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# ELECTRIC CAR AND RELATED PQ ISSUES IN CHINA

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# MY ELECTRIC CAR

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- ✖ Bought at the end of 2014
- ✖ Delivery at the beginning of 2015 Feb
- ✖ Run fine over 4000 km up to now
- ✖ Shape of Mercedes-Benz Model B 200





# QUESTION

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- ✗ EV sales in China in 2013
  - ✗ Up to 13600
- ✗ Target of EV sales in China in 2020 ?



# 2013-2014 GLOBAL EV\* SALES - DATA OF JOINT INVESTIGATION BY "REALLI RESEARCH", "SADI CONSULTANT" AND "CHINA BATTERY"

Country\Year	2013	2014	Growth rate	Note
U.S.	99099	120730	21.83%	
E.U.	73983	101540	37.25%	
China	13600	87845	545.92%	Including imported
Japan	32374	33010	1.97%	
Others	6430	10397	61.70%	Including Canada, Australia, New Zealand, Korea,etc.
Total:	225486	353522	56.78%	

Note \*: EV required to be over Double 80;  
Max. speed over 80 km/h; distance per charge over 80 km



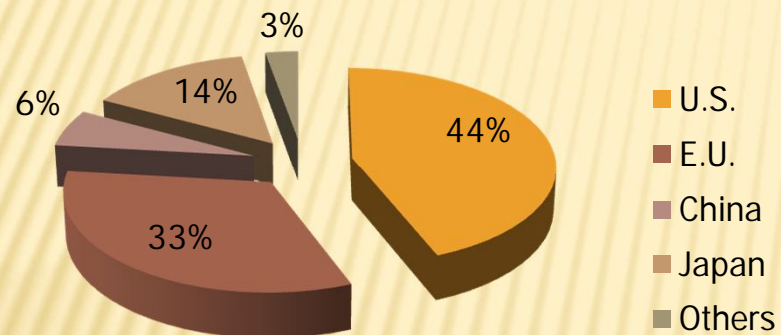
# EV SALES IN OTHER COUNTRIES

Country	2014
Canada	5053
Australia	1197
Korea	885
New Zealand	260
Others	2602

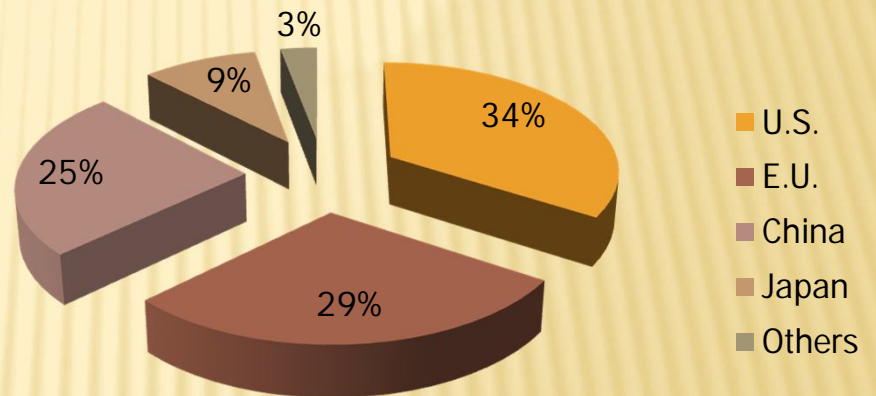


# Global EV sales by countries 2013-2014

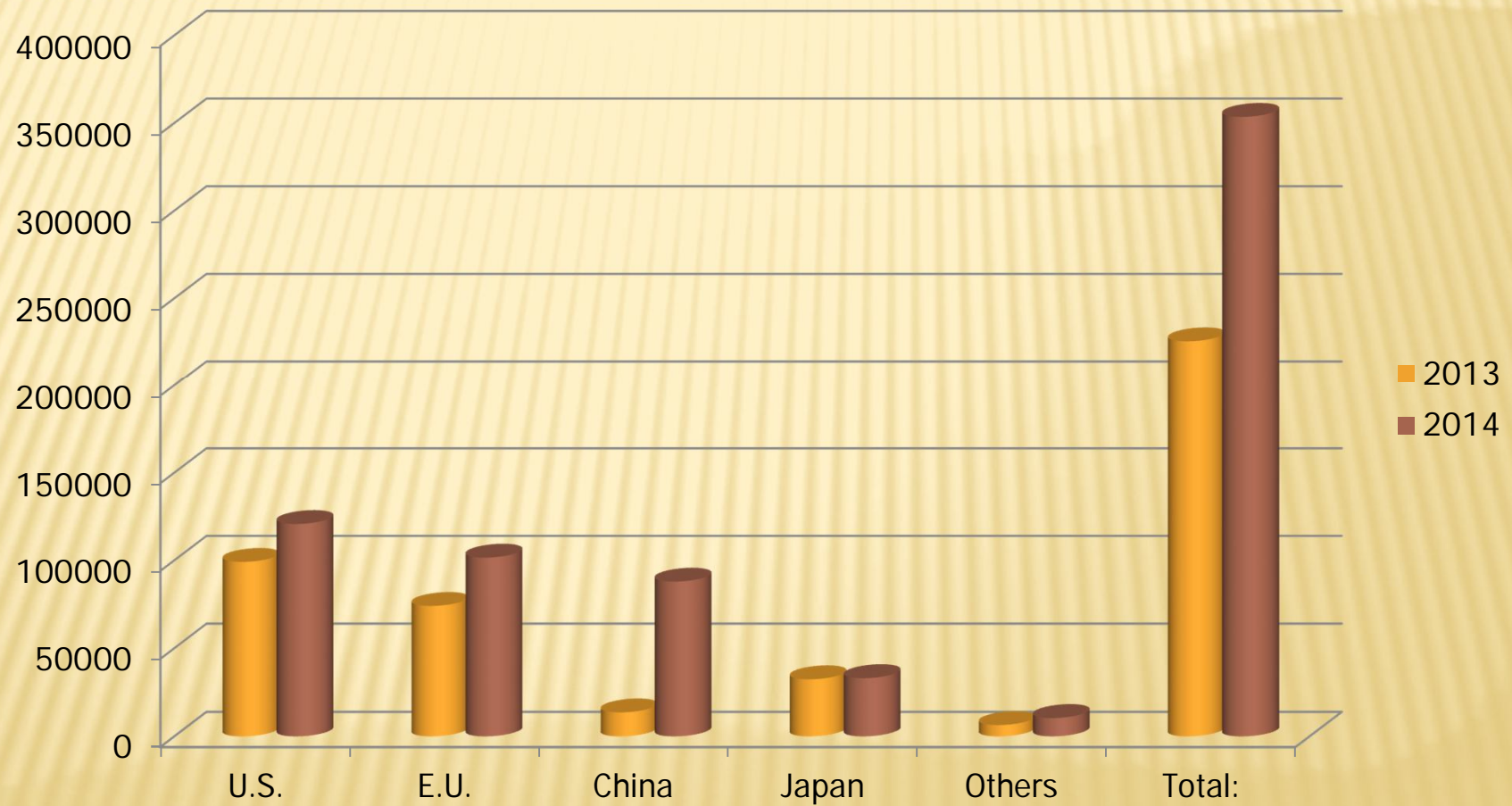
## 2013 Global EV Sales



## 2014 Global EV Sales



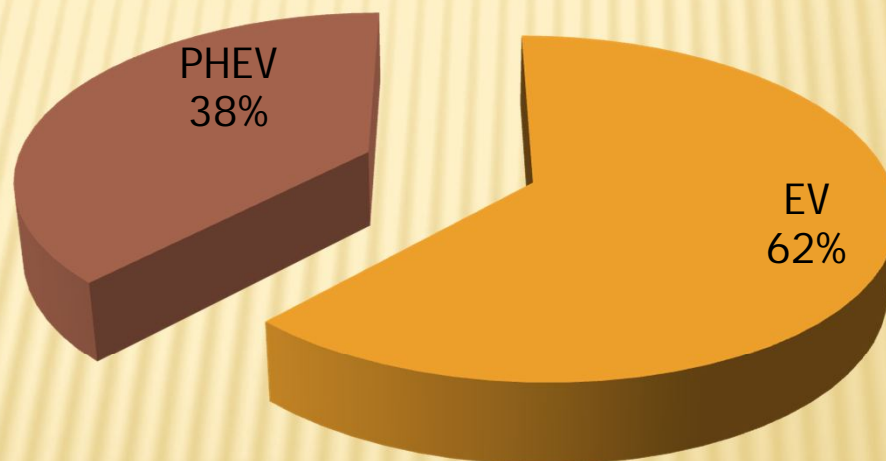
# EV GROWTH BY COUNTRIES 2013-2014





## 2014 Global EV sales – EV & PHEV

EV	PHEV	Total
219406	134116	353522
62.06%	37.94%	100.00%



# QUESTION

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- ✗ EV sales in China in 2013
  - ✗ Up to 13600
- ✗ Target of EV sales in China in 2020 ?

5,000,000 !

What about electricity then?



# SUBSIDY FOR EV BY CHINESE GOVERNMENT

- ✖ RMB 45,000 by central gov + RMB 45,000 by BJ gov in 2015 (for 200 – 250km range)
- ✖ Free of car consumption tax (10%)
