

MLC Positions Decode

TEL, DICOM, MOSAIQ, and More

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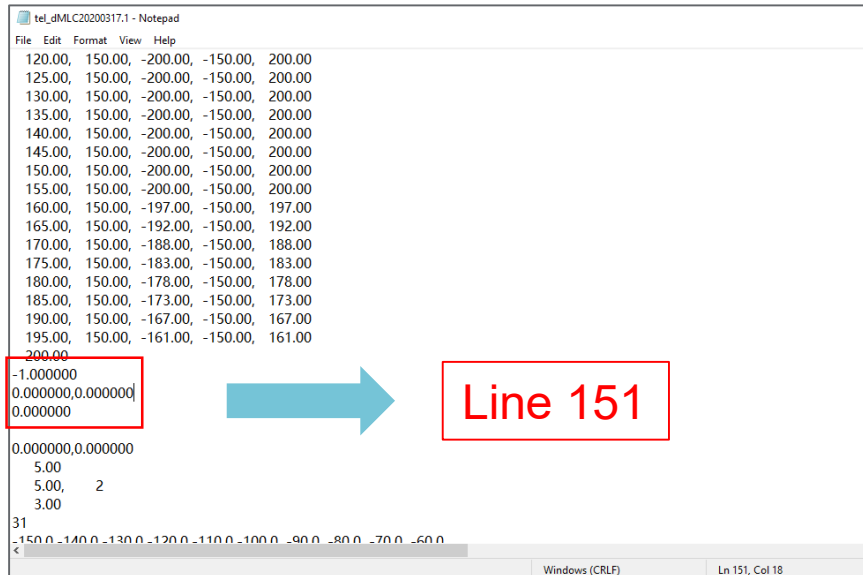
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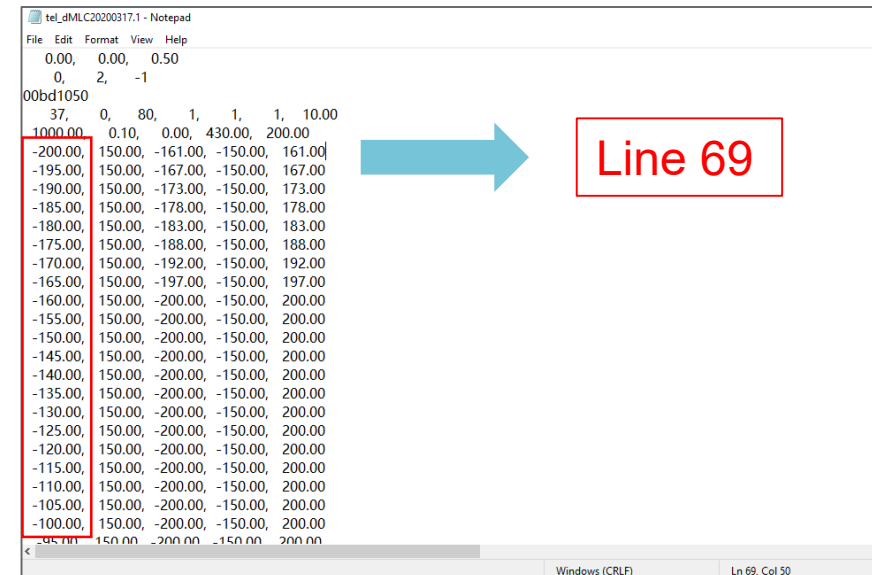
TEL File Decode

