

The anatomy of an XML file

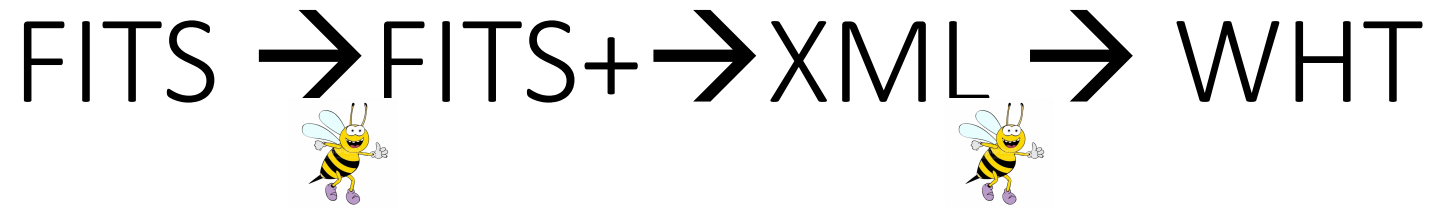
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Context – WASP validates two parts of the dataflow...



Input FITS files

- Each SV proposal = 1 survey = 1 catalogue
- Additional columns supplied with survey-specific data
- Each target row specifies
 - What instrument configuration does it need? (PROGTEMP)
 - Under what conditions should it be observed? (OBSTEMP)
- Surveys **can** supply sky positions if they want
- Some targets can have higher priority than others

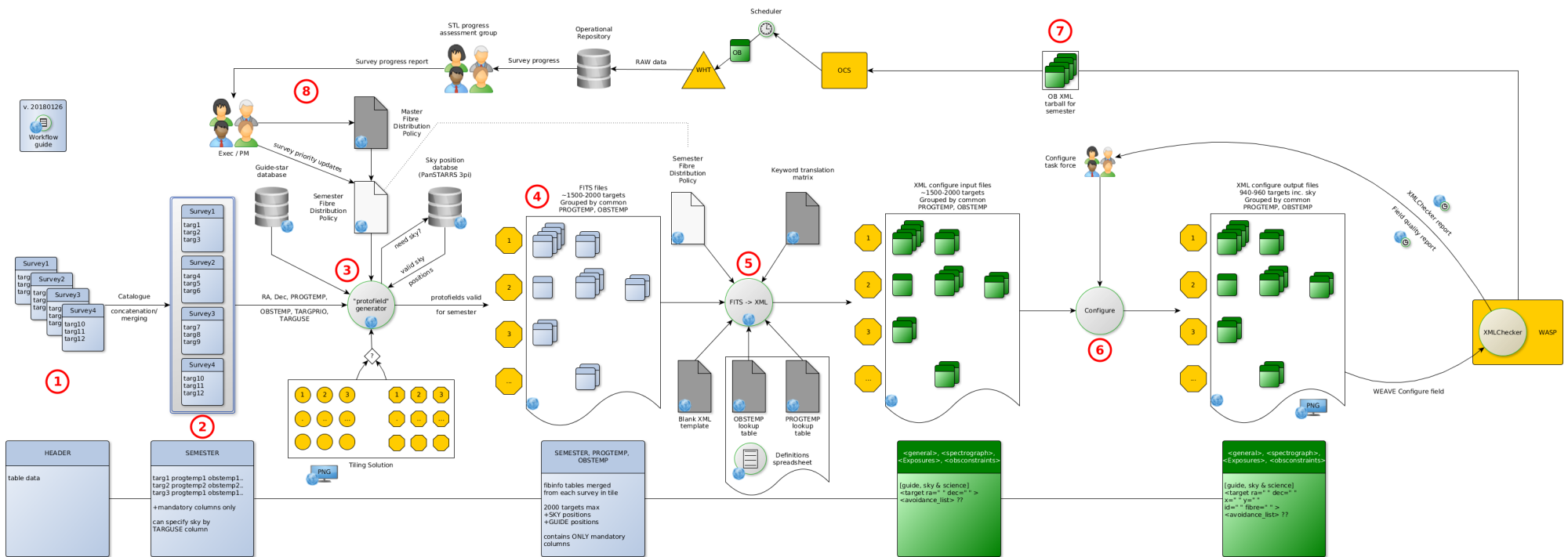
Input FITS files – life after WASP: FITS → XML