- ✖ No draw lots for car license plate
  - + Lot winning rate: 1:172 (gas car)
- ✖ Free of traffic restriction in BJ
- ✖ (Future) Free of high way toll and parking fee, congestion fee...

# EV PRICES

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- ✖ EV200 cost; RMB 116,900. (US\$19,000), free of charger and installation
  - + EV150 cost; RMB 84,000 (US\$ 14,000)
- ✖ More cars with lower prices expected



# REASONS FOR CHINESE GOVERNMENT TO PROMOTE EV

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## ✖ Haze

- + More than 20% contributed by car exhaust in Beijing and Guangzhou

- CO<sub>2</sub> emissions
- Energy usage efficiency

# TRAFFIC IN BEIJING

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- ✗ More than 5, 370,000 cars at the end of 2014
- ✗ “First Jam” in China
- ✗ Average car speed – less than 20 km/h during rush hours







# ABOUT THE EV

- ✖ Made by Beijing Auto
- ✖ 200 km distance per charging – but 20% reservation suggested
- Maximum speed
  - ✖ – 125 km/h





# BATTERY

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- ✗ Battery by JV with Korean company (SK Corp.)
  - + 30.4 kwh capacity, Lithium
  - + Average consumption; 15 kwh/ 100km
    - ✗ Electricity cost; RMB 0.5/kwh, RMB 8-9 yuan/100km
    - ✗ Vs. gas car cost; RMB 50 – 60 Yuan/100km
- ✗ Life time; 85% capacity after 3000 charging

# SLOW CHARGING

220V AC, Charging  
current 16 Amp –  
appx full charging/ 8  
hours





# FAST CHARGING

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- + Power to fast chargers; 380 VAC (3 phase)
  - × Charging current 63A – appx charging 80% capacity/hour
- + Fast charger to car; 600V DC, 100A



# CHARGING STANDARD

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- ✗ Input voltages, currents of chargers
- ✗ Output voltages, currents
- ✗ Shape
- ✗ Control signals
- ✗ Insulation, grounding
- ✗ ...
- ✗ Chinese and German standards

