Mobile Phase Recovering Equalizer
AH1000-MPRE

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INTRODUCTION

The Mobile Phase Recovering Equalizer (MPRE) FPGA core combines Channel Equalization, Phase Recovery, and Symbol Slicing in a single module. Advanced, patented, signal processing in the MPRE provides robust and reliable QPSK demodulation in high Doppler and mobile multipath environments. Mobile multipath radio environments that are too harsh for broadband single-carrier QPSK reception can be used reliably with the MPRE.

APPLICATIONS

- Mobile Video - Sports, News gathering, etc.
- Surveillance, Telemetry
- Airborne - UAV, Jet, Helicopter
- Mountainous or Urban Canyon areas

FEATURES

- 17-tap complex-arithmetic LMS Channel Equalizer with adaptation bandwidth and leakage rate control as well as independent coefficient hold and reset controls
- VV4 Quasi-Coherent Demodulator for signal phase recovery and differential detection
- Integrated Symbol Slicer provides demodulated soft-decision outputs
- AGC output controls in proportional and up/dn format for constant-modulus and phase-locked processing
- Phase-locked constellation output
- Equalized signal output for FLL or other processing
- Clock rates up to 200 MHz supported
- Symbol rates up to 1/5 of clock rate

DESCRIPTION

For mobile systems the presence of multipath reflections and Doppler-induced frequency offsets can create a challenge for demodulation of broadband single-carrier PSK signals. Spatial nulls created by destructive multipath interference are characterized by a signal phase

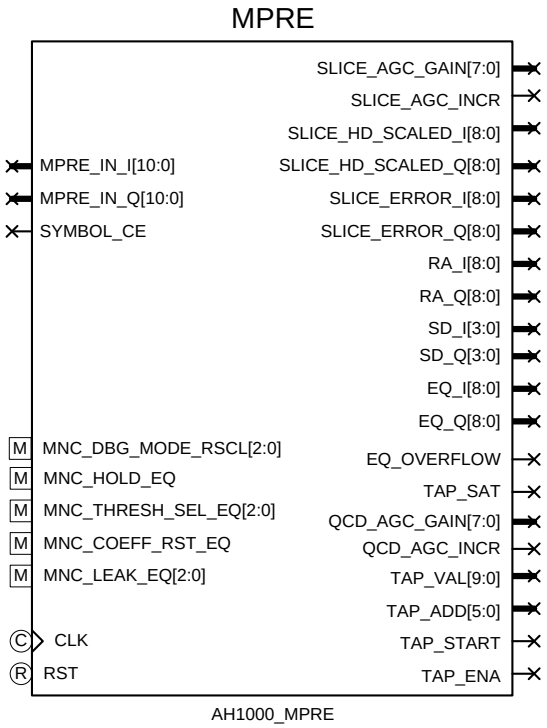

Figure 1. MPRE Schematic Symbol

reversal across the null, so traversing a null typically results in loss of phase lock in a traditional single-carrier receiver. The use of differential signaling can mitigate phase perturbations but excludes the use of a channel equalizer. Anchor Hill's MPRE technology provides near-coherent-reception performance with robustness to phase perturbations and with channel equalization capability using advanced, patented, signal processing techniques. This allows the use of efficient and flexible single-carrier modulation with low PAPR and adjustable symbol rates in mobile applications, providing range extension, increased battery life, and channel reuse opportunities that are not available with OFDM technologies.

The MPRE fits easily into the signal flow of most single-carrier demodulators with a minimal amount of configuration and supporting input signals. Figure 2 shows a block diagram of a

typical demodulator with the MPRE installed in the signal flow chain. With only the time-synchronized symbols as input, the MPRE provides:

- Equalized symbols to feed a Frequency-Locked Loop or other processing elements
- Phase-locked, derotated constellation symbols
- Differentially detected soft-decision outputs for FEC decoding
- Sliced symbol error vectors to facilitate SNR estimation
- AGC control signals

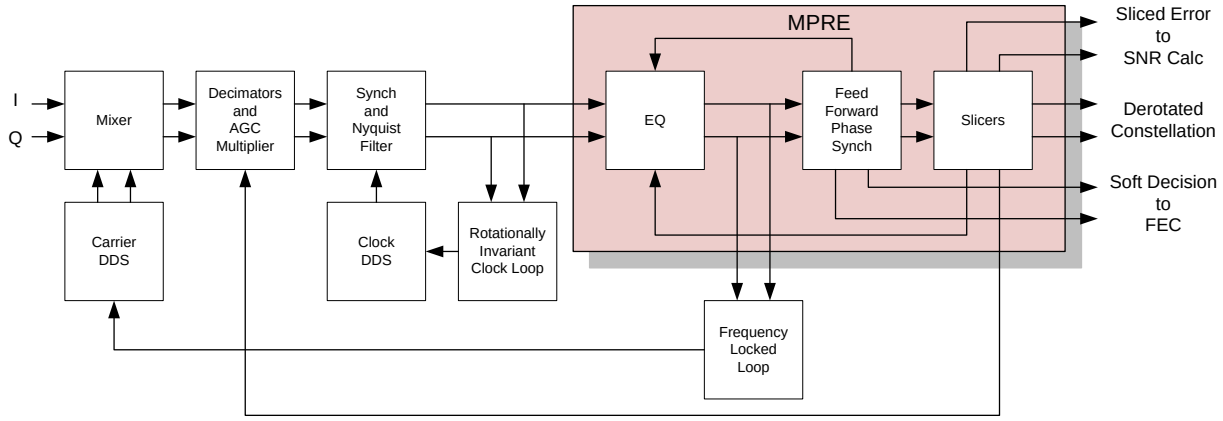

Figure 2. Signal flow diagram showing how the MPRE integrates easily into a typical demodulator.

Resource Utilization

The MPRE has been synthesized with the resource utilizations shown in Table 1 for the indicated Xilinx device families. Results shown are from the Xilinx XST synthesis tool with the specific devices selected as indicated.

Family	Device	Slice Regs	Slice LUTs	Occupied Slices	FF Pairs	DSP48	RAMB36	RAMB18
Kintex-7	xc7k70t	3026	3393	1350	3939	29	10	1
Spartan-6	xc6slx75t	3026	2927	1190	3461	29	0	20
Virtex-5	xc5vlx50	3106	4341	1811	4712	29	10	1

Table 1. MPRE Resource Utilization for certain Xilinx Device Families

Contact Information

Please contact Anchor Hill Communications for any updates, additional information, product pricing, new products or other related needs.

Anchor Hill Communications LLC, Scottsdale, AZ , USA
www.anchorhill.com
Email: info@anchorhill.com
Phone: 480-515-1142

For information regarding patents related to Anchor Hill's technology described above, see www.anchorhill.com.