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A Measurement of the Isotropy of the Cosmic Microwave Backround at 19 GHz

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50.03

Use of Uncertainties in Place of Upper Limits

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Several methods are discussed to handle data samples which consist of measurements with large associated uncertainties. The uncertainties may be so large for a fair fraction of the sample, so that one would ordinarily consider assigning upper limits to these points and applying techniques from survival statistics. In the methods to be presented, there is no need to replace measured values with limits. Parametric and non-parametric approaches are demonstrated. Simulations show that the use of uncertainties reduces the variance of the resultant distributions and improves estimates of derived quantities. Data for the quasar X-ray luminosity function is analyzed as an example, to determine the dependence of the X-ray to optical luminosity ratio on luminosity.

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50.04

What is the Origin of the QSO Absorbers?

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Recent observations show that many, if not all, MgII QSO absorbers arise in HII regions. It can be argued, statistically, that the low redshift sample of mainly MgII absorbers is identical to the higher z absorbers, known mainly from CIV. Therefore, it is likely that the high z absorbers are also formed directly in HII regions, so the main ionization source for the absorbing gas is nearby O stars. Archival IUE data show that, empirically, strong absorption lines of a wide range of ions can be formed in such situations, with CIV often the dominant ion. Analogies with halos of normal low redshift galaxies, including our own, do not provide good analogies to the absorbers.

The statistics of the absorbers then may reveal something of the history of galaxy formation. The data are consistent with a population of galaxies that reached a maximum cross-section in hot gas near z=2.5; were smaller, or had much lower metallicities at higher redshift; and have become smaller, on average, at lower redshift. On average, star formation does not lead to so much local activity in gas near stars as in modern, gas-rich dwarfs. Giant HII regions, such as 30 Dor or Carina are more typical analogies to strong-line systems. Detection of numerous weak CIV doublets at high z with high signal-to-noise suggests that the objects were more extended and of lower metallicity at high z.

50.05

Periodicity In Redshift Distributions of Quasars and Distant Galaxies : a Clue To the Origin Of Very Large Scale Structure?

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The distribution of redshifts in $\ln(1+z)$ taken from the Palomar Bright Quasar Survey (Schmidt and Green 1983) is found to be consistent with a periodic distribution having $\Delta\ln(1+z) \approx 0.04-0.05 \equiv C$. The $\ln(1+z)$ distribution of quasar redshifts taken from the APM Survey (Foltz *et al.* 1987) appears to be consistent with the same periodicity. Although the samples used to establish this periodicity are new, the attempts of finding some regularities in the distribution of quasar redshifts have been undertaken for a long time. An early finding of two (Burbidge 1968) and then many peaks in $\ln(1+z)$-distribution of quasars led to revealing a periodicity of those peaks with $\Delta\ln(1+z) \approx 0.20 \equiv C_Q$ (Karlsson 1977), that has been confirmed by many authors (for a comprehensive review, see Arp *et al.* 1990). Most of the researchers are agree that this periodicity cannot be explained by selection effects such as influence of spectral lines. Recently, a similar periodicity has been found in the very deep pencil-beam redshift surveys of galaxies at the Galactic poles with $\Delta\ln(1+z) \approx 0.043\ h_{100} \equiv C_G$ (Broadhurst *et al.* 1990). Our value for C is much closer to C_G than to C_Q. As the distribution of absorption-line redshifts in $Ly\ \alpha$- forest also shows a periodicity with $\Delta\ln(1+z) \approx 0.05$ (Chu and Zhu 1989), the value of C_G seems to represent an intrinsic characteristic of the periodicity.

I have analyzed several models to explain the origin of the suggested periodicities. A model in which inhomogeneities 1) had originated before inflation and 2) transformed eventually into density peaks with maximum wavelength equal to the horizon size at the moment of recombination ($z \approx 10^3$) would give at the present for very large scale structure a periodic distribution: $\ln(1+z) \approx 0.04n + 0.04$, $n = 0, 1, 2, \ldots$, which is close to that suggested above. Some of numerous implications which follow from these considerations are discussed in the talk.

50.06

A Measurement of the Isotropy of the Cosmic Microwave Background at 19 GHz

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We have completed a 19.2 GHz full sky survey with 3 degree angular resolution. The average noise per resolution element expressed as an equivalent blackbody temperature is 0.7 mK. There is evidence of Galactic emission even at high galactic latitudes. Nevertheless, we are able to place an upper limit on fluctuations of the microwave background of $\Delta T/T \lesssim 4\times10^{-5}$ on angular scales from 10 to 90 degrees. The limit on the quadrupole anisotropy of the radiation is $\Delta T/T \lesssim 2\times10^{-5}$. The implication for several cosmological models will be discussed.

50.07

Limits on Cold Dark Matter Models from Recent Measurements of the Cosmic Background Radiation

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We have made recent balloon borne and S. Pole measurements of the anisotropy in the Cosmic Background Radiation. The measurements were done using a 30 arc minute beam at a wavelength of 3mm. The instrument uses a 1 meter diameter off axis Gregorian telescope with a chopping elliptical secondary. The detector used was a Superconductor-Insulator-Superconductor (SIS) mixer with a High Electron Mobility Transistor (HEMT) IF amplifier. The detector noise is 5 times the quantum limit. No anisotropy is seen at a 95% confidence level of 2.7×10^{-5} at an angular scale of 20 arc minutes for a simple gaussian autocorrelation function model of fluctuations. This places stringent limits on Cold Dark Matter cosmology models. In particular for an unbiased model with $\Omega_{BARYON} \leq 3\%$, open CDM universes must have $\Omega_0 \geq 0.8$ at 95% confidence level. In addition, measurements of the galactic plane indicate an anomolously low spectral index for interstellar dust emission.