# Where's the Science in Low Frequency Emissions Regulation? A Study of European Norm 61000-3-2

## Master of Arts Project prepared by S. Anthony Grasso and finished on the 4th of April in the year 2000.

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*This paper was researched and written to fulfill the M.A. project requirement for completing the Monterey Institute of International Studies' Master of Arts in Commercial Diplomacy. It was not commissioned by any government or other organization. The views and analysis presented are those of the student alone.*

*For more information about the Commercial Diplomacy program and the M.A. project requirement, please visit www.commercialdiplomacy.org.*

## PREFACE

For the purposes of this project, I assume the fictitious role of a consultant who has been hired by a group of information technology companies to 1) analyze the problems associated with the European Union's soon to be implemented harmonic emissions standard (EN 61000-3-2); and 2) develop a strategy for delaying implementation of the standard. As part of this work, I propose the development of a fictitious coalition, the Coalition on Harmonic Emission Issues (CHEI).

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# EXECUTIVE SUMMARY

**Issue**

On January 1, 2001, the European Union will begin requiring all electronic/electrical equipment sold in the EU market to conform to its low frequency emissions standard, European Norm (EN) 61000-3-2. The standard will cost the electronic/electrical industries billions of dollars, yet there is no scientific evidence that the standard is necessary.

The purpose of EN 61000-3-2 is to limit the harmonic or low frequency emissions (LFE) of electronic/electrical products and to ensure that these products are acceptably immune to such emissions—emissions that can, at least in theory, create disruptive noise on the power lines. All electronic/electrical products are covered by the standard (e.g. computers, audio and video equipment, light dimmers, fluorescent lights, air conditioners, refrigerators, etc.).

In total, the low frequency EN standard is expected to cost worldwide electronic/electrical equipment manufacturers $50 billion by 2001—an increase in production costs of 2.5 to 1,000 percent. The information technology (IT) industry alone will pay an estimated $3.4-$5.6 billion annually by 2001 to conform to the standard. Consumer prices for electronic/electrical equipment are expected to rise three to five percent as a result of the standard.

These costs are unjustified because there is no scientific evidence that demonstrates the need for a standard that covers all electronic products. Indeed, there is no data or record of complaint from European or American utilities to show that harmonic signals have in fact been disruptive. The costs of EN 61000-3-2 are yet less justifiable because the International Electrotechnical Commission (IEC) recently decided to rewrite the IEC standard on which EN 61000-3-2 is based, and the European Committee for Electrotechnical Standardization (CENELEC) is currently reviewing, and potentially revising, the standard itself. It simply does not make sense to require manufacturers to come into conformity with EN 61000-3-2 by January 1, 2001 if the standard is likely to be changed soon thereafter.

Without scientific justification, EN 61000-3-2 violates Article 2.2 of the World Trade Organization Agreement on Technical Barriers to Trade. Moreover, it will have a strong negative impact on manufacturers:

- the language of EN 61000-3-2 is ambiguous, which will make it difficult to bring products into conformity with the standard;

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- the standard conflicts with other European standards, which means that bringing some products into conformity will cause them to be in violation of other European Norms,
- the standard will slow the speed with which companies can bring new products to market (because more time will be required to develop and test new products to ensure conformity with EN 61000-3-2); and
- the standard will make some products too expensive to sell profitably because of the costs of conformity.

**Recommendation**

The IT industry must:

1) Persuade the EU to postpone the implementation of EN 61000-3-2 until after the IEC and CENELEC respectively rewrite and review the standard. The EU should also allow ample time for the electronic/electrical industry to conform to the revised standard.
2) Participate more actively in the IEC committees TC77 and SC77A as they prepare the revised version of IEC/EN 61000-3-2. It will be crucial to ensure this new standard meets the electronic/electrical industry requirements/concerns.

A detailed strategy for achieving these recommendations is laid out in the final section of this paper.

# INTRODUCTION

As international agreements chisel away at tariff barriers to trade in information technology (IT) products, significant, potentially devastating, non-tariff barriers are emerging. The most important of these emerging barriers are standards-related barriers, which are proving to be very costly for producers of computer hardware, software, and telecommunications equipment.[1] Indeed, intense competition has already shortened the economic life cycles of high-tech products and left companies with little time to recover research and development (R&D) costs. Requiring companies to spend extra time and money ensuring that products conform to technical regulations only exacerbates this problem.[2]

The impact of technical, standards barriers is particularly detrimental to the competitiveness of industries within the United States and European Union, which share the largest two-way trade and investment relationship in the world.[3] Approximately 22 percent of all U.S. goods and services exports (approximately $110 billion in merchandise) go to the European Union (EU) every year,[4] and a full fifty percent ($66 billion) of these exports require some form of EU certification in addition to any U.S. domestic certification requirements.[5] The heterogeneous standards and duplicative regulatory requirements on both sides of the Atlantic increase the base cost of exports by up to 15 percent.[6]

Since the early 1990s, the European Union has attempted to impose EMC standards on electronic/electrical products sold in the Union. One of these standards, and the focus of this project, is European Norm (EN) 61000-3-2. EN 61000-3-2 is designed to limit the low frequency emissions of electronic/electrical products and to ensure that these products are acceptably immune to such emissions. The IT industry must be fully compliant with this standard if it wishes to sell its products on the EU market after January 1, 2001, the implementation date for the standard.

The product limitations created by EN 61000-3-2 will impose great costs and severe product-design restrictions on manufacturers, which in turn will increase costs for consumers. The electronic/electrical industry estimates that the low frequency emissions standard (EN 61000-3-2) will increase worldwide manufacturers' costs by an estimated

[1] Office of Industries, U.S. International Trade Commission, Global Assessment of Standards Bariers to Trade in the Information Technology Industry, November 1998, p. iii.
[2] TABD, Mid Year Report, May 10, 1999, p. 4.
[3] USITC, Global Assessment, p. iii; USTR, European Report 1998 www.ustr.gov.
[4] Paula Stern, "The Transatlantic Business Dialogue: A New Model for Trade Expansion and Regulatory Harmonization," 1999.
[5] Stern
[6] Stern

$50 billion annually—a little less than half of which would be borne by U.S. manufacturers (see *Commercial Analysis* for greater details).

Yet there is no scientific evidence to show that the standard is necessary. In theory, harmonic emissions can reduce the quality of publicly distributed electric power. However, strong scientific data suggests that harmonic distortion caused by electrical products has not had a significant impact on EU power supply systems. Accordingly, EN 61000-3-2 will create a significant, and unnecessary, trade barrier.

**Project Overview**

The following project begins with an in-depth history of the problem and then analyzes the issue from five perspectives: commercial, economic, legal, policy, and stakeholder. (The macroeconomic analysis is included in Appendix A illustrates the importance of the high-tech sector to the overall U.S. economy—although the macroeconomic impacts of EN 61000-3-2 are expected to be negligible.) The final sections provide recommendations and an action strategy.

The final outcome of this project should be a clear presentation of the issue, a solid groundwork of facts in support of the U.S. industry position, and the development of a strong U.S. plan for action. The project's ultimate goal is to provide a means of working towards a satisfactory solution to the harmonic emissions problem before it escalates into a trade war or WTO dispute settlement. By addressing the problem early, the U.S. and EU may be able to avoid a debacle like the banana and beef hormone trade disputes.

# BACKGROUND

## I. INTRODUCTION

Electromagnetic compatibility (EMC) has been a concern ever since the first volt of electricity lit a light bulb. However today's rapid proliferation of sensitive electronic devices has greatly increased the possibility of electromagnetic feedback problems, which in extreme cases might cause overheating, shortened equipment lifetimes, or catastrophic failure of equipment connected to the power lines.[7] As a result, nations have created various standards to control harmonic emissions.[8]

As defined by the U.S. Department of Commerce, electromagnetic compatibility is:

> . . . the condition which prevails when telecommunications equipment is performing its individually designed function in a common electromagnetic environment without causing or suffering unacceptable degradation due to unintentional electromagnetic interference (EMI) to or from other equipment in the same environment. It is also the ability of systems, equipment, and devices that utilize the electromagnetic spectrum to operate in their intended operational environments without suffering unacceptable degradation or causing unintentional degradation because of electromagnetic radiation or response.[9]

All modern electronically controlled equipment creates harmonic signals that are fed back into the power lines to which they are connected. These signals, also called low frequency emissions (LFE), can appear as noise on the power lines and may be problematic when utilities begin using their lines for purposes other than power distribution (i.e. sending voice, video, or data). LFE or "noise" may limit such capabilities.

The Europeans adopted EN 61000-3-2 in an attempt to regulate the amount of harmonic signals that feed back into power lines—although a survey conducted by the Information Technology Industrial Council and IBM shows that U.S. and European utilities have little problem with these signals.

[7] James McKim, "An Examination of the Rationale for Limiting Harmonic Emissions from Low-Voltage Equipment," 1999.
[8] Harmonics are signals that are multiples of a base frequency or vibration.
[9] Department of Commerce: http://glossary.its.bldrdoc.gov/fs-1037/dir-013/_1932.htm.

## II. ELECTROMAGNETIC COMPATIBILITY REGULATIONS

### Overview of U.S. and EU EMC Regulations

Many nations have developed standards and regulations to protect electronic/electrical products and utilities from electromagnetic distortions and to prevent those products from creating such interference.

In the United States, the Federal Communications Commission requires electromagnetic (EM) compliance to the following two international standards: International Electrotechnical Commission (IEC) 950 and International Special Committee on Radio Interference (CISPR) 22. Most U.S. efforts to regulate electronics are sponsored by the Institute of Electrical and Electronics Engineers, Inc. (IEEE) and the American National Standards Institute (ANSI). Regulations generally focus on "…installations and facilities, large point source loads, and, more recently, on smaller loads with large aggregate impact on the network."[10] (For a greater explanation of U.S. standards development policy, see *Policy Analysis* section.)

In the EU, the development of electromagnetic compatibility (EMC) regulations is guided by the Council Directive 89/336, the "EMC Directive." The majority of the European Union's EMC standards are adopted wholesale from the IEC. The EU began regulating low frequency emissions (LFE) with the standard IEC 555-2,[11] which covered only household appliances. In 1995, the EU replaced IEC 555-2 with IEC/EN 61000-3-2, which expanded coverage to include all electronic/electrical equipment. (See *Standards Setting in the U.S. & E.U.* for more information on the European Union's standard setting process.)

### EMC Directive 89/336

The EMC Directive was adopted by the European Council of Ministers on May 3, 1989. A "new approach" directive, it laid down apparatus protection requirements and left it to standards, primarily European harmonized standards, to define technical specifications for achieving those protection requirements. On July 1, 1991, the EMC Directive became

[10] McKim.

[11] IEC 555-2 is the predecessor to IEC/EN 61000-3-2. It was used for many years and enforced as a mandatory requirement in Europe. The standard covers domestic appliances, includes a simpler measurement system than IEC/EN 61000-3-2, and applies to ITE, TV and other electronic equipment marketed to use in the home. According to a fact sheet presented by Girtz Zeidenbers of IBM at the June 17, 1999 LFEIC meeting, it has not been shown that the accumulation of small equipment has caused increasing harmonic distortion prior to and while IEC 555-2 has been in effect in Europe.

national law, thereby replacing all national EMC standards. Its provisions have been in effect since January 1, 1992.[12]

The EMC Directive is designed to guarantee the free movement of "apparatus"[13] and to create an acceptable electromagnetic environment in the EEA territory. Its specific goals are:

- To ensure that electromagnetic disturbances produced by electrical and electronic "apparatus" do not affect the operation of other "apparatus," as well as radio and telecommunications networks, related equipment, and electricity distribution networks.
- To ensure that "apparatus" have an adequate level of intrinsic immunity to electromagnetic disturbances[14] to enable them to operate as intended.

Additionally, the EMC Directive seeks to ensure that EM phenomena do not affect how appliances, installations, and systems function. If an apparatus, when used as intended, does not degrade the performance of other apparatus in its EM environment, both present and foreseeable, it should be considered to be in compliance with the emission requirement of the directive.

The EMC Directive has been amended by the following directives:

- Council Directive 91/263/EEC of April 29, 1991, as consolidated by European Parliament and Council Directive 98/13/EC of February 12, 1998;
- Council Directive 92/31/EEC of April 28, 1992;
- Council Directive 93/68/EEC of July 22, 1993.

The second of these, Council Directive 92/31/EEC, gave manufacturers three and a half years (until December 31, 1995) to implement the EMC Directive. During this transitional period, manufacturers had the choice of placing on the market and/or putting into service:

- apparatus manufactured in accordance with the EMC Directive (whereby the free movement of the apparatus was guaranteed pursuant to the directive), or
- apparatus manufactured in accordance with national regulations (whereby free movement of apparatus was guaranteed pursuant to Article 30 of the EEC Treaty,

[12] European Union, Council of Ministers, Guidelines on the Application of Council Directive 89/336/EEC of 3 May 1989 on the Approximation of the Laws of the Member States Relating to Electromagnetic Compatibility, Brussels, 1997.

[13] As defined in Article 1.1 of 89/336/EEC: all electrical and electronic appliances together with equipment and installations containing electrical and/or electronic components.

[14] Article 1.2 of 89/336/EEC defines electromagnetic disturbances as any EM phenomenon that may degrade the performance of apparatus. An EM disturbance may be an EM noise, an unwanted signal, etc.

albeit subject to the possible derogation provided for in Article 36 and the jurisprudence of the European Community Court of Justice).

As of January 1, 1996, all member states should have abolished national regulations concerning electromagnetic compatibility and applied the provisions of the EMC Directive for all apparatus. Also, as mandated by Directive 92/32/EEC, many of the harmonized standards derived from the EMC Directive should have taken full effect. One exception to this is EN 61000-3-2.

**The History of IEC 61000-3-2**

In 1973, the International Eletctrotechnical Commission (IEC)[15] established Technical Committee (TC) 77 to begin the process of defining harmonic emissions standards. [16] The committee was to consider the following aspects of EMC:

- immunity, over the whole frequency range,
- emission in the low frequency range (<=9kHtz),
- emission in the high frequency range (>9kHtz) in coordination with CISPR, and disturbance not covered by CISPR.[17]

In 1981, TC77 established sub-committee (SC) 77A,[18] to focus on standardization in the field of EMC with regard to low frequency phenomena (ca. <=9kHtz). SC77A/WG1 published its first harmonic emissions standards in 1982. These were IEC 725, which set references for impedance levels, and IEC 555-2 (first addition), which covered equipment for household and similar usage. In 1985, SC77A/WG1 amended 555-2 to add special limits for television receivers. This was a precursor to Class D[19] limits for all electronic equipment and the beginning of standards that address switch mode.

[15] The International Eletctrotechnical Commission was founded in 1906. Today, it prepares and publishes international standards for all electrical, electronic, and related technologies. Over 50 countries, including the world's major trading nations and a growing number of industrializing nations, are participating members of the IEC.

[16] Working groups within TC77 are WG 1—Terminology; WG 13—Generic EMC standards; WG 14—EMC and functional safety; and WG 15—Measurement methods for EMC phenomena.

[17] This standard is intended to establish uniform requirements for the radio disturbance level of the equipment contained in the scope, to fix limits of disturbance, to describe methods of measurement, and to standardize operating conditions and interpretation of results.

[18] Working groups included in SC77A are WG1—Harmonics and other low frequency disturbances; WG2—Voltage fluctuation and other low frequency disturbances; WG 6—Low frequency immunity tests; WG8—Electromagnetic interference related to the network frequency; and WG9—Power quality measurements methods.

[19] Class D products are those that currently consume between 75W and 600W and have harmonically rich current waveforms of the type typically produced by rectifier circuits. James McKim, James, "How to Read and Use EMC Standards," Test and Measurement World, August 1998.

Around 1986, the IEC SC77A began writing a standard that expanded IEC 555-2 by limiting allowable harmonic feedback currents for *all* products that connect to the electric utility power lines. Published in 1990, this new standard (61000-2-2) set the compatibility levels for public distribution systems. At that time, the information technology industry had little interest and no representation in committee SC77A, and therefore minimal input in the development of IEC 61000-2-2.

