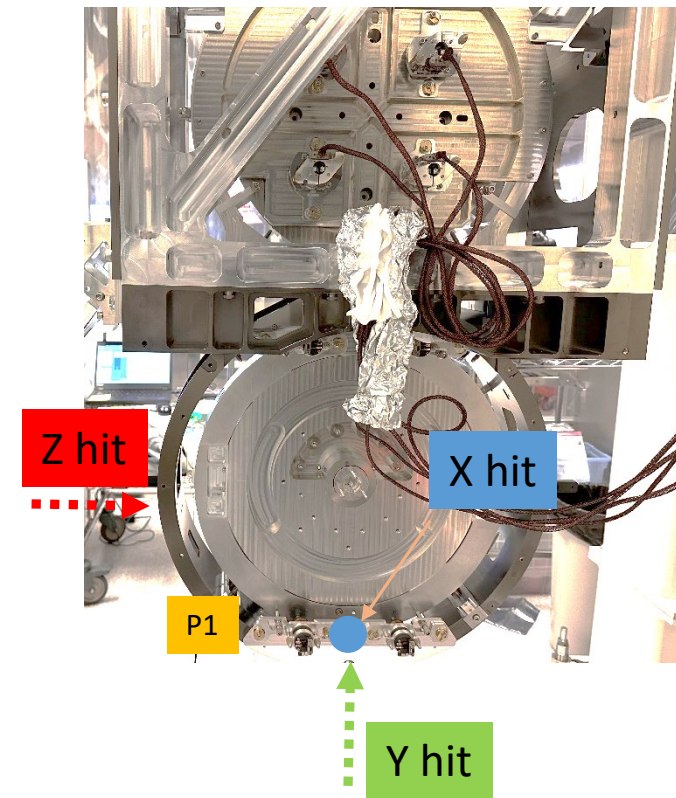
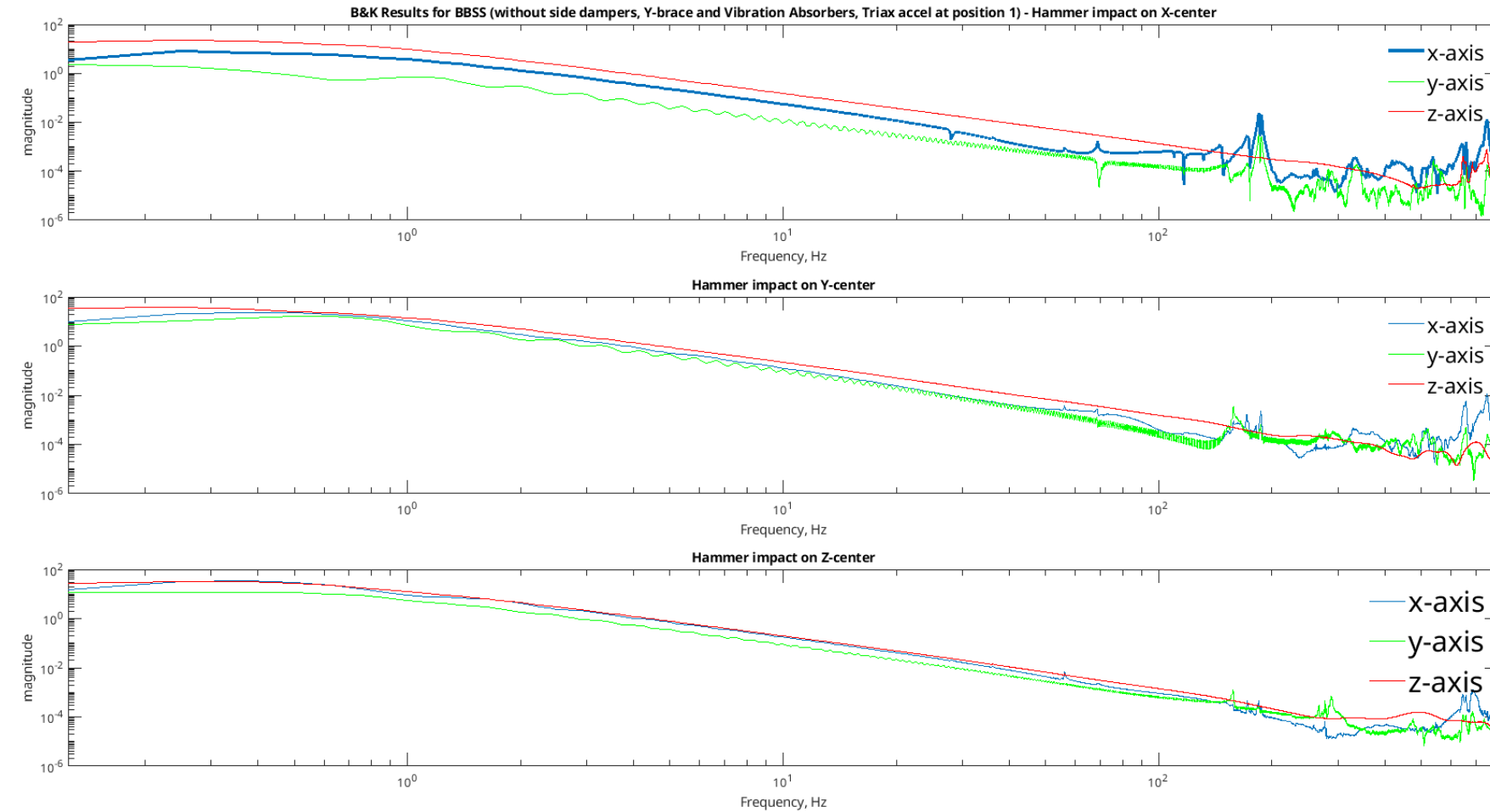


B&K hammer measurement results for BBSS+HRTS at LHO

Rahul Kumar, Ibrahim Abouelfettouh, Betsy Weaver, Jeff Kissel
LHO, June 2025

Test 1a:- BBSS (**without HRTS**) – without side-dampers or Y-brace (accelerometer position P1)



Y (vertical)



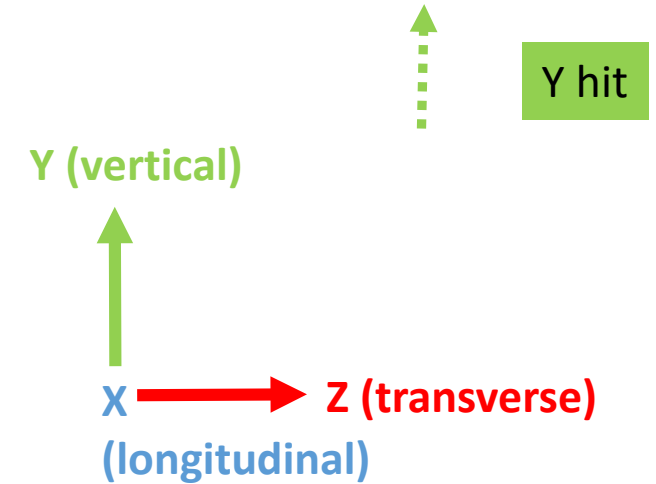
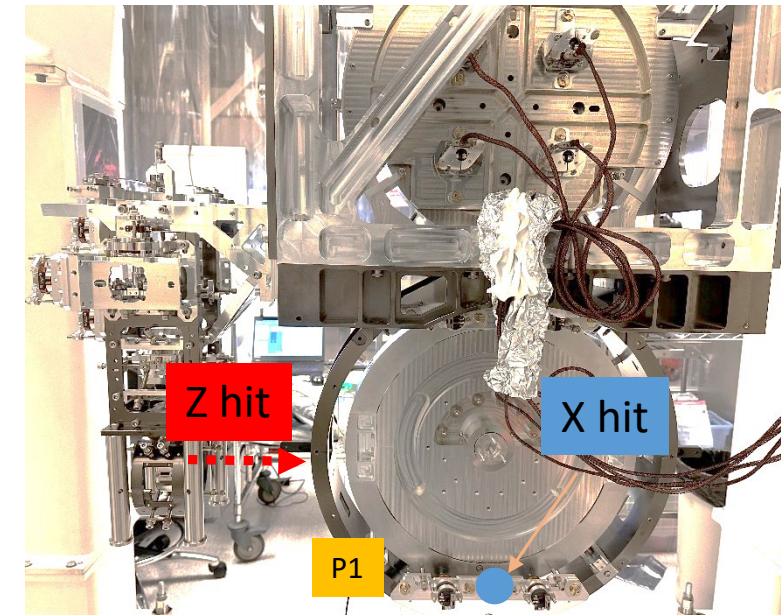
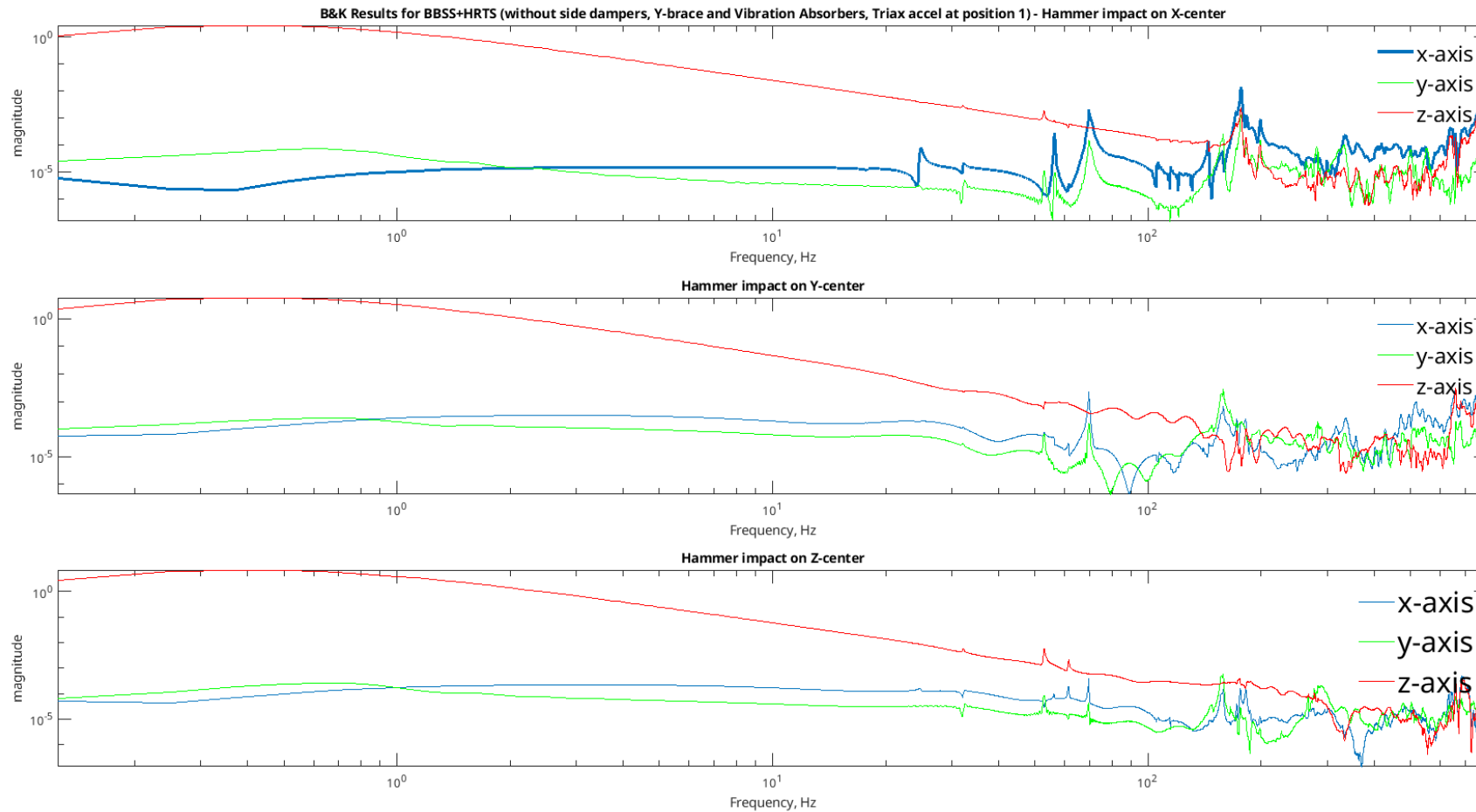
X

(longitudinal)

Z (transverse)

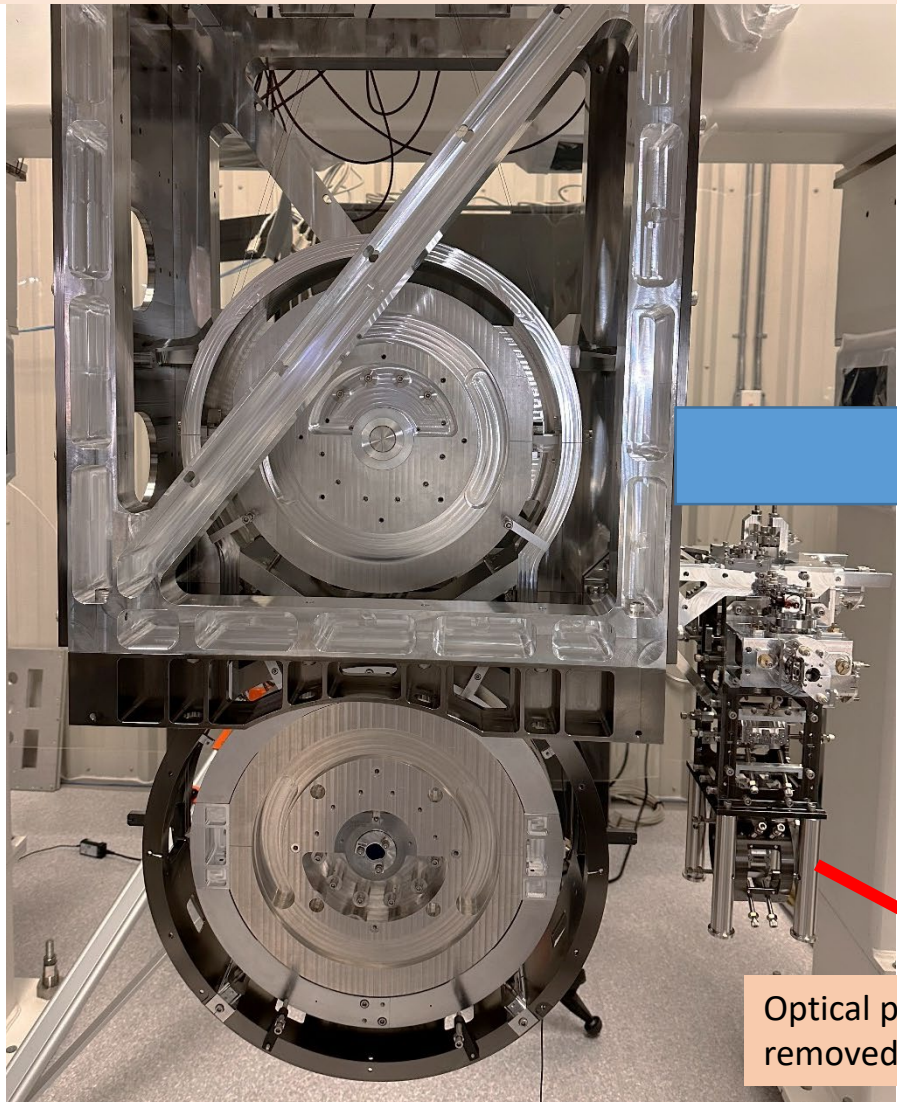
Accelerometer axis and
hammer hit direction

