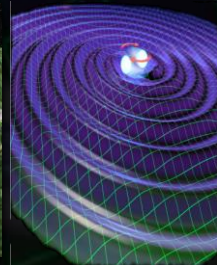


KAGRA Program Advisory Board Report

Risk Management

Masaki Ando (Univ. of Tokyo/NAOJ)



To Do by PAB

- Action items
 - Ask subsystems for updated information.
 - Summarize them and discuss in SEO.
- Presentation file
 - Update the contents.

Previous PAB Report

- In 'Project management and organization' section.

Recommendations:

We recommend that the tools which have been developed now be used to identify areas of concern and to manage the project. Specifically, the schedule should be updated at least every two months, and preferably monthly, to anticipate delays that might impact other activities, and to develop work-around to minimize total project delay. The risk register should be revisited on a periodic basis to understand how different risks are evolving and to look for ways to mitigate risk.

→ Some actions.

Risk Management

Risk Management

- Potential risks are important information for the project management.
 - Important for careful progress evaluation.
 - Basic information for effective allocation of resources.
 - To clarify and to remind risks
 - Back-up plans or mitigation to avoid or to minimize delay.



Technical and schedule risks for each subsystem are being summarized.

- ※1 We thank P.Grey (TMT) for useful discussions and materials.
- ※2 Hazard analysis (for human health and life) should be independent.

Risk Management Activities

- Collected risk information from subsystems (Feb. 2012 -).
- Summarized them and presented at PAB (Feb. 23).
 - Suggestions from PAB members.



- Visited P. Grey (TMT sub-PM, Risk management leader) to hear about the TMT risk management (March 5).
- Risk meeting by subsystems + SEO (April 2012).
- Reports at PAB and External Reviews.

KAGRA Risk Register

- KAGRA Risk Management.
 - Summarized in simple Excel files.
 - Risk registers mainly by sub-group chiefs.
 - Total ~130 risks (~10 risks for each subsystem)
 - Risk ID, Item, Date,
Explanation, Impact, Mitigation/Back-up plan,
Quantitative evaluation P, S, R
(Probability, Seriousness, and Degree of Risk)
Remark by SEO
 - Risk meeting
 - Still with biases by personal impressions.

Update in Format

- The risk register has not been updated or referred frequently.
 - The importance is not recognized well.
 - The editing and refer opportunity is not well defined.
 - No contingency in KAGRA for mitigation.
 - Slightly updated the format.

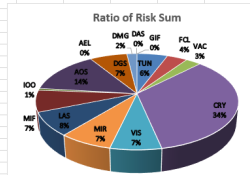
Previous : One Excel page

KAGRAリスク要因												
仮ID	No	サブシステム	項目	説明	インパクト	対応	P	S	R	情報元		
							Estimated Degree of	Degree of	Selection			
							Prevalence	Incurrence	MA	KS	SM	Source
							Rate	Risk				
TUN-1	1	トンネル (TUN)	トンネル	期待しているほどの掘削速度が得られない。掘削速度が多量の地下水による影響等。大気汚染など。	掘削速度の低下・掘削の悪化。	各サブシステムの性能向上、掘削設備等の充実。	1	3	3			Uchiyama Aug. 9, 2012
TUN-2	1	TUN	掘削経路の確保	X-axisからの掘削経路が確保されていない。	重大な危険。		2	3	6	10		Uchiyama Aug. 9, 2012
TUN-3	1	TUN	掘削完成遅れ	掘削完成遅れ	支保スクリーンに影響有り。	掘削業者がすべての責任を担う。	2	3	6	10		Uchiyama Aug. 9, 2012
TUN-4	1	TUN	防振用掘削位置ずれ	防振用の掘削位置が設計値からずれる。	支保設計に影響有り。	測量も正確に行う。防振グループ以外の掘削も設計で行っている。	1	3	3			Uchiyama Aug. 9, 2012
FCL-0	2	施設 (Facility)	施設	伝送データ伝送やエレクトロニクスシステムの急ぎ修繕になる。	伝送も伝送障害になる。	できる限り、伝送・観測の少ない機器の選定、七調整	2	3	2			Miyuki Aug. 9, 2012
FCL-1	2	FCL	電気環境	伝送データの急ぎ修繕になる。	データの品質も低下する。		3	4	3			Miyuki Aug. 9, 2012
FCL-2	2	FCL	クリーン環境	観測のロスを増やす	観測の予定性能が低下し、感度悪化。	真鍮のNon-soluble材料のプールの利用	3	3	3			Miyuki Aug. 9, 2012
FCL-3	2	FCL	温度・湿度環境	高温・高湿度環境が、観測機の故障を誘発する	観測データの損失・観測機の故障	特に観測は、観測機に冷却ファンを付ける	3	5	3			Miyuki Aug. 9, 2012
FCL-4	2	FCL	ネットワーク	データ転送速度の維持・冗長性	データが伝達できず、データが失われる。観測データにばら。	二重化できるようにする	1	5	1			Miyuki Aug. 9, 2012



