IEEE P802.11
Wireless LANs

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| Resolution of CID39 in CC against D2.1 |
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Abstract

This contribution proposes revised working text and a graph for the mixed mode operation of the LC PHY to be embedded in 32.3.5 in D3.0. It has been prepared to assist the resolution of CID 39 in doc. 11-22-0949-01.

Rev.0: initial text for discussion

Rev.1: revision after disussion

**Motivation**

It is well known [1] that the transparent transmission of 802.11 waveforms over the LC channel can be used to build a hybrid RF-LC link. Ideally, the capacity in both media is added and adapted instantaneously to the time-varying channel.

E.g. if the LOS in the LC link is broken, the RF link can further be used. A second idea is to use additional LC optical antennas to increase area capacity with “personal optical cells” and offload data from RF into the optical spectrum.

If instead of LC optical antennas, further RF antennas would be used, the crosstalk between them has to be removed. This requires a higher complexity of MIMO processing at the PHY layer. The use of LC is orthogonal in the spectrum and causes no interference to the RF link. Thus, the MIMO channel matrix can be partitioned as, where the off-diagonal sub-matrices are zero and, in most cases, is diagonal. Compared to a full N*TX* x N*TX*

channel matrix, the complexity for the MIMO processing, particularly for the precoding at TX and equalization at RX, can be reduced.

**Proposed new text** and figure to be embedded after P19 L7

The LC PHY may be used for hybrid RF-LC operation underneath single STAs with multiple transmit chains and multiple receive chains. Therefore, antenna ports 1 to N*RF* shall be connected to RF antennas and antenna ports N*RF*+1 to N*TX*-N*RF* antennas to LC optical antennas, as shown in Figure 32-X (Hybrid RF-LC operation).



**Figure 32-X—Hybrid RF-LC operation**

If hybrid RF-LC operation is used, the same mapping from 5 GHz or 6GHz band to LC IF channels shall be used as defined in 32.3.4 (Channel numbering) on the LC optical antennas. Moreover, RF antennas shall be used on the corresponding 5 GHz or 6 GHz RF channels. The use of LC optical antennas is transparent for the waveform and not necessarily known at each STA. Thus the same signaling over the air shall be used.

References

[1] A. Zubow, et al., "Hy-Fi: Aggregation of LiFi and WiFi using MIMO in IEEE 802.11," in 2021 IEEE 22nd International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM), Pisa, Italy, 2021 pp. 100-108.

[2] https://www2.tkn.tu-berlin.de/bib/zubow2021hyfi/zubow2021hyfi.pdf