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加藤 修三 教授 業績目録

平成 27 年 3 月  
東北大学史料館

**加藤 修三**  
**電気通信研究所・教授**

**(学歴情報)**

<u>Degrees</u>	<u>College, University, Institution</u>	<u>Country</u>	<u>Year</u>
<b>Doctorate</b>	<b>Tohoku University</b> (Electrical and Communications Engineering)	<b>Japan</b>	<b>1977</b>
<b>Master</b>	<b>Tohoku University</b> (Electrical and Communications Engineering)	<b>Japan</b>	<b>1974</b>
<b>Bachelor</b>	<b>Kitami Institute of Technology</b> (Electrical Engineering)	<b>Japan</b>	<b>1972</b>

**(職歴情報)**

<b>From (year) to (year)</b>	<b>Name of Company</b>	<b>Position Held and Responsibilities</b>
2008 to present,	RIEC, Tohoku University	Professor
2006 to 2008	RIEC, Tohoku University	Visiting Professor
2005 to 2010	Nat. Inst. of Info. and Communi. Tech.	Program Director
2002 to 2005	Teradyne Japan KK	Exec. VP, GM Japan Div.
2001 to 2004,	Omni Wireless, Inc,	President
2001 to 2005	Zucotto Wireless, Inc.	Advisory Board Member
1999 to 2002	Widcomm, Inc.	Advisory Board Member
1999 to 2001	Mitsubishi Wireless Communi. Inc.,	Exec. Vice President
1998 to 2001,	Mitsubishi Wireless Tech Center,	President
1998 to 2002	University of Hawaii,	Affiliate Faculty Member
1997 to June 1998,	Uniden Corporation,	President and COO
1997 to June 1998,	Pacific Communi. Research Corp.,	Managing Director
1995 to 1997,	Uniden Corporation,	Senior EVP and GM
1995 to 1997,	Pacific Communi. Research Corp.,	President and CEO
1993 to 1995,	Tohoku University,	Adjunct Professor
1990 to 1995,	Akita University,	Adjunct Professor
1990 to 1995,	Kitami Institute of Technology,	Adjunct Professor
1988 to 1995,	NTT Labs,	Research Group Leader (Responsible for R&D on satellite TDMA and PCS systems)
1985 to 1988	NTT Labs,	Project Leader (Responsible for R&D on satellite TDMA and systems)
1981 to 1982	University of Ottawa,	Post-doctoral Research Fellow
1981 to 1985	NTT Labs,	Senior Researcher, (Responsible for R&D on satellite TDMA and system)
1977 to 1981	NTT Labs,	Researcher

## **(研究経歴情報)**

### **専門分野**

無線通信分野。特に衛星通信方式、PHS (Personal Handy Phone)システム、携帯電話端末、ミリ波通信方式、広域ワイヤレスセンサネットワーク通信方式および国際標準化(IEEE802)推進。

### **研究課題**

周波数の高い有効利用率の達成、Gbps 信号の伝送、半径~5 km 程度の広域無線通信の実現、通信端末の低消費電力化等及び、開発技術の国際標準化他。

### **研究経歴**

#### **1. ゼロから世界トップレベルへの技術立ち上げ 1: 衛星 TDMA 通信技術**

当時、誰もが不可能と考えていた”汎用的に適用可能な TDMA ASIC”による装置化を、6 種 ASIC の開発により世界で初めて実現した(1986 年)。各 ASIC の基本周波数は 25MHz であるが、並列処理により、より高速な Intelsat, Eutelsat 等種々の TDMA システムに適用可能である。汎用的に適用可能な ASIC の開発により、装置あたり「1 架~数架」必要とされていた巨大なシステムを、約 1/5 の大きさで実現。これがブレークスルーとなり、衛星 TDMA 通信システムの真の商業化(特に国内衛星通信)への道が大きく開かれた。日本では国内衛星通信システムがその後 3 世代にわたり、本 LSI の恩恵を受け開発・実用された。また、開発技術の一部は ESA(European Space Agency)の研究部門である ESTEC にも輸出された。

#### **2. ゼロから世界トップレベルへの技術立ち上げ 2: PHS 通信技術**

他社より、3年遅れでスタートし、プロジェクト開始から4年後には世界最高の受信性能と世界で最初の商用2V CMOS LSIを実現し、世界のトップに技術を持ち上げた。これは当時の他社製品に比較し、6 dB優れた受信性能を移動通信環境下で動作する世界初の同期検波方式の実現及びADPCM符号化された音声信号の回線誤りへの耐性を増すことにより実現(共に特許)し、かつ世界初の2V動作SOCによりワンチップ化し低消費電力で最も優れたPHS (Personal Handy Phone)用ベースバンドチップを開発 (1994年時)。

10 件以上の特許からなる本 LSI は以下の特長を有し、国内大手企業を含め多くの企業から技術供与希望が出された。

- (1) 世界初の移動通信環境下で動作する同期検波の発明、ADPCM符号化された音声のError Concealment技術の発明による6 dB優れた受信性能の実現
- (2) 世界最小電力のADPCM Codecの開発(当時のADPCM Codec LSIの最小消費電力の1/10(500 micro W))を達成)、
- (3) 世界で初めてLayer2をランダム・ロジックで実現しCPUの低消費電力化を実現
- (4) 世界初の2V動作CMOS SOC (実用LSIとしては世界初)による最も少ない消費電力PHS用ASICの実現 (1994年当時)

#### **3. リワークフリーを実現する ASIC 開発手法の開発 39 品種の ASIC をリワークフリーで開発**

同氏は現在まで、39品種のASIC (ほとんどは商用ASIC) を全てリワーク (re-work)無しで開発に成功している。これは世界的なリワーク平均回数、「2.5~3

回/ASIC」に比較すると突出して優れた値であり、ASIC開発のための設計Validation toolの開発の結果である。開発した手法はコンピュータによるシミュレーションで、「デバイスのウェーハ上の位置、動作電圧の変動、温度変動によるトランジスタ性能のばらつき」をLSIの動作タイミングへの尤度として評価するタイミングシミュレーションと、ASIC設計データを直接FPGA設計データに変換する手法を開発し、FPGAにより実環境動作をハードウェアシミュレーションすることにより、全機能が実速度・実環境で満たされることの検証を可能とした。本ASICのValidation手法をASIC黎明期の1980年代初期に世界に先駆け開発し、その結果、「リワーク無しで39品種のLSIを開発するレコード」を達成した。この手法で開発したASICには以下のASICを含む。

#### (1) ビタービ復号器 ASIC

商用品として世界最高速の復号器ASICを2度実現。SST (Scarce State Transition)型 ビタービ復号の考案(特許、電子情報通信学会論文賞)により、耐熱問題を解決し、1987年に世界最高速 (25MHz ( $R=1/2$ ,  $K=7$ ))のビタービ復号器ASICの開発に成功(競争相手のQualcomm社(Dr. Viterbiのチーム)は1週間遅れで17 Mbps版を発表)。本LSIの特性を1987年のICC1987で発表し、翌週にINTELSATを訪問し、そこで検討中であった、BCH方式に代わり、本ASICを用いた「たたみ込み符号化・Viterbi復号方式」の採用へ変更させることに成功。その後、GSM方式を含め、ほぼ全ての無線通信システムに同方式が採用されることになった。開発したASICは世界の高速誤り訂正市場の約50%のシェアを獲得。さらに6年後には符号化率可変 ( $R=1/2 - 15/16$ ,  $K=7$ )で世界最高速の60MHz ま で動作する復号器ASICを開発した(1993年)。

#### (2) ワンチップ変調器、復調器LSI

1993年当時、「1サンプル/シンボル」で動作するデジタル変調器、復調器の開発に成功し(特許)、当時のCMOS 2  $\mu$ m技術を用い、世界最高速の60Mb/sで動作するワンチップ変調器、復調器LSIを実現した。また、OQPSK方式では世界初の同期検波・バーストモードでの復調器を実現し、変調器LSIの変調方式はBPSK/QPSK/OQPSKに対応する。当時衛星からの映像信号の配送に必要な、いわゆる「セットトップボックス」を実現するために必要な全てのLSIを1993年には開発完了していた。セットトップボックスのマーケットはそれから5年以上経過し、大きく認知されるようになった。

#### (3) 携帯電話用 (IS-136 TDMA用)

米国内標準移動通信システムの一つであるTDMAシステム(IS-136 TDMAシステム)用ベースバンドASIC(Embedded ARM及びOALK (DSP)を使用)を米国にて開発し、米国マーケットで最も優れた受信性能を有するハンドセットを開発・製造 (2000年)(ATT Wireless購買品質評価課長談)。本チップが同氏にとり39品種目のLSI。2000年当時の米国における携帯電話は未だ、ホットスポット的であり、受信感度の差が屋内通信で明確に現れる環境にあり、開発ハンドセットが当時ベストハンドセットと言われていたノキア製品よりも明らかに優れていた。また、EMSを使用し、メキシコにて携帯電話を製造し、大量生産に入ってから3ヶ月未満で90%以上の歩留まりを達成し、図らずも米国携帯電話製造の記録を作った(2001年)。

