Comments to MRI text.

1) Section a2 line 3:
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a) There are NO experiments PAC approved that use the mTPC

2) Detector Setup as outlined in figure 1 AND target as in fig. 7
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a) The distance between the downstream face of the solenoid and the
   entrance to the SBS is about 1192mm. The stray fields of the solenoid
   are enormous since it has no return joke and a wide open bore.
   The iron of the SBS will affect the solenoid not just with regards to
   the magnetic field but also forces that act on the superconducting coils
   inside the solenoid. Is the mechanical strength of the suspension of the
   superconducting coils sufficient to handle these forces?

b) Electrons scattered upstream of the center of the target will pass
   through the target and partly through the mTPC in order to reach SBS.
   This is for the desired physics events. Is this an issue for tracking?
   There are many background scattering processes that will generate
   particles entering the mTPC!

c) The effective target length is much more than 40cm according to fig.7
   For a substantial part of the target length recoiling particles will
   have to pass through aluminum or will never enter the mTPC volume at all.

3) mTPC design as in figure 3,4 together with the target figure 7.
---
a) there is no explicit design shown that could constructed to an mTPC.
   The design is conceptually only and does not reflect reality in any way.
   The GEM foils that provide the amplification stages need to be stretched
   and supported on the outside and inside of the barrel. However the
   proposed glass rings have not proper support structure on the inside
   and there are no structure that take the radial forces to maintain
   a stretched foil.

b) A detailed design of the mTPC that will actually work mechanically will
certainly reduce the overall acceptance and most likely will generate
a phi dependence in the acceptance.

c) The proposed readout asks for 2 GEM foil amplification stages. Is this really
sufficient. All such detector systems found in literature have at least 3 to
reach sufficient signal amplifications.

d) caption figure 4 quotes the inner tube to be a 2 micron kapton foil while
figure 7 quotes it to be 12 micron and porous. In both cases these foils
are too weak to provide any mechanical support to the detector.

e) the position resolution is quoted to be about 1.5mm on page 8 second
paragraph. This required neighbouring pads to have a signals and these
signals being recorded in time AND amplitude. Are two pads next to
each other with signals sufficient to achieve that?

4) Expected Rates and Detector Simulations and figure 6
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a) there is a significant discrepancy of the expected rates in this document
and what has been quoted in the proposal C12-15-006 and the approval request.
In this document:
on page 10 a background rate of 71MHz per module is quoted. It is not specified
what causes this rate. In the proposal a 100MHz rate is quoted specifically
coming for recoil protons only and not considering other sources of background.
The resulting mean track multiplicity quoted here is 71 per event while in
the proposal it is 150 per module.

b) the mTPC occupancy per event is not quoted in this document only in the proposal
where it is of the order of 60% or even more! This number is the

main issue that
made the TAC committee really worried and basically renders the detector blind.

c) on page 10 second paragraph it states: "With this cut the expected readout occupancy
level is approximately 14%"
This is difficult to reconcile. The occupancy is given by the readout. The above statement
is applied to the data after the readout applying analysis cuts on the data based on
an algorithm that is described in this second paragraph on page 10 which will not work.

d) The described timing cut (again page 8 second paragraph) only applies after the fact.
Meaning the actual track that coincides with the scattered electron in the SBS has already
been identified. In reality this is of course not the case. Track pass through the mTPC
modules at all angles in all directions giving rise to all possible arrival times of
the drift electrons at the GEM itself. Therefore the timing is not correlated with radius.
In particular for tracks that pass through 2 neighbouring modules.

e) The caption of figure 6 states that this is a simulated event at full luminosity in the
TDIS experiment. However the hit pattern in the left most plot does not reflect the expected
track and hit multiplicity. It is not state how many tracks are really in that plot.

f) The quoted average hit multiplicity expected in an mTPC module is much larger than what
is shown in fig6 on the left. Even with the factor of 2 lower rate quoted here (as compared
to the proposal and the approval request) the occupancy would still be in the order of 30%
to 40%. Therefore this does not represent a fully simulated average event with all hits
in the mTPC.

g) The dotted red line in fig6 left shows the actual recoil proton track associated with the
sought after physics event. This is only possible because it is MC data. In reality this
is not know apriori. An algorithm needs to be developed that does the identification of
the corresponding track with the electron going into the SBS. This

is one of the main
concerns the TAC committee voiced as being non existent. There is not code that allows
the reconstruction AND identification of the recoiling proton track with the forward going
electron in the SBS.

h) The reconstruction efficiency shown in figure 6 is based on MC data using known quantities.
This is of course not possible with real data. In addition the actual efficiency is not
just the track reconstruction but also the identification of the actual recoil proton
that is associated with the scattered electron.

5) Calibration of the mTPC (page 11)

a) In the proposal the calibration of the mTPC using the HCAL, thereby tagging the recoil
neutron, is only suggested as a possibility using the term "maybe".
But in this document it is stated as a fact to be done. But no simulations are done to
show that this method will actually work.

b) The position of the HCAL is proposed to be 15m from the target at around 60 degree, however
no details are provided on how the neutrons are identified and discriminated against the
background that must be very large since the detector is fully open with direct sight to
the target. The signal neutron rate may be low but certainly not the overall detector
rate.

c) The neutron detection efficiency is directly related to the detector readout threshold.
What is the expected neutron detection and identification efficiencies?

6) Gas-Target

a) The entrance and exit windows of the target are much further upstream and downstream
of the thin target cell kapton wall. For a substantial length the recoil protons will
hit the aluminum holding frame and will not be detected adding to

the background due
   to mismatching of the scattered electron with a wrongly assigned track in the mTPC.
   It is about 20% of the total target length.

b) what is the material in the volume between the target cell and the start of the mTPC.
   Is it the same as in the mTPC gas as suggested by the term "porous kapton" for the
   inner radius mTPC wall?

c) In this document the target cell thickness is not given. According to the "approval request"
   calculations were done for 20 to 60 micron thick kapton. What is the thickness required
   to be from a target construction point of view in terms of mechanical stability and gas
   permeability (not just gas getting out but more importantly helium getting in)?