1. MLC Bound

- The segment and beam information is written in an incremental order in the tel file.
 - Beam1: Segment #1, #2, #3, ...; Beam2: Segment #1, #2, #3, ...; Beam3: Segment #1, #2, #3, ...
 - All position information is in mm.
- To find the MLC bound information of each beam, locate the following indicator:
 - Line(i), where line(i-1) = "-1.000000", line(i) = "0.000000,0.000000", line(i+1) = "0.000000".
 - The MLC bound info of this beam begins at line(i-2-number of leaf pairs): the first number of each line is the MLC bound location.



```
tel_dMLC20200317.1 - Notepad
File Edit Format View Help
120.00, 150.00, -200.00, -150.00, 200.00
125.00, 150.00, -200.00, -150.00, 200.00
130.00, 150.00, -200.00, -150.00, 200.00
135.00, 150.00, -200.00, -150.00, 200.00
140.00, 150.00, -200.00, -150.00, 200.00
145.00, 150.00, -200.00, -150.00, 200.00
150.00, 150.00, -200.00, -150.00, 200.00
155.00, 150.00, -200.00, -150.00, 200.00
160.00, 150.00, -197.00, -150.00, 197.00
165.00, 150.00, -192.00, -150.00, 192.00
170.00, 150.00, -188.00, -150.00, 188.00
175.00, 150.00, -183.00, -150.00, 183.00
180.00, 150.00, -178.00, -150.00, 178.00
185.00, 150.00, -173.00, -150.00, 173.00
190.00, 150.00, -167.00, -150.00, 167.00
195.00, 150.00, -161.00, -150.00, 161.00
200.00
-1.000000
0.000000,0.000000
