Test		
	OBJET *(Subject)* : VM2 and LM elastomer bumper frame Test results	**Ref** : GLAST-LLR-RP-008-A **GLAST LAT Doc No.** LAT-TD-00976-02 **Pages** :1/6 **Annexes** : **Date : 20/03/02**

Destinataires *(to)* : **N. Virmany (Swales, NRL), P. Dizon (Swales, NRL)**

Pour application :

Pour information : **P. Prat (LLR), W. N. Johnson (NRL), P. Carosso (Swales, NRL)**

Change History log

Ind.	Date	Modifications	Visa Auteur	Visa RAQ	Visa Vérificateur	Visa Approb.
	20/03/02		0. Ferreira			

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1 Goal

The goal of the test is to measure the mechanical characteristics of the elastomer bumper frames that are being used to equip VM2 and LM models.

2 Material

A non qualified silicone elastomer from RHODIA Company has been used since it was a cheap, very easy to use product. An equivalent material qualified is available: MAPSIL 213 from MAP Company. The designation of the product is:
Rhodorsil RTV141 A resin and RTV 141B catalyst, mix ration 10 to 1
Hardness 50 Shore A (vendor specifications)

3 Fabrication of the frames

Slots have been machined on PVC plastic plates to be used as a mould for the fabrication of the elastomer frames.
The resin and catalyst have been carefully mixed at 10 to 1 radio using a precision weighing machine and a mixing machine
A dispensing machine has been used to inject the resin with a controlled pressure and fill the slots with the resin.
The resin has been cured at 50 °C

4 Measurements

4.1 Durometer

Six samples have been prepared to measure the durometer of the elastomer. The samples have a cylindrical shape with a diameter of 12 mm and a height of 10 mm. The measured values are given in table 1.

Durometer	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
Shore A	51	50	50	51	50	52

Table 1: Durometer measurements
Values measured are consistent with the specifications from the vendor

4.2 Dimensions

The dimensions of 6 of the 200 frames produced for VM2 have been measured with a microscope and are given in table 2

Dimension	Average value in mm	Tolerance in mm
Width	20.17	+/- 0.05
length	27.05	+/- 0.05
Height	2.50	+/- 0.1
Thickness	1.92	+/- 0.05

Table 2: Dimensions of frames
The dimensions are dependant on the size of the slots that have been used as a mould which are very precise, except for the height which was not constraint (free area of the resin). The tolerance is larger for this dimension.

4.3 Compression

The load compression curve of the elastomer frame has been measured by simply loading the frames with weights and measuring the displacements corresponding to the compression.
Four frames have been simultaneously loaded to have a sufficient surface to stack the weights (lead blocks).The test samples have been positioned on a marble table and an thick aluminum plate placed on top of them to distribute the load. The displacements have been measured at the center of each of the frames. The plots below show the compression of the 4 bumper frames. The maximum load is 12.8 per bumper is considered equally shared.

