

HIREX ENGINEERING®



Heavy ion SEE testing of RH119 “Dual Voltage Comparator” for XMM

Final Presentation of ESTEC Contract No. 13413/98/NL/MV, CCN-1

QCA Final Presentation Day, January 26th 2000

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RH119 SEU Test Presentation



Test performed in April 99
at the European Heavy Ion Facility (HIF),
Université Catholique de Louvain (Belgium)

- ➡ Presentation of the three different test conditions
- ➡ RH119 test samples
- ➡ Test set-up
- ➡ Results



RH119 SEU Test Presentation

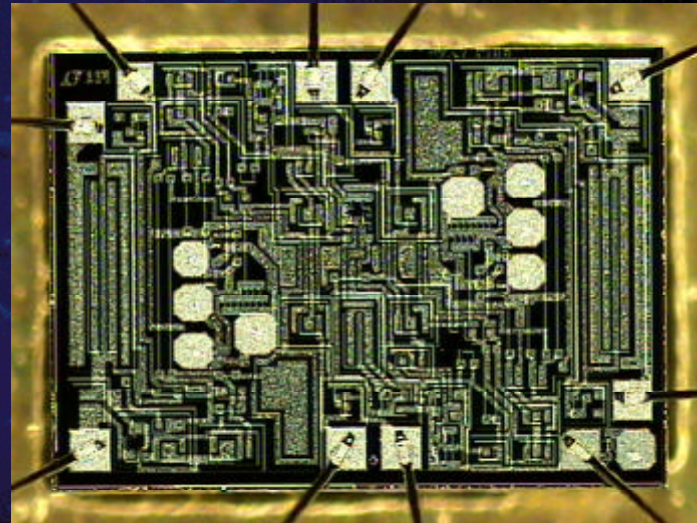
Three different XMM applications involving a comparator followed by a latch element

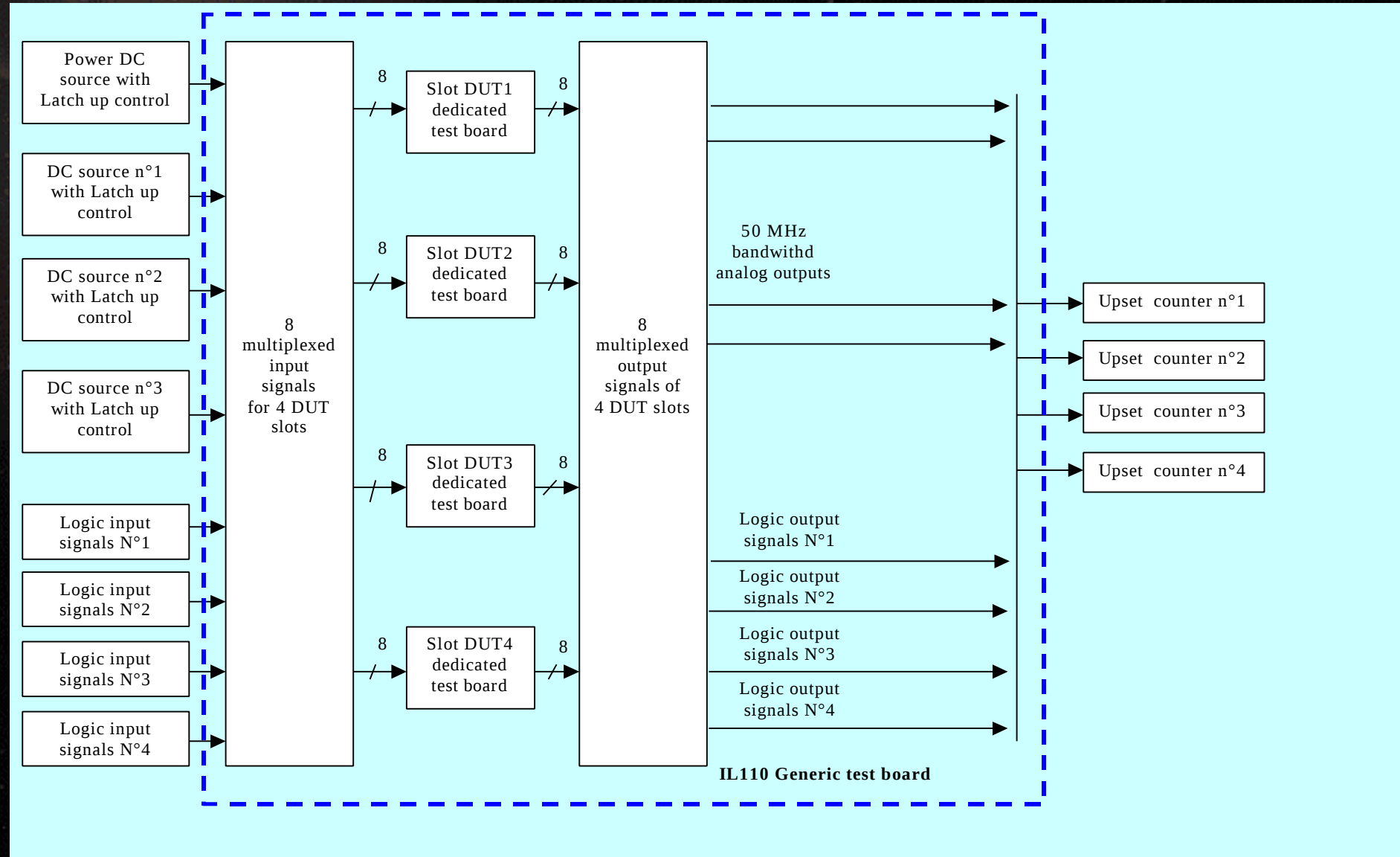
- ➡ WDE design: Monitoring a shunt current with respect to ground level
- ➡ FDE/Temp: Monitoring two temperature sensors (thermistors)
- ➡ FDE/Sun: Sun acquisition control, two analog voltages monitored with two trigger levels fixed to 2.5V



