

# Palpatine AR

## INSTRUCTIONS FOR FABRICATION

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POLIFACTORY

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# 1. Basic info about Palpatine bra

**PALPATINE is an analogue wearable educational device to learn the correct breast palpation techniques designed by F. Poli, D. Sanchez, B. Beltrami, L. Sommariva and C. Parise.**



*Fig. 1. PALPATINE: the final object (photo credits: Gabriele Renna)*

Palpatine is a bra made by laser cutting technique that uses an auxetic structure, allowing it to fit into different sizes and cups. This structure suggests to the users the correct movements for breast self-examination.

For us aesthetics is a key point since it should be a desirable product that aims to set its own trades. This project looks forward to creating new habits and awareness in young women about this important practice and changing the stressful perception that it has. Your boobs change every month, touch them!

## BILL OF MATERIALS

The table below contains all the materials necessary for the reproduction of the product (consumables, electronics, components).

Name and tipology	Link	Quantity	Price
Cotton neoprene	n.a.	45x70 cm	n.a.
Velcro	n.a.	5 cm	n.a.
Straps	n.a.	2	n.a.
Strap sliders	n.a.	2	n.a.

## TECHNOLOGY AND TOOLS USED

- Laser Cut machine to cut the wearable
- Sewing machine to sew the Velcro strip and the straps

## 2. Step By Step installation

PALPATINE AR works only with Android devices. Specifically Palpatine was developed for a Samsug Galaxy Tab S6 Lite tablet device, adapting to the resolution of this screen and technical specifications, such as the version, which is the Android Oreo (API Level 26). However, Palpatine was exported and it is available for several Android devices, with different API Level.

**STEP 1:** Select and extract Palpatine.svg file related to your breast size (sizes m-l and s-m) from Palpatine\_digitalfiles.zip

**STEP 2:** If you want to modify\* open the file in Illustrator, Autocad or Rhino and, after, export it as a vector file.

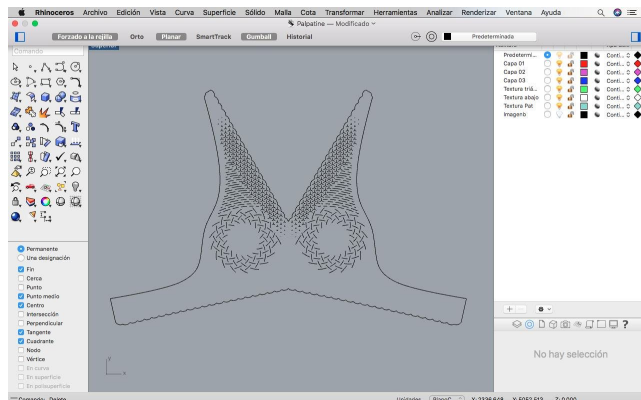
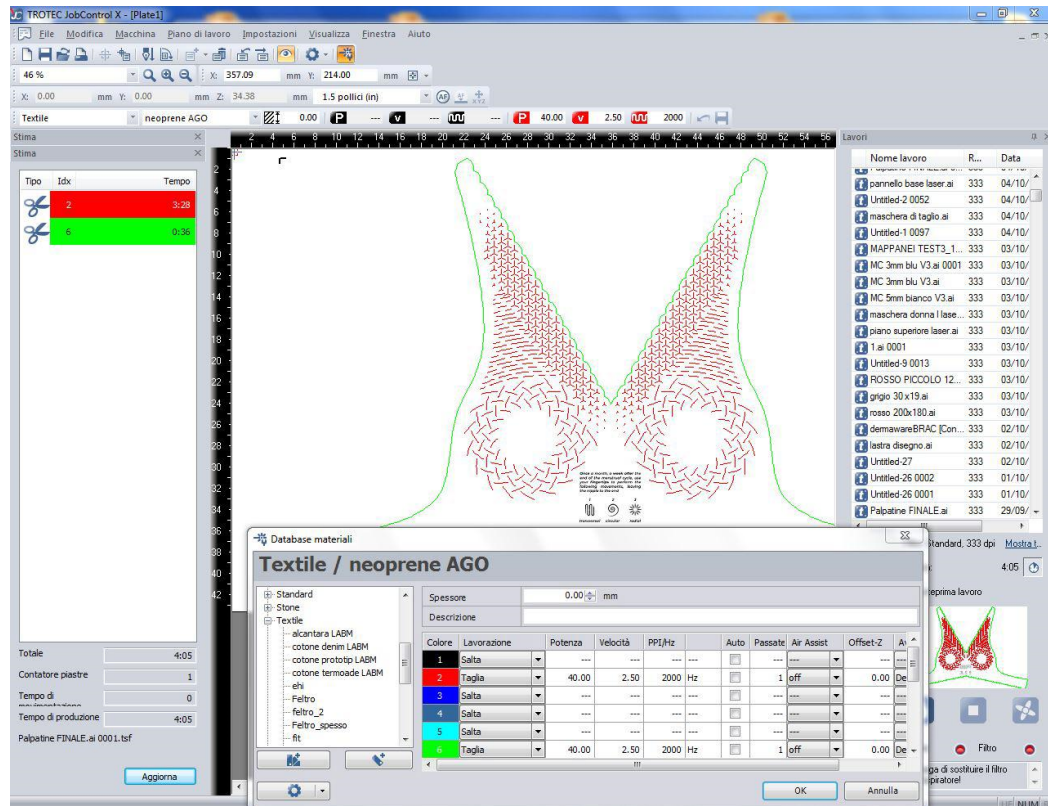


