39,41,353: "kind of" is a weak expression
Solution: Revised.

47-50 do not really belong in a thesis abstract
Solution: Removed.

58: "Above 10 GV the time structure is mostly ignorable." is redundant with "... the antiproton to proton flux ratio keeps stable in the high rigidity range."
Solution: Removed the later one.

Fig. 2.1a, Fig. 2.2, Fig. 2.3b, Fig. 3.3, Fig. 3.5: quote original sources instead of the references you use at the moment
Discussion:
Fig. 2.1a,
The figure is made by William F. Hanlon from the University of Utah. See here:
https://web.physics.utah.edu/~whanlon/spectrum.html
I cite this link instead of the previous PhD thesis of Alicia López-Oramas.

[11] H. William. Cosmic Ray Spectra of Various Experiments. URL: https://web.physics.utah.edu/ whanlon/spectrum.html.

Fig. 2.2,
I think the original source is ACE news here: https://izw1.caltech.edu/ACE/ACENews/ACENews83.html, so I cite this instead.

[13] M. Israel et al. An Overview of Cosmic-Ray Elemental Composition. ACE News, Oct 2004. URL: https://izw1.caltech.edu/ACE/ACENews/ACENews83.html.

Fig. 2.3b,
According to WIKI figure source, the original source is: http://voyager.gsfc.nasa.gov/heliopause/heliopause/v1la1.html
but this link is not valid anymore. For the published paper, I don't find one includes this figure at the moment. So I think I should use the one from WIKI as I showed before.

[43] NASA. Solar wind at voyager 1, 2012. Retrieved 16:20, July 20, 2022 from: https://commons.wikimedia.org/wiki/File:Solar_wind_at_Voyager_1.png.

Fig. 3.3,
This schematic view of AMS-02 is used in many AMS papers. I am not sure which is the original source. Previous one in my thesis is taken from: Fabian's Thesis, since he modified the figure from AMS website. So i cite his thesis. Now I cite the original figure from "AMS official website" and no modification on this figure.

[81] AMS Collaboration. The Alpha Magnetic Spectrometer on the International Space Station, 2022. URL: https://ams02.space.

Fig. 3.5:
For figure 3.5(a), I don't find a published paper that includes exactly same figure at the moment. Currently I cite the AMS official website, and there is no reference for this figure in the website.
For figure 3.5(b), Thomas Kirn gives a similar figure in https://doi.org/10.1016/j.nima.2007.07.052, but more particle species with different energy. So i use it instead of the old one.

[85] T. Kirn. The AMS-02 transition radiation detector. *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, 581(1):156–159, 2007. DOI: 10.1016/j.nima.2007.07.052.

103, and in general: no space between reference and '.'

Discussion: I check carefully and I think there is no space between (see latex code below). I think the effect is due to auto-tuning of latex.

```
% Cosmic ray
The story of cosmic rays began in 1912 when a balloon experiment carried out by Victor Hess showed a significant rise in the air
ionization rate with increasing altitude, confirming the existence of cosmic rays \cite{NobelCosmicRay}. The discovery of cosmic rays
```

52: what does the spectrum look like?

122: Fig. 62c of the Phys. Rep. gives a different impression.

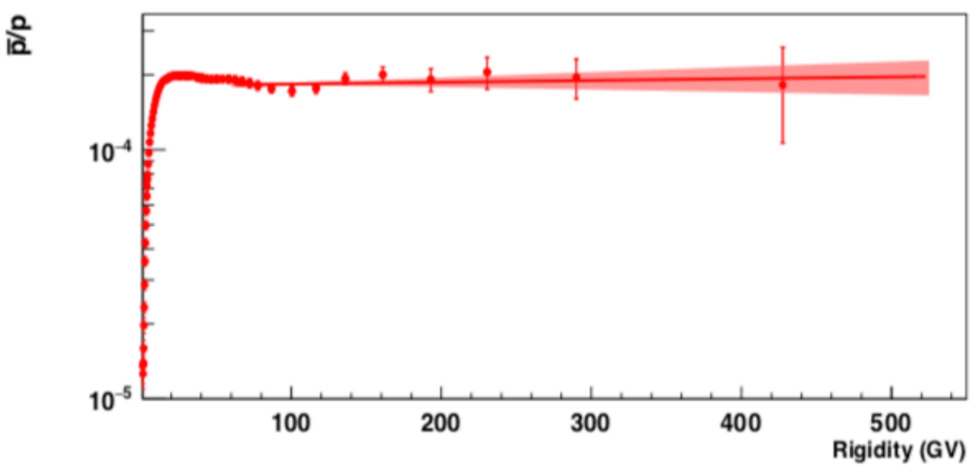
Fig. 5.1: You should try to get some physics out of the data: Is there a spectral break around 100 GeV? What is the significance? Are the data consistent with a straight line in log R?

Discussion: The three comments are about time-averaged pbar/P ratio in the high rigidity range, so I reply together here.

In AMS Antiproton PRL paper(https://journals.aps.org/prl/pdf/10.1103/PhysRevLett.117.091103), we did a straight line fit above 60.3 GV. This gives a very small slope value (-0.7±0.9)X10^-7.

In Phys.Rep, we tried to match with dark matter model so we showed the result in LogX axis. The impression is different in this case, but we didn't showed the straight line fit in Phys Rep result.

