

Interconnections Q1 to D1 new
longitudinal space allocation and
general view of data provided to
WP2 as input for new optics
evaluation

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22/01/2015

Input data provided to WP2

original 1.1				changes							new							
IR5 Right Beam 1	Position [m]	Start [m]	End [m]	Length [m]	IR5 Right Beam 2	Position [m]	Start [m]	End [m]	mag length [m]	reason	amount [m]	cumulative mech [m]	cumulative mag centers shift [m]	new mag length [m]	Position mag cente [m]	Start [m]	End [m]	
										elongation VCX area	0.993000	0.993000						
										change distance end cold mass start mag length	0.007000	1.000000						
MQXFA.1R5	25.00000	23.00000	27.00000	4.00000	MQXFA.1R5	25.00000	23.00000	27.00000	4.00000	increase MQXFA mag length	0.200000	1.200000	1.100000	4.200000	26.100000	24.000000	28.200000	
										change distance between magnetic centers	0.150000	1.350000	1.250000					
MQXFA.B1R5	29.50000	27.50000	31.50000	4.00000	MQXFA.B1R5	29.50000	27.50000	31.50000	4.00000	increase MQXFA mag length	0.200000	1.550000	1.450000	4.200000	30.950000	28.850000	33.050000	
										change distance end mag length end CM	0.007000	1.657000						
										increase interconnect length	0.080000	1.637000						
										decrease space in front in CM in front MCBX	-0.147500	1.489500	1.489500					
MCBFBH.A2R5	34.10000	33.50000	34.70000	1.20000	MCBFBH.A2R5	34.10000	33.50000	34.70000	1.20000			1.489500	1.489500	1.200000	35.589500	34.989500	36.189500	
MCBFBV.A2R5	34.10000	33.50000	34.70000	1.20000	MCBFBV.A2R5	34.10000	33.50000	34.70000	1.20000			1.489500	1.489500	1.200000	35.589500	34.989500	36.189500	
										decrease distance end mag length MCBXF/start MQXFB	-0.012500	1.477000						
MQXFB.A2R5	38.60000	35.20000	42.00000	6.80000	MQXFB.A2R5	38.60000	35.20000	42.00000	6.80000	increase MQXFB mag length	0.340000	1.817000	1.647000	7.140000	40.247000	36.677000	43.817000	
										change distance end MQXFB /end CM	0.007000	1.824000						
										increase interconnect length	0.080000	1.904000						
										change distance beginning CM/start MQXFB	0.007000	1.911000						
MQXFB.B2R5	47.40000	44.00000	50.80000	6.80000	MQXFB.B2R5	47.40000	44.00000	50.80000	6.80000	increase MQXFB mag length	0.340000	2.251000	2.081000	7.140000	49.481000	45.911000	53.051000	
										decrease distance end mag length MCBXF/start MQXFB	-0.012500	2.238500						
MCBFBH.B2R5	51.90000	51.30000	52.50000	1.20000	MCBFBH.B2R5	51.90000	51.30000	52.50000	1.20000			2.238500	2.238500	1.200000	54.138500	53.538500	54.738500	
MCBFBV.B2R5	51.90000	51.30000	52.50000	1.20000	MCBFBV.B2R5	51.90000	51.30000	52.50000	1.20000			2.238500	2.238500	1.200000	54.138500	53.538500	54.738500	