### 4. 実用装置開発への貢献

#### (1) 衛星通信システム

TDMAシステムコア技術の開発 (バーストモデム、同期制御、誤り訂正、及びネッ

トワークインタフェース)、TDMA ASIC (6種)の開発 (世界初 (1986)), 衛星 TDMA システム設計, 開発及び 設置・導入: NTT の衛星通信システムを3世代にわたり、事業部門から受託し、ASIC設計、装置設計から開発までを研究所で行い、設置・導入までを現地にて実施。これらには世界のTDMA通信システムの中でも最も高性能な(バースト毎のデマンドアサインメント、トランスポンダホッピング、バースト動作型地上局HPA制御、基準局のサイトダイバーシテイ)TDMA通信システムから、ISDNネットワークの加入者線を実現するTDMA衛星通信システム等がある。

- A. 50 Mb/s TDMA システム: トランクトランスミッション・システム (1985年),
- B. 50Mb/s デマンド・アサインメントTDMA システム-世界で最大のTDMA ネットワーク (1987年)
- C. 17Mb/s ISDN TDMA システム: ISDN ターミナルの T/U点サービスを衛星通信で実現 (1991年)

## (2) 米国向けデジタル携帯電話

米国携帯電話用コア ASIC の開発から携帯電話本体までの全技術と高効率製造技術の開発: ベースバンド ASIC (IS-136), ハンドセットの開発からハンドセットの全米での validation と 3 種交換機との整合試験 certificate 取得を一貫して行い、米国携帯電話製造の記録を破った短期間での高い製造歩留まり実現 (量産開始後 3 ヶ月以内に 90%超の製造歩留まりを実現)(2000 年)。

## 5. 国際標準化(IEEE802 標準)

### (1) 概要

日本産業界が不得意ではあるが、今後の国際競争に必須の国際標準化力を築くために、国内にミリ波実用化コンソシアム(COMPA, **Consortium for Millimeter-Wave Practical Applications**)を構築し、これを率いて IEEE の標準化会議で日本発のアイデア、技術の標準化のために貢献し標準化を達成。IEEE にてすでに標準化活動が行われていたミリ波(60 GHz 帯)標準化のためのコンソシアムを 2 年遅れの 2006 年 7 月に日本の 20 機関(後ほど、米国の 1 機関の参加を得、21 機関)で構成し、約 8 ヶ月間で技術的に全ての面でリードするにいたり、IEEE 標準化への取り組み方をコンソシアム参加機関に示す良い機会を得た。後追いで勝つための戦略を、“システム構築に必要な全ての技術分野をカバーし、これらに貢献・リードすること”と設定し、これを実現することにより、多くの浮動票を得ることができた。また、COMPA は 21 機関(日本 20 機関、米国 1 社)から、多くの機関の賛同を得るようになり、標準完了に向けての最後の 2 年はこれに賛同した海外機関(Affiliate members)18 の参加を得、39 の国際機関を標準化に向け、COMPA Chair として同氏がマネージし、標準化を 2009 年に達成した。

### (2) 戦略

後追いで勝つための戦略を以下の 6 点に設定し、コンソーシアムを運営。

- A. 日本機関だけではなく、海外機関の賛同 - 浮動票を得ること、
- B. 参加者数ではなく、技術で標準化会議をリードすること、
- C. ”技術分野は Usage モデル、伝播モデル、システム設計、メディアアクセス制御、RF, アンテナまで、全てをカバーすること、
- D. コンソーシアムが 1 団体でシステム設計全てができる能力を持ち、個別技術を提案する機関を“収容”すること、
- E. コンソーシアム内ではフリーに技術討論が行える環境とし、数、資本等にバイアスされないこと、
- F. コンソーシアム内の技術選択は徹底した討論による Fair な決定とし、“数”に

よるリードは行わないこと。

(3) 成功のインパクト

- A. COMPA コンソーシアムが提案し、採用された異なるエアーインタフェースを接続する Common mode は苛烈なキャンプ間の競争を避ける方式として、標準化会議にて高い評価を受け、この標準化以降の多くの標準化で採用されている
- B. 本標準化は日本機関が最初から標準化完了までリードして成功させた最初の例であり、COMPA コンソーシアム参加日本機関へ良い成功例を示すことができた
- C. この成功により、日本機関の IEEE 標準化会議での存在感が大きく高まり、上手で無い英語の発表でも聞いてくれるようになった
- D. 日本人の IEEE 標準化への関心も多いに高まり、2014 年 12 月に東京で行った IEEE Standardization Promotion セミナーでは 95 名を超える参加者があった。
- E. 今後の日本企業の“積極的な参加”が期待される

6. XPSK 特許

現在までに取得した 117 件の特許の内、最も使われた特許の一つが定包絡線変調信号を生成する 1981 年発明の特許(US Pat. No. 4567602), “Cross Correlated Signal Processing (XPSK)”である。これは非線形増幅器を飽和点で動作させることが可能となる定包絡線変調信号生成に関するものであり、従来の FM 変調をベースとした信号生成(GMSK 方式)に代わり、直交変調器で、両チャネル信号間に一定の相関を一定期間与えれば定包絡線変調信号が生成できることを新しく示したものである。デジタル回路による実現に適し、かつ変調信号生成による劣化を一定値以下とできることから、現在の携帯電話に搭載されている変調信号発生にはほぼ例外無く使用されているくらいにポピュラーである。なお、これに続く特許としては NUFEC (US Pat. No. 4805174)があり、これは高速誤り訂正復号器の世界市場の約 1/2 を占める原動力となった。

## **国際会議の発表・講演**

### **I. 基調・招待講演：74**

#### **1. 無線通信関連**

- (1) Invited – “Wide Area Wireless Sensor Networks from Propagation Measurements to System Development”, University of British Columbia, Vancouver, Canada, August, 2014**
- (2) Invited – “Wide Area Wireless Sensor Networks from Propagation Measurements to System Development”, University of Ottawa, Ottawa, Canada, August, 2014**
- (3) Invited – “Wide Area Wireless Sensor Networks from Propagation Measurements to System Development”, Communications Research Center, Ottawa, Canada, August, 2014**
- (4) Keynote – “60 GHz Hot Spot Communications for 5G Cellular Systems”, Wireless World Research Forum (WWRF) 2014, Marrakech, Morocco, May, 2014**
- (5) Invited – “Wide Area Wireless Sensor Networks from Propagation Measurements to System Development”, Yonsei University, Korea, March, 2014**
- (6) Invited – “Wide Area Wireless Sensor Networks from Propagation Measurements to System Development”, Inha University, Korea, March, 2014**
- (7) Invited – “Wide Area Sensor Networks”, Institute for Inforcomm Research (IIR), Singapore, December, 2013**
- (8) Invited – “Full Blooming Wireless Communications: from Short to Long Range Communications”, 1<sup>st</sup> International Conference on C5 (Communications, Connectivity, Convergence, Content, and Cooperation), India, 2013**
- (9) Invited – “Millimeter Wave CMOS PA and Phase Shifter for Beam Forming Portable Terminals for Highly Reliable Super Broadband Indoor Wireless Communications”, Tohoku University – IMEC Workshop, Belgium, June 22, 2012**
- (10) Invited – “Smart Phones: Unlimited Potential Applications and Core Technologies”, 「Smart phone X MEMS」 Matching Forum by Sendai City, February, 2012**
- (11) Invited – “60 GHz (Millimeter Wave) Standardization and Future Core Technologies / Applications”, Panel Session on WPAN, IEEE Radio Wireless Week (RWW), USA, 2012**
- (12) Keynote – “On Global Standardization focusing on Wireless Sensor Applications and Smart Grid”, STARC Symposium 2011, Japan, 2012 (無線センサー応用とスマートグリッドを中心とした国際標準化)**

