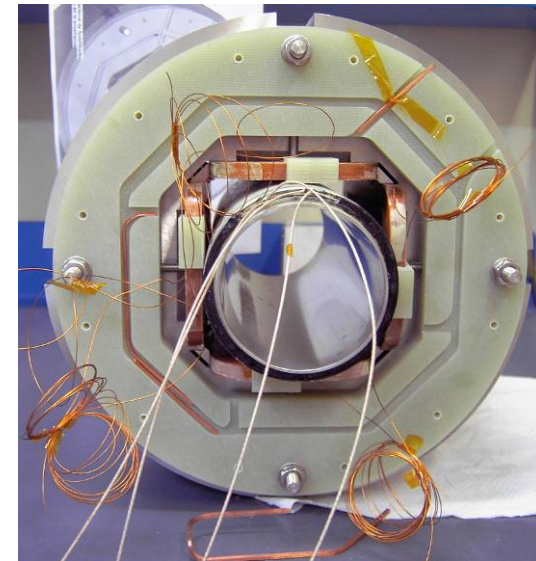
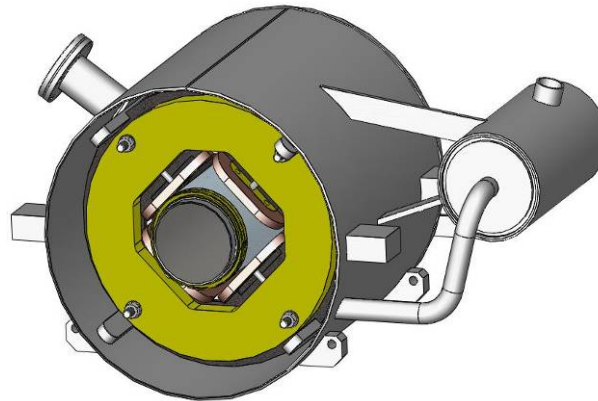
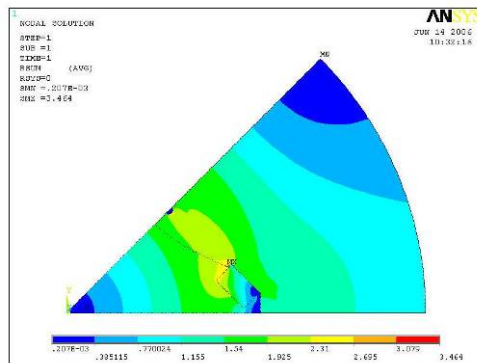
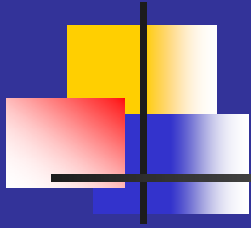


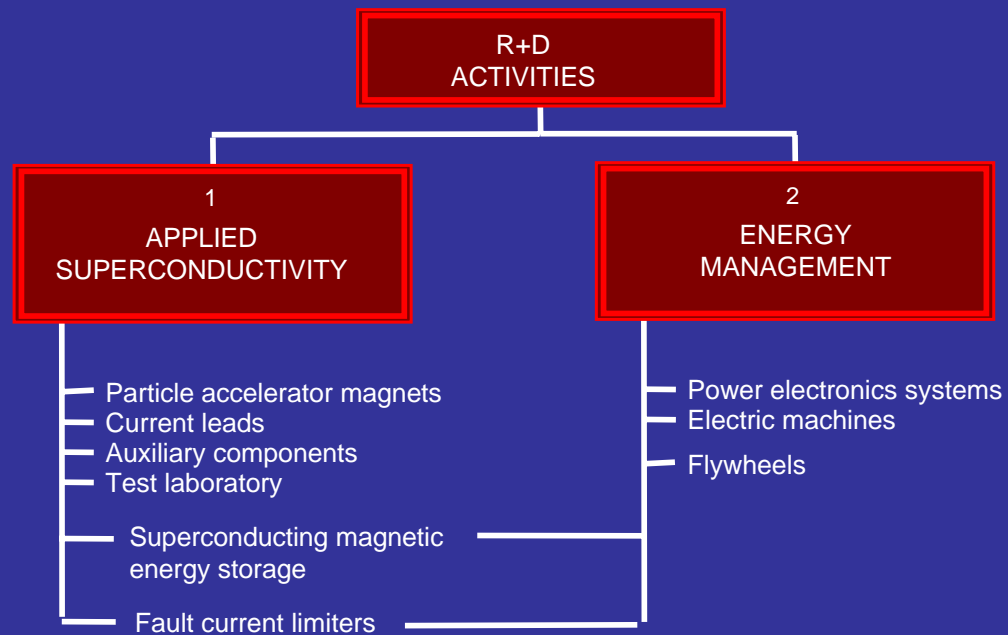
Review of CIEMAT contributions to linear accelerators





CIEMAT activities

To develop know-how, techniques and applications of superconductivity and electric power systems.



