

## **ENCLOSURE 2**

### **Attachment 8**

**C.D.I. Technical Note No. 05-34,"Test Condition TC15a Load  
Comparison for Quad Cities Unit 1," Revision 0, dated  
August 2005**

Test Condition TC15a Load Comparison for Quad Cities Unit 1

Revision 0

Prepared by

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A handwritten signature in black ink, reading "Alan Bilanin". The signature is written in a cursive style with a horizontal line underneath.

Alan J. Bilanin

August 2005

## ***SUMMARY***

To date, two high resolution loads have been developed for Quad Cities Unit 1 (QC1) at Test Condition TC15a, as shown below.

Test Condition Identifier	Strain Gage (SG) Correction Technique	Acoustic Circuit Model Used
TC15a	Reduced 80 Hz on C main steam line, averaged single SG S32/S34 with SG pair S31/S33 on C main steam line only	Minimum Error Model
TC15a_2	Reduced 80 Hz on A and C main steam lines, averaged single SG with SG pairs for all failed strain gage locations	Modified Benchmark Model

Justification for reducing the 80 Hz frequency peak ( $\pm 4$  Hz on either side) may be found in [1], while justification for averaging a single strain gage with a corresponding strain gage pair may be found in [2]. A description of the Modified Benchmark and the Minimum Error models may be found in [3].

C.D.I. has been asked by Exelon to develop the QC1 high resolution load

Test Condition Identifier	Strain Gage (SG) Correction Technique	Acoustic Circuit Model Used
TC15a_3	Reduced 80 Hz on A and C main steam lines, averaged single SG with SG pairs for all failed strain gage locations	Minimum Error Model

and compare its predictions against TC15a, the other Minimum Error model. This report summarizes the low resolution results for TC15a\_3 compared against TC15a, in preparation for delivery of a high resolution load for structural analysis.

## ***MODELING RESULTS***

Table 1 compares the minimum, maximum, and RMS pressure levels for TC15a\_3 and TC15a at 27 locations on the QC1 dryer. Also included in this table is the comparison for two sensor differences from the outside to the inside of the outer bank hoods at the same location: P3 - P13 (the A-B side of the dryer) and P20 - P14 (the C-D side of the dryer). Figure 1 plots the values presented in Table 1.

A comparison of these values at the 27 locations shows that the differences between the two load cases translate into an average reduction of the minimum pressure by 0.066 psid (the average minimum pressure in TC15a\_3 is less minimum than the average minimum pressure in TC15a),

an average reduction of the maximum pressure by 0.027 psid (the average maximum pressure in TC15a\_3 is less maximum than the average maximum pressure in TC15a), and an average increase of the RMS pressure of 0.002 psid (the RMS pressure in TC15a\_3 is slightly larger than the RMS pressure in TC15a).

Correspondingly, for the pressure difference P3 - P13, the minimum pressure in TC15a\_3 is less minimum than the minimum pressure in TC15a (by 0.056 psid), the maximum pressure in TC15a\_3 is larger than the maximum pressure in TC15a (by 0.021 psid), and the RMS pressure in TC15a\_3 is smaller than the RMS pressure in TC15a (by 0.042 psid). For the pressure difference P20 - P14, the minimum pressure in TC15a\_3 is more minimum than the minimum pressure in TC15a (by 0.161 psid), the maximum pressure in TC15a\_3 is larger than the maximum pressure in TC15a (by 0.219 psid), and the RMS pressure in TC15a\_3 is larger than the RMS pressure in TC15a (by 0.056 psid).

Figures 2 to 28 show the PSD comparisons for locations P1 to P27. Figures 29 and 30 show the PSD comparisons for P3 - P13 and P20 - P14, respectively. It is seen that the two load cases are very similar, with a noticeable, yet slight, 80 Hz signal in TC15a (possibly resulting from the fact that no adjustment was made to the A main steam line strain gage data).

## ***REFERENCES***

1. Exelon Generation Company. 2005. QC1 Evaluation to Remove 80 Hz from Strain Gage Data. White Paper.
2. Structural Integrity Associates, Inc. 2005. Quad Cities Unit 1 Main Steam Line Strain Gage Reductions. Letter Report No. SIR-05-208 Revision 2 (draft), KKF-05-034.
3. Continuum Dynamics, Inc. 2005. Evaluation of Continuum Dynamics, Inc. Steam Dryer Load Methodology Against Quad Cities Unit 2 In-Plant Data. C.D.I. Report No. 05-10.

Table 1. Summary of pressure predictions at 27 sensors on the QC1 dryer, based on the first 65 seconds of data collected.

Pressure Sensor Number	TC15a Minimum (psid)	TC15a Maximum (psid)	TC15a RMS (psid)	TC15a_3 Minimum (psid)	TC15a_3 Maximum (psid)	TC15a_3 RMS (psid)
P1	-1.342	1.341	0.438	-1.355	1.440	0.464
P2	-1.028	1.010	0.224	-1.121	1.140	0.270
P3	-1.938	1.830	0.504	-1.776	1.688	0.467
P4	-0.723	0.755	0.177	-0.777	0.728	0.182
P5	-1.038	0.813	0.199	-0.766	0.799	0.194
P6	-1.301	1.267	0.347	-1.164	1.171	0.312
P7	-1.054	1.038	0.338	-1.125	1.179	0.386
P8	-0.837	0.809	0.182	-0.678	0.713	0.161
P9	-1.674	1.695	0.510	-1.550	1.562	0.518
P10	-1.322	1.364	0.436	-1.361	1.393	0.458
P11	-0.946	0.866	0.209	-0.789	0.848	0.193
P12	-2.335	2.231	0.678	-2.069	2.116	0.741
P13	-0.549	0.403	0.106	-0.355	0.343	0.087
P14	-0.461	0.512	0.114	-0.452	0.489	0.106
P15	-2.027	1.896	0.569	-2.012	1.882	0.572
P16	-0.366	0.289	0.078	-0.304	0.262	0.063
P17	-1.160	1.135	0.275	-1.112	1.014	0.287
P18	-1.691	1.696	0.501	-1.617	1.701	0.517
P19	-1.986	1.894	0.589	-2.031	1.941	0.613
P20	-3.342	3.621	1.075	-3.503	3.781	1.124
P21	-1.641	1.461	0.407	-1.503	1.462	0.395
P22	-1.439	1.527	0.435	-1.407	1.351	0.445
P23	-0.332	0.257	0.073	-0.251	0.204	0.056
P24	-1.138	1.193	0.280	-1.029	1.125	0.257
P25	-1.342	1.348	0.328	-1.260	1.258	0.295
P26	-0.294	0.280	0.077	-0.238	0.245	0.064
P27	-0.335	0.285	0.074	-0.242	0.231	0.059
Average	-1.246	1.215	0.342	-1.180	1.188	0.344
P3 - P13	-1.984	1.952	0.553	-1.928	1.973	0.511
P20 - P14	-3.660	3.877	1.148	-3.821	4.096	1.204

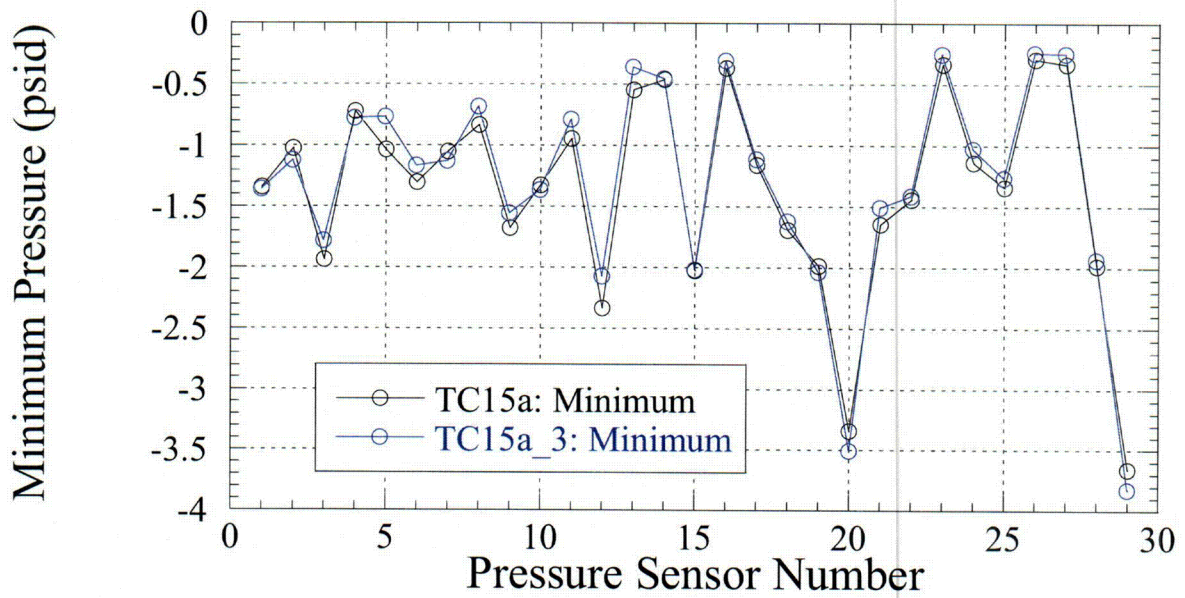


Figure 1a. Comparison between TC15a and TC15a\_3 (minimum pressure). Pressure sensor number P28 = P3 - P13, while pressure sensor number P29 = P20 - P14.

