

## INTRODUCTION

ALBA is a 3 GeV, 400 mA, 3rd generation Synchrotron Light Source

The RF System provides up to 3.6 MV of accelerating voltage and restore up to 540 kW of power to the electron beam.

Six RF plants, working at 500 MHz, are installed.

The RF plants include several new developments:

### 1) DAMPY cavity

The normal conducting HOM damped cavity developed by BESSY and based in the EU design.

### 2) CaCo & CoStub

A cavity combiner to add the power of two 80 kW IOT's.

### 3) WATRAX

A waveguide transition to coaxial, specially designed to feed the DAMPY cavities due to the geometrical and cooling constrains.

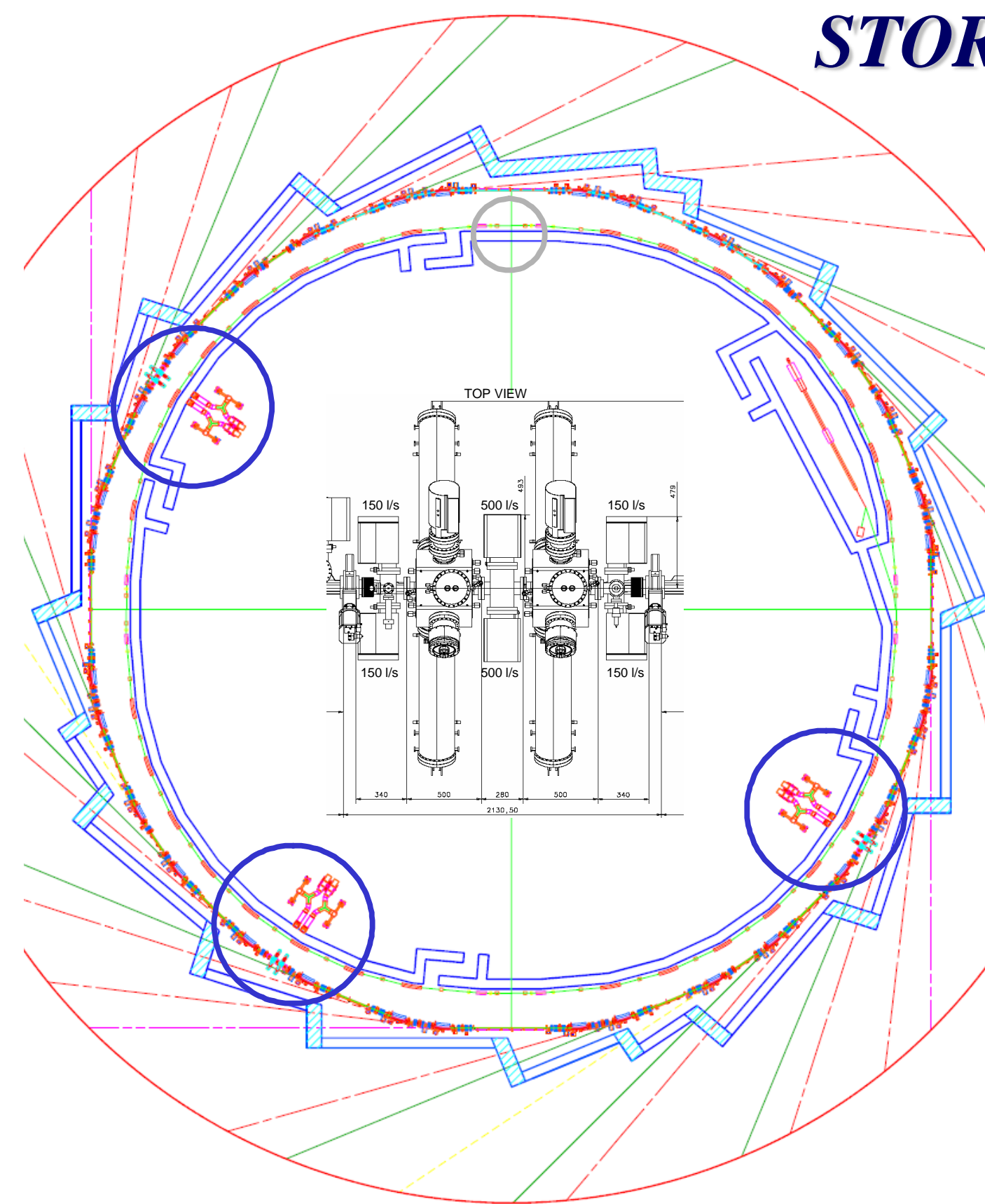
### 4) Digital LLRF

Customized for the ALBA accelerator.

