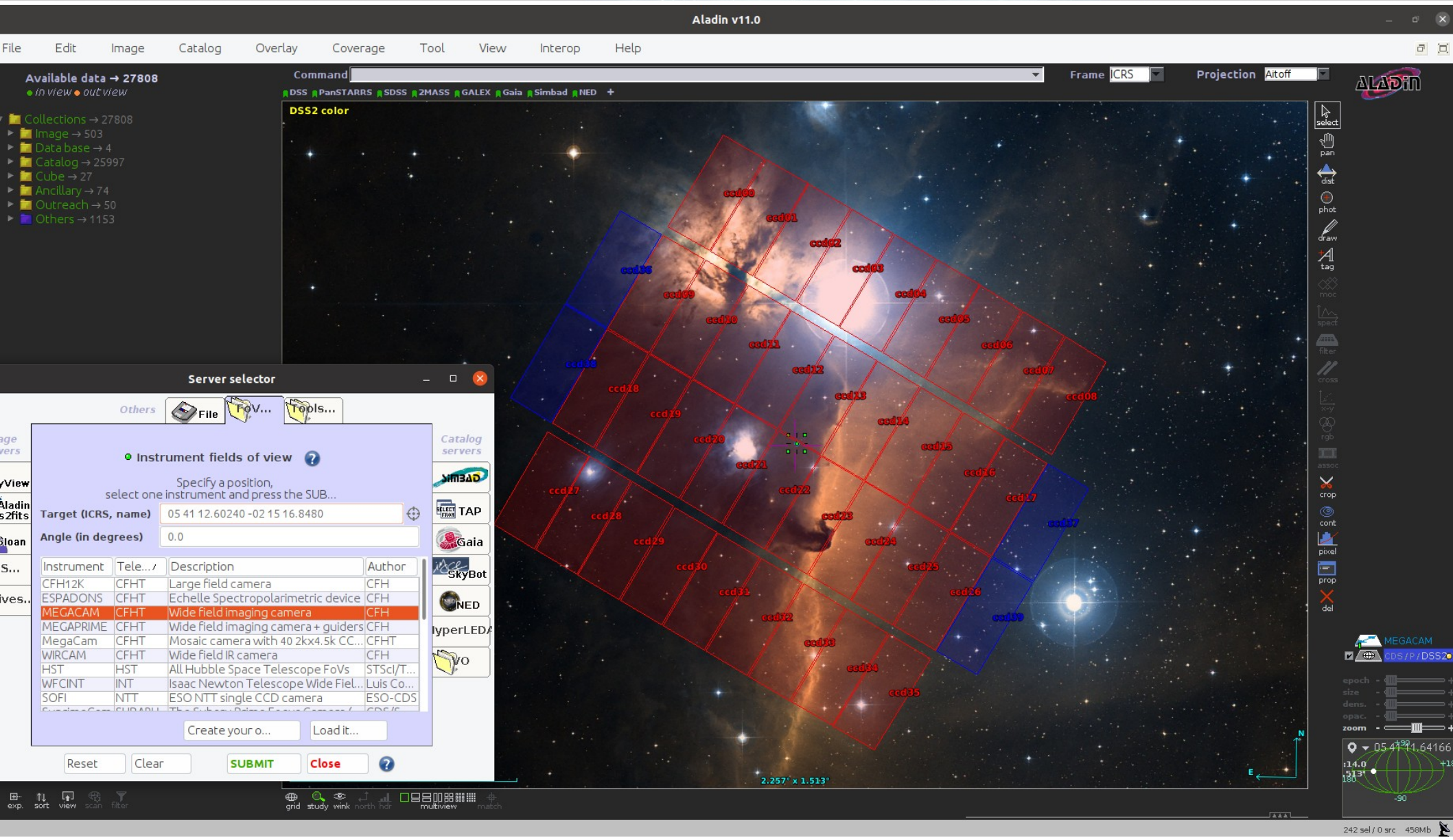
Project status

- Data model developped by CDS + Laurent Michel
- Serialization in VOTAble using MIVOT specification (currently in RFC)
- Internship project goals already presented in April
- Implementation in AladinDesktop and AladinLite prototypes done by the student since then

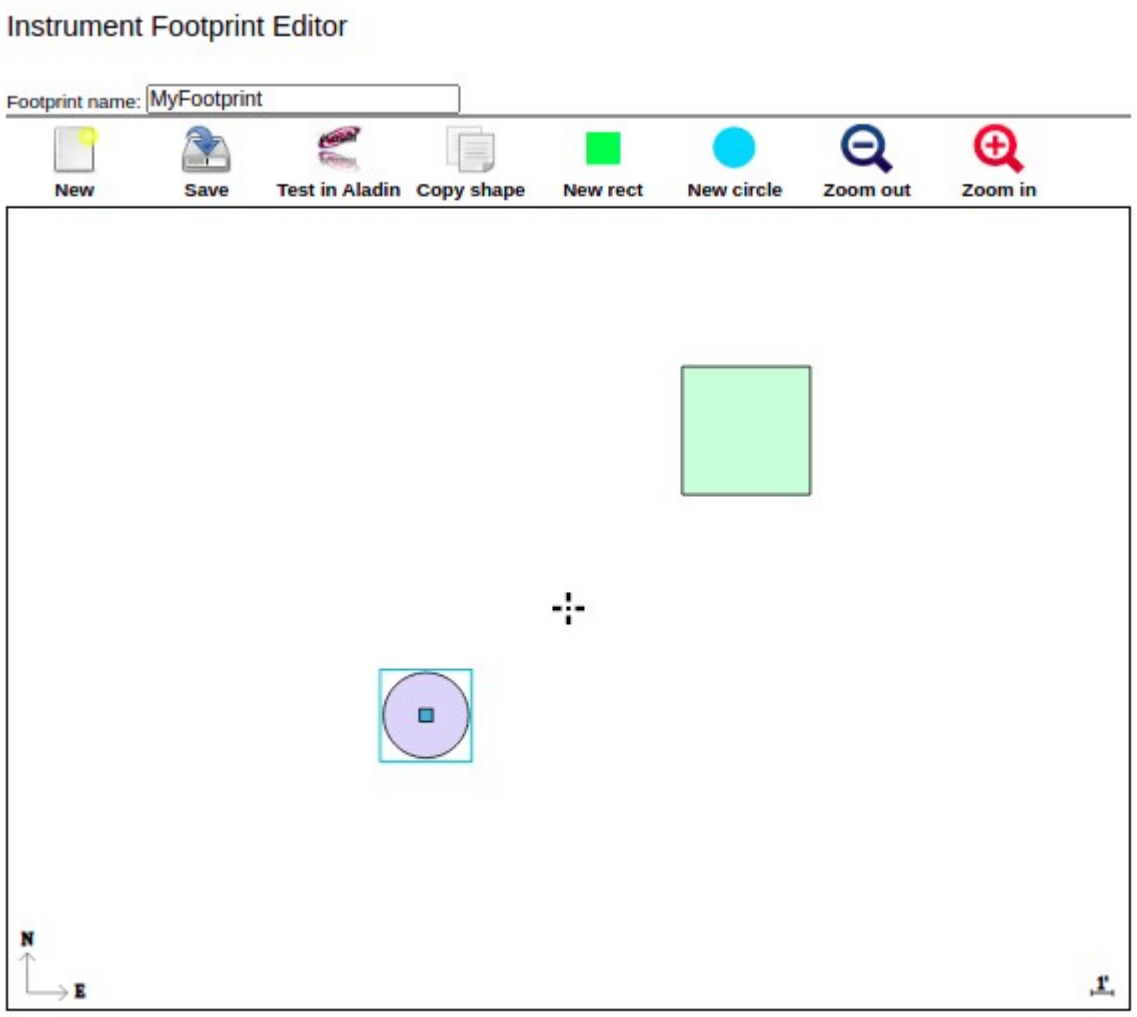
Motivation : replace Instrument FoV facility in Aladin → HST

