

SIG-B Encoding Structure

Date: 2015-07-13

Authors:

Name	Affiliation	Address	Phone	Email
Ron Porat	Broadcom			rporat@broadcom.com
Sriram Venkateswaran				mfischer@broadcom.com
Matthew Fischer				
Leo Montreuil				
Vinko Erceg				
Robert Stacey	Intel	2111 NE 25th Ave, Hillsboro OR 97124, USA	+1-503-724-893	robert.stacey@intel.com
Po-Kai Huang				po-kai.huang@intel.com
Qinghua Li				qinghua.li@intel.com
Xiaogang Chen				xiaogang.c.chen@intel.com
Chitto Ghosh				chittabrata.ghosh@intel.com
Laurent cariou				laurent.cariou@intel.com
Rongzhen Yang				rongzhen.yang@intel.com

Authors (continued)

Name	Affiliation	Address	Phone	Email
Hongyuan Zhang	Marvell	5488 Marvell Lane, Santa Clara, CA, 95054	408-222-2500	hongyuan@marvell.com
Yakun Sun				yakunsun@marvell.com
Lei Wang				Leileiw@marvell.com
Liwen Chu				liwenchu@marvell.com
Jinjing Jiang				jinjing@marvell.com
Yan Zhang				y Zhang@marvell.com
Rui Cao				ruicao@marvell.com
Jie Huang				jiehuang@marvell.com
Sudhir Srinivasa				sudhirs@marvell.com
Saga Tamhane				sagar@marvell.com
Mao Yu	my@marvel.com			
Edward Au	edwardau@marvell.com			
Hui-Ling Lou	hlou@marvell.com			

Authors (continued)

Name	Affiliation	Address	Phone	Email
Albert Van Zelst	Qualcomm	Straatweg 66-S Breukelen, 3621 BR Netherlands		allert@qti.qualcomm.com
Alfred Asterjadhi		5775 Morehouse Dr. San Diego, CA, USA		aaasterja@qti.qualcomm.com
Bin Tian		5775 Morehouse Dr. San Diego, CA, USA		btian@qti.qualcomm.com
Carlos Aldana		1700 Technology Drive San Jose, CA 95110, USA		caldana@qca.qualcomm.com
George Cherian		5775 Morehouse Dr. San Diego, CA, USA		gcherian@qti.qualcomm.com
Gwendolyn Barriac		5775 Morehouse Dr. San Diego, CA, USA		gbarriac@qti.qualcomm.com
Hemanth Sampath		5775 Morehouse Dr. San Diego, CA, USA		hsampath@qti.qualcomm.com
Menzo Wentink		Straatweg 66-S Breukelen, 3621 BR Netherlands		mwentink@qti.qualcomm.com
Richard Van Nee		Straatweg 66-S Breukelen, 3621 BR Netherlands		rvanee@qti.qualcomm.com
Rolf De Vegt		1700 Technology Drive San Jose, CA 95110, USA		rolfv@qca.qualcomm.com
Sameer Vermani		5775 Morehouse Dr. San Diego, CA, USA		svverman@qti.qualcomm.com
Simone Merlin		5775 Morehouse Dr. San Diego, CA, USA		smerlin@qti.qualcomm.com
Tevfik Yucek		1700 Technology Drive San Jose, CA 95110, USA		tyucek@qca.qualcomm.com
VK Jones		1700 Technology Drive San Jose, CA 95110, USA		vkjones@qca.qualcomm.com
Youhan Kim	1700 Technology Drive San Jose, CA 95110, USA		youhank@qca.qualcomm.com	

Authors (continued)

Name	Affiliation	Address	Phone	Email
James Yee	Mediatek	No. 1 Dusing 1 st Road, Hsinchu, Taiwan	+886-3-567-0766	james.yee@mediatek.com
Alan Jauh				alan.jauh@mediatek.com
Chingwa Hu				chingwa.yu@mediatek.com
Frank Hsu				frank.hsu@mediatek.com
Thomas Pare	Mediatek USA	2860 Junction Ave, San Jose, CA 95134, USA	+1-408-526-1899	thomas.pare@mediatek.com
ChaoChun Wang				chaochun.wang@mediatek.com
James Wang				james.wang@mediatek.com
Jianhan Liu				Jianhan.Liu@mediatek.com
Tianyu Wu	Apple			tianyu.wu@mediatek.com
Russell Huang				russell.huang@mediatek.com
Joonsuk Kim				joonsuk@apple.com
Aon Mujtaba				mujtaba@apple.com
Guoqing Li				guoqing_li@apple.com
Eric Wong				ericwong@apple.com
Chris Hartman				chartman@apple.com

Authors (continued)

