

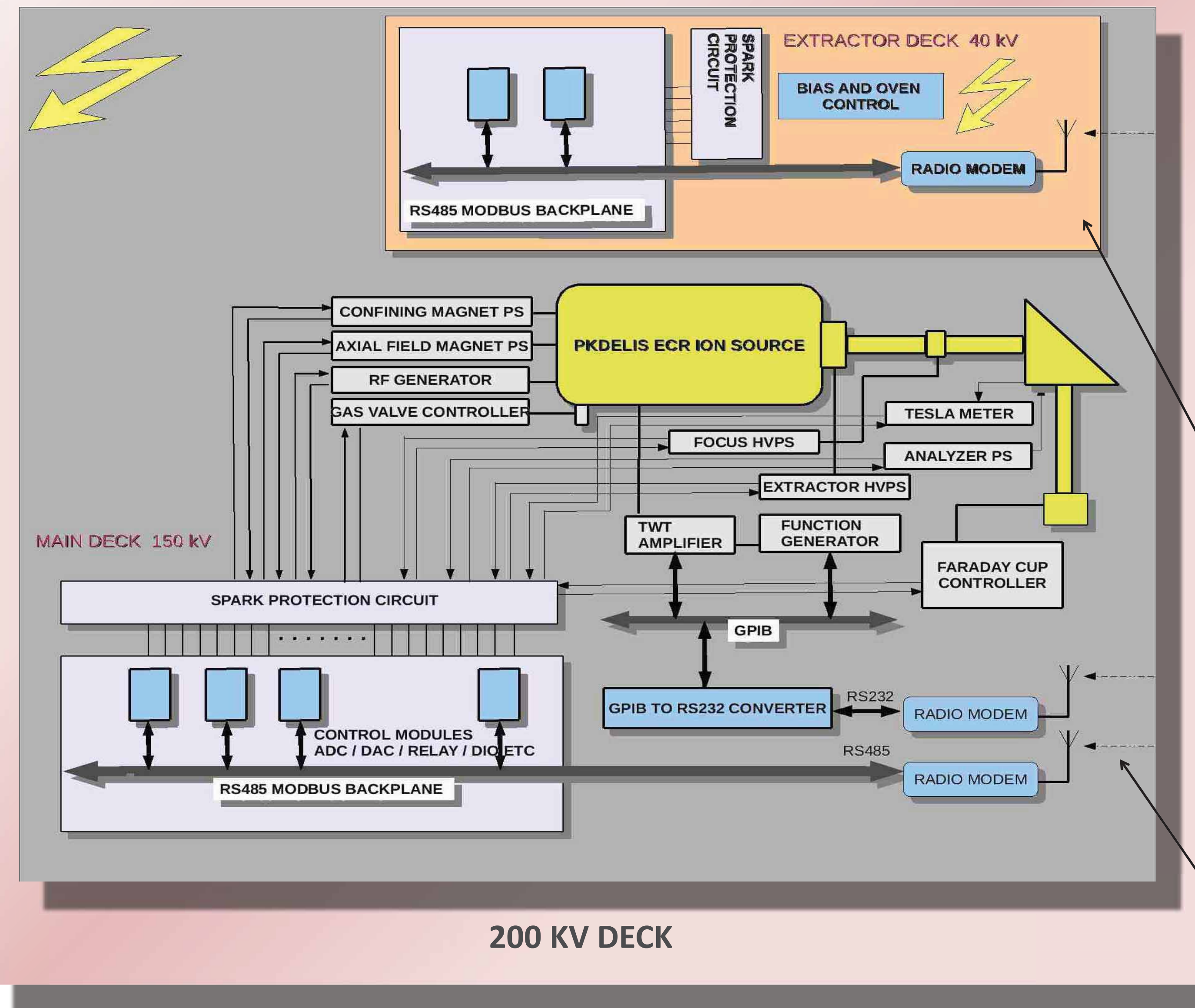


A WIRELESS CONTROL SYSTEM FOR THE HTS-ECRIS, PKDELIS AND LOW ENERGY BEAM TRANSPORT

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ABSTRACT

A wireless control system based on MODBUS protocol has been developed and tested for operation and control of the High Temperature Superconducting ECR ion source, PKDELIS on a 200 kV High Voltage platform coupled with the **low energy beam transport system (LEBT)**. The system has been in regular operation and has proven to be rugged and reliable in a spark environment.



