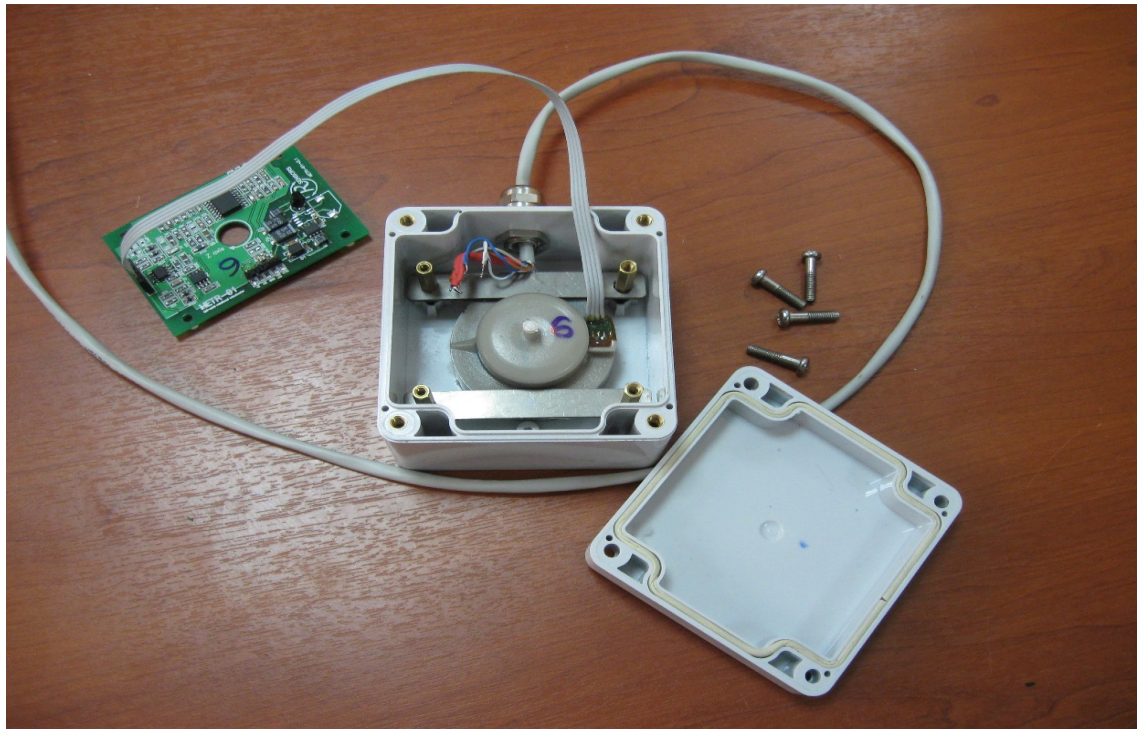
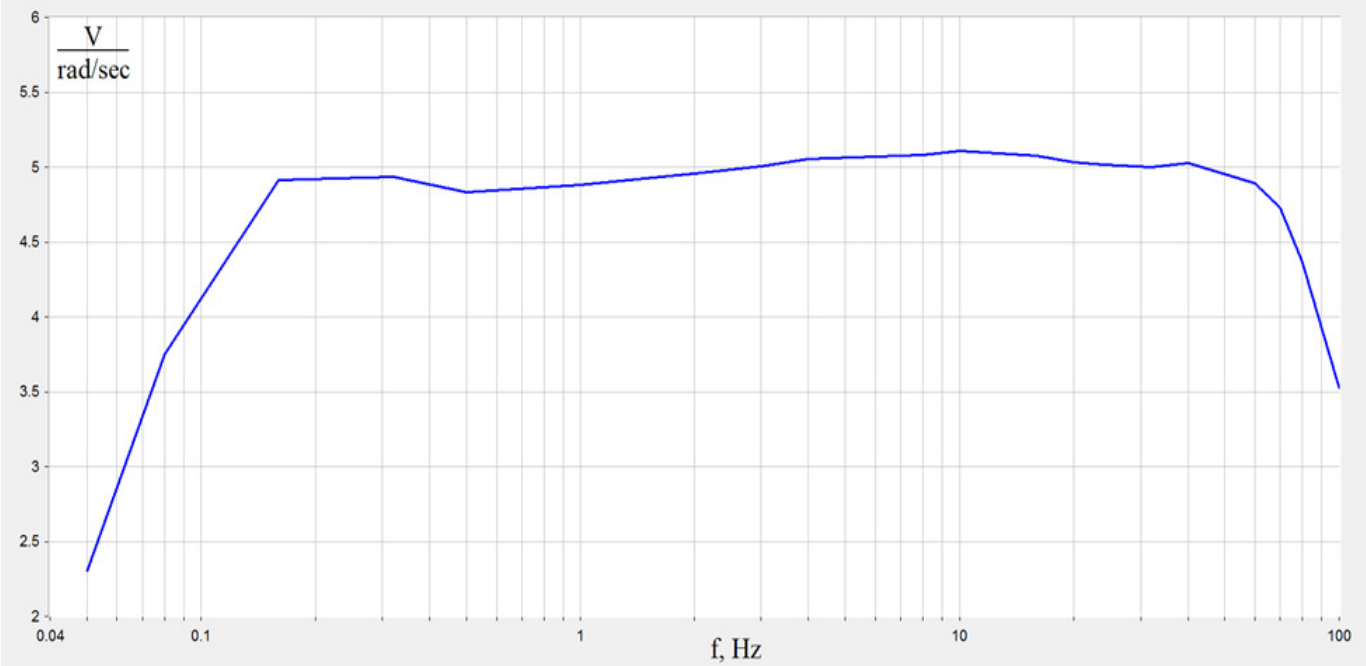
Rotational sensors with reduced sensitivity $5\frac{V}{rad/\sec}$ were designed and produced. In order to introduce an extra damping to mechanical motion of the working fluid, an additional separating element was placed inside the toroidal channel. This extra damping element was made of 0.4 mm thick ceramic paper. The exterior of the METR-01LS sensor was unchanged.



