



# Target Operations CM32

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on behalf of the Target Team

8<sup>th</sup> February 2012



# Introduction



- Target operations on ISIS:
  - Summary of operation
  - Beam Bump studies summary
  - Ed's target summary reports
- Investigation into the failure of T1
- Updates to the Target Controller
- Continued testing in R78
- **New Stator design to be presented by Geoff Barber on Friday!**



# Operations on ISIS

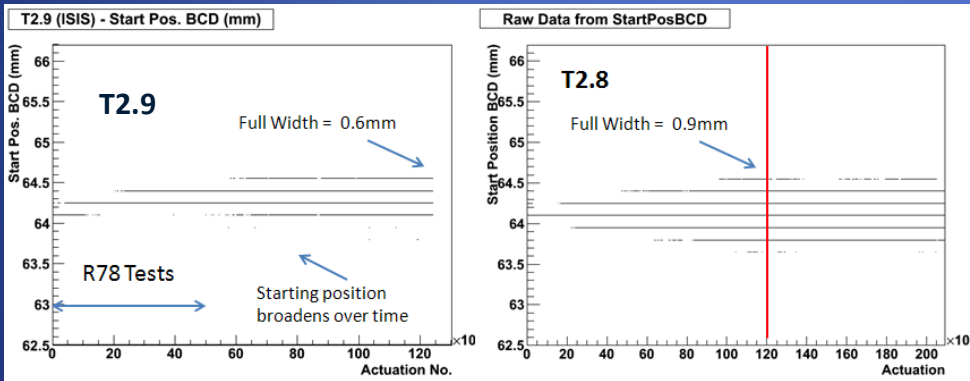
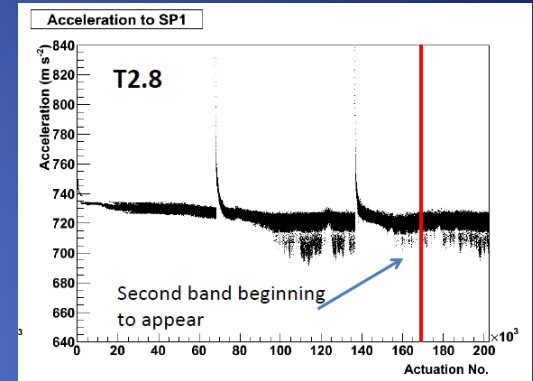
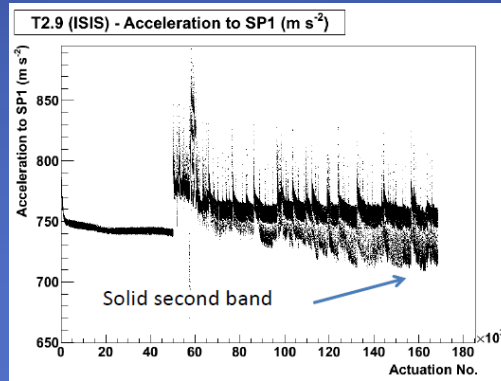
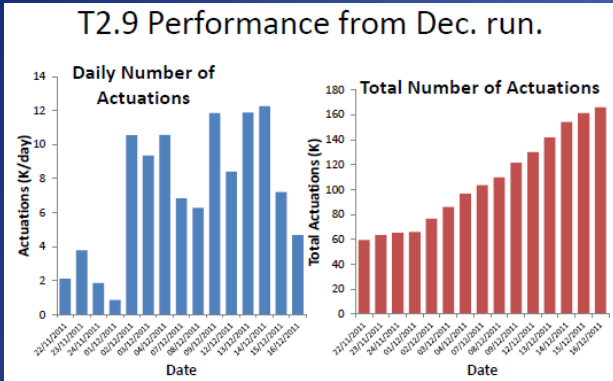


T2.9 was installed in ISIS on Tuesday 13<sup>th</sup> September 2011 after running 50k test actuations in R78 on the 12<sup>th</sup>.

