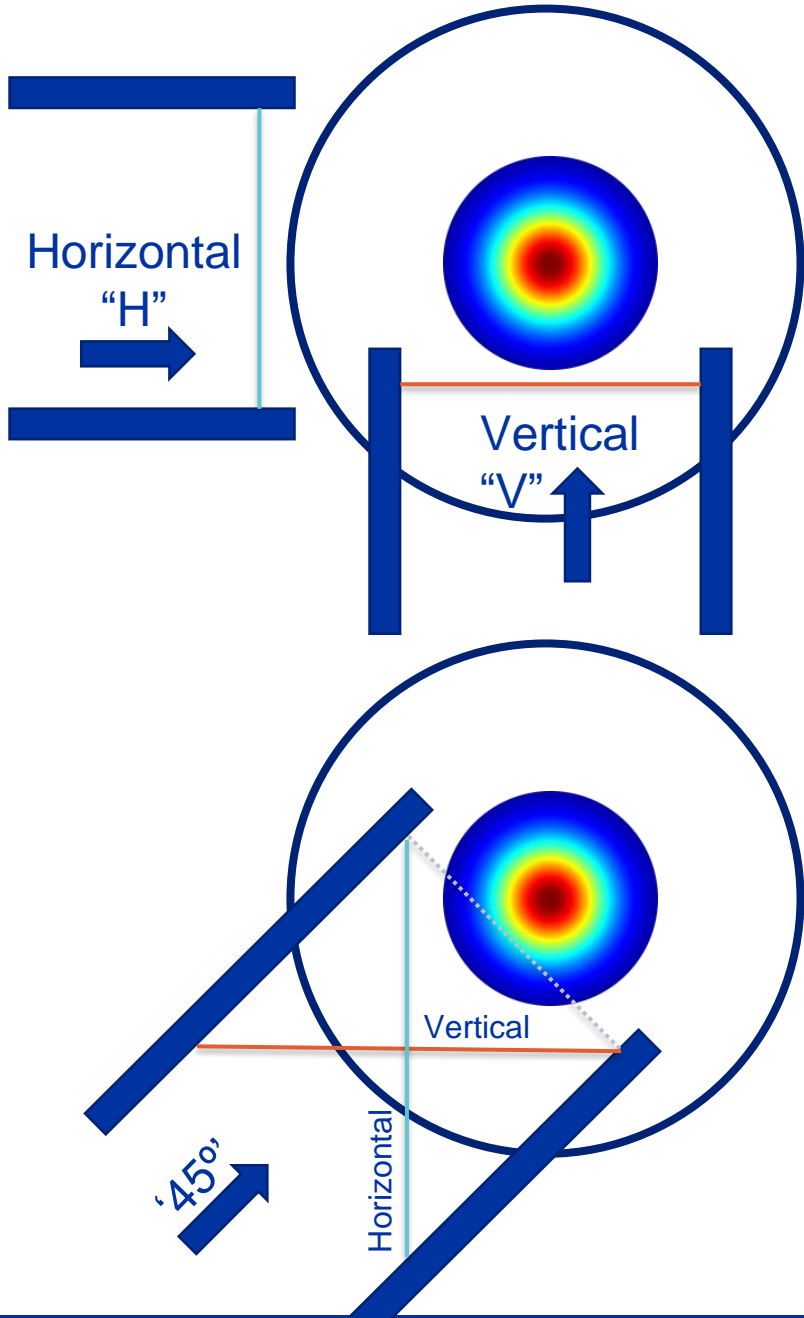


# Qualitative comparison of the motion orientation H-V and 45° for the Beam Wire Scanner linear system

	H - V	45 deg	Risk assessment	action / mitigation
C-wire length	1	1.41 x	More mass & resistivity, natural frequency changes	Adapt the wire tension and/or check deflection and calibrate
Forks length	~Beam pipe	Beam pipe + forks aperture	Longer cantilever increases the deflection and risk to elongate the c-wire. More mass to move.	Optimize fork design to increase stiffness while lowering the mass.
Stroke length (= ~wire exposition)	~beam pipe	Beam pipe + forks aperture	Overall wire stay longer in the beam pipe, more exposed to RF heating	Increase of the nominal speed and adapt trajectory to equal the time the wire stay in the vacuum chamber
Wire speed	1	1.41 x	Higher nominal speed required to touch beam at same transverse speed. Means more power requirement, more stress to the mechanism, larger wire deflection?	Change of motion trajectories to use longer stroke to reach the top speed with less stress (at the cost of longer c-wire exposition). Study wire position determination/calibration
Gravitational acceleration	0 (H) 9.81 (V)	4.905	Same acceleration for both planes better compared to H - V case	-
Force / acceleration on the c-wire	100% Perpendicular to the wire length	70.7% perpendicular 29% longitudinal (pulling the wire from its side)	Weight of the c-wire is low. Experience with fast rotational going much faster (20m/s). But no experience with longitudinal acceleration!	Experimental test and qualification on samples to be conducted for this configuration

