

VDE/FTZ INTERFERENCE REGULATIONS — WEST GERMANY

ITEM has presented a review of the West German RFI specifications since 1975. Each article was somewhat redundant with the previous one. Consequently, in *ITEM* 1983 and 1984 only updates were provided. However, recent requests from our readers for a comprehensive treatment of the VDE/FTZ requirements prompted this article. Because of space limitations, *ITEM* can not present all details. This article, though, will give the answers to the questions most frequently asked. Generally, *ITEM* readers are familiar with FCC Part 15 Subpart J requirements and the FCC measurement procedure MP-4. What is not generally known, is that the RFI limits and measurement procedures are essentially the same for VDE and FCC and most other countries, since the limits and procedures are derived from the work of the International Special Committee for Radio Interference (CISPR).

FTZ and VDE

Contrary to popular belief, the VDE is not a regulatory agency of the West German government. The regulatory agency is the Deutsche Bundespost, the German Postal Service. The International Telecommunication Union Treaty of 1947 is the foundation of the "Law for the Operation of High Frequency Apparatus," dated 9 August, 1949. This is generally known as "H Fr G" law and it assigns the responsibility of interference control to the Minister fuer das Post und Fernmeldewesen. The Telecommunication Central Office, or FTZ, Referat S-24, Am Kavalleriesand, D-6100 Darmstadt, is the administrative office, and handles all regulatory matters related to RFI. In 1982, the licensing and permit procedures for RFI matters were assigned to a new office: Deutsche Bundespost, Zentralamt für Zulassungen des Fernmeldewesens

Law (Postverfügung)	Equipment Type	Test Procedure
Individual Permits Vfg 523, 1969 Limit A	- Individual Permits of HF Equipment and Computers with FTZ-Series Test No. Limit A of VDE 0871	- VDE 0871 Limit A
Individual Permits Vfg 523, 1969 Limit C	- Individual Permits of HF Equipment without FTZ Series Test No. Measured at place of operation	- VDE 0871 Limit C see VDE 0871, Sec. 8
General Permit Vfg 1044, 1984 & German RFI law, Part I, No. 38 of 31 August 1984	- Household and Industrial Equipment with Broadband RFI Sources - Fluorescent Fixtures	- VDE 0875 Part 200 Limits of 82/499, EEC - VDE 0875 Part 200 Limits of 82/500 EEC
General Permit Vfg 1046, 1984 Limit B	- Computers and HF Equipment	- VDE 0871 Limit B
General Permit Vfg 339, 1979 Limit B	- Infrared Equipment	- VDE 0871 Limit B
General Permit Vfg 478, 1981 Vfg 479, 1981 Limit B	- TV and Radio Receivers	- VDE 0872
General Permit Vfg 604, 1977 Vfg 605, 1977 Limit B	- RFI Measuring Sets and Measuring Receivers	- VDE 0871
Vfg 631, 1979 Limits A & B	- Private Wire Systems, Modems, etc., TV Attachments	- VDE 0871
General Permit Vfg 694, 1979	- Motor Vehicles	- VDE 0879 Part I
Vfg 1114, 1981 Limit B	- Traffic Light Systems Ultrasound Message Systems Master Antenna Systems (Vfg 631 and 1114 are related)	- VDE 0871

Table 1. The FTZ RFI Laws and VDE Test Procedures.

(ZZF), Referat: T-4 (for transmitters and HF equipment) Talstrasse 34-42, D-6600 Saarbrücken. The VDE Testing and Certification Institute is the recognized testing agency of the FTZ.

The RFI-related VDE specifications are prepared by a committee of the German Electrotechnical Commission (DKE) under the umbrella of the Society of German Electrical Engineers (i.e., the VDE) and the German Standards Institute (DIN). The VDE specifications are advisory only. They become legal documents when they are referenced in a German Law.