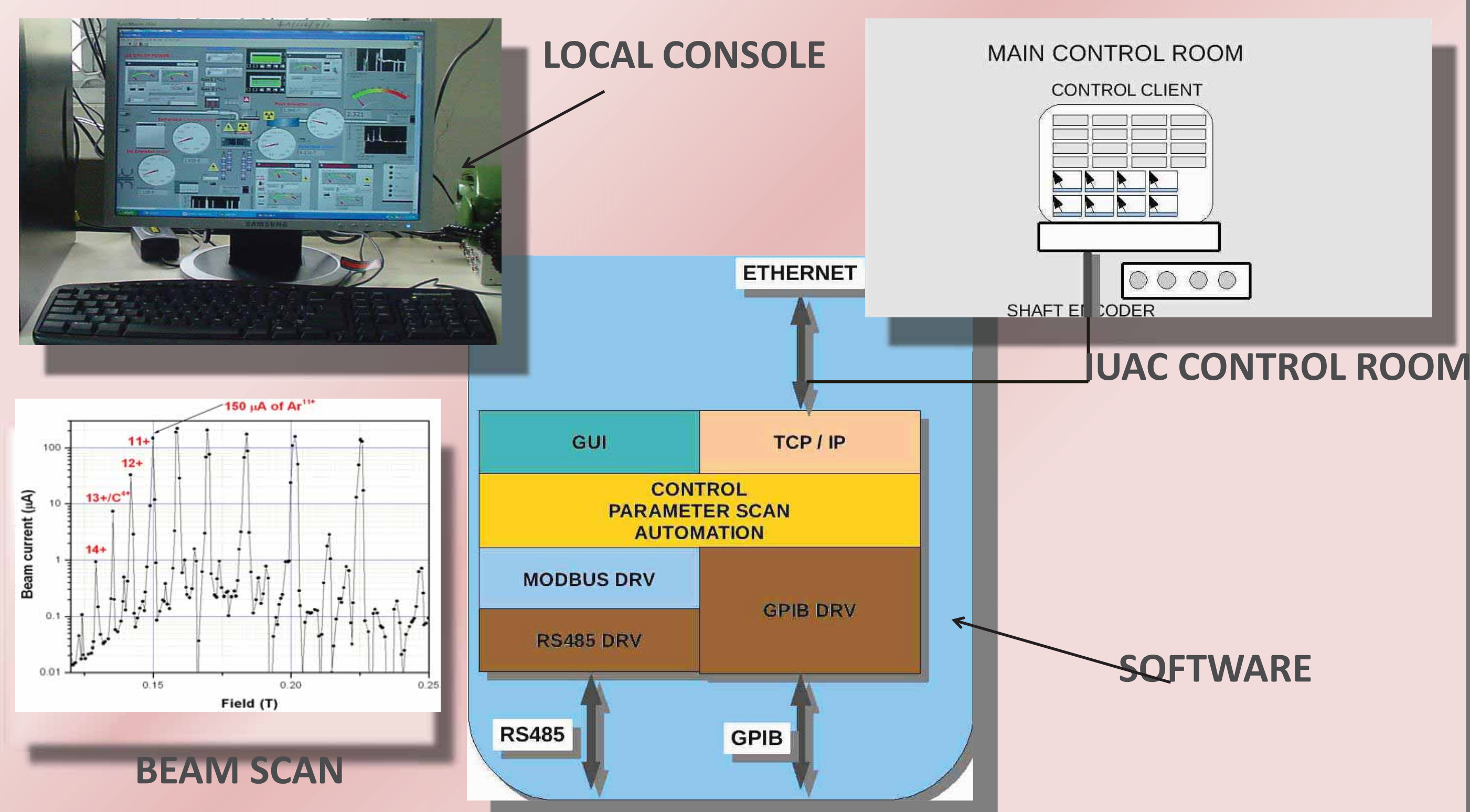
INTRODUCTION

The 18 GHz HTS-ECRIS, PKDELIS[3] is designed to inject beams from the High Current Injector (HCI) into superconducting LINAC. It is driven by an 18 GHz, 1.8 kW klystron and has been upgraded with additional frequency using a TWT amplifier for alternate frequency injection [4]. LEBT section consists of the HTS -ECRIS, extraction system, a large acceptance mass analyzer and diagnostic system consisting of double slits, BPMs and faraday cups. The HV power supplies, Magnet power supplies, the RF amplifiers and other systems are installed on two high voltage decks and ground. Most of the devices are remote controlled and monitored by voltage. The TWT amplifier and the function generator are GPIB devices.

SOFTWARE

A GUI based local control console with history and graphing capabilities is provided. Functions for automatic beam scan in fast and slow scan modes have been incorporated. A typical full beam scan is available in less than 10 minutes.

Standard UNIX drivers and libraries and function for the MODBUS RTU have been used on an implementation of UNIX for implementation of client server remote control interface. Variable requests from clients are resolved by database look up.



