

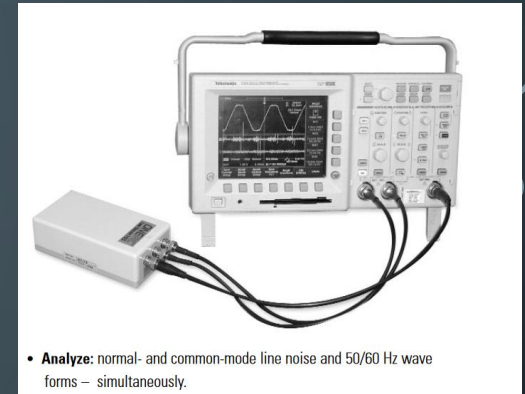
# POWER QUALITY THAILAND LTD

SINCE 1986



# PQ TEST EQUIPMENT (1980'S TO 2015)

- BMI Power Quality recorders (\$20,000)
- BMI Energy recorders (\$8,000)
- BMI Line viewers (with oscilloscope) (\$2000)
- Dranetz 606 (1975)
- 626 (1980's)



# FORMED IN 1986 TO PROVIDE POWER QUALITY ENGINEERING SERVICES FOR THE ELECTRONICS MANUFACTURING INDUSTRY IN S.E. ASIA

- Power Quality and Energy metering instruments

- Dranetz Inc USA

- **Electrotek Concepts®** is a Power Quality software development company.



- 



- Power Quality consulting services

- Site evaluations

- Power Quality Practitioner™ Training Series



# PRODUCTS AND SERVICES

- Site evaluation tools
  - Sonel Thermal cameras
- Substation test equipment
  - PONOVO relay test instruments
- Revenue meter testing and calibration
  - PowerMetrix
- Safety Connection kit for connection of power meters to live circuits by Power Quality Thailand LTD





# ELECTROTEK PRODUCTS & SERVICES

A DRANETZ COMPANY



<http://www.electrotek.com/>

## Software

[PQView®](http://www.pqview.com) WWW.pqview.com

[PQWeb®](#)

[PQDiffractor®](#)

[SuperHarm®](#)

[TOP, The Output Processor®](#)

[PQSoft®](#)

## TRAINING AND SERVICES

[PQ Analysis](#)

[Power Monitoring](#)

## POWERMONITORING.COM®

[Power Monitoring Solutions](#)

[Wind Plant Monitoring](#)

[Extended Monitoring](#)

[PQWeb.com](#)

# INTRODUCING THE PQSIM 200D POWER QUALITY TRAINING TOOL AND PQ METER EVALUATION TOOL



A Power Quality Thailand LTD /Power Quality Inc Product

# THE PQSIM 200 D



- A **3** channel Power Quality signal generator dedicated to task of generating the unique signals, waveforms and RMS values needed to test, demonstrate and evaluate a Power Quality meter.
- It generates on command the power quality parameter variations. (events)
- The power quality event designs are based on 25+ years of actual power quality events recorded at 100s of sites worldwide
- It continuously generates voltage and current signal outputs for 230v 50Hz or 120 60 HZ or 230 V 60HZ
- The continuous waveform contains distortion typical of an inverter output.

# POWER QUALITY TRAINING TOOL

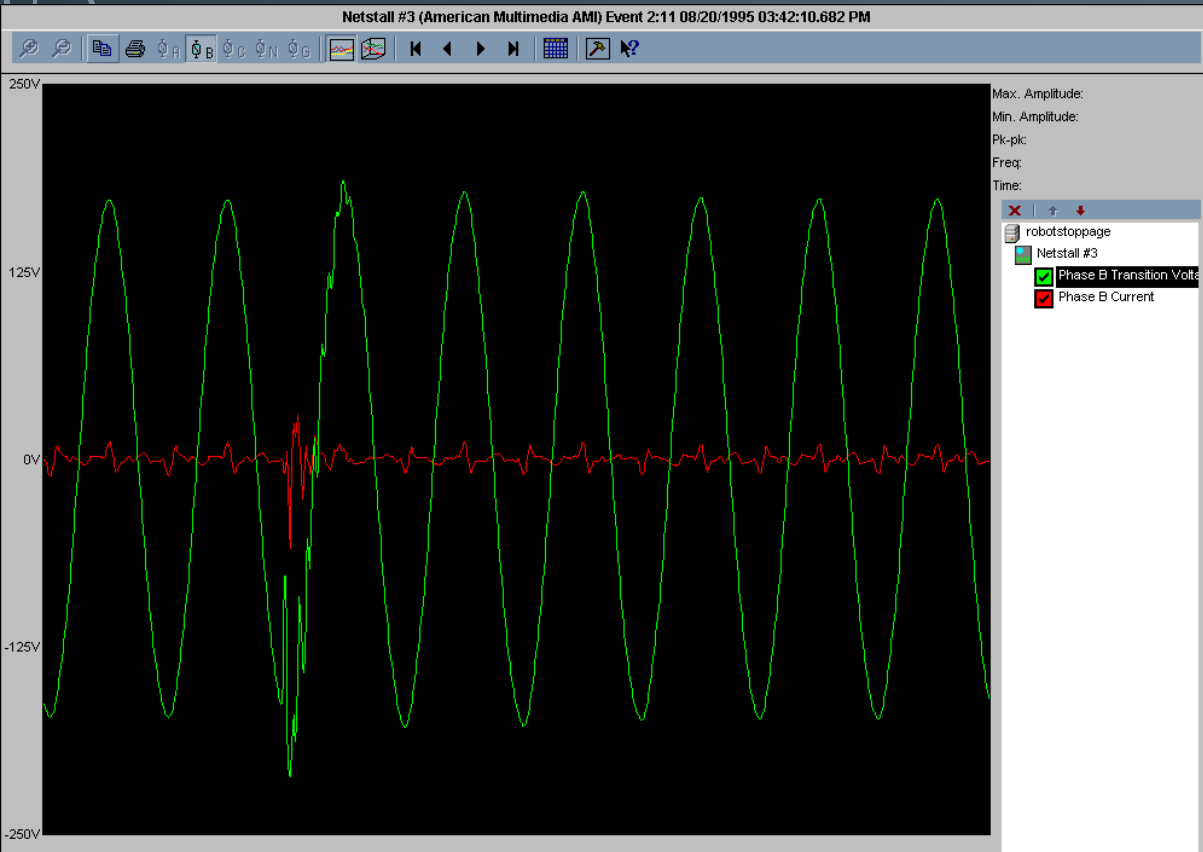
- The task of training new users of Power Quality meters has always been challenging.
  - Power Quality generally consists of 10 basic electrical properties or characteristics.
  - Power Quality meters can record hundreds of parameters simultaneously.
  - The sudden disturbance of one of these parameters is captured, recorded and time stamped. The sensitivity settings for capturing those parameters is the challenge.
  - Defining the allowable variance in a parameter disturbance (setting the threshold limits) requires knowledge of the International standards and understanding of the exceptions to normal setting for specific situations.