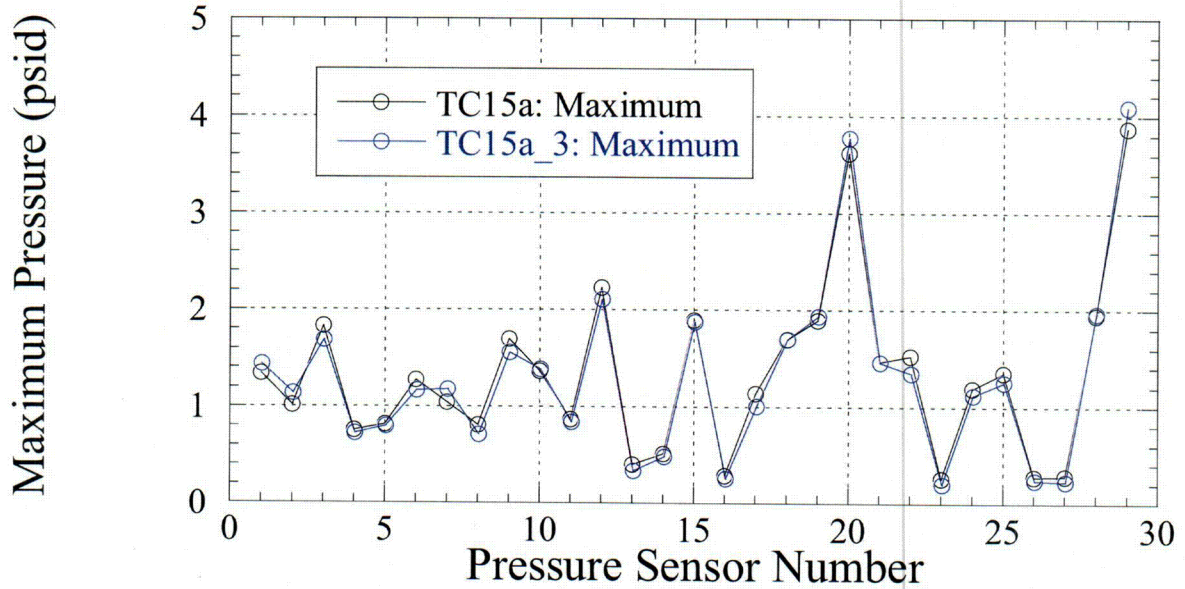


Figure 1b. Comparison between TC15a and TC15a\_3 (maximum pressure). Pressure sensor number P28 = P3 - P13, while pressure sensor number P29 = P20 - P14.

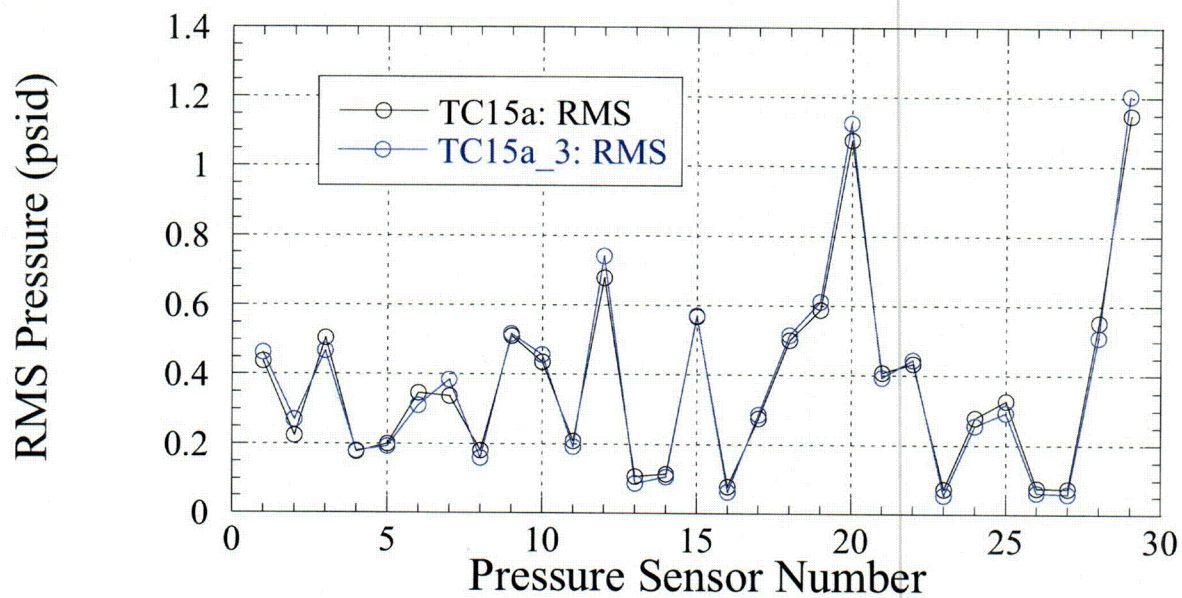


Figure 1c. Comparison between TC15a and TC15a\_3 (RMS pressure). Pressure sensor number P28 = P3 - P13, while pressure sensor number P29 = P20 - P14.

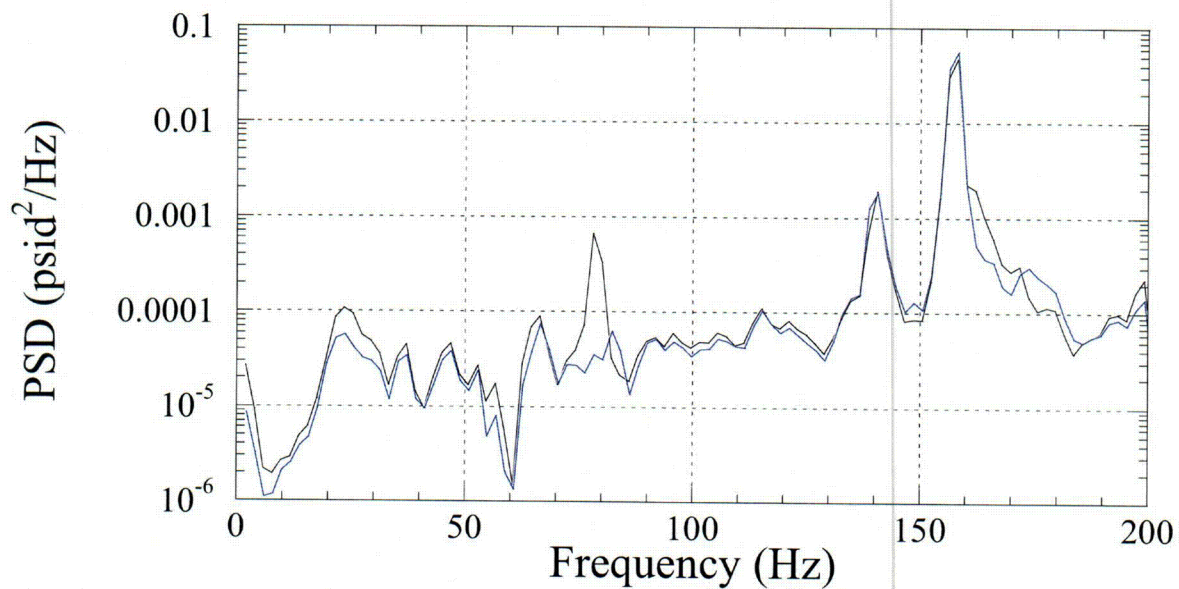


Figure 2. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P1.



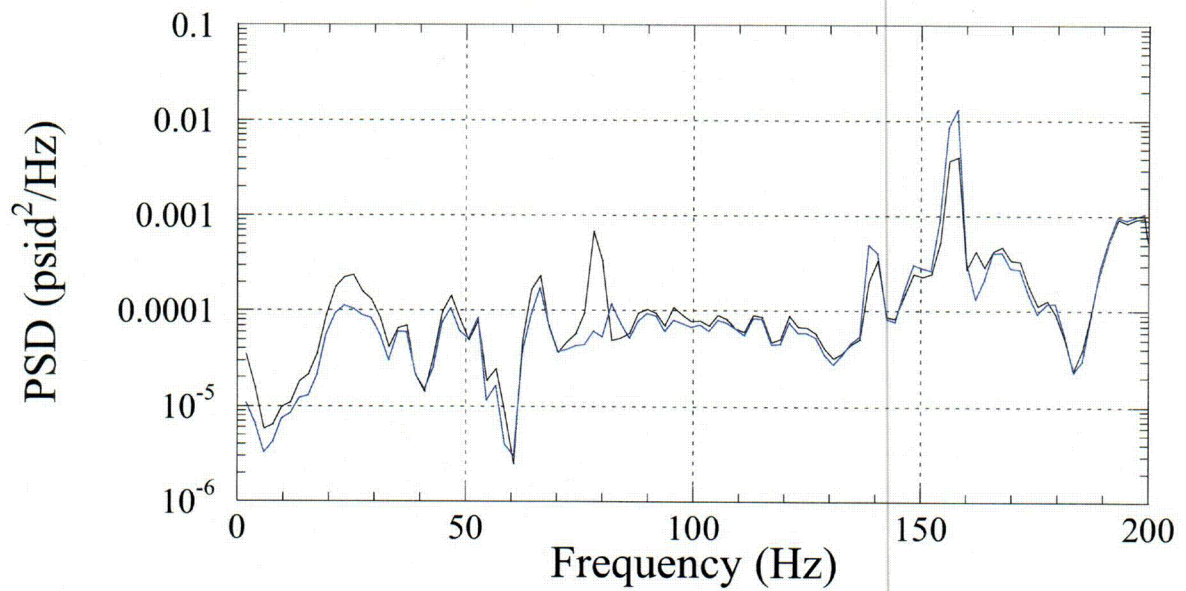


Figure 3. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P2.

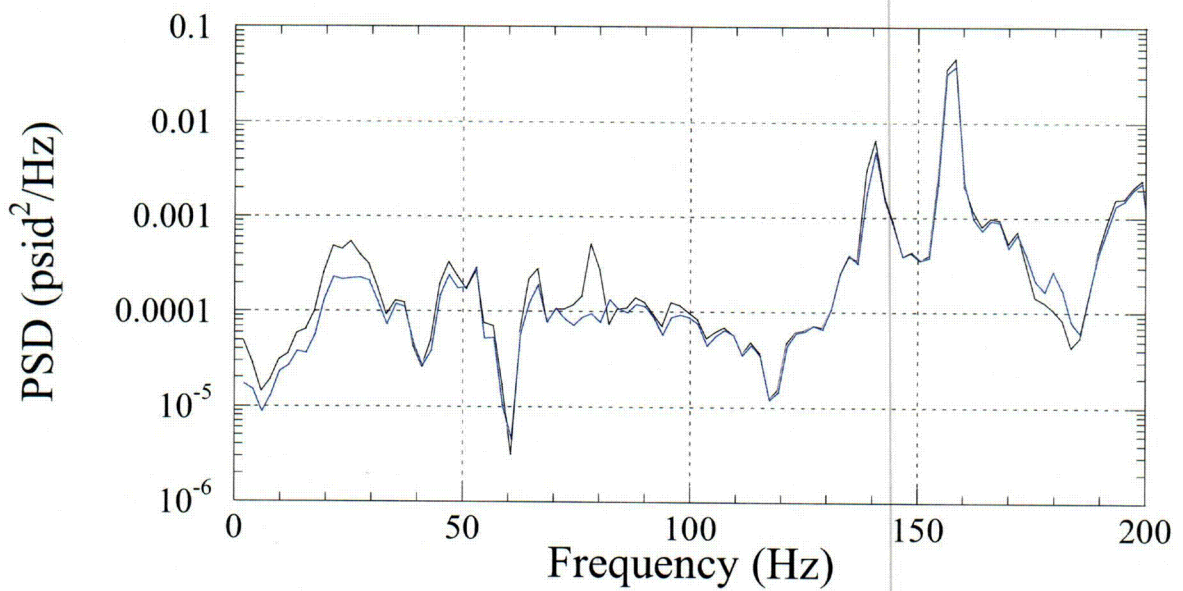


Figure 4. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P3.