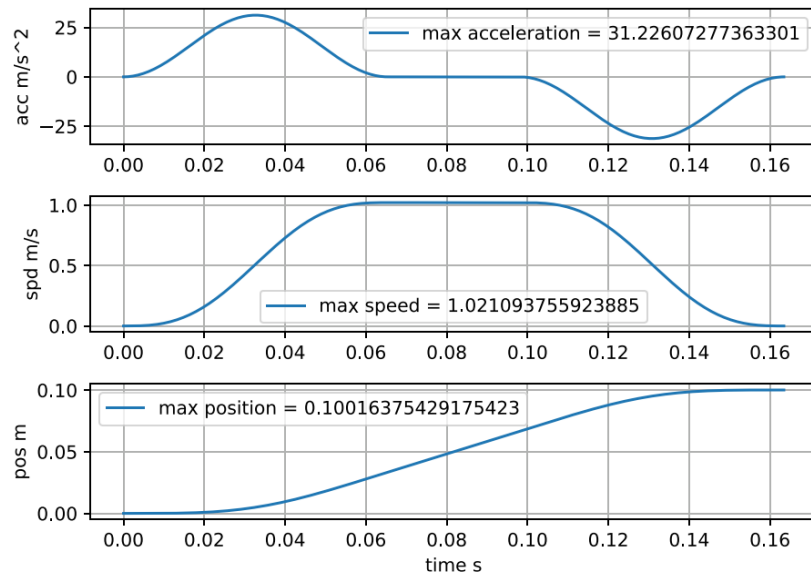


# Qualitative comparison of the motion orientation H-V and 45° for the Beam Wire Scanner linear system

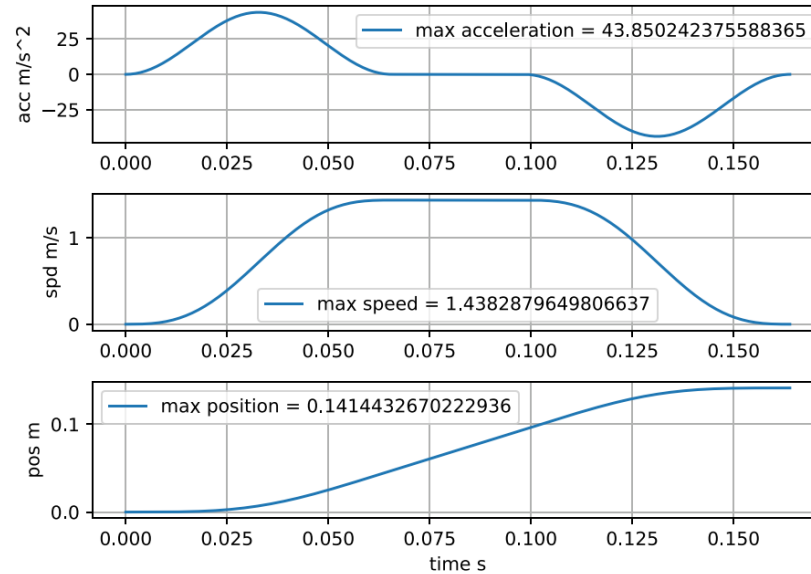
Motion study to equal the time the carbon wire stays in the beam pipe during the scan for all orientation options (H-V & 45). To satisfy this constraint, the 45 option requires a higher acceleration and top speed (41%). This correspond also to the necessary speed increase to touch the beam at the same transverse speed (1m/s).

Motion trajectories comparison	H - V	45°	difference
Stroke (mm)	100	141	+41%
Interaction speed (m/s)	1	1.41	+41%
Acc (m/s <sup>2</sup> )	31.2	43.9 / 36.7	+41% / +18%
Duration of the wire in the beam pipe (s)	0.16	0.16 / 0.175	0% / +9%

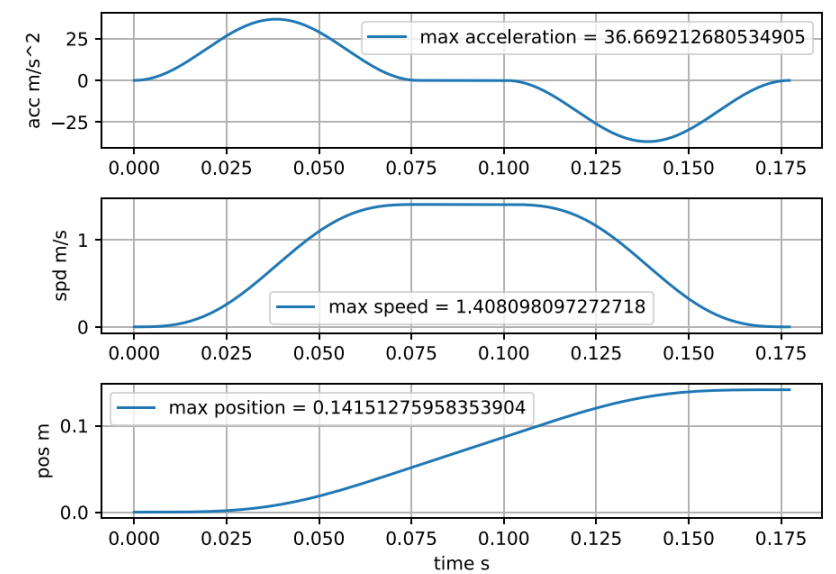
H-V orientation



45° orientation variant 1  
(stroke duration equals H-V version)



45° orientation variant 2  
(constant speed region equals H-V version)



# Qualitative comparison of the motion orientation H-V and 45° for the Beam Wire Scanner linear system