Test 1b:- BBSS & HRTS – without side-dampers or Y-brace (accelerometer position P1)

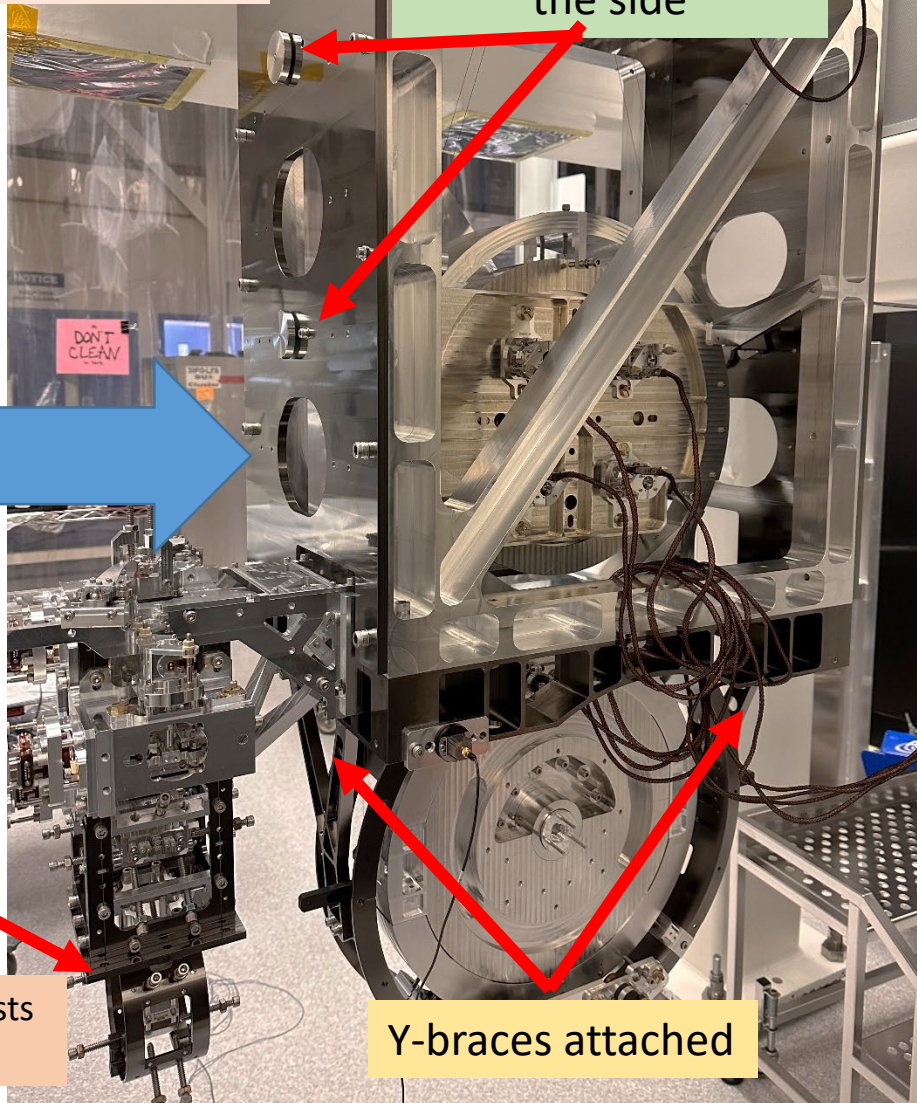


Accelerometer axis and
hammer hit direction

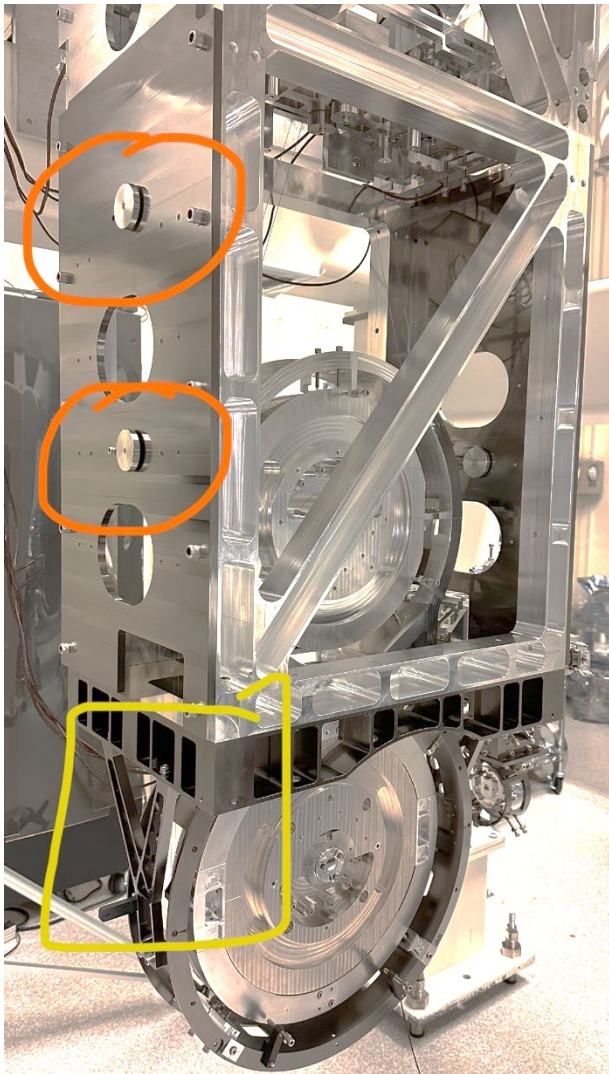
Side dampers and Y-brace attached to BBSS (no
Vibration Absorbers)
(Hammer tests:- 2 to 5)



Optical posts removed

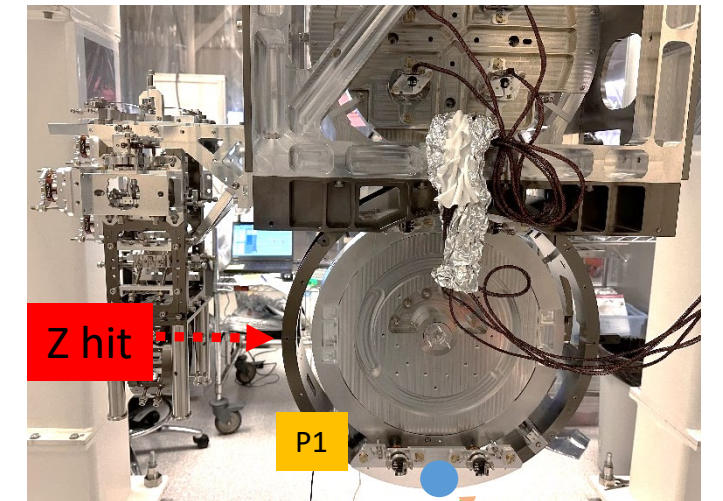
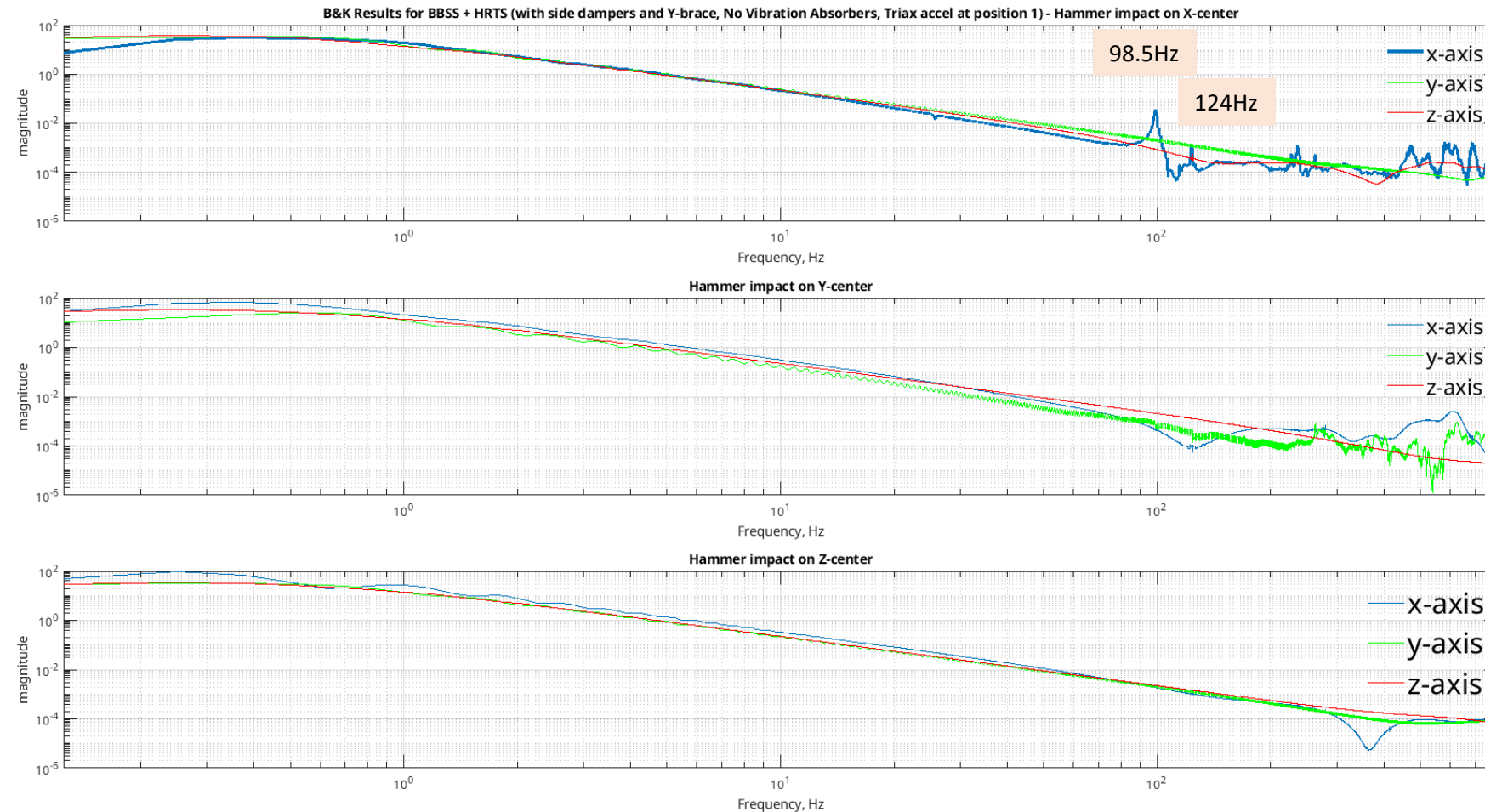


Y-braces attached



Side view after attaching additional parts

Test 2a (accelerometer position P1) (hit on the center of the XYZ axis) With side dampers and Y-brace, No Vibration Absorbers



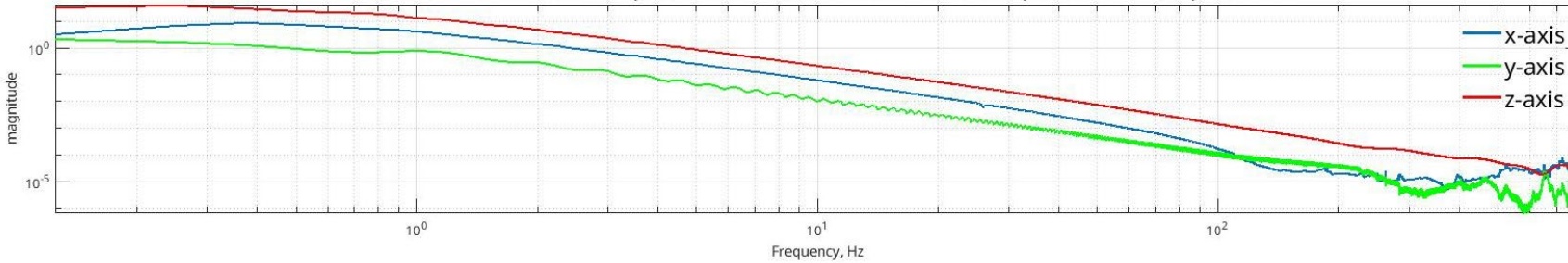
Y (vertical)

X — Z (transverse)
(longitudinal)

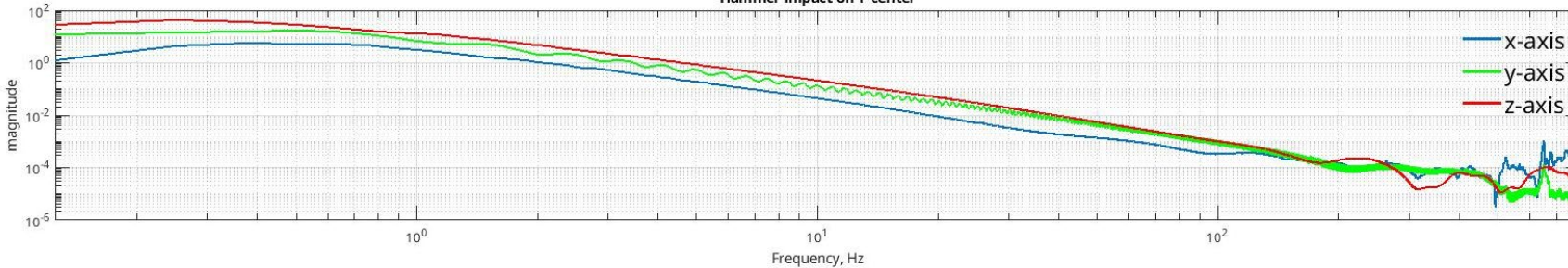
Accelerometer axis and
hammer hit direction

Test 2b (accelerometer position P2) (hit on the center of the XYZ axis) With side dampers and Y-brace, No Vibration Absorbers

