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Whole-body Vibration Assessment of the Palletized Load System

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July 1994

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Fort Rucker, Alabama 36362-0577

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An evaluation of all new tactical vehicles and aircraft is required to assess potential whole-body vibration (WBV) health hazards to crewmembers. As requested by the U.S. Army Environmental Hygiene Agency, a health hazard assessment (HHA) was performed by the U.S. Army Aeromedical Research Laboratory (USAARL) on the Palletized Load System (PLS) truck. The PLS was tested on five cross-country courses at Aberdeen Proving Ground, MD, by the U.S. Army Combat Systems Test Activity in coordination with the Response and Tolerance Branch of USAARL. The PLS was tested with speeds ranging from 3 to 20 mph. The results of these tests show that, for the worst-case scenario for each course, the lowest tolerances for WBV were on course 5. Less severe WBV occurred on courses 1 and 3, which had near equal tolerances, followed by course 4. Finally, the highest tolerances for WBV exposure were on course 2. The results also show that both driver and passenger were exposed to a Hazard Severity-Category III (marginal), with a Hazard Probability-Level C (occasional). The overall Risk Assessment Code (RAC) was 3. This indicates the PLS does not present a significant health risk to its crewmembers.

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Introduction

All new tactical vehicles and aircraft are required to be evaluated for potential whole-body vibration (WBV) health hazards to their crewmembers. This requirement is contained in AR 40-10, "Health hazard assessment program in support of the Army materiel acquisition decision process." In support of this program, the U.S. Army Aeromedical Research Laboratory (USAARL) was requested by the U.S. Army Environmental Hygiene Agency (USAEHA) to perform a Health Hazard Assessment (HHA) on the Palletized Load System (PLS) Truck.*

The PLS, shown in Figure 1, is a family of all wheel drive (10X10) vehicles and trailers that are equipped with material handling equipment. The PLS vehicles are designated as follows: the M1074 truck (with a crane), the M1075 truck (without a crane), the M1076 trailer and the M1077 flatrack. The PLS is capable of attaining a maximum speed of 90.1 km/h and has a range of 362 km.

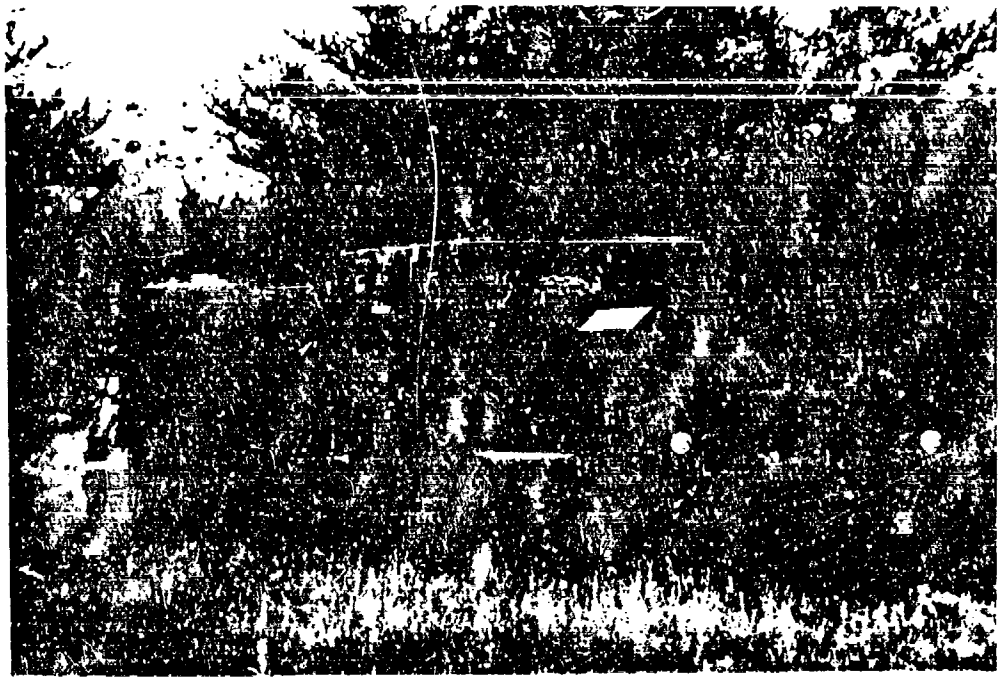

Figure 1. Palletized Load System Truck.

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* See list of manufacturers.

The PLS truck is a Kenworth diesel tractor with a stakebed body equipped with the M1077 cargo "flatrack" in lieu of a fixed truck bed. The trucks have a load capacity of 16.5 tons of payload mounted on the flatrack; the truck also can tow an M1076 trailer loaded with an additional 16.5 tons of flatrack cargo. The flatrack can be lowered to the ground behind the vehicle by the driver in the cab using a unique hydraulic system which allows a 16.5-ton flatrack to be loaded or unloaded from the cab in less than 1 minute.

The unique loading/unloading capabilities of the PLS provide a significant reduction in the time required for the issue of cargo. Because of this capability, PLS vehicles are employed by artillery transportation units for the supply and resupply of ammunition. As such, the PLS will be employed primarily over cross-country terrain, where vehicle load, speed, and terrain define the conditions for measuring WBV signatures.

The methods for measuring and analyzing WBV are found in the International Organization for Standardization's (ISO) guideline entitled "Guide for the evaluation of human exposure to whole-body vibration (ISO 2631)." ISO 2631 is reflected in MIL-STD-1472D, "Human engineering design criteria for military systems, equipment and facilities." The relative severity of the processed WBV signatures are interpreted using the Risk Assessment Codes (RAC) found in AR 40-10. These publications, as a set, define the criteria used in evaluating the WBV signatures of the PLS.

ISO 2631 identifies three criteria for the evaluation of human exposure to WBV which can be described in terms of intensity, frequency, direction, and duration. These criteria are the preservation of comfort, the preservation of working efficiency, and the preservation of health or safety. They are known formally as the reduced comfort boundary (RCB), fatigue-decreased proficiency boundary (FDPB), and the exposure limit (EL), respectively.

The RACs, as described in Appendix B of AR 40-10, require the classification of a health hazard according to its severity and probability. Processing vibration signatures using ISO-2631 results in measurements of vibration severity, but does not yield a measure of the probability of occurrence. RACs are obtained by combining vibration severity with the probability that the test condition will occur in a real life scenario. For vibration, RACs would be determined for each vibration amplitude for each direction and frequency.

Methods

Whole-body vibration data for the PLS truck were collected at Aberdeen Proving Ground (APG), Maryland, by Waterways Experiment Station (WES) in coordination with the U.S. Army Combat Systems Test Activity (USACSTA) and then sent to the Response and Tolerance Branch of USAARL for evaluation. A test matrix was developed that represented the planned operating environment of the PLS truck with respect to terrain type and vehicle speed (Table 1).

Experimental conditions

The PLS truck was tested over five cross-country test courses in a loaded configuration for WBV assessment. These courses are part of the APG test track facilities. Paved road terrains were not tested since the WBV tolerance results typically are higher than those of cross-country terrains. Exact characterizations of the cross country-surfaces can be obtained from APG (U.S. Army Human Engineering Laboratory, 1991).

Table 1.

Test matrix for WBV testing of the PLS truck.

	Cross-country				
Speed (mph)	Course #1	Course #2	Course #3	Course #4	Course #5
3					X
5	X	X	X	X	X
6					X
7					X
8				X	
9				X	
10	X	X	X	X	
13	X	X		X	
14	X				
15	X		X		
18			X		
20			X		

The PLS truck was tested using vehicle speeds ranging from 3 to 20 mph. Specific vehicle speeds were selected to mirror likely employment scenarios for each cross-country terrain test track. On course 1, the PLS truck was tested at five speeds: 5, 10, 13, 14, and 15 mph. Course 2 test speeds were 5, 10, and 13 mph. On the third course, the PLS was tested at five speeds: 5, 10, 15, 18, and 20 mph. Test speeds were 5, 8, 9, 10, and 13 mph on the fourth course. Finally, the PLS was tested on course 5 at 3, 5, 6, and 7 mph.

Instrumentation

Seat accelerations were obtained in the Z-axis (vertical) for the driver and passenger seats of the PLS using the WES hybrid ride meter. The ride meter captured acceleration signals using a microprocessor controlled analog-to-digital (A/D) converter, digital input/output controller, and memory. This system was connected to four Z-axis aligned accelerometers with two of the accelerometers fixed to the passenger and driver seat pads, and two of the accelerometers fixed to the M1 hull underneath each seat. The accelerometer signals were weighted and integrated by the WES hybrid ride meter and then digitized by the A/D converter. Processed data was stored in digital format on an IBM lap-top computer. A more detailed characterization of the instrumentation (U.S. Army Corps of Engineers, 1987) can be obtained from Instrumentation Services Division, Waterways Experiment Station, Vicksburg, Mississippi 39180-0631.

Analysis

Single-axis seat pad vibration data were processed using the methods prescribed in ISO 2631 for broadband signals using third-octave analysis with weighting. Digitized acceleration signals from the z-axis from both the driver and passenger seat pad accelerometers were read into a Dolch* model 486 portable computer. A USAARL-developed automated analysis program was used to produce tabular and graphic plots of the acceleration data. These plots (Appendix B) were used to identify vibration exposure limits which occurred under projected normal daily operating conditions.

The RACs require classification of the health hazard according to the hazard severity and probability. Since the ISO 2631 standard does not use RACs, the severity of the hazard may be reasonably estimated from worst-case exposure before the onset of ELs for each vibration frequency and direction. An indicator which may be used for the assessment of hazard severity is the duration of safe exposure (DSE). The DSE is defined as the length of time a person can be exposed to WBV before reaching the

health and safety exposure limit (HSEL). Thus, a long DSE indicates tolerable WBV, whereas a short DSE indicates severe WBV. In order to translate the DSEs to RACs, Table 2 was used to define the category (I-IV) of exposure.

Table 2.

Hazard severity classification.

Attribute	Category	WBV duration of safe exposure
Catastrophic	I	Less than 5 minutes
Critical	II	Between 5 and 30 minutes
Marginal	III	Between 30 minutes and 4 hours
Negligible	IV	More than 4 hours

Hazard severity categories are defined as:

Category I - Catastrophic: Hazard may cause death or total loss of a bodily system.

Category II - Critical: Hazard may cause severe bodily injury, severe occupational illness, or major damage to a bodily system.

Category III - Marginal: Hazard may cause minor bodily injury, minor occupational illness, or minor damage to a bodily system.

Category IV - Negligible: Hazard would cause less than minor bodily injury, minor occupational illness, or minor bodily system damage.

The operational environments of the PLS truck determine the likelihood of occurrence, or probability level, of exposure to WBV. These levels, identified as levels A through E in AR 40-10, with their corresponding operating conditions relevant to the WBV signatures in the PLS truck, are listed in Table 3.

Operating the PLS over cross-country terrains represents the primary portion of its mission, therefore, each cross-country course was assigned a hazard probability level according to the likelihood of actual occurrence. The assignment of the levels was based on the severity of the track terrain and the range of test speeds. The PLS was tested only for its primary operating

scenario (cross-country) with no other terrains considered in the final determination of RAC.

Table 3.

Hazard probability classification.

Attribute	Level	Road/terrain type, operating speed
Frequent	A	Cross-country, course 3, 5-15 mph; course 1, 5 mph and under
Probable	B	Cross-country, course 1, 10-13 mph; course 2, 5-13 mph; course 4, 5-10 mph;
Occasional	C	Cross-country, course 1, 14-15 mph; course 3, 18-20 mph; course 4, 13 mph
Remote	D	Cross-country, course 5, 5-7 mph
Improbable	E	Conditions not likely to occur

Hazard severity categories and levels used to find the RACs for each test condition. Using Table 4, the RACs are found at the intersection of the hazard category and hazard probability level. The overall RAC is then determined by weighting the individual RACs according to the percent of mission time represented by the test run, and then averaging and rounding to produce a final RAC.

Table 4.

RAC determination.

Hazard category	Hazard probability levels				
	A	B	C	D	E
I	1	1	1	2	3
II	1	1	2	3	4
III	2	3	3	4	5
IV	3	5	5	5	5

Results

The duration of exposure (in hours) necessary to reach the HSEL was calculated for all 46 data sets for Z-axis acceleration. Since the PLS truck mission requires 10 hours of operation over cross-country terrain, the exposure times of less than 10 hours were flagged for assessment.

The RAC categories and levels for each test course were determined using Tables 2 and 3. The hazard categories and hazard probability levels were combined for each test condition using Table 4. The resulting data are shown in Tables 5 and 6 for driver and passenger, respectively. These results are listed in order of DSE for each test condition. The DSE is determined from the time required to reach the HSEL (Appendix B) according to ISO-2631. The RAC is a measure of the hazard severity of the test condition and is based on the DSE, course terrain, and speed.

The worst-case exposure limits for the cross-country test courses were determined from each test's lowest DSE. The worst case DSEs for course 1 indicate that exposure to WBV be limited to 2.1 hours. Course 2 exposure time is limited to 4 hours of WBV. The exposure limit for WBV for course 3 was determined to be 2 hours. WBV exposure is limited to no more than 2.25 hours for course 4. Finally, the exposure limit for course 5 indicates that WBV exposure be restricted to 1.4 hours.

The DSEs below 10 hours ranged from a low of 1.433 and 1.6 hours and a high of 9.4 and 8.767 hours for driver and passenger, respectively. The hazard severity was assigned to each condition according to the DSE. These categories consistently were either marginal or negligible for both passenger and driver. With the combination of marginal or negligible hazard severity and exposure probabilities ranging from A to E, the RACs were calculated to be predominantly 3s and 5s for both driver and passenger.

As can be seen from Tables 5 and 6, the majority of the frequencies at which the exposure limits were reached were at 2 Hz. In the case of the driver's seat, approximately 82 percent of the HSELs that were below 10 hours occurred at a frequency of 2 Hz, which is outside the range of whole-body resonance frequencies (4 to 8 Hz). About 18 percent of the HSELs below 10 hours for the driver's seat occurred at the edge of whole-body resonance at 4 Hz. This pattern was similar for the passenger's seat with approximately 78 percent of HSELs below 10 hours occurring at 2 Hz and about 11 percent occurring at 4 Hz.

Table 5.

Driver seat HSEL for times of less than 10 hours with respect to Z-axis, vibration frequency, vehicle speed, and test course.

Determination of RAC category				Determination of RAC level				Overall RAC
DSE	Hz	Hazard severity	RAC category	Test course	Speed (MPH)	Exposure probability	RAC level	
1.433	2	Marginal	III	5	7	Remote	D	4
1.9	2	Marginal	III	5	6	Remote	D	4
1.95	2	Marginal	III	3	20	Frequent	A	2
2.117	2	Marginal	III	1	15	Probable	B	3
2.167	2	Marginal	III	1	14	Probable	B	3
2.25	2	Marginal	III	4	8	Occasional	C	3
2.283	4	Marginal	III	3	18	Frequent	A	2
2.583	4	Marginal	III	4	13	Occasional	C	3
3.983	2	Marginal	III	2	13	Occasional	C	3
4.1	2	Negligible	IV	4	9	Occasional	C	5
4.15	2	Negligible	IV	1	10	Probable	B	5
4.367	2	Negligible	IV	2	5	Occasional	C	5
4.517	2	Negligible	IV	4	5	Occasional	C	5
5.567	2	Negligible	IV	2	10	Occasional	C	5
5.85	2	Negligible	IV	1	13	Probable	B	5
6.067	2	Negligible	IV	5	5	Remote	D	5
9.4	4	Negligible	IV	4	10	Occasional	C	5

Table 6.

Passenger seat HSEL for times of less than 10 hours with respect to Z-axis, vibration frequency, vehicle speed, and test course.

Determination of RAC category				Determination of RAC level				Overall RAC
DSE	Hz	Hazard severity	RAC category	Test course	Speed (MPH)	Exposure probability	RAC level	
1.6	2	Marginal	III	5	7	Remote	D	4
1.783	2	Marginal	III	3	20	Frequent	A	2
2.133	1	Marginal	III	5	6	Remote	D	4
2.217	2	Marginal	III	1	15	Probable	B	3
2.35	2	Marginal	III	1	14	Probable	B	3
2.55	4	Marginal	III	4	13	Occasional	C	3
2.617	2	Marginal	III	3	18	Frequent	A	2
2.783	2	Marginal	III	4	8	Occasional	C	3
3.817	2	Marginal	III	1	10	Probable	B	3
4.1	2	Negligible	IV	4	9	Occasional	C	5
4.467	2	Negligible	IV	1	10	Probable	B	5
4.783	2	Negligible	IV	4	5	Occasional	C	5
4.933	2	Negligible	IV	2	5	Occasional	C	5
5.05	2	Negligible	IV	2	10	Occasional	C	5
5.05	2	Negligible	IV	5	5	Remote	D	5
6.233	2	Negligible	IV	1	13	Probable	B	5
7.283	3.17	Negligible	IV	4	10	Occasional	C	5
8.767	4	Negligible	IV	3	10	Frequent	A	3

Discussion

For the worst-case scenario for each test course, WBV exposure tolerances were lowest for cross-country course 5, with limits of 1.433 and 1.6 hours for driver and passenger, respectively. Courses 1 and 3 had near equal tolerances with course 1 limited to 2.1 hours for the driver and 2.2 hours for the passenger, and course 3 being limited to 2 and 2.1 hours for driver and passenger, respectively. Courses 1 and 3 were followed by course 4 with driver and passenger WBV tolerances of 2.25 and 2.8 hours, respectively. Course 2 had the highest tolerance with 4 and 3.8 hours for driver and passenger, respectively.

Comparison of the exposure limits for passenger and driver shows that the differences were slight, indicating that seating position had little effect on WBV exposure for the cross-country terrain. Also, the majority of the exposure limits for both passenger and driver occurred at a frequency of 2 Hz. This indicates that WBV does not present a significant health risk to the passenger and driver where WBV resonance is concerned because the frequency lies outside of the WBV resonance range (4 to 8 Hz). Another indication that the PLS does not pose a significant risk to the crewmembers is the combination of the hazard categories and the hazard probability levels. This combination resulted in RACs of 3s and 5s which signifies that WBV exposure is in the mid-to-low range of probability and severity.

Conclusion

Results from this WBV HHA indicate both driver and passenger were exposed to a hazard severity-category III (marginal), with a Hazard Probability-level C (occasional), for an overall RAC of 3 (AR 40-10), during the operation of the PLS. This indicates that WBV in the tested PLS truck does not present a significant health risk to its crewmembers. However, it is recommended that, under normal operating conditions of the PLS, WBV exposure be limited to 4 hours in any 24-hour period.

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International Organization for Standardization. 1985. Evaluation of human exposure to whole-body vibration, Part 1: general requirements. ISO-2631. 2nd edition 1985-05-15.

U.S. Army Corps of Engineers. 1987. Measurement of suspension and ride characteristics of the M1 main battle tank. Vicksburg, MS: Waterways Experiment Station.

U.S. Army Human Engineering Laboratory. 1991. Soldier-machine performance field trails - ammunition loading of the palletized loading system. Aberdeen Proving Ground, MD: Technical Memorandum 12-91.

Appendix A.

List of manufacturers.

Hewlett-Packard Company
4700 Baylou Boulevard
Pensacola, FL 32502

Larson-Davis Laboratories
280 South Main
Pleasant Grove, UT 84062

Oshkosh Truck Corporation
PO Box 2566
Oshkosh, WI 54903

TEAC Corporation of America
7733 Telegraph Road
Montebello, CA 90640

Appendix B.

ISO 2631 tables and graphs.

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-02 P-seat

17-MAY-94 13:18:47

Sensor....	**P-seat**
Course....	**#3 APG, 0-500 feet**
Speed.....	**5 mph**
Vehicle...	**PLS truck**
Date.....	**May 19, 1992**
Note.....	**HHA of PLS truck, passenger (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**0.6100**	**0.4313**	**0:44**	**5:11**	**13:12**
3.17	0.2300	0.2048	2:49	14:11	32:45
4.00	0.1300	0.1300	5:33	24:47	54:36
1.00	0.2600	0.1300	5:33	24:47	54:36
6.35	0.1200	0.1200	6:13	27:15	59:45

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

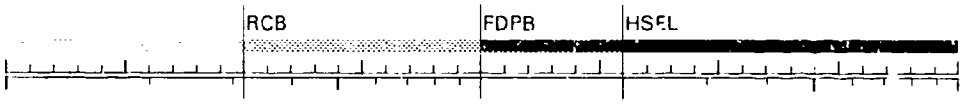
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-02 **P-seat**

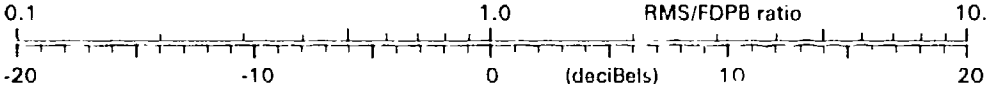
May 19, 1992 **PLS truck**

Exposure: 10h 0m



(Hz)		RMS / FDPB
1.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.26 / 0.536
1.26	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.03 / 0.477
1.59	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.09 / 0.425
2.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.61 / 0.379
2.52	X	0.00 / 0.241
	Y	0.00 / 0.241
	Z	0.10 / 0.338
3.17	X	0.00 / 0.303
	Y	0.00 / 0.303
	Z	0.23 / 0.301
4.00	X	0.00 / 0.383
	Y	0.00 / 0.383
	Z	0.13 / 0.268
5.04	X	0.00 / 0.482
	Y	0.00 / 0.482
	Z	0.06 / 0.268
6.35	X	0.00 / 0.608
	Y	0.00 / 0.608
	Z	0.12 / 0.269
7.94	X	0.00 / 0.760
	Y	0.00 / 0.760
	Z	0.09 / 0.268
10.00	X	0.00 / 0.957
	Y	0.00 / 0.957
	Z	0.08 / 0.335
12.60	X	0.00 / 1.206
	Y	0.00 / 1.206
	Z	0.08 / 0.422
15.87	X	0.00 / 1.519
	Y	0.00 / 1.519
	Z	0.08 / 0.531
20.00	X	0.00 / 1.914
	Y	0.00 / 1.914
	Z	0.09 / 0.670
25.20	X	0.00 / 2.411
	Y	0.00 / 2.411
	Z	0.15 / 0.844
31.75	X	0.00 / 3.038
	Y	0.00 / 3.038
	Z	0.08 / 1.063
40.00	X	0.00 / 3.827
	Y	0.00 / 3.827
	Z	0.08 / 1.340
50.40	X	0.00 / 4.823
	Y	0.00 / 4.823
	Z	0.08 / 1.688
63.50	X	0.00 / 6.076
	Y	0.00 / 6.076
	Z	0.04 / 2.127

17-MAY-94 13:18:47



Course: #3 APG, 0-500 feet
Speed: 5 mph
Note: HHA of PLS truck, passenger (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-02 D-seat