IEC 61000-3-2 further expanded the IEC's harmonic feedback standard to include all electronic/electrical equipment. This standard was published in 1995, but the IEC recently decided to rewrite it. Best estimates are that it will take the IEC three to five years to rewrite the standard.

**EN 61000-3-2 and the Role of the European Committee for Electrotechnical Standardization**

The official European standards-setting body for electrotechnical products is the European Committee for Electrotechnical Standardization (CENELEC). This standards body works closely with the IEC. In fact, CENELEC often adopts standards directly from the IEC. Within the regulatory framework of the EMC Directive, CENELEC and the European Commission turn many of the IEC low frequency emission standards into European Norms, such as IEC/EN 61000-3-2, IEC/EN 61000-3-3, and IEC/EN 61000-4-7.

CENELEC published EN 61000-3-2 in 1995,[20] thereby turning the voluntary IEC standard into a mandatory European Union standard. However the standard was amended in 1998 to allow for a delay in its implementation. EN 61000-3-2 is now scheduled to take full effect on January 1, 2001—this despite that the IEC is rewriting its counterpart standard and that CENELEC recently decided to review the European standard.

**European Commission Review of the EMC Directive**

Due to the numerous concerns raised by the EMC Directive, the European Commission sent the EMC Directive to be reviewed by the Simpler Legislation for the Single Market Initiative (SLIM) team. The result was a number of recommendations that have received strong support from many companies and trade associations within the IT industry. However, the SLIM report did essentially nothing to change the low frequency emissions standard EN 61000-3-2.

The SLIM team did recommend that "EMC legislation should not result in added costs for consumers due to unique requirements where this cannot be appropriately justified as

[20] The full title of the EN 61000-3-2 is "Electromagnetic compatibility (EMC) – Part 3.2: Limits for harmonic current emissions (equipment input current up to and including 16 A per phase)."

being essential for the European Market only."[21] But the European Commission still has not decided how to implement this recommendation in the context of the forthcoming revision of the directive and harmonized standards. There is only limited indication that the EU might change the harmonized standard (EN 61000-3-2).

### U.S./EU Mutual Recognition Agreement

The U.S. and the EU recently negotiated mutual recognition agreements (MRAs) on conformity assessment. These agreements took effect on December 1, 1998 and cover recreational craft, telecommunications equipment, and products that must be inspected for electromagnetic compatibility. They included a two-year phase-in period for IT products to allow time for mutual acceptance of U.S. and EU test data.[22] After the two-year phase-in, each country will recognize the certifications of designated laboratories, inspection bodies, and conformity-assessment bodies within the other country.

The result of these MRAs is a reduction in the cost of such assessments and the time needed to bring new products to market. However, the Mutual Recognition Agreement for products that must be inspected for EMC does nothing to resolve the conflict over the regulations themselves.

## III. PAST U.S. LOBBY EFFORTS

### U.S. Opposition to EN 61000-3-2

Anticipating huge costs for complying with the EMC Directive's harmonic standards, U.S. trade associations and companies have actively lobbied against these standards for years. The largest amount of work was done prior to the second implementation deadline of February 1998, however the IT industry continues to actively monitor the activities of the EU legislature and continues to pressure the European Commission and standards-setting bodies through letter writing, etc. The IT industry's ultimate goal is to persuade IEC/SC77A to rewrite IEC 61000-3-2, and to get the Europeans to follow suit.

## IV. CONCLUSION

Although the EU adopted EN 61000-3-2 as a precautionary standard to protect against the potential threat of harmonic feedback, EN 61000-3-2 actually creates a technical barrier to trade. If this barrier is not addressed now, before it takes effect, it will likely be addressed before a World Trade Organization (WTO) dispute settlement panel.

[21] SLIM Report
[22] USITC, Global Assessment, p. 2-23.

# COMMERCIAL ANALYSIS: THE COST OF EN 61000-3-2

## Introduction

If the International Electrotechnial Commission and/or the European Union do not change their low frequency emissions (LFE) standard, many companies will be forced to alter their existing product designs and expend greater resources on new product designs.[23] These efforts alone will be very costly. Additionally, the standard will create new design constraints that add weight to products, increase end-of-product waste, limit technology gains achieved by product miniaturization and other factors, [24] and decrease product efficiency and reliability because of increased component counts. In some cases, the cost of compliance with the IEC/EU LFE requirements is expected to price products out of the market.

The following analysis examines the cost impact of the LFE limits imposed by EN 61000-3-2.[25] The analysis makes the assumption that manufacturers will adjust all production (whether sold domestically or abroad) to conform to the EU's regulations. It may be possible for some companies to alter production in order to produce separate products for Europe, but such product differentiation would be extremely costly in and of itself.

## The Cost of Compliance: The Big Picture

European Norm 61000-3-2 sets limits on allowable harmonic current emissions for equipment with input current less than 16 amps per phase. Assuming this limit will increase the cost of production of all categories of electronic/electrical equipment by two percent, and assuming that all production is made to comply with the limit, the standard will cost worldwide electronic/electrical manufacturers $50 billion annually by 2001—$17 billion each for U.S. and EU electronic/electrical manufacturers.[26] As for the information technology industry, conservative estimates (estimates that do not include

[23] Information Technology Industry Council (ITI) issue paper, "Trade Implications of European Regulations on Low-Frequency Electromagnetic Emissions.

[24] Based on a draft letter to U.S. Government written by the Low Frequency Emissions Industry Coalition (LFEIC).

[25] The overall impact of standards-related measures on trade is substantial. According to the Information Technology Industry Council, "duplication in mandatory U.S. and European testing and certification for computers, telecommunications equipment and other information technology (IT) products costs U.S. companies and consumer more than $1.3 billion annually." Even more alarming are indications that global welfare costs created by duplicative standards-related barriers to trade may be "several times larger than the direct costs of these measures." USITC, Global Assessment, p. 4-9.

[26] Estimates are based on the three-year period beginning January 1, 1998 and ending January 1, 2001. See Robert E. Gardinier, "Cost Impact of Implementing the IEC Harmonic Limits," 1998, p.1; William Johnson, "Trade Implications of European Regulations on LF Electromagnetic Emissions," June 17, 1999.

costs associated with product redesign and hardware testing) place the standard's cost at $3.4 - $5.6 billion annually.[27]

These increased costs will eliminate certain products from being manufactured. For example, the commercial light industry predicts that the cost of its high power commercial light dimmers will increase by 800 to 1000 percent—an increase that would make the dimmers unaffordable to most customers and thus unprofitable to manufacture. The same may happen for audio power amplifiers, for which production costs are expected to increase by 15 percent.[28] Lap top computers and other small IT equipment may not have the space to install the components necessary to meet the standard.

In the long run, the $50 billion annual cost estimate is likely to rise since this number is based on a modest two percent increase in production costs. While the number could shrink if enough products are priced out of the market, this might mean company bankruptcies and job losses.

Meeting the standard is also expected to increase consumer prices by three to five percent depending on product complexity and volumes.[29]

**The Cost of Compliance: Individual Product Impacts**

For the past 15 years, the majority of ITE products have used switched mode power supplies (SMPS), which offer size, weight, and cost advantages, but also are a source of harmonic currents. For low-power products (i.e., less than or equal to 130 watts) the harmonic currents are a relatively small problem. Such products can be brought into compliance with LFE limits by adding a series inductive component (a simple filter that prevents sudden current changes). The component does not change the operation of the power supply's rectifier circuits, but peak current and harmonic content are both reduced.[30]

Bringing higher-power products into compliance is more difficult. The most cost-effective way to reduce current harmonics for these products is to use active power factor correction (APFC) circuitry. However, this increases the component count of a typical SMPS by 10 to 20 percent, which, in turn, increases hardware costs, space requirements, and the effective failure rate of the power supply. Currently, the increase in hardware costs is estimated in the range of $.05-$.08 per watt for high production volumes (>100K). A higher percentage cost increase is expected for low volume products.[31]

[27] Gardinier p. 1. This estimate assumes 15 percent annual market growth. Exact cost figures will be presented at a meeting in Baltimore, MD in May this year.
[28] Based on a draft letter to the U.S. Government written by the LFEIC.
[29] Gardinier p. 1.
[30] Gardinier p. 1.
[31] Gardinier p. 1.

Bringing existing products into compliance with the LFE limits will be perhaps most costly. Because there is no grandfather clause in the European requirements, any product already in production that will stay in production after the January 1, 2001 deadline will have to have its power supply retrofitted. For products like PCs, which have short product-life cycles, this is not a serious problem. However, bringing products with longer product-life cycles (e.g. communication networking products) into compliance will result in substantial engineering and hardware costs. The cost of this type of retrofit is often as high as the cost of developing a power supply for a new product, which is a better use of resources.[32]

Consider the costs associated with retrofitting a product as simple as an electric coffee grinder. According to one of the electromagnetic interference (EMI) tests, called conducted emissions, a device should not generate an excessive amount of noise that may flow down the power cord back into the electrical power system. Because coffee grinders have this very problem, they must be equipped with an EMI noise filter. The problem is not the cost of the filter, but the time and resources needed to 1) locate space for the filter within the grinder; and 2) design a mounting system that complies with safety requirements such as insulation and spacing requirements.[33] Installing the filter also increases assembly time.

Keeping the coffee grinder example in mind, it should be easy to understand how the European LFE requirements could cause product costs to rise 15 to 600 percent. In fact, the EIA/CEMA estimate that material and labor costs will rise 600 percent in bringing audio and video electronic products that consume less than 600W into compliance with EN 61000-3-2.[34] This despite the fact that these particular products have an insignificant impact on the power system—an estimated total load of less than one-tenth of one percent of the total mains distribution network, i.e. insignificant.

**The Cost of Non-Compliance**

In 1998, total U.S. high tech exports to the European Union were valued at $36.5 billion. If 30 percent of U.S. exports to the EU were blocked because of EN 61000-3-2, the United States would lose almost $11 billion in exports, thereby decreasing the U.S. trade balance with Europe from $14.8 billion to $3.9 billion.[35] The loss would also translate into a loss of market position in Europe for U.S. technology companies—a loss that would be difficult to reverse.

[32] Gardinier p. 2.
[33] Ed Nakauchi, "Designing for Compliance," Appliance Manufacturer 47 (1999): 56, 2p.
[34] Industry letter from EIA/CEMA to Charles T. Zegers, Secretary of USNC/IEC, TC77A. 11/11/1998.
[35] The 30 percent figure is an assumption. No information has been compiled on the status of companies' efforts to comply with the European standard.

The loss is likely to hit larger companies disproportionately hard. Smaller companies that do not export to the EU or who only export minimal amounts may be able to sell their products for less in the United States while larger companies alter all production to conform to the standard (which would increase their total production costs and product prices). This would give smaller companies a better position within the U.S. market hurting the sales of larger corporations and possibly increasing their profit losses even further.

Conforming to the standard is expected to be particularly costly because of its ambiguous, difficult to interpret language. In fact, it is estimated that 50 to 70 percent of self-declared CE (European Conformity) marked products will fail their first compliance test.

# LEGAL ANALYSIS

## Introduction

The European Union's Electromagnetic Compatibility (EMC) Directive 89/336/EEC lays down apparatus protection requirements and leaves it to standards, primarily European harmonized standards, to define technical specifications for achieving those protection requirements. The EMC directive is a total harmonization directive that replaced all national EMC standards (as well as created some new ones).[36]

One of the new standards was EN 61000-3-2, which is designed to limit the low frequency emissions from products such as computers, toasters, and fluorescent lights. The legal basis for the standard is found in the preamble of the EMC Directive 89/336:

> "Member States are also responsible for ensuring that electric energy distribution networks are protected from EM disturbance which can affect them and, consequently, equipment fed by them."

Simply put, this means, or at least it is interpreted as meaning, that products should not create electromagnetic disturbances above a certain level, and that they should be sufficiently immune to such interference.

While the concern addressed in the Directive is reasonable, EN 61000-3-2 is problematic for three key reasons:

1) it violates the WTO Agreement on Technical Barriers to Trade (TBT Agreement);
2) it is ambiguous and internally inconsistent; and
3) it conflicts with other EU technical standard requirements.

(See Appendix B for a discussion of U.S. EMC requirements and further details concerning the EU's EMC Directive.)

## EN 61000-3-2 & the WTO Technical Barriers to Trade Agreement

Article 2.2 of the TBT Agreement states that:

> "Members shall ensure that technical regulations are not prepared, adopted or applied with a view to or with the effect of creating unnecessary obstacles to international trade. For this purpose, technical regulations shall not be more trade

[36] "Guidelines of the Council Directive 89/336/EEC of 3 May 1989 on the Approximation of the Laws of the Member States Relating to Electromagnetic Compatibility," 1st version published on 25/26 October 1993.

> restrictive than necessary to fulfill a legitimate objective, taking account of the risks non-fulfillment would create. Such legitimate objectives are, *inter alia*: national security requirements; the prevention of deceptive practices; protection of human health or safety, animal or plant life or health, or the environment. In assessing such risks, relevant elements of consideration are, *inter alia*: available scientific and technical information, related processing technology or intended end-uses of products." (Emphasis added.)

EN 61000-3-2 violates this article because there is no substantial scientific proof that low frequency emissions can pollute power lines to the point of being disruptive. Indeed, the need for the EU standard is based only on the theory that such disruptions might happen in the future as more and more data is transferred via electronic networks. But the IT industry has evidence to the contrary.

In 1998, the Information Technology Industrial Council (ITIC) in cooperation with IBM conducted a survey on the effects of LFE and harmonics. The purpose was to determine the extent of harmonics and other LFE-related problems inside customer facilities or in utility systems due to distributed harmonic sources. The sites chosen for the study had high concentrations of information technology equipment (ITE) and other distributed non-linear loads. For example, some of the manufacturing plants chosen contained over 22,000 personal computers, more than one hundred servers, and several mainframes.

Survey sites were located in Europe (44%), the United States (21%), Japan (14%), South America (13%), and Canada (8%). Of these 63 sites, 90.5 percent of those questioned, responded that they had no problems related to the use of non-linear loads inside their facilities/utilities that required corrective actions. The remaining 9.5 percent said that they had made minor changes within their facilities to rectify such problems. None of the sites reported that their utility suppliers had voiced any concerns over their low frequency emissions.

**EN 61000-3-2's Ambiguities**

Standards play a critical role in developing an environment that "promotes cost-effectiveness, uniformity, and stability."[37] However, the costs of poorly crafted standards can outweigh their benefits. In order to ensure that international harmonized standards are sensible and useful, the IEC recommends they:

- Establish explicit and unambiguous methods for demonstrating compliance,
- Reflect a cost/benefit perspective,
- Minimize imposition of mandatory requirements,
- Properly balance competing economic interests,

[37] McKim, A Manufacturer's Perspective.

- Evolve slowly to avoid rapid obsolescence of products and compliance test instruments, and
- Encourage utilization of "best practices" on a worldwide basis.[38]

EN 61000-3-2 fails to live up to the IEC recommendation. No cost/benefit analysis was undertaken as part of the drafting process, and because there is no proof that the standard is needed (at least in the case of ITE), the standard creates unnecessary costs.

The largest problem with EN 61000-3-2, however, is its internal inconsistencies and ambiguities:

- Equipment Class Definitions. The standard includes four classes (A, B, C, and D), and each is defined by a different means.[39] Classes B and C are defined as specific types of equipment, while Classes A and D are only partially defined by equipment type and otherwise defined by the shape of their current waveform and active input power.

- Harmonic Emissions Limits. The standard uses different limit definitions for each class of equipment. For Class D equipment, the standard's emissions-limit levels increase in proportion to the power consumption of a product. Class C lighting-equipment limits are defined in a similar manner, although in this case, limits are proportional to fundamental current. Specified, fixed limits are given for Class A and B equipment.[40]

- Power Measurement. The standard does not define how power measurements should be made or how Class D input current waveforms should be evaluated, and it uses different power measurements in different places.[41] In one place, for example, the standard defines Class D limits by rated load conditions. In another place, it defines power consumption as the mean value, taken over one period, of the instantaneous power. By contrast, manufacturers define Class D limits by the EUT's rated power consumption, and they find it more practical to do so.

