

# Receiving messages from operational CubeSats - Budget

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# 1 Introduction

This document addresses the detailed costs of the complete development of the project. A distinction has been made into four separate sections, material costs, manpower costs, software costs, and hardware costs.

This distinction is established to facilitate the calculation and the search for what should be added to the cost of each stage of real development of the project, since it is projected to develop in several stages of which the first has been developed, this is the reception of signals in VHF band.

## 2 Material costs

A study has been carried out on the cost of each of the materials that are not available in the laboratory and therefore it will be necessary to purchase them in order to successfully develop the actual construction of the TGS expansion.

Materials such as the VHF band antenna, the necessary RF400LRP radio frequency cable or certain types of SMA and N connectors are not considered within the budget since the estimated quantities necessary for construction are available.

Therefore, Table 1 shows the pertinent calculations of the development cost of the full extension, both for TX and for RX in the VHF and S frequency bands.

| ITEM                | MODEL              | UNITS | UNIT PRICE (€) | SHIPPING (€) | TOTAL PRICE (€)  |
|---------------------|--------------------|-------|----------------|--------------|------------------|
| S band antenna      | OJ-2327SPE9-24×2   | 1     | 79.04          | 38.64        | 117.68           |
| VHF band LNA        | MVV 144-VOX        | 1     | 219            | 11.9         | 230.9            |
| S band LNA          | Lna-4000           | 1     | 169            | 18           | 187              |
| VHF band HPA        | MKU PA 2M-60W HY-2 | 1     | 352            | 0            | 352              |
| S band HPA          | MKU PA 13CM-10W    | 1     | 439            | 29           | 468              |
| VHF band circulator | DPVCC60A           | 1     | 40             | 12           | 52               |
| S band circulator   | DPVCC18A           | 1     | 40             | 12           | 52               |
| VHF band filter     | 144-146 BPF        | 1     | 89             | 9.5          | 98.5             |
| S band filter       | ZFBP-2400+         | 1     | 40.71          | 0            | 40.71            |
| Bandwidth limiter   | ZFLM-252-1WL-S+    | 2     | 42.34          | 7.9          | 92.58            |
| Camera              | Wansview W6        | 1     | 35.99          | 0            | 35.99            |
| Connectors          | N (male)           | 16    | 3.21           | 6.34         | 57.7             |
|                     |                    |       |                | <b>TOTAL</b> | <b>€1,785.06</b> |

TABLE 1: Material cost calculations.

The price of each component has been extracted from the links provided in the project report. As the table shows, the total price of the materials amounts to **€1,785.06**.

### 3 Manpower costs

To estimate the calculations of the total price of manpower, a distinction has been established between each chapter of the main report of the project within Table 2. Each section incorporates the hours applied, where these include both the search for information or writing and its practical development.

The estimated cost for each hour of work has been established at €8.00, based on the average price of the hourly salary of an engineering student in practice, it has not been established with the salary of a senior engineer, which would amount to more than double, since it is not the real case that applies.

| TASK  | TIME (h)   | TOTAL PRICE (€)  |
|---|------------|------------------|
| Introduction                                | 15         | 120              |
| History and previous concepts               | 30         | 240              |
| Current TGS configuration                   | 40         | 320              |
| TGS expansion design                        | 65         | 520              |
| TGS expansion development                   | 40         | 320              |
| Results                                     | 20         | 160              |
| Receiving data from satellites              | 10         | 80               |
| Current TGS representation and details      | 30         | 240              |
| New design and details of the TGS expansion | 42         | 336              |
| Total budget study                          | 8          | 64               |
| <b>TOTAL</b>                                | <b>300</b> | <b>€2,400.00</b> |

TABLE 2: Manpower cost calculations.

As the table shows, the total price of the manpower amounts to **€2,400.00** for a total of 300 hours dedicated to full development of the project.

## 4 Software costs

The cost of the software used is taken into account since for the comfortable drafting and calculations of the project, licenses for two types of programs are required in this case. The calculations are attached in Table 3.

On the one hand, the Microsoft Office package is required, which incorporates, among other things, Word, which has been used for a document and Excel, which has helped to establish all the budget calculations.

On the other hand, the Overleaf price is incorporated, which is used for all the writing and presentation of project documents. The price of these programs has been incorporated taking into account the months that are used only for this project.

| SOFTWARE                             | ANNUAL COST (€) | TIME (months) | CORRESPONDING PRICE (€) |
|--------------------------------------|-----------------|---------------|-------------------------|
| Microsoft Office Personal 365 (2019) | 69              | 4             | 23                      |
| Professional Overleaf                | 336             | 4             | 112                     |
| <b>TOTAL</b>                         |                 |               | <b>€135.00</b>          |

TABLE 3: Software cost calculations.

As the table shows, the total price of the software programs amounts to **€135.00**.



## 5 Hardware costs

In the hardware budget, calculated in Table 4, the corresponding amortization of the personal laptop used during the four months of the project has been taken into account. To establish the estimated calculation, a useful life of 5 years has been established.

| <b>HARDWARE</b>                     | <b>TOTAL<br/>COST (€)</b> | <b>USEFUL LIFE<br/>(years)</b> | <b>USE TIME<br/>(months)</b> | <b>CORRESPONDING<br/>PRICE (€)</b> |
|-------------------------------------|---------------------------|--------------------------------|------------------------------|------------------------------------|
| ASUS ZenBook 14 Intel Core 10TH GEN | 960                       | 5                              | 4                            | <b>€64.00</b>                      |

TABLE 4: Hardware cost calculations.

As the table shows, the total price of the hardware amounts to **€64.00**.

## 6 Total budget

Once the price of each of the four partial budgets corresponding to each block is known, the total budget can be estimated by adding the corresponding quantities as in Table 5:

| BUDGET SECTION | TOTAL COST (€)   |
|----------------|------------------|
| Material Costs | 1785.06          |
| Manpower Costs | 2400             |
| Software Costs | 135              |
| Hardware Costs | 64               |
| <b>TOTAL</b>   | <b>€4,384.06</b> |

TABLE 5: Total budget calculation.

As the table shows, the total budget for the entire project amounts to **€4,384.06**.