- After successful validation by the WASP, the catalogue needs to be subjected to a variety of operations. These are (broadly):
 - Copy of full catalogue sent to WAS and APS
 - Stripped-down copy (“SPA-columns”) only worked on by the SWG
 - Divide into common PROGTEMP (ie, can’t mix MOS LR targets w/ LIFU!)
 - Divide into common OBSTEMP (dark-time can’t go with bright time targets)
 - Divide into common position on the sky (WEAVE has a FOV!)
 - (MOS) divide into “configurable”-sized files – for ~940-960 targets, overpopulate a proposed field with ~1500-2000 candidate targets (more == slower configure time)
 - Convert these 1500-target “protofields” --> XML

The evolution of a WEAVE XML file

- A WEAVE XML file is built from a “Master template” XML
- Information is added to this template by a variety of processes:
 - The SWG have developed tools to fill some of the template
 - The fibre allocation tool (Configure) adds fiber position data
 - Post-processing (IFUs) can add target photometric data from imaging
 - ...or dither pattern generation
 - The WASP adds CNAMEs to sky fibers.
- This means a lot of the XML “anatomy” I present here has come from different stages in the OB production workflow, not all presented linearly as above.

- The overall process is complicated. Details aren't really needed for this workshop



Basics: what's in an XML file

- Nomenclature (I keep forgetting...)
- `<element>`
- `<element attribute="1.0">`
- `<element attribute="1.0">`
 - `<sub_element attribute="0.0">`

What's in a WEAVE XML file?

- <root> -- top-level
- <spectrograph> -- how is the spectrograph configured?
- <exposures> -- what exposures will be taken in the OB, what order?
- <observation> -- various identifiers useful to propagate into RAW FITS
- <configure> -- information on the fibre configuration tool
 - <conditions> -- the environmental assumptions used for fibre configuration
- <surveys> -- description of the surveys in this OB
- <obsconstraints> -- what observing conditions should we observe in?
- <field> -- what is the centre of the field?
 - <target> -- where am I putting a fibre?
 - <target>
 - <target>....

What's in a WASP XML file?

- As previously mentioned, a lot of these element attributes will be written for you (phew) by the various tools
- The XML files are designed for use by the observatory....
- **Many options are fundamentally locked down (to observers), despite options in the XML:**
 - You can't set the readout speed
 - You can't change the spatial binning
 - WASP says no!
 - Let the SWG tools do the hard work – tinkering will lead to a WASP sting...
- ...let's look at a “real-world” example. This is an “end-state” – after all the modifications have been made, and it's been through WASP:

- <root> -- top-level
- Who needs to know about this OB?
- How badly do you want WASP to tell you off?
- What is the template's data model version this XML version this was written in?

```
--<root author="sara.lucatello@inaf.it" cc_report="ricardo.carrera@oapd.inaf.it" report_verbosity="1" version="1.10">  
  --<programme>
```

- <spectrograph> -- how is the spectrograph configured?
- What VPH? What spectral / spatial binning?
- What resolution?

```
< spectrograph >  
  < red_Arm VPH="VPH1" binning_X="1" binning_Y="1" resolution="low" speed="slow" />  
  < blue_Arm VPH="VPH1" binning_X="1" binning_Y="1" resolution="low" speed="slow" />  
< / spectrograph >
```

