

# SmarT

SMART TRANSCEIVER FOR SMALLSAT APPLICATIONS

FOR ASI WORKSHOP "L'IMPEGNO ITALIANO NEL SETTORE DEI CUBESAT: TECNOLOGIE E MISSIONI FUTURE" 2° EDIZIONE

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### Instruments and EGSEs

Explore our high-performance digital and RF solutions, that include micro-satellite RADAR payloads and dedicated RADAR testing equipment to support system ground testing activities. Supporting SmallSats with on-board technology through innovative products:

- SmarT: Smart Multi-channel Advanced Radar Transceiver
  SmarT SAR as SAR On-board Computer
  SmarT COM as Communication Transceiver
  - SmarT PRO as On-board Processing Unit
- RF and Power Units development from C to Ka band
- Evolving RadarBench, the ARESYS unique Radar EGSE
- Developing Radar Drone technology: SAR imaging and anticollision solutions
- Evolving ScanBrick the short range solution for industrial applications

### **Smart Transceiver – SmarT**



Experience the pinnacle of technology with SmarT's cutting-edge, scalable, and performance-driven processing solutions. Perfectly engineered for Radar and Communications applications, SmarT offers seamless IF direct conversion with multi-input/output channels and superior analog performance at intermediate frequencies.

#### Smart Transceiver designed for RADAR \ TLC payloads for next generation SmallSats

Feature	Details
Core Technology	Xilinx MPSoC + high performing external AD/DA converters
Input + Output Channels	Scalable design: IF front-end meets custom requirements
Analog BW	Up to 8 GHz
IF Direct Conversion	Up to 8 GHz / 75dBc Improved SFDR
Processing Capabilities	4core ARM + 2core RT + GPU + PL with integrated DPU for Edge-AI
Transceivers	32 @ 16.3 Gb/s + 16 @ 32.75 Gb/s
PCIe g3x16	4
BSP	Heritage from RadarBench v1 + use-cases customizations



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### **Board Scheme**

MxFE area:

aresys

- ≻ AD9081
- Wide bandwidth 4 DACs + 4 ADCs
- Direct IF conversion up to 5 GHz







### Rad Tolerant Island (100 krad):

- Power supply
- FPGA Supervisor
- CAN / RS485 interface
- Flash Memory

## System-on-Module

The selected system-on-module is intended to unlock the full potential of CubeSats and MicroSats applications, boosting exceptional high-processing capabilities and a wide range of digital interfaces. Versatility and performance are its key features.

Feature	Description	
Processing System		
CPU	Quad-core Arm Cortex-A53	
Real-Time CPU	Dual-core Arm Cortex-R5	
Graphics Processing Unit	Arm Mali-400MP2	
Memory	2MB L2 Cache	
I/O Peripherals	Multiple interfaces including Ethernet and SATA	
Programmable Logic		
Logic Cells	930K	
DSP Slices	3,528	
Block RAM	53.0 Mb	
UltraRAM	22.5 Mb	
Transceivers	32 GTH (16.3Gb/s)	
I/O Pins	416 (high-performance) and 96 (high-density)	
PCIe	Gen3 x16	





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### **SmarT as SAR Board Computer**

SmarT may be used as SAR Board Computer as in the case of ASI SATURN mission in the frame of ALCOR program.

#### SAR Board Computer for SmallSats

- OBC interface with redundant CAN-TS buses
- timing and synchronization
- AWG based signal generation and direct conversion to IF
- sampling of Rx channel directly at IF
- I & Q demodulation
- baseband bandpass filtering and DDC
- BAQ data compression & formatting
- SAR data storing
- SAR data downlink via external XBT

Mechanical frame designed for SATURN













### **SmarT as Payload Data Transmission Unit**

### TRL 6 @ Feb 2025

SmarT may be used as Payload Data Transmission Unit as in the case of X-DLS.

#### SAR best mate for data downloading to the Earth

- OBC interface with single CAN-TS bus
- Time alignment and synchronization
- Multi-payload (SAR and AIS) data acquisition and storage:
  - High data-rate IF (WizardLink)
  - Low data-rate IF (Spacewire)
- Data handling and transmission
- ECSS compliant coding and modulation up to 1 Gbps
- Signal conditioning toward RF section
  - o I/Q modulation
  - o Oversampling
- Direct IF synthesis
  - o Multichannel on different bands, if required





# SmarT as Light SAR Digital processor

SmarT may be used as LIght SAR Digital processor In the micro or mini versions for SmallSats.

#### SAR companion for RADAR processing and imaging

- OBC interface with redundant CAN-TS buses
- Processing System for raw SAR data calibration and conditioning
- High performing FPGA for conventional SAR processing flow  $\geq$
- Portable AI models for change detection and object classification
- Multi-payload data interface:  $\geq$ 
  - High data-rate IF (WizardLink) 0
  - Low data-rate IF (Spacewire)  $\cap$





## dresvs

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### TRL 6 @ Jun 2025/6

# Thank you for your attention

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# Your feedbacks are welcome



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