17-MAY-94 13:18:47

Sensor.... **D-seat**
Course.... **#3 APG, 0-500 feet**
Speed..... **5 mph**
Vehicle... **PLS t uck**
Date..... **May 19, 1992**
Note..... **HHA of PLS truck, driver (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**0.6700**	**0.4738**	**0:36**	**4:31**	**11:42**
3.17	0.1800	0.1602	4:05	19:15	43:17
4.00	0.1400	0.1400	5:00	22:40	50:21
1.00	0.2700	0.1350	5:16	23:40	52:30
7.94	0.1200	0.1200	6:13	27:15	59:45

* International Standards Organization ISO 2631:

Comfort . . Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

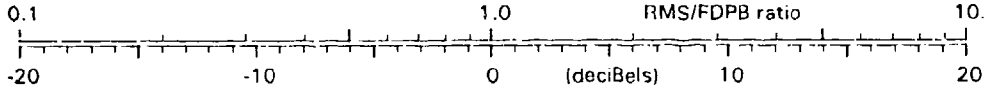
RUN-02 **D-seat**

May 19, 1992 **PLS truck**

Exposure: 10h 0m

(Hz)		RMS / FDPB
1.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.27 / 0.536
1.26	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.03 / 0.477
1.59	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.10 / 0.435
2.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.67 / 0.379
2.52	X	0.00 / 0.241
	Y	0.00 / 0.241
	Z	0.09 / 0.338
3.17	X	0.00 / 0.303
	Y	0.00 / 0.303
	Z	0.18 / 0.301
4.00	X	0.00 / 0.383
	Y	0.00 / 0.383
	Z	0.14 / 0.268
5.04	X	0.00 / 0.482
	Y	0.00 / 0.482
	Z	0.10 / 0.268
6.35	X	0.00 / 0.608
	Y	0.00 / 0.608
	Z	0.12 / 0.268
7.94	X	0.00 / 0.760
	Y	0.00 / 0.760
	Z	0.12 / 0.268
10.00	X	0.00 / 0.957
	Y	0.00 / 0.957
	Z	0.09 / 0.335
12.60	X	0.00 / 1.206
	Y	0.00 / 1.206
	Z	0.07 / 0.422
15.87	X	0.00 / 1.519
	Y	0.00 / 1.519
	Z	0.10 / 0.531
20.00	X	0.00 / 1.914
	Y	0.00 / 1.914
	Z	0.08 / 0.670
25.20	X	0.00 / 2.411
	Y	0.00 / 2.411
	Z	0.16 / 0.844
31.75	X	0.00 / 3.038
	Y	0.00 / 3.038
	Z	0.08 / 1.063
40.00	X	0.00 / 3.827
	Y	0.00 / 3.827
	Z	0.07 / 1.340
50.40	X	0.00 / 4.823
	Y	0.00 / 4.823
	Z	0.08 / 1.688
63.50	X	0.00 / 6.076
	Y	0.00 / 6.076
	Z	0.04 / 2.127

17-MAY-94 13:18:47



Course: #3 APG, 0-500 feet
Speed: 5 mph
Note: HHA of PLS truck, driver (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-03 P-SEAT

17-MAY-94 13:18:47

Sensor.... **P-SEAT**
Course.... **#3 APG**
Speed..... **10 mph**
Vehicle... **PLS truck**
Date..... **May 19, 1992**
Note..... **HHA of PLS truck, passenger**

Third-octave bands with greate
weighted RMS acce'erations (m/s

Durations of WBV exposure
before reaching ISO limits*
(given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0.01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0·01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**0.5900**	**0.4172**	**0:47**	**5:26**	**13:48**
1.00	0.5100	0.2550	2:00	10:41	25:17
4.00	0.2500	0.2500	2:03	10:57	25:52
3.17	0.2300	0.2048	2:49	14:11	32:45
6.35	0.1900	0.1900	3:11	15:34	35:41

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

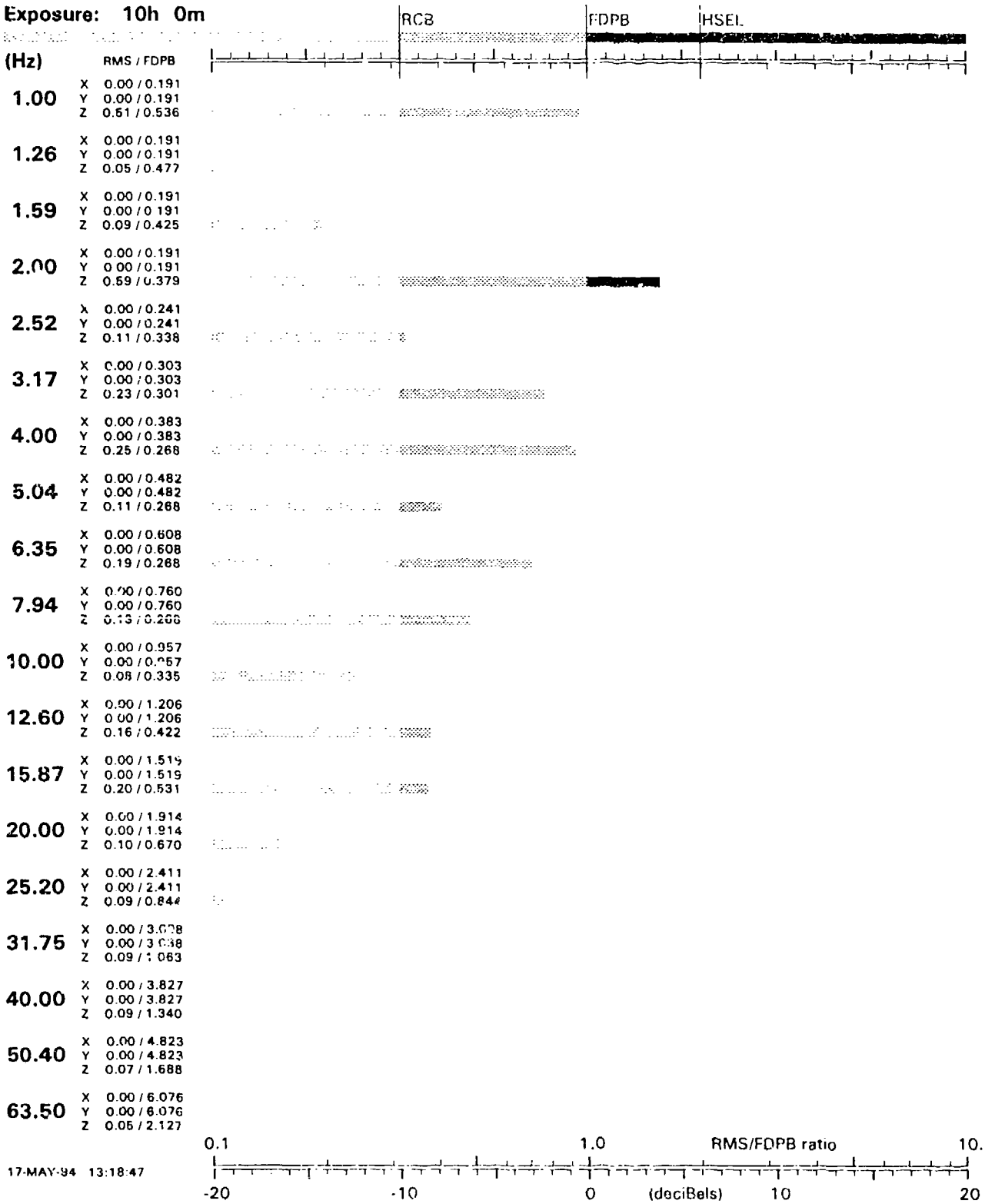
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-03 **P-SEAT**

May 19, 1992 **PLS truck**

Exposure: 10h 0m



Course: #3 APG
Speed: 10 mph
Note: HHA of PLS truck, passenger

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-03 D-SEAT

17-MAY-94 13:18:47

Sensor.... **D-SEAT**
Course.... **#3 APG**
Speed..... **10 mph**
Vehicle... **PLS truck**
Date..... **May 19, 1992**
Note..... **HHA of PLS truck, driver**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**0.6200**	**0.4384**	**0:42**	**5:03**	**12:56**
4.00	0.3400	0.3400	1:13	7:15	17:50
3.17	0.3600	0.3205	1:21	7:52	19:10
1.00	0.5600	0.2800	1:42	9:26	22:37
6.35	0.2300	0.2300	2:20	12:12	28:32

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

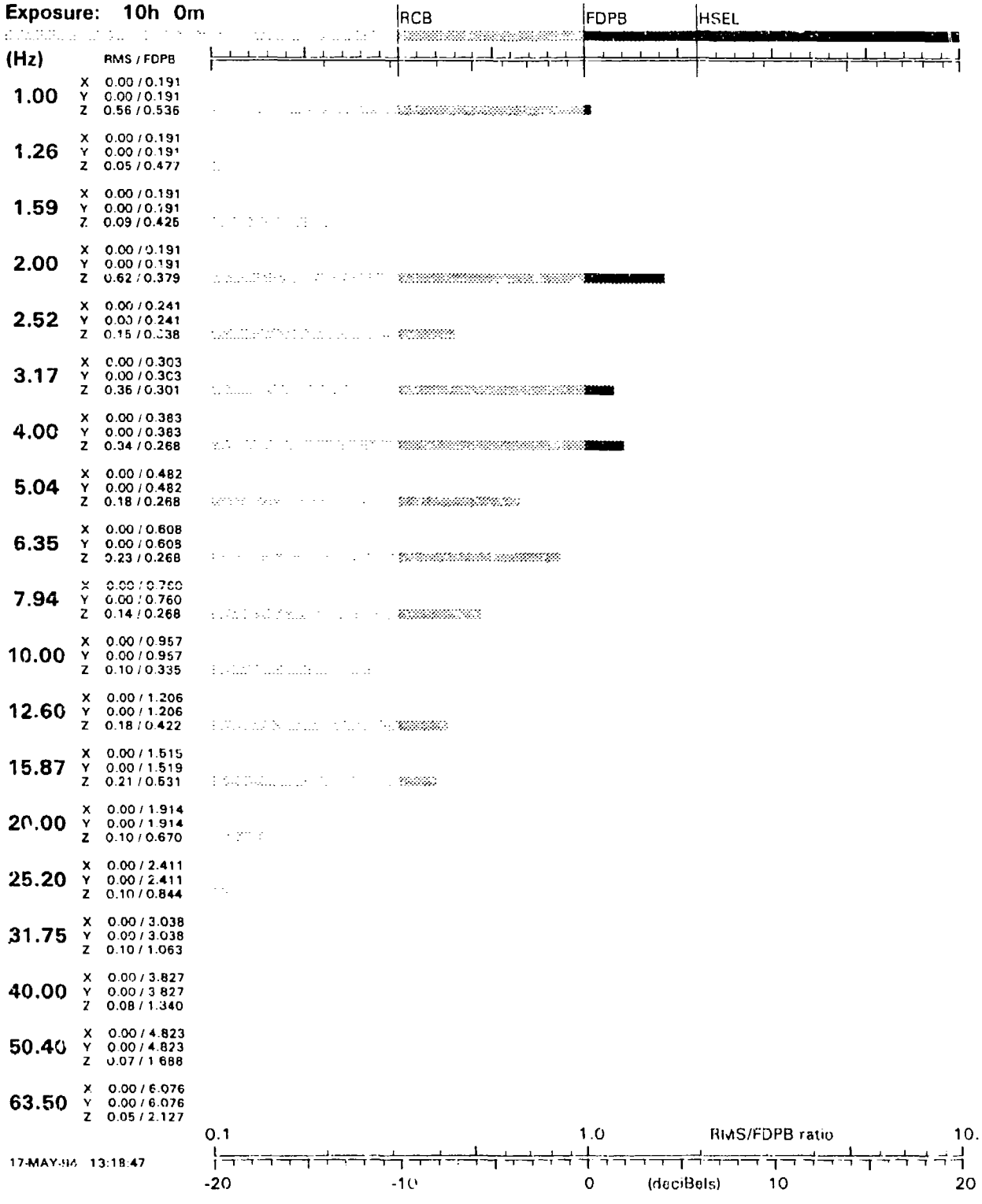
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-03 **D-SEAT**

May 19, 1992 **PLS truck**

Exposure: 10h 0m



Course: #3 APG
Speed: 10 mph
Note: HHA of PLS truck, driver

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-05 P-seat

17-MAY-96 13:18:48

Sensor....	**P-seat**
Course....	**#3 APG**
Speed.....	**15 mph**
Vehicle...	**PLS truck**
Date.....	**May 19, 1992**
Note.....	**HHA of PLS truck, passenger (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
4.00	**0.5900**	**0.5900**	**0:20**	**3:15**	**8:45**
2.00	0.7400	0.5233	0:30	3:55	10:18
3.17	0.4400	0.3917	0:53	5:56	14:56
1.00	0.7500	0.3750	0:59	6:20	15:48
5.04	0.3100	0.3100	1:25	8:12	20:00

* International Standards Organization ISO 2631

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

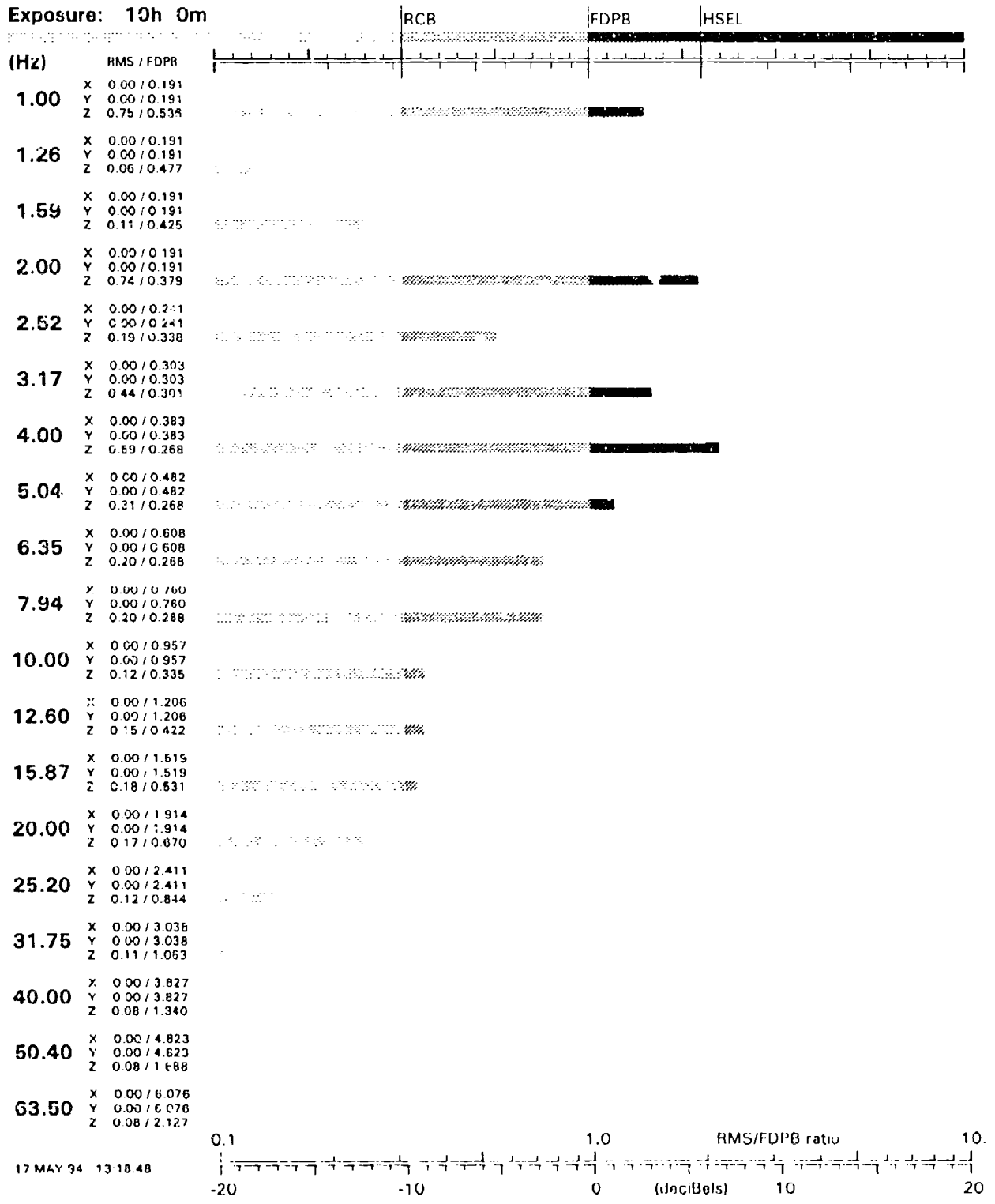
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-05 **P-seat**

May 19, 1992 **PLS truck**

Exposure: 10h 0m



Course: #3 APG
Speed: 15 mph
Note: HHA of PLS truck, passenger (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-05 D-seat

17-MAY-94 13:18:48

Sensor.... **D-seat**
Course.... **#3 APG**
Speed..... **15 mph**
Vehicle... **PLS truck**
Date..... **May 19, 1992**
Note..... **HHA of PLS truck, driver (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
4.00	**0.5000**	**0.5000**	**0:32**	**4:11**	**10:56**
2.00	0.7000	0.4950	0:33	4:15	11:03
1.00	0.7300	0.3650	1:05	6:35	16:20
5.04	0.3000	0.3000	1:30	8:36	20:47
7.94	0.2000	0.2000	2:56	14:34	33:36

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

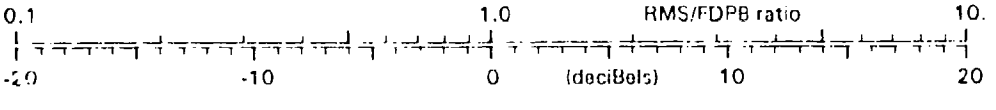
X: Longitudinal
Y: Transverse
Z: Vertical

RUN-05 **D-seat**

May 19, 1992 **PLS truck**

Exposure: 10h 0m

(Hz)		RMS / FDPB
1.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.73 / 0.536
1.26	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.06 / 0.477
1.59	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.10 / 0.425
2.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.70 / 0.379
2.52	X	0.00 / 0.241
	Y	0.00 / 0.241
	Z	0.10 / 0.338
3.17	X	0.00 / 0.303
	Y	0.00 / 0.303
	Z	0.22 / 0.301
4.00	X	0.00 / 0.383
	Y	0.00 / 0.383
	Z	0.50 / 0.268
5.04	X	0.00 / 0.482
	Y	0.00 / 0.482
	Z	0.30 / 0.268
6.35	X	0.00 / 0.608
	Y	0.00 / 0.608
	Z	0.18 / 0.268
7.94	X	0.00 / 0.760
	Y	0.00 / 0.760
	Z	0.20 / 0.268
10.00	X	0.00 / 0.957
	Y	0.00 / 0.957
	Z	0.13 / 0.335
12.60	X	0.00 / 1.206
	Y	0.00 / 1.206
	Z	0.16 / 0.422
15.87	X	0.00 / 1.519
	Y	0.00 / 1.519
	Z	0.18 / 0.531
20.00	X	0.00 / 1.914
	Y	0.00 / 1.914
	Z	0.22 / 0.670
25.20	X	0.00 / 2.411
	Y	0.00 / 2.411
	Z	0.13 / 0.844
31.75	X	0.00 / 3.038
	Y	0.00 / 3.038
	Z	0.14 / 1.063
40.00	X	0.00 / 3.827
	Y	0.00 / 3.827
	Z	0.09 / 1.340
50.40	X	0.00 / 4.823
	Y	0.00 / 4.823
	Z	0.08 / 1.688
63.50	X	0.00 / 6.076
	Y	0.00 / 6.076
	Z	0.12 / 2.127



17-MAY-94 13:18:48

Course: #3 APG
Speed: 15 mph
Note: HHA of PLS truck, driver (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-08 P-SEAT

17-MAY-94 13:18:50

Sensor.... **P-SEAT**
Course.... **#3 APG**
Speed..... **18 mph**
Vehicle... **PLS truck**
Date..... **May 19, 1992**
Note..... **HHA of PLS truck, passenger**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**1.9200**	**1.3576**	**0:01**	**0:44**	**2:36**
4.00	1.1600	1.1600	0:01	1:04	3:19
3.17	0.8200	0.7300	0:13	2:20	6:33
5.04	0.6600	0.6600	0:16	2:45	7:31
6.35	0.5400	0.5400	0:30	3:44	9:52

* International Standards Organization ISO 2631

Comfort .. Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

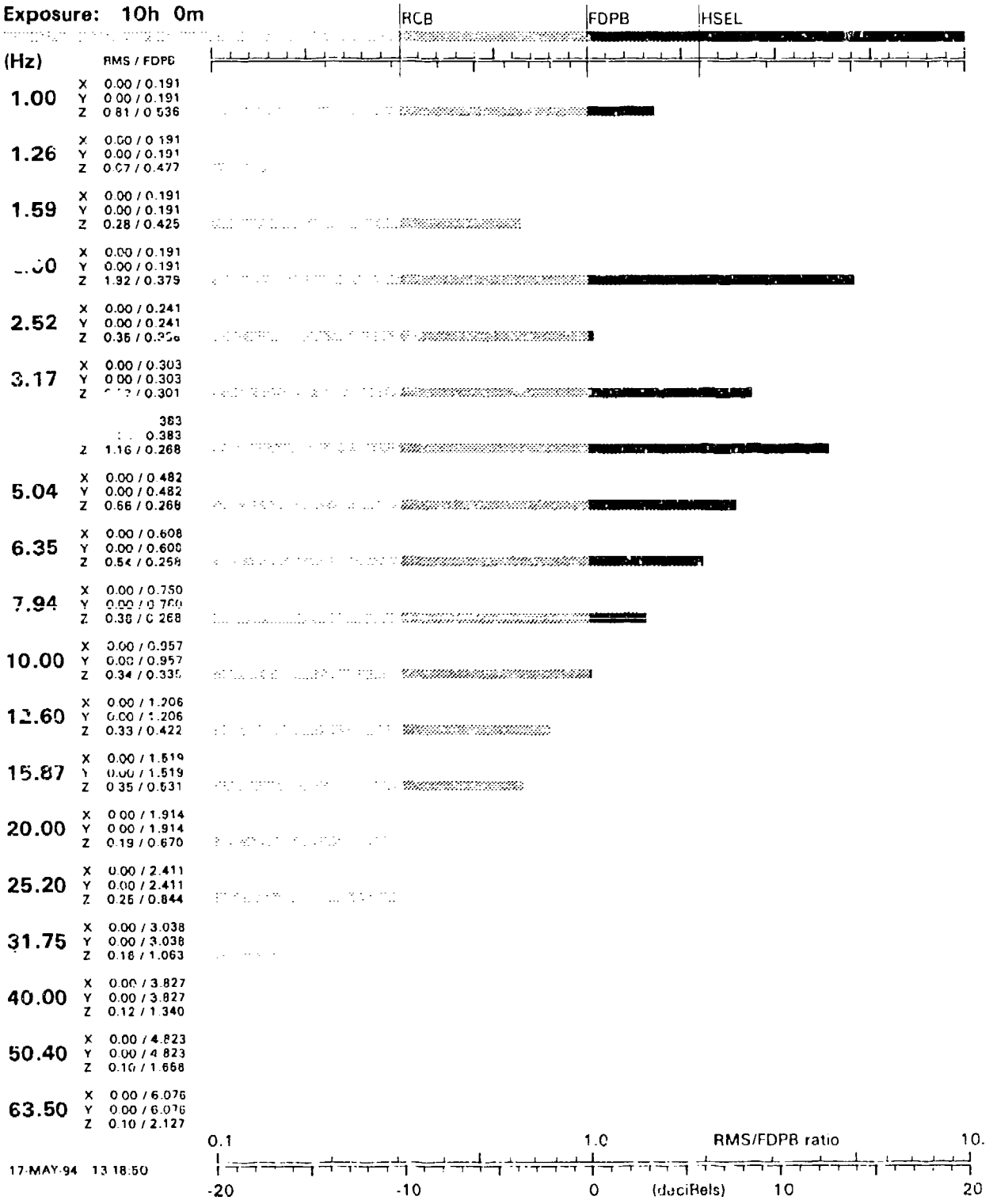
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-08 **P-SEAT**

