

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
19 August 2004 (19.08.2004)

PCT

(10) International Publication Number
WO 2004/070958 A2

(51) International Patent Classification⁷: **H04B**

Drive, Clifton, VA 20124 (US). **SHAPIRO, Jerome, M.**
[US/US]; 41 Madison Street, Belmont, MA 02478 (US).

(21) International Application Number:
PCT/US2004/002318

(74) Agents: **TOBIN, Christopher, M.** et al.; Collier Shannon
Scott, PLLC, 3050 K Street N.W., Suite 400, Washington,
District of Columbia 20007-5108 (US).

(22) International Filing Date: 29 January 2004 (29.01.2004)

(25) Filing Language: English

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,
MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,
ZW.

(26) Publication Language: English

(30) Priority Data:
60/443,655 30 January 2003 (30.01.2003) US
10/765,202 28 January 2004 (28.01.2004) US

(71) Applicant (for all designated States except US): **THE
MITRE CORPORATION** [US/US]; 7515 Colshire
Drive, McLean, VA 22102-7508 (US).

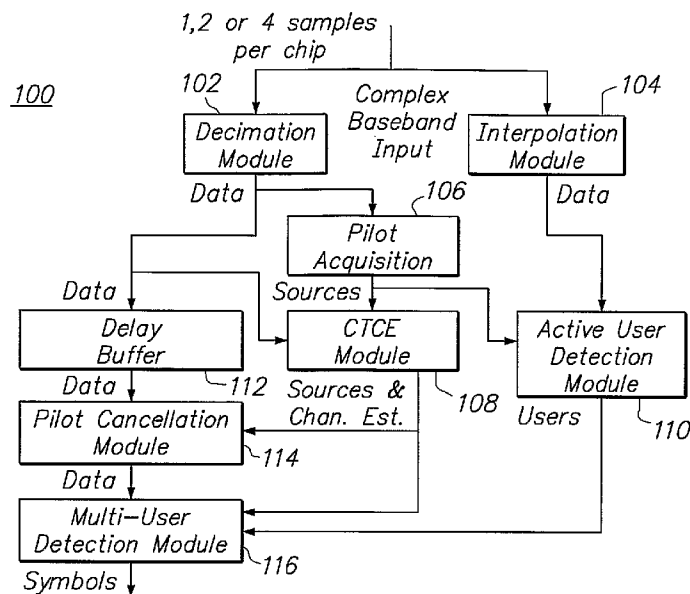
(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), Euro-
pean (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR,
GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK,

(72) Inventors; and

(75) Inventors/Applicants (for US only): **DUNYAK, James,
P.** [US/US]; 124 Adams Street, Lexington, MA 02420
(US). **FTTE, John, D.** [US/US]; 12518 Knollbrook

[Continued on next page]

(54) Title: SUB-SYMBOL PARALLEL INTERFERENCE CANCELLATION



(57) Abstract: Reduction of multiple access interference, in one example for asynchronous CDMA systems using long codes. In one aspect, parallel interference cancellation (PIC) implements a decoupled estimate, preferably non-linear and applied at chip intervals. According to another aspect, interference is cancelled using a technique that estimates bits for a symbol by interpolating signature waveforms for users to a common sampling lattice of the received data. According to another aspect, multi-stage, hybrid multi-stage, and reconfigurable recursive multi-stage multi-user detection architectures and corresponding processes are provided.

WO 2004/070958 A2



TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:

- *without international search report and to be republished upon receipt of that report*