

KAGRA 3rd External review for Analog Electronics subgroup

2014/4/3(Thu)
@ICRR

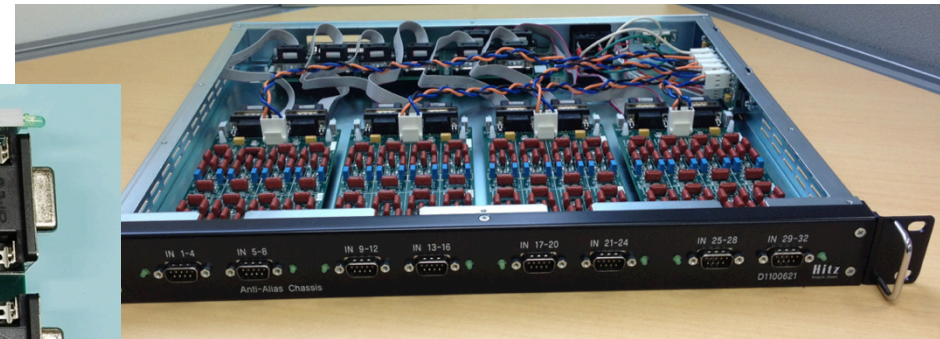
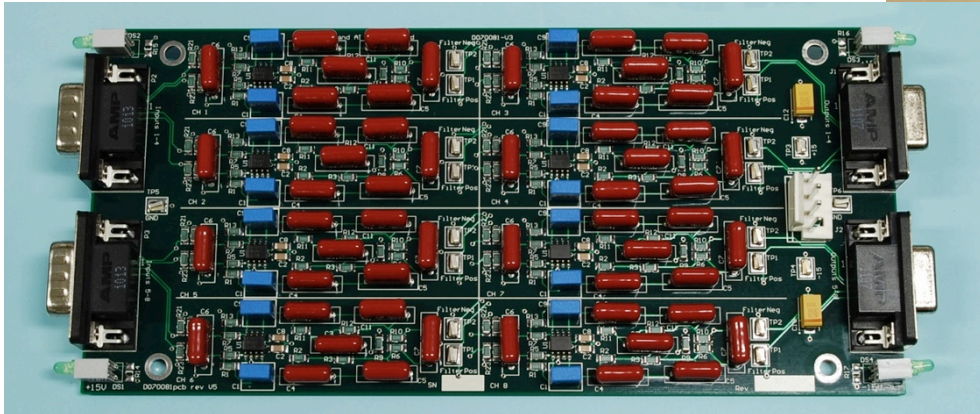
Osamu Miyakawa

1. AEL makes analog electronics for KAGRA.
2. Basically each subgroup of KAGRA orders necessary circuits to AEL.
3. AEL does not disturb that each subsystem will make circuits by their own, but AEL suggests to share the shape of connectors, chassis or cables.
4. Each subsystem submits circuit diagrams when ordering.
 - AEL does not accept concept only ideas.
 - AEL asks to implement DAQ monitoring points, controllable switches for digital I/O signal.
 - AEL suggests to use existing circuit diagrams, for example LIGO DCC.
5. Management of circuit and the diagram
 - All circuit diagrams will be stored in JGWDoc.
 - Each circuit must have a serial number.
 - The diagram with serial numbers and each modification of the diagrams are recorded by JGWDoc.

