CompactLight
XLS Lineariser Status and Updates

Date and Time	Monday 16 March 2020 at 16:30
Venue	XLS_General_Vidyo_Room, and Indico
Participants	Graeme Burt, Jinchi Cai, Alejandro Castilla, Adrian Cross, Andrea Latina, Bruno Spataro, Igor Syratchev, Xiaowei Wu, Walter Wuensch, and Liang Zhang.
Apologies	Xingguang Liu.

Preamble

This meeting had as purpose to review the status of the research done in the different element related to the **Lineariser System** for the CompactLight project. All these in views of the upcoming IPAC'20 (*now cancelled due to the Covid-19 outbreak*) contributions and the condensed version of a peer reviewed journal paper, as well as the CDR. The agenda and contributions can be reviewed in this link: Indico.

1 Remarks

Below are some highlighted remarks given by the presenters.

- **Bruno**:
  - 80 MV/m in 8 cm would be a low integrated voltage (6.4 MV) for an X-band injector, which needs about 20 MV. However, for a C-band injector, the total integrated voltage at 36 GHz is about 6.2 MV, so it seems to be sufficient.
- **Andrea**:
  - 2 mm iris aperture option seems to work ok wake fields wise.
  - Ka-band max 36 MV/m at 0.6 m for ∼6 or 10 MV integrated voltage should be optimum.
- **Liang**:
  - Gyro-klystron:
    - 36 GHz 2.75 MW power (6.75 MW beam power) 150 kV, 50 A 40% eff.
    - 48 GHz design oscillates at 140 kV 50 A 3.1 MW at 37 A its more.
    - 2 MW output depending on velocity spread.
    - 1.5 m length including collector, 15 A/m^2, 2.02 T superconducting coil.
- **Jinchi**:
  - HOM Multi Beam Klystron:
    - 20 beams 60 kV 100 mm long—excluding collector—and 10 A/cm^2.
    - Tolerances might not be so tight as it's a resonator so can be tuned, and it's broadband.
    - 2.4 MW 33.6% eff and 41 dB gain.
    - Bandwidth a little narrow, E_{max} 67 kV/mm. 0.3 T magnetic field.
- **Xiaowei**:
  - Dual mode SLED2 pulse compressor:
    - 6.8 power-gain 3 MW gives 15.8 MW with losses.
    - With smaller bandwidth of 50 MHz power is only slightly reduced (10% voltage drop) from 200 MHz but not a flat top.
    - Flat top is not an issue and can be compensated.

2 Comments

Below we enlist the given comments specific to the presenter.

- **Bruno**:
  - The high power circulator could present a complication, an option to explore to mitigate this, is to consider splitting the structure in two and use a hybrid instead.
  - Finally, 24 cells for a SW structure in π-mode seems a little long. However, due to the fact that the cell-to-cell coupling is high, this may not be an issue, but the mode spacing needs to be looked at.

- **Alex**:
  - The scaling law of the harmonic voltage needs to be corrected.
  - A table indicating the power and number of structures needed for different frequencies could be helpful. Once this table has been made, will be given as input to Andrea and the beam dynamics team to run a full comparison.
  - The study can be extended beyond the CompactLight injector, should look into 2 or 3 structure options next.
- **Andrea**:
  - We should look at low energy lineariser as well.
  - Follow up with Alex for the frequency comparison.

Action List

The following are the general comments and remarks presented by the assistants, previous to the closing of the session:

Num.	Action	Responsible
1	Follow up on the comments given in section 2	Bruno, Alex, Andrea
2	Call the structure's paper.*	Alex
3	Call the sources paper.*	Graeme
4	WP deliverable for CDR due to June.	**Everyone**

* To be combined for peer-reviewed journal.

Next meeting to be potentially on June 15th via XLS General Vidyo Room.