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(19) **United States**(12) **Patent Application Publication** (10) **Pub. No.: US 2023/0231676 A1**  
(43) **Pub. Date: Jul. 20, 2023**(54) **MOBILE STATION AND RECEPTION METHOD**(71) Applicant: **Sun Patent Trust**, New York, NY (US)(72) Inventors: **Seigo Nakao**, Osaka (JP); **Masayuki Hoshino**, Kanagawa (JP); **Atsushi Sumasu**, Tokyo (JP); **Katsuhiko Hiramatsu**, Osaka (JP)(21) Appl. No.: **18/190,016**(22) Filed: **Mar. 24, 2023****Related U.S. Application Data**

(63) Continuation of application No. 17/193,956, filed on Mar. 5, 2021, now Pat. No. 11,646,842, which is a continuation of application No. 16/840,001, filed on Apr. 3, 2020, now Pat. No. 10,972,243, which is a continuation of application No. 16/552,787, filed on Aug. 27, 2019, now Pat. No. 10,651,994, which is a continuation of application No. 16/225,375, filed on Dec. 19, 2018, now Pat. No. 10,439,778, which is a continuation of application No. 15/953,984, filed on Apr. 16, 2018, now Pat. No. 10,211,959, which is a continuation of application No. 15/478,704, filed on Apr. 4, 2017, now Pat. No. 9,979,523, which is a continuation of application No. 15/218,877, filed on Jul. 25, 2016, now Pat. No. 9,654,190, which is a continuation of application No. 14/830,527, filed on Aug. 19, 2015, now Pat. No. 9,438,322, which is a continuation of application No. 13/972,586, filed on Aug. 21, 2013, now Pat. No. 9,148,268, which is a continuation of application No. 12/673,560, filed on May 11, 2010, now Pat. No. 8,542,770, filed as application No. PCT/JP2008/002221 on Aug. 15, 2008.

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## (57)

**ABSTRACT**

Provided is a radio communication device which can separate propagation paths of antenna ports and improve a channel estimation accuracy even when using virtual antennas. The device includes: a mapping unit which maps a data signal after modulation to a virtual antenna and a virtual antenna; a phase inversion unit which inverts the phase of S0 transmitted from an antenna port in synchronization with a phase inversion unit between the odd-number slot and the even-number slot; the phase inversion unit which inverts the phase of R0 transmitted from the antenna port; a phase inversion unit which inverts the phase of S1 transmitted from an antenna port in synchronization with a phase inversion unit; and the phase inversion unit which inverts the phase of R1 transmitted from an antenna port.