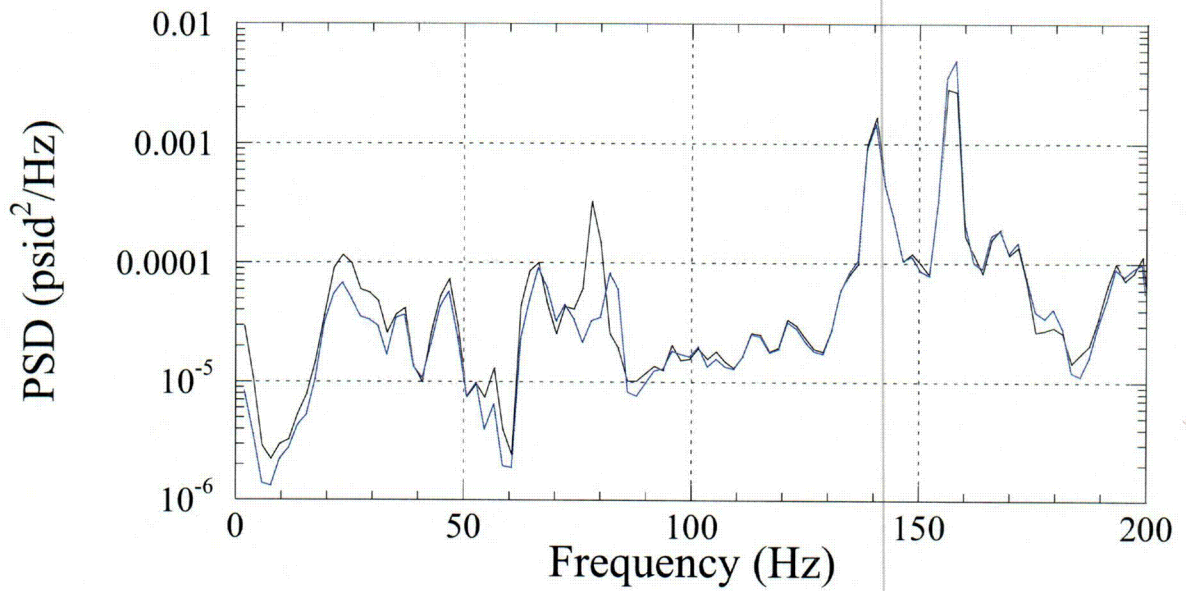


Figure 5. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P4.

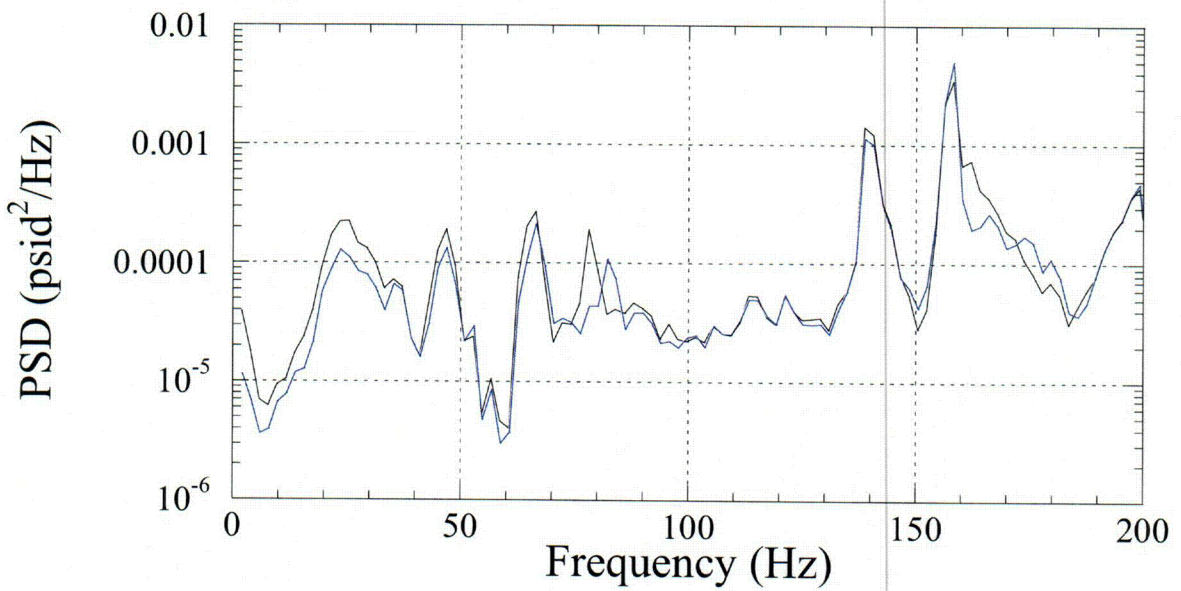


Figure 6. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P5.

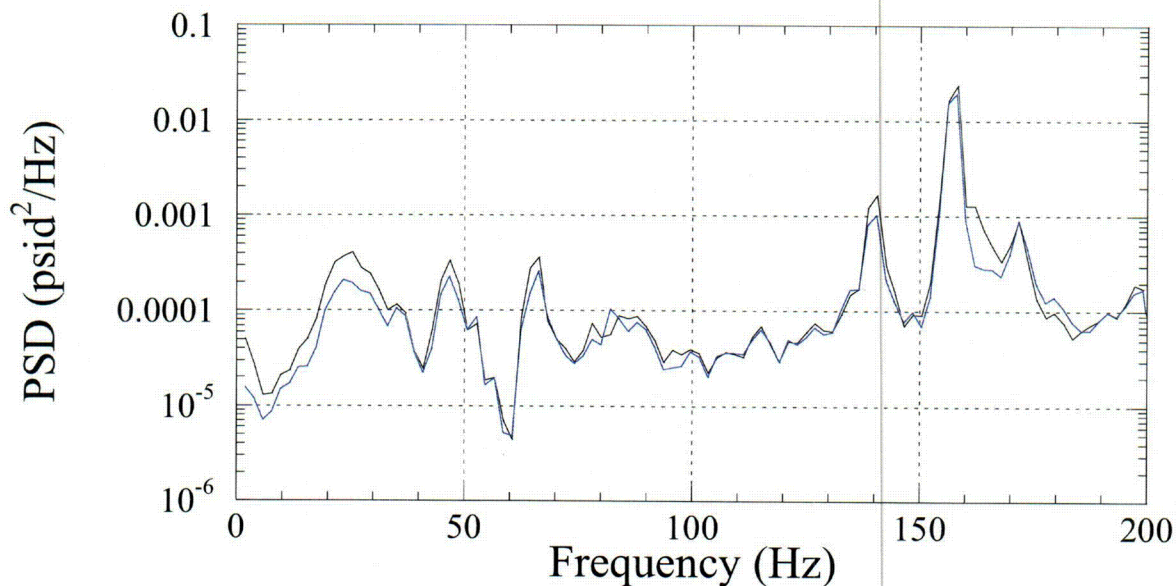


Figure 7. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P6.

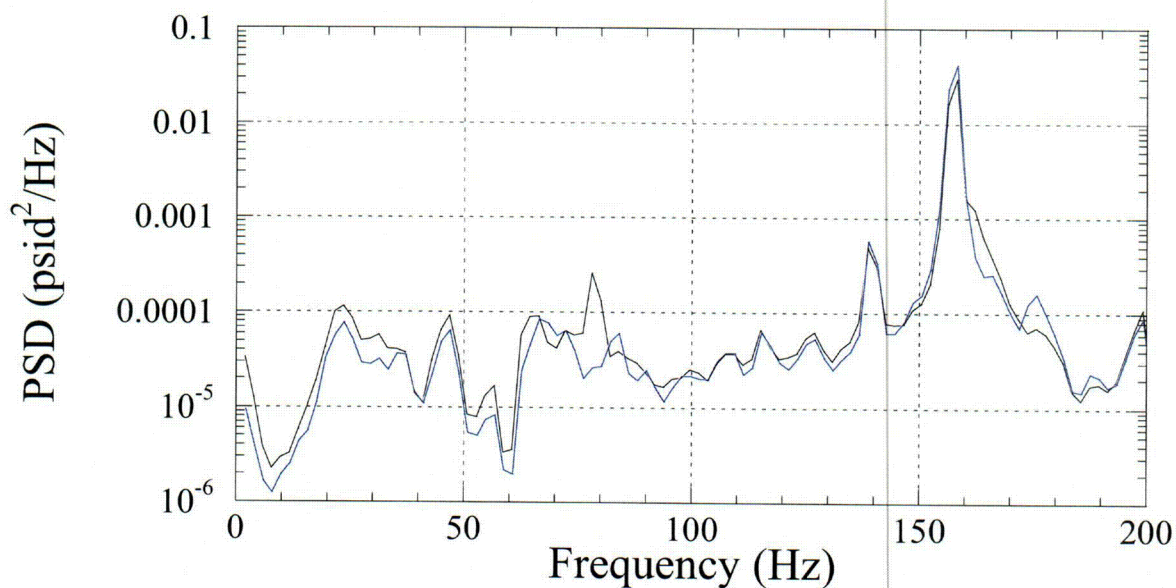


Figure 8. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P7.

