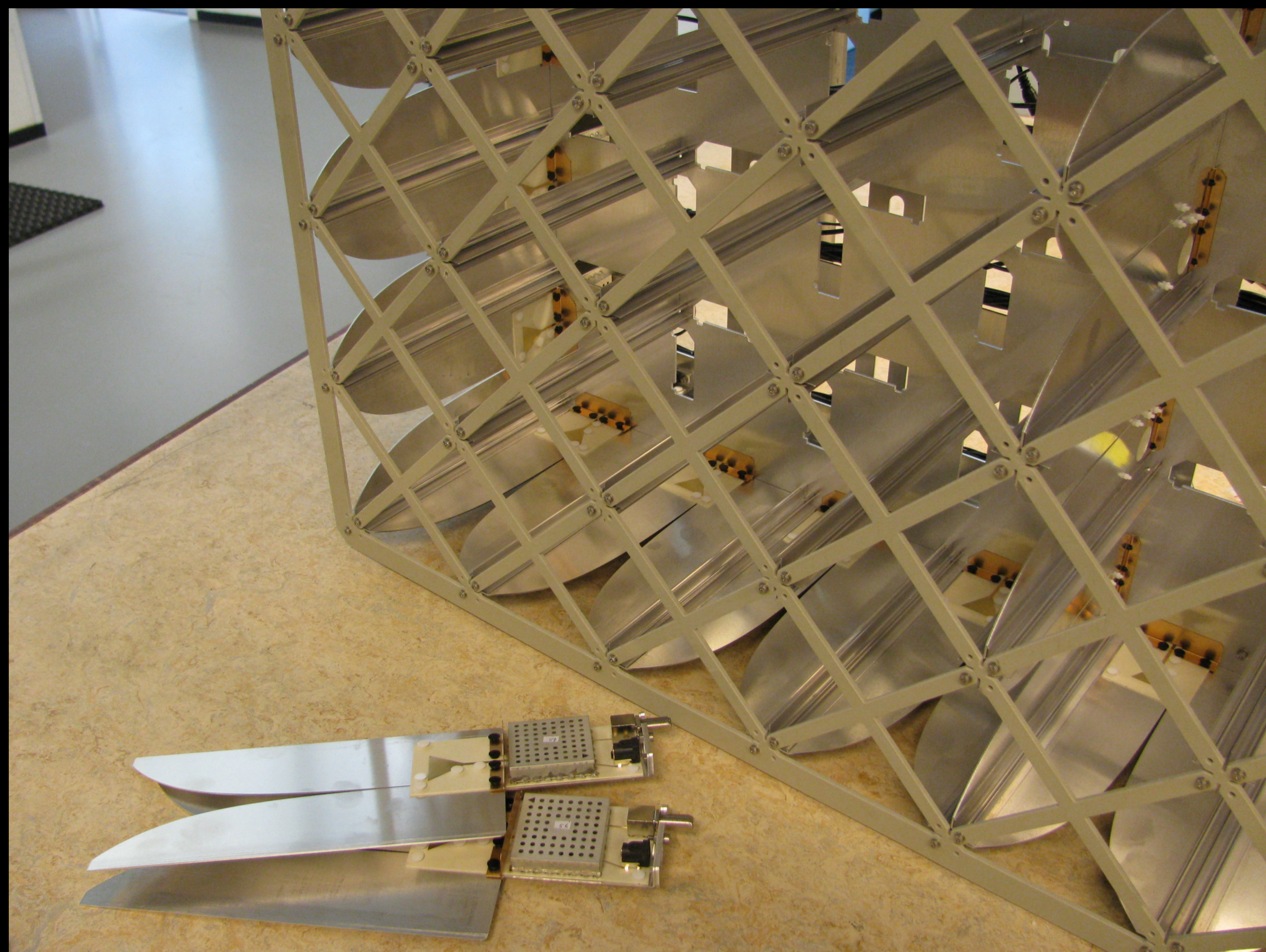




A wide-field camera for the WSRT

Current radio telescopes, such as the WSRT, utilise only a single receiver in the focal point of each dish to detect the cosmic signals. By combining these signals from all 14 dishes, the WSRT can image a region on the sky about as large as the size of the full moon. In the past 40 years, the WSRT has been used in this way to study many galaxies in the nearby Universe. However, in order to find out what galaxies at larger distances (and hence in the distant past!) look like, and how such galaxies evolve into what they are now, it is necessary to study galaxies over the entire sky. With the current WSRT, such a project would take about 100 years, but with the improvements of the Apertif project, these observations can be done in only a few years! The Apertif project will replace, in each dish, the current single-receiver systems by an array of 121 small receivers. As a result, a much larger region can be studied in a single observation. Because of this, the survey speed of the WSRT will increase by a factor 30.



