

Helicon Plasma Cell

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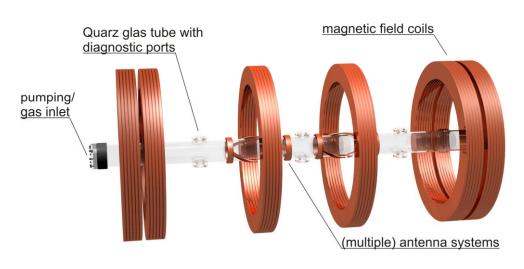
- status of the experiment / progress
- project overview (timeline/problems)



Helicon Cell - Status

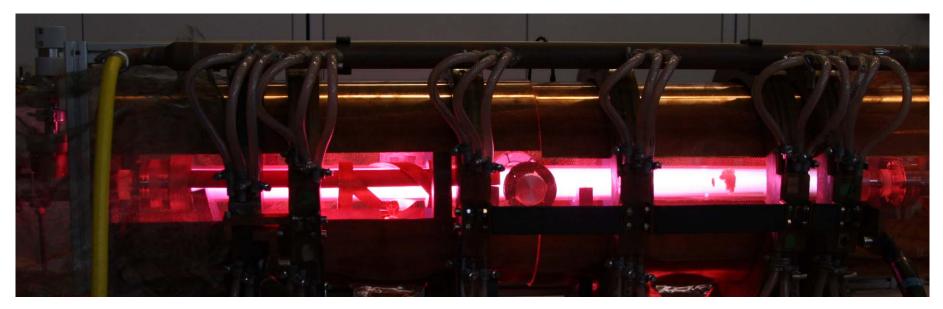


scheme:



- layout of prototyp finalized
- reliable low-power (≤3kW) operation
- helicon discharge achieved in a number of gases (H,He,Ar)
 - ⇒ required power for helicon discharge depends on gas species (as expected)

helicon discharge in 1m prototyp cell:

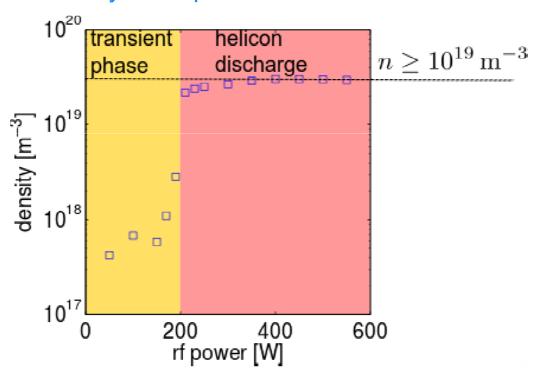




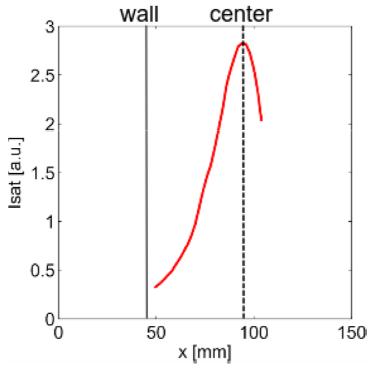
Helicon Discharge Characteristics



density vs. rf power



radial density profile



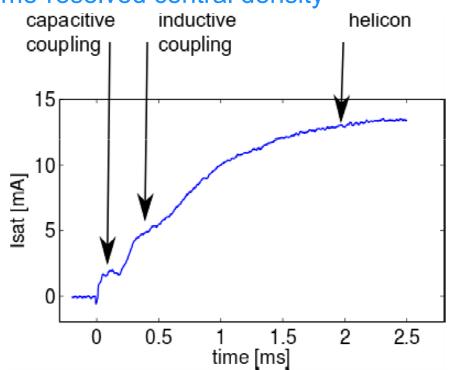
- helicon discharge already at low rf-power (200W)
- stable (cw) helicon discharge with n $\approx 10^{19} \text{m}^{-3}$ @ P_{rf}=500W
- radial profile peaked in the center



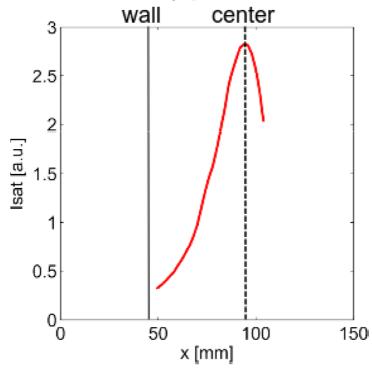
Helicon Discharge Characteristics



time-resolved central density



radial density profile



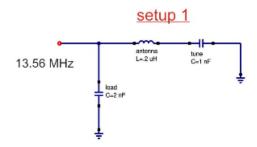
- helicon discharge already at low rf-power (200W)
- stable (cw) helicon discharge with $n \approx 10^{19} \text{m}^{-3}$ @ P_{rf} =500W
- radial profile peaked in the center
- in transition phase mode jumps capacitive ⇒ inductive ⇒ helicon clearly observed

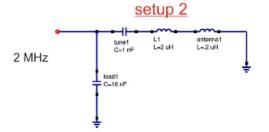


Technical Requirements



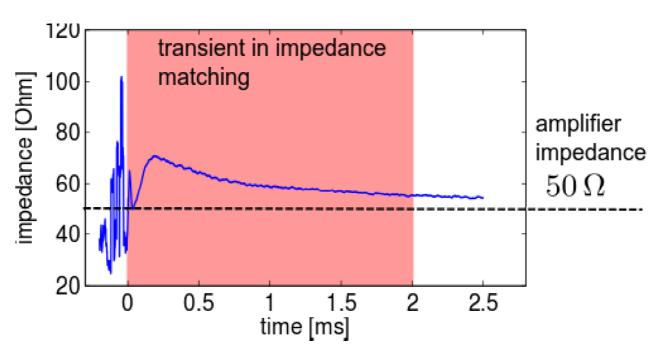
- helicon discharge achieved in rf frequency range f=2-14MHz
- impedance matching scheme differs significantly





transient phase of impedance matching requires amplifier to

cope with ~2ms of mismatch





Original Timeline



					2012						2013					
task	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
low-power operation																
multiple antenna operation																
antenna geometry studies																
impedance measurements/ matching																
axial density measurements																
radial density measurements																
comparison to dispersion/ power balance																
decrease of frequency																
high power amplifier requirements																
amplifier modification																
fixing of final design																
PostDoc																
high power operation																
in-house installations																
commissioning amplifier																
moderate power system test																
neutral gas inventory																
performance studies																

we are here



Status





- low-power operation successful and as expected
- antenna geometry: m=+1 antenna way to go
- impedance matching schemes fixed for frequency range
- high-power amplifier requirements finalized
- budget on track



- multiply antenna operation still pending
- CO₂ interferometer set up, first results pending
- choice of amplifier system time-critical

□ lack of man power



- dedicated PostDoc will start 01. July
- technical support from rf expert group (IPP Garching)
 established