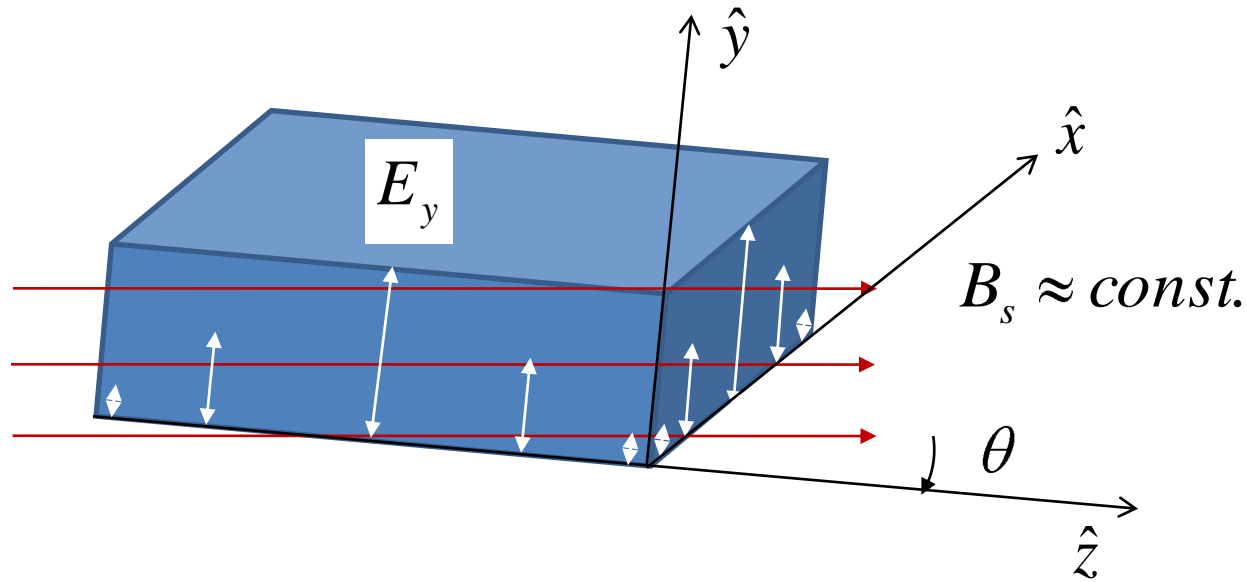


# Status of Box Cavity

Moses Chung

MAP Friday meeting  
2010. 6. 4.

# Box Cavity 101



$$E_y = E_0 \sin(\pi x / l_x) \sin(\pi z / l_z) \cos(\omega t)$$

$$B_z = B_s \cos \theta, \quad B_y = B_s \sin \theta$$

$$f = \frac{\omega}{2\pi} = \frac{c}{2} \sqrt{\frac{1}{l_x^2} + \frac{1}{l_z^2}} \approx 808 \text{ MHz}$$

250 mm
276.5 mm

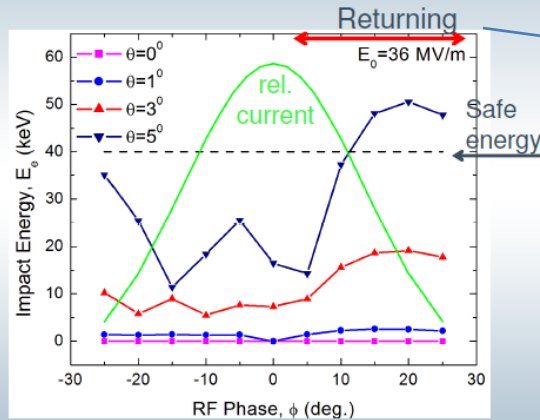
$$\ll f_c = \frac{\omega_c}{2\pi} = \frac{qB \overset{3\text{T}}{\leftarrow}}{2\pi m_e} \approx 84 \text{ GHz}$$

$$\Rightarrow \frac{dv_{\parallel}}{dt} = qE_{\parallel} = qE_y \sin \theta, \quad \vec{v}_{\perp gc} = \frac{\vec{E}_{\perp} \times \vec{B}}{B^2} = \hat{x} \frac{E_y}{B_s} \cos \theta$$

