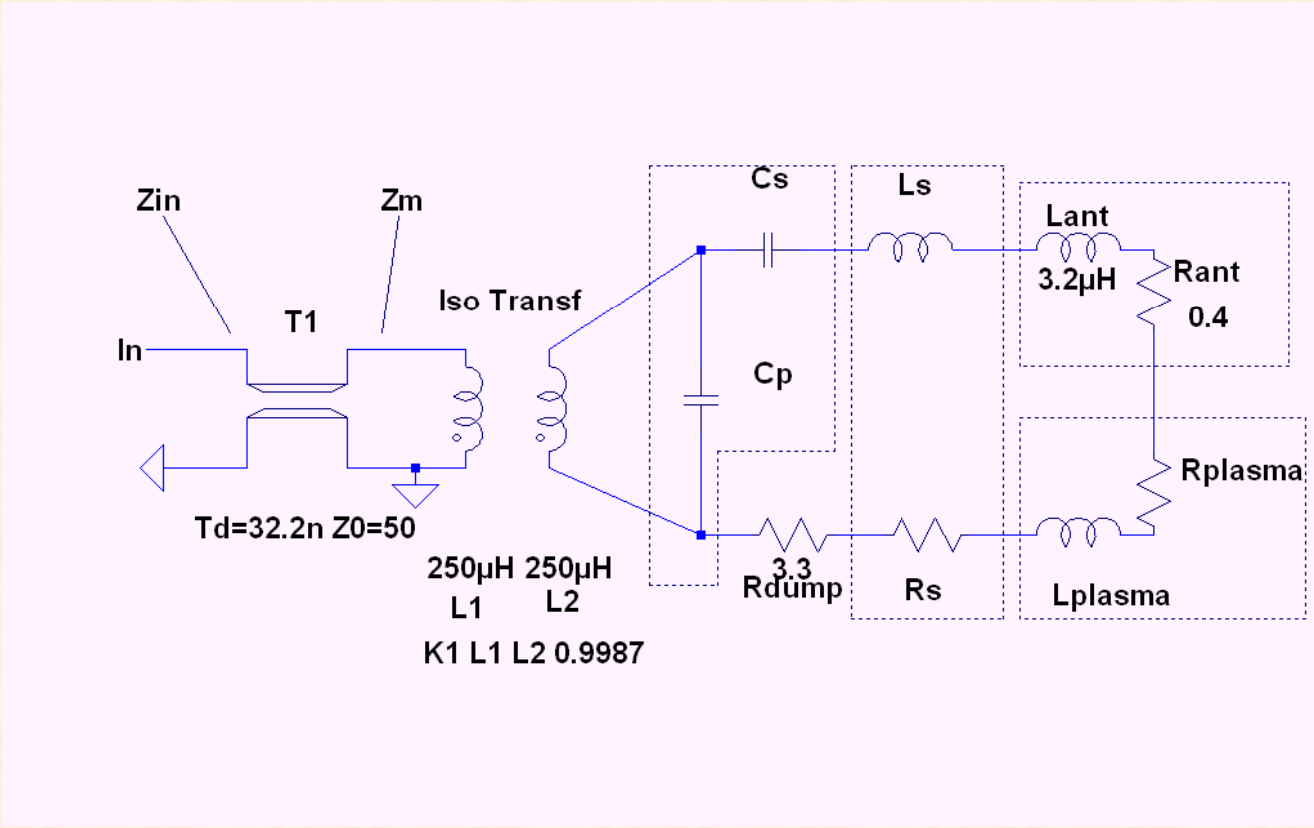
LINAC 4 H- Source RF System and Measurement of RF power Coupling to the Plasma.