0.000000
0.000000,0.000000
5.00
5.00, 2
3.00
31
-150.0 -140.0 -130.0 -120.0 -110.0 -100.0 -90.0 -80.0 -70.0 -60.0
<
Windows (CRLF) Ln 151, Col 18
```

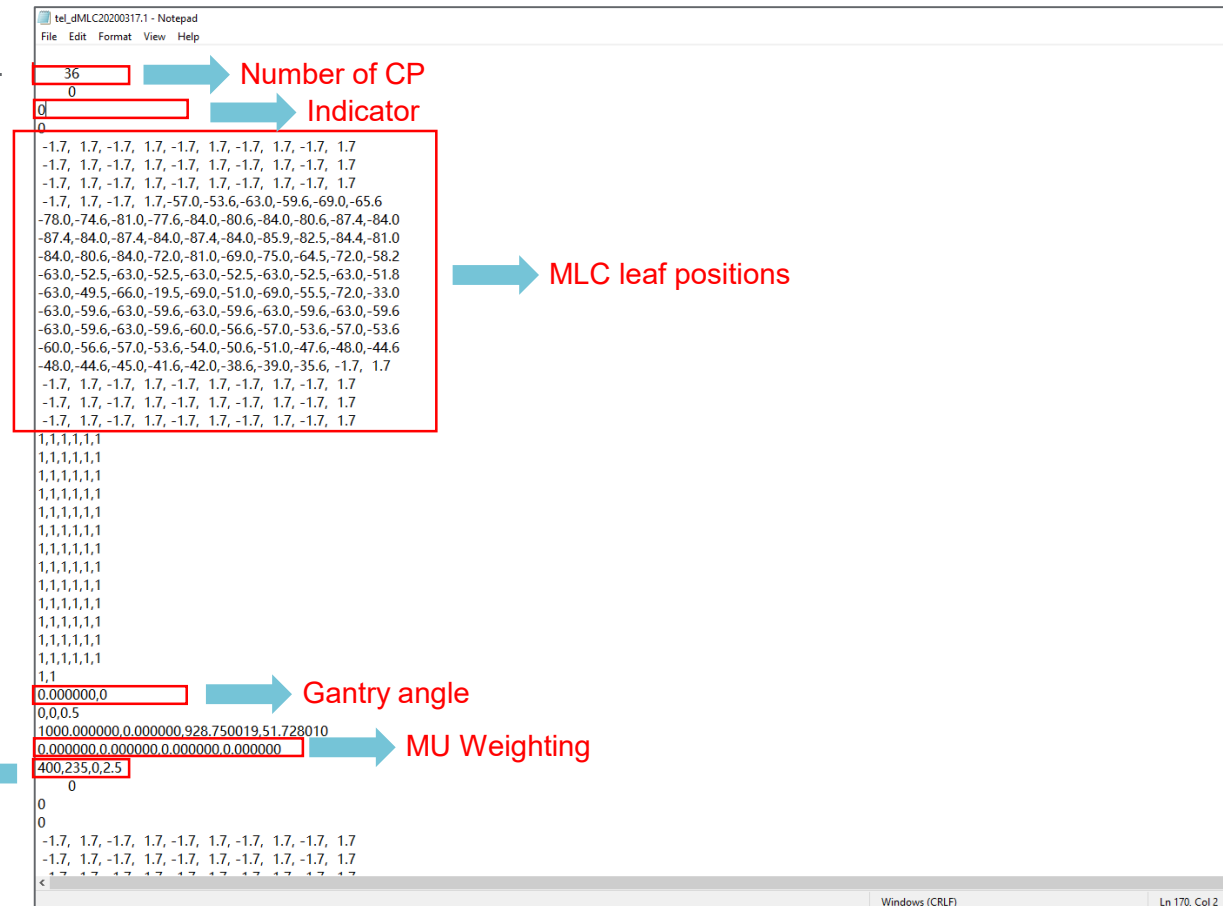


```
tel_dMLC20200317.1 - Notepad
File Edit Format View Help
0.00, 0.00, 0.50
0, 2, -1
00bd1050
37, 0, 80, 1, 1, 1, 10.00
1000.00 0.10, 0.00, 430.00, 200.00
-200.00, 150.00, -161.00, -150.00, 161.00
-195.00, 150.00, -167.00, -150.00, 167.00
-190.00, 150.00, -173.00, -150.00, 173.00
-185.00, 150.00, -178.00, -150.00, 178.00
-180.00, 150.00, -183.00, -150.00, 183.00
-175.00, 150.00, -188.00, -150.00, 188.00
-170.00, 150.00, -192.00, -150.00, 192.00
-165.00, 150.00, -197.00, -150.00, 197.00
-160.00, 150.00, -200.00, -150.00, 200.00
-155.00, 150.00, -200.00, -150.00, 200.00
-150.00, 150.00, -200.00, -150.00, 200.00
-145.00, 150.00, -200.00, -150.00, 200.00
-140.00, 150.00, -200.00, -150.00, 200.00
-135.00, 150.00, -200.00, -150.00, 200.00
-130.00, 150.00, -200.00, -150.00, 200.00
-125.00, 150.00, -200.00, -150.00, 200.00
-120.00, 150.00, -200.00, -150.00, 200.00
-115.00, 150.00, -200.00, -150.00, 200.00
-110.00, 150.00, -200.00, -150.00, 200.00
-105.00, 150.00, -200.00, -150.00, 200.00
-100.00, 150.00, -200.00, -150.00, 200.00
-95.00, 150.00, -200.00, -150.00, 200.00
<
Windows (CRLF) Ln 69, Col 50
```