- (13) Invited – “A Super Broadband Indoor Wireless Communication System and Core Technology Development”, Inha University, October 26, 2011**
- (14) Invited – “Ultra Low Speed Wide Area Wireless Communications Systems for Disaster Resilient Lifelines” RIEC Tohoku University Tokyo Forum 2011, Tokyo 2011**
- (15) Invited – “Super Broadband (60 GHz) Indoor Wireless Communications and Their Roll in 4G Mobile Communications Era” Wireless VITAE2011, Denmark, 2011**
- (16) Invited – “Super Broadband (60 GHz) Indoor Wireless Communications: A Dream Comes True” The International Workshop on Millimeter Wave Wireless Technology and Applications (At Tokyo Institute of Technology), Japan, December 6, 2010**
- (17) Invited – “Ultra-High Speed millimeter Wave Wireless Communications and International Standardization”, Electronic Device Technical Group, IEE Japan, Tokyo July 2010 (超高速ミリ波ワイヤレス通信と国際標準化動向)**
- (18) Invited – “Millimeter Wave (60 GHz) Global Standardization and Super Broadband Wireless Communications Systems”, Wireless Technology Park 2010, Japan, 2010 (ミリ波(60 GHz)国際標準化と超高速屋内無線通信システム)**
- (19) Invited – “Bright Future of Millimeter Wave: Super Broadband Wireless Communications and Related Technologies”, Global Symposium on Millimeter Wave 2010, Korea, 2010**
- (20) Invited – “A Dream Comes True: Wireless Super Broadband Communications – Millimeter Wave PANI”, Home Wireless Symposium for Gigabit Era 2010 (Organized by Agilent Technology), Japan, 2010 (夢の超高速無線通信 – ミリ波WPAN)**
- (21) Invited – “Millimeter-wave Wireless PAN Global Standardization”, Short Range Wireless (SRW) First Technical Group, IEICE, Tokyo, February 2010**
- (22) Invited – “Millimeter Wave (60 GHz) Standardization and Applications to Indoor Wireless Super Broadband Communications”, Sendai EMC Research Center, Sendai, February, 2010 (ミリ波国際標準化と屋内ワイヤレススーパーブロードバンドへの応用)**
- (23) Invited – “Millimeter Wave (60 GHz) System Global Standardization and Opportunities for Ultra / Super Broadband Indoor Wireless Communications”, 2009 Workshop for Microwave and Millimeter-waves, Korea, 2009**
- (24) Invited – “Millimeter Wave (60 GHz) Standardization Update and Opportunity of Super Broadband Wireless Communications”, KKE Vision 2009, Japan, 2009 (ミリ波(60 GHz)の標準化動向と超高速屋内ブロードバンド無線通信実現の機会)**



- (25) Invited – “WPAN (Wireless Personal Area network) Standardization Trend Update at IEEE802.15.3c”, Wireless Conference 2009, Japan, 2009 (IEEE802.15.3c ミリ波 WPAN の標準化最新動向)
- (26) Invited – “Standardization Trend Update at IEEE802.15.3c”, Wireless Japan 2009, Japan, 2009 (IEEE802.15.3c ミリ波 WPAN の標準化最新動向)
- (27) Invited – “Trends of Technology Development for Indoor Wireless Super Broadband in Japan”, Frequency Resource Development Symposium 2009, Japan, 2009 (日本における家庭内ワイヤレススーパーブロードバンドの技術動向)
- (28) Invited – “Millimeter Wave (60 GHz) Standardization Update at IEEE802.15.3c – Dreams Come True” Communications Research Center, Canada, May, 2009
- (29) Keynote – “Global Standardization (IEEE802.15.3c) for Millimeter Wave Communications and Applications”, IEICE Electronics Society Plenary Session 2009 at IEICE General Conference 2009, Japan, March, 2009 (「ミリ波 (60GHz)PAN の国際標準化(IEEE802.15.3c)と応用, 電子情報通信学会エレクトロニクスソサエティプレナリーセッション特別講演)
- (30) Invited – “Extremely High Frequency Aerospace Communications: A Technology Overview”, EHF – AERCOMM Workshop at Globecom 2008, 2008
- (31) Invited – “IEEE 802.15.3c update: Millimeter Wave WPAN Standardization Activities and Applications”, MWE (Microwave Workshops and Exhibition) 2008, Japan, 2008
- (32) Invited – “Recent Trends of IEEE 802.15.3c Standardization”, Multimedia Mobile Access Communications Forum 2008, Japan, 2008 (IEEE802.15.3c の標準化最新動向について)
- (33) Invited – “A Dream Comes True: Multi-Gbps Millimeter Wave PAN Getting into Commercialization”, ICMMT and GSMM2008, Nanjing China, 2008
- (34) Invited – “A Dream comes true: R&D and Global Standardization Trends on Ultra High Speed Wireless PAN”, Kansai Electronics Industry Promotion Center, Japan, 2008 (夢の実現:超高速 WPAN の研究開発・標準化のトレンド) June, 2008
- (35) Invited – “Millimeter Wave (60 GHz) Standardization (IEEE802.15.3c) Trends”, Panel Session at IEICE General Meeting 2008, Japan, March 2008 (ミリ波(60 GHz)標準化(IEEE802.15.3c)動向)
- (36) Invited – “Harmonized Cognitive Wireless Communications for B3G Era”, ICB3G 2008, March, 2008
- (37) Invited – “Cognitive Radio for Best Spectrum Utilization – Various Definitions and Implications”, Asia –Pacific Wireless Broad Forum 2008 [AP-WBF’08], Thailand, January 2008

- (38) Keynote –“Cognitive Radio for Best Spectrum Utilization through SDR – Various Definitions and Implications”, SDR FORUM 2007, Denver, USA, 2007**
- (39) Keynote –“R&D on Millimeter Wave (60 GHz) Systems and IEEE Standardization Updates”, International Conference on Ultra Wideband (ICUWB) 2007, Singapore, 2007**
- (40) Invited –“Technical Challenges for Next and Future generations of UWB Systems”, Panel at International Conference on Ultra Wideband (ICUWB) 2007, Singapore, 2007**
- (41) Invited –“Cognitive radio for Best Spectrum Utilization: Various Definitions and implications”, Frequency Resource Development Symposium 2007 Japan, 2007 (スペクトラム有効利用のためのコグニティブ無線技術)**
- (42) Invited - “R&D on Millimeter Wave (60 GHz) Systems and IEEE Standardization Activities”, The 8th MINT Millimeter-Wave International Symp. and the 9th Topical Symp. on Millimeter Waves, Korea, 2007**
- (43) Invited - “Paradigm Shift Towards Ubiquitous Mobile communications: From Carrier to Customer Centric Networks and Services” Microwave, 2007 Sendai International Workshop on Network security and Wireless Communications, January, 2007**
- (44) Invited - “Current Global R&D Status, Trends and NICT’s Activities on ITS Communications” Microwave, Millimeter Wave Photonics (MWP) Technical Group, IEICE, Nov. 2006, Shizuoka, Japan, 2006 (ITS 研究開発の現状・動向と NICT における取り組み)**
- (45) Keynote - “Visions for the Wireless World in 2020 and beyond”, First CTIF (Center for Tele-infrastructure) Annual Workshop, Aalborg, Denmark, 2006**
- (46) Invited - “Mobile Internet Services” WOC 2001 (International Conf. on Wireless and Optical Communications) Calgary, Canada, 2001**
- (47) Invited - “Vision and Projections for New Products - Mobile Internet Phone Toward 3G Wireless Systems”, Globecom 2000, San Francisco, USA, 2000**
- (48) Keynote - “Personal Communications Systems Towards 21<sup>st</sup> Century”, VTC1999, Netherlands, 1999**
- (49) Keynote - “Wireless Communications Toward 21<sup>st</sup> Century” PIMRC’99, Japan, 1999**
- (50) Invited - as a representative of Wireless Communications in Japan- “Personal Communication Systems and Low Earth Orbit Satellites”, 75<sup>th</sup> Anniversary Meeting, URSI Space and Radio Science Symposium, Belgium, 1995**
- (51) Invited - “Personal Communication Systems and Low Earth Orbit Satellites”, Faculty of Electrical Engineering, Delft University of Technology, Delft, The**

Netherlands, 1995

- (52) Keynote - "Technologies for Personal Communications", IEEE Asia-Pacific Conference on Circuit and Systems, Taipei, Taiwan, 1994
- (53) Invited - "Roll of Mobile Satellite Communications in Personal Communication Era ", 1994 International Zurich Seminar on Digital Communications, ETH, Zurich, Switzerland, 1994
- (54) Keynote - "System Engineering for Portability of Services", PIMRC'94, The Netherlands, 1994
- (55) Invited - "TDMA Satellite Communication Systems in Japan" at IEE Evening Seminar in London, U.K., September 1991
- (56) Invited - "Satellite Communication Systems in Japan" at Milan Technical University, Milan, Italy, July 1991
- (57) Invited - "ISDN Services via TDMA Satellite Communication Systems" and "Digital Video Transmission via Satellite" at Telespazio, Italy, July 1991
- (58) Invited - "On-board Signal Processing" Satellite Communications Research Laboratory, October 1990
- (59) Invited - "Onboard Signal Processing" at Satellite Communication Research Labs., Japan, October, 1990 (オンボード信号処理)
- (60) Invited - "TDMA Satellite Communication Systems" in Washington D.C. (at INTELSAT HQ), April, 1990
- (61) Invited - "TDMA Satellite Communication Systems" in Washington D.C. (at INTELSAT HQ), April 1990
- (62) Invited - "Onboard Digital Signal Processing" and "TDMA Satellite Communication Systems" at ESA ESTEC in the Netherlands, May, 1989
- (63) Invited - "Onboard Digital Signal Processing" and "TDMA Satellite Communication Systems" at ESA ESTEC in the Netherlands, May 1989
- (64) Invited - "Satellite Communication Systems in Japan" at IEEE London Chapter in U.K., May 1989
- (65) Invited - "TDMA Satellite Communication Systems and Satellite Communications in Japan" at ESA Headquarters in Paris, France, August 1988

## **2. 工学教育関連**

- (1) Invited - "Goal of Engineering Education in Global Competition Era - Suggestions from 38-year experience in industry and academia, in Japan and USA -", Wireless Workshop 2015, co-sponsored by RCS, SR and SRW Technical Groups, IEICE, Japan, March, 2015 (Scheduled)

