

Meeting 4 - The cosmic microwave background
Feb. 3, 2021

1. Announcements

Wilson 1978 Nobel Prize lecture - posted

Question

Next week: recipe and will learn about particle interactions and more QM

From last week: z, a, t, and d all related

2. CMBR

Second big piece of evidence, after nuclei form, need it to understand

slide 5 - sky surveys

slide 6 - wave picture, particle picture (phase)

slide 7 - from accelerators, good for atoms (eV)

slide 8 -

slide 9 - pinball machine, atoms cannot form until below 1 eV, binding energy

slide 10 - need to have few high energy to break up atoms, not just average

radiation t^4

slide 11 - size $t^{2/3}$, density t^{-2} , T^{-2} (matter Dom)

$t^{1/2}$, density $t^{-3/2}$, T^{-1}

slide 12 -

slide 13 - Neutrinos decoupled earlier, next week

slide 14 - Not sure which is which

slide 15 - Altitude and azimuth, feed to cab on right, detectors there

slide 16 - Detector like a radio, Dicke switch, measure power over some

frequency level

slide 17 - Princeton experiment came just after Holmdale. Oscillating universe,

Dicke unique.

Slide 18 - Recap - CMB energy density decrease as universe expanded, waves

stretched

slide 19 - Visible range

slide 20 - recall acceleration and charge

slides 21-26

slide 27 - photo electric-frequency, not intensity

slide 28 - differential measurement

slide 29 - best map to date

slide 30 -

slide 31 - future a big deal, wrong result already

slide 32 - next week

