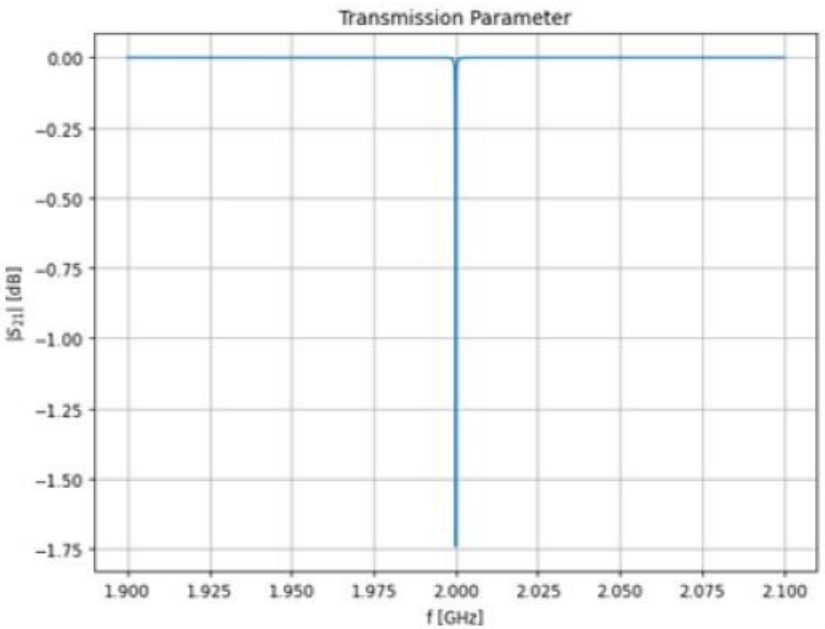
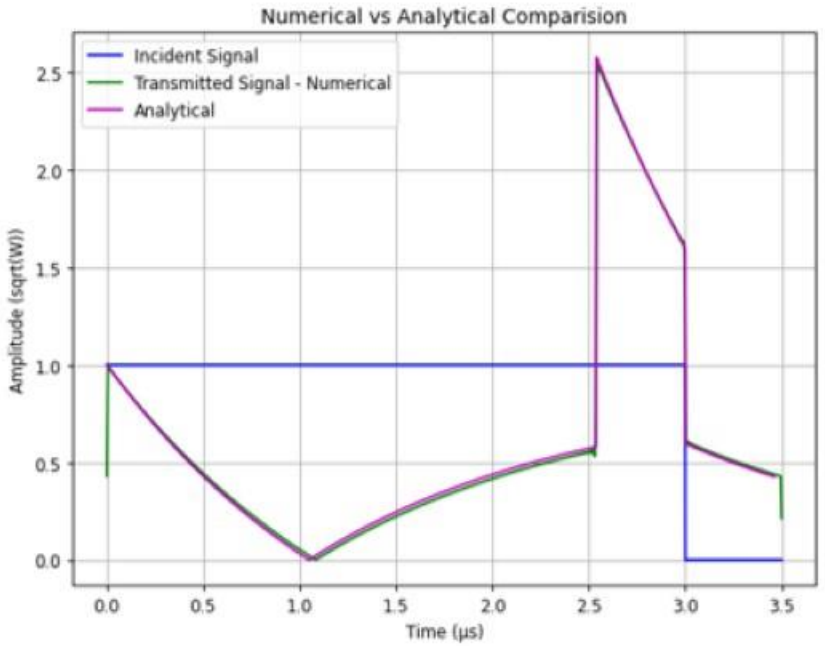
CLIC booster linac studies

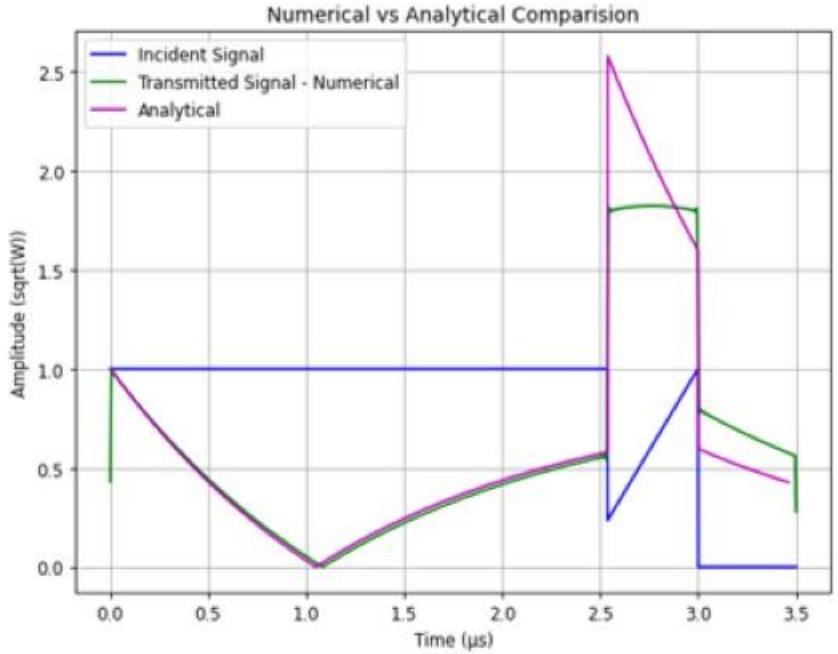
Adnan Kurtulus, Alexej Grudiev

- **Frequency Response studies:**

- f = 2 GHz, Length = 3m, Phase advance = 2π/3, $Q_{0,SLED}$ = 2e5, $T_{klystron}$ = 5 us

