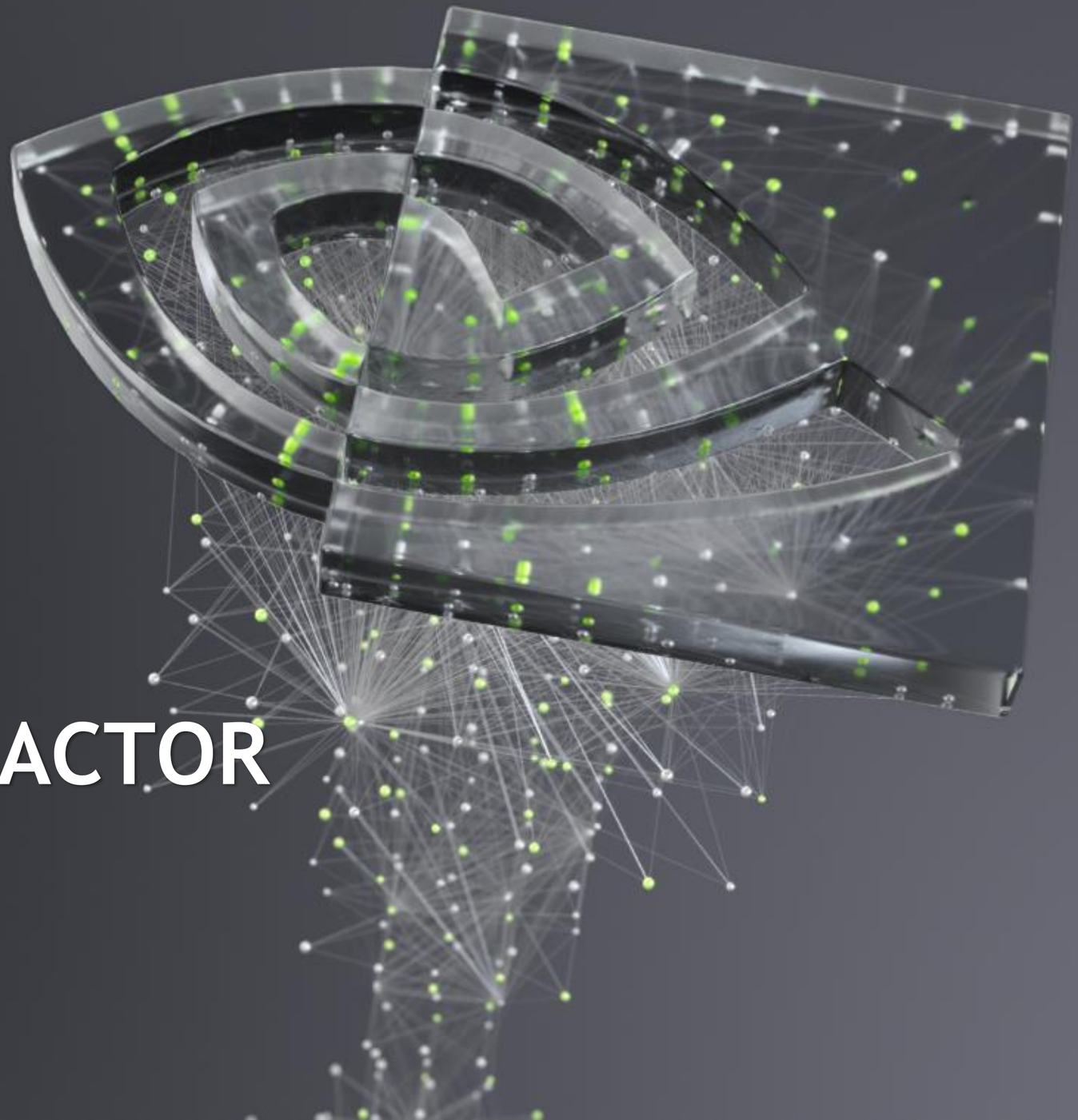
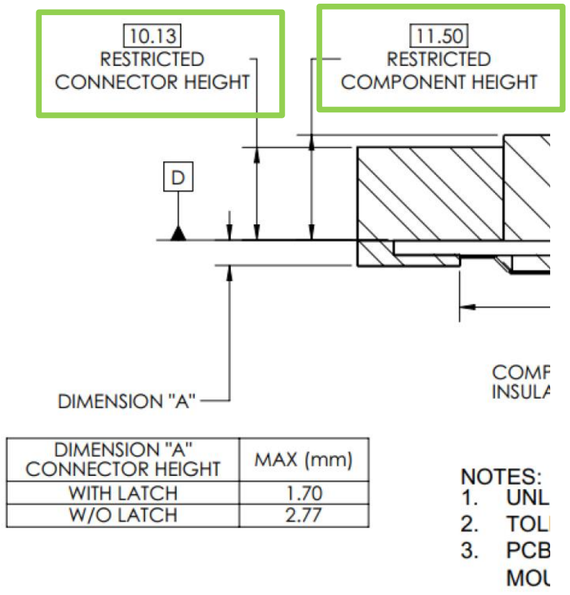


OCP 3 TALL FORM FACTOR PROPOSAL

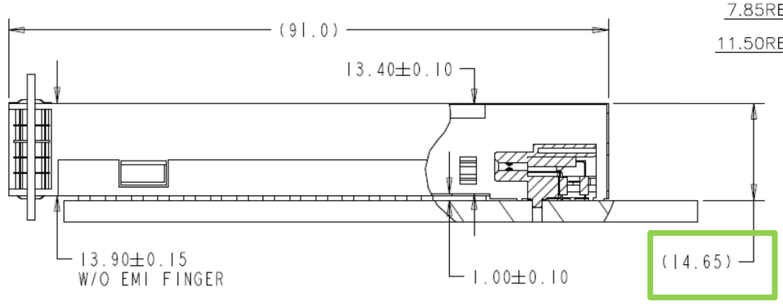
Andrey Lashchuk, September 3rd 2020

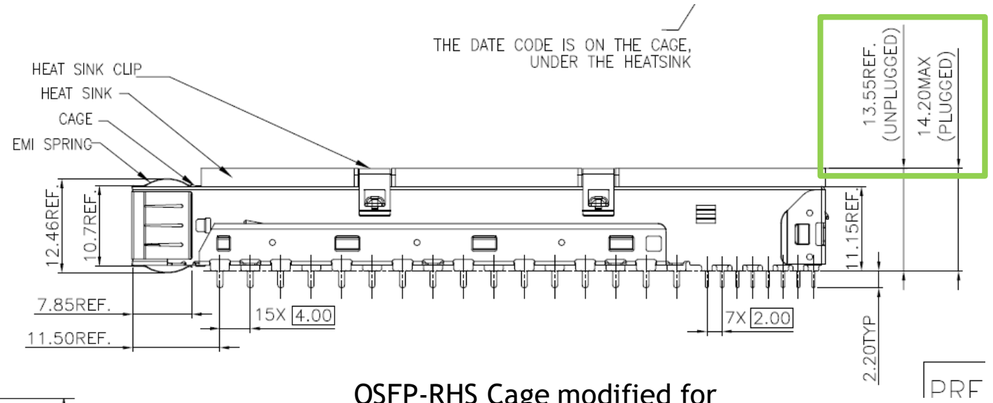
MOTIVATION

1. Nvidia Networking has chosen OSFP as POR solution for Infiniband NDR 400Gb/s. The advantages of OSFP over QSFP112 or QSFP-DD are:
    - Thermal – larger thermal contact area and integrated fins in the backshell.
    - Signal integrity – based on our SI team study, OSFP shows better performance than currently available alternatives in the market.
2. In order to fit into PCIe CEM boundaries, OSFP-RHS cage modification is used. A cage with specific thermal solution was simulated in PCI CEM environment, successfully. Simulation in OCP 3.0 environment is yet to come.
3. Current OCP 3.0 rev 1.0 could not accommodate OSFP interface, as shown below:



