DO-RA portable dosimeter-radiometer

Customer

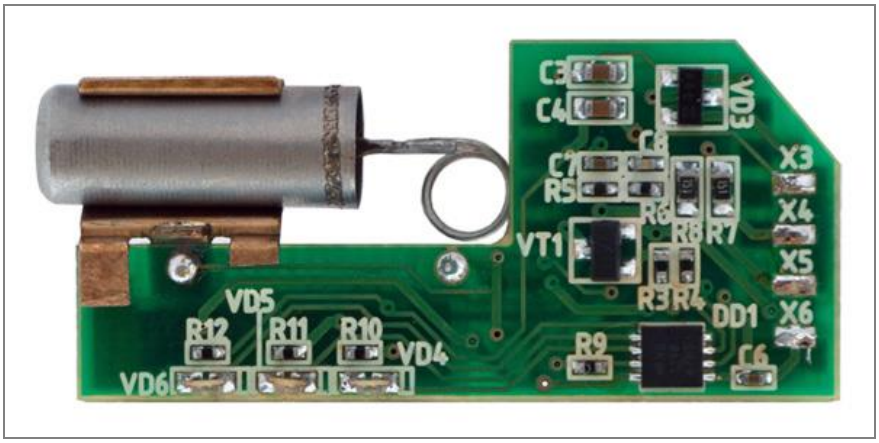
Intersoft Eurasia, ltd., is the operator of the DO-RA project which involved the development of this miniature device for measuring radiation (dosimeter-radiometer, DO-RA). DO-RA is used as a clip-on device attached to a mobile device. It makes calculations and displays measurements using special software.

Objective

1. Design an enclosure for the DO-RA.Classic which can be connected to iPhones version 4 and 4s. A standard smartphone audio input should be used as an interface.
2. The enclosure should be as compact as possible and its design should not complicate the use of an iPhone in the usual mode.
3. Create the design of an enclosure for an all-purpose device DO-RA.uni, which can be connected to any mobile phone, tablet PC or laptop through a standard audio input. DO-RA.uni will automatically detect the device class and switch to the correct mode.

Solution

The size of enclosure for DO-RA.Classic and DO-RA.uni was determined on the basis of the size of the board and its elements:



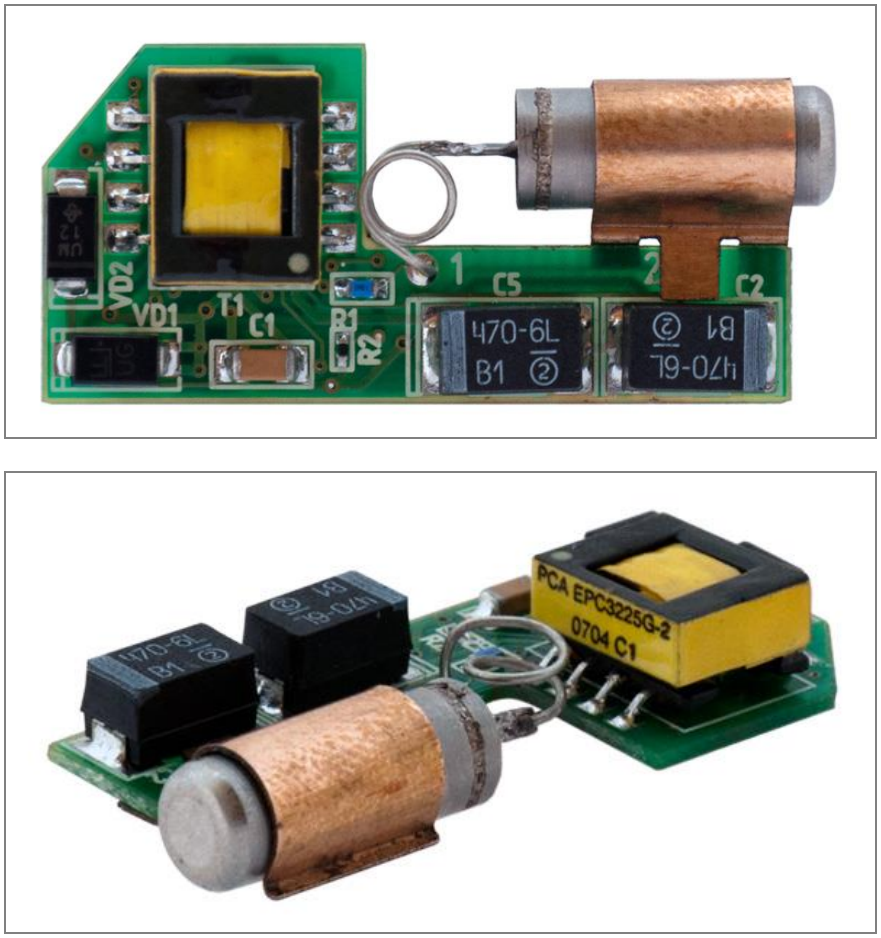


Figure 1. DO-RA hardware

Based on an analysis of analogues and prototypes, the first sketches were made for the design of an enclosure for the customer. This led developers to make the following choice:

Figure 2. DO-RA.Classic enclosure sketches

Figure 3. DO-RA.uni enclosure sketches

The development of an enclosure for DO-RA.uni presented a major design challenge. It was necessary to take into account the broad field of application of the dosimeter-

radiometer and make sure it is convenient to use with any type of mobile device. The solution involved an option with a hinged cover fitted with an audio jack (3.5 mm). When closed, the connector is hidden in the device enclosure.

Another special feature about the development is working with small dimensions. The DO-RA.005 prototype was a very compact mobile device with the dimensions 57 x 9 x 11 mm, which is about 5.6 cubic cm.

It should be mentioned that Intersoft Eurasia has applied to the Guinness Book of Records for the DO-RA to be recognized the world's smallest all-purpose dosimeter.

The solution to this problem involved extensive 3D modeling of enclosure design and prototype testing.

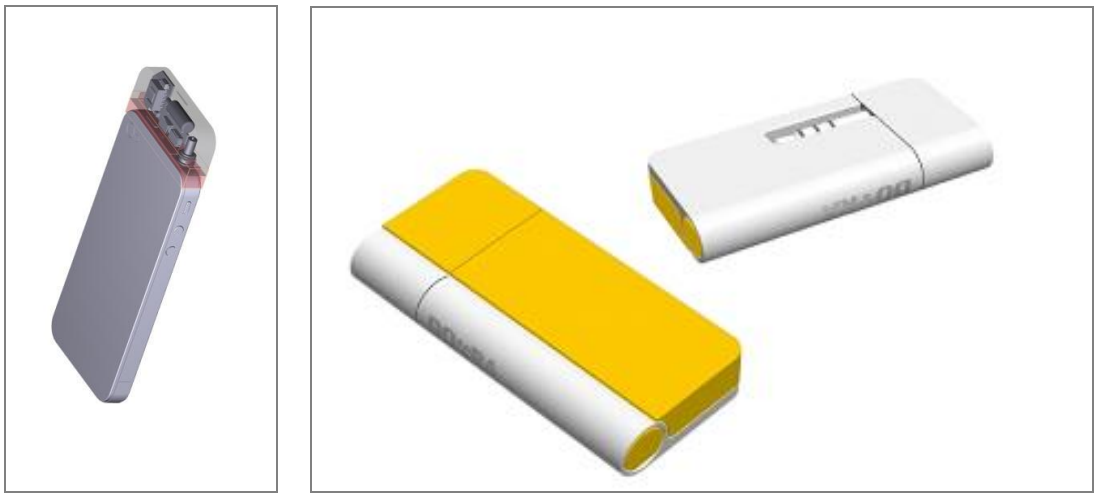


Figure 4. 3D modeling for DO-RA.Classic and DO-RA.uni enclosures

Based on the developed mathematical enclosure model, Promwad experts set up prototype manufacturing and debugging for both enclosure models. Below you can see pictures of prototypes manufactured using laser stereolithography:

Figure 5. DO-RA.uni enclosure prototypes constructed in a 3D printer

The manufactured prototypes were used to perform the following tests: they were tested for assemblability and ease of use.

The color scheme of the DO-RA.uni enclosure should take into account different consumer preferences. Intersoft Eurasia is planning to start supplying devices to different countries. The DO-RA.uni user menu will be translated into twenty most important languages of the world. That is why the developers worked through dozens of design options in different colors, as combined and single-color.

