


Converged fibre-wireless access networks for next generation mobile backhaul enabling CoMP

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WELCOME TO PRESENTERS

- **Next Generation Mobile Backhaul - Considerations**
- **Fibre-Wireless Integration - Promising Candidates**
 - BS/RRU Configurations
 - Performance Analysis
 - Energy Consumption
 - Experimental Results
- **Summary**

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Next Generation Mobile Backhaul

Convergence of mobile backhaul and optical networks

Low-cost and environment friendly BS/RRU configuration

Optimized network resource allocation and minimized interference

Supporting Coordinated Multi-Point (CoMP) for LTE-advanced

Centralized backhaul architecture

Converged fibre-wireless access networks

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Fibre-Wireless Integration

Conventional Mobile backhaul architecture

Central Office (CO) Switching Centre

5) Network INTERFACE

4) Baseband INTERFACE

3) DSP INTERFACE

2) Radio Frequency INTERFACE

1) AIR INTERFACE


1. RF combining, RF filtering;
2. Power amplification, frequency up/down conversion;
3. D/A & A/D Conversion, digital pre-distortion, crest factor reduction, control and management;
4. Baseband processing, signal modulation/ demodulation
5. O-E/E-O conversion

How to realize centralization ???

Remove both baseband and RF processing from BS; enable centralized control and management.

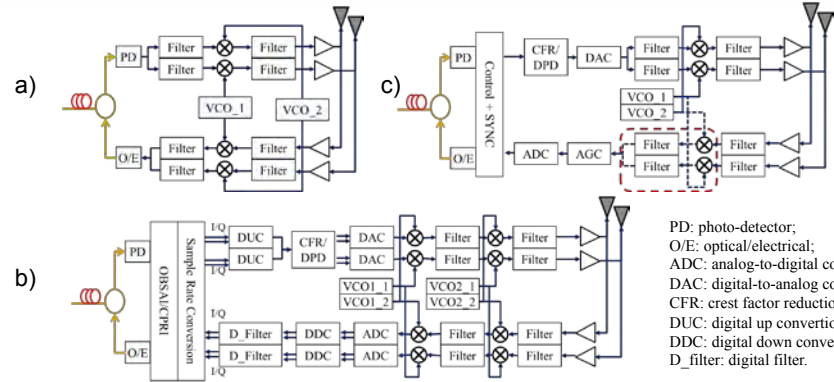
Sampled data is transported digitally over fibre; both RF and IF digitization are possible solutions.

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BS/RRU Configurations



PD: photo-detector;
O/E: optical/electrical;
ADC: analog-to-digital converter;
DAC: digital-to-analog converter;
CFR: crest factor reduction;
DUC: digital up conversion;
DDC: digital down conversion;
D_filter: digital filter.


a) Analog RF-over-fiber
Simplest configuration, potentially low-cost, lack of local control and management capability, WDM/SCM are needed for multiple RF signals and becomes complex.

b) Digitized IF-over-fiber
Keep the RF processing functions of the current BS, transmit digitized IF samples to CO, use additional processing implementing OBSAI/CPRI interface.

c) Digitized RF-over-fiber
Direct digitization of RF signals using bandpass sampling ADC, reduce the complexity of RF processing, be able to use OBSAI/CPRI interface.

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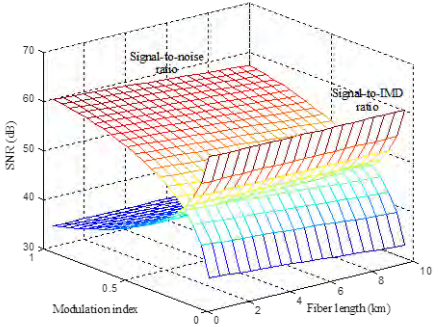
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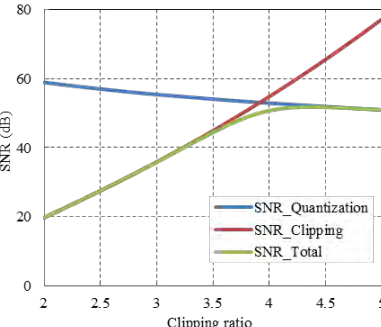
Performance Analysis – SNDR

Analog RoF



Linearity plays an important role
Interplay of IMD and Receiver noise
Limited modulation depth and distance