The target was subsequently run:

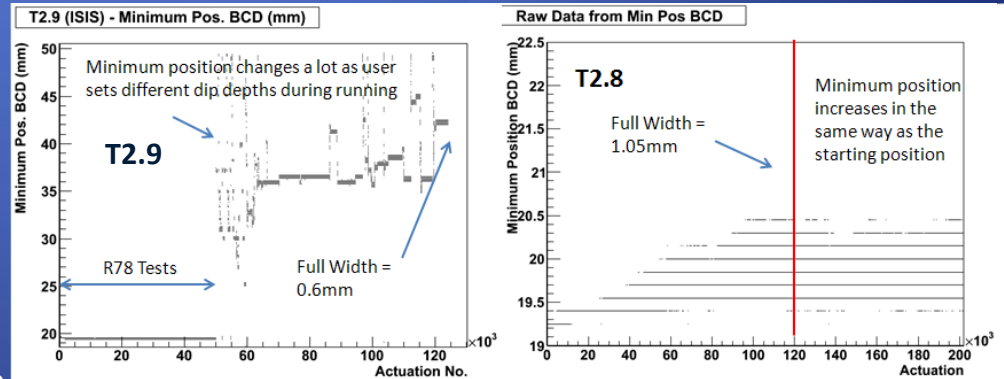
- 27<sup>th</sup> – 29<sup>th</sup> September – Beamline Run-up
- 22<sup>nd</sup> – 24<sup>th</sup> November 2011 – Beam Bump studies.
- 1<sup>st</sup> – 4<sup>th</sup> December 2011 – Data taking
- 7<sup>th</sup> – 9<sup>th</sup> December 2011 – Data taking
- 12<sup>th</sup> – 16<sup>th</sup> December 2011 – Data taking

Details of the data taking periods were covered in Yordan's presentation so I won't repeat that here!



