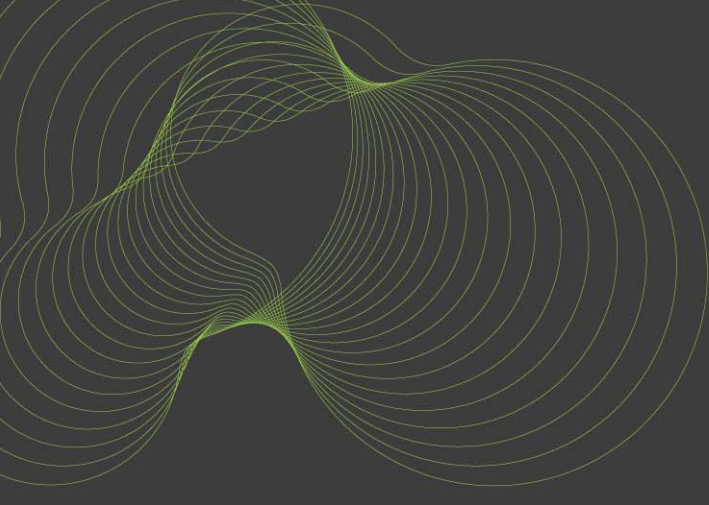


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Living with Electromagnetic Fields.

Andrew Williams

Building Research Establishment, Garston, UK

**Materials for Space Age Consumer Products and Living
Space.**

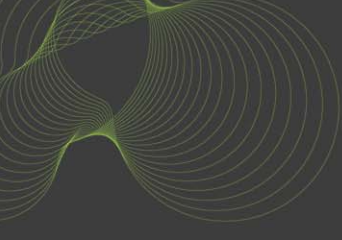
24th April 2008



Background to Concept

- Growing need for construction materials capable of blocking microwave based communications, including:
 - Mobile Phone Signals.
 - Wireless Networks.
 - Bluetooth Devices.
- Applications Include:
 - Shielding for Improved Health / Wellbeing.
 - Shielding Against Unauthorised Communication.
 - Shielding for Enhanced Security.
- Buildings where this technology is required include:
 - Military structures, civilian airports, financial institutions, prisons, hospitals and schools.

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Our Shielding Material

- A Patented Cementitious Composition.
 - Patent No. EP 0759017
- Benefits Over Existing Solutions.
 - Can be incorporated into Existing Construction products (*Blocks, Tiles, Screeds & Mortars*)
 - Harder to damage / compromise than foils.
 - Appears to operate by signal absorption rather than simply by reflection – work is continuing to investigate this behaviour.