RSENSORS

The output response in the frequency range 0.05-100 Hz of new sensors is velocity-flat with -3dB slope at the edges. The resulting frequency response of the sensor, which was obtained by means of an angular motion shake table, is shown in the Figure below.



The amplitude-frequency response of a METR-01LS rotational sensor.

R SENSORS

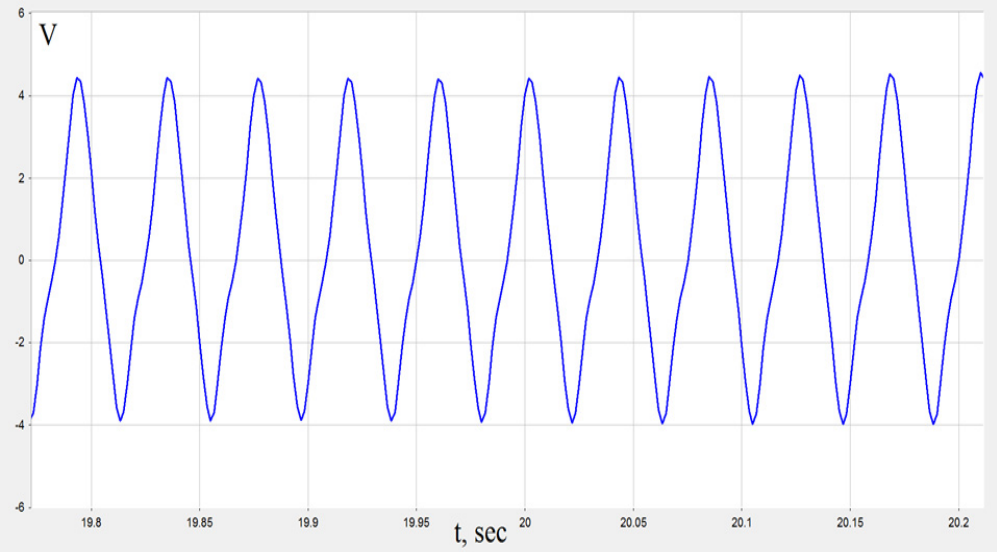
The measurements at high frequencies met some difficulties due to limitations of the experimental equipment. The R-sensors angular shake table is designed for operation at amplitudes less than 0.1 rad/sec. This amplitude is achievable at all frequencies in the operating range. The data for the 10 Hz frequency is presented in the table.

