High energy magnetic excitations in the itinerant electron ferromagnet iron measured throughout the Brillouin zone.

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As canonical examples of strongly correlated electron magnetism, the spin dynamics of the transition metal ferromagnets have been addressed both theoretically and experimentally for decades, and as such also act as benchmarks of the latest experimental and calculational tools.

We report the results of a complete measurement of the spin wave excitations in bcc iron up to 0.4eVthroughout the Brillouin zone, using the time of flight spectrometer MAPS at the ISIS facility.

In contrast to earlier triple axis spectrometer (TAS) results [1], the lower energy spin waves do not show a marked decrease in intensity as they extend beyond 0.1eV, a result which had been ascribed to the spin waves entering the Stoner continuum. Along the [111] direction the spin wave dispersion rises continuously to zone boundary energy 0.25eV, in qualitative agreement with later TAS results [2], and along [110] the dispersion rises continuously to 0.35eV at the zone boundary. However, we do not observe the break in the dispersion along [100] between  0.12-0.25eV reported in Ref. 2. We discuss these differences, and will compare the data with Green function and recent time dependent DFT calculations [3]. Notably, the former predict a gap in the dispersion along [110], in contrast to the data, whereas the latter are in good qualitative agreement.

[1] H.A. Mook and R.M. Nicklow, *Phys. Rev. B* **7** 336(1973)

[2] D.M. Paul et al., *Phys Rev B***38** 580 (1988)

[3] P. Buczek et al., *Phys Rev B* **84** 174418 (2011)