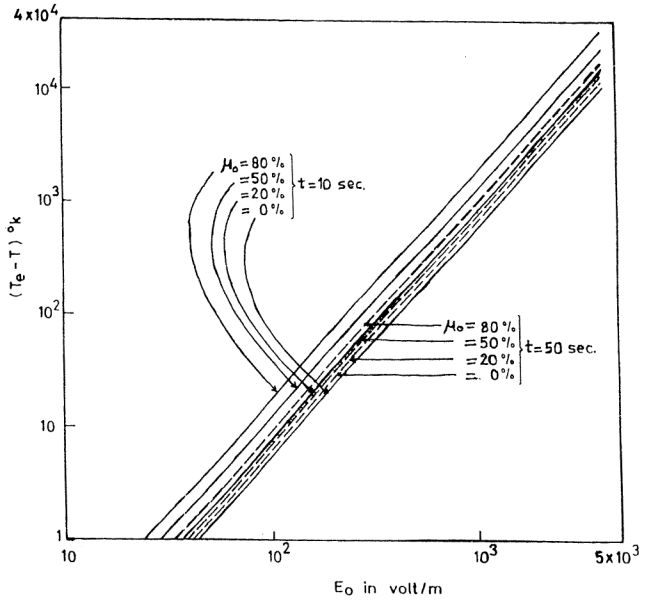

Figure 4. Variation of electron temperature with electric field strengths for different modulation indices for $\Omega = 0.03$ rad sec^{-1}.

of constant amplitude is seen to increase with enhanced heating of the filamentary solar plasma. The electron temperature is found to increase with increasing amplitude of the high frequency waves and is also affected by the changing index of amplitude modulation of long-period waves.

The present analysis clearly shows that the high frequency electromagnetic radiations, at times, could be modulated by the long-period p-mode oscillations associated with the growing filamentary solar magnetic flux tubes. Careful recording of the high frequency signal strength over a long period is required for ascertaining its origin in the sunspot regions. The modulation of high frequency waves by long-period oscillations can be best seen by time compression of the long-period modulation. The depth of modulation index of high frequency signal is governed by the varying solar conditions and has inbuilt potential for diagnostic studies of sunspot processes.

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Relationship between the reference value of young people's haematocrit and geographical factors in China

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This paper provides a scientific basis for a unified standard of the reference value of healthy young people's haematocrit in China. It studies the relationship between the reference values of healthy young people's haematocrit, tested according to the Wintrobe Laws and five geographical factors. It is found that the altitude is the most important factor affecting this reference value. As the altitude gradually increases, the reference value also increases, the relationship is quite significant. By using the method of stepwise regression analysis, two multivariate regression equations are deduced. If the geographical index values in a particular area in China are known, the reference value of haematocrit in this area can be established by means of the regression equations. Furthermore, China can be divided into six districts: Qingzang, South-west, North-west, South-east, North and North-east.

HAEMATOCRIT is an important index of haemorheology. At present, it is difficult to achieve accuracy in clinical practice, because of the lack of a unified standard of the reference value of young people's haematocrit in China. Many researchers have measured the reference value (Wintrobe) of local young people's haematocrit[1–47]. No reports on the relationship between this reference value and geographical factors were found. By means of correlation and stepwise regression analysis, research on this relationship has showed that there are certain regular patterns between the reference value of young people's haematocrit and geographical factors.

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The reference values of healthy young people's haematocrit from various administrative units (hospitals, research institutes and universities) have been collected in China. It includes the reference values of 13,818 young men, tested in 200 units and those of 8486 young women, tested in 133 units. The ages of the volunteers range from 18 to 25 years. It is a mean value of young people's haematocrit in each area, the reference values of young men's haematocrit range from 39 to 68%, and those of young women's range from 33 to 60%. 40 180 random samples have been studied in every area. These units are located in 33 provinces, cities, special administrative regions and autonomous regions in China, excluding Taiwan province. The reference value of young people's haematocrit was determined according to Wintrobe[48]. In this routine method, 2.5 ml venous blood was collected in an anticoagulant (heparin) test tube. After that, the mixture was stirred slightly and absorbed into Wintrobe test tube up to the '10' graduation, without any air bubbles. Then the tube was centrifuged for 30 min at 2300 *g*, after which the reference value of young people's haematocrit was read.

The geographical factors come from relevant geographical works and dictionaries[49,50]. Geographical factors selected include altitude (0 to 5500 m), annual sunshine hour (1000 to 3600 h), relative humidity (30 to 85%), annual average temperature (– 10 to 26°C) and annual precipitation (30 to 2500 mm).