# Theoretical Prediction

## Operation at Small Angles ( $B=3T$ )

- AI proposes to vary the gradient from 21 MV/m to 36 MV/m
- Run at  $B=0$  T and  $B=3$  T
- Run at angles,  $\theta < 5^\circ$



- Simulation predicts little damage as long as  $\theta=3^\circ$  or less and  $B < 3T$

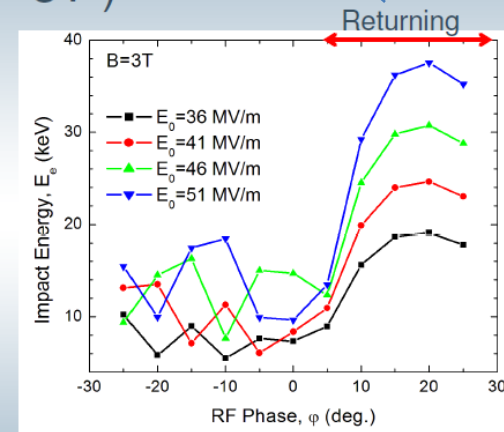
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By Stratakis et. al.

More concern for the returning electrons than for the electrons hitting the side wall

## Operation at Small Angles ( $\theta=3^\circ$ and $B=3T$ )

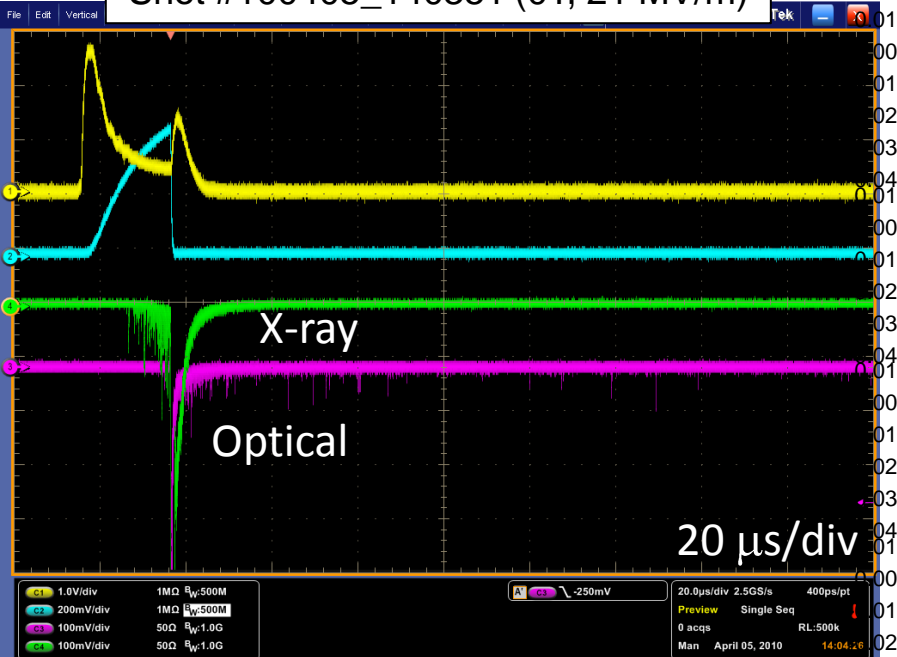
- AI proposes to vary the gradient from 36 MV/m to 50 MV/m
- Run at  $B=0$  T and  $B=3$  T
- Run at small angles