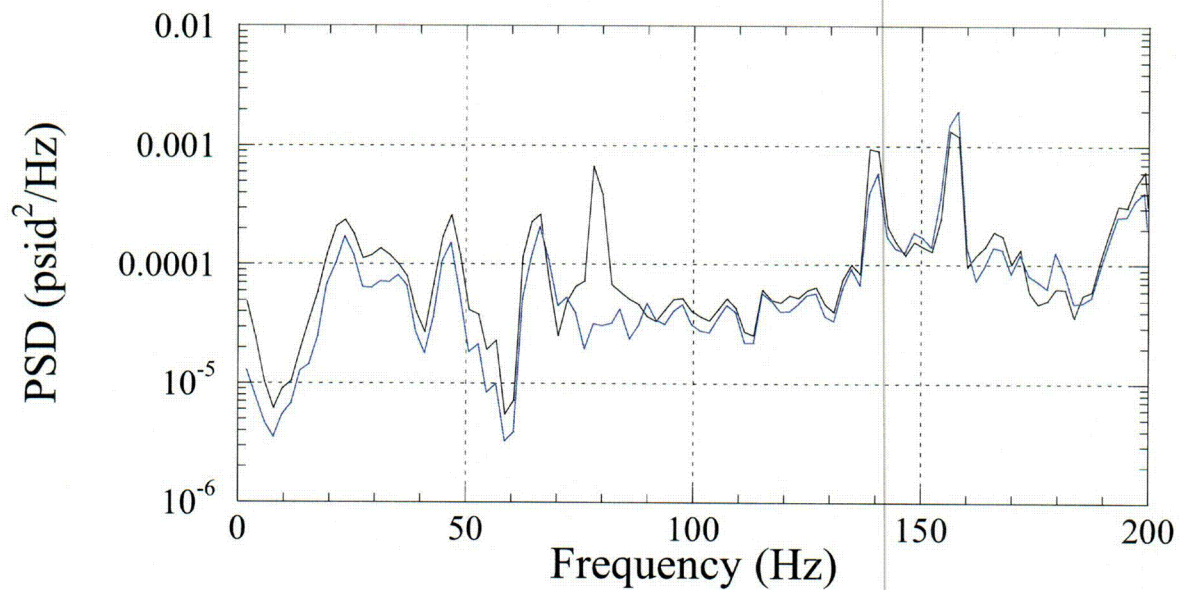


Figure 9. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P8.

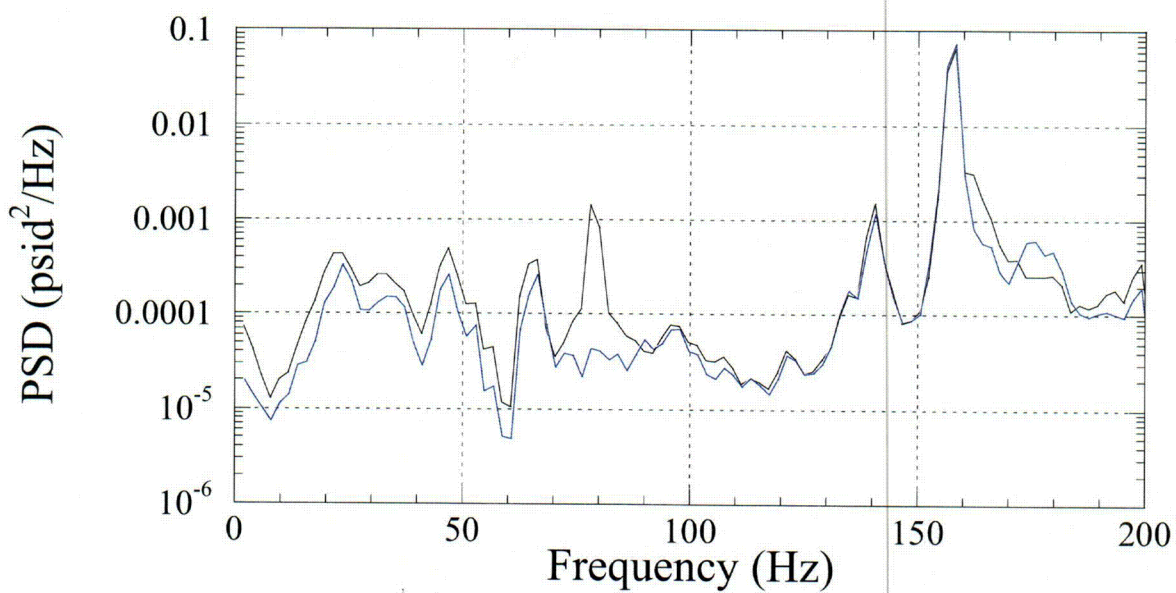


Figure 10. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P9.

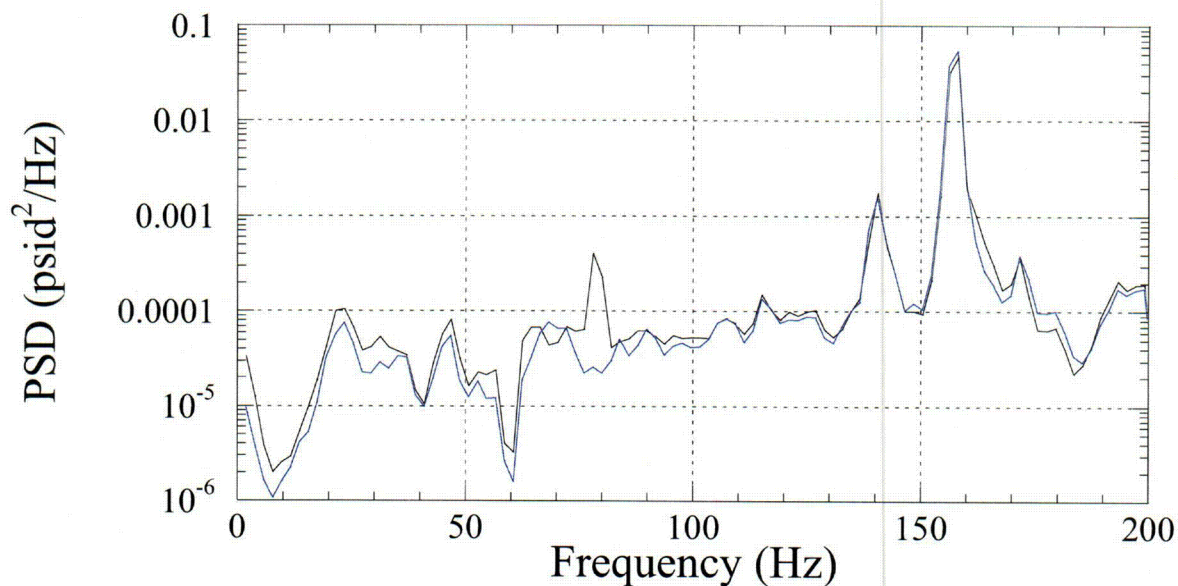


Figure 11. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P10.

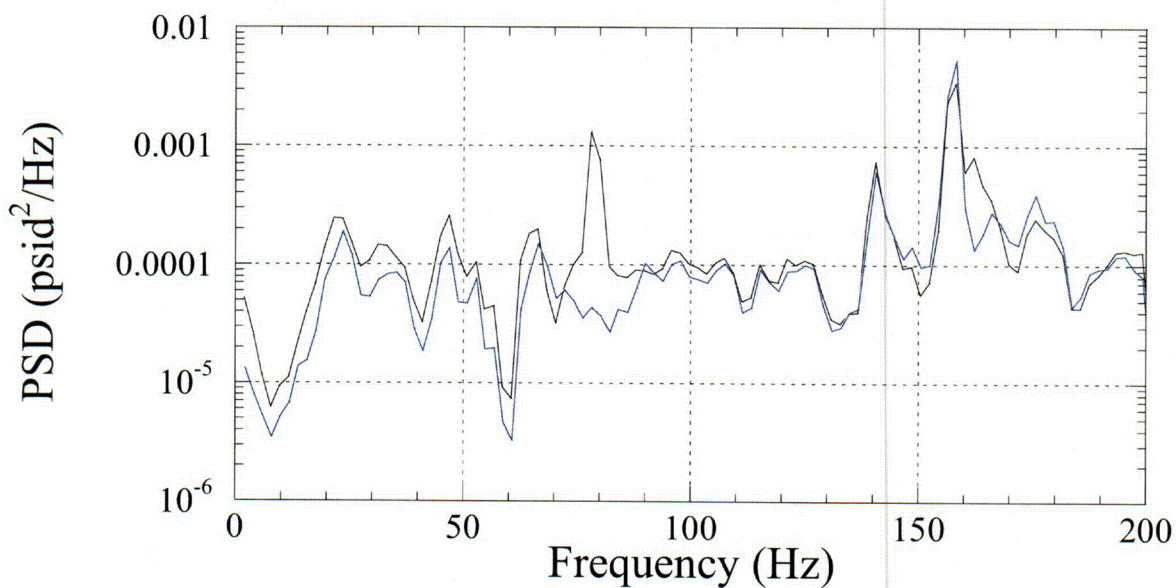


Figure 12. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P11.



