Updated Radix Optimized Package Model

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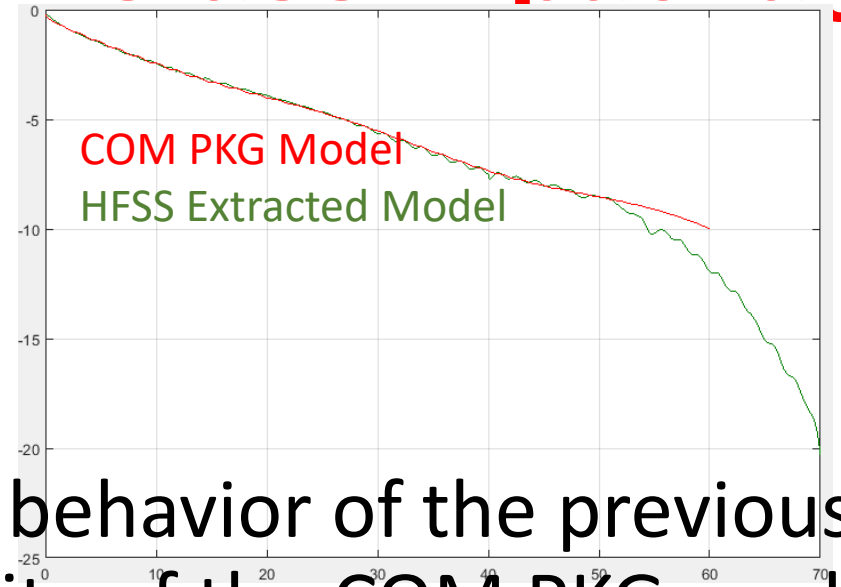
Agenda

- In benartsi_3dj_01_2311 a “close enough” representation of the “Radix optimized” Class B package was presented; the resulting parameters were adopted (motion #10 of the 11/2023 meeting)
- In the same presentation further steps to get a better package fit to the designated as a “radix optimized” class were also mentioned as future work.
- This presentation addresses all the steps that were specified to be done and provides a suggested updated Class B package model for COM

Recap: Frequency Domain Comparison of the "Close Enough" Representation – 45mm Class B package



- Role-off behavior of the previously HFSS extracted model limited the quality of the COM PKG model fit to the extracted one - the previous fit correlated well up to ~50 GHz
- The updated package HFSS extraction has extended bandwidth that allows better fit

