



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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| <b>(51) International Patent Classification <sup>6</sup> :</b><br><br><b>H04B 3/23</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>A1</b> | <b>(11) International Publication Number:</b> <b>WO 96/15597</b><br><br><b>(43) International Publication Date:</b> 23 May 1996 (23.05.96)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>(21) International Application Number:</b> PCT/GB95/02618<br><br><b>(22) International Filing Date:</b> 7 November 1995 (07.11.95)<br><br><b>(30) Priority Data:</b><br>94308291.7 10 November 1994 (10.11.94) EP<br>(34) Countries for which the regional or international application was filed: GB et al.<br>94308290.9 10 November 1994 (10.11.94) EP<br>(34) Countries for which the regional or international application was filed: GB et al.<br><br><b>(71) Applicant (for all designated States except US):</b> BRITISH TELECOMMUNICATIONS PUBLIC LIMITED COMPANY [GB/GB]; 81 Newgate Street, London EC1A 7AJ (GB).<br><br><b>(72) Inventors; and</b><br><b>(75) Inventors/Applicants (for US only):</b> TRAILL, Douglas, Mackay [GB/GB]; 4 Kemball Street, Ipswich, Suffolk IP4 5EE (GB). SHEPPARD, Philip, Julian [GB/GB]; 7 Park View Road, Ipswich, Suffolk IP1 4HN (GB). BAI, Jianxiong [CN/GB]; Micro Systems Engineering Limited, Unit 24, Heathcote Building, Highfields, Science Park, University Boulevard, Nottingham NG7 2RJ (GB). MILLNER, Simon [GB/GB]; Fujitsu Microelectronics Limited, |           | European VLSI Design Centre, Vaughan Street, West Gorton, Manchester M12 5DU (GB).<br><br><b>(74) Agent:</b> LIDBETTER, Timothy, Guy, Edwin; BT Group Legal Services, Intellectual Property Dept., 8th floor, Holborn Centre, 120 Holborn, London EC1N 2TE (GB).<br><br><b>(81) Designated States:</b> AL, AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, UG, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, LS, MW, SD, SZ, UG).<br><br><b>Published</b><br>With international search report.<br>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments. |
| <b>(54) Title:</b> ECHO CANCELLATION USING CROSS-CORRELATION OF BUFFERED RECEIVE AND TRANSMIT SAMPLE SEGMENTS TO DETERMINE CANCELLING FILTER COEFFICIENTS<br><br><div data-bbox="284 1240 1374 1724" data-label="Diagram"> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>(57) Abstract</b><br><br>An echo detection system comprises data stores (8, 18) for storing signals from up and down channels (5, 15) respectively. The signals undergo pre-processing (9, 19) to identify signals forms characteristic of speech and instruct the measurement unit (10) to carry out comparison using cross-correlation techniques between the signals stored in stores (8, 18) only when such characteristics are detected. This reduces the processing power required and raises the accuracy of the correlations. Parallel processing techniques allow echoes with longer delay periods to be detected. The results of the measurement may be used to generate an echo-cancellation signal (units 7, 17).                                                                                                                                                                                                                                                                                                                                                                                     |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |