A B S T R A C T

r - formalism, suggested by Feynman, Vernon and
Hellwarth, has been found successful to describe the optical
free induction decay and other nonlinear optical effects. This
cumbersome analysis involves three equations which are reduced
to one differential equation by recent z - formalism indepen-
dently suggested by Venkatesh and his coworkers, Hanna et al.,
and Carmichael. To analyse the recent observations by DeVoe
and Brewer of free induction decay, optical Bloch equations are
modified to incorporate the effects of detuning and damping.
We therefore modify z - formalism to include the detuning and
damping. With the modified z-formalism, we first study the
trajectories of the reduced $\vec{r}$ - vector on the surface of the
Bloch sphere. We observe that the Bloch sphere starts collapsing
due to damping towards its centre. All the trajectories
shrink at the poles of their origin due to detuning and the
only trajectory which relaxes to the other pole is with zero
detuning.

Finally we calculate the optical nutation and free
induction decay and find that our results are in agreement
with earlier calculations including the recent ones.