May 19, 1992 **PLS truck**

Exposure: 10h 0m



Course: #3 APG
Speed: 18 mph
Note: HHA of PLS truck, passenger

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-08 D-seat

17-MAY-94 13:18:50

Sensor.... **D-seat**
Course.... **#3 APG**
Speed..... **18 mph**
Vehicle... **PLS truck**
Date..... **May 19, 1992**
Note..... **HHA of PLS truck, driver (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
4.00	**1.4800**	**1.4800**	**0:01**	**0:37**	**2:16**
2.00	2.0100	1.4213	0:01	0:40	2:26
3.17	0.9700	0.8635	0:11	1:46	5:09
6.35	0.6200	0.6200	0:18	3:01	8:11
5.04	0.6200	0.6200	0:18	3:01	8:11

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

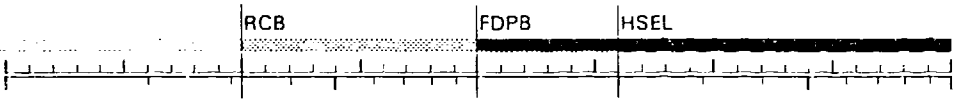
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

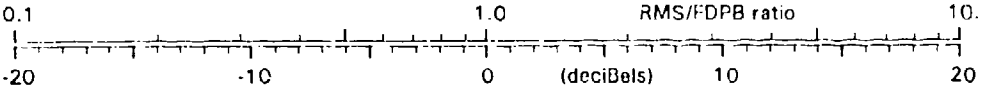
RUN-08 **D-seat**

May 19, 1992 **PLS truck**

Exposure: 10h 0m



(Hz)		RMS / FDPB
1.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.89 / 0.536
1.26	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.08 / 0.477
1.59	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.30 / 0.425
2.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	2.01 / 0.379
2.52	X	0.00 / 0.241
	Y	0.00 / 0.241
	Z	0.42 / 0.338
3.17	X	0.00 / 0.303
	Y	0.00 / 0.303
	Z	0.97 / 0.301
4.00	X	0.00 / 0.383
	Y	0.00 / 0.383
	Z	1.48 / 0.268
5.04	X	0.00 / 0.482
	Y	0.00 / 0.482
	Z	0.62 / 0.268
6.35	X	0.00 / 0.608
	Y	0.00 / 0.608
	Z	0.62 / 0.268
7.94	X	0.00 / 0.760
	Y	0.00 / 0.760
	Z	0.51 / 0.268
10.00	X	0.00 / 0.957
	Y	0.00 / 0.957
	Z	0.34 / 0.335
12.60	X	0.00 / 1.206
	Y	0.00 / 1.206
	Z	0.32 / 0.422
15.87	X	0.00 / 1.519
	Y	0.00 / 1.519
	Z	0.44 / 0.531
20.00	X	0.00 / 1.914
	Y	0.00 / 1.914
	Z	0.26 / 0.670
25.20	X	0.00 / 2.411
	Y	0.00 / 2.411
	Z	0.27 / 0.844
31.75	X	0.00 / 3.038
	Y	0.00 / 3.038
	Z	0.19 / 1.063
40.00	X	0.00 / 3.827
	Y	0.00 / 3.827
	Z	0.14 / 1.340
50.40	X	0.00 / 4.823
	Y	0.00 / 4.823
	Z	0.13 / 1.688
63.50	X	0.00 / 6.076
	Y	0.00 / 6.076
	Z	0.13 / 2.127



17 MAY 94 13:18:50

Course: #3 APG
Speed: 18 mph
Note: HHA of PLS truck, driver (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-10 P-seat

17-MAY-94 13:18:51

Sensor.... **P-seat**
Course.... **#3 APG**
Speed..... **20 mph**
Vehicle... **PLS truck**
Date..... **May 19, 1992**
Note..... **HHA of PLS truck, passenger (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**2.4400**	**1.7253**	**0:01**	**0:28**	**1:46**
1.00	2.1300	1.0650	0:01	1:15	3:47
4.00	0.7400	0.7400	0:13	2:16	6:26
6.35	0.6200	0.6200	0:18	3:01	8:11
3.17	0.5600	0.4985	0:32	4:11	10:57

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

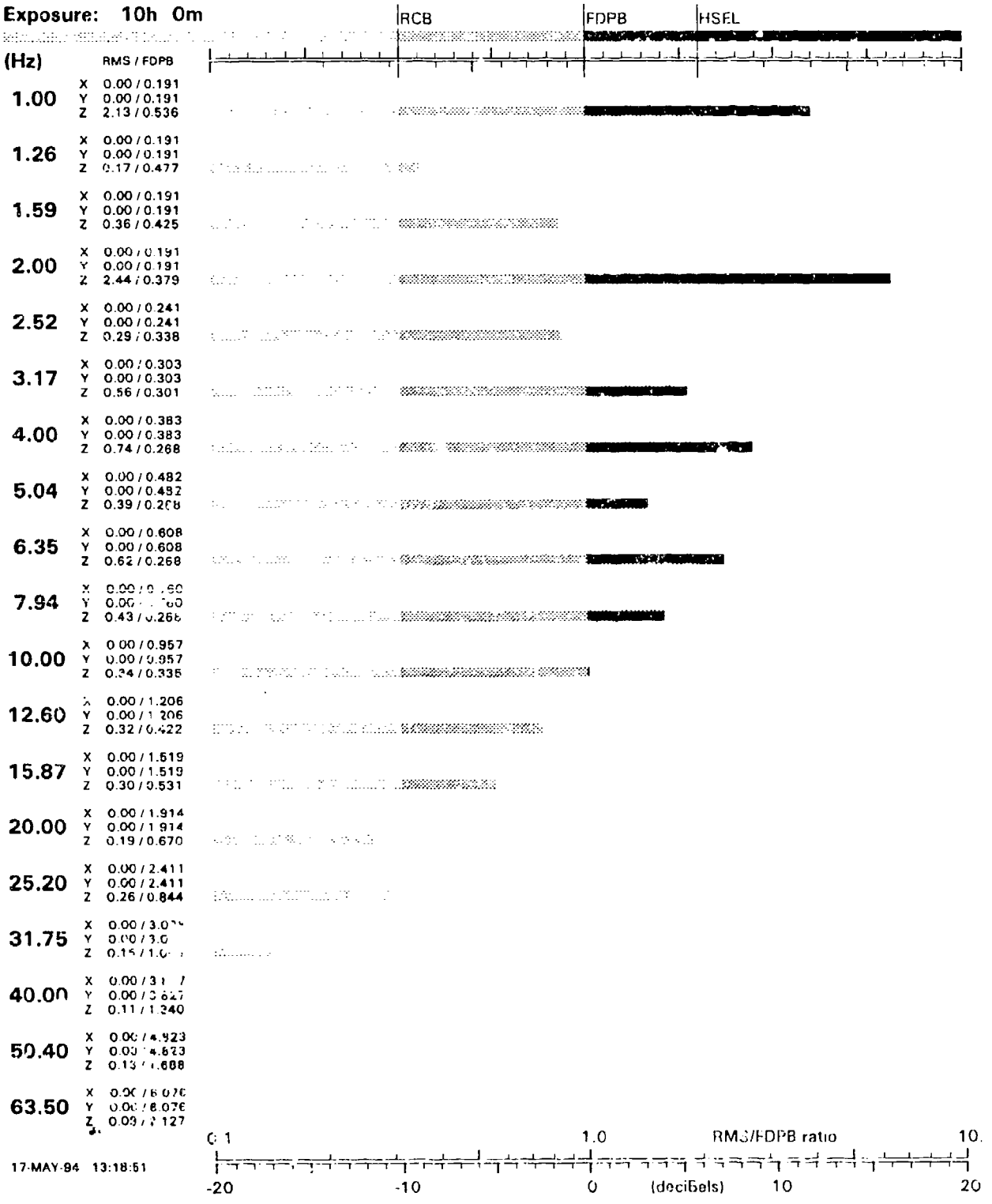
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-10 **P-seat**

May 19, 1992 **PLS truck**

Exposure: 10h 0m



Course: #3 APG
Speed: 20 mph
Note: HHA of PLS truck, passenger (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-10 D-seat

17-MAY-94 13:18:51

Sensor.... **D-seat**
Course.... **#3 APG**
Speed..... **20 mph**
Vehicle... **PLS truck**
Date..... **May 19, 1992**
Note..... **HHA of PLS truck, driver (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**2.3100**	**1.6334**	**0:01**	**0:30**	**1:57**
1.00	2.3200	1.1600	0:01	1:04	3:19
4.00	0.8100	0.8100	0:11	1:59	5:39
5.04	0.7800	0.7800	0:12	2:05	5:58
7.94	0.6400	0.6400	0:16	2:53	7:50

* International Standards Organization ISO 2631:

Comfort .. Reduced comfort boundary
Fatigue .. Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

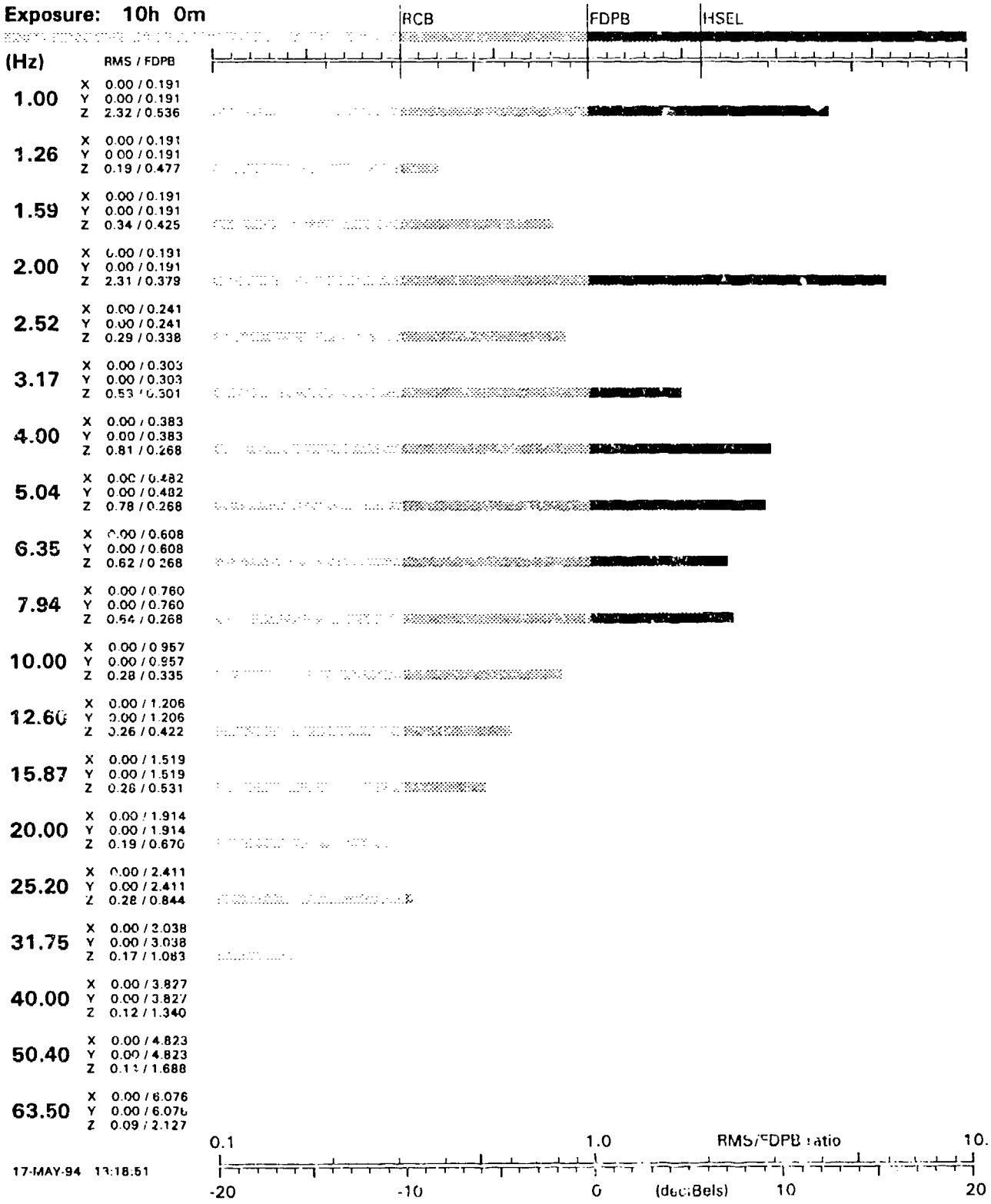
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-10 **D-seat**

May 19, 1992 **PLS truck**

Exposure: 10h 0m



17-MAY-94 13:18:51

Course: #3 APG
Speed: 20 mph
Note: HHA of PLS truck, driver (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-15 P seat

17-MAY-94 13:18:53

Sensor.... **P-seat**
Course.... **#2 APG**
Speed..... **10 mph**
Vehicle... **PLS truck**
Date..... **May 20, 1992**
Note..... **HHA of PLS truck, passenger (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**1.2400**	**0.8768**	**0:11**	**1:44**	**5:03**
3.17	0.8000	0.7122	0:14	2:26	6:46
4.00	0.6400	0.6400	0:16	2:53	7:50
6.35	0.4400	0.4400	0:41	5:03	12:53
1.00	0.8100	0.4050	0:49	5:41	14:19

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

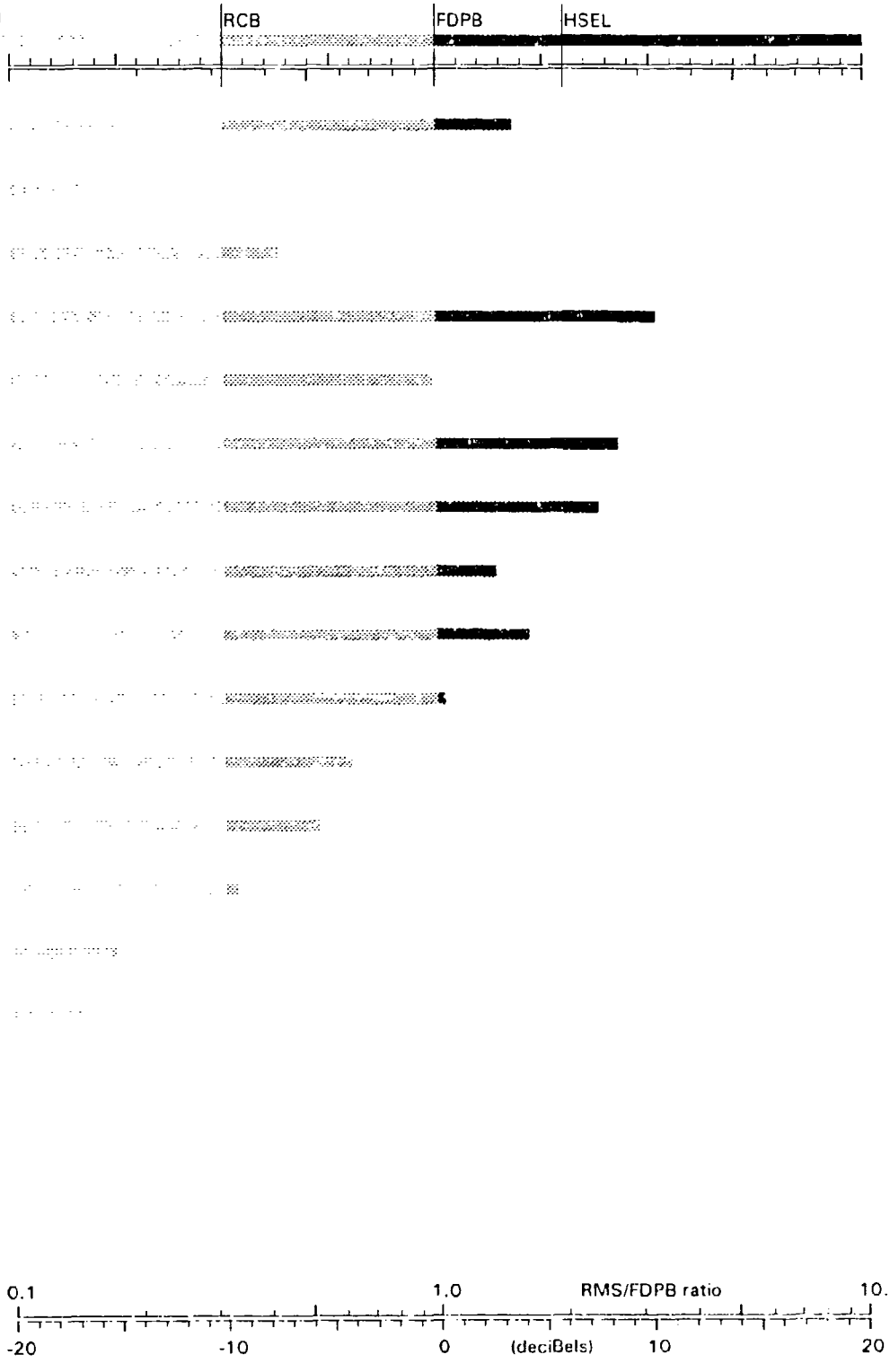
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-15 **P-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



17-MAY-94 13:18:53

Course: #2 APG
Speed: 10 mph
Note: HHA of PLS truck, passenger (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-15 D-seat

17-MAY-94 13:18:53

Sensor.... **D-seat**
Course.... **#2 APG**
Speed..... **10 mph**
Vehicle... **PLS truck**
Date..... **May 20, 1992**
Note..... **HHA of PLS truck, driver (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**1.1600**	**0.8202**	**0:11**	**1:55**	**5:33**
4.00	0.4700	0.4700	0:37	4:35	11:49
1.00	0.8800	0.4400	0:41	5:03	12:53
3.17	0.4900	0.4362	0:42	5:07	13:00
6.35	0.4200	0.4200	0:47	5:24	13:41

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

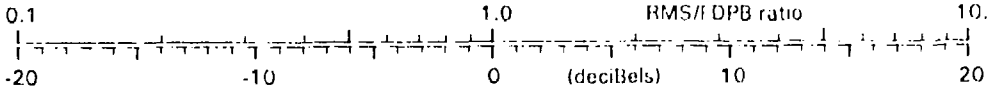
X: Longitudinal
Y: Transverse
Z: Vertical

RUN-15 **D-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m

(Hz)		RMS / FDPB
1.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.88 / 0.536
1.26	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.07 / 0.477
1.59	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.17 / 0.425
2.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	1.16 / 0.379
2.52	X	0.00 / 0.241
	Y	0.00 / 0.241
	Z	0.22 / 0.338
3.17	X	0.00 / 0.303
	Y	0.00 / 0.303
	Z	0.49 / 0.301
4.00	X	0.00 / 0.383
	Y	0.00 / 0.383
	Z	0.47 / 0.268
5.04	X	0.00 / 0.482
	Y	0.00 / 0.482
	Z	0.39 / 0.268
6.35	X	0.00 / 0.608
	Y	0.00 / 0.608
	Z	0.42 / 0.268
7.94	X	0.00 / 0.760
	Y	0.00 / 0.760
	Z	0.31 / 0.268
10.00	X	0.00 / 0.957
	Y	0.00 / 0.957
	Z	0.19 / 0.335
12.60	X	0.00 / 1.206
	Y	0.00 / 1.206
	Z	0.20 / 0.422
15.87	X	0.00 / 1.519
	Y	0.00 / 1.519
	Z	0.24 / 0.531
20.00	X	0.00 / 1.914
	Y	0.00 / 1.914
	Z	0.14 / 0.[illegible]
25.20	X	0.00 / 2.[illegible]
	Y	0.00 / 2.411
	Z	0.13 / 0.844
31.75	X	0.00 / 3.038
	Y	0.00 / 3.038
	Z	0.13 / 1.063
40.00	X	0.00 / 3.827
	Y	0.00 / 3.827
	Z	0.09 / 1.340
50.40	X	0.00 / 4.823
	Y	0.00 / 4.823
	Z	0.07 / 1.688
63.50	X	0.00 / 6.076
	Y	0.00 / 6.076
	Z	0.07 / 2.127



17-MAY-94 13:18:03

Course: #2 APG
Speed: 10 mph
Note: HHA of PLS truck, driver (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-17 P-seat

17-MAY-94 13:18:54

Sensor....	**P-seat**
Course....	**#2 APG**
Speed.....	**13 mph**
Vehicle...	**PLS truck**
Date.....	**May 20, 1992**
Note.....	**HHA of PLS truck, passenger (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**1.5000**	**1.0607**	**0:01**	**1:15**	**3:48**
3.17	0.9600	0.8546	0:11	1:49	5:15
4.00	0.6600	0.6600	0:16	2:45	7:31
1.00	0.9700	0.4850	0:33	4:22	11:22
6.35	0.4400	0.4400	0:41	5:03	12:53

* International Standards Organization ISO 2631: Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

