



Fig. 2.1: A schematic diagram of the history of the Universe, taken from [41]. The accelerated expansion that the Universe is currently experiencing, due to Dark Energy, is not depicted in this diagram.

of the primordial gas from starlight produced by the first stars (the so-called Population III stars). The affect that reionization has on the matter in the Universe at early times is captured by using the **optical depth**

$$\tau(t) \equiv \sigma_T \int_t^{t_0} n_e(t) dt \quad (2.43)$$

where n_e is the number density of free electrons and σ_T is the Thomson scattering cross-section. With this definition, the probability that a photon that is observed now that was emitted between the time of recombination and reionization, at a time t , has traveled freely is $e^{-\tau(t)}$, with the value being practically constant for emission times between recombination and