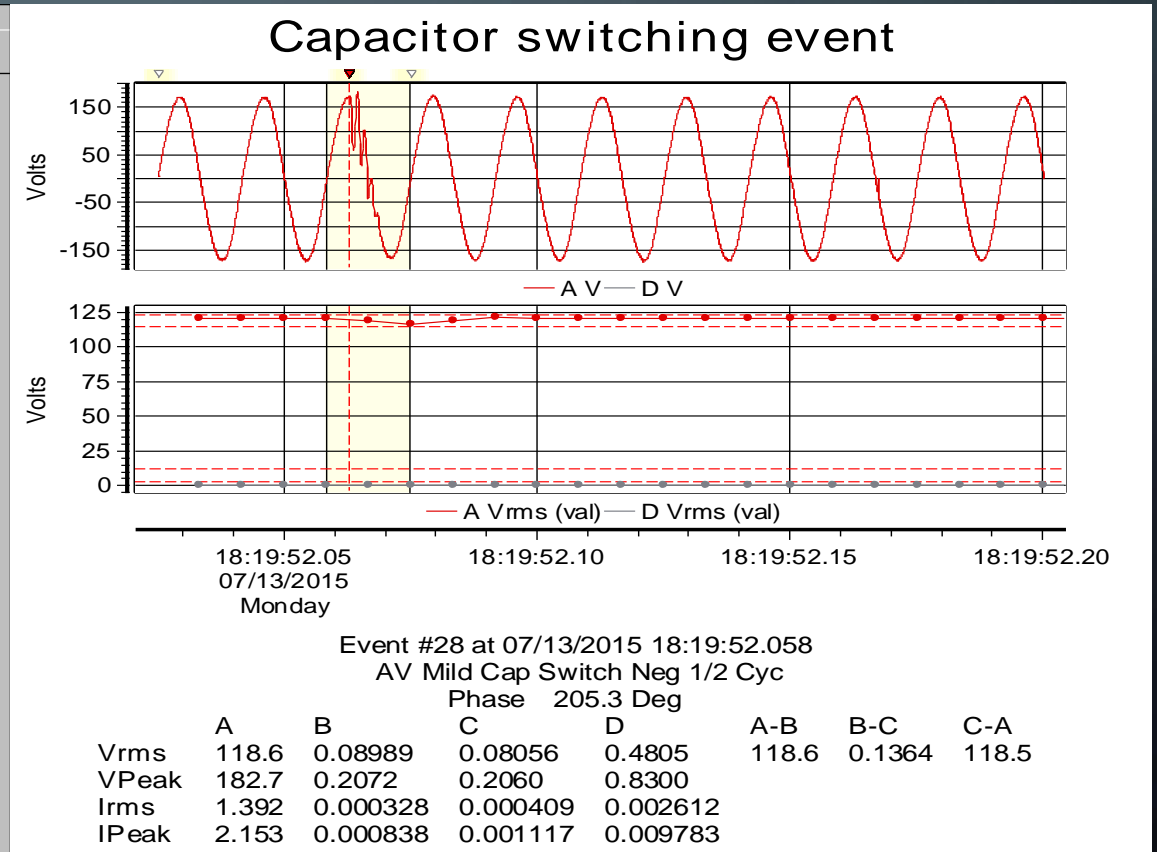
# POWER QUALITY PARAMETERS AT THE PUSH OF A BUTTON

- RMS voltage variations by magnitude and duration
  - Voltage sags (user selects **magnitude and duration**)
  - Voltage notching
  - Voltage swells (user selects **duration**)
- Voltage transients Phase to neutral
  - **Unipolar**
  - **Bipolar**
  - **Decaying ringwave**
- Voltage transients Neutral to Ground

# A SINGLE CYCLE WAVEFORM DISTORTION EVENT IEC DEFINES AS A DECAYING RING WAVE



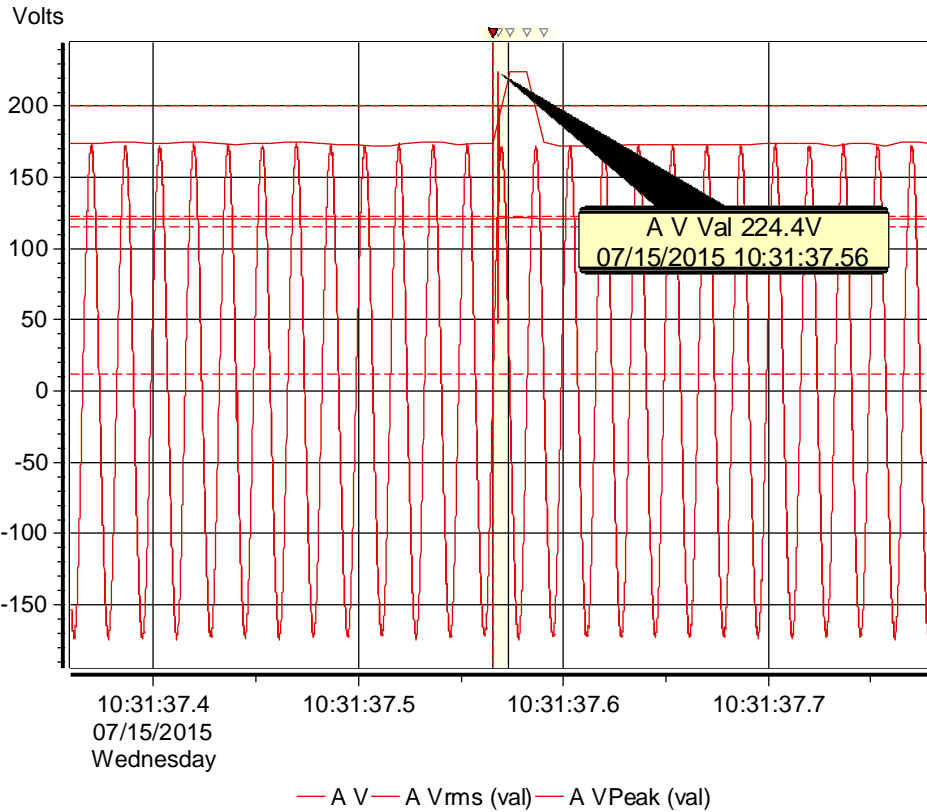
As recorded in 1995 (RPM PQ meter)