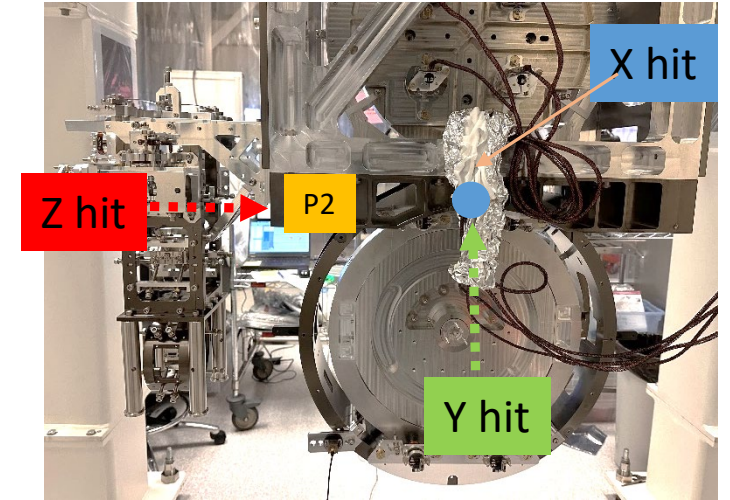
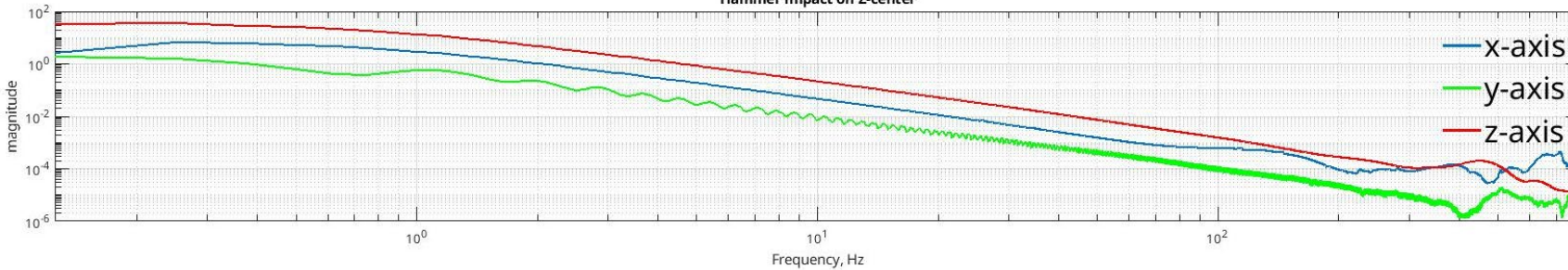
B&K Results for BBSS + HRTS (with side dampers and Y-brace, No Vibration Absorbers, Triax accel at position 2) - Hammer impact on X-center



Hammer impact on Y-center



Hammer impact on Z-center



Y (vertical)



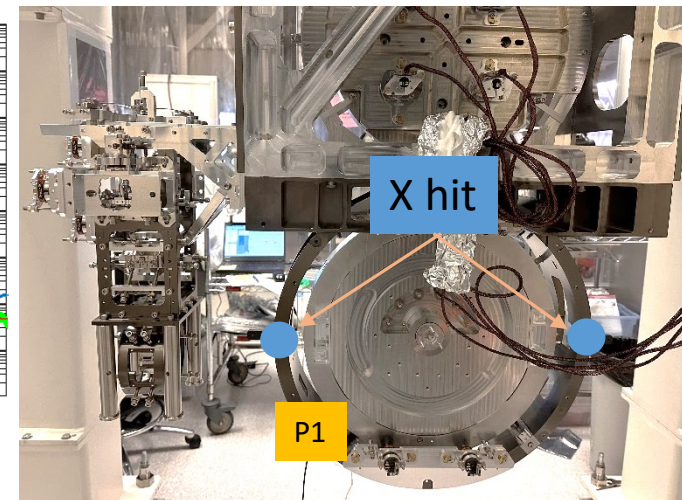
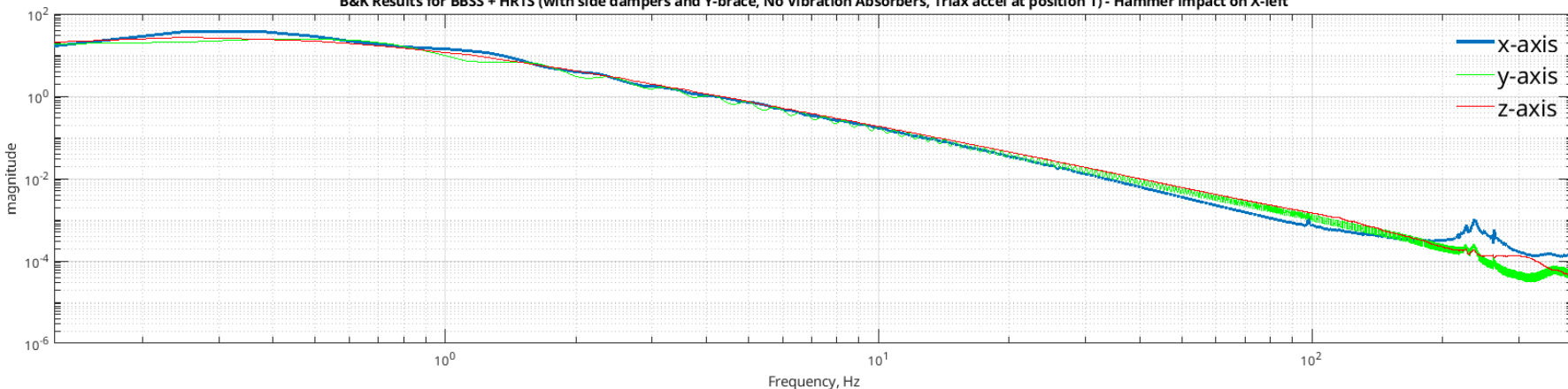
X

Z (transverse)
(longitudinal)

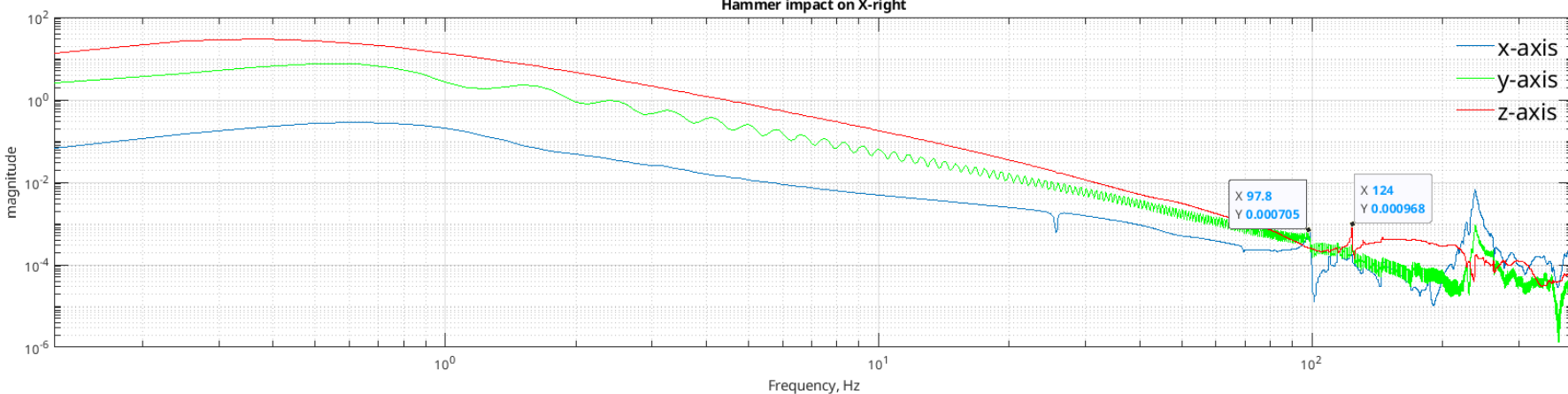
Accelerometer axis and
hammer hit direction

Test 3 (accelerometer position P1) (hit on the **sides** (left & right) of the X axis) With side dampers and Y-brace, No Vibration Absorbers

B&K Results for BBSS + HRTS (with side dampers and Y-brace, No Vibration Absorbers, Triax accel at position 1) - Hammer impact on X-left



Hammer impact on X-right



Y (vertical)

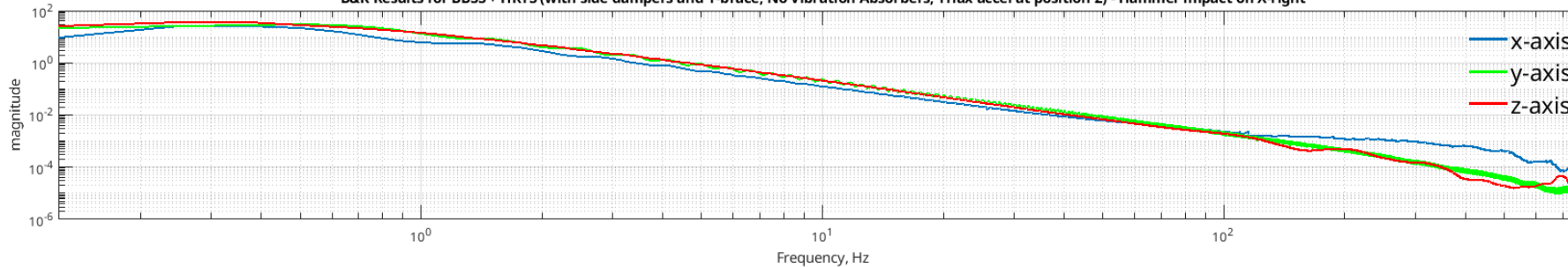


X (longitudinal) → Z (transverse)

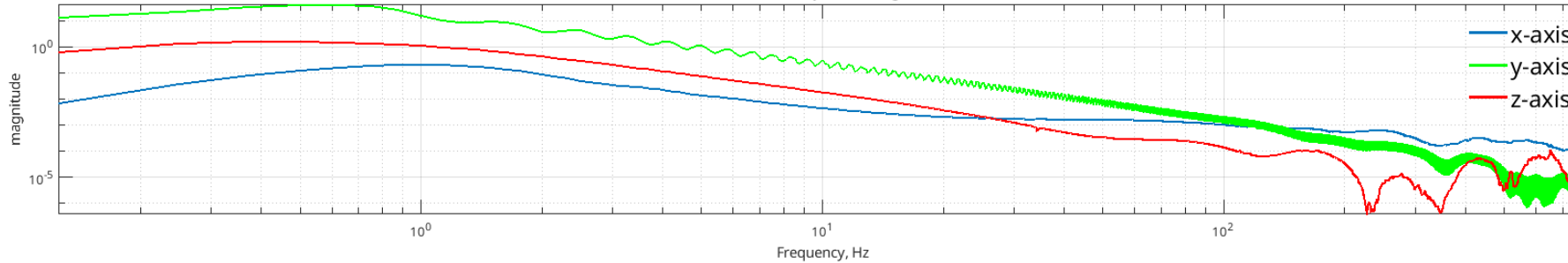
Accelerometer axis and
hammer hit direction

Test 4 (accelerometer position P2) (hit on the sides (left & right) of the XYZ axis) With side dampers and Y-brace, No Vibration Absorbers

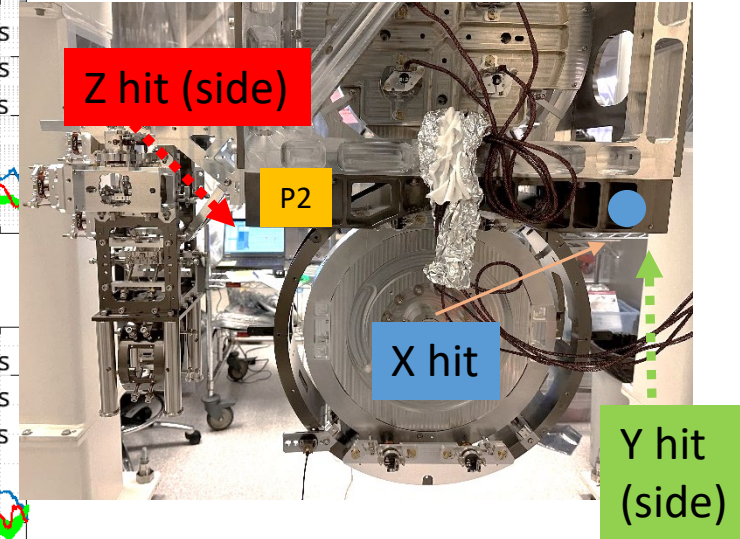
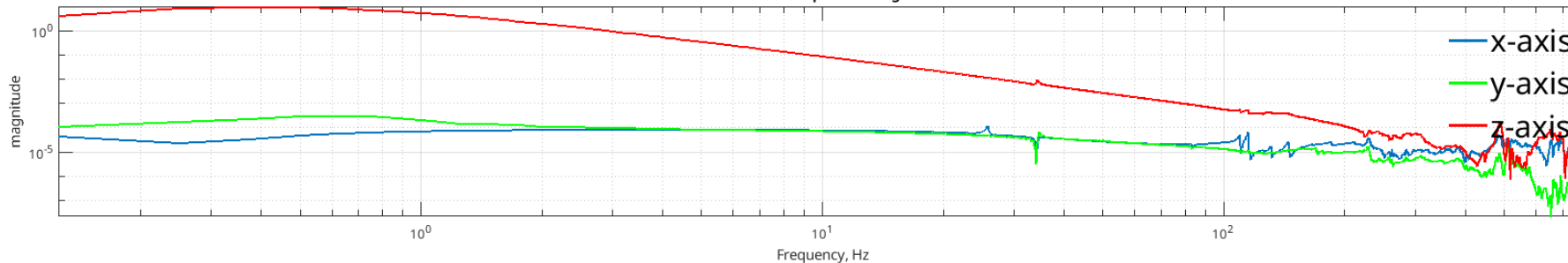
B&K Results for BBSS + HRTS (with side dampers and Y-brace, No Vibration Absorbers, Triax accel at position 2) - Hammer impact on X-right



Hammer impact on Y-right



Hammer impact on Z-right



Y (vertical)



X

Z (transverse)

