Retrofitting a Shielded Camera Enclosure with an Internet Protocol Camera and Testing for Radiated Immunity and Emission in a Reverberation Chamber

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1. Introduction

Idea:
• Camera for monitoring the EUT in a reverberation chamber needed
• Replacement of old shielded camera with a new one
• Communication over IP via media converters and optical fibers

Approach:
• Retrofitting the new camera in the old shielded enclosure
• Performance check according to IEC 61000-4-21 [1]
  – radiated immunity with CW and AM signals from 200 MHz to 3 GHz
  – radiated emission according to 200 MHz to 1.3 GHz

2. Selection of Suitable Camera

Existing Shielded Enclosure:

![Old back panel](image1.png)

![Modified back panel](image2.png)

Figure 1: Dimensions of the shielded enclosure

Camera Requirements:
Dimensions: smaller than the enclosure
Viewing angle: optimum observation of the DUT
Supply voltage: fits to media converter & shielded battery
Protocol: enables real-time streaming

Selection of a Suitable Camera:

Internet-protocol camera from Inkovideo [2]

Communication:
Protocols: TCP/IP (transmission control protocol/internet pr)
HTTP (hypertext transfer protocol)
Media converters: electrical signals –– optical signal
Optical cables: no interference with electromagnetic fields

Hardware Modification:
Camera: rear and top cover removed
Shielded enclosure: new ports for optical cables inserted
Old ports have been sealed

![Old and modified back panel](image3.png)

Figure 2: Internet-protocol camera from Inkovideo [2]

![Old and modified back panel](image4.png)

Figure 3: Old and modified back panel of the shielded enclosure

3. Radiated Immunity Test

Measured Frequencies:
• From 200 MHz to 1 GHz in steps of 20 MHz
• From 1 GHz to 3 GHz in steps of 50 MHz
• Both CW (continuous wave) and AM (amplitude modulation)

4. Radiated Emission Measurement

Measured Frequencies:
200 MHz to 1 GHz: sweep time of 10 ms and a RBW of 100 kHz
1 GHz to 3 GHz: sweep time of 260 ms and a RBW of 1 mHz
Number of points: 800

Measurement Devices:
• Spectrum analyzer: FSP from Rohde&Schwarz (9 kHz to 13.6 GHz)
• Stirrer: continuous stirring for 10 min

5. Summary

Conclusion:
• IP camera inside the shielded enclosure withstands the high-intensity electromagnetic field in the reverberation chamber
• Only negligible emissions from the shielded camera
• Easy streaming of the live video to any computer in the laboratory
• Very economic solution

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Further reading
Download from: http://www.env.ovgu.de/Forschung_Lehre/Publikationen.html

References