Rev 1.3
12.03.2010

Handheld spectrum analyzer series
SPECTRAN® HF-6060 V4, HF-6080 V4, HF-60100 V4

Portable Spectrum Analyser with world record in sensitivity (DANL)

HF-4040 Rev.3   HF-4040 Rev.3

"Unbeatable price.."
"Particularly Aaronia's very powerful (especially considering their price)
SPECTRAN handheld spectrum analysers caused much excitement."
(Markt&Technik 20/2005)

References / examples of proof:

◆ EADS, Munich, Germany
◆ Mercedes Benz, Austria
◆ Deutsche Bahn, Berlin, Germany
◆ EnBW Kernkraft GmbH, Germany
◆ RTL Television, Cologne, Germany
◆ NDR, Hamburg, Germany

AARONIA AG
WWW.AARONIA.DE

Made in Germany

Specifications

SPECTRAN® HF-6060 V4:

- Up to **100x faster SampleTime** as Rev.3
- Up to **60dB higher sensitivity** as Rev.3
- 14Bit Dual-ADC
- DDC Hardware-Filter
- 150 MIPS DSP (CPU)
- Frequency range: 10MHz to **6GHz**
- Max measurement range: -135dBm (1Hz)
- Max measurement range PreAmp: **-150dBm** (1Hz)
- AbsMax Level: +10dBm
- Lowest possible SampleTime: **1mS**
- Typ. accuracy: +/- 2dB**
- Dimensions (L/W/D): (260x86x23) mm
- Weight: 420gr
- **Warranty: 10 years**

SPECTRAN® HF-6080 V4:

- Up to **100x faster SampleTime** as Rev.3
- Up to **70dB higher sensitivity** as Rev.3
- 14Bit Dual-ADC
- DDC Hardware-Filter
- 150 MIPS DSP (CPU)
- Frequency range: 10MHz to **8GHz**
- Max measurement range: -145dBm (1Hz)
- Max measurement range PreAmp: **-160dBm** (1Hz)
- AbsMax Level: +10dBm
- Lowest possible SampleTime: **1mS**
- Typ. accuracy: +/- 2dB**
- Dimensions (L/W/D): (260x86x23) mm
- Weight: 420gr
- **Warranty: 10 years**

SPECTRAN® HF-60100 V4 (with Worldrecord in sensitivity!):

- Up to **100x faster SampleTime** as Rev.3
- Up to **80dB higher sensitivity** as Rev.3
- 14Bit Dual-ADC
- DDC Hardware-Filter
- 150 MIPS DSP (CPU)
- Frequency range: 1MHz to **9,4GHz**
- Max measurement range: -155dBm (1Hz)
- Max measurement range PreAmp: **-170dBm** (1Hz)
- AbsMax Level: +20dBm
- AbsMax Level: **+40dBm** (Option)[3]
- Lowest possible SampleTime: **1mS**
- Typ. accuracy: +/- 1dB**
- Dimensions (L/W/D): (260x86x23) mm
- Weight: 420gr
- **Warranty: 10 years**

Application examples Spectran HF-60xxx Spectrum Analyzer

Analysis and measurement of:

- WLan
- UMTS
- WiFi
- active Radar
- GSM
- Mobile phones
- Bluetooth
- Microwave ovens
- DECT phones
- TETRA
- radio stations
- TV stations

Description

Conforming to standards and exact

RF Measurement in this price range has never been this professional.

Find radiation sources in your surroundings. Find their respective frequencies and signal strengths, including **direct display of exposure limits**. This used to be impossible in this price category, professional units often costing several thousand euros and being excessively complicated in handling.

The highly complex calculations in spectrum analysis incl. exposure limit calculation is being performed, unnoticed in the background, by a high-performance DSP (digital signal processor). This ultra-fast processor even allows REAL-TIME display in all EMF (LF) versions of the SPECTRAN® series.

