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Detection of the $10^{6.7}$ Kelvin Intergalactic Medium in Long Cosmic Filaments

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The warm/hot intergalactic medium (WHIM) within cosmic filaments is one of the least well-characterized baryon repositories in the local Universe. The extremely weak signals in either X-rays or the Sunyaev-Zeldovich effect challenge its robust detection. We utilize SRG/eROSITA All-Sky Survey data to examine WHIM emission properties in > 20 Mpc long cosmic filaments. We detect a 9.2σ significance of X-ray emission spatially coincident with cosmic filaments traced by galaxy distribution. After correcting for undetected source contributions, the WHIM detection remains significant at $> 4\sigma$. We stack a broadband 100-eV resolution spectrum of cosmic filaments and measure a mean WHIM gas temperature of $10^{6.7}$ Kelvin, suggesting that the phase we detect is in the highest temperature among the entire WHIM phases predicted by numerical simulations.

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