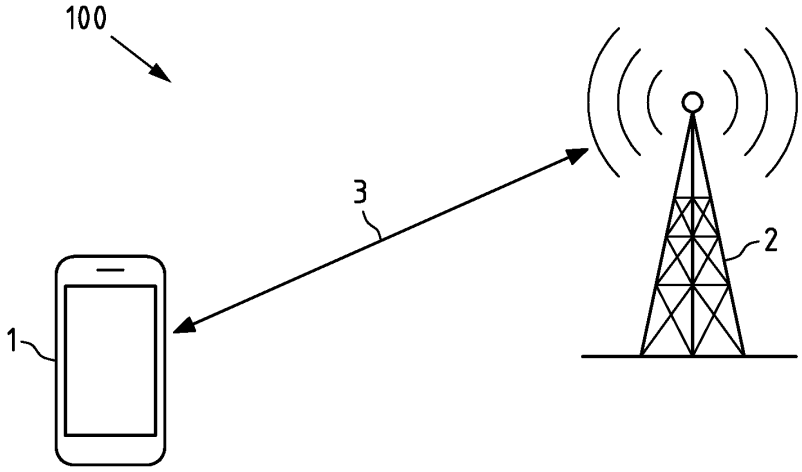

100
3
2
1

Fig.1

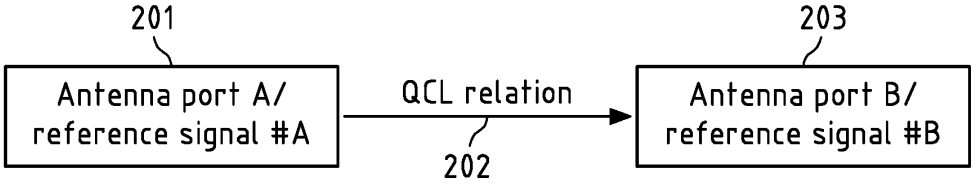

201
Antenna port A/
reference signal #A
QCL relation
202
203
Antenna port B/
reference signal #B

Fig.2

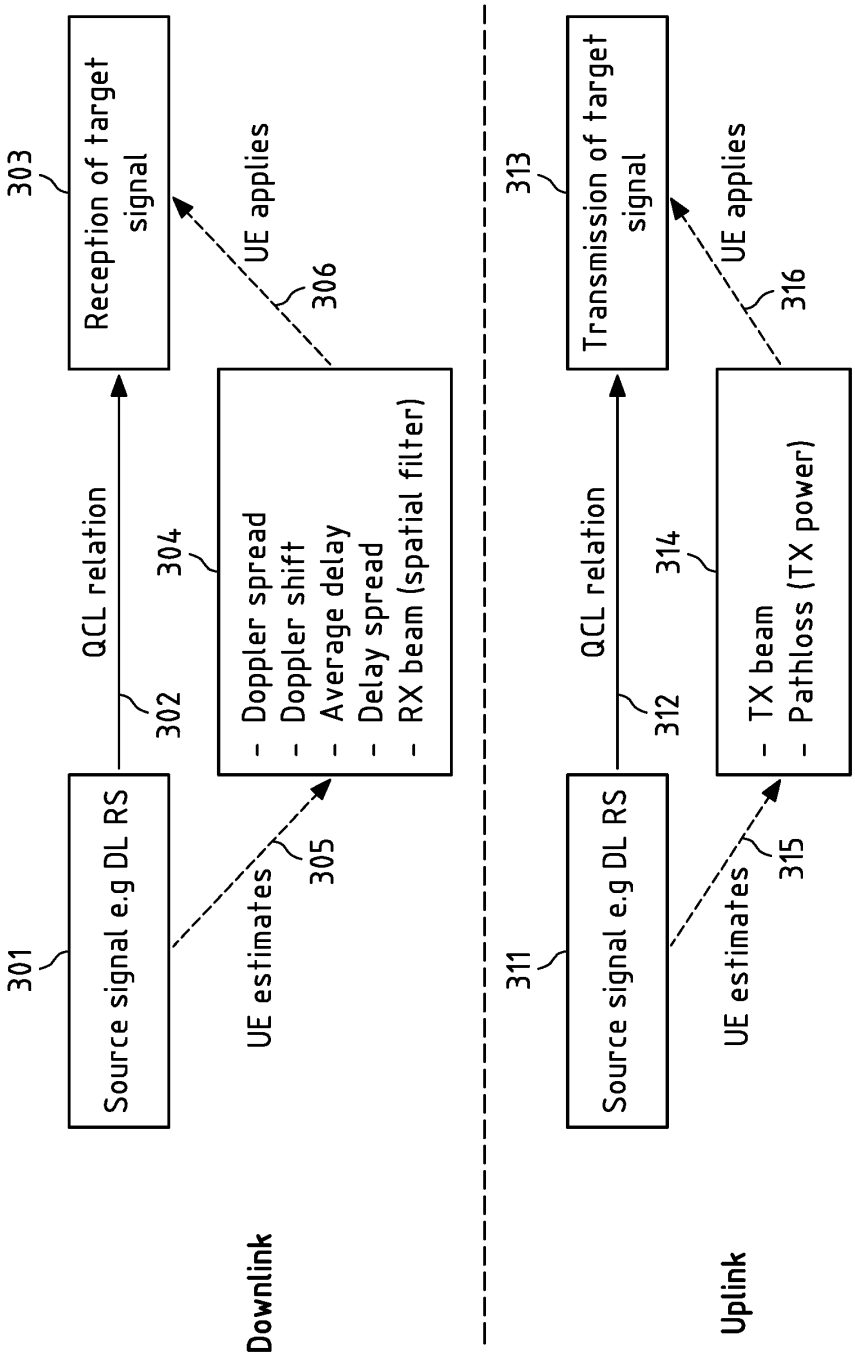

Downlink
Uplink
301
Source signal e.g DL RS
302
QCL relation
303
Reception of target signal
304
- Doppler spread
- Doppler shift
- Average delay
- Delay spread
- RX beam (spatial filter)
305
UE estimates
306
UE applies
311
Source signal e.g DL RS
312
QCL relation
