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FERMI FEL Linac Achievements and Upgrade

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LINAC16, East Lansing, MI USA

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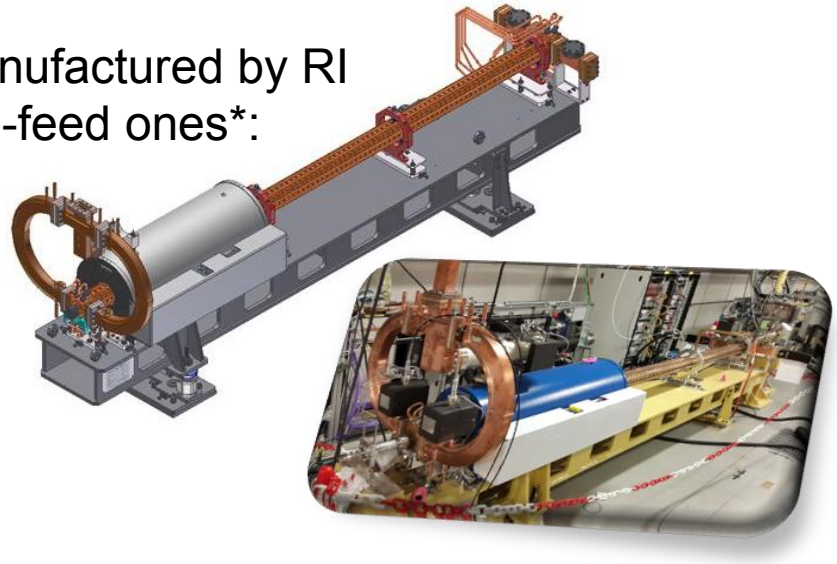
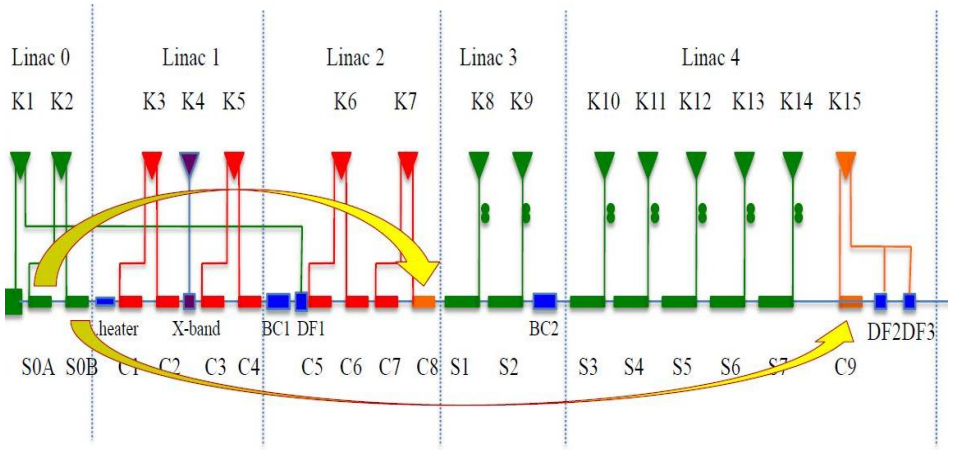
Linac Status

INJECTOR UPGRADE

Two 3-m long, dual-feed accelerating structures (manufactured by RI GmbH) have been installed, replacing the old, single-feed ones*:

- The transverse kick has been reduced from 330 μrad per MV/m to approximately **90 μrad per MV/m**.
- The normalized emittance at **700 pC** resulted to be **10-15% smaller** than the previous ones.





