

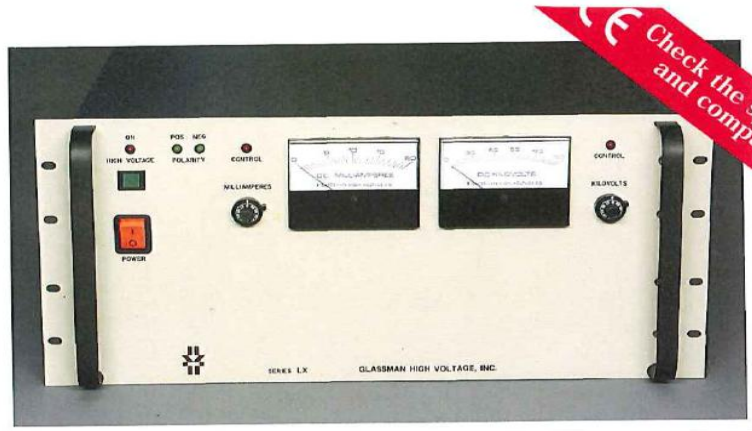
High Voltage Power Supply

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13th US – Japan IECF Workshop Sydney Australia

High Voltage Power Supply



【GLASS MAN】



【SPELLMAN】



【KURITA】

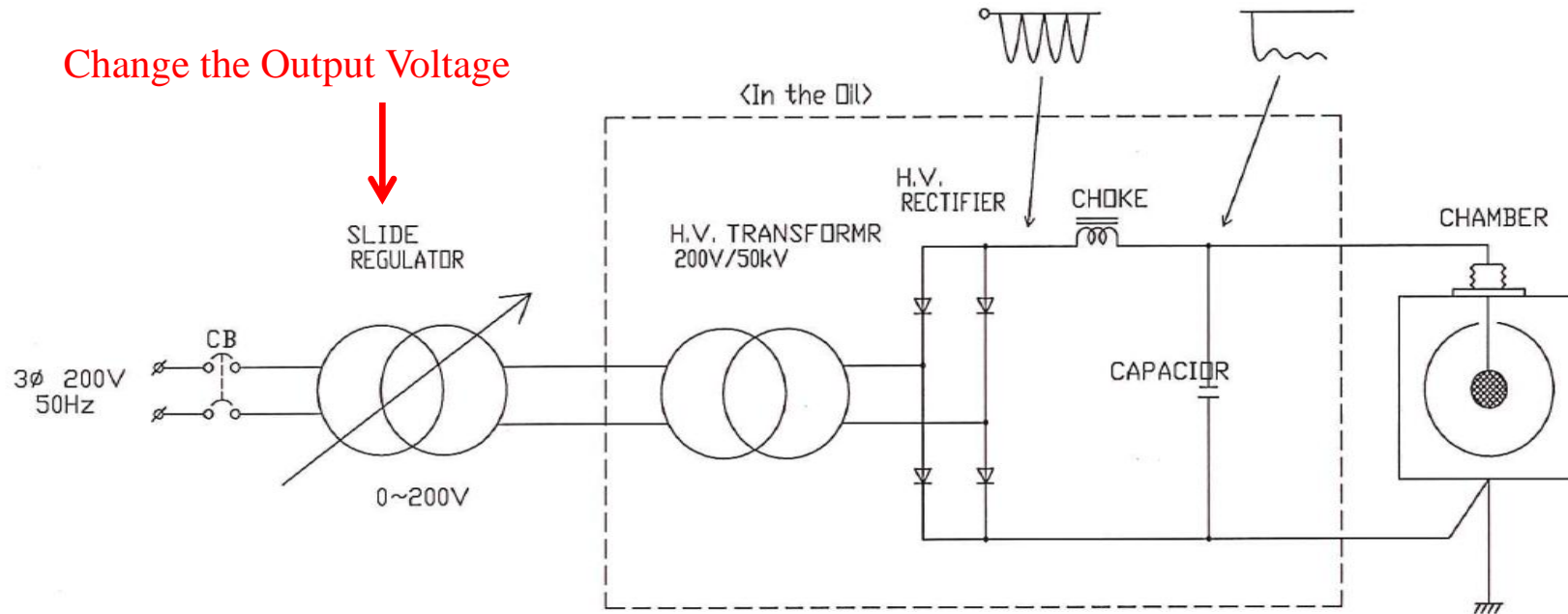
High Voltage Power Supply is a must for IEC research

- We are very familiar with these power supplies.
- We know these are seldom broken against arcing , the other word load shortage.
- No break against severe arcing is a must to these kind of power supplies.
- This presentation I talk about electric circuit to protect power supply safe against the arcing. Also about V constant control and I constant control.

