This thesis deals with the measurements of the internal hyperfine fields acting at the impurity nuclei embedded in ferromagnetic hosts (like iron, cobalt, nickel and gadolinium) and the g-factors of the excited nuclear states using the integral perturbed angular correlation (IPAC) technique. The lifetimes of the intermediate nuclear states of γ-γ cascades of all the cases reported in this thesis were inbetween $10^{-9}$ - $10^{-12}$ sec. For such cases IPAC technique is most suited. For IPAC measurements, a slow fast coincidence set up having an effective resolving time $\tau = 60$ nsec was fabricated. An electromagnet capable of providing an external field of 25 kilo Oersted was modified to make the present measurements. For making measurements of hyperfine field in gadolinium at liquid nitrogen temperature, a low temperature cryostat was especially developed.

The present investigations yielded information about the hyperfine fields and the g-factors. The knowledge of hyperfine fields is very useful in understanding the origin of electronic magnetism. The measurement of the g-factors of excited nuclear states is useful for understanding the nature of the low lying nuclear states and testing the validity of various theoretical nuclear models.

This thesis is presented in six chapters. Chapter I, besides introduction, carries a brief description of the
various other techniques of measuring the hyperfine interactions. A comparison of perturbed angular correlation technique with nuclear magnetic resonance, Mössbauer effect and electron paramagnetic resonance is given.

In Chapter II the theory of the origin of the internal hyperfine fields is given. Various models to predict the hyperfine fields on impurities in ferromagnets are given. Systematics of the experimentally observed hyperfine fields in different hosts (iron, cobalt and nickel) are discussed. A brief discussion about the origin of the hyperfine fields on rare earths in ferromagnets and fields on s-p impurities in gadolinium host is also given.

Chapter III deals with the theory of unperturbed and perturbed angular correlation. The different types of interactions causing the perturbations are discussed briefly. Also the different methods of measuring the rotation are discussed. A brief discussion about paramagnetic correction is also given.

Chapter IV describes the necessary instrumentation which was fabricated and used to carry out the investigations reported in this thesis.

In Chapter V are described the measurements of internal hyperfine fields. The following measurements have been reported:

(i) Arsenic in iron
(ii) Arsenic in cobalt
(iii) Arsenic in nickel.
(iv) Arsenic in gadolinium.
(v) Hafnium in iron
(vi) Hafnium in nickel
(vii) Platinum in cobalt
(viii) Platinum in nickel.

Interpretation of the measured hyperfine fields on the basis of various models is also given.

Chapter VI describes the measurements of the g-factors. A brief discussion of the various nuclear models is also given. The following g-factor measurements have been reported.

(i) The 658 keV state in Cd$^{110}$.
(ii) The 284 keV state in Dy$^{160}$.
(iii) The 317 keV state in Pt$^{192}$.

The main features of the present investigations are summarized below:

The measurements of the hyperfine fields on arsenic in iron, cobalt, nickel and gadolinium hosts have been done using the known g-factor and lifetime of the 279.6 keV level of As$^{75}$. The hyperfine field on arsenic in iron was known already from NMR. The fields on arsenic in cobalt and nickel were not known at the time of measurement. As the work on arsenic in cobalt and nickel was published, Chopra et al also reported their measurements on arsenic in iron, cobalt and nickel. The hyperfine field on arsenic in gadolinium at liquid nitrogen temperature is reported for the first time.
The hyperfine fields on hafnium in iron and nickel have been measured using the known g-factor and lifetime of the 113 keV level of Hf$^{177}$. In the present investigations we have performed IPAC experiments on diffused sources. In all, but one, earlier measurements, the samples were prepared by implantation technique. One Mössbauer measurement was performed with diffused samples. IPAC measurements with diffused sources are reported for the first time.

The hyperfine fields on platinum in cobalt and nickel have been measured using the g-factor and lifetime of the 317 keV state of Pt$^{192}$. Earlier available measurements were with Mössbauer and spin echo methods. Hyperfine fields using IPAC with diffused sources are measured for the first time.

We have remeasured the g-factor of the 668 keV state of Cd$^{110}$ using the internal hyperfine field of cadmium in iron. Earlier two available measurements had large statistical errors. Johansson et al while attempting remeasurement of the g-factor reported the evaporation of 90% of the activity. Also their measured value of the g-factor, using the hyperfine field of cadmium in gadolinium was higher than the two previous results. We were successful in preparing Ag-Fe alloys after proper diffusion without any loss of activity. Our measured value is in good agreement with that of Johansson et al.
The g-factor of the 284 keV state of Dy$^{160}$ is reported for the first time. This measurement has been done with external fields.

The g-factor of the 317 keV state of Pt$^{192}$ is measured using the known value of the hyperfine field on platinum in iron and this g-factor value has been used in deducing the hyperfine fields of platinum in cobalt and nickel.