May 2020

OfficeHours_IS5_20160407_Seg01.pdf

Participants: IS5 (glasses), I1 (dark blue shirt)
Setting: I1 helping IS5 prepare for her presentation/meeting with professor by reviewing numerous papers and articles

0:00
xxx I1: you can have a seat?
xxx it's ok
xxx ((sits down))
xxx IS5: ((sits down))
xxx ((whispers)) (I was hoping I was) going to talk
xxx I1: um:
xxx so today,
xxx we are going to do a <practice>
xxx <fo:r>
xxx um
xxx ((looks up at IS5)) a presentation.
xxx IS5: ((scrunches face)) yea
xxx I1: or a meeting with faculty.
xxx IS5: ((nods)) yes
xxx m-maybe a meeting [with-((opens packet))
xxx I1: [a meeting with faculty
xxx and you are-,
xxx w-what is the topic that you are going to talk about,
xxx IS5: (it is) about
xxx uh:
xxx uh:
xxx yea ((turns packet over to I1))
xxx this is but-
xxx I1: ((reads packet))
xxx ↑high fidelity, (.) preparation gates,
xxx memory, (.) and
xxx readout of a trapped-ion quantum bit.
xxx IS5: ((smiles and laughs softly)) yea.
xxx I1: ((nervous)) o:kay,
xxx ((laughs))
xxx so
xxx are you going to: present a ↑summary of this reading?=
xxx IS5: =yes
xxx uh
xxx just (.) try to show how (it) make the-
xxx how they do the experiments
xxx I think
xxx I1: oh:
xxx ok
xxx IS5: [but I'm not ↑pretty sure (to) he wants me to talk-
xxx to say.
xxx I1: is this,

xxx uh:
xxx a project for (.) a [class?
xxx IS5: [this is a-
xxx class yes.
xxx I1: oh:
xxx ok↓
xxx wha-which class is [this?
xxx IS5: [It's a seminar
xxx like
xxx uh: (.1)
xxx the class name is seminar.
xxx I1: seminar
xxx IS5: yea ((nods))
xxx I1: ok
xxx and
xxx wow
xxx first on (.2) on this page
xxx ((shows packet to camera))
xxx [there's a (.) ↑awesome (.) diagram
xxx IS5: [uh-huh
xxx ((laughs))
xxx I1: that I don't know how to interpret
xxx IS5: ((laughs))
xxx I-=
xxx I1: =so
xxx well↑
xxx I am not your [professor
xxx IS5: [uh-huh
xxx I1: so I will not know all the terminologies=
xxx IS5: =mhm
xxx I1: is it possible↑ for you to explain this
xxx in a very
xxx um
xxx unprofessional way-
xxx ↑not- uh
xxx like in a very:=
xxx IS5: =I mean currently=
xxx I1: =yea
xxx IS5: I don't understand this ((points to page)) procedure
xxx very well↓
xxx so I have to ask him like (what this)
xxx (but what they want to do) is just try to uh use the
xxx calcium atom,
EXC to uh
EXC t-to trap the ((incomprehensible)) quantum (cubit)-
EXC quantum bit
xxx so this is how we make it,
xxx how we do the preparation
xxx and how they-=

xxx I1: =so
xxx IS5: transform the quantum state and how they
xxx uh
xxx measure
xxx I1: quantum (.)[bit
xxx IS5: [state
xxx IS5: yea
xxx I1: what is a quantum [(.) bit?
xxx IS5: [ok
xxx uh
xxx (quantums are),
xxx you know
xxx bit
xxx for uh:
xxx classic
xxx like
xxx for a computer,
xxx [a bit is ((incompr[ehensible))
xxx I1: [yes [right
xxx IS5: quantum bit the same thing
xxx just we use uh
xxx um: (.1)
xxx just a for quantum (they will like)
xxx we use the spin of (.) electron,
xxx which is up and down so
xxx it's (semi) but-
xxx uh:
xxx the ↑difference of quantum (bit and bit) is that
xxx quantum bit you can think it is a continuous
xxx like
xxx uh but
EXC uh
EXC (for the- from-from the) fundamental
EXC u:m
xxx assumption or (postulation of the quantum bit)
xxx ↑we ↑((incomprehensible))
xxx (it would uh become one state or another
xxx state)
xxx so
xxx there just a two state for you (to matter)
xxx which is similar with zero [and one yea ((trails off))
3:00
xxx I1: [zero and one
xxx but use
xxx you use different (.) numbers?
xxx IS5: [no no
xxx I1: [you record it state one and state two?
xxx IS5: yes
xxx it just like uh: if you know the spin

