Towards a bytran utility mobile lidar (BUM-LIDAR)

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ABSTRACT

An ultra compact bytran utility mobile platform (BUMP) with a low power consumption/design cost DAQ system is described towards the goal of developing a dually mobile lidar. A tilt and elevate equipped Permobil C500 power wheelchair base with 265 lb (120 kg) weight capacity and 200 lb (90 kg) estimated payload is used in combination with a Rollx Vans handicapped-accessible 2015 Chrysler Town & Country minivan as lidar utility vehicles. The minivan is equipped with a 115V/150W outlet, a sunroof with 13" x 24" (33 x 60 cm) opening, an automated in-floor ramp with a kneeling capability and retractable tie-downs. Van rooftop allows installation of solar panels up to 20 sqft (1.85 m^2). The wheelchair base is equipped with a 10U rack and an 18"x30"x0.5" (45.7 x 76.2 x 1.25 cm) aluminum breadboard for lidar optics and electronics with additional room for a telescope. Up to 45° slant sensing geometries are possible using wheelchair tilt. Modified rack mount compact 1.5U Openscape Branch 500i enclosure is used. A full size 2U Athena Power RM-2U251 (R/L) is available. The data system is based on AlazarTech ATS9462 16-bit 180 MS/s PCIe digitizer with a possible addition of a 14-bit 100MS/s NI PCI-5122. Currently using SUPoX/Biostar A5545MX7 and 12-24V DC powered Advantech AIMB-275 motherboards. Long range Alfa Network WiFi equipment is provided. Possible remote wheelchair driving from the van using R-Net Input/Output Module is being evaluated. Custom lidar data processing and visualization software is planned. BUMP is suitable for atmospheric or hard target lidar as well as in-situ systems and could be useful for the detection of adverse residential signatures using scientific grade testing equipment.

Keywords: Permobil, power wheelchair, wheelchair minivan, LIDAR, mobile platform, data acquisition, tilt, slant path

1. INTRODUCTION

Mobile lidar and other remote sensing systems are commonly built with reserve space and power consumption capacity which is often excessive to the remote sensing task at hand.

Significant reductions in the system size and power consumption of a mobile lidar system may be achieved by selecting components already optimized for size / power consumption and performance and which are also just large and powerful enough for a target remote sensing application and desired detection range. The reduction of a mobile lidar system size also allows bringing the size of the transport vehicle down leaving more room for the creation of a system with a higher degree of mobility.

In this paper we suggest the possibility and illustrate advantages of using a handicapped accessible vehicle in combination with a power wheelchair base for scientific research applications including LIDAR. An example dually mobile system called the "bytran utility mobile platform" (BUMP) based on the Rollx Vans handicapped-accessible 2015 Chrysler Town & Country minivan and a Permobil C500 power wheelchair base is described.

The BUMP may become useful for molecular and hard target LIDAR systems, in-situ measurements as well as other uses including the detection of adverse residential signatures negatively affecting the human body. An unusual and controversial example of adverse residential signatures observed at a multi-storey apartment complex research cite in Hampton, Virginia, 23666 is presented being a candidate for future studies using the BUMP.

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2. POWER WHEELCHAIR

2.1 Overview

There is a number of different power wheelchair manufacturers,[1] Permobil being one of them. Permobil[2] was recently acquired by an investor which resulted in a significant improvement in the quality of Permobil and expanded its presence. Comparing 2010 Permobil C500, the 2017 Permobil F5, and 2022 Permobil F5 indicates that the recent improvements introduced in the Permobil Power wheelchairs make them suitable for scientific applications.

2.2 Permobil C500 power wheelchair being modified

The Permobil C500[3] used in this study is a power wheelchair equipped with a 45° tilt and 8" (20 cm) elevator. The C500 is rated at a maximum load of 265lb, more recent F5 models are rated at a maximum load capacity of 300lb which has been increased to 330lb since June of 2022. The width of Permobil C500 base is 25" (63.5 cm) and the length measuring from the front small rocker wheels to back wheels is 41" (104 cm) moving forward or 38.5" (98 cm) moving backwards depending on how the back wheels are rotated. The C500 is equipped with separate shock absorbers on large front wheels while the two back wheels have a single shock absorber spring. More recent Permobil F5 models include separate shock absorbers on all wheels.

Figure 1. Photos of 2010 Permobil C500 with the seat removed to be used in this study (left) next to a 2017 Permobil F5 (right).

Fig. 1 shows Permobil C500 next to a newer F5 model. The C500 wheelchair frame shown on the left in Fig. 1 is to be equipped with an equipment rack and an aluminum optical breadboard for use in the current study.

3. HANDICAPPED-ACCESSIBLE MINIVAN

3.1 Overview

Handicapped accessible minivans are very convenient to use and have a lot of potential for applications beyond transportation of disabled people. There are a number of companies in the United States[4] and abroad[5] specializing in modifications to make minivans handicapped accessible. However the added cost related to modifications such as the addition of the ramp are substantial making handicapped accessible minivans a luxury for most people who are not disabled. Handicapped accessible minivans are available in the rear and side entry configurations[4] with manual or motorized ramps in in-floor or foldable configurations and may have one or more sunroofs depending on the trim level of the base vehicle being modified.

Figure 2. Photos of the 2015 handicapped-accessible Chrysler Town & Country minivan modified by Rollx Vans used in this study showing the motorized ramp, the cargo area (for the power wheelchair base), and the automated sunroof.

3.2 Rollx Vans modified 2015 Chrysler Town & Country (Limited Platinum) Minivan

The handicapped-accessible minivan used in this study is a 2015 Chrysler Town & Country (Limited Platinum) minivan modified by Rollx Vans[6] is shown in Fig. 2. The van has potential for the transportation of two remote sensing systems: **(1)** One system permanently attached inside of the van under the sunroof, and **(2)** The second remote sensing system mounted onto the Permobil base for a dually mobile design.

