HighEnd Outdoor Spectrum Analyzer
SPECTRAN® HF-XFR
Worldwide first "military-standard" Spectrum Analyzer!

Highlights
- Highest performing fully rugged laptop and world’s most sensitive Handheld Analyzer in one device
- Ready to go, LCS-Analyzer-Software already installed
- Ballistic Armor™ Protection System to meet or exceed real world and military standards (MIL-STD-810F)
- Built tough for tough environments

AARONIA AG
WWW.AARONIA.DE
Made in Germany
Technical details

**Notebook** (based on Dell Latitude E6400XFR)

- Processor: Intel Core 2 Duo P9600 (2.66GHz, 1.066MHz, 6MB)
- nVidia Quadro NVS 160M, 256MB with express-card and Fingerprint Reader
- 14.1” WXGA (1280 x 800) wide-aspect transmissive display with DirectVue™ technology for outdoor readability
- Memory: 4096MB (2x2048) 800MHz DDR2 Dual Channel
- Primary Storage: 64GB Solid State Drive
- Battery: 6-cell primary battery
- Wireless: Intel WiFi Link 5100 (802.11 a/b/g/n 1X2) 1/2 MiniCard with Centrino label
- 10/100/1000 Gigabit Ethernet-network card
- Keypad: Internal English Qwertz with background light
- Operating System: Windows XP Pro SP3 with Windows Vista Business SP1 Medias
- Ports: IEEE - 1394, docking connector, USB 2.0 (x4), VGA, Display Port, RJ-11 (optional), RJ-45, eSATA, USB PowerShare, headphone/speaker out, mic (all protected behind sealed doors)
- Multi Media: 2 speakers
- Independently Tested to MIL-STD-810F for:
  - 4ft Transit Drop, Aggravated Rain, Blowing Dust, Vibration, Functional Shock, Humidity, Salt Fog, Altitude, Explosive Atmosphere, Temperature Shock, and Temperature Extremes (Operating: -20°F to 145°F (-29°C to 63°C); Non-Operating: -58°F to 160°F (-50°C to 71°C))
- IP-65 Certified Protection — Dust-Tight and Protected against Pressurized Water Ingress
- UL1604 Certified for Hazardous Locations (Class 1, Division 2, Zones A, B, C, D)
- Weight: 8.5 lbs/3.9 kg
- Width: 13.9” x 353.06 mm
- Depth: 10.1-11.5” x 257.8-293.1 mm
- Height: 2.2” x 58.8 mm

**Spectrum Analyzer** (based on Spectran HF-60100 V4)

- Frequency range: 1MHz - 9.4GHz
- 14Bit Dual-ADC
- DDC Hardware-Filter
- 150 MIPS DSP (CPU)
- AVG Noise Level (DANL): -170dBM (1Hz)
- AbsMax Level: +20dBm
- AbsMax Level (Option): +40dBm
- Filter bandwith (RBW) Min: 200Hz
- Filter bandwith (RBW) Max: 50MHz
- EMC-Filter (RBW): 9kHz, 120kHz, 5MHz, 20MHz, 40MHz
- Lowest possible SampleTime: 1mS
- Accuracy (typical): +/- 1dB
- Vector power measurement (IQ) and True RMS
- AM/FM/PM Demodulation
- Extended full ICNIRP range
- Standards-conformant exposure limits (ICNIRP, BGV B11, B1mSchV etc.)
- Fast ZERO-SPAN sweep
- HOLD Mode
- Time-Slot-Analyser

Application examples SPECTRAN® HF-XFR Spectrum Analyzer

Analysis and measurement of:

- GSM 900
- DECT
- GSM 1800
- UMTS
- WLAN
- Microwave ovens
- WiFi
- WiMax
- Radar
- 5GHz Wlan
- PAR-Radar
- UWB (FB1-FB12)
Description

Real World Rugged

Built for tough environments, the SPECTRAN HF-XFR rises to the challenges you face every workday. The HF-XFR is built to be ready out of the box to withstand pounding rain, blowing dust and dirt, extreme temperatures, accidental drops and more.

Key rugged features include:

- The exclusive BallisticArmor Protection System featuring PR481™ chassis material provides twice the impact strength versus traditional magnesium alloy.
- The SPECTRAN HF-XFR with Ballistic Armor Protection enables excellent protection and is the first in its class to meet a 4ft drop specification.
- With PrimoSeal™ technology we provide the highest combined ingress protection rating (IP65), for enhanced protection against blowing dust and liquid.