Thickness of the bumper in mm vs. load in Kg

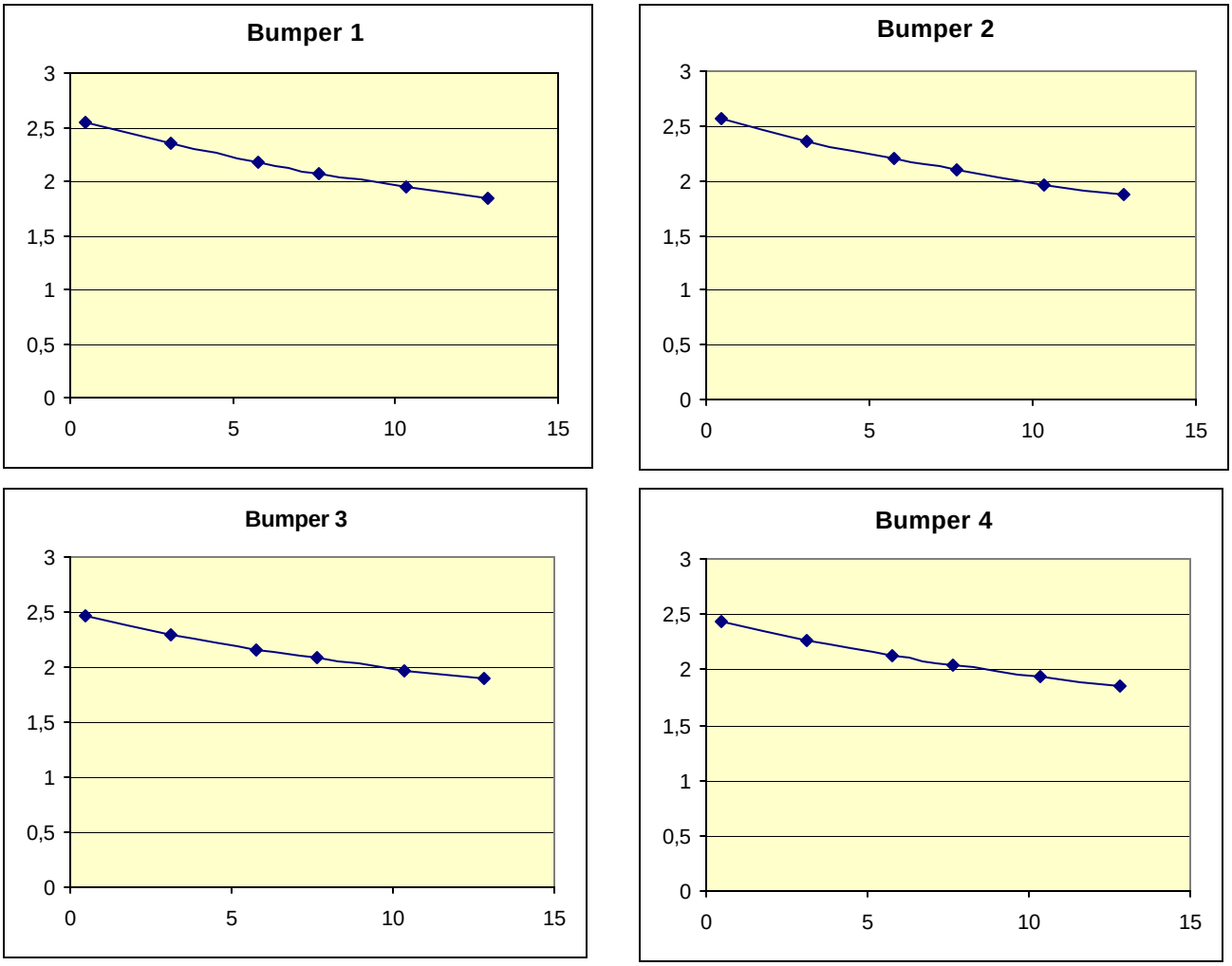


Figure 1: compression vs. load

4.4 Creep

The evolution of the compression of the 4 bumper is being monitored to evaluate the creep of the material. The maximum load (51.3 Kg total) is being used. The results are presented in figure 2.