3.2.1 Automated ramp with kneeling capability

The van is equipped with an automated in-floor side entry ramp with a kneeling capability which can be used to quickly and conveniently move the scientific equipment in and out of the van. The kneeling capability allows lowering the ramp side of the minivan using built-in automated suspension lifts when the ramp is retracted to reduce the angle between the ramp, the road surface and the floor of the minivan.

3.2.2 Retractable tie-downs

As can be seen from Fig. 2 the van has 4 retractable tie-downs allowing fast and easy securing of the cargo such as the Permobil C500 wheelchair base with the attached equipment inside of the van for transportation.

3.2.3 Automated sunroof

The van further contains an automated sunroof with 13" x 24" (33 x 60 cm) opening located above the front row driver and passenger seats as shown in Fig 2 (right bottom figure). As can be seen, a telescope for a lidar system may be installed under the sunroof if the front passenger seat is removed. The rectangular shape of the sunroof makes slant path sensing geometry possible.

An installation of 2 telescopes side-by-side might be possible but would require a retractable design where the driver sit is moved back and the telescope is positioned under the sunroof.

3.2.4 Cargo space dimensions

The width of the automatic ramp is 30" (76 cm), the space available inside of the van cargo area is around 66" x 52" (167 x 132 cm), the width of the back seat row being around 39" (99 cm).

3.2.5 Emergency power source

The minivan is equipped with a 115V/150W outlet providing an emergency power source.

3.2.6 Possible installation of solar panels

The minivan rooftop allows installation of solar panels up to 20 sqft (1.85 m^2) capable of delivering an estimated maximum power of 400 kWh.

4. DATA ACQUISITION SYSTEM, REMOTE CONTROL AND ELECTRONICS

4.1 Computer

A computer system to be used on a power wheelchair base would preferably be small in size, power efficient, fast, lightweight, and be powered by 12V or 24V. The power efficiency is significantly affected by the processor used, as such the use of embedded motherboards containing a processor meant for mobile use would be preferable. This section will provide an overview of the computer system options evaluated in this study.

4.2 Industrial motherboard

The features desirable for a motherboard to be used on a Permobil base are the **(1)** 12V or 24V input power, **(2)** Presence of at least one full size x16 ePCI slot **(3)** ePCI bifurcation support (one x16 to two x8) split allowing 2 cards to be connected to one ePCI slot,[7] **(4)** small form factor and **(5)** low power consumption.

After evaluating several inexpensive SoC motherboard options described in the next section we elected for the use of an industrial motherboard instead.

For the current application the use of industrial small form factor (Mini-ITX) motherboards is useful. Besides the small form factor, a lot of industrial motherboards accept 12V or 24V input power which is suitable for lead acid batteries used in cars and power wheelchairs. This eliminates the need for an extra power supply/adapter leading to lower power losses and resulting in a smaller size and weight DAQ system. Some motherboards also support a PCIe bifurcation meaning they allow "splitting out" a PCIe x16 port into two x8 ports or four x4 ports making it possible to attach a larger number of PCIe peripheral devices and acquisition data cards. PCIe bifurcation also allows building a smaller size DAQ system by using enclosures with vertical PCIe card extension slots like the ones mentioned further in this study. Such motherboards typically provide a lot of options for the connection of external hardware and are offered by a number of manufacturers including Advantech, AAEON, Kontron, and GIGAIPC (Ref. 8–11). The industrial motherboards more often deploy desktop processors resulting in a slightly higher (around 35W if low power versions (T) of the desktop processors are used) power consumption compared to the mobile processors. A more thorough search may be performed in the future for an industrial motherboard with a low power mobile style processor.

As such, the industrial motherboard acquired to be initially used with the Permobil base is an Advantech AIMB-275[12] equipped with an i7-6700T processor.[13]

4.3 Computer enclosures

Two types of computer enclosures were selected for the installation onto the Permobil base: **(1)** Modified rack mount compact 1.5U Openscape Branch 500i and **(2)** a 2U Athena Power RM-2U251 (R/L).

The 1.5U OpenScape Branch 500i[14] is a Voice-over-IP server based on the Advantech SYS-2USM03-6M01E server. The enclosure from this server was selected to be used on the Permobil base with the following modifications: **(1)** the motherboard was replaced, **(2)** Enclosure fans are to be replaced with Noctua NF-A6x25 PWM,[15] **(3)** The back of the case is being modified to accept a standard size motherboard shield plate. A smaller size 1.5U OpenScape Branch 50i[14] enclosure was also considered but not used due to high weight attributed to bulkier mounting hardware.

The 2U Athena Power RM-2U251L[16] or RM-2U251R[17] was selected as a full size enclosure to be used for more demanding applications. Originally the RM-2U251L was purchased. The difference between the RM-2U251L and RM-2U251R is in the replaceable PCIe expansion slot card back plate which was purchased separately for the RM-2U251R variant. The PCIe cards back plate is a Vertical Low-Profile x7 for RM-2U251L, and a Horizontal Full-Height x3 for RM-2U251R.

4.4 Data acquisition cards

The data acquisition system is based on AlazarTech ATS9462 data acquisition card. Two ATS9462 cards are available. Originally NI PCI-5122[18] (which uses and older PCI interface and is now obsolete) was being considered for repair and further use but this option was later put on hold once the AlazarTech ATS9462 cards became available. If the NI PCI-5122 is eventually restored it may be used for cross comparisons with the AlazarTech ATS9462.