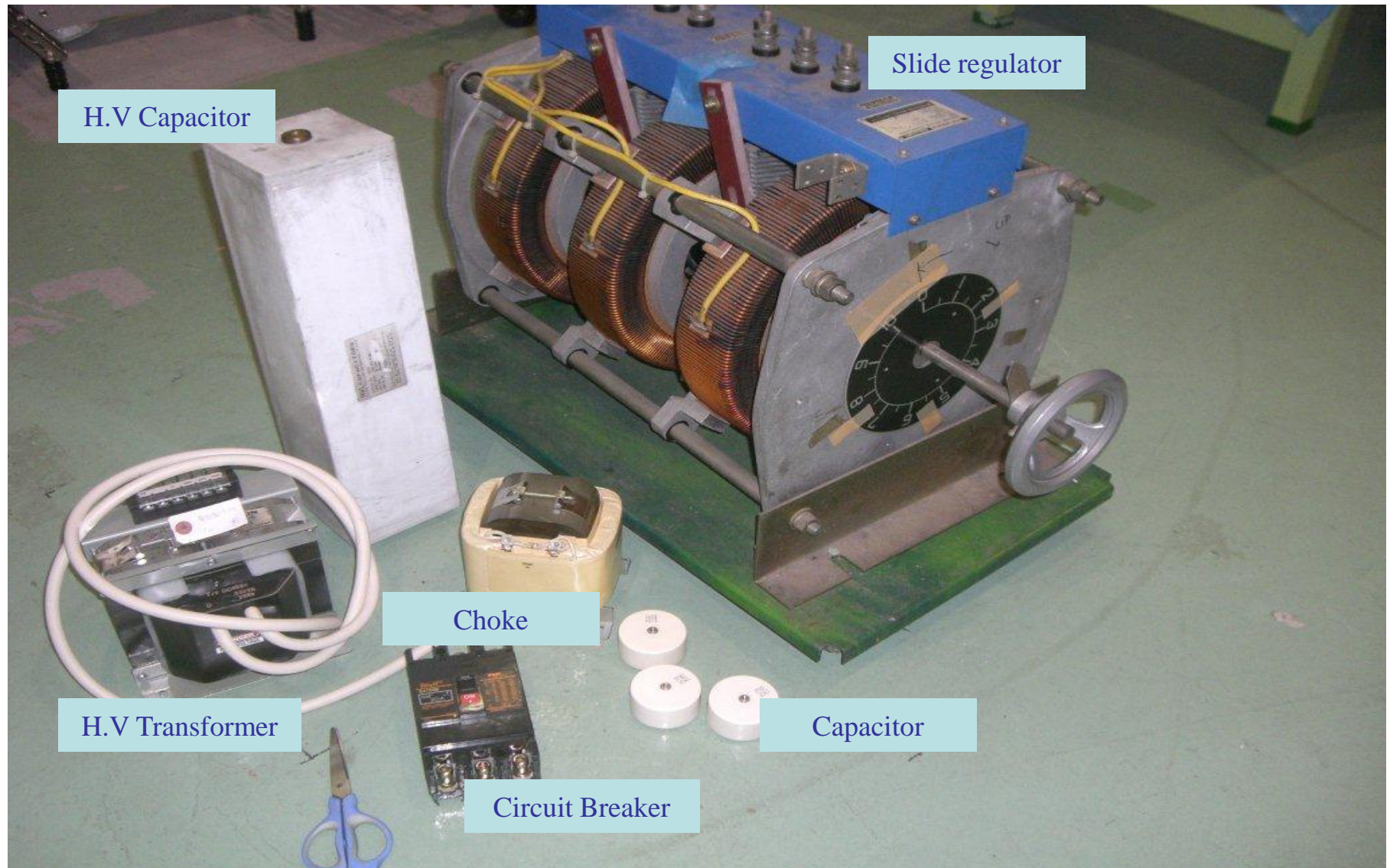
Content

- How to make high voltage power supply? (principle)
- How to make high voltage power supply? (practical one)
- How to control V constant, I constant.
- Voltage amp, Current amp (PID action)
- What makes the power supply safe when arcing occur?
- Some hints to keep power supply safe.

How to make DC High Voltage? (Principle)



Parts picture 1.