The interpretation of data is not very clear and i prefer to focus on the "official" statement of PRL paper in my thesis. So I also did a straight line fit above 60.3 GV, see below:



(b)

Figure 5.1: The time-averaged antiproton to proton flux ratio with the data collected from May 2011 to May 2021. The error bars are the total errors calculated from the quadratic sum of the statistical and the systematic errors. a). Antiproton to proton flux ratio in linear Y scale; b). Antiproton to proton flux ratio in logarithmic Y scale. The solid line shows a linear fit above 60.3 GV together with the 68% C.L. ranges of the fit parameters (shaded regions).

And the new fit gives a slope of (0.31±0.73)X10^(-7). I add some description like below:

In figure 5.1(b), a linear fit in the antiproton to proton flux ratio is performed above 60.3 GV, this leads to a fitted slope $k = (0.31 \pm 0.73) \times 10^{-7}$ GV^{-1}. Compared to the linear fit result in the same rigidity range in the previous AMS-02 publication [57] , the observed behavior keeps the same.

Eq. 2.1: remove parenthesis around "-gamma"
Solution: Removed.

218: This sentence makes no sense to me.
Solution: Revised to:
“Since particles are produced via pair production and proton (antiproton) is much heavier than electron (positron), pulsars can produce positrons while antiprotons can not be produced by pulsars \cite{PulsarProducePositronOnly, PulsarProducePositronOnly2}. ”

Eq. 2.4: that's not really a "solution". What about the spatial dependence?
Solution: After "The basic assumption is that the galaxy is a box where particles can freely propagate while undergoing only elastic scattering" I add one more sentence to describe the spatial dependence: "In this case, the density of cosmic rays does not depend on the location within the box."

284: but the diffusion coefficient is orders of magnitude smaller
Solution:Add this into sentence:
“When galactic cosmic rays enter the solar system, they travel through the heliosphere first before reaching the Earth. The propagation process is similar to the propagation in the galaxy but the diffusion coefficient is orders of magnitude smaller. ”

472: p etc.
Solution: Done. Changed from p to p.

Figs. 3.16, 3.17: put side by side at half size?
Solution: Done.

590: "should" implies that you did not actually do it, despite better knowledge
Solution: Revised.

611: But you just showed that the measuring time cancels from the equations…?
Discussion: Rephrase the sentences to:
“In section \ref{MeasuringTimeSection}, the measuring time used in this analysis is determined. Although the measuring time is canceled in the antiproton to proton flux ratio calculation, it has to be calculated because the rigidity cutoff is not simulated in the MC simulation which is used for unfolding, also the measuring time in the time-dependent analysis is important to understand the event numbers change.”

657: discuss the jumps in the spectral shapes
Solution: Add description sentence:
“The jumps in the ISS data are due to the different selections in different rigidity ranges. ”

668: a weight cannot be calculated as a ratio of event number over flux, dimensions don't match
Solution: Rephrase to:
“In order to correct this, the weights of MC events are reassigned by making the spectrum of MC simulation is same as the reference one.”

676: the "pass ratio" is not well defined. What exactly is the denominator? Events before all cuts? After the previous cut? …?
Solution:
(1). Define “selector” and then define pass ratio:
“The pass ratio is the event number passed in this cut to the total event number before applying the selector (a group of cuts at this level of selection) to which this cut belongs.”
(2). Then define different selectors in Preselection and Selection.
“The preselection consists of two parts: data taking quality cuts and analysis data quality cuts. Each part is a selector.”
“The selection cuts and the pass ratios are presented in Table \ref{Quality cuts}. There are three selectors in this table: Tracker Charge, Upper and Lower TOF Charge, all the rest cuts in this table.”

718, 722: show the charge distributions (after suitable cuts)
Discussion: Add a figure, show the “Lower TOF Charge” cut as an example.

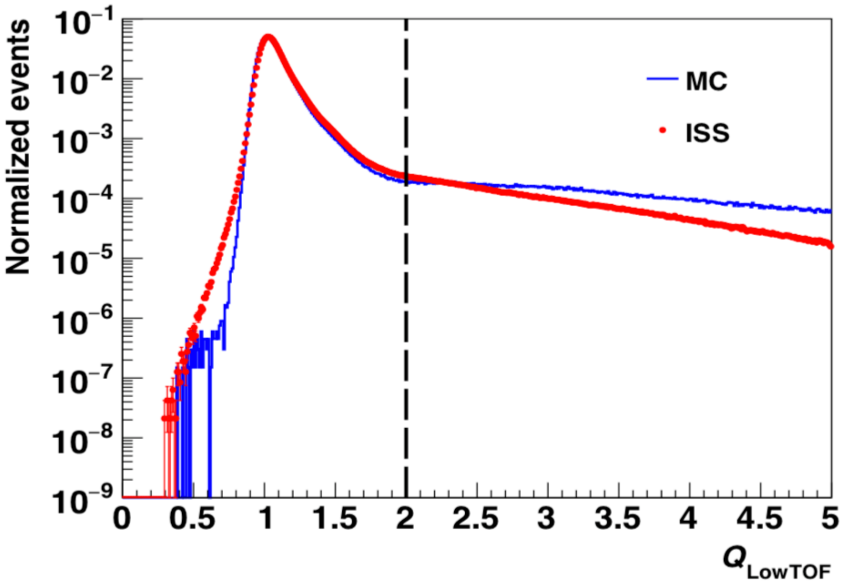


Figure 4.2: Comparison of the lower TOF charge distributions for ISS positive rigidity data and proton MC in the rigidity bin of 0.7 to 18 GV. The vertical black dashed line denotes the cut value. Higher charge events are removed after the cut. There are some differences between the tails of the distributions of data and MC, but this have no impact on the analysis since the templates in the low and intermediate rigidity range are taken from data directly (see Section 4.4).