**EN 61000-3-2 & Other EU Technical Standards**

The EMC Directive enabled the EU to implement numerous standards relating to electromagnetic compatibility and low frequency emissions. These new standards, however, sometimes conflict and overlap with other standards. For example, some manufacturers may use switching power supplies in order to comply with EN 61000-3-2, and this creates additional radio-frequency emissions that could make it more difficult, if

[38] James McKim, A Manufacturer's Perspective on Interpretive and Other Issues with EN 61000-3-2, H-P.
[39] James McKim, "How to Read and Use EMC Standards," Test & Measurement World, August 1998, p.1.
[40] McKim, How to Read.
[41] McKim, How to Read.

not impossible, to comply with EN 55013 and/or EN 55022.[42] Similarly, conformity may require the use of larger EMC "Y" filtering capacitors on some products, but this increases mains leakage current, which might make it possible for products to comply with the safety standards IEC65/IEC60065 and UL6500.[43]

[42] Position statement regarding EN 61000-3-2 from the National Systems Contractors Association (NSCA), November 11, 1998.
[43] ibid.

# STANDARD SETTING IN THE U.S. & E.U.

Technical barriers to trade have become priority concerns since the Information Technology Agreement reduced tariff barriers to trade for most information technology (IT) equipment. Because the United States' and the European Union's policies for developing technical standards are significantly different, technical barriers to U.S.-EU trade are increasing, not decreasing.[44]

## U.S. POLICY

U.S. standards usually percolate from the bottom up; the government plays a limited role in the process. Sometimes standards set by dominant companies or groups of companies become de facto, voluntary standards for an entire industry.[45] Other times, standards are set by one of the country's over 600 standards-development organizations—organizations that are nonhierarchical, governed by democratic rules relating to due process and voluntary consensus, and open to participation from foreign firms.

This fragmented approach to standard setting makes it difficult to promote U.S. standards abroad. It also makes the U.S. standards system less transparent, and manufacturers that export to the United States have complained about this difficulty.[46]

The standard-setting body that represents the United States within the IEC (and the ISO) is the American National Standards Institute (ANSI), a self-designated, private, national coordinating body for U.S. standards.[47]

## EU POLICY

The European standard-setting system is a centralized, top down approach designed to balance national government interests with European Commission interests. The main EU standards-development bodies are the European Committee for Standardization (CEN), the European Committee for Electrotechnical Standardization (CENELEC), and the European Telecommunications Standards Institute (ETSI).

Many U.S. manufacturers have complained that the EU standards-setting process is non-transparent and that it discriminates against non-European companies. This complaint stems largely from the fact that, unlike U.S. voluntary standards-setting bodies, European

[44] USITC, Global Assessment, p. iii.
[45] USITC, Global Assessment, p.3-10.
[46] USITC, Global Assessment, p. 3-12.
[47] USITC, Global Assessment, p. 3-10.

standards-setting bodies generally do not allow foreign firm participation.[48] Moreover, some U.S. industry representatives have complained that EU technical regulations/standards are created within the EU Commission without adequate input from EU or foreign industries until the process is well advanced.[49]

The most important difference between U.S. and European policy, however, is that the EU actively promotes its standards and standards-process abroad, providing millions of dollars for electronic component test laboratories in large developing markets.[50] Moreover, the EU Commission and member country governments work much more closely with key international bodies like the ISO and the IEC. According to the U.S. International Trade Commission, "some analysts believe that the substantial support the EU and member countries provide to these standards-setting bodies has strengthened these bodies' role in international standards activities, providing European companies with more effective representation and influence than U.S. firms in such work."[51] In 1991, just 22 percent of U.S. national standards were identical or technically equivalent to either ISO or IEC standards in 1991. By contrast, 85 percent of the EU standards produced by CEN or CENELEC were identical to ISO or IEC standards.[52]

This problem is only exacerbated by the fact that the U.S. IT industry tends not to participate in standards-development activities.[53] Indeed, because the U.S. IT industry failed to get involved with IEC Sub-Committee 77A, the low frequency emissions standard IEC 61000-3-2 was drafted by a committee dominated by the utility industry.

[48] USITC, Global Assessment, p. 3-14.
[49] USITC, Global Assessment, p. 3-15.
[50] "ITC Report Details Standards Barriers to Information Tech Trade," Inside U.S Trade, November 20, 1998
[51] USITC, Global Assessment, p. 3-15.
[52] USITC, Global Assessment, p. 3-15.
[53] USITC, Global Assessment.

# STAKEHOLDER ANALYSIS

The Europeans' close relationship with international standards-setting bodies like the ISO and IEC was key to the development of EN 61000-3-2. It was not, however, the European electronic/electrical equipment manufacturers that pushed for the adoption of EN 61000-3-2, but rather the European power producers. Power producers dominated the committees responsible for the standard in both the IEC and CENELEC despite the large impact the standard will have on the electronic/electrical industries.

## I. THE EUROPEAN UTILITES INDUSTRY

IEC sub-committee 77A (SC77A) was formed and began working on the development of a harmonics standard in 1981. But it wasn't until 1988, after seven years of work, that representatives from the IT industry were included on SC77A. By that time, it was already focused on the interests of the European utility industry. Despite IT industry complaints, the standard quickly grew to encompass all products connected to electric utility power lines.[54] When in the early 1990s, TC74/WG9[55] discovered some safety problems associated with high harmonic currents and circulated several proposals to address these problems, SC77A was unwilling to accept the proposals.[56] "Dr. Gretsch, convenor of SC77A/WG1, agreed that at least one of the proposals was logical, but he was not willing to agree to a change or write IT into the second half of 61000-3-2 (1KW to 16 amps)."[57]

Currently, IT manufacturer participation in SC77A is gradually increasing, particularly within WG1 (harmonics). Now, the agenda and content is being more influenced by objective data brought to the table by manufacturers. However, the attitude toward the IT industry's presence on SC77A and its working group is still somewhat negative. For example, some SC77A members have recently started a campaign against the IT industry saying that it is trying to get special and unfair advantage from various proposed amendments (e.g. 77A/261/CDV and 77A/262/CDV).[58]

[54] According to a letter from sub-committee member John Roberts to Dr. Girts Zeidenbergs of IBM, the committee did not even acknowledge in its minutes a paper presented to the sub-committee by Dr. Mack Grady of the University of Texas on the cancellation of harmonics in industrial and commercial buildings and low voltage distribution systems. The Roberts letter also quotes a sub-committee member stating: "Where have you been the past 7 years, you come in now and try to tell us what should be in the document. The pie has been allocated and there is only 25% left for all you late comers."

[55] TC74/WG9 was established to develop a harmonic current limit standard for information technology equipment (ITE) that could be accepted and supported by the IT industry. TC74 was responsible for preparing safety and the energy efficiency requirements for ITE, including electrical business and telecommunication equipment.

[56] The proposals wereWG9/SEC/411, WG9/SEC/13, and 74/436/CDV. They were rejected by the IEC on May 15, 1996.

[57] Roberts.

[58] James McKim. A report given at EIA to LFEIC on June 17, 1999.

There are several reasons why the European utilities want to limit low frequency emissions from products. The main reason seems to be that European utilities wish to begin delivering high-speed, residential Internet access over power lines. In early 1999, 10 European utilities in Sweden, Germany, the Netherlands, Italy, and England began testing the feasibility of such service. If the tests prove successful, so-called digital-power-line service may open a large market in Europe that could put utilities in direct competition with traditional telecommunications companies for voice and data services.[59] The utilities probably developed IEC/EN 61000-3-2 in order to guard against the theoretical possibility that LFE emitted by electronic/electrical products could impede the development of digital-power-line service.

IEC/EN 61000-3-2 also solves problems that the older, more inefficient, southern European utilities are having because of the increased use of electronic/electrical products. Instead of upgrading and rebuilding these utilities, the industry sought to remedy the problem via the standard.

Some electronic/electrical product manufacturers also believe that Electricité de France (EDF) is behind the LFE requirements. EDF is a world operator in the power field and is pursuing an international strategy based on investment and the sale of services. Recently, EDF expanded its presence in Europe and strengthened its position as a partner European electrical utility. It is also one of the leading operators in this market, which is undergoing far-reaching changes and moving toward unification. One of these far reaching changes may be to not only deliver energy, but Internet services as well.

## II. NON-GOVERNMENTAL AND QUASI-GOVERNMENTAL INSTITUTIONS

### American National Standards Institute (ANSI)[60]

For more than 80 years the American National Standards Institute (ANSI) has served as administrator and coordinator of the United States private-sector voluntary standardization system. Since its founding in 1918, the Institute has remained a private, non-profit membership organization supported by a diverse constituency of private and public sector organizations.

ANSI promotes and facilitates the development and use of voluntary consensus standards and conformity assessments systems; it represents the interests of companies, organizations, government agencies, and institutional and international members.

[59] "Europeans Try Internet Access Over Power Lines," Photonics Spectra, February 1999.
[60] ANSI Online: http://web.ansi.org/public/about .html

ANSI does not itself develop American national standards. Instead, it facilitates development by working to build consensus among qualified groups. The more than 175 distinct entities currently accredited under one of ANSI's three methods of accreditation (organization, committee or canvass) are required to follow its guiding principles—consensus, due process, and openness.

ANSI's most important role in the context of IEC/EN 61000-3-2 is that it serves as the sole U.S. representative and dues-paying member of the International Electrotechnical Commission (IEC).[61] The U.S. National Committee (USNC), which represents ANSI in the IEC, is one of 12 members on the IEC's governing Committee of Action. The current president of the IEC is American.

ANSI participates in 91 percent of all IEC technical committees and administers many key committees and subgroups (17 percent in the IEC). An important committee established by the USNC is the U.S. Coordinating Committee on Electromagnetic Compatibility (USCCEMC), which has three duties. It:

- coordinates the U.S. position in the various IEC technical committees, sub-committees and working groups that deal with electromagnetic compatibility matters;
- reviews all positions taken in the Advisory Committee on Electromagnetic Compatibility (ACEC) and advises the USNC on what positions it should take in the Committee of Action with regard to these and other EMC matters; and
- provides advisory information on EMC matters to the U.S. representative (or representatives) serving on ACEC.

**TransAtlantic Business Dialogue (TABD)**

The TABD offers a framework for enhanced cooperation between the transatlantic business community and the governments of the European Union and the United States. The TABD's aim is to boost transatlantic trade and investment opportunities by removing costly inefficiencies caused by excessive and redundant regulations, and by differences in the EU and U.S. regulatory systems and customs procedures. Because the TABD currently is working to place guidelines for regulatory cooperation within the Transatlantic Economic Partnership (TEP) Action Plan, it may be an appropriate forum in which to address the problems associated with IEC/EN 61000-3-2.

**European Power Supply Manufacturers Association (EPSMA)[62]**

The EPSMA was formed to provide a forum for discussing and addressing issues of concern to power supply manufacturers and users. It represents more than 75 percent of European power supply manufacturers. Among other functions, EPSMA provides members with information concerning European Commission proposals to harmonize

[61] ANSI Online: http://web.ansi.org/rooms/room_22/public/gen_info/purpose.html
[62] www.epsma.org.

laws, regulations and standards that affect the power-supply industry. It also acts as a lobbying group during the formation and introduction of new legislation.

EPSMA opposes undermining or changing the EMC Directive. It specifically opposes any changes to EN 61000-3-2, as well as any postponement of its implementation. EPSMA's main argument is that power-supply manufacturers have been designing products with the expectation of full conformity to EN 61000-3-2 on January 1, 2001. If the professional IT industry gets an extension of this deadline, it will seriously disrupt power-supply production. Also, EPSMA rejects any attempt to label "Professional IT Equipment" as separate from other professional equipment for fear that this will become abused by other manufacturers. EPSMA is a formidable trade association that will have to be monitored and considered during the implementation of the lobbying strategy.

**European Information and Communications Technology Industries Association[63]**

In 1999, the two relevant European trade associations—the European Association of Manufacturers of Business Machines and Information Technology (EUROBIT)[64] and the European Telecommunications and Professional Electronics Industry (ECTEL)[65]—merged to form the European Information and Communications Technology Industries Association (EICTA). Although EICTA is intended to provide a new and integrated voice for these industries, there has been some dispute between the two groups on how to deal with the EMC issue. EUROBIT has been a strong supporter of the U.S. position and has actively lobbied the European Commission on behalf of the IT industry. ECTEL, on the other hand, has focused its attention on radio emissions and the problems of immunity as prescribed in the EMC Directive.

EUROBIT (and the rest of the European IT industry) was not involved in the development of EN 61000-3-2. It filed its first protests with CENELEC in the spring of 1995. It was EUROBIT that negotiated with CENELEC and the European Commission to get the initial implementation date for EN 61000-3-2 extended from 1996 to 1998.

**The European Committee for Electrotechnical Standardization (CENELEC)**

CENELEC is the European Union's main standard-setting body. It was established in 1973 as a non-profit organization under Belgian Law, but European Commission

[63] www.eurobit.org.
[64] The European Association of Manufacturers of Business Machines and Information Technology (EUROBIT) was formed in 1974 as a European federation of national IT industry associations. EUROBIT represents 2,000 companies in 14 European countries via its member associations. It represented more than 90 percent of the European industry in the field of information technology, business machines, and telecommunications terminal equipment, including hardware, software and services.
[65] ECTEL was established in 1985 and was the representative body of the European Telecom Equipment systems and the Professional Electronics Industries. Its members were the relevant trade associations in the member states of the EU and EFTA.

Directive 83/189 established it as the official European standards organization in its field. CENELEC's members have been working together in the interests of European standards harmonization since the late 1950s. It works with 40,000 technical experts from 19 European Union and European Free Trade Area countries to publish standards for the European market.

The highest-level body within CENELEC is the General Assembly (AG), which makes all policy decisions and is composed of delegations from each of the European Union's 19 National Committees (NCs). CENELEC's Administrative Board is made up of eight officers and is led by a president. The Administrative Board supervises all CENELEC work to ensure that it is carried out according to the AG's resolutions. Technical Boards (BT) coordinate the work of the technical bodies, which include Technical Committees (TCs) and Sub-Committees (SCs), Special Task Forces (BTTFs) and Working Groups (BTWGs). The BT is made up of one permanent delegate from each NC, and it decides on ratification of draft standards prepared by the technical bodies.

The majority of initial-standards documents come to CENELEC from the International Electrotechnical Commission (IEC) (e.g. EN 61000-3-2 was originally IEC 61000-3-2). Once a suitable draft is available, it is submitted to the NCs for CENELEC inquiry (lasting six months). Comments from the NCs are studied by the appropriate technical body and incorporated into a standard, where justified, before final vote.

To ratify a standard, the vote must yield: 1) a majority of NCs in favor of the document and 2) at least 71percent of the weighted vote.[66] (The weighted vote is based on population size. The votes of larger countries like France and Germany are weighted more heavily than those of smaller countries).

The CENELEC committee with primary responsibility for EN 61000-3-2 is CLC/TC 210. The membership of this committee is very similar to the membership of IEC committees TC77 and SC77A.

[66] European Union, Europa Website, "General Information on CENELEC," www.cenelec.org/generalinfo/hp_general_info.htm.

## III. GOVERNMENT

### A. European Union

### European Council of Ministers[67]

The Council of the European Union (Council of Ministers) and the European Commission are the key policymaking bodies within the EU government. The Council of Ministers sets political objectives, coordinates national policies and resolves differences between member states and other institutions. The Council is the main decision-making body within the EU. Each Council meeting brings together member states' representatives, usually ministers.

The Council of Ministers is also responsible for adopting community law. It may establish regulations that are directly applied without the need for national measures to implement them or, conversely, it may issue directives that bind member states to achieve specified objectives but allow national authorities to determine how they will achieve these objectives.

### European Commission[68]

The European Commission lies at the heart of the European Union's policymaking process. The other institutions of the EU derive much of their energy and purpose from the European Commission. The European Council and Parliament, for example, need a proposal from the Commission in order to pass new legislation. The Commission is responsible for upholding EU law and policing the integrity of the single market. It also orchestrates research and technological development programs.