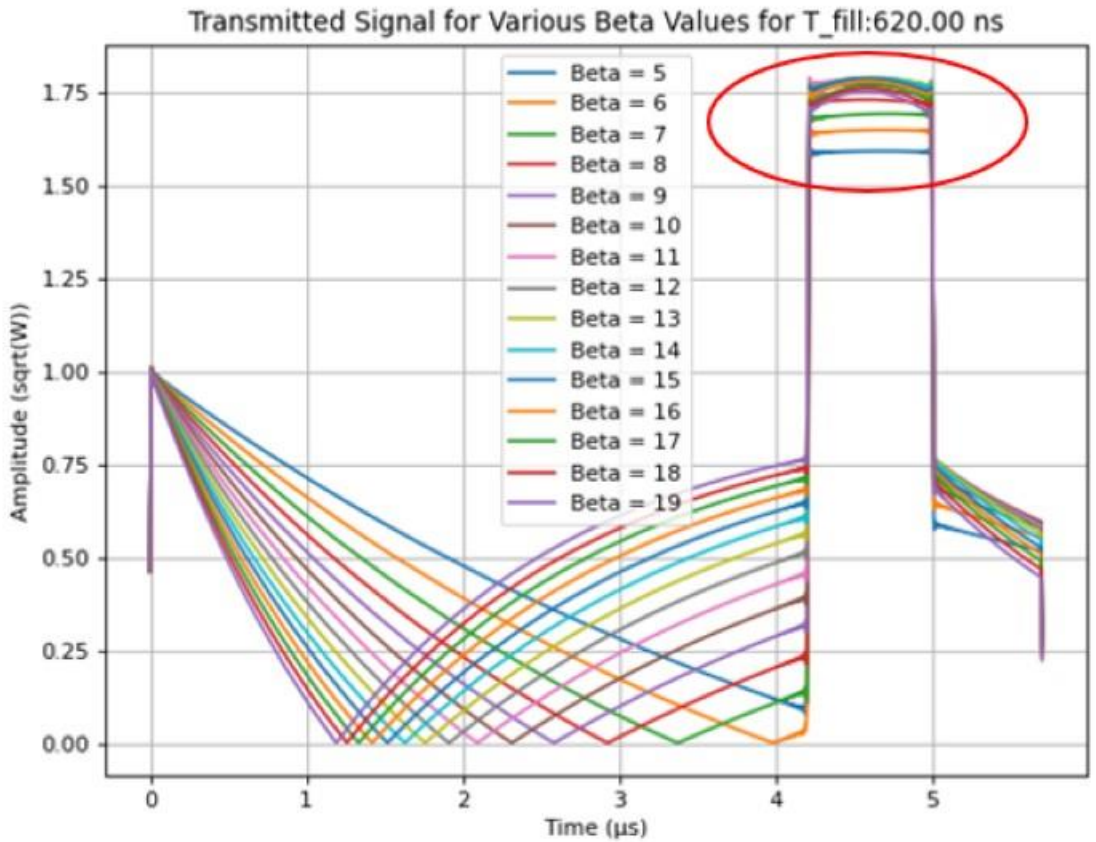


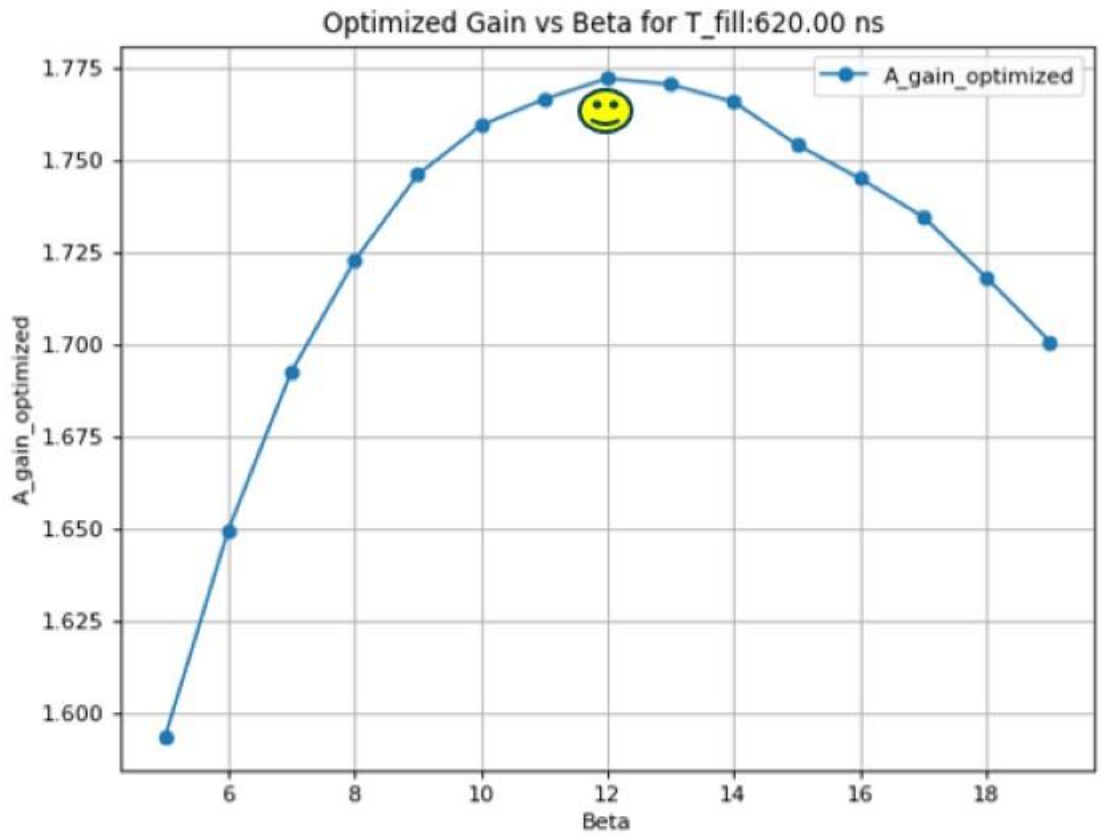




- **Pulse compressor coupling optimization:**
- f = 2 GHz, Length = 3m, Phase advance = 2π/3, $Q_{0,SLED}$ = 2e5, $T_{klystron}$ = 5 us

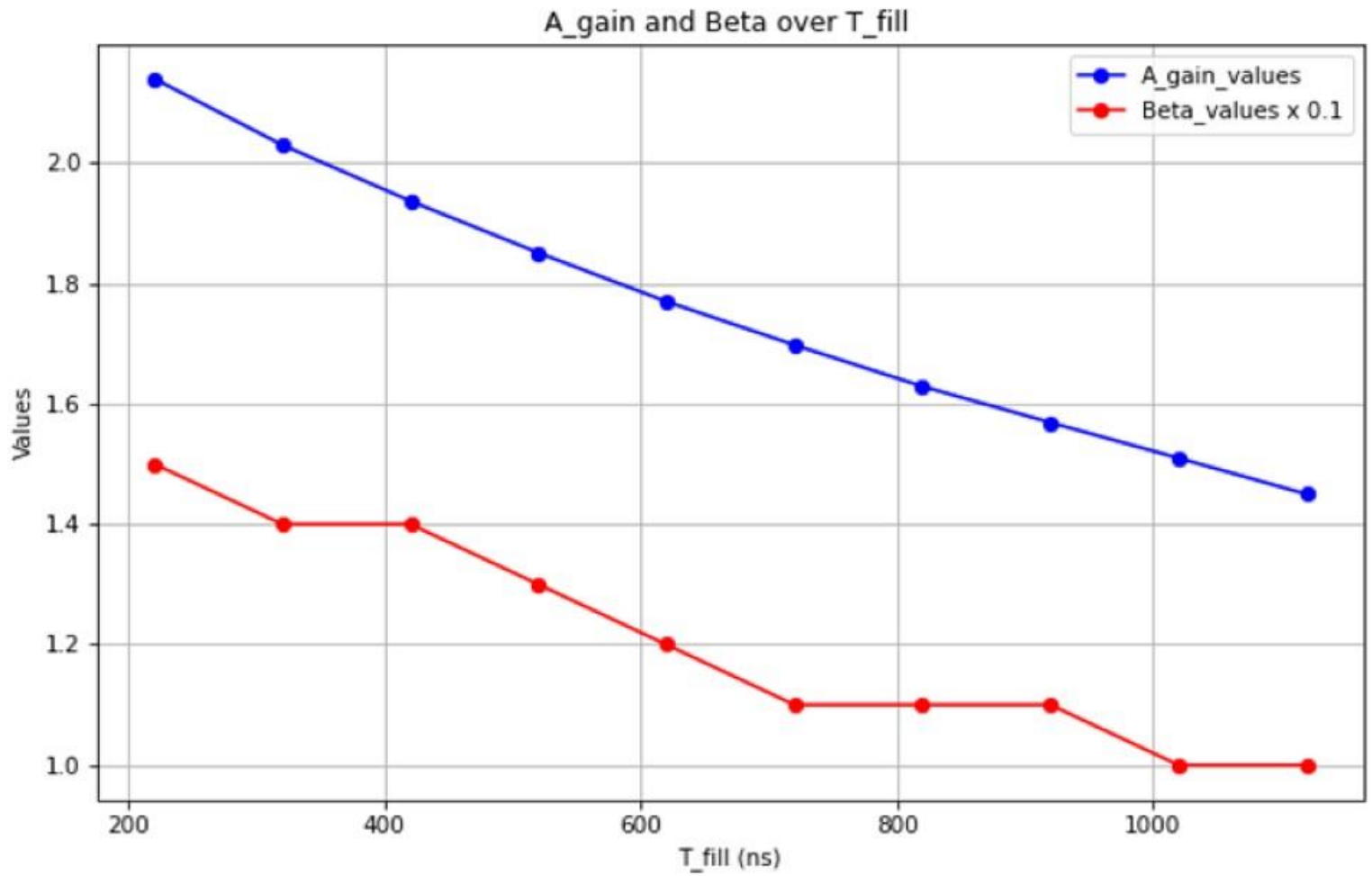
Flat part is the A_gain. Rsh can be directly calculated as SS now.



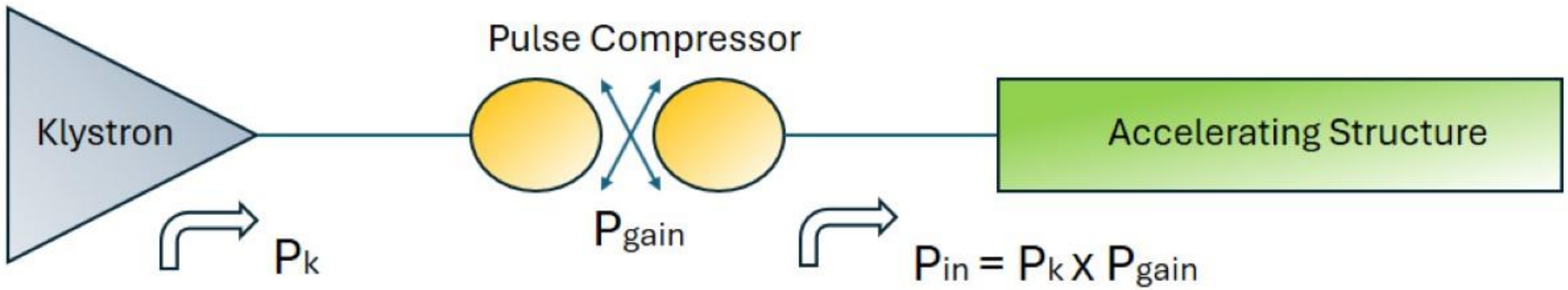


- Outcome for the structure T_fill= 620 ns.