- <exposures> -- what exposures will be taken in the OB, what order?
- This is the "structure" of the OB, currently the template is:
 - Flat, Arc, Science frames, Arc
- Each element indicates the arm, exposure time, where it is in sequence
- You can't change any of this, it will be filled for you.

```

--<exposures>
  <exposure arm="red" cal_lamp="1" cal_lamp_filter_A="1" cal_lamp_filter_B="1" exp_time="20" ff_ilu_1="0" ff_ilu_2="0" ff_ilu_3="0" order="1" type="flat"/>
  <exposure arm="blue" cal_lamp="1" cal_lamp_filter_A="1" cal_lamp_filter_B="1" exp_time="20" ff_ilu_1="0" ff_ilu_2="0" ff_ilu_3="0" order="1" type="flat"/>
  <exposure arm="red" cal_lamp="2" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="25" ff_ilu_1="45" ff_ilu_2="34" ff_ilu_3="56" order="2" type="arc"/>
  <exposure arm="blue" cal_lamp="2" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="25" ff_ilu_1="45" ff_ilu_2="34" ff_ilu_3="56" order="2" type="arc"/>
  <exposure arm="both" cal_lamp="0" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="1020" ff_ilu_1="0" ff_ilu_2="0" ff_ilu_3="0" order="3" type="science"/>
  <exposure arm="both" cal_lamp="0" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="1020" ff_ilu_1="0" ff_ilu_2="0" ff_ilu_3="0" order="4" type="science"/>
  <exposure arm="both" cal_lamp="0" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="1020" ff_ilu_1="0" ff_ilu_2="0" ff_ilu_3="0" order="5" type="science"/>
  <exposure arm="red" cal_lamp="2" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="25" ff_ilu_1="45" ff_ilu_2="34" ff_ilu_3="56" order="6" type="arc"/>
  <exposure arm="blue" cal_lamp="2" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="25" ff_ilu_1="45" ff_ilu_2="34" ff_ilu_3="56" order="6" type="arc"/>
</exposures>

```

- <observation> -- various identifiers useful to propagate into RAW FITS
- Also instructions to TCS (for position angle*)
- Is this OB probabilistically linked to other OBs?
- What's the name of the OB?
- What trimester was it submitted, etc etc

```
--<observation chained="False" coordinate_system="ICRS" name="CCG_NGC6791_LR_F1W1" ob_class="science" ob_priority="1.0" obs_type="MOS" obsgroup="" pa="0.0"
progtemp="11331" semester="S4">
```

- *Position angle can only be set for the LIFU

- `<surveys>` -- description of the surveys in this OB
- For SV, you won't be sharing, so it will be just your surveyID
- White Dwarf sources are calibration targets – not (for these purposes) considered a dedicated “survey”
- (As an aside) – where fields are shared, the XML can specify
 - The maximum number of fibres allowed for a given survey
 - The relative priority of surveys when allocating fibres with Configure

```

</configure>
-<surveys>
  <survey max_fibres="960" name="CCG" priority="1"/>
</surveys>
<obsconstraints elevation_min="28.68" meridian_min="0" object_min="1"

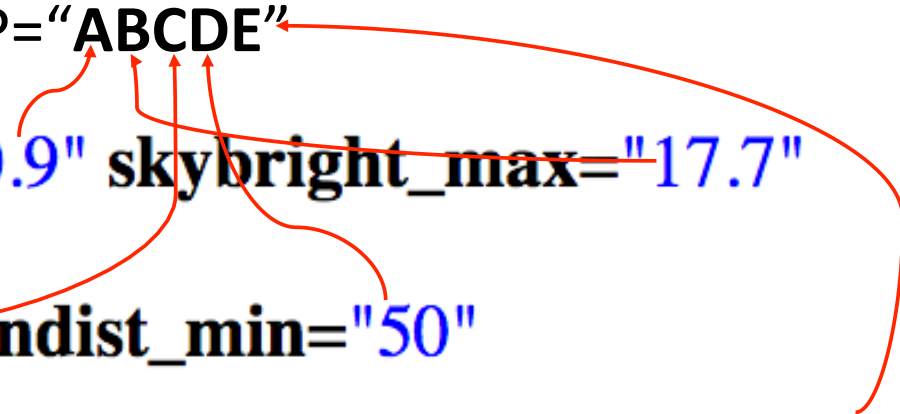
```

- <obsconstraints> -- what observing conditions should we observe in?
- Part of the WEAVE-developed code takes the OBSTEMP and populates these values, eg:

```
<obsconstraints elevation_min="38.68" moondist_min="0" obstemp="FBDEE" seeing_max="1.2" skybright_max="19.6" transparency_min="0.7"/>  
<dithering apply dither="0"/>
```

OBSTEMP="ABCDE"

<obsconstraints seeing_max="0.9" skybright_max="17.7"
elevation_min="41.81" moondist_min="50"
transparency_min="0.4"/>



- <field> -- what is the centre of the field?
 - <target> -- where am I putting a fibre, what is it meant to be, what is it called...
 - <photometry> -- what are the “important” magnitudes & errors for this target?
 - <target>
 - <target>...
- RA_d, Dec_d → centre of the field
- Order → connects fields : science exposures
 - Used for dithering – can specify multiple <field> w/ different RA,Dec
 - Dithering only available for LIFU and mIFU

–<fields>

–<field Dec_d="37.77170000" RA_d="290.22080000" order="">

–<target cname="WVE_19232650+3654414" configid="1" targcat="Guides_S4.fits" targclass="STAR" targdec="36.91149110" targepoch="2015.50000000" targid="2050254320098866944" targname="guide_3641_1104" targpmdec="-7.76599979" targpmra="-2.70199990" targprio="10" targprog="" targra="290.86043590" targsrvy="GUIDES" targuse="G" targx="105.5413631924351" targy="-176.4717087473522">

<photometry emag_bp="0.00300000" emag_g="" emag_gg="0.00000000" emag_i="" emag_r="" emag_rp="0.00100000" mag_bp="16.09300041" mag_g="" mag_gg="15.36299992" mag_i="" mag_r="" mag_rp="14.53299999"/>

</target>

--<exposures>

```
<exposure arm="red" cal_lamp="1" cal_lamp_filter_A="1" cal_lamp_filter_B="1" exp_time="20" ff_ilu_1="0" ff_ilu_2="0" ff_ilu_3="0" order="1" type="flat"/>
<exposure arm="blue" cal_lamp="1" cal_lamp_filter_A="1" cal_lamp_filter_B="1" exp_time="20" ff_ilu_1="0" ff_ilu_2="0" ff_ilu_3="0" order="1" type="flat"/>
<exposure arm="red" cal_lamp="2" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="25" ff_ilu_1="45" ff_ilu_2="34" ff_ilu_3="56" order="2" type="arc"/>
<exposure arm="blue" cal_lamp="2" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="25" ff_ilu_1="45" ff_ilu_2="34" ff_ilu_3="56" order="2" type="arc"/>
<exposure arm="both" cal_lamp="0" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="1020" ff_ilu_1="0" ff_ilu_2="0" ff_ilu_3="0" order="3" type="science"/>
<exposure arm="both" cal_lamp="0" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="1020" ff_ilu_1="0" ff_ilu_2="0" ff_ilu_3="0" order="4" type="science"/>
<exposure arm="both" cal_lamp="0" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="1020" ff_ilu_1="0" ff_ilu_2="0" ff_ilu_3="0" order="5" type="science"/>
<exposure arm="red" cal_lamp="2" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="25" ff_ilu_1="45" ff_ilu_2="34" ff_ilu_3="56" order="6" type="arc"/>
<exposure arm="blue" cal_lamp="2" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="25" ff_ilu_1="45" ff_ilu_2="34" ff_ilu_3="56" order="6" type="arc"/>
```

</exposures>

For dithers, connect the order number in <field>
to the same order number in <exposures type="science">

--<fields>

```
--<field Dec_d="37.77170000" RA_d="290.22080000" order="1">
--<target cname="WVE_19232650+3654414" configid="1" targcat="Guides_S4.fits" targclass="STAR" targdec="36.91149110" targepoch="2015.50000000"
targid="2050254320098866944" targname="guide_3641_1104" targpmdec="-7.76599979" targpmra="-2.70199990" targprio="10" targprog="" targra="290.86043590"
targsrvy="GUIDES" targuse="G" targx="105.5413631924351" targy="-176.4717087473522">
  <photometry emag_bp="0.00300000" emag_g="" emag_gg="0.00000000" emag_i="" emag_r="" emag_rp="0.00100000" mag_bp="16.09300041" mag_g=""
mag_gg="15.36299992" mag_i="" mag_r="" mag_rp="14.53299999"/>
</target>
```

