Report

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Protocoll

Protocoll 2019/12/16

+ last time agreed upon thoroughly, step-by-step redo the STRAHL scan; i.e. change transport, profiles and values at the LCFS on at a time to distinguish their effects
+ do easy, quick and dirty Minimum Fisher Regularization inversions of the same radiation distribution using Daihongs tool
+ find missing parts in total radiation distribution and final/last ionistation stage in STRAHL for accurate calculations

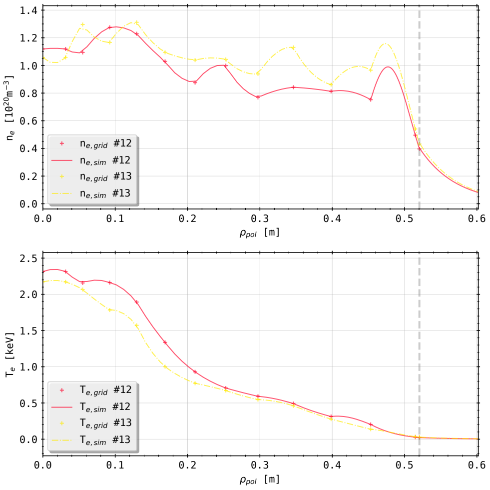
STRAHL simulations

Simulations

- mainly two sets of Thomson scattering profile shapes: orignal and spline interpolated, using different orders (3, 5) of polynoms and number of points
- values at ($\rho_{pol} = 1.0$) the LCFS change between 80% and 33% of previous value
- different decay lengths of 1 cm to 5 cm; transport $D =$2 m s^{-2} to 4 m s^{-2}
- D/v shape either flat or electron root-like

Orig. TS, 5cm, $2m/s^2$, D/v flat, 80%

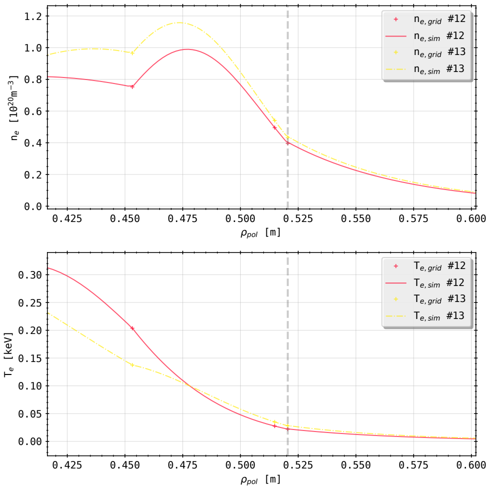
Simulations



full profiles of n_e and T_e at $f_{rad} = 0.9$(12) and 1.0(13)

Orig. TS, 5cm, $2m/s^2$, D/v flat, 80%

Simulations



full profiles of n_e and T_e at $f_{rad} = 0.9$(12) and 1.0(13)

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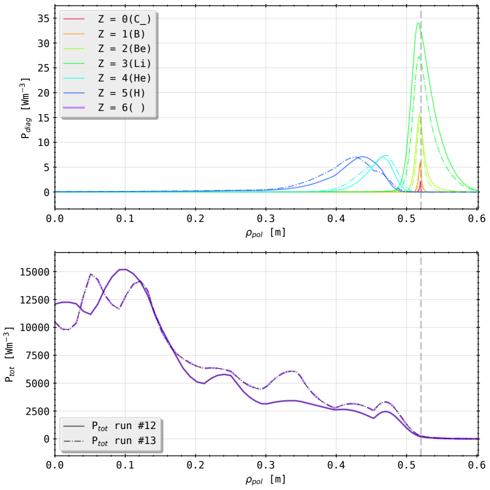
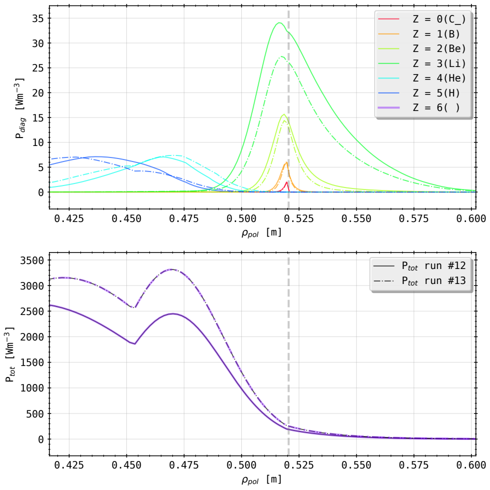
Simulations



radiation of each diagnostic line/ionisation at $f_{rad} = 0.9(12)$ and $1.0(13)$