- **Pulse compressor coupling optimization:**
- f = 2 GHz, Length = 3m, Phase advance = 2π/3, $Q_{0,SLED}$ = 2e5, $T_{klystron}$ = 5 us



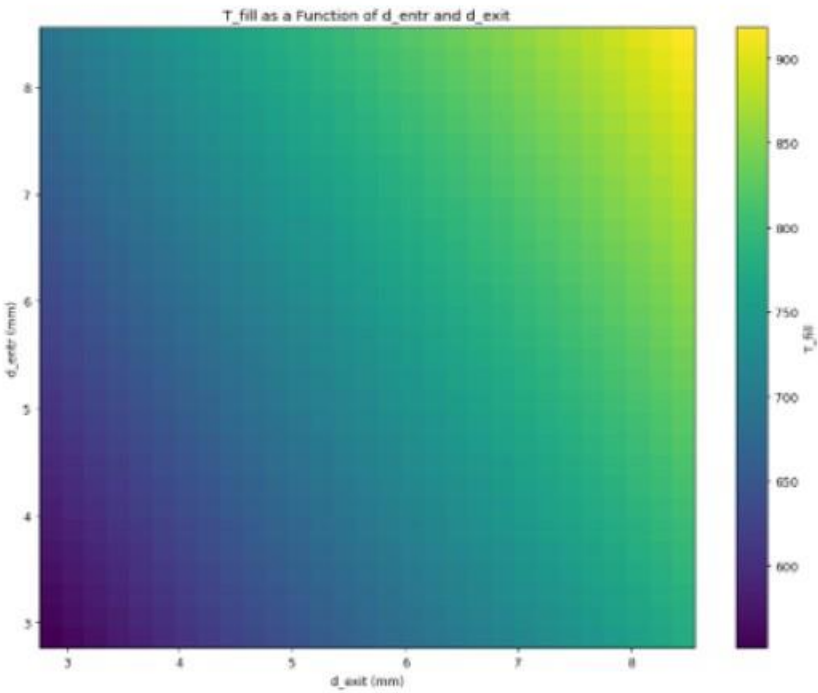
- **Effective Shunt Impedance Calculation:**
- f = 2 GHz, Length = 3m, Phase advance = 2π/3, $Q_{0,SLED}$ = 2e5, $T_{klystron}$ = 5 us



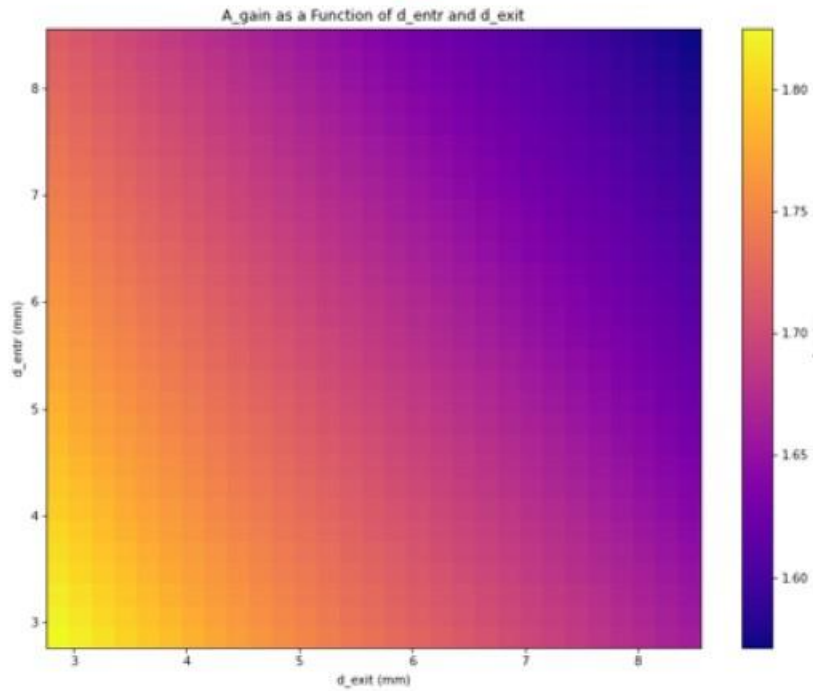
$$R_{sh} = \frac{V^2}{P_k} = \frac{V^2 . P_{gain}}{P_{in}} = R_{AS} . P_{gain}$$

- **Effective Shunt Impedance Calculation:**
- f = 2 GHz, Length = 3m, Phase advance = 2π/3, $Q_{0,SLED}$ = 2e5, $T_{klystron}$ = 5 us, P_klystron = 31 MW
- Avg. Aperture = 16mm with delta = 3mm:

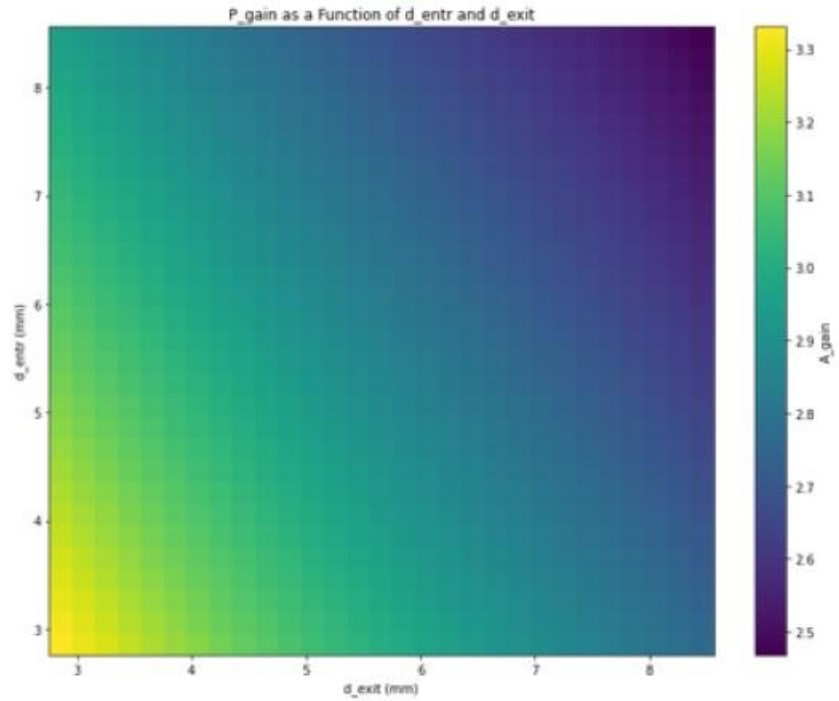
T_fill



A_gain



P_gain



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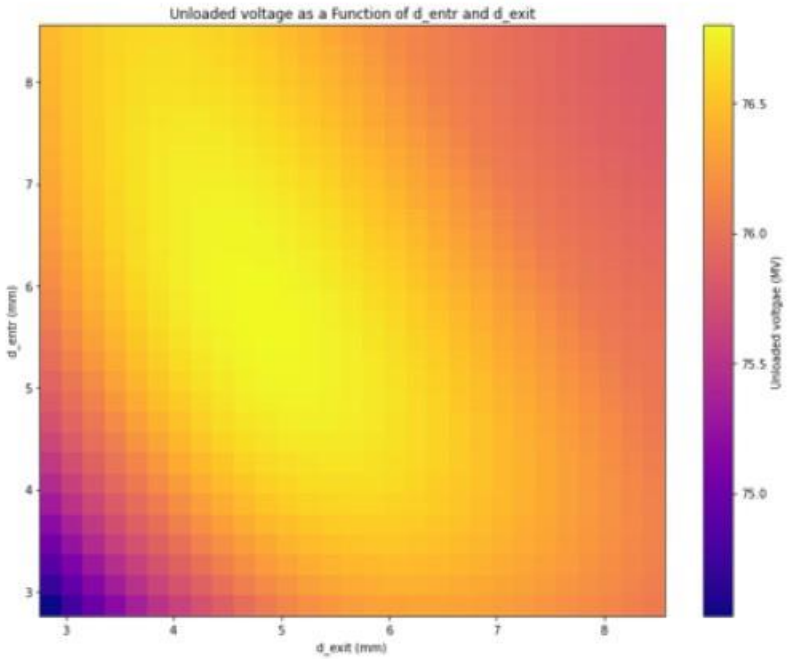
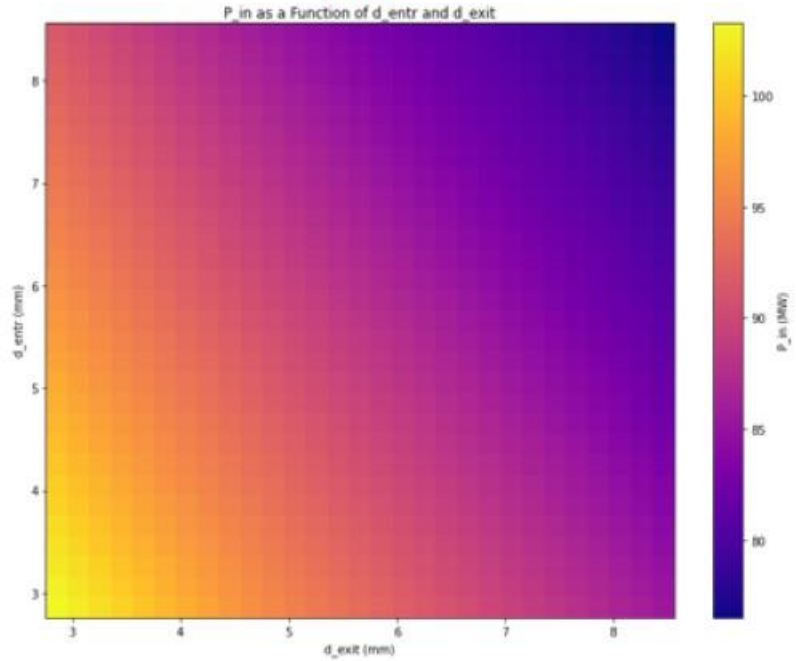
Unloaded Voltage