2. MLC leaf positions at each control point

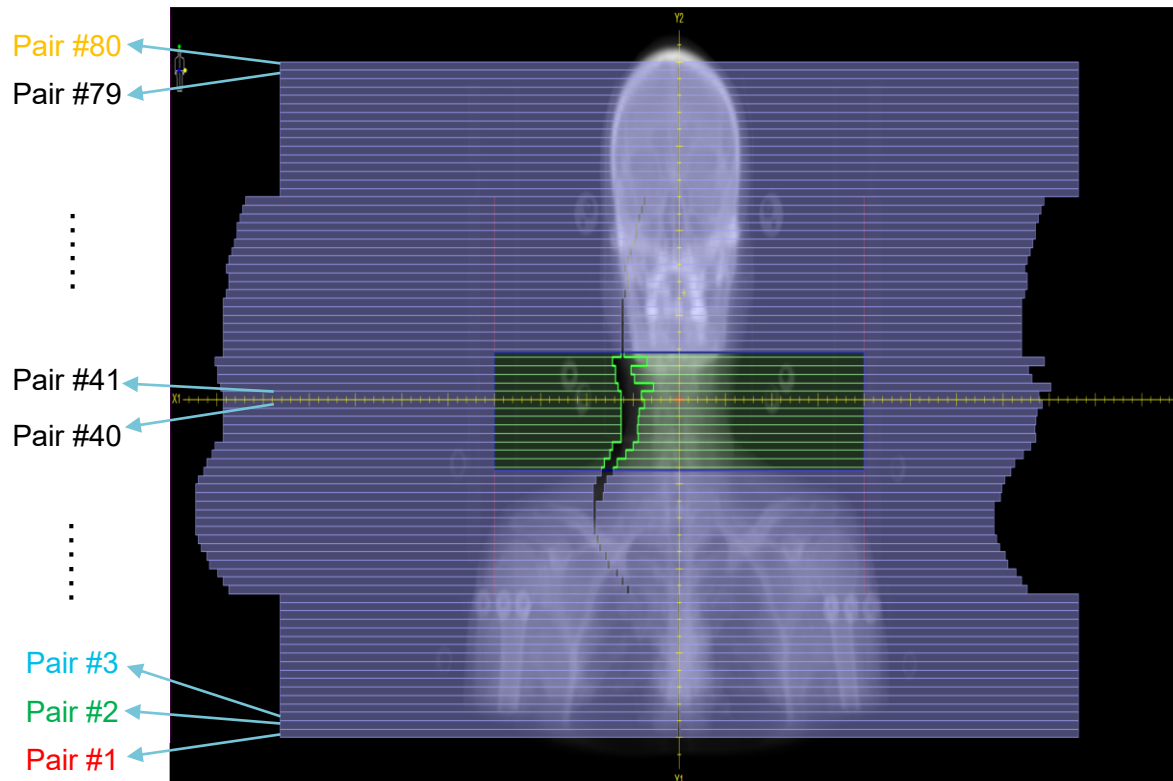
- To find the MLC leaf positions of each control point, locate the following indicator:

- Line(i), where line(i-1) = “ 0”, line(i) = “0”, line(i+1) = “0”.
- The number at line (i-2) indicates the number of control point of this beam.
- The MLC leaf position info of each control point begins at line(i+2).
- The gantry angle position is recorded at line(i+32).
 - The 2nd number of line(i+32) represents the gantry angle (in degree)
- The MU of one control point and its weighting is at line(i+35).
 - The 1st number of line(i+35) is the MU delivered at this control point
 - The 4th number of line(i+35) indicates the MU weighting
- The jaw position information is recorded at line(i+36).
 - 1st number: the distance between 2 jaws in the x-direction
 - 2nd number: the distance between 2 jaws in the y-direction
 - 3rd number: the center location of x jaws
 - 4th number: the center location of y jaws



2. MLC leaf positions at each control point

- Correlate the TEL MLC leaf positions with Monaco display
 - The TEL MLC positions are written in a order representing the **leaf pair number**: 1st and 2nd number is the position of left leaf and right leaf of pair #1 respectively, 3rd and 4th is pair #2, 5th and 6th is pair #3, etc.
 - The positions indicate the **right end of leaves at the left band** or **left end of leaves at the right band**.

[illegible]

DICOM File Decode

1. MLC Bound

- The DICOM example shown here is read with 'dicomread()' function in MATLAB.
- Similar functions can be found in Python (pydicom) or realized via DICOMPYLER app.