- (2) Invited – “Goal of Engineering Education in Global Competition Era and How to Foster Students”, Workshop on “Is this OK Japanese Research, Education and Fostering Students in Information and Communications?” Co-sponsored by Waseda University Shiratori Lab and Electromagnetic Applications Lab., Tokyo, Japan, February, 2015(国際競争下における工学教育のゴールと人材育成)
- (3) Invited – “What kind of Graduates are Sought by Industry in Global Era - What Society Demands for Students Now” at Sendai No.2 High School, Japan, January, 2014 (グローバル社会で求められる人材とは - 今社会が大学生に何を求めているか)
- (4) Invited – “University – Industry Interface Mandated for Globalization of Japan” Japan Business Federation, April 4, 2013 (日本の国際化に必要な”大学 – 産業界インタフェース”)
- (5) Invited – “University – Industry Interface needed for Globalization of Japan – Compared with Foreign Countries”, A Working Group on fostering IT/Electronics Engineers, JEITA (Japan Electronics and Information Technology Industries Association) February, 2013 (日本の国際化に必要な”大学 – 産業界インタフェース” – 日本と海外と比較して -)
- (6) Invited - “University Globalization and Skill Required for Students – Comparing with Japan and Overseas”, at Keio University, Oct., 25, 2012 (大学の国際化と学生に求められるスキル – 日本と海外を比較して)
- (7) Invited – “What Universities, Industries, Government and Academic Institutes should do for Japanese Wireless Industry to Play an Active Part in Global Competition”, Panel Session, SR (Software Radio) Technical Group, IEICE, July, 2012 (日本産業が世界で元気に活躍するために：大学、産業界、国、学会は何をなすべきか)
- (8) Invited – “Lessons Learned from the 311 Earthquake: For Re-construction of Shining Japan”, KKE Vision, Japan 2012 (311 大震災から得られた教訓と輝く日本の再生)
- (9) Invited - “Technology Management and Business – Expectation for Young Engineers” Electrical and Electronics Department, Faculty of Engineering, Niigata University, January, 2007, Niigata, Japan, 2007 (ITS 研究開発の現状・動向と NICT における取り組み)

## II. 国際会議論文：211

- (1) Y Sato and S Kato: Small and Low Side Lobe Beam-forming Antenna Composed of Narrow Spaced Patch Antennas for Wireless Sensor Networks, Proc. of Sensorcom2014, Nov. 2014
- (2) Y Tada and S Kato: High Deployability of IEEE 802.15.4k DSSS Systems in Interference Dominated Bands, Proc. of Sensorcom2014, Nov. 2014

- (3) Y Sato, V Ith and S Kato: 60GHz Radio Hose for Wireless Harness Communication Systems Proc. of Sensorcom2014, Nov. 2014
- (4) T Baykas, L Goratti, T Rasheed and S Kato: On the Spectrum Efficiency of Mesh and Star Topology Wide Area Wireless Sensor Networks, Proc. of PIMRC2014, Sep., 2014
- (5) Y. Sato and S Kato: Easy Implementation Beam-forming Antenna Composed of Odd-Number- Element Double Slot Array Antennas, GSMM2014, May, 2014
- (6) S Kato: IEEE802.15.4k DSSS Systems for Wide Area Sensor Networks, Proc. of International Symposium on Wireless Sensor Networks 2014, Jan. 30, 2014
- (7) S Kato "Toward Highly Reliable and Low Power 60 GHz Indoor Communications -Thorough Deployment of Reflected Waves and their Channel Models Establishment –", MiWEBA 2013 workshop, Oct., 2013
- (8) I Vannsith, T Baykas, S Kato, "Improving Preamble Detection Performance of IEEE P802.15.4k DSSS PHY", in Proceedings of PIMRC 2013, Sept 2013
- (9) Y. Tada, and S Kato, "A Star – Topology Sensor Network System for Agriculture using 802.15.4k Standard", SENSEA'13 Workshop at PIMRC 2013, Sept 2013
- (10) Hideki Kato, Shuzo Kato, "A Throughput Analysis and Complexity Estimation of 802.11ad MAC Hardware Implementations" GSMM 2013, April 22-23, 2013, Japan
- (11) Y Shoji, B Zhongwei and S Kato, "A Proposal for 60 GHz Beam-tracking Single Carrier Communications Systems with High Gain FEC and Simple Equalizer" GSMM 2013, 2013, Japan
- (12) L Materum, H Sawada, T Baykas and S Kato, "Radio Channel Power Delay Profile Models for 60 GHz Beam Tracking Systems in a NLOS In-Room Scenario" GSMM 2013, April 22-23, 2013, Sendai Japan
- (13) L Materum, H Sawada, T Baykas and S Kato, "Radio Channel Power Delay Profile Models for 60 GHz Beam Tracking Systems in a NLOS In-Room Scenario" GSMM 2013, April 22-23, 2013, Sendai Japan
- (14) Y Tada, T Baykas, S Kato, "Performance Evaluation of IEEE802.15.4k DSSS System in the Presence of 802.15.4q Co-Channel Interference" GSMM 2013, April 22-23, 2013, Sendai Japan
- (15) I Vannsith, T Baykas and S Kato, "Novel Preamble Design for IEEE802.15.4k System with DSSS PHY" GSMM 2013, April 22-23, 2013, Sendai Japan
- (16) H Sawada, S Kato and M Umehira "A Proposal on Arrayed RX Antenna Switching Diversity for 60 GHz Desktop Communications" GSMM 2013, April 22-23, 2013, Sendai

Japan

- (17) T Baykas, L Materum, H Sawada, S Kato, "Performance of 60 GHz Single Carrier Systems with a Modified Saleh-Valenzuela Channel Model" GSMM 2013, April 22-23, 2013, Sendai Japan
- (18) Shuzo Kato, Yuya Osumi, Yosuke Sato, Hirokazu Sawada, "Odd Numbered Elements Double Slot Array Antenna with Simplified 90 Degree Step Phase Shifter Implementation", Proc. of Asia-Pacific Microwave Conference 2012, Taiwan, 2012
- (19) Y. Sato, H Sawada, and S Kato "High Gain Beam-forming Antenna with Two-layer Super Gain Antenna for 2.4 GHz Wireless LAN", Proc. of Asia-Pacific Microwave Conference 2012, Taiwan, 2012
- (20) H Sawada, H Nakase, S Kato, K Sato and H Harada, "Disconnection Probability Improvement by using Artificial Multi Reflectors for Millimeter-wave Indoor Wireless Communications," Proc. of 75th Vehicular Technology Conference (VTC Spring 2012), Yokohama, May 2012
- (21) L Goratti, J Haapola and S Kato, "Highly Reliable Star and Sub-Mesh Hybrid, Critical Infrastructure Sensor Network" Proc. of PIMRC 2012, Sydney, Australia, 2012
- (22) L Goratti, J Haapola and S Kato, "Highly Reliable Star and Sub-Mesh Hybrid Sensor Network for Smart Grid Monitoring" Proc. of Globecom 2012, Anaheim, CA USA, 2012
- (23) H. Sawada, S. Takahashi, S. Kato, "Disconnection Time Improvement by using Artificial Multi Reflectors for Millimeter-wave Indoor Communications", Proc. of International Symposium on Antennas and Propagation 2012, Nagoya Japan, 2012
- (24) Zhongwei Bao, Yuichi Sato, Hirokazu Sawada, Shuzo Kato, "A Proposal of Single Carrier Beam Tracking Communications Systems for Low Power 60GHz Indoor Wireless Communications Terminals," Proceedings of Global Symposium on Millimeter Waves 2012, Harbin, China 2012
- (25) L. Goratti, T. Wysocki, M-R. Akhavan, J. Lei, H. Nakase, and S Kato, "Optimal Bandwidth for Beacon and Contention Access Periods in IEEE 802.15.3c WPAN" PIMRC 2011, Sep. 2011
- (26) J Haapola and S Kato: Efficient mm-Wave beam-forming protocol for group environments. PIMRC 2011, Sep. 2011
- (27) H Harada, R Funada, K Li and S Kato: 60 GHz band CMOS based transceiver for millimeter wave WPAN and WLAN systems. WPMC 2011
- (28) Y Sato, K Fujita, H Sawada, H Nakase, S Kato, "A Millimeter-wave 8-element Double Slot Array Antenna for High Gain Beam-forming," Global Symposium on Millimeter