Reference, rad/sec	Response, V	Sensitivity, V/rad/sec
0,0055	0,0277	5,036363636
0,0166	0,085	5,120481928
0,0446	0,219	4,910313901
0,088	0,419	4,761363636

Table. 10 Hz response at different input amplitudes.

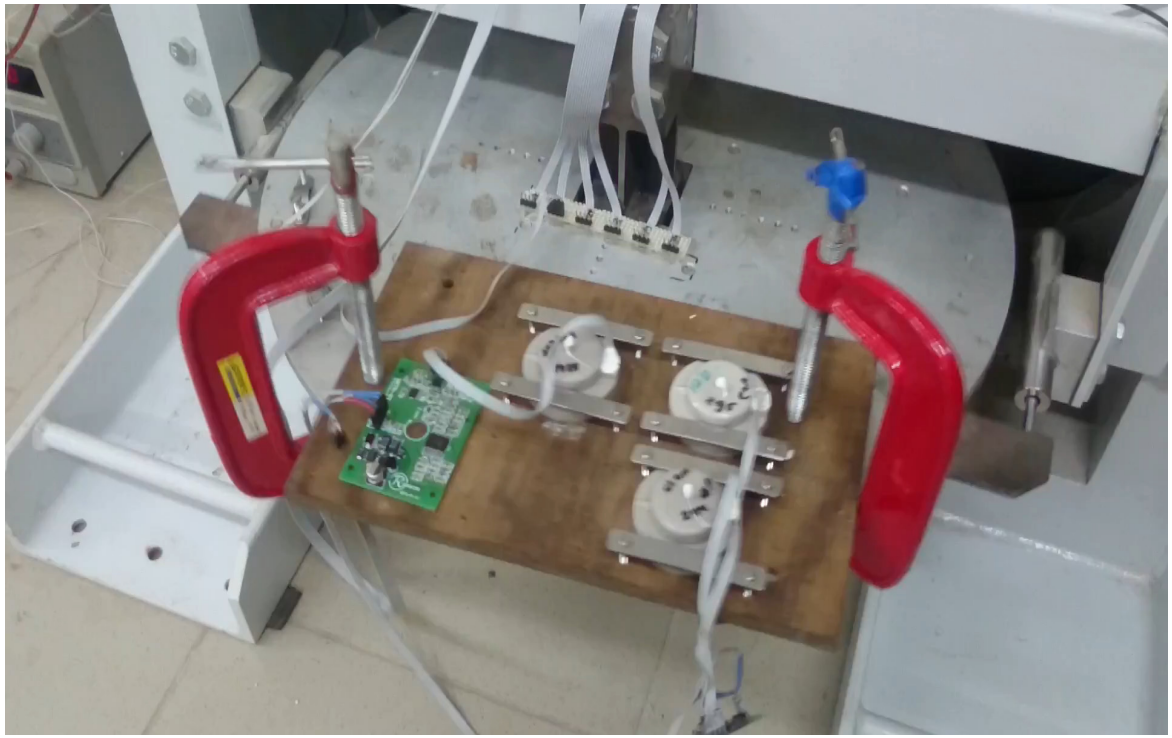
The amplitudes close to 1 rad/sec were achieved at 24 Hz – the resonant frequency of the angular motion shake table's suspension. The studies of a sensors' responses to the harmonic input with the amplitude of 0.82 rad/sec at 24 Hz frequency have been made (right plot). The table below shows the actual amplitude characteristics behavior and gives notion of the sensor's response under maximum input amplitude condition.