The interrelationships of VDE specifications, individual permits, general permits and the H Fr G Law are shown in Table 1. It should be observed that Vfg 1046/1984 was released, which updates 1115/1982, and which reaffirms the limit B of VDE 0871 from 10 kHz to 1000 MHz. The H Fr G Law stipulates that a general permit shall be issued if the equipment meets the applicable limits of VDE 0871, VDE 0872 and VDE 0875. "General Permit" means that the equipment can be sold and used without further restrictions. The proof of compliance is either a self-certification statement by the manufacturer (importer) or the "Radio Protection Emblem", issued by the VDE Testing and Certification Institute, that must be affixed to the equipment for "Limit B" of VDE 0871 or "Limit N" of VDE 0875. For the relaxed "Limit A" requirements of VDE 0871, the equipment must be registered with the FTZ upon each scale. It is important to realize that the VDE specifications show the limits and the measurement procedures. However, regulatory RFI requirements are given in FTZ laws.

THE "A" LIMIT

The demonstration of compliance with the relaxed VDE 0871 "A" limit requires certain steps:

- Application is made to the VDE Testing and Certification Institute, Merianstrasse 28, D-6050 Offenbach, Tel. (611) 83061, Telex: 4152796 (VDEP-D).
- The VDE will test the equipment for compliance.
- The VDE will issue a Certificate of Conformity to the FTZ.
- The FTZ will issue a Certificate (Urkunde) with a "FTZ Series Test Number."
- This FTZ number must be shown on the equipment.
- After the equipment is installed a postcard must be sent to the FTZ, reporting the location of the equipment.

The "A" Limits are applicable from 150 kHz to 1,000 MHz as shown in Figure 1. The radiated limit below 30 MHz is 34 dBuV/m at a distance of 100 meters.

THE "B" LIMIT

The demonstration of compliance with the "B" limit of VDE 0871, or with any other of the Special Postal Laws, has been made easier with the new Postal Law: Vfg. 1046/1984. This law allows self-certification and compliance labeling by the manufacturer or importer. As an option, the equipment can also be submitted to the VDE for RFI testing if the manufacturer desires the use of the VDE Radio Protection Mark for marketing purposes. The procedure for self-certification is as follows:

- The manufacturer performs the test or has it performed by an independent test lab to verify that the equipment tested complies with the "B" limits for:
 - Powerline Conducted RFI;
 - Radiated RFI;
 - Conducted RFI Power on all cables which may be measured in lieu of radiated RFI if the equipment is not larger than one meter including stretched out signal cables.

