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o Automatische Codeerzeugung / Automatic Code Generation Prof. Mecklenbräuker / Dr. Wess	3537, 3519
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MITARBEITER DES INSTITUTS (STAND: 1.10.1996)
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Dipl.-Ing. Klaus Kudielka
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Em.O.Prof. Dr. Günther Kraus
AO.Univ.Prof. Dr. Johannes Riegl
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Dipl.-Ing. Otto Horak
Dr. Markus Kommenda
Dr. Peter Kreuzgruber
Dr. Wolfgang Lothaller
Dr. Helmut Malleck
Mag. Dr. Bernhard Mayr
Dipl.-Ing. Bernhard Oehry
Dr. Peter Proksch
Dr. Alexander Renner
Dipl.-Ing. Paul Skritek

Im letzten Jahr sind folgende Mitarbeiter ausgeschieden:
Irene Gattermann
Dipl.-Ing. Martin Birgmeier
Dipl.-Ing. Thomas Keznikl
Mag. Dr. Bernhard Mayr
Dipl.-Ing. Bernhard Oehry

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Pauliina Erätuuli	01.96 -	Technische Universtät, Helsinki, Finnland
Ben Green	07.96 - 08.96	Queens University, Belfast, UK
Juha Laurila	06.96 -	Technische Universtät, Helsinki, Finnland
Fernando Lopez-de-Victoria	01.09.96 - 30.09.96	Cornell University, Ithaca, New York, USA
Khanh P. Nguyen	03.94 -	HCMC University of Technology, Vietnam
Csaba Török	22.07.96 - 04.08.96	CEF Technical University, Kosice, Slowakei

Im Bereich der digitalen Signalverarbeitung bearbeiten wir derzeit die folgenden Schwerpunkte: *Zeit-Frequenz-Signalverarbeitung, Nichtlineare Signal- und Sprachverarbeitung, Digitale Filter und adaptive Systeme zur Sprachentstörung,* sowie die *Automatische Generierung optimierter Programme für Signalprozessoren.*

Zur Analyse und Verarbeitung instationärer Signale wenden wir *Zeit-Frequenz-Signaldarstellungen* an. Im Rahmen zweier vom FWF finanzierter Forschungsprojekte entwickeln wir neue Z-F-Verfahren zur Analyse, Filterung, Codierung und Detektion von Signalen. Einerseits arbeiten wir an statistischen Z-F-Verfahren zur optimalen Filterung und Detektion, andererseits an der Analyse und dem Entwurf überabgetasteter ein- und mehrdimensionaler Filterbänke sowie deren Anwendungen auf die Kompression von Audio- und Videosignalen.

Zunehmende Bedeutung erlangt die *nichtlineare Signal- und Sprachverarbeitung* sowohl für die Modellierung als auch für die Signalprädiktion bei unterschiedlichen Anwendungsgebieten. Dabei werden neue Algorithmen aus der Chaostheorie und der Informationstheorie ebenso eingesetzt wie neurale Netze und nichtlineare adaptive Filter. Anwendungen realisieren wir in der Sprachsynthese und Sprachcodierung, der Fehlerverdeckung für Bild- und Sprachsignale, der digitalen Übertragungstechnik und der Analyse und Prädiktion von Lastkurven in der Energieversorgung. Ein Teil dieser Projekte wird mit Unterstützung des FWF, in Kooperation mit der Industrie oder mit internationalen Partnern (Bell Laboratorien, Cornell University) durchgeführt.

Mit der stark gestiegenen Leistungsfähigkeit integrierter digitaler Signalprozessoren eröffnen sich immer mehr Anwendungen für den Einsatz *digitaler Systeme*. Hierfür werden gegenwärtig im Rahmen eines industrienahen FWF-Projekts effiziente und flexible Entwurfsalgorithmen für *digitale Filter* entwickelt. Ein weiteres Forschungsgebiet umfaßt die *Entstörung massiv verrauschter Sprachsignale* mit Hilfe von Filterbänken. Neben dem Entwurf von Multiratenfilterbänken werden auch adaptive Algorithmen zur Modifikation der einzelnen Teilbandsignale entwickelt.

In the area of *digital signal processing* we focus on the following topics*: Time-frequency signal processing, nonlinear signal and speech processing, digital filters and adaptive systems for speech enhancement,* and *automatic program generation for signal processors.*

We apply *time-frequency signal representations* to the analysis and processing of nonstationary signals. In the framework of two FWF supported research projects, we develop new time-frequency methods for the analysis, filtering, coding, and detection of signals. On the one hand, we work on statistical time-frequency methods for optimal filtering and detection; on the other hand, we investigate the analysis and design of oversampled one- and multidimensional filterbanks, as well as their application to the compression of audio and video signals.

Nonlinear signal and speech processing receives growing interest for modeling purposes and signal prediction in various application scenarios. New algorithms from chaos theory and information theory are instrumental tools as are neural networks and nonlinear adaptive filters. We solve application problems in speech synthesis, speech coding, error concealment for image and speech signals, digital communications, and the analysis and prediction of load profiles in energy management systems. Some of these projects are carried out with support from FWF, in cooperation with industry, or with international partners (Bell Laboratories, Cornell University).

The dramatic performance increase witnessed by integrated digital signal processors opens ever more application possibilities for digital systems. For this purpose, efficient and flexible algorithms for *digital filter design* are being developed in an industrially-oriented FWF project. Another research area comprises the *enhancement of massively noise-corrupted speech* signals with the help of filterbanks. Besides the design of multi-rate filterbanks, a number of adaptive algorithms is developed for the modification of the subband signals.

Die Leistungsfähigkeit moderner Signalprozessoren kann nur durch effiziente Programme wirklich ausgenutzt werden. Dazu entwickeln wir Algorithmen für die *automatische Umsetzung von Datenflußgraphen in optimierte Programme für Signalprozessoren*. Auf diesem Gebiet werden wir durch den FWF und die OeNB unterstützt, es bestehen aber auch enge Kooperationen mit Industriefirmen.

The exploitation of the full performance of modern signal processors requires efficient programs. To meet this challenge, we develop *algorithms for the automatic conversion of data flow graphs into optimal programs for signal processors*. In this area, we receive support from FWF and OeNB, and there exist close cooperations with industrial companies.

Im Bereich der *Kanalcodierung* untersuchen wir Trellis-codierte Modulation für unterschiedliche Kanäle (z.B. Fading-Kanäle) sowie fehlerkorrigierende Übertragungsverfahren, die an den Frequenzgang des Kanals angepaßt sind. Wir versuchen, das Prinzip der Turbo-Codes bzw. der iterativen Decodierung auf Kanal angepaßte Übertragungsverfahren anzuwenden. Im Bereich der Quellencodierung testen wir verschiedene Varianten der Datenkompression bei der Bildcodierung und arbeiten an einer optimalen Kombination von Quellen- und Kanal-Codierung.

