Claims

1. A RFID tag (1) configured to transmit a predetermined code represented by a juxtaposition of symbols (3_{A-K}) as a RF backscattered radiation (2) in response to an impinging RF signal (41),

wherein the RFID tag (1) is configured to react to an impinging signal at a predetermined reference frequency (23) with a reference backscattered signal (2_R) having a reference amplitude,

characterized in that

the RFID tag (1) is further configured to react to an impinging signal (41) at any of a group of predefined distinct transmission frequencies (21, 22) comprising at least a transmission frequency with coding backscattered signals (2_{A-G}) whose amplitudes (20_A, 20_B, 20_R) relative to the reference amplitude (20_R) of the reference backscattered signal define the code (3_{A-K})~~;~~

~~the group of transmission frequencies comprises at least a transmission frequency (21, 22), preferably the group of transmission frequencies comprises a plurality of transmission frequencies (21, 22); more preferably the number of transmission frequencies being a power of 2~~, wherein the amplitude of each coding backscattered signal (2_{A-E}) is greater, equal or smaller than the reference amplitude (20_R) based on one of the symbols.

~~2. The RFID Tag according to claim 1, wherein the amplitude (20_R) of the reference backscattered signal (20_R) is either~~

~~smaller or larger than the amplitudes of the coding backscattered signals, or~~

~~identical than the smallest or largest amplitude of the coding backscattered signals.~~

~~3.~~2. The RFID tag according to ~~any one of claims~~ claim 1 ~~to 2~~, comprising a group of dipole antennas;

the group of dipole antennas comprising one or more coding dipole antennas (24_{A-K}), each coding dipole antenna (24_{A-K}) providing the coding backscattered signal at one transmission frequency of the group of transmission frequencies (22, 23).

4.3. The RFID tag according to any one of claims 1 to 32, comprising a group of resonating units;

the group of resonating units comprising one or more coding resonating units (25_{A-D}), each comprising a resonator transmission line (251_A, 251_C) electrically connected between two antennas (253_A, 253_C), preferably being monopole antennas;

each coding resonating unit (25_{A-D}) providing the coding backscattered signal at one transmission frequency of the group of transmission frequencies (22, 23).

5.4. The RFID tag according to any one of claims 1 to 43, comprising a group of meander line loaded antennas;

the group of meander line loaded antennas comprising one or more coding meander line loaded antennas (26_{A-B}), each coding meander line loaded antenna providing the coding backscattered signal at one transmission frequency of the group of transmission frequencies (22, 23).

6.5. The RFID tag according to any one of claims 3 2 to 54, wherein

the group of dipole antennas further comprises a reference dipole antenna (24_R) providing the reference backscattered signal (2_R); or wherein

the group of resonating units further comprises a reference resonating unit (25_R) comprising a resonator transmission line electrically connected between two antennas, the reference resonating unit providing the reference backscattered signal (2_R); or wherein

the group of meander line loaded antennas further comprises a reference meander line loaded antenna (26_R) providing the reference backscattered signal (2_R).

7.6. The RFID tag according to any one of claims 3 2 to 65, wherein at least one dipole antennas of said group of dipole antennas and/or at least one resonator transmission line of said group of resonating units and/or at least one meander line loaded antenna of said the group of meander line loaded antennas is printed on a support (10);

preferably a plurality of dipole antennas of said group of dipole antennas and/or a plurality of the resonator transmission lines of said group of resonating units and/or a plurality of meander line loaded antennas of said the group

of meander line loaded antennas are printed on a support (10), preferably on a same support (10).

~~8.~~7. The RFID tag according to claim ~~7~~6, wherein each of said plurality of dipole antennas and/or of said plurality of the resonator transmission lines and/or of said plurality of meander line loaded antennas comprises a coding portion;

electrical impedances of said coding portions with respect to a reference electrical impedance define the code (3_{A-H});

preferably shapes and/or dimensions and/or materials of said coding portions define the code (3_{A-H});

preferably said reference electrical impedance being related to an electrical impedance of the reference dipole antenna (24_R) and/or of the reference resonating unit and/or of the reference meander line loaded antenna (26_R).

8. The RFID tag according to claim ~~8~~7, wherein the material of said coding portions is selected within a set of conductible printable materials;

preferably said set of conductible printable materials comprises: a conductive metal, a conductive ceramic and/or a conductive polymer.

9. The RFID TAG of any one of claims 1-8, wherein each symbol is represented by more than one digital bit.

10. A RFID reader (4) arranged to emit an interrogation RF signal (41), receive backscattered signals (2) from an RFID tag (1), and reconstruct a code (3_{A-K}) encoded in the backscattered signals, characterized in that

the RFID reader (4) is further arranged to:

measure a reference amplitude (20_R) of a backscattered signal (2_R) at a predetermined reference frequency (23),

measure the coding amplitudes (20_{A-B}) of backscattered signals (2_{A-E}) at any of a group of predefined distinct transmission frequencies (21, 22),

for each measured coding amplitude determine a coding symbol based on whether the coding amplitude is greater, equal or smaller than the reference amplitude, and

determine a code (3_{A-K}) of the RFID tag (1) ~~based on the coding~~

~~amplitude (20_{A-B}) relative to the reference amplitude (20_R)~~juxtaposing the coding symbols.

11. A kit (5) comprising:
a RFID tag (1) according to any one of claims 1 to 9, and
a RFID reader (4) according to claim 10.

12. A method for transmitting a code from a device (1) to a reader (4) as a RF backscattered radiation (2) in response to an impinging RF signal (41) generated by the reader (4), the code being represented by a juxtaposition of symbols the method comprising:

providing a reference backscattered signal (2_R) having a reference amplitude in reaction to an impinging signal at a predetermined reference frequency (23); characterized by

providing a plurality of coding backscattered ~~signal~~ signals (2_{A-G}) in reaction to an impinging ~~signal~~ signals having ~~at~~ a ~~first~~ transmission frequency in a group of predefined distinct transmission frequencies;

wherein the amplitude (20_A, 20_B, 20_R) of ~~the~~ each coding backscattered signal (2_{A-E}) is greater, equal or smaller than the reference ~~relative to the~~ amplitude (20_R) ~~of the reference backscattered signal defines the code (3_{A-H})~~based on one of the symbols.

~~13. The method according to claim 12, the method further comprising:~~
~~in reaction to any impinging signal at one of a groups of transmission frequencies, providing a coding backscattered signal (2_{A-E});~~

~~wherein the amplitudes (20_A, 20_B, 20_R) of the coding backscattered signals (2_{A-E}) relative to the amplitude (20_R) of the reference backscattered signal define the code (3_{A-H}).~~

~~14.~~13. The method according to claim 11~~12 or 13~~, wherein a modification of the amplitude (20_A, 20_B, 20_R) of each of said coding backscattered signals (2_{A-E}) relative to the amplitude (20_R) of the reference backscattered signal is obtained by modifying the electrical impedance of an electrical conductive portion (29_{A-Q}) of the device (1);

said electrical conductive portion (29_{A-Q}) being a portion of an antenna or being an electrical conductive portion electrically connected to one or more antennas.

~~15.~~14. The method according to claim ~~14~~13, wherein said an electrical conductive portion (29_{A-Q}) is a portion of: a dipole antenna, a resonator transmission line electrically connected between two antennas (28), and/or of meander line loaded antenna (26_A, 26_B,26_R).

15. The method according to claim ~~14~~ 13 or ~~15~~14, wherein said electrical conductive portion (29_{A-Q}) is printed on a support (10).

16. The method of any one of claims 12 to 15, wherein each symbol is represented by more than one digital bit.