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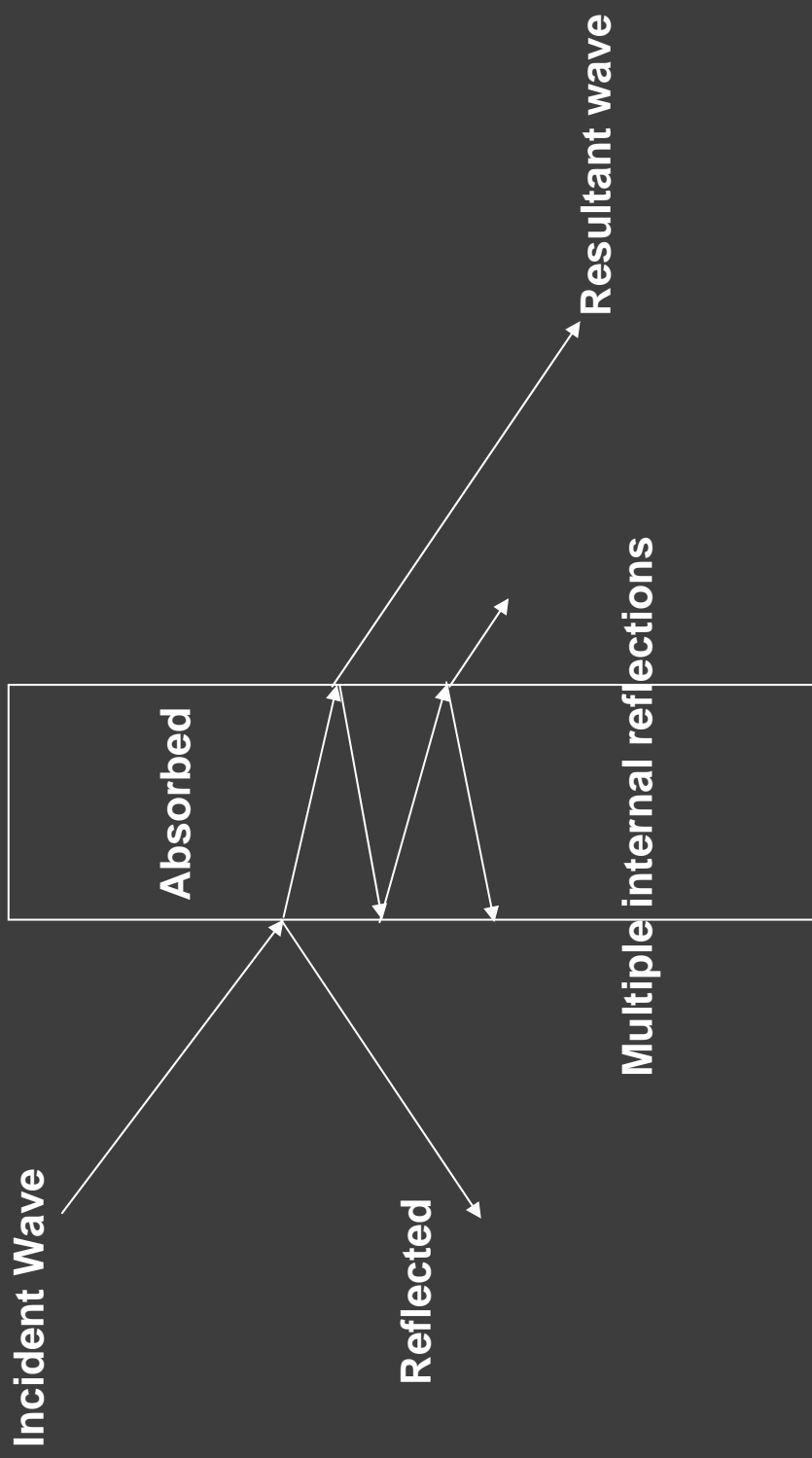
What are EM Fields?

- Propagating energy in the form of Electromagnetic (EM) waves covering the frequency range (1 Hz to 400 GHz)
- Made up of two field components:
 - Magnetic field (H-Field) predominates at low frequencies
 - Electric field (E-Field) predominates at higher frequencies
 - Transition from H to E field dominance usually occurs around 30 MHz
- For H-field - Materials of high relative permeability are required to attenuate fields
- For E-field – Materials of high conductivity are required to attenuate fields

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What is EM Shielding?

- The ability of a material to reduce the resultant EM field from one side of the material to the other.



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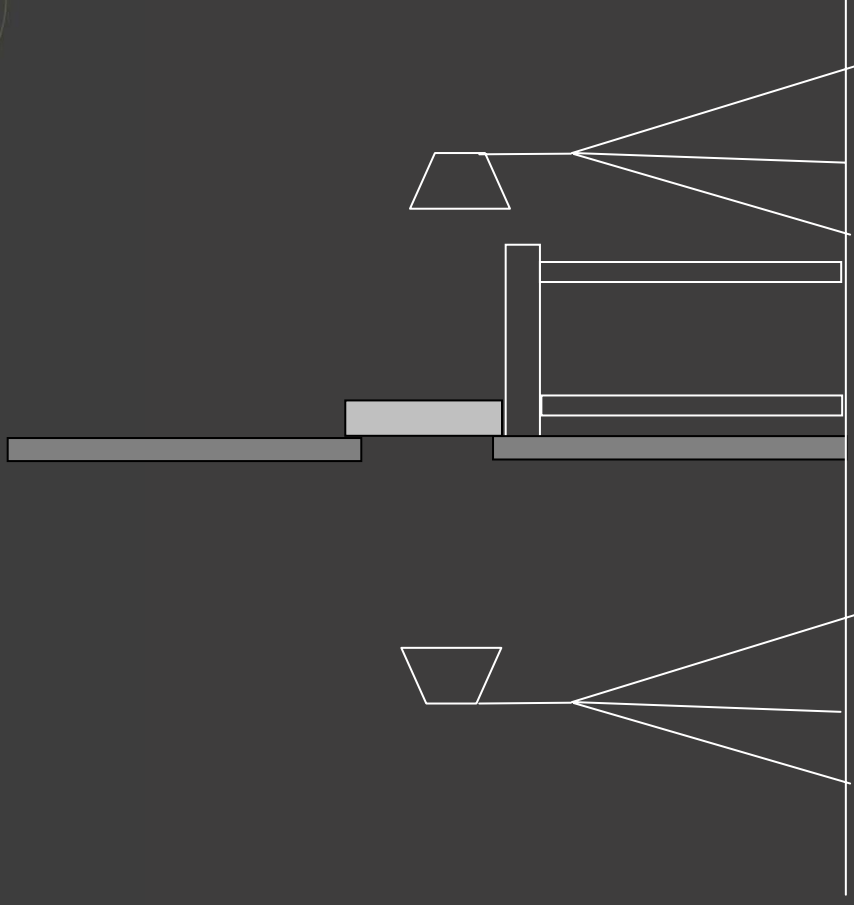