### 5) Transmitters

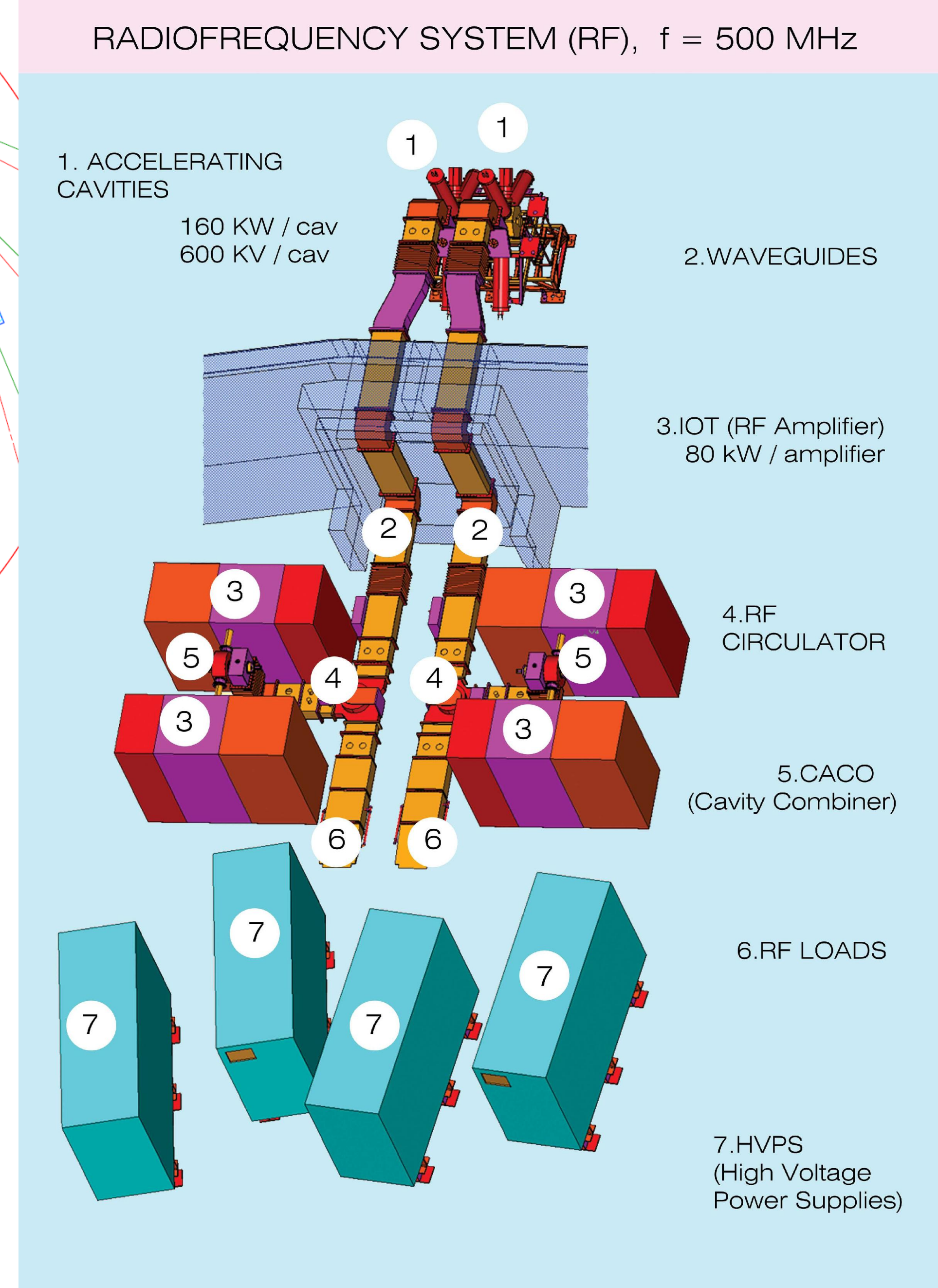
A total of 14 IOT based transmitters providing 80kW each one.