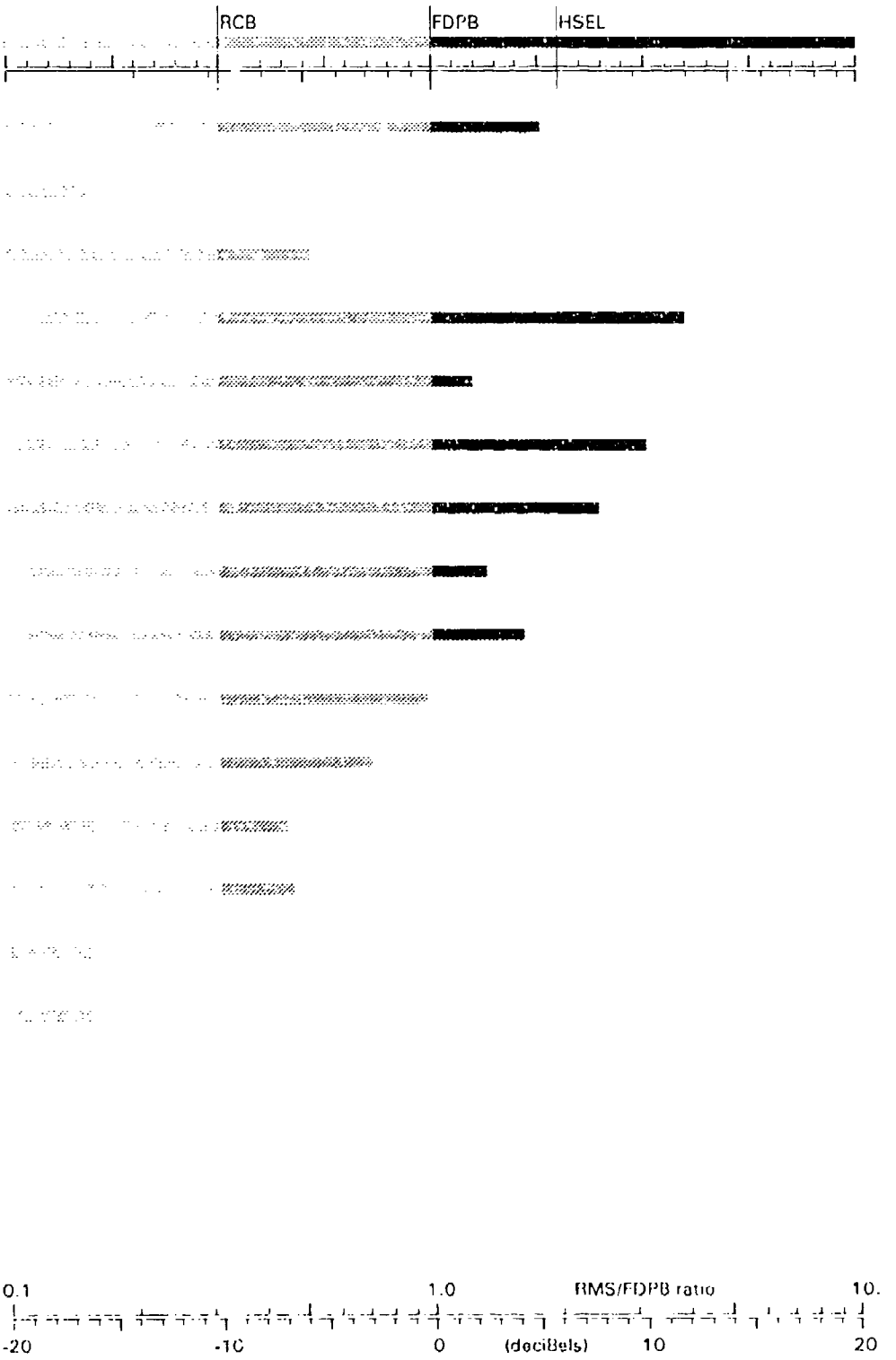
HSEL: Health and safety exposure limit
FDPB: Fatigue decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-17 **P-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



Course: #2 APG
Speed: 13 mph
Note: HMA of PLS truck, passenger (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-17 D-seat

17-MAY-94 13:18:54

Sensor.... **D-seat**
Course.... **#2 APG**
Speed..... **13 mph**
Vehicle... **PLS truck**
Date..... **May 20, 1992**
Note..... **HHA of PLS truck, driver (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**1.4600**	**1.0324**	**0:01**	**1:19**	**3:59**
4.00	0.5900	0.5900	0:20	3:15	8:45
1.00	1.1600	0.5800	0:22	3:20	8:57
3.17	0.6000	0.534[illegible]	0:30	3:47	10:00
6.35	0.3700	0.3700	1:02	6:26	16:02

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue .. Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

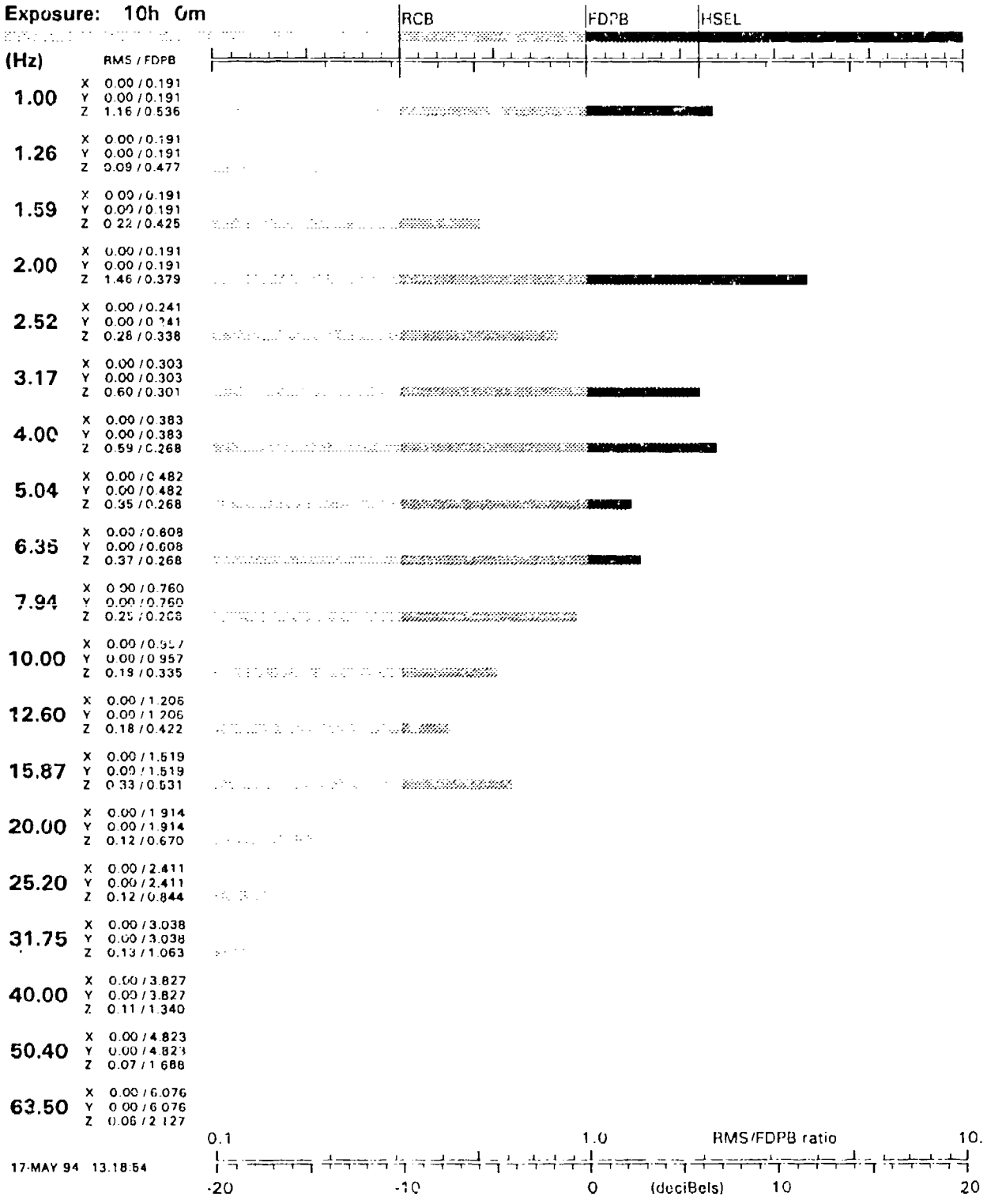
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-17 **D-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



Course: #2 APG
Speed: 13 mph
Note: HHA of PLS truck, driver (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-20 P-seat

17 MAY-94 13:18:56

Sensor....	**P-seat**
Course....	**#1 APG**
Speed.....	**5 mph**
Vehicle...	**PLS truck**
Date.....	**May 20, 1992**
Note.....	**HHA of PLS truck, passenger (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**0.6500**	**0.4596**	**0:38**	**4:43**	**12:11**
1.00	0.3400	0.1700	3:45	17:52	40:30
3.17	0.1500	0.1335	5:20	24:00	53:06
7.94	0.1100	0.1100	7:01	30:10	65:37
6.35	0.1000	0.1000	8:00	33:45	72:45

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

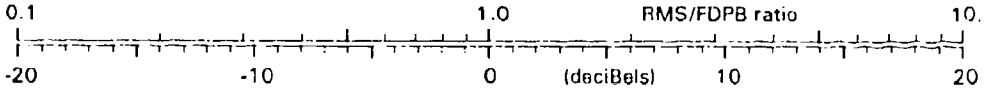
RUN-20 **P-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m

(Hz)		RMS / FDPB
1.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.34 / 0.536
1.26	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.03 / 0.477
1.59	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.10 / 0.425
2.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.65 / 0.379
2.52	X	0.00 / 0.241
	Y	0.00 / 0.241
	Z	0.08 / 0.336
3.17	X	0.00 / 0.303
	Y	0.00 / 0.303
	Z	0.15 / 0.301
4.00	X	0.00 / 0.383
	Y	0.00 / 0.383
	Z	0.09 / 0.268
5.04	X	0.00 / 0.482
	Y	0.00 / 0.482
	Z	0.09 / 0.268
6.35	X	0.00 / 0.608
	Y	0.00 / 0.608
	Z	0.10 / 0.268
7.94	X	0.00 / 0.760
	Y	0.00 / 0.760
	Z	0.11 / 0.268
10.00	X	0.00 / 0.957
	Y	0.00 / 0.957
	Z	0.06 / 0.335
12.60	X	0.00 / 1.206
	Y	0.00 / 1.206
	Z	0.07 / 0.422
15.87	X	0.00 / 1.519
	Y	0.00 / 1.519
	Z	0.11 / 0.531
20.00	X	0.00 / 1.914
	Y	0.00 / 1.914
	Z	0.11 / 0.670
25.20	X	0.00 / 2.411
	Y	0.00 / 2.411
	Z	0.10 / 0.844
31.75	X	0.00 / 3.038
	Y	0.00 / 3.038
	Z	0.07 / 1.063
40.00	X	0.00 / 3.827
	Y	0.00 / 3.827
	Z	0.07 / 1.340
50.40	X	0.00 / 4.823
	Y	0.00 / 4.823
	Z	0.06 / 1.688
63.50	X	0.00 / 6.076
	Y	0.00 / 6.076
	Z	0.05 / 2.127

17 MAY 94 13:18:56



Course: #1 APG
Speed: 5 mph
Note: HHA of PLS truck, passenger (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-20 D-seat

17-MAY-94 13:18:56

Sensor.... **D-seat**
Course.... **#1 APG**
Speed..... **5 mph**
Vehicle... **PLS truck**
Date..... **May 20, 1992**
Note..... **HHA of PLS truck, driver (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**0.7100**	**0.5020**	**0:32**	**4:09**	**10:52**
1.00	0.3300	0.1650	3:56	18:32	41:51
3.17	0.1700	0.1513	4:28	20:37	46:11
6.35	0.1200	0.1200	6:13	27:15	59:45
7.94	0.1100	0.1100	7:01	30:10	65:37

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

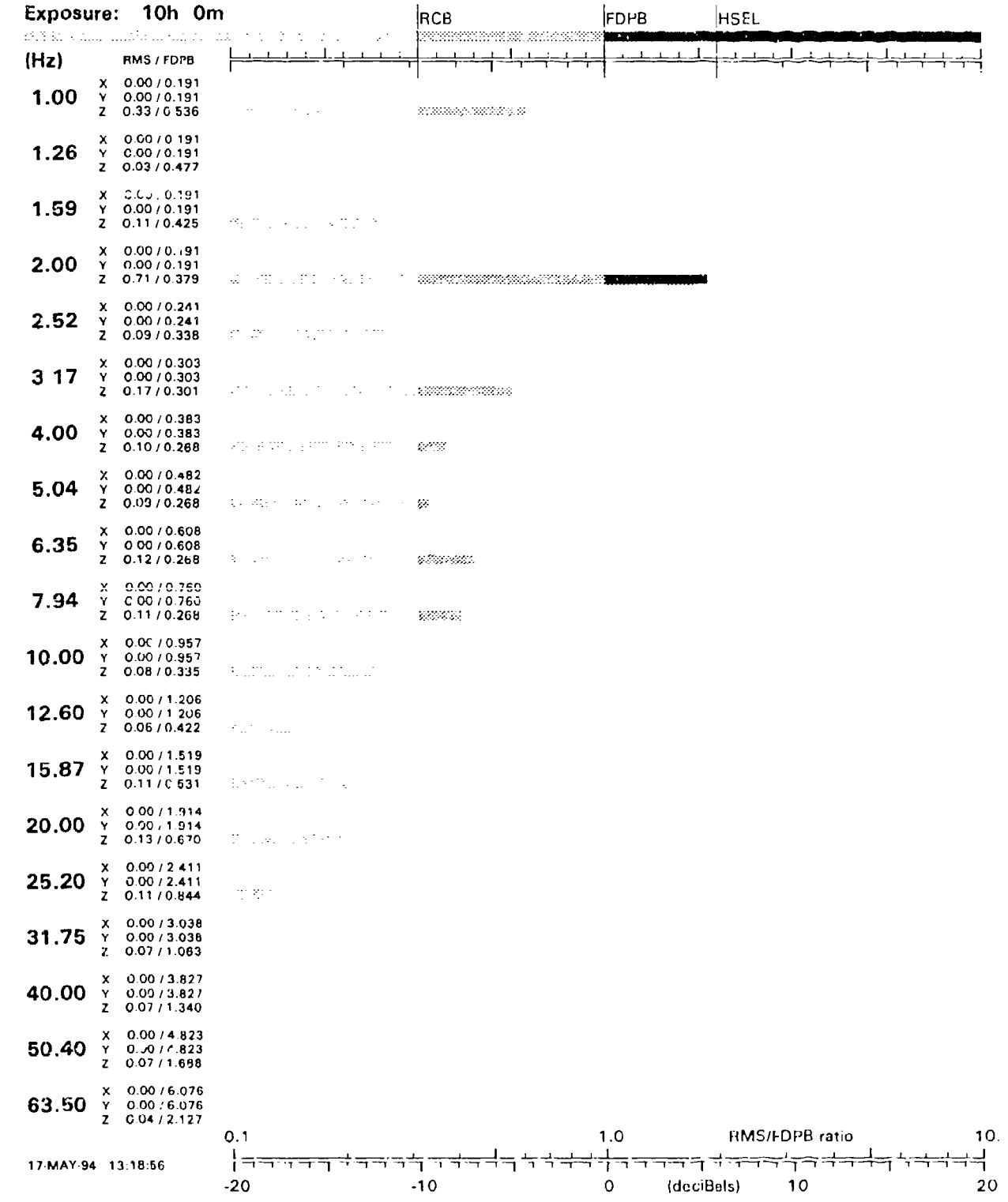
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-20 **D-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



Course: #1 APG
Speed: 5 mph
Note: HHA of PLS truck, driver (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-22 P-seat

17-MAY-94 13:18:57

Sensor.... **P-seat**
Course.... **#1 APG**
Speed..... **10 mph**
Vehicle... **PLS truck**
Date..... **May 20, 1992**
Note..... **HHA of PLS truck, passenger (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**1.3500**	**0.9546**	**0:01**	**1:30**	**4:28**
3.17	0.5100	0.4540	0:40	4:48	12:22
1.00	0.7300	0.3650	1:05	6:35	16:20
4.00	0.3100	0.3100	1:25	8:12	20:00
6.35	0.2000	0.2000	2:56	14:34	33:36

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

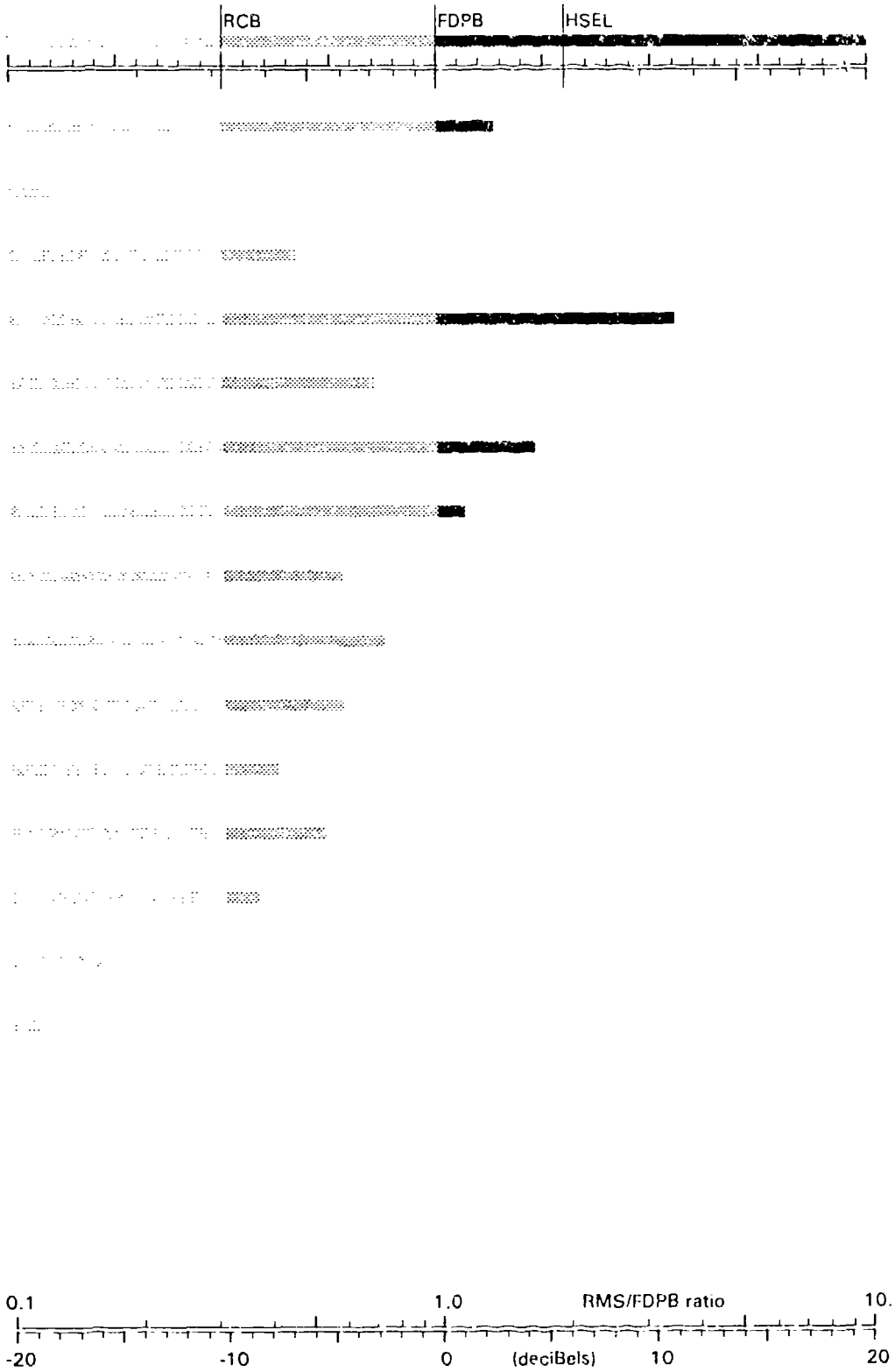
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-22 **P-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



17-MAY-94 13:10:57

Course: #1 APG
Speed: 10 mph
Note: HHA of PLS truck, passenger (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-22 D-seat

17-MAY-94 13:18:57

Sensor....	**D-seat**
Course....	**#1 APG**
Speed.....	**10 mph**
Vehicle...	**PLS truck**
Date.....	**May 20, 1992**
Note.....	**HHA of PLS truck, driver (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**1.4200**	**1.0042**	**0:01**	**1:22**	**4:09**
1.00	0.8400	0.4200	0:47	5:24	13:41
3.17	0.3700	0.3294	1:17	7:35	18:32
4.00	0.3000	0.3000	1:30	8:36	20:47
6.35	0.2000	0.2000	2:56	14:34	33:36

* International Standards Organization ISO 2631

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

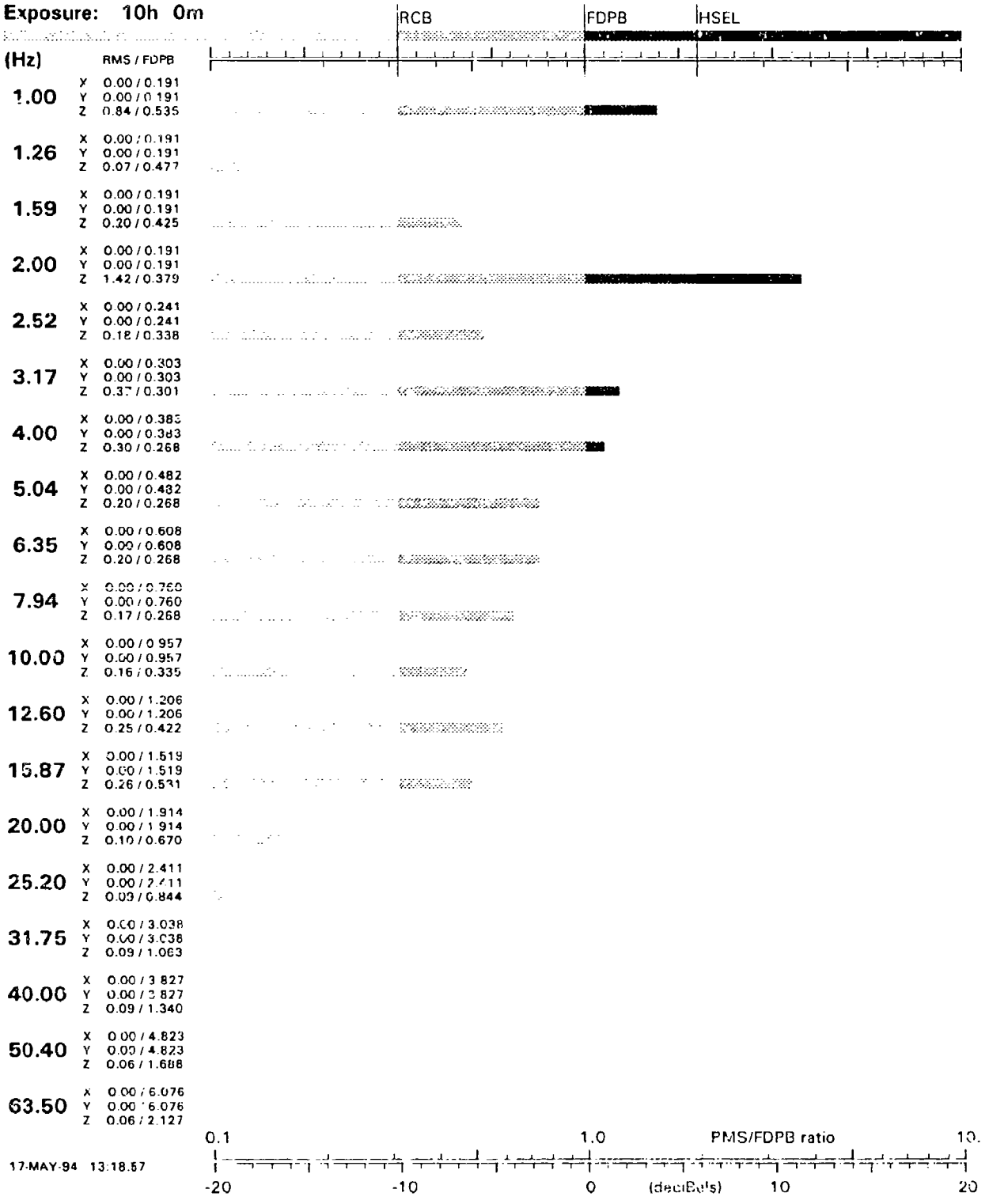
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-22 **D-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



