TD spreadsheet - rationale and more:
"MKID on-sky demonstration"
"KIDs module characterization"
"KID tone tracking"

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2018-02-14
revised 2018-02-21

Spreadsheet - https://docs.google.com/spreadsheets/d/101ncyzfDAHrTF9O0rTPRGbX6dqut_WdfVA7-2ck9qGQ/edit#gid=0
Evaluation guidance - https://cmb-s4.org/CMB-S4workshops/images/2017_11_30_CMBS4_TDCombinedNovember.pdf

KIDs module characterization

Short description: specific kid testing/measurements

	Evaluation/ Status	Rationale
Baseline	KID specific testing: resonance frequency identification, bifurcation and operational power, readout system verification, detector mapping.	These are tests routinely done in-lab. Note that this assumes all the other ‘module characterization’ lines like bandpass measurement, responsivity, beam profile, efficiency, etc also apply to KIDs and we have only listed KID-specific characterizations here.
TD Goal	Baseline but on a larger scale.	For pre-deployment S4 testing, this is mainly an issue of software development.
Cost reduction [k$]	0	This will not reduce the cost; it’s necessary.
Schedule	1	Similarly, this will not save time from a nominal plan, it’s necessary.
Science Stat	5	
Science Sys	5	The KIDs need to be fully and accurately characterized in order to understand any systematics arising from the detectors
Target Completion Date	FY18	Multiple mm and submm KID instruments are coming online in FY18 all of which will need to or have demonstrated the above.
Estimated Investment	1 year FTE	
Likelihood of Success	5	These KID-specific measurements are done in lab; it’s a question of software automation.

MKID on-sky demonstration

Short description: On-sky demonstration of KIDs

	Evaluation/ Status	Rationale
Baseline	NIKA/NIKA2	Demonstrated direct-absorption LEKIDs at 1 and 2 mm with NIKA/NIKA2 on IRAM 30m; NIKA2 recently started to get polarization data at 1mm (Catalano 2016). NIKA2 is not a CMB survey experiment. SZ papers have been published with NIKA data, for example Adam 2017.
TD Goal	Demonstration on CMB polarimeter; large-scale mapping	Source: (S4 technology book 2017). Demonstration on a mm/sub-mm polarimeter with controlled systematics. **This is one of the most, if not the most, important R&D topic for KIDs!**
Cost reduction [k$]	0	
Schedule	1	
Science Stat	5	This is necessary
Science Sys	5	An on-sky demonstration with KIDs will provide valuable feedback about the detector systematics for future experiments including whether tone-tracking is necessary, etc.
Target Completion Date	FY19/20	BLAST (250, 350, 500 μm/ 3-7 THz) (for example, Galitzki 2016) - flies December 2018. TolTEC (150 - 350 GHz?) ((http://toltec.astro.umass.edu/) - on-sky in Nov. 2019.
Estimated Investment	3 people, 2 years FTE	Estimated investment to demonstrate a focal plane on KIDs in an existing experiment - for example ABS (150 GHz)
Likelihood of Success	4	Contingent on funding and access. A number of mm/sub-mm polarimeter experiments are planned for the next year or two including BLAST (for example, Galitzki 2016) , TolTEC (http://toltec.astro.umass.edu/), ABS.

KID tone tracking (Active)

Short description: tone tracking of KID resonances - to be combined with tone tracking for umux

	Evaluation/ Status	Rationale
Baseline	uMux demonstration	**It is not clear that real-time true tone tracking is required for KID readout to the same extent that is required for umux TES readout.** The dynamic range of the KID can likely be tuned appropriately by choice of the resonator Q-factor/detector volume for a given set of observing conditions. Active tone tracking has not been demonstrated with KIDs but similar systems have been demonstrated for umux readout on small-scales at SLAC.
TD Goal	If it is required, active tone tracking with KIDs with a multiplexing factor x1000	The development effort for umux will provide a demonstration/implementation of tone tracking. If it is to be required for KIDs, then a similar implementation could be developed for KIDs with the specific frequency range, power, etc needed.
Cost reduction [k$]	0	Need to determine whether active tone tracking is required to estimate cost and schedule savings.
Schedule	1	
Science Stat	5	If required
Science Sys	5	If required
Target Completion Date	FY19	
Estimated Investment	1.5 FTE, 2 years	(see Shawn's slide)
Likelihood of Success	4	Would be based on the umux tone-tracking development at SLAC (see Shawn's slide)

KID tone tracking (LO modulation)

Short description: tone tracking of KID resonances

	Evaluation/ Status	Rationale
Baseline	NIKA2	A different option for ‘‘tracking’, distinct from active tracking, is based on rapid (~1 kHz) modulation of the local oscillator (LO) has proved useful in existing KID readout (NIKA2). This technique provides a real-time estimate of the resonator frequency shift, but does not actively track the resonance. Instead, LO modulation provides a significant gain in observation efficiency by removing the need to sweep the resonances, which is currently time consuming. This is now being actively developed for the Roach 2 systems and will be field tested on the BLAST, TolTec, MUSCAT experiments. https://www.aanda.org/articles/aa/pdf/2013/03/aa19854-12.pdf
TD Goal	Implement in ROACH2 KID readout system	NIKA readout (NIKEL https://arxiv.org/pdf/1204.1415.pdf) have successfully implemented this technique.
Cost reduction [k$]	0	
Schedule	1	
Science Stat	3	With the LO switching technique, NIKA2 state that they gain a 75% reduction in the re-tuning time compared to traditional re-sweeping, with the NIKEL electronics, and in principle, re-tuning could be synchronised with the telescope scan strategy. Currently it takes ~120 s to re-sweep and retune the Roach systems. Depends on site and atmospheric conditions.
Science Sys	3	This is unknown, and requires investigation.
Target Completion Date	End 2018	
Estimated Investment	6 months FTE	This is under development at ASU currently.
Likelihood of Success	4 / 75%	