## STORAGE RING RF SYSTEM



RF Voltage	3600	kV
Beam current	400	mA
Losses (inc. ID's)	1300	keV/turn
Beam power	520	kW

TRANSMITTER		
Tube type	IOT	
Number	6 x 2 IOT's	
Power	2 x 80 kW	
Combination	CaCo	



## DAMPY

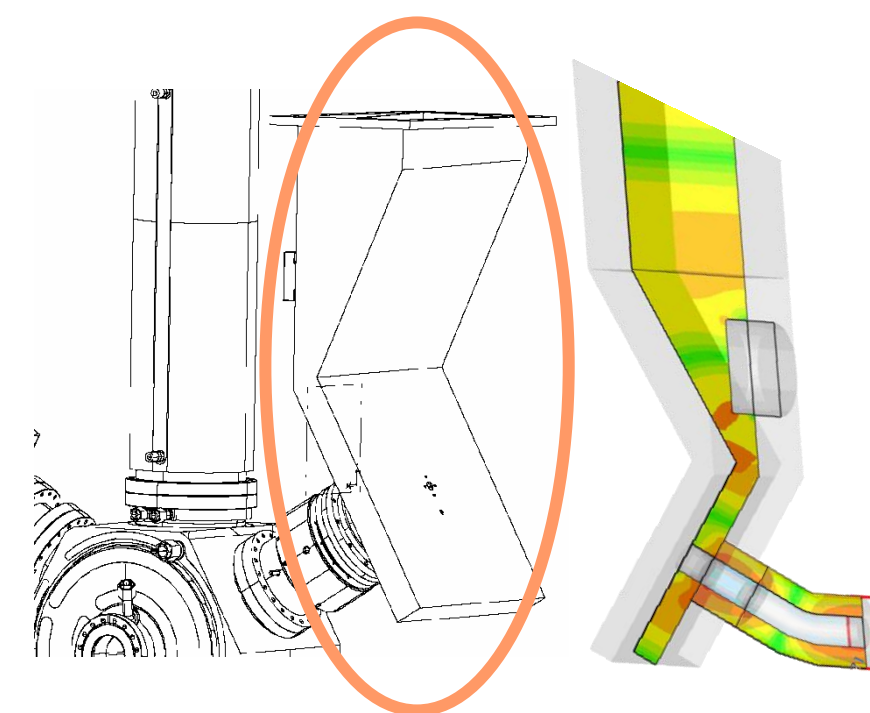
6 RF cavities delivering each one 600kV (90kW) to the electron beam.



Type	Single-cell	
HOM damped:		
Longitudinal	< 2	MΩ.MHz
Transverse	< 60	kΩ/m
Number	6	
Frequency	500	MHz
R <sub>shunt</sub>	3.3	MΩ
Max. Voltage	> 700	kV
Input power	> 150	kW
Cooling capacity	> 80	kW

