The current document includes a corporative presentation of Sistemas Radiantes F. Moyano, and an explanation of the last activities and R+D+I lines, carried out by the engineering department, in the main areas of investigation, researching and business of the company.

I. INTRODUCTION

ISTEMAS RADIANTES F. MOYANO S. A. is a telecommunication company that makes and commercializes all the elements necessary to obtain the complete operability of the radiating systems. The main activities of the company are: the design, manufacture, installation and radiating assembly of antennas and systems, the design, manufacture and installation of structures, camouflage systems and supports elements. S R F. Moyano, S.A. is a pioneering company in Spain since 1960 of Radio Frequency technology and it offers the best solutions in broadcasting, and base stations cellular systems. S.R.F. Moyano, S.A. incorporates highly qualified personnel in its full range of products. Since its creation there has been special emphasis in the production quality to be superior to general customer expectations.

The effort made by the company has been recognized by Dragados Industrial (company of the Group Dragados) who has positioned itself like reference partner of the society facing
the accomplishment of great investments in investigation, Development and Innovation and of its international expansion.

The company manufactures products can be classified in four areas: Broadcast, structures, camouflage and mobile communications systems.

A. Broadcast.

Include the design, manufacture, and installation of antennas, filters, multiplexers, and the different components of radiant systems. It has standard and customized solutions for low, medium and high power systems obtaining high gains, long reach, and coverage. The product range includes Medium wave and Bands I, II, III, IV/V (44-862 MHz) in horizontal, vertical, circular polarization, to crosspolar..., as well as solutions for DAB and DVB.

B. Structures

The department of structures of S R F Moyano, S.A. makes the design, structural calculation, manufacture and installation of structures support of antennas, guaranteeing the conditions of service to which they are going to be put under. It is had standard and customized solutions for: Self Supported Towers of lattice window with troncopiramidal structure for high altitude and load capacity, Braced Towers of lattice window of up to 200 meters of height and Tubular Towers and Monopoles.

C. Antenna Camouflage

Solutions of camouflage of antennas and structures for each urban and rural atmosphere necessity are contributed, including the radomization of antennas and locations with dielectric materials. It entails, in addition to the design of forms, volumes and colors, the study and radioelectric optimization of the dielectric elements for the camouflage of its electromagnetic influence on hidden antennas.

D. Mobile Communication systems

Between the range of antennas for cellular application in base stations, S. R. F. Moyano, S.A. provides:

- Sectorial, trisectorial and omnidirectional or indoor.
- Vertical or crosspolar polarization
- Electrical or mechanical adjustable downtilt (FET, RET, VET)
- Solutions for AMPS, DAMPS, GSM900, GSM1800, PCS y UTMS bands
- Communications for fixed link multipoint point-point or, WLL.
- Systems of surface-to-air communication for trains and Communications in closed group (Trunking), TETRA.

S R F Moyano, S.A. makes of the technology its bet by the future, thanks to the noticeable innovating vocation of its engineers, technicians and analysts. S R F Moyano, S.A. counts on its own unit of R+D+I.

S R F Moyano, S.A. has the most modern technical means: anechoic chambers, networks analyzers, intermodulation product measurers, radiant patterns calculation software, coverage zones calculation, simulation of electromagnetic and structures software etc.

Between our collaborating partners in the technological developments are organizations of recognized prestige,

emphasizing:

- Universidad Politécnica de Madrid (ETSIT, EUIT)
- Universidad de Granada (Facultad de Ciencias Físicas)
- Universidad Politécnica de Catalunya (ETSIT)
- Universidad Carlos III de Madrid (ETSIT)
- CDTI, Miner, IMADE, IFA.

II. Activities

The most important last activities of S R F Moyano, S.A. can be classified into four groups depending on the area of business.

A. Broadcast

1) DVB-T compliant filters and diplexers:

Combline Multimplexer: it consists of a low power and reduced dimensions modular multiplexer in combline technology which needs only one filter per channel. Combline technology consists in a five-row rod magnetically coupled resonators witch are grounded at the same end, and a loading capacitor effect at the other end. These resonators provide the capability of tuning. Due to the technology, filters are compact, light, and modular. The specifications of combline diplexer are: 200 W, UHF band and one guard channel is required.