dcminfo	dcminfo.BeamSequence	dcminfo	dcminfo.BeamSequence	dcminfo	dcminfo.BeamSequence	dcminfo.BeamSequence.Item_1.BeamLimitingDeviceSequence	dcminfo.BeamSequence.Item_1.BeamLimitingDeviceSequence.Item_2	dcminfo.BeamSequence.Item_1.BeamLimitingDeviceSequence.Item_2.LeafPositionBoundaries
1x1 struct with 52 fields	dcminfo.BeamSequence	dcminfo.BeamSequence.Item_1	dcminfo.BeamSequence.Item_1.BeamLimitingDeviceSequence	dcminfo.BeamSequence.Item_1.BeamLimitingDeviceSequence.Item_2	dcminfo.BeamSequence.Item_1.BeamLimitingDeviceSequence.Item_2	dcminfo.BeamSequence.Item_1.BeamLimitingDeviceSequence.Item_2.LeafPositionBoundaries	dcminfo.BeamSequence.Item_1.BeamLimitingDeviceSequence.Item_2.LeafPositionBoundaries	dcminfo.BeamSequence.Item_1.BeamLimitingDeviceSequence.Item_2.LeafPositionBoundaries
Field ^	Field ^	Field ^	Field ^	Field ^	Field ^	Field ^	Field ^	Field ^
AccessionNumber	Item_1	InstitutionDepartmentName	Item_1	RTBeamLimitingDeviceType	Value	1	1	1
Modality	Item_2	Unknown_3002_0050	Item_2	SourceToBeamLimitingDeviceDistance	'MLCX'	2	2	2
Manufacturer	Item_3	TreatmentMachineName		NumberOfLeaflawPairs	349	3	3	3
ReferringPhysicianName	Item_4	PrimaryDosimeterUnit		LeafPositionBoundaries	80	4	4	4
OperatorName	Item_5	SourceAxisDistance			81x1 double	5	5	5
ManufacturerModelName	Item_6	BeamLimitingDeviceSequence				6	6	6
PatientName	Item_7	BeamNumber				7	7	7
PatientID	Item_8	BeamName				8	8	8
PatientBirthDate	Item_9	BeamDescription				9	9	9
PatientSex		BeamType				10	10	10
OtherPatientID		RadiationType				11	11	11
OtherPatientName		TreatmentDeliveryType				12	12	12
PatientComments		NumberOfWedges				13	13	13
SoftwareVersion		NumberOfCompensators				14	14	14
StudyInstanceUID		NumberOfBoli				15	15	15
SeriesInstanceUID		NumberOfBlocks				16	16	16
StudyID		FinalCumulativeMetersetWeight				17	17	17
SeriesNumber		NumberOfControlPoints				18	18	18
InstanceNumber		ControlPointSequence				19	19	19
FrameOfReferenceUID		ReferencedPatientSetupNumber				20	20	20
PositionReferenceIndicator						21	21	21
RTPlanLabel						22	22	22
RTPlanName						23	23	23
RTPlanDescription						24	24	24
RTPlanDate						25	25	25
RTPlanTime						26	26	26
PlanIntent						27	27	27
RTPlanGeometry						28	28	28
PrescriptionDescription						29	29	29
DoseReferenceSequence						30	30	30
FractionGroupSequence						31	31	31
BeamSequence						32	32	32
PatientSetupSequence						33	33	33
ReferencedStructureSetSequence						34	34	34
ApprovalStatus						35	35	35

DICOM File Decode

2. MLC leaf positions at each control point

- The MLC leaf positions information is stored at the following path:

Field	Field	Field	Field	Field	Field	Field	Field
1x1 struct with 52 fields	Item_1	InstitutionalDepartmentName	Item_1	ControlPointIndex	Item_1	RTBeamLimitingDeviceType	1
Modality	Item_2	Unknown_3002_0050	Item_2	NominalBeamEnergy	Item_2	Leaf/JawPositions	-1.7000
Manufacturer	Item_3	TreatmentMachineName	Item_3	BeamLimitingDevicePositionSequence			
ReferringPhysicianName	Item_4	PrimaryDosimeterUnit	Item_4	GantryAngle			
OperatorName	Item_5	SourceAxisDistance	Item_5	GantryRotationDirection			
ManufacturerModelName	Item_6	BeamLimitingDeviceSequence	Item_6	BeamLimitingDeviceAngle			
PatientName	Item_7	BeamNumber	Item_7	BeamLimitingDeviceRotationDirection			
PatientID	Item_8	BeamName	Item_8	PatientSupportAngle			
PatientBirthDate	Item_9	BeamDescription	Item_9	PatientSupportRotationDirection			
PatientSex		BeamType	Item_10	TableTopEccentricAngle			
OtherPatientID		RadiationType	Item_11	TableTopEccentricRotationDirection			
OtherPatientName		TreatmentDeliveryType	Item_12	TableTopVerticalPosition			
PatientComments		NumberOfWedges	Item_13	TableTopLongitudinalPosition			
SoftwareVersion		NumberOfCompensators	Item_14	TableTopLateralPosition			
StudyInstanceUID		NumberOfBoli	Item_15	IsocenterPosition			
SeriesInstanceUID		NumberOfBlocks	Item_16	SurfaceEntryPoint			
StudyID		FinalCumulativeMetersetWeight	Item_17	SourceToSurfaceDistance			
SeriesNumber		NumberOfControlPoints	Item_18	CumulativeMetersetWeight			
InstanceNumber		ControlPointSequence	Item_19	ReferencedDoseReferenceSequence			
FrameOfReferenceUID		ReferencedPatientSetupNumber	Item_20				
PositionReferenceIndicator			Item_21				
RTPlanLabel			Item_22				
RTPlanName			Item_23				
RTPlanDescription			Item_24				
RTPlanDate			Item_25				
RTPlanTime			Item_26				
PlanIntent			Item_27				
RTPlanGeometry			Item_28				
PrescriptionDescription			Item_29				
DoseReferenceSequence			Item_30				
FractionGroupSequence			Item_31				
BeamSequence			Item_32				
PatientSetupSequence			Item_33				
ReferencedStructureSetSequence			Item_34				
ApprovalStatus							