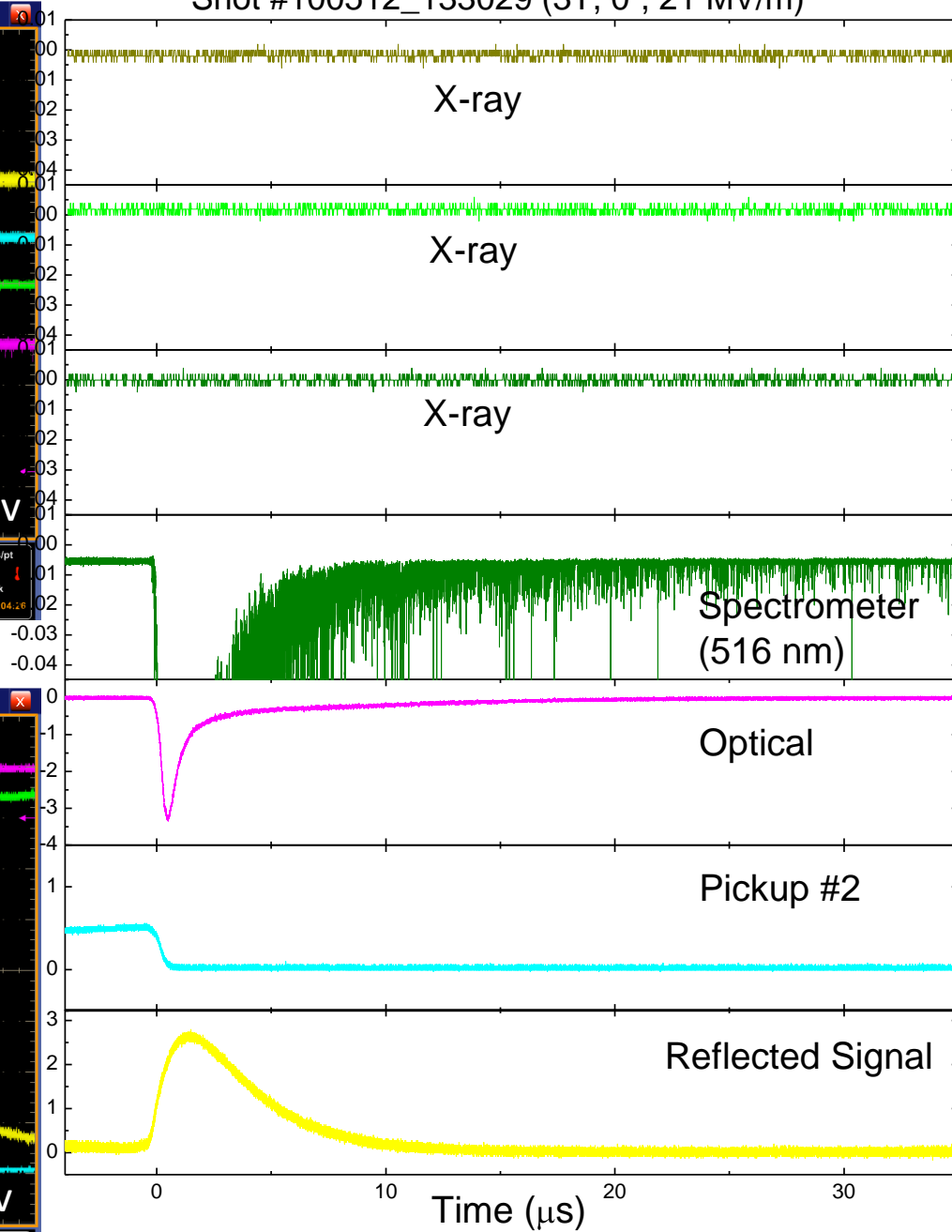
- Simulation predicts little damage as long as  $E < 45$  MV/m and  $\theta < 5^\circ$  and  $B < 3T$

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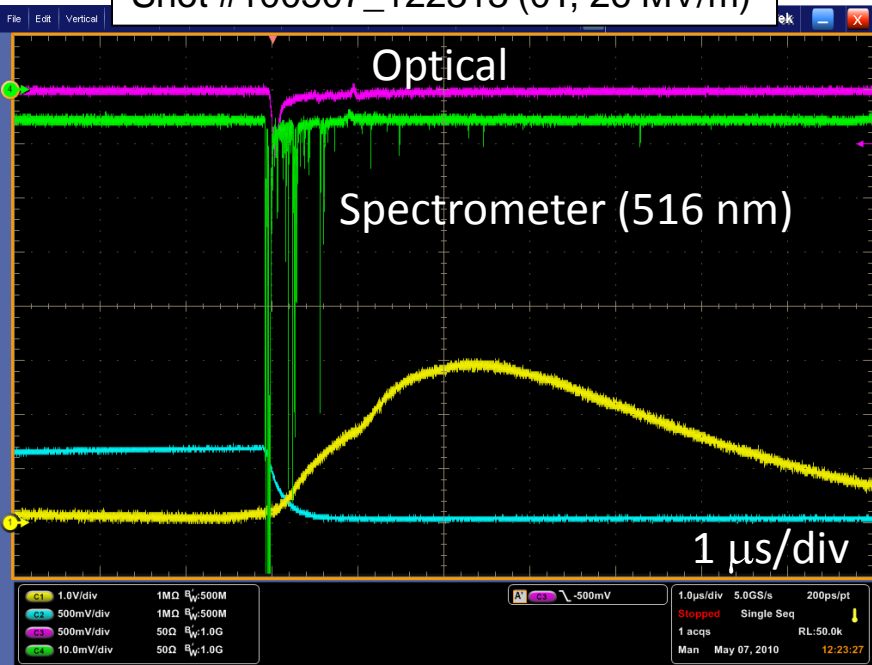
Shot #100405\_140351 (0T, 21 MV/m)