In the area of *channel coding* we investigate Trellis Coded Modulation for specific channels (e.g. fading-channels) as well as error correction methods combined with spectral shaping. We try to adapt the principle of Turbo-Decoding to channel matched data transmission methods. We are furthermore testing several data compression methods in connection with image coding and try to combine source coding and channel coding in an optimal way.

In der *Mobilkommunikation* arbeiten wir mit der Post und Telekom Austria AG zusammen auf den Gebieten Intelligente Antennen, Wellenausbreitung, Funknetzplanung und digitale Mobilfunksysteme (GSM, DECT, HiperLAN, künftiges UMTS). Wir untersuchen die grundlegenden Fehlermechanismen in Mobilfunkkanälen und spezifizieren im Rahmen eines EU-Projekts, was an Mobilfunkkanälen mit welcher Genauigkeit gemessen werden soll. An den COST Aktionen 231 "Evolution of Land Mobile Communications (Including Personal Communications)" und 259 "Wireless Flexible Personalized Communications" nahmen und nehmen wir aktiv teil. Die Einbindung in das ITG-Fokusprojekt "Mobile Kommunikation" führt zu einem intensiven Wissensaustausch mit deutschen Hochschulen und Firmen. Die Spezialausbildung in der Mobilkommunikation, zu der verschiedene Bereiche des Instituts beitragen, zieht Studenten aus ganz Europa an.

In the field of *mobile communications*, we cooperate with the Austrian PTT on smart antennas, wave propagation, on network planning, and on digital mobile radio (GSM, DECT, HiperLAN, future UMTS). We actively contribute(d) to COST 231 "Evolution of Land Mobile (Including Personal) Communications" and 259 "Wireless Flexible Personalized Communications". Our involvement in the ITG project "Mobile Kommunikation" lead to intensive mutual knowledge exchange with German universities and companies. The dedicated course plan in mobile communications draws students from all over Europe.

Auf dem Gebiet der *Hochfrequenztechnik* beschäftigen wir uns mit Sendeempfängern einerseits für Frequenzbänder bis zu mehreren GHz und andererseits für Kurzwelle. In allen Fällen steht der Einsatz digitaler Verfahren im Vordergrund. Selbstverständlich streben wir an, die entwickelten Baugruppen hochintegrierbar zu gestalten.

In the domain of *radio frequency technology* we deal with the exploitation of bands up to several GHz on one hand and with shortwave radio on the other. In both cases we employ digital technology wherever possible. Our main goal is to develop systems which are highly integratable.

Im Bereich der *Mikrowellentechnik* stehen Industrieaufträge zur Entwicklung von Mikrowellen-Anlagen im Vordergrund. Derzeit wird ein Leistungsverstärker für 1,6GHz entworfen und aufgebaut, der nach dem Prinzip der Beeinflussung der Harmonischen arbeitet. Es werden zwei unterschiedliche Konzepte untersucht, die sich durch die Ansteuerung des Verstärkers voneinander unterscheiden. Mit einem halbsinusförmig angesteuerten Verstärker wurde ein Wirkungsgrad von besser als 75% erreicht.

Auf dem Gebiet der *Optischen Nachrichtentechnik* setzen wir zur Zeit zwei Forschungsschwerpunkte. Zum einen entwickeln wir im Auftrag der Europäischen Weltraumbehörde ESA eine optische, phasengesteuerte Antennengruppe für Datenübertragungssyteme mittels Laserlicht und untersuchen Wind-Lidar-Empfänger. Zum anderen beteiligen wir uns an den ACTS-Projekten "PHOTON" und "MOON" der Europäischen Kommission, in denen Wellenlängenmultiplexsysteme mit Datenraten von 10Gbit/s aufgebaut werden.

Our *microwave group* thrives on industrial contracts for the development of microwave systems. At present we design and build a power amplifier for the 1.6GHz frequency range. We use the concept of harmonic control amplifiers with different input waveforms. With a half-sinusoidally driven harmonic control amplifier we obtained a power-added efficiency of better than 75%.

In the area of *optical communications* we currently work in two main research areas. First, we develop an optical phased array antenna to be used in the European Space Agency's (ESA) intersatellite communication links and investigate wind lidar receivers. Second, we participate in the European Commission's ACTS projects "PHOTON" and "MOON", where wavelength-multiplexed systems with data rates of 10Gbit/s are implemented.

PREISTRÄGER DES INSTITUTS / AWARDS (1.10.1995 - 30.9.1996)

Dipl.-Ing. Mathias Lang	ÖVE/GIT-Preis	1995
Dipl.-Ing. Gerald Matz	ÖVE/GIT-Preis	1995

ERNENNUNGEN UND EHRUNGEN / HONORS AND DESIGNATIONS

Prof. Dr. Wolfgang Mecklenbräuker

Ernennung zum korrespondierenden Mitglied der Österreichischen Akademie der Wissenschaften in der mathematisch-naturwissenschaftlichen Klasse.

Prof. Dr. Wolfgang Mecklenbräuker

Elected as a corresponding member of the Austrian Academy of Sciences (Section for Mathematics and the Natural Sciences).

INSTITUT FÜR KOMMUNIKATIONSNETZE / INSTITUTE OF COMMUNICATION NETWORKS

In den Räumen des Instituts ist seit 01.03.1996 auch das neu eingerichtete Institut für Kommunikationsnetze (Inst. Vorstand: O.Univ.Prof. Dr. Harmen R. van As) untergebracht. Diese Interimslösung soll die Zeit bis zur Adaptierung der für dieses Institut zugesagten Räume in der Favoritenstraße 9-11 überbrücken.

Since 01.03.1996 the recently established Institute of Communication Networks (Head: Prof. Dr. Harmen R. van As) is accommodated within the premises of the Institut für Nachrichtentechnik und Hochfrequenztechik. This interim solution is planned to bridge the time period needed for adaptation of premises at Favoritenstrasse 9-11 designated to this new Institute.