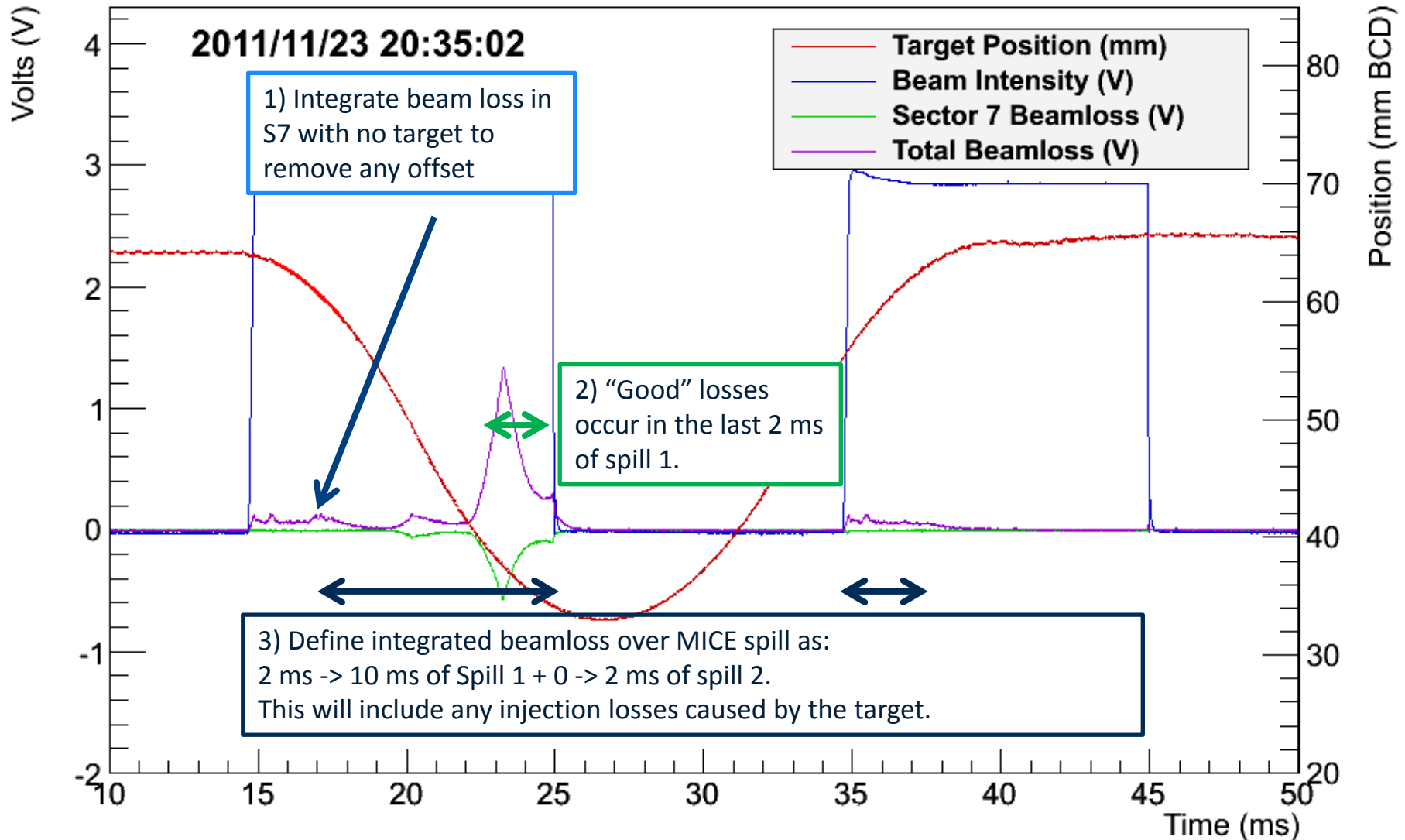
Target Acceleration

Target Start Position

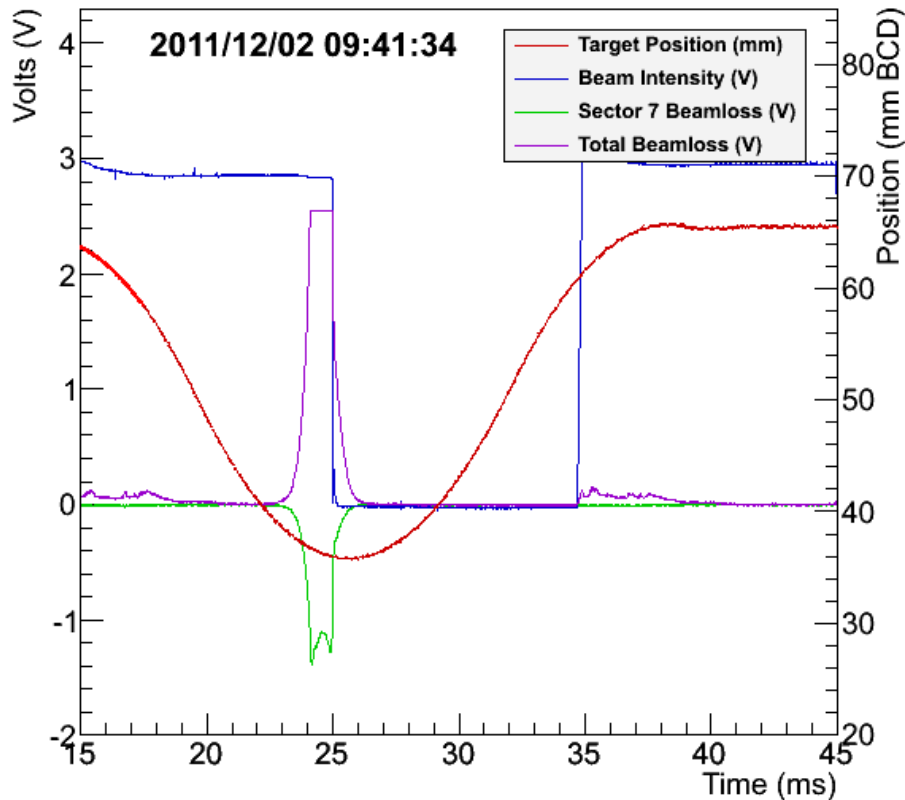


Target Minimum Position

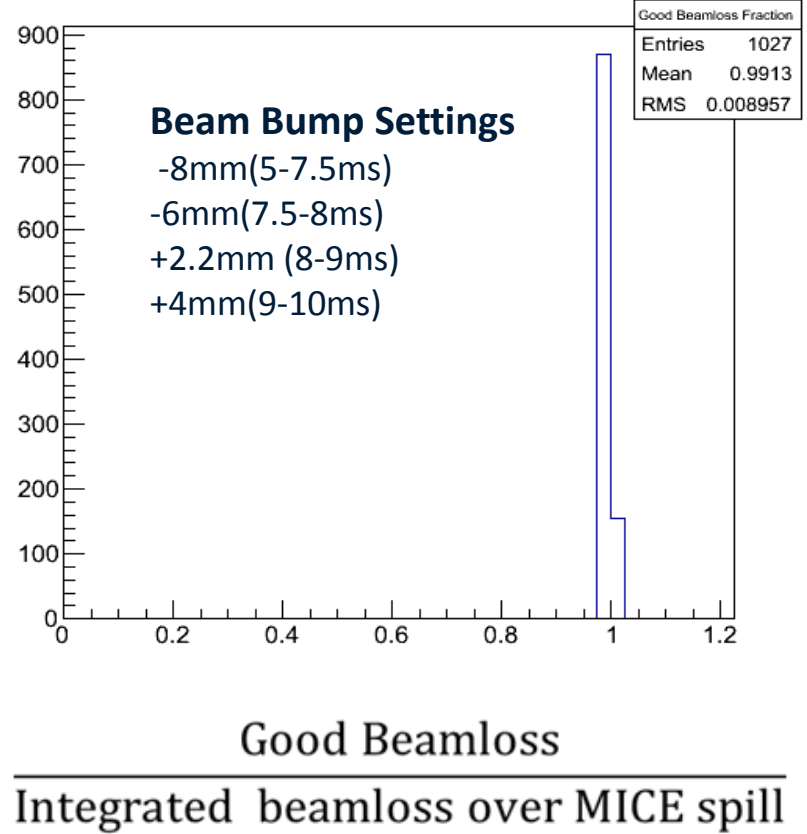
- Looking only at beam loss in Sector 7!



T2.9: Target Position and Beamloss



Good Beamloss Fraction



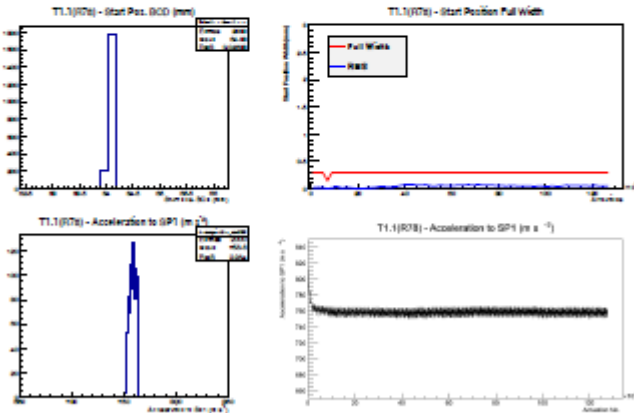
The present target operating with the beam bump on is producing 99% beam loss in the last 2ms of the spill.

