U.S. Department
of Transportation
**Research and
Special Programs
Administration**

400 Seventh St., S.W.
Washington, D.C. 20590

OCT 19 2004

Ref. No. 04-0085

Dr. Gerald P. Jackson
President
Hbar Technologies, LLC
1275 Roosevelt Road, Suite 103
West Chicago, IL 60185

Dear Dr. Jackson:

Thank you for your March 24, 2004 letter regarding the classification of antiprotons under the Hazardous Material Regulations (HMR; 49 CFR parts 171-180). Specifically, you ask whether antiprotons, transported in quantities capable of producing a worst case acute exposure to the public of no more than 2 mrem or 1,000 rem from prompt ionizing radiation, are considered a hazardous material, and if so, which category (hazard class and division) applies. You state that the antiprotons are intrinsically stable and would only emit radiation upon contact with residual gas within the bottle or the walls of the bottle.

Your letter does not provide sufficient information on the hazardous properties of your particular material, the amount of material to be transported, or the manner in which the material is packaged to provide you with specific guidance. Nevertheless, based upon the information you provided, we believe that sufficient quantities of antimatter offered for transportation would meet the defining criteria of a Class 1 (explosive), a Class 7 (radioactive), and perhaps other Class material. For example, a dose of 1,000 rem of prompt ionizing radiation to the public is significantly greater than the defining annual dose criteria for Class 7 (radioactive) material. As with other hazardous materials, we also believe a graded approach based on the quantities of antiprotons and their related possible effects would be appropriate.

We recognize that antimatter is not specifically listed in the HMR and the need for possible future rulemaking on this emerging technology. In order to complete our review of your proposed single transport of antiprotons later this year from the Fermi National Accelerator Laboratory in Batavia, IL to the NASA Marshall Space Flight Center in Huntsville, AL, we have identified the following issues pertaining to your request.

Material

1) Provide information on the material purity as well as the method and accuracy of measuring the quantities of antiprotons proposed to be transported.

2) Provide the quantities of antiprotons that you may desire to transport, based on your evaluation of the information requested in this letter.

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Containment System

3) Describe the antimatter transport bottle, including design features such as materials of construction, barriers, shielding, vacuum system, cryogenics, superconducting magnets, detection systems for loss of design feature functions or annihilation of the antiprotons, and contingency backup systems.

4) Provide information on magnetic fields produced by the bottle system.

5) Describe any other hazardous materials present other than antiprotons, such as helium or other compressed or liquefied gas, batteries, or fuels.

Failure Modes

6) Detail the processes, such as prolonged or rapid loss of vacuum, cryogenics, or electromagnetic containment in the transport bottle, that could cause annihilation of the antiprotons with matter, as well as information on any steady state annihilation.

7) Provide information on any past experience with planned or unplanned stored antiproton annihilation.

Transport

8) Provide details on the truck and any design features, such as shielding or barriers, to be used for the transport.

9) Provide details on any operational controls or contingency planning to be used during transport.

10) Provide details on any personnel or environmental monitoring for hazardous materials to be instituted during transport, such as dosimetry selection for prompt or delayed radiation hazards, including radiation type and energy coverage as well as any applicable accreditation.

Consequences

11) Provide the supporting information for the ionizing radiation exposure determination you provided from antiproton annihilation with matter, specifying contributions from all products and processes, including energies and decay times. Provide information on the total effective dose equivalent, deep dose equivalent, committed effective dose equivalent if any, committed dose equivalent if any, shallow dose equivalent, and lens dose equivalent; and quality factors used. Include contribution from decay chain daughter products. Provide spatial and time data.

12) Provide an analysis of the level of safety of the bottle under normal and accident conditions during transport that could lead to annihilation of the antiprotons with matter.

13) Provide information on possible fission effects caused by antiproton annihilation with matter, such as caused by pions or high-energy gamma rays, on any transuranic and fissile material that may be impacted.

14) Provide information on airborne radioactivity, radioactive material contamination, and induced activation caused by the antiproton annihilation.

15) Your memo provides data for a single prompt dose to the public. Provide the quantity of antiprotons that would cause this dose and the assumptions used. Provide the total, and not just prompt dose, if the total dose is different. Provide estimated total doses to any transport workers and the assumptions, such as distance, utilized. Provide a time and spatial plot of total doses estimated.

16) Provide data on heat generated and the explosive potential of the antiprotons annihilating with matter.

17) Explain the correlation of effects based on the quantity of antiprotons, e.g., linearity, or any phenomena that would cause non-linear or threshold effects based on the quantity of antiprotons.

General

18) Estimate the margin of error in any calculations or experimental data you provide.

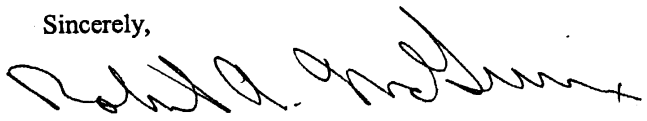
19) Provide references used and details on any computer codes used to provide information relevant to these issues, and any verification and validation performed.

20) Provide details on the credentials and backgrounds of personnel involved in providing information relevant to the issues, including peer reviewers.

21) Provide any test data that substantiates calculated data, or of any physical testing that is planned to be conducted to corroborate any calculated data.

Should you have further questions on this matter, please contact Mr. Jim Williams, Office of Hazardous Materials Technology, (202) 366-4545.

Sincerely,



Robert A. McGuire
Associate Administrator for
Hazardous Material Safety

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March 24, 2004

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Robert A. McGuire
Associate Administrator DHM-1
Office of Hazardous Materials Safety
Research & Special Programs Administration
U.S. Department of Transportation
400 Seventh Street, SW
Washington, DC 20590-0001

Dear Mr. McGuire,

On April 9, 2004 Hbar Technologies will drive down to the NASA Marshall Space Flight Center (MSFC) in Huntsville, AL to pick up an empty antiproton transport bottle and deliver it to our corporate offices in West Chicago, IL. At the conclusion of several more months of preparations, we anticipate delivering antiprotons via truck back to MSFC near the end of this calendar year. The quantity of antiprotons is sufficiently low that a worst-case accident would not expose the public to any more than a single acute dose of 2 mrem of prompt ionizing radiation.

As I pointed out in my briefing several weeks ago, we plan to increase the quantity of delivered antiprotons over the next few years. Ultimately, the state-of-the-art portable antiproton bottle built by NASA can hold a sufficient number of antiprotons to expose the public, under worst-case accident conditions, to a single acute dose of 1000 rem of prompt ionizing radiation.

Does the transport of antiprotons, at quantities capable of producing a worst-case acute exposure of less than 2 mrem, fall under the definition of a hazardous material? If so, which category (class and division) of hazard do antiprotons fall under?

Clearly, quantities of antiprotons capable of producing a worst-case exposure of 1000 rem do represent a hazard to the public. Given that the antiprotons are intrinsically stable and only emit radiation upon contact with residual gas within the transport bottle or the walls of the bottle, are antiprotons in this quantity considered a hazardous material? If so, which category (class and division) of hazard do antiprotons fall under? What are the relevant regulations to which we should adhere?

Thank You for your attention in this matter.

Sincerely,

Dr. Gerald P. Jackson

Dr. Gerald P. Jackson
President & Co-Founder

P.S. Thank You for the outstanding hospitality during my visit to your administration. I was impressed with the enthusiasm, knowledge, and professionalism of your staff. Especially notable was James Williams, who has been tremendously helpful and proactive. It is too bad that most taxpayers do not have the opportunity to see this positive example of the federal government at work.