



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

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(54) **CODEBOOK SUBSET RESTRICTION SIGNALING**

(52) **U.S. Cl.**  
CPC ..... **H04B 7/0469** (2013.01); **H03M 7/3068** (2013.01); **H04B 7/0456** (2013.01);  
(Continued)

(71) Applicant: **Telefonaktiebolaget LM Ericsson (publ)**, Stockholm (SE)

(58) **Field of Classification Search**  
CPC .. H04B 7/0469; H04B 7/0478; H04B 7/0639; H03M 7/3068; H03M 7/3082  
See application file for complete search history.

(72) Inventors: **Sebastian Faxér**, Järfälla (SE); **Mattias Frenne**, Uppsala (SE); **Simon Järmyr**, Skarpnäck (SE); **George Jöngren**, Sundbyberg (SE); **Niklas Wernersson**, Solna (SE)

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(73) Assignee: **Telefonaktiebolaget LM Ericsson (publ)**, Stockholm (SE)

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(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 224 days.

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Primary Examiner — Brian D Nguyen

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(74) *Attorney, Agent, or Firm* — Coats & Bennett, PLLC

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(57) **ABSTRACT**

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A network node (10) signals to a wireless communication device (14) which precoders in a codebook are restricted from being used. The network node (10) in this regard generates codebook subset restriction signaling that, for each of one or more groups of precoders, jointly restricts the precoders in the group by restricting a certain component (e.g., a certain beam precoder) that the precoders in the group have in common. This signaling may be for instance rank-agnostic signaling that jointly restricts the precoders in a group without regard to the precoders' transmission rank. Regardless, the network node (10) sends the generated signaling to the wireless communication device (14).

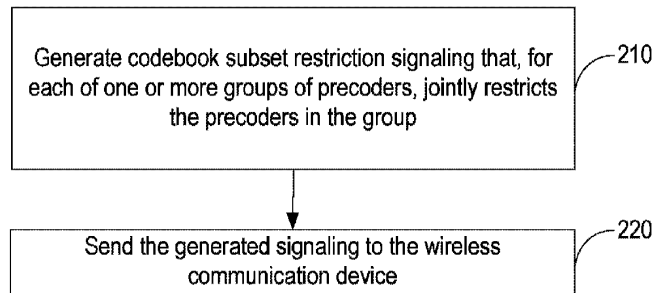
**Related U.S. Application Data**

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**28 Claims, 14 Drawing Sheets**

(51) **Int. Cl.**  
**H04B 7/04** (2017.01)  
**H03M 7/30** (2006.01)

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(51)	<b>Int. Cl.</b> <i>H04B 7/0456</i> (2017.01) <i>H04B 7/06</i> (2006.01)	2014/0198868 A1* 7/2014 Yang ..... H04B 7/0478 375/267 2014/0205031 A1* 7/2014 Nammi ..... H04B 7/0413 375/267
(52)	<b>U.S. Cl.</b> CPC ..... <i>H04B 7/0478</i> (2013.01); <i>H04B 7/0658</i> (2013.01); <i>H03M 7/3082</i> (2013.01); <i>H04B</i> <i>7/0639</i> (2013.01)	2014/0254508 A1* 9/2014 Krishnamurthy .... H04B 7/0417 370/329 2014/0269577 A1* 9/2014 Hammarwall ..... H04B 7/0634 370/329 2016/0233939 A9* 8/2016 Hammarwall ..... H04B 7/0634

