Helium-Based Mixtures

Maintain the good, and cure the bad with mixtures.
Even 50 – 80% He increases X_0 dramatically.

For B factories, **focus is on hydrocarbons**:

- Decrease radiation length

But:

- Increase primary ions
- Decrease diffusion
- Acceptable V_{drift}

Also, He-based mixtures vs. Ar-Ethane:

- Smaller Lorentz angle: good at large distance

Table 2: Mixed Gas Properties (at 800 V/cm and 1.5 T)

Gas	X_0 [m]	N_P [ions/cm]	V_{drift} [μm/ns]	σ_{diff} [μm/$\sqrt{cm}$]	θ_L [°]
50-50 Ar-C_2H_6	178	34	45	140	69
50-50 He-C_2H_6	686	25	30	143	41
60-40 He-C_3H_8	569	33	27	136	35
80-20 He-C_4H_{10}	807	23	24	151	29

Heavier hydrocarbons change properties faster
$\rightarrow$ use **smaller fractions**