Magnetic fields of O and B stars: measurements, statistics and evolution

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We review the recent measurements of the magnetic fields of early-type stars. Most of them are collected in a new catalogue of the magnetic fields of OBA stars including our recent data. Basing on the data from the catalogue, we have investigated the statistical properties of an ensemble of the magnetic fields of OB stars. As a possible measure of the mean field we used the rms longitudinal magnetic field $\overline{\langle B_l \rangle}$. Our statistical experiment showed that for a number of field measurements $n \geq 3$ the value $\left\langle \overline{B}_l \right\rangle$ weakly depends on the distribution of the random moments of observations and on a structure of the field. We have investigated an eventual connection between the values of the rms mean field and the rotation velocity and found no correlation which is in an accordance with the fossil nature of the field. We also have calculated the differential magnetic field function (MFF) $F(B)$ for OB stars, determined by a such manner that a value of $F(B)dB$ is a probability that a mean field of an arbitrary chosen star is in interval $(B, B + dB)$. We found that MFF can be approximated by the power function $F(B) = \alpha \left(\frac{B}{B_0} \right)^{-\beta}$ with parameters $\alpha = 0.22$ and $\beta \approx 1.6$. The evidences of the steep decreasing of the MFF for small values of $\overline{\langle B_l \rangle} < 150$ G are found. We study the field evolution during the life of a star on the main sequence (MS) and found that the mean magnetic field can decrease in 4-5 times during the evolution from ZAMS to TAMS.