SAS-2 SSC Investigation (06-064r0)

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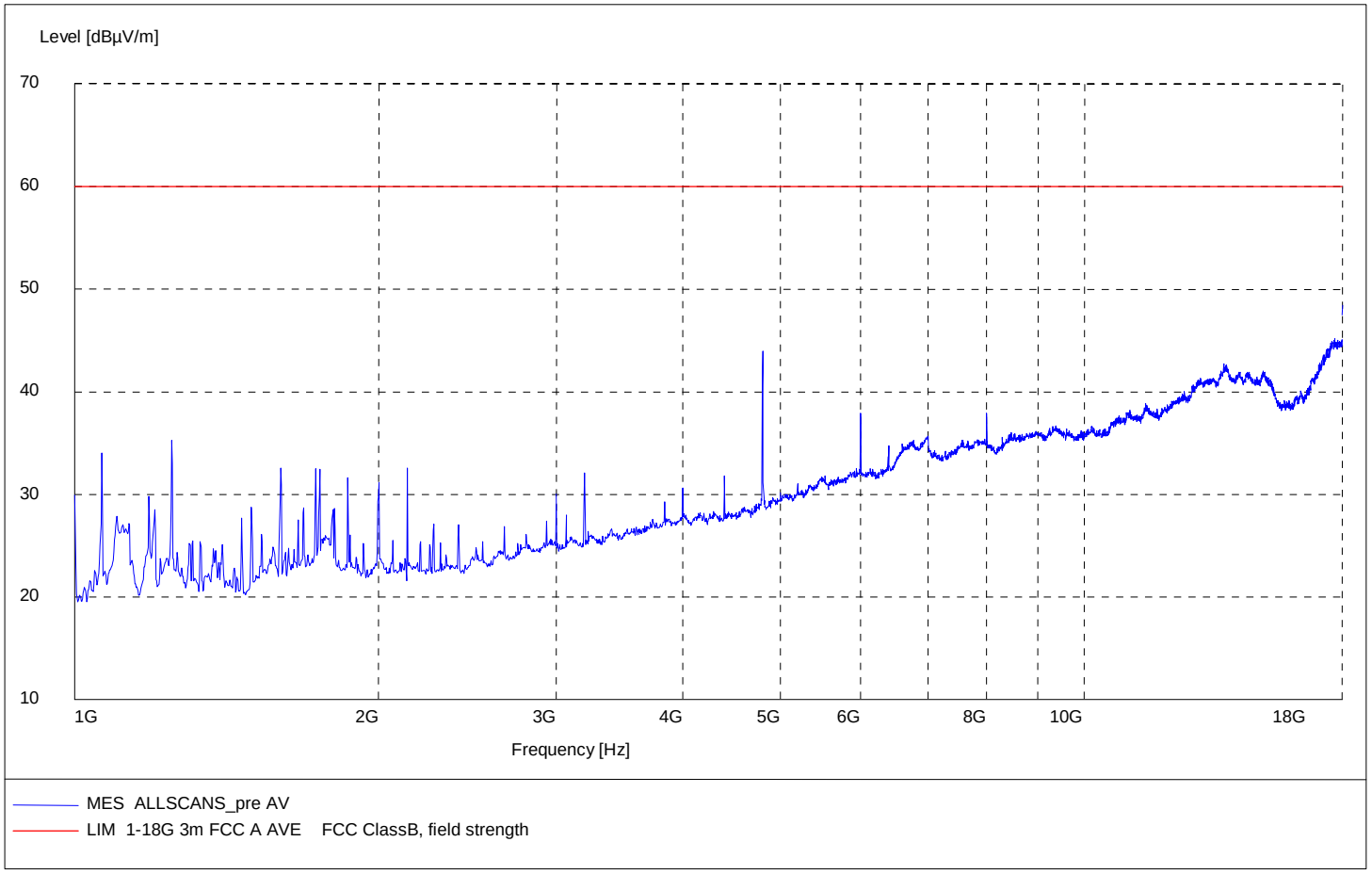
SAS-2 SSC Investigation – Objectives

- At the last face-to-face, hp was requested to provide data demonstrating that SSC lowers emissions levels
- Discuss issue with hp's EMC test experts. Understand how tests are performed and get opinions on level of noise reduction to be expected.
- To compare results with and without SSC, calculate the difference in dB. This number is a ratio of the noise levels and is an indicator of the effectiveness of SSC. Also note that it is independent of the absolute noise level.