313
Transmission of target signal
314
- TX beam
- Pathloss (TX power)
315
UE estimates
316
UE applies

Fig.3

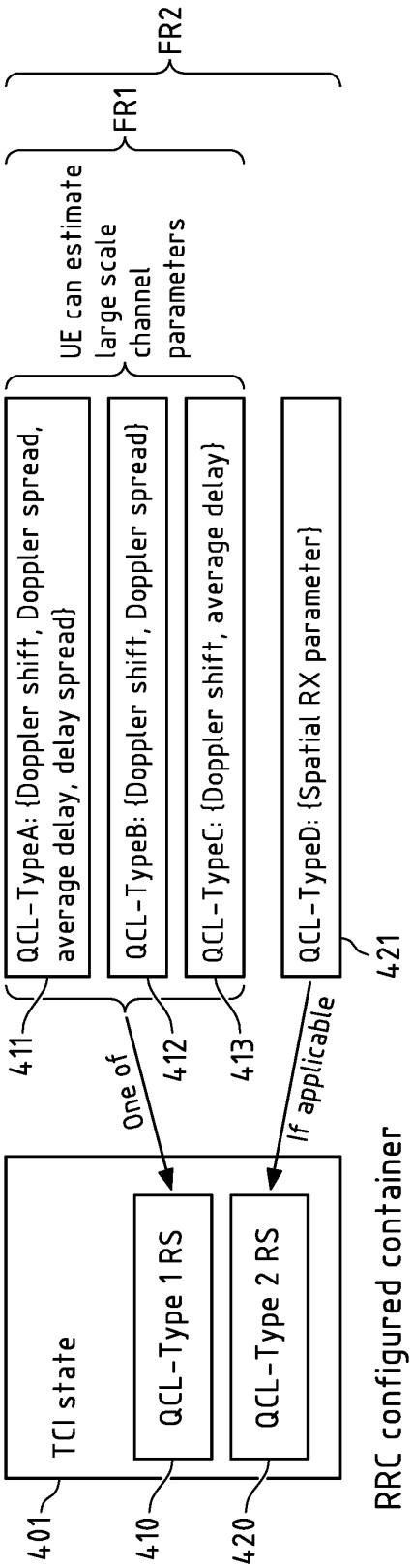

FR2
FR1
UE can estimate large scale channel parameters
QCL-TypeA: {Doppler shift, Doppler spread, average delay, delay spread}
QCL-TypeB: {Doppler shift, Doppler spread}
QCL-TypeC: {Doppler shift, average delay}
QCL-TypeD: {Spatial RX parameter}
411
412
413
421
One of
If applicable
TCI state
QCL-Type 1 RS
QCL-Type 2 RS
401
410
420
RRC configured container

