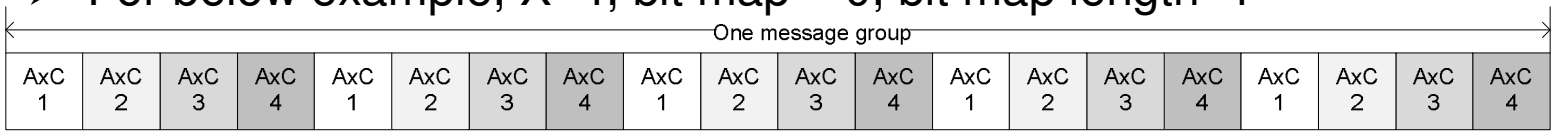
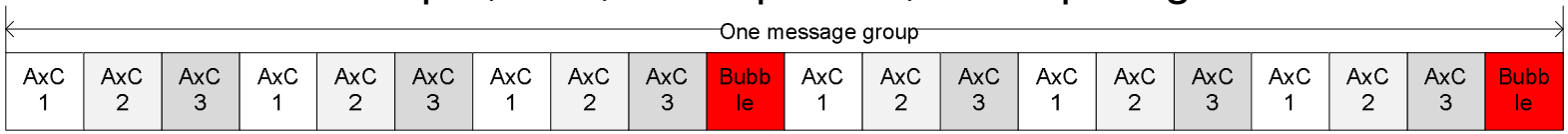
Dual Bit Map (DBM)

- **A link may carrier just multiple of AxC number, for example WCDMA, LTE, TD-SCDMA.**
  - DBM is not really necessary for these cases
  - For below example, X=4, bit map = 0, bit map length=1



- **For some radio standards, such as 15MHz LTE, Wimax and GSM, the link speed is not just multiple of antenna data speed.**
  - DBM rules should be used to implement a “rate matching”
  - For example, if the link speed/antenna data speed = 10/3= 3.33333…
  - For below example, X=3, bit map= 001, bit map length =3



- **DBM is defined by OBSAI specification, CPRI specificatin does not define it. But AIF2 implements it for both OBSAI and CPRI.**

LTE Sample Packing in CPRI 2x link

2x basic Frame

16x 1.4MHz		A0S0	A1S0	A2S0	A3S0	A4S0	A5S0	A6S0	A7S0		A8S0	A9S0	A10S0	A11S0	A12S0	A13S0	A14S0	A15S0		A0S1	A1S1	A2S1	A3S1	A4S1	A5S1	A6S1	A7S1		A8S1	A9S1	A10S1	A11S1	A12S1	A13S1	A14S1	A15S1
8x 3MHz		A0S0	A1S0	A2S0	A3S0	A4S0	A5S0	A6S0	A7S0		A0S1	A1S1	A2S1	A3S1	A4S1	A5S1	A6S1	A7S1		A0S2	A1S2	A2S2	A3S2	A4S2	A5S2	A6S2	A7S2		A0S3	A1S3	A2S3	A3S3	A4S3	A5S3	A6S3	A7S3
4x 5MHz		A0S0	A1S0	A2S0	A3S0	A0S1	A1S1	A2S1	A3S1		A0S2	A1S2	A2S2	A3S2	A0S3	A1S3	A2S3	A3S3		A0S4	A1S4	A2S4	A3S4	A0S5	A1S5	A2S5	A3S5		A0S6	A1S6	A2S6	A3S6	A0S7	A1S7	A2S7	A3S7
2x 10MHz		A0S0	A1S0	A0S1	A1S1	A0S2	A1S2	A0S3	A1S3		A0S4	A1S4	A0S5	A1S5	A0S6	A1S6	A0S7	A1S7		A0S8	A1S8	A0S9	A1S9	A0S10	A1S10	A0S11	A1S11		A0S12	A1S12	A0S13	A1S13	A0S14	A1S14	A0S15	A1S15
1x 15MHz		A0S0	A0S1	A0S2	A0S3	A0S4	A0S5				A0S6	A0S7	A0S8	A0S9	A0S10	A0S11				A0S12	A0S13	A0S14	A0S15	A0S16	A0S17				A0S18	A0S19	A0S20	A0S21	A0S22	A0S23		

