IVDR Summary and Status

Dave McGinnis

Internal Vertical Design Reviews (IVDRs)

(taken from TB12 Presentation)

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- As of TB12, ESS has held two CDRs in the past 6 months with three more planned in the next 4 months. At the first two CDRs,
  - The list of specifications were incomplete.
  - The interface specifications between Accelerator Disciplines were non-existent, incomplete or not ready.
- To avoid these types of gaps of information at future CDRs, the Chief Engineer will hold an internal review of the AIG prior to every CDR
  - The internal review will focus on the Level 3 system that is the subject of the CDR
  - The review will be vertical in nature; all L4 disciplines will be examined, but this also includes L4 interfaces

IVDR Organization

(taken from TB12 Presentation)

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- The Accelerator Integration Section Leader will organize the review.
- The review committee will consist of the following:
  - Chief Engineer (Dave McGinnis)
  - System Engineer (Eugene Tanke)
  - Accelerator Integration Section Leader (Steve Molloy)
  - Lead Mechanical Integration Engineer (Nick Gazis)
- Review will span 2 days

IVDR Home Page

https://ess-ics.atlassian.net/wiki/display/IVDR/Integrated+Vertical+Design+Reviews+Home

Integrated Vertical Design Reviews Home

Created by Stephen Molloy, last modified by David McGinnis 3 minutes ago

Schedule

Review topic	Start date	Responsible LE	Page	Report
RFQ	28 Apr 2015	@Edgar Sargsyan	Link	
DTL	19 May 2015	@Edgar Sargsyan	Link	Report
A2T	09 Jun 2015	@Stephen Molloy	Link	
HEBT	30 Jun 2015	@Inigo Alonso	Link	Report
SPK	08 Sep 2015	@Stephen Molloy	Link	Report
MEBT	29 Sep 2015	@Aurélien Ponton		
ELP	20 Oct 2015	@Stephen Molloy		
ISRC	10 Nov 2015	@Aurélien Ponton		
DMP	01 Dec 2015	@Stephen Molloy		

Original Charge

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VDR Format and Charge (Deprecated)

Created by Stephen Molloy, last modified by David McGinnis on Jun 24, 2015

Review Format

- The review team will hold one hour informal interviews with each work package leader that has an engineering discipline with the Level 3 System.
- The work package leader can bring as many staff as he/she would like to the interview.
  - Teleconferences with external members of the work package **are welcomed**.
  - To keep the interview informal, attendance at the interview will be limited to only members of the work package that is being interviewed.
  - The interview will be in a a round table format. *PowerPoint presentations are discouraged*.
- For the specific engineering discipline pertaining to the L3 system, it would be **extremely helpful** if the work package leader can bring to the interview the following
  1. **A few short sentences describing the technical scope.**
  2. **A few short sentences describing the design concept.**
  3. **The list of the L4 requirements in DOORS**
  4. **The list of interfaces to other engineering disciplines**
  5. **The list of interface requirements that are in DOORS**
  6. **A list of the top three technical risks.**

Review Charge

1. Are all L3 and L4 requirements, including interface requirements, baselined in DOORS?
2. Are the L3 requirements and specifications complete and traceable?
3. Are the L4 requirements and specifications complete and traceable?
4. Are the interfaces between Level 4 disciplines documented?
5. Are the interfaces between the Level 4 disciplines and the physical space understood?
6. Does the current state of the detailed design meet the L4 requirements and specifications?

Engineering Disciplines

Discipline	Description	WorkPackages
BMD	Beam Line Magnets and Deflectors	WP2, WP3, WP6
CNPW	Cabling and Conventional Power	WP15
CRYO	Cryogenics	WP10
EMR	Electromagnetic Resonators	WP3, WP4, WP5
ICS	Controls	
PBI	Proton Beam Instrumentation	WP7
PWRC	Power Convertors	WP17
RFS	Radio Frequency Systems	WP8
VAC	Vacuum	WP12
WTRC	Water Cooling	WP16

L3 Systems

System	Description
ISRC	Ion Source and Low Energy Beam Transport
RFQ	Radio Frequency Quadrupole
MEBT	Medium Energy Beam Transport
DTL	Drift Tube Linac
SPK	Spoke Cavity Linac
ELP	Elliptical Cavity Linac
HEBT	High Energy Beam Transport
A2T	Accelerator to Target
DMP	Tuning Dump

RFQ and DTL IVDR

- First IVDR was on RFQ L3 System
  - Organizational issues
  - Some miscommunications
  - Mostly no interfaces defined
  - Decision to do-over at a later date - no report written
- Second IVDR was on DTL L3 System
  - Mostly no interfaces defined
  - Decided to write report using grading system so that AIG could see progress
  - Decided to have AIG
    - write example Interfaces and example interface requirements
    - to show WP Leaders how to define interfaces and write interface requirements
  - To help WP Leaders on next IVDR, AIG wrote
    - defined 68 ***example*** interfaces
    - wrote 394 ***example*** requirements

IVDR Score Cards

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Scorecard

EMR	Weight (%)	Not Started	Conceptual	Documented	Approved	Score
		0	33	67	100	
Requirements	30				X	100
Interfaces	10		X			33
Interface Requirements	30	X				0
Integration Model	30			X		67
Percentage Complete	100	30	10	30	30	53.4

