EMV-Verstärker und ihr Zubehör

Durch aktuelle und zukünftige Funk-Technologien, wie etwa autonomes Fahren, wachsen die Anforderungen an EMV-Mess- und Prüftechnik. In Heft 1 und 2 wurden speziell dafür entwickelte Verstärker, EMC Amplifier, näher vorgestellt. Ein EMC-Amplifier allein nützt jedoch wenig. Für umfangreiche und qualifizierte Messungen benötigt er diverses Zubehör. EMV-Testingenieure oder Hochfrequenztechniker erfahren hier aus renommierter Quelle mehr darüber.

Mobile Radiated Immunity Test System

An often-overlooked important part of an EMC test setup are the accessories. The cost and time associated with EMC testing warrants the use of high quality accessories. AR offers all the accessories needed to round out your system.

Amplifier Accessories

This includes a family of antennas that operate up to 50 GHz and handle up to 20 kW. AR's inhouse antenna designers and experienced EMC design engineers have collaborated over the years to develop antennas that provide very attractive alternatives to traditional antenna designs. Examples include the models Radiant Arrow, ATT Pyramidal Log Period and AA series amplifier antenna products.

AR offers these accessories, with an experienced sales and engineering organization available to offer customers the best solution. Figure 1 and Figure 2 are examples of accessories used in radiated and conducted RF immunity test setups, respectively.

Manufacturing a wide range of the most common, to the largest and most complex EMC systems in the world sets AR systems apart from the competition. The ability to pull together the right amplifiers for the job, with training and ongoing support is one of the many elements AR prides itself on. This approach allows test engineers and technicians the ability to do what they do best: test.

Complete EMC RI and CI systems are available up to 50 GHz. Everything is provided from: amplifiers, antennas, couplers, signal generators, system controllers, receivers, and more, along with the software to control it – all in one comprehensive test system.

The above shown example of a mobile RI test system was designed meet HIRF (High Intensity Radiated Fields) levels. This figure shows a shielded rack (doors not shown) containing: amplifiers, RF switch matrix, power measurement equipment, signal generator, antenna mast, antenna assembly, and motor drive to raise and lower the antenna assembly. All components are mounted to a heavy duty mobile cart.

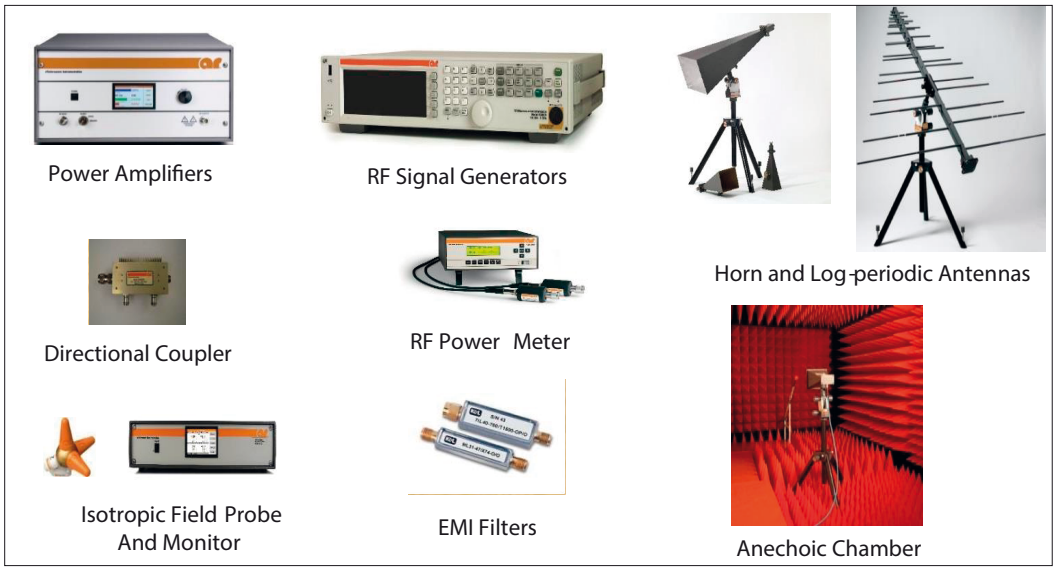

Figure 1: Components Used in a Typical Radiated Immunity Test Setup

Quelle:
Application Note #77
Specifying RF/Microwave Power Amplifiers for EMC Testing
AR RF/Microwave Instrumentations
info@arworld.us
www.arworld.us