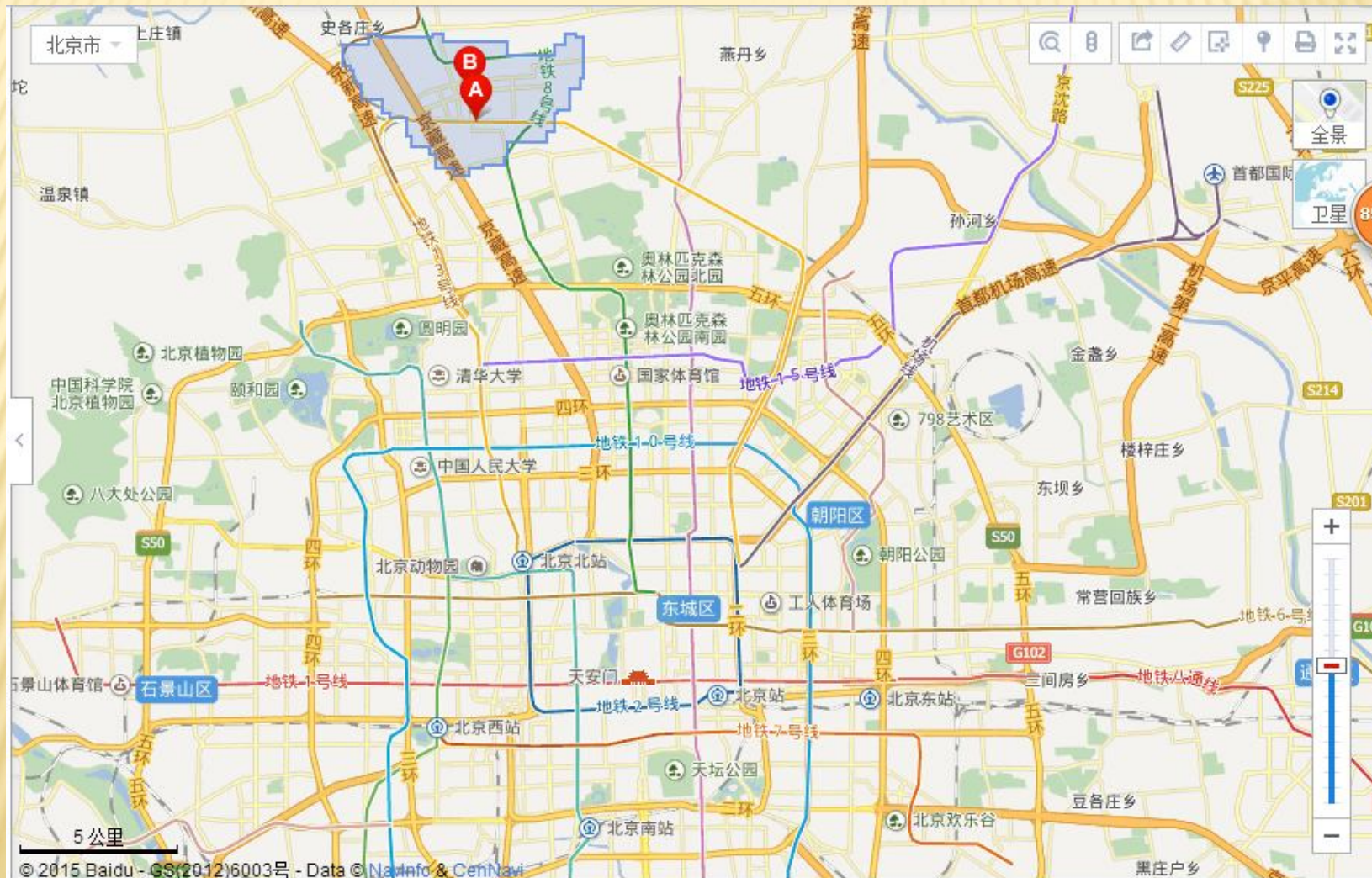


# RESIDENTIAL DISTRICT IN BJ





# RESIDENTIAL DISTRICT IN BEIJING





# RESIDENTIAL DISTRICT IN BEIJING



# A RESIDENTIAL DISTRICT IN BJ

- ✖ 1532 apartments
- ✖ 750 car parking places
- ✖ Including 320 underground car parking places
- ✖ Property managing company allows installation of EV chargers.
- ✖ Electricity capacity allows EV charging at present.



# CAR PARKING IN THE DISTRICT





# UNDERGROUD PARKING ENTRANCE





# EV CHARGER INSTALLATION



# EV FAST CHARGERS IN THE DISTRICT





# FAST EV CHARGERS



# FAST EV CHARGERS





# PQ TESTING FOR EV

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- ✘ Slow charging test at home through “Flying Wire”
- ✘ Fast charging test is not available
- ✘ Instrument ; Dranetz PowerVisa
- ✘ Analysis software; DranView 6 Enterprise Version



# FLYING WIRE





# CHARGER FOR "FLYING WIRE"





# CHARGER FOR "FLYING WIRE"





# CHARGING THROUGH FLYING WIRE





# INSTRUMENT POWERVISA INSTALLATION

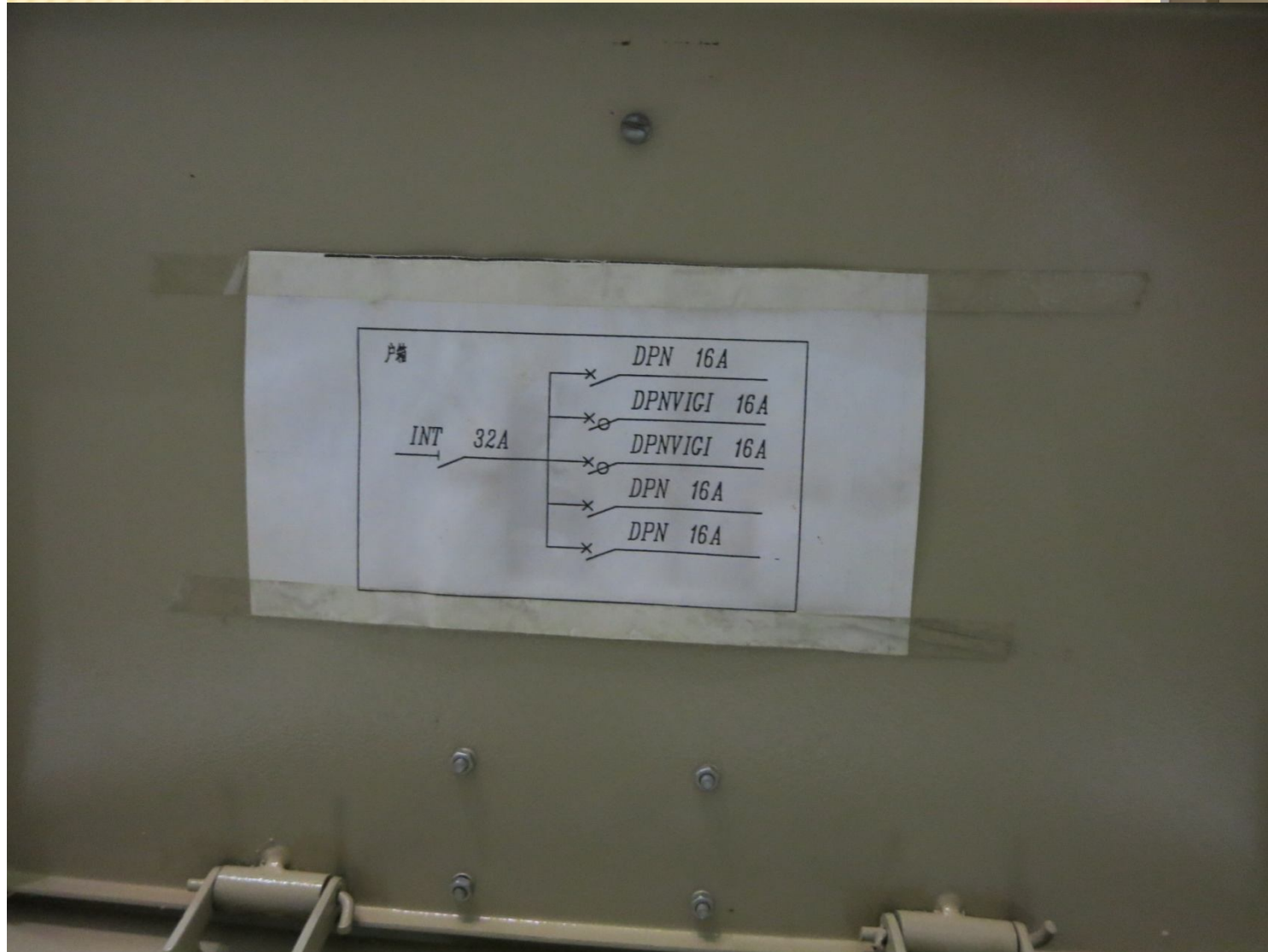




## A photograph of a cluttered indoor space, likely a laundry room, showing a large black cable reel, a cardboard box labeled 'Watch Laundry Detergent', a power strip, and various tangled cables (red, green, yellow, black) connected to electronic devices. A small digital scale is visible on the floor.