Course: #1 APG
Speed: 10 mph
Note: HHA of PLS truck, driver (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-23 P-seat

17-MAY-94 13:18:57

Sensor.... **P-seat**
Course.... **#1 APG**
Speed..... **15 mph**
Vehicle... **PLS truck**
Date..... **May 20, 1992**
Note..... **HHA of PLS truck, passenger (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**2.1300**	**1.5061**	**0:01**	**0:36**	**2:13**
1.00	2.6800	1.3400	0:01	0:45	2:40
3.17	0.9100	0.8101	0:11	1:59	5:39
4.00	0.7400	0.7400	0:13	2:16	6:26
5.04	0.6100	0.6100	0:18	3:05	8:22

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

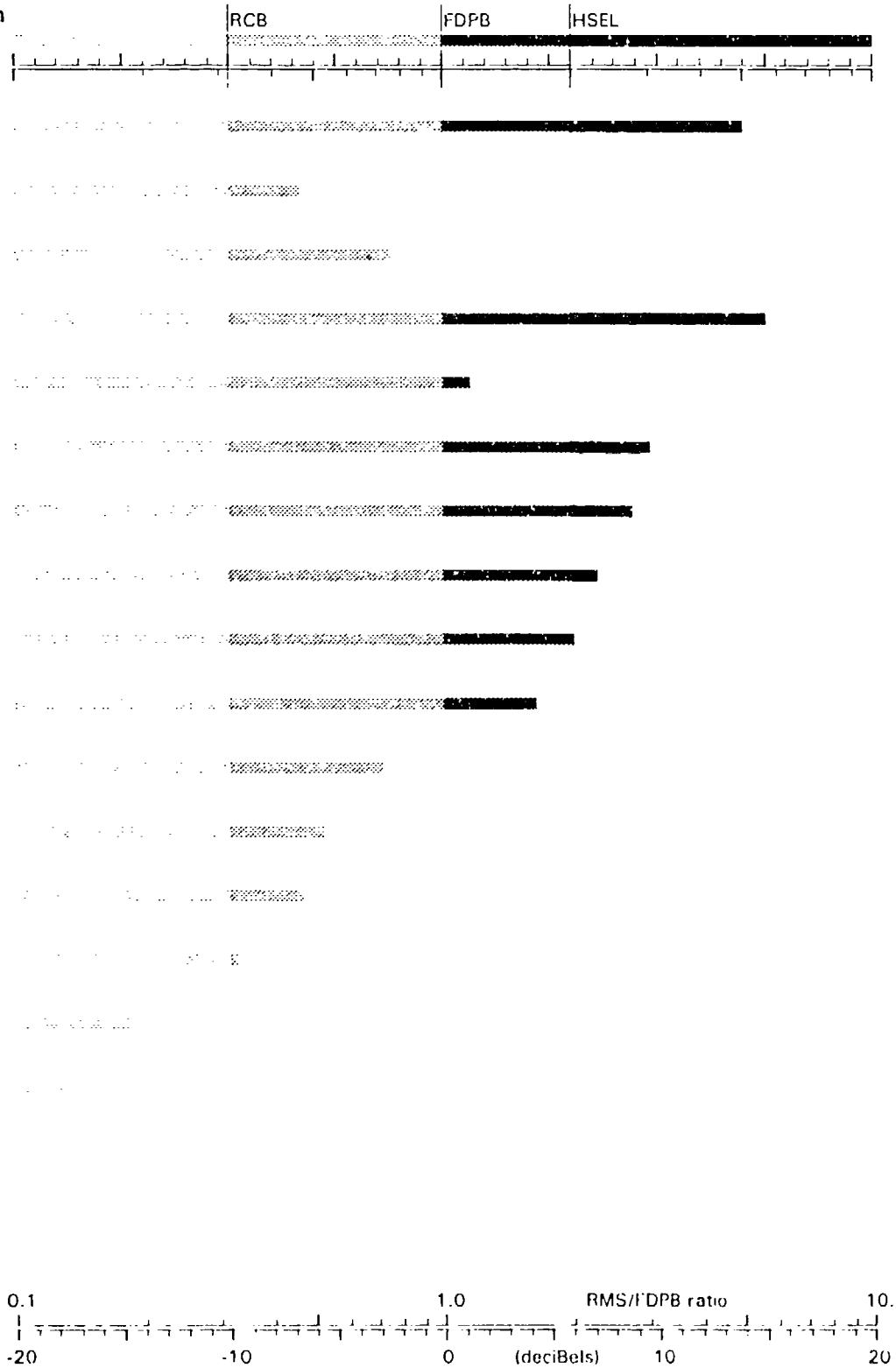
HSEL: Health and safety exposure limit
FDPB: Fatigue decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-23 **P-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



Course: #1 ARG
Speed: 15 mph
Note: HHA of PLS truck, passenger (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-23 D-seat

17-MAY-94 13:18:57

Sensor.... **D-seat**
Course.... **#1 APG**
Speed..... **15 mph**
Vehicle... **PLS truck**
Date..... **May 20, 1992**
Note..... **HHA of PLS truck, driver (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**2.1900**	**1.5486**	**0:01**	**0:33**	**2:06**
1.00	2.6500	1.4250	0:01	0:40	2:26
3.17	0.8500	0.7567	0:12	2:13	6:13
4.00	0.6300	0.6300	0:18	2:57	8:00
5.04	0.4400	0.4400	0:41	5:03	12:53

* International Standards Organization ISO 2631:

Comfort . Reduced comfort boundary
Fatigue ... Fatigue decreased proficiency boundary
Health ... Health and safety exposure limit

HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

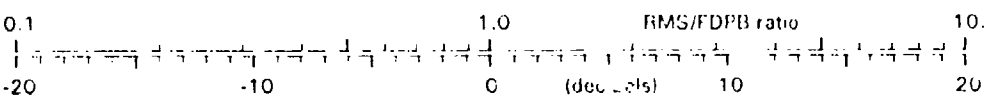
X: Longitudinal
Y: Transverse
Z: Vertical

RUN-23 — May 20, 1992

D-seat — PLS truck

Exposure: 10h. 0m

(Hz)		RMS / FDPB
1.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	2.85 / 0.536
1.26	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.23 / 0.477
1.59	X	0.00 / 0.191
	Y	0.00 / 0.131
	Z	0.32 / 0.425
2.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	2.19 / 0.379
2.52	X	0.00 / 0.241
	Y	0.00 / 0.241
	Z	0.38 / 0.338
3.17	X	0.00 / 0.303
	Y	0.00 / 0.303
	Z	0.85 / 0.301
4.00	X	0.00 / 0.383
	Y	0.00 / 0.383
	Z	0.63 / 0.268
5.04	X	0.00 / 0.482
	Y	0.00 / 0.482
	Z	0.44 / 0.268
6.35	X	0.00 / 0.608
	Y	0.00 / 0.608
	Z	0.37 / 0.268
7.94	X	0.00 / 0.760
	Y	0.00 / 0.760
	Z	0.36 / 0.268
10.00	X	0.00 / 0.957
	Y	0.00 / 0.957
	Z	0.27 / 0.335
12.60	X	0.00 / 1.206
	Y	0.00 / 1.206
	Z	0.20 / 0.422
15.87	X	0.00 / 1.519
	Y	0.00 / 1.519
	Z	0.16 / 0.531
20.00	X	0.00 / 1.914
	Y	0.00 / 1.914
	Z	0.28 / 0.670
25.20	X	0.00 / 2.411
	Y	0.00 / 2.411
	Z	0.17 / 0.844
31.75	X	0.00 / 3.038
	Y	0.00 / 3.038
	Z	0.15 / 1.063
40.00	X	0.00 / 3.827
	Y	0.00 / 3.827
	Z	0.11 / 1.340
50.40	X	0.00 / 4.823
	Y	0.00 / 4.823
	Z	0.11 / 1.688
63.50	X	0.00 / 6.076
	Y	0.00 / 6.076
	Z	0.11 / 2.127



17 MAY-94 13:18:57

Course: #1 APG
Speed: 15 mph
Note: HHA of PLS truck, driver (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-26 P-seat

17-MAY-94 13.18.59

Sensor.... **P-seat**
Course.... **#1 APG**
Speed..... **13 mph**
Vehicle... **PLS truck**
Date..... **May 20, 1992**
Note..... **HHA of PLS truck, passenger (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**1.0700**	**0.7566**	**0:12**	**2:13**	**6:13**
3.17	0.7800	0.6944	0:14	2:31	7:01
1.00	1.3800	0.6900	0:15	2:33	7:05
4.00	0.4300	0.4300	0:44	5:13	13:15
2.52	0.3200	0.2540	2:00	10:42	25:25

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue decreased proficiency boundary
Health ... Health and safety exposure limit

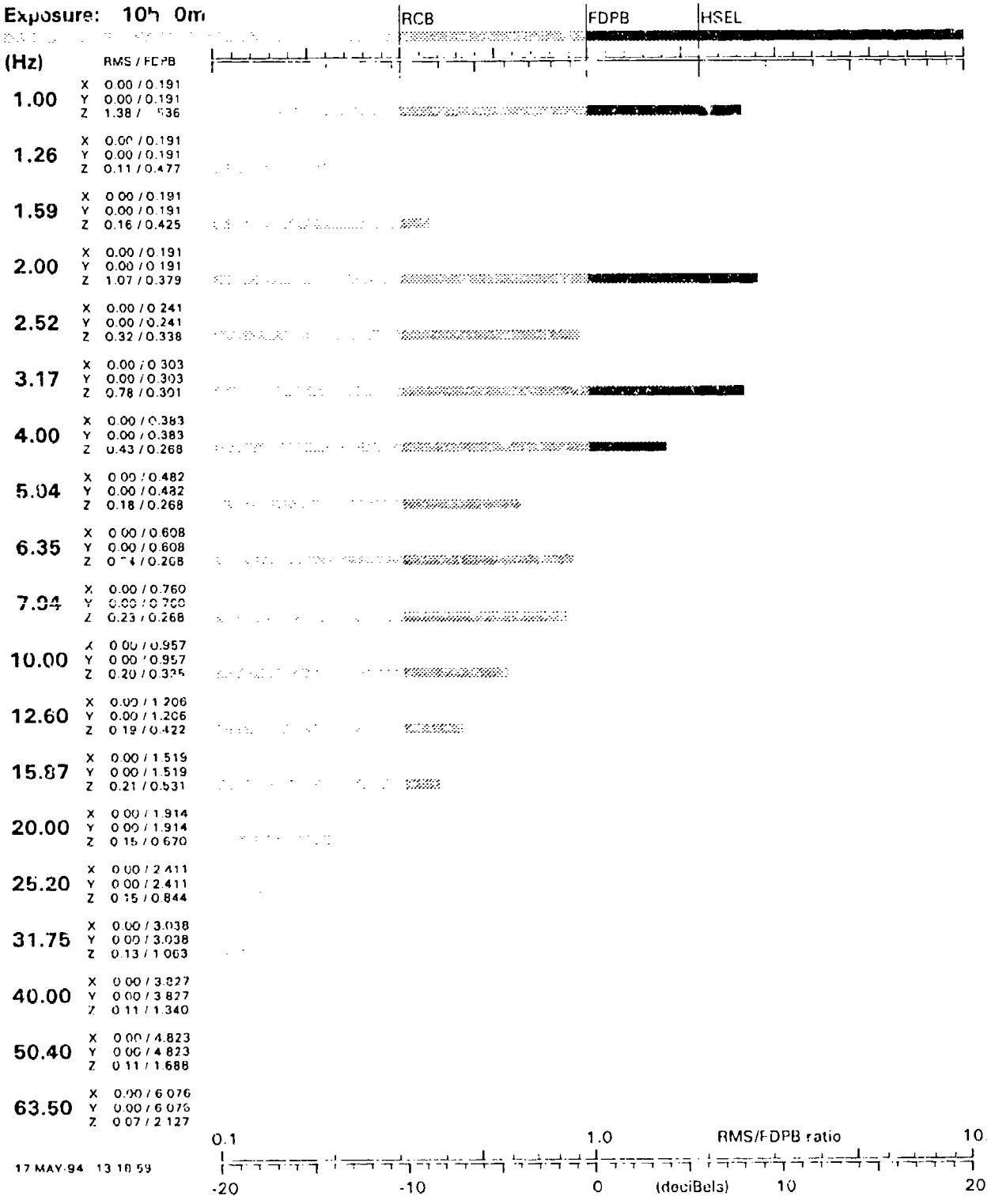
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-26 **P-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



Course: #1 APG
Speed: 13 mph
Note: HHA of PLS truck, passenger (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-26 D-seat

17-MAY-94 13:18:59

Sensor.... **D-seat**
Course.... **#1 APG**
Speed..... **13 mph**
Vehicle... **PLS truck**
Date..... **May 20, 1992**
Note..... **HFA of PLS truck, driver (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**1.1200**	**0.7920**	**0:11**	**2:02**	**5:50**
1.00	1.4800	0.7400	0:13	2:16	6:26
3.17	0.7600	0.6766	0:15	2:39	7:16
4.00	0.4600	0.4600	0:37	4:43	12:11
6.35	0.3300	0.3300	1:16	7:33	18:30

* International Standards Organization ISO 2631.

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

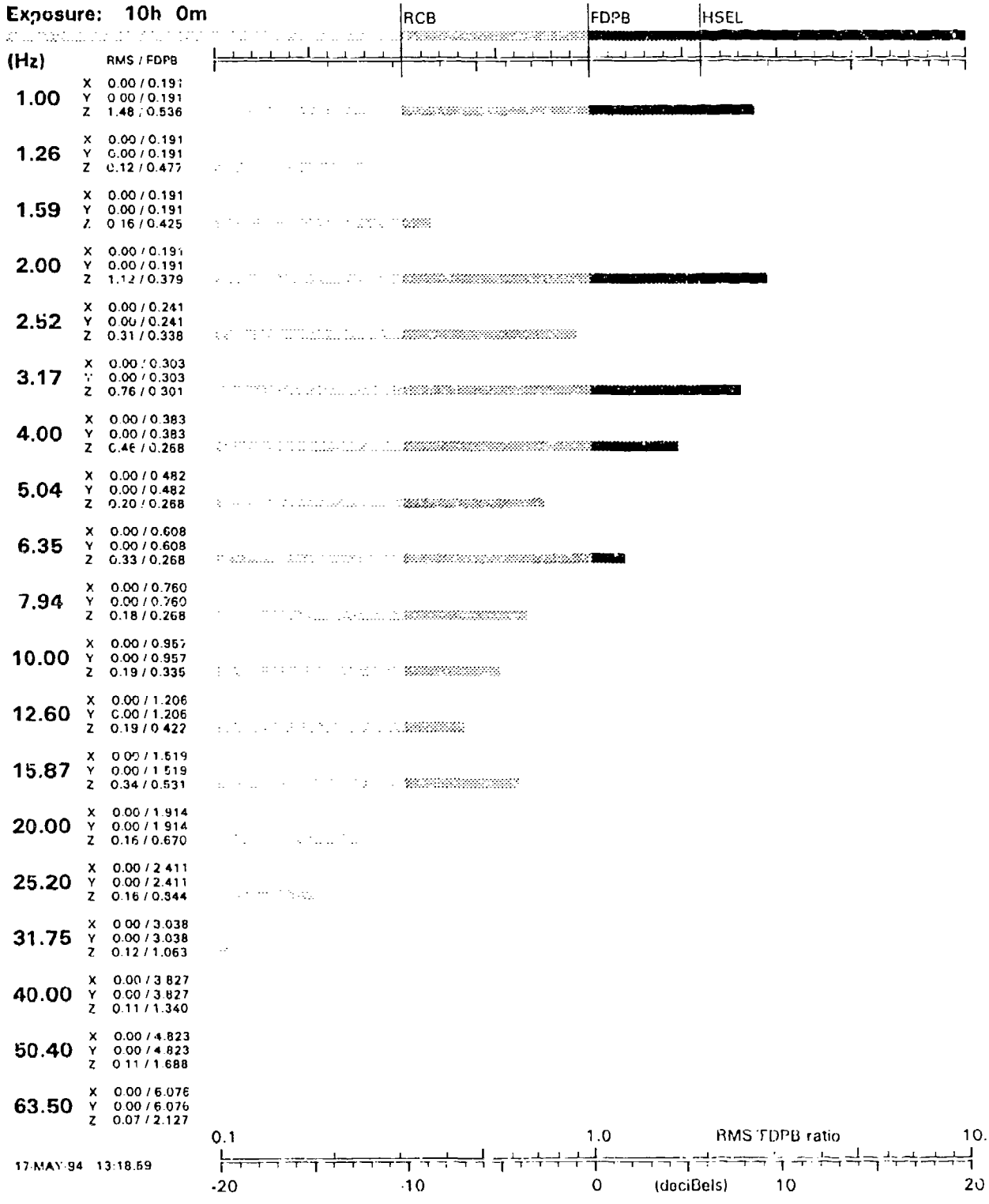
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-26 **D-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



Course: #1 APG
Speed: 13 mph
Note: HHA of PLS truck, driver (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-27 P-seat

17-MAY-94 13:18:59

Sensor....	**P-seat**
Course....	**#1 APG**
Speed.....	**14 mph**
Vehicle...	**PLS truck**
Date.....	**May 20, 1992**
Note.....	**HHA of PLS truck, passenger (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**2.0600**	**1.4566**	**0:01**	**0:37**	**2:20**
3.17	0.8100	0.7211	0:13	2:23	6:39
4.00	0.6300	0.6300	0:18	2:57	8:00
1.00	1.2600	0.6300	0:18	2:57	8:00
6.35	0.4200	0.4200	0:47	5:24	13:41

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

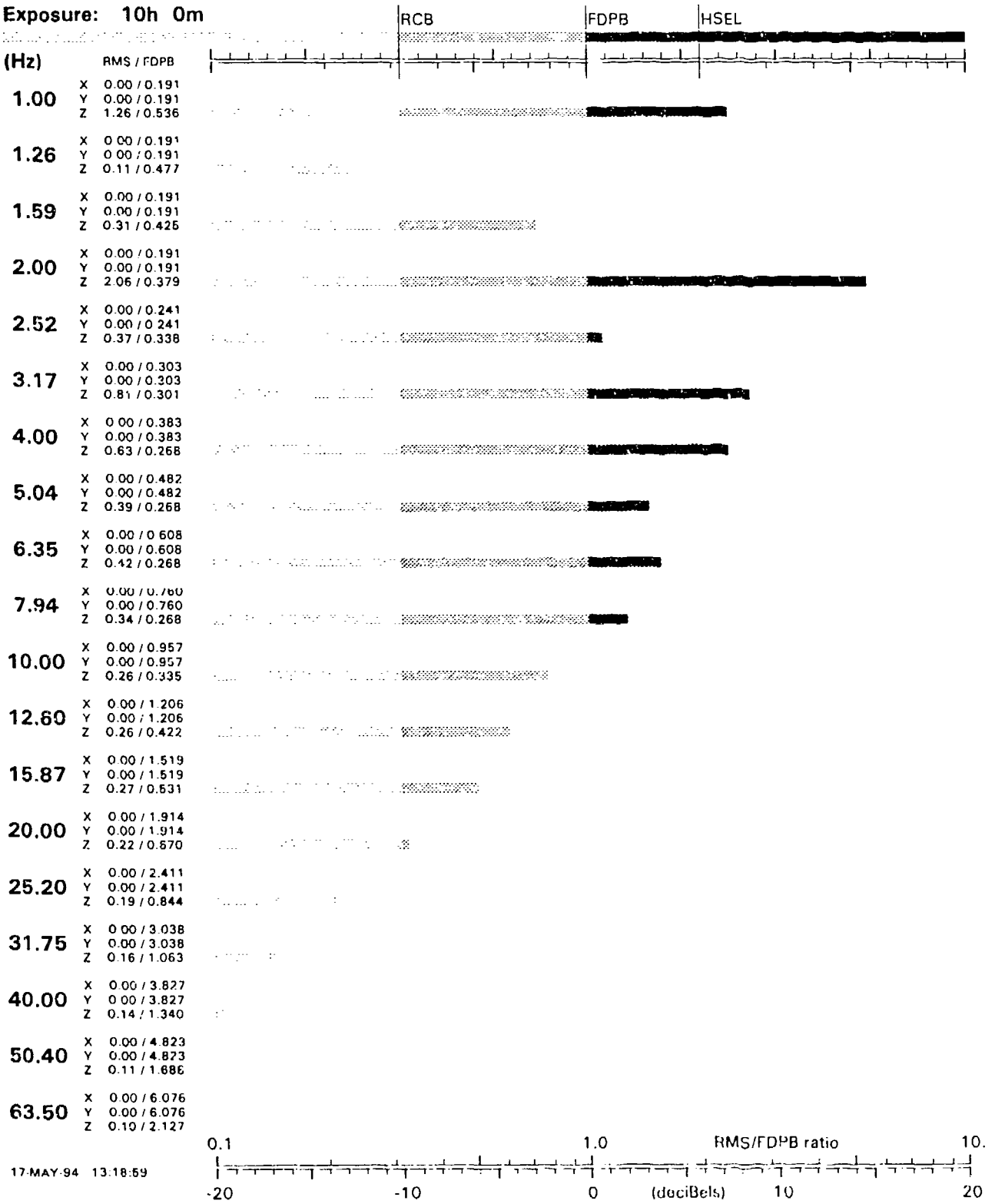
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-27 **P-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



Course: #1 APG
Speed: 14 mph
Note: HHA of PLS truck, passenger (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-27 D-seat

17-MAY-94 13:18:59

Sensor....	**D-seat**
Course....	**#1 APG**
Speed.....	**14 mph**
Vehicle...	**PLS truck**
Date.....	**May 20, 1992**
Note.....	**HHA of PLS truck, driver (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**2.1600**	**1.5274**	**0:01**	**0:34**	**2:10**
1.00	1.3000	0.6500	0:16	2:48	7:41
3.17	0.6900	0.6143	0:18	3:03	8:18
4.00	0.5900	0.5900	0:20	3:15	8:45
5.04	0.5100	0.5100	0:30	4:03	10:38

