AA/DB/1

Intra-beam scattering

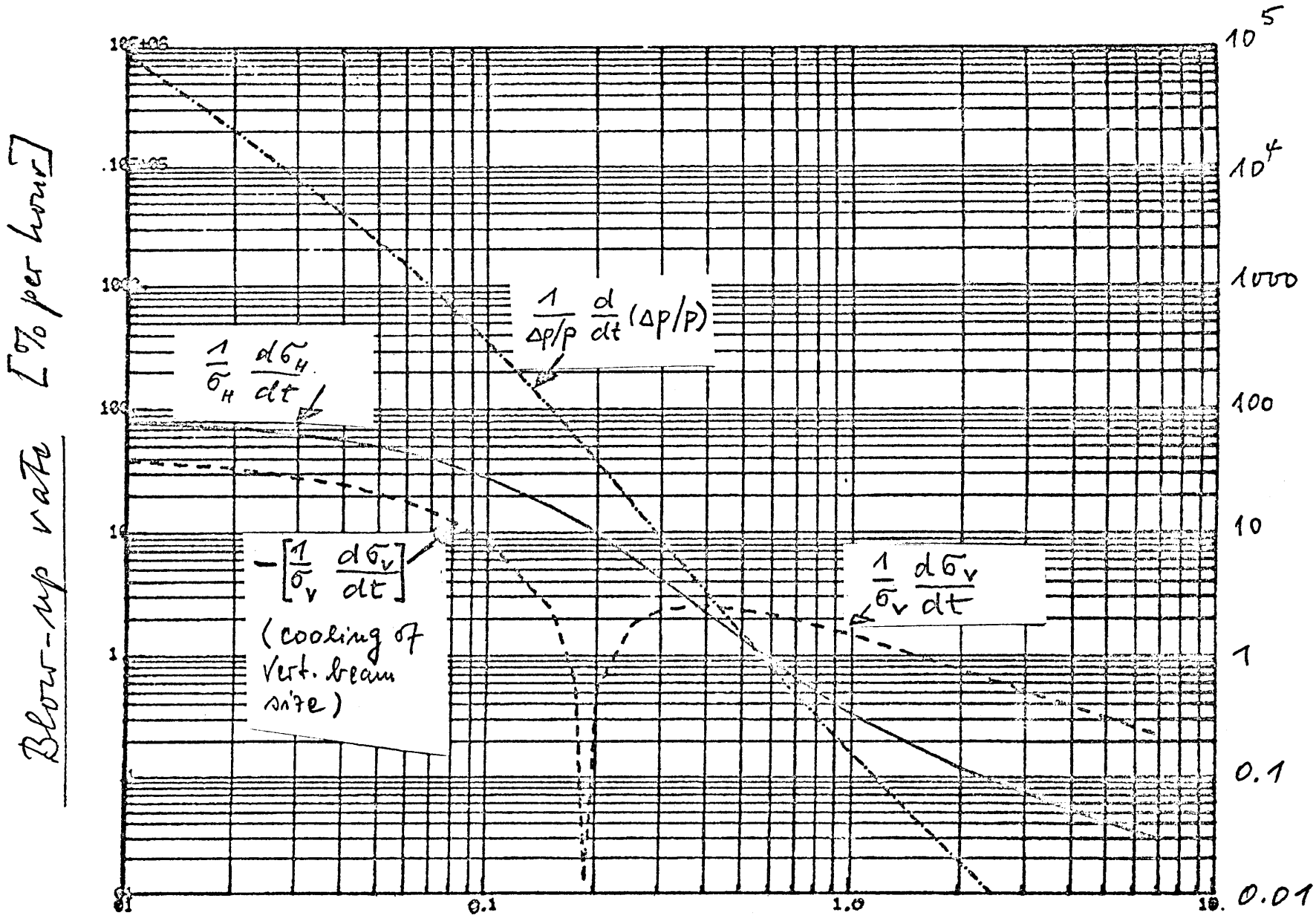
An online programme has been written to calculate blow-up rates due to intra-beam scattering. The formalism of A. Piwinski, Proc. of the 1974 Stanford Conf. has been used.

The attached figure shows results obtained for

$$\begin{aligned} E_H &= 2\pi \text{ mm. mrad} \\ E_V &= 1\pi \text{ mm. mrad} \\ \gamma_{beam} &= 2.43 \\ Q_H &= 2.28 \\ Q_V &= 2.29 \\ N &= 2\times10^{11}\ \bar{p}\text{'s} \\ \rho &= 3.5 \text{ GeV/c} \\ R &= 25 \text{ m} \end{aligned}$$

The blow-up of the momentum spread is only half as large for a bunched beam. Below $\Delta p/p = \sqrt{1.8}\,‰$ the vertical beam width shrinks with time.

D.B. 9.12.77


Blow-up rate [% per hour]
$\frac{1}{\sigma_H}\frac{d\sigma_H}{dt}$
$\frac{1}{\Delta p/p}\frac{d}{dt}(\Delta p/p)$
$-\left[\frac{1}{\sigma_V}\frac{d\sigma_V}{dt}\right]$
(cooling of Vert. beam size)
$\frac{1}{\sigma_V}\frac{d\sigma_V}{dt}$
10^5
10^4
1000
100
10
1
0.1
0.01
0.1
1.0
10.
Momentum spread [%]