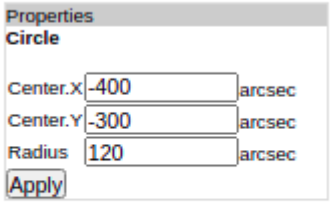


Motivation : replace Instrument FoV facility in Aladin → MEGACAM



Motivation : replace Instrument FoV facility in Aladin → Editor





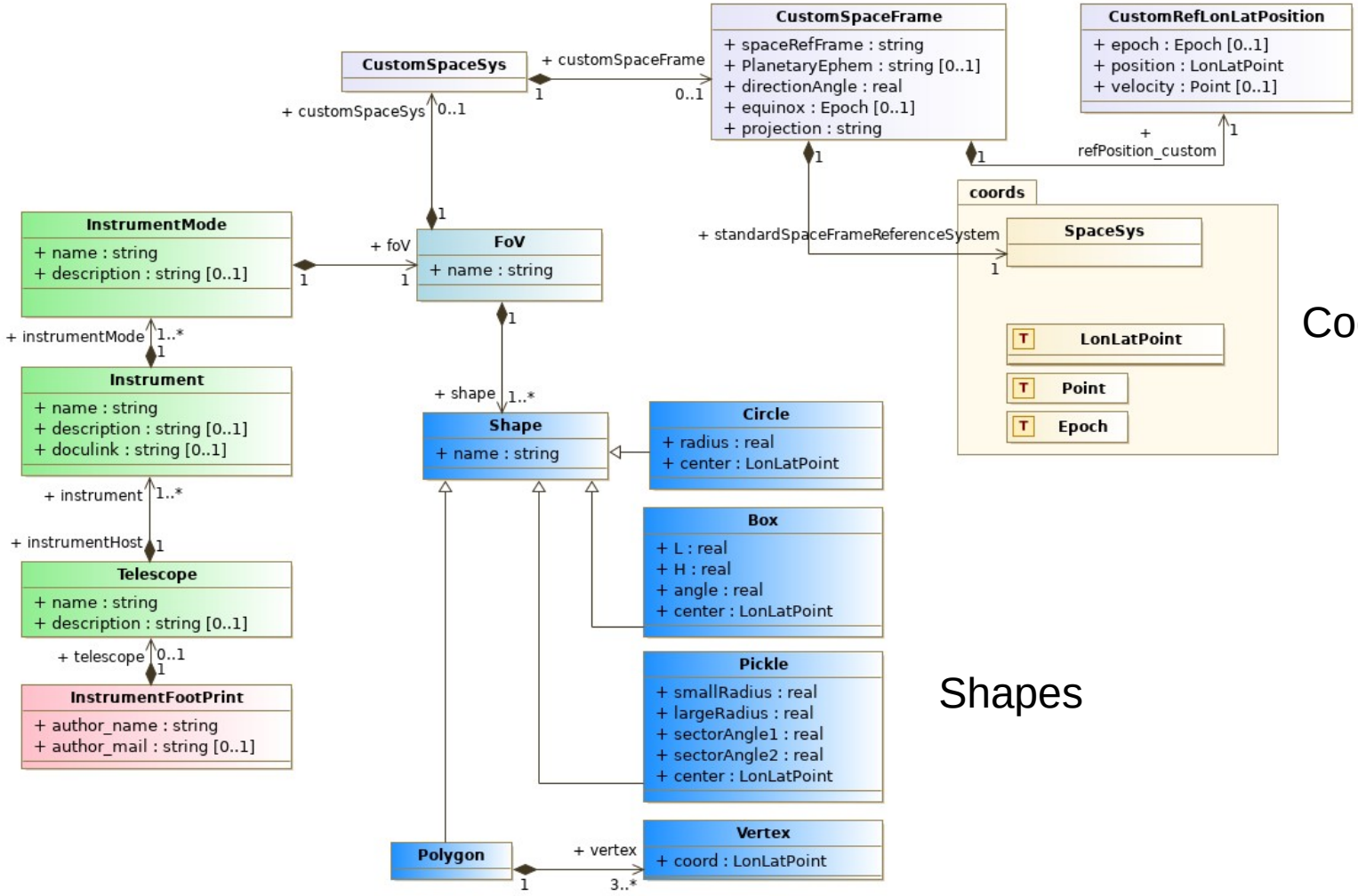
Why a new project ?

