BACKGROUND

Data Analytics is a very crucial component for robust performance of any Semiconductor Industry. And Semiconductor Laboratory (SCL) is no different in this regard. Better Data Analytics would help in pre-determining of any faulty equipment part by visualizing at the parameter(s)' drifts in process charts & improve the device yield.

This document illustrates the Data Analytics on "**Average Product Lot yield with Device's Effective Area"** for year-2020. Please, read the DISCLAIMER section in the end before forming any opinion based on the data shown.

The data visualization chart:

- shows the trend of 'Lot Yield' with Device's Effective Area
- shows the yield of lot ids for any 'Device' like Vikram 1601, etc.., independently.
- visualizes the zone where device(s) has maximum & minimum 'Lot Yield'.
- features interactive (zoom-in/out, hover, 360° rotation) with portability (in .html format) via mails, etc…

ANALYTICS

Data Analytics is comprised of 3 main modules:

1. Data Acquisition:
   - The data is available in form of excel file (in .xlsx format).
   - Each device has min. 1 lot ID.
   - There are total **40** device names.
   - The effective area varies from **0.89 mm^2** to **203.08 mm^2**.

	A	B	C	D	E	F
1	Aeff (mm2)	Device_ID	Device_Name	LotID	Lot Yield (%)	
2	0.89	SC1408-0	First Order Bandgap Ref	F19040002.F1	95.6	
3	1.04	SC9015_0	Standard 8 bit counter	F16320004.F1	98.0	
4	1.04	SC9007-0	RADHARD 8 Bit Counter	F15080001.F1	88.3	
5	1.13	SC9005-0	RADHARD 8 Bit Shift Register	F15080001.F1	79.8	
6	1.54	SC1009-0	8 Channel Analog Mux/Demux (5V)	F16350002.F1	98.0	
7	1.61	SC1118-0	CD4093_33	F16320003.F1	76.0	
8	1.85	SC1117-0	CD4093_5	F16350002.F1	98.0	
9	2.24	SC1005_1	Octal Buffer	F15220002.F1	87.5	
10	3.19	SC1002-1	QLVDS Driver	F15080001.F1	75.3	
11	3.19	SC1002-1	QLVDS Driver	F16320003.F1	84.3	
12	3.4	SC1001-0	QUAD LVDS Transmitter	F15080001.F1	75.3	
13	3.71	SC1402-0	LVR	F15080001.F1	79.7	
14	4.24	SC1023-0	LDO 32 Bit Processor	F18220001.F1	94.3	
15	4.24	SC1023-0	LDO 32 Bit Processor	F18220002.F1	93.7	
16	5.12	SC1004-2	16 BIT BUFFER	F15220002.F1	94.0	
17	5.12	SC1004-2	16 BIT BUFFER	F15220002.F3	68.8	
18	5.12	SC1004-2	16 BIT BUFFER	F17400004.F1	89.0	
19	5.79	SC1106	BEXM	F16320003.F2	83.6	
20	5.91	SC1012-0	HC4050 Hex Buffer (5V)	F16350002.F1	98.0	
21	5.91	SC1013-0	HC4050 RH Hex Buffer (5V)	F16350002.F1	98.0	
22	5.91	SC1013-0	HC4050 RH Hex Buffer (5V)	F16430006.F1	95.4	
23	5.91	SC1013-0	HC4050 RH Hex Buffer (5V)	F19080001.F1	92.6	
24	11.32	SC1506_0	FFT-1K	F17180001.F1	88.9	
25	13.18	SC1218	Sigma Delta ADC RH	F16320004.F2	66.7	
26	13.18	SC1218	Sigma Delta ADC RH	F17020001.F1	85.5	
27	13.6	SC1703_0	RADHARD 8k x 8k SRAM	F17180001.F1	88.9	
28	13.76	SC1124_0	Transreceiver	F17180001.F1	88.9	
29	14.96	SC1507_0	FFT-4K	F17180001.F1	88.9	
30	16.97	SC1216_0	CMOS Cam V2 RH	F16320004.F1	85.5	
31	25	SC1203-0T1	14 Bit Pipeline ADC	F15080001.F1	40.0	
32	25	SC1203-0T1	14 Bit Pipeline ADC	F15080002.F1	65.4	

Average Products yield Aeff onl | Sheet1

Fig. Data of Avg. Product Yield with Effective Area in Excel format

- For this, the coding script is written as:

2. Data Wrangling
   - This module is for cleansing of acquired data and converts into a palette for data visualization.
   - Here, the acquired data is converted into “structured & filtered” format.