Model Number	Frequency Range (GHz)	Guaranteed Field Strength (V/m)	Spot Size (m)
AA18G26-20	18 – 26	20	0.31 x 0.31
AA18G26-50	18 – 26	50	0.14 x 0.17
AA26G40-20	26 – 40	20	0.29 x 0.32
AA26G40-50	26 – 40	50	0.15 x 0,17

Table 1: AA Series Options

Other examples include; full emissions test capabilities, low, medium, and high power radiated and conducted immunity test systems. These systems are fully automated with AR's emcware.

High-Frequency Field Generating Systems

Traditionally, generating low-level electric fields in the 18...40 GHz band has been performed TWTAs. These TWTAs often produce much more power than is required to generate the required field strengths while also being an extremely costly solution. Why pay for unnecessary power? AR has the answer with the introduction of its AA-Series field generating systems, see Figure 3. These systems produce field strengths of up to 50 V/m in the 18...26.5, and 26.5...40 GHz bands.

The AR models AA18G26 and AA26G40 each consist of an antenna directly mounted to a solid-state amplifier, along with sufficient heat sink and over-temperature fault detection. By connecting the antenna directly to the amplifier, we have eliminated cable losses and can deliver maximum amplifier power to the antenna. The RF loss associated with the cable can be significant, requiring a higher power amplifier to generate the same RF field as the amplifier/antenna unit. Within each frequency band, there are two available options. The model suffixes -20 and -50 associated with each model indicates the guaranteed minimum field strength (20 V/m or 50 V/m). To minimize amplifier size, the AA-Series uses antenna gain, rather than amplifier gain to achieve higher field strengths. Table 1 gives a listing of all the available AA field generating units with their associated frequency ranges, field strengths and antenna spot sizes.

Conducted Immunity Test System

Constantly improving the AR product offering provides customers with the latest technologies and best return on investment. The new CI00402 CI test system (see figure 4) comes with a standard 100 W, 10 kHz to 400 MHz amplifier and full access to the 100A400 amplifier, a spectrum analyzer, and a signal generator. This allows the lab to continue testing in the event other test equipment must is due for calibration, or a failure occurs.

Complete Testing Solutions to the following standards: MIL-STD-461 CS114, DO160 (Section 20) BCI Testing, EN/IEC 61000-4-6, IEC 60601-1-2, EN 50130-4, EN 61000-6-1/2, EN 55024.

Radiated Immunity Multi-Tone Test System

For radiated and conducted immunity testing, the multi-tone approach has many benefits. While the multi-tone methodology, specifically the MT06002 Multi-Tone System (see figure 5), was initially implemented to increase the speed of immunity testing, it has been found that this method also makes the most out of available amplifier power.

Figure 6 shows an example of the efficiency of the multi-tone system. The traditional IEC 61000-4-3 method requires one tone swept from 80 to 1000 MHz. Multi-tone methodology utilizes a group of tones, which are simultaneously stepped through the required test band. As shown, the amplifier only uses 100 W at the lowest frequencies for a single tone. At higher frequencies power is wasted if the single tone test method is used. This efficiency is only achieved by using AR's propriety software, which reviews output power, amplifier compression, and measures intermodulation products. In addition, a multi-tone system, with the appropriate amplifier offers greater flexibility to truly test the equipment (EUT) to threats that are more representative of real-world conditions, as well as