- Old system was used by several projects (HST, CFHT, ….) but not by several clients.
- Old « standardisation » was simply
  - VOTable,
  - STC1 utypes, GROUPS, and Fov structure (obsoleted)
  - not an IVOA recommendation (only a Note)
- Restart the project in a more interoperable way by
  - deriving a new FoV data Model from Coords,
  - using the upcoming MIVOT mapping syntax to describe model elements
- Explore usage outside AladinDesktop

The FOV datamodel (vo-dml consistent)

CONTEXT

CustomSpaceSys



Coords datamodel

Shapes

The FOV datamodel

- Extending coords model :
  - Coordinates classes
  - coordinates systems classes
- Define CustomSpaceSys on the tangent plane :
  - projection instrument specific
  - variable central positions and orientation
- Define shapes (instrument specific) in this custom CoordSpaceSys

The Serialisation : Mapping using MIVOT

- MIVOT is a Proposed recommendation in RFC
  - Xml schema available
  - Validation software in python
  - Parsing code in python
- Provides :
  - Mapping of ***instances*** of data models (Coords, Meas, PhotDM, Mango) on top of VOTables
  - Full serialization of ***instances*** of datamodels

The Serialisation / Mapping using MIVOT

Telescope
Instrument
Mode

Shapes

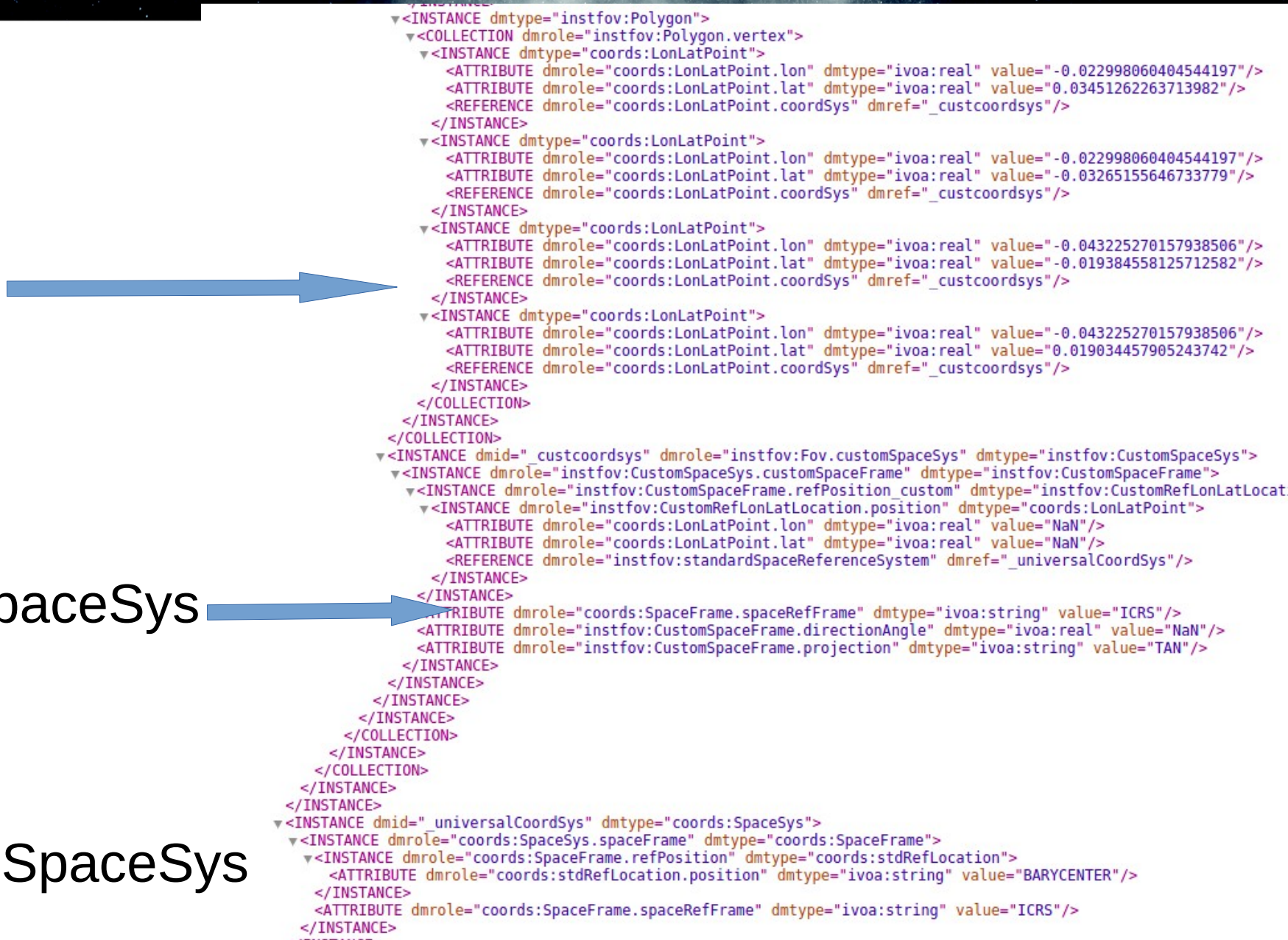
```
<VOTABLE xmlns="http://www.ivoa.net/xml/VOTable/v1.3" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.4" xsi:schemaLocation="http://www
 <RESOURCE xmlns="" type="results">
  <RESOURCE type="meta">
   <VODML xmlns:dm-mapping="http://www.ivoa.net/xml/merged-syntax">
    <REPORT status="OK">hand-made mapping: ad hoc model so far</REPORT>
    <MODEL name="instfov" url="https://www.ivoa.net/xml/instfov.xml"/>
    <MODEL name="coords" url="https://www.ivoa.net/xml/Coords-v1.xsd"/>
    <GLOBALS>
     <INSTANCE dmid="_footprint" dmtype="instfov:InstrumentalFootPrint">
      <ATTRIBUTE dmrole="instfov:InstrumentalFootPrint.author_name" dmtype="ivoa:string" value="Laurent MICHEL"/>
      <ATTRIBUTE dmrole="instfov:InstrumentalFootPrint.author_email" dmtype="ivoa:string" value="laurent.michel@astro.unistra.fr"/>
      <INSTANCE dmrole="instfov:InstrumentalFootPrint.telescope" dmtype="instfov:Telescope">
       <ATTRIBUTE dmrole="instfov:Telescope.name" dmtype="ivoa:string" value="MockedTelescope"/>
       <ATTRIBUTE dmrole="instfov:Telescope.description" dmtype="ivoa:string" value="mocked telescope"/>
       <COLLECTION dmrole="instfov:Telescope.instrument">
        <INSTANCE dmtype="instfov:Instrument">
         <ATTRIBUTE dmrole="instfov:Instrument.name" dmtype="ivoa:string" value="MockCamera"/>
         <ATTRIBUTE dmrole="instfov:Instrument.description" dmtype="ivoa:string" value="mocked camera"/>
         <COLLECTION dmrole="instfov:Instrument.insrumentMode">
          <INSTANCE dmtype="instfov:InstrumentMode">
           <ATTRIBUTE dmrole="instfov:InstrumentMode.name" dmtype="ivoa:string" value="AllFrames"/>
           <ATTRIBUTE dmrole="instfov:InstrumentMode.description" dmtype="ivoa:string" value="full frames together"/>
           <INSTANCE dmid="_fov" dmrole="instfov:InstrumentMode.fov" dmtype="instfov:Fov">