H.V Capacitor

Slide regulator

Choke

H.V Transformer

Capacitor

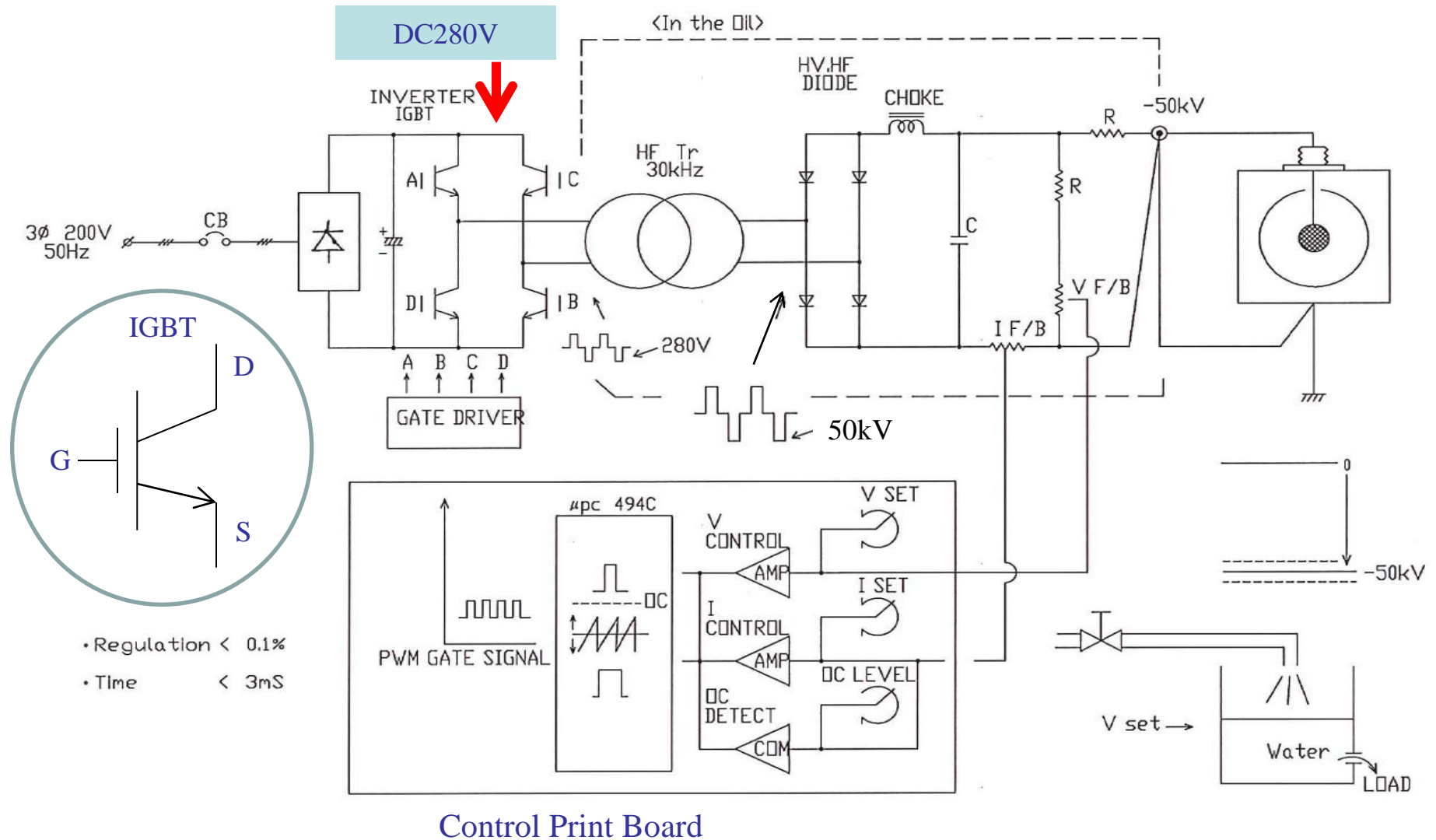
Circuit Breaker

Parts picture 2.

