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ISO/IEC JTC 1/SC 29/WG 4  
MPEG VIDEO CODING**

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**Title:** Wedgelet-based block division in geometry features extraction  
**Source:** PUT, ETRI  
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## **Abstract**

This document presents a description of the preliminary results of the experiments on enabling the wedgelet division of blocks in encoder-derived features used in DSDE. The results show improvement of the proposal over G65.

## **1 Proposal**

In order to more accurately represent the local features of depth maps, we present an approach based on modelling the geometry with wedgelets.

### **1.1 Feature extraction algorithm**

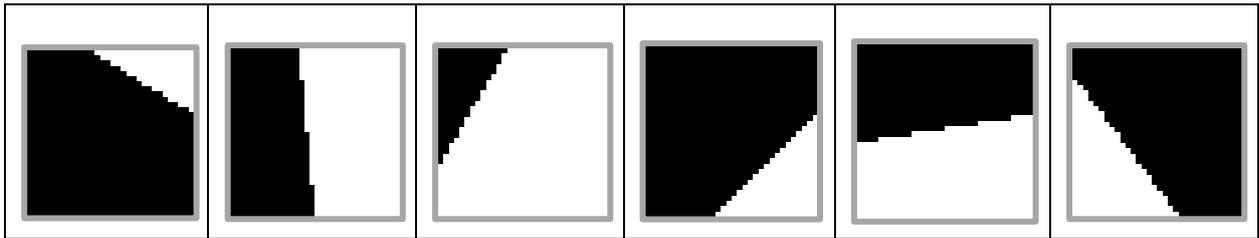
The first step is common with the current feature extraction approach. Each frame is split into main blocks of `maxBlockSize` x `maxBlockSize`. For each block minimum and maximum depth value is found (`ZMin`, `ZMax`). When the condition (1) is met, the block is split into two wedges.

$$\text{if } ((ZMax - Zmin) < \text{splitThreshold}) \tag{1}$$

Then the block is tested with all combinations of wedgelets. For each part, a `ZMin` and `ZMax` are found. Then a `costVolume` (2) of each part is calculated and summed up. The variant with lowest sum is selected.

$$\text{costVolume} = \text{wedgeArea} * (ZMax - ZMin + 1) \tag{2}$$

Example of wedgelet templates (black region – wedge A, white region – wedge B):



In successive frames, a temporal redundancy is evaluated to use depth information from the previous wedgelet. The basic condition (3) that does not allow the re-use of information from the previous wedge is the extension of the depth range in the current wedge (current and previous block must be splitted with the exact variant):

$\text{if}(\text{currentWedge.Zmin} < \text{previousWedge.Zmin} \parallel \text{currentWedge.Zmax} > \text{previousWedge.Zmax}) \text{ noSkip}$  (3)

If the above condition is not met, a skip threshold is used to exploit the similarity of depth values of successive frames in the block. SkipThreshold is defined as a percentage of the possible maximum depth value – MAX\_DEPTH\_VALUE (for 10 bit 1023). Then a percentage deviation is calculated for ZMin, ZMax, and average SAD for each wedge with respect to MAX\_DEPTH\_VALUE. A condition is checked:

$\text{if}(\text{ZminCurrPrevPerc} \geq \text{skipThresh} \parallel \text{ZmaxCurrPrevPerc} \geq \text{skipThresh} \parallel \text{AvgSADPerc} \geq \text{skipThresh}) \text{ noSkip}$  (4)

Otherwise, the depth information from the previous wedge can be used.

