INFOWARE 2011
PANEL 1: Mobile Computation

Challenges in Signal Processing, Global Information and Mobile Communications

INTRODUCTION

Eugen Borcoci,
University Politehnica Bucharest

PANEL

Mobile Computation Challenges in Signal Processing, Global Information and Mobile Communications

Moderator:
Eugen Borcoci, University Politehnica of Bucarest, Romania

Guest Panelists:

Dragana Krstic, University of Nis, Serbia
György Kálmán, ABB AS - Akershus, Norway
Yasunori Iwanami, Nagoya Institute of Technology, Japan
Eugen Borcoci, University Politehnica Bucuresti, Romania

Panel topics

- **Short presentations:**
  - ***Dragana Krstic: Methods for reducing the impact of fading in mobile telecommunications***
  - ***György Kálmán: Bearer or Service Provider: Future role of the Mobile Operator***
  - ***Yasunori Iwanami: Coded MIMO OFDM***
  - ***Eugen Borcoci: Service mobility- case study example***
- **Q/As**

Methods for reducing the impact of fading in mobile telecommunications

Dragana Krstić
Faculty of Electronic Engineering,
University of Niš
Aleksandra Medvedeva 14, 18000 Niš, Serbia
dragana.krstic@elfak.ni.ac.rs

- Wireless channels are simultaneously affected by short-term fading and long-term fading (shadowing).
- In wireless communication systems, various techniques for reducing fading effect and influence of shadow effect are used:

- They are:

- diversity reception,
- dynamic channel allocation and
- power control.

- Upgrading transmission reliability and increasing channel capacity without increasing transmission power and bandwidth is the main goal of diversity techniques

- We are studing wireless communication system following microdiversity to mitigate the effects of fast fading and macrodiversity processing to reduce shadowing effects.
- Fast signal variations are described by several distributions such as Rayleigh, Rice, Nakagami-m, α-μ, Weibull and Hoyt.

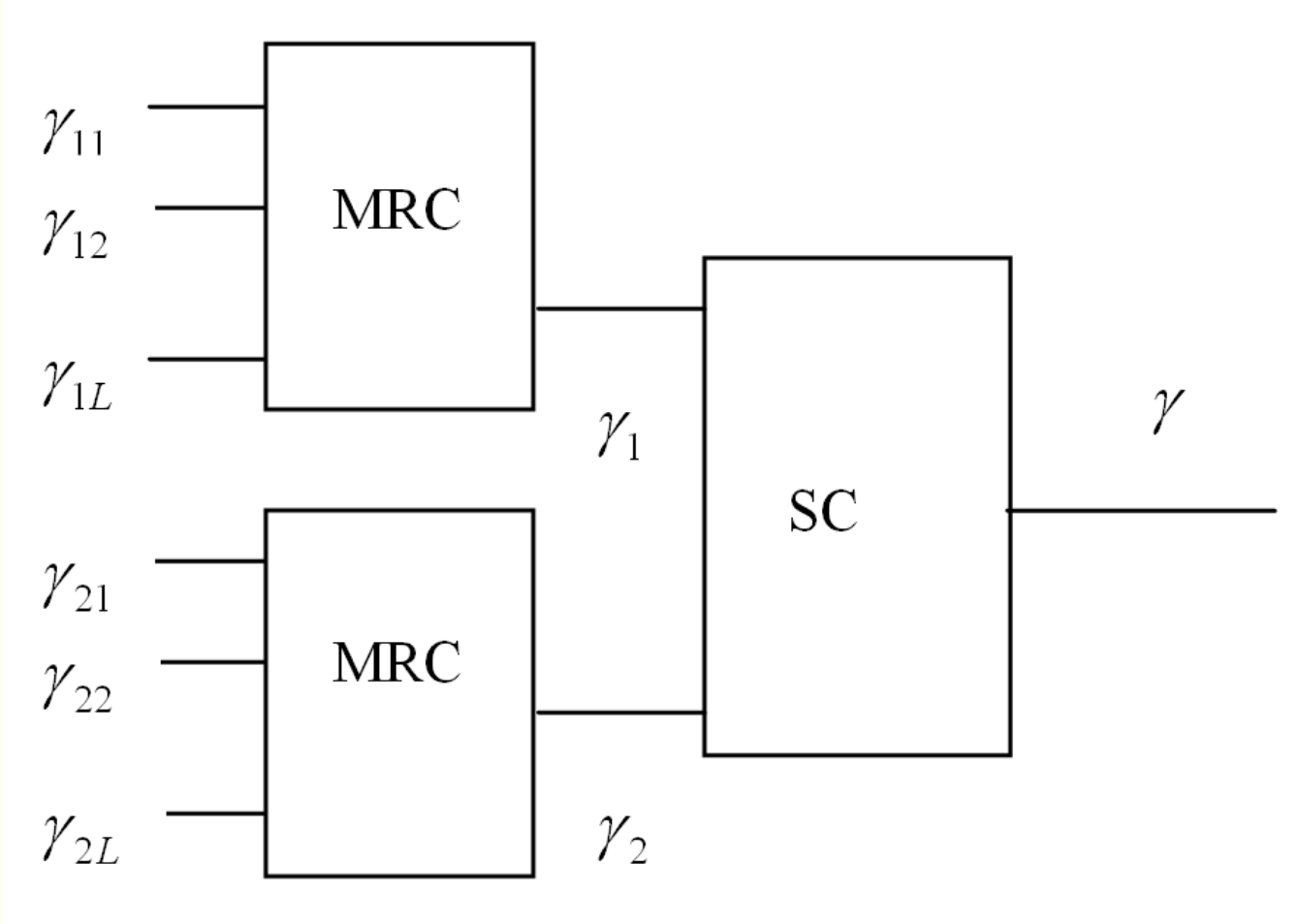
- Considering Nakagami-*m* and Hoyt distribution multipath scattering with relatively large delay-time spreads, with different clusters of reflected waves are described.
- Also the consideration of propagation paths, consisting of one strong direct line-of sight (LoS) signal, and many randomly reflected, usually weaker signals is included trought the Ricean distribution.

