

**From:** Tirso Velasco <tvelasco@rssd.esa.int>  
**To:** Niels Lund <nl@dsri.dk>,  
"Juana =?iso-8859-1?Q?Mar=EDa?= Rodrigo" <Juana.M.Rodrigo@uv.es>  
**Subject:** About JEM-X Mask  
**Date:** Fri, 05 Jul 2002 12:38:30 +0200

Dear Niels,

I have been checking the questions you sent me last Wednesday. Sorry for the delay.

Here are the answers:

- \*Inside/outside radius of 1st ring: 45.0/48.0 mm, 3 mm OK! (Sorry, I didn't remember this value was not 2.2mm!)
- \*Inside/outside radius of 2nd ring: 114.9/117.1 mm 2.2 mm OK!
- \*Inside/outside radius of 3rd ring: 210.0/212.2 mm 2.2 mm OK!
- \*Inside radius of interface ring: 267.5 mm

\*Outside radius of interface ring:

This is not an easy question, the geometry of the ring is complicated and different radius can be measured from 271mm (minimum) to 282.5 mm (maximum, that is the value you proposed). As an approach, the profile of the ring is a C-form. The height of the C is 38mm. The outer radius for the "C" top (14mm height along approximately 5/9 the ring circumference and 3mm height on the other 4/9) is 276.5mm. The outer radius of the middle (which is the narrow part of the "C", 20mm height in 5/9 circumference and 31 in the other 4/9) is 271mm. The outer radius of the bottom part (4mm height) is 274,5mm.

And apart from these profile you can find the greater radius at the I/F points with the Upper Strongback (6 points, 22mm wide, 5mm high) and with the INTEGRAL PLM (12 points, 24mm wide, 4mm high; but two of them 34mm wide).

- \* Outside radius of threaded cylinders on 1st and 2nd ring: 4.5 mm OK!
- \* Also consider the cylinders on the 3rd ring: 4.5mm. This dimension was 3.5mm in the CDR but was changed and a Change Notice was issued

- \* 6 major spokes at 60 degree intervals from 1st ring to interface ring. Additionally 6 minor spokes between 2nd and 3rd ring at 30 degrees from major spokes. OK!

Lower exoskeleton:

- \* 21 mm high everywhere except for minor spokes and 2nd and 3rd ring which are only 10 mm high. OK!, notice that, at the end of the major spokes (radius >250mm in the interface with the ring), it increases uniformly to 25mm.
- \* Width: 2.2 mm everywhere except 1st ring which is 3 mm wide. OK!
- \* Material: Titanium Alloy. Density: 4.4 g/cm<sup>3</sup> (instead of 4.5gr/cm<sup>3</sup>). The composition is Ti4Al6V. This value is theoretical, if needed we still have the material and we can calculate the density more accurately)

Upper exoskeleton:

- \* 1st ring: 21 mm high and 3 mm wide. OK!

- \* 2nd and 3rd ring and minor spokes: 10 mm high and 2.2 mm wide. OK!
- \* Major spokes: 21 mm within 116 mm radius, between 116 mm and 262.5 mm uniformly decreasing to 17.5 mm. Width: 2.2 mm everywhere.

According to my calculations, I would say: "21 mm within 122 mm radius, between 122 mm and 256 mm uniformly decreasing to 16 mm. From there to the I/F with the Ring (up to radius 267.5mm) decreases to 15mm". It depends on where you consider the slopes to start, in any case the differences I think are negligible.

The interface with the Ring consists of an horizontal flat piece (21mmx13.5mm base x3mm high) with two 4.5diam holes, a vertical flat trapezium piece (2x21mm bottom base, 2x12mm top base, 15mm high), and a triangle vertical flat piece between both (base: 12mm, height: 11.5mm)

- \* Width: 2.2 mm everywhere OK!
- \* Material: Titanium. density: The same as before

Pretension blocks:

- \* Material: CuBe. density: 8.25 g/cm<sup>3</sup> (instead of 8.4g/cm<sup>3</sup>). We also have material if a deeper test is needed.
- \* Be content: 2% Be, 98% Cu. We have the chemical analysis from the provider, with the content of the rest of elements, if needed.
- \* Geometry: It is not an easy question either. There are 4 different sort of pieces but all very similar. I have drawn by hand the dimensions of the most representative (28 of the total 44 pieces), you can consider all are the same. I am sending to you this drawing by fax. If needed, we have in Valencia spare pieces and can send to you one.