xxx you will know (that) electron has:
xxx I1: mhm
xxx IS5: spin,
xxx which is half,
xxx so you will have the (positive) [(.) component and
xxx I1: [mhm
xxx IS5: (negative) component
xxx [so
xxx I1: [mhm
Xxx IS5: like if its spin is up,
xxx so you can treat it as (though it was) ↑zero in the:
xxx (classic orbit)=
xxx I1: =mhm
Xxx IS5: and (it its spin down) so you treat it as one (.)
xxx yea
xxx I1: so
xxx trapped↑ (.) ion,=
EXC IS5: =trapped ion is- is- is a
EXC is a
EXC a kind of
EXC uh: (implement)
EXC like
EXC you use- you use a
EXC (it is) how they make- how they prepare the (.)
EXC quantum bit=
xxx I1: =quantum bit [p]
xxx so
xxx the experimenters (.) are creating quantum bits,
xxx or they are just observing quantum bit,
xxx or they are=
xxx IS5: =they uh:
xxx how to say°=
xxx I1: =what are they doing↓
xxx IS5: ↑because they
xxx because uh
xxx ↑first you can see quantum bit is a mathematical
xxx uh
xxx objects,
xxx I1: [mhm
xxx [(but) we want to- but ↑actually it <u>is</u> a physical
xxx things=
xxx I1: =uh-huh?=
EXC IS5: =we want to
EXC uh: (.)
EXC make p-
xxx ↑we can't say we create it because
xxx like
EXC the spin- the ↑spin is there↓=
xxx I1: =right=

xxx IS5: =but we want to ↑make it
xxx uh: (.1)
xxx as what we want
xxx to make it become (.) the thing we want
xxx to make it- to make it transform like (.) what we desire.=
xxx I1: =what is the thing that you desire
xxx what do you want?
xxx IS5: like
xxx I1: it to be (.1)
xxx IS5: ((leans forward)) huh?=
xxx I1: =what do you want the quantum bits to (.) [look like
xxx IS5: [(we want)
xxx I1: or what do you want=
EXC IS5: =uh: as I said
EXA ((stammers)) two level things
xxx up and down
xxx I1: up and down
xxx IS5: yea
xxx I1: [oh ok
Xxx IS5: [or um:
xxx well of course we use for l-l-lots of ((??))
xxx like
xxx like trapped ion is one way
xxx we also can use the (photon)
xxx because the (polarizing-)
xxx we can use the polarization photon [as (a quantum bit
xxx too)
xxx I1: [mhm
Xxx IS5: (but ↑there are) some practical: (.) factors which can uh
xxx constrain our- our choice of [(.) (quantum bit)
xxx I1: [oh ok]
xxx IS5: so=
xxx I1: =so this is,
xxx you said
xxx is a experimental study?
xxx IS5: ((nods)) yes.
xxx I1: so ↑how did (they) design (.) the experiment
xxx what are the (.) individual (.) variable
xxx dependent
xxx dependent variable↑
xxx IS5: yea
xxx this,
EXC like
EXC this uh: ((??))
EXC this is there apparatus
xxx I- I think=
xxx I1: =ok,=
xxx IS5: =yea
EXC but uh

EXC I'm not very uh:
EXC I don't know- (I don't) understand the experiment
EXC (well)
EXC like,
xxx I1: [ok]
xxx IS5: ((unclear)) ((pointing at page)) I just know (which is)
xxx trapped ion but I still have no idea how they
xxx uh
xxx do it in (.) practically=
xxx I1: =so is this the first paper that you read about
xxx trapped [ion and quantum bit?
xxx IS5: [yes
xxx [yes ((incomprehensible))
xxx I1: [((incomprehensible))((overlapping speech with IS5))
EXC IS5: (I'm just reading) some uh
EXC basic concept
EXC which can (let me know what to)- because I- I still
EXC uh
EXC I didn't know (what is) trapped ion either,
EXC before I read this- this paper so=
xxx I1: =ok=
xxx IS5: =so ↑now I just reading some (great) fundamental
6:00
xxx concepts >[so that I can understand (these things)<
xxx I1: [mhm
Xxx IS5: but as for uh how they (.) do the experiment
xxx I have to talk with professor
xxx I1: ok=
xxx IS5: =yup↑
xxx I1: [what is your result
xxx good result?
xxx or bad result↓
xxx IS5: good
xxx I1: [good result
xxx IS5: [good- g- this said
xxx mm:
xxx they- uh: they claim that they get high fidelity,
xxx compared with the ((incomprehensible))
xxx I1: what does that mean
xxx high fidelity ((laughs))
xxx IS5: high fideli-↑ ((raises hand to chin and thinks))
xxx uh: ((pushes up glasses))
xxx fidelity↑ is something like um
xxx when you have some uh input
xxx I1: mhm
xxx IS5: and you get the output,
xxx and you will compare them,
xxx I1: [mhm
xxx IS5: [to see the:

xxx if they are (.) same
xxx I1: ok
xxx IS5: yea
xxx I think [((incomprensible))
xxx I1: [whether the (.)
xxx input and output are identical or not?
xxx IS5: I don't know if-
EXC i-it shouldn't↑
EXC it should ↑not be identical
EXC it just (.) compared with what you- (.)
EXA uh ((hand gestures))
xxx (.1) because there will be some transformation↓
xxx I1: mhm
xxx IS5: uh in the: [((??))
xxx I1: [during the process
xxx [yea
xxx IS5: [yea
xxx so
xxx uh: (what is) high fidelity means?
xxx I (.) don't know (it) very well,
xxx I1: m[hm ((leans in))
xxx IS5: [but
xxx (.2) hhh (.)
xxx so you know the
xxx the meaning of this (.) ↓word
xxx I1: mm: (.2)
xxx not really= ((laughs))
xxx IS5: =I mean:
xxx ((incomprehensible))
xxx ((turns to laptop and begins typing and mumbles))
xxx but because
xxx uh
xxx ((continues typing from 7:17-7:35 while mumbling))
xxx ((lifts laptop and shows I1))
xxx I1: ((reads page)) ok
xxx yea I know the:°
xxx (↑social meaning uh the) ((mummering))°
xxx ↑oh: cool
EXA IS5: but- but- it pr- I mean ((stammers))
xxx (really um impractical↓)=
xxx I1: =mhm
xxx IS5: ((incomprehensible))
xxx uh
xxx ((opens packet)) this paper ((incomprehensible)),
xxx I1: mhm
xxx IS5: ((8:00-8:08 incomprehensible))
xxx the definition of fidelity is that
xxx um (.1)
xxx the overlap of the quantum state

xxx so
xxx >((incomprehensible))< we have different definition
xxx but we just use the same name
xxx so
xxx actually
xxx I'm not-
xxx I don't know like what to-=
xxx I1: =very ↑interesting argument
xxx title (varies) gates, memory,
xxx IS5: yea
xxx preparation gates memory and [readouts
xxx I1: [and readouts
xxx IS5: it's the-
xxx it's the-
xxx I1: [(looks like something that's(.))
xxx IS5: [it's the pr- operation=
xxx I1: =like a machine↑ or something
xxx IS5: yea
xxx prepara↑tion is ((??)) as an input
xxx I1: [oh:
xxx IS5: [and the gates is like
xxx u:m
xxx like transformation
xxx [like
xxx I1: [uh-huh
xxx IS5: uh for: (the) classical things
xxx we
xxx like
xxx if you- you input zero,
xxx and you want to get one
xxx I1: [right
xxx IS5: [you use (not) gate
xxx right=
xxx I1: =yes
xxx IS5: so
xxx same here
xxx we have quantum gate here (.1) yea
xxx I1: mhm
xxx IS5: and memory,
xxx memory
9:00
xxx ((grabs paper)) here's the sample
xxx I still- I haven't read this paper
xxx I1: (.1)[wow
xxx IS5: [but
xxx I1: so many papers ((laughs))
xxx IS5: ↑a:nd
xxx the readout is (outputting) what [you (think)
xxx I1: [ah: ok]

