Joint Odd-Even Quantisation in Cartesian Delta Sigma (ΔΣ) Upconverters

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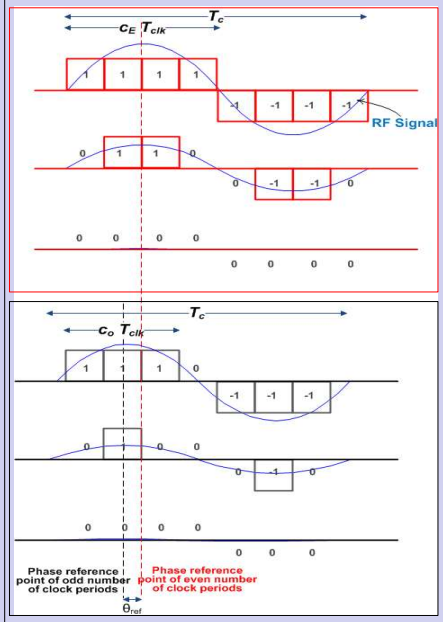
INTRODUCTION:

Pulse-width and pulse-position modulation enables an all digital Tx architecture. ΔΣ is used for noise shaping. The results of a joint quantisation will be compared to the results of even-quantisation and odd-quantisation scheme in the quantisers output only. The overall performance of the joint-quantisation scheme has about 5dB reduced in noise floor.

AMPLITUDE QUANTISATION LEVELS

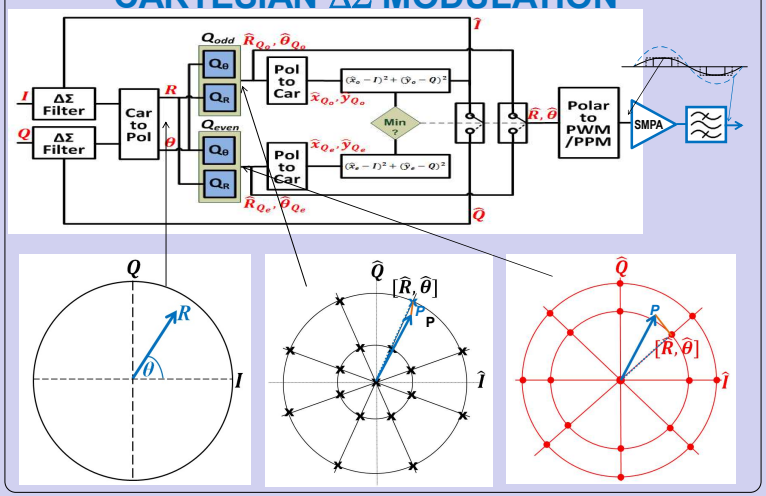


- f_{clock} oversamples the nominal carrier frequency (f_c) by the sampling ratio (OSR), $f_{clock} = OSR \times f_c$

  There are OSR clock periods in one cycle of f_c, OSR=N_p
- Change in phase reference between odd and even is

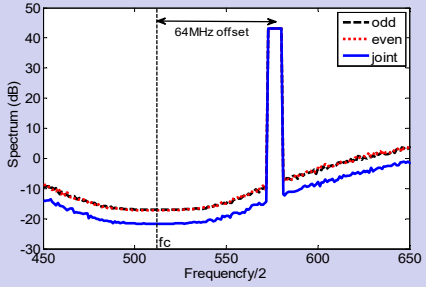
$$\theta_{ref} = \frac{2\pi/N_P}{2}$$

CARTESIAN ΔΣ MODULATION



RESULT

- ✓Carrier frequency f_c is nominally set to 1.024 GHz, OSR_{RF}=32.
- ✓Noise floor in Joint-quantisation reduce by 5 dB from the Odd-quantisation.



JOINT ODD-EVEN QUANTISATION

(Select the closest quantisation point)

Method-1 by
Exhaustive search

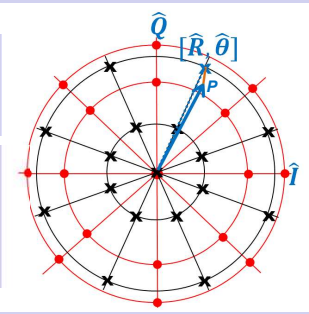
$$\arg\min_i(\|R - P_{all}{}^i\|)$$

Method-2 by

$$\arg\min_i(\|R - P_{odd}{}^i\|)$$

and

$$\arg\min_i(\|R - P_{even}{}^i\|)$$



Number of constellation Point	Equation	Quantisation Scheme	OSR 4	8	16	32
Phase level increment, N_P	OSR	Odd or Even	4	8	16	32
Amplitude level increment, N_A	$\frac{OSR}{4}+1$	Odd or Even	2	3	5	9
Quantised point, N_Q	$\frac{OSR^2}{4}+1$	Odd or Even	5	17	65	257
Phase level increment at Joint, $N_{P_{joint}}$	$2OSR$	Joint	8	16	32	64
Amplitude level increment at Joint, $N_{A_{joint}}$	$\frac{OSR}{2}+1$	Joint	3	5	9	17
Total quantised point at Joint, $N_{Q_{joint}}$	$\frac{OSR^2}{2}+1$	Joint	9	33	129	513

Number of operation						
Scheme	Equation	Quantisation Scheme	OSR 4	8	16	32
Method-1: exhaustive search						
Select closest constellation point	*1*	Joint	1	1	1	1
Minimize $\arg_i \min(\|R - P_i\|)$, i=1:$N_{Q_{joint}}$	$5N_{Q_{joint}} = 5(\frac{OSR^2}{2}+1)$	Joint	54	198	774	3078
Method-2: Combination Odd/Even						
Minimize Even	$N_P + N_A = \frac{5OSR}{4}+1$	Odd & Even	6	11	21	41
Polar to Cartesian	2	Odd & Even	2	2	2	2
Total operation	$2OSR + 2(\frac{OSR}{4}+1) + 4 + (2x5) + 1$	Odd & Even	27	37	57	97

CONCLUSION:

- Joint Odd-Even quantisation gives more quantisation points and lower noise.
- Reduced complexity by using 'combination Odd/Even' method.