Waves 2011, May 23-25, 2011, Espoo, Finland

- (29) L Materum, S Kato and H Sawada, "Channel Measurements for Short Range Beam Tracking/Switching Systems,"FrE1-1, International Symposium on Antennas and Propagation 2011, Oct. 25-28, 2011, Jeju, Korea
- (30) H Sawada, K Fujita, S Kato, K Sato and H Harada, "Impulse Response Model for the Cubicle Environments at 60GHz," Proceedings of APMC 2010, Yokohama Dec.10, 2010
- (31) Y Sato, K Fujita, H Sawada, H Nakase and S Kato, "Development of 4 Slot Array Antenna with Discrete Phase Shifter for Millimeter Wave Wireless Communications System," Proceedings of the 3rd Student Organizing International Mini-Conference on Information Electronics Systems, F7P-43, Sendai Oct. 2010
- (32) H Sawada, K Fujita, S Kato, K Sato and H Harada, "Millimeter Wave Indoor Channel Modeling for Living, Conference, and Cubicle Environments," Proceedings of the 3rd Student Organizing International Mini-Conference on Information Electronics Systems, F7P-38, Sendai Oct. 2010
- (33) S Takahashi, H Sawada, H Nakase and S Kato, "Disconnection Probability Improvement for Student Organizing International Mini-Conference on Information Electronics Systems, F7P-37, Sendai Oct. 2010
- (34) Kazuya Fujita, Hirokazu Sawada and Shuzo Kato, "Millimeter Wave Intra Car Communications System Using Flexible Metalized Rubber Hose," Proceedings of the 3rd Student Organizing International Mini-Conference on Information Electronics Systems, F7P-35, Sendai Oct. 2010
- (35) S. Takahashi, H. Sawada, and S Kato, "Connection Probability Enhancement Using Artificial Reflectors for Millimeter Wave Communications" Proceedings of APMC 2010, Yokohama Dec.9, 2010
- (36) Y Sato, Kazuya F, Sawada and S Kato, "Design and Performance of Beam-forming Antenna with Discrete Phase Shifter for Practical Millimeter-Wave Communications Systems," Proceedings of APMC 2010, Yokohama Dec.9, 2010
- (37) S Takahashi, H Sawada, H Nakase and S Kato, "Connection Probability Enhancement Using Artificial Reflectors for Millimeter Wave Communications," Proceedings of APMC 2010, Yokohama Dec.10, 2010
- (38) J Wang, Z Lan, C Woo Pyo, T Baykas, C S Sum, M A Rahman, J Gao, R Funada, F Kojima, H Harada, S Kato: A Pro-Active Beamforming Protocol for Multi-Gbps Millimeter-Wave WPAN Systems. WCNC 2010
- (39) J Wang, Z Lan, C Woo Pyo, T Baykas, C S Sum, M A Rahman, J Gao, R Funada, F Kojima, H Harada, S Kato: A Pro-Active Beamforming Protocol for Multi-Gbps

- (40) C S Sum, Z Lan, J Wang, T Baykas, R Funada, M A Rahman, H Harada and S Kato: A Cross Layer Interference and Coexistence Model for Millimeter-Wave WPAN with Directional Antennas. WCNC 2010
- (41) T Baykas, X An, C S Sum, M A Rahman, J Wang, Z Lan, R Funada, H Harada and S Kato: Investigation of Synchronization Frame Transmission in Multi-Gbps 60 GHz WPANs. WCNC 2010
- (42) C S Sum, M A Rahman, Z Lan, J Wang, R Funada, T Baykas, H Harada, S Kato: A Scalable Heuristic Scheduling Strategy for 60GHz WPAN STDMA System with Directional Antennas. ICC 2010
- (43) Z Lan, J Wang, J Gao, C S Sum, F Kojima, T Baykas, H Harada and S Kato: Directional Relay with Spatial Time Slot Scheduling for mmWave WPAN Systems. VTC Spring 2010
- (44) H Sawada, H Nakase, S Kato, M Umehira K Sato and H Harada: Impulse Response Model and Parameters for Indoor Channel Modeling at 60GHz. VTC Spring 2010
- (45) H Sawada, H Nakase, S Kato, K Sato and H Harada, "Millimeter-wave Indoor Channel Models for Super Broadband Wireless Communications," Proceedings of GSMM 2010, pp.133-136, Korea Apr. 2010
- (46) C S Sum, Z Lan, M A Rahman, J Wang, T Baykas, R Funada, H Harada and S Kato: A Multi-Gbps Millimeter-Wave WPAN System Based on STDMA with Heuristic Scheduling. GLOBECOM 2009
- (47) J Wang, Z Lan, C W Pyo, T Baykas, C S Sum, M A Rahman, R Funada, F Kojima, I Lakkis, H Harada and S Kato: Beam Codebook Based Beamforming Protocol for Multi-Gbps Millimeter-Wave WPAN Systems. GLOBECOM 2009
- (48) H Sawada, H Nakase, S Kato, M Umehira, K Sato, H Harada, "Polarization Dependence in Double Directional Propagation Channel at 60GHz," Proceedings of PIMRC 2009, D9-6, Tokyo, Sept. 2009
- (49) H Sawada, K Sato, R Funada, H Harada, and S Kato, "Propagation Characteristics of Millimeter Wave Wireless Personal Area Network," Proceedings of PIMRC 2009, WS4-4, Tokyo, Sept. 2009
- (50) H Sawada, H Nakase, S Kato, M Umehira, K Sato and Hiroshi Harada, "Millimeter-wave Propagation Characterization for Multi-gigabit Video Transmission System," Proceedings of APMC 2009, WE3E-5, pp.1080-1083, Singapore Dec. 2009
- (51) H Sawada, T Tomatsu, G Ozaki, H Nakase, S Kato, K Sato, and H Harada, "A Sixty GHz Intra-car Multi-media Communications System," Proceedings of IEEE 69th



- Vehicular Technology time-slot allocation throughput enhancement scheme with multiple modulations for a multi-Gbps millimeter-wave WPAN system. WCNC 2009
- (52) C S Sum, Z Lan, R Funada, J Wang, T Baykas, M A Rahman, H Harada and S Kato: A virtual time-slot allocation throughput enhancement scheme with multiple modulations for a multi-Gbps millimeter-wave WPAN system. WCNC 2009
  - (53) Z Lan, C S Sum, J Wang, T Baykas, J Gao, H Nakase, H Harada and S Kato: Deflect routing for throughput improvement in multi-hop millimeter-wave WPAN system. WCNC 2009
  - (54) M A Rahman, C S Sum, S Sasaki, T Baykas, J Wang, R Funada, H Harada, S Kato: Exact error probabilities for MRC in frequency selective Nakagami fading with ISI, CCI and ACI. WCNC 2009
  - (55) C W Pyo, H Harada, S Kato: Throughput analysis and improvement of hybrid multiple access in IEEE mmWave-WPAN. IWCMC 2009
  - (56) C W Pyo, H Harada and S Kato: A Predictive Channel Assignment Method (PCAM) for Interference Avoidance in IEEE 802.15.3 WPANs. VTC Fall 2009
  - (57) C S Sum, M A Rahman, Z Lan, R Funada, J Wang, T Baykas, H Harada and S Kato: A Space-Time Resource Management Scheme for Multi-Gbps Millimeter-wave WPAN System. VTC Fall 2009
  - (58) Z Lan, C S Sum, J Wang, T Baykas, F Kojima, H Nakase, H Harada, S Kato: Achieving Gbps Throughput for Millimeter-wave WPAN with an Anti-blocking Scheme Using Deflection Routing. VTC Fall 2009
  - (59) J Wang, Z Lan, C S Sum, C W Pyo, J Gao, T Baykas, M A Rahman, R Funada, F Kojima, I Lakkis, H Harada, S Kato: Beamforming Codebook Design and Performance Evaluation for 60GHz Wideband WPANs. VTC Fall 2009
  - (60) H Sawada, H Iseya, T Satou, M Umehira, H Nakase, S Kato, K Sato and H Harada, "Double directional propagation measurement at 60GHz," Proceedings of WPMC 2009, S27-1, Sendai, Sept. 2009
  - (61) C S Sum, X An, Z Lan, T Baykas, J Wang, R Funada, M A Rahman, Hiroshi Harada, Shuzo Kato: A synchronization-frame-aided interference mitigation mechanism for millimeter-wave WPAN. PIMRC 2009
  - (62) C W Pyo, H Harada, S Kato: Throughput comparison of CSMA/CA and hybrid CSMA/CA-TDMA in IEEE 802.15.3c WPAN. PIMRC 2009: 385-389
  - (63) K Sato, H Sawada, R Funada, H Harada, S Kato, "Propagation Characteristics of millimeter wave WPAN," Proceedings of Global Symposium on Millimeter Waves 2009,

