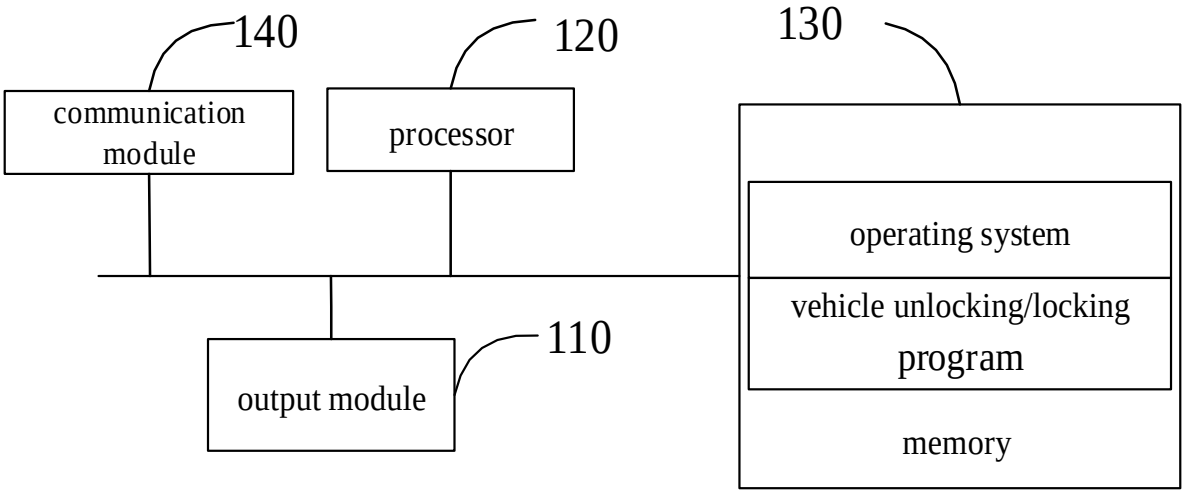

140
120
130
communication module
processor
operating system
vehicle unlocking/locking program
110
output module
memory

FIG. 1

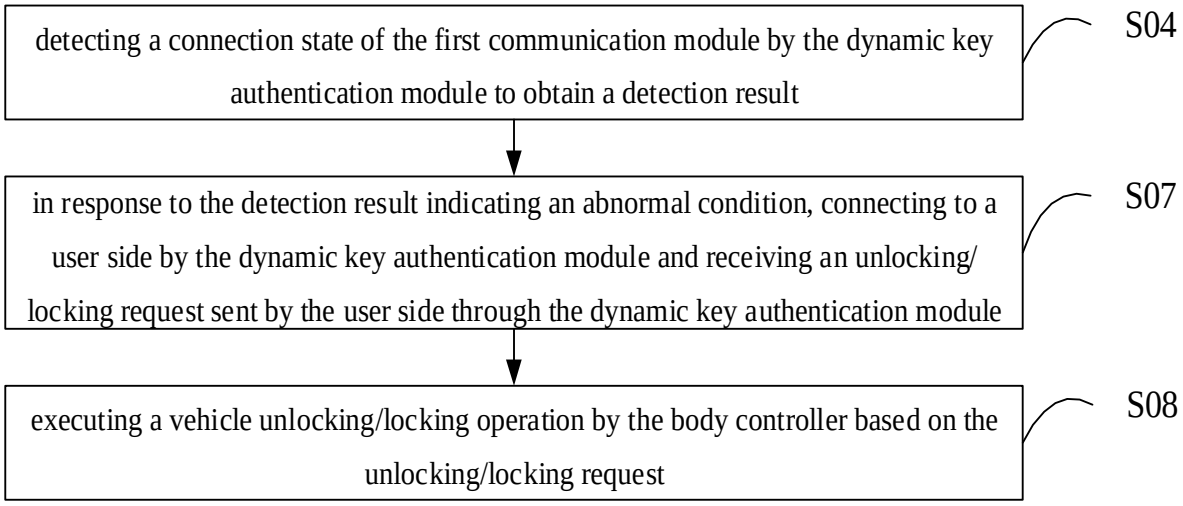

detecting a connection state of the first communication module by the dynamic key authentication module to obtain a detection result
S04
in response to the detection result indicating an abnormal condition, connecting to a user side by the dynamic key authentication module and receiving an unlocking/ locking request sent by the user side through the dynamic key authentication module
S07
executing a vehicle unlocking/locking operation by the body controller based on the unlocking/locking request
S08