Integrated Spectrum Analyzer (based on the Spectran HF-60100 V4)

The PROFESSIONAL PC analysis software demonstrates SPECTRAN's vast capabilities.

- HIGH-RESOLUTION!, freely scalable, coloured spectrum display with falloff function.
- Display of CHANNEL IDENTIFIERS! for exact identification of providers. Channel numbers etc. freely programmable and extensible.
- Up to 10 markers with frequency and level display.
- Intuitive zoom control with very comfortable frequency adjustment.
- High quality "waterfall"-display with timecode. Colour scale freely configurable. Size freely scalable. Optional display of data directly on top of the graph by pointing with your mouse and CTRL-clicking!
- High-resolution Slot Analyser with 3D display!
- SUPER-LOGGER: all data can be written to disk continuously. File format is readable by spreadsheet applications, for creating custom reports, etc.
- Freely positionable windows for comfortable entry of frequency, RBW, sweep etc., etc.
- Various pre-defined profiles for DECT, UMTS, GSM, WLan etc. etc. for instant recall. Incl. optimal parameters and extensive channel information! Freely programmable and extensible!
- Independent main display with SIMULTANEOUS display of dBm, dBµV, V/m, W/m2 and A/m, each with AUTORANGE. Freely transposable and scalable.
- Exposure limit display with various profiles (ICNIRP, Salzburg precautionary values, ECOLOG, etc. etc.). Freely programmable with a virtually infinite amount of display options.
- Functionality to update firmwares.
- etc. etc. etc.
**Inspired Design**

SPECTRAN HF-XFR features securely sealed port covers and a wide range of key peripherals to work wherever you need it to.

- Work in direct sunlight with the large 14.1" wide-aspect LCD featuring DirectVue™ Technology LCD.
- Vehicle docking allows flexibility for police and field technicians to mount systems directly in their vehicles where they work.
- Secure, simple, locking doors with PrimoSeal™ for exceptional protection while working in wet or dusty conditions.

**Uncompromising Performance**

The high performing, fully rugged laptop is the first in its class to ship with both Intel® Core™2 Duo Processor with vPro™ technology. The SPECTRAN HF-XFR has brains as well as brawn.

- QuadCool™ Thermal Management System enables the XFR to meet the MIL-STD for temperature extremes and supports world-class performance, while running the latest Intel® Core™2 Duo Processors.
- Extended field use batteries equipped with ExpressCharge enables primary battery re-charge times up to 2 times faster than Panasonic CF-30.

**Included in delivery**

- SPECTRAN HF-XFR Outdoor Spectrum Analyzer
- HyperLOG 60100 EMC LogPer Antenna (black) with Pistolgrip
- OmniLOG 90200 miniature Broadband Antenna
- 1m SMA-cable
- SMA-Tool
- Battery
- Battery charger
- Detailed English manual