Compression in mm vs. time in hours

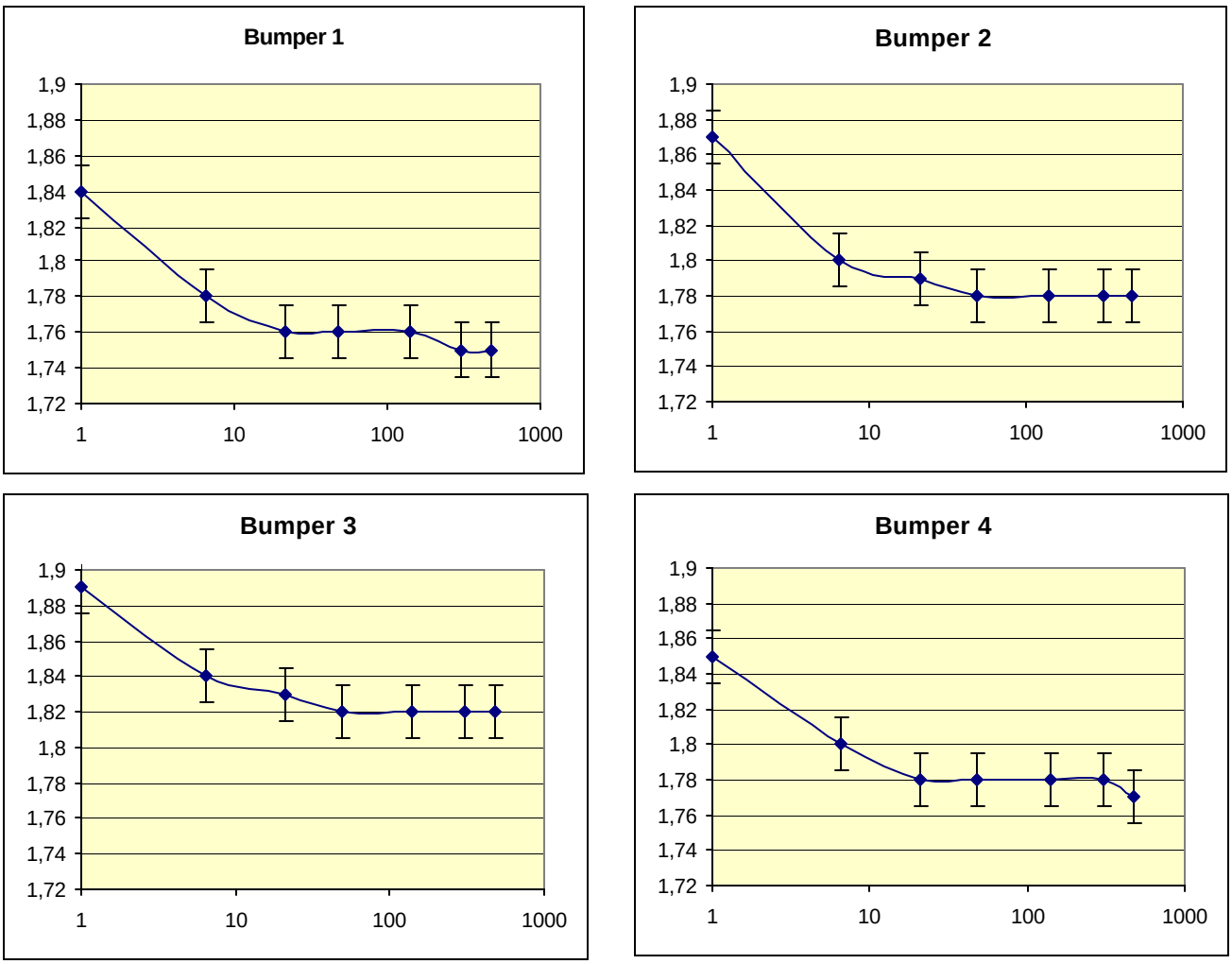


Figure 2: compression vs. time

Results show an evolution of the compression rate during the first day than stabilization.

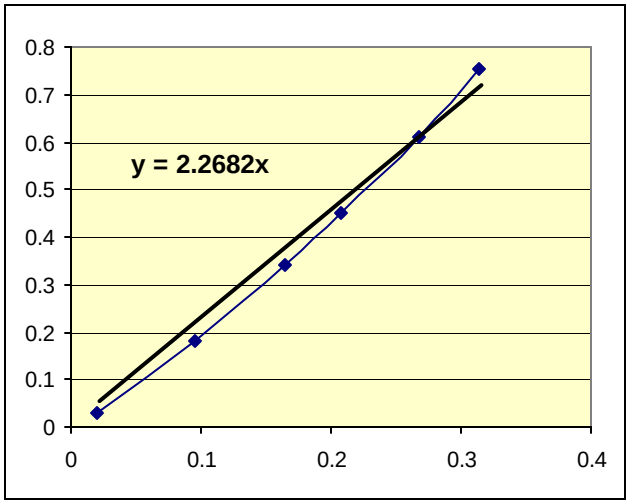
5 Stress strain behavior

The stress strain behavior of the elastomer can be obtained from the test data for compression load. The results are dependant on the shape factor of the elastomer and are therefore specific to the geometry that has been used for the samples. The coefficient of friction is also an important factor to be taken into account for a compression test. The materials in contact with the bumpers for the test are different from the ones in the assembled modules. The results can only be an estimate of what will be observed in the final configuration.

Engineering and true stress – strain relationships are plotted below

Stress in MPa as a function of strain

True



Engineering

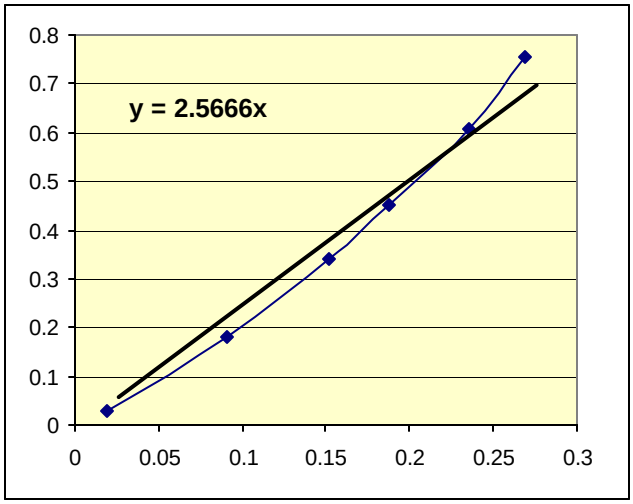


Figure 3: stress vs. strain

Within the load range, the behavior of the material is quite linear. The modulus of elasticity can be estimated at 2.27 MPa from the true stress strain curve.