4.5 Remote control

The anticipated remote control option for BUMP (i.e. controlling the wheelchair base from the minivan or other location) will use the R-Net Input/Output Module (IOM)[19] SK78814/1 by PG Drives Technology (now owned by Curtiss-Wright) mounted on the Permobil base and connected to a computer. The ultimate goal is to enable remote control of both the driving functions of the wheelchair base as well as of the measurement equipment installed onto it.

Figure 3. Main components to be used to assemble remote control stations.

Two portable remote control stations are being assembled - **(1)** one to be used by a data collection scientist, and **(2)** the second station to be used for BUMP remote driving if necessary. Selected components to be used for the remote control stations are depicted in Fig. 3. The portable remote control stations are based on a Dell E-Flat Panel Stand[20] which can be modified to be used with a Fujitsu Lifebook U748[21] attached to a matching Fujitsu docking station[22] or the Dell OptiPlex 5070 Micro desktop equipped with a low power i7-9700T processor[23] and bundled with a 24" or 27" monitor and a Logitech T-BB18 wired USB TrackMan Trackball Mouse. The advantage of the fujitsu Lifebook laptops is low weight and a larger number of connection ports than in most modern laptops. An alternative based on Dell OptiPlex 5070 Micro desktop is dictated by the small form factor, and a more capable low power i7-9700T processor. The OptiPlex 5070 also has an external power supply allowing connection to a 12V power supply through a 12V-to-19.5V adapter.[24] One or both stations may be additionally equipped with a control(s) for easier remote driving.

4.6 WIFI EQUIPMENT

The long range WiFi equipment currently available and being evaluated to be used with BUMP includes the following Alfa Network[25] WiFi equipment:
1) 2.4GHz USB WiFi adapters:[26] AWUS036NH, AWUS036NHRv2,[27]
2) Dual band (2.4GHz and 5GHz) USB WiFi adapters:[28] WUS036ACHM, AWUS036ACH.
3) Routers[29] accepting specific Alfa WiFi USB adapters: R36A, R36AH, and AIP-W525HU.[30]
4) High power AIP-W525H[31] Class B long-range AP/Router (with a stated WiFi signal output power 4 - 6 times higher[32,33] than that of conventional routers).
5) Standard and directional APA-M04[34] antennas.
6) Antenna magnetic base[35] mounts and an extension cable.

4.7 VOIP PHONE

The minivan is being equipped with a low cost VOiP phone service based on VoIP.ms.[36] The analog telephone adapters currently being considered to be used in the van for VoIP service include the Grandstream HT812,[37] Grandstream HT802[38] as well as the discontinued Cisco SPA122[39] or Cisco SPA112.[40] Possible future use of an analog telephone adapter with the DECT[41] capability is being considered.

5. ALTERNATIVE COMPUTER SYSTEM SOLUTIONS CONSIDERED

5.1 SoC Motherboards

The SoC motherboards are frequently used for embedded applications. They are more customizable and have a lot of I/O ports compared to laptops. The additional power reduction in SoC motherboards is due to the use of processors typically installed in laptops which are less power hungry than their desktop counterparts. As such the use of a SoC motherboard to be installed on a Permobil base has benefits. Despite all the benefits the drawback of SoC motherboards is that they often require a standard computer power supply while the Permobil base is powered by two 12V batteries. And unfortunately the availability of new SoC motherboards with modern processors has significantly declined.[42]

5.2 SUPoX/Biostar A5545MX7 motherboard

One of the motherboards evaluated in this study is an older SUPoX/Biostar A5545MX7[43] equipped with a SOC A8-5545M processor with 19W thermal design power. Besides the low thermal design power this motherboard was chosen for evaluation because it is relatively recent, is able to run Windows 10 operating system with acceptable speed and has a legacy PCI slot for the connection of older data acquisition cards such as the NI-PCI5122.[18] There are a couple more similar A5200MX7 and J3160MX7 motherboards by SUPoX with a legacy PCI slot which could be used as an alternative.[44]

5.3 Dell motherboards

Dell Inspiron 3655[45,46] and Dell Inspiron 3656[47] desktop motherboards with a soldered in processor were evaluated due to their extra low cost and the low power processors used.

The Inspiron 3655 motherboard equipped with A4-7210 APU is powered by a 19.5V output laptop style power supply and contains a single ePCI x1 slot which is only sufficient for the most basic ePCI data acquisition cards (i.e. AlazarTech ATS1946[48]). The thermal design power of the A4-7210 APU is stated as 65W at the AMD website[49] which is different from the 25W reported in Ref. 50,51. In addition the power supply to be used with Dell Inspiron 3655[45] has a maximum rating of 65W which is unlikely for a motherboard[46] equipped with a 65W TDP processor. Upon contacting AMD however we were reassured that the 65W value for A4-7210 APU reported at their website[49] is correct.

The Dell Inspiron 3656[47] equipped with an AMD FX-8800P APU has two ePCI slots (x1 and x16) permitting the connection of more advanced data acquisition cards (i.e. AlazarTech ATS9146[48]) but is powered by a standard computer power supply making it non-optimal for use on the Permobil base.

5.4 Use of laptops

It should be possible, though this has not been confirmed, to connect an ePCI x1 (i.e. Ref. 48) data acquisition card to a laptop through a miniPCIe (mPCIe) slot by means of a miniPCIe to PCIe 1X adapter, or to connect an ePCI x4 data card (i.e. Ref. 52) using a NGFF M.2 to PCIe 4X converter. Some laptops have multiple miniPCIe or M.2 sockets, such as the Fujitsu Lifebook U748 or an older Sony VAIO SVS131G21L.