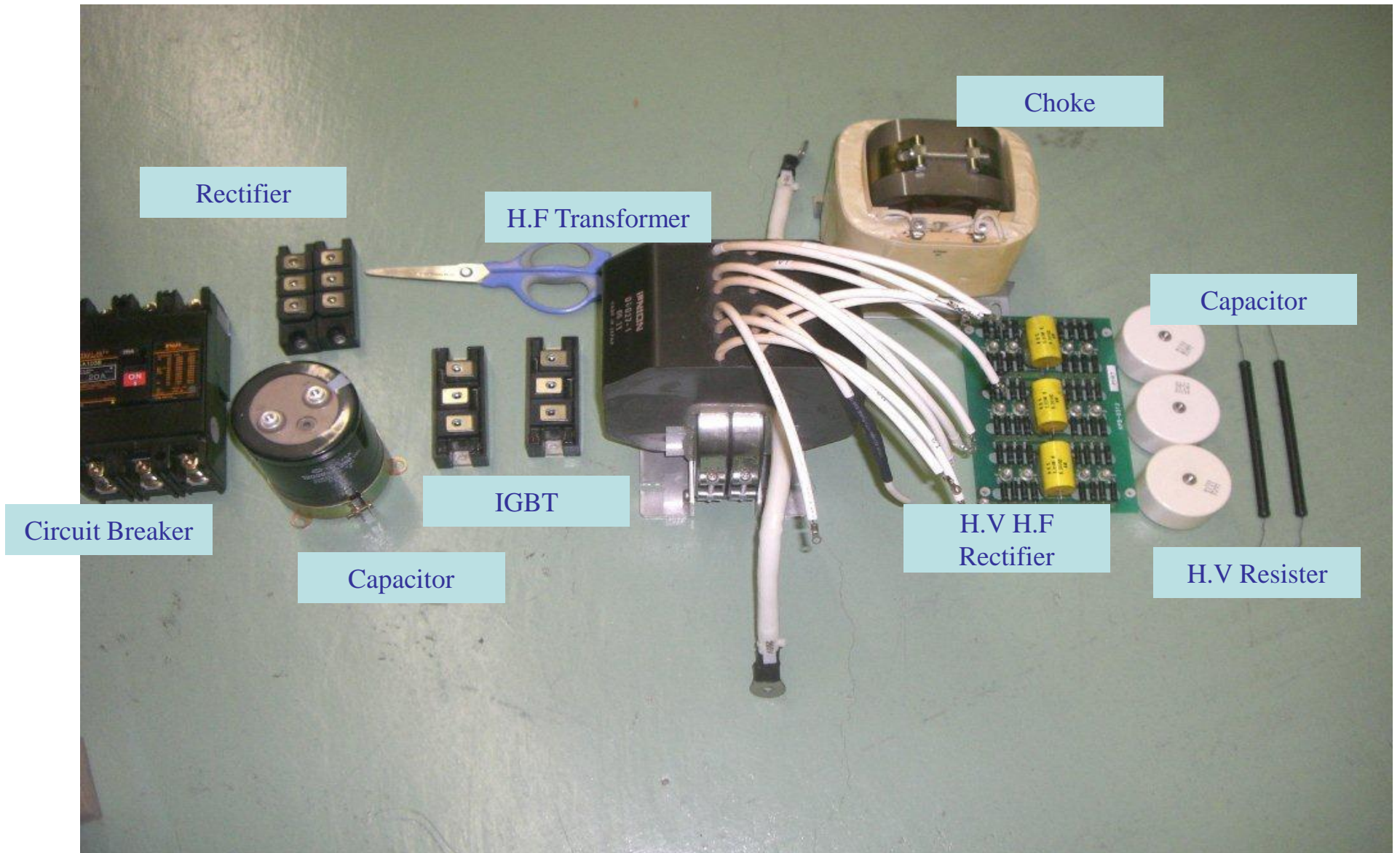


HVPS Block Diagram

[PWM method]