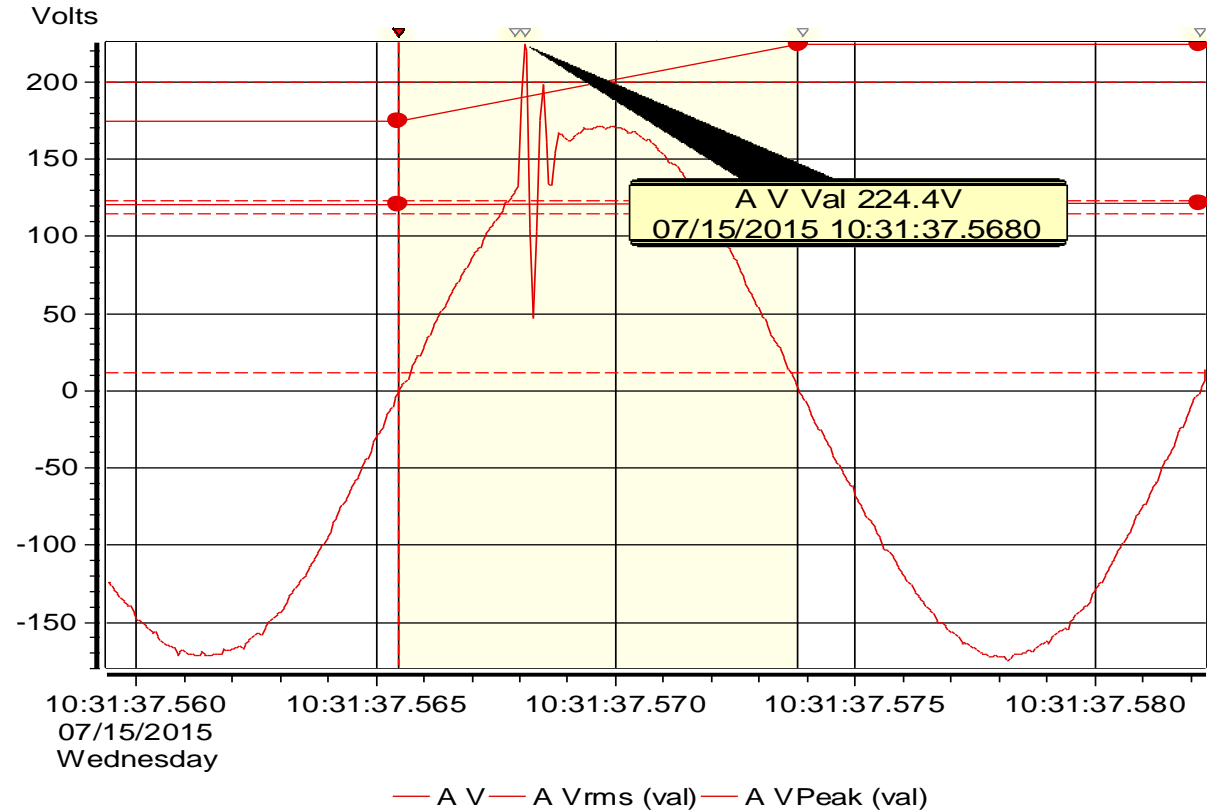
As generated by PQSIM 200 and recorded on a Dranetz PX-5

# BIPOLAR TRANSIENT RING

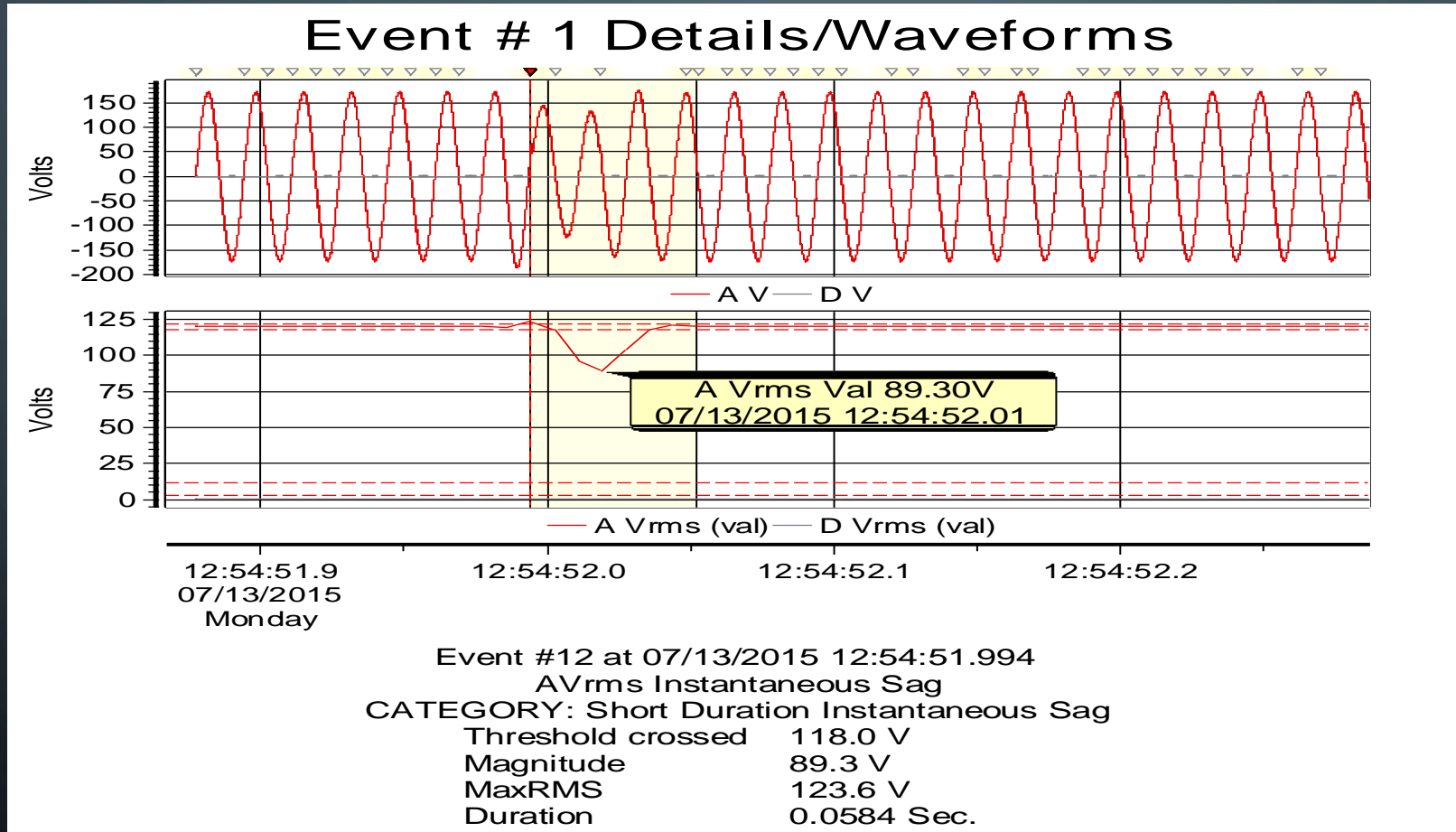
Event 6 Bipolar transient Phase to neutral  
224 Vpeak



