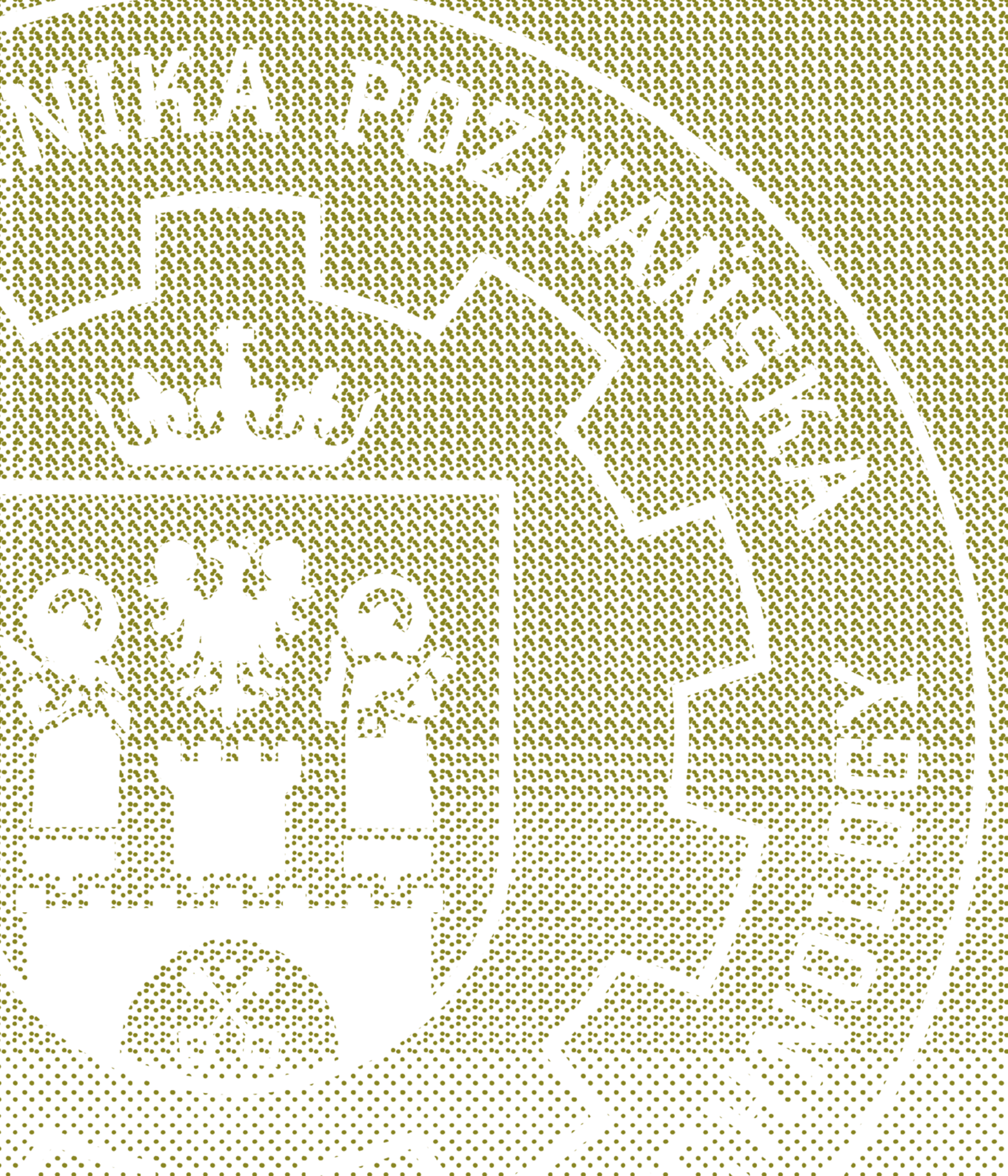


FACULTY OF ELECTRONICS AND TELECOMMUNICATIONS

Information on the selected test equipment at The Faculty of Electronics and Telecommunications, Poznan University of Technology