AusCTW Adelaide, 2013

VICTORIA UNIVERSITY MELBOURNE AUSTRALIA

2013 Australian Communications Theory Workshop (AusCTW)

2013 Australian Communications Theory Workshop (AusCTW) took place January 29 - February 1, 2013 in Adelaide, Australia.

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Program

2013 Australian Communications Theory Workshop (AusCTW)

Poster 1

Talks 1

Poster 2

Talks 2

Poster 3

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BOOKLET OF ABSTRACTS

14th Australian Communications Theory Workshop

AusCTW 2013

University of South Australia

Adelaide, Australia

29th January – 1st February, 2013

Welcome

We are pleased to welcome you all to Adelaide and to the 14th Annual Australian Communications Theory Workshop (AusCTW). Thank you for choosing to attend AusCTW 2013.

The technical program follows AusCTW's now well established format:

three plenary lectures by invitation,

twelve technical talks by invitation, and

three poster sessions for accepted peer-reviewed papers and abstracts.

We are delighted to announce the plenary speakers are

Prof. Alex Grant, *University of South Australia*;

Dr. Mathew McKay, *Hong Kong University of Science and Technology*; and

Prof. Stephen Hanly, *Maquarie University*.

In addition, this year's workshop will host a tutorial by A/Prof. Vaughan Clarkson, from the *University of Queensland*. The tutorial is on "Lattice Theory for Signal Processing and Communications," and it will be held prior to the technical sessions on Tuesday the 29th of January.

In the spirit of past workshops, a strong emphasis is maintained on early career researchers and post-graduate students. A number of prizes will be offered, including the best student paper award.

The workshop would not have been possible without the generous support of our sponsors:

The Institute for Telecommunications Research and the University of South Australia,

The Commonwealth Scientific and Industrial Research Organisation,

The Defence Science and Technology Organisation,

The Institute of Electrical and Electronics Engineers, and

Tourism SA.

We thank the Hawke Centre for making the *Kerry Packer Civic Gallery* available for our poster sessions.

Last, but not least, we thank the presenters, the TPC, the steering committee, the technical reviewers, and the volunteers. Your contribution defines and drives the workshop.

We wish you all an enjoyable and productive workshop.

Gottfried Lechner
Workshop Chair

Roy Timo
Local Chair

Message from the Technical Program Committee

The submitted papers underwent an independent blind review process by an average of 2.63 local or international experts in the field.

We used EDAS (Editor's Assistant) for handling paper submissions and the review process and adopted a four-category scoring system, similar to that used in leading international conferences such as the IEEE International Communication Conference (ICC). The categories attempted to measure timeliness, technical content, novelty, and quality of presentation. Reviewers were also asked to provide feedback comments to the TPC and to the authors. Papers were accepted based on the quality criteria rather than an acceptance rate.

Similar to the past few years, the accepted papers will appear on the IEEE-Xplore™. Special thanks are in order to the IEEE Information Theory Chapter (SA/ACT/VIC) for providing technical sponsorship and recognition of AusCTW 2013.

Finally, we hope that the Workshop continues to encourage high quality research, stimulate collaboration and a sense of community in Australia, New Zealand and beyond.

Robby McKilliam
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Technical Program

	Wednesday 30th Jan.	Thursday 31st Jan.	Friday 1st Feb.
8:30	Registration opens		
8:50	Welcome	Announcements	Announcements
9:00	**Plenary 1** Alex Grant (University of South Australia)	**Plenary 2** Mathew McKay (Hong Kong University of Science and Technology)	**Plenary 3** Stephen Hanly (Macquarie University)
9:45	**Morning coffee and tea**	**Morning coffee and tea**	**Morning coffee and tea**
10:15	**Poster Session 1**	**Poster Session 2**	**Poster Session 3**
12:30	**Lunch**	**Lunch**	**Awards and Workshop Close**
	Technical Session 1	**Technical Session 3**	
14:00	Linda Davis (University of South Australia)	Jean Armstrong (Monash University)	
14:20	Tansu Alpcan (Melbourne University)	Thuy Tran (University of South Australia)	
14:40	Min Li (Macquarie University)	Malcolm Egan (University of Sydney)	
15:00	**Coffee**	**Coffee**	
	Technical Session 2	**Technical Session 4**	
15:30	Khoa Nyguen (University of South Australia)	Bill Cowley (University of South Australia)	
15:50	Julian Sorensen (DSTO)	Amin Sakzad (Monash University)	
16:10	Salman Durrani (Australian National University)	Yi Hong (Monash University)	
16:30	**Finish**	**Finish**	
18:30		**Workshop Dinner** (Rockford Hotel)	

	Tuesday 29th Jan
14:00	Tutorial: Lattice Theory for Signal Processing and Communications I. Vaughan L. Clarkson (University of Queensland)
16:30	**Finish**

Tuesday 29th January, 2013

Tutorial, 14:00-16:30

Lattice Theory for Signal Processing and Communications

I. Vaughan L. Clarkson
University of Queensland

Abstract: Lattices have been an indispensable tool in information theory since Shannons landmark 1949 paper on the capacity of the AWGN channel. Lattices are mathematical objects; regular arrangements of points in space. In the last twenty-five years, lattices have moved from being a useful theoretical auxiliary to a central building block in high-gain and capacity-achieving codes and optimal quantisers in a wide range of scenarios. This tutorial will teach foundational concepts in lattice theory. Theoretical ideas will be illustrated with applications in signal processing and communications.

