

Review of FCC-ee crab-waist option

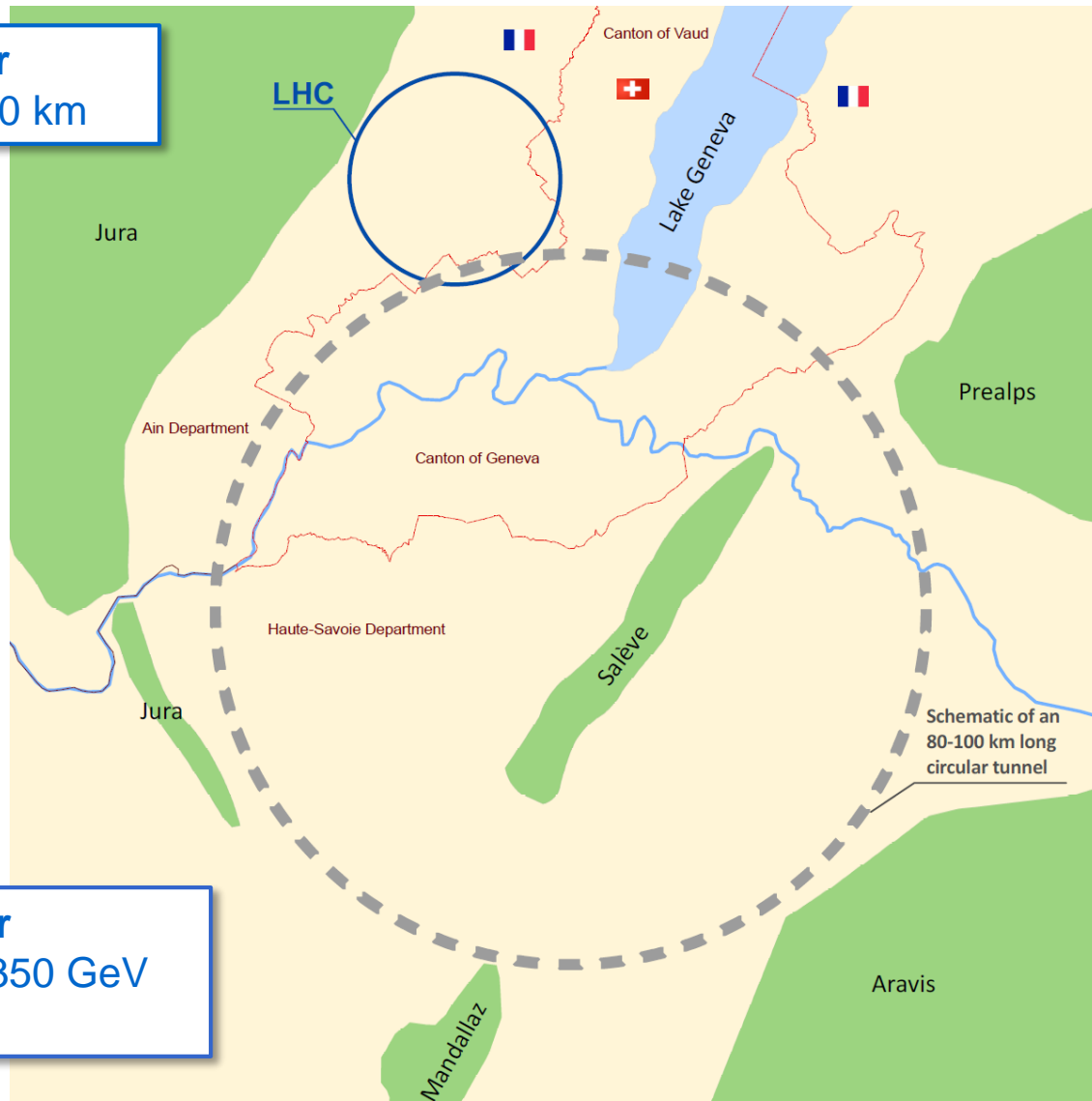


CERN, 12 June 2015

Review Charge & Constraints