Fig.4

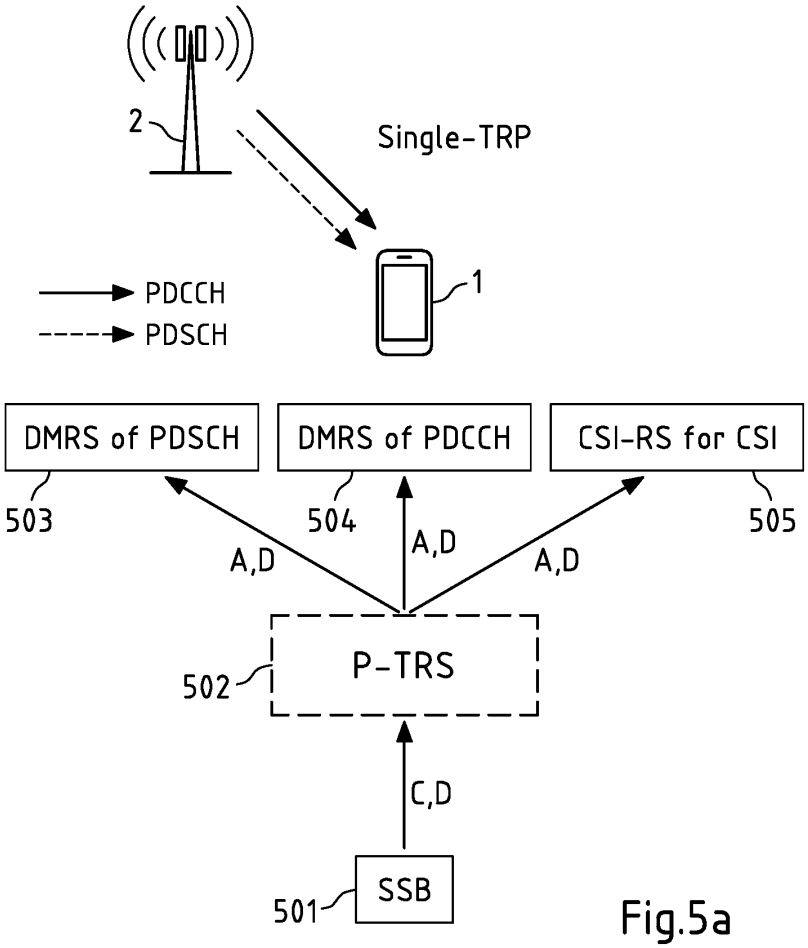

2
Single-TRP
1
PDCCH
PDSCH
DMRS of PDSCH
DMRS of PDCCH
CSI-RS for CSI
503
504
505
A,D
A,D
A,D
P-TRS
502
C,D
SSB
501

Fig.5a

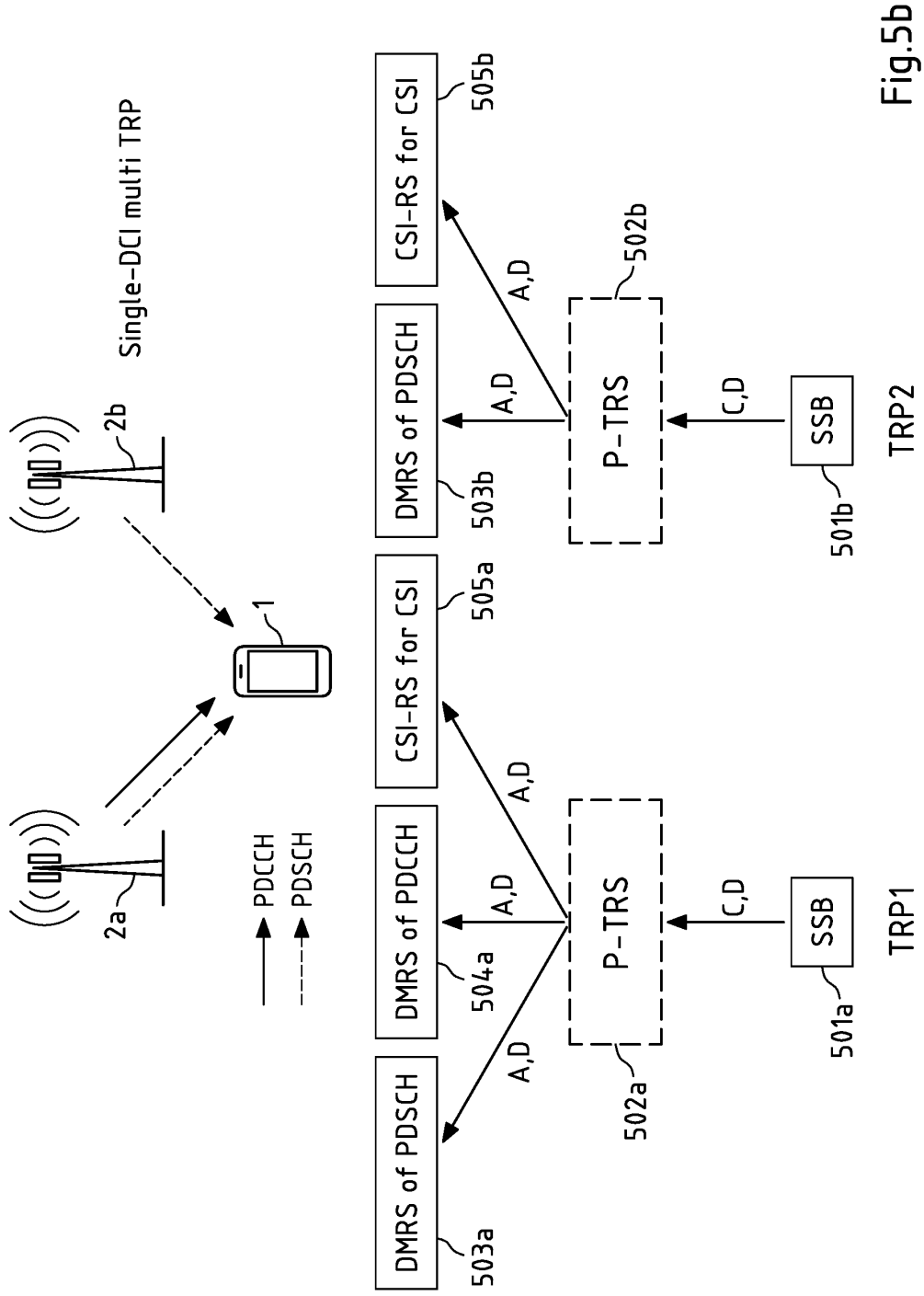

Single-DCI multi TRP
2b
2a
1
PDCCH
PDSCH
DMRS of PDSCH
503a
DMRS of PDCCH
504a
CSI-RS for CSI
505a
P-TRS
502a
SSB
501a
TRP1
DMRS of PDSCH
503b
CSI-RS for CSI
505b
P-TRS
502b
SSB
501b
TRP2
A,D
C,D