RH119 test samples

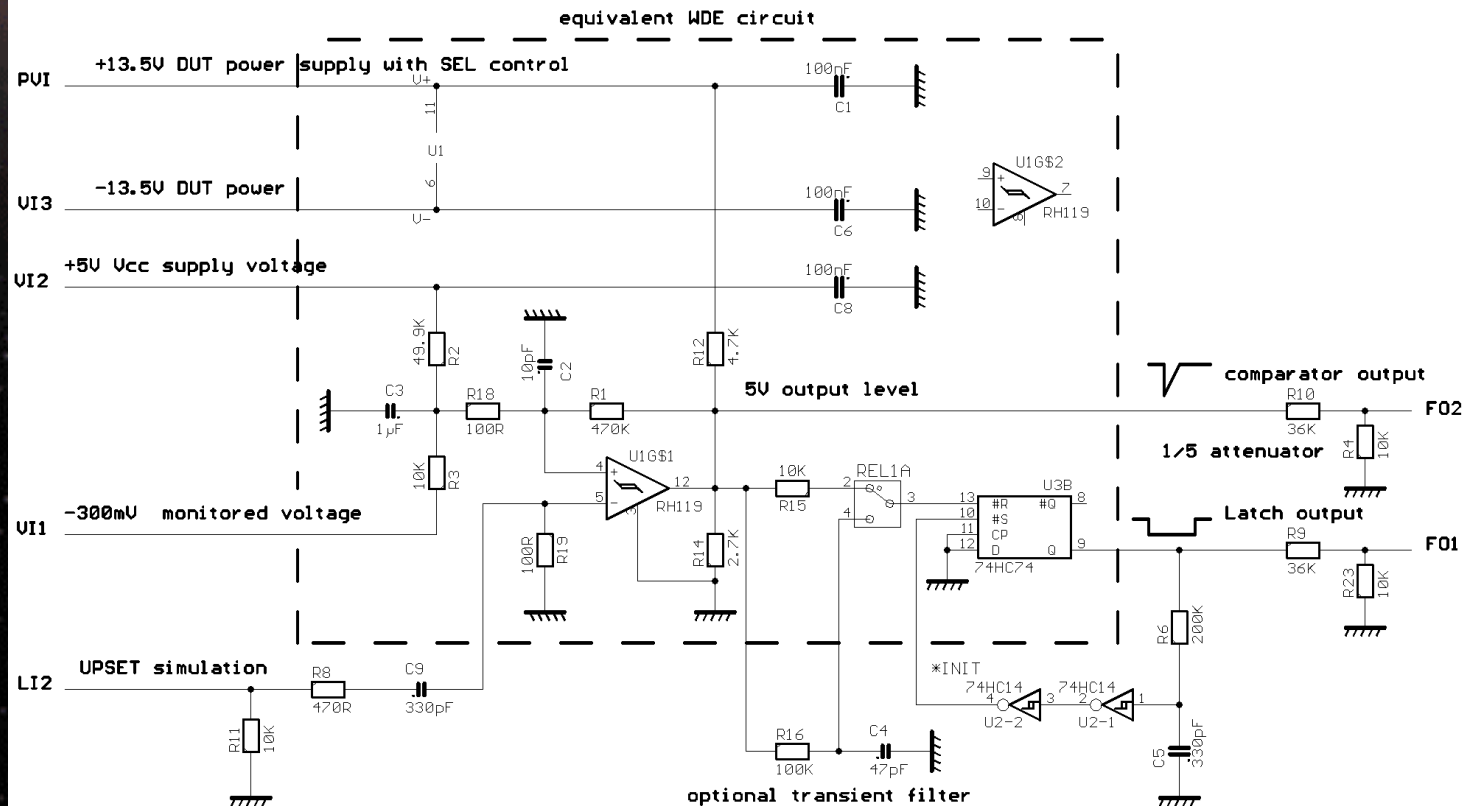
Part type : RH119
Manufacturer : Linear Technology
Package : 10-Lead TO-5 Metal Can
Quality Level : Hirel
Date Code : 9639A
Die Technology : Bipolar
Die Size : 2.0 mm x 1.4 mm approximately



