**Wire corrector systems for the compensation of the Long-Range Beam-Beam effects**

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* Beam-Beam Long-Range Compensators with physical wires are considered a valuable option for HL-LHC to increase dynamic aperture at small crossing angles by compensating the nonlinear beam-beam effects.
* Prototype wires embedded in collimators in LHC have already demonstrated the potential of a wire corrector to reduce the tune spread and increase the dynamic aperture. Simulations of the TRIUMF beam physics group under Rick Baartman could confirm these effects.
* Experimentally, it was possible to reduce the crossing angle, without increasing the losses. That will reduce the irradiation on the final focussing triplets and background at the experiments.
* The wires thereby will allow for and estimated 3-5% improvement in integrated luminosity compared to baseline (crab cavities, round beams) including flat beams.

Systems of the wire corrector assembly (information from CERN group members of the beam-beam long-range corrector (BBLRC) collaboration member Adriana Rossi):



4 of these assemblies, each 4.5 m long, are required, two for each side of IP1 and IP5 of LHC.

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| **System** | **Details** |
| Vacuum chamber + wire | * 1 mm Mo wire brazed on a AlN ceramics, Cu backing, 6 m per assembly
* insulator and wire are mechanically clamped to a Cu-based housing (Cu due to RF impedance)
* Water cooling channel obtained by housing machining and cover welding. Cu half-shell welded to the housing.
* Commercial feedthrough connection carrying up to 185 A
* Stainless steel flange brazed to copper and then welded to vacuum chamber.TRIUMF proposes and accessible vacuum chamber, but that’s still in discussion
* Ports for pumping and vacuum instrumentation will be required.
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| Mechanical tables | Support cradles required for precise alignment of the assembly itself |
| Frame and support | Rigid support structure required for the alignment against the beam, could be I-beams and CERN type frame bases |
| Beam position monitors and bellows (RF-modules) | The accurate beam-based alignment requires precise determination of the beam position with button pick-upsIn addition the BPMs are required for machine protection system4 BPMs are required per assembly located in the connection modules at the extremities of the system |
| Connection modules | 4 connections including bellows and RF contacts, connecting the 6 tank/wire modules |
| Stepper motors, drives and controls electronic | 4 stepper motors, power drives and controls electronics are required per assembly to perform the automatic beam-based alignment. |
| Vacuum equipment | Separation of the wire system from LHC, valves according to LHC standard equipment, vacuum instrumentation |
| Power supplies(contingency, will ask CERN to provide them if we run over budget) | The correctors must establish up to 450 A\*m. A current of 150 A will be required in operations. 8 bipolar power supplies of 185 A, 20 V will provide maximum flexibility. |