Subsystem	Project name	Item name	種別	Description	prototype 必要数	iKAGRA 必要数	bKAGRA 必要数	完了数		開始日	終了予定日	終了日	Currrnt Status	提案者	実作業をする人	達成率
VIS	LVDT driver		prototype		1			1		2011/9/1	2012/1/31	2012/1/31	使用中。	高橋	NIKHEF	100%
VIS	LVDT driver		iKAGRA			8				2013/2/15	2014/11/30		基板待ち。	高橋	NIKHEF	20%
VIS		Over all design								2013/2/15			箱にどのように入れるか検討			
VIS		LVDT driver board		HIKHEFデザインの基板					30	2013/5/29	2014/1/15		NIKHEFに基板を30セット頼んでいる。一月半ばに出来上がる。		NIKHF	
VIS		LVDT interface											デザイン検討中、サスペンド		上泉	
VIS		LVDT chassis											未定		上泉	10%
VIS	LVDT driver		bKAGRA				11			2015/3/1	2015/5/31			高橋		0%
VIS	LVDT-Coil distributor		prototype	LVDTとCoilに分岐	1					2013/11/18	2014/1/31	2014/2/4	仕様がほぼ決定。	関口	宮川	100%
VIS		仕様決定								2013/11/18	2013/12/18	2013/12/27	仕様決定。	関口	宮川	100%
VIS		基板デザイン								2013/12/19	2013/12/25	2014/1/9	終了		宮川	100%
VIS		board製作							1	2014/1/1	2014/1/15	2014/1/29	終了		上泉	100%
VIS		Front panelデザイン								2013/12/19	2013/12/25	2014/1/20	終了		上泉	100%
VIS		Front panel製作							5	2014/1/1	2014/1/15	2014/1/28	終了		上泉	100%
VIS		Rear panelデザイン								2013/12/19	2013/12/25	2014/1/20	終了		上泉	100%
VIS		Rear panel製作							5	2014/1/1	2014/1/15	2014/1/28	終了		上泉	100%
VIS		組み立て								2014/1/15	2014/1/31	2014/2/4	終了		上泉	100%
VIS	LVDT-Coil distributor		iKAGRA	LVDTとCoilに分岐		7				2014/9/1	2014/11/30			関口		0%
VIS	LVDT-Coil distributor		bKAGRA	LVDTとCoilに分岐			4			2015/3/1	2015/5/31			関口		0%
VIS	GEO phone distributor		prototype	出力と電源供給	1					2013/11/18	2014/1/31	2014/2/4	仕様がほぼ決定。	関口	宮川	100%
VIS		仕様決定								2013/11/18	2013/12/18	2013/12/27	仕様がほぼ決定。	関口	宮川	100%
VIS		基板デザイン								2013/12/19	2013/12/25	2014/1/9	終了		宮川	100%
VIS		board製作							1	2014/1/1	2014/1/15	2014/1/28	終了		上泉	100%
VIS		Front panelデザイン								2013/12/19	2013/12/25	2014/1/20	終了		上泉	100%
VIS		Front panel製作							5	2014/1/1	2014/1/15	2014/1/28	終了		上泉	100%
VIS		Rear panelデザイン								2013/12/19	2013/12/25	2014/1/20	終了		上泉	100%
VIS		Rear panel製作							5	2014/1/1	2014/1/15	2014/1/28	終了		上泉	100%
VIS		組み立て								2014/1/15	2014/1/31	2014/2/4			上泉	100%
VIS	GEO phone distributor		iKAGRA	出力と電源供給		1				2014/9/1	2014/11/30			関口	上泉	0%
VIS	GEO phone distributor		bKAGRA	出力と電源供給			7			2015/3/1	2015/5/31			関口	上泉	0%
VIS	Coil driver		prototype		5					2013/5/29	2014/1/15		EMACにて組み立て中、パネル納品待ち	高橋	EMAC, 上泉	100%
VIS		Design								2013/5/29	2013/8/31		EMACにて設計済		EMAC	100%