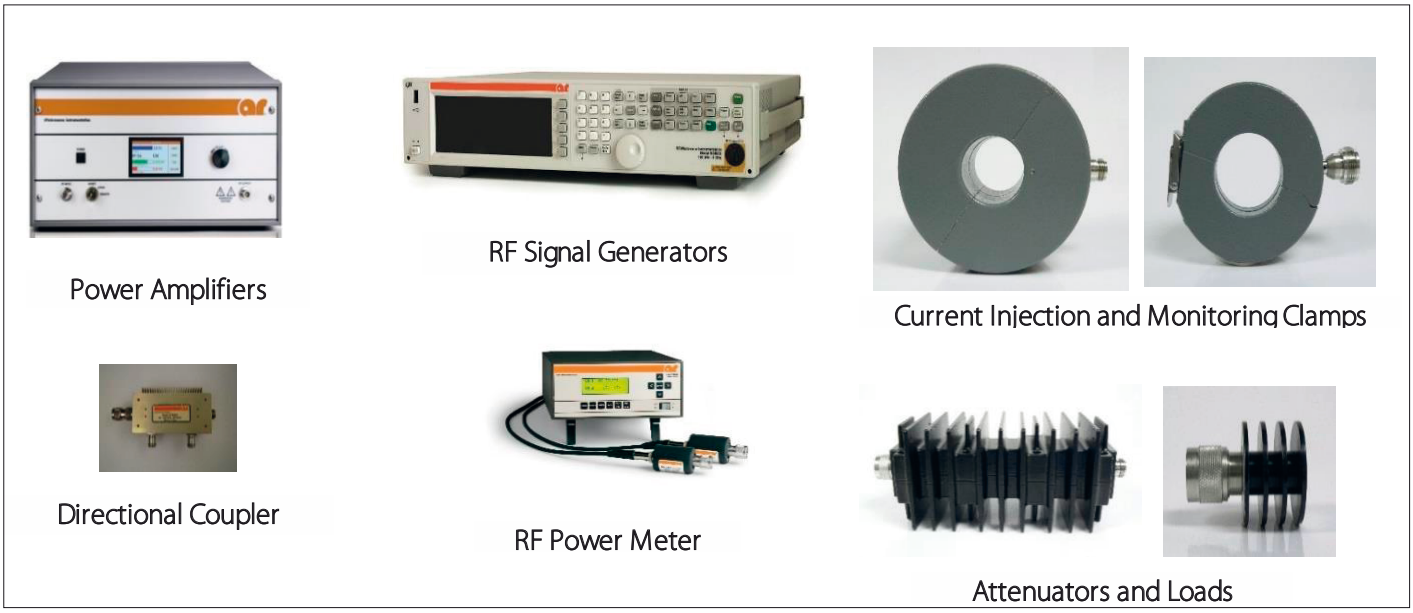

Figure 2: Components Used in a Typical Conducted Immunity Test Setup

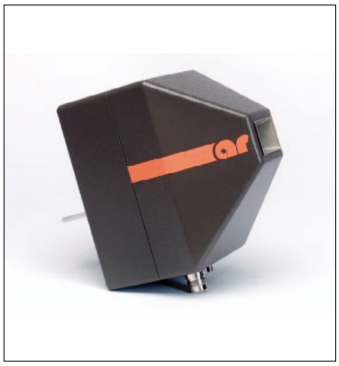

Figure 3: AA18G26-20

Figure 4: CI00402 Conducted Immunity Test System

Figure 5: MT06002 Multi-Tone System

testing in accordance with EMC standards. Benefits also include more efficient use of financial and human resources as well as faster time-to-market for new and enhanced products.

Other Considerations

The transistors used in the amplifier are a main component of the amplifier and can provide hints about the design and provide you with another data point in your purchasing decision. For instance, AR has used GaN technology in its higher frequency amplifiers for a longer period than the competition. The benefit of GaN is greater power density than other technologies, which translates into higher power amplifiers and smaller overall packages compared to competitor's similarly powered amplifiers.

Another important point

is having the ability to develop one's own module using die bonding technologies. This allowed AR to be the first to offer a continuous frequency range amplifier from 0.7 to 6 GHz. Not only are these modules beneficial for EMC purposes, but they are also widely used by wireless component and product manufacturers for R&D purposes. The overall importance is a demonstration to the commitment of AR to provide customers with alternatives with clear benefits.

