



DECISION OF THE ENDURANCE COMMITTEE



To: Teams Manufacturers
Category: LM P1 LM P2 LM GTE Pro LM GTE Am
Decision N°: **16-D0002-All categories**
Date: 18/03/2016
Re: Official on board camera

Mission concerned

Article: 2.5

- 2016 FIA World Endurance Championship Sporting Regulations**
- 2016 Technical Regulations for Prototypes LMP1
- 2016 Technical Regulations for Prototypes LMP2
- 2016 Technical Regulations for Le Mans Grand Touring Cars LM GTE Pro
- 2016 Technical Regulations for Le Mans Grand Touring Cars LM GTE Am
- Internal Regulations of the FIA Endurance Commission

Decision

Technical description is summarized in document "On board camera WEC 2016.pdf"

With a minimum weight of all cars defined and maintained without camera system, it is considered of major importance that the cars equipped with camera system do not suffer any performance penalty.

The following will be put in place, considering the weight of camera system = 3kg

- Cars without camera will need to have ballast on board (total 3kg). When removed, cars must be at least at the minimum weight defined by the regulations.
- LMP1 cars: all cars to be equipped with antennas and looms
If no camera, a dummy box to be installed in due position in cockpit (same dimensions as TS2+L1700 assembly weight of = 1.5kg).
- LMP2 and LMGTE: no necessity to equip all cars
If no camera, a dummy box to be installed in cockpit (same dimensions as TS2+L1700 assembly, weight same as complete system = 3.0kg)

Period of validity/application of the decision

This decision comes into effect:

- with immediate application
- from:
- from the following event :

And is applicable:

- until further notice
- for the above-mentioned event(s) only:

Committee Members



Denis CHEVRIER



Vincent BEAUMESNIL

Any decision taken by the Endurance Committee is not subject to appeal, in accordance with Article 4.11.2 b of the Sporting Regulations.

This decision is available on the following websites:

- <http://www.fia.com/events/world-endurance-championship/season-2016/fia-endurance-committee>
- <http://sport.lemans.org/login.php>



RF FACTORY



*FIA WORLD **ENDURANCE**
CHAMPIONSHIP*

Specifications for the 2016 TV system

Table of contents:

Presentation and installation:

- 1- TSII
- 2- Power loom
- 3- transmitter
- 4- Cameras
 - 4.1- 2016 POV camera
 - 4.2- other shots
 - 4.3- LMP 1 camera set
- 5- Antennas
 - 5.1- Active antenna
 - 5.2- VHF antenna
- 6- Total weight

Contacts

The TS2 is the brain of our system. Driven by radio frequency, it allows us to:

- Control the energy supplied to all connected devices
- Control the devices through an RS232 or an RS485 data connection
- Synchronize four HD-SDI video inputs for live switching
- Distribute two HD-SDI signals dissociated
- Record an ASI stream with Micro-SD*
- Read the GPS positioning data (optional)
- Have a feedback on the data provided by the accelerometer
- Embed car's can data (optional)

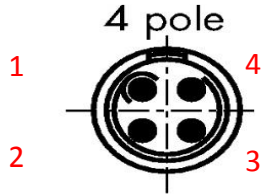
Mounting procedure:

- The TS2 needs to be assembled to the transmitter,
- It must be inside the car in a dry and accessible location.
- The set must be mounted on silent blocks ,
- A free space is required to connect the attached devices. About 50mm over the face including the connectors.
- The mounting holes (unthreaded) have a diameter of 4.5 mm and are spaced from:
 - Width: 7.5mm
 - Length: 116,5mm
 - Depth: 28,075mm
- The power supplied to our system needs to be 12 V with a maximum current of 5A.
- A "low current" limit needs to be set to not go lower than 2,21A.
- The power supplied must be connected to the main power supply of the car. This source of supply devices should not be switched-off during refuelling.
- Weight: 380g

Power supply connector

Each team has to provide this connector close to where equipments will be mounted.