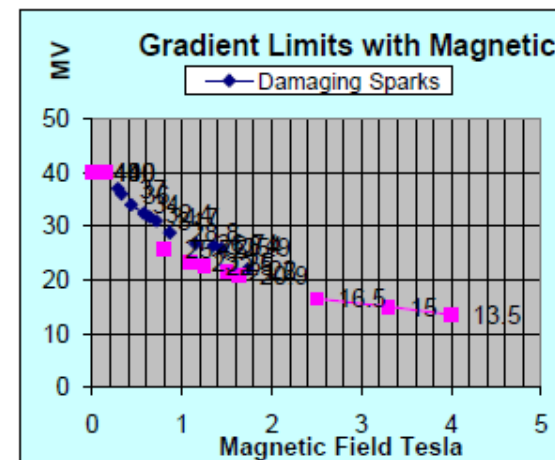
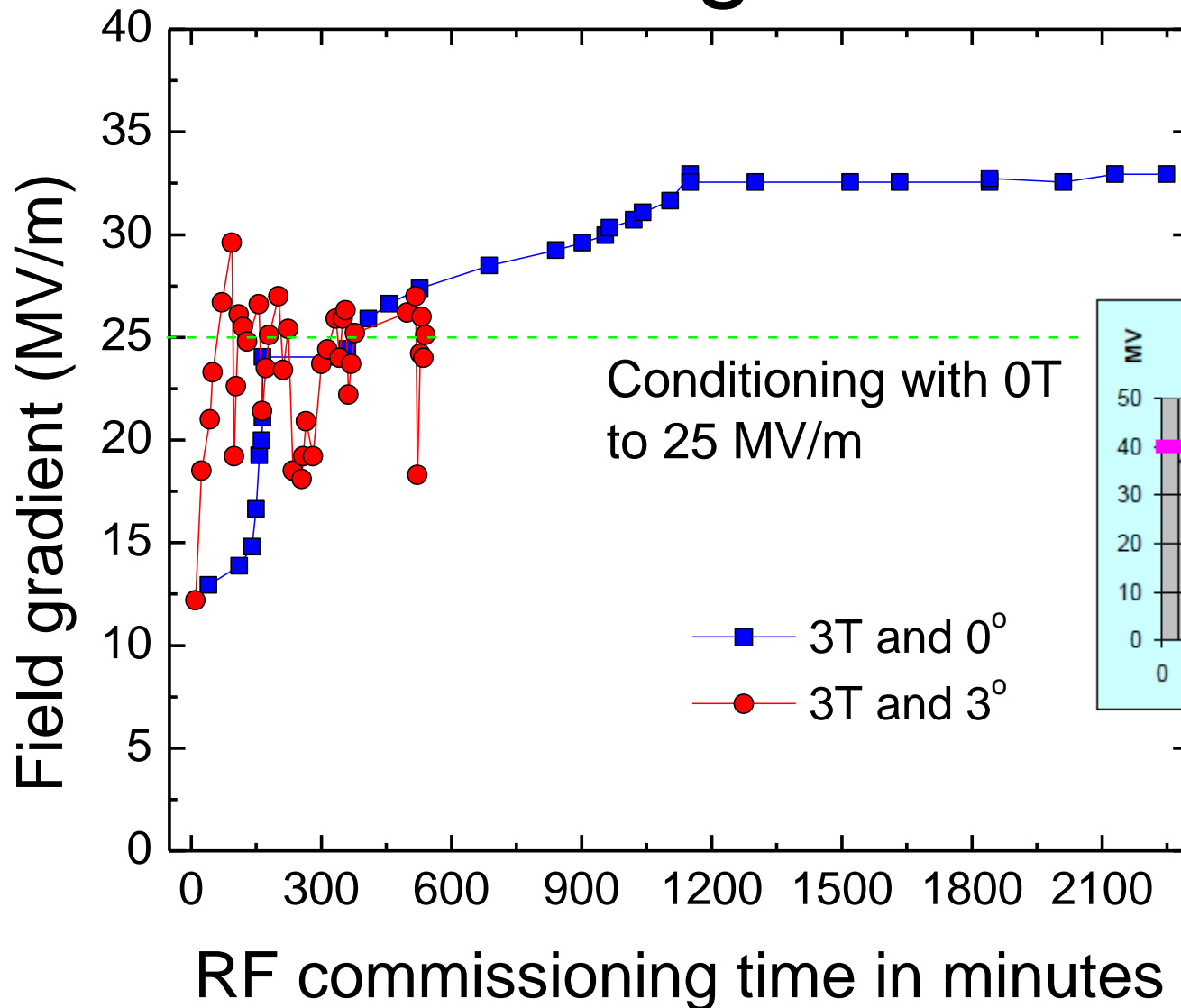
Shot #100512\_133029 (3T, 0°, 21 MV/m)



