

DE LA RECHERCHE À L'INDUSTRIE



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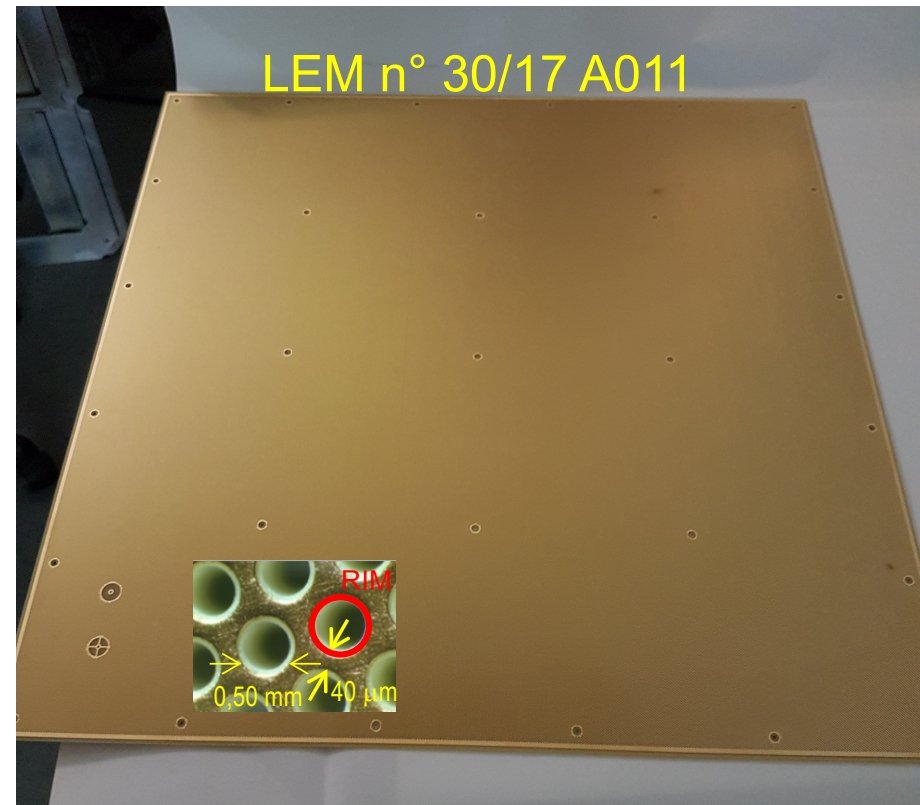


STATUS OF LEM

PRODUCTION AND QA/QC

A. Delbart, Ph. Cotte, M. Karolak, E. Mazzucato,

Y. Pénichot, Y. Piret, M. Zito (Irfu), S. Murphy (ETHZ)



WA105 integration vidyo meeting, september 1st 2017



ELTOS LEM PRODUCTION STATUS AND LEM PRODUCTION SCHEDULE



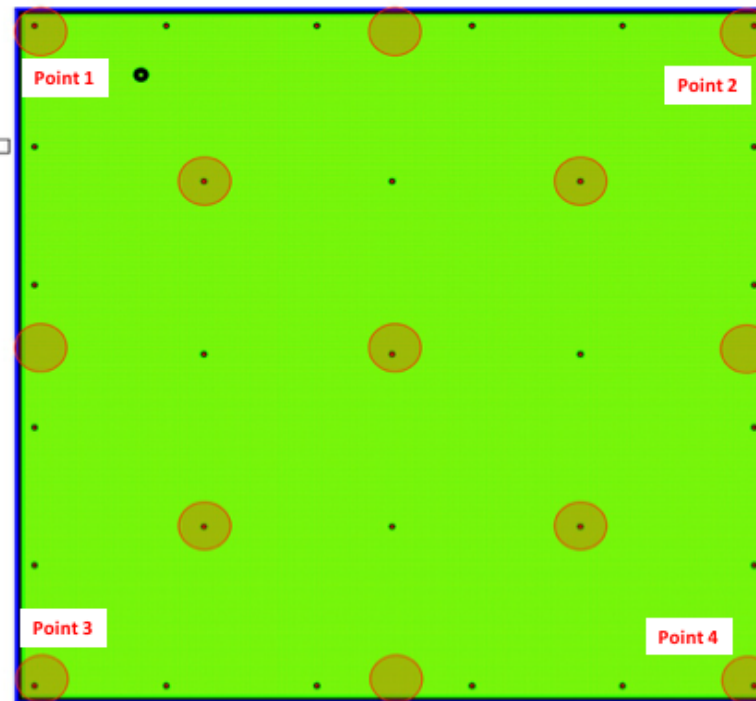
- After the Production kick-off meeting and the delivery of the A001-A008, we fixed with ELTOS both the production procedures, the QA/QC to be done & documented.
- For each batch of 6 LEMs are delivered :
 - the production travelling sheet.
 - an excel file reporting for each LEM the QA/QC : the laminate thickness, the RIM & hole diameter surveys on 23 zones, the insulation test @ 500V, the microsection measurements for cross-check of thicknesses and hole diameters.
 - 2 metallographic sections associated to each LEM