**Fast, handy, cost-effective, beautiful exterior and PRECISION - what more could you ask ?**

Professional PC analysis software (free download)

The professional PC analysis software demonstrates SPECTRAN's vast capabilities. This software can be used in addition to SPECTRAN and offers an incredible amount of features. All this for FREE. Just download it from our homepage, and your PC turns into a real spectrum analyser with a huge display:

- ◆ **MULTI-device capability**! Remote control of several SPECTRAN units. These can be controlled and their data displayed at once on a single PC.
- ◆ **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-clik-king!
- ◆ **High-resoution 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, sweeptime 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!
- ◆ Independant main display with SIMULTANEOUS display of dBm, dBµV, V/m, W/m2 and A/m, each with AUTORANGE. Freely transposable and scalable.
- ◆ **SUPERB 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 SPECTRAN measurement device firmwares.
- ◆ Freely programmable key assignments and labels for SPECTRAN measurement devices.
- ◆ Filemanager and COMPILER for creation and management of YOUR OWN PROGRAMS for SPECTRAN measurement devices.
- ◆ "Rename" option for renaming any of your SPECTRAN units (for example, including location) for better identification
- ◆ etc. etc. etc.
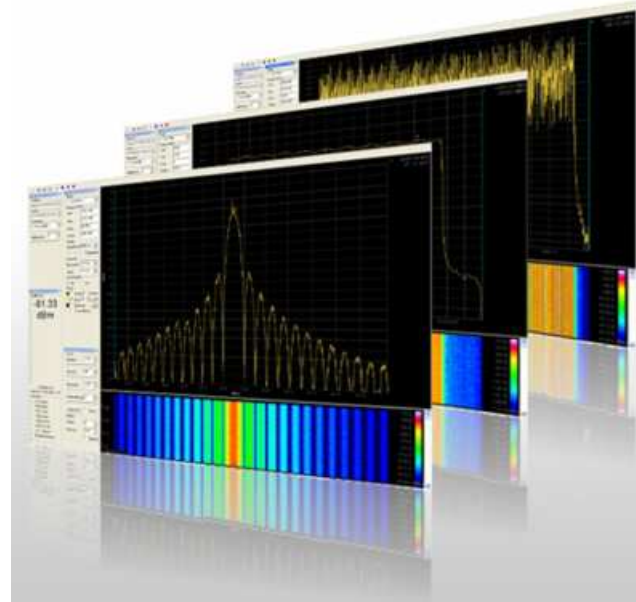
AMAZING: The PROFESSIONAL PC software for SPECTRAN. Get to know SPECTRAN's real capabilities!
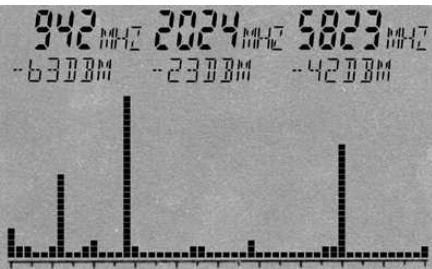
RF spectrum display and automatic triple multi-marker display on the digital screen of SPECTRAN® (Screenshot)
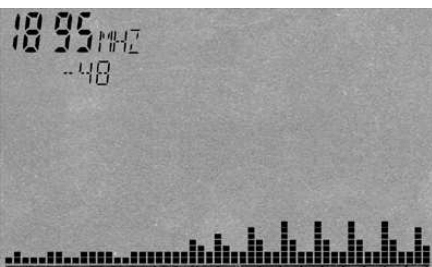
Well visible: "Frequency hopping" of a DECT portable phone between 1890 and 1900 MHz (Screenshot)

Spectrum ANALYSIS

The perfect analysis:
Professional RF measurement devices use a **frequency dependant measurement approach**, the so-called **spectrum analysis**. In a certain frequency range, the individuals signals and their respective strengths are being broken down, for example into a "bargraph" display (see SPECTRAN® screenshots on the left). The height of the individual bars represents the corresponding signal strength. For the 3 strongest signal sources, SPECTRAN® automatically displays the exact frequency and signal level, thanks to its "Auto Marker" feature. Of course, you can also setup the filter width and the frequency range to be analysed as you like.

In the RF spectrum shown, a frequency range of approx. 100MHz to 7GHz from left to right is being analysed (full sweep). During analysis, the Auto Marker feature has determined - fully automatic - three main signal sources:
Signal#1=942MHz (GSM communications) at -63dBm
Signal#2=2024MHz (UMTS) at -23dBm
Signal#3=5832MHz (802.11a WLan) at -42dBm

Thanks to its DIRECT frequency display of the individual signal sources, a doubtless mapping of measurement results to the corresponding radiation sources is possible.

Long-term measurement (data logging feature)

SPECTRAN® measurement devices with data logger allow **long-term recordings of measurement results** over a **freely adjustable** period of time. This is particularly indispensable for seriuos evaluation of exposure by appliances and machinery which have a changing power consumption or radiation strength over time. Examples for these include railroads, power lines and plants, but also home appliances and their respective power cables, and various high-frequency transmission facilities like mobile phone transmission towers, mobile phones, radar etc. Depending on the time of day, considerable variation of exposure can occur (see graphics on the right). Without long-term recordings, massive misinterpretation of total exposure can occur. With long-term data logging using SPECTRAN®, the daily variation of exposure can be recorded and analysed. Thus, the actual total exposure can be evaluated precisely.