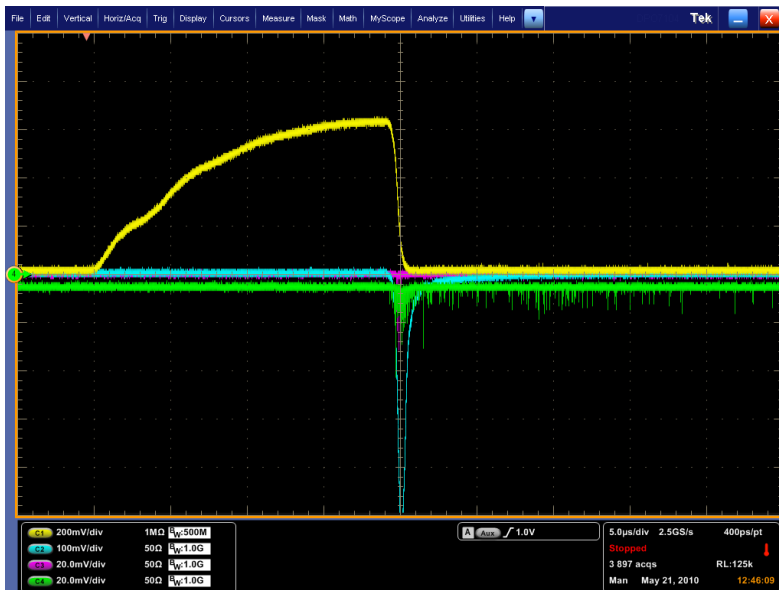
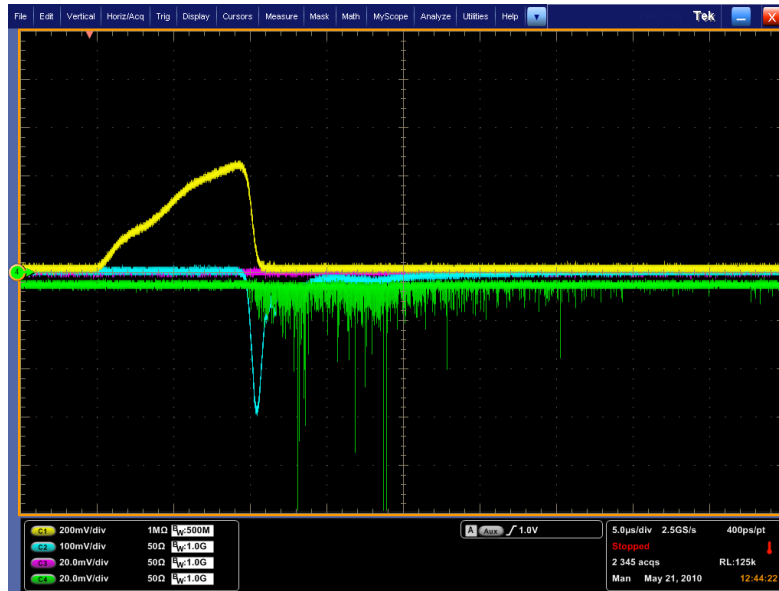
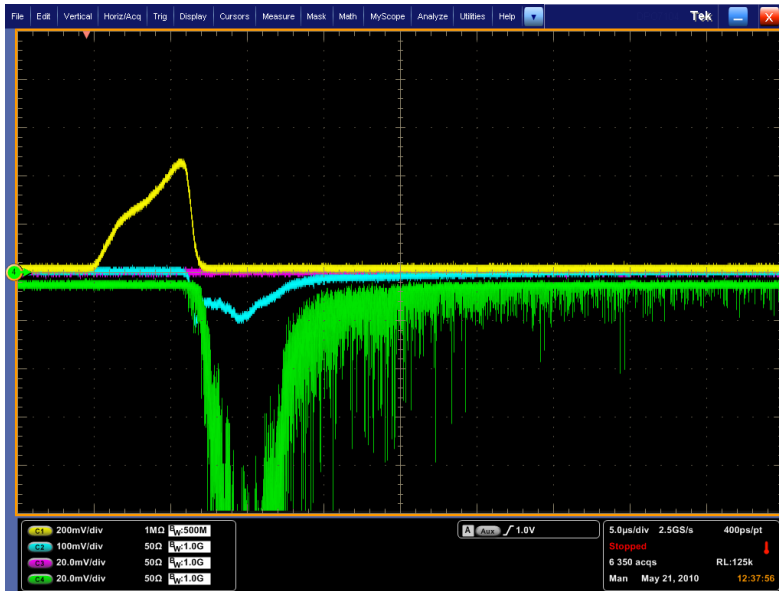
Shot #100507\_122313 (0T, 26 MV/m)