										decrease space from end MCBXF to end cold mass	-0.147500	2.091000						
										increase interconnect length	0.080000	2.171000						
										change distance start CM to begin mag length	0.007000	2.178000						
MQXFA.A3R5	56.50000	54.50000	58.50000	4.00000	MQXFA.A3R5	56.50000	54.50000	58.50000	4.00000	increase MQXFA mag length	0.200000	2.378000	2.278000	4.200000	58.778000	56.678000	60.878000	
										change distance between magnetic centers	0.150000	2.528000	2.428000					
MQXFA.B3R5	61.00000	59.00000	63.00000	4.00000	MQXFA.B3R5	61.00000	59.00000	63.00000	4.00000	increase MQXFA mag length	0.200000	2.728000	2.628000	4.200000	63.628000	61.528000	65.728000	
										change distance end mag length end cold mass	0.007000	2.735000						
										increase interconnect length	0.080000	2.815000						
MCBFAH.3R5	66.44444	65.34444	67.54444	2.20000	MCBFAH.3R5	66.44444	65.34444	67.54444	2.20000			2.815000	2.815000	2.200000	69.259440	68.159440	70.359440	
MCBFAV.3R5	66.44444	65.34444	67.54444	2.20000	MCBFAV.3R5	66.44444	65.34444	67.54444	2.20000			2.815000	2.815000	2.200000	69.259440	68.159440	70.359440	
MCSXF.3R5	68.243940	67.840440	68.647440	0.807000	MCSXF.3R5	68.243940	67.840440	68.647440	0.807000			2.815000	2.815000	0.807000	71.058940	70.654440	71.462440	
MCTXF.3R5	69.003820	68.788820	69.218820	0.430000	MCTXF.3R5	69.003820	68.788820	69.218820	0.430000			2.815000	2.815000	0.430000	71.818820	71.603820	72.038820	
MCTSF.3R5	69.401190	69.356690	69.445690	0.089000	MCTSF.3R5	69.401190	69.356690	69.445690	0.089000			2.815000	2.815000	0.089000	72.216190	72.116190	72.260690	
MCDXF.3R5	69.627570	69.580070	69.637070	0.095000	MCDXF.3R5	69.627570	69.580070	69.637070	0.095000			2.815000	2.815000	0.095000	72.442570	72.395070	72.490070	
MCDXF.3R5	69.856950	69.809450	69.904450	0.095000	MCDXF.3R5	69.856950	69.809450	69.904450	0.095000			2.815000	2.815000	0.095000	72.671950	72.624450	72.719450	
MCOXF.3R5	70.080330	70.036830	70.123830	0.087000	MCOXF.3R5	70.080330	70.036830	70.123830	0.087000			2.815000	2.815000	0.087000	72.895330	72.851830	72.938830	
MCOXF.3R5	70.297710	70.254210	70.341210	0.087000	MCOXF.3R5	70.297710	70.254210	70.341210	0.087000			2.815000	2.815000	0.087000	73.112710	73.069210	73.156210	
MCSXF.3R5	70.527090	70.471590	70.582590	0.111000	MCSXF.3R5	70.527090	70.471590	70.582590	0.111000			2.815000	2.815000	0.111000	73.342090	73.286590	73.397590	
MCSXF.3R5	70.768470	70.712970	70.823970	0.111000	MCSXF.3R5	70.768470	70.712970	70.823970	0.111000	remember for us change CO cryostat length +190 mm		2.815000	2.815000	0.111000	73.583470	73.527970	73.638970	
										increase interconnect length	0.190000	3.005000						