Scorecard

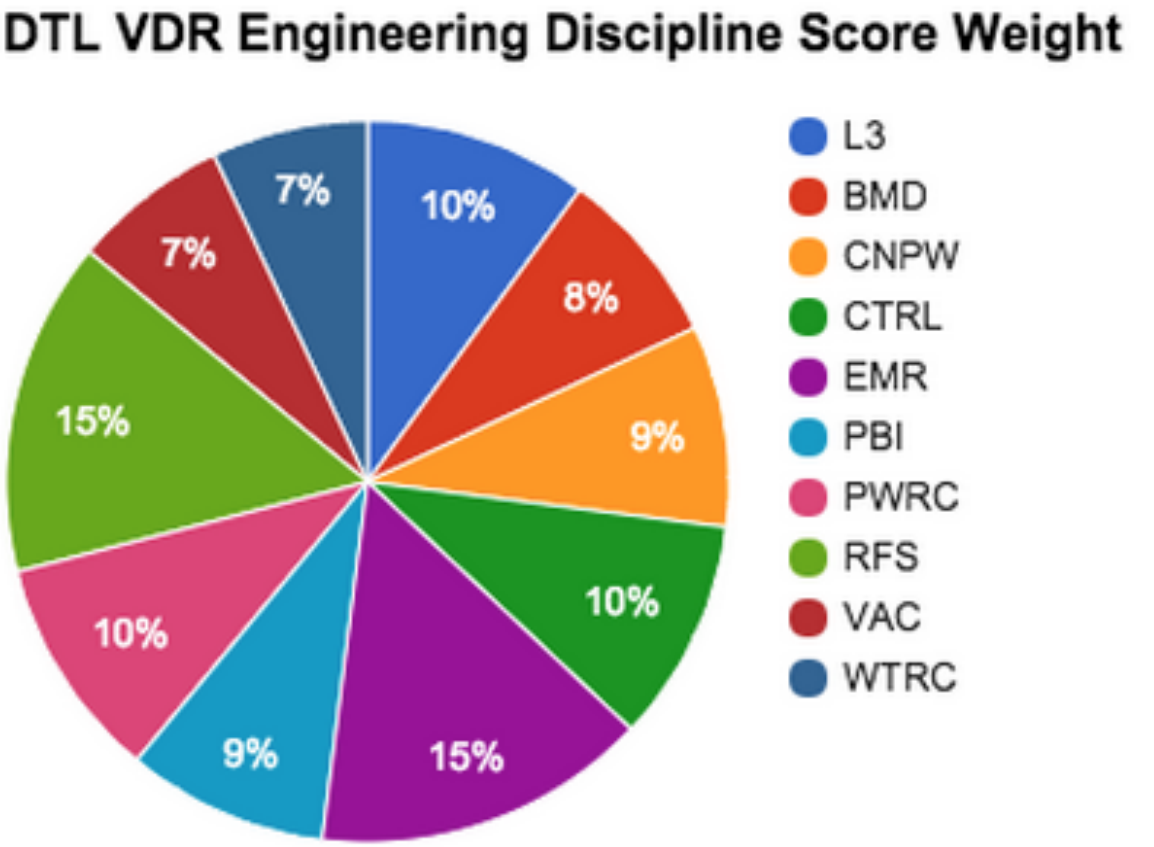
PBI	Weight (%)	Not Started	Conceptual	Documented	Approved	Score
		0	33	67	100	
Requirements	30	X				0
Interfaces	10		X			33
Interface Requirements	30	X				0
Integration Model	30		X			33
Percentage Complete	100	60	40	0	0	13.2

Scorecard

WTRC	Weight (%)	Not Started	Conceptual	Documented	Approved	Score
		0	33	67	100	
Requirements	0				X	100
Interfaces	20		X			33
Interface Requirements	40			X		67
Integration Model	40			X		67
Percentage Complete	100	0	20	80	0	60.2