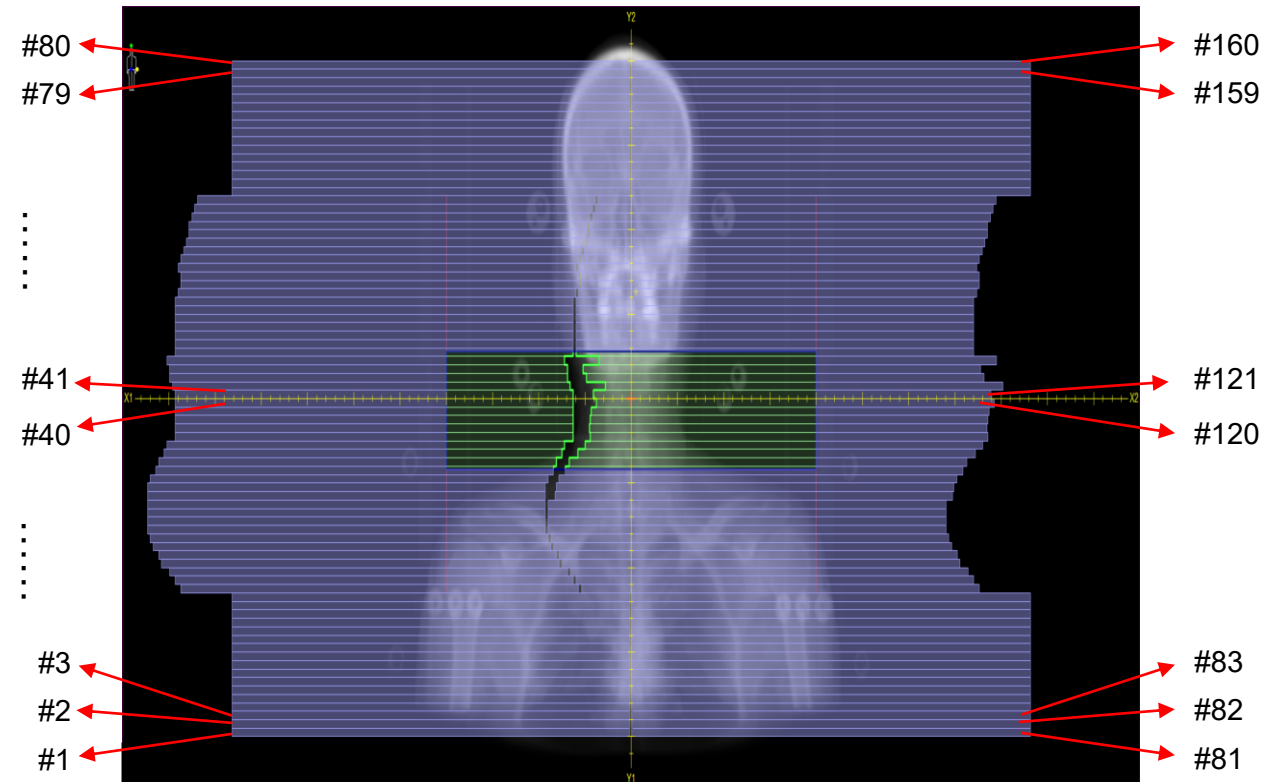
1	2	3	4	5	6	7	8
1	-1.7000						
2	-1.7000						
3	-1.7000						
4	-1.7000						
5	-1.7000						
6	-1.7000						
7	-1.7000						
8	-1.7000						
9	-1.7000						
10	-1.7000						
11	-1.7000						
12	-1.7000						
13	-1.7000						
14	-1.7000						
15	-1.7000						
16	-1.7000						
17	-1.7000						
18	-57						
19	-63						
20	-69						
21	-78						
22	-81						
23	-84						
24	-84						
25	-87.4000						
26	-87.4000						
27	-87.4000						
28	-87.4000						
29	-87.4000						