- The non-linearity fading effects are included trought consideration of Weibull and α-μ fading distributions.
- If base stations at the macrodiversity level are widely located, due to sufficient spacing between antennas, long-term fading can be moddeled with joint distribution of two statistically independent Gamma distributions.

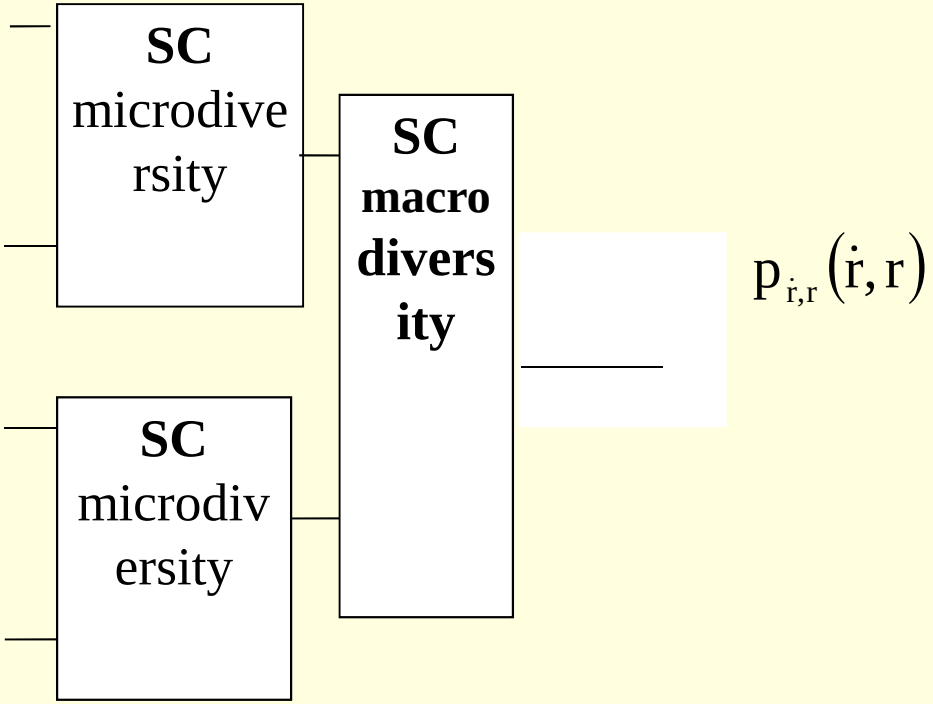
- The contribution of this analysis for dualbranch macrocombiner, is that it has been done for general case of *α-μ* (Generalized Gamma) distribution, which includes as special cases important other distributions such as Weibull and Nakagami-*m* (therefore, the One-Sided Gaussian and Rayleigh are also special cases of it).

- Diversity reception, based on using multiple antennas at the receiver (space diversity, with two or more branches) is a very efficient method used for improving system's quality of service
- Multiple received copies of signal could be combined on various ways.