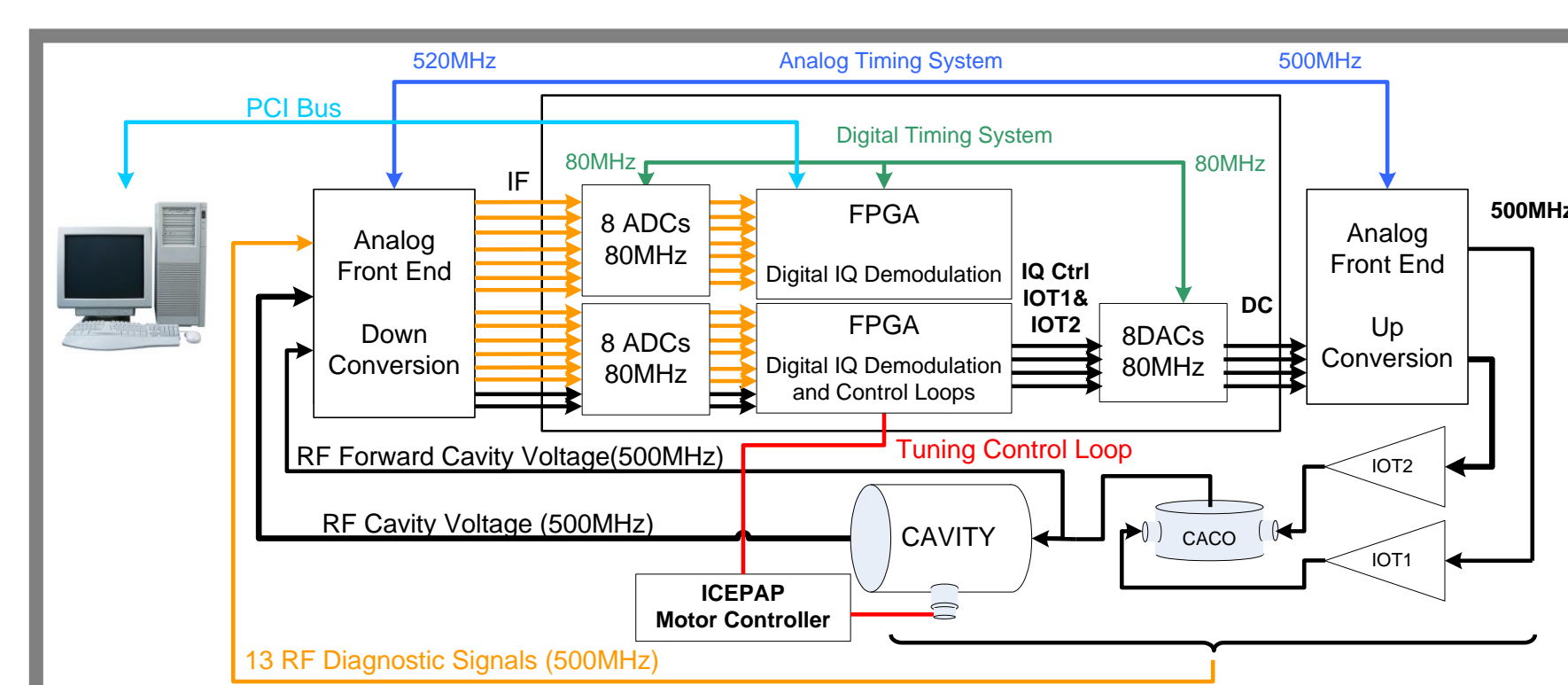
## WATRAX

Waveguide to coaxial transition for the DAMPY cavities



Maximum CW power	150	kW
VSWR	1.02	
Max. peak electric field	265	kV/m
Power dissipated	132	W