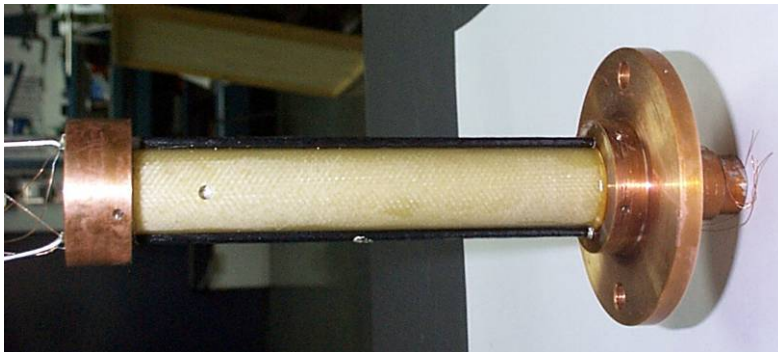


CIEMAT capabilities

- Calculations:
 - Electromagnetic analysis (both low and high frequencies).
 - Mechanical analysis.
 - Quench simulation (superconducting devices).
- Prototyping:
 - Design and manufacturing of tooling.
 - Manufacturing and assembly of electromechanical devices.
- Tests:
 - Two cryostats for liquid helium.
 - One GM cryocooler (down to 10 K).
 - Pit to test high-speed flywheels.

TESLA500 contribution (1/2)

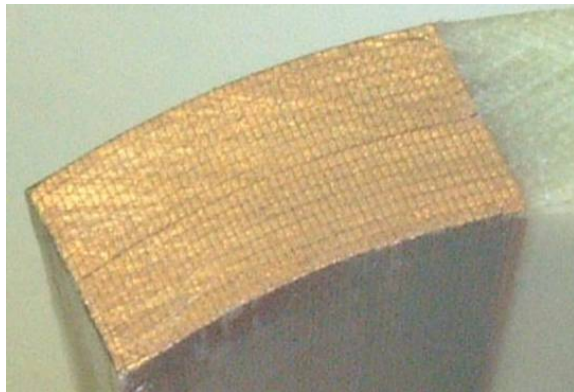
- Design and cost estimation of the **superconducting magnet package** for the TESLA 500 Technical Design Report (2000).
- Design and fabrication of a pair of **100 A HTS current leads** (2001).
- Design and fabrication of a **machine to glue ribbons of superconducting wires** (2001): thickness accuracy better than 5 microns for a 130 m long ribbon of 8 wires (0.46 mm x 0.69 mm).



TESLA500 contribution (2/2)

- Calculation and detailed design of a combined superconducting prototype magnet for TESLA500: a quadrupole and two dipoles. (2002-04)

