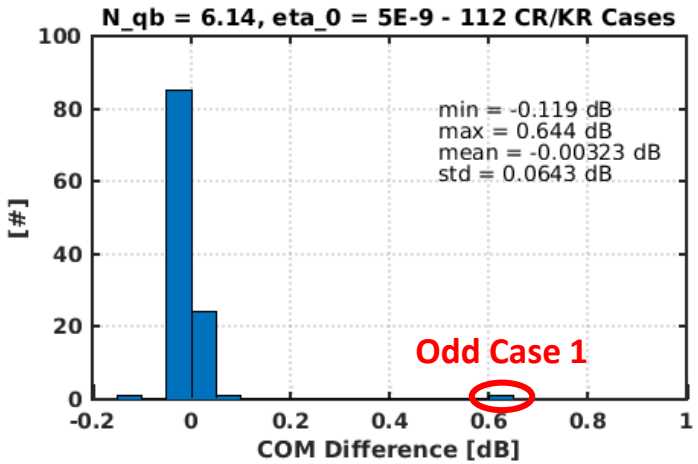
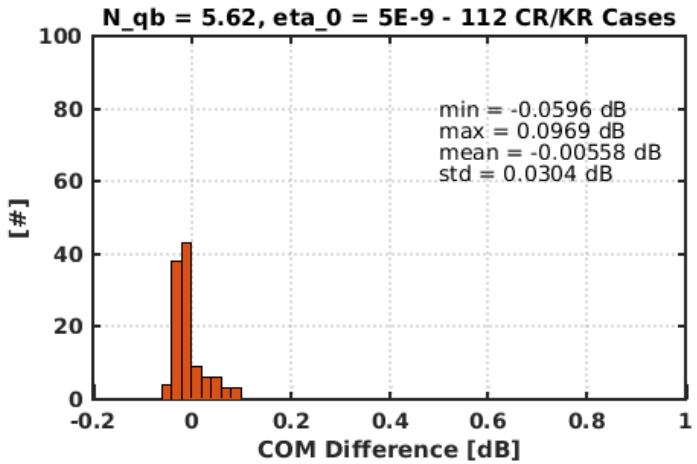
Investigating Odd Cases with Noticeable Different COM Results with Two Quantization Noise Methods

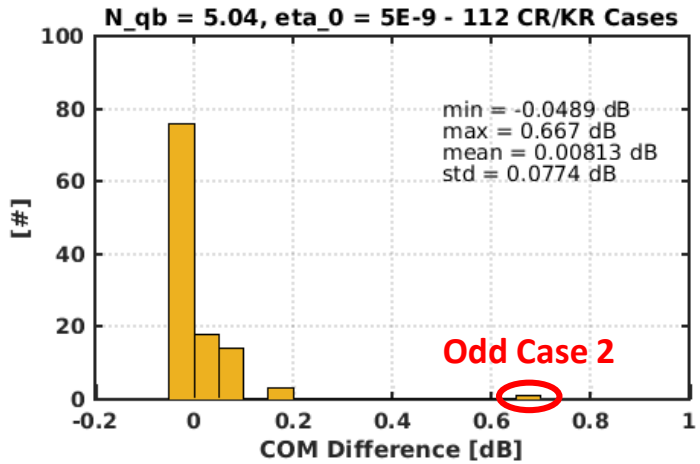
Hossein Shakiba
Huawei Technologies Canada
xxx xx 2025

Introduction

- Two methods were considered for calculation of quantizer clip level during the optimization loop (shakiba_COM_01a_250617.pdf)
  1) Fast and less accurate
  2) Slow and more accurate
- For 3x112 of test cases COM calculations demonstrated a negligible difference between two methods except for two odd cases
  - ❖ Updated plot (after COM bug fixes of commit requests 4p0_6 and 4p9_7):