Event 6 Bipolar transient Phase to neutral  
224 Vpeak

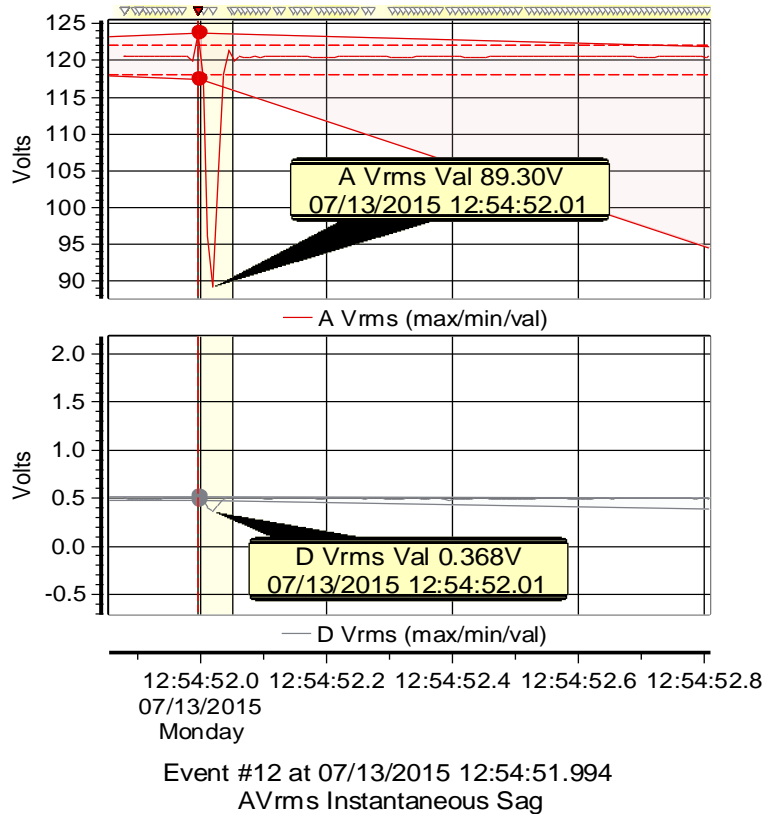


# VOLTAGE SAG 2 CYCLES

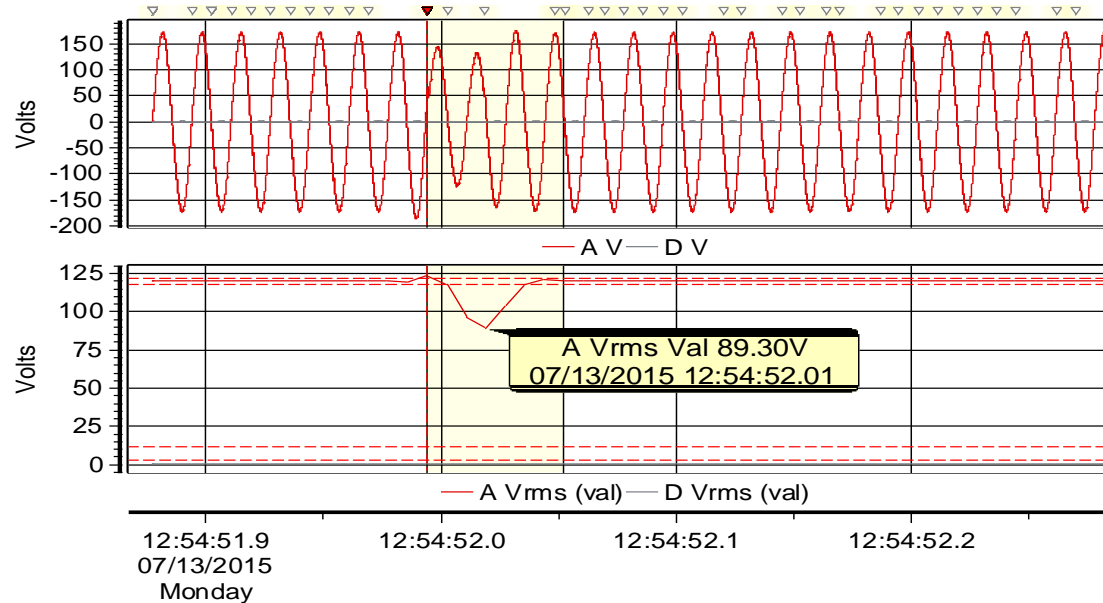


# VOLTAGE SAG RMS AND WAVEFORM

## Event 1 Voltage sag to 90v



## Event # 1 Details/Waveforms

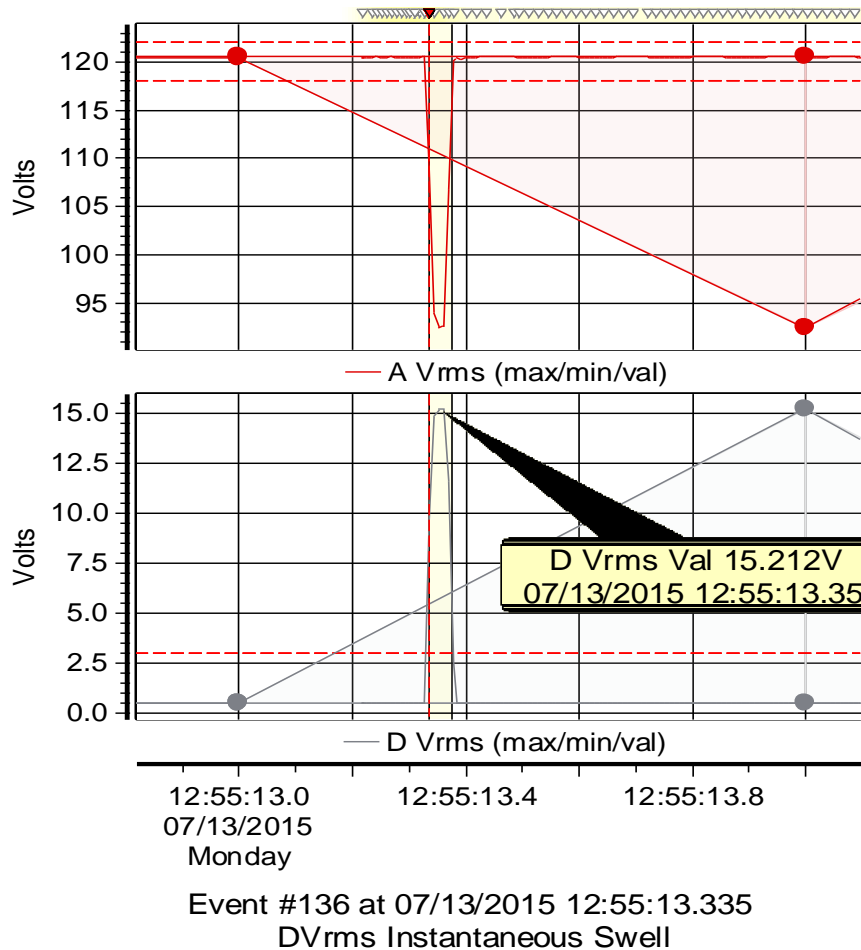


Event #12 at 07/13/2015 12:54:51.994  
AVrms Instantaneous Sag  
CATEGORY: Short Duration Instantaneous Sag  
Threshold crossed 118.0 V  
Magnitude 89.3 V  
MaxRMS 123.6 V  
Duration 0.0584 Sec.