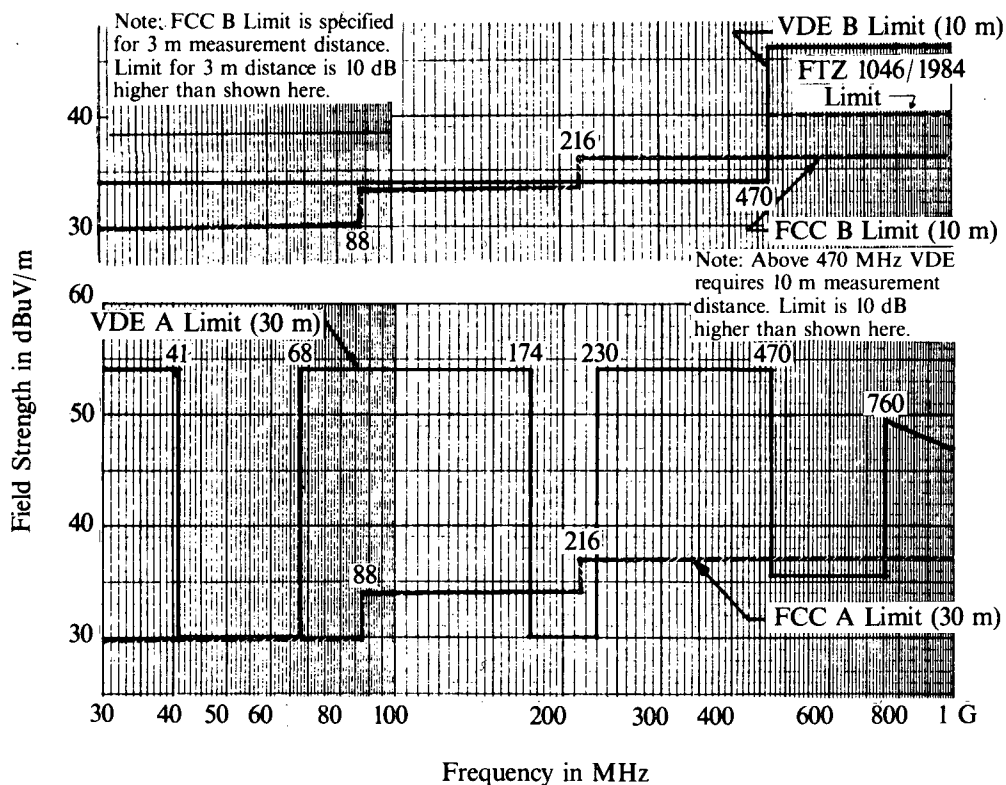


Figure 1. Comparison of FCC and VDE Radiated RFI

- The manufacturer must label his equipment as follows (in German and on the equipment or on a Certificate):

**CERTIFICATE OF THE
MANUFACTURER OR IMPORTER**

We hereby certify that the _____
Model XYZ, complies with the RFI Suppression Requirements of Vfg. 1046/1984.
The German Postal Service was notified that the equipment is being marketed. The German Postal Service has the right to re-test the equipment and to verify that it complies.

- The manufacturer sends a letter to:

Deutsche Bundespost
ZZF, Referat T-4
Postfach 3050
D-6600 Saarbruecken
West Germany

stating that the equipment will be marketed in West Germany.

- The manufacturer may now market the equipment.
- The ZZF will perform sampling tests to verify compliance with the "B" limits.
- If the sampling test reveals non-compliant equipment, the manufacturer will be notified, or the equipment may be confiscated, or the user will be told to cease operation.

The "B" limits are applicable from 10 kHz to 1,000 MHz as shown in Figure 1. Even though VDE 0871 implies that compliance below 150 kHz is only recommended, the FTZ Vfg. 1046/1984 Law mandates compliance with the "B" limit (from 10 kHz to 1,000 MHz) for equipments for which the manufacturer desires a General Permit. The "B" limit is also required for equipments which are freely portable, such as printers, terminals, typewriters, word processors, personal computers, home computers, ultrasound diagnostic equipment and micro-processor-controlled equipment. The RFI power meas-

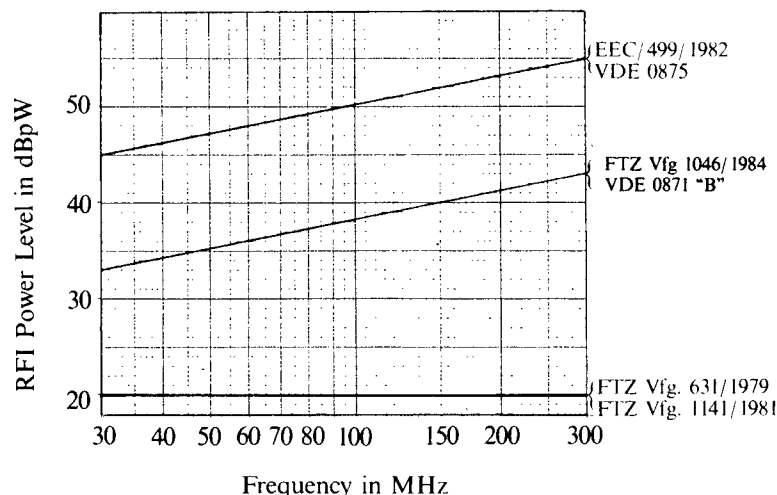


Figure 2. RFI Power Limits for Various Equipments Measured with Absorbing Clamp.

urement is no longer mandated. However, the RFI power on any cable (that must be lengthened to at least 6 meters, if easily done) may be measured with the absorbing clamp in lieu of radiated RFI measurements. The RFI power shall not exceed 33 dBpW at 30 MHz and linearly increasing to 43 dBpW at 300 MHz. This limit is equivalent to the VDE 0875 "N" limit minus 12 dB since it is for narrow-band RFI. The different RFI power limits are shown in Figure 2. The radiated RFI below 30 MHz may be measured at 3 meters (instead of the 30 meters required in VDE 0871). This 3 meter limit is shown in Figure 3. If the equipment does not comply with the 3 meter limit, the equipment may be re-measured and compared to the 30 meter limit of 34 dBuV from 10 kHz to 30 MHz. If the equipment has unshielded data cables, the RFI voltage on all wires must be measured. The permissible voltage limit is "B-limit plus 14 dB".