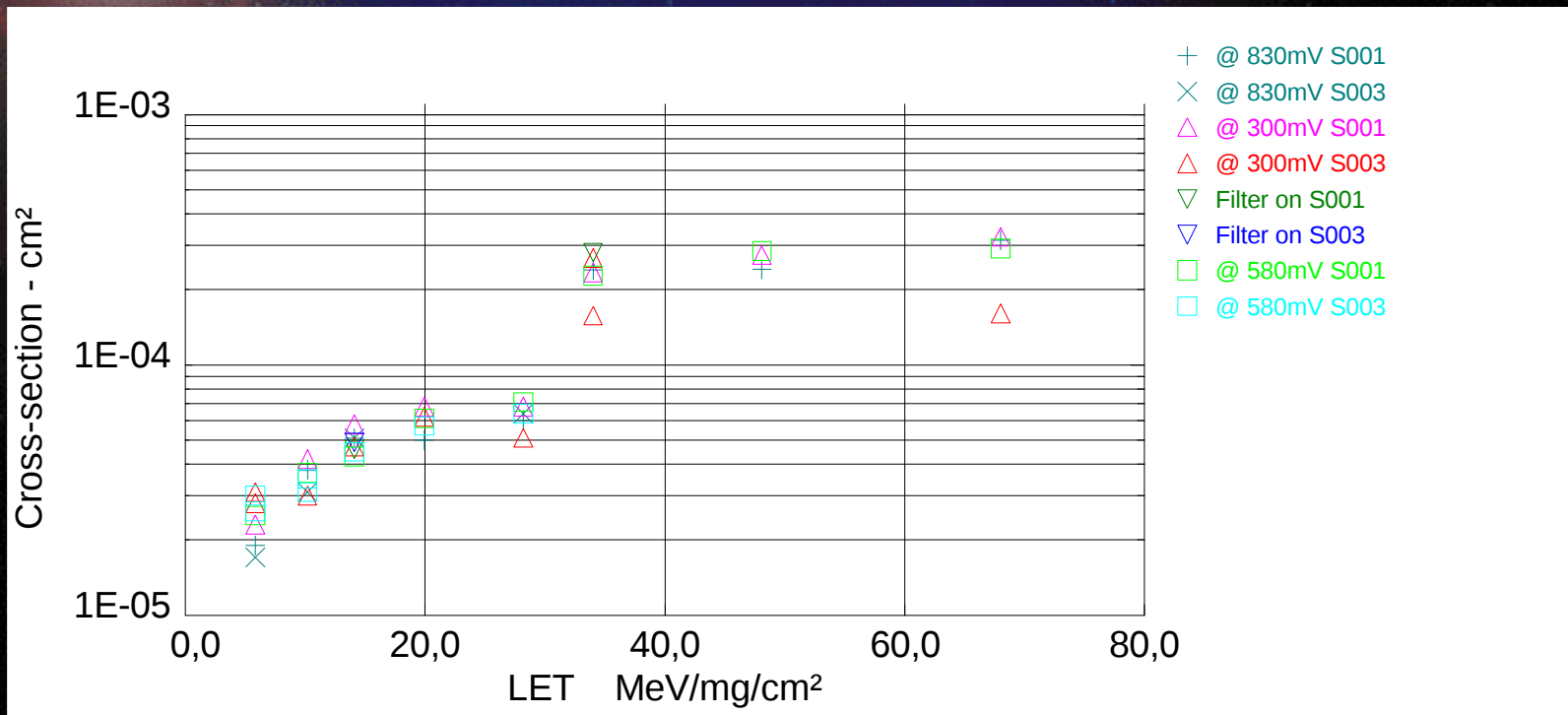


WDE Design

XMM3 / Design 1 / WDE / LM119H



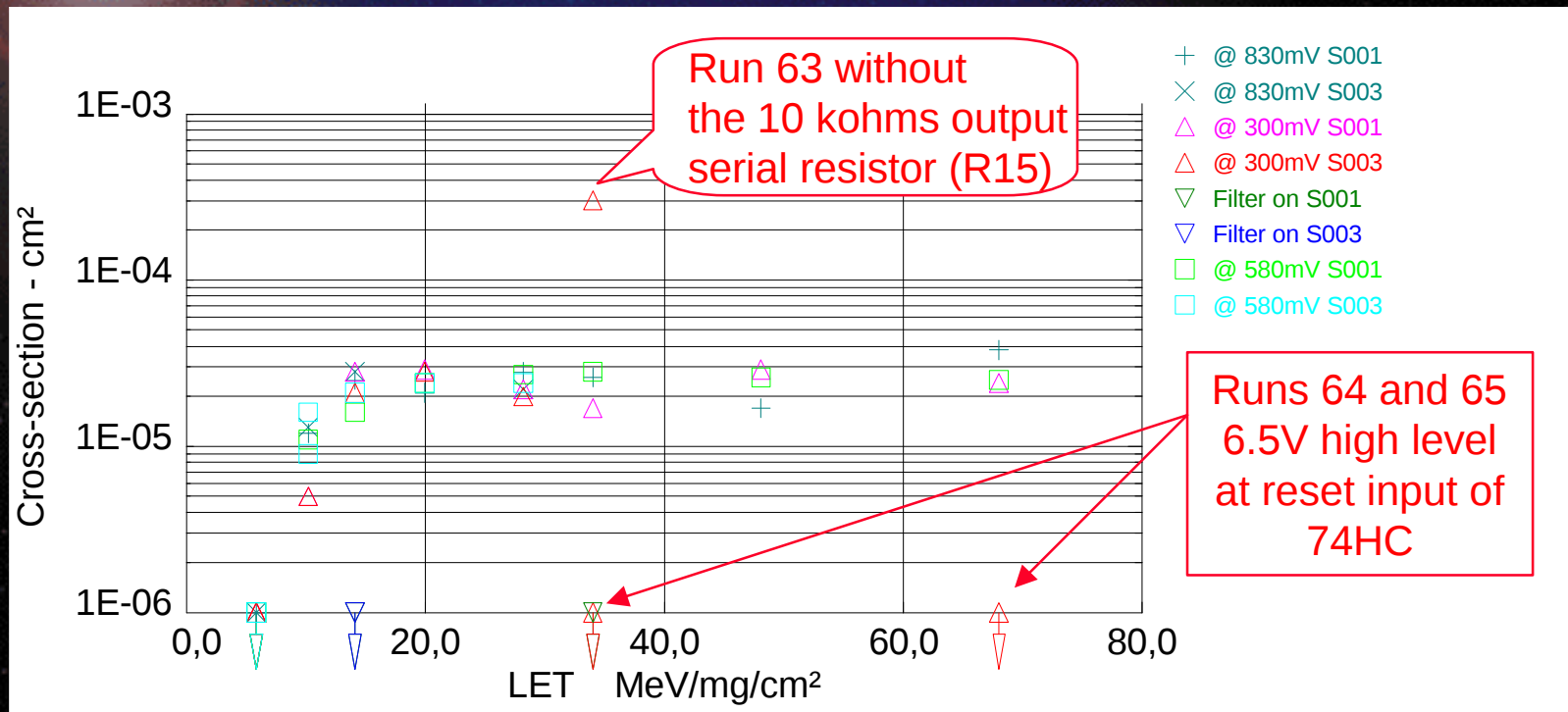
SEE Test Results : WDE



WDE Comp, SEU Error cross section versus LET



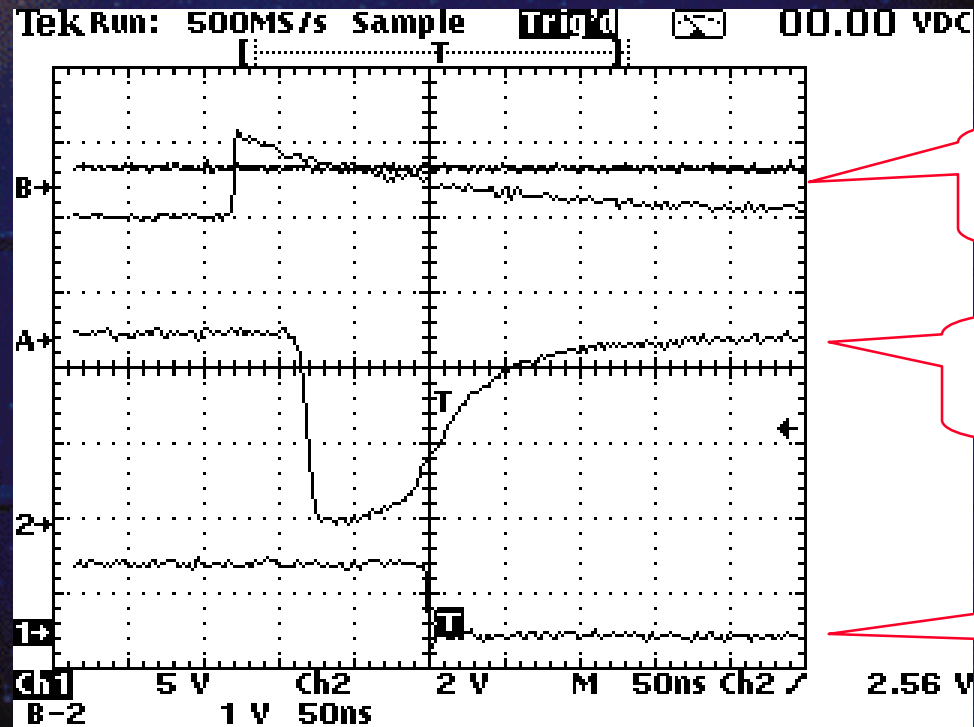
SEE Test Results : WDE



WDE Latched,SEU Error Cross section versus LET



SEE Test Results : WDE



Comparator inputs

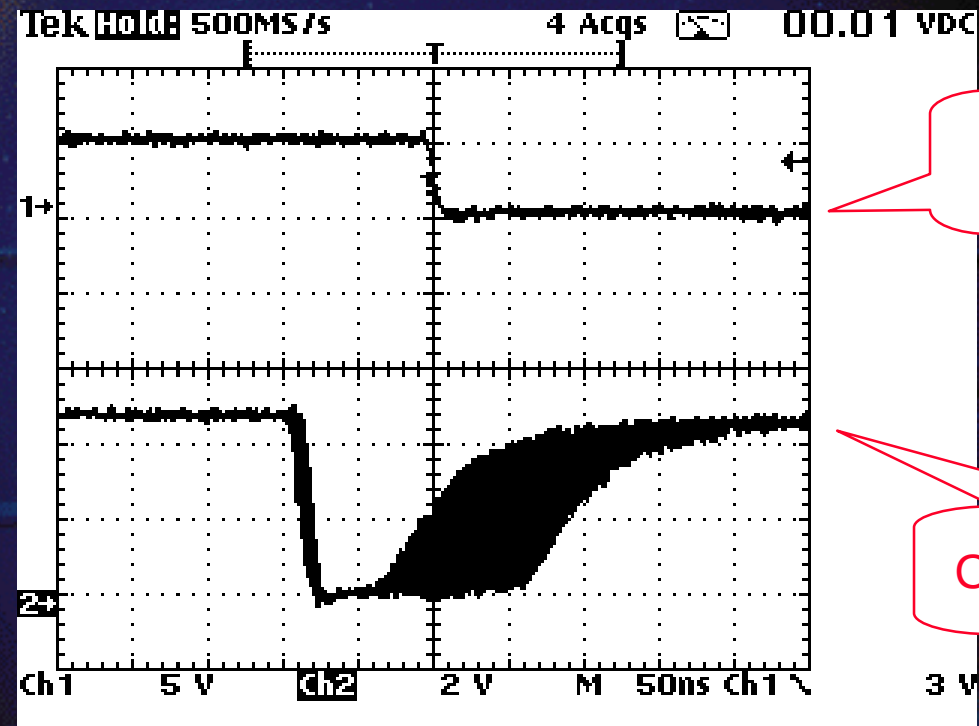
Comparator output

Latch output