FIG. 2

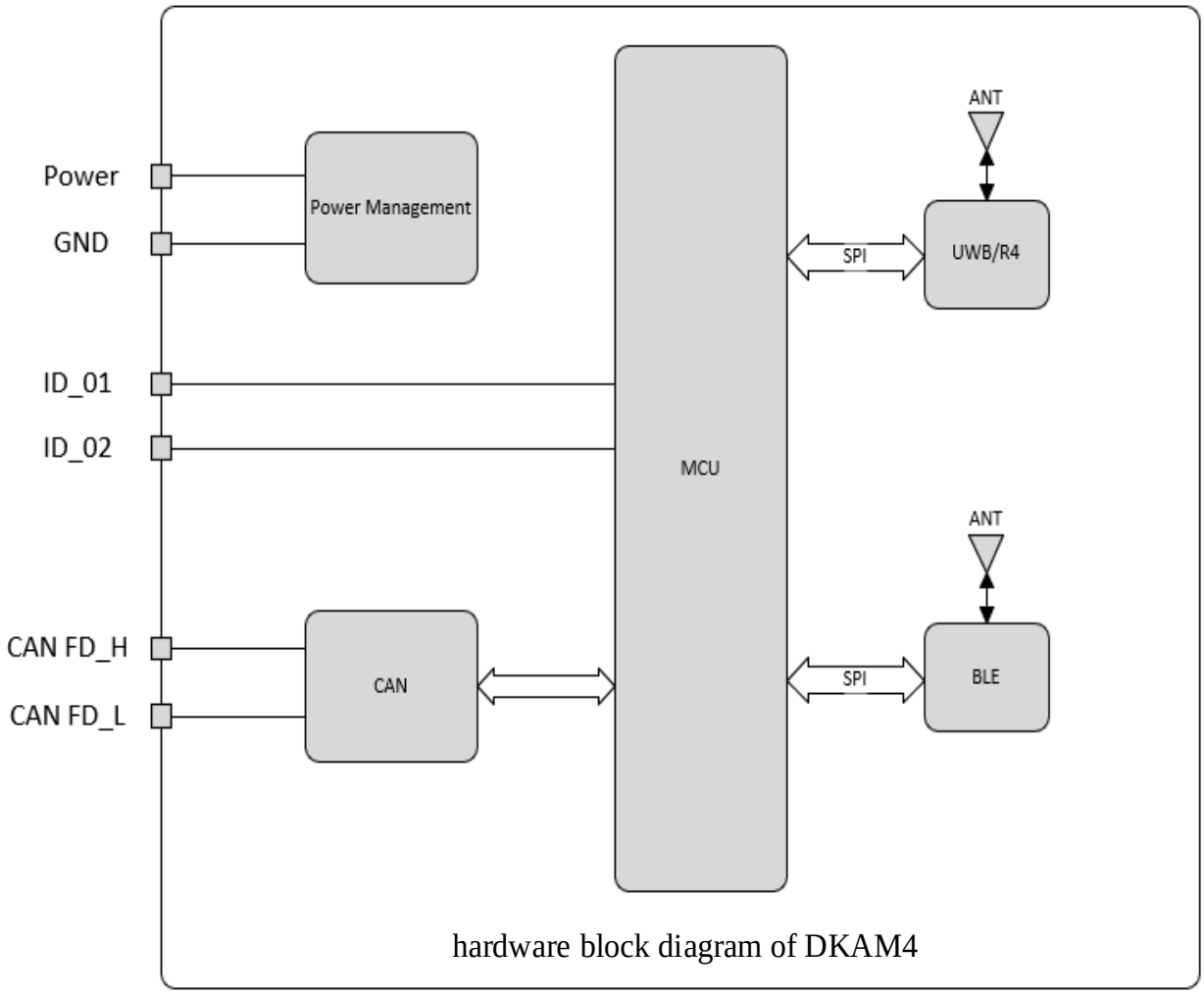

Power
GND
ID_01
ID_02
CAN FD_H
CAN FD_L
Power Management
CAN
MCU
SPI
SPI
ANT
ANT
UWB/R4
BLE
hardware block diagram of DKAM4

