



(12) **United States Patent**  
**Tsai et al.**

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(54) **METHOD AND APPARATUS FOR MULTIPLE TRANSMIT/RECEIVE POINT (TRP) OPERATIONS**

(58) **Field of Classification Search**  
CPC ... H04L 5/0048; H04L 5/0023; H04L 5/0035; H04L 5/0053; H04W 72/042  
See application file for complete search history.

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(56) **References Cited**

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**Chie-Ming Chou,** Hsinchu (TW)

**U.S. PATENT DOCUMENTS**

(73) Assignee: **FG Innovation Company Limited,**  
Tuen Mun (HK)

2017/0288743	A1*	10/2017	Nam	.....	H04B 7/024
2018/0302889	A1	10/2018	Guo et al.		
2019/0230545	A1*	7/2019	Liou	.....	H04W 24/10
2020/0015200	A1*	1/2020	Vilaipornsawai	...	H04W 72/042
2020/0045700	A1*	2/2020	Sun	.....	H04W 72/04
2020/0178280	A1*	6/2020	Guan	.....	H04B 7/0626
2020/0221487	A1*	9/2020	Lee	.....	H04W 72/12

(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 88 days.

**FOREIGN PATENT DOCUMENTS**

(21) Appl. No.: **16/673,151**

CN	108092754	A	5/2018
CN	108199819	A	6/2018
WO	2018128376	A1	7/2018

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\* cited by examiner

(65) **Prior Publication Data**

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**Related U.S. Application Data**

(60) Provisional application No. 62/754,706, filed on Nov. 2, 2018.

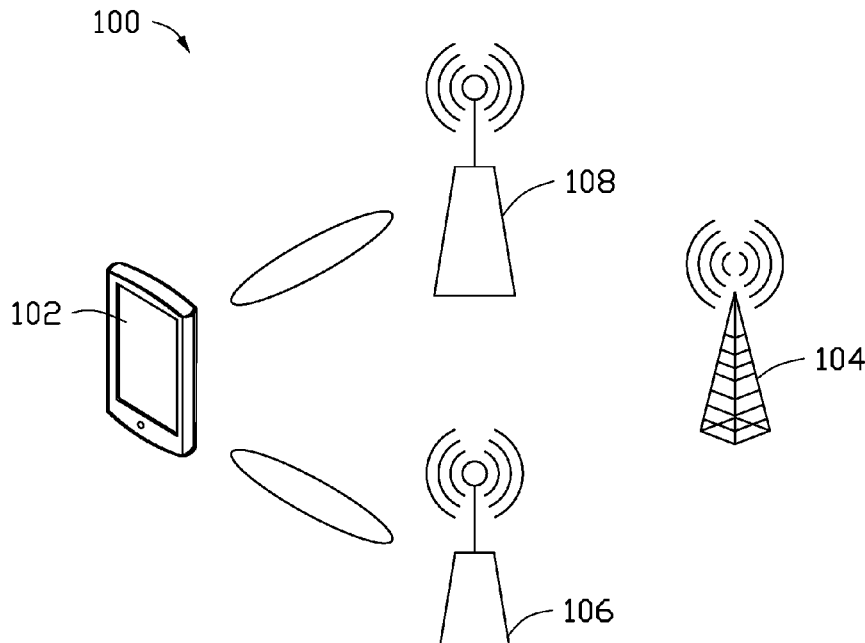
(57) **ABSTRACT**

(51) **Int. Cl.**  
**H04L 1/00** (2006.01)  
**H04W 72/04** (2009.01)  
**H04L 5/00** (2006.01)

A method includes receiving, by a User Equipment (UE), Transmission Configuration Indicator (TCI) state data in a Physical Downlink Control Channel (PDCCH) determining multiple Physical Downlink Shared Channels (PDSCHs), where the TCI state data is associated with multiple Demodulation Reference Signal (DMRS) port groups, and obtaining, by the UE, multiple Quasi Co-Location (QCL) assumptions for receiving the PDSCHs based on the DMRS port groups associated with the TCI state data.

