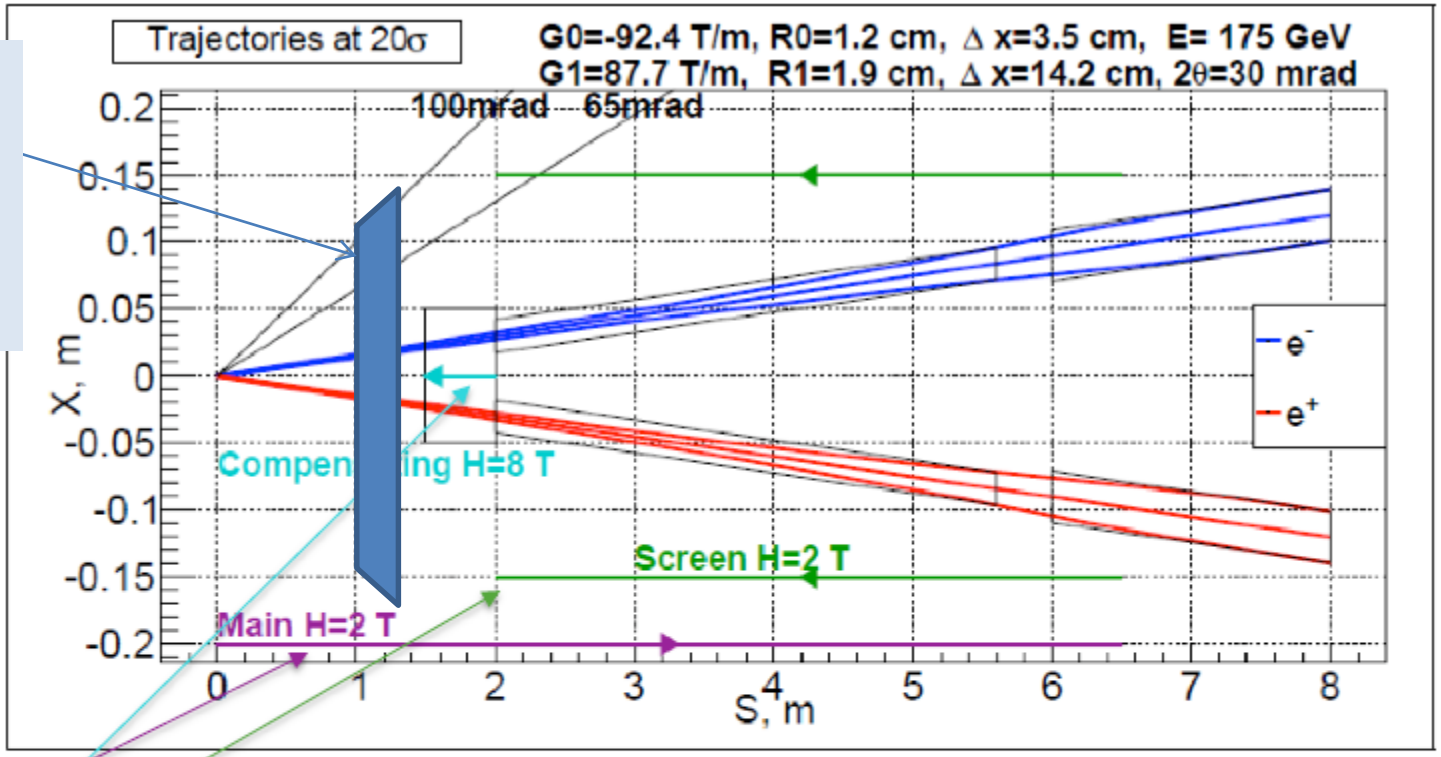
MDI for FCC-ee

One of the most striking conclusions of the FCC general meeting at Washington was the need for a FCC-ee Machine Detector Interface (MDI) working group.

A mandate was drafted last year and the working group has been invited to convene with Manuela Boscolo (INFN Frascati) and Nichola Bacchetta (INFN, Padova, CMS) as convener and co-convener.

The MDI group establishes a bridge between the accelerator and physics studies.

Luminosity monitor centered on outgoing beam



Beams are crossing detector B-field at an angle of 0.015 mrad. Need compensation.

- Here assumed +2 Tesla detector main field
- Screening of quadrupoles: - 2 Tesla
- Compensation for beam path through detector: - 8 Tesla over one quarter of path

Very strong influence of solenoid edges on vertical emittance especially at Z peak

- May in the end put an effective limit on the strength of the detector field

Bogomyagkov, Dam, Koratzinos

Mandate for the MDI Working Group for FCC-ee

A Machine-Detector Interface is created for the FCC-ee. The task is to study the integration of beams, machine elements and detectors able to produce/exploit the very high luminosities expected at FCC-ee at the interaction regions (IR). The group is charged to come up with a plausible design and, if needed, a set of necessary technical R&D or measurements.

The group will have monthly video meetings and will report progress to the FCC-ee accelerator design and physics meetings, as well as to FCC general meetings on request. A first written report is expected in October 2016.

The non-exclusive list topics to be addressed with high priority is described in the following. The group should feel free to bring up additional issues to the FCC coordination, to ensure that they are either added to their remit or treated elsewhere.

1. **Synchrotron radiation and masking**

   - Provide estimates of the intensity, spectrum, spatial and angular distribution of the synchrotron radiation emitted by the beam passing through the various machine elements.
   - understand the limits imposed by experimental detectors sensitivity to synchrotron radiation and possibly establish a program of R&D needed to evaluate and possibly improve the resistance of detectors.
   - consider the impact of masking on the machine performance e.g. due to transverse impedance and aperture issues.

2. **Other accelerator backgrounds**

   - provide a list of accelerator-created backgrounds
   - develop the simulations of these processes in order to allow the assessment of their impact on detector performance

3. **Magnetic integration**

   - develop a concept for one magnetic system comprising the main detector magnet, the final focus elements, the necessary compensation devices.
   - consider the feasibility of such a system, the necessary R&D and prototyping, the possible issues with complexity and reliability.
   - consider the impact of the magnetic system on beam polarization and energy calibration

4. **Luminosity measurements and other desired particle detectors have to be integrated in the final design of the interaction region.**

The proposed initial membership of the group is as follows:

- Accelerator-born backgrounds: Manuela Boscolo (chair)
- Synchrotron radiation and masking: Helmut Burkhardt, Hiroyuki Nakayama
- Detector aspects and layout: Nicola Bacchetta (Co-chair)
- Luminosity measurements: Mogens Dam
- Solenoid field compensation: Sergey Sinyatkin
- L* and links to optics, coupling corrections: Eugene Levichev, Katsunobu Oide
- Technical infrastructure requirements and interfaces: John Osborne
- Effect of synchrotron radiation on particle detectors: Michael Moll
- Integration of magnetic systems: Herman Ten Kate

In attendance: Jorg Wenninger, Frank Zimmermann (FCC-ee accelerator); Alain Blondel, Patrick Janot (FCC-ee experiments),

NB everyone has agreed except Michael Moll – we are looking for a replacement