Current : Summary page + Subsystem files

KAGRAリスク要因														
							Risk Registers : 5				Risk Sum : 12		High Risk : 0	
仮ID	No	サブシステム	項目	説明	インパクト	対応	P	S	R	情報元				
							Estimated Degree of	Degree of	Selection			Source		
							Prevalence	Incurrence	MA	KS	SM			
							Rate	Risk						
01	TUN						4	4.5	18	5.7	2			
02	FCL						5	2.4	12	3.6	0			
03	VAC						8	1.1	9	2.9	0			
04	GRY						26	4.2	108	34.3	3			
05	VIS						9	2.9	22	7.0	1			
06	MIR						7	3.3	23	7.3	0			
07	LAS						6	4.2	25	7.9	2			
08	MIF						7	3.3	23	7.3	0			
09	IOO						6	0.3	2	0.6	0			
10	ACS						11	4.1	45	14.3	2			
11	AEL						3	0.0	0	0.0	0			
12	DGS						8	2.8	22	7.0	1			
13	DMG						3	2.0	6	1.9	0			
14	DAS						0	0.0	0	0.0	0			
15	GIF						0	0.0	0	0.0	0			
Total							102	3.1	315	100	11			



KAGRA Risk Register

• Quantitative evaluation P, S, R

Probability P

- 0 The probability is extremely low and will almost never occur.
- 1 The probability is not large and will probably not occur.
- 2 The probability is around 0.5.
- 3 The probability is large and will probably occur.

Seriousness S

- 0 It will not affect the successful completion of the project.
- 1 It will to some degree affect the successful completion of the project.
- 2 It will to some degree endanger the successful completion of the project.
- 3 It will result in the failure of the project.

Degree of risk

$$R = P \times S.$$

Subsystem Details

Subsystem	Entry	Avg(R)	Sum(R)	R \geq 6
1. TUN	4	2.3	9	1
2. FCL	7	1.2	16	0
3. VAC	9	4.1	11	0
4. CRY	27	5.1	112	4
5. VIS	7	5.4	36	4
6. MIR	8	4.2	43	4
7. LAS	6	3.3	25	2
8. MIF	33	0.3	109	6
9. IOO	6	3.8	2	0
10. AOS	12	6.3	46	2
11. AEL	3	2.8	19	2
12. DGS	8	3.0	22	1
13. DMG	4	2.3	12	0
14. DAS	3	3.9	7	0
15. GIF	7	3.6	27	1
Total	144		496	27

Update

Update

Update

Update

Update

Update

Update

Update

Update

Update

Update

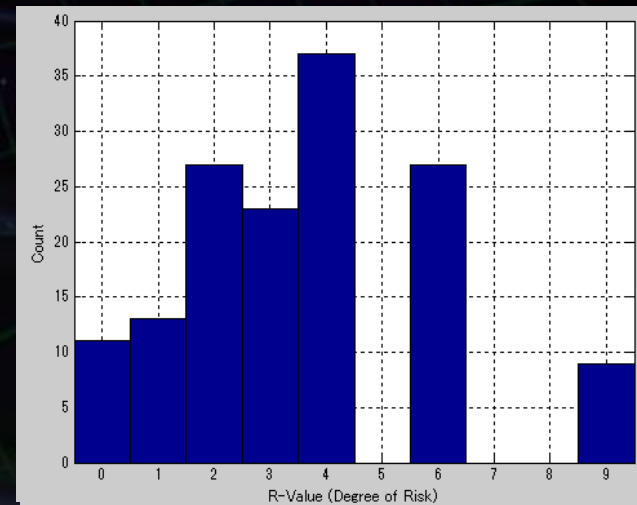
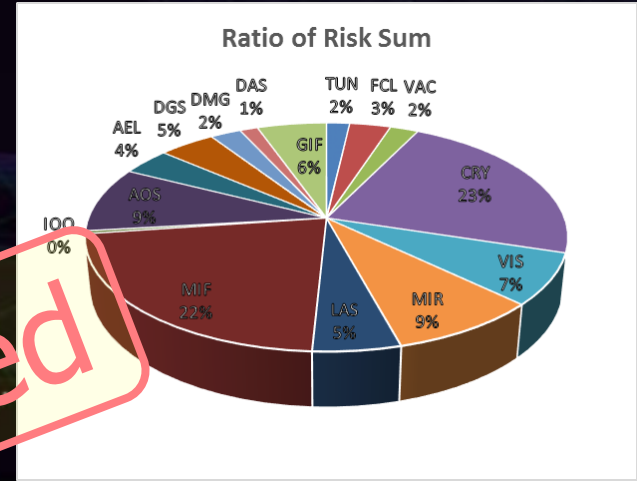
Update