OSFP Cage





OSFP-RHS Cage modified for PCIe CEM application

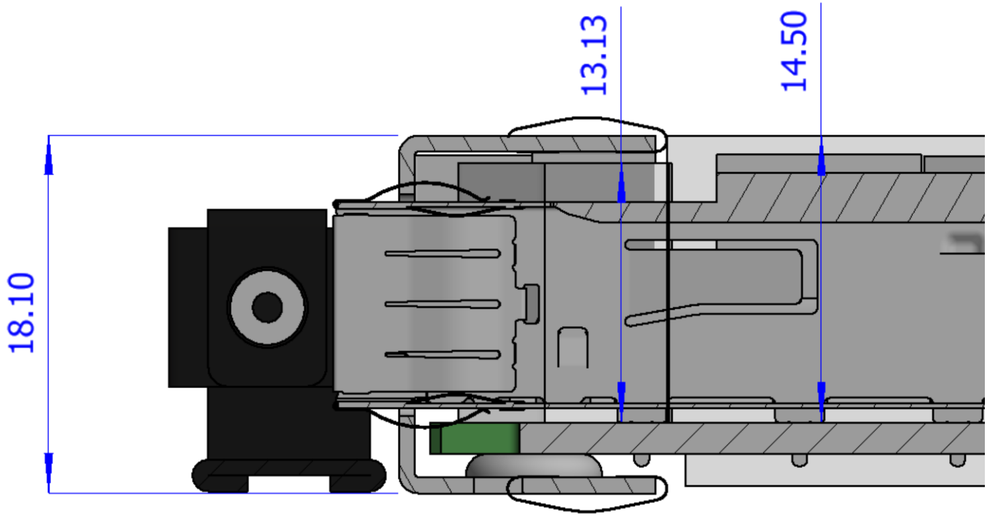
DESIGN TARGETS

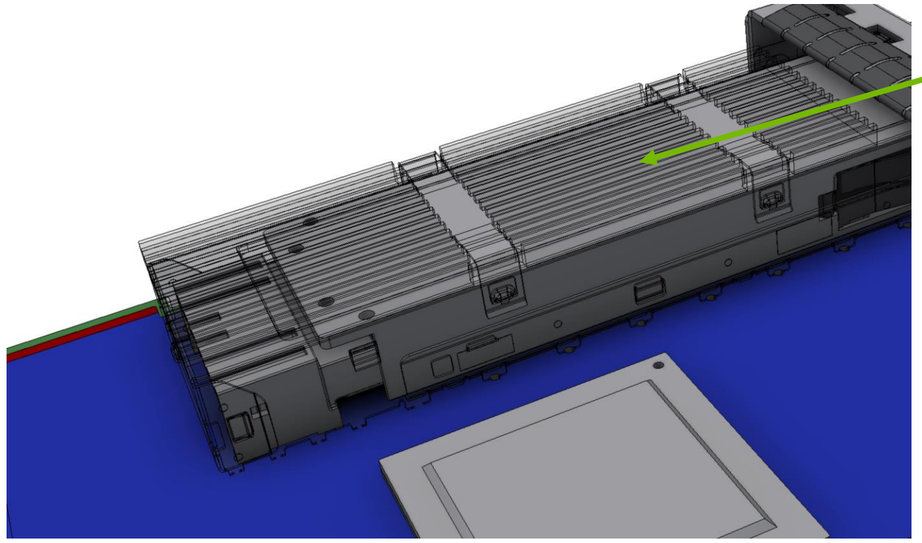
Listed below our targets for new form-factor design

1. Clean and simple design, straight forward approach.
2. Accommodate both OSFP and OSFP-RHS cages including thermal solution within minimal volume.
3. Provide sufficient thermal performance to operate under OCP 3.0 server system airflow capability, tiers.
4. Preserve as much as possible existing faceplate tooling, including sub-assembly.
5. Minimize the impact on running NICs mass production lines, assembly complexity and testing machinery.
6. System side – Enable easy support for all form factors in the same chassis, with minimal adaptations.
7. System side – Keep stacking options in 1U/2U envelopes.
8. The design changes shall be applicable to LFF as well.

