Review of the manuscript "Ground-based Multichannel Microwave radiometer Antenna Pattern Measurements using Solar Observations" by Lianfa Lei et al.

The manuscript presents an estimation of the amplitude antenna pattern using solar scans. The authors show an application of the method to solar measurements from a multi-channel microwave radiometer. A good agreement of the retrieved patterns with those measured in an anechoic chamber was found.

In my opinion the manuscript has a number of flaws:

1. Lack of novelty. The presented method has been known for long time. Antenna pattern measurements with the sun as a signal source are widely used for active and passive microwave instruments in meteorology (Reimann and Hagen, 2016 "Antenna Pattern Measurements of Weather Radars Using the Sun and a Point Source" and references therein). In particular, solar scans are recommended as a daily routine for weather radars of national weather services (Chandrasekar et al 2015 "Calibration Procedures for Global Precipitation-Measurement Ground-Validation Radars", Fresch et al 2019, "Pointing Accuracy of an Operational Polarimetric Weather Radar"). Authors themselves give a list of references confirming this.
2. A large part of the manuscript shows radiometry and antenna basics, which can be found in every handbook on the microwave radiometers (e.g. in Ulaby and Long "Microwave Radar and Radiometric Remote Sensing").
3. The authors do not mention design and dimensions of the antennas. Typically, mirrors with no subreflectors are used. In this case the antenna properties can be relatively accurately approximated following known relations between the gain and beamwidth and the antenna aperture size. It is also not clear why uncertainties of the beamwidth are so large (given are 3.8+/-0.8 deg and 1.9+/-0.8 deg). If the design of the antenna system is known, it should be possible to calculate the beam width with an accuracy of 15 %.
4. Lack of motivation for meteorological applications of MWR. For main applications of radiometers in meteorology, which are temperature and humidity profiling and integrated water vapor, the atmosphere is often assumed to be uniform, i.e. the radiation is constant within the antenna beam. Taking into account that beamwidths of MWR are in the order of 1-4 deg, in the case of clear sky this assumption is fully justified. In such cases only the antenna loss, which is included in the total loss during the hot-cold calibration, matters. Gain and beamwidth have no impact. In presence of liquid clouds, the radiation within the beam is not homogeneous. But it is not clear how more precise knowledge of the beamwidth and gain can help to take this effect into account.

Taking the above-mentioned points, I think that the manuscript does not fulfil requirements for the publication in AMT and should be rejected.