FIG. 3

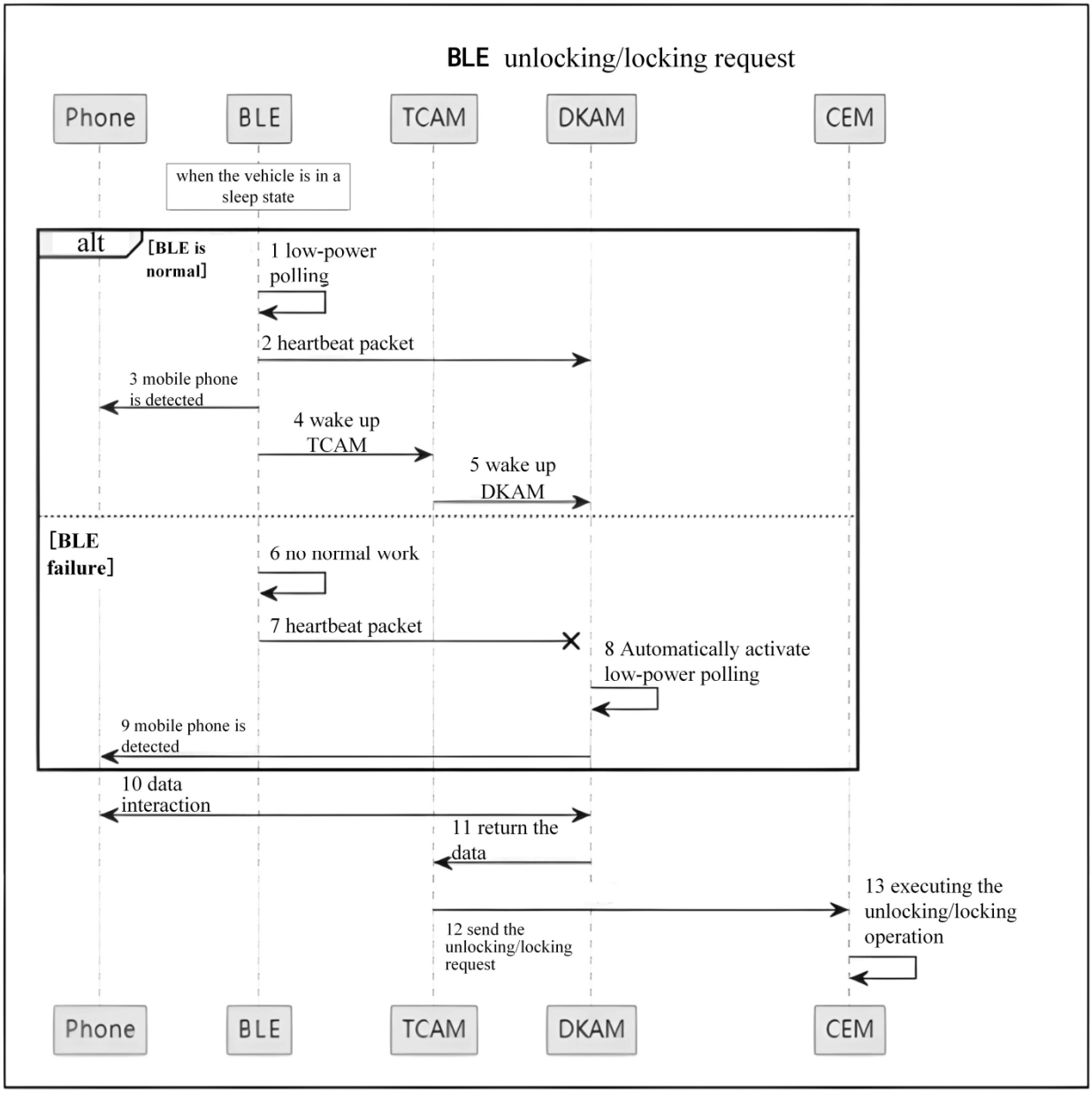

BLE unlocking/locking request
Phone
BLE
TCAM
DKAM
CEM
when the vehicle is in a sleep state
alt
[BLE is normal]
1 low-power polling
2 heartbeat packet
3 mobile phone is detected
4 wake up TCAM
5 wake up DKAM
[BLE failure]
6 no normal work
7 heartbeat packet
8 Automatically activate low-power polling
9 mobile phone is detected
10 data interaction
11 return the data
12 send the unlocking/locking request
13 executing the unlocking/locking operation
Phone
BLE
TCAM
DKAM
CEM

