

## Test Report # 158 / 05

**Customer:**

AREVA ENERGIECHNIK GmbH

**Customer PO#:**

3234-45000067657

**Our Reference:**

BX 04 092 R1 TECH

**Test Laboratory:**

AREVA T&D BRASIL

**Standard:**

IEC 60289/88

**Material:**

2 three-phase current limiting reactors type 3xLCC-175/2500

Rated inductance .....	0.175 mH
Rated current .....	2500 A
Rated frequency .....	50 Hz
Short-time current / duration .....	31.5 kA / 1s
Offset peak current .....	80.5 kA
Total losses at 75° C with 2500 A .....	8.5 kW
Rated Voltage .....	6.3 kV
BIL .....	75 kV
Weight without insulators .....	3x369 kg
Cooling .....	AIR
Year .....	2005
WO .....	05.9041
Serial number .....	05.9041 - 01 and 02 (U,M,L)*

\* U = Upper reactor / M = Middle reactor / L = Lower reactor

Summary:

ROUTINE TEST

Lightning Impulse Test.....PASS  
Measurement of resistance with direct current.....PASS  
Measurement of winding impedance, with 3Ø source in star connection.....PASS  
Measurement of impedance, inductance and losses, on single phase coils.....PASS

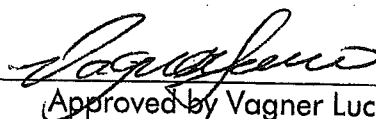
Conclusion:

The reactors type 3xLCC-175/2500, serial numbers 05.9041-01 and 02 have **PASSED** the tests.

Approval:



Issued by Bruno R Fonseca  
AREVA T&D BRASIL



Approved by Vagner Lucio  
AREVA T&D BRASIL

## TEST SEQUENCE

### ROUTINE TESTS

June 6 to 7, 2005

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## ROUTINE TESTS

June 6 to 7, 2005

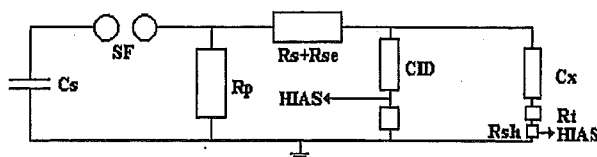
### 1.0) Lightning Impulse Test:

#### 1.1) Test description:

The test consists of applying, on each terminal of the reactor one at a time, 4 (four) impulses in the following order: 1 (one) with a peak value between 50 % and 70 % of the equipment insulation level, and 3 (three) with the peak value equal to the equipment insulation level. All the impulses are positive polarity.

The reactor under test was connected to the impulse generator in parallel with the voltage divider. Current measurement was performed by inserting a shunt resistor between the reactor and laboratory grounding grid.

#### 1.2) Impulse test circuit:



	Number of stages	8 stages
Cs	Series capacitor	(2 $\mu$ F / 2)
SF	Spark-Gap switch	
Rp	Parallel resistor	840 $\Omega$
Rs	Series resistor	15 $\Omega$
Rse	External resistor	200 $\Omega$
CID	Damped Capacitive Impulse Divider	1842 pF (215.2 V/V)
HIAS	High Resolution Impulse Analysis System	
Cx	Equipment under test	0.175 mH
Rt	Tail resistor	500 $\Omega$
Rsh	Shunt resistor	1.0 $\Omega$

#### 1.3) Atmospheric Conditions:

05.9041-	01 and 02
Temperature	20.0 $^{\circ}$ C
Pressure	700.0 mmHg
Relative Air Humidity	72.0 %
Altitude	895 m

#### 1.4) Specified Values:

Voltage (peak value)	U <sub>p</sub>	75.0 kV	-3 % / +3 %
Front time (Rise time)	T <sub>1</sub>	1.20 $\mu$ s	-30 % / +30 %
Time to one-half value	T <sub>2</sub>	50.0 $\mu$ s	-20 % / +20 %

**NOTE:** The voltage values were corrected according to the standards mentioned in annex C.

### 1.5) Result:

No breakdown nor flashover had occurred. The reactors type 3xLCC-175/2500, serial numbers 05.9041-01 and 02 have **PASSED** the Lightning Impulse Test. For further informations refer to attached lightning impulse waveform oscillograms. (ANNEX D)

### 2.0) Measurement of resistance with direct current:

05.9041-	R <sub>DC</sub> (mΩ)	T <sub>AMB</sub> (°C)	R <sub>DC 75°C</sub> (mΩ)
01 Upper	0.947	16.0	1.179
01 Middle	0.934	16.0	1.163
01 Lower	0.957	16.0	1.191
02 Upper	0.949	16.0	1.181
02 Middle	0.934	16.0	1.163
02 Lower	0.955	16.0	1.189

The reactors have PASSED the test.

For formulary information's refer to ANNEX A – Item A.1.

For applied measurement instruments information's refer to ANNEX B – Item B.2.

### 3.0) Measurement of winding impedance, with 3Ø source in star connection:

#### 3.1) Measurement at 60 Hz: (Reactor mounted as a 3Ø stack)

05.9041-	V (V)	I (A)	T <sub>AMB</sub> (°C)	Z <sub>60Hz</sub> (mΩ)
01 Upper	1.429	20.52	17.0	69.65
01 Middle	1.384	19.82	17.0	69.81
01 Lower	1.407	20.10	17.0	69.99
02 Upper	1.456	20.81	17.0	69.95
02 Middle	1.413	20.26	17.0	69.73
02 Lower	1.422	20.33	17.0	69.96

#### 3.2) Calculation of winding impedance from 60 Hz measurement to 50 Hz:

05.9041-	Z (mΩ)	L (μH)
01 Upper	58.04	184.75
01 Middle	58.18	185.19
01 Lower	58.32	185.64
02 Upper	58.29	185.56
02 Middle	58.11	184.96
02 Lower	58.30	185.56

Specified value of inductance at 50 Hz:

$L_{MN}(\mu H)$	$L(\mu H)$	$L_{MAX}(\mu H)$	Tolerance
175.0	<b>175.0</b>	210.0	-0/+20%

The reactors have PASSED the test.

For formulary information's refer to ANNEX A – Item A.2.

For applied measurement instruments information's refer to ANNEX B – Item B.3.

#### 4.0) Measurement of impedance, inductance and losses, on single phase coils:

##### 4.1) Measurement at 60 Hz:

05:9041-	V (V)	I (A)	P (W)	T <sub>AMB</sub> (°C)	Z <sub>60 Hz</sub> (mΩ)	R <sub>AC 60 Hz</sub> (mΩ)
01 Upper	1.382	20.23	0.46	16.0	68.30	1.124
01 Middle	1.348	20.51	0.47	16.0	65.74	1.118
01 Lower	1.405	20.51	0.49	16.0	68.52	1.165
02 Upper	1.403	20.56	0.48	16.0	68.23	1.135
02 Middle	1.352	20.64	0.48	16.0	65.51	1.127
02 Lower	1.393	20.35	0.47	16.0	68.47	1.135

##### 4.2) Calculation of impedance, inductance and losses from 60 Hz measurement to 50 Hz:

05:9041-	Z (mΩ)	R <sub>AC</sub> (mΩ)	L (μH)	R <sub>AC 75°C</sub> (mΩ)	Q <sub>75°C</sub>	Losses <sub>75°C</sub> (kW)
01 Upper	56.92	1.070	181.18	1.28	44.56	7.984
01 Middle	54.78	1.062	174.37	1.27	43.30	7.907
01 Lower	57.10	1.102	181.75	1.31	43.67	8.172
02 Upper	56.86	1.078	180.98	1.29	44.24	8.032
02 Middle	54.59	1.068	173.77	1.27	42.98	7.939
02 Lower	57.06	1.080	181.62	1.29	44.25	8.059

Specified value of losses at 75°C with rated current, at 50 Hz:

Losses at 75°C
≤ 8.5 kW

The reactors have PASSED the test.

For formulary information's refer to ANNEX A – Items A2 and A3.

For applied measurement instruments information's refer to ANNEX B – Item B3.

## ANNEX A

### FORMULARY:

#### A.1) Calculation of DC resistance at reference temperature:

$$R_{DC\ TREF} = R_{DC\ TAMB} \times \frac{(K + T_{REF})}{(K + T_{AMB})}$$

$R_{DC}$  = DC resistance.  
 $k$  = 225 for Aluminum.  
 $R_{DC\ TREF}$  = DC resistance at reference temperature.  
 $T_{REF}$  = Reference temperature.  
 $T_{AMB}$  = Ambient temperature.

#### A.2) Calculation of impedance:

##### A.2.1) Calculation of impedance at 60 Hz:

$$Z_{60\ Hz} = \frac{V}{I}$$

$Z_{60\ Hz}$  = Impedance at 60 Hz.

##### A.2.2) Calculation of impedance from 60 Hz measurement to 50 Hz:

$$Z = Z_{60\ Hz} \times \frac{50}{60}$$

$Z$  = Impedance at 50 Hz.  
 $f$  = frequency.

#### A.4) Calculation of Q factor and losses at reference temperature:

$$R_{AC} = R_{DC} + R_{AD}$$

$$R_{AD\ TREF} = R_{AD\ TAMB} \times \frac{(K + T_{AMB})}{(K + T_{REF})}$$

$$R_{AC\ TREF} = R_{DC\ TREF} + R_{AD\ TREF}$$

$$Q_{TREF} = \frac{(2 \times \pi \times f) \times L}{R_{CA\ TREF}}$$

$$\text{Losses}_{TREF} = I^2 \times R_{AC\ TREF}$$

$R_{AD}$  = Stray loss resistance.  
 $R_{AC\ TREF}$  = Equivalent loss resistance at reference temperature.  
 $R_{AD\ TREF}$  = Stray loss resistance at reference temperature.  
 $Q_{TREF}$  = Q factor at reference temperature.  
 $\text{Losses}_{TREF}$  = Losses at reference temperature.  
 $I$  = Rated current.

## ANNEX B

### APPLIED MEASUREMENT INSTRUMENTS:

#### B.1) Item 1.0:

- **GIA-001** - High Resolution Impulse Analyzing System model HIAS 743 – Haefely.  
Calibration report number E-011/02 - Laboratory: CEPEL.
- **SGE 2400** - Impulse Generator 2400 kV, 120 kJ – Haefely.  
Calibration report number 734216 - Laboratory: Haefely.
- **CR 2400** - Damped Capacitive Impulse Divider 2400 kV – Haefely.  
Calibration report number HT\_0018 - Laboratory: Haefely.

#### B.2) Item 2.0:

- **PRE-006** – Thomson (Kelvin) bridge model 2222 – Tettex AG Zurich  
Calibration report number 0365 / 2004 - Laboratory: Vegtron.

#### B.3) Items 3.0 and 4.0:

- **WAT-004** – WT 230 Digital Power Meter model 760503 - Yokogawa.  
Calibration report number 0315 / 2004 – Laboratory : Vegtron.

## ANNEX C

### STANDARDS AND TECHNICAL SPECIFICATIONS CONCERNED:

#### IEC 60060-1

High Voltage Test Techniques, General Definitions and Test Requirements Measurement Systems.

#### IEC 60289

Reactors

#### IEC 60076-3

Insulation Levels and Dielectric Tests.

#### IEC 60076-4

Guide to lightning impulse and switching impulse testing – Power transformers and reactors

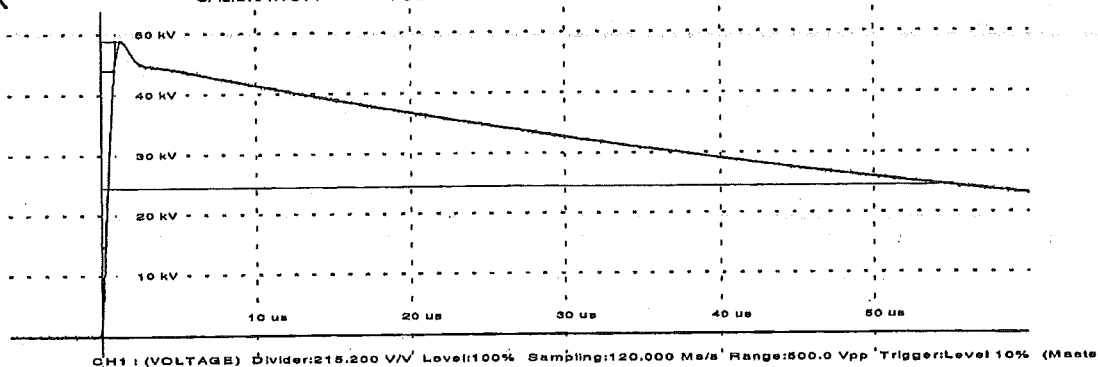
#### IEC 726

Dry-type power transformers

05.9041-01 UPPER

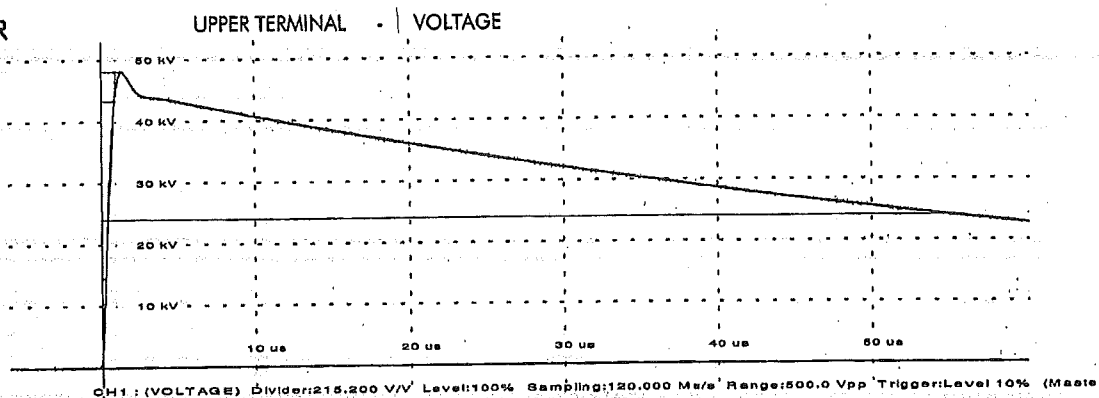
No. 1  
LI full  
Upk: 48.650 kV  
T1 : 1.021 us  
T2 : 55.313 us

CALIBRATION - VOLTAGE



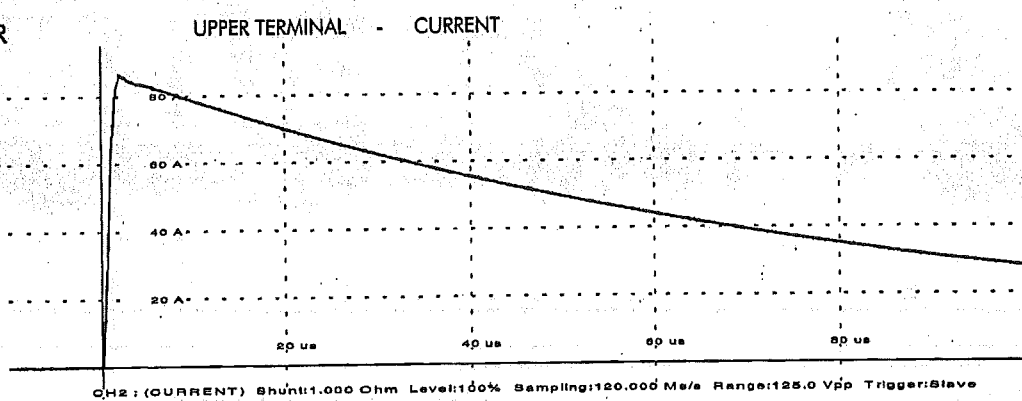
### 05.9041-01 UPPER

No. 1  
LI full  
Upk: 48.105 kV  
T1 : 1.025 us  
T2 : 55.425 us



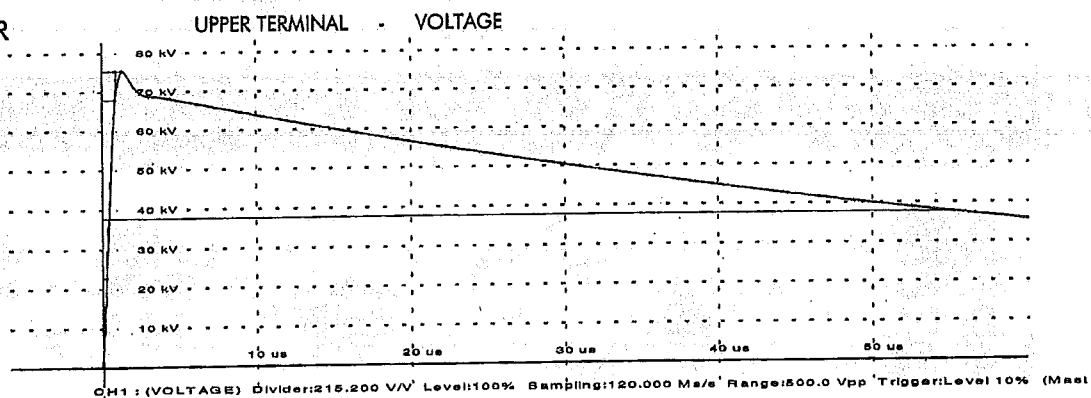
### 05.9041-01 UPPER

No. 1  
LI full  
Ipk max: 86.372 A  
Ipk min: -360.982 mA



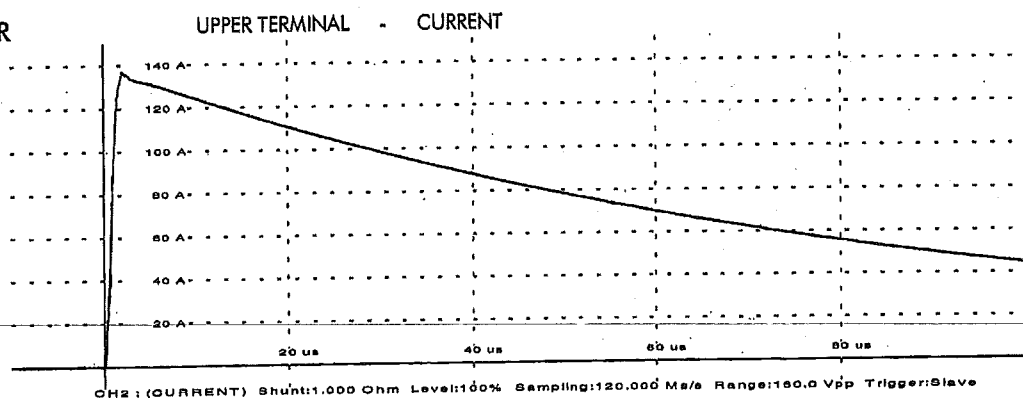
### 05.9041-01 UPPER

No. 2  
LI full  
Upk: 75.718 kV  
T1 : 1.022 us  
T2 : 55.404 us



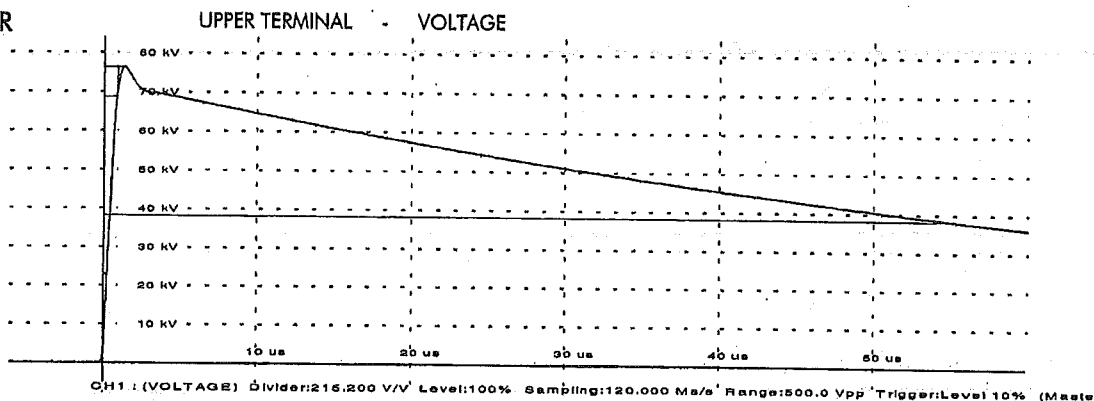
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No. 2  
LI full  
Ipk max: 135.967 A  
Ipk min: -695.822 mA