MBXF.4R5	75.455000	72.320000	78.590000	6.270000	MBXF.4R5	75.455000	72.320000	78.590000	6.270000			3.005000	3.005000	6.270000	78.460000	75.325000	81.595000	
												3.005000						
DFXJ.4R5	81.52	80.270000	82.770000	2.500000	DFXJ.4R5	81.52	80.270000	82.770000	2.500000			3.005000	3.005000		84.525000	80.270000	84.525000	
DFMJ.4R5	129.558480	86.372320	90.372320	4.000000	DFMJ.4R5	129.558480	86.372320	90.372320	4.000000			3.005000	3.005000		132.563480	86.372320	132.563480	
												3.005000						
MBRD.4R5.B1	142.396000	138.506000	146.286000	7.780001	MBRD.4R5.B2	142.396000	138.506000	146.286000	7.780001			3.005000	3.005000	7.780001	145.401000	141.511000	149.291001	
MCBRDV.4R5.B1	147.516000	146.766000	148.266000	1.500000	MCBRDV.4R5.B2	147.516000	146.766000	148.266000	1.500000	increase MCBRD mag length	0.300000	3.305000	3.155000	1.800000	150.671000	149.771000	151.571000	
MCBRDH.4R5.B1	149.496000	148.746000	150.246000	1.500000	MCBRDH.4R5.B2	149.496000	148.746000	150.246000	1.500000	increase MCBRD mag length	0.300000	3.605000	3.455000	1.800000	152.951000	152.051000	153.851000	
												3.605000						
ACFCA.AR5.B1	153.574000	153.574000	153.574000	0.000000								3.605000					153.574000	
ACFCA.BR5.B1	154.624000	154.624000	154.624000	0.000000								3.605000					154.624000	
					ACFCA.AR5.B2	156.974000	156.974000	156.974000	0.000000			3.605000						156.974000
					ACFCA.BR5.B2	158.024000	158.024000	158.024000	0.000000			3.605000						158.024000
ACFCA.CR5.B1	160.174000	160.174000	160.174000	0.000000								3.605000					160.174000	
ACFCA.DR5.B1	161.224000	161.224000	161.224000	0.000000								3.605000					161.224000	
					ACFCA.CR5.B2	163.574000	163.574000	163.574000	0.000000			3.605000						163.574000
					ACFCA.DR5.B2	164.624000	164.624000	164.624000	0.000000			3.605000						164.624000
										decrease space in CM in front MCBYY	-0.017500	3.587500						
MCBYY.4R5.B1	172.605000	171.855000	173.355000	1.500000	MCBYY.4R5.B2	172.605000	171.855000	173.355000	1.500000	increase MCBYY mag length	0.300000	3.887500	3.737500	1.800000	176.342500	175.442500	177.242500	
										decrease space between MCBYY 1 and 2	-0.095000	3.792500						
MCBYY.4R5.B1	174.585000	173.835000	175.335000	1.500000	MCBYY.4R5.B2	174.585000	173.835000	175.335000	1.500000	increase MCBYY mag length	0.300000	4.092500	3.942500	1.800000	178.527500	177.627500	179.427500	
										increase distance MCBYY MQYY	0.013500	4.106000						
MQYY.4R5.B1	177.600000	175.685000	179.515000	3.830000	MQYY.4R5.B2	177.600000	175.685000	179.515000	3.830000	increase mech length MQYY	0.028000	4.120500	4.120000	3.830000	181.720000	179.805000	183.635000	

