Drift Compensation Module for Pulsed or CW Machines at 1.3GHz, 3.0 GHz and 3.9 GHz.

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Abstract
The drift compensation module uses an injected reference approach which is used to compensate for amplitude and phase drifts in the receiver section induced by environmental changes. In the contribution we present the electrical and mechanical design flows for various frequencies and the two different modes of operation. During the design process we used several microwave modelling tools and the contribution summarises the results. The evaluation results include long term measurements of one drift calibration module in a realistic environment. Special emphasis is put on the implementation of the mechanics of the module since it is tightly coupled to the final performance.

Common Mechanical Design

TMCB (Temperature Monitoring & Control Board)
- 8 x ADC, 18-bit, 16ks/s
- 4 x ADC, 16-bit, 15Ms/s
- 2 x ADC, 24-bit, 16ks/s
- 2 x DAC, 18-bit, 15Ms/s
- 6 x DAC, 16-bit, 16ks/s
- 16 GPIOs
- 4 precision temp sensors
- 2 x SFP cages (Rocket IO)
- RJ45 for timing signals from x2timer
- Xilinx Spartan 6
- FMC for temperature controllers (3 x Pellet elements)
- Has its own backplane for interconnects (DC, RF-grade, power, IOs)

FRED (Fuse Relay Board)
- Fuses for 8 input channels
- Fast MOSFET switches as relays
- Separate section dedicated to fan control
- Voltage and current sensors

PSM (Power Supply Module)
- Manufactured by Wibner
- Provides:
  - 7V 6A, (for analog, low power applications)
  - 15V 5A, (for analog, low power applications)
  - 8A, (for analog, high power applications)
- Redundant and hot-swappable
- 20 mVpp ripple at 20 MHz BW

SMA launch optimization:
- Optimization for bandwidths up to 6 GHz.

Drift Compensation Module for 3.9 and 3.0 GHz Improvements

RF up optimization:
- Optimization for bandwidths up to 6 GHz.

Operation
- Full integration into DOOCS
- Common control panel for temperature regulation control, board diagnostics and calibration control.

Coupling cell:
- Optimize isolation between channels. For this reason good matching of intermediate stages is needed.
- Two possible variants. With couplers or splitters.

References
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- Control System Implementation Based on Multi-channel Frequency Division Multiplexing Communication using Pilot Tone Channel Compensation, LLRF Workshop 2011
- G. Haing et al.: Signal processing for high precision phase measurements, BMWi, 2010