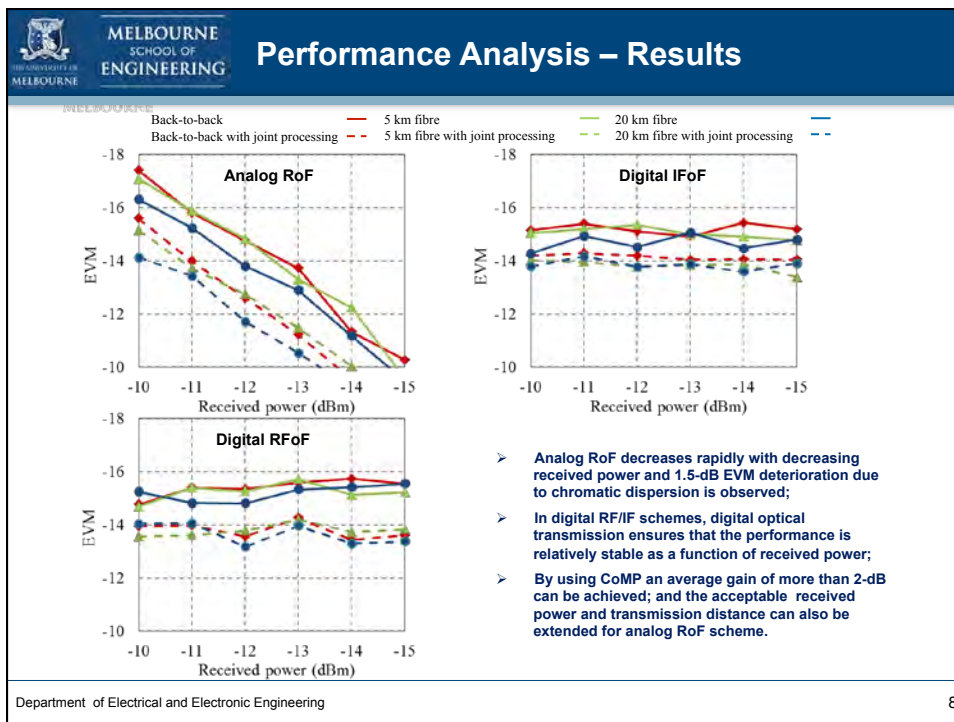
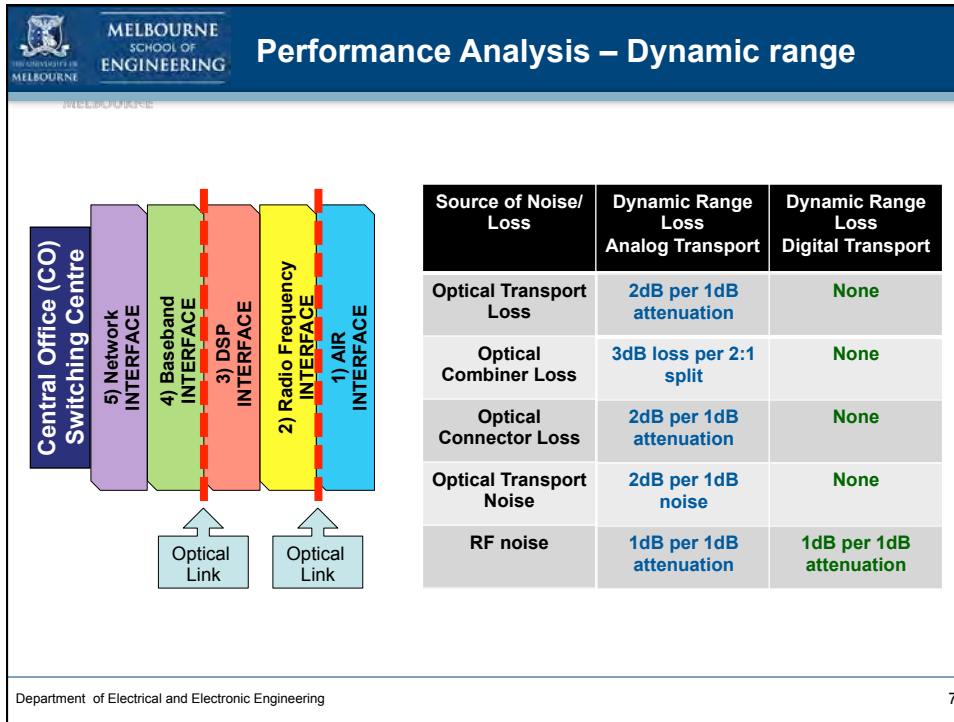
Digital RoF