TALL SMALL FORM FACTOR

TSFF – Supports OSFP-RHS cage with PCIe CEM heat-sink



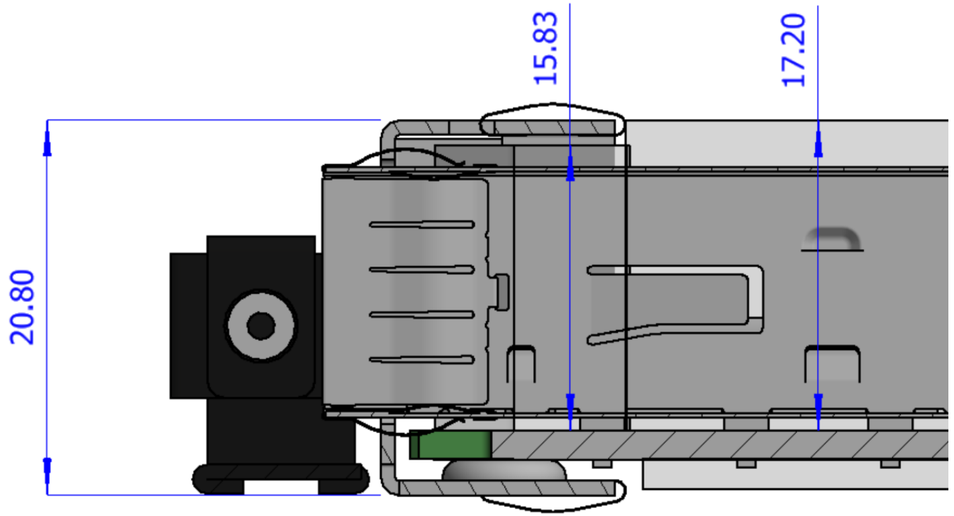


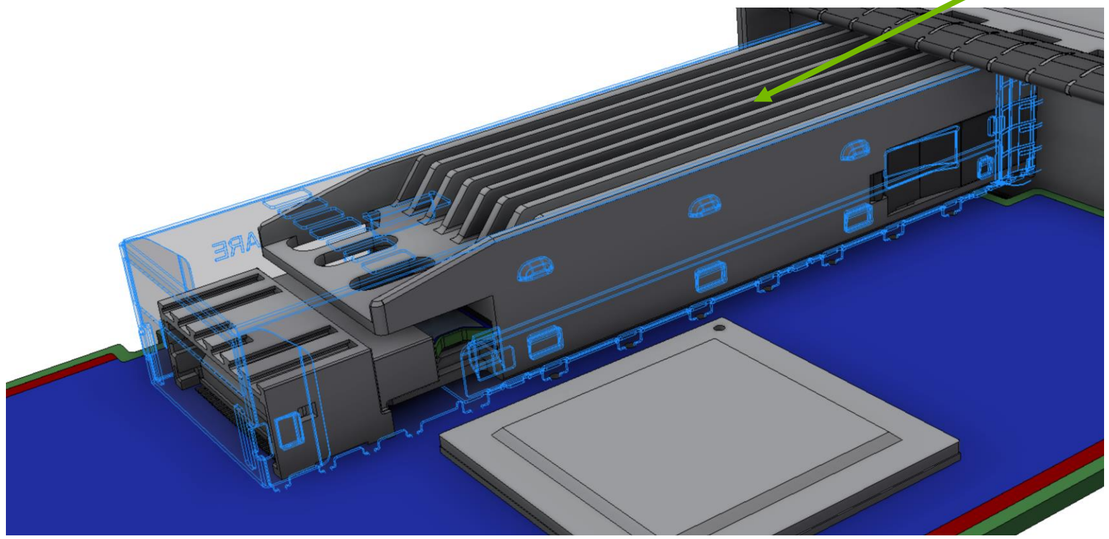
Flat back-shell module, riding heat-sink (RHS) assembled on the cage

- Straight forward approach – extending current design.
- Ejector latch faceplate taken as a case study since it is the most restrictive design.
- Cage heat-sink (above) is given for representation purpose only.

EXTRA TALL SMALL FORM FACTOR

ETSFF – Supports OSFP cage, could accommodate finned back-shell module

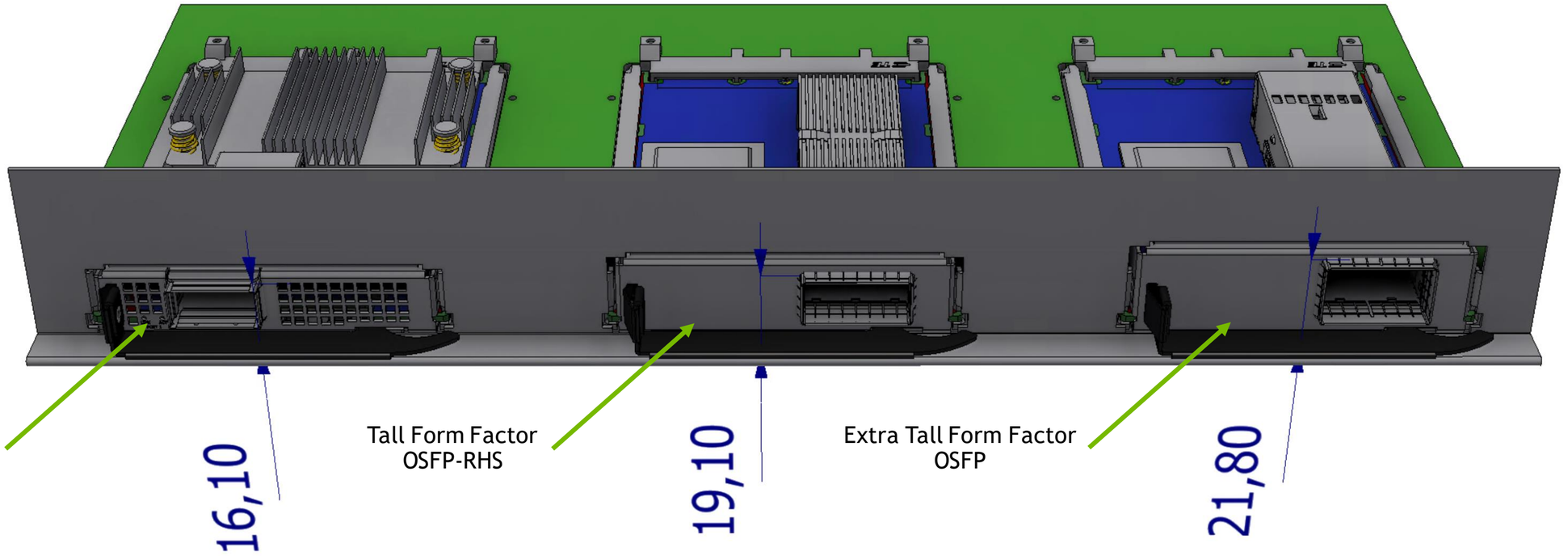




- Straight forward approach – extending current design.
- Ejector latch faceplate taken as a case study since it is the most restrictive design.

CHASSIS APERTURE

Adjustments required in chassis aperture



- Same chassis could accommodate all form factors using interposer inserts.
- Ejector latch faceplate taken as a case study; the concept applicable for all faceplate flavors.

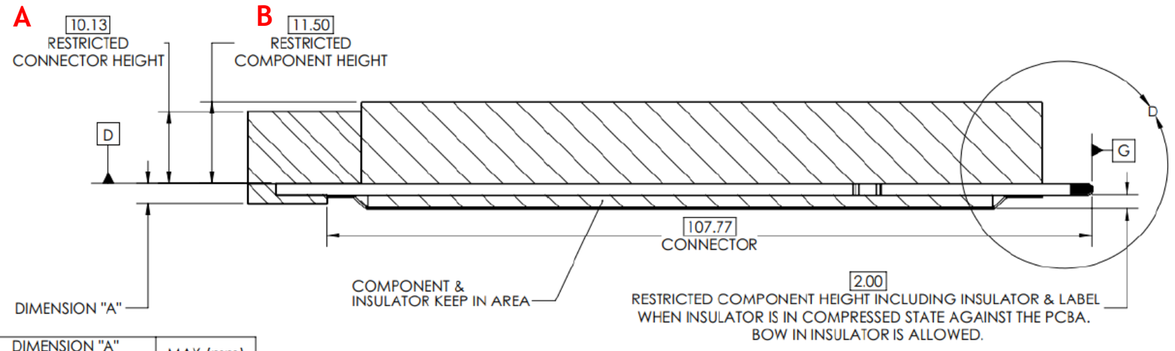
KEY DIMENSIONS CHANGES SUMMARY

List of main dimensional deviations from ‘standard height’ form factor

Dimension	Standard	TSFF (S+3)	ETSFF (S+5.7)
A	10.13	13.13	15.83
B	11.5	14.5	17.2
C	15.1	18.1	20.8
D	12.81	16.01	18.51
E	16.1	19.1	21.8

