TEMPERATURE AND HUMIDITY DRIFT CHARACTERIZATION OF PASSIVE RF COMPONENTS FOR A TWO-TONE CALIBRATION METHOD.

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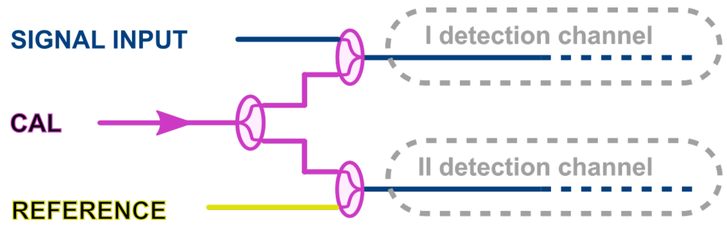
Introduction

Femtosecond-level synchronization is required for various systems in modern accelerators especially in fourth generation light sources. In those high precision synchronization systems the phase detection accuracy is crucial. However, synchronization to a low noise electrical source is corrupted by a phase detection error originating in the electrical components and connections due to thermal and humidity-related drifts.
In future, we plan to implement calibration methods to mitigate these drifts. Those methods require a calibration signal injection, called second tone, into the system. Intrinsically, the injection circuit remains uncalibrated therefore it needs to be drift-free. We performed drift characterization of a set of RF components, which could serve for implementation of a signal injection circuit, namely selected types of couplers and splitters. We describe the measurement setup and discuss the challenges associated with this kind of measurement. Finally, we provide a qualitative and quantitative evaluation of the measurements results..