Lemo FGG.0B.304 Pin out details (soldering side) :



PIN	Fonction
1	Gnd
2	Gnd
3	12 Volts
4	12 Volts

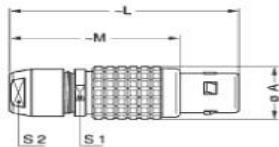


FGG.0B.304.CLAD52Z

MECHANICAL DETAILS

Shell Style Model	FG* : Straight plug cable collet
Keying	1 key (alpha=0, plug: male contacts, receptacle: female contacts)
Housing Material	Brass (chrome plated) shell and collet nut, nickel plated brass latch sleeve and mid pieces
Cable Fixing	4.3 - 5.2 mm
Variant 2	Z : Nut for fitting a bend relief

	A	L	M	S1	S2
Min	8.5	35	20	8	7
In	0.37	1.42	1.02	0.31	0.28



Available Download

unipole_multipole.pdf

PERFORMANCE DETAIL

Insert	0B.304 : 4 Low Voltage
Insulator	L: PEEK
Specifications	
Contact Type:	Solder
Max. Matings:	5000
Contact Dia.:	0.7 mm (0.028in)
Bucket Dia.:	0.8 mm (0.031in)
Max. Stranded	0.34 mm ² (AWG 22)
Max. Conductor:	0.34 mm ² (AWG 22)
R (max):	6.1 mOhm



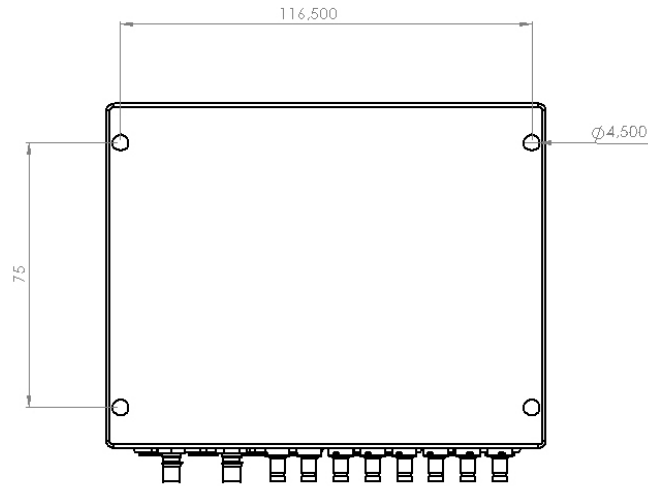
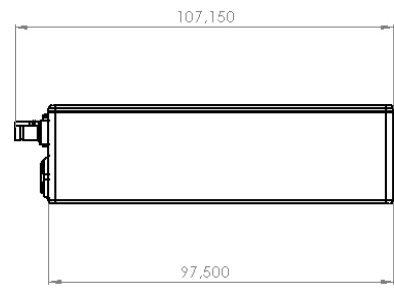
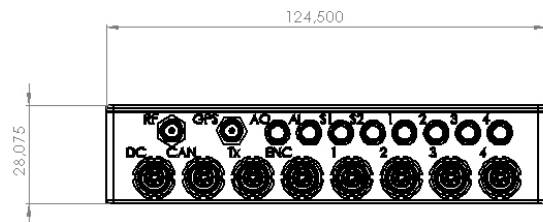
OTHER CHARACTERISTICS

Endurance (Shell)	Endurance (Shell):
Temp (min)	-55°C
Temp (max)	+250°C
Humidity (max):	<=95% [at 60 deg C /140 F]
Vibration:	15 g [10 Hz - 2000 Hz]
Shock Resistance:	100 g [6 ms]
Salt Spray	>144 hr
Climatical	50/175/21
Shielding (min):	75 dB (10 MHz)
Shielding (min):	40 dB (1 GHz)
IP Rating	50



Related links

- [Contact](#)
- [Quote Request](#)
- [Catalogs Downloads](#)
- [Catalogs Requests](#)
- [Sample Request](#)
- [3D drawings](#)



SANS INDICATION CONTRAIRE: Tous les connexions en mm/centimètres		PROJONCTEUR		CASSER LES ANCHES VMS		NE PAS CHANGER VICHETTE		REVISED	
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L1700