1. PFLICHTLEHRVERANSTALTUNGEN / MANDATORY COURSES

			WS	SS
Bonek:	Wellenausbreitung 1	VO	2,0	—
Bonek mit Hagenauer:	Wellenausbreitung 1	UE	1,0	—
Magerl:	Wellenausbreitung 2	VO	—	2,0
Magerl mit Kuchar:	Wellenausbreitung 2	UE	—	1,0
Bonek, Mecklenbräuker, Seifert:	Nachrichtentechnik Labor B	LU	9,0	—
Bonek:	Nachrichtentechnik Labor für TPH	LU	—	4,0
Leeb:	Optische Nachrichtentechnik	VO	2,0	—
Leeb mit Kudielka:	Optische Nachrichtentechnik	UE	1,0	—
Bonek:	Hochfrequenztechnik 1	VO	—	2,0
Bonek mit Novak:	Hochfrequenztechnik 1	UE	—	1,0
Geirhofer:	Telekommunikationsnetze und -dienste	VO	—	1,5
Malleck:	Vermittlungstechnik	VO	—	2,0
Mecklenbräuker:	Signal- und Systemtheorie 1	VO	1,5	—
Mecklenbräuker mit Kubin:	Signal- und Systemtheorie 1	UE	1,0	—
Mecklenbräuker:	Signal- und Systemtheorie 2	VO	—	1,5
Mecklenbräuker mit Doblinger:	Signal- und Systemtheorie 2	UE	—	1,0
Mecklenbräuker:	Übertragungsverfahren 1	VO	2,0	—
Mecklenbräuker mit Bernhard:	Übertragungsverfahren 1	UE	1,0	—
Mecklenbräuker:	Übertragungsverfahren 2	VO	—	2,0
Mecklenbräuker mit Hlawatsch:	Übertragungsverfahren 2	UE	—	1,0
Mecklenbräuker, Bonek:	Nachrichtentechnik Labor B für Computertechnik	LU	3,5	—
Mecklenbräuker, Bonek, Seifert:	Nachrichtentechnik Labor A	LU	—	5,0
Scholtz:	Hochfrequenztechnik 2	VO	2,0	—
Scholtz mit Ehrlich-Schupita:	Hochfrequenztechnik 2	UE	1,0	—
Weinrichter:	Einführung in die Nachrichtentechnik	VO	—	3,0
Weinrichter mit Sucher:	Einführung in die Nachrichtentechnik	UE	—	1,5
Weinrichter:	Grundlagen nachrichtentechn. Signale	VO	—	2,0
Weinrichter mit Birgmeier:	Grundlagen nachrichtentechn. Signale	UE	—	1,0

2. WAHLLEHRVERANSTALTUNGEN / OPTIONAL COURSES

			WS	SS
Bonek:	EDV-orientierte Projektarbeit für ET	AG	4,0	4,0
Bonek mit Molisch:	Mobilkommunikation	SV	2,0	—
Bonek, Weinrichter, Molisch:	Mobilfunk	KO	—	3,0
Bonek, Weinrichter, Molisch:	Mobile Radio Communications	KO	—	3,0
Braunbeck:	Geschichte der Nachrichtentechnik	VO	1,5	—
Doblinger:	Signalprozessoren	VO	1,5	—
Doblinger, Bernhard:	Programmieren von Signalverarbeitungsalgorithmen in C	SE	—	1,5
Ehrlich-Schupita, Oehry:	Meßgeräte der Hochfrequenztechnik A	KO	—	1,5
Fröhling, Renner:	Numerische Methoden in der HF- und Mikrowellentechnik	VO	1,5	—
Garn:	Elektromagnetische Verträglichkeit elektronischer Geräte	VO	—	1,5
Garn:	Elektromagnetische Verträglichkeit elektronischer Geräte	UE	—	1,5
Hlawatsch:	Time-Frequency Methods for Signal Processing	VO	1,5	—
Horak:	Einführung in die Kryptologie	VO	1,5	—
Kommenda:	Ein- und Ausgabe von Sprache	VO	—	2,0
Kreuzgruber:	Meßgeräte der Hochfrequenztechnik B	KO	1,5	—
Kubin:	Chaotic Signal Processing	VO	—	1,5
Kubin:	Adaptive Signal Processing	VO	1,5	—
Leeb:	EDV-orientierte Projektarbeit für ET	AG	4,0	4,0
Leeb:	Kohärente optische Systeme	VO	—	1,5
Lothaller:	Satellitennachrichtentechnik	VO	—	1,5
Magerl:	Mikrowellenmeßtechnik	SE	1,5	—
Magerl:	Integrierte Mikrowellenschaltungen	VO	—	1,5
Magerl mit Ingruber, Oehry:	EDV-orientierte Projektarbeit für ET	AG	4,0	4,0
Mayr:	Modulationsangepaßte Codierung	VO	—	1,5
Mecklenbräuker:	EDV-orientierte Projektarbeit für ET	AG	4,0	4,0

			WS	SS
Mecklenbräuker:	Ausgewählte Kapitel der digitalen Signalverarbeitung	VO	1,5	—
Mecklenbräuker, Birgmeier, Doblinger:	Digitale Signalverarbeitung A	SE	3,0	—
Mecklenbräuker, Birgmeier, Doblinger:	Digitale Signalverarbeitung B	SE	—	3,0
Mecklenbräuker:	Signalverarbeitung mit MatLab	LU	3,0	—
Proksch:	Phasenregelschleifen in der Nachrichtentechnik	VO	—	1,5
Riegl:	Radartechnik	VO	—	1,5
Scholtz:	EDV-orientierte Projektarbeit für ET	AG	4,0	4,0
Scholtz:	Hochfrequenz-Schaltungstechnik	VO	—	1,5
Skritek:	Computerunterstützter Schaltungs-entwurf	VO	—	1,5
Weinrichter:	EDV-orientierte Projektarbeit für ET	AG	4,0	4,0
Weinrichter:	Einführung in die Codierung	VO	2,0	—
Weinrichter:	Filter	VO	1,5	—
Wess:	Dimensionierung und Simulation analoger Filter	SE	—	1,5
Zemanek:	Computerentwicklungen in Nordamerika, Europa, Japan	VO	1,0	—
Zemanek:	Abstrakte Computer-Architekturen	VO	1,5	—

GASTVORLESUNGEN / GUEST LECTURES

Prof. Johannes Huber Universität Erlangen-Nürnberg März - Juni 1996	Informationstheorie und deren Anwendung für die digitale Nachrichtenübertragung	VO	—	2,0
Prof. Johannes Huber Universität Erlangen-Nürnberg März - Juni 1996	Informationstheorie und deren Anwendung für die digitale Nachrichtenübertragung	UE	—	1,0
Prof. Russell M. Mersereau Georgia Institute of Technology Dept. Electrical Engineering, Atlanta August - September 1996	Multidimensional Digital Signal Processing	VO	—	2,0

Automatische Codeerzeugung / Automatic Code Generation

Code generation for digital signal processors.
Contact: M. Gotschlich Partner: SIEMENS Duration: 01.02.93 -

Automatic code generation for processors with parallel computational units.
Contact: B. Wess Partner: OeNB (Project: 5491) Duration: 15.07.95 - 30.09.96

Generation of optimized DSP assembly programs.
Contact: B. Wess Partner: FWF (Project P10701-ÖTE) Duration: 01.08.95 -

Digital signal processing for Cochlear implants.
Contact: S. Fröhlich Partner: Cochlear AG, Basel Duration: 01.04.96 -

Codierung und Datenübertragung / Coding and Data Communications

Coding techniques for fading channels.
Contact: B.J. Mayr Partner: FWF (Project P10294-ÖPY) Duration: 01.10.94 - 30.09.96

Error correcting codes with run-length limitation.
Contact: J. Weinrichter Partner: Doz. Farkas, TU Bratislava Duration: 01.07.95 - 15.10.95