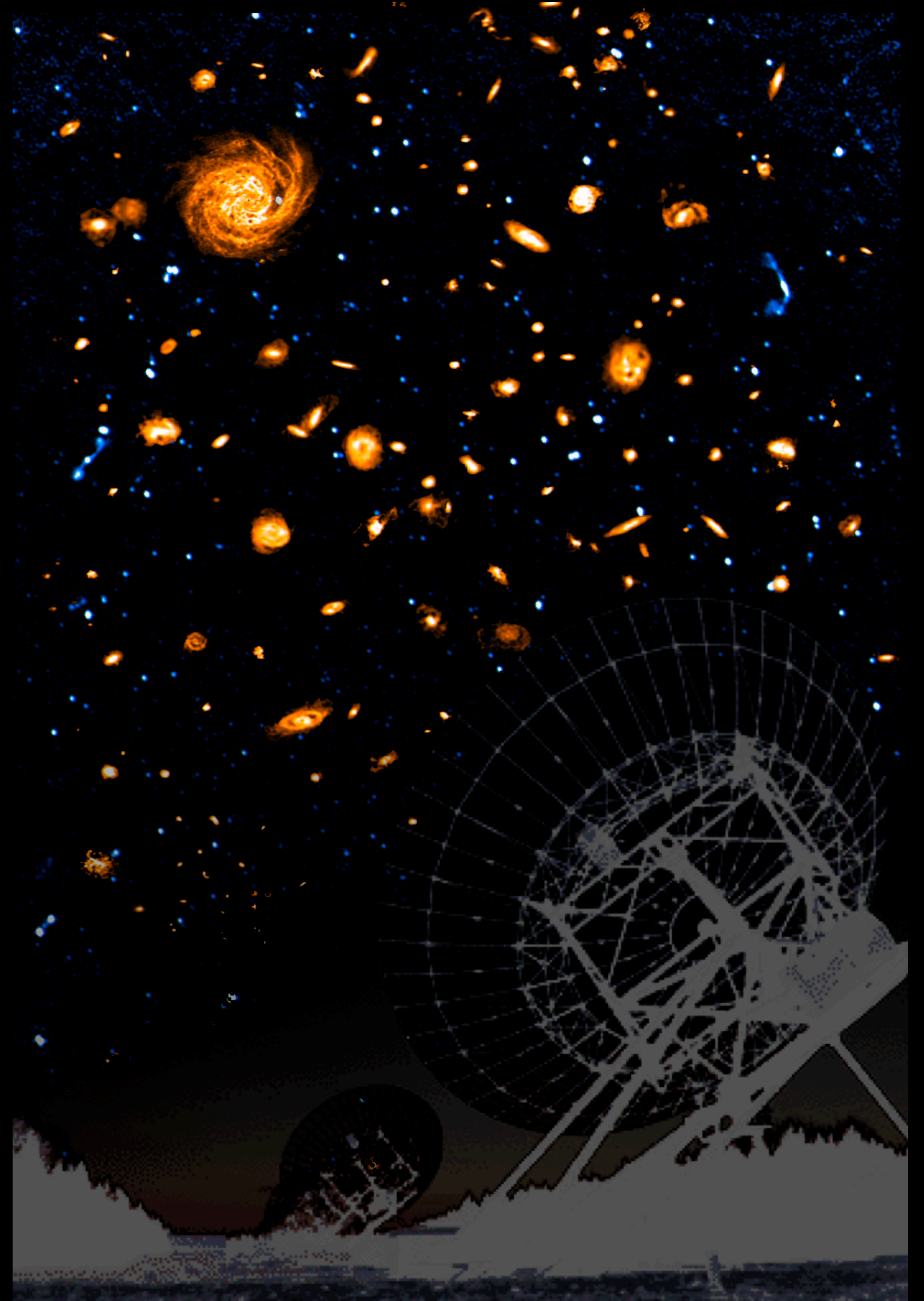
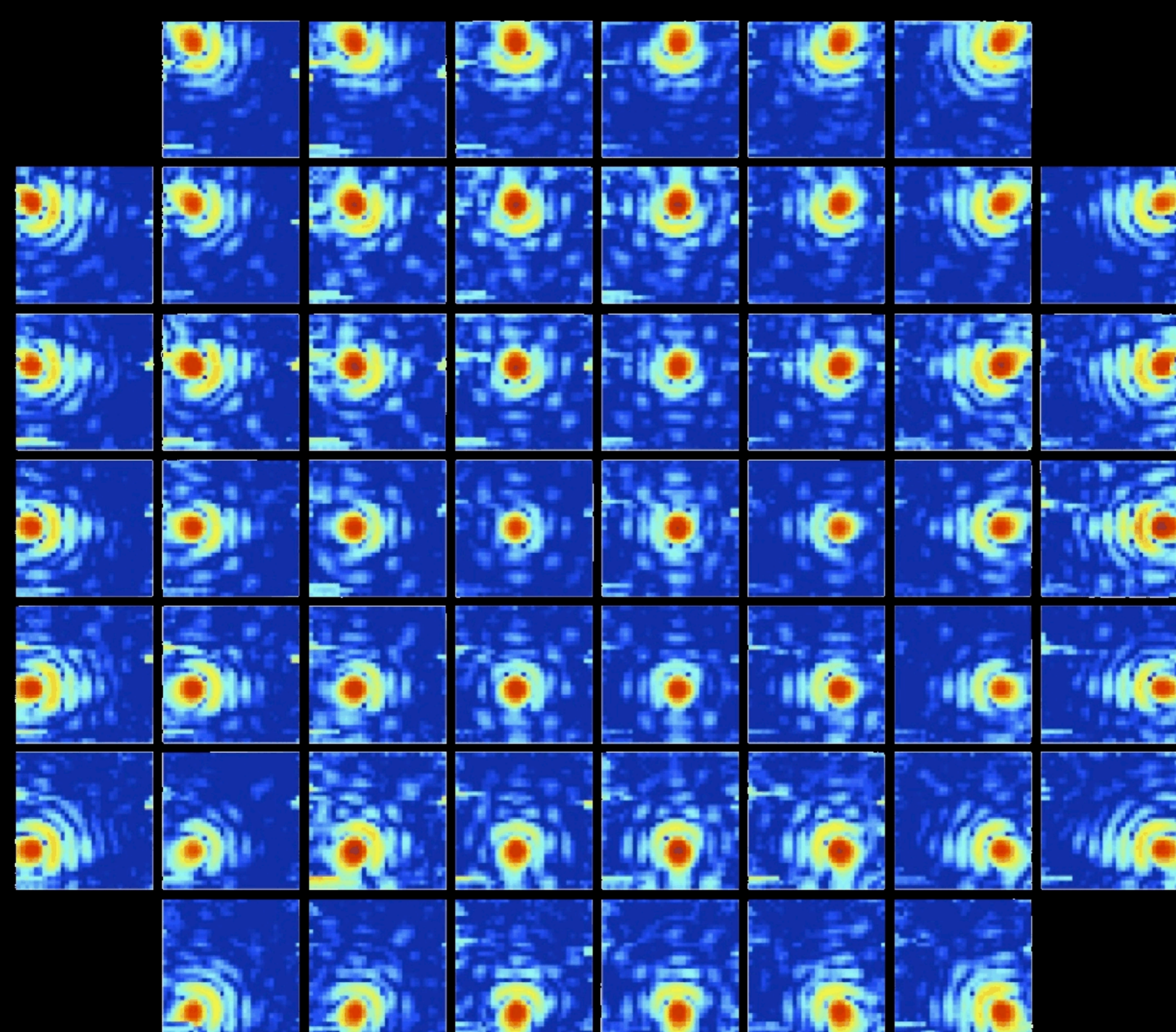
Left: detail of an Apertif receiver system. It consists of 121 separate small antennas. The current WSRT corresponds to only a single such antenna. Each WSRT dish will be equipped with such an array of 121 antennas. Right: a full Apertif receiver mounted in the focal plane of one of the WSRT dishes.



Because each antenna in an Apertif array is located in a slightly different position in the focal plane of a WSRT dish, it detects the cosmic signals from a slightly different location on the sky. In this way, one can build a 'radio camera'. By combining all signals from all elements of an Apertif array, the field of view of the telescope is increased by a factor 30. The figure below illustrates the difference with the field of view of the current WSRT.



Each square in the figure below corresponds to the same region on the sky, with an area of about 10 times the size of the full moon. Every red spot shows the region on the sky from which a particular element of an Apertif array detects the cosmic signals. This illustrates that each array is sensitive to radiation from a slightly different direction. However, it is also clear that, when taken together, they cover the entire region. Therefore, by combining the signals from all array elements, one can observe the entire region in a single observation. The field of view of the current WSRT corresponds to a single red spot.



The sky as Apertif will see it. The blue objects show the radio continuum emission from star forming galaxies and from galaxies with an Active Galactic Nucleus. The orange objects illustrate the cold, atomic Hydrogen in galaxies. Apertif will detect the Hydrogen in more than 100,000 galaxies, and the continuum emission from about 10,000,000 objects.