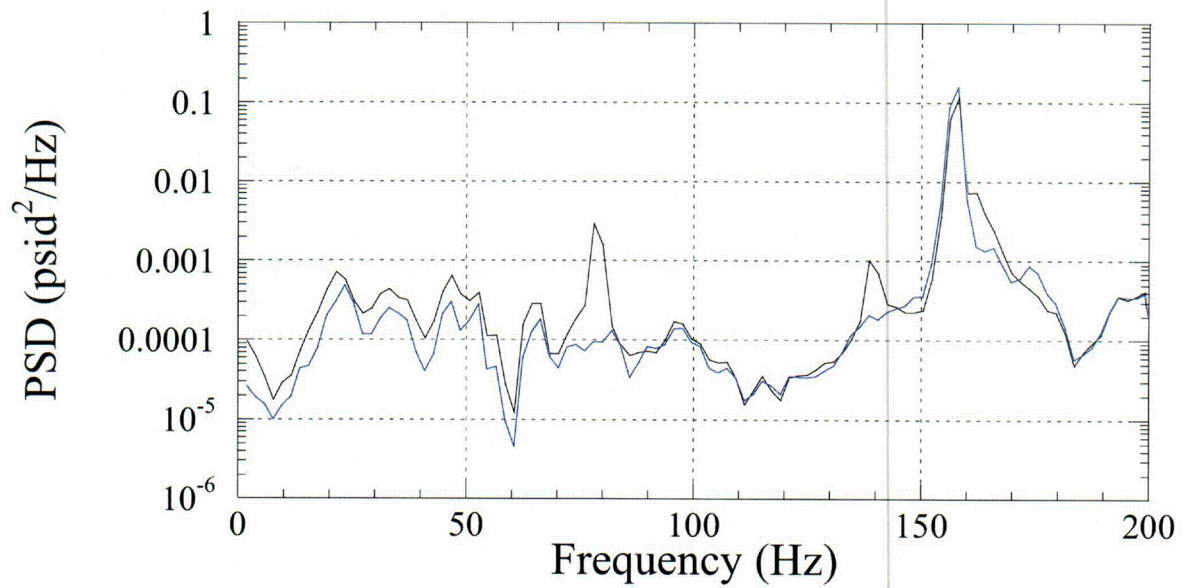


Figure 13. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P12.

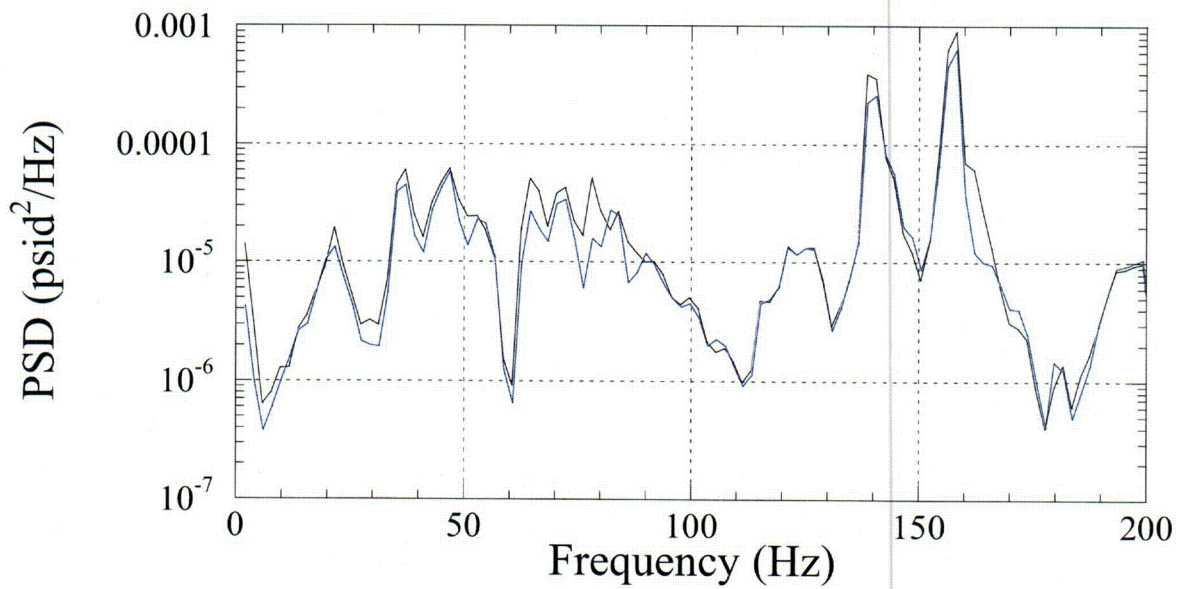


Figure 14. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P13.

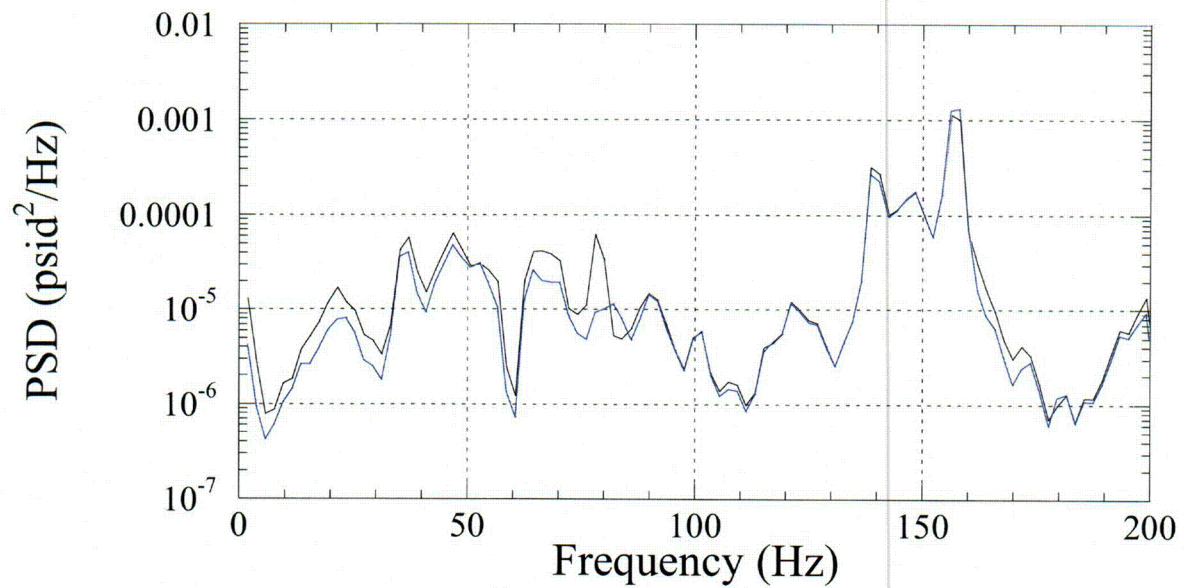


Figure 15. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P14.

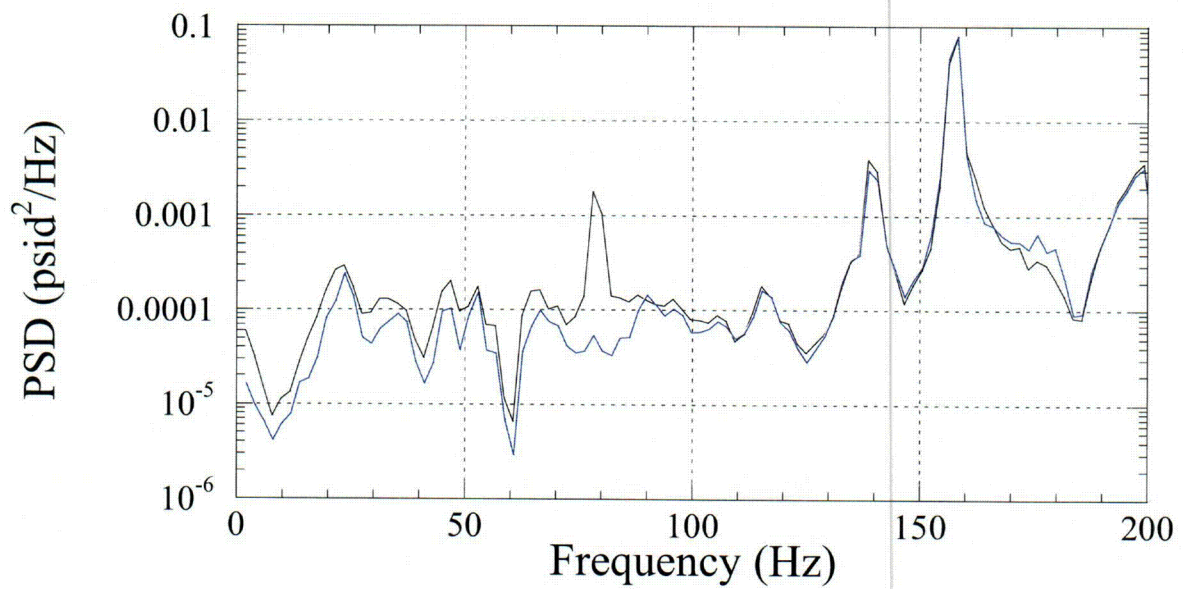


Figure 16. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P15.

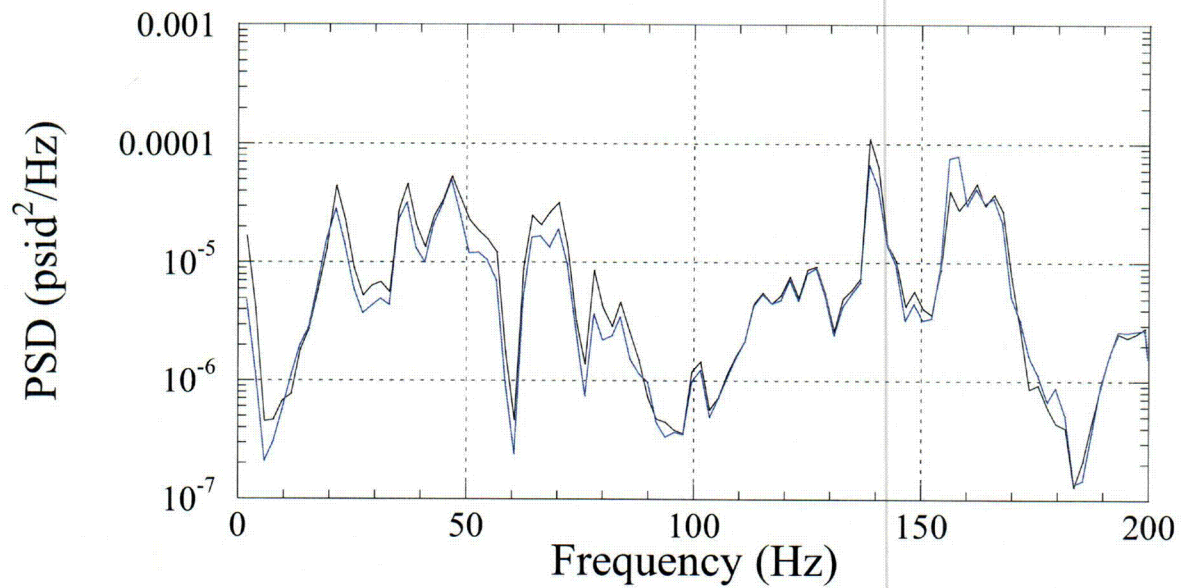


Figure 17. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P16.