# BREAKER

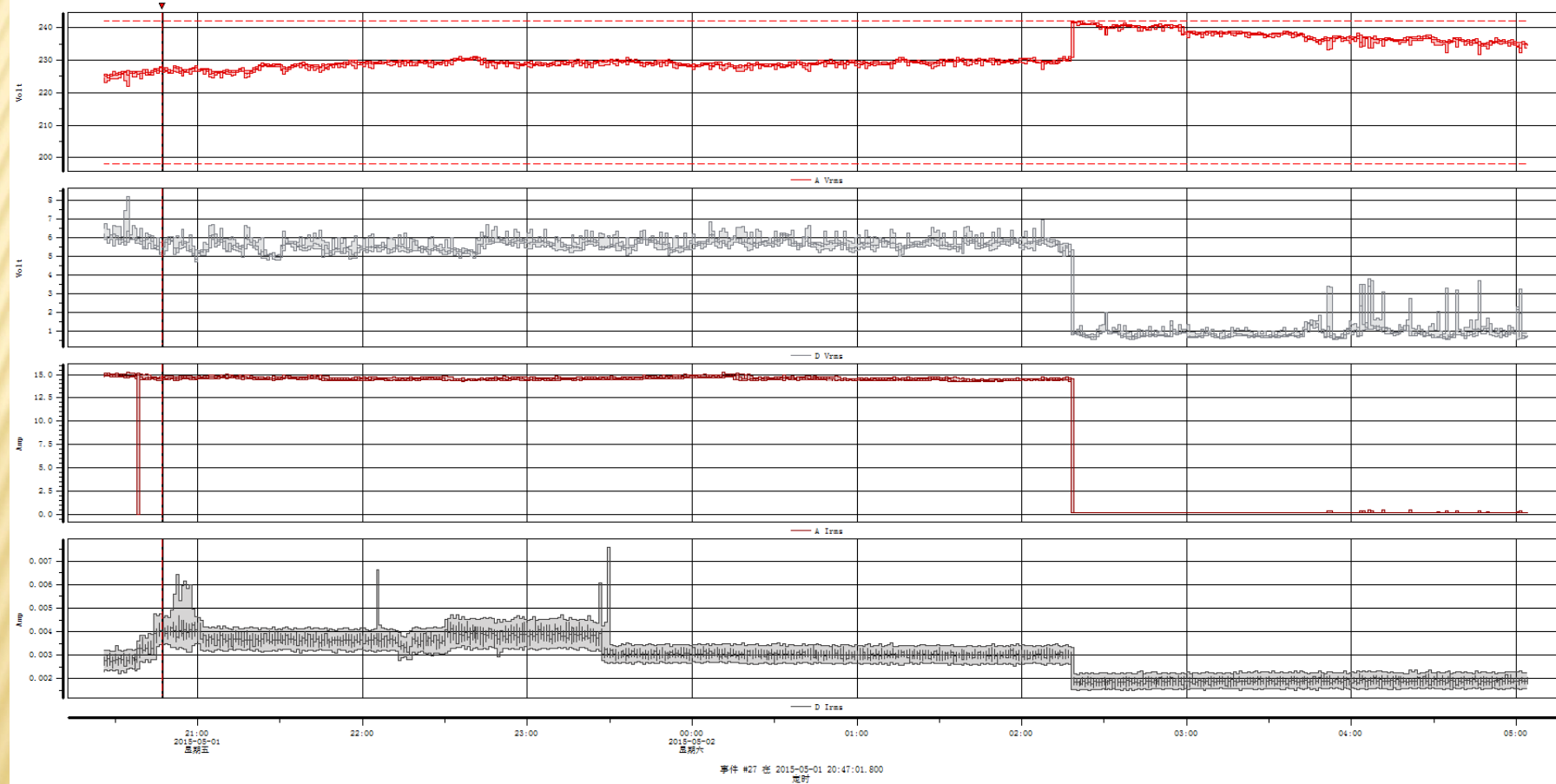




# TEST DATA – V & I

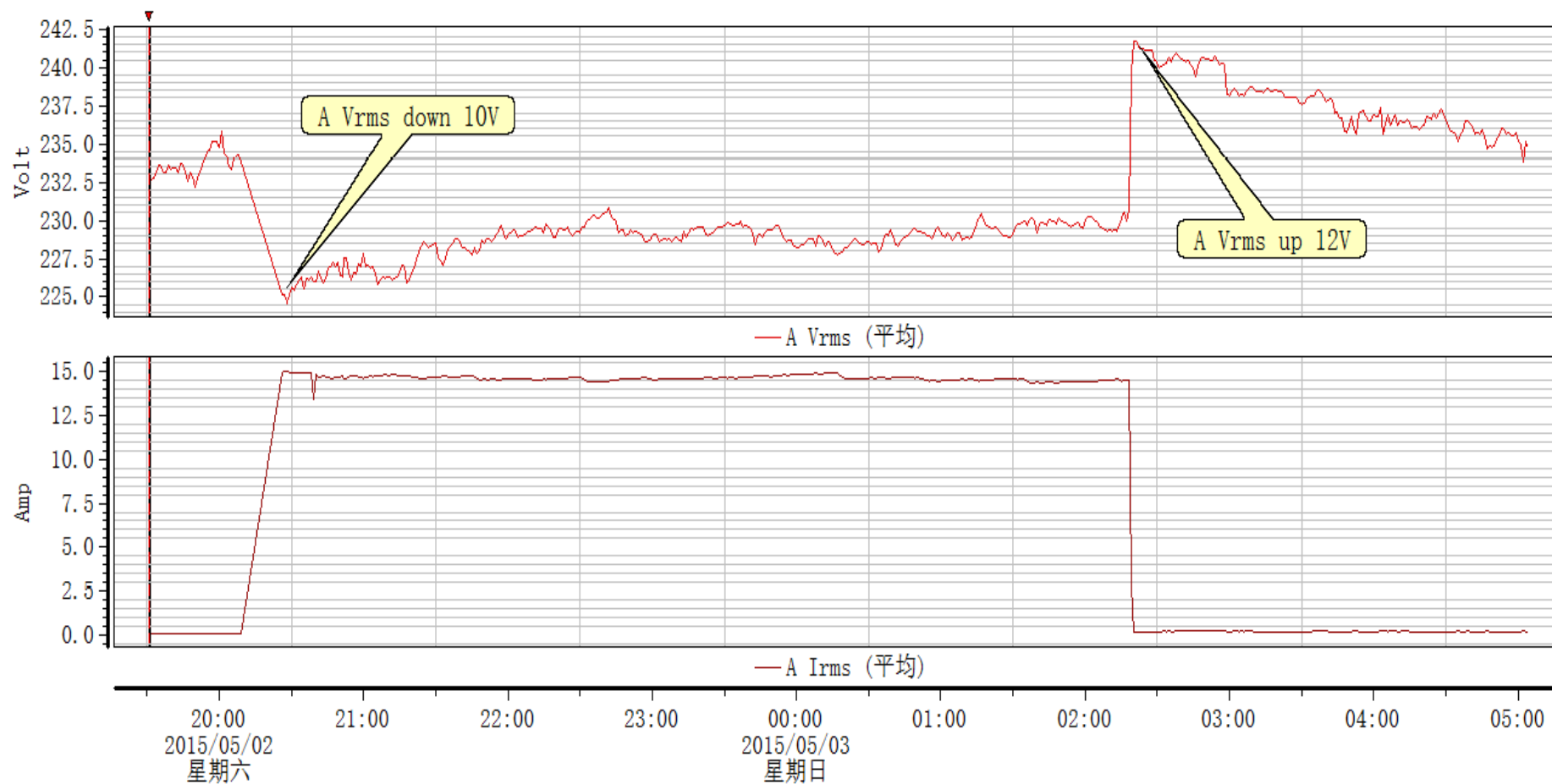
Drain-View 6.16.00 RASP : 1264134493 (48592953h)