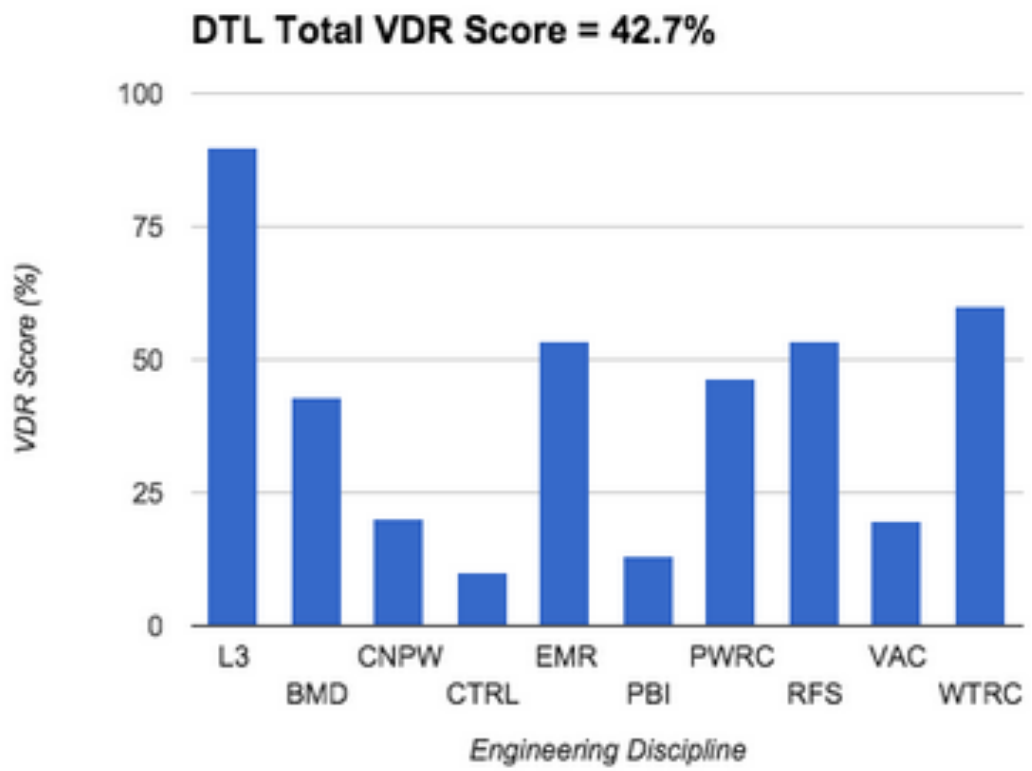
Discipline Weight for DTL

DISC	Weight (%)
L3	10
BMD	8
CNPW	9
CTRL	10
EMR	15
PBI	9
PWRC	10
RFS	15
VAC	7
WTRC	7
Total	100



DTL IVDR Score

DISC	Score
L3	90.1
BMD	43.2
CNPW	20
CTRL	9.9
EMR	53.4
PBI	13.2
PWRC	46.6
RFS	53.4
VAC	19.8
WTRC	60.2
Score	42.7



DTL ***Example*** Interfaces

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RecDtlInterfaces

File Edit View Insert Format Data Tools Add-ons Help Last edit was on June 15

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Comments Share

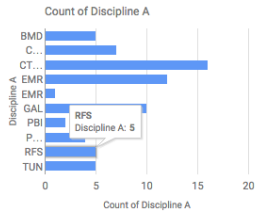
More

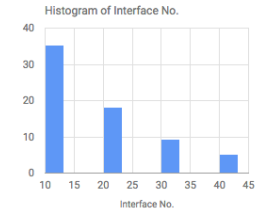
fx ID

	A	B	C	D	
1	ID	Discipline A	Discipline B	Interface	Text (EXAMPLE)
2	DTL.BMD.CTRL.010	BMD	CTRL	Corrector Temperature Status	Corrector Temperature Monitors
3	DTL.BMD.CTRL.020	BMD	CTRL	PMQ Temperature Status	PMQ Temperature Monitors
4	DTL.BMD.EMR.010	BMD	EMR	Corrector Mounting	DTL Corrector Magnets Mounting in Drift Tubes
5	DTL.BMD.EMR.020	BMD	EMR	PMQ Mounting	DTL PMQ Mounting in Drift Tubes
6	DTL.BMD.PWRC.010	BMD	PWRC	Corrector Dipoles	DTL Corrector Magnets Power Connection
7	DTL.CNPW.GAL.010	CNPW	GAL	Rack	DTL Gallery Racks Power Connection
8	DTL.CNPW.GAL.020	CNPW	GAL	Gallery Grounding System	DTL Gallery Grounding System
9	DTL.CNPW.CTRL.010	CNPW	CTRL	Rack Circuit Breaker	DTL Rack Circuit Breaker Monitoring
10	DTL.CNPW.PWRC.010	CNPW	PWRC	Klystron Modulator	DTL Modulators Power Connections
11	DTL.CNPW.TUN.010	CNPW	TUN	Tunnel Grounding System	DTL Tunnel Grounding System Connection
12	DTL.CNPW.WTRC.010	CNPW	WTRC	Cooling Skid Power	DTL Cooling Skid Power Connection
13	DTL.CNPW.WTRC.020	CNPW	WTRC	Pump Power	DTL Water Pump Connection
14	DTL.CTRL.EMR.010	CTRL	EMR	DTL Temperture Status	DTL Temperture Monitors
15	DTL.CTRL.GAL.010	CTRL	GAL	Electronics Crates	DTL CTRL Electronic Crates Connection and Location
16	DTL.CTRL.PBI.010	CTRL	PBI	BPM	DTL BPM Monitoring and Control
17	DTL.CTRL.PWRC.010	CTRL	PWRC	Klystron Modulator	DTL Modulator Monitoring and Control
18	DTL.CTRL.PWRC.020	CTRL	PWRC	Corrector Dipoles Power Supply	Corrector Power Supply Monitoring and Control
19	DTL.CTRL.PWRC.030	CTRL	PWRC	Klystron Filament Power Supply	Klystron Filament Power Supply Monitoring and Control
20	DTL.CTRL.PWRC.040	CTRL	PWRC	Klystron Solenoid Supply	Klystron Solenoid Supply Monitoring and Control
21	DTL.CTRL.RFS.010	CTRL	RFS	RF Regulation	DTL RF Regulation Monitoring and Control
22	DTL.CTRL.RFS.020	CTRL	RFS	Master Oscillator	Master Oscillator CTRL Connection
23	DTL.CTRL.RFS.030	CTRL	RFS	Reference Line	DTL Reference Line Monitoring
24	DTL.CTRL.TUN.010	CTRL	TUN	Tunnel HVAC	DTL Tunnel HVAC Monitoring
25	DTL.CTRL.VAC.010	CTRL	VAC	Vacuum Ion Pump	DTL Tank Ion Pump Monitoring and Control
26	DTL.CTRL.VAC.020	CTRL	VAC	Vacuum Gauge	DTL Tank Vacuum Gauges Monitoring and Control
27	DTL.CTRL.VAC.030	CTRL	VAC	Gate Valve	DTL Tank Gate Valves Monitoring and Control
28	DTL.CTRL.WTRC.010	CTRL	WTRC	Cooling Skid	DTL Cooling skid Monitoring and Control
29	DTL.CTRL.WTRC.020	CTRL	WTRC	Water System Status	DTL Water system Status Monitoring
30	DTL.EMR.PBI.010	EMR	PBI	BPM Mounting	DTL BPM Mounting in Drift Tubes
31	DTL.EMR.PBI.020	EMR	PBI	Intertank instrumentation Section	DTL Intertank Instrumentation Section
32	DTL.EMR.RFS.010	EMR	RFS	Coupler	DTL Waveguide Coupler Connection
33	DTL.EMR.RFS.020	EMR	RFS	RF Permit	DTL RF Permit
34	DTL.EMR.RFS.030	EMR	RFS	Tuner	DTL Tank Tuner Monitor and Control
35	DTL.EMR.RFS.040	EMR	RFS	RF Gap Monitors	DTL Tank Gap Monitor Connection
36	DTL.EMR.TUN.010	EMR	TUN	Tanks	DTL Tank Location and Mounting
37	DTL.EMR .VAC.010	EMR	VAC	Pumps	DTL Tank Vacuum Pump Connection
38	DTL.EMR.VAC.020	EMR	VAC	Gauge	DTL Tank Vacuum Gauge Connection
39	DTL.EMR.VAC.030	EMR	VAC	End of Tank Beampipe	DTL Intertank Gate Valve Connection
40	DTL.EMR.VAC.040	EMR	VAC	Tank1 UpstreamFlange	DTL Tank 1 Gate Valve Connection
41	DTL.EMR.WTRC.010	EMR	WTRC	DTL Tank Cooling Supply header	DTL Tank Cooling Supply Header Connection
42	DTL.EMR.WTRC.020	EMR	WTRC	DTL Tank Cooling Return header	DTL Tank Cooling Return Header Connection
43	DTL.GAL.PBI.010	GAL	PBI	Electronics Crates	DTL Instrumentation Electronics Location
44	DTL.GAL.PWRC.010	GAL	PWRC	Modulator	DTL Modulator Location and Mounting
45	DTL.GAL.PWRC.020	GAL	PWRC	Rack Mounted Power Convertors	DTL Rack Mounted Power Convertors Location and Connection

