Standards Change Request

Title: Add Astronomical Unit (AU) as a valid unit   **<SCR3-1162.v2>**

History:

Origination Date: 2010-03-30
Author(s): Rafael Alanis (Rafael.Alanis@jpl.nasa.gov), John Diehl (Imaging Node)
Working Group: R. Alanis (lead), B. Sword, R. Simpson

Problem:

The Moon Mineralogy Mapper (M3) instrument team requests addition of Astronomical Unit (AU) to the list of PDS-acceptable units. The solar distance value is used by the M3 team as a measure of the distance to the Sun to modulate the solar irradiance. The solar flux varies a few percent (as $1/R^2$) as the to-Sun distance varies from about 0.98 to 1.02 AU during the year. Units of AU (in meters or terameters, Tm) are requested because they are common, accepted units used to express the relative distance to the Sun.

Current Urgency:

The M3 team has just completed the PDS Peer Review and is in the process of resolving all liens in preparation for production of data products for a June, 2010 delivery.

Proposed Solution:

Add Astronomical Unit (AU) to the list of valid units. It can then be used with any keyword-value pair specifying 'length'.

Impact Assessment:

PDS Standards Reference – No impact

Archive Preparation Guide – No impact

Proposer's Archive Guide – No impact

Planetary Science Data Dictionary – Update list of accepted units in Section 2.6.

PDS tools – "AU" will need to be allowed as an alternative anywhere a 'length' value is expected. EN estimates that this will have no impact.

Priority:

High

Recommended Approval Authority:

PDS Technical Group

Additional Information:

Background: The AU, a basic non-SI unit of length for bodies within the solar system, is recognized by the International Astronomical Union (IAU) for use in astronomy and planetary science. The AU is also recognized by the National Institute of Standards and Technology (NIST). For more information see

    http://www.iau.org/science/publications/proceedings_rules/units/
    http://physics.nist.gov/cuu/Units/outside.html

        The IAU defines the AU as equal to the distance from the center of the Sun at which a particle of negligible mass, in an unperturbed circular orbit, would have an orbital period of 365.2568983 days. One AU is exactly 149,597,870.691 kilometers (roughly 150 million kilometers), slightly less than the mean Sun-Earth distance.

Abbreviations: The *IAU Style Manual* (1989, page 23) recommends 'au' while ISO 31-1 (Annex B) recommends 'AU'. NIST and the International Bureau of Weights and Measures recognize 'ua'. Generally upper case is reserved for units named after individuals; but 'au' is the commonly accepted abbreviation for 'atomic unit' and it is sometimes used to mean 'arbitrary unit'.

PDS Standards Reference: Chapter 18 appears to discourage proliferation of units "The uniform use of units of measure facilitates broad catalog searches across archive systems."   Chapter 18 also requires that each keyword have a default unit (if appropriate): "The default units for data elements in the *Planetary Science Data Dictionary* (PSDD) are determined as each element is defined and added to the dictionary." The PDS On-line Data Dictionary says the default unit for SOLAR_DISTANCE has been km since at least 1989-01-01.

PDS PSDD, Section 2.6: There is precedent for accepting units which are simple variants of other units (arcsecond and degree are alternatives for radian; day, hour, and minute are alternatives for second). All except 'bar' and 'degree Celsius' are related by an exact mathematical relationship to the fundamental SI unit; AU would become the third. From Section 2.6 we also learn that the units for radiance and irradiance, which are to be related by SOLAR_DISTANCE, are watts per square meter per steradian and watts per square meter, respectively — all conventional SI units.

Dependencies/Contingencies:

None

Requested Changes:

Planetary Science Data Dictionary,
Update Section 2.6, Units of Measurement, to include Astronomical Unit (AU).

Unit Name = Astronomical Unit
Symbol = AU
Measured quantity = length