Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Uplink HARQ for transparent RS**
Date Submitted	**2007-~~3-5~~05-09**

Source(s)		
	Junichi Suga Fujitsu Laboratories Ltd. Kamikodanaka 4-1-1, Kawasaki, 211-8588, Japan	Voice: +81-44-754-2811 Fax: +81-44-754-2786 Email: suga.junichi@jp.fujitsu.com
	Michiharu Nakamura Fujitsu Laboratories LTD 5-5, Hikarinooka Yokosuka, Japan. 239-0847	Voice: +81-46-839-5371 Fax: +81-46-839-5560 Email: michi@labs.fujitsu.com
	Haihong Zheng, Yousuf Saifullah, Shashikant Maheshwari Nokia 6000 Connection Drive, Irving, TX	Voice: 972 894 5000 Fax: Email: haihong.1.zheng@nokia.com shashikant.maheshwai@nokia.com Yousuf.saifullah@nokia.com
	Aik Chindapol Nikolaj Marchenko Jimmy Chui Siemens Corporate Research Princeton, NJ, USA	Voice: +1 609 734 3364 Fax: +1 609 734 6565 Email: aik.chindapol@siemens.com
	Kyu Ha Lee Samsung Thales San 14, Nongseo-Dong, Giheung-Gu, Yongin, Gyeonggi-Do, Korea 449-712	Voice: +82-31-280-9917 Fax: +82-31-280-1562 Email: kyuha.lee@samsung.com
	Suchang Chae ETRI 161, Gajeong-Dong, Yuseong-Gu, Daejeon, Korea 305-350	Voice: +82-42-860-6642 Fax: +82-42-861-1966 Email: schae@etri.re.kr
	David Comstock, Huawei Technologies No.98, Lane91, Eshan Road, Shanghai, P.R.C	Voice: +1 858 735 9382 Email: dcomstock@huawei.com
	Youngbin Chang Samsung Electronics Co., Ltd.	Voice: +82-31-279-5519 Email: yb.chang@samsung.com

416 Maetan-3, Suwon, 442-600,
Korea

Voice: +82-31-280-9635
Email: rakesh.taori@samsung.com

Rakesh Taori
Samsung Advanced Institute of Technology
C.P.O. Box 1142, Seoul, 100-611,
Korea

Eugene Visotsky
Motorola, Inc.
1301 E. Algonquin Road
Schaumburg, IL 60196

eugenev@motorola.com

Jeffrey Z. Tao, Koon Hoo Teo, Jinyun Zhang
Mitsubishi Electric Research Lab
201 Broadway
Cambridge, MA 02139 USA

Voice: 617-621-{7557,7527}
Fax: 617-621-7550
{tao, teo, jzhang}@merl.com

Arnaud Tonnerre
THALES COMMUNICATIONS, FRANCE

arnaud.tonnerre@fr.thalesgroup.com
Voice: +33 1 46 13 2850

Djamal-Eddine Meddour
FRANCE TELECOM, FRANCE

djamal.meddour@orange-ft.com

Yong Sun
Toshiba Research Europe Limited
32 Queen Square
Bristol BS1 4ND
UK

Sun@toshiba-trel.com

Tel. no.: +441179060749

Kanchei (Ken) Loa, Youn-Tai Lee, Shiann Tsong Sheu, Yi-Hsueh Tsai, Yung-Ting Lee, Heng-Iang Hsu, Hua-Chiang Yin, , Frank C.D. Tsai

Voice: +886-2-2739-9616
E-mail: loa@iii.org.tw

Institute for Information Industry
8F., No. 218, Sec. 2, Dunhua S. Rd.,
Taipei City, Taiwan

Hang Zhang, Mo-Han Fong, G.Q. Wang ,Peiying Zhu, Wen Tong,

Voice: +1 613 7631315
[mailto:WenTong@nortel.com]

David Steer, Gamini Senarath, Derek Yu, Mark Naden [mailto:pyzhu@nortel.com]

Nortel
3500 Carling Avenue
Ottawa, Ontario K2H 8E9

Wei Ni, Kaibin Zhang, Gang Shen, Shan Jin
Alcatel-Lucent, Research & Innovation
No. 388, Ningqiao Rd., Pudong Jinqiao, Shanghai, P. R. C
Voice: 86-21-50554550
Fax: 86-21-50554554
mailto: wei.a.ni@alcatel-sbell.com.cn