original 1.1	changes			
IR5 Right Beam 1	reason	amount	cumulative mech	cumulative mag centers shift
		[m]	[m]	[m]
	elongation VCX area	0.993000	0.993000	
	change distance end cold mass start mag length	0.007000	1.000000	
MQXFA.A1R5	increase MQXFA mag length	0.200000	1.200000	1.100000
	change distance between magnetic centers	0.150000	1.350000	1.250000
MQXFA.B1R5	increase MQXFA mag length	0.200000	1.550000	1.450000
	change distance end mag length end CM	0.027000	1.557000	
	increase interconnect length	0.080000	1.637000	
	decrease space in front in CM in front MCBX	-0.147500	1.489500	
MCBFBH.A2R5			1.489500	1.489500
MCBFBV.A2R5			1.489500	1.489500
	decrease distance end mag length MCBXF/start MQXFB	-0.012500	1.477000	
MQXFB.A2R5	increase MQXFB mag length	0.340000	1.817000	1.647000
	change distance end MQXFB /end CM	0.007000	1.824000	
	increase interconnect length	0.080000	1.904000	
	change distance beginning CM/start MQXFB	0.007000	1.911000	
MQXFB.B2R5	increase MQXFB mag length	0.340000	2.251000	2.081000
	decrease distance end mag length MCBXF/start MQXFB	-0.012500	2.238500	
MCBFBH.B2R5			2.238500	2.238500
MCBFBV.B2R5			2.238500	2.238500
	decrease space from end MCBXF to end cold mass	-0.147500	2.091000	
	increase interconnect length	0.080000	2.171000	
	change distance start CM to begin mag length	0.007000	2.178000	
MQXFA.A3R5	increase MQXFA mag length	0.200000	2.378000	2.278000
	change distance between magnetic centers	0.150000	2.528000	2.428000
MQXFA.B3R5	increase MQXFA mag length	0.200000	2.728000	2.628000
	change distance end mag length end cold mass	0.007000	2.735000	
	increase interconnect length	0.080000	2.815000	
MCBFAH.3R5			2.815000	2.815000
MCBFAV.3R5			2.815000	2.815000
MQSXF.3R5			2.815000	2.815000
MCTXF.3R5			2.815000	2.815000
MCTSXF.3R5			2.815000	2.815000
MCDXF.3R5			2.815000	2.815000
MCDVSXF.3R5			2.815000	2.815000
MCOXF.3R5			2.815000	2.815000
MCOVSXF.3R5			2.815000	2.815000
MCSXF.3R5			2.815000	2.815000
MCSSXF.3R5	remember for us change CO cryostat length +190 mm		2.815000	2.815000
	increase interconnect length	0.190000	3.005000	
MBXF.4R5			3.005000	3.005000
			3.005000	
DFXJ.4R5			3.005000	3.005000
DFMJ.4R5			3.005000	3.005000
			3.005000	
MBRD.4R5.B1			3.005000	3.005000
MCBRDV.4R5.B1	increase MCBRD mag length	0.300000	3.305000	3.155000
MCBRDH.4R5.B1	increase MCBRD mag length	0.300000	3.605000	3.455000
			3.605000	
ACFCA.AR5.B1			3.605000	
ACFCA.BR5.B1			3.605000	
			3.605000	
ACFCA.CR5.B1			3.605000	
ACFCA.DR5.B1			3.605000	
			3.605000	
			3.605000	
	decrease space in CM in front MCBYY	-0.017500	3.587500	
MCBYYH.4R5.B1	increase MCBYY mag length	0.200000	3.887500	3.737500
	decrease space between MCBYY 1 and 2	-0.095000	3.792500	
MCBYYV.4R5.B1	increase MCBYY mag length	0.300000	4.092500	3.942500
	increase distance MCBYY MQYY	0.015000	4.106000	
MQYY.4R5.B1	increase mech length MQYY	0.028000	4.120500	4.120000

