

|  |
| --- |
|  |
| TMT.SEN.MGT.18.028.REL01 |

June 21, 2018

**Document Approval**

**Prepared By:**

|  |
| --- |
| //signature on file //  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Kyle Kinoshita  Telescope Structure Group Leader |

**Concurrence:**

|  |
| --- |
| //signature on file //  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Gelys Trancho  Sr. Systems Engineer |

**Document Change Record**

|  |  |  |  |
| --- | --- | --- | --- |
| **Revision** | **Change Approval** | **Release Approval** | **Date Released** |
| REL01 | Initial Release | Docushare Routing # 33781 | 21 Jun 2018 |

**Table of Contents**

1 Introduction 5

1.1 Purpose and Scope 5

1.2 Objective 5

1.3 Reference Documents 5

1.4 Acronyms 5

2 Project Plan 6

2.1 Description 6

2.2 Tools 6

2.3 Deliverables 6

3 Management Plan 7

3.1 Overview 7

3.2 Risks 7

3.2.1 TUS CAD model incomplete or not containing enough information 7

3.3 Roles and Responsibilities 7

3.3.1 Intern 7

3.3.2 Mentors 7

3.4 Project Milestones 7

# Introduction

## Purpose and Scope

This document describes the project to calculate mass properties of the Telescope Utility Services (TUS) and Services (SER) distribution items along the TUS routing path for the TUS preliminary design.

## Objective

The objective of this project is to develop a systematic process for, and tools to tabulate a mass properties estimate of fluid filled TUS and SER distribution items.

This estimate defines the mass properties for all TUS and SER distribution items along the utilities routing path from the Azimuth Wraps Entrance Areas to the Last Mile drop-point for each consumer subsystem. All distribution items along the routing path are defined systematically, following the SER distribution identification scheme described in RD2.

Mass properties include the mass, volume, center of mass and moments of inertia of the object. The mass properties estimate will be used to verify compliance to the Mass Budget for Telescope Mounted Subsystems (RD3) and Mass Estimation Summary for TEL.STR (RD4).

## Reference Documents

1. [TMT Acronyms and Abbreviations](https://docushare.tmt.org/docushare/dsweb/Get/Document-8283/) (TMT.PMO.MGT.07.013)

1. [TMT Services Distribution Identification Scheme](https://docushare.tmt.org/docushare/dsweb/Get/Document-64630/) (TMT.SEN.SPE.17.004)

1. [Mass Budget for Telescope Mounted Subsystems](https://docushare.tmt.org/docushare/dsweb/Get/Document-8607/) (TMT.SEN.TEC.07.028)

1. [Mass Estimation Summary for TEL.STR](https://docushare.tmt.org/docushare/dsweb/Get/Document-49372/) (TMT.STR.TEC.15.454)

1. [TUS PDR Design Description Documents](https://docushare.tmt.org/docushare/dsweb/View/Collection-12629) (Collection-12629)

1. [TUS PDR CAD Models/Model Description](https://docushare.tmt.org/docushare/dsweb/View/Collection-12631) (Collection-12631)

1. [TMT Coordinate Systems and Transforms](https://docushare.tmt.org/docushare/dsweb/Get/Document-8763/) (TMT.SEN.TEC.07.031)

1. [TUS Akamai Project – Mass Properties](https://docushare.tmt.org/docushare/dsweb/View/Collection-20097) (Collection-20097)

## Acronyms

A complete list may be found in TMT Acronyms and Abbreviations (RD1).

# Project Plan

## Description

The objective of this project is to develop a systematic process for, and tools to tabulate a mass properties estimate of fluid filled TUS and SER distribution items. An independent mass properties estimate for these components is to be delivered. This independent estimate will be compared to the TUS Contractor M3 Engineering (M3E) provided estimate.

The mass properties estimate will be divided into subassemblies described in [**TM-N61030 - List of TUS CAD model**](https://docushare.tmt.org/docushare/dsweb/Get/Document-68102/TM-N61030_list%20of%20TUS%20CAD%20model.xlsx)

The following coordinate systems will be used, as described in RD7:

* 1. OCRS for Foundation
  2. ACRS for AZ
  3. ECRS for EL

The TUS and SER distribution items are described in the CAD model, as well as the TUS PDR reports in RD5 and RD6.

The Navisworks and STEP CAD model files prepared by the TUS Contractor representing the TUS and SER distribution items are located in PDM in the directory path \TIO\Inbox\M3 Engineering\.

The Navisworks CAD model files prepared by the STR Contractor Mitsubishi Electric (MELCO) representing the Telescope Structure (STR) are located in PDM in the directory path \TIO\Inbox\MELCO\_IN\.

The mass budgets are listed in RD3 andRD4 RD4.

Requirements for the inputs and outputs of the tools developed are to be established in conjunction with the TUS Contractor Lead CAD Engineer.

## Tools

Information on the TUS and SER mass properties are found in the Solidworks PDM, Navisworks and Solidworks tools. The mass properties are provided in Microsoft Excel.

## Deliverables

• (Research) Understanding STR, TUS and SER

• Explore Navisworks/Solidworks to identify TUS/Services

• Identify Excel template for defining mass properties along the TUS/SER utility path

• Calculate mass properties

• Compare to mass budget

• Prepare Report on mass properties

All project deliverables should be uploaded to the TUS Akamai Project – Mass Properties folder (RD8) on Docushare (DCC).

# Management Plan

## Overview

Initial development of the mass properties is to be carried out over summer 2018 as an intern project lasting 7 weeks. The resulting effort forms the basis for continuing development of TUS mass and evaluation of supporting Mass budgets, carried out by TMT project office staff.

## Risks

### TUS CAD model incomplete or not containing enough information

Risk: If the CAD model is broad, unspecific, or vague, it will be difficult to determine the appropriate mass properties.

Mitigation: Note any difficult path/routing or missing/unclear information, and then set it aside. Work on the easy information first. Provide the mentor a list of difficult issues at least each Friday. Come back to these difficult ones at the end, and work with the mentor to complete them.

## Roles and Responsibilities

### Intern

Keoki Massad:

* Carry out the work described in this plan
* Maintain the schedule, and alert mentor as soon as the schedule slips
* Seek help promptly when difficulties arise
* Organize mass properties template and calculations
* Prepare and deliver final presentation

### Mentors

Kyle Kinoshita, Gelys Trancho, Jamie Nakawatase, Amir Sadjadpour, and Hiroshi Terada

* Develop this project plan
* Monitor schedule and replan as necessary
* Be available to answer questions and provide feedback on ongoing work
* Participate in review of mass properties template and calculations
* Provide advice and support for the dry run and final presentation

## Project Milestones

June 22: First day (DCC training, project kick off)

June 25: PDM/Navisworks training completed

June 26-29: Research and understand TUS, SER and the CAD models

July 6: Provide mass properties template

July 13: Mass properties of utilities at floor 0-2

July 20: Mass properties of utilities at floor 3-4

July 27: Mass properties of utilities at floor 5-7

August 3: Compare with TMT STR/TUS mass budgets

August 8: Dry run presentation

August 14: Final presentation