

FP7 Programme, SPACE Theme

CALL for Partnership from TÜBİTAK Uzay, Space Technologies Research Institute, TURKEY

We are looking for partnership and cooperation in space technologies area under the Third Space Call of FP7. We propose to be a work package leader or partner on the following critical technological areas in research projects.



Specific Sectors of Interests:

On-board Data Systems;

- ASICS (Deep Submicron)
- ASICS (Co-Processors)
- FPGAs

Space Debris

- High power VHF and UHF transmission chain and beam control

Research Topic According to the Work Programme 2010:

Area 9.2.2: Research to support space transportation and key technologies SPA.2010.2.2-01 Space technologies

Page 30 of the Space Work Programme declare developing priority technologies. TÜBİTAK UZAY has expertise to supply all the requirements defined in EC-ESA-EDA Joint Task Force (JTF) Final Report.

Suggestions for Cooperation and Specific Expertise of TÜBİTAK UZAY on suggested areas:

TÜBİTAK coordinates space R&D activities in Turkey. TÜBİTAK UZAY is one of TÜBİTAK's research and development units, which has initiated satellite technologies in Turkey.

- We want to work in cooperation with a project team for designing and development of ASICS (Deep Submicron)
- We want to work in cooperation with a project team for designing and development of ASICS (Co-Processors)
- We want to work in cooperation with a project team for designing and development of Rad hard Reprogrammable Field-Programmable Gate Array (FPGA)

EC-ESA-EDA Joint Task Force Final Report page 27 defines ASICS (Deep Submicron) and ASICS (Co-Processors) requirements:

“Low power very high performance sub micron technologies for Data path and signal processing applications. Development of rad hard, long life-time libraries for commercial DSM, definition of “platform ASIC architecture” ASIC technology including High Speed Serial Links (as hard macro and standalone chip). Validation and space qualification.”

TÜBİTAK UZAY has very experienced VLSI Design Group, which has circuit design and integration capabilities for a wide range of electronic applications and ASIC design experience in both silicon and on Reconfigurable Gate Arrays (FPGAs). Some of our designed ASICs are:

- An AES (Rijndael) Encryption ASIC in 0.35um 5-metal CMOS technology to be integrated on the image data compression path of a satellite subsystem.
- 024-bit RSA Encryption ASIC in 0.35um 5-metal CMOS technology to be integrated on the telemetry/telecommand path of a satellite sub-system
- 125Mbps Spacewire interface controller and high speed communication controller design on FPGA on the data path of the “RASAT” LEO satellite platform
- A Fully integrated JPEG 2000 Image Compression ASIC on FPGA for an on-board multi-spectral, real-time image compression sub-system “GEZGİN-2” on the “RASAT” TÜBİTAK UZAY's LEO satellite platform

- A Baseband signal processing ASIC on FPGA for the 100Mbps X-Band Transmitter Module of our (RASAT) LEO satellite
- A CCD Array type image sensor readout and Interface Controller ASIC on FPGA for the multi-spectral camera “ÇOBAN” on the BILSAT-1 LEO satellite (launched in 2003)

Page 28 of JTF report defines requirements for ASICS (Co-Processors) “Development of application-specific co-processors: CCSDS 122.0-B-1 image compression ASIC”. The requirements for FPGAs are defined in page 28 as “Rad hard Reprogrammable Field-Programmable Gate Array (FPGA) of European source, large gate density (1- 2M-ASIC-equivalent gates)”.

The most complicated of our designed ASICs is a fully integrated JPEG 2000 Image Compression ASIC for multi-spectral, real-time image compression on-board satellite. This ASIC has several sophisticated image processing features in addition to the ones specified in CCSDS 122.0-B-1. These are:

- Tile based encoding
 - Lossless (Reversible) compression
 - Lossy compression with adaptive Rate-Distortion optimization where the real-time data flow through the processor is non-iterative
 - Adaptive Region of Interest Coding where cloudy regions in the satellite images are detected as RONI
- TÜBİTAK UZAY has full-custom ASIC design experience, especially in construction of logic design libraries for semi-custom VLSI design.
- We want to work in cooperation with a project team for designing and development of High power VHF and UHF transmission chain and beam control

Page 28 of EC-ESA-EDA Joint Task Force Final Report defines requirements for the High power VHF and UHF transmission chain and beam control “...accuracy are required for at least the following components of the transmission chain for the VHF and UHF bands:-RF generators, -radar beam controllers....Existing technologies require adaptation and qualification for the high output power required taking into account limitations as through the warming of the amplifiers and the amplifier technology as such. VHF/UHF antenna beam control and steering concepts need to be developed”.

TÜBİTAK UZAY has highly qualified expertise on design and producing printed antennas especially for UHF and upper bands, as dual mode, shaped pattern, linear and circular polarization. Our experts can design, simulate and produce printed antenna arrays and feeding parts. TÜBİTAK UZAY produced and tested monopole, patch and Quadrifilar antennas for LEO satellite communication sub-systems. UZAY has the capability to design and simulate RF switches for antenna applications.

TÜBİTAK UZAY has expertise in passive microwave circuits, especially filters and couplers and voltage controlled oscillator and power amplifier design. We are working on filter synthesis, filter design, coupler design and voltage control oscillator design and a number of MSc. and PhD thesis are completed in this area by our researchers. Our experts have various international peer reviewed publications on these research areas.

TÜBİTAK UZAY has designed and produce power amplifier for X-band and S-band and VHF systems. TÜBİTAK UZAY can take role also in amplifier design.

- TÜBİTAK UZAY can successfully collaborate with other European researchers in design of Critical Technologies specifically on On-board Data Systems and High power VHF and UHF transmission chain and beam control. TÜBİTAK UZAY has qualified critical technology expertise to deliver for European non-dependence process.

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