Update

Update

Update

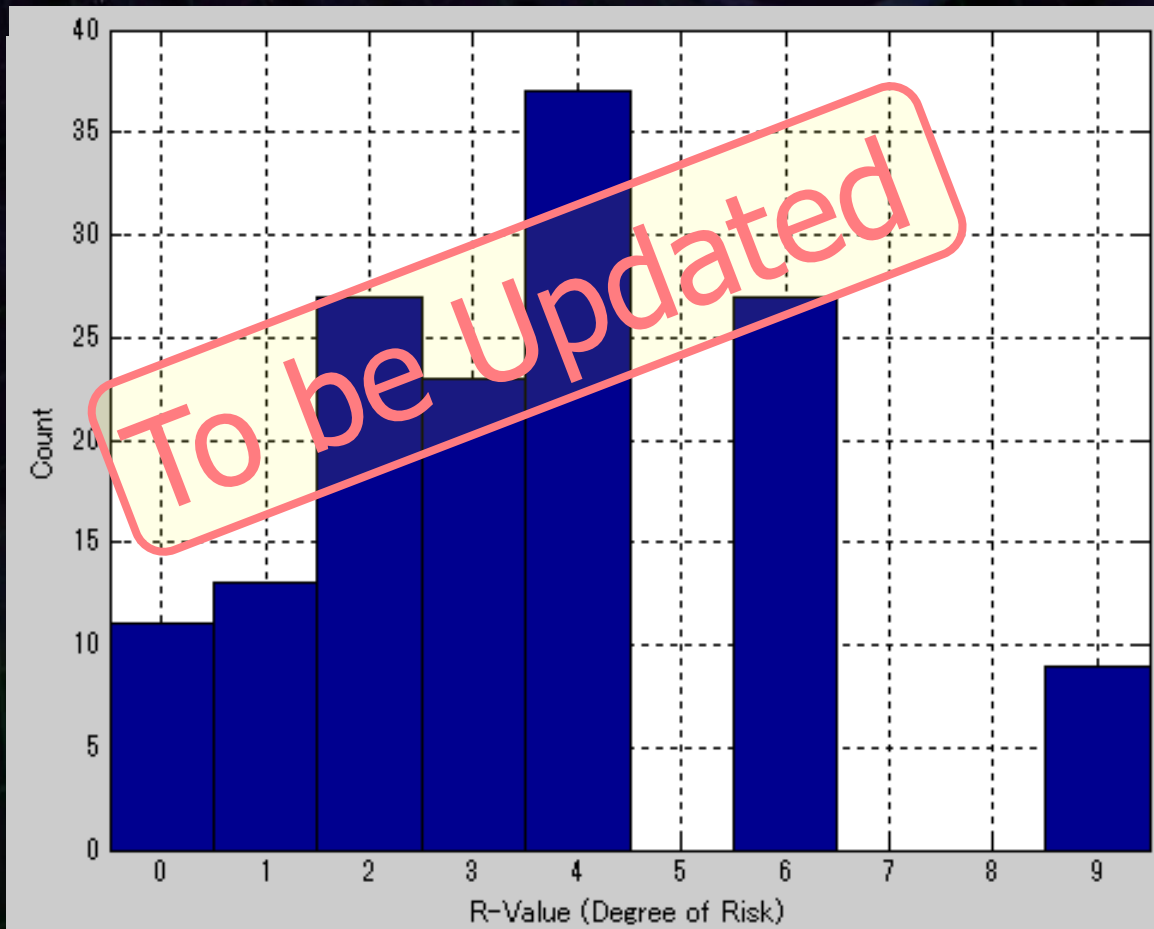
To be Updated



※ With biases by personal impression.
Numbers will be changed easily.