Start Q1 shift of 1 m

End of D1 shift of 3 m

End of D1 shift of 3 m

Q4 shift of 4.1 m

Region Q1->TAS

- Reduction of the dose to the personnel optimising v line equipment
 - Change of the vacuum components from steel to Al
 - Use of quick flanges



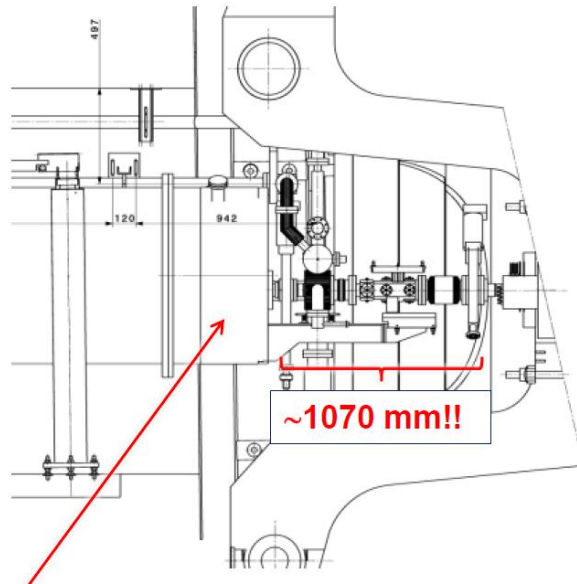
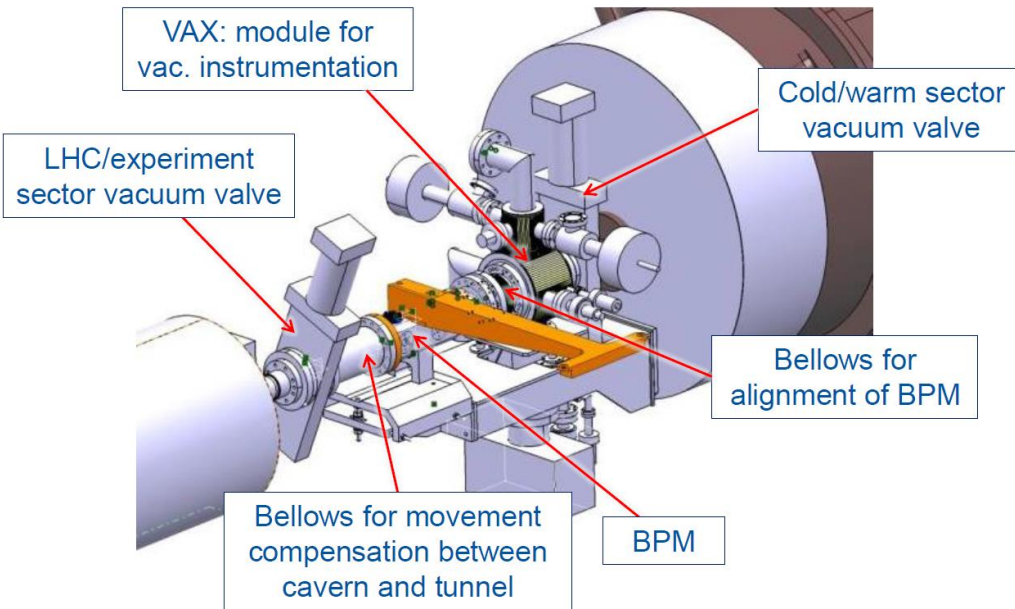
+ 390 mm

