

	<b>RHM</b>		Project: RHM	
	DDR3 SDRAM low-energy proton test report		WP 3120	
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## RHM

### DDR3 SDRAM low-energy proton test report

RHM-IDA-TN3-2

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## 1 Overview

On September 21, 2017, a test was performed at RADEF to determine the sensitivity of DDR3 SDRAM devices to single-event effects caused by low-energy protons (1 to 10 MeV).

## 2 Test facility

The test was performed at RADEF, Jyväskylä, Finland, using the low-energy proton beam line.

## 3 Samples

The tested device types are described in the following table.

Part ID	Manufacturer	Part number	Capacity	Feature size	Date code
Hyn4	Hynix	H5TQ4G83MFR-H9C	4 Gbit	Unknown	1223
Sam4	Samsung	K4B4G0846B-HCH9	4 Gbit	35 nm	1216



Figure 1: Package photos

All tested samples had been prepared for backside irradiation by thinning them to a die thickness of 60  $\mu\text{m}$ .

## 4 Test procedure

Devices were irradiated in read mode without software conditioning. Before each irradiation run, a pseudo-random pattern was written to the device. The device was then irradiated while repeatedly reading the entire address space.

Due to RADEF equipment malfunction, only a limited number of irradiation runs could be performed. The following energy levels were used:

Energy [MeV]	LET [MeV $\text{cm}^2$ / mg] (60 $\mu\text{m}$ )
2.70	0.170
3.10	0.120
3.45	0.110
3.80	0.092
4.50	0.076

## 5 Test results

The SEU cross sections for the two device types are shown in the following figures. No SEFIs of any kind or latch-ups were observed.