System model 1



System model 2



György Kálmán, ABB Corporate Research Norway

Bearer or Service Provider
Future role of the Mobile Operator

Status

- Market trends:
  - Smartphones in all segments
  - Content consumption and creation is increasing
  - Lower data traffic charges allow continous online service access
  - Online payments are usual for consumers
  - Two IT companies have taken over the complete control of the phone market

Role of the Provider

- Past: the degradation of the fixed telephony network to a bearer service, mobile provider sells VoIP for circuit switched price
- Present: VoIP over 3G data is available
  - Regulatory and provider-initiated restrictions may be present
  - Continous internet access common
- Future?
  - Bearer (e.g. iTunes) or content provider (e.g. Telenor MobileTV) or trusted party (e.g. BankID)

Trust, payments and user experience

- Key features!
- The trust relationship already exists between the provider and the subscriber
- Payments: telecom standardization is slow, missing the opportunity window.
  - Smartphones can access ”desktop” services with good user experience
  - Do we need more complex hardware? – Paypal, webbank

Questions

- Where is the place of the mobile provider?
- In the payment area, is it worth to use trusted hardware?
- Is NFC the future for payments or missed the window?
- What can the telco industry learn from IT?
- Future of standardization?

Power and productivity
for a better world™

INFOWARE 2011
Panel: Mobile Computation

Challenges in Signal Processing, Global Information and Mobile Communications

Mobility issues
Service Mobility- case study

Eugen Borcoci,
University Politehnica Bucharest

Mobility

Terminal mobility (IP based solutions)

- Technologies: IEEE 802.11x, 15x, 16x, LTE, 3G, …
- Solutions
  - Mobility solved at L2/L3 layer
  - solved at higher layer (e.g SIP supported mobility)
- Within the same L1-L2 technology
  - Horizontal mobility
    - Micro-mobility (L2)
    - Macro-mobility (L2+L3)
    - Handover styles :
      - Hard HO (Break before make)
      - Soft/seamless HO (session preservation)
- Q: what are the major unsolved problems related to terminal mobility in horizontal HO?
- Between different L1-L2 technologies
  - Vertical mobility- more challenging
  - New solution (MIH) Media Independent HO

    Q: How much is currently deployed ?

Mobility

- Service/personal mobility
  - End user (EU) has registered for some services to an SP
  - EU can get registered services
    - conforming his/her user profile and SLA concluded with SP
    - through a residential gateway
  - EU is visiting another (IP) network
  - Service mobility:
    - EU can get the same services with the same user profile
    - Using its portable terminal or a fixed terminal in the visited network
    - Through the visited gateway
  - Q: Can be the service mobility better served by integrated mobility solutions?

- New issue (also in FI-oriented studies) :
  - Identity/location decoupling attempts/solutions
  - What is the impact of this approach on mobility ?

Case study example: Service Mobility

- The system: MediA Ecosystem Deployment Through Ubiquitous Content-Aware Network Environments ALICANTE, 2010-2013, Integrated Project (IP)