- Reduction of the dose to personnel providing better and quicker access



+ 1000 mm
(+610 respect
the one
above)

Region Q1->TAS

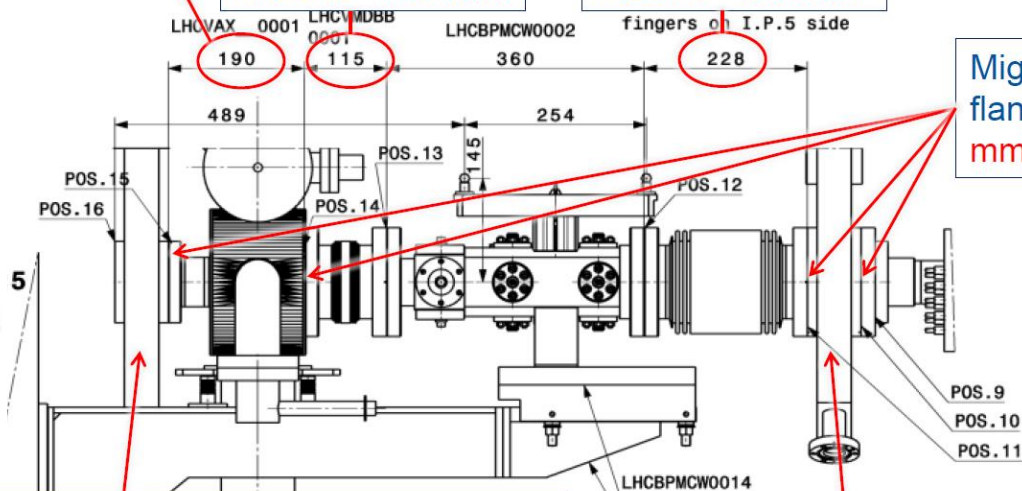


Mat. Al: ~285 mm

1070 mm → 1460 mm

Mat. Al: ~145 mm

Mat. Al: ~315 mm

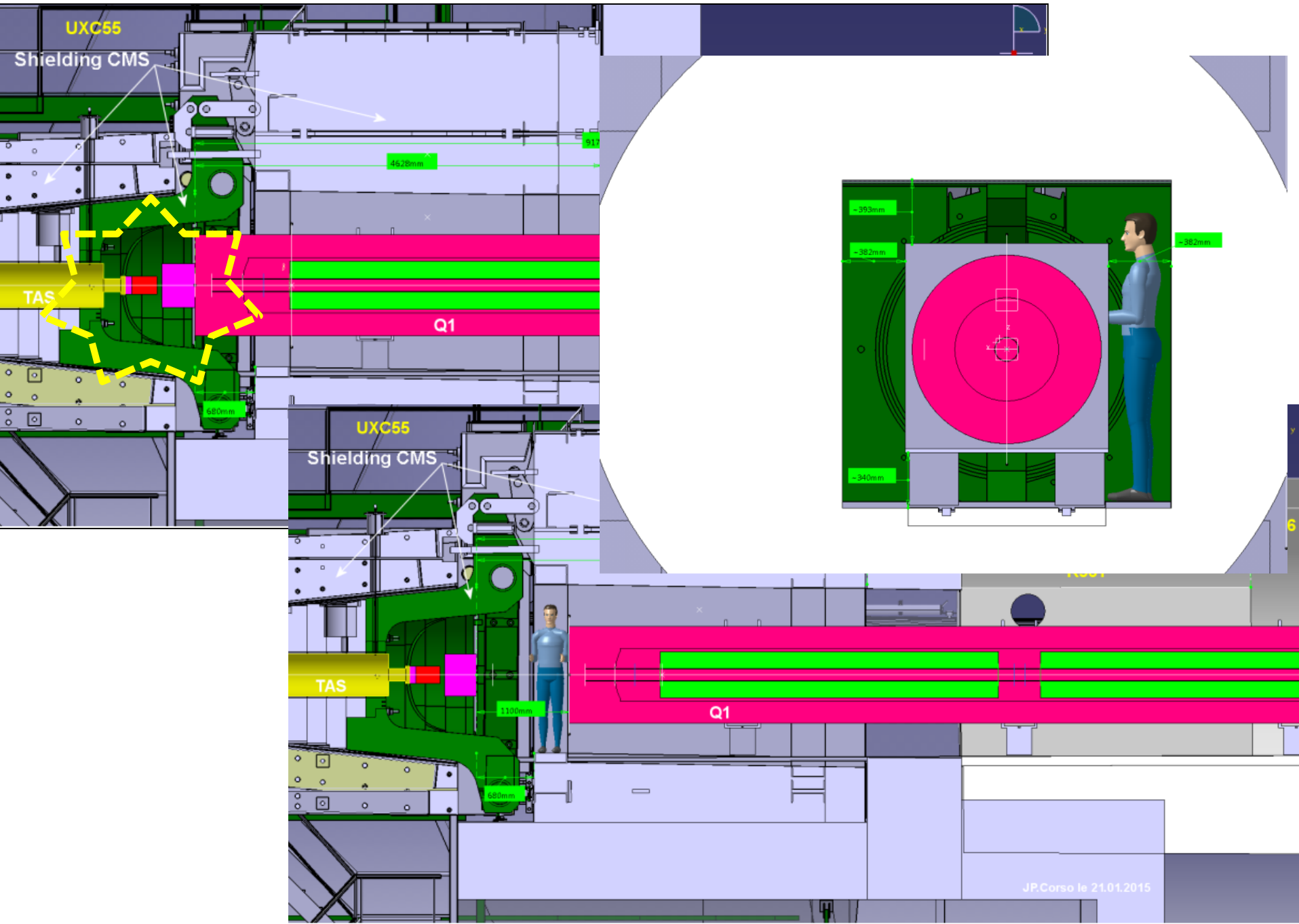


Migration to quick flange: 4x (+30 mm)