Michael Benedikt and Frank Zimmermann

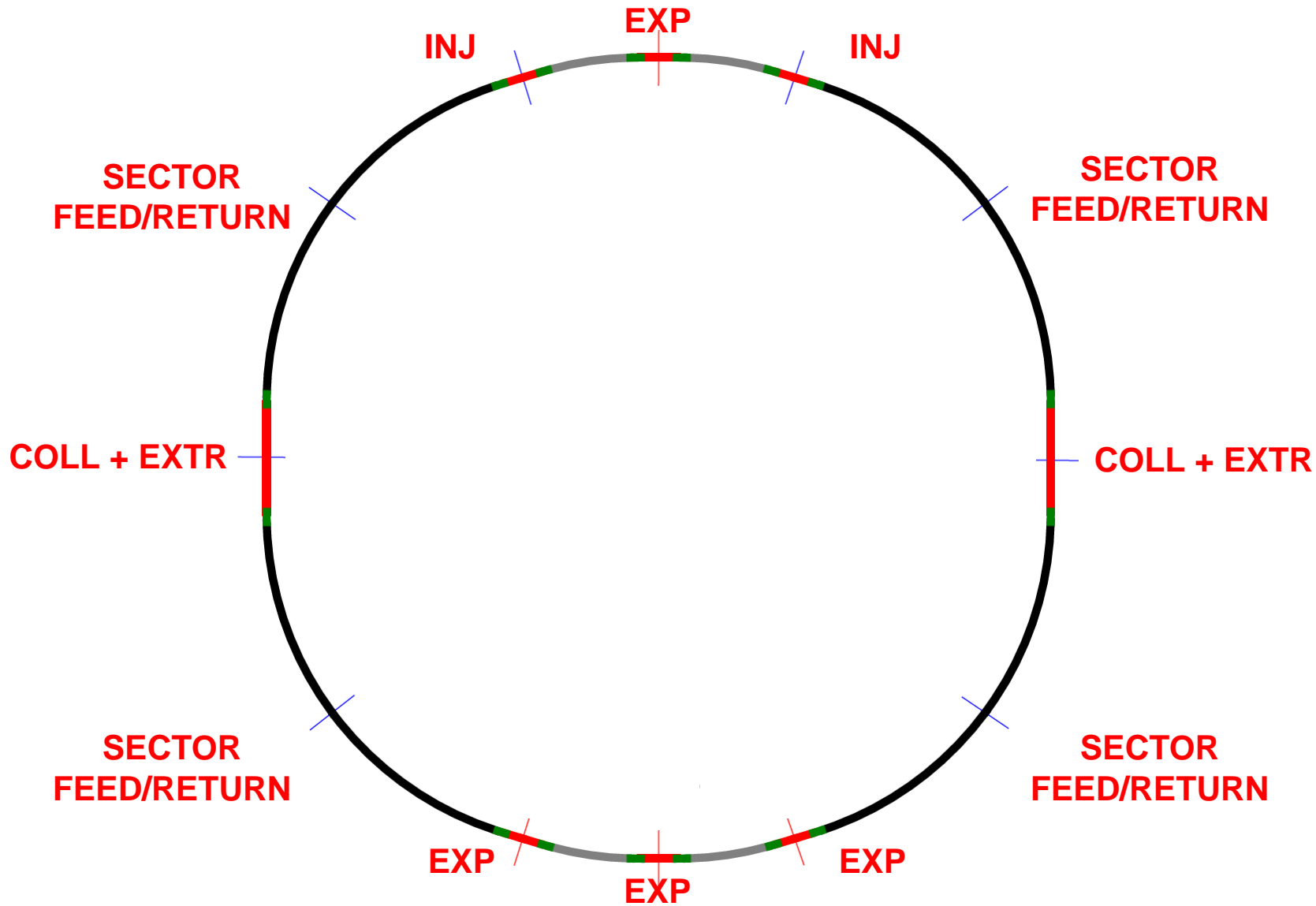
Hadron collider
16 T \Rightarrow 100 TeV for 100 km

