Digital Beam Former (DBF)

PRODUCT DESCRIPTION

The Digital Beam Former (DBF) is an indigenisation project where CoreEL has pioneered the beam forming for phased array RADARs in the digital domain using FPGAs. It was delivered as a turnkey solution.

The DBF uses a modular and scalable architecture which enables it to be efficiently adapted as per new requirements. Two variants of DBF and its ATE, with different capacities were developed and delivered on the same underlying framework.

DBF accepts the data from front-end of the phased array through optical links, synthesize beams and deliver this data to signal processing units for further processing. The beam formation is done by algorithmic processing of the received data in FPGAs. Configuration, control and status monitoring of the DBF unit takes place through Ethernet, it also supports an optical control link.

KEY FEATURES

- Remote configuration and reconfiguration over Ethernet links
- High speed optical backplane with optical blindmate connectors
- Floating point algorithms implemented on FPGAs
- Gigabit Ethernet based management interface
- In-system dedicated BITE processor
- The Automated Test Equipment (ATE) developed for DBF is capable of simulating a complete real-time external environment for DBF
- Available as two variants with different capabilities
  - 24 AGR DBF: Ability to perform beam forming for 24 AGR array
  - 51 AGR DBF: Ability to perform beam forming for 51 AGR array

SPECIFICATIONS

Interfaces
- Front end receiver interface : 24 / 51 Optical links up to 3.6 Gbps
- Signal Processor interface : 3x sFPDP & 3x sFPDP mirrored
- System controller interface : 1x sFPDP interface
- Ethernet Interface : 1 for Health monitoring, 1 for Radar environment simulator

FPGAs
- Number of FPGAs in DBF : 28 (Xilinx Virtex-5 FX100T, Spartan-3 AN400)
- BITE implemented on : 7 dedicated FPGAs

Processor
- One Freescale MPC8640 processor
- PPC440 Embedded Processor on FX FPGAs
Additional Information
- Data path frequency: 180 MHz
- Total number of optical links: 87
- Optical link speed: 3.6 Gbps
- Number of different cards in DBF: 13 cards of 9 types
- Multiply and Accumulate (MACs) in DBF: ~98 GMAC/s
- Raw Data processing bandwidth: 65 Gbps
- Cables & connectors: MIL-DTL-38999

Software / IP
- Linux running on: 6 FPGAs + 1 MPC8640 CPU
- XILKERNEL running on: 15 FPGAs

MECHANICAL
- Custom built forced air cooled chassis
- 24 AGR DBF weighs 25 kg (40 kg with cables)
- 51 AGR DBF weighs 35 kg (63 kg with cables)

POWER CONSUMPTION
- 24 AGR DBF consumes 350W
- 51 AGR DBF consumes 600W

ENVIRONMENTAL
- Qualification: JSS 55555, MIL-STD-461E
- Temperature range: -20°C and +55°C (Operational)
  -30°C and +85°C (Storage)

PART NUMBER(S)
Two variants produced with different capabilities:

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<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
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<tbody>
<tr>
<td>CS1010</td>
<td>24 AGR DBF: Ability to perform beam forming for 24 AGR array</td>
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<tr>
<td>CS1011</td>
<td>51 AGR DBF: Ability to perform beam forming for 51 AGR array</td>
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