6. POTENTIAL USE FOR LIDAR AND IN-SITU MEASUREMENTS

The C500 Power wheelchair could be potentially used for an atmospheric LIDAR[53,54] in the future as illustrated in Fig. 4. At the time of this writing the optical breadboard and the equipment rack are not yet mounted onto the wheelchair base. In the initial implementation the equipment rack will be made out of a modified aluminum server open frame rack by Raising Electronics model CR6N24-7001[55] which needs to be shortened to the correct length. In the implementation sought all optical components (including the laser and the telescope) are mounted on the Permobil seat frame and tilted together for a slant path geometry. The server rack mount is not meant to be used in a tilted geometry, however it is anticipated that the C500 frame back rest support which is left intact (as can be seen from Fig. 4) will provide the required support to the attached hardware when tilted. If the laser used with a remote sensing system requires a refrigeration unit, it would not be mounted onto the wheelchair frame.

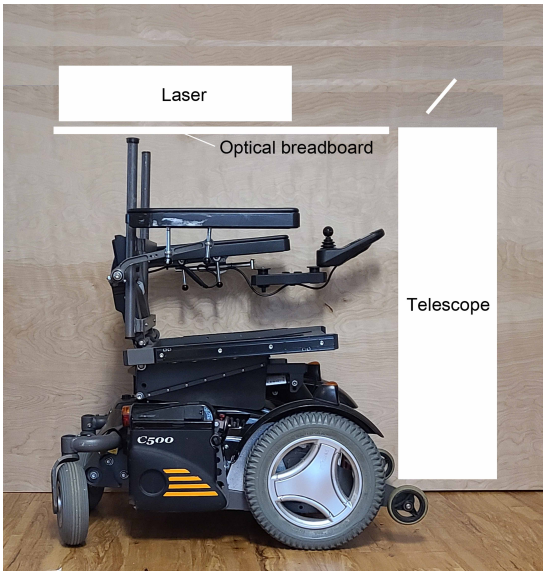

Figure 4. Illustration of Permobil C500 potential use for atmospheric LIDAR.

The application of the wheelchair base could also be adapted for the transport of spectroscopic and testing equipment, as well as for hard target remote sensing systems such as those using remote laser induced breakdown spectroscopy.[56]

7. POTENTIAL USE FOR THE DETECTION OF ADVERSE RESIDENTIAL SIGNATURES

7.1 General description

The information presented in this section is based on a single personal account of observations made by a person who has been exposed to a set of unidentified adverse signatures at a multi-storey residential site in Hampton, Virginia, 23666 for a period of over 1 year. Every effort was made to ensure the information provided in this section is accurate but is provided as is.

The affected person lives on the first floor and has experienced a number of negative effects in the body most of which appear to target the spinal cord and the brain.

The observations made by the affected person suggest that the adverse signatures reported in this section may include manipulation of a form of matter capable of binding to and penetrating the human body including the capability to interface with the brain and the spinal cord, and transmit data. The application of the adverse signatures appears to mostly be done when the body remains still such as during sleep or work. The adverse signatures described in this section caused the affected person severe discomfort and as such it is speculated that they could be used as what could be thought of as "untraceable" residential warfare systems.

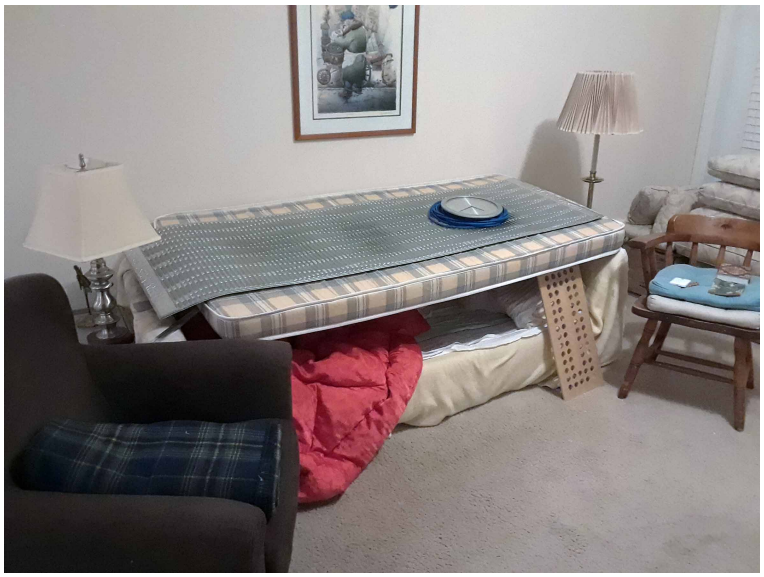

Figure 5. A "covered sleeping area" assembled based on a sofa frame with a foam mattress cover.

The adverse effects experienced at the research site are attributed in part to the presence of some type of equipment believed to be operated by residents occupying the apartment above the one the affected person resides in. Such assumption was formed due to a number of observations including sounds resembling relocation of heavy objects to the locations frequently occupied by the affected person and footstep sounds of being followed around.

The realization of the adverse effects being related to some equipment operated one floor above came as a result of an experience where the affected person would feel some type of pulses repeatedly hitting the head early morning while still trying to stay asleep. The person would try to relocate multiple times by using a foam mattress placed on the floor but the pulses continued until after the person in question moved his head to under the frame of the country chair (shown on the right in Fig.5) which appeared to be blocking the pulses hitting that person's head.