Digitale Filter und Signalprozessoren / Digital Filters and Signal Processors

FIR filter design by complex function approximation.
Contact: G. Doblinger Partner: FWF (Project P11133-ÖMA) Duration: 01.05.96 - 30.04.98

Digitale Signalverarbeitung / Digital Signal Processing

Digital signal processing in data transmission facilities.
Contact: W. Kreuzer Partner: ERICSSON Austria Duration: 01.10.93 -

Mikrowellentechnik / Microwave Engineering

High efficiency solid state power amplifier for L-band.
Contact: G. Magerl Partner: Hirschmann Electronic GmbH and ESA Duration: 01.02.94 - 31.03.96

Harmonisch kontrollierter Verstärker mit hohem Wirkungsgrad.
Contact: G. Magerl Partner: FWF (Project P11422-ÖPY) Duration: 01.06.96 - 31.05.97

Mobilkommunikation / Mobile Communications

Evolution of land mobile (including personal) communications.
Contact: E. Bonek Partner: COST 231 Duration: 1989 - 04.96

Telecommunications.
Contact: E. Bonek Partner: PTA Duration: 1990-

Optische Nachrichtentechnik / Optical Communications

Optical phased arrays.
Contact: W. Leeb Partner: ESA-ESTEC Duration: 01.08.94 - 01.08.97

Coherent detection at low photon numbers (DELPHI).
Contact: W. Leeb Partner: ESA-ESTEC Duration: 01.03.96 - 30.04.97

Paneuropean photonic network (PHOTON).
Contact: W. Leeb Partner: European Commission Duration: 01.10.95 - 30.09.98

Management of optical networks (MOON).
Contact: W. Leeb Partner: European Commission Duration: 01.09.96 - 31.12.98

Sprachverarbeitung und Nichtlineare Signalverarbeitung / Speech Processing and Nonlinear Signal Processing

Acoustic signal generation for the text-to-speech system GRAPHON.
Contact: G. Kubin Partner: FWF (Project P9745-PHY) Duration: 01.11.93 - 31.01.96

Signal analysis and modelling using chaos theory methods.
Contact: G. Kubin Partner: FWF (Project P8779) Duration: 01.10.92 - 31.12.95

European network of excellence in language and speech (ELSNET).
Contact: G. Kubin Partner: ESPRIT Div. for Basic Research and OeFAI
Duration: 1992 -

Information- and chaos-theoretic analysis for control and automation engineering.
Contact: H.-P. Bernhard Parnter: SIEMENS PSE Duration: 12.94 -

Digital speech coding at 2400bit/s.
Contact: G. Kubin Partner: AT&T Bell Laboratories Duration: 07.95 - 10.95

Conversion of phonological representations into acoustical parameters for a concept-to-speech system.
Contact: G. Kubin Partner: FWF (Project P10822) and OeFAI
Duration: 1995-1997

Zeit-Frequenz-Signalverarbeitung / Time-Frequency Signal Processing

Time-frequency methods for statistical signal processing.
Contact: F. Hlawatsch Partner: FWF (Project P10012-ÖPH) Duration: 01.05.94-

Matched time-frequency signal representations.
Contact: F. Hlawatsch Partner: FWF (Project P10531-ÖPH) Duration: 01.06.95 -

Design of filterbanks for video coding applications.
Contact: H. Bölcskei Partner: Philips Research Laboratories Eindhoven
Duration: 01.02.96 - 31.05.96

HABILITATIONEN (1.10.1995 - 30.9.1996)
HABILITATION THESES

HLAWATSCH Franz **Time-Frequency Analysis and Synthesis of Linear Signal Spaces, with Signal Processing Applications**

Linear signal spaces are of great importance in signal and system theory as well as for modern signal processing methods. This thesis proposes a time-frequency (TF) analysis of linear signal spaces, thereby combining the field of linear signal spaces with the field of TF analysis. Linear signal spaces are no longer viewed merely as an abstract mathematical concept but as surfaces extending over a joint TF plane. This new viewpoint is based mathematically on the introduction of the *Wigner distribution and ambiguity function of a linear signal space*.

A detailed study of these two "TF space representations" is performed. Various results on the TF localization of linear signal spaces are derived, including the extension of classical uncertainty relations to linear signal spaces. A systematic method for the optimum TF synthesis or TF design of linear signal spaces is also proposed.

Several signal processing applications of the Wigner distribution and ambiguity function of a linear signal space are discussed. A major application of the Wigner distribution of a signal space is the optimum design of TF filters, perfect-reconstruction TF filter banks, and TF basis systems. The application of these methods in a stochastic signal enhancement and signal detection context is also considered. Finally, it is shown that the ambiguity function of a signal space is relevant to the radar/sonar problem of estimating the range and radial velocity of a slowly fluctuating point target.

UHLIRZ Markus **Adapting GSM for Use in High-Speed Railway Networks**

The Global System for Mobile Communication (GSM) has gained broad acceptance in Europe and many other countries all over the world. Its international roaming capability allows to be reached throughout any country supporting GSM while still using the same mobile equipment.

Several European countries have begun to build high-speed railway lines with passenger trains operating at speeds around 300 km/h. High-speed rail links might soon play a major role in European medium-range traveling. Today, international high-speed rail traffic is heavily handicapped by the variety of national rail radio systems existing in different countries.

Therefore the International Union of European railroad operators (Union Internationale Chemins des Fer, UIC) has in 1993 decided to build a supra-national rail radio network based on GSM technology. The existing GSM standard needs to be enhanced by additional features such as Group and Broadcast calls in order to comply with the needs and requirements of railroad operators. The modified system must be capable of operating at speeds of up to 500 km/h. Passengers will also soon demand mobile phone and other communication services while traveling in high-speed trains. However, direct coverage from outdoor cells is impractible due to the topology of high-speed rail lines, because they typically include numerous tunnels and artificial cuttings. A repeater system mounted on the train is likely to suffer from the required high dynamic amplification range. Together with the high speed this discourages using existing public GSM networks for either railroad internal or passenger communications.

This theses proposes necessary modifications to the existing GSM standard in order to meet UIC's requirements for the new rail radio system. Consideration of network aspects leads to following modifications of GSM protocols: i) accelerated call setup for group calls ii) contention resolution for subsequent speakers in group calls iii) a priority setup service for urgent calls iv) introduction of a "connected mode" for listening mobiles in group and broadcast calls. We introduce the "Group Downlink Channel" and the "Group Paging Channel" as new logical channels in GSM. Message flow examples and measurement results illustrate and analyze the improvements to be achieved.

Radio aspects cover the characteristics of the railroad environment, radio wave propagation and demodulation at high vehicular speed. Radio network planning becomes greatly simplified when reduced to line coverage. We discuss some implementation aspects, taking advantage of the typical railroad environment. An "Offline Handover" mechanism offers a better radio link reliability and less critical timing constraints than conventional handover schemes. Using directional antennas on trains improves the signal quality and signal-to-interference ratio.

