

# The importance of ripple & noise for power supplies

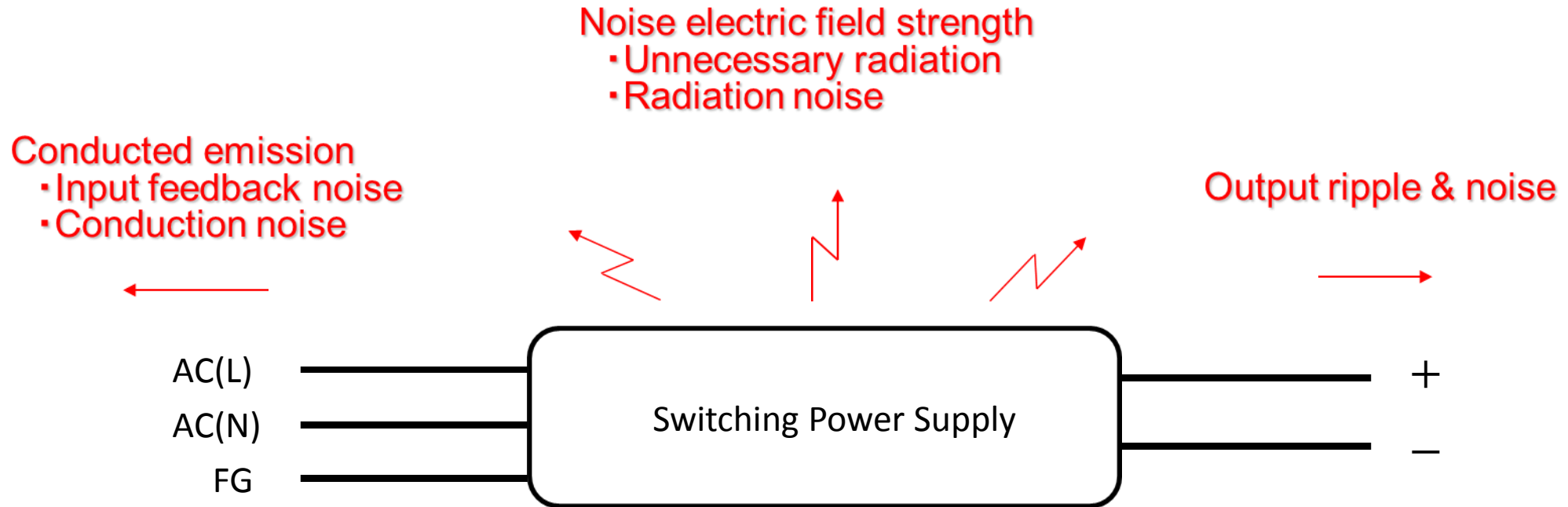
*Hiroshi Terui, Daitron Japan on behalf of A&C Solutions*