xxx yea
xxx huh?
xxx ↑(so in- in terms of (.) like)
xxx machine↑ processing
xxx (I ↑think I ↑get [it
xxx IS5: [because uh:↑
xxx this is what we want to do to make
xxx uh
xxx so the- s- so the (.1)
xxx big picture of all the
xxx all the ultimate [goal is to make quantum computer
xxx I1: [uhuh
xxx oh:
xxx cool
xxx what is go-
xxx w-what is the advantage of a quantum computer↓
xxx like what [can we
xxx IS5: [fast
xxx I1: fast
xxx IS5: and
xxx uh:
xxx ((leans towards computer))
xxx (I ↑noticed that) ((incomprehensible)) (English name
xxx I can find it) ((begins typing))
xxx I1: ok,
xxx ((IS5 typing))
xxx IS5: yea
xxx the: (computation)
xxx the
xxx I1: ((leans forward to see screen)) oh:↑↓
xxx ok
xxx IS5: this one°
xxx yea°
Xxx I1: (the importation)?
Xxx IS5: yea
xxx ((mumbles))°
xxx I1: so it's more secure
xxx IS5: ((nods)) yea°
xxx I1: more secure and more fast
xxx IS5: (yea but)
xxx it's so hard to make it.
xxx I1: why?
xxx what was the problem (.) of making it
xxx IS5: first we cannot make
EXC ((stammers))
EXC we can't-,
xxx we are trying to know truth of <u>good</u> quantum bit
xxx I1: mhm
xxx IS5: (candidates right)

xxx and it’s hard to (.) make it (elastic)
xxx to get stable (and) last it for [a long time
xxx I1: [ok
xxx IS5: so (.) yea
xxx I1: (.2) [hhh
xxx IS5: [it’s still in the (.) very very-
xxx I-° I think it’s in the very beginning=
xxx I1: =uh-huh
xxx the beginning stage
xxx IS5: yea but
xxx I1: so it won’t be ready in (.1)
xxx before 2020
xxx IS5: 2020?
xxx you mean two-oh-two-oh?
xxx I1: two-oh-two-oh=
xxx IS5: =of course
xxx it’s impossible
xxx yea
xxx ((incomprehensible)) I think 100 years
xxx I1: oh ↑really↓
xxx IS5: I think so
xxx because
xxx I1: [why↑!
xxx IS5: [we have so much tech- technical problems and
xxx I1: what is the technical problem (that we face)?
xxx IS5: like- like first
xxx we still
EXC w-we still don’t
EXC w-we are still talking about how to (.) uh
xxx talking about the- the ((incomprehensible))
xxx ((pointing at page)) because this is the <u>way</u> we
xxx trying to
xxx I1: mhm
xxx IS5: implement (.) [((incomprehensible))
xxx I1: [so ↑for this experiment↓
xxx we can get <u>good</u> candidates of quantum bit?
xxx IS5: mhm
xxx ((looks at I1 waiting for her to continue)) what-
xxx I1: [is that what this means?
xxx IS5: u- yea
xxx I just say it’s like (.) [w-
xxx I1: [so if something is higher fidelity
xxx if the quantum bit has very high fidelity,
xxx does that mean that ((incomprehe[nsible))
xxx IS5: [it’s-
xxx for ↑that it is uh:::
xxx one factor that we uh: we evaluate
xxx I1: ok
xxx IS5: the candidate

xxx but there are some other (.)
xxx I1: ah
xxx IS5: factors of, ((mumbles, incomprehensible))↑
xxx ((mumbles and thinks))
xxx hhh
xxx I can't remember
xxx I1: ((leans forward to look at paper))
xxx IS5: but yea
xxx this is just one example there are a lot of
xxx other practical (.) considerations
xxx I1: mhm↑
xxx [ok
xxx IS5: [ok
xxx I1: and ion trap is- trapping-
xxx trapped ion is just one way to [f:igure out
xxx IS5: [yea
xxx it's just uh: one implement=
xxx I1: =↑cool
xxx IS5: [((incomprehensible)) (you can use three or four times)
xxx I1: ↑what is the measurement?=
xxx IS5: =what do you mean?=
xxx I1: =of doing this ((looks through paper))
12:00
xxx never mind
xxx I'm just asking very general (.) scientific terms
xxx ((laughs))
xxx IS5: I don't-
xxx I still don't know this one very well.
xxx I1: oh! can I ask you a question,
xxx what do people↑
xxx um:
xxx what ↑software do people use in physics world when
xxx they are trying to make graphs of this°
xxx IS5: you mean to make plots?
xxx I1: ((nods)) mhm↑
xxx IS5: uh:↑
xxx we use different softwares I think if you-=
xxx I1: =you don't use excel
xxx right?
xxx IS5: uh:
xxx I1: [sometimes
xxx IS5: [some- s- sometimes we use excel
xxx I1: uhuh
xxx IS5: but-
xxx but like for high-
xxx for high-
xxx for high energy experiments we use
xxx ((incomprehensible)) which is the (.)
xxx different masses framework of designed by CERN=