Fig. 5 illustrates the first covered sleeping area subsequently set up by the affected person by removing the pillows from a couch and placing a twin foam mattress over the sofa frame. As can be seen, the structure of this kind is enclosed at all sides with the exception of the front side and a small subsection at the top (due to the smaller length of the mattress). If a Twin XL was used, it would have covered the sofa frame completely at the top. Most of the types of negative effects experienced and reported in this section were first felt within this first "covered sleeping area". The adverse effects felt included vibrations in the neck and head area as well as other parts of the body, different pulses hitting the head and neck, something that felt like continuous radiation as well as some activity in the feet and legs later referred to in this paper as "feet wrap".

While the structure in Fig. 5. showed some shielding effectiveness initially it soon proved to be insufficient which is thought to be attributed to the improvements implemented by the residents of the apartment above to bypass the shielding implemented by the affected person. Several shielding additions were implemented mostly

at the head area such as the placement of different higher density household objects (an example shown in Fig. 5 includes an extension cord with a clock placed around the head area) which showed limited effectiveness.

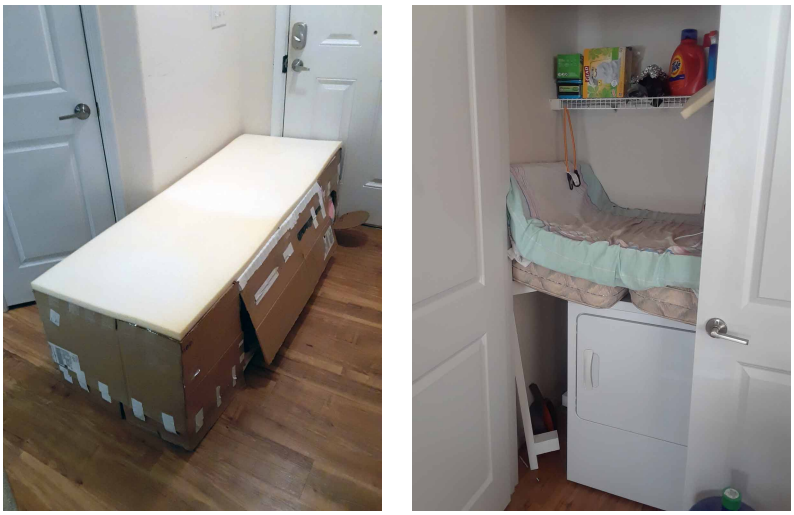

Figure 6. Two "covered sleeping areas" assembled based on a card box located at the entrance and in the laundry room.

Following the initial "covered sleeping area" design of Fig. 5, a number of shielding schemes and relocation of the bed was tested. Examples of the configurations tested the longest include the "covered sleeping area" in a card box next to the entrance (left photo in Fig. 6) with different shielding materials used as cover including foam, aluminum foil, and wood. The configuration shown in left photo in Fig. 6 proved to have limited effectiveness.

Another attempt for a new shielding scheme was moving the "sleeping area" to the laundry room by placing the foam mattress over the washer and dryer. This approach was attempted assuming the difficulties in placing equipment directly above the affected person and due to the enclosed design of the laundry room. While initially very effective, the laundry room design was eventually discontinued. However it uncovered several aspects of the technique being used to target the affected person. It was realized that the adverse processing begins with a test pulse of unknown type which could be clearly felt including the direction of propagation when the intensity of the test pulse is high. After relocating into the laundry room the affected person experienced an intense test pulse which could be felt as propagating into the laundry room mainly though the vertical slit between the sliding doors. After relocating to the laundry room the affected person started experiencing intense perspiration and skin burning sensation which is believed to have been caused by electromagnetic radiation such as of a microwave type. The assumption of the use of electromagnetic radiation was supported by placing aluminum foil reflectors around the upper portion of the affected person's body which increased the severity of the burning sensation to the skin. The electromagnetic radiation also appeared to affect the body by reflecting from the surface of the washing machine.

The laundry room test suggested that the true shielding effectiveness could only be achieved if large surface area continuous sheets of materials were used. As such a new covered sleeping area was assembled as shown in Fig. 7. In this configuration one of the main approaches tested included the use of a 3 layer top shielding material consisting of 4 feet x 8 feet sheets of a 1/4" birch plywood, a 2" FOAMULAR NGX[57] Insulation, and a layer of 2 stacked 8 foot x 25.75 inch corrugated galvanized steel roof panels (manufactured by Gibraltar item number 13513)[58] as shown in Fig. 7. As can be seen from Fig. 7 the sleeping surface was made out of plywood material and was elevated from the ground. Originally a foam mattress placed on the floor was used as a sleeping surface. However it was found that one of the adverse effects which exhibits itself as spatially distributed vibrations in different parts of the body was substantially reduced if the bed surface was made out of thicker and denser materials and when the bed surface was raised up higher from the ground to form a gap between the floor and the sleeping surface. Eventually this sleeping area configuration was discontinued as it did not provide a consistent shielding experience.

Figure 7. A "covered sleeping area" assembled in the corner of the bedroom (both corner walls are facing the street).

The next covered sleeping area configuration attempted is shown in Fig. 8 and uses the same 3 layer top cover as the one described in reference to Fig. 7 but only placed over the bed in such a way as to reduce the gap between the bed surface and the shielding cover to the minimum necessary. In particular the gap between the bed surface and the shielding cover was narrower in the feet than in the shoulders and head area. Sleeping directly under the shielding sheets (without support) was also attempted and had some effectiveness. As can be seen from Fig. 8, there is a metal plate in the head of the bed which was added in response to the perception of something penetrating the spinal cord down from the top of the head and believed to have been related to the illumination of the body from the direction of the back wall. A conclusion was made that some equipment may have been installed in the closest unit(s) of the adjacent buildings within the apartment complex.