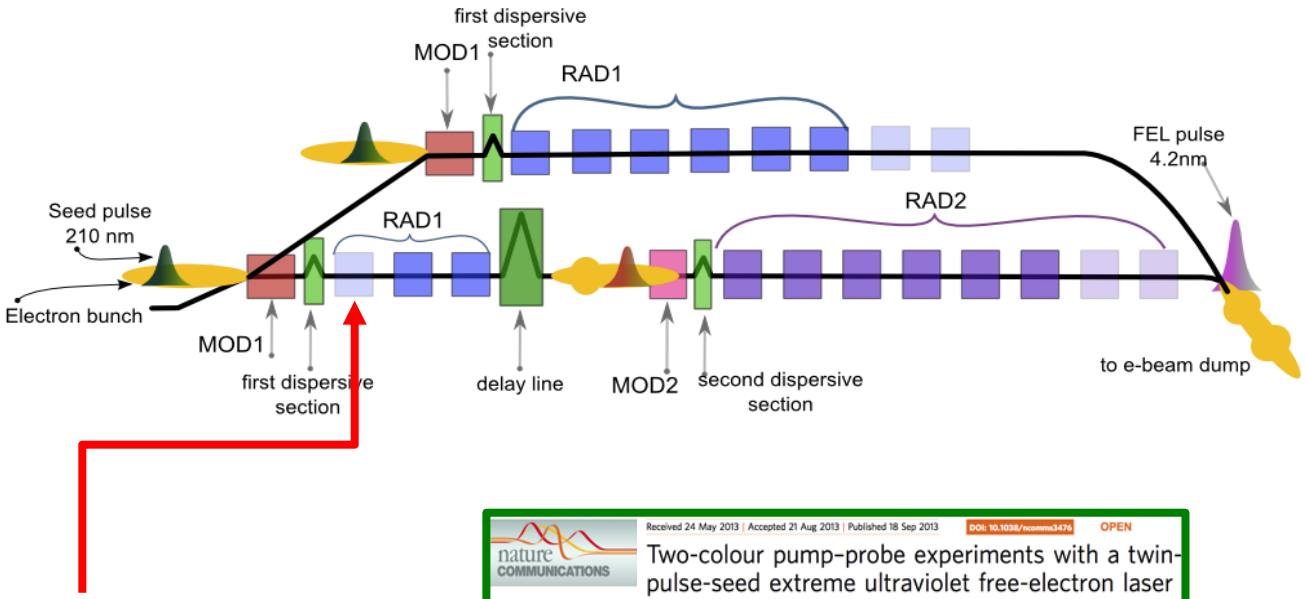
ENERGY UPGRADE

The old structures were moved to the high energy part of the Linac.

The measured maximum Linac energy now available is 1629 MeV. The maximum operating energy at 700 A of nominal current, is currently about **1550 MeV** at **10 Hz** rep rate.

*(*Ref. 'Design, manufacturing and installation of two dual-feed accelerating structure for the FERMI injector', MOP1008, this Conference)*

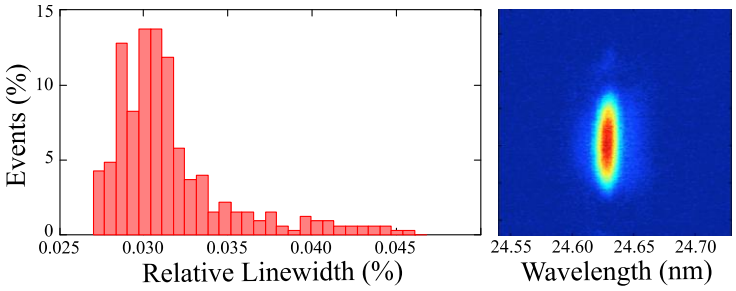
FEL Achievements

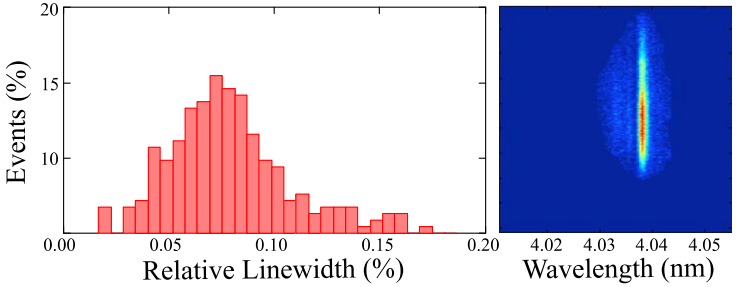


One more RAD for:

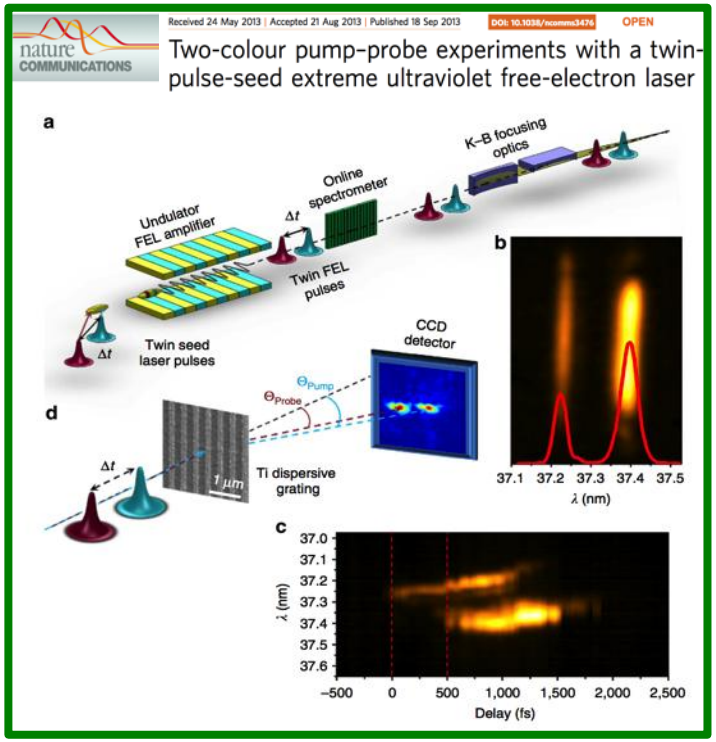
- Higher energy from 1st stage.
- Seed laser at lower energy and larger spectral range.