Fig.5b

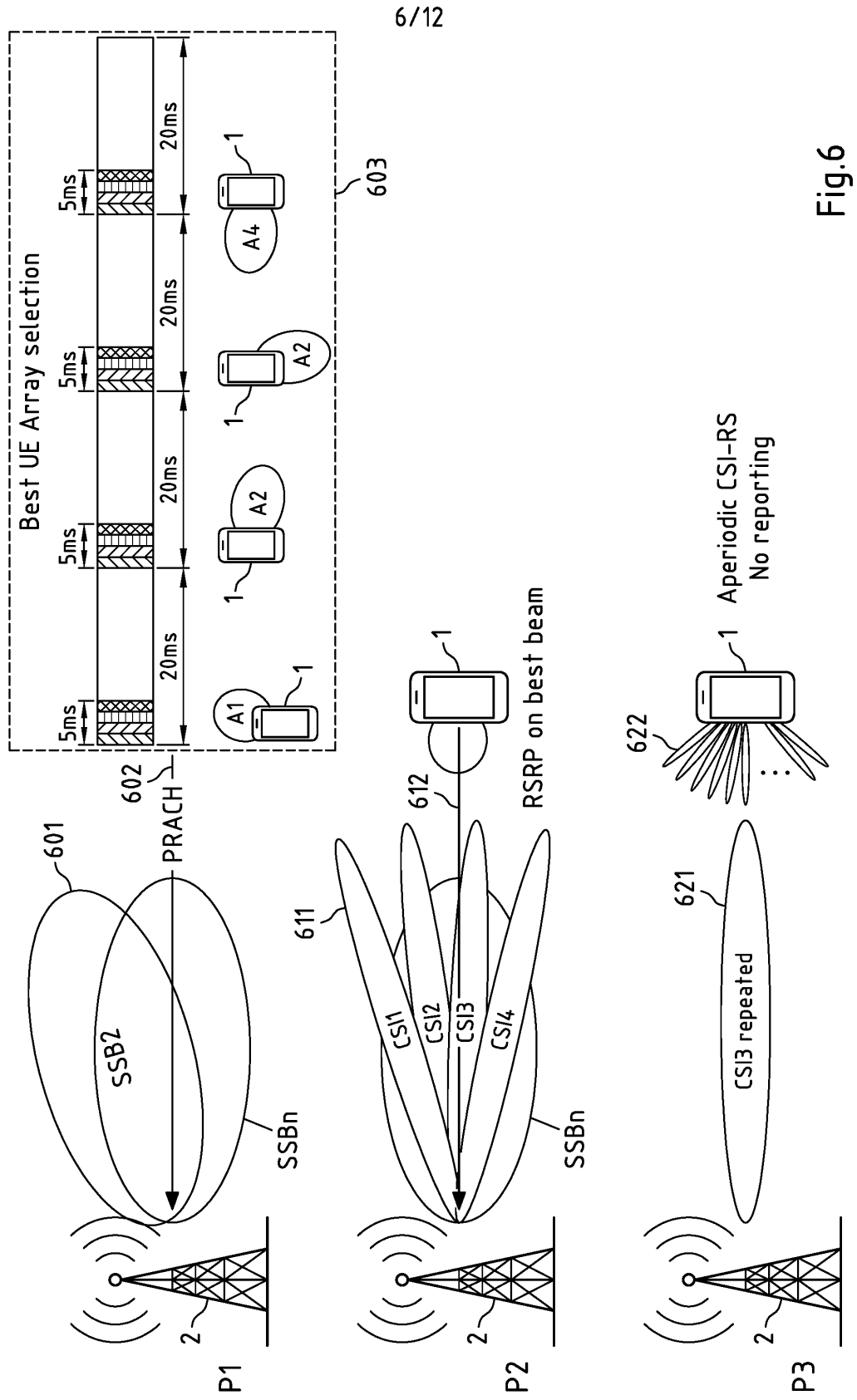

Best UE Array selection
5ms
20ms
603
A1
A2
A4
602
PRACH
601
SSB2
SSBn
P1
611
612
RSRP on best beam
CSI1
CSI2
CSI3
CSI4
P2
621
CSI3 repeated
622
Aperiodic CSI-RS
No reporting
P3