19 juni 2019  
1931 Congrescentrum 's-Hertogenbosch

**POWER**  
**ELECTRONICS**

2019

# Are you troubled by the noise?



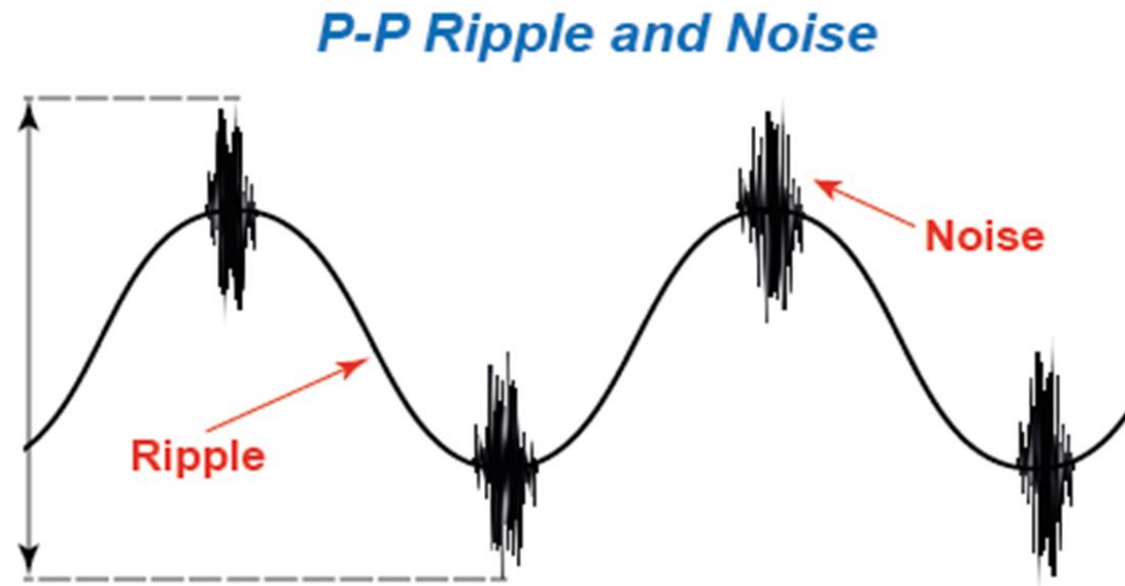
# Topics

1. What is ripple & noise?
2. Effects of ripple & noise
3. Reducing ripple & noise at source
4. Conducted emission
5. Radiated emission
6. Applications for low noise power supplies

# 1. What is ripple noise?

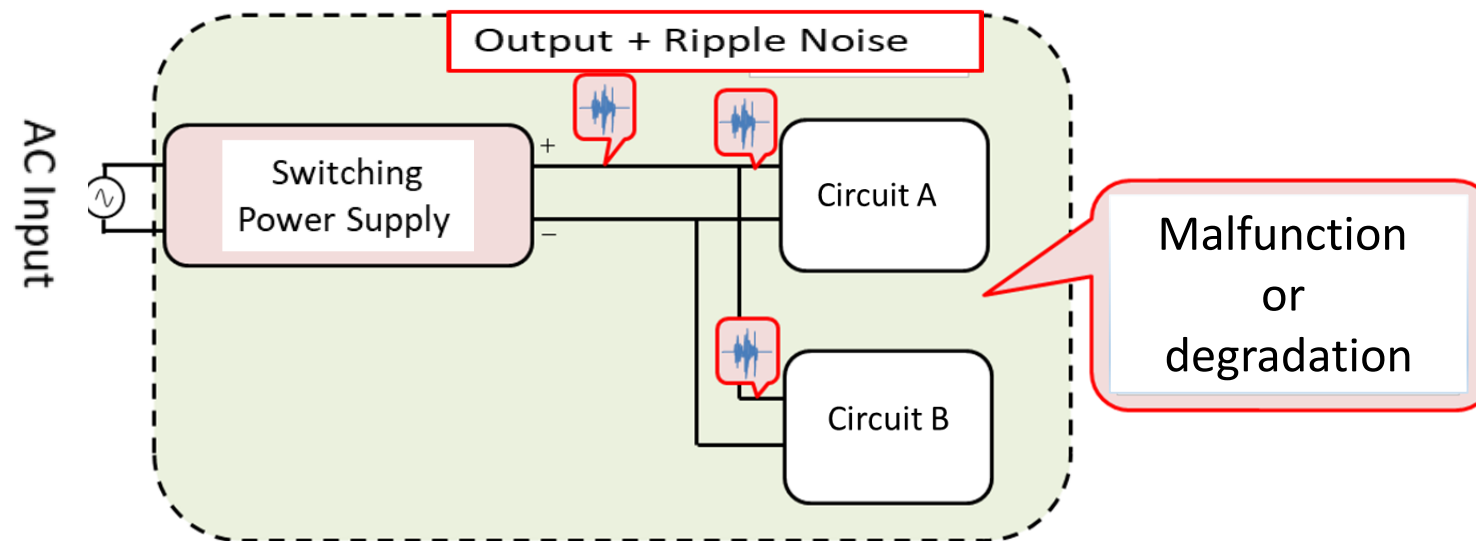
Ripple = the residual periodic variation of the DC voltage within a power supply which has been derived from an alternating current (AC) source

Noise = is the switching noise generated by the switching frequency of the power supply



## 2. Effects of ripple & noise

Ripple & noise will be the reason of malfunction or performance degradation for a customer's application.