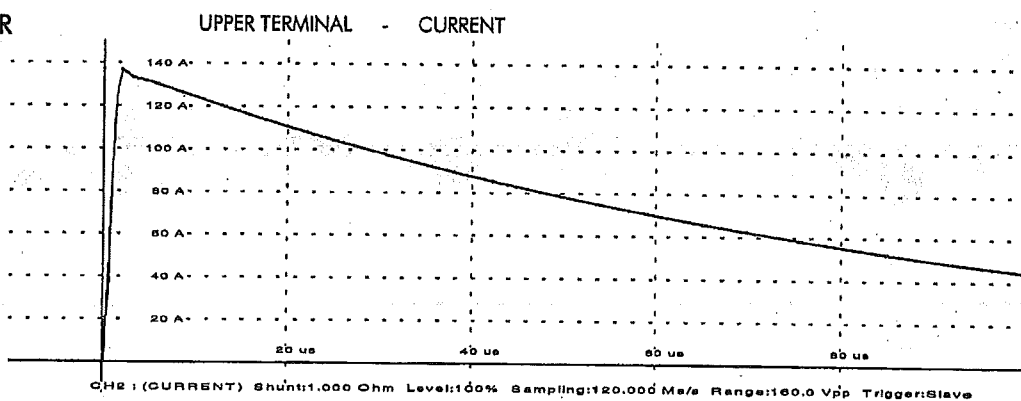
## 05.9041-01 UPPER

No. 3  
LI full  
Upk: 76.073 kV  
T1 : 1.022 us  
T2 : 55.437 us



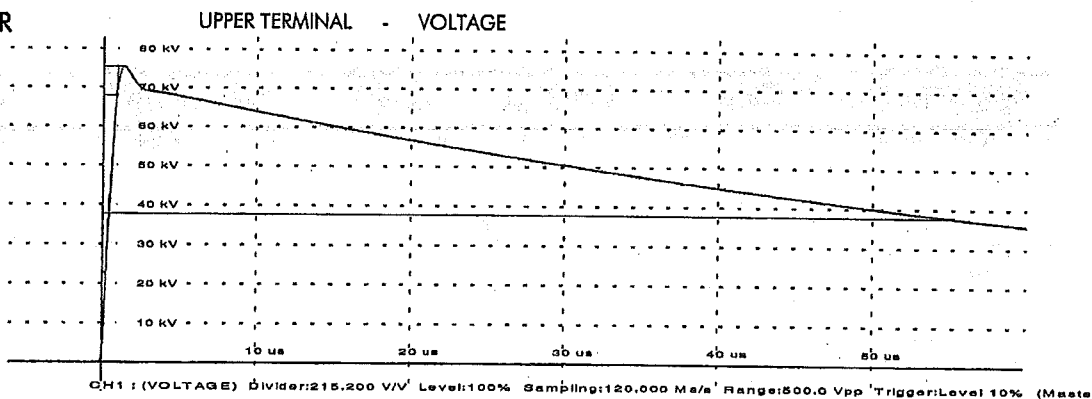
## 05.9041-01 UPPER

No. 3  
LI full  
Ipk max: 136.824 A  
Ipk min: -659.076 mA



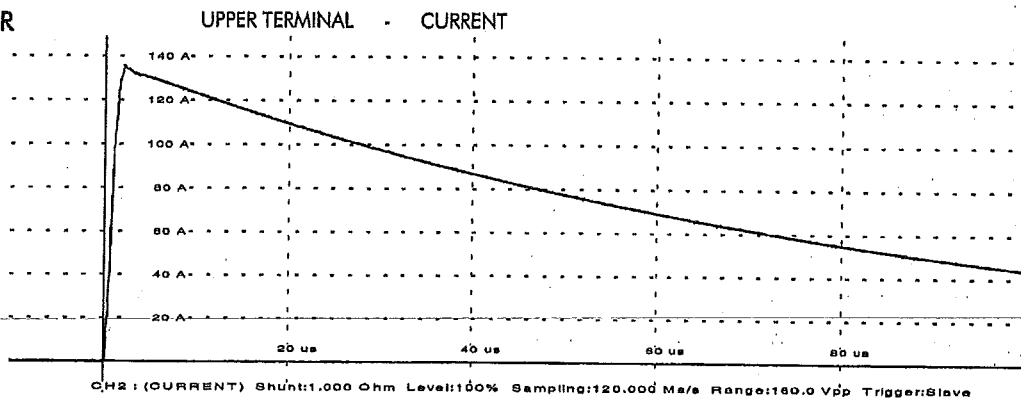
## 05.9041-01 UPPER

No. 4  
LI full  
Upk: 75.248 kV  
T1 : 1.020 us  
T2 : 55.480 us



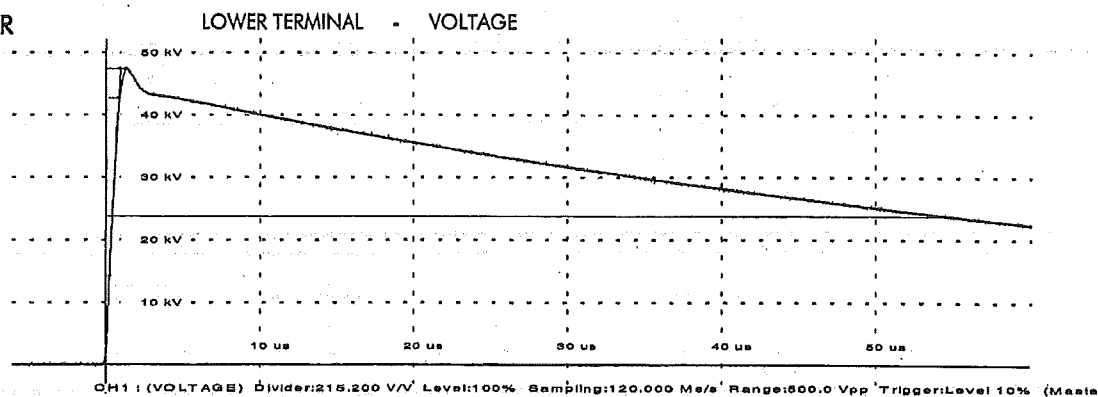
## 05.9041-01 UPPER

No. 4  
LI full  
Ipk max: 135.376 A  
Ipk min: -582.458 mA



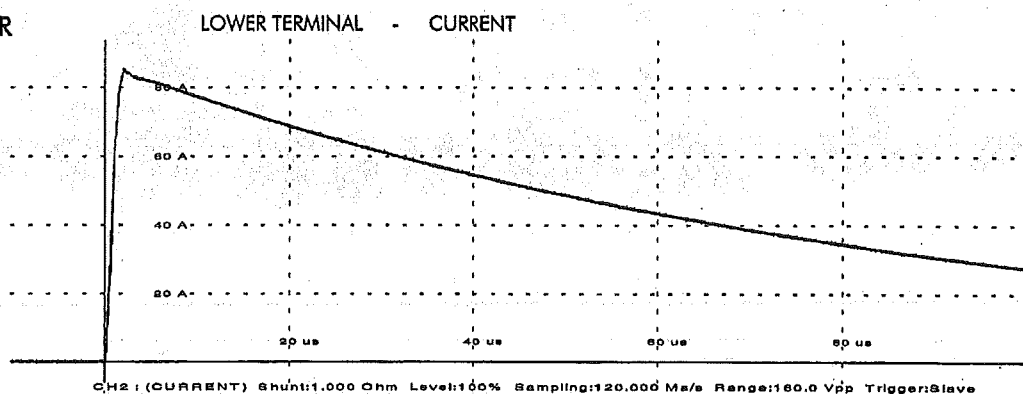
## 05.9041-01 UPPER

No. 5  
LI full  
Upk: 47.268 kV  
T1 : 1.028 us  
T2 : 55.211 us



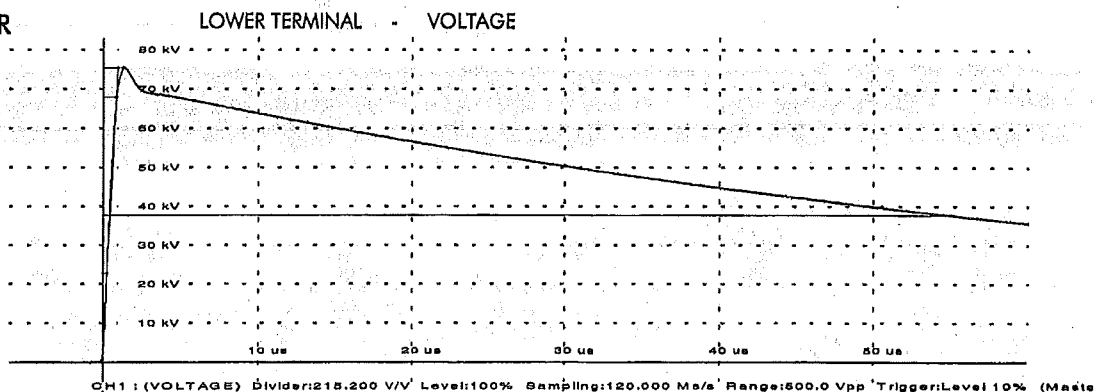
## 05.9041-01 UPPER

No. 5  
LI full  
Ipk max: 84.904 A  
Ipk min: -509.748 mA



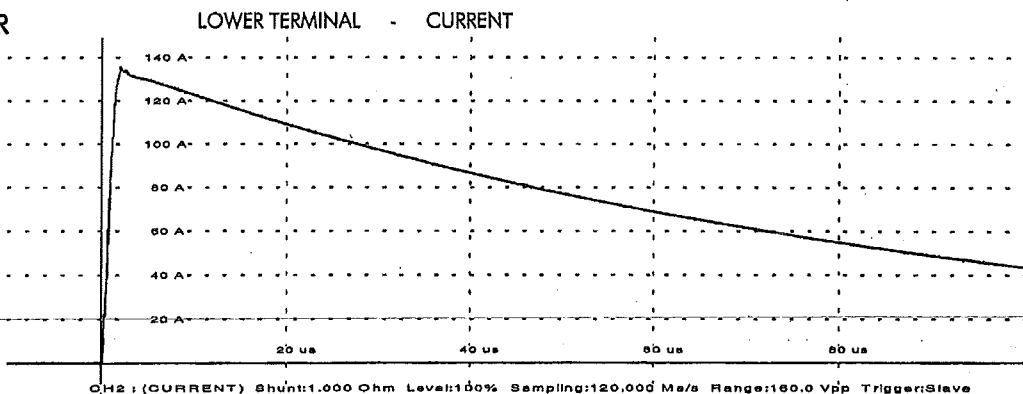
## 05.9041-01 UPPER

No. 6  
LI full  
Upk: 75.362 kV  
T1 : 1.023 us  
T2 : 55.256 us



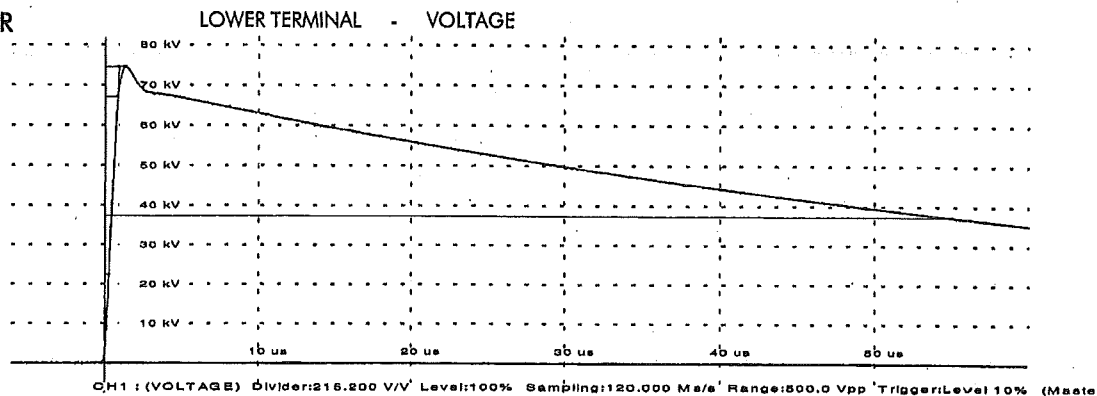
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No. 6  
LI full  
Ipk max: 135.571 A  
Ipk min: -583.240 mA