Fig. 2. Opening the Palpatine file with Rhino.

**STEP 3:** Stretch well the fabric on the plane of the laser cut.



*Fig. 3. Setting Laser Cut (Trotec Speedy 300) to cut Palpatine.*

**STEP 5:** Sew the velcro into the back of the bra.

**STEP 6:** Sew two buttonholes on the back of the bra to attach the straps.

**STEP 7:** Cut a 32cm strap of your choice, sew it to the slide wing and adjust it using the strap slider.

**STEP 8:** Wear your bra and be awesome.

\*available sizes: s/m - m/l

\*\*ask to a person who used the machine or the Fab Manager for settings parameters

### **3. Credits – Palpatine bra**

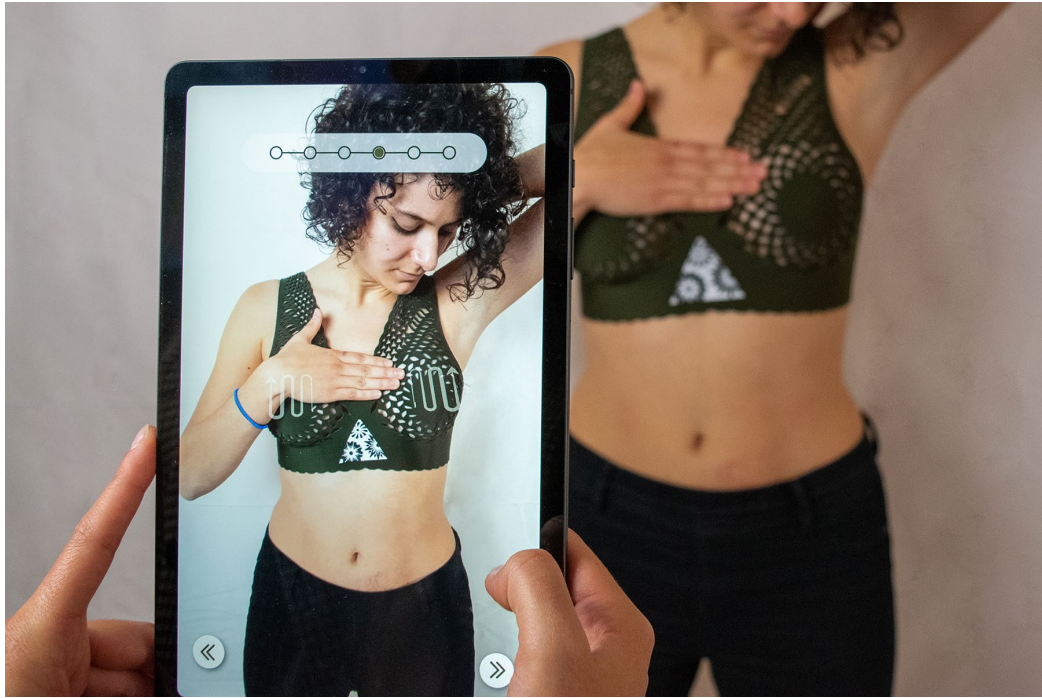
PALPATINE BRA is a project publicly released and made available in open source mode according to the Creative Common License (CC-BY) and promoted by Distributed Design Market Platform with the related documentation.