xxx I1: =wow
xxx IS5: [you know CERN?
xxx the ((incomprehensible))
xxx the institute in Europe
xxx (C-E-R)
xxx >ok you don't know it's ok<
xxx I1: ((smiles sheepishly and laughs))
xxx IS5: but for:
xxx I don't know what they use for ((incomprehensible))
xxx this is too new for me
xxx I1: do we have those kind of softwares in Stony Brook?
xxx are they free software,
xxx or they are you have to buy them
xxx IS5: um
xxx for ↑((incomprehensible))
xxx it is
xxx I ↑think it's free=
xxx I1: =it's free
xxx so everybody can have access to it. ((nods))
xxx IS5: yes but
xxx but I mean-
xxx people never (.) use (root) out of um
xxx outside of the kind of experiments
xxx I1: oh: ok
xxx IS5: [because they have like
xxx I1: [so it's very spe↑cific
xxx IS5: yea
xxx I1: just for this
xxx IS5: yea
xxx I1: few ((nods))
xxx [cool
xxx IS5: [there's no need to use it
xxx like
xxx it's complicated and you will
xxx you will have to know (it is and uh:)
xxx how to make program
xxx I1: mm:
xxx IS5: so:
xxx but you know
xxx uh in daily life
xxx excel or (origin) are enough
xxx I1: ((nods and laughs))
xxx IS5: don't need to use root
xxx I1: powerpoint (enough)
xxx ((leans towards paper))
xxx cool!
xxx so what other questions are you going to ask your
xxx professor tomorrow
xxx IS5: mm:

xxx too many questions I-
xxx I1: ((laughs))
xxx IS5: yea° ((laughing))
xxx first is what do we- what we are trying to talk,
xxx I1: [ok
xxx IS5: [and: uh
xxx like uh
xxx I want
xxx I have to ask about the (apparatus),
xxx [how they do the experiments,
xxx I1: [mhm
xxx IS5: yea and there are some (.1)
xxx that is a two way: problem question I'm gonna (.) ↑ask
xxx I1: ((nods and twiddles thumbs))
xxx ok.
xxx do you bring a handout?
xxx when you meet with your professor?=
xxx IS5: =yea.
xxx I1: ok
xxx do you have the (outline) yet?
xxx IS5: ((whispers)) I plan to make it°
xxx I1: ((laughs))
xxx good luck then
xxx IS5: yea because,
xxx yea
xxx I'm
xxx but I
xxx I still don't know how they do it like
xxx uh in ↑this part (.)
xxx this one they have a: introduction of the:
xxx the trapped ion
xxx what (a) trapped ion is
xxx I1: ((slowly grabs paper))
xxx ((unclear)) computers
xxx physical realization
xxx IS5: uh here:
xxx oh sorry this is not- ((flips pages))
xxx oh in <u>this</u> one
xxx we have the- but ↑this is a book
xxx (this is a one [chapter book)
xxx I1: [((incomprehensible))
xxx IS5: [it is that?
xxx I1: [ah no
xxx that's just a quote
xxx I thought that was the author
xxx IS5: this
xxx (the) ↑author is… is (.2) ((incomprehensible))
xxx but ((incomprehensible))
15:00

xxx this is a one to- ↑topic↓
xxx or one chapter of the (.) book
xxx I1: ((flips through paper))
xxx ((reading from paper)) conditions for quantum
xxx computation,
xxx (square), ((incomprehensible)) ((seems confused))
xxx IS5: [you can read it
xxx (it's quantum bit)
xxx I1: oh:
xxx oh! because of quantum (.1)
xxx (cubits)
xxx I learned a new term
xxx IS5: ((laughs))
xxx I1: ((continues reading)) separation of ((attempts to
xxx read))
xxx ((incomprehensible))
xxx IS5: yea
xxx this is the
xxx like
xxx the preparation
xxx I1: ↑oh:
xxx the ↑input
xxx IS5: yes the input
xxx I1: ((continues skimming paper))
xxx cool↑
xxx measurement of output=
xxx IS5: =((incomprehensible))
xxx I1: ((nods head))
xxx ((reading paper)) (harmonic)
xxx IS5: uh::
xxx yea
xxx this is[:
xxx I1: [oscillator
xxx I ↑know oscillator
xxx it means ((draws wave with finger in air)) regular
xxx wave forms↑
xxx IS5: yea
xxx like
xxx if you- if you have a
xxx a spring?
xxx I1: yea
xxx ah: ok
xxx cool
xxx ((continues reading and laughs))
xxx formulas
xxx ((laughs and continues to read paper))
xxx IS5: ((laughs))