The SPECTRAN HF-XFR was built for tough environments
<table>
<thead>
<tr>
<th>Specifications basic unit(1)</th>
<th>NF-5030 X</th>
<th>HF-6080V4 X</th>
<th>HF-6080V4 X</th>
<th>HF-60100V4 X</th>
<th>NF-XFR</th>
<th>HF-XFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range (min)</td>
<td>1 Hz</td>
<td>10 MHz</td>
<td>10 MHz</td>
<td>1 MHz</td>
<td>1 Hz</td>
<td>1 MHz</td>
</tr>
<tr>
<td>Frequency Range (max)</td>
<td>30 MHz</td>
<td>60 MHz</td>
<td>8 GHz</td>
<td>9.4 GHz</td>
<td>30 MHz</td>
<td>9.4 GHz</td>
</tr>
<tr>
<td>Optional PEAK Power-Detector (Maximum usable frequency)(2)</td>
<td>-</td>
<td>6 GHz</td>
<td>8 GHz</td>
<td>10 GHz</td>
<td>-</td>
<td>10 GHz</td>
</tr>
<tr>
<td>DANL (Displayed Average Noise Level)(3)</td>
<td>200 mV</td>
<td>-135dBm(1Hz)</td>
<td>-145dBm(1Hz)</td>
<td>-155dBm(1Hz)</td>
<td>200 mV</td>
<td>-155dBm(1Hz)</td>
</tr>
<tr>
<td>DANL (Displayed Average Noise Level) with Preamp (Option 020)(3)</td>
<td>-</td>
<td>-150dBm(1Hz)</td>
<td>-160dBm(1Hz)</td>
<td>-170dBm(1Hz)</td>
<td>-</td>
<td>-170dBm(1Hz)</td>
</tr>
<tr>
<td>Max. Power at RF input</td>
<td>2V&lt;sup&gt;2&lt;/sup&gt;</td>
<td>+10dBm</td>
<td>+10dBm</td>
<td>+40dBm</td>
<td>2V&lt;sup&gt;2&lt;/sup&gt;</td>
<td>+40dBm</td>
</tr>
<tr>
<td>RSBW (Resolution bandwidth) (min)</td>
<td>0.3 Hz</td>
<td>10 kHz</td>
<td>3 kHz</td>
<td>200 Hz&lt;sup&gt;&lt;1&gt;&lt;/sup&gt;</td>
<td>0.3 Hz</td>
<td>200 Hz</td>
</tr>
<tr>
<td>RSBW (Resolution bandwidth) (max)</td>
<td>1 MHz</td>
<td>50 MHz</td>
<td>50 MHz</td>
<td>50 MHz</td>
<td>1 MHz</td>
<td>50 MHz</td>
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<tr>
<td>EMC Filter 200 Hz, 9kHz, 120kHz, 200kHz, 1.5MHz, 5MHz</td>
<td>-</td>
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<tr>
<td>Demodulator</td>
<td>AM/FM</td>
<td>AM/FM</td>
<td>AM/FM/PM</td>
<td>AM/FM/PM/GSM</td>
<td>AM/FM</td>
<td>AM/FM/PM/GSM</td>
</tr>
<tr>
<td>Detector</td>
<td>RMS/MinMax</td>
<td>RMS/MinMax</td>
<td>RMS/MinMax</td>
<td>RMS/MinMax</td>
<td>RMS/MinMax</td>
<td>RMS/MinMax</td>
</tr>
<tr>
<td>Units dBm, dBuV, V/m, A/m, W/m² (dBuV/m, W/cm² etc. via PC software)</td>
<td>V, dBV</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Lowest Sample Time</td>
<td>10 μs</td>
<td>10 μs</td>
<td>10 μs</td>
<td>5 μs</td>
<td>10 μs</td>
<td>5 μs</td>
</tr>
<tr>
<td>Accuracy (typical)</td>
<td>+/- 3%</td>
<td>+/- 2dB</td>
<td>+/- 2dB</td>
<td>+/- 1dB</td>
<td>+/- 3%</td>
<td>+/- 1dB</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Highlights</th>
<th>✔</th>
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</thead>
<tbody>
<tr>
<td>Real-Time remote control via USB</td>
<td>✔</td>
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<td>✔</td>
<td>✔</td>
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<tr>
<td>Calibration setup (antenna, cable, attenuator etc.)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Exposure limit calculation according to ICNIRP, EN55011, EN55022 etc.</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Extended full ICNIRP range</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Suitable for Pre-Compliance test</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Suitable for conductive EMC/EMI test</td>
<td>✔</td>
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<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Real-Time limit calculation, limit line display and limit percentage bar display</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Time Domain and fast Zero Span sweep incl. DECT and Time Slot Analyzer</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Unlimited longterm recording and playback feature</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Simultaneously displays frequency and signal strength</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Multiple unit handling and unlimited multiple window handling</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Number of marker (showing frequency and field strength simultaneously)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Spectrum, waterfall, persistence and level vs time display</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Sweep, AVG, Max, Min and Hold function</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Unlimited number of sweep points, resolution and display size</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Supports programming of custom P-Code, C++ based custom software support</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Free of charge firmware update (via Internet)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>14Bit Dual-AOC &amp; DDC hardware filter</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>150MIPS high performance DSP (Digital Signal Processor)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Vector power measurement (IQ) and True RMS</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Solid 3mm aluminum housing with excellent shielding performance</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Integrated rechargeable battery</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Internal speaker</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

Please continue on next page.