VIS		board							5	2013/9/1	2013/11/30		EMACにて製作中		EMAC	100%
VIS		Chassis							5	2013/9/9	2013/10/1		IUのHamilton Metacraft製の物を5箱EMACに配布済。	宮川	上泉	100%
VIS		Front pannel							5	2013/11/12	2013/12/13		EMACに送付済		上泉	100%
VIS		Rear pannel							5	2013/11/12	2013/12/13		EMACに送付済		上泉	100%
VIS		組み立て								2013/12/1	2013/1/10		組み立て完了		EMAC	100%
VIS	Coil driver		iKAGRA			29				2014/7/1	2014/9/30			高橋		0%
VIS	Coil driver		bKAGRA				23			2015/3/1	2015/5/31			高橋		0%
VIS	OSEM driver		prototype 1		3			3		2013/9/1	2013/12/1			高橋		100%
VIS	OSEM driver		prototype 2		3					2014/4/1	2014/8/31			高橋		0%
VIS	OSEM driver		iKAGRA			18				2014/7/1	2014/9/30			高橋		0%
VIS	OSEM driver		bKAGRA				8			2015/3/1	2015/5/31			高橋		0%
VIS	OSEM distributor		prototype	SensorとCoilに分岐	3					2014/4/1	2014/8/31			関口		0%
VIS	OSEM distributor		iKAGRA	SensorとCoilに分岐		21				2014/7/1	2014/9/30			関口		0%
VIS	OSEM distributor		bKAGRA	SensorとCoilに分岐			8			2015/3/1	2015/5/31			関口		0%
VIS	BO adapter chassis		prototype		1			1		2012/6/12	2013/11/1	2013/11/1	関口君に配布済。	宮川	上泉	100%
VIS		board							1	2012/6/12	2012/6/12	2012/6/12	関口君に配布済。		上泉	100%
VIS		Front pannel							1	2012/10/23	2013/11/1	2013/11/1	関口君に配布済。		上泉	100%
VIS		Chassis							1	2013/10/20	2013/11/1	2013/11/1	基板と接続して関口君に配布済。	上泉	上泉	100%
VIS	Stepper motor driver		prototype	TAMA回路改良版	1			1		2012/4/1	2012/6/12	2012/6/12	関口君に配布済。	宮川	宮川	100%
		Design								2012/4/1	2012/4/9					100%
		製作								2012/4/10	2012/5/7					100%
		test								2012/5/8	2012/5/24					100%
		Installation								2012/6/12	2012/6/12					100%
VIS	Stepper motor driver		prototype		1					2013/12/20	2014/2/28			高橋	高橋	5%
VIS		Design								2013/12/20	2014/2/15	2014/2/13	基本方針決定済	関口		100%
VIS		Front panelデザイン													上泉	0%
VIS		Front panel製作													上泉	0%
VIS		Rear panelデザイン													上泉	0%
VIS		Rear panel製作													上泉	0%
VIS		組み立て													上泉	0%
VIS	Stepper motor driver		iKAGRA			1				2014/9/1	2014/11/30			高橋	高橋	5%
VIS	Stepper motor driver		bKAGRA				11			2015/3/1	2015/5/31			高橋	高橋	0%
VIS	Picomotor driver		iKAGRA			7				2014/3/1	2014/5/31			高橋	高橋	0%
VIS	Picomotor driver		bKAGRA				8			2015/3/1	2015/5/31			高橋	高橋	0%
VIS	RMS-DC converter		prototype		1					2013/7/22			麻生君のデザイン待ち。	麻生		5%
VIS	OSEM		iKAGRA							2014/1/27	2014/3/31		CADデータ製作中	高橋		100%
VIS		仕様決定								2014/1/27	2014/2/10		終了	高橋	Fabian	100%
VIS		基板デザイン								2014/2/11	2014/2/28				Fabian,上泉	20%