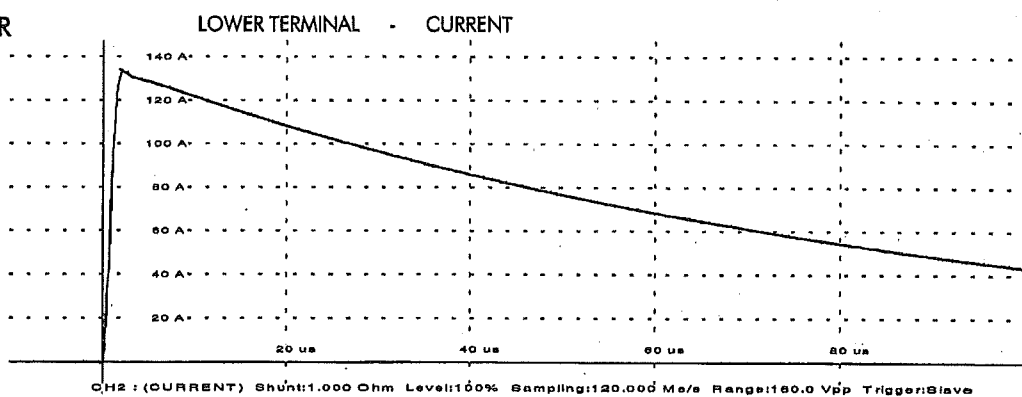
**05.9041-01 UPPER**

No. 7  
LI full  
Upk: 74.812 kV  
T1 : 1.023 us  
T2 : 55.297 us



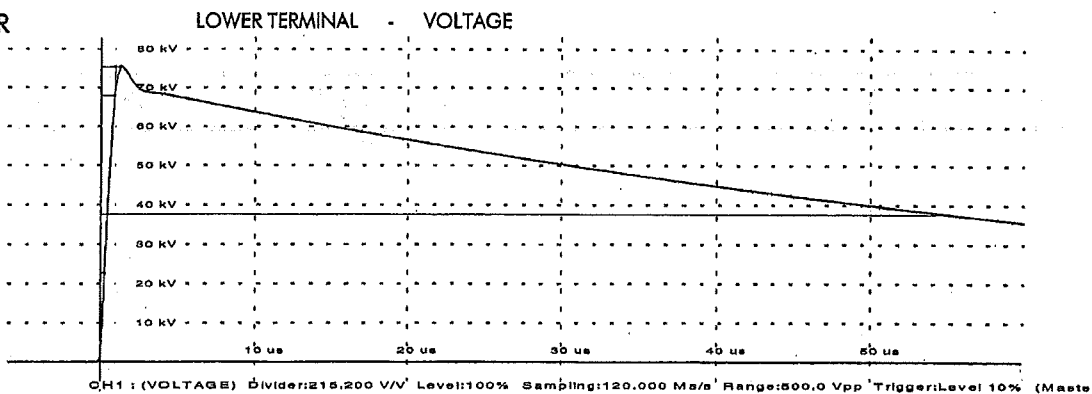
**05.9041-01 UPPER**

No. 7  
LI full  
Ipk max: 134.134 A  
Ipk min: -730.222 mA



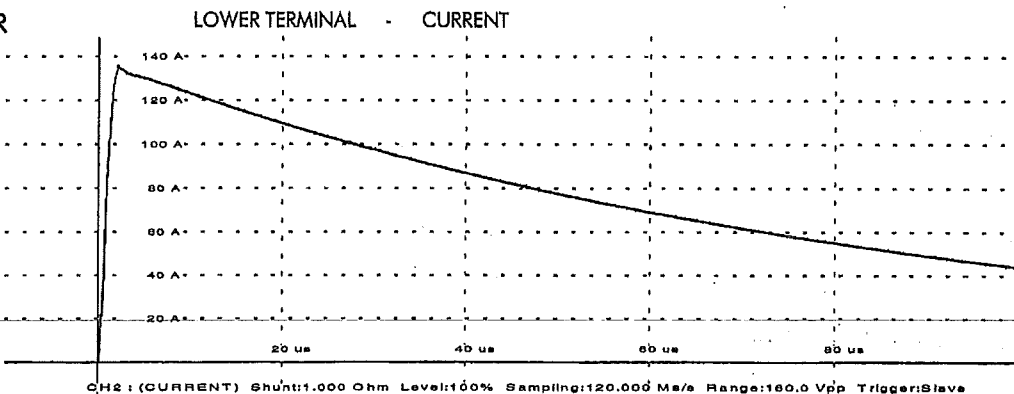
**05.9041-01 UPPER**

No. 8  
LI full  
Upk: 75.725 kV  
T1 : 1.023 us  
T2 : 55.307 us



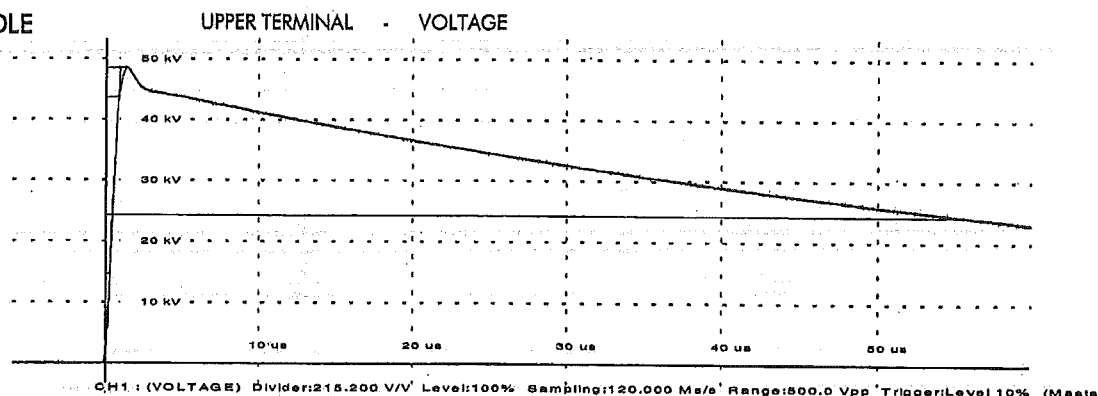
**05.9041-01 UPPER**

No. 8  
LI full  
Ipk max: 135.882 A  
Ipk min: -467.530 mA



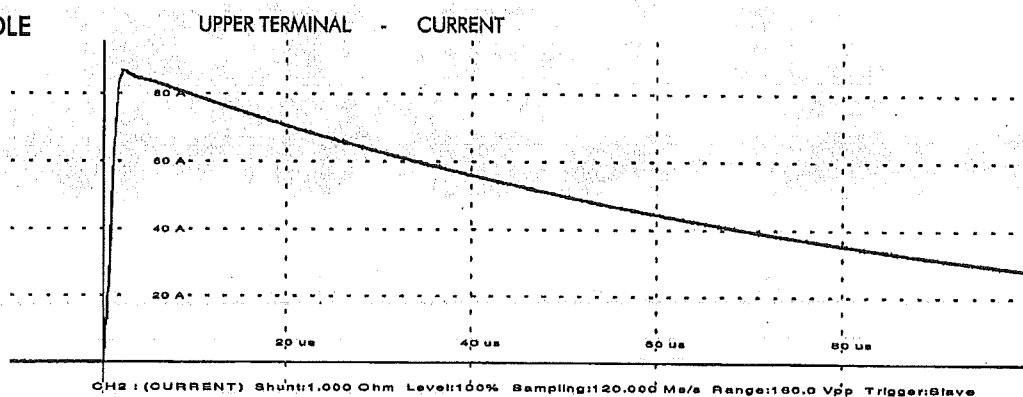
### 05.9041-01 MIDDLE

No. 1  
LI full  
Upk: 48.435 kV  
T1 : 1.026 us  
T2 : 55.778 us



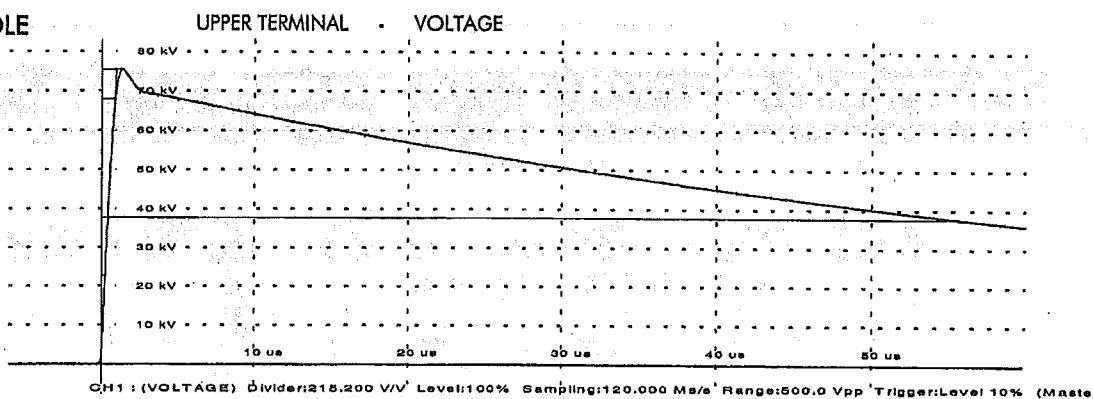
### 05.9041-01 MIDDLE

No. 1  
LI full  
Ipk max: 87.161 A  
Ipk min: -519.912 mA



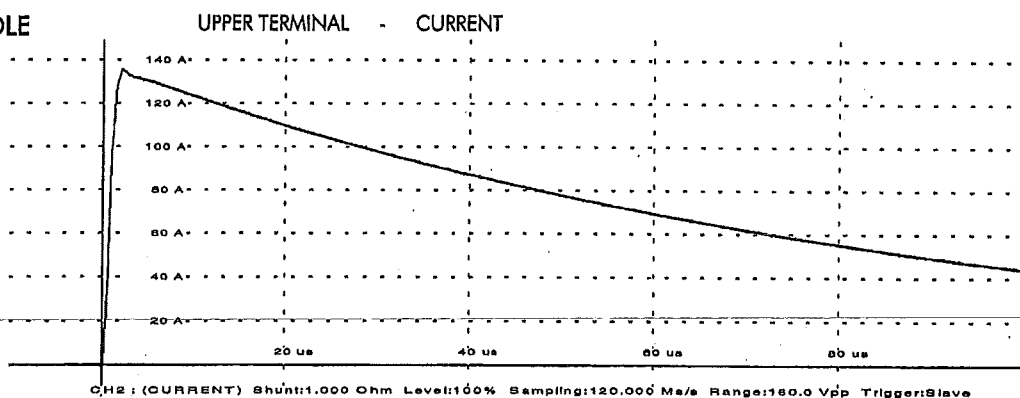
### 05.9041-01 MIDDLE

No. 2  
LI full  
Upk: 74.916 kV  
T1 : 1.026 us  
T2 : 55.855 us



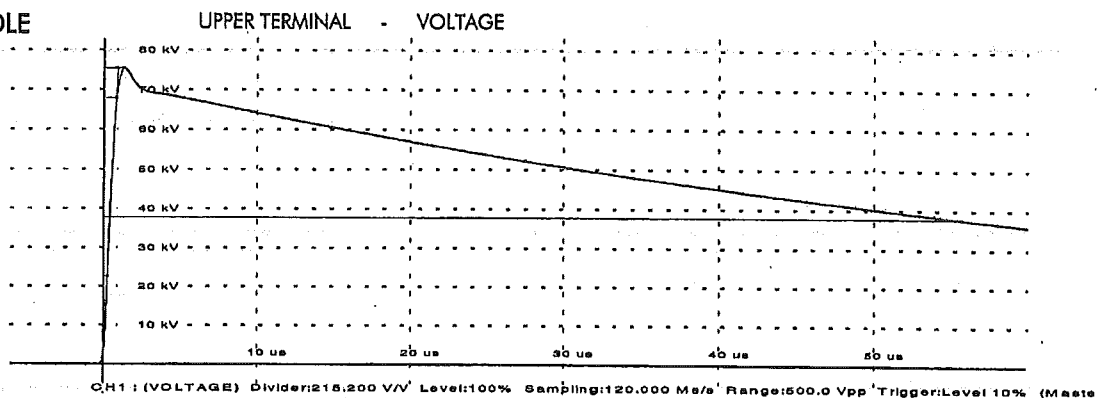
### 05.9041-01 MIDDLE

No. 2  
LI full  
Ipk max: 134.870 A  
Ipk min: -619.985 mA



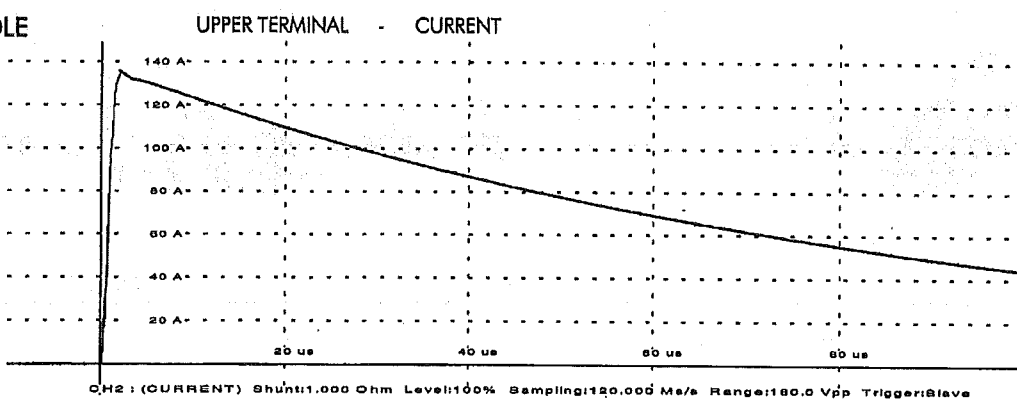
## 05.9041-01 MIDDLE

No. 3  
LI full  
Upk: 75.012 kV  
T1 : 1.024 us  
T2 : 55.878 us



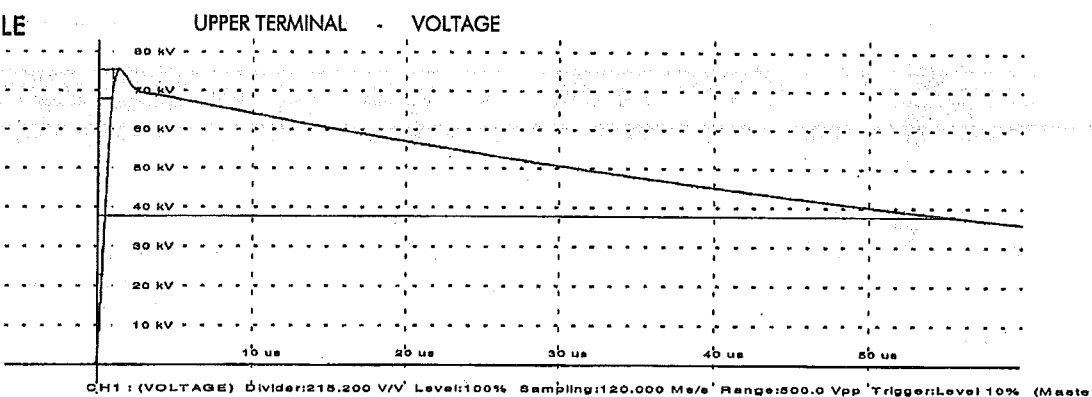
## 05.9041-01 MIDDLE

No. 3  
LI full  
Ipk max: 135.263 A  
Ipk min: -539.458 mA



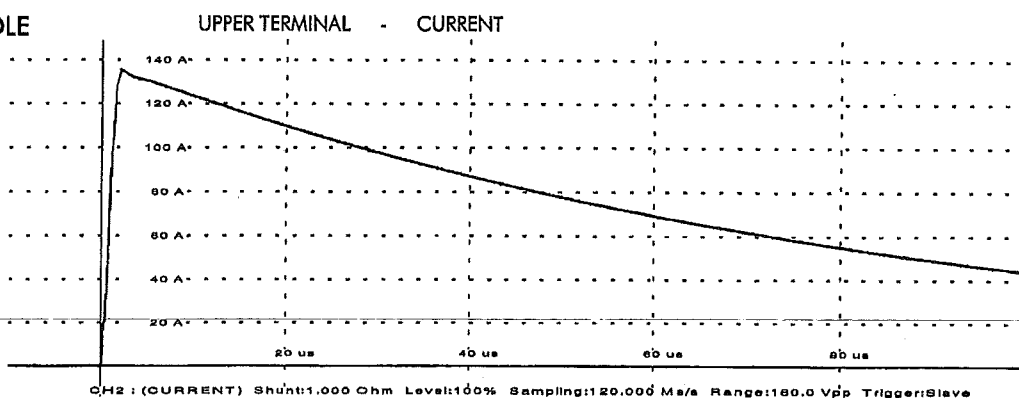
## 05.9041-01 MIDDLE

No. 4  
LI full  
Upk: 75.401 kV  
T1 : 1.024 us  
T2 : 55.771 us



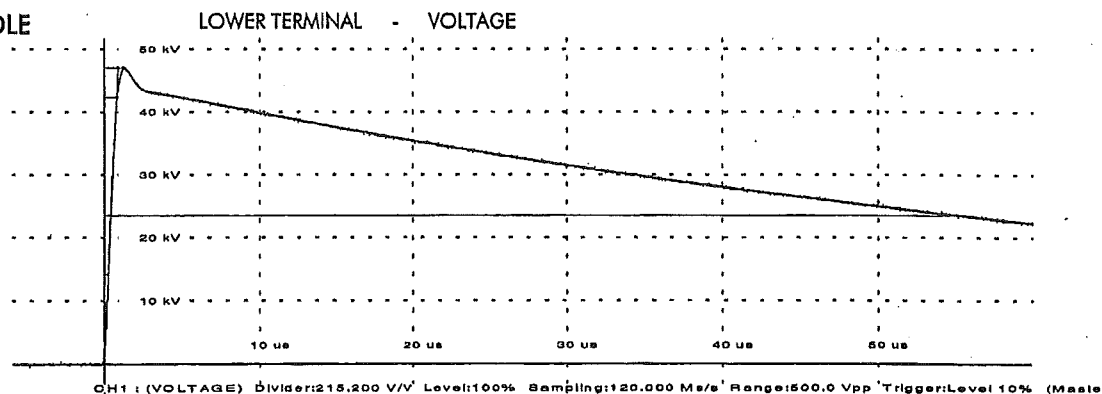
## 05.9041-01 MIDDLE

No. 4  
LI full  
Ipk max: 135.789 A  
Ipk min: -600.440 mA



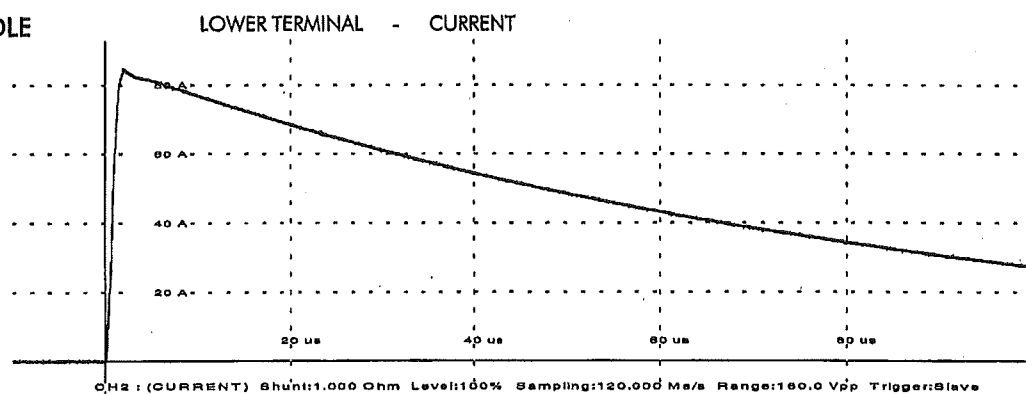
## 05.9041-01 MIDDLE

No. 5  
LI full  
Upk: 46.993 kV  
T1 : 1.026 us  
T2 : 55.694 us



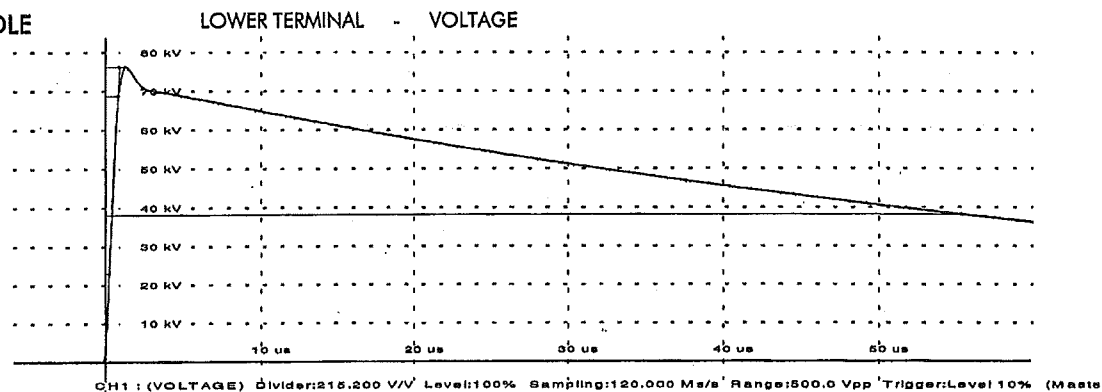
## 05.9041-01 MIDDLE

No. 5  
LI full  
Ipk max: 84.542 A  
Ipk min: -559.785 mA



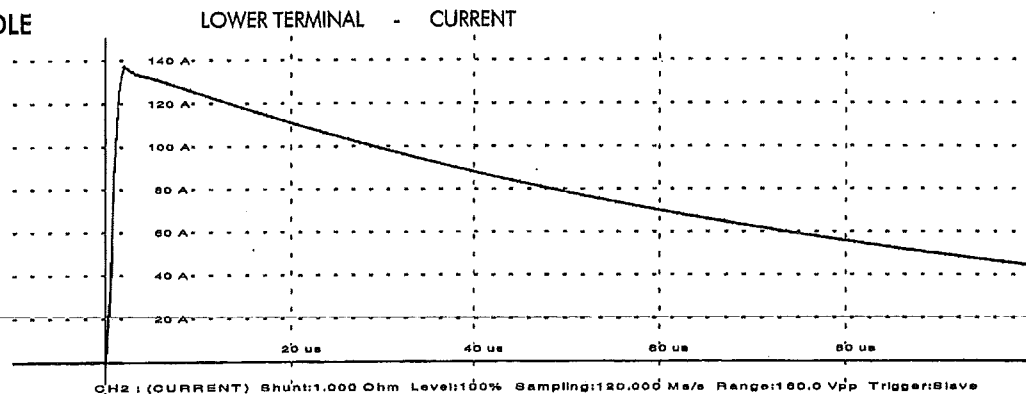
## 05.9041-01 MIDDLE

No. 6  
LI full  
Upk: 75.791 kV  
T1 : 1.025 us  
T2 : 55.616 us



## 05.9041-01 MIDDLE

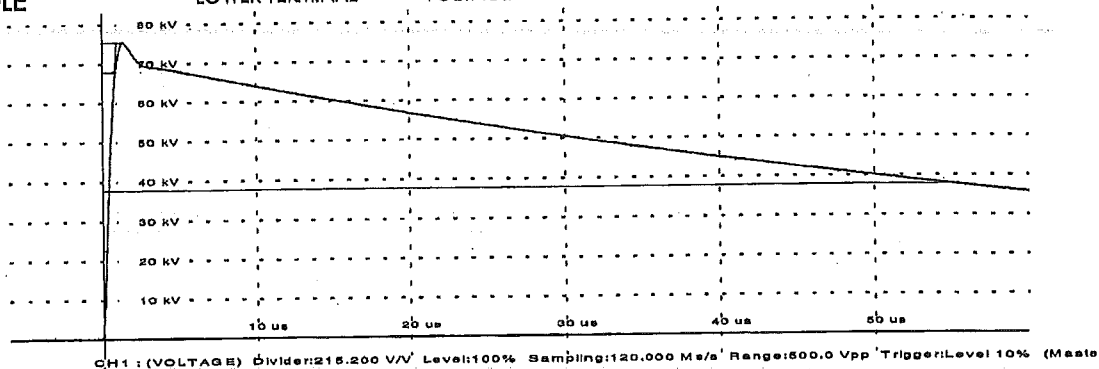
No. 6  
LI full  
Ipk max: 136.358 A  
Ipk min: -500.366 mA



