Optimal wireless communication by ‘sensing’ clear transmission space

This technology optimises the use of wireless spectrums and does this by identifying ‘clear transmission space’. More specifically, the technology improves channel estimation performance in dynamic spectrum access (DSA) multi-carrier systems operating in an interference-affected environment. DSA channels are characterised by the presence of multiple in-band interference sources, having random spectrum characteristics. In such conditions, conventional pilot signal patterns are often inapplicable for the channel state information identification. The technology resolves this issue, increasing bandwidth for wireless network service providers, wireless device manufacturers, and regulatory structures. This innovation, using a novel method and algorithm, improves channel estimation performance in DSA multi-carrier systems operating in an interference-affected environment.

Benefits

- The algorithm limits interference from primary spectrum users during DSA and optimises the pilot structure
- Minimises channel estimation error variance
- Is capable of incorporating any restrictions on the transmit sub-carriers
- Uplink multi-user multi-carrier interfaces can be developed
- Suitable for systems operating in the range 1-100 GHz

Market

The technology has been developed specifically for pilot-assisted systems, i.e. communication systems embedding continuous channel identification (tracking) procedures and will find application in new generation and dynamic broadband wireless communication systems.

The technology could be of value to:

- Wireless network service providers
- Wireless device manufacturers
- Regulatory structures

Technical Description

The scope of the patent application covers a method for improving the channel estimation performance in a dynamic spectrum access multicarrier system, using a pattern of pilot symbols included in transmitted signals. The algorithm could be implemented on either a general purpose signal processing hardware system (such as a Software Defined Radio platform) or integrated into the PHY protocol of a bottom-up designed ASIC-based transceiver. The appropriate pilot symbols are determined adaptively by carrying out the following steps:
a. explicitly characterising an interference-affected propagation environment by defining a covariance matrix of interference and white Gaussian noise based on external measurements for the propagation environment;

b. determining the placement of a predetermined number of equally powered pilot symbols by computing a placement pattern that results in the minimum sum of square errors of a maximum likelihood channel estimation performed based on the covariance matrix; and

c. with the pilot symbols in their placed positions, determining relative power distribution between the placed pilot symbols by computing a power loading that results in the minimum sum of square errors of a maximum likelihood channel estimation performed based on the covariance matrix.

Intellectual Property Status

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The inventor is Eugene Golovins.

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