Electrical Upset Simulation (No beam)



SEE Test Results : WDE



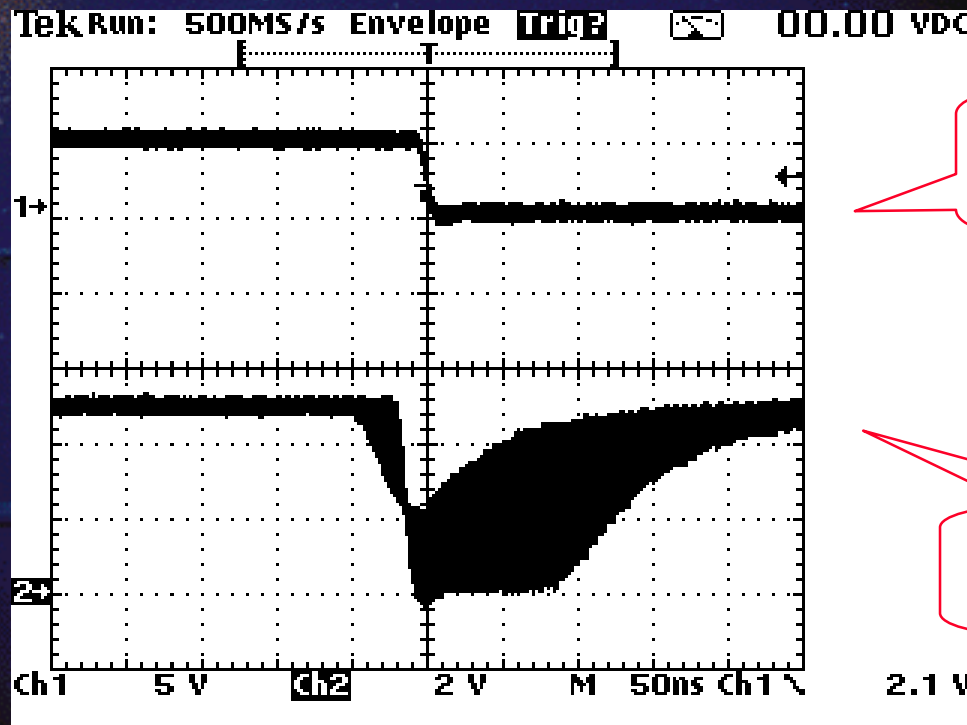
Latch output

Comparator output

Minimum and maximum widths of Upset pulses which induce a latch error
(with the 10kohms output serial resistance R15)



SEE Test Results : WDE



Latch output

Comparator output

Minimum and maximum widths of Upset pulses which induce a latch error
(without the 10kohms output serial resistance R15)