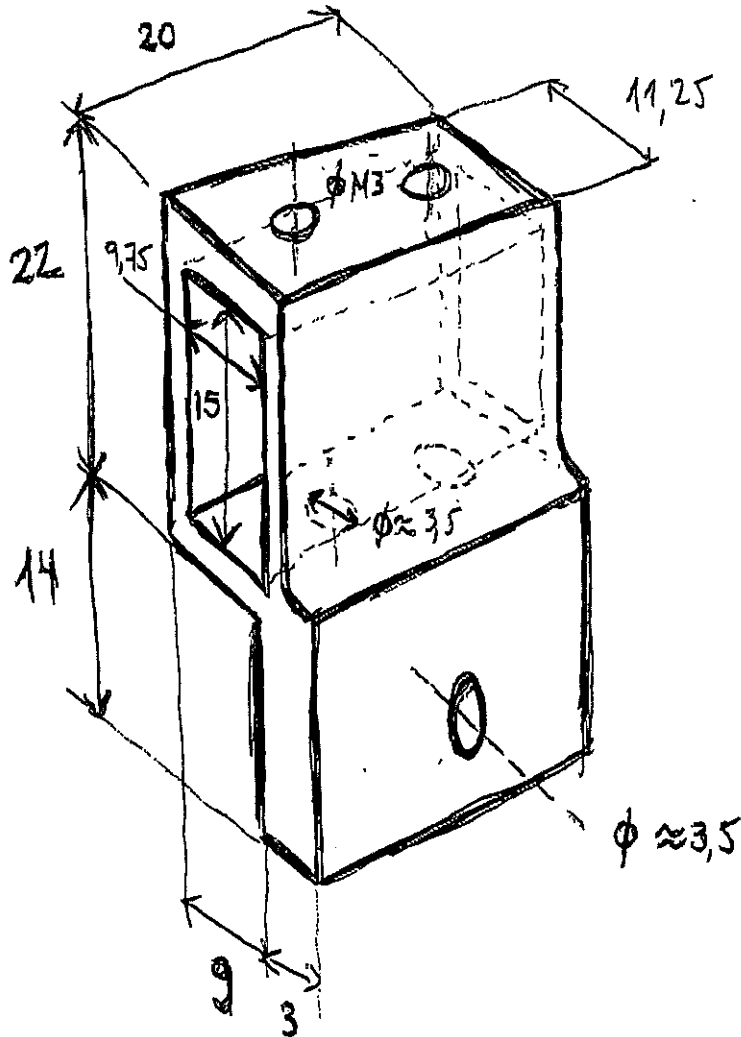
I hope it has been useful. For further information, do not hesitate to contact me. My phone here is +31 71 565 3571.

Best regards,

Tirso Velasco

to : Niels Lund / DSPi  
from : Tirso Velasco / ESTEC  
05/07/02

Dear Niels,  
here you have a scheme of a pretension piece of the  
JEM-x Mask.