The Faculty of Electronics and Telecommunications offers B.Sc. and M.Sc. studies in Electronics and Telecommunications and B.Sc. studies in Teleinformatics. The Faculty holds full academic rights in the area of telecommunications. Research activities of the faculty staff members focus on significant aspects of electronics and telecommunications, such as cellular systems, wireless networks, cognitive radio systems, optimization of communication and computer networks, signal processing, processing of video and audio sequences, VLSI testing methods, computer measurement systems, and optical fiber systems. The Committee for Evaluation of Scientific Research Institutions has awarded the Faculty of Electronics and Telecommunications category A, so the faculty belongs to distinguished academic units of the best Polish technical universities. Several research teams have substantial scientific achievements and cooperate with leading scientific centers and companies all over the world. For example, some faculty research teams participate in projects funded by the European Union (within the 5th, 6th, 7th and H2020 Framework Programs), obtain funding for research from the National Science Center and National Center for Research and Development, and engage in research projects for both domestic and foreign industries. The major industrial partners include: Nokia Networks, Huawei, Samsung Electronics, Orange, Haliburton, Advanced Digital Broadcast (ADB), and Mentor Graphics Corporation. Some of the research teams are also active in international standardization within ISO, IEC and ITU.

In the catalog submitted to you, we present our unique laboratory equipment, special instrumentation and measurement devices designed by our team, and comprehensive proposals for industrial and scientific cooperation.

Professor Krzysztof Wesolowski, PhD Eng.

Dean of the Faculty of Electronics and Telecommunications

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Timing and synchronization signal splitter DST-16 with individually programmable outputs

APPLICATION:

- distribution of 2048 kHz or 2048 kbit/s timing/synchronization signals synchronized in phase and frequency to up to 16 independent receivers placed in a telecommunication/computer network node
- elimination of input signal imperfections observed in real systems, e.g., phase jumps, short-term signal decays, etc.
- detection of the lack of input and output signals

KEYWORDS

- telecommunication and computer networks
- timing
- synchronization
- distribution of timing and synchronization signals in telecom/computer nodes.



TECHNICAL SPECIFICATION:

- Timing and synchronization signal splitter DST-16 with individually programmable outputs has two inputs and 16 outputs. Distributed signal is extracted from primary input or from secondary input when primary input signal is unavailable or has low quality. The input signal can be a 2048 kHz periodic signal or 2048 kbit/s with HDB-3 code. At the output, a 2048 kHz sinusoidal signal (ITU-T G.703-13) or 2048 kbit/s PCM signal with CRC4 and “empty frame” (ITU-T G. 703-9) can be chosen individually for 16 galvanically separated output ports. DST-16 standardizes output signals independently of primary and secondary signal imperfections, such as phase jumps, short-term signal decays, etc., observed in real telecommunication/computer networks. DST-16 offers 3 alarms that can be distributed to the management center with existing monitoring systems available in, e.g., SDH multiplexers (no special costs are required to organize a management system for DST-16 devices).

Portable source of reference signals with high-quality rubidium atomic clock and built-in accumulator - **SYN-Rb**



TECHNICAL SPECIFICATION:

- SYN-Rb contains a high-quality rubidium atomic clock with frequency disciplined to GPS/Glonass/BeiDou/Galileo signal or to any periodic signal with frequency from the range of 1Hz (1pps) to 20MHz. SYN-Rb is supplied with Li-Io accumulator that enables its operation out of any power supply system for at least 12 hours. The phase and frequency are synchronized to primary input (1Hz to 20 MHz) or to secondary input (GPS/Glonass/BeiDou/Galileo antenna) when primary input signal is unavailable.

APPLICATION:

- a source of four reference signals with frequency 2048 kHz, four reference signals with frequency 10 MHz, two 1 Hz signals with slopes synchronized to 1 pps impulses provided by internal GPS/Glonass/BeiDou/Galileo receiver or to any periodic signal with frequency 1Hz (1pps).
- a source of timing/synchronization signals for telecom/computer networks (Stratum-1)
- a universal source of timing/synchronization signals synchronized in phase and frequency for synchronizing any clock, lower-quality generators with quartz or LC oscillators, DDS synthesizers, etc.