Fig.6

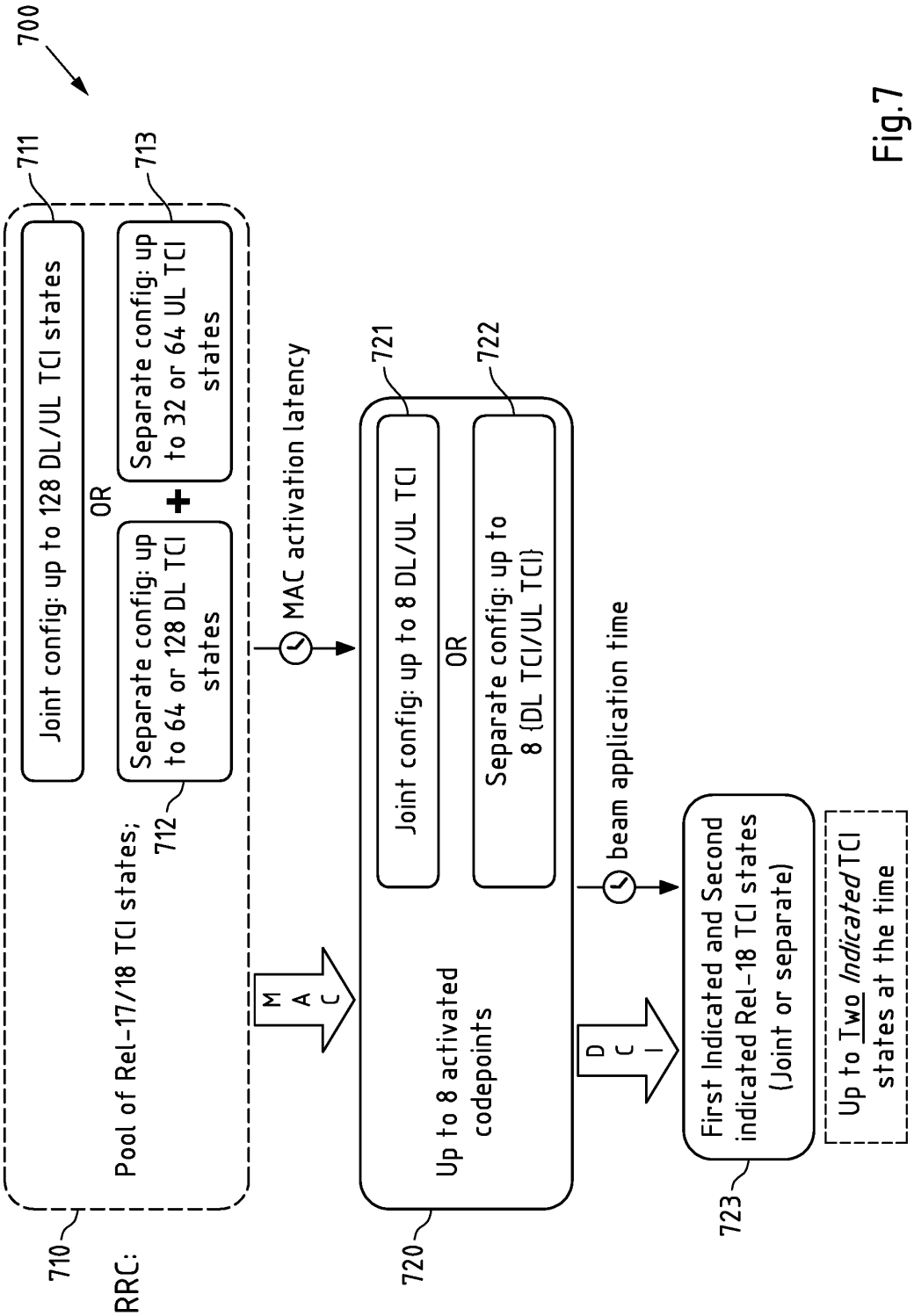

700
711
713
Joint config: up to 128 DL/UL TCI states
OR
Separate config: up to 64 or 128 DL TCI states
+
Separate config: up to 32 or 64 UL TCI states
Pool of Rel-17/18 TCI states;
712
RRC:
710
MAC
MAC activation latency
721
722
Joint config: up to 8 DL/UL TCI
OR
Separate config: up to 8 {DL TCI/UL TCI}
Up to 8 activated codepoints
720
DCI
beam application time
First Indicated and Second indicated Rel-18 TCI states (Joint or separate)
723
Up to Two Indicated TCI states at the time