**05.9041-01 MIDDLE**

No. 7  
LI full  
Upk: 75.487 kV  
T1 : 1.030 us  
T2 : 55.623 us

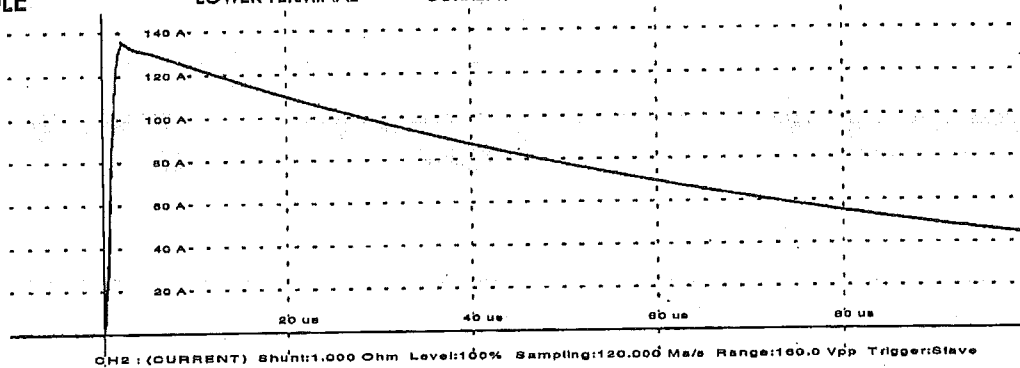
**LOWER TERMINAL - VOLTAGE**



**05.9041-01 MIDDLE**

No. 7  
LI full  
Ipk max: 135.721 A  
Ipk min: -511.312 mA

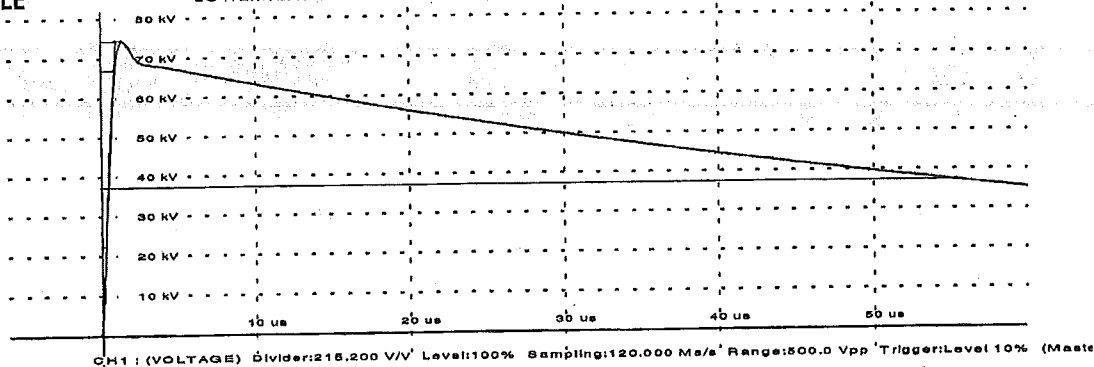
**LOWER TERMINAL - CURRENT**



**05.9041-01 MIDDLE**

No. 8  
LI full  
Upk: 74.655 kV  
T1 : 1.025 us  
T2 : 55.650 us

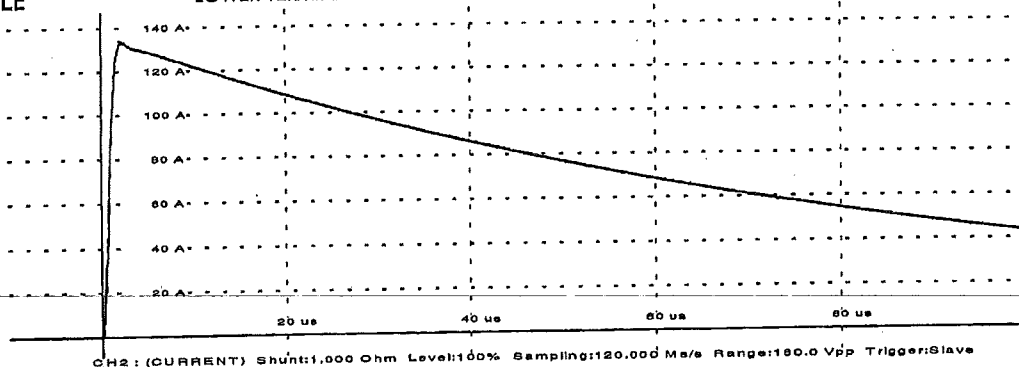
**LOWER TERMINAL - VOLTAGE**



**05.9041-01 MIDDLE**

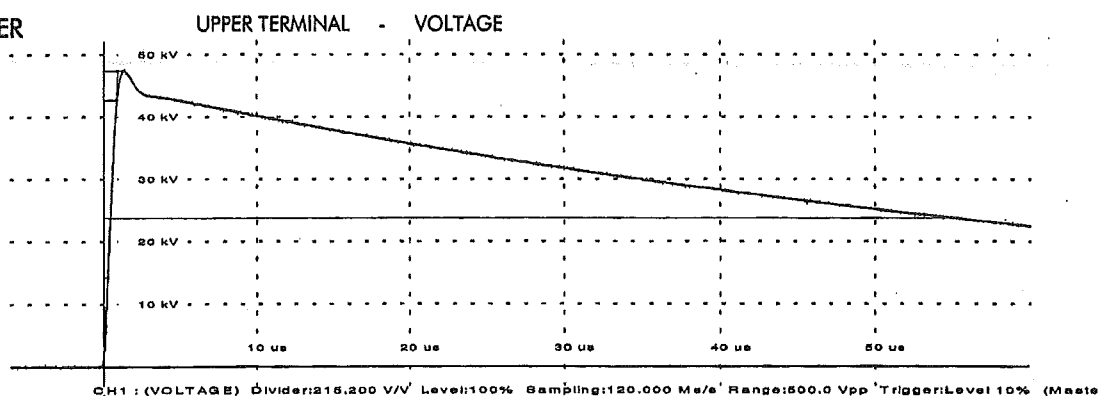
No. 8  
LI full  
Ipk max: 134.259 A  
Ipk min: -605.131 mA