- Currently 804 chassis(boxes) are counted!
 - The number may increase x1.5 times when actual drivers or interfaces are considered.
 - Prototype: 95 chassis, iKAGRA: 456 chassis, bKAGRA: 253 chassis
 - 149 chassis have been manufactured.
 - 149 means VIS:13, MIF:2, IOO:2, DGS:132, not much progress except for DGS.

- Manufactured by company For 100 chassis, 520 boards -> ~50000k Yen: 500k Yen/ea.
- 7 months including design, manufacturing, inspection for noise and transfer function



- AA/AI filter interface board x 12
 - Estimated by AEL : 233k Yen
 - Made by company A: 559k Yen
- AA/AI filter interface
 - Made by AEL for 10 boards: parts -> 355k Yen, board, soldering -> 285k Yen, total 740k Yen
 - Made by company A for 30 boards -> 4515k Yen
- Roughly speaking, 2-2.5 times more cost if asking to company
- 1U chassis
 - Company B: 1355k Yen / 12 chassis = 113k Yen/ea. (including front/end panels)
 - Company C: 907k Yen / 8 chassis = 113k Yen/ea.
 - including initial cost, additional order -> 17k Yen/ea.
 - Needs initial cost for each design change
 - Hamilton Metalcraft: \$1300+70kYen (shipping, tax) for 10 chassis = 20k Yen /ea.

1. Asking to AEL: each subgroup to AEL
2. Design diagram: by each subsystem
 - Introduces existing diagrams (EX.LIGO DCC)
3. Designing diagram: by each or each subsystem or AEL
4. Ordering electronic parts: by AEL
5. Making boards: by AEL
6. Soldering electronic parts: by AEL
7. Design chassis: by each or each subsystem or AEL
8. Making chassis: by AEL
9. Putting them into chassis: by AEL
10. Inspection: by each subsystem

