# Summary of NCSA Validation Tests

The following summarizes the tests performed by the NCSA cone search and simple image access validators. Note that for the SIA validation there are many columns whose presences is only recommended but when included have a required format.

# NCSA Cone Search Validator Tests

## MUST/Errors

**2.1a** VOTable must contain only one RESOURCE.

**2.1b** The RESOURCE element must contain exactly one TABLE.

**2.2.1a** The TABLE must contain exactly one FIELD with ucd='ID\_MAIN'.

**2.2.1b** The ID\_MAIN column must have datatype='char'.

**2.2.1c** The ID\_MAIN column must have a string-appropriate arraysize (recommend '\*').

**2.2.1d** Values in the ID\_MAIN column must be unique.

**2.2.2a** The TABLE must contain exactly one FIELD with ucd='POS\_EQ\_RA\_MAIN'.

**2.2.2b** The POS\_EQ\_RA\_MAIN column must have datatype='double'.

**2.2.2c** The POS\_EQ\_RA\_MAIN column must not provide arraysize (non-empty) attribute.

**2.2.3a** The TABLE must contain exactly one FIELD with ucd='POS\_EQ\_DEC\_MAIN'.

**2.2.3b** The POS\_EQ\_DEC\_MAIN column must have datatype='double'.

**2.2.3c** The POS\_EQ\_DEC\_MAIN column must not provide arraysize (non-empty) attribute.

**2.2.4a** VOTABLE can not contain both a PARAM and a FIELD with ucd='OBS\_ANG-SIZE'.

**3a** Error message must appear in an INFO or PARAM with name='Error' in required location.

**3b** Error response should only contain one PARAM.

### Errors thrown by the HEASARC testing framework:

Could not find a tester class for this service [indicates an error in HEASARC metadata regarding the service]

Could not find proper handler [indicates an error in HEASARC metadata regarding the services]

Apparent communication error produced an exception inside the validator [indicates and error commicating with either the validtor service or the underlying cone search capability]

unknown error [Unhandled exception]

## Recommendations

**2.2.2c** Recommend unit='degrees' for FIELD with ucd='POS\_EQ\_RA\_MAIN'.

**2.2.3c** Recommend unit='degrees' for FIELD with ucd='POS\_EQ\_DEC\_MAIN'.

**2.3b** Recommend including DESCRIPTION under TABLE that describes what each row in the table represents.

**2.3c** Recommend an empty table (no TR elements) when SR=0.

**2b** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='bii'

**2b** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='dec'

**2b** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='lii'

**2b** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='name'

**2b** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='num\_epochs'

**2b** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='ra'

**2b** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='redshift'

**2b** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='source\_number'

**2c** Recommend specifying unit for FIELD with name='bii' when datatype is floating-point.

**2c** Recommend specifying unit for FIELD with name='dec' when datatype is floating-point.

**2c** Recommend specifying unit for FIELD with name='lii' when datatype is floating-point.

**2c** Recommend specifying unit for FIELD with name='log\_flux' when datatype is floating-point.

**2c** Recommend specifying unit for FIELD with name='log\_lx' when datatype is floating-point.

**2c** Recommend specifying unit for FIELD with name='log\_tau\_max' when datatype is floating-point.

**2c** Recommend specifying unit for FIELD with name='log\_tau\_min' when datatype is floating-point.

**2c** Recommend specifying unit for FIELD with name='ra' when datatype is floating-point.

# Simple Image Validator Tests

## Musts/Errors

**4.1** Legal query produced an ERROR result.

**4.2.1a** VOTable must contain exactly one RESOURCE with type='results'.

**4.2.1b** There must be exactly one TABLE in the RESOURCE containing the results.

**4.2.4a/a** The TABLE must contain exactly one FIELD or PARAM with ucd='VOX:Image\_Title'.

**4.2.4a/b** The VOX:Image\_Title column must have datatype='char'.

**4.2.4a/c** The VOX:Image\_Title column must have arraysize='\*'

**4.2.4b/b** The INST\_ID column must have datatype='char'.

**4.2.4b/c** The INST\_ID column must have arraysize='\*'

**4.2.4d/a** The TABLE must contain exactly one FIELD or PARAM with ucd='POS\_EQ\_RA\_MAIN'.

**4.2.4d/b** The POS\_EQ\_RA\_MAIN column must have datatype='double'.

**4.2.4d/c** The POS\_EQ\_RA\_MAIN column must be defined as a scalar--i.e. arraysize="1", arraysize="", or not provided (preferred).

