Considering $L = 2\times30$ mm (Twyman-Green interferometer) and measured phase change $\Delta\varphi = 10\pi$, the uncertainty in determining the temperature change correspond to $\varepsilon_{\Delta\mathrm{T}} = 0.3$ °C.

Reconstruction of 3D temperature fields is based on the inverse Radon transformation. Its accuracy depends mainly on the range of projection angles and their total number. This effect can be estimated by comparing the known field with the results of this field after the reconstruction process. A known temperature field (Fig.6a) was transformed into a sinogram using direct Radon transformation with projections of (0°÷179°) with step 1°. The inverse Radon transformation was also performed with projections from 0° to 179° but with reduced number of projections. The reconstructed temperature field is shown in Fig. 6b. The difference between the phase fields (a) and (b) is visible in Fig. 6c. RMS differential map corresponds to 0.2 °C. The dependence of the RMS variation of the temperature fields on the number of projections is plotted in Fig. 7.

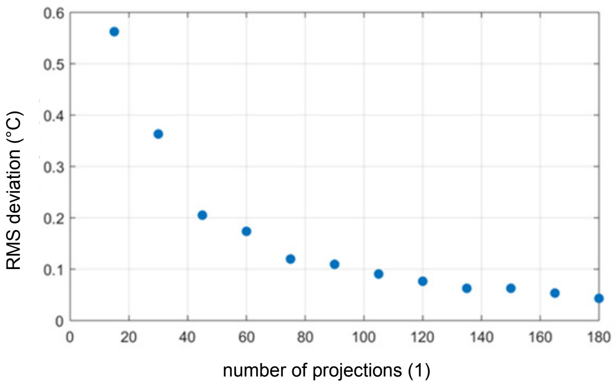

Figure 7 Dependency of RMS variation of temperature fields on the number of projections

Temperature change causes the refractive index change within the measured area. It consequently leads to deflection of the waves passing through the measured area. Equation (5) is considering a change in the optical wave path dependence on refractive index change. Changing the optical path caused by the divergence of the wave from the original trajectory brings uncertainty to the measurement. This phenomenon is negligible for lightly refractive fields, as is the case of experiments devoting the measurement of temperature in the air. In this case the approximation $\frac{\mathrm{d}n}{\mathrm{d}T} = -1\mathrm{e}^{-6}$ could be applied. The uncertainty caused by the deflection of the wave is at least one order smaller than the uncertainty described above. On the other hand, for highly refractive fields (e.g. in water, when $\frac{\mathrm{d}n}{\mathrm{d}T} = -1\mathrm{e}^{-4}$) it can play a major role.

Abbreviation:

CCA	constant current anemometry
DHI	digital holographic interferometry
HI	holographic interferometry
M-Z	Mach-Zehnder
T-G	Twyman-Green

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