**LOWER TERMINAL - CURRENT**



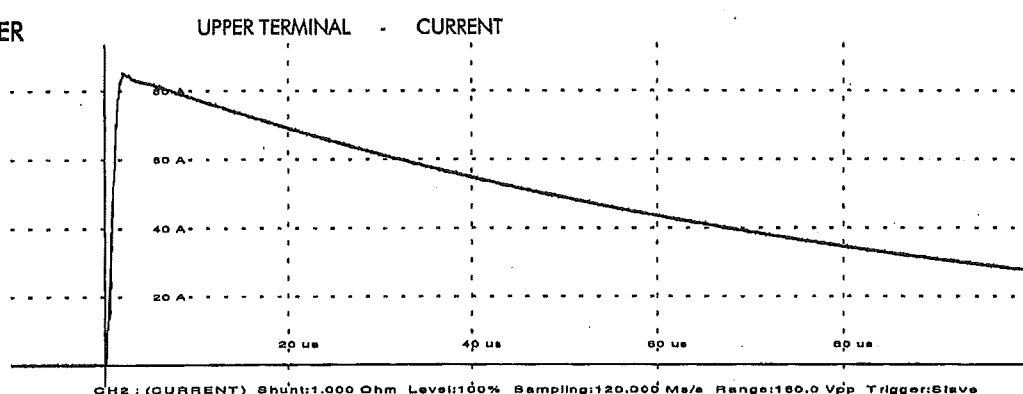
**05.9041-01 LOWER**

No. 1  
Li full  
Upk: 47.402 kV  
T1 : 1.024 us  
T2 : 55.484 us



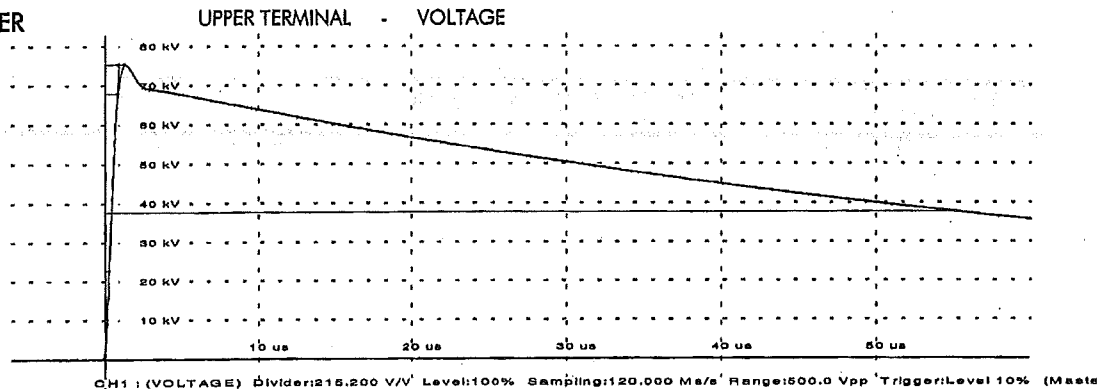
**05.9041-01 LOWER**

No. 1  
Li full  
Ipk max: 85.264 A  
Ipk min: -501.930 mA



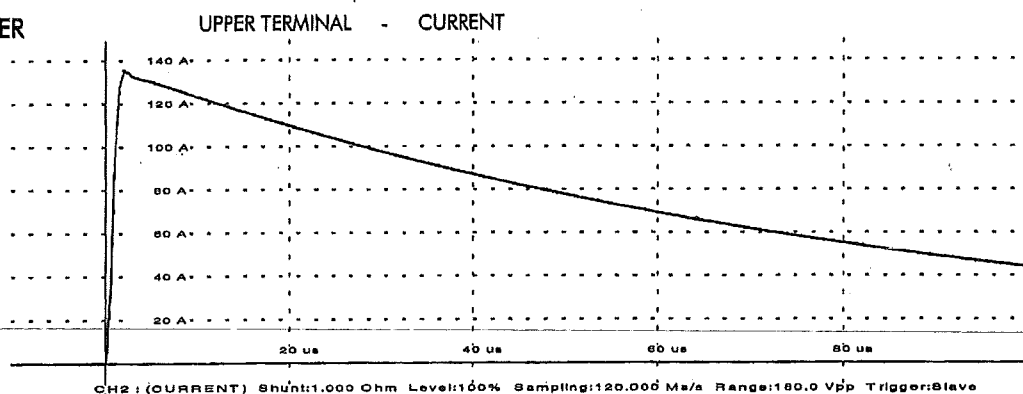
**05.9041-01 LOWER**

No. 2  
Li full  
Upk: 75.220 kV  
T1 : 1.023 us  
T2 : 55.354 us



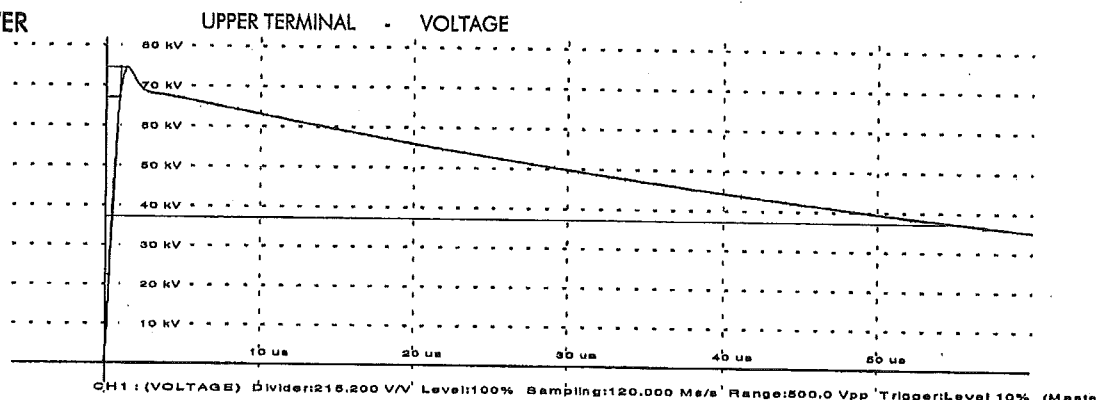
**05.9041-01 LOWER**

No. 2  
Li full  
Ipk max: 135.141 A  
Ipk min: -505.057 mA



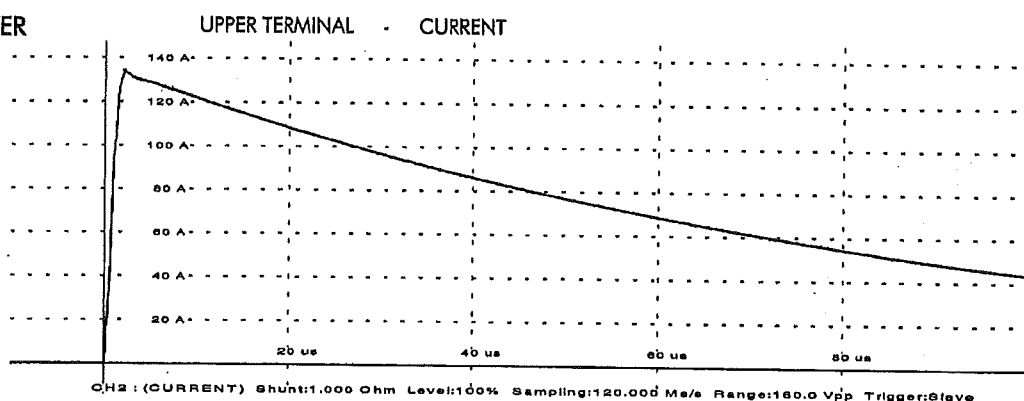
### 05.9041-01 LOWER

No. 3  
LI full  
Upk: 74.464 kV  
T1 : 1.023 us  
T2 : 55.422 us



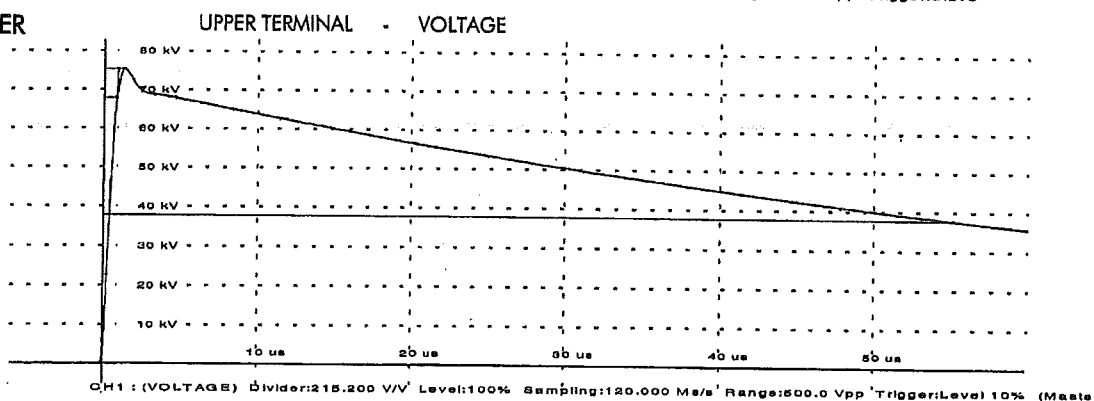
### 05.9041-01 LOWER

No. 3  
LI full  
Ipk max: 133.720 A  
Ipk min: -480.039 mA



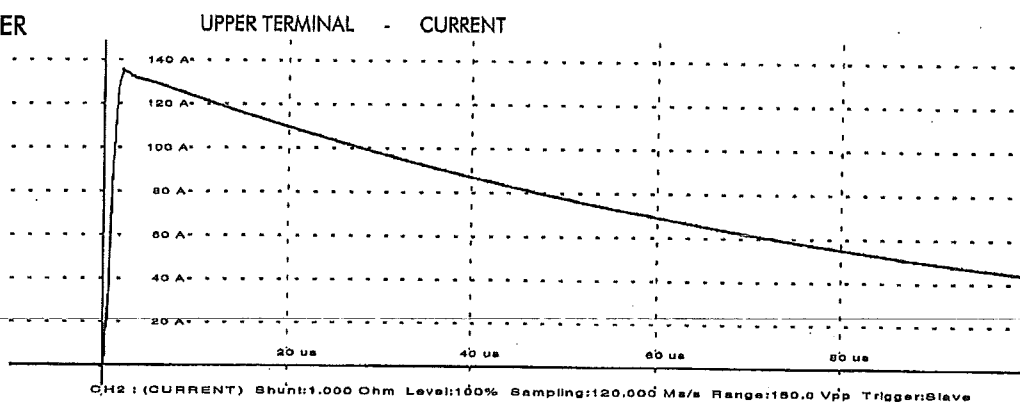
### 05.9041-01 LOWER

No. 4  
LI full  
Upk: 75.525 kV  
T1 : 1.024 us  
T2 : 55.445 us



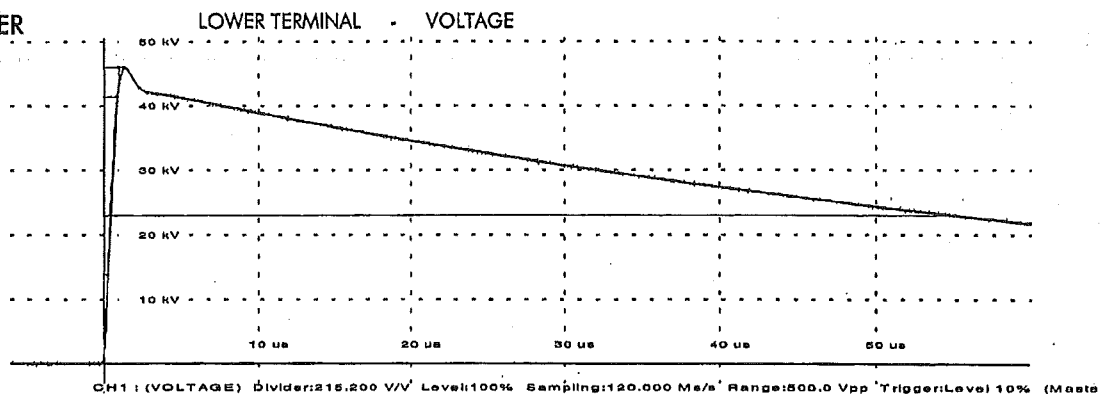
### 05.9041-01 LOWER

No. 4  
LI full  
Ipk max: 135.588 A  
Ipk min: -605.913 mA



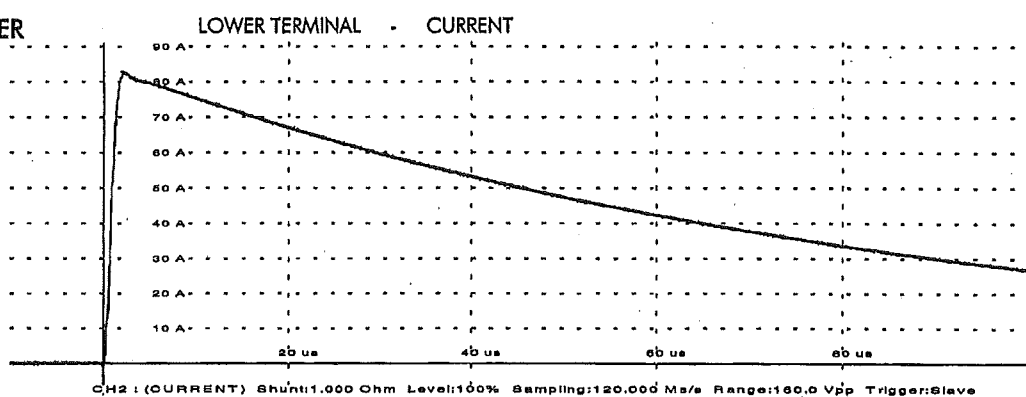
**05.9041-01 LOWER**

No. 5  
LI full  
Upk: 45.850 kV  
T1 : 1.029 us  
T2 : 55.345 us



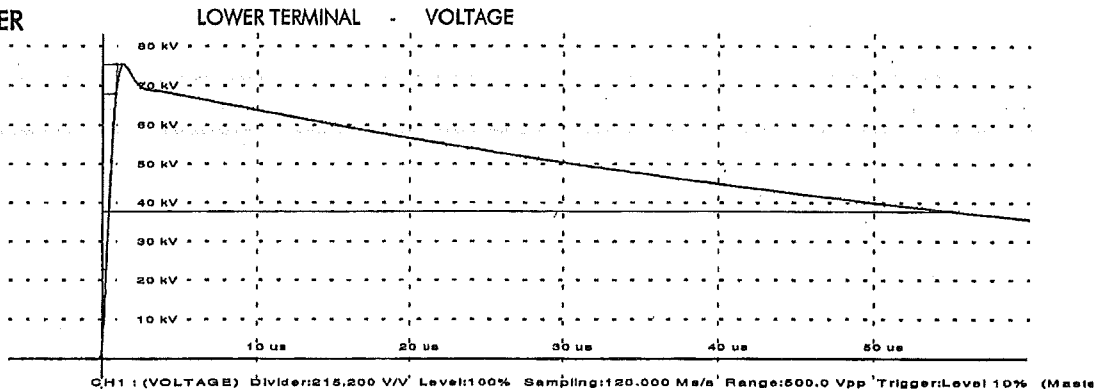
**05.9041-01 LOWER**

No. 5  
LI full  
Ipk max: 82.288 A  
Ipk min: -663.767 mA



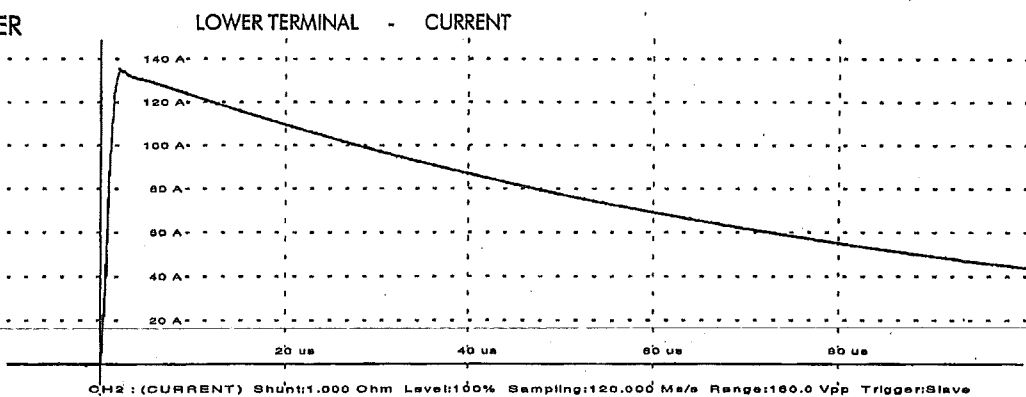
**05.9041-01 LOWER**

No. 6  
LI full  
Upk: 74.965 kV  
T1 : 1.023 us  
T2 : 55.330 us



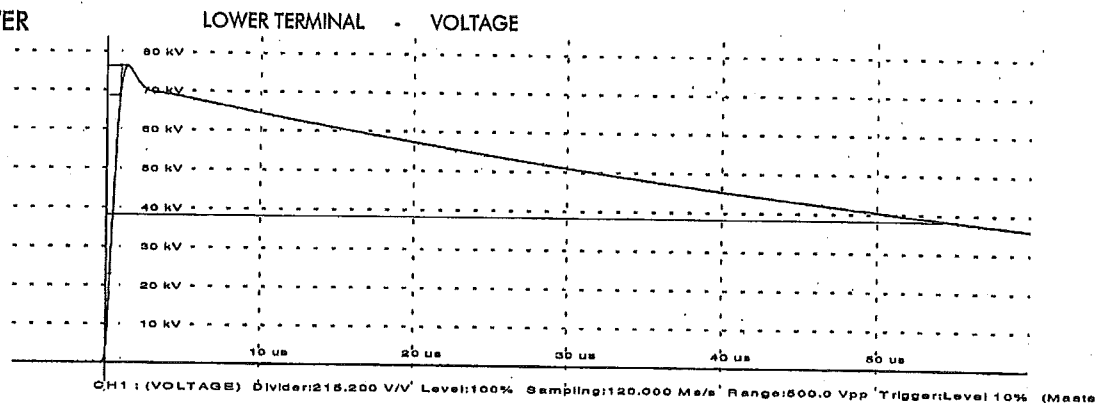
**05.9041-01 LOWER**

No. 6  
LI full  
Ipk max: 134.628 A  
Ipk min: -587.931 mA



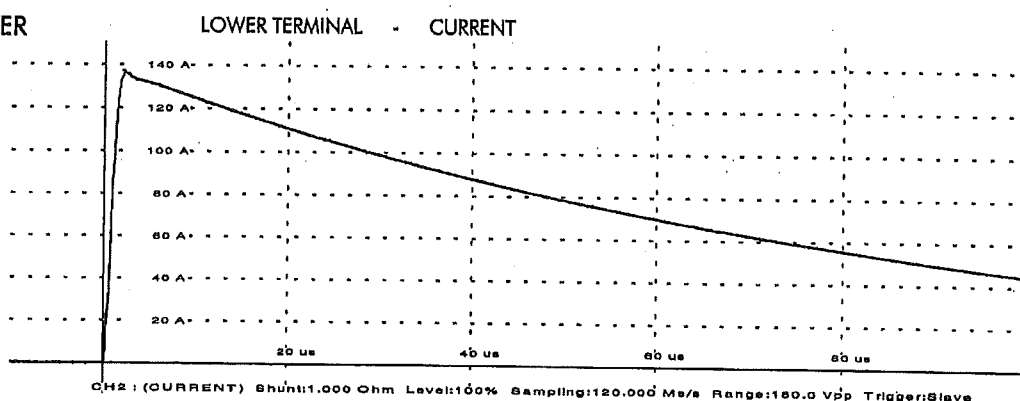
**05.9041-01 LOWER**

No. 7  
LI full  
Upk: 76.448 kV  
T1 : 1.022 us  
T2 : 55.353 us



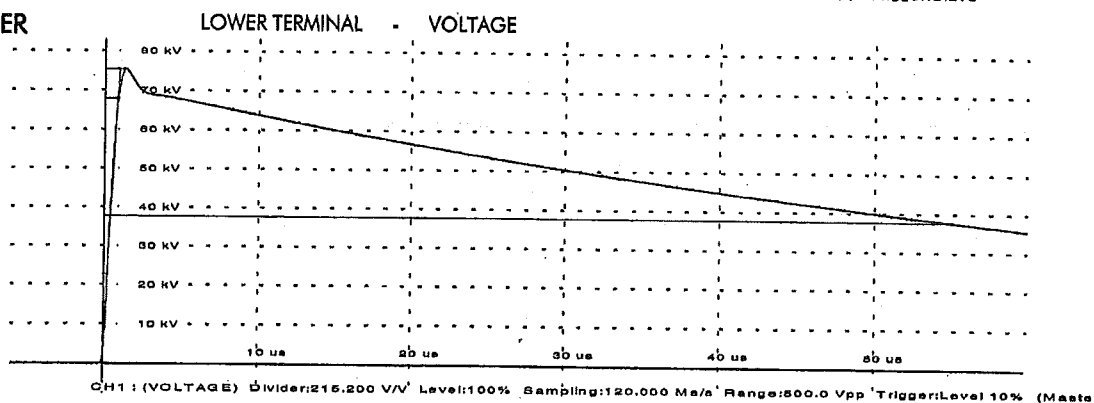
**05.9041-01 LOWER**

No. 7  
LI full  
Ipk max: 137.222 A  
Ipk min: -457.366 mA



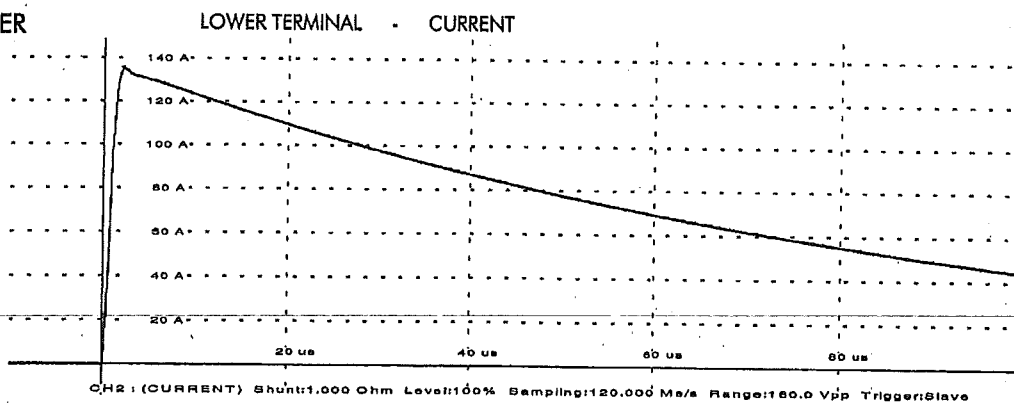
**05.9041-01 LOWER**

No. 8  
LI full  
Upk: 75.141 kV  
T1 : 1.022 us  
T2 : 55.302 us



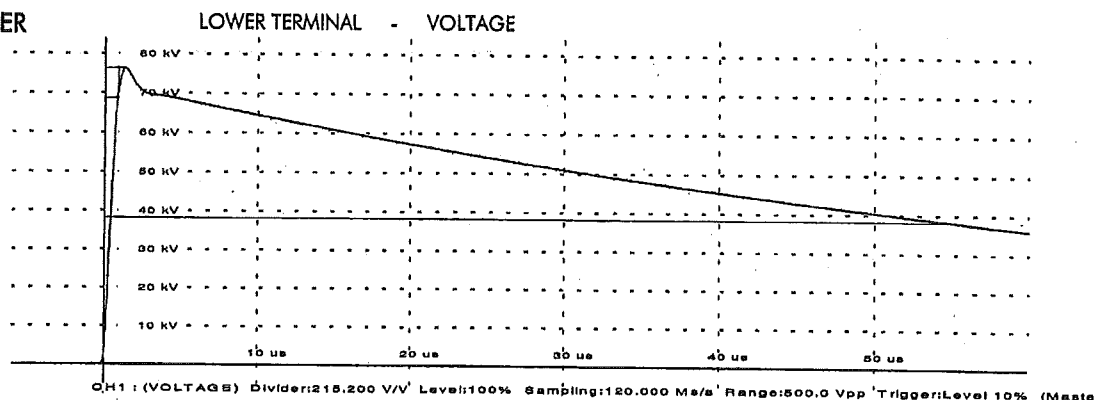
**05.9041-01 LOWER**

No. 8  
LI full  
Ipk max: 134.882 A  
Ipk min: -490.203 mA