The authors of PALPATINE are Francesca Poli, Daniel Sanchez, Benedetta Beltrami, Luca Sommariva and Chiara Parise.

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## 4. Basic info about Palpatine AR

**PALPATINE AR is an application created to aid and integrate the experience of learning the right breast palpation techniques. It is based on the PALPATINE bra, designed by F. Poli, D. Sanchez, B. Beltrami, L. Sommariva and C. Parise.**



*Fig. 4. Palpatine AR project overview.*

PALPATINE AR is a project that intends to use Augmented Reality to help the user through the monthly breast palpation process. The AR filter present in the application works with a floral marker created on Illustrator and it guides the users, teaching them through animated arrows the correct motions that have to be made to complete the self-palpation.

It is an App based on the concept of education and awareness that, inspired by many fitness Apps and using the possibilities of Augmented Reality, helps young women to approach this sensible topic and guides them through each step.

## 5. Step-by-step installation

However, Palpatine was exported and it is available for several Android devices, with different API Level.

### **TABLET SUPPORT**

**STEP 1:** Download the Fusion 360 3D model file for the tablet support. If your device is different from the one used in our project, you can simply modify its dimensions thanks to the software features (parametric design).

**STEP 2:** Once your tablet supports a 3D model file ready, pass it through a 3D slicer to prepare the file for the 3D printing.

**STEP 3:** Place your file on the 3D printer of your choice using PLA filament preferably. As an alternative, you can also use ABS or PETG filaments.

**STEP 4:** Once printed and cleaned, place your tablet in the support and attach the support to the photo studio light stand.

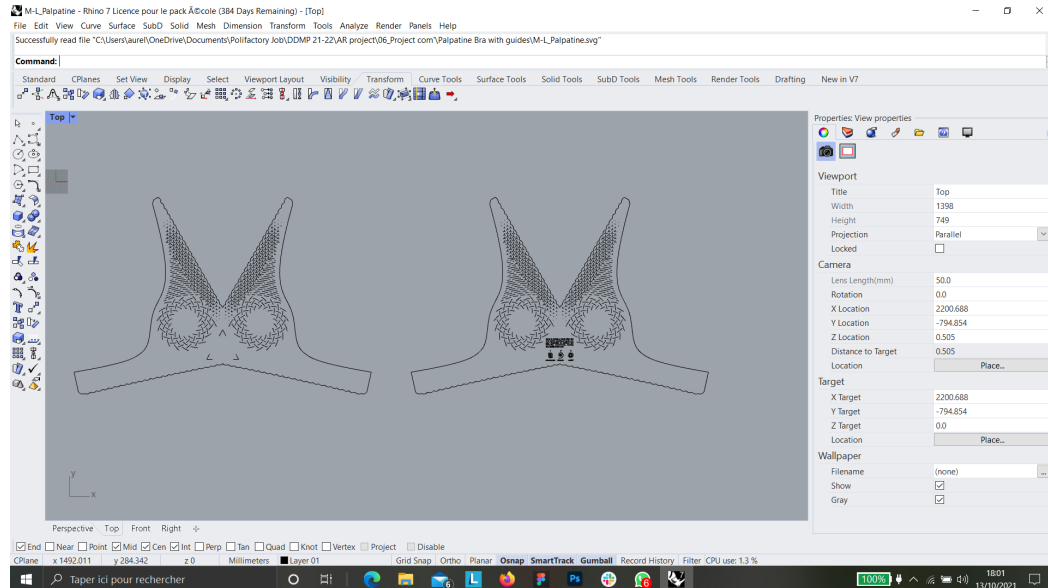
*\*If you already have another kind of stand, or no stand but a table/shelf of the right height (bust), no need to purchase a stand. You can directly place your tablet and the 3D support on the table.*



