



**ICS RADIATION TECHNOLOGIES, INC.**

8416 Florence Avenue, Suite 207  
Downey, CA 90240-3949

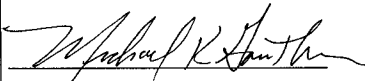
TEL: 562.923.1837 FAX: 562.923.3609

WEB: [www.icsrad.com](http://www.icsrad.com)

**CERTIFICATE OF CONFORMANCE**

This document certifies that the task requirements of Line Item Number 1 of Purchase Order Number G0193570, dated 6/28/01 have been completed and meet the requirements of the above Purchase Order.

Our Quality Assurance procedures are in conformance to MIL-I-45208A and MIL-Q9858A. A government subcontractor has inspected our facilities.

  
\_\_\_\_\_  
Quality Assurance Officer

June 30, 2001  
\_\_\_\_\_  
Date



(seal)



5335 PRICE AVENUE  
BUILDING 258  
McCLELLAN, CA 95652  
PHONE: (916) 614-6200  
FAX: (916) 614-6250  
WEB: <http://www.ucdavis.edu/mnrc>

29 June 2001

MEMORANDUM FOR ICS, Inc.

FROM: UCD/MNRC

SUBJECT: Dosimetry for <sup>137</sup>Cs Irradiations 6/27/01-6/28/01

1. The following 1 MeV Equivalent Fluence (1 MeV neutrons/cm<sup>2</sup>) values were measured during the irradiations performed at the UCD/MNRC 4/2/01-4/4/01.

Date	1 Mev Equivalent Fluence (Exposure)	1 Mev Equivalent Fluence (Accumulated)
6/27/01	9.40E11	9.40E11
6/28/01	8.10E12	9.04E12

2. Attached please find additional data you may require. If you have any questions please call.

Daniel L. Newell  
Nuclear Engineer, UCD/MNRC

IN COLLABORATION WITH  
SCIENCE APPLICATIONS  
INTERNATIONAL CORPORATION



Sulfur Activity for ICS Irradiations			UCD/McClellan Nuclear Radiation Center				
Sulfur Constants:							
A.W. =	31.97207	g/g-at					
S32% ab =	95.02	%					
AV. # =	6.02E+23	at/g-at					
Standard from Irradiator			1 MeV Eq. Fluence =	3.97E+13	n/cm <sup>2</sup> -sec		
Final Report:			dps/nucleus S =	6.70E-19			
Date	Exp #	Pwr ( <sup>14</sup> W)	Expos (min)				
06/27/2001	01-173	50	13				
S Foil	Mass	Nucleons	Act. (dps)	dps/nuc	1MeV E.F.		
T5	0.482	8.62E+21	136.79	1.59E-20	9.40E+11	Ave =	9.40E+11
T8	0.476	8.52E+21	134.89	1.58E-20	9.39E+11	Std Dev =	1.52E+09
T1	0.484	8.66E+21	137.6	1.59E-20	9.42E+11	error =	0.00161
Average Accumulated Dose =							9.40E+11
Date	Exp #	Pwr (kW)	Expos (min)				
06/28/2001	01-175	400	15				
S Foil	Mass	Nucleons	Act. (dps)	dps/nuc	1MeV E.F.		
T4	0.468	8.37E+21	1150.76	1.37E-19	8.15E+12	Ave =	8.10E+12
T7	0.464	8.30E+21	1141.24	1.37E-19	8.15E+12	Std Dev =	9.04E+10
T9	0.465	8.32E+21	1121.56	1.35E-19	7.99E+12	error =	0.01117
Average Accumulated Dose =							9.04E+12
							06/29/2001
							D. Newell

I C S Radiation Test Results
IRH67260 N-CHANNEL POWER MOSFET (IRC)

IGSSF VGS=20V nA

Table with 5 columns: FLUENCE, neutrons/cm2, INITIAL, 9.40E+11, 8.10E+12. Rows include S/N, 15, MINIMUM, MEAN, MAXIMUM, and statistical data (+P, -P, SIGMA).

IGSSF VGS=20V nA [DELTA]

Table with 5 columns: FLUENCE, neutrons/cm2, INITIAL, 9.40E+11, 8.10E+12. Rows include S/N, 15, MINIMUM, MEAN, MAXIMUM.

DEVICE TYPE IRH67260 N-MOSFET (IRC)
RADIATION SOURCE TRIGA Reactor (MNRC), 1.00MeV.

D/C CIRC 01 || PACKAGE TO-3 || LOT# ER14253
LOG# 972 || TEST DATE 06/26/01 || RTP# 386

I C S RADIATION TECHNOLOGIES, INC.

I C S Radiation Test Results
IRH67260 N-CHANNEL POWER MOSFET (IRC)

IGSSR VGS=-20V nA

Table with 5 columns: FLUENCE, neutrons/cm2, INITIAL, 9.40E+11, 8.10E+12. Rows include S/N, 15, MINIMUM.

