The extraterrestrial spectral irradiance distribution at one astronomical unit distance from the sun is commonly referred to as the AM0 spectrum. At present, international consensus standards do not exist for AM0 measurements. Each country's space agency has adopted its own internal procedures. However, an international standard is in the draft stage [15]. Measurements of the total AM0 irradiance used by the aerospace community have varied from 1353 Wm^{-2} to 1372 Wm^{-2} [8, 14, 16, 24, 25]. Many groups still rely on the less accurate value of 1353 Wm^{-2} total AM0 irradiance [16, 24]. Recently, a new ASTM AM0 standard has been adopted that uses more accurate spectral irradiance measurements that are given in Table 16.3 and Figure 16.1 [8]. The best estimate for the solar "constant" is 1367 Wm^{-2} recommended by the World Radiation Center [14] or 1366.1 recommended by ASTM [8]. Both of these values were obtained from long-term monitoring of the solar irradiance with an active-cavity radiometer on the Solar Max and Nimbus 7 and other satellites [26]. Fortunately, the 1353 Wm^{-2} total AM0 irradiance, used by many groups for efficiency measurements and reporting purposes does not enter into the spacecraft PV power measurements. This is because primary balloon or space-based AM0 reference cells are calibrated at whatever irradiance that exists at the time of calibration, corrected to one astronomical unit distance from the sun. This means that numerical values of the AM0 total irradiance and spectral irradiance are not used in calibrating primary AM0 reference cells as discussed in Section 16.3.3.

A variety of definitions for cells and modules have been proposed [1, 5, 27, 28]. A module consists of several encapsulated, environmentally protected, and electrically interconnected cells. The area of a cell is taken to be the total area of the space charge region which includes grids and contacts. The standard cell area definitions replace the term *space charge region* with frontal area, but this term does not adequately account for devices with multiple cells on a single substrate or superstrate. The area of a concentrator cell is based upon the cell area that is designed to be illuminated [5]. This area is taken to be the area of the space charge region minus the area of any peripheral bus bars or contacts. A submodule or minimodule is an unencapsulated module.

The PV efficiency (η) is inversely proportional to the area definition used (equation 16.1). In fact, differences in the area definition often account for the greatest differences in η between various groups and values published in the literature [28, 29]. The largest differences occur when the so-called active area (total device area minus all area that is shaded or not active) is used. The use of an active area in the efficiency neglects the trade-off between lower resistance losses and increased shading. Several thin-film PV device structures do not have any shading losses, so the active and total area is the same. To prevent an artificial increase in the efficiency, care must be taken to ensure that light outside the defined area cannot be collected by multiple internal reflections or that carriers generated outside the defined area are collected due to incomplete electrical isolation. The smaller the cell area, the larger this possible effect. The larger the perimeter-to-area ratio, the greater the effect of the current being collected outside the defined area. This phenomenon is the reason a 1-cm^2 minimum area is required for inclusion in the *Progress in Photovoltaics* efficiency tables [30]. To be sure that the region enclosed by the total area is the only active region, an aperture should be used [30]. At the module level, the total area including the frame is used. For prototype modules, where the frame design is less important than the encapsulation and cell interconnections, an aperture-area definition is often used. The aperture-area definition is the total area minus the frame area.