It must be noted that if commercial equipment can not comply with the "B" limit, it needs to comply only with the "A" limit for commercial applications, but, each equipment or system sold requires registration with the ZZF.

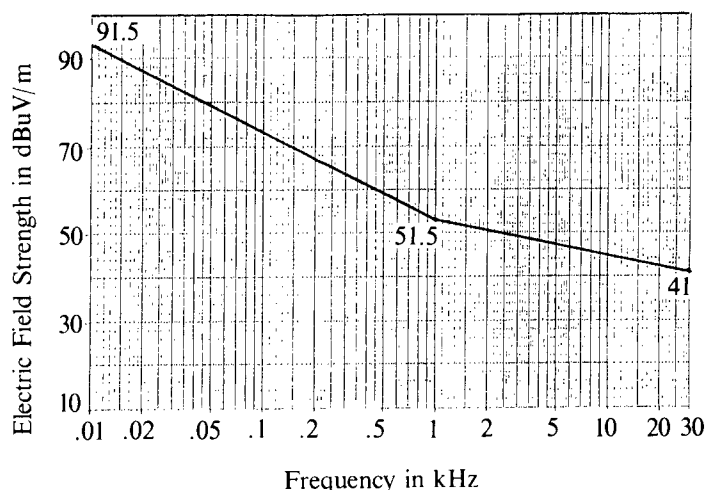


Figure 3. Radiated RFI Limit of Vfg 1046 and other Vfg's measured at 3 meters. Alternately, 34 dBuV/m Limit at 30 meters may be used.

RFI LIMITS FOR SPECIFIC EQUIPMENT.

The FTZ also has additional laws for equipment and systems that are connected to Post Office owned telephone lines or other public and private wire networks. Most RFI limits are the same as for the "B" limit of Vfg 1046/1984 and VDE 0871.

In the FTZ Law 1114/1981 the limits are somewhat tighter. The radiated limit from 30 MHz to 1,000 MHz is 20 dBpW into a resonant dipole. This is measured by the substitution method. The RFI power limit on all conductors shall not exceed 20 dBpW from 30 to 300 MHz when measured with the absorbing clamp. In the future, these special purpose equipment RFI limits will be listed in VDE 0878, Part 1. The document is in the review cycle and will be published in 1985.

RFI LIMITS FOR ELECTRICAL EQUIPMENT

THE VDE 0875 Part 1/11.84 is applicable for household and industrial electrical equipment which does not utilize frequencies above 10 kHz. The document is harmonized with 82/499/EEC and CISPR 14. The powerline conducted limit is shown in Figure 4 as measured with a 50 uH/50 ohm LISN. For handheld tools and equipment above 700 watts, the limits are increased from 4 to 14 dB depending on the equipment types. Instead of radiated RFI, the RFI power is measured on the power cord with the absorbing clamp. The limit is 45 dBpW at 30 MHz and increases to 55 dBpW at 300 MHz as shown in Figure 2.

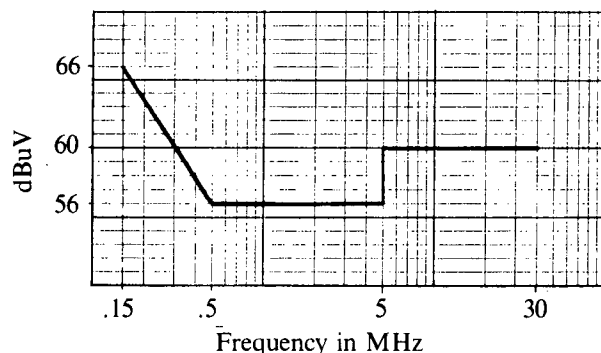


Figure 4: RFI Voltage Limit per VDE 0875, Part 1 and 82/499/EEC with 50 Ohm LISN.

PERFORMANCE OF RFI MEASUREMENTS

The RFI measurements are performed in the same way as for FCC Part 15 J, MP-4 and ANSI C 63.4; however, there are certain key deviations as follows:

The RFI voltages are measured with the ground safety wire connected and also isolated. This is specified in VDE 0871, Revision A. When RFI voltages are less than 5 dB from the limit, the entire frequency range must be re-measured with a 1.6 mH choke connected in series with the ground safety wire.