            <COLLECTION dmrole="instfov:Fov.shape">
             <INSTANCE dmtype="instfov:Polygon">
              <COLLECTION dmrole="instfov:Polygon.vertex">
               <INSTANCE dmtype="coords:LonLatPoint">
                <ATTRIBUTE dmrole="coords:LonLatPoint.lon" dmtype="ivoa:real" value="0.04156275976724854"/>
                <ATTRIBUTE dmrole="coords:LonLatPoint.lat" dmtype="ivoa:real" value="0.0187580621064599"/>
                <REFERENCE dmrole="coords:LonLatPoint.coordSys" dmref="_custcoordsys"/>
               </INSTANCE>
               <INSTANCE dmtype="coords:LonLatPoint">
                <ATTRIBUTE dmrole="coords:LonLatPoint.lon" dmtype="ivoa:real" value="0.04156275976724854"/>
                <ATTRIBUTE dmrole="coords:LonLatPoint.lat" dmtype="ivoa:real" value="-0.017449787534225568"/>
                <REFERENCE dmrole="coords:LonLatPoint.coordSys" dmref="_custcoordsys"/>
               </INSTANCE>
               <INSTANCE dmtype="coords:LonLatPoint">
                <ATTRIBUTE dmrole="coords:LonLatPoint.lon" dmtype="ivoa:real" value="0.021889720144084225"/>
                <ATTRIBUTE dmrole="coords:LonLatPoint.lat" dmtype="ivoa:real" value="-0.032651556467337785"/>
                <REFERENCE dmrole="coords:LonLatPoint.coordSys" dmref="_custcoordsys"/>
               </INSTANCE>
               <INSTANCE dmtype="coords:LonLatPoint">
                <ATTRIBUTE dmrole="coords:LonLatPoint.lon" dmtype="ivoa:real" value="0.022166805209199225"/>
                <ATTRIBUTE dmrole="coords:LonLatPoint.lat" dmtype="ivoa:real" value="0.034789018435923705"/>
                <REFERENCE dmrole="coords:LonLatPoint.coordSys" dmref="_custcoordsys"/>
               </INSTANCE>
              </COLLECTION>
             </INSTANCE>
             <INSTANCE dmtype="instfov:Pickle">
              <ATTRIBUTE dmrole="instfov:Pickle.smallRadius" dmtype="ivoa:real" value="0.009722222222222222"/>
              <ATTRIBUTE dmrole="instfov:Pickle.largeRadius" dmtype="ivoa:real" value="0.018055555555555554"/>
              <ATTRIBUTE dmrole="instfov:Pickle.sectorAngle1" dmtype="ivoa:real" value="0"/>
              <ATTRIBUTE dmrole="instfov:Pickle.sectorAngle2" dmtype="ivoa:real" value="180"/>
              <INSTANCE dmrole="instfov:Circle.center" dmtype="coords:LonLatPoint">
               <ATTRIBUTE dmrole="coords:LonLatPoint.lon" dmtype="ivoa:real" value="0"/>
               <ATTRIBUTE dmrole="coords:LonLatPoint.lat" dmtype="ivoa:real" value="0"/>
               <REFERENCE dmrole="coords:LonLatPoint.coordSys" dmref="_custcoordsys"/>
              </INSTANCE>
             </INSTANCE>
             <INSTANCE dmtype="instfov:Pickle">
              <ATTRIBUTE dmrole="instfov:Pickle.smallRadius" dmtype="ivoa:real" value="0.009722222222222222"/>
              <ATTRIBUTE dmrole="instfov:Pickle.largeRadius" dmtype="ivoa:real" value="0.018055555555555554"/>
              <ATTRIBUTE dmrole="instfov:Pickle.sectorAngle1" dmtype="ivoa:real" value="0"/>
              <ATTRIBUTE dmrole="instfov:Pickle.sectorAngle2" dmtype="ivoa:real" value="90"/>
```

