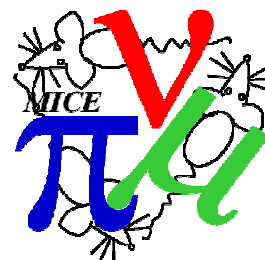


Activation in the Vicinity of the MICE Target (SP7)

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MICE-NOTE-GEN-438

As reported already (MICE Note 417), the MICE Target system has been experiencing a loss of signal from its optical position sensors, which may be due to radiation damage of the optical fibres. Not only has this degradation become more noticeable in recent months, but an inspection visit in August 2013 had to be postponed because of unexpectedly high radiation levels persisting well into the ISIS shutdown.

This document tabulates radiation levels measured in the vicinity of the MICE Target as given in the most recent Radiation Surveys available in the MICE document store. The survey templates were those used for the Activation Studies. The surveys considered here were made on

- 7th January 2014 – 2 weeks after end of Machine Physics/start of Shutdown after cycle 2013/04.
- 23rd December 2013 – first morning of shutdown, after Machine Physics over weekend at end of cycle 2013/04. ISIS running for three weeks with no MICE activity.
- 4th November 2013 – first morning of shutdown, after Machine Physics over weekend at end of cycle 2013/03 (7 weeks). MICE had been running over the four extended weekends before that.
- 9th October 2013 – afternoon of a maintenance day (Wed.) in mid-cycle 2013/03, after MICE running over extended prior weekend (until Mon.).
- 28th August 2013 – 2 weeks after end of Machine Physics/start of Shutdown after cycle 2013/02.
- 13th and 14th February 2013 – before and after 4 V 50/128 Hz Activation Study with beam-bump, during start-up for cycle 2012/5 after *long* shutdown.
- 16th August 2010 – 2 days after “10 V” run in Machine Physics at end of cycle 2010/2
- 19th and 20th June 2010 – before and after 4 V 50/128 Hz Activation Study in Machine Physics during start-up for cycle 2010/2, after *short* shutdown

MICE does not appear to have records of any Radiation Surveys in 2011 or 2012; in particular the effects of

- replacement of the target assembly (after July 2011)
- perceived shift in ISIS beam position following replacement of ISIS kicker magnet PSU (27th September 2013)

- deployment of ISIS beam-bump (29th September 2011)

are a significant omission.

Location		Jan. 2014	Dec. 2013	Nov. 2013	Oct. 2013	Aug. 2013	Feb. 2013 Activation Run		Aug. 2010	June 2010 Activation Run	
							after	before		after	before
First Bellows after D7	Top	935	1800	1700	2900	1550	480	380	870	350	400
	Base	1215	2000	1700		1750	600	555	2200	650	1100
Second Bellows after D7	Top	680	1300	1200	2100	1100	350	340	470	240	160
	Base	650	1300	1150		1100	370	390	400	150	170
Bellows after MICE Target vessel	Top	860	1250	1670	2300	1300	810	650	700	400	450
	Base	410	630	660		600	410	280	1100	740	780
(Top of) Target Gate Valve		245	420	1210	750	800	600	110	540	660	130
Target Window (ISIS beampipe)		580	600	1240		550	360	300	400	200	150

All numbers are in $\mu\text{Sv/h}$. Shaded columns indicate data taken at similar delay with respect to ISIS running. Locations as per radiation survey captions.

The readings since summer 2013 are higher than previously (Nov. & Dec. 2013 vs. Aug. 2010), though it is not clear whether the increase in activation has appeared since February 2013 or was already happening earlier. Although recent readings are increased over 2010, summer 2013 may have been unusually high (Aug. 2013 vs. Jan. 2014).

As expected, the effects of the MICE target dipping are most pronounced downstream of the target, e.g. “Bellows after MICE Target vessel”, “Target Gate Valve”, “Target Window” (Nov. 2013 vs. Dec. 2013).

Recommendation: we need at least one Radiation Survey each year, made under conditions comparable with previous surveys (i.e. either immediately, or a fortnight, after an ISIS user run).

Note we shouldn't ask for unnecessary surveys, to avoid exposure of Health Physics staff and also to reduce the risk of physical damage to the fibres from the probe.

References

H. Nebrensky, E. Overton and C.T. Rogers: “MICE Target Issues During Run 2nd-5th August 2013” MICE Note 417 (2013)

Acknowledgements

Thanks to the RAL Health Physics team for making the measurements, especially the October ones at short notice.