LINAC 4 H^- Source RF System

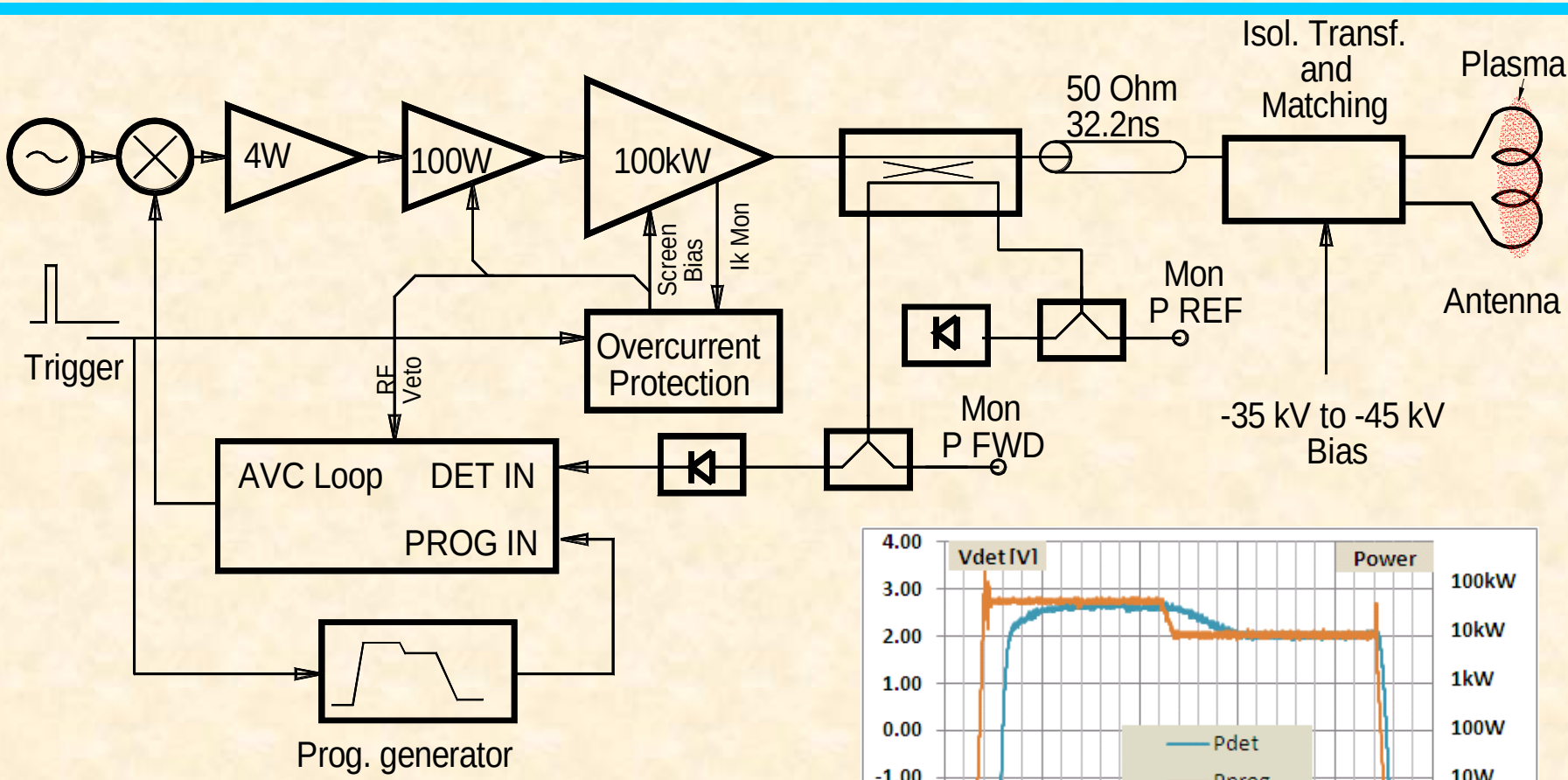
- 2ms pulses, 2Hz rep. rate (50Hz in future SPL)
- All equipment grounded.
- Wideband solid-state drivers.
- 2MHz ±200 kHz, 100 kW final stage.
- Isolation transformer : wideband, 1÷1 device
- Capacitive matching network with adjustable inductance for tuning.
- Adjustable frequency agile operation.
- AVC loop stabilizes the FWD power.

