

# SHIELDED BAG TEST SYSTEM

# Model 4431T

Measures the shielding effectiveness of static shielding bags

## Features:

- ❑ Performs energy test:  
ANSI/ESDA S11.31  
MIL-PRF-81705E
- ❑ Performs voltage test:  
EIA 541
- ❑ Test Voltage: 1000V
- ❑ 3½-digit LED voltage display
- ❑ Oscilloscope interface outputs
- ❑ 90-260VAC Input power
- ❑ Turnkey System



ETS Model 431 Energy Calculation Test Report v1.10  
Test Standard: ESD S11.31-1994 Static Shielding Bags  
Print Date: 7/21/98 Page: 1

Customer: Electro-Tech Systems, Inc PO # Sample #: 8.0 x 10.0  
Reference #: 12 % of Wave Captured: 100 Sample Size:  
Test Tech: SPW Cal Peak Current (mA): 452.00 Cal Energy Level (nJ): 49737.47

Date in Chamber:  
Time in Chamber: Test Date: 7/21/98 Test Humidity: % Ambient Humidity: %  
Conditioning Period: Hrs Test Time: 13:58:13 Test Temp: °F Ambient Temp: °F

Chamber: ETS Model 518 Environmental Chamber Scope Type: ID TEK/TDS 360,CF91,1CT,FV-v1.02  
Controller: N/A Probe 1 Type: TEK CT-1  
Test System: ETS Model 431 Shielded Bag Test System Scope Cal Date: 1/1/98  
E.S. Sys Cal Date: 1/1/98

Test Data					
Sample 1			Sample 2		
Discharge	Peak Current (mA)	Energy Level (nJ)	Discharge	Peak Current (mA)	Energy Level (nJ)
1	23.00	15.76	1	24.40	14.50
2	23.60	15.51	2	23.20	14.20
3	26.00	15.23	3	26.40	13.89
4	23.20	15.33	4	24.40	13.95
5	26.40	15.27	5	26.00	14.00
6	24.40	14.71	6	26.00	13.97
Average	25.53	15.36	Average	25.40	14.10
Std Deviation	6.60	0.35	Std Deviation	6.87	0.24
Sample 3			Sample 4		
Discharge	Peak Current (mA)	Energy Level (nJ)	Discharge	Peak Current (mA)	Energy Level (nJ)
1	24.40	13.54	1	25.20	15.97
2	24.40	13.89	2	26.00	15.46
3	26.00	13.82	3	26.40	15.66
4	24.40	13.91	4	23.60	15.34
5	24.40	13.89	5	26.40	15.09
6	23.60	13.71	6	25.60	15.03
Average	24.87	13.80	Average	25.37	15.37
Std Deviation	6.73	0.14	Std Deviation	6.48	0.36
Sample 5			Sample 6		
Discharge	Peak Current (mA)	Energy Level (nJ)	Discharge	Peak Current (mA)	Energy Level (nJ)
1	24.80	16.19	1	25.20	17.62
2	26.40	15.63	2	26.00	17.46
3	25.60	15.29	3	25.20	16.80
4	26.80	15.40	4	26.40	16.55
5	24.40	15.11	5	26.80	16.49
6	25.00	15.06	6	24.40	16.07
Average	25.60	15.25	Average	25.67	16.33
Std Deviation	6.91	0.42	Std Deviation	6.89	0.60

Data Analysis: Average (nJ) 15.15 Min (nJ) 13.54 Max (nJ) 17.62 Std Dev 1.87

## Applications:

Sensitive electronic devices are susceptible to damage or degradation by electrostatic discharge (ESD) from personnel, equipment, or by a charged device discharge. Static shielding bags are designed to protect these components from ESD events.

Devices may be either voltage or energy sensitive. EIA-541-1988 "Packaging Material Standards for ESD sensitive Items", defines the measurement of the voltage ( $\Delta V$ ) inside an ESD protective bag when a 1kV, HBM discharge is applied. ANSI/ESDA STM11.31 "Evaluating the Performance of Electrostatic Discharge Shielding Bags" defines the measurement of the energy (nJ) inside the bag from a specified 1kV, HBM discharge.