Parts Picture



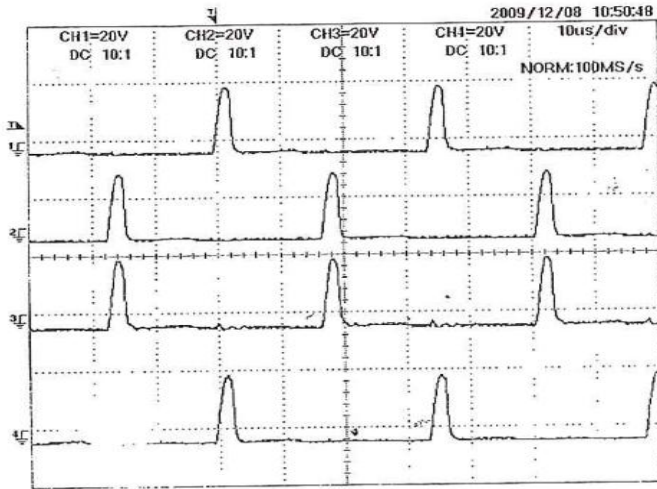
Control Print Board



Switching Regulation IC

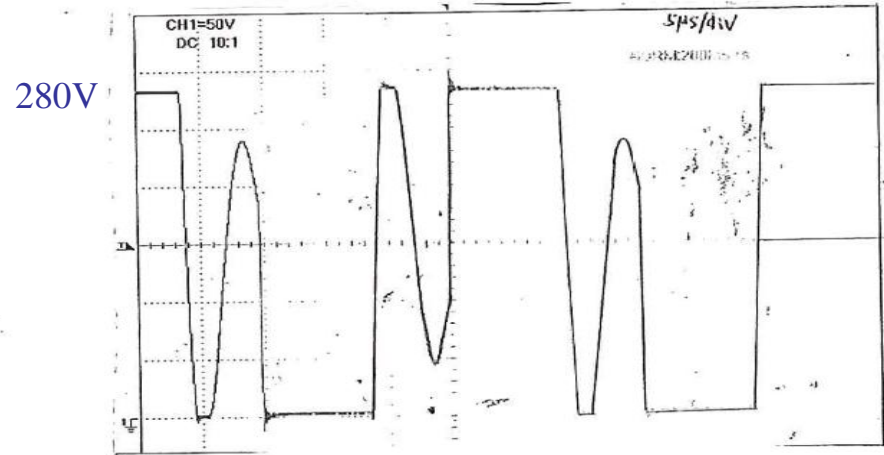
Wave form

IGBT Gate Wave Form

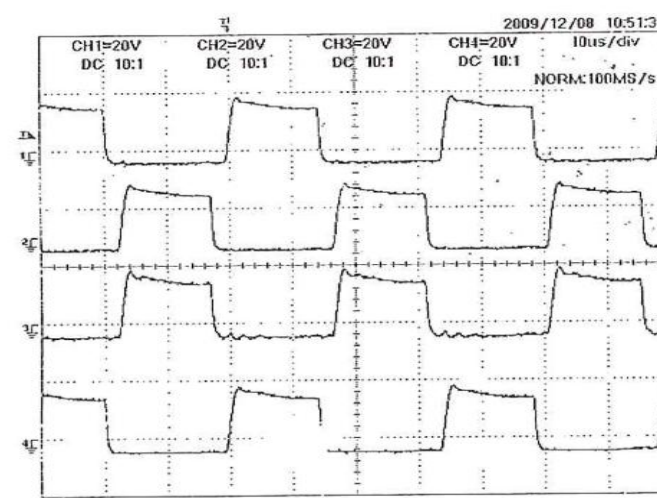


A
C
D
B

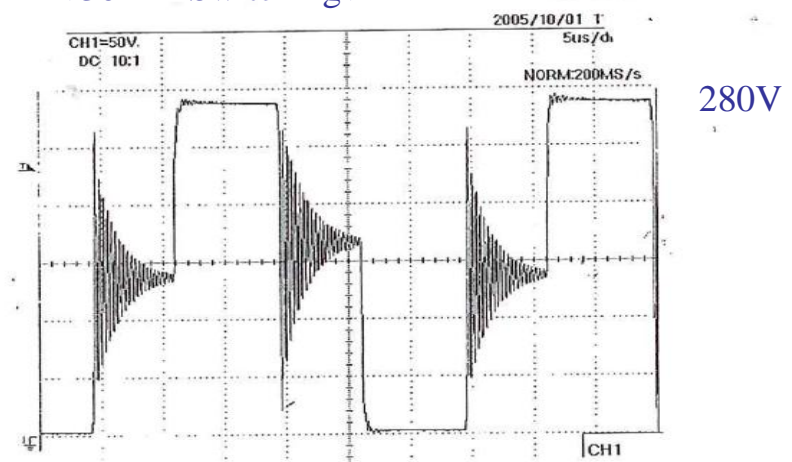
IGBT D-S Wave Form



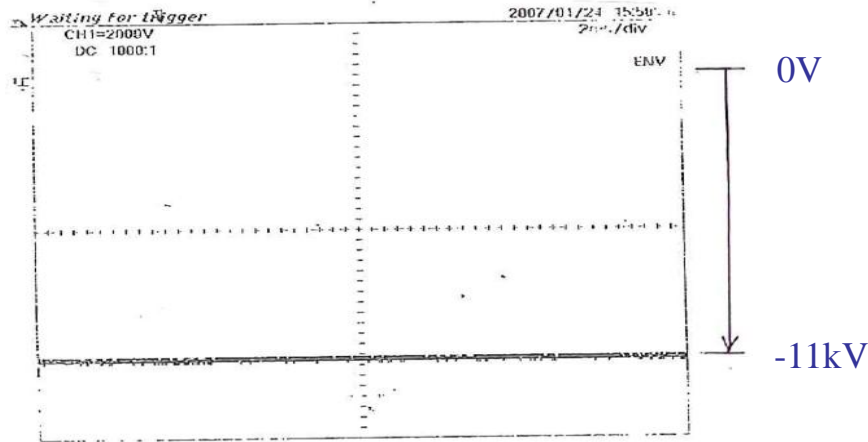
< 30kHz Switching >



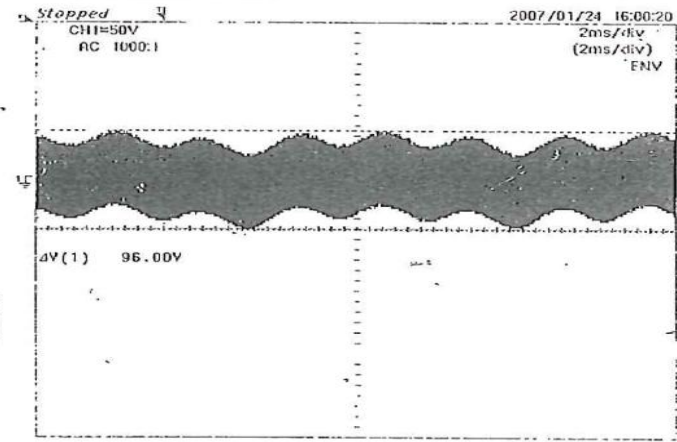