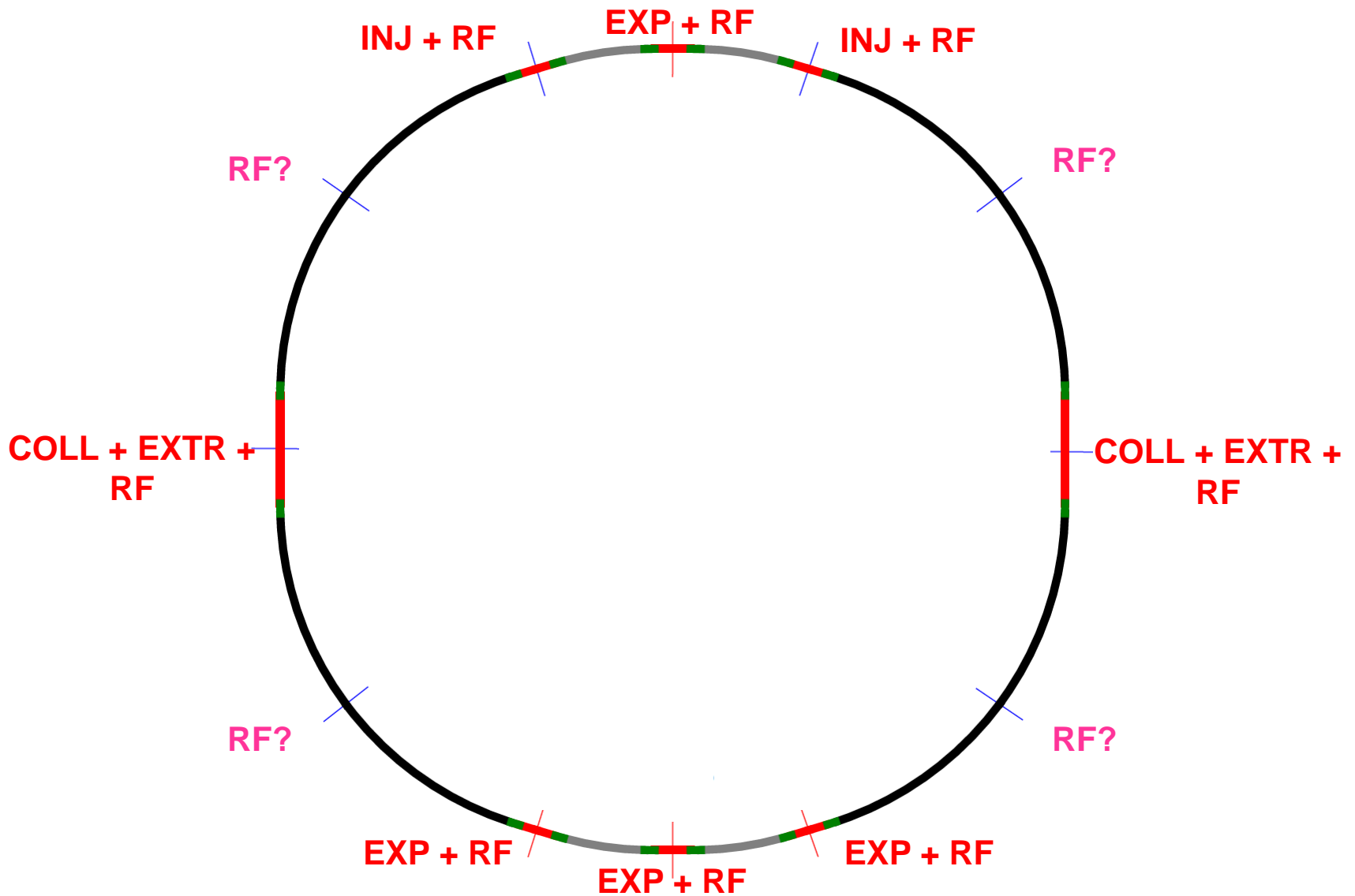


e+ e- collider
Collision energy 90 to 350 GeV
