AMI Simulation Flow Round 3

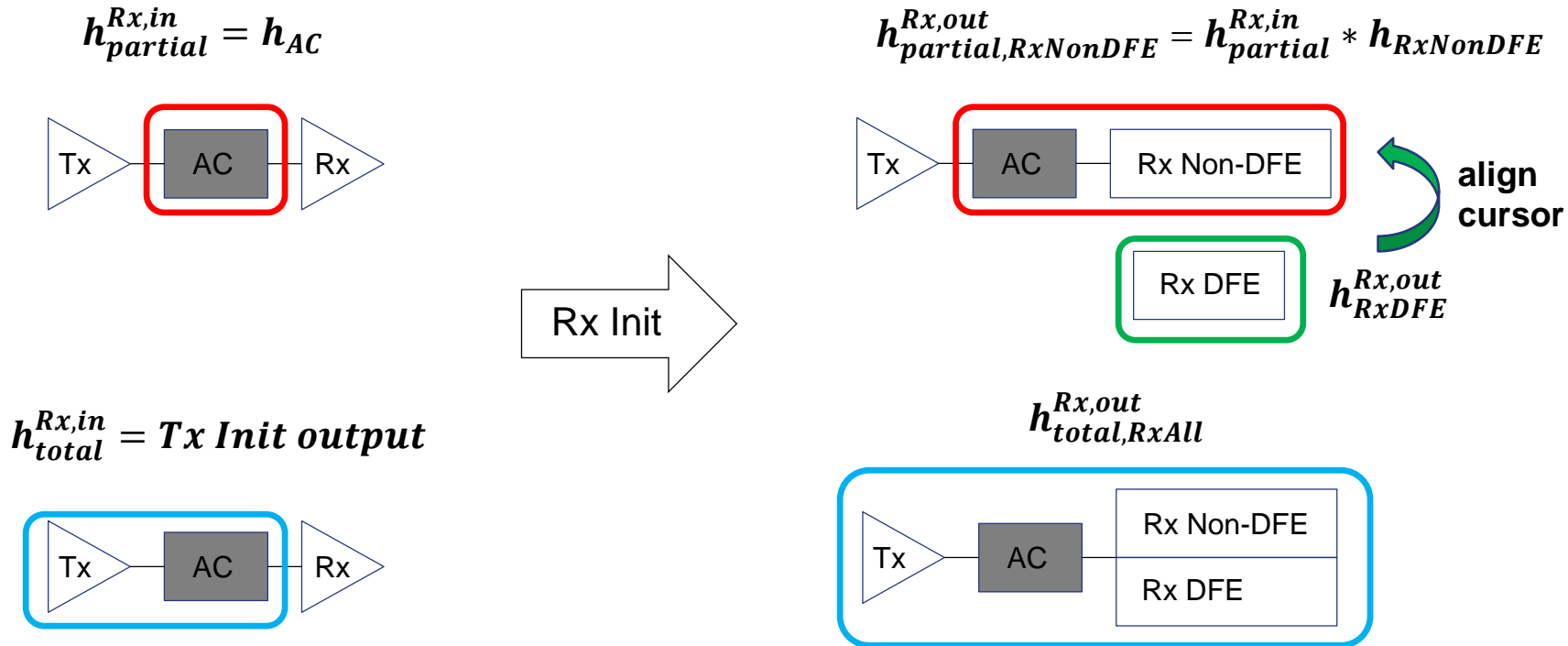## Fangyi Rao

Motivations

- Handle Init-only Rx properly in both time domain and statistical flows for normal and redriver channels

- Provide full redriver channel impulse to Rx Init for optimization

- Eliminate the need for deconvolution

KEYSIGHT
TECHNOLOGIES

Summary

- No change to Tx Init
- Augment Rx Init impulse matrix by two columns for total impulse and Rx DFE