738: which cut value?
Solution:”TRD TOF Track Match XY” is a predefined cut in ACsoft/cuts/standardcuts/TRDCuts.C, and the cut value is TrdTofTrackMatchXY(0|40). The cut value is relatively large, but this cut also requires TrdTrack and TofBeta.

747: noise/spurious hits close to the particle track …
Solution: Revised:
“The second reason is the interactions with the AMS sub-detectors: the particle scattering can produce kinks in the trajectory and spurious hits close to the particle track, which confuse the tracker fit and result in an opposite rigidity sign. ”

778: but mathematically, this quantity should be between -1 and 1, in contradiction with Fig. 4.2b.
1372, Fig. 2: you should see -1 < delta < 1
Discussion: the charge correct and charge confused events are decided by the R constructed by all layers. R constructed with specific tracker layers could have different signs. So the ranges of these MVA variables are not from -1 to 1 but larger.

793: is the training done separately in different rigidity bins? if so, which binning?
Solution: Add this information here:
"Each part is divided into a training sample, a validation sample and a test sample with a ratio of 6:3:1. The training is done in the same rigidity binning as the one used for antiproton to proton flux ratio, but only above 14.1 GV, since charge confusion protons are only dominant in the high rigidity range."

Fig. 4.2: the range 330 to 525 GV refers to reconstructed rigidity?
Solution: Yes, write "reconstructed rigidity" instead of "rigidity".

822: the pdfs also depend on the layer number, Xe partial pressure and pathlength inside the straw
Solution: Revised to:
"Then the information about all the layer hits, layer number, Xe partial pressure and pathlength inside the straw are combined to construct a likelihood $\mathcal{L}$ for each particle species:"

Fig. 4.5: it seems that there is a contamination in the ISS electron sample around Lambda_TRD=1, maybe from charge-confused protons? Do you apply a cut on CC before filling these histograms?
Solution: I didn't applied CC cut on this. After I applied the CC cut it gets slightly better but still a little contamination. Since it is at 0.1% level, I think it's fine to illustrate the separation.

831: what is a template fit?
Discussion: add more description about template fit at beginning of this section:

In this section, the template fits are shown in detail for the time-averaged analysis and the time-dependent analysis. The template fit is a method to extract signal and background events from the total event distribution. If the data distribution is $D(x)$ and it has k components, then the goal of the template fit is to extract the event number of different components from the data distribution. In this analysis, the binned maximum likelihood fit is used. The fit is performed by minimizing the negative log-likelihood function L:

$$L = -\left(\sum_x D(x) \cdot \log(P(x)) - N_{\text{total}}\right) \tag{4.7}$$

where N_{total} is the total number of event, P is the normalized likelihood, which is defined as the sum of the product of the number of events N_i and the PDF of the template P_i:

$$P(x) = \sum_{i=1}^{k} N_i \cdot P_i(x) \tag{4.8}$$

The minimization is achieved using the Minuit minimizer [119] . The PDFs of templates are constructed before the template fit and the numbers of events are free parameters. By minimizing the negative log-likelihood function, the best-fit parameters, namely the number of events for signals and backgrounds, can be extracted.

Table 4.4: I do not understand your choice of cuts here: How can you compare beta_low to 1/beta_TOF? Why do you even allow negative beta?
Discussion: “beta_low” denotes “low edge of the template fit range in 1/beta_TOF side”, not about “beta value”. I change this name to “beta_LowEdge” now. See below:

$$\frac{1}{\beta_{\text{LowEdge}}(R)} < \frac{1}{\beta_{\text{TOF}}} - \frac{1}{\beta(R, m_{\text{p}})} < 0.2$$

850: the "secondaries" need more explanation/motivation. Also, they appear to be awfully degenerate with electrons according to your plots. How can the fit tell them apart from the electrons?
Discussion:
(1). For the first comment, I expand the description as:
“In the low rigidity range, the dominant background sources are light particles. Except the electrons, the interaction between the incoming particles with the AMS-02 materials can produce secondary interaction particles like pions. These background components have to be separated from the antiproton signals. ”

(2). For the second comment, in AMS antiproton analysis, we never separated electrons and interaction pions. For example:
(2.1) For the template fit in 2016 PRL paper, they are given in this presentation in General meeting: https://indico.cern.ch/event/485560/attachments/1219841/1782761/01_WXu_pbar_MIT.pdf (page 9). The electrons and pions are not separated in mass^2. (mass constructed from TOF)
(2.2) In Taiwan group, they are given here:https://indico.cern.ch/event/924391/attachments/2047390/3432081/203_HChang_Taiwan.pdf (page 31-32). They mixed electrons and pions to construct the background template (e+pion).
(2.3) MIT group analysis (Zhili Weng) for Physics Report, I discussed with him and he tried both methods: The first one is using one mixed background template. The second one is using electrons and pions as two templates. The template is Rigidity dependent, so in some low R bins the TRD can help to separate electron and pion, but in general he didn’t separate neither.
(2.4) IHEP group analysis: https://indico.cern.ch/event/1012783/attachments/2197822/3718144/1a_ZLi_IHEP.pdf (page 31). They use the mixed template of electrons+pions.
So in summary, it’s good to separate and study the backgrounds better, but to get a healthy template fit, what we did at this moment is sufficient.

Table 4.4: What kind of template is "negative rigidity data”?
Solution: "negative rigidity data” is ISS data to be fitted. This column shows the further selections in the ISS data in low rigidity range. So I change the name to “Further selections for ISS Data”.

