Electromagnetic Interference (EMI)

Basic Background Information

1. Why are we involved with EMI Shielding?
    a. Customers have asked if our 3M™ Sun Control Window Films will block radio waves or microwaves
    b. Some of our current competitors claim that their products work for this application
2. What is EMC, EMI and EMIC?
    a. **EMC** - Electromagnetic Compatibility - Electrical devices have EMC when the electrical noise generated by each device does not interfere with the normal performance of the other device
    b. **EMI** - Electromagnetic Interference - EMI is said to exist when undesirable voltage or currents adversely affect the performance of a device
    c. **EMIC** - Electromagnetic Interference Control - The process of making design changes or adjustments of signal or noise levels is called EMIC
3. What is EMI and EMIC?
    a. When electricity flows it generates electromagnetic waves
    b. The wavelength and frequency of the wave determines where these waves are classified in the Electromagnetic Spectrum
    c. EM waves can interfere with the performance of electronic devices
    d. All electronic devices generate EMI.
    e. Grounding or adding filters is an EMIC method.
4. Why is EMIC necessary?
    a. Protect electronic equipment from destructive outside interference such as:
        1. High power transmitters (radar, FM, etc.)
        2. Nuclear effects - electromagnetic pulse (EMP)
        3. Lighting
    b. Protect electronic equipment from temporary equipment malfunctions
5. How is the EMI shielding achieved?
    a. EM waves (fields) are reduced (attenuated) through absorption or reflection by conductive surfaces (shields)
    b. b. The most effective shields are metallic and electrically conductive
    c. c. How well the shield attenuates the field is called its shielding effectiveness (SE)

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TEST RESULTS

Shielding Effectiveness for 3M™ Films

Tested according to ASTM D 4935, "Standard Test Method for Measuring the Electromagnetic Shielding Effectiveness of Planar Materials." This is a far field test measurement taken using a coaxial cell. The dynamic range indicates the maximum measurement capability of our test setup, in other words the response of a "perfect" shield. The following table provides EMI test results for a sample of 3M Sun Control films. Test results for all 3M Sun Control films are available upon request.

Frequency

Product	100 MHz	300 MHz	1 GHz	2.5 GHz	4.5 GHZ
Low E 35	33 dB	33 dB	33 dB	39 dB	36 dB
Affinity 15	26 dB	26 dB	26 dB	34 dB	27 dB
Affinity 30	15 dB	15 dB	16 dB	20 dB	17 dB
Thinsulate 75	22 dB	22 dB	23 dB	27 dB	24 dB
Silver 15 Exterior	21 dB	21 dB	21 dB	27 dB	24 dB
Silver P-18	20 dB	20 dB	21 dB	27 dB	22 dB
Neutral 20	18 dB	17 dB	18 dB	22 dB	20 dB
Night Vision 15	17 dB	18 dB	18 dB	23 dB	19 dB
Night Vision 25	10 dB	11 dB	11 dB	14 dB	11 dB
Night Vision 35	8 dB	8 dB	8 dB	10 dB	8 dB
Ultra Night Vision	15 dB	15 dB	14dB	18 dB	15 dB
Silver 35 Exterior	16 dB	16 dB	16 dB	21 dB	19 dB
Neutral 35	10 dB	11 dB	11 dB	14 dB	13 dB
Ceramic Series	6 dB	6 dB	6 dB	8 dB	6 dB
Prestige Interior And Exterior	0 dB	0 dB	0 dB	0 dB	0 dB
Dynamic Range	97 dB	97 dB	97 dB	93 dB	88 dB

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