DVB-T 8+2 Constant Impedance Diplexer*:* it consists of two filter and two crossed couplers. The diplexer uses coupled-transmission-line technology. The filters are designed with resonant cavities, which are coupled by iris. The external coupling is obtained by adjustable loops. Due to the restrictive specifications for the critical mask in DVB-T standard, eight resonators plus two notch resonators are required in order to fulfill the standard. Notch lateral resonators add zeros in the transmission response of the filters increasing selectivity. The specifications of 8+2 constant impedance diplexer are: 1.5 KW, UHF band and it can be used for digital adjacent channels addition. The Figure 1 shows a Constant Impedance Diplexer of 8+2 poles.

Fig. 1 DVB-T 8+2 Constant impedance Diplexer

DVB-T 6+2 Constant Impedance Diplexer: it consists of two filter and two crossed couplers. The technology used in the couplers is coupled-transmission-line. The filters are formed by resonant cavities, that are coupled by iris and the external coupling is obtained by adjustable loops. Due to the restrictive specifications for the non-critical mask in DVB-T standard, six resonators plus two notch resonators are required in order to fulfill the standard. Notch resonators add zeros in the transmission response of the filters increasing selectivity. The specifications of 6+2 constant impedance diplexer are: 1.5 KW, UHF band and it can be used for analogical-digital adjacent channels addition.

DVB-T 4+2 Constant Impedance Diplexer*:* it consists of two filter and two crossed couplers. The technology used in the couplers is coupled-transmission-line. The filters are formed by four resonant cavities plus two notch ones, that are coupled by iris and the external coupling is obtained by adjustable loops. Notch resonators add zeros in the transmission response of the filters increasing selectivity. The specifications of 4+2 constant impedance diplexer are: 1.5 KW, UHF band and a guard channel is required.

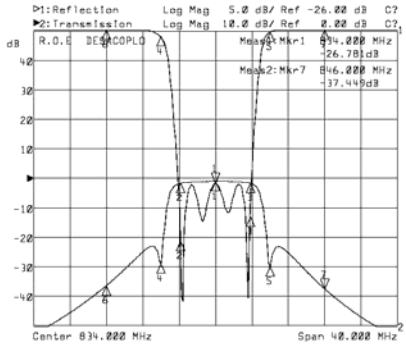

Fig. 2 DVB-T 4+2 Filter Response

DVB-T Gap Filler: this system provides the isolation needed between reception and transmission antennas of re-emitter of Single Frequency Terrestrial Digital Television networks. The solution will facilitate the network deployment and a coverage increasing established by the "Plan Técnico de Radio Digital Terrenal". The Figure 3 shows the application environment of the DVB-T Gap Filler. The Figure 4 shows the hardware used to program the GAP Filler's software

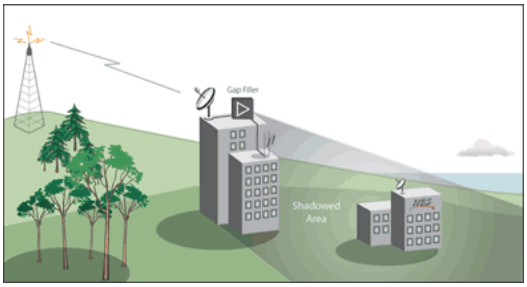

Fig. 3 GAP FILLER application environnent

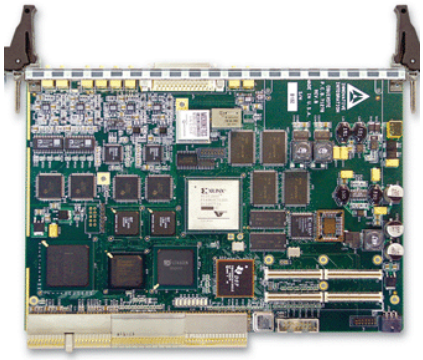

Fig. 4 GAP FILLER's FPGA

DVB-T, DVB-H Transmitters: They are scalable and flexible, supporting applications from 500 mW up to 5 kW; low power applications are available in two compact versions, up to 5 W in 3U and up to 50 W in 4U and combined with the range of power amplifiers they offer transmission solutions up to 5 kW.