趋势图



# TEST DATA – V & I

趋势图

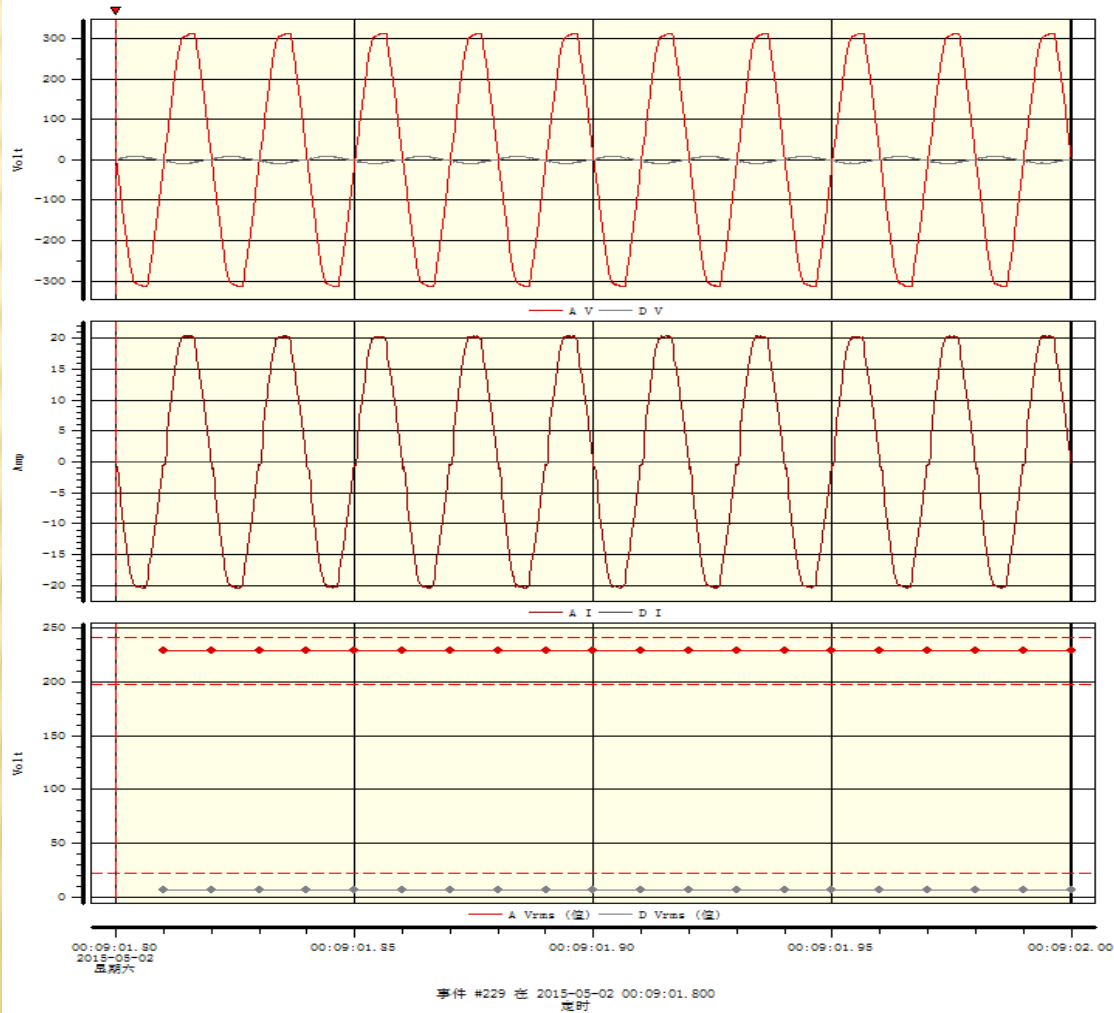




# V & I WAVEFORM WHEN CHARGING

Drac-View 6.16.00 HASP : 1264134483 (4B592953h)

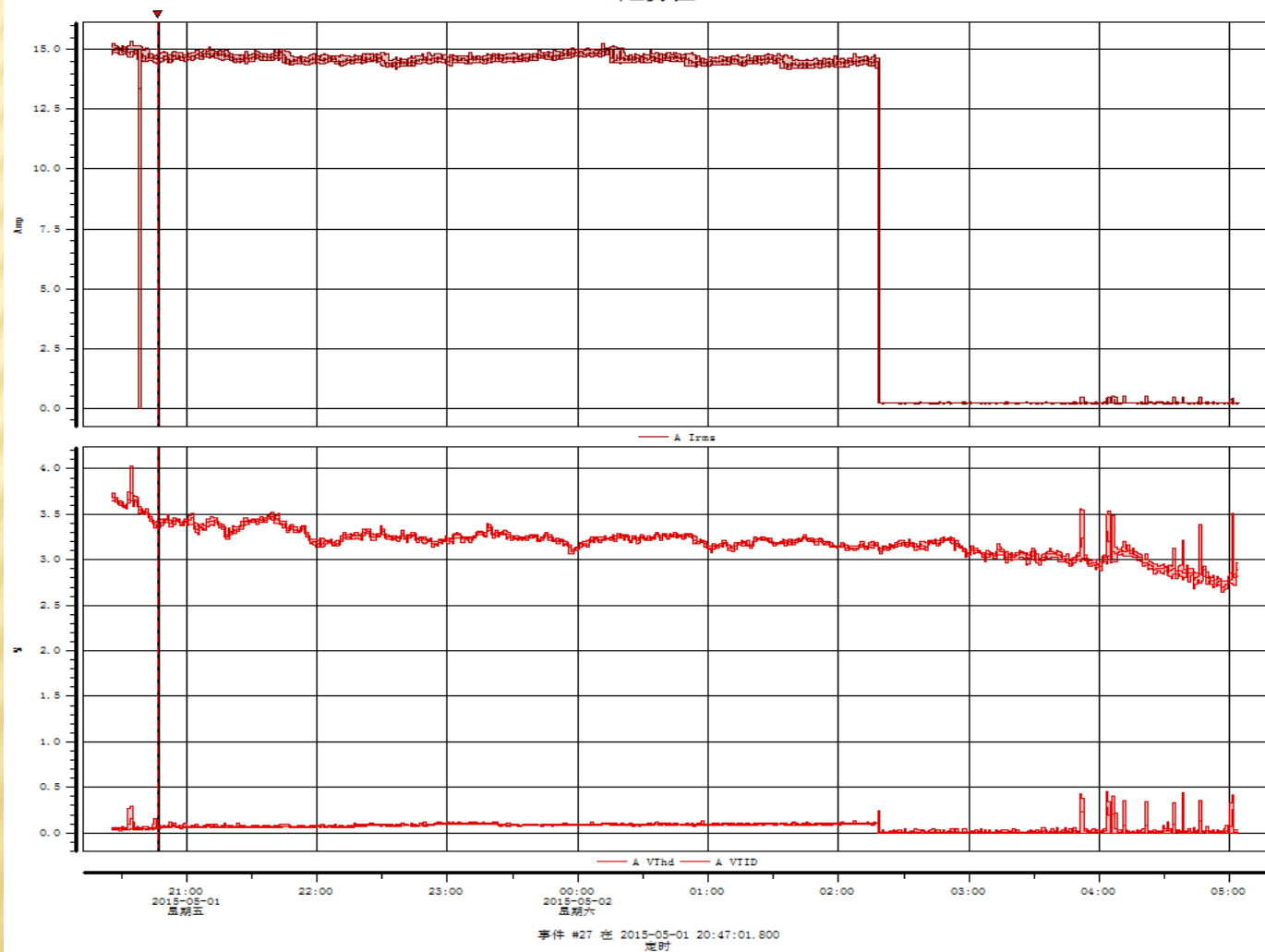
事件信息/波形



# TEST DATA VTHD

Drac-View 6.16.00 HASP : 1264134483 (4B592953h)