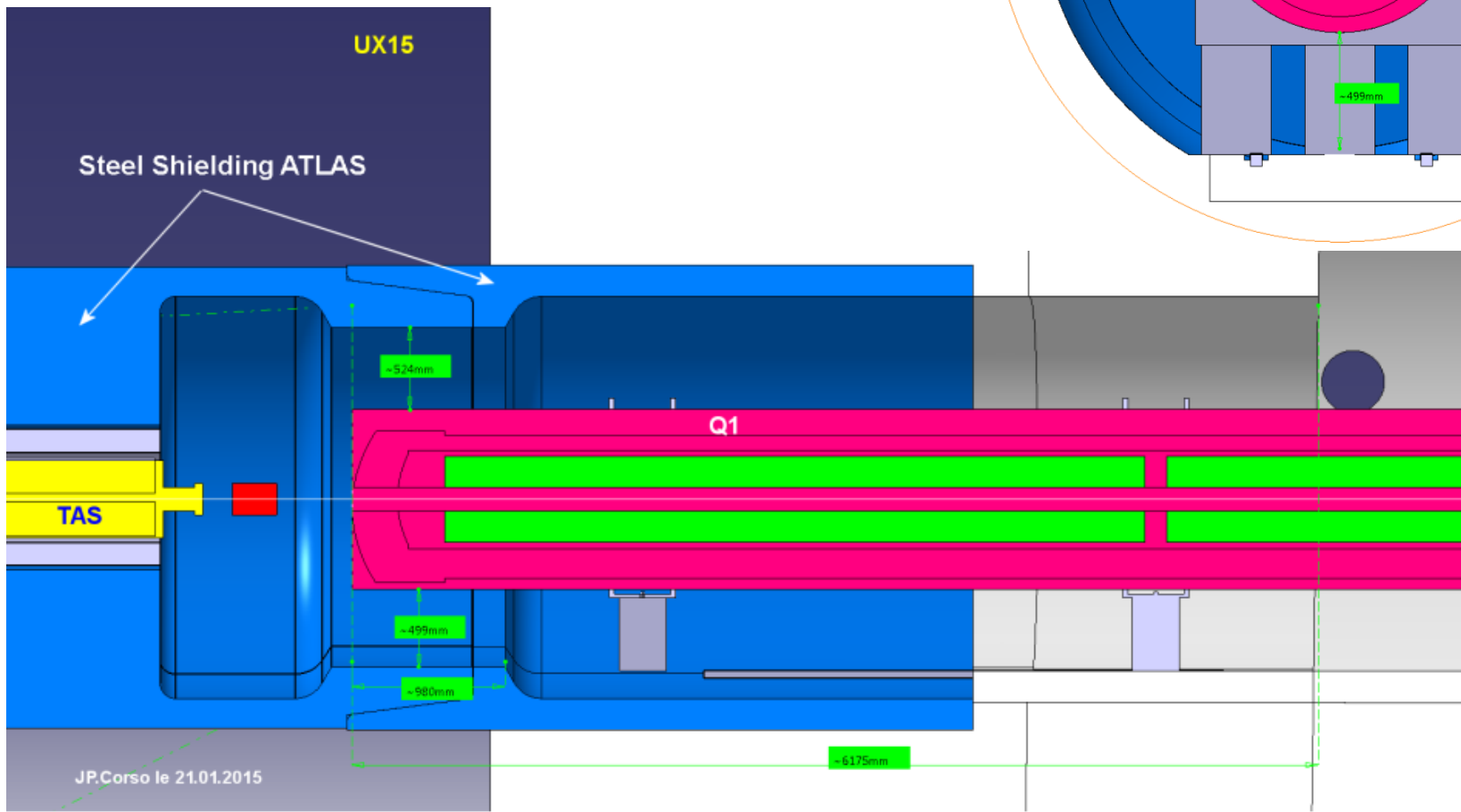
Change of aperture: 75 mm ⇒ 85 mm
Mat. Al: 85 mm → ~115 mm??

Mat. Al: 75 mm → ~100 mm??

CMS



ATLAS



Options to be pursued in order to reduce dose to personnel limiting the 1000 mm increase request

- Moving the BPM from warm to cold (from VAX to Q1)
 - Pros
 - Perfect alignment with centre of Q1: better operation of the machine
 - Reduced risk of vacuum leaks (machine vacuum vs insulation vacuum)
 - Removal of one element to align between Q1 and TAS. No intervention of
 - EN-MEF-SU for operational alignment
 - BE-BI at the VSC intervention and EN-MF-SU for maintenance alignment
 - Cons
 - More difficult replacement in case of BPM malfunction but today LHC demonstrates that they are very reliable
 - Verify positon for parasitic encounters
- Revision of the area to see if putting the TAS in the global optimisation game we can help simplification of the vacuum layout in order to completely eliminate access needs in the area
- Keep cryostat Q1 equal cryostat Q3 compensate for BPM extra length in the cryostat dome enclosure