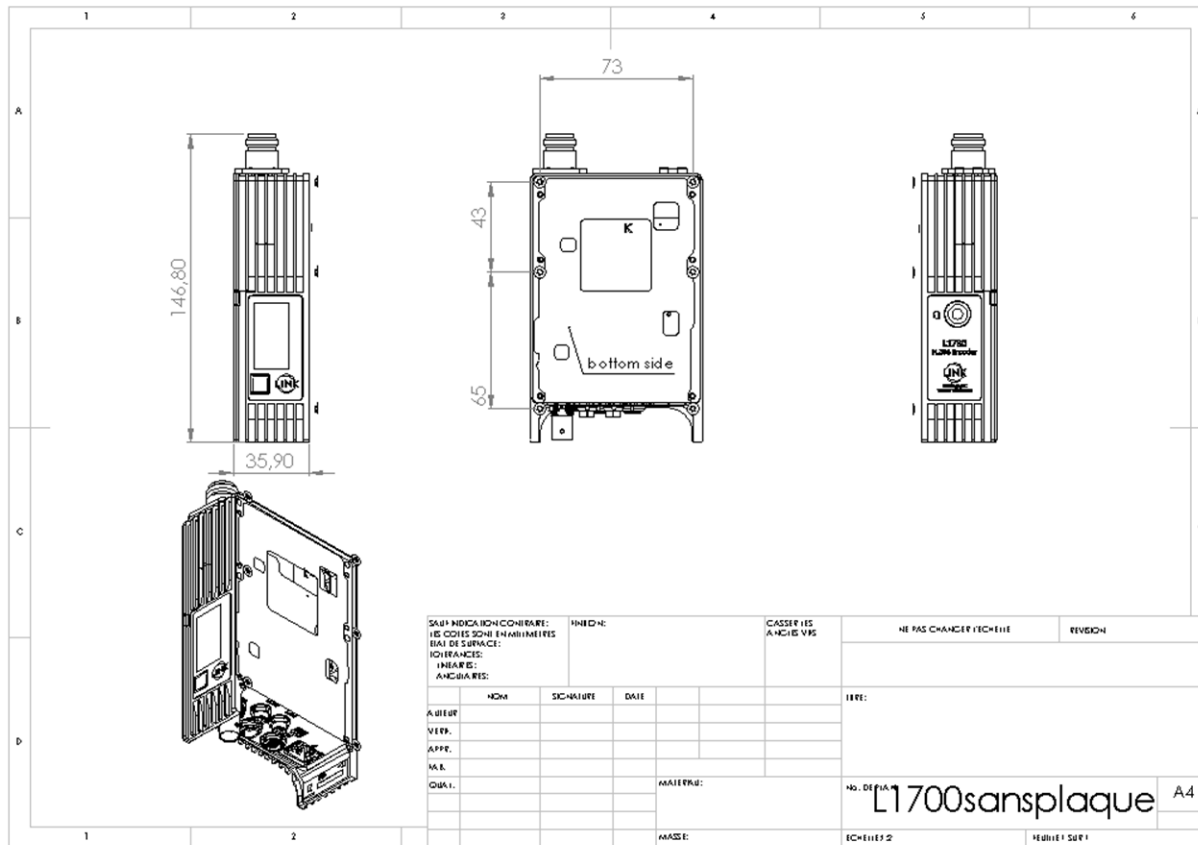


The L1700 is the transmitter of our system. It transmits the images mixed by the TSII. It uses an H264 encoder and narrow band transmission. 6MHz bandwidth gives similar to 10MHz previously. With this we can equip more than 40% additional cars.

Monting procedure:

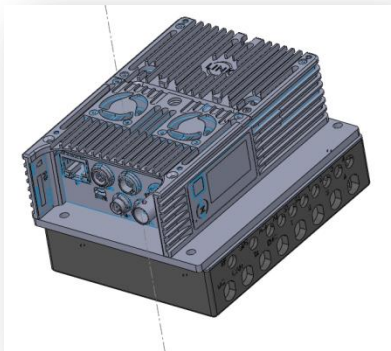
- The L 1700 needs to be assembled on the top of the TS2,
- A free space of 30mm is required above the fans,
- This equipment also require a free space of 30mm on both side (where connectors are attached)
- B-box mounting : 6 x 3,2mm holes on the bottom side as shown on the drawing.
- Weight: 550g