Rx Init Input Impulse		Rx Init Output Impulse	
Symbol	Definition	Symbol	Definition
$h_{partial}^{Rx,in}$	Impulse from upstream Tx input or output, depending on whether Tx has GetWave and whether simulation is in time domain or statistical, to Rx input	$h_{partial,RxNonDFE}^{Rx,out}$	Combined impulse of $h_{partial}^{Rx,in}$ and Rx's non-DFE portion (including gain and linear EQ)
$h_{total}^{Rx,in}$	Impulse from terminal Tx input to Rx input. Rx Init performs optimization based on this impulse	$h_{total,RxAll}^{Rx,out}$	Combined impulse of $h_{total}^{Rx,in}$ and the entire Rx (including gain, linear EQ and DFE)
$h_{RxDFE}^{Rx,in}$	Empty place holder for Rx Init to return DFE impulse	$h_{RxDFE}^{Rx,out}$	Rx DFE. Aligned cursors to $h_{partial,RxNonDFE}^{Rx,out}$
$h_{xtlk}^{Rx,in}$	Impulses from aggressors to Rx input	$h_{xtlk}^{Rx,out}$	Combined impulse of $h_{xtlk}^{Rx,in}$ and Rx's non-DFE portion (including gain and linear EQ)

KEYSIGHT
TECHNOLOGIES

Normal Time Domain Flow: GetWave Tx

$$h_{partial}^{Rx,in} = h_{AC}$$

$$h_{partial,RxNonDFE}^{Rx,out} = h_{partial}^{Rx,in} * h_{RxNonDFE}$$

Tx ▷— AC —▷ Rx

Tx ▷— AC — Rx Non-DFE

align cursor

Rx DFE $h_{RxDFE}^{Rx,out}$

Rx Init ⇒

$$h_{total}^{Rx,in} = Tx\ Init\ output$$

$$h_{total,RxAll}^{Rx,out}$$

Tx ▷— AC —▷ Rx

Tx ▷— AC — Rx Non-DFE / Rx DFE

- GetWave Rx

Rx output = Tx GetWave output $* h_{AC}$ → Rx GetWave

- Init-only Rx

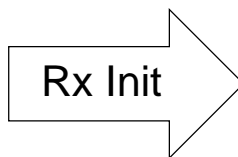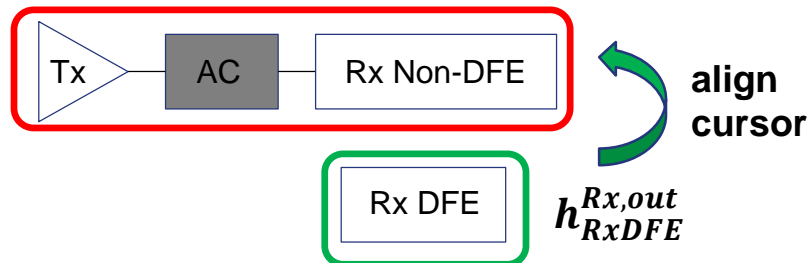Rx output = Tx GetWave output $* h_{partial,RxNonDFE}^{Rx,out}$ + Tx digital input $* h_{RxDFE}^{Rx,out}$

(note: EDA tool must align Tx digital input and Tx GetWave output)
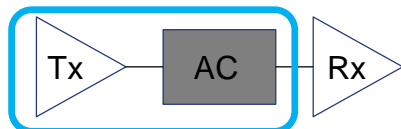
Normal Time Domain Flow: Init-only Tx
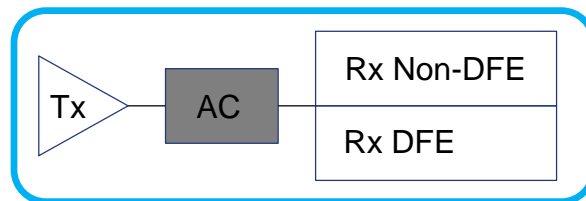
$$h_{partial}^{Rx,in} = Tx\ Init\ output$$
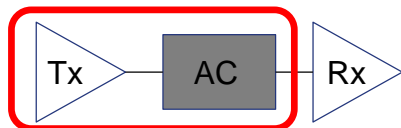
$$h_{partial,RxNonDFE}^{Rx,out} = h_{partial}^{Rx,in} * h_{RxNonDFE}$$

align cursor

$$h_{RxDFE}^{Rx,out}$$

Rx Init

$$h_{total}^{Rx,in} = Tx\ Init\ output$$

$$h_{total,RxAll}^{Rx,out}$$
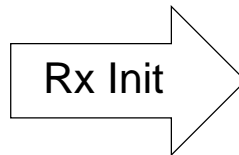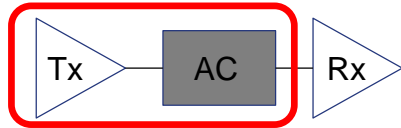

