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Redshift Studies of Scintillating and Non-scintillating Extragalactic Radio Sources: Direct Detection of the Ionized Intergalactic Medium?

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Abstract. Interstellar scintillation has been shown to be primarily responsible for intraday variability exhibited by extragalactic sources at centimeter wavelengths. The recent Micro-Arcsecond Scintillation-Induced Variability (MASIV) survey has shown that 56% of flat-spectrum extragalactic radio sources scintillate; such behaviour is both too common and too important to ignore. A study of the physical properties of scintillating sources is severely handicapped by the absence of reliable redshift measurements for most such objects. This paper presents new redshifts obtained at the 2.6 m Nordic Optical Telescope in La Palma, Spain. It also presents a critical evaluation of redshifts obtained from the literature. The entire dataset is then used to examine any difference in the redshift distributions of scintillating and non-scintillating extragalactic radio sources. We report a strong formal detection, with 98% confidence, of a redshift dependence on the fraction of scintillators with a deficit of scintillating sources above a redshift of ~ 2. This deficit is consistent with angular broadening due to scattering in the intergalactic medium, which then makes the higher-redshift sources too large to exhibit scintillation due to the interstellar medium of our Galaxy. If confirmed, this constitutes a detection of scattering due to the ionized IGM at z$>$ 2 resulting from intergalactic turbulence and thus detection of energy input into the IGM. More redshifts are necessary, however, to rule out selection effects including the possibility that the deficit of scintillating sources at high redshift simply results from the paucity of measured redshifts for weaker sources. A companion poster (Lazio et al., p. 372) presents a related multi-wavelength VLBA program to study the cores of scintillating and non-scintillating AGN and search for indications of an IGM.