The Serialisation /Mapping using MIVOT

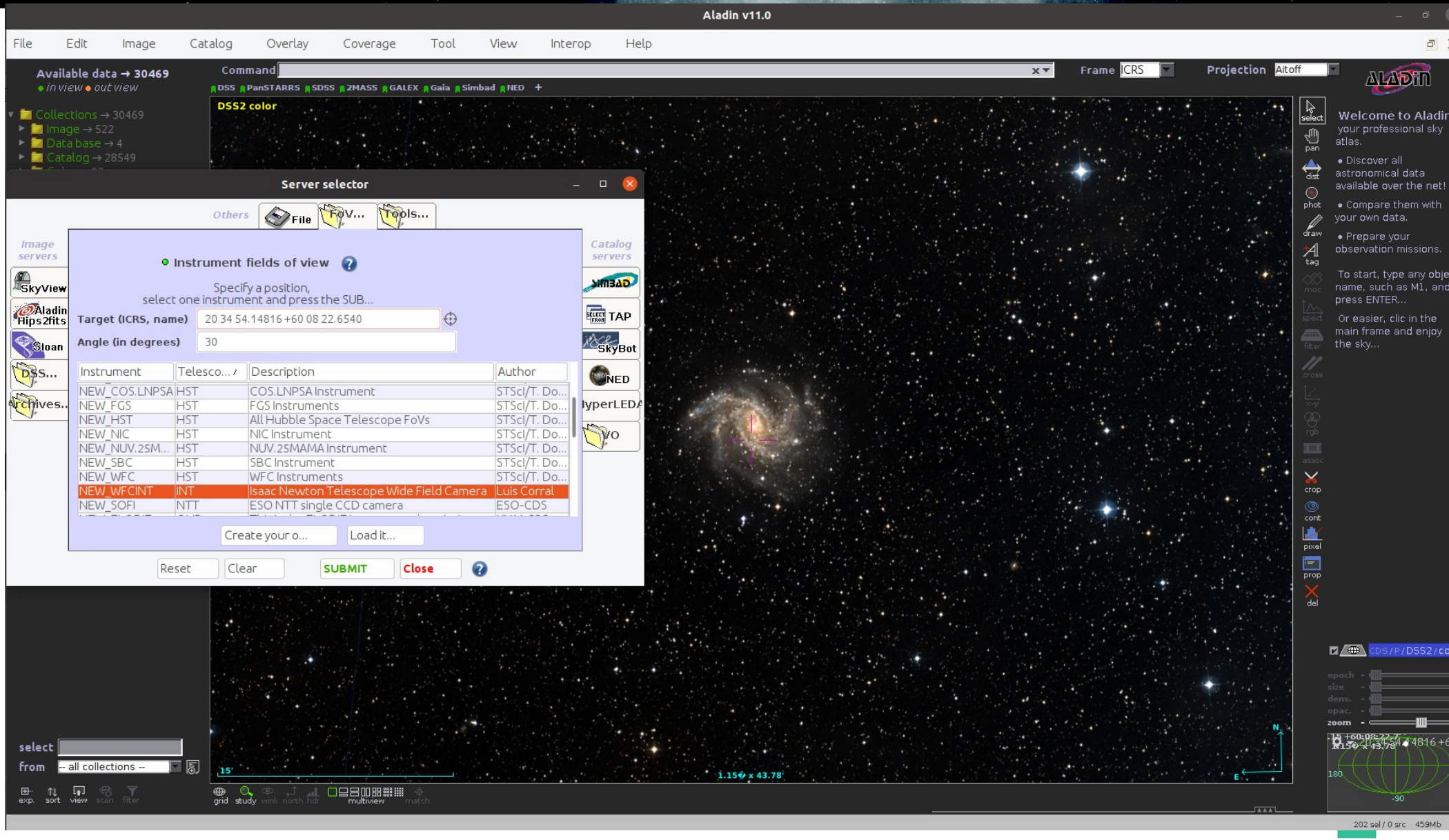
Shapes

CustomSpaceSys

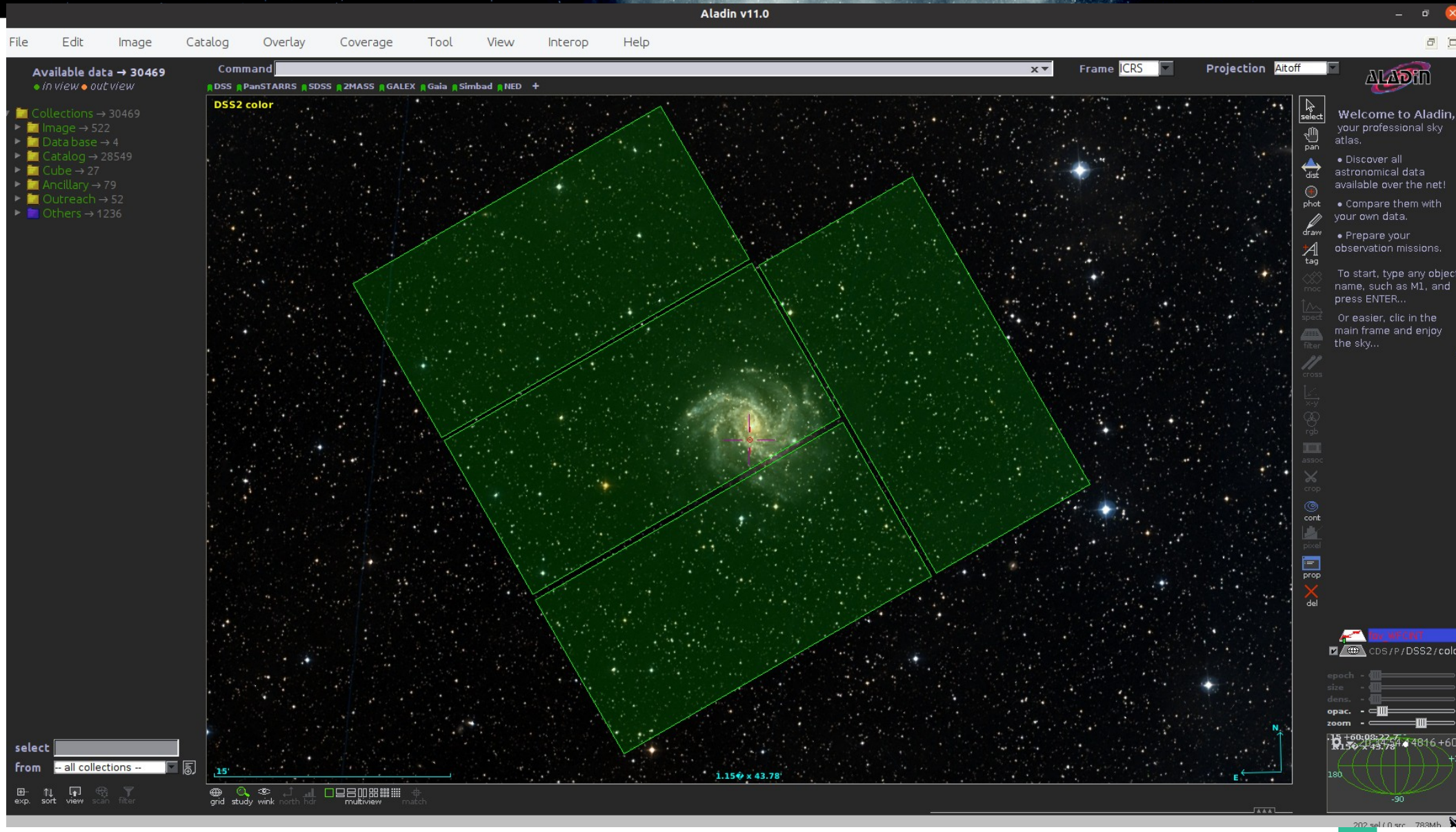
Standard SpaceSys



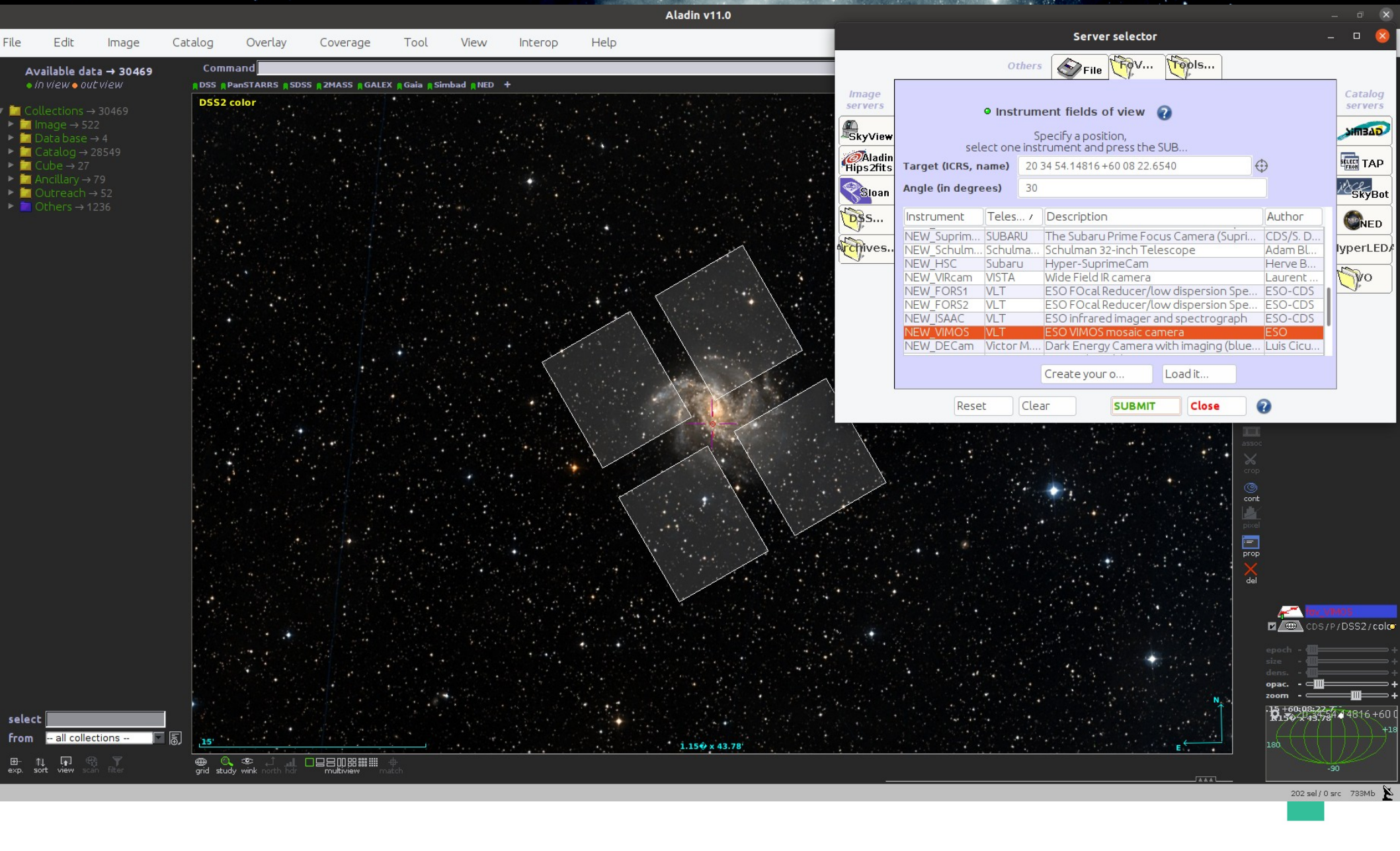