Very high luminosity

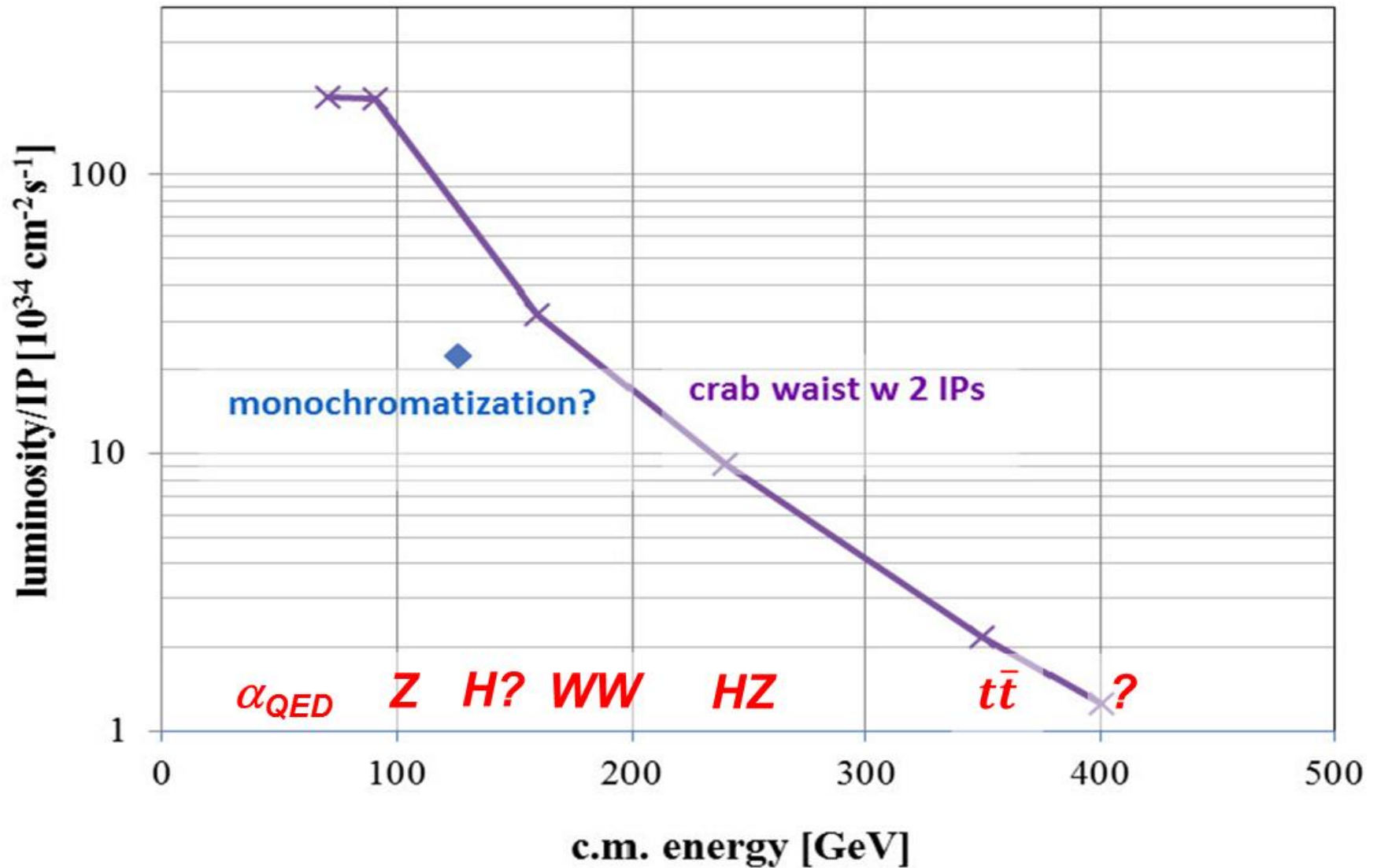


