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MOTIVATION

❖ Hybrid electromagnetic interference (EMI) filter combining an active EMI filter (AEF) and a passive EMI filter could lead to lower weight than a pure passive EMI filter. This work compares experimentally the EMI noise suppression performance between conventional passive EMI filter and hybrid EMI filter for a DC-fed motor drive based on two-level voltage source inverter (VSI). Both DC-side Common-Mode (CM) and Differential-Mode (DM) noise are considered. Potential benefits with AEF technology are investigated.

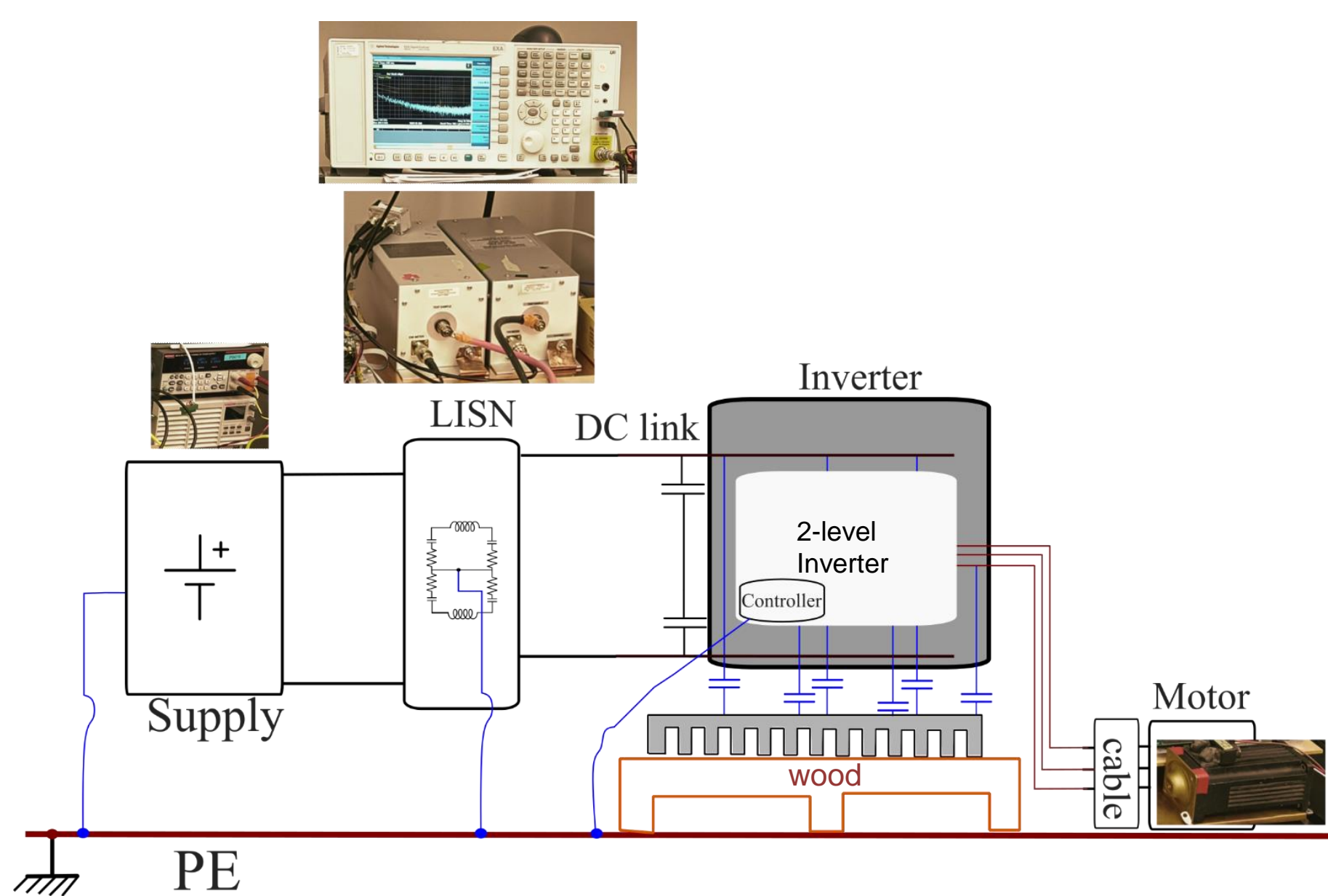
CONCLUSIONS AND PROSPECTIVES