1. Theory: lattices and the geometry of numbers, packings and coverings, root lattices, their duals and other important lattices.
2. Algorithms: lattice reduction, Euclidean algorithms, sphere decoding.
3. Applications: channel codes, quantisers, frequency estimation, blind detection, timing recovery.

(This tutorial is based on a course that was taught at the Institute of Telecommunications in the Vienna University of Technology over their Summer Semester, 2012, while the presenter was on sabbatical there.)

Biography: I. Vaughan L. Clarkson was born in Brisbane in 1968. He received a B.Sc. in Mathematics and a B.E. (Hons. I) in Computer Systems Engineering from The University of Queensland in 1989 and 1990, respectively, and a Ph.D. in Systems Engineering from The Australian National University in 1997. Starting in 1988, he was employed by the Defence Science and Technology Organisation in Adelaide, first as a Cadet, later as a Professional Officer, and finally as a Research Scientist. From 1998 to 2000, he was a Lecturer at The University of Melbourne. From 2000 to 2008, he was a Senior Lecturer in the School of Information Technology and Electrical Engineering at The University of Queensland. In 2008, he was promoted to Reader. He was a Visiting Professor in the Department of Electrical and Computer Engineering at The University of British Columbia, Vancouver, Canada, in 2005 and at the Institute of Telecommunications, Vienna University of Technology, Austria, in 2012. His research interests include statistical signal processing for communications and defence, image processing, information theory and lattice theory.

Poster Session 1: Wednesday 30th January, 10:15-12:30

Key: [pa] = paper in proceedings

W1. *Rajitha Senanayake, Phee Lep Yeoh, Jamie Evans*: Optimal Multiuser Detection in a Cooperative Two-Cell Network [pa]

W2. *Md Rakibul Islam, Mark C Reed*: Near Field Broadband Beam Space Antenna Array Processor for Multiple Interference Canceler [pa]

W3. *Amin Sakzad, J Harshan, Emanuele Viterbo*: On Complex LLL Algorithm for Integer Forcing Linear Receiver [pa]

W4. *Biao He, Xiangyun Zhou*: Impact of Channel Estimation Error on Secure Transmission Design [pa]

W5. *Yongfeng Diao, Xiang Gui, Min Zhang, Aaron Dow*: Computational Complexity Reduction in Taguchi Method Based Joint Optimization of Antenna Parameters in LTE-A Networks [pa]

W6. *Jeewani Kodithuwakku, Nick A Letzepis, Alex Grant, Robby G. McKilliam*: Decoder-Aided Synchronization for Multiuser CDMA Systems [pa]

W7. *Rajan Kadel, Gottfried Lechner*: Repeat-Accumulate Codes for Block-Fading Channels [pa]

W8. *Gediminas Simkus, Martin Holters, Udo Zlzer*: Ultra-low delay lossy audio coding using DPCM and block companded quantization [pa]

W9. *Ying Chen, David Haley, Quoc Bao Nguyen*: Frequency Offset Compensation in Physical-Layer Network Coding Systems [pa]

W10. *Ahmed Arif Atik*: Performance and usability of wireless Vehicular Ad hoc Networks (VANET)

W11. *Sanjeev Naguleswarant, Matthew Britton*: WiFi Ad-hoc Networks using TDMA and Multi-User Detectio

W12. *Giovanni Geraci, Jinhong Yuan, Iain B. Collings*: Secrecy in Multiuser Wireless Communications: Flirting with Many Girls or Boys at the Same Time

W13. *Jie Dong, Dr. David Smith*: Opportunistic Relaying for Coexistence of Wireless Body Area Networks

W14. *Yeqing Hu, Jamie Evans, Yi Hong*: On Blocking Probability in Poisson Cellular Networks

W15. *Amin Movahed, Mark C. Reed*: Recovering signals with variable sparsity levels from the noisy 1-bit compressive sensing measurements

W16. *J. Guo, S. Durrani, Z. Khalid*: Exact probability of node isolation in finite wireless sensor networks

W17. *Asanka Nuwanpriya, Alex Grant, Siu-Wai Ho, Lin Luo*: Multipath Interference Mitigation for Visible Light Communication Systems

W18. *Yixuan Xie*: Quantum stabilizer codes from finite difference set group

W19. *Paul Hirschausen, Linda Davis, David Haley*: Ionospheric High Frequency Communication

W20. *Khaled Mahbub Morshed, Ingmar Land, Gottfried Lechner*: Practical codes for the coded side information problem

W21. *Alex Leong, Subhrakanti Dey, Girish Nair*: Multi-Sensor Linear State Estimation Under High Rate Quantization

Poster Session 2: Thursday 31st January, 10:15-12:30

Key: [pa] = paper in proceedings

T1. *Zubair Khalid, Salman Durrani*: Connectivity of Three Dimensional Wireless Sensor Networks Using Geometrical Probability [pa]