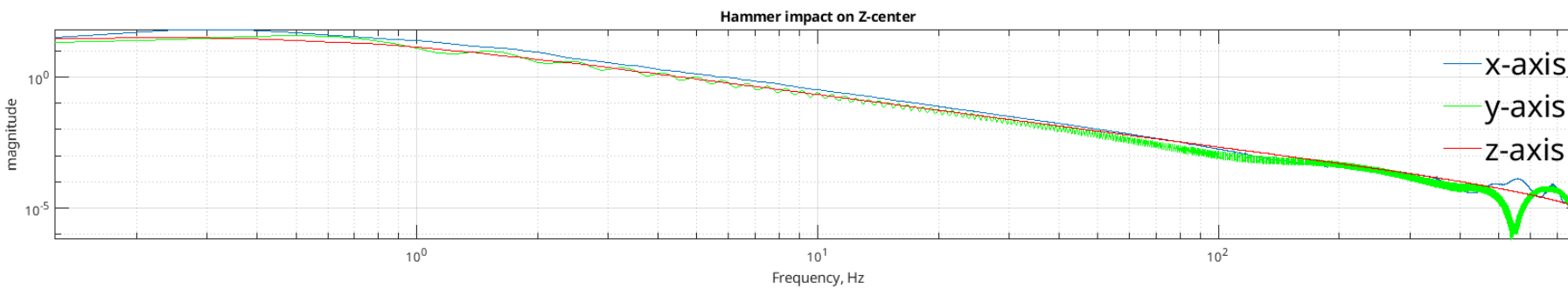
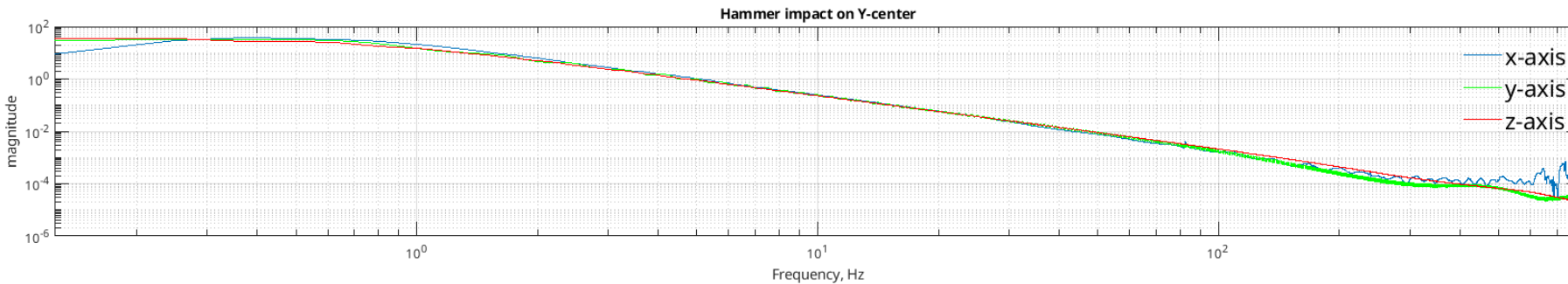
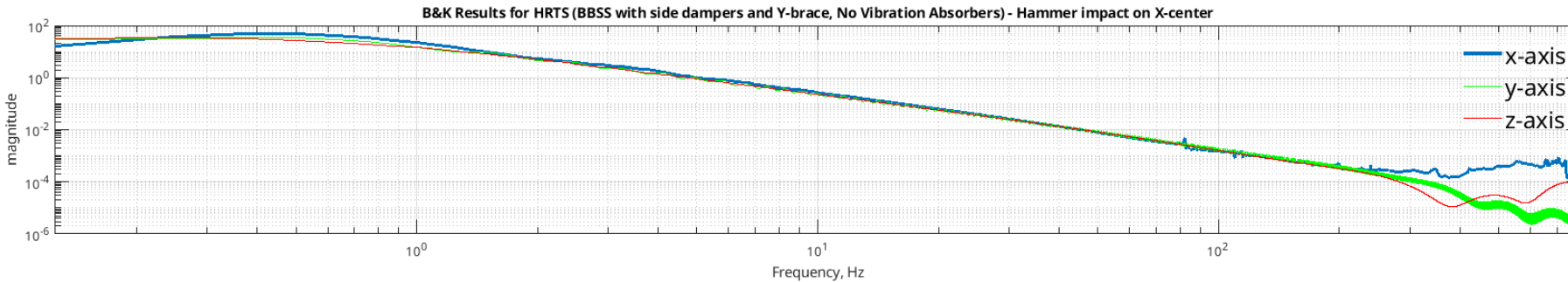
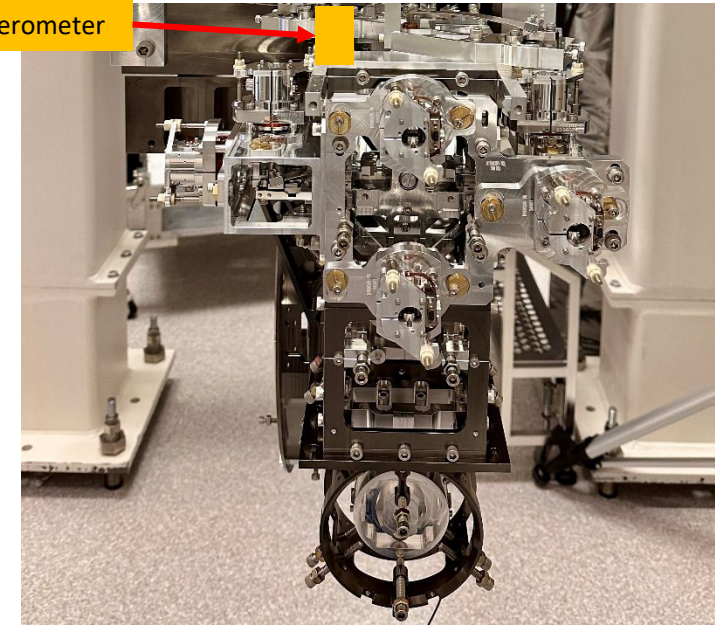
(longitudinal)

Accelerometer axis and
hammer hit direction

Test 5 (accelerometer on HRTS)

With side dampers and Y-brace on BBSS, No Vibration Absorbers

accelerometer



Y (vertical)



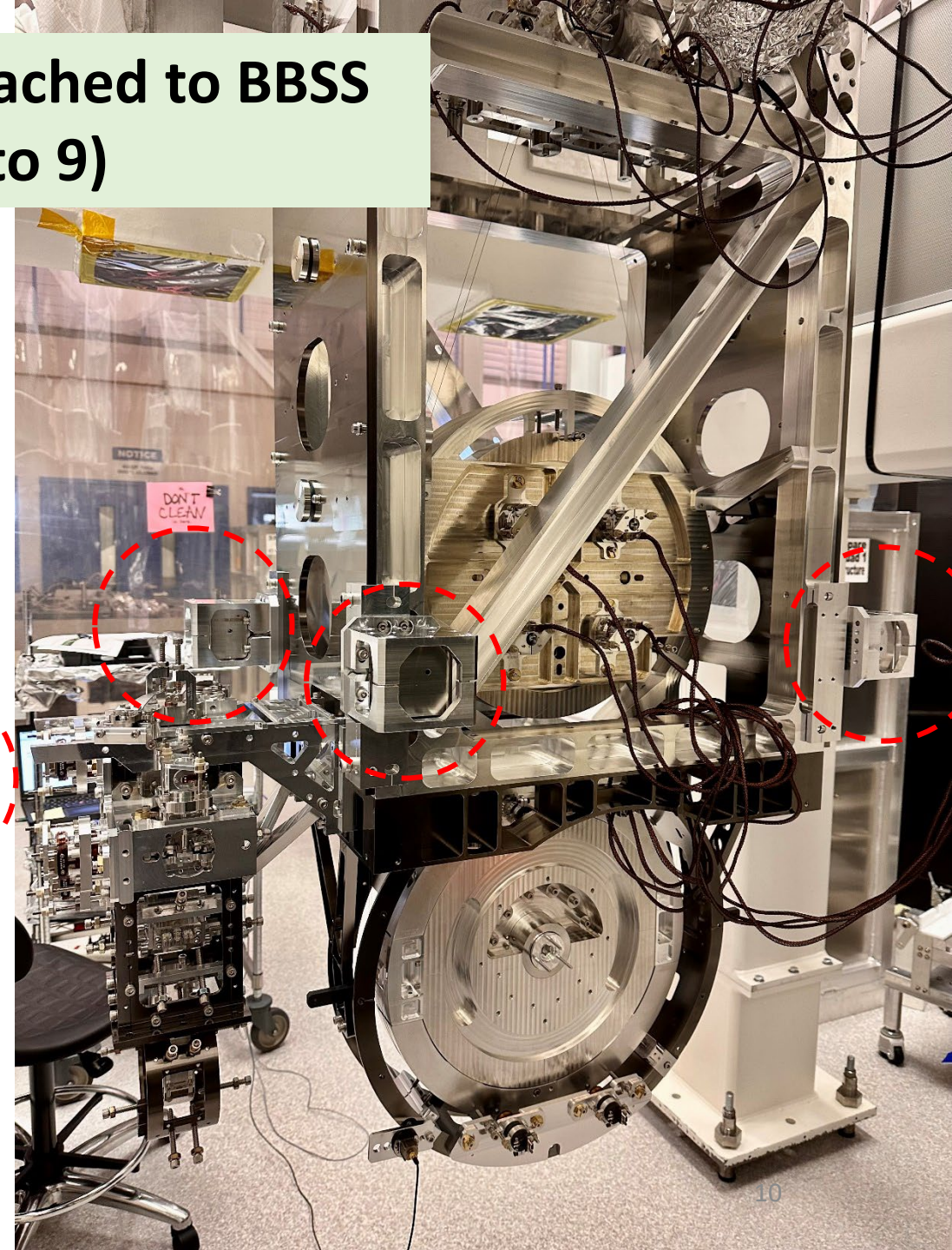
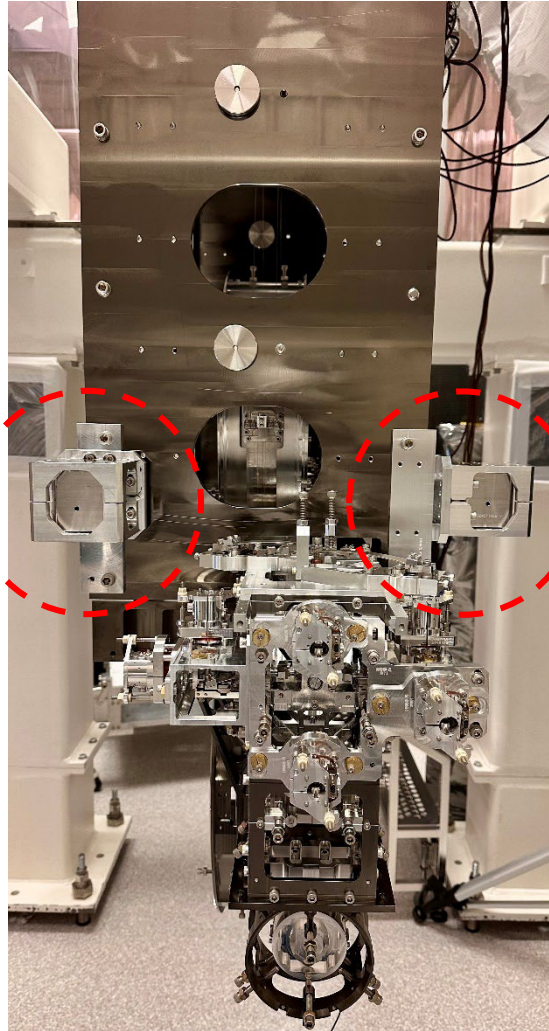
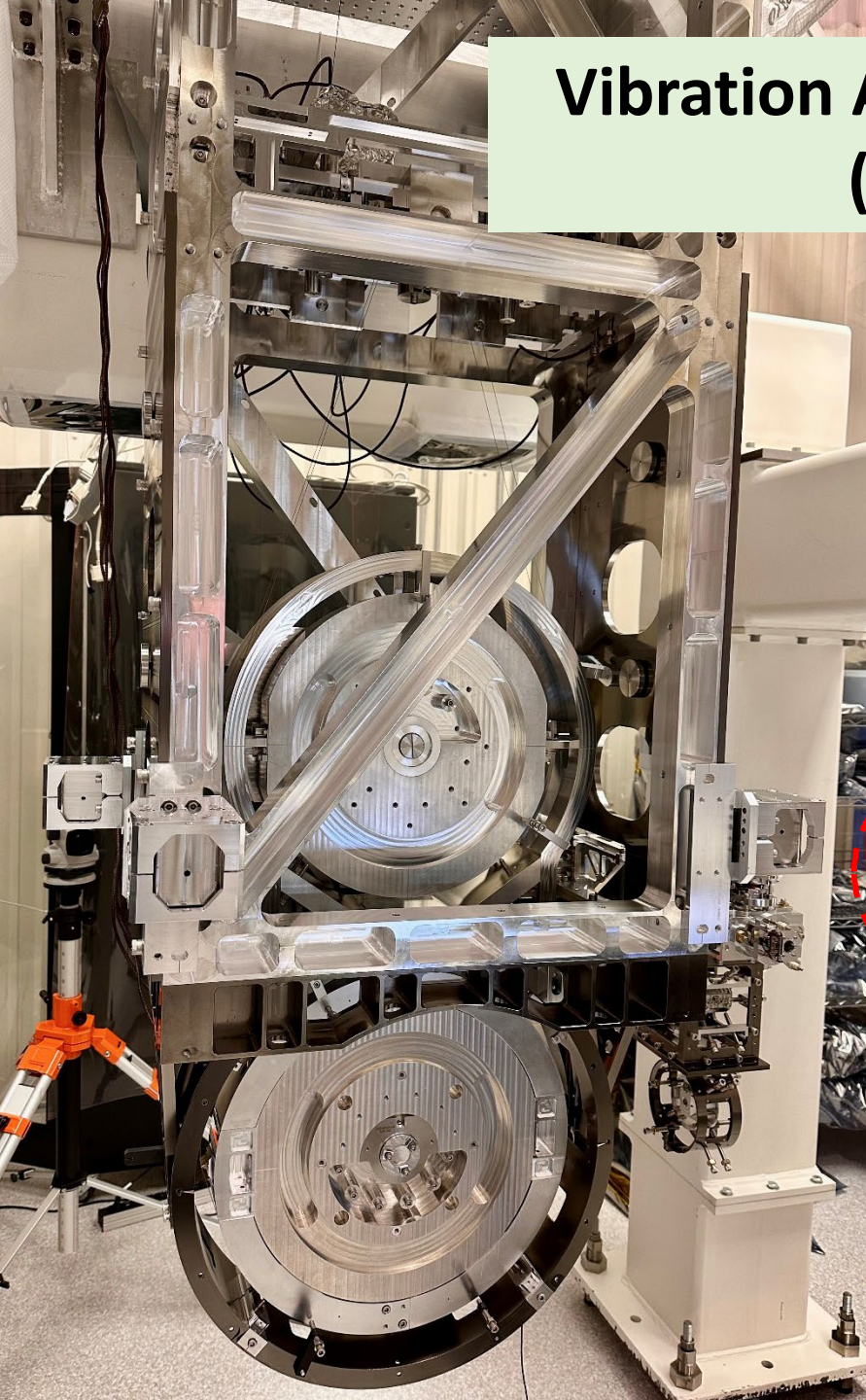
X

(longitudinal)

Z (transverse)