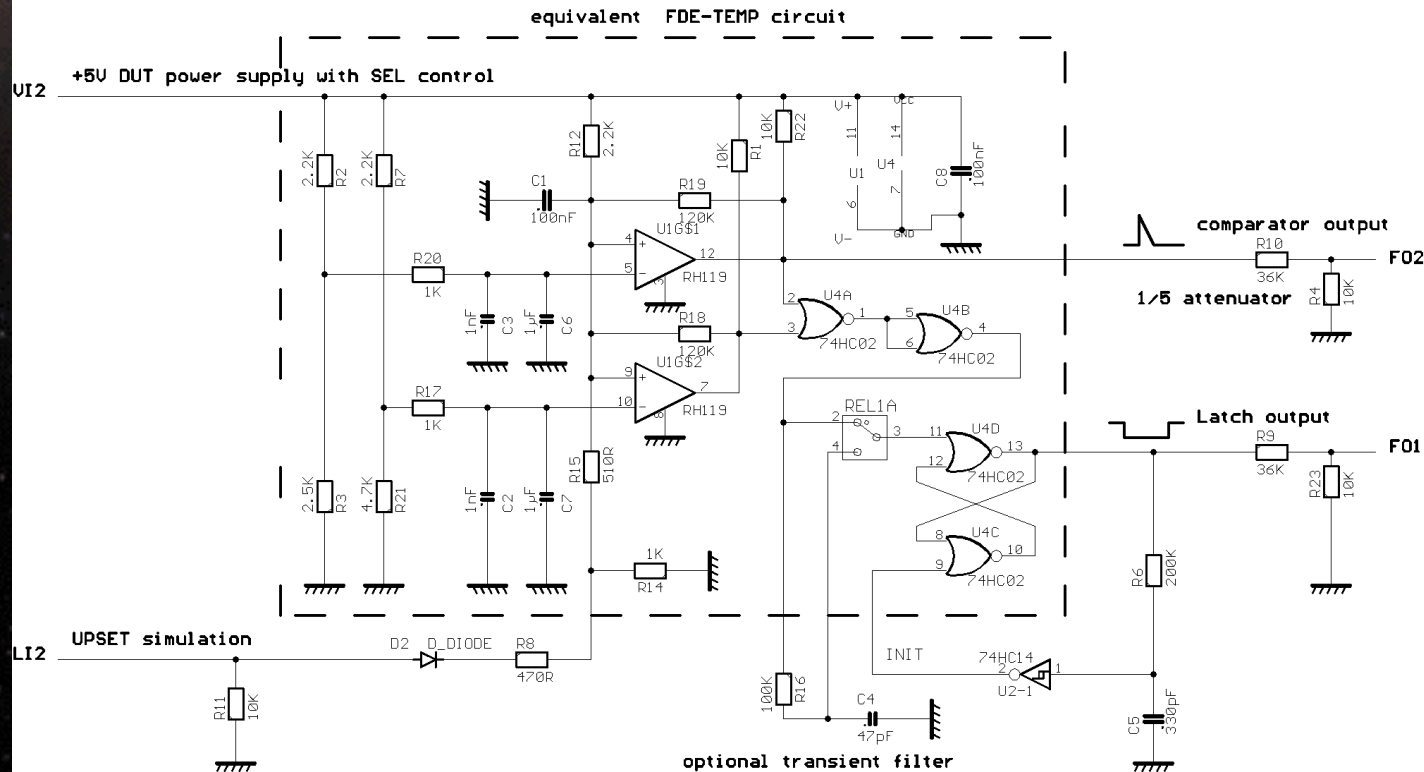
SEE Test Results : WDE

Error Type	Test Conditions	Asymptotic Cross section (cm ²)	LET Threshold (MeV/mg/cm ²)
Comparator	Comp Input @ 300mV	~2.5E-4	< 5.8
	Comp Input @ 580mV	~2.9E-4	< 5.8
	Comp Input @ 830mV	~3.1E-4	< 5.8
Latch	Comp Input @ 300mV	~2.4E-5	5.8
	Comp Input @ 580mV	~2.8E-5	5.8
	Comp Input @ 830mV	~3.8E-5	5.8
	Comp Input @ 300mV and without output Serial resistor	~3E-4 @ LET of 34MeV/mg/cm ²	
	Comp Input @ 300mV and with 6.5V at 74HC Reset Input	< 1E-6	