Target Performance Report - T1.1(R78)  
 Report Generated: January 26, 2012,  
 Last Actuation: 26/01/12 12:39:04

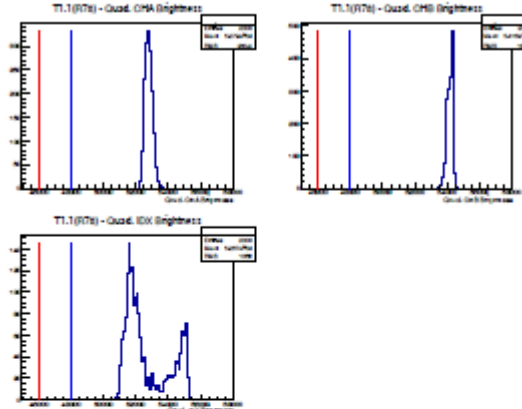
## 1 Operation Summary

	Last Shift	Total
Actuations:	127.4K	127.8 K
Quadrature errors:	0	0
Fiber errors:	0	0
Fiber warnings:	0	0
BPS errors:	0	0
BPS warnings:	0	0
(R78) Gaps > 3c:	0	0
(R78) Gaps > 10c:	0	2
(R78) Capture Corrections:	0	0

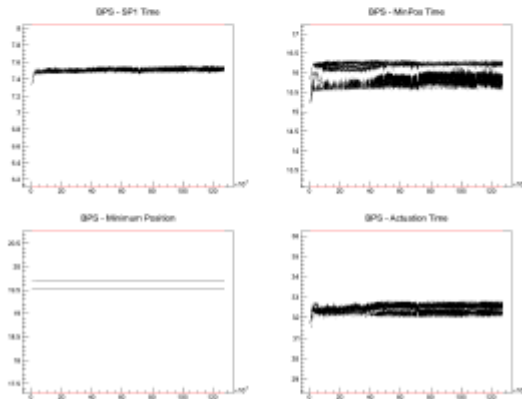
## 2 Mechanical Performance



## 3 Optical Performance



## 4 BPS Check



At the end of a shift you will be able to press a button on the GUI and you will get a pdf with auto generated plots that summarises the target's performance during the shift!



# Investigation into the Failure of T1



I have written a draft MICE note into the investigation into the Failure of T1, although I don't want to publish it just yet because I would like some more data from running the target on ISIS. There's quite a lot of detail but the conclusions are fairly straight forward:

The failure (13<sup>th</sup> July 2011) was certainly due to a malfunction of the T1 quadrature system.

- No mechanical failure observed.
- No electronics failure found.
- No gross attenuation of fibres but note we haven't precluded some attenuation – as there was no means by which to monitor this prior to the controller upgrade.

From the data taken on ISIS we have observed some change in the signal levels on the optical system. However we don't yet have enough data to draw any definitive conclusions.

Variations are seen on the system in R78, we think this is likely due to power supply fluctuations.