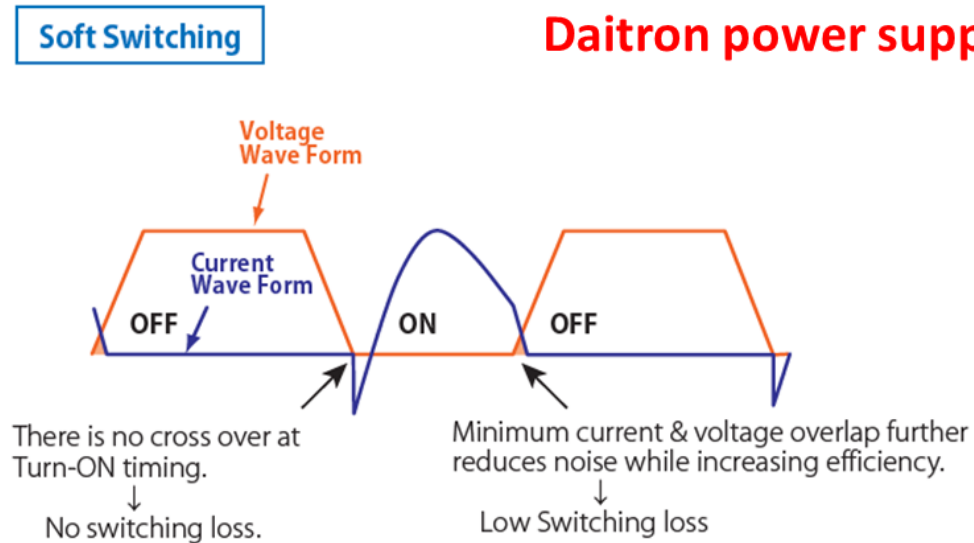
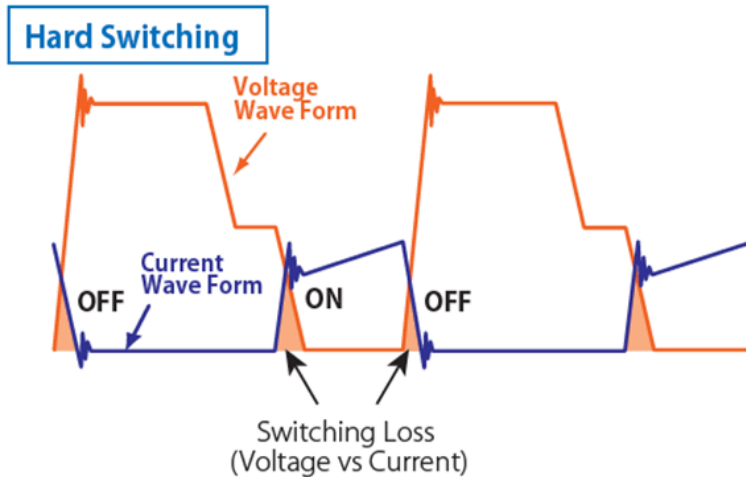
# 3.1. Reducing ripple & noise at the source

## Soft-switching topology

The topology creates a clean current wave. Our engineers carefully designed current and voltage timing synchronized at the "Zero-Cross (ZVS\*1, ZCS\*2)" point. This ensures that the power supply operates at the lowest possible noise level.