The radiated RFI test setup is specified in VDE 0877, Part 2. Cables connected to an Equipment Under Test must be arranged horizontally for 1.5 meters; at a minimum height of 0.8 meters for table-top equipment; and 0.1 meters for floor-mounted equipment. Beyond the 1.5 meters distance the cables are routed vertically to the ground and may be routed under the ground plane. If the cable is shorter than 1.5 meters and cannot easily be extended by the user, the test is performed with the supplied cable.

The test site attenuation is calibrated in the same way as for the FCC requirements. However, the antenna factor and cable loss is subtracted from the measured attenuation to give a normalized site attenuation. During the test, fixed antenna heights may be used if the measurement distance is at least 10 times the maximum dimension of

the Equipment Under Test. For example, if the Equipment Under Test is 30 cm wide and the measurement distance is 3 m, a fixed antenna height can be used. If the equipment is larger, the antenna height must be varied from one to four meters. Both horizontal and vertical antenna polarizations must be used. The maximum radiation potential of the Equipment Under Test must be measured. If this requires rotation of the Equipment Under Test, the equipment must be placed on a turntable.

THE VDE RFI SPECIFICATIONS

The following VDE RFI specifications are of primary interest. These specifications are also commercially available in English.

VDE 0871/6.78	RFI Limits: Equipment Operation Above 10 kHz
VDE 0872/7.72	RFI Limits: Radio and TV Receivers
VDE 0874/10.73	RFI Suppression Design Guide
VDE 0875-1/11.84	RFI Limits: Equipment Operation Below 10 kHz
VDE 0876-1/9.78	Part 1: RFI Measurement Set
VDE 0877-1/11.81	Part 1: Instruction: RFI Voltage Measurement
VDE 0877-2/.82	Part 2: Instruction: RFI Field Strength Measurement
VDE 0877-3/4.80	Part 3: Instruction: RFI Power Measurement
VDE 0877-101/.78	Part 101: Instruction: RFI Decoupling Factor Measurement
VDE 0879-1/5.74	Part 1: Ignition System RFI Far Field Suppression
VDE 0879-2/1.58	Part 2: Ignition System RFI Near Field Suppression