- GetWave Rx

Rx output = Tx digital input $* h_{partial}^{Rx,in}$ → Rx GetWave

- Init-only Rx

Rx output = Tx digital input $* h_{total,RxAll}^{Rx,out}$
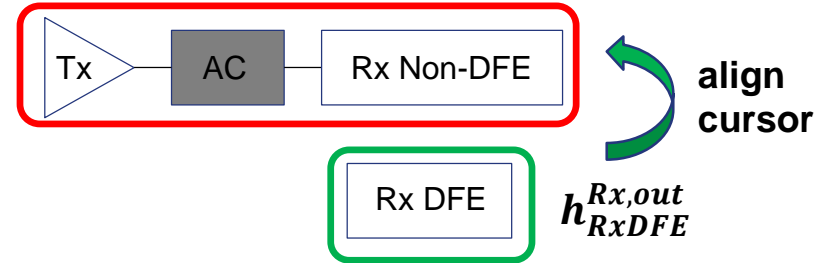
Note: $h_{total,RxAll}^{Rx,out} = h_{total,RxNonDFE}^{Rx,out} + h_{RxFE}^{Rx,out}$

Normal Statistical Flow

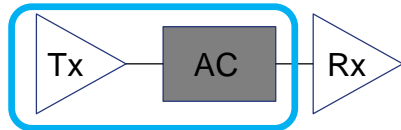$$h_{partial}^{Rx,in} = Tx\ Init\ output$$

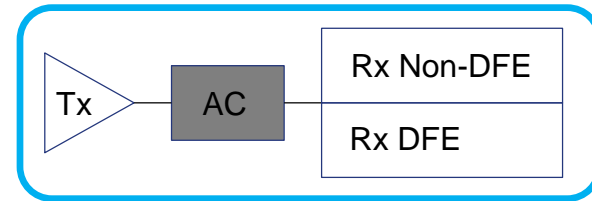$$h_{partial,RxNonDFE}^{Rx,out} = h_{partial}^{Rx,in} * h_{RxNonDFE}$$

align cursor

$$h_{RxDFE}^{Rx,out}$$

$$h_{total}^{Rx,in} = Tx\ Init\ output$$

Rx Init

$$h_{total,RxAll}^{Rx,out}$$

- Statistical uses $h_{total,RxAll}^{Rx,out}$

Note: $h_{total,RxAll}^{Rx,out} = h_{total,RxNonDFE}^{Rx,out} + h_{RxFE}^{Rx,out}$

