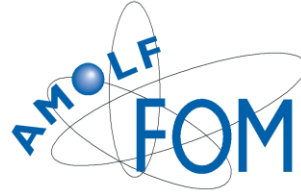


Dispersion and Scattering of Plasmon Particle Chains

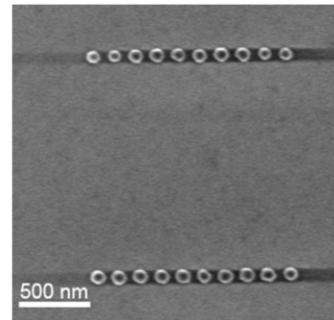
Femius Koenderink

Center for Nanophotonics
FOM Institute AMOLF
Amsterdam



René de Waele
Bart Noordam
Albert Polman

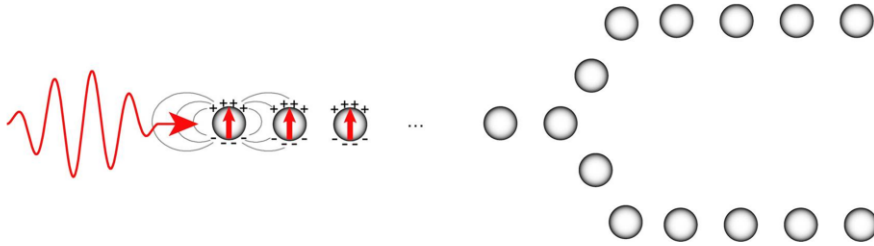
Auburn
Jesus Hernandez
Francis Robicheaux



Note on each slide the lower red band that is in the master slide.
That red band prevents the presenter from putting information there.
Information that would be invisible to people sitting in the back rows.
Font size of two-line titles differ from font size of single-line title.

Plasmon nanoparticle chains

Dipole coupling for electromagnetic transport
on sub-wavelength scale

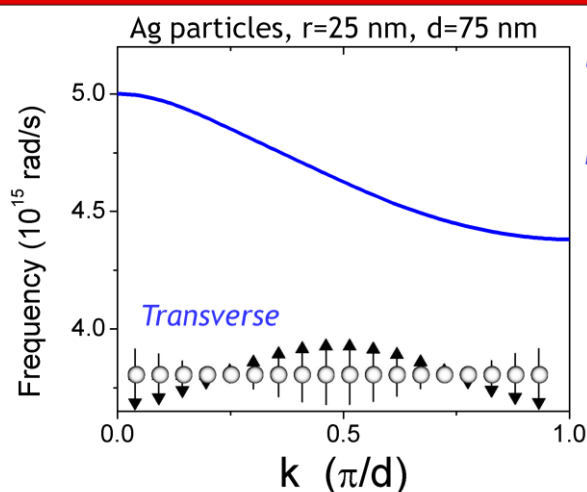


Plasmon particles: large polarizability
lithographic fabrication

Uni Graz, Austria: Quinten et al. Opt. Lett. **23**, 1331 (1998);
Caltech: Brongersma et al., PRB **62**, 16356 (2000)

The talk was allotted only 12 minutes. For this reason there is no outline slide.
Fonts are of excellent. Sketches are clear and not busy.

Quasistatic approximation



If Spacing $d \ll \lambda$

Electrostatics $E \propto \frac{p}{d^3}$

Only one graph/figure per slide. Very good.

The blue curve is thick enough to stand out.

Happily there are two x- and y-axes, which clearly separates the figure from the rest.

Formula's are not done with MS Word equation

editor or MathType equation editor, but

are done with the superior Tex/TexPoint combination.

TexPoint has been developed starting in 2000

by George Necula (University of California at Berkeley).