Fang Liu, Lan Chen, Xiaoming She, Daqing Gu
DoCoMo Beijing Lab
7/F, Raycom Infotech Pack Tower A
No.2 Kexueyuan South Rd.,
Haidian District, Beijing, China
Voice: +86-10-82861501 ex.331
Fax: +86-10-82861506
mailto: {liu, gu}@docomolabs-beijing.com.cn

Fujio Watanabe
DoCoMo USA Labs
3240 Hillview Avenue, Palo Alto, CA
Voice: 650-496-4726
mail to: watanabe@docomolabs-usa.com
Voice: +82-31-280-9635
mailto: rakesh.taori@samsung.com

Re:~~Abstract~~	Call for Technical Proposals regarding IEEE Project P802.16j (IEEE 802.16j-07/007r2)~~This contribution proposes a procedure for handling retransmission of uplink HARQ for transparent RS.~~
Abstract~~Purpose~~	This contribution proposes a procedure for handling retransmission of uplink HARQ for transparent RS.~~Add proposed spec changes in P802.16j Baseline Document~~
Purpose~~Notice~~	Add proposed spec changes in P802.16j Baseline Document ~~This document has been prepared to assist IEEE 802.16. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.~~
Notice~~Release~~	This document has been prepared to assist IEEE 802.16. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.~~The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE~~

	~~802.16.~~
Release~~Patent Policy and Procedures~~	The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.~~The contributor is familiar with the IEEE 802.16 Patent Policy and Procedures <http://ieee802.org/16/ipr/patents/policy.html>, including the statement "IEEE standards may include the known use of patent(s), including patent applications, provided the IEEE receives assurance from the patent holder or applicant with respect to patents essential for compliance with both mandatory and optional portions of the standard." Early disclosure to the Working Group of patent information that might be relevant to the standard is essential to reduce the possibility for delays in the development process and increase the likelihood that the draft publication will be approved for publication. Please notify the Chair <mailto:chair@wirelessman.org> as early as possible, in written or electronic form, if patented technology (or technology under patent application) might be incorporated into a draft standard being developed within the IEEE 802.16 Working Group. The Chair will disclose this notification via the IEEE 802.16 web site <http://ieee802.org/16/ipr/patents/notices>.~~
Patent Policy and Procedures	The contributor is familiar with the IEEE 802.16 Patent Policy and Procedures <http://ieee802.org/16/ipr/patents/policy.html>, including the statement "IEEE standards may include the known use of patent(s), including patent applications, provided the IEEE receives assurance from the patent holder or applicant with respect to patents essential for compliance with both mandatory and optional portions of the standard." Early disclosure to the Working Group of patent information that might be relevant to the standard is essential to reduce the possibility for delays in the development process and increase the likelihood that the draft publication will be approved for publication. Please notify the Chair <mailto:chair@wirelessman.org> as early as possible, in written or electronic form, if patented technology (or technology under patent application) might be incorporated into a draft standard being developed within the IEEE 802.16 Working Group. The Chair will disclose this notification via the IEEE 802.16 web site <http://ieee802.org/16/ipr/patents/notices>.

Uplink HARQ for transparent RS

1. Specific text changes

[Insert new sub-clause 6.3.17.5.2]

6.3.17.5.2 UL HARQ for transparent RS

When the MR-BS chooses to receive an HARQ sub-burst from the MS through the RS, it shall inform the RS and allocate UL transmission for the RS to relay the burst to the MR-BS. If an RS receives a HARQ sub-burst from an MS correctly, the RS saves it for any possible retransmission, and sends an ACK signal to the MR-BS using the ACK channel prepared by MR-BS. Then the MR-BS allocates bandwidth for the RS to relay the HARQ sub-burst. If the MR-BS receives ACK signal from the RS, it sends an ACK on HARQ ACK Bitmap IE to the MS directly. If the MR-BS cannot decode the sub-burst relayed by the RS correctly, the MR-BS sends a NAK to the RS and allocates bandwidth for the RS to retransmit the saved sub-burst. If an RS fails to receive the HARQ sub-burst from MS correctly, the RS sends a NAK signal to the MR-BS and the MR-BS sends a NAK to the MS. Subsequently, the MR-BS may request the MS to retransmit the HARQ sub-burst.