Twenty members of the Commission provide its political leadership and direction. At the head of the Commission is a president chosen by the European Council. The Commission meets once a week to conduct its business, which may involve adopting proposals, finalizing policy papers and discussing the evolution of its priority policies.

The Commission has a staff of 15,000 employees, which makes it the largest of the Union's institutions. It is divided into 26 directorates-generals (DGs) with an additional 15 or so specialized services. Each DG is headed by a director-general who reports to a commissioner with the political and operational responsibility for the work of the DG.

[67] European Union, Europa Website, The Council of the European Union, www.europa.eu.int/inst/en/cl.htm.
[68] European Union, Europa Website, The European Commission. www.europa.eu.int/inst/en/com.htm.

However, the Commission is not all-powerful. It does not make the main decisions on Union policies and priorities—which is the prerogative of the Council and, in some cases, of the European Parliament.

The Commission is a primary lobbying target because it is responsible for proposing legislation to the Council of Ministers and the Parliament. Moreover, because the Commission implements EU policies, it is the Commission that has to be persuaded to postpone implementing EN 61000-3-2 prior to January 1, 2001. The Commission is also important because it can decide to adopt a revised version of the standard or to not implement the standard at all.

**Key EU Government Offices and Officials**

Within the European Commission, the Enterprise Directorate-General (DG), under Commissioner Erkki Liikanen, is responsible for Industry, Information Technology and Telecommunications (and thus the EMC Directive). The key objective of the Enterprise DG is to promote the competitiveness of European industry.

The Enterprise DG is the directorate responsible for electronic/electrical products and has issued the recommendations for regulations that protect power-supply networks from disturbances caused by LFE. The specific unit responsible for LFE concerns is DGIII/B/2. Mr. Cornelius Brekelmans is the deputy head of this unit.

## B. United States

**Key U.S. Government Offices and Officials**

Various offices and people within the U.S. Departments of Commerce and State and the Office of the U.S. Trade Representative (USTR) will be important in resolving this issue.

In the Department of Commerce (DOC), the main office concerned with the EMC issue is the European Office. The person to contact within that office is Deputy Assistant Secretary for Europe Charles Ludolph. Another important DOC office is the Office of European Union and Regional Affairs, and the key contact there is Victoria A. Kader.

The key official to contact within the Department of State is Marc Grossman, Assistant Secretary of State for European and Canadian Affairs.

Within USTR, the key contact is Catherine Novelli, Assistant United States Trade Representative for Europe and the Mediterranean.

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Another important member of the U.S. government is Ambassador Charles Ford of the U.S. Mission in the EU.

**Congress**

The following list includes members of Congress that have major IT plants in their districts, as well as the chairs of relevant House committees. The list rates each member based on how high-tech friendly he or she is. The higher the number (100 is the highest), the more high-tech friendly the representative. The scale is based on yes and no votes on high tech legislation.

Representatives:
F. James Sensenbrenner (R-9th-WI)
Charles H. Talyor (R-11th NC) - 67
Robert A. Weygand (D-19th FL) - ?
William Clay (D-1st MO) - 22
Zoe Lofgren (D-16th CA) - 100
Sam Farr (D-17th CA) - 90
Thomas M. Reynolds (R-27th NY) - ?
Louise Slaughter (D-28th NY) - 80
Stephanie Tubbs Jones (D-11th OH) - ?
Christopher Shays (R-4th CT) – 90
Steven T. Kuykendall (R-36th CA) - ?
Sherwood L. Boehlert (R-23rd NY) - ?
Eddie Bernice Johnson (D-30th TX) - 70

# RECOMMENDATIONS

**The Problem**

The European Union's standard (EN 61000-3-2) for controlling harmonic emissions has become a serious issue of dispute between utility companies and electronic/electrical equipment manufacturers.

The crux of the problem is that, although there is no agreement on the severity of existing harmonic emissions, the severity of potential future problems, and therefore, the need to control harmonic emissions, EN 61000-3-2 places the entire burden of preventing harmonic interference on product manufacturers. It doesn't make the utilities industry take any responsibility for cleaning noise from its power lines.

The IT industry is also concerned with the difficult and ambiguous language of EN 61000-3-2, and the fact that by conforming to EN 61000-3-2, some products will come into conflict with other European standards.

**Recommendations**

1. *Short Run*: Persuade the European Union to postpone the implementation of EN 61000-3-2 until after the IEC and CENELEC rewrite and review, respectively, the standard and allow for ample time for the electronic/electrical industry to conform.

2. *Long Run*: The IT industry needs to participate more actively in IEC committees TC77and SC77A as they prepare the revised version of EN 61000-3-2 and as they draft future standards.

The short-run step is essential for avoiding unnecessary costs. If the European Union doesn't postpone implementation until after the IEC rewrites the standard, electronic/electrical manufacturers will have to first conform to the current version and then, a few years later, will likely have to conform to a new version of EN 61000-3-2.

In the long run, it is essential that the IT industry participate in the redrafting of IEC/EN 61000-3-2 to ensure, at a minimum, that the redrafted standard takes full account of the IT industry's concerns. Active participation in the redrafting process also will provide the industry with an opportunity to try to remove IT equipment from the LFE requirements.

The IT industry will need to stake out a strong presence in IEC/SC77A to offset the influence and greater representation of the European utilities industry. Additionally, the IT industry will need to ensure that the United States National Committee will support its efforts.

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A good standard will:

- establish explicit and unambiguous methods for demonstrating compliance;
- be based on scientific evidence and encourage a dialogue between governments on precautionary measures;
- reflect the cost/benefit realities for all industries concerned;
- minimize imposition of mandatory requirements;
- properly balance competing economic interests;
- be implemented slowly to avoid rapid obsolescence of products and compliance test instruments; and
- encourage utilization of "best practices" on a worldwide basis.

By participating fully in the rewriting of IEC/EN 61000-3-2, the U.S. IT industry should be able to ensure that its interests are met. The main goal of the U.S. IT industry is to have easy-to-follow and understand standards that ease the flow of trade instead of creating barriers to it.

# STRATEGY

In order to ensure that the IEC adopts a new harmonic emissions standard that fully accounts for the IT industry's interests, the IT industry should pursue a comprehensive strategy both domestically and abroad. As detailed below, this strategy will involve legislative, media, and negotiation strategies. The Coalition on Harmonic Emission Issues (CHEI) will be formed to organize and implement the strategy. Immediate action is called for in order to beat the January 1, 2001 deadline for compliance with EN 61000-3-2.

## DOMESTIC STRATEGY

CHEI will need to build support in the United States from the electronic/electrical industry, the U.S. Congress, the Office of the United States Trade Representative (USTR), and the U.S. Departments of Commerce and State.

To be successful, CHEI will need to educate members of the electronic/electrical industry, gather objective data, and fund industry participation in the standards-setting technical committees. Each member will be expected to attend CHEI meetings and will keep industry members updated with information and progress reports. Additionally, members will be responsible for lobbying Congress; will be called upon to use their European offices to lobby the European Council; and will be expected to participate in the International Electrotechnical Commission Technical Committee (TC) 77 and its Sub-Committee (SC) 77A.

CHEI should take two immediate steps. It should:

- issue a letter to all electronic/electrical equipment manufacturing companies to inform them about this issue and solicit industry support for the coalition.
- collect funds from members of the coalition and from outside sources to fund collection of harmonic feedback data in Europe. This data will be crucial for pushing the IEC and CENELEC to adopt a standard that doesn't overestimate the problem.

### U.S. LEGISLATIVE STRATEGY

In order to build congressional support for a revision of EN 61000-3-2, individual coalition member companies should focus their attention on each of the congressional representatives in their districts. In addition to this grass-roots style approach, the coalition should send a letter to the entire House of Representatives.

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**Objective:** The goal of the U.S. legislative strategy is to persuade the U.S. Congress and the U.S. government to pressure the EU to revise or at least postpone the implementation of EN 61000-3-2. This is important because EN 61000-3-2 in its current state poses a technical barrier to trade and creates unnecessary costs for the electronic/electrical industry.

The first step is to prepare informational documents to present to the U.S. Congress, the Department of Commerce (DOC) and the Office of the United States Trade Representative (USTR). These documents should include the following:

- Lobbying packet, including white paper (Exhibit 7) and dear colleague letter (Exhibit 4).
- Fact sheet on the costs of conforming to EN 61000-3-2.
- USCCEMC Harmonics Position Paper (Exhibit 9).
- Report on the importance of the European market to the U.S. electronics industry and especially the IT industry (Appendix A: Macroeconomic Analysis).

*Lobbying Congress*

Each core member should send company representatives to visit their congressional representatives. They should:

- Meet the congressperson him/herself, if possible. Otherwise meet with a staff member.
- Mail letters to each member of the House and the Senate.
- Telephone congresspersons and staff members.
- If at all possible, give testimony at a committee hearing (including hearings held by the House Ways and Means Subcommittee on Trade and the Senate Finance Committee).
- Garner support of a congressperson and persuade him/her to send letters to fellow congresspersons.
- Convince a congressperson to prepare legislation to support full U.S. participation in international standards preparation.

Key House members who should be lobbied include:

F. James Sensenbrenner Jr. (R-9 WI), Chair of Science Committee
Connie A. Morella (R-8 MD), Chair of Science Subcommittee on Technology
Bill Archer (R-7 TX), Chair of Ways and Means Committee
Philip M. Crane (R-8 IL), Chair of Ways and Means Subcommittee on Trade
Charles H. Taylor (R-11 NC)

Robert A. Weygand (D-19 FL)
William Clay (D-1 MO)
Zoe Lofgren (D-16 CA)
Sam Farr (D-17 CA)
Thomas M. Reynolds (R-27 NY)
Louise Slaughter (D-28 NY)
Stephanie Tubbs Jones (D-11 OH)
Christopher Shays (R-4 CT)
Steven T. Kuykendall (R-36 CA)
Sherwood L. Boehlert (R-23 NY)
Eddie Bernice Johnson (D-30 TX)

*Please see institutional analysis for tech-friendly rating of each member listed above.

***Lobbying the DOC, DOS and USTR***

Letters (Exhibit 6) should be sent to U.S. Government officials in the Departments of Commerce and State, and the United States Trade Representative. These letters should be designed to solicit support for the IT industry's position and request assistance in communicating with the European Union. These letters should contain the following:

- Brief background of the EN 61000-3-2 standard
- Information on the costs of complying with the standard
- Request for support

Letters should be sent to:

- Charles Ludolph, Deputy Assistant Secretary for Europe
- Victoria A. Kader, Office European Union and Regional Affairs
- Charles Ford, Ambassador, U.S. Mission to the EU
- Catherine Novelli, Assistant USTR for Europe and the Mediterranean
- Marc Grossman, Assistant Secreatary of State for European and Canadian Affairs

After sending letters, a few of the coalition members should schedule meetings with officials at the Departments of Commerce and State, and the Office of the United States Trade Representative. These meetings are essential because such meetings demonstrate the importance of the issue to the IT industry and give the coalition an opportunity get a sense of these officials' views on the issue.

The goal of the lobbying effort should be to ensure that the U.S. government will put pressure on the European Union to rewrite, or at least postpone implementing, EN 61000-3-2. Specifically, the coalition would like to see the Administration:

- Officially inform the European Union of U.S. industry concerns. Charles Ford, the Ambassador to the European Union, is in an ideal position to spread the word about this issue within the EU government.
- Apply pressure on counterparts in the European Commission to postpone implementation of EN 61000-3-2.
- Encourage CENELEC to support delayed implementation of EN 61000-3-2 and to adopt the rewritten version that the IEC is currently preparing.
- Assign a U.S. representatives to IEC Subcommittee 77A to fully participate in the rewriting of IEC 61000-3-2.
- If necessary, negotiate with DG Enterprise an acceptable solution to the problem.

***Lobbying the United States National Committee (USNC)***

It should be quite easy to gain support from the USNC since the U.S. Coordinating Committee on Electromagnetic Compatibility (USCCEMC) has already taken a position that is fully consistent with the IT industry's (and the coalition's) own position. Support from USNC is crucial because USNC is responsible for appointing members of the IT/electronic/electrical industry to participate within the technical committees of the IEC. In order to ensure USNC support, the coalition should:

- Send a letter (Exhibit 1) to Charles Zegers of USNC/ANSI in order to request support and ensure that USNC appoints IT/electronic/electrical equipment industry representatives to participate in TC77 and SC77A.
- Meet with representatives (Mr. Zegers) from the USNC in order to coordinate activities within the IEC.

# MEDIA STRATEGY

**Objective:** The goal of the media strategy is to build support from within the industry itself and to inform industry members of both the seriousness of the EN 61000-3-2 issue and what is being done about it.

**Strategy:** To accomplish this, the coalition should prepare op-eds, press releases, and advertisements to draw attention to the issue. Because the general public will not be very interested in this issue, the coalition should focus its efforts on industry-specific publications, not mainstream media outlets such as national and local newspapers (although publications *like The Financial Times, The Wall Street Journal, and the Journal of Commerce* should be considered). The coalition should also hold press conferences and debates between power-supply manufacturers and electronic/electrical product manufacturers.

The media strategy should cover both the United States and the European Union (see below for European strategy). It should target:

- Electronic/Electrical (specifically ITE) manufacturers
- Electronic/Electrical Engineers
- Investors in electronic/electrical companies
- Knowledgeable citizens
- U.S. government officials (of DOC, USTR)
- Members of U.S. Congress

Two key publications that should be given top priority include *Electronics Weekly* and *Electronics Business*:

- *Electronics Weekly* printed at least two article in 1999 that opposed the IT industry's goals. These two articles were "Cross Wires" (February 10, 1999) and "Euro EMC Fudge" (March 24, 1999). The IT industry needs to present itself in a better light to the readers of this publication. This could be done by writing an op-ed piece or by placing an advertisement in the publication.

- *Electronics Business* attracts over 52,000 management-level subscribers, so it is a great place to gain coverage of EN 61000-3-2.

Other publications that might be targeted include:

Specialty Publications
- Electronics Now
- Electronic Business
- Electronics Weekly
- IEEE Publications
  - IEEE Technology and Society Magazine
  - IEEE Industry Applications Magazine
  - IEEE Computer Applications in Power Magazine
  - IT Professional Magazine
  - IEEE EMC Society Newsletter
- Electronic News
- Electronic Product Design
- Electronics Times
- EMC Engineering
- Journal of Industry and Technology (Greentrees Publications)
- Industrial Technology (New Wave Publishing Ltd.)
- PC Magazine

Business Newspapers
- The Wall Street Journal
- The Financial Times

California Publications
- San Jose Mercury News (Silicon Valley) (Business Section)
- San Francisco Chronicler (Business Section)
- Los Angeles Times (Business Section)

Washington, DC
- Washington Post

Specifically, the coalition should:

- Write op-ed pieces (prepared by technicians and policy experts) and letters to the editors of key industry magazines listed above.
- Prepare an op-ed piece (Exhibit 7) for U.S. newspapers such as the Wall Street Journal, San Jose Mercury News, the Journal of Commerce, and the Washington Post
- Meet with newspaper and magazine reporters in order to persuade them to write articles that articulate the IT industry position.
- Issue press releases on coalition-member activities to industry publications and post them on coalition members' web sites.
- Issue press release with results of the coalition's survey on harmonic problems in the EU.
- Buy advertising space in key industry publications.

# EUROPEAN UNION STRATEGY

The Coalition on Harmonic Emission Issues should establish a working party in the European Union to carry out the European legislative and media strategies. The members of this group will come from U.S. companies with subsidiaries in Europe, European companies, and from European and American trade associations.

*Coalition Building*

A key first step is to build a coalition that includes European companies and trade associations. It will be essential to have European industry support for sending letters to and meeting with members of the European Commission. European companies will also be helpful if the debate comes down to European utilities versus the American and European electronic/electrical equipment manufacturers.