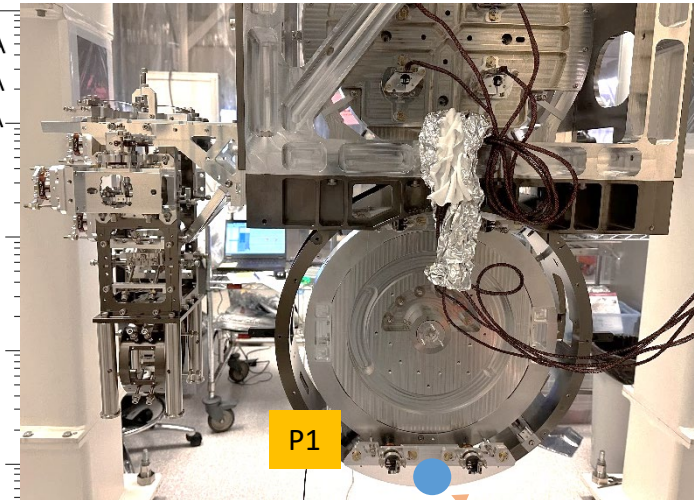
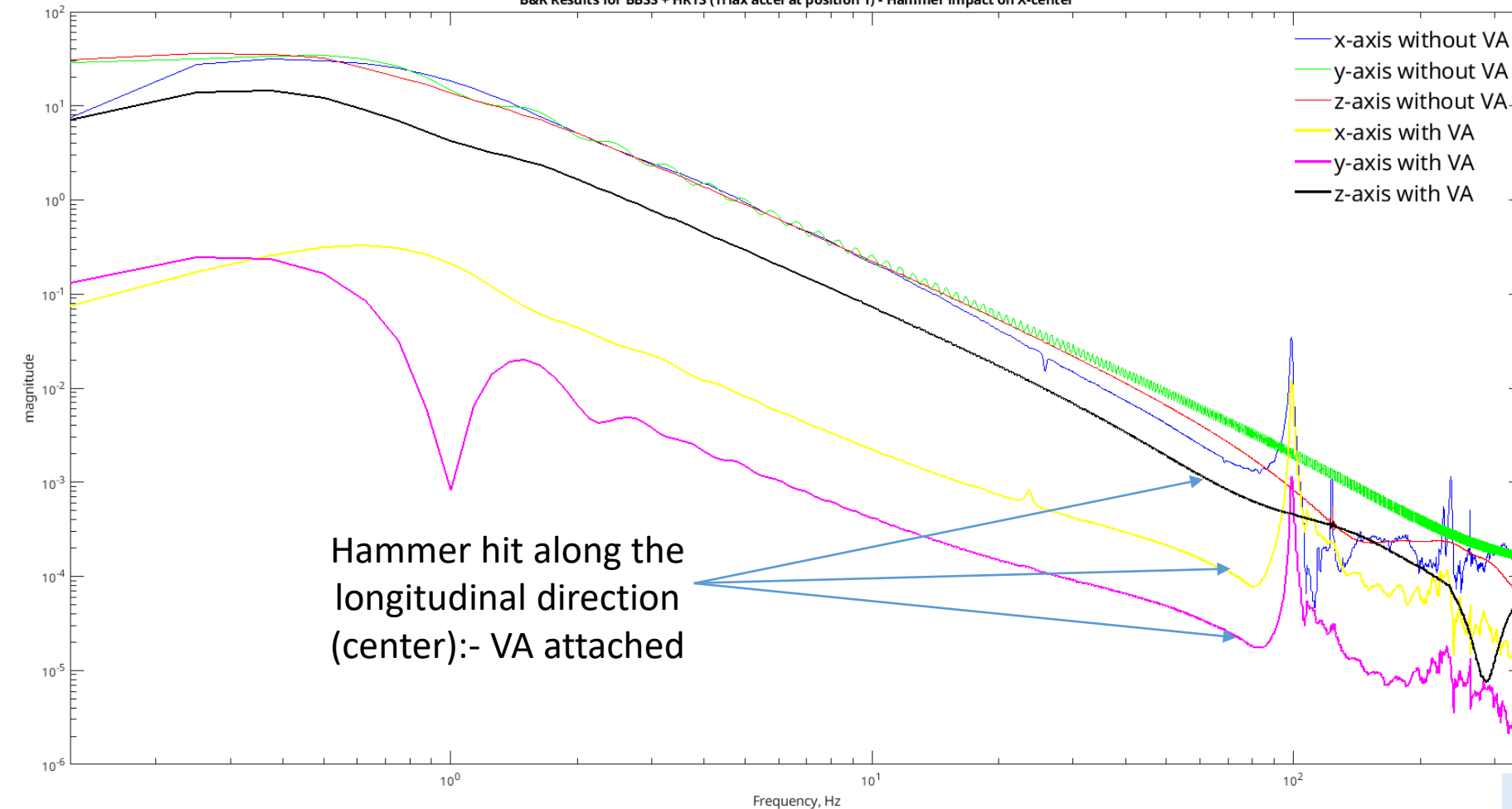
Accelerometer axis and
hammer hit direction

Vibration Absorbers (VA) Attached to BBSS (Hammer tests:- 6 to 9)



Test 6a (accelerometer position P1)
(hit on the **center** of the X axis)
With side dampers Y-brace and **Vibration Absorbers**

B&K Results for BBSS + HRTS (Triax accel at position 1) - Hammer impact on X-center



Y (vertical)



X

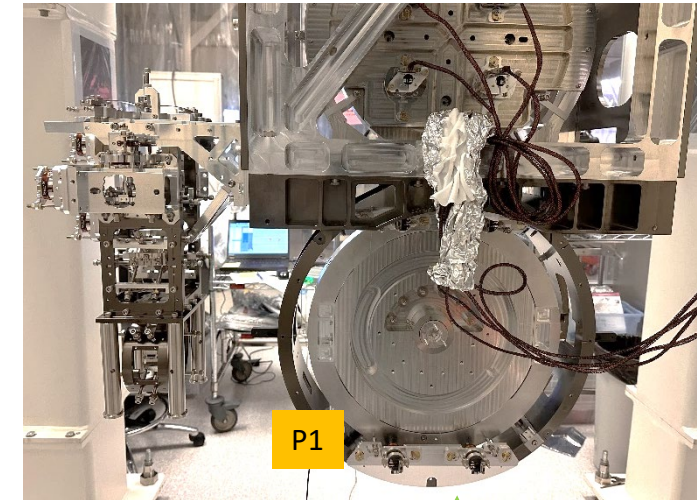
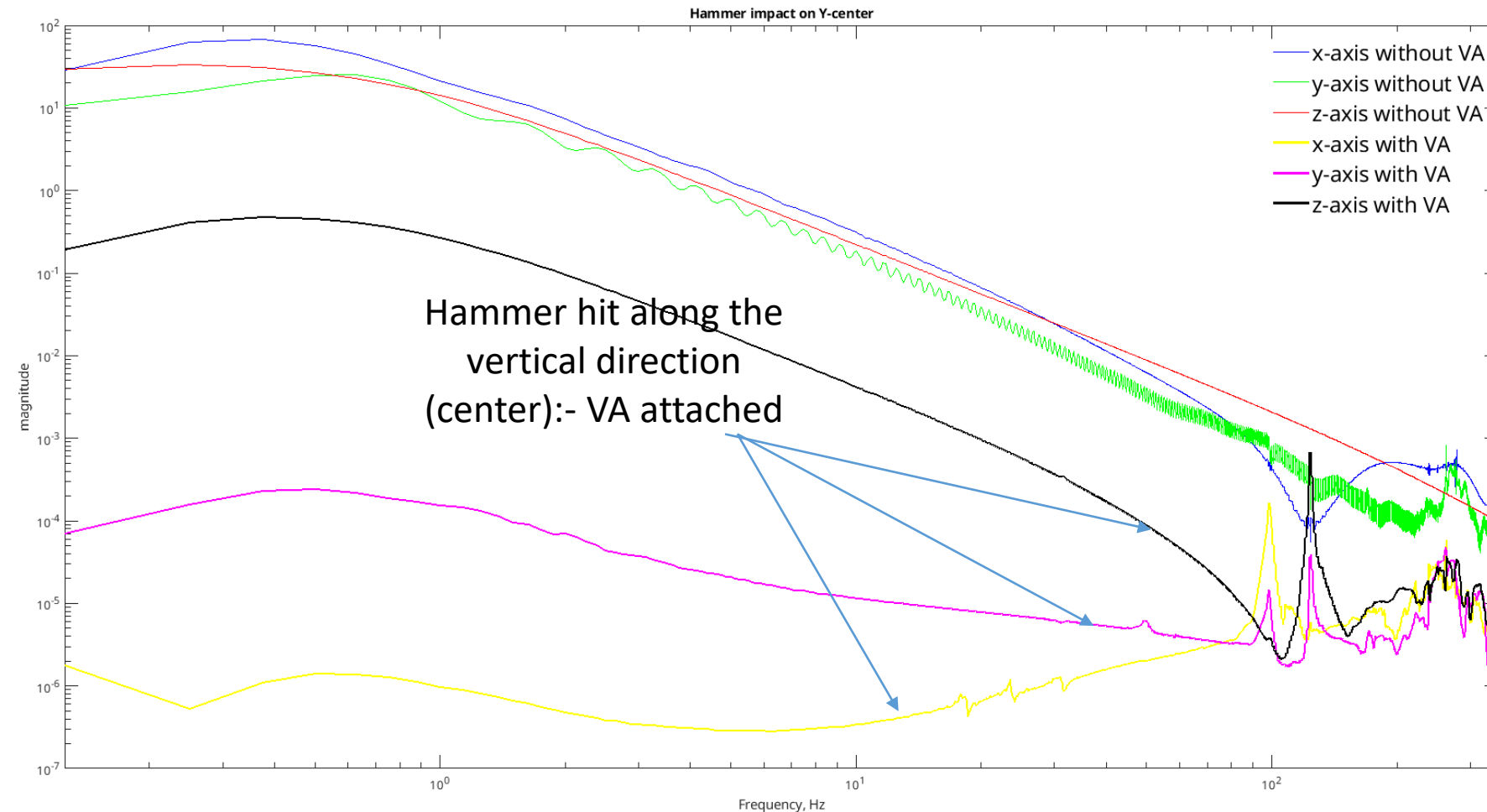
(longitudinal)

Z (transverse)

X hit

Accelerometer axis and
hammer hit direction

Test 6b (accelerometer position P1)
(hit on the **center** of the Y axis)
With side dampers Y-brace and **Vibration Absorbers**



Y (vertical)



Y hit

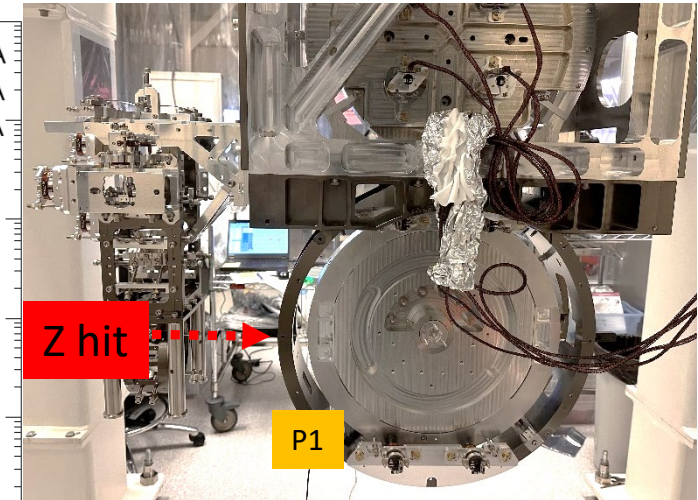
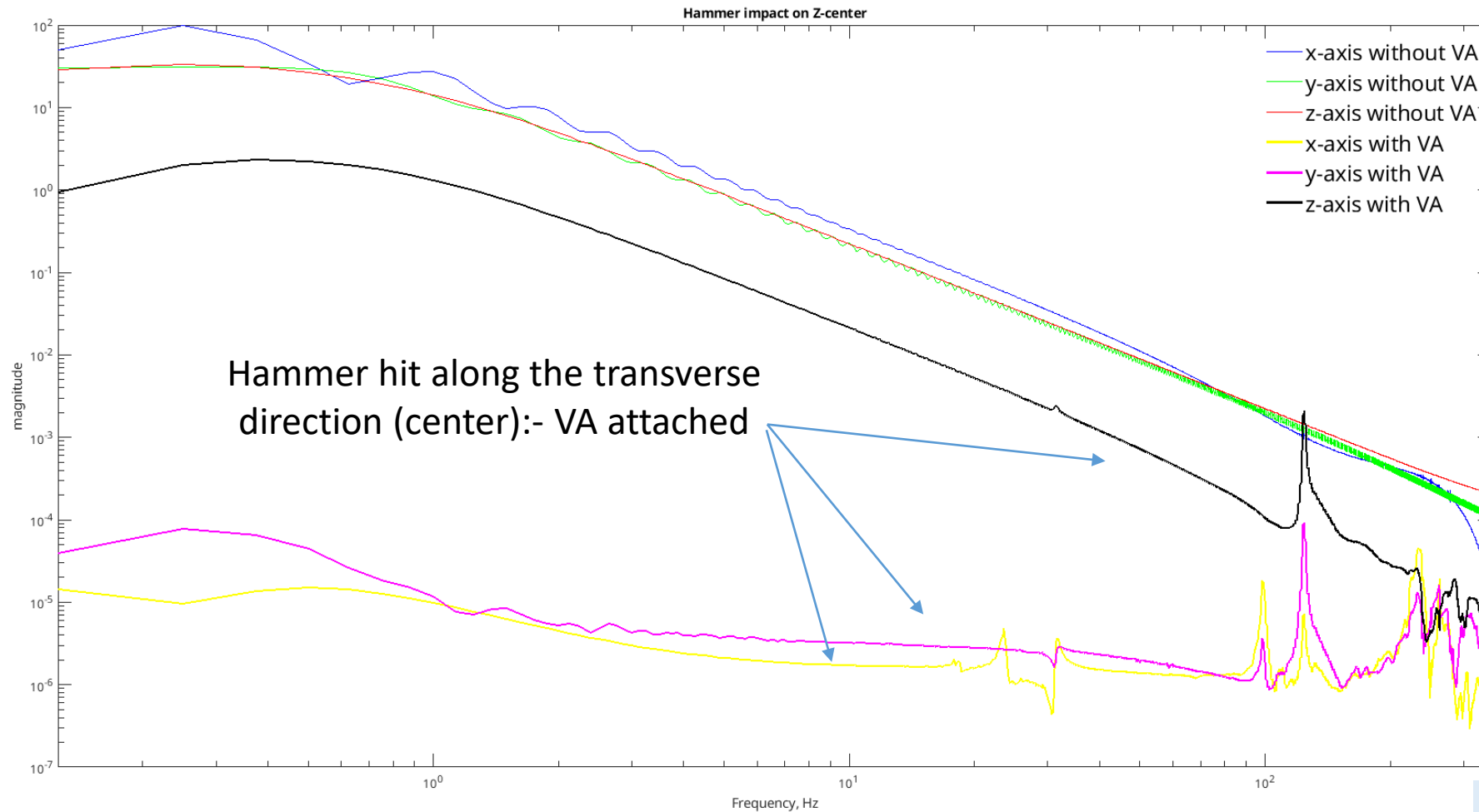
X



Z (transverse)
(longitudinal)

Accelerometer axis and
hammer hit direction

Test 6c (accelerometer position P1)
(hit on the **center** of the Z axis)
With side dampers Y-brace and **Vibration Absorbers**



Y (vertical)