	A	B	C	D	E	F
1	Aeff (mm	Device_I	Device_Name	LotID	Lot Yield (%	
35	35.64	SC1120	Vikram 1601	F16320004.F1	69.4	
36	35.64	SC1120	Vikram 1601	F16490001.F1	86.6	
37	35.64	SC1120	Vikram 1601	F16490001.F2	82.4	
78						
79						

Fig. Filtered Excel data e.g. 'Vikram 1601' device

3. Data Visualization
    - Below is the chart generated out of the filtered data using data wrangling method, done in the previous module.

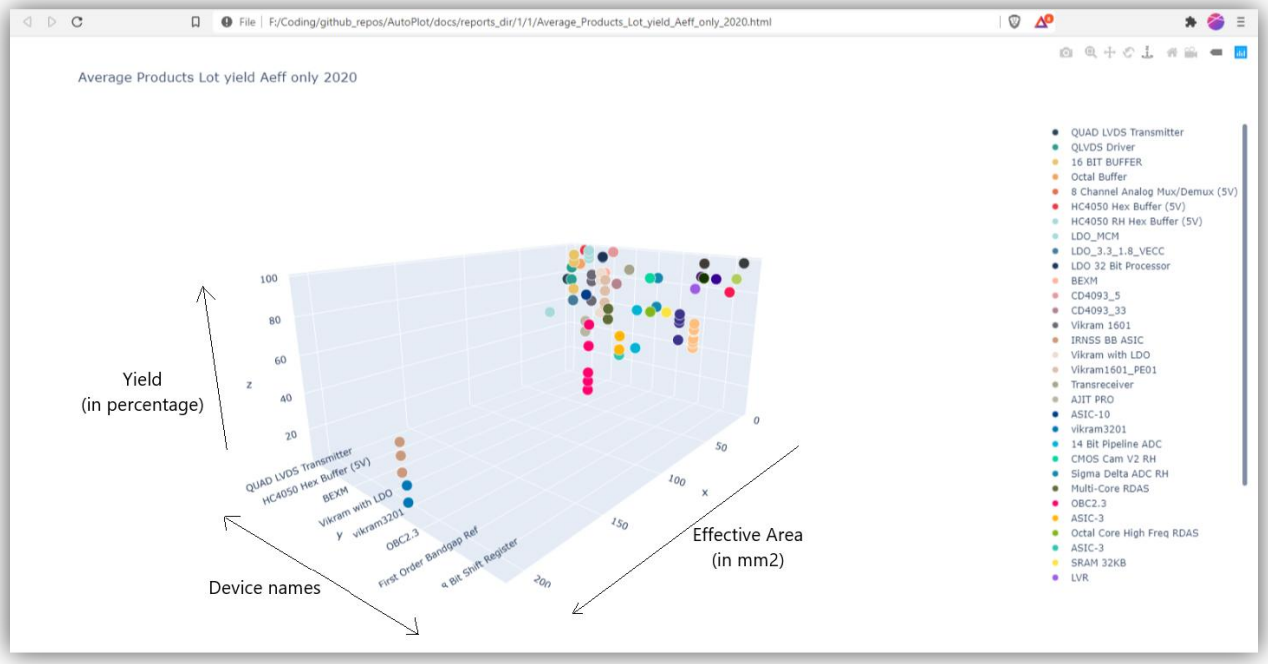

Fig. 3-D Chart Visualization for all devices

- The chart can be visualized for devices independently like Vikram 1601, etc… Here, please note that the data points are lying in a straight line, as the y-value (i.e. device name) is same for all these data points.