KEYWORDS

- telecommunication and computer networks
- timing
- synchronization
- atomic clocks
- time scales

SP-4000

Measurement System



TECHNICAL SPECIFICATION:

- The measurement system consists of several independent devices placed in the same housing. They include: four independent time interval meters, rubidium source of reference signal disciplined to GPS/Glonass/BeiDou/Galileo signal or to any periodic signal with frequency from the range of 1 Hz (1pps) to 20 MHz, E1 probe extracting timing signals from E1 bit streams and built-in computer with 10" touch screen and Windows 10 operation system.

KEYWORDS

- telecommunication and computer networks
- timing
- synchronization
- atomic clocks
- phase and frequency parameters of timing signals
- evaluation of synchronization quality
- national and international standards concerning synchronization signals

APPLICATION:

- measurement of time error with low-pass filtration with tunable cut-off frequency from 1 nHz to 10 Hz
- computation of timing and synchronization signal parameters, such as MTIE, Allan deviation, time deviation TDEV, frequency inaccuracy, frequency instability, etc.
- off-line reconstruction of measurements triggered manually or automatically with programmable measurement duration.
- analysis of measurements with cursors, rolling subsequent screens, compression of all screens into one measurement screen, etc.
- comparison of measurement results with national standards, international standards and user-defined standards
- making standardized electronic and graphic measurement reports and documentation

TECHNICAL SPECIFICATION:

The movie camera Red One enables capturing video of very good quality and low level of noise.

Features of the camera:

- photosensitive matrix with resolution of 12 million points and of Super35 format
- ultra HD video capturing (resolution 4 and 4,5 K, maximum 4480x1920 pixels)
- capturing video with frequency of 120 frames per second for FullHD resolution (1080p120)
- video storage using high – fidelity format RedCode RAW
- XLR inputs for multichannel sound capturing
- the capability of remote controlling and synchronization with an external signal

Equipment:

- a set of high quality, bright, fixed – focal – length
– lenses: 25mm f/1.8, 35mm f/1.8, 50mm f/1.8, 85mm f/1.8, 100mm f/1.8
- portable disk array for video registration
- a set of accumulators allowing two hours of work with no external supply
- a tripod adjusted for heavy cameras

APPLICATION:

- high - quality video acquisition with resolution of maximum 4.5K
- slow - motion video acquisition

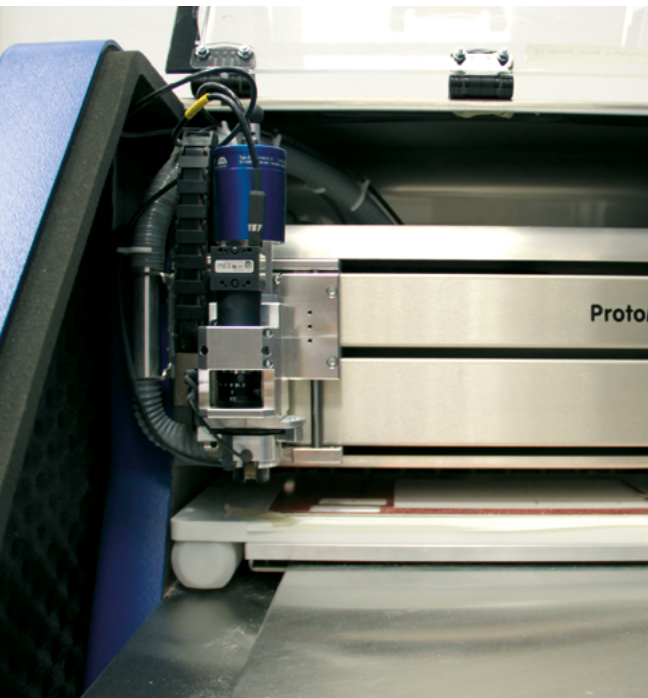
Ultra HD movie camera



KEYWORDS

- high resolution sequences acquisition
- 4K, UltraHD
- slow motion

Laboratory of printed circuit boards



TECHNICAL SPECIFICATION:

- In the laboratory, there are machines for prototyping of printed circuit boards: milling machine LPKF Protomat S100, plating machine LPKF Contact RS, a reflow oven LPKF ProtoFlow S. The equipment enables production of boards of up to 20x30 cm size with the following features: trace spacing: 12 mils, standard trace width: 12 mils, minimum drill size: 0.4 mm. Milling of different shapes, slots and cut outs is also possible.
- There is also additional equipment in the laboratory: soldering sets and irons: Reeco PH-A3 + RA-250e, IR Jovy RE-7500 , PACE ST50 with a set of tips, microscope Targano Magnus HD Uno, as well as oscilloscopes: Tektronix TDS1000 and Tektronix DPO4034.

APPLICATION:

- prototyping of printed circuit boards:
 - one – sided
 - double - sided with through-hole plating.
- production of milled panels for devices.
- soldering circuits onto boards in a reflow oven.
- tests and corrections of printed circuit boards.

KEYWORDS

- prototyping of PCBs
- setting of PCBs
- prototyping and testing of electronic circuits

Photonics and fiber optic system **laboratory**

A DESCRIPTION OF COMPREHENSIVE TEST MEASUREMENT OFFER FOR IN- DUSTRY AND SCIENCE

The equipment available in photonics and fiber communications lab enables to perform a wide range of tests and measurements in time and frequency domain both for passive and active optical devices and modules. The measuring methods with application of professional equipment comprise:

- **attenuation and insertion loss measurements**

applied equipment:

- EXFO IQ 203 optical test platform
- Anritsu OTDR

- **spectral characterization of active and passive components**

applied equipment:

- Optical spectrum analyzer Anritsu, broadband EDF source, TLS Agilent, Santec, Photonetics, optical power meters HP, ILX Lightwave, Anritsu, EXFO

- **DWDM channel analysis**

applied equipment:

- Agilent DWDM wavelength meter
- EXFO IQ 203 / IQ 5320 optical test platform

- **return loss measurements**

applied equipment:

- EXFO IQ 203 optical test platform
- Agilent 8164A lightwave test system

- **polarization depend parameters measurements**

applied equipment:

- Agilent 8509 C polarization analyzer

- **PDL measurements**

applied equipment:

- Agilent 8509 C polarization analyzer,
- JDS Fitel PS3 PDL meter

- **PMD measurements**

applied equipment:

- Agilent 8509 C polarization analyzer,
- GN Nettest PMD

- **CD measurements**

applied equipment:

- GN Nettest PMD analyzer-

- **analysisi of Digital sygnal parameters**

applied equipment:

- Agilent DCA digital communications analyser,
- Agilent 8133A pattern generator

- **SDH/SONET analysis**

applied equipment:

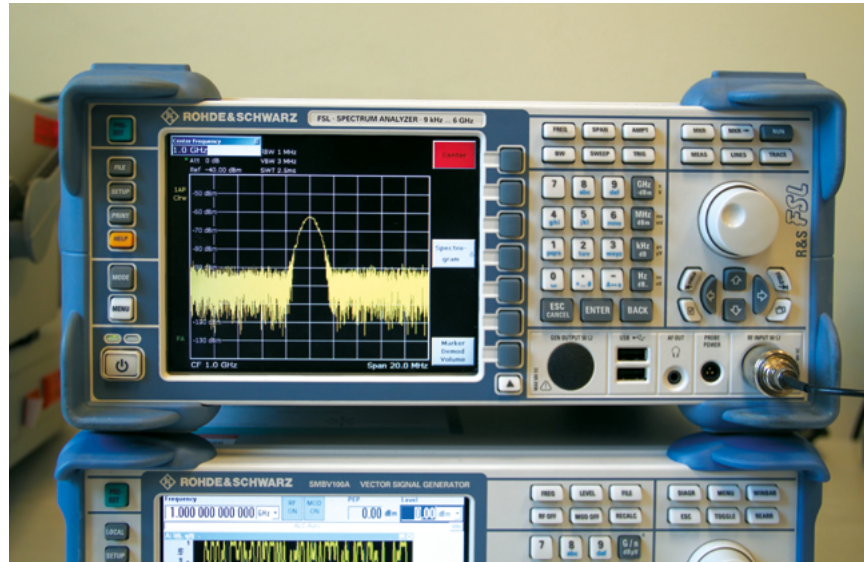
- Tektronix SDH/SONET test set

Rohde & Schwarz

FSL6 Spectrum Analyzer

TECHNICAL SPECIFICATION:

- lightweight and compact,
- frequency range 9 kHz to 6 GHz with 10 Hz resolution,
- 28 MHz demodulation bandwidth,
- average noise level < -140 dBm-cyjnnych



APPLICATION:

- RF signals measurements, including 3GPP wireless communication (3G/4G) and IEEE 802.11 family standards
- DVB and CATV signals measurements

KEYWORDS

- wireless communications
- RF spectrum analysis
- EMC measurements

Rohde & Schwarz

SMBV 100A

Vector Signal Generator

TECHNICAL SPECIFICATION:

- lightweight and compact,
- frequency range 9 kHz to 6 GHz with 0.001 Hz resolution,
- 120 MHz modulation bandwidth,
- arbitrary signal generator with 32Msamples, 16 bit memory



APPLICATION:

- signal generation for wireless communication standards, e.g., GSM/EDGE, 3GPP WCDMA, HSPA/HSPA+, IEEE 802.11 a/b/g/n, LTE, DVB-H/DVB-T
- arbitrary waveform generation

KEYWORDS

- wireless communications
- RF signals generation
- vector signal generator
- arbitrary signal generator

Multicamera video acquisition system with autostereoscopic monitor



TECHNICAL SPECIFICATION:

- Multicamera video acquisition system consists of ten cameras Canon XHG1. Each camera captures video of Full HD resolution 1080p (1920x1080 samples) by 25 images per second. For the cameras, the Chair is in the possession of a linear rig, as well as a set of professional tripods. All the cameras are precisely synchronized (with the accuracy of about $3 \mu\text{s}$) using a dedicated synchronization generator. The whole system can be controlled and managed with an application for a PC.
- Autostereoscopic monitor for 3D video presentation: 28-views, 52-inches monitor DIMENCO (model BDL5231V3D). No special glasses needed for watching 3D video

APPLICATION:

- 3D and multiview video sequences acquisition
- professional tests of 3D video subjective quality

KEYWORDS

- multicamera system
- multiview sequences acquisition
- autostereoscopic monitor

Contact

- 4** **Timing and synchronization signal splitter DST-16
with individually programmable outputs**
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- 5** **Portable source of reference signals with high-quality rubidium
atomic clock and built-in accumulator - SYN-Rb**
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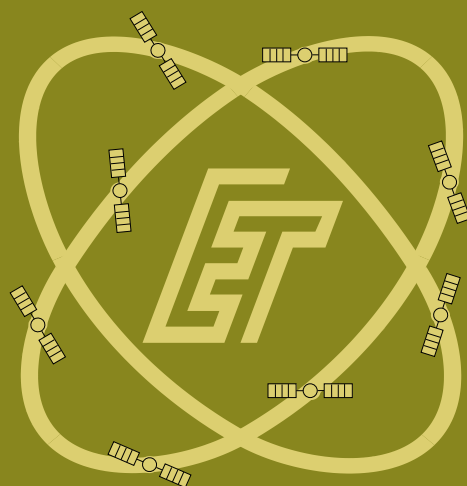
- 6** **SP-4000 Measurement System**
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POZNAN UNIVERSITY OF TECHNOLOGY