趋势图

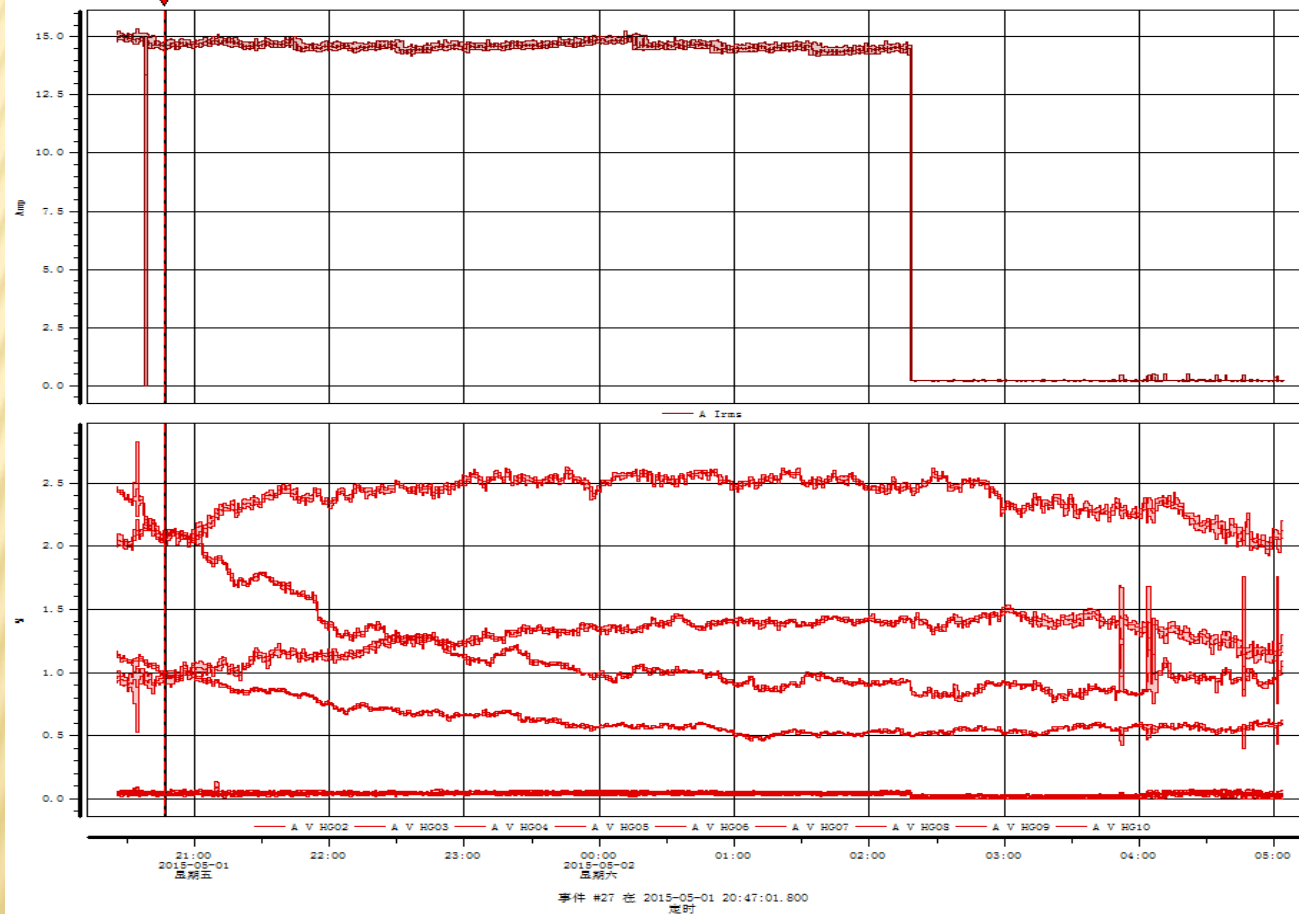




# ORDER 2-10 ORDERS OF HARMONICS

Draw-View 5.16.00 HASP : 1264134453 (4B592953h)