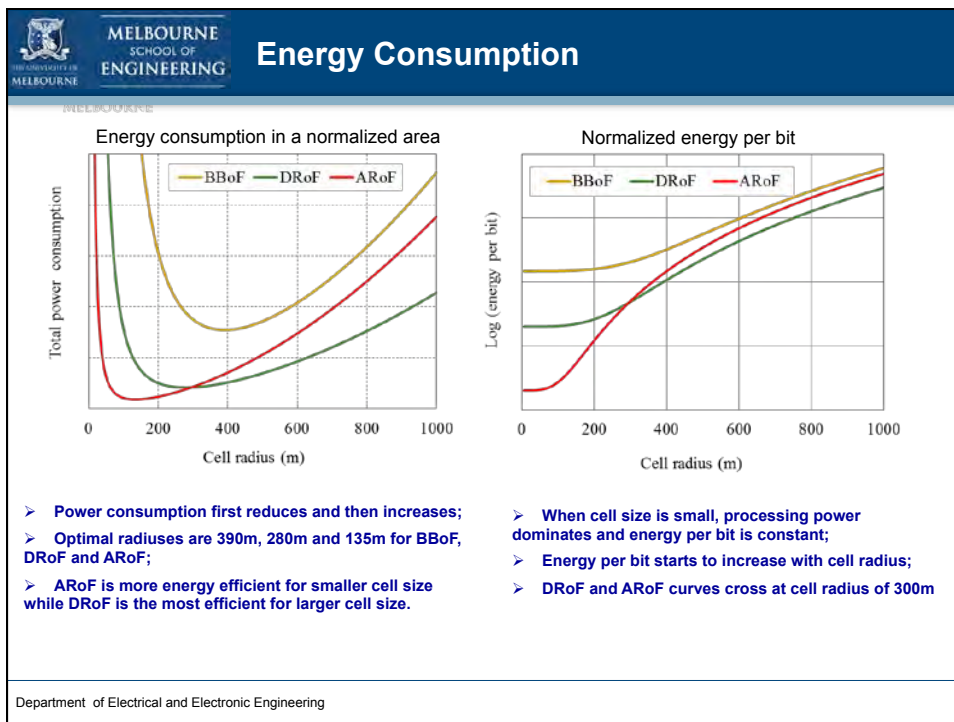
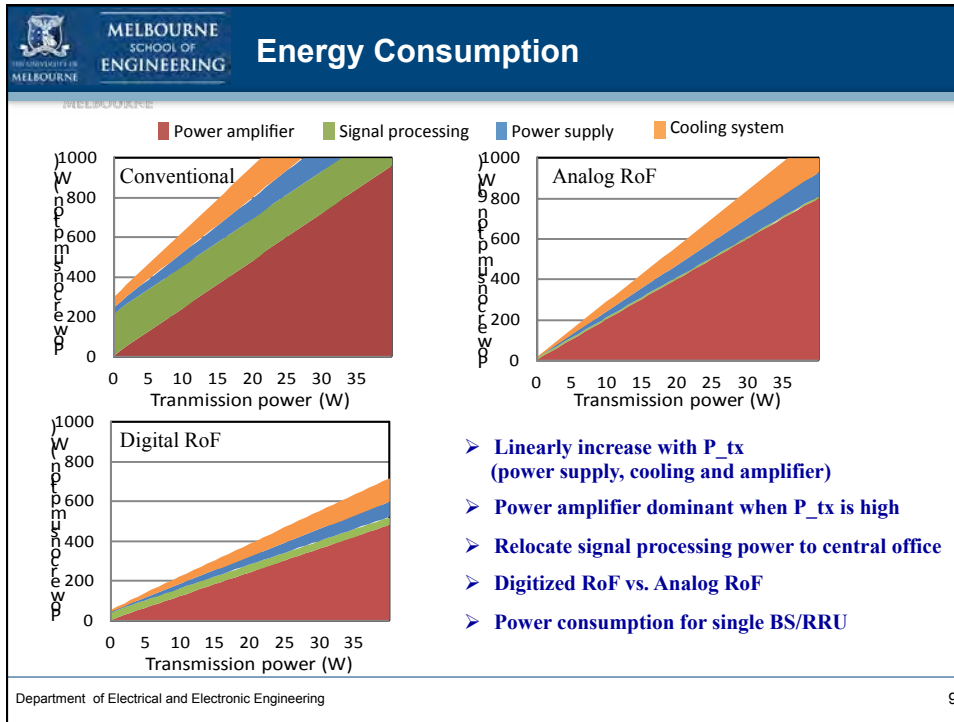



Better performance nonlinear and noise tolerance
Clipping noise and quantization noise
Additional aliasing noise in direct RF sampling

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Summary

❖ **Propose a converged mobile backhaul and optical access networks to maximize the infrastructure sharing and support next generation mobile network using CoMP;**

❖ **Fibre-wireless integration technologies are introduced as promising candidate to realized a centralized architecture and reduce the cost/energy of BSs**

❖ **Both analog and digitized RoF technologies are discussed as possible solutions, in terms of base station configuration, system performance and energy efficiency;**

❖ **Experimental demonstration of the proposed scheme is presented with more than 2-dB SNR improvement.**

Analog RoF	Digital RoF
Simple base station architecture Good for short links (fibre and wireless) Limited SFDR Not easy to standardize	Mature technology Compatible with optical backhaul Standardized interface Complex base station

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