



# Electromagnetic Eavesdropping Risks of Flat-Panel Displays

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<http://www.cl.cam.ac.uk/~mgk25/pet2004-fpd.pdf>

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# Summary

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- The article demonstrates that flat-panel displays with digital interface cables, including those in many laptops, can pose at least as much of an eavesdropping risk as CRTs. It also introduces a very effective new software-based protection technique.



# Comments

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- The software-based protection technique introduced is an effective security solution for DVI connected displays.
- The equipment utilized in the experiments is highly specialized and often restricted, the article does not comment on the feasibility of building or obtaining 'Tempest' type equipment.
- The article is too technical and complex for computer science students. It assumes an understanding of physics at university level.



# Overview

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- Electromagnetic eavesdropping involves using the unintentional emissions of computers to reproduce the targets display.
- CRT's are high voltage and amplify the signal by 100's of times making them easy eavesdropping targets.
- LCD's are low voltage and have been traditionally assumed to be low radiation devices and as such not pose electromagnetic eavesdropping risks.



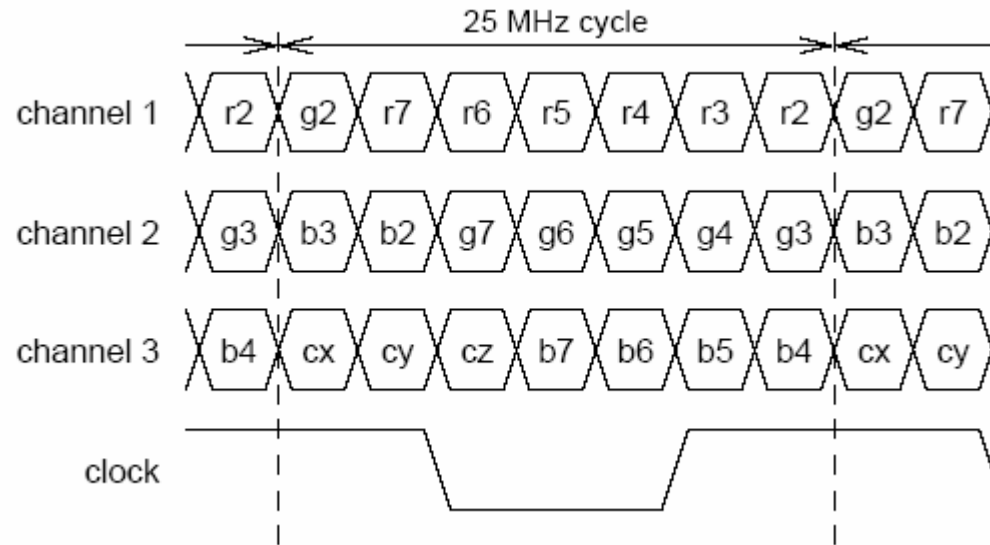
# Explanation of Comment

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- The article looks at two case studies of electromagnetic eavesdropping:
  - A laptop that utilizes a FPD-Link to reduce the number of wires passing through its hinge.
  - A flat panel connected to a desktop computer via a DVI cable.



# Laptop & the FPD-Link



- The laptop utilizes a digital video link consisting of parallel-to-serial converters with a LVDS transmitter chip. The LVDS chip breaks down the 21-bit signal and transmits it over the 3 twisted pair channels at 7 times the clock rate, in doing so it spreads out the RGB bit values for easy detection.



# Desktop & the DVI Cable

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- The DVI interface utilizes a TMDS (Transition Minimization Differential Signaling) signaling scheme. This is designed to minimize the signal transition frequency; this has the side effect of lowering eavesdropping resolution.



# Questions

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- What risk does electromagnetic eavesdropping pose in the university setting and how does it differ from other security risks?
- How would a high security civilian operator such as a digital-signature key certification authorities deal with the electromagnetic eavesdropping risk?
- The article does not consider the most common case; this is an LCD monitor with an internal ADC connected via a VGA cable. What security risk does this pose?





# Answers

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- VGA cables exhibit the same properties as DVI cables but without the encoding issues.
- The ADC converter on LCD's is a likely source of emissions, especially if the shielding is inadequate.
- It's highly likely that the VGA cable is just as susceptible to electromagnetic eavesdropping but because of the traditional implementation with a CRT, it has not been the preferred source of emissions for eavesdroppers.