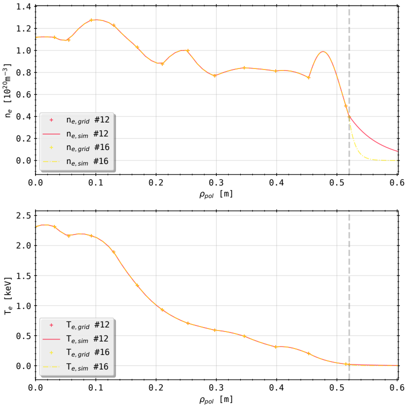
Orig. TS, 5cm, $2m/s^2$, D/v flat, 80%

Simulations



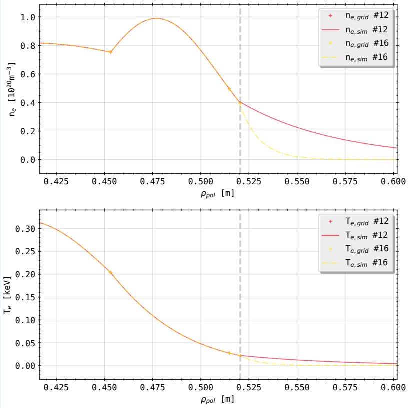
radiation of each diagnostic line/ionisation at $f_{rad} = 0.9(12)$ and $1.0(13)$

Simulations



full profiles of n_e and T_e at $f_{rad} = 0.9$ with 5cm(12) and 1cm(16) decay length

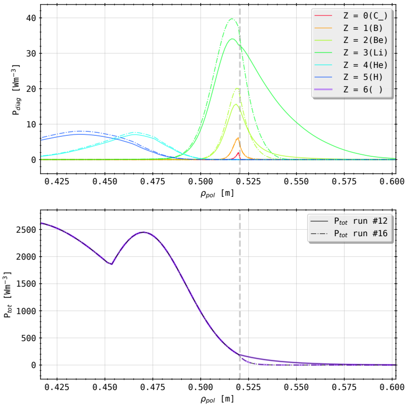
Simulations



edge profiles of n_e and T_e at $f_{rad} = 0.9$ with 5cm(12) and 1cm(16) decay length

Orig. TS, 1cm, $2m/s^2$, D/v flat, 80%

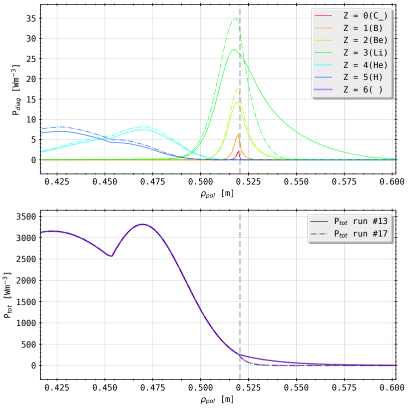
Simulations



radiation of each diagnostic line/ionisation at $f_{rad} = 0.9$ with 5cm(12) and 1cm(16) decay length

Orig. TS, 1cm, $2m/s^2$, D/v flat, 80%

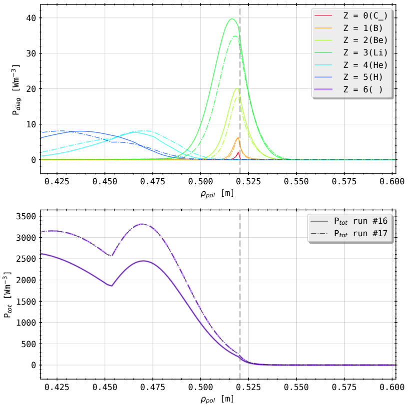
Simulations



radiation of each diagnostic line/ionisation at $f_{rad} = 1.0$ with 5cm(13) and 1cm(17) decay length

Orig. TS, 1cm, $2m/s^2$, D/v flat, 80%

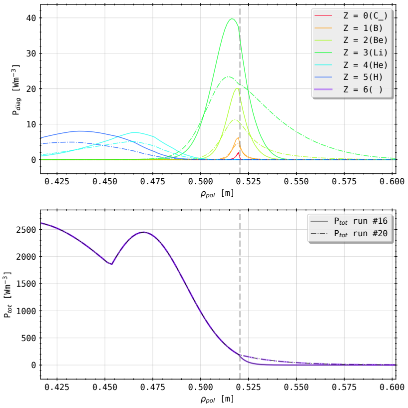
Simulations



radiation of each diagnostic line/ionisation at $f_{rad} = 0.9$(16) and 1.0(17) with 1cm decay length

