NRL Anechoic Chamber Absorber Replacement and Modifications

The Naval Research Laboratory is requesting quotes to procure new absorber and its installation for an existing anechoic chamber. The chamber will be upgraded and repurposed to function as a Far-Field chamber and a cylindrical Near-Field antenna system measurement facility at one end of the chamber. The absorber currently in place will have to be removed and replaced with a new RF absorber with a new absorber configuration within the existing chamber. Two modifications to the anechoic chamber room will have to be made prior to installation of the new absorber. Specific sections of steel used for the chaff chamber equipment will have to be removed and modified. The new large aluminum filler panel that contains a single door to the chamber will need to be fabricated to meet new requirements.

Quotes for this procurement must include the cost of removing and disposing of the current absorber, selection of the new absorber design, preparation of chamber surfaces, and installation of the new absorber. The quotes will also include the costs for removing the some of the steel components from the floor and also the design, fabrication and installation of new filler panel with a single door to replace the current filler panel that has two swinging doors. The work will be performed at the Naval Research Laboratory facility located at 4555 Overlook Avenue, SW, Washington, DC 20375. NRL will provide temporary storage as needed for the procurement installation.

1. Anechoic Chamber Information

The anechoic chamber is located on the second floor of Building 210, Room 2334. The inside chamber dimensions are: 49 feet long x 15 feet high x 16 feet wide with the RF absorber removed. The height dimension does not include a one foot subfloor which holds the absorber one foot off the floor and cannot be removed for most of the chamber floor. Placing absorber down into the subfloor in the area around the large door can be done to provide improved RF performance if necessary.

Prospective contractors may request a visit to view the chamber. The original chaff chamber blueprint document for the absorber design is provided by the government can be found at the end of this RFQ. Figures 1 and 2 below are photographs of the current anechoic chamber.

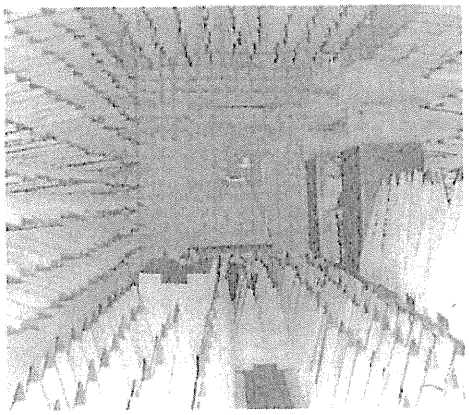

Figure 1: Looking toward the instrumentation room (East) end of the chamber. The picture shows the location of the far-field measurement antenna and the video camera at the top right. Additionally, the instrumentation room is behind the wall.

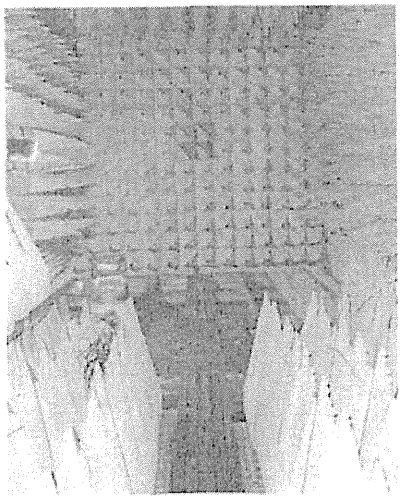

Figure 2: Looking toward the West end of the chamber, the end where the scanner will be installed.

In addition to the original blueprints, the following block diagram (Figure 3) shows a basic concept location of the Near-Field and Far-Field equipment within the chamber. It illustrates the cylindrical Near-Field equipment required and how it will fit into the current anechoic chaff chamber.