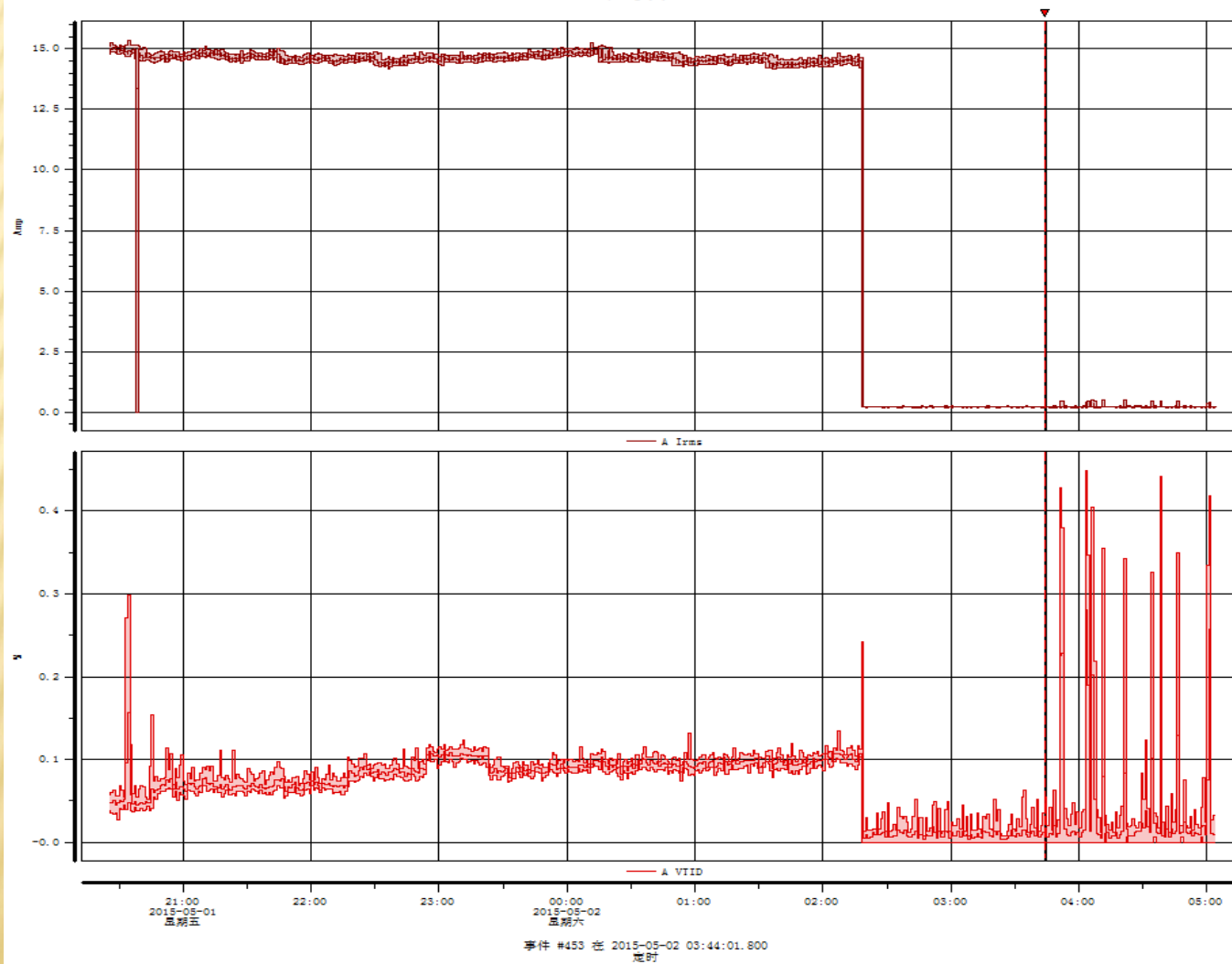
趋势图



# VTID, INTERHARMONICS

Drac-View 6.16.00 HASP : 1264134453 (48592953h)

趋势图

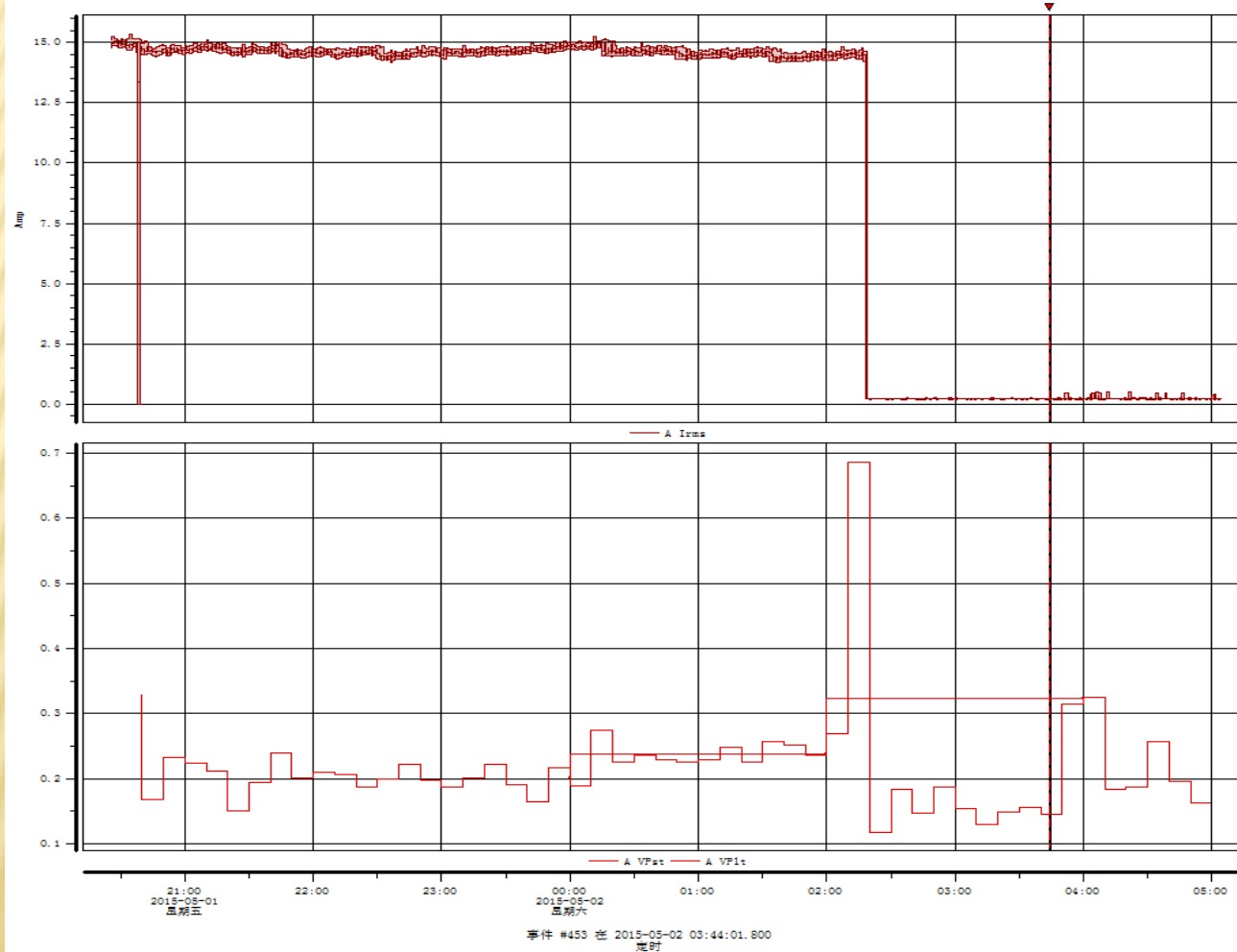




# FLICKER

Drac-View 5.15.00 HASP : 1264134453 (45592953h)