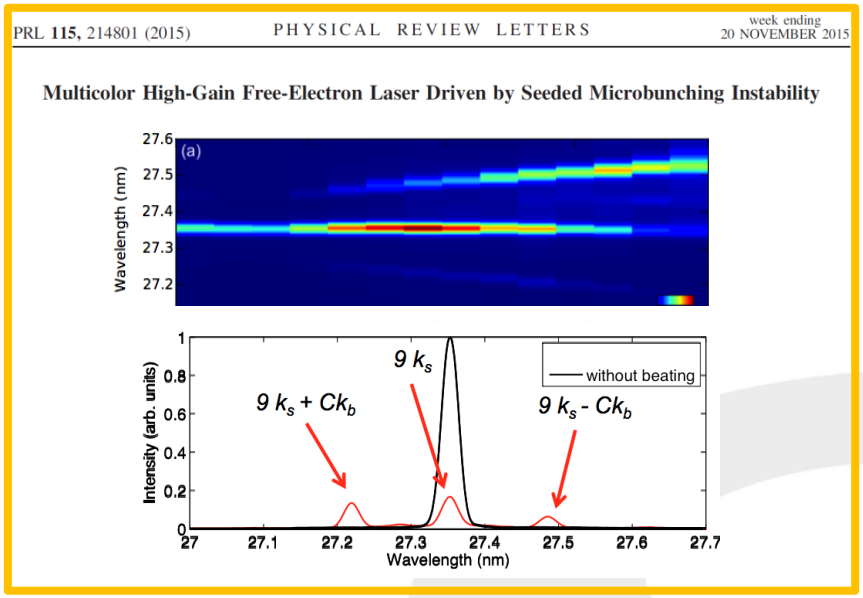
FEL1, h14, ~10μJ

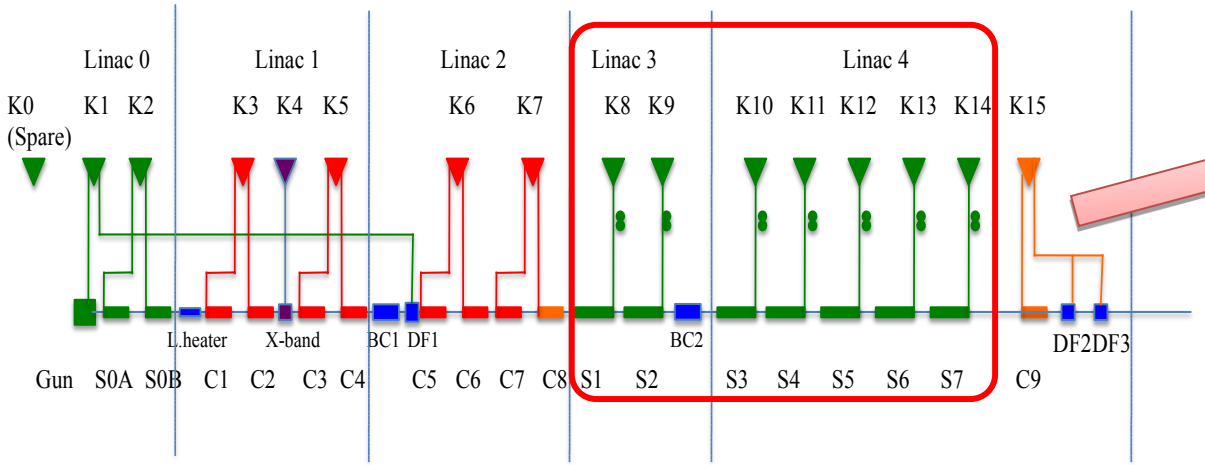




FEL2, h64, ~16μJ







Limitations to the attainable energy at 50 Hz come from the BTW structures

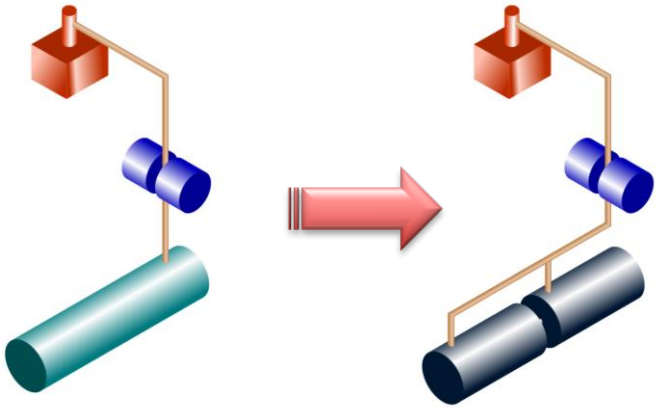
A possible development of high-gradient, S-band accelerating structures for the replacement of the existing BTWs is under consideration*