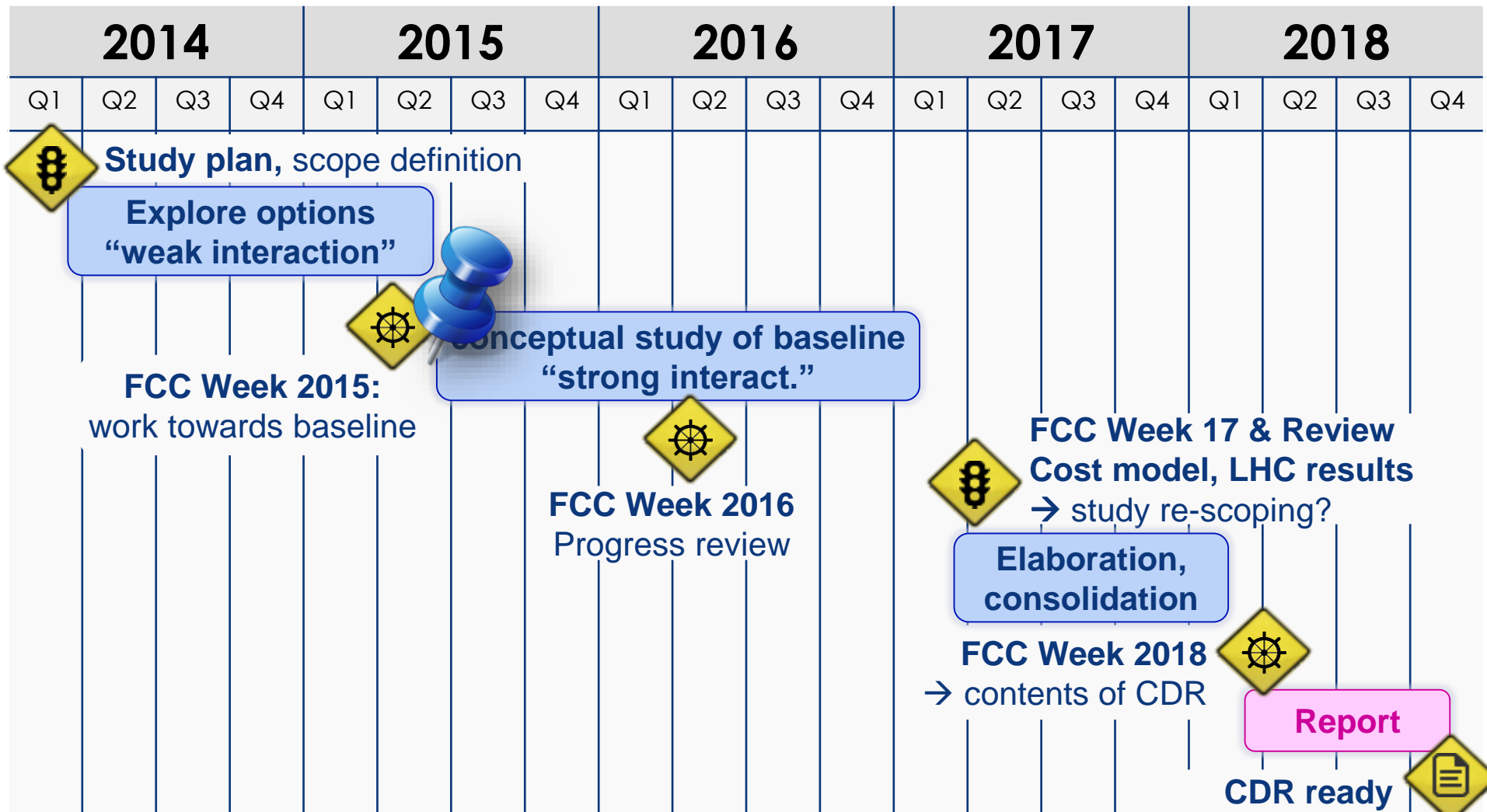
allocation of straight sections *FCC-hh*