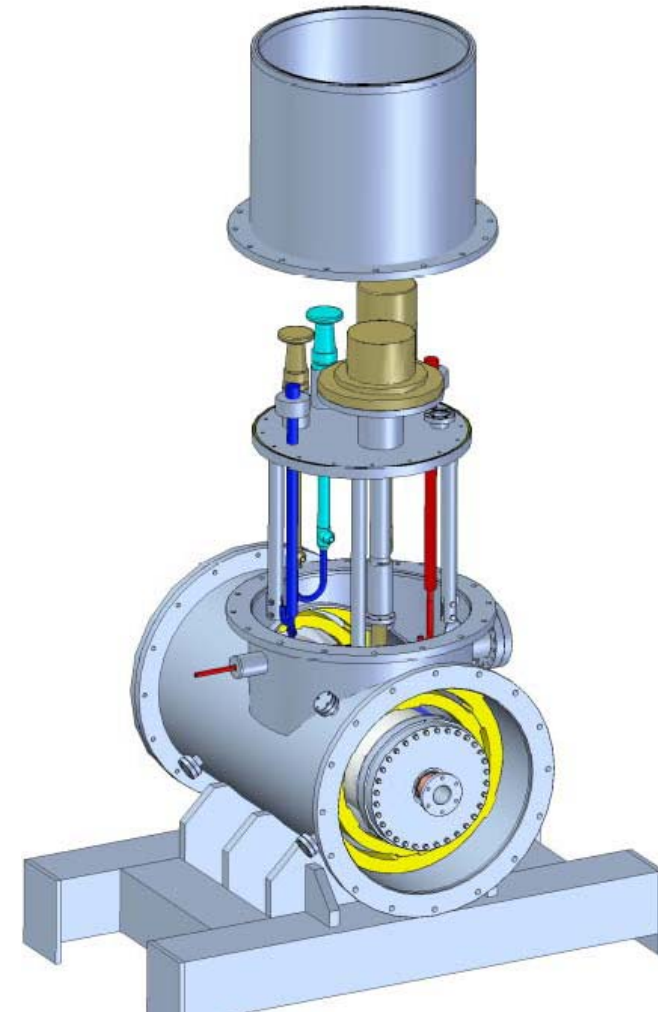
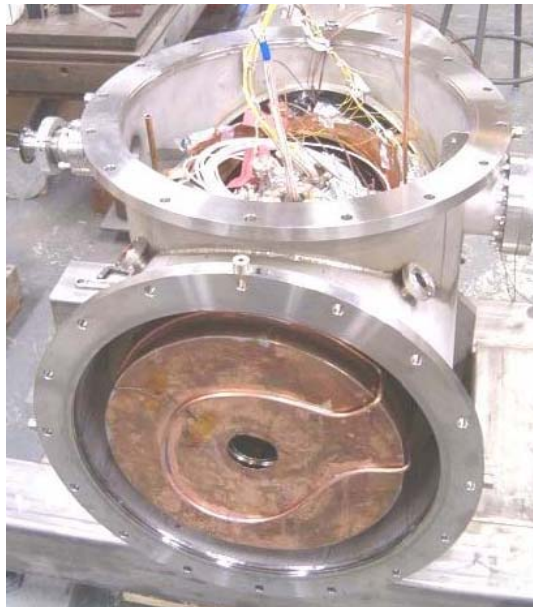
Parameter	Quadrupole	Inner dipole	Outer dipole	Units
Nominal current	100	40	40	A
Bore diameter	90	114.56	118.02	mm
Number of turns	50x16	111x1	114x1	
Bare wire	0.42x0.63	0.42x0.63	0.42x0.63	mm
Insulated wire	0.46x0.69	0.46x0.69	0.46x0.69	mm
Cu/Sc ratio	1.84	1.84	1.84	
Main field	60	0.140	0.144	T/m - T
Magnetic length	588	588	588	mm
First multipole**	0.4348	-0.23	1.34	unit
Second multipole**	35.845	-146.32	-143.42	unit
Third multipole**	1.056	--	--	unit
2-D peak field	3.20	0.160	0.175	T
3-D peak field	3.62	--	--	T
Working point@2K	49.5	15.5*	14.8*	%
Self inductance	2.35	0.0332	0.0364	H



ILC contribution

The TESLA500 prototype magnet will be tested in SLAC (Winter '06) to carefully measure:

- The stability of the magnetic axis (should be better than 5 microns according to ILC requirements).
- The field quality at low currents (persistent currents effect).

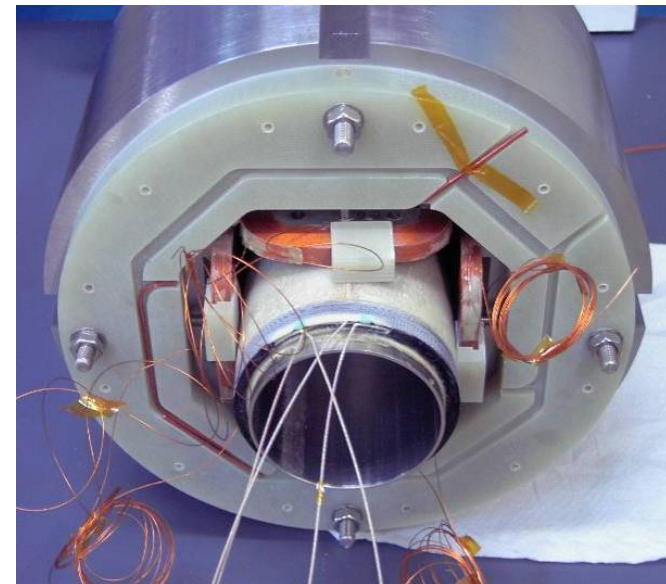
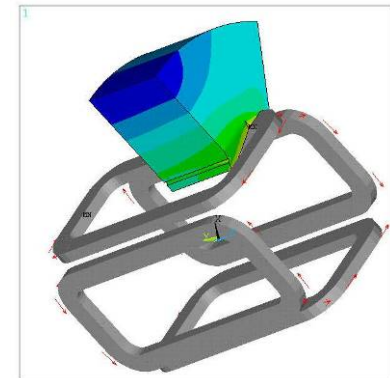


Courtesy C. Adolphsen, SLAC

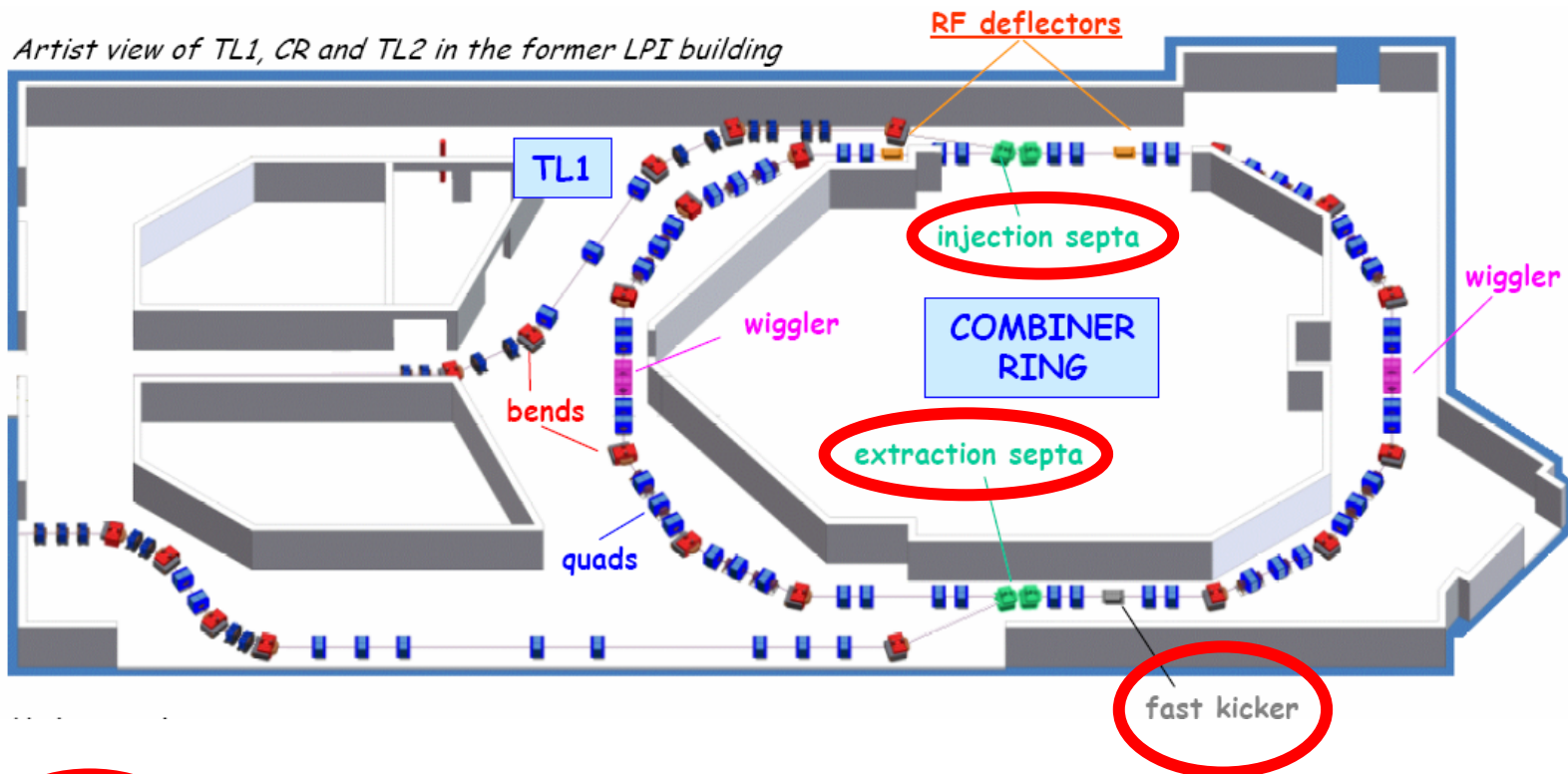
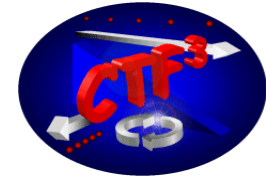
XFEL contribution