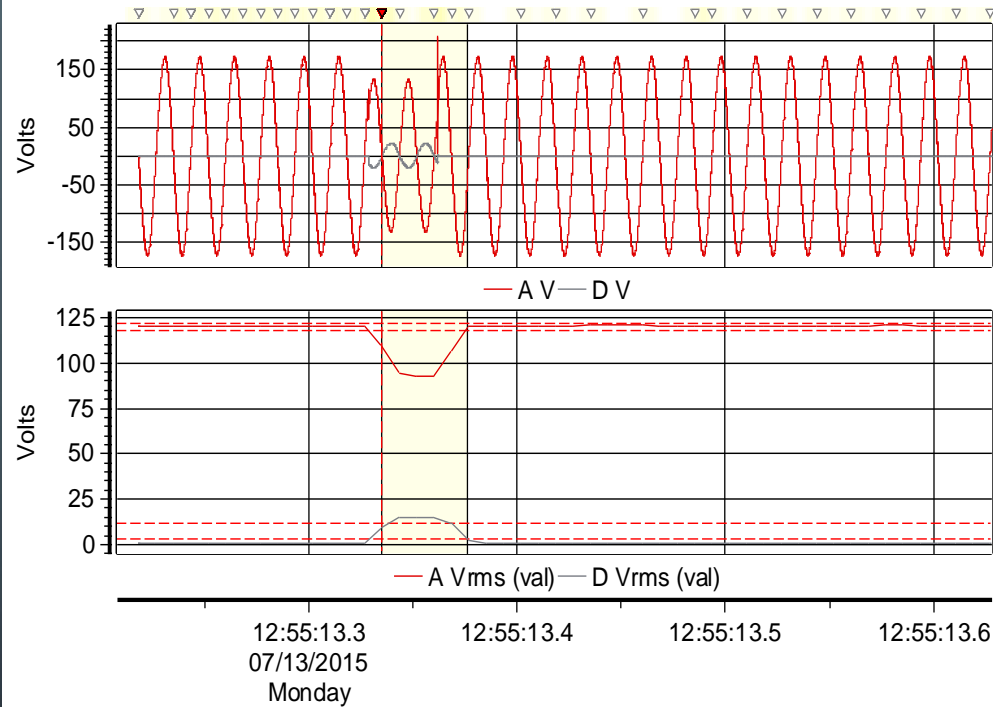


# VOLTAGE SWELL NEUTRAL TO GROUND

## Event 3 Swell neutral to ground



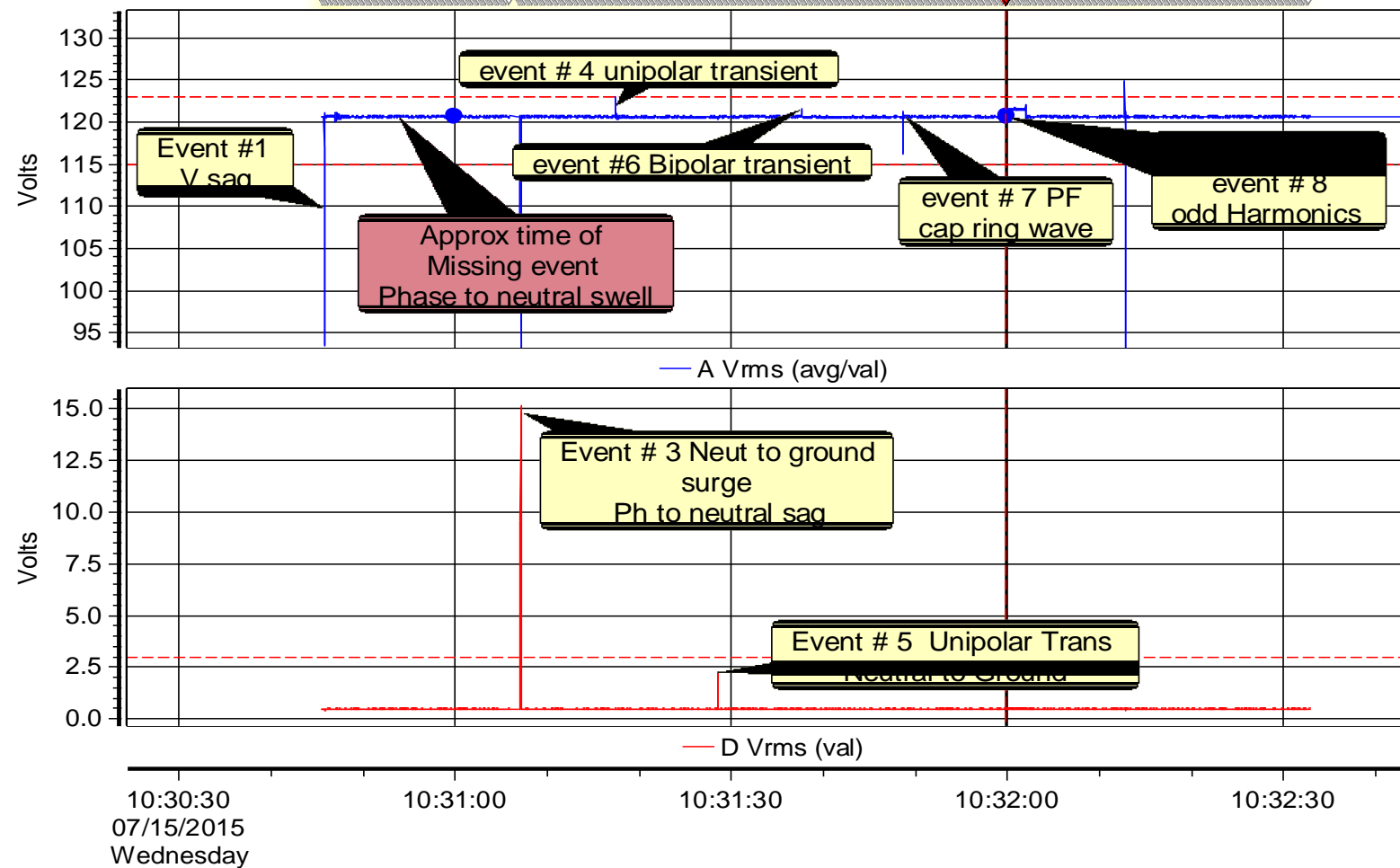
## Event # 3 Details/Waveforms



Event #136 at 07/13/2015 12:55:13.335  
 DVrms Instantaneous Swell  
 CATEGORY: Short Duration Instantaneous Swell  
 Threshold crossed 3.0 V  
 Magnitude 15.22 V  
 MinRMS 9.644 V  
 Duration 0.04173 Sec.