T2. *Effariza Hanafi, Philippa A. Martin, Peter J Smith, Alan J Coulson*: Performance of quickest spectrum sensing over various fading channels [pa]

T3. *Tao Huang, Jinhong Yuan, Tiffany Jing Li*: Analysis of Compute-and-Forward with QPSK in Two-way Relay Fading Channels [pa]

T4. *Shashika Biyanwilage, Upul Gunawardana, Ranjith Liyanapathirana*: Power Allocation in OFDM Cognitive Radio Relay Networks with Average Interference Constraints [pa]

T5. *Udara Sadathana Wijetunge, André Pollok, Sylvie Perreau*: Fault-tolerant Stochastic Routing for Wireless Sensor Networks with Unreliable Links [pa]

T6. *Afsana Khatoon, William G Cowley, Nick A Letzepis*: FSO/RF correlation measurement and hybrid system hidden Markov model [pa]

T7. *Tharaka Samarasinghe, Hazer Inaltekin, Jamie Evans*: Optimal SNR-based Coverage in Poisson Cellular Networks with Power Density Constraints [pa]

T8. *Meng Wang, Feng Li, Jamie Evans*: Modified Semi-orthogonal User Scheduling Scheme with Optimized User Selection Parameter [pa]

T9. *Vikram Arkalgud Chandrasetty, Sarah Johnson, Gottfried Lechner*: Memory Efficient Decoders using Spatially Coupled LDPC Codes

T10. *Md Noor-A-Rahim, Khoa Nguyen, Gottfried Lechner*: Finite Length Analysis of LDPC Codes

T11. *Alan J. Coulson*: Statistical Modelling of Wireless Data Signals

T12. *James Yew*: A Novel Integrated Wireless Optical DAC

T13. *Balachander Ramamurthy, William G. Cowley, Gerald Bolding, Linda Davis*: MIMO in Satellite Communications

T14. *André Pollok, Robby McKilliam*: Modified Cramér-Rao Bounds for Parameter Estimation in CPM Systems

T15. *Chinthani Uduwerelle, Siu-Wai Ho, Terence Chan*: On the Expected Key Consumption in Error Free Perfect Secrecy Systems

T16. *Mohammadreza Pourakbar , Michael Faulkner*: Tunable Duplex Filter Sub-System of Adaptive Duplexer Architecture

T17. *Mirhojjat Seyedi, Daniel T.H. Lai, Mike Faulkner*: Body Limb Motion Effects on Intra-Body Communications

T18. *Lawrence Ong*: The Uniprior Index Coding Problem

T19. *Ken Lever*: Recent advances in generating pseudorandom processes with simultaneously specified power spectral density and first-order probability density function

T20. *Roy Timo, Tobias Oechtering, Michèle Wigger*: Source Coding with Conditionally Less Noisy Side Information

Poster Session 3: Friday 1st February, 10:15-12:30

Key: [pa] = paper in proceedings

F1. *Sudhir Singh, Paul D Teal, Pawel A. Dmochowski, Alan J Coulson*: Statistically Robust Cognitive Radio Beamforming [pa]

F2. *Nirmal Fernando, Yi Hong, Emanuele Viterbo*: Analysis of Self-het OFDM Enhancements for 60 GHz Indoor RF Channels [pa]

F3. *Nikeeth Ramanathan, Feng Li, Margreta Kuijper, Jamie Evans*: Performance of Multi-mode Transmission with Finite Rate Feedback in MIMO Broadcast Systems [pa]

F4. *Muhammad Nasir Khan, William G Cowley, Khoa D. Nguyen*: Puncturing Optimization Algorithm and its Applications in Free Space Communications [pa]

F5. *Anuradha Wickramasooriya, Ingmar Land, Ramanan Subramanian*: Comparison of Coding Strategies for the Block Fading Erasure Wiretap Channel [pa]

F6. *Min Li, Chunshan Liu, Stephen Hanly, Iain B. Collings*: Transmitter Optimization for the Network MIMO Downlink with Finite-Alphabet and QoS Constraints [pa]

F7. *Qimin You, Zhuo Chen, Yonghui Li*: A Multi-hop Bidirectional Relay Selection Scheme Based on Viterbi Algorithm [pa]

F8. *Muhammad Yasir, Badri Vellambi, Siu Wai Ho*: An Overview of Indoor Positioning Systems

F9. *Nitin Masleakr,E.R.Rajkumar*: VANETs - a wireless platform for Intelligent Transportation Systems

F10. *Ido Nevat, Iain B. Collings*: Localization in Mobile Wireless Sensor Networks via Sequential Global Optimization

F11. *Nolan (Nan) Zhang, Khoa Nguyen, Badri Vellambi*: Distributed Source Streaming for Delay-Constrained Applications

F12. *Assefa Kassa Teshome, Siu Wai Ho, Badri N. Vellambi*: Lossy Common Information between Correlated Sources

F13. *Nayeema Sadeque, Ingmar Land, Ramanan Subramanian*: Average Secrecy Rate under Transmit Antenna Selection for the Multiple-Antenna Wiretap Channel

F14. *Wan Hafiza Wan Hassan, Horace King , Mike Faulkner*: Modified Backoff Technique with the Transmission Priority Scheme in Fiber-Wireless Networks

F15. *Yinyue Qiu, Ying Chen, David Haley*: Spectrum Sensing for Cognitive Radios

F16. *Leith Bade, Mark C. Reed, Sean Zhou*: Modelling of Mobility in LTE-Advanced Heterogeneous Networks