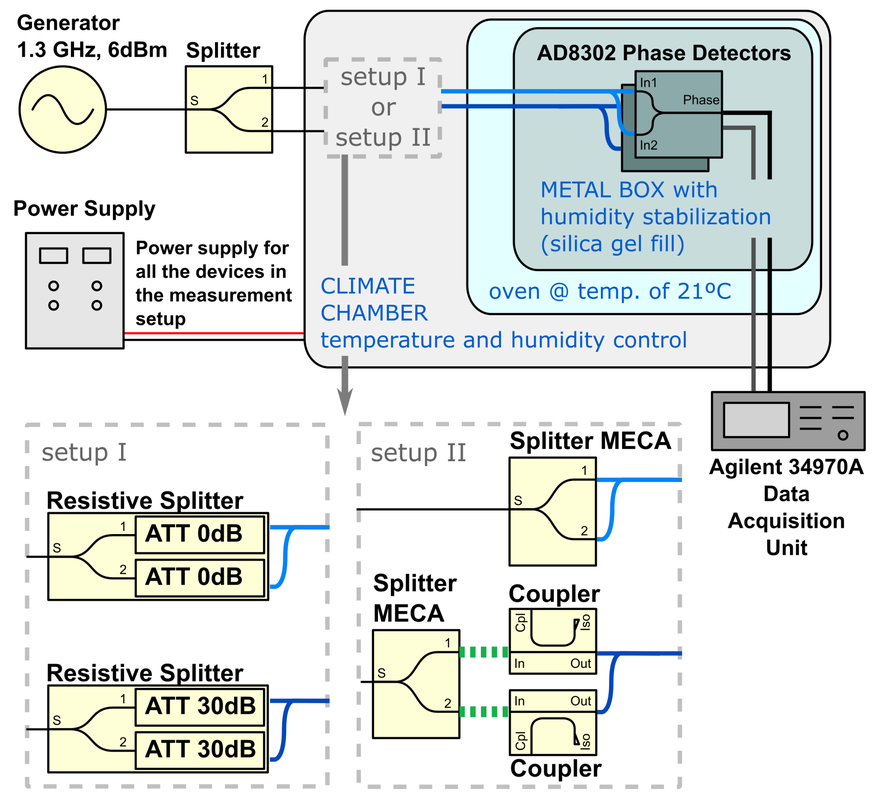
Injection circuit



Measured components

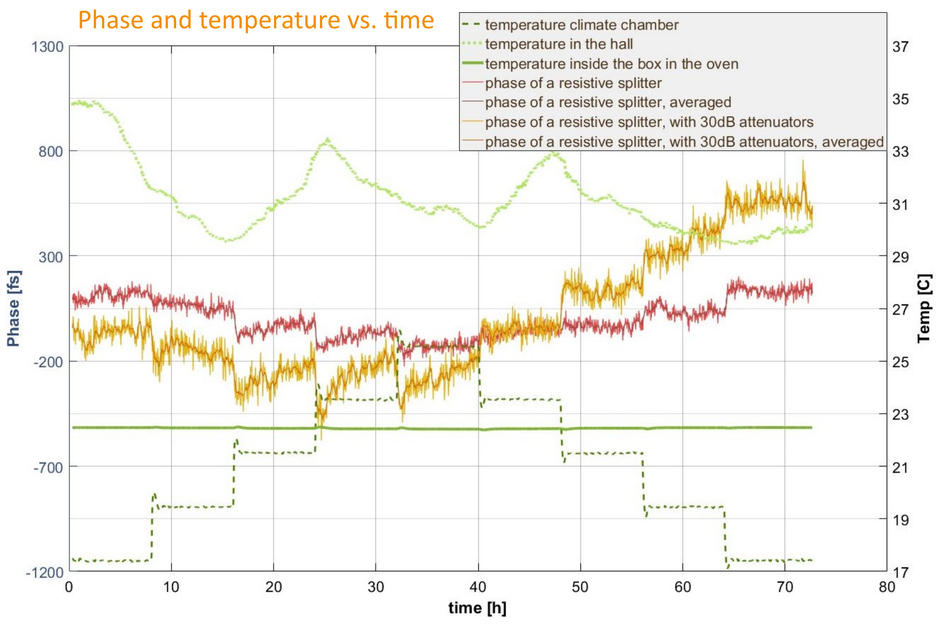
	Component	Manufacturer, part number	Properties
>	Resistive splitter	self-made	wideband, isolation = IL+splitting
>	Resistive splitter with 30dB attenuators	self-made	wideband, isolation = IL+splitting+attenuation
>	Wilkinson splitter	MECA, S 802-4-1.900-M02	not wideband (0.8-3.0 GHz), isolation=27 dB
>	Wilkinson splitter with couplers	Marki Microwave, CBR16-0006	BW = 200 kHz - 6 GHz