MEAN	-4.42E+00	-3.27E+00	-3.19E+00
MAXIMUM	-4.42E+00	-3.27E+00	-3.19E+00
+P 50/90	*****	*****	*****
-P 50/90	*****	*****	*****
+P 99/90	*****	*****	*****
-P 99/90	*****	*****	*****
SIGMA	*****	*****	*****

IGSSR VGS=-20V nA [DELTA]

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=====
FLUENCE neutrons/cm2 INITIAL          9.40E+11    8.10E+12
----- S/N -----
15                                1.15E+00    1.23E+00
MINIMUM                          1.15E+00    1.23E+00
MEAN                              1.15E+00    1.23E+00
MAXIMUM                          1.15E+00    1.23E+00

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.
.   DEVICE TYPE      IRH67260 N-MOSFET (IRC)
.   RADIATION SOURCE TRIGA Reactor (MNRC), 1.00MeV.
.
.   D/C  CIRC 01 || PACKAGE  TO-3      || LOT#  ER14253
.   LOG# 972   || TEST DATE 06/26/01 || RTP#  386
.
.
=====
I C S RADIATION TECHNOLOGIES, INC.

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I C S Radiation Test Results
IRH67260 N-CHANNEL POWER MOSFET (IRC)
=====
IDSS VDS=160V VGS=0V uA
=====
FLUENCE neutrons/cm2 INITIAL          9.40E+11    8.10E+12
----- S/N -----
15                                4.40E+00    4.40E+03    5.07E+03
MINIMUM                          4.40E+00    4.40E+03    5.07E+03
MEAN                              4.40E+00    4.40E+03    5.07E+03
MAXIMUM                          4.40E+00    4.40E+03    5.07E+03
+P 50/90                          *****
-P 50/90                          *****
+P 99/90                          *****
-P 99/90                          *****
SIGMA                             *****

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IDSS VDS=160V VGS=0V uA [DELTA]

=====

FLUENCE	neutrons/cm2	INITIAL	9.40E+11	8.10E+12
----- S/N -----				
15			4.40E+03	5.07E+03
MINIMUM			4.40E+03	5.07E+03
MEAN			4.40E+03	5.07E+03
MAXIMUM			4.40E+03	5.07E+03

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.
.   DEVICE TYPE      IRH67260 N-MOSFET (IRC)   .
.   RADIATION SOURCE TRIGA Reactor (MNRC), 1.00MeV. .
.
.   D/C  CIRC 01 || PACKAGE  TO-3      || LOT#  ER14253 .
.   LOG# 972  || TEST DATE 06/26/01 || RTP#  386   .
.
.....
I C S RADIATION TECHNOLOGIES, INC.
    
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I C S Radiation Test Results  
 IRH67260 N-CHANNEL POWER MOSFET (IRC)  
 =====

VGS(th) ID=1mA VDS=VGS V  
 =====

FLUENCE	neutrons/cm2	INITIAL	9.40E+11	8.10E+12
----- S/N -----				
15		2.49E+00	2.50E+00	2.48E+00
MINIMUM		2.49E+00	2.50E+00	2.48E+00
MEAN		2.49E+00	2.50E+00	2.48E+00
MAXIMUM		2.49E+00	2.50E+00	2.48E+00
+P 50/90		*****	*****	*****
-P 50/90		*****	*****	*****
+P 99/90		*****	*****	*****
-P 99/90		*****	*****	*****
SIGMA		*****	*****	*****

VGS(th) ID=1mA VDS=VGS V [DELTA]  
 =====

FLUENCE	neutrons/cm2	INITIAL	9.40E+11	8.10E+12
----- S/N -----				
15			1.00E-02	-1.00E-02
MINIMUM			1.00E-02	-1.00E-02
MEAN			1.00E-02	-1.00E-02
MAXIMUM			1.00E-02	-1.00E-02

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.
.   DEVICE TYPE      IRH67260 N-MOSFET (IRC)   .
    
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.      RADIATION SOURCE      TRIGA Reactor (MNRC), 1.00MeV.
.
.  D/C  CIRC 01 || PACKAGE    TO-3      || LOT#   ER14253
.  LOG# 972   || TEST DATE  06/26/01 || RTP#   386
.
.
.....
I C S RADIATION TECHNOLOGIES, INC.
    