F17. *Shabbir Ahmed , Mike Faulkner*: Use of Software Radio to Mitigate Reverse Intermodulation Products at Colocated Base Stations

F18. *David Haley; Ying Chen; Bao Nguyen*: Physical-Layer Network Coding Test Bed using Software Defined Radio

F19. *Sirmayanti Sirmayanti, Vandana Bassoo, Horace King, Mike Faulkner*: Joint Quantisation in Cartesian Delta Sigma Upconverters

F20. *Geordie Z. Zhang, Horace King, Mike Faulkner*: The Transport Capacity of Cellular Networks

Wednesday, 30th January, 2013

Plenary, Wedndesday 9:00-9:45

Vehicle to Vehicle Communications

Alex Grant
University of South Australia

The world is on the cusp of widespread deployment of vehicle to vehicle communications for road safety applications. I will talk about some of the technical challenges and technology solutions for providing reliable communications in safety critical non line of sight conditions.

Talks, Wednesday 14:00-15:00

Polarization MIMO for Satellite Communications

Linda Davis
University of South Australia

Spatial multiple-input multiple-output (MIMO) offers increased rate and/or reliability in rich scattering environments characterized by multipath non-line-of-sight (NLOS) channels. In line-of-sight (LOS) conditions, spatial diversity is reduced. Polarization offers an alternative source of diversity and its application is well-suited to LOS environments. In this talk, we will consider the MIMO polarization channel for satellite communications. We focus on the challenges in channel modelling and waveform design, and present recent results.

Quantifying Information for Decision Making

Tansu Alpcan
Melbourne University

Decisions in optimisation, control, and game theory are often made under limited information in a variety of real world problems. In some cases, fully identifying the system is simply infeasible due to prohibitive costs or observation limitations. In others, the observed system may be so non-stationary that by the time a full description is obtained, it is already outdated due to the systems fast-changing nature. The class of problems sharing these properties include black-box optimisation, dual control, and limited information games.

A promising approach to addressing such problems is to develop a strategy for collecting information efficiently and estimate the system within a chosen modelling framework while trying to achieve the given objective. In order to develop solutions in a principled way, the amount and value of information acquired needs to be quantified explicitly and an appropriate learning model has to be chosen. Concepts and metrics from information theory are natural candidates for this task.

This talk presents ongoing research on the definition and use of information theoretic metrics for quantifying information in black-box optimisation, dual control, and model selection problems. Multi-objective formulations are used to explicitly quantify information, modelling, and decision making objectives. Specific results are presented within a statistical learning (Gaussian process regression) framework. Applications to game theory and distributed resource allocation algorithms are discussed as future research directions.

Use of Software Radio to Mitigate Reverse Intermodulation Products at Colocated Base Stations

Shabbir Ahmed and Mike Faulkner
Victoria University, Melbourne

Wireless communication service providers are having to co-locate base stations on common sites, since little space is available to build new ones. In a colocated setting, large jamming signals from one transmitter can radiate into the antenna system of a second transmitter in the reverse direction and mix in the output stage of its power amplifier to produce intermodulation products. These intermodulation products are called reverse intermodulation (RIM) products and get radiated through the antenna system. Further, the RIM products are likely to fall on a victim receivers desired channel and cause interference. The poster proposes an architecture that regenerates an estimate of the RIM products using the fundamental jamming components and mitigates them in a baseband postdistortion cancellation circuit. A multiple-front-end receiver architecture is demonstrated using Universal Software Radio Peripherals (USRPs). It comes with frequency offset issues that are mitigated using a signal correlation technique. The hardware prototype demonstrates a 16dB reduction of the interfering RIM product.

Physical-Layer Network Coding Test Bed using Software Defined Radio

David Haley; Ying Chen; Bao Nguyen
University of South Australia

The limited availability of spectrum has motivated new techniques to increase efficiency of channel use. A recent extension to the concept of network coding (NC) is physical-layer network coding (PNC), which was first proposed in 2006 by Zhang. Instead of avoiding interference between multiple received signals, PNC embraces interference and encourages the signals to be superimposed for simultaneous reception at the relay node. Exploiting the additive nature of the radio signals, in a perfectly synchronized system PNC has the potential to improve link throughput by 50% when compared to conventional NC and 100% when compared to non-NC transmission. However, a number of challenges remain for practical PNC implementation. These include synchronization at both the packet and symbol boundaries, carrier-frequency offset and carrier-phase offset. Channel coding and estimation techniques must be designed to target these issues in the context of a PNC system. An important problem is to determine optimal PNC mapping and channel coding schemes for different channel types so that reliability can be further improved. Observing the promise of PNC, several groups are now actively researching the topic in order to address the associated challenges, especially the synchronization issues. Despite the recent rise in PNC research activity there are currently only a limited number of successful implementations. Demonstration systems exist for PNC and its simplified version, called Analog Network Coding (ANC), on a Two Way Relay Channel (TWRC). The implementations use the Universal Software Radio Peripheral (USRP), which is controlled by GNU Radio. USRP is a low-cost, flexible Software Defined Radio (SDR) platform and GNU Radio is an open-source software toolkit, providing a library of signal processing blocks in order to be used with URSP. Due to the flexibility and convenience of SDR, USRP and GNU Radio are a good option for designing and testing model-based waveforms and wireless communication systems. Noting both the potential of PNC and its challenges, the first step of this study is to gain more insights into PNC techniques. In order to do so we have implemented a USRP based PNC SDR test bed. The system has provided knowledge on the impacts of physical layer imperfections. Following a study of state-of-the-art approaches to PNC, the test bed will be used to develop techniques that increase the resilience of PNC to imperfect practical conditions.