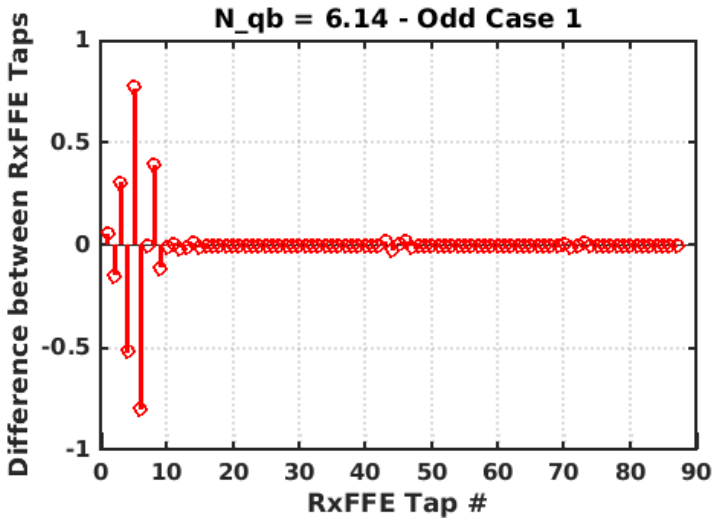


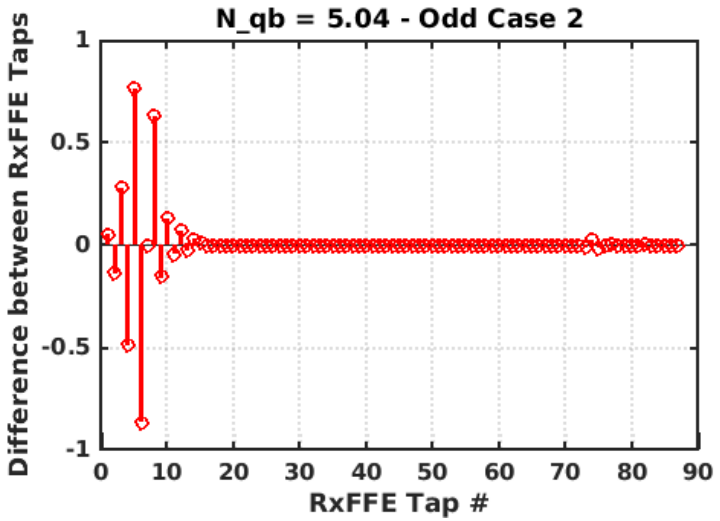


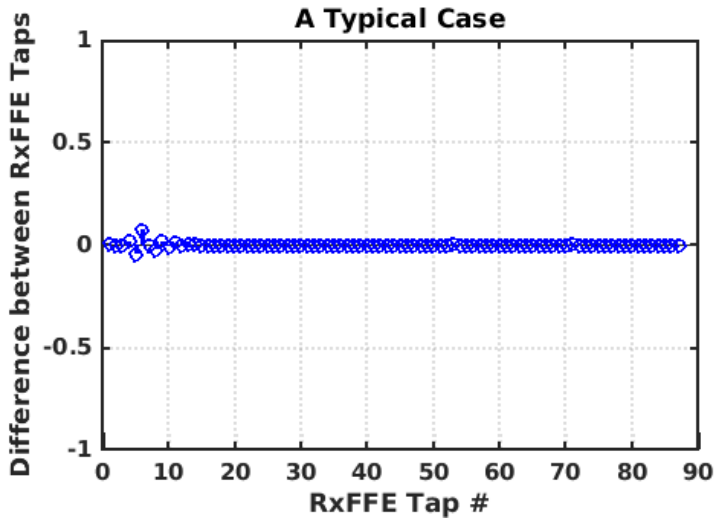
- This contribution presents the root cause study results that led to the two odd cases

Observation

- Any change in conditions, such as noise level, naturally triggers optimization and a redistribution of equalization
- Two aforementioned methods are expected to differ in the quantization noise level only slightly with no pronounced change in optimization and equalization re-distribution
- Closer look at the two odd cases revealed an unexpectedly large change in RxFFE tap values:

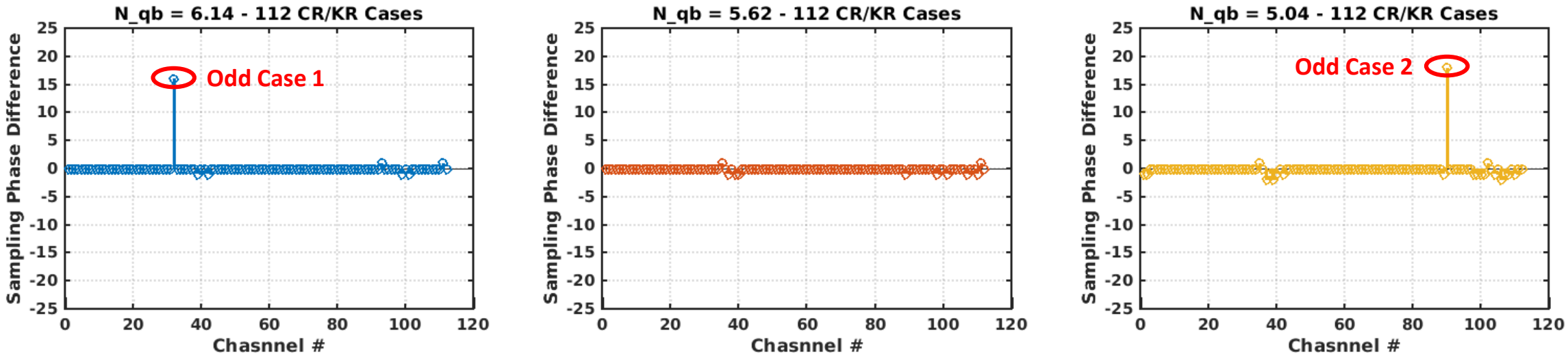






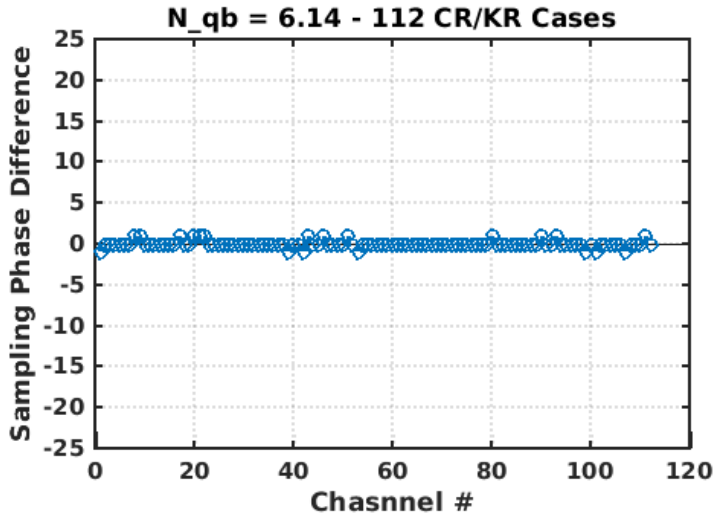
The Root Cause

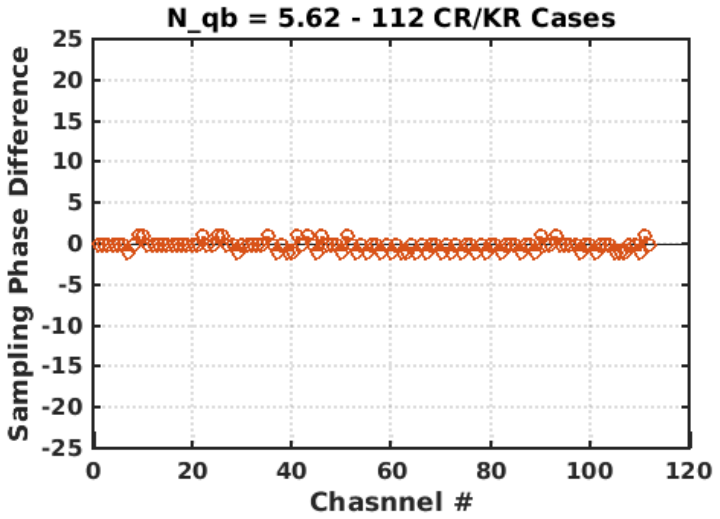
- The only possible explanation to this observation is if there was a large change in sampling points
- Figure shows difference between sampling phases when slow and fast methods are used:

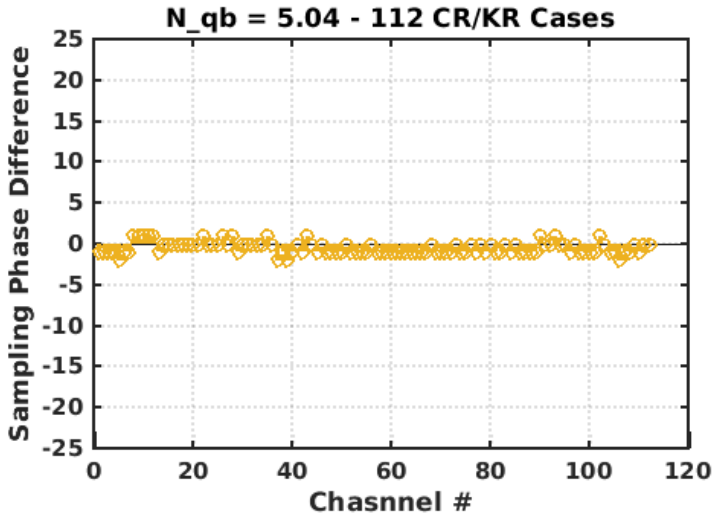


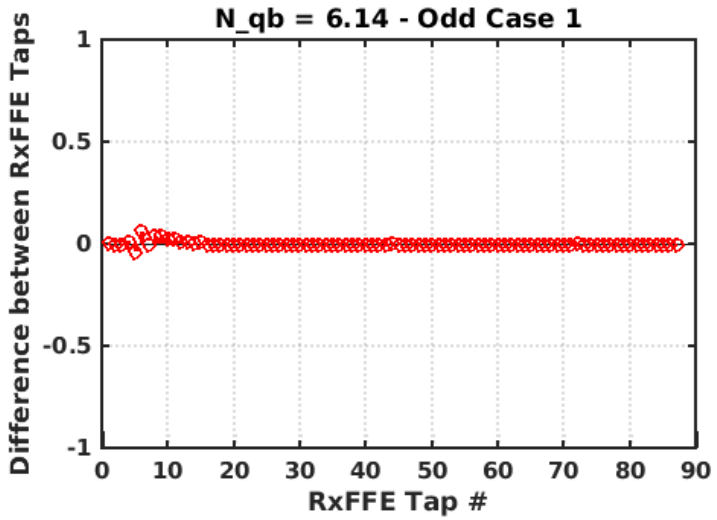
- Further investigations revealed that this issue was caused by the choice of limited sampling phase range of [-16 16] (recommended range used in the COM config) for optimization search
- Expanding this range to [-32 32] solved the issue and the odd cases became similar to other cases