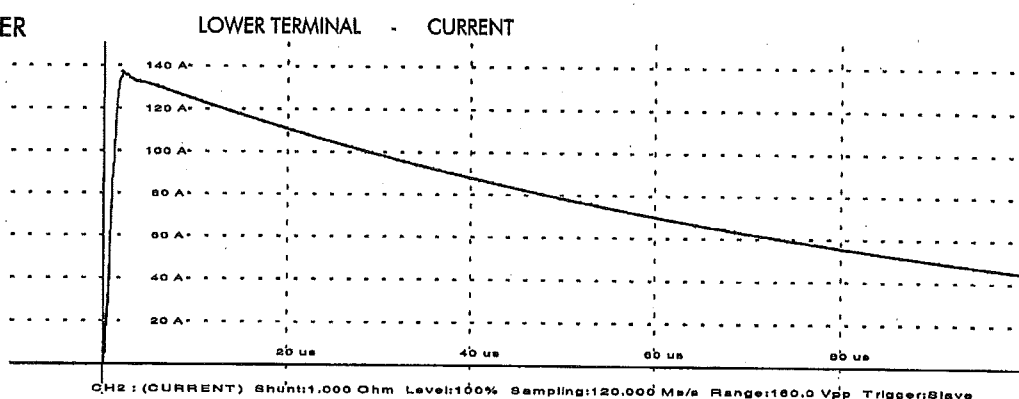
**05.9041-01 LOWER**

No. 7  
LI full  
Upk: 76.448 kV  
T1 : 1.022 us  
T2 : 55.353 us



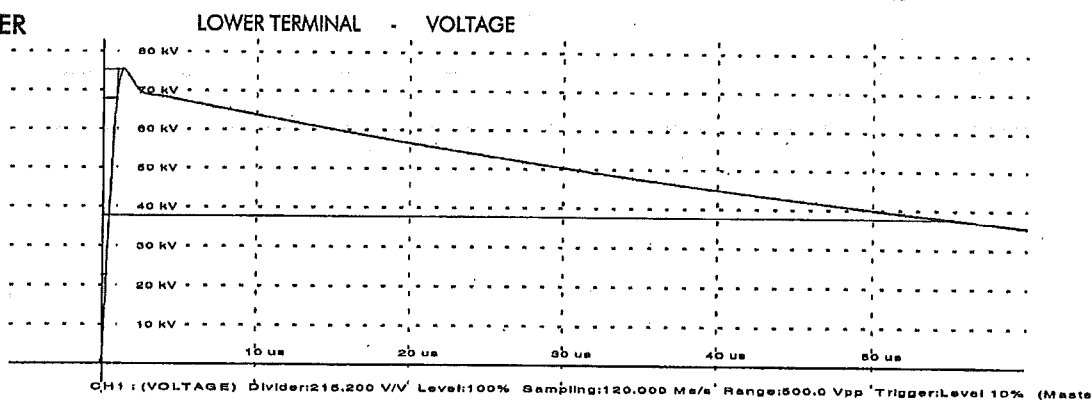
**05.9041-01 LOWER**

No. 7  
LI full  
Ipk max: 137.222 A  
Ipk min: -457.366 mA



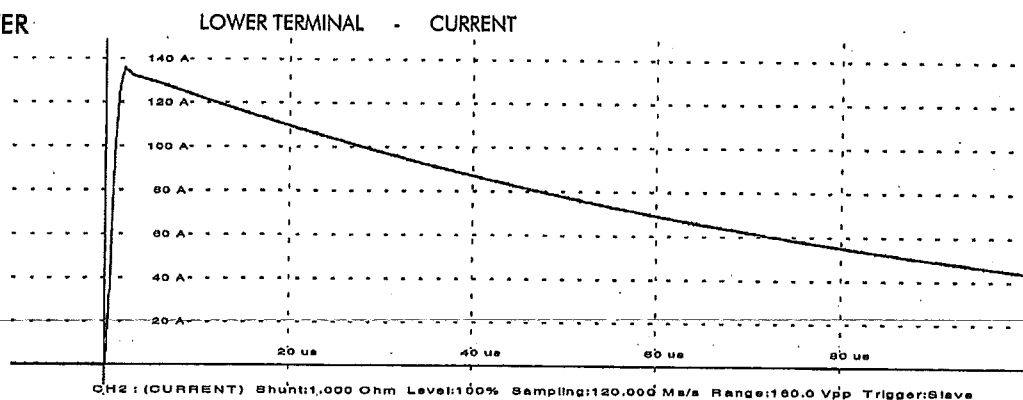
**05.9041-01 LOWER**

No. 8  
LI full  
Upk: 75.141 kV  
T1 : 1.022 us  
T2 : 55.302 us



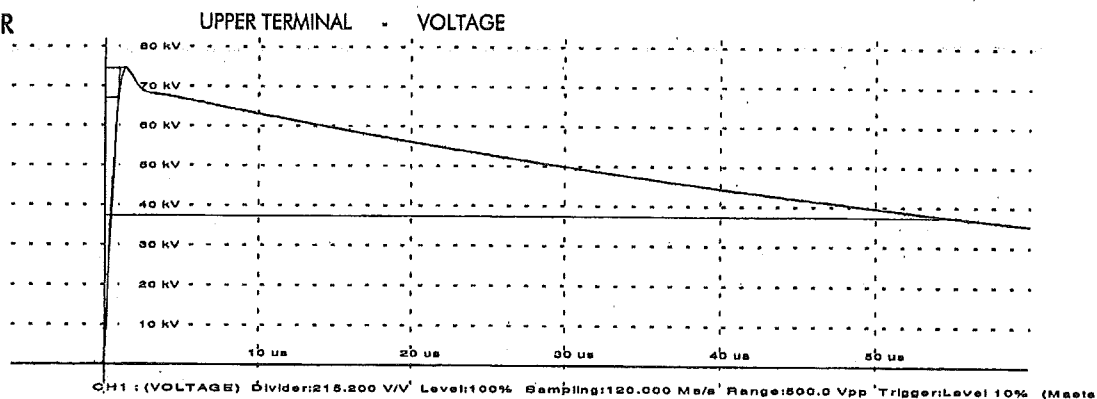
**05.9041-01 LOWER**

No. 8  
LI full  
Ipk max: 134.882 A  
Ipk min: -490.203 mA



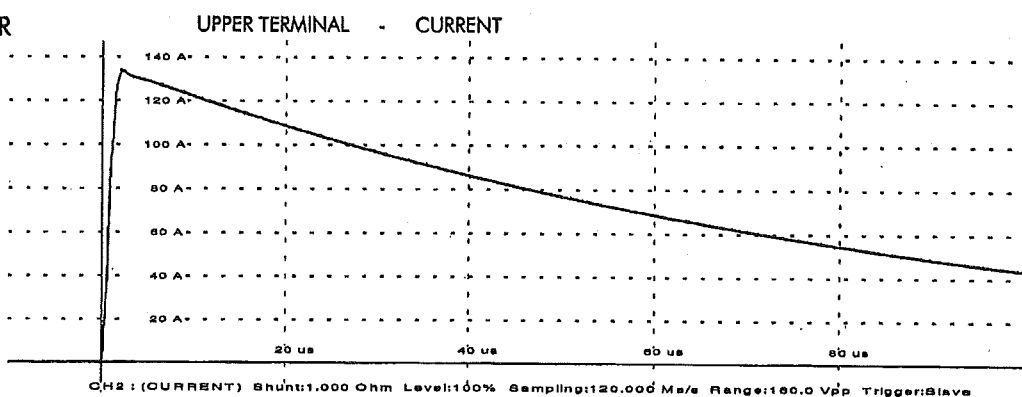
## 05.9041-02 UPPER

No. 3  
LI full  
Upk: 74.368 kV  
T1 : 1.028 us  
T2 : 55.516 us



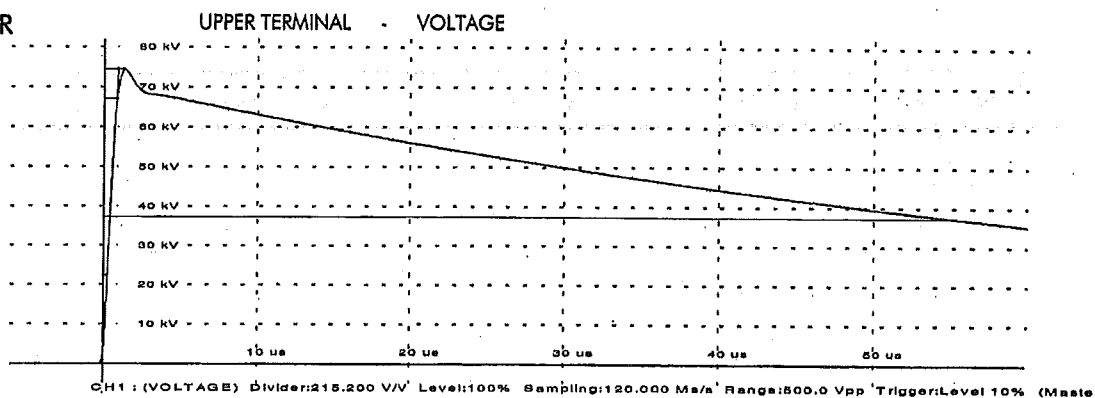
## 05.9041-02 UPPER

No. 3  
LI full  
Ipk max: 133.506 A  
Ipk min: -655.167 mA



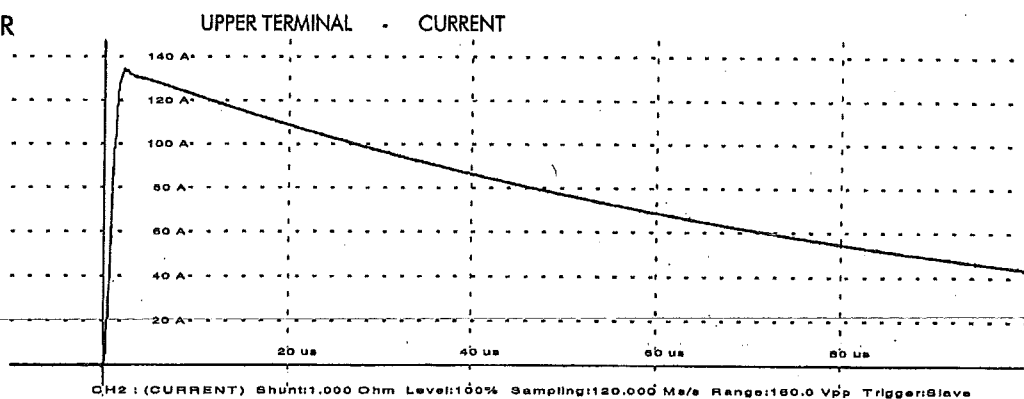
## 05.9041-02 UPPER

No. 4  
LI full  
Upk: 74.420 kV  
T1 : 1.025 us  
T2 : 55.593 us



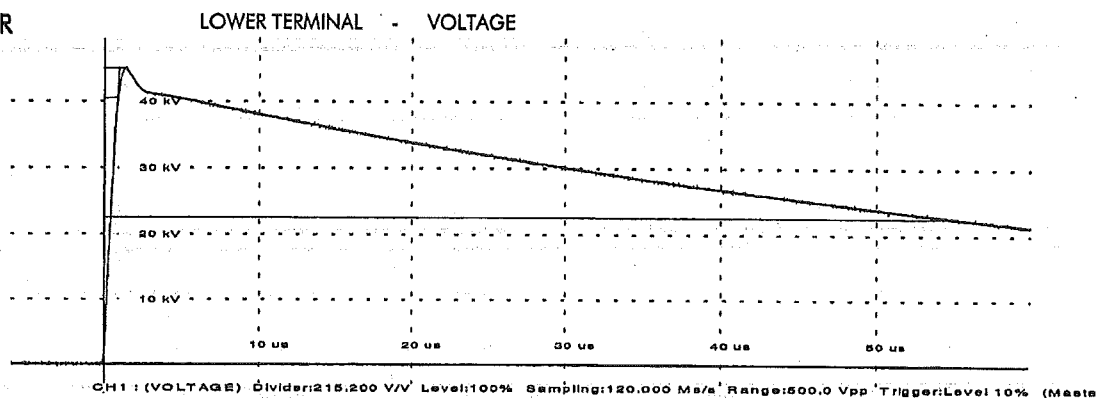
## 05.9041-02 UPPER

No. 4  
LI full  
Ipk max: 133.573 A  
Ipk min: -548.839 mA



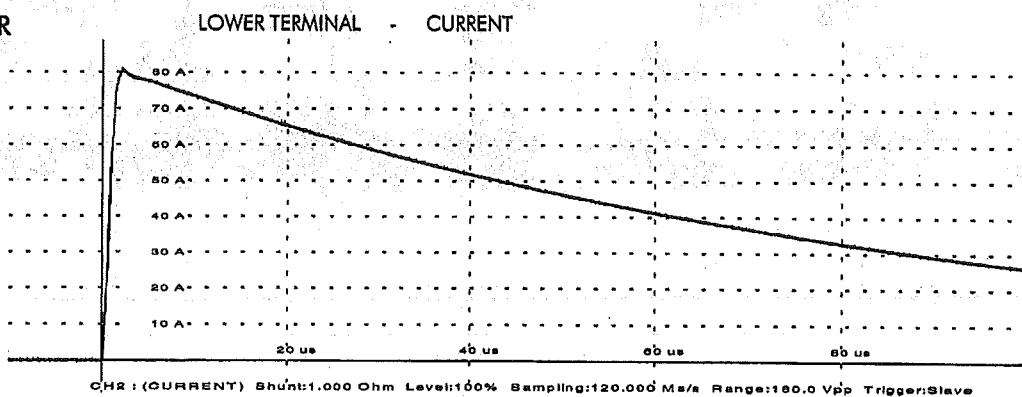
## 05.9041-02 UPPER

No. 5  
LI full  
Upk: 45.011 kV  
T1 : 1.033  $\mu$ s  
T2 : 55.421  $\mu$ s



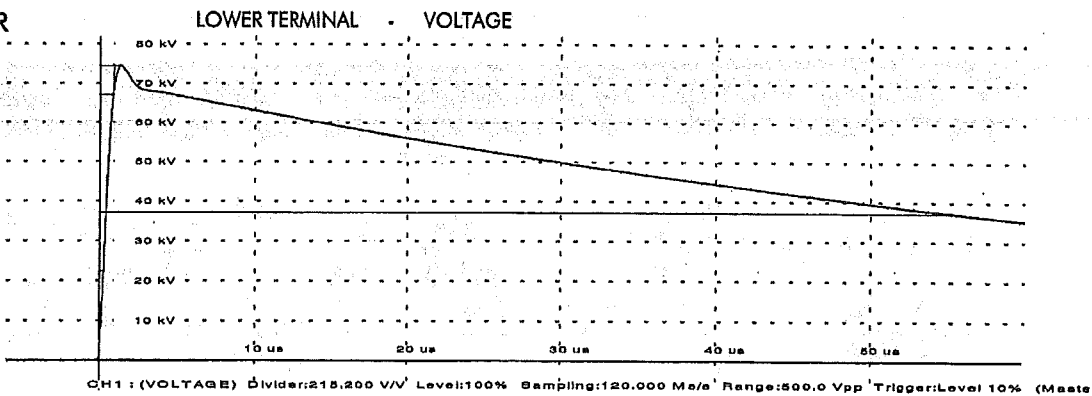
## 05.9041-02 UPPER

No. 5  
LI full  
Ip max: 80.915 A  
Ip min: -551.185 mA



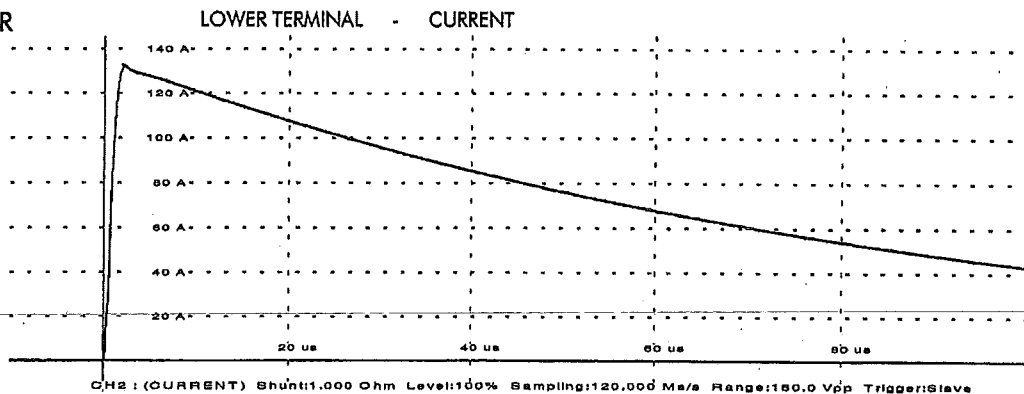
## 05.9041-02 UPPER

No. 6  
LI full  
Upk: 74.017 kV  
T1 : 1.026  $\mu$ s  
T2 : 55.534  $\mu$ s



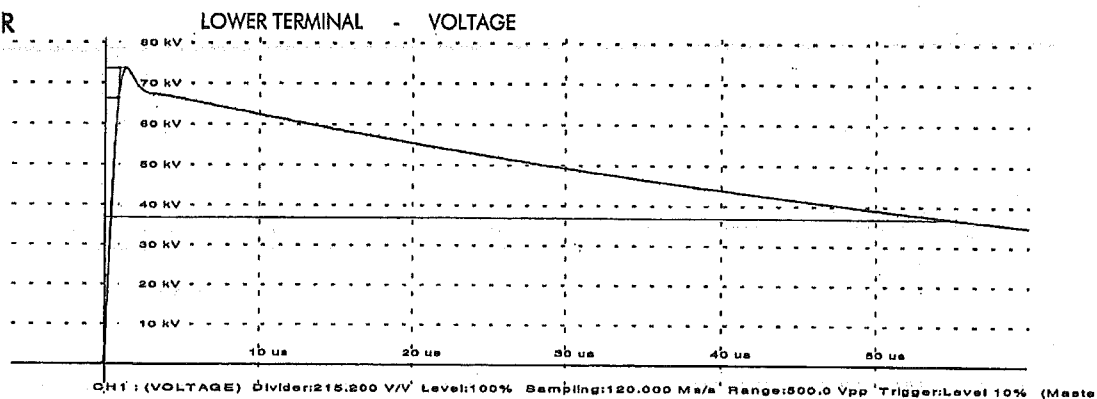
## 05.9041-02 UPPER

No. 6  
LI full  
Ip max: 132.745 A  
Ip min: -477.694 mA



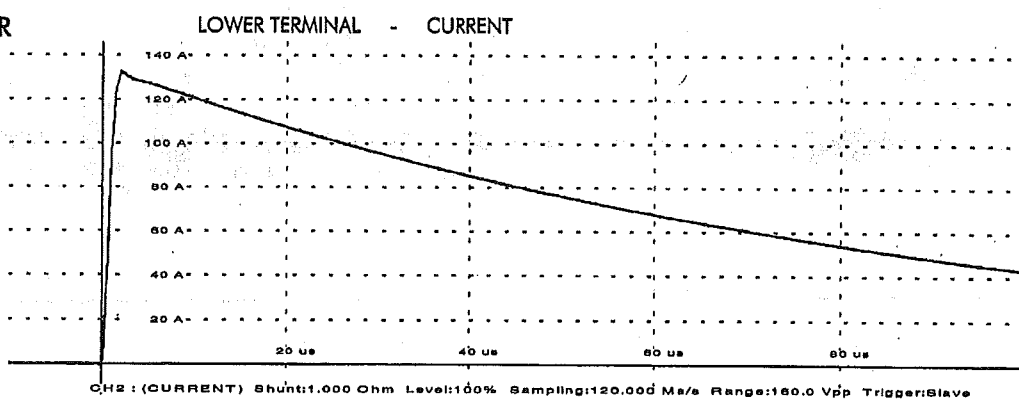
**05.9041-02 UPPER**

No. 7  
LI full  
Upk: 73.776 kV  
T1 : 1.027 us  
T2 : 55.518 us



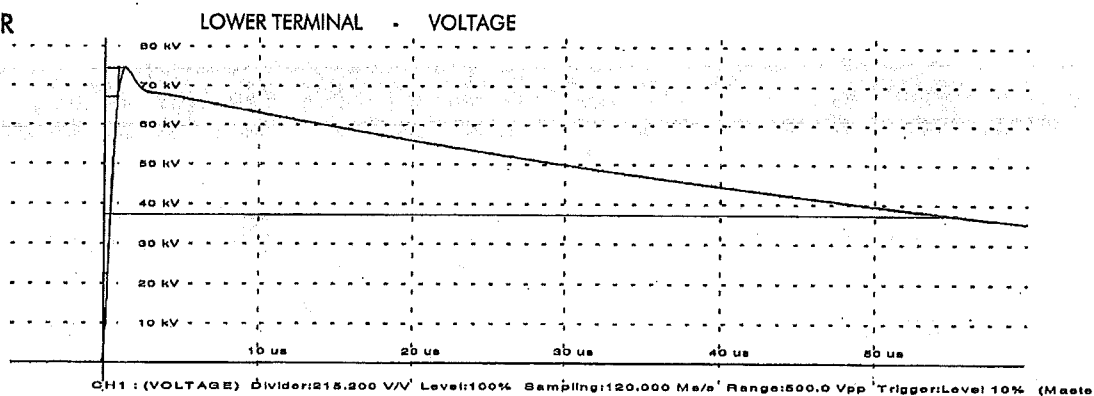
**05.9041-02 UPPER**

No. 7  
LI full  
Ipk max: 132.469 A  
Ipk min: -558.221 mA



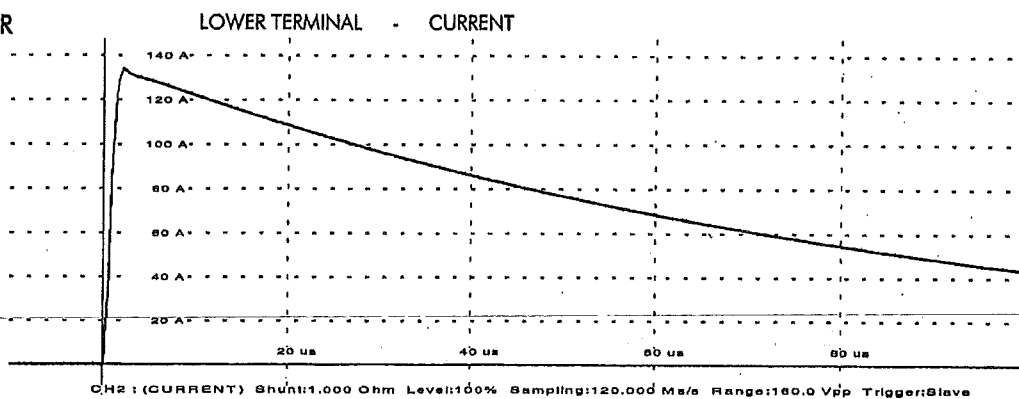
**05.9041-02 UPPER**

No. 8  
LI full  
Upk: 74.237 kV  
T1 : 1.025 us  
T2 : 55.491 us



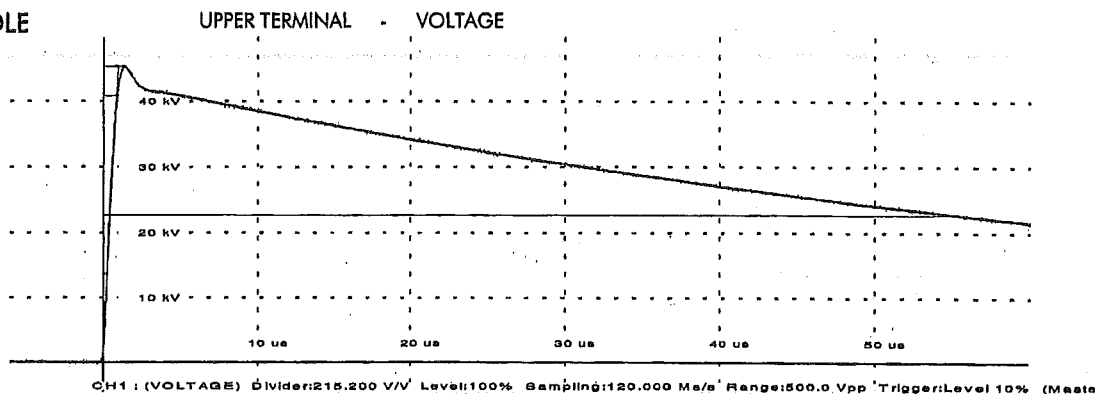
**05.9041-02 UPPER**

No. 8  
LI full  
Ipk max: 133.191 A  
Ipk min: -657.513 mA



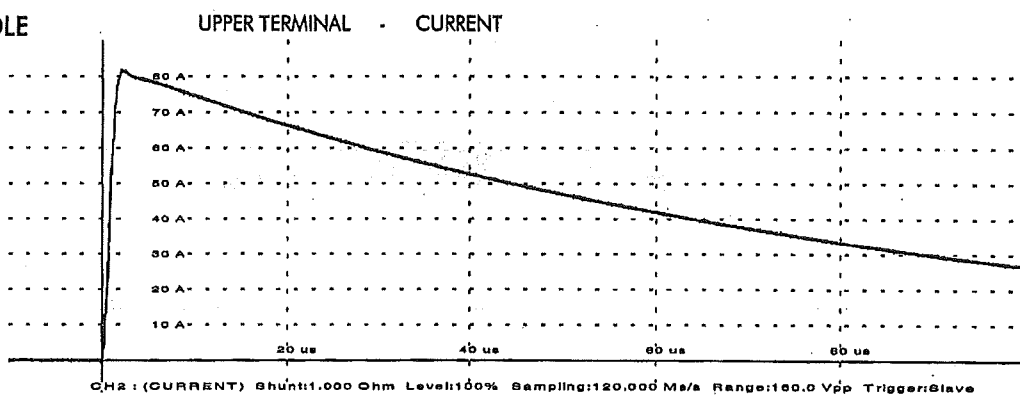