With this functionality, you can even discover sporadic EMC problems which would otherwise be very hard to detect. Even though SPECTRAN® units "only" last 2 to 3 (depending on model) hours with one battery charge, the intelligent "Powerdown mode" enables much longer data logging and measurement timespans. Finally, if this is not enough, the external power supply can be used to extend the recording timespan infinitely.

Daily variation of this RF transmitter discloses EXTREME variation in time

INCLUDED WITH DELIVERY

- ◆ RF spectrum analyzer SPECTRAN HF-6060 V4, HF-6080 V4 or HF-60100 V4
- ◆ HyperLOG 7060, 6080 or 60100 EMC/directional antenna
- ◆ 1300mAh power battery with charger
- ◆ Pistol grip with miniature tripod mode
- ◆ SMA toolset
- ◆ SMA adapter
- ◆ 1m SMA cable
- ◆ Sturdy aluminum-design carrycase (with custom padding!)
- ◆ Exhaustive manual with lots of basic information, hints and exposure limit tables

Included in delivery of Spectran HF-60xx Spectrum Analyzer

Overview of features SPECTRAN® RF Spectrum Analyzer

SPECIFICATIONS base unit*	Novice	Intermediate		Professional			Outdoor
	HF-2025E	HF-4040	HF-4060	HF-6060V4	HF-6080V4	HF-60100V4	HF-XFR
Frequency range Min	700MHz	100MHz	100MHz	10MHz	10MHz	**1MHz**	**1MHz**
Frequency range Max	2,5GHz	4GHz	6GHz	6GHz	8GHz	**9,4GHz**	**9,4GHz**
Optional PEAK Power-Detector (Maximum usable frequency)***	2,5GHz	4GHz	6GHz	6GHz	8GHz	10GHz	-
AVG Noise Level (1Hz)	-80dBm	-90dBm	-90dBm	-135dBm	-145dBm	-155dBm	-
AVG Noise Level (1Hz) **with PreAmp**	-	-	-	-150dBm	-160dBm	**-170dBm**	**-170dBm**
Maximum Level	0dBm	0dBm	0dBm	+10dBm	+10dBm	**+40dBm****	**+40dBm****
Filter bandwith **(RBW) Min**	1MHz	100kHz	100kHz	3kHz	1kHz	**200Hz** (TCXO)	**200Hz**
Filter bandwith **(RBW) Max**	50MHz	50MHz	50MHz	50MHz	50MHz	50MHz	50MHz
EMC-Filter (RBW) 9kHz, 120kHz, 5MHz; 20MHz; 40MHz	-	-	-	✓	✓	✓	✓
Accuracy Base unit (typical)	+/-4dB	+/-3dB	+/-3dB	+/-2dB	+/-2dB	+/-1dB	+/-1dB
Vector power measurement (I/Q) and True RMS	-	✓	✓	✓	✓	✓	✓
Lowest possible **SampleTime**	100mS	100mS	100mS	1mS	1mS	1mS	**1mS**
FEATURES							
14Bit Dual-ADC & DDC-Hardware-Filter	-	-	-	✓	✓	✓	✓
Standards-conformant exposure limits (ICNIRP, BGV B11, BlmSchV etc.)	✓	✓	✓	✓	✓	✓	✓
Extended **full ICNIRP range**	-	-	-	-	-	-	✓
Fast ZERO-SPAN Sweep	-	✓	✓	✓	✓	✓	✓
PULS-Mode	✓	✓	✓	✓	✓	✓	✓
ADVANCED HOLD mode (HOLD function)	-	✓	✓	✓	✓	✓	✓
INTERNAL Data Logger (long-term measurements)	-	✓	✓	✓	✓	✓	64GB
TIME-SLOT-ANALYZER	✓	✓	✓	✓	✓	✓	✓
Internal speaker	Piezo	✓	✓	✓	✓	✓	✓
Configurable antenna and cable calibration data	-	✓	✓	✓	✓	✓	✓
Audio demodulation	AM	AM&**FM**	AM&**FM**	AM&**FM**&**PM**	AM&**FM**&**PM**	AM&**FM**&**PM**	-
DISPLAY							
DIRECT RF spectrum display	✓	✓	✓	✓	✓	✓	✓
Exposure limits display with simultaneous percentage display	✓	✓	✓	✓	✓	✓	✓
Main display in dBm, V/m, A/m or dBìV (switchable)	✓	✓	✓	✓	✓	✓	simultaneous
ADDITIONAL display in W/m² with AUTORANGE (**p**W, **µ**W etc.)	✓	✓	✓	✓	✓	✓	simultaneous
High-resolution bargraph (trend display)	✓	✓	✓	✓	✓	✓	14" Display
3fold marker display (ex. 3x power & frequency **at once**)	✓	✓	✓	✓	✓	✓	10fold
INTERFACES / CONNECTORS							
Fast USB 2.0 Interface (PC connection)	✓	✓	✓	✓	✓	✓	2x
Audio output (2,5mm MONO)	✓	✓	✓	✓	✓	✓	-
DC input (max. 15V) for external power supply	✓	✓	✓	✓	✓	✓	✓
50 Ohm SMA RF input (F)	✓	✓	✓	✓	✓	✓	✓
Jog Dial (multi-function dial) for "one-hand operation"	✓	✓	✓	✓	✓	✓	Key- & Touchpad
OPTIONS (extra charge)							
Option 001 (1MB memory expansion)	-	-	✓	✓	✓	✓	Harddisk
Option 002 (high sensitive 0,5ppm TCXO timebase)	-	-	-	-	-	✓	**inclusive**
Option 020 (internal, switchable 15dB PreAmplifier)	-	-	-	✓	✓	✓	**inclusive**
Option 20x (REALTIME broad band Power-Meter)	2,5GHz	4GHz	6GHz	6GHz	8GHz	10GHz	-
INCLUDED ACCESSORIES (in addition to the base unit)							
Miniature SMA rod antenna	✓	✓	✓	-	-	-	Omnilog 90200
HyperLOG EMC directional LogPer antenna (model)	**7025**	**7040**	**7060**	**7060**	**6080**	**60100**	**60100 (black)**
Aaronia 7,2V high-performance battery (1300mAh) + charger							6 cell battery
Aluminum design transport case	✓	✓	✓	✓	✓	✓	-
PC analysis software (Windows, downloadable)	✓	✓	✓	✓	✓	✓	**installed**