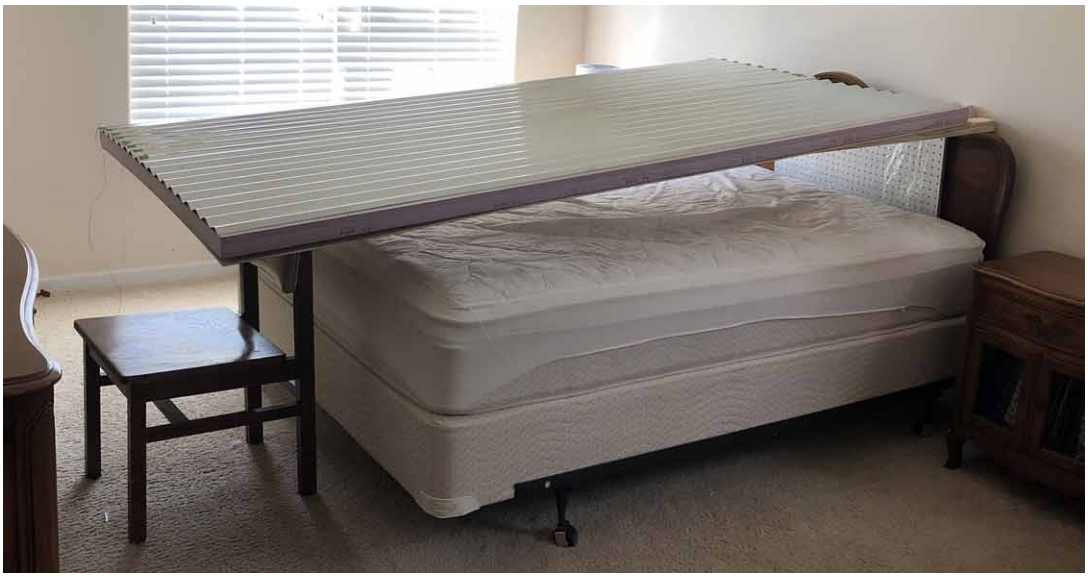

Figure 8. Bed shielding scheme tested.

The configurations tested mentioned so far led to the following conclusions. The most effective bed configuration is thought to be the "capacitor" configuration where the bed is protected at the bottom the same way as it is protected at the top (i.e. using a combination of metal and thick dense materials). The use of metallic only shielding (although only relatively thin metal was used) did not prove to be sufficient which could be because some adverse signature types resembled a form matter as opposed to radiation based on the way it was felt by the body. The most effective and convenient to use bed configuration would probably be the "couch style" configuration (all sides covered with one side open) with the sleeping surface elevated from the ground as in Fig.

5 with a continuous large surface area top cover like the ones used in Fig. 7 and 8.

The "sleeping area" configurations tested showed that the relocation and shielding reduced the negative effects initially but worsens again after several days. The author attributes this to the adjustments (relocation of the equipment, using a large number of units or their combination etc.) made by the personnel operating equipment generating adverse signatures.

The experiments with the sleeping area setups also demonstrate that the techniques used to apply adverse signatures do not require a direct line-of sight access and can propagate behind obstacles.

Figure 9. Dead zone spot example

Subsequently the affected person moved his sleeping location to the van described in this study. At first the van was placed in the parking lot next to the apartment the affected person lives in. However once the negative influence got worse again several days later the van was moved to one of the most remote spots within the apartment complex which did cause a further reduction in the strength of the negative effects but did not completely eliminate it. Further shielding tests of the van appear effective and are being experimented with.

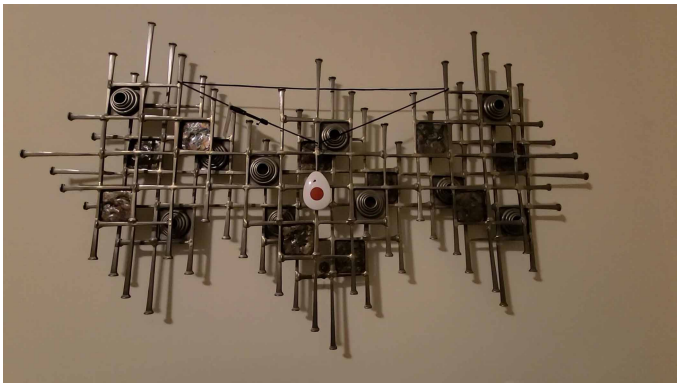

Figure 10. Decoration located at the research site apartment exhibiting vibration induced sounds. Corresponds to Video 1. http://dx.doi.org/doi.number.goes.here

It should be pointed out that recently the affected person also reported feeling negative effects at remote locations in other states including in a rural area (although the effects felt at a remote location did not include

all the types of adverse signatures observed at the Hampton Research cite). As such it is the conclusion of the author that the adverse methods described in this submission can also be induced at a substantial distance including using some type of an areal vehicle or a satellite.

It was found that there exists a "dead zone spot" next to the fridge above the counter the toaster oven is placed on where a lot of the negative effects observed had reduced strength (Fig. 9).

A wall decoration (Fig. 10) in the apartment where the affected person lives was observed to exhibit vibrational sounds over a course of about one week (the clicking sound in the corresponding video is due to the latex gloves worn by the person taking the video). This effect was only observed once for about a week in over a year hanging on the wall. Within two days of first noticing the vibrational sound from the wall decoration the microwave in the apartment malfunctioned and "went up in smoke". It is unclear if these events were caused by a common cause and whether they are related to the adverse signatures observed at the site.