FEATURES

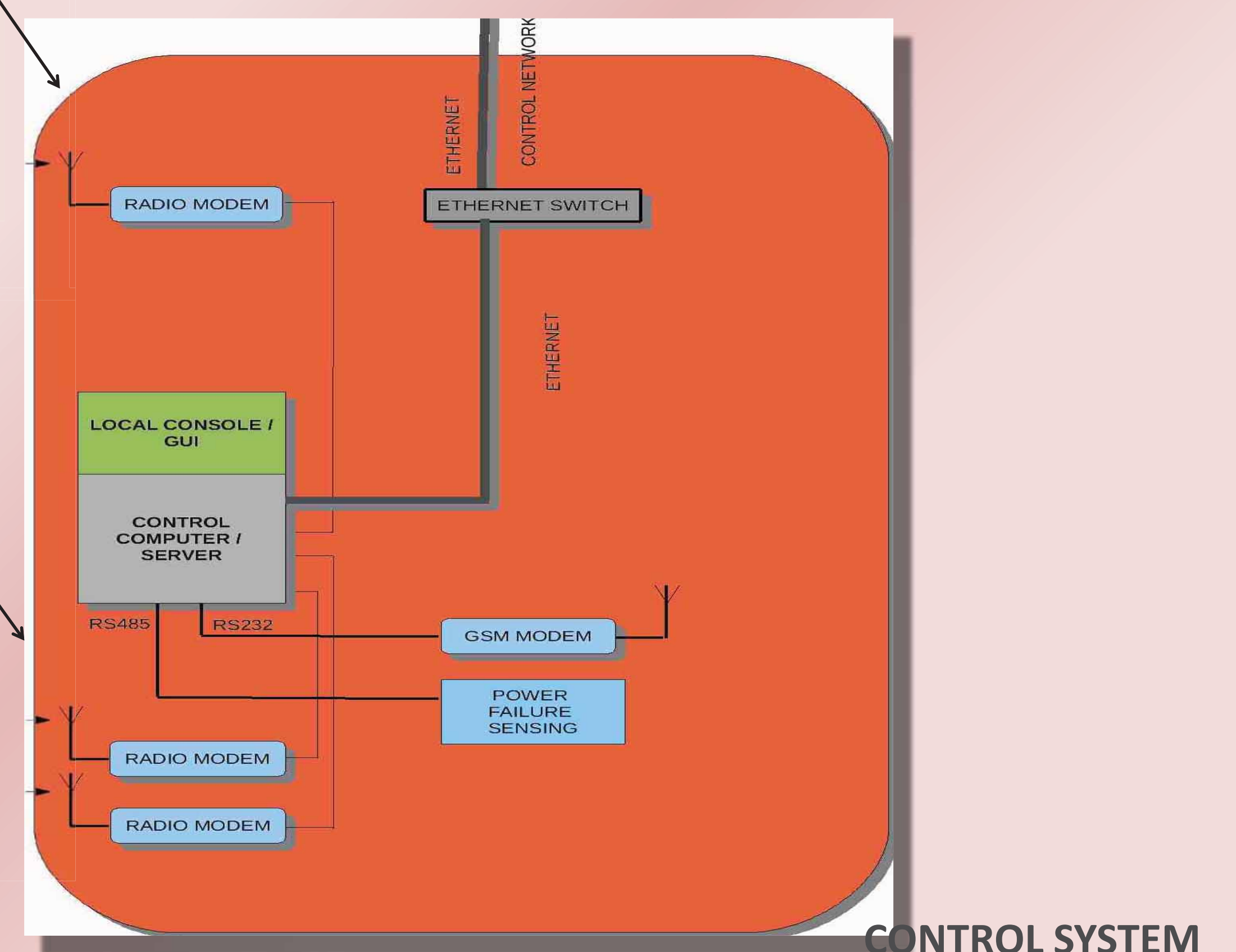
- Wireless channels improve reliability due to lack of any contacts.
- Ethernet control network server interface for main control system.
- Automatic fast and slow beam scan.
- Incorporation of GPIB based systems.
- GUI based local control console.
- Parameter history.

HARDWARE

IO HARDWARE A MODBUS / RTU on RS485 backplane has been implemented for IO modules. This backplane directly connects to CDMA Radio Modems for isolation. GPIB based TWT amplifier and Signal Generator are connected via RS232 conversion and Radio translation using a separate link. A spark protection system has been incorporated. A non isolated RS485 channel is implemented for ground systems. Interlocks are implemented with PLCs.

SERVER The server for remote control via the control room has been incorporated. A fan-less intel based system server with a solid state Compact Flash for primary storage is used. The hardware has support for Ethernet and directly supports a high speed RS485 interface.

WIRELESS LINK



CONCLUSION

The wireless based control system for the HTS-ECRIS and low energy beam transport has proven to be a reliable workhorse in terms of smooth operation inspite of the severe spark environment. Interference due to sparks during the communication and control of various parameters has not been observed, since the spark frequency spectrum is way below the control frequency of 2.45 GHz.

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