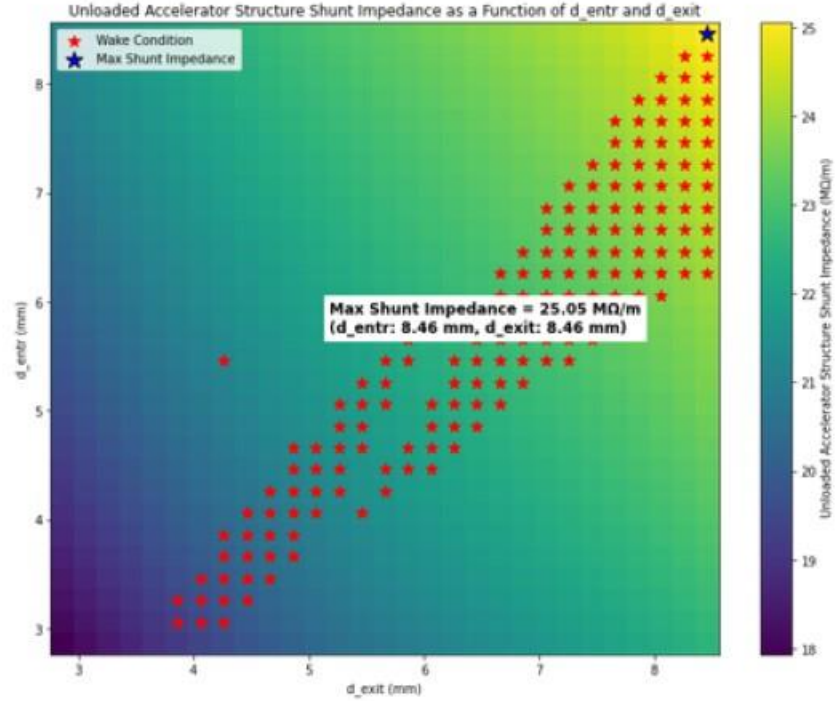


Pin



Acc. Struc. Shunt Impedance

$$R_{AS} = \frac{V^2.}{P_{in}}$$



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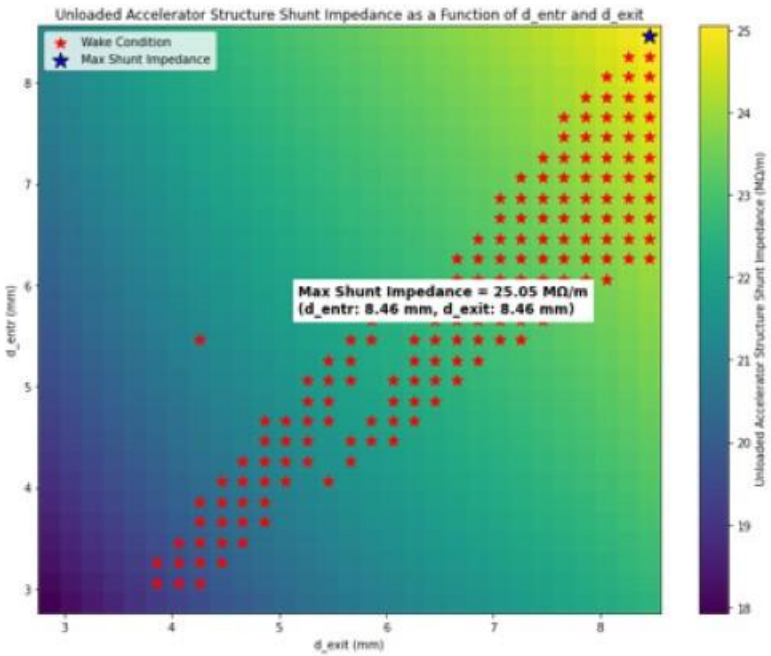
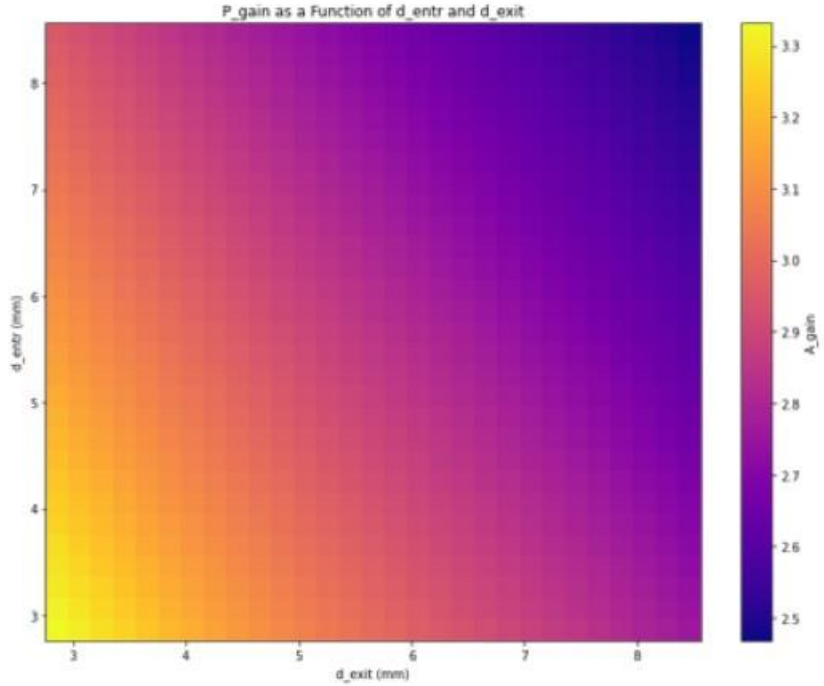
Effective Shunt Impedance