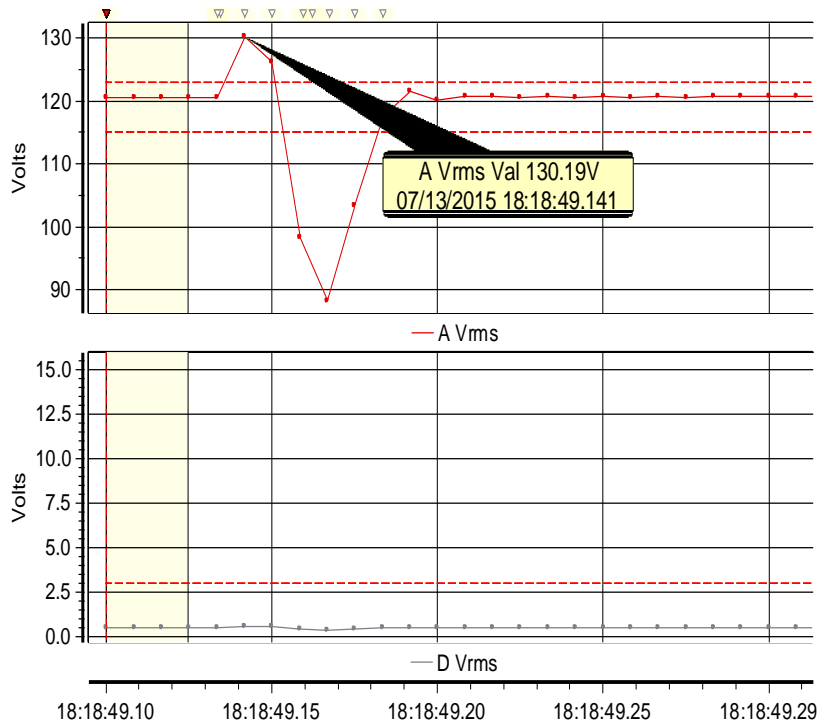
# AUTO SEQUENCE GENERATES A SAMPLE OF ALL EVENT TYPES

1 full auto sequence with events marked



# PHASE TO NEUTRAL SWELL AND SAG

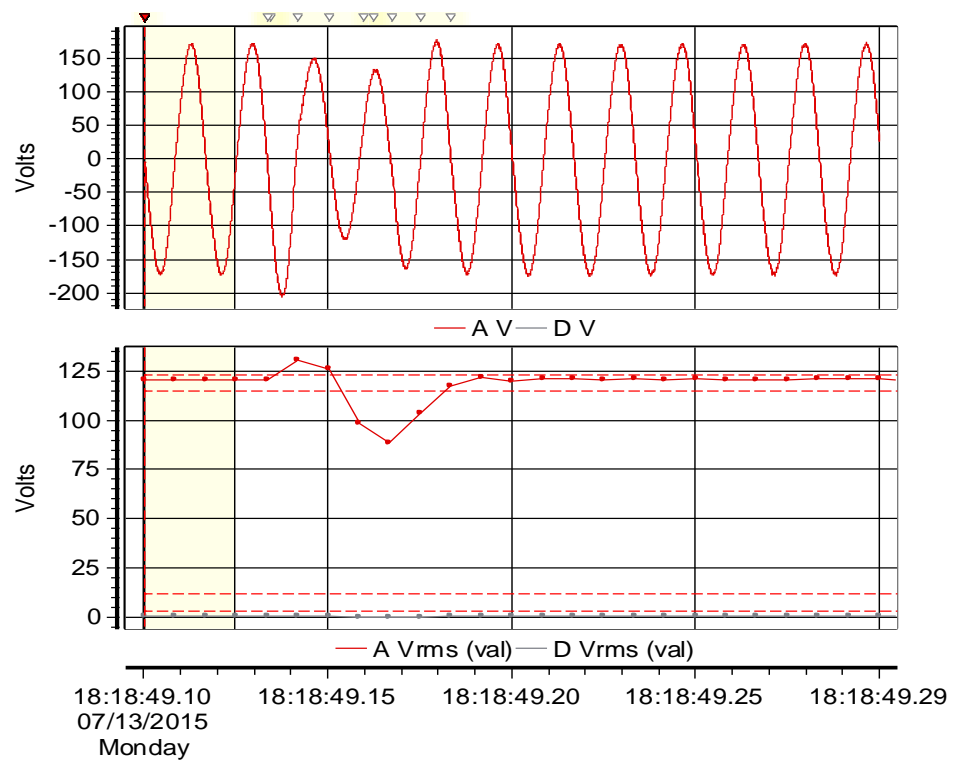
## Event 1 PH to Neutral Sag preceded by a swell



18:18:49.10 18:18:49.15 18:18:49.20 18:18:49.25 18:18:49.29  
07/13/2015  
Monday

Event #1 at 07/13/2015 18:18:49.100  
Pre-trigger

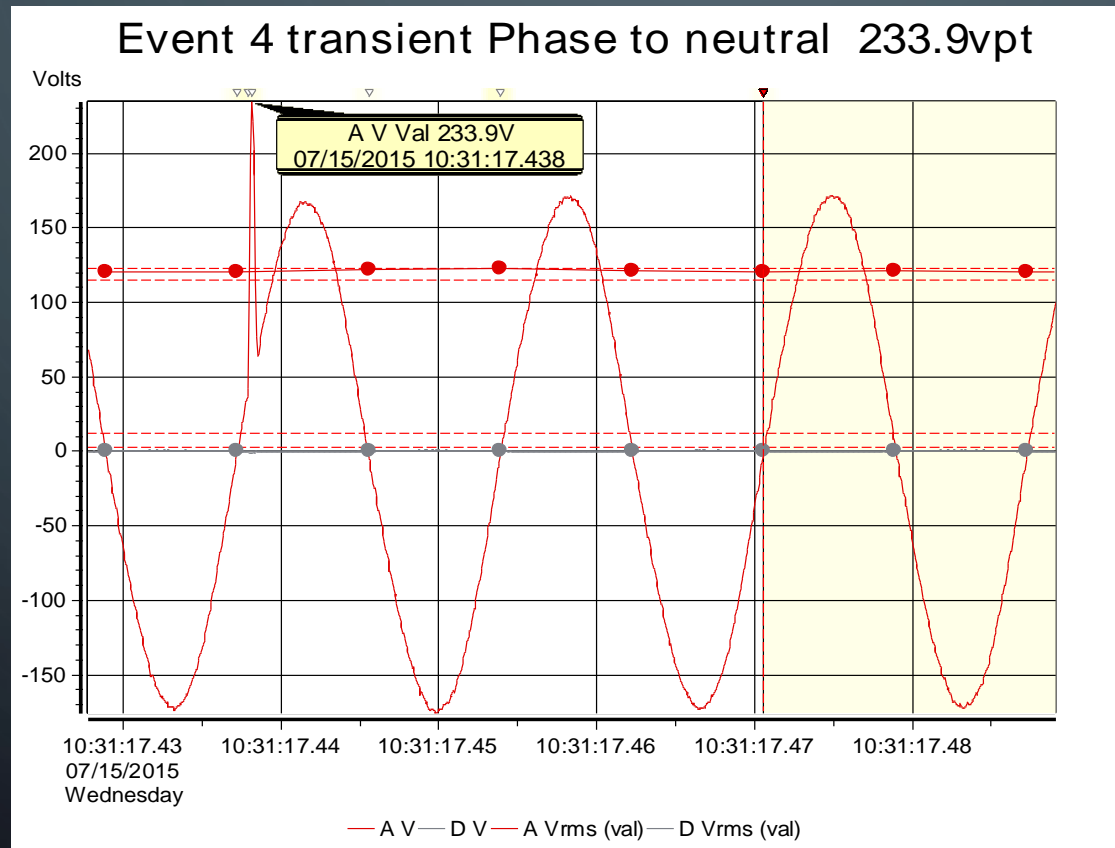
## event #1 waveforms



18:18:49.10 18:18:49.15 18:18:49.20 18:18:49.25 18:18:49.29  
07/13/2015  
Monday