**4.2.4e/a** The TABLE must contain exactly one FIELD or PARAM with ucd='POS\_EQ\_DEC\_MAIN'.

**4.2.4e/b** The POS\_EQ\_DEC\_MAIN column must have datatype='double'.

**4.2.4e/c** The POS\_EQ\_DEC\_MAIN column must be defined as a scalar--i.e. arraysize="1", arraysize="", or not provided (preferred).

**4.2.4f/a** The TABLE must contain exactly one FIELD or PARAM with ucd='VOX:Image\_Naxes'.

**4.2.4f/b T**he VOX:Image\_Naxes column must have datatype='int'.

**4.2.4f/c** The VOX:Image\_Naxes column must be defined as a scalar--i.e. arraysize="1", arraysize="", or not provided (preferred).

**4.2.4g/a** The TABLE must contain exactly one FIELD or PARAM with ucd='VOX:Image\_Naxis'.

**4.2.4g/b** The VOX:Image\_Naxis column must have datatype='int'.

**4.2.4g/c** The VOX:Image\_Naxis column must have arraysize='\*'

**4.2.4h/**a The TABLE must contain exactly one FIELD or PARAM with ucd='VOX:Image\_Scale'.

**4.2.4h/b** The VOX:Image\_Scale column must have datatype='double'.

**4.2.4h/c** The VOX:Image\_Scale column must have arraysize='\*'

**4.2.4i/a** The TABLE must contain exactly one FIELD or PARAM with ucd='VOX:Image\_Format'.

**4.2.4i/b** The VOX:Image\_Format column must have datatype='char'.

**4.2.4i/c** The VOX:Image\_Format column must have arraysize='\*'

**4.2.4j/b** The VOX:STC\_CoordRefFrame column must have datatype='char'.

**4.2.4j/c** The VOX:STC\_CoordRefFrame column must have arraysize='\*'

**4.2.4m/b** The VOX:WCS\_CoordRefPixel column must have datatype='double'.

**4.2.4m/c** The VOX:WCS\_CoordRefPixel column must have arraysize='\*'

**4.2.4n/b** The VOX:WCS\_CoordRefValue column must have datatype='double'.

**4.2.4n/c** The VOX:WCS\_CoordRefValue column must have arraysize='\*'

**4.2.4o/b** The VOX:WCS\_CDMatrix column must have datatype='double'.

**4.2.4o/c** The VOX:WCS\_CDMatrix column must have arraysize='\*'

**4.2.4p/b** The VOX:BandPass\_ID column must have datatype='char'.

**4.2.4p/c** The VOX:BandPass\_ID column must have arraysize='\*'

**4.2.4q/b** The VOX:BandPass\_Unit column must have datatype='char'.

**4.2.4q/c** The VOX:BandPass\_Unit column must have arraysize='\*'

**4.2.4r/b** The VOX:BandPass\_RefValue column must have datatype='double'.

**4.2.4r/c** The VOX:BandPass\_RefValue column must be defined as a scalar--i.e. arraysize="1", arraysize="", or not provided (preferred).

**4.2.4s/b** The VOX:BandPass\_HiLimit column must have datatype='double'.

**4.2.4s/c** The VOX:BandPass\_HiLimit column must be defined as a scalar--i.e. arraysize="1", arraysize="", or not provided (preferred).

**4.2.4t/b** The VOX:BandPass\_LoLimit column must have datatype='double'.

**4.2.4t/c** The VOX:BandPass\_LoLimit column must be defined as a scalar--i.e. arraysize="1", arraysize="", or not provided (preferred).