Does table 4.4 only refer to the low rigidity range?
Solution: Yes. I add “in the low rigidity range” in the caption of this figure.

Motivate why you use 1/beta instead of beta.
Discussion: No particular reason for this. Andy used 1/beta and When I started this low energy analysis, i try to compare some plots with his plots.

869: You can simply define beta(R,m) once. Use π for pion.
Solution: Done.

876, 1163: "official" is a bad word.
Solution: Avoid “official” and rephrase like:
“For the final time-averaged antiproton to proton flux ratio, the template fit result at 90\% signal efficiency is used.”

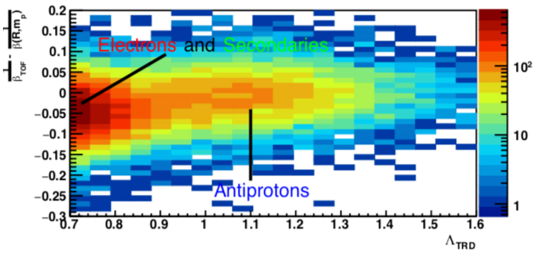
881: what is L? what is f? I don't think this notation makes sense.
883: the N_i are the free parameters in the fit
Solution: Removed this part. Description of template fit is given according to the Comment on “831: what is a template fit?”

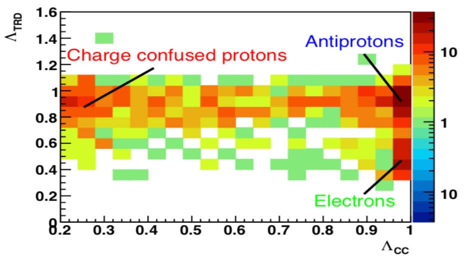
Table 4.4:The Lambda_TRD peaks at 0.4 for electrons, so you will cut almost all of them away when constructing the electron template?

885: it makes no sense to cut Fig. 4.7 at x=0.7. Show the full plot, and also for R>0, to illustrate where the contributions are found in the 1/beta-Lambda plane. You need the protons to prove that the antiprotons are not simply a tail of the electron distribution.

Fig. 4.8: plot ranges are too narrow.

Table 4.5: Also here, you cannot cut on the same quantity that you want to extract a template for (Lambda_TRD).
Description: The four comments are about two things: TRD cut in the plot; R>0 range.
(1). For the first comment of TRD cut, here are three explanations for it.
(1.1) Due to the large amount of backgrounds, the general principle is “**Cut first to remove most backgrounds, then do the template fit at signal range.**” For example, in high rigidity range, I always cut on CC to remove most CCProtons, then do the template fit. In low rigidity range, I also cut on TRD to remove most electrons and pions first, then do the template fit. See below:





The left is data in low rigidity and the right is data in high rigidity range. For the left, TRD cut is set first to remove most light particles. For the right, CC cut is set first to remove most CCProtons (peak at Lambda_CC=0). The general principle should be applied for both rigidity ranges.
(1.2) Yes, currently I construct my electron&pion templates after the TRD cut, and my cuts and selections to select electron/pion templates are only tested for signal ranges(after TRD cut). I never tried to do the template fit in the full range (without TRD cut) before. To do this, it might not be very quickly since i probably do some tuning for the cuts to select templates.
(1.3) Due to the overwhelming background of electrons and pions in the low rigidity range, the chi2 of the template fit in the full range will be dominant by background range. In this case, I still need to do the fit after TRD cut.

(2). For the proton numbers, I used a simple cut based method. So there is no template fit in the R>0 range. Due to the large number of protons, cut based and template fit based method lead to small differences. I add some descriptions in the corresponding places.

888: you should also show the full 2D plots (data and best-fit model) first, for illustration. And what about R>0? You need the proton counts, too.

Description: Done, I give data and best-fit model now(see below). Proton number is taken from cuts.

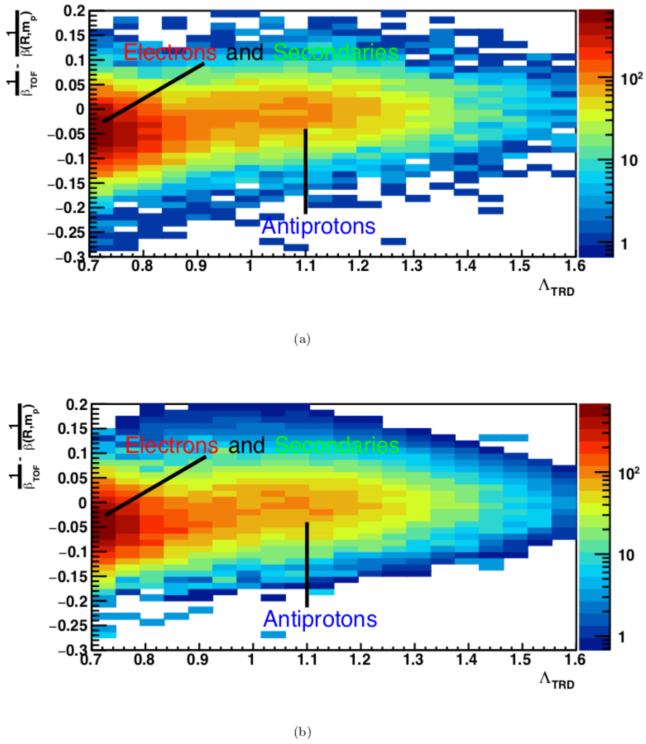


Figure 4.8: a) Negative rigidity ISS data in the rigidity range of 2.97 to 3.29 GV in $1/\beta_{\mathrm{TOF}}$ and Λ_{TRD} space. In the Y axis, $1/\beta$ calculated with rigidity and antiproton mass is subtracted from the value of $1/\beta_{\mathrm{TOF}}$, so the distribution of antiproton can be normalized to be around 0. Antiproton signal, electron and secondaries background components are seen in this plot. To remove the most backgrounds, Λ_{TRD} cut of 0.7 is applied in this plot. b) The 2D template fit result in the same rigidity bin of 2.97 to 3.29 GV in $1/\beta_{\mathrm{TOF}}$ and Λ_{TRD} space.