FIG. 4

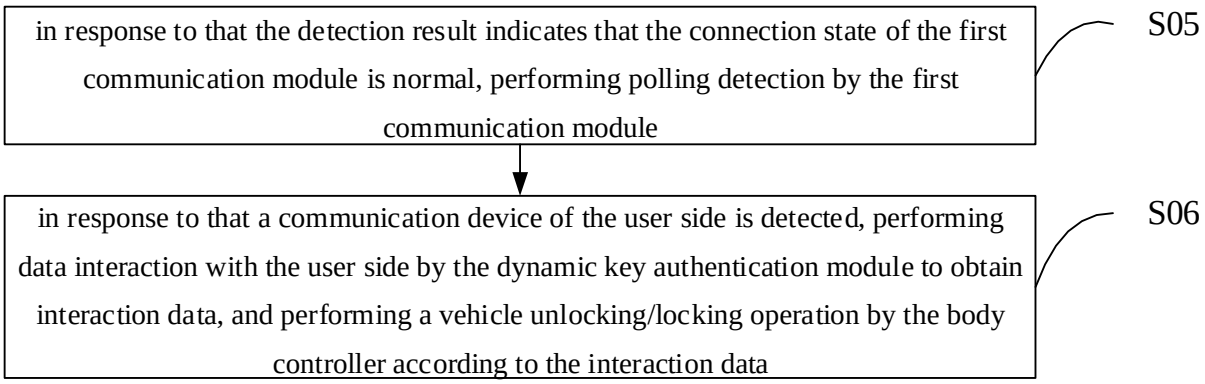

in response to that the detection result indicates that the connection state of the first communication module is normal, performing polling detection by the first communication module
S05
in response to that a communication device of the user side is detected, performing data interaction with the user side by the dynamic key authentication module to obtain interaction data, and performing a vehicle unlocking/locking operation by the body controller according to the interaction data
S06

