РАКЕТНО-КОСМИЧЕСКОЕ ПРИБОРОСТРОЕНИЕ И ИНФОРМАЦИОННЫЕ СИСТЕМЫ
2021, том 8, выпуск 1, с. 11–23

Satellite Microwave Radiometry for Earth Remote Sensing

I. A. Barsukov, *contact@spacecorp.ru*
Joint Stock Company "Russian Space Systems", Moscow, Russian Federation
V. V. Boldyrev, *contact@spacecorp.ru*
Joint Stock Company "Russian Space Systems", Moscow, Russian Federation
M. I. Gavrilov, *Cand. Sci. (Engineering), contact@spacecorp.ru*
Joint Stock Company "Russian Space Systems", Moscow, Russian Federation
G. E. Evseev, *contact@spacecorp.ru*
Joint Stock Company "Russian Space Systems", Moscow, Russian Federation
A. N. Egorov, *Cand. Sci. (Engineering), contact@spacecorp.ru*
Joint Stock Company "Russian Space Systems", Moscow, Russian Federation
P. A. Il'gasov, *contact@spacecorp.ru*
Joint Stock Company "Russian Space Systems", Moscow, Russian Federation
V. Yu. Pantsov, *contact@spacecorp.ru*
Joint Stock Company "Russian Space Systems", Moscow, Russian Federation
N. I. Strel'nikov, *contact@spacecorp.ru*
Joint Stock Company "Russian Space Systems", Moscow, Russian Federation
A. M. Strel'tsov, *contact@spacecorp.ru*
Joint Stock Company "Russian Space Systems", Moscow, Russian Federation
I. V. Chernyy, *Dr. Sci. (Engineering), icherny@cpi.infospace.ru*
Joint Stock Company "Russian Space Systems", Moscow, Russian Federation
G. M. Chernyavskiy, *Corresponding Member of the Russian Academy of Sciences, Dr. Sci. (Engineering), Prof., contact@spacecorp.ru*
Joint Stock Company "Russian Space Systems", Moscow, Russian Federation
V. V. Yakovlev, *Cand. Sci. (Phys.-Math.), contact@spacecorp.ru*
Joint Stock Company "Russian Space Systems", Moscow, Russian Federation

Abstract. The issues of development of the direction of satellite microwave radiometry in Russia in the interests of operational meteorology and oceanography are considered. The analysis of the current state of Russian and foreign radiometric ERS equipment in the microwave range is carried out. The technical characteristics of onboard multichannel microwave radiometers, combining the functions of a scanner and a sounder, are analyzed. The issues of metrological support of microwave measurements of equipment installed on Russian satellites of the Meteor-M series are considered. The original method of internal calibration of the MTVZA-GYA microwave scanner/sounding device is analyzed in detail in order to form the antenna temperature scale. The MTVZA-GYA calibration unit measures the radiation intensity of two matched loads with known brightness temperatures ("hot" and "cold"). An on-board calibrator is used as a "hot" load, it serves as an imitator of an absolutely black body, its brightness temperature of which is in the range of 240–300 K. Absolute (external) calibration is a transition from antenna to brightness temperatures and is performed using high-precision radiation calculations for specially selected natural testing sites. The issues of preliminary processing of MTVZA-GYA data are considered and examples of microwave images of the Earth in the scale of brightness temperatures are given.

Keywords: remote sensing, microwave radiometry, internal and absolute calibration, antenna, microwave scanner/sounder, antenna and brightness temperatures, satellite, radiometer, remote sensing data processing