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

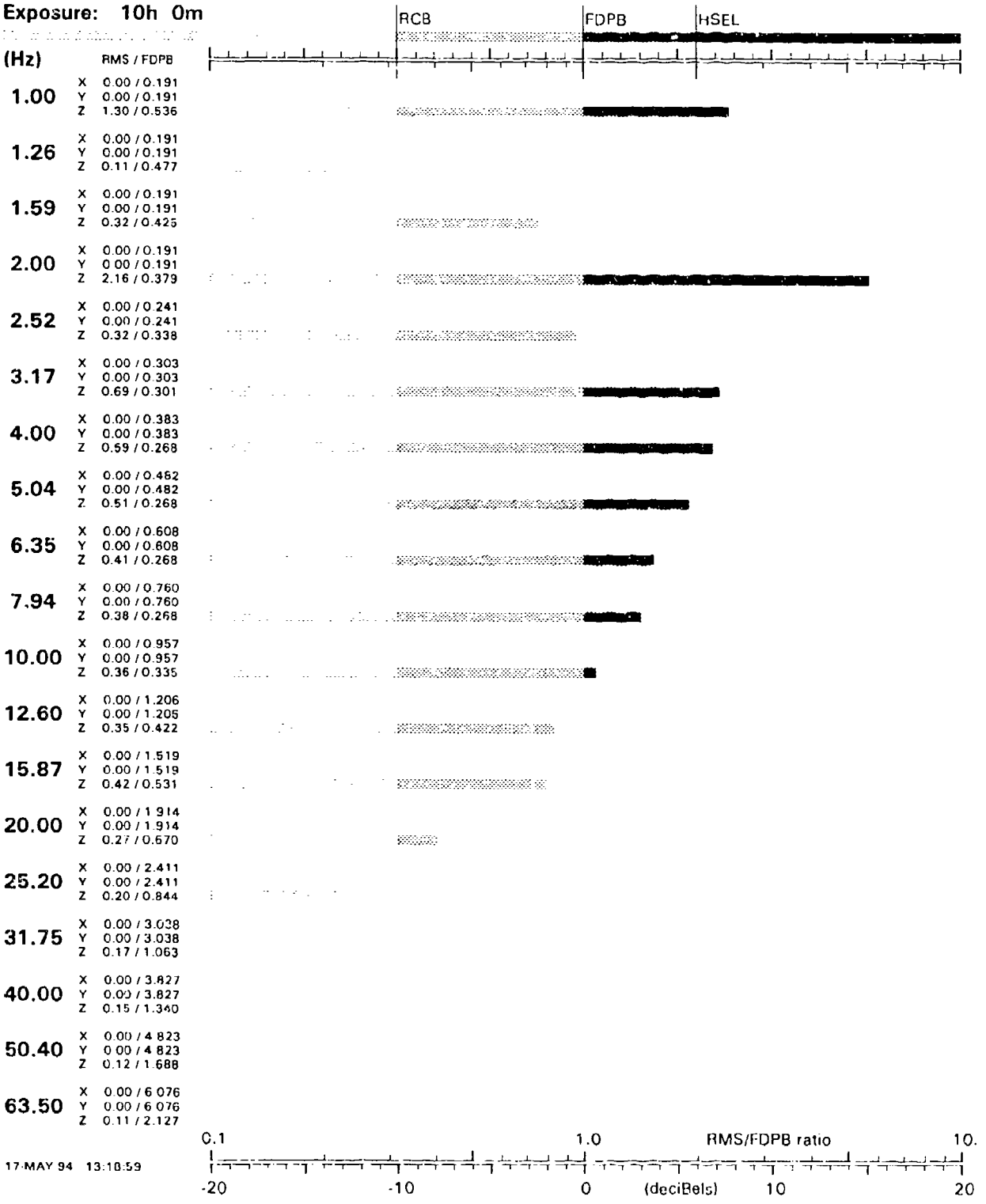
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-27 **D-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



Course: #1 APG
Speed: 14 mph
Note: HHA of PLS truck, driver (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-33 P-seat

17-MAY-94 13:19:02

Sensor....	**P-seat**
Course....	**#5 APG**
Speed.....	**5 mph**
Vehicle...	**PLS truck**
Date.....	**May 20, 1992**
Note.....	**HHA of PLS truck, passenger (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**1.2400**	**0.8768**	**0:11**	**1:44**	**5:03**
1.00	1.2400	0.6200	0:18	3:01	8:11
3.17	0.5400	0.4807	0:34	4:26	11:30
4.00	0.3500	0.3500	1:09	6:58	17:13
6.35	0.3300	0.3300	1:16	7:33	18:30

* International Standards Organization ISO 2631

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

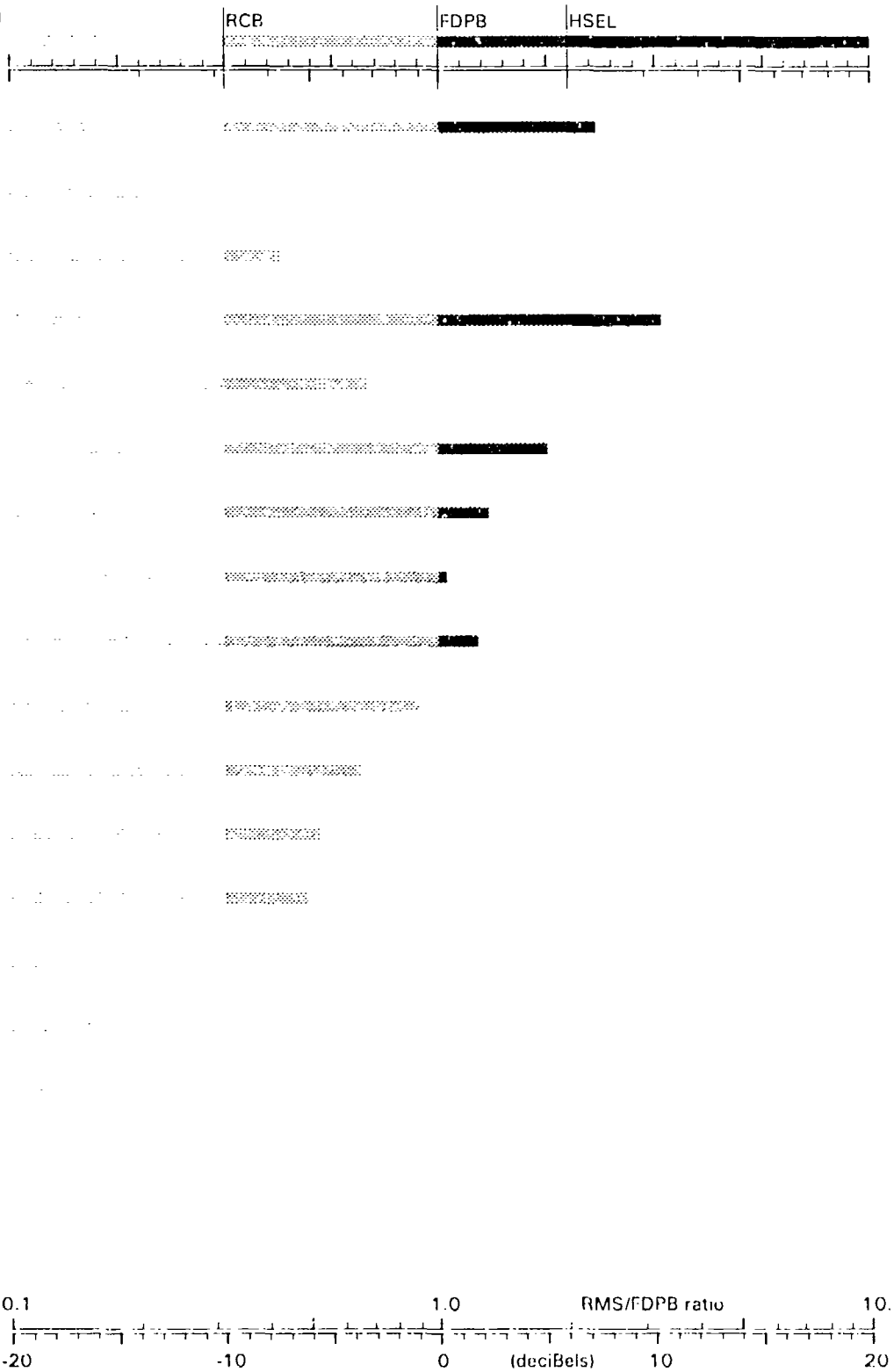
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-33 **P-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



Course: #5 APG
Speed: 5 mph
Note: HHA of PLS truck, passenger (seat)

USAARL summary of analysis
per ISO 2631* guideline on
whole-body vibration (WBV)

RUN-33 D-seat

17-MAY-94 13:19:02

Sensor....	**D-seat**
Course....	**#5 APG**
Speed.....	**5 mph**
Vehicle...	**PLS truck**
Date.....	**May 20, 1992**
Note.....	**HHA of PLS truck, driver (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**1.0900**	**0.7707**	**0:12**	**2:09**	**6:03**
1.00	1.0700	0.5250	0:30	3:46	10:00
3.17	0.5100	0.4240	0:40	4:48	12:22
4.00	0.3400	0.3400	1:13	7:15	17:50
6.35	0.2800	0.2800	1:42	9:26	22:37

* International Standard Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

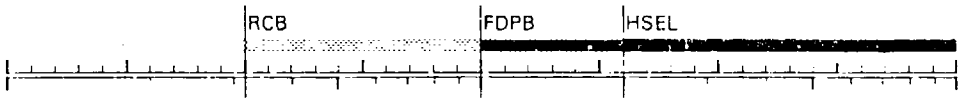
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X Longitudinal
Y Transverse
Z Vertical

RUN-33 **D-seat**

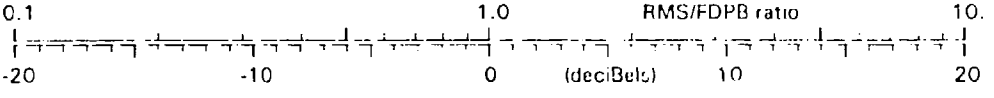
May 20, 1992 **PLS truck**

Exposure: 10h 0m



(Hz)		RMS / FDPB
1.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	1.07 / 0.536
1.26	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.09 / 0.477
1.59	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.16 / 0.425
2.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	1.09 / 0.379
2.52	X	0.00 / 0.241
	Y	0.00 / 0.241
	Z	0.22 / 0.338
3.17	X	0.00 / 0.303
	Y	0.00 / 0.303
	Z	0.51 / 0.301
4.00	X	0.00 / 0.383
	Y	0.00 / 0.383
	Z	0.34 / 0.268
5.04	X	0.00 / 0.482
	Y	0.00 / 0.482
	Z	[illegible].28 / 0.268
6.35	X	0.00 / 0.608
	Y	0.00 / 0.608
	Z	0.28 / 0.268
7.94	X	0.00 / 0.760
	Y	0.00 / 0.760
	Z	0.22 / 0.268
10.00	X	0.00 / 0.957
	Y	0.00 / 0.957
	Z	0.21 / 0.335
12.70	X	0.00 / 1.206
	Y	0.00 / 1.206
	Z	0.17 / 0.422
15.87	X	0.00 / 1.519
	Y	0.00 / 1.519
	Z	0.25 / 0.531
20.00	X	0.00 / 1.914
	Y	0.00 / 1.914
	Z	0.18 / 0.670
25.20	X	0.00 / 2.411
	Y	0.00 / 2.411
	Z	0.11 / 0.844
31.75	X	0.00 / 3.038
	Y	[illegible] / 3.038
	Z	0.12 / 1.062
40.00	X	0.00 / 3.827
	Y	0.00 / 3.827
	Z	0.11 / 1.340
50.40	X	0.00 / 4.8[illegible]3
	Y	0.00 / 4.8[illegible]3
	Z	0.08 / 1.688
63.50	X	0.00 / 6.076
	Y	0.00 / 6.076
	Z	0.07 / 2.127

17 MAY 94 13 19 02



Course: #5 APG
Speed: 5 mph
Note: HHA of PLS truck, driver (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-34	P-seat

17-MAY-94 13:19:03

Sensor....	**P-seat**
Course....	**#5 APG**
Speed.....	**7 mph**
Vehicle...	**PLS truck**
Date.....	**May 20, 1992**
Note.....	**HHA of PLS truck, passenger (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**2.5900**	**1.8314**	**0:01**	**0:22**	**1:36**
1.00	2.9400	1.4700	0:01	0:37	2:17
5.04	0.6600	0.6600	0:16	2:45	7:31
3.17	0.7200	0.6410	0:16	2:53	7:50
6.35	0.5800	0.5800	0:22	3:20	8:57

* International Standards Organization ISO 2631

Comfort Reduced comfort boundary
Fatigue Fatigue-decreased proficiency boundary
Health Health and safety exposure limit

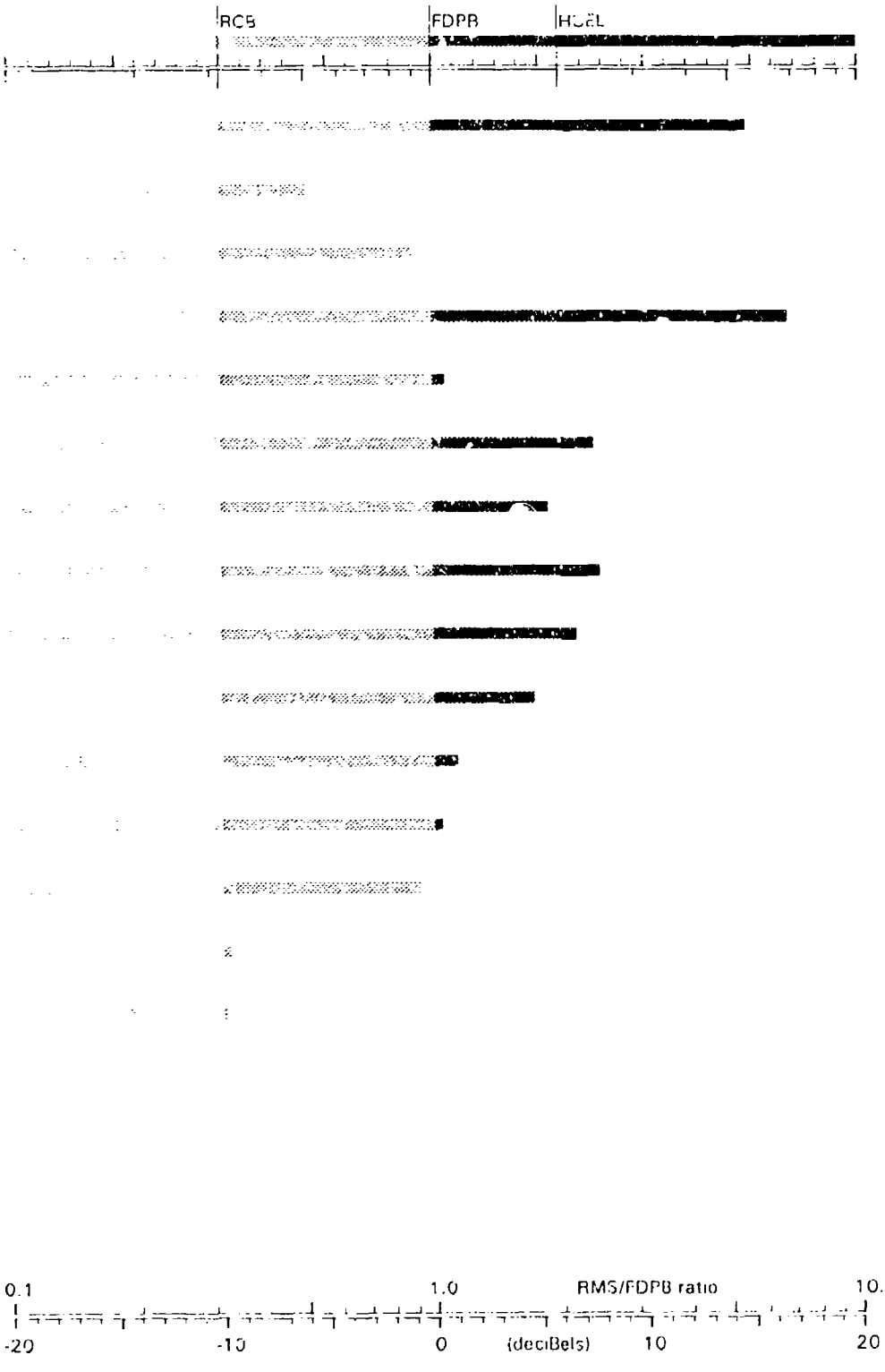
HSEL: Health and safety exposure limit
FDPB: Fatigue decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-34 **P-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0.n



17-MAY-94 13:19:03

Course: #5 APG
Speed: 7 mph
Note: HIIA of PLS truck, passenger (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-34	D-seat

17-MAY-94 13:19:03

Sensor....	**D-seat**
Course....	**#5 APG**
Speed.....	**7 mph**
Vehicle...	**PLS truck**
Date.....	**May 20, 1992**
Note.....	**HHA of PLS truck, driver (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**2.7600**	**1.9516**	**0:01**	**0:18**	**1:25**
1.00	3.0600	1.5300	0:01	0:34	2:10
3.17	0.8800	0.7834	0:12	2:04	5:56
6.35	0.7600	0.7600	0:12	2:12	6:11
5.04	0.5700	0.5700	0:24	3:27	9:11

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue decreased proficiency boundary
Health ... Health and safety exposure limit

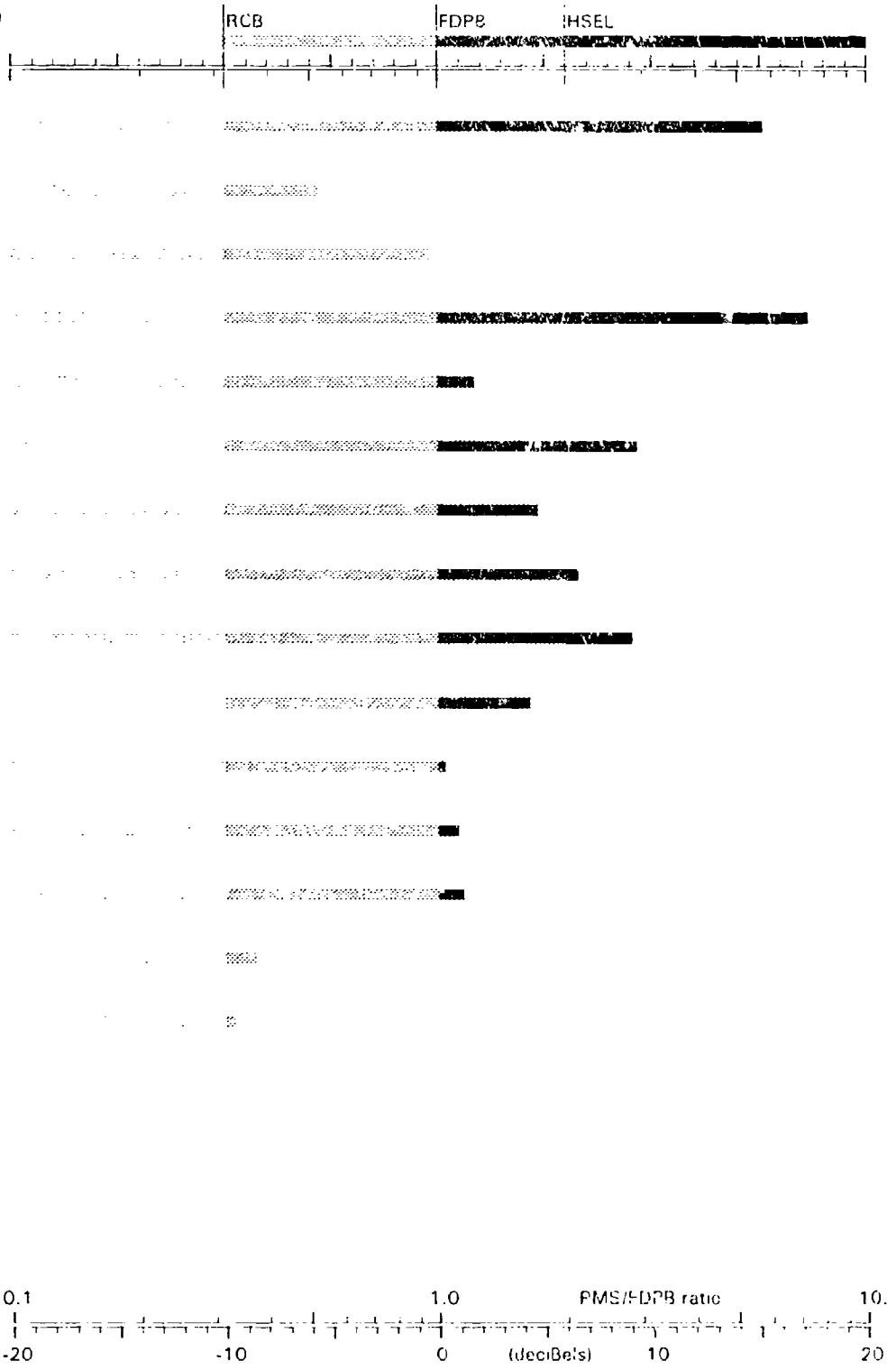
HSEL Health and safety exposure limit
FDPB Fatigue-decreased proficiency boundary
RCB Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X Longitudinal
Y: Transverse
Z Vertical

RUN-34 **D-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



17 MAY 94 13:19:03

Course: #5 APG
Speed: 7 mph
Note: HHA of PLS truck, driver (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-35 P-seat

17-MAY-94 13:19:03

Sensor.... **P-seat**
Course.... **#5 APG**
Speed..... **6 mph**
Vehicle... **PLS truck**
Date..... **May 20, 1992**
Note..... **HHA of PLS truck, passenger (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
1.00	**3.0900**	**1.5450**	**0:01**	**0:33**	**2:08**
2.00	1.5400	1.0889	0:01	1:12	3:41
3.17	0.8700	0.7745	0:12	2:08	6:01
6.35	0.6300	0.6300	0:18	2:57	8:00
4.00	0.5200	0.5200	0:30	3:57	10:22

* International Standards Organization ISO 2631

Comfort . Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

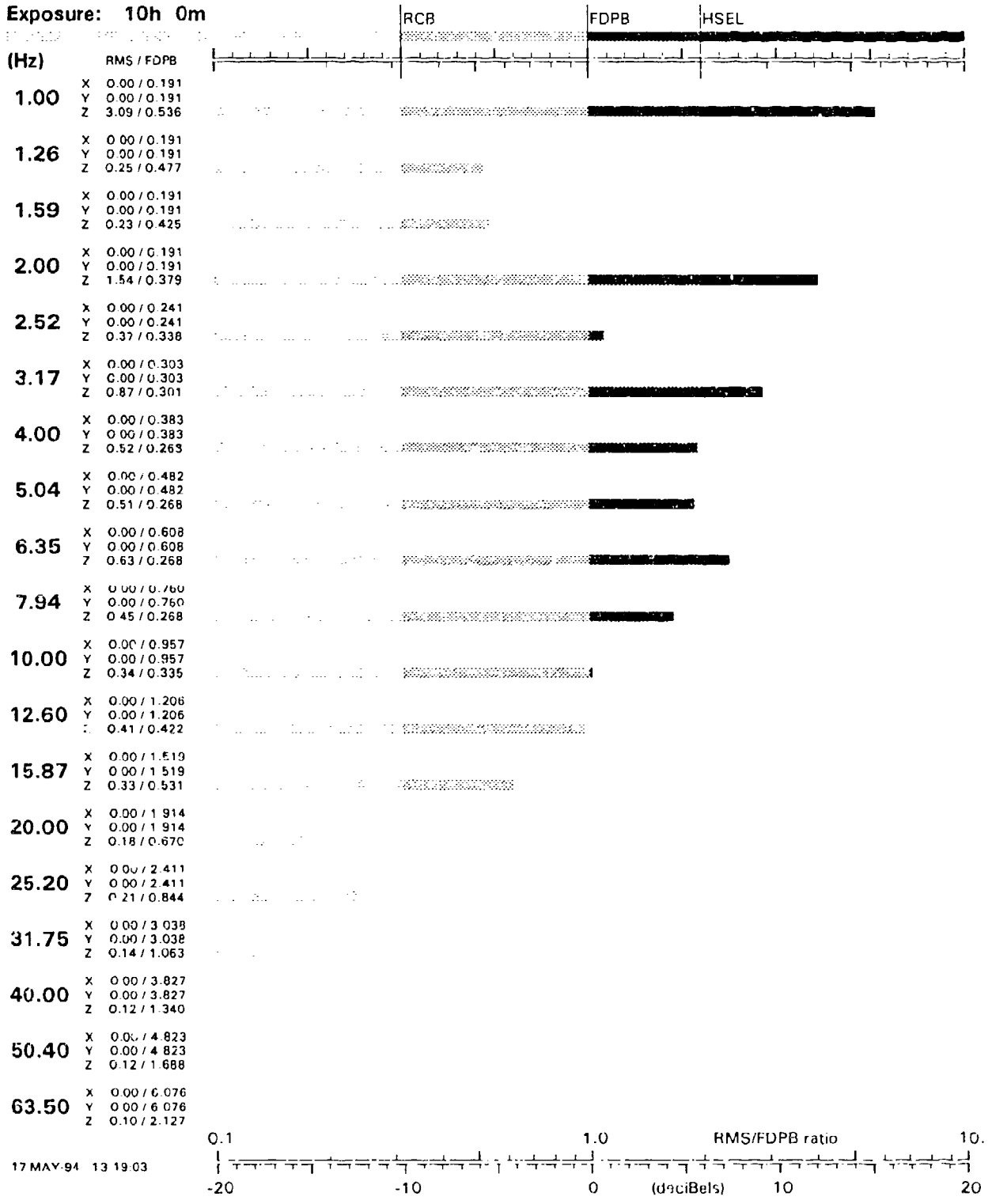
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y Transverse
Z Vertical

RUN-35 **P-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



Course: #5 APG
Speed: 6 mph
Note: HHA of PLS truck, passenger (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-35 D-seat

17-MAY-94 13:19:03

Sensor.... **D-seat**
Course.... **#5 APG**
Speed..... **6 mph**
Vehicle... **PLS truck**
Date..... **May 20, 1992**
Note..... **HHA of PLS truck, driver (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**2.3400**	**1.6546**	**0:01**	**0:30**	**1:53**
1.00	3.0700	1.5350	0:01	0:33	2:09
3.17	0.8700	0.7745	0:12	2:08	6:01
4.00	0.5000	0.5000	0:32	4:11	10:56
7.94	0.4800	0.4800	0:34	4:26	11:30

* International Standards Organization ISO 2631.