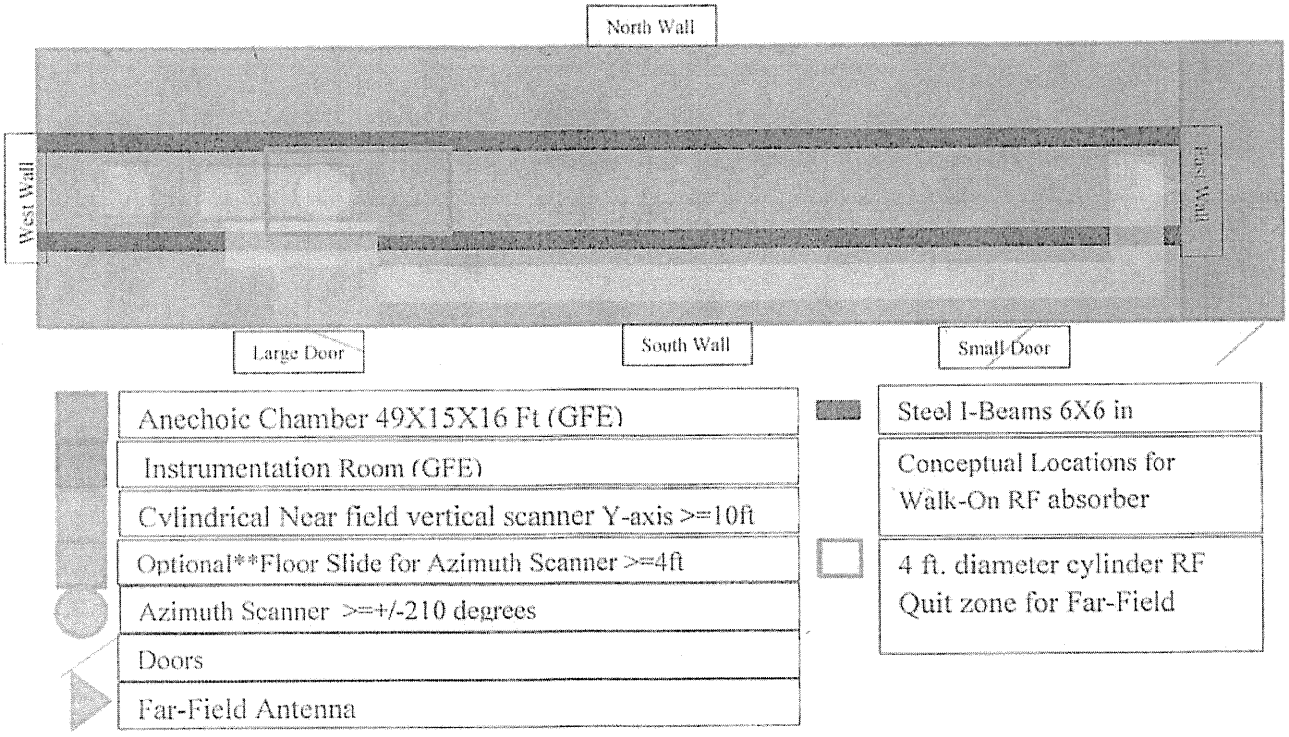

Figure 3: Basic Concept for Equipment Location

2. Specific Chamber Absorber Replacement Requirements

The replacement of the absorber will require selection of a new absorber that will be configured to optimize the performance of the Cylindrical Near-Field System Antenna Scanner at one end of the chamber and the Far-Field Antenna Scanner that will use most of the entire length of the chamber. Based on the new Far- and Near-Field applications of the chamber, the proposals shall include the selection of absorber that will optimize applications performance of the chamber and also meet the requirements listed below. Proposals should document a set of absorber configuration drawings that show the arrangement of absorber sections on the walls, ceiling, and floor. Specifications for each type of absorber used within the chamber should be included with the drawing.

2.1 The RF reflectivity of the absorber shall be at least -50 dB down over the frequency range from 6 to 40 GHz.

2.2 The absorber shall handle power density of no less than 1.0 Watt /in^2.

2.3 For the Far-Field antenna scanner the RF absorber design in the chamber shall be optimized for a 4 ft. diameter cylindrical RF Quiet Zone that is 12 feet long and is centered over the azimuth scanner in the floor plan above (Figure 3.)