Almost always forgotten is the importance of product regulatory compliance. It is crucial for amplifiers to undergo safety, EMC, and hazardous substance evaluations. AR uses independent third-party laboratories to evaluate AR products to international safety and EMC test standards, so there is no question about validity of compliance compared to those manufactures who choose to perform in-house evaluations. ◄

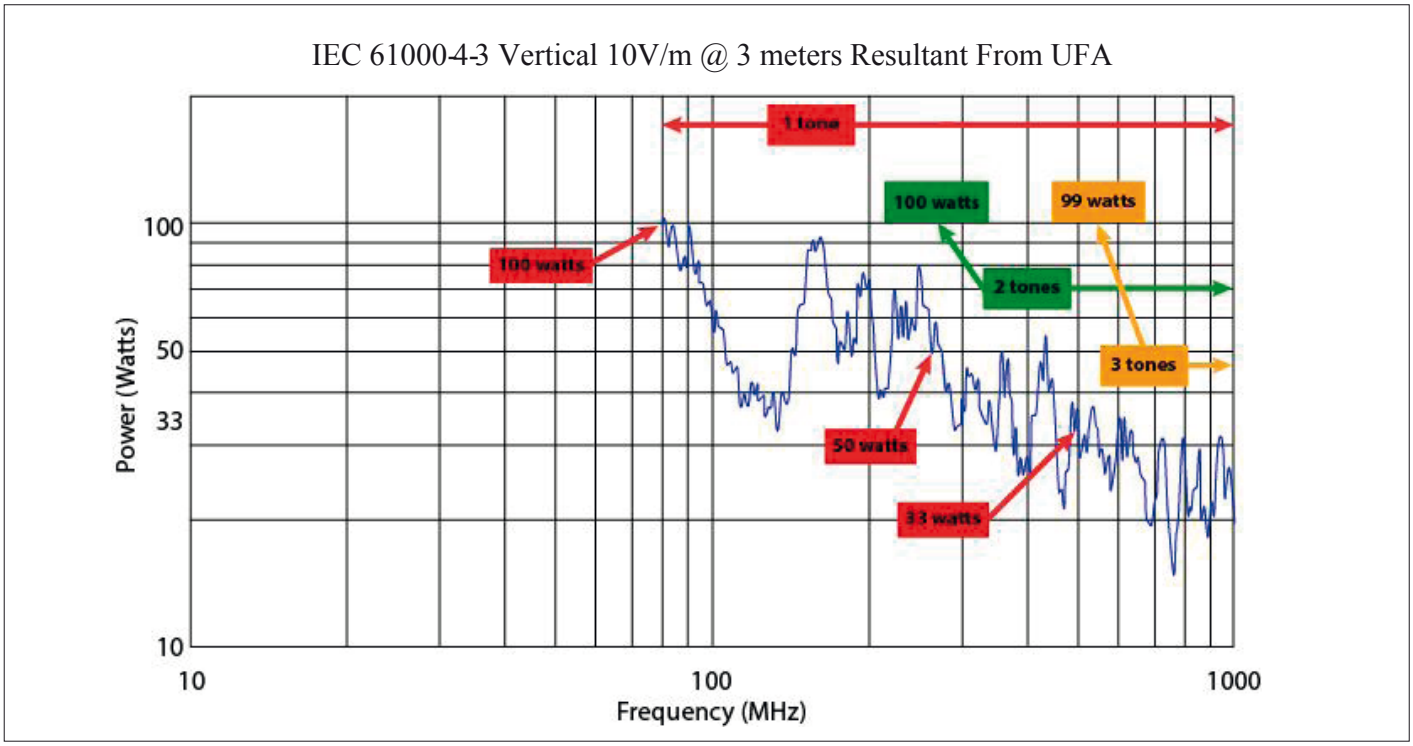

Figure 6: Multi-Tone vs Available Power