- Given dimensions are also valid for Large Form Factor
- Internal faceplate dimensions were omitted, shall be updated in manufacturing drawing

Figure 27: SFF Keep Out Zone – Side View



DIMENSION "A" CONNECTOR HEIGHT	MAX (mm)
WITH LATCH	1.70
W/O LATCH	2.77

NOTES:
1. UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS
2. TOLERANCE UNLESS OTHERWISE SPECIFIED: ±0.13, ±1.0°
3. PCBA SHALL ADHERE TO IPC-A-600G, CH. 2-11 FLATNESS: FOR PRINT BOARDS USING SURFACE MOUNT COMPONENTS THE BOW AND TWIST SHALL BE 0.75% OR LESS. THE FLATNESS MEASUREMENT IS DEFINED ACCORDING TO IPC-TM-650 2.4.22

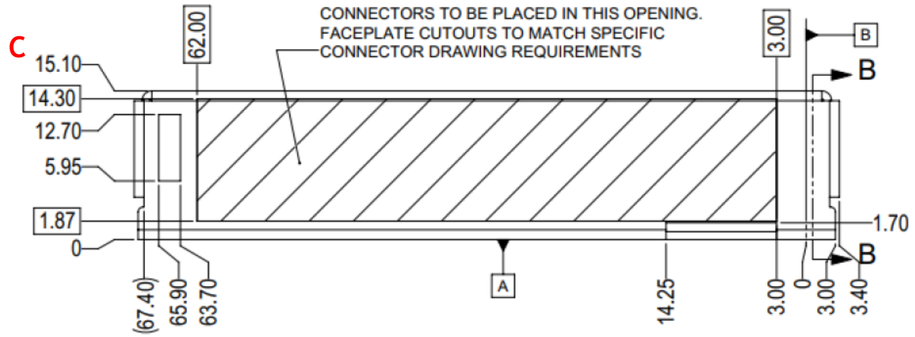
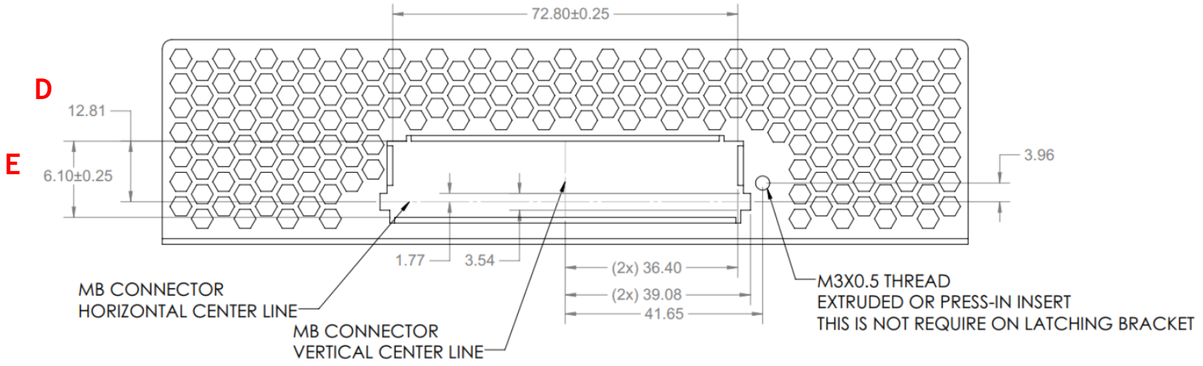


Figure 49: SFF Baseboard Chassis CTF Dimensions (Rear View)

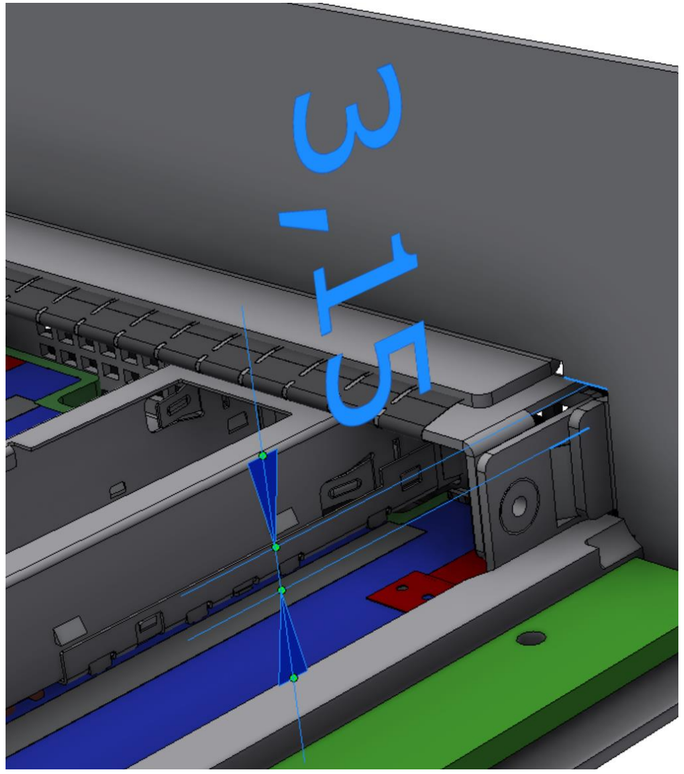


POINT OF CONCERN

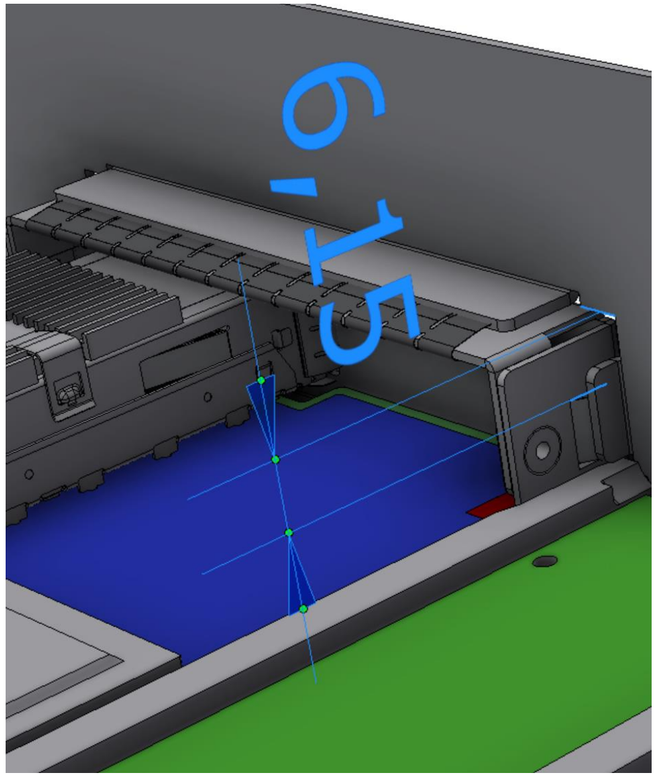
EMI Shielding on faceplate sides

In purpose of simplicity, the side EMI finger was kept the same. The gap increased as shown below.
Is this a significant change? Guidance from system manufacturers is required.