## 05.9041-02 MIDDLE

No. 1  
LI full  
Upk: 45.357 kV  
T1 : 1.027 us  
T2 : 55.664 us



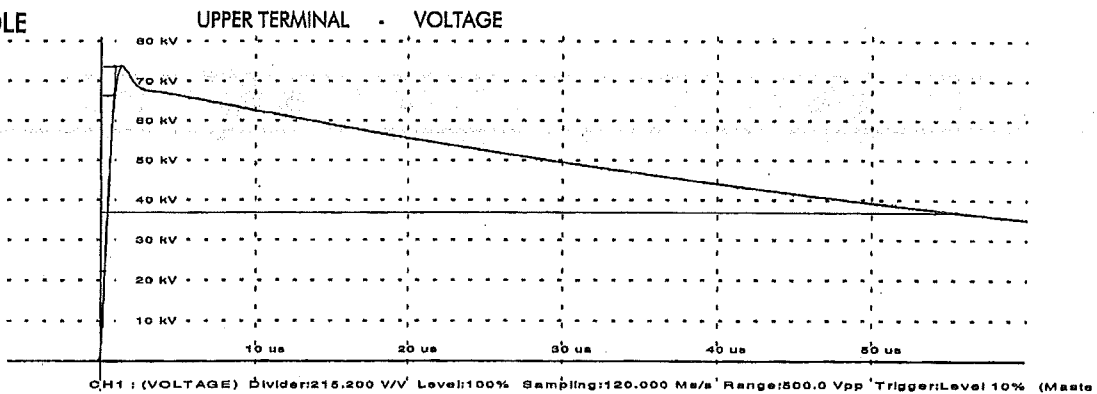
## 05.9041-02 MIDDLE

No. 1  
LI full  
Ipk max: 81.655 A  
Ipk min: -592.622 mA



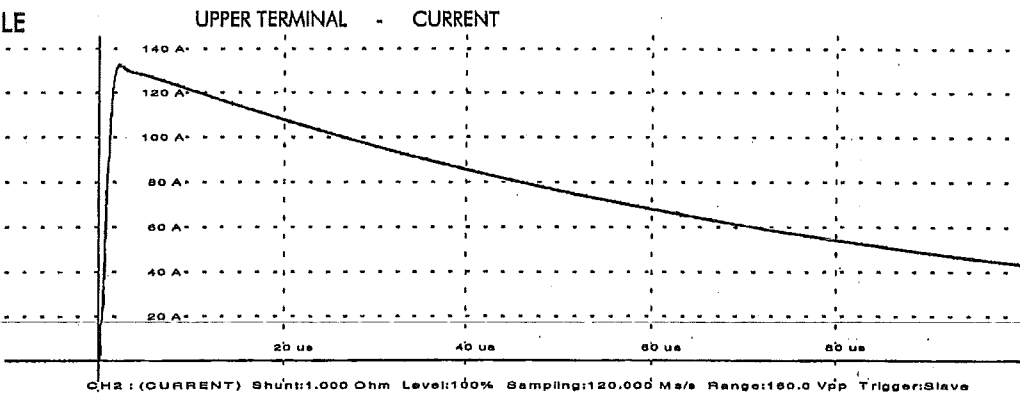
## 05.9041-02 MIDDLE

No. 2  
LI full  
Upk: 73.722 kV  
T1 : 1.026 us  
T2 : 55.802 us



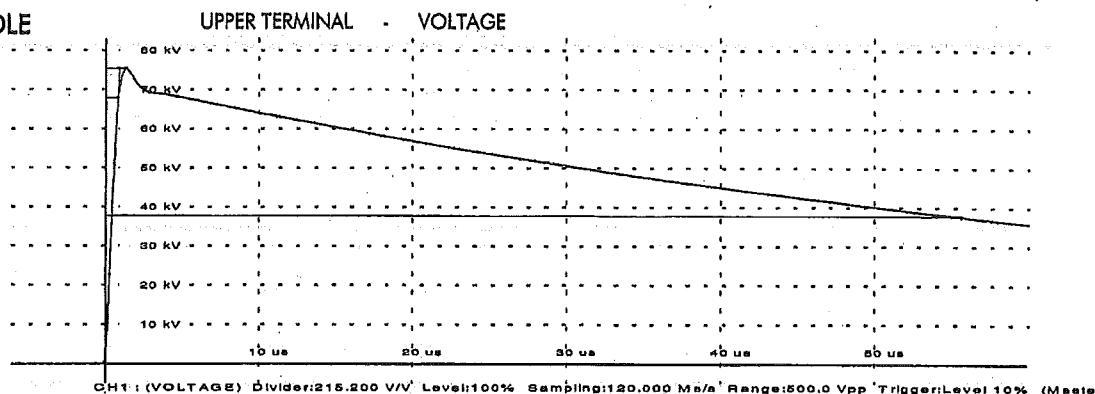
## 05.9041-02 MIDDLE

No. 2  
LI full  
Ipk max: 132.649 A  
Ipk min: -494.894 mA



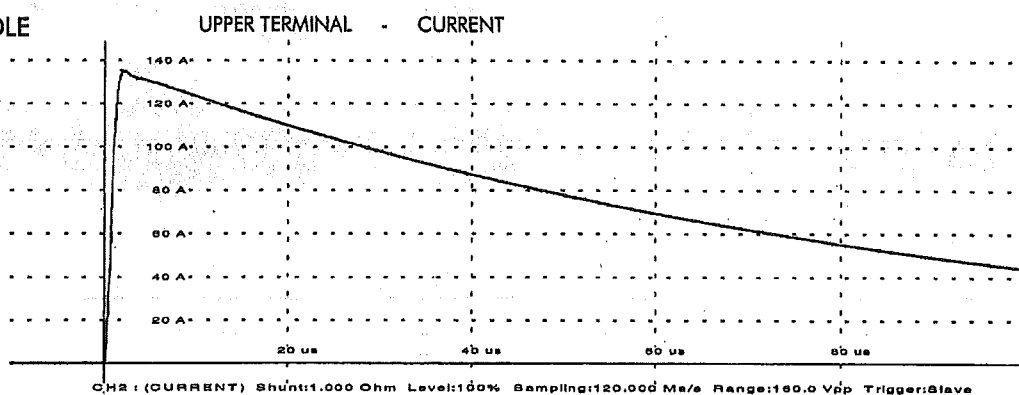
### 05.9041-02 MIDDLE

No. 3  
LI full  
Upk: 75.207 kV  
T1 : 1.027  $\mu$ s  
T2 : 55.857  $\mu$ s



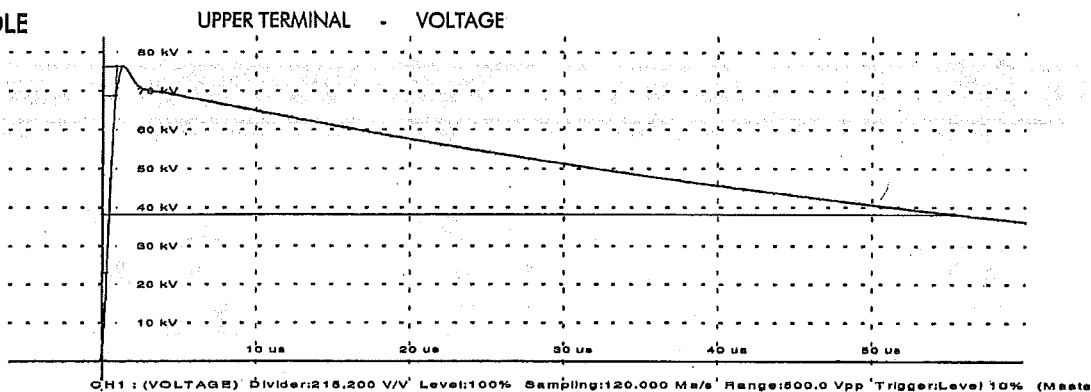
### 05.9041-02 MIDDLE

No. 3  
LI full  
Ipk max: 135.287 A  
Ipk min: -633.276 mA



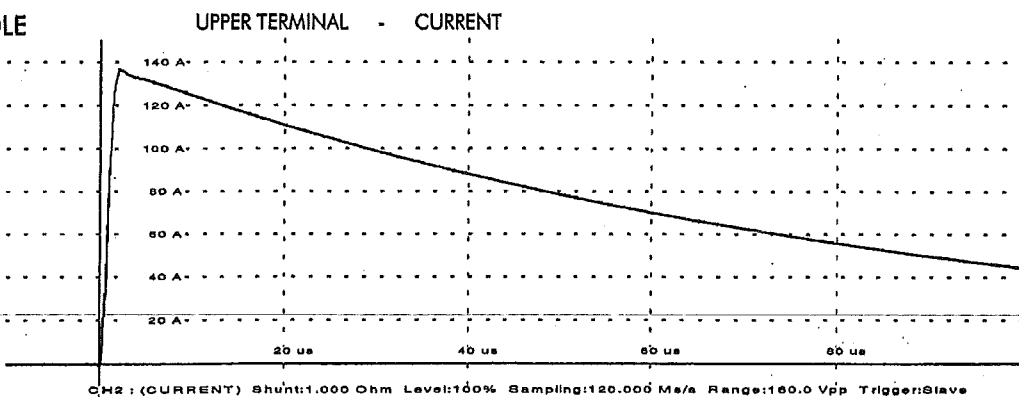
### 05.9041-02 MIDDLE

No. 4  
LI full  
Upk: 75.836 kV  
T1 : 1.025  $\mu$ s  
T2 : 55.676  $\mu$ s



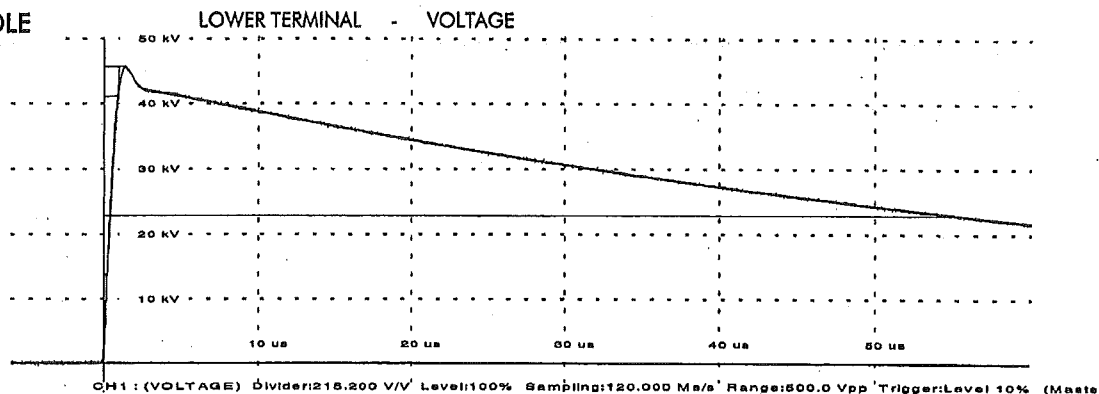
### 05.9041-02 MIDDLE

No. 4  
LI full  
Ipk max: 136.344 A  
Ipk min: -787.295 mA



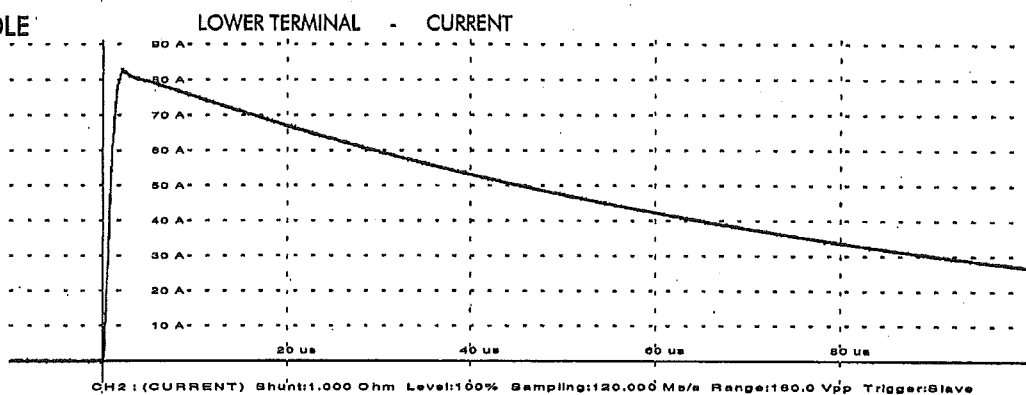
### 05.9041-02 MIDDLE

No. 5  
LI full  
Upk: 45.722 kV  
T1 : 1.024  $\mu$ s  
T2 : 55.682  $\mu$ s



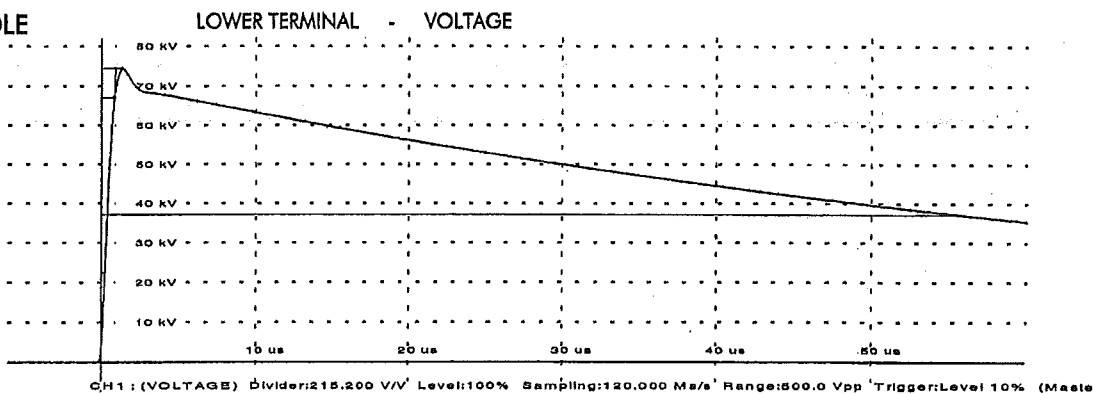
### 05.9041-02 MIDDLE

No. 5  
LI full  
Ipk max: 82.529 A  
Ipk min: -578.549 mA



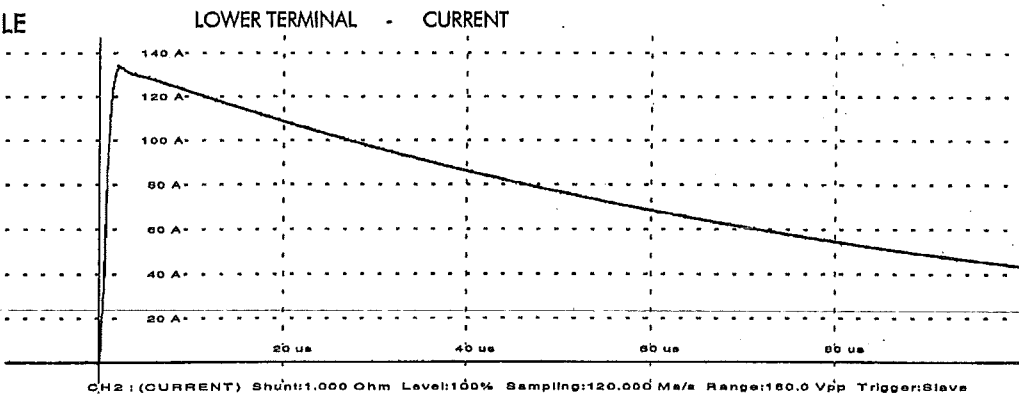
### 05.9041-02 MIDDLE

No. 6  
LI full  
Upk: 74.486 kV  
T1 : 1.025  $\mu$ s  
T2 : 55.777  $\mu$ s



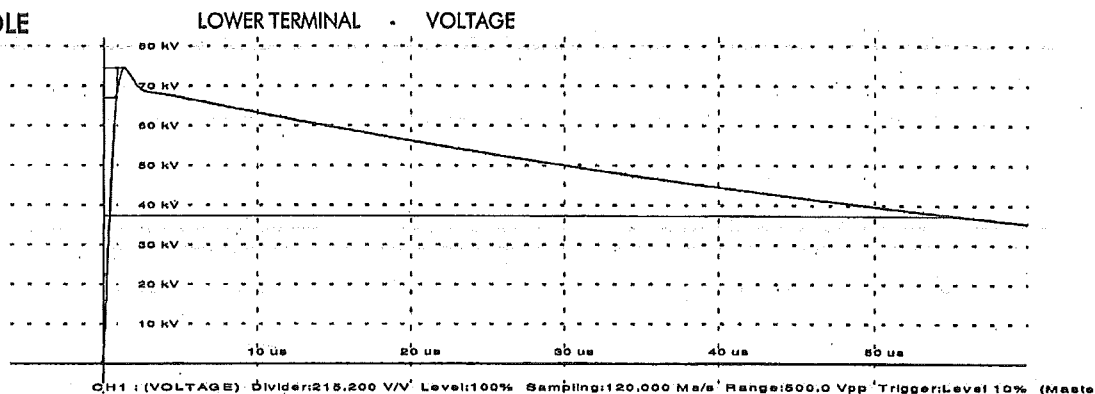
### 05.9041-02 MIDDLE

No. 6  
LI full  
Ipk max: 133.961 A  
Ipk min: -551.967 mA



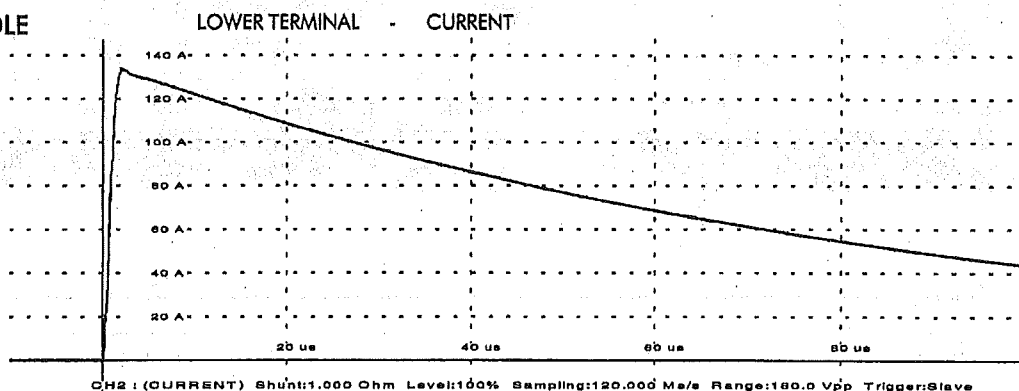
**05.9041-02 MIDDLE**

No. 7  
LI full  
Upk: 74.627 kV  
T1 : 1.026 us  
T2 : 55.735 us



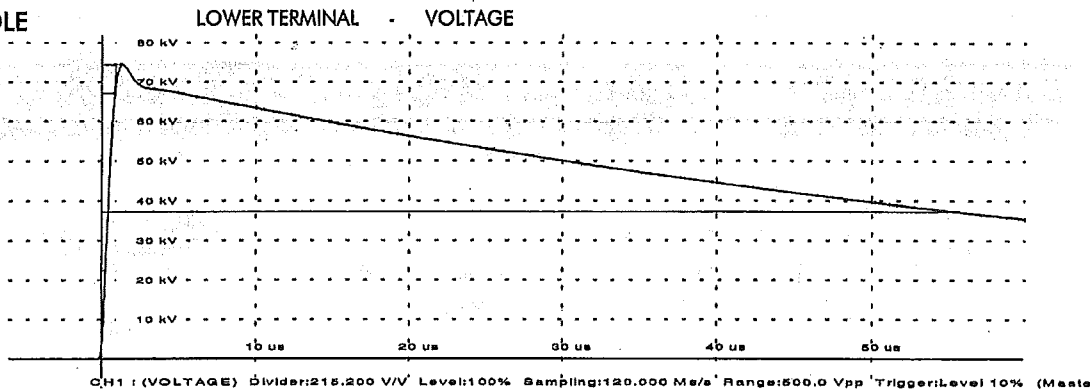
**05.9041-02 MIDDLE**

No. 7  
LI full  
Ipk max: 134.131 A  
Ipk min: -655.167 mA



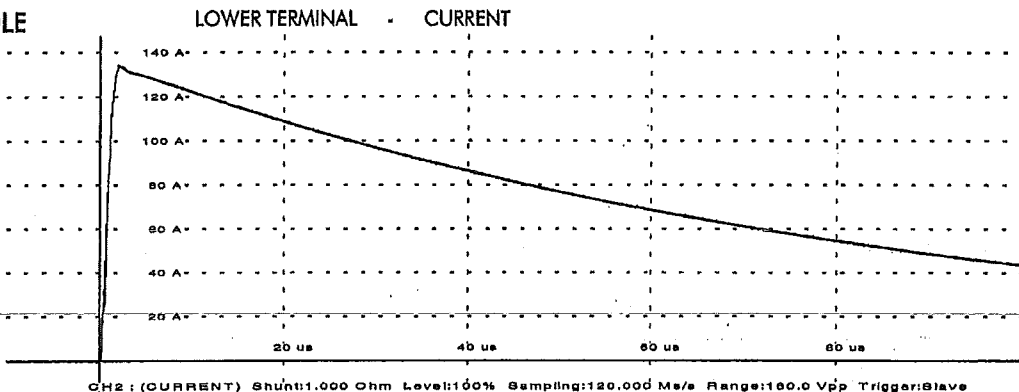
**05.9041-02 MIDDLE**

No. 8  
LI full  
Upk: 74.596 kV  
T1 : 1.025 us  
T2 : 55.840 us



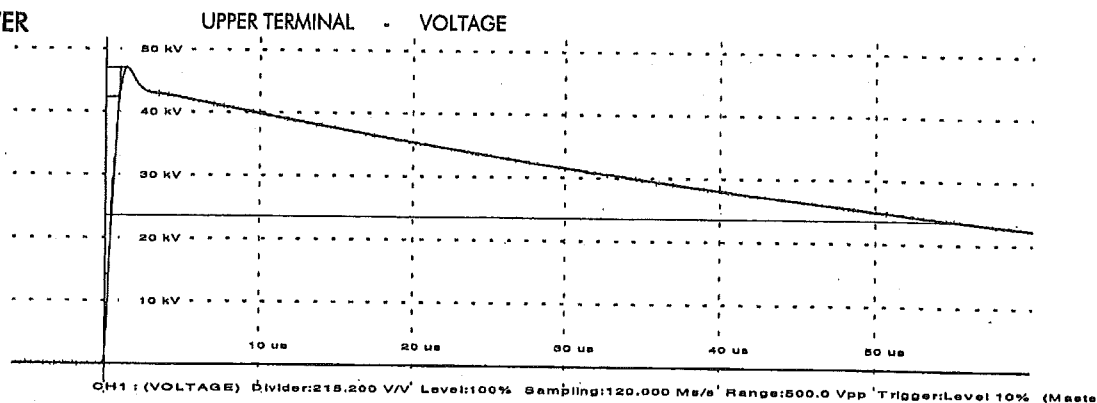
**05.9041-02 MIDDLE**

No. 8  
LI full  
Ipk max: 134.159 A  
Ipk min: -587.931 mA