AladinDesktop : Collection of new version of previous footprints



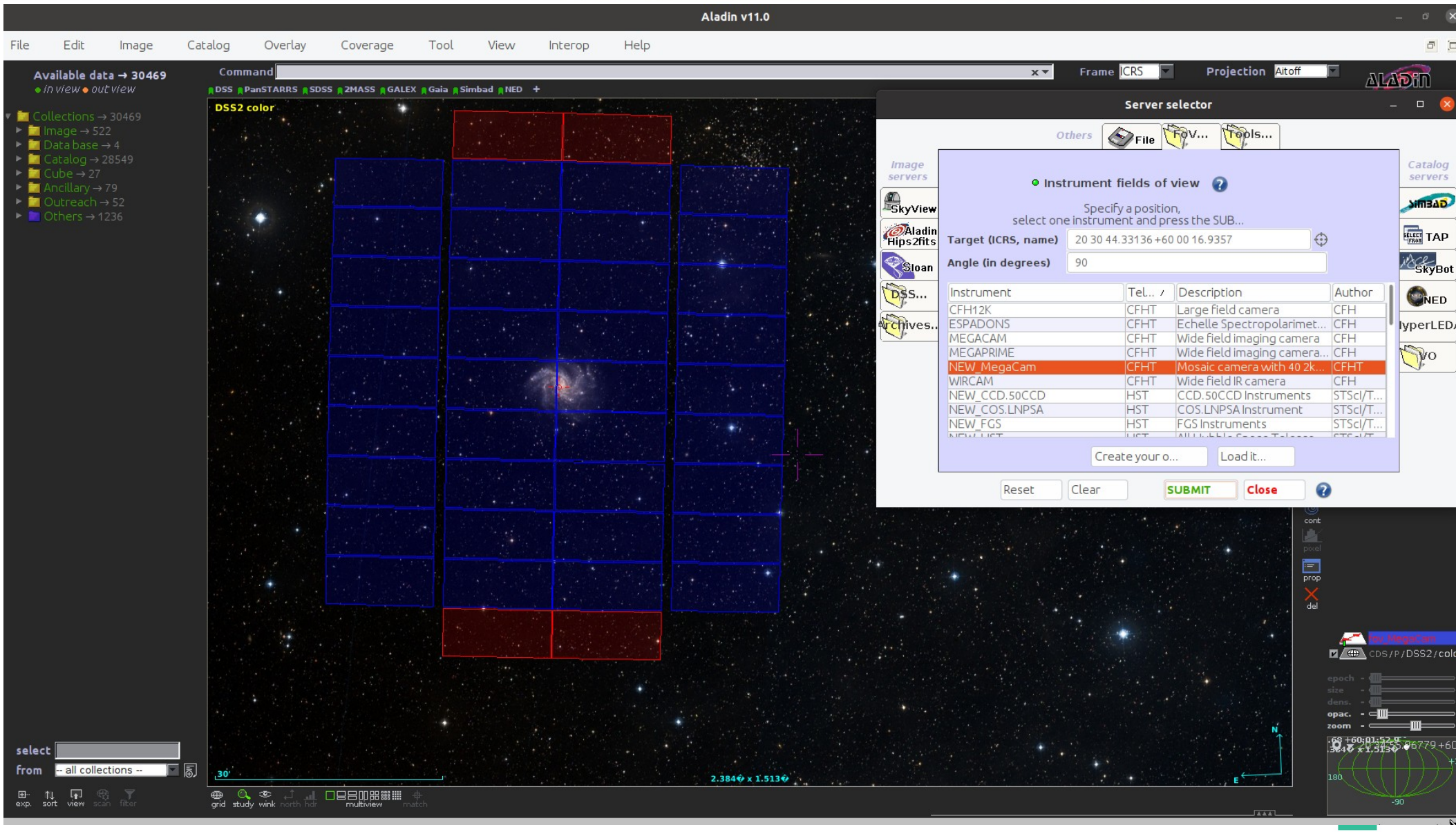
AladinDesktop : Collection of new version of previous footprints