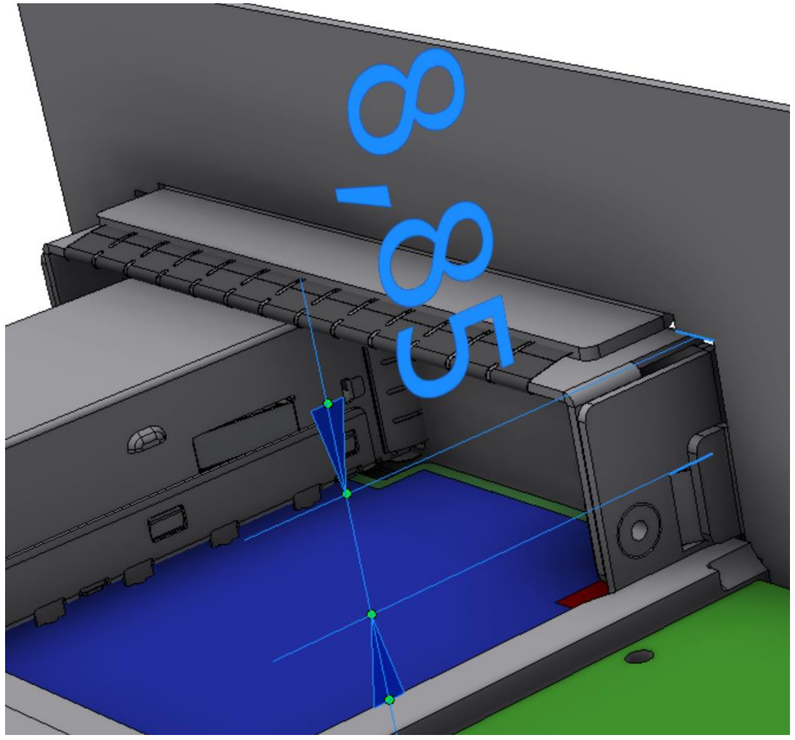
Standard height
QSFP



Tall Form Factor
OSFP-RHS

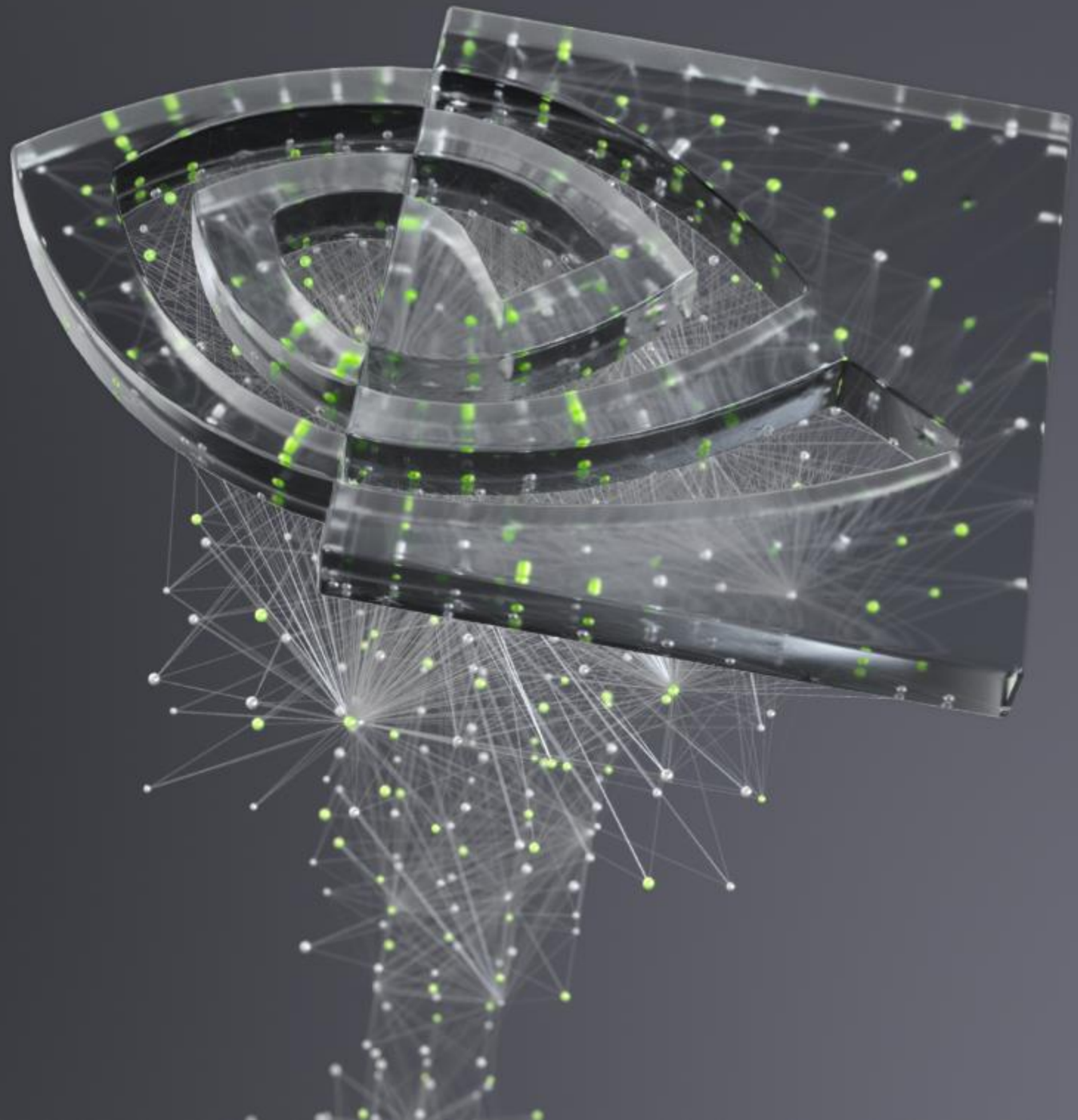


Extra Tall Form Factor
OSFP



SUMMARY

1. Clean and simple design, straight forward approach. - Done
2. Accommodate both OSFP and OSFP-RHS cages including thermal solution within minimal volume. - Done
3. Provide sufficient thermal performance to operate under OCP 3.0 server system airflow capability, tiers. – TBD
4. EMI performance evaluation of TSFF and ETSFF is required, in case of marginal results the side EMI spring could be extended. - TBD
5. Preserve as much as possible existing faceplate tooling, including sub-assembly. - Done
6. Minimize the impact on running NICs mass production lines, assembly complexity and testing machinery. - Done
7. System side – Enable easy support for all form factors in the same chassis, with minimal adaptations. – TBD, Feedback from system level manufacturers is required.
8. System side – Keep stacking options in 1U/2U envelopes. – TBD, Feedback from system level manufacturers is required.
9. The design changes shall be applicable to LFF as well. – Done
10. **In case of proposal/s acceptance, Nvidia Networking will take care of drawings and prototypes manufacturing.**