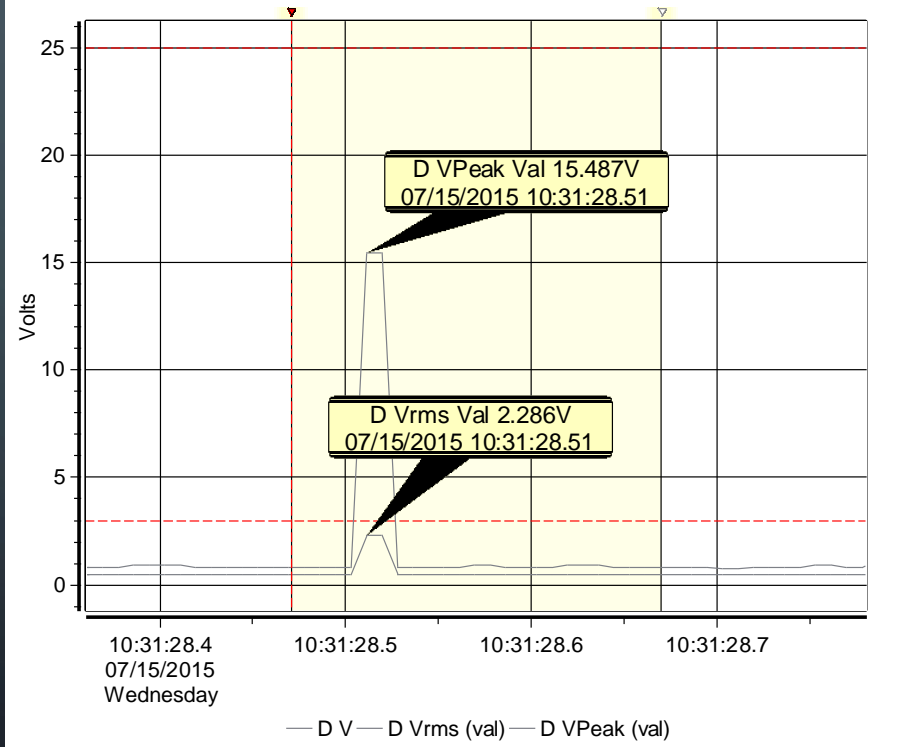
Event #1 at 07/13/2015 18:18:49.100  
Pre-trigger

# UNIPOLAR TRANSIENT



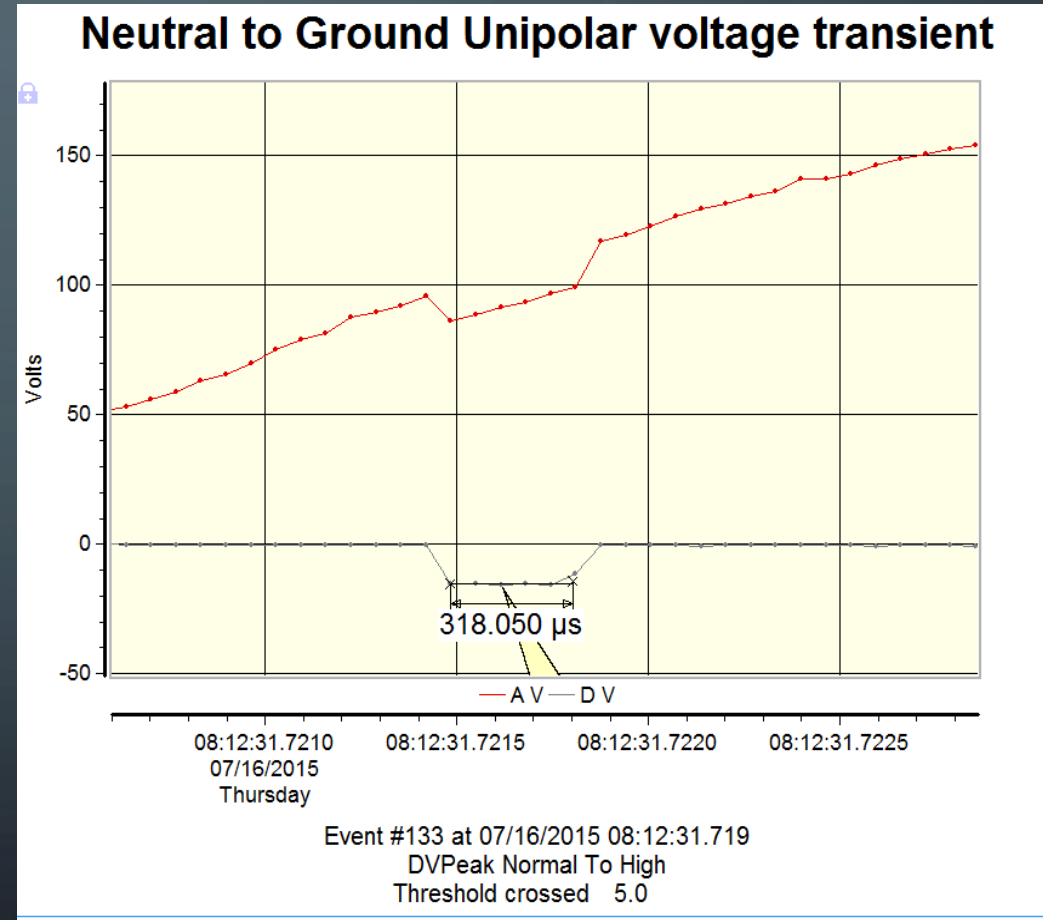
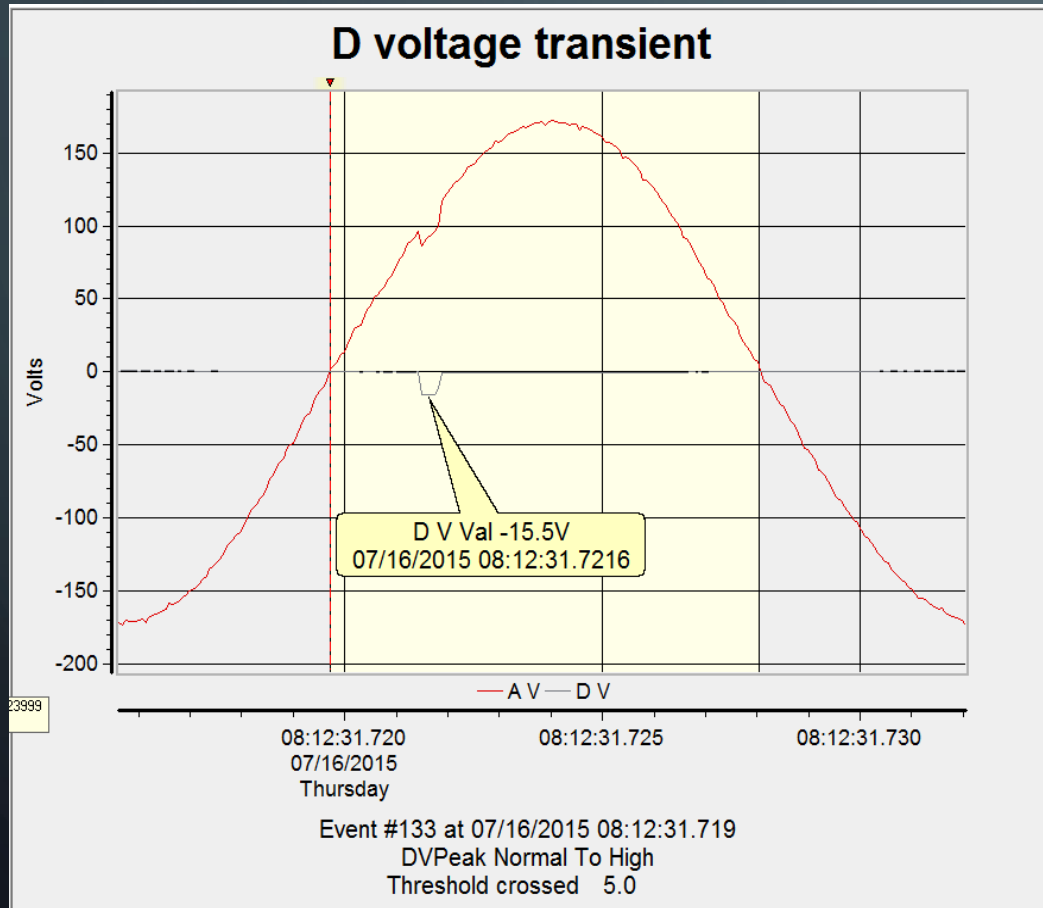
# TRANSIENT NEUTRAL TO GROUND