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I C S Radiation Test Results  
 IRH67260 N-CHANNEL POWER MOSFET (IRC)  
 =====

BVDSS ID=1mA VGS=0V V  
 =====

FLUENCE	neutrons/cm2	INITIAL	9.40E+11	8.10E+12
----- S/N -----				
15		2.04E+02	2.04E+02	2.05E+02
MINIMUM		2.04E+02	2.04E+02	2.05E+02
MEAN		2.04E+02	2.04E+02	2.05E+02
MAXIMUM		2.04E+02	2.04E+02	2.05E+02
+P 50/90		*****	*****	*****
-P 50/90		*****	*****	*****
+P 99/90		*****	*****	*****
-P 99/90		*****	*****	*****
SIGMA		*****	*****	*****

BVDSS ID=1mA VGS=0V V [DELTA]  
 =====

FLUENCE	neutrons/cm2	INITIAL	9.40E+11	8.10E+12
----- S/N -----				
15			0.00E+00	1.00E+00
MINIMUM			0.00E+00	1.00E+00
MEAN			0.00E+00	1.00E+00
MAXIMUM			0.00E+00	1.00E+00

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.      DEVICE TYPE          IRH67260 N-MOSFET (IRC)
.      RADIATION SOURCE      TRIGA Reactor (MNRC), 1.00MeV.
.
.  D/C  CIRC 01 || PACKAGE    TO-3      || LOT#   ER14253
.  LOG# 972   || TEST DATE  06/26/01 || RTP#   386
.
.
.....
I C S RADIATION TECHNOLOGIES, INC.
    
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I C S Radiation Test Results  
 IRH67260 N-CHANNEL POWER MOSFET (IRC)



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=====
RDS(on)   VGS=12V  ID=16A OHMS
=====
FLUENCE  neutrons/cm2  INITIAL          9.40E+11  8.10E+12
-----  S/N -----
15              2.35E-02      2.30E-02      2.40E-02

MINIMUM        2.35E-02      2.30E-02      2.40E-02
MEAN           2.35E-02      2.30E-02      2.40E-02
MAXIMUM        2.35E-02      2.30E-02      2.40E-02
+P 50/90      *****          *****          *****
-P 50/90      *****          *****          *****
+P 99/90      *****          *****          *****
-P 99/90      *****          *****          *****
SIGMA         *****          *****          *****

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RDS(on)   VGS=12V  ID=16A OHMS  [DELTA]
=====
FLUENCE  neutrons/cm2  INITIAL          9.40E+11  8.10E+12
-----  S/N -----

15              -5.00E-04      5.00E-04

MINIMUM        -5.00E-04      5.00E-04
MEAN           -5.00E-04      5.00E-04
MAXIMUM        -5.00E-04      5.00E-04

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.
.   DEVICE TYPE      IRH67260 N-MOSFET (IRC) .
.   RADIATION SOURCE TRIGA Reactor (MNRC), 1.00MeV. .
.
.   D/C  CIRC 01 || PACKAGE  TO-3      || LOT#  ER14253 .
.   LOG# 972   || TEST DATE 06/26/01 || RTP#  386 .
.
.....
I C S RADIATION TECHNOLOGIES, INC.

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RADIATION TEST PROCEDURE

No. 386

Device Type: IRH 67260 N-Channel Power MOSFET  
 Manufacturer: International Rectifier Corp.  
 Lot No: ER14253 Date Code: Circ. 2001  
 Package Type: TO-3 Can  
 No. of Devices Supplied: 10  
 No. of Devices to be tested: 9 + 1 Control

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RADIATION CONDITIONS: MIL STD 750D, Test Method 1017

Facility: TRIGA Reactor

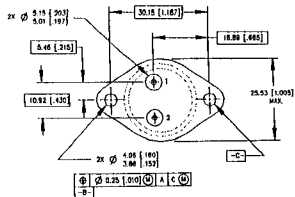
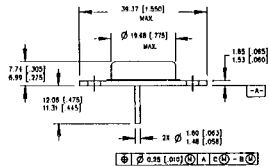
Energy: 1 MeV Equivalent

Neutrons/cm <sup>2</sup>	1E12	1E13
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BIAS CONDITIONS DURING IRRADIATION: All leads grounded.

Pin No.	Name
---------	------

- |   |              |
|---|--------------|
| 1 | SOURCE       |
| 2 | GATE         |
| 3 | DRAIN (Case) |



RADIATION TEST PROCEDURE

Device Type: IRH 67260 N-Channel Power MOSFET

Electrical Parameter Measurement Conditions\*

TEST NUMBER	TEST NAME	TEST CONDITIONS	LIMIT/UNITS
1	IGSSF	VGS=20 V	100 nA
2	IGSSR	VGS=-20 V	-100 nA
3	IDSS	VDS=160 V VGS=0 V	10 $\mu$ A
4	VGSTH	ID=1mA VDS=VGS	2 to 4 V
5	BVDSS	ID=1 mA	200 V
6	RDSON	VGS=12 V ID=20 A*	0.025 $\Omega$

\*Pulsed: Pulse width  $\leq$  300  $\mu$ s; Duty Cycle  $\leq$  2%.

\*Measurements shall be made using a Tektronix 370 Curve Tracer at room ambient temperature.