Key U.S. companies and trade associations with branch offices and subsidiaries in Europe include:

American Companies
Xerox
IBM
Lucent
Hewlett-Packard

American Trade Associations
American Electronics Association Europe (AEA Europe)
Telecommunications Industry Association

American Government Offices
United States Department of Commerce Foreign Commercial Service
United States Embassy

Transatlantic Business Dialogue (TABD)
Group I - Standards & Regulatory Policy
EU Chair: Hakan Mogren, Deputy Chairman of Astra Zaneca
U.S. Chair: Fred Smith, President and CEO of FEDEX

Key European companies and trade associations include:

European Companies
Thomson Corporation
Royal Philips Electronics
Siemens
Heywood Willliams Ltd.
Olivetti Lexikon

European Trade Association
European Information and Communications Technology Industries Association (EICTA)

**Short Run Strategy**

Working party members will lobby the European Commission to postpone implementation of EN 61000-3-2 indefinitely or until the IEC rewrites the standard and CENELEC adopts the new version. The working party should immediately:

- Send letters (Exhibit 3) to DG Enterprise calling for it to postpone implementation of EN 61000-3-2 for another two to four years, or until the IEC rewrites the standard.
- Send letters to (Exhibit 2) to CENELEC seeking its support for postponement.

- Encourage the TransAtlantic Business Dialogue (TABD) to push concerns about the EMC regulations, specifically about the low frequency emissions standard EN 61000-3-2, into its dialogue with the EU government on the issue of technical barriers to trade. The coalition should also solicit the support of the TABD Working Group I – Standards and Regulatory Policy. This group is working towards an "approved once, accepted everywhere" regulatory model and has worked out detailed action plans for removing obstacles associated with duplicative standards, testing and certification procedures.
- Send letters to CENELEC (Exhibit 2) expressing support of committee TLC/TC 210's decision to review EN 61000-3-2. The committee should also be encouraged to support postponement of the implementation deadline for the current version of EN 61000-3-2.

Next, the working party should schedule meetings with key members of the Commission. At these meetings, the following informational documents should be left behind:

- White paper (Exhibit 8)
- Fact sheet
- United States National Committee: Powerline Harmonics Position Paper (Exhibit 9)
- Costs evaluation
- Results of the IBM survey of European plants

Finally, the USNC should begin lobbying the European National Committees for their support in rewriting EN 61000-3-2. The Danish National Committee has already shown its support regarding other EMC regulations so this would be a good place to begin lobbying efforts.

**Long Run Strategy**

For the long run, the working party should ensure that IT industry representatives participate on a regular basis in CENELEC Committee CLC/TC 210 as it reconsiders and revises EN 61000-3-2 and considers other relevant standards.

Because CENELEC committees are closed to foreign national participation, it will be up to citizens of the EU to participate in these committees. However, since CENELEC originally adopted the standard whole from the IEC, European representatives from the IT industry should encourage CENELEC to participate in SC77A as it revises IEC 61000-3-2 and then to adopt the revised-version once it is finished.

# MEDIA STRATEGY

The media strategy should cover the entire European Union but give particular attention to Germany, France and the United Kingdom. Targets of the media strategy are:

- European Union Government (Commission)
- CENELEC
- European utilities
- European electronic/electrical equipment manufacturers
- European businesses
- European consumers
- the public
- electronics/IT industry
- electronic/electrical engineers

Specific media outlets that should be used include:

Europe:
- Electric Utilities
- Power Plays
- Financial Times

Germany:
- Ausgewahlte Zahlen zur Energiewirtschaft
- Der Elektromeister + Deutsches Eletrohandwerk
- Elektro Wirtschaff

France:
- Electronique Techniques et Industries
- Industries Electriques et electroniques
- Science Magazine

United Kingdom:
- Electrical Wholesaling

The CHEI working group will be responsible for both monitoring domestic and international media and keeping the CHEI in the U.S. informed of activities in support of and against its goals.

Specific actions the working party should take are to:

- Send op-eds pieces to the publications listed above.
- Meet with editorial boards of these publications in order to inform them of the current situation, with the goal of gaining their support (i.e. write advocacy pieces).
- Offer to be interviewed on this issue and/or provide information to writers/reporters of above publications.
- Issue press releases of relevant activities.
- Issue press release on results of survey currently being conducted in Europe.
- Buy advertising space in selected publications.

# INTERNATIONAL STRATEGY

The international strategy has two parts: 1) ensuring U.S. participation in IEC SC77A as the subcommittee rewrites IEC/EN 61000-3-2; and 2) gaining Japanese government and business support for the postponement and redrafting of IEC/EN 61000-3-2.

**Ensuring U.S. Participation in IEC SC77A**

The IT industry needs to participate actively in IEC committees TC77and SC77A as they prepare the revised version of EN 61000-3-2. This is essential to ensure that the IT industry's interests are not ignored and that science is used as the basis for designing a cost-efficient standard.

CHEI members who are appointed by the USNC to TC77 and SC77A need to attend all meetings of relevance. The IT industry must ensure representation at the following upcoming meetings:

- The Advisory Committee on Electromagnetic Compatibility (ACEC) meeting on April 25-27, 2000 in Fontenay aux Roses, France. (This is a great opportunity to express opinions on IEC 61000-3-2.)
- The ACEC meeting in September 18, 2000 in Stockholm, Germany.

Additionally, the United States National Committee (USNC), and particularly the U.S. Coordinating Committee on Electromagnetic Compatibility (USCCEMC), should continue to build support among other countries' national committees and begin to put pressure on the IEC to draft responsible science-based standards and to balance out the utilities versus IT industry representation on IEC/TC77 and IEC/SC77A. (Exhibit 5 provides a sample letter expressing this view.) The USNC will also need to balance the various views of U.S. industry in order to achieve the most acceptable outcome.

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An immediate opportunity for the USNC to push the IT industry's concerns is at the IEC's Committee of Action meeting on May 25-26, 2000 in Geneva. This committee is responsible for the management of the IEC's standards work including the creation, dissolution and scopes of the IEC technical committees. Frank K. Kitzantides and Charles Zegers represent the U.S. in the Committee of Action. Members of CHEI should inform these two of its position.

The USNC should also consider building a stronger relationship with the IEC in order to tie American standards in more closely with international ones.

**Gaining Support of the Japanese Government and Business**

Japan is the second largest exporter of information technology (IT) equipment to the European Union. Therefore, postponing the implementation of EN 61000-3-2 will be of interest to Japan. The following organizations may be able to help the coalition.

Keidanren. The Japan Federation of Economic Organizations, known as the Keidanren, is a key nationwide trade association in Japan. Its membership includes 1,009 of Japan's leading corporations (including 63 foreign firms), as well as 119 industry-wide groups representing such major sectors as manufacturing, trade, distribution, finance, and energy. It should be asked if it will help pressure the EU to change its LFE requirements and postpone the implementation of EN 61000-3-2.

American Electronics Association Japan. The American Electronics Association (AEA) has a branch office in Japan that could be used to solicit the support of the Keidanren. This office could also be used as a base from which to ask Japanese businesses and government officials to send letters to the DG Enterprise and CENELEC in support of the IT industry position.

American Chamber of Commerce - Japan. The American Chamber of Commerce - Japan (ACCJ) provides another source of contacts who might be able to solicit the support of the Japanese government and businesses.

# NEGOTIATION STRATEGY

If the above strategy fails, it may be necessary for the U.S. government engage DG Enterprise in negotiations to resolve the issues raised by EN 61000-3-2. The following negotiation strategy should be implemented. The greatest amount of attention will be placed on the analysis stage. The analysis section describes in detail the interests, options, objective criteria, and best alternatives to negotiated agreement (BATNA) of all the key players and interested parties in the negotiated outcome (see Appendix D).

**ANALYSIS**

**Objective**: To convince the European Commission that implementation of EN 61000-3-2 needs to be postponed until the IEC and CENELEC finish rewriting and reviewing the standard.

### *Preferred outcome*

The European Commission postpones implementation of EN 61000-3-2, adopts revised IEC/CENELEC version of the standard (when finished), and allows an acceptable amount of time for companies to conform to the revised EN 61000-3-2.

### *Who Negotiates*

Catherine Novelli, Assistant United States Trade Representative for Europe and the Mediterranean and Charles Ludolph, Deputy Secretary for Europe of DOC, will carry out the negotiations for the IT industry. Their counterpart will be Directorate-General Erkki Liikanen of DG-Enterprise within the European Commission.

### *Allies*

- U.S. industry (IT/electronics/electrical) and utilities.
- European IT companies and associations, particularly EICTA.
- Japanese government and/or companies (Keidanren).

### *Objective criteria*

See chart for a detailed account (Appendix D).

### *BATNA*

File a complaint within the WTO against the EU.

### *Negotiation tactics*

USTR needs to clearly present its case giving all the facts and evidence available to it. It will be important to describe the costs of EN 61000-3-2, as well as present scientific evidence that the standard is unnecessary. USTR should show openness to a negotiated

solution and approach the negotiation as a group effort to fix a common problem and not as one group trying to triumph over another. Since there may be some truth to the European Union's theory, the U.S. should work with the EU to negotiate a more acceptable standard; possibly one that adjusts to future changes.

## EXHIBIT 1

Charles T. Zegers, Secretary
USNC/IEC, TC77A
American National Standards Institute
11 West 42nd Street
New York, NY 10036

Dear Mr. Zegers:

The Coalition on Harmonic Emission Issues (CHEI) would like to solicit your support in ensuring that the rewritten International Electrotechnical Commission (IEC) standard 61000-3-2 adequately accounts for the information technology (IT) industry's interests. This standard is of grave concern to the IT industry because, despite its many flaws, the European Union has adopted it wholesale in its standard EN 61000-3-2 and is requiring that all products comply with it by January 1, 2001.

IEC/EN 61000-3-2 lacks reproducibility in measurement, its language is ambiguous, and most importantly, there is no scientific evidence or record of the low frequency emission problem the standard is designed to address. For all of these reasons, the IEC recently decided to rewrite the standard.

CHEI and the electronic/electrical equipment manufacturers need your help in ensuring that the rewritten standard adequately addresses the IT industry's concerns.

When IEC Sub-Committee (SC) 77A drafted the original standard, the IT industry had limited to no input; the European utilities industry dominated the process. It is of utmost importance that the USNC and the IT industry have a strong showing within SC77A during the re-drafting process. We need to make sure that the revised IEC/EN 61000-3-2 is based on science and that cost-effective means are prescribed to remedy whatever problem is reflected by this science.

Members of CHEI would like to meet with you and members of the U.S. Coordinating Committee on Electromagnetic Compatibility (USCCEMC) to discuss our concerns and solicit your input on how to go about participating in the re-drafting process. CHEI is already requesting that members of the IT industry be appointed by the USNC to serve on SC77A and its working groups during the redrafting process.

By coordinating our efforts with the USNC and USCCEMC we are certain that this standard can be revised to efficiently resolve all of its current problems.

Thank you for your time and for considering our concerns. We look forward to meeting with you soon.

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## EXHIBIT 2

CENELEC

Dear Mr./Ms. _____:

On January 1, 2001, EN 61000-3-2 is to take full effect. This standard has many flaws. It lacks reproducibility in measurement, its language is ambiguous, and more importantly, there is no scientific evidence or record that the problems the standard is designed to address actually exist. There are many other flaws in EN 61000-3-2, so many that the organization that developed the standard, the International Electrotechnical Commission (IEC), recently decided to rewrite it.

It simply does not make sense for CENELEC and the European Commission to continue with its intended plans to implement EN 61000-3-2 on January 1, 2001 given the IEC's decision to re-write its standard. Implementing EN 61000-3-2 will only create a situation where governments and companies expend resources conforming to a standard that is only going to change in a few years when the IEC finishes rewriting IEC 61000-3-2.

In order to prevent unnecessary expenditures of government and company resources, the European Commission and CENELEC should postpone implementation of EN 61000-3-2 until the IEC completes the new version of 61000-3-2. Upon completion of the rewritten version, CENELEC should properly review the revised standard within its committees—taking particular care to ensure that the information technology industry and all other interested parties are fairly represented in the review process. Indeed, everyone knows that power suppliers and distributors are over-represented on CENELEC's low frequency emissions committee.

The IT industry commends the work CENELEC has done to harmonize standards throughout Europe and wishes to offer its support in preparing standards that facilitate the free flow of goods.

Sincerely,

## EXHIBIT 3

European Commission, DG Enterprise
Rue de la Loi, 200
B-1049 Brussels
Belgium

Dear Mr./Ms. _____:

We the undersigned trade associations and companies that are involved in the manufacture of electronic/electrical products and components are writing to express our concerns about the negative effects that the EMC Directive will have on the electronics/electrical industry. Of particular concern is standard EN 61000-3-2, which addresses low frequency emissions created by electronic/electrical products.

The saga of developing a low frequency emission standard began in International Electrotechnical Commission Committee SC77A, which produced IEC Publication 555. This Publication specified the permissible harmonic emission levels for household/consumer equipment. As is normal for the EU standard setting body, CENELEC, this standard was readily adopted by the corresponding CENELEC BTTF TF68-6. Shortly afterwards this standard was listed in the Official Journal.

More recently this standard was developed further by the IEC Committee and re-designated as Publication 61000-3-2. The most important change to this standard was to increase its scope to include all electronic/electrical equipment below 16 ampere, which includes information technology equipment (ITE).

What concerns us, is the fact that the ITE industry was never consulted on this standard and that it was almost immediately adopted by CENELEC, which is comprised of the same Europeans that sit on IEC SC77A—a group that is dominated by the utilities industry and has little to no representation from the ITE industry.

Fortunately, the protests of the ITE industry did lead to a delay of the original implementation deadline until January 1, 2001. But the extension did little to solve our concerns. It did nothing to alleviate the increased costs the ITE industry will incur in redesigning products to meet the standard. Nor did it do anything to address the limitations it will place on technological development.

The fact is that EN/IEC 61000-3-2 is based on concerns over a potential problem rather than sound science. No other place in the world enforces a similar standard.

The IEC recently decided to rewrite IEC 61000-3-2. In light of this fact we implore the European Commission to consider postponing the January 1, 2001 implementation date

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for EN 61000-3-2 until the IEC completes its rewrite. Otherwise, the ITE industry will have to revise its products to conform with EN 61000-3-2, and then a few years later, when the IEC finishes its rewrite, the ITE industry will have to revise its products yet again.

Additionally, we would like to call your attention to the need for greater ITE participation in the standards development process. As noted above, all of the committees involved in drafting IEC/EN 61000-3-2 are dominated by the power supply manufacturers industry, and as a result, standards have been developed that account solely for the interests of this industry. Indeed, IEC/EN 61000-3-2 does not require the utilities industry to do anything to clean up problems that may contribute to harmonic emissions feedback. The cost of dealing with any potential problems is placed entirely on the electronic/electrical equipment manufacturing industry—despite the fact that the total cost impact of this solution on the eventual user will be much greater than a solution that would require utility companies to clean up their lines.

The standards development processes in the IEC and the EU should account for all costs in the most efficient manner possible.

Additional problems are created by the close link between the IEC and CENELEC. This link means that voluntary IEC standards very quickly become mandatory CENELEC regulations. The result is that the IEC appeals process does not function properly because the IEC is divided between the views of European and non-European member countries. We would be pleased to see the European Union should undertake a careful review of the process by which CENELEC adopts IEC standards.

Thank you for considering our concerns. Please do not hesitate to call me if you have any question.

Sincerely,

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## EXHIBIT 4

Base Letter for Key Members of the U.S. House of Representatives:

Dear Representative

We the undersigned U.S. trade associations and companies that are involved in the manufacture of electronic/electrical products and components are writing to you to voice our concerns about a European Union low frequency emission standard—European Norm 61000-3-2.

This standard is designed to prevent electronic equipment, such as computers, from emitting low amounts of electromagnetic interference back onto the power lines from which they get their energy. It is set to take full effect on January 1, 2001, although there is no scientific evidence or record of complaint from European or local energy providing companies to justify such a standard.

Conforming to this standard is expected to cost the U.S. electronic/electrical industry $25 billion dollars by January 1, 2001. This estimate is based on the fact that, more likely than not, all production facilities will have to be altered since it is not feasible to differentiate production by end-product destination. For certain electronic/electrical products, manufacturing costs are expected to rise from 2 to 1000 percent. In either case, consumer prices will rise, and U.S. exports of electronic/electrical equipment will be hurt. The information technology industry will be hit particularly hard.