24 Hz		
Reference, rad/sec	Response, V	Sensitivity, V/rad/sec
0,0497	0,23	4,6277666
0,11	0,54	4,909090909
0,21	0,98	4,666666667
0,29	1,38	4,75862069
0,37	1,83	4,945945946
0,82	4,3	5,243902439

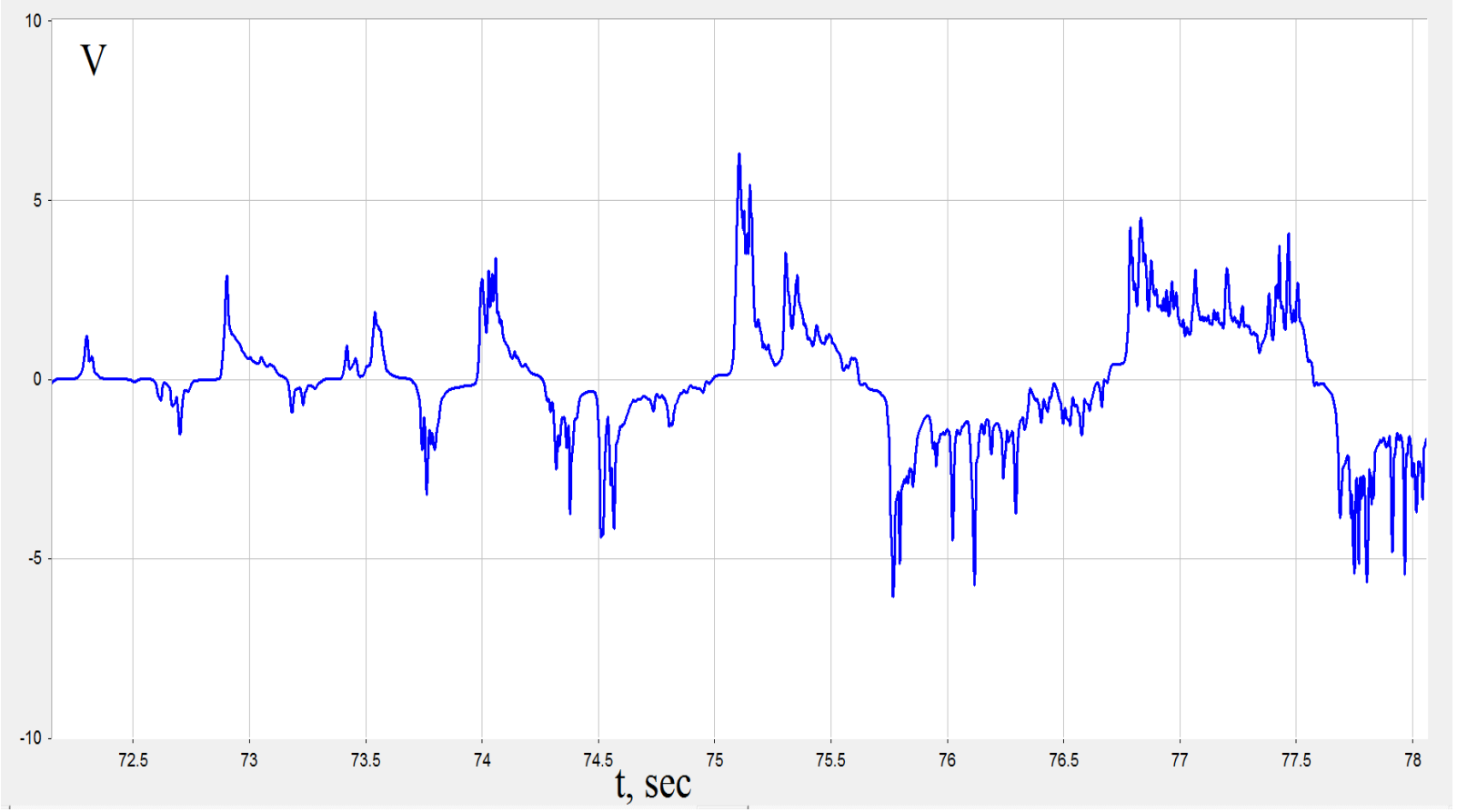


Angular motion sensor response at 0.82 rad/sec input amplitude.