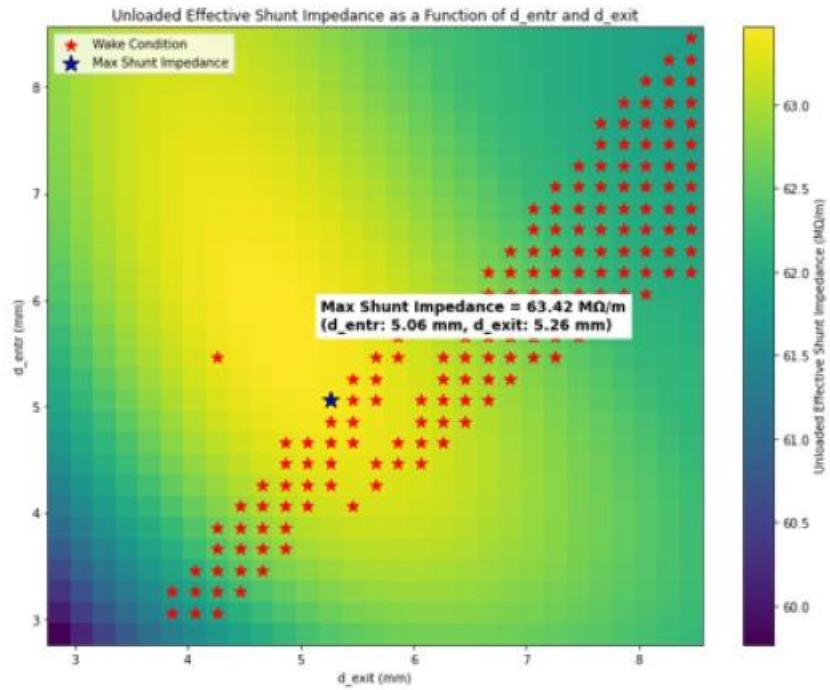
$$R_{sh} = \frac{V^2}{P_k}$$

RAS



Pgain





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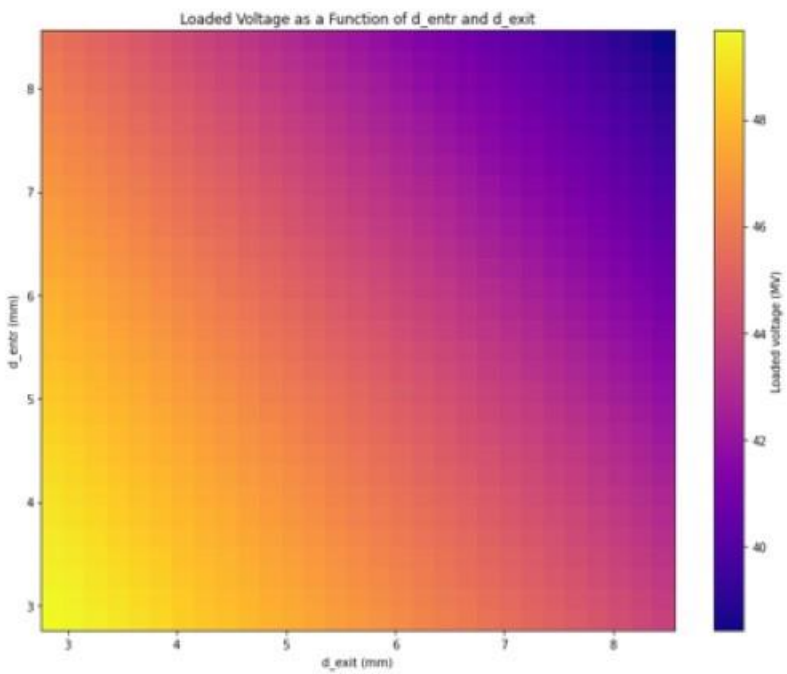
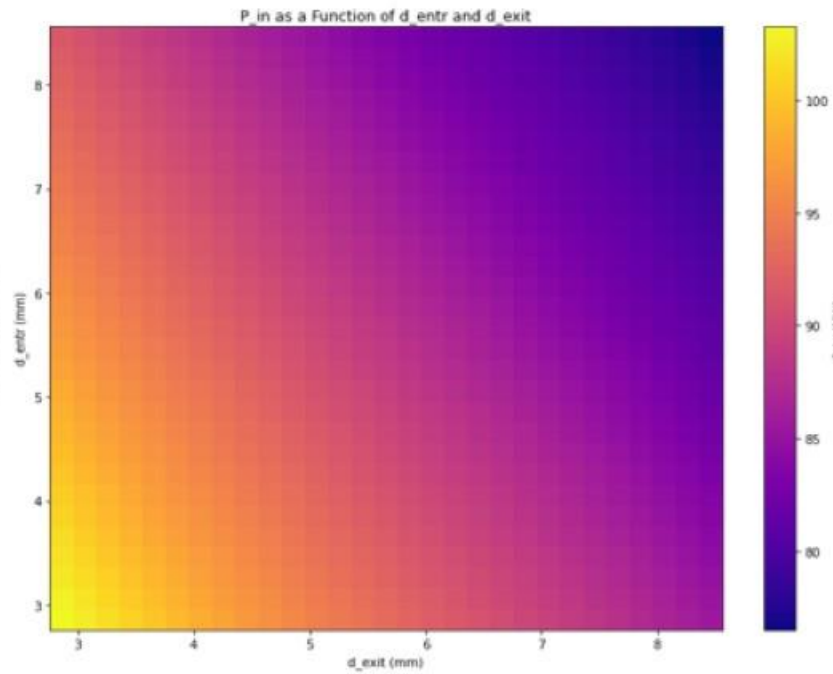
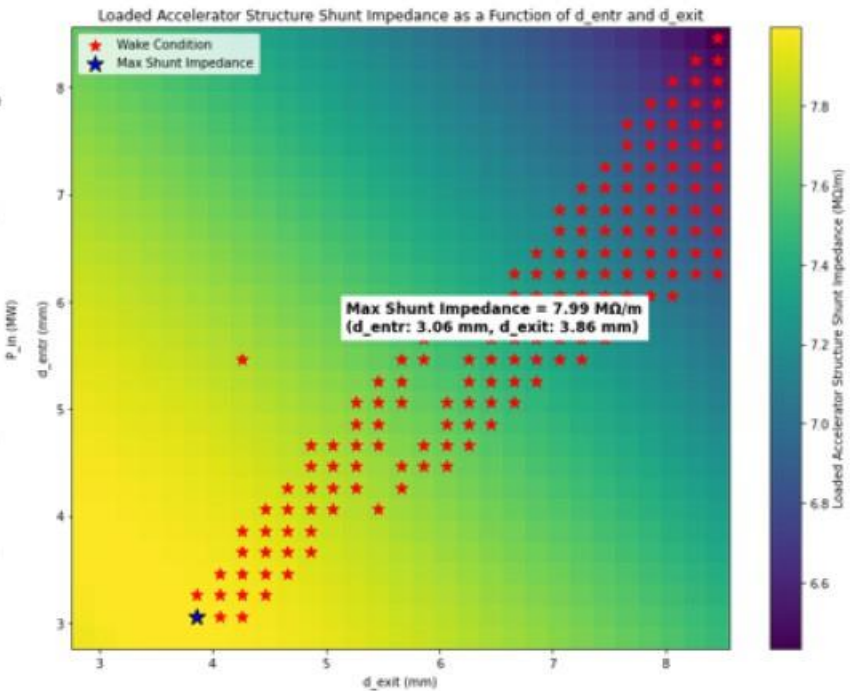
Loaded Voltage



Pin





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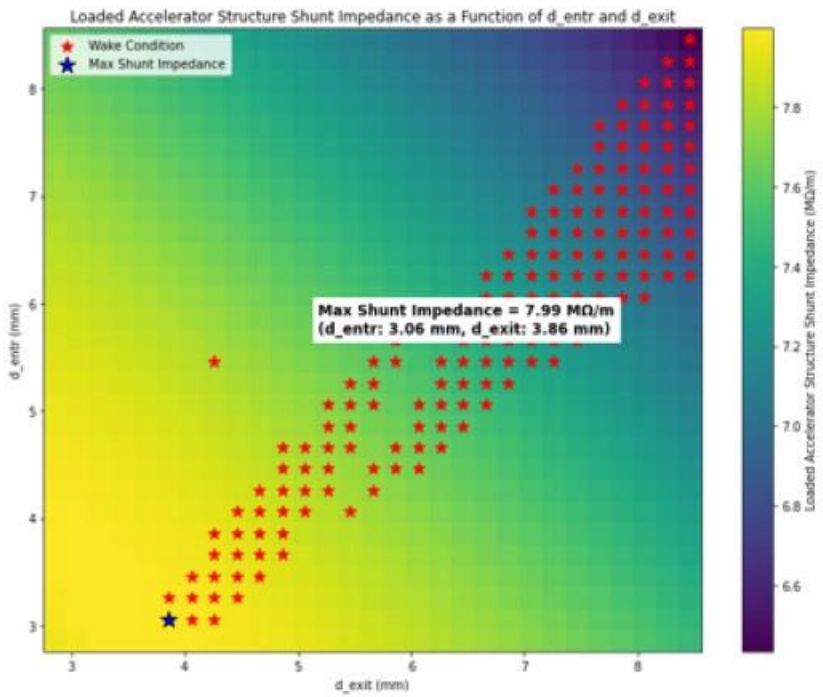
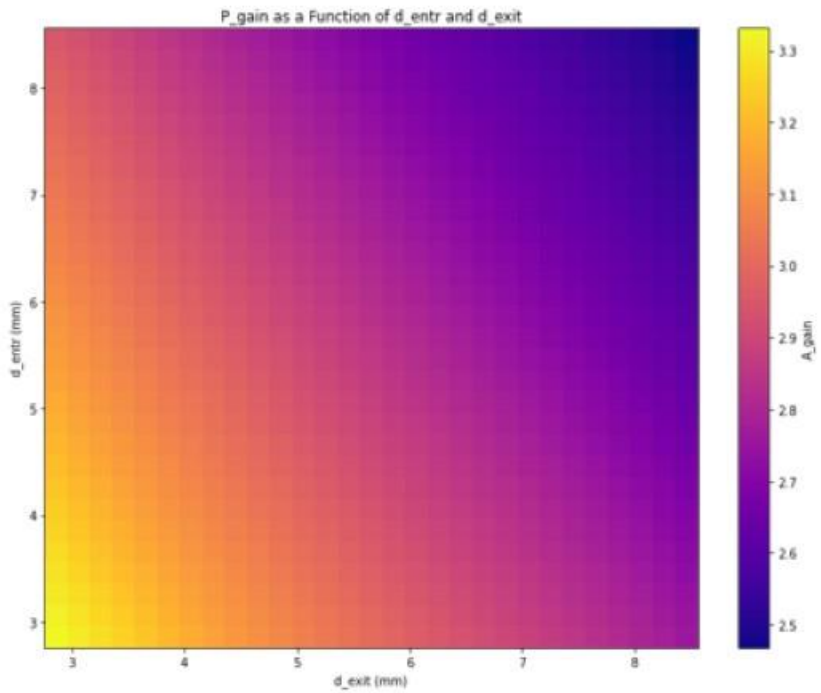
Effective Shunt Impedance