## 1.2 Features examples

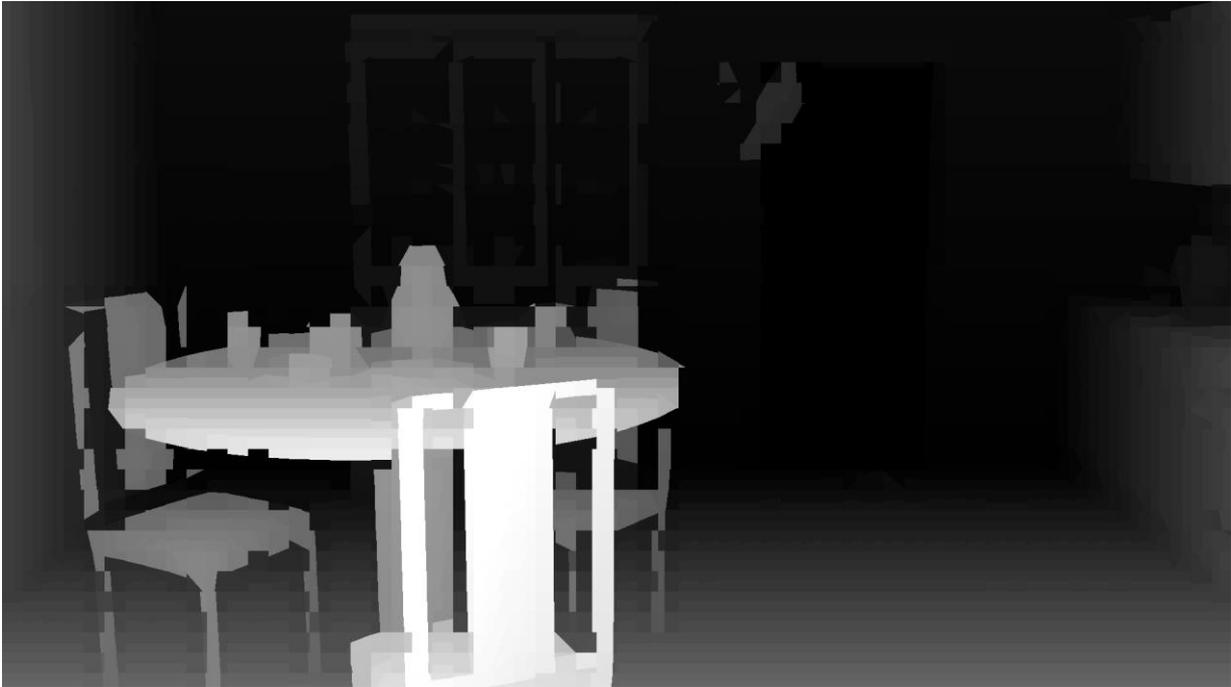
Extraction parameters:

- maxBlockSize = 32
- splitThreshold = 2562 (16 bit), 64 (10 bit)
- skipThreshold = 2%

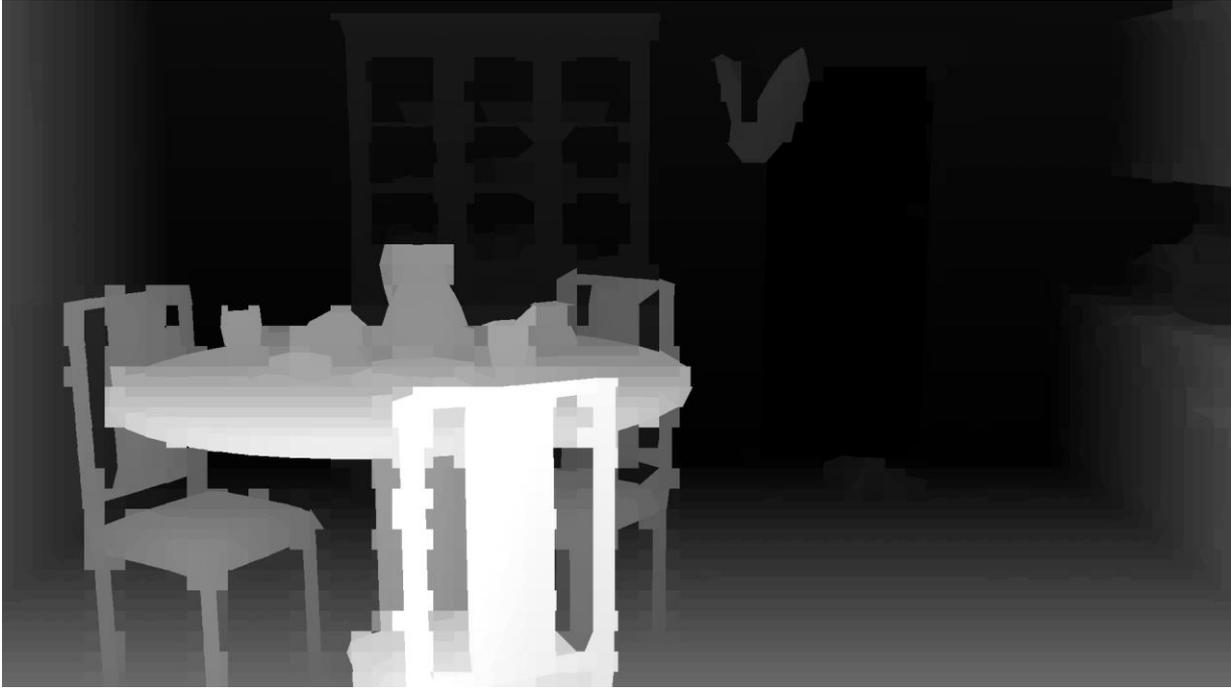
Presented examples are in the form of depth maps, which are fed later into IVDE:

Sequence J01, v15, 19<sup>th</sup> frame:

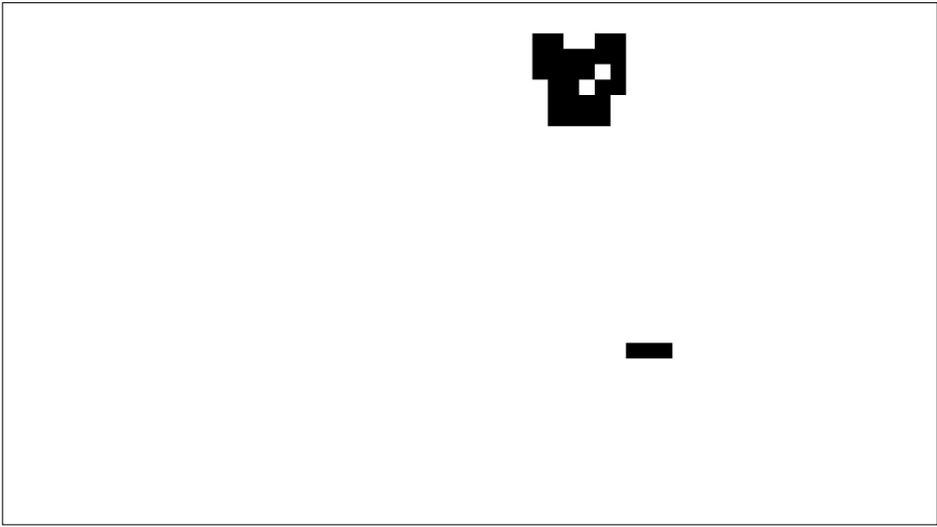
Min depth values map:



Max depth value map:



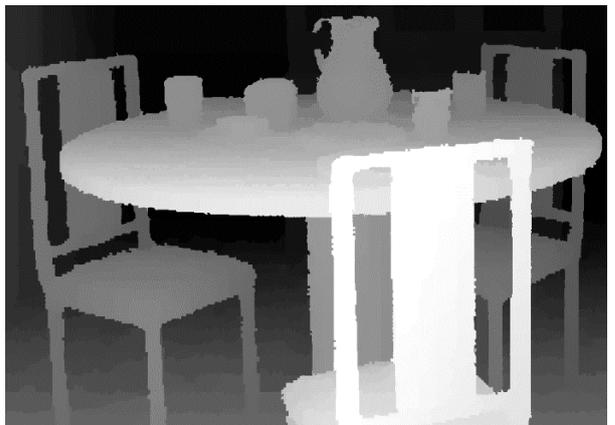
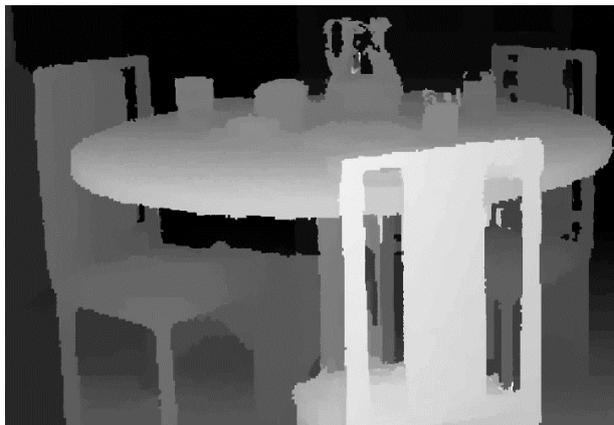
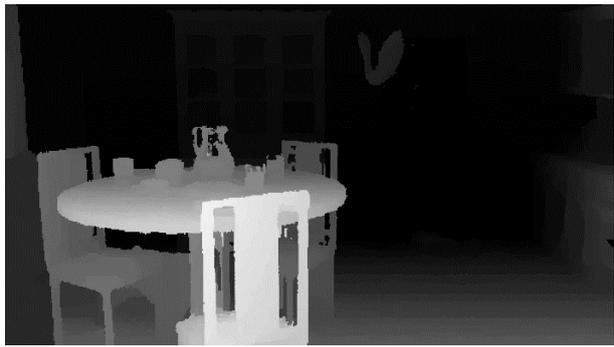
Depth skip map:



Estimated depth maps:

DSDE anchor

Proposal



View synthesis

Anchor



Proposal



Sequence D01, v12, 1<sup>st</sup> frame

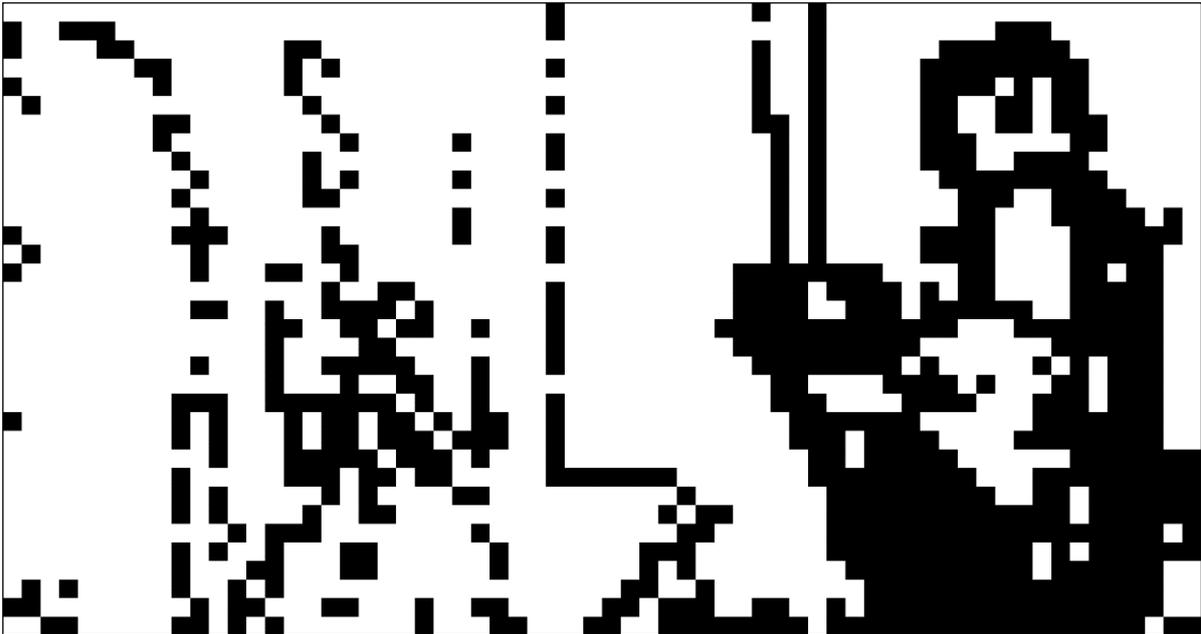
Min depth value map:



Max depth value map:



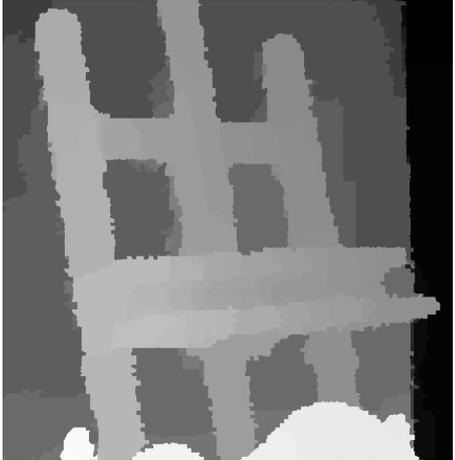
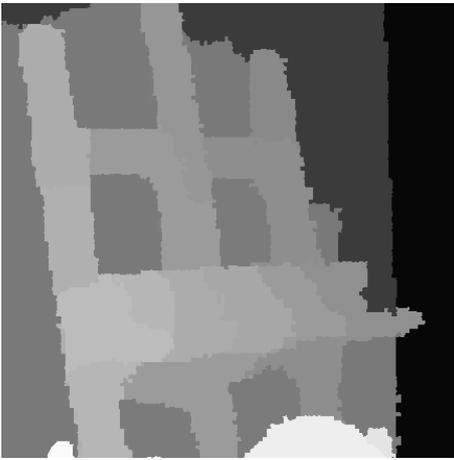
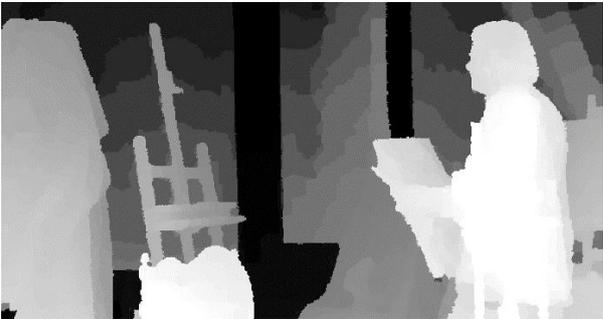
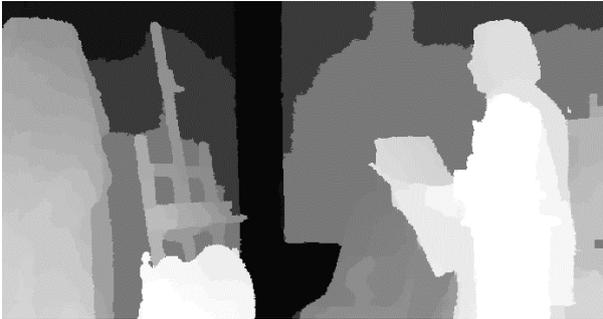
Depth skip map:



