033005 20427 U.S.PTO

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c)

Express Mail Label No.: EV600329084US

112975 U.S.PTO 60/666494 033005

INVENTORS	
Inventor Name	Residence (City and either State or Foreign Country)
Brian K. Classon	Palatine, Illinois, United States
Additional inventors are being named on the 2 *separately numbered sheet attached hereto*	

TITLE OF THE INVENTION (280 characters maximum)

MULTIFRAME CONCEPT FOR ENHANCED UTRA (EUTRA)

CORRESPONDENCE ADDRESS

Direct all correspondence to:

☒ Customer Number 22917

OR

☐ Firm or Individual Name					
Address					
Address					
City		State		Zip	
Country		Telephone		Fax	

ENCLOSED APPLICATION PARTS (*check all that apply*)

- [X] Specification Pages — Number of Pages 24
- [ ] CD(s), Number
- [X] Drawings — Embedded in Specification
- [ ] Other (specify)
- [X] Application Data Sheet. See 37 CFR 1.76

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT

- [ ] Applicant claims small entity status. See 37 CFR 1.27.
- [ ] A check or money order is enclosed to cover the filing fees
- [X] The Director is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: **502117**. A Fee Transmittal in duplicate is attached. — Filing Fee Amount ($): $200.00
- [ ] Payment by credit card. Form PTO-2038 is attached.

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

- [X] No.
- [ ] Yes, the name of the U.S. Government agency and the Government contract number are: ______

Respectfully submitted, Date March 30, 2005

SIGNATURE [signature]

TYPED or PRINTED NAME Kenneth A. Haas — REGISTRATION NO. 42,614 *(if appropriate)*

TELEPHONE 847-576-6937 — Docket Number: CML02476M

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Effective on 12/08/2004

Fees pursuant to the Consolidated Appropriations Act. 2005 (H.R. 4818)

FEE TRANSMITTAL
For FY 2005

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT | ($)

Complete if Known	
Application Number	
Filing Date	March 30, 2005
First Named Inventor	Classon et al.
Examiner Name	
Group Art Unit	
Attorney Docket No.	CML02476M

METHOD OF PAYMENT (check all that apply)

☐ Check ☐ Credit card ☐ Money Order ☐ None ☐ Other (please identify):____________

☒ Deposit Account Deposit Account Number: **502117** Deposit Account Name: **MOTOROLA, INC.**

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☒ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, **except for the filing fee**

☒ Charge any additional fee(s) or underpayments of fee(s) under 37 CFR 1.16 and 1.17 ☒ Credit any overpayments

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FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
		Small Entity		Small Entity		Small Entity	
Application Type	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fees Paid ($)
Utility	300	150	500	250	200	100	
Design	200	100	100	50	130	65	
Plant	200	100	300	150	160	80	
Reissue	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	$200.00

2. EXCESS CLAIM FEES

Fee Description	Fee($)	Small Entity Fee ($)
Each claim over 20 or, for Reissues, each claim over 20 and more than in the original patent	50	25
Each independent claim over 3 or, for Reissues, each independent claim more than in the original patent	200	100
Multiple dependent claims	360	180

Total Claims ____ - 20 or HP= Extra Claims ____ x Fee ($) ____ = Fee Paid ($) ____

HP=highest number of total claims pad for, if greater than 20

Multiple Dependent Claims: Fee($) ____ Fee Paid ($) ____

Indep. Claims ____ - 3 or HP= Extra Claims ____ x Fee ($) ____ = Fee Paid ($) ____

HP=highest number of independent claims paid for, if greater than 3

3. APPLICATION SIZE FEE:

If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets ____ - 100 = Extra Sheets ____ /50 = Number of each additional 50 or fraction thereof ____ (round **up** to a whole number) x Fee ($) ____ Fee Paid($) ____

4. OTHER FEE(S)

Fee Paid ($)

Non-English Specification, $130 fee (no small entity discount) ________

Other: ________________________ ________

SUBMITTED BY		Complete (if applicable)			
Name (Print/Type)	Kenneth A. Haas	Registration No.	42,614	Telephone	847-576-6937
Signature	[signature]	Date	March 30, 2005		

PROVISIONAL APPLICATION COVER SHEET
Additional Page

Docket Number: CML02476M

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Kenneth A. Stewart	Grayslake, Illinois, United States

Number ____ of ____

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Multiframe concept for Enhanced UTRA

Brian Classon, Kevin Baum, Bob Love, Ken Stewart, Vijay Nangia, Amitava Ghosh

Background

One of the key requirements for wireless broadband system development, such as in the 3GPP Long Term Evolution (LTE), is reducing latency in order to improve user experience. From a link layer perspective, the key contributing factor to latency is the round-trip delay between a packet transmission and an acknowledgment of the packet reception. The round-trip delay is typically defined as a number of frames, where a frame is the time duration upon which scheduling is performed. The round-trip delay itself determines the overall ARQ design, including design parameters such as the delay between a first and subsequent transmissions of a packet, or the number of hybrid ARQ channels (instances). A reduction in latency is therefore key in developing enhanced UTRA and UTRAN (also known as EUTRA and EUTRAN), with the focus on defining the optimum frame duration.