--<exposures>

```
<exposure arm="red" cal_lamp="1" cal_lamp_filter_A="1" cal_lamp_filter_B="1" exp_time="20" ff_ilu_1="0" ff_ilu_2="0" ff_ilu_3="0" order="1" type="flat"/>
<exposure arm="blue" cal_lamp="1" cal_lamp_filter_A="1" cal_lamp_filter_B="1" exp_time="20" ff_ilu_1="0" ff_ilu_2="0" ff_ilu_3="0" order="1" type="flat"/>
<exposure arm="red" cal_lamp="2" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="25" ff_ilu_1="45" ff_ilu_2="34" ff_ilu_3="56" order="2" type="arc"/>
<exposure arm="blue" cal_lamp="2" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="25" ff_ilu_1="45" ff_ilu_2="34" ff_ilu_3="56" order="2" type="arc"/>
<exposure arm="both" cal_lamp="0" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="1020" ff_ilu_1="0" ff_ilu_2="0" ff_ilu_3="0" order="3" type="science"/>
<exposure arm="both" cal_lamp="0" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="1020" ff_ilu_1="0" ff_ilu_2="0" ff_ilu_3="0" order="4" type="science"/>
<exposure arm="both" cal_lamp="0" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="1020" ff_ilu_1="0" ff_ilu_2="0" ff_ilu_3="0" order="5" type="science"/>
<exposure arm="red" cal_lamp="2" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="25" ff_ilu_1="45" ff_ilu_2="34" ff_ilu_3="56" order="6" type="arc"/>
<exposure arm="blue" cal_lamp="2" cal_lamp_filter_A="0" cal_lamp_filter_B="0" exp_time="25" ff_ilu_1="45" ff_ilu_2="34" ff_ilu_3="56" order="6" type="arc"/>
```

</exposures>

<exposure order=3 type="science">	<field RA_d="300" Dec_D="20" order="3"
<exposure order=4 type="science">	<field RA_d="301" Dec_D="21" order="4"
<exposure order=5 type="science">	<field RA_d="299" Dec_D="19" order="5"

--<fields>

```
--<field Dec_d="37.77170000" RA_d="290.22080000" order="">
--<target cname="WVE_19232650+3654414" configid="1" targcat="Guides_S4.fits" targclass="STAR" targdec="36.91149110" targepoch="2015.50000000"
targid="2050254320098866944" targname="guide_3641_1104" targpmdec="-7.76599979" targpmra="-2.70199990" targprio="10" targprog="" targra="290.86043590"
targsrvy="GUIDES" targuse="G" targx="105.5413631924351" targy="-176.4717087473522">
  <photometry emag_bp="0.00300000" emag_g="" emag_gg="0.00000000" emag_i="" emag_r="" emag_rp="0.00100000" mag_bp="16.09300041" mag_g=""
mag_gg="15.36299992" mag_i="" mag_r="" mag_rp="14.53299999"/>
</target>
```

- <target>
 - Attributes in here v. important: these end up in the fibre info table
 - They originate from
 - the input FITS catalogue
 - Configure
 - CASU (the CNAME)
 - Data in the <photometry> sub-element are the bands we can use for fibre throughput estimates in the L1 pipeline (specifically Quick-Look on-summit)
- Configure does not remove <targets> that were not allocated:
 - Configure output → Configure input → Configure output

```

-<fields>
  -<field Dec_d="37.77170000" RA_d="290.22080000" order="">
    -<target cname="WVE_19232650+3654414" configid="1" targcat="Guides_S4.fits" targclass="STAR" targdec="36.91149110" targepoch="2015.50000000"
      targid="2050254320098866944" targname="guide_3641_1104" targpmdec="-7.76599979" targpmra="-2.70199990" targprio="10" targprog="" targra="290.86043590"
      targsrvy="GUIDES" targuse="G" targx="105.5413631924351" targy="-176.4717087473522">
      <photometry emag_bp="0.00300000" emag_g="" emag_gg="0.00000000" emag_i="" emag_r="" emag_rp="0.00100000" mag_bp="16.09300041" mag_g=""
      mag_gg="15.36299992" mag_i="" mag_r="" mag_rp="14.53299999"/>
    </target>
  </field>