2.4 The absorber shall be no thicker than *18 inches (see Note) on the North Wall, South Wall, Ceiling and Floor that are within 15 feet of the cylindrical near-field scanner. This will allow for thicker absorber to optimize the Far-Field chamber performance. See Example in Figure 4. (*Note: The requirement of 18 inches may be reduced to 12 inches if the 6 inch reduction in absorber thickness has negligible effect on overall chamber RF performance, from 6 to 18 GHz for RF reflectivity and RF power handling density capacity.)

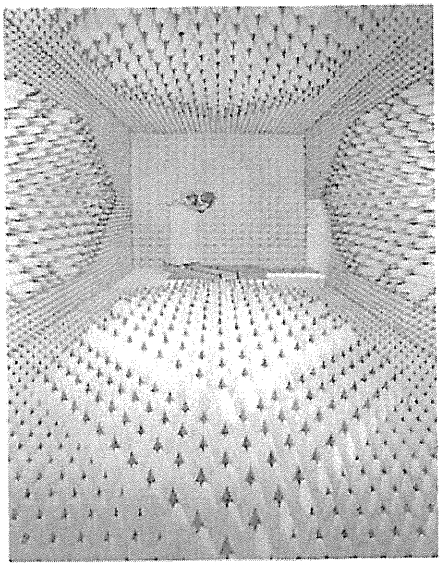

Figure 4: Example of absorber design.

2.5 Requirements are based on the current design of the chamber documented on the floor plan above (Figure 3) and in the original blueprints. (See attached GFI.) The blueprints show the current configuration for the walls, ceiling and floor for reference. The current opening on the West Wall will no longer be required.

2.5.1 East Wall

a) The absorber shall contain an opening for Far-Field equipments.
b) The absorber shall be installed around the fixed camera and housing that is mounted to the wall.

2.5.2 North Wall

a) The absorber shall be installed to allow the two air supply vents to function.

2.5.3 South Wall

a) The absorber shall be installed to allow the lights to operate.
b) The small light next to the large door shall be removed.
c) The absorber shall be installed to allow the air return vent to function properly.
d) The absorber shall be installed to allow the large and small doors to open and close.
e) The absorber on and around the large door shall be selected for increasing absorber abrasion durability. The increase shall be allowed only if the abrasion resistance absorber can be shown to have a negligible effect on overall chamber RF performance, from 6 to 18 GHz for RF reflectivity and RF power density handling capacity.
f) The access door design shall be modified to allow 18 inch absorber to be installed on the door providing an opening with dimensions of 32 inches wide by 82 inches high minimum, without touching the absorber when the door is opened/closed.
g) The access door design shall be modified to optimize the RF performance of the absorber on the floor and around the door opening. This will include options such as raising the bottom of the door opening, or lowering the absorber down into the subfloor around the door to achieve optimum performance.

2.5.4 Ceiling

a) The absorber shall be installed around fire detection and suppression components in a manner that allows sufficient clearance, based on best practice standards and fire codes. Cutouts with exposed metal and extension pipes will require care with absorber wrapped around them. Contractors should be in compliance with accepted standards and may request a visit to view the chamber.
b) The National Fire Protection Agency (NFPA) has published documentation that provides standards and guidance for proper installation. (Reference NFPA Standard 2001, revised.) NFPA document "Clean Agent Fire Extinguishing Systems" recommends 360 degree clearance around the chamber nozzles that discharge certain fire suppression agents.
c) Baltimore Fire Protection & Equipment (BFPE) offers products, service, inspection and testing services. They are another recommended reference for fire protection standards.