Initial Lab Based Shielding Measurement

- Laboratory based Quick-Look-See measurements to highlight indicative E-field Shielding Effectiveness of
 - Standard Concrete Block
 - Typical Absorber RAM material
 - Conductive Concrete Block
- Pushed up against a window in a screened room
- Some leakage would occur around the blocks especially at high frequencies
- Measurements made over the entire swept frequency range 300 MHz to 5 GHz

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Lab-Based Measurement Setup

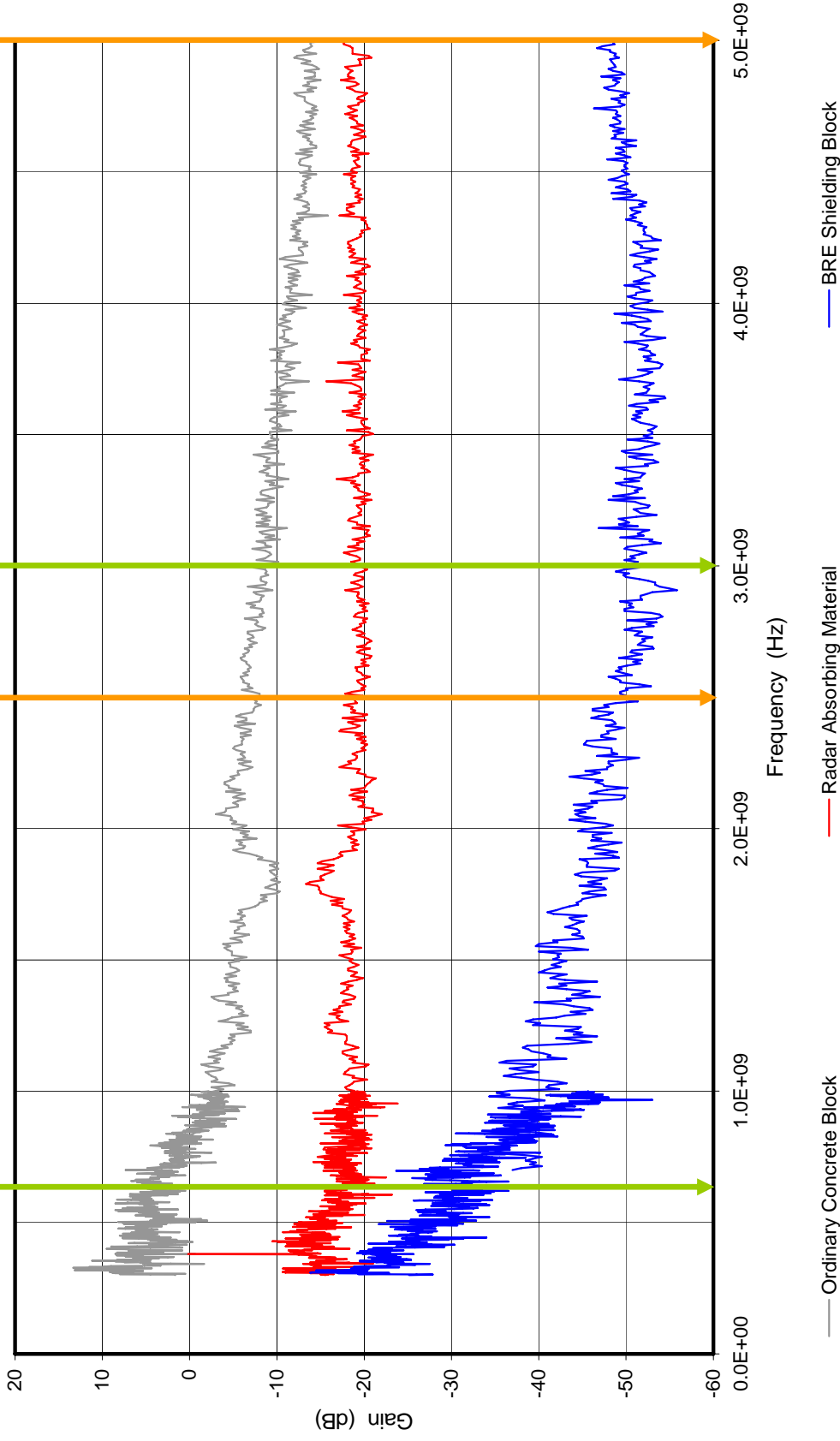


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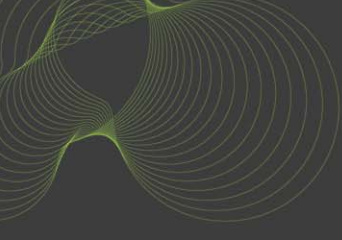
Lab Based Measurements (E-Field)

Mobile Phones

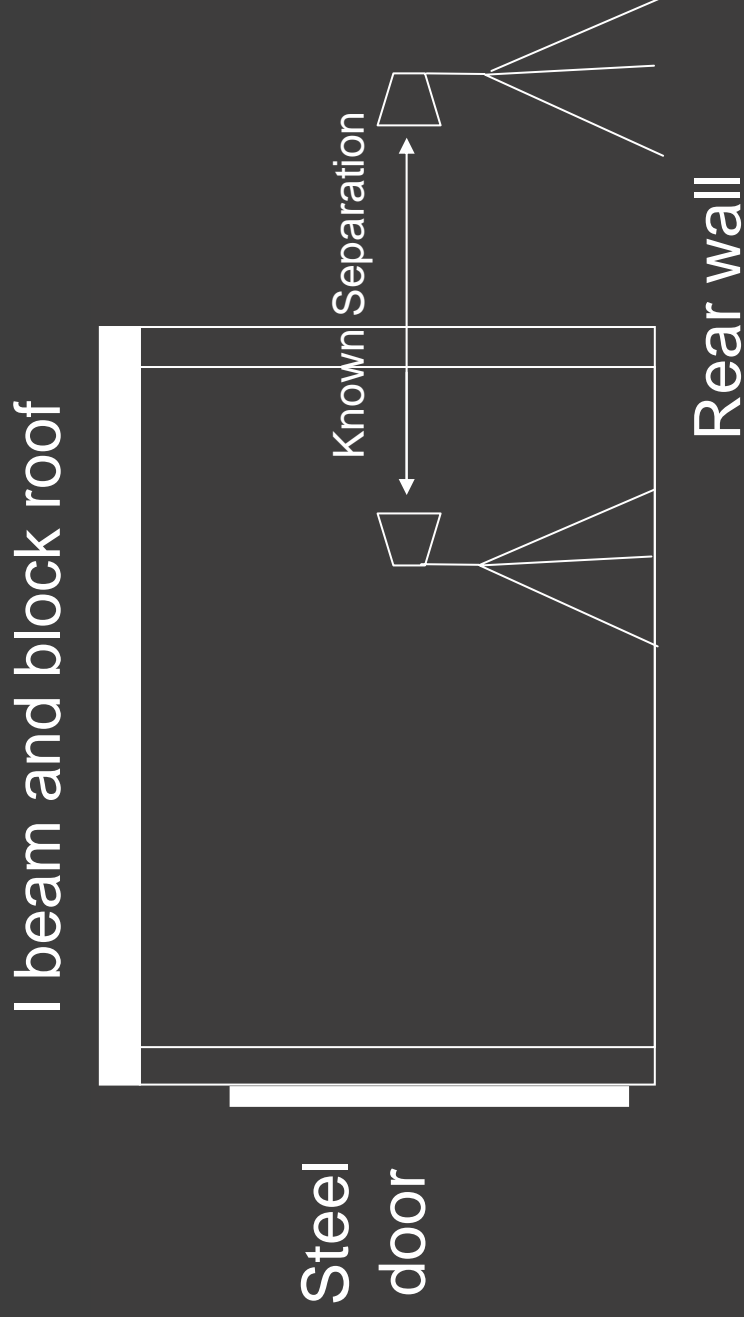
Wi-Fi



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Field Based Measurements (E & H Fields)

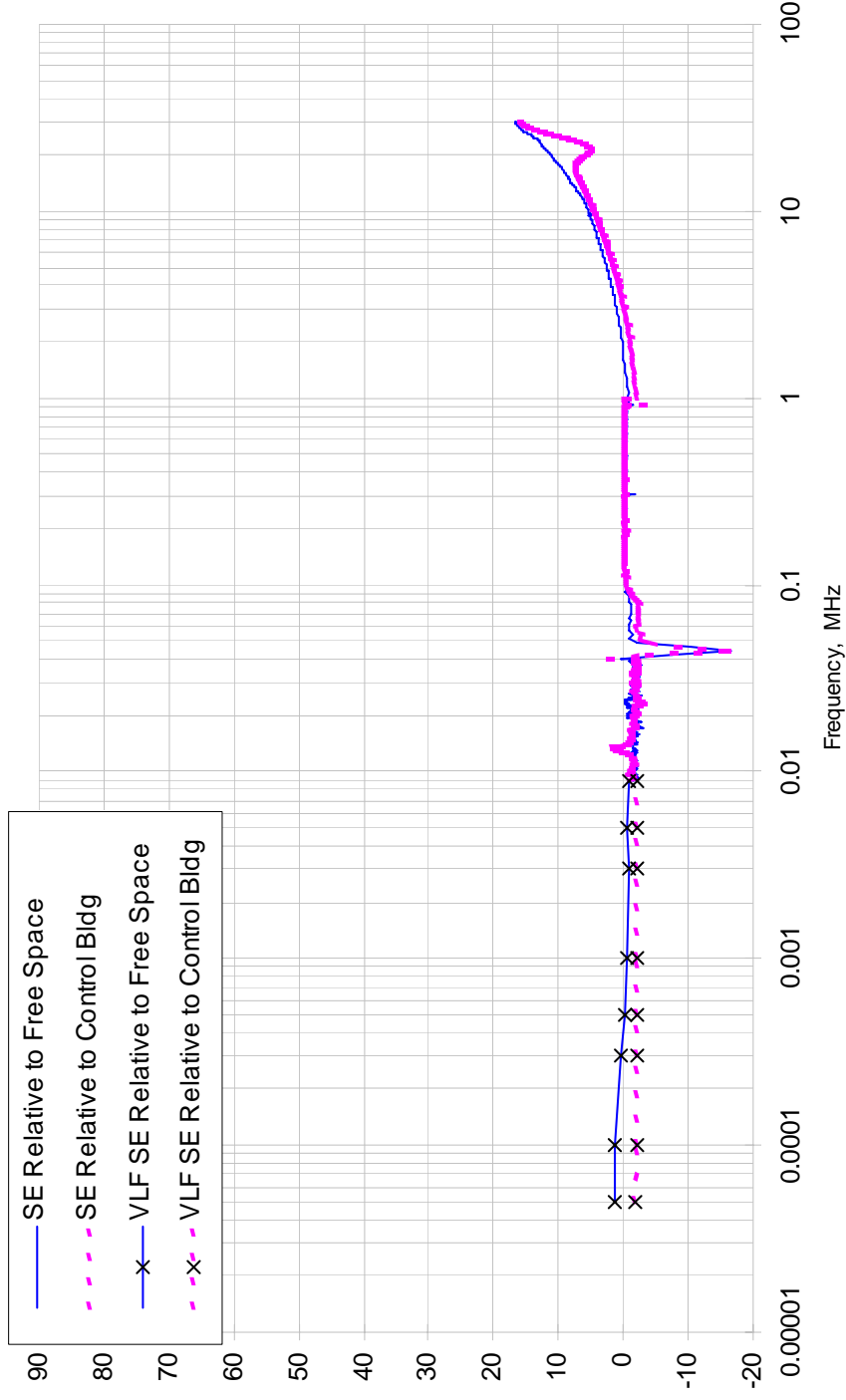


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Building Measurements : H-Field

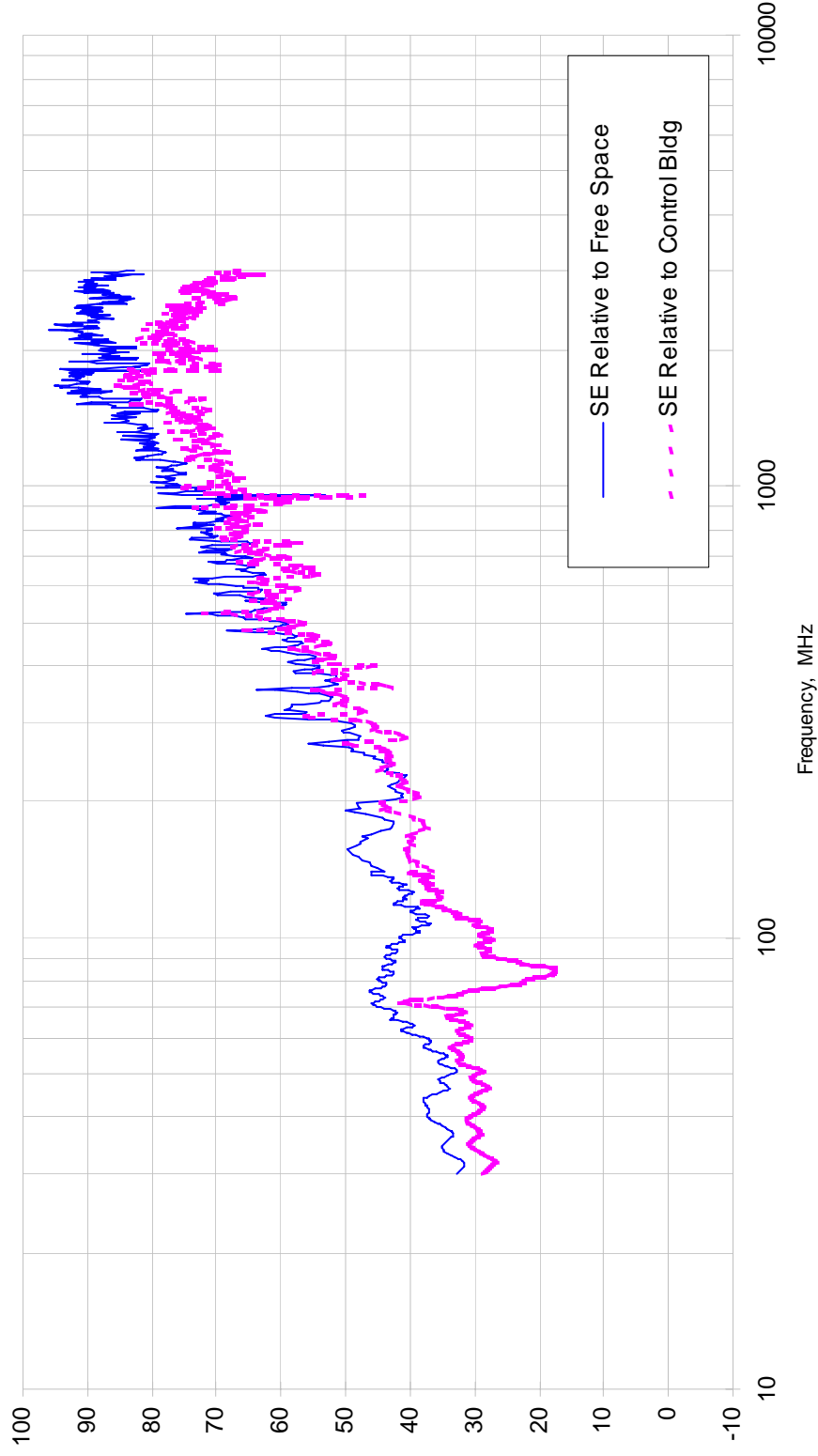
H Field Screening Effectiveness (SE): 50 Hz - 30 MHz



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Building Measurements : E-Field

E Field Screening Effectiveness (SE): 30 MHz - 3 GHz



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Concluding comments

- Typical Shielding Effectiveness (SE) for standard concrete block building varied between 6 and 20 dB across the frequency range (30 MHz to 3 GHz).
- The conductive concrete block building had very good Shielding Effectiveness against electric fields from 32 dB at 30 MHz to 90 dB at 3 GHz – This is expected to provide effective shielding.
- Currently negligible shielding performance for low frequency magnetic fields – But we are working on this!
- Little difference between Horizontal and Vertical Polarisations of electric fields

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Thank you for Listening.

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Andrew Williams

Building Research Establishment, Garston, UK

Contact:

WilliamA@bre.co.uk

01923-664-563

MorlidgeJ@bre.co.uk

01923-664-366

GoddinJ@bre.co.uk

01923-664-368