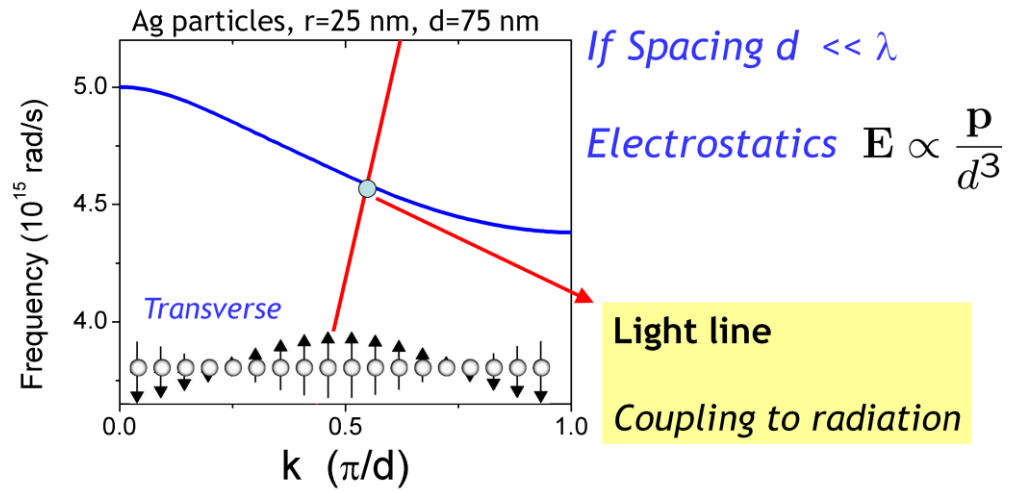
A few years later, Andreas Glatz (Argonne National Laboratory)

joined the team. <http://texpoint.necula.org/index.html>

Older versions were freeware for academic institutions, but now you have to buy a license.

One minor remark: I would have put tickmarks on the right y-axis.

Quasistatic approximation

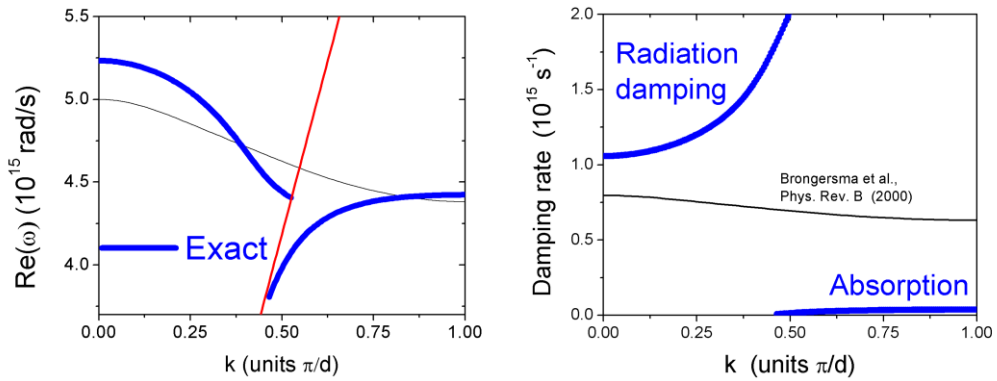


Weber & Ford, PRB **70**, 125429 (2004)
Citrin, Opt Lett. **31**, 98 (2006)

Same remarks as previous slide.

The yellow box is not really necessary.

Exact dispersion relation



Include retardation, radiation & ohmic damping

- Lower branch: loss time > 100 optical periods.
- Loss length > $10 \mu\text{m}$

Koenderink & Polman, cond-mat/0512187

Left figure is excellent. Right figure also very good.

Figures very well aligned.

Italic part in title not necessary

Why is the polariton anticrossing a surprise ?

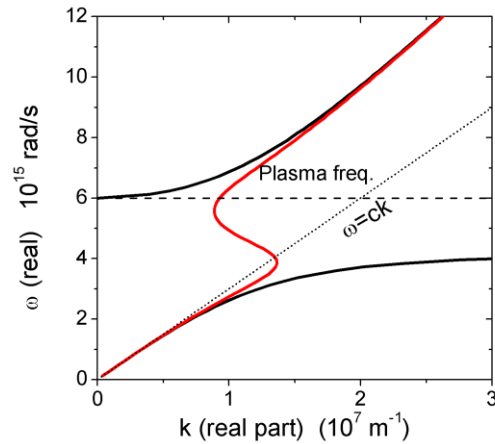
Classical example:
Polariton in Drude material

