# High-Gradient Booster Linac for Multi-GeV pRad at LANSCE

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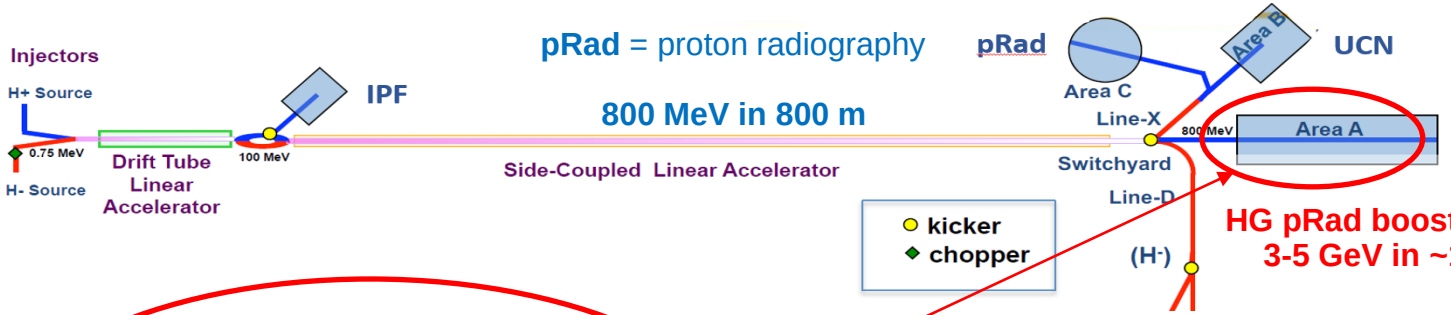
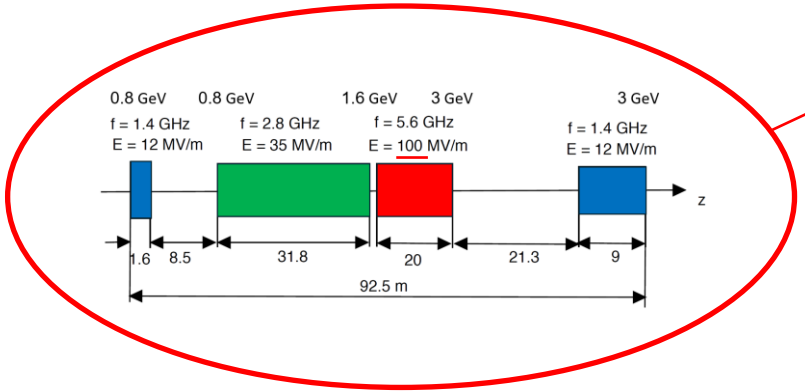
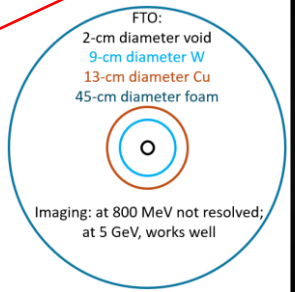
THPO006

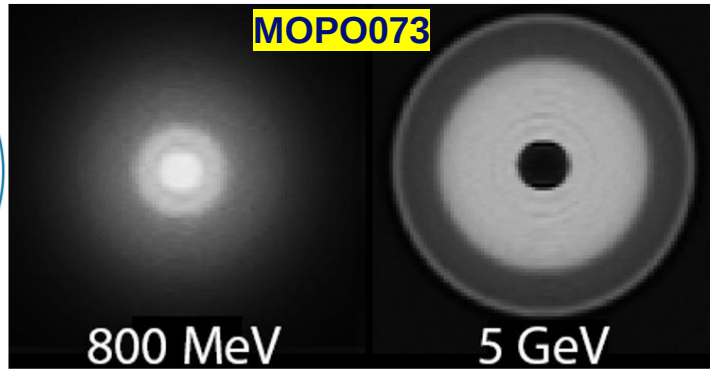



High-gradient (**HG**) booster linac




MOPO073




Proton beam energy increase from 800 MeV to 3–5 GeV enhances pRad resolution by one order of magnitude.

