Sec. 6.2.4
Glen's log book for the magnetic field mapping. Showed me in person.

Fig. D.4
Glen made this.

Appendix H.6

```
Date: Thu, 06 Mar 2008 11:28:13 -0800
From: Glen Marshall <glen.marshall@triumf.ca>
Reply-To: glen.marshall@triumf.ca
To: Dick Mischke <mischke@triumf.ca>, James Bueno <jbueno@triumf.ca>
Subject: SRIM tests of muon stopping in scintillators

Hi,

There is more to do, but I've put some of the results so far on

http://trshare.triumf.ca/~marshall/srim/

See http://www.srim.org/ to find out about SRIM and TRIM.

The stopping distributions with some statistics are in the eps files,
where the filename indicates the Mylar thickness in microns (700, 725,
750). The beam so far is 29.2 MeV/c with a fractional rms width of 0.02
(FWHM = 29.2*0.02*2.355 MeV/c), with no upper cut at 29.79 on momentum.
The momentum distribution is shown in

http://trshare.triumf.ca/~marshall/srim/simulated_momentum.eps

The .pdf files are from the SRIM/TRIM graphics, and show the details of
the geometry and calculations. Simply put, there is a mylar layer
followed by a vacuum layer (comprising region R1), then three adjacent
scintillator layers S1, S2, and S3 of 125, 125, and 250 microns
respectively, followed by a second vacuum layer and finally an Al layer
(comprising R2). My aim is to adjust the Mylar layer thickness to
approximate the 86% stopping fraction measured for the 0.020" (approx
500 microns) scintillator muSR runs. That is nearly achieved for the
M725-labelled files as shown in the .eps file (the vertical lines on the
graph show the layer boundaries for the fraction estimates.

The fraction in S2 is 9%, which is rather large, but it depends on
momentum distribution assumed. I don't know if we can reliably state
anything more, but I will try another smaller momentum distribution.

Glen

--
  Glen Marshall                mailto:Glen.Marshall@triumf.ca
  TRIUMF, 4004 Wesbrook Mall   phone: 604-222-7466
  VANCOUVER, BC V6T 2A3        fax:   604-222-1074


Date: Tue, 11 Mar 2008 15:36:51 -0700
From: Glen Marshall <glen.marshall@triumf.ca>
Reply-To: glen.marshall@triumf.ca
To: Richard Mischke <mischke@triumf.ca>, James Bueno <jbueno@triumf.ca>
Subject: Re: SRIM tests of muon stopping in scintillators

Hi,

There are new files in http://trshare.triumf.ca/~marshall/srim/ . I have
tried a slightly different approach. I've used three different rms
fractional momentum spreads, 0.010, 0.015, and 0.020 (should be clear
from filenames *0p010* etc.). In each case, the central momentum is
adjusted so that it is 2*sigma lower than the cutoff at 29.8. The cutoff
is included in the momentum distributions (*pdist.eps). Then the Mylar
thickness is adjusted so that about 13% of the muons pass through the
scintillator. The reasoning for this approach is that the muSR strategy
is to adjust the momentum to be at the maximum of the intensity of
surface muons, so they would only lose a small part of the beam above
the cutoff.

The files *_M6xx.eps correspond to the range distribution following the
adjustment, where 6xx microns of Mylar was found to be about right. The
results are summarized:

dp/p, rms    Mylar       scint2     scint3     r2
              (microns)   fraction   fraction   fraction
=========================================================
0.010        690         0.004      0.853      0.141
0.015        670         0.018      0.849      0.131
0.020        690         0.057      0.807      0.133
```

The scint2 fraction is what stops in the scintillator thickness between
125 and 250 microns, while the scint3 fraction is between 250 and 500
microns. The scint1 fractions (0 to 125 microns, corresponding to the
0.005" scintillator) are all small by comparison.

The scint2 fraction is very dependent on the momentum distribution
assumed. I don't know what is correct, but I expect the 0.015 and 0.020
are more likely to be correct. This would disfavor as much as 9%
stopping in the 0.010" scintillator, but certainly allows anything from
1% to 6%.

All that this can tell us is that it is very unlikely that there was
anything stopping in the scintillator when we used only 0.005".

Glen

Richard Mischke wrote:
> Glen, I am not able to view all the files; .pdf and .txt have the wrong
> permissions. The M725 plot is encouraging, in that it suggests a
> convincing plot may be achievable. Is it possible to apply an upper
> momentum cutoff? I think that will be important to accommodate a
> plausible momentum bite.   An essential input is the allowed ratio of
> stops in 5 and 10 mil scints from the data. Your current plot already
> shows that the stopping distribution can be mostly contained in the
> second half of a 20 mil scint, with ~15% stopping beyond the scint. The
> shape of the upstream part of the distribution is as we imagined, i.e.
> if there is 9% stopping in the 10 mil scint, the fraction stopping in
> the 5 mil is <1%, which is inconsistent with the data. I conclude the
> stopping distribution is currently too wide and the fraction stopping in
> the 5 mil and 10 mil must be much less than 9%. Dick

--
  Glen Marshall   mailto:Glen.Marshall@triumf.ca
  TRIUMF, 4004 Wesbrook Mall   phone: 604-222-7466
  VANCOUVER, BC V6T 2A3   fax: 604-222-1074

Date: Wed, 19 Mar 2008 19:10:30 -0700
From: Glen Marshall <glen.marshall@triumf.ca>
To: Richard Mischke <mischke@triumf.ca>
CC: James Bueno <jbueno@triumf.ca>
Subject: Re: SRIM tests of muon stopping in scintillators
Hi,

No, no subsequent thoughts or ideas. Except that we should not have
assumed some things when we took the data...

Glen

Richard Mischke wrote:
> Glen, I have not responded to this report because I did not know what
> to say or what comes next. I think you have carried this exercise to
> completion. Now James needs to decide on his story and put together an
> abstract. It seems that your simulation did not result in a
> breakthrough for reducing the systematic uncertainty in the 10 mil
> scint, but it reinforces our opinion that the fit result of 9% stopping
> in the scint is too high. Have you had any additional thoughts since
> sending the email? Dick
>
> Glen Marshall wrote:
>> Hi,
>>
>> There are new files in http://trshare.triumf.ca/~marshall/srim/ . I
>> have tried a slightly different approach. I've used three different
>> rms fractional momentum spreads, 0.010, 0.015, and 0.020 (should be
>> clear from filenames *0p010* etc.). In each case, the central momentum
>> is ...
>>

--
  Glen Marshall   mailto:glen.marshall@triumf.ca
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