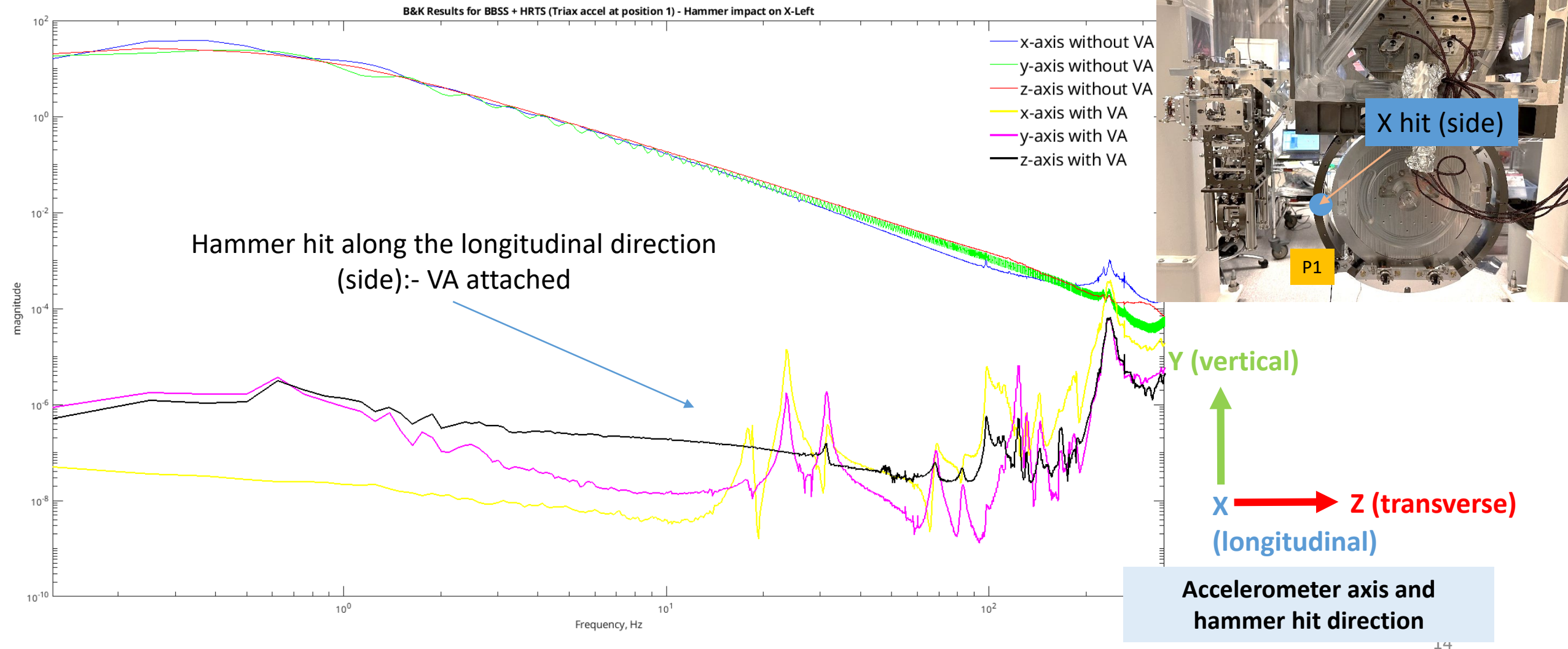


X

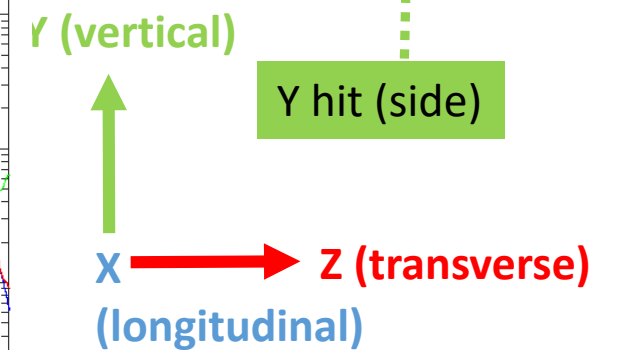
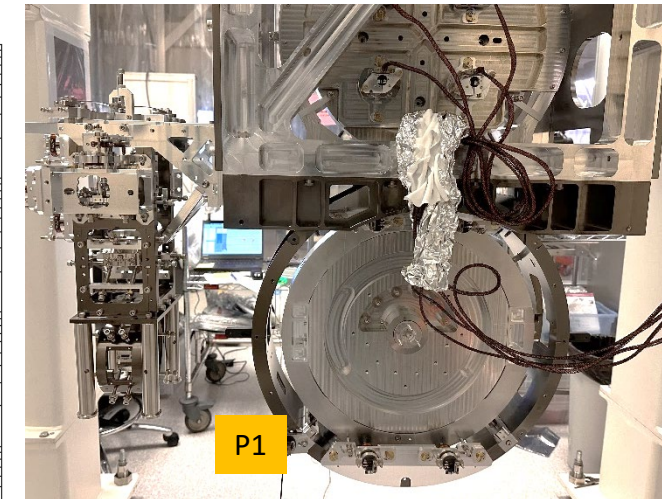
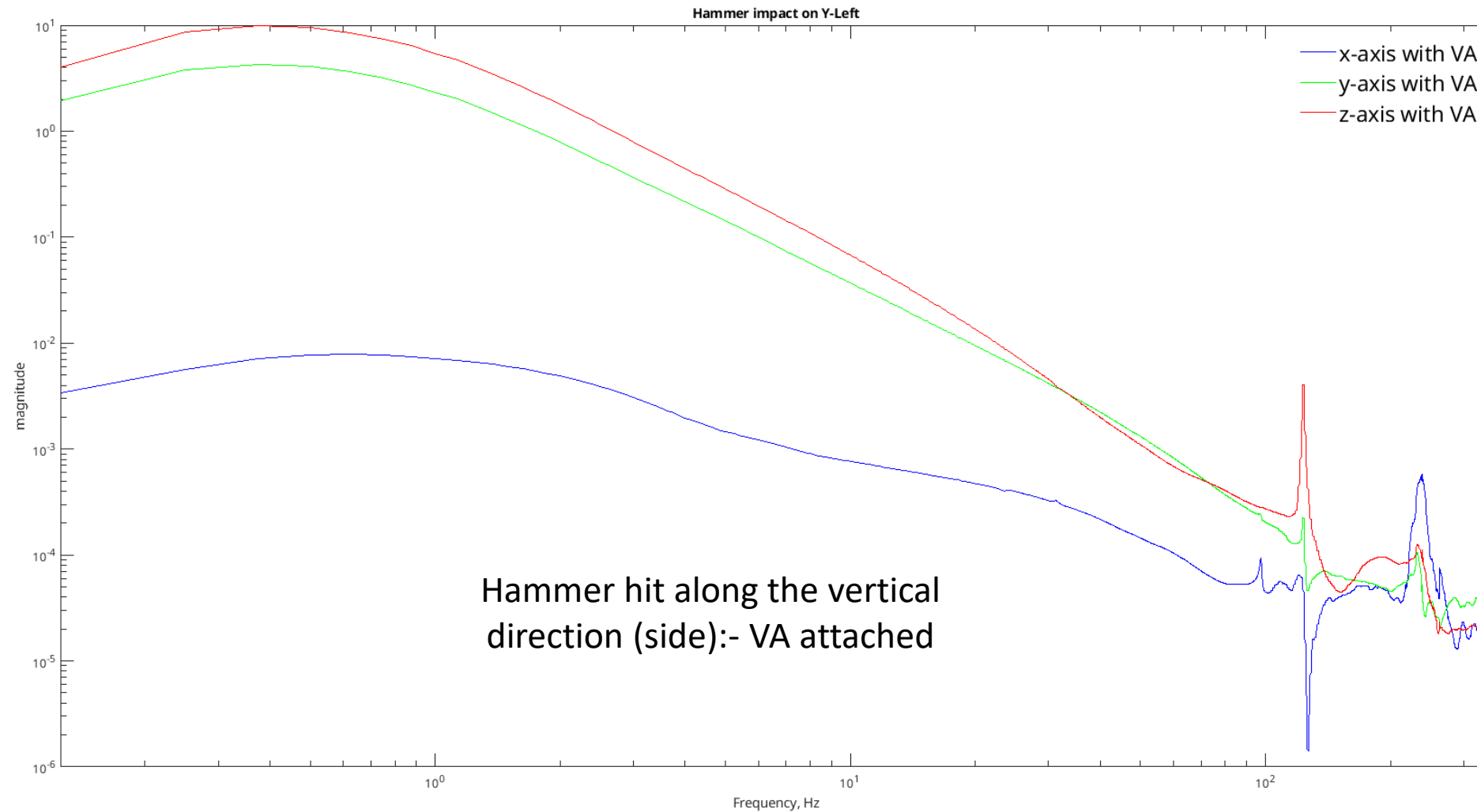
Z (transverse)
(longitudinal)

Accelerometer axis and
hammer hit direction

Test 7a (accelerometer position P1)
(hit on the **side** of the X axis)
With side dampers Y-brace and **Vibration Absorbers**

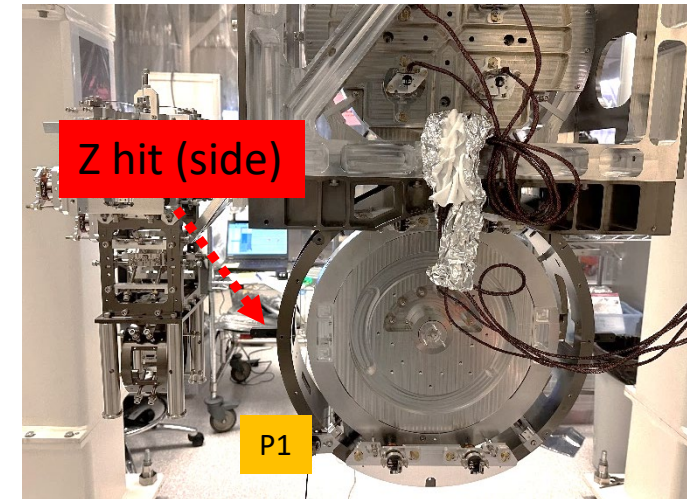
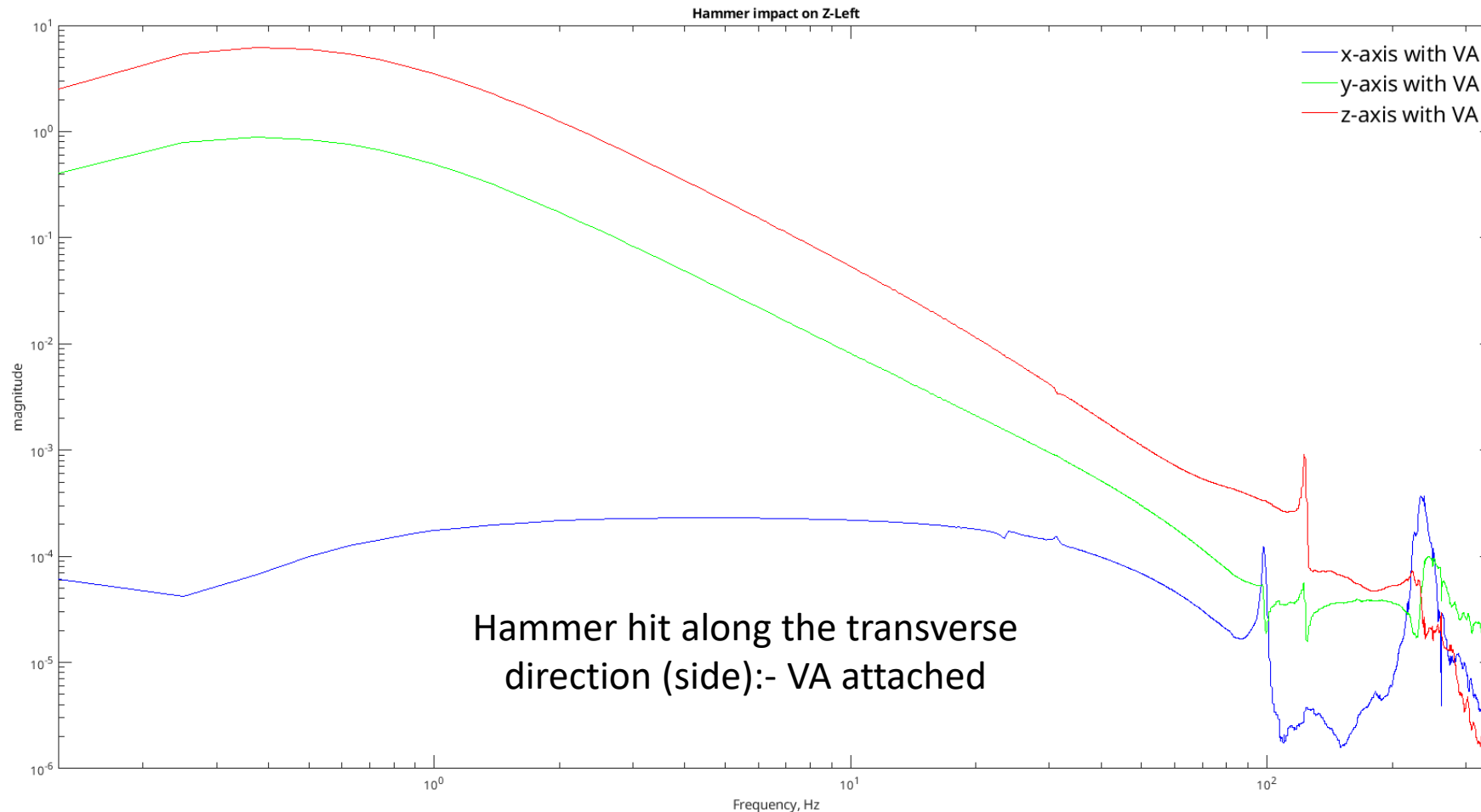


Test 7b (accelerometer position P1) (hit on the **side** of the Y axis) With side dampers Y-brace and **Vibration Absorbers**



Accelerometer axis and
hammer hit direction

Test 7c (accelerometer position P1)
(hit on the **side** of the Z axis)
With side dampers Y-brace and **Vibration Absorbers**



Y (vertical)