Fig.7

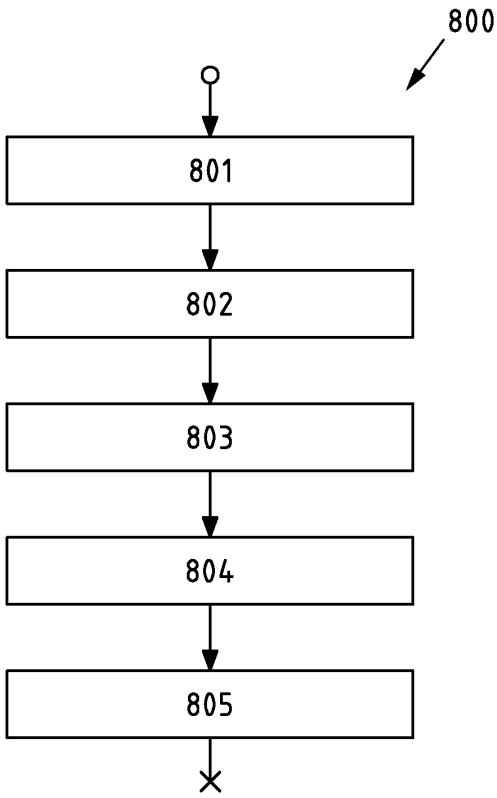


Fig.8

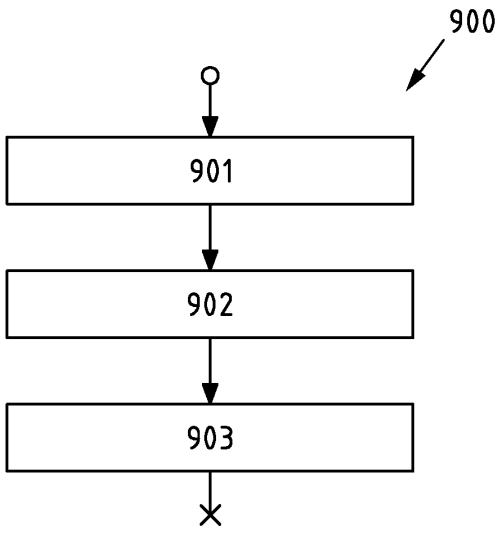


Fig.9

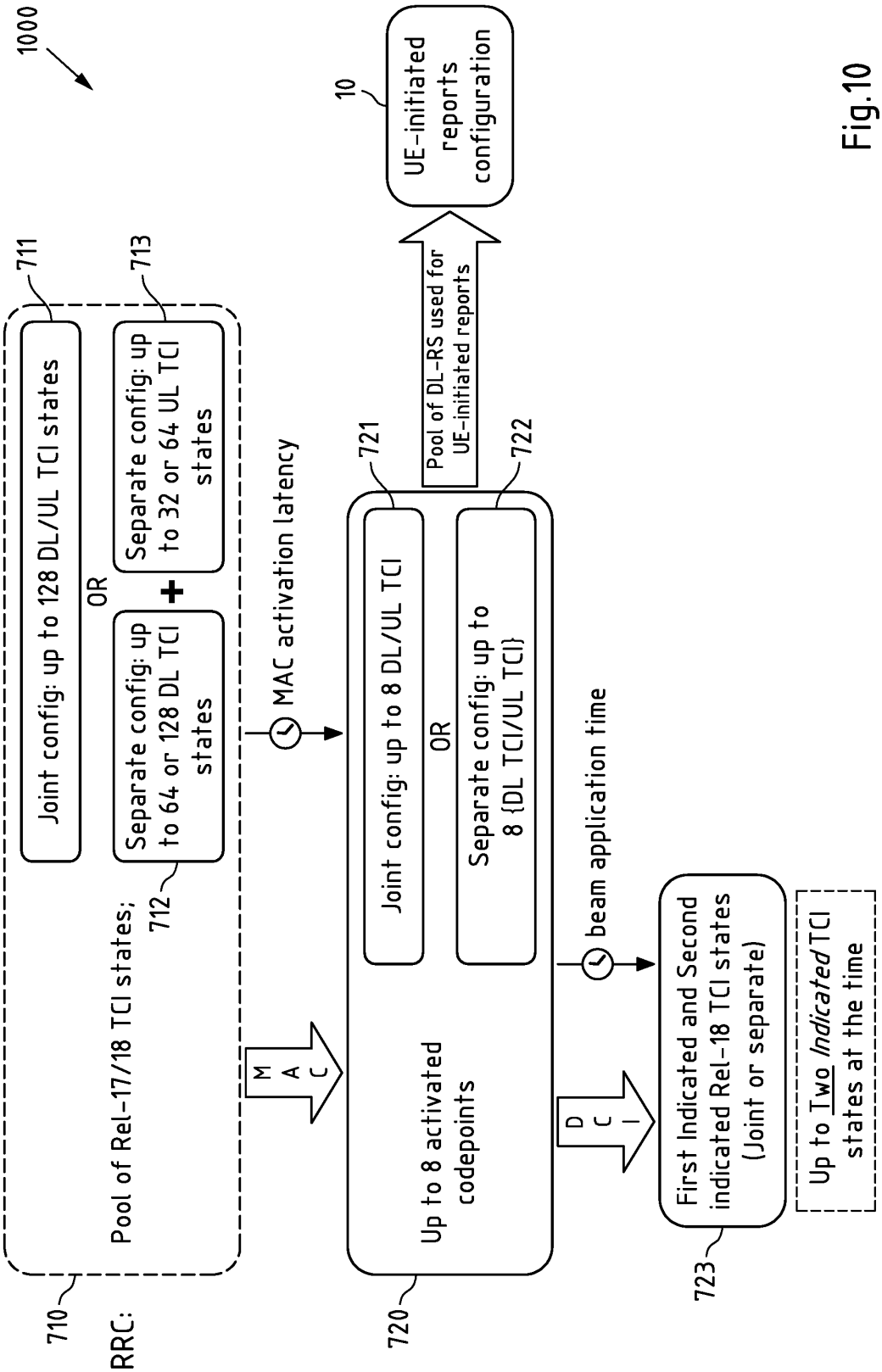

1000
10
UE-initiated reports configuration
Pool of DL-RS used for UE-initiated reports
711
713
Joint config: up to 128 DL/UL TCI states
OR
Separate config: up to 64 or 128 DL TCI states
+
Separate config: up to 32 or 64 UL TCI states
712
Pool of Rel-17/18 TCI states;
RRC:
710
MAC activation latency
MAC
721
722
Joint config: up to 8 DL/UL TCI
OR
Separate config: up to 8 {DL TCI/UL TCI}
Up to 8 activated codepoints
720
beam application time
DCI
First Indicated and Second indicated Rel-18 TCI states (Joint or separate)
723
Up to Two Indicated TCI states at the time