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

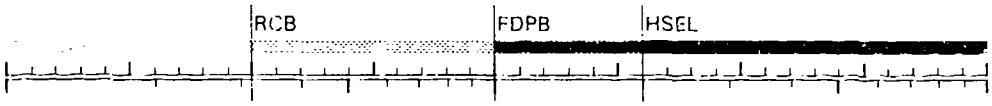
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

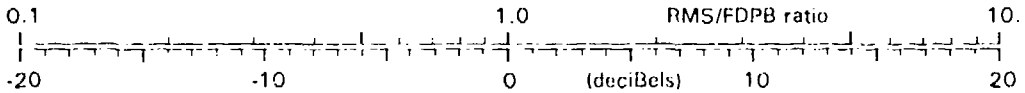
RUN-35 **D-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



(Hz)		RMS / FDPB
1.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	3.07 / 0.536
1.26	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.25 / 0.477
1.59	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.35 / 0.425
2.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	2.34 / 0.379
2.52	X	0.00 / 0.241
	Y	0.00 / 0.241
	Z	0.40 / 0.338
3.17	X	0.00 / 0.303
	Y	0.00 / 0.303
	Z	0.87 / 0.301
4.00	X	0.00 / 0.383
	Y	0.00 / 0.383
	Z	0.50 / 0.268
5.04	X	0.00 / 0.482
	Y	0.00 / 0.482
	Z	0.34 / 0.268
6.35	X	0.00 / 0.608
	Y	0.00 / 0.608
	Z	0.46 / 0.268
7.94	X	0.00 / 0.760
	Y	0.00 / 0.760
	Z	0.48 / 0.268
10.00	X	0.00 / 0.957
	Y	0.00 / 0.957
	Z	0.31 / 0.335
12.60	X	0.00 / 1.206
	Y	0.00 / 1.206
	Z	0.42 / 0.422
15.87	X	0.00 / 1.519
	Y	0.00 / 1.519
	Z	0.40 / 0.531
20.00	X	0.00 / 1.914
	Y	0.00 / 1.914
	Z	0.21 / 0.670
25.20	X	0.00 / 2.411
	Y	0.00 / 2.411
	Z	0.22 / 0.844
31.75	X	0.00 / 3.038
	Y	0.00 / 3.038
	Z	0.15 / 1.063
40.00	X	0.00 / 3.827
	Y	0.00 / 3.827
	Z	0.12 / 1.340
50.40	X	0.00 / 4.823
	Y	0.00 / 4.823
	Z	0.13 / 1.688
63.50	X	0.00 / 6.076
	Y	0.00 / 6.076
	Z	0.10 / 2.127



17-MAY-94 13:19:03

Course: #5 APG
Speed: 6 mph
Note: HHA of PLS truck, driver (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-36 P-seat

17-MAY-94 13:19:04

Sensor.... **P-seat**
Course.... **#4 APG**
Speed..... **10 mph**
Vehicle... **PLS truck**
Date..... **May 21, 1992**
Note..... **HHA of PLS truck, passenger (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
4.00	**0.4800**	**0.4800**	**0:34**	**4:26**	**11:30**
3.17	0.4700	0.4184	0:47	5:24	13:45
2.00	0.5900	0.4172	0:47	5:26	13:48
5.04	0.3100	0.3100	1:25	8:12	20:00
6.35	0.2700	0.2700	1:49	9:53	23:37

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

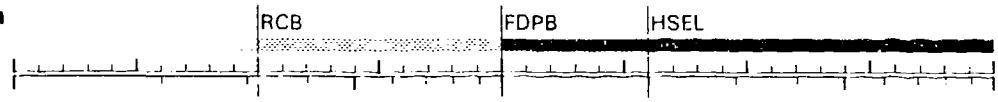
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-36 **P-seat**

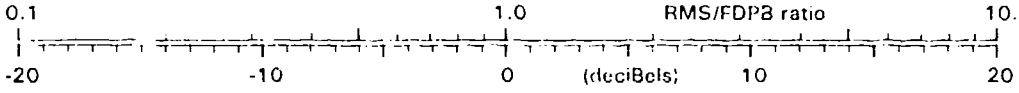
May 21, 1992 **PLS truck**

Exposure: 10h 0m



(Hz)		RMS / FDPB
1.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.28 / 0.536
1.26	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.02 / 0.477
1.59	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.09 / 0.425
2.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.59 / 0.379
2.52	X	0.00 / 0.241
	Y	0.00 / 0.241
	Z	0.19 / 0.338
3.17	X	0.00 / 0.303
	Y	0.00 / 0.303
	Z	0.47 / 0.301
4.00	X	0.00 / 0.363
	Y	0.00 / 0.383
	Z	0.48 / 0.268
5.04	X	0.00 / 0.482
	Y	0.00 / 0.482
	Z	0.31 / 0.268
6.35	X	0.00 / 0.608
	Y	0.00 / 0.608
	Z	0.27 / 0.268
7.94	X	0.00 / 0.760
	Y	0.00 / 0.760
	Z	0.22 / 0.268
10.00	X	0.00 / 0.957
	Y	0.00 / 0.957
	Z	0.16 / 0.335
12.60	X	0.00 / 1.206
	Y	0.00 / 1.206
	Z	0.22 / 0.422
15.87	X	0.00 / 1.519
	Y	0.00 / 1.519
	Z	0.25 / 0.531
20.00	X	0.00 / 1.914
	Y	0.00 / 1.914
	Z	0.14 / 0.670
25.20	X	0.00 / 2.411
	Y	0.00 / 2.411
	Z	0.13 / 0.844
31.75	X	0.00 / 3.038
	Y	0.00 / 3.038
	Z	0.10 / 1.063
40.00	X	0.00 / 3.827
	Y	0.00 / 3.827
	Z	0.10 / 1.340
50.40	X	0.00 / 4.823
	Y	0.00 / 4.823
	Z	0.06 / 1.688
63.50	X	0.00 / 6.076
	Y	0.00 / 6.076
	Z	0.05 / 2.127

17-MAY-94 13:19:04



Course: #4 APG
Speed: 10 mph
Note: HHA of PLS truck, passenger (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-36 D-seat

17-MAY-94 13:19:04

Sensor.... **D-seat**
Course.... **#4 APG**
Speed..... **10 mph**
Vehicle... **PLS truck**
Date..... **May 21, 1992**
Note..... **HHA of PLS truck, driver (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
5[illegible]	0.0000	0.0000	0:01	0:01	0:0[illegible]

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
4.00	**0.5600**	**0.5600**	**0:24**	**3:31**	**9:23**
2.00	0.6500	0.4596	0:38	4:42	12:11
3.17	0.4700	0.4184	0:47	5:24	13:45
6.35	0.3700	0.2700	1:02	6:26	16:02
5.04	0.3600	0.3600	1:06	6:41	16:37

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue decreased proficiency boundary
Health ... Health and safety exposure limit

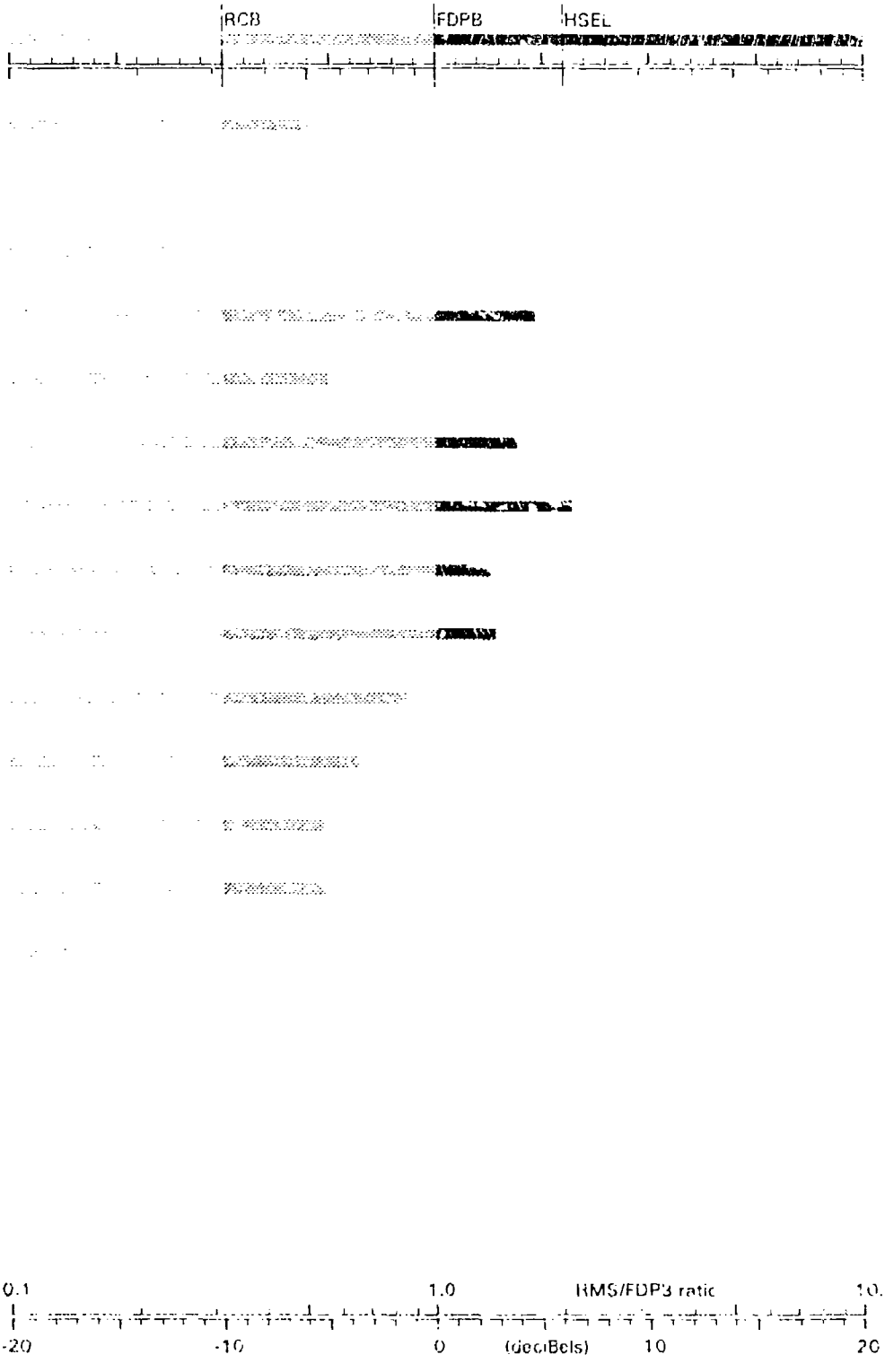
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-36 **D-seat**

May 21, 1992 **PLS truck**

Exposure: 10h 0m



Course: #4 APG
Speed: 10 mph
Note: HHA of PLS truck, driver (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-38	P-seat

17-MAY-92 13:19:05

Sensor....	P seat
Course....	#4 APG
Speed.....	5 mph
Vehicle...	PLS truck
Date.....	May 21, 1992
Note.....	HRA of PLS truck, passenger (seat)

Third-octave bands with greatest weighted RMS accelerations (m/s²)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**1.2900**	**0.9122**	**0:01**	**1:37**	**4:46**
1.00	0.8300	0.4150	0:48	5:28	13:53
6.35	0.2700	0.2700	1:49	9:53	23:37
4.00	0.2500	0.2500	2:03	10:57	25:52
3.17	0.2600	0.2315	2:19	12:07	28:22

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

HSEL: Health and safety exposure limit
FDPB: Fatigue decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X Longitudinal
Y Transverse
Z Vertical

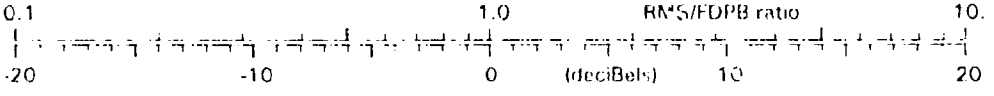
RUN-38 **P-seat**

May 21, 1992 **PLS truck**

Exposure: 10h 0m

(Hz)		RMS / FDPB
1.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.83 / 0.506
1.26	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.07 / 0.477
1.59	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.19 / 0.425
2.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	1.29 / 0.379
2.52	X	0.00 / 0.241
	Y	0.00 / 0.241
	Z	0.14 / 0.338
3.17	X	0.00 / 0.303
	Y	0.00 / 0.303
	Z	0.26 / 0.301
4.00	X	0.00 / 0.383
	Y	0.00 / 0.383
	Z	0.25 / 0.268
5.04	X	0.00 / 0.482
	Y	0.00 / 0.482
	Z	0.22 / 0.268
6.35	X	0.00 / 0.608
	Y	0.00 / 0.608
	Z	0.27 / 0.268
7.94	X	0.00 / 0.760
	Y	0.00 / 0.760
	Z	0.17 / 0.268
10.00	X	0.00 / 0.957
	Y	0.00 / 0.957
	Z	0.13 / 0.335
12.60	X	0.00 / 1.206
	Y	0.00 / 1.206
	Z	0.12 / 0.422
15.87	X	0.00 / 1.519
	Y	0.00 / 1.519
	Z	0.16 / 0.531
20.00	X	0.00 / 1.914
	Y	0.00 / 1.914
	Z	0.15 / 0.670
25.20	X	0.00 / 2.411
	Y	0.00 / 2.411
	Z	0.11 / 0.844
31.75	X	0.00 / 3.038
	Y	0.00 / 3.038
	Z	0.09 / 1.063
40.00	X	0.00 / 3.827
	Y	0.00 / 3.827
	Z	0.10 / 1.340
50.40	X	0.00 / 4.823
	Y	0.00 / 4.823
	Z	0.06 / 1.688
63.50	X	0.00 / 6.076
	Y	0.00 / 6.076
	Z	0.05 / 2.127

17 MAY 94 13:19:05



Course: #4 APG
Speed: 5 mph
Note: IHA of PLS truck, passenger (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-38 D-seat

17-MAY-94 13:19:05

Sensor....	**D-seat**
Course....	**#4 APG**
Speed.....	**5 mph**
Vehicle...	**PLS truck**
Date.....	**May 21, 1992**
Note.....	**HHA of PLS truck, driver (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**1.3400**	**0.0475**	**0:01**	**1:30**	**4:31**
1.00	0.8700	0.4350	0:42	5:07	13:04
3.17	0.3800	0.3383	1:14	7:18	17:55
4.00	0.2800	0.2800	1:42	9:26	22:37
5.04	0.2300	0.2300	2:20	12:12	28:32

* International Standards Organization ISO 2631

Comfort — Reduced comfort boundary

Fatigue — Fatigue decreased proficiency boundary

Health — Health and safety exposure limit

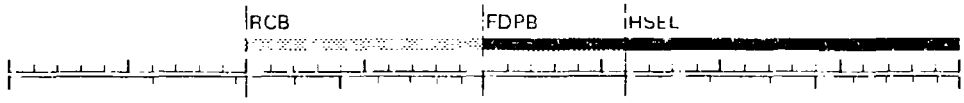
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-38 **D-seat**

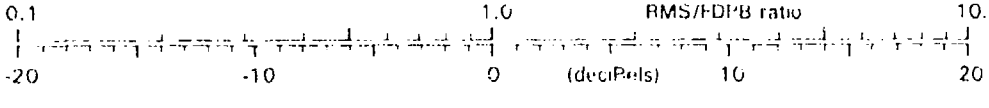
May 21, 1992 **PLS truck**

Exposure: 10h 0m



(Hz)		RMS / FDPB
1.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.87 / 0.536
1.26	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.07 / 0.477
1.59	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.20 / 0.425
2.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	1.34 / 0.379
2.52	X	0.00 / 0.241
	Y	0.00 / 0.241
	Z	0.18 / 0.338
3.17	X	0.00 / 0.303
	Y	0.00 / 0.303
	Z	0.38 / 0.301
4.00	X	0.00 / 0.383
	Y	0.00 / 0.383
	Z	0.28 / 0.268
5.04	X	0.00 / 0.482
	Y	0.00 / 0.482
	Z	0.23 / 0.268
6.35	X	0.00 / 0.608
	Y	0.00 / 0.608
	Z	0.22 / 0.268
7.94	X	0.00 / 0.760
	Y	0.00 / 0.760
	Z	0.16 / 0.268
10.00	X	0.00 / 0.957
	Y	0.00 / 0.957
	Z	0.11 / 0.335
12.60	X	0.00 / 1.206
	Y	0.00 / 1.206
	Z	0.10 / 0.422
15.87	X	0.00 / 1.519
	Y	0.00 / 1.519
	Z	0.16 / 0.531
20.00	X	0.00 / 1.914
	Y	0.00 / 1.914
	Z	0.14 / 0.670
25.20	X	0.00 / 2.411
	Y	0.00 / 2.411
	Z	0.11 / 0.844
31.75	X	0.00 / 3.038
	Y	0.00 / 3.038
	Z	0.09 / 1.063
40.00	X	0.00 / 3.827
	Y	0.00 / 3.827
	Z	0.09 / 1.340
50.40	X	0.00 / 4.823
	Y	0.00 / 4.823
	Z	0.07 / 1.688
63.50	X	0.00 / 6.076
	Y	0.00 / 6.076
	Z	0.06 / 2.127

17 MAY 94 15:19:05



Course: #4 APG
Speed: 5 mph
Note: HHA of PLS truck, driver (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-40 P-seat

17-MAY-94 13:19:06

Sensor.... **P-seat**
Course.... **#4 APG**
Speed..... **8 mph**
Vehicle... **PLS truck**
Date..... **May 20, 1992**
Note..... **HHA of PLS truck, passenger (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**1.8500**	**1.3081**	**0:01**	**0:48**	**2:46**
4.00	0.4800	0.4800	0:34	4:26	11:30
3.17	0.4500	0.4006	0:51	5:46	14:30
6.35	0.2800	0.2800	1:42	9:26	22:37
1.00	0.5600	0.2800	1:42	9:26	22:37

* International Standards Organization ISO 2631.

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

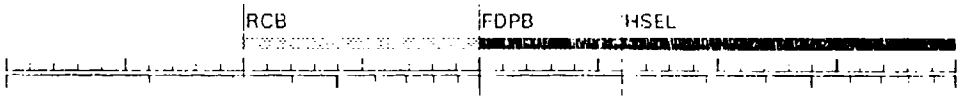
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

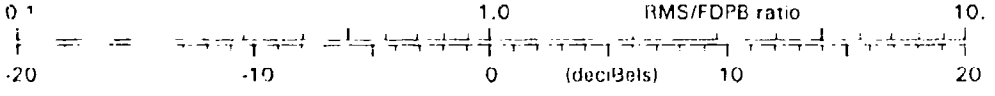
RUN-40 **P-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



(Hz)		RMS / FDPB
1.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.56 / 0.536
1.26	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.05 / 0.477
1.59	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.27 / 0.425
2.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	1.85 / 0.379
2.52	X	0.00 / 0.241
	Y	0.00 / 0.241
	Z	0.24 / 0.338
3.17	X	0.00 / 0.303
	Y	0.00 / 0.303
	Z	0.45 / 0.301
4.00	X	0.00 / 0.383
	Y	0.00 / 0.383
	Z	0.48 / 0.268
5.04	X	0.00 / 0.482
	Y	0.00 / 0.482
	Z	0.18 / 0.268
6.35	X	0.00 / 0.608
	Y	0.00 / 0.608
	Z	0.28 / 0.268
7.94	X	0.00 / 0.760
	Y	0.00 / 0.760
	Z	0.20 / 0.268
10.00	X	0.00 / 0.957
	Y	0.00 / 0.957
	Z	0.15 / 0.335
12.60	X	0.00 / 1.206
	Y	0.00 / 1.206
	Z	0.16 / 0.422
15.87	X	0.00 / 1.519
	Y	0.00 / 1.519
	Z	0.18 / 0.531
20.00	X	0.00 / 1.914
	Y	0.00 / 1.914
	Z	0.14 / 0.670
25.20	X	0.00 / 2.411
	Y	0.00 / 2.411
	Z	0.16 / 0.844
31.75	X	0.00 / 3.038
	Y	0.00 / 3.038
	Z	0.10 / 1.063
40.00	X	0.00 / 3.827
	Y	0.00 / 3.827
	Z	0.07 / 1.340
50.40	X	0.00 / 4.823
	Y	0.00 / 4.823
	Z	0.08 / 1.888
63.50	X	0.00 / 6.076
	Y	0.00 / 6.076
	Z	0.05 / 2.127



7-MAY-92 3:19:06

Course: #4 AP
Speed: 8 mph
Note: HHA of PLS truck, passenger (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-40	D-seat

17-MAY-94 13:19.06

Sensor....	**D-seat**
Course....	**#4 APG**
Speed.....	**8 mph**
Vehicle...	**PLS truck**
Date.....	**May 20, 1992**
Note.....	**HHA of PLS truck, driver (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**2.1100**	**1.4920**	**0:01**	**0:36**	**2:15**
4.00	0.3200	0.3200	1:22	7:52	19:13
1.00	0.6100	0.3050	1:29	8:23	20:12
6.35	0.2900	0.2900	1:37	9:00	21:40
3.17	0.3100	0.2760	1:45	9:37	23:10

* International Standards Organization ISO 2631.