A
C
D
B



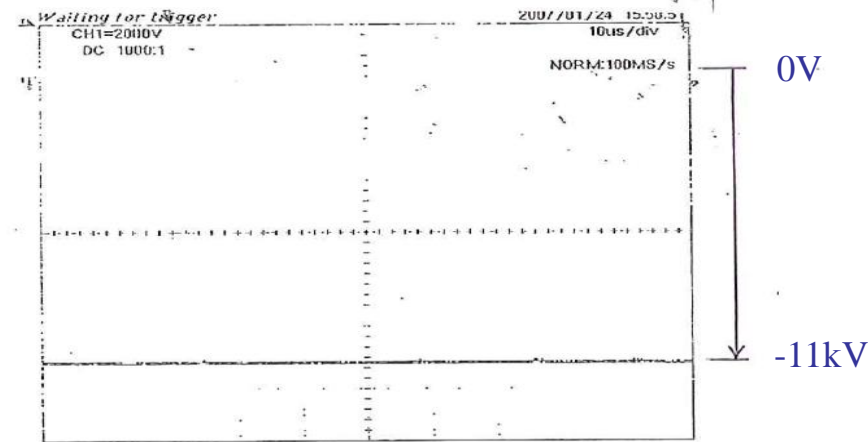
DC High Voltage Wave Form



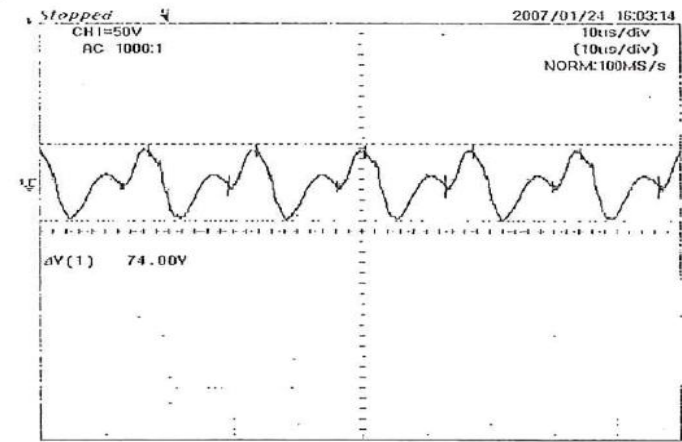
2kV/div 2ms/div



50V/div 2ms/div



2kV/div 2us/div

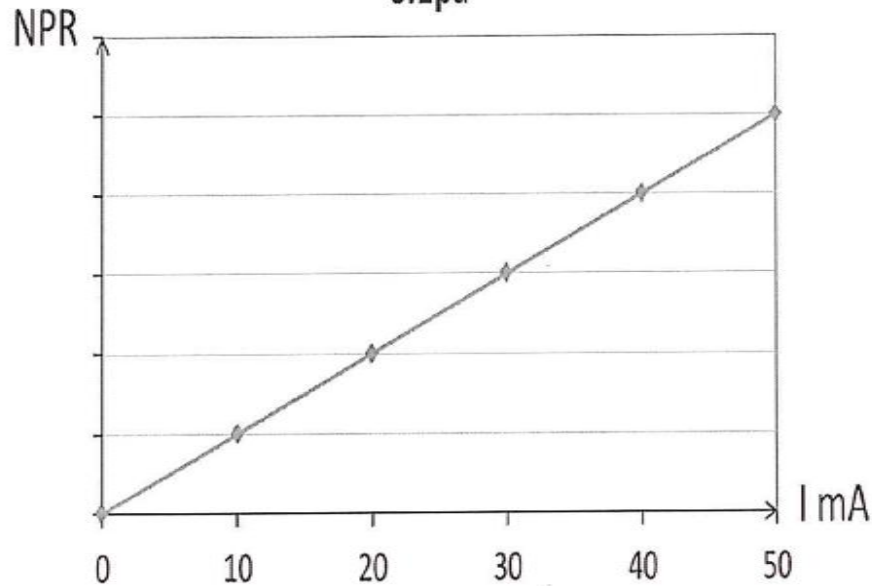


50V/div 10us/div

V constant control I constant control

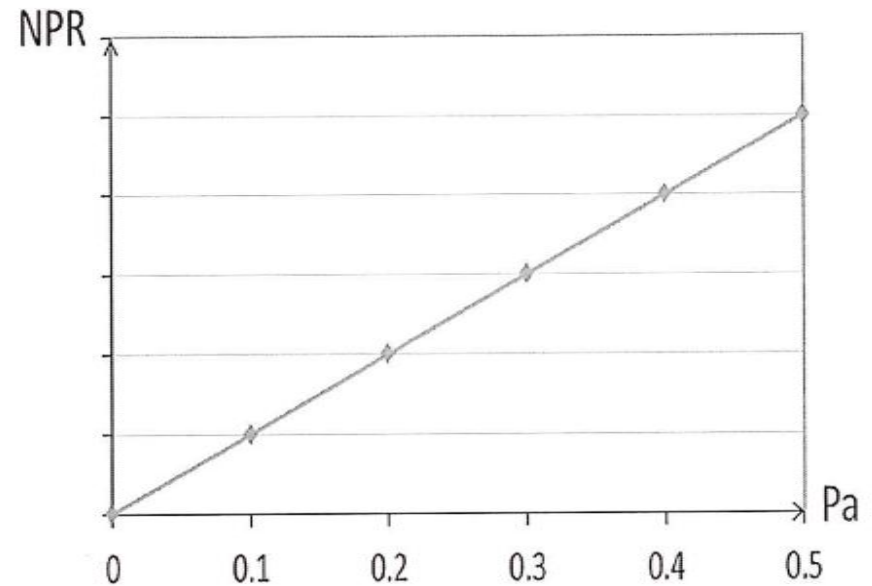
Everyone knows V control but I control is very useful

