

Strand 1: Radio Network Architecture and Technologies (5GPP)

Visible Light Communications (VLC) - HW Communications Ltd, Lancaster, UK

Dr. Sharadha Kariyawasam, Shahid Ayub (sharadha@hwcomms.com)

Economic Impact

- Spectrum is unlicensed spectrum aiming to achieve Gb/s data rates.
- Illumination as well as data communication from the same LED light bulb.
- Harmonising with legacy and modern infrastructure.
- Complementary technology in heterogeneous networks, providing an alternative connectivity solution for reducing RF spectrum congestion.

Societal Impact

- Low EMR and no interference with RF infrastructure and supports green ICT.
- Can be used in EMI sensitive environments (Hospitals, schools, power stations etc)
- Does not penetrate through walls and ceiling. Enhances the information assurance and deterrent for eavesdropping. (Homes, offices, defence org.).

Innovative architectures for 5G

Indoor networks based on Gb/s wireless optics (Visible Light)

This may consist of many small cells connected through optical fibre, LAN or RF backhaul. Communications within a small cell based on full duplex short range Visible Light Communication.

- Commercially we are already working with a vision and mission for this realisation for the 5G infrastructure. Require further investment, collaboration and R&D.



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Innovative architectures for 5G

VLC has no interference with RF networks, Low EMR, Ubiquitous coverage with scalability, Use of Massive MIMO. Require mobility and handover. *In VLC node, the conical beam is limited to a specific coverage areas. If a user is moving away from the VLC coverage area, user needs to maintain continuous connectivity to a next VLC node.*

- There should be a solution for handover among VLC nodes.

Low cost Ubiquitous Access:

- Building construction industry suggested us that VLC should be proposed for inclusion in future building regulations. *Lighting is considered as a utility for future building designs therefore seamless infrastructure will be available.*
- Use of LED bulbs with two-in-one functionality to provide illumination and data communication which will be readily available as low cost COTS product in future.

- There is a request made by commercial stakeholders to integrate VLC into new building infrastructure and include this technology into building construction regulations.

Flexible backhaul options:

- **Optical Fibre** - Optical fibre connectivity and data delivery Gbp/s speeds have not been maintained continuously through to end users due to lack of suitable high speed end user solution.
- **Power line Comms (PLC)**- Integration of existing power line with VLC is an attractive solution
- **CAT-5/6 Ethernet** - This will provide sufficient backhaul speeds up to 1Gb/s for VLC systems
- **60GHz (Beam forming)** - mmWave beam forming is another candidate for high speed backhaul for VLC.

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We have following in-house VLC capabilities:

- Full duplex high speed VLC communications and networking demonstrator platform.
- Integrating VLC to Powerline (Homeplug) and SMART GRID.
- VLC demonstrator for Air-to Ground communication for disaster relief use.
- VLC demonstrator across the air/water interface for underwater communications.

