Recent ion cyclotron resonance heating experiments in JET in preparation of a DT campaign

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Fusion reactors will require metal walls. Since 2011 JET is equipped with a Beryllium ”ITER-like” wall (ILW) and a Tungsten divertor. High Z impurities pose a potential danger as they can lead to reduced core temperature and even radiative collapse.

Hydrogen minority ion cyclotron heating at sufficiently high power (> 4MW in JET) is already well known to be an effective cure for this problem. In the context of exploring the available options for a DT campaign but without actually using T, this paper reports on investigations checking if D majority ion cyclotron resonance heating (ICRH) scenarios exist that can simultaneously ensure (i) a high ion heating efficiency - needed for reaching fusion relevant temperatures and igniting the plasma - and (ii) high Z impurity chase-out.

3 ICRH scenarios were tested in combination with NBI heating:

- H minority heating
- ^{3}He minority heating
- combined H and ^{3}He minority heating i.e. simultaneously operating at 2 generator frequencies

Efficient heating has been demonstrated. H minority heating proved most efficient for electron heating and mixed heating for good overall and ion heating. Hints of high Z chasing have been obtained (core W concentrations are similar for all heating scenarios, including NBI-only heating) but extra experiments are needed to come to firmer conclusions.