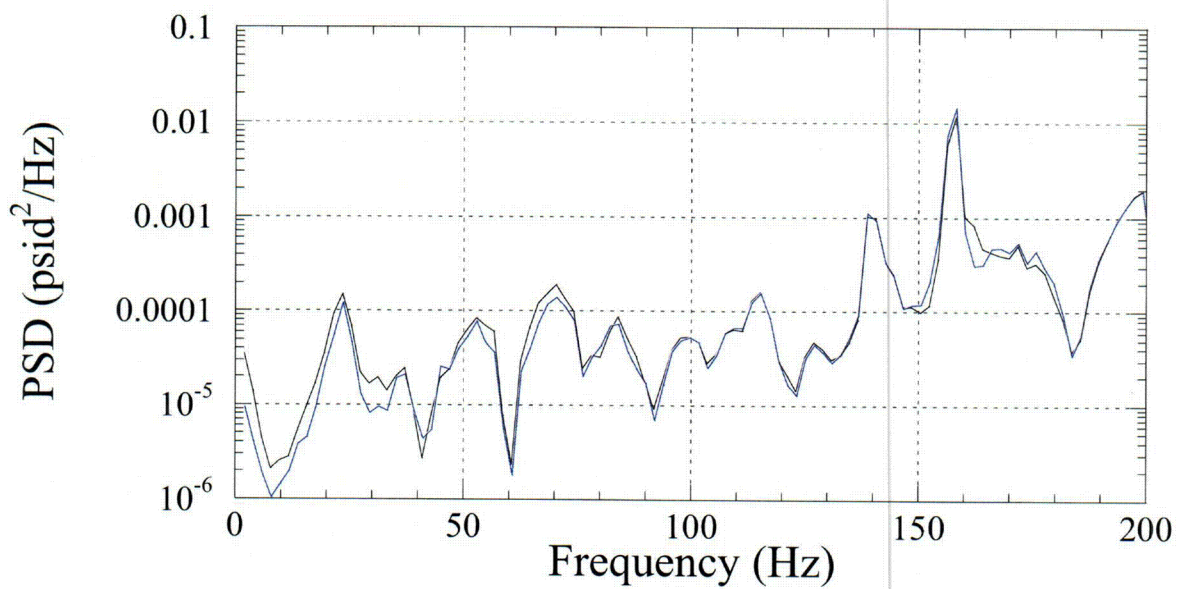


Figure 18. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P17.



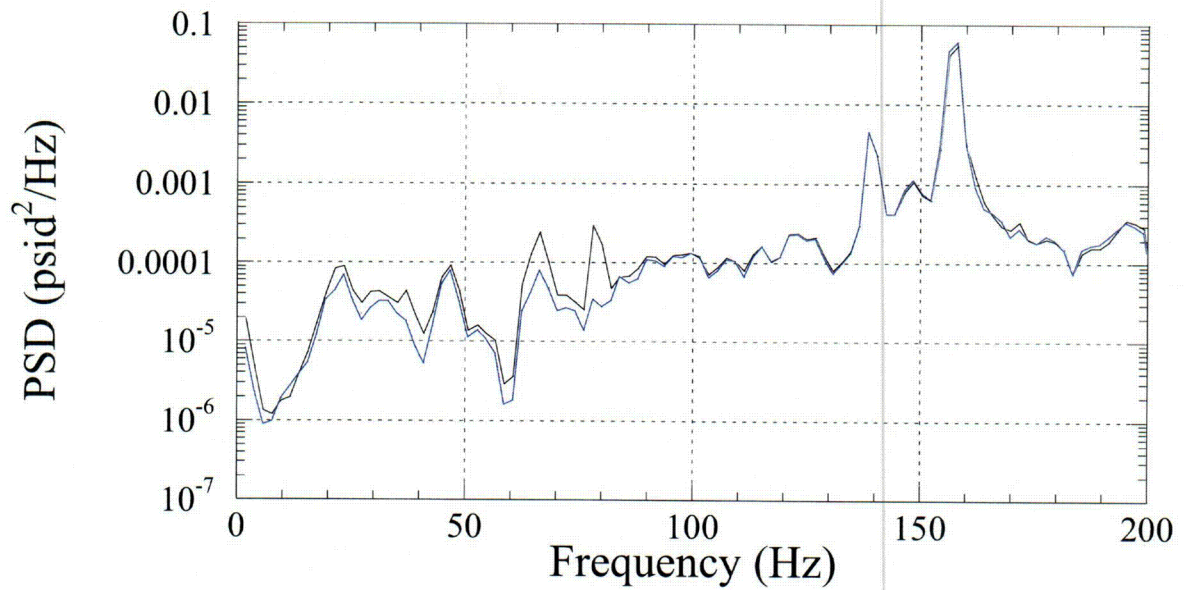


Figure 19. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P18.

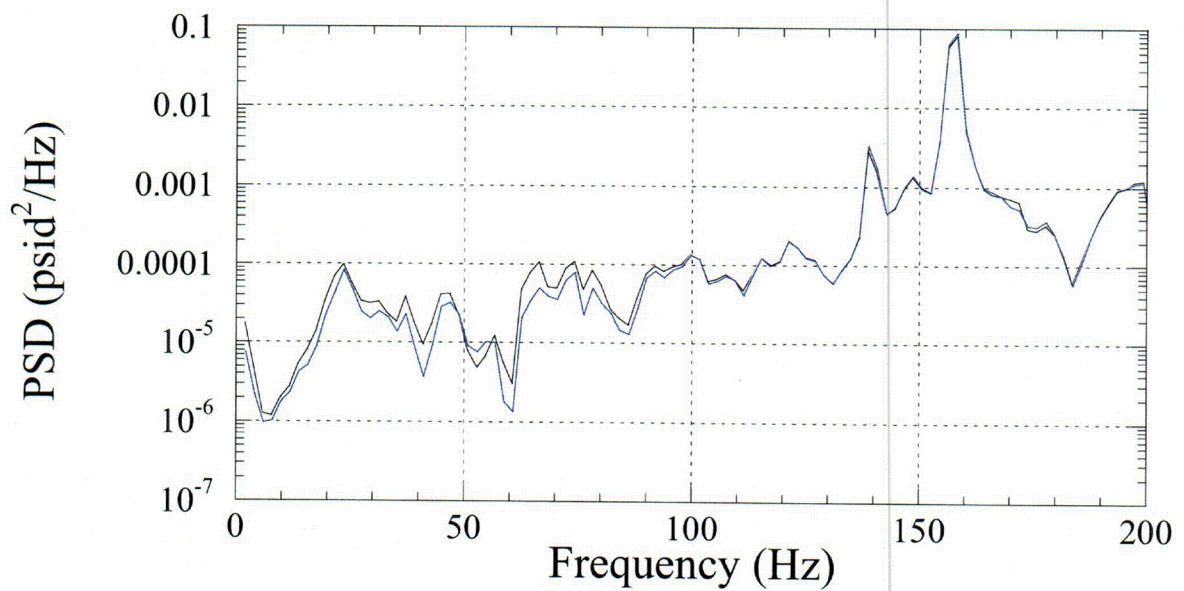


Figure 20. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P19.

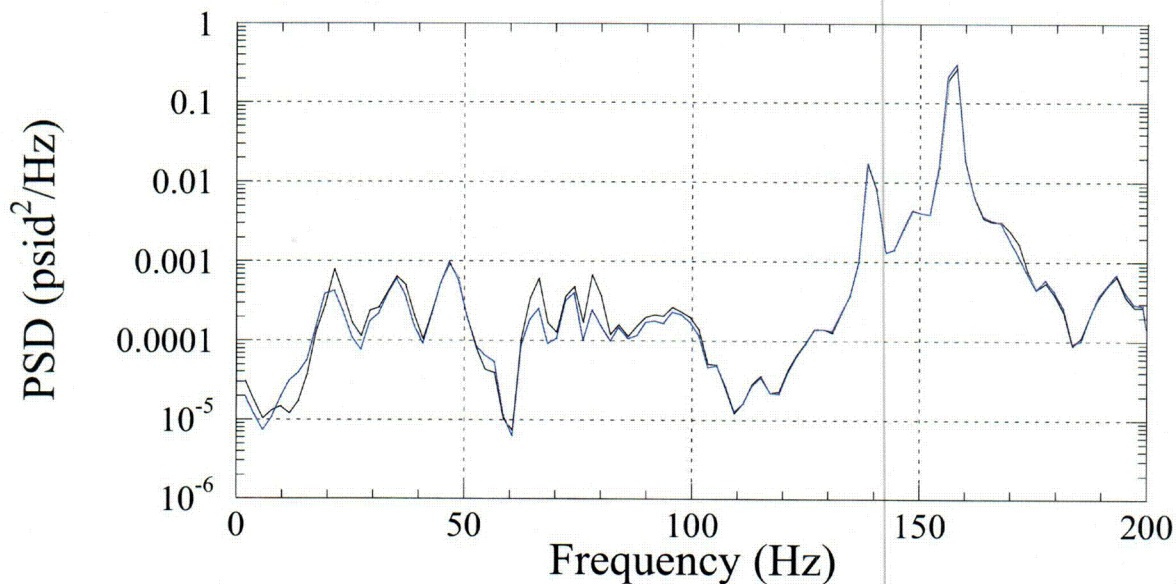


Figure 21. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P20.