Unfortunately, no single frame duration is best for different traffic types requiring different QoS characteristics or offering differing packet sizes. This is especially true when the control channel and pilot overhead in a frame is considered. For example, if the absolute control channel overhead is constant per user per resource allocation and a single user is allocated per frame, a frame duration of 0.5ms would be roughly four times less efficient than a frame duration of 2ms. In addition, different frame durations could be preferred by different manufacturers or operators, making the development of an industry standard or compatible equipment difficult. Therefore, there is a need for an improved method for reducing both round-trip latency and overhead.

Detailed Description

Overview

A Radio Frame (RAF) and subframe are defined such that the RAF is divided into a number (an integer number in the preferred embodiment) of subframes. For example, a 10ms core RAF structure from UTRA may be defined, with Nrf subframes per radio frame (e.g., Nrf=20 Tsf=0.5ms subframes, where Tsf=duration of one subframe). For OFDM transmission, subframes comprise an integer number P of OFDM symbol intervals (e.g., P=10 for Tsn=50us symbols, where Tsn=duration of one OFDM symbol), and one or more subframe types may be defined based on guard interval or cyclic prefix (e.g., normal or broadcast).

Within a RAF, frames are constructed from an integer number of subframes for data transmission, with two or more frame durations available (e.g., a first frame duration of one subframe, and a second frame duration of three subframes). The different frame durations may be used to reduce latency and overhead based on the type of traffic served. The radio frame structure may additionally be used to define common control channels for the DL (such as broadcast channel, paging channel, synchronization channel, indication channels) in a manner which is time-division multiplexed into the subframe sequence, which may simplify processing or increase battery life at the user equipment (UE). Similarly for UL, the radio frame structure may additionally be used to define contention channels (e.g. RACH), control channels including pilot time multiplexed with the shared data channel.

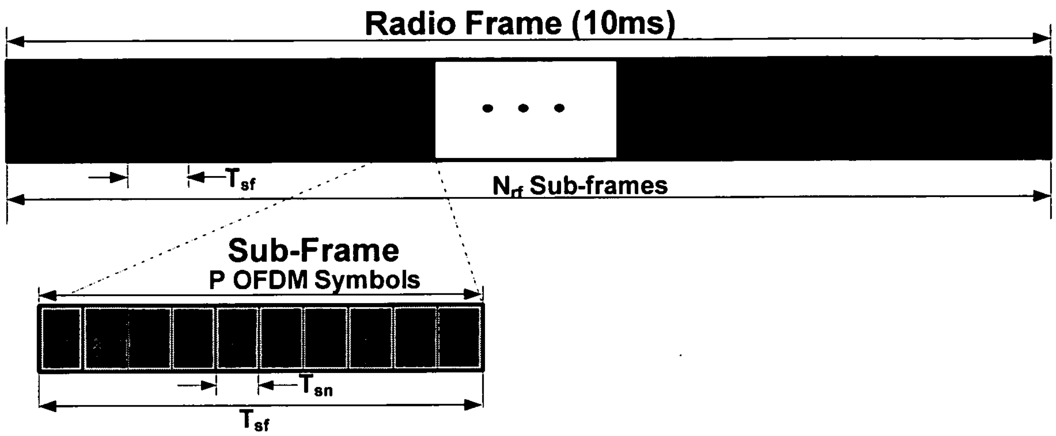

Figure 1 – Radio frame with m=20 subframes of duration 0.5ms consisting of j=10 symbols.

Data transmission is provided by:

- Receiving data to be transmitted over a radio frame, wherein the radio frame is comprised of a plurality of subframes wherein the duration of a subframe is substantially constant and the duration of the radio frame is constant;
- Selecting a frame duration from two or more frame durations, wherein the frame duration is substantially the subframe duration multiplied by a number;
- Based on the frame duration, grouping into a frame the number of subframes
- Placing the data within the subframes
- Transmitting the frame having the number of subframes over the radio frame.

The data transmission may be a downlink transmission or an uplink transmission. The transmission scheme may be OFDM with or without cyclic prefix or guard interval such as IOTA, or single carrier with or without cyclic prefix or guard interval (e.g., IFDMA, DFT-Spread-OFDM), CDM, or other.

The following sections provide details on:

- Frame durations
- Reasons for selecting a frame duration
- Subframe types
- Radio Frame Ancillary Function Multiplexing
- Framing Control

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