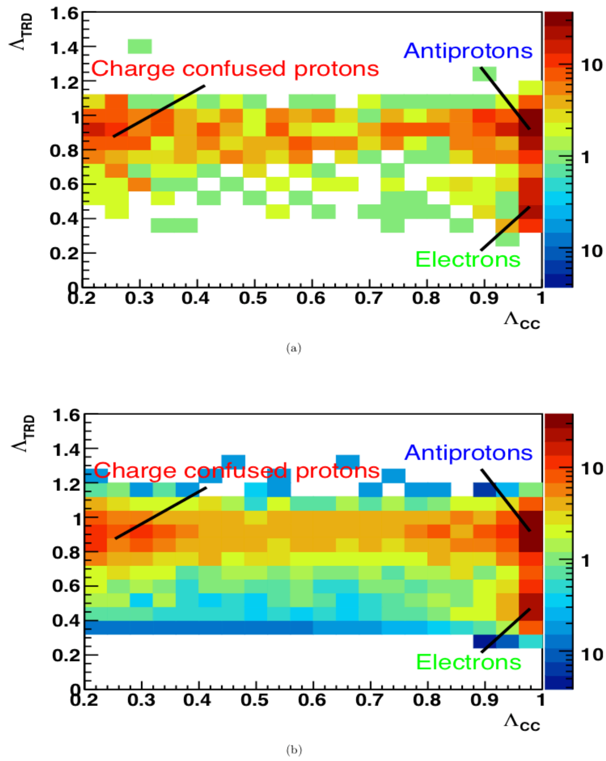


Figure 4.13: a) Negative rigidity ISS data in the rigidity range of 175 to 211 GV in Λ_{CC} and Λ_{TRD} space. Three components of antiprotons, electrons and charge confused protons are seen in this plot. To remove most backgrounds of charge confused protons, Λ_{CC} cut of 0.2 is applied. b) The 2D template fit result in the same rigidity bin of 175 to 211 GV in Λ_{CC} and Λ_{TRD} space.

Fig. 4.9, 4.11: also plot the proton numbers

Solution: Done.

908: I do not understand this sentence.

Solution: Since the “Sign(R)·Lambda_TRD” changed to “Lambda_TRD”. Edge of template fit is “Lambda_LowEdge” now.

Fig. 4.10: also show the R>0 side, or the sign(R) on the x-axis makes no sense.

Solution: “Sign(R)·Lambda_TRD” changed to “Lambda_TRD”.

911: you need a plot to illustrate this cut.

Discussion: Most events don't have RICH Beta value. This cut is not very efficient to select, but this is what i did so i have put it here. I don't think a plot to illustrate this is needed.

971: what about tau?

Discussion:The most important parameters to describe the shape of template is: the mean and width. I think tau is not important in this case. Just like Nico PhD thesis p140. He also only showed mean and width to describe the time dependent template.

Fig. 4.15: Lambda_TRD should not be negative. Use histograms instead of points for electron, antiproton.
Solution: Done.
(1). Correct from Sign(R)·Lambda_TRD to "Lambda_TRD". Now it is positive.
(2). Changed from points to histograms.

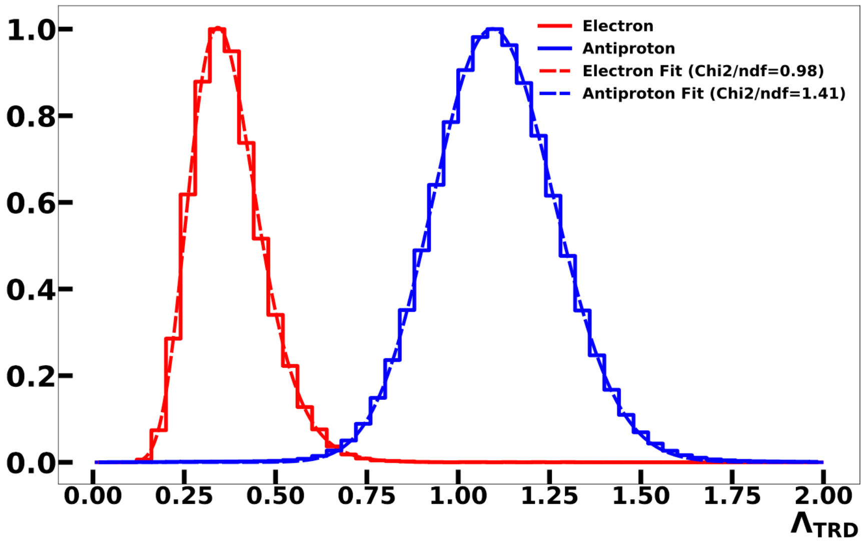


Figure 4.16: The parameterizations of the normalized antiproton and electron templates by Novosibirsk functions in the rigidity range of 6.47 to 7.76 GV with data collected from Feb.18.2017 to Jul.30.2017.

