

### 6.1. Frequency Bands

The ASAC reiterates that the goal for ALMA should be complete coverage of the atmospheric windows across the millimeter and submillimeter spectrum. We concur that the four bands to be initially installed on the array should be (in order of increasing frequency) Band 3 (84–116 GHz), Band 6 (211–275 GHz), Band 7 (275–370 GHz), and Band 9 (602–720 GHz). In considering the manner in which additional receiver bands should be added to the array, we note that several enable unique science to be performed that would otherwise not be possible. Table 6.1 presents the ASAC recommendations for the ALMA receiver band priorities grouped by first priority (bands 3, 6, 7, and 9), second priority (bands 1, 4, 8, and 10), and third priority (bands 2 and 5) along with a description of the important science goals to be addressed with the individual receiver bands. We stress that the bands within the groupings are presented in order of increasing frequency only; this is not intended to be a strict priority ranking. As the project moves forward, the ASAC requests continued involvement in the process by which receiver band priority is established.

Table 1: Summary of Receiver Band Priorities

Band no.	Frequency Range (GHz) <sup>a</sup>	Science drivers
3	84–116	Bulk of low-excitation lines, SiO 86 GHz maser, high- $z$ CO, dust SED
6	211–275	Bulk of medium-exc. lines, dust SED, high- $z$ CO and dust search, [CII] $z = 5.9$ – $8.0$
7	275–370	Bulk of medium-exc. lines, dust maps, polarization, high- $z$ dust search, [C II] $z = 4.1$ – $5.9$ , $o$ -H <sub>2</sub> D <sup>+</sup> and N <sub>2</sub> H <sup>+</sup> at 373 GHz
9	602–720	High-exc. lines, warm gas, dust SED, [C II] $z=1.6$ – $2.2$
1	31.3–45	Sunyaev-Zeldovich, free-free, synchrotron, heavy molecules, SO at 30.0 GHz
4	125–163	Many low-exc. lines, H <sub>2</sub> S at 169 GHz, CO $z \approx 0.6$ – $0.8$
8	385–500	[C I] 492 GHz, HDO 464 GHz, CO 4–3, [C II] $z = 2.8$ – $3.9$
10	787–950	[C I] 810 GHz, CO 7–6, dust SED, [C II] $z=1.0$ – $1.4$
2	67–90	Low-exc. lines deuterated molecules, high- $z$ CO
5	163–211	H <sub>2</sub> O 183 GHz, H <sub>2</sub> <sup>18</sup> O 203 GHz

<sup>a</sup> Frequency ranges as given in *Specifications for the ALMA Front End Assembly*, Draft 1.4, August 31, 2000.

<sup>b</sup> The top 4 bands are the highest priority bands, the next 4 bands are the second priority bands, whereas the last 2 bands are the third priority bands. Within each group, the order is in increasing frequency.

Space for all ten receiver bands should be included in all cryostat designs, and the LO and IF system designs should remain capable of supporting the full receiver suite. We recommend that the JRDG consider carefully the achievable receiver coverage for band 1; specifically, to investigate the cost/performance trade-off for increased bandwidth designs. Extending the frequency coverage to lower values, would improve the overlap with the Enhanced VLA and would bring new science capabilities to ALMA. We also note that Zeeman splitting observations of the 30.0 GHz transition of SO has the potential to allow magnetic field determinations.