❖ In the preliminary experiment stage, conclusions can be made that hybrid EMI filter is contributing to the overall filter weight to some extent with no sacrifice of noise attenuation compared to conventional passive filter.
 ❖ In prospective experiments, DM noise is expected to be attained for evaluating the performance of hybrid EMI filter on DM noise attenuation. Adjustments on parameter design and hardware design are expected for having enough attenuation according to preliminary anticipations on noise attenuation.

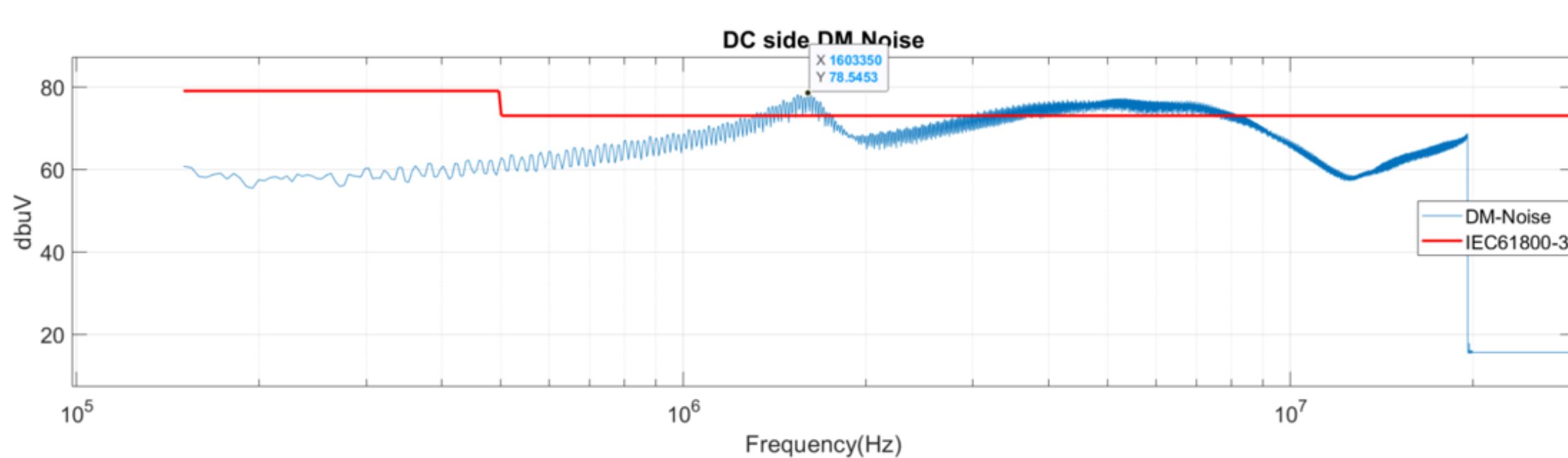
SELECTED TEST SET-UP

❖ Test Set-Up and Specifications:

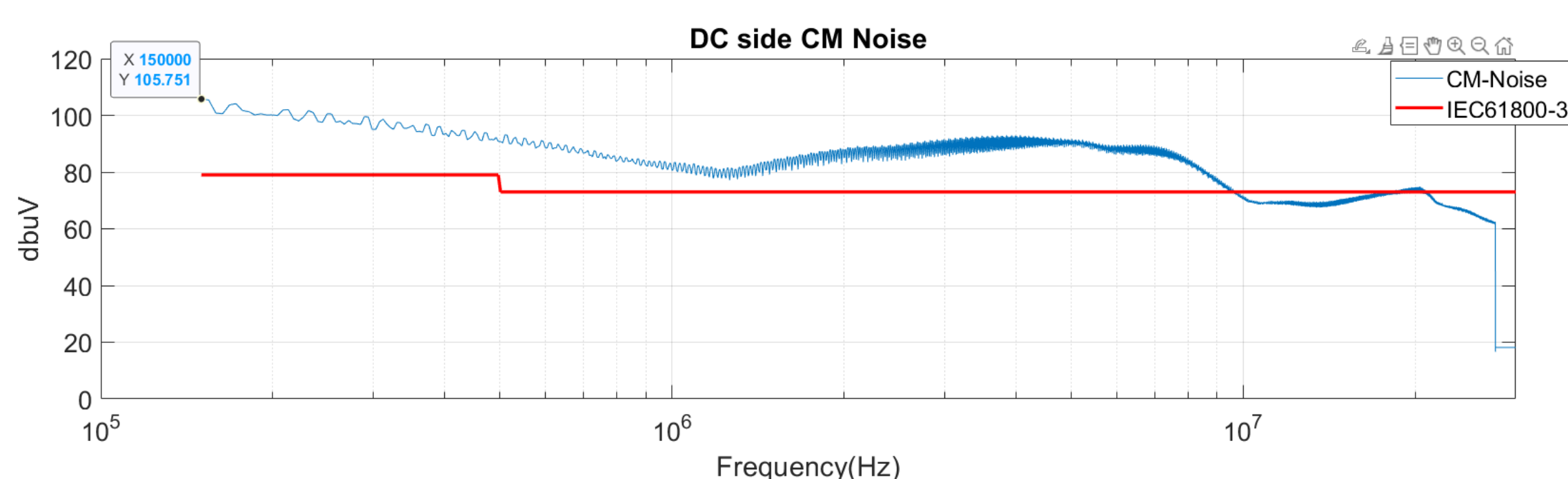
Two-Level VSI with a motor running at 1200 rpm
 DC Input: 400V, 0.7A
 Modulation Index: 0.25



CM & DM NOISE COLLECTION



DM noise attenuation required 11.54dbuV @1.6MHz

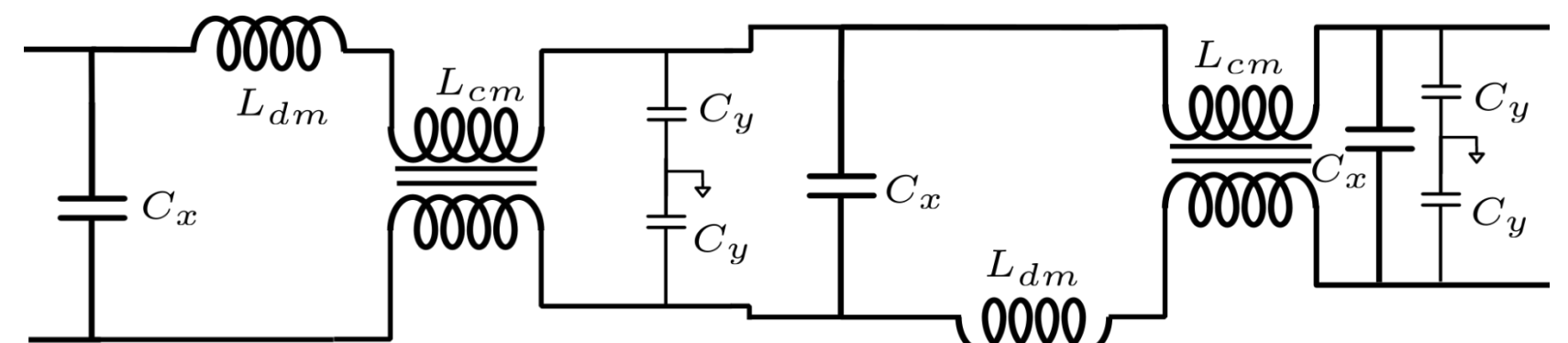


CM noise attenuation required: 32.75dbuV @150kHz

Both required DM and CM noise attenuation are with 6 dbuV tolerance

FILTER PARAMETER DESIGN RESULTS

❖ Selected Two-Stage LC EMI Filter Topology:



DM Corner Frequency	213.6 kHz	CM Corner Frequency	58.44 kHz
Ldm	12uH	Lcm	334uH
Cx	49.33 nF	L_cm_leak	2.7uH
		Cy	11.1nF

