



US 20230231617A1

(19) **United States**(12) **Patent Application Publication**  
**MURAKAMI et al.**(10) **Pub. No.: US 2023/0231617 A1**(43) **Pub. Date: Jul. 20, 2023**(54) **RELAY METHOD AND RELAY DEVICE**

Jun. 24, 2011 (JP) ..... 2011-140747

Sep. 2, 2011 (JP) ..... 2011-192123

(71) Applicant: **Sun Patent Trust**, New York, NY (US)**Publication Classification**(72) Inventors: **Yutaka MURAKAMI**, Kanagawa (JP);  
**Tomohiro KIMURA**, Osaka (JP);  
**Mikihiro OUCHI**, Osaka (JP)(51) **Int. Cl.****H04B 7/155** (2006.01)**H04L 27/34** (2006.01)**H04L 25/03** (2006.01)**H04L 27/26** (2006.01)**H04B 7/06** (2006.01)**H04L 5/00** (2006.01)**H04B 7/0456** (2006.01)**H04W 4/06** (2006.01)**H04W 40/22** (2006.01)(21) Appl. No.: **18/123,505**(22) Filed: **Mar. 20, 2023****Related U.S. Application Data**

(63) Continuation of application No. 17/243,988, filed on Apr. 29, 2021, now Pat. No. 11,658,733, which is a continuation of application No. 16/790,358, filed on Feb. 13, 2020, now Pat. No. 11,070,281, which is a continuation of application No. 16/017,244, filed on Jun. 25, 2018, now Pat. No. 10,623,084, which is a continuation of application No. 15/617,550, filed on Jun. 8, 2017, now Pat. No. 10,044,432, which is a continuation of application No. 15/202,924, filed on Jul. 6, 2016, now Pat. No. 9,806,793, which is a continuation of application No. 14/582,610, filed on Dec. 24, 2014, now Pat. No. 9,426,631, which is a continuation of application No. 14/110,783, filed on Oct. 9, 2013, now Pat. No. 8,989,237, filed as application No. PCT/JP2012/002676 on Apr. 18, 2012.

(52) **U.S. Cl.**

CPC ..... **H04B 7/15542** (2013.01); **H04L 27/34** (2013.01); **H04L 25/03171** (2013.01); **H04L 27/2614** (2013.01); **H04B 7/0604** (2013.01); **H04L 25/03949** (2013.01); **H04L 5/0053** (2013.01); **H04B 7/0456** (2013.01); **H04L 25/0391** (2013.01); **H04W 4/06** (2013.01); **H04W 40/22** (2013.01); **H04B 7/0413** (2013.01)

(30) **Foreign Application Priority Data**

Apr. 19, 2011 (JP) ..... 2011-093539

Apr. 28, 2011 (JP) ..... 2011-102099

May 26, 2011 (JP) ..... 2011-118453

(57)

**ABSTRACT**

Disclosed is a relay method including: receiving, as input, respective reception signals by two receive antennas, the reception signals each including a reception signal resulting from multiplexing respective transmission signals transmitted by two transmission antennas in a first frequency band; performing frequency conversion on the reception signal received by one of the receive antennas so as to obtain a signal of a third frequency band; and performing frequency multiplexing on the signal having the third frequency band and the reception signal received by the other of the receive antennas.