2.5.5 Floor

a) The absorber shall be installed around the Near-Field scanner.
b) The installation shall contain walk-on absorber from the large door to the azimuth scanner.
c) The installation shall contain walk-on absorber extending from the large door and ending at the East Wall, just below the opening for the Far-Field equipment in the East Wall.

2.6 Specified portions of the steel subfloor left over from the chaff chamber equipment shall be removed prior to installation of the new absorber. The three cross beams between two main beams are required to be removed. The pictures in Figure 5 show specific sections of the floor to be removed that are outlined in red. Figure 5A includes an arrow pointing to the cross-beams to be removed from between the two main beams.

Cross beams to be removed

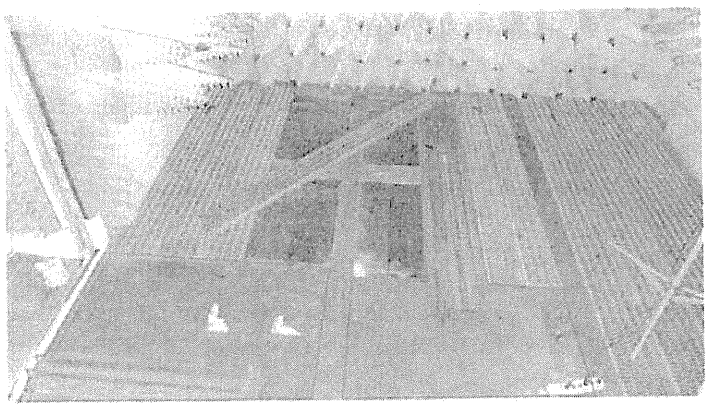

Figure 5A: Red outline indicates the steel to be removed on Subfloor. The three cross beams are below the arrow

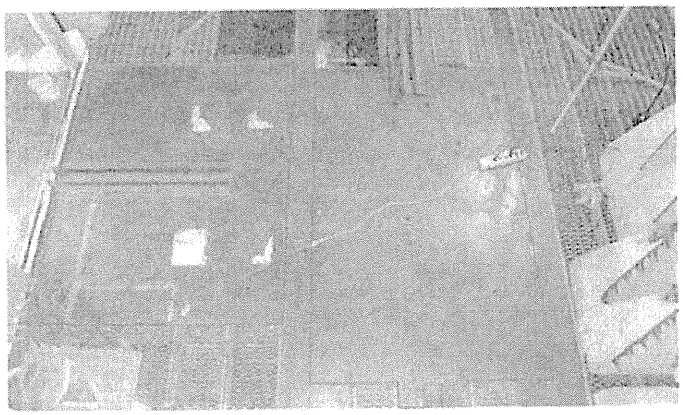

Figure 5B: Red outline indicates the steel to be removed on Subfloor.

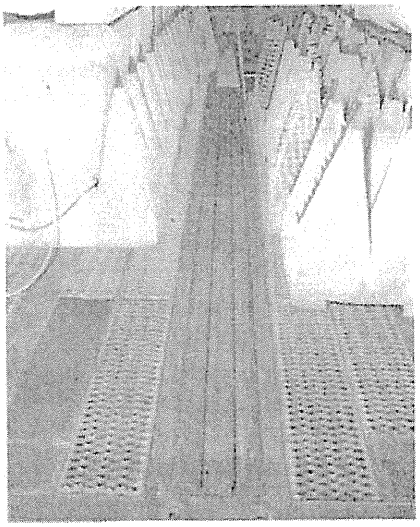

Figure 5C: Red outline indicates the steel to be removed on Subfloor.

2.7 Filler Panel and Large Chamber Door

A new filler panel with a single swinging door to access the chamber shall be fabricated to replace the existing large door filler panel, which has two swinging doors. The new filler panel will be held in place the same way as the current filler panel, by two bolts on each side of the filler panel that slip into slots on the chamber door. See a picture of the current filler panel in Figure 6 below.

Figure 6: Picture of current large door filler with dual swinging doors to be replaced.

