# Exoplanet Standard Definitions and Evaluation Team (ExSDET) – Charter DRAFT

**Date:** 05-11-2016

## A. Background:

To prepare for 2020 Astrophysics Decadal Survey, the Astrophysics Division (APD) has chartered the study of four large mission concepts for prioritization by the decadal survey committee. Each study will be completed by a Science and Technology Definition Team with support from a NASA Center Study Office. The science and engineering cases for these missions will be developed and delivered to the decadal survey committee by 2019. APD coordinates all four large concept studies through the Decadal Survey Management Team (DSMT). The charter, deliverables, membership, and management plan for these studies is described at the Astrophysics Division website [1].

Exoplanet direct-imaging and spectroscopy will be performed by two of the mission concept studies: the Habitable-zone Exoplanet Imaging Mission (HabEx), the Large Ultra-Violet-Optical-Infrared Survey (LUVOIR). A common understanding of the scientific figures of merit for each mission will be essential to APD and to the Decadal Survey committee. The science metrics include but are not limited to yields for planet detection, orbit characterization, and spectroscopic characterization. The specific figures of merit for each study will be determined by each of the STDTs. Because of likely differences in input assumptions, modeling methods, and definitions of outputs the Astrophysics Division charters the Exoplanet Standard Definition and Evaluation Team (ExSDET) for these two purposes:

1. To provide science yield analyses based on transparent, unbiased, exoplanet science metrics common to both the HabEx and LUVOIR studies, and for any exoplanet direct-imaging probe-scale studies that may be later chartered by APD, and;
2. To document transparent, unbiased inputs, assumptions, and analysis methods common to both the HabEx and LUVOIR studies for production of these science metrics.

The ExSDET is Chartered by the NASA APD and coordinated and funded through the Exoplanet Exploration Program (ExEP) for APD. The ExSDET is accountable to the DSMT, and will work with the HabEx and LUVOIR STDTs to accomplish the work product. The ExSDET will adopt STDT science metrics, compare these metrics for both studies, and promote common definitions. The STDTs remain responsible for performing their own yield modeling to perform their study-specific work and specific science metrics, and may (but are not required to) make use of any tools produced by the ExSDET. The Exoplanet Technical Assessment Committee (ExoTAC) [2] will perform an independent review of the ExSDET deliverables.

## B. Deliverables:

The ExSDET is directed by the NASA Astrophysics Divisions to develop and deliver:

1. Transparent and consistent definitions, common to both large mission studies of input parameters and analysis assumptions, including but not limited to: planet and star properties, star lists, instrument properties, and detection thresholds;

[1] http://science.nasa.gov/astrophysics/2020-decadal-survey-planning/
[2] https://exoplanets.jpl.nasa.gov/exep/technology/enabling-technologies/

2. Transparent and unbiased analysis tools to provide analyses based on science metrics common to both the HabEx and LUVOIR studies, including:
    a. A Program analysis tool developed based on module additions to Dmitry Savransky's open-source tool funded under WFIRST Preparatory Science funding[3],[4]
    b. Complementary analysis using other tools (e.g. Altruistic Yield Optimization developed by Chris Stark, or others at the ExSDET discretion) to validate the science metrics of the Program analysis tool
3. Physics-based instrument models to accommodate specific internal and external mask designs;
4. Test cases to validate the models;
5. Periodic comparisons to APD for exoplanet science metrics common to both studies, tied to the interim and final STDT deliverables defined in the Management Plan for Large Concept Studies;

**C. Period of Performance:**

The period of performance will be 6/1/2016 through the concept study delivery the Decadal Survey committee (currently March 2019 per the Management Plan)

**D. Membership**

The ExSDET is a small team composed of analysis experts from the general science community. The following individuals will participate as ExSDET members. The HabEx and LUVOIR teams will appoint a liaison to the ExSDET.

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| Dr. Rhonda Morgan | Lead, NASA ExEP, JPL, California Institute of Technology |
| Dr. Bruce Macintosh | Stanford University |
| Dr. Dimitri Savransky | Cornell University |
| Dr. Chris Stark | Space Telescope Science Institute |
| Dr. Avi Mandell | NASA Goddard Spaceflight Center |
| Dr. Ruslan Belikov | NASA Ames Research Center |
| Dr. John Krist | NASA Jet Propulsion Laboratory, California Institute of Technology |

STDT Liaisons: *(pending STDT chair confirmation)*

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|---|---|---|
| Tbd | tbd | (LUVOIR) |
| Tbd | tbd | (HabEx) |

The ExSDET may seek subject matter expert advice from the large concept study STDTs, and may adjust membership over time depending on the work requirements that follow from the STDT large concept study designs and science cases.

[3] http://wfirst.gsfc.nasa.gov/science/sdt/wps/WPS_Investigations.pdf
[4] https://github.com/dsavransky/EXOSIMS

**Approved:**

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