## Palpatine AR Bra with guidelines Laser Cutting

**STEP 1:** Select and extract Palpatine.svg file related to your breast size (sizes m-l and s-m) from Palpatine\_digitalfiles.zip

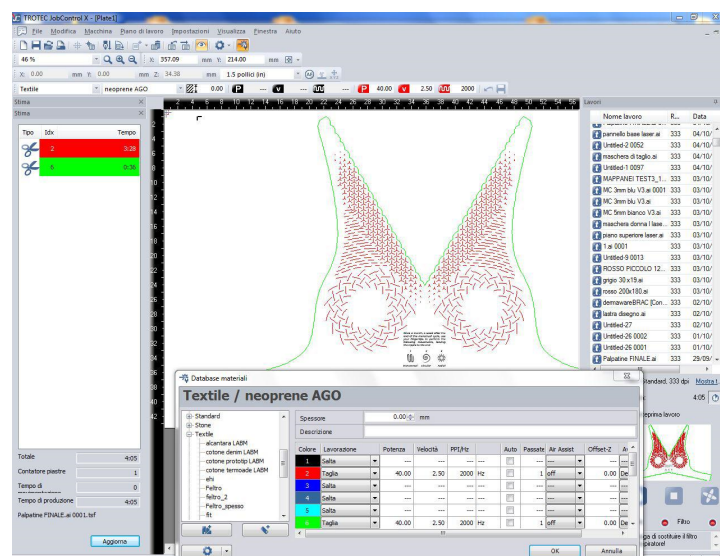
**STEP 2:** If you want to modify\* open the file in Illustrator, Autocad or Rhino and, after, export it as a vector file.



*Fig. 5. Opening the Palpatine file with Rhino.*

**STEP 3:** Stretch well the fabric on the plane of the laser cut.

**STEP 4:** Laser cut the bra. If you use a Trotec machine, you can use these settings\*\*: (Cutting level: power 40, speed 2.5, 2000 Hz, 1 passage, air assist OFF; Engraving level: power 17, speed 14, 1000 PPI, 1 passage, air assist OFF).





*Fig. 6. Setting Laser Cut (Trotec Speedy 300) to cut Palpatine.*

**STEP 5:** Sew the velcro into the back of the bra.

**STEP 7:** Cut a 32cm strap of your choice, sew it to the slide wing and adjust it using the strap slider.

**STEP 8:** Wear your bra and be awesome.

\*available sizes: s/m – m/l

\*\*ask to a person who used the machine or the Fab Manager for settings parameters

## **APP INSTALLATION**

**STEP 1:** Before proceeding with the steps related to the installation you will then need to determine the API Level related to your device.

**STEP 2:** Once this is done, to be able to install Palpatine AR on your device you need just to connect it to the computer, enable the exchange of data between the two and drag the correct file .apk into one of your the device folders. To enable data exchange it will probably be necessary to enable the Developer Mode, directly from the settings of your device.

**STEP 3:** When the .apk file is installed you can launch the application directly from your device.

## **BILL OF MATERIALS**

The table below contains all the materials necessary for the reproduction of the product (consumables, electronics, components).