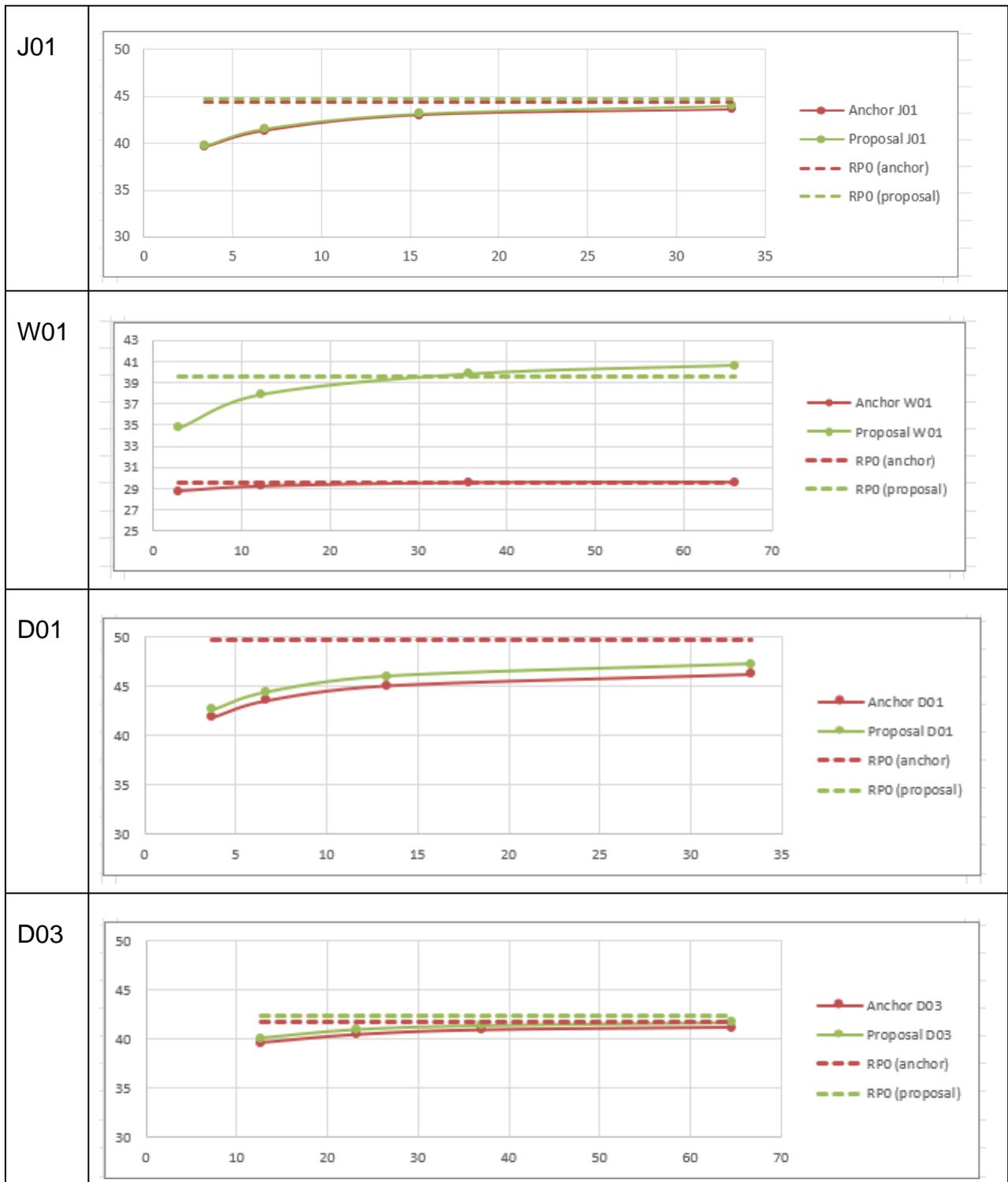
Depth estimation

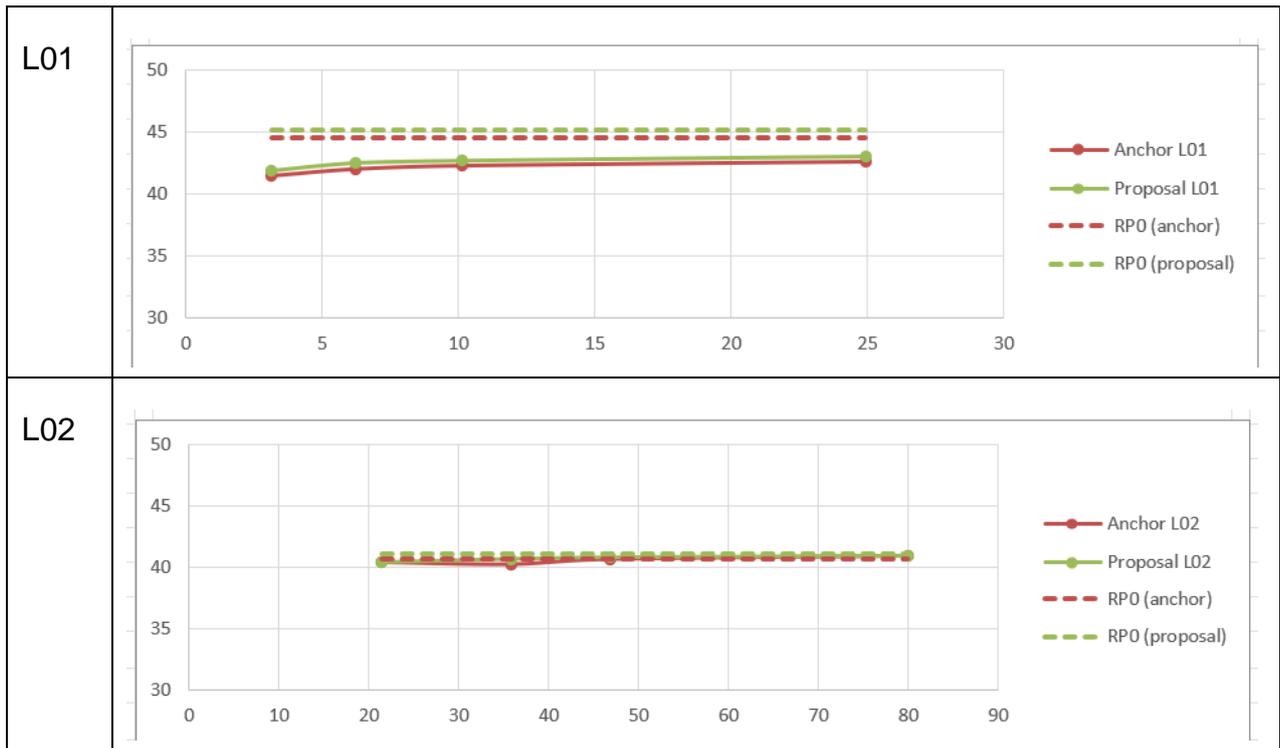
Anchor

Proposal



## 2 Objective results





### 3 Acknowledgement

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