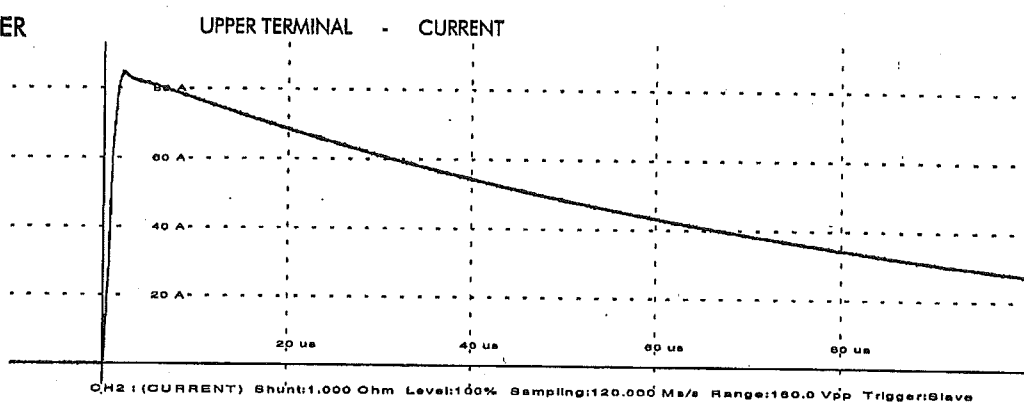
## 05.9041-02 LOWER

No. 1  
LI full  
Upk: 47.019 kV  
T1 : 1.022  $\mu$ s  
T2 : 55.571  $\mu$ s



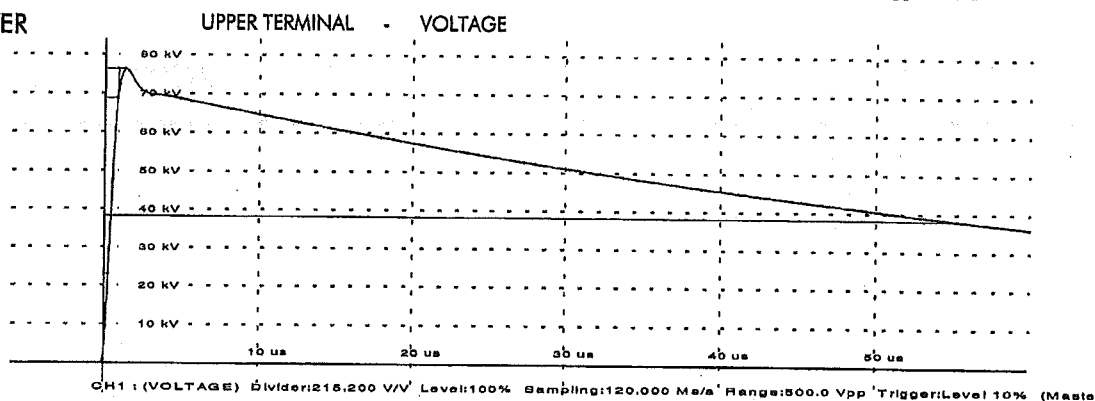
## 05.9041-02 LOWER

No. 1  
LI full  
Ipk max: 84.576 A  
Ipk min: -486.294 mA



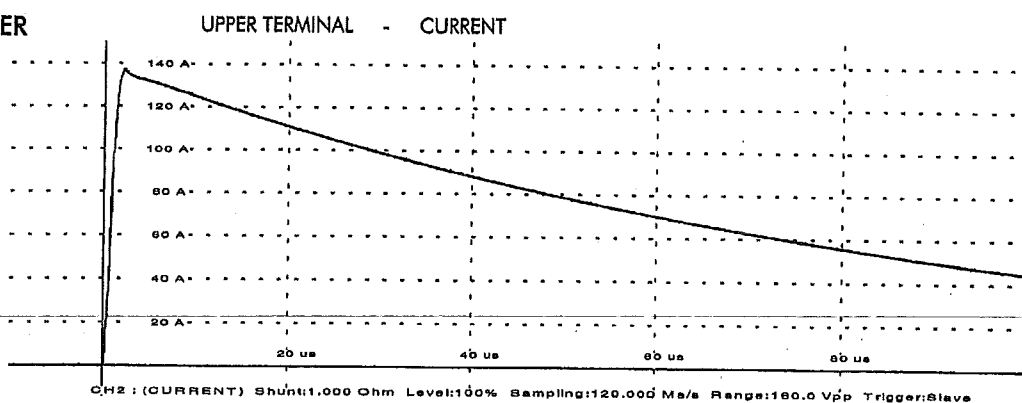
## 05.9041-02 LOWER

No. 2  
LI full  
Upk: 76.196 kV  
T1 : 1.023  $\mu$ s  
T2 : 55.508  $\mu$ s



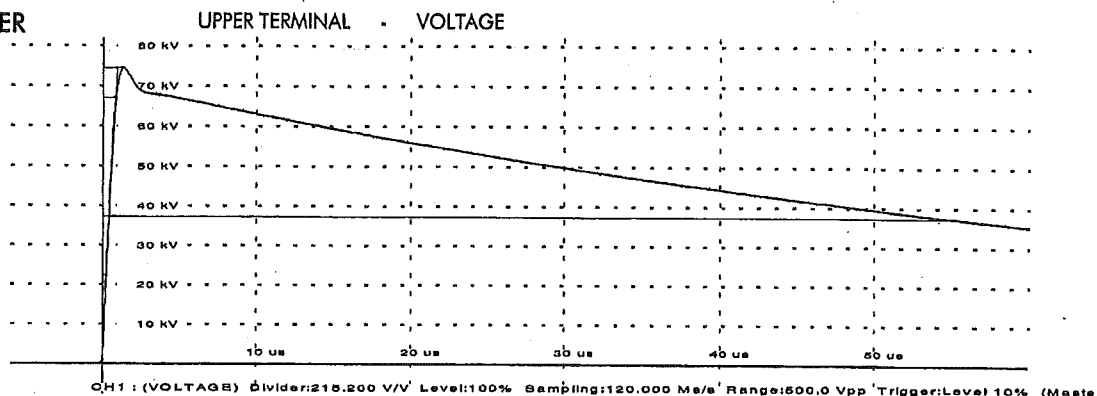
## 05.9041-02 LOWER

No. 2  
LI full  
Ipk max: 136.903 A  
Ipk min: -541.021 mA



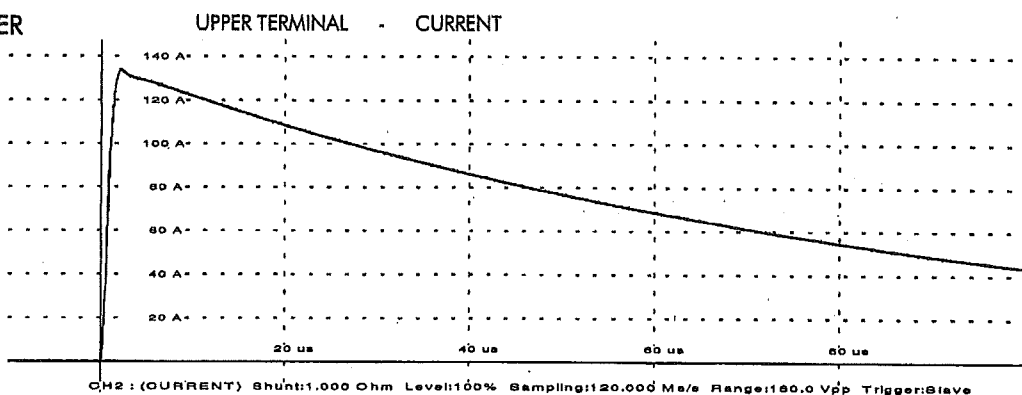
**05.9041-02 LOWER**

No. 3  
LI full  
Upk: 74.666 kV  
T1 : 1.021 us  
T2 : 55.442 us



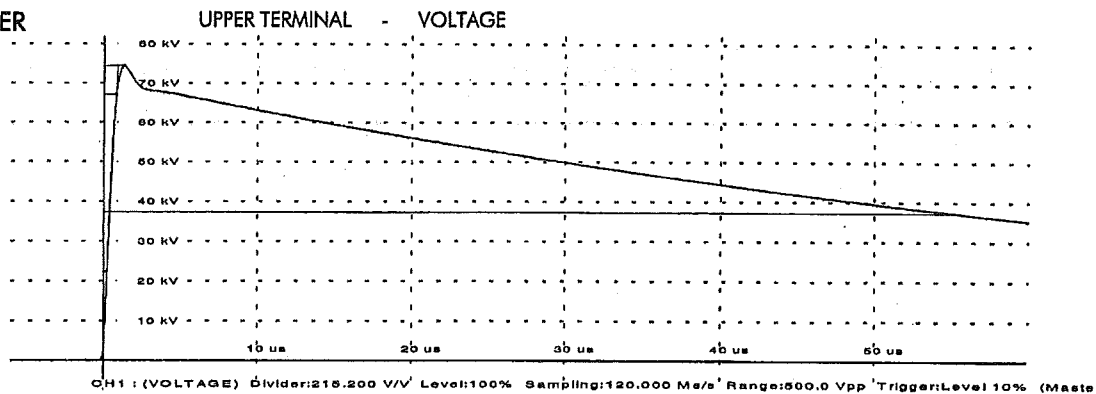
**05.9041-02 LOWER**

No. 3  
LI full  
Ipk max: 133.961 A  
Ipk min: -591.058 mA



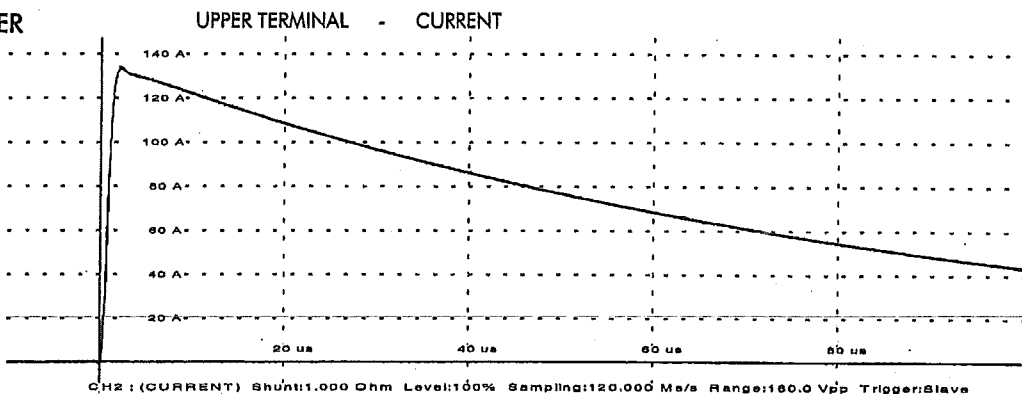
**05.9041-02 LOWER**

No. 4  
LI full  
Upk: 74.407 kV  
T1 : 1.025 us  
T2 : 55.443 us



**05.9041-02 LOWER**

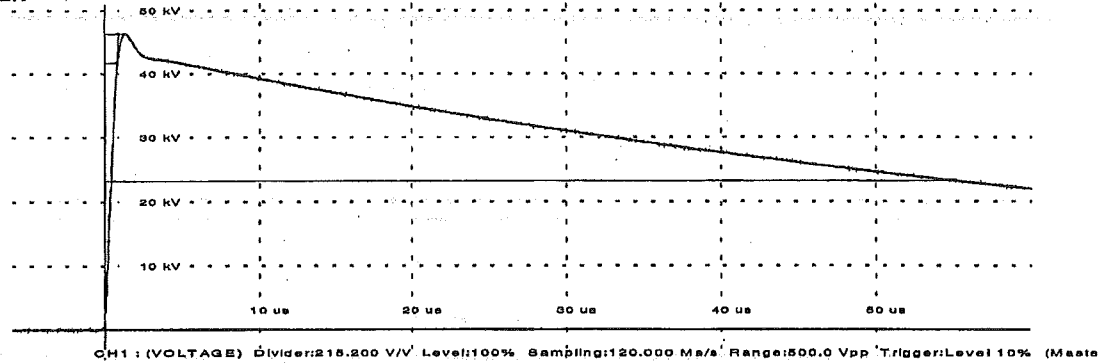
No. 4  
LI full  
Ipk max: 133.678 A  
Ipk min: -599.658 mA



**05.9041-02 LOWER**

No. 5  
LI full  
Upk: 46.243 kV  
T1 : 1.025 us  
T2 : 55.427 us

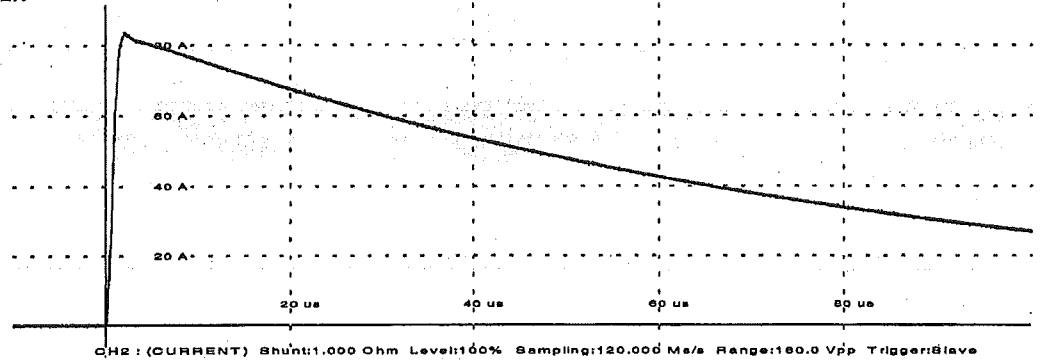
**LOWER TERMINAL - VOLTAGE**



**05.9041-02 LOWER**

No. 5  
LI full  
Ipk max: 83.094 A  
Ipk min: -561.349 mA

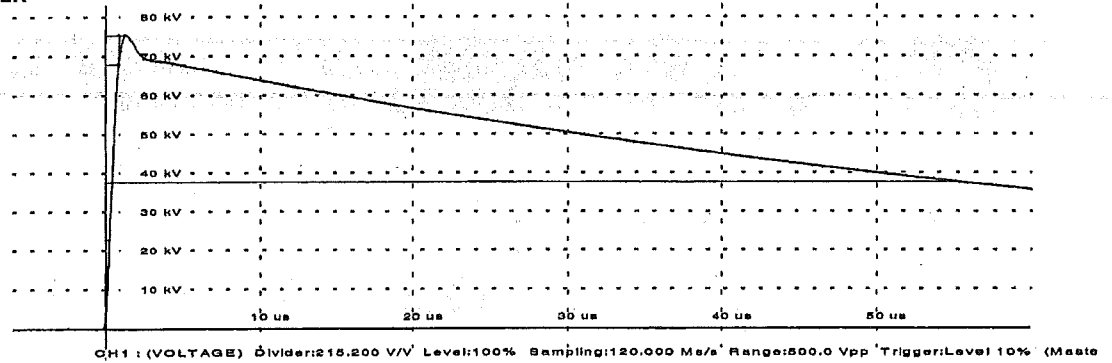
**LOWER TERMINAL - CURRENT**



**05.9041-02 LOWER**

No. 6  
LI full  
Upk: 75.724 kV  
T1 : 1.024 us  
T2 : 55.405 us

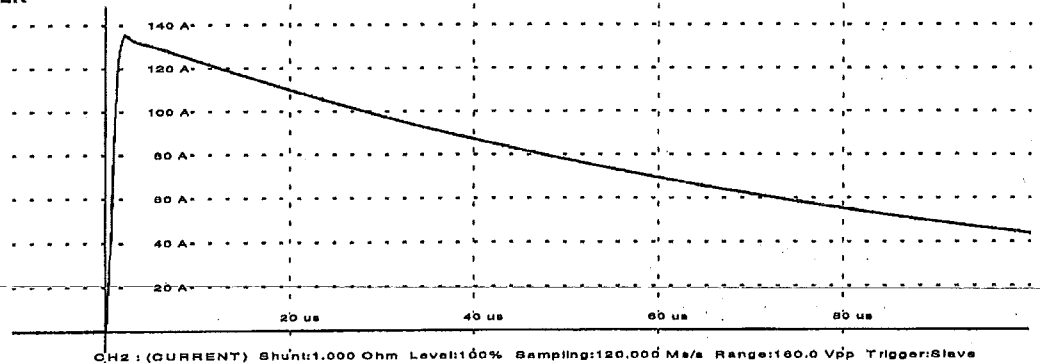
**LOWER TERMINAL - VOLTAGE**



**05.9041-02 LOWER**

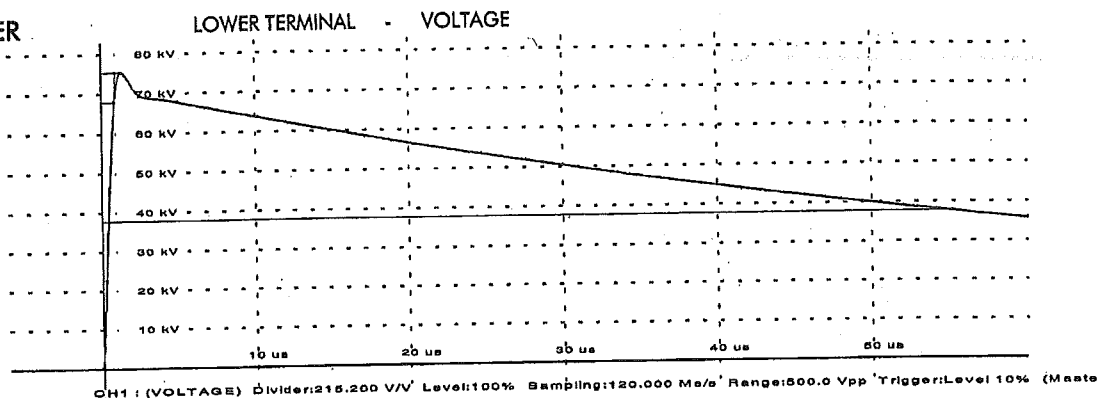
No. 6  
LI full  
Ipk max: 135.595 A  
Ipk min: -559.003 mA

**LOWER TERMINAL - CURRENT**



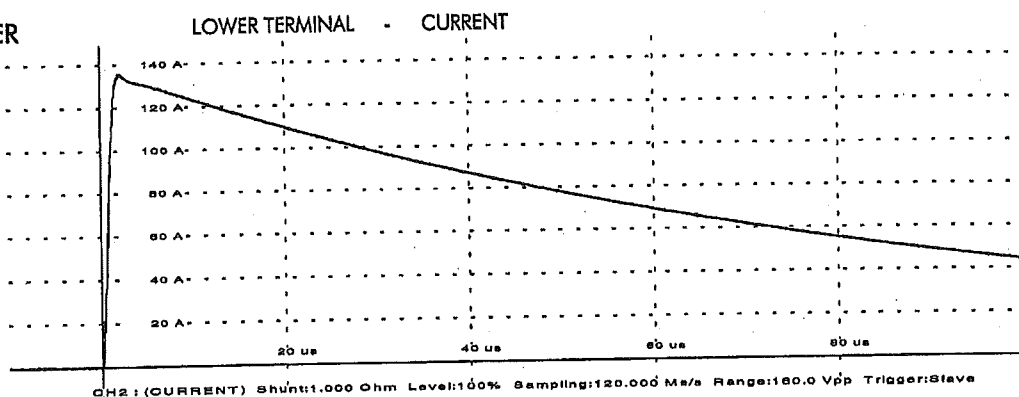
## 05.9041-02 LOWER

No. 7  
LI full  
Upk: 75.579 kV  
T1 : 1.024 us  
T2 : 55.438 us



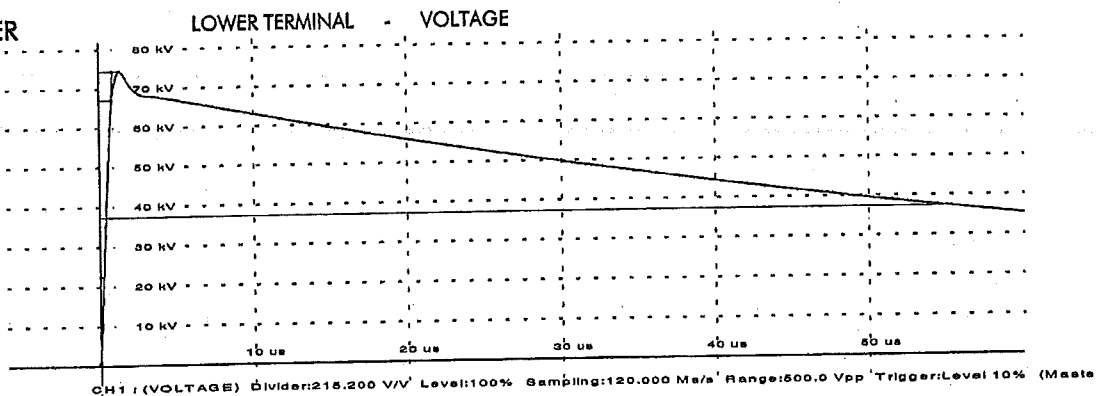
## 05.9041-02 LOWER

No. 7  
LI full  
Ipk max: 135.574 A  
Ipk min: -463.621 mA



## 05.9041-02 LOWER

No. 8  
LI full  
Upk: 74.594 kV  
T1 : 1.022 us  
T2 : 55.450 us



## 05.9041-02 LOWER

No. 8  
LI full  
Ipk max: 133.685 A  
Ipk min: -592.622 mA

