Highlights of the 12 February 2009 SPIN@COSY Teleconference Meeting

ATTENDEES:
R Gebel, B Lorentz, R Maier (COSY); F Hinterberger (Bonn); A M Kondratenko (Novosibirsk); E J Stephenson (IUCF); Ya S Derbenev (J-LAB); A D Krisch, M A Leonova, V S Morozov, R S Raymond, V K Wong (Michigan).

A.D. KRISCH: Papers, Possible June Quasi-Run.
1. He said that three SPIN@COSY papers were submitted to the SPIN 08 Symposium Proceedings; they should be published in late winter or early spring 2009.
2. He said the paper on the deuteron spin resonance strength was posted on the arXiv website; Prasuhn is now trying to rewrite the paper to make it agreeable to the COSY authors. [NOTE: Prasuhn e-mailed the draft on 16feb09.]
3. Krisch said the paper on Kondratenko Crossing test was submitted to PRL in November; Referee B’s Report arrived at PRL two weeks ago, but nothing had happened since then. [NOTE: On 13feb09 PRL e-mailed that the paper would be accepted if we properly address Referee B’s comments. Referee A said publish as is. The paper was resubmitted on 18feb09 with all Referee B’s comments addressed.]
4. He said Morozov will later discuss the new paper about the proton and deuteron spin resonance widths. Orlov recently sent an e-mail noting that around 1969 he may have predicted the observed narrow deuteron spin resonance effect; this prediction was discussed in J. Bailey and E. Picasso, Prog. Nucl. Phys. 12, 43 (1970); the relevant section of the paper was scanned and e-mailed to the collaboration. He noted that there is still no explanation of why the bunched proton resonance map widths are so much wider than the bunched deuteron widths.

R. MAIER: COSY 2009 Schedule.
1. He said COSY is back on schedule as indicated on COSY’s website; this week is a Machine Development (MD) for ANKE. The 2 weeks allocated for TOF were moved to a later time.
2. He added that the broken septum coils were replaced but not yet tested.
3. He noted that the PAC recommended a SPIN@COSY run for about one week sometime during a MD period; thus, COSY now proposes that SPIN@COSY run after the dEDM polarized deuteron run, starting early on 15 June. He said SPIN@COSY could run for up to 5 days; Krisch noted that 3 days would probably not be enough while 4 or 5 days seemed reasonable. Maier and Krisch tentatively agreed that the run might end Friday morning 19 June. Maier said this exact date would be confirmed by the next SPIN@COSY Teleconference, to allow cheap air-tickets.
4. Maier suggested that SPIN@COSY might help the dEDM run. Stephenson said they had just enough people to cover the shifts. Stephenson and Krisch agreed that SPIN@COSY’s participation in the dEDM run could be mutually beneficial. Krisch suggested that SPIN@COSY people might arrive on the dEDM run’s last Thursday.

1. Maier said Prasuhn is working on modifying the deuteron spin resonance strength paper posted on the arXiv website; he would send a revised version of the paper on the following day. [See above NOTE.]

E.J. STEPHENSON: EDM Status.
1. He said he did not have any update concerning the dEDM status.
2. Krisch said SPIN@COSY decided to use the dEDM “tube” target along with EDDA’s electronics for its run; but it did not seem practical to use the dEDM electronics. He noted that Morozov, Lorentz and Hinterberger would discuss some suggestions on how one might improve the deuteron polarimetry by updating EDDA’s logic system.
3. Krisch said that Michigan people might start running their usual shifts during the dEDM run to help adjust to the time change.

V.S. MOROZOV/ B. LORENTZ/ F. HINTERBERGER: Add Semi-Ring Tensor Data?
1. Morozov discussed the two main ideas on improving deuteron polarimetry: one is to add a d-p elastic condition to help separate the good data from the background; the other is to record the counts in each half-ring (we now record only the total numbers of counts in each of the four quadrants). Both of these improvements need additional hardware, because all existing coincidence channels are used, and the calibration run hardware is too slow.
2. Lorentz said that EDDA uses CAMAC ECLINE logic modules from LeCroy; they can deal with maximum rates of 65-150 MHz and minimum widths of 10 ns. Krisch asked if using NIM instead of CAMAC was possible; Lorentz said that it would not be compatible with the existing software. Moreover, recabling for new hardware might damage the fragile cabling to the polarimeter hardware, which is needed for every polarized beam experiment.
3. Hinterberger said that when they first established fast deuteron polarimetry, they considered using the d-p elastic condition to reduce the background. They tried to maximize (effective analyzing power)\times\langle\text{cross section}\rangle for fast polarimetry, but the d-p elastic cross section was too small for this to be practical. Krisch asked about the ratio between the p-p and d-p elastic cross sections. Hinterberger replied it was about 10 or so; he offered to find some data on it. [NOTE: On 14feb09 he e-mailed that the ratio was about 10.]
4. Lorentz said he had sent all the requested information about hardware to Morozov; he had nothing more to add.
M.A. LEONOVA: December 08 Data Analysis.
1. She continued analyzing the November 08 proton frequency-sweep resonance maps; there were 2 maps with unbunched beam and 2 maps with bunched beam.
2. She fit the data to different-order (1st to 3rd) Lorentzians using three types of analyses. One type involved fitting the data using the normal statistical PV errors. The second analysis converted each ±200 Hz frequency sweep into an “effective” PV error by multiplying the derivative of the fit curve by ±200 Hz; unfortunately this gave very different weights to different points. The third analysis minimized PV by minimizing each PV distance from the fit curve.
3. She said analyzing the data in these 3 different ways tested how sensitive the fit parameters were to the different analyses. Krisch noted that no one knows what the shapes of the map curves should be.
4. Leonova discussed similar analyses of other resonance map data. She did only the first two types of analyses of the bunched beam maps; she is still working on their third analysis. Krisch noted that we must do a careful analysis of the frequency-sweep maps because the fixed frequency map with unbunched proton beam had only a very small dip resulting in large uncertainties in the resonance frequency and width.

V.S. MOROZOV: Narrow Deuteron Resonance Paper.
1. He said that there is not yet a draft of the paper itself, we are still focused on analysis of the data for the paper. The paper will contain Fixed-Frequency Resonance Maps for both bunched and unbunched beams of deuterons; and Fixed-Frequency and Frequency-Sweep Resonance Maps for both bunched and unbunched beams of protons.
2. His p. 1 showed a Fixed-Freq. Map for unbunched deuterons, with a 2nd-order Lorentzian fit and the fit parameters.
3. His pp. 2-7 showed Fixed-Freq. Maps for bunched deuterons, analyzed in different ways. The different analyses gave very different results. The table on each page listed the Lorentzian’s order for the main peak and for the side bands, and weather or not the fit was symmetric. The red label on each plot specified weather the spin states were averaged, and weather the multiple measurements (at 3 frequencies) were averaged.
4. His p. 8 showed a numerical calculation for a Fixed-Freq. Map for bunched deuterons and a simple set of parameters given above the figure. The calculation qualitatively describes our data fairly well.
5. This calculation was suggested by Chao during the May 08 run; Morozov recently e-mailed Chao’s 2-page note dated 26 May 08. It calculated numerically the differential equations of spin motion, when the strength varies with time, with the synchrotron frequency and amplitude as parameters. The differences between Chao’s calculations on pp. 1 and 2 were the synchrotron frequencies of 100 and 215 Hz, and the rf solenoid on-times of 400 and 500 ms, respectively. The calculated curves on p. 2 were similar to our bunched deuteron data.
6. Morozov discussed Orlov’s prediction of narrowing a resonance. It suggested that if particles make rapid enough synchrotron oscillations, their effective energy is the energy of a central-momentum particle, and the whole beam starts behaving as a single central-momentum particle. Morozov said that this seems consistent with our bunched deuteron data. The Chao calculation also shows that the central-momentum particle and particles 1σ and 2σ away in momentum spread behave similarly.
7. Morozov’s pp. 9 and 10 showed Fixed-Freq. and Freq.-Sweep Resonance Maps for unbunched protons. The tables on the right gave the results for 2nd-order Lorentzian fits. The Sweep-Map analysis on p. 9 treated the ±200 Hz sweep as an error. The analysis on p. 10 used only the statistical error.
8. Morozov’s pp. 11 and 12 showed the Fixed-Freq. and Freq.-Sweep Maps for bunched protons. The tables on the right gave results for fits to 3rd-order Lorentzians. The Sweep-Map analysis on p. 11 used only statistical errors, the analysis on p. 12 treated the ±200 Hz sweep as an error.
9. Using Chao’s method Morozov’s p. 13 showed two single-particle numerical calculations for protons. Morozov said that applying Chao’s method to protons is simple conceptually, but the calculation takes much longer because the parameters for protons are generally much larger. The calculations were for a central-momentum particle and a particle with a 30 Hz synchrotron amplitude, which is much smaller than our actual spread. Morozov said the fact that these two calculations are very different suggests that Orlov’s condition for making a resonance narrower, by making all particles behave the same, was not satisfied during our proton run. To make a complete calculation for comparison with our data, one should make single-particle calculations at many different synchrotron amplitudes, and then fold them together. This may take a an unknown but very long time; thus, it may be impractical.

ROUNDTABLE:
1. The next SPIN@COSY Teleconference was tentatively scheduled for Thursday, 26 March 2009 at 16:00 German time or 11:00 Michigan time. [NOTE: The 30 min. time change is due to the US change to Summer time.]