Statistics

- Total risks : 144, Avg. of 'R' : 3.4,
R \geq 6 risks : 27, R=9 risks : 9



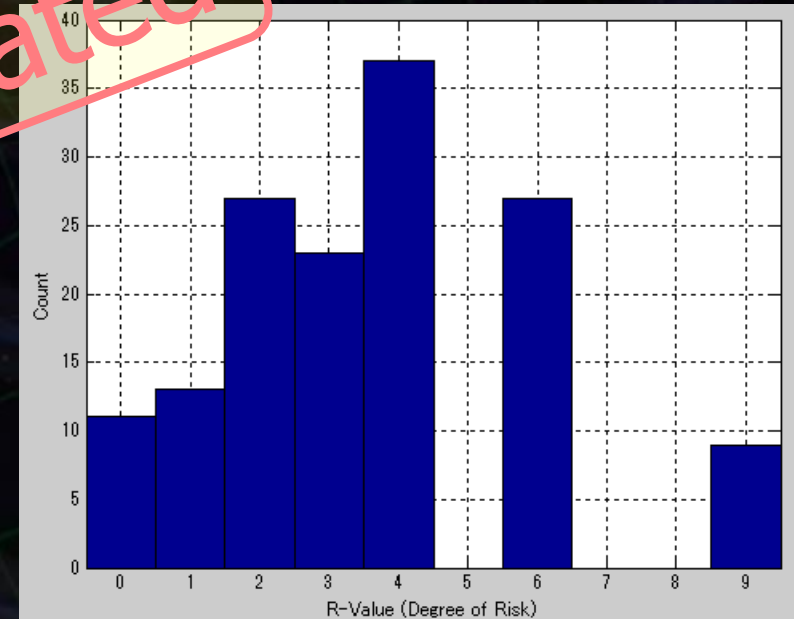
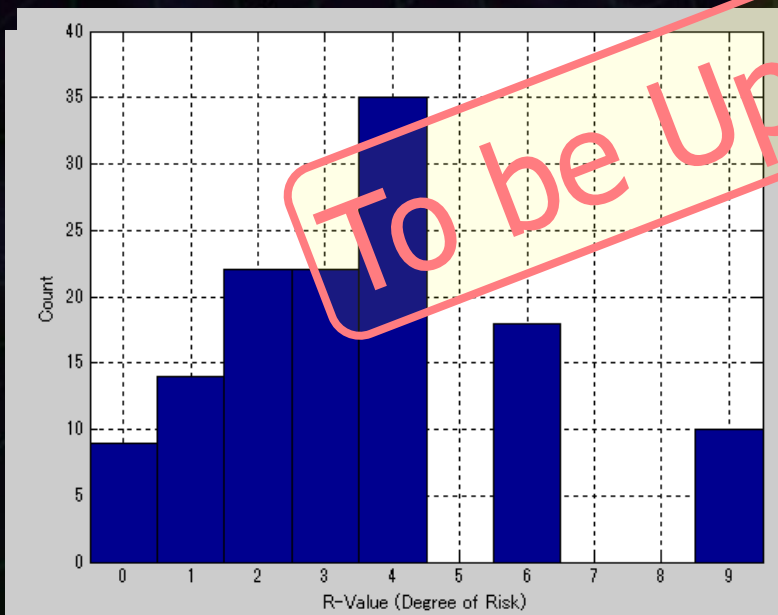
Updates

Previous (2013.11.2)

Total risks : 128, Avg. of 'R' : 3.6,
Risk Sum : 455, $R \geq 6$ risks : 23,
R=9 risks : 10

Current (2014.4.23)

Total risks : 144, Avg. of 'R' : 3.4,
Risk Sum : 496, $R \geq 6$ risks : 27,
R=9 risks : 9