# Investigation into the Failure of T1

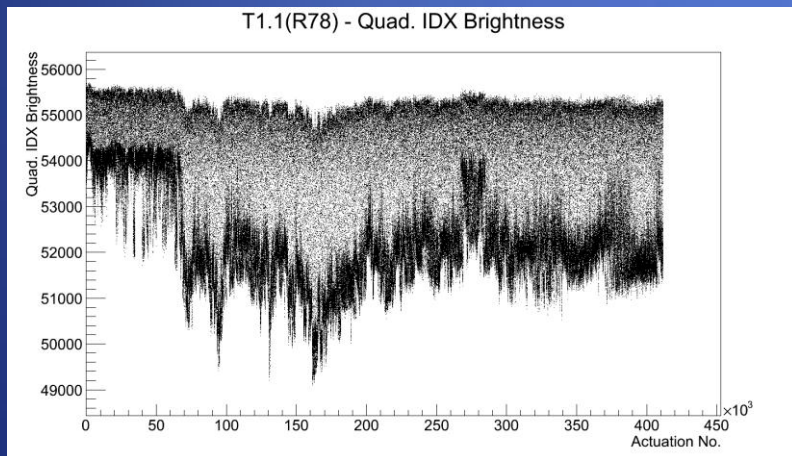
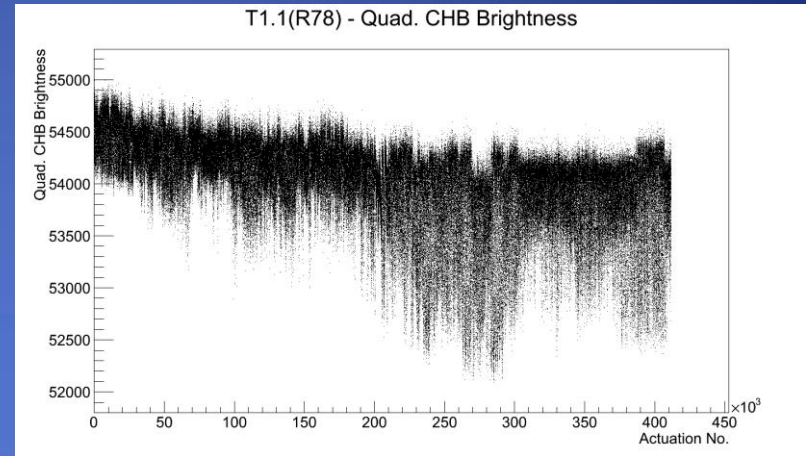
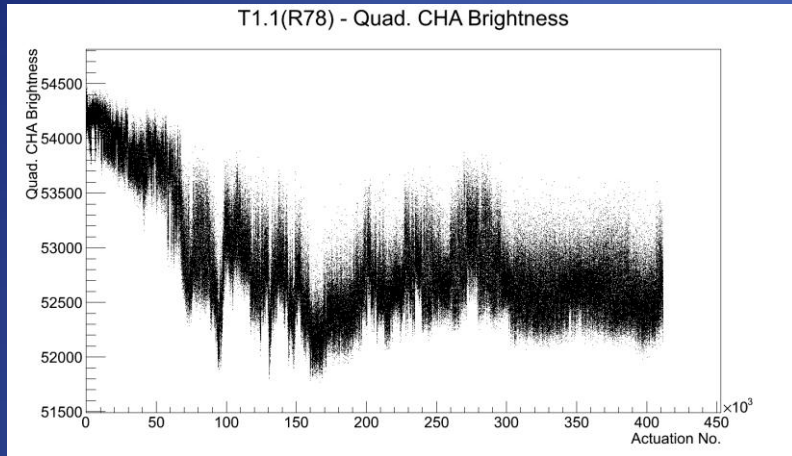


The new controller monitors the return signal levels on the quadrature system via three ADCs.

Unfortunately the ADC's were built into the design of the controller before the T1 incident and are only referenced to the power supply rails (i.e. not a precision voltage source). Therefore they are not as accurate as we would now like them to be!

Now we have had some experience with how these channels behave we have added two further interlocks to the controller:

- 1) If the signal levels drop below a predetermined value then the controller stops further actuations. Normal operation gives a signal level of 50k - 55k (These values are out of 65,536) ADC limit is currently set to a value of 48k. Quadrature Channels would start malfunctioning at ~43k.
- 2) If any quadrature signal disappears for longer than 2.5 ms during an actuation then power is cut to the stator and a Beam Protection System Error is thrown. This acts as a damage limitation system. Bear in mind that the target spends >95% of its time not actuating so this is likely to catch any problem at the start of an actuation.



Different broadness of graphs is a combination of the following:

- 1) SNR is very sensitive to setup of optics block.
- 2) Gain is set to operate close to the amplifiers saturation. (very non-linear region)

Due to the correlations, I strongly suspect that power supply variations are the cause of the variation.



# R78 Tests



We're currently continuing our target tests in R78:

- 1) Baseline T1.1 DLC/Vespel test 1 million pulses to compare with T2.8. These tests are underway now.
- 2) T1.2 Uncoated/Vespel for 1 million + pulses will continue as long as we see no wear/sticking.
- 3) DLC/Vespel at higher voltages (125-135V?) hitting target harder -> more wear?
- 4) As soon as new 'S' series stator ready we start testing this - will want to interrupt above testing to do this.

Evolution of target T1.2 is significantly different to that of T2.x. Significantly better wear profile.