SINGLE EVENT EFFECTS TEST REPORT ADL8142S

May 2022

Radiation Test Report	
Product:	ADL8142S
Effective LET:	62.4 MeV-cm^2/mg
Fluence:	1E7 Ions/cm^2
Facilities:	TAMU
Tested:	May 21, 2022

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SEE Test Report for the ADL8142S –
0.01GHz to 10GHz LNA

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Test Date:
May 21, 2022

I. Introduction

The purpose of this test is to determine the heavy ion-induced Single-Event Effects (SEE) susceptibility of the ADL8142S, a 23 GHz – 31 GHz LNA.

Single Event Latch-up was evaluated with high supply voltage and high temperature with no latch-up or other destructive SEE events observed to the highest LET tested (62.4 MeV-cm^2/mg). The device was evaluated at 90°C using a custom Iomega heating system (forced air).

II. Device Under Test

The ADL8142is a GaAs, monolithic microwave integrated circuit (MMIC), pseudomorphic high electron mobility transistor, pHEMT, low noise, wide bandwidth amplifier that operates from 23 GHz to 31 GHz. The ADL8142S provides a typical gain of 27dB, a 1.6dB typical noise figure, and a typical output third order intercept (OIP3) of 29dBm, requiring only 25mA from a 2 V supply voltage. Figure 1 shows a functional block diagram of the device. Table 1 shows the basic part and test details. Detailed device parameters and functional descriptions can be found in the datasheet.

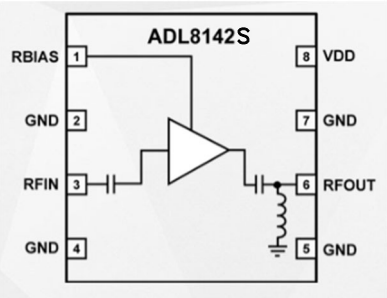

Figure 1. Functional block diagram.

Table 1
Part and test information.

Generic Part Number:	ADL8142S
Date of Test:	May 21, 2022
Manufacturer:	Analog Devices
Die Revision:	ADL8142S
Part Function:	23 GHz to 31 GHz LNA
Part Technology:	GaAs
Package Style:	8-Ld LFCSP
Test Equipment:	Keithley Power Supply, PXA, Hittite Signal Generator, Computer

III. Test Facilities

The heavy-ion beam testing was carried out at the Texas A&M University Cyclotron Facility. The facility utilizes the K500 cyclotron with a superconducting magnet which generates the magnetic field used to accelerate the ions. The test setup was in an air environment. The SEE testing was primarily focused on SEL.

Facility: Texas A&M University Cyclotron Facility
Beam: 15 A MeV
Flux: up to 1.2×10^5 $cm^{-2} \cdot s^{-1}$
Fluence: up to 1×10^7 cm^{-2} (per run)
Ions: Au

IV. Test Method

A. Test Setup

The device under test (DUT) was chemically de-processed to expose the wire-bonded die. The Rf input was set to 30 GHz using a Hittite HMC-T2240 Rf Generator. The power supply to the DUT was set to 3.45 V with ~46 mA supply current. The output was monitored using a Keysight PXA 50 GHz Spectrum Analyzer. The power supply current was monitored using Python scripts. An Iomega temp forcing system was used to get the device to 90°C. The test configuration is shown in Figure 2. The test routine is shown below:

1) Turn on power to DUT
2) SEL: Measure temperature of DUT at 90°C
3) Start power supply current monitoring script
4) Start Beam
5) Stop beam at 1E7 total ions

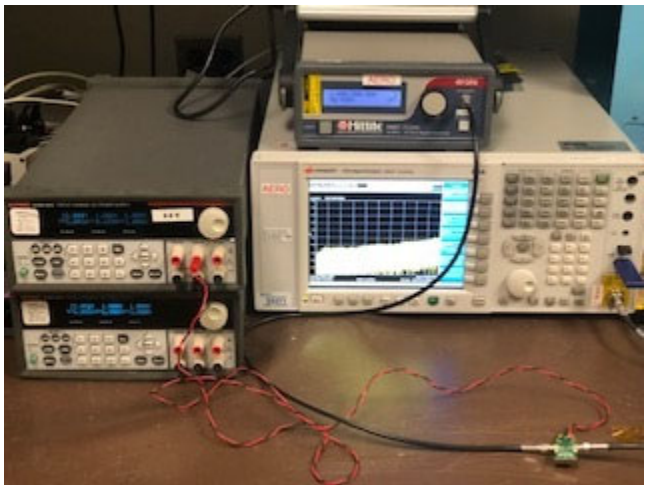

Figure 2: ADL8142S Test Setup

B. Irradiation procedure

SEL: The Iomega temperature forcing system was used to get the DUT to 90°C. A custom python script was used to continuously monitor the supply current. Measurements were ~10 readings/second.