Comfort .. Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health . Health and safety exposure limit

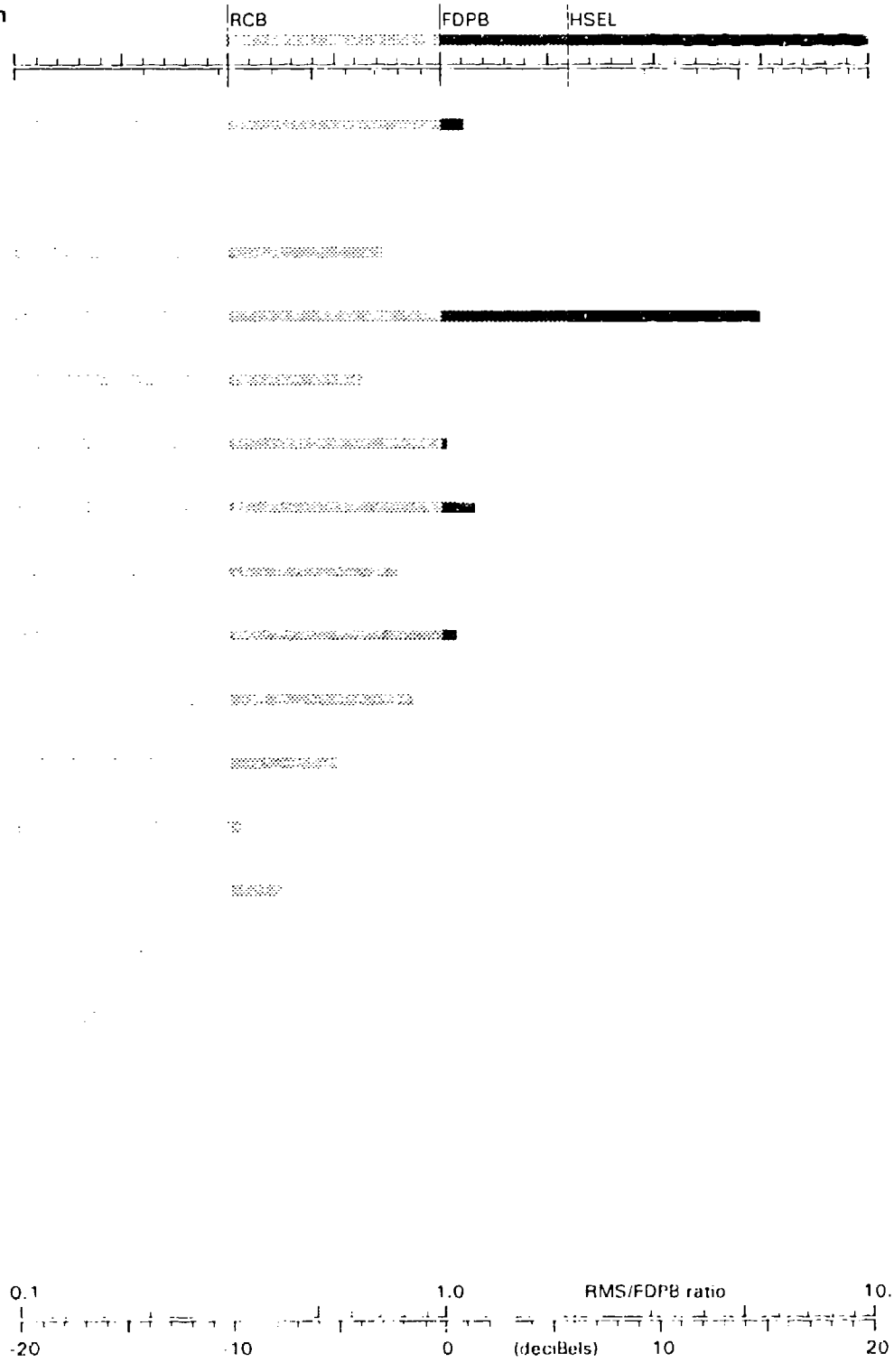
HSEL: Health and safety exposure limit
FDPB: Fatigue decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-40 **D-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



Course: #4 APG
Speed: 8 mph
Note: HHA of PLS truck, driver (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-43 P-seat

17-MAY-94 13:19:08

Sensor....	**P-seat**
Course....	**#4 APG**
Speed.....	**13 mph**
Vehicle...	**PLS truck**
Date.....	**May 20, 1992**
Note.....	**HHA of PLS truck, passenger (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
4.00	**1.3800**	**1.3800**	**0:01**	**0:42**	**2:32**
3.17	1.0400	0.9258	0:01	1:35	4:39
2.00	0.8200	0.5798	0:22	3:20	8:57
5.04	0.5500	0.5500	0:28	3:38	9:37
6.35	0.4300	0.4300	0:44	5:13	13:15

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

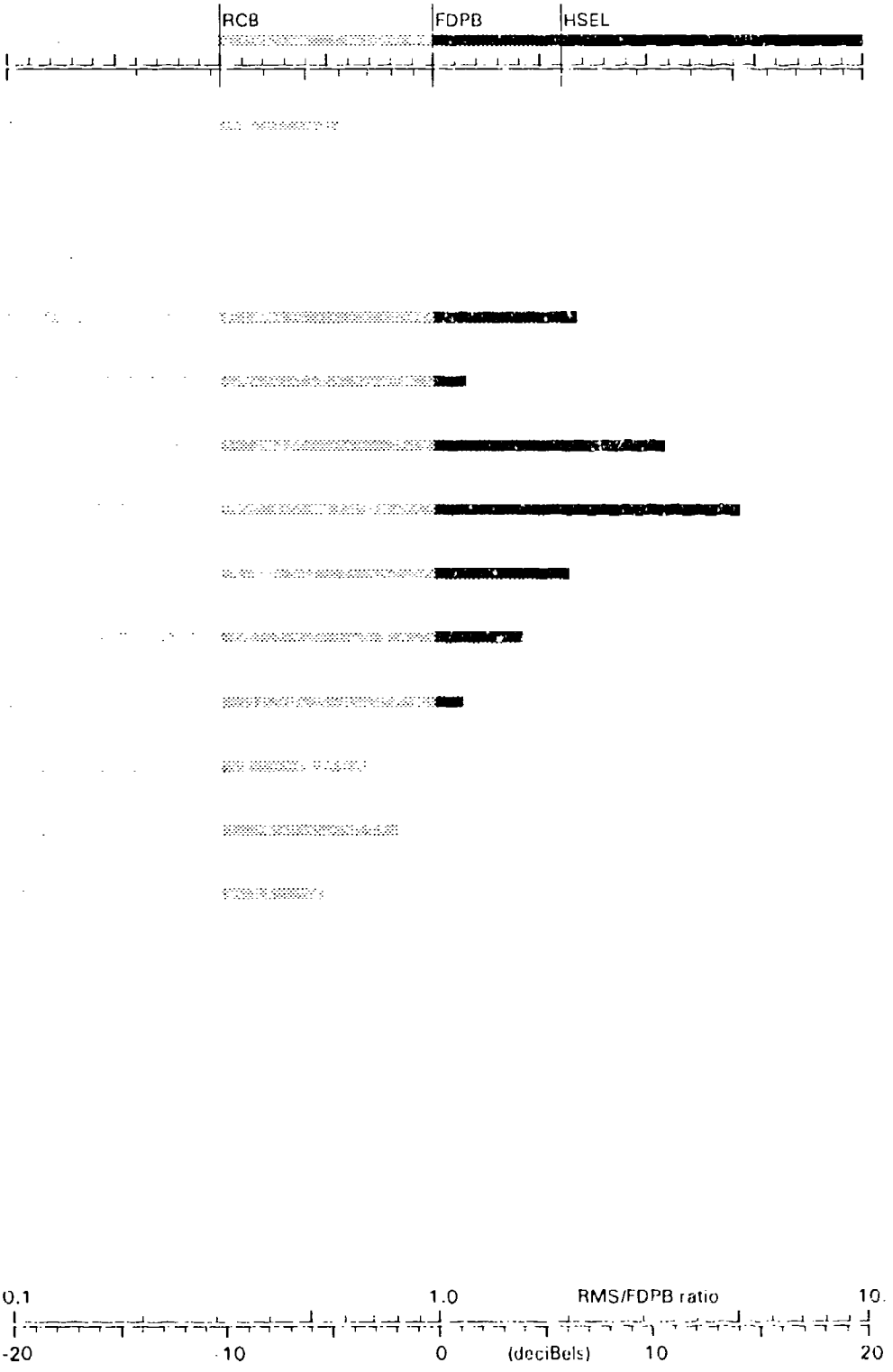
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-43 **P-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



Course: #4 APG
Speed: 13 mph
Note: HHA of PLS truck, passenger (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-43 D-seat

17-MAY-94 13:19:08

Sensor.... **D-seat**
Course.... **#4 APG**
Speed..... **13 mph**
Venicle... **PLS truck**
Date..... **May 20, 1992**
Note..... **HHA of PLS truck, driver (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
4.00	**1.3700**	**1.3700**	**0:01**	**0:44**	**2:34**
5.04	1.0000	1.0000	0:01	1:22	4:09
3.17	1.0000	0.8902	0:01	1:40	4:56
6.35	0.6400	0.6400	0:16	2:53	7:50
2.00	0.6900	0.4879	0:33	4:20	11:15

* International Standards Organization ISO 2631:

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

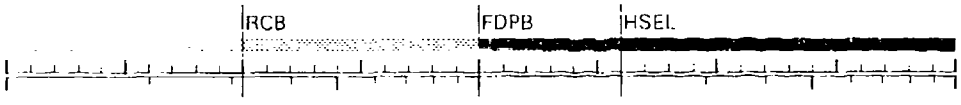
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

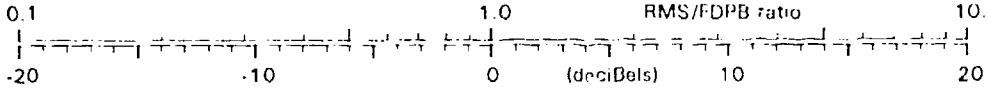
RUN-43 **D-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



(Hz)		RMS / FDPB
1.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.33 / 0.536
1.26	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.03 / 0.477
1.59	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.10 / 0.425
2.00	X	0.00 / 0.191
	Y	0.00 / 0.191
	Z	0.69 / 0.379
2.52	X	0.00 / 0.241
	Y	0.00 / 0.241
	Z	0.36 / 0.338
3.17	X	0.00 / 0.303
	Y	0.00 / 0.303
	Z	1.00 / 0.301
4.00	X	0.00 / 0.383
	Y	0.00 / 0.383
	Z	1.37 / 0.268
5.04	X	0.00 / 0.482
	Y	0.00 / 0.482
	Z	1.00 / 0.268
6.35	X	0.00 / 0.608
	Y	0.00 / 0.608
	Z	0.64 / 0.268
7.94	X	0.00 / 0.760
	Y	0.00 / 0.760
	Z	0.36 / 0.268
10.00	X	0.00 / 0.957
	Y	0.00 / 0.957
	Z	0.39 / 0.335
12.60	X	0.00 / 1.206
	Y	0.00 / 1.206
	Z	0.28 / 0.422
15.87	X	0.00 / 1.519
	Y	0.00 / 1.519
	Z	0.31 / 0.531
20.00	X	0.00 / 1.914
	Y	0.00 / 1.914
	Z	0.18 / 0.670
25.20	X	0.00 / 2.411
	Y	0.00 / 2.411
	Z	0.19 / 0.844
31.75	X	0.00 / 3.038
	Y	0.00 / 3.038
	Z	0.12 / 1.063
40.00	X	0.00 / 3.827
	Y	0.00 / 3.827
	Z	0.09 / 1.340
50.40	X	0.00 / 4.823
	Y	0.00 / 4.823
	Z	0.10 / 1.688
63.50	X	0.00 / 6.076
	Y	0.00 / 6.076
	Z	0.07 / 2.127



17-MAY 94 13 19:08

Course: #4 APG
Speed: 13 mph
Note: HHA of PLS truck, driver (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-45 P-seat

17-MAY-94 13:19:09

Sensor.... **P-seat**
Course.... **#4 APG**
Speed..... **9 mph**
Vehicle... **PLS truck**
Date..... **May 20, 1992**
Note..... **HHA of PLS truck, passenger (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**1.5200**	**1.0748**	**0:01**	**1:13**	**3:45**
3.17	0.6500	0.5786	0:22	3:21	9:00
4.00	0.5300	0.5300	0:30	3:49	10:07
6.35	0.2400	0.2400	2:12	11:33	27:10
2.52	0.2900	0.2302	2:20	12:11	28:32

* International Standards Organization ISO 2631

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

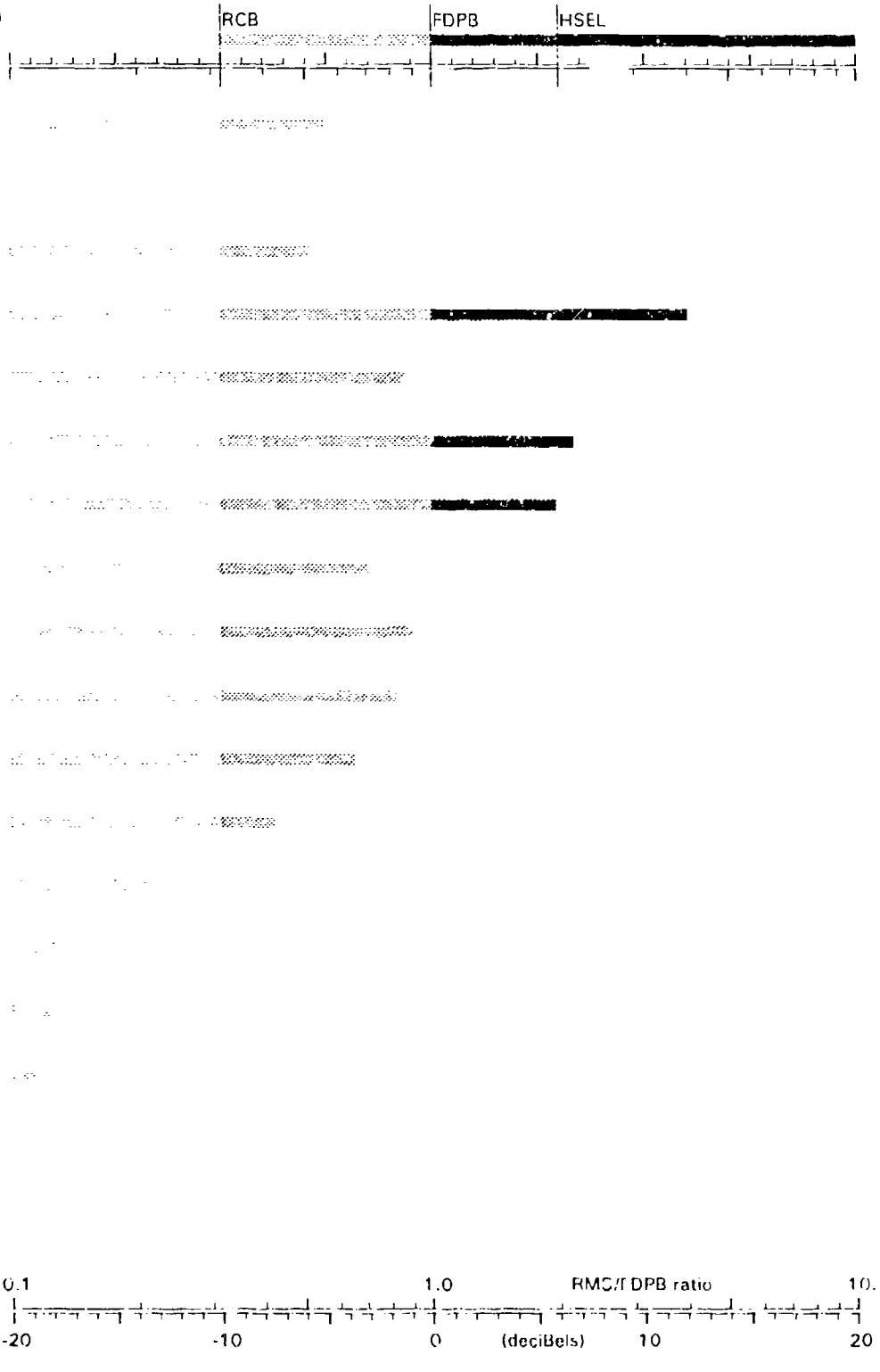
HSEL: Health and safety exposure limit
FDPB: Fatigue decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-45 **P-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



Course: #4 APG
Speed: 9 mph
Note: HHA of PLS truck, passenger (seat)

USAARL summary of analysis
per ISO-2631* guideline on
whole-body vibration (WBV)

RUN-45	D-seat

17-MAY-94 13:19:09

Sensor....	**D-seat**
Course....	**#4 APG**
Speed.....	**9 mph**
Vehicle...	**PLS truck**
Date.....	**May 20, 1992**
Note.....	**HHA of PLS truck, driver (seat)**

Third-octave bands with greatest weighted RMS accelerations (m/s^2)

Durations of WBV exposure before reaching ISO limits* (given in hours:minutes)

X: Longitudinal

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Y: Transverse

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
63.50	**0.0000**	**0.0000**	**0:01**	**0:01**	**0:01**
50.40	0.0000	0.0000	0:01	0:01	0:01
40.00	0.0000	0.0000	0:01	0:01	0:01
31.75	0.0000	0.0000	0:01	0:01	0:01
25.20	0.0000	0.0000	0:01	0:01	0:01

Z: Vertical

(Hz)	actual	weighted	COMFORT	FATIGUE	HEALTH
2.00	**1.4300**	**1.0112**	**0:01**	**1:22**	**4:05**
3.17	0.7100	0.6321	0:18	2:56	8:00
4.00	0.6300	0.6300	0:18	2:57	8:00
7.94	0.3100	0.3100	1:25	8:12	20:00
6.35	0.2800	0.2800	1:42	9:26	22:37

* International Standards Organization ISO 2631

Comfort ... Reduced comfort boundary
Fatigue ... Fatigue-decreased proficiency boundary
Health ... Health and safety exposure limit

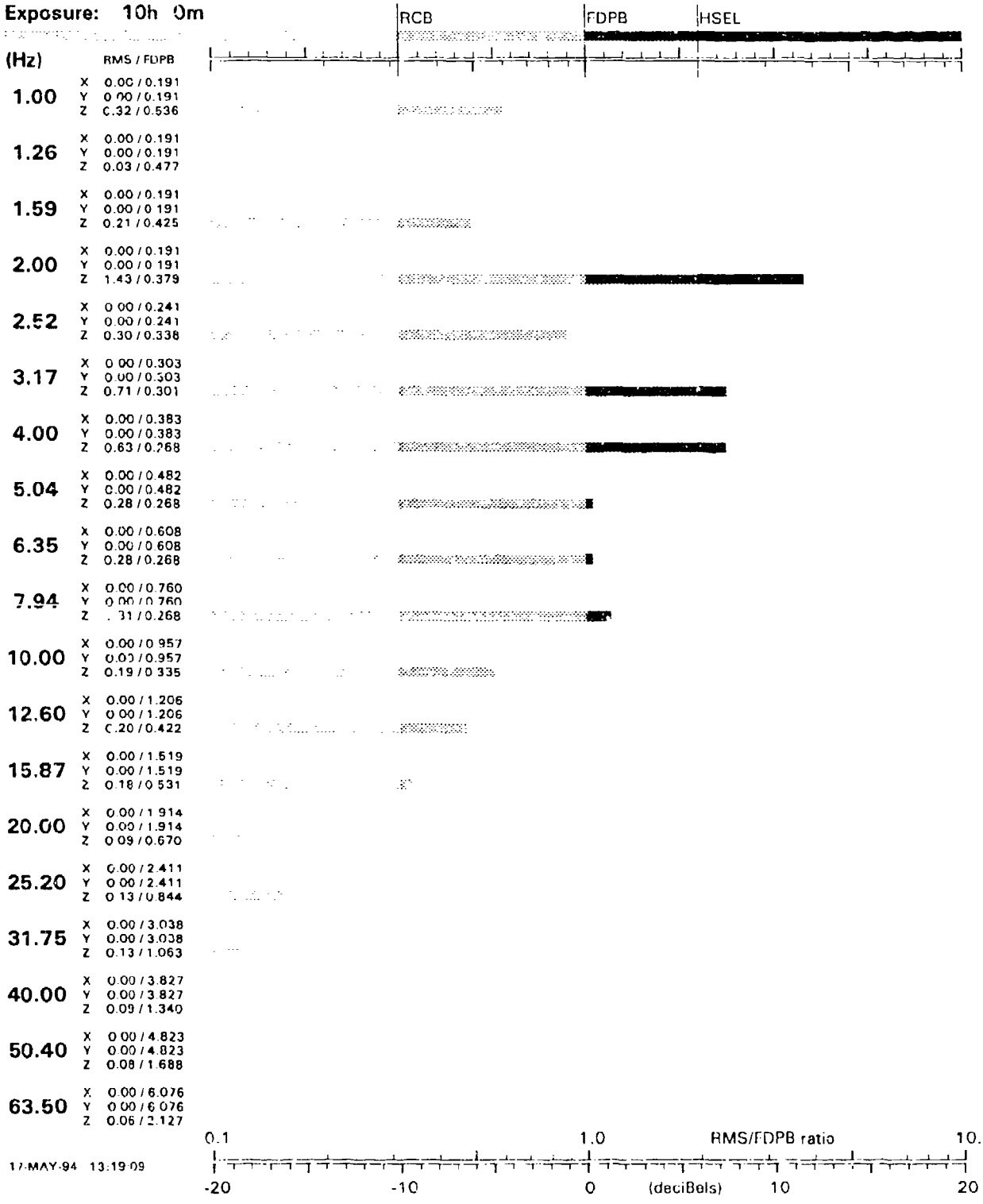
HSEL: Health and safety exposure limit
FDPB: Fatigue-decreased proficiency boundary
RCB: Reduced comfort boundary
RMS: Vibration R.M.S. acceleration (m/s2)

X: Longitudinal
Y: Transverse
Z: Vertical

RUN-45 **D-seat**

May 20, 1992 **PLS truck**

Exposure: 10h 0m



Course: #4 APG
Speed: 9 mph
Note: HHA of PLS truck, driver (seat)

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