Multicell DDA Structure Design and Simulation

S. Weatherly[2], C. Jing[1,3], B. Freemire[1], E. Wisniewski[2,3], L. Spentzouris[2,3], S. Doran[3], J. Power[3]

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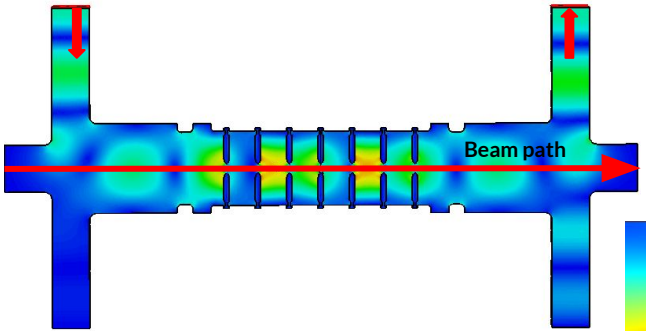
2 ILLINOIS TECH

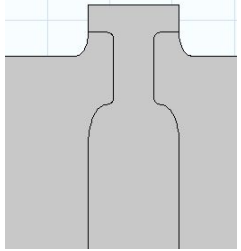
3 Argonne NATIONAL LABORATORY

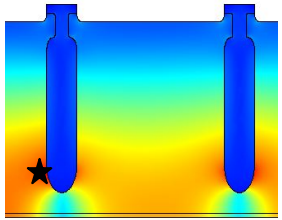
Motivation

- High shunt impedance and group velocity
- r/Q is large (better rf to beam efficiency)
- Short pulse regime: larger accelerating gradient, shorter structure, lower breakdown rate

Multicell RF Design







Inner Aperture Diameter [mm]	Length of Structure [mm]	Transmission Bandwidth (GHz)	Cell Number	Dielectric Constant	Cell Length [mm]
2.39	78.1	0.8	6	48.65	8.541 (120° phase shift)

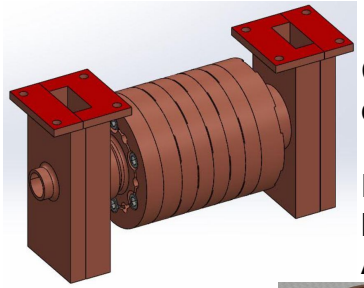
Special thanks to: SBIR Phase 2, GARD University Proposal, Chicagoland Accelerator Science Traineeship

DDA Structure vs Metallic Structures

	Multicell DDA	CLIC-G
Working Frequency (GHz)	11.7	11.944
Accelerating Gradient (MV/m)	108 @ 400 MW	100 @ 60 MW
Shunt Impedance (MOhm/m)	184.4	107~137
Beam Aperture (mm)	2.39	6.3~4.7
Group Velocity (v_g/c)	0.24	0.0199~0.0106
Q	9,612	7,112~7,445
r/Q	19,184	15,045 ~18,401

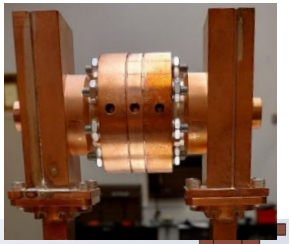
Valery Dolgashev. High gradient, x-band and above, metallic rf structures. In 2nd European Advanced Accelerator Concepts Workshop (EAAC 2015), page 34, September 2015.

Engineering and Fabrication

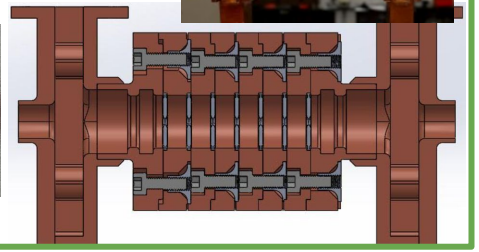


Clamped structure design.

High power testing later this year at AWA.



Candidate to be used in AWA 500 MeV Demonstrator



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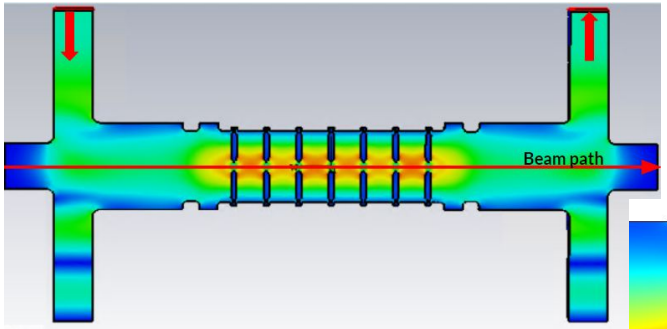

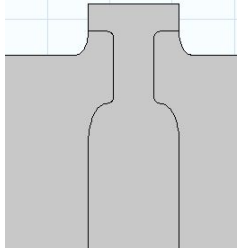

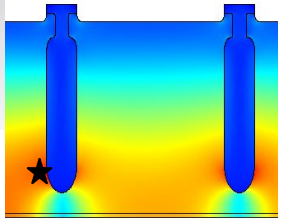

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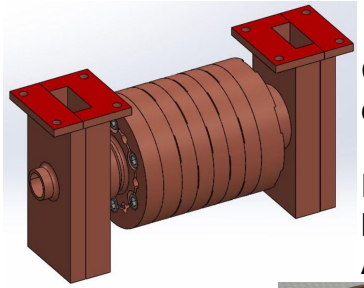

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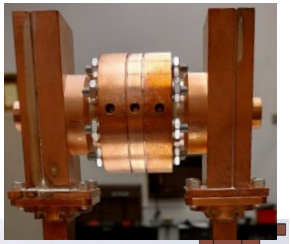

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