```

- <target> types

-<fields>

-<field Dec_d="37.77170000" RA_d="290.22080000" order="">

-<target cname="WVE_19232650+3654414" configid="1" targcat="Guides_S4.fits" targclass="STAR" targdec="36.91149110" targepoch="2015.50000000" targid="2050254320098866944" targname="guide_3641_1104" targpmdec="-7.76599979" targpmra="-2.70199990" targprio="10" targprog="" targra="290.86043590" targsrvy="GUIDES" targuse="G" targx="105.5413631924351" targy="-176.4717087473522">

<photometry emag_bp="0.00300000" emag_g="" emag_gg="0.00000000" emag_i="" emag_r="" emag_rp="0.00100000" mag_bp="16.09300041" mag_g="" mag_gg="15.36299992" mag_i="" mag_r="" mag_rp="14.53299999"/>

</target>

-<target cname="WVE_19170694+3748299" configid="2451" fibreid="782" targcat="WD_S4" targclass="STAR" targdec="37.80831930" targepoch="2015.50000000" targid="WD298029" targname="da011400_800.dat" targpmdec="-76.80699921" targpmra="-32.19100189" targprio="6" targprog="" targra="289.27893260" targsrvy="WD" targuse="C" targx="-152.1835610362453" targy="7.996689835767069">

<photometry emag_bp="0.00200000" emag_g="0.01800000" emag_gg="0.00200000" emag_i="0.00200000" emag_r="0.01800000" emag_rp="0.00200000" mag_bp="17.79599953" mag_g="17.75499916" mag_gg="17.81800079" mag_i="18.09600067" mag_r="17.90200043" mag_rp="17.79999924"/>

<simulation dither_id="NA" filterid="2" fwhm="0.0" ifu_spaxel="NA" mag="17.8180007935" redshift="0.0" targid="WD298029" template="da011400_800.dat" velocity="-4.59999990463"/>

</target>

-<target cname="WVE_19211738+3830392" configid="2459" fibreid="13" ifu_spaxel="" targcat="CCG_S4" targclass="STAR" targdec="38.51088670" targepoch="2015.50000000" targid="154212903224043705" targname="s4250:g+2.0:m1.0:t02:z+0.50:a+0.00.AMBRE.gz" targpmdec="-0.20800000" targpmra="-2.70099998" targprio="2" targprog="NA" targra="290.32239890" targsrvy="CCG" targuse="T" targx="16.000904852181" targy="151.1904935181236">

<photometry emag_bp="" emag_g="0.00500000" emag_gg="" emag_i="0.00300000" emag_r="0.00100000" emag_rp="" mag_bp="15.28899956" mag_g="14.78899956" mag_gg="14.82800007" mag_i="13.30599976" mag_r="13.85400009" mag_rp="14.20300007"/>

<simulation dither_id="NA" filterid="9" fwhm="0.0" ifu_spaxel="NA" mag="14.7891998291" redshift="0.0" targid="154212903224043705" template="s4250:g+2.0:m1.0:t02:z+0.50:a+0.00.AMBRE.gz" velocity="-54.7147369385"/>

</target>

- <target> types

```
<target automatic="1" cname="WVE_19204977+3821154" configid="3960" fibreid="3" targdec="38.354265" targname="auto generated sky" targra="290.207387" targuse="S" targx="-2.345650113973589" targy="118.7565241879687"/>  
<target automatic="1" cname="WVE_19204752+3823447" configid="3961" fibreid="4" targdec="38.395738" targname="auto generated sky" targra="290.197986" targuse="S" targx="-3.863638052612448" targy="127.3019361873263"/>
```

Validating your XMLs

- Once you have generated your XMLs, you need to validate them with WASP
- Per xml – there is a file size limit, naming restrictions
- Bulk – as a tarball of the above xmls
- ...let's now see how you can do this in the WASP