CEA contract 4000759184 for the production of 78 LEMs of WA105

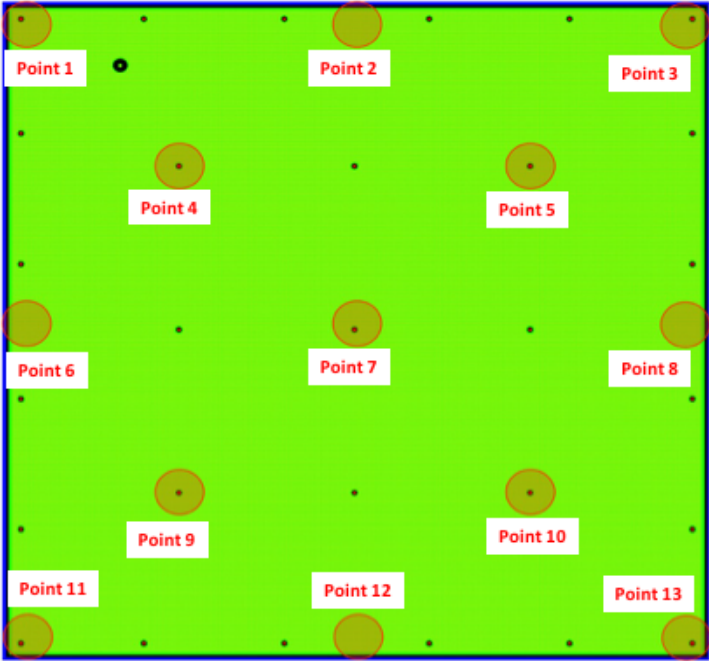
A. Delbart (CEA) / R. Pinamonti (CEA)				
last update date		23 August 2017 by S. Mazzi		
LEM S/N	shipment to CEA	ELTOS QA/QC	QA/AC at saclay	Comments
A001-A002	23 June 2017	26 June 2017	passed	A002 needed 2 cleaning-drying-HV QC
A003-A008	02 August 2017	28 August 2017	A004,A005,A007 OK	A003,A006,A008 need second cleaning-drying-HV QC
A009-A014	scheduled 28 august	04 August 2017		A013 under repair at ELTOS
A015-A026	scheduled 31 august			QA/QC started at ELTOS. Delayed to sept 4
A027-A038	scheduled 14 september			up to 20 LEM can be shipped sept 11 & sept 28
A039-A050	scheduled 29 september			
A051-A062	scheduled 13 october			
A063-A078	scheduled 27 october			

ID. ELTOS	CFR-34	Date	07/07/2017
Customer PN	LEM 50X50 RIMS-WA105	Operator	MP
PO#	344000759184	Working sheet	27/149

Instruction 1: Check the laminate thickness in the marked points with micrometers and caviderm
Instrument: Digital micrometer/Caviderm
Required: 1,00 +/-0,05 mm without copper;