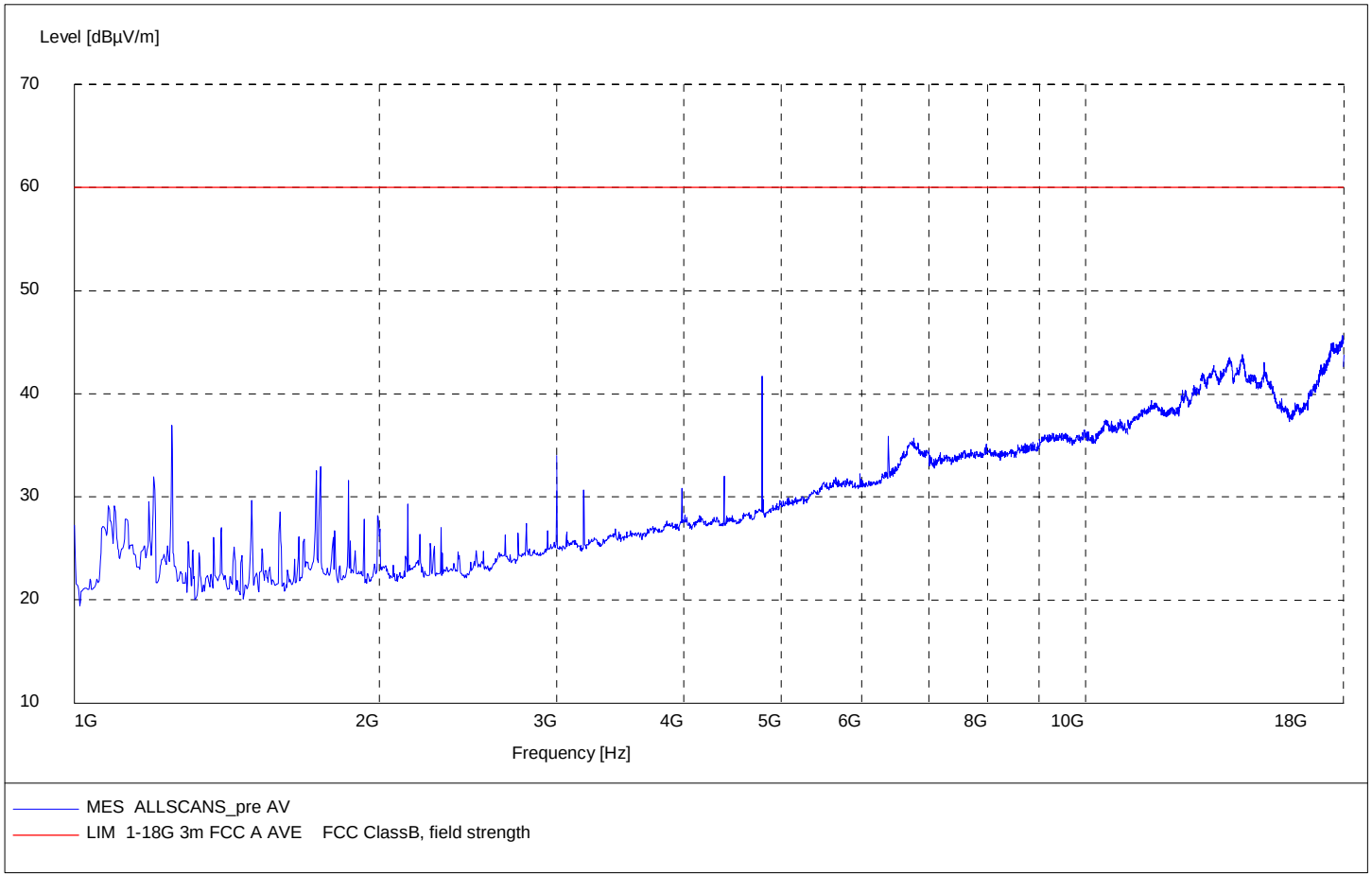
SAS-2 SSC Investigation – Test Platform #1

- Intel based server with SSC on the memory bus.
- Frequency of interest is 4.8 GHz
- FCC test method is two part process
  - Perform automated preliminary scan and graph results
  - Perform manual scan to locate physical position and orientation with highest peak value