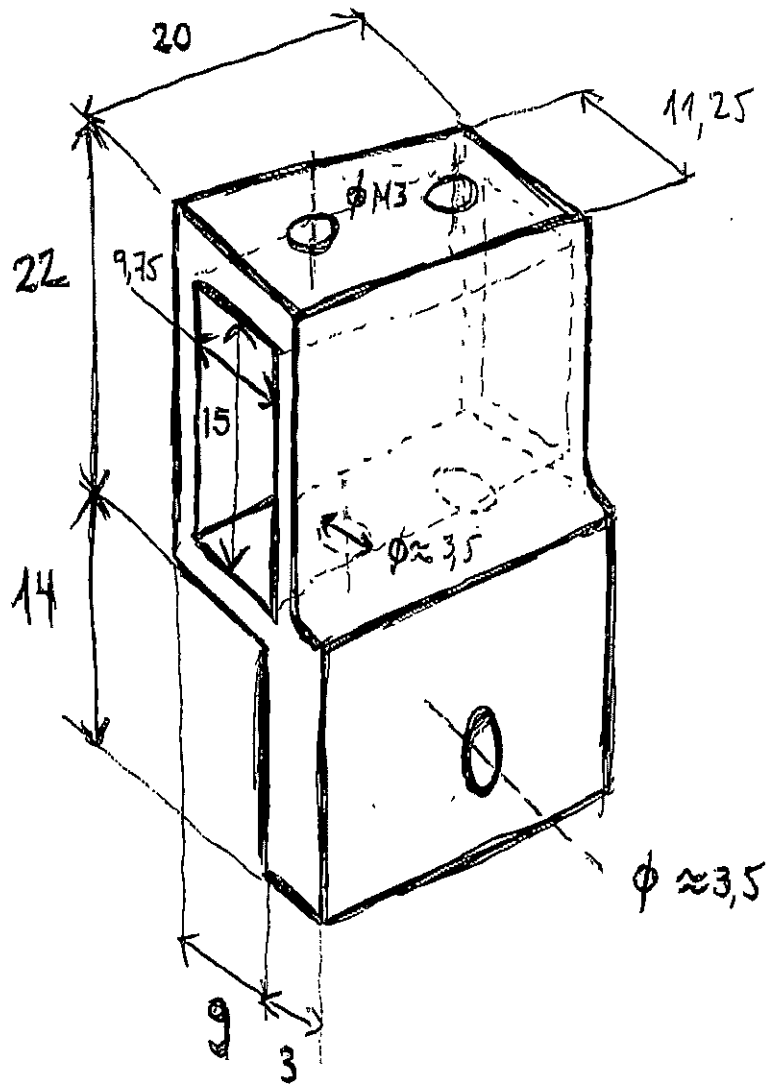


Best regards,

Tirso

to : Niels Lund / DSPi  
from : Tirso Velasco / ESTEC  
05/07/02

Dear Niels,  
here you have a scheme of a pretension piece of the JEM-X Mask.



Best regards,

Tirso

From: Tirso Velasco <tvelasco@rssd.esa.int>  
To: Niels Lund <nl@dsri.dk>  
Subject: JEM-X Ring Mass  
Date: Fri, 05 Jul 2002 13:08:09 +0200

Dear Niels,

I have been thinking that it could be a solution for the complicated geometry of the ring to considered as simply limited by to cylinders, the inner with radius 267.5mm, and the outer with an "average" radius. The height being 38mm.

In order to calculate this average radius you can consider the total mass of the ring, which is 1.33kg (this value, not measured, comes from the design report) and the density of the ring.

Best regards,

Tirso Velasco

Delivered-To: nl@dsri.dk  
Date: Thu, 27 Jun 2002 16:49:31 +0200  
From: Tirso Velasco <tvelasco@rssd.esa.int>  
X-Accept-Language: en  
MIME-Version: 1.0  
To: Niels Lund <nl@dsri.dk>, "Juana María Rodrigo" <Juana.M.Rodrigo@uv.es>  
Subject: JEM-X Strongback thickness

Dear Niels,

with respect to your question about the thickness of the ribs of the JEM-X Strongbacks, we have checked the dimensions from the Masks Drawings. I forward you the mail Juana has sent me from Valencia.

The dimension is 2.2mm for both upper and lower Strongbacks.

For more information, please ask.

Best regards,

Tirso Velasco

P.S. The drawings above mentioned should be included in the Mask EIDP. However the reduction to an A3 format may make difficult to understand all details.

> Dear Tirso following your email on the JEM-X Masks Strongbacks ribs  
> thickness we can confirm you that this parameter is 2.2 mm, according  
> to manufacturing drawings reference IN-JX-SR-DW-610-00 Sheet 5/7 & 6/7  
> (Upper and inner strong back respectively). Please do not hesitate to  
> contact us for any additional information may be required Cheers Juana  
> M<sup>a</sup> Rodrigo  
> GACE University of Valencia  
> PO Box 22085 E-46071 Valencia