FIG. 5

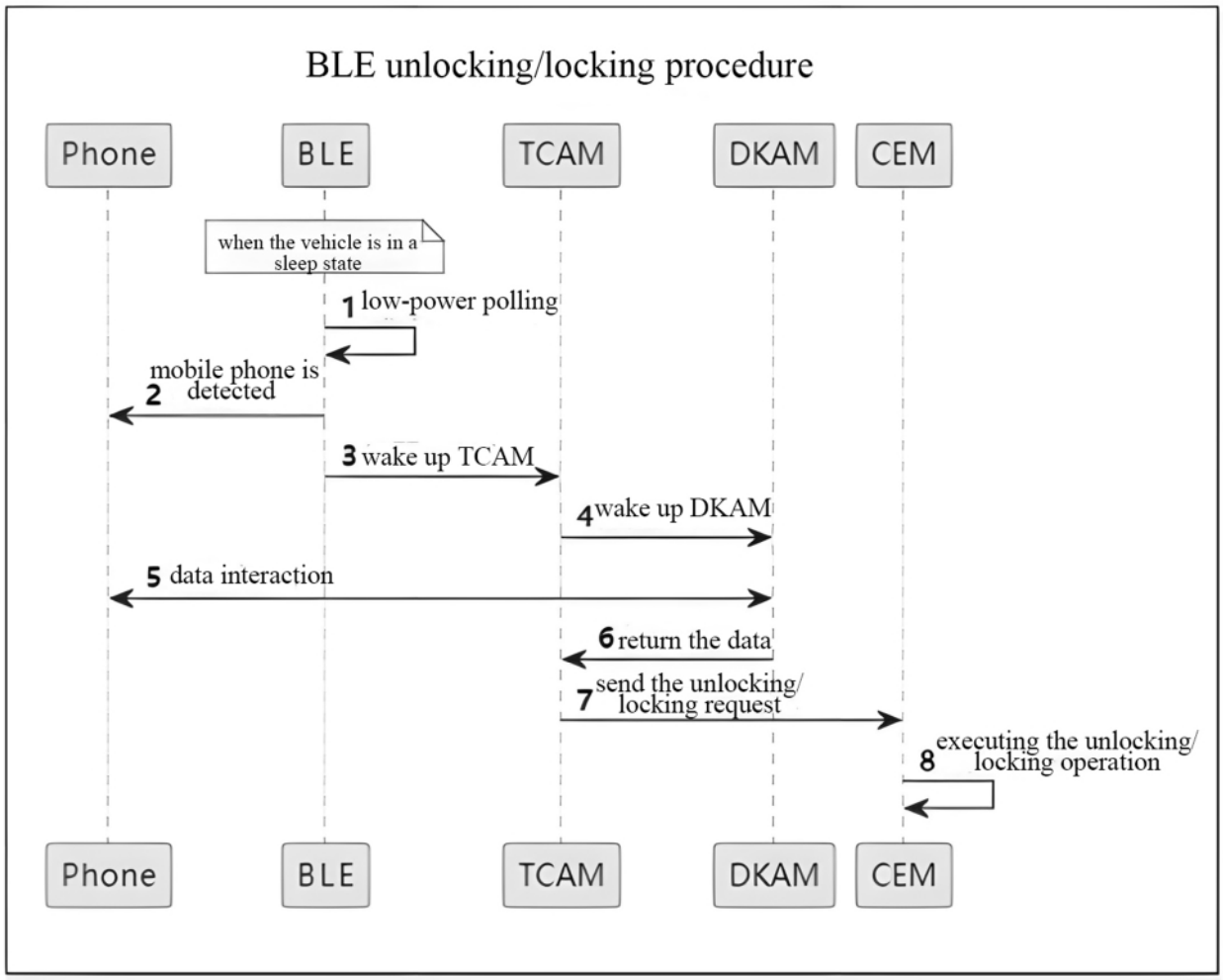

BLE unlocking/locking procedure
Phone
BLE
TCAM
DKAM
CEM
when the vehicle is in a sleep state
1 low-power polling
mobile phone is detected
2
3 wake up TCAM
4 wake up DKAM
5 data interaction
6 return the data
7 send the unlocking/ locking request
8 executing the unlocking/ locking operation
Phone
BLE
TCAM
DKAM
CEM