We are writing to you for two reasons: (1) to inform you of this very serious problem and (2) to request your assistance. Your ability to create greater awareness of this problem cannot be underestimated. (Place company name here if going to a specific district representative, otherwise use "We are") is relying on your support.

Thank you for your time and for considering our concerns. If you have any questions please notify _____.

Sincerely,

## EXHIBIT 5

IEC Committees TC77 and SC77A:

We the undersigned would like to commend IEC committees TC77 and SC77A for deciding to rewrite IEC 61000-3-2. The standard is fundamentally flawed and would cost the information technology industry billions of dollars, despite the fact that there is no scientific evidence that the standard addresses a real problem.

Nonetheless, we remain concerned that the re-written standard will have its own flaws if TC77 and SC77A do not change the way they go about drafting standards. Specifically, the committees need to ensure that:

1. There is scientific evidence of the need for the standard (e.g., statistically valid field data and technical studies).

2. The standard accounts for cost-benefit factors, businesses needs, market impacts, and product feasibility considerations for all industries concerned.

3. All affected industry sectors are adequately represented and all industry concerns are adequately addressed during the re-drafting process.

4. The re-written standard does not inappropriately address regional standards issues instead of global issues.

Respectfully,

## EXHIBIT 6

# SAMPLE WHITE PAPER

### I. ISSUE

On January 1, 2001 the European Union (EU) will begin requiring all electronic/electrical products sold on the European market to conform to the low frequency emissions standard EN 61000-3-2. The standard is difficult to interpret, it will cost worldwide electronic/electrical product manufacturers $50 billion annually, and it conflicts with other standards (so in complying with EN 61000-3-2, some standards will fall out of compliance with other European standards). However, there is no scientific evidence to show that the standard is actually needed. The standard will do nothing more than create a significant technical barrier to trade.

### II. BACKGROUND

#### The World Electronics Market

The European Union is a large producer and consumer of electronic goods. It accounts for about 26 percent of world production; is the world's largest computer and office equipment market; and is the second largest market for consumer electronics and telecommunications equipment (after the United States).

The U.S. and Japan dominate EU imports of electronics goods accounting for 27 and 23 percent of imports respectively. In the past few years, the European Union's electronics trade deficit has increased. The deficit registered with the United States is particularly large—$2,813 million in 1998. The European Union is also running a negative trade balance in high-tech products.

The high-tech industry is the United States' largest exporter. In fact, the United States is the world's leading producer of computers and personal computers. It accounts for 39 percent of worldwide computer production. Western Europe accounts for just 23 percent.

#### EU Electromagnetic Compatibility Regulations

In 1989 the European Union passed the Electromagnetic Compatibility (EMC) Directive 89/336. The directive's objective is to guarantee the free movement of apparatus (electronic/electrical appliances together with equipment and installations containing electrical and/or electronic components) and to create an acceptable electromagnetic environment in the EEA territory. The EMC Directive is a regulatory framework that lays down apparatus protection requirements and leaves it to standards, primarily European

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This paper was researched and written to fulfill the M.A. project requirement for completing the Monterey Institute of International Studies' Master of Arts in Commercial Diplomacy. It was not commissioned by any government or other organization. The views and analysis presented are those of the student alone. For more information about the Commercial Diplomacy program and the M.A. project requirement, please visit www.commercialdiplomacy.org.

harmonized standards, to define technical specifications for achieving those protection requirements.

EN 61000-3-2 grew out of the EMC Directive. The standard is designed to limit the harmonics and low frequency emissions that are produced and fed back into the power lines by all electronic/electrical products—including computers, audio and video equipment, light dimmers, fluorescent lights, air conditioners, refrigerators, etc. The standard is designed to ensure that low frequency feedback cannot reach levels that could create noise on the power lines.

However, neither European nor American power suppliers have actually complained about feedback problems, and there is no scientific evidence to justify imposing a standard that limits low frequency emissions from all electronic products. The Europeans' concern about low frequency emissions is based on speculation rather than science.

## III. ANALYSIS

### Commercial Impact

Conforming to EN 61000-3-2 will cost EU and U.S. electronic/electrical products manufactures an estimated $34 billion annually—approximately $17 billion each. The U.S. information technology industry alone will pay an estimated $3.4 to $5.6 billion annually.

The standard will force electronic/electrical product manufacturers to redesign existing products (since the EMC Directive has no grandfather clause). It will also make it more costly to get new products to market; add a layer of complexity to the product design process; and increase the time it takes to get a product from design to market because of the EN61000-3-2's testing and conformity assessment requirements. Moreover, the new design constraints imposed by EN 61000-3-2 will add weight and volume to products, thereby creating more end of product waste and negating some of the technology gains achieved by product miniaturization. Lower product efficiency and reliability can also be expected due to increased component counts.

### Legal Concerns

Article 2.2 of the TBT Agreement states that:

> "Members shall ensure that technical regulations are not prepared, adopted or applied with a view to or with the effect of creating unnecessary obstacles to international trade. For this purpose, technical regulations shall not be more trade

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> restrictive than necessary to fulfill a legitimate objective, taking account of the risks non-fulfillment would create. Such legitimate objectives are, inter alia: national security requirements; the prevention of deceptive practices; protection of human health or safety, animal or plant life or health, or environment. In assessing such risks, relevant elements of consideration are, inter alia: available scientific and technical information, related processing technology or intended end-uses of products."

EN 61000-3-2 violates this article because there is no substantial scientific proof that low frequency emissions can pollute power lines to the point of being disruptive. Indeed, the need for the EU standard is based only on the theory that this might happen in the future as more and more data is transferred via electronic networks. The IT industry has evidence to the contrary.

In 1998, the Information Technology Industrial Council (ITIC) in cooperation with IBM conducted a survey on the effects of low frequency emissions and harmonics in Europe. The purpose was to determine the extent of harmonics and other low frequency emission related problems inside customer facilities or in utility systems due to distributed harmonic sources. The sites chosen for the study had high concentrations of information technology equipment (ITE) and other distributed non-linear loads.

Survey sites were located in Europe (44%), the United States (21%), Japan (14%), South America (13%), and Canada (8%). Out of the 63 survey sites, 90.5 percent of those questioned responded that they had no problems related to the use of non-linear loads inside their facilities/utilities that required corrective actions. The remaining 9.5 percent said that they had made minor changes within their facilities to rectify such problems. None of the plants reported that their utility suppliers had voiced any concerns over their low frequency emissions.

**European Power Supply Industry Interests**

European power supply producers and distributors (utilities) are largely responsible for the development of and language in standard IEC/EN 61000-3-2. Members of the power supply industry dominated the International Electrotechnical Commission subcommittee 77A that drafted the standard. These very same members also dominated the European Committee for Electrotechnical Standardization (CENELEC) committee that adopted EN 61000-3-2 directly from the IEC.

Although it is true that the manufacturers of electronic appliances began participating in the standard's development process very late in the game, this does not justify the subsequent blatant disregard for their concerns.

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The key reason for the European utilities' interest in this standard is that the utilities see an opportunity in the near future to begin delivering high-speed, residential Internet access over the power lines, and in order to do this, they need to limit the amount of low frequency emissions that returns to those power lines. EN 61000-3-2 provides a means for the European utilities to avoid taking steps to clean noise from the power lines and instead shifts the cost of improving and expanding the power supply business onto electronic/electrical equipment manufacturers.

The key European trade association that supports EN 61000-3-2 is the European Power Supply Manufacturers Association (EPSMA). EPSMA represents over 75 percent of European power supply manufacturers. It is also very active in lobbying against the IT industry's efforts to change EN 61000-3-2.

## IV. RECOMMENDATIONS

The control of low order power-line harmonic emissions from nonlinear loads is a serious issue that requires cooperation between utilities, equipment manufacturers, premises owners, and end users. Currently, two different approaches to regulating the effects of low frequency emissions are under consideration. One is the Institute of Electrical and Electronics Engineers (IEEE) Standard 519, which seeks to control emissions at the interface between facilities and the public distribution system. The other is typified by the IEC/EN 61000-3-2 standard, which focuses primarily on controlling emissions at the product level.

Ultimately, all costs associated with harmonic emissions are born by consumers. Emission control requirements, including guidelines and standards, should strive to minimize the overall cost to consumers while providing both needed flexibility for product design and the ability for utilities companies to maintain acceptable electric power quality. Also, regulations should promote free market mechanisms and promote free trade. They should not create trade or market barriers. There should be equal opportunity for all affected parties to participate in the establishment of the limits.

Finally, limits should be based on sound science and objective data. The following factors should be considered when drafting a low frequency emissions standard: power level, actual or expected market volume, usage patterns, efficiency, and emission properties. Electric utility and building electric power network properties must also be considered. These properties include, but are not limited to, system impedance, network topologies, attenuation, cancellation, and dilution.

The application of limits is appropriate only when statistically valid field data documents the existence of voltage distortion problems that may be attributed to harmonic emissions from identifiable product classes.

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**Action**

1. It is essential for the U.S. electrical/electronics sector to become more involved in the international standards writing committees of the International Electrotechnical Commission (IEC) and the International Standard Organization (ISO). Specifically, electrical/electronics manufacturers need to begin participating fully in IEC committee SC77A as it redrafts IEC 61000-3-2.

2. The United States must persuade the EU to postpone the January 1, 2001 implementation date for EN 61000-3-2. The date should be postponed until the IEC completes its review of the same standard, IEC 61000-3-2, which should take three to five years.

3. The United States should offer support to the EU as it begins its own review of the EMC Directive 89/336. Specifically the United States should encourage the EU to rethink its establishment of disparate and potentially inconsistent product design requirement that will disrupt worldwide trade in electronic/electrical products by diminishing the prospect for global harmonized standards.

4. The U.S. should become more active in its promotion of U.S. standards abroad.

## V. CONCLUSION

The IT industry is growing quickly, which makes it essential to eliminate unnecessary technical trade barriers. The U.S. and the European government and electronic/electrical equipment manufacturing industry need to act now to ensure that the rewritten version of EN 61000-3-2 is based on science. Using science as a basis for the standard is the only way to ensure that the standard is written in the most most cost-efficient way possible. Otherwise, products that do not create harmonics problems will be required to conform to the standard, which will unnecessarily result in an increase in consumer prices and may also serve to impede technological improvements.

In the end, the best solution for controlling low frequency feedback may lie somewhere in between the IEEE 519 standard and IEC/EN 61000-3-2.

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## APPENDIX A

# MACROECONOMIC ANALYSIS

*INTRODUCTION*

Throughout the 1990s, the high-tech industry has been the leading export industry in the United States. Economists estimate that technology diffusion from high-tech source industries to other parts of the economy accounts for some one-third to one-half of GDP growth and at least two-thirds of productivity growth.[69]

Government regulation, however, has the potential to significantly slow down the growth of the high-tech industry, and this is just what the EU Electromagnetic Compatibility (EMC) Directive threatens to do. The EMC Directive has created an opportunity for the EU to establish standards for areas of the electronics/electrical industry that have never before been regulated within the EU. EN 61000-3-2 is one of these standards.

Despite the importance of the high-tech industry to the overall economy, however, the macroeconomic impact of EN 61000-3-2 is expected to be negligible.

*ANALYSIS*

The European Union is a large producer and consumer of electronic goods accounting for about 26 percent of world production. It is also the world's largest computer and office equipment market. As for consumer electronics and telecommunications, the EU market is the second largest after the United States.[70] (The following subsections are included in the electronics sector: computers and office equipment, telecommunication equipment, electronic components and consumer electronics.)

The United States and Japan dominate EU trade in the electronics sector. The U.S. accounts for 27 percent and Japan accounts for 23 percent of total EU imports of electronics.[71] The remaining 50 percent is accounted for by intra-EU trade and imports from various other nations.

The high-tech industry is the United States' largest export industry. In fact, the United States is the world's leading producer of computers and personal computers. It accounts

[69] U.S. R&D Trends in the U.S. Economy, p. 5.
[70] "Trade in Goods: Electronic Sector" www.europa.eu.int/comm/trade/goods/electro/index_en.htm.
[71] "Trade in Goods: Electronic Sector" www.europa.eu.int/comm/trade/goods/electro/index_en.htm.

for 39 percent of worldwide personal computer production. Western Europe represents 23 percent of production.[72]

The United States' total trade balance with the European Union is negative. In 1998, the U.S. trade deficit with Europe was $34 billion, up from the 1992 deficit of $3 billion. Within the high-tech sector,[73] however, the U.S. is running a positive trade balance with the EU. In 1998, the U.S. exported $36 billion worth of high tech equipment to the EU but imported just $21 billion worth of such equipment from the EU. Exports exceeded imports by almost $15 billion. And 1998 is not an anomaly. The EU's high-tech trade deficit with the United States increased steadily from 1994 to 1998. Twenty-six percent of all U.S. exports to the EU in 1998 were high-tech goods[74]

The electronics industry is one of the largest contributors to the U.S. gross domestic product (GDP). The gross domestic product of the U.S. electronics industry in current dollars as a percentage of GDP for 1995-1997 remained consistently around 2 percent.[75] The electronics industry's contribution to U.S. GDP was $136.7 billion in 1995; $141.6 billion in 1996; and 157.3 in 1997.[76] The United States' electronics trade surplus with the European Union was 2,813 million dollars in 1998.[77]

Conforming to the EU/IEC 61000-3-2 low frequency emissions standard will cost the U.S. electronic/electrical industry an estimated $25 billion or just 0.003 percent of total U.S. GDP (using 1997 figures).

*U.S. DIRECT INVESTMENT IN THE EU*

EN 61000-3-2 is unlikely to have a significant effect on U.S. foreign direct investment in Europe. First, since all companies selling electronic/electrical products on the EU market must conform to this standard, there is no significant advantage to producing in the EU over producing elsewhere; there will be no need to expand production facilities in Europe. Second, since the U.S. and EU recently negotiated a mutual recognition agreement on electromagnetic compatibility standards, it is possible to certify within a manufacturer's home country that his electronic/electrical products comply with the standards of either market. So, again there is no benefit to expanding production in Europe. Finally, conforming to the EU standard will lower parent company earnings in the short run, thus lowering investment. However, this does not imply that overall U.S. direct investment, such as venture capital, will be negatively affected.

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[72] U.S. Department of Commerce, Office of Computers and Business Equipment, The Personal Computer Market, Washington, 1996.
[73] Please see the *Definitions Section* for a description of this industry.
[74] USITC Trade Data Bank. www.dataweb.usitc.gov.
[75] U.S. Department of Commerce, Bureau of Economic Analysis, National Accounts Data: GDP by Industry in Current Dollar as a Percentage of GDP: 1987-91 and 1992-97, November 1998.
[76] ibid.
[77] "Trade in Goods: Electronic Sector" www.europa.eu.int/comm/trade/goods/electro/index_en.htm.

The one way in which U.S. direct investment in the EU could increase as a result of EN 61000-3-2 is if companies are able to split production so that only those plants located in Europe would be restructured to conform to the EU standard while other facilities would continue manufacturing as always. This would only be a desirable choice for those companies that already have enough production facilities in the EU to completely supply that market. U.S. direct investment into the EU would then increase due to the extra costs for restructuring plants in order to comply with the low frequency emissions standard and perhaps because of increased production. The benefit of this approach is that a company would not have to restructure all of its production facilities.

*Employment*

EU standard EN 61000-3-2 is not expected to have a large effect on employment. The standard may result in some job loss if the standard causes some products to be too costly to be produced profitably. However, the standard may actually create jobs as more people may be needed for research and development, increased component production, and restructuring of production facilities in order to comply to the standard. There may also be an increased need for inspectors and inspection facilities in order to determine compliance to the standard prior to sale in the EU.

In any event, the overall numbers of these job losses and gains are expected to be small in terms of the overall picture, and they are likely to balance each other out at least somewhat. The impact will be mitigated further by the fact that some of the losses and gains will be within American companies' European facilities.

*Conclusion*

Overall the macro-economic impact of EN 61000-3-2 is expected to be negligible with the most significant impact occurring in the short run as companies adjust to the standard.

