

A MicroTCA.4 Timing Receiver for the Sirius Timing System



WEPA01

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Abstract

The AMC FMC carrier (AFC) is a MicroTCA.4 AMC board which has a very flexible clock circuit that enables any clock source to be connected to any clock input, including telecom clock, FMC clocks, programmable VCXO oscillator and FPGA. This paper presents the use of the AFC board as an event receiver connected to the Sirius timing system to provide low jitter synchronized clocks and triggers for Sirius BPM electronics and other devices.

Hardware

AFC board is an open hardware project developed to the Sirius BPM and orbit feedback systems. Now, it is also integrating the Sirius timing system, where more than 20 AFC timing receivers will generate synchronized clocks for the BPM electronics and hundreds of triggers around the accelerator.



FPGA Gateware

The AFC clocking resources were used to implement a frequency and phase locked loop to generate a low-jitter synchronized reference clock to the ADCs of the BPM electronics.





Slow Digital Tune	
Olow Digital Turic	

I2C out

Figure 4: Synchronized clock block diagram.

Figure 5: Frequency and phase feedback controller.



Figure 6: Digital Dual Mixer Time Difference.

Figure 1: AFC board with two FMC 5 POF mounted.

Phase Noise Performance



		R&S FSUP 8	Signal Source Analyzer			LOCKED
<u> </u>	Settings	Residual Noise [T1 w/o spurs]		Phase Detector +20 dB		
Signal Frequency:	69.443664 MHz	Int PHN (1.0 5.0	0 M) -58.5 dBc			
Signal Level:	-9.34 dBm	Residual PM	96.641 m°			
Cross Corr Mode	Harmonic 1	Residual FM	1.975 kHz			
Internal Ref Tuned	Internal Phase Det	RMS Jitter	3.8657 ps			
Phase Noi	se [dBc/Hz]					
RF Atten	5 dB					
Top -20 d	Bc/Hz					



Figure 2: FMC 5 POF (5 plastic optical fiber outputs).



Figure 3: RTM with 8 SFP slots.



Figure 7: Phase noise characterization of VCXO controlled (1), VCXO free-running (2) and reference clock (3).