The new large door filler panel shall be made of aluminum and shall be strong enough to support the RF absorber on the inside of the panel and access door. A conceptual drawing of the new large door filter panel with the single door is shown in Figure 7 below. The access door in the drawing will swing out with hinges at the center of the filler panel. Outside dimensions of the large door panel in the diagram are accurate, but the size and placement for the swinging door

within the filler panel will need to be modified for the selected RF absorber that is installed on the door and panel. The hinge depth distance from the inside wall to the pivot point of the hinge will have to be only 1.5 inches to make sure the RF Absorber does not hit the fire safety sliding door when the swinging door is all the way open.

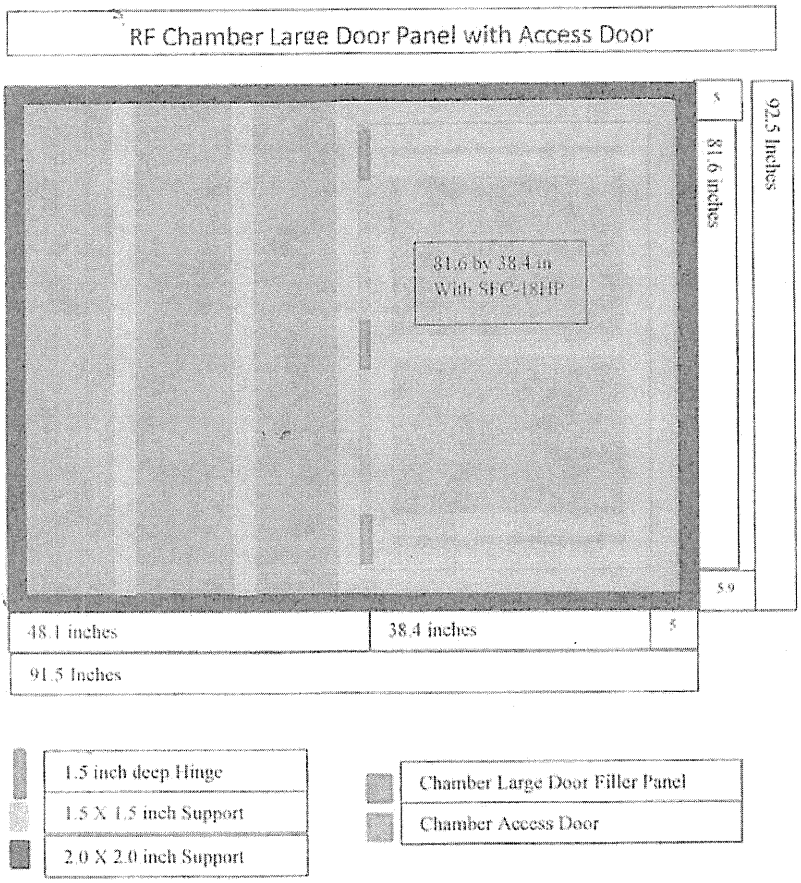

Figure 7: Conceptual drawing of large door filler panel single swinging door.

3. Pricing Information for Submitted Procurement Quotation

Quotations submitted for this procurement shall include costs for the following as line items:

3.1 Cost for removal of RF absorber, cleaning adhesive from the walls and floor, and disposal of the material.
3.2 Cost for removal and disposal of the steel on the subfloor and other steel materials.
3.3 Cost for fabrication and installation of the new large door filler panel with a single swinging access door.
3.4 Cost for providing detailed drawings of the types of absorbers installed in the chamber.
3.5 Cost for installation of absorber on the walls, floor and ceiling, including removal of the scraps from the space under the subfloor.
3.6 Cost of 30 square feet of extra walk-on absorber that is used on the floor, and also one replacement set of any custom made walk-on absorber with in the chamber.