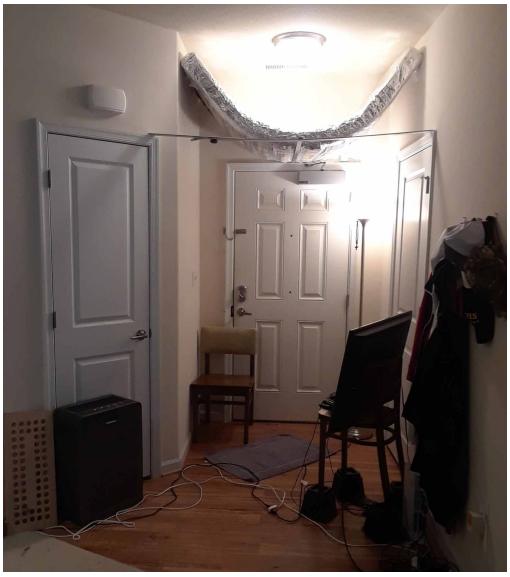

Figure 11. Foam mattress reflector with an aluminum foil cover set up under the dome light above the apartment entrance door.

At some point a foam mattress covered with foil was installed under the dome light at the apartment entrance where the affected person lives (Fig. 11) in an attempt to shield from what is believed to be some type of equipment installed one floor above responsible for generating adverse signatures. Based on the observations and the sounds heard from the apartment upstairs the following appears to be true: (1) The dome light reflector configuration seemed to create a problem for how and what was being used at the floor above to negatively affect the person in question, an (2) on a given day shortly after the the mattress was covered with aluminum foil the residents of the unit upstairs could not leave the apartment until after the foam mattress was taken down.

7.2 Remote sensing pulse

The tests described in the section 7.1 above indicate that the adverse signature manipulations with the human body are preceded with a remote sensing pulse of an unidentified physical type. Based on the perception, the remote sensing pulse can be initiated in various points of space including in direct proximity to the human body and may have variable intensity. Less intense pulses are used when some prior knowledge of the tested environment is available and the pulse can be generated closer to the area of interest (human body). The direction of propagation of the test pulses can be felt when the intensity in high enough. For example, when the configuration in Fig. 7 was first implemented the propagation of the remote sensing pulse could be felt as propagating along the walls of the room to under the foam mattress to "hit" the body upwards from under the mattress placed on the floor. Based on the way the testing pulse is perceived, it starts with a high intensity

with an origin at a location remote to the human body to be affected followed by repeat pulses usually with lower intensity. It is possible that the testing pulses are able to perform sensing within the human body i.e. by being initiated inside of the body close to the location of desired application of adverse signatures. No sure way of shielding from the testing pulse has been found but it was determined that the use of high density materials having a tight contact with the skin have some effectiveness. The part of the body most frequently affected by the testing pulse is the neck area and the spinal cord region.

7.3 Adverse signature types

Several adverse signature types were identified as described below which are usually used when a person is asleep probably due to the lack of movement during sleep compared to when the person is awake. It should be pointed out that the adverse signatures appeared to usually be used in combination with each other. The successfully application of adverse signatures caused the affected person the perception of some matter penetrate or attach to the neck and head area as well as weird dreams and hearing music being played while asleep.

7.3.1 Vibrating cloud (submersion)

Description: This type of signature is felt as a submersion into a "vibrating cloud" which is usually felt in the neck and head area but may also span larger areas including a full body submersion. According to the physical perception, the areas covered by a vibrating cloud may be customized i.e. a thin sheet of a vibrating cloud may be created along the top surface of the bed the targeted person sleeps on. Prolonged submersion to the vibrating cloud usually results in the onset of concentrated spot in the spinal cord area which frequently will manifest itself in unpleasant physical effects accompanied by playing of different music tunes and unnatural and weird dreams.
Protection methods: (1) Sleeping without a t-shirt, i.e. leaving the upper body naked and uncovered by clothing. This approach will not remote the vibrating cloud effect but should reduce the effectiveness in the creation and the onset of the concentrated spot in the spinal cord thus preventing the saturation effect and making the "connection to the brain" much less effective **(2)** Relocating to a different area if possible **(3)** "Capacitor bed configuration" described above was found to have some effectiveness against this type of signature. It was found that in addition to shielding the bed above using thicker and denser uniform materials (i.e thick plywood, metals etc.) shielding the sleeping surface resulted in the reduction of the vibrating cloud effects. It is preferable that the materials used are uniform as opposed to consisting of several smaller sheets. In addition the "behavior" of the vibrating cloud is such as if it was concentrated closer to the floor (thus having similarity to fog) with the possibility of being configured to be lifted up by some means (i.e. supposedly by the equipment placed above the sleeping area one floor above or some other adjacent buildings). Raising the sleeping surface to a higher elevation was found somewhat effective in the reduction of the "vibrating cloud" effects.

7.3.2 Implantation

Description: The personal perception for this type of a signature suggests the possibility of creating by some means of custom shape 3D objects at locations adjacent to the human body to be affected (i.e. in air surrounding the human body). With a subsequent possibility of propelling such 3D objects (in transnational or rotational motion) into the human body. The areas frequently targeted by this signature type is the back of the neck (spinal cord region) and/or the joints (i.e knees, hip joints, shoulders, wrist and hand joints), or the stomach. The author assumes that the preference of the joints is dictated by the lack of muscular coverage allowing easier access to the nervous system. The 3D objects implanted using this method may feel as small or large objects not limited by the size of the joints (i.e. the whole body implant). If this technique is used the affected person would feel some object being moved into the body "out of thin air".
Protection methods: Protection with dense conducting materials with grounding terminals. May be difficult to implement technologically and inconvenient to use including during sleep.