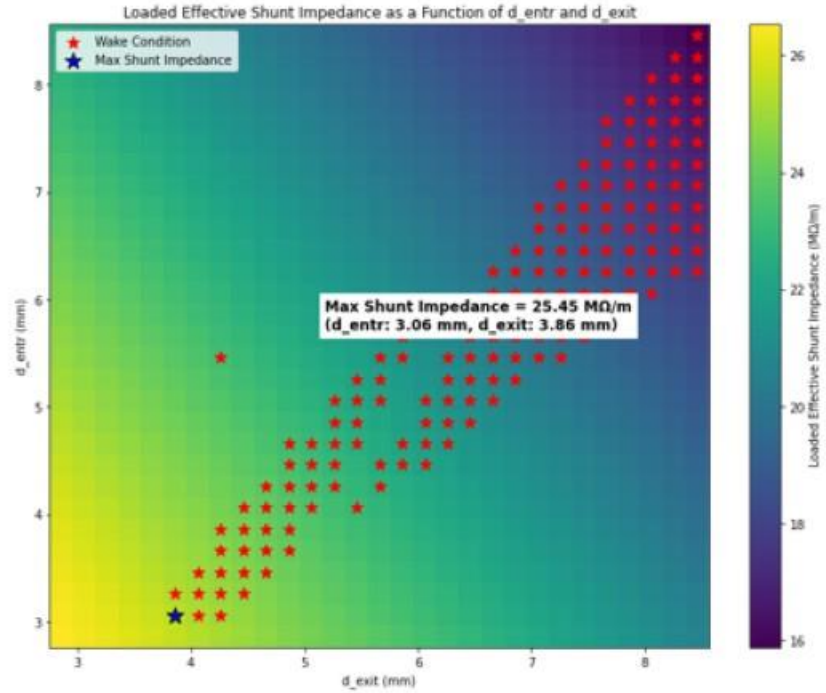
$$R_{sh} = \frac{V^2}{P_k}$$

RAS



Pgain





CLIC Booster Linac Accelerating Structure Shunt Impedances

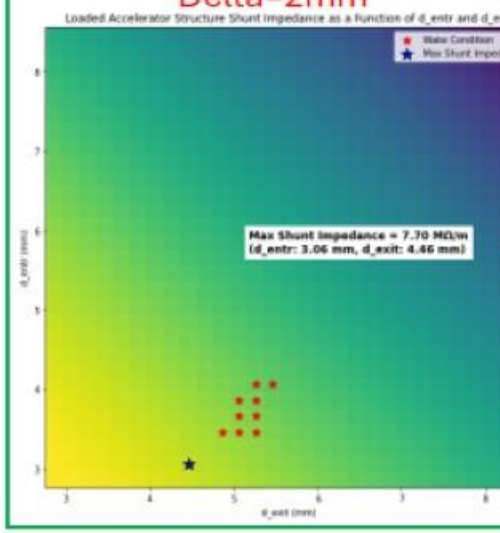
CLIC Booster Linac A.S. Shunt. Imp.

Scanned from avg. aperture 12 mm to 19 mm.
Avg. Aperture 15 mm and above satisfy the wake conditon.

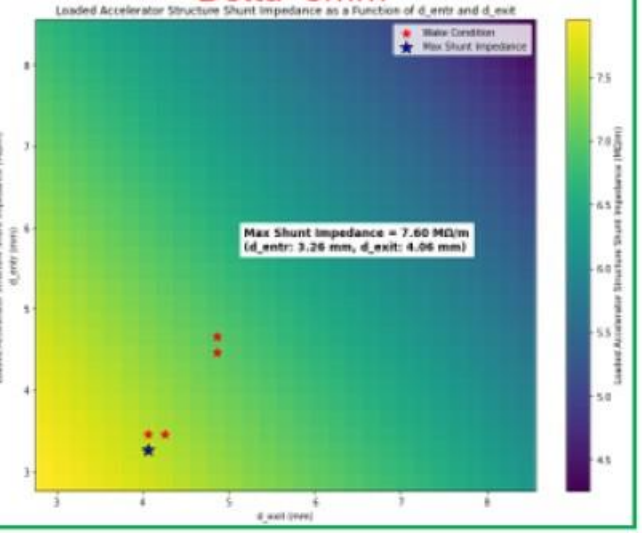
- **Parameters for the structure:**
- f = 2 GHz, Length = 3m, Phase advance = 2π/3, $Q_{0,SLED}$ = 2e5, $T_{klystron}$ = 5 us, P_klystron = 31 MW (2 acc. Struc. Per klystr.)