Measurement setup

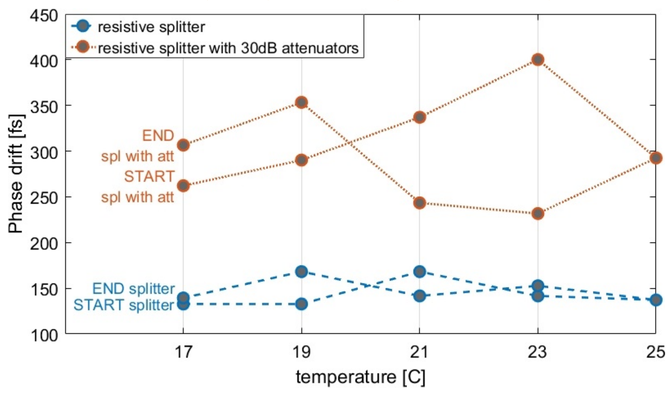


Setup I measurements

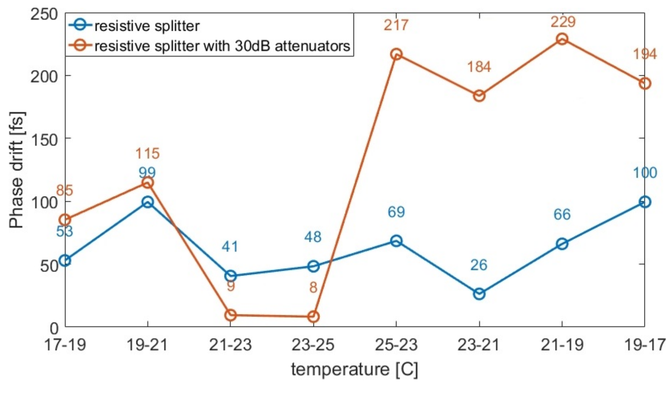
Phase and temperature vs. time



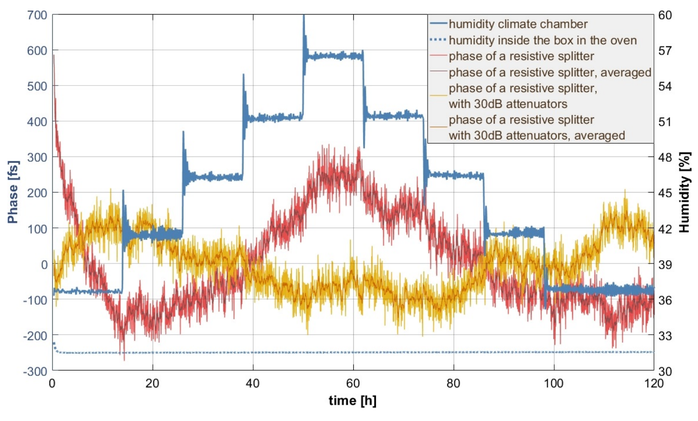
Peak-peak phase changes within steps



Phase drifts per 2°C change

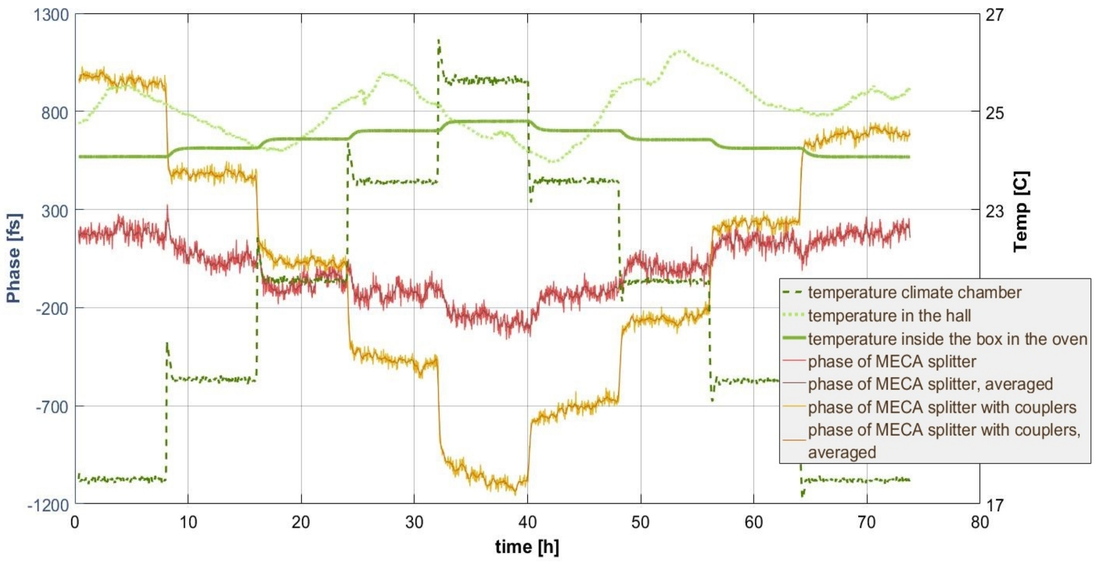


Phase drifts per 5% HUMIDITY change



Setup II measurements

Phase and temperature vs. time



Peak-peak phase changes within steps

Phase drifts per 2°C change

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