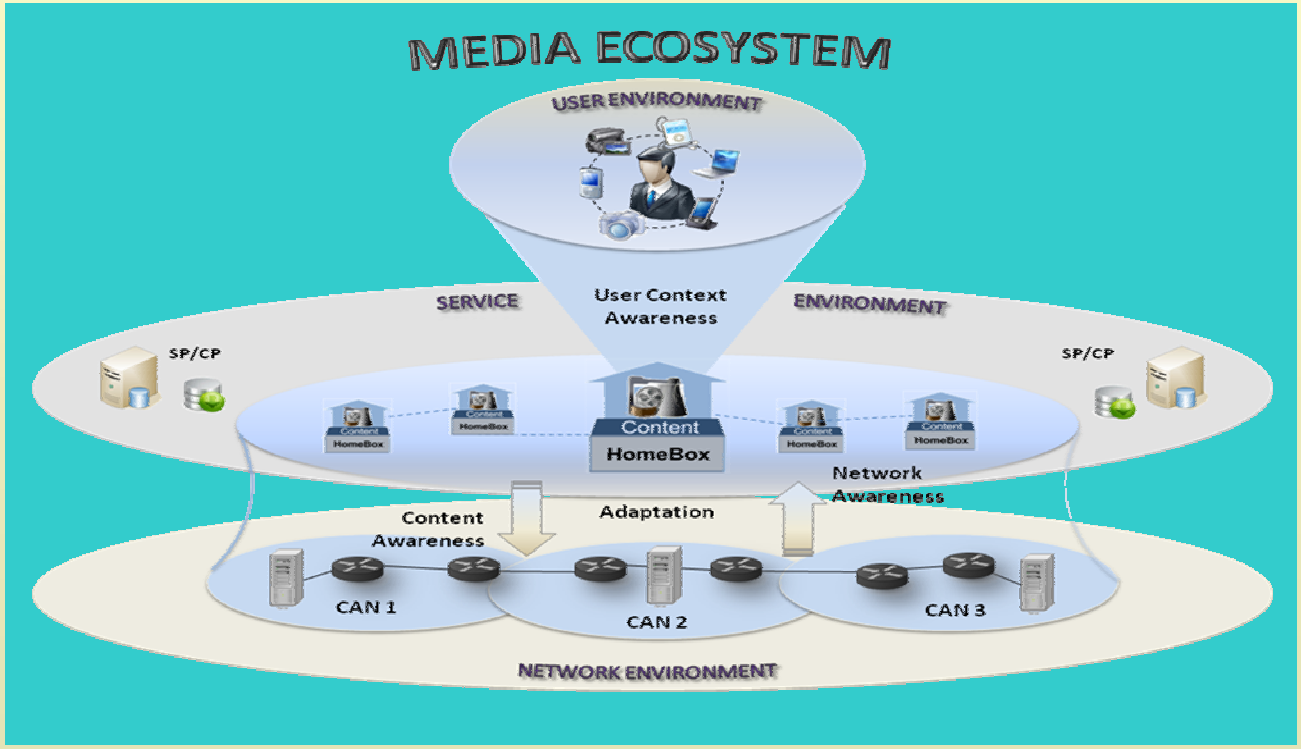
  - Complete system (network + services) - media oriented, multiple domain, …
    - Virtual networking: parallel virtual planes customised for different type of media content (based on CA properties)

  - Business Entities:
    - End Users (EU)
    - Service/Content Providers
    - Virtual network Providers
    - Infrastructure Network providers

  - EU connection – to the core network
    - via Home Boxes (enhanced Residential GWs)

Case study example: Service Mobility

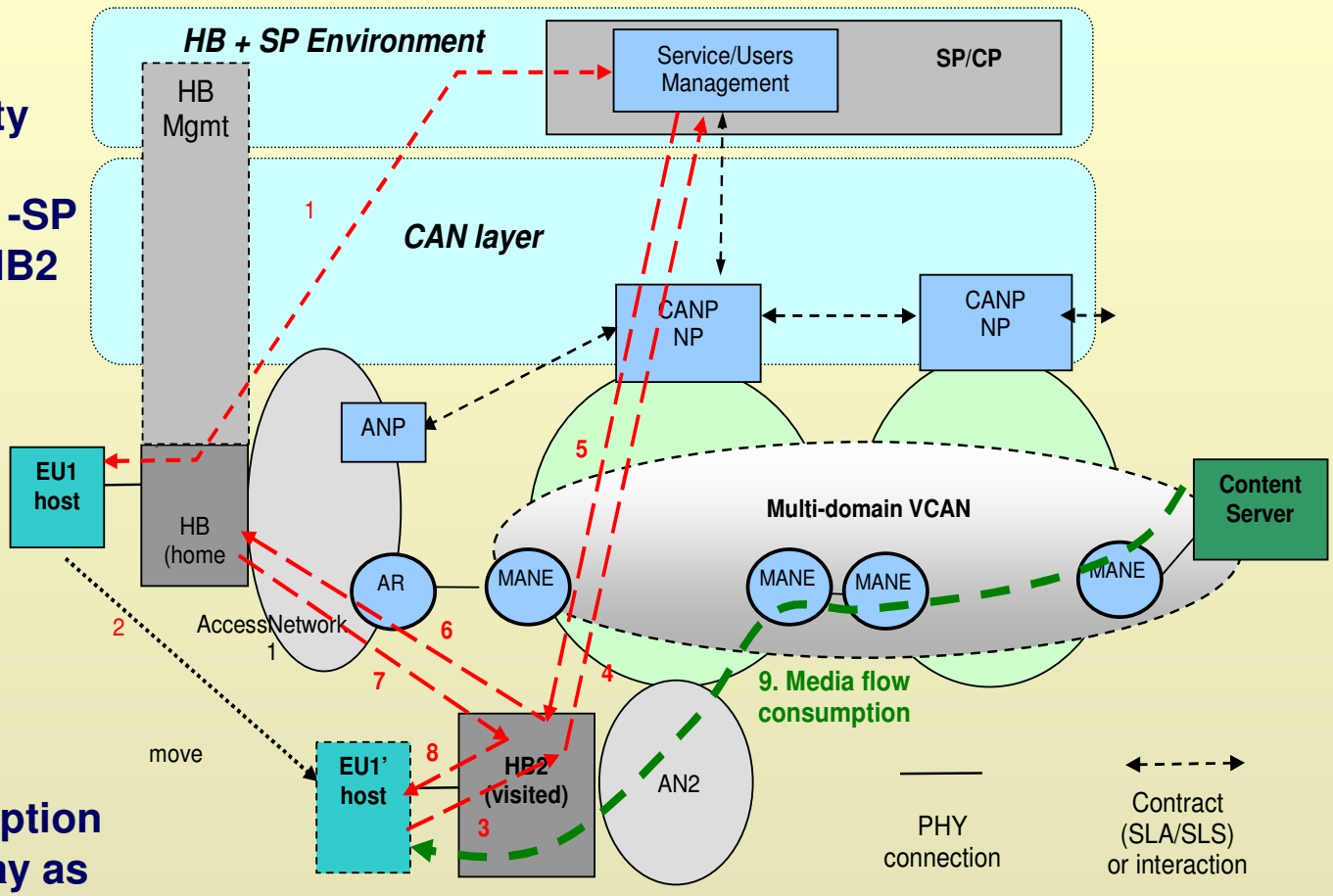
- The system: MediA Ecosystem Deployment Through Ubiquitous Content-Aware Network Environments ALICANTE, 2010-2013, Integrated Project (IP)