Orig. TS, 5cm, $4m/s^2$, D/v flat, 80%

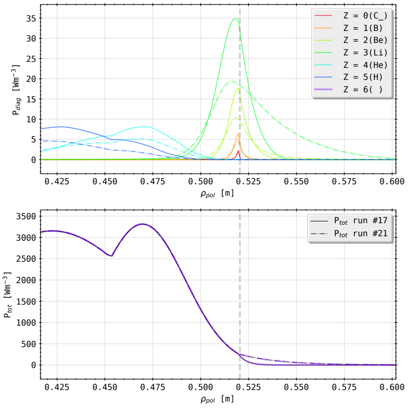
Simulations



radiation of each diagnostic line/ionisation at $f_{rad} = 0.9$ with D=2m/s^2(16) and 4m/s^2(20)

Orig. TS, 5cm, $4m/s^2$, D/v flat, 80%

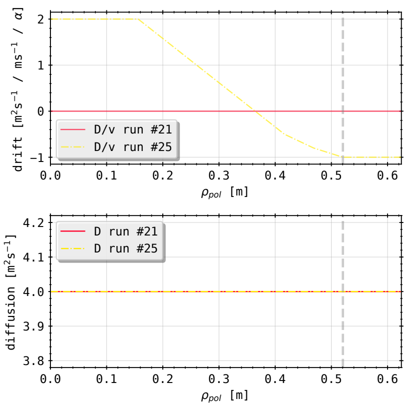
Simulations



radiation of each diagnostic line/ionisation at $f_{rad} = 1.0$ with D=2m/s^2(16) and 4m/s^2(20)

Orig. TS, 5cm, $4m/s^2$, D/v electron root, 80%

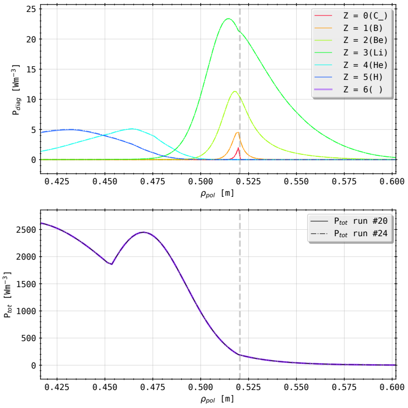
Simulations



profile shapes for D and D/v

Orig. TS, 5cm, $4m/s^2$, D/v electron root, 80%

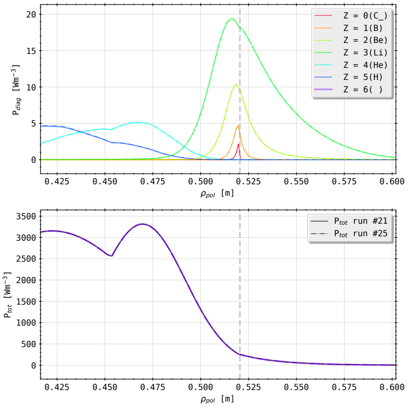
Simulations



radiation of each diagnostic line/ionisation at $f_{rad} = 0.9$ with(24) and without(20) D/v profile

Orig. TS, 5cm, $4m/s^2$, D/v electron root, 80%

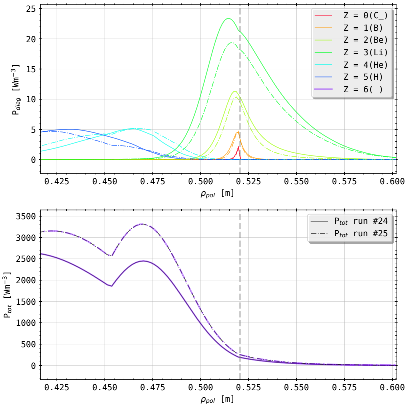
Simulations



radiation of each diagnostic line/ionisation at $f_{rad} = 1.0$ with(25) and without(21) D/v profile

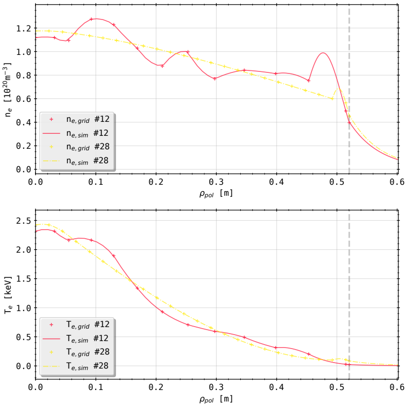
Orig. TS, 5cm, $4m/s^2$, D/v electron root, 80%

