PAINEL 175

SOFTWARE DE REDUÇÃO DE DADOS PARA ESPECTRÓGRAFOS DE CAMPO INTEGRAL

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O projeto de software do espectrografo SIFS/Eucalyptus foi desenvolvido para minimizar a contaminação entre espectros de fibras adjacentes. Para isto desenvolvemos um algoritmo que ajusta perfis gaussianos na direção espacial das fibras. O procedimento consiste em determinar a largura e a posição do espectro de cada fibra em uma situação ideal: usando lâmpadas de calibração e cobrindo fibras vizinhas. Desta forma podemos com uma alta razão sinal–ruído e sem contaminação caracterizar cada fibra. Após feita a caracterização de todas fibras em todos comprimentos de onda de interesse podemos observar nossos objetos e determinar sua intensidade em cada comprimento de onda. Para isso fazemos o ajuste simultâneo da intensidade de todas fibras. É importante notar que neste estágio a posição e a largura do espectro de cada fibra são assumidos iguais aos medidos na fase de calibração. Durante o ano de 2004 reescrevemos inteiramente os programas de ajuste para melhorar sua performance e confiabilidade de um ponto de vista computacional. Também determinamos os limites aceitáveis para mudanças nos valores da posição e largura de cada fibra entre o momento da calibração e da observação.

PAINEL 176

THE WHITE MOUNTAIN POLARIMETER: A TELESCOPE TO MEASURE CMB POLARIZATION

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A current issue in observational cosmology is to measure and map polarization of the Cosmic Microwave Background (CMB). Linear CMB polarization results from Thomson scattering of CMB photons during the decoupling and reionization era. Detection of CMB polarization at different angular scales provides information that helps break degeneracies between some combinations of cosmological parameters. The White Mountain Polarimeter (WMPol) is a ground-based telescope and microwave receiver system. The receiver system consists of two pseudo-correlation polarimeters based on High Electron Mobility Transistor amplifier technology and operates in Q-band and W-band. The receiver is mounted on an off-axis Gregorian telescope with a 2.2 m parabolic primary and a 0.9 m ellipsoidal secondary mirrors. A Gifford-McMahon cycle cryogenic refrigerator, with helium as the refrigerant, is used to cool the radiometers to less than 30 K. WMPol was installed at the White Mountain Research Station in Eastern California in September 2003. A novel remote control system was installed in January 2004 to allow the telescope to be operated via the internet. During April through October 2004 we observed a sky region of approximately one degree angular diameter centered about the North Celestial Pole resulting in 2169 hours of raw data for each band, including CMB data and data obtained for instrument characterization. We present here a description of the instrument and the data collected during our observing campaign.

PAINEL 177

WIDE-FIELD IMAGING WITH THE GIANT METERWAVE RADIO TELESCOPE (GMRT)

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The Giant Meterwave Radio Telescope (GMRT - $19^{\circ}05'48''N,74^{\circ}03'00''E$) is presently the largest radio telescope in the world operating in the meter-decimeter wavelengths. It consists of 30 parabolic antennas, each of 45-meter diameter, spread in a "Y" configuration where the largest baselines are of the order of 25 km. The field-of-view is ~24'×24' and the resolution is ~2''×2'' while operating at 1.4 GHz. At 153 MHz, the GMRT field-of-view is ~$3^{\circ}48'\times3^{\circ}48'$ and the resolution is 20''×20''. The dual-polarization bandwidth is 16 MHz. In this work, we present the particulars of obtaining wide-field images using such a high spatial resolution radio telescope. The observational techniques, as well as the data reduction procedure using the National Radio Astronomy Observatory (NRAO) software AIPS (Astronomical Image Processing System), are summarized in this work. We use extragallactic data from the GMRT archive as well as solar data obtained mainly in the month of April, 2005 as examples of the wide-field imaging.

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W-BAND FEED-HORNS WITH PECULIAR GEOMETRIES FOR HIGH-EFFICIENCY LARGE FOCAL-PLANE ARRAYS

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New instruments to measure the polarization of the Cosmic Microwave Background (CMB) need to be at least one order of magnitude more sensitive than current detectors. However, since cryogenic detectors are reaching the photon-noise limit, the only way to increase their sensitivity is to use an array with increasing number of detector elements. On the other hand, as the number of components increases, common focal-plane arrays quickly lose their efficiency, become much more complex and expensive. Focal-plane arrays also suffer from beam mismatch that generates dangerous effects, like mode mixing, which are prohibitive for CMB polarization measurements. As a solution we propose a new concept of feed-horns, where an intrinsic tilt angle is introduced between the wave propagation vector and the symmetry axis of the horn. This results in a simplification to assemble the horns into an array. By increasing the tilt angle as a function of the distance of the horn from the center of the focal-plane, we can improve its efficiency. Using computational simulations based on a finite integration method, we compute the performance of this kind of horns in the W-band for three tilt angles: 0, 3, and 7 degrees. We find a very good impedance matching, with a backscattering coefficient smaller than -25 dB across the band. The gain is higher than 20 dBi and side lobe levels lower than -22 dB. One unexpected result is that the angle between the main beam and the horn axis changes within the frequency band.