Loss: S-curve, no splitting
Damping length

Surprise: splitting with loss

*Dispersion relation with
loss time not loss length*

Barker & Loudon, Rev. Mod. Phys. 44 (1972)



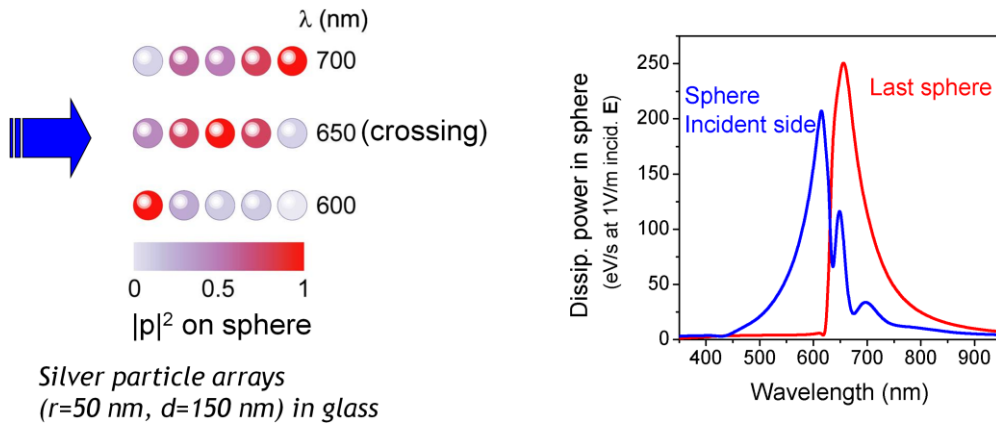
Right figure is excellent, apart from the too thin dotted line.

Box with black thin lines around blue text is superfluous.

Meaning of color code of text is not clear. Font sizes are excellent.

The second line in the title should have had a few words of the first line, to make it more balanced.

Optical response near avoided crossing



Arrays from 5 to 20 particles:
Nanoscale tunable field concentration

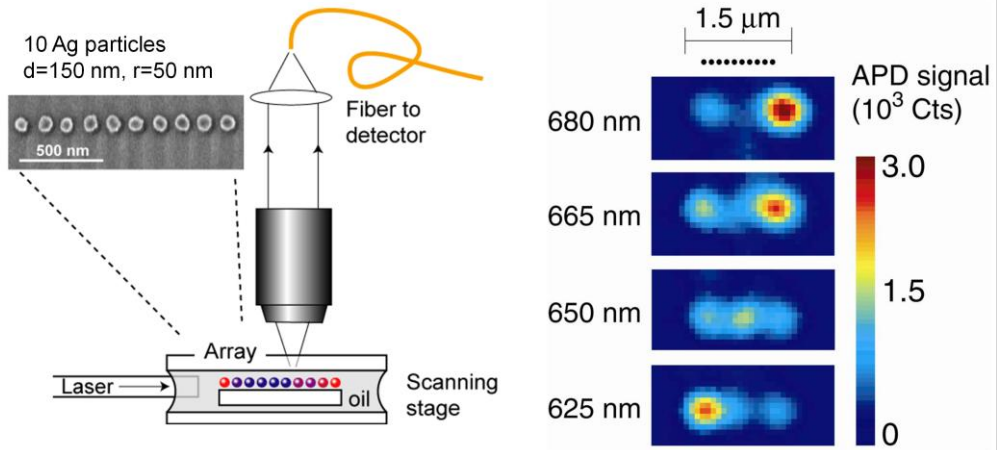
Very nice figure on the right.

Very nice sketch on the left (excellent proportions).

Left blue arrow a little ugly.

Font sizes excellent.