It is also possible for the MR-BS to receive the first transmission from an MS directly. In such a case, the MR-BS informs the RS using the Compact_UL-MAP MONITOR IE that it needs to monitor the transmission. The RS, having the information on uplink resource allocations sent in the UL-MAP for the MS, monitors the HARQ sub-burst transmission sent by the MS to the MR-BS directly and attempts to decode it. When the RS receives the HARQ sub burst correctly, the RS saves it for a possible retransmission and sends an ACK to the MR-BS. On receiving the ACK from RS, MR-BS sends an ACK on HARQ ACK Bitmap IE to the MS directly. If the burst is received incorrectly at the RS the RS sends a NAK to MR BS. If MR-BS did not receive the HARQ sub-burst from the MS correctly and received a NAK from the RS, the MR-BS sends NAK on HARQ ACK Bitmap IE to the MS. Subsequently, the MR-BS may request the MS to retransmit the HARQ sub-burst. If MR-BS receives the HARQ sub-burst from the MS correctly then regardless of the ACK/NAK received from the RS, the MR-BS sends ACK on HARQ ACK Bitmap IE to the MS.

Multiple transparent RSs can also be involved in the HARQ process. The schedule of source station transmitting a sub-burst to multiple transparent RSs can be signaled by using UL_COMPACT_MONITOR_IE Compact_UL-MAP MONITOR IE which points to the burst to be received by the RSs.If an RS fails to decode the burst correctly, it shall not reencode the erroneous packet to transmit to the next hop station. In case of hop-by-hop HARQ involving multiple RSs, HARQ data is scheduled and forwarded to the next hop when MR-BS receives an ACK from at least one of the RSs. In case of multiple RSs when the resource is prescheduled for all the links, one of the RSs can be selected as designated RS, which is responsible for forwarding and reporting status to MR-BS in addition to the data forwarding.

If MS sends an ACK, the designated RS reports a C_0 code; otherwise the designated RS replies by choosing C_2 from Table xxx.

[Insert new subclause 6.3.2.3.43.6.11 and add table:]

6.3.2.3.43.6.11 Compact_UL-MAP_MONITOR_IE

The Compact_UL-MAP MONITOR IE provides the list of CIDs of the MS whose transmissions need to be

monitored in the UL part of the current frame and relayed in the next frame to the MS.

Syntax	Size	Notes
Compact DL-MAP_IE() {		
UL-MAP Type = 7	3 bits	
UL-MAP subtype	5 bits	
Number of CIDs	4 bits	Number of CIDs in the IE
For(i=0; i<Number of CIDs; i++) {		
CID(i)	16 bits	The CIDs of the connections that RS shall monitor in the current frame
}		
}		

8.4.5.4.25 HARQ ACK region allocation IE

[Insert the following text at the end of the subclause]

This IE may be used by MR-BS to define an ACK channel region on the R-UL to include one or more ACK channel(s) for RS.

RS receives HARQ UL sub-burst from MS for relaying to MR-BS at frame *i* shall transmit the ACK/NAK signal through the ACK Channel in the ACKCH region for UL MS data at frame (*i*+*k*). The frame offset *k* is defined by the "HARQ ACK Delay for UL Burst for MR" field in the UCD message.

[Insert the following table after table 302t]

Table 302xx – HARQ ACKCH region allocation for UL Data IE

Syntax	Size	Notes
HARQ ACKCH_Region_for UL Data IE() {		
Extended-2 UIUC	4 bits	0xYY
Length	8 bits	Length in bytes
OFDMA Symbol offset	8 bits	
Subchannel offset	7 bits	
No.OFDMA symbols	5 bits	
No.subchannels	4 bits	
}		

2. References

[1] C802.16j-06_132, “Relaying methods proposal for 802.16j”

[2] C802.16j-06_266r1, “Relay-Assisted Hybrid ARQ”

[3] C802.16j-06_197r1, “HARQ with Relays”

[4] C802.16j-07_002r1, “DL HARQ with Relays”

[5] C802.16j-07_029, “UL HARQ with Relays”

[6] C802.16-07_185r6, “HARQ in Multi-hop Relay System”