- Calculation and design of a combined superferric magnet (2005).
- Fabrication of four prototypes (starting in 2006).

COIL	QUAD	INNER DIPOLE	OUTER DIPOLE	
Winding type	Superferric	COS- θ	COS- θ	
Coil inner diameter	94.4	83.6	88.5	mm
Nominal current	50	50	50	A
Nominal gradient	35	0.04	0.04	T/m
Magnetic length	169.6	203.7	205	mm
Number of turns	646 (34x19)	36	37	
Wire diameter (bare/insulated)	0.4/0.438	0.7/1.03		mm
Copper to superconductor ratio	1.35	1.8		
RRR	>70	<100		
Filament diameter	35	<20		micron
Twist pitch	50	~25		mm
Iron yoke length	145	140		mm
Coil length	200.6	230	230	mm
Stored magnetic energy at 50A	1462			J
Self inductance at 50A	1.17	0.96e-3	1.07e-3	H
Integrated strength at 50A	5.976	0.00815	0.00820	T--Tm
Integrated b6 at 50A	1.87			units
Integrated b10 at 50A	-2.75			units
Coil peak field	2.47	~1.5	~1.6	T
Working point on load line 4.2K	45			%
Saturation at 50 A (integrated)	3.9	9.0	10.1	%



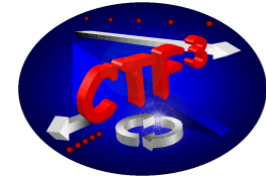
CTF3 contribution (1/4)



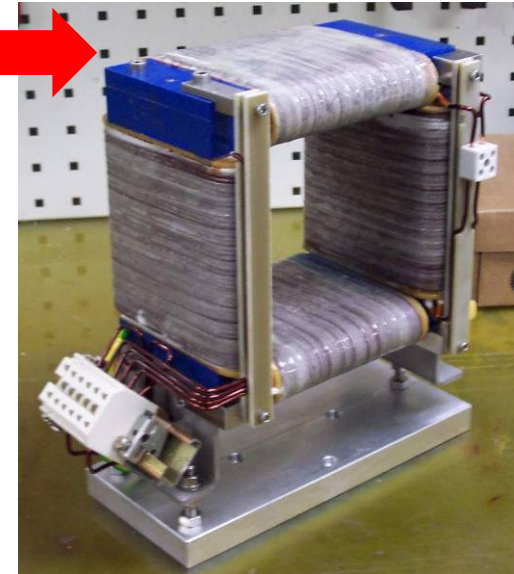
 = Spanish contribution

TBL quads, kicker pulser and H/V dipole correctors not shown in the graph

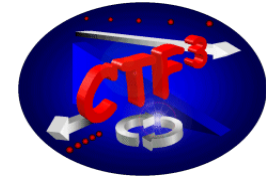
CTF3 contribution (2/4)



