Antennas:

We looked at five different antennas to be used for connecting to the ZigBee network and transmit/receive data. The MicroTick antenna is an Omni-directional, vertically polarized antenna with a gain of 2 dBi operating in the 2.4 GHz range (has a 3 dBi gain in the 5 GHz range). This antenna has a U.FL connector which is perfect for our XBee S2C module that the hub utilizes. It has an antenna length of 86mm and the U.FL connection cable is 151mm, which is more than enough for our application. The next antenna is the HyperLink PCB antenna, which has a 2 dBi gain operating in the 2.4 GHz range. This antenna is  Omni-Directional and has either verticle or horizontal polarization. It has a U.FL connection with a cable length of 85.7mm. Unfortunately, since this is a PCB antenna, it will not give us the extended range that we need due to issues with noise from the circuit, that having an isolated antenna will prevent.

The next antenna we researched was a ChangHong RP-SMA antenna with a 5 dBi gain at the 2.4 GHz range. This antenna is a dipole directional, linear verticle antenna. It has an antenna length of 180mm. However, it does not come with a U.FL connection cable. Due to this, we have decided to not use this antenna. The HighFine antenna was the next we looked at. It is a Omni-directional, verticle polarization antenna with 6 dBi gain at 2.4 GHz frequency range. It has a 173mm antenna with a 200mm U.FL connection cable length. This antenna is made for WiFi devices and it is unclear how well it supports ZigBee signals. The last antenna we researched was a dipole, verticle polarization Digi International antenna. It has a 201 dBi gain in the 2.4 GHz range. The U.FL connector cable is 127mm and the antenna has a length of 100mm. We decided that the MicroTik antenna would be the best antenna for our purpose because it filled all of the S.M.A.R.T. Alarm needs as well as being readily available to the team.

Communication:

Due to the fact that ZigBee has an ultra-low power consumption compared to Wi-Fi while offering a larger range of transmission than Bluetooth, as well as a rather large ability to add additional nodes to a network, we have decided it will be the best form of wireless communication for the S.M.A.R.T. Alarm system. The fact that ZigBee does not transfer large amounts of data is no worry to the S.M.A.R.T. Alarm team because all data being sent wirelessly is relatively small, allowing ZigBee to be able to handle them. ZigBee will be a perfect form of wireless communication that will fulfill all our the needs of the S.M.A.R.T. Alarm system.