Fig. 5. DVB-T &H Transmitter and User environment

2) FM Radio Applications

***FM Band Broadband Antenna*:** for FM broadband applications that circular polarization is required and The 'Double V' Antenna is the proper solution. The main characteristic considered in the design is to have very low return losses in all operating Band. It consists of two dipoles with 'V' shape and perpendicularly faced.

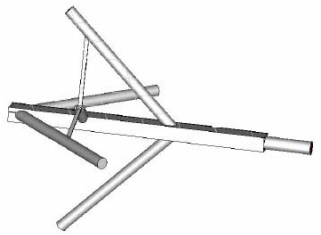

Fig. 6 FM Band Double-V Antenna

High Power Fm Band Crossed Coupler: it is a high power crossed coupler for broadcasting systems. It implies a saving of spaces and elements of interconnection. It consists of a quarter wave coupled-transmission-line.

3) DAB Applications

DAB Compliant Filters and Diplexers: it is a constant impedance diplexer. It consist of two filter and two crossed couplers and a dummy load. The coupler uses a The coupled-transmission-line technology. The filters are formed by resonant cavities, which are coupled by iris. The external coupling is obtained by adjustable loops. Due to the restrictive specifications for the critical mask in DAB standard, six resonators plus a feedback loop are required in order to fulfill the standard. The feedback loop adds symmetrical zeros in transmission response. This fact increases the selectivity. The situation of the zeros in the response can be adjusted changing the loop long or the coupling of the feedback. The specifications of the diplexer are: 500 W, UHF band.

B. Mobile Communication Systems

MY-1741: it is a Triband Broadband Panel Antenna which covers the following bands: 870-960, 1710-1880, 1900-2200 MHz with only two connectors. The radiant element consists of broadband log-periodical dipole that provides a 65º horizontal beamwidth, and crosspolar polarization.

MY-1743: it is an Indoor Panel Triband Antenna which covers from 870 to 2170 MHz. It consists of two broadband dipoles in a substrate fed using maximum and minimum field in a open transmission line. It is radomized.

***MY 2-409 and MY 3-413, 314, 315*:** it is a Triband Trisectorial Antenna which covers the following bands: 870-960, 1710-1880, 1900-2170 MHz. It features crosspolar polarization and variable electrical downtilt with remote control option, having four connectors.

***MY ROCKET VA 2-409 and MY ROCKET VA 3-413, 314, 315*:** it is a Trisectorial Triband Antenna, which presents low visual impact providing an integrated solution. It features easy bottom access to connectors for crosspolar polarization, in addition it presents adjustable downtilt and azimuth through the controllers located at the bottom. It also provides an easy operation or maintenance without removing radome.

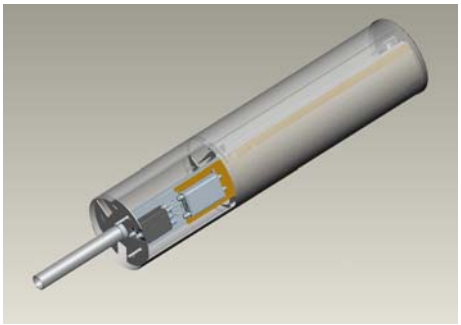

Fig. 7 MY ROCKET VA 3-415

SMART PROYECT: the engineering department of S. R F. Moyano participates in the Smart Antennas system for Radio Transceivers Project in PIDEA+ Organization in collaboration with EADS DCS, CENAM, EADS CCR, RADIALL,

CIMNE, NLR, LIONIX, University of Twente and CYNER Substrates. The consortium from European countries has been build to provide the complementary know-how needed to reach the project objectives. Tasks in the consortium of S. R. F. Moyano is to develop the specifications and system needs including the evaluation of users needs and the definition of technical specifications and tools design to get the desired characteristics, advanced techniques and processing development. Including advanced algorithms for reconfigurable in MIMO systems, development of general electromagnetics tools and simulations of electromagnetic propagation, development of antennas system MIMO with time-space processing in different indoor environments such as halls, corridors and direct view contexts, prototypes for the evaluation of development technologies, including a platform of WLAN Networks, from measures of radiation patterns, BER, etc…