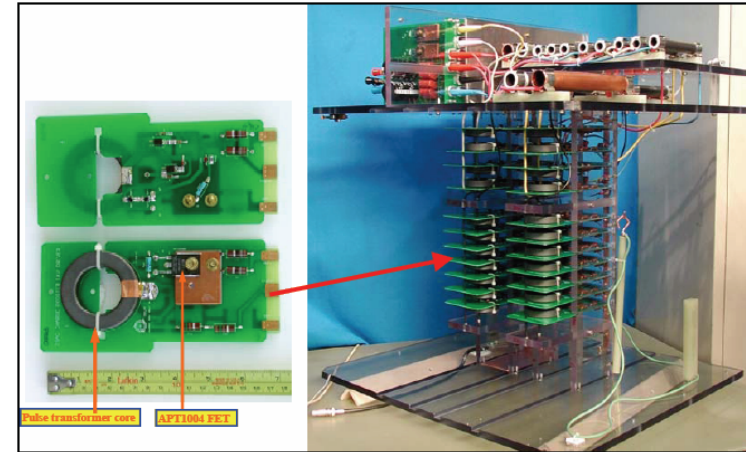
- 33 orbit corrector magnets (delivered April'06).
- 2 thin and 2 thick septa magnets for the combiner ring (delivered July'06).



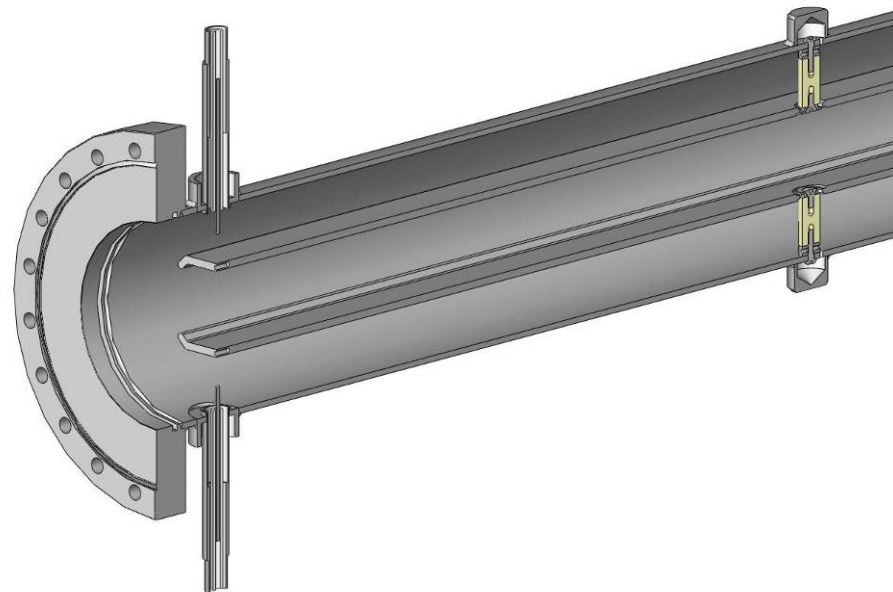
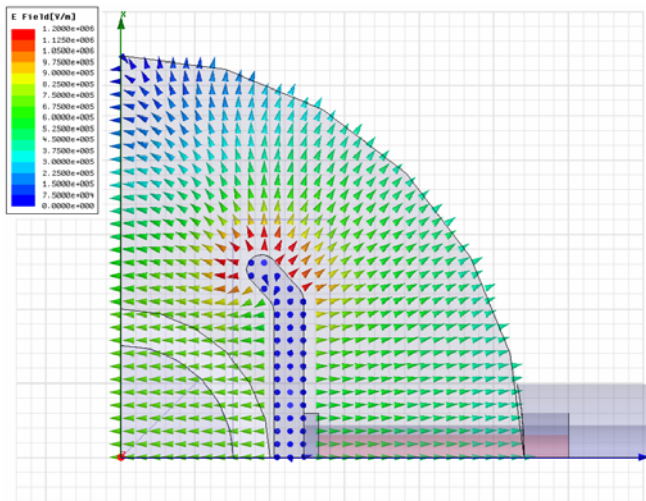
CTF3 contribution (3/4)



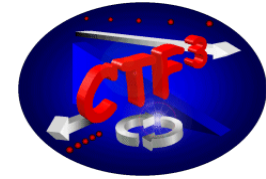
- Design and fabrication of the interlock system for the septa magnets (autumn'06).
- Design and fabrication of a stripline kicker magnet for the combiner ring (in collaboration with INFN-Frascati).
- Design and fabrication of a HV pulser for the kicker.



Courtesy M. Barnes, TRIUMPH



CTF3 contribution (4/4)



- Design and fabrication of the TBL quads.
- Design of RF components.
- Design and fabrication of some PETS prototypes.