#LEM	MICROMETERS Dielectric thickness (mm)				CAVIDERM Copper thickness (micron)			
	POINT 1	POINT 2	POINT 3	POINT 4	POINT 1	POINT 2	POINT 3	POINT 4
A009	0.96		0.96		100		100	
A010	0.95		0.95		95		95	
A011	0.95		0.97		100		95	
A012	0.97		0.96		95		95	
A013	0.98		0.97		95		100	
A014	0.95		0.95		100		100	

Instruction 2:	Check the RIM in the marked points												
Instrument:	NIKON SMZ245T												
Requirement:	40 +/-4 micron												
													
TOP													
#LEM	POINT 1	POINT 2	POINT 3	POINT 4	POINT 5	POINT 6	POINT 7	POINT 8	POINT 9	POINT 10	POINT 11	POINT 12	POINT 13
A009	36	36	37	41	41	38	38	37	39	37	41	37	37
A010	37	37	39	36	41	37	41	37	36	37	37	37	41
A011	42	41	39	37	39	39	41	39	38	40	39	41	39
A012	40	36	40	40	37	37	39	39	37	36	37	37	36
A013	40	37	42	38	37	41	40	37	41	39	38	39	42
A014	37	36	36	41	37	37	37	38	39	41	38	40	38
BOT													
#LEM	POINT 1	POINT 2	POINT 3	POINT 4	POINT 5	POINT 6	POINT 7	POINT 8	POINT 9	POINT 10	POINT 11	POINT 12	POINT 13
A009	36	38	37	39	41	39	38	38	37	37	36	41	40
A010	41	43	40	39	38	36	36	38	39	38	36	39	40
A011	37	37	41	39	37	37	38	38	38	37	41	40	37
A012	38	36	37	36	36	39	37	39	42	38	37	40	37
A013	41	37	37	37	36	37	37	37	43	39	41	38	39
A014	37	36	37	39	37	37	37	39	38	37	38	38	39

ID. ELTOS	CFR-34	Date	23/08/2017
Customer PN	LEM 50X50 RIMS-WA105	Operator	M.S.
PO#	344000759184	Working sheet	27/149
Instruction 3:	Check the hole diameter in the marked points		
Instrument:	OGP machine		
Requirement:	0,5 +/-0,01 mm		



#LEM	POINT 1	POINT 2	POINT 3	POINT 4	POINT 5	POINT 6	POINT 7	POINT 8	POINT 9	POINT 10	POINT 11	POINT 12	POINT 13
A009	0,500	0,500	0,499	0,499	0,499	0,500	0,499	0,499	0,499	0,499	0,500	0,499	0,499
A010	0,499	0,500	0,499	0,499	0,499	0,500	0,499	0,499	0,499	0,499	0,499	0,499	0,499
A011	0,500	0,499	0,499	0,500	0,499	0,499	0,495	0,499	0,499	0,499	0,499	0,499	0,499
A012	0,499	0,499	0,499	0,499	0,499	0,499	0,499	0,499	0,499	0,500	0,499	0,499	0,500
A013	0,499	0,499	0,500	0,499	0,499	0,499	0,499	0,499	0,499	0,499	0,499	0,499	0,500
A014	0,499	0,500	0,499	0,499	0,500	0,499	0,500	0,499	0,499	0,499	0,499	0,499	0,499

ID. ELTOS	CFR-34	Date	23/08/2017										
Customer PN	LEM 50X50 RIMS-WA105	Operator	M.S.										
PO#	344000759184	Working sheet	27/149										
Instruction 4: Check the PCB thickness in the marked points Instrument: Digital micrometer Requirement: 1,10 +0,02/-0,05 mm													
													
#LEM	POINT 1	POINT 2	POINT 3	POINT 4	POINT 5	POINT 6	POINT 7	POINT 8	POINT 9	POINT 10	POINT 11	POINT 12	POINT 13
A009	1,11		1,11								1,11		1,11
A010	1,11		1,11								1,11		1,11
A011	1,11		1,12								1,12		1,12
A012	1,11		1,11								1,11		1,11
A013	1,11		1,11								1,11		1,11
A014	1,11		1,12								1,11		1,11

A009-A014 INSULATION MEASUREMENT

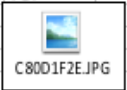
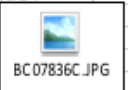