*Preliminary specifications as of 05.03.2009. The V4 and XFR-series are available with latest Beta-Firmware. All options are available for the V4 series too. The Beta-Firmware is in continuous development. Some functionality may still be limited and not fully to specifications (Beta-Status). By regularly checking our homepage for updates, you can always keep your measurement device up-to-date. As soon as V1.0 of the firmware is released, all functionality and features will be fully available. Range, sensitivity and accuracy can change depending on frequency, antenna and used parameters. Precision values are based on Aaronia calibration-reference under specific test conditions. Unless otherwise stated, these specifications apply for the reference condition: ambient temperature 22±3°C, relative air humidity 40% to 60%, continuous wave signal (CW), RMS detection. V4 and XFR Noise Level @5,555GHz. Maximum sensitivity of Rev.3 units: -90dBm @2,2GHz.
** Internal: +20dBm. External (with optional 20dB precision attenuator): +40dBm
*** Depending on frequency the optional PEAK power meter offers sensitivity up to -50dBm and max. +10dBm input power with an extremely fast response time.

OPTIONS RF / HF Spectrum Analyzer 60xxx series

Option 001: 1MB memory expansion

This internal memory expansion is a MUST-HAVE particularly when using the data logger, as the standard capacity can quickly become exhausted in this mode. The memory expansion provides space for more than 10,000 logs, while the standard memory will only accomodate approximately 100 of them.
Standard memory size is 64K.

Order/Art.-No.: 180

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

(Only available for Spectran® HF-60100 V4).
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

Option 20x: 6GHz / 8GHz / 10GHz peak power meter

A 6 to 10GHz peak power meter (3 versions depending on the SPECTRAN® model, see our price list). This option augments your SPECTRAN® with a power meter with up to 10GHz of bandwidth. Furthermore, it allows exact measurement of signal peaks with high crest factor like those occuring in WLAN technology, or extremely short signals, like RADAR bursts. What's more, measurement is performed in REAL TIME and BROADBAND, while at the same time being temperature-compensated. It is also an ideal solution for measurement of cable attenuation or receiver output. Depending on the actual frequency, the power meter provides a sensitivity of up to approx. -50dBm, while the maximum permissible level is +10dBm. By adding our 20dB attenuator (see price list), the maximum measurable signal level can be enhanced to +30dBm or +50dBm!