## Digital LLRF



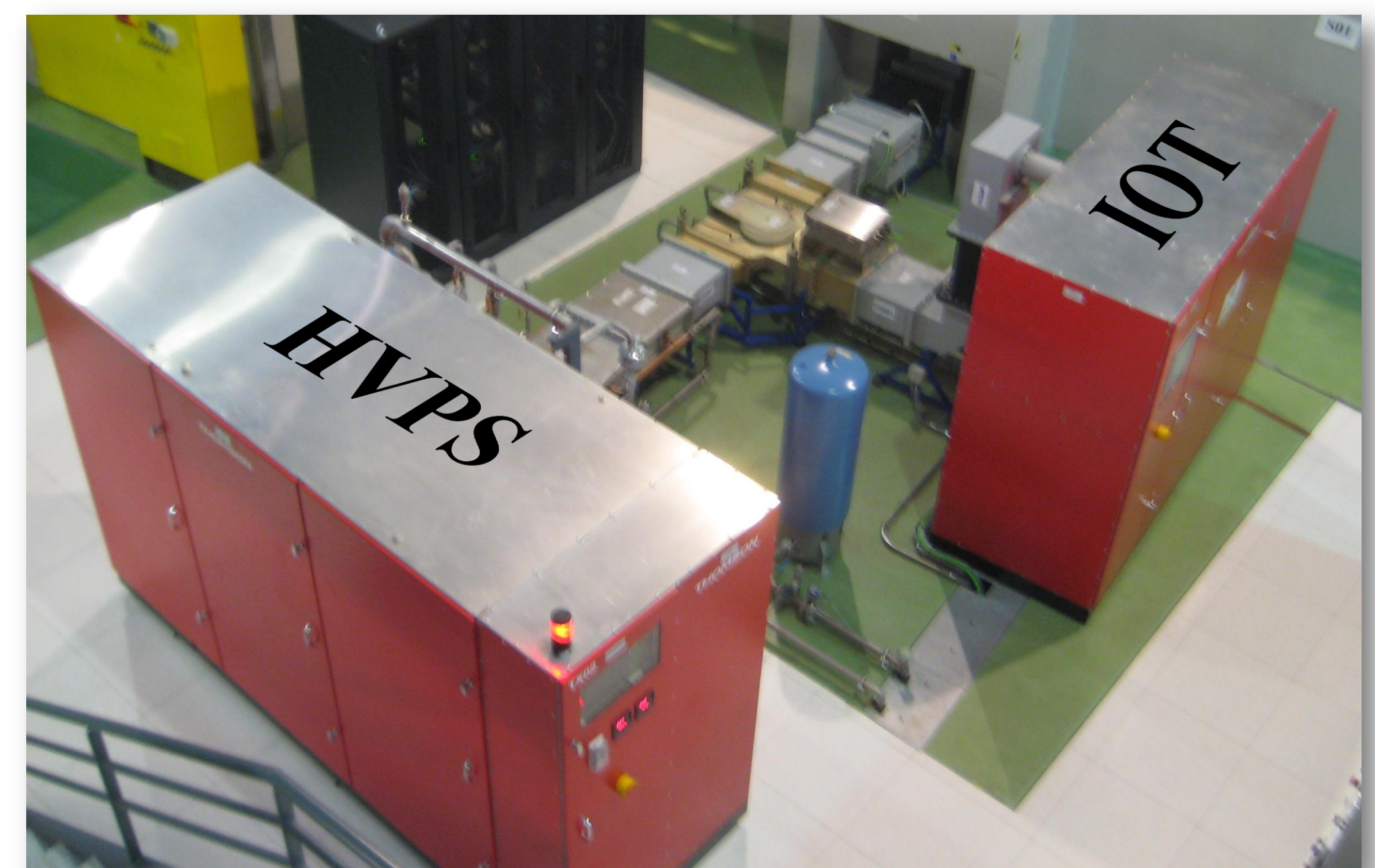
Based on downconversion and digital IQ modulation-demodulation technique. Implemented using commercial components.

Amplitude stability [rms]	< 0.1	%
Phase stability [rms]	< 0.1	°
Bandwidth [PID dependent]	1 - 100	kHz
Dynamic range [inside specs]	~ 23	dB

## IOT amplifiers

A total of 14 IOT based transmitters are used in ALBA:

- 1 for the booster accelerator
- 12 for the storage ring
- 1 for the high power RF test laboratory



The HVPS provides up to -38kV 4A to the IOT. It uses 60 switching modules, up to 3 can fail at the same time without affecting operation.

