



FM-1.

JEM-X Detector Assembly
for
INTEGRAL Satellite

Determination of Center of Gravity Position.

(IN-13-JEM-0110)

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1. INTRODUCTION

Flight Model 1 of Jem-X Detector Assembly is one of the two detectors to be flown on the Integral satellite. After the Detector Assembly, consisting of the Detector part and the electronic read out box, (the so-called DFEE box), were fully assembled, the Center of Gravity was determined. This document shows the results of the Center of Gravity determination. During the CoG determination the unit was weight several times. These data were used also to determine the weight of the FM1.

2. METHOD OF DETERMINATION

The determination of the position of the Center of Gravity was done with the help of the single electronic Metler weight and the special jig holding the Jem-X detector assembly. The jig had two parallel support lines allowing the jig to function like a simple lever beam. The Detector Assembly (DA) is bolted to the jig without any dowel pins corresponding to the way the DA is mounted to the Alenia interface on the satellite. This secures the positioning accuracy of the order of tenth of the mm. Other factors contribute to the overall CG determination accuracy that is evaluated to be of an order of ± 0.4 mm.

The whole procedure was commissioned before its application for the FM1 Detector Assembly by measuring the CG position of the simple object with the Center of Gravity determined by simple geometrical calculations.

3. CG-DETERMINATION SEQUENCE

The Detector Assembly was bolted to the jig composed so the CG could be determined in the X direction. The jig was placed in two 180° opposite positions allowing the determination of the support forces acting on the two parallel line supports.

The distance between the supports and the Origo of the Unite Coordinate System was also determined for these two positions.

The numbers determined are loaded into the Spreadsheet prepared for quick calculations of the CG position with respect to Origo of UCS.

The procedure is repeated for the Y and Z-axes.

4. RESULTS of CENTER of GRAVITY DETERMINATION

As seen from the enclosed encl.1 the center of gravity of FM1 with respect to the Unite Coordinate System is positioned in the point XYZ=(50,7; 158.3; 175,2) mm.

5. RESULTS of THE WEIGHT DETERMINATION

The enclosed encl.2 shows the results of the weight determination. The overall weight of the Jem-X Detector Assembly excluding the satellite interface bolts and connector savers was determined to be 27.6 kg.

Calculation of Center of Gravity					
Write in test results in framed boxes					
Fixture is base-plate + stand.					
Test weighing of fixture without item for finding weight composants.					
The fixture is weighed at one end at a time (base-plate horizontal)					
Distance between supports				500	mm
Weight +X direction on item				9690	gram
Weight -X direction on item				9090	gram
Summation				18780	gram
(X direction is defined as the items axis)					
X-coordinate of +X support line				287	mm
Weight of item (control)				8713	gram
Weighing with item mounted in X-direction					
Weight +X direction				24390	gram
Weight -X direction				22260	gram
Summation				46650	gram
Minus fixture weight:					
Weight item +X direction				14700	gram
Weight item -X direction				13170	gram
Summation (see weight of item)				27870	gram
Distance center of gravity from +X support line.				236.3	mm
Distance X-direction on item from origo.				50.7	mm

Test weighing of fixture without item for finding weight composants.						
The fixture is weighed at one end at a time (base-plate horizontal)						
Distance between supports				500	mm	
Weight +Y direction on item				9760	gram	
Weight -Y direction on item				9750	gram	
Summation				19510	gram	
(Y direction is defined as the items axis)						
Y-coordinate of +Y support line				409.6	mm	
Weighing with item mounted in Y-direction						
Weight +Y direction				23590	gram	
Weight -Y direction				23720	gram	
Summation				47310	gram	
Minus fixture weight:						
Weight item +Y direction				13830	gram	
Weight item -Y direction				13970	gram	
Summation (see weight of item)				27800	gram	
Distance center of gravity from +Y support line.				251.3	mm	
Distance Y-direction on item from origo.				158.3	mm	

Test weighing of fixture for finding weight composants					
Distance between supports				500	mm
Weight +Z direction				9760	gram
Weight -Z direction				9750	gram
Summation				19510	gram
Z-coordinate of +Z support line				424.5	mm
Weighing with item mounted in Z-direction					
Weight +Z direction				23690	gram
Weight -Z direction				23600	gram
Summation				47290	gram
minus fixture weight					
Weight item +Z direction				13930	gram
Weight item -Z direction				13850	gram
Summation (see weight of item)				27780	gram
Distance center of gravity from +Z support line.				249.3	mm
Distance Z-direction on item from origo				175.2	mm

Avarage Weight of Object:					
Weight determined					
during measurement in X-direction:				27870	grams
Weight determined					
during measurement in Y-direction:				27800	grams
Weight determined					
during measurement in Z-direction:				27780	grams
Avarage weight:				27816.67	grams
Dedacted weight of bolts				-64	grams
Dedacted weight of connector savers				-150	grams
Weight of item:				27.60	kg