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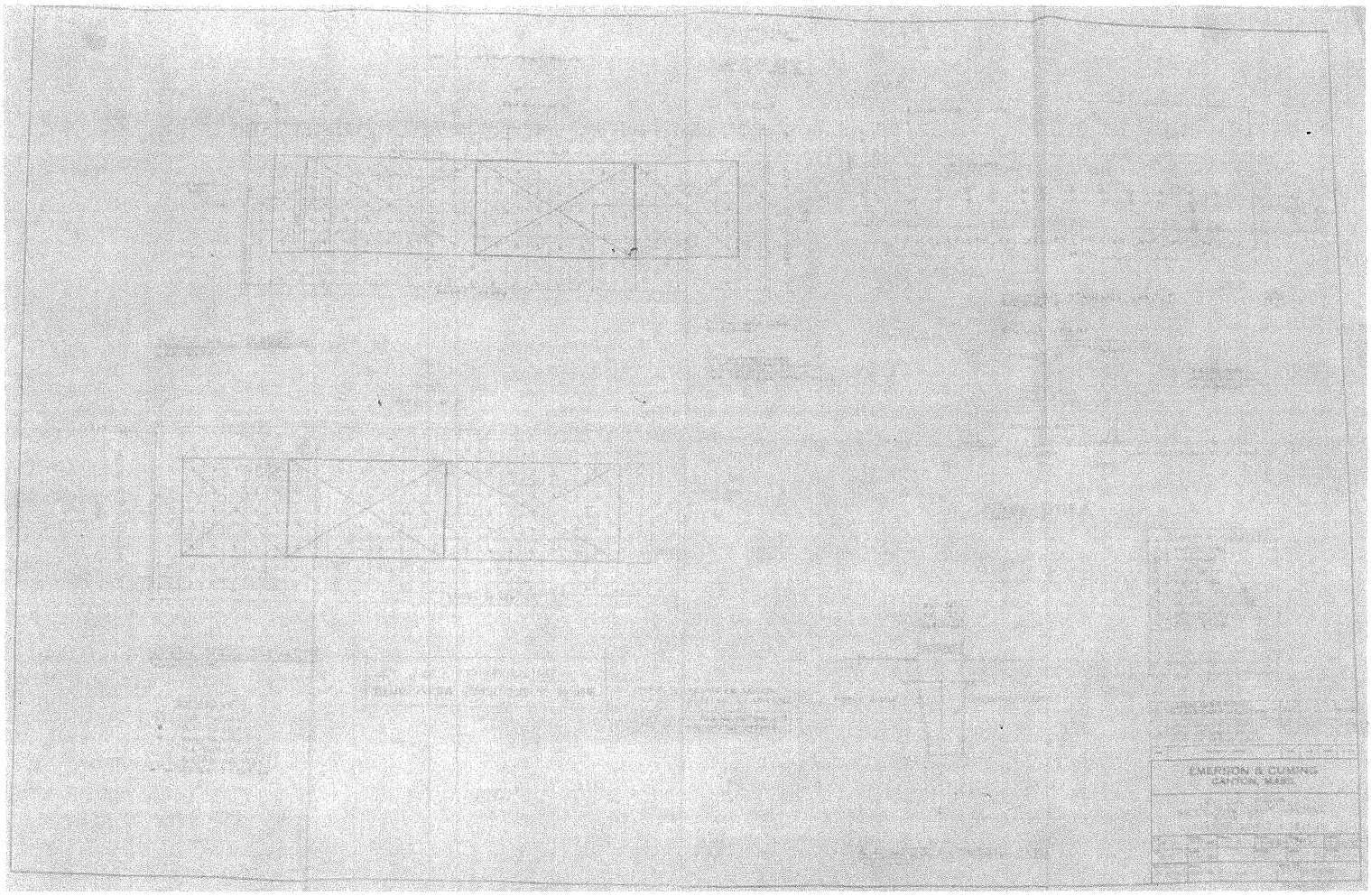

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