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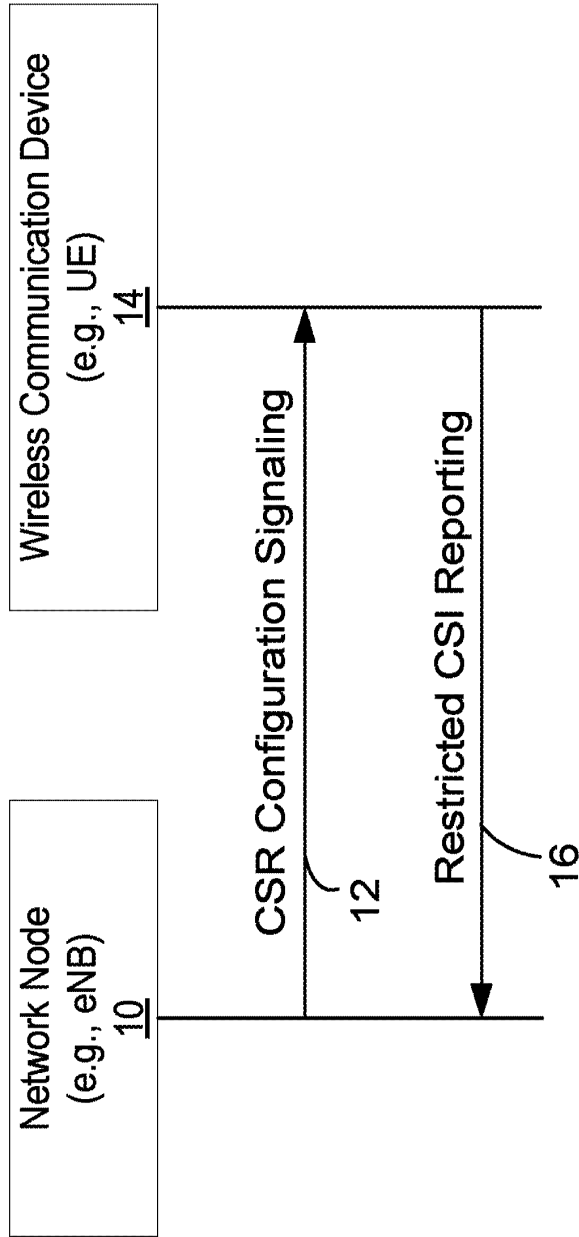
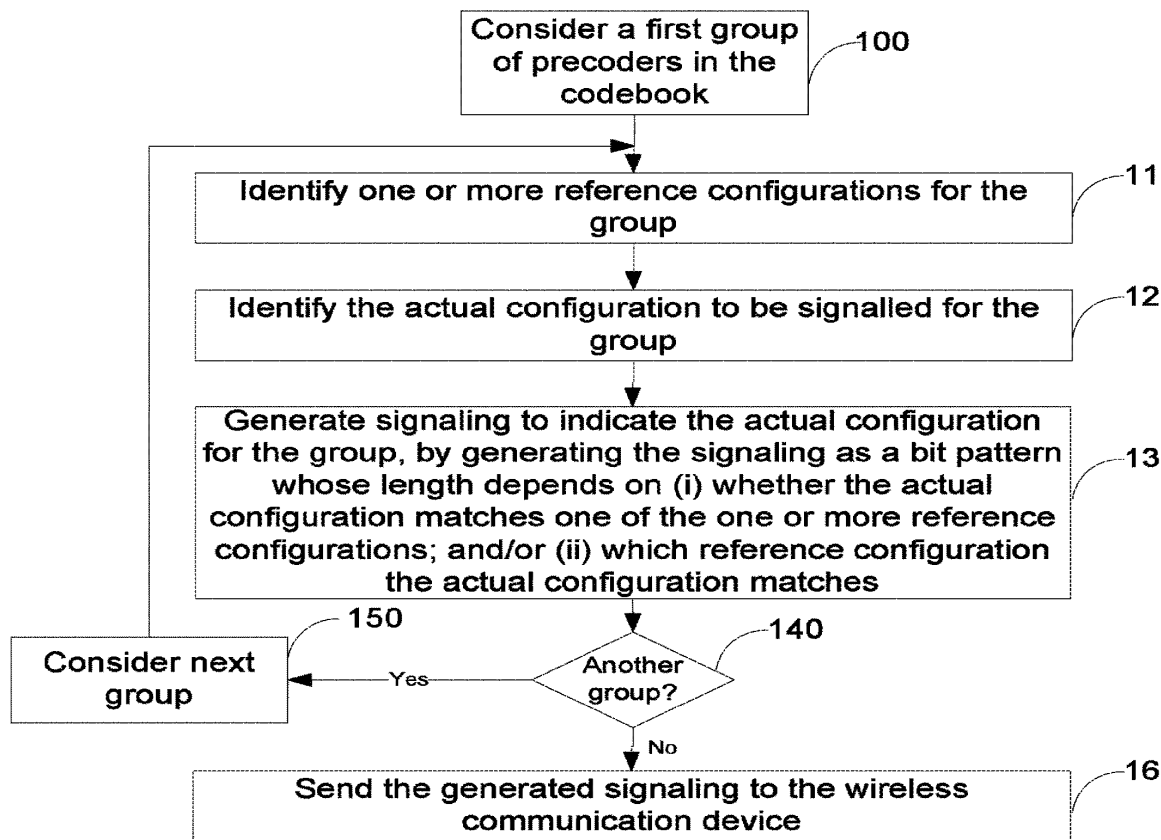


Figure 1



**Figure 2**

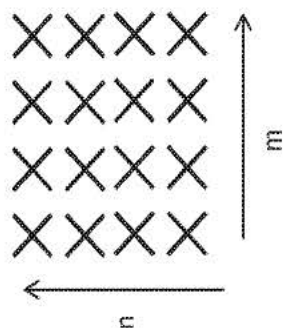


Figure 3

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