Submission Title: Requirements on Wireless Backhauling and Fronthauling

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Abstract: Wireless backhauling/fronthauling is one of the potential applications for a standard on 100G. In this contribution the terms wireless backhauling and fronthauling are explained and requirements coming from recent developments in cellular networks are explained.

Purpose: Information of IEEE 802.15 SG 100G

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Requirements on Wireless Backhauling/Fronthauling

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Introduction

• Wireless backhauling/fronthauling is one of the potential applications for a standard on 100G (100 Gbit/s over beam switchable wireless point-to-point links)

• In the following the terms wireless backhauling and fronthauling are explained and requirements coming from recent developments in cellular networks are explained.
(Simplified) Architecture of Cellular Networks (1/3)
(Simplified) Architecture of Cellular Networks (2/3)
(Simplified) Architecture of Cellular Networks (3/3)

In the following slides the LTE architecture is displayed only
Backhaul Links

- A backhaul link is a connection between the base station and a more centralized network element.
Fronthaul Links

- The fronthaul link is the link between the base station and the remote radio head

![Diagram showing fronthaul and backhaul links]
Increase of Traffic in Cellular Networks

• In the near future an enormous increase of mobile data volumes are predicted, e. g. traffic increase by a factor of 25 by 2016 [5]
• Network operators have to increase the capacity of the networks
• Since the income does not increase in the same way the cost per bit has to be reduced at the same time
• More cost efficient and easy-to-deploy solutions are required.
Technical Trends in Cellular Networks to increase the Capacity

- A couple of new techniques are developed in cellular networks
- Some of them require additional backhaul or fronthaul links
- In the following slides three examples are discussed
  - Deployment of Small Cells
  - Cooperative multi-point transmission (CoMP)
  - Centralized radio access networks (C-RAN)
Massive Deployment of Small Cells

- If cell sizes are getting smaller the capacity per area increases.
- Deployment of small cells with coverage areas similar to those of WLAN APs require a large number of backhaul links.
- Possibly aggregated high-capacity backhaul links will be used (e.g. backhauling all small cells form a large multi-storey building).
Cooperative Multipoint Transmission

- Tight coordination of transmitted signals by several base stations will reduce interference
- By reducing interference capacity can be increased
- Each base station requires information about transmission of all other base stations received within a cell
- Requirement for high backhaul capacity currently restricts deployment of CoMP

Backhauling between base stations
C-RAN

- C-RAN centralises the base band part of all base stations at a centralized place
- Coordination among base stations becomes easier
- C-RAN could be an enabler for more intensive use of CoMP
- Additional fronthaul links will be required.
Trends in Backhauling Technologies

• There is a trend that IP/Ethernet gets more importance as a transport technology for backhauling in mobile networks [1,2,3]

• Currently fiber is used as the physical medium

• Sometimes microwave links are used as an alternative, if fiber is not available.

• Backhaul Networking flexibility is critical to successful deployments [1]

• This situation offers opportunities for the application of wireless 100 Gbps links.
Specific Requirements on Fronthauling Links [4]

- Fronthauling links use the CPRI (Common Public Radio Interface)
- This protocol is extremely latency sensitive
- Signal synchronisation has to be transferred transparently.
- These requirements may be a challenge for wireless 100 Gbps links.
References

[1] Alcatel Lucent Application Note; A New Era of Mobile Backhaul; http://resources.alcatel-lucent.com/?cid=163517


Technical Expectations Document (TED)

All information contained in this presentation is meant to be included in the technical expectations document 15-11-0745-10-0thz-thz-ig-technical-expectations-document-ted.doc.