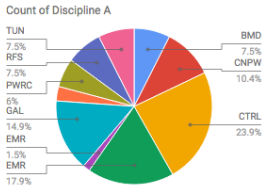
Interfaces | Requirements | BMD | CNPW | CTRL | EMR | GAL | PBI | PWRC | RFS | TUN | VAC | WTRC

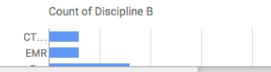
Explore





Ranges from 10 ("DTL.BMD.CTRL.010", "DTL.BMD.EMR.010", "DTL.BMD.PWRC.010", and 32 others) to 40 ("DTL.CTRL.PWRC.040", "DTL.EMR.RFS.040", "DTL.EMR.VAC.040", and 2 others), but 80% of values are less than or equal to 30.





DTL *Example* Interface Requirements

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RecDtlInterfaces

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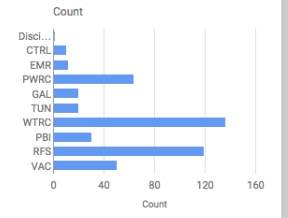
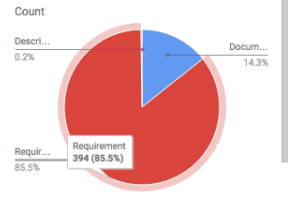
Comments Share