Altium

Altium

2 months

Digikey, Mouser, RS, Tip One Stop

P-ban.com

P-ban.com

Front Panel Express

Hamilton Metalcraft, Densie

AEL, Densie

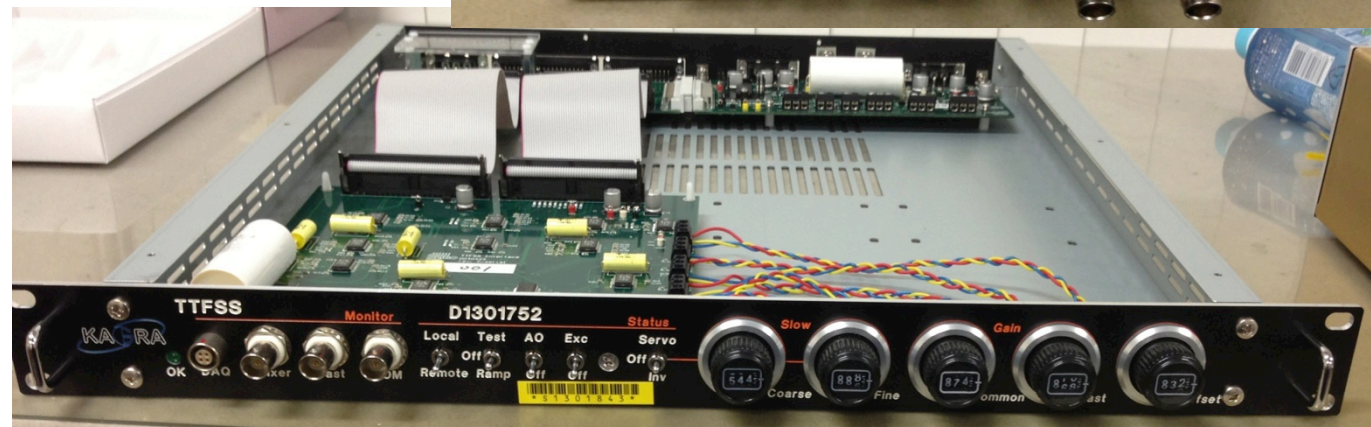
3 more months

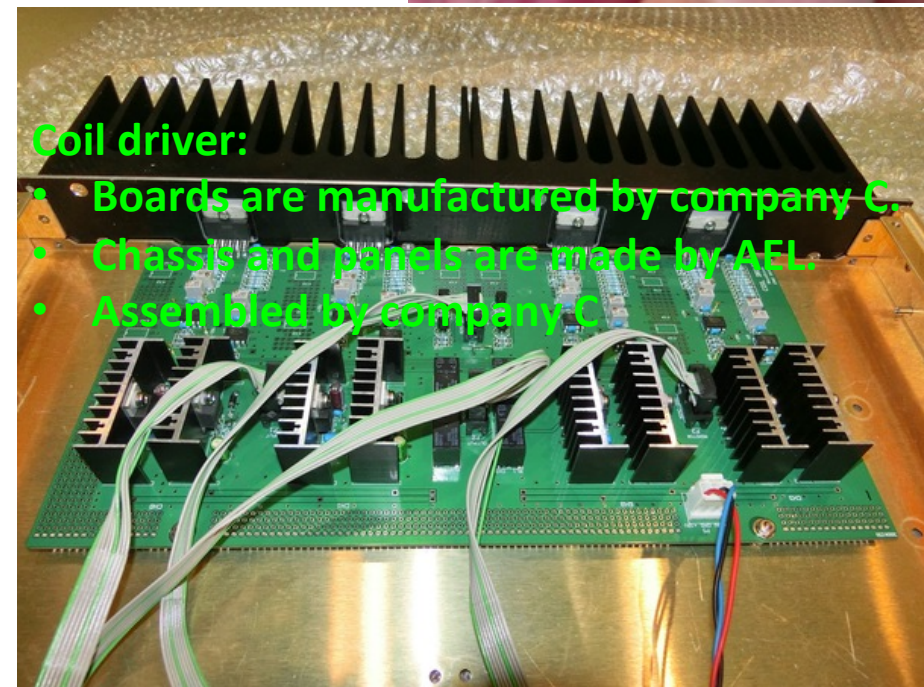
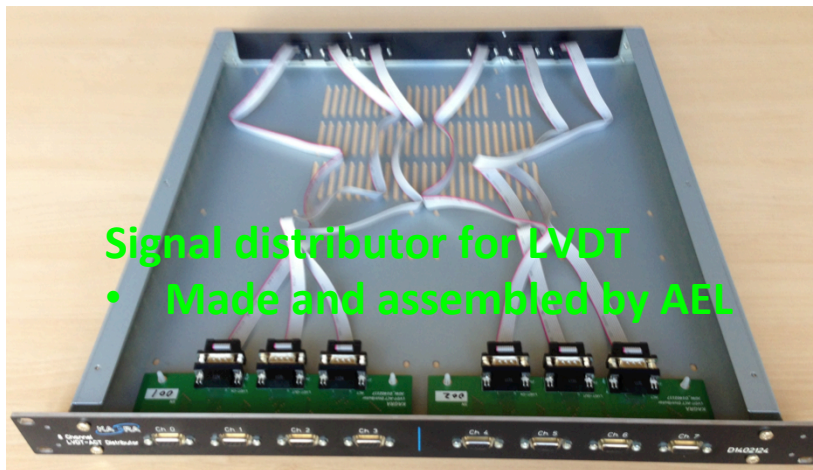
- Osamu Miyakawa
 - contact to subsystem for design and concept
- Kamiizumi
 - Drawing diagram and board
 - Parts ordering
 - Assembling
- New engineer?
 - CAD administrator, but not familiar with electronics
- Warsaw University of Technology
 - Full manufacturing from drawing, but no budget

Ex. 2: Table Top Frequency Stabilization Servo

Made by AEL

1. Discussion and design for 4months
 2. Board and soldering: 2months
 3. Assembling: 1.5 month
- Total 7.5month





- Design and fabrication for DC power supply network
 - KEPCO ATE series:
50 x 36V:30A, 15 x 25V:10A, 15 x 15V:6A, 15 x 6V:5A were ordered and stored at Kamioka building, and will be installed into the mine by October(?).
 - How to establish DC distribution to each circuits, using tap?
- Design for wiring, purchasing cables and actual cabling in mine
 - For DC signal
 - For RF signal