By using the method of mathematical correlation analysis[51], single correlation coefficients between the reference value of young people's haematocrit and five geographical factors can be calculated (Table 1).

By using the method of stepwise regression analysis, two regression equations are given according to the reference value of young people's haematocrit and geographical factors:

$$\hat{Y}_1 = 42.6 + 0.00340X_1 + 0.0494X_3 - 0.124X_4 \pm 7.3,$$

$$\hat{Y}_2 = 43.7 + 0.00213X_1 - 0.350X_4 + 0.00151X_5 \pm 4.8.$$

In the above equations, $\hat{Y}_1$ is the reference value of young men's haematocrit (%); $\hat{Y}_2$ is the reference value of young women's haematocrit (%); X_1 is altitude (m); X_3 is the relative humidity (%); X_4 is the annual average temperature (°C); and X_5 is the annual precipitation (mm). 7.3 and 4.8 are the value of 1.96 standard deviations, respectively[52].

For both sexes, the predictors in the above two regression equations showed statistically significant association with haematocrit, based on F-test.

From single correlation coefficients, it is found that the reference value of young people's haematocrit increases with altitude; the correlation is quite significant and the relation is the closest. With the increase in the annual sunshine hour, this reference value also increases; the correlation is quite significant, but the relation is the slightest. The reference value of young people's haematocrit decreases with increase in relative humidity, increase in annual average temperature, increase in annual precipitation; the correlation is quite significant. From this analysis, it can be concluded that altitude is the main factor affecting the reference value. As altitude rises, the air becomes thinner and thinner, and the oxygen content gradually reduces. In response to the lack of oxygen, the amount of red blood cells in the human body gradually increases. It induces an increase in the reference value of young people's haematocrit[53].

If geographical factors of a particular area are known in China, the reference values of young people's haematocrit in this area can be calculated according to the regression equations. For example, in the Beijing area, the altitude is 31.2 m, the relative humidity is 60.0%, the annual average temperature is 11.5°C, the annual precipitation is 644.2 mm. By means of the regression equations, the following can be calculated:

$$\hat{Y}_1 = 42.6 + 0.00340 \times 31.2 + 0.0494 \times 60.0 - 0.124 \times 11.5 \pm 7.3 = 44.2 \pm 7.3,$$

$$\hat{Y}_2 = 43.7 + 0.00213 \times 31.2 - 0.350 \times 11.5 + 0.00151 \times 644.2 \pm 4.8 = 40.7 \pm 4.8.$$

Hence the calculated reference value of young people's haematocrit can be obtained, the value for young men is 44.2 ± 7.3%; that for young women is 40.7 ± 4.8%. It has been found that the reference value in the case of men is higher than that of women.

The topographical outline of China is a three-step, west-east staircase. It is high in the western area and low in the eastern area. It begins with the Qingzang plateau, which is about 4000 m above sea level. Crossing the Kunlun and Qilian ranges on the plateau's northern edge and the Hengduan Mountains on its eastern edge, the land

Table 1. Correlation coefficient of hematocrit with selected geographical factors

Variable	Men (n = 200)	P value	Women (n = 133)	P value
Altitude	0.882	< 0.01	0.906	< 0.01
Annual sunshine hour	0.577	< 0.01	0.516	< 0.01
Relative humidity	– 0.702	< 0.01	– 0.679	< 0.01
Annual average temperature	– 0.831	< 0.01	– 0.870	< 0.01
Annual precipitation	– 0.626	< 0.01	– 0.601	< 0.01

slopes away to highlands and basins mostly from 2000 to 1000 m above sea level; then it descends further eastward to hilly regions and plains mostly below 500 m. With the gradual reduction of annual sunshine hours in a northwest-southeast direction, the annual average temperature gradually rises from north to south, and the relative humidity and annual precipitation gradually increase in a northwest-southeast direction. The population is much denser in the eastern area than in the western area.

According to the similarity of the reference value of young people's haematocrit and taking the altitude as the main differentiating factor, China can be divided into three parts, namely the eastern part, the middle part and the western part. Furthermore, on the basis of altitude, referring to distribution of population density and other geographical factors, we can divide three districts in the eastern part (South-east, North and North-east districts), two districts in the middle part (South-west and North-west districts), and one district in the western part (Qingzang district).