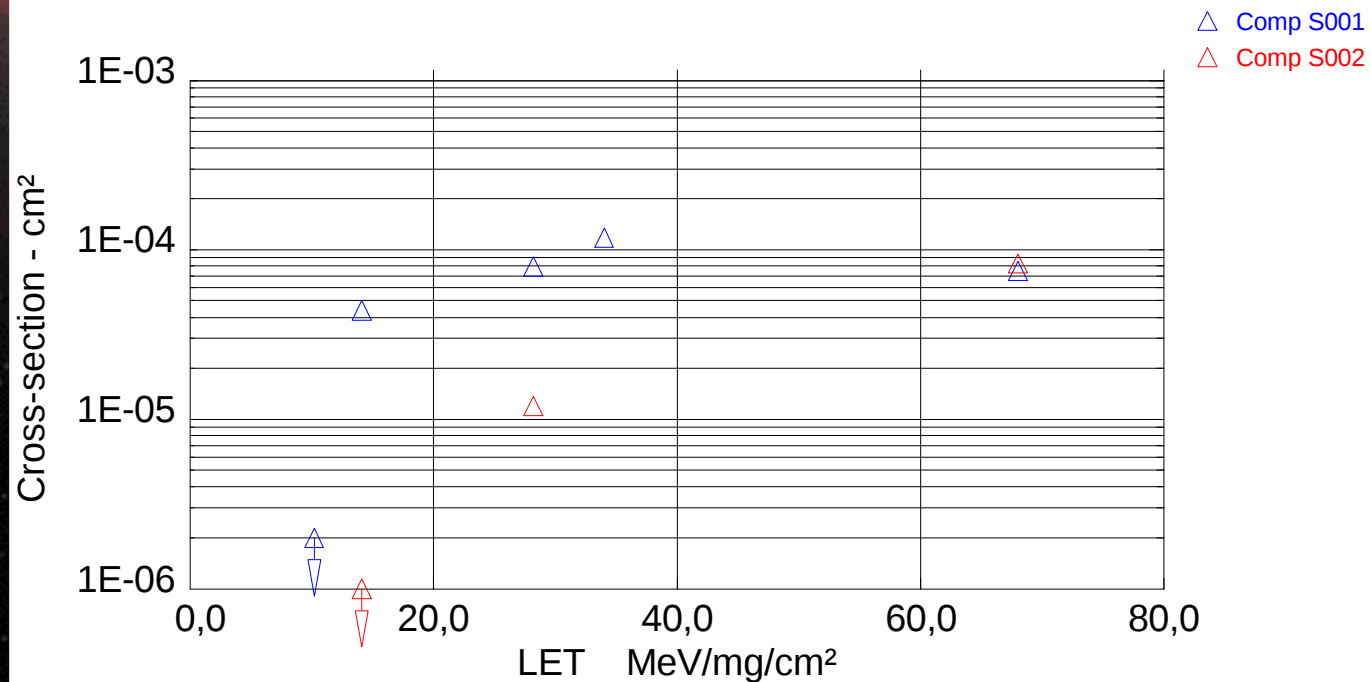


FDE/Temp Design

XMM3 / Design 2 / FDE-TEMP / RH119H



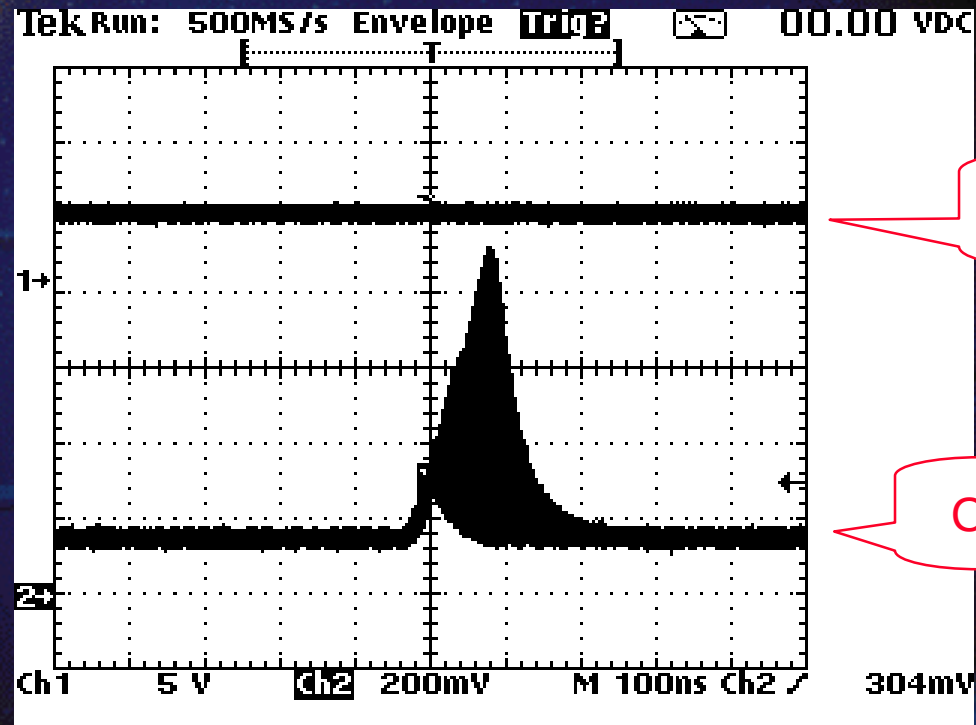
SEE Test Results : FDE/Temp



Comp. Error cross section versus LET



SEE Test Results : FDE/Temp



Latch output

Comparator output