We have identified by measurement an additional loss of approx. 30dB in signal level due to metallized windows commonly used in modern trains. For passenger communications on high-speed trains we propose a new solution named GSM-R, where "R" stands for "Rail". This overcomes the problems of direct coverage from outdoor cells and repeaters. GSM-R introduces a new "Janus" entity serving as the link between train and ground infrastructure. Seen from the network, Janus is a fast-moving multiple mobile station. Seen from the mobiles onboard the train, it is part of the transmission link towards the fixed network. GSM-R also includes a proposal for integration of "moving cells" into an existing network.

Thus the concept of GSM-R presents a consistent approach of necessary modifications to the existing specifications adapting GSM for use in high-speed railway networks.

MAYR Bernhard J. **Codiertechniken für den Schwundkanal**

This thesis deals with coding techniques for the fading channel. The construction methods presented are adapted to the time variant structure of fading channel statistics which can vary between the AWGN-channel and the Rayleigh fading channel depending on the existence of a line of sight between the transmitter and the receiver. Following the landmark idea of Trellis Coded Modulation (TCM) a number of time variant and time invariant multidimensional TCM with M-Phase Shift Keying (MPSK)-symbols has been constructed. There are three theoretical results which made the improvements feasible: First, a new construction method for subsets. The symbols in these sets have larger free distance and/or a smaller number of nearest neighbors than the symbols of the usual subsets. Second, a new TCM-construction method (the *element-module method*) which is based on the state transition matrix of the codes. Third, an improvement bit-to-symbol mapping that minimizes the number of bit errors per error event. Additionally, a new definition of TCM-complexity provides a useful tool for the comparison of multidimensional TCM.

Altogether more than 100 new TCM-codes with information rates from R_b = 0.375 to 3 bit per symbol have been constructed and evaluated via Monte-Carlo simulation. The new codes outperform the multidimensional MPSK-TCM codes and many binary coded systems given in the so far known literature. For instance, a 2 dB coding gain compared to the R = 1/2 binary convolutional channel code of speech data in the GSM-system has been obtained. The question whether time variant or time invariant TCM performs better cannot be answered uniquely. While the time invariant TCM performs a little better in terms of bit error ratio, the time variant TCM is less complex and offers more flexibility in terms of information rate R_b due to its modular structure.

SCHREIBLEHNER Martin **Coherent Optical Free-Space Multicarrier Communication**

This thesis investigates the performance of coherent optical multicarrier transmission systems for space-borne laser communications. I summarize the performance limiting mechanisms for such systems like shot noise, laser phase noise, circuit noise of the receiver frontend and crosstalk of adjacent channels. After compiling various implementation alternatives for multicarrier transmitters as well as for multicarrier receivers I describe an implementation of a dualcarrier experimental setup with a channel distance variable between 15MHz and 150MHz. This system works at 2x8.45Mbit/s and employs DPSK modulation of Nd:YAG ring lasers at 1.064µm. In the transmitter, the channel distance is set by means of a synthesizer-stabilized optical PLL. In the receiver, a balanced frontend based on a polarization-preserving fiber directional coupler, InGaAs photodiodes, and a 5mW local laser oscillator transposes the optical input channels to a first intermediate frequency. To achieve good channel separation and reliable simultaneous demodulation, conversion to a second and third intermediate frequency is implemented. If only one channel carries information, a sensitivity of 3.2dB above the shot noise limit is achieved. The crosstalk penalty depends on the optical channel distance, on the channel selection filter, and the post-detection filter. For a channel distance of twice the data rate I determined a crosstalk penalty of less than 2dB.

I investigated this power penalty due to crosstalk also numerically employing two different simulation methods, one operating in the time domain and the second one in the frequency domain. The latter approximates the crosstalk of the neighbor channel falling into the desired channel's passband by a Gaussian probability density function. The results predicted from these two simulations are in good agreement with the results measured in the experimental setup. Based on the findings from theory and experiment I propose and characterize an operational optical multicarrier receiver with 10 channels modulated at 25Mbit/s each.

SIMBÜRGER Werner **Integrated Single-Chip Direct Conversion RF-Transceiver**

In the future in mobile communications the demand of the market will be high numbers of cheap and simple to use but reliable mobile terminals which supply different mobile services with high connectivity independent of the users location. Nevertheless new frequency bands for mobile radio have been allocated. Today's constant envelope modulation methods will be replaced by highly spectrals efficient linear modulation methods combined with Frequency Domain Multiple Access (FDMA), Time Domain Multiple Access (TDMA) and Code Division Multiple Access (CDMA) transmission. Especially the future Universal Mobile Telecommunications Systems (UMTS) will be the realization of a new generation of mobile communications technology for a world in which personal services will be based on a combination of the support of various frequency bands, different access methods (FDMA, TDMA, CDMA), variable data rates and different modulation methods. Thus UMTS will require a revolution in radio air-interface design. Quadrature signal processing and direct conversion is the promising method. An intelligent architecture of the RF- and as well of the baseband signal processing section is necessary. The architecture group's the required functions such that the constraints of price, (die-)size, power consumption, weight and reliability are met.

This thesis presents the concept, circuit design, simulation- and measurement results of an entirely new, fully functional integrated single-chip direct conversion transceiver RF-frontend. The chip resulting from a first-Silicon run, contains all RF functions except the antenna and has been realized in a bipolar 0.8µm/25GHz technology supplied by the semiconductor R&D laboratories of SIEMENS-AG in Munich/Germany.

The complexity of the integrated circuit is about 1100 transistors. It contains a complete DC-1.5GHz RF-transceiver built up by a voltage controlled oscillator including AGC circuit, a dual modulus prescaler (dividing by 64, 65, 128 and 129), phase shifter generating quadrature signals (static 2:1 prescaler), a complete receiver and a complete transmitter. The receiver consists of a preamplifier, variable gain amplifier and a quadrature down converter. The transmitter consists of a quadrature up-converter, and a linear 2x0dBm medium power amplifier. An additional limiter amplifier and quadrature FM detector is implemented testing the properties of heterodyne operation mode. Further band-gap reference networks and power-down circuits are integrated.

All functions of the RF-transceiver are simulated with SPICE. Using special simulation techniques evaluation of S parameters, intermodulation and compression characteristics and noise figure was done. Simulation and measurement results show good to fair agreement, but only if the capacitances caused by transmission lines on chip-depending on the layout structure - are included in the simulation setup.

The chip is fully functional with a single supply voltage of 4V to 6V. For the direct conversion mode the upper frequency limit is given by the static 2:1 prescaler in the phase shifter. The operation limit is 3GHz in the first design. Therefore the transceiver in the direct conversion mode can be operated from DC up to 1.5GHz. By spending more power at the critical divider stage the maximum operating frequency was increased. The second Silicon run covers the frequency band from near DC up to 2.2GHz. The maximum operation frequency of the on-chip prescaler is 4.4GHz.