[1] "" HTML, 1677 bytes

*ibiseskee1.gif  
ibiseskee2.gif  
ibisesensi.doc*

*ISSGRifm.ps*

*ajd@phastk.soton.ac.uk*

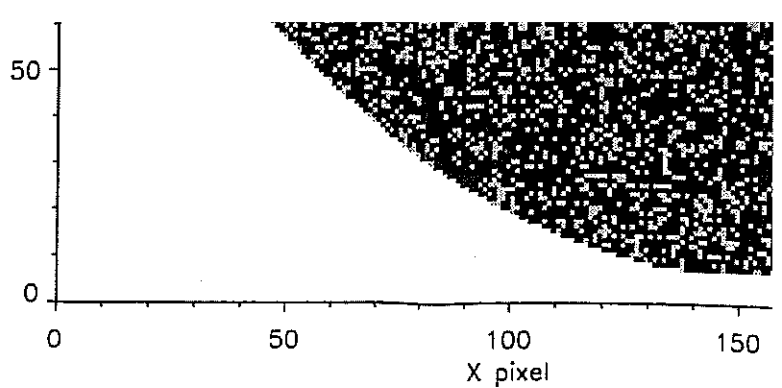


Figure 8: The coded mask pattern

```

BITPIX 16 / 16-bit integers
NAXIS 2 / Number of data axes
NAXIS1 200 / Length of data axis 1
NAXIS2 200 / Length of data axis 2
EXTNAME JMX1-MASK-MOD / Extension name
EXTREL 'MODIF' / ISDC release number
BASETYPE DAL_ARRAY / Data Access Layer base type
TELESCOP INTEGRAL / Telescope or mission name
ORIGIN DSRI / Origin of FITS file
INSTRUME JMX1 / Instrument name
CREATOR String / Program that created this FITS file
CONFIGUR String / Software configuration
DATE UTC_format / FITS file creation date
NU 22501 / Unit pattern size
R 1133 / Multiplier
EXPAND 1.030 / Expanding factor
RAD_MASK 267.5 / [mm] Radius of mask
RAD_UPAT 267.5 / [mm] Radius of unit pattern
RHO 1.650 / [mm] Half size of unit cell
TIMSIZ 200 / Matrix size of pattern
GHOSTY1 -0.057544 / [rad] Y ghost source center 1
GHOSTZ1 0.133056 / [rad] Z ghost source center 1
GHOSTY2 0.0864579 / [rad] Y ghost source center 2
GHOSTZ2 0.116363 / [rad] Z ghost source center 2
GHOSTY3 0.144002 / [rad] Y ghost source center 3
GHOSTZ3 -0.0166935 / [rad] Z ghost source center 3
GHOSTY4 0.057544 / [rad] Y ghost source center 4
GHOSTZ4 -0.133056 / [rad] Z ghost source center 4
GHOSTY5 -0.0864579 / [rad] Y ghost source center 5
GHOSTZ5 -0.116363 / [rad] Z ghost source center 5
GHOSTY6 -0.144002 / [rad] Y ghost source center 6
GHOSTZ6 0.0166935 / [rad] Z ghost source center 6
RMIN_RG1 45.0000 / [mm] Exoskeleton parameter
RMAX_RG1 48.0000 / [mm] Exoskeleton parameter
RMIN_RG2 114.900 / [mm] Exoskeleton parameter
RMAX_RG2 117.100 / [mm] Exoskeleton parameter
RMIN_RG3 210.000 / [mm] Exoskeleton parameter
RMAX_RG3 212.200 / [mm] Exoskeleton parameter
X_BT1_01 49.5000 / [mm] Exoskeleton parameter
Y_BT1_01 0.00000 / [mm] Exoskeleton parameter
X_BT1_03 24.7500 / [mm] Exoskeleton parameter
Y_BT1_03 42.8680 / [mm] Exoskeleton parameter
X_BT1_05 -24.7500 / [mm] Exoskeleton parameter
Y_BT1_05 42.8680 / [mm] Exoskeleton parameter
X_BT1_07 -49.5000 / [mm] Exoskeleton parameter
Y_BT1_07 0.00000 / [mm] Exoskeleton parameter
X_BT1_09 -24.7500 / [mm] Exoskeleton parameter
Y_BT1_09 -42.8680 / [mm] Exoskeleton parameter
X_BT1_11 24.7500 / [mm] Exoskeleton parameter
Y_BT1_11 -42.8680 / [mm] Exoskeleton parameter
R_BT1 4.50000 / [mm] Exoskeleton parameter
X_BT2_01 116.000 / [mm] Exoskeleton parameter