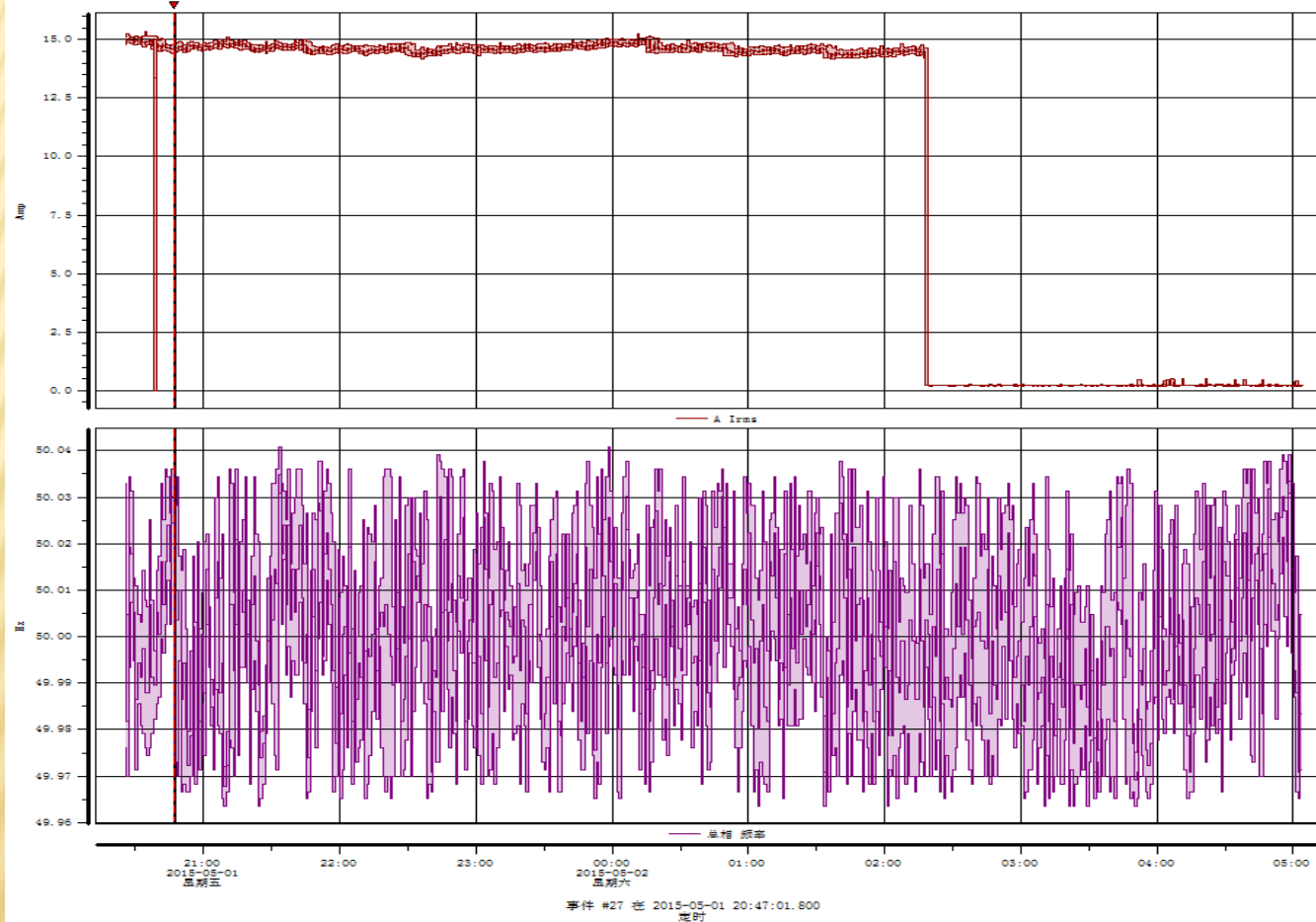
趋势图



# FREQUENCY

Drac-View 6.16.00 HASP : 1264134483 (4E592953h)

趋势图

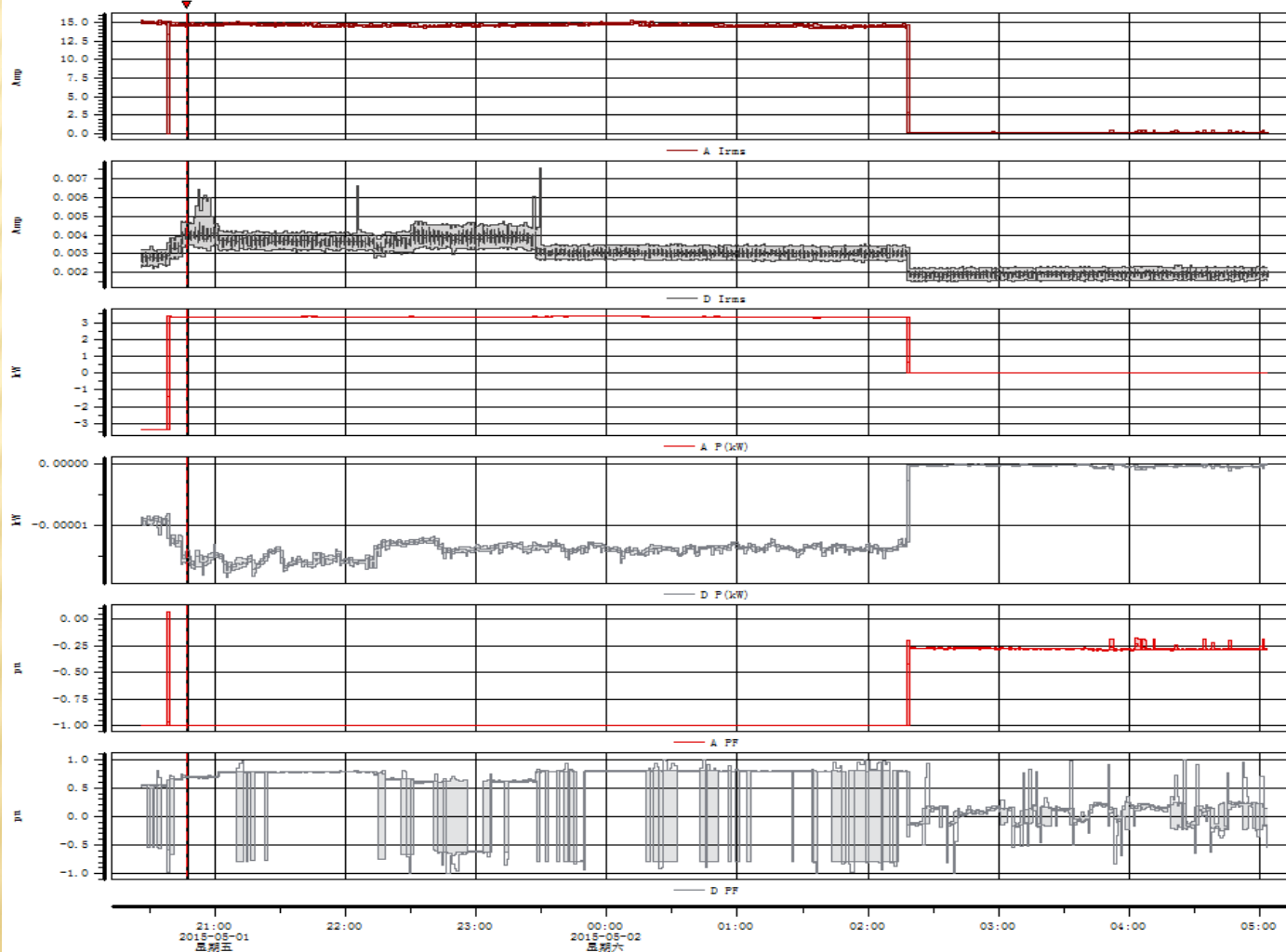




# POWER AND PF

Dran-View 6.16.00 HASP : 1264134483 (4B592953h)

趋势图



事件 #27 在 2015-05-01 20:47:01.800  
定时

# CONCLUSION

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- ✖ Voltage drop and surge significantly caused by EV charging.
- ✖ Harmonics caused by EV are not observed.
- ✖ Slight increase of  $V_{tid}$  when EV charging
- ✖ Flickers, Frequency, PF are normal.



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Thank you!