Apr.2009

- (64) J Wang, T Baykas, R Funada, C S Sum, M A Rahman, Z Lan, H Harada and S Kato: A SNR Mapping Scheme for ZF/MMSE Based SC-FDE Structured WPANs. VTC Spring 2009
- (65) H Sawada, T Tomatsu, G Ozaki, H Nakase, S Kato, K Sato, H Harada: A Sixty GHz Intra-Car Multi-Media Communications System. VTC Spring 2009
- (66) M A Rahman, Sh Sasaki, S T Islam, T Baykas, C S Sum, J Wang, R Funada, H Harada, S Kato: Analysis and Comparison of Inter-Symbol/Frame Interference in Pulsed DS- and Hybrid DS/TH-UWB Communications. VTC Spring 2009
- (67) C S Sum, R Funada, J Wang, T Baykas, M A Rahman, H Harada, S Kato: Error Performance and Throughput Evaluation of a Multi-Gbps Millimeter-Wave WPAN System in Multipath Environment in the Presence of Adjacent and Co-Channel Interference, VTC Spring 2009
- (68) T Baykas, J Wang, R Funada, M A Rahman, C S Sum, R Kimura, H Harada, S Kato: Preamble Design for Millimeter-Wave Single Carrier WPANs. VTC Spring 2009
- (69) C S Sum, Z Lan, R Funada, J Wang, T Baykas, M A Rahman, H Harada and S Kato: Virtual Time-Slot Allocation Scheme for Throughput Enhancement in a Millimeter-Wave GBPS WPAN Cross Layer Design, ICC 2009
- (70) C S Sum, R Funada, J Wang, T Baykas, M Lei, Y Nishiguchi, R Kimura, Y Shoji, H Harada and S Kato: Adjacent channel interference resistance of a multi-Gbps millimeter-wave WPAN system, PIMRC 2008
- (71) M Hasegawa, T Kawamura, H N Tran, G Miyamoto, Y Murata, H Harada, S Kato: Decentralized optimization of wireless sensor network lifetime based on neural network dynamics, PIMRC 2008
- (72) R Kimura, R Funada, Y Nishiguchi, M Lei, T Baykas, C S Sum, J Wang, M A Rahman, Y Shoji, H Harada, S Kato: Golay sequence aided channel estimation for millimeter-wave WPAN systems, PIMRC 2008
- (73) R Funada, T Baykas, C S Sum, J Wang, M A Rahman, H Harada and S Kato: Novel frame design methodology for multi-gigabit 60GHz WPAN systems, PIMRC 2008
- (74) M A Rahman, S Sasaki, S T Islam, M Asai, H Kikuchi, H Harada and S Kato: On the performance of pulsed DS- and hybrid DS/TH-UWB multiple access systems in frequency selective Nakagami fading, PIMRC 2008
- (75) Ha Nguyen Tran, Mikio Hasegawa, Yoshitoshi Murata, Homare Murakami, Goh Miyamoto, Kentaro Ishizu, Stanislav A. Filin, Hiroshi Harada, Shuzo Kato: A user-centric

- access point selection scheme for cognitive wireless network, PIMRC 2008
- (76) Z Lan, C Pyo, F Kojima, H Harada and S Kato: On-demand device discovery enhancement of IEEE802.15.3 MAC for 60GHz WPAN system. PIMRC 2008
  - (77) S A. Filin, H Harada, M Hasegawa and S Kato: QoS-guaranteed load-balancing dynamic spectrum access algorithm, PIMRC 2008
  - (78) M Hasegawa, T Takeda, T Kuroda, H N Tran, G Miyamoto, Y Murata, H Harada and S Kato: Application of Higher Order Neural Network Dynamics to Distributed Radio Resource Usage Optimization of Cognitive Wireless Networks, ICONIP (1) 2008: 851-858
  - (79) H Sawada, K Yaginuma, M Umehira, K Sato, S Kato and H Harada, "Non-Line-of-Sight Propagation Measurements at 60GHz for Millimeter-waves WPAN," Proceedings of Asia-Pacific Microwave Conference 2008
  - (80) K Sato, S Kato, H Harada, H Nakase, H Sawada, "Measurement of the double directional propagation characteristics for millimeter wave WPAN," Proceedings of Asia-Pacific Microwave Conference 2008
  - (81) M Lei, I Lakkis, CS Sum, T Baykas, J Wang, M A Rahman, R Kimura, R Funada, Y Shoji, H Harada and S Kato: Hardware Impairments on LDPC Coded SC-FDE and OFDM in Multi-Gbps WPAN (IEEE 802.15.3c). WCNC 2008
  - (82) J Wang, Z Lan, H Harada, S Kato "A Feasible Frequency domain Pre-equalization proposal based on cross layer design in 60GHz WPANs", IWCMC 2008, 6-8 August 2008, Crete island Greece
  - (83) M Lei, I Lakkis, H Harada and S Kato: "MMSE-FDE based on Estimated SNR for Single-Carrier Block Transmission (SCBT) in Multi-Gbps WPAN (IEEE 802.15.3c)". ICC 2008
  - (84) M Lei, I Lakkis, T Baykas, C S Sum, H Harada and S Kato: Fixed Point Decoding Performance of Short-Length Structured LDPC Codes for SC-FDE Based 60-GHz WPAN (IEEE 802.15.3c). VTC Spring 2008
  - (85) F. Kojima, C W Pyo, Z. Lan, S Kato and H. Nakase, "Necessary modifications on Conventional IEEE802.15.3B MAC to Achieve IEEE802.15.3c Millimeter Wave WPAN" PIMRC2007, 2007
  - (86) R. Funada, H. Harada, Y. Shoji, R. Kimura, Y. Nishiguchi, M. Lei, C S Choi, F. Kojima, C W Pyo, Z. Lan, I. Lakkis, M. Umehira, S Kato, "A Design of Single Carrier based PHY for IEEE802.15.3c Standard" PIMRC2007, 2007
  - (87) K. Sato, H. Sawada, Y. Shoji, S Kato, "Channel Model for Millimeter Wave WPAN"

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- (88) M. Lei, C S Choi, R. Funada, H. Harada, S Kato, "Throughput Comparison of Multi-Gbps WPAN (IEEE802.15.3c) PHY Layer Designs under Non-Linear 60-GHz Power Amplifier" PIMRC2007, 2007
- (89) M. Hasegawa, H N Tran, G Miyamoto, Y Murata, S Kato, "Distributed Optimization based on Neuro dynamics for Cognitive wireless Clouds" PIMRC2007, 2007
- (90) H Harada, H Murakami, Ke Ishizu, S A. Filin, Y Saito, H N Tran, G Miyamoto, M Hasegawa, Y Murata, S Kato, "A Software Defined Cognitive Radio System: Cognitive Wireless Cloud" GLOBECOM2007, 2007
- (91) M Lei, R. Funada, H Harada and S Kato, "High-data-rate DPC-OF/TDMA based on multi-layer STBC coded MIMO-OFDM scheme," in Proc. of IEEE WCNC 2007, Hong Kong, March 2007
- (92) M Lei, R. Funada, H Harada and S Kato, "Subcarrier-Grouping based Detection Schemes for Multi-Layer STBC coded MIMO-OFDM," in Proc. of IEEE WCNC 2007, Hong Kong, March 2007
- (93) Ming Lei, Hiroshi Harada, and Shuzo Kato: "MIMO-OFDM Scheme Achieving Compromise between Diversity and Multiplexing " Proc. IEEE VTC 2007, April 2007.
- (94) Ming Lei, Hiroshi Harada, and Shuzo Kato: "Reducing Detection Complexity of MIMO-OFDM by using New Nulling Vectors" Proc. IEEE VTC 2007, April 2007.
- (95) Zhou Lan, Fumihide Kojima, Chang Woo Pyo, and Shuzo Kato: "IEEE 802.15.3 MAC Throughput Enhancement to Support Millimeter-Wave PAN" MINT 2007
- (96) Chang-Soon Choi, Yozo Shoji, Ryuhei Funada, Hiroshi Harada, and Shuzo Kato: "Behavioral models of 60GHz-band power amplifier and phase-locked oscillators, and their effects on system performance of multi-gigabit wireless transmission systems" MINT 2007
- (97) Ming Lei, Ryuhei Funada, Hiroshi Harada, Chang-Soon Choi, and Shuzo Kato: "Comparison of OFDM & SC-FDE based Multi-Gigabit PHY Designs for Millimeter-Wave 60-GHz WPAN (IEEE 802.15.3c)" MINT2007
- (98) Yozo Shoji, Chang-Soon Choi, Hirokazu Sawada, Ryuhei Funada, Hiroshi Harada, and Shuzo Kato: "Adaptive null-switching antenna solution for signal fading under desktop environment for mmW WPAN system" MINT 2007
- (99) Chang Woo Pyo, Zhou Lan, Fumihide Kojima, Hiroshi Harada, Shuzo Kato: "Challenges for Throughput Achievement in Millimeter-Wave Wireless Systems" MINT 2007

- (100) K. Iigusa, K. Sato, H. Harada and S. Kato "Design of a slim Electronically Steerable Parasitic Array Radiator Antenna in the 2.4-GHz Band" WPMC 2006 pp.204 – 208, September, 2006
- (101) I. Lakkis, J. Su, S. Kato "A Simple Coherent GMSK Demodulator" PIMRC 2001, pp. A-112 A-114, September, 2001
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## **会議の主催・運営 : 54**

### **1. 無線・標準化関連**

- (1) **Seminar on "IEEE Standardization Promotion Seminar in Japan", Tokyo, Japan, Dec., 2014**
- (2) **International Symposium on "Wireless Sensor Networks 2014", Tokyo, June, 2014**
- (3) **International Seminar on "Wireless Sensor Networks 2014", Sendai, Japan, January, 2014**
- (4) **International Workshop on "Wireless Sensor Networks Standardization and Applications (SENSA'13)" at PIMRC2013, London, Sep. 2013**