AladinDesktop : Collection of new version of previous footprints

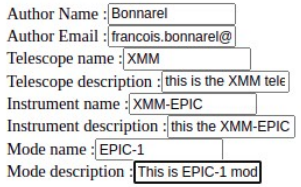


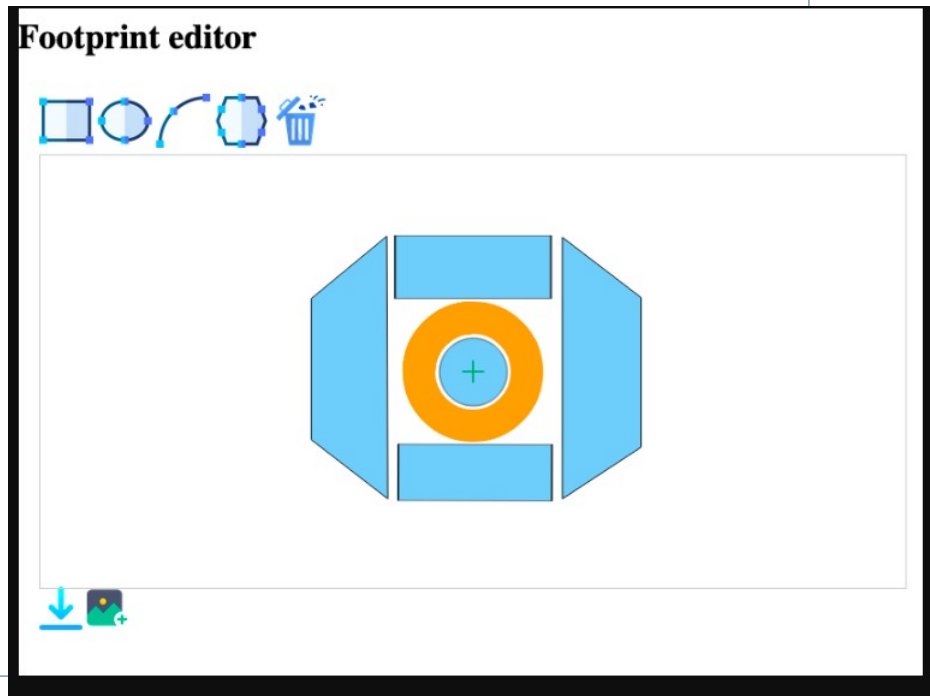
AladinDesktop : Collection of new version of previous footprints



JavaScript Editor interface

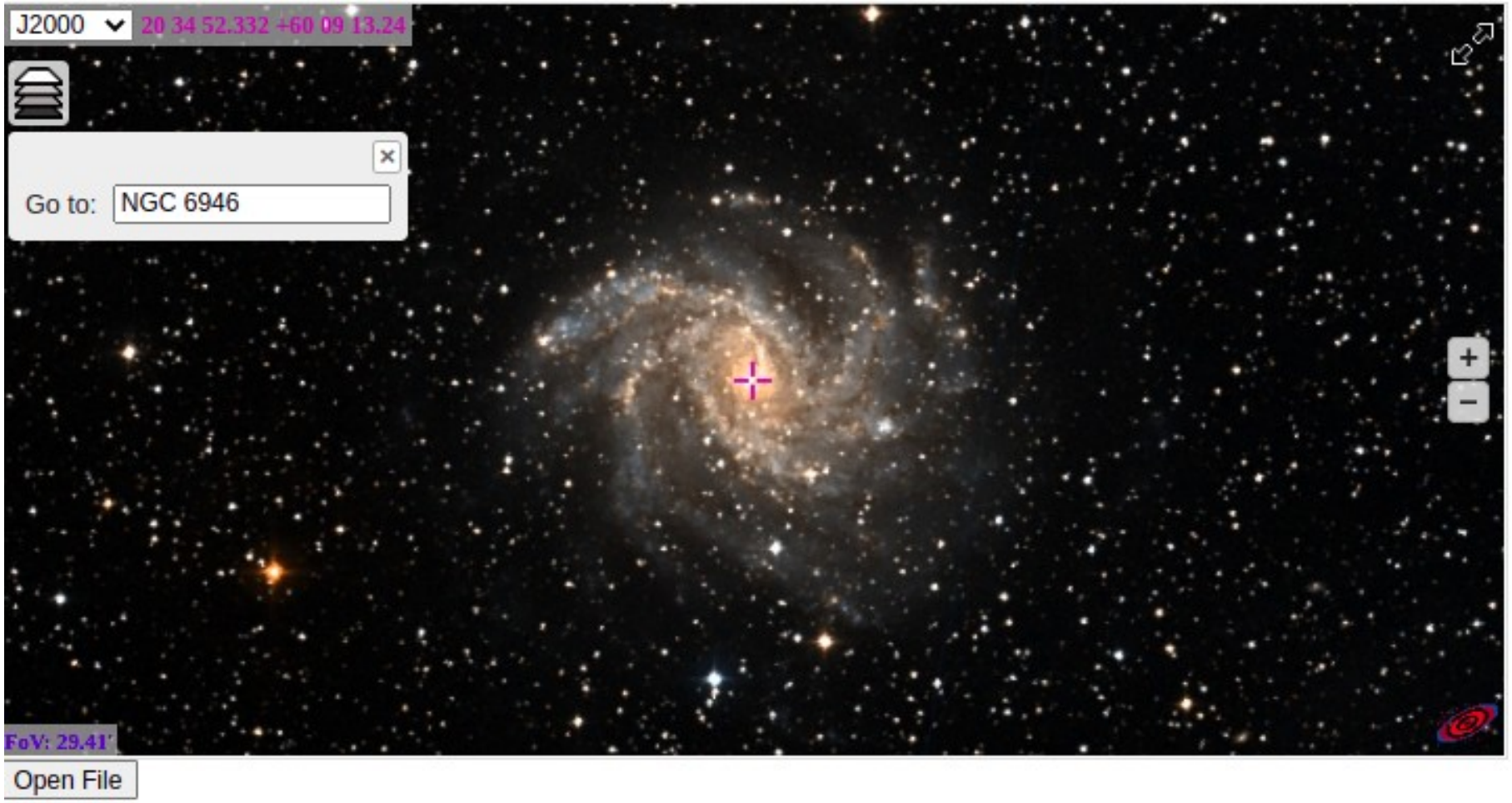
- Draw instrument footprints description with the editor and save it in MIVOT format