Order/Art.-No.: 182-x

Option 022: 40dB low-noise preamplifier DC-1GHz

(Only available for Spectran® HF-60100 V4).
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

Recommended accessories for Aaronia Spectrum Analyzer

Heavy Plastic Carrycase PRO

Shock resistant, heavy version with padding. Offers spaces for 2 SPECTRAN units with all accessories and a HyperLOG 70xx or 60xx antenna. A MUST for the professional user or outdoor usage!

Order/Art.-No.: 243

Pistol grip / miniature tripod

Detachable handle with super-practical miniature tripod mode: this handle is attachable to the backside of the unit and allows optimal handling (esp. for directional measurement) and even fixed installation of the unit. STRONGLY recommended for PC use!

Order/Art.-No.: 280

Aluminum tripod

Height adjustable, high stability. STRONGLY recommended for PC use! Max. height: 105cm.

Order/Art.-No.: 281

Calibration Certificate

Available for all SPECTRAN® units. With detailed calibration sheet.

Order/Art.-No.: 784

USB Cable (Special Version)

To connect your Spectran to the PC. Special version with high performance EMC-ferrite. STRONGLY recommended for PC use!

Order/Art.-No.: 774

1m / 5m / 10m SMA-Cable

High quality special SMA cable for connecting any HyperLOG®-Antenna or BicoLOG®-Antenna with our RF Spectrum-Analyzer. Available as 1m, 5m and 10m Cable. All versions: SMA plug (male) / SMA plug (male).

3000mAh LiPo Power-Battery

Offers a MUCH higher runtime of your SPECTRAN (up to 400%). Strongly recommended for autonomic measurement! The 1300mAh standard-battery will be replaced.

Order/Art.-No.: 254

Car power adapter for mobile use

With power-LED. For charging batteries or operating our units in your car, including special plug.

Order/Art.-No.: 260

Protection rubber

Protect and personalize your SPECTRAN with a sturdy rubber case and keep it scratch-n-dent free. Allows full access to all functions.

Order/Art.-No.: 290

DC-Blocker (SMA)

It prevents the RF-input of the SPECTRAN to be destroyed by the DC-voltages of f.e. DSL/ISDN lines.

Order/Art.-No.: 778

Calibration Resistor (DC-18GHz)

This calibration resistor is necessary for the best possible calibration of the noise-floor of each Spectran V4-Analyzer.

Order/Art.-No.: 779

20dB SMA high-end Attenuator

Expands the measurement range to +40dBm. (ONLY SPECTRAN HF-60100 V4 and HF-XFR).

Order/Art.-No.: 775

Frequency overview Analyzer & Antennas

Frequency Overview SIECTRAN Spectrum Analyzer

SPECTRAN NF-1010
SPECTRAN NF-1010E
SPECTRAN NF-3010
SPECTRAN NF-3020
SPECTRAN NF-5010
SPECTRAN NF-5030 (opt. 30MHz)
SPECTRAN NF-XFR (opt. 30MHz)
SPECTRAN HF-2025E Rev3
SPECTRAN HF-4040 Rev3
SPECTRAN HF-4060 Rev3
SPECTRAN HF-6060 V4
SPECTRAN HF-6080 V4
SPECTRAN HF-60100 V4
SPECTRAN HF-XFR

Frequency Overview HyperLOG and BicoLOG Antennas and Probes

HyperLOG 7025
HyperLOG 7040
HyperLOG 7060
HyperLOG 6080
HyperLOG 60100
HyperLOG 60180
HyperLOG 4025
HyperLOG 4040
HyperLOG 4060
HyperLOG 3080
HyperLOG 30100
HyperLOG 30180
OmniLOG90200
BicoLOG 5070
BicoLOG 30100
BicoLOG 30100E
BicoLOG 20100
BicoLOG 20100E
BicoLOG 20300
Aaronia EMV Probe-Set PBS1 & PBS2
Aaronia Active Differential Probe (NF-50xx series)
Geophon (Aaronia GEO 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)

Research/Development, Science and Universitys

- Deutsches Forschungszentrum für Künstliche Intelligenz, Kaiserslautern
- Universität Freiburg
- Indonesien Institute of Sience, Indonesien
- Max-Planck-Institut für Polymerforschung, Mainz
- Los Alamos National Labratory, 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

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
- Pro Sieben – 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

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