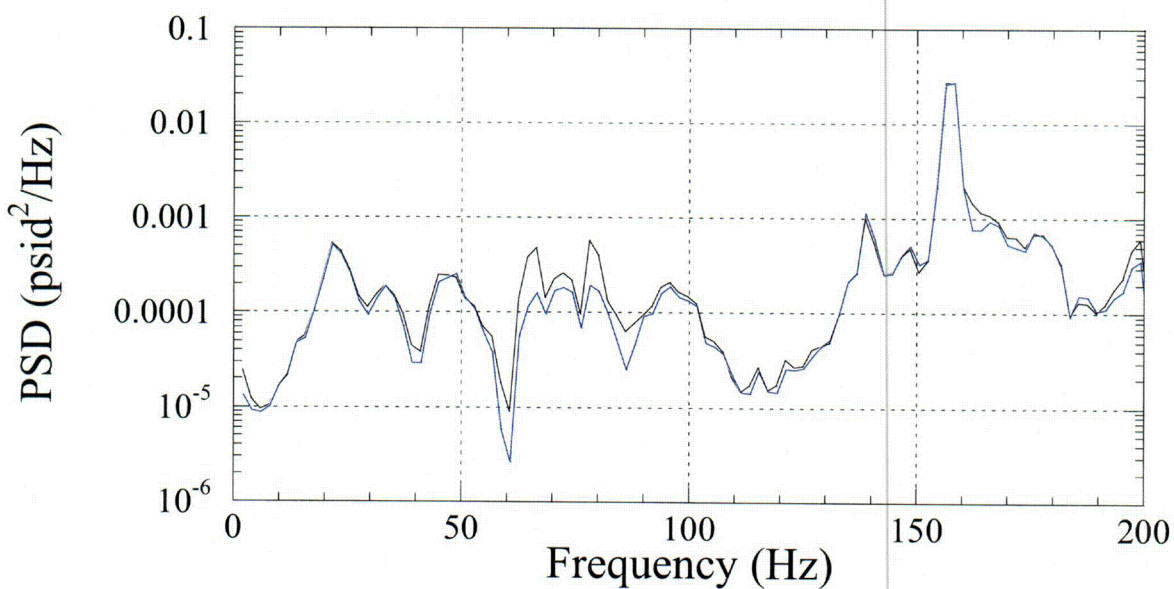


Figure 22. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P21.

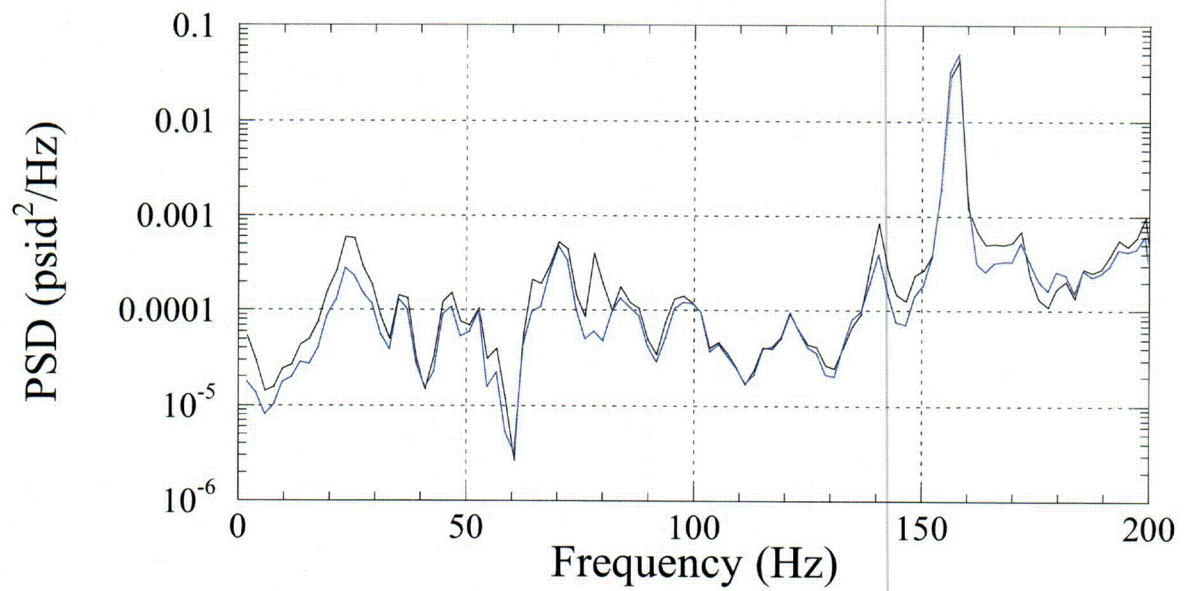


Figure 23. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P22.

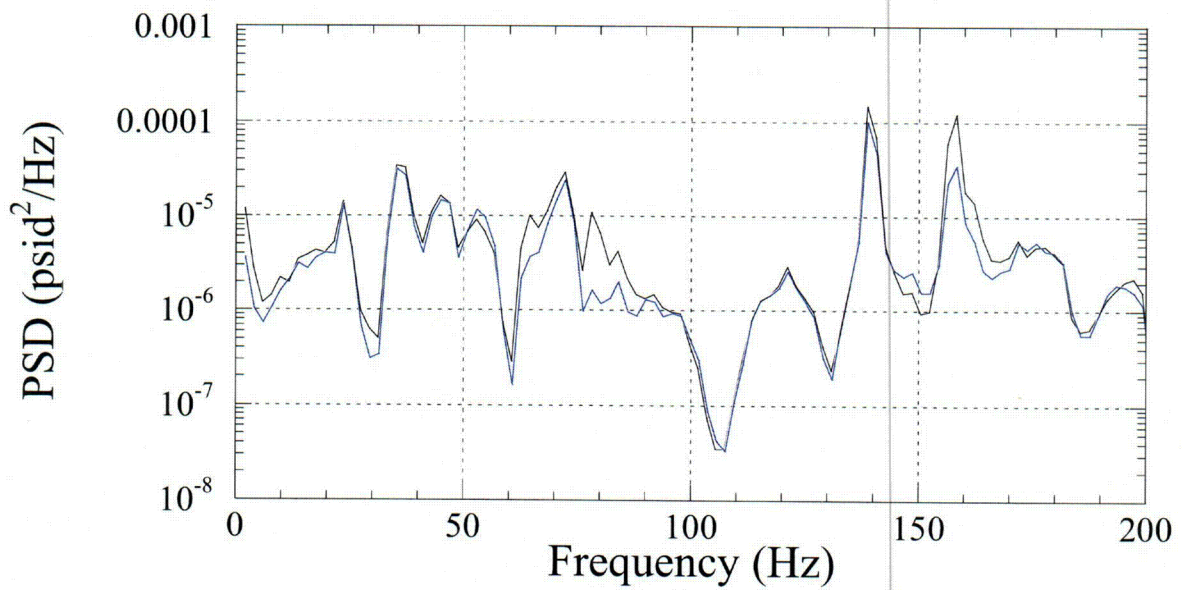


Figure 24. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P23.

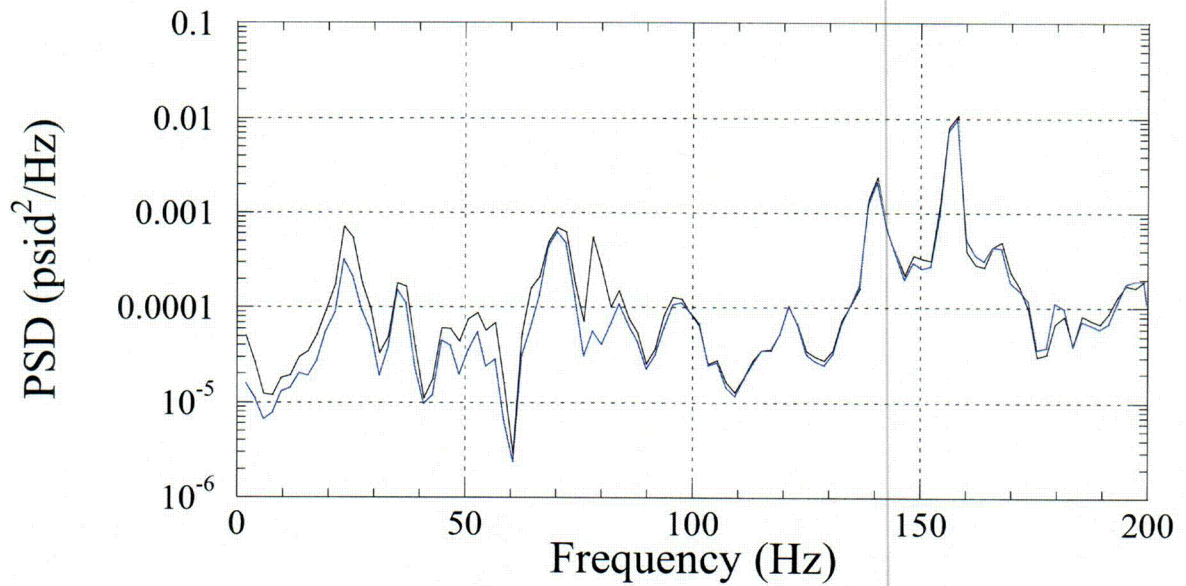


Figure 25. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P24.

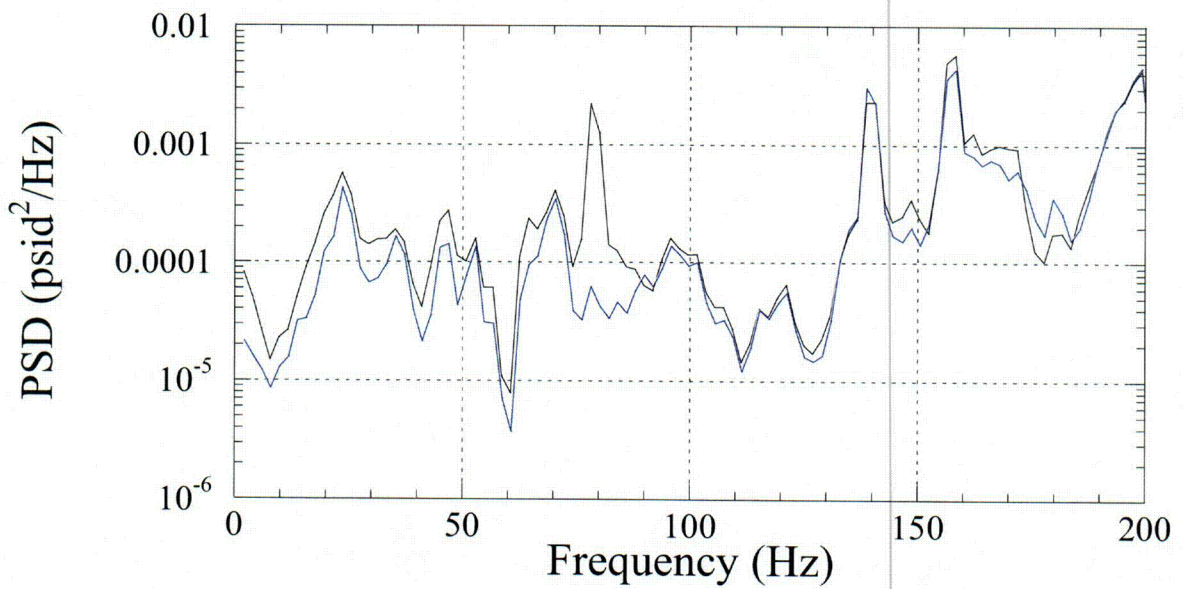


Figure 26. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P25.