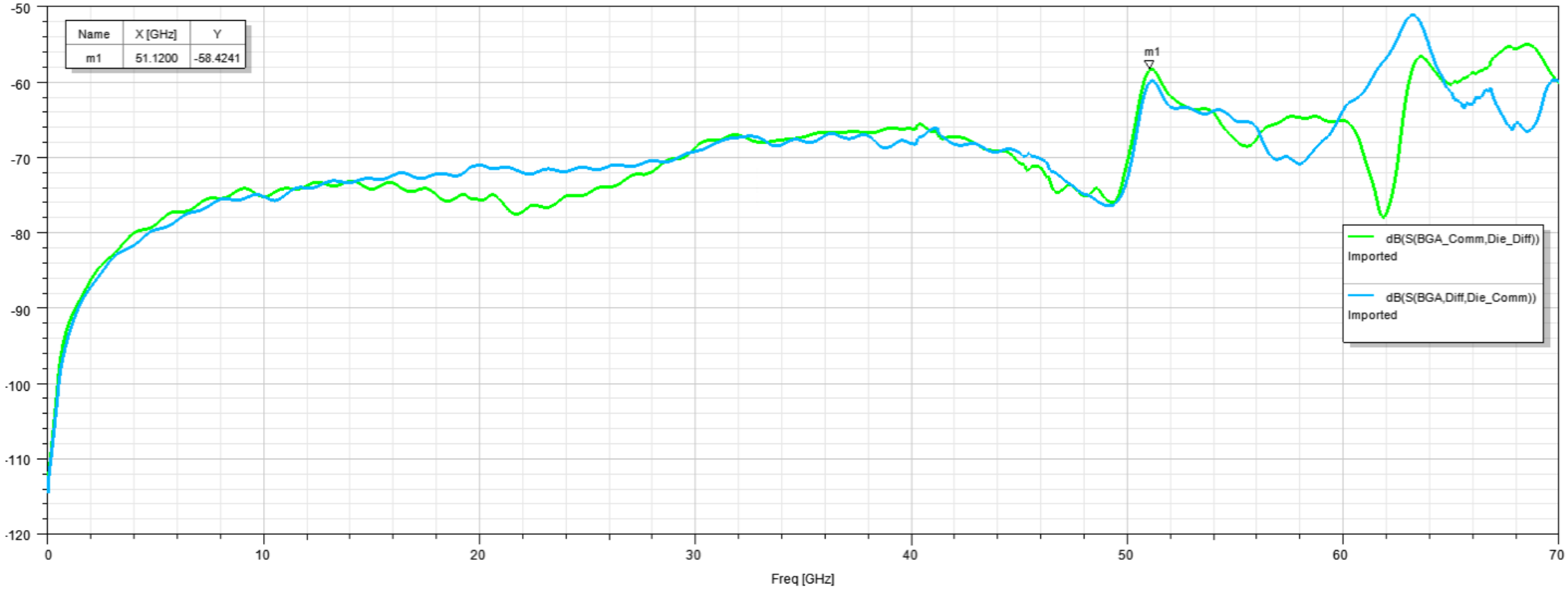
Package Geometry adjustment

- Intermediately used an 8-2-8 with 800µ core thickness and 1mm pitch
- A stack up of as many as 9 build-ups may be needed
- A core thickness of 1200µ or more will probably be needed for a radix optimized package co-planarity
- A package core transfer of ~1200µ was already optimized (not integrated yet into the end to end model) ≈ 0.5dB at 53.125GHz; Committed to integrate into an updated PKG model alongside buildup vias

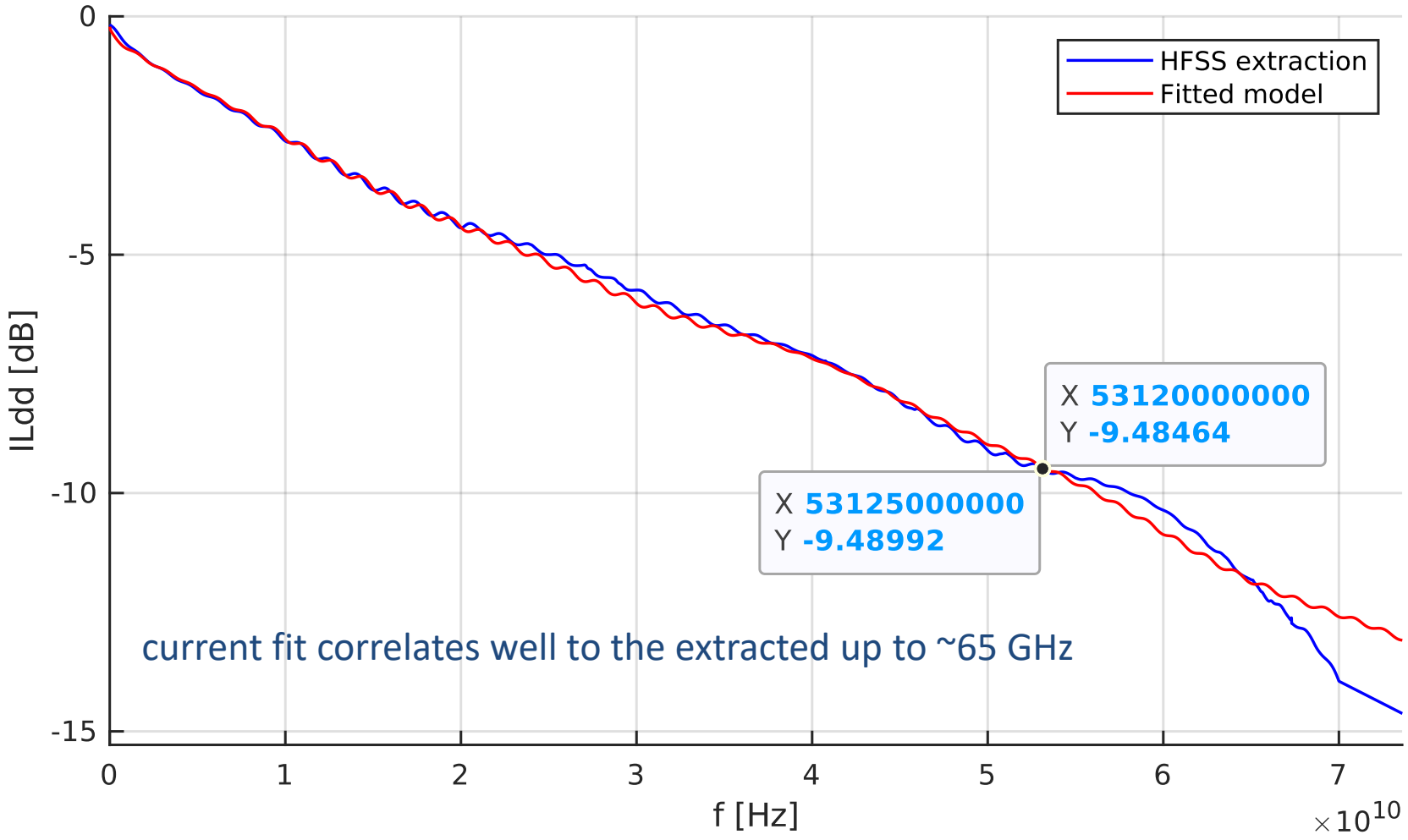
- As committed: The integration of a 1200µ core was done alongside 9 buildup layers