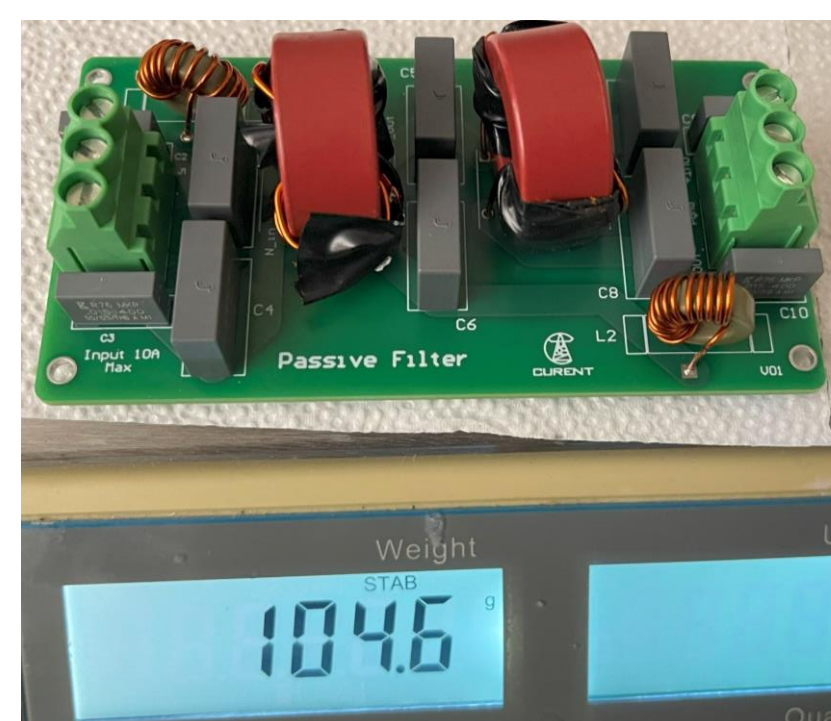
Passive EMI Filter

DM Corner Frequency	213.6 kHz	CM Corner Frequency	101 kHz
Ldm	15uH	Lcm	111uH
Cx	38.9 nF	L_cm_leak	0.56uH
		Cy	11.1 nF

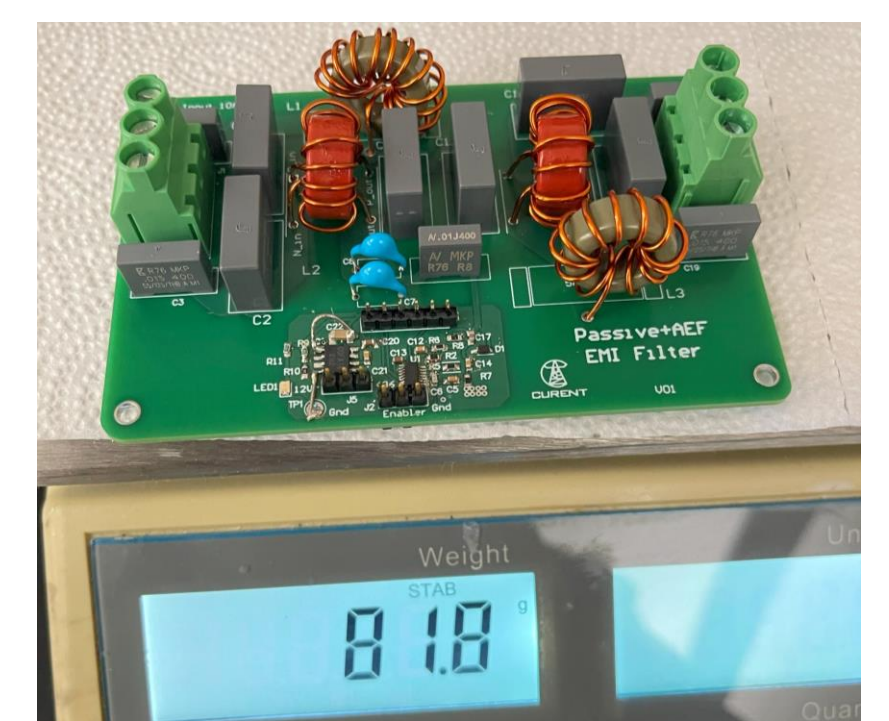
Hybrid EMI Filter with AEF

HARDWARE DESIGN

Passive EMI Filter (104.6g)



