**Fe paper structure**

Introduction

* Motivation
  + Magnetism and dynamics central role in metallic systems with strong e-e correlations
    - Numerous examples (high TC, QCP, oxides and functional materials, transport
  + X’’(Q,w) at the heart of time-dependent response
  + Reliable prediction leads to understanding in complex systems
* Iron

Iron is considered as a sample of material, which exhibits both itinerant and localized The magnetism of iron has been investigated in multiple experimental and theoretical works.

* + fruit-fly material
    - Classic itinerant electron magnet
    - Correlated electron system
    - Calculations: a benchmark for calculation of spin dynamics
    - Experiment: development of instrumentation
      * Reactors and TAS
      * Pulsed sources and mapping of S(Q,w)
* Background
  + About iron
  + Localisation .v. itinerancy;
    - local moment formation
    - Heisenberg picture
    - Stoner picture
  + Spin waves measurements
    - Collins (possibly earliest spin wave measurements I think, 1955)
    - Mook & Nicklow 🡺 damping 🡺 Stoner
    - Mook, Paul at ILL
    - Pulsed sources: early stuff (Loong; Perring)
  + Spin wave calculations
    - Cooke and Blackman
  + We present state-of-the art experiment and calculation…

Measurements

* TOF technique
* What we did
* Horace
* Resolution convolution and Tobyfit

Results

* Overview
* Low energies
  + Stiffness
  + Intensities
  + Damping
  + Comparison with Mook et al
* High energies
  + Overview of features
  + Comparison with Paul and Mook

TD-DFT

* Theory
  + Buczek1
  + Questaal 2
  + Cao3

Discussion

* Energy scale at long wavelength limit
  + We agree with old data
* Intermediate energies (up to 150 meV say)
  + Marked discrepancy with old data
  + Comparison with calculation
* High energy
  + Energy scale
  + Different behavior of [100] direction, P point
  + Additional scattering
* Meaning

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References

1. Buczek, P., Ernst, A. & Sandratskii, L. M. Different dimensionality trends in the Landau damping of magnons in iron, cobalt, and nickel: Time-dependent density functional study. *Phys. Rev. B* **84**, (2011).

2. Questaal.

3. Cao, K., Lambert, H., Radaelli, P. G. & Giustino, F. Ab initio calculation of spin fluctuation spectra using time-dependent density functional perturbation theory, plane waves, and pseudopotentials. *Phys. Rev. B* **97**, 024420 (2018).