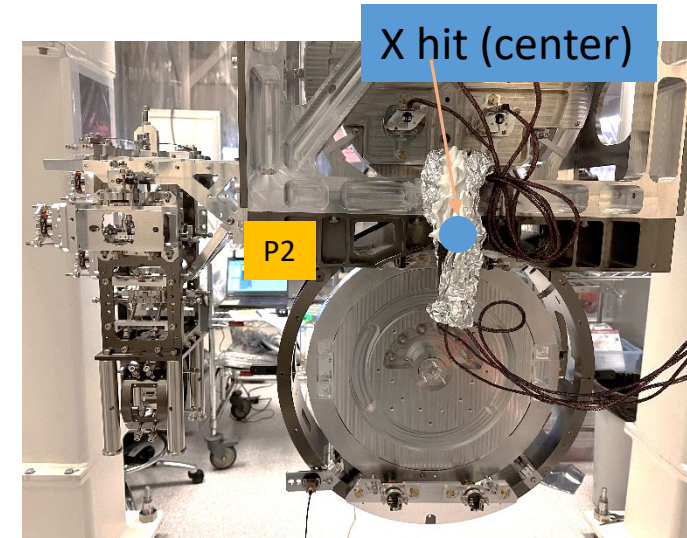
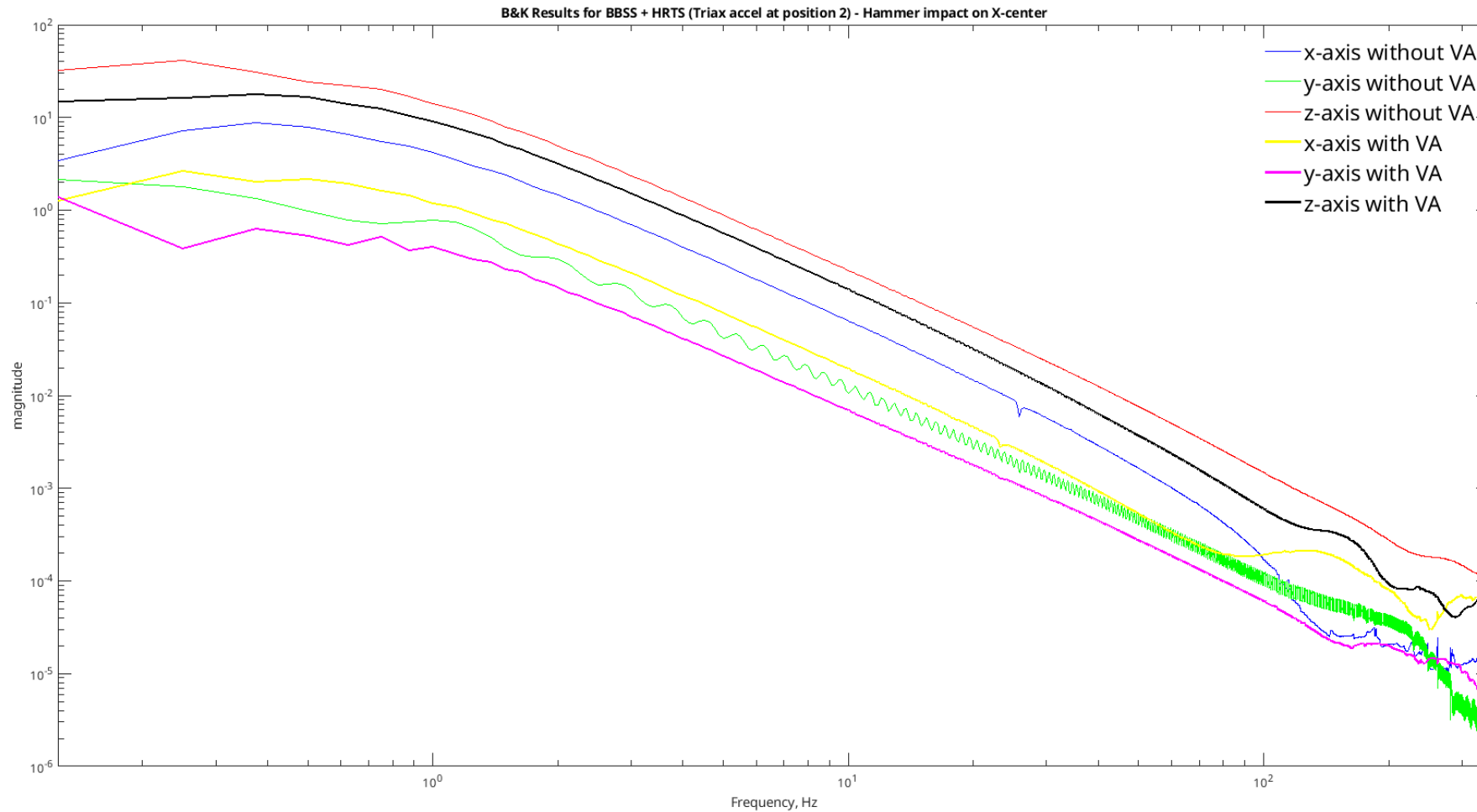
X

(longitudinal)

Z (transverse)

Accelerometer axis and
hammer hit direction

Test 8a (accelerometer position **P2**)
(hit on the **center** of the X axis)
With side dampers Y-brace and **Vibration Absorbers**



Y (vertical)



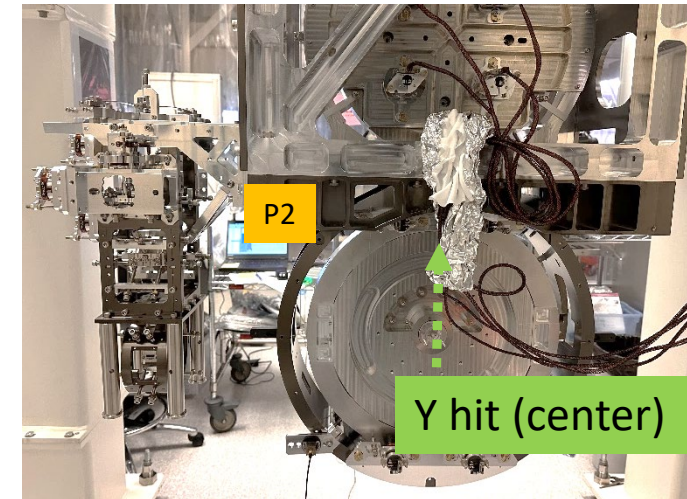
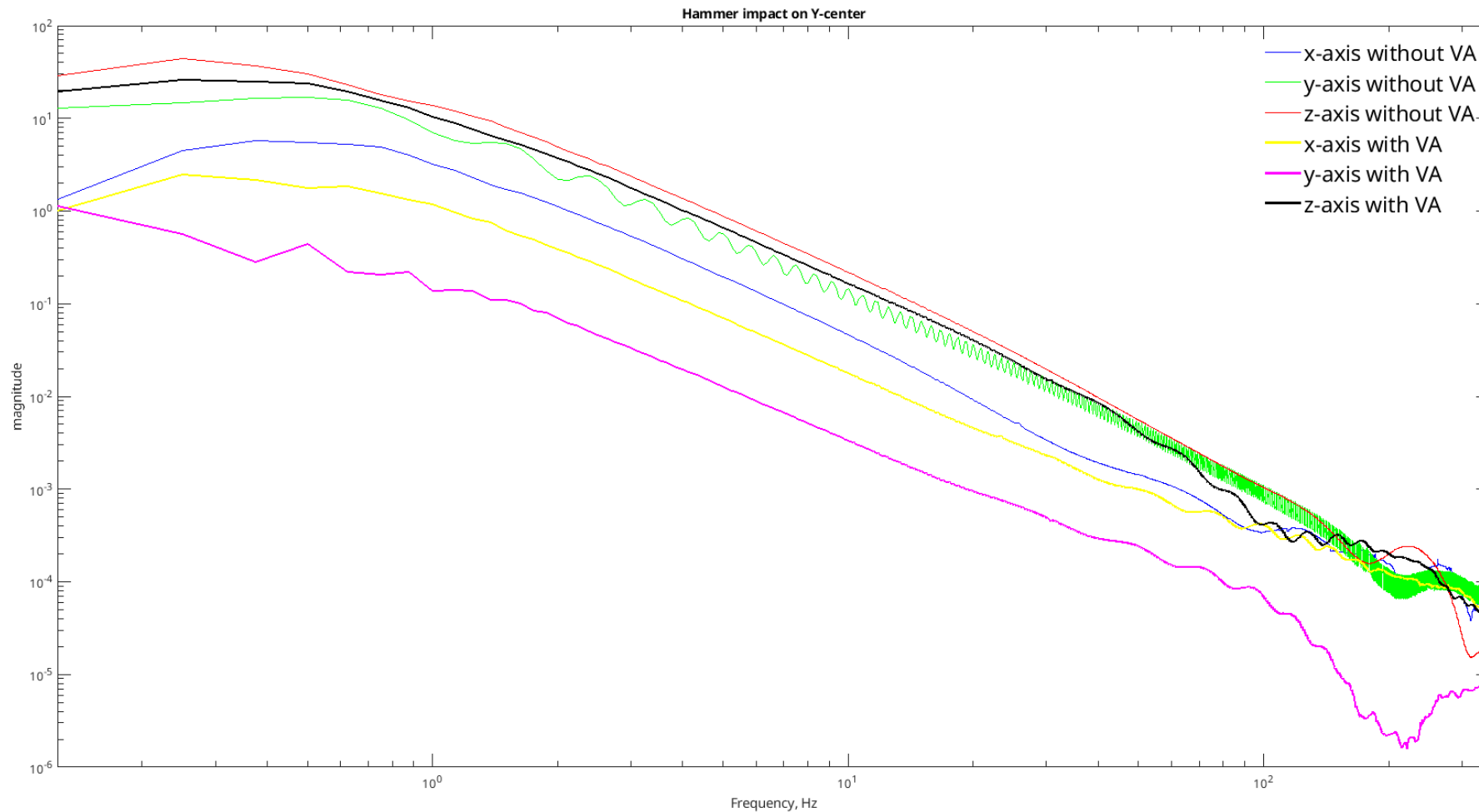
X

(longitudinal)

Z (transverse)

Accelerometer axis and
hammer hit direction

Test 8b (accelerometer position **P2**)
(hit on the **center** of the Y axis)
With side dampers Y-brace and **Vibration Absorbers**



Y (vertical)



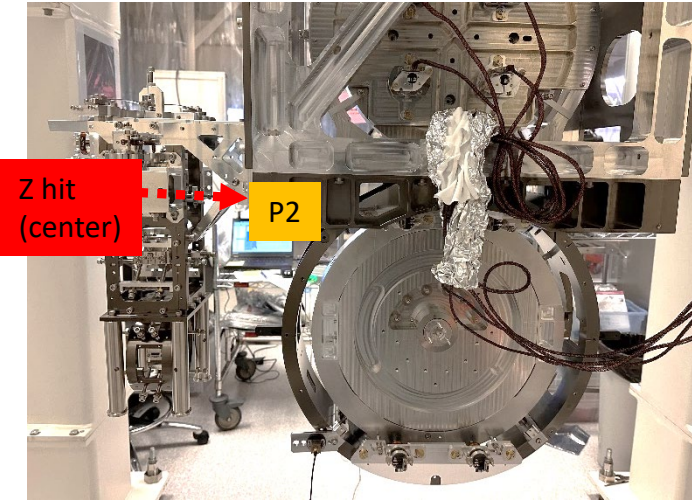
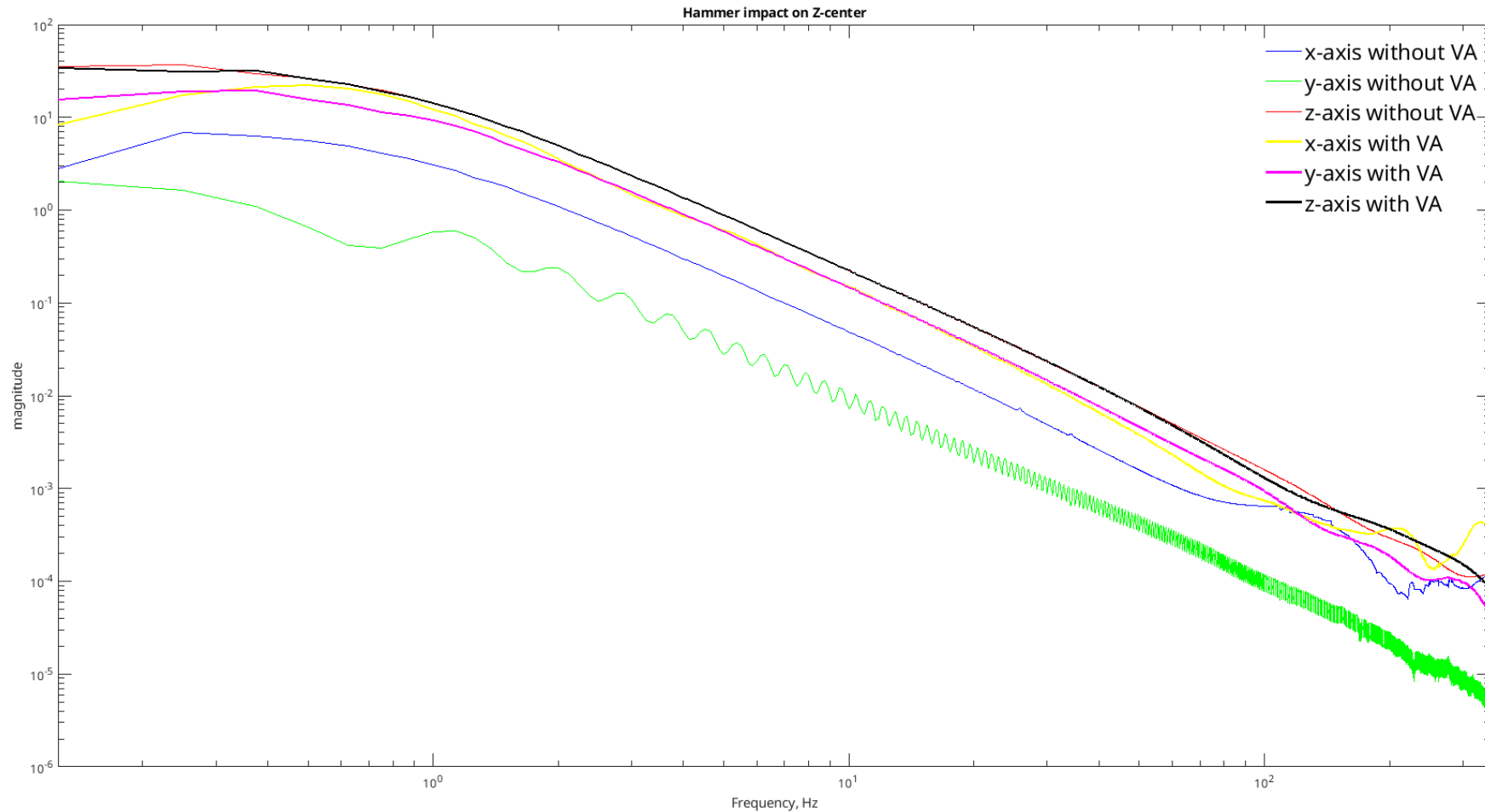
X

(longitudinal)

Z (transverse)

Accelerometer axis and
hammer hit direction

Test 8c (accelerometer position **P2**)
(hit on the **center** of the Z axis)
With side dampers Y-brace and **Vibration Absorbers**



Y (vertical)