Name	Affiliation	Address	Phone	Email
Phillip Barber	Huawei	The Lone Star State, TX		pbarber@broadbandmobiletech.com
Peter Loc				peterloc@iwirelesstech.com
Le Liu		F1-17, Huawei Base, Bantian, Shenzhen	+86-18601656691	liule@huawei.com
Jun Luo		5B-N8, No.2222 Xinjinqiao Road, Pudong, Shanghai		jun.l@huawei.com
Yi Luo		F1-17, Huawei Base, Bantian, Shenzhen	+86-18665891036	Roy.luoyi@huawei.com
Yingpei Lin		5B-N8, No.2222 Xinjinqiao Road, Pudong, Shanghai		linyngpei@huawei.com
Jiyong Pang		5B-N8, No.2222 Xinjinqiao Road, Pudong, Shanghai		pangjiyong@huawei.com
Zhigang Rong		10180 Telesis Court, Suite 365, San Diego, CA 92121 NA		zhigang.rong@huawei.com
Rob Sun		303 Terry Fox, Suite 400 Kanata, Ottawa, Canada		Rob.Sun@huawei.com
David X. Yang		F1-17, Huawei Base, Bantian, Shenzhen		david.yangxun@huawei.com
Yunsong Yang		10180 Telesis Court, Suite 365, San Diego, CA 92121 NA		yangyunsong@huawei.com
Zhou Lan		F1-17, Huawei Base, Bantian, SHenzhen	+86-18565826350	Lanzhou1@huawei.com
Junghoon Suh		303 Terry Fox, Suite 400 Kanata, Ottawa, Canada		Junghoon.Suh@huawei.com
Jiayin Zhang		5B-N8, No.2222 Xinjinqiao Road, Pudong, Shanghai	+86-18601656691	zhangjiayin@huawei.com

Authors (continued)

Name	Affiliation	Address	Phone	Email		
Wookbong Lee				wookbong.lee@lge.com		
Kiseon Ryu				kiseon.ryu@lge.com		
Jinyoung Chun				jiny.chun@lge.com		
Jinsoo Choi				js.choi@lge.com		
Jeongki Kim	LG Electronics	19, Yangjae-daero 11gil, Seocho-gu, Seoul 137- 130, Korea		jeongki.kim@lge.com		
Giwon Park				giwon.park@lge.com		
Dongguk Lim				dongguk.lim@lge.com		
Suhwook Kim				suhwook.kim@lge.com		
Eunsung Park				esung.park@lge.com		
HanGyu Cho				hg.cho@lge.com		
Thomas Derham			Orange			thomas.derham@orange.com
Bo Sun			ZTE	#9 Wuxingduan, Xifeng Rd., Xi'an, China		sun.bo1@zte.com.cn
Kaiying Lv		lv.kaiying@zte.com.cn				
Yonggang Fang		yfang@ztetx.com				
Ke Yao		yao.ke5@zte.com.cn				
Weimin Xing		xing.weimin@zte.com.cn				
Brian Hart	Cisco Systems	170 W Tasman Dr, San Jose, CA 95134		brianh@cisco.com		
Pooya Monajemi				pmonajem@cisco.com		

Authors (continued)

Name	Affiliation	Address	Phone	Email
Fei Tong	Samsung	Innovation Park, Cambridge CB4 0DS (U.K.)	+44 1223 434633	f.tong@samsung.com
Hyunjeong Kang		Maetan 3-dong; Yongtong-Gu Suwon; South Korea	+82-31-279-9028	hyunjeong.kang@samsung.com
Kaushik Josiam		1301, E. Lookout Dr, Richardson TX 75070	(972) 761 7437	k.josiam@samsung.com
Mark Rison		Innovation Park, Cambridge CB4 0DS (U.K.)	+44 1223 434600	m.rison@samsung.com
Rakesh Taori		1301, E. Lookout Dr, Richardson TX 75070	(972) 761 7470	rakesh.taori@samsung.com
Sanghyun Chang		Maetan 3-dong; Yongtong-Gu Suwon; South Korea	+82-10-8864-1751	s29.chang@samsung.com
Yasushi Takatori	NTT	1-1 Hikari-no-oka, Yokosuka, Kanagawa 239-0847 Japan		takatori.yasushi@lab.ntt.co.jp
Yasuhiko Inoue				inoue.yasuhiko@lab.ntt.co.jp
Yusuke Asai				asai.yusuke@lab.ntt.co.jp
Koichi Ishihara				ishihara.koichi@lab.ntt.co.jp
Akira Kishida				kishida.akira@lab.ntt.co.jp
Akira Yamada				yamadaakira@nttdocomo.com
Fujio Watanabe	NTT DOCOMO	3-6, Hikarinooka, Yokosuka- shi, Kanagawa, 239-8536, Japan		watanabe@docomoinnovations. com
Haralabos Papadopoulos			3240 Hillview Ave, Palo Alto, CA 94304	