1.ZVS : Zero volt switching : switching with zero voltage

2.ZCS : Zero current switching : switching with zero current

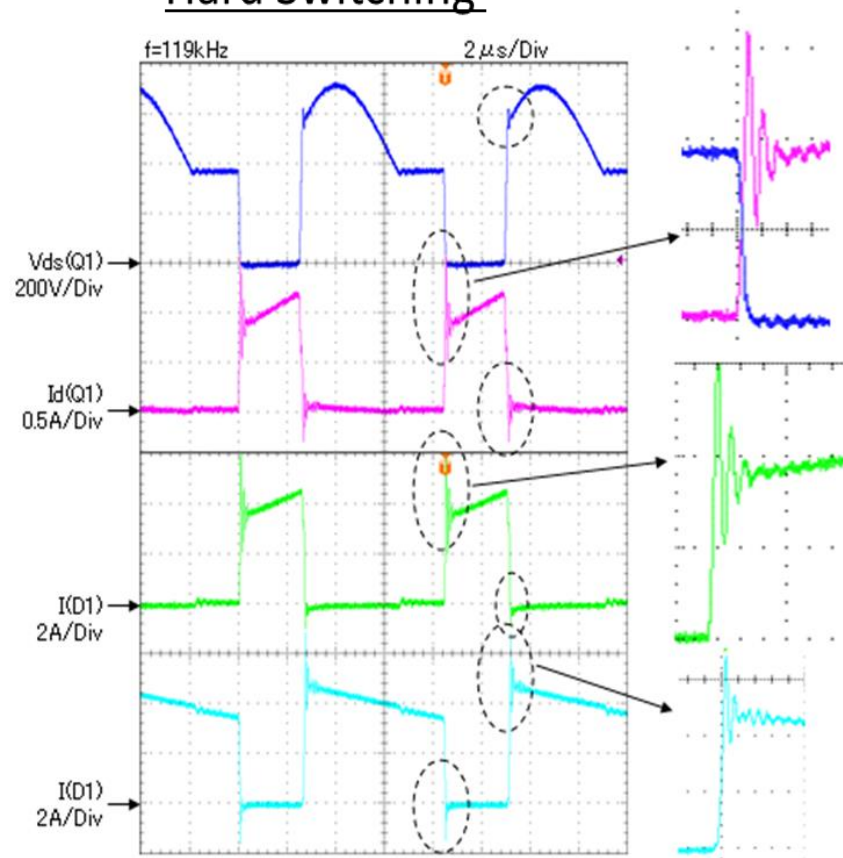


**Typical power supply : hard switching**  
**Daitron power supply : soft switching**



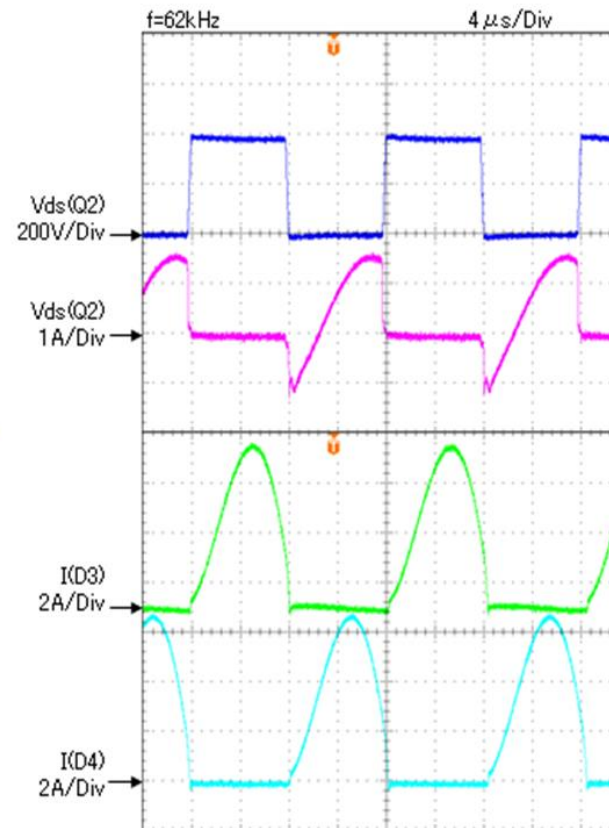
## 3.2. Reducing ripple & noise at the source