Fig. 4.16: these changes probably reflect the changing Xe partial pressure in the TRD due to the way the TRD was operated.
Solution: The Xe partial prerssure is mentioned in the caption of this figure.

Fig. 4.19: notation! Label x-axis ("date").
Discussion: i think the x-axis ("date") is not very necessary and i should try to make it simple. I guess it's will not confuse people. Also, Fabian and Nico didn't label "date" in their time-dependent plots in their PhD thesis neither.

1004: not a complete sentence.
Solution: revised the sentence and make it complete.

1019: which parameterizations? this was not mentioned before.
Solution: "parameterizations of the effective acceptance ratios".

Fig. 4.21: Combine in a single plot, or at least use same y-range, avoid yellow.
Solution: Done. Use same y-range now. (Combining into one plot will give too much information in one plot)

Fig. 4.22: never use yellow markers.
Solution: Changed color.

1021: I don't think that is true.
Solution: Expand the sentence and explain more about the necessity of Measuring time:
“Although the measuring time is canceled in the antiproton to proton flux ratio calculation, it has to be determined due to the rigidity cutoff in the cuts and selections, which explains the low statistics in the low rigidity analysis. Also, in the time-dependent analysis, the measuring time in six Bartels Rotations helps to understand the antiproton number changes. Furthermore, in the MC simulation the rigidity cutoff is not simulated, this effect has to be corrected in unfolding.”

1026: time needed for readout
Solution: Revised the sentence to:
“Due to the detector's operation cuts and the trigger dead time, which is the time needed for readout, the measuring time is lower than the exposure time, which is the total data-taking time since the start of the experiment.”

Figs. 4.23-4.26: do you really need these figures?
Discussion: I think it's harmless to keep these figures.
Figs. 4.23,24 are about live-time fraction. In my Preselection cuts, i have "Bad Live Time", which is removing the seconds when the live time fraction < 0.5. I write "see Section 4.6". So i think i should keep this information about the live-time fraction here in Section 4.6 (section of Measuring time).
Figs. 4.25 is the illustration of the magnetic field axis and rotation axis. I think a figure about this is fine.
Figs. 4.26 is the map of Størmer rigidity cutoff value. I think it's an interesting figure to show the cutoff values around the poles and the equator.

1080: but if IGRF is correct, your particles will be under-cutoff!?
Discussion: Yes, The IGRF cutoff leads to lower statistics and almost zero measuring time less than 1.16 GV.
(1). see also Fabian Thesis Figure 4.40 and related paragraph. He also presents a similar result. Below 1.X GV the measuring time from IGRF is zero. To have more statistics, he also use Størmer cutoff. That's always what we did and defend for the usage of Størmer cutoff.
(2). see Nico thesis p116. For convenience, i copy it from the thesis here:
"Furthermore the Størmer cut-off was exchanged for the more sophisticated IGRF cut-off while scanning the safety factor from 0.9 – 1.4. With the chosen nominal safety factor fsafety = 1.2 all fluxes were identical to those obtained using the Størmer cut-off, **except for the first energy bin 0.5 – 0.7 GeV which has zero events when using the IGRF cut-off.** Since AMS already published electron and positron fluxes starting at 0.5 GeV and since the remaining flux data points are consistent between IGRF / Størmer, the Størmer cut-off was chosen for this work."
The empty bins is lower than mine and Fabian’s, but he also used Størmer cutoff.

Fig. 4.29: why does T drop in 2018?
Discussion: I don't know the details of the operation. The only thing I write it here is "the measuring time in each time bin decreased due to frequent changes of the pump running status." The four repair missions is relatively short so i don't mention them in this caption.

1098: this is not really how unfolding works.
Discussion: I compare my description of the unfolding with descriptions in Fabian (p64) and Nico's (p107) thesis. I am not sure about the differences. Do you mean i should emphasize more on the "matrix multiplication"? I rewrite it like:
"The unfolded counts $\hat{n}$, namely the event counts in the true rigidity, can be obtained by matrix multiplication of raw event counts n (the event counts in reconstructed rigidity) and the unfolding matrix U:"

1110: No, you have to normalize every projection along y such that the sum of probabilities is 1.
Solution: Done.

Fig. 4.31: The y-axis is poorly labelled. Avoid yellow and light cyan markers. On this scale, and with so many different categories in the plot, it's very hard to see anything.
I think to show that the results of the unfolding can be trusted, you need at least a simple toy MC study. What happened to the ratio plot of raw vs unfolded counts? How important is the unfolding?
Solution:
(1) I revised the plot and put them vertically and give raw/unfolded ratio.