SEL Test Conditions

Test Temperature:	90°C
RF Input Frequency:	30 GHz
Power Supply(s):	3.45V
Angles of Incidence:	0º (normal)
Parameters:	Supply Current
Samples:	3

V. Results

SEL – The ADL8142S did not exhibit SEL at ≤ 62.4 MeV-cm^2/mg to 1.0E7 ions/ cm^2 while heated to 90°C. No SEL induced current increases were observed as can be seen in the SEL plots. The test runs are below in Table 2. Plots are shown below in Figures 3-5.

Run	Dut	ion	LET	Range	Energy	angle	TID	flux	fluence
Run 8	1	Au	62.4	59.6	1609	0	1.39E+04	1.19E+05	1.00E+07
Run 9	2	Au	62.4	59.6	1609	0	1.24E+04	1.29E+05	1.24E+07
Run 10	3	Au	62.4	59.6	1609	0	1.01E+04	1.03E+05	1.01E+07

Table 2: SEL test runs

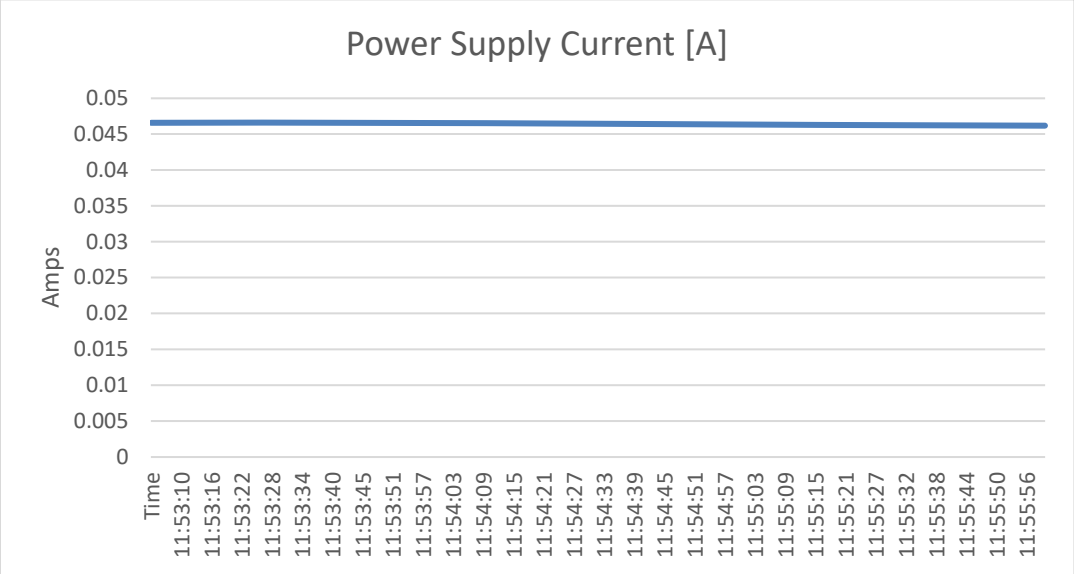

Figure 3: ADL8142S Run 8 Power Supply Current Bd 1

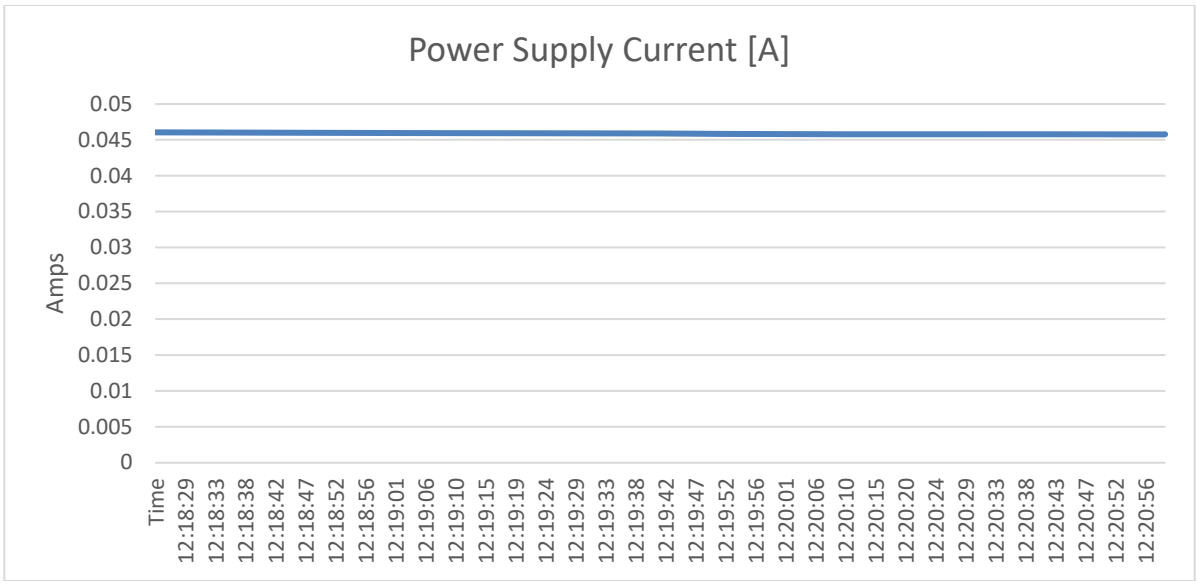

Figure 4: ADL8142S Run 9 Power Supply Current Bd 2

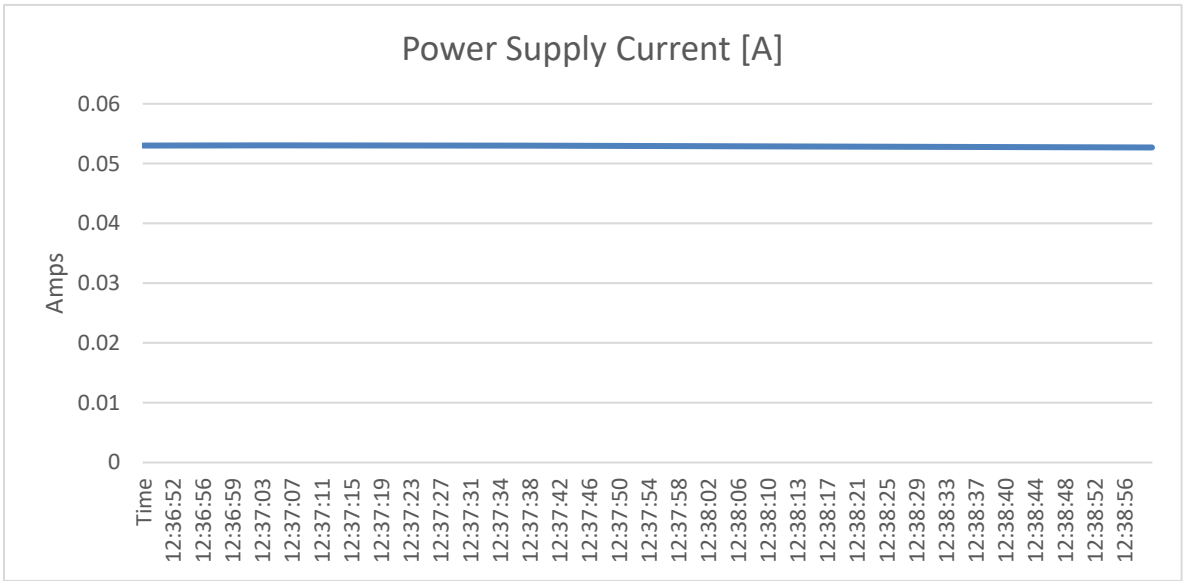

Figure 5: ADL8142S Run 10 Power Supply Current Bd 3

VI. Conclusion:

The ADL8142S does not exhibit SEL at the maximum LET evaluated: ≤62.4MeV-cm2/ mg.

Test Hardware:

1) Keithley triple Power Supplies – 2230G-30-1
    a. SN# 9204335 Calibration due 8/31/22
2) Hittite HMCT2240 RF Generator
    a. SN# 27795 Calibration due 9/16/22
3) Keysight PXA
    a. MY53311081 Calibration due 2/23/23
4) ADL8142S Eval boards – 1, 2, 3