others, it is found that the UBV colors of galaxies (from ellipticals to irregulars) can be explained with exponentially decreasing star formation rates and bimodal initial mass functions.

Inflation and Generation of Primordial Black Holes

Chungyun Cho and J. J. Hyun
Department of Astronomy, Seoul National University

The formation of primordial black holes in 'two scalar fields' model is investigated. The scalar field ϕ_1 is one of Linde's chaotic inflationary field and scalar field ϕ_2 is is the adjoint Higgs field of SU(5) grand unified theory with Coleman-Weinberg spontaneous symmetry breaking. It is assumed that inflation is driven by ϕ_1. It is shown that primordial black holes can be produced right after the critical temperature of ϕ_2 (i.e., $\approx 1.31\times10^{14}$ Gev). If the reheating temperature is 1.48×10^{14} Gev, black holes with $M\approx$1kg are formed and the total mass of the black holes produced then within 10cm, corresponding to today's horizon, is about 10^{55}g—the horizon mass of the present Universe.

The Effects of Initial Mass Function and Star Formation Rate on the Galactic Chemical Evolutions

Rim, Jung Ea and Ann, Hong Bae
Department of Earth Science, Pusan National University

We investigated the effects of the Initial Mass Function (IMF) and Star Formation Rate (SFR) on the galactic chemical evolutions using numerical models based on the disk-halo two zone model of Lee and Ann(1981). In our models metal free intergalactic gas comes into halo and dilutes the halo metals, while the enriched gas from massive halo stars increases the disk metal abundance in the initial period of disk evolution. We also take into account the radial gas flow in the disk evolution. The models with time-dependent IMFs can solve the G-dwarf problem and agree with the observations in the solar neighborhood. The power law SFR (n=2) well describes the chemical history of the solar neighborhood, if there is no more stellar formation in the halo after the initial period of the halo formation.

The Development of a Cryogenic 40 GHz-Band Receiver

Seog-Tae Han, Chang-Hoon Lee, Young-Sun Park,
Hyun-Goo Kim, Se-Hyung Cho, Jeong-Bin Seo
Daeduk Radio Astronomy Observatory
Institute of Space Science & Astronomy

We built a cryogenic receiver working at the frequency range 35 GHz~50 GHz for the cosmic radio observations for the first time in Korea.

A GaAs Schottky diode was employed for the biased cryogenic balanced mixer. We used the three stage HEMT amplifier for the first amplifications, which has a 400 MHz bandwidth at the center

frequency 1.4 GHz. We built a dewar to cool down the receiver to 20K using liquid helium to minimize thermal noise.

The minimum receiver noise temperature was found to be 83K (DSB) by biasing the mixer, which is more than about 2 times improvement compared to the mixer without the bias.

This receiver will be installed on the 14m radio telescope and used to detect the extremely weak interstellar molecular lines.

150 GHz대 초저잡음 우주전파 수신기 제작

이창훈 · 한석태 · 조세형 · 서정빈
천문우주과학연구소, 대덕전파천문대

우주전파 관측용 150 GHz대 (120~170) 초저잡음 수신기를 14m 전파망원경에 설치 사용할 목적으로 독일 Radio-Physics사에 의해 제작 하였다.

수신시스템은 전형적인 GaAs Schottky 다이오드를 사용한 믹서, 2단 HEMT 증폭기, 60~85GHz를 cover하는 Gunn 발진기를 중심으로 한 국부발진계, RF 입력신호와 LO 빔을 coupling 시켜주는 FABRY-PEROT Diplexer, CTI-350 refrigerator에 의한 냉각장치 및 front-end 각 부품들의 제어장치로 구성되었다.

실험실 시험 결과 수신기 잡음온도 (DSB)는 150K(125GHz), 140K(150GHz)를 얻어 현재 사용중인 미국 FCRAO의 150 GHz대 수신기 잡음온도, 200K(125GHz), 150K(150GHz)의 결과보다 우수한 감도를 나타냈다.

따라서 망원경에의 설치 및 시험에 이어 아직 활발히 진행되고 있지 않는 이대역의 우주전파 분광 관측에 활용됨으로써 전파천문학 연구에 기여할 것이다.

Manufacture of an Autocorrelation Spectrometer for Radio Astronomical Observations

In-Sung Yim, Duk-Gyoo Roh and Se-Hyung Cho
Daeduk Radio Astronomy Observatory
Institute of Space Science & Astronomy

The autocorrelation spectrometer as a new type backend of the 14-m radio telescope has been manufactured in co-operation with Five College Radio Astronomy Observatory. The design method and construction details are presented.

This spectrometer consists of an IF-to-baseband converter, analog-to-digital converter, autocorrelator board and interface board. It has a total of 1024 channels from which four sets of resolutions such as 2.5, 5, 10 and 20KHz can be chosen. Thus, the autocorrelation spectrometer has much higher resoltuion than the filter bank type spectrometer and we can make advanced high resolution observations for dark clouds, maser sources, etc.