Novel Measurement of Intermodulation Distortion (IMD) in Ferrite Circulators

BACKGROUND
The rapid expansion of wireless communications and the development of mobile phone technology have resulted in a market requirement for large capacity communication systems. Wideband Code Division Multi-Access (WCDMA) is considered to be promising technology to meet this requirement. Ideally, the base station of a WCDMA system should handle signals over a very wide frequency range with minimum distortion. Any change of the antenna load condition in base station WCDMA can cause intermodulation distortion (IMD) and serious adjacent channel power leakage (ACPL).

A ferrite circulator is a three terminal device that causes a RF signal to flow cyclicly between any two adjacent ports. This flow is restricted to one direction only or it can be switched. Inserted between the antenna and the power amplifier, the circulator isolates any change in the antenna condition. However, due to non-linearities and the circulator, IMD may be generated.

THE TECHNOLOGY
Understanding and measurement of IMD is critical for the design of next-generation microwave and RF amplifier. However, although the measurement of IMD in ferrite circulators is already established, to date it has not been possible to examine the individual causes of IMD. Research at the University of Manchester has generated a method for measuring and evaluating the IMD of the ferrite elements within circulators and separating the individual factors contributing to IMD. As a consequence, this evaluation has allowed the development of ferrite circulators with significantly reduced IMD.

KEY BENEFITS
- Method for measuring and evaluating the performance of circulators
- Optimisation of circulator design with enhanced performance, i.e. reduced IMD

POTENTIAL APPLICATIONS
- Wireless communications
- Mobile Telephone Technology
PATENT STATUS
A UK patent has been filed by the University of Manchester.

The work has been carried out by Dr Taro Miura and Prof Lionel Davis in the School of Electrical & Electronic Engineering, University of Manchester.

COLLABORATION OPPORTUNITY
The technology has been established and the test rig is operational. The team would like to hear from companies interested in:
- Measurement and evaluation of IMD in ferrite materials
- Improving Circulator performance
- Technical advice on IMD and Circulators

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