NVIDIA

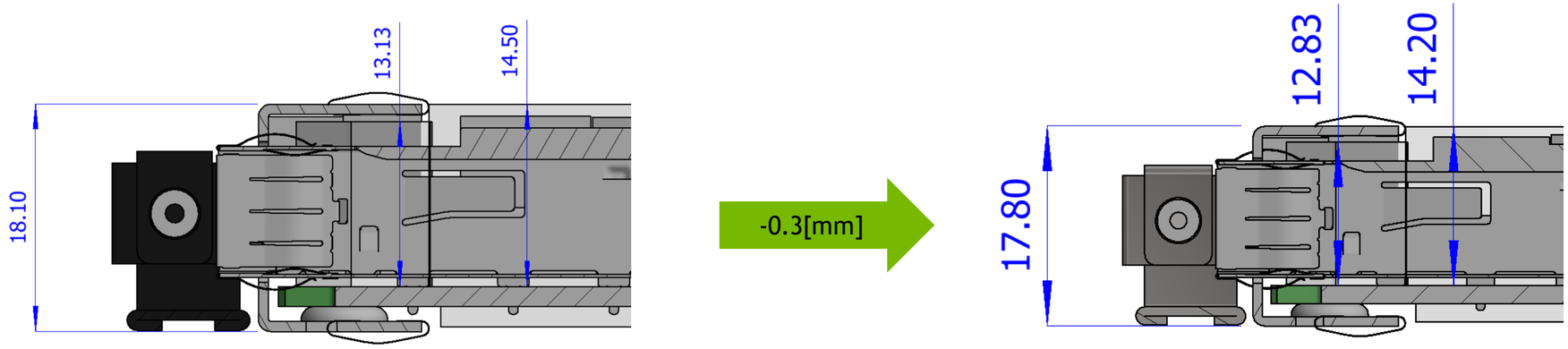
UPDATE #1

Andrey Lashchuk, October 7th 2020

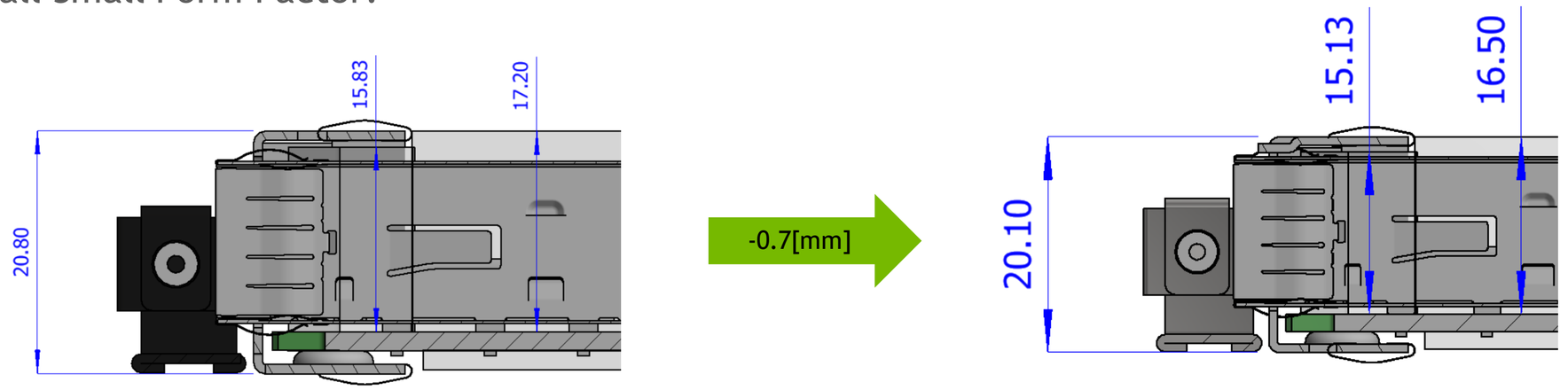
PROPOSAL UPDATE

During last month we did a development effort with DellEMC. As a result the proposed heights were adjusted, to provide better 1U stacking capability, as shown below:

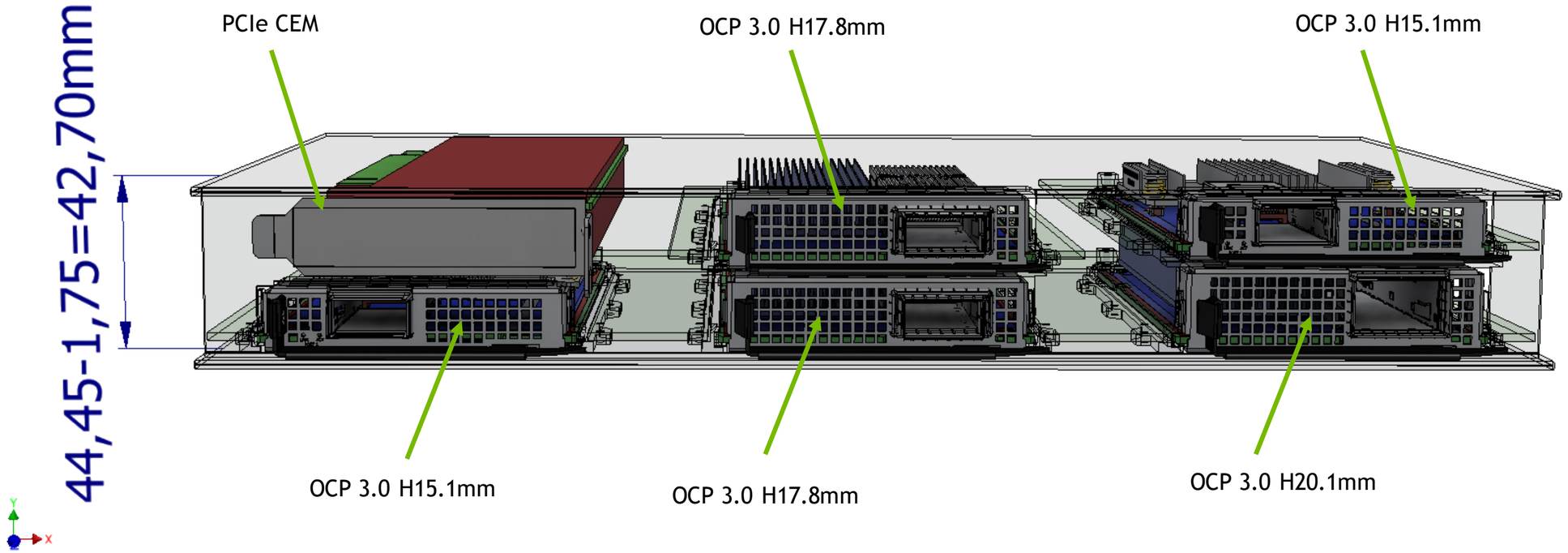
- Tall Small Form Factor:



- Extra Tall Small Form Factor:

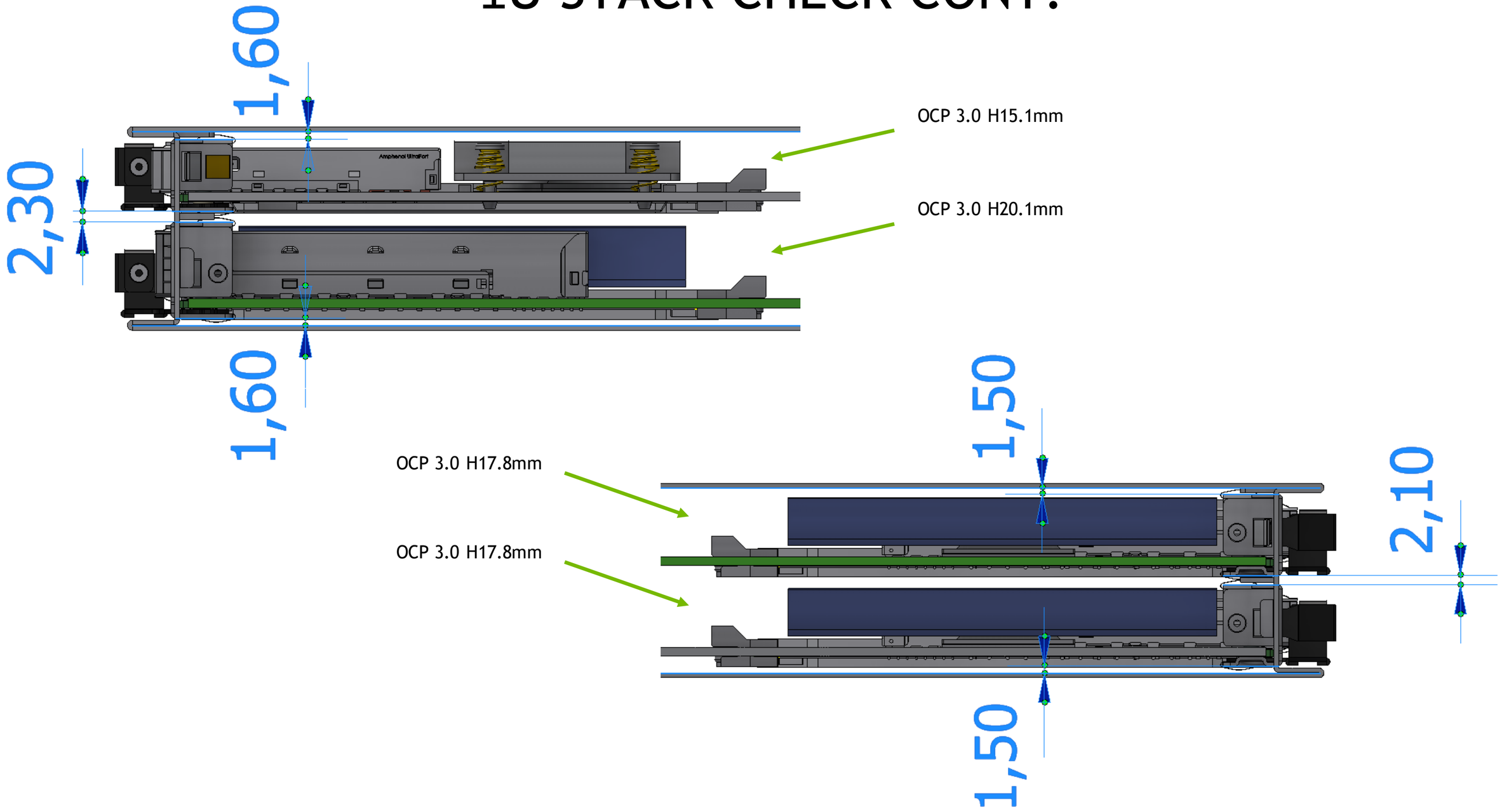


1U STACK CHECK

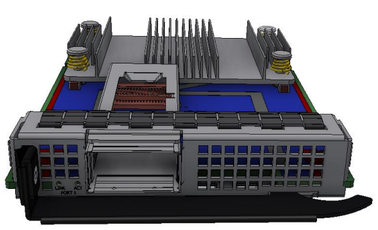
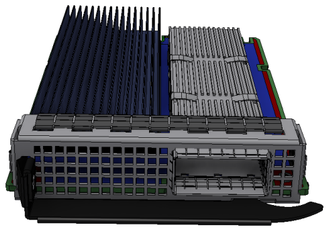
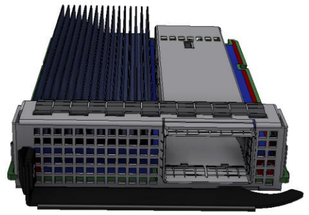
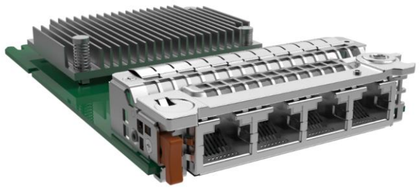


Stack options in 1U envelope				
	PCIe CEM	H15.1	H17.8	H20.1
PCIe CEM		V	X	X
H15.1	V	V	V	V
H17.8	X	V	V	X
H20.1	X	V	X	X

1U STACK CHECK CONT.



FORM FACTOR COMPARISON CHART

Dimension	H15.1	H17.8	H20.1	HDHP
A	10.13	12.83	15.13	TBD
B	11.5	14.2	16.5	14.2
C	15.1	17.8	20.1	17.8
D	12.81	15.51	17.81	15.51
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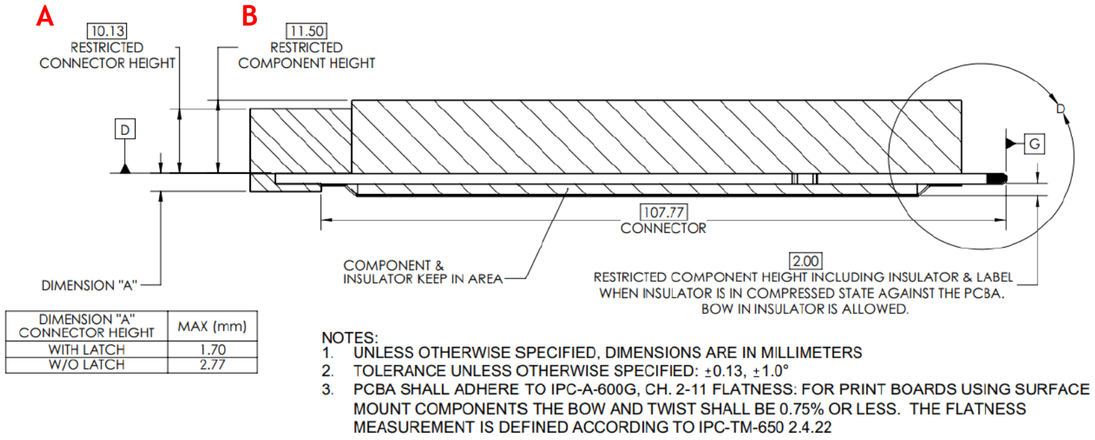