(52) **U.S. Cl.**  
CPC ..... **H04L 5/0048** (2013.01); **H04L 5/0023** (2013.01); **H04L 5/0035** (2013.01); **H04L 5/0053** (2013.01); **H04W 72/042** (2013.01)

**12 Claims, 6 Drawing Sheets**



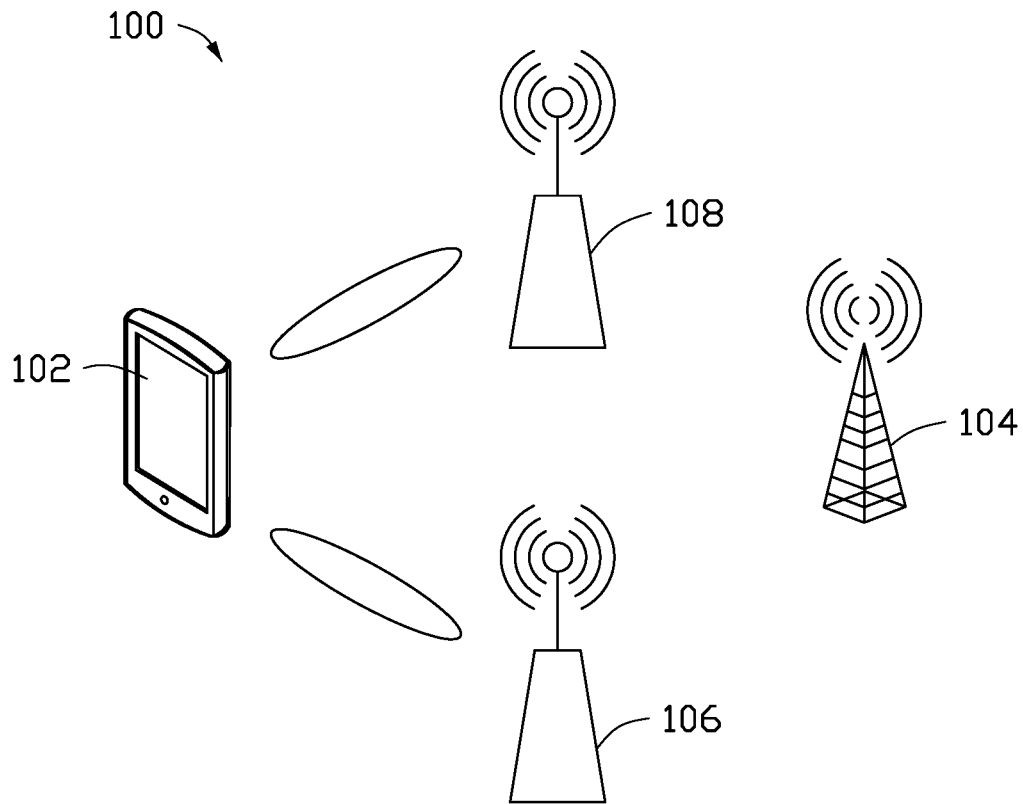


FIG. 1

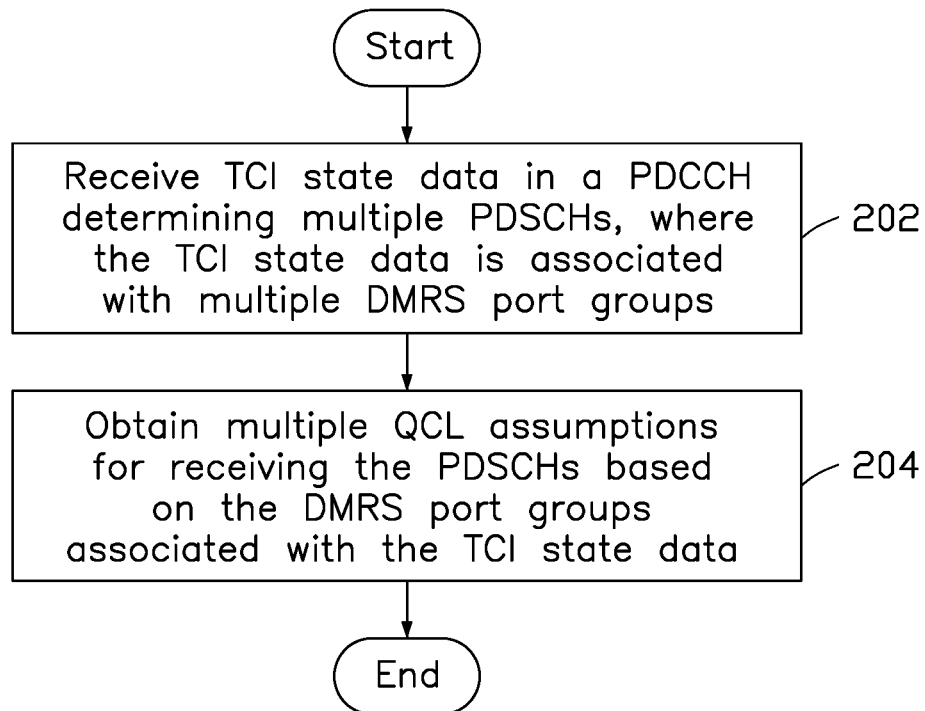


FIG. 2

