



# C2M option trade-offs

**Jeff Slavick, Adam Healey**

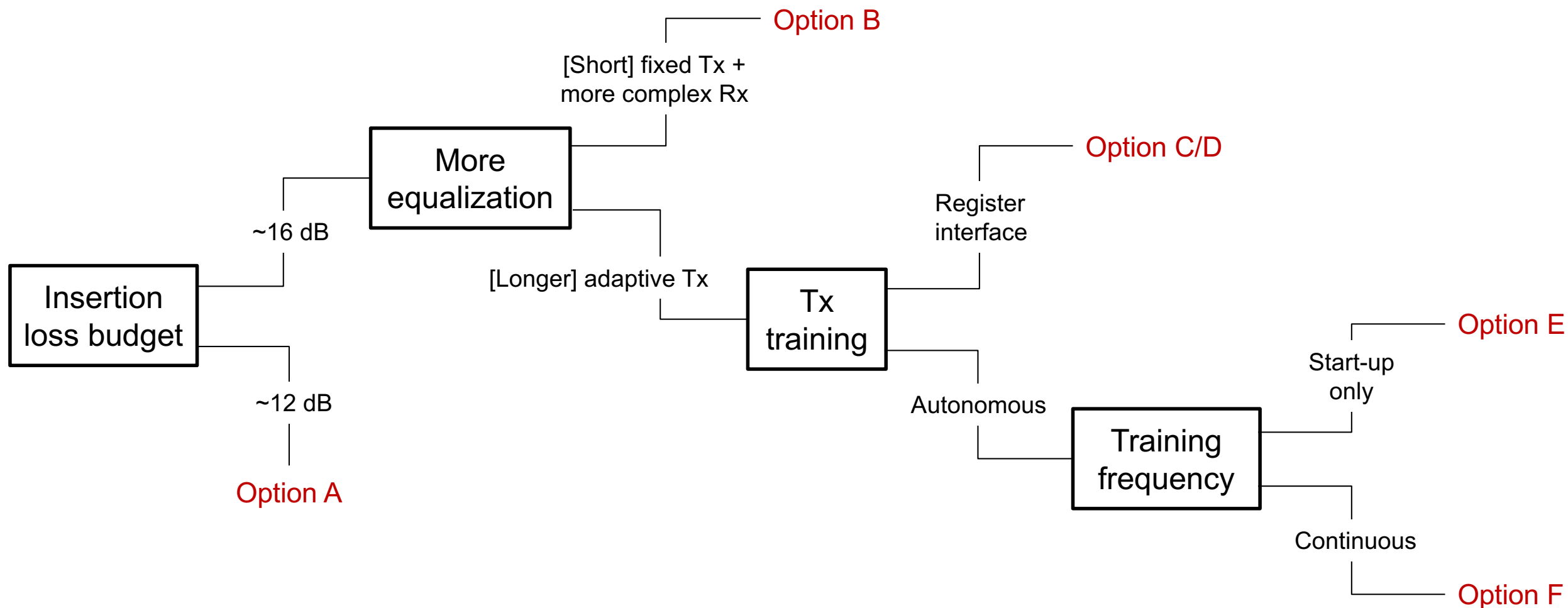
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# Agenda

- Decision tree
- Details of six options that are available (A-F)
- Decision tree with details
- Summary of trade-offs in a tabular view

# Chip-to-module decision tree



# Option A: Low loss C2M channel

- Short Tx FFE, reference Rx CTLE only
- Pro
  - Enables simpler electrical Rx equalizer in module
  - System management interaction with module is minimal
  - Universal port (supports DAC & module)
  - Spec. very similar to what we've done it in the past (eye mask at TP1a)
- Con
  - Lower reach from host to module
  - Tx FFE set using HCB breakout to test equipment and may not provide ideal settings for module
    - Due to differences in channel and module Rx equalizer capabilities relative to HCB and reference receiver