original 1.1	changes			
IR5 Right Beam 1	reason	amount	cumulative mech	cumulative mag centers shift
		[m]	[m]	[m]
	elongation VCX area	0.993000	0.993000	
	change distance end cold mass start mag length	0.007000	1.000000	
MQXFA.A1R5	increase MQXFA mag length	0.200000	1.200000	1.100000
	change distance between magnetic centers	0.150000	1.350000	1.250000
MQXFA.B1R5	increase MQXFA mag length	0.200000	1.550000	1.450000
	change distance end mag length end CM	0.007000	1.557000	
	increase interconnect length	0.080000	1.637000	
	decrease space in front in CM in front MCBX	-0.147500	1.489500	
MCBFBH.A2R5			1.489500	1.489500
MCBFBV.A2R5			1.489500	1.489500
	decrease distance end mag length MCBXF/start MQXFB	-0.012500	1.477000	
MQXFB.A2R5	increase MQXFB mag length	0.340000	1.817000	1.647000
	change distance end MQXFB /end CM	0.007000	1.824000	
	increase interconnect length	0.080000	1.904000	
	change distance beginning CM/start MQXFB	0.007000	1.911000	
MQXFB.B2R5	increase MQXFB mag length	0.340000	2.251000	2.081000
	decrease distance end mag length MCBXF/start MQXFB	-0.012500	2.238500	
MCBFBH.B2R5			2.238500	2.238500
MCBFBV.B2R5			2.238500	2.238500
	decrease space from end MCBXF to end cold mass	-0.147500	2.091000	
	increase interconnect length	0.080000	2.171000	
	change distance start CM to begin mag length	0.007000	2.178000	
MQXFA.A3R5	increase MQXFA mag length	0.200000	2.378000	2.278000
	change distance between magnetic centers	0.150000	2.528000	2.428000
MQXFA.B3R5	increase MQXFA mag length	0.200000	2.728000	2.628000
	change distance end mag length end cold mass	0.007000	2.735000	
	increase interconnect length	0.080000	2.815000	
MCBFAH.3R5			2.815000	2.815000
MCBFAV.3R5			2.815000	2.815000
MQSXF.3R5			2.815000	2.815000
MCTXF.3R5			2.815000	2.815000
MCTSXF.3R5			2.815000	2.815000
MCDXF.3R5			2.815000	2.815000
MCDVSXF.3R5			2.815000	2.815000
MCOXF.3R5			2.815000	2.815000
MCOVSXF.3R5			2.815000	2.815000
MCSXF.3R5			2.815000	2.815000
MCSSXF.3R5	remember for us change CO cryostat length +190 mm		2.815000	2.815000
	increase interconnect length	0.190000	3.005000	
MBXF.4R5			3.005000	3.005000
DFXJ.4R5			3.005000	3.005000
DFMJ.4R5			3.005000	3.005000
			3.005000	
MBRD.4R5.B1			3.005000	3.005000
MCBRDV.4R5.B1	increase MCBRD mag length	0.300000	3.305000	3.155000
MCBRDH.4R5.B1	increase MCBRD mag length	0.300000	3.605000	3.455000
			3.605000	
ACFCA.AR5.B1			3.605000	
ACFCA.BR5.B1			3.605000	
			3.605000	
ACFCA.CR5.B1			3.605000	
ACFCA.DR5.B1			3.605000	
			3.605000	
			3.605000	
	decrease space in CM in front MCBYY	-0.017500	3.587500	
MCBYYH.4R5.B1	increase MCBYY mag length	0.300000	3.887500	3.737500
	decrease space between MCBYY 1 and 2	-0.095000	3.792500	
MCBYYV.4R5.B1	increase MCBYY mag length	0.300000	4.092500	3.942500
	increase distance MCBYY MQYY	0.013500	4.106000	
MQYY.4R5.B1	increase mech length MQYY	0.028000	4.120500	4.120000

Interconnect +80 mm to 1000 mm total

Interconnect +80 mm to 1000 mm total

Interconnect +80 mm to 1000 mm total

Interconnect +80 mm to 1000 mm total

Interconnect +190 mm to 1000 mm total

Total shift due to interconnects length:
(4X80+190) mm=510 mm

Interconnect global longitudinal space reservation. Allocation of space to single component

TE-MSC

TE-VSC

BE-BI

component

