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**BACCO et al.**(10) **Pub. No.: US 2024/0214189 A1**(43) **Pub. Date: Jun. 27, 2024**(54) **QUANTUM KEY DISTRIBUTION  
TRANSMITTER**(71) Applicant: **QTI SRL**, Firenze (IT)(72) Inventors: **Davide BACCO**, Codevigo (PD) (IT);  
**Francesco Saverio CATALIOTTI**,  
Firenze (IT); **Paolo DE NATALE**,  
Prato (IT); **Tommaso OCCHIPINTI**,  
Vicenza (IT); **Iliaria VAGNILUCA**,  
Firenze (IT); **Alessandro ZAVATTA**,  
Firenze (IT)(73) Assignee: **QTI SRL**, Firenze (IT)(21) Appl. No.: **18/280,960**(22) PCT Filed: **Mar. 9, 2022**(86) PCT No.: **PCT/EP2022/056067**

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CPC ..... **H04L 9/0852** (2013.01)(57) **ABSTRACT**

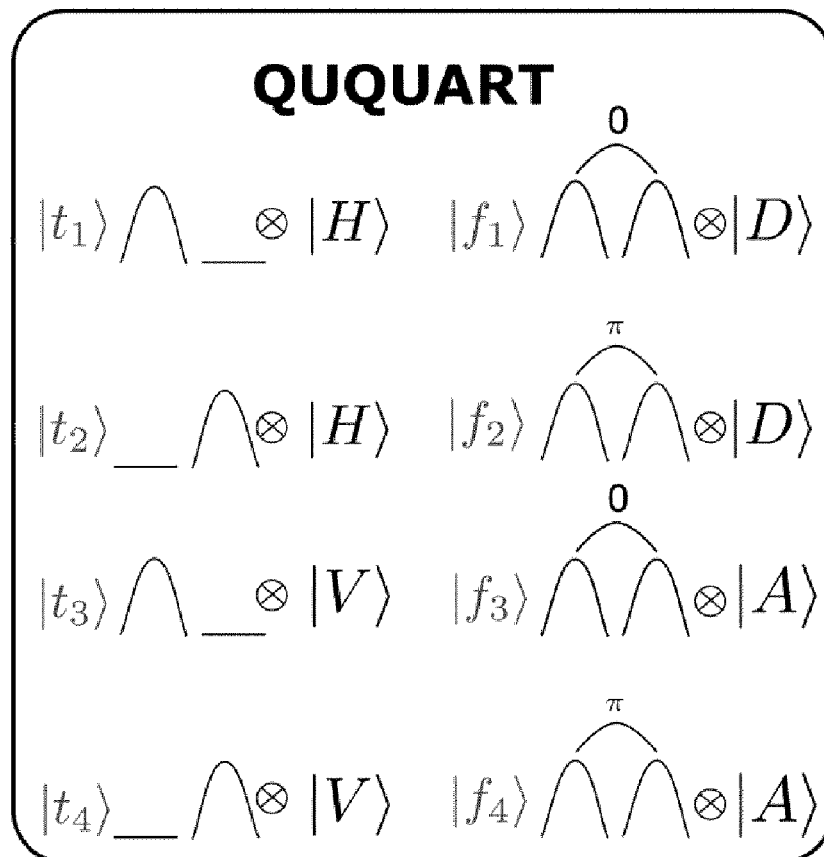
A quantum key distribution transmitter for sending a quantum key via a quantum channel via N-dimensional protocol, including a p-dimensional time-bin protocol, includes:

a pulsed laser configured to emit a train of laser pulses, each pulse having a random phase with respect to the phase of the following pulse in the train,

a first intensity modulator configured to divide a pulse of the train of pulses in a group of p consecutive sub-pulses identical to each other;

a variable optical attenuator configured to reduce the intensity of each sub-pulse of the group of p consecutive sub-pulses;

a beam splitter comprising a first arm and a second arm, the beam splitter being configured to receive the group of p sub-pulses and split the group of p sub-pulses in a first and second split groups of p sub-pulses identical to each other in the first and second arms.

**Z basis****X basis**