Event 5 Bipolar transient neutral to Ground  
2.24 vrms 15.48 Vpeak



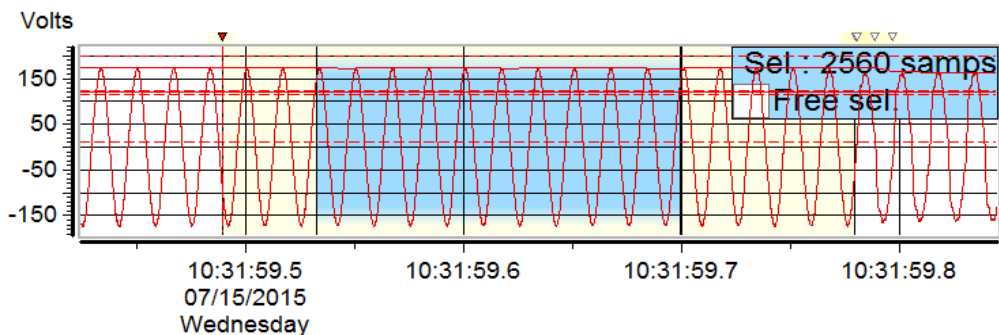


# VOLTAGE TRANSIENT "NOTCH"



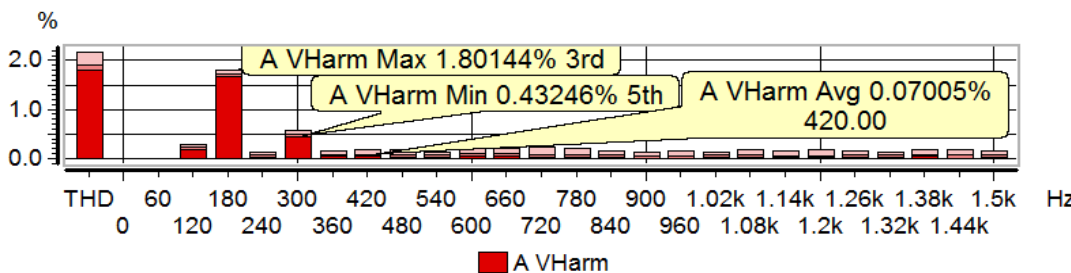
# ODD HARMONIC INCREASE

## Event # 8 Odd harmonic increase



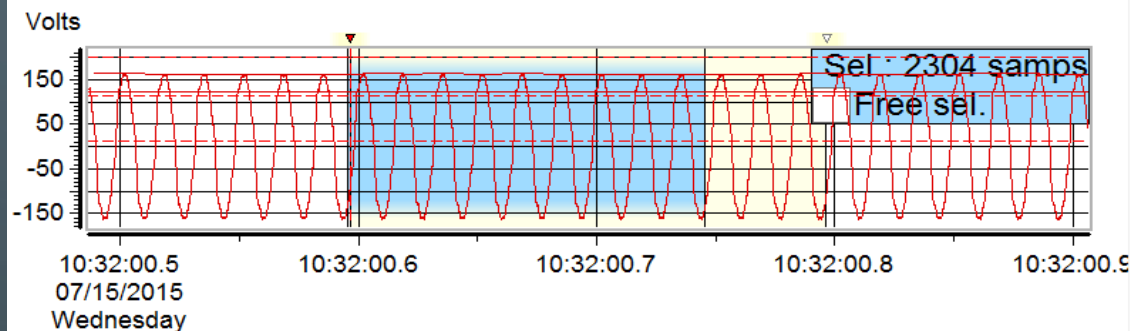
— A V — A Vrms (val) — A VPeak (val)

## Waveform harmonics before event



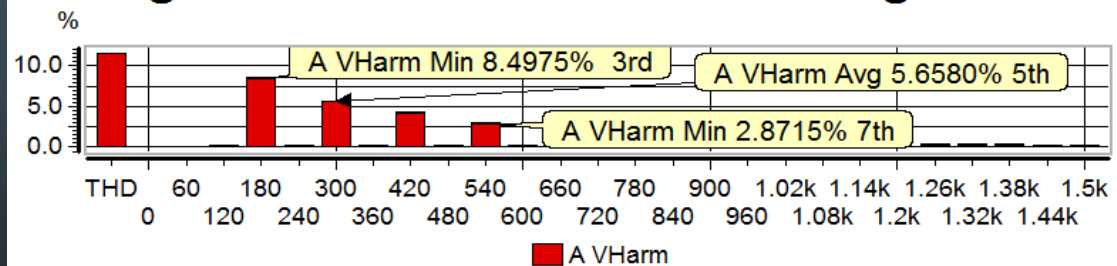
	AV	DV	AI
RMS	109.68	N/A	0.02
FND	100.00	N/A	0.00
DC	0.02	N/A	0.00
THD	1.90	N/A	0.01

## Event # 8 Odd harmonic increase



— A V — A Vrms (val) — A VPeak (val)

## Voltage Waveform harmonics during the event



	AV	DV	AI
RMS	121.55	N/A	0.02
FND	100.00	N/A	0.01
DC	-0.00	N/A	0.00
THD	11.56	N/A	0.01

# PQSIM POWER QUALITY PARAMETER GENERATOR OPTIONS

- Current cable adapter
  - Output 0 to 1.5vac to a BNC connector. Cable converts BNC to connector used by the PQ Meter
- 4 channel voltage set.
  - Neutral and phase
- 4 channel current adapter

# THANK YOU

- [Terryc@powerquality.org](mailto:Terryc@powerquality.org)
- [Terryc@powerquality.co.th](mailto:Terryc@powerquality.co.th)