The Qingzang district includes the Tibet Autonomous Region and Qinghai Province. In the Lhasa area, for example, the altitude is 3658.0 m, the relative humidity is 45.0%, the annual average temperature is 7.5°C and the annual precipitation is 454.0 mm. Using the regression equations, the reference value of young people's haematocrit can be obtained; the reference value for men is 56.3 ± 7.3% and that for women is 49.5 ± 4.8%.

The South-west district includes Sichuan Province, Chongqing City, Guizhou Province and Yunnan Province. In the Guiyang area, the altitude is 1071.2 m, the relative humidity is 79.0%, the annual average temperature is 15.3°C and the annual precipitation is 1174.7 mm. The reference value of young men's haematocrit is 48.2 ± 7.3% and that of young women is 42.4 ± 4.8%.

North-west district includes Shaanxi Province, Gansu Province, the Xinjiang Uighur Autonomous Region, the Ningxia Hui Autonomous Region, the Inner Mongolia Autonomous Region and Shanxi Province. In the Yinchuan area, the altitude is 1111.5 m, the relative humidity is 59.0%, the annual average temperature is 8.5°C and the annual precipitation is 202.8 mm. The reference value of young men's haematocrit is 48.2 ± 7.3% and that of young women is 43.4 ± 4.8%.

The South-east district includes Taiwan Province, Hainan Province, Guangdong Province, Hongkong Special Administrative Region, Macao Special Administrative Region, the Guangxi Zhuang Autonomous Region, Shanghai city, Jiangsu Province, Zhejiang Province, Anhui Province, Fujian Province, Jiangxi Province, Hunan Province and Hubei Province. In the Nanchang area, for example, the altitude is 46.7 m, the relative humidity is 77.0%, the annual average temperature is 17.5°C and the annual precipitation is 1596.4 mm. The reference value of young men's haematocrit is 44.4 ± 7.3% and that of young women's is 40.1 ± 4.8%.

The North district includes Beijing City, Tianjin City, Hebei Province, Shandong Province and Henan Province. In the Beijing area, the altitude is 31.2 m, the relative humidity is 60.0%, the annual average temperature is 11.5°C and the annual precipitation is 644.2 mm. The reference value of young men's haematocrit is 44.2 ± 7.3% and that of young women's is 40.7 ± 4.8%.

The North-east district includes Liaoning Province, Jilin Province and Heilongjiang Province. In the Changchun area, the altitude is 236.8 m, the relative humidity is 65.0%, the annual average temperature is 4.9°C and the annual precipitation is 593.8 mm. The reference value of young men's haematocrit is 46.0 ± 7.3% and that of young women is 43.4 ± 4.8%.

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Analysis of drug susceptibility in *Mycobacterium tuberculosis* isolated from Thiruvananthapuram using Alamar Blue assay

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Tuberculosis (TB) is caused by *Mycobacterium tuberculosis* and the control of the disease is hampered by widespread emergence of drug resistance in this pathogen. An early information on drug susceptibility would greatly facilitate an effective treatment of TB. Seventy-eight isolates of *M. tuberculosis* were obtained from TB patients from Thiruvananthapuram over a period of about 18 months. Resistance and susceptibility of these isolates to four frontline drugs were assayed using Alamar Blue, an oxidation–reduction dye. Thirty-six per cent of the isolates were susceptible to all the four drugs used, 21.8% were resistant to isoniazid, 8.9% to ethambutol and 2.6% to rifampicin. None was found resistant to streptomycin alone. Multidrug resistance (resistance to at least rifampicin and isoniazid) was found in 7.7% of the isolates. The remaining ones were resistant to combinations of two or more of the drugs. Alamar Blue-based assay promises to be an economical and fast method to determine drug susceptibility and resistance of *M. tuberculosis* to aid effective drug therapy.

AMONG the world's adult population, tuberculosis (TB) is the foremost cause of death from a single infectious agent[1]. In 1993 the World Health Organization declared TB as a global health emergency[2] and estimated that about three million people die of TB every year in the world, with about one-sixth of the deaths occurring in India. Human Immunodeficiency Viral (HIV) infection has been shown to increase the risk of developing tuberculosis. TB used to be completely curable by anti-TB drugs. Due to a variety of reasons[3], however, strains resistant to one or more of these drugs have emerged all over the world. In fact, multidrug-resistant (MDR) TB is the major hurdle in the TB control programmes. Global surveillance of drug resistance has been proposed as a means of augmenting databases of drug-resistant *Mycobacterium tuberculosis* isolates to help the development of future programme policy recommendations[4]. The widely followed Directly Observed Therapy, Short-

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