UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VOLKSWAGEN GROUP OF AMERICA, INC. Petitioner

v.

NEO WIRELESS, LLC Patent Owner

Case IPR2022-01539 U.S. Patent No. 10,965,512

DECLARATION OF DR. PAUL MIN IN SUPPORT OF PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO. 10,965,512

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	B.	OFDM/OFDMA cellular systems implemented pilot signals for channel estimation and data recovery	.22	
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	D.	Cellular systems routinely implemented beamforming for transmitti downlink signals	•	
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	D.	Li	.39	
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XII.		UND 1: THE COMBINATION OF KIM AND TONG TEACHES	.42	

A.	A PO	SA would have been motivated to combine Kim and Tong42
	1.	A POSA would have been motivated to implement beamforming in Kim's base station, as taught by Tong42
	2.	A POSA would have been motivated to use Kim's pilots for channel estimation, and to recover the transmitted data, as taught by Tong
B.	Indep	pendent Claim 1
	1.	[1.P]: An orthogonal frequency division multiple access (OFDMA)-compatible base station that uses subcarriers in a frequency domain and time slots in a time domain, the OFDMA-compatible base station comprising:
	2.	[1.1] a plurality of antennas; and a transmitter operably coupled to the plurality of antennas;
	3.	[1.2] the transmitter configured to: insert first pilots of a first type onto a first plurality of subcarriers, wherein the first pilots are cell-specific pilots; and
	4.	[1.3] insert data and second pilots of a second type onto a second plurality of subcarriers;
	5.	[1.4] wherein at least some subcarriers of the first plurality of subcarriers or the second plurality of subcarriers are beam-formed; and
	6.	[1.5] the plurality of antennas configured to transmit the first plurality of subcarriers and the second plurality of subcarriers in at least one of the time slots;
	7.	[1.6] wherein the second type is different than the first type and wherein the first pilots do not interfere with the second pilots.66
C.	Independent Claim 867	
	1.	[8.P] A method performed by an orthogonal frequency division multiple access (OFDMA)-compatible base station that uses subcarriers in a frequency domain and time slots in a time domain, the method comprising:
	2.	[8.1] inserting, by the OFDMA-compatible base station, first pilots of a first type onto a first plurality of subcarriers, wherein the first pilots are cell-specific pilots;

	3.	[8.2] inserting, by the OFDMA-compatible base station, data and second pilots of a second type onto a second plurality of subcarriers;		
	4.	[8.3] wherein at least some subcarriers of the first plurality of subcarriers or the second plurality of subcarriers are beam-formed; and		
	5.	[8.4] transmitting, by the OFDMA-compatible base station, the first plurality of subcarriers and the second plurality of subcarriers in at least one of the time slots using a plurality of antennas;		
	6.	[8.5] wherein the second type is different than the first type and wherein the first pilots do not interfere with the second pilots.68		
D.	Indep	Independent Claim 15		
	1.	[15.P] An orthogonal frequency division multiple access (OFDMA)-compatible mobile station that uses subcarriers in a frequency domain and time slots in a time domain, the OFDMA-compatible mobile station comprising:		
	2.	[15.1] at least one antenna; and a receiver; and69		
	3.	[15.2] the at least one antenna and the receiver are configured to: receive first pilots of a first type on a first plurality of subcarriers, wherein the first pilots are cell-specific pilots; and 		
	4.	[15.3] receive second pilots of a second type and data on a second plurality of subcarriers, wherein the first plurality of subcarriers and the second plurality of subcarriers are received in at least one of the time slots;		
	5.	[15.4] wherein at least some subcarriers of the first plurality of subcarriers or the second plurality of subcarriers are beam-formed; and		
	6.	[15.5] the receiver is further configured to: recover the data using channel estimates from at least the second pilots; and72		
	7.	[15.6] recover cell-specific information using the cell-specific pilots;		

	8.	[15.7] wherein the second type is different than the first type and wherein the first pilots do not interfere with the second pilots	5	
E.	Indep	Independent Claim 23		
	1.	[23.P] A method performed by an orthogonal frequency division multiple access (OFDMA)-compatible mobile station that uses subcarriers in a frequency domain and time slots in a time domain, the method comprising:	6	
	2.	[23.1] receiving first pilots of a first type on a first plurality of subcarriers, wherein the first pilots are cell-specific pilots;76	5	
	3.	[23.2] receiving second pilots of a second type and data on a second plurality of subcarriers, wherein the first plurality of subcarriers and the second plurality of subcarriers are received in at least one of the time slots;	6	
	4.	[23.3] wherein at least some subcarriers of the first plurality of subcarriers or the second plurality of subcarriers are beam-formed;	6	
	5.	[23.4] recovering the data using channel estimates from at least the second pilots; and		
	6.	[23.5] recovering cell-specific information using the cell-specific pilots;	7	
	7.	[23.6] wherein the second type is different than the first type and wherein the first pilots do not interfere with the second pilots	7	
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F.				
G.		ns 3, 10, 17, and 25		
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