Simulations



radiation of each diagnostic line/ionisation at $f_{rad} = 0.9$(24) and 1.0(25) with D/v profile

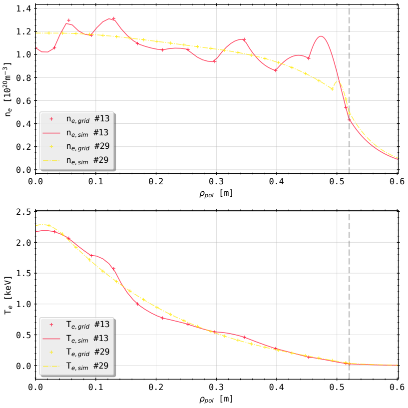
Simulations



full profiles of n_e and T_e at $f_{rad} = 0.9$

Spline interp., 80%, k=3, N=25

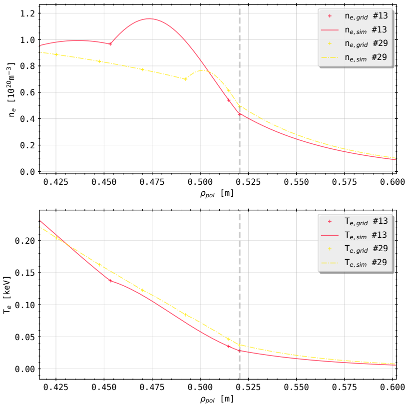
Simulations



full profiles of n_e and T_e at $f_{rad} = 1.0$

Spline interp., 80%, k=3, N=25

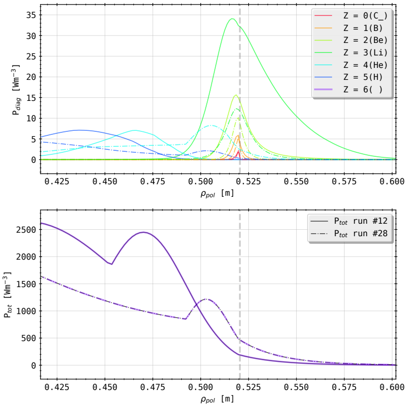
Simulations



edge profiles of n_e and T_e at $f_{rad} = 1.0$

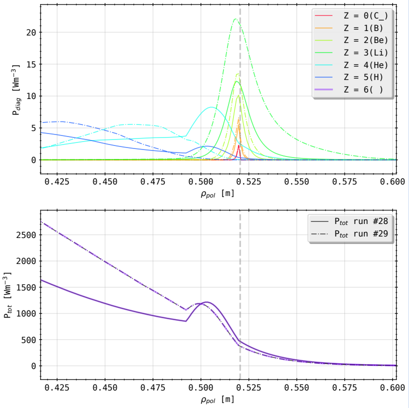
Spline interp., 80%, k=3, N=25

Simulations



radiation of each diagnostic line/ionisation at $f_{rad} = 0.9$ from orig.(12) and spline interp.(28) profile

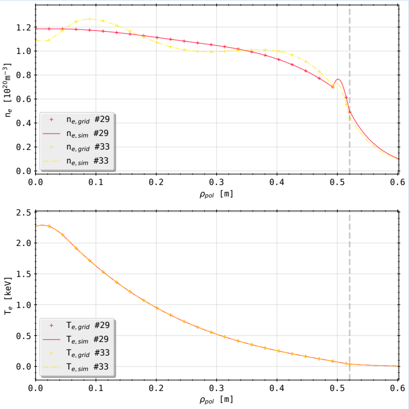
Simulations



radiation of each diagnostic line/ionisation at $f_{rad} = 0.9$(28) and 1.0(29) from spline interp. profile

Spline interp., 33%, k=35 N=25

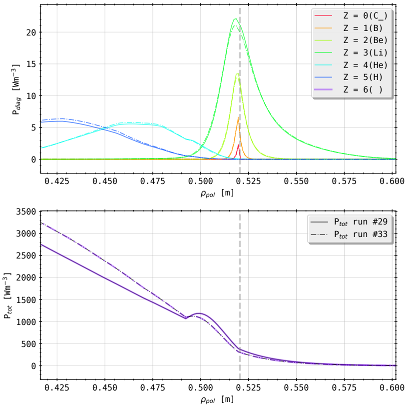
Simulations



full profiles of n_e and T_e at $f_{rad} = 0.9$ with k=3(29) and 5(33)

