Breakout rooms

- Now go to one of the following breakout rooms

  You can swap later. Material from all rooms (1-5) will be provided later.

  1. Relic density (standard)
  2. Relic density (dark sector, coupled Boltzmann eqs.)
  3. Gamma-ray (and other CR) spectra
  4. J-factors
  5. Neutrino signals
  6. General technical support [installation/coding/shell usage/…]

- You can start right away with problem I and II above…

  See also the link to the tutorial from the ISAPP homepage

Actively help each other while Joakim and me go around !

Dark Sector relic density

- Let's have a look at one of the example programs, demonstrating relic density calculations in secluded dark sectors

Problem III:

Copy examples/aux/oh2_dark_sector.f **to your private directory**

1. **Make sure that you can compile and run this main program**
2. **Try to understand what the program does, and how**
3. **Produce a plot corresponding to one of the curves in Fig. 1 of 2007.03696.**
4. **Replace** dsrdxi **to explore the effect of a constant dark sector to visible sector temperature ratio**
5. **Replace** dsgivemodel_vdSIDM... **to explore the effect of changing the dark sector particle content (masses and d.o.f.)**

Coupled Boltzmann equations

- Let's have a look at one of the example programs, demonstrating the use of coupled Boltzmann equations for the Scalar Singlet model

Problem IV:

Copy examples/aux/ScalarSinglet_RD_cBE.f **to your private directory**

1. **Make sure that you can compile and run this main program**
2. **Try to understand what the program does, and how**
3. **Produce a plot corresponding to one of the curves in Fig. 3 of 1706.07433.**
4. **Try to modify the program such that it can be linked to the** generic_wimp **module instead**
5. **Replace** generic_wimp/kd/dskdm2.f **and** generic_wimp/an/dsanwax.f **such that you get a difference between cBE and the standard approach**

Hints :

- **The simplest way to ensure early kinetic decoupling is to make** dskdm2 **return just a power law in the SM particle energy, with an (ad hoc) small coefficient. As for** dsanwx**, you could e.g. multiply a Breit-Wigner resonance to the present output.**