Target fabrication operational statistics

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RAL experiments

A total of 11 Vulcan and 4 Astra experiments were supported by the Target Fabrication Group in the reporting period April 2007 to April 2008. Of these 10 Vulcan experiments and 2 Astra experiments were 'solid target' experiments and 1 Vulcan experiment was a combination of gas jet shots and solid target shots. Over the year Target Fabrication provided a total of 71 weeks experimental support for Vulcan and 13 weeks for Astra on solid target experiments. This report will show target numbers from the 11 Vulcan and 2 Astra solid target experiments. The report does not include the extensive amount of filter and pinhole support provided from Target Fabrication for some gas jet experiments. It should also be noted from the schedule that at times during the reporting period the Target Fabrication Group was supporting 4 experiments running concurrently and additionally external contracts.

1) Target numbers

For the reporting year the total target numbers produced are shown in figure 1. This table is broken down into separate experiments and gives data on total target numbers and also the number of high specification complex 3D targets that have been produced. High specification 3D targets are defined as targets that have taken significant highly skilled micro-assembly or micro-machining to be produced over and above standard target manufacture. The total number of internal targets produced by the group in 2007-2008 was 2223 (not including filters and pinhole arrays). Of these 413 were high specification targets.

Experiment Targets	Targets Produced	High Specification
June 2007 TAP	153	5
June 2007 TAW	175	39
July 2007 ATA2	69	27
Aug 2007 TAP	191	43
Sept 2007 TAW	88	26
Nov 2007 TAP	127	15
Nov 2007 TAW	34	-
Jan 2008 TAP	132	20
Jan 2008 TAE	391	145
Feb 2008 TAP	117	-
Feb 2008 ATA2	99	-
April 2008 TAE	176	70
April 2008 TAP	471	23
TOTAL	**2223**	**413**

Figure 1. Target production summary for 2007-2008.

2) Target types

The high specification targets can be separated into five main types as shown in figures 2 and 3 where they are listed along with the number of multilayer foil targets made during 2007-2008. Multilayer foil targets involve more than two materials and require specialized coatings to be produced above the level of standard target manufacture.

Target Type	Number Produced
Cone Target	13
Microsquares (hand cut 100um x 100um)	29
Precision Machined	163
XRTS	70
Multilayer foil packages	83
X-ray Backlighters	138

Figure 2. High specification target delivery summary.

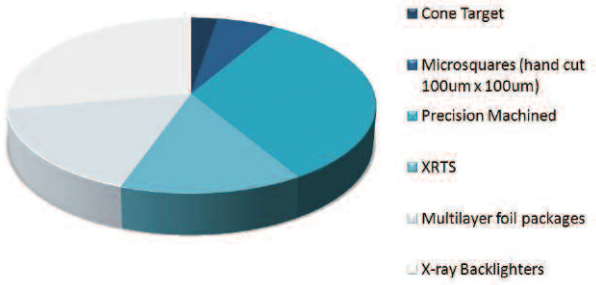

Figure 3. High specification target delivery summary.

3) Target design

Over the last few years there has been an ongoing increase in the number of different target designs requested for experimental campaigns. The total number of different target designs that were produced throughout out the year was 381 compared to 294 in 2006-2007. However, this

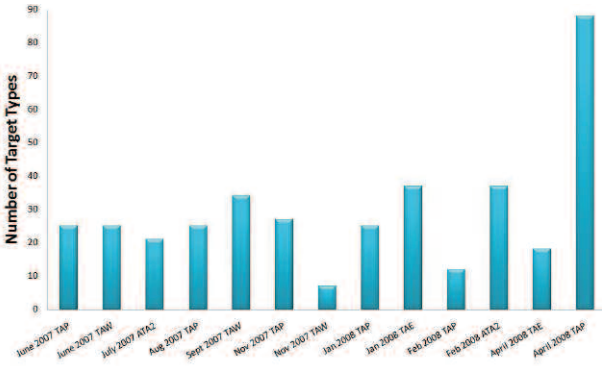

Figure 4. The number of different target designs fabricated throughout the year by each experiment.

figure is weighted by an experiment (in April 2008) that had a large number of design close variants.

4) Experimental response

It is seen as a significant strength of Target Fabrication to be rapidly responsive to experimental results and conditions by working collaboratively with experimentalists. The Target Fabrication Group responds to experimental changes during a run and often implements a number of modifications or redesigns to the original requests. The number of modifications and variations usually fluctuates widely across a year and is dependent on the type of experiment and also on experimental conditions such as diagnostic and laser performance. On average during experiments in the reporting period 32% of the targets that were shot were modified or redesigned from the planned target specifications. Figure 5 shows the proportion of targets that were redesigned or modified during the experiments supported in 2007-2008.

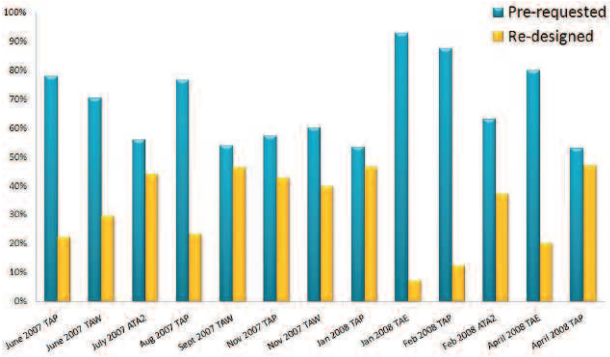

Figure 5. The percentage of pre-requested targets compared to redesigned targets fabricated throughout the year for each experiment.

The redesign of targets during experiments means that there are often a number of targets that have been fabricated but that are not shot by the end of experimental campaigns. As shown in figure 6 throughout the year an average of 36% of targets that were fabricated were either returned un-shot to Target Fabrication or were unused having been made in preparation for the experiment but not required due to changes.

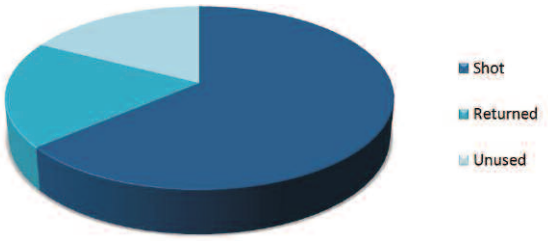

Figure 6. The average proportion of targets shot, returned and unused over all solid target experiments supported during 2007-2008.

External contracts

The Target Fabrication Group also supplied microtargets, specialist coatings and expertise to external groups and other departments at RAL during the reporting period. This activity included the production of high specification microgroove targets, hemisphere shell targets, diamond targets for warm dense matter studies and a number of complex thin foil coatings. All of the work required to supply targets to external groups was carried out in addition to the experimental support for the CLF.

Summary

The Target Fabrication Group has supported 22 internal and external experimental groups in the last year as well as providing an increasing amount of characterisation services and acting as a knowledge base for target fabrication activities throughout Europe.