SHORT TERM GOAL

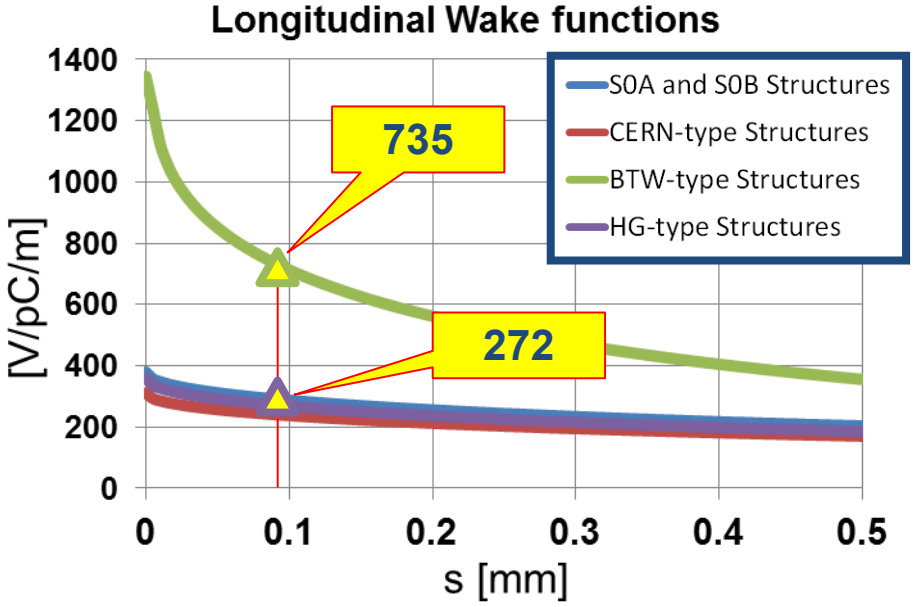
- A routinely operation at **1.55 GeV** (after compression) and **50 Hz**. This energy will require an operting gradient of **24 MV/m** on Linac3 and Linac4.
- Longitudinal and transverse wakefields effects shall be mitigated (with respect to the actual BTW structures).

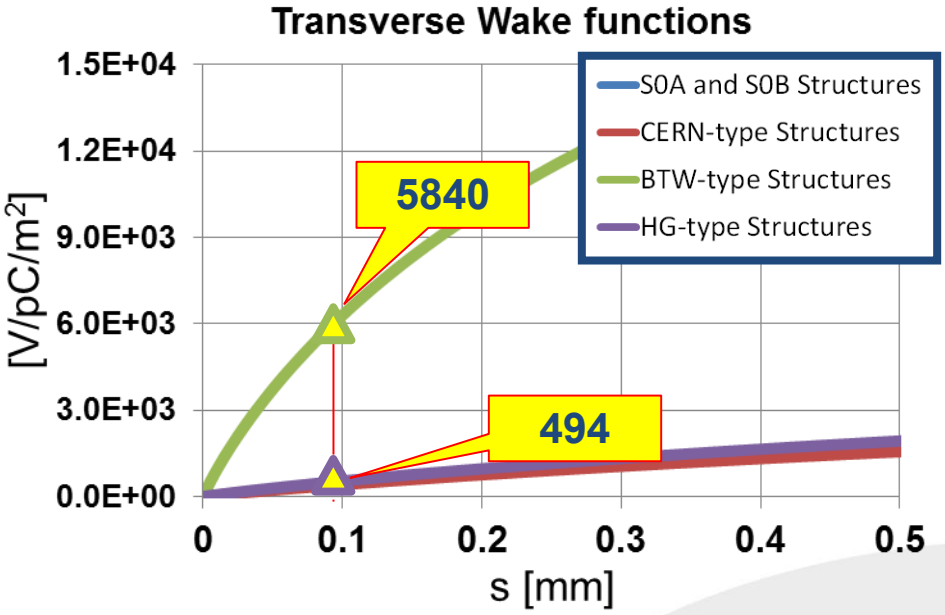
Linac Upgrades

- The new accelerating module will be comprised of two 3.1-m long accelerating structures.
- Each structure will be of the **constant-gradient type.**
- RF couplers will be of the electric-coupled type*.



SHORT-RANGE WAKEFIELDS





The new structures will mitigate wakefields effects.

*(*Ref. 'Development of an High Gradient, S-band, Accelerating Structure for the FERMI Linac', MOP1007, this conference)*

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Thank you!

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