

Universidad de Oviedo

Electrical Engineering Department

Power Supply Systems

(Grupo de Sistemas Electrónicos de Alimentación,
Área de Tecnología Electrónica)



Manpower & facilities

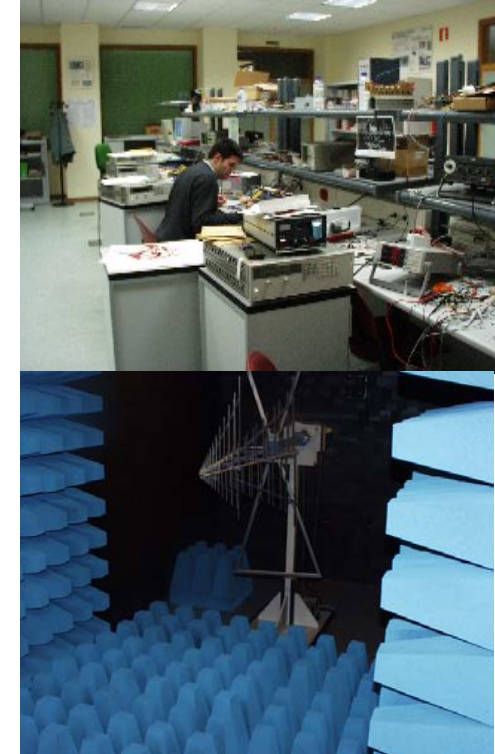
*Power Supply
Systems*

Manpower:

- ***Javier Sebastián, Full professor***
- ***Marta Hernando, Associate professor***
- ***Arturo Fernández, Associate professor***
- ***Diego González, Assistant Professor (PhD)***
- ***Manuel Arias, Assistant Professor (PhD, 15/02/2010)***
- ***Miguel Rodríguez, Researcher***
- ***Alberto Rodríguez, Researcher***
- ***Pablo Fernández, Researcher***
- ***Aitor Vázquez, Researcher***

Facilities:

- ***3 Research labs***
- ***1 Lab for PCB manufacturing***
- ***1 Anechoic chamber***





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Achievements (1982-2009)

- ✓ **55 projects and contracts with companies**
- ✓ **42 papers in international journals (*mainly IEEE Transactions*)**
- ✓ **35 papers in national journals**
- ✓ **195 papers in international conferences (*mainly IEEE conferences*)**
- ✓ **45 papers in national conferences**
- ✓ **15 PhDs (thesis)**
- ✓ **3 patents (*two of them international*)**

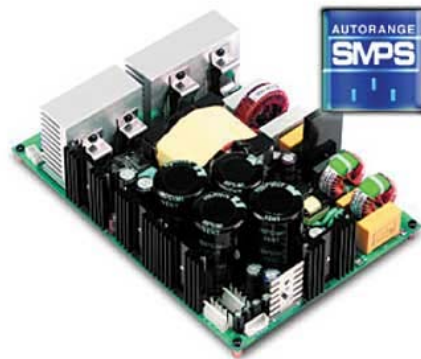


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Main partners in projects

International:

- Alcatel
- Chloride Power Protection
- Philips
- Oldham France
- General Electric CGR
- AVX (Kyocera)
- Behringer
- Ferroperm
- SISC



National:

- INISEL (Indra)
- CESELISA
- SUINSA
- AMV
- ACORDE
- Orona





Topics in projects (I)

▪ Converters for avionics and microwave amplifiers

Projects:

- *ALCOTÁN*, for *INISEL*, with *UPM* 1987-1988
- *RESONANTES* (Spanish Gov.), with *UPM* 1987-1989
- *FARPA* (Reg. Gov.), for *ELMA*, 1989-1990
- *MODEBUS* , for *CESELSA*, with *UPM*, 1989
- *FAMUS*, for *INISEL*, with *UPM* 1989-1990
- *CIBELES*, for *INISEL*, with *UPM* 1989-1991

▪ Converters for X-ray generation

Projects:

- *ESAFAX*, for *General Electric CGR*, with *UPM* 1990-1992
- *DCFAT*, for *SUINSA* 1999-2000
- *COTALVA* (Sp. Gov.), for *SUINSA* 1999-2001



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Topics in projects (II)

▪ Converters for telephone exchanges

Projects:

- *SADAD*, for *Alcatel*, with *UPM* 1989-1991
- *SACO*, for *Alcatel*, 1996
- *ALTERDIS I & ALTERDIS II (Sp. Gov.)*, for *Alcatel*, 1996-1998
- *HIPO*, for *Alcatel*, 1997-1998
- *MICE (Sp. Gov.)*, for *Alcatel*, 1997-1999
- *ESNUP & ESNUP II*, for *Alcatel*, 1999-2000
- *NUAL*, for *Alcatel*, 2001
- *RA2 (Sp. Gov.)*, for *Alcatel* and *TANDEM SCC*, 2001-2000
- *DESSICA*, (Sp. Gov.) , for *Alcatel*, with *CNM* 2001-2004
- *NINYAR (Sp. Gov.)*, for *Alcatel*, 2001-2004
- *RECOR*, for *Alcatel*, 2002



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Topics in projects (III)

▪ High density DC/DC converters for mobile terminals

Projects:

- *SADAD*, for *Alcatel*, with *UPM*, 1989-1991
- *MAGIC*, for *Alcatel* and *Philips*, with *IMA* and *UPM*, 1995-1996
- *IMPASS (Esprit 23910)*, for *Alcatel*, with *AVX*, 1997-1999
- *TRAMST (Esprit 25644)*, for *Alcatel*, with *Ferroperm* and *UPM*, 1997-1999
- *FABA*, for *AMV*, 1999
- *Nebula*, for *SISC*, with *UPM*, 2009-2010

▪ Uninterruptible Power Supplies (UPS)

Projects:

- *PCUPS (Reg. Gov.)*, for *Chloride*, 1999-2001
- *DESI (Sp. Gov.)*, for *Chloride*, 1999-2001
- *EMITEST*, for *Chloride*, 2002
- *PCUPS2 (Reg. Gov.)*, for *Chloride*, 2002-2003
- *ACURA (Reg. Gov.)*, for *Chloride*, 2005-2006
- *OPERA (Reg. Gov.)*, for *Chloride*, 2007-2008



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Topics in projects (IV)

▪ Other converters

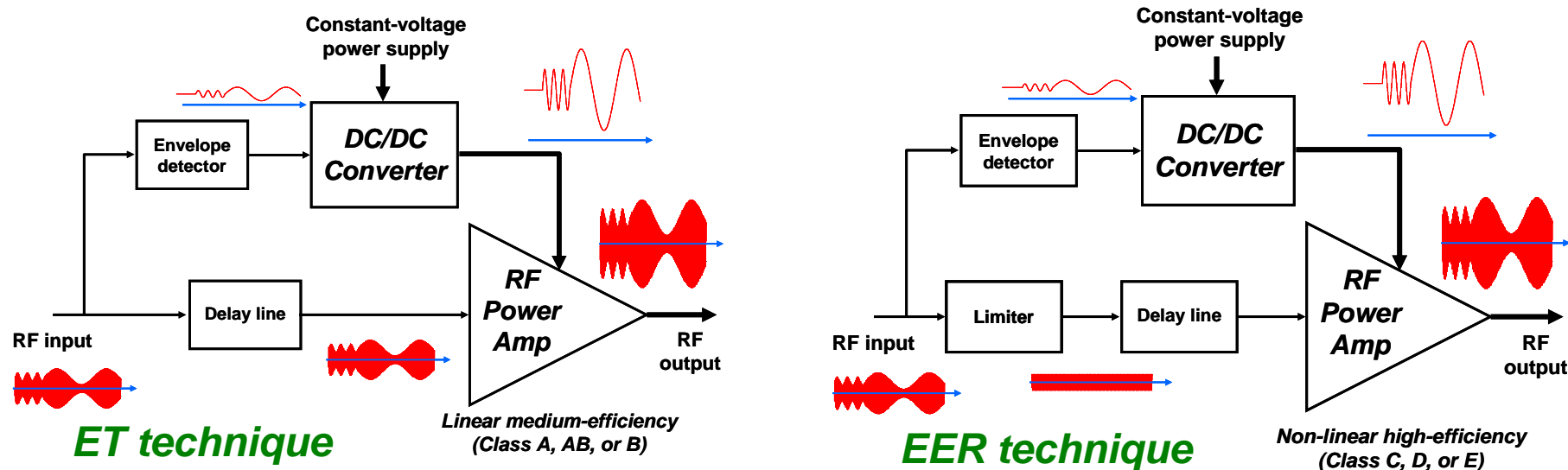
Projects:

- **CABALC**, for **OLDHAM FRANCE**, 1998-1999
- **SOLÍN**, for **Alcatel**, 2003
- **BEHRINGER 1**, for **Behringer**, 1998-1999
- **CRESA (Sp. Gov.)**, 2003-2005
- **FATS**, for **Acorde**, 2004
- **MINIEMI (Sp. Gov.)**, 2005-2007
- **SMOD (Sp. Gov.)**, 2007-2010
- **NETOLIFT (Sp. Gov.-Cenit)**, for **Orona**, 2007-2010
- **MULTIPUF (Reg. Gov.)**, 2009-2010
- **RUE (Sp. Gov.-Consolider-Ingenio)**, 2009-2014



Current Topics (I)

DC/DC converters to modulate the voltage supply of RF power amplifiers



Features:

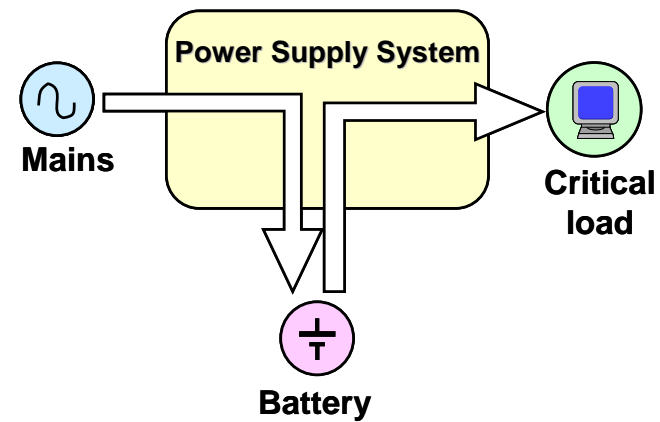
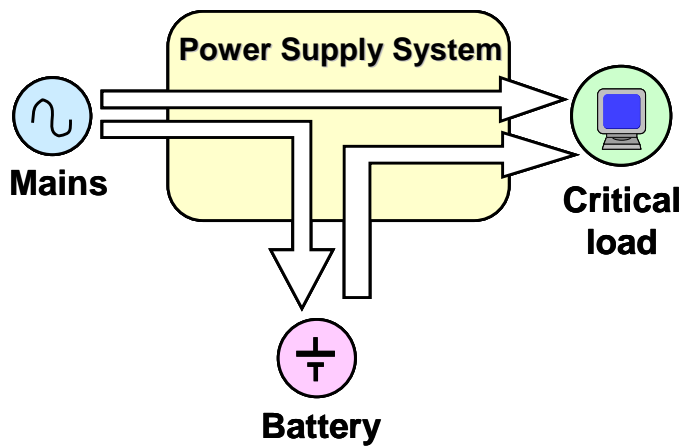
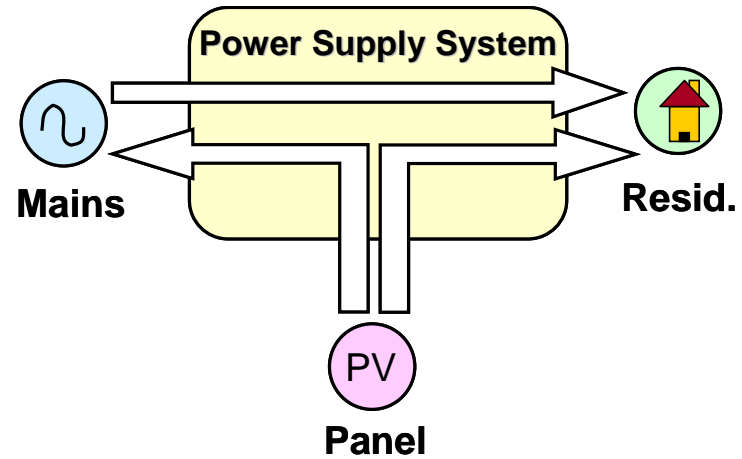
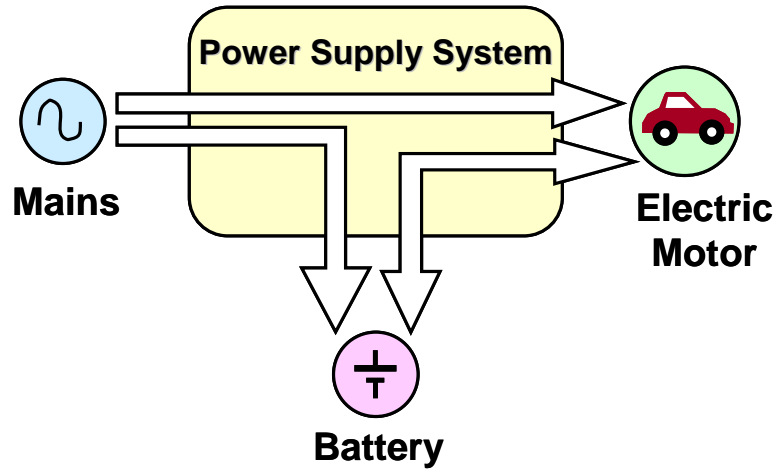
- Variable voltage supply values: $V_{CC} = 12-48 \text{ V}$
- Extremely fast variations: $1-10 \text{ V}/\mu\text{s}$ with Si devices, $100-1000 \text{ V}/\mu\text{s}$ with GaN devices
- High switching frequency: $0.5-5 \text{ MHz}$ with Si devices and $20-100 \text{ MHz}$ with GaN
- Output power in the range of $10-200 \text{ W}$



Current Topics (II)

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Multiple-port, power supply systems (examples)

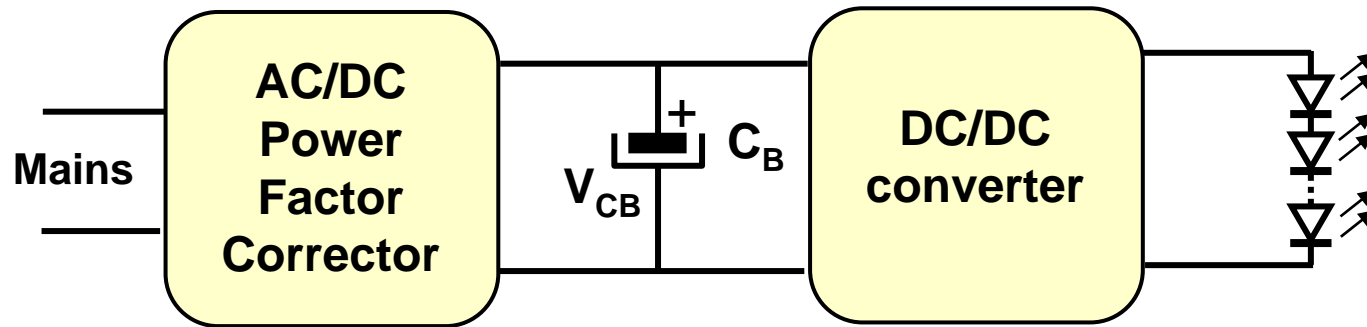




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Current Topics (III)

AC/DC converters for LEDs



Features:

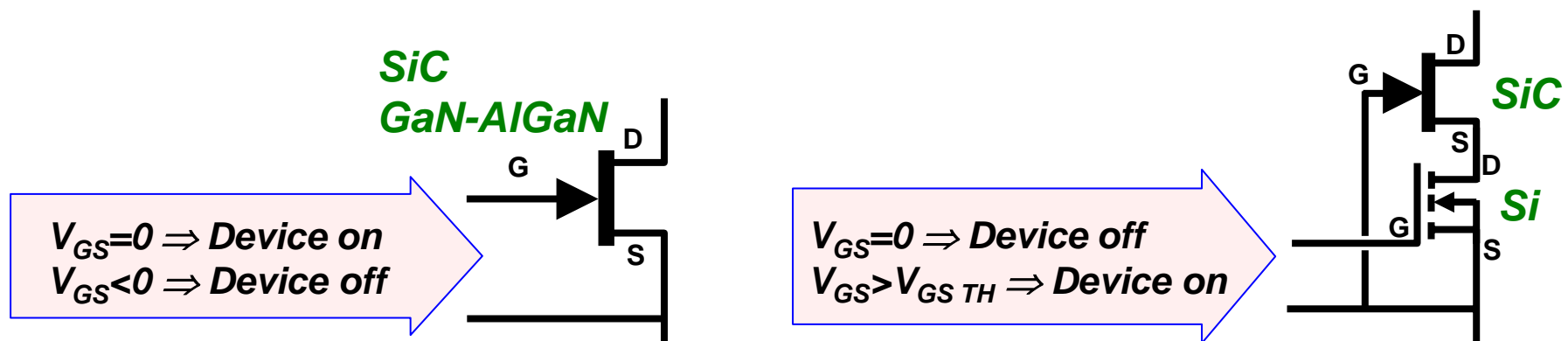
- High efficiency (94%)
- Output power in the range of 20-200 W
- Long MTBF
- Low-cost



Current Topics (IV)

Converters using SiC or/and GaN power devices RUE Project (Consolider-Ingenio)

- SiC Schottky diodes (almost no recovery time)
- SiC JFETs (normally-on devices)
- SiC-Si cascodes (normally-off devices)
- GaN-AlGaN HEMTs (High Electron Mobility Transistors) which also are normally-on devices.





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Current Topics (V)

Traditional (life) topics

- **Modelling of DC/DC converters**
- **DC/DC converters with synchronous rectification**
- **Modelling of Single-Phase Power Factor Correctors**
- **Integrated (single-stage) Single-Phase Power Factor Correctors**
- **Low-cost control of Single-Phase Power Factor Correctors**
- **Improvements in Uninterruptible Power Supplies (UPSs)**
- **EMI measurement in power converters**
- **Modelling of switching power losses in MOSFETS operating in power converters**