Joint Quantisation in Cartesian Delta Sigma Upconverters

Sirmayanti Sirmayanti, Vandana Bassoo, Horace King, Mike Faulkner
Victoria University, Melbourne
University of Technology, Mauritius

This paper studies the joint even-odd quantisation technique when subject to OFDM input signals in a Cartesian Delta Sigma Upconverters. The results will be compared to the results of even-quantisation and odd-quantisation methods in the quantisers output only. The smaller first quantisation step results in lower quantisation noise for small signals, leading to a lower noise floor. The overall performance of the joint-quantisation scheme has about 5dB reduced adjacent channel power (ACP) compared to the odd-quantisation scheme, which has better noise performance compared to the even-quantisation method. When the signal is frequency offset, a number of distortions become visible in the spectrum. The third harmonic is the biggest distortion contributor followed by the image. Interestingly, the overall better noise performance of the joint-quantisation scheme does not improve the distortion spectra. Best performance occurs when frequency offsetting is avoided. Simulation and measurement results show that the new approach enables operation in the cellular frequency bandwidth with improved spectral efficiency.

The Transport Capacity of Cellular Networks

Geordie Z. Zhang, Horace King, and Mike Faulkner
Victoria University, Melbourne

Transport capacity was originally introduced in the study of wireless ad hoc networks as a measure of the distance hauling capacity of a wireless network. We present here some recent results on the transport capacity of wireless cellular networks. It has been shown that the tranport capacity of a p-dimensional regular cellular network follows the scaling law of $\Theta(N^{\frac{p+1}{p}})$. Ideas on future works stemming from these results are also presented.

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SIRMAYANTI / SIRMAYANTI MS

e3 After Hours Bookings: Should you make a booking after hours via e3 our online booking tool for travel within the next 6 hours, please contact our after hours emergency assist team to reconfirm your booking. Calls within Australia 1300 662 703 or from overseas + 61 2 9734 0333.

IT IS YOUR RESPONSIBILITY TO CONFIRM THE ITINERARY DETAILS ARE CORRECT AND THE NAME MATCHES AS PER PHOTO ID.

EMERGENCY AFTER HOURS ASSISTANCE
For urgent assistance during office hours Mon-Fri 0830-1730hrs please contact the office on 03 9026 3001.
Outside normal business hours, please call 1300 622 703 (Australia) or +61 2 9734 0333 (International).

E-TICKETS HAVE BEEN ISSUED FOR YOUR JOURNEY. DETAILS ARE AS FOLLOWS:

FARE RULES :
Change and refund rules apply. All rules are subject to relevant airline terms and conditions.
Any changes must be made 24 hours prior to the flight.
Airfare is non refundable.

Your Itinerary

Mon 28 Jan 2013 at 0700	**Jetstar Airways (JQ770)**
Departing:	MELBOURNE (Terminal 1) at 0700
Arriving:	ADELAIDE (Terminal 1) at 0750
Class of Service:	S - Economy Class [S-null] *
Flight Status:	Confirmed [AK]
Airline Reference:	I6M9QS
Ticket Number (SIRMAYANTI / SIRMAYANTI MS):	100 I6M9QS
Aircraft:	AIRBUS 320
Number of Seats:	5
Number of Stops:	0
Flight Time:	1 hrs 20 mins
Remarks:	20kgs of checked luggage

Fri 01 Feb 2013 at 2145	**Jetstar Airways (JQ775)**
Departing:	ADELAIDE (Terminal 1) at 2145
Arriving:	MELBOURNE (Terminal 1) at 2335
Class of Service:	S - Economy Class [S-null] *
Flight Status:	Confirmed [AK]
Airline Reference:	I6M9QS
Ticket Number (SIRMAYANTI / SIRMAYANTI MS):	100 I6M9QS
Aircraft:	AIRBUS 320
Number of Seats:	5
Number of Stops:	0
Flight Time:	1 hrs 20 mins
Remarks:	20kgs of checked luggage

*** Please check the booking terms and conditions for the rules of carriage for each flight on your itinerary.**

CANCELLATION FEES
Cancellation fees apply to all bookings subject to the supplier conditions plus Campus Travel administration fee

NO SHOW
A no show for your flight may cause the airline(s) to cancel all onward reservations and may also require ticket upgrade to a higher fare type.

SEATING
Seating requests are not guaranteed by airlines and may be changed without notice

SYDNEY -
* Flights QF1-QF399 operate from Terminal 1 (Sydney International terminal)
* Flights QF400-QF1599 operate from Terminal 3 (Qantas Domestic terminal)
* Virgin Blue, Regional Express, Aeropelican, Horizon, Qantas QF1600 and above, Jetstar, QF5000 (Jetstar) operate from Terminal 2
ALL OTHER CITIES -
* Flights QF1-QF399 operate from the International Terminal.
* All other Airlines and Qantas QF400 above operate from Domestic terminal.

Hotel Guarantees
In order for your hotel booking to be held after 6pm, your arrival has to be guaranteed with a credit card or a Campus Guarantee. We will always use the credit card number in your Campus Travel Profile, or your Company's credit card if that is the policy. If we do not have a credit card to guarantee your arrival, the hotel is within their rights to cancel your reservation at 6pm.