LINAC 4 H^- Source RF System

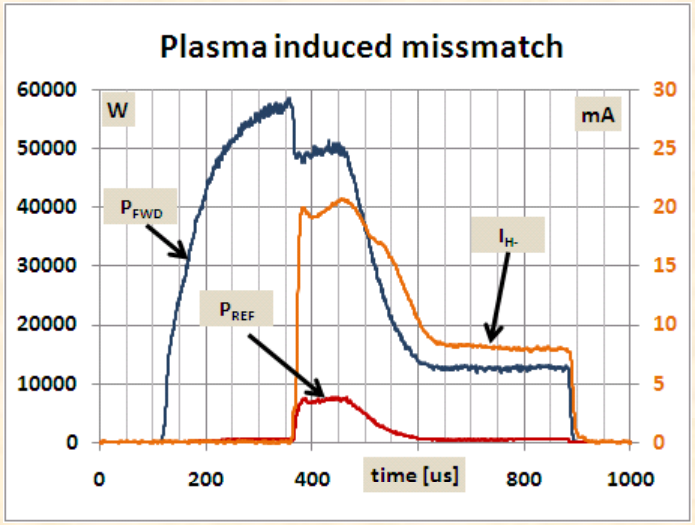
Antenna, matching network and connection line

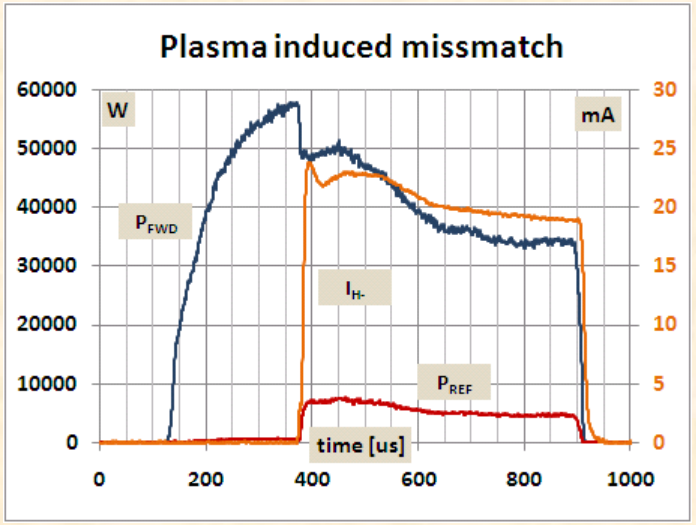


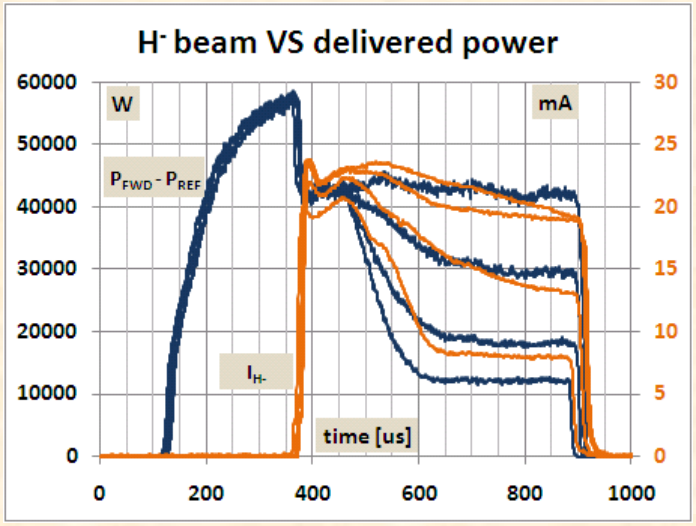
LINAC 4 H⁻ Source RF System



LINAC 4 H⁻ Source RF System



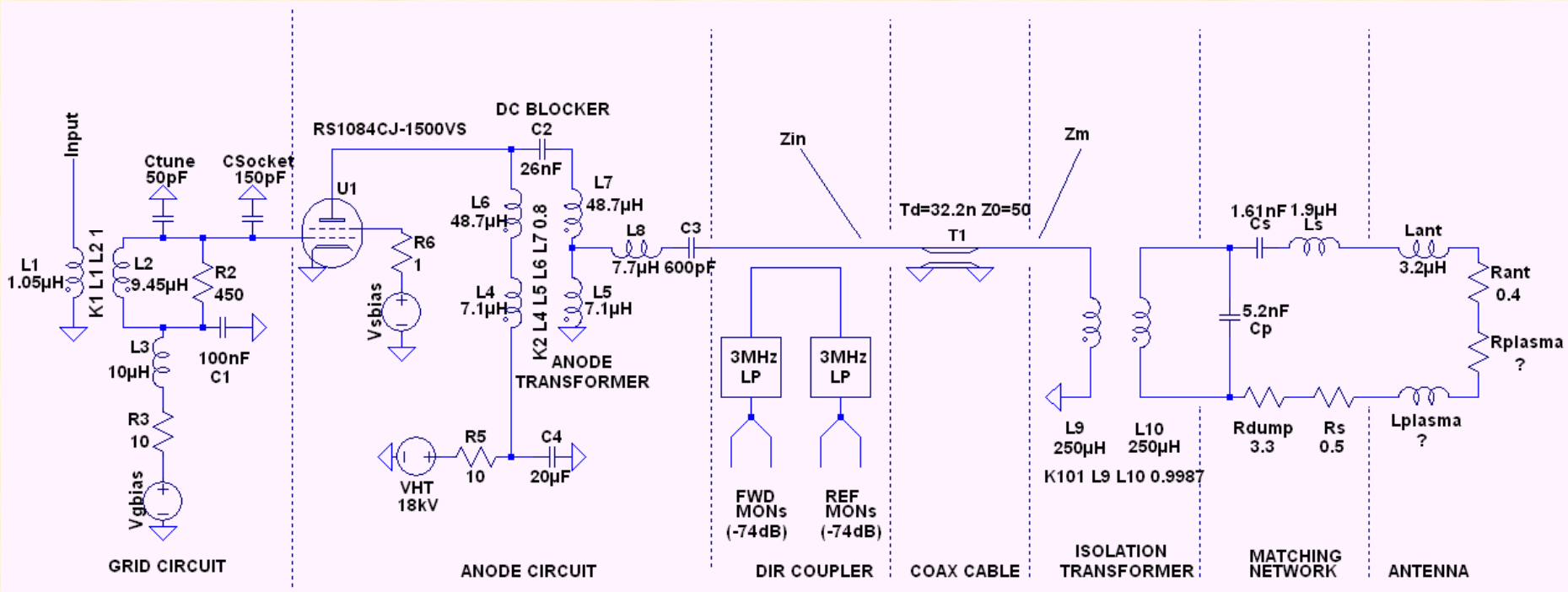




How can we estimate the power delivered to the plasma and the plasma impedance?