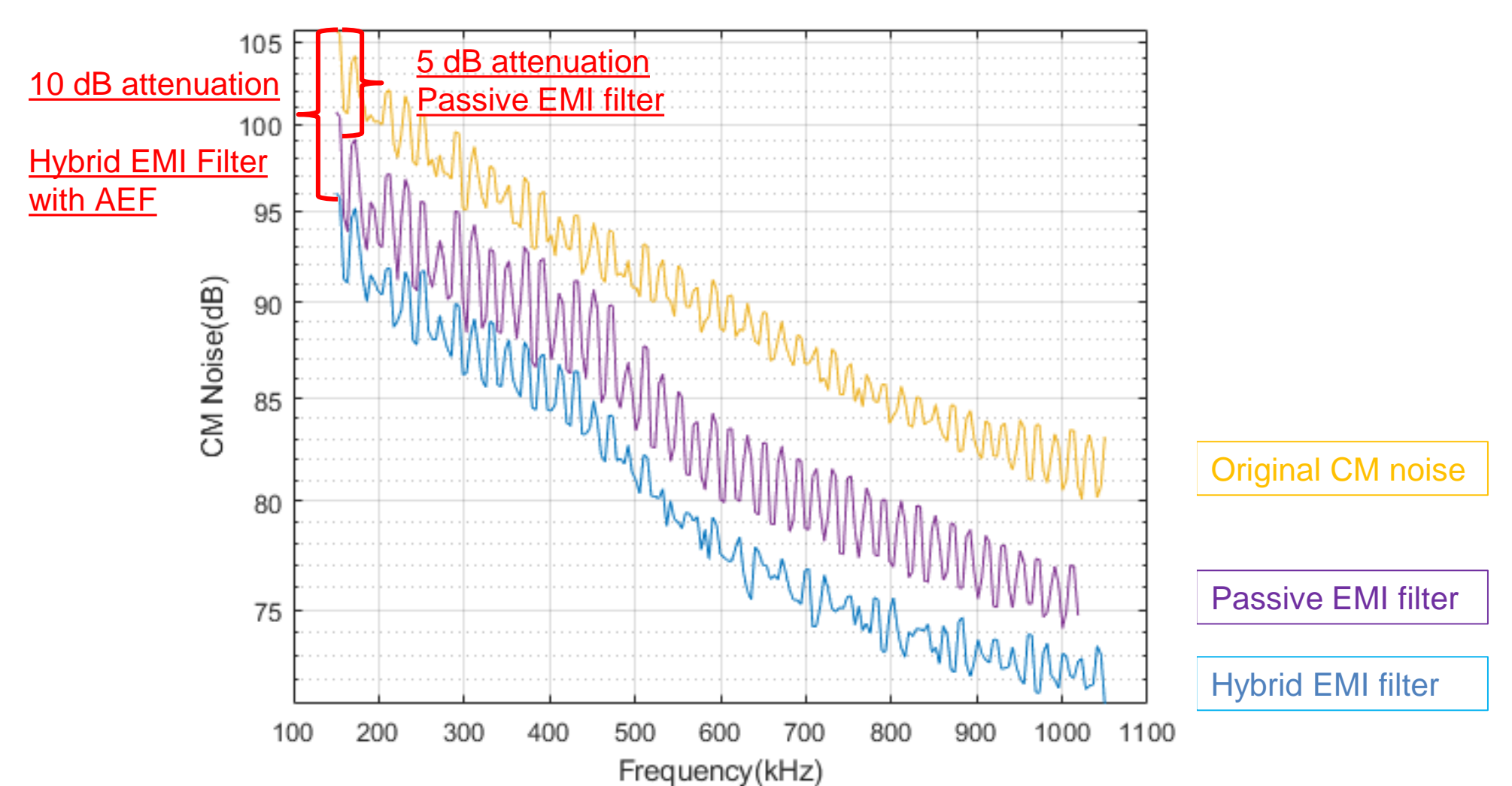
Hybrid EMI Filter(81.8)



23g reduction in weight (26g anticipated)

PRELIMINARY EXPERIMENT RESULTS

❖ CM noise comparisons for different cases



Noise are measured up to 1MHz with quasi peak sweep