15 mm

Delta=2mm

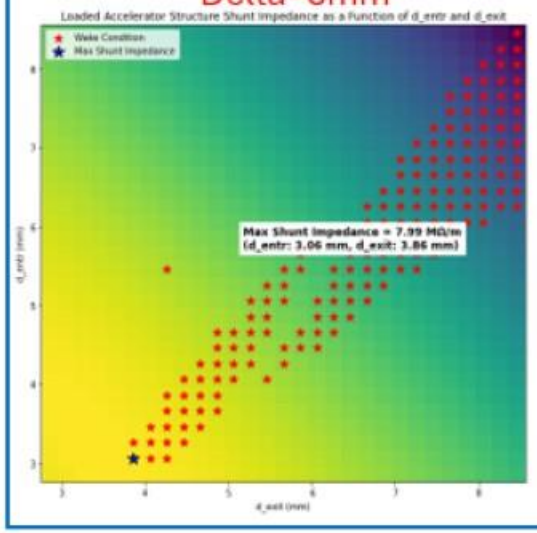


Delta=3mm

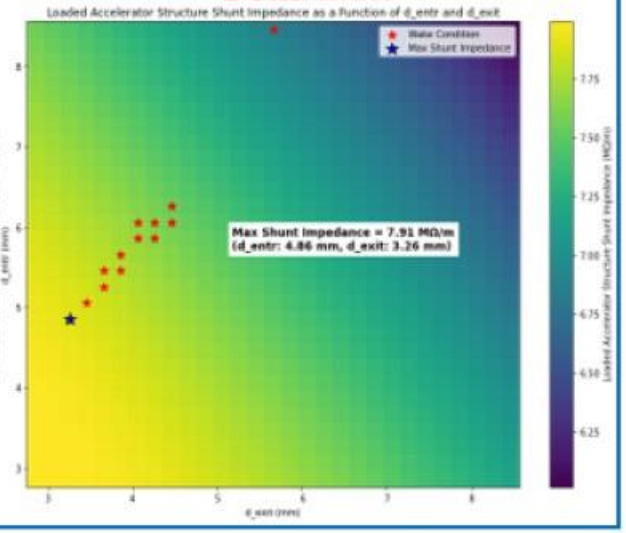


16 mm

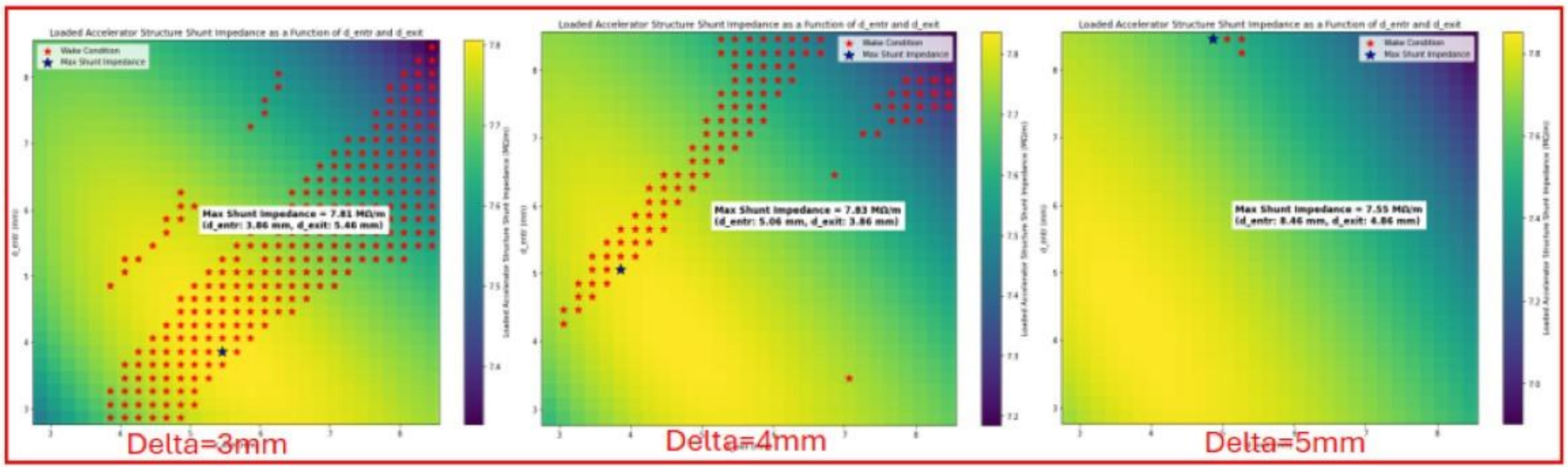
Delta=3mm



Delta4mm



17 mm



Delta=3mm Delta=4mm Delta=5mm

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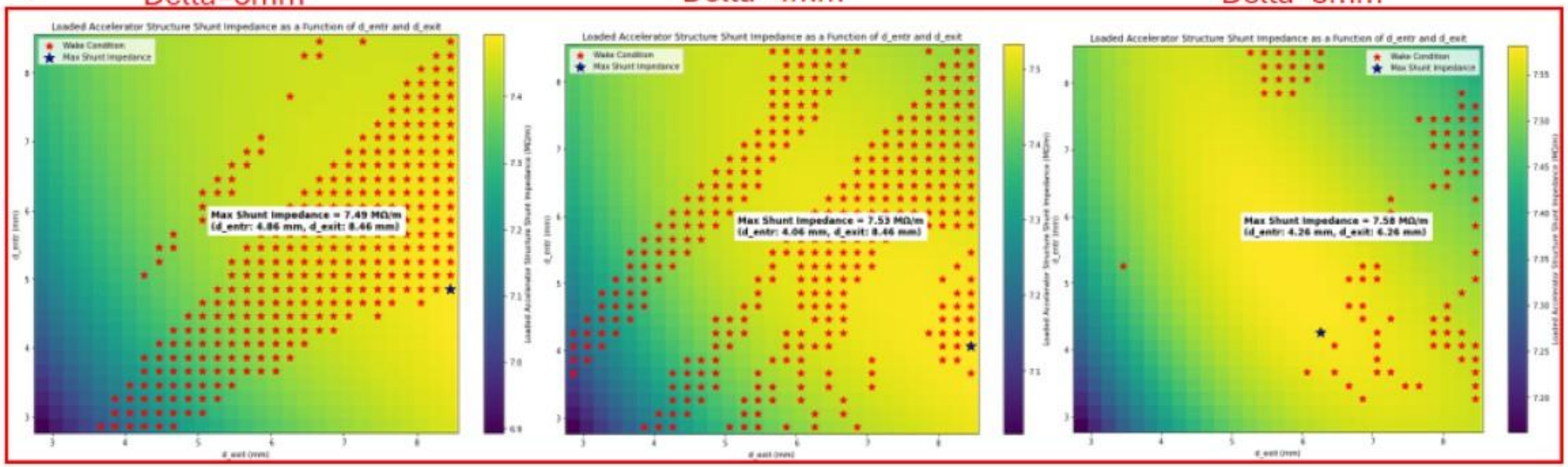
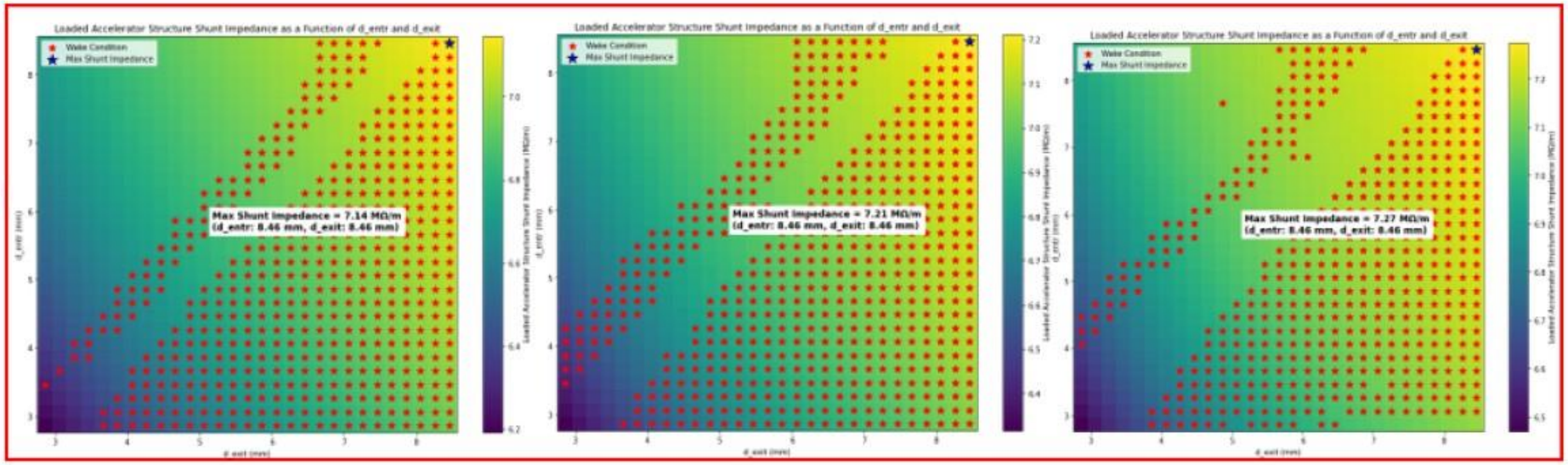
Delta=3mm | Delta=4mm | Delta=5mm

18 mm



19 mm



CLIC Booster Linac Effective Shunt Impedances

CLIC Booster Linac Eff. Shunt. Imp.

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Avg. Aperture 15 mm and above satisfy the wake conditon.

- **Parameters for the structure:**
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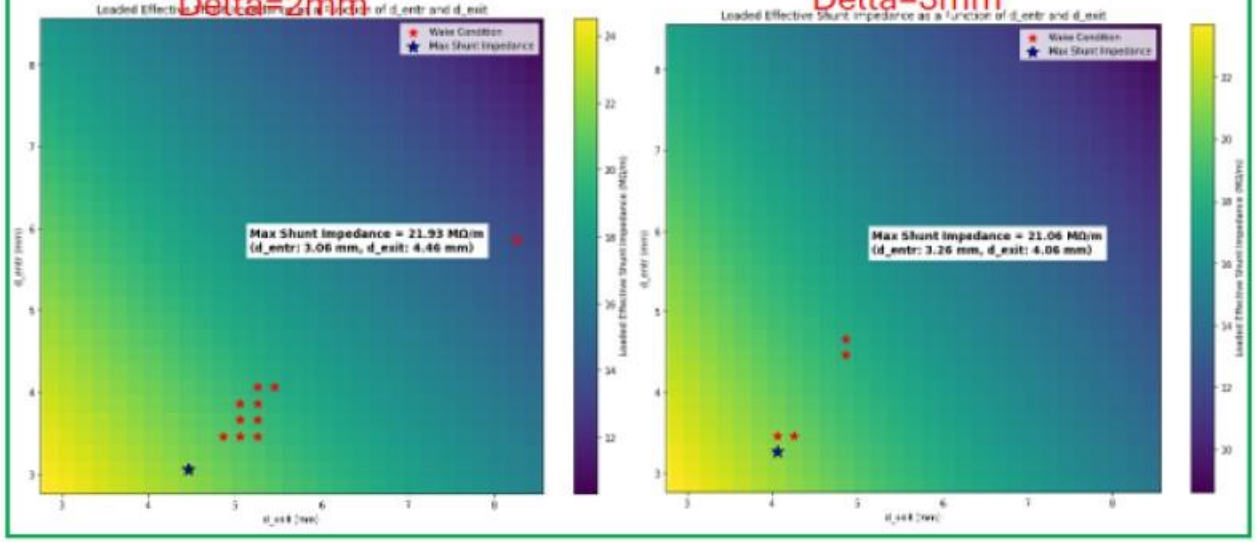
15 mm