LINAC 4 H- Source RF System

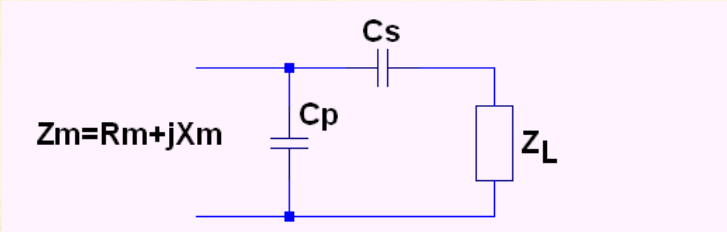
Power section of the system.



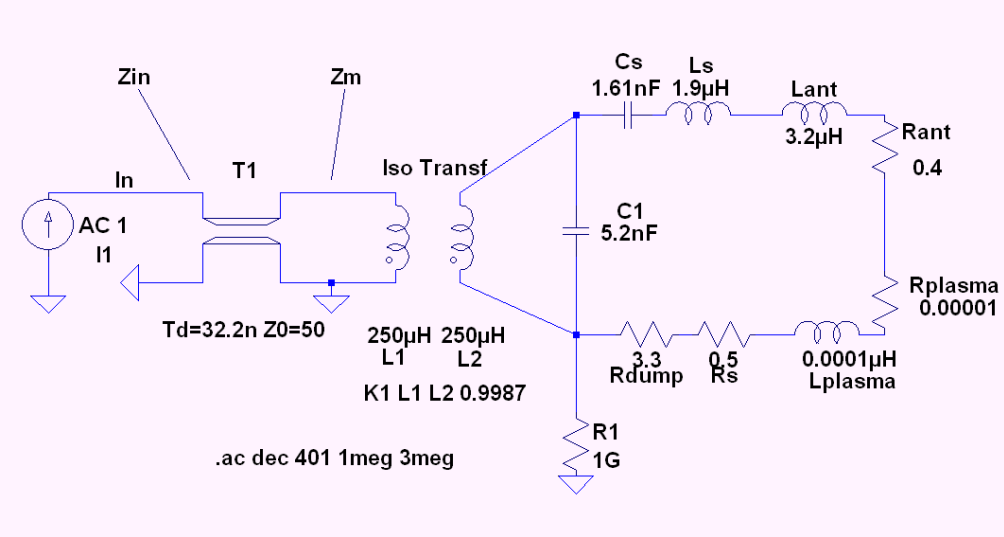
LINAC 4 H^- Source RF System

From measured forward and reflected signals the complex reflection coefficient can be computed.
Then, knowing the circuit components, the antenna impedance can be worked out…

… either analytically…



… or with Spice simulations.