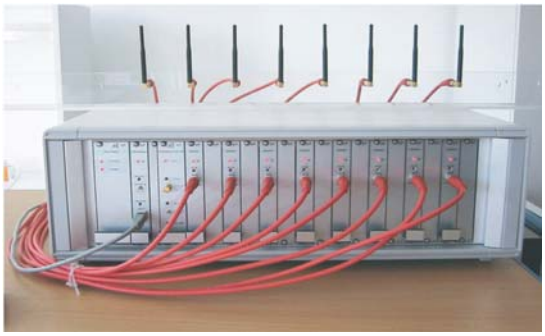

Fig.8 WLAN SMART Antenna

C. Camouflage

Cylindrical Radome: Solutions of camouflage for each urban and rural atmosphere necessity are contributed, including the radomization of antennas and locations with dielectric materials. The cylindrical radome is specially designed for trisectorial antennas. It consists in the design of a discreet form (cylindrical) for the environment, volume and color. The radioelectric optimization of the dielectrics elements for the camouflage has been studied.

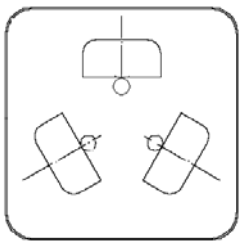

Fig. 9 Square radome

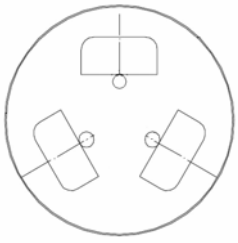

Fig. 10 Cylindrical radome

Square Radome: Following the previous philosophy, this type of radome has a chimney appearance. The square radome is specially designed for trisectorial antennas. It consists in the design of a discreet form (square) for the environment, volume and color. The radioelectric optimization of the dielectrics elements for the camouflage has been studied.

D. Structures

SIMMO Mast: The current development of cellular telephone sector demands infrastructure that is compatible with environmental concerns, without affecting the normal operation of radiating systems.

The solution provided by S R F Moyano, S.A. includes comprehensive camouflaged systems with low visual impact. The comprehensive systems are made up of tri-sector antennas and masts. The comprehensive camouflaged system is defined for heights of masts (tower): 1, 2, 3, 4 and 5 meters.

The mast is easily transportable and carried out due to a modular construction. The mast is radomized with the same material as the trisectorial antenna (Styrosum) in order to camouflage the global structure. The radome of the mast can be opened (2/3 -1/3) so that the installer can go up along the structure and consequently get an easy access to the RF devices (MHA, RCU, feeders….). The mast is compliant with all safety legislations (European).

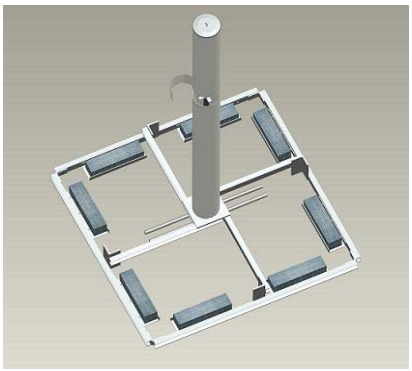

Fig. 11 SIMMO Mast

III. I+D Activities

The previous activities carried out by S. R. F. Moyano can be classified into two different kind of projects depending on nationality and participation scope.

A. European Projects

PIDEA+ SMART PROJECT: The main activity in this kind of projects where S. R. F. Moyano participates is the.

B. National Projects

***PROFIT PROJECT*:** Some activities included in this project are SANTTRA (Smart Antennas) and the GAP FILLER in collaboration with other organisms.

IMADE PROJECT: S. R. F. Moyano takes part in this project through filters for radio and television broadcasting under DAB and DVB-T standards. It includes the DVB-T compliant filters and diplexers activities such as: Combline Multiplexer and the DVB-T 8+2, 6+2 and 4+2 Constant Impedance Diplexers and DAB compliant filter and diplexer.