Challenges in Signal Processing, Global Information and Mobile Communications: Mobility

- Case study example:
- Service Mobility

1. Initial SLA EU1-SP
2. EU1 move to HB2
3. 3-..8 : service handover



9. Media consumption in the same way as at home

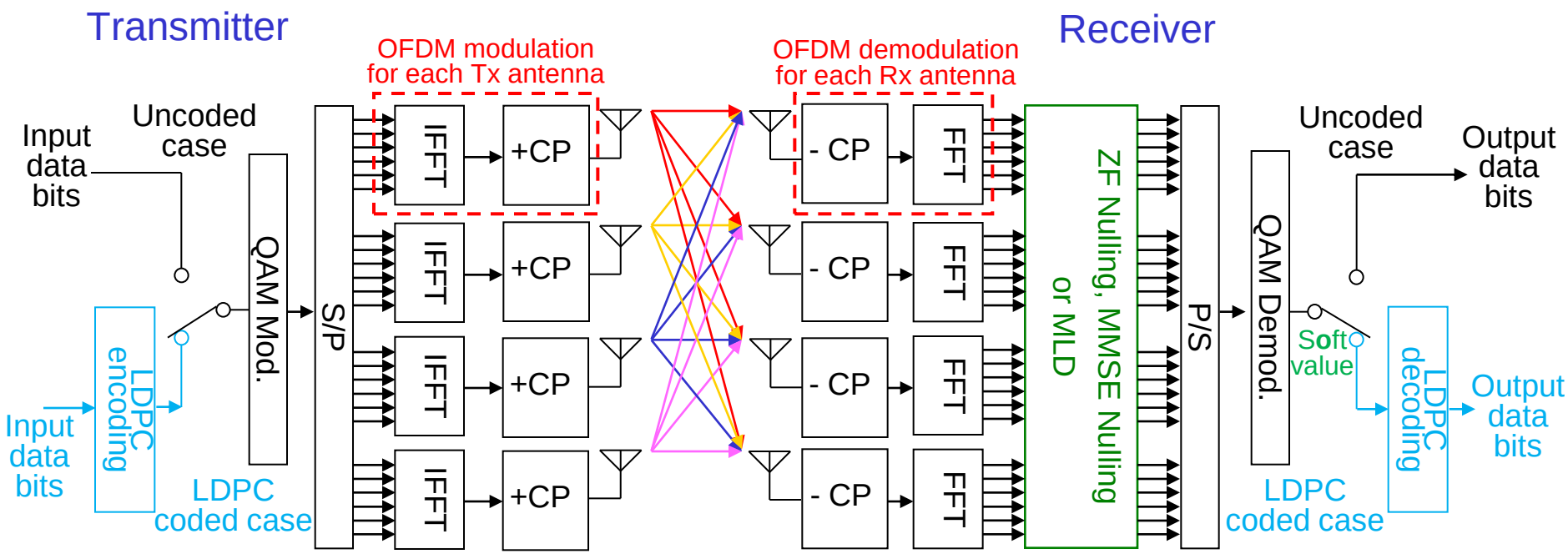
Thank you

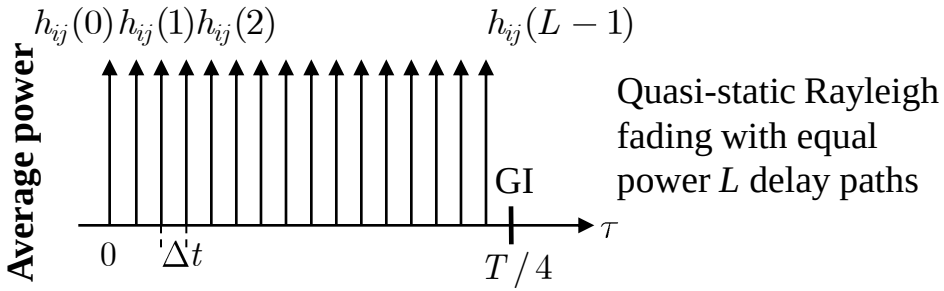
On coded MIMO OFDM

- How to obtain spatial and frequency diversity effects -

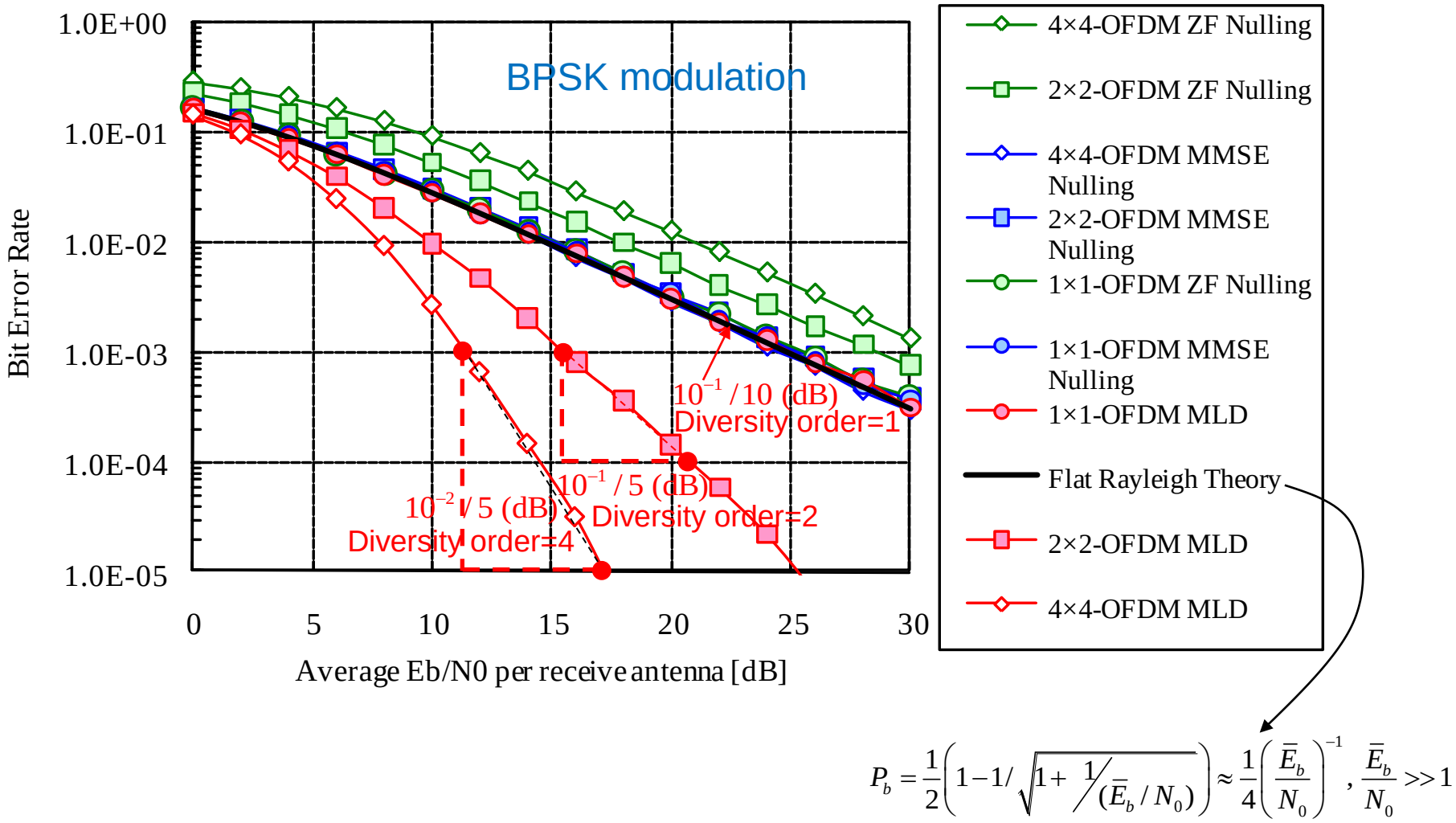
Yasunori Iwanami
Nagoya Institute of Technology
Nagoya, Japan