- (5) **Global Symposium on Millimeter Wave (GSMM) 2013, Sendai, April, 2013**  
 “Outline of WLAN and WPAN – How to design, Propagation model” by Shu. Kato - **IEEE Standardization Seminars organized by Shu Kato in Tokyo, in 2013**
- (6) “Ultra high speed (60 GHz) communications (802.15.3c, 11.ad)” by Shu. Kato - **IEEE Standardization Seminars organized by Shu Kato in Tokyo, in 2013**
- (7) “WiSUN (4G)” by Hiroshi Harada - **IEEE Standardization Seminars organized by Shu Kato in Tokyo, in 2013**
- (8) “ZigBee” – by Shigeru Fukunaga- **IEEE Standardization Seminars organized by Shu Kato in Tokyo, in 2013**
- (9) WLAN ~ 802.11a,b,n” by Masahiro Morikura- **IEEE Standardization Seminars organized by Shu Kato in Tokyo, in 2013**
- (10)“Advanced WLAN -802.11ac and HEW-SG” by Yasushi Takatori- **IEEE Standardization Seminars organized by Shu Kato in Tokyo, in 2013**
- (11)“802.11ai (first session switching)” by Hiroshi Mano- **IEEE Standardization Seminars organized by Shu Kato in Tokyo, in 2013**
- (12)“802.11 ah/af Status” by Shu Kato- **IEEE Standardization Seminars organized by Shu Kato in Tokyo, in 2013**
- (13)“Wireless sensor networks and applications” by Shu Kato- **IEEE Standardization Seminars organized by Shu Kato in Tokyo, in 2013**
- (14)“VLC / LED Communications” by Shu Kato- **IEEE Standardization Seminars organized by Shu Kato in Tokyo, in 2013**
- (15)“Body Area Networks” by Van Li- **IEEE Standardization Seminars organized by Shu Kato in Tokyo, in 2013**
- (16)“TVWS 802.11af / 19”, by Tuncer Baykas- **IEEE Standardization Seminars organized by Shu Kato in Tokyo, in 2013**
- (17)“TVWS 802.22” by Shigenobu Sasaki- **IEEE Standardization Seminars organized by Shu Kato in Tokyo, in 2013**
- (18) Seminar on “Wireless Localization and Propagation” Sendai Japan, November, 2012
- (19) **International Symposium - Technical University of Dresden and Tohoku University Symposium 2012 on “Ultra High Speed Wireless Communications Technologies”, Sendai, November, 2012**
- (20) Seminar on “Sensor Network Technologies and Applications”, Sendai Japan, June, 2012 (センサネットワーク技術とその応用)

- (21) Seminar on “Short Range Wireless Communications and its Standardization Update”, 2012
- (22) **Seminar on “IEEE Standardization and Smart Grid Standardization Updates”, - to promote IEEE Standardization in Japan, Tokyo, Japan September, 2011**
- (23) Seminar on “Applications of Low Power Wireless Communications”, Sendai, Japan, August, 2011 (小電力無線通信技術の応用)
- (24) International Seminar on “The US National Broadband Plan & Its Ongoing Spectrum Controversies, and Wireless Broadband Standardization”, Sendai Japan, May, 2011
- (25) **Seminar on “Cognitive Radio and Short range Wireless Communications”, Co-sponsored by WINLAB, Rutgers University and RIEC, Tohoku University, Sendai, Japan, March, 2011**
- (26) “The First SRW Technical Committee Conf. on “Short range Wireless Communications and Technology Development Trends”, (co-sponsored by SRW Technical Committee, IEICE), Tokyo, August, 2010 (第1回 SRW 研究会：短距離無線通信と技術開発動向)
- (27) Seminar on “From Basic to Applications of Forward Error Correction”, Sendai, Japan, July, 2010 (誤り制御技術の基礎と応用)
- (28) Seminar on “Wireless Networking and Device Technologies”, Sendai, Japan, March, 2010 **With special Speech on “Expectation on Young University Staff and Graduates from Device Industry” by Mr. Masaya Hijikigawa (Ex. Board Member, Sharp)**
- (29) Seminar on “Global Standardization and Applications”, Sendai, Japan, February, 2010 **With Special Speech on “Expectation on Young University Staff and Graduates from Communications and Equipment Manufacturing Industry” by Mr. Susumu Ohtani (Board member, NEC)**
- (30) Seminar on “Millimeter Wave Device Technologies”, Sendai, Japan, February, 2010 **With Special Speech on “Expectation on Young University Staff and Graduates from Electric and Communications Industry” by Michio Nakanishi (Ex. Board Member, Mitsubishi Electric)**
- (31) **Symposium on Personal Indoor and Mobile Radio Communications (PIMRC) 2009 in Tokyo, Japan, September, 2009 (This attracted more than 800 attendees including 200 Japanese)**
- (32) **Global Symposium on Millimeter Wave (GSMM) 2009** in Sendai, April, 2009
- (33) Seminar on “Easy to Understand Most Advanced Wireless IT: Gigabit Transmission – Millimeter Wave Wireless Communication Technologies and Standardization Trends” By S. Kato and K. Takahashi, Japan, February, 2009 (ギガビット伝送：ミリ



波無線通信技術応用と標準化動向)

- (34) Seminar on “Easy to Understand Most Advanced Wireless IT: Cognitive Radio Technology and Recent Trends in IEEE802.22 / P1900” By S. Sasaki and H. Harada, Japan, January, 2009 (コグニティブ無線技術と IEEE802.22 / P1900 の最新動向)
- (35) Seminar on “Easy to Understand Most Advanced Wireless IT: Standardization Trends of 4<sup>th</sup> Generation Mobile Communications” By K. Sato, Sendai, Japan October, 2008 (第 4 世代移動通信システムの標準化動向)
- (36) Seminar on “Easy to Understand Most Advanced Wireless IT: Next Generation Wireless IT Technology” By K. Tsubouchi, Sendai, Japan September, 2008 (次世代ワイヤレス技術)
- (37) Panel Session on “Millimeter Communications and Technology・Equipment Development Supported by Standardization on going at IEEE” IEICE National Conference, March, 2008 (通信ソサイエティパネルセッション：IEEE で標準化が進むミリ波通信システムと技術・装置開発)
- (38) Symposium on “Personal Indoor and Mobile Radio Communications 2001” in San Diego, USA, 2001 (which was held against 911 attack (just one week after the incident))
- (39) Symposium on “Personal Indoor and Mobile Radio Communications 1993” in Yokohama, Japan, 1993 (which attracted more than 500 attendees for the first time for PIMRC)
- (40) Workshop on “Personal Satellite Communication Systems” sponsored by IEEE COMSOC and the Dallas IEEE Section in Dallas, USA, 1992

## 2. 工学教育関連：14（詳細は後述）

### 学術受賞

- |   |            |
|---|------------|
| (1) Nikkei Electronics Japan Technology Awards 2014 (Radio hose)                      | May 2014   |
| (2) IEEE Standard Association Award (LR-WPANs, LECIM)                                 | Nov. 2013  |
| (3) IEEE Standard Association Award (Wireless LAN in 60 GHz Band)                     | Mar. 2013  |
| (4) IEEE Standard Association Award (Wireless Body Area Networks)                     | July. 2012 |
| (5) IEEE 2010 Satellite Communications Distinguished Service Award                    | Dec. 2010  |
| (6) IEEE Standard Association Award (Millimeter wave)                                 | Aug. 2010  |
| (7) The Best Paper Award of the Telecommunication Standard Sector of ITU (ITU-T) 2008 | May 2008   |
| (8) The Best Paper Award of the IEICE (New Viterbi decoding algorithm)                | May 1986   |

## 特許 : 117

### 1. [米国 特許]

- (1) S. Kato and K. Feher: "Cross Correlated Signal Processing" US Pat. No. 4567602, 1986  
**- invented in 1982 and became Department of Defense (USA) standard in 1998, popularly used in most of cellular phones globally now**
- (2) S. Kubota and S. Kato: "Error Correcting coder/decoder" US Pat. No. 4805174, 1986
- (3) T. Sugiyama, S. Kubota and S. Kato: "Interference Cancellation for CDMA/TDMA Transmission" US Pat. No. 5280537, 1992
- (4) K. Kawazoe, S. Kubota and S. Kato: "Simple Decoder for Super NU FEC" US Patent No. 5327441, 1992
- (5) T. Yagi, S. Kato, and S. Kubota: "Error Control Coding Arrangement for Digital Communications System", US Patent No. 5384809, 1993