### Hard Switching



A lot of ringing occurs at hard switching

### Soft Switching



Little ringing occurs at soft switching

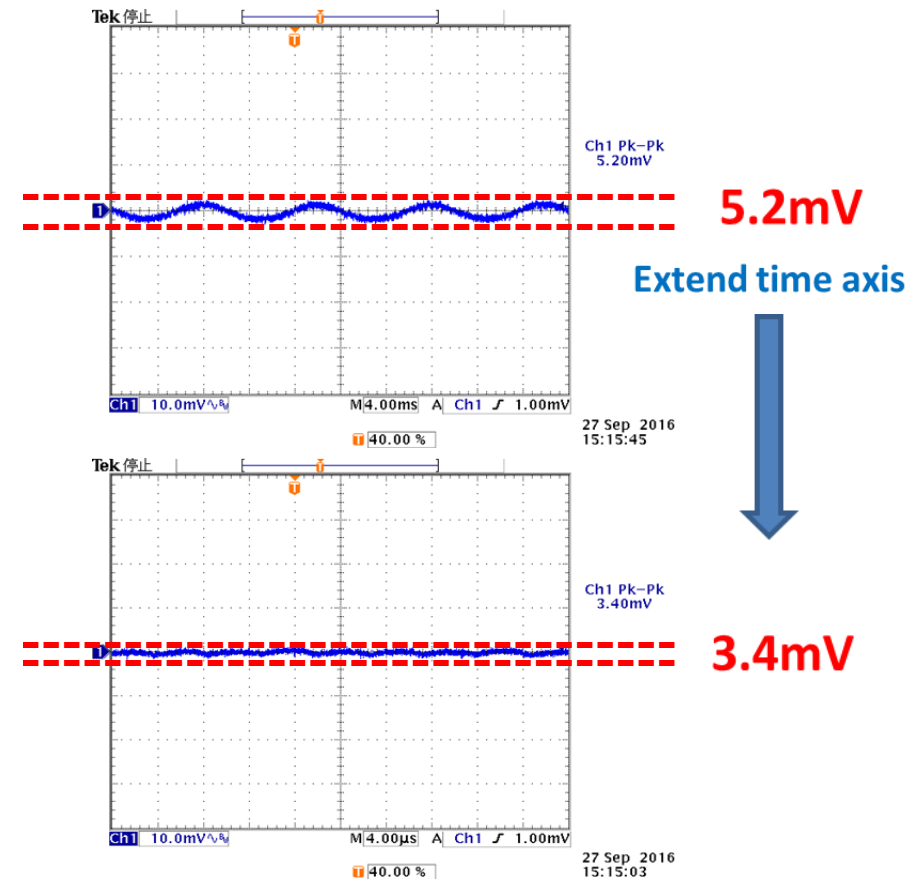
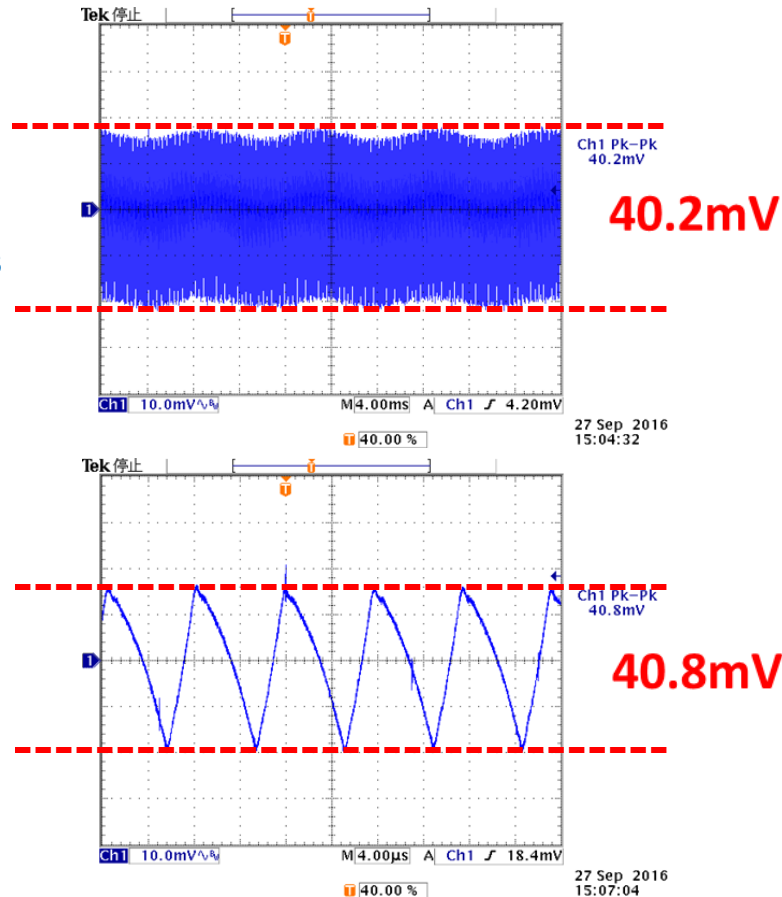
# 3.3. Reducing ripple & noise at the source