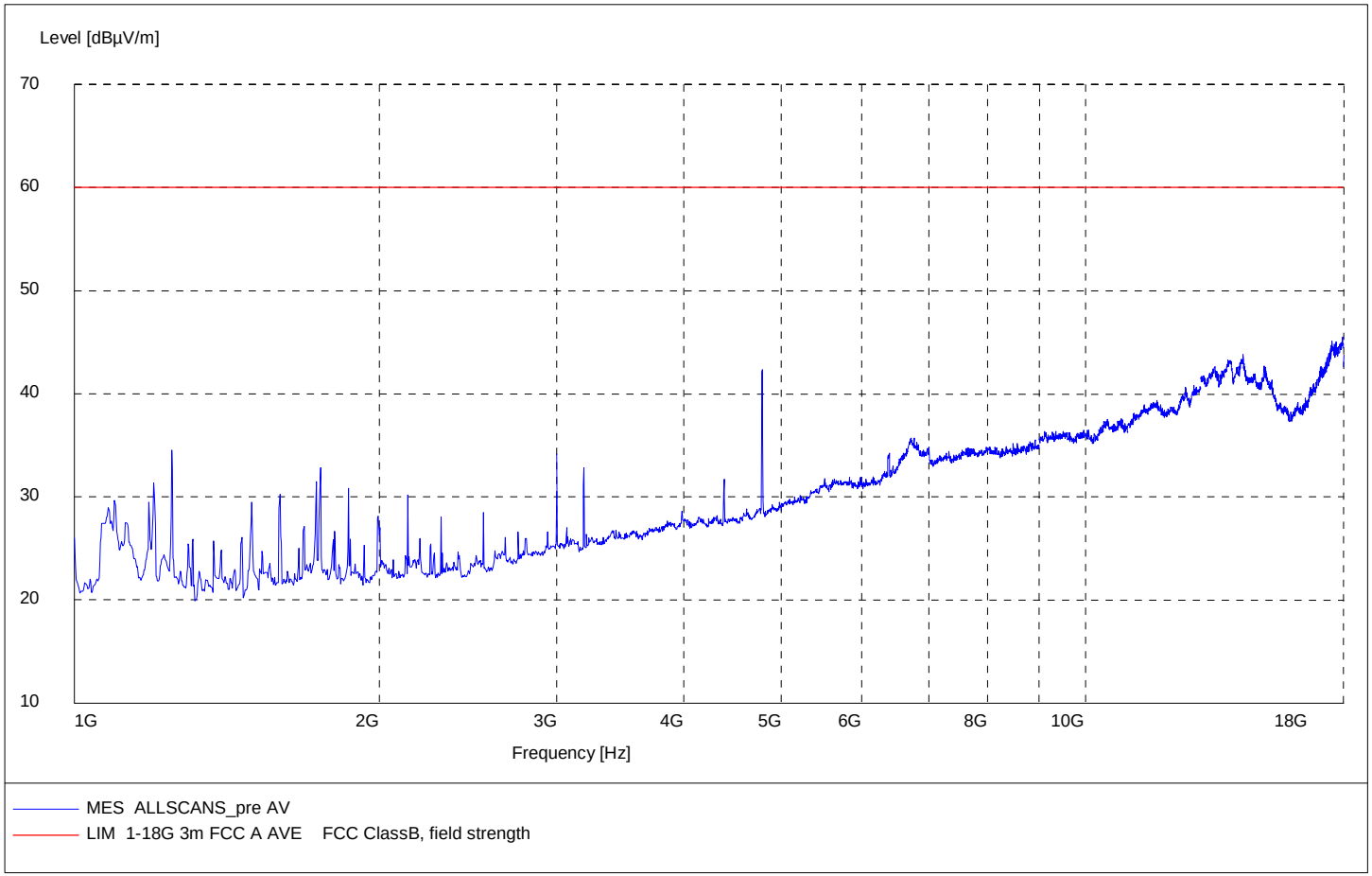
SAS-2 SSC Investigation – Platform #1 – Memory SSC Disabled



SAS-2 SSC Investigation – Platform #1 – Memory SSC Enabled (0.04%)



SAS-2 SSC Investigation – Platform #1 – Memory SSC Enabled (0.15%)



SAS-2 SSC Investigation – Platform #1 – Manual Scan Results

- Although the automated scan shows minimal improvement the manual scan shows a large improvement
- With SSC disabled the 4.8 GHz component is 63.0 dBµV/m
- With SSC enabled and an SSC span of 0.04% of the center frequency (Serial ATA is 0.25%), the 4.8 GHz component is 54.3 dBµV/m
- With a span of 0.15%, the 4.8 GHz component is 45.8 dBµV/m
- Reduction in emissions is 17 dBµV/m

SAS-2 SSC Investigation – Test Platform #2

- Intel based motherboard in business class PC with one Serial ATA Gen II drive
- Host chip set has SSC enabled for all tests
- System level tests performed with SSC enabled and SSC disabled
- Disk drive SSC is the only variable
- Frequencies of interest are 3 GHz and 6 GHz

SAS-2 SSC Investigation – Platform #2 – Manual Scan Results

- With SSC disabled, the 3 GHz component is 37.8 dBµV/m and the 6 GHz component is 44.3 dBµV/m
- With SSC enabled, both components fell to below 30 dBµV/m
- Reduction is at least 8 dBµV/m for 3 GHz and 14 dBµV/m for 6 GHz

SAS-2 SSC Investigation – Other Points

- Measured data correlates with hp's EMC experts position that 10 to 20 dB reduction is typical
- CISPR (European) specifies no levels above 6GHz. FCC class A is 54 dBµV/m
  - New CISPR requirements will be 6dB tighter than FCC
- Experts say shielding apertures need to be no more than 1/20 of a wavelength to be effective.
  - This is 2.5mm for 3GHz and 1.25mm for 6GHz

SAS-2 SSC Investigation – Other Points

- Server market continues to migrate to lower cost designs with packaging similar to a PC
  - See IDC Market Analysis Report, “Worldwide and U.S. Server 2005-2009 Forecast”

SAS-2 SSC Investigation – Conclusions

- Measured data correlates with experience of EMC experts
- Feedback from OEM's at last face-to-face demonstrate that emissions are a serious issue
- SSC has provided 10 to 20 dB reduction in manual scan of emissions where used
- With increasing speeds and tighter emissions specs the problem is getting worse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