DICOM File Decode

2. MLC leaf positions at each control point

- Correlate the DICOM MLC leaf positions with Monaco display

dcmInfo.BeamSequence.Item_1.ControlPointSequence.Item_1.BeamLimitingDevicePositionSequence.Item_1								
	1	2	3	4	5	6	7	8
1	-1.7000							
2	-1.7000							
3	-1.7000							
4	-1.7000							
5	-1.7000							
6	-1.7000							
7	-1.7000							
8	-1.7000							
9	-1.7000							
10	-1.7000							
11	-1.7000							
12	-1.7000							
13	-1.7000							
14	-1.7000							
15	-1.7000							
16	-1.7000							
17	-1.7000							
18	-57							
19	-63							
20	-69							
21	-78							
22	-81							
23	-84							
24	-84							
25	-87.4000							
26	-87.4000							
27	-87.4000							
28	-87.4000							
29	-87.4000							



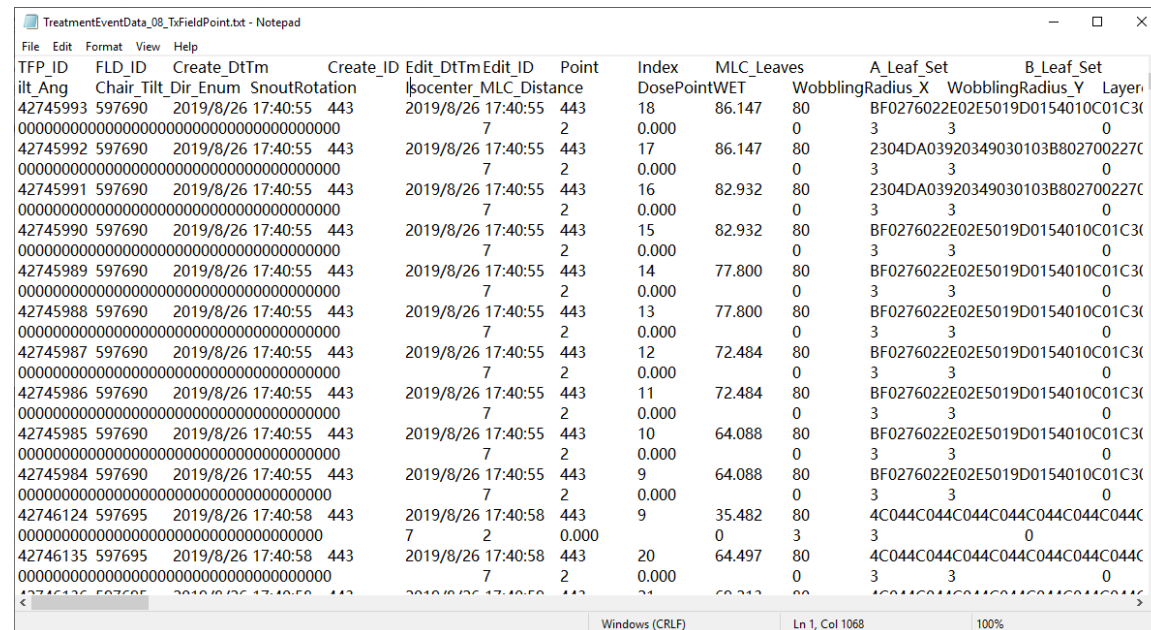
MOSAIQ Log File Decode

1. MOSAIQ Log File Read

- The MOSAIQ machine will store plan data in a unique format:
 - Each line in the text file records the information of one treatment segment and can be read by the following commands.

```
filename = 'TreatmentEventData_08_TxFieldPoint.txt';  
opts = detectImportOptions(filename,'NumHeaderLines',0);  
T = readtable(filename,opts);
```

- The **cumulative** MU of each segment is in the “Index” column: $MU_i = Index_i - Index_{i-1}$.
- The gantry angle is in “Gantry_Ang” column.
- Jaw positions are in the “Coll_X1”, “Coll_X2”, “Coll_Y1”, “Coll_Y2” columns.
- Individual leaf positions are in “A_Leaf_Set_Convert” and “B_Leaf_Set_Convert”.



TFP_ID	FLD_ID	Create_DtTm	Create_ID	Edit_DtTm	Edit_ID	Point	Index	MLC_Leaves	A_Leaf_Set	B_Leaf_Set
42745993	597690	2019/8/26 17:40:55	443	2019/8/26 17:40:55	443	18	86.147	80	BF0276022E02E5019D0154010C01C30	BF0276022E02E5019D0154010C01C30
42745992	597690	2019/8/26 17:40:55	443	2019/8/26 17:40:55	443	17	86.147	80	2304DA03920349030103B802700227C	2304DA03920349030103B802700227C
