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A bildungsroman of the TCS in Advanced Virgo

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The sensitivity and operability of advanced interferometric gravitational wave detectors are impacted by the distributed budget of optical aberrations due to cold defects and thermal effects enhanced by the high input power. The Thermal Compensation System (TCS) of Advanced Virgo is a complex and versatile environment with the twofold scope of characterizing and correcting the aberration budget. The integration of the TCS is the result of many years of experience in the design of thermal actuators/wavefront sensing and in the implementation of commissioning strategies. Thermal effects are now managed using several configurations of wavefront sensing and many actuators exploiting thermo-elastic and thermo-optic couplings. The Advanced Virgo commissioning phases have been a rich and rewarding build environment to understand the features of thermal effects and the variety of compensation strategies. We report about the evolution of TCS concepts in the framework of Advanced Virgo commissioning efforts.

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