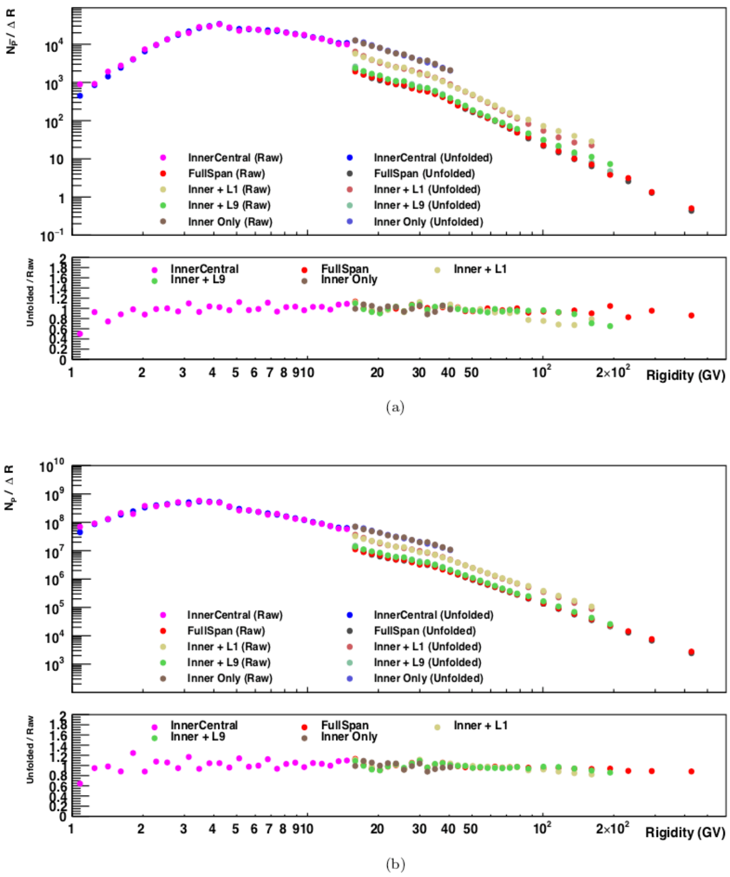


Figure 4.32: The raw and unfolded events for a) antiproton b) proton over rigidity bin width. Different migration matrices are used for different tracker patterns. Due to the different shapes of the raw event distributions for antiproton and proton, this unfolding effect can not cancel strictly.

(2) The different ranges require different unfolding and it takes a relatively long time to study in detail. So currently I didn't have a check study of it.

1129: so how are the results calculated from the data in Fig. 4.32?
Solution: Add more description of the overlapping range:
"The overlapping range is dealt with the best matching results. Below 4.43 GV the result in the low rigidity range is used. From 4.43 to 15.3 GV the result in the intermediate range is used. Above 15.3 GV the result in the high rigidity range is used."

Fig. 4.35. Fig. 5.5: it's pbar/p / 10^-5, not pbar/p x 10^-5
Solution: Changed. (also for other plots)

1167: But in part, the spread seen here will be simply due to statistical fluctuations.
Discussion: Currently I don't have good ideas to defend it and that's what I have right now.

Fig. 4.42: It's not really clear how you calculate the yellow uncertainty band.
Solution: The confidence interval is calculated in "KMPfit" python package, i think it's too detailed to mention this in thesis.

1212: you need a statement which syst. errors are correlated over time.
Discussion: Done, add this statement:
“In the low and intermediate rigidity range, the systematic uncertainties are from the acceptance and fit range. Since the acceptance is taken from MC, therefore it is time-independent. The temple fit is performed in each six Bartels Rotation time bin so it is time-dependent.”

Fig. 4.45: Plotting the relative uncertainties should simplify things, e.g. the acceptance error should become constant?
Solution: Done. Changed to relative error. (acceptance error is constant in relative error. Due to the absolute Pbar/P value is time-dependent and not constant, acceptance error is not constant in absolute value.)

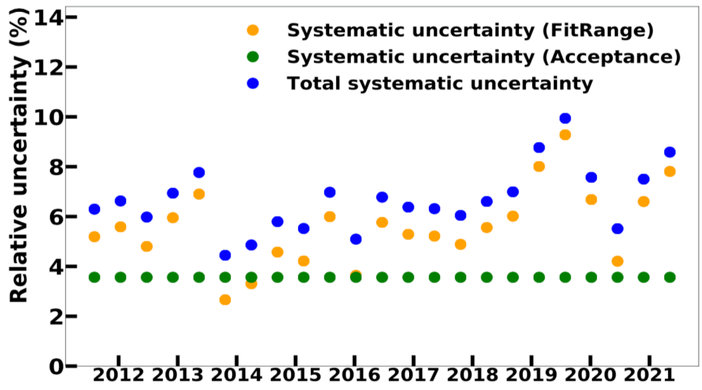


Figure 4.46: The contributions of different sources of the systematic uncertainty and the relative total systematic uncertainty of the antiproton to proton flux ratio in the rigidity bin of 1.92 to 2.4 GV in six Bartels Rotation time bin.

Fig. 5.2: "due to limited statistics": that is clearly not the case. Could the deviation be related to different treatments of the geomagnetic cutoff? Use the full text width for the figure. Legend: quote time range (May 2011 - ...) instead.
Discussion:
(1) I am not about the specific reason for this deviation, so I removed “due to limited statistics”. I don’t have time to try IGRF cut since I need to write new trees from the beginning. Also, the PRL and Physics Report result also have some discrepancies at the lowest rigidity range (some jumps so it’s not due to time-variation).
(2) It is already in full text width: “\includegraphics[width=1.0\textwidth, height=0.36\textheight]…”
(3) Legend changed to “May 2011 - Nov 2017”.

1236: AMS-02~\cite{…ref2...}
Discussion: I am not sure about the meaning of this comment. But I revised the sentence like this: “To check the consistency between the result of this analysis and the one published by the AMS-02 collaboration \cite{PhysicsReport2},”

1238-1239: remove line break
Solution: Done.

1251: Plus, you probably use stricter cuts.
Solution: Revised sentence, added this.

Figs. 5.5, 5.9: Here, you may only use the statistical and time-dependent systematic errors.
Solution:
(1). For figure 5.5: Done. Exclude time-independent sys error (from acceptance).
(2). For figure 5.9: In this plot, I use total error (include time-independent error), since the error of electron/positron ratio is total error too.