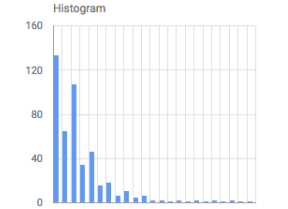
Floor Mounting

	A	B	C	D	E	F	
358	DTL.PWRC.RFS.010.020	PWRC	RFS	Modulator	Cable Connection	Requirement	PWRC and RFS shall connect the klystrons to the modulator using xx-yytype cables and connect
359	DTL.PWRC.RFS.010.030	PWRC	RFS	Modulator	Peak voltage	Requirement	PWRC shall provide a peak voltage of 120kV to each klystron
360	DTL.PWRC.RFS.010.040	PWRC	RFS	Modulator	Voltage range	Requirement	PWRC shall be able to continuously adjust this voltage from 80kV to 120kV
361	DTL.PWRC.RFS.010.050	PWRC	RFS	Modulator	Voltage droop	Requirement	The flattop voltage droop should not exceed 1%
362	DTL.PWRC.RFS.010.060	PWRC	RFS	Modulator	Voltage ripple	Requirement	The flattop voltage ripple should be less than 0.1%
363	DTL.PWRC.RFS.010.070	PWRC	RFS	Modulator	Flatop current	Requirement	RFS shall not draw more than 40 Amps at a voltage of 120 kV to the klystron
364	DTL.PWRC.RFS.010.080	PWRC	RFS	Modulator	Klystron perveance	Requirement	RFS shall provide a klystron pervveance of xx uP
365	DTL.PWRC.RFS.010.090	PWRC	RFS	Modulator	Flattop length	Requirement	PWRC shall provide a flatop length of 3.5 mSec
366	DTL.PWRC.RFS.010.100	PWRC	RFS	Modulator	Rise time	Requirement	PWRC shall rise from 0 to 120 kV in 50 uS
367	DTL.PWRC.RFS.010.110	PWRC	RFS	Modulator	Fall Time	Requirement	PWRC shall fall from 120kV to 0 kV in 50uS
368	DTL.PWRC.RFS.010.120	PWRC	RFS	Modulator	Stored Energy dump	Requirement	Upon arc detection, PWRC shall not dump more than 20J into the klystron
369	DTL.PWRC.RFS.010.130	PWRC	RFS	Modulator	Arc detection	Requirement	RFS shall provide PWRC an arc detection signal using a protocol described in document
370	DTL.PWRC.RFS.010.140	PWRC	RFS	Modulator	Modulator Status	Requirement	PWRC shall provide RFS a digital status 16 bit word using a protocol described in document
371	DTL.PWRC.RFS.010.150	PWRC	RFS	Modulator	RF Ready Bit	Requirement	RFS shall provide PWRC an RF ready bit.
372	DTL.PWRC.RFS.010.160	PWRC	RFS	Modulator	Voltage inhibit	Requirement	PWRC shall not supply voltage to the klystron collector unelss the RF Ready bit is high.
373	DTL.PWRC.RFS.020	PWRC	RFS	Klystron Filament	Description	Document	DTL Klystron Filament Power Connection
374	DTL.PWRC.RFS.020.010	PWRC	RFS	Klystron Filament	Locations	Requirement	PWRC shall provide power convertors to power each DTL klystron filament supply independently
375	DTL.PWRC.RFS.020.020	PWRC	RFS	Klystron Filament	Operating voltage	Requirement	PWRC shall provide a voltage range from 0 V to 10V in a continous manner
376	DTL.PWRC.RFS.020.030	PWRC	RFS	Klystron Filament	Operating current	Requirement	RFS shall not draw more than XX amps at 10V
377	DTL.PWRC.RFS.020.040	PWRC	RFS	Klystron Filament	Connector Type	Requirement	PWRC and RFS shall connect according to connectors xxx-yyy as described in document
378	DTL.PWRC.RFS.030	PWRC	RFS	Klystron Solenoid	Description	Document	DTL Klystron Solenoid Power connection
379	DTL.PWRC.RFS.030.010	PWRC	RFS	Klystron Solenoid	Locations	Requirement	PWRC shall provide power convertors to power each DTL klystron solenoid independently as des
380	DTL.PWRC.RFS.030.020	PWRC	RFS	Klystron Solenoid	Operating voltage	Requirement	PWRC shall provide a voltage range from 0 V to 20V in a continous manner
381	DTL.PWRC.RFS.030.030	PWRC	RFS	Klystron Solenoid	Operating current	Requirement	RFS shall not draw more than XX amps at 20V
382	DTL.PWRC.RFS.030.040	PWRC	RFS	Klystron Solenoid	Connector Type	Requirement	PWRC and RFS shall connect according to connectors xxx-yyy as described in document
383	DTL.PWRC.WTRC.010	PWRC	WTRC	Modulator Cooling	Description	Document	DTL Klystron Modulator Cooling Connection
384	DTL.PWRC.WTRC.010.010	PWRC	WTRC	Modulator Cooling	Location	Requirement	The location to of the water cooling connections to the modulators are shown in document
385	DTL.PWRC.WTRC.010.020	PWRC	WTRC	Modulator Cooling	Shutoff Valve	Requirement	WTRC shall provide a valve to shut off the supply inlet water to each modulator
386	DTL.PWRC.WTRC.010.030	PWRC	WTRC	Modulator Cooling	Flange type	Requirement	WTRC and PWRC shall provide a flanges according to drawing .
387	DTL.PWRC.WTRC.010.040	PWRC	WTRC	Modulator Cooling	Supply Pressure	Requirement	WTRC shall provide a supply water at a pressure between xx to yy bar
388	DTL.PWRC.WTRC.010.050	PWRC	WTRC	Modulator Cooling	Supply Temperature	Requirement	WTRC shall provide a water temperature in the range of xx to yy C.
389	DTL.PWRC.WTRC.010.060	PWRC	WTRC	Modulator Cooling	Supply quality	Requirement	WTRC shall provide a water quality between xx to yy goobers
390	DTL.PWRC.WTRC.010.070	PWRC	WTRC	Modulator Cooling	Supply flow	Requirement	WTRC shall provide a flow between xx to yy liters per minute to each modulator
391	DTL.PWRC.WTRC.010.080	PWRC	WTRC	Modulator Cooling	Return pressure	Requirement	PWRC shall return water at a pressure between xx to yy bar
392	DTL.PWRC.WTRC.010.090	PWRC	WTRC	Modulator Cooling	Return temperature	Requirement	PWRC shall return a water temperature in the range of xx to yy C.
393	DTL.RFS.TUN.010	RFS	TUN	Waveguide Distribution	Description	Document	DTL Tunnel Waveguide Location and Monitoring
394	DTL.RFS.TUN.010.010	RFS	TUN	Waveguide Distribution	Waveguide routing	Requirement	RFS shall route the DTL waveguides in the tunnel as shown in document
395	DTL.RFS.TUN.010.020	RFS	TUN	Waveguide Distribution	Waveguide support	Requirement	TUN shall provide waveguide supports as shown in document
396	DTL.RFS.TUN.010.030	RFS	TUN	Waveguide Distribution	Waveguide cooling	Requirement	RFS shall disappate all lost power into TUN HVAC
397	DTL.RFS.WTRC.010	RFS	WTRC	Klystron Collector	Description	Document	DTL Klystron Collector Cooling Connection
398	DTL.RFS.WTRC.010.010	RFS	WTRC	Klystron Collector	Location	Requirement	The location to of the water cooling connections to the klystron collectors are shown in document
399	DTL.RFS.WTRC.010.020	RFS	WTRC	Klystron Collector	Shutoff Valve	Requirement	WTRC shall provide a valve to shut off the supply inlet water to each klystron collector
400	DTL.RFS.WTRC.010.030	RFS	WTRC	Klystron Collector	Flange type	Requirement	WTRC and RFS shall provide a flanges according to drawing .
401	DTL.RFS.WTRC.010.040	RFS	WTRC	Klystron Collector	Supply Pressure	Requirement	WTRC shall provide a supply water at a pressure between xx to yy bar
402	DTL.RFS.WTRC.010.050	RFS	WTRC	Klystron Collector	Supply Temperature	Requirement	WTRC shall provide a water temperature in the range of xx to yy C.

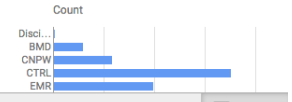
Explore







Ranges from 0 ("DTL.BMD.CTRL.010", "DTL.BMD.CTRL.020", "DTL.BMD.EMR.010", and 63 others) to 330 ("DTL.CTRL.RFS.010.330"), with most values at the low end. The median is 30.