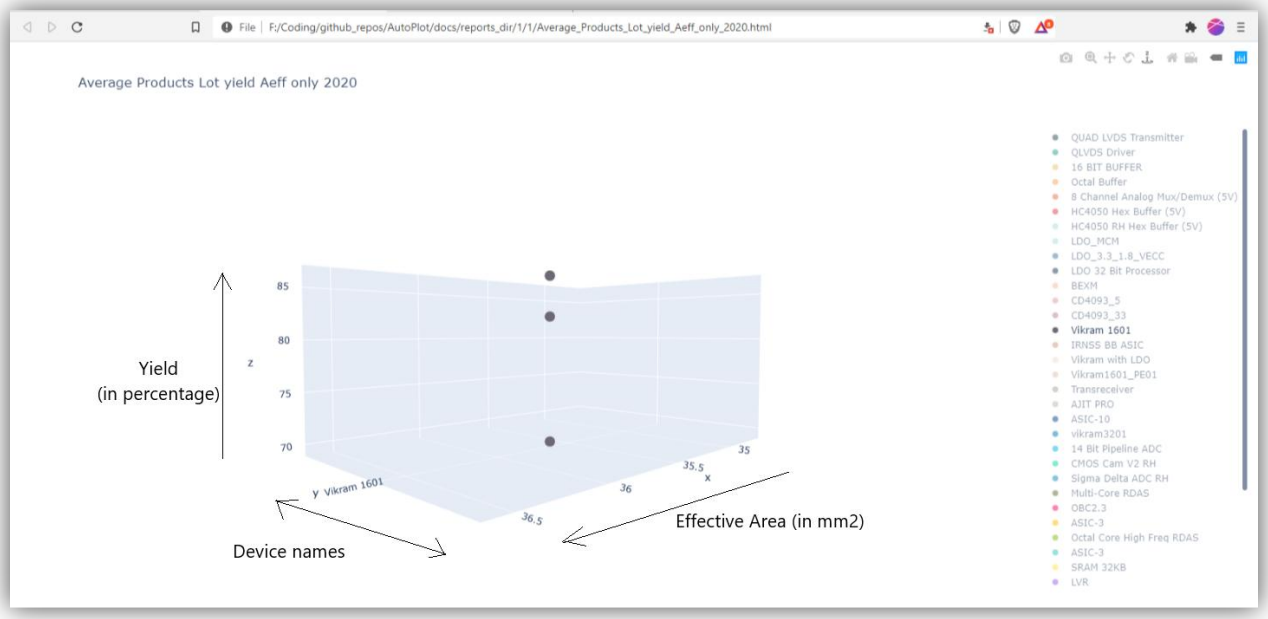

Fig. 3-D Chart Visualization for a device e.g. 'Vikram 1601'

- Specific zone is visually found where device(s) has maximum 'Lot Yield'. Then we can hover on the data points & see the corresponding device names & Lot IDs. Similarly, we can do the same for finding out the zone where devices have minimum yield. Therefore, further actions can be taken based on the max/min yield results for respective devices.

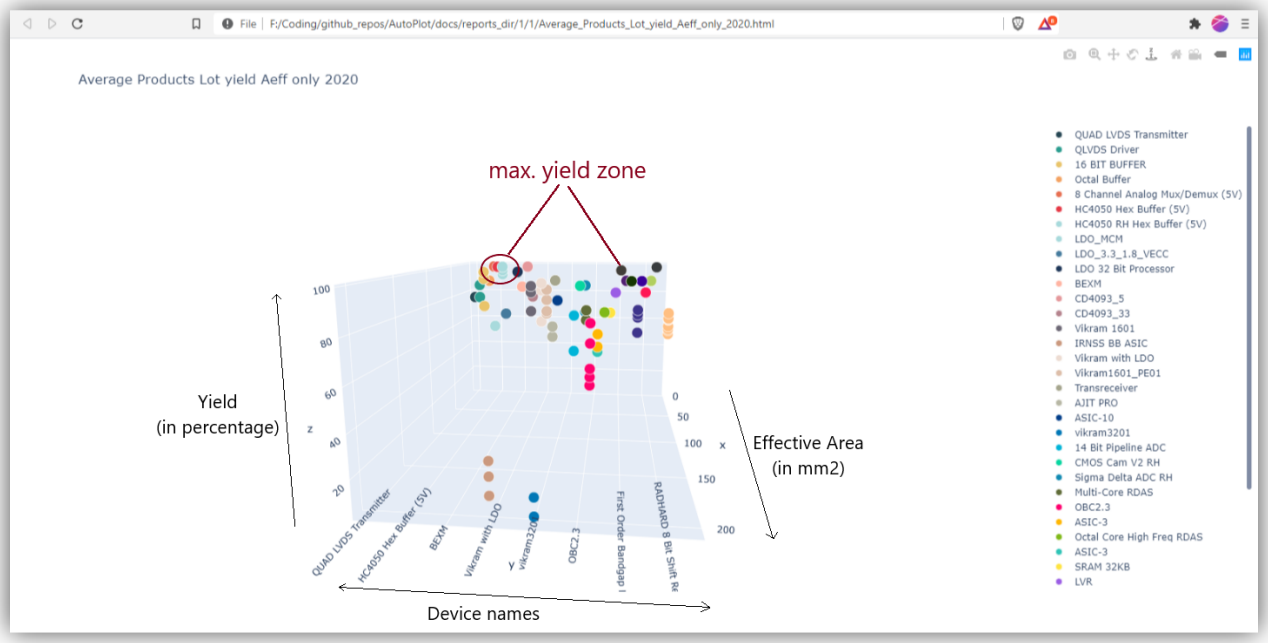

Fig. 3-D Chart Visualization for zone defining of max./min. yield

INFERENCE

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- Fab-out dates can be added in one of the axes in charts. This would give the information about *"whether the lot_id (pointed at) is recent or not in terms of Fab-out"*.

APPENDIX

DISCLAIMER

TODO

- Add no.s to the figures