**IEEE P802.15**

**Wireless Personal Area Networks**

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| Source | Guixia Kang, Ningbo Zhang Voice: +86 10 61198115  BUPT, China E-mail: nbzhang@bupt.edu.cn |
| Re: | IEEE 802.15.4t |
| Abstract | Analysis on Hybrid Multiple Access of IEEE 802.15.4t |
| Purpose | To address the coexistence capability of IEEE 802.15.4t to satisfy requirements of large number of accesses, NOMA is introduced [1]. |
| Notice | This document has been prepared to assist IEEE P802.15 Multiple Access. |
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# Scope

In NOMA, SIC receiver is required to cancel inter-user interferences at STA[2]. SIC receiver requires diverse arrived power to distinguish multiplexing users. To obtain the diverse arrived power, a power back-off scheme is proposed for uplink NOMA transmission.

This document addresses the hybrid multiple access of the IEEE 802.15.4t PHY.

# References

1. IEEE 11-15-1386-00, “Hybrid Multiple Access in 802.11ax,” 2015.
2. Z. Ding, Z. Yang, P. Fan, and H. V. Poor, “On the performance of nonorthogonalmultipleaccessin5Gsystemswithrandomlydeployedusers,” IEEE Signal Process. Lett., vol. 21, no. 12, pp. 1501–1505, Dec. 2014.

# Hybrid Random Access

## Access mode selection



* + Received SNR at STA
  + where  is the variance of noise and  is the received power at SAT.



## NOMA Random Access

* Step 1: Peer discovery: This step is to discover neighbor paired STAs.
* Step 2: NOMA group establishment: Select a group center and allocate the power back-off index.
* Step 3: Channel detection: The group center sends preamble to detect the channel on behalf of NOMA group.
* Step 4: Detection response: AP sends back the detection response to NOMA group STAs.
* Step 5: Power back-off: NOMA group STA power back-off to guarantee diverse received power at AP.
* Step6: SIC reception and ACK: AP performs SIC receiver to cancel multi-STA interferences and sends back ACK/NACK.

## Multiple User Decoding at STA

* Two Users are multiplexed
  + The first User: baseline arrived power
  + The second User:  dB lower than near user
* AP decoding
  + For the first user, AP direct decodes the message since the interference from far user is neglected.
  + For the second user, AP cancels the first user’s message and then decodes the second user’s message.

## Power Control for Uplink NOMA

* The transmit power of the *i*-th User in a NOMA set is:

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where  is the maximum transmit power,  is the target arrived power and  is the path loss including distance-dependent path loss and lognormal shadowing.  is the assigned resource unit.

* the first user



* the second user