# APPENDIX B

## THE E.U. ELECTROMAGNETIC COMPATIBILITY (EMC) DIRECTIVE[78]

**EMC Directive 89/336/EEC**

The main objective of the EMC Directive is to guarantee the free movement of apparatus[79] and to create an acceptable electromagnetic environment in the EEA territory.

The main goals of the EMC Directive are:

- "To ensure that the electromagnetic disturbances produced by electrical and electronic apparatus does not affect the correct functioning of other apparatus according to the definition of Article 1.1 of the EMC Directive, as well as radio and telecommunication networks, related equipment and electricity distribution networks."
- "To ensure that apparatus have an adequate level of intrinsic immunity to electromagnetic disturbances to enable them to operate as intended."

The Directive does not intend the level of protection requirement to be an absolute zero emission level or to provide total immunity for all apparatus. It leaves room for future technical development by only describing protection requirements in general terms.

**Definitions as Provided from the Guidelines**

*Placing of an apparatus on the market.* This means the first-time availability, against payment or free of charge, of an apparatus covered by the Directive, in the EEA market, for the purpose of distribution and/or use in the EEA. The Directive's provisions and obligations concerning its placement on the market apply to each apparatus individually. The Directive does not apply to a specific type, group or family nor is the date and place of manufacturing relevant. It is the responsibility of the manufacturer to guarantee that each and all apparatus comply where the apparatus falls under the scope of the Directive.

*Taking an apparatus into service.*This means the first time that the end-user uses an apparatus referred to in the Directive within the EEA territory. An apparatus covered by the EMC Directive is put into service when it is first used.

[78] All information pertaining to this Directive was drawn from the Guidelines on the Application of Council Directive 89/336/EEC of 3 May 1989 on the Approximation of the Laws of the Member States relating to Electromagnetic Compatibility.

[79] As defined in Article 1.1 of the Directive: all electrical and electronic appliances together with equipment and installations containing electrical and/or electronic components.

*Manufacturer.* This is the entity responsible for the design and construction of an apparatus covered by the Directive with a view to placing it on the EEA market on the entity's own behalf. Whoever modifies substantially an apparatus resulting in an "as-new" apparatus, with a view to placing it on the EEA market, also becomes the manufacturer. The manufacturer has sole and ultimate responsibility for the conformity of an apparatus. Manufacturers bear responsibility for:

- Designing and constructing the apparatus in accordance with protection requirements laid down in the Directive; and
- Following the procedures for the certification of conformity of the apparatus with the protection requirements laid down in the Directive

*Authorized representative.* The manufacturer may appoint with a written mandate a person or persons to act on behalf of the manufacturer in respect to certain of the manufacturer's obligations. This person(s) can be appointed to undertake the testing in the EEA territory, sign the declaration of conformity, affix the CE marking, and hold the declaration of conformity and the technical construction file at the disposal of the competent authorities.

*Importer.* This is a person who places on the EEA market an apparatus that is covered by the Directive and imported from a third country.

*Finished product.* A finished product is any device, or unit of equipment that has a direct function, its own enclosure, and if applicable, ports and connections intended for end-users. These products are fully subject to the provisions of the EMC Directive and must be CE marked (discussed later).

*Direct function.* "Direct function" is defined as any function of a component or a finished product that fulfills the intended use specified by the manufacturer in the instructions for use by an end-user.

**The Scope of the EMC Directive**

The Directive directly covers several sectors of electrical/electronic engineering, such as household appliances, consumer electronics, industrial manufacturing, information technology, radio communication, and telecommunications apparatus.

The following is a non-restrictive list of apparatus explicitly covered by the scope of the EMC Directive:

5.2.1) Electrical household appliances, portable tools and similar equipment (last recital of the EMC Directive and Annex III(g);

5.2.2) Fluorescent lighting luminaires fitted with starters (last recital of the EMC Directive);
5.2.3) Fluorescent lamps (partially Annex III(1);
5.2.4) Industrial manufacturing equipment (Annex III(b) of the EMC Directive);
5.2.5) Information technology equipment (Annex III(f);
5.2.6) Domestic radio and television receivers;
5.2.7) Radio and television broadcast transmitters (Annex III(k);
5.2.8) Aeronautical and marine radio apparatus (Annex III(h);
etc.

*Key Articles Concerning the Scope of the EMC Directive*

Article 1.1. *Apparatus means all electrical and electronic appliances together with equipment and installations containing electrical and/or electronic components.*

Article 1.2. *Electromagnetic disturbance means any electromagnetic phenomenon which may degrade the performance of apparatus. An electromagnetic disturbance may be an electromagnetic noise or unwanted signal, etc. The EMC Directive intends to ensure that appliances and systems function without suffering degradation by an electromagnetic phenomenon. A product is considered compliant when it is used as intended and does not degrade the performance of other products within its electromagnetic environment.*

Article 1.3. *Immunity means the ability of an apparatus to perform satisfactorily against the performance criteria for the apparatus in the presence of an electromagnetic disturbance. The aim of this protection requirement is to ensure that the function of electrical/electronic appliance, equipment, and installation containing electrical and/or electronic components is immune to electromagnetic disturbance within its intended environment. It does not expect the product to be immune to EM disturbances from outside of its intended environment. The expected level of protection must be proportional to the objectives pursued.*

Article 1.4. *Electromagnetic compatibility means the ability of an electrical/electronic appliance, equipment, and installation containing electrical and/or electronic components to function satisfactorily*[80] *in its electromagnetic environment without introducing intolerable EM disturbances to anything in that environment.*

Article 2.1. *This Directive applies to apparatus liable to cause electromagnetic disturbance or the performance of which is liable to be affected by such disturbance.*

[80] "Function satisfactorily" means function without degradation of quality of performance below an acceptable performance criteria level.

Article 4. *The apparatus referred to in Article 2 shall be so constructed that:*
The EM disturbance it generates does not exceed a level allowing radio and telecommunications equipment and other apparatus to operate as intended.
The apparatus has an adequate level of intrinsic immunity to EM disturbance to enable it to operate as intended.

**Technical Justification**

The Directive covers only three types of emitted disturbances:
- Conducted (continuous and intermittent) radio-frequency disturbance;
- Radiated radio frequency disturbance; and
- Harmonics, flicker and voltage fluctuations on the mains power supply.

**Procedures for Assessment of the Conformity of Apparatus Intended to be Placed on the Market**

There are three procedures for assessment of the conformity of an apparatus specified in Article 10 of the EMC Directive.
- Article 10.1 describes the procedure in the case of apparatus for which the manufacturer has applied harmonized standards;
- Article 10.2 describes the procedure where the manufacturer has not applied the standards, or has applied them only in part, or in the absence of relevant standards;
- Article 10.5 describes the specific procedure for apparatus designed for the transmission of radio communications" The EMC Directive does not refer directly to Council Decision 93/465, which established CE marking, the following information is based on this Decision.

*Article 10.1* describes how a manufacturer or his authorized representative can ensure or declare that a product conforms to the applicable harmonized standards. When a product properly conforms, the manufacturer or his representative (established in the EEA) affixes the CE marking and draws up a written EC declaration of conformity (explained below). The EC declaration of conformity needs to be retained for ten years after a product is placed on the market for purposes of inspection. The manufacturer is fully responsible for determining and documenting compliance of his products to the EMC Directive and the subsequent regulations. However, this is a simple process since the only documentation required is the EC declaration of conformity. There is no requirement for a technical file to demonstrate the steps taken to show compliance with the Directive.

*Article 10.2* describes how a manufacturer or his authorized representative may satisfy the protection requirements of the Directive when the manufacturer does not follow the harmonized standards or has applied them only in part in producing an apparatus. Again, it is the manufacturer's responsibility to determine compliance to the Directive and his

responsibility to affix the CE label and to draw up a written EC declaration of conformity. Also, from the time the apparatus is placed on the market, the manufacturer must keep a technical construction file at the disposal of competent authorities (explained below). All the technical data needed to assess the apparatus' EMC performance and a certificate or technical report obtained from a competent body must be included in the technical file. (For greater explanation and detail, please see the *Guidelines on the Application of Council Directive 89/336/EEC of 3 May 1989 on the Approximation of the Laws of the Member States Relating to Electromagnetic Compatibility*, pages 41-45.

*Article 10.5* is applicable only to apparatus designed for the transmission of radio communications, as defined in the International Telecommunication Union Convention.

**EC Declaration of Conformity**

Manufacturers or their authorized representatives within the EEA territory are responsible for drawing up the EC declaration of conformity. When neither party is established within the EEA, the obligation to keep the EC declaration of conformity is the responsibility of the person who places the apparatus on the EEA market. Again, a copy is kept for inspection purposes by the competent authority.

The content of the EC declaration of conformity, as described by paragraph 1 of Annex I, includes the following:

- description of the apparatus to which it refers,
- reference to the specifications (pursuant to Article 7) under which conformity is declared and, where appropriate, the internal measures implemented to ensure the conformity of the apparatus with the provisions of the Directive,
- identification of the signatory empowered to bind the manufacturer or his authorized representative, established within the EEA,
- where appropriate, reference to the EC type-examination certificate issued by the notified body.

The declaration of conformity must be written in one of the languages of the EEA.

***Apparatus Marking***

"All apparatus covered by the Directive in accordance with the protection requirements and accompanied by one of the means of certification provided for in Article 10 must bear the CE marking." The manufacturer affixes the CE marking to the apparatus or to the packaging or the instructions for use or guarantee certificate if there is no room on the apparatus itself. The application of a CE marking will imply that the apparatus complies to all other directives that may require the CE marking.

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**Competent Authorities**

The administrations of the Member States of the EEA responsible for fulfilling the obligations of market control are the competent authorities. It is possible to find a list of the names and addresses of the competent authorities known to the Commission in Annex IV of the directive.

**Competent Bodies**

According to the EMC Directive, if a body fulfills the criteria set out in Annex II of the Directive, it is considered to be competent. Bodies that present a certificate of accreditation or other means of documentary proof to their Competent Authorities and the Commission are considered competent and conform to the requirements of the Directive.

A competent body may be a manufacturer's laboratory. However, to be recognized as such, it must prove that it satisfies the above criteria and that it can assure its independence and impartiality from the design and production processes.

The following bodies can recognize a body as competent:

- an accreditation body recognized as such by the competent authority of a Member State of the EEA; or
- a body representing the supervisory authority of a Member State of the EEA.

A provisional list of the competent bodies as well as their area of competence is reproduced in Annex 5 and may be used as a guide.

**Standards Published in the Official Journal**

A reference list of which standards have been published in the EC's Official Journal is included in Annex VII of the Directive. Once a manufacturer applies the appropriate harmonized standards to an apparatus, it confers that the apparatus conforms to the protection requirements of the Directive. In case an apparatus is challenged, it is the national authority's responsibility to prove that the product is not in conformity.

European standards are available from:
- CENELEC, rue de Stassart, 35, 1050 Brussels,
- ETSI, 650 Route des Lucioles F-06921 Sophia Antipolis CEDEX – France, and
- CEN, rue de Strassart, 36, 1050 Brussels.

National transpositions of harmonized standards are available from the national standardization bodies (see Annex 9).

The list of harmonized standards published in the Official Journal is also available at the following Internet Address: http://www2.echo.lu/nasd.

# APPENDIX C

## INFORMATION TECHNOLOGY AGREEMENT (ITA)

During the 1996 World Trade Organization Ministerial meeting in Singapore, 28 countries or customs territories, including the U.S., signed the Information Technology Agreement. This agreement addresses barriers to trade in the information technology industry. Since October 1998, the agreement has expanded to include 44 countries that represent approximately 93 percent of world trade in IT products.[81] The overall purpose and result of this agreement is the elimination of tariffs on a non-discriminatory basis on a specific list of IT products by January 1, 2000. These products include computer software, computer hardware, telecommunications equipment, semiconductors, and other electronic components and equipment.[82]

Although the ITA has increased market-access opportunities, there are still issues that need to be addressed, including standards-related issues. As tariffs are eliminated, non-tariff barriers emerge and are proving a greater obstacle. For example, market access for foreign products remains low in countries like Japan even though Japan has a zero tariff on IT products. Non-tariff measures that are of specific concern to IT industry representatives are:

- discriminatory certification, testing, conformity assessment, and other standards-related measures,
- unfair marking and labeling requirements, and
- proliferation of quality-system-registration requirements."[83]

An annex to the agreement prescribes that signatories to the agreement meet periodically in order to consult on non-tariff barriers to trade in IT products. There have been at least four of these meetings. The first was on September 30, 1997. The next three were in July, October, and on November 20, 1998. During the last meeting signatories decided to resolve a few remaining tariff issues and to embark on some "serious work on non-tariff measures, in particular with respect to standards."[84]

There is also talk of extending the Information Technology Agreement to cover more products for tariff reduction. This new agreement would be called the Information Technology Agreement II. Hundreds of IT product categories have been proposed, including printed-circuit-board-manufacturing equipment; flat-panel-display

[81] USITC, Global Assessment.
[82] USITC, Global Assessment.
[83] USITC, Global Assessment.
[84] USITC, Global Assessment.

manufacturing equipment; capacitor manufacturing equipment, audio, radio, television and video apparatus; electrical/electronic machines; and many more (WTO). The ITA II is not expected to come into fruition soon, but negotiations in this area may provide an opportunity to discuss technical regulations, such as those pertaining to low frequency emissions.[85]

[85] World Trade Organization, "Information Technology Products," www.wto.org.

**APPENDIX D**

# Negotiation Strategy

| People | Interests | Options | **Objective Criteria** | BATNA |
|---|---|---|---|---|
| International Electrotechnical Commission (IEC) | ▪ Internationally harmonized electro-technical standards<br>▪ Clear and clean electromagnetic environment<br>▪ Protect power lines<br>▪ Reduce electromagnetic interference<br>▪ Products immune to EM interference<br>▪ Member nations (national committees) | ▪ Restructure TC77<br>- Replace current members<br>▪ Rewrite IEC 61000-3-2 (currently doing so)<br>▪ Cancel standard<br>▪ Ensure TCs have equal representation<br>▪ Encourage utilization of "best practices" on a worldwide basis | ▪ Scientific data instead of theory<br>▪ IBM's survey<br>▪ Data from utilities in U.S./Europe<br>▪ Cost/benefit analysis<br>▪ IT industry papers: "A Manufacturer's Perspective on Interpretive and Other Issues with EN 61000-3-2" | ▪ Status quo |
| European Commission (DGIII) | ▪ Harmonized standards to ease flow of trade<br>- Interests of southern and northern utilities<br>▪ Maintain quality of European power lines<br>▪ Maintain high quality of European utilities<br>▪ Consumers<br>▪ Standards and regulations | ▪ Postpone implementation date of 1/1/2001 until IEC/ EN 61000-3-2 is rewritten<br>▪ Implement EN61000-3-2 on 1/1/2001<br>▪ Propose to Council to rewrite EMC Directive 89/336/EEC<br>▪ Encourage CENELEC to rewrite EN61000-3-2<br>▪ Return to using IEC 555-2 | ▪ Scientific Data:<br>- IBM's survey<br>- Data from utilities in Europe/U.S.<br>- Data from IT manufacturers in Europe/U.S.<br>- Data gathered prior to and during use of IEC 555-2 in Europe | ▪ Request WTO dispute settlement panel<br>▪ Maintain status quo |

| | | | | |
|---|---|---|---|---|
| | ▪ Success of EU industry<br>▪ Preventive action – may be a problem in the future | | ▪ Theory: may be a future problem so regulate now<br>▪ SLIM report<br>▪ IT industry papers: "A Manufacturer's Perspective on Interpretive and Other Issues with EN 61000-3-2" | |
| Council of the European Union | ▪ Interests of Europeans, companies – constituency<br>▪ Interests of EU companies<br>▪ Monitoring directorate generals<br>▪ Harmonized standards to ease flow of trade in EU/world<br>▪ Maintain an acceptable EM environment<br>▪ Uphold EMC Council Directive 89/336/EEC<br>▪ European citizens<br>▪ Maintaining position of authority | ▪ Withdraw EMC Directive 89/336/EEC<br>▪ Alter the wording of EMC Directive: specifically change/remove the offending paragraph in the preamble<br>▪ Postpone implementation date of 1/1/2001 until EN61000-3-2 is rewritten<br>▪ Implement EN61000-3-2 on 1/1/2001<br>▪ Rewrite EMC Directive 89/336/EEC<br>▪ Rewrite EN61000-3-2 | ▪ Scientific Data:<br>- IBM's survey<br>- Data from utilities in Europe/U.S.<br>- Data from IT manufacturers in Europe/U.S.<br>- Data gathered prior to and during use of IEC 555-2 in Europe<br>▪ Theory: may be a future problem so regulate now<br>▪ SLIM report<br>IT industry papers: "A Manufacturer's Perspective on Interpretive and Other Issues with EN 61000-3-2" | ▪ Status quo |

