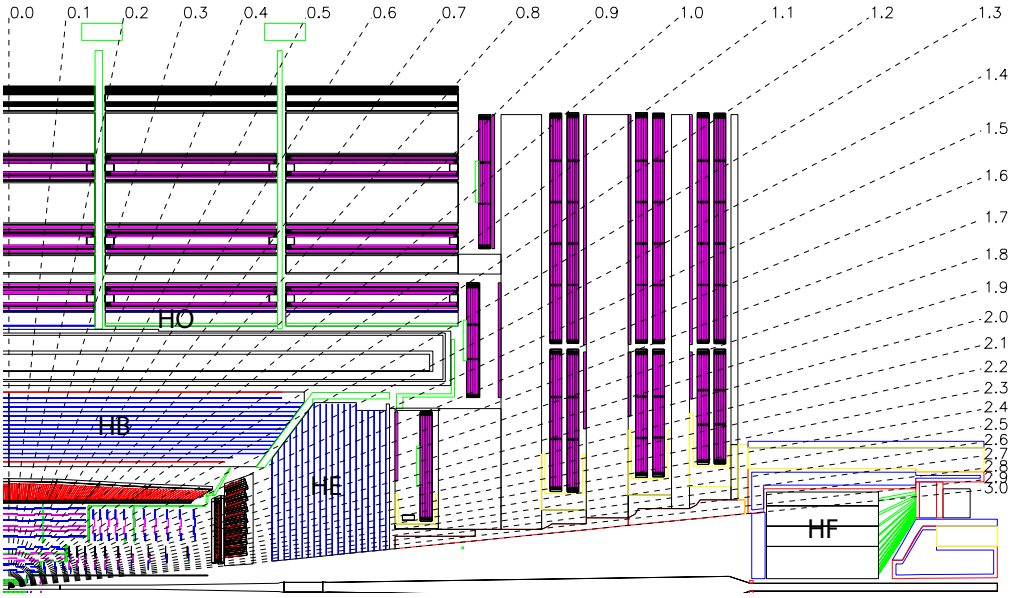

Figure 5.1: Longitudinal view of the CMS detector showing the locations of the hadron barrel (HB), endcap (HE), outer (HO) and forward (HF) calorimeters.

Table 5.1: Physical properties of the HB brass absorber, known as C26000/cartridge brass.

chemical composition	70% Cu, 30% Zn
density	8.53 g/cm^3
radiation length	1.49 cm
interaction length	16.42 cm

$(\Delta\eta, \Delta\phi) = (0.087, 0.087)$. The wedges are themselves bolted together, in such a fashion as to minimize the crack between the wedges to less than 2 mm.

The absorber (table 5.2) consists of a 40-mm-thick front steel plate, followed by eight 50.5-mm-thick brass plates, six 56.5-mm-thick brass plates, and a 75-mm-thick steel back plate. The total absorber thickness at 90° is 5.82 interaction lengths (λ_I). The HB effective thickness increases with polar angle (θ) as $1/\sin\theta$, resulting in 10.6 λ_I at $|\eta| = 1.3$. The electromagnetic crystal calorimeter [69] in front of HB adds about 1.1 λ_I of material.

Scintillator

The active medium uses the well known tile and wavelength shifting fibre concept to bring out the light. The CMS hadron calorimeter consists of about 70 000 tiles. In order to limit the number of individual elements to be handled, the tiles of a given ϕ layer are grouped into a single mechanical scintillator tray unit. Figure 5.5 shows a typical tray. The tray geometry has allowed for construction and testing of the scintillators remote from the experimental installation area. Furthermore,