

performance to be improved	development item	degree of improvement	speed/technical difficulties	cost	beneficial for	Note
sensitivity	more antenna	add 5 antenna ==> 10%	quick	expensive	all science	
	new digital system/2GC	10%	moderate	expensive	all science	
	2SB for Band 9	a factor of 2	moderate?	moderate?	all science	
	Widening the IF Bandwidth of Band 6	a factor of 2 in a certain case	moderate	moderate(\$1.6M?)	All science	Three CO isotopes simultaneously
	receiver development (lower noise): Especially at band 3	10 - 20%?	moderate?	moderate?	all science	
angular resolution	longer baseline	a factor of a few	easy/quick but phase stability issues (including atmospheric and LO reference) should be improved as well	expensive?	limited brightest sources	
	VLBI	orders of magnitude	easy/quick? LO reference should be improved. A lot of software efforts needed	cheap (\$5M?)	Black hole: Sgr A* and very limited sources, 200GHz or higher frequencies AGN Jets at 86GHz and above	
field of view	multi-beam receiver	a factor of a few?	long/tough? Enhance correlator power is also required?	expensive?	almost all science (but for compact sources)	
	under-illuminated feed	a factor of a few	moderate?	moderate	Solar obs only	
spectral coverage	band 1		medium-term	moderate (\$4M for the first five sets)	SZ, redshifted lines, protoplanetary disks, solar	Q band (31-50GHz)
	band 2		medium-term	moderate	SZ, redshifted lines, protoplanetary disks, solar	
	band 5		medium-term	moderate	redshifted lines, planetary atmosphere	163-211GHz European deliverable (6 cartridges)
	band 11		long-term/difficult	moderate?	redshifted atomic lines, galaxies?	
simultaneous frequency coverage	multi-frequency feed	a factor of a few	moderate? Enhance correlator power is also required (for narrow band observations BLC can accommodate?)	moderate?	almost all science?	
	receiver development (wider frequency coverage)	a factor of a few?	moderate? Enhance correlator power is also required to cover whole wide freq. range?	moderate?	ISM, galaxies?	
	new digital system/2GC	an order of magnitude? (at high spectral resolution mode)	moderate	expensive	ISM, galaxies?	
imaging quality	more antenna	add 5 antennas ==> 2 times fidelity	quick	expensive	targets with extended structures	
	more 7m antenna	?	moderate?	expensive?	targets with extended structures	
	software development	??	all	moderate?	all science	
accuracy of amplitude	improved calibration device	???	difficult?	??	ISM?	
accuracy of phase	improved atmospheric correction	???	difficult?	??	almost all science which requires high angular resolution	
accuracy of polarization	improved calibration device	???	difficult?	??	star formation, ISM	
flexibility	more subarrays (two more LO reference systems)	a factor of a few?	moderate	moderate(\$620k?)	transient objects(gamma ray bursts, cometary ejection events, solar flares)	
usability	software development	??	long term	moderate	all science	