g Factor Test Measurements with the MINIBALL Detector Array on Stable ^{48}Ti Beams ◊

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For the first time a g factor test measurement has been carried out using the MINIBALL detector array. This instrument was especially designed for spectroscopy studies in conjunction with low-intensity radioactive beams as currently available at REX ISOLDE of CERN. For the g factor test a stable ^{48}Ti beam of 100 MeV was provided by the Cologne tandem accelerator where the MINIBALL was temporarily stationed for experiments.

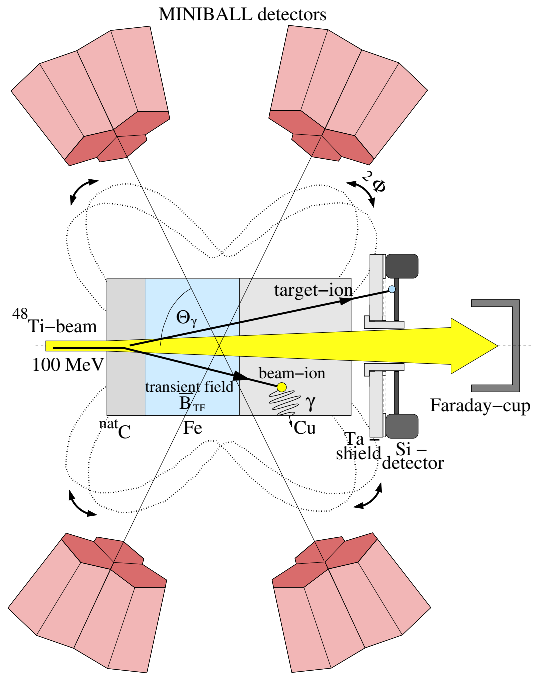

Fig. 1: *Schematic experimental setup*

Under experimental conditions close to those at REX ISOLDE, the beam was Coulomb excited to its first 2^+ state at 0.984 MeV with lifetime $\tau = 5.7(2)$ ps and g factor $g(2_1^+) = +0.392(19)$ [1]. Four out of six modules of the detector array were used, each module consisting of three 6-fold segmented Ge crystals. The detector modules were placed in pairs symmetric to the beam direction and were operated in coincidence with forward scattered carbon ions registered in an annular Si detector at 0° to the beam direction. The target consisted of 0.38 mg/cm^2 ^{nat}C deposited on a 3.31 mg/cm^2 Fe layer which was evaporated on a 2.4 mg/cm^2 thick copper foil. The ^{48}Ti beam has been steered through the target and the centre hole of the Si detector and was stopped in a down-stream Faraday cup (Fig.1). This precaution will be an essential ingredient for radioactive beams to minimize random coincidences from the beam radioactivity.

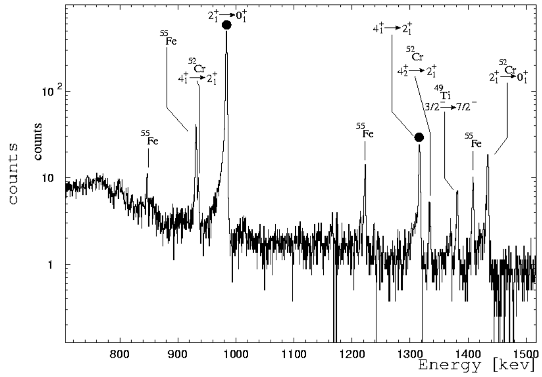

Fig. 2: *γ coincidence spectrum of ^{48}Ti*

The magnetized Fe layer of the target provided the transient magnetic field for the precession of the 2_1^+ state. A coincident γ spectrum is shown in Fig.2. Particle-γ- angular correlations were derived from the fixed angle positions of the individual Ge crystals and measured relative efficiencies which were obtained from in-beam (nearly isotropic) ^{55}Fe γ-lines (see Fig.2) produced in a fusion reaction (Fig.3).

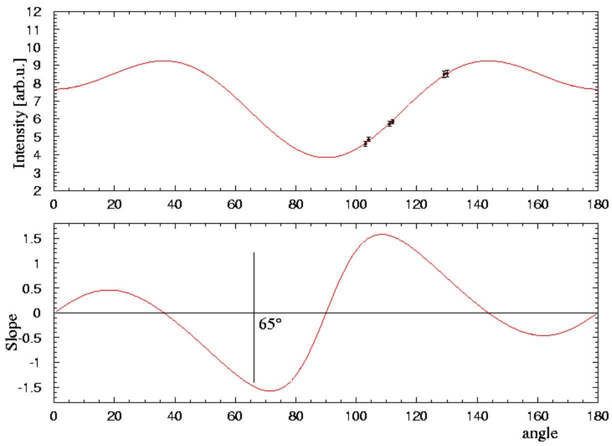

Fig. 3: *Angular correlation and logarithmic slopes of the $2_1^+ \rightarrow 0_1^+$ transition in ^{48}Ti. The curves are fits to the data.*

Precession angles were determined for symmetric detector pairs with their specific slopes of the angular correlation. The average precession obtained $\Phi^{exp} = 11(3)$ mrad is in good agreement with the expectation based on the known g factor, the Fe layer thickness and the TF strength calculated with the empirical linear parametrization using a strength parameter a=12 Tesla [2].

References

[1] R.Ernst *et al.*, Phys. Rev. Lett. **84** (2000) 416
[2] K.-H. Speidel *et al.*, Prog. Part. Nucl. Phys. **49** (2002) 91

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