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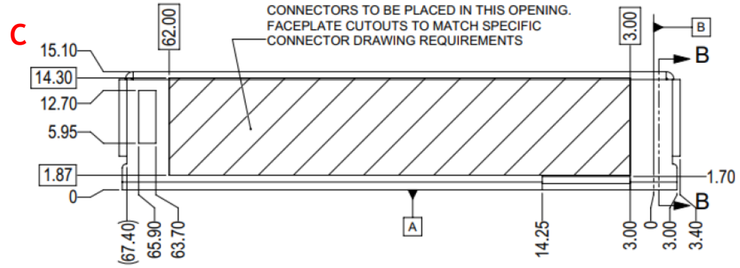
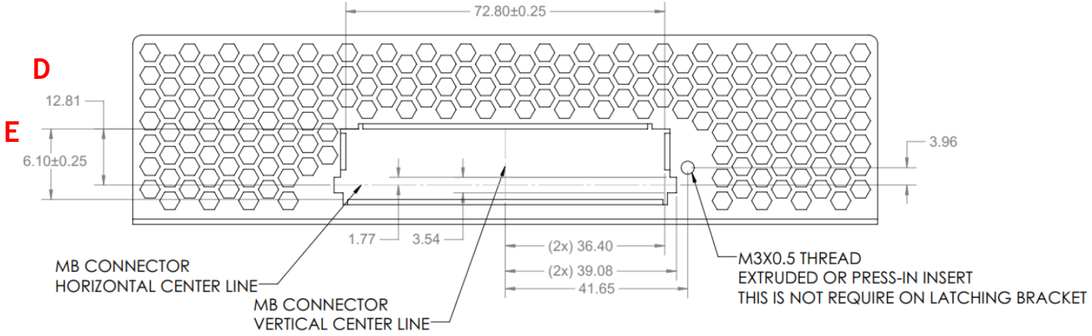


Figure 49: SFF Baseboard Chassis CTF Dimensions (Rear View)

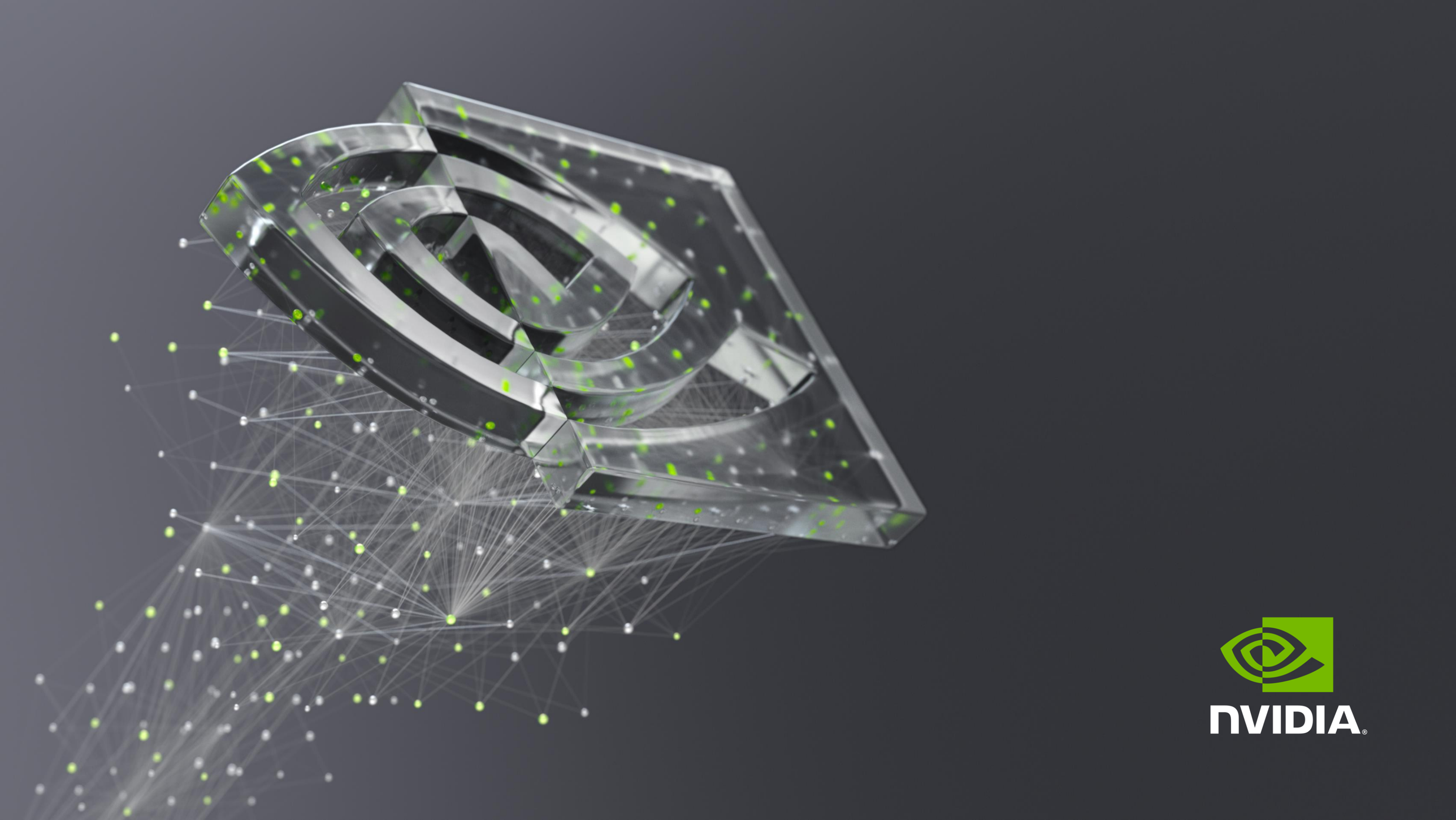


PROS/CONS CHART

FOR OPEN DISCUSSION

Type	H17.8		H20.1		HDHP	
	PROS	CONS	PROS	CONS	PROS	CONS
Thermal	Improved thermal performance compared with H15.1. For both ASIC and ports.	Smaller thermal envelope volume than H20.1	Provides the largest volume for thermal solution, compared to all other FF		Effective perforation in fully populated faceplate, quad RJ-45 and quad SFP	Restricting thermal solution for the ports, compared to H17.8 and H20.1 due to jog and ejector features
					More volume for ASIC thermal solution, compared with H15.1	
Mechanical	Enable usage of OSFP-RHS	No PCIe CEM card stack option in 1U	1U stack option with H15.1, no volume above is ‘wasted’	No 1U stack option with PCIe CEM and H17.8	Horizontal stack in 2U chassis	Restricting connector height
	1U Stack option with H15.1 and H17.8		Enable use of ‘full’ OSFP interface		1U Stack option with HDHP or H17.8	
Operative	Design extension of H15.1 bracket, no significant cost addition		Design extension of H15.1 bracket, no significant cost addition			Higher cost due to complexity and larger BOM

- Quantified data shall be presented during TechWeek session. Simulations are still in progress.


NVIDIA