42745991	597690	2019/8/26 17:40:55	443	2019/8/26 17:40:55	443	16	82.932	80	2304DA03920349030103B802700227C	2304DA03920349030103B802700227C
42745990	597690	2019/8/26 17:40:55	443	2019/8/26 17:40:55	443	15	82.932	80	BF0276022E02E5019D0154010C01C30	BF0276022E02E5019D0154010C01C30
42745989	597690	2019/8/26 17:40:55	443	2019/8/26 17:40:55	443	14	77.800	80	BF0276022E02E5019D0154010C01C30	BF0276022E02E5019D0154010C01C30
42745988	597690	2019/8/26 17:40:55	443	2019/8/26 17:40:55	443	13	77.800	80	BF0276022E02E5019D0154010C01C30	BF0276022E02E5019D0154010C01C30
42745987	597690	2019/8/26 17:40:55	443	2019/8/26 17:40:55	443	12	72.484	80	BF0276022E02E5019D0154010C01C30	BF0276022E02E5019D0154010C01C30
42745986	597690	2019/8/26 17:40:55	443	2019/8/26 17:40:55	443	11	72.484	80	BF0276022E02E5019D0154010C01C30	BF0276022E02E5019D0154010C01C30
42745985	597690	2019/8/26 17:40:55	443	2019/8/26 17:40:55	443	10	64.088	80	BF0276022E02E5019D0154010C01C30	BF0276022E02E5019D0154010C01C30
42745984	597690	2019/8/26 17:40:55	443	2019/8/26 17:40:55	443	9	64.088	80	BF0276022E02E5019D0154010C01C30	BF0276022E02E5019D0154010C01C30
42746124	597695	2019/8/26 17:40:58	443	2019/8/26 17:40:58	443	9	35.482	80	4C044C044C044C044C044C044C044C	4C044C044C044C044C044C044C044C
42746135	597695	2019/8/26 17:40:58	443	2019/8/26 17:40:58	443	20	64.497	80	4C044C044C044C044C044C044C044C	4C044C044C044C044C044C044C044C

2. MLC leaf positions at each control point

- Individual leaf positions are stored in “A_Leaf_Set_Convert” and “B_Leaf_Set_Convert”
 - “A_Leaf” indicates the leaf of the leading band: from leaf #1 to leaf #80.
 - “B_Leaf” is the trailing band of the same segment: from leaf #81 to #160.

[illegible]

Helping clinicians improve patients' lives.