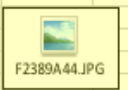






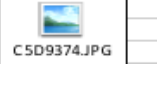
ID. ELTOS	CFR-34	Date	24/08/2017
Customer PN	LEM 50X50 RIMS-WA105	Operator	M.S.
PO#	344000759184	Working sheet	27/149
Instruction 5:	Insulation test 500V 1 GOhm		
Instrument:	Fluke 1550C		
Parameters:	500V 1 GOhm		
#LEM	Value		
A009	2 Gohm		
A010	2 Gohm		
A011	3 Gohm		
A012	10 Gohm		
A013	5 Gohm		
A014	3 Gohm		

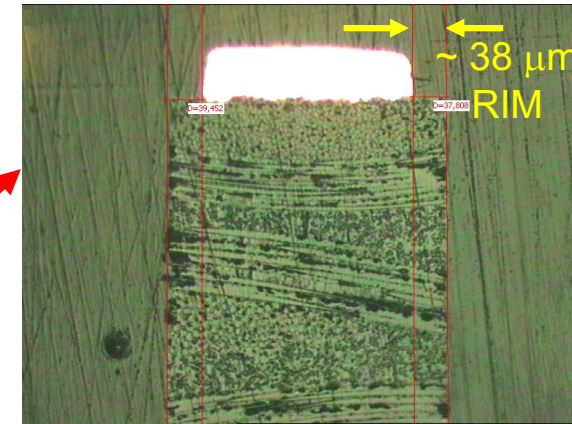


A009-A014 DIMENSIONAL MEASUREMENT

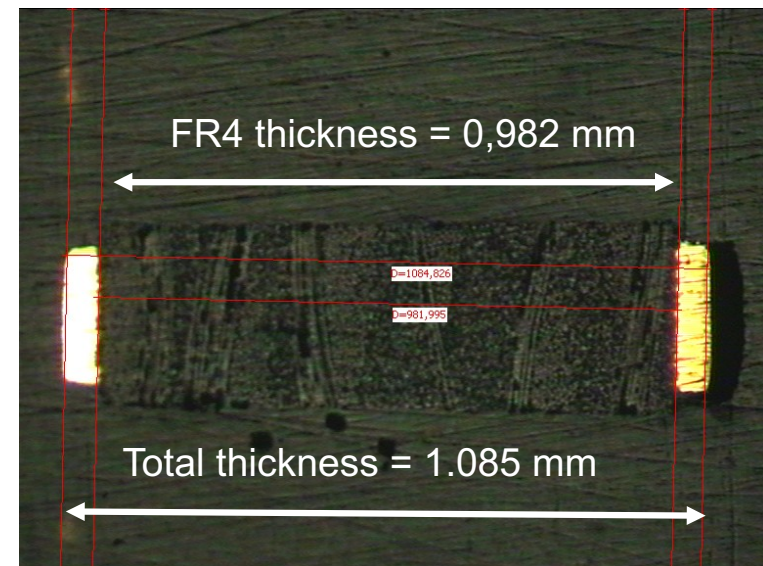


ID. ELTOS		CFR-34	Date	23/08/2017
Customer PN		LEM 50X50 RIMS-WA105	Operator	S.A.
PO#		344000759184	Working sheet	27/149
Instruction 6:	Check the PCB external dimension			
Instrument:	OGP MACHINE			
Required:	499,5 +/-0,3 mm			
#LEM	Value			
A009	499,37 x 499,35			
A010	499,42 x 499,40			
A011	499,35 x 499,34			
A012	499,37 x 499,36			
A013	499,42 x 499,38			
A014	499,39 x 499,38			

ID. ELTOS	CFR-34	Date	28/08/2017
Customer PN	LEM 50X50 RIMS-WA105	Operator	G.F. Orlandi
PO#	344000759184	Working sheet	27/149
Microsection Report			
Microscope Nikon			
#A009	TOP	BOT	Thickness
			
#A010			
#A011			
#A012			
#A013			
#A014			



From A012 previous measurements
 $0.97(\text{FR4}) + 2 \times 0.085 (\text{copper}) + 2 \times 0.005 (\text{Au/Ni}) - 2 \times 0.038 (\text{RIM}) = 1.074 \text{ mm total}$