Comparator output transient envelop

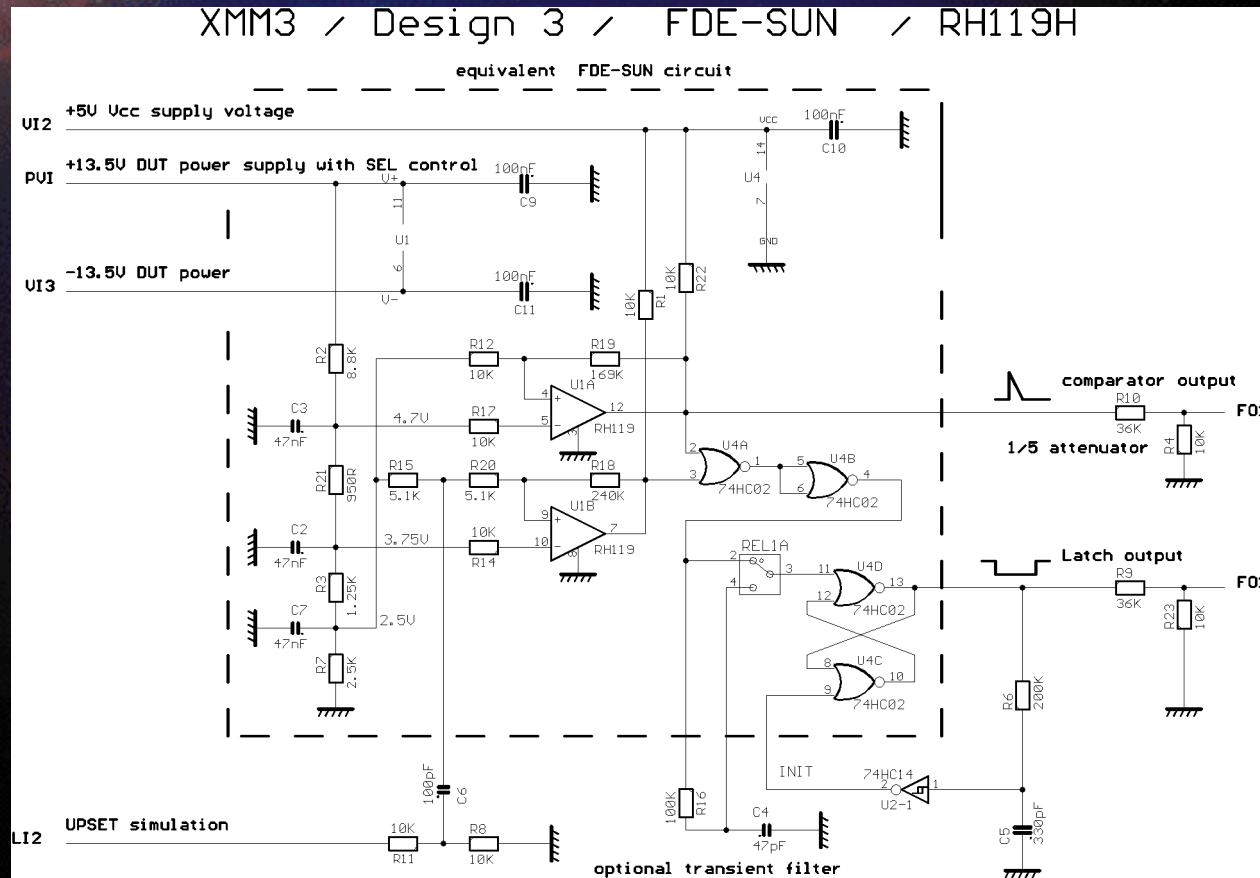


SEE Test Results : FDE/Temp

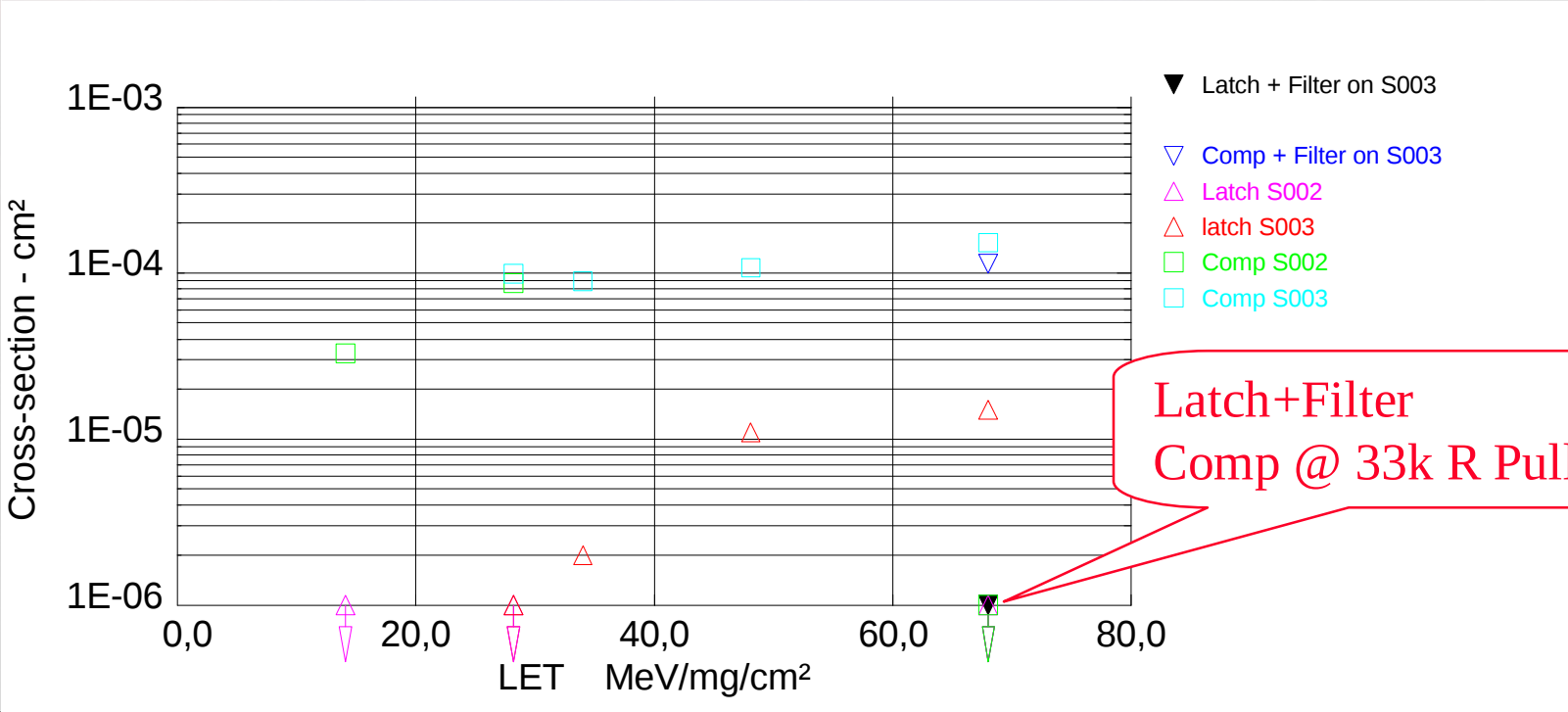
Error Type	Test Conditions	Asymptotic Cross section (cm ²)	LET Threshold (MeV/mg/cm ²)
Comparator		~1E-4	5.8
Latch		< 1E-6	