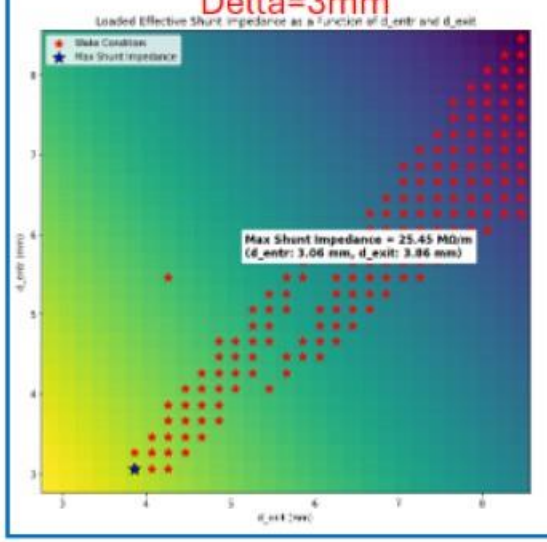
Delta=2mm



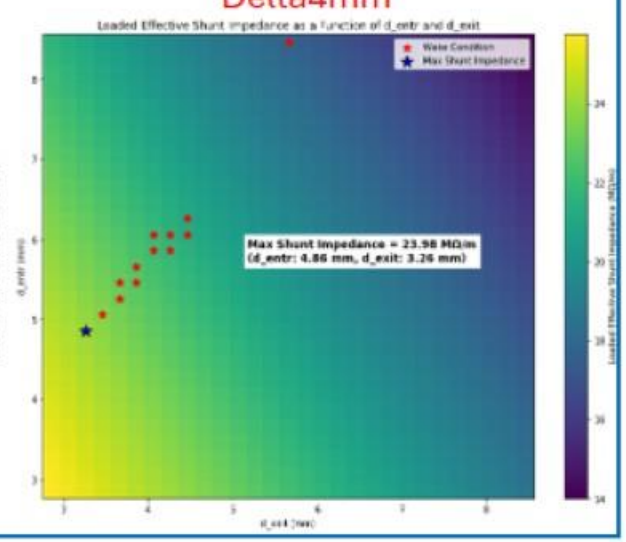
Delta=3mm

16 mm

Delta=3mm

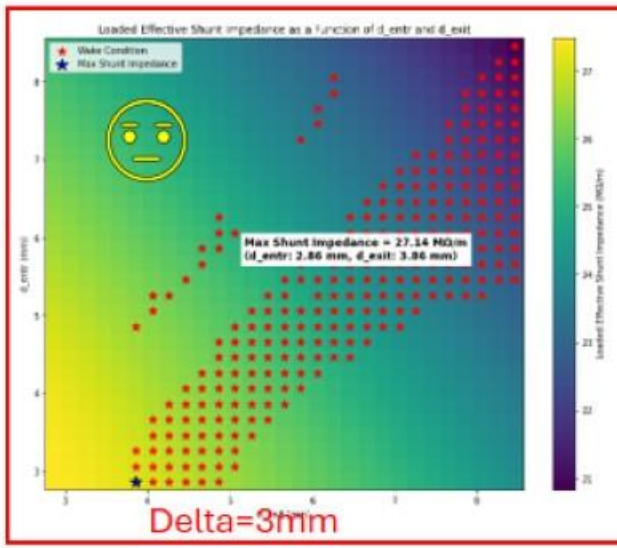


Delta4mm

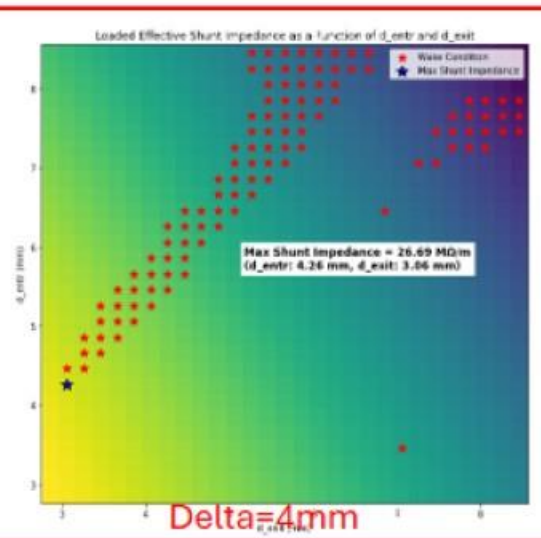


17 mm

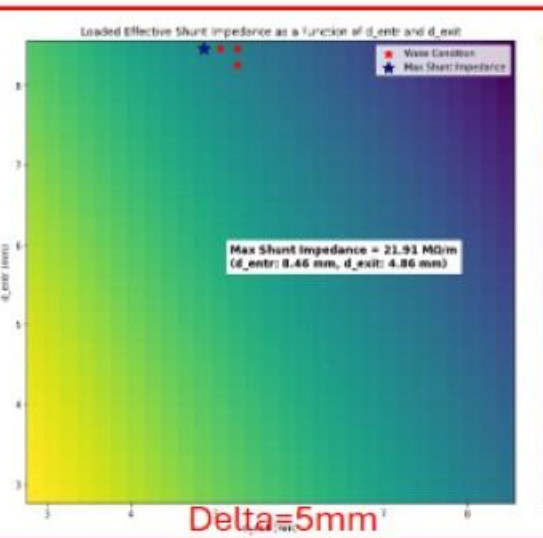
Delta=3mm



Delta=4mm



Delta=5mm



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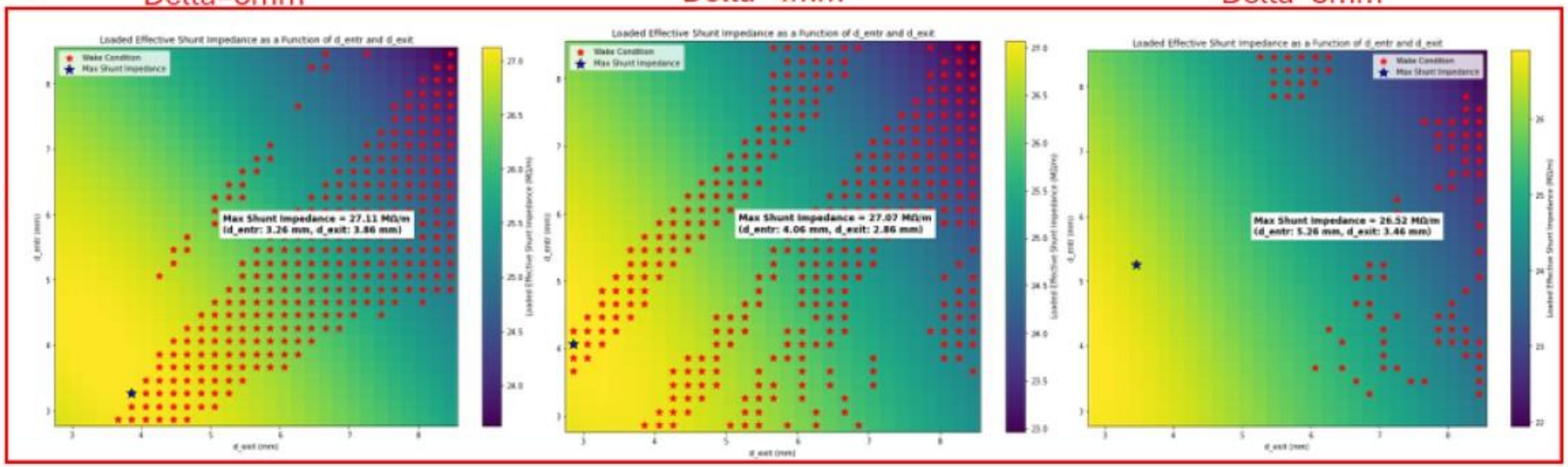
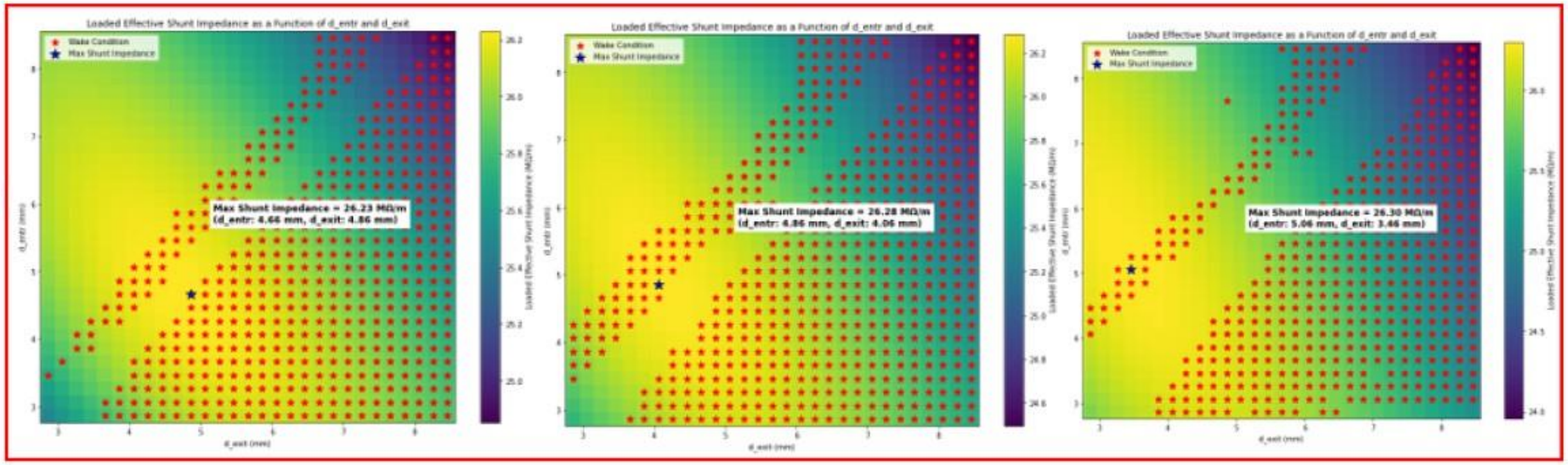
Delta=3mm | Delta=4mm | Delta=5mm

18 mm



19 mm



Gradients for the structure 17mm avg. Aperture, delta=3mm

f = 2 GHz, Length = 3m, Phase advance = 2π/3, $Q_{0,SLED}$ = 2e5, $T_{klystron}$ = 5 us, P_klystron = 31 MW
P_gain = 3.53, P_in = 109.51 MW

The best structure from our scans.