To be Updated

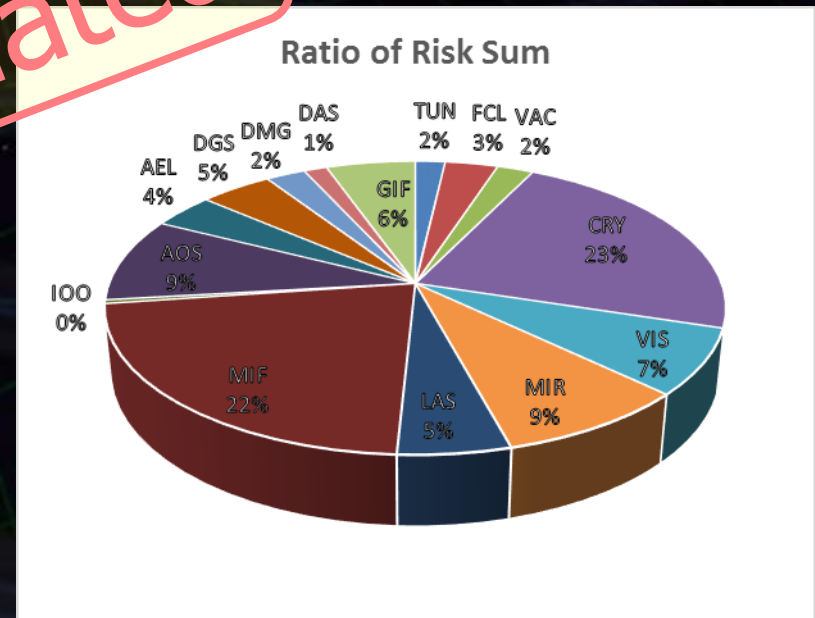
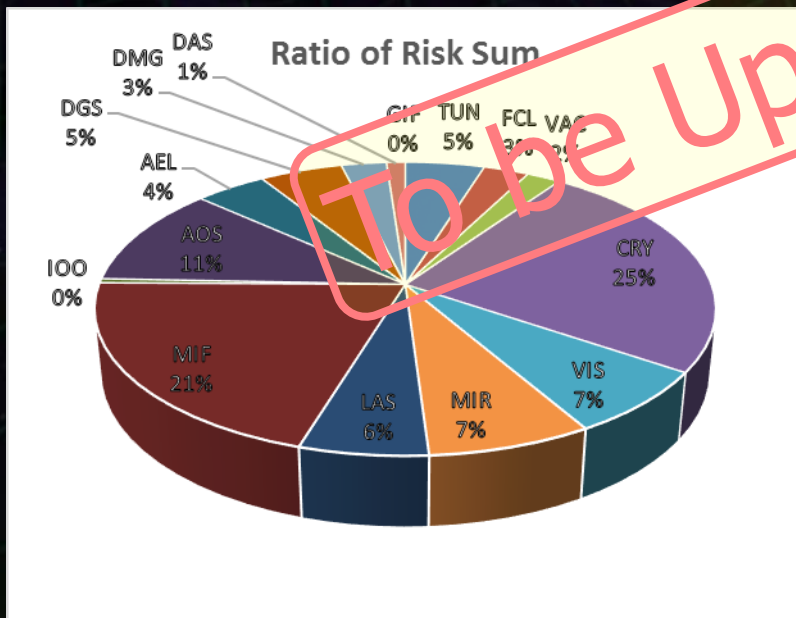
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Subsystem Details

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Total	144		496	27

Large risk factors (R \geq 6)

- Man power, Budget, Schedule
- Material availability (VIS, CRY)
- Environment (CRY, AOS, AEL)
- Damage (LAS, AOS, DGS)
- Mirror quality (MIF)
- Scattered light (AOS)

※ With biases by personal impression.
Numbers will be changed easily.

Updates in 'Risk 9'

※ With biases by personal impression.

- Risk reduced or disappeared
 - Tunnel (TUN) : Schedule.
 - Vibration Isolation (VIS) : Material.
 - Cryogenics (CRY) : Budget
- Risks increased
 - Mirror (MIR) : Spare Mirror and Budget.

To be Updated

Nine-Largest Risks

※ With biases by personal impression.

- Vibration Isolation (VIS) : Contract.
 - Troubles in contract.
 - Very serious. Procurement plan should be revised.
 - Buy from domestic companies.
 - Schedule delay is unavoidable.

New!

- Mirror (MIR) : Spare Mirror and Budget.
 - No spare mirrors are prepared.
 - Trouble in mirror will cause direct delay of the project.
 - Prepare spares considering project impact.

Nine-Largest Risks

※ With biases by personal impression.