Name & typology	Link	Quantity	Price
Wire spool PLA	n.a.	50.70g	0.28 euros
Neewer - 2.1m Aluminium Alloy Photo Studio Light Stand for Video, Portrait, Photo Lighting, Softbox and Umbrella	n.a.	1	27.49 euros
Cotton Neoprene	n.a.	45X70 cm	n.a.
Velcro	n.a.	5 cm	n.a.
Straps	n.a.	2	n.a.
Straps sliders	n.a.	2	n.a.

## 6. Technology and tools used

- Adobe Illustrator (App Interface and Marker)
- Adobe After Effects (Animated arrows and tutorials)
- Unity and Unity Mars plug-in (App implementation)
- Vuforia Engine Developer Portal (Marker quality check)
- Fusion 360 Autodesk (Tablet support 3D modelling)
- FDM 3D printer (Tablet support 3D printing)
- Laser Cut machine to cut the wearable
- Sewing machine to sew the Velcro strip and the straps

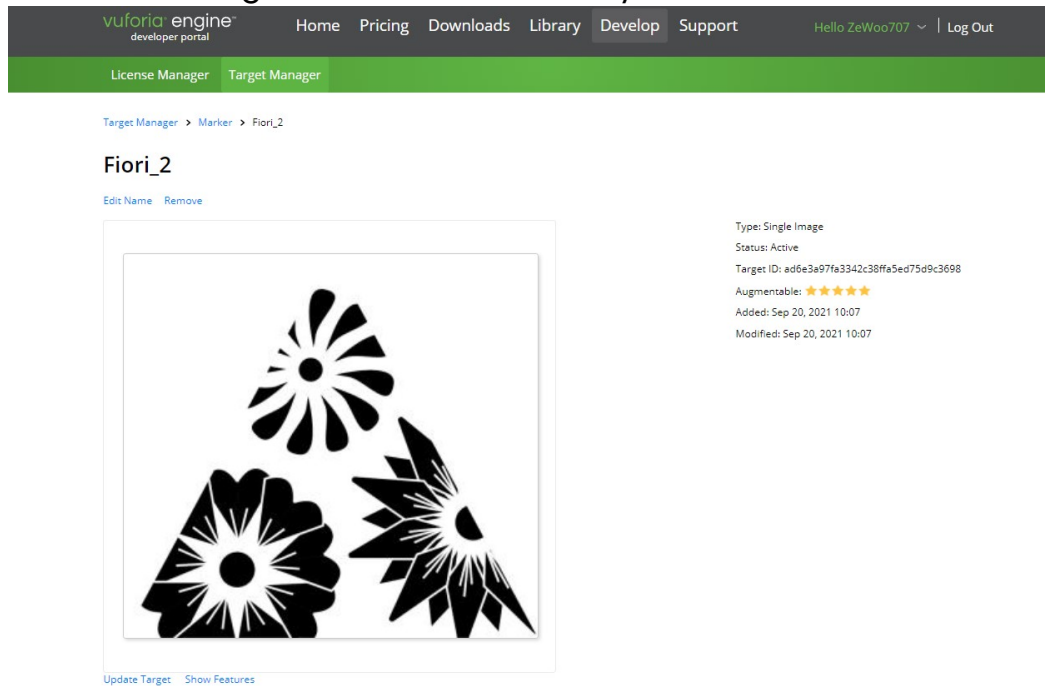
## 7. Marker

### CREATION

Our floral marker was created on Illustrator following the rules of efficient AR marker:

- Asymmetrical pattern
- Without circular elements
- With a lot of cusps and vertex

The floral pattern was chosen to have continuity with the pattern of the Palpatine bra and maintain its elegant aesthetic. To verify its quality, the marker was uploaded on the Vuforia Engine Developer Portal, receiving 5 stars for its efficiency.