Figure 6. Examples of the enclosure color scheme (DO-RA.uni prototypes after dyeing)

Black was selected for the DO-RA.Classic enclosure model to make it easy to us with an iPhone:

Figure 7. Trial samples and comparative sizes of DO-RA.Classic

Promwad experts provided support for Eurasia Intersoft in manufacturing DO-RA.uni trial samples:

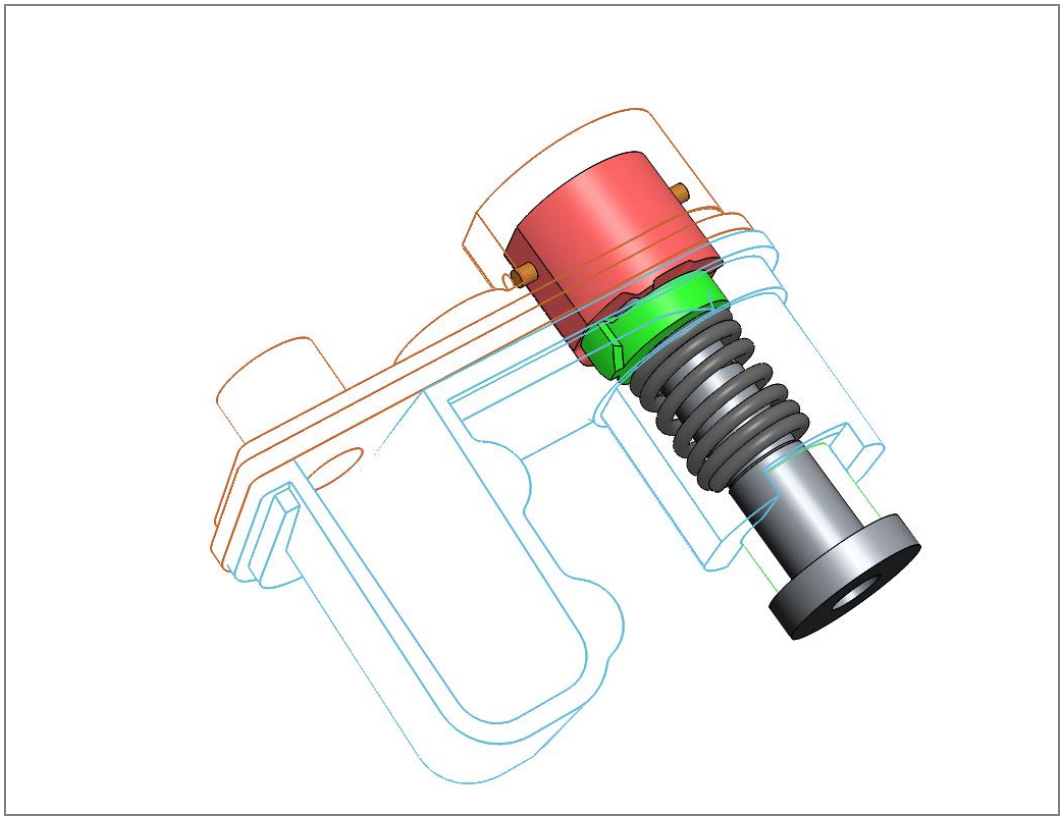
Figure 8. DO-RA. uni trial samples

Eurasia Intersoft and Promwad have worked together to create a complete package of design documentation in full compliance with international standards (in Russian and English).