L1700

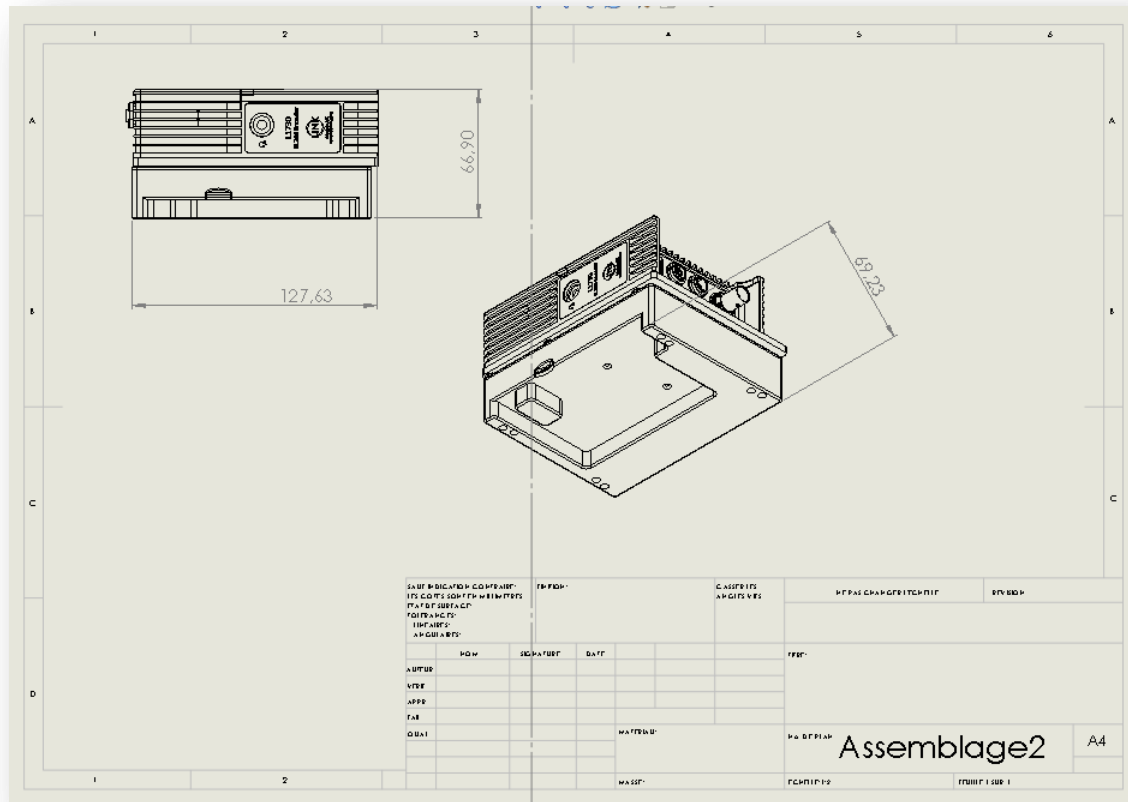
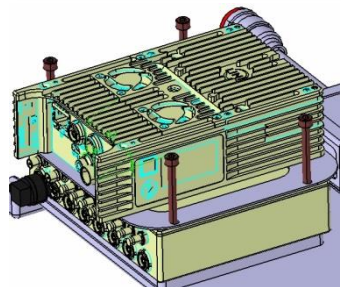


Bracket

Example of a mounting bracket for TS2 and L1700.



or



Cameras



The TSII can control between 1 and 4 cameras. The cameras can be controlled from the OB van in terms of colorimetric, diaphragm and electronic zoom. As they are installed in different places in the car, they enable a diverse range of views: cockpit, driver, rear, subjective view, etc.

4.1 2016 P.O.V camera (not available before SPA)

It's the Point Of View camera. It's a very high quality camera with high sensitivity for night time operation. To install it, we need to find a cool and dry place where the spectator can think he is the driver. Due to its price, it also needs to be in a safe place. For teams that wish to design their own brackets, please allow for pan and tilt adjustment.

