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(12) United States Patent

Merlin et al.

(54) METHODS AND APPARATUS FOR MULTIPLE USER UPLINK RESPONSE RULES

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(56) References Cited

U.S. PATENT DOCUMENTS

2011/0268094 A1*	11/2011	Gong H04L 1/1685
2012/0082147 A1*	4/2012	370/338 Liu H04L 5/001
2012/0207036 A1*	8/2012	370/338 Ong H04W 74/0816
		370/252
(Continued)		

International Search Report and Written Opinion—PCT/US2016/029574—ISA/EPO—dated Jul. 13, 2016.

(Continued)

OTHER PUBLICATIONS

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(57) ABSTRACT

Methods and apparatus for multiple user uplink are provided. In one aspect, method for wireless communication includes receiving a message comprising a request for two or more stations to concurrently transmit an uplink transmission. The method further includes determining a status of a medium at a station based on a clear channel assessment (CCA) or a network allocation vector (NAV). The method further includes selectively transmitting the uplink transmission based on the indication of the status of the medium.

22 Claims, 7 Drawing Sheets