Goal is to define the QA/QC acceptance criteria on A001-A002 preseries LEM

This qualification test is done the LEM mounted on its support plate

Filling HP chamber with air / argon after pumping down to a few 10^{-4} mbar

LEM	Dry air @1 bar	Argon @1 bar	Argon @1.5 bar	Argon @3.3 bar
LEM 10x10 #07	5160V / 0nA	1880V / 0nA	2300V / 0nA	3760V / 0nA 3740V / 0nA
LEM 50x50 #01	4680V / 0nA	1470V / 0nA	1800V / 0nA	2450V / 0nA 2600V / 0nA
LEM 50x50 A001	4680V / 0nA	1400V / 0nA	1750V / 0nA	2600V / 0nA 2550V / 0nA
LEM 50x50 A002	4600V / 25nA	1450V / ?nA		2400V / 7nA 2650V / 0nA

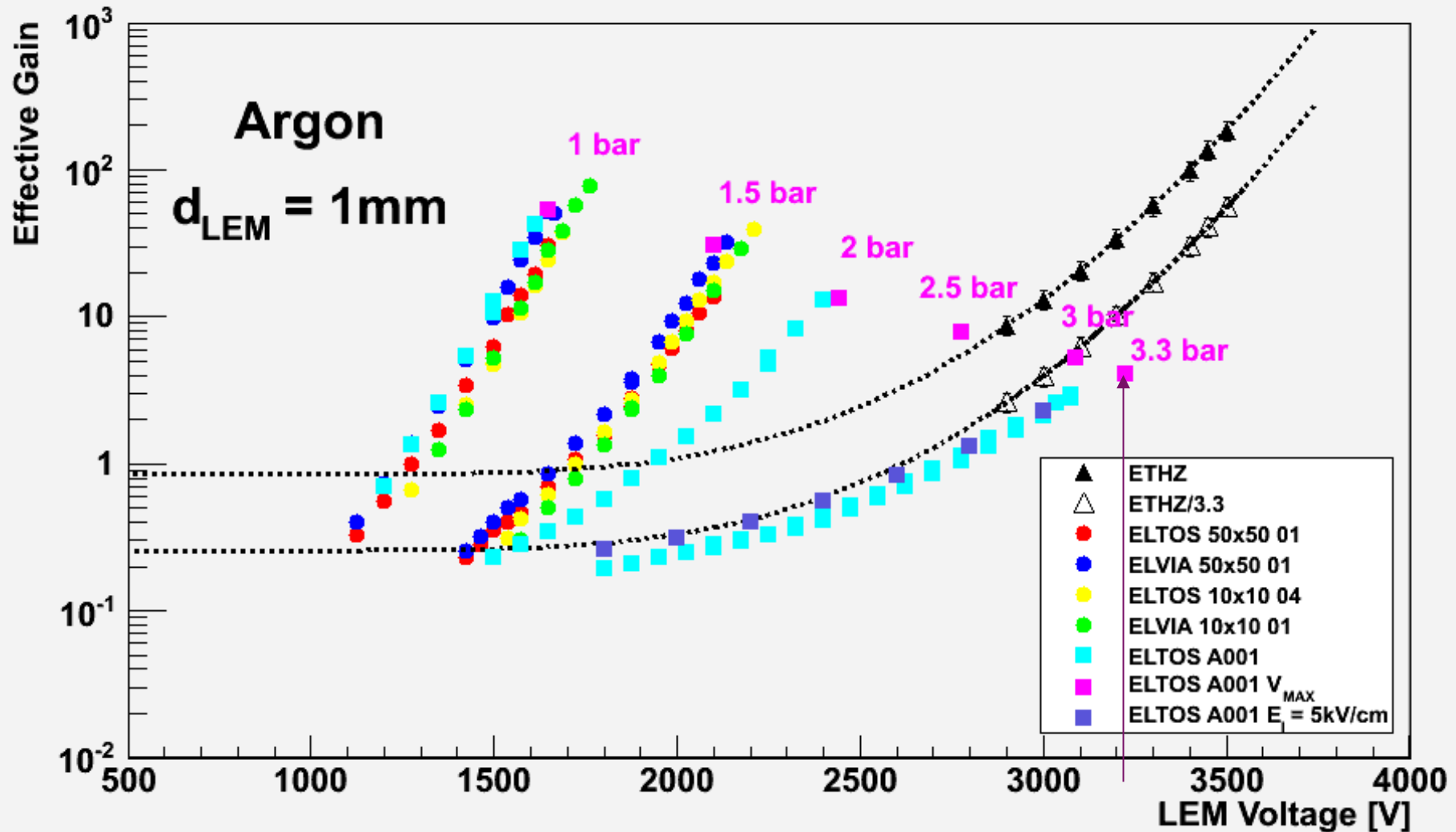
- Inspection of A002 revealed a «dark» deposit around one of the Teflon supporting pillars. This deposit was removed with ethanol and A002 LEM was cleaned and dried at 80°C.
- The HV cabling inside the vessel was redone with special care on insulation distances.

