Duplex-coding mechanism:

The duplex-coding mechanism is used for full-duplex communication without transfering any physical particles. Each party encodes 1 bit by applying Pauli operators on the Bell pair. This creates 4 possible Bell states. They perform D-CNOT in a counterfactual (without transfering physical particle) way using modified quantum Zeno (MQZ) gates. After applying D-CNOT, both parties can measure their qubits to recover each others bits. If at any point a photon actually goes through the channel, the protocol discards measurement as an “erasure” and the bits are considered lost.

Core resources of duplex-coding mechanism:

1) preshared maximally entangled Bell pair

2) QZ/CQZ/MQZ gates that let information be exchanged without sending physical particles through the channel.

3) D-CNOT operation realized counterfactually.

4) local Pauli operations for decoding the bit