# Option B: Rx does it all

- Shorter fixed Tx FFE, more complex reference Rx (e.g. CTLE + FFE)
- Pro
  - Longer reach from host to module
  - System management interaction with module is minimal
- Con
  - Complex electrical Rx in module is likely to consume a larger portion of module budgets (area/power/cost) than in previous generations
  - Complex electrical Rx in module requires additional logic to adapt and evaluate the equalization settings to find optimal
  - Complex reference receiver needs specification on how it adapts for host Tx compliance testing
  - Tx FFE set using HCB breakout to test equipment and may not provide ideal settings for module

# Option C: Tx FFE set with registers at start-up

- Longer Tx FFE, reference Rx CTLE only
- Module/Host have registers used to request/assign remote Tx FFE updates
- Pro
  - Longer reach from host to module
  - Enables simpler electrical Rx equalizer in module
  - Module Rx enabled to optimize Tx FFE to meet required performance based upon actual operating environment (and not for HCB and ref. Rx proxy)
- Con
  - More Tx FFE taps to set, perhaps with higher resolution – more complex Tx host compliance validation
  - Tester must include longer Tx FFE to evaluate module Rx performance
  - Register interface may be slow, may increase bring-up time if adapted at each start-up
  - Increased management interaction with module
  - Module has to include method to calculate requests
  - New test to confirm module can make requests?
    - Don't think so. Requirement is that module meet performance when it states it's ready to pass mission data.
    - It is possible the module contains a receiver that might be able to meet performance with whatever Tx FFE the host provides by default.

# Option D: Continuously monitor registers

- Longer Tx FFE, reference Rx CTLE only
- Module/Host have registers used to request/assign remote Tx FFE updates
- Pro
  - Longer reach from host to module
  - Enables simpler electrical Rx equalizer in module
  - Module Rx allowed to optimize Tx FFE to meet required performance
  - Tx FFE can be adjusted to help maintain performance over time (e.g., temp. variation)
- Con
  - More Tx FFE taps to set, perhaps with higher resolution – more complex Tx host compliance validation
  - Tester must include longer Tx FFE to evaluate module Rx performance
  - Register interface may be slow, may increase bring-up time if adapted at each start-up
  - Continuous management interaction with module to monitor requests and update host Tx FFE
  - Module has to include method to calculate requests