Typical power supply 50W, 5Vdc

Low noise power supply 50W, 5Vdc

Extend time axis

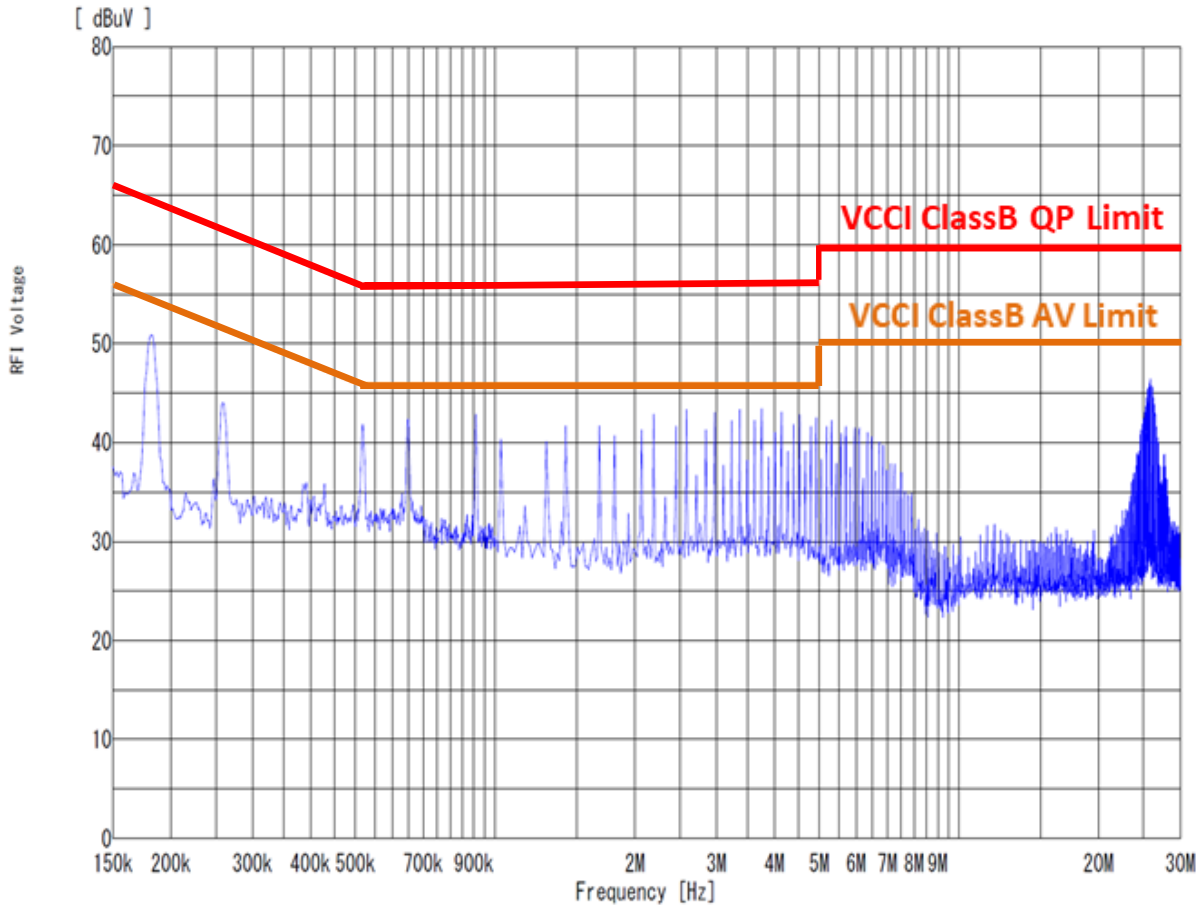
Extend time axis



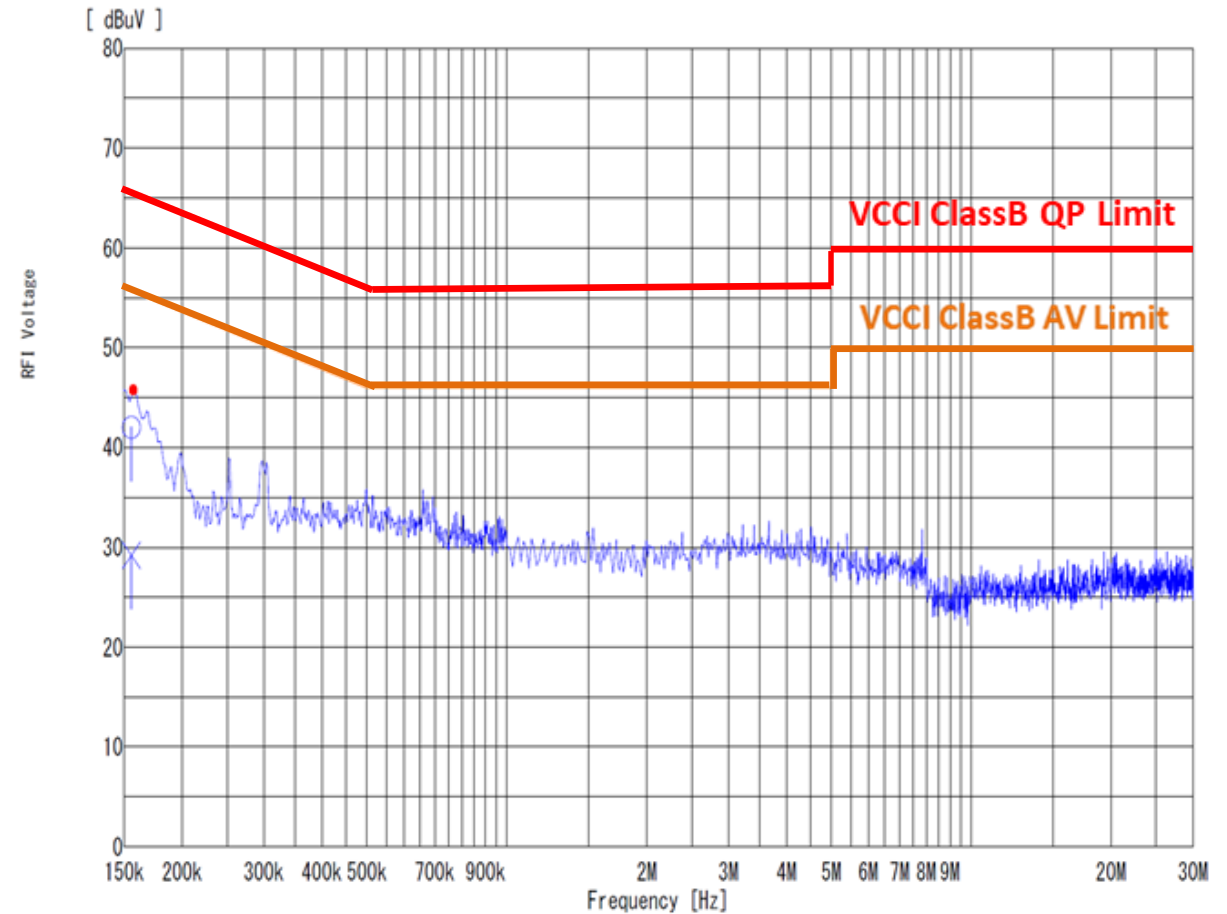


# 4. Conducted emission

Typical power supply 50W, 5Vdc

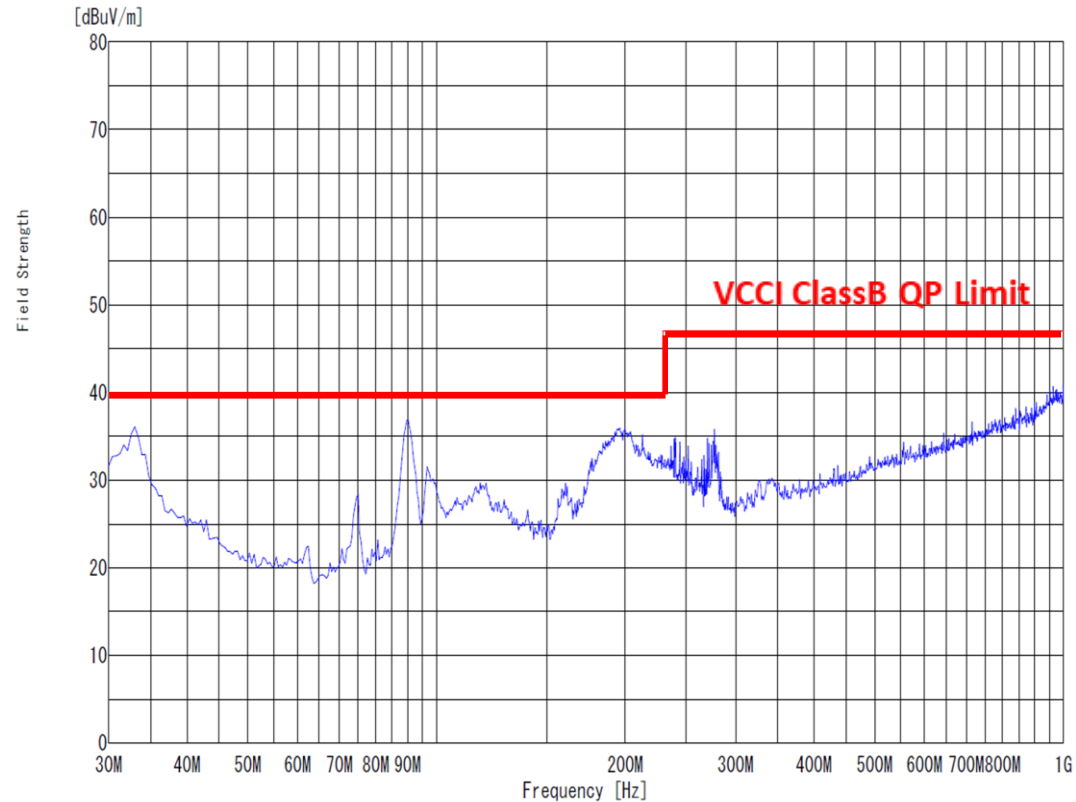


Low noise power supply 50W, 5Vdc

