Essential Telemetry (ETM) ASIC

All spacecraft traditionally implement a direct essential telecommand capability, where the telecommands are decoded purely by H/W with a minimum amount of electronics involved. This allows for immediate commanding of critical subsystems even in case the on-board control computer is not fully operational. However, a corresponding essential telemetry function is not always implemented although such a function could be extremely valuable. The essential telemetry function should, in analogy with the essential telecommand function, allow for a selected number of essential telemetries (digital as well as analog) to be down-linked without the need for the on-board computer to be active.

The Single Chip Telemetry Telecommand ASIC, [SCTMTC], previously developed under ESA contract, implements in one single ASIC the telecommand decoding capability and dedicated telemetry virtual channel input interfaces allowing external components to insert telemetry packets into the telemetry downlink. To complement the SCTMTC ASIC, the essential telemetry acquisition functionality was implemented in the dedicated Essential Telemetry (ETM) ASIC developed by SPACE-ASICS S.A. and the Space Research Laboratory of the Democritus University of Thrace (DUTH/SRL) under ESA Contract No. 4200020198/06/NL/GLC.

The ETM ASIC is capable of autonomous acquisition of discrete telemetries and formats the acquired data into packets for further transmission to the telemetry encoder in the SCTMTC. As a result, it is now possible to implement a very compact and powerful TC/TM front-end simply by using the SCTMTC and the ETM ASICs. In addition, the ETM ASIC provides a CAN bus interface that enables the ETM to also be used in remote terminals for analogue and digital data acquisition applications.

During the first phase of the ETM development, ETM ASICs were manufactured and available in Engineering Model (EM) quality. These components were then exposed to a test program. After this first phase, the program was extended. A few design modifications were introduced and a complete lot of ETM ASICs where manufactured and subjected to a lot acceptance test program according to ESCC 9000.

Abstract: "Development of a Miniaturized Essential Telemetry Unit based on ETM ASIC for Mini-Satellites"

In the frame of ESA Contract No. 4000111685/14/NL/AK, SPACE-ASICS S.A. and DUTH/SRL developed a miniaturized Remote Terminal Unit (RTU) based on the Essential Telemetry (ETM) ASIC and a stand-alone housing, equipped with connectors and mounting feet, which is capable of supporting the ETM functionalities on board spacecraft.

The ETM-RTU was designed for potential future use in mini-Satellite applications.

The miniaturized ETM-RTU box specifically allows for:

- ☐ Power to be provided to the ETM device and the associated support electronics.
- ☐ Interfacing measurement channels of the ETM ASIC to the mini spacecraft.
- ☐ Interfacing the PacketWire and CAN communication interfaces of the ETM ASIC to the OBC or any other subsystem.
- ☐ Time information signals to be provided to the ETM ASIC.

Two ETM-RTUs were manufactured and functional tests were performed in ambient and thermal conditions.