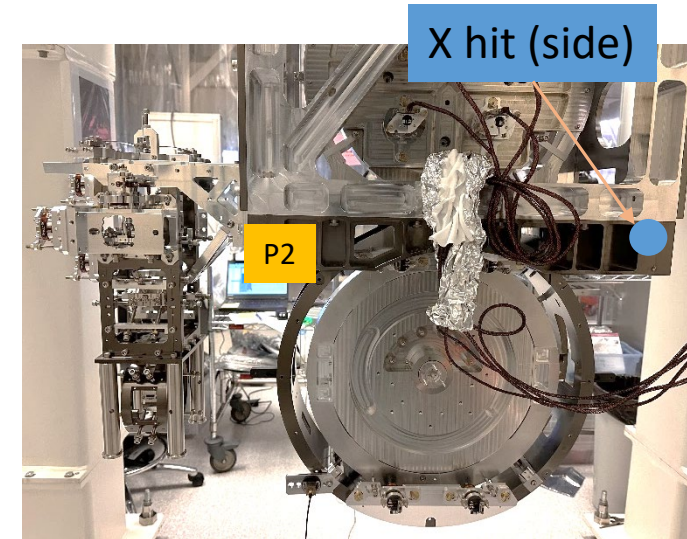
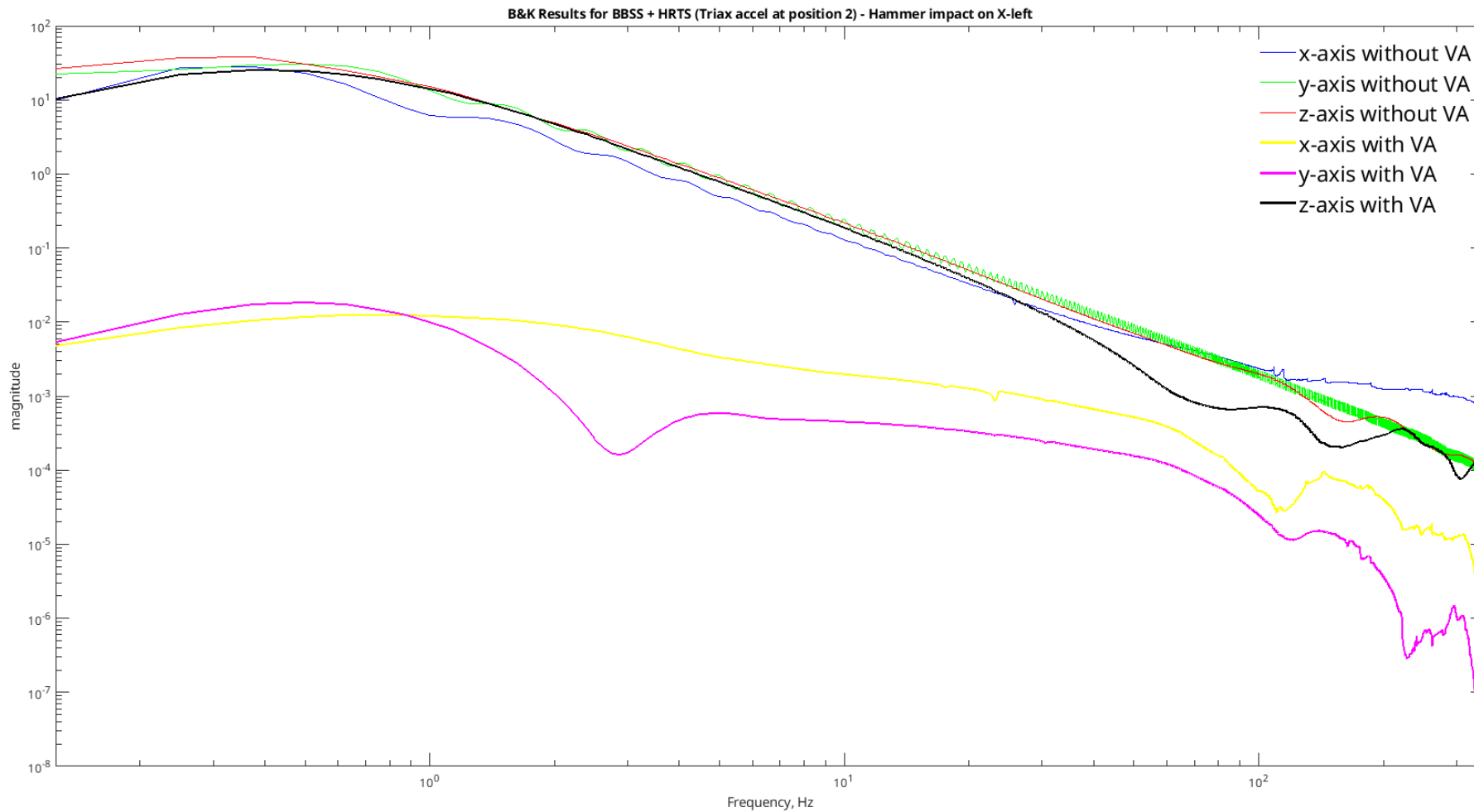
X

(longitudinal)

Z (transverse)

Accelerometer axis and
hammer hit direction

Test 9a (accelerometer position **P2**)
(hit on the **side** of the X axis)
With side dampers Y-brace and **Vibration Absorbers**



Y (vertical)



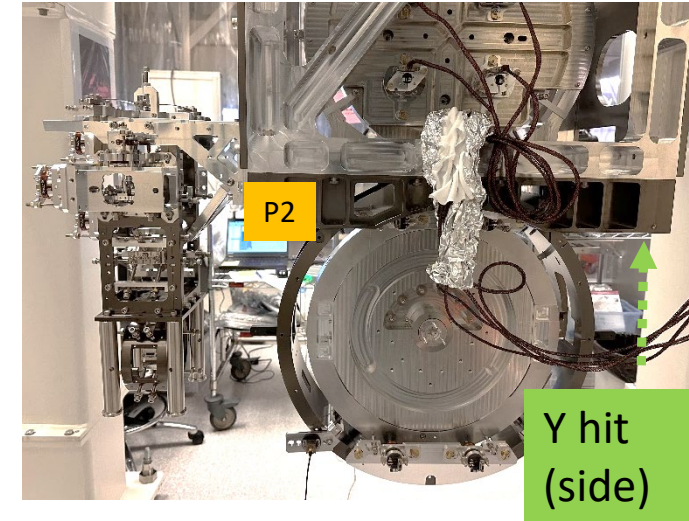
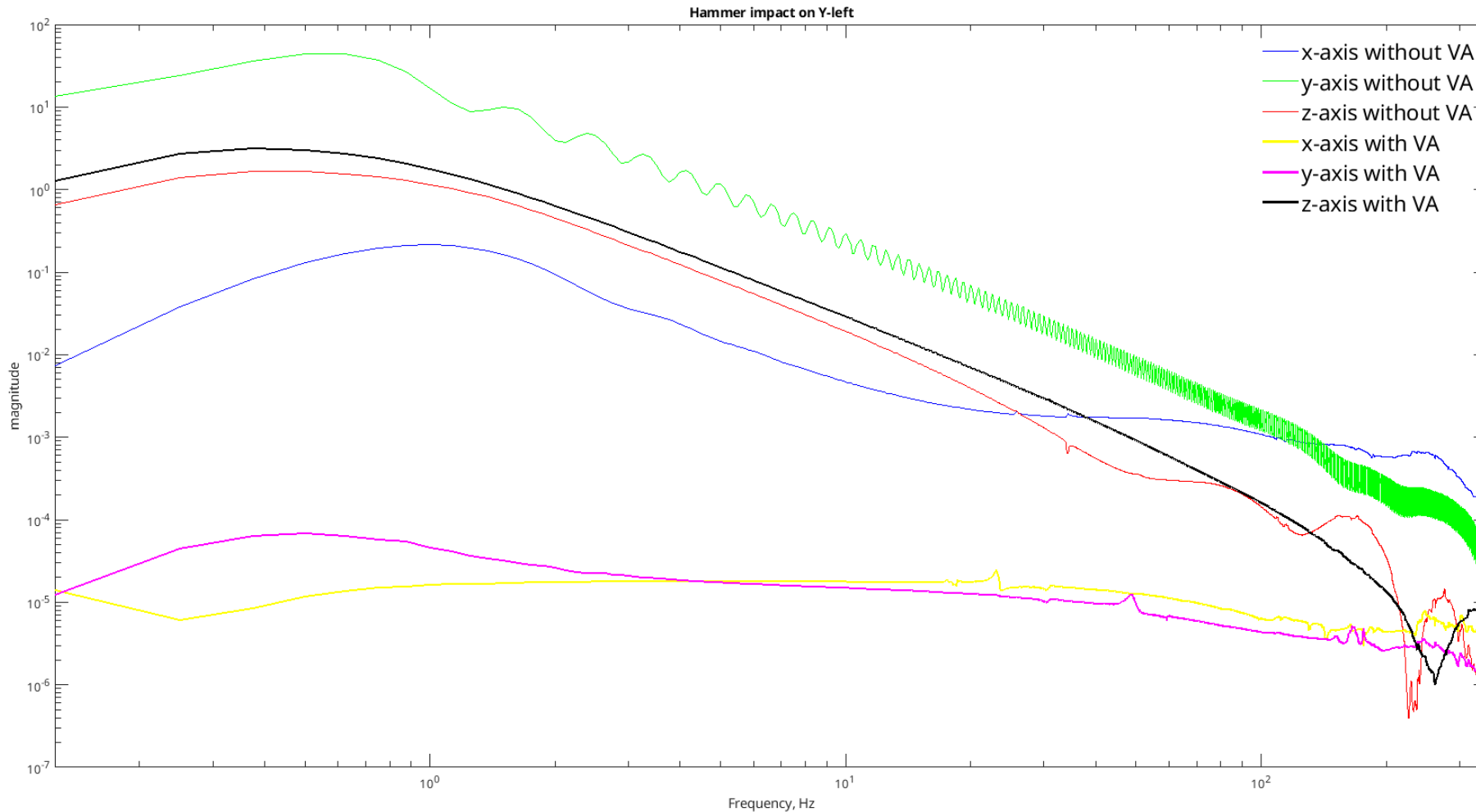
X

(longitudinal)

Z (transverse)

Accelerometer axis and
hammer hit direction

Test 9b (accelerometer position **P2**)
(hit on the **side** of the Y axis)
With side dampers Y-brace and **Vibration Absorbers**



Y (vertical)



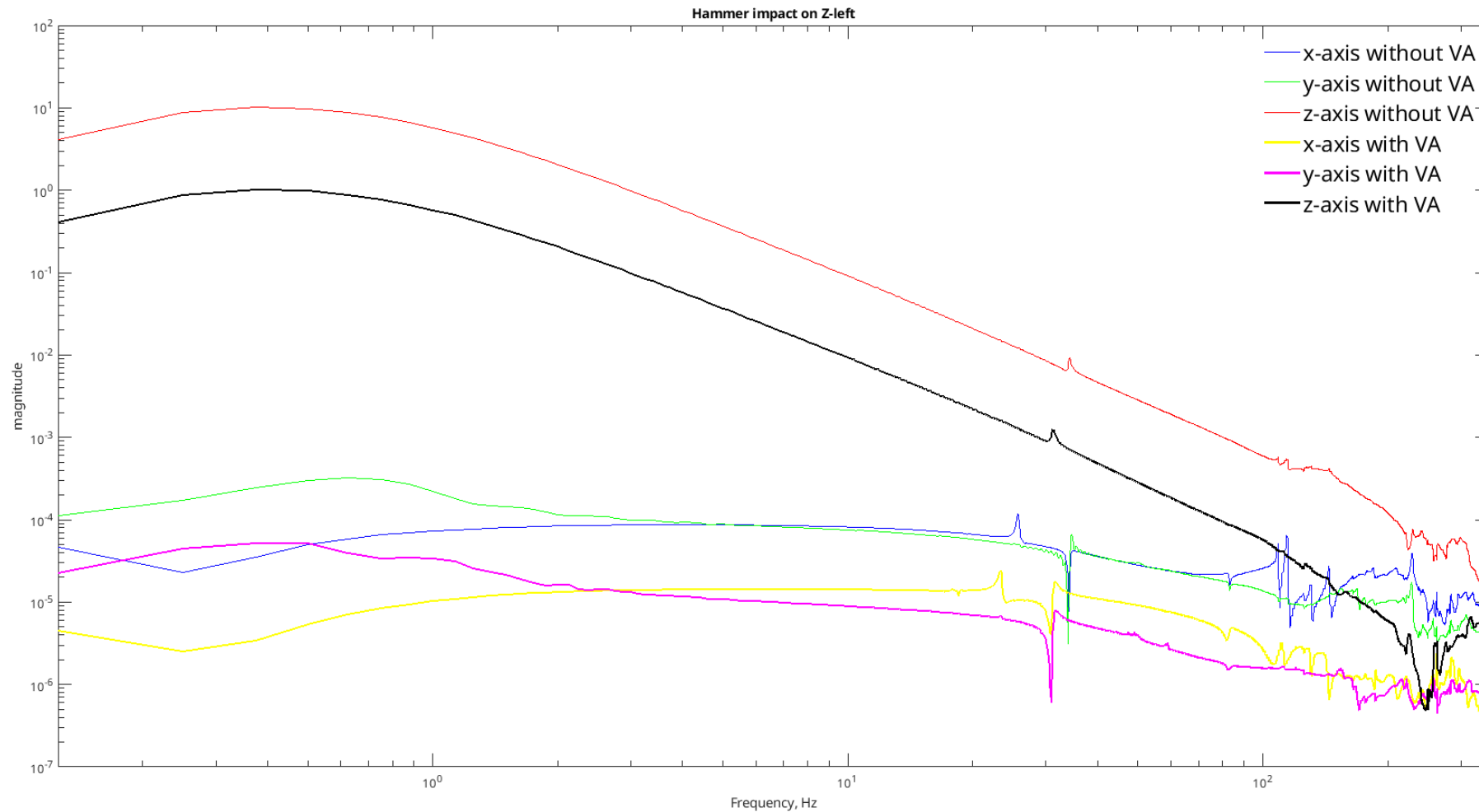
X

(longitudinal)

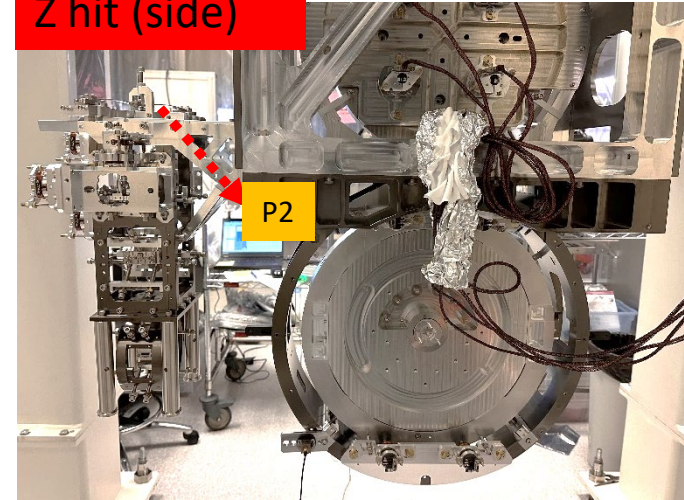
Z (transverse)

Accelerometer axis and
hammer hit direction

Test 9c (accelerometer position **P2**)
(hit on the **side** of the Z axis)
With side dampers Y-brace and **Vibration Absorbers**



Z hit (side)



Y (vertical)



X

(longitudinal)

Z (transverse)

Accelerometer axis and
hammer hit direction