Cancellation Penalties
Hotels can charge a cancellation penalty, dependent on the notice given.
Some hotels will charge for cancellations after 4pm, others after 6pm.
Conditions vary during special event periods. These should be checked prior to booking. Please refer to your itinerary for the cancellation period applicable to your hotel booking(s)

Hotel Check In Time
If you intend arriving at your accommodation later than 8pm, please contact your accommodation to make arrangements for late check-in.

VIRGIN AUSTRALIA / AIR NEW ZEALAND CODE SHARE
**NZ flight series 7000 - flights operated by Virgin Australia - checkin at the Virgin counter
**DJ flight series 8000 - flights operated by Air New Zealand - checkin at the Air New Zealand counter

AFTER HOURS TRAVEL ASSISTANCE If dialling from within Australia, phone 1300 662 703. If dialling from abroad, phone 61 2 9734 0333. PLEASE NOTE: Between 6pm-8am AEST week days and on weekends, our After Hours Service is for urgent bookings/amendments. It is operated by our own staff for personalised service. We access same systems and profiles. Voicemail is actioned in order of receipt.

Rules of Carriage

Booking Terms and Conditions

Please read the following terms and conditions carefully. You must not accept any booking unless you understand and agree with the following terms and conditions. Campus Travel is a division of Australian OpCo Pty Ltd which is in turn owned by Flight Centre Limited. References to "us", "we", "our" and/or "Campus Travel" in these booking terms and conditions shall mean and include Australian OpCo Pty Ltd trading as Campus Travel and Flight Centre Limited.

Prices: All prices are subject to availability and can be withdrawn or varied without notice. The price is only guaranteed when paid in full. Please note that prices quoted are subject to change. Price changes may occur by reason of matters outside our control which increase the cost of the product or service. Such factors include adverse currency fluctuations, fuel surcharges, taxes and airfare increases. Please contact your consultant for up to date prices.

Refunds, Changes and Cancellation Fees: We are unable to provide a refund to you until we receive the funds from the relevant supplier. Cancelled bookings will incur charges. These charges can be up to 100% of the cost of the booking, regardless of whether travel has commenced. Fees and extra charges will apply where a booking is changed. Fees and extra charges will also apply when tickets or documents are re-issued. Where we incur any liability for a cancellation fee or charge for any booking which you cancel, you agree to indemnify us for the amount of that fee or charge.

Deposit and Final Payment: You will be required to pay a deposit or deposits when booking. Your consultant will advise you of how much that will be. All deposits are non-refundable. Final payment is required no later than 6 weeks prior to departure unless otherwise stated. Some airfares or services must be paid in full at the time of booking.

Payments by Credit Card: Credit card surcharges of 1.98% for Visa, Mastercard and American Express, and 3% for Diner's Club will apply when paying by credit card. If for any reason any travel service provider is unable to provide the services for which you have contracted, your remedy lies against that provider, and not against us. In the event that payment has been made to us by credit card, you agree that you will not seek to charge back your payment to us.

Payments by B-Pay: Please note that BPAY takes up to 3 business days to process. If you are paying by this method you will need to make the payment at least 3 business days prior to the actual due date. You must notify your consultant of your payment once it has been made.

Payments by Cheque: Please note that cheque payments (including bank cheques) require 5 business days to process. If you are paying by this method you will need to make the payment at least 5 business days prior to the actual due date. You agree not to stop payment of the cheque even when you cancel a booking. You agree that we may apply the proceeds of the cheque to satisfy any liability you have to us, including any liability in respect of cancellation fees, before refunding the balance to you.

Taxes: Airline taxes are subject to change and are confirmed at the time your airline ticket is issued. There may also be a local tax charged at some airports.

Travel Insurance: We are an authorised representative of CoverMore Travel Insurance Services Pty Ltd, Australian Financial Services Licence number 241713, on whose behalf we act. You must obtain a Product Disclosure Statement relating to the travel insurance product you are considering purchasing and should read that document before making any decision about whether to acquire the product. Travel Insurance is strongly recommended by the Department of Foreign Affairs and Trade for all overseas travel. Please complete your travel insurance application form, sign it and return it to us. We cannot issue your insurance until this form is provided regardless of whether payment has been made. If you decline travel insurance you may be required to sign a disclaimer.

Agency: We act as an agent only. We sell various travel related products on behalf of numerous transport, accommodation and other service providers, such as airlines, coach, rail and cruise line operators. Our obligation is to make travel bookings on your behalf and to arrange relevant contracts between you and travel service providers. We have no responsibility for these services nor do we make or give any warranty or representation regarding their standard. All bookings are made on your behalf subject to the terms and conditions and limitations of liability imposed by these service providers. Your legal recourse is against the specific provider and not us. If for any reason, any travel service provider is unable to provide the services for which you have contracted your remedy lies against the provider and not with us.

Liability: We do not accept any liability of whatever nature, whether in contract, tort or otherwise, for the acts, omissions or default, whether negligent or otherwise, of third party providers over whom we have no direct control. Under circumstances where liability cannot be excluded, such liability is limited to the value of the purchased travel arrangements. We do not accept any liability in contract, tort or otherwise for any injury, damage, loss (including consequential loss), delay, additional expense or inconvenience caused directly or indirectly by force majeure or any other event which is beyond our control and which is not preventable by reasonable diligence on our part.

Special Requirements: Please liaise with your consultant regarding any special requirements you may have for your travel arrangements such as special meal and seating requests.

Frequent Flyer: Please advise your consultant of your frequent flyer membership details for inclusion in your booking. Please check your frequent flyer program for the specific terms of your membership. We cannot guarantee that the supplier will credit you with points for your booking.