**4.2.4u/b** The VOX:Image\_PixFlags column must have datatype='char'.

**4.2.4u/c** The VOX:Image\_PixFlags column must have arraysize='\*'

**4.2.4v/a** The TABLE must contain exactly one FIELD or PARAM with ucd='VOX:Image\_AccessReference'.

**4.2.4v/b** The VOX:Image\_AccessReference column must have datatype='char'.

**4.2.4v/c** The VOX:Image\_AccessReference column must have arraysize='\*'

**4.2.4x/b** The VOX:Image\_fileSize column must have datatype='int'.

**4.2.4x/c** The VOX:Image\_FileSize column must be defined as a scalar--i.e. arraysize="1", arraysize="", or not provided (preferred).

**4.3a** On error, RESOURCE must include one INFO element with name="QUERY\_STATUS".

**4.3b** Errors must be reported using INFO element with name=QUERY\_STATUS and value='ERROR'.

**4.3d** Unrecognized QUERY\_STATUS: OK; must be either OK, ERROR, or OVERFLOW.

**7.1a** Metadata query produced an ERROR result.

### Errors thrown by the HEASARC testing framework:

Could not find a tester class for this service (indicates an error in HEASARC metadata regarding the service)

Could not find proper handler (indicates an error in HEASARC metadata regarding the services)

Apparent communication error produced an exception inside the validator (indicates and error commicating with either the validtor service or the underlying cone search capability)

Could not find reference URL element [Unable to find data in the the reference URL]

Could not find data format element [Unable to get the expected format for the rferenced data]

Could not find image URL [The referenced image cannot be found or has an improper format]

Unknown error [Unhandled exception]

## Should

**4.2.1c** Query results (with type='results') should be the first RESOURCE.

**4.2.2a** RESOURCE should include one INFO element with name="QUERY\_STATUS".

**4.2.4a/a** UCD VOX:Image\_Title should match documented case (VOX:Image\_Title); otherwise, some clients may fail to recognize them.

**4.2.4b/a** The TABLE should contain exactly one FIELD or PARAM with ucd='INST\_ID'.

**4.2.4d/a** UCD POS\_EQ\_RA\_MAIN should match documented case (POS\_EQ\_RA\_MAIN); otherwise, some clients may fail to recognize them.

**4.2.4d** Recommend unit='degrees' for FIELD with ucd='POS\_EQ\_RA\_MAIN'.

**4.2.4e** Recommend unit='degrees' for FIELD with ucd='POS\_EQ\_DEC\_MAIN'.

**4.2.4e/a** UCD POS\_EQ\_DEC\_MAIN should match documented case (POS\_EQ\_DEC\_MAIN); otherwise, some clients may fail to recognize them.

**4.2.4f/a** UCD VOX:Image\_Naxes should match documented case (VOX:Image\_Naxes); otherwise, some clients may fail to recognize them.

**4.2.4g/**a UCD VOX:Image\_Naxis should match documented case (VOX:Image\_Naxis); otherwise, some clients may fail to recognize them.

**4.2.4h/a** UCD VOX:Image\_Scale should match documented case (VOX:Image\_Scale); otherwise, some clients may fail to recognize them.

**4.2.4i/**a UCD VOX:Image\_Format should match documented case (VOX:Image\_Format); otherwise, some clients may fail to recognize them.

**4.2.4j/a** The TABLE should contain exactly one FIELD or PARAM with ucd='VOX:STC\_CoordRefFrame'.

**4.2.4j/a** UCD VOX:STC\_CoordRefFrame should match documented case (VOX:STC\_CoordRefFrame); otherwise, some clients may fail to recognize them.

**4.2.4m/a** The TABLE should contain exactly one FIELD or PARAM with ucd='VOX:WCS\_CoordRefPixel'.

**4.2.4m/a** UCD VOX:WCS\_CoordRefPixel should match documented case (VOX:WCS\_CoordRefPixel); otherwise, some clients may fail to recognize them.