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Specifications subject to change without further notice, errors excepted. Subject to our most current terms and conditions.
## SPECTRAN® USB Spectrum Analyser

**APPLICATION EXAMPLES:** Pre-Compliance test, conductive EMI/EMI test, exposures limit measurement etc.

<table>
<thead>
<tr>
<th>Connectors / Interface</th>
<th>NF-5030 X</th>
<th>HF-6080V4 X</th>
<th>HF-6080V4 X</th>
<th>HF-80100V4 X</th>
<th>NF-XFR</th>
<th>HF-XFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>50Ohm SMA input (f)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>USB 1.1/2.0</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Audio output (2.5mm jack)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Charger plug (max. 12V)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

### Included In Delivery

- **HyperLOG EMC directive LogPer antenna (model):**
  - 60100 (black)
- **OmniLOG 90200 radial isotropic antenna:**
- **Rechargeable Battery:**
- **Battery charger and/or power supply incl. international adapter set:**
- **Aluminum carrying case with foam protection:**
- **Detailed English manual (on CD):**
- **Analyzer Software for MAC-OS, Linux and Windows (on CD):**
- **1m SMA Cable:**
- **SMA Tool:**
- **USB Cable (special EMC screened version):**

### Available Options (extra charge)

- **Option 002 (high accurate 0.5ppm TCXO timebase):**
- **Option 005 (12Bit DDC for ultra high sensitivity):**
- **Option 008 (20MHz frequency expansion, New range: 1Hz-20MHz):**
- **Option 010 (30MHz frequency expansion, New range: 1kHz-30MHz):**
- **Option 020 (15dB internal low noise preamplifier, switchable):**
- **Option 20x (Real-time Broadband Peak Power Meter):**
- **Option UBBV1 (40dB external preamplifier 1MHz-1GHz):**
- **Option UBBV2 (40dB external preamplifier DC-8GHz):**

### Optional Accessories

- **DC-Blocker (protects the input against DC voltage):**
- **20dB Attenuator (expands the measurement range by 20dB):**
- **PBS1 Near Field Probe Set (passive):**
- **PBS2 Near Field Probe Set (active, incl. UBBV2 preamplifier):**
- **ADP1 Active Differential Probe (conductive measurement):**
- **GEO10 Vibration sensor (4Hz-1kHz):**
- **GEO14 Vibration sensor (10Hz-1kHz):**
- **5m or 10m low loss SMA cable:**
- **Calibration Resistor (for noise floor calibration, SMA):**
- **Calibration Certificate:**

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Specifications subject to change without further notice, errors excepted. Subject to our most current terms and conditions.
Included in delivery:

**Option 020:** Internal 15dB low-noise preamplifier

This option provides an internal, super low-noise 15dB preamplifier, enabling maximum performance particularly when measuring extremely weak signals. It is switched via a TRUE RF switch. There really is no excuse for not ordering this one, considering its very attractive price!
The maximum sensitivity of the V4 series without option 020 is lower by 15dB.
*Order/Art.-No.: 177*

**Option 002:** 0,5PPM TCXO timebase

This highly precise TCXO timebase, which has been especially developed for the SPECTRAN®, offers significantly reduced phase noise (jitter). This will allow the use of far narrower filters (in development), which will in turn vastly enhance sensitivity. To fully exploit the maximum sensitivity of the HF-60100 V4, this option is indispensable! Furthermore, the TCXO timebase allows far more accurate frequency measurement and display and is therefore a MUST-HAVE for future applications like time-domain measurements or code-selective measurement of UMTS, all already in development.
The standard accuracy without option 002 is 50ppm.
*Order/Art.-No.: 181*

**OmniLOG 90200 broadband antenna**

The OmniLOG® 90200 Antenna is specially developed for a quasi isotropic (radial isotropic) measurement in the GSM (GSM900, GSM1800, GSM1900), UMTS and 2,4GHz WLAN frequency ranges. It fits perfectly in addition to our SPECTRAN measurement devices.
Compared to our HyperLOG-Antennas, the OmniLOG antenna offers the possibility for a direct, radial measurement of field strength without the need to move the antenna to the source. This offers the possibility to get a direct field strength reading without any hassle.
*Order/Art.-No.: 177-2*

Available options (extra charge):

**Option 022:** 40dB low-noise preamplifier 1kHz-8GHz

This option provides an external, super low-noise 40dB preamplifier, enabling maximum performance particularly when measuring extremely weak signals at a EN55011, EN55022 or EN50371 EMC-test. If you use our BicoLOG antenna or our PBS1 Probeset and EMC-Sniffer this amplifier is a MUST HAVE to get the best performance!
The 40dB preamplifier is already included in the EMC-Bundle1.
*Order/Art.-No.: 177-2*
### Frequency Overview SPECTRAN Spectrum Analyzer