Redriver Time Domain Flow: GetWave Tx2

$$h_{partial}^{Rx,in} = h_{AC2}$$

$$h_{partial,RxNonDFE}^{Rx,out} = h_{partial}^{Rx,in} * h_{Rx2NonDFE}$$

Rx2 Init

$$h_{RxDFE}^{Rx,out}$$

$$h_{total}^{Rx,in} = Rx1\ Init\ output * Tx2\ Init\ output$$

$$h_{total,RxAll}^{Rx,out}$$
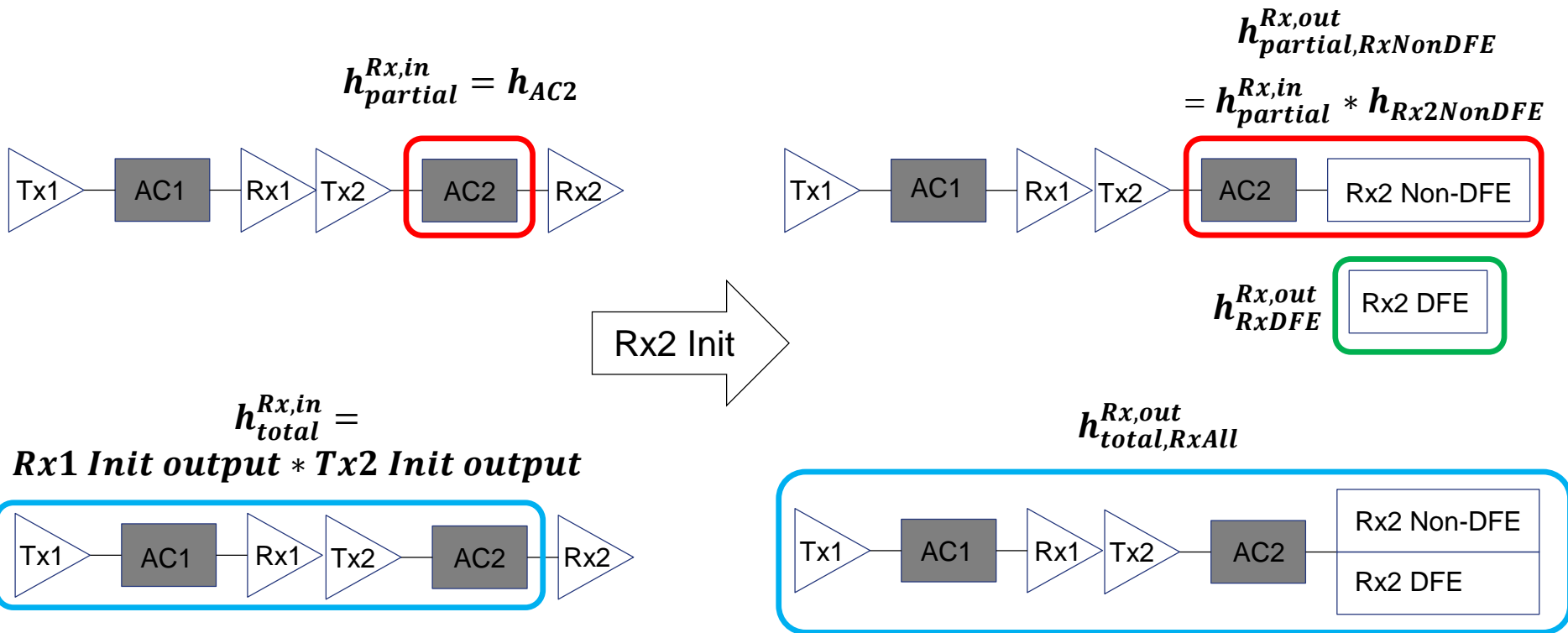
- GetWave Rx2

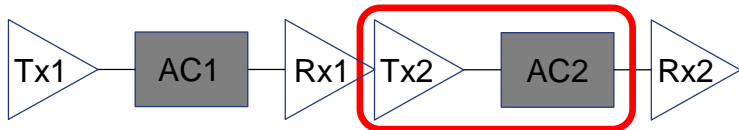   Rx2 output = Tx2 GetWave output $* h_{AC2}$ → Rx2 GetWave

- Init-only Rx2

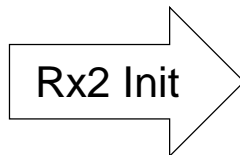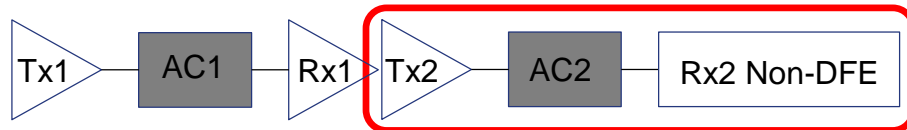   Rx2 output = Tx2 GetWave output $* h_{partial,RxNonDFE}^{Rx,out}$ + Tx1 digital input $* h_{RxDFE}^{Rx,out}$

    (note: EDA tool must align Tx1 digital input and Tx2 GetWave output)
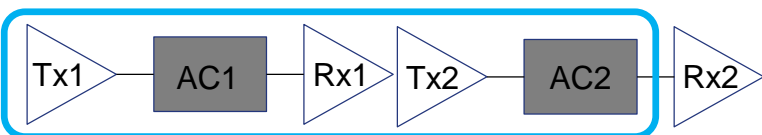
Redriver Time Domain Flow: Init-only Tx2

$$h_{partial}^{Rx,in} = Tx2\ Init\ output$$

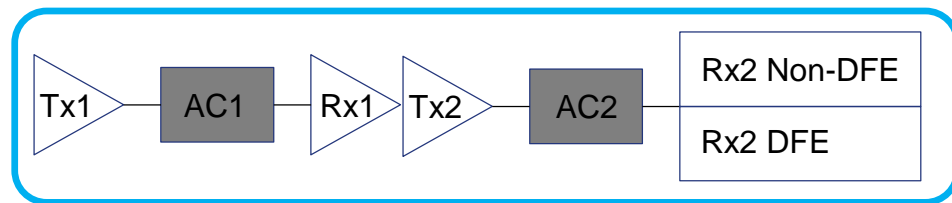$$h_{partial,RxNonDFE}^{Rx,out} = h_{partial}^{Rx,in} * h_{Rx2NonDFE}$$