| | | | | |
|---|---|---|---|---|
| CENELEC | ▪ European harmonized electrotechnical standards<br>▪ IEC<br>▪ European utilities<br>▪ European manufacturers (less so than utilities)<br>▪ Regulated European electromagnetic environment<br>▪ Consumers who use electronic/electrical products and energy (power)<br>▪ European Commission<br>▪ Member companies | ▪ Alter the IEC Standard<br>▪ Delay 4 more years implementation of EN61000-3-2<br>▪ Accept alteration of EMC Directive 89/336/EEC<br>▪ Do nothing<br>▪ Restructure committee CLC/TC 210<br>▪ Support full implementation on 1/1/2001 | ▪ Perform own electromagnetic environment tests/surveys<br>▪ Use existing evidence: IBM's Study<br>▪ Theory: preemptive measures<br>▪ Evidence from studies in U.S.<br>▪ IT industry papers: "A Manufacturer's Perspective on Interpretive and Other Issues with EN 61000-3-2" | ▪ Maintain status quo |

| | | | | |
|---|---|---|---|---|
| USTR | ▪ Economic Impact/costs to U.S. electronic/electrical industry<br>▪ Maintain flow of goods between U.S. and EU<br>▪ Reinforce the U.S./EU MRA<br>▪ Removal of technical barriers to trade<br>▪ Good relationship with EU – avoid another trade dispute (if possible)<br>▪ Assist U.S. IT industry (a powerful industry) | ▪ Fully support U.S. IT industry<br>▪ Take EU standard to WTO as a TBT<br>▪ Negotiate a mutually acceptable standard with DG Enterprise<br>▪ Do nothing<br>▪ Options that provide solutions to EU's interests<br>- Offer technical assistance to improve Southern European utilities | ▪ IBM's European plant study<br>▪ Evidence of problems with EN61000-3-2 from engineers of major U.S. companies<br>▪ Evidence from EMC European/American experts<br>▪ No theory: preemptive measures<br>▪ Information from U.S. utilities<br>▪ Data gathered prior to and during use of IEC 555-2 in Europe<br>▪ IT industry papers: "A Manufacturer's Perspective on Interpretive and Other Issues with EN 61000-3-2"<br>▪ WTO TBT Agreement | ▪ Request WTO dispute settlement panel review |

| | | | | |
|---|---|---|---|---|
| USDOC | ▪ Removal of TBT's for U.S. IT products<br>▪ American consumers<br>▪ Imports/Exports from/to EU<br>▪ Represent interests of U.S. IT manufacturers<br>▪ Strong U.S. economy<br>▪ Good economic relationship with EU<br>▪ Free trade<br>▪ Protect U.S. producers | ▪ Do nothing<br>▪ Put pressure on DG Enterprise<br>▪ Take EN61000-3-2 to WTO dispute settlement body as a violation of TBT Agreement<br>▪ Negotiate more acceptable EMC standard<br>▪ Impose trade sanctions<br>▪ Advocate for ANSI to draft a standard to limit EU exports to U.S. | ▪ IBM's European plant study<br>▪ Evidence of problems with EN61000-3-2 from engineers of major U.S. companies<br>▪ Evidence from EMC European/American experts<br>▪ IT industry papers: "A Manufacturer's Perspective on Interpretive and Other Issues with EN 61000-3-2"<br>▪ No theory: preemptive measures<br>▪ Information from U.S. utilities<br>▪ Data gathered prior to and during use of IEC 555-2 in Europe<br>▪ WTO TBT Agreement | ▪ Request WTO dispute settlement panel review |

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| ANSI/USNC | ▪ Acceptable electrotechnical standards from IEC<br>▪ Interests of U.S. electronic/electrical equipment industry<br>▪ Internationally harmonized standards<br>▪ Promoting U.S. standards and standards-setting procedures abroad<br>▪ Members interests | ▪ Insist on restructuring of TC77<br>▪ Withdraw from IEC<br>▪ Insist on equal representation in all TCs<br>▪ Appoint U.S. representatives from the IT companies and encourage to attend TC77 and SC77A meetings<br>▪ Block revised EN 61000-3-2 from being published<br>▪ Ensure science based methods are used in drafting standards | ▪ IBM's European plant study<br>▪ Evidence of problems with EN61000-3-2 from engineers of major U.S. companies<br>▪ Evidence from EMC European/American experts<br>▪ IT industry papers: "A Manufacturer's Perspective on Interpretive and Other Issues with EN 61000-3-2"<br>▪ No theory: preemptive measures<br>▪ Data gathered prior to and during use of IEC 555-2 in Europe<br>▪ Information from U.S. utilities | ▪ Block IEC from publishing revised EN 61000-3-2 |

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| EPSMA | ▪ European Utilities<br>▪ Clean power lines so utilities can use lines to send audio, voice, or data signals | ▪ No change to EMC Directive 89/336/EEEC<br>▪ No postponement of implementation of EN61000-3-2<br>▪ Strict enforcement of EMC standards<br>▪ Accept alternate standard if maintains integrity of power lines<br>▪ Rewriting of standard within IEC<br>▪ No change to IEC 61000-3-2 | ▪ Theory – electromagnetic interference could jeopardize power supplies<br>▪ Survey's from utilities on this issue (no studies carried out yet, but perhaps in the future)<br>▪ IBM's study results (possibly)<br>▪ Scientific evidence from utilities of problems caused by EMI created by IT products | ▪ Maintain status quo |

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| EUROBIT | ▪ Member companies (90% of all European companies)<br>▪ Harmonized standards to ease flow of trade but:<br>- uncomplicated test methods<br>- simple certification methods<br>- necessary standards based on science<br>▪ Reduced costs to member companies<br>▪ Fair representation in standard writing committees | ▪ Rewrite EMC Directive 89/336/EEC<br>- remove offending paragraph from preamble<br>▪ Delay implementation of EN61000-3-2 another 4 years<br>▪ Rewrite standard<br>▪ Remove standard for IT equipment<br>▪ Break up IEC TC77 and all its subgroups | ▪ IBM's European plant study<br>▪ Evidence of problems with EN61000-3-2 from engineers of major U.S. companies<br>▪ Evidence from EMC European/American experts<br>▪ IT industry papers: "A Manufacturer's Perspective on Interpretive and Other Issues with EN 61000-3-2"<br>▪ No theory: preemptive measures<br>▪ Information from U.S. utilities<br>▪ Data gathered prior to and during use of IEC 555-2 in Europe<br>▪ WTO TBT Agreement | |

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| AEA | ▪ IT member companies<br>▪ Reduce costs to IT companies<br>▪ Ease export of IT products<br>▪ Keeping member companies (no matter what manufacture)<br>▪ Improve competitiveness of member companies<br>▪ Improve productivity of member companies | ▪ Push USTR to take EU to WTO dispute settlement<br>▪ Encourage member companies to conform to EN61000-3-2<br>▪ Negotiate a more acceptable IEC/EN61000-3-2<br>▪ Break up IEC TC77<br>▪ Special 301 | ▪ IBM's European Plant Study<br>▪ Evidence of problems with EN61000-3-2 from engineers of major U.S. companies<br>▪ Evidence from EMC European/American experts<br>▪ IT industry papers: "A Manufacturer's Perspective on Interpretive and Other Issues with EN 61000-3-2"<br>▪ No theory: preemptive measures<br>▪ Information from U.S. utilities<br>▪ Data gathered prior to and during use of IEC 555-2 in Europe<br>▪ WTO TBT Agreement | ▪ Request USTR to take EU to WTO dispute settlement |

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| US Utilities: National Association of Regulatory Utility Commissioners, Utility Communicators International | ▪ Member utilities<br>▪ Clean power sources<br>▪ Efficient electronic/electrical equipment<br>▪ Good rapport with electronic/electrical manufacturers<br>▪ Consumers<br>▪ U.S. government (regulators)<br>▪ Environmental groups | ▪ Support electronic/electrical equipment manufacturers position<br>▪ Support postponement of implementation of IEC/EN 61000-3-2<br>▪ Support full implementation on 1/1/2001<br>▪ Encourage U.S. regulators to adopt IEC 61000-3-2<br>▪ Oppose U.S. adoption of IEC 61000-3-2<br>▪ Support USTR taking EU to WTO dispute settlement<br>▪ Status quo<br>▪ Avoid getting caught up in the dispute | ▪ IBM's European plant study<br>▪ Evidence of problems with EN61000-3-2 from engineers of major U.S. companies<br>▪ Evidence from EMC European/American experts<br>▪ IT industry papers: "A Manufacturer's Perspective on Interpretive and Other Issues with EN 61000-3-2"<br>▪ No theory: preemptive measures<br>▪ Information from U.S. utilities<br>▪ Data gathered prior to and during use of IEC 555-2 in Europe<br>▪ WTO TBT Agreement | ▪ Avoid getting caught up in the dispute |

# APPENDIX E

## Definitions

1. **Apparatus**: All electrical and electronic appliances together with equipment and installations containing electrical and/or electronic components.

2. **Component**: **1**. An assembly, or part thereof, that is essential to the operation of some larger assembly and is an immediate subdivision of the assembly to which it belongs. Note: For example, a radio receiver may be a component of a complete radio set consisting of a combined transmitter-receiver, i.e., transceiver. The same radio receiver could also be a subsystem of the combined transmitter-receiver, in which case the IF amplifier section, items, such as resistor, capacitor, vacuum tubes and transistors, are components of that section. **2**. In logistics, a part, or combination of parts having a specified function, that can only be installed or replaced as an entity. **3**. In material, an assembly or any combination of parts, subassemblies, and assemblies mounted together in manufacture, assembly, and maintenance.

3. **Degradation**: **1**. The deterioration in quality, level, or standard of performance of a functional unit. **2**. In communications, a condition in which one or more of the required performance parameters fall outside predetermined limits, resulting in a lower quality of service. Note: Degradation is usually categorized as either "graceful" or "catastrophic."

4. **EC Type-Examination Certificate**: This is a document in which a notified body referred to in Article 10 of the EMC Directive 89/336 certifies that the type of equipment examined complies with the provisions of the Directive that concern it.

5. **Electromagnetic Compatibility**: The ability of a device, unit of equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

6. **Electromagnetic Disturbance**: Any electromagnetic phenomenon that may degrade the performance of a device, unit of equipment of system. An electromagnetic disturbance may be electromagnetic noise, an unwanted signal or a change in the propagation medium itself.

7. **Harmonic**: **1**. Of a sinusoidal wave, an integral multiple of the frequency of the wave. Note: The frequency of the sine wave is called the fundamental frequency or the first harmonic, the second harmonic is twice the fundamental frequency, the third harmonic is thrice the fundamental frequency, etc. **2**. Of a periodic signal or other periodic phenomenon, such as an electromagnetic wave or a sound wave, a component frequency of the signal that is an integral multiple of the fundamental

frequency. Note: The fundamental frequency is the reciprocal of the period of the periodic phenomenon.

8. **High Tech**: Computers and office equipment, semiconductors, communications equipment, consumer electronics, electronic components, industrial electronics, photonics, and electro-medical equipment; unless otherwise defined within the project.

9. **Immunity**: The ability of a device, unit of equipment or system to perform without degradation of quality in the presence of an electromagnetic disturbance.

10. **Information Technology**: see high tech

11. **Interference**: **1**. In general, extraneous energy, from natural or man-made sources, that impedes the reception of desired signals. **2**. A coherent emission having a relatively narrow spectral content, e.g., a radio emission from another transmitter at approximately the same frequency, or having a harmonic frequency approximately the same as, another emission of interest to a given recipient, and which impedes reception of the desired signal by the intended recipient. Note: In the context of this definition, interference is distinguished from noise in that the latter is an incoherent emission from a natural source (e.g., lightning) or a man-made source, of a character unlike that of the desired signal (e.g., commutator noise from rotating machinery) and which usually has a broad spectral content. **3**. The effect of unwanted energy due to one or a combination of emissions, radiation, or inductions upon reception in a radio communication system, manifested by any performance degradation, misinterpretation, or loss of information which could be extracted in the absence of such unwanted energy. **4**. The interaction of two or more coherent or partially coherent waves, which interaction produces a resultant wave that differs from the original waves in phase, amplitude, or both. Note: Interference may be constructive or destructive, i.e., it may result in increased amplitude or decreased amplitude, respectively. Two waves equal in frequency and amplitude, and out of phase by 180 degrees, will completely cancel one another. In phase, they create a resultant wave having twice the amplitude of either interfering beam.

12. **Noise**: **1**. An undesired disturbance within the frequency band of interest; the summation of unwanted or disturbing energy introduced into a communications system from man-made and natural sources. **2**. A disturbance that affects a signal and that may distort the information carried by the signal. **3**. Random variations of one or more characteristics of any entity such as voltage, current, or data. **4**. A random signal of known statistical properties of amplitude, distribution, and spectral density. **5**. *Loosely*, any disturbance tending to interfere with the normal operation of a device or system.

13. **Signal**: **1**. Detectable transmitted energy that can be used to carry information. **2**. A time-dependent variation of a characteristic of a physical phenomenon, used to convey information. **3**. As applied to electronics, any transmitted electrical impulse. **4**. Operationally, a type of message, the text of which consists of one or more letters, words, characters, signal flags, visual displays, or special sounds, with prearranged meaning and which is conveyed or transmitted by visual, acoustical, or electrical means.

14. **Standard**: **1**. Guideline documentation that reflects agreements on products, practices, or operations by nationally or internationally recognized industrial, professional, trade associations or governmental bodies. Note: This concept applies to formal, approved standards, as contrasted to de facto standards and proprietary standards, which are exceptions to this concept. **2**. An exact value, a physical entity, or an abstract concept, established and defined by authority, custom, or common consent to serve as a reference, model, or rule in measuring quantities, establishing practices or procedures, or evaluating results. A fixed quantity or quality.

15. **Switch Mode Power Supply**: A switch mode power supply is a widely used circuit nowadays and it is used in a system such as a computer, television receiver, battery charger, etc. The switching frequency is usually above 20kHz, so that the noise produced by it is above the audio range. It is also used to provide a variable DC voltage to armature of a DC motor in a variable speed drive. It is used in a high-frequency unity-power factor circuit

16. **Technical Regulation**: Document which lays down product characteristics or their related processes and production methods, including the applicable administrative provisions, with which compliance is mandatory. It may also include or deal exclusively with terminology, symbols, packaging, marking or labeling requirements as they apply to a product, process or production method.

## APPENDIX F

*Abbreviations*

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| 1. | EMC: | electromagnetic compatibility |
| 2. | EMI: | electromagnetic interference |
| 3. | IEC: | International Electrotechnical Commission |
| 4. | WTO: | World Trade Organization |
| 5. | ITA: | Information Technology Agreement |
| 6. | LFE: | Low Frequency Emissions |
| 7. | CENELEC: | European Committee for Electrotechnical Standardization |
| 8. | ANSI: | American National Standards Institute |
| 9. | USNC: | United States National Committee (of the IEC) |
| 10. | USCCEMC: | United States Coordinating Committee on Electromagnetic Compatibility |
| 11. | .TABD: | TransAltantic Business Dialogue |
| 12. | EPSMA: | European Power Supply Manufacturers Association |
| 13. | EICTA: | European Information and Communications Technology Industries Association |
| 14. | AEA: | American Electronics Association |
| 15. | CHEI: | Coalition on Harmonic Emission Issues (a fictitious organization proposed for creation in this project) |