Spline interp., 33%, k=35 N=25

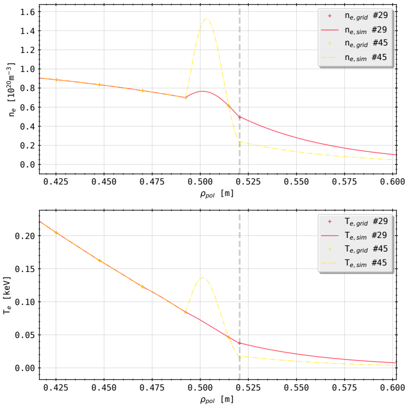
Simulations



radiation of each diagnostic line/ionisation at $f_{rad} = 0.9$ with k=3(29) and 5(33)

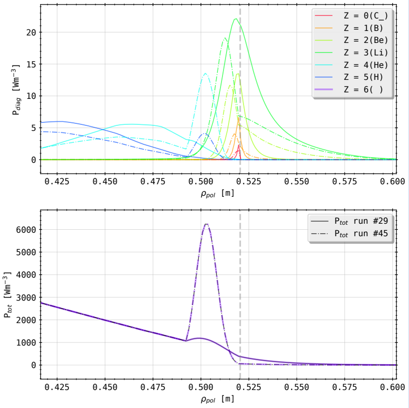
Spline interp., 33%, k=35 N=25

Simulations



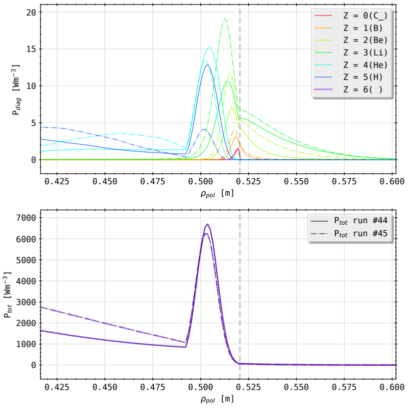
full profiles of n_e and T_e at $f_{rad} = 1.0$ with values of 80%(29) and 33%(45) at LCFS

Simulations



radiation of each diagnostic line/ionisation at $f_{rad} = 1.0$ with values of 80%(29) and 33%(45) at LCFS

Simulations



radiation of each diagnostic line/ionisation at $f_{rad} = 0.9$(44) and 1.0(45)

Conclusions

STRAHL results

- simple TS profiles with 'standard' settings yield small to no seperations between 90% and 100% radiation fracation in radial location shift of line maximum
- lower ionisation stages seemingly don't move at all, higher charges shift roughly 10 cm to 15 cm at a quarter of the intensity

Conclusions

STRAHL results

+ smaller decay length modelled for SOL without adjunct plasma island region, where profiles would be expected to appear flat or even peaked
+ slightly moved peak positions of lower stages, only around a few centimeters (insignificant, not within Bolometer resolution); intensity at LCFS increases noteably

Conclusions

STRAHL results

- additional increase of D from 2 to $4\,\mathrm{m\,s^{-2}}$ yields neither a change in maximum position nor change in intensity
- likewise picking a D/v profile according to effects of electron root heating adds no new information

Conclusions

STRAHL results

+ inclusion of spline smoothed profile instead of the original, 'rough' TS datasets holds two effects:

1) STRAHL mapping of profile intput points gives large hill right before LCFS, where the manually 80% input follows
2) unrelated towards its effect, higher ionisation levels move even further from 90% to 100% f_{rad}

+ changing the LCFS values level shifts the lower ions especially even disregarding the large bump created by STRAHL

Conclusions

STRAHL results

- possibly biggest distinguishable shift from high to highest fraction in spline interpolated profiles with 33% at LCFS
- the higher the profile gradiant towards LCFS, the greater the shift inside; governing factor is edge profile shape

Conclusions

Inversion & Exp. Comparison

- could not access inversion tool, AFS access not granted properly and deprecated version on E5 server ..., waiting for Daihongs eMail response to copy the most recent edition to drive
- added all radiation sources (incl. brems., cont. imp. etc.) to calculated data from STRAHL routine
- started calculations based off of STRAHL simulations to compare experimental results; projection tool for slanted fluxsurfaces to map to from VMEC? (forgot about it ...)