Interfaces | Requirements | BMD | CNPW | CTRL | EMR | GAL | PBI | PWRC | RFS | TUN | VAC | WTRC | LeftOver

Explore

A2T IVDR

- Mostly no interfaces defined
- Decided to not write report
- Decided to re-vamp next IVDR to help WP leaders write interface requirements during the review.
- Made new IVDR charge that focussed on Interface requirements
- New Grading Format (developed by I. Alonso)

New IVDR Charge

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New VDR Format and Charge

Created by David McGinnis on Jun 24, 2015

Review Format

- **Based on the results of previous VDR's, the format of the review has changed to focus on the definition of Level 4 interfaces and Interface requirements.**
- The review team will hold one hour informal interviews with each work package leader that has an engineering discipline with the Level 3 System.
- The work package leader can bring as many staff as he/she would like to the interview.
  - Teleconferences with external members of the work package **are welcomed**.
  - To keep the interview informal, attendance at the interview will be limited to only members of the work package that is being interviewed.
  - The interview will be in a a round table format. ***PowerPoint presentations are discouraged***.
- For the specific engineering discipline pertaining to the L3 system, the following questions will be asked:
  - **What engineering disciplines are covered by your work package?**
  - **With what other engineering disciplines does your work package have interfaces?**
  - **For each engineering discipline that your work package has interfaces, what are the interfaces?**
  - **For each interface, where do you document the interfaces (drawing, CHESS document, Confluence, etc)?**
  - **For each interface, what are the major requirements that describe the interface (list at least 3)?**

Review Charge

1. Are the Level 4 interfaces known?
2. Are the Level 4 interface descriptions documented?
3. Are the major level 4 interface requirements known?
4. Are the major level 4 interface requirements documented

HEBT IVDR ScoreCard (I. Alonso)

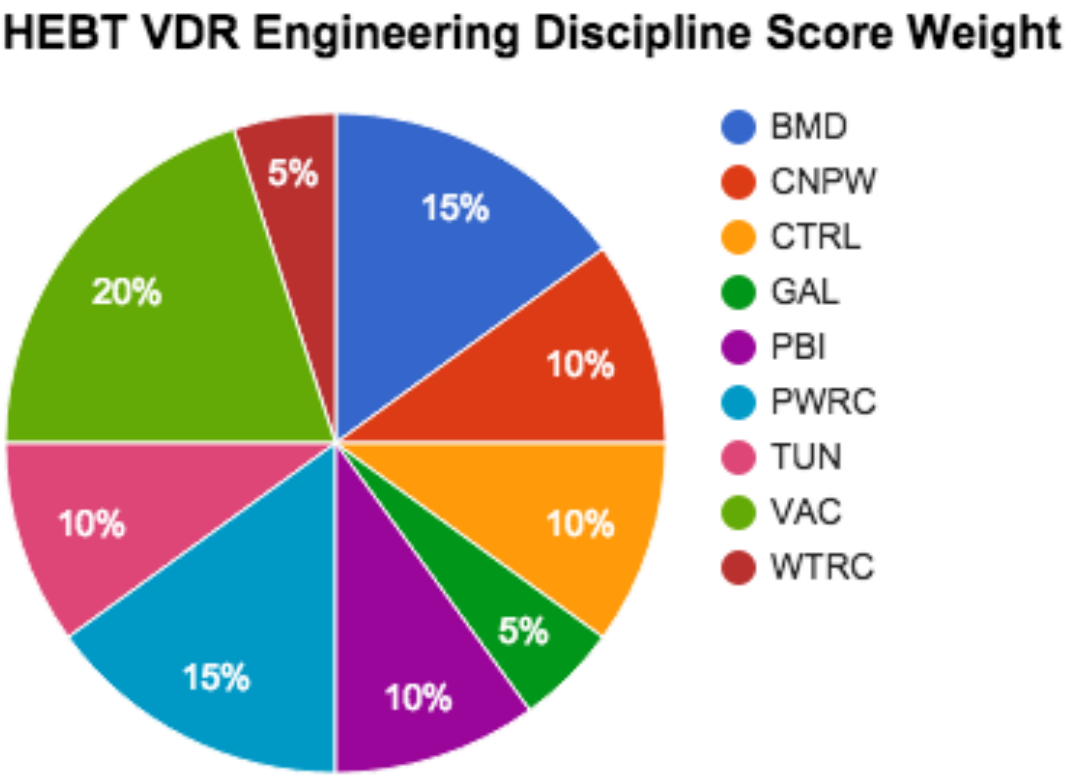
EUROPEAN SPALLATION SOURCE

CTRL	Weight (%)	Not Started	Conceptual	Documented	Approved	Score
		0	33	67	100	
BMD	0	-	-	-	-	
CNPW	20	x				0
CTRL	0	-	-	-	-	
GAL	0	-	-	-	-	
PBI	40	x				0
PWRC	20		x			33
TUN	0	-	-	-	-	
VAC	20		x			33
WTRC	0	-	-	-	-	
Percentage Complete	100	0	40	0	0	13.2

VAC	Weight (%)	Not Started	Conceptual	Documented	Approved	Score
		0	33	67	100	
BMD	15		x			33
CNPW	15		x			33
CTRL	15		x			33
GAL	0	-	-	-	-	
PBI	30			x		67
PWRC	0	-	-	-	-	
TUN	25		x			33
VAC	0	-	-	-	-	
WTRC	0	-	-	-	-	
Percentage Complete	100	0	70	30	0	43.2