```

Y\_BT2\_01 0.00000 / [mm] Exoskeleton parameter  
X\_BT2\_03 58.0000 / [mm] Exoskeleton parameter  
Y\_BT2\_03 100.459 / [mm] Exoskeleton parameter  
X\_BT2\_05 -58.0000 / [mm] Exoskeleton parameter  
Y\_BT2\_05 100.459 / [mm] Exoskeleton parameter  
X\_BT2\_07 -116.000 / [mm] Exoskeleton parameter  
Y\_BT2\_07 0.00000 / [mm] Exoskeleton parameter  
X\_BT2\_09 -58.0000 / [mm] Exoskeleton parameter  
Y\_BT2\_09 -100.459 / [mm] Exoskeleton parameter  
X\_BT2\_11 58.0000 / [mm] Exoskeleton parameter  
Y\_BT2\_11 -100.459 / [mm] Exoskeleton parameter  
R\_BT2 4.50000 / [mm] Exoskeleton parameter  
X\_S\_01\_1 49.5000 / [mm] Exoskeleton parameter  
Y\_S\_01\_1 0.00000 / [mm] Exoskeleton parameter  
X\_S\_01\_2 277.000 / [mm] Exoskeleton parameter  
Y\_S\_01\_2 0.00000 / [mm] Exoskeleton parameter  
X\_S\_02\_1 101.412 / [mm] Exoskeleton parameter  
Y\_S\_02\_1 58.5500 / [mm] Exoskeleton parameter  
X\_S\_02\_2 181.865 / [mm] Exoskeleton parameter  
Y\_S\_02\_2 105.000 / [mm] Exoskeleton parameter  
X\_S\_03\_1 24.7500 / [mm] Exoskeleton parameter  
Y\_S\_03\_1 42.8680 / [mm] Exoskeleton parameter  
X\_S\_03\_2 138.500 / [mm] Exoskeleton parameter  
Y\_S\_03\_2 239.889 / [mm] Exoskeleton parameter  
X\_S\_04\_1 0.00000 / [mm] Exoskeleton parameter  
Y\_S\_04\_1 117.100 / [mm] Exoskeleton parameter  
X\_S\_04\_2 0.00000 / [mm] Exoskeleton parameter  
Y\_S\_04\_2 210.000 / [mm] Exoskeleton parameter  
X\_S\_05\_1 -24.7500 / [mm] Exoskeleton parameter  
Y\_S\_05\_1 42.8680 / [mm] Exoskeleton parameter  
X\_S\_05\_2 -138.500 / [mm] Exoskeleton parameter  
Y\_S\_05\_2 239.889 / [mm] Exoskeleton parameter  
X\_S\_06\_1 -101.412 / [mm] Exoskeleton parameter  
Y\_S\_06\_1 58.5500 / [mm] Exoskeleton parameter  
X\_S\_06\_2 -181.865 / [mm] Exoskeleton parameter  
Y\_S\_06\_2 105.000 / [mm] Exoskeleton parameter  
X\_S\_07\_1 -49.5000 / [mm] Exoskeleton parameter  
Y\_S\_07\_1 0.00000 / [mm] Exoskeleton parameter  
X\_S\_07\_2 -277.000 / [mm] Exoskeleton parameter  
Y\_S\_07\_2 0.00000 / [mm] Exoskeleton parameter  
X\_S\_08\_1 -101.412 / [mm] Exoskeleton parameter  
Y\_S\_08\_1 -58.5500 / [mm] Exoskeleton parameter  
X\_S\_08\_2 -181.865 / [mm] Exoskeleton parameter  
Y\_S\_08\_2 -105.000 / [mm] Exoskeleton parameter  
X\_S\_09\_1 -24.7500 / [mm] Exoskeleton parameter  
Y\_S\_09\_1 -42.8680 / [mm] Exoskeleton parameter  
X\_S\_09\_2 -138.500 / [mm] Exoskeleton parameter  
Y\_S\_09\_2 -239.889 / [mm] Exoskeleton parameter  
X\_S\_10\_1 0.00000 / [mm] Exoskeleton parameter  
Y\_S\_10\_1 -117.100 / [mm] Exoskeleton parameter  
X\_S\_10\_2 0.00000 / [mm] Exoskeleton parameter  
Y\_S\_10\_2 -210.000 / [mm] Exoskeleton parameter  
X\_S\_11\_1 24.7500 / [mm] Exoskeleton parameter  
Y\_S\_11\_1 -42.8680 / [mm] Exoskeleton parameter  
X\_S\_11\_2 138.500 / [mm] Exoskeleton parameter  
Y\_S\_11\_2 -239.889 / [mm] Exoskeleton parameter  
X\_S\_12\_1 101.412 / [mm] Exoskeleton parameter  
Y\_S\_12\_1 -58.5500 / [mm] Exoskeleton parameter  
X\_S\_12\_2 181.865 / [mm] Exoskeleton parameter  
Y\_S\_12\_2 -105.000 / [mm] Exoskeleton parameter  
W\_RED\_SP 2.20000 / [mm] Exoskeleton parameter  
W\_GRN\_SP 2.20000 / [mm] Exoskeleton parameter  
DM\_DIST 3401.000 / [mm] Distance between mask and det. window