Al BULISHI Ahmed **Radio Propagation in the Gulf Region and its Impact on GSM**

The last few decades have seen a remarkable increase in the practical utilization of the radio spectrum above 30MHz in the Arabian Gulf and Oman Area. This, in turn, has focused attention upon the phenomena by which these radio waves are propagated, prevailing occurrences of ducting condition causing mutual and co-channel interferences by propagating longer distances. As the radio refractivity of the troposphere is of central concern, calculation of discete data on ducting from meteorological measurements were carried out. Two equations are introduced in general form to determine the minimum frequency for ground based duct and elevated duct respectively that can be trapped in the existence of super refracting condition. Further, two computer programs based upon these two equations and for the first order of mode are introduced to deliver specific characteristics about ducting and obtain a statistical analysis of the probability of ducting of designated sites. The first program in particular plots the ray tracing of the trapped frequency propagating to longer distance due to the occurrence of superrefracting condition.

With this knowledge, the impact of this physical behavior to operating GSM in the Arabian Gulf and Oman Area was investigated.

For Superrefractive Classification, a new factor $K_{Ducting}$ has been introduced with the path loss equation in the modeling approach. The values of K_1, K_2, K_3 and K_5 of this equation have been derived, based upon curves of CCIR Report 567-3 figure 2. Numerical example of $K_{ducting}$ has also been derived.

A measurement program of continuous wave field-strength and time-dispersion was conducted in Oman at five sites in the Capital Muscat to quantify their effects on implementing GSM network. The results showed that received signal strength exceeded the predicted values by minimum of 6dB and maximum of 20dB. This could be considered as another factor confirming the existence of ducting and its trapping impact on GSM frequencies. For the time-dispersive measurement, the average delay, delay spread and maximum excess delay values are obtained. The maximum excess delay recorded was 11.2μsec, which is below the maximum permitted GSM window value of 16μsec.

Thus, it can be concluded that the effect of ducting conditions has its impact on GSM network, particularly for rural coverage in the Arabian Gulf and Oman Area, causing GSM frequencies being trapped and propagated to longer distances, increasing the field strength of the received signal with possible causes of mutual and co-channel interferences. These effects should be considered in any GSM network planning in the Area.

DIPLOMARBEITEN (1.10.1995 - 30.9.1996)
DIPLOMA THESES

AUBAUER, H.	Faseroptisches Phasenstellglied, 1995.
BAUER, W.	Rauscharmer, breitbandiger HEMT-Distributed Amplifier für Mobilfunk-Meßtechnik, 1996.
CLARA, M.	CCD-Element als Detektor für eine optische Antennengruppe, 1996.
COLAKOGLU, H.	Futuresat: A communications satellite system, 1996.
DREGER, Th.	Chaotic signal communications, 1996.
FEISTRITZER, K.	Experimente mit kohärent-optischem Zweikanal-Freiraumübertragungssystem, 1996.
FREISINGER, M.	Entwurf eines direktumsetzenden Sendeempfängers für Mobilfunk-systeme im Frequenzbereich von 1,6 GHz bis 2,5 GHz, 1995.
FRÖHLICH, St.	Numerische Berechnung der Transinformation von Zeitreihen, 1996.
GOTSCHLICH, M.	Codegenerator für die Signalprozessorfamilie ADSP2100, 1995
HAIDER, Ch.	Simulation eines optischen Switched-Carrier Homodynempfängers, 1995.
HOFBAUER, P.	Systemsoftware für DECT-Testbed, 1995.
KALMAR, A.	Modulare optische Empfangsantenne, 1995.
KARAVDIC, O.	MSK Übertragung über den Mobilfunkkanal, 1995.
KOCH, B.	Antenne mit vorort absenkbarem Richtdiagramm für DCS 1800, 1995.
KUCHAR, A.	Aperture-coupled microstrip patch antenna array, 1996.
KUMMERNECKER, M.	Zeit-Frequenz-Korrelationsanalyse natürlicher Signale, 1995.
LUKESCH, M.	Entwicklung eines Beschallungssystems, 1996.
NOWOTNY, W.	Faltungscodes für ISI-Kanäle, 1996.
PROIDL, A.	Entwurf und Aufbau von effizienten 3V/2GHz-Leistungsverstärkern, 1995.
PUTZ, F.	Pulse forming driver amplifier stage for a half sinusoidally driven harmonic control amplifier at 1.6 GHz, 1996.
RANK, E.	Simulation von Musikinstrumenten mit nichtlinearen dynamischen Systemen, 1996.
RAUSCHER, K.	CW-Dopplerradar im X-Band zur Geschwindigkeitsmessung von Kraftfahrzeugen, 1995.
SCHNAIT, P.	Neugestaltung der Laborübung Antennen, 1996.
SCHUCH, W.	Simulation der Regelung einer optischen 16-Element-Antenne, 1995.
VAVRINA, K.	Lineare Zeit-Frequenz-Filter, 1995.
WACHUTKA, M.	Optimization of a half sinusoidally driven harmonic control amplifier at 1.6 GHz, 1996.
WIMMER, Th.	PLL-Modellschaltung für Messungen im Bereich von 600 bis 900 kHz, 1995.
WINZER, P.	Detection at low light levels, 1996.
ZACH-KIESLING, T.	Frequenzmoduliertes Dauerstrich-Radar zur Entfernungsmessung, 1995.
ZIMONIC, M.	Aufbau der Elektronik einer optischen Phasenregelschleife, 1996.
ZUKIC, T.	Filter banks for auditory analysis-resynthesis, 1996.

ALMEIDA., T., AYRE, R., BACHUS, E.J., DEMEESTER, P., HEIN, B., HUBER, M.N., JUKAN, A., MARSDEN, R., MÜLLNER, W., RASZTOVITS-WIECH, M., SCHULIEN, C., VERBEEK, B.H., PHOTON - a progressive step towards optical transport networks in Europe, NOC'96 Network & Optical Communications, Heidelberg, Deutschland, Juni 1996, 174-181.

BERNHARD, H.-P., Determining the predictability of signals, Proc. IEEE Digital Signal Processing Workshop, Loen, Norwegen, Sept. 1996, 291-294.

BEZUGLOV, N.N., KLUCHAREV, A.N., TARATIN, B., STACEWICZ, T., MOLISCH, A.F., FUSO, F., ALLEGRINI, M., Radiation trapping in an alkali-vapor-noble-gas mixture excited by a strong laser pulse, Optics Communications 120 (1995) 249-256.

BIRGMEIER, M., A fully Kalman-trained radial basis function network for nonlinear speech modeling, Proc. IEEE Internat. Conf. on Neural Networks, ICNN'95, Perth, Australien, Nov. 1995, 259-264.

BIRGMEIER, M., Evolutionary programming for the optimization of trellis-coded modulation schemes, Fifth Annual Conf. on Evolutionary Programming 1996, San Diego, CA, Feb. 1996.

BIRGMEIER, M., Nonlinear prediction of speech signals using radial basis function networks, EUSIPCO-96, Triest, Italien, Sept. 1996, 459-462.