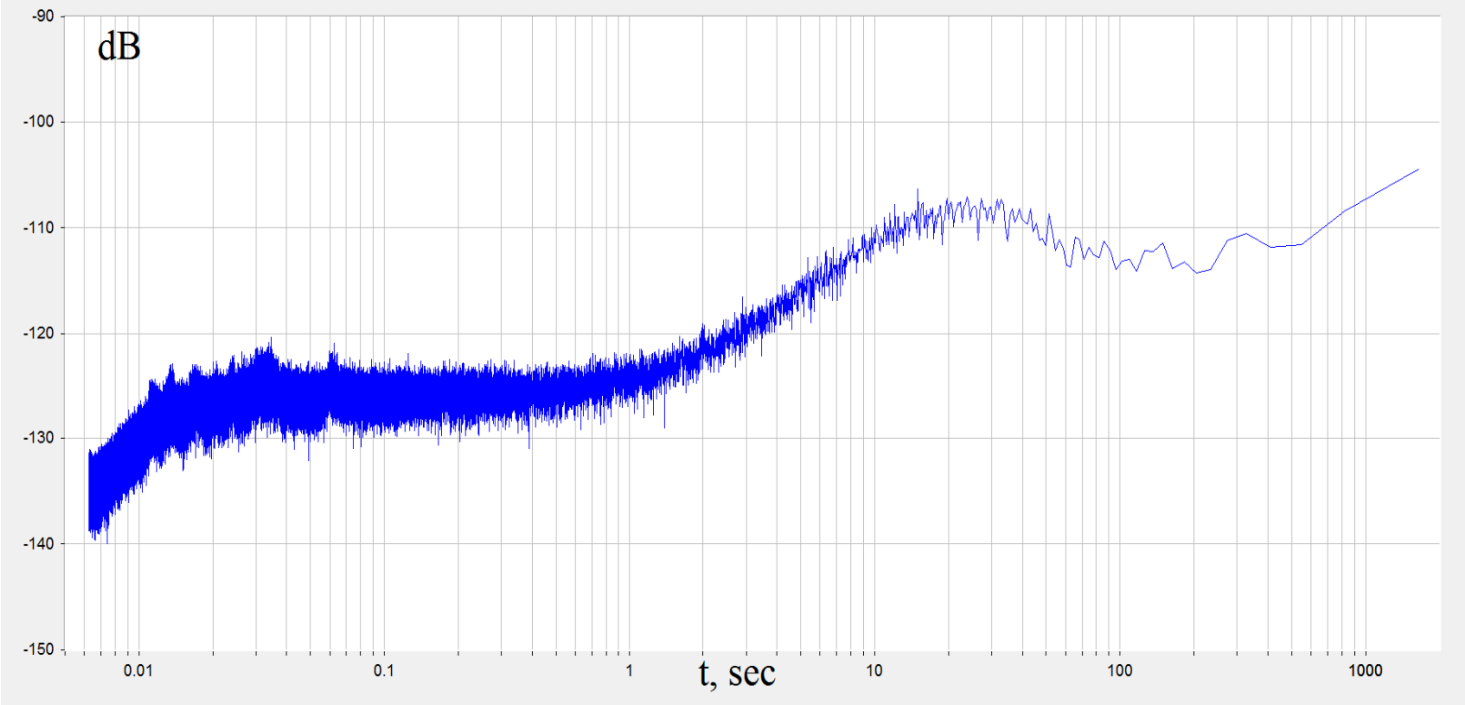
The tests at the highest amplitude may have larger experimental error due non-linear behavior of the experimental system.



In addition, strong amplitude movements were produced manually by jerking the table. The maximum output signal exceeded 5 V or >1 rad/sec in this case. The response is given in the Figure below.



Noise spectrum density in dB relative to 1 rad|/sec/sqrt(Hz)



The maximum input signal for the sensors is ~ 1rad/sec. Taking in account that the instrument self-noise is ~ 5*10-7 rad/sec/√Hz the dynamic range referred to 1Hz bandwidth self-noise is more than 120 dB.

SENSORS