**4.2.4n/a** The TABLE should contain exactly one FIELD or PARAM with ucd='VOX:WCS\_CoordRefValue'.

**4.2.4n/a** UCD VOX:WCS\_CoordRefValue should match documented case (VOX:WCS\_CoordRefValue); otherwise, some clients may fail to recognize them.

**4.2.4o/a** The TABLE should contain exactly one FIELD or PARAM with ucd='VOX:WCS\_CDMatrix'.

**4.2.4o/a** UCD VOX:WCS\_CDMatrix should match documented case (VOX:WCS\_CDMatrix); otherwise, some clients may fail to recognize them.

**4.2.4p/a** The TABLE should contain exactly one FIELD or PARAM with ucd='VOX:BandPass\_ID'.

**4.2.4p/a** UCD VOX:BandPass\_ID should match documented case (VOX:BandPass\_ID); otherwise, some clients may fail to recognize them.

**4.2.4q/a** The TABLE should contain exactly one FIELD or PARAM with ucd='VOX:BandPass\_Unit'.

**4.2.4q/a** UCD VOX:BandPass\_Unit should match documented case (VOX:BandPass\_Unit); otherwise, some clients may fail to recognize them.

**4.2.4r/a** The TABLE should contain exactly one FIELD or PARAM with ucd='VOX:BandPass\_RefValue'.

**4.2.4r/a** UCD VOX:BandPass\_RefValue should match documented case (VOX:BandPass\_RefValue); otherwise, some clients may fail to recognize them.

**4.2.4s/a** The TABLE should contain exactly one FIELD or PARAM with ucd='VOX:BandPass\_HiLimit'.

**4.2.4s/a** UCD VOX:BandPass\_HiLimit should match documented case (VOX:BandPass\_HiLimit); otherwise, some clients may fail to recognize them.

**4.2.4t/a** The TABLE should contain exactly one FIELD or PARAM with ucd='VOX:BandPass\_LoLimit'.

4**.2.4t/a** UCD VOX:BandPass\_LoLimit should match documented case (VOX:BandPass\_LoLimit); otherwise, some clients may fail to recognize them.

**4.2.4u/a** The TABLE should contain exactly one FIELD or PARAM with ucd='VOX:Image\_PixFlags'.

**4.2.4u/a** UCD VOX:Image\_PixFlags should match documented case (VOX:Image\_PixFlags); otherwise, some clients may fail to recognize them.

**4.2.4v/a** UCD VOX:Image\_AccessReference should match documented case (VOX:Image\_AccessReference); otherwise, some clients may fail to recognize them.

**4.2.4x/a** The TABLE should contain exactly one FIELD or PARAM with ucd='VOX:Image\_FileSize'.

**4.3.1a** Service should report syntax errors (such as bad position formats)

**4.3c** INFO element with QUERY\_STATUS not equal to 'OK' should include an error message as content.

## Recommend

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='ACCESS\_REF'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='BAND\_HILIMIT'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='BAND\_LOLIMIT'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='BAND\_NAME'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='BAND\_REFVAL'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='BAND\_UNIT'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='CD'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='CENTER\_DEC'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='CENTER\_RA'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='EQUINOX'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='FILE\_SIZE'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='FLAG\_PIX'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='FORMAT'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='FRAME'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='IMAGE\_TITLE'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='INSTRUMENT'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='NAXES'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='NAXIS'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='REF\_PIX'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='REF\_VALUE'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='REGION'

**4.2.4y** Recommend specifying datatype, ucd, and DESCRIPTION for FIELD with name='SCALE'

**4.2.4y/b** Recommend specifying unit for FIELD with name='BAND\_HILIMIT' when datatype is floating-point.

**4.2.4y/**b Recommend specifying unit for FIELD with name='BAND\_LOLIMIT' when datatype is floating-point.

**4.2.4y/**b Recommend specifying unit for FIELD with name='BAND\_REFVAL' when datatype is floating-point.

**4.2.4y/**b Recommend specifying unit for FIELD with name='CENTER\_DEC' when datatype is floating-point.

**4.2.4y/b** Recommend specifying unit for FIELD with name='CENTER\_RA' when datatype is floating-point.