BÖLCSKEI, H., FEICHTINGER, H.G., GRÖCHENIG, K., HLAWATSCH, F., Discrete-time Wilson expansions, Proc. IEEE-SP Int. Sympos. on Time-Frequency and Time-Scale Analysis, Paris, Frankreich, Juni 1996, 525-528.

BÖLCSKEI, H., HLAWATSCH, F., FEICHTINGER, H.G., Frame-theoretic analysis and design of oversampled filter banks, Proc. IEEE Int. Sympos. on Circuits and Systems, ISCAS-96, Atlanta, GA, USA, Mai 1996, 409-412.

BÖLCSKEI, H., HLAWATSCH, F., FEICHTINGER, H.G., Oversampled FIR and IIR DFT filter banks and Weyl-Heisenberg frames, Proc. IEEE Int. Conf. on Acoustics, Speech, Signal Processing, ICASSP-96, Atlanta, GA, USA, Mai 1996, 1391-1394.

DOBLINGER, G., ZEITLHOFER, T., Improved design of uniform and nonuniform modulated filter banks, 1996 IEEE Nordic Signal Processing Sympos., NORSIG'96, Helsinki, Finnland, Sept. 1996, 327-330.

FUHL, J., BONEK, E., BALDUCCI, P., NOWAK, H., GARN, H., Internal antenna arrangements for personal communication systems, Proc. 1st EPMCC'95, Bologna, Italien, Nov. 1995, 62-67.

FUHL, J., BONEK, E., Comparison of different adaption schemes for smart antennas, Proc. ICT'96, Istanbul, Türkei, April 1996, 427-432.

FUHL, J., BONEK, E., On the performance of adaption schemes for SDMA, Proc. RVK'96, Lulea, Schweden, Juni 1996, 415-419.

FUHL, J., MOLISCH, A.F., Capacity enhancement and BER in a combined SDMA/TDMA system, Proc. VTC'96, Atlanta, GA, USA, April 1996, 1481-1485.

FUHL, J., ROSSI, J.-P., BONEK, E., High-resolution DOA retrieval in urban mobile radio channels, Proc. URSI General Assembly 96, Lille, Frankreich, Aug. 1996, 325.

FUHL, J., Upgrading a mobile communications system by SDMA, Proc. URSI General Assembly 96, Lille, Frankreich, Aug. 1996, 142.

GLATT, W., SCHREIBLEHNER, M.A., HAIDER, C., LEEB, W.R., Optical PSK homodyne system using a switched residual carrier for phase synchronisation, Electronic Letters, Vol. 32, No. 15, Juli 1996, 1386-1387.

HÄRING, U., KREINER, W.A., MAGERL, G., SCHUPITA, W., Side-band spectroscopy in the visible with a tunable modulator, Canadian Journal of Physics, Okt. 1995, 452-457.

HLAWATSCH, F., BÖLCSKEI, H., Covariant time-frequency distributions based on conjugate operators, IEEE Signal Processing Letters, Vol. 3, No. 2, Feb. 1996, 44-46.

HLAWATSCH, F., TWAROCH, T., BÖLCSKEI, H., Wigner-type a-b and time-frequency analysis based on conjugate operators, Proc. IEEE Int. Conf. on Acoustics, Speech, Signal Processing, ICASSP-96, Atlanta, GA, USA, Mai 1996, 1395-1398.

HLAWATSCH, F., TWAROCH, T., Covariant (α,β), time-frequency, and (a,b) representations, Proc. IEEE-SP Int. Sympos. on Time-Frequency and Time-Scale Analysis, Paris, Frankreich, Juni 1996, 437-440.

INGRUBER, B., PRITZL, W., MAGERL, G., High efficiency harmonic control amplifier, Proc. 1996 MTT-S Int. Microwave Symposium, San Francisco, USA, Juni 1996, 859-862.

KNAPP, B., STRASSER, H., YURTSEVER, K., BERNHARD, H.-P., Chaos-theoretic methods for load forecasting in the field of energy management systems, Proc. Power System Computation Conf., Dresden, Deutschland, Aug. 1996, 224-230.

KREUZER, W., GOTSCHLICH, M., WESS, B., A retargetable optimizing code generator for digital signal processors, Proc. IEEE Int. Sympos. on Circuits and Systems, ISCAS'96, Atlanta, GA, USA, Mai 1996, 257-260.

KREUZER, W., WESS, B., Optimized code compaction for digital signal processors, Proc. Internat. Conf. on Signal Processing Applications and Technology, ICSPAT'95, Boston, MA, USA, Okt. 1995, 1753-1757.

KUBIN, G., Nonlinear modeling for speech signal processing, Dynamics Days'96, Lyon, Frankreich, Juli 1996, 18-20.

KUBIN, G., Nonlinear processing of speech, Buchbeitrag, erschienen in W.B. Kleijn and K.K. Paliwal, Speech coding and synthesis, Elsevier Science B.V., Amsterdam, Niederlande, Nov. 1995, 557-610.

KUBIN, G., Nonlinear signal and speech processing, First Noblesse Workshop on Nonlinear Methods in Model-Based Image Interpretation (ESPRIT LTR Project #20229), Lausanne, Schweiz, Sept. 1996, 23-28.

KUBIN, G., Synthesis and coding of continuous speech with the nonlinear oscillator model, Proc. IEEE Int. Conf. Acoustics, Speech, and Signal Processing, ICASSP'96, Atlanta, GA, USA, Mai 1996, 267-270.

KUBIN, G., The nonlinear oscillator model for speech analysis and synthesis, 13th Int. (EURASIP/IEEE) Conf. BIOSIGNAL'96, Brno, Tschechische Republik, Juni 1996, 329.

KUDIELKA, K.H., LEEB, W.R., Adaptive telescope arrays for laser communications and astronomy, Proc. Topical Meeting on Adaptive Optics, Garching bei München, Deutschland, Okt. 1995, 427-432.

LANG, M., Chebyshev design of FIR filters with arbitrary magnitude and phase responses, EUSIPCO'96, Signal Processing VIII, Triest, Italien, Sept. 1996, 1757-1760.

LOPES, L.B., MOLISCH, A.F., PAIER, M., FUHL, J., On the error floor in DECT-like systems, Proc. EPMCC'95, Bologna, Italien, Nov. 1995, 170-175.

MATZ, G., HLAWATSCH, F., Time-frequency formulation and design of optimal detectors, Proc. IEEE-SP Int. Sympos. on Time-Frequency and Time-Scale Analysis, Paris, Frankreich, Juni 1996, 213-216.

MAYR, B.J., WEINRICHTER, H., New multiple MPSK trellis codes for the mobile radio channel and their complexity, 8th IEEE Signal Processing Workshop on Statistical Signal and Array Processing, SSAP 96, Korfu, Griechenland, Juni 1996, 476-478.