7.3.3 Pulsed injection

Description:
It appears that this category of adverse effects may consist of a number of different methods used which have not been differentiated between as of yet. What unites adverse signatures in this category is they are felt as an intense pulse (or strike, shot) usually delivered to the head or neck area which then quickly propagates to the

target area such as the spinal cord and results in the perception of stiffness in the affected regions and a feeling of something being bound to the human tissue in that region. Pulsed injection appears to be the technique used to directly affect the targeted body region.
Protection methods: (1) Sleeping without a t-shirt (probably due to skin surface cover and conductivity), i.e. leaving the upper body naked and uncovered by clothing.**(2)** Grounded conductive terminals tightly attached to the skin surface adjacent to the area being affected by this type of signature, (3) Use of chemical or swim goggles enclosing the air in the vicinity of the eyes.

7.3.4 Feet wrap

Description: Is perceived as a type of "liquid energy" circulating and wrapping around the feet. Frequently felt when going to sleep. Experiments suggest that this signature can only be applied by equipment placed above the affected area (i.e. one floor above in a multi-storey building). It is assumed that the feet are used as an entrance point for further propagation to other body parts. The choice of feet may have to do with easier admission due to the extremities resembling a branch of a tree.
Protection methods: (1) Covering feet with a metal oval oven roaster while asleep (Fig. 12). (2) Using bed shielding as in Fig. 7 and 8.

Figure 12. Oval oven roaster.

7.3.5 Continuous radiation

Description: This signature is felt as a beam of numbing radiation resulting in distributed stiffness in the affected region. It may be possible that this mode pertains to the application of the same matter as the Pulse injection described in section 7.3.3 above but only in a continuous distributed manner. It seems that this signature is mainly used when no other methods seem to work.
Protection methods: Shielding with thick dense materials (i.e. made of metal).

It should be pointed out that the excessive sweating was observed quite frequently at selected parts of the body such as the neck or the sides of the torso facing up until after the protective sheets of materials were installed above the sleeping area (as in Fig. 7 and 8).

One of the methods affecting the body appears to include a combination of a vibration cloud and a pulse. If the vibrating cloud is felt it most likely means that the negative processing of the body would be succesful if the person falls a sleep at such a location.

7.3.6 Beam of low frequency vibrations

Description: Felt as passing through a beam of low frequency vibration.
Protection methods: Ear plugs.

7.4 Personal protective equipment

This section describes some of the "personal protective equipment" found to be somewhat effective against the adverse signatures described in Section 7.3 above.

Figure 13. Examples of personal protective equipment found to have some effectiveness against adverse signatures.

7.4.1 Chemical goggles, swim goggles etc.

The use of chemical goggles appears to reduce the negative influence by the Pulsed injection, as well as (in some cases) the extreme stiffness in the neck caused by one or more methods described preciously. May also be useful when the adverse signatures cause high pitched ringing in the ears. Tighter air seal of the region adjacent to the eyes increases effectiveness.

7.4.2 Grounded conductive terminals

The use of metals and grounded terminals (Fig. 13 and 14) proved to be very effective. This protection method frequently resulted in intense perspiration in the targeted skin area (skin area where adverse signature is felt to be applied to first such is the neck).

7.4.3 Neck brace

The use of a neck brace, though very uncomfortable, proved to be somewhat useful in shielding from the pulses targeting the neck area. Only one brand of a neck brace by ComfyMed was tested however.

8. AFTERWORD

The author is aware of two accounts from scientists working in the US and living alone who stated noticing some people following them around accompanied by seeing weird dreams at night. The initial reaction to reports like that is usually the assumption of a medical condition. If you are in the United States and seem to have noticed being followed especially if those following you are dressed in bright or distinctive colors and it is not for safety reasons, and/or if you experience life circumstances that bear resemblance to events described in Ref. 59, 60 and/or depicted in Ref. 61, the author recommends visiting an Orthodox Church and taking a look at Appendix A.

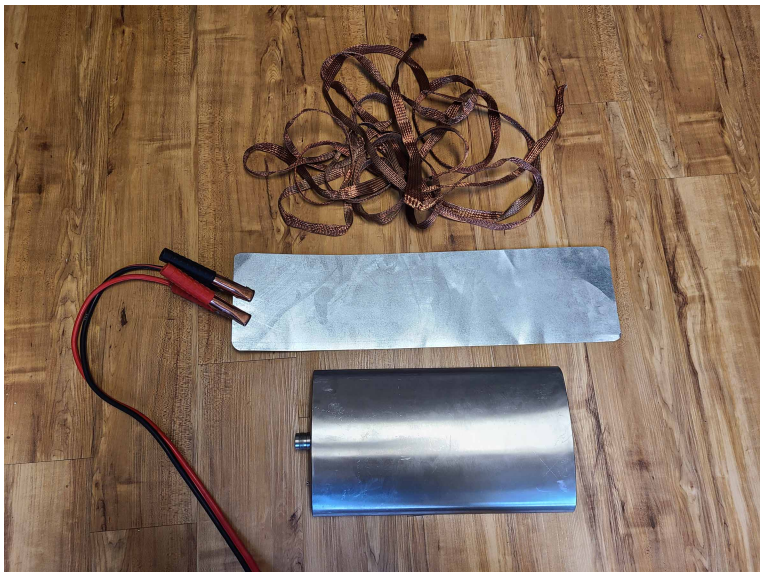

Figure 14. Widely available components which could be used for body grounding purposes.

APPENDIX A. ORTHODOX CHRISTIAN SCHEDULE SUGGESTED DURING SEVERE EXPOSURE TO ADVERSE EFFECTS DESCRIBED IN SECTION 7

Reading one Kathisma of Psalter (including prayers for the commemoration of the living and the dead), followed by 150 Hail Mary[62] prayers with "Belt-low bow with touching earth by a hand"[63] after each time the Hail Mary is read, followed by one more Kathisma of Psalter (including prayers for the commemoration of the living and the dead).

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