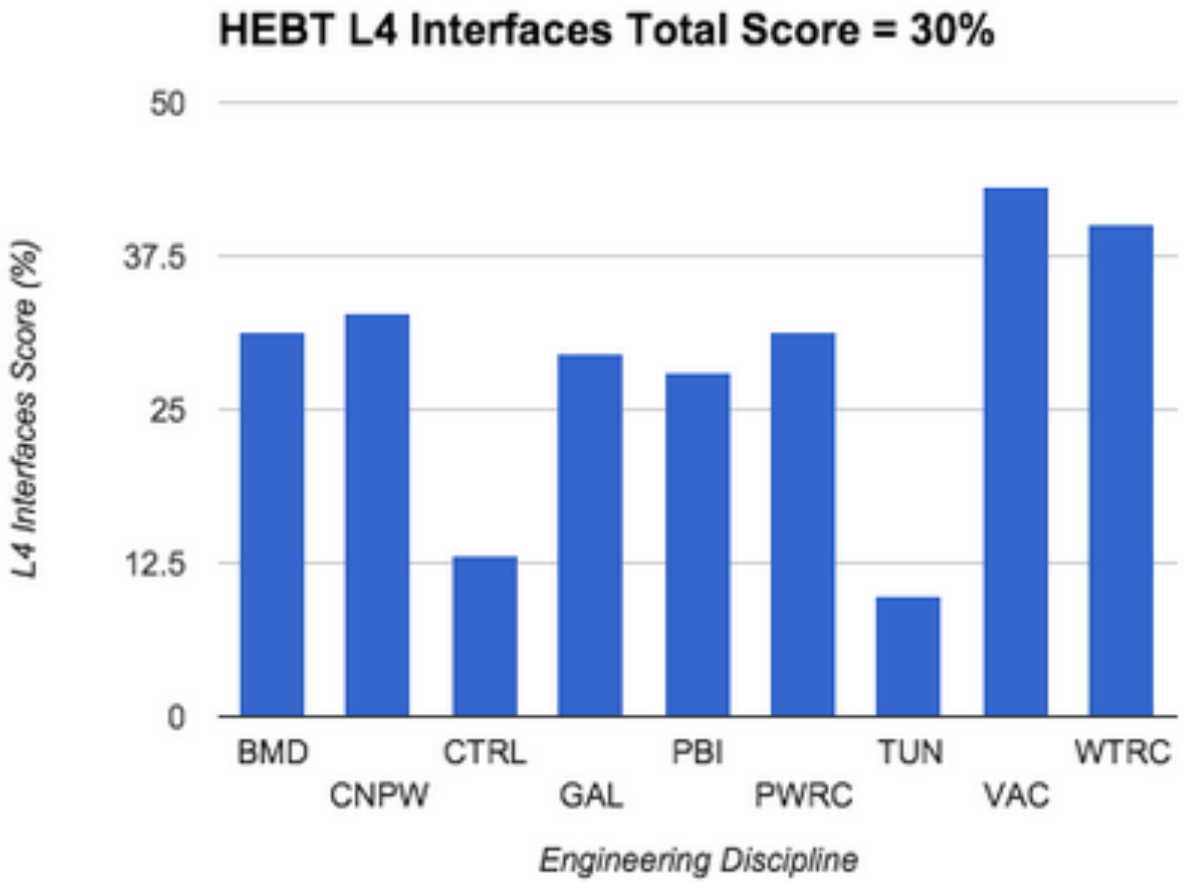
HEBT IVDR Weighting (I. Alonso)

DISC	Weight (%)
BMD	15
CNPW	10
CTRL	10
GAL	*5*
PBI	10
PWRC	15
TUN	*10*
VAC	20
WTRC	5
Total	100



HEBT IVDR Score (I. Alonso)

DISC	Score
BMD	31.35
CNPW	33
CTRL	13.2
GAL	29.7
PBI	28.05
PWRC	33
TUN	9.9
VAC	43.2
WTRC	40.15
Score	30.2



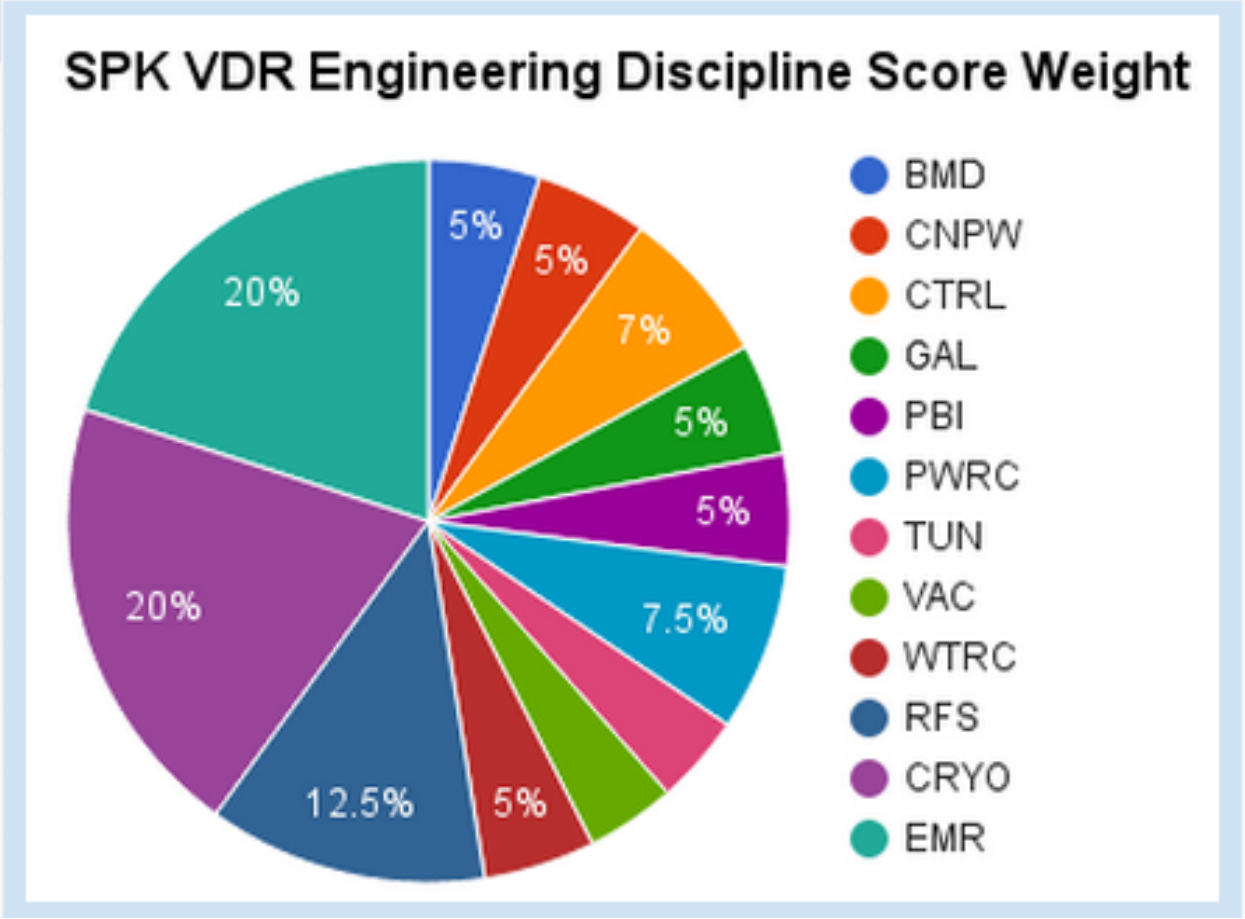
SPK IVDR ScoreCard (S. Molloy)