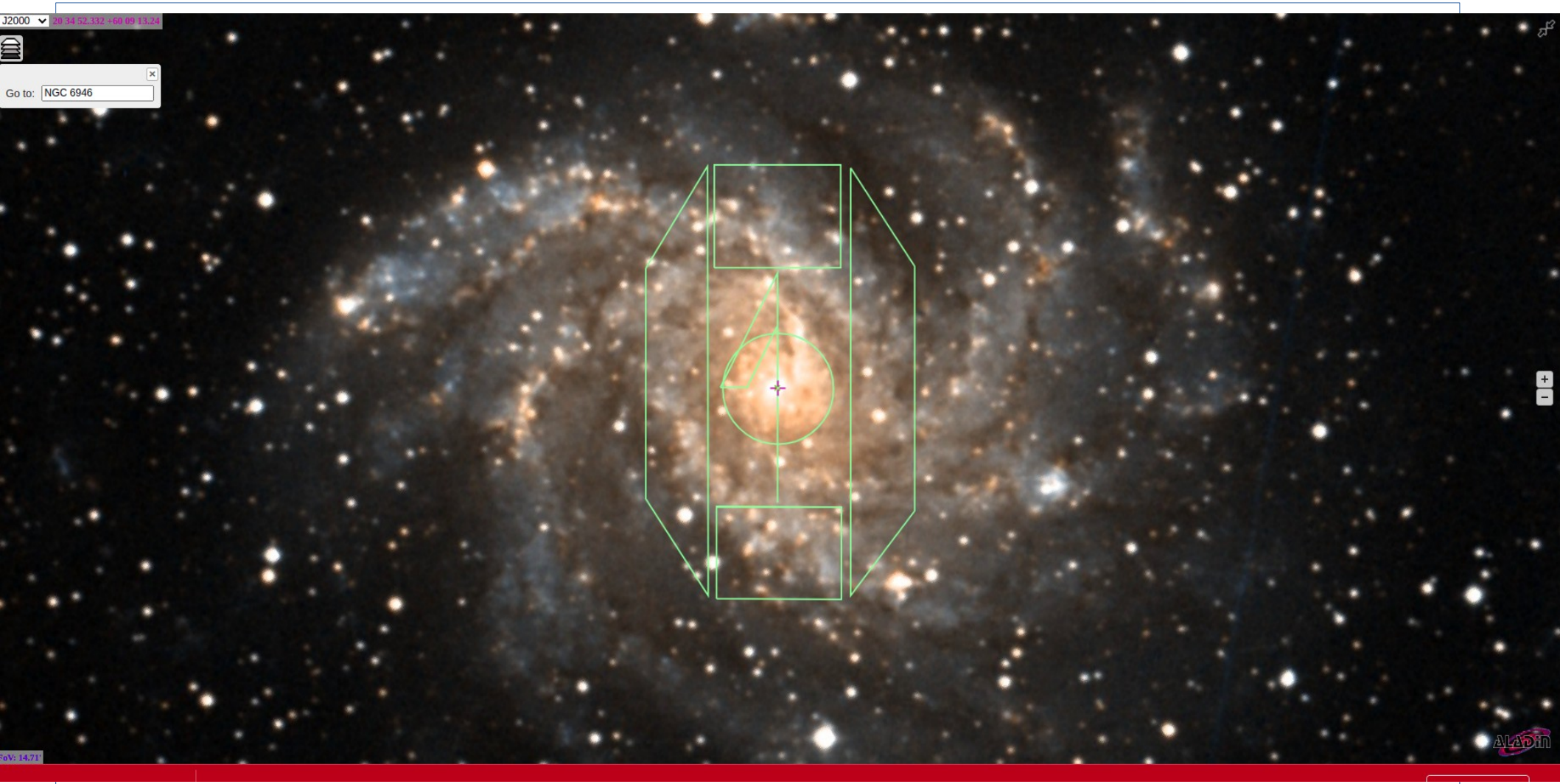


- Can also be done on top of an image of the sky with a given instrument

Loading footprints in AladinLite
→ interoperability with another tool



Loading footprints in AladinLite
→ interoperability with another tool



Future work

- Extend the usage of the format to new instruments (X-ray : XMM, Chandra)
- Use the standard to display sources detected during an observation on top of the FoV display
- Write a Working draft for an IVOA « instrument footprint datamodel »
- Manage the « rendering » of the footprint display in the serialization.

  ---→ add a rendering class as an extension of the data model