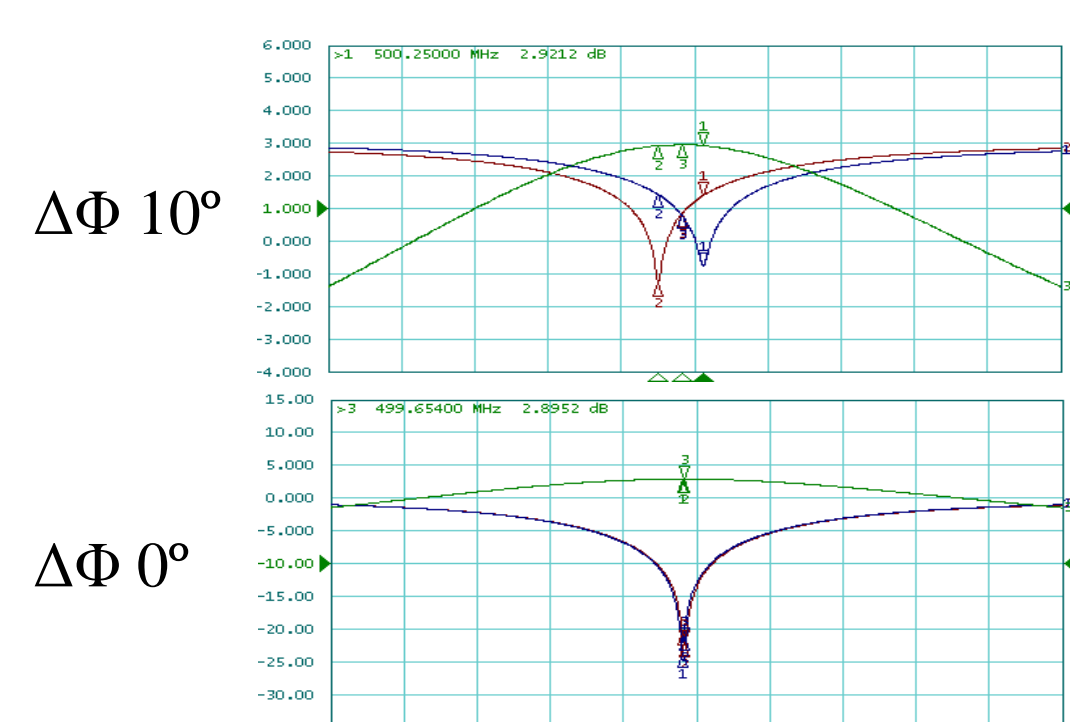


IOT's are the main component of the transmitter. They provide 80kW of RF power in CW with a maximum efficiency of 70%.

A solid state preamplifier transforms the 2 mW output signal of the DLLRF in up to 500W, which are needed to drive the IOT to its full power.

## CaCo & CoStub

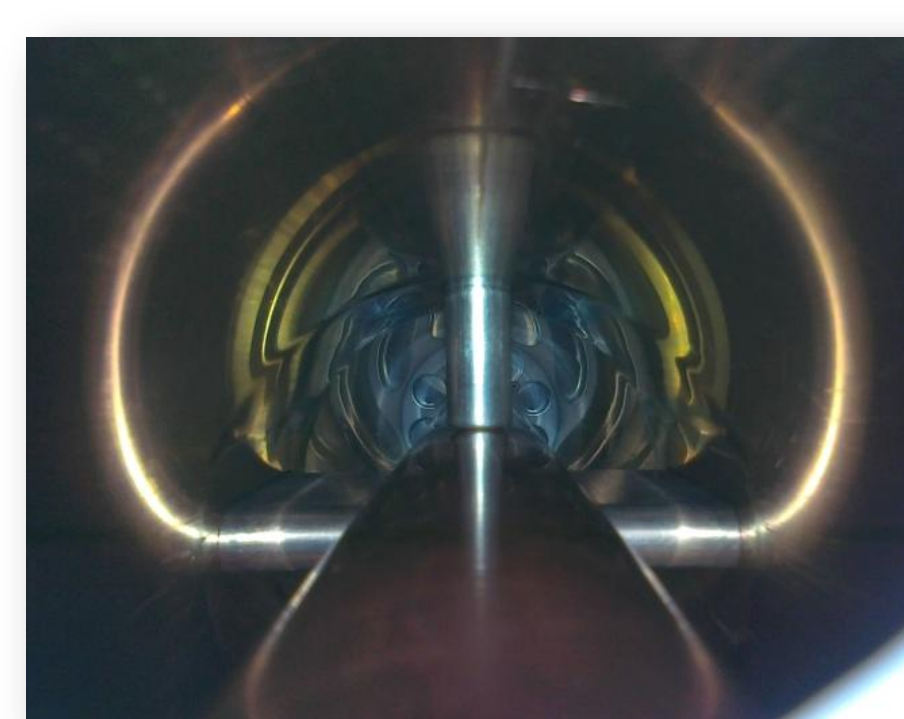
CaCo combines the power of two 80kW amplifier.



Phase and amplitude coming from both amplifiers must be identical to minimize VSWR.



CoStub replaces the coaxial between CaCo and the IOT's and allows to short-circuit the waveguide when working only with one IOT.



## Control system

The control and supervision system checks all the operation parameters of all the components of the RF plant and cuts power instantly in case of malfunction.

