Claims

1. Communication system (1) for enabling a communication between a guided vehicle (60) comprising one or several on-board systems (62) and a remote control center (10), wherein the guided vehicle (60) is powered by electricity provided by an electrified railway network comprising a power electrical infrastructure -hereafter PEI- used for providing electrical power to the guided vehicle (60), the communication system (1) comprising:
   - a power line communication system - hereafter PLC system (30), configured for being connected via an IP network (20) to the control center (10), said PLC system (30) being configured for receiving from and/or transmitting to the control center (10) IP-based telegrams via said IP network (20), the PLC system (30) further comprising a coupling unit (30A) for its coupling to the PEI in order to use the latter as physical communication channel, the PLC system (30) being configured
     i. for encoding each IP-based telegram received from the control center (10) into a PLC signal and for sending the PLC signal to the guided vehicle (60) by using the PEI as communication channel, and/or
     ii. for decoding a PLC signal sent by the guided vehicle (60) via the PEI and optionally for transmitting to the control center (10) an IP-based telegram determined by decoding the received PLC signal if the control center (10) is a recipient of the IP-based telegram,
   - an on-board power line IP based communication system - hereafter OPLC system (65), configured for

being installed on-board the guided vehicle (60), configured for being connected to said one or several on-board systems (62) of the guided vehicle, said OPLC system (65) comprising a coupling unit (65A) configured for coupling the OPLC to the PEI in order to receive and/or transmit PLC signals by using the PEI as physical communication channel, the OPLC system being configured

i. for encoding an IP-based telegram received from one of said one or several on-board systems (62) into a PLC signal and for sending the PLC signal to another guided vehicle and/or to the control center (10) by using the PEI as communication channel, and/or

ii. for decoding into an IP-based telegram a PLC signal received from the control center (10) and/or from another guided vehicle via the PEI and for determining whether the IP-based telegram is addressed to one of said one or several on-board systems of the guided vehicle it is configured to equip, and in the affirmative, transmitting the IP-based telegram or data comprised within said IP-based telegram to the on-board system (62) addressed by said IP-based telegram, otherwise reencoding the IP-based telegram into a PLC signal and reinjecting the latter in the PEI;

wherein each IP-based telegram comprises an identification data configured for enabling an identification of one or several recipients of the IP-based telegram.

2. Communication system (1) according to claim 1, comprising
   - the control center (10) configured for receiving and/or transmitting IP-based telegrams from/to said one or several on-board systems of the guided vehicle, said control center being configured for using the IP network for the reception and/or transmission of the IP-based telegrams, wherein the control center is configured for sending to the PLC system said IP-based telegrams, or for receiving from said PLC system IP-based telegrams, wherein each IP-based telegram is configured for encoding signals or data using an internet protocol;
   - said IP network (20) configured for enabling the communication of said IP-based telegrams between the control center and the PLC system.

3. Communication system (1) according to claim 2, wherein said recipients are one or several guided vehicles (60) that are defined each as recipient of the IP-based telegram, and/or a control center (10).

4. Communication system (1) according to one of the claims 1 to 3, comprising a line termination unit - hereafter LTU - configured for being connected to the PEI, said LTU being further configured for being installed at a location wherein each guided vehicle arriving in the neighborhood of said location according to a first moving direction stops, and then departs in a second moving direction being opposite to the first moving direction.

5. Communication system (1) according to claim 4, wherein the LTU comprises a capacitor connected in series with

the PEI, and a line trap connected in series with the capacitor.

6. Communication system (1) according to one of the claims 1 to 5, wherein if the OPLC system (65) determines that the IP-based telegram is addressed to an on-board system of another guided vehicle and/or to the control center in addition of being addressed to one of the on-board systems of the guided vehicle it is configured to equip, then the OPLC system is further configured for encoding an amended IP-based telegram into a PLC signal, wherein said amended IP-based telegram is the received IP-based telegram to which the identification data has been amended by withdrawing each recipient that corresponds to an on-board system of the guided vehicle it is configured to equip and that was already addressed by the identification data of the received IP-based telegram, and then for reinjected into the PEI the PLC signal encoding the amended IP-based telegram.

7. Communication system (1) according to one of the claims 1 to 6, wherein the coupling unit (30A) of the PLC system (30A) and the coupling unit (65A) of the OPLC system (65) comprise each a capacitor and a line trap, the capacitor of the OPLC/PLC system being connected with the PEI, the line trap being connected in series with the capacitor, and communication equipment of the PLC/OPLC system being connected in series with the line trap.

8. Method of communication between a guided vehicle (60) and a remote control center (10) and/or another guided vehicle, wherein the guided vehicle (60) is powered by electricity provided by an electrified railway network

comprising a power electrical infrastructure – hereafter PEI – used for providing electrical power to the guided vehicle (60), the method comprising the following steps:

a) for transmitting a signal or data from the control center (10) to the guided vehicle (60):
   - sending (201) from the control center (10) to a PLC system (30) an IP-based telegram encoding said signal or data;
   - encoding (202), by means of the PLC system (30), the received IP-based telegram into a PLC signal;
   - sending (203) from the PLC system (30) said PLC signal, wherein said sending comprises using the PEI as channel for communicating PLC signals;
   - receiving (204), by means of an OPLC system (65) configured for being installed on-board the guided vehicle (60), said PLC signal and decoding the latter in order to determine the IP-based telegram which was encoded into said PLC signal;
   - determining (205) whether the IP-based telegram is addressed to an on-board system (62) of the guided vehicle the OPLC system equips, and in the affirmative, transmitting the IP-based telegram or data comprised within said IP-based telegram to the on-board system addressed by said IP-based telegram, otherwise reencoding the IP-based telegram into a PLC signal and reinjecting the latter in the PEI as it was originally sent by the PLC or OPLC system that created the original PLC signal;

b) for transmitting a signal or data from the guided vehicle (60):

- sending (206) by an on-board system (62) of the guided vehicle (60) data or an IP-based telegram encoding said data which have to be transmitted to the control center (10) and/or to another guided vehicle;
- receiving (207) by the OPLC system (65) said data or said IP-based telegram and creating a PLC signal encoding the received IP-based telegram or an IP-based telegram encoding the received data;
- sending (208) from the OPLC system (65) said PLC signal, wherein said sending comprises using the PEI as communication channel for communicating said PLC signal;
- receiving (209), by means of the PLC system (30), said IP-based telegram and decoding the latter in order to determine the IP-based telegram which was encoded into the PLC signal;
- determining, by the PLC system (30), whether the IP-based telegram is addressed to the control center and/or to one or several on-board systems of said another guided vehicle, and if the control center (10) is indicated by the identification data as a recipient of the IP-based telegram, then transmitting by means of the PLC system the IP-based telegram to the control center (10), otherwise if an on-board system of said another guided vehicle is indicated as recipient of the IP-based telegram, while the control center is not part of the recipients, then the PLC system reencodes the

received IP-based telegram into a PLC signal and reinjects the latter into the PEI.

9. Method according to claim 8, wherein if the identification data indicates, in addition to the control center (10), an on-board system of another guided vehicle as recipient of the decoded IP-based telegram, then, in addition to transmitting the IP-based telegram to the control center (10), the PLC system is configured for creating an amended IP-based telegram being the received IP-based telegram to which the identification data has been amended by withdrawing the control center from the recipients, the PLC system encoding then the amended IP-based telegram into a PLC signal and injecting the latter into the PEI.