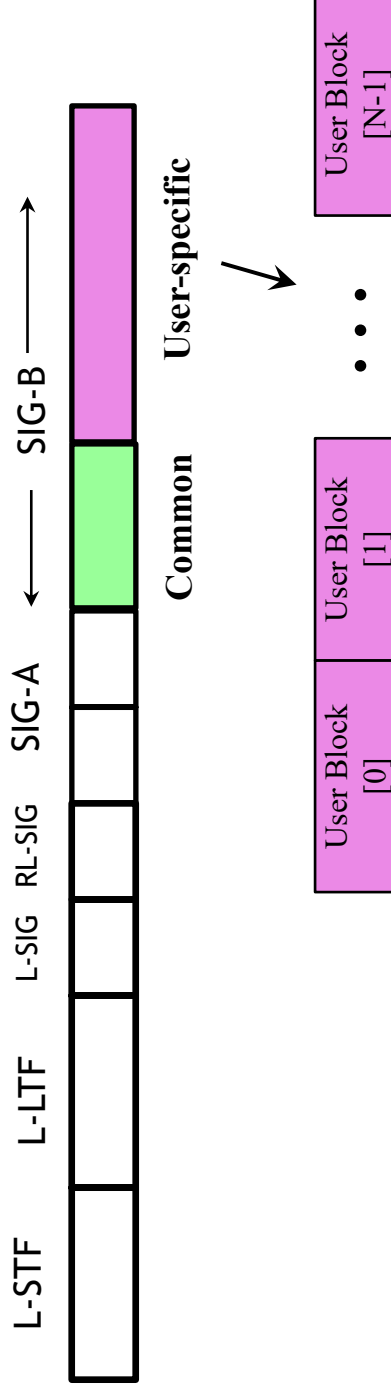
Introduction

- **Background**
 - In companion contributions [1] and [2], we propose the basics of signaling structure for 11ax
 - SIG-A
 - Carries bits common to all users, including OBSS STAs
 - 2 symbols @ MCS0 with BCC encoding
 - SIG-B
 - Carries bits only for intended recipient(s) of the packet
 - Further split into two logical fields - “common” and “user-specific”

- **This contribution**
 - Propose SIG-B encoding structure in time and frequency domains based on the following design philosophies
 - Simple extensions of SIG-A design structure that do not require fundamentally more complex or different encoding/decoding
 - Flexible design operating in the bit domain

SIG-B encoding scheme

- SIG-B encoded on a per-20 MHz basis using BCC as shown below.
- The common and per-user blocks are separated in the bit domain → flexibility to have any number of bits in the common and per-user blocks



- Why encode on a per-20 MHz basis?
 - In tune with OFDMA philosophy: user indicates preferred band, information flows on that band, user's signaling is sent on the same band as payload
 - If signaling is carried in a band other than the preferred band, interference can cause errors.
 - Maintain a simple unit of 20MHz for preamble encoding as in SIG-A

Scaling of encoding scheme for higher BWs

- For bandwidths ≥ 40 MHz
 - Two 20 MHz subbands carry different information
 - Other 20 MHz subbands are duplicated as per the structure shown on the side
 - Therefore, each STA must decode two subbands
- Why this choice?
 - Tradeoff between implementation complexity & efficiency
 - **Complexity:** More subbands \rightarrow more parallel decoders
 - **Efficiency:** As BW increases, support more users without increasing SIGB duration.
 - Number of users may not increase much in 80MHz and 160MHz because we will be scheduling large 40MHz and 80MHz users.
 - Why the [1 2 1 2 . . .] structure?
 - 80 MHz is a natural extension of 40 MHz
 - In addition, assume one 40 MHz allotted to single large user (or as MU) and second 40MHz is allocated to many small units. Signaling scheme amortizes the overhead across two independent 20MHz.
 - Likewise for 160 MHz

40 MHz



80 MHz



160 MHz



- Each square: 20 MHz subband
- 1/2: Different signaling info

References

- [1] 11-15-0822-00-00ax SIG-A Structure in 11ax Preamble
- [2] 11-15-0821-00-00ax HE-SIG-B Structure

SP #1

Do you support the following: SIG-B is encoded on a per-20 MHz basis using BCC, with common and user blocks separated in the bit domain?

Yes

No

Abs

SP #2

Do you support the following: for bandwidths ≥ 40 MHz, the number of 20MHz subbands carrying different content is two and with structure as shown

40 MHz



80 MHz



160 MHz



- Yes
No
Abs
- Each square: 20 MHz subband
 - 1/2: Different signaling info