Two additional questions about prototyping:

- Is there a physical prototype already available (how you read it out, etc. Or when is it planned)

We have tested one at JLab that was 40 channels and are preparing another that will be 128 channels. We are read it with CAEN FERS-5200 (CITIROC 1A)

- Do you already have a waveform from the SiPM output available (picture or data)

SiPM information/requirements (not exactly ASIC-related, but good information to have):

- manufacturer

Hamamatsu

- size [mm] (individual chip)

1.3 or 3 mm (TBD)

- bias range (min & max that need to be set) [V]

38-45 V

- operating overvoltage (planned) [V]

+2V (so about 40V)

- stability required [mV]

Not determined yet

- bias voltage accuracy (IF NEEDED, for using pre-calibration voltages) [%]

Not determined yet

- bias voltage current (max, after lifetime irradiation) [uA]

We expect up to ~1 mA after 1E12 neutrons, depending on voltage

- bias voltage temperature compensation (or will SiPM temperature be controlled instead)?

Not determined yet

- array of SiPM/channel [how many; series/parallel scheme]

1 SiPM per channel

- capacitance/channel

That of 1.3 mm or 3 mm

- #pixel/channel

7.3k pixel or 38k pixel depending on SiPM size

- dynamic range required/channel [pC]

Up to ~300 MIP (for 3x3 cm2 cell)

(minimum signal important to detect is discussed below (Hit requirements))

FEB signal processing requirements:

(Preamp information)

- linearity requirement [max nonlinearity % over full range, or a more detailed spec]

Not determined yet

- gain stability (w.r.t. time/drift, internal noises of the FEB, FEB temperature, external interferences) [%]

Not determined yet

- peak time (or max peak time to avoid pile-up) [ns]

Not determined yet

- charge resolution [% of full scale or a more detailed spec, e.g. % of signal at various signal sizes]

Not determined yet

- Time-of-hit resolution [ns]

We expect an intrinsic resolution from scintillator + SiPM to be a few hundred picoseconds at 1 MIP. We would like to have better resolution than that from electronics.

- double-pulse resolving time [ns] (i.e. readout of two pulses separated by less than this **may have pileup errors or may be seen as one pulse**)

Not determined yet

Hit processing / streaming readout requirements:

- Hit threshold [pC] (OR a more detailed spec over detector geometry if appropriate)

This will be in the range 0.1 to 0.5 MIP

- Hits defined by something more than each channel independently? (Default answer "no")

No

- Hit rate (physics+background) per channel maximum [kHz] (OR a more detailed spec over detector geometry if appropriate)

We have not done the study but can refer to this that includes insert:

https://wiki.bnl.gov/EPIC/index.php?title=Hadron_Beam_Gas

- Does the hit rate requirement apply independently to all channels or has to be understood with some correlation in mind?

Beam gas is not random, but localized

Slow control:

- SiPM bias current monitoring [Yes / combined / none]

Yes

- temperature monitoring [Yes/No]

Not determined yet

Accessibility of the FEB and RDO:

- FEB on detector [Yes/No]

No

- FEB accessibility [During run/between runs] (Radiation tolerance)

Yes, it will be accessible. This will be at the back of HCAL

- FEB-RDO minimum distance [m]

Not determined yet

- RDO on detector [Yes/No] (default No)

No

- RDO accessibility/location (Radiation tolerance)

At the back of HCAL