Transmitter and Receiver configuration of MIMO OFDM



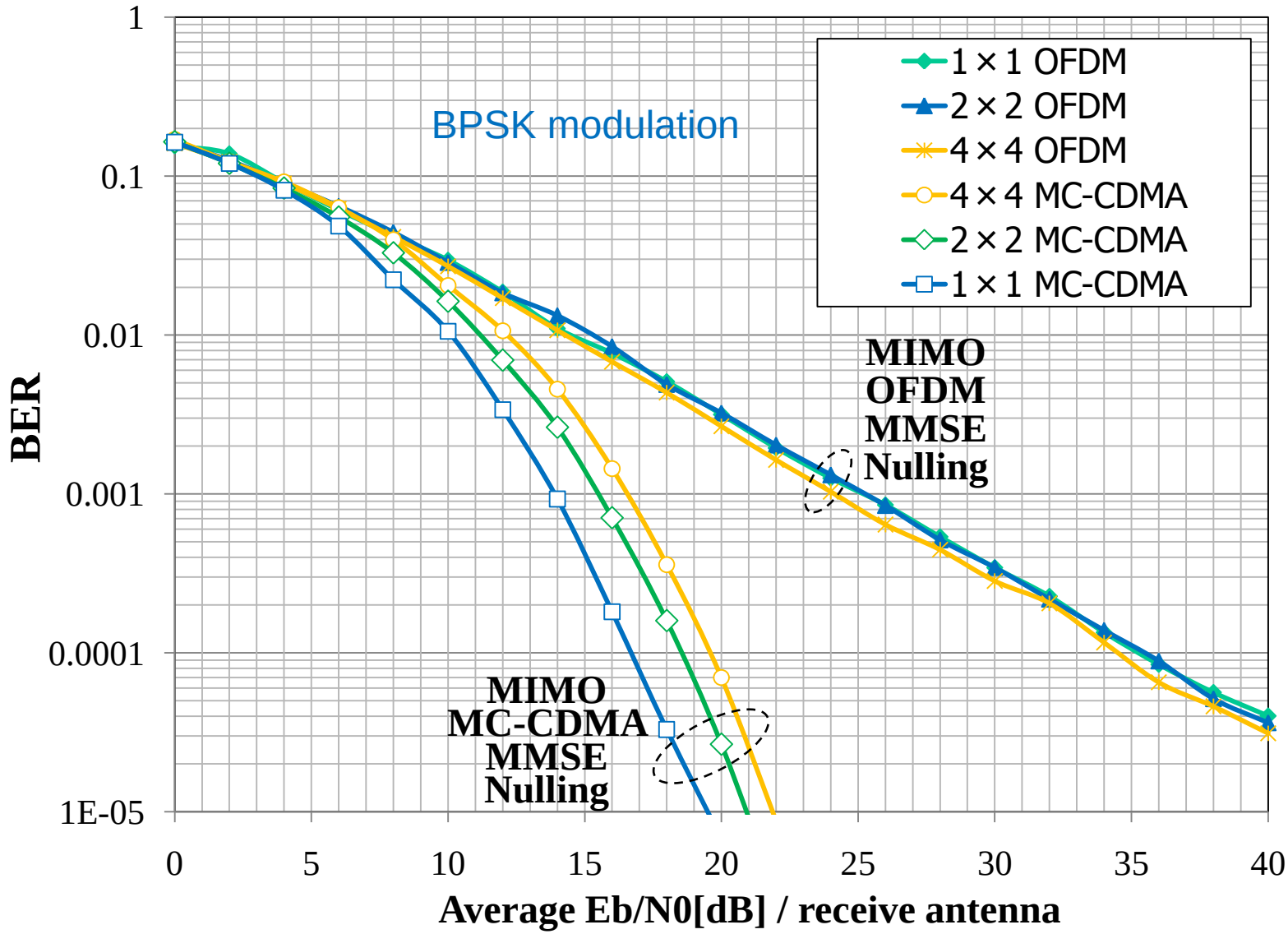


Delay profile between each Tx and Rx antenna

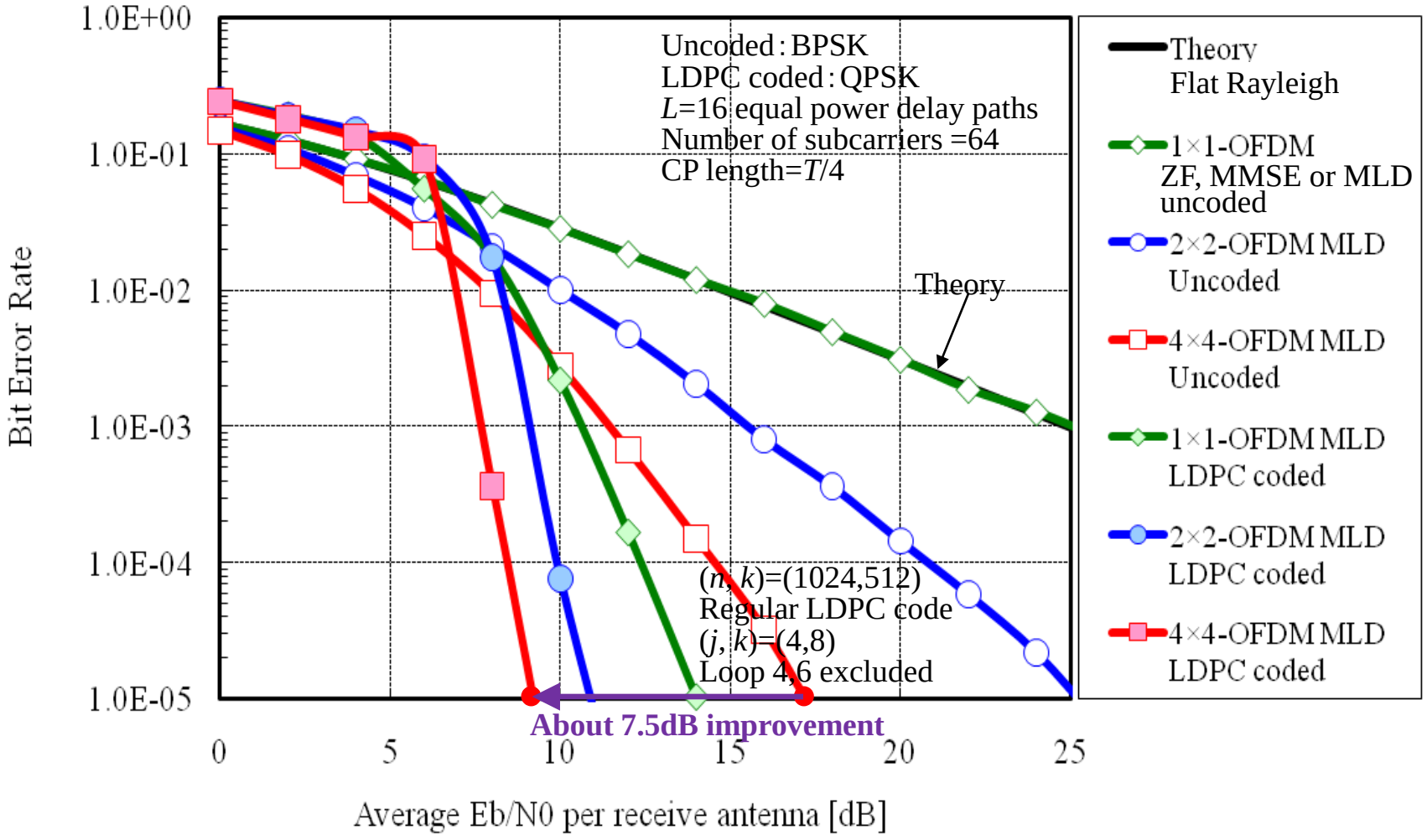


$$P_b = \frac{1}{2}\left(1 - 1/\sqrt{1 + \frac{1}{(\bar{E}_b / N_0)}}\right) \approx \frac{1}{4}\left(\frac{\bar{E}_b}{N_0}\right)^{-1}, \quad \frac{\bar{E}_b}{N_0} >> 1$$

BER characteristics for uncoded MIMO OFDM



BER characteristics for uncoded MIMO MC-CDMA



BER characteristics for LDPC coded MIMO OFDM with MLD

Obtained results

- By using MLD, spatial diversity effect is obtained.
- By using MC-CDMA, frequency diversity effect is obtained.
- By using LDPC code with MLD, spatial and frequency diversity effects with coding gain is obtained.