1270: I don't really see a rising trend.
Discussion: Rewrite as:
“A distinct trend is observed in the antiproton to proton flux ratio from 2011 to 2021. Below 4 GV, the antiproton to proton flux ratio shows a rising trend first and then gradually goes down, at last, relatively stabilized for a few years. ”

1271: rephrase the (incomplete) sentence "At last, …"
Solution: Done

1271: there is no such thing as "the" solar modulation model
Solution: Rewrite as:
“The trend of antiproton to proton flux ratio in a complete solar cycle is shown in the solar modulation model \cite{TimeDependentPbarRatioModelPaper}. “
This paper is https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.83.674, and has a prediction of the Pbar/P ratio behavior in a solar cycle.

Fig. 5.6: you should be more precise on what "taken from [129]" means, since the curve you display is not found in that paper.
Discussion: Yes, we discussed about this last time. I used “WebPlotDigitizer” to download the figure from the paper, but I promised Aslam to use his latest result of finer time resolution of One Bartel Rotation. (The one shown in the paper has poor resolution: In each year, they predict Pbar/P result in 2 Bartels Rotations and interpolate for the period in between.)
So I rewrite as:
“The modulation model is taken from \cite{AslamModulationPaper}, but the prediction curve in this figure is given in a finer time resolution of one Bartel Rotation. Prediction data provided by O.P.M. Aslam.”

Figs. 5.7, 5.8: separate syst. error into time-dependent and
time-independent errors. Syst. errors should be flat as a function of
time?
Solution: Done.
Time-dependent error: template fit (a straight line fit in the normal data-taking is also fine, but I still need to present the original one in TTCS-off period, so I prefer to say it’s time-dependent.)
Time-independent errors: acceptance. Flat as a function time.

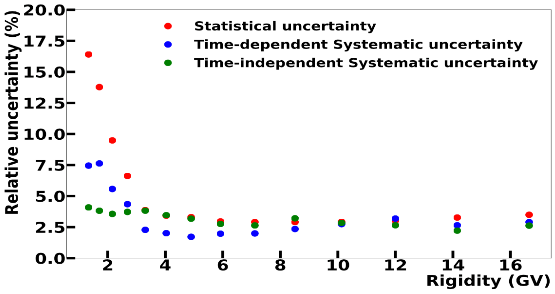


Figure 5.7: Averaged relative statistical and systematic uncertainties of the time-dependent antiproton to proton flux ratio. Below 3 GV, statistical uncertainty is dominant. Above 3 GV, the contributions of statistical and systematic uncertainty are at a similar level.

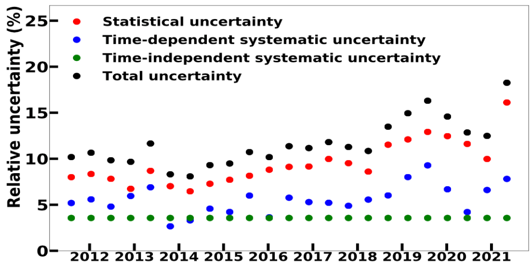


Figure 5.8: Breakdown of the total relative uncertainty of the antiproton to proton flux ratio into its statistical and systematic parts as a function of time for the rigidity bin of 1.92 to 2.4 GV. The statistical uncertainty corresponds to the antiproton events, which are subject to the solar modulation.

Fig. 5.9: It seems to me that you could match pbar/p and e-/e+ by
introducing a time-shift between the two, which decreases with
rigidity.
Discussion: Yes. In general, this comment is about model-independent approach to describe the flux ratio, and there is a history about this.
1. In 2018 time-dependent positron PRL paper, the e+/e- ratio is fitted with a logistic function.
2. In General Meeting May 2020, Taiwan group fit the pbar/p and e-/e+ ratio with logistic functions.
See Here: https://indico.cern.ch/event/924391/attachments/2047390/3432081/203_HChang_Taiwan.pdf (page38-45)
3. In Genral Meeting Oct.2020. Perugia group fit the e+/e- with sines(cosines) functions. See Here: https://indico.cern.ch/event/961899/attachments/2114165/3572259/27_MGraziani_electrons_positrons.pdf (page 17-21)
There are some discussions about the fit functions in the AMS-02 Collaboration but i think it's not decided yet. A simple time-shift parameter may describe the pbar/p and e-/e+ results but it may easily leads to more questions about the phenomenon. I also tried to fit the results with logistic function before, but if I remember correctly, Prof Schael prefers to present the result without any analytic discussion. So I think I should just present the like it is in my thesis.

1343: This sentence doesn't really make sense.
Solution: Removed“therefore they are subject to different modulation effects.”

1382, Fig.3: wrong x-axis labels, "log" is missing
Solution: Revised.

1398: you could show the plot for a different R range then.
Solution: Since lower rigidity range it’s harder to get clean CCProton sample, so i change from full span to Inner+L1 in the same R bin.

Appendix: you quote uncertainties as 0.01 or 0.02, but in these cases,
an additional digit should be given.
Discussion:Only some statistical uncertainties are 0.01 or 0.02, most are higher.

The antiproton analysis in AMS official publication (both 2016 Pbar PRL paper's supplemental material & 2021 Physics Report) use 2 digits even some errors are 0.01 or 0.02. So I prefer to follow this.

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Other comments about notation and style of figure:
Figs. 4.9, 4.11, 4.14: use consistent notation (-> Eq. (4.7)), and avoid slang ("BinWidth").
Figs. 4.15, 4.16, 4.19, 4.20, 4.29, and many others:
Keep the style of your figures consistent. Use boldface Arial fonts like in Fig. 4.13.
Solution: I am revising all the plots.
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