FDE/Sun Design



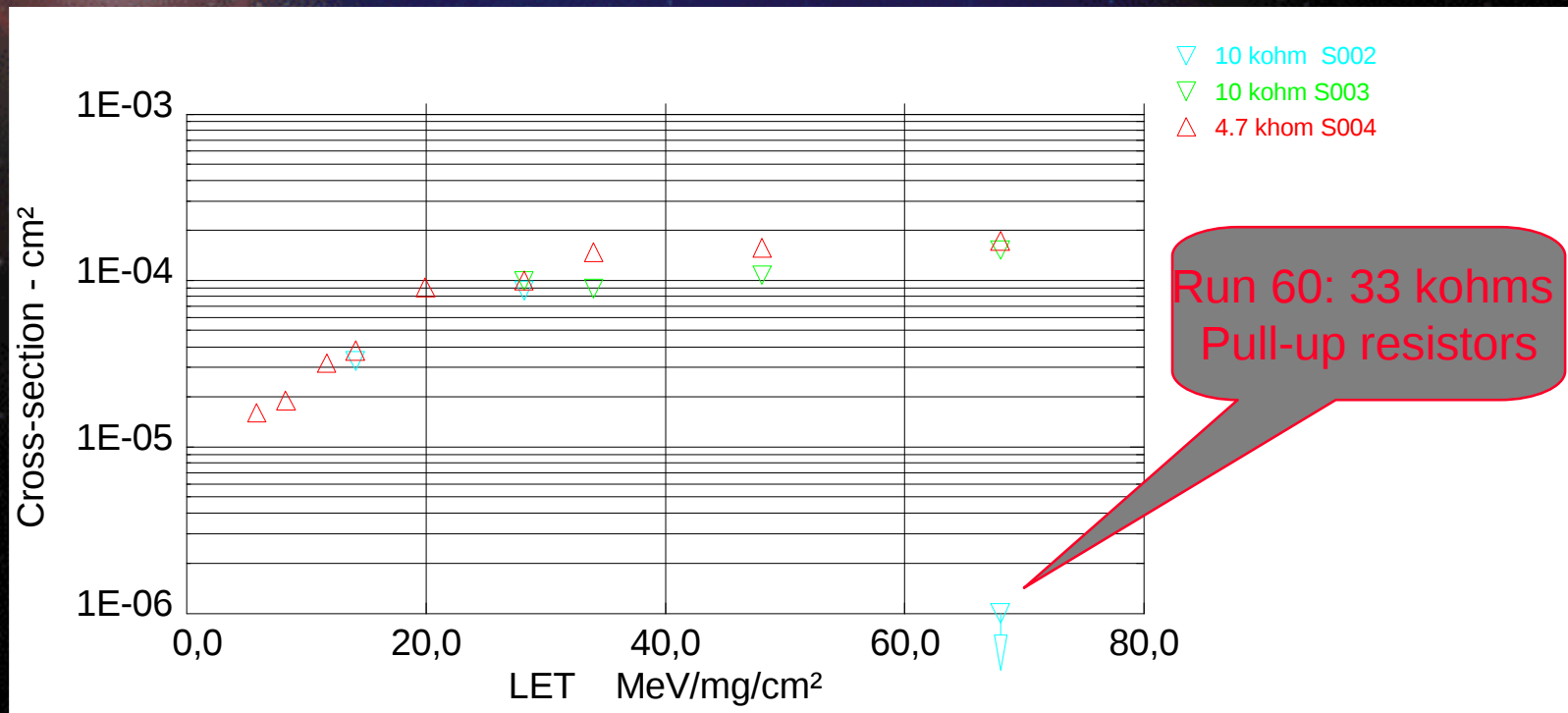
SEE Test Results : FDE/Sun



Comp. and Latch Error cross-section versus LET



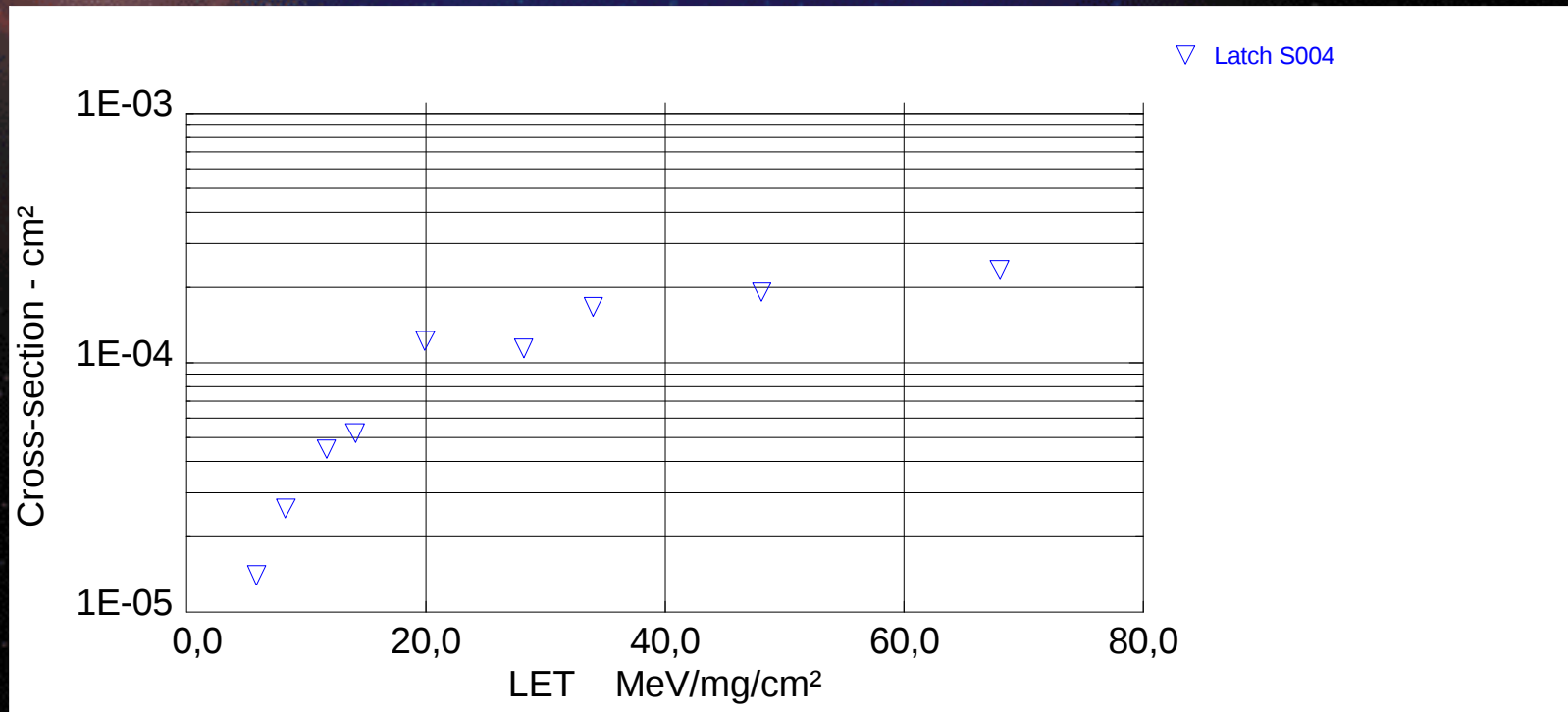
SEE Test Results : FDE/Sun



Comp. Error Cross-Section for different pull-up resistors values



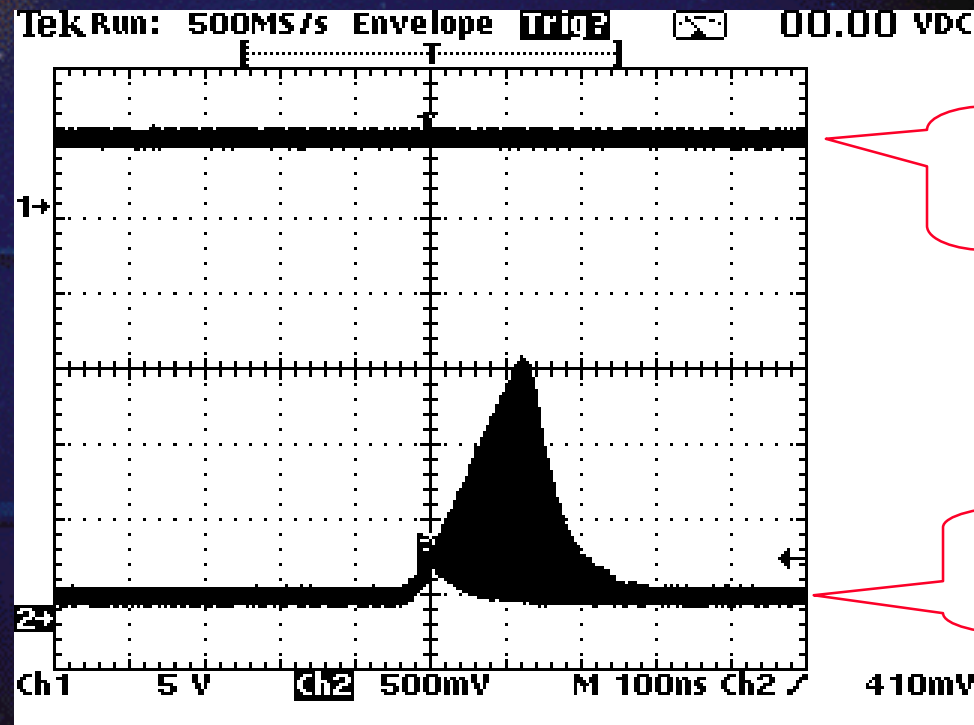
SEE Test Results : FDE/Sun



Latch Error Cross section with 4.7kohms resistors



SEE Test Results : FDE/Sun



Typical example of comparator output SEU transient



SEE Test Results : FDE/Sun

Error Type	Test Conditions	Asymptotic Cross section (cm ²)	LET Threshold (MeV/mg/cm ²)
Comparator	Pull-up resistors=10kohms	~1.5E-4	< 14.1
	Pull-up resistors=33kohms (*)	< 1E-6	
Latch	Pull-up resistors=10kohms	~1.7E-4	28.2

(*) transients heights are below the comparator counter threshold value of 1.12V.