# Option E: Start-up Protocol

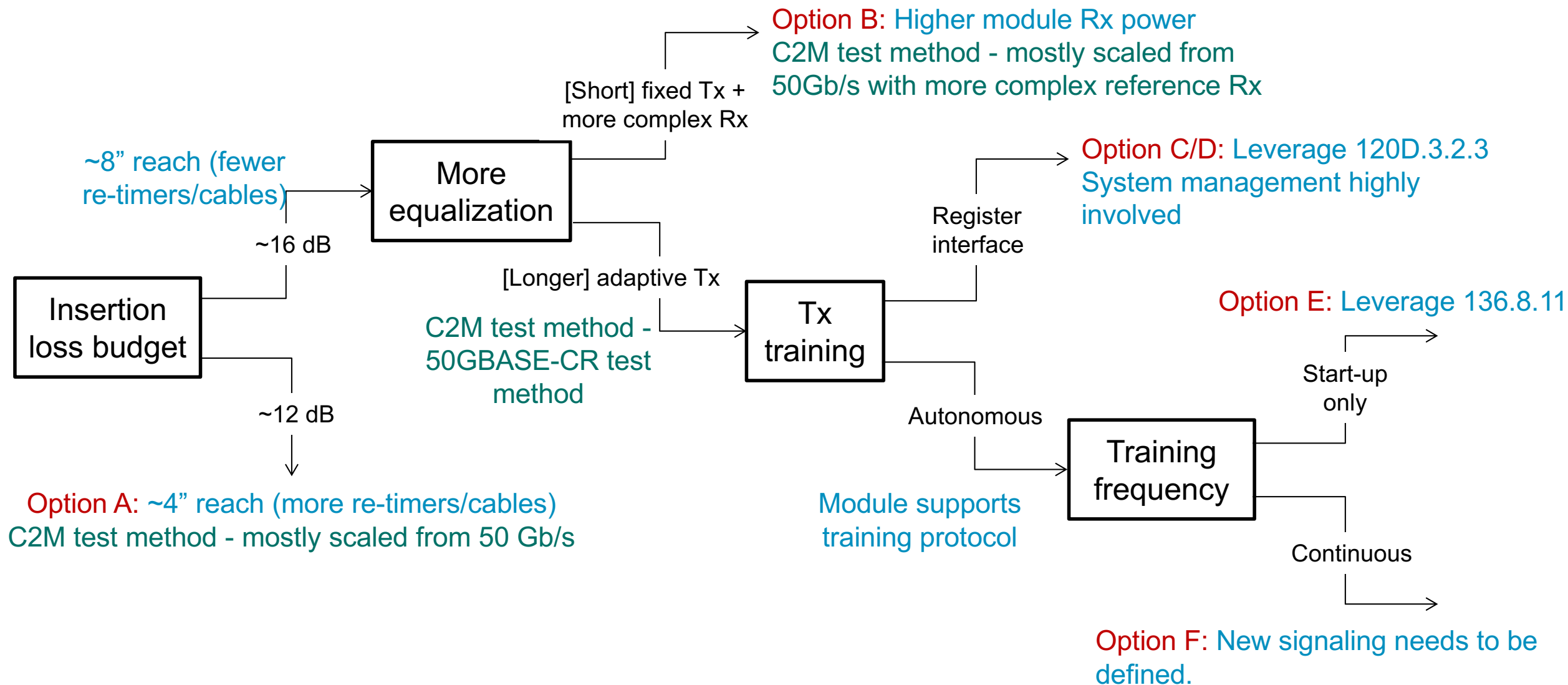
- Longer Tx FFE, reference Rx CTLE only
- Clause 136 protocol (or similar) used to configure remote Tx FFE
- Pro
  - Longer reach from host to module
  - Enables simpler electrical Rx equalizer in module
  - Module Rx allowed to optimize Tx FFE to meet required performance
  - System management interaction with module is minimal
- Con
  - More Tx FFE taps to set, perhaps with higher resolution – more complex Tx host compliance validation
  - Tester must include longer Tx FFE to evaluate module Rx performance
  - Module has to include logic for generating/receiving protocol
  - Module has to include method to calculate requests



# Option F: Continuous protocol

- Longer Tx FFE, reference Rx CTLE only
- In-band signaling of Tx FFE adjustment requests/acknowledgments
- Pro
  - Longer reach from host to module
  - Enables simpler electrical Rx equalizer in module
  - Module Rx allowed to optimize Tx FFE to meet required performance
  - System management interaction with module is minimal
  - Tx FFE can be adjusted to help maintain performance over time (e.g., temp. variation)
- Con
  - More Tx FFE taps to set, perhaps with higher resolution – more complex Tx host compliance validation
  - Tester must include longer Tx FFE to evaluate module Rx performance
  - Module has to include logic for generating/receiving protocol
  - Module has to include method to calculate requests
  - New in-band signaling needs to be defined

# Chip-to-module decision tree with details



# Tabular Summary of trade-offs

	A: Low loss C2M	B: Rx does it all	C: Regs at startup	D: Regs continuously	E: Startup Protocol	F: Continuous Protocol
Reach	Short	Medium	Medium	Medium	Medium	Medium
Module Electrical Rx	Simple	Complex	Simple	Simple	Simple	Simple
Host Electrical Tx FFE	Fixed	Fixed	Adaptive	Adaptive	Adaptive	Adaptive
Module Electrical Rx Input Eye	HCB based	HCB based	Set at startup VT	Updated over VT shifts	Set at startup VT	Updated over VT shifts
Host Compliance	Same as past	Similar to past	KR/CR style	KR/CR style	KR/CR style	KR/CR style
Management involvement	Low	Low	Low -> High (burst at startup?)	High	Low	Low
LinkUp time	Shortest	Short	Short->Long	Short->Long	Medium	Medium



Thank You

