1st Barcelona Forum on Ph.D. research in EE venue

Jordi Aubert, FICOSA
Our business: **Global Automotive Supplier**
- 2007 Turnover: **€ 877 M**
- 2007 Team: **7,172 people worldwide**
- We are present in **19 different countries (Europe, North America, South America, Asia)**
- Headquarters in **Barcelona (Spain)**
- **Our R & D investments represent the 4% of our total Group’s sales (606 patents).**
Current Business

- Windshield washers
- Headlamp washers
- Parking brakes
- Shifters
- Cables
- Antennas systems and smart communication modules
- External and internal rear-view mirrors
- ADAS
- Locks, handles
- Door & seat release sys.
- Seat comfort sys.

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Component / System Concept

80% of all automotive functions are controlled by Electronics
Example: Hot Washer system

**Function:**
Windshield liquid reservoir + expulsion valve

Weight: 200g

**Function:**
Windshield liquid reservoir + heater + expulsion valve + timed activation & monitoring

Weight: 500g
Example: Exterior Mirror

1980
- Mirror
- Manual folding
- Mechanical mirror adjustment

2008
- Mirror
- Heater
- Electrical adjustment with memory
- Power folding
- Courtesy Lamp
- Blinker
- Side Position Lamp
- Temperature Probe
- Blind Spot Detector
- Multi-service Antenna
- Electro-chromatic glass
- Multiplexing electronics
- ...

A single mirror must be treated as a Complex System.
Integration effort surpasses the development cost of 1980 Mirrors.
Example: Electronic Parking Brake

- Manual activation
- Around 9 parts: 8 mechanical, 1 electrical
- Simple vehicle interface
- Emergency braking depends on driver expertise
- Direct feedback of applied force
- Dynamics of the system are irrelevant

- Automated activation
- Around 25 mechanical parts, 500 electronic components and 40,000 lines of code
- Complex and multi-modal vehicle interface (15+ vehicle signals processed)
- Optimized and controlled emergency braking
- No haptic feedback to the driver
- Dynamic behavior is a key element

From working system to safe working system, there is a 40% overhead in components and lines of code. Safety of operation offers huge opportunities of integration.
FICOSA Technology Division
DIVISIÓN DE INNOVACIÓN

Desarrollo Electrónico

Advanced Communications

ADASENS

P10

Research 1 (Night Vision)

Research 2

Planificación de Producto

Propiedad Intelectual
Fusión de tecnologías ADAS

- Lane Departure Warning (LDW)
- Lane Keeping Support (LKS)
- High Beam Assistant (HBA)
- Traffic Sign Recognition (TSR)
- Detector de Túnel
- Detector de peatones
- Detector de paso de peatones

- Blind Spot Detector (BSD) (10 m)
- Ayuda al cambio de carril (LCA) (30 m)
- Ayuda al cambio de carril (50-70 m)

- Visión nocturna pasiva (Far IR)
- Visión nocturna activa (Near IR)
- Adaptive Cruise Control (ACC) (150 m)
- Stop & Go (70 m)
- Frontal Pre-crash

- Cámara Parking
- Rear Pre-crash
- Detector de Intersección

- Traffic Sign Recognition (TSR)
- Detector de peatones
- Detector de paso de peatones

- Vision
- Infrarrojo (IR)
- RADAR
- LIDAR
ADVANCED COMMUNICATIONS

INTEGRATED ANTENNAS IN VEHICLES
Integrated antenna and RF systems into car plastic body parts for broadcasting bands.

TELEMATIC PRODUCTS
Smart and compact communication modules to satisfy the demand of telematic services in the vehicles.

ANTENNAS FOR NAVIGATION AND SHORT RANGE
Integrated Antennas for PND and Antennas for Short Range Applications in vehicle.

AERONAUTIC AND SECURITY ANTENNA SOLUTIONS
Antennas for communication, navigation and identification applications in the world of aeronautics and security applications.
Antennas Solutions for Integration

Configuration (example)

Left rear-view mirror
- AM/FM 1
- GPS
- TV 1

Right rear-view mirror
- FM2
- DAB
- TV 2
in-Vehicle Telematic Unit (iVTU)

The iVTU is a compact and cost effective telematic solution to enable security and safety services in the vehicle. The iVTU is designed to minimize the installation costs and maximize system robustness in case of accident and external manipulation.

Main characteristics and benefits:

- Enabled by current technology and capable to integrate new ones to support future telematic services
- Cost effective and compact electronic design
- Optimal design and performance of integrated antennas
- Easy installation, only one connector to the vehicle
- System robustness in case of accident and external manipulation thanks to integrated antennas in the same module
- Current products:
  - iVTU 2.0 for Emergency Services
  - iVTU 2.1 for Anti-Theft Services