Fig.10

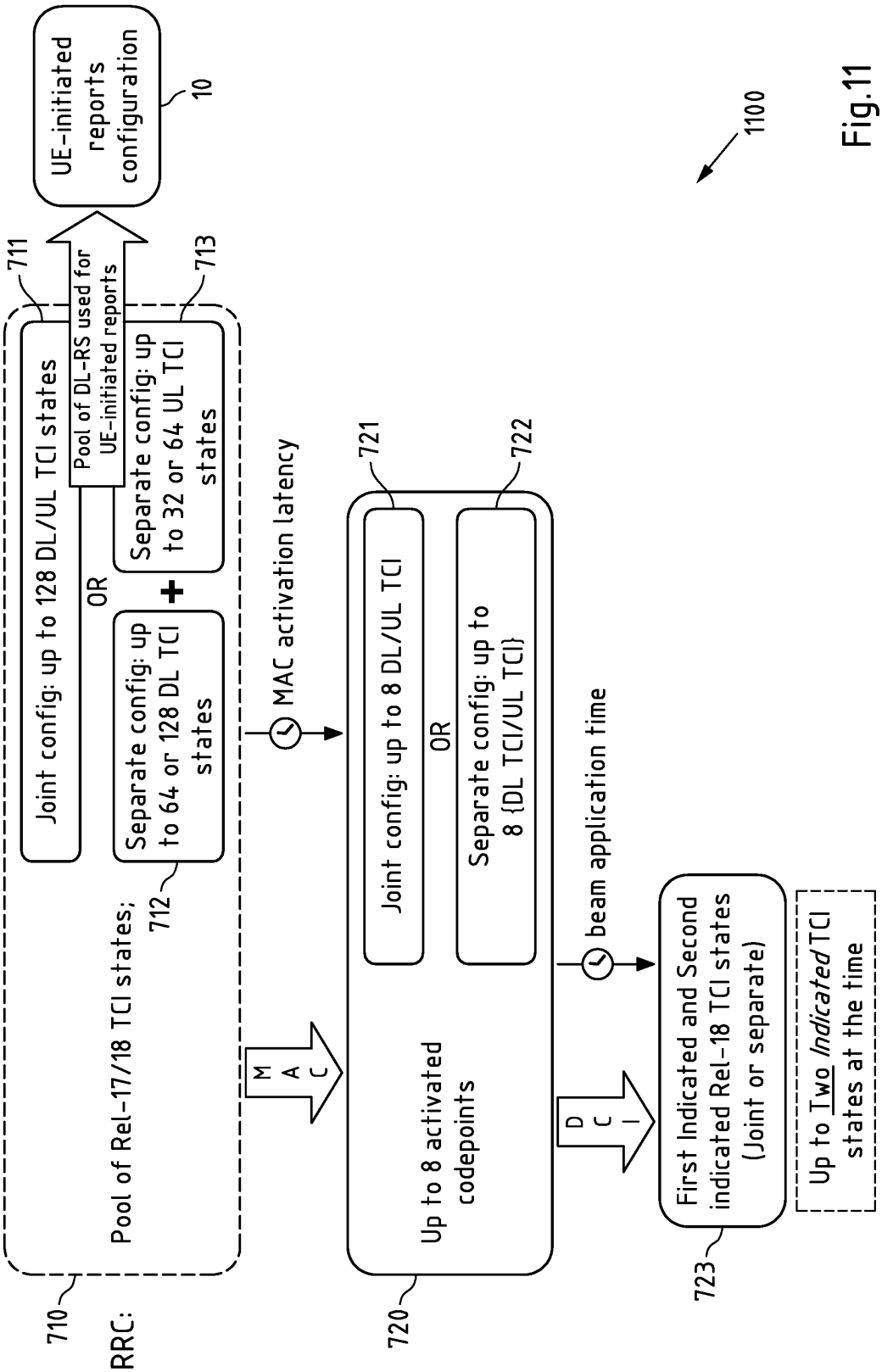

UE-initiated reports configuration
10
1100
711
713
Pool of DL-RS used for UE-initiated reports
Joint config: up to 128 DL/UL TCI states
OR
Separate config: up to 64 or 128 DL TCI states
+
Separate config: up to 32 or 64 UL TCI states
712
RRC:
Pool of Rel-17/18 TCI states;
710
MAC
MAC activation latency
721
722
Joint config: up to 8 DL/UL TCI
OR
Separate config: up to 8 {DL TCI/UL TCI}
Up to 8 activated codepoints
720
DCI
beam application time
First Indicated and Second indicated Rel-18 TCI states (Joint or separate)
723
Up to Two Indicated TCI states at the time