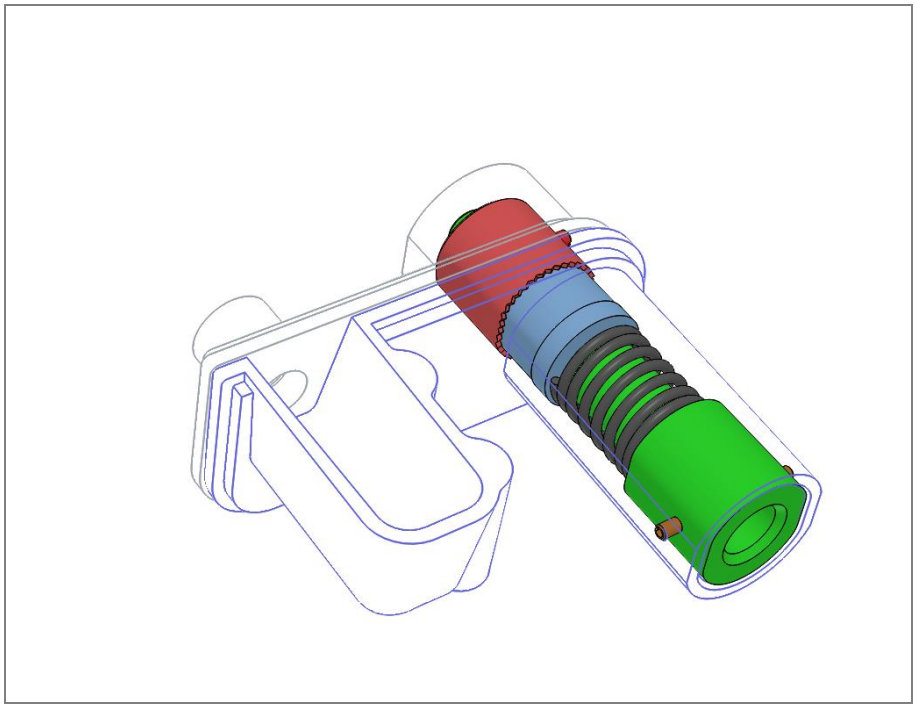
The DO-RA design documentation takes into account international nomenclature of components with reference to a number of industrial parks in Russia, Taiwan, China, Malaysia and South Korea.

Further development of the enclosure construction

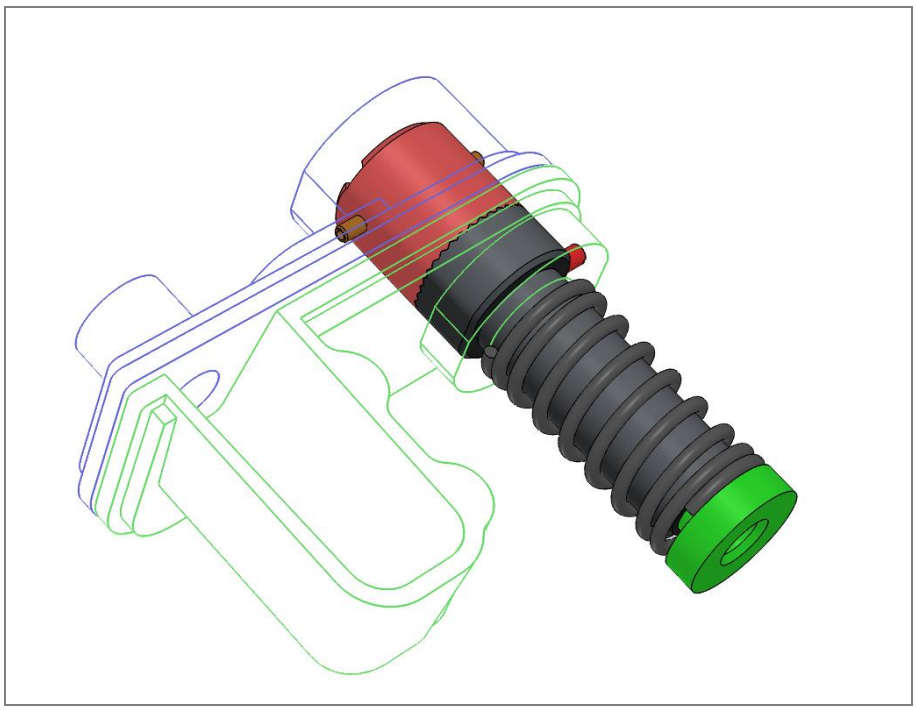
On the request of the client we have modified the construction of the DO-RA enclosure and created a new turning mechanism within a separate project:



Option 1



Option 2



Option 3

Here are the final version of the mechanism:

Advantages

- Ergonomic and compact enclosure, which enables the use of mobile devices in the usual mode
- Best production cost and ease of assembly for the enclosure
- A small number of enclosure parts, which helps reduce the cost of manufacturing molds
- Design documentation available for mass production