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AVIATION GRAVIMETRIC COMPLEX WITH DUAL-CHANNEL GRAVIMETER

The aviation gravimetric complexes, the sensitive unit of which is a gravimeter, are meant for the Earth gravity performances measurement. By means of the aviation gravimetric complex (AGC) it is possible to obtain the gravimetric information in the awkward-to-reach zones of the globe much faster and at lower costs than doing this by means of ground-mounted, sea-going and land-based gravimetric units. The data of Earth's gravitational field are stored in the onboard digital computer of the AGC will sufficiently promote navigation parameters accuracy increase along with efficiency of the gravimetric discovery. Than is the reason, why the realisation of a high-quality calculations is a very topical issue as of today

The present article suggests an automatic aviation gravimetric complex consisting of the dual-channel capacitive gravimeter, system of the current navigator parameters definition and the measuring unit of the current altitude, the outputs of which are connected to the inputs of the onboard digital computer, besides, the gravimeter is installed at the horizontal-stabilized platform.

The gravimeter is constructed with the two channels, where the capacitive elements 1 and 2 are installed. The capacitive elements G1 and G2 of the both channels are identical and designed in the form of two metal (movable and immovable) plates, both having equal masses $m_1 = m_2$, each of the two is attached to the lower and upper parts of the movable plates G1 and G2 correspondingly. The outputs of the capacitive elements G1 and G2 of the two channels are connected to the outputs of the counter, an input of which is connected to the onboard digital computer, where the actuating signal of the gravitational anomaly is calculated in accordance the set algorithm.

The dual-channel gravimeter works in the following way. The acceleration of earth gravity, has an effect on the capacitive elements of the both channels along with vertical acceleration of the plane, instrumental errors from the influence of residual nonidentity of constructions of identical plates and masses, change of temperature, humidity and pressure of the environment.

At frequencies lower than 0.1 rad/s, the auto-pilot system makes a dent in influence of vertical acceleration, at frequencies higher than 0.1 rad/s, the spectral density approaches infinity. That is why it is important to secure the filtration process of the output signal of the dual-channel capacitive gravimeter with the frequency equal to 0.1 rad/s. The most popular method of the constructive implementation of this process in the known gravimeters is the usage of the low-frequencies filters with the cutoff frequency equal to 0.1 rad/s.

However, in the conditions of the dual-channel capacitive gravimeter operation, the work of filter electronic components become inconsistent, changing the cutoff frequency.

As a final result, the filter starts to pass the errors to the output of the the dual-channel capacitive gravimeter or will black the useful signal out at all. That is why the availability of the low-frequencies filter, as a separate unit within the gravimeter, firs of all sufficiently reduces instrument accuracy ant its reliability. The method of the the dual-channel capacitive gravimeter output signal filtration is suggested: by means of creation of the AGC new gravimeter sensitive unit, the natural vibration frequency of which is equal to the highest frequency of the gravity acceleration, which can be measured against the background of culprits – 0.1 rad/s.

The new dual-channel capacitive gravimeter of an automatic AGC suggested. It has the better of accuracy of 1 mGal, and speed work (completely automatic) if compared with the known ones. The principle of the new dual-channel capacitive gravimeter is described.

Due to the use of an additional second channel, the absence of errors in the gravimeter output signal caused by the influence of vertical acceleration and the residual nonidentity of construction of the two capacitive elements, which can be substantial, is secured.