Fig.11

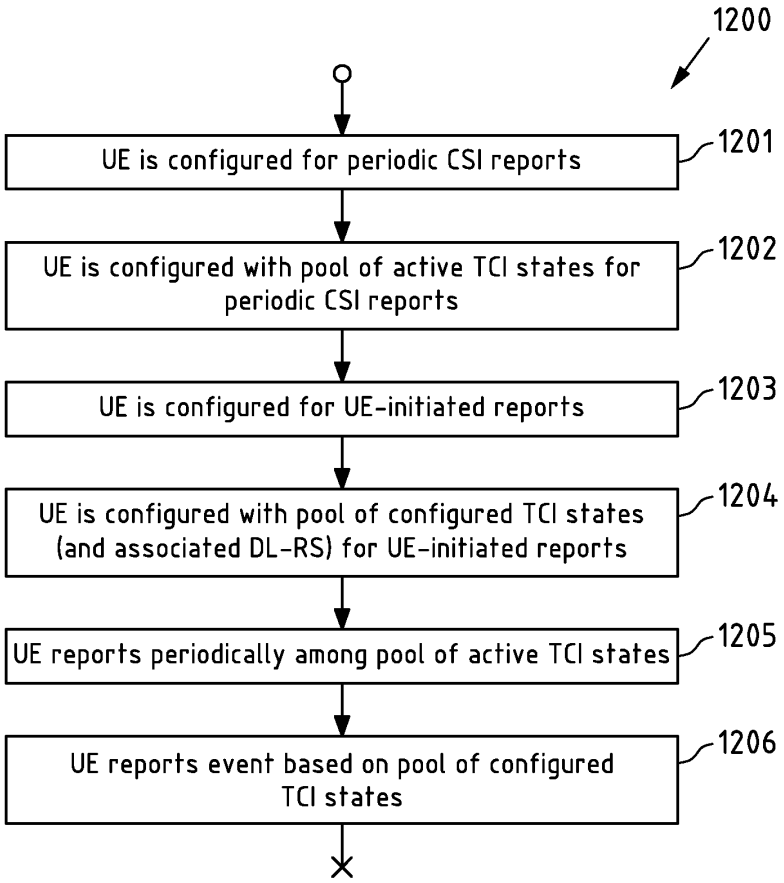

1200
UE is configured for periodic CSI reports
1201
UE is configured with pool of active TCI states for periodic CSI reports
1202
UE is configured for UE-initiated reports
1203
UE is configured with pool of configured TCI states (and associated DL-RS) for UE-initiated reports
1204
UE reports periodically among pool of active TCI states
1205
UE reports event based on pool of configured TCI states
1206

Fig.12

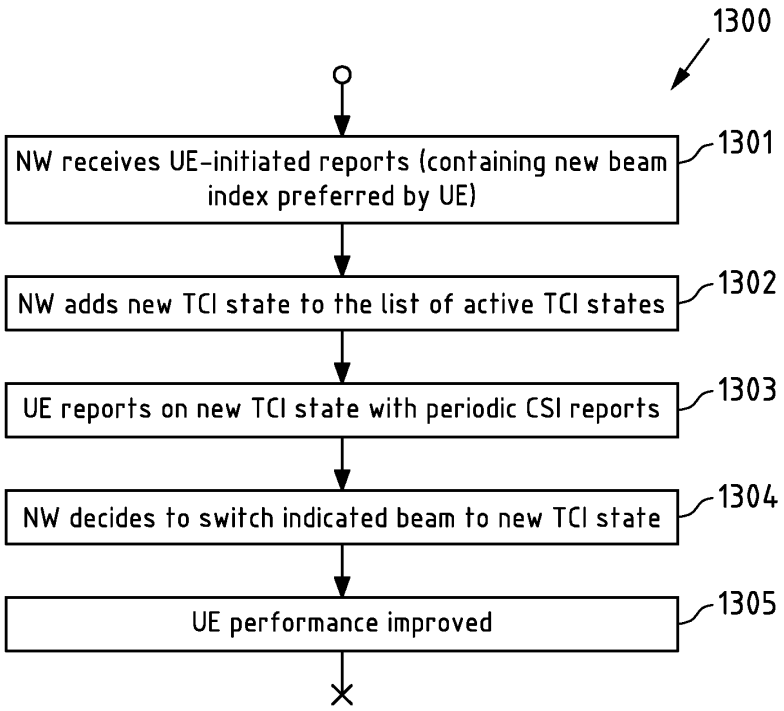

1300
NW receives UE-initiated reports (containing new beam index preferred by UE)
1301
NW adds new TCI state to the list of active TCI states
1302
UE reports on new TCI state with periodic CSI reports
1303
NW decides to switch indicated beam to new TCI state
1304
UE performance improved
1305

Fig.13

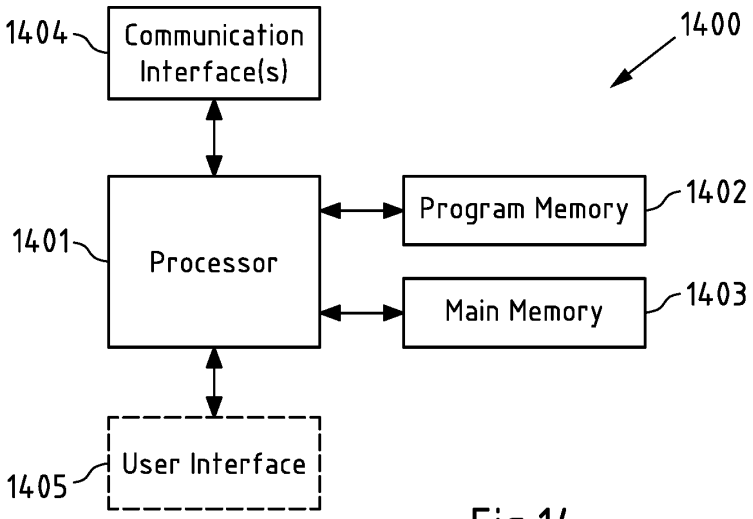

1404
Communication Interface(s)
1400
1401
Processor
Program Memory
1402
Main Memory
1403
User Interface
1405

Fig.14