- highest possible luminosity
- *beam energy range from 35 GeV to ~200 GeV*
- physics programs / energies:
 - α_{QED} (35 GeV): *running coupling constant close to the Z pole ?*
 - Z (45.5 GeV): *Z pole, ‘TeraZ’ and high precision M_Z & Γ_Z ,*
 - H (63 GeV): *H production in s channel (with mono-chromatization) ??*
 - W (80 GeV): *W pair production threshold, high precision M_W*
 - H (120 GeV): *ZH production (maximum rate of H’s),*
 - t (175 GeV): *$t\bar{t}$ threshold*
 - *>175 GeV: physics?*
- some polarization up to ≥ 80 GeV for beam energy calibration
- optimized for operation at 120 GeV?! (2nd priority “Tera-Z”)





Plan: **converge on optics and beam dynamics by autumn 2015.**

Presently **two variants** are being studied:

- **crab waist – small emittance option, mainly by BINP**
- small crossing angle – variable cell option with constant geometric emittance, mainly by CERN

An external review of all variants is foreseen for the second half of September 2015.



today's agenda



time	length	title	speaker(s)
08:30-08:45	15 min.	Review charge & constraints	Michael Benedikt and Frank Zimmermann
08:45-09:15	30 min.	BINP studies overview	Eugene Levichev
09:15-09:45	30 min.	Parameters, beam-beam and luminosity performance	Dmitry Shatilov
09:45-10:15	30 min.	IR optics and chromaticity correction	Anton Bogomyagkov
10:15-10:30	15 min.	<i>Coffee break</i>	
10:30-11:00	30 min.	Dynamic aperture and momentum acceptance	Pavel Piminov
11:00-11:25	25 min.	Polarization, spin rotation (for planar machine and for machine with a kink),	Ivan Koop
11:25-11:50	25 min.	IR synchrotron radiation & quantification	Anton Bogomyagkov, Helmut Burkhardt
11:50-12:15	25 min.	IR quadrupole & solenoid design parameters and assumed field qualities	Eugene Levichev
12::15-12:30	15 min.	Questions and discussions	
12:30-13:30	60 min.	Lunch break	
13:30-15:30	120 min.	Executive session	



Speakers: Anton Bogomyagkov, Helmut Burkhardt, Ivan Koop, Eugene Levichev, Pavel Piminov, Dmitry Shatilov

Reviewers: Alain Blondel, Stephane Fartoukh, John Jowett, Katsunobu Oide (Chair), Pantaleo Raimondi

Additional invitees: Michael Benedikt, Bernhard Holzer, Rogelio Tomas, Frank Zimmermann



review charges



- Are the **parameters** reasonable and feasible (**emittances, beta*, dynamic aperture with momentum acceptance**)?
- Assess the **solenoid configuration and compensation** scheme
- Choice of **crossing angle** and final quadrupole design
- Is there a **complete consistent design for two extreme energies** (Z and top running)?
- Is the **IR synchrotron radiation** (power, critical energy) acceptable or can it be reduced to an acceptable level?
- Compatibility with the **insertion length and tunnel constraints**
- Which approach(es) should be taken for **polarization and energy calibration**?
- **Have any important, critical items be overlooked?** (kinematic terms, fringe fields, field errors,...)
- **Which items should be further studied with high priority?**