$$h_{RxDFE}^{Rx,out}$$

Rx2 Init

$$h_{total}^{Rx,in} =$$
$$Rx1\ Init\ output * Tx2\ Init\ output$$

$$h_{total,RxAll}^{Rx,out}$$

- Getwave Rx2

   Rx2 output = Rx1 output $* h_{partial}^{Rx,in}$ $\rightarrow$ Rx2 GetWave

- Init-only Rx2
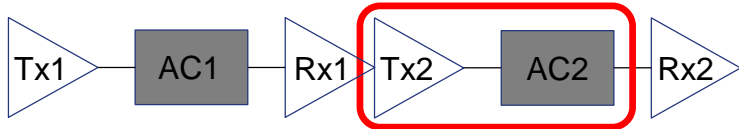
   Rx2 output = Rx1 output $* h_{partial,RxNonDFE}^{Rx,out}$ + Tx1 digital input $* h_{RxDFE}^{Rx,out}$

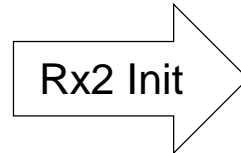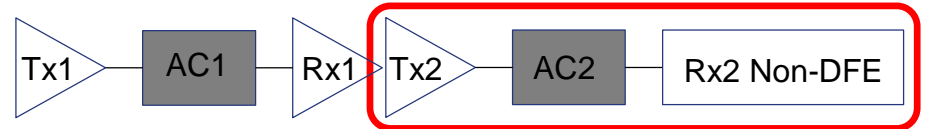   (note: EDA tool must align Tx1 digital input and Rx1 output)
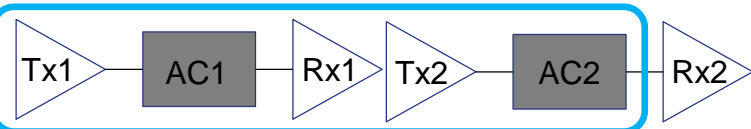
Redriver Statistical Flow

$$h_{partial}^{Rx,in} = Tx2\ Init\ output$$

$$h_{partial,RxNonDFE}^{Rx,out} = h_{partial}^{Rx,in} * h_{Rx2NonDFE}$$

$$h_{RxDFE}^{Rx,out}$$

Rx2 Init

$$h_{total}^{Rx,in} = Rx1\ Init\ output * Tx2\ Init\ output$$
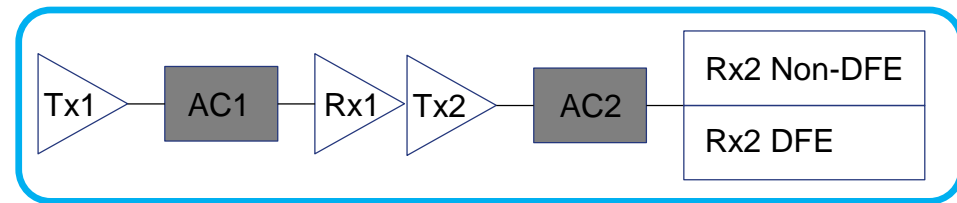
$$h_{total,RxAll}^{Rx,out}$$

- Statistical uses $h_{total,RxAll}^{Rx,out}$ for victim and $h_{partial,RxNonDFE}^{Rx,out}$ for aggressors received by Rx1

Summary

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- Augment Rx Init impulse matrix by two columns for total impulse and Rx DFE

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$h_{RxDFE}^{Rx,in}$	Empty place holder for Rx Init to return DFE impulse	$h_{RxDFE}^{Rx,out}$	Rx DFE. Aligned cursors to $h_{partial,RxNonDFE}^{Rx,out}$
$h_{xtlk}^{Rx,in}$	Impulses from aggressors to Rx input	$h_{xtlk}^{Rx,out}$	Combined impulse of $h_{xtlk}^{Rx,in}$ and Rx's non-DFE portion (including gain and linear EQ)