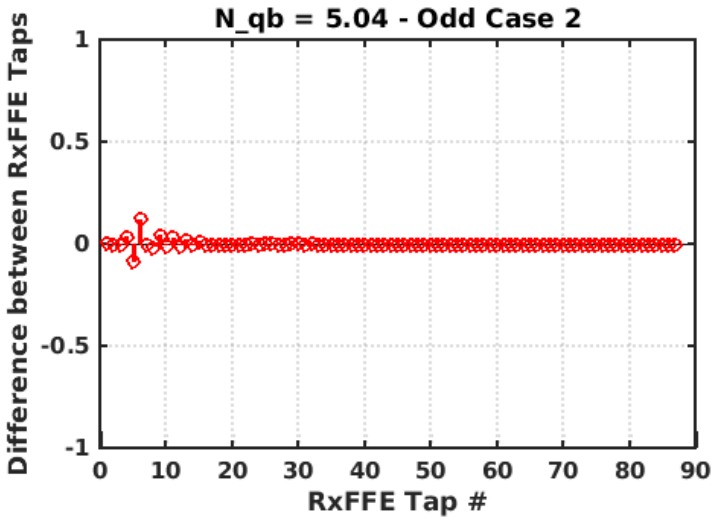
The Root Cause

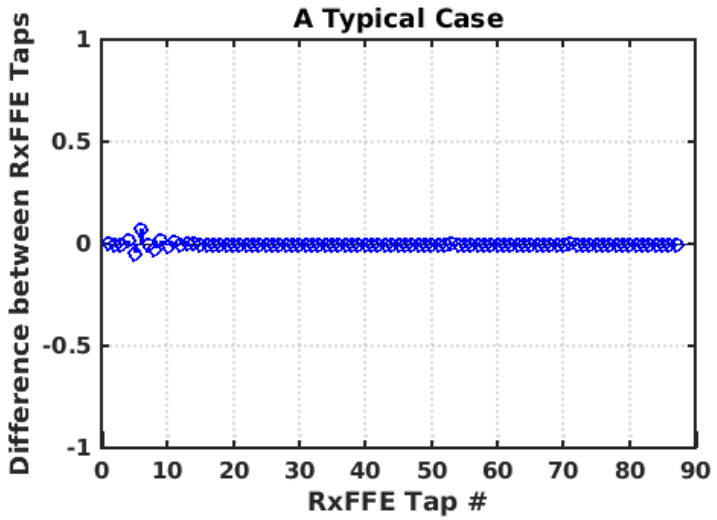






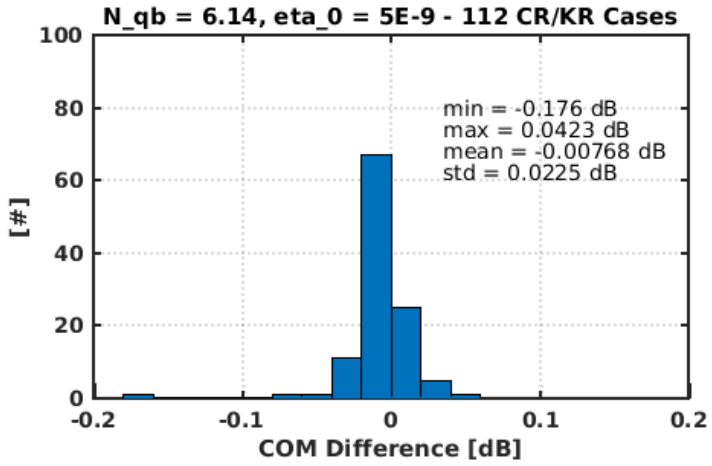


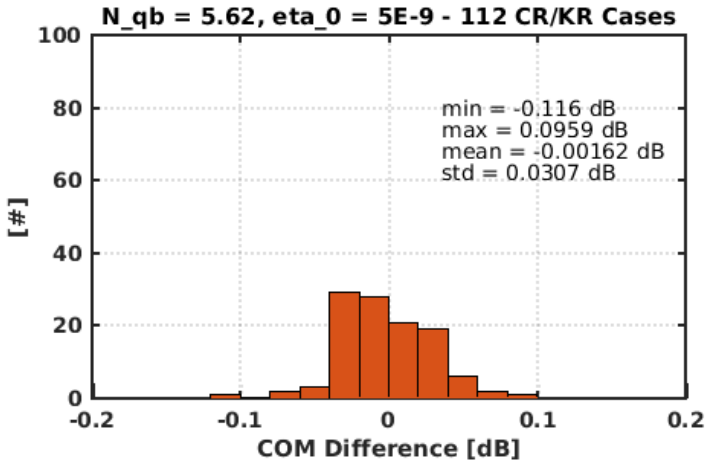


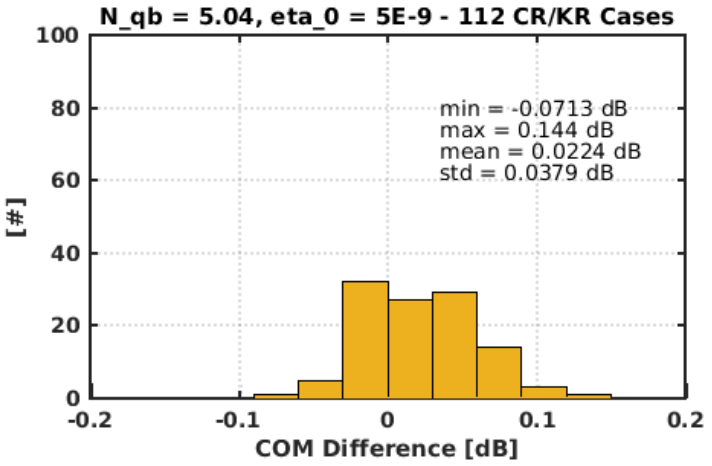


The Root Cause

- With this extended range the difference between COM values in two methods is always very small







- Note that expanding the sampling phase search range will proportionally increase the runtime
- Possible performance impact due to limited search for sampling phase is a general limitation and was only noticed during quantization noise COM runs because there was an opportunity to compare two cases that expected to yield close results. This could happen to all COM runs but won't be noticed due to lack of a reference to compare with, unless COM with different sampling point search ranges are run and compared.

Thank You ☺

Hossein Shakiba
Huawei Technologies Canada