Tunable field concentration



Confocal microscopy + side illumination

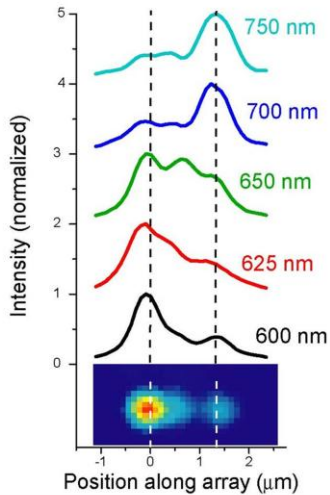
Very clear figures (two is enough).

The two-dimensional map on the right has a scale (very good) that is not arbitrary (brilliant).

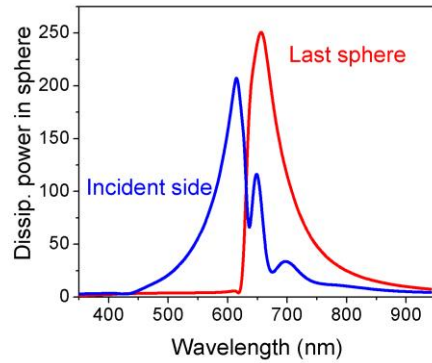
Fonts perfect.

Tunable energy concentration

Experiment -cross cuts



Calculation



Good agreement between measurement and theory on position of crossing point

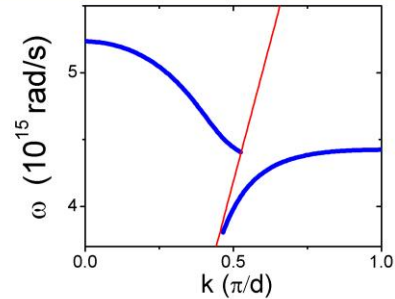
Excellent color coding in left figure.
Excellent thickness of colored curves.
Excellent vertical shifting.
Perfect figure.
Right side also very good.
Italic font in figure title not necessary.

Conclusions

1. Anticrossing dispersion relation

Increased bandwidth
reduced loss

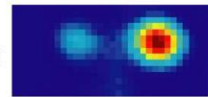
Sub- λ guide @ 10 μm loss length



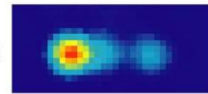
2. Tunable sub- λ localized power at unfocused driving

*Nano-sensors
Programmable lithography*

680 nm



625 nm



Conclusion slide is a little too busy. Figures on the right are not necessary.

Use of italic font is unclear.

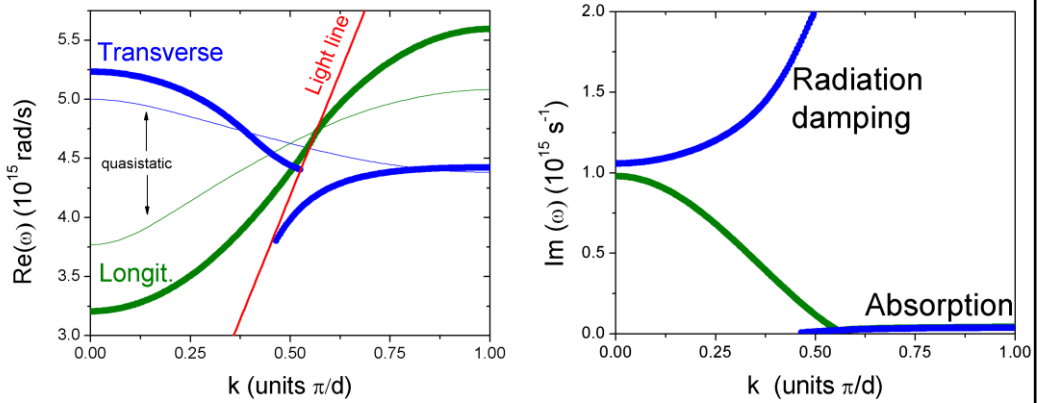
Happily only a few conclusions.

Excellent font sizes.

I do not like it (personal taste) when itemized lists are part of the title (as is the case here).

You can only see this if you have the powerpoint file.

Exact dispersion and loss



Longitudinal mode: retardation doubles bandwidth

This is a back-up slide in case somebody asks a technical question.
Very nice figures again.