

MEMO

Date:	10/10/2022	Ref.:	EUCL-EST-ME-8-009
From:	R. Laureijs on behalf of the EST	Visa:	
To:	ESA		
Copy:	Public document		

Subject: Allocation of Euclid science time during the nominal mission

1. Introduction

This memo specifies the understanding of the Euclid Science Team (EST) about the allocation of science time during the Euclid nominal mission, which is the 6-year period after the commissioning phase. The understanding is based on the instructions provided in the Euclid Science Management Plan (SMP, [AD1]) and is detailed in Section 2 below. Section 3 describes the role of the EC and the definition of the allocated time. Section 4 deals with the treatment of the unallocated time and provides a policy for usage of this time for legacy surveys. Section 5 outlines the legacy surveys' processing and the time allocation.

2. EST overseeing the Euclid science time during the nominal mission

In the SMP section 3.1, the survey plan is not listed as a deliverable by the Euclid Consortium (EC, denoted as EMC in the SMP). The survey is mentioned to relate tasks for the Project Scientist (PS) and EST. For the PS: "He/she monitors the execution of the survey and the exploitation of the data to ensure that the scientific objectives of the mission can be achieved in a timely manner and to maximise Euclid's scientific output within programmatic constraints." and "The ESA Project Scientist defines the Euclid-specific observing requirements based on

the scientific guidelines provided by the EST. He/she approves the resulting observing plan which is produced by the SOC before it is sent to MOC for execution" (SMP section 3.2).

For the EST, the definition of the *survey strategy* is listed as a main task: the EST should give recommendations to the PS regarding "formulating, optimising, and maintaining the survey strategy and the calibration strategy" (SMP section 3.3). A dedicated Survey Scientist is appointed "who plays a key role in the definition and optimisation of the surveys and monitor its execution." The term survey strategy is given here in italic because at the time of writing of the SMP people were thinking of a survey strategy rather than a (pointing) plan. Considering Euclid to be a survey mission, it was assumed to use only one single operational mode for the scientific observations with a systematic and rigid description of the sky scanning strategy, see for instance Planck or Gaia. However, with the present mission design, Euclid will use different observing modes for the deep and wide surveys and the wide survey consists of patches of sky for which size, placement and coverage are determined by a complex algorithm. In addition, the patches are interspersed with routine calibration observations which can have dedicated observing modes.

The SMP section 2.6 states: "However the EST, after proper analysis and evaluation, may recommend changes to the design or to the operations of the satellite that are deemed to have a positive impact on Euclid legacy science in general."

The Euclid SMP has also considered the possibility of additional or *legacy* surveys. Section 2.1 of the SMP states: "The Euclid instruments and pointing capabilities offer the possibility to carry out surveys serving science topics beyond those of the wide and deep surveys. If time windows for such observations exist during the later mission phases, and in a way not affecting the completion of the wide and deep surveys, the EST shall define a mode for scientific use of this opportunity."

It can be concluded that the EST has to set the guidelines for the usage of the science time during the nominal mission, it is the only body entrusted to take this role. The EST defines the entire Euclid survey strategy to satisfy the needs of the core science governed by the EC (wide survey, deep surveys, and calibrations), and any legacy survey that can be accomplished in the nominal mission calling out that one of the criteria for selection of additional surveys will be careful consideration of the potential impact on the Euclid core surveys. This matches well with the EST ownership of the Science Requirements Document (SciRD), which includes the top-level requirements for the wide and deep surveys.

3. The role of the Euclid Consortium defining the allocated time.

Already during the definition study phase, it was recognized that the SciRD requirements demand a large effort to construct a survey plan that fits the nominal mission. A survey group was established for the implementation of the science requirements and matching all mission constraints. The EC has taken the lead in the definition of the survey because of their close connection with the primary science requirements and capabilities of the scientific instruments. Note that the transfer of science-related tasks from project to the EC was also applied to the SGS at an earlier stage. As a consequence, observing time is allocated to the EC to schedule the wide, deep, and routine calibration observations during the 6 year nominal mission. The survey plan is in accordance with the SciRD requirements and the calibration programme, the latter flowing down from the science requirements. This defines the “allocated time” for the nominal survey.

4. Unallocated time and policy for usage

The remaining time, defined as the *unallocated time*, is owned by ESA, and will be administered by the PS using input from the EST. The PS will inform the ESA Executive so that, if the plan goes beyond what is stated in the SMP, it can be brought to the attention of the Advisory Structure in a timely manner.

After the start of the nominal mission, white papers for the use of the unallocated time will be solicited from the general community including the Euclid Consortium with the objective to enable the competition of science ideas, rather than the competition between teams. Since the total amount of unallocated time depends on the scientific and operational performances, there are no guarantees for execution, there will be only a priority list of the legacy surveys that have been selected as described below.

ESA, advised by the EST, will release and process such a call. The work would involve ESA, mostly the SOC, to prepare the call, process the white papers, and support proposers. The white papers are assessed by the EST or by an independent time allocation committee (TAC) appointed by the EST; such a committee would include significant representation from the Euclid Consortium. If a proposal is accepted the EST shall approve the allocated observing time, the pointing and scheduling requirements and the subset of

standard L2 products. The process requires commitment from the both the EC and ESA to carry out the feasibility assessment, the eventual planning of the additional surveys, and the processing of the L2 data by the SGS. Details of the end-to-end handling of the unallocated time will be given elsewhere.

The data have no proprietary time period. The L2 products approved by the EST and processed by the nominal SGS processing functions will be released at latest to the public at the next earliest possible data release, which can be a Q or DR release. In practice this happens within one year of observation. Before release, no scientific analysis is allowed with these data.

5. Processing of white papers and time allocation

ESA/SOC shall provide information or tools that help the submission of technically feasible white papers. This includes an accounting of the available unallocated time periods, visibility maps, survey footprint and coverage maps, etc. The feasibility reports are provided to the EST/TAC who will provide a time allocation, priority, and observing request. The consolidated technical implementation shall be ready on time such that the routine scheduling cycle is respected.

After selection, the EST will assign to each legacy survey a prioritisation and an endorsed observing request.

An observing request contains (1) the observing block sequence, and (2) scheduling request. Only the standard reference observing sequence (ROS), a ROS flavour (cycling rule) or a ROS with allowed configurable parameters shall be executed. The scheduling request consists of a description of the sky area(s) to be covered, number of repetitions or magnitude limit, cadence and time constraint if applicable.

6. Additional Remarks

Following the discussion in 2019, EST decided to accept and allocate proposals only after launch when the in-orbit performances of the instruments and survey are sufficiently established.

The time allocation for the two months commission phase, consisting of the spacecraft commissioning and performance verification phases is not part of the



nominal mission and is controlled by ESA. The scientific value of the dedicated calibration and characterisation measurements collected during commission is acknowledged. Scientific (data) products that can be obtained from these observations are released only after the calibration and/or scientific validation purposes have been fulfilled.

Reference

[AD1] ESA/SPC(2012)19: Euclid Science Management Plan, version 2.4 (24/05/2013)