LEM	Dry air @1 bar	Argon @1 bar	Argon @1.5 bar	Argon @3.3 bar
LEM 10x10 #07	5050V / 0nA			3740V / 0nA
LEM 50x50 #01	4820V / 0nA			3530V / 0nA
LEM 50x50 A001	4790V / 0nA			3510V / 0nA
LEM 50x50 A002	4850V / 0nA			3560V / 0nA

- no more ~2500V limit previously observed and A002 passed HV QA/QC
- But we need to investigate the nature and origin of the A002 « dark » deposit revealed after HV tests : NGL soap not totally removed with water rinsing, local sparks around the pillar due to electric field distortions ...

→ QC fixed @ 4500 V in dry air and @ 3200 V in 3.3 bar Argon (see next slide)

The 3200 V max for the LEM mounted on its anode is confirmed with 1/16 source flux
 There is still the gain curve with a 10x10 mm² LEM to be done @ 3,3 bar in the same conditions to state about this HV limitation of a LEM-Anode Sandwich.



LEM production & QA/QC status



A. Delbart
last update date 30 August 2017

LEM S/N	ELTOS QA/QC	CEA visual inspection	4500V, I<2 nA HV in synthetic air	3200V, I<2 nA HV in 3,3 bar Argon	Comments
A001	23 June 2017	Passed	Passed	Passed	A001 was not polymerized at 160 °C
A002	23 June 2017	Passed	Passed	Passed	"dark" deposit. A second cleaning-drying-HV test was needed
A003	02 August 2017	Passed	Passed	3000V / not passed	to be inspected, cleaned and tested again
A004	02 August 2017	Passed	4100V / not passed	Passed	9 nA increasing current in synthetic air. OK in Argon
A005	02 August 2017	Passed	passed	Passed	
A006	02 August 2017	Passed	not passed	2750V / not passed	Same kind of "dark" deposit around Teflon supporting pillar as A002
A007	02 August 2017	Passed	passed	Passed	
A008	02 August 2017	Passed	not passed	2300V / not passed	to be inspected, cleaned and tested again
A009	28/08/2017/ Not passed				under repair at ELTOS (a rim is missing- hole filling with epoxy)
A010	28 August 2017	not Passed	Cleaning-drying september 1st HV QC tests sept 4-		"suspicious" dark zones. Will be checked after cleaning
A011	28 August 2017	not Passed			a hole is partially filled. Will be checked after cleaning
A012	28 August 2017	Passed			some dark stains. Will be checked after cleaning
A013	28 August 2017	not Passed			"suspicious" dark zones. Will be checked after cleaning
A014	28 August 2017	not Passed			"suspicious" dark zones. Will be checked after cleaning
A015	~sept 4				ELTOS QC is on-going
A016					
A017					
A018					
A019					
A020					
A021					
A022					
A023					
A024					
A025					
A026					
A027-A038	scheduled 14 september				
A039-A050	scheduled 29 september				
A051-A062	scheduled 13 october				
A063-A078	scheduled 27 october				

ELTOS QA/QC, CEA QA/QC, production schedule
Excel file and this production status file will be
uploaded on the WA105 Integration CERNBox
and regularly updated