- Analog Electronics (AEL) : Schedule and Budget
 - Detailed development schedule is not established yet.
 - Budget for analog electronics is not fixed.
 - Planning.

To be Updated

Nine-Largest Risks

※ With biases by personal impression.

- Main Interferometer (MIF) : Commissioning and Man Power.
 - There will be unexpected delay in commissioning.
Lack of Man power will be crucial.
 - Very serious. Schedule will not be kept.
 - Detailed commissioning plan.
Careful test before installation.
- Auxiliary Optics (AOS) : Manpower and Schedule.
 - Manpower and schedule.
 - Careful planning and preparation for installation.

To be Updated

Summary

- We are summarizing risk factors
 - Basic information for the project management.
- The contents are not upgraded or referred so frequently in this one year. → Minor version-up in the format.
- Continuous update and remind are important.
 - Advises are appreciated!!!


To be Updated

It is important to 'predict unexpected problems'.

Summary

Risk Management

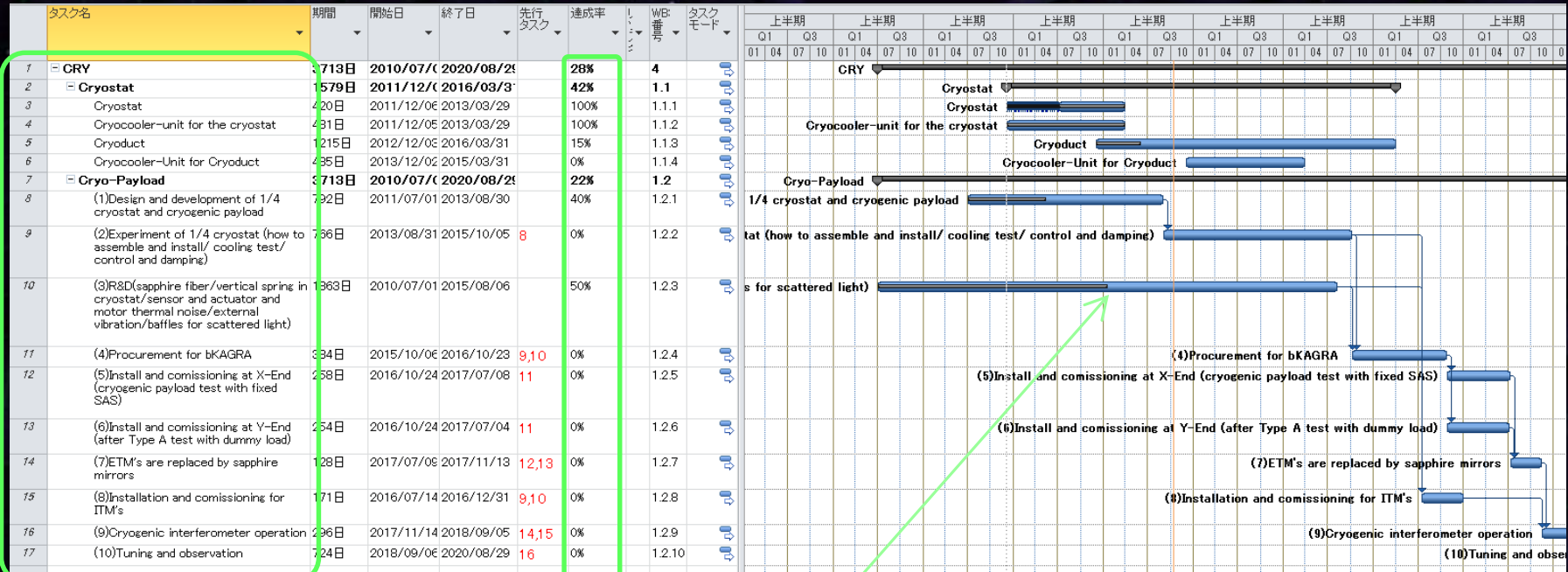
- Changed the file structure, to be useful for subsystem leaders, not only for management group.
- Updates in contents.
- Still need to be effectively used by the management.

A visualization of a gravitational well, showing a grid of lines that curves inward towards a central point, representing the curvature of spacetime. The background is dark blue with a grid of light blue lines. The word "End" is written in large white letters in the center.

