Finite-Medium-Splitting-Rates-Using-Non-perturbative-Kernel

Determination of the medium-induced splitting rates using non-perturbatively determined broadening kernel

Dependencies :

- This program depends on the latest Boost library as well as the GNU Scientific library and the cuba multidimensional integration library v3.11.

Compiling:

The Makefile has two variable `COLLISION_KERNEL=${LATTICE_EQCD_KERNEL}` and `PROCESS=${GToGG}` which set the broadening kernel used and the process computed.

Different programs are available to obtain different rates:

- `make FullRate` creates the executable `FullRate.exe`, which computes the full finite medium rate in the output folder "OUTPUT".
- `make Opacity` creates the executable `OpacityRate.exe`, which computes the first order Opacity rate in the output folder "Opacity".
- `make ImprovedOpacity` creates the executable `ImprovedOpacity.exe`, which computes the first order Opacity rate in the output folder "OpacityImproved".

- `make Harmonic` creates the executable `HO.exe`, which computes the first order Opacity rate in the output folder "HO".

Runing

To run any executable `exe.exe`, run the command `./exe.exe -P x -z y` where $P = x$ is the parent particle's energy in units of temperature $[T]$, and $z = y$ is the momentum fraction of the emission with energy $\omega = zP$.
The rate is written into a file `OUTPUTFolder/Rate-Px-zy.txt` where the first column is the dimensionless time $\tau = \frac{t}{2Pz(1-z)}T^2$ and the second column is the rate $\frac{d\Gamma_a^{bc}}{dz}(P, z, t)$ in units of T.

Example with Plot

In addition to the makefile, we provide 3 scripts `GToGG.sh`, `QToGQ.sh` and `GToQQ.sh`. In order to create comparison plots of the non-perturbative broadening kernel using all the different approximation at $P = 300T$ and $z = 0.25$, follow these steps:

- Run each file successively using `source File.sh`: it computes the radiation rate for all the different approximation and the output is moved to the folders inside `PlotMaking/Process/File`.
- Then cd to the folder `cd PlotMaking` and run `source MakePlots.sh`