For 15MHz LTE, with different Dual Bit Map (DBM) configuration, the bubble may be placed in different position, here are just two examples

1x 15MHz		A0S0	A0S1	A0S2	A0S3		A0S4	A0S5			A0S6	A0S7	A0S8	A0S9		A0S10	A0S11			A0S12	A0S13	A0S14	A0S15		A0S16	A0S17			A0S18	A0S19	A0S20	A0S21		A0S22	A0S23	
1x 20MHz		A0S0	A0S1	A0S2	A0S3	A0S4	A0S5	A0S6	A0S7		A0S8	A0S9	A0S10	A0S11	A0S12	A0S13	A0S14	A0S15		A0S16	A0S17	A0S18	A0S19	A0S20	A0S21	A0S22	A0S23		A0S24	A0S25	A0S26	A0S27	A0S28	A0S29	A0S30	A0S31

	CPRI control word 16 bits	AxSy	Antenna x Sample y 30 bits		Bubble 30 bits

- UMTS is similar as 3MHz LTE case

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LTE Sample Packing in CPRI 4x link

4x basic Frame

32x 1.4MHz		A0S0	A1S0	A2S0	A3S0	A4S0	A5S0	A6S0	A7S0	A8S0	A9S0	A10S0	A11S0	A12S0	A13S0	A14S0	A15S0		A16S0	A17S0	A18S0	A19S0	A20S0	A21S0	A22S0	A23S0	A24S0	A25S0	A26S0	A27S0	A28S0	A29S0	A30S0	A31S0
16x 3MHz		A0S0	A1S0	A2S0	A3S0	A4S0	A5S0	A6S0	A7S0	A8S0	A9S0	A10S0	A11S0	A12S0	A13S0	A14S0	A15S0		A0S1	A1S1	A2S1	A3S1	A4S1	A5S1	A6S1	A7S1	A8S1	A9S1	A10S1	A11S1	A12S1	A13S1	A14S1	A15S1
8x 5MHz		A0S0	A1S0	A2S0	A3S0	A4S0	A5S0	A6S0	A7S0	A0S1	A1S1	A2S1	A3S1	A4S1	A5S1	A6S1	A7S1		A0S2	A1S2	A2S2	A3S2	A4S2	A5S2	A6S2	A7S2	A0S3	A1S3	A2S3	A3S3	A4S3	A5S3	A6S3	A7S3
4x 10MHz		A0S0	A1S0	A2S0	A3S0	A0S1	A1S1	A2S1	A3S1	A0S2	A1S2	A2S2	A3S2	A0S3	A1S3	A2S3	A3S3		A0S4	A1S4	A2S4	A3S4	A0S5	A1S5	A2S5	A3S5	A0S6	A1S6	A2S6	A3S6	A0S7	A1S7	A2S7	A3S7
2x 15MHz		A0S0	A1S0	A0S1	A1S1	A0S2	A1S2			A0S3	A1S3	A0S4	A1S4	A0S5	A1S5				A0S6	A1S6	A0S7	A1S7	A0S8	A1S8			A0S9	A1S9	A0S10	A1S10	A0S11	A1S11		

For 15MHz LTE, with different Dual Bit Map (DBM) configuration, the bubble may be placed in different position, here are just two examples

2x 15MHz		A0S0	A1S0	A0S1	A1S1		A0S2	A1S2		A0S3	A1S3	A0S4	A1S4		A0S5	A1S5			A0S6	A1S6	A0S7	A1S7		A0S8	A1S8		A0S9	A1S9	A0S10	A1S10		A0S11	A1S11	
2x 20MHz		A0S0	A1S0	A0S1	A1S1	A0S2	A1S2	A0S3	A1S3	A0S4	A1S4	A0S5	A1S5	A0S6	A1S6	A0S7	A1S7		A0S8	A1S8	A0S9	A1S9	A0S10	A1S10	A0S11	A1S11	A0S12	A1S12	A0S13	A1S13	A0S14	A1S14	A0S15	A1S15

