We investigate the formation of tidal dwarf galaxies in mergers of spiral galaxies. High resolution simulations of mergers have been run to investigate the formation of structure in the tidal arms of the merger remnant. We determine a set of properties for the bound objects detected in the tidal arms. We also compare mergers with mass ratios of 1:1 to those with 3:1.

We have used WINE, a new hybrid N-body / SPH code to simulate structure formation in the tidal arms of merging spiral galaxies. The code uses a parallel tree structure together with the special-purpose hardware GRAPE-5 for the computation of gravitational forces. Individual particle timesteps as well as various other features have been implemented (Wetzstein et al, in preparation).

The simulations included mergers with mass ratios of 1:1 and 3:1. Each progenitor galaxy consisted of a dark matter halo in which a gaseous and a stellar disk component as well as a stellar bulge were embedded. The encounters were prograde.

We use a friends-of-friends group finder in order to detect objects in the tidal arms. Then for each detected object, we extract the gravitationally bound particles for all later analyses.

Figure 1 shows the number of detected bound objects as a function of distance from the center of the merger remnant at the time when the central parts of the two progenitors merge. The time evolution of this mass spectrum is more significant for the 3:1 merger than for the 1:1 merger. For the latter the population of bound objects covered a mass range from a few $10^6 M_\odot$ up to $6 \cdot 10^8 M_\odot$, with the number of objects for a given mass decreasing roughly exponentially with increasing mass. For the 3:1 merger, the masses of the objects range from a few $10^6 M_\odot$ to initially a few $10^8 M_\odot$. However by the time a new disk starts to build up in the remnant, the total number of objects has decreased by a factor $\approx 2 - 3$. In addition, the highest mass objects have fallen back into the remnant and were dispersed, resulting in a decreased upper mass limit of $10^8 M_\odot$ for the detected objects. The nature of these objects is still unclear at the current resolution of the simulations, but new simulations should allow us to discriminate between possible progenitors of globular clusters and / or tidal dwarf galaxies.

An analysis of the composition of the detected objects shows that gas and stars contribute almost equally to the total mass of any particular object. There is only a small amount of dark matter in just a few objects, but this result could be influenced by different mass resolution between the dark and gaseous components.

1Max-Planck-Institut für Astronomie, Königstuhl 17, 69117 Heidelberg, Germany (wetzstein@mpia.de).