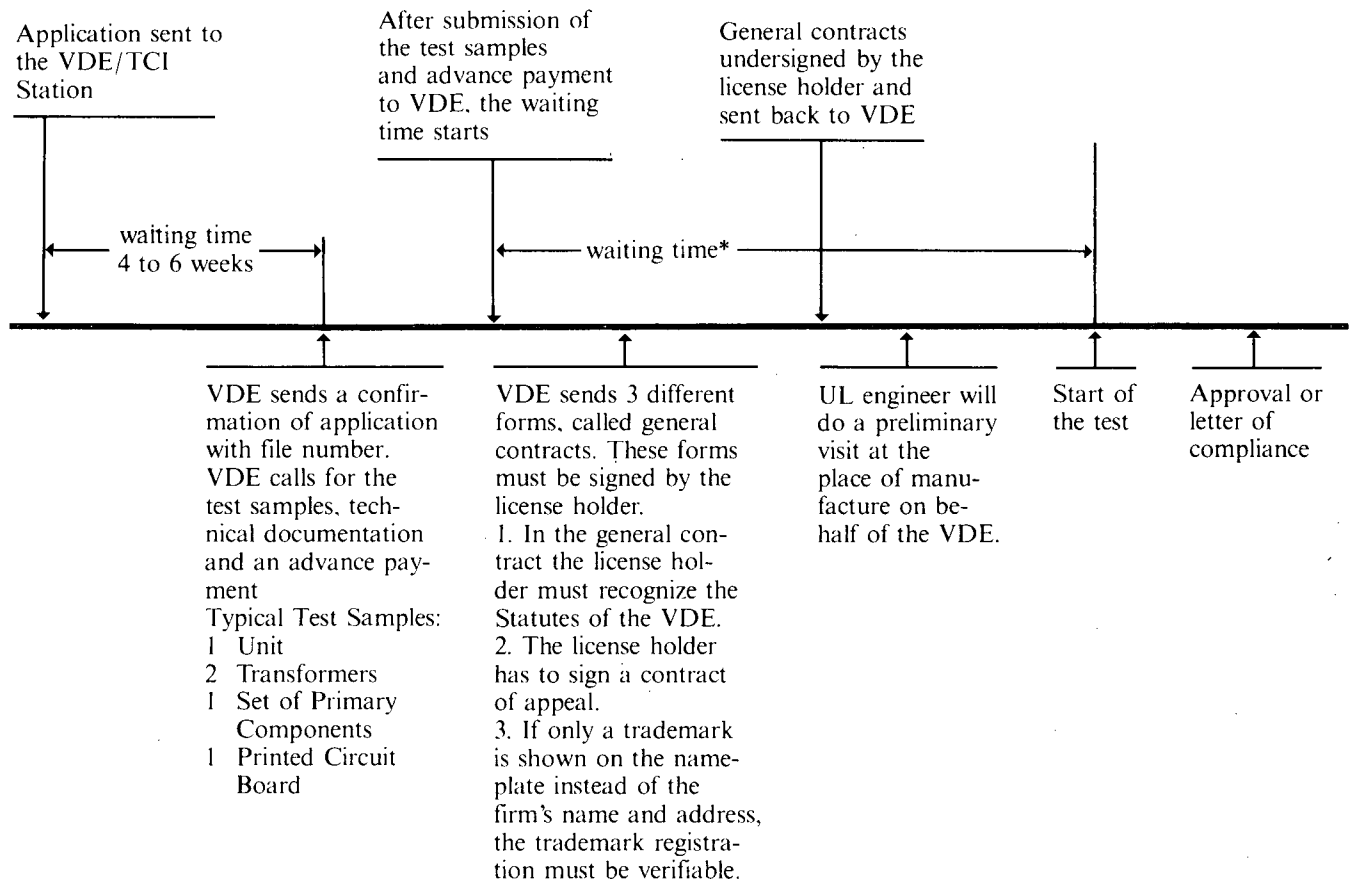
RFI CONTROL AND ELECTRICAL SAFETY

The electrical safety design of a product must comply with the West German Safety Law. Since the RFI suppression devices influence electrical safety, the capacitors, chokes and filters must be in compliance with VDE 0565 Parts 1 to 3. The insulation requirements for capacitors are:

X Capacitors, Plate-to-Plate	1075 VDC for 1 minute
	1625 VDC for 2 seconds
Y Capacitors, Plate-to-Plate	1500 VAC for 1 minute
	1800 VAC for 2 seconds

In addition, the individual requirements of each equipment specification must be considered. For instance VDE 0806/IEC 380 requires a high-pot test of 1250 VAC from line to housing. For this case the 1,500 VAC Y-capacitors will be adequate.

The West German Safety Law requires that all technical equipment is safe. Compliance with this requirement is demonstrated when electrical equipment is designed to meet the requirements of the VDE specifications. It is not mandatory to have the equipment safety-tested by the VDE Testing and Certification Institute (NOTE: The RFI



* Waiting time depends on the kind of appliance. Presently, the waiting time is six (6) months.

Figure 5. VDE Testing and Certification Institute Application and Test Schedule

test or permit procedure is required by law). However, when the equipment is tested by a recognized testing agency (VDE or TUV) the "GS" Mark can be affixed to the end-use equipment.

The VDE safety specifications are being harmonized with the international IEC specifications. For instance, IEC 380, Safety for Office Equipment, is being used by the VDE as VDE 0806. Most other European countries are harmonizing their specifications per the Common Market Directive. In 1982, a CENELEC Certification Agreement (CCA) came into effect. This means that, when a test is performed to IEC 380 by the VDE, they will also upon application issue a CCA, which is valid at the other CENELEC member countries' testing agency.

THE VDE APPLICATION PROCEDURE

Applications for RFI and Safety testing must be sent to the VDE Testing and Certification Institute, Merianstrasse 28, D-6050 Offenbach, West Germany, Tel.: (611) 83061, Telex: 4152796 (VDEP-D). There are two separate applications required, one for RFI and one for safety. Typical waiting time is 3 months for RFI and 6 months for safety. The initial contact should be on company letterhead requesting the type of test and describing the equipment to be tested. A brochure of the equipment will be helpful. The subsequent steps are outlined in Figure 5.

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