Passports & Visas: It is your responsibility to ensure that you have valid passports, visas and re-entry permits which meet the requirements of immigration and other government authorities. Any fines, penalties, payments or expenditures incurred as a result of such documents not meeting the requirements of those authorities will be your sole responsibility. All travelers must have a valid passport for international travel and many countries require at least 6 months validity from the date of return and some countries require a machine-readable passport. If you need information regarding visa and other travel document requirements for your trip please let us know. We can obtain such information from an external visa advisory service provider on your behalf. We do not warrant the accuracy of such information and accept no liability for any loss or damage which you may suffer in reliance on it. If you wish, we can obtain visas for you through this external service and fees will apply. If you are travelling to the United States please see https://esta.cbp.dhs.gov for information regarding compulsory pre-registration for their visa waiver program. Please note, you may not meet the requirements of ESTA and may be required to obtain a visa.

Travel Advice: For travel advice please contact the Department of Foreign Affairs and Trade or visit their website at www.smartraveller.gov.au.

Health: You must ensure that you are aware of any health requirements for your travel and ensure that you carry all necessary vaccination documentation. Please check with your local doctor or specialist vaccination clinic.

Travel Documents: Travel documents include (without limitation) airline tickets, hotel vouchers, tour vouchers or any other document (whether in electronic form or otherwise) used to confirm an arrangement with a service provider. Travel documents may be subject to certain conditions and/or restrictions including (without limitation) being non-refundable, non-date-changeable and subject to cancellation and/or amendment fees. Travel documents cannot be transferred to another person to use. All airline tickets must be issued in the name of the passport/photo identity holder. An incorrect name on a booking may result in an inability to use that booking and the booking being cancelled. Any errors in names, dates and timings on your documentation will be your responsibility if not advised at the time of booking. It is your responsibility to collect all travel documents from us prior to travel. As a general rule your travel documents will be available for collection 2 weeks prior to departure, however this will depend on your individual arrangements. Please contact your consultant to confirm when your travel documents are ready for collection.

Privacy Policy: We are committed to protecting your personal information. Our Privacy Policy is available for viewing at www.flightcentre.com.au or in store.

Monies Not Held On Trust: All monies paid by you to us will be the property of us and will be a debt due and payable to the travel service provider once the services to which the money relates have been provided. You agree and acknowledge that such monies will not be held by us on trust for and on behalf of you and we may hold such monies in any account as we see fit, including with our own and/or other customer monies.

Governing Law: If any dispute arises in relation to the agreement between you and us, the laws of Australia will apply. You irrevocably and unconditionally submit to the exclusive jurisdiction of the courts of Australia, and waive any right that you may have to object to an action being brought in those courts.

I acknowledge that I am 18 years of age or older and that I understand and agree with the above terms and conditions.
Signature:_____

Full
Name:_____Date:_____

These terms were last updated on 1 April 2010.

LEMBAR
HASIL PENELITIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
KARYA ILMIAH: POSTER

Judul Poster : Joint Quantisation in Cartesian Delta-Sigma Upconverters
Jumlah Penulis : 4 (Empat) Orang
Status Pengusul : Penulis pertama
Identitas Prosiding : a. Judul Prosiding : 14th Australian Communications Theory Workshop (AusCTW) 2013
b. ISBN/ISSN : -
c. Tahun Terbit, Tempat Pelaksanaan : 2013, Adelaide, Australia
d. Alamat Repository PT/Web Prosiding :
e. Terindeks di (jika ada) : -

Kategori Publikasi Poster (beri ✓ pada kolom yang tepat) : ☑ Prosiding Forum Ilmiah International
☐ Prosiding Forum Ilmiah Nasional

Hasil Penilaian Peer Review :

Komponen yang dinilai	Nilai Maksimal Poster		Nilai Akhir yang diperiksa
	Internasional ☑	Nasional ☐	
a. Kelengkapan unsur isi poster (10%)	1		1
b. Ruang lingkup dan kedalaman pembahasan (30%)	3		2,5
c. Kecukupan dan kemutahiran data/informasi dan metodologi (30%)	3		2,5
d. Kelengkapan unsur dan kualitas terbitan/ prosiding (30%)	3		3
Total = (100%)	10		9
Nilai Pengusul = (0.6) * 9 = 5,4			

Catatan penilaian paper oleh *Reviewer*:
1. Kelengkapan unsur isi poster: Substansi artikel sesuai dengan bidang penugasan pengusul. Sistematika paper telah sesuai dengan sistematika yang ditentukan pada AusCTW 2013 (Skor = 1)
2. Ruang lingkup dan kedalaman pembahasan: Substansi artikel telah sesuai dengan ruang lingkup AusCTW 2013. Kedalaman pembahasan baik (Skor = 2,5).
3. Kecukupan dan kemuktahiran data/informasi dan metodologi: Data hasil penelitian cukup mutakhir. Tidak ada paper rujukan yang kadaluarsa saat paper yang diusulkan dipublikasi (Skor = 2,5)
4. Kelengkapan unsur dan kualitas terbitan/prosiding: Prosiding diterbitkan sebagai kumpulan seluruh paper yang dipresentasikan pada AusCTW 2013 (Skor = 3)

Makassar, 11 September 2021
Reviewer 2,

Iin Karmila Yusri, SST. MEng. PhD
NIP. 19760403 200212 2 001
Unit Kerja: Jurusan Teknik Elektro PNUP