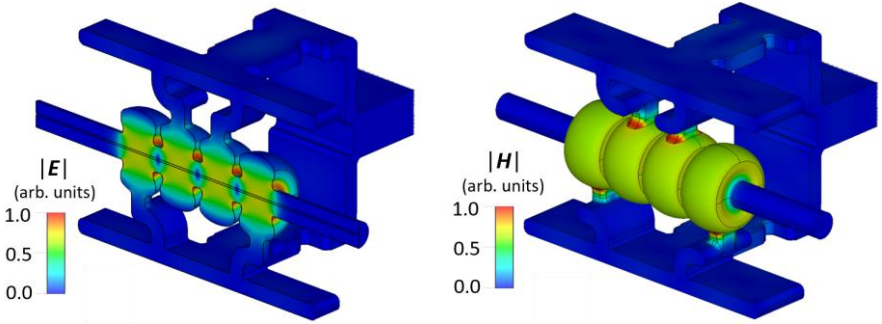
LDRD
LABORATORY DIRECTED RESEARCH & DEVELOPMENT

**Booster linac will use cryo-cooled (LN2, 77K) HG accelerating structures.**

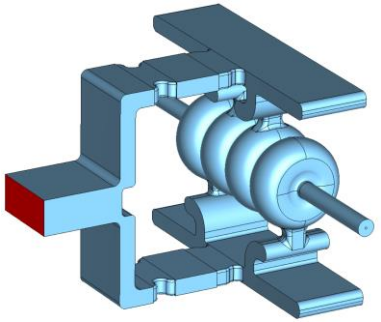
# High-Gradient Booster Linac for Multi-GeV pRad at LANSCE

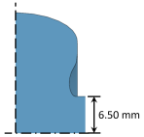
Four-cell prototype C-band structure with distributed RF coupling for 1.6-GeV ($\beta$ = 0.93) protons (IPAC'26)

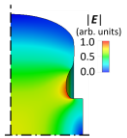
**THPO006**

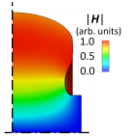



Vacuum volume of 4-cell S-band test structure for 800-MeV protons

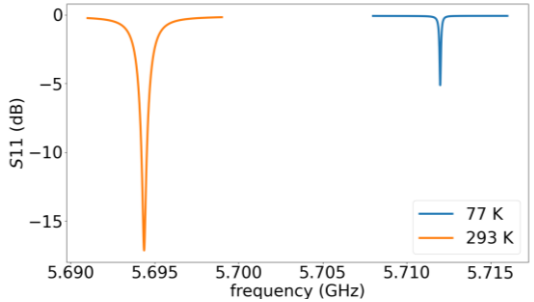





The accelerating cavity shape was optimized using multi-objective genetic algorithm.




## Test cavity parameters: S-band and C-band

| | | |
|---|---|---|
| Frequency @ LN2, GHz | 2.856 | 5.712 |
| $\beta = v/c$ | 0.84 | 0.93 |
| Aperture radius, mm | 8 | 6.5 |
| Unloaded $Q$ @ LN2 | 46259 | 32496 |
| $Z'_{eff}$ @ LN2, MΩ/m | 172 | 190 |
| $E_{max}/E_{acc}$ | 2.41 | 2.59 |
| $Z_0 H_{max}/E_{acc}$ | 1.30 | 1.72 |
| $(\lvert\boldsymbol{E}\rvert \times Z_0\lvert\boldsymbol{H}\rvert)_{max}/(E_{acc})^2$ | 1.43 | 1.93 |
| Max $E_{acc}$ in RF tests, MV/m* | 69 | 121 |

* At max RF peak power available for tests

**HG cryo-cooled (LN2) accelerating test structures for protons in S- and C-band**