Package Geometry Adjustment

- Mode conversion of the extraction was minimized well above required frequency – below ~-60dB up to at least 60GHz



Updated COM Model Fit Vs. Updated Extraction of a 45mm Class B package



- Recap: Extraction brought for the November Plenary showed ~9.35dB loss at 53.125GHz

Suggested Class B Package Parameters

Table 93A–3 parameters			
Parameter	Setting	Units	Information
package_tl_gamma0_a1_a2	[5e-4 6.5e-4 2.93e-4]		
package_tl_tau	0.006141	ns/mm	
package_Z_c	[87.5 87.5 ; 95 95; 100 100; 78 78]	Ohm	
z_p select	[1 2 3 4]		[test cases to run]
z_p (TX)	[8 24 30 45 ; 2 2 2 2; 1.3 1.3 1.3 1.3 ; 1.5 1.5 1.5 1.5]	mm	[test cases]
z_p (NEXT)	[7 23 29 44 ; 2 2 2 2; 1.3 1.3 1.3 1.3 ; 1.5 1.5 1.5 1.5]	mm	[test cases]
z_p (FEXT)	[8 24 30 45 ; 2 2 2 2; 1.3 1.3 1.3 1.3 ; 1.5 1.5 1.5 1.5]	mm	[test cases]
z_p (RX)	[7 23 29 44 ; 2 2 2 2; 1.3 1.3 1.3 1.3 ; 1.5 1.5 1.5 1.5]	mm	[test cases]
C_p	[40e-6 40e-6]	nF	[TX RX]

Follow-up on Committed next Steps as specified during November Plenary

- Suggest to use the current parameters as a good enough representation of Class B package – Radix optimized (Done)
- Integrate the 1200µ core section into the bump to ball model – Estimated adjusted overall loss to be around 9.5dB – Real close to current package (Done – Actual extraction result is 9.48dB at 53.125GHz)
- Use the newly extracted model to minorly refit the parameters and provide during one of the coming adhocs (Done – By eliminating the roll-off we were able to get a much better COM package model fit)
- Suggest adopting this update COM package model according to former commitment to the group as “Class B” package parameters

Thank You!