MOLISCH, A.F., ALLEGRINI, M., OEHRY, B.P., SCHUPITA, W., MAGERL, G., Nonlinear radiation trapping in a saturated cesium vapor, World Scientific, XII Int. Conf. Laser Spectroscopy, Capri, Italien, Juni 1995, 343-344.

MOLISCH, A.F., BONEK, E., Computation of the bit error probability of MSK with fractional-bit detection in time-dispersive AWGN fading channels, Proc. 1996 SNRV and NUTEK Conf. on Radio Sciences and Telecommunications - RVK 96, Lulea, Schweden, Juni 1996, 390-394.

MOLISCH, A.F., BONEK, E., Error floor of $\pi/4$-DQPSK in mobile radio channels, Proc. Virginia Tech. Sympos. on Wireless Personal Communications, Blacksburg, Virginia, USA, Juni 1996, 5.1-5.12.

MOLISCH, A.F., FUHL, J., Bit error probability of differentially detected (G)MSK in unequalized mobile radio channels, Proc. 46th Vehicular Technology Conf., Atlanta, GA, USA, April 1996, 1404-1408.

MOLISCH, A.F., FUHL, J., PROKSCH, P., Error floor of MSK modulation in a mobile-radio channel with two independently fading paths, IEEE Transactions on Vehicular Technology, Vol. 45, No. 2, Mai 1996, 303-309.

MOLISCH, A.F., OEHRY, B.P., SCHUPITA, W., MAGERL, G., McTrap, a program for the computation of radiation trapping in 3-level atoms including bleaching effects, Computer Physics Communications 93 (1996) 127-135.

MOLISCH, A.F., OEHRY, B.P., SCHUPITA, W., MAGERL, G., Optimization of mercury-vapor lasers, Proc. European Quantum Electronics Conf., Hamburg, Deutschland, Sept. 1996, QTuJ8.

MOLISCH, A.F., Statistical properties of the RMS delay-spread of mobile radio channels with independent Rayleigh-fading paths, IEEE Transactions on Vehicular Technology, Vol. 45, No. 1, Feb. 1996, 201-205.

NGUYEN, K., Comment on Text compression as rule-based pattern recognition; Text compression using rule based encoder, Electronic Letters, Vol. 31, No. 9, April 1995, 701-702.

NGUYEN-PHI, K., WEINRICHTER, H., Image compression using bit-plane coding of wavelet coefficients, Electronic Letters, Vol. 32, No. 19, Sept. 1996, 1773-1775.

VERÖFFENTLICHUNGEN (1.10.1995 - 30.9.1996)
PUBLICATIONS

PAPANDREOU-SUPPAPPOLA, A., HLAWATSCH, F., BOUDREAUX-BARTELS, G.F., Power class time-frequency representations: Interference geometry, smoothing, and implementation, Proc. IEEE-SP Int. Sympos. on Time-Frequency and Time-Scale Analysis, Paris, Frankreich, Juni 1996, 193-196.

PUSCH, W., WEINRICHTER, H., New ternary trellis code for the AWGN and the 1-D partial response channel, Electronic Letters, Vol. 32, No. 3, Feb. 1996, 177-178.

SHTRIKMAN, I., FUHL, J., Low absorbtion broadband internal antennas for hand-held terminals, Proc. PIERS 96, Innsbruck, Österreich, Juli 1996, 556.

SUCHER, R., A distortion measure for impulse noise in images, Proc. of the 9th IEEE IMDSP Workshop, Belize City, März 1996, 62-63.

SUCHER, R., A recursive nonlinear filter for removal of impulse noise, Proc. IEEE Int. Conf. on Image Processing 1995, ICIP-95, Washington D.C., USA, Okt. 1995, Vol. I, 183-186.

SUCHER, R., A self-organizing nonlinear filter based on fuzzy clustering, Proc. of the IEEE ISCAS 1996, Atlanta, GA, USA, Mai 1996, 101-103.

WESS, B., GOTSCHLICH, M., Automatic synthesis of trellis diagrams for optimized DSP assembly code generation, Proc. Internat. Conf. on Signal Processing Applications and Technology, ICSPAT'95, Boston, MA, USA, Okt. 1995, 855-859.

WESS, B., KREUZER, W., GOTSCHLICH, M., Automatic generation of optimized DSP assembly code, Proc. 21st Internat. Conf. on Industrial Electronics, Control, and Instrumentation, IECON'95, Orlando, FL, USA, Nov. 1995, 979-984.

TECHNISCHE BERICHTE (1.10.1995 - 30.9.1996)
TECHNICAL REPORTS

BÖLCSKEI, H., HLAWATSCH, F., Frame-theoretic analysis and design of filter banks. Part I: Theory of uniform filter bank frames; Part II: Oversampled and critically sampled uniform filter banks. Technical Report 95-2, Nov. 1995.

BÖLCSKEI, H., HLAWATSCH, F., Discrete Zak transforms, polyphase transforms, and applications. Technical Report 96-6, Mai 1996.

DOBLINGER, G., Vergleich von Spektralanalysemethoden für ein Sprachentstörungssystem. Technical Report 96-3, März 1996.

FUHL, J., BONEK, E., Adaptation schemes for smart antennas - A comparison based on a realistic channel model including directions-of-arrival. Technical Report 96-2, Jan. 1996

FUHL, J., BONEK, E., MOLISCH, A.F., Smart antenna schemes for mobile radio applications: A Review. Technical Report 96-1, Jan. 1996.

HLAWATSCH, F., PAPANDREOU-SUPPAPPOLA, A., BOUDREAUX-BARTELS, G.F., The hyperbolic class of quadratic time-frequency representations, Part II: Subclasses, intersection with the affine and power classes, regularity, and unitarity. Technical Report 95-1, Sept. 1995.

HLAWATSCH, F., Time-frequency analysis and synthesis of linear signal spaces, with signal processing applications. Technical Report 95-3, Dez. 1995.

HLAWATSCH, F., TWAROCH, T., BÖLCSKEI, H., Displacement-covariant time-frequency analysis. Technical Report 96-4, März 1996.

MATZ, G., HLAWATSCH, F., KOZEK, W., Generalized evolutionary spectral analysis and the Weyl spectrum of nonstationary random processes. Technical Report 95-4, Nov. 1995.

MATZ, G., HLAWATSCH, F., Time frequency formulation and design of optimal detectors in nonstationary environments. Technical Report 96-5, Sept. 1996.

MAYR, B. J., WEINRICHTER, H., Codiertechniken für den Schwundkanal. Technical Report 96-7, Sept. 1996

LANG, M., Turbo--Codes: Iterative Decodierung zweidimensionaler Faltungscodes. Technical Report 95-5, Nov. 1995

SCHREIBLEHNER, M., GLATT, W., HAIDER, C., LEEB, W., Simulation eines optischen Switched-Carrier Homodynempfängers, Tagungsbericht: ITG-Diskussionssitzung "Simulation von Systemen und Baugruppen der optischen Nachrichtentechnik", Technische Universität Ilmenau, Deutschland, Mai 1996.