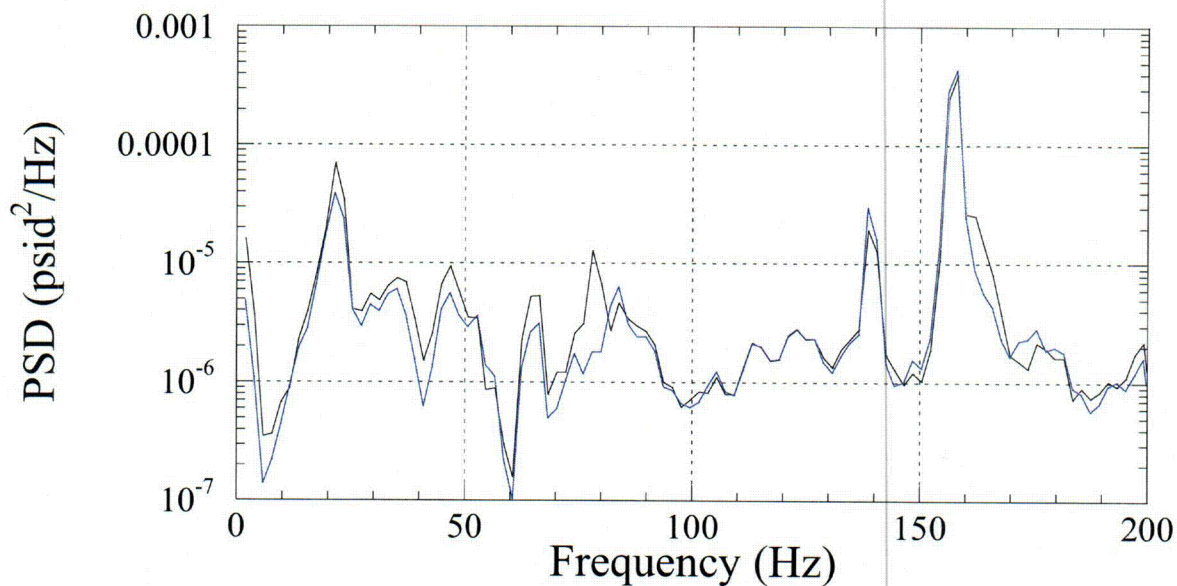


Figure 27. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P26.

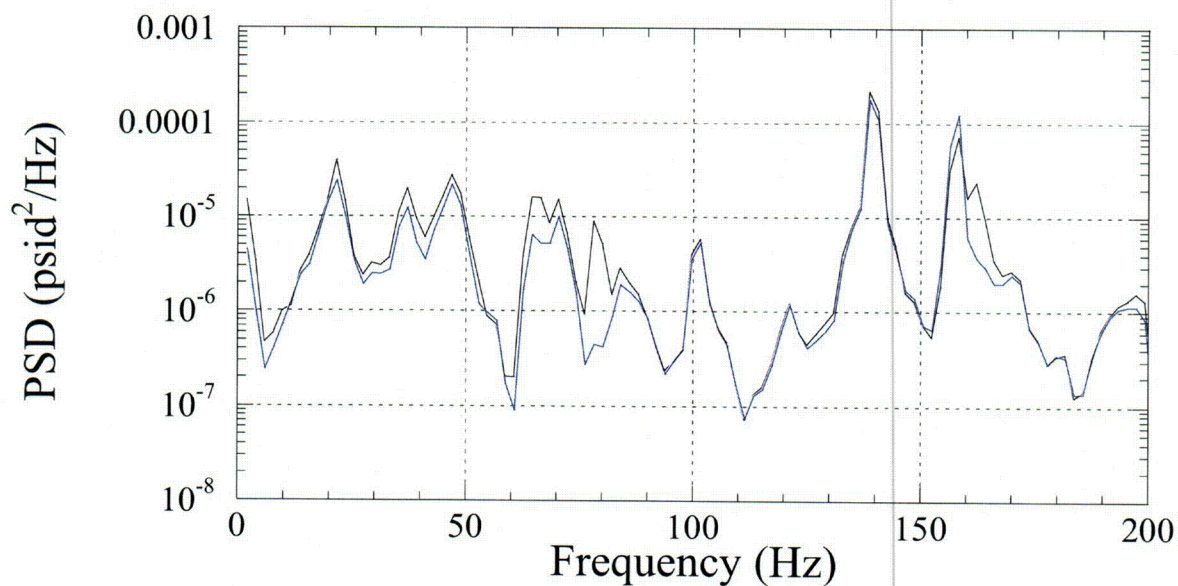


Figure 28. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for pressure sensor number P27.

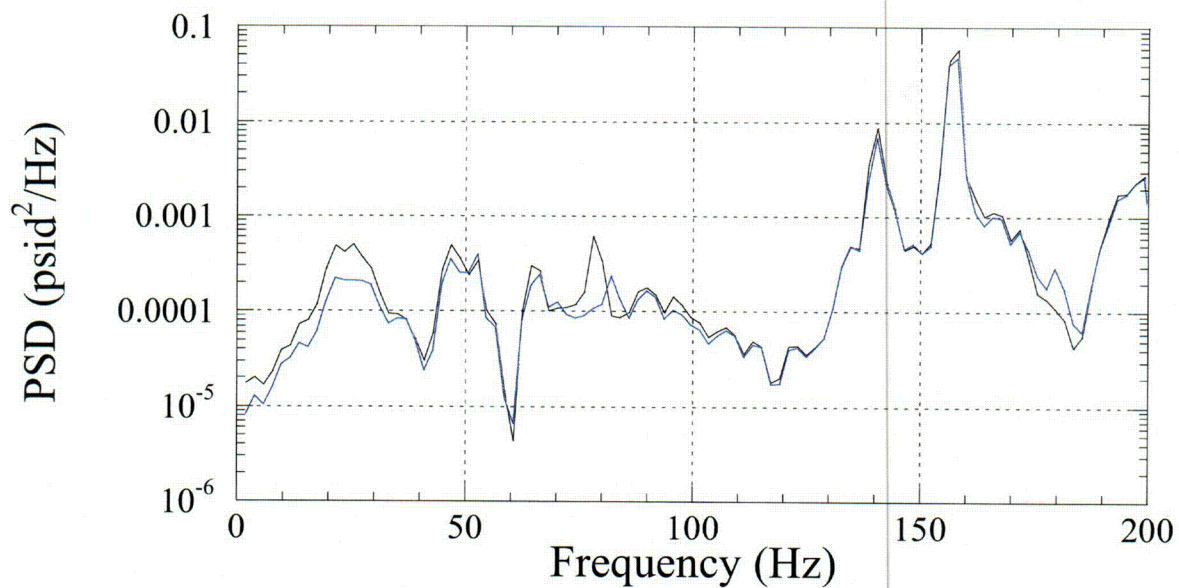


Figure 29. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for the difference between pressure sensor number P3 and pressure sensor number P13.

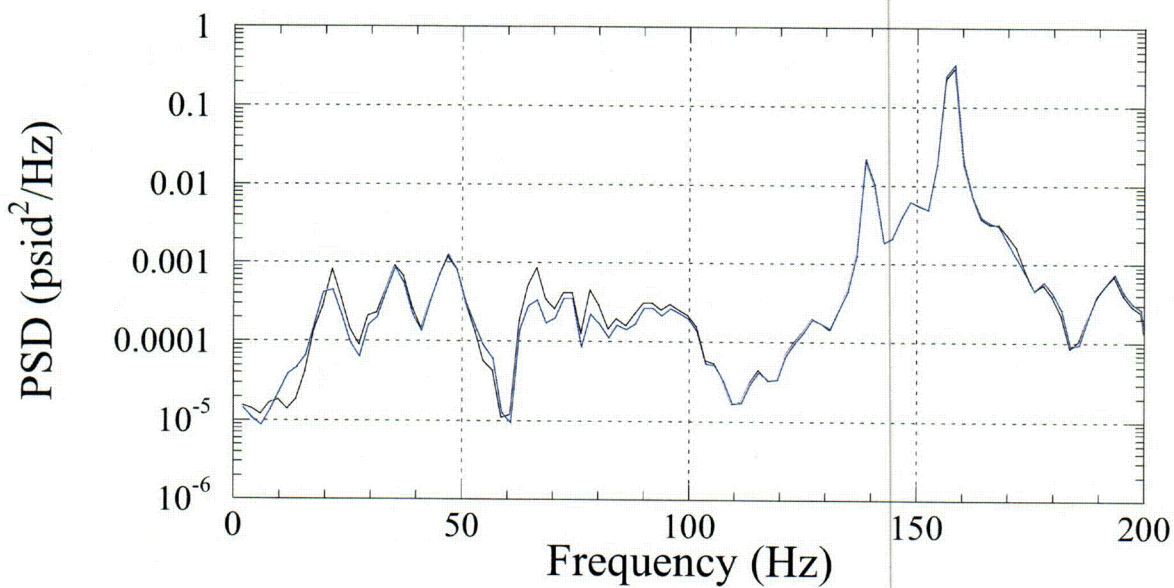


Figure 30. PSD comparison between TC15a (black curve) and TC15a\_3 (blue curve) for the difference between pressure sensor number P20 and pressure sensor number P14.