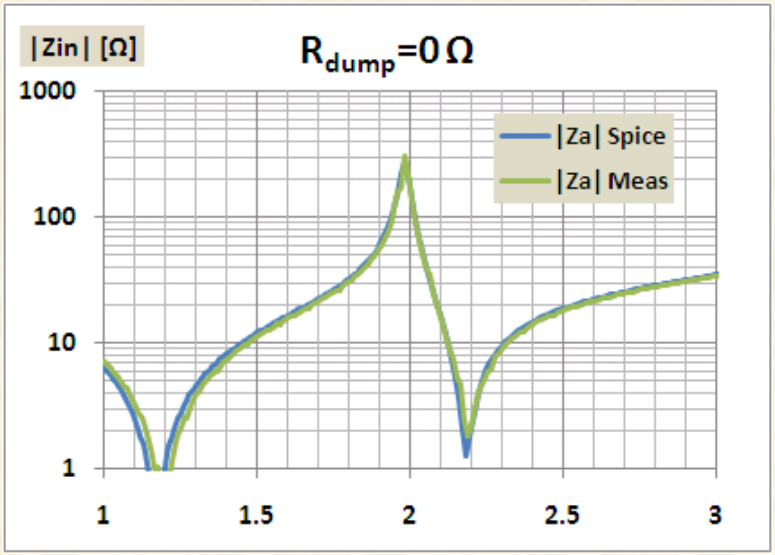
LINAC 4 H^- Source RF System

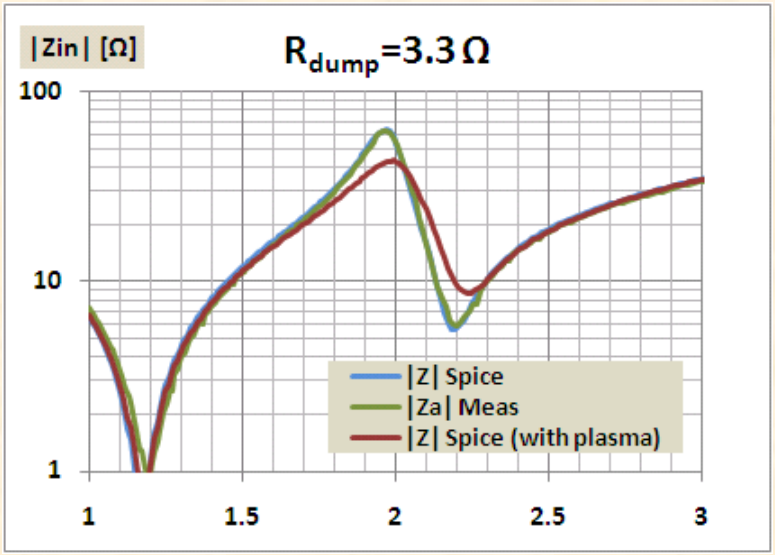
SPICE simulation

P_{FDW} [kW]	R_{plasma} [Ω]	L_{plasma} [uH]	P_{plasma} [kW]	I_{H-} [mA]
24.0	**1.8**	**-0.13**	**6.9**	**14**
41.2	**2.2**	**-0.21**	**12.9**	**19**
64.0	**2.2**	**-0.21**	**20.0**	**22**

Analytical method

24.0	**1.6**	**-0.13**	**6.7**	**14**
41.2	**1.6**	**-0.20**	**11.4**	**19**
64.0	**1.6**	**-0.20**	**17.8**	**22**





LINAC 4 H^- Source RF System

Next steps

- **Design the matching network for higher efficiency.**
- **Improve the AVC loop performance.**
- **Implement a dynamic measurement system of the complex reflection factor.**