	CPRI control word 32 bits	A x S y	Antenna x Sample y 30 bits		Bubble 30 bits

- UMTS is similar as 3MHz LTE case

Texas Instruments

LTE Sample Packing in CPRI 8x link

8x basic Frame

64x 1.4MHz		A0S0	A1S0	A2S0	A3S0	A4S0	A5S0	A6S0	A7S0	A8S0	A9S0	A10S0	A11S0	A12S0	A13S0	A14S0	A15S0	A16S0	A17S0	A18S0	A19S0	A20S0	A21S0	A22S0	A23S0	A24S0	A25S0	A26S0	A27S0	A28S0	A29S0	A30S0	A31S0
32x 3MHz		A0S0	A1S0	A2S0	A3S0	A4S0	A5S0	A6S0	A7S0	A8S0	A9S0	A10S0	A11S0	A12S0	A13S0	A14S0	A15S0	A16S0	A17S0	A18S0	A19S0	A20S0	A21S0	A22S0	A23S0	A24S0	A25S0	A26S0	A27S0	A28S0	A29S0	A30S0	A31S0
16x 5MHz		A0S0	A1S0	A2S0	A3S0	A4S0	A5S0	A6S0	A7S0	A8S0	A9S0	A10S0	A11S0	A12S0	A13S0	A14S0	A15S0	A0S1	A1S1	A2S1	A3S1	A4S1	A5S1	A6S1	A7S1	A8S1	A9S1	A10S1	A11S1	A12S1	A13S1	A14S1	A15S1
8x 10MHz		A0S0	A1S0	A2S0	A3S0	A4S0	A5S0	A6S0	A7S0	A0S1	A1S1	A2S1	A3S1	A4S1	A5S1	A6S1	A7S1	A0S2	A1S2	A2S2	A3S2	A4S2	A5S2	A6S2	A7S2	A0S3	A1S3	A2S3	A3S3	A4S3	A5S3	A6S3	A7S3
4x 15MHz		A0S0	A1S0	A2S0	A3S0			A0S1	A1S1	A2S1	A3S1	A0S2	A1S2	A2S2	A3S2			A0S3	A1S3	A2S3	A3S3			A0S4	A1S4	A2S4	A3S4	A0S5	A1S5	A2S5	A3S5		

For 15MHz LTE, with different Dual Bit Map (DBM) configuration, the bubble may be placed in different position, here are just two examples

4x 15MHz		A0S0	A1S0	A2S0	A3S0	A0S1	A1S1	A2S1	A3S1			A0S2	A1S2	A2S2	A3S2			A0S3	A1S3	A2S3	A3S3	A0S4	A1S4	A2S4	A3S4			A0S5	A1S5	A2S5	A3S5		
4x 20MHz		A0S0	A1S0	A2S0	A3S0	A0S1	A1S1	A2S1	A3S1	A0S2	A1S2	A2S2	A3S2	A0S3	A1S3	A2S3	A3S3	A0S4	A1S4	A2S4	A3S4	A0S5	A1S5	A2S5	A3S5	A0S6	A1S6	A2S6	A3S6	A0S7	A1S7	A2S7	A3S7

	CPRI control word 64 bits	AxSy	Antenna x Sample y 30 bits		Bubble 30 bits

- UMTS is similar as 3MHz LTE case

Texas Instruments

Supporting Radio Standards

Radio Standards	Sample Rate	AxC per Link (Typical case)		
		2x	4x	8x
TD-SCDMA	1.28MHz	24	48	96
WCDMA	3.84MHz	8	16	32
LTE 5MHz	7.68MHz	4	8	16
LTE 10MHz	15.36MHz	2	4	8
LTE 20MHz	30.72MHz	1	2	4

- WCDMA is CPRI and OBSAI originally designed for.
- Sample rate of TD-SCDMA and most LTE bandwidth is multiple of WCDMA, so they fit into OBSAI and CPRI very well (Do not require DBM).
- 15MHz LTE, GSM and Wimax sample rate is not multiple of WCDMA, DBM (Dual Bit Map) is required for rate matching.