FIG. 6

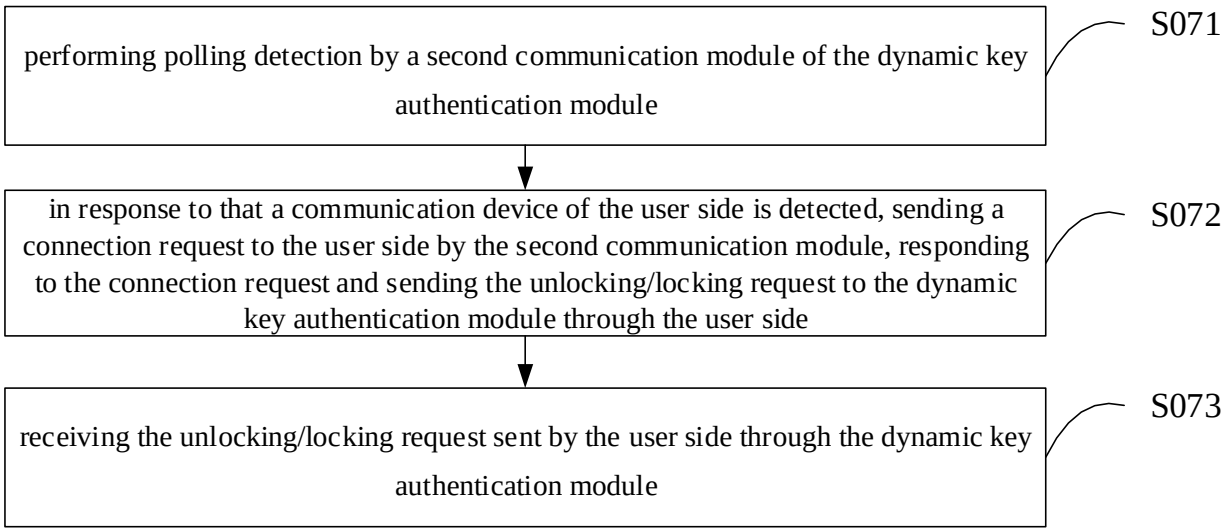

performing polling detection by a second communication module of the dynamic key authentication module
S071
in response to that a communication device of the user side is detected, sending a connection request to the user side by the second communication module, responding to the connection request and sending the unlocking/locking request to the dynamic key authentication module through the user side
S072
receiving the unlocking/locking request sent by the user side through the dynamic key authentication module
S073

FIG. 7

positioning procedure

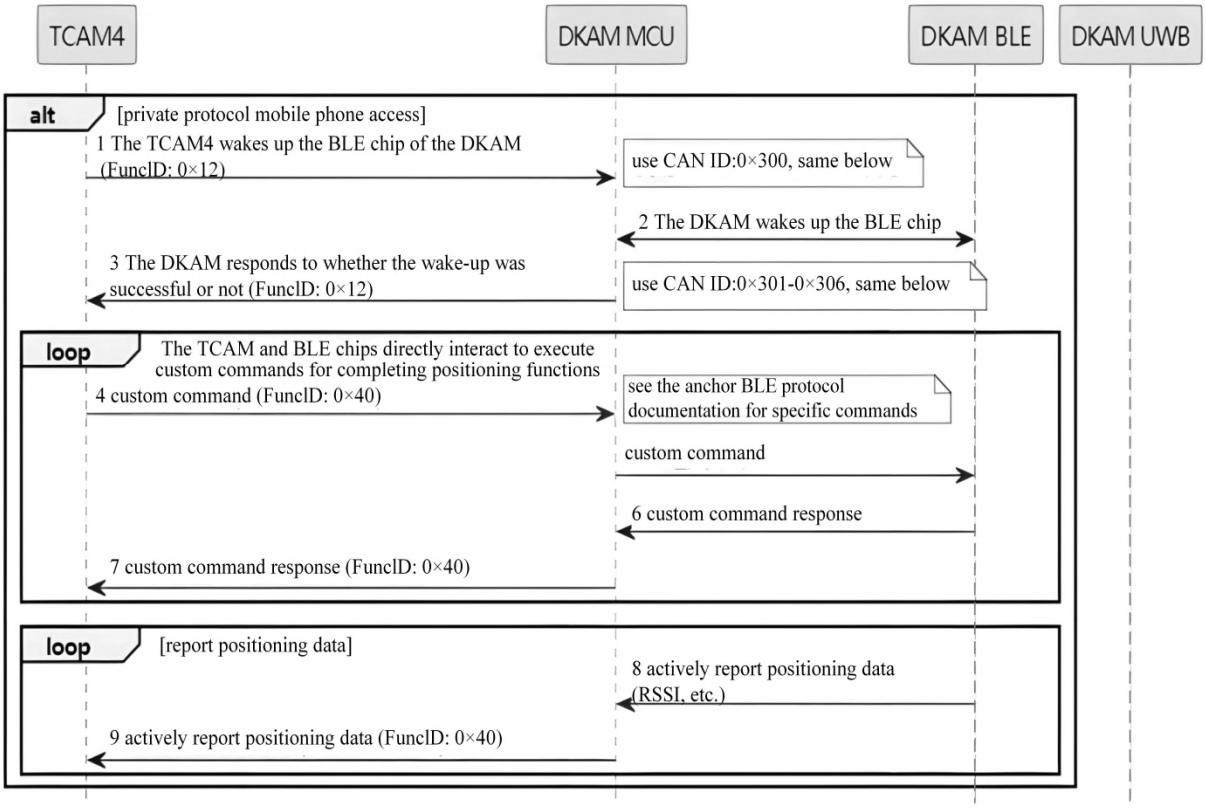


FIG. 8