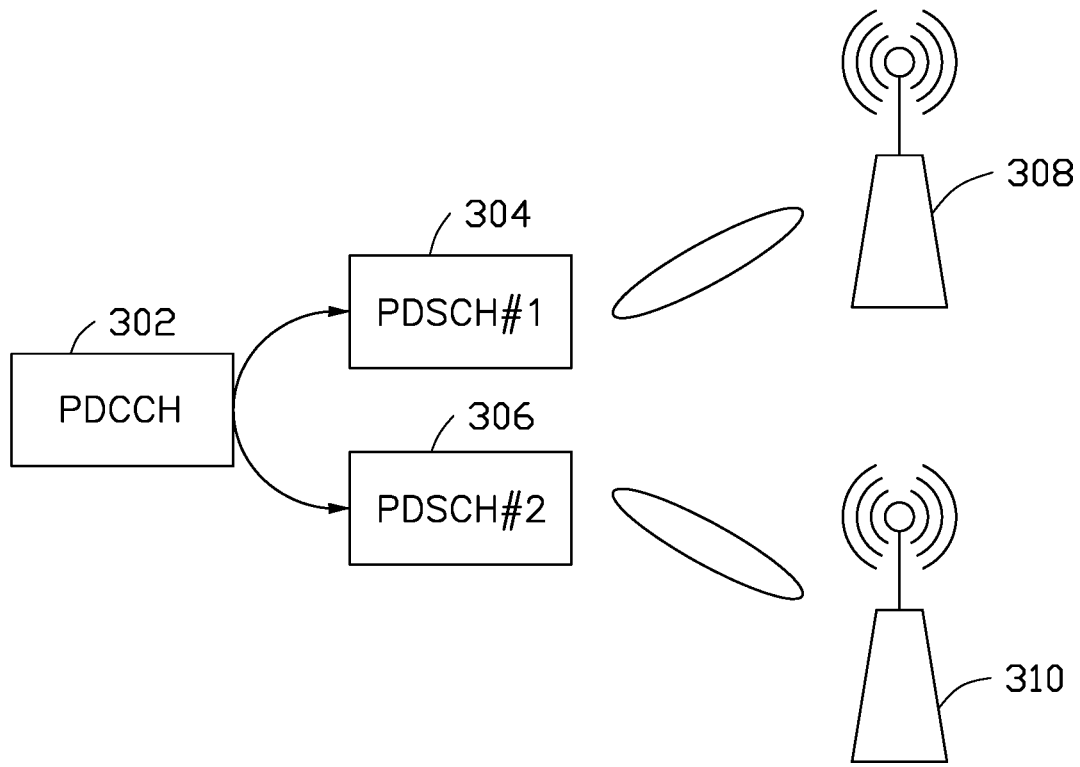


FIG. 3

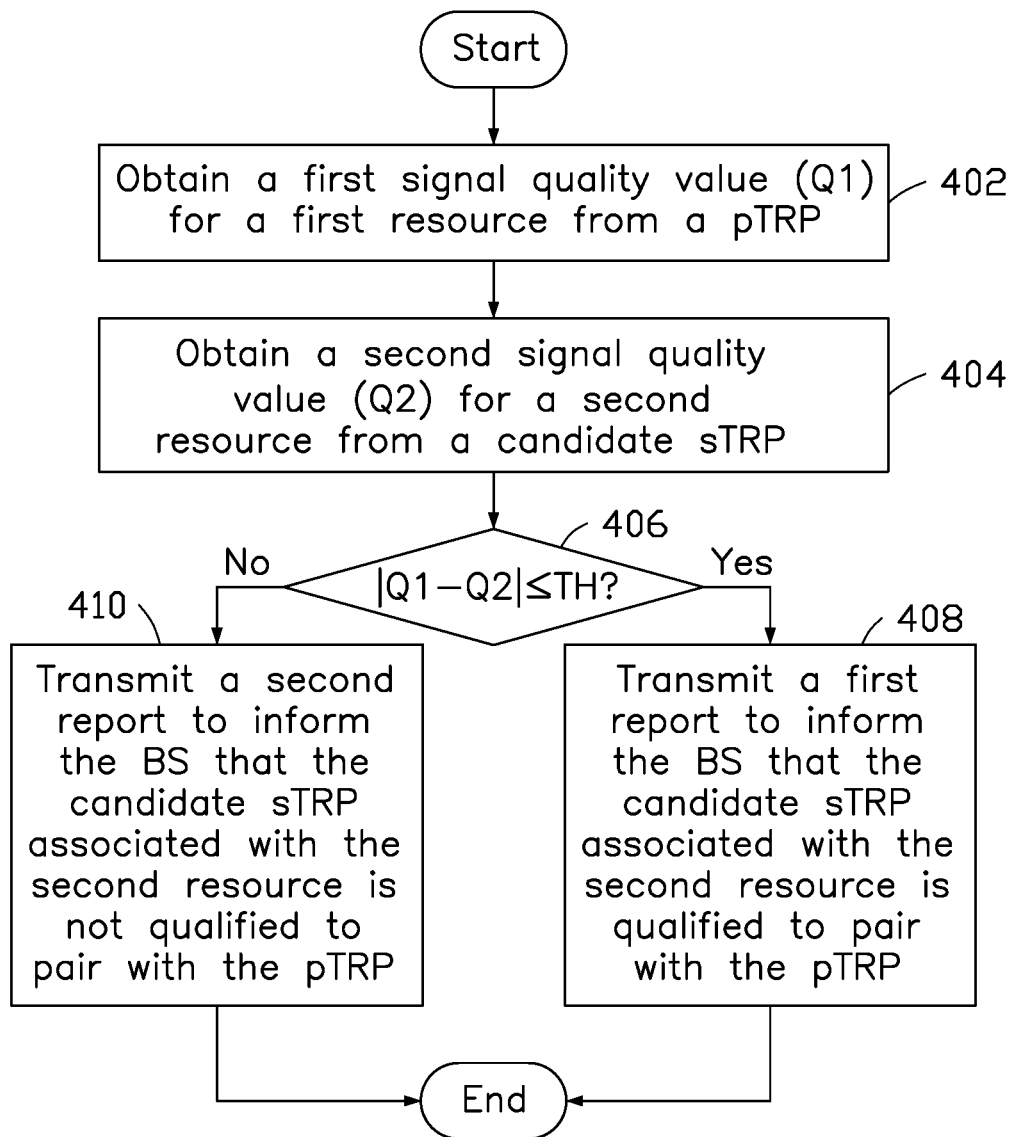


FIG. 4

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