### 2. [日本国特許]

- (6) 加藤他 “時分割多元接続装置” 特許登録番号第 1436760, 1980
- (7).加藤他 “時分割多元接続装置” 特許登録番号第 1492833, 1980
- (8).加藤他 “ビタビ復号回路” 特許登録番号第 1506457, 1983
- (9).加藤他 “誤り訂正回路” 特許登録番号第 1521309, 1983
- (10).加藤他 “誤り訂正方式” 特許登録番号第 1569710, 1984
- (11).加藤他 “誤り訂正回路” 特許登録番号第 1569711, 1984
- (12).加藤他 “搬送波再生回路” 特許登録番号第 1590803, 1984
- (13).加藤他 “復調器制御方式” 特許登録番号第 1614078, 1984
- (14).加藤他 “秘話方式” 特許登録番号第 1671364, 1984
- (15) 加藤他 “周波数再送方式” 特許登録番号第 1722792, 1985
- (16) 加藤他 “搬送波再生回路” 特許登録番号第 1734273, 1986
- (17) 加藤他 “デジタル形軟判定復調器” 特許登録番号第 1828848, 1984
- (18) 加藤他 “軟判定方式” 特許登録番号第 1852852, 1984
- (19) 加藤他 “無線通信方式の周波数発生方式” 特許登録番号第 1865967, 1983
- (20) 加藤他 “自動周波数制御装置” 特許登録番号第 1894912, 1989
- (21) 加藤他 “回線設定方法” 特許登録番号第 1905817, 1984

- (22) 加藤他 “回線制御方法” 特許登録番号第 1905824, 1984
- (23) 加藤他 “SS-TDMA衛星通信のバースト同期方式” 特許登録番号第 1916956, 1985
- (24) 加藤他 “オフセット4相位相変調波復調器のクロック制御方法” 特許登録番号第 1919301, 1986
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- (28) 加藤他 “帯域ろ波器” 特許登録番号第 1960610, 1986
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- (35) 加藤他 “ディジタル化直交位相変調器” 特許登録番号第 2109299, 1989
- (36) 加藤他 “並列処理型同期語検出器” 特許登録番号第 2110782, 1987
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- (40) 加藤他 “搬送波再生回路” 特許登録番号第 2530965, 1992
- (41) 加藤他 “マルチトランスポンダ運用TDMAフレーム構成” 特許登録番号第 2545824, 1987
- (42) 加藤他 “ディジタル信号の重畳伝送方式” 特許登録番号第 2554219, 1991
- (43) 加藤他 “送信電力制御装置” 特許登録番号第 2562858, 1992
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- (47) 加藤他 “無線通信用回線設定方式” 特許登録番号第 2624594, 1991
- (48) 加藤他 “複数トランスポンダの送信電力制御方法” 特許登録番号第 2699725, 1991
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- (51) 加藤他 “ $\pi/4$ シフトQPSK変調用マッピング回路” 特許登録番号第2901169, 1993
- (52) 加藤他 “クロック再生回路” 特許登録番号第2940895, 1993
  
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- (64) 加藤他 “周波数制御回路” 特許登録番号第3152358 1991
- (65) 加藤他 “自動初期捕捉時分割多元接続装置” 特許登録番号第3175068 1993
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- (68) 加藤他 “デジタル信号の重畳伝送方式” 特許登録番号第3201444 1993
- (69) 加藤他 “検波回路” 特許登録番号第3214677 1993
- (70) 加藤他 “移動通信の基地局間フレーム同期方法” 特許登録番号第3219114 1993

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- (76) 加藤他 “デジタル化直交位相変調回路” 特許登録番号第3230786 1994
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- (80) 加藤他 “アンテナ装置”, 特許登録番号第4734655号, 2011
- (81) 加藤他 “水平面ビーム走査型アンテナ”, 特許登録番号第4761219号, 2011
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- (88) 加藤他 “通信システム、ならびに、プログラム”, 特許登録番号第5007972号, 2012
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- (92) 加藤他 “電磁結合給電可変アンテナ”, 特許登録番号第5071904号, 2012
- (93) 加藤他 “複数のアンテナを重畳した可変デバイス装荷アンテナ” 特許登録番号第5071903号, 2012
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- (95) 加藤他“通信ネットワークシステム及びネットワーク通信方法、通信管理装置”，特許登録番号第5093671号, 2012
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- (98) 加藤他“無線通信方法及び無線通信システム”，特許登録番号第5252441号, 2013
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- (114) 加藤他“複数の物理層の間での干渉を緩和した無線通信システム”, 特許登録番号第5353088号, 2013
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## その他競争的資金獲得実績

事業名	氏 名	研究期間	補助金総額	研 究 課 題
NHK	加 藤 修 三	2008 - 2009	1,000	ミリ波を用いた映像伝送方式

## <受託研究>

単位: 千円

機関名	氏 名	研究期間	代表又は分担	補助金総額	研 究 課 題
CREST	加 藤 修 三	2008 - 2013	分担	16,000	デペンダブル無線通信の研究
JSPS	加 藤 修 三	2009 - 2009	代表	36,000	先端学術研究人材養成事業: 「超高速屋内ブロードバンド無線通信システム」
JST	加 藤 修 三	2009 - 2011	代表	78,000	携帯端末搭載用ミリ波ビームフォーミングアンテナ
総務省	加 藤 修 三	2010 - 2012	代表	130,000	超高速無線通信非見通し環境での符号化・等価技術

## ＜企業との共同研究＞

単位：千円

機関名	氏 名	研究期間	研究費総額	研 究 課 題
東京ドローイング	加藤 修 三	2011 - 2012	10,000	無線電力伝送方式
Mebius	加藤 修 三	2013 - 2014	55,800	900 MHz 帯無線通信共存条件に関する研究
Mebius	加藤 修 三	2014 - 2015	59,400	900 MHz 帯無線通信システム共存条件に関する研究

## 国内外の学会活動

学外においては、電子情報通信学会の編集理事として、同学会への論文投稿システムの電子化を提案・実現し、投稿費用の 1/2 化を達成した(1995 年)。また、近年は東北大学通研での「小電力無線通信」共同プロジェクト研究の成功を受け、同学会に「短距離無線通信研究会」を提案・新設し、2013 年にはこれを 1 種研究会へ昇格させた。

国際的には、世界 3 大陸を移動して開催される国際会議 PIMRC (Personal Indoor and Mobile Radio Communications) を 1991 年に Co-founder として創設し、論文の質及び発表論文数で世界一(無線分野)の国際会議(参加者数 800 超)へと成長させ、世界の無線通信発展に大きく貢献した。

## (教育および大学運営に関する情報)

### 学内活動

2012 - 2013: 電気通信研究所人間情報部門長を担当。

工学部卒業生のスキル獲得のための条件を明らかにするため、世界 17 ヶ国の "job finding" における学生と産業界のインタフェースを調査し、学内的には過去 7 年間で 14 回のセミナー、シンポジウムを開催し、論理的に思考力の弱い、卒業時にスキルの無い学生輩出の原因と対応策の 1 つを明確にすることができた。

以下には主催した教育関連のセミナー、シンポジウムを示す。

### 工学教育関連主催セミナー、シンポジウム：14

1. International Symposium on "University Globalization 2014 - How to Foster Skilled Students and Young Staff" Tokyo, June, 2014
2. Seminar on "University Globalization - How to Improve English Quality of Japanese Students", Sendai, Japan, June, 2014
3. Seminar on "University Globalization - How to Improve Students and Education quality of Universities", Sendai, Japan, October, 2013



4. Seminar on “University Globalization – Towards Better Quality University Education and Graduates”, Sendai, Japan, August, 2013
5. Seminar on “University Globalization: Actions from Universities” Sendai, Japan, November, 2012
6. Seminar on “University Globalization – How Japanese Education / Employment Systems are Different from Other Countries” Sendai Japan, July, 2012
7. Seminar on “To Foster Globally Competitive Graduates – What University Should Do ”, Sendai, Japan, November, 2011(Globalに Competitive な学生輩出のために II – 大学は何をすべきか)
8. Seminar on “To Foster Globally Competitive Graduates – What Industry Expects”, Sendai Japan, July, 2011 (Globalに Competitive な学生輩出のために I – 産業界の期待)
9. Project management seminar on “Critical path, How to keep the schedule, Qualification of PM Manager” By Shu Kato, Sendai, Japan, March, 2009 (クリチカルパス・スケジュール確保とマネージャーに求められる資質)
10. Project management seminar on “Setting the Goal, Alternatives and Risk Analysis” By Shu Kato, Sendai, Japan February, 2009 (ゴールの設定・オルタナティブとリスク分析)
11. Project management seminar on “7 Step Analysis and PDCA” By Kimio Nonaka (QA Solutions), Sendai, Japan January, 2009 (7 Step 解析と PDCA)
12. Project management seminar on “TQM and Six Sigma” By Kimio Nonaka (QA Solutions), Sendai, Japan December, 2008 (TQM と Six シグマ)
13. Seminar on “Easy to Understand Most Advanced Wireless IT: モバイルブロードバンド技術の最新動向(WiMAX, 次世代 PHS)” By T. Shono and H. Kawai, Japan December, 2008 (第 4 世代移動通信システムの標準化動向)
14. Project management seminar on “Project Management and Your Life Design -Japanese and American Management Difference” By Shu Kato, Sendai, Japan November, 2008 (プロジェクトマネジメントと人生設計)

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##### **1. 分担執筆著書**

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(6) Co-editor on "Advances in Satellite Communications Networking and Applications II", IEEE Journal on Selected Areas in Communications, Vol.10, No. 6, August, 1992,

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