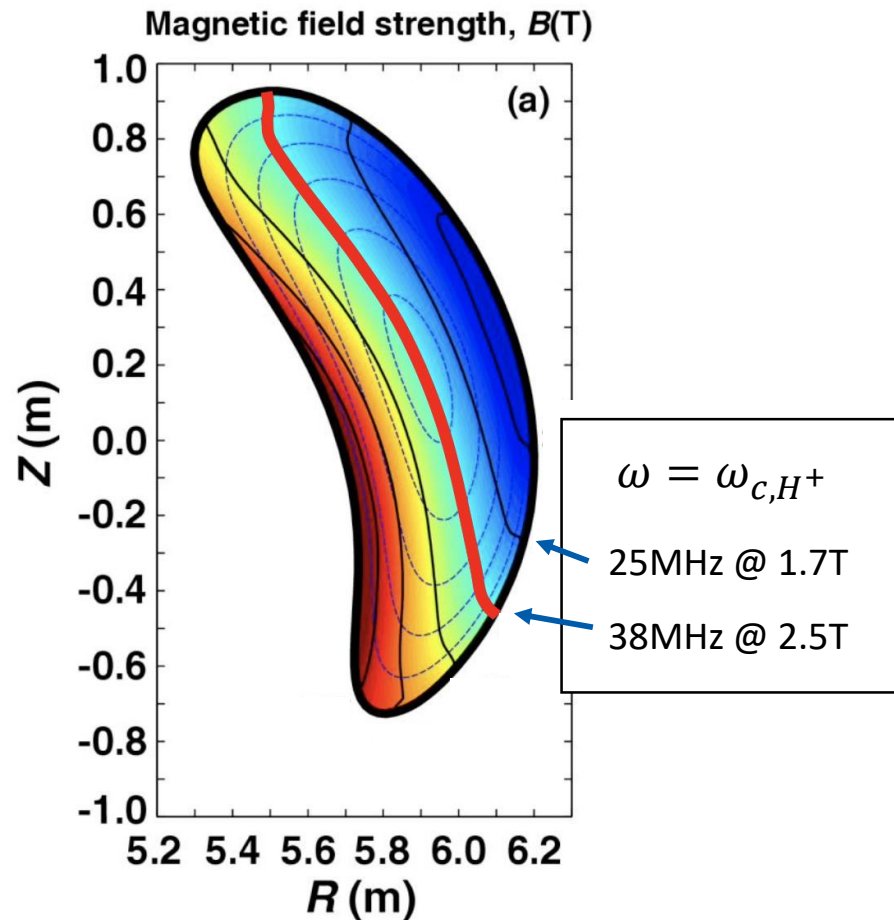


Ion Cyclotron wall conditioning (ICWC)

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- ICRH will perform several important tasks for W7-X including Ion Cyclotron Wall Conditioning (ICWC) and start-up at 1.7 T/1.85 T.
- ICWC and IC target plasma production have similar plasma production aspects but different optimization: the partially ionized ICWC discharge aims at maximal fluxes to the (main) wall.
- This proposal aims at preparing the first ICWC operation in W7-X based on the similar experiments planned to be carried out in LHD during the ongoing campaign.



Potential applications of ICWC in W7-X

- Impurity removal: hydrogen
- Isotopic exchange: hydrogen
- Wall desaturation: helium
- Boron coating: helium + boron

Source: T Wauters (2021)

- We propose to explore the operational window for IC plasma production
- Parameters to scan are pressure (Helium $1e-5$ mbar to $5e-4$ mbar), power 0.1 MW (OP2.1) and 0.1 – 1.0 MW (OP2.2), antenna phasing: monopole vs dipole
- Magnetic configuration: Standard (2.5 T and 1.7 T/1.85 T) → 5 discharges of 10 s each.
- Working gases: He (H_2 puffing for one shot for the 2.5 T and 1.7 T/1.85 T each, keeping $H/(H+He) < 15\%$).
- Diagnostics required: density, temperature, gas pressure and content, spectroscopy (H and impurity content), Neutral gas pressure, quadrupole mass spectrometer and charge exchange spectroscopy measurements.
- Example for pulse: constant gas flow (or feedback-controlled pressure), breakdown at 100 kW monopole. Repeat at lower/higher gas flow or antenna phasing.
- Deliverable:
 - identify the IC discharge parameters that are optimum for the wall conditioning
 - compare the ICWC with other wall conditioning techniques applied in W7-X.