Weight: 300 g

As we are still developing our own camera to be able to provide you a better sensitivity, we are not able to provide you information before end of March. Except that it should be the same shape and weight than the KAPPA.



Cameras

4.2 other shots.

To understand what is happening on the track and in the cockpit during the race cameras will be fitted in various locations about the car.

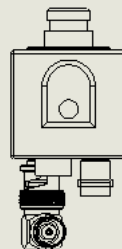
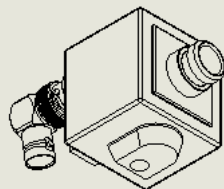
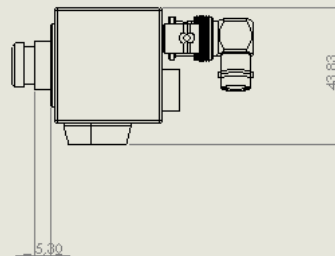
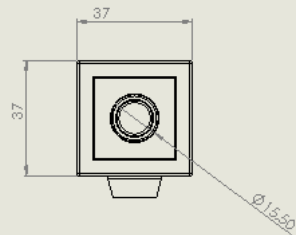
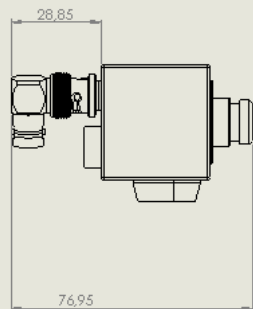
Often one view is of the driver's face, another is at the rear of the car filming behind.

This kind of shot will be available with those small Cameras.

For teams that wish to design their own brackets, please allow for pan and tilt adjustment.

Weight: 120g

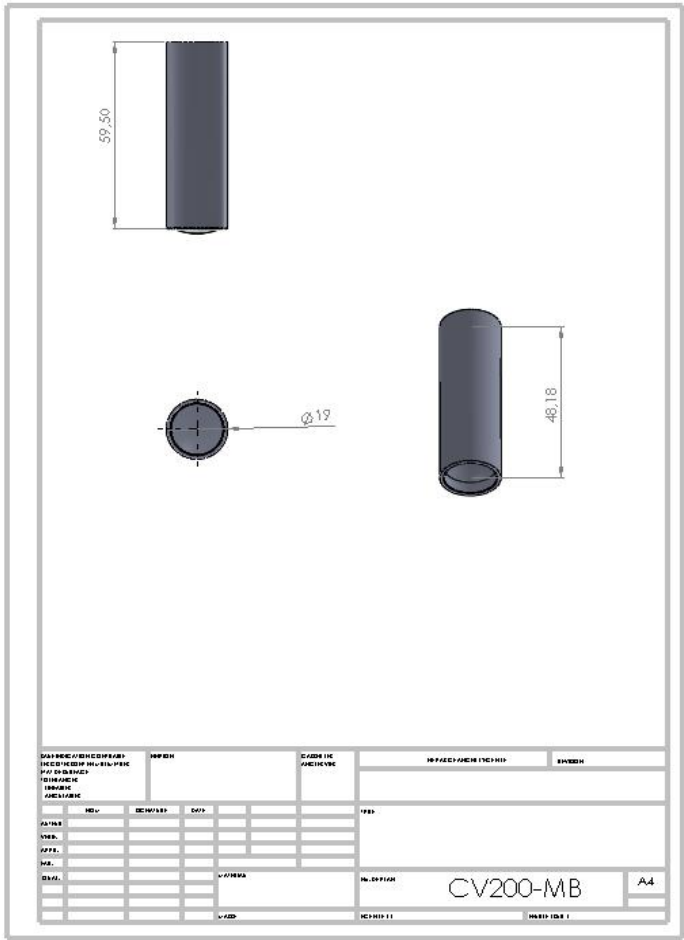




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CV500

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САРБЕДИСЕРИЈА
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CV200-MB

A4

Cameras

4.3 LMP1 camera set

To clear problems we had last year with our square cameras, we will replace them all by the bullet camera in every LMP1 cars .