WTRC	Weight (%)	Not Started	Conceptual	Documented	Approved	Score
		0	33	67	100	
BMD	0					0
CNPW	10		x			33
CTRL	5		x			33
GAL	10		x			33
PBI	5		x			33
PWRC	0					0
TUN	10		x			33
VAC	0					0
WTRC	0					0
RFS	35			x		67
CRYO	0					0
EMR	25			x		67
Percentage Complete	100	0	40	60	0	53.4

RFS	Weight (%)	Not Started	Conceptual	Documented	Approved	Score
		0	33	67	100	
BMD	0					0
CNPW	10	x				0
CTRL	10	x				0
GAL	10	x				0
PBI	5	x				0
PWRC	20	x				0
TUN	5		x			33
VAC	0					0
WTRC	10		x			33
RFS	0					0
CRYO	0					0
EMR	30	x				0
Percentage Complete	100	85	15	0	0	4.95

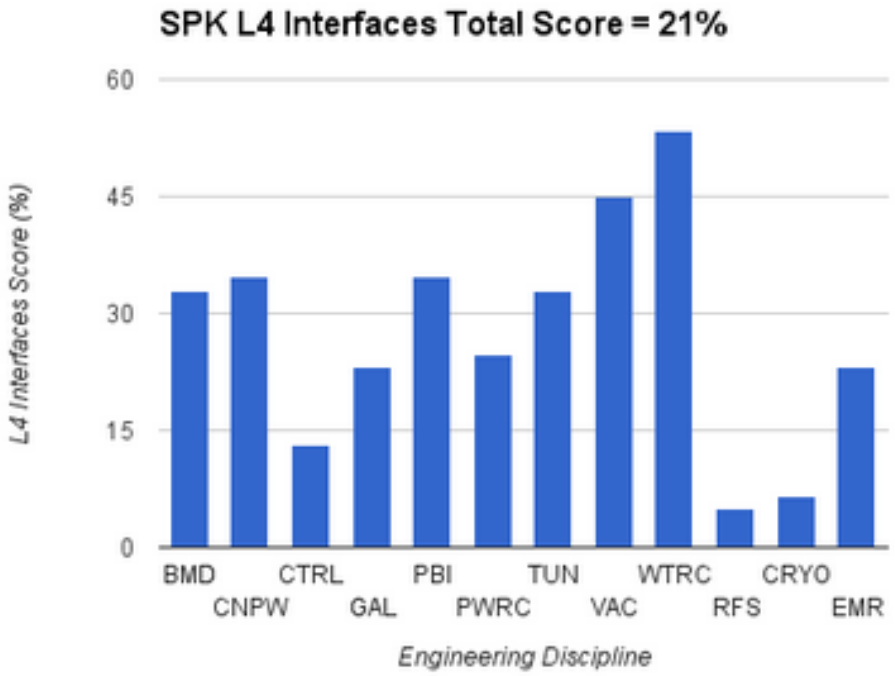
SPK IVDR Weighting (S. Molloy)

DISC	Weight (%)
BMD	5
CNPW	5
CTRL	7
GAL	5
PBI	5
PWRC	7.5
TUN	4
VAC	4
WTRC	5
RFS	12.5
CRYO	20
EMR	20
Total	100



SPK IVDR Score (S. Molloy)

DISC	Score
BMD	33
CNPW	34.85
CTRL	13.25
GAL	23.1
PBI	34.7
PWRC	24.75
TUN	33
VAC	45
WTRC	53.4
RFS	4.95
CRYO	6.6
EMR	23.15
Score	21.4



Summary

- With the exception of a few WP's, little progress on defining interfaces has been made.
  - IVDRS are very time consuming.
  - IVDRs are not working.
  - Need to reassess the need for interface requirements
- A little success…
  - **Interview** format for review very successful in getting to root issues quickly
  - For the interview format to work:
    - Very focussed charge
    - Small review committee
    - No peanut gallery
    - Little or no PowerPoint
  - Concept of weighting and scoring keeps review as objective as possible.