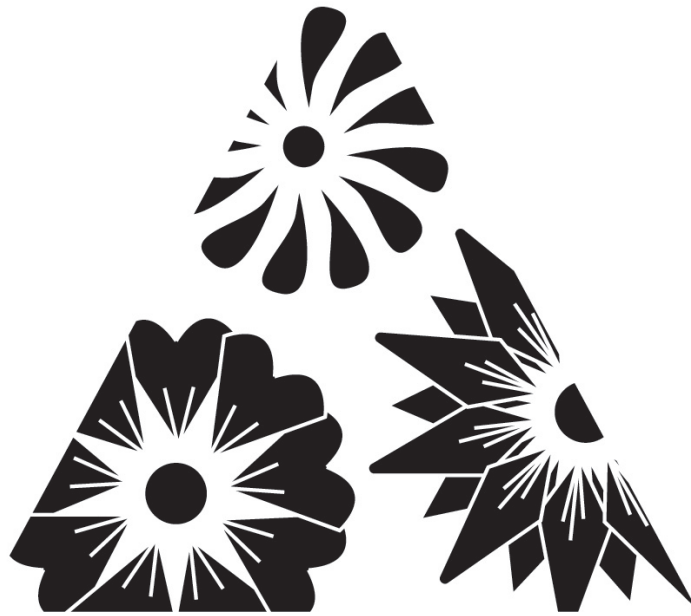


*Fig. 7. Marker rating and checking on Vuforia Engine Developer.*

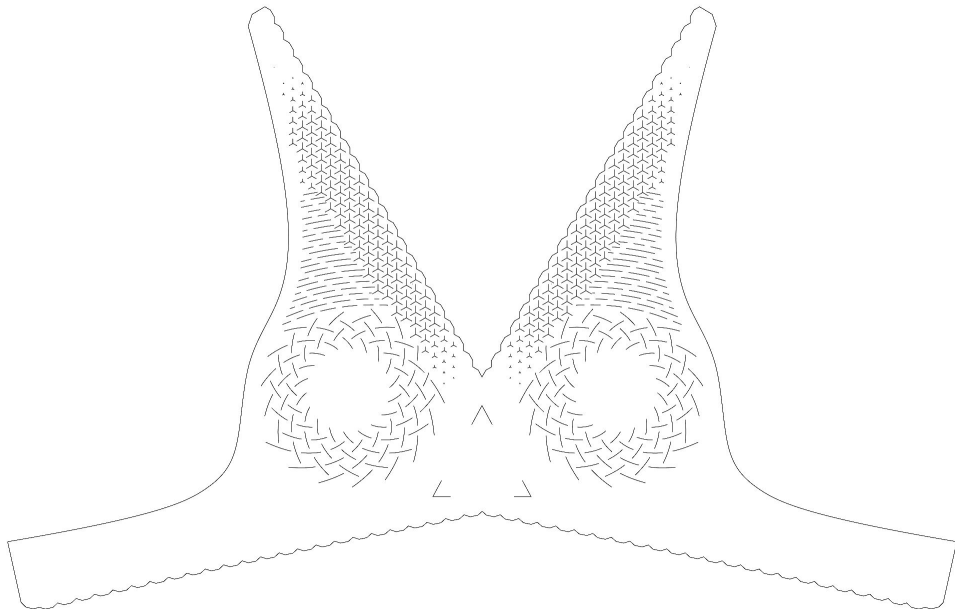
The application and positioning of the marker is very simple.

### **Marker positioning and application**

The marker is a triangle with a base of 6 cm and height of 7 cm. It can be downloaded within the App and be printed. It must be put on the center of the bra, at the bottom part - with the base aligned to the edge of the bra, between the breasts.



*Fig.8. - PALPATINE AR: Marker Design and details.*



*Fig.9. - PALPATINE AR: Implemented Palpatine file with guides for marker positioning.*



*Fig.10. – PALPATINE AR: Laser cut bra and marker.*

## **8. Credits – Palpatine AR**

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## 9. Downloadable files

PALPATINE AR files can be download at:

[www.polifactory.polimi.it/en/polifactory/ctrl](http://www.polifactory.polimi.it/en/polifactory/ctrl)

CONTACT:

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