Example
0.1pa



I dependent NPR characteristic

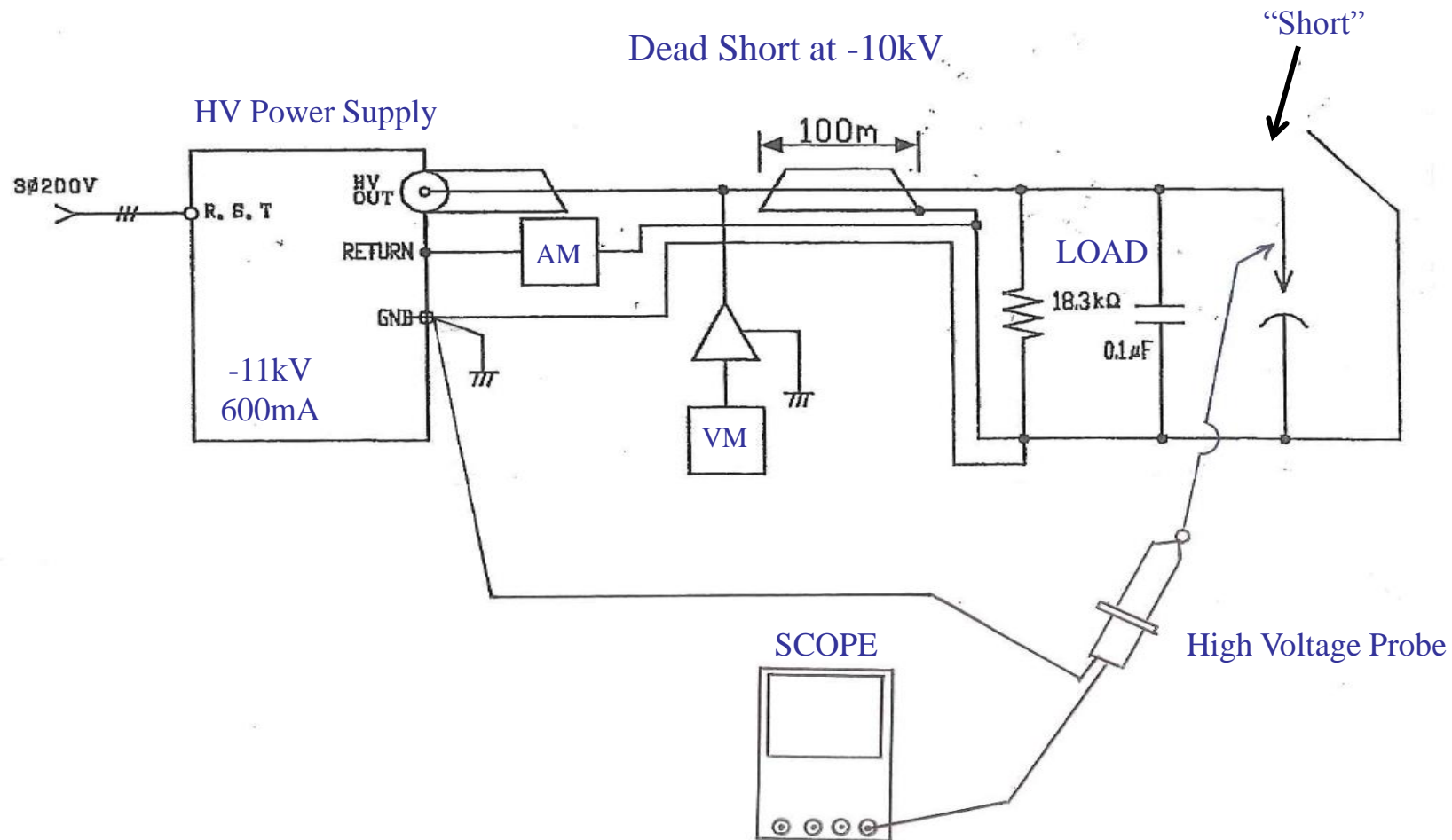
I:fix value
50mA



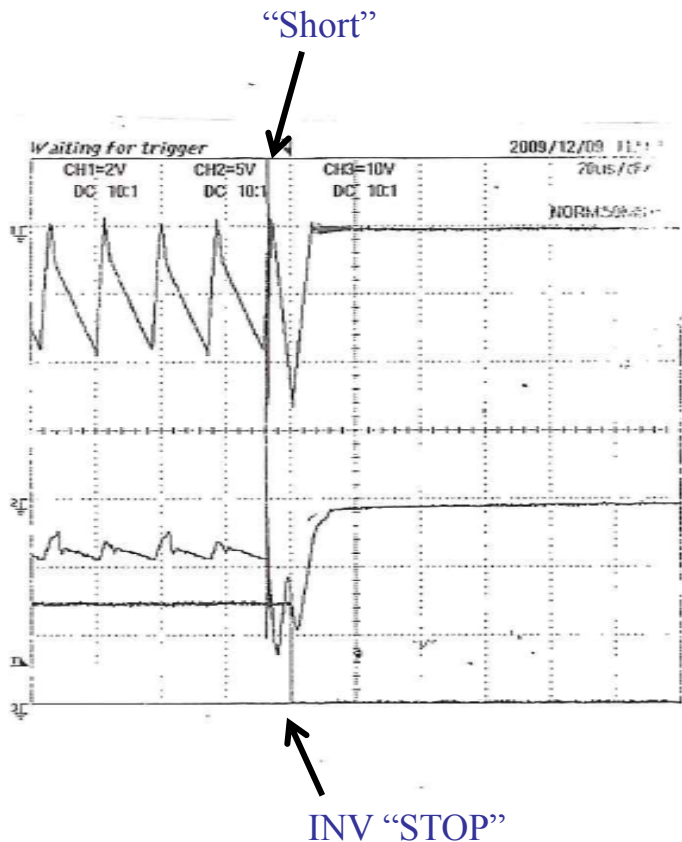
I value fixed NPR characteristic

Easy to control, harder to become arc.

Load terminal dead short test during Power Supply live.