# Commissioning Results with 3T



# What happens for 3° case ?

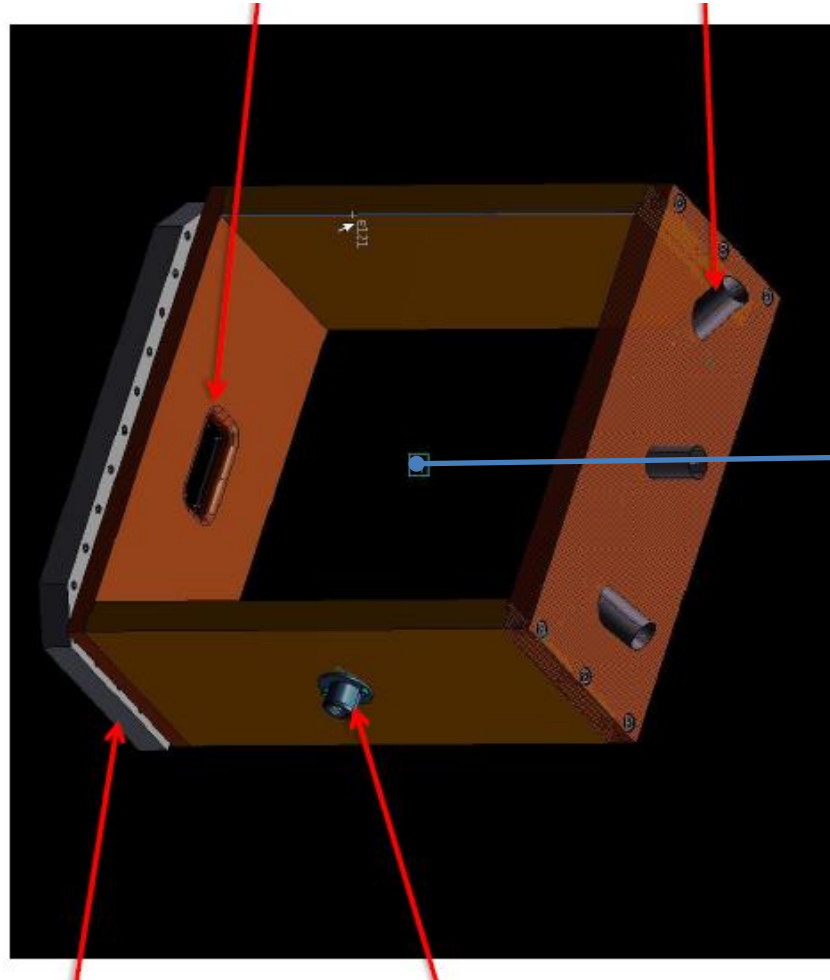


Snapshots of  
4 consecutive  
breakdowns  
with same  
setting

# Inspection with Boroscope

RF Coupling aperture

Viewport for spectrometer



Boroscope

Waveguide flange

Rotational pivot axial support