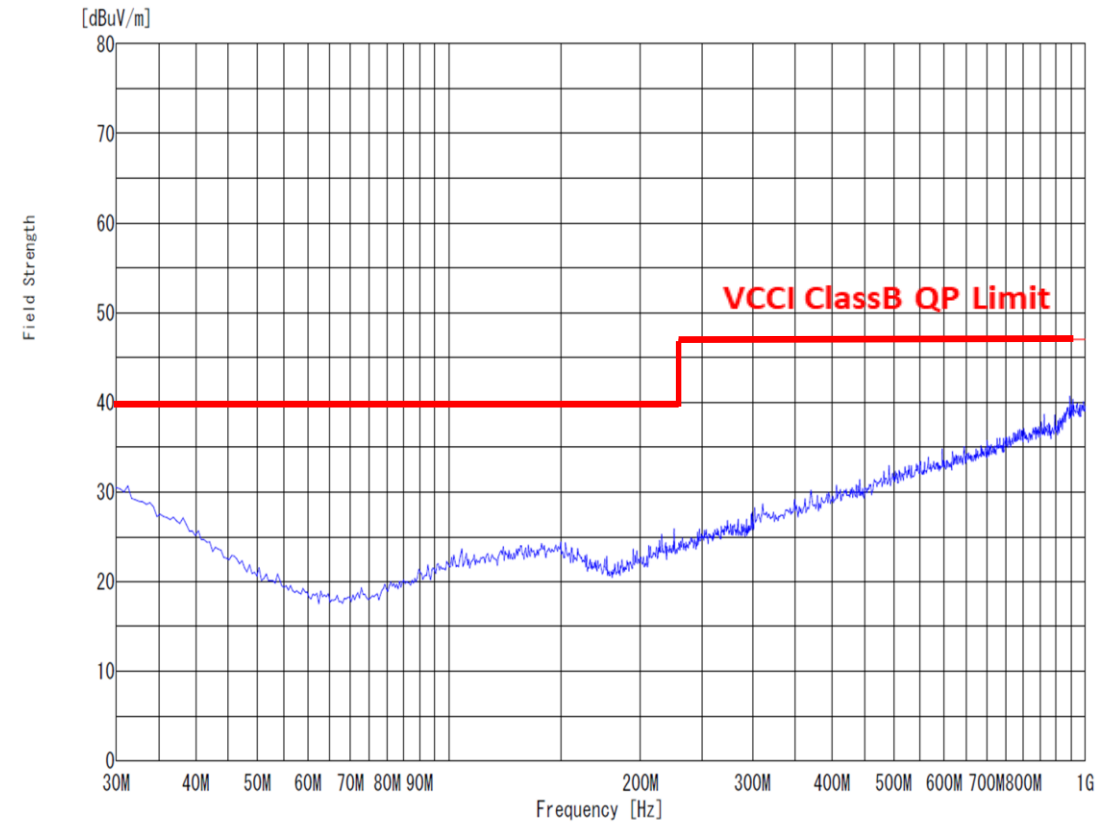


# 5. Radiated emission

Typical power supply 50W, 5Vdc

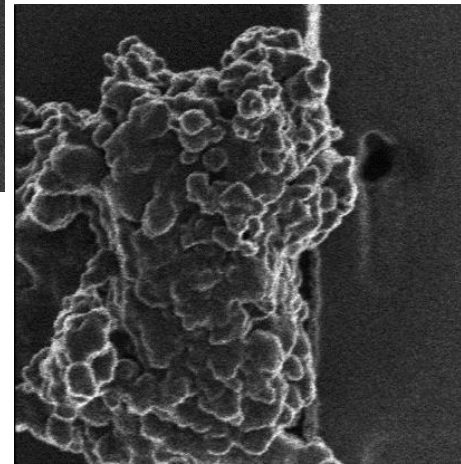
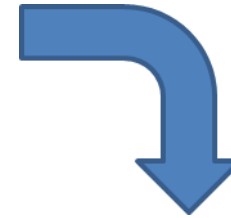
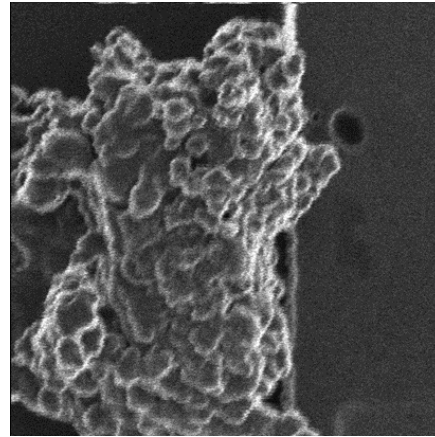


Low noise power supply 50W, 5Vdc



## 6. Applications for low noise power supplies

- High precision measurement equipment
- Microscopy
- Medical equipment
- Audio





# *Daitron*



## SOLUTIONS

CONNECTOR – POWER SUPPLY – ASSEMBLY

Please visit us at stand 25 to see the complete range of low noise power supplies

[www.ac-solutions.be](http://www.ac-solutions.be)

[www.daitronpower.com](http://www.daitronpower.com)



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