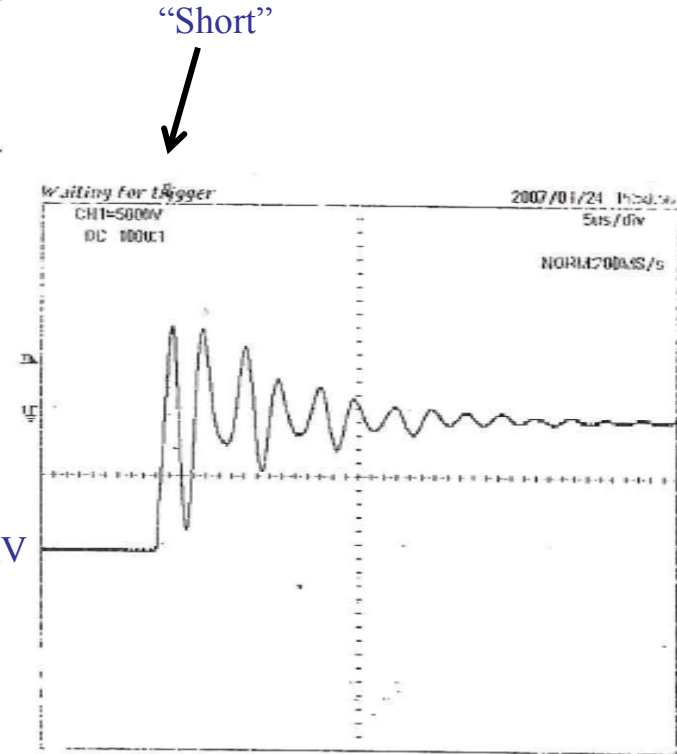
Arcing!! What is happened inside the power supply?



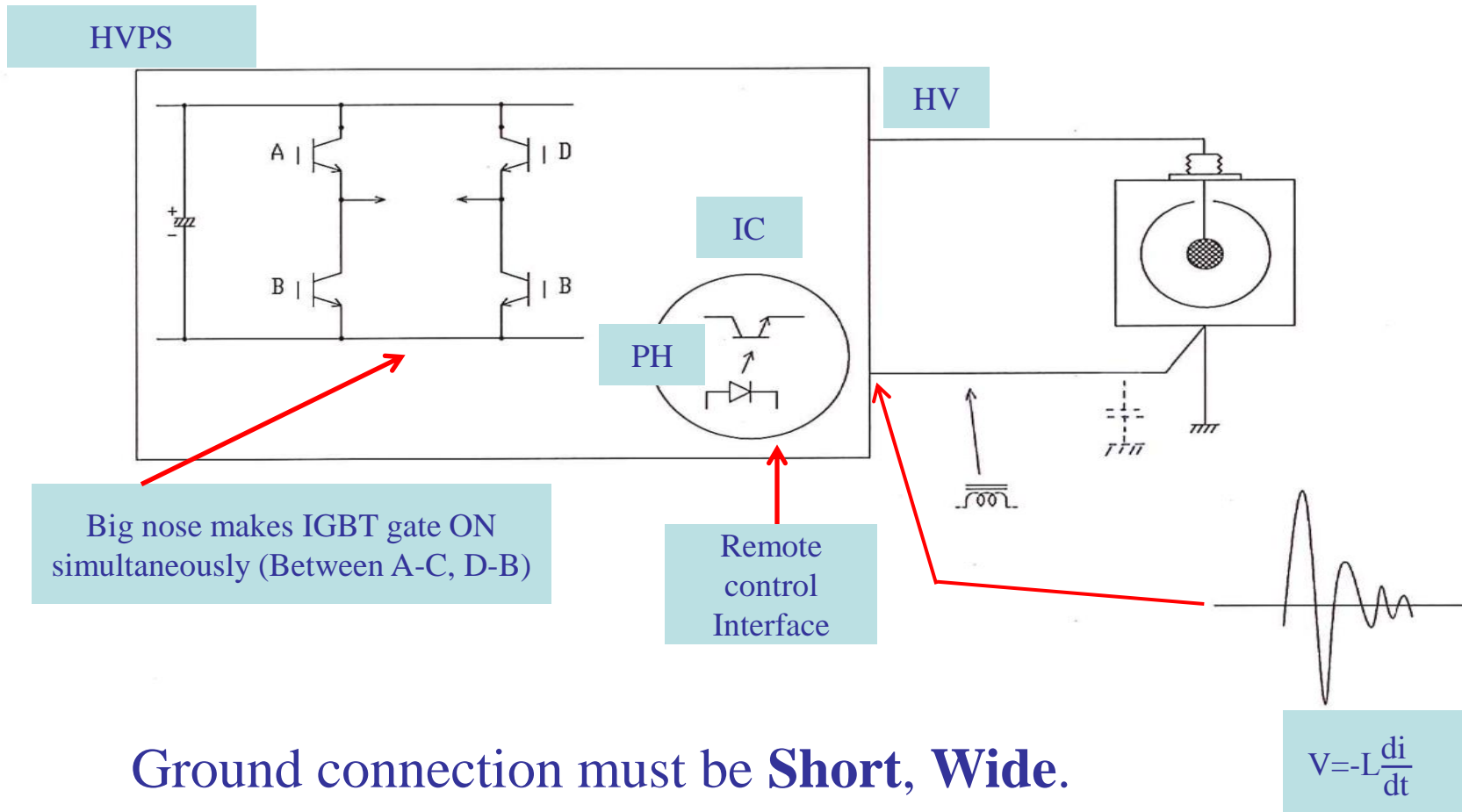
INV Tr Primary I
 40A/div (60A = OC)

Out put I (1A/div) -10kV

INV RUN Signal



Power supply : easy to break when arcing occur.



Summary

- I talked how to control DC power supply V and I , and also how's power supply works against the arcing in the vacuum chamber.
- Ground connection is the most important to keep power supply safe against the arcing.