<table>
<thead>
<tr>
<th>Hz</th>
<th>1Hz</th>
<th>10Hz</th>
<th>100Hz</th>
<th>1kHz</th>
<th>10kHz</th>
<th>100kHz</th>
<th>1MHz</th>
<th>10MHz</th>
<th>100MHz</th>
<th>LGHz</th>
<th>20GHz</th>
<th>100GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECTRAN NF-1010</td>
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<td>SPECTRAN NF-1010G</td>
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<td>SPECTRAN NF-3010</td>
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<td>SPECTRAN NF-3020</td>
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### Frequency Overview HyperLOG and BicoLOG Antennas and Probes

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### Equipment
- Antenna EMV ReQtS 5100, 51000
- Antenna Active Differential Links (AM 5000 series)
- Antenna Active Differential Links (AM 5000 series)
- Antenna Active Differential Links (AM 5000 series)
References

User of Aaronia Antennas and Spectrum Analyzers (Examples)

Government, Military, Aeronautic, Astronautic
- NATO, Belgien
- Boeing, USA
- Airbus, Hamburg
- Bund (Bundeswehr), Leer
- Bundeswehr (Technische Aufklärung), Hof
- Lufthansa, Hamburg
- DLR (Deutsches Zentrum für Luft- und Raumfahrt, Stuttgart
- Eurocontrol (Flugüberwachung), Belgien
- Australian Government Department of Defence, Australien
- EADS (European Aeronautic Defence & Space Company) GmbH, Ulm
- Institut für Luft- und Raumfahrtmedizin, Köln
- Deutscher Wetterdienst, Tauche
- Polizeipräsidium, Bonn
- Landesamt für Umweltschutz Sachsen-Anhalt, Halle
- Zentrale Polizeitechnische Dienste, NRW
- Bundesamt für Verfassungsschutz, Köln
- BEV (Bundesamt für Eich- und Vermessungswesen)

Industry
- Shell Oil Company, USA
- ATI, USA
- Fedex, USA
- Walt Disney, Kalifornien, USA
- Agilent Technologies Co. Ltd., China
- Motorola, Brasilien
- IBM, Schweiz
- Audi AG, Neckarsulm
- BMW, München
- Daimler Chrysler AG, Bremen
- BASF, Ludwigshafen
- Deutsche Bahn, Berlin
- Deutsche Telekom, Weiden
- Siemens AG, Erlangen
- Rohde & Schwarz, München
- Infineon, Österreich
- Philips Technologie GmbH, Aachen
- ThyssenKrupp, Stuttgart
- EnBW, Stuttgart
- RTL Television, Köln
- ProSieben – SAT 1, Unterföhring
- Channel 6, Großbritannien
- WDR, Köln
- NDR, Hamburg
- SWR, Baden-Baden
- Bayerischer Rundfunk, München
- Carl-Zeiss-Jena GmbH, Jena
- Anritsu GmbH, Düsseldorf
- Hewlett Packard, Dornach
- Robert Bosch GmbH, Plochingen
- Mercedes Benz, Österreich
- EnBW Kernkraftwerk GmbH, Neckarwestheim
- AMD, Dresden
- Infineon Technologies, Regensburg
- Intel GmbH, Feldkirchen
- Philips Semiconductors, Nürnberg
- Hyundai Europe, Rüsselsheim
- Saarschmiede GmbH, Völklingen
- Wilkinson Sword, Solingen
- IBM Deutschland, Stuttgart
- Vattenfall, Berlin
- Fraport, Frankfurt

Research/Development, Science and Universities
- Deutsches Forschungszentrum für Künstliche Intelligenz, Kaiserslautern
- Universität Freiburg
- Indonesien Institute of Science, Indonesien
- Max-Planck-Institut für Polymerforschung, Mainz
- Los Alamos National Laboratory, USA
- University of Bahrain, Bahrain
- University of Florida, USA
- Universität Erlangen, Erlangen
- Universität Hannover, Hannover
- University of Newcastle, Großbritannien
- Universität Strasbourg, Frankreich
- Universität Frankfurt, Frankfurt
- Uni München – Fakultät für Physik, Garching
- Technische Universität Hamburg, Hamburg
- Max-Planck-Institut für Radioastronomie, Bad Münstereifel
- Max-Planck-Institut für Quantenoptik, Garching
- Max-Planck-Institut für Kernphysik, Heidelberg
- Max-Planck-Institut für Eisenforschung, Düsseldorf
- Forschungszentrum Karlsruhe, Karlsruhe