End

Progress Evaluation

Example for progress evaluation



Milestones
(tasks with
~few month scale)

Progress

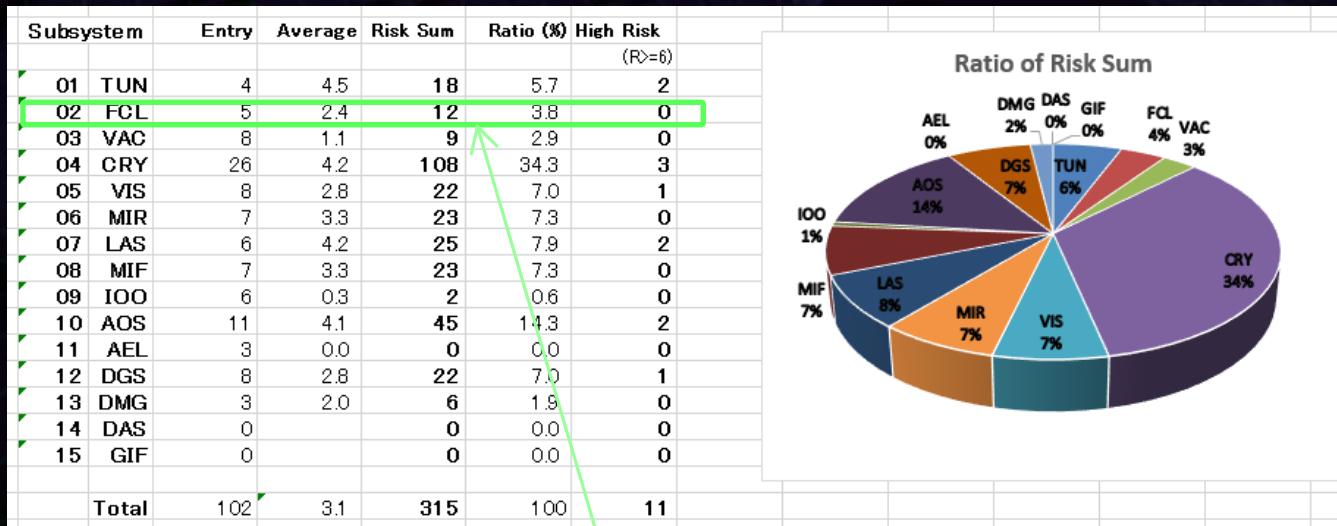
Reference date
(Present)

Progress Evaluation

- Progresses are evaluated by a 'Milestone scheme'.
 - ~10 milestones are set for each subsystem, picked up from a detailed schedule of each subsystem.
 - Status for the milestones are checked in regular meetings, progress evaluation with ~20% resolution.
 - The status will be open for all the collaborators.
 - Tools: MS Project and Web server.
- Progress checked in biweekly chief meetings.

Screenshot of Risk Register

- Top page : Summary page



- Subsystem Files

Results of updates are immediately reflected to the summary page.

KAGRA スク要因				2012.8.13								
(FCL)				Risk Registers : 5	Risk Sum : 12			high Risk : 0				
仮ID	サブシステム	項目	説明	インパクト	対応	P	S	R	Selection	情報元		
No.	Subsystem	Item	Explanation	Impact	Design/back-up plan	Estimated Degree of Probability	Seriousness	Degree of Risk	MA	KS	SM	Source
FCL-0	2	施設 Facility	静寂環境	信号取得系機器やエアコン・クーリーンプースの音が雑音源になる	感度を抑す雑音源になる	できるだけ、振動・騒音の少ない機器の選定、と隔離	2	3	2			Miyoki Aug. 8, 2012
FCL-1	2	FCL	電気環境	よいグラウンドが取れなくて、ハムが大きく舞り、データ品質を落とす。	データ品質を落とす。		3	4	3			Miyoki Aug. 8, 2012
FCL-2	2	FCL	クリーン環境	銀のロスを増やす	銀の予定性能が出ない。感度悪化。	奥研のferinaを利用したブースの利用	3	3	3			Miyoki Aug. 8, 2012
FCL-3	2	FCL	温度・湿度環境	高温・高湿度環境が、機器類の故障を誘発する	維持コストの増大・Duty Factorの低下を招く	特に制御部は、除湿機給付きボックスに格納	3	5	3			Miyoki Aug. 8, 2012
FCL-4	2	FCL	ネットワーク	ネット転送速度の維持・冗長性	データが転送できず、データがふれる。暴走取りこぼす。	二重化できるところはする	1	5	1			Miyoki Aug. 8, 2012