The ETS Model 4431T Shielded Bag Test System is a complete system that generates the specified ESD pulse applied to the outside surface of the bag and detects either the voltage or current induced onto a capacitive sensor placed inside the bag. The Model 4431T is a turnkey package that includes the Test Unit, ETS Test Suite Manager software that processes and presents the data in accordance with STM11.31, oscilloscope and computer.



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## Description:

The Model 4431 (Test Unit portion) provides the correct discharge pulse and 100:1 attenuated voltage output to a 2-CH oscilloscope for the EIA 541  $\Delta V$  test or a current pulse through a 500 $\Omega$  resistor to the oscilloscope for the ESDA STM11.31 test.

The Test Unit consists of a 1kV power supply with LED voltage and CHG/DISCHG displays, built-in 100pF/1500 $\Omega$  HBM network, mercury wetted charge/discharge relay, capacitive sensor and a force clamp electrode. Adjustable bag insertion stops enable the user to configure the Model 4431 for different bag sizes per specification. A built-in Tektronix CT-1 current transducer and a 500 $\Omega$  resistor are incorporated into the capacitive sensor along with built-in 100:1 voltage attenuators for interfacing the Test Unit to the appropriate oscilloscope. FUNCTION switches select HV On/Off,  $\Delta V$  (1.5K/200pf & 400k/200pf), nJ, MANUAL or AUTO discharge.

Figure 1 shows the discharge waveform for the specified STM11.31 100pF/1500 $\Omega$  HBM network. Figure 2 is an actual waveform detected inside a shielding bag.

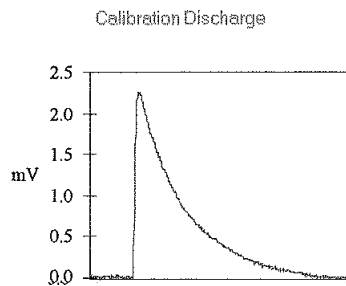


Figure 1

Peak: 452 (mA)  
Energy: 50928.32 (nJ)

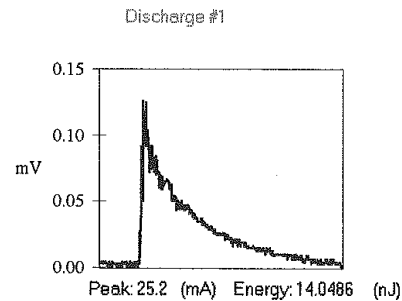


Figure 2

Peak: 25.2 (mA) Energy: 14.0486 (nJ)

The EIA 541  $\Delta V$  test specifies a 200pF/400k $\Omega$  network, but current industry practice uses a 200pF/1500 $\Omega$  network. A 400k $\Omega$  resistor is built-in.

The ETS Test Suite Manager Software displays the waveforms, calculates energy inside the bag, processes the data in accordance with S11.31 plus controls the AUTO nJ function, programs the oscilloscope and records the necessary sample information entered by the user.

## Specifications:

### HV Power Supply:

Adjustable, +800 to +1200V

### Discharge Network:

STM11.31: 100pF/1500 $\Omega$

EIA 541: 200pF/1.5 or 400k $\Omega$

### Discharge Waveform STM11.31:

Rise time @ 0 $\Omega$ : <10nsec

@ 500 $\Omega$ : <20nsec

Fall time @ 0 $\Omega$ : 150 $\pm$ 15nsec

@500 $\Omega$ : 200 $\pm$ 20nsec

Ringing: <15%

### Discharge Method:

Bounceless SPDT mercury wetted relay

### Discharge & Ground Electrodes:

1.5" (38mm) Stainless steel

### Capacitive Sensor:

Electrodes: 0.875" (22mm) stainless steel

Dielectric: 0.5" (12mm)

Capacitance: 6pF

### Oscilloscope, Tektronix TDS2022C

Voltage output: 100:1 Attenuated signal into 1 meg $\Omega$

Current output: Tektronix CT-1: 5mV/mA

Signal input/output to computer: USB

### Computer, PC:

Operating systems: Windows XP, Vista

### Power:

90-260VAC, 50/60Hz

### Test Unit Dimensions:

4"Wx12"Dx6"H (102x305x152mm)

### Warranty: One (1) Year