In addition, we will install in every LMP1-H a third camera with a subjective view of what the driver see and particularly his hands on the steering wheel.

Here is a proposal of the desired effect:



The bracket of those three cameras needs to allowed pan ajustement and tilt ajustement.

The specifications of this bullet camera are:

Lenght: 60mm

Diameter: 20mm

Weight: 120G



Please consider that one of those bullet camera will be replaced by the P.O.V caméra before the race of SPA .

Antennas

Two antennas are used: one to transmit the digital signal (active antenna) and the other to receive data from the OB van.

5.1 Active antenna

As it transmits the digital signal ground-to-ground, its position on the car is crucial. It has to be visible to the reception antennas.

This means that it must be fixed on the outside of the car, in a horizontal position in the highest and least obstructed place.

It must be mounted on the top off the roof.

It also requires a ground plane for operation.

Frequency: between 2.2 and 2.7 GHz

Power: + 19 dBm max

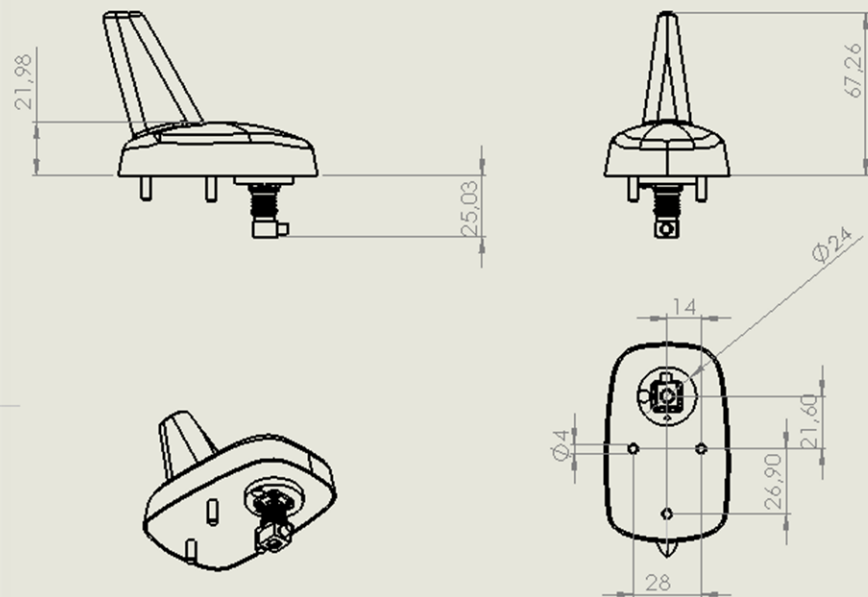
Size (LxWxH): 85x54x77

Weight: 102g

This antenna needs 4 holes, 1 for the cable, 3 for the screws.

If a cover is created to integrate the antenna into the aerodynamics of the car, this cover must be of fiberglass or plastic and not of carbon-fibre or metal.





SAUF INDICATION CONTRAIRE:
 LES COISSONS EN MILLIMETRES
 ETAL DE SERVICE
 TOLERANCES:
 LINEAIRES:
 ANGULAIRES:

FINITION:

CASER LES
 ANCIENS VPS

NE PAS CHANGER TITRE

REVISION

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APPR.					
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ANALYSEUR:

TITRE:

NO. DE PLAN

CarAntenna+plug A4

DATE:

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SCALE:

Antennas



5.2 UHF antenna

As it receives the data signal transmitted by the OB van, it has to be fixed on the outside of the car. The antenna requires a ground plane so that it remains within the following dimensions:

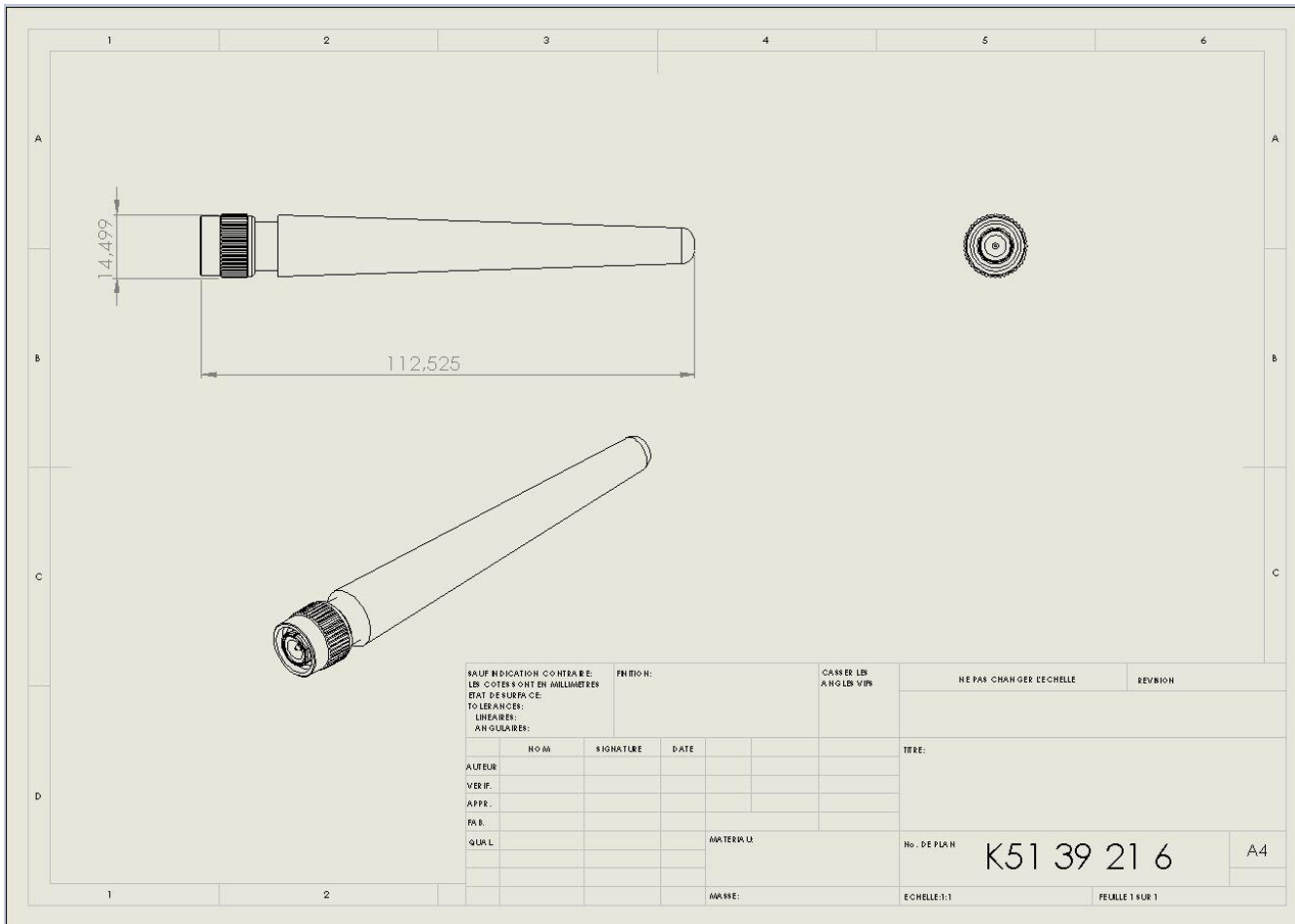
Frequency: between 146 and 174 MHz in reception mode (not in transmission mode)

Size (LxW): 110x15

Weight: 70g

This antenna needs 1 hole with 11mm diameter





SAUF INDICATION CONTRAIRE: LES COTES SONT EN MILLIMETRES ETAT DE SURFACE: TOUS FINICES: LINEAIRES: ANGULAIRES:		FINITION:		CASER LES ANGLES VIVS		NE PAS CHANGER L'ECHELLE		REVISION	
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				MARQUE:		ECHELLE:1:1		FEUILLE 1 SUR 1	

Total weight



The total weight of our system is estimated at 2,7kg.

This includes:

- One TS2
- One transmitter
- Three bullet cameras
- One microphone
- One active antenna
- One data antenna
- A batch of 2M cables (antennas and cameras)

Contacts



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