MIL-STD-461C UPDATE

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MIL-STD-461C has been in effect since August 4, 1986. On April 1, 1987 Notice 1 to the MIL-STD was issued. This notice was prepared by the Navy and simply added an identification number to the AMSC code. On October 15, 1987 Notice 2 of 461C was issued focusing on Part 2 of the standard. This notice was prepared by the Air Force and delineates the requirements for tests to be performed for equipment and subsystems procured for Air Force use.

Part 2 of MIL-STD-461C supplements Part 1 of the standard by defining emission/susceptibility requirements and limits for equipment/subsystems intended for use aboard aircraft (Class A1). This standard also transfers associated nonshipboard ground support equipment from Class A3 (Part 4) to Class A1, Part 2 when procured for the Air Force. Notice 2 of MIL-STD-461C adds three new tests to Part 2 categories A1a (air-launched missiles), A1b (equipment installed on aircraft), and A1g (jet engine accessories) for equipment and subsystems. These tests are now listed in the MIL-STD Table 2-II (emission and susceptibility requirements for Class A1 equipment and subsystems — Air Force and Navy use). The actual designations for these new tests are as shown below.

- CS12 Conductive Susceptibility Common Mode Cable, Current Pulse, Interconnecting and Power Cables.
- CS13 Conducted Susceptibility, Single Wire Coupled Pulse.
- RS06 Radiated Susceptibility, Electromagnetic Field, Switching Pulses (Chattering Relay).

Again it should be noted that the CS12, CS13 and RS06 are new. The basic test procedures to be utilized in the performance of these new tests are called out by Part 6 of MIL-STD-462, dated 1 April 87. Until the issuance of Notice 2 of MIL-STD-461C the basic requirements for Air Force equipment and subsystems were called out by MIL-STD-461C Table 2-II (Part 2) as CS10 (Conducted Susceptibility, Damped Sinusoidal Transients, Pins and Terminals [pin injection], 10 kHz to 100 MHz) and CS11 (Conducted Susceptibility, Damped Sinusoidal Transients, Cables, 10 kHz to 100 MHz). Reference to the original requirements show that for all categories CS10 was a tailored requirement and that CS11 requirements were limited and were to be specified by the procuring activity. The addition of CS12 and CS13 defines specific requirements for air launched missiles, equipment in-

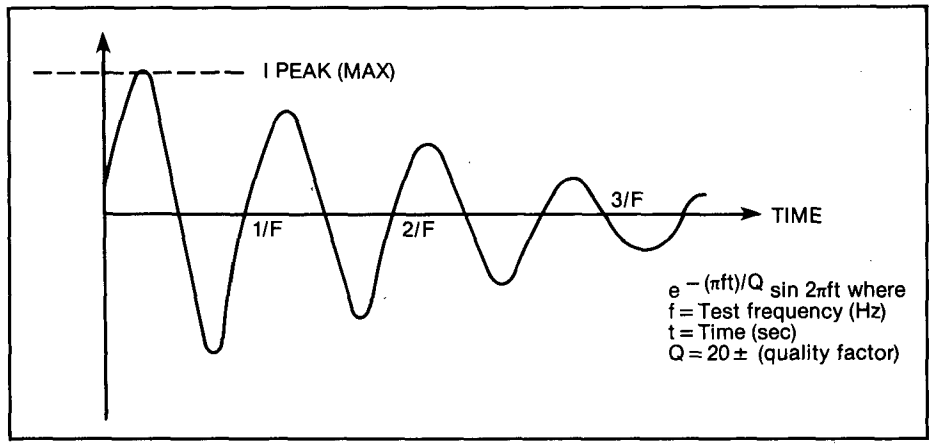

Figure 1. Induced Current Waveform Required for CS12, CS13.

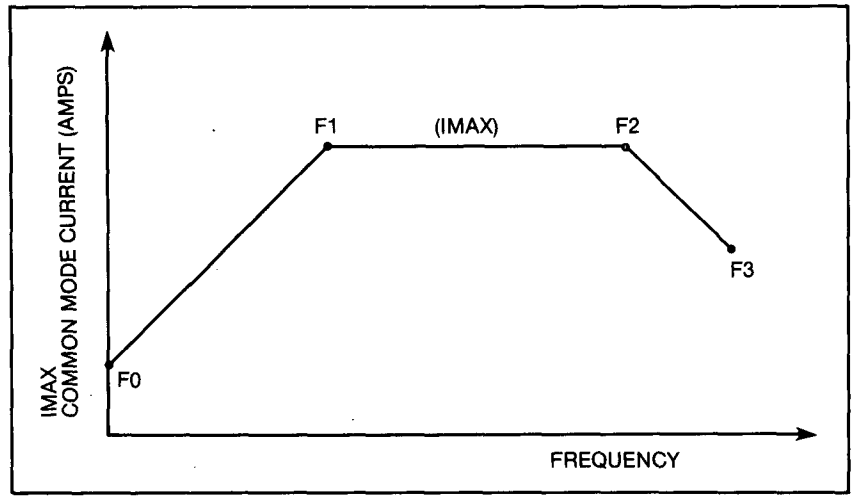

Figure 2. Current Limit Versus Frequency.

TEST FREQUENCY		IMAX. (AMPS)	TEST FREQUENCY		IMAX. (AMPS)
CS10 METHOD	CS11 METHOD		CS12 METHOD COMMON MODE COUPLING	CS13 METHOD	
10KHz (F0)	10KHz (F0)	0.16	10KHz (F0)	10KHz (F0)	0.05
100KHz	100KHz	1.6	100KHz	100KHz	0.50
630KHz (F1)	630KHz (F1)	10.0	—	—	—
1MHz	1MHz	10.0	1MHz (F1)	1MHz (F1)	5.0
10MHz (F2)	10MHz (F2)	10.0	10MHz	10MHz	5.0
30MHz	30MHz	3.5	50MHz (F2)	50MHz (F2)	5.0
100MHz (F3)	100MHz (F3)	1.0	100MHz (F3)	100MHz (F3)	2.5

Table 1. Comparison of CS10/CS11 and CS12/CS13 Current Limits Versus Frequency.

stalled on aircraft and jet engine accessories.

It should be noted that the Air Force method for bulk current damped sinusoidal transient tests is often impossible to accomplish as specified. The requirement is to inject a defined damped sinusoidal wave shape on a cable and to monitor the cable to assure that frequency and quality factor (Q) are achieved. However, a cable which has a complex impedance termination characteristic will not support the imposition of a damped sinusoid at a given frequency or quality factor. Depending upon the number of lines within the cable, the termination impedance and coupling device, a widely distorted waveshape at a different frequency may be seen with the monitor. As a result, it is expected that the Air Force will convert to the Navy's precalibrated signal injection method, i.e., to develop the desired signal through a 100 ohm noninductive calibration network and then to inject that signal onto the cable under test. Whatever then appears on the cable will be the result of the cable and its termination characteristics — the parameter actually intended for measurement.

Figure 1 illustrates the waveform that must be induced in each interconnecting and power cable (CS12) and single wire or multiple wire unit of interconnecting and power leads (CS13). Figure 2 illustrates the current limit versus frequency for each test frequency. Table 1 lists the test frequencies and maximum current amplitudes to be induced for each test frequency. Table 1 also lists test frequencies and maximum currents and amplitudes for CS10 and CS11 methods for comparative purposes. It should also be noted that the quality factor Q for CS10 and CS11 is called out by MIL-STD-462, Notice 5 to be 15 ± 5 where Notice 2 of MIL-STD-461C, Part 2 calls out a quality factor (Q) of 20 ± 5 for the CS12 and CS13 requirements.

The new radiated susceptibility requirement RS06 requires that the equipment/subsystem be subjected to a radiated electromagnetic field generated by fast switching pulses from a relay coil. Once again MIL-STD-462, Part 6 delineates the test methods. While the test is indeed new to MIL-STD-461C the test has been utilized in other specifications and is commonly known as the "chattering relay" test. MIL-STD-462, Part 6 calls out the use of MIL spec relay, MS2527, wired to self-interrupt. MIL-STD-461C, Notice 2, Part 2 calls out a minimum peak-to-peak transient voltage (across the relay coil) of 600 volts.

The actual electromagnetic radiated field is generated due to the constant interruption of the 600 volts being supplied to the relay coil. The actual field can be described as a "stream" of transient current/voltage "spikes" occurring at a relatively low frequency rate (< 1 kHz).

In Summary, it should be emphasized